SMART CAR

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ABSTRACT

Science is a long way from producing machine as powerful as the human brain. However, the Search for artificial intelligence has come a long way since the first robots. New technologies Enables scientists to produce devices capable of a range of human-like action, while many Scientists now look to the insect world for inspiration for tomorrow's thinking machines. This Project aims at three basic concepts of driving that is vehicle efficiency, driver comfort & Eco friendliness. The future is not something that we enter' but we create; so, the smart car. Smart cars just don't mean cars that run on artificial intelligence. It's a combination of works Assembled to make a masterpiece. Imagine a car with high efficiency, a car that can ease the Driver stress, increase the safety & finally be eco-friendly, when all this comes in one bundle we get the smart cars. Artificial intelligence (ai) is the intelligence of machines and the branch of Computer science that aims to create it. The study and design of intelligent agents," where an intelligent agent is a system that perceives its environment and takes actions that maximize its Chances of success.

Keywords- Capacitor, Comparator, IR Sensor, Limit Switch, Printed Circuit Board.

CHAPTER 1
INTRODUCTION

1.1 Introduction

In contrast to a traditional mechanical car, the Smart Car is a highly computerized automobile featuring ubiquitous computing, intuitive human-computer interaction and an open application platform. In this paper, we propose an advanced Smart Car demonstration platform with a transparent windshield display and various motion sensors where drivers can manipulate a variety of car-appropriate applications in augmented reality. Similar to smartphones, drivers can customize their Smart Car through free downloads of car-appropriate applications according to their needs. Additionally, three potential car-appropriate applications related to computer vision are investigated and implemented in our platform for increased driving safety. The first and second car appropriate applications aim to enhance the driving visual field by restoring the low-visibility scenes captured during inclement-weather or nighttime driving conditions to be high-visibility ones, respectively, and display them on a transparent windshield display. We also survey pedestrian tracking techniques that combine multiple driving recorders' information as a mobile surveillance network, including one proposed framework we have developed as the third car-appropriate application. By embedding these car appropriate applications, the

Smart Car has the potential to increase safety of driving conditions both in daytime and nighttime, even in bad weather.

Artificial intelligence has been the subject of optimism, but has also suffered Setbacks and, today, has become an essential part of the technology industry, providing the heavy Lifting for many of the most difficult problems in computer science. Ai research is highly technical and specialized, deeply divided into subfields that often fail to communicate with each other. In This paper we are discussing about the impacts of ai in automobile industry. I-car is the latest Emerging trend using ai as the base of operation. Most of the time, smart cars are mistaken with Hybrid vehicles; smart cars are vehicles that use the latest technologies along with ai & other Ultra-modern technologies to ease human control over vehicles.

The smart car is the system in which the car is designed in such a way that it will help the driver to drive safely and the system is used for driver safety in this system we have used the IR sensor for monitoring the system which will control the lamp and it will control the device light intensity after that it will also turn the light when the steering is moved in the one direction With gas prices at historic highs in the United States and fuel-efficient cars in vogue, the time might be perfect for daimlerchrysler to introduce the Smart Car to U.S. markets. Already popular in Europe, the Smart Car is small in stature but big on economy. The updated Smart Fortwo (named because it's "for two" people) is ready for release in 2008, so we could be seeing a lot more Smart Cars on the road in the near future.

The Smart Car began with Nicolas Hayek, the man who invented Swatch watches. He wanted to make a small car that would be fuel efficient, environmentally responsible and easy to park in small spaces. The Swatch Company collaborated with Daimler-Benz (after a failed venture with Volkswagen) to create the first City Coupe under the company name Micro Compact Car (MCC). Development began in 1994, and the first car was unveiled at the Frankfurt Motor Show in 1997. The MCC went on sale the following year, but Hayek was disappointed with the use of a conventional engine -- he'd wanted a hybrid or pure electric motor -- and the price of the car, which was higher than expected.

CHAPTER 2
LITERATURE SURVEY

2.1 Literature survey

In late 1982, SMH (makers of the Swatch brand of watches) CEO Nicolas Hayek began developing an idea for a new car using the same type of manufacturing strategies and personalization features used to popularize Swatch watches. He believed that the automotive industry had ignored a sector of potential customers who wanted a small and stylish city car. This idea soon became known as the "Swatchmobile". Hayek's private company Hayek Engineering AG began designing the new car for SMH, with seating for two and a hybrid drivetrain.[7]

While design of the car was proceeding, Hayek feared existing manufacturers would feel threatened by the Swatch mobile. Thus, rather than directly competing, he preferred to cooperate with another company in the automotive industry. This would also relieve SMH of the cost burden in setting up a distribution network. Hayek approached several automotive manufacturers and on July 3, 1991, he reached an agreement with Volkswagen to share development of the new project.[8]

By 1993, Ferdinand Piëch had become CEO of Volkswagen and he immediately sought to terminate the project with SMH. Volkswagen had already been working on their own "three-litre car": a car which would

consume three litres of fuel per 100 km of driving (the eventual Volkswagen Lupo 3L). Volkswagen's own concept was believed to be a better business proposition, featuring four seats and more cargo room.

Hayek had suspected that Piëch would seek to end the agreement with SMH upon his ascendancy to the CEO position; therefore, he discreetly began approaching other car companies with the Swatchmobile project. Rebuffed by BMW, Fiat, General Motors and Renault, he finally reached an informal agreement with Daimler-Benz AG, maker of Mercedes-Benz cars.[10]

A deal was announced on March 4, 1994, at a press conference at Mercedes-Benz headquarters in Stuttgart that the companies would join forces in founding Micro Compact Car AG (MCC). 49% of the initial capital of 50 million Swiss francs were provided by SMH and the remaining 51% by Daimler-Benz. The company consisted of two subsidiaries: MCC gmbh based in Renningen (a suburb of Stuttgart) which would design the car, and the then-unnamed manufacturing plant. SMH Auto SA, owned by Hayek, would design a hybrid electric drive system for the car, while Hayek Engineering would audit the design and manufacturing.

The press conference also featured the debut of two concept cars: the eco-sprinter and eco-speedster, styled by Mercedes-Benz's design studio in California.[12]The cars were similar to the eventual Smart City-Coupé. No mention was made of the fact that SMH had no input in the design of these concepts,[13] and they were badged as Mercedes-Benzes.

2.1 Priyanka Dubal et. al. in this paper, The highest fatal traffic accident rate occurs on curved roads at nighttime. Night time driving with conventional headlamps is particularly unsafe. Only 25% of the driving is done at night but 55% of the driving accidents occur during this period. The existing conventional light systems do not provide illumination in the right direction on curve roads. Due to this constrain, a need to understand an alternative technology solution. The aim is to improve visibility for driver and so achieve a significant increase in safety and driving comfort. This calls for a flexible front light for automobiles to illuminate road ahead in the night at corner. Adaptive front lighting system (AFS) helps improve driver's visibility at night time hence achieving enhance safety. AFS (adaptive front-lighting system) used to detect information about corner in advance with help of sensor which detect the information send it to motor to adjust headlamps to get the lighting beam which was suitable for the corner. Through this way, it could avoid "blind spot" caused by the fixed lighting area when coming into the corner, and improve driving safety.

2.2 Robert Tamburo et. al. in this paper, The primary goal of an automotive headlight is to improve safety in low light and poor weather conditions. But, despite decades of innovation on light sources, more than half of accidents occur at night even with less traffic on the road. Recent developments in adaptive lighting have addressed some limitations of standard headlights, however, they have limited flexibility - switching between high and low beams, turning off beams toward the opposing lane, or rotating the beam as the vehicle turns - and are not designed for all driving environments. This paper introduces an ultra-low latency reactive visual system that can sense, react, and adapt quickly to any environment while moving at highway speeds. Our single hardware design can be programmed to perform a variety of tasks. Anti-glare high beams, improved driver visibility during snowstorms, increased contrast of lanes, markings, and sidewalks, and early visual warning of obstacles are demonstrated.

2.3 Pranav Mankikar et. al. in this paper**,** Vehicle intelligent front light system is one of the advanced driver assistance systems. Vision based intelligent front light system is currently the research focus in this field. The purpose of this paper is to present a comprehensive survey of the vehicle front light system development and the latest vision based key technologies and proposals. By analyzing the significant disadvantages of traditional intelligent light systems, some possible improvement proposals and algorithms for lane, vehicle lamp recognition and track are provided. This survey shows that the Matrix-LED system could make the system more flexible and more effective.

2.4 R. K. Moje et. al. in this paper**,** In today's fast and crowded world, road accident is a major concern. The highest fatal traffic accidents occur on the curved roads at night time. Also the glare problem due to focus of headlight is dangerous. Even the improper indications given to the nearby vehicle increases chances of fatal accidents. These facts indicate the importance of advancement in conventional vehicle systems. This paper explains the prototype model of vehicle system consisting of intelligent headlight intensity control, adaptive headlights, auto indicator-off system, anti-collision system and vehicle to vehicle communication. Proposed system is very cost efficient and reliable and can be mounted on any vehicle, it is specially focused to increase the safety and security of low-end vehicles.

2.5 Ajinkya Gaikwad et. al. in this paper**,** Safety is important parameter in today's every vehicle. According to survey done by the "Institute for Traffic Accidents Research and Data Analysis", Japan about 70% the road accidents occurs at night time and poor vision at night time is one of the reason for this. Aim is to improve the vision in front of the vehicle, so that the driver can judge the vehicles coming from the front side and stop collision. Which is serious problem along curvy road? The convention headlight system are fixed in position hence it does not give good vision. Logic behind developing new headlight system is simply to turn the headlight according to the rotation of the steering. Such headlight is called as, "smart Headlight System" (SHS). This can be achieved in three possible ways .i.e. 1. Mechanical 2. Hydraulic 3. Mechatronics Form these above method we selected the last on i.e. Mechatronics method to develop this headlight system. This is feasible, accurate than other two and can be implemented into vehicle

CHAPTER 3
PRINCIPLE

3.1 Objective of the Project

3.1.1 Use of Mechanical Linkages

As discussed above, the mechanical linkages are very reliable and rigid. So we can switch to them, instead of electronic systems. Also, mechanical linkages easy to set up, there's no chance of short circuits, system failures due to power supply cut-off & mechanical systems are inexpensive compared to the electronic systems. Also skilled workers are required to replace the electronics systems in case of failures, vice versa mechanical systems require less skilled and even a person a bit of knowledge of mechanical systems can repair and install the system. Also the mechanical systems as we stated earlier are reliable because they won't malfunction and would ensure safety of the driver as well as the passengers.

