DEPARTMENT OF ELECTRICAL/ ELECTRONIC ENGINEERING

FEDERAL UNIVERSITY OYE- EKITI, EKITI STATE

DESIGN AND CONSTRUCTION OF AN ELECTRONIC VOTING MACHINE

BY

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EEE/11/0392

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING.

FEDERAL UNIVERSITY, OYE EKITI.

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A PROJECT PRESENTED TO THE DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING, FEDERAL UNIVERSITY, OYE EKITI, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR DEGREE IN ELECTRICAL AND ELECTRONICS ENGINEERING (B.ENG)

SEPTEMEBER, 2016

TOTAL
400
800
1400
200
500
500
240
250
120
25
700
200
150
800
10.000
500
500
200
1,700
7.000
5000
21.185

DECLARATION

I Ifejube Segun Emmanuel hereby declare that this project work carried out is the result of my personal effort and has not been submitted elsewhere for this purpose. All sources of information are duly acknowledged by means of references.

18/10/2016

....

[illegible] DATE

[illegible]

CERTIFICATION

This project work is titled "the design and construction of an electronic voting machine system" by Ifejube Segun Emmanuel, meets the requirement for the award of Bachelor of Engineering (B.Eng.) degree in Electrical/Electronics Engineering Department, Federal University Oye-Ekiti, Ekiti.

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EXTERNAL EXAMINER   DATE

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I thank God for His infinite mercy and grace that has kept me through my B.Eng. days in the University.

I would like to recognize the patience, guidance and help shown by my Project supervisor, Engr. A.K Babarinde, under the leadership of my Head of Department (H.OD) Dr. O. Akinsanmi . My families fo their love and support both financially and spiritually.

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I also appreciate my lecturers and my course mates who have in no small way encouraged me toward th successful completion of this project.

Thank you all may God continue to bless you more abundantly.

DEDICATION

This thesis is dedicated to Almighty God who spared my life throughout my degree programme till this moment in sound and good health.

ABSTRACT

This project presents a simple electronic voting machine which employs the timer and counters for operation. The project work was based on the production of a power circuit, sensor stage, timer and counters together in a unit operation. During implementation, I discovered there was daylight interference which impaired the sensitivity of the break-beam stages. This problem was solved by shielding the infrared sensors from daylight using an infrared filter. The relay I used to switch power directly to the Alarm circuit as using an emitter follower to drive the alarm module resulted in overheating of the emitter follower transistors .The circuit generated noise whenever the alarm was set off, this was due to the relatively large current drained from the DC power supply by the alarm module. To remove this noise a capacitor was put across the 12V supply rail as well as the 5V supply rail and a voltage follower and heat sink was used for the 12V regulator. Any further work on this project, there should be a kind of sensor to sense a particular paper to be used, so that the machine can recognize only a particular paper (voting card). Further work could be done to make the project work used in a larger environment involving a large number of people. This project could be applied for elections. Further application include the use in the bottling companies for counting bottles.

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ABBREVIATIONS

1. OP-AMP - Operational amplifier

2. AC – Alternating current

3. DC – Direct current

4. IC – Integrated Circuit

CHAPTER ONE

INTRODUCTION

1.1 PREMABLE

The electronic voting `machine makes use of electronic counters. timers and a software GUI (graphic user interface) designed using an object oriented environment.

Electronic counters and electronic timers are absolutely electronic units with several features and applications; they may be programmable through computer interface. Electronic counters and timers can be single/multi-functional units. Electronic counting applications may include: mathematical operations, control functions, batch counting, totalizing, event counting, preset or predetermining counting, pulse counting, up/down/bi-directional counting, frequency counting. or position indication. Electronic timer functions may include: time indication (such as in time meters and clocks). and rate indication (such as tachometers).

Counters are electronic instruments used for detecting. totalizing. and indicating an order of events. They can be mechanical, electromechanical or electronic devices that can keep trail of the number of input signals or pulses. Timers are used for automatically starting. or stopping. a machine or other devices.

Counter / timer combinations can perform both counting and timing functions. Electronic counters and electronic timers can be single function or multi-function, or programmable for more than one function. Electrical counters and electrical timers can be broken into the up directional. down directional. or bi-directional. Up directional counters can advance forward in its counting sequence. [1]

1.2 PROJECT MOTIVATION

In this modern age of technological advancement. I discovered that the mode at which Nigerians in all aspect perform elections is still undeveloped.

The traditional mode of counting votes but making a loud paper count of number can be eradicated and turned to a digital mode of counting making use of seven segment display that shows the number count.

Although, this project is limited to the school environment. But as it is said "A little drop of water can make a mighty ocean". From the school environment more advances could be brought to develop into a more sophisticated technology to compete with the ever advancing technological world.

The voting system in Nigeria has witnessed a lot of problems in counting of votes leading to loss of lives and properties. The mishap may be caused by inaccurate counting schemes in which causes violence in voting centers.

With the use and modernization of technology such problems could be reduced to a very medium stage. Electronics advancement has made it possible to able to bring about suitable method of living and faster way of doing things.

I deemed it necessary to design and implement this model project of an electronic vote counting machine in order to help in counting of votes in voting centers and reduce the threat of a party cheating at least to a minimal extent during the counting process.

1.3 SCOPE OF PROJECT

The scope employed in this project took in consideration hardware design (designing, testing and modeling) of a mini prototype electronic vote counting machine.

1.4 AIM

This project is aimed at the design and implementation of electronic vote counting machine using counters and timers in the production of the system.

1.5 OBJECTIVES OF PROJECT

This project was designed and constructed to meet the following objectives;

1. To produce a power sector in which the operation of the machine depends upon and to make use of a secondary supply being the use of a lead acid battery.

2. To construct a sensor sector where the ballot paper would pass through and be automatically counted

3. To implement the timer stage, counter, driver (decoder) stage to operate together to have a quality, precise and accurate conversion process.

4. To make use of seven segment to produce a display in which result could be view from a distance.

1.6 PROBLEM DEFINITION AND METHODOLOGY

In the course of designing and implanting this project, the major problems encountered are: Firstly, There was daylight interference which impaired the sensitivity of the break-beam stages. Secondly, A relay was used to switch power directly to the Alarm circuit as using an emitter follower to drive the alarm module resulted in overheating of the emitter follower transistors.

The methodology applied to produce the project is summarized as follows:

1. Designing the circuit to be implemented

2. The use of Proteus and Multism software to analyse the circuit to be implemented.

3. Testing of circuit on a breadboard

4. Coupling and setting up the entire model

1.7 PROJECT OUTLINE

For the paperwork the project is broken into four aspects: Chapter 2: gives the theoretical background of the project. Chapter 3; comprises the design and analysis of the whole project. Chapter 4: contains the construction and testing of the electronic voting system. Chapter 5: draws the conclusion, the limitations and the recommendation of the project work.

CHAPTER TWO

THEORETICAL BACKGROUND

2.1 INTRODUCTION

This chapter looks at the theoretical use of major components used for the construction of the project. Each of these components is important to the proper functionality of the electronic vote counting machine discussed in earlier chapter.

2.2 LITERATURE REVIEW

Electronic voting refers to the use of computers or computerized voting equipment to cast ballots in an election. Sometimes, this term is used more specifically to refer to voting that takes place over the Internet. Electronic systems can be used to register voters, tally ballots, and record votes. [2]

The use of electronic voting system date back to the 1960's when punched card system debuted. In 1964, seven counties in the USA switched to this system for the presidential elections. this was the first widespread of this system.

In U.S. Government is given a report by Roy Saltman, a consultant in developing election technology and policies, in which the certification of voting machines is analysed for the first time.

"In 1986, The Uniformed and Overseas Citizen Absentee Voting Act of 1986 (UOCAVA) requires that US states allow certain groups of citizens to register and vote absentee in elections for federal offices". "1990 The FEC (Federal Election Commission) released a universalized standard for computerized voting. 1996 The Reform Party uses I-Voting (Internet Voting) to select their presidential candidate. This election is the first governmental election to use this method in the U.S". [3]

In 2002, The FEC revised the standards established for electronic voting from 1990. While in November 2004, 4,438 of votes in the general election are lost by North Carolina's electronic voting machines. The machines continued to count electronic votes past the device's memory capacity and the votes were irretrievably lost.

In 2005, Black Box Voting showed how it easily it is to hack an electronic voting system. Computer experts in Leon County lead a simulation where they changed the outcome of a mock election by tampering with the tabulator without leaving evidence of their actions.

In 2006, it was demonstrated that. Diebold Electronic Voting Machine can be hacked in less than a minute. Princeton's Professor of Computer Science, Edward Felten who installed a malware which could steal votes and replace them with fraudulent numbers without physically coming in contact with the voting machine or its memory card. The malware can also program a virus that can spread from machine to machine.

