

AN ENERGY EFFICIENT STREET LIGHTING SYSTEM

Project report submitted in partial fulfillment for the Degree of

Bachelor of Technology

In

Electronics and Communication Engineering

Under the supervision of

Ms. VANITA RANA

By

NEHA GUPTA 101005

SHUBHAM ARORA 101019

LOVEDEEP BANSAL 101021



May 2014

DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING
JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY,
WAKNAGHAT, SOLAN-173234,
HIMACHAL PRADESH



JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY,
(Established by H.P. State Legislature vide Act No. 14 of 2002)
P.O. Wagnaghat, Teh. Kandaghat, Distt. Solan – 173234 (H.P.) INDIA
Website: www.juit.ac.in

Certificate

This is to certify that project report entitled “An Energy Efficient Smart Street Lighting System”, submitted by Neha Gupta (101005), Shubham Arora (101019), Lovedeep Bansal (101021) in partial fulfillment for the award of degree of Bachelor of Technology in Electronics and Communication Engineering to Jaypee University of Information Technology, Wagnaghat, Solan has been carried out under my supervision.

This work has not been submitted partially or fully to any other University or Institute for the award of this or any other degree or diploma.

Date: 27/05/14


VANITA RANA

(Assistant Professor)

Acknowledgement

This project involved the collection and analysis of information from a wide variety sources and the efforts of many people beyond us. Thus it would not have been possible to achieve the results reported in this document without their help, support and encouragement.

We would like to especially thank Ms. **Vanita Rana**, Assistant Professor, JUIT for showing genuine concern and for being the guidance light in our project and building a strong platform for our future. We would also take this opportunity to thank her for taking out time from her busy schedule to provide us the basic skeleton frame work of the assignment. She has been a constant source of inspiration and motivation to us throughout our project. A special thanks

ABSTRACT

We started this project by realizing that a large amount of power is wasted meaninglessly in conventional street lighting system where street lights are on at regular intervals of time irrespective of the seasonal variations. The street lights are generally switched on in the evening and turned off in the morning. As energy consumption is an issue of increasing interest, possible energy savings in public street lighting systems are recently discussed from public viewpoints. So we started reading various IEEE papers [1. Automatic street light control using embedded system 2. Intelligent street light system using GSM] and came to the conclusion that we'll implement this project.

Initially we designed the basic block diagram for the project prototype. After that we focused on the software design and made the code in keil software burned the code successfully by making the basic microcontroller module. After the software design was tested, we moved on to the hardware part .Our hardware part comprised of two important modules a) vehicular detection and b) light intensity module. We studied the datasheets of all the components which would be used in the project and learned their components specifications, their voltage, and current ratings etc .After that we started implementing our hardware design. Once the design was completed on general purpose PCB, individually we tested each module and when we got correct results, we interfaced the modules with the microcontroller. The final stage was design fabrication, in which we used the card board and lighting module and made all the connections of lighting module with the microcontroller .Our project was tested and that worked properly.

Our work once implemented on a large scale can bring in significant reductions in the power consumption caused by street lights. This initiative will help the government to save the Energy and meet the domestic and industrial needs.

Signature of Student

Name *Shubham*
Date *27/05/14*

Signature of Supervisor

Vanita Rana
Date *27/05/14*

(i)

(I)
TALBLE OF CONTENTS

Chapter No.	Topics	Page No.
	Abstract	i
	List of Figures	ii
	List of Tables	iv
Chapter-1	INTRODUCTION	1
1.1	Problem definition	1
1.2	Objective	1
1.3	Thesis	1
Chapter-2	BLOCK DIAGRAM	3
2.1	Working	3
Chapter-3	HARDWARE DESCRIPTION	4
3.1.	Microcontroller	4
3.2	MAX-232	19
3.3	Light Dependent Resistors	21
3.4	IC-555	22
3.5.	Infrared Led Pair	23
3.6	LM-324	28
3.7	Voltage Regulator	30
3.8	BC 548	31
3.9	Voltage Supply Circuit	37
Chapter-4	SOFTWARE DESCRIPTION	43
4.1	Code	43
	Results	45
	Conclusion	47
	References	48

List of Figures

S.No.	Title	Page No.
1.	Block Diagram	3
2.	Microcontroller 8051 Pin Diagram	5
3.	8051 Internal Architecture	9
4.	EEPROM and RAM Memory	10
5.	I/P and O/P Port Connections	13
6.	Oscillator	13
7.	Timers/Counters	14
8.	Brown out state	16
9.	Serial Communication	16
10.	MAX-232	19
11.	LDR	21
12.	IC 555	22
13.	Infrared LED Pairs	23
14.	Transmitter Circuit	24
15.	Complete Tx-Rx Circuit	26
16.	LM-324	28

(ii)

17. Voltage Regulator	30
18. BC 548	31
19. Diode	32
20. LED	34
21. Voltage Supply Circuit	37
22. Waveforms	37
23. Bridge Rectifier	38
24. Positive Half Cycle	39
25. Negative Half Cycle	39
26. Full Wave Rectifier	41
27. Interfacing of Microcontroller 8051 with Max232	45
28. Object Sensing Circuit	46
29. Day Night Detector	46

(iii)

List of Tables

S.No.	Title	Page No.
1.	Pin Description of MAX-232	13
2.	Pin Description of IC-555	19

CHAPTER 1

INTRODUCTION

Street lighting provides a safe night time environment for all road users including pedestrians. Researchers indicate that night-time vehicular accidents are significantly reduced by the provision of street lighting. It also helps to reduce the fear of crime, and encourages social inclusion by providing an environment in which people feel they can walk in hours of darkness. Providing street lighting is one of the most important and expensive responsibilities of a city. Lighting can account for 10–38% of the total energy bill in typical cities worldwide. Street lighting is a particularly critical concern for public authorities in developing countries because of its strategic importance for economic and social stability. Inefficient lighting wastes a large amount of financial resources each year, and poor lighting creates unsafe conditions.

1.1 Problem Definition

The aim of this project is to design Lighting control system that could minimize the reduction of energy consumption of the lighting without impeding comfort goals.

1.2 Objectives of Project

1. To understand how to interface light intensity module to the microcontroller unit.
2. To design a program that works together with the lighting module and sensor units.
3. To build the model of simple adaptive street lighting system that can overcome the problems of energy wastage.

1.3 Thesis Outline

Chapter 1 is the introduction to street light systems. This chapter also explains about project objectives and scopes and discuss about problem statement. In chapter 2, the working of the project is explained with the help of block diagram and chapter 3 will describe all the theory related to different components required for this project. It also includes hardware description of each hardware module. Chapter 4 and 5 focuses

on the system hardware & software implementation of street lighting control system. Finally, results and discussions regarding this project are presented in chapter 6 and conclusions and future recommendations about this project are presented in chapter 7.

CHAPTER -2

BLOCK DIAGRAM

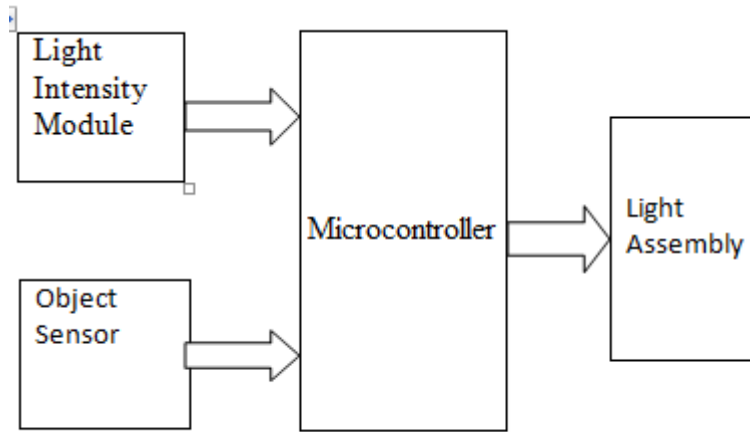


Figure- 1

2.1 WORKING

The working of this project is as follows:

There are two sensors used:

- i. Object Sensor-It detects the vehicular motion using the IR Receiver/Transmitter Pair. The analog output is then fed to LM 324 which functions as both comparator and A/D Converter thus converting the analog input to digital output .This output is then interfaced with Microcontroller.
- ii. Day Night Sensor-It detects the variations in natural light conditions using the LDR and according to that gives the output. This output is then interfaced with the Microcontroller

From the microcontroller the various outputs are then fed to the street lights assembly.

CHAPTER 3

HARDWARE DESCRIPTION

The hardware part of this project is Object Sensor, Day Night Detection, Power Supply, a street light model and pairs of Infra-Red Sensors. The one way lane street light model was constructed to display how this street light system is running. This street light model has a complete set of lights which are white LED'S. The lane also has sensors on the road. The sensors are placed on the lane to detect the presence of a car.

The junction is developed using Paper Board, Screws, Light Emitting Diodes and Resistors. In order to display the simulation of the street light system, the lane has a set of LED'S lights which changes from off state to on state whenever there is detection of vehicle .The lane also has IR sensor on sideway of the road. The sensors are placed to detect the cars through that lane. Four infra-red sensors (detectors) are placed on the lane . These sensors are connected to the Microcontroller which counts the pulses coming from the sensors.

3.1 MICROCONTROLLER

A microcontroller (sometimes abbreviated **μC**, **uC** or **MCU**) is a small computer on a single integrated circuit containing a processor core, memory, and programmable input output peripherals. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it to digital control even more devices and processes. Mixed signal microcontrollers are common, integrating analog components needed to control non-digital electronic systems.

Some embedded systems are very sophisticated; many have minimal requirements for memory and program length, with no operating system and low software. Typical input and output devices include switches, relays, solenoids, LEDs, small or custom LCD displays, radio frequency devices, and sensors for data such as

temperature, humidity, light level etc. Embedded systems usually have no keyboard, screen, disks, printers, or other recognizable I/O devices of a personal computer, and may lack human interaction devices of any kind.

The Intel 8051 microcontroller is one of the most popular general purpose microcontrollers used today. The success of the Intel 8051 spawned a number of clones which are collectively referred to as the MCS-51 family of microcontrollers, which includes chips from vendors such as Atmel, Philips, Infineon, and Texas Instruments.

3.1(A) 8051 PIN DIAGRAM

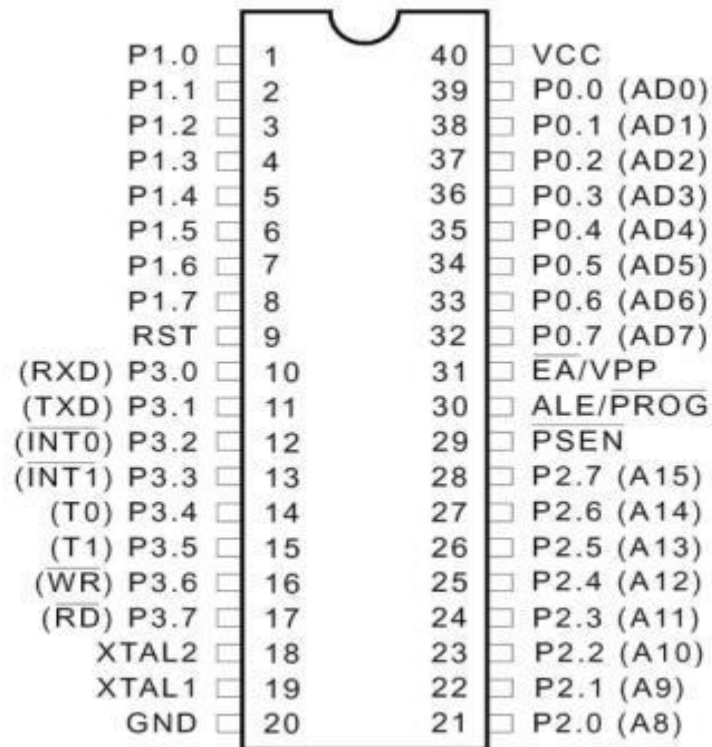


Figure-2

Basic Pins:-

PIN 9: PIN 9 is the reset pin which is used to reset the microcontroller's internal registers and ports upon starting up.