3.1.2 Auto turn Indicator

As stated earlier, the auto-turn indicators are also vital parts of our project. The indicators will auto-on themselves according to the set angle of steering rotation.

The key features of these auto-turn indicators are:

- As we know, many drivers in our observations turn immediately or suddenly don't turn on their indicators. So there are possible chances of vehicles which are following them.
- To avoid the angle of steering rotation and the limit switches are in accordance to such sudden turns of vehicles.
- This would ensure that the forward vehicle is turning or not. So many fatal accidents can be avoided. Thus, we can without hesitating drive our cars between such pathetic drivers.

3.1.3 Energy Crisis Solution

1. On a small start-up basis, we are contributing to energy saving by using solar panels, solar-cell 441pigments/paints in out project.
2. The use of solar cell will awake people's interests in energy saving and its importance in day- to-day life and its future scope.

3.1.4 Use of Laser Fog Lamps

1. We have experienced sudden breaking as the front car may not be visible due to dense fog and rains.
2. Due to this fatal accidents may take place and it can injure the passengers.
3. To avoid this and to guide the pre-ceding cars which may not happen with the help of conventional fog lamps, we replaced them with laser lamps.
4. Laser fog lamps thus can help the cars behind avoid the collision.

3.2 Scope of the Project

1. The system can be implemented in the car
2. The system can be implement in the Bus trucks or heavy vehicles
3. The system is can be implement in two Wheelers

CHAPTER 4

DESIGN

4.1 Power Supply Design

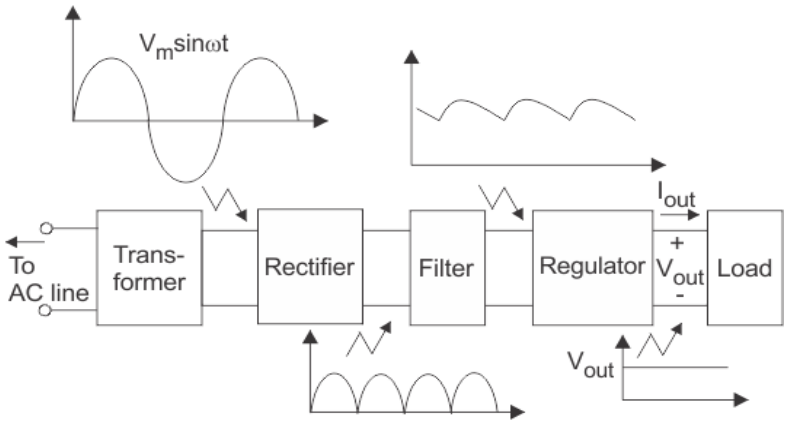


Fig. block diagram of power supply

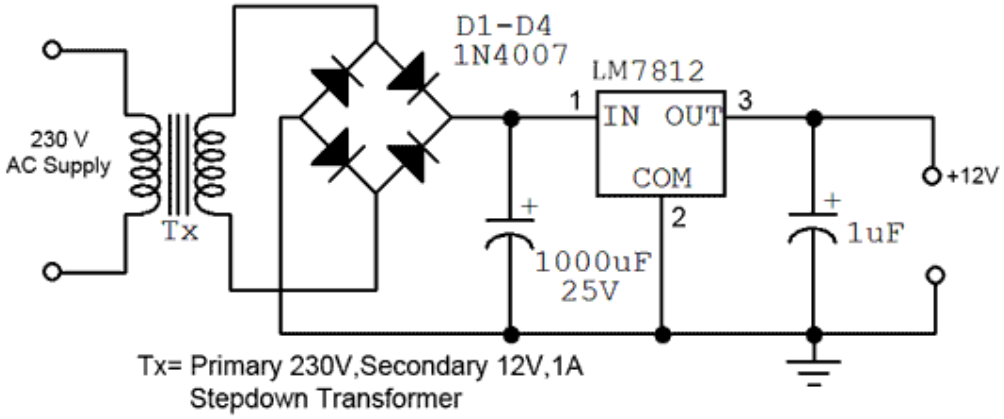


Fig. Circuit diagram of power supply

Description

The electrical power is almost exclusively generated, transmitted and distributed in the form of ac because of economical consideration but for operation of most of the electronic devices and circuits, dc supply is required. Dry cells and batteries can be used for this purpose. No doubt, they have the advantages of being portable and ripple free but their voltages are low, they need frequent replacement and are expensive in comparison to conventional dc power supplies.

Now days, almost all electronic equipment includes a circuit that converts ac supply into dc supply. The part of equipment that converts ac into dc is called DC power supply. In general at the input of the power supply there is a power transformer. It is followed by a rectifier (a diode circuit) 1a smoothing filter and then by a voltage regulator circuit.

From the block diagram, the basic power supply is constituted by four elements,

i. Transformer
ii. Rectifier
iii. Filter
iv. Regulator

The output of the dc power supply is used to provide a constant dc voltage across the load. Let us briefly outline the function of each of the elements of the dc power supply. Transformer is used to step-up or step-down (usually to step-down) the-supply voltage as per need of the solid-state electronic devices and circuits to be supplied by the dc power supply. It can provide isolation from the supply line-an important safety consideration. It may also include internal shielding to prevent unwanted electrical noise signal on the power line from getting into the power supply and possibly disturbing the load. It is used to supply the power to ADC and microcontroller, LCD, etc.

Design of power supply

i. Transformer

Step-down transformer is one whose secondary voltage is less than its primary voltage. It is designed to reduce the voltage from the primary winding to the secondary winding. This kind of transformer "steps down" the voltage applied to it. As a step-down unit, the transformer converts high-voltage, low-current power into low-voltage, high-current power. The larger-gauge wire used in the secondary winding is necessary due to the increase in current. The primary winding, which doesn't have to conduct as much current, may be made of smaller-gauge wire.

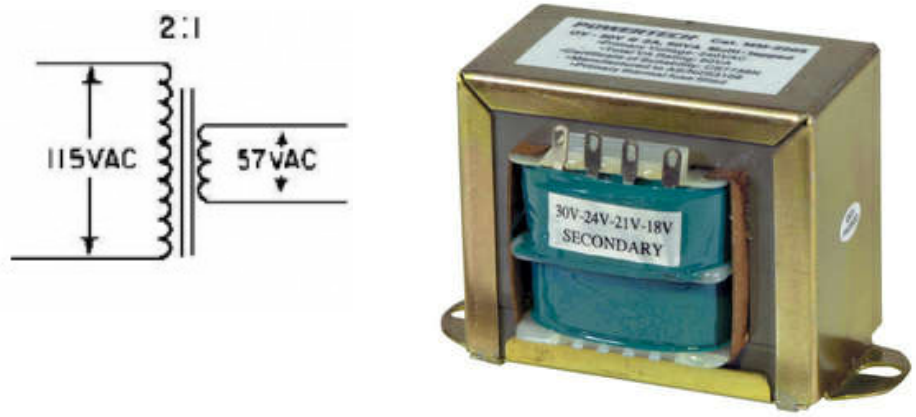


Fig. i step-down transformer

Design of step down transformer:

The following information must be available to the designer of the transformer.

1) Power output.
2) Operating voltage.
3) Frequency range.

4) Efficiency and regulation.

Size of core is one of the first consideration in regard of weight and volume of a transformer. This depends on type of core and winding configuration used. Generally following formula is used to find Area or Size of the Core.

$$Ai = \sqrt{Wp} / 0.87$$

Where Ai = Area of cross section in square cm.

Wp = Primary Wattage.

For our project we require +5V output, so transformer secondary winding rating is 9V, 500mA.

So secondary power wattage is,

$$P2 = 9 * 500mA$$

$$= 4.5Watt$$

So,

$$Ai = \sqrt{4.5} / 0.87$$

$$= 2.4$$

Generally 10% of area should be added to the core.

So,

$$Ai = 2.8$$

a) Turns per volt: - Turns per volt of transformer are given by relation.

$$\text{Turns per volt} = 100000 / 4.44 f * Bm * Ai$$

Where,

F = Frequency in Hz.

Bm = Density in Wb / Square meter.

Ai = Net area of the cross section.

Following table gives the value of turns per volt for 50 Hz frequency.

Flux density 0.76 Wb /sq m	1.14	1.01	0.91	0.83
Turns per Volt 45 / Ai	40 / Ai	45 / Ai	50 / Ai	55 / Ai

Generally lower the flux density better the quality of transformer. For our project we have taken the turns per volt is 0.91 Wb / sq.m from above table.

$$\text{Turns per volt} = 50 / Ai$$

$$= 50 / 2.8$$

$$= 17.85$$

Thus the turns for the primary winding is,

$$220 * 17.85 = 3927$$

And for secondary winding,

$$9 * 17.85 = 160$$

Wire size: - As stated above the size is depends upon the current to be carried out by winding which depends upon current density. For our transformer one tie can safely use current density of 3.1 Amp / sq.mm.

For less copper loss 1.6Amp/sq.mm or 2.4sq.mm may be used generally even size gauge of wire are used.