In 2006, the governor of Maryland, Bob Ehrlich (R), advised against casting electronic votes as an alternative method for casting paper absentee ballots. This was a complete turnaround since Maryland became one of the first states to accept electronic voting systems state-wide during his term. The voter uses metallic hole-punch to punch a hole on the blank ballot. It can count votes automatically, but if the voter's perforation is incomplete, the result is probably determined wrongfully.

In 2014, a similar project was carried out by Ifatami Dare, University of Lagos, Department of Electrical and computer Engineering. The project had a limitation of not being able to operate when there is no electricity. The project was powered by A.C source, which could not allow it to operate in a case of power outage.

This present work is based on the same principle in that it uses a counter for counting the number of votes. This project presents a simple electronic voting machine which utilizes the timer and counters for operation. The ballot paper blocks a projected infrared beam (in an opto-isolator) and generates a clock pulse when a vote is made by casting a ballot. The opto-isolator is made up of an infrared transmitter and a photo-diode receiver. When the beam is broken, the output of the LM393 op-amp in the detector stage goes low, to allow for the appropriate trigger condition of the monostable stage. The one shot monostable gives a clock pulse each time the object passes the opto-isolator (sensor) point. The clock pulse is sent to the counter which updates the count each time the object breaks the beam.

2.3 OPERATIONAL AMPLIFERS & COMPARATORS

An operational amplifier is a differential amplifier with an extremely high open-loop voltage gain. Negative feedback circuits are employed in op-amps to control the gain when precise gain values are needed. The comparator is an operational amplifier without a feedback. Hence, it is controlled by the open loop voltage gain.

The op-amp was originally developed for use with analog computers but now they found place in almost all aspect of electronics. The op-amp has the following ideal characteristics:

- Infinite voltage gain
- Infinite input impedance
- Infinite bandwidth.

In practice however there are deviations from ideal conditions due to manufacturing processes and other physical conditions the various components might be subjected to which make up the op-amps. Below show the actual characteristics of 741 μA op-amp.

Voltage gain – 106dB (numerical gain = 2000000.0)

Input impedance – 1MΩ

Output impedance – 7500Ω

Bandwidth – up to 1MHz

The voltage gain and bandwidth are two parameters that must be critically looked, for successfully application of this device. The figure 2.1 below describes the structure of the comparator

$$v_{in} = (v^+) - (v^-)$$

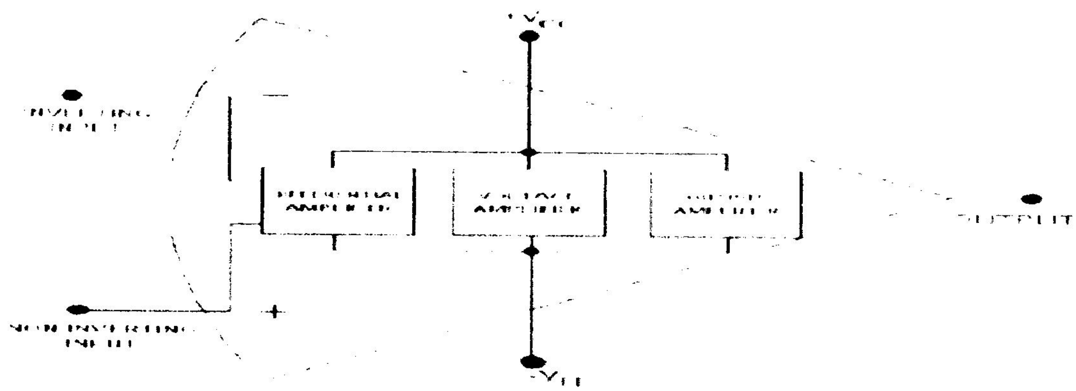


Figure 2.1: Comparator

$$v_{out} = A_o \times v_{in} \quad \text{.......... } 2.1$$

Where A_o = open loop voltage gain.

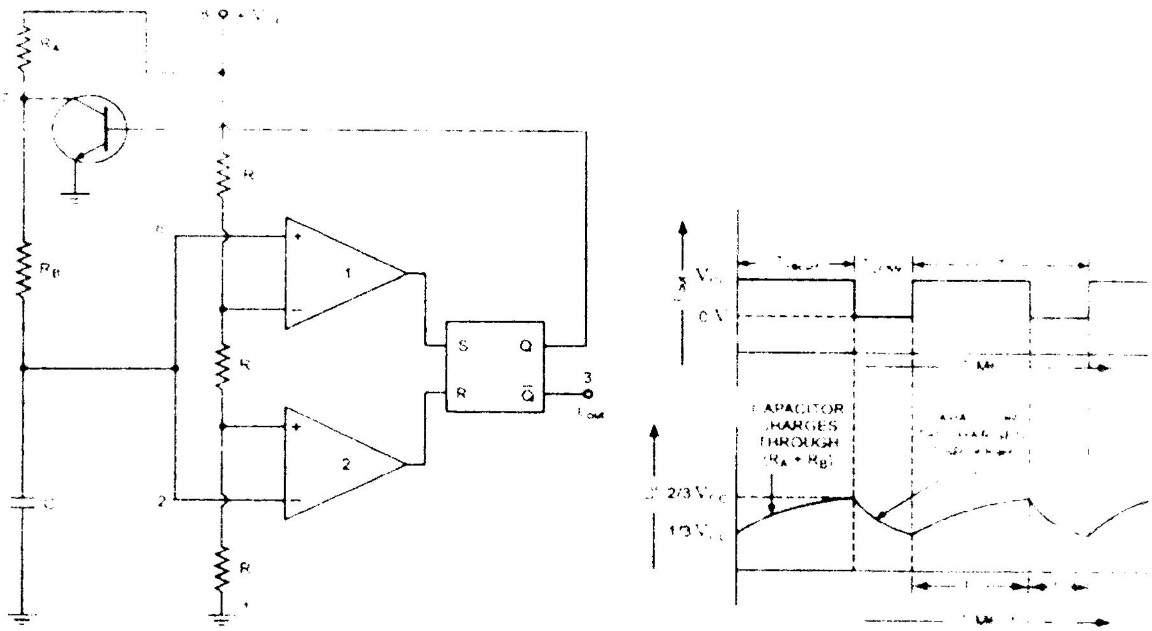
Due to the very high A_0, V_{out} will tend to saturate upon any difference in input. Other op-amp circuits include, inverting and non – inverting amplifiers, summing amplifiers, unity gain buffers etc.

2.4 IC TIMERS

The emanation of IC timers eliminated a wide range of mechanical and electromechanical timing devices .It also helped in the generation of clock and oscillator circuits.

Timing circuits are those, which will provide an output change after a predetermined time interval. This is, of course, the action of the monostable multi vibrator, which will give time delay from a fraction of a second to several minutes quite accurately. The most popular of the present IC is the 555 timer, which is available in an eight, pin dual-in -line package in both bipolar and CMOS form. The 555 timer is a relatively stable IC capable of being operated as an accurate bi-stable, monostable or astable multi vibrators. [6]

The 555 timer is one of the most popular and versatile integrated circuits ever produced. It includes 23 transistors, 2 diodes and 16 resistors on a silicon chip installed in an 8-pin mini dual-in-line package



Internal Circuitry With External Connections *Capacitor and Output Voltage Waveforms*

Astable Operation

Figure 2.2: 555- Timer Internal Circuitry

Figure 2.3: 555- Timer DIL Package.

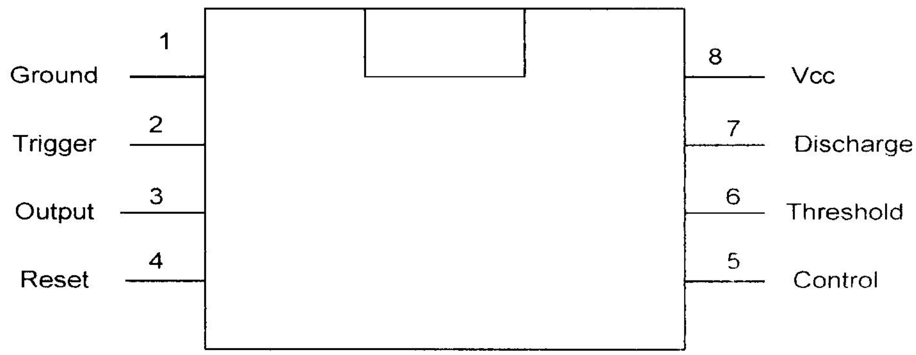


Figure 2.4: 555 Timer Pin Orientations

2.5 COUNTERS

Grouping of flip-flops together so that they act as a data store produces a register. Certain types of register can be used to count pulses and are known as counters. Flip-flops generally may be used to form counters but the JK flip-flop is the most popular and most flexible to use.

Counters generally are categorized to Asynchronous (ripple) and synchronous. They are made up of flip-flop, which are triggered sequentially (as in the case of Asynchronous counters) and simultaneously as in the case of synchronous counters. The simultaneous triggering of the ripple counter is useful in cases, which the propagation delay associated with ripple – through counter may be a problem.