PINS 18 & 19: The 8051 has a built-in oscillator amplifier hence we need to only connect a crystal at these pins to provide clock pulses to the circuit.

PIN 40 and 20: Pins 40 and 20 are VCC and ground respectively. The 8051 chip needs +5V 500mA to function properly.

PINS 29, 30 & 31: If external memory is connected then PIN 31, also called EA/VPP, should be connected to ground to indicate the presence of external memory. PIN 30 is called ALE (address latch enable), which is used when multiple memory chips are connected to the controller and only one of them needs to be selected. PIN 29 is called PSEN. This is "program store enable". In order to use the external memory it is required to provide the low voltage (0) on both PSEN and EA pins.

PORTS:-

There are 4 8-bit ports: P0, P1, P2 and P3.

PORT P1 (Pins 1 to 8): PORT P1 is a general purpose input/output port which can be used for a variety of interfacing tasks

PORT P3 (Pins 10 to 17): PORT P3 acts as a normal IO port, but Port P3 has additional functions such as, serial transmit and receive pins, 2 external interrupt pins, 2 external counter inputs, read and write pins for memory access.

PORT P2 (pins 21 to 28): PORT P2 can also be used as a general purpose 8 bit port when no external memory is present, but if external memory access is required then PORT P2 will act as an address bus in conjunction with PORT P0 to access external memory.

PORT P0 (pins 32 to 39): PORT P0 can be used as a general purpose 8 bit port when no external memory is present, but if external memory access is required then PORT P0 acts as a multiplexed address and data bus can be used to access external memory in conjunction with PORT P2.

Crystal oscillator

A crystal oscillator is an electronic oscillator circuit which uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time (as in quartz wristwatches), to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits incorporating them became known as crystal oscillators, but other piezoelectric materials including polycrystalline ceramics are used in similar circuits.

Quartz crystals are manufactured for frequencies from a few tens of kilohertz to tens of megahertz. More than two billion crystals are manufactured annually. Most are used for consumer devices such as wristwatches, clocks, radios, computers, and cell phones. Quartz crystals are also found inside test and measurement equipment, such as counters, signal generators, and oscilloscopes.

Advantages over Hartley and Colpitts oscillator:

Stable at high frequencies.

High Frequency response

Good resonance

Sip resistor

SIP means 'single in-line package', so it is a pack of several resistors, often with one end common. The connections are a series of pins like one side of a DIP (dual in-line package) as often seen in integrated circuits. The resistors may be used for a variety of purposes, like bus terminators, resistor ladder networks, pull-ups or pull-downs, but usually in microcontroller boards.

HOW DOES THE MICROCONTROLLER OPERATE?

Even though there is a large number of different types of microcontrollers and even more programs created for their use only, all of them have many things in common. Thus, if you learn to handle one of them you will be able to handle them all. A typical scenario on the basis of which it all functions is as follows:

Power supply is turned off and everything is still...the program is loaded into the microcontroller, nothing indicates what is about to come...

Power supply is turned on and everything starts to happen at high speed! The control logic unit keeps everything under control. It disables all other circuits except quartz crystal to operate. While the preparations are in progress, the first milliseconds go by. Power supply voltage reaches its maximum and oscillator frequency becomes stable. SFRs are being filled with bits reflecting the state of all circuits within microcontroller. All pins are configured as inputs. The overall electronics starts operation in rhythm with pulse sequence. From now on the time is measured in micro and nanoseconds.

Program Counter is set to zero. Instruction from that address is sent to instruction decoder which recognizes it, after which it is executed with immediate effect. The value of the Program Counter is incremented by 1 and the whole process is repeated...several million times per second.

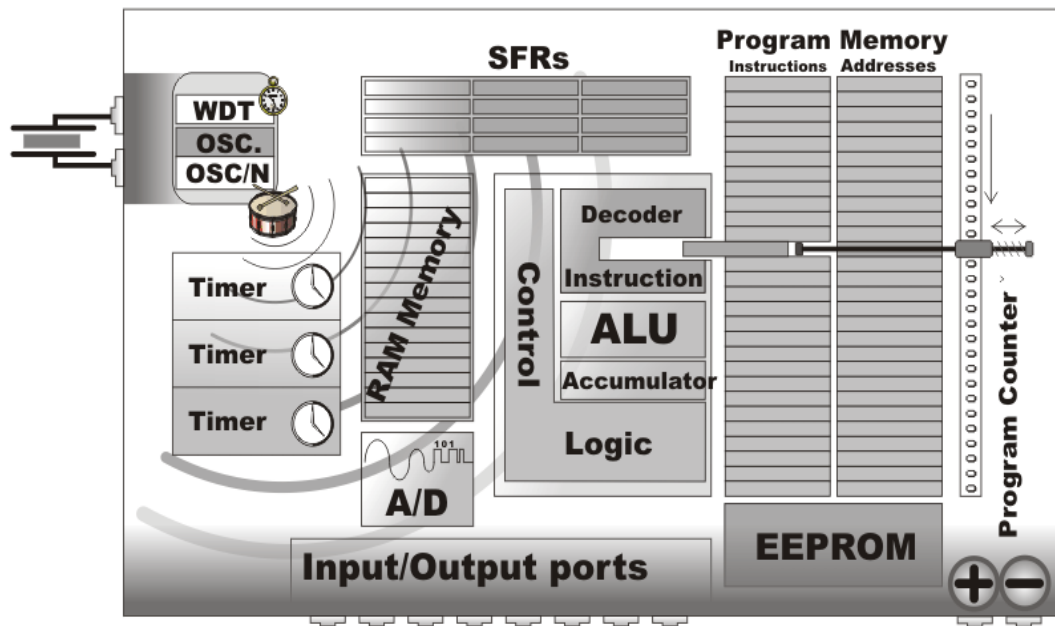


Figure-3

WHAT IS IN THE MICROCONTROLLER?

As you can see, all the operations within the microcontroller are performed at high speed and quite simply, but the microcontroller itself would not be so useful if there are not special circuits which make it complete.

I. Read Only Memory (ROM)

Read Only Memory (ROM) is a type of memory used to permanently save the program being executed. The size of the program that can be written depends on the size of this memory. ROM can be built in the microcontroller or added as an external chip, which depends on the type of the microcontroller. Both options have some disadvantages. If ROM is added as an external chip, the microcontroller is cheaper and the program can be considerably longer. At the same time, a number of available pins is reduced as the microcontroller uses its own input/output ports for connection to the chip. The internal ROM is usually smaller and more expensive, but leaves more pins available for connecting to peripheral environment.

II. Random Access Memory (RAM)

Random Access Memory (RAM) is a type of memory used for temporary storing data and intermediate results created and used during the operation of the microcontrollers.

The content of this memory is cleared once the power supply is off. For example, if the program performs an addition, it is necessary to have a register standing for what in everyday life is called the “sum”. For that purpose, one of the registers in RAM is called the "sum" and used for storing results of addition. The size of RAM goes up to a few KBs.

III. Electrically Erasable Programmable ROM (EEPROM)

The EEPROM is a special type of memory not contained in all microcontrollers. Its contents may be changed during program execution (similar to RAM), but remains permanently saved even after the loss of power (similar to ROM). It is often used to store values, created and used during operation (such as calibration values, codes, values to count up to etc.), which must be saved after turning the power supply off. A disadvantage of this memory is that the process of programming is relatively slow. It is measured in milliseconds (ms).

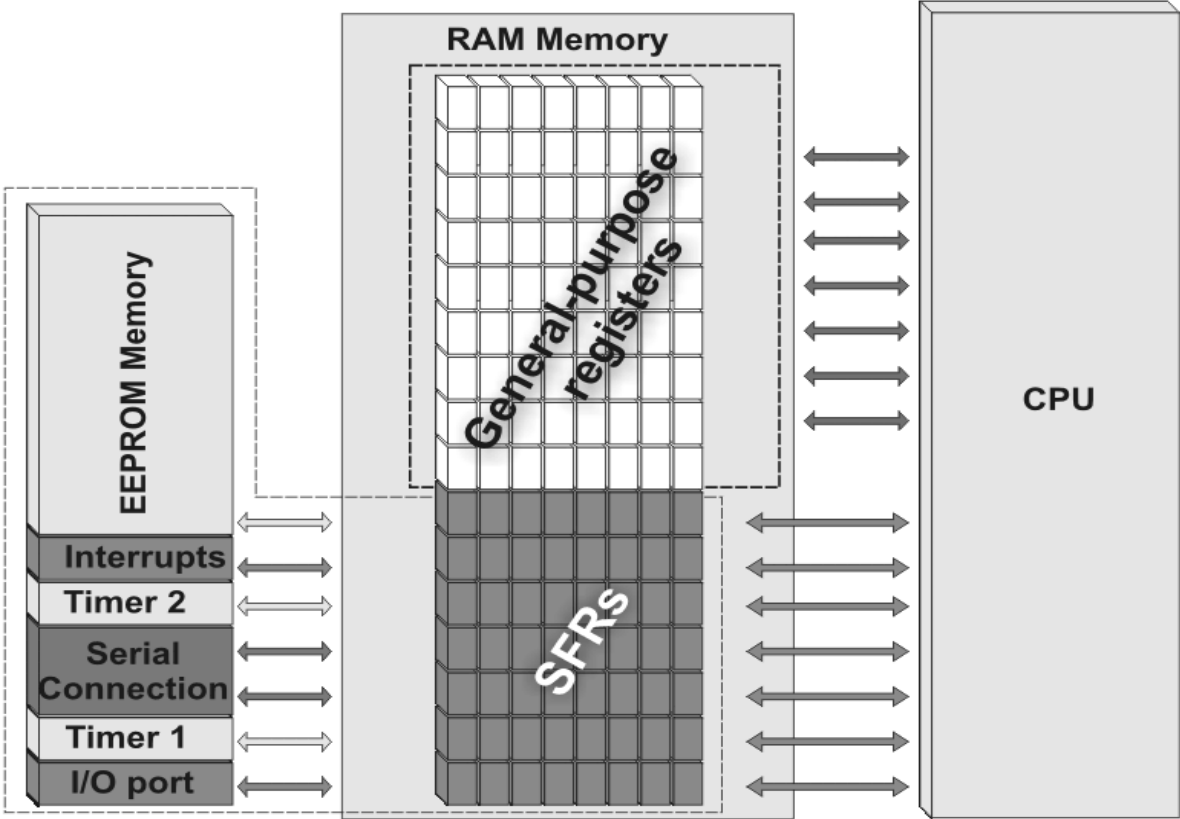


Figure- 4

IV. Special Function Registers (SFR)

Special function registers are part of RAM memory. Their purpose is predefined by the manufacturer and cannot be changed thereafter. Since their bits are physically connected to particular circuits within the microcontroller, such as A/D converter, serial communication module etc., any change of their state directly affects the operation of the microcontroller or some of the circuits. For example, writing zero or one to the SFR controlling an input/output port causes the appropriate port pin to be configured as input or output. In other words, each bit of this register controls the function of one single pin.