R.M.S secondary voltage at secondary to transformer is 9V. so maximum voltage Vm across secondary is

= 9 * 1.141

= 12.727v

D.C output voltage Vm across secondary is,

Vdc = 2 * Vm/pi

= 2 * 12.727/3.14

= 8.08 V

P.I.V rating of each diode is

PIV = 2Vm

= 2 * 8.08

= 16.16 V

Maximum forward current, which flow from each diode, is 500 mA. So from above parameter, we select diode IN4007 from the diode selection manual.

ii. Rectifier

Rectifier is a device which converts the sinusoidal ac voltage into either positive or negative pulsating dc. P-N junction diode, which conducts when forward biased and practically does not conduct when reverse biased, can be used for rectification i.e. for conversion of ac into dc. The rectifier typically needs one, two or four diodes. Rectifiers may be either half-wave rectifiers or full-wave rectifiers (centre-tap or bridge) type. The output voltage from a rectifier circuit has a pulsating character i.e., it contains unwanted ac components (components of supply frequency f and its harmonics) along with dc component. For most supply purposes, constant direct voltage is required than that furnished by a rectifier. To reduce ac components from the rectifier output voltage a filter circuit is required.

Thus filter is a device which passes dc component to the load and blocks I ac components of the rectifier output. Filter is typically constructed from reactive circuit I elements such as capacitors and/or inductors and resistors. The magnitude of output dc voltage may vary with the variation of either the input ac voltage or the magnitude of load current. So at the output of a rectifier filter combination a voltage regulator is required, to provide an almost constant dc voltage at the output of the regulator. The voltage regulator may be constructed from a Zener diode, and or discrete transistors, and/or integrated circuits (ICs). Its main function is to maintain a constant dc output voltage. However, it also rejects any ac ripple voltage that is not removed by the filter. The regulator may also include protective devices such as short-circuit protection, current limiting, thermal shutdown, or over-voltage protection.

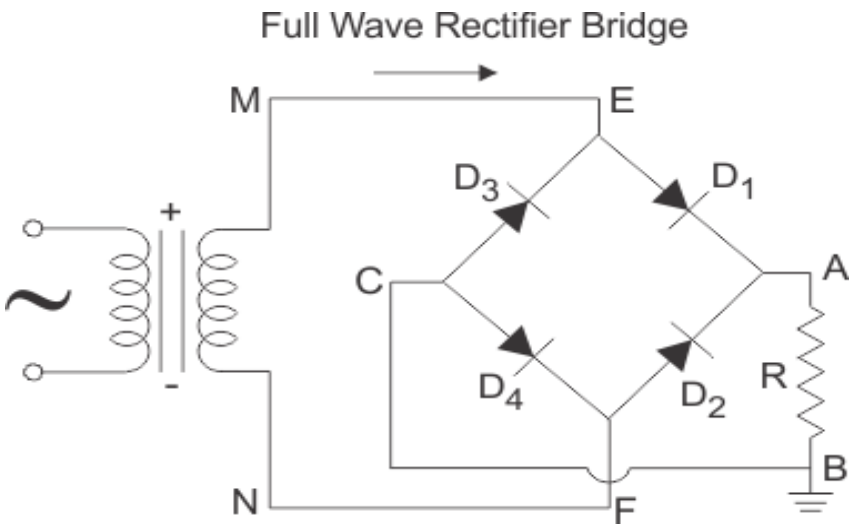


Fig. ii full wave bridge rectifier

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 four diodes labeled D_1 to D_4 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

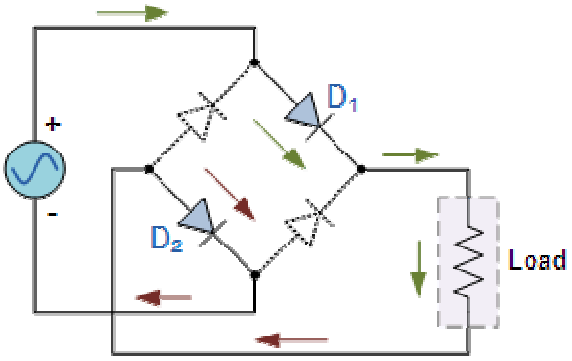


Fig. iii positive half cycle

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

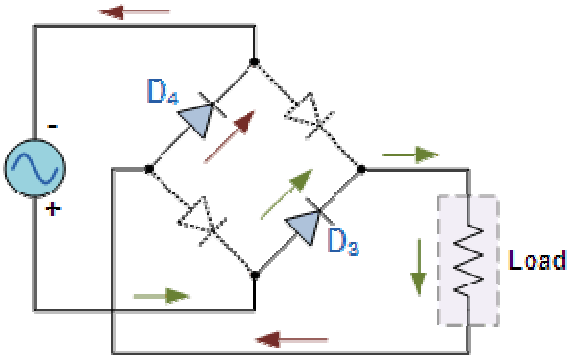
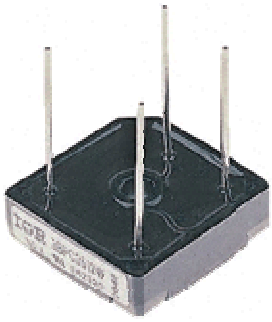


Fig. iv positive half cycle

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 x 0.7 = 1.4V) less than the input V_{MAX} amplitude. The ripple frequency is now twice the supply frequency (e.g. 100Hz for a 50Hz supply or 120Hz for a 60Hz 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.

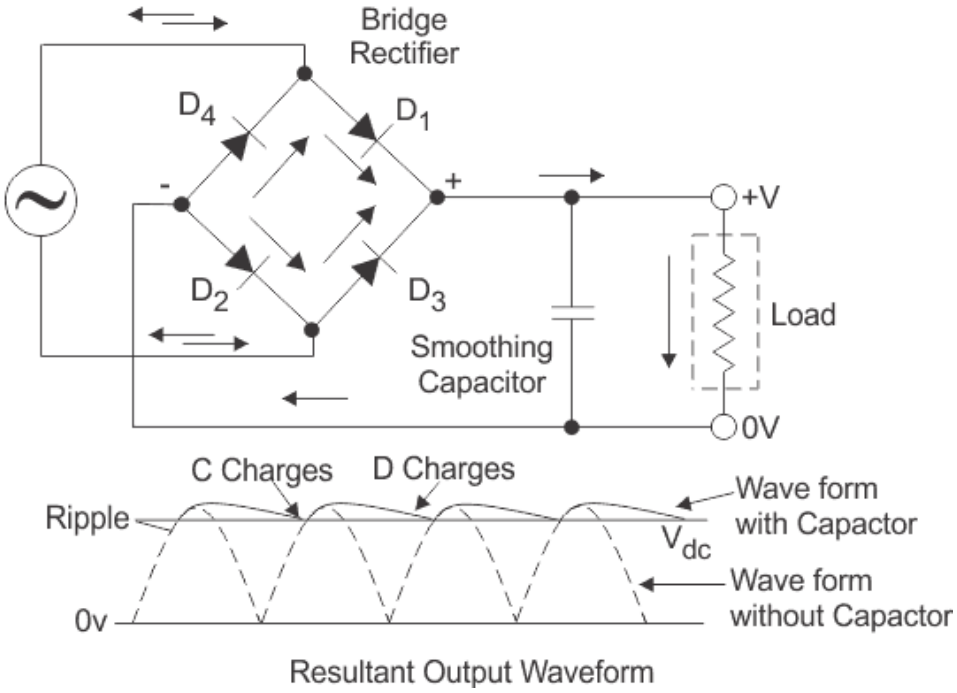


Fig. v output waveform of full wave bridge rectifier

iii. Filter

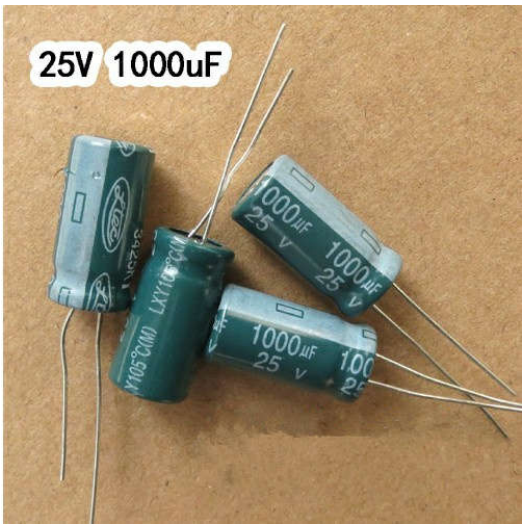


Fig.vi electrolytic capacitor

An electrolytic capacitor is a sort of capacitor that utilizes an electrolyte to obtain greater capacitance than the other type of capacitors. An electrolyte is a gel or fluid in which concentration of ions is very high. Electrolytic capacitor is a general term used for three different capacitor family members:

- Aluminum electrolytic capacitors
- Tantalum electrolytic capacitors

- Niobium electrolytic capacitors

Fig. vii aluminum electrolytic capacitor indicating positive and negative terminals

Almost all the electrolytic capacitors are polarized which means the voltage of anode must be always higher than the cathode. The ability of large capacitance makes them highly useful for sending low-frequency signals. They are extensively used for noise filtering or decoupling in power supplies. The advantage of large capacitance comes with few drawbacks as well. Drawbacks include leakage currents, equivalent series resistance and a limited lifetime. Electrolytes are made up of aluminum or tantalum and few other metals.

A special type of electrolytic capacitors with capacitances of hundreds and thousands of farads are known as super capacitors. They are also known as double-layer electrolytic capacitors.

Characteristics:

Capacitance Drift:

-The electrical characteristics highly depend on the type of electrolyte used and the anode. The capacitance of electrolytic capacitors has large tolerances 20% and drifts from nominal value as the time passes. This implies aluminum capacitor whose nominal capacitance is 47μF is expected to have a value between 37.6μF and 56.4μF. Tantalum capacitors can also be made with higher tolerances, but their maximum operating voltage is very low. So they cannot be used as perfect replacement aluminum capacitors.

Applications:

- Used to reduce voltage fluctuations in various filtering devices.
- Used in output and input smoothing to filter when DC signal is weak with AC component.
- They are extensively used for noise filtering or decoupling in power supplies.