2.5.1 ASYNCHRONOUS COUNTERS

Consider the three-stage counter using JK flip-flops connected in toggle mode shown in fig. 2.5 below.

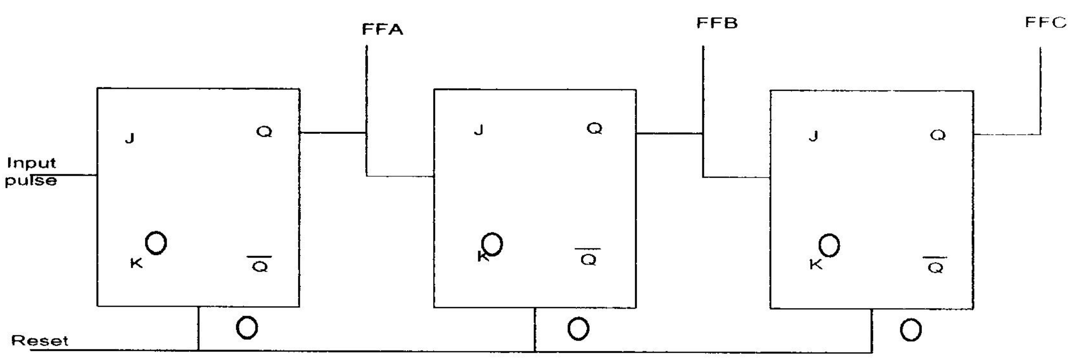


Figure 2.5: Asynchronous Counters

If all outputs and initially reset to zero by an input going low in the clear line prior to the input signal arriving and the JK flip-flops are master-slave then the input pulse to flip-flop A (FFA) will have no effect on the QA output until the pulse changes from logic 1 to logic 0 level. However, the output QB reset at 0 since the input pulse to flip-flop B (FFB) has gone from 0 to 1. Similarly, QC will remain at 0. [7]

When the second input pulse has arrived and gone from logic 1 to logic 0. However, this is a negative transition and as such will cause the output of (FFB) to toggle so that QB goes to 1. Since this is a positive transition QC will be unaffected and remains at 0.

At the end of the third input pulse, QA again toggles; this time to logic1 QB and QC retain their values of 1 and 0 respectively. At the end of the fourth input pulse, QA toggles and falls to 0. The transition from 1 to 0 at the input to FFB causes QB to fall to 0 and this transition in turn causes FFC to toggle so that QC goes to 1.

This procedure repeats until the output completes the cycle and resets should the pulse signals at the input still be present.

The module of a counter is the total count it provides. The counters so far described can count from zero to seven inclusive and are known as modulo 8 counters. The count of 8 is produced from three stages (since 2 = 8).

Similarly a counter of 2 could be produced by one stage (2 = 2) and a count of 16 by 4 stages.

The module 10 counter or otherwise the decade counter is very important since this is required in the conversion of binary counts to the seven segment display.

In cases where modulus of counters is required and problems of unwanted count or bits arise alternative method using feedback and dividers are used.

So far we have designed Asynchronous counters using the flip-flops in the toggle mode with the single input to be counted brought to the clock input of the least significant bit (LSB) and the output stage used to clock the next stage. This design seems to be error free but could give rise to errors if a special count value is required of the counter. For cases such as this a commercial counter with reset is recommended.

A commercially available counter is the 7490. This circuit is internally divided into two sections giving a ÷2 and a ÷5 representation. [8]. As shown in figure 2.6

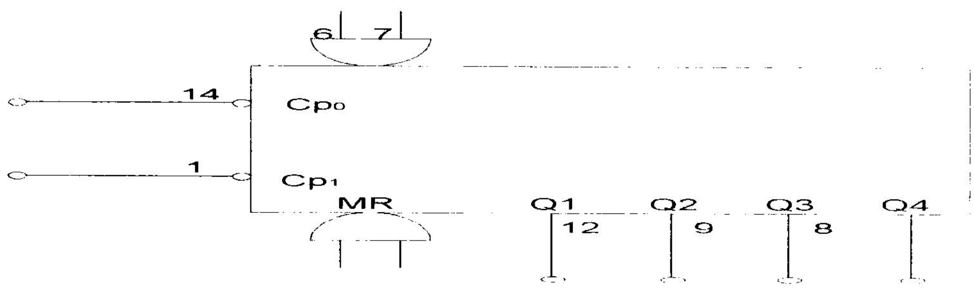


Figure 2.6: 7490 Decade Counter

The 7490 counter when used as BCD counter or an equivalent decade counter could be cascaded to give larger decimal counts. Suppose it is required to build a counter to count from 000 to 999 before units being used to clock the next count, which represents tents. The QD output of the tents counter would likewise be used to trigger the 7490 to be used to count hundreds.

2.5.2 DECADE COUNTERS

Each of the counters can count from 0 to 9 and in the case of say. the units counter; once the count is complete a carry is passed to the next (tens) counter so that a count of ten is recorded. The units count continues to count up to 9 and when resetting produces a count of 20 (2 on the tens counter and 0 on the units counter). [8]Via a suitable decoder the BCB output of each counter could be used to derive a display element such as an LED seven-segment display, gas-discharge etc. so that a direct visual output can be obtained.

Others types of commercially available counters exist like the 4 – bit binary counter (7493), resettable up down counters (74192), GRAY CODE COUNTERS, EXCESS 3 COUNTER etc.

Synchronous counters are left out since they are not of relevance to my scope of work

2.6 DECODER/DRIVERS

Drivers are small software programs that help control devices attached to your computer because drivers enable your operating system and other software to communicate with various hardware devices, controllers, and other peripherals. In other words, drivers work as instruction manuals that provide software with the information with regard to controlling and communicating with different hardware devices.

Drivers help computers identify and run installed hardware. A device driver is a code that an operating system uses to control disk devices, display adapters, input devices such as a mouse or trackball, modems, fax machines, printers, and other hardware. Without drivers, computers will not be able to distinguish between a sound card and a modem. Most computer devices and peripherals need drivers to run, which means that computer accessories, such as printers, scanners and digital cameras also need drivers to function. This is what all computer hardware and accessories that are purchased come with drivers stored in either a floppy disk or a CD. [9]A computer automatically loads the drivers when these disks are inserted in their respective drives.

Like any other software, drivers are upgraded and updated by the manufacturers to remove bugs, add extra functionality to the hardware or to improve the performance of the device. Unless you update your drivers regularly you may face problems ranging from the relatively minor, such as having hardware that seems to perform poorly, to the more major problems such as hardware failure, hardware conflicts and complete system crashes.

Choosing and installing the correct device drivers for a given hardware is often a key component of computer system configuration.

2.7 OPTOELECTROINIC DISPLAYS

SEVEN SEGMENT DISPLAY

Most 7-segment displays provide for a decimal point (sometimes two), a separate LED and terminal designated for its operation. As shown in the figure 2.7 below. The 7- segment display can be categorized into two namely:

1. Common anode
2. Common cathode.

The common cathode is used for the purpose of this project.

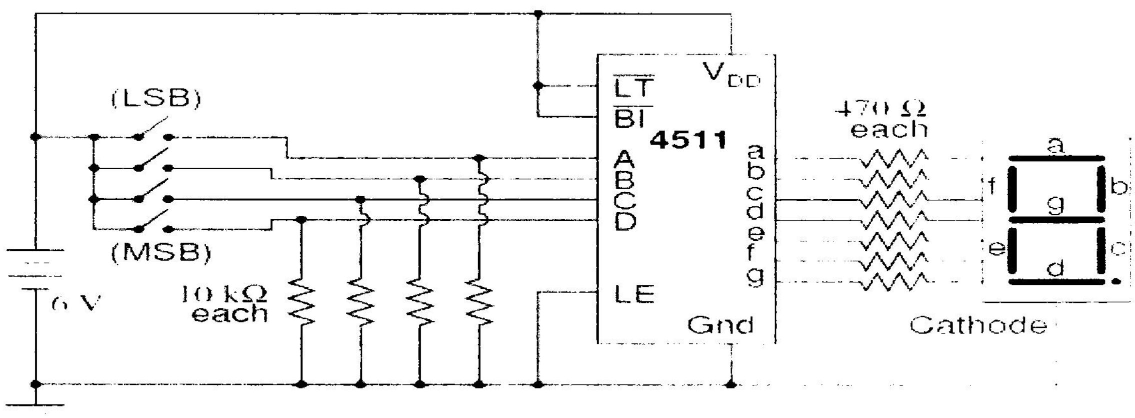


Figure 2.7: Seven Segment Display

ILLUSTRATION

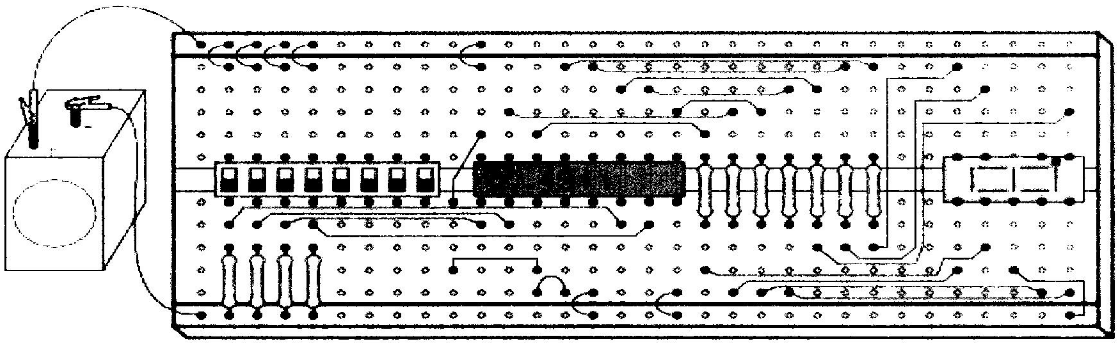


Figure 2.8: Seven Segment Display Illustration

This figure shows the arrangement of the seven segment using a bread board and battery supply