V. Program Counter

Program Counter is an engine running the program and points to the memory address containing the next instruction to execute. After each instruction execution, the value of the counter is incremented by 1. For this reason, the program executes only one instruction at a time just as it is written. However...the value of the program counter can be changed at any moment, which causes a “jump” to a new memory location. This is how subroutines and branch instructions are executed. After jumping, the counter resumes even and monotonous automatic counting +1, +1, +1...

VI. Central Processor Unit (CPU)

As its name suggests, this is a unit which monitors and controls all processes within the microcontroller and the user cannot affect its work. It consists of several smaller subunits, of which the most important are:

- *Instruction decoder* is a part of the electronics which recognizes program instructions and runs other circuits on the basis of that. The abilities of this circuit are expressed in the "instruction set" which is different for each microcontroller family.
- *Arithmetical Logical Unit (ALU)* performs all mathematical and logical operations upon data.

- **Accumulator** is an SFR closely related to the operation of ALU. It is a kind of working desk used for storing all data upon which some operations should be executed (addition, shift etc.). It also stores the results ready for use in further processing. One of the SFRs, called the Status Register, is closely related to the accumulator, showing at any given time the "status" of a number stored in the accumulator (the number is greater or less than zero etc.).
 - A **bit** indicates whether the voltage is present on a conductor or not. If it is present, the appropriate pin is set to logic one (1), i.e. the bit's value is 1. Otherwise, if the voltage is 0 V, the appropriate pin is cleared (0), i.e. the bit's value is 0. It is more complicated in theory where a bit is referred to as a binary digit, but even in this case, its value can be either 0 or 1.
-
- **Input/output ports (I/O Ports)**
 - In order to make the microcontroller useful, it is necessary to connect it to peripheral devices. Each microcontroller has one or more registers (called a port) connected to the microcontroller pins.

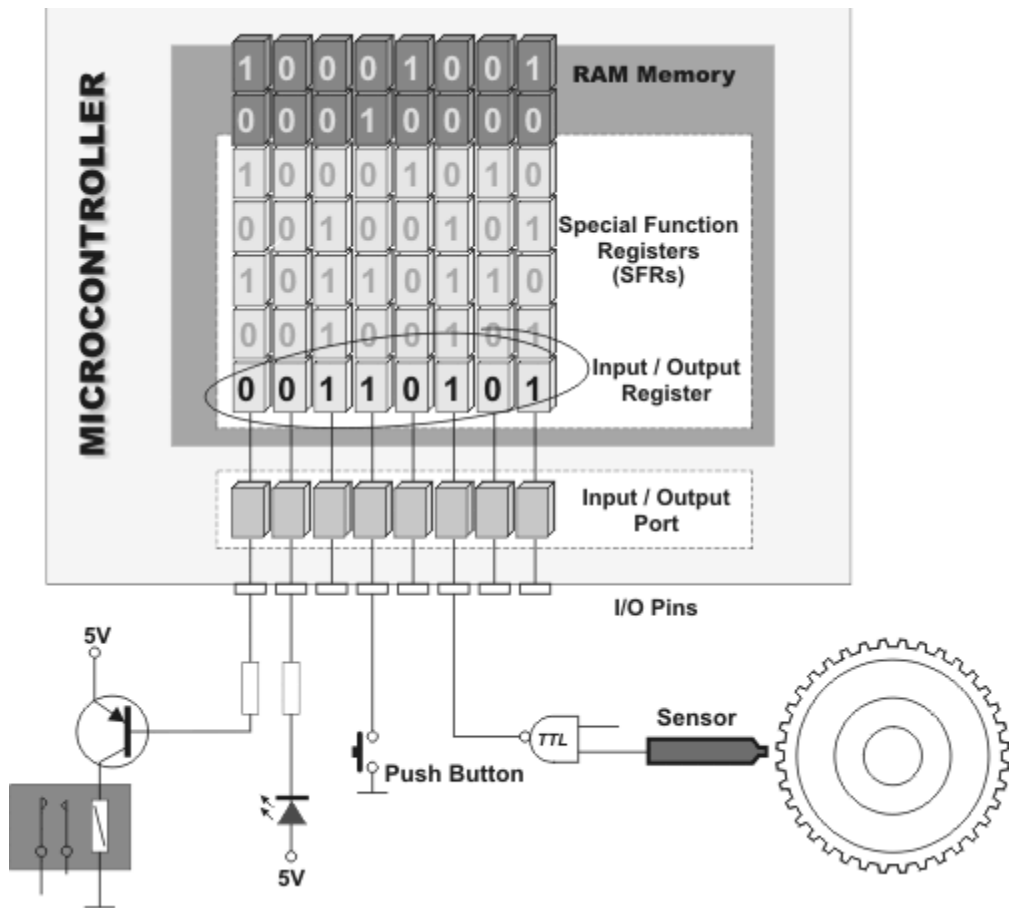


Figure- 5

- Why do we call them input/output ports? Because it is possible to change a pin function according to the user's needs. These registers are the only registers in the microcontroller the state of which can be checked by voltmeter!
- **Oscillator**

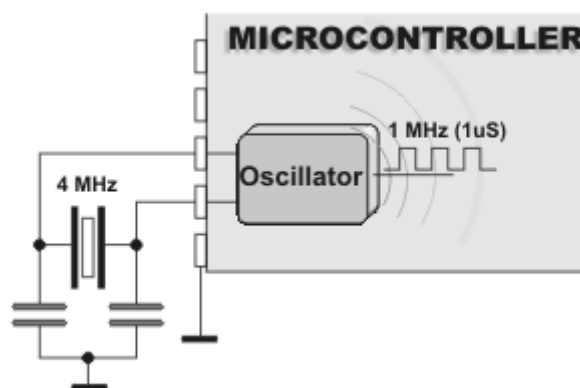


Figure- 6

- Even pulses generated by the oscillator enable harmonic and synchronous operation of all circuits within the microcontroller. It is usually configured as to use quartz-crystal or ceramics resonator for frequency stabilization. It can

also operate without elements for frequency stabilization (like RC oscillator). It is important to say that program instructions are not executed at the rate imposed by the oscillator itself, but several times slower. It happens because each instruction is executed in several steps. For some microcontrollers, the same number of cycles is needed to execute any instruction, while it's different for other microcontrollers. Accordingly, if the system uses quartz crystal with a frequency of 20MHz, the execution time of an instruction is not expected 50nS, but 200, 400 or even 800 nS, depending on the type of the microcontroller!

- **Timers/Counters**

- Most programs use these miniature electronic "stopwatches" in their operation. These are commonly 8- or 16-bit SFRs the contents of which is automatically incremented by each coming pulse. Once the register is completely loaded, an interrupt is generated!
- If these registers use an internal quartz oscillator as a clock source, then it is possible to measure the time between two events (if the register value is T1 at the moment measurement has started, and T2 at the moment it has finished, then the elapsed time is equal to the result of subtraction $T2 - T1$). If the registers use pulses coming from external source, then such a timer is turned into a counter.

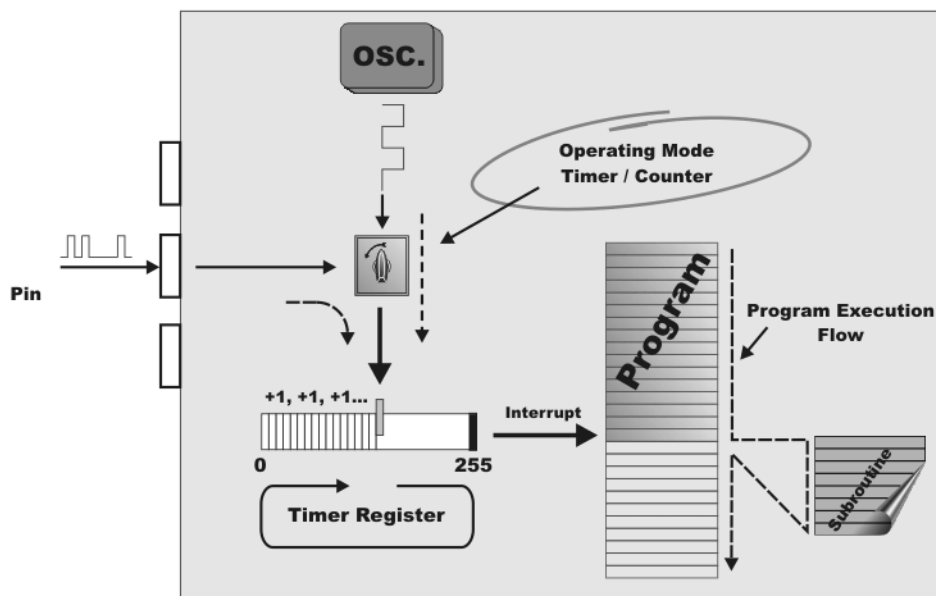


Figure- 7

A register or a memory cell is an electronic circuit which can memorize the state of one byte. Besides 8 bits available to the user, each register has also a number of addressing bits. It is important to remember that:

- All registers of ROM as well as those of RAM referred to as general-purpose registers are mutually equal and nameless. During programming, each of them can be assigned a name, which makes the whole operation much easier.
- All SFRs are assigned names which are different for different types of the microcontrollers and each of them has a special function as their name suggests.

Watchdog timer

The Watchdog Timer is a timer connected to a completely separate RC oscillator within the microcontroller.

If the watchdog timer is enabled, every time it counts up to the program end, the microcontroller reset occurs and program execution starts from the first instruction. The point is to prevent this from happening by using a special command. The whole idea is based on the fact that every program is executed in several longer or shorter loops.

If instructions resetting the watchdog timer are set at the appropriate program locations, besides commands being regularly executed, then the operation of the watchdog timer will not affect the program execution.

If for any reason (usually electrical noise in industry), the program counter "gets stuck" at some memory location from which there is no return, the watchdog will not be cleared, so the register's value being constantly incremented will reach the maximum .

Power Supply Circuit

There are two things worth attention concerning the microcontroller power supply circuit:

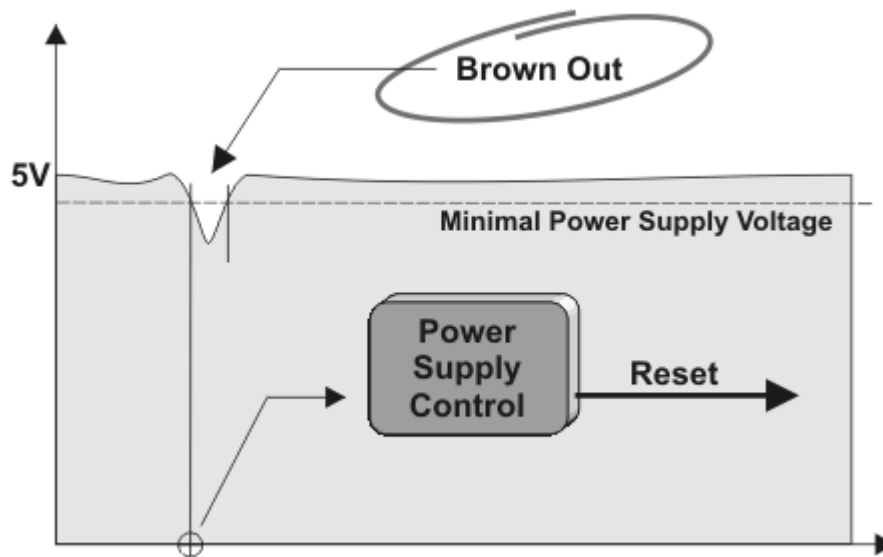


Figure- 8

Brown out is a potentially dangerous state which occurs at the moment the microcontroller is being turned off or when power supply voltage drops to the lowest level due to electric noise. As the microcontroller consists of several circuits which have different operating voltage levels, this can cause its out of control performance. In order to prevent it, the microcontroller usually has a circuit for brown out reset built-in. This circuit immediately resets the whole electronics when the voltage level drops below the lower limit.