They are used for coupling signals between amplifier stages and also to store energy in flash lamps

iv. Voltage Regulator

A voltage regulator is an electronic circuit that provides a stable dc voltage independent of the load current, temperature and ac line voltage variations. It may use an electromechanical mechanism, or electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. Voltage sources in a circuit may have fluctuations resulting in not giving fixed voltage outputs. Voltage regulator

IC maintains the output voltage at a constant value. 7805 IC, a voltage regulator integrated circuit (IC) is a member of 78xx series of fixed linear voltage regulator ICs used to maintain such fluctuations. The xx in 78xx indicates the fixed output voltage it provides. 7805 IC provides +5 volts regulated power supply with provisions to add heat sink as well. Let's look into some of the basic ratings to get an overview.

7805 IC Rating

- Input voltage range 7V- 35V
- Current rating I_c = 1A
- Output voltage range V_{Max} =5.2V, V_{Min} =4.8V

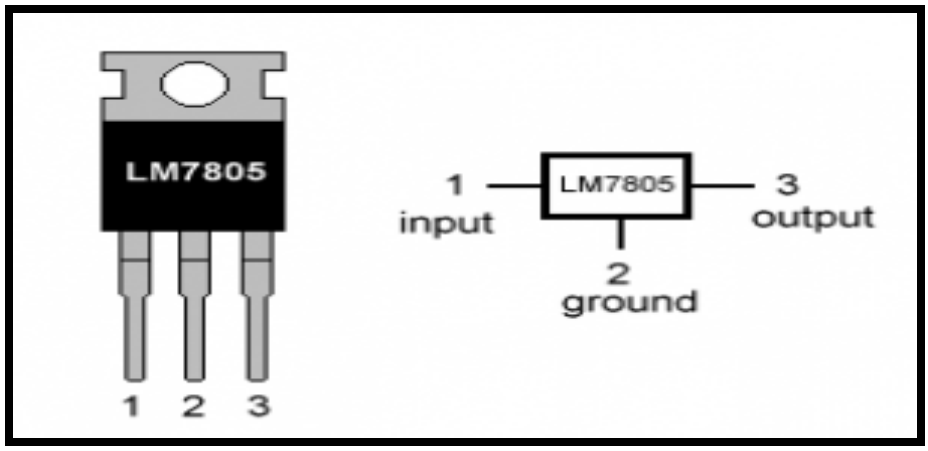


Fig. viii pinout diagram of LM7805

Pin Description of 7805 IC

Table: Pin Details of 7805 IC

PIN NO	PIN	Function	Description
1	INPUT	Input voltage (7V-35V)	In this pin of the IC positive unregulated voltage is given in regulation.
2	GROUND	Ground (0V)	In this pin where the ground is given. This pin is neutral for equally the input and output.
3	OUTPUT	Regulated output; 5V (4.8V-5.2V)	The output of the regulated 5V volt is taken out at this pin of the IC regulator.

The difference between the input and output voltage appears as heat. The greater the difference between the input and output voltage, the more heat is generated. If too much heat is generated, through high input voltage, the regulator can overheat. If the regulator does not have a heat sink to dissipate this heat, it can

be destroyed and malfunction. Hence, it is advisable to limit the voltage to a maximum of 2-3 volts higher than the output voltage. So the two options are, design your circuit so that the input voltage going into the regulator is limited to 2-3 volts above the output regulated voltage or place an appropriate heat sink that can efficiently dissipate heat.

4.2 PCB Designing process

4.2.1 Introduction to PCB

Printed circuit boards may be covered in two topics; technology and design. Printed circuit boards are called PCB in short. Printed circuit consists of conductive circuit pattern applied to one or both sides of an insulation base, depending upon that ,it is called single side PCB or double sided PCB(SSB and DSB).Conductor materials like silver, brass, aluminum and copper are most widely used. The thickness of the conducting material depends upon the current carrying capacity of circuit. Thus a thicker copper layer will have more current carrying capacity.

The printed circuit board usually serves three distinct functions:

1) It provides mechanical support for the components mounted on it.
2) It provides necessary electrical interconnections.
3) It acts as a heat sink that is it provides a conduction path leading to removal of most of the heat generated in the circuit.

4.2.2 Manufacturing process of printed circuit board:

The conductor pattern which is on the master film is transferred on copper clad laminate by two methods:

1) Photo resists printing.
2) Screen printing.

1) Photo resists printing:-

Photopolymer resist is a light sensitive organic material like KPR (Kodak Photo Resist) which is applied to the board as thin film. The photo resist when exposed to ultraviolet light hardens or polymerizes. Once it is polymerized, it becomes insoluble to certain chemical solvents known as developers.

The developer dissolves the portion which is masked or which is not exposed to light. Thus the pattern that is to be drawn on PCB is derived from the artwork which is photographic process. This is transferred to a master film on 1:1 scale. This can be reduced to any small size thus miniaturization is possible. The pattern is transferred to a mask. This mask is kept on PCB. The whole process is known as Image Transfer.

The unpolymerized or masked portion is washed away in developer leaving wanted copper pattern on board KPR or photo resist is then removed.

Requirements of photo resists

1) It should have good resolution and light sensitivity.
2) It should be resistant to developers which are used to remove unwanted copper.
3) It should have possibility to strip after unwanted copper is removed.
4) Its cost must be less.

Photo resist is normally applied by:

1) Flow coating OR
2) Roller coating OR
3) Dip coating OR
4) Spraying

4.2.3 Screen printing:

This technique is similar to the one used in printing industry. The copper foil is covered with printing ink where the conducting paths are going to be. The screen which is used for pattern is of either stainless steel or polymer mesh which is dimensionally accurate and fine mesh. The open meshes of screen correspond to the pattern.

PCB is placed under the screen. Printing ink is placed at one end of the screen, and by means of a rubber squeegee it is pushed through open meshes. Printed circuit board is then removed for drying. After drying board is washed in ferric chloride which acts as etchant. Etching is chemical process by which unwanted copper is removed. The portion which is covered by ink is not removed, that is the pattern remains intact. Later ink stripping is done with trichloroethylene.

4.2.4 Protection of copper tracks:

Copper when exposed to atmosphere for a long time gets tarnished and problems arise at the time of soldering.

The tracks can be protected by applying lacquer or varnish depending upon the thickness of the track. Copper is also protected by plating. There are three methods of plating.

1) Immersion plating
2) Electro less plating
3) Electroplating

Immersion plating utilizes tin and its alloys and gold. It is done by chemical replacement from coating material salt solution. This method is simple and less costly.

In electro less copper coating electric current is not used. Instead, a chemical reducing agent is used which supplies electrons for reaction in which copper is reduced from its ionic state.

In electroplating, a DC current is passed between two electrodes, and a thin coating is deposited on cathode when immersed in electrolyte.

4.2.5 Etching:-

Removal of unwanted copper, to give final copper pattern is known as etching. Solutions which are used in etching are known as etchants.

1) Ferric chloride
2) Cupric chloride
3) Chromic acid
4) Alkaline ammonia

Out of these chemicals, ferric chloride is widely used because it has short etching time and it can be stored for a longer time. Rinsing follows etching.

4.2.6 Solders and soldering techniques:

Solders are special alloys which are used to get either a mechanically strong joint or electric joint of low contact resistance. Solders have low melting points compared to metals to be joined. Therefore when solder is heated, molten solder wets the metal, spreads and joints.

Any contamination on the surface of the metal to be joined acts as a paired and hampers the action of wetting.

Solders are divided into two groups, soft and hard. Soft solders have lower melting point and lower tensile strength. Soft solders are largely tin lead alloys and silver based compositions. Fluxes are auxiliary materials used while soldering is done.

1) They dissolve and remove oxides and contaminants from surface of metals to be soldered.
2) They protect the metal surface and molten solder from oxidation.
3) They reduce the surface tension of molten solder.
4) They improve the ability of solder to wet the metal.

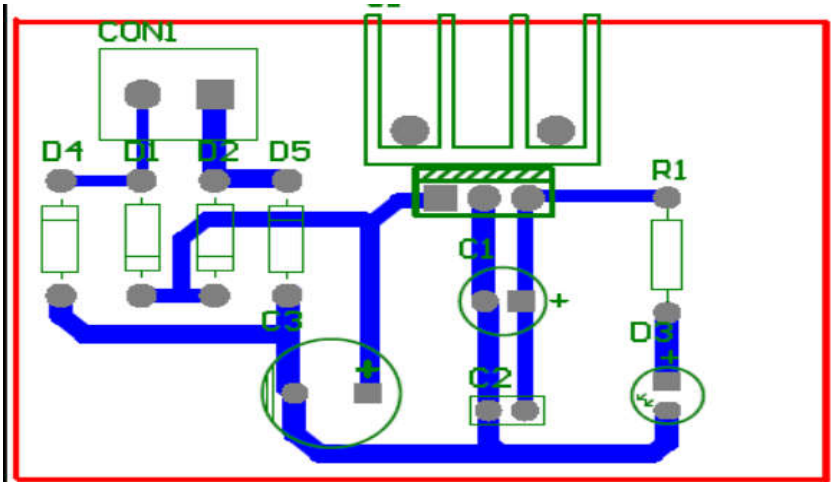
1. Active or acid fluxes: they are prepared on the basis of active substances, such as hydrochloric acid, chlorides and fluorides of metals, etc. these fluxes intensively dissolve oxide films on the metal surface and thus make for better adhesion of the solder to the base metal, the residue must be thoroughly removed after soldering

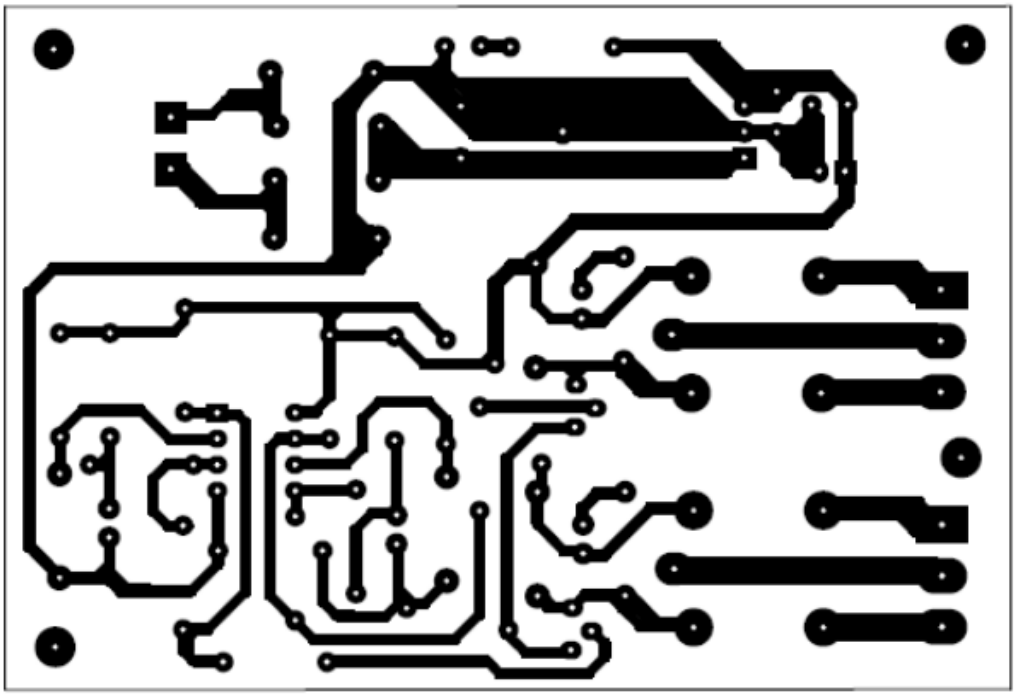
Active fluxes are not used in soldering the circuit wires of radio devices.

