DESIGN AND CONSTRUCTION OF AN INFRA RED REMOTE CONTROLLED LIGHT DIMMER

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DEDICATION

This project is dedicated to GOD ALMIGHTY, the creator of heaven and earth, without whom I wouldn't have made it through

DECLARATION

I Audu Reuben Okpanachi declare that this work " the design and construction of an infra red remote controlled light dimmer" was done by me under the supervision of Mr S. N. Rumala in the Department of Electrical and Computer Engineering ,Federal University of Technology Minna and has never been presented elsewhere for the award of a degree. I also hereby relinquish the copyright to the Federal University of Technology, Minna.

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To my entire family THE IDAKWOJI'S; thanks for believing in me. My appreciation to my supervisor Mr S. N Rumala for His assistance, constructive advice and time spent. My heart of gratitude also goes to my lecturer and Head of Department Engr. M. D. Abdullahi, He has been an inspiration since I knew Him. .

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ABSTRACT

The project is the design and construction of a remote controlled light dimmer which is a device that enables the user to operate a light switch from a distance of approximately 10meters.

The remote transmit a tone using an infra-red light emitting diode this tone is decode by the receiver since the receiver only switches when it receives the tone there are no accidental activations.

The top – down design approach was used in the design and implementation of this project whereby the system was broken down into simpler blocks

The successful implementation of this project involves the careful plan and layout of the circuit components such that troubleshooting and repairs could be carried out with ease

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Chapter 1

1.0 Introduction

Switches around the house especially light switches are often required to be easier to operate. A case where light intensity needs to be regulated by dimming also requires much ease in operation.

For the physically disabled people and probably children locations of light switches and their height present a real challenge to them..

It may also be required that an individual may want to do away with the inconveniences of having to get up and walk across the room to switch off or dim the light and then walk back to bed before retiring to sleep. Though bed switches have taken care of these inconveniences to some extent nevertheless hazards caused by damaged cables or bad switches are potent treat of an individual's well being.[4]

Therefore it would be of more convenience for the users to operate the switch from a distance. The remote controlled light switch and dimmer solves this problem

The advancement in semiconductor technology [10] has made it possible for many electronics to be now incorporated with infra-red remote control feature. The project involves such technology in controlling or dimming, a bulb. The project involves two devices, an infra-red remote controller and the other is a receiver connecting to a light load. With the use of the remote controller the load (lamp or bulb) at the receiver is controlled in four stages through a toggling switch. One of the control stages involves complete switching off of the involved light. While the other three cause different level of dimming effect on the light or lamp.

1.1 Aims and Objectives

The aim of the project is to facilitate the operation of light switches and dimmers around the home from a distance. With a motivation for making life a little bit easier for everyone especially the physically disabled and people who due to one reason or the other might not have the ability to reach the switch and have their desired effect of light.

1.2 Methodology

The project is based on the application of infra-red radiation. The project's operational techniques are transmission of infra-red beam and its reception on a particular receiver which is incorporated with control logic units.

The infra-red is transmitted through an infra-red emitting diode. An infra-red sensor at the receiver converts the infra-red energy into a corresponding electrical signal which is amplified before having any reasonable logical importance [3]

The project embodies the following units for the execution of the main task:-

i. Infra-red remote controller

ii. Infra-red sensor

iii. Signal amplifier