Reset pin is usually referred to as Master Clear Reset (*MCLR*) and serves for external reset of the microcontroller by applying logic zero (0) or one (1) depending on the type of the microcontroller. In case the brown out is not built in the microcontroller, a simple external circuit for brown out reset can be connected to this pin.

Serial communication

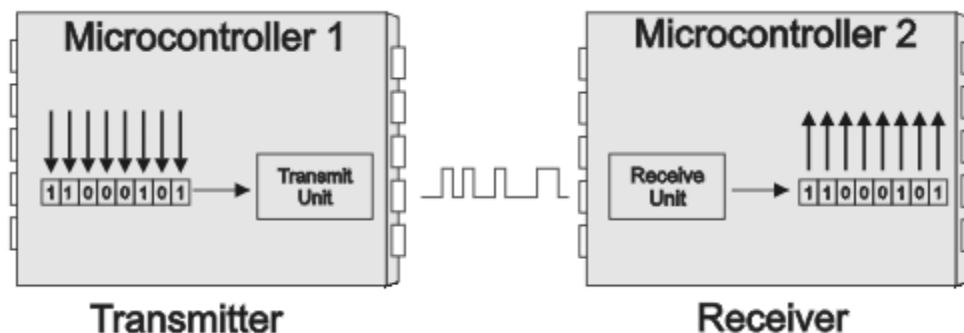


Figure- 9

Parallel connections between the microcontroller and peripherals established over I/O ports are the ideal solution for shorter distances up to several meters. However, in other cases, when it is necessary to establish communication between two devices on longer distances it is obviously not possible to use parallel connections. Then, serial communication is the best solution.

Today, most microcontrollers have several different systems for serial communication built in as a standard equipment. Which of them will be used depends on many factors of which the most important are:

- How many devices the microcontroller has to exchange data with?
- How fast the data exchange has to be?
- What is the distance between devices?
- Is it necessary to send and receive data simultaneously?

One of the most important things concerning serial communication is the Protocol which should be strictly observed. It is a set of rules which must be applied in order that devices can correctly interpret data they mutually exchange. Fortunately, the microcontrollers automatically take care of this, so the work of the programmer/user is reduced to a simple write (data to be sent) and read (received data).

A byte consists of 8 bits grouped together. If a bit is a digit then it is logical that bytes are numbers. All mathematical operations can be performed upon them, just like upon common decimal numbers, which is carried out in the ALU. It is important to remember that byte digits are not of equal significance. The largest value has the leftmost bit called the most significant bit (MSB). The rightmost bit has the least value and is therefore called the least significant bit (LSB). Since 8 digits (zeros and ones) of one byte can be combined in 256 different ways, the largest decimal number which can be represented by one byte is 255 (one combination represents zero).

Program

Unlike other integrated circuits which only need to be connected to other components and turn the power supply on, the microcontrollers need to be programmed first. This is a so called "bitter pill" and the main reason why hardware-oriented electronics engineers stay away from microcontrollers. It is a trap causing huge losses because the process of programming the microcontroller is basically very simple.

In order to write a program for the microcontroller, several "low-level" programming languages can be used such as Assembly, C and Basic (and their versions as well). Writing program procedure consists of simple writing instructions in the order in which they should be executed. There are also many programs running in Windows environment used to facilitate the work providing additional visual tools.

Interrupt - electronics is usually faster than physical processes it should keep under control. This is why the microcontroller spends most of its time waiting for something to happen or execute. In other words, when some event takes place, the microcontroller does something. In order to prevent the microcontroller from spending most of its time endlessly checking for logic state on input pins and registers, an interrupt is generated. It is the signal which informs the central processor that something attention worthy has happened. As its name suggests, it interrupts regular program execution. It can be generated by different sources so when it occurs, the microcontroller immediately stops operation and checks for the cause. If it is needed to perform some operations, a current state of the program counter is pushed onto the Stack and the appropriate program is executed. It's the so called interrupt routine.

Stack is a part of RAM used for storing the current state of the program counter (address) when an interrupt occurs. In this way, after a subroutine or an interrupt execution, the microcontroller knows from where to continue regular program execution. This address is cleared after returning to the program because there is no need to save it any longer, and one location of the stack is automatically available for further use. This enables subroutines' nesting, i.e. calling one subroutine from another.

3.2 MAX-232

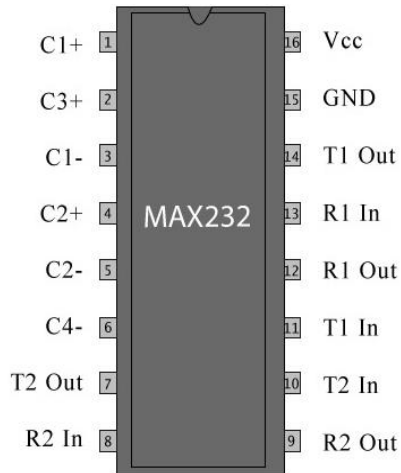


Figure- 10

The MAX232 is an IC that converts signals from RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case. The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 V TTL levels. These receivers have a typical threshold of 1.3 V, and a typical hysteresis of 0.5 V.

The MAX232 (A) has two receivers (converts from RS-232 to TTL voltage levels), and two drivers (converts from TTL logic to RS-232 voltage levels). This means only two of the RS-232 signals can be converted in each direction.

PIN DESCRIPTION OF MAX-232:-

Pin No	Function	Name
1	Capacitor connection pins	Capacitor 1 +
2		Capacitor 3 +
3		Capacitor 1 -
4		Capacitor 2 +
5		Capacitor 2 -
6		Capacitor 4 -
7	Output pin; outputs the serially transmitted data at RS232 logic level; connected to receiver pin of PC serial port	T ₂ Out
8	Input pin; receives serially transmitted data at RS 232 logic level; connected to transmitter pin of PC serial port	R ₂ In
9	Output pin; outputs the serially transmitted data at TTL logic level; connected to receiver pin of controller.	R ₂ Out
10	Input pins; receive the serial data at TTL logic level; connected to serial transmitter pin of controller.	T ₂ In
11		T ₁ In
12	Output pin; outputs the serially transmitted data at TTL logic level; connected to receiver pin of controller.	R ₁ Out
13	Input pin; receives serially transmitted data at RS 232 logic level; connected to transmitter pin of PC serial port	R ₁ In
14	Output pin; outputs the serially transmitted data at RS232 logic level; connected to receiver pin of PC serial port	T ₁ Out
15	Ground (0V)	Ground
16	Supply voltage; 5V (4.5V – 5.5V)	Vcc

3.3 LIGHT DEPENDENT RESISTORS

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.

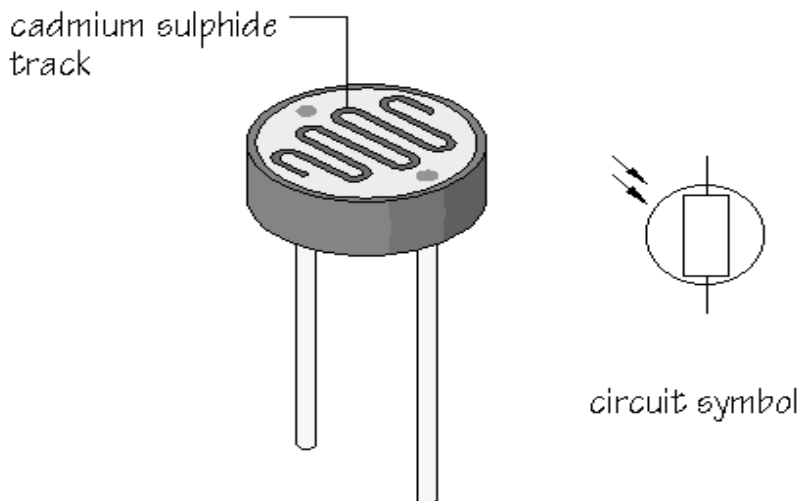


Figure- 11

3.3(A) WORKING:

An LDR is made of a high-resistance semiconductor. If light falling on the device is of high frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

A photoelectric device can be either intrinsic or extrinsic. In intrinsic devices, the only available electrons are in the valence band, and hence the photon must have enough energy to excite the electron across the entire bandgap. Extrinsic devices have impurities added, which have a ground state energy closer to the conduction band - since the electrons don't have as far to jump, lower energy photons (i.e. longer wavelengths and lower frequencies) are sufficient to trigger the device. When the light level is low the resistance of the LDR is high. This prevents current from flowing to the base of the transistors. Consequently the LED does not light.

However, when light shines onto the LDR its resistance falls and current flows into the base of the first transistor and then the second transistor. The LED lights.

The preset resistor can be turned up or down to increase or decrease resistance, in this way it can make the circuit more or less sensitive.

3.4 IC-555

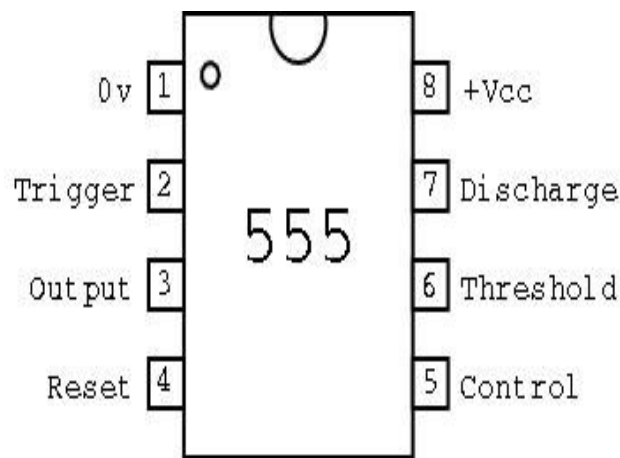


Figure- 12

The **555 timer IC** is an integrated circuit (chip) used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays, as an oscillator, and as a flip-flop element. Depending on the manufacturer, the standard 555 package includes 25 transistors, 2 diodes and 15 resistors on a silicon chip installed in an 8-pin mini dual-in-line package.

PIN DESCRIPTION OF IC-555:-

Pin No	Function	Name
1	Ground (0V)	Ground
2	Voltage below $1/3 V_{cc}$ to trigger the pulse	Trigger
3	Pulsating output	Output
4	Active low; interrupts the timing interval at Output	Reset
5	Provides access to the internal voltage divider; default $2/3 V_{cc}$	Control Voltage
6	The pulse ends when the voltage is greater than Control	Threshold
7	Open collector output; to discharge the capacitor	Discharge
8	Supply voltage; 5V (4.5V - 16 V)	Vcc

It is an 8pin timer IC and has mainly two modes of operation: monostable and astable. In monostable mode time delay of the pulses can be precisely controlled by an external resistor and a capacitor whereas in astable mode the frequency & duty cycle are controlled by two external resistors and a capacitor.

3.5 Infrared Led Pairs

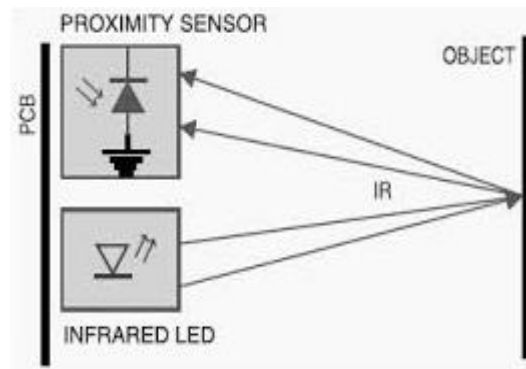


Figure- 13

IR sensor is nothing but a diode, which is sensitive for infrared radiation. This infrared transmitter and receiver is called as IR TX-RX pair.