2. Acid –free fluxes: these are rosin and rosin base material with the addition of inaction substances such as alcohol and glycerin.

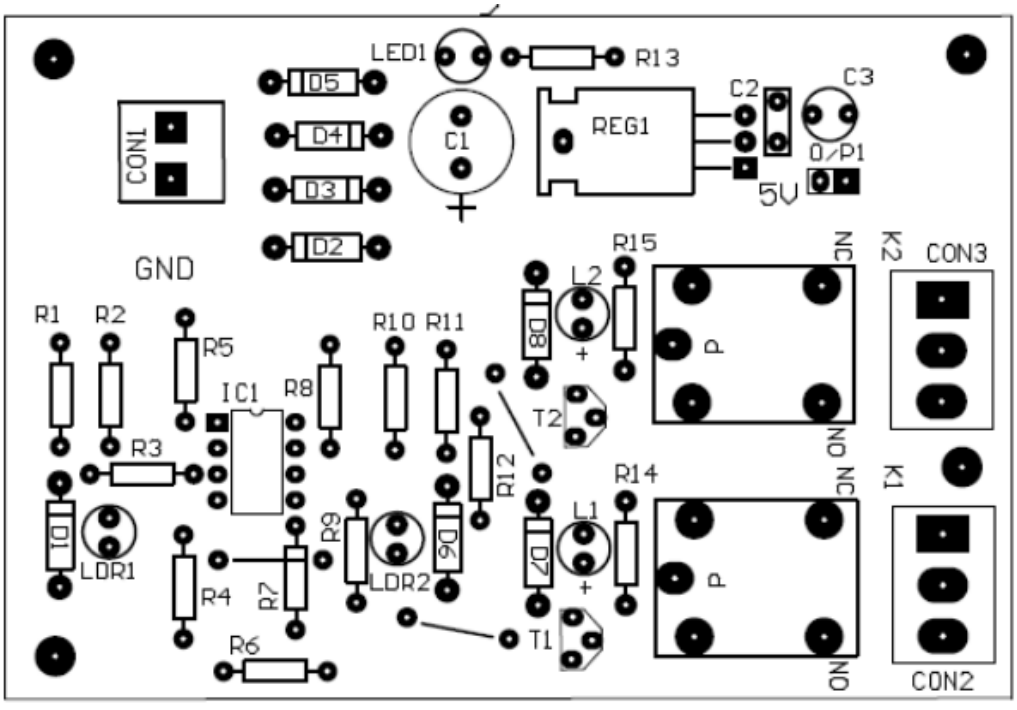
3. Activated fluxes: these include rosin base fluxes containing activating agents in small quantities, such as hydrochlorides and phosphates of aniline, salicylic acid and hydrochlorides of diethyl amine. A high activity of some of these fluxes makes the preliminary removal of oxides after degreasing unnecessary.

4.3 Layout





Bottom layer



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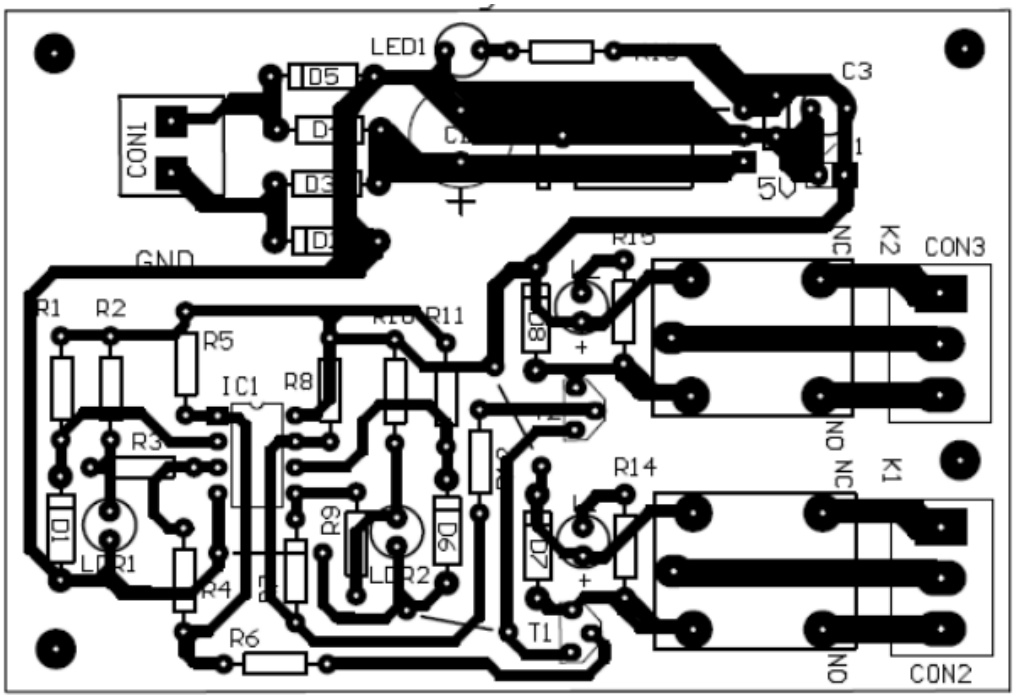


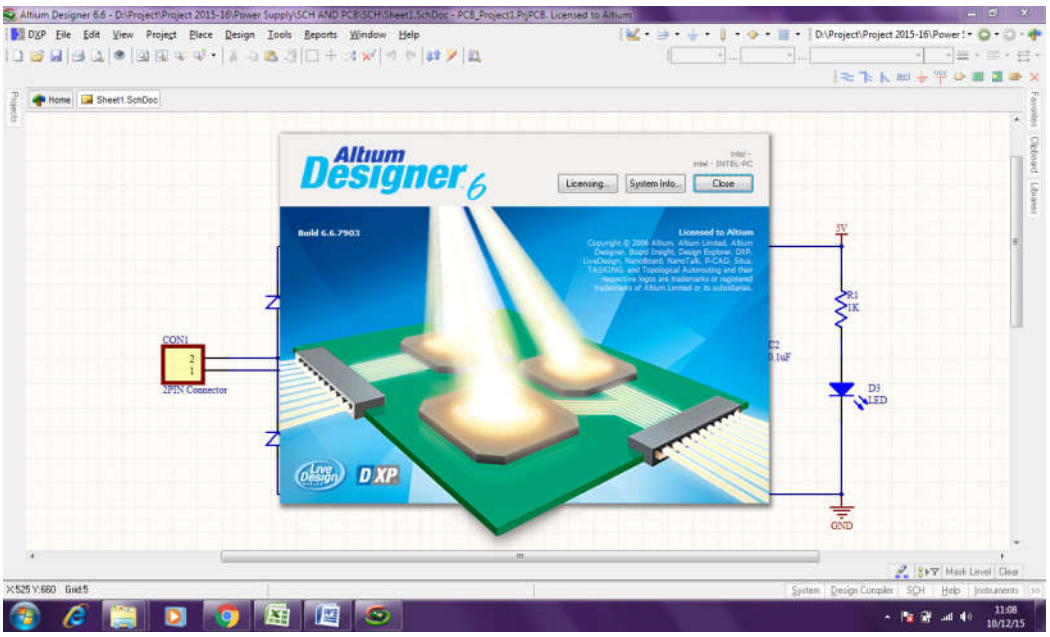
Composite layer

4.4 Software Required

1. ALTIUM for PCB making
2. OrCAD- For circuit diagram

1. ALTIUM for PCB making

Altium Limited is an Australian owned public software company that provides PC-based electronics design software for engineers. Founded in Tasmania, Australia 1985, Altium now has regional headquarters in Australia, China, United States, Europe, and Japan, with resellers in all other major markets. The company was known as "Protel" until 2001.