FILTER

The function of this circuit element is to remove the fluctuations or pulsation (called ripples) present in the output voltage supplied by the rectifier. No filter can in practice give an output voltage as ripple free as that of a dc battery but it approaches it so closely. Figure 2.9 describes the structure of the filter.

The capacitor filters any noise at the output of the regulator to ensure smooth operation of the integrated circuits (2)

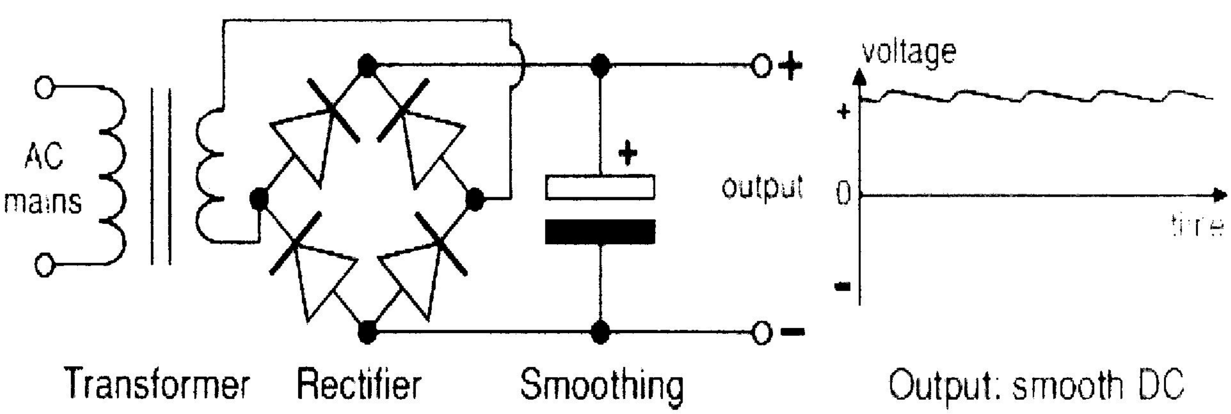


Figure 2.9: The Supply

CHAPTER THREE

DESIGN AND ANALYSIS

3.1 INTRODUCTION

This chapter discuss about the hardware structure of the project. It gives a detail of the choice of some devices and elaborate explanation of the function devices used. This entails the block diagram, operation of the whole circuit and why the selection of some components.

3.2 PRINCIPLE OF OPERATION AND DESIGN

The ballot paper blocks a projected infrared beam (in an opto-isolator) and generates a clock pulse when a vote is made by casting a ballot.

The opto-isolator is made up of an infrared transmitter and a photo-diode receiver. When the beam is broken, the output of the LM393 op-amp in the detector stage goes low, to allow for the appropriate trigger condition of the monostable stage.

The one shot monostable gives a clock pulse each time the object passes the opto-isolator (sensor) point. The clock pulse is sent to the counter which updates the count each time the object breaks the beam. [7]

DESIGN SPECIFICATIONS.

Supply Voltage: 5Vdc

Input Voltage: 220VAC

Number of counts: 100 (Counts for software)

3.3 POWER SUPPLY STAGE

The power supply stage provides the appropriate DC voltage requirements to ensure the circuit components (especially the Active components) are powered properly.

The circuit uses +5V DC supply. The power supply stage is a linear power supply type and involves in step down transformer, Rectifier, Filter capacitor, and a voltage regulators, to give the regulated DC voltage. Figure 3.1 and 3.2 shows the power stage.

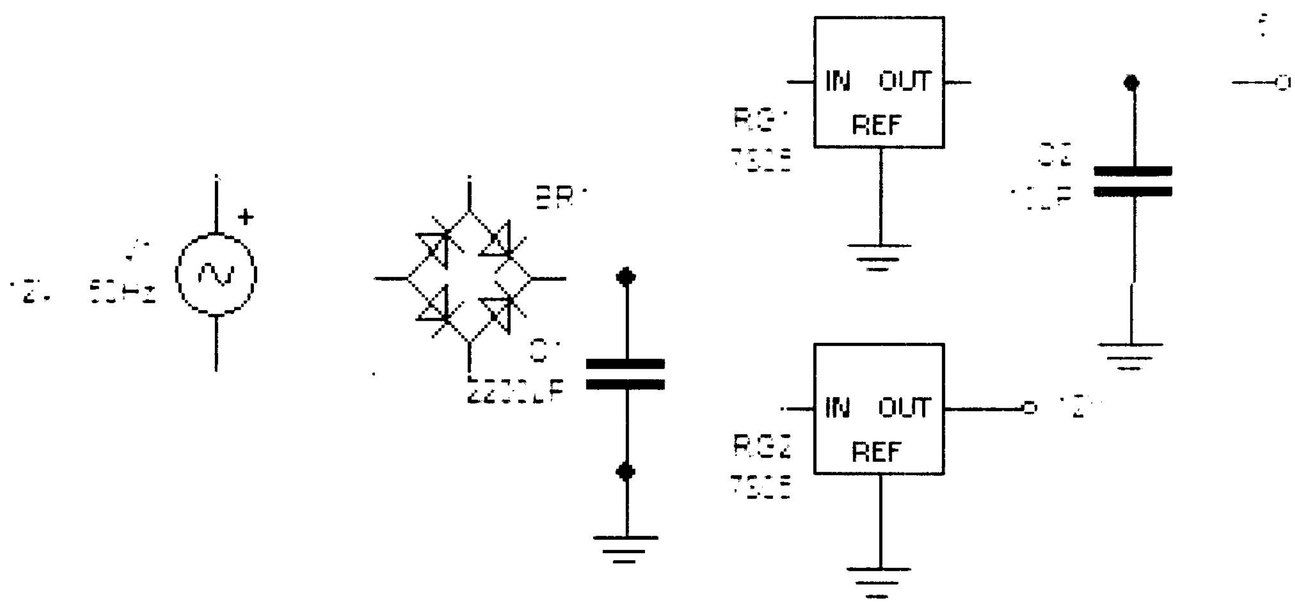


Figure 3.1: The Power Supply Stage

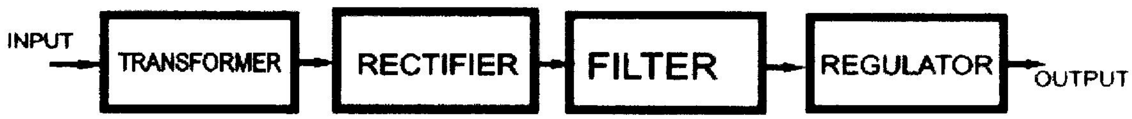


Figure 3.2: Block Diagram Of Power Supply

ANALYSIS

$$\frac{dv}{dt} = \frac{1}{c} i \quad \text{.............................} (3.1)$$

Where: dv = ripple voltage

dt = period

c = capacitance value (C1) and,

i = load current

If we set an allowable ripple of 20%, then

$\delta t = 0.2\ X\ 16.9 = 3.38\ V$ ---(16.9V *being the peak voltage for an r.m.s of 12V*).

From (1), $$c = i\,\frac{dt}{dv} \text{..................................} (3.2)$$

$$C = 0.5\ X\ {}^{0.01}\!/_{3.38} \text{-----} (for\ i = 0.5A(\max),\ and\ \delta t = 10ms)$$
$$= 1479\mu F$$
$$= 2200\mu F\ (preferred\ value)$$

The value of dt = 10ms for a frequency of 50Hz, full wave rectification, while the maximum. Current expected from the power supply is 0.5A.