Why IR sensor?

- It is very low cost and can be constructed on general purpose PCB
- It is of very small size.
- You can increase numbers of transmitter as you want for good result

Good immunity to ambient light and waves are invisible to eyes.

An IR LED, also known as IR transmitter, is a special purpose LED that transmits infrared rays in the range of 760 nm wavelength. Such LEDs are usually made of gallium arsenide or aluminium gallium arsenide. They, along with IR receivers, are commonly used as sensors.

The appearance is same as a common LED. Since the human eye cannot see the infrared radiations, it is not possible for a person to identify whether the IR LED is working or not, unlike a common LED. To overcome this problem, the camera on a cell phone can be used. The camera can show us the IR rays being emanated from the IR LED in a circuit.

Light emitting diodes (LEDs) are semiconductor light sources. The light emitted from LEDs varies from visible to infrared and ultraviolet regions. They operate on low voltage and power. LEDs are one of the most common electronic components and are mostly used as indicators in circuits. They are also used for luminance and optoelectronic applications.

Based on semiconductor diode, LEDs emit photons when electrons recombine with holes on forward biasing. The two terminals of LEDs are anode (+) and cathode (-) and

can be identified by their size. The longer leg is the positive terminal or anode and shorter one is negative terminal.

The forward voltage of **LED** (1.7V-2.2V) is lower than the voltage supplied (5V) to drive it in a circuit. Using an LED as such would burn it because a high current would destroy its p-n gate. Therefore a current limiting resistor is used in series with LED. Without this resistor, either low input voltage (equal to forward voltage) or PWM (pulse width modulation) is used to drive LED

Working:-

Working of IR sensor is very simple and working principle is totally based on change in resistance of IR receiver which is similar to LDR (light dependent register) and reflection of light.

Here in this sensor we connect IR receiver in reverse bias so it give very high resistance if it is not exposed to IR light. The resistance in this case is in range of Mega ohms. But when IR light reflected back and falls on IR receiver. The resistance of Rx it comes in range between Kilo ohms to hundred of ohms. We convert this change in resistance to change in voltage.

Then this voltage is applied to a comparator IC which compares it with a threshold level (defined by us according to required range and sensitivity).

If voltage of sensor is more than threshold then output is high else it is low (depends on your connection to comparator) which can be used directly for microcontroller.

When the Tx is forward biased, it begins emitting infrared. Since it's not in visible spectrum, you will not be able to see it through naked eyes but you will be able to view it through an ordinary cell phone camera.

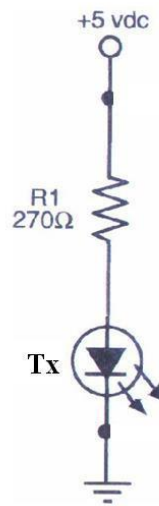


Figure- 14

The resistance R1 in the above circuit can vary. It should not be a very high value (~ 1Kohm) as then the current flowing through the diode would be very less and hence the intensity of emitted IR would be lesser. By increasing the current flowing in the circuit, you can increase the effective distance of your IR sensor. However, there are drawbacks of reducing the resistance. Firstly, it would increase the current consumption of your circuit and hence drain the battery (one of the few ‘precious’ resources for any embedded system) faster. Secondly, increasing the current might destroy the Tx. So, the final choice should be a calculated trade-off between these various factors.

One can also modulate the IR to achieve better distance and immunity. The receiver diode has a very high resistance, typically of the order of mega Ohms when IR is not incident upon it. However, when IR is incident upon it, the resistance decreases sharply to the order of a few kilo Ohms or even lesser. This feature forms the basis of using IR as a sensor. You will need to connect a resistance of the order of a few mega Ohm in series with the Rx the output voltage at the point of connectivity of these two resistors.

A complete Tx-Rx circuit is given below.

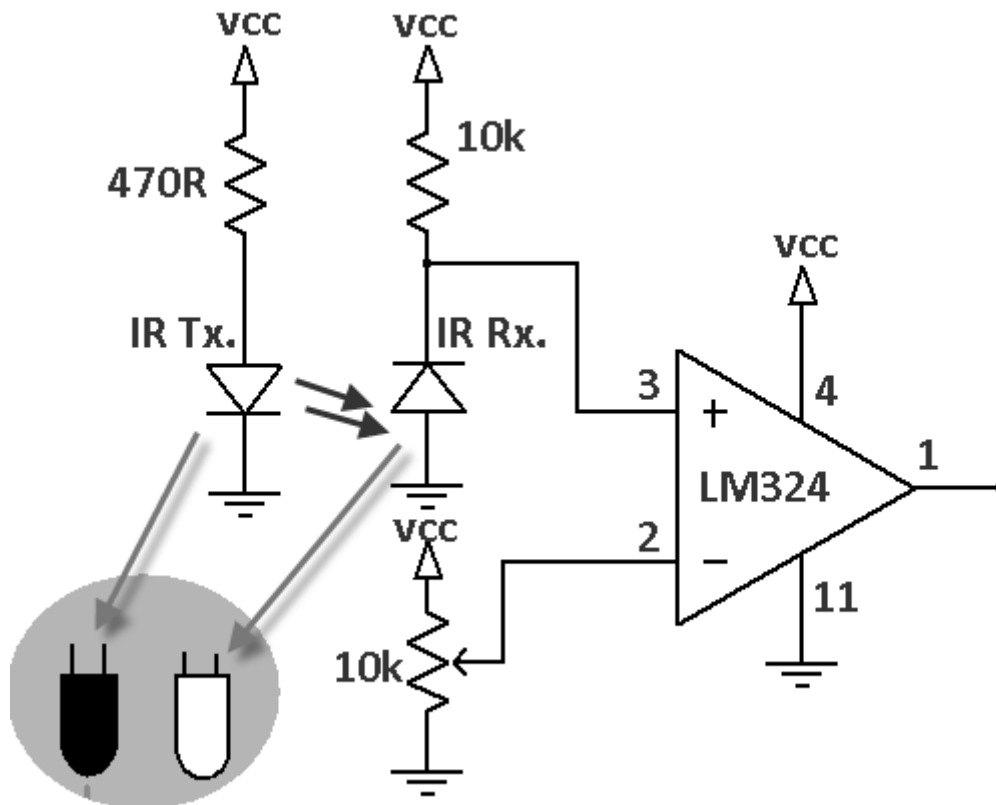


Figure- 15

The output voltage is in the form of analog voltage. One needs to convert it into digital format so that whenever IR is incident upon the Rx, the final conditioned output voltage is a logic high (binary 1) and whenever IR is not incident upon the Rx, the conditioned output voltage should be a logic low (binary 0). One can use a comparator IC to serve this purpose. A comparator IC compares 2 input voltages using an op-amp and gives logic high or a logic low as the final output. LM324 is one such comparator.

Case1: when IR is not incident upon the Rx. When the IR Tx is above a black line, the black line will absorb all the IR and will not reflect an appreciable amount of IR for the Rx to receive. If you are making an obstacle avoiding robot, then when there is no obstacle in front of the IR Tx, Rx will not receive back the transmitted IR. However, when an obstacle comes in front of the Tx, it will reflect the IR incident upon it and hence Rx will receive the IR. In this case, the output voltage of the sensor = 2.5v. Hence the input voltage at pin2 =2.5v. Input voltage at pin2 > input voltage at pin3 ; Output1=> logic 0

3.6 LM-324

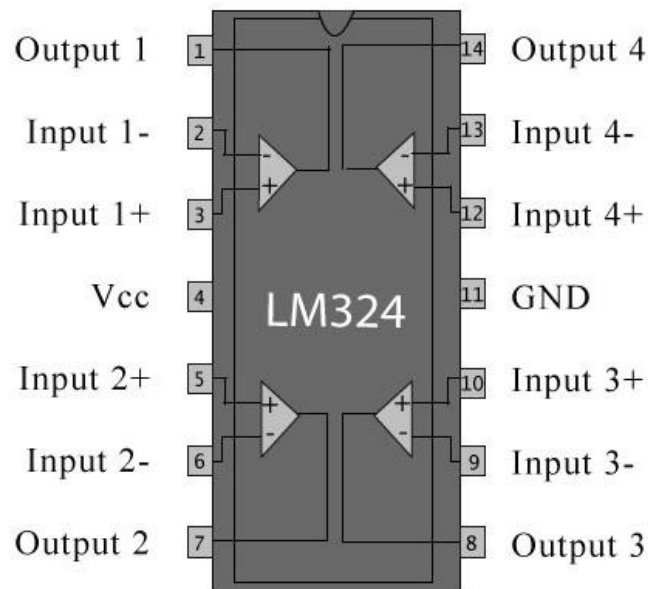


Figure- 16

LM324 is a 14pin IC consisting of four independent operational amplifiers (op-amps) compensated in a single package. Op-amps are high gain electronic voltage amplifier with differential input and, usually, a single-ended output. The output voltage is many times higher than the voltage difference between input terminals of an op-amp.

These op-amps are operated by a single power supply LM324 and need for a dual supply is eliminated. They can be used as amplifiers, comparators, oscillators, rectifiers etc. The conventional op-amp applications can be more easily implemented with LM324.

CHARACTERISTICS

- In the Linear Mode the Input Common-Mode Voltage Range Includes Ground and the Output Voltage can also Swing to Ground, even Though Operated from Only a Single Power Supply Voltage

- The Unity Gain Cross Frequency is Temperature Compensated
- The Input Bias Current is also Temperature Compensated
- Internally Frequency Compensated for Unity Gain
- Large DC Voltage Gain 100 dB Single Package
- Wide Bandwidth (Unity Gain) 1 MHz (Temperature Compensated)
- Wide Power Supply Range:
 - Single Supply 3V to 32V
 - Dual Supplies $\pm 1.5V$ to $\pm 16V$
- Very Low Supply Current Drain (700 μA)
- Low Input Biasing Current 45 nA (Temperature Compensated)
- Low Input Offset Voltage 2 mV – and Offset Current: 5 nA .
- Input Common-Mode Voltage Range Includes Ground
- Differential Input Voltage Range Equal to the Power Supply Voltage
- Large Output Voltage Swing 0V to $V+ - 1.5V$

ADVANTAGES

- Eliminates Need for Dual Supplies
- Four Internally Compensated Op Amps in a Single Package
- Allows Directly Sensing Near GND and VOUT also Goes to GND
- Compatible with All Forms of Logic
- Power Drain Suitable for Battery Operation

3.7 Voltage Regulator

7805 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed output voltage output. The voltage regulator IC maintains the output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.

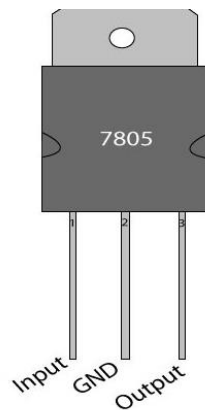


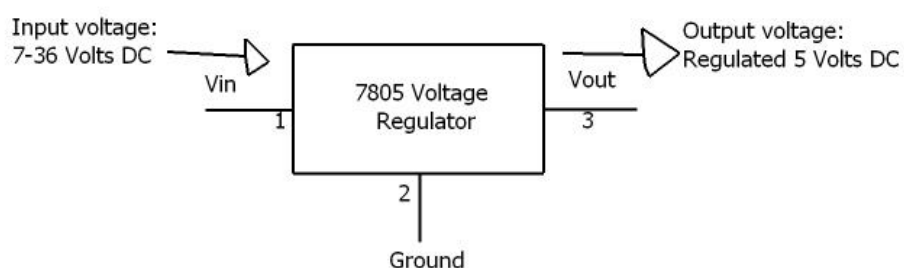
Figure- 17

PIN DESCRIPTION:-

Pin 1 (Input Pin): The Input pin is the pin that accepts the incoming DC voltage, which the voltage regulator will eventually regulate down to 5 volts.