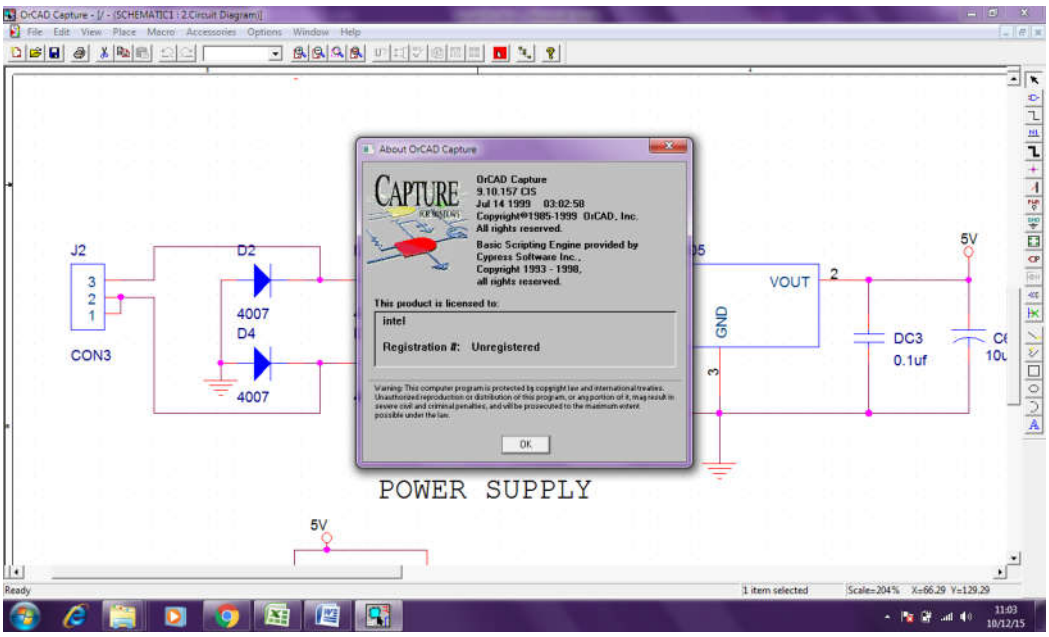
3. OrCAD- For circuit diagram

OrCAD is a proprietary software tool suite used primarily for electronic design automation (EDA). The software is used mainly by electronic design engineers and electronic technicians to create electronic schematics and electronic prints for manufacturing printed circuit boards.

The name OrCAD is a portmanteau, reflecting the company and its software's origins: **Or**egon + **CAD**. **OrCAD PCB Designer** is a printed circuit board designer application, and part of the OrCAD circuit design suite. PCB Designer includes various automation features for PCB design, board-level analysis and design rule checks (DRC).

The PCB design may be accomplished by manually tracing PCB tracks, or using the Auto-Router provided. Such designs may include curved PCB tracks, geometric shapes, and ground planes.

PCB Designer integrates with OrCAD Capture, using the component information system (CIS) to store information about a certain circuit symbol and its matching PCB footprint.



CHAPTER 5

IMPLEMENTATION

5.1 Key Concept

As of now, we know about adaptive headlamps in many vehicles. These vehicles, most probably the luxury one i.e. BMWs, use the AFS Technology from several years till date. These cars use electronic sensors and electric motors which are directed as per the turning angle of the steering. As this would be a completely electronics based idea, we have thought of something different other than electronics. Our key concept will use mechanical linkages in place of expensive electronic systems, which are also non-reliable and hard to maintain and replace.

Our key concept is as follows:

1. All mechanical linkages are to be used for AFS, so the elimination of electronics will help to eliminate the cost and hence this technology will be in reach of every human being.
2. As we are using mechanical linkages, the replacement of any faulty parts can be done in any local garage, service stations or even by self at home.
3. The steering will be thus set as if we rotate it to a certain decided angle, the respective side indicators will switch on automatically using a limit switch.
4. As today's energy crises are sky leveling, we have decided to use solar panels and if the budget permits we will use paint containing solar nano-cells.
5. So, this will give our project a new definition rather than what we are observing in our day-to-day lives.

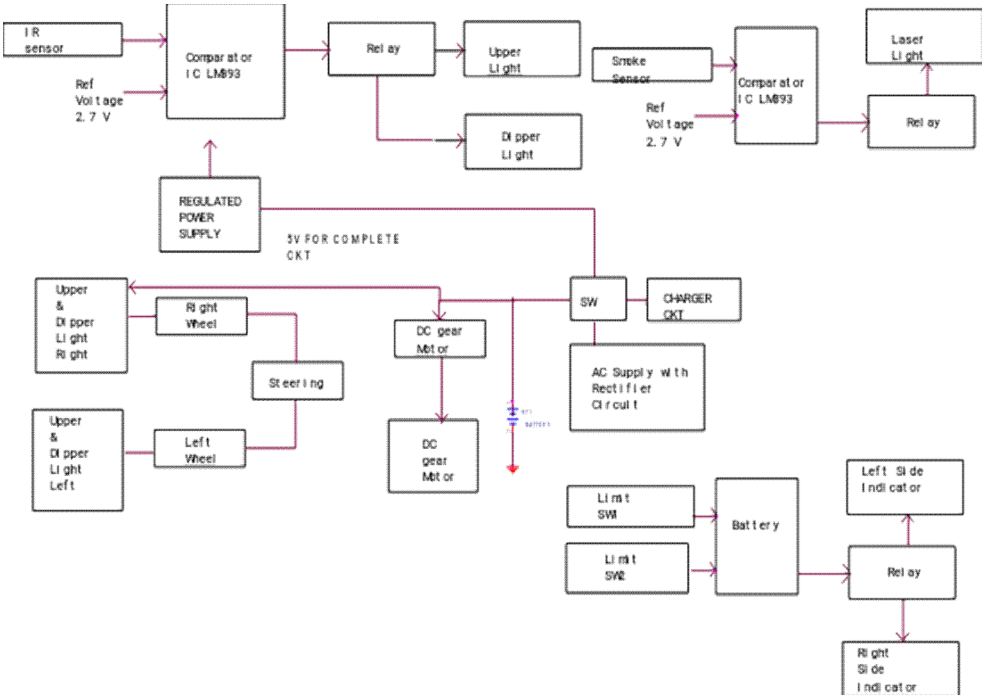
6. We're also using our fourth specification, i.e. laser tail lights which will function as pilot/guiding light for the preceding vehicle in rainy and foggy days where conventional are also not visible.

7. Pertaining to the failure of electronic components and the system when there is no power supply from the battery and also pertaining to the day-to-day surveys of accidents that take place majorly because of lack of illumination on such winding roads which we go through our journeys once a day (mainly night times).

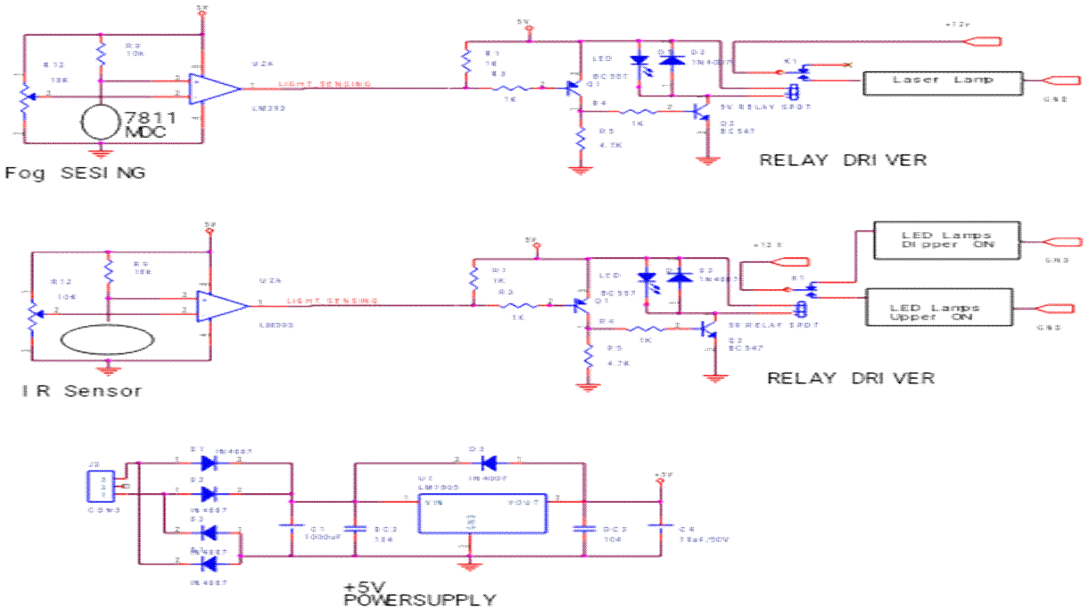
Fig.1.2 Conventional Headlight

Fig.1.3 Adaptive Headlight

5.2 Block diagram



5.3 Circuit Diagram



5.4 Working

As shown in fig. using Comparator IC LM393, Relay, IR Sensor, smoke sensor, battery etc. various features of a car are carried out to become it a smart car.

They are,

1. **Obstacle sensor**

Here IR Sensor is used to sense the obstacle; output of IR sensor is connected to LM393 Comparator IC, so when sensor senses the obstacle i.e. a bike, truck or a car it will give the upper or dipper light indicator which is operated using SPDT relay. It requires 2.7V.

2. **Laser light will be on when detects a smoke by smoke sensor**

A sensor senses the smoke and gives the output to Comparator IC LM393 if smog is present then laser light will turn on otherwise it will off. To perform the operation it requires 2.7v and on/off of a laser light is done using relay.

3. **Upper and dipper light**

When a car's steering is rotate to right then upper and dipper light will on of right side and when it is rotated to left side then upper and dipper light of left side should be on this mechanism requires DC Gear motor to move the steering.

4. **Left and right side indicator**

For the safety purpose left and right side indicator is must. This is done using relay. When a car is going to left side then it will give the left indicator using relay similarly right indicator when turning to right side. It requires a battery to operate.

3.3 Hardware required

3.3.1 IR Sensor

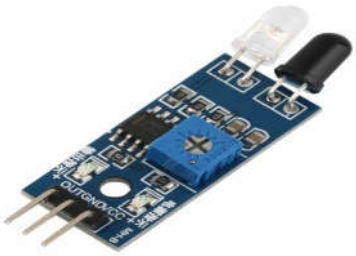


Fig.2.10 IR Sensor

Proximity Sensor is used to detect objects and obstacles in front of sensor. Sensor keeps transmitting **infrared light** and when any object comes near, it is detected by the sensor by monitoring the reflected light from the object. It can be used in robots for obstacle avoidance, for automatic doors, for parking aid devices or for security alarm systems, or contact less tachometer by measuring RPM of rotation objects like fan blades.