C2 filters any noise at the output of the regulator to ensure smooth operation of the ICs

3.4 BALLOT SENSOR STAGE

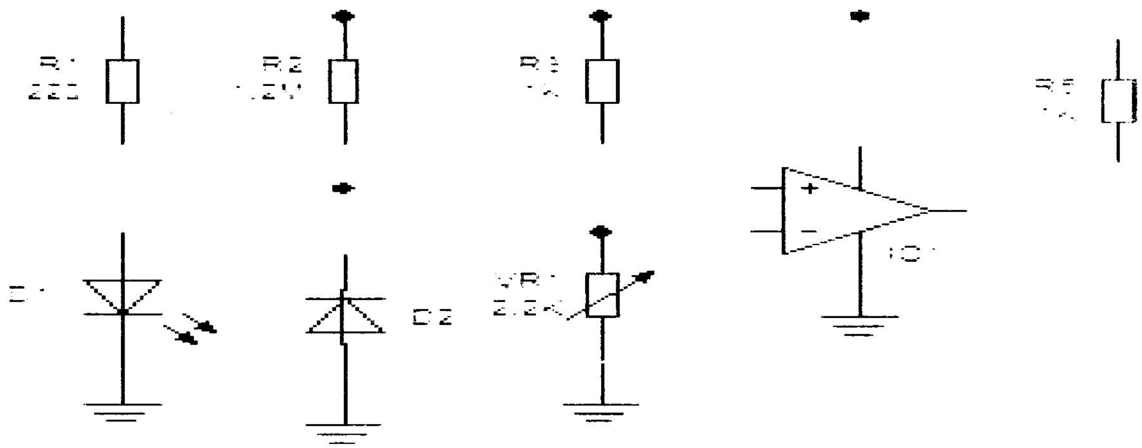


Figure 3.3: Break-Beam Sensor Stage.

ANALYSIS

For the infrared emitter (D1),

$$\text{forward voltage } (v_f = 1.7), \text{ forwad current } (i_f = 150mA)$$

$$\text{hence } R_1 = \frac{(v^+) - (v_f)}{i_f}$$

$$= \frac{5-1.7}{0.15} = 22\Omega$$

This value is however for maximum range. To conserve current 220Ω has been used since the lab model is for a very short range. The diagram in figure 3.3 above shows the break beam sensor stage.

The photo diode was used as the main opto-sensor due to its ability to resist day light interference better than the other optical devices mentioned. The photodiode is operated in reverse biased condition. In darkness (i.e. without infrared transmission) or during break-beam the photodiode has a high resistance, and a low resistance upon reception of infrared light. The change in resistance causes a change in the drop across the diode, which is fed to the input of the comparator IC1. The resistance measured from the photodiode when there is no transmission is approximately 1MΩ. R2 forms a potential divider network with the photo diode.

DESIGN CALCULATIONS.

Transmission resistance --------- 10kΩ

Break-beam resistance----------- 1MΩ

Voltage across diode during transmission,

$$V_{DT} = \frac{R_D}{R_2 + R_D} \times V^+$$
$$V_{DT} = \frac{10K\Omega}{1M\Omega + 10K\Omega} \times 5V^+ \quad (\text{let } R_2 = 1M\Omega)$$
$$V_{DT} = 0.05V$$

This value is approximately zero volts. Hence during transmission the diode output gives 0V.

Voltage across diode during break-beam is,

$$V_{DB} = \frac{R_2}{R_2 + R_D} \times V^+$$
$$= \frac{1M\Omega}{1M\Omega + 10K\Omega} \times 5V^+ \quad (\text{since } R_2 = 1M\Omega)$$
$$V_{DB} = 4.995V$$

The two voltage levels are still influenced by the presence of daylight interference and the separation distance between the transmitter and the receiver. To ensure two distinct levels a voltage comparator is used.

The comparator stage allows a precise point to be set where the output voltage will change. This is achieved by adjusting V_{R1}

Setting V_{R2} to 2.0V means any voltage above 2.0V in the inverting input (as the beam is broken) will make the comparator LOW. This LOW output is used to trigger a 555 timer one shot monostable that generates the clock pulse for the counting.

Since

$V_{out} = A_0$ Vin..(3.3)

Where A_0 = open loop voltage gain.

And $V_{in} = V^+ - V^-$ ....(3.4)

Vout will drop to V^+ for the slightest positive difference in voltage since A_0 is often very large (in order of 20000).

The comparator is meant to give an HIGH when the beam is broken and a LOW when the infrared is transmitting to D_2(the photo diode).

TRANSFORMER

The main purpose of the transformer is to step down ac supply voltage to suit the requirement of the solid state electronic device and circuits fed by the dc power supply. It provides isolation from the supply line-an important safety consideration. Thus a step down transformer steps the voltage down from 220V to 9V. as shown in figure 3.4 .

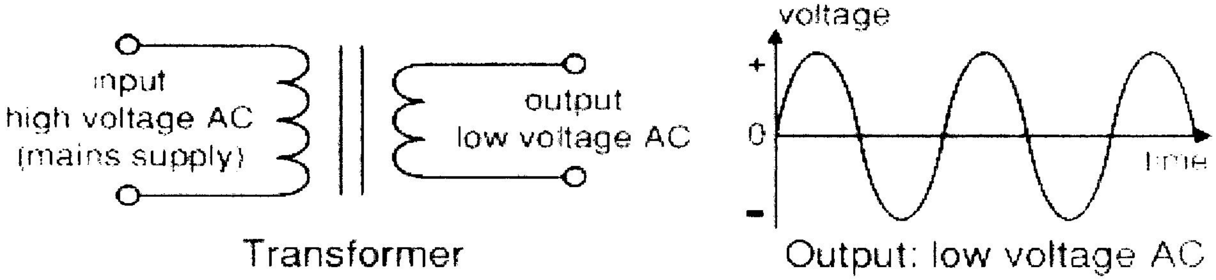


Figure 3.4: The Diagram Transformer And Its Output.

VOLTAGE REGULATOR

The main function of the voltage regulator is to keep the terminal voltage of the dc supply constant even when ac input voltage to the transformer varies (deviation from 220v are common) and also when the load varies.

Regulator can be viewed as a dc steady state voltage shaper. Depending on the value of voltage needed to enter a respective circuit after rectification and filtration, a regulator is used to reduce the value of the supply to the needed value.

For the 5V dc supply needed in some subunits of this system, the correct size and value of the regulator needed is 7805. This is to avoid damages as a result of excessive voltage. Shown in figure 3.5 and 3.6.

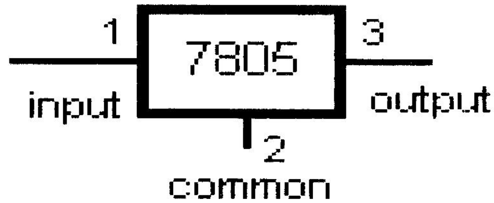


Figure 3.5: The Voltage Regulator Symbol

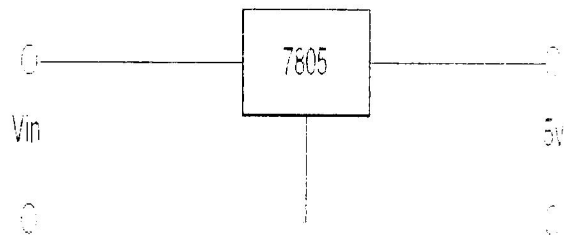


Figure 3.6: The Voltage Regulator Circuit.

In this project, the power supply unit used is made up of a step down transformer that step down voltage from 220volts of mains unit to 9volts. In other words it is a step down transformer with ratings of 9volts, 0.5Amps. The voltage is then rectified using four diodes to ensure full wave rectification.

After rectification, the voltage is filtered to remove all the ripples in it before connecting it to the load. This filtering action is achieved using one, 1000uF electrolytic capacitor. This filters the voltage after which the 9v is connected to the input of a 5volts regulator (7805) which is used to regulate the voltage down to 5volts for the integrated circuits and other subunits

3.5 FUNDAMENTAL BLOCK DIAGRAM

This block diagram of the circuit is a block of drawings that shows the different segement of stage involved in the functionality of the circuit. The block diagram is in figure 3.7 and a comprehensive circ uit diagram in figure 3.8