Pin 2 (Ground): Ground pin establishes the ground for the regulator.

Pin 3 (Output Pin): The Output pin is the regulated 5 volts DC.



3.8 BC 548

BC 548 is general purpose silicon, NPN, bipolar junction transistor. It is used for amplification and switching purposes. The current gain may vary between 110 and 800. The maximum DC current gain is 800.

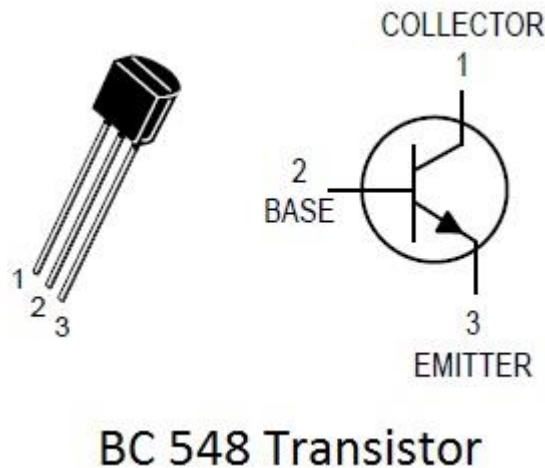


Figure- 18

The input signal at base is amplified and is taken at the emitter. BC548 is used in common emitter configuration for amplifiers. The voltage divider is the commonly used biasing mode. For switching applications, transistor is biased so that it remains fully on if there is a signal at its base. In the absence of base signal, it gets completely off.

The Absolute Maximum Ratings V_{CEO} and V_{CBO} differ in most transistors but are identical in the case of the BC548; both relate to the maximum safe voltage between collector and emitter, but the V_{CEO} rating applies to the situation where the base is either open-circuit or fed from a relatively high resistance source - and so the more prudent choice for designers, while V_{CBO} apply only to voltage across the collector-base junction and may be valid in circuits where the base is supplied with a voltage from a low-resistance path.

Diode

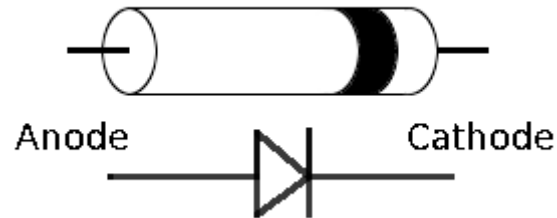


Figure- 19

A diode is a semiconductor device which allows current to flow through it in only one direction. Although a transistor is also a semiconductor device, it does not operate the way a diode does. A

diode is specifically made to allow current to flow through it in only one direction.

Some ways in which the diode can be used are listed here.

A diode can be used as a rectifier that converts AC (Alternating Current) to DC (Direct Current) for a power supply device..

What is a Diode and how to work?

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

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

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

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

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

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

To get rid of the depletion zone, you have to get electrons moving from the N-type area to the P-type area and holes moving in the reverse direction. To do this, you connect the N-type side of the diode to the negative end of a circuit and the P-type side to the positive end. The free electrons in the N-type material are repelled by the negative electrode and drawn to the positive electrode. The holes in the P-type material move the other way. When the voltage difference between the electrodes is high enough, the electrons in the depletion zone are boosted out of their holes and begin moving freely again. The depletion zone disappears, and charge moves across the diode.

When the negative end of the circuit is hooked up to the N-type layer and the positive end is hooked up to P-type layer, electrons and holes start moving and the depletion zone disappears.

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

When the positive end of the circuit is hooked up to the N-type layer and the negative end is hooked up to the P-type layer, free electrons collect on one end of the diode and holes collect on the other. The depletion zone gets bigger.

The interaction between electrons and holes in this setup has an interesting side effect -- it generates light! In the next section, we'll find out exactly why this is.

LED'S:

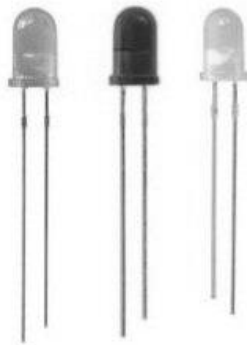


Figure- 20

LED working principle

What is LED?

Light emitting diodes, commonly called LEDs, are real unsung heroes in the electronics world. They do dozens of different jobs and are found in all kinds of devices. Among other things, they form the numbers on digital clocks, transmit information from remote controls, light up watches and tell you when your appliances are turned on. Collected together, they can form images on a jumbo television screen or illuminate a traffic light.

Basically, LEDs are just tiny light bulbs that fit easily into an electrical circuit. But unlike ordinary incandescent bulbs, they don't have a filament that will burn out, and they don't get especially hot. They are illuminated solely by the movement of electrons in a semiconductor material, and they last just as long as a standard transistor.

How can a diode produce light?

Light is a form of energy that can be released by an atom. It is made up of many small particle-like packets that have energy and momentum but no mass. These particles, called photons, are the most basic units of light.

Photons are released as a result of moving electrons. In an atom, electrons move in orbital around the nucleus. Electrons in different orbital have different amounts of energy. Generally speaking, electrons with greater energy move in orbital farther away from the nucleus.

For an electron to jump from a lower orbital to a higher orbital, something has to boost its energy level. Conversely, an electron releases energy when it drops from a higher orbital to a lower one. This energy is released in the form of a photon. A greater energy drop releases a higher-energy photon, which is characterized by a higher frequency.

As we saw in the last section, free electrons moving across a diode can fall into empty holes from the P-type layer. This involves a drop from the conduction band to a lower orbital, so the electrons release energy in the form of photons. This happens in any diode, but you can only see the photons when the diode is composed of certain material. The atoms in a standard silicon diode, for example, are arranged in such a way that the electron drops a relatively short distance. As a result, the photon's frequency is so low that it is invisible to the human eye -- it is in the infrared portion of the light spectrum. This isn't necessarily a bad thing, of course: Infrared LEDs are ideal for remote controls, among other things.

Visible light-emitting diodes (VLEDs), such as the ones that light up numbers in a digital clock, are made of materials characterized by a wider gap between the conduction band and the lower orbital. The size of the gap determines the frequency of the photon -- in other words, it determines the colour of the light.

While all diodes release light, most don't do it very effectively. In an ordinary diode, the semiconductor material itself ends up absorbing a lot of the light energy. LEDs are specially constructed to release a large number of photons outward. Additionally, they are housed in a plastic bulb that concentrates the light in a particular direction. As you can see in the diagram, most of the light from the diode bounces off the sides of the bulb, travelling on through the rounded end.

LEDs have several advantages over conventional incandescent lamps. For one thing, they don't have a filament that will burn out, so they last much longer. Additionally, their small plastic bulb makes them a lot more durable. They also fit more easily into modern electronic circuits.

But the main advantage is efficiency. In conventional incandescent bulbs, the light-production process involves generating a lot of heat (the filament must be warmed). This is completely wasted energy, unless you're using the lamp as a heater, because a huge portion of the available electricity isn't going toward producing visible light. LEDs generate very little heat, relatively speaking. A much higher percentage of the electrical power is going directly to generating light, which cuts down on the electricity demands considerably.

Up until recently, LEDs were too expensive to use for most lighting applications because they're built around advanced semiconductor material. The price of semiconductor devices has plummeted over the past decade, however, making LEDs a more cost-effective lighting option for a wide range of situations. While they may be more expensive than incandescent lights up front, their lower cost in the long run can make them a better buy. In the future, they will play an even bigger role in the world of technology.

3.9 VOTAGE SUPPLY CIRCUIT

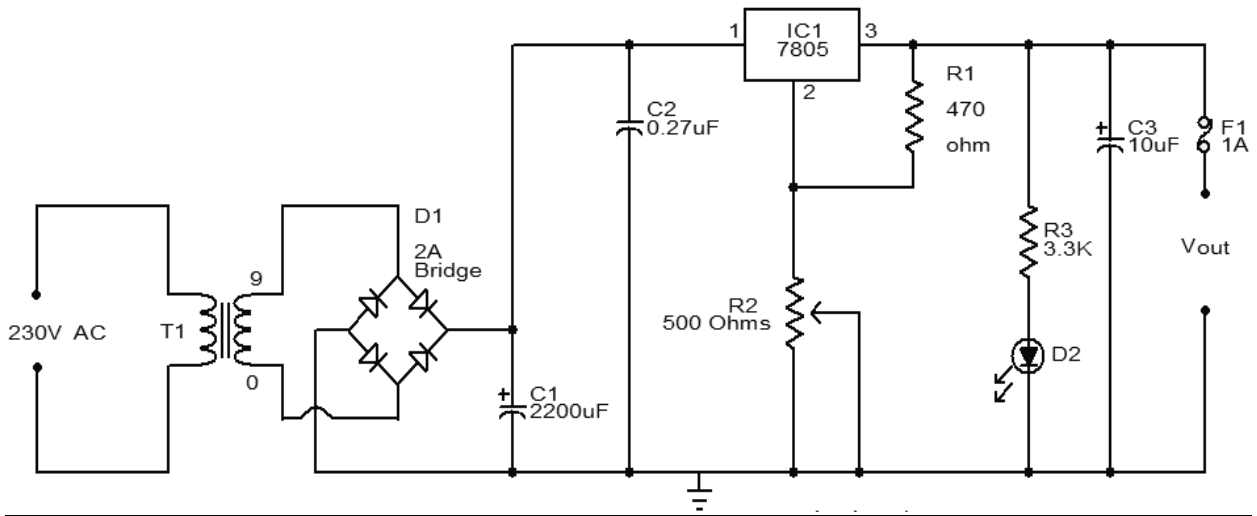


Figure- 21

This circuit diagram shows how to make a 5V to 12V variable DC power supply from a fixed 5V regulator IC 7805. This is attained by adding two resistors R1 and R2 as shown in figure. When the resistors R1 and R2 are added the equation for the output voltage of 7805 becomes

$$V_{out} = V_{fixed} + \left\{ R_2 \left[\left(\frac{V_{fixed}}{R_1} \right) + I_{standby} \right] \right\}, \text{ where } V_{fixed} = 5V \text{ and } I_{standby} = \frac{V_{fixed}}{R_1}.$$

By varying the POT R2 we can adjust the output voltage between 5V and 12V.

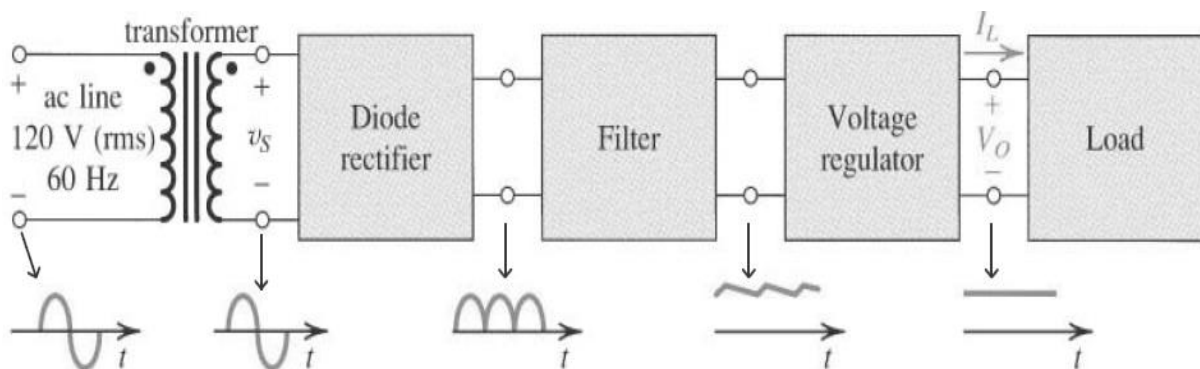


Figure- 22

The Full Wave Bridge Rectifier

This type of single phase rectifier uses four individual rectifying diodes connected in a closed loop “bridge” configuration to produce the desired output. The main advantage of this bridge circuit is that it does not require a special centre tapped transformer, thereby reducing its size and cost. The single secondary winding is connected to one side of the diode bridge network and the load to the other side as shown below.