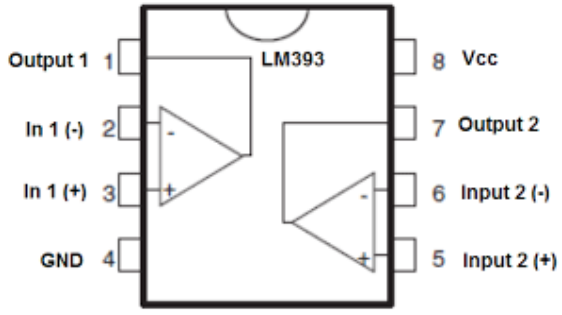
Features of IR Proximity Sensor

1. IR transmitter
2. Ambient light protected IR receiver
3. 3 pin easy interface connectors
4. Indicator LED & Power LED
5. Distance 2cm to 30cm
6. Can differentiate between dark and light colors
7. Active Low on object detection
8. 3.3 to 5V operation

Applications of IR Proximity Sensor

1. Proximity Sensor
2. Obstacle Detector Sensor
3. Line Follower Sensor
4. Wall Follower Sensor

3.3.2 Comparator LM393 IC



The LM193 series consists of two independent precision voltage comparators with an offset voltage specification as low as 2.0 mV max for two comparators which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators

also have a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage. Application areas include limit comparators, simple analog to digital converters; pulse, square wave and time delay generators; wide range VCO; MOS clock timers; multivibrators and high voltage digital logic gates. When operated from both plus and minus power supplies, the LM193 series will directly interface with MOS logic where their low power drain is a distinct advantage over standard comparators.

Features

1. Wide supply
2. Voltage range: 2.0V to 36V
3. Single or dual supplies: ±1.0V to ±18V
4. Very low supply current drain (0.4 mA) — independent
5. supply voltage
6. Low input biasing current: 25 nA
7. Low input offset current: ±5 nA
8. Maximum offset voltage: ±3 mV
9. Input common-mode voltage range includes ground
10. Differential input voltage range equal to the power
11. Supply voltage
12. Low output saturation voltage,: 250 mV at 4 mA
13. Output voltage compatible with TTL, DTL, ECL, MOS and CMOS logic systems
14. Available in the 8-Bump (12 mil) micro SMD package

Advantages

1. High precision comparators
2. Reduced VOS drift over temperature
3. Eliminates need for dual supplies
4. Allows sensing near ground
5. Compatible with all forms of logic
6. Power drain suitable for battery operation

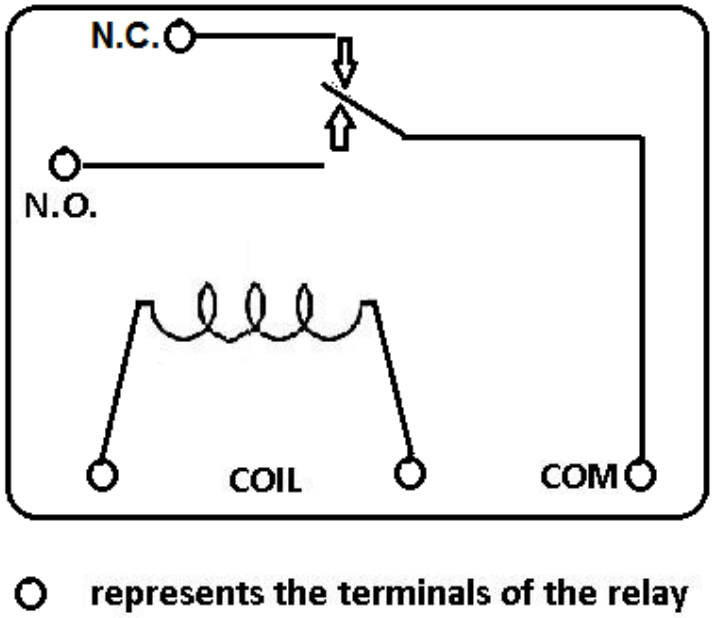
3.3.3 Relay

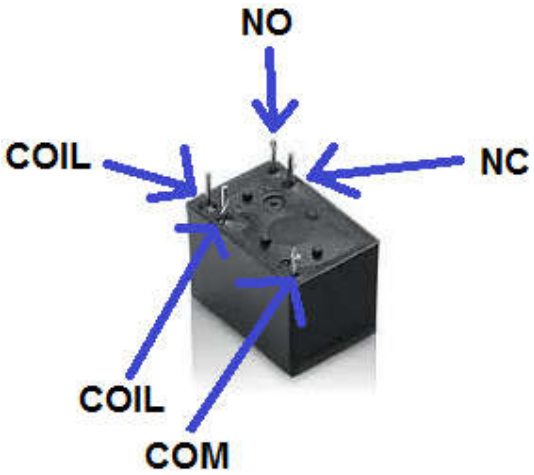
The Single Pole Double Throw SPDT relay is quite useful in certain applications because of its internal configuration. It has one common terminal and 2 contacts in 2 different configurations: one can be Normally Closed and the other one is opened or it can be Normally Open and the other one closed. So basically you can see the SPDT relay as a way of switching between 2 circuits: when there is no voltage applied to the coil one circuit “receives” current, the other one doesn’t and when the coil gets energized the opposite is happening.

Terminal Pins

A Single Pole Double Throw Relay comes with five terminal points.

The terminals are COIL, COIL, COM, and NO, and NC.





Terminal Descriptions

1 COIL

This is one end of the coil.

2 COIL

This is the other end of the coil. These are the terminals where you apply voltage to in order to give power to the coils (which then will close the switch). Polarity does not matter. One side gets positive voltage and the other side gets negative voltage. Polarity only matters if a diode is used.

3 NO

This is Normally Open switch. This is the terminal where you connect the device that you want the relay to power when the relay is powered, meaning when the COIL receives sufficient voltage. The device connected to NO will be off when the relay has no power and will turn on when the relay receives power.

4 NC

This is the Normally Closed Switch. This is the terminal where you connect the device that you want powered when the relay receives no power. The device connected to NC will be on when the relay has no power and will turn off when the relay receives power.

5 COM

This is the common of the relay. If the relay is powered and the switch is closed, COM and NO have continuity. If the relay isn't powered and the switch is open, COM and NC have continuity. This is the terminal of the relay where you connect the first part of your circuit to.

Features

1. MI-1 pole series relay cover switching capacity 10A.
2. Slim type and small occupying area can offer high density P. C. Board technique.
3. Insulation distance of 8mm min. is designed. By using insulation that meets JIS insulation class E, a dielectric strength of 5000V min. and surge resistances of 1000V min. are possible.
4. Employment of suitable plastic materials to be applied to high temperature and various chemical solutions.
5. Complete protective construction from dust and soldering flux.

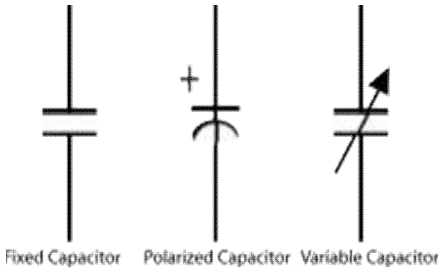
3.3.4 Resistors

Resistors are the most common *passive* electronic component (one that does not require power to operate). They are used to control voltages and currents. While a resistor is a very basic component, there are many ways to manufacture them. Each style has its own characteristics that make it desirable in certain types of applications. Choosing the right type of resistor is important to making high-performance or precision circuits work well. This bonus chapter covers the resistor types and helps with picking the right one for your project. All resistors are basically just a piece of conducting material with a specific, value of resistance. For that piece of conducting material to be made into a practical resistor, a pair of electrodes and leads is attached so current can flow. The resistor is then coated with an Insulating material to protect the conducting material from the surrounding environment and vice versa. There are several different resistor construction methods and body styles (or packages) that are designed for a certain range of applied voltage, power dissipation, or other considerations. The construction of the resistor can affect its performance at high frequencies where it may act like a small inductor or capacitor has been added, called parasitic inductance or capacitance.

Fig.3.1resistor

3.3.5 Capacitor

A capacitor is a passive two-terminal electrical component that stores potential energy in an electric field. The effect of a capacitor is known as capacitance. While some capacitance exists between any two electrical conductors in proximity in a circuit, a capacitor is a component designed to add capacitance to a circuit. The capacitor was originally known as a condenser.



The physical form and construction of practical capacitors vary widely and many capacitor types are in common use. Most capacitors contain at least two electrical conductors often in the form of metallic plates or surfaces separated by a dielectric medium. A conductor may be a foil, thin film, sintered bead of metal, or an electrolyte. The non-conducting dielectric acts to increase the capacitor's charge capacity. Materials commonly used as dielectrics include glass, ceramic, plastic film, paper, mica, and oxide layers. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, an ideal capacitor does not dissipate energy.

When two conductors experience a potential difference, for example, when a capacitor is attached across a battery, an electric field develops across the dielectric, causing a net positive charge to collect on one plate and net negative charge to collect on the other plate. No current actually flows through the dielectric, however, there is a flow of charge through the source circuit. If the condition is maintained sufficiently long, the current through the source circuit ceases. However, if a time-varying voltage is applied across the leads of the capacitor, the source experiences an ongoing current due to the charging and discharging cycles of the capacitor. Capacitance is defined as the ratio of the electric charge on each conductor to the potential difference between them. The unit of capacitance in the International System of Units (SI) is the farad (F), defined as one coulomb per volt (1 C/V). Capacitance values of typical capacitors for use in general electronics range from about 1 picofarad (pF) (10^{-12} F) to about 1 millifarad (mF) (10^{-3} F).

The capacitance of a capacitor is proportional to the surface area of the plates (conductors) and inversely related to the gap between them. In practice, the dielectric between the plates passes a small amount of leakage current. It has an electric field strength limit, known as the breakdown voltage. The conductors and leads introduce an undesired inductance and resistance. Capacitors are widely used in electronic circuits for blocking direct current while allowing alternating current to pass. In analog filter networks, they smooth the output of power supplies. In resonant circuits they tune radios to particular frequencies. In electric power transmission systems, they stabilize voltage and power flow. The property of energy storage in capacitors was exploited as dynamic memory in early digital computers.