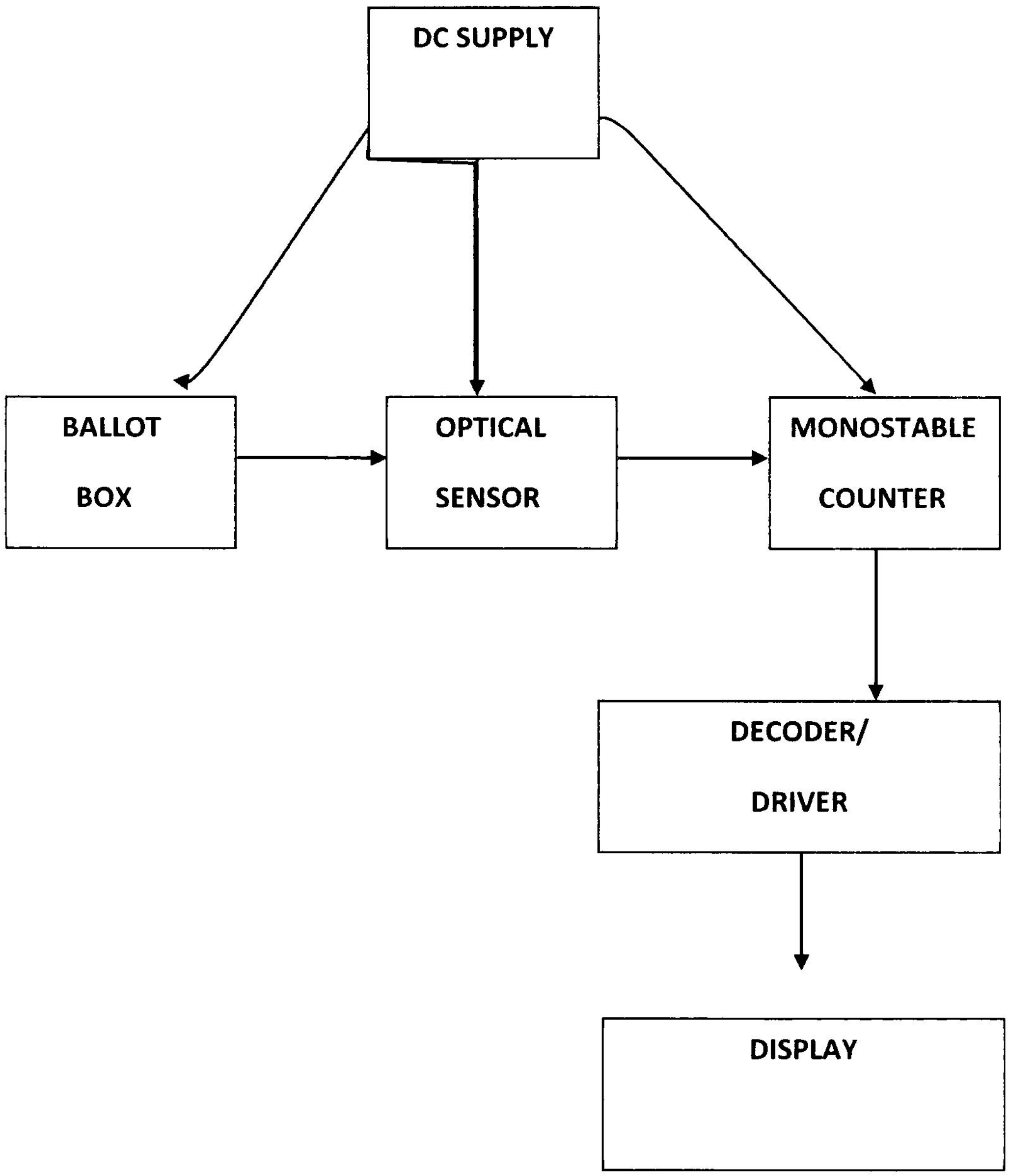


Figure 3.7: Generalized Block Diagram.

Figure 3.8: Comprehensive Circuit Diagrams

CHAPTER FOUR

HARDWARE CONSTRUCTION AND TESTING

4.1 INTRODUCTION

This chapter also discusses about the hardware section of the project. It gives a detail of the pictures used during contruction and some elaborate explanation of the devices used. This entails the construction and testing of the electronic voting system.

4.2 CONSTRUCTION

The construction commenced with the soldering of the components to the Vero board and test. For the soldering the following steps were taken;

All jumper wires were soldered first

Followed by integrated circuit sockets

The tip of the soldering iron was tinned to avoid dry solder joints

Each stage on the Vero board was tested as soldering progressed

The wires were rated to match necessary power required, like the mains, jumper wires etc.

4.3 TESTING

The physical realization of the project is very vital. This is where the fantasy of the whole idea meets reality. As the designer, I am able to see my work not just on paper but also as a finished hardware.

After carrying out all the paper design and analysis, the project was implemented and tested to ensure it's working ability, and was finally constructed to meet desired specifications.

The testing of the project was first done on a breadboard whereby all the component used for the project were afixed into a breadboard as it is in the circuit diagram. Usually it is not expected to work at first attempt and so each connection terminal is checked carefully to make sure that they are all fitted in perfectly on the breadboard.

Also, another testing is done when the components have all been soldered on the Veroboard, before the final work is cased. At this point, the working principle of the project is tested to make sure it is working perfectly before we go ahead to couple and case the circuit.

Some voting was carried out and the results are displayed in figure 4.1 below, on the voting machine.

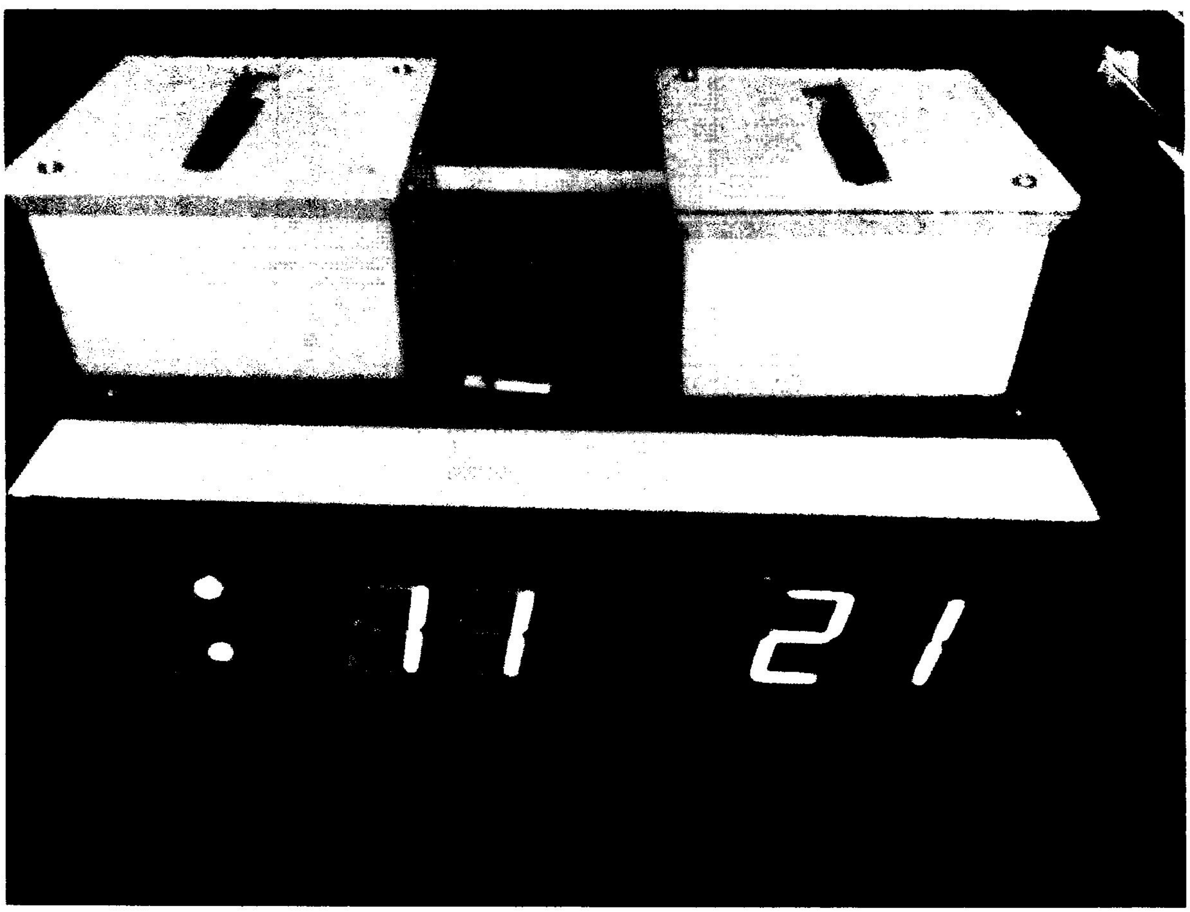


Figure 4.1: Testing Of The Project

The process of testing involved the use of some test and measuring equipment stated below.

(i) **BENCH POWER SUPPLY**: This was used to supply voltage to the various stages of the circuit during the breadboard test before the power supply in the project was soldered. Also during the soldering of the project the power supply was still used to test various stages before they were finally soldered.

(ii) **DIGITAL MULTIMETER**: The digital multi-meter basically measures voltage, resistance, and continuity, current. The process of implementation of the design on the board required the measurement of parameters like, voltage, continuity, current and resistance values of the components. The digital multi-meter was used to check the output voltage supply in this project. Figure 4.2 shows the constructed project.