The Diode Bridge Rectifier

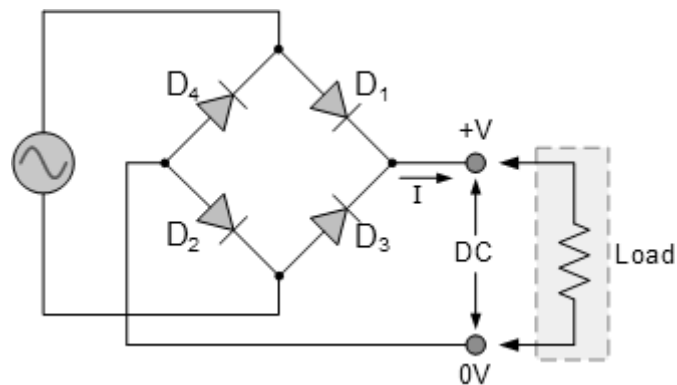


Figure- 23

The four diodes labelled D₁ to D₄ are arranged in “series pairs” with only two diodes conducting current during each half cycle. During the positive half cycle of the supply, diodes D₁ and D₂ conduct in series while diodes D₃ and D₄ are reverse biased and the current flows through the load as shown below.

The Positive Half-cycle

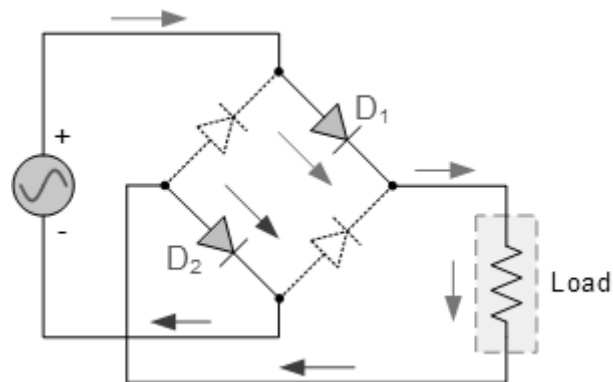


Figure- 24

During the negative half cycle of the supply, diodes D3 and D4 conduct in series, but diodes D1 and D2 switch “OFF” as they are now reverse biased. The current flowing through the load is the same direction as before.

The Negative Half-cycle

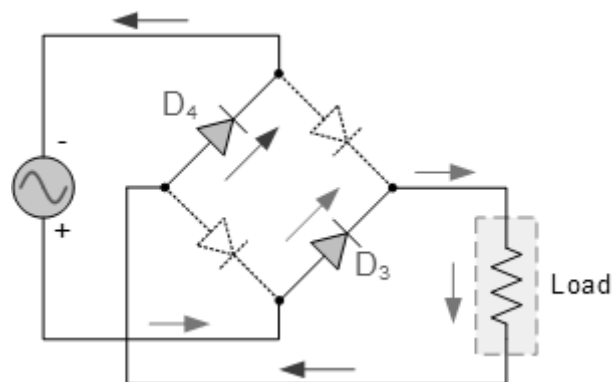


Figure- 25

As the current flowing through the load is unidirectional, so the voltage developed across the load is also unidirectional the same as for the previous two diode full-wave rectifier, therefore the average DC voltage across the load is $0.637V_{max}$.

Typical Bridge Rectifier

However in reality, during each half cycle the current flows through two diodes instead of just one so the amplitude of the output voltage is two voltage drops ($2 \times 0.7 = 1.4\text{V}$) less than the input V_{MAX} amplitude. The ripple frequency is now twice the supply frequency (e.g. 100Hz for a 50Hz supply)

Although we can use four individual power diodes to make a full wave bridge rectifier, pre-made bridge rectifier components are available “off-the-shelf” in a range of different voltage and current sizes that can be soldered directly into a PCB circuit board or be connected by spade connectors.

The image to the right shows a typical single phase bridge rectifier with one corner cut off. This cut-off corner indicates that the terminal nearest to the corner is the positive or +ve output terminal or lead with the opposite (diagonal) lead being the negative or -ve output lead. The other two connecting leads are for the input alternating voltage from a transformer secondary winding.

The Smoothing Capacitor

The full-wave bridge rectifier gives us a greater mean DC value ($0.637 V_{\text{max}}$) with less superimposed ripple while the output waveform is twice that of the frequency of the input supply frequency. We can therefore increase its average DC output level even higher by connecting a suitable smoothing capacitor across the output of the bridge circuit as shown below.

Full-wave Rectifier with Smoothing Capacitor

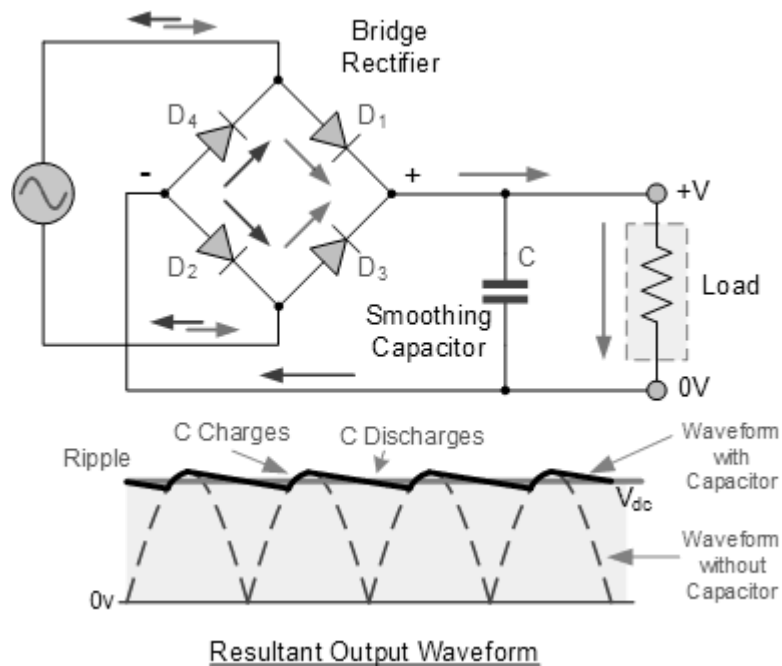


Figure- 26

The smoothing capacitor converts the full-wave rippled output of the rectifier into a smooth DC output voltage. Generally for DC power supply circuits the smoothing capacitor is an Aluminium Electrolytic type that has a capacitance value of 100 μ F or more with repeated DC voltage pulses from the rectifier charging up the capacitor to peak voltage.

However, there are two important parameters to consider when choosing a suitable smoothing capacitor and these are its Working Voltage, which must be higher than the no-load output value of the rectifier and its Capacitance Value, which determines the amount of ripple that will appear superimposed on top of the DC voltage.

Too low a capacitance value and the capacitor has little effect on the output waveform. But if the smoothing capacitor is sufficiently large enough and the load current is not too large, the output voltage will be almost as smooth as pure DC. As a general rule of thumb, we are looking to have a ripple voltage of less than 100mV peak to peak.

The maximum ripple voltage present for a **Full Wave Rectifier** circuit is not only determined by the value of the smoothing capacitor but by the frequency and load current, and is calculated as:

Bridge Rectifier Ripple Voltage

$$V_{(\text{ripple})} = \frac{I_{(\text{load})}}{f \times C}, \text{ Volts}$$

Where: **I** is the DC load current in amps, **f** is the frequency of the ripple or twice the input frequency in Hertz, and **C** is the capacitance in Farads.

The main advantages of a full-wave bridge rectifier is that it has a smaller AC ripple value for a given load and a smaller reservoir or smoothing capacitor than an equivalent half-wave rectifier. Therefore, the fundamental frequency of the ripple voltage is twice that of the AC supply frequency (100Hz) where for the half-wave rectifier it is exactly equal to the supply frequency (50Hz).

The amount of ripple voltage that is superimposed on top of the DC supply voltage by the diodes can be virtually eliminated by adding a much improved π -filter (pi-filter) to the output terminals of the bridge rectifier. This type of low-pass filter consists of two smoothing capacitors, usually of the same value and a choke or inductance across them to introduce a high impedance path to the alternating ripple component

Another more practical and cheaper alternative is to use an off the shelf 3-terminal voltage regulator IC, such as a LM7805 for a positive output voltage which can reduce the ripple by more than 70dB while delivering a constant output current of over 1 amp.

CHAPTER -4

SOFTWARE DESCRIPTION

- Keil compiler is the software used where the machine language code is written and compiled.
- The machine source code is converted into hex code, this hex code is dumped into the microcontroller for further processing.

4.1 CODE

```
ORG 00H
MOV P0,@00H
MOV P1,@0FFH
```

```
shubh: JB P1.0,shubh1
      SETB P0.0
      SETB P0.1
```

```
shubh1:    JB P1.1,shubh2
          SETB P0.2
          CLR P0.0
```

```
shubh2:    JB P1.2,shubh3
          SETB P0.3
          CLR P0.1
```

```
shubh3:    JB P1.3,shubh4
          SETB P0.4
          CLR P0.2
          CALL DELAY
          MOV P0,@00H
```

```
shubh4: JMP shubh
```

DELAY: MOV R0,@25

H3: MOV R1,@100

H2: MOV R2,@100

H1: DJNZ R2,H1

 DJNZ R1,H2

 DJNZ R0,H3

 RET

 END

RESULTS AND DISCUSSIONS

The desired project was implemented and the results of the systems are illustrated in this Chapter.