3.3.6 Battery

An electric **battery** is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smart phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that when connected to an external circuit will flow and deliver

energy to an external device. When a battery is connected to an external circuit, electrolytes are able to move as ions within, allowing the chemical reactions to be completed at the separate terminals and so deliver energy to the external circuit. It is the movement of those ions within the battery which allows current to flow out of the battery to perform work. Historically the term "battery" specifically referred to a device composed of multiple cells, however the usage has evolved additionally to include devices composed of a single cell.

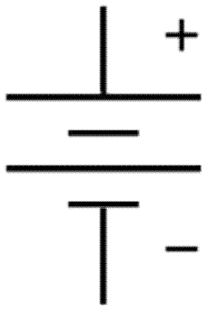


Fig. electronic symbol

Primary (single-use or "disposable") batteries are used once and discarded; the electrode materials are irreversibly changed during discharge. Common examples are the alkaline battery used for flashlights and a multitude of portable electronic devices. Secondary (rechargeable) batteries can be discharged and recharged multiple times using an applied electric current; the original composition of the electrodes can be restored by reverse current.

Principle of operation

Batteries convert chemical energy directly to electrical energy. A battery consists of some number of voltaic cells. Each cell consists of two half-cells connected in series by a conductive electrolyte containing anions and cations. One half-cell includes electrolyte and the negative electrode, the electrode to which anions (negatively charged ions) migrate; the other half-cell includes electrolyte and the positive electrode to which cations (positively charged ions) migrate. Redox reactions power the battery. Cations are reduced (electrons are added) at the cathode during charging, while anions are oxidized (electrons are removed) at the anode during charging. During discharge, the process is reversed. The electrodes do not touch each other, but are electrically connected by the electrolyte. Some cells use different electrolytes for each half-cell. A separator allows ions to flow between half-cells, but prevents mixing of the electrolytes.

Each half-cell has an electromotive force (*emf*), determined by its ability to drive electric current from the interior to the exterior of the cell. The net emf of the cell is the difference between the emfs of its half-cells. Thus, if the electrodes have emfs and, then the net emf is; in other words, the net emf is the difference between the reduction potentials of the half-reactions.

The electrical driving force or across the terminals of a cell is known as the *terminal voltage (difference)* and is measured in volts. The terminal voltage of a cell that is neither charging nor discharging is called the open-circuit voltage and equals the emf of the cell. Because of internal resistance,[18] the terminal voltage of a cell that is discharging is smaller in magnitude than the open-circuit voltage and the terminal voltage of a cell that is charging exceeds the open-circuit voltage. An ideal cell has negligible internal resistance, so it would maintain a constant terminal voltage of until exhausted, then dropping to zero. If such a cell maintained 1.5 volts and stored a charge of one coulomb then on complete discharge it would perform

1.5 joules of work. In actual cells, the internal resistance increases under discharge and the open circuit voltage also decreases under discharge. If the voltage and resistance are plotted against time, the resulting graphs typically are a curve; the shape of the curve varies according to the chemistry and internal arrangement employed.

The voltage developed across a cell's terminals depends on the energy release of the chemical reactions of its electrodes and electrolyte. Alkaline and zinc–carbon cells have different chemistries, but approximately the same emf of 1.5 volts; likewise NiCd and NiMH cells have different chemistries, but approximately the same emf of 1.2 volts. The high electrochemical potential changes in the reactions of lithium compounds give lithium cells emfs of 3 volts or more.

3.3.7 Limit switch

This is a rugged, easy to use, highly reliable limit switch. It is also used as **bump sensor** in accident detection projects and also used in Mechanical based projects where you have to determine if the object has reached a specific location. It is also used in CNC machines & 3D printer to detect if the part has reached the start or end point.

Features of Limit Switch

1. Technical Name: Limit Switch/Bump Switch
2. Dimension: 20 mm x 16 mm x 6.7 mm
3. Operating Temperature: -25 to +65
4. Operating Max Volt and Current: 5A 125V-3A 250V

CHAPTER 5

COSTING

5.1 Power supply component cost

Table5.1 component cost list of power supply

Comment	Description	Designator	Lib Ref	Quantiy	Cost
10uf/16v, Radial	Through Hole Radial 6mm dia.	C1	10uF/16v	1	8
0.1uF\CERAMIC	SMT Ceramic Capacitor	C2	0.1uF Ceramic	1	4
1000uf/16v, 5mm pitch	Electrolytic Capacitor Thru Hole 5mm pitch	C3	1000uF/16v	1	8
IN4007	Diode	D1, D4, D5, D6	IN4007	4	8
LED 5mm	Typical RED GaAs ED	D3	LED 5mm	1	2
2 Pin connector		P1	SIP2	1	10
1K AXIAL0.4	AXIAL0.4 MFR Resistor	R1	1K AXIAL0.4	1	1
KA7805, TO220	5V LDO	U1	LM7805	1	25
Total					**66**

Comment	Designator	Quantity	Price
1000uF/50V	C1	1	8
1uF	C2, C4, C5	3	8
0.1uF	C3	1	8
104	C6, C13	2	4
1uF/63v	C7	1	8
10uf/63V	C8	1	8
10uF/25V	C9, C12	2	8
33PF	C10, C11	2	8
DB9 FEMALE	CON1	1	15
	CON2	1	15
9 PIN RELYMATE	CON3	1	10
BUG STRIP MALE/FE	CON4	1	10
8PIN RELYMATE	CON5	1	10
IN4007	D1, D2, D3, D4, D5	5	2
MAX232	IC1	1	50
89C52	IC2	1	50
ULN2803	IC3	1	50

RED	L1	1	2
10K	P1	1	1
10K/9PIN	PACK1, PACK3, PACK4	3	4
10K 9 PIN	PACK2	1	4
1K	R1	1	1
8.2K	R2	1	1
47E	R3	1	1
LM7805	REG1	1	25
12MHz	X1	1	8
Total			319

CHAPTER 6

RESULTS AND DISSCUTION

6.1. Part name:-chassis

Part size - 650x550 mm

Part weight - 1.5 kg

Part quantity - 1

Part material: - soft cold rolled mild steel

Sr. No	Operation	Machine	Tool	Time
1	Cutting the material as required size	Metal cutting scissor	Scissor	30 min
2	Bending	Gravity fly press m/c	Bending blade	30 min

6.2 Part Name: - wheel bracket front

Part size : - 71.4mmx170.46mm

Part quantity : - 2

Part weight : -150 gm

Part material: - mild steel

Sr .no	Operation	Machine	Tool	Time
1	Cutting the material as our required size	Gas cutter	Gas nozzle	20 min
2	Drilling four hole	Drilling machine	Drill bit 15mm	20 min

6.3. Part name: - steering wheel and shaft

Part size : - 1.wheel dia.-165.1mm

2. Shaft length-228.6mm

Part quantity : - 2

Part weight : - 0.5 kg

Part material: - cast iron

Sr .no	Operation	Machine	Tool	Time
1	Cutting the material as our required size	Gas cutter	Gas nozzle	20min
2	Grinding the faces of tool	Grinding m/c	Grinding tool	15min
3	Welding the tool	Arc welding	Welding torch	15min

6.4 Part name: -steering linkages vertical and horizontal

Part size : - 1.horizontal -152.4mm

2. vertical-63.5mm

Part quantity : - 2

Part weight : - 120 gm

Part material: - mild steel

Sr .no	Operation	Machine	Tool	Time
1	Cutting the material as per our required size 1.155mmx20 mm 2.65mmx20mm	Saw machine	Saw machine blade	30 min

6.5 Part name: - Wheel bracket rear

Part size : - 114.3mmx50mm

Part quantity : - 2

Part weight : -100 gm

Part material: - mild steel

Sr .no	Operation	Machine	Tool	Time
1	Cutting the material as our required size	Gas cutter	Gas nozzle	20 min
2	Drilling six hole	Drilling machine	Drill bit 15mm	20 min

CHAPTER 7
CONCLUSION

7.1 Advantages

1. Running cost is low.
2. Low maintenance cost.
3. Speed cutting is high.
4. No need of skilled driver.
5. Rate of cutting is high.
6. Complexity is low.

7.2 Applications

The project can be used directly in the industry where punching process is done. The project in self as it is can be implemented verity wherever the material to be cut fulfills the range of specification of raw material the project is designed for currently the model that forms the project in capable of punching works.

In the industry like cutting small gasket, special purpose metal sheets, PVC sheets etc. this project can be implement in several working mode.

If the industry has completely done automation more particularly then this project along with the automation can be also used within such type of industry for this all purposes. The automated unit may require some type of interfacing along depending upon the automation system used in the industry.

The size of the material to be cut right is changed as per requirement of magnetic power. We can replace manual operated punching machine can directly by automatic punching machine. This machine preferably will get attached at the end of production line whenever required depending on plant layout production process, production type etc.

7.3 Conclusion

While concluding this report, we feel quite fulfill in having completed the project assignment well on time, we had enormous practical experience on fulfillment of the manufacturing schedules of the working project model. We are therefore, happy to state that the in calculation of mechanical aptitude proved to be a very useful purpose.

The selection of choice raw materials helped us in machining of the various components to very close tolerance and thereby minimizing the level of wear and tear. Needless to emphasis here that we had lift no stone unturned in our potential efforts during machining, fabrication and assembly work of the project model to our entire satisfaction.

CHAPTER 9

FUTURE SCOPE

The project included very simple type of Machine parts requiring very less component than conventional machinery. As work was successful studying & completing the results of this automatic electromagnetic punching m/c with solving other types of conventional punching machine problems associated with machine that can be implemented from higher to lower units cost. Its lowermost requirement of maintenance can again be beneficial for keeping cost down. This machine runs on electricity only during punching operation. This few out of very large no of rows can project this m/c across the investment.

As per Indian content is concern this machine can be very beneficial for virtually all type of punching units as it has very low capital investment.

This machine may form a simple solution for punching in the future. This machine also can be controlled by computer programs.

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