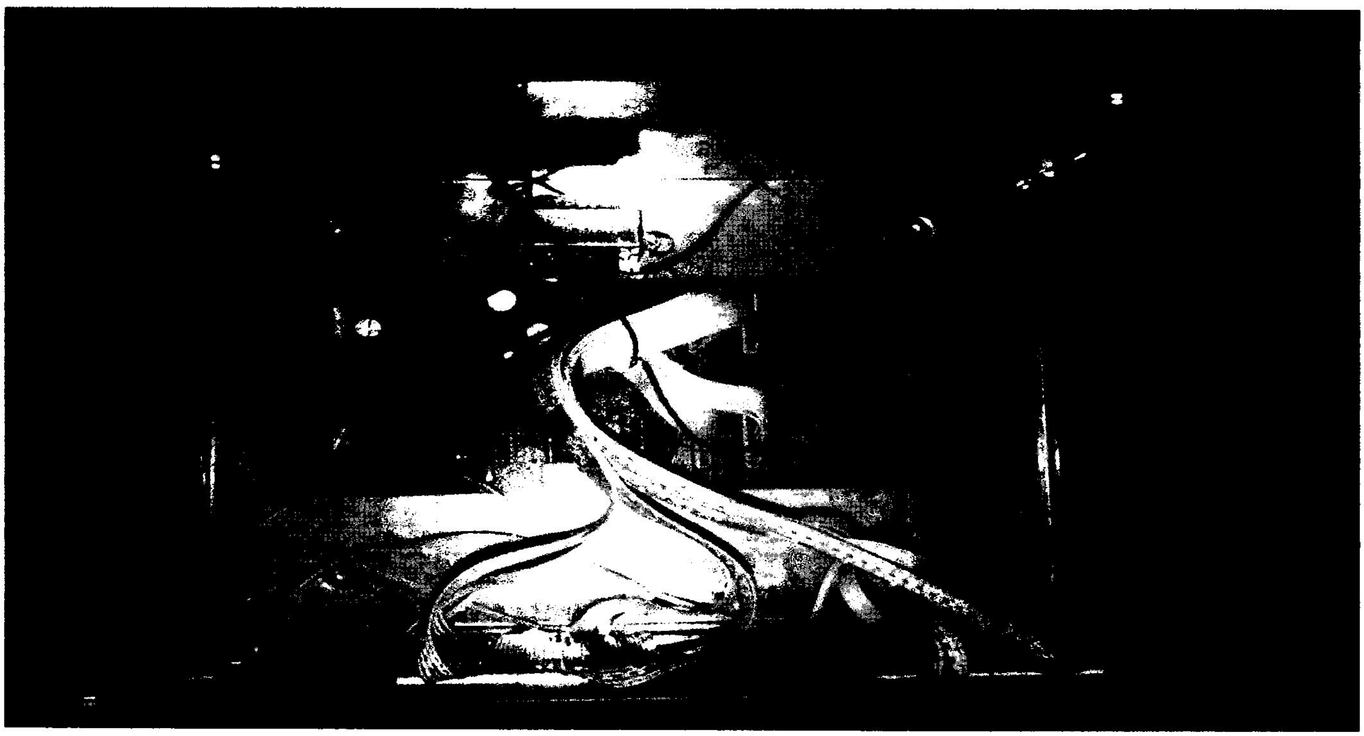


Figure 4.2: Constructed Project

4.4 DESIGN STAGES AND PROCEDURES

The implementation of this project was done on the breadboard.

Stage by stage testing was done according to the block representation on the breadboard.

1. Before soldering of circuit commenced on Vero board, the various circuits and stages were soldered in tandem to meet desired workability of the project.

2. There was a lot of modification in the process of construction which led to the modification of the circuit diagram.

3. The second phase of the project construction is the casing of the project.

4. This project was coupled in a metal casing. The casing material being wrought metal, designed with special perforation and vents and also sprayed to ensure insulation.

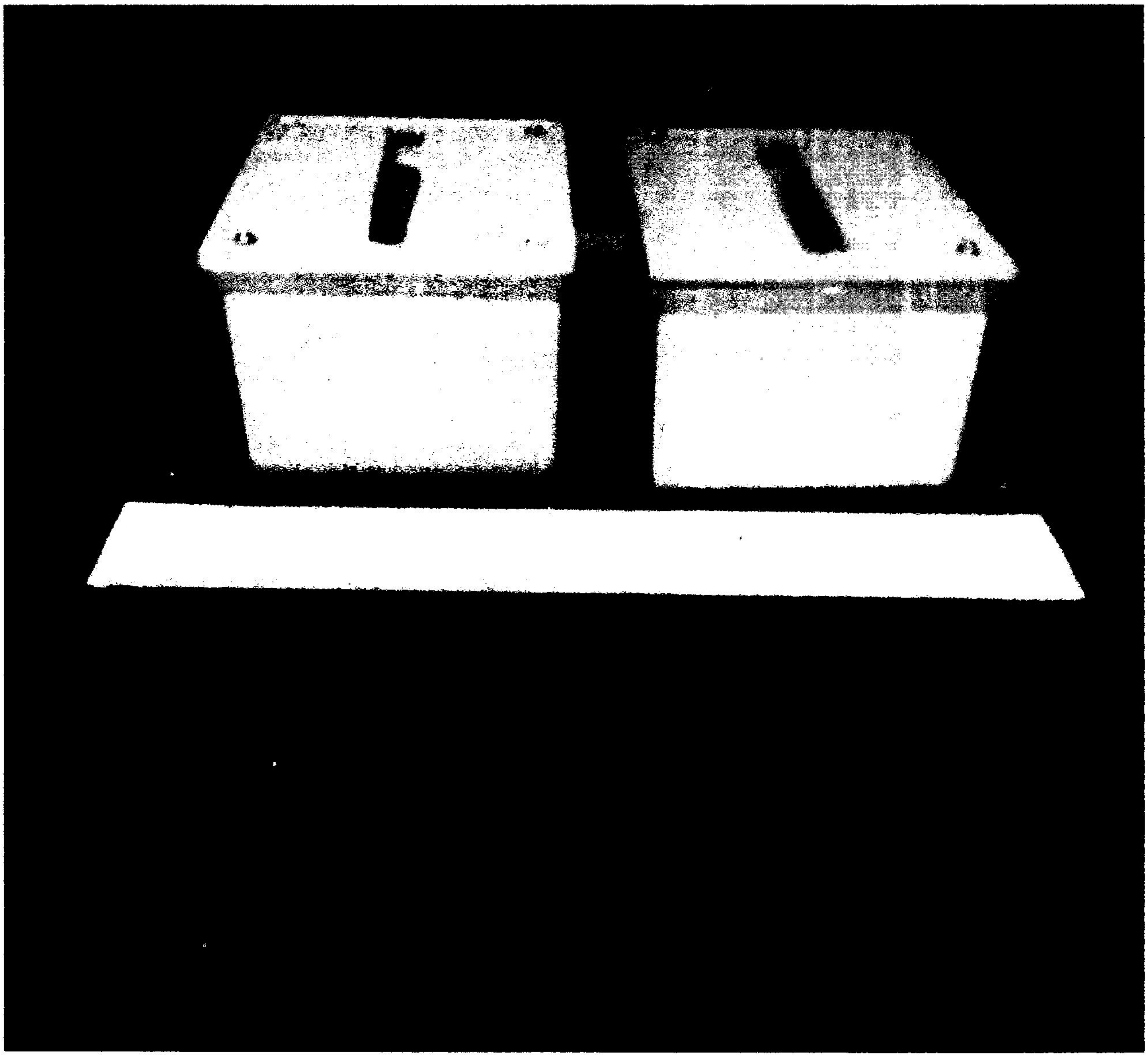


Figure 4.3: The Cased Project.

Figure 4.3 displays the whole cased project in full.

4.5 PROBLEMS ENCOUNTERED

The following problems are list of the problems I encountered during the project construction to implantation process.

i. During implementation, I discovered there was daylight interference which impaired the sensitivity of the break-beam stages. This problem was solved by shielding the infrared sensors from daylight using an infrared filter.

ii. The relay I used to switch power directly to the Alarm circuit as using an emitter follower to drive the alarm module resulted in overheating of the emitter follower transistors

iii. The circuit generated noise whenever the alarm was set off. this was due to the relatively large current drained from the DC power supply by the alarm module. To remove this noise a capacitor was put across the 12V supply rail as well as the 5V supply rail and a voltage follower and heat sink was used for the 12V regulator.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.0 INTRODUCTION

This chapter also discusses about the roundup of the project. It draws the conclusion, the limitations and the recommendation of the project work.

5.1 CONCLUSION

The project which is the design and construction of an electronic voting machine was designed considering some factors such as economic application, design economy, availability of components and research materials, efficiency, compatibility and portability and also durability. The performance of the project after test met design specifications.

Also the operation is dependent on how well the soldering is done, and the positioning of the components on the Vero-board. Other factors that might affect performance include transportation, packaging, ventilation, quality of components, handling and usage.