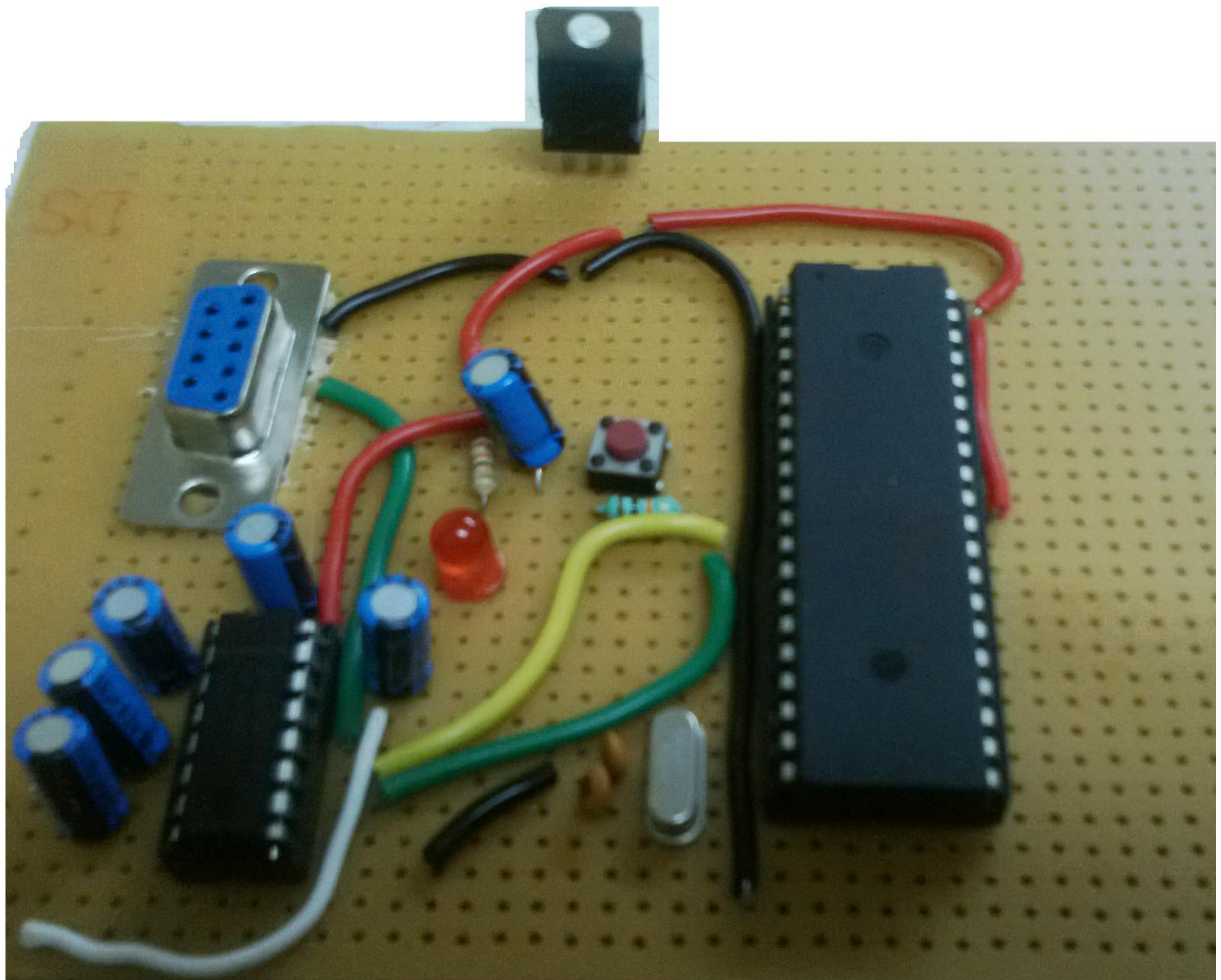
The Prototype

The prototype was mainly built by combining the paper board design and the electrical designs. The 12V power supply needed for the operation of microcontroller is supplied using the bridge rectifier.

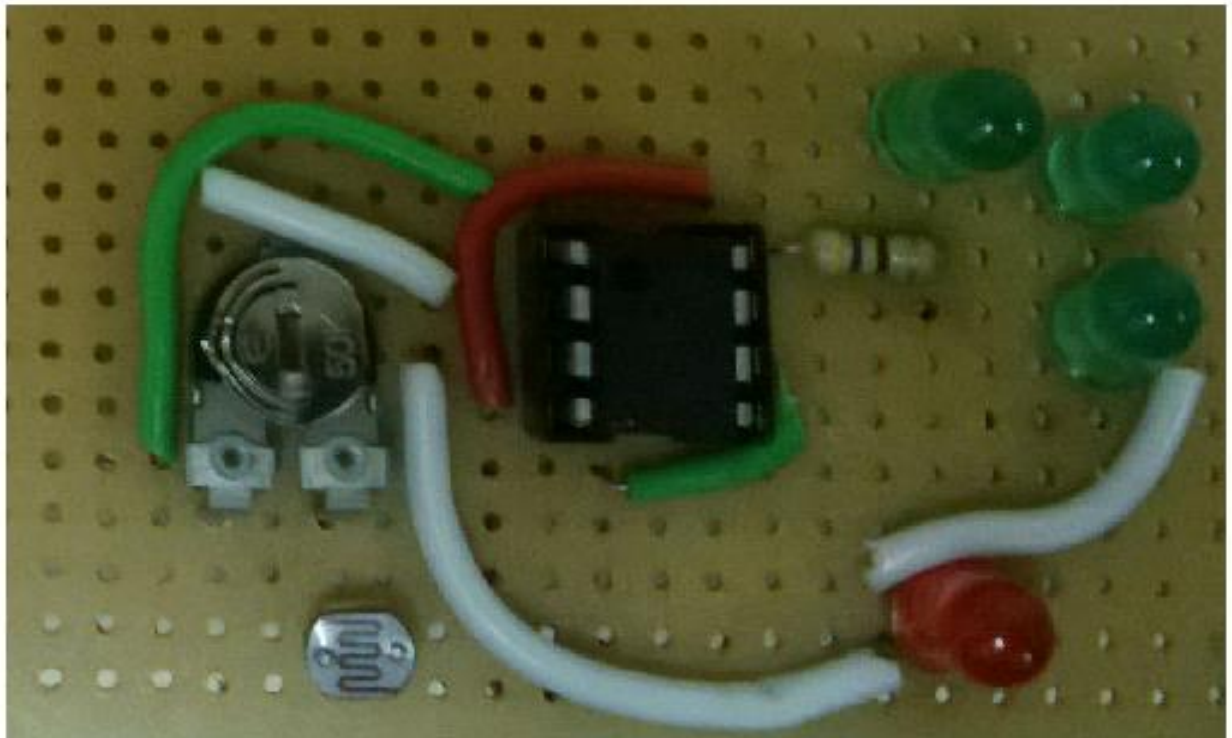
Project Operation

The program is downloaded into microcontroller and 12V power is supplied to microcontroller.

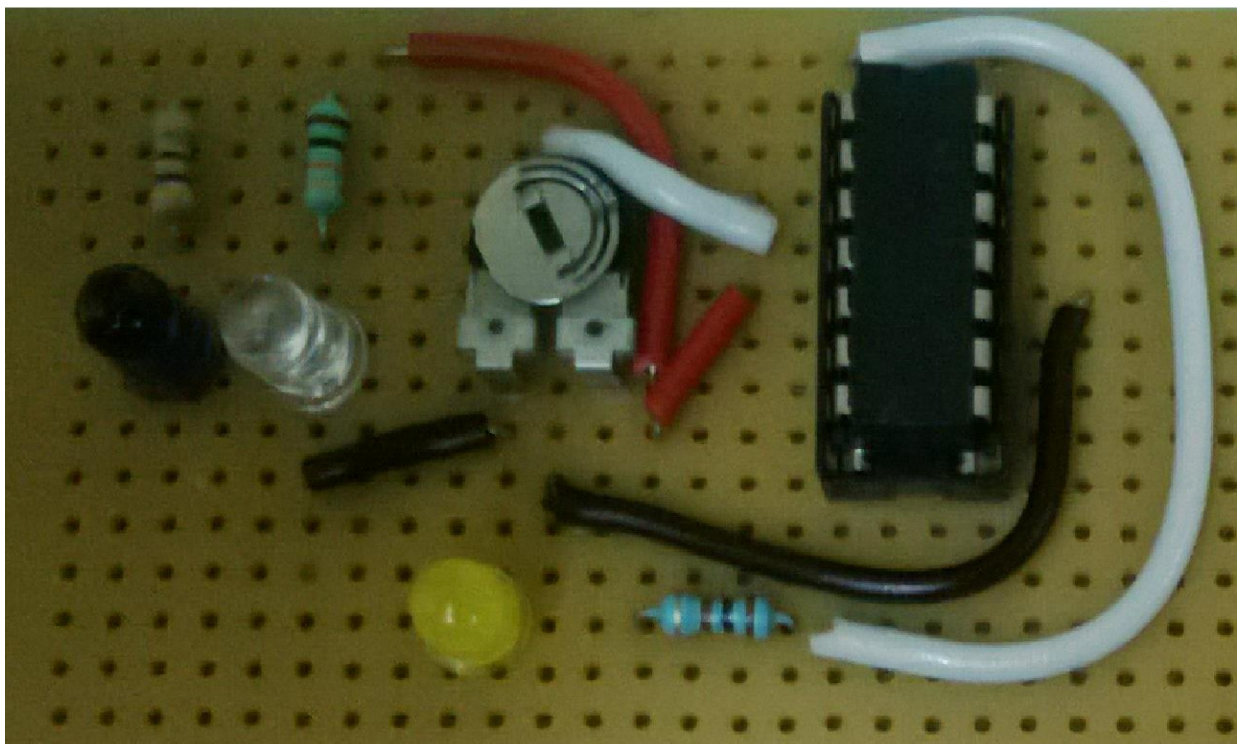
Interfacing of Microcontroller with MAX232:-



Day Night Detector:-



Object Sensing Circuit:-



Advantages

The street light system that had been developed presents several advantages. Since the lights are getting on only when the vehicle is coming and the intensity of lights is varying depending on the natural light status, the emission of carbon monoxide from the vehicles is reduced. This will give a positive effect to the greenhouse effect towards the environment.

Since Energy related emissions are responsible for approximately 80% of air emissions and central to the most serious global environmental impacts thus Intelligent lighting control and energy management system is a perfect solution for energy saving, especially in public lighting management. It realizes remote on/off and dimming of lights, which can save energy by 40%, save lights maintenance costs by 50%, and prolong lamp life by 25%. The system application in streetlight control for each lamp will reduce in streetlight electricity and maintenance cost, and increase availability of street light.

CONCLUSION

A street light system had successfully been designed and developed with proper integration of both the hardware and the software.. The infra-red sensors were interfaced with the Microcontroller. This interface is synchronized with the whole process of the lighting system. It could be seen from the objectives of this project, that knowledge and skills were combined together in order to complete this task.

We aimed at designing and implementing an automatic system where in the street lights that are not required through the night can be dimmed. Additionally, the ambiance of light is checked and lights are turned ON when it is dark and turned OFF during the day. Our government is striving hard to provide electricity to customers. Thus our work once implemented on a large scale can bring in significant reductions in the power consumption caused by street lights. This initiative will help the government to save the Energy and meet the domestic and industrial needs. The proposed system is appropriate

REFERENCES

1. Radhi Priyasree; Rafiya Kauser.H; Vinita.E; Gangatharan.N, “Automatic Street Light Intensity Control Module Using Embedded System”, International Conference on Computing and Control Engineering (ICCCE 2012), 12 & 13 April, 2012,radhipriyasree@gmail.com,vinitthamaran@gmail.com;n.gangatharan@yahoo.com; riyakulz@gmail.com
2. Prof. K.Y.Rajput, Gargeyee Khatav, Monica Pujari, Priyanka Yadav, ”Intelligent Street Lighting System using GSM”, International Journal of Engineering Science Invention ISSN (Online): 2319 – 6734, ISSN : 2319 – 6726 www.ijesi.org Volume 2 Issue 3 | March. 2013 | PP.60-69
3. Hengyu Wu, Minli Tang, Guo Huang, “Design of Multi-functional Street Light Control System Based on AT89S52 Single-chip Microcomputer”, 2010 2nd International Conference on Industrial Mechatronics and Automation, whytml@163.com, gslstml@163.com, connopapion@126.com
4. http://en.wikipedia.org/wiki/Main_Page
5. <http://electronicdesign.com/lighting/measure-light-intensity-8-bit-microcontroller>
6. https://www.google.co.in/search?q=pir+sensor&newwindow=1&tbm=isch&tbu=u&source=univ&sa=X&ei=QJ2VUpuuNsbDrAeDuIHADg&ved=0CEEQsAQ&biw=1366&bih=599#facrc=0%3Bpir%20sensor%20price&imgdii=_&imgrc=_
7. Street Lights And Green Gas Emissions, Municipal Association of Victoria