The construction was done in such a way that it makes maintenance and repairs an easy task and affordable for the user should there be any system breakdown.

The project has really exposed me to practical electronics generally which is one of the major challenges I shall meet in my field now and in future. The design of the electronic voting machine involved research and hard work. Extensive work was done on the design, analysis and construction of this work.

The project was quite challenging and tedious but eventually was a success.

5.2 LIMITATIONS

After making this project, I realized some limitations which are discussed as thus:

i. There was daylight interference which impaired the sensitivity of the break-beam stages. This problem was solved by shielding the infrared sensors from daylight using an infrared filter.

ii. A relay was used to switch power directly to the Alarm circuit as using an emitter follower to drive the alarm module resulted in overheating of the emitter follower transistors

iii. The circuit generated noise whenever the alarm was set off. this was due to the relatively large current drained from the DC power supply by the alarm module. To remove this noise a capacitor was put across the 12V supply rail as well as the 5V supply rail and a voltage follower and heat sink was used for the 12V regulator.

iv. Some of the purchased components were bad and were replaced. This led to a delay in the process of the construction of the circuit.

v. Other problems were simple construction problems which were easily solved by troubleshooting and carrying out continuity tests.

5.3 RECOMMENDATIONS

Although the main objectives of the project were achieved. it is still subject to further improvement.

i) I recommend that any further work on this project, there should be a kind of sensor to sense a particular paper to be used, so that the machine can recognize only a particular paper (voting card).

ii) The use of solar power supply can be recommended in the future due to remote areas.

iii) A finger print sensor may be introduced to replace the ballot for easy voting.

iv) I recommend that further work could be done to make the project work used in a larger environment involving a large number of people. .

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APPENDIX A

PIN CONFIGURATION OF THE 555 TIMER

Pin 1: This is the ground pin

Pin 2: This is the trigger input.

Pin 3: This is the output pin

Pin 4: This is the reset pin

Pin 5: This is the control voltage input.

Pin 6: This is the threshold input.

Pin 7: This is the discharge pin.

Pin 8: This is the power supply pin.

APPENDIX B

SEVEN SEGMENT DATASHEET

PIN NUMBER.

PIN 1: Cathode E

PIN 2: Cathode D

PIN 3: Common Anode DIG. 1

PIN 4: Cathode C

PIN 5: Cathode DP

PIN6: Cathode B

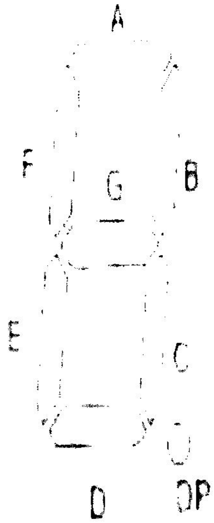
PIN 7: Cathode A

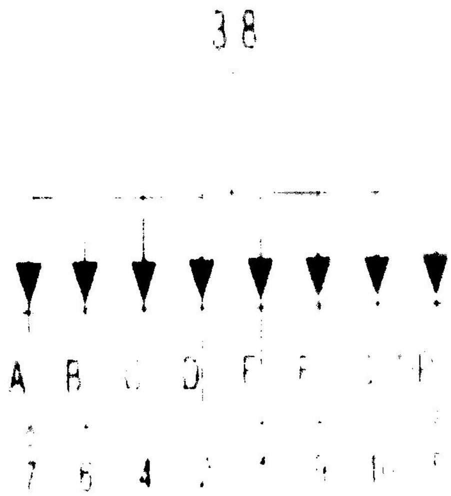
PIN 8: Common Anode DIG. 2

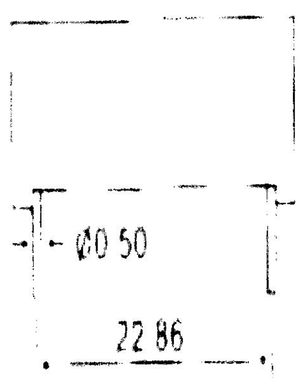
PIN 9: Cathode F

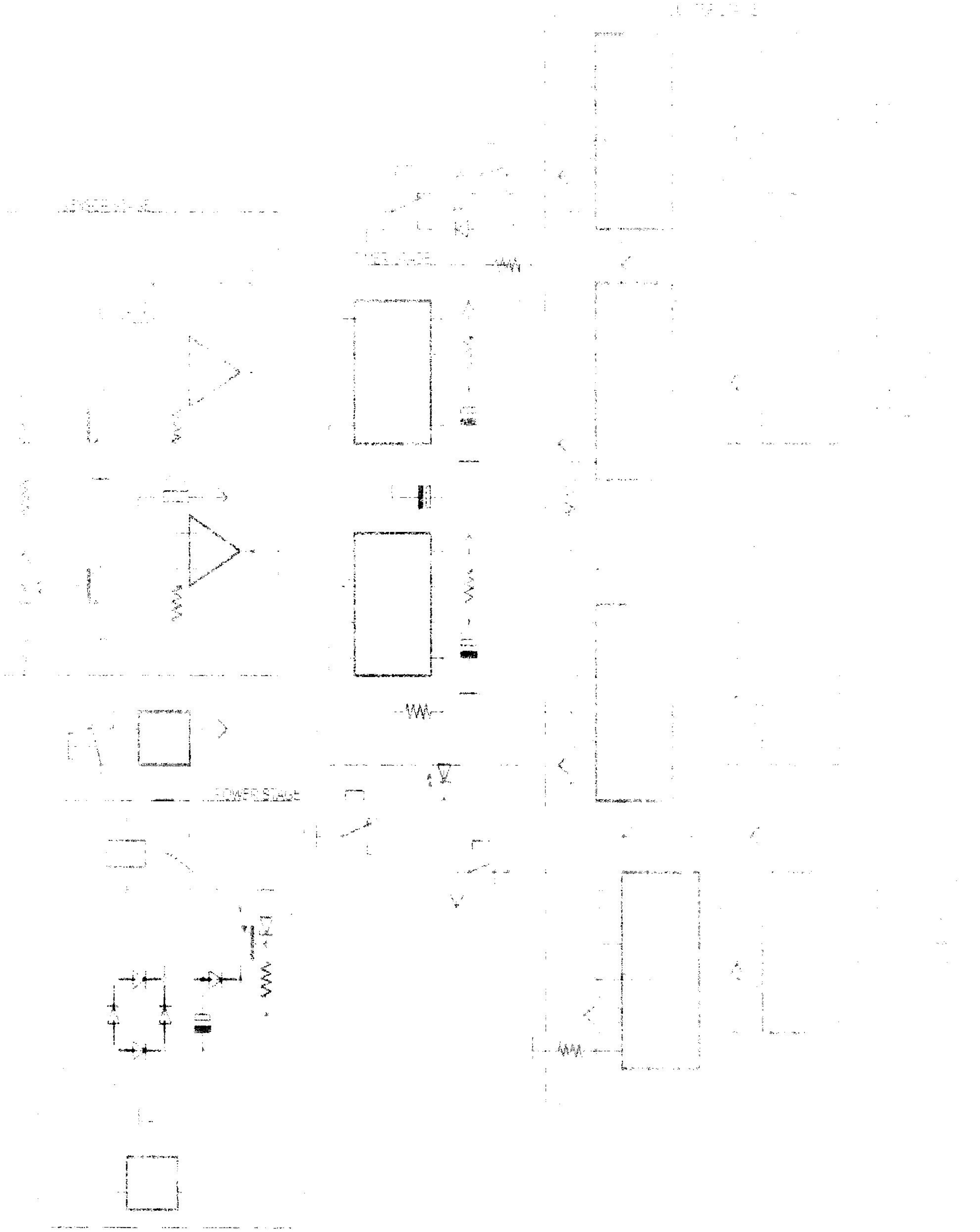
PIN 10: Cathode G


10
1.75
20.40(0.8")
27.70
20.00
10
2.54*4=10.16


A
B
C
D
E
F
G
DP


3 8
A
B
7
6
4


Ø0.50
22.86



A CIRCUIT DIAGRAM OF THE SIMPLE ELECTRONIC VOTING MACHINE

COST ANALYSIS

COMPONENT	COST	QUANTITY	TOTAL
Lm393	200	2	400
BPW42(IR emitter)	400	2	800
BPW 41	700	2	1400
NE555	100	2	200
7490	250	2	500
7447	250	2	500
7805	120	2	240
IW4001	50	5	250
2200 µF	120	1	120
10µF	25	1	25
4mHz crystal	700	1	700
Capacitors	50	4	200
Resistor	10	15	150
Transformer (2A)	800	1	800
Casing and Paspet	10000	1	10,000
7 Segment Display	250	2	500
VGA Connector	500	1	500
Vero board	200	1	200
Soldering Iron and Lead	1,700	2	1,700
Transportation of items	7000		7,000
Lead acid battery and switches	5000	1	5000
		Grand Total	21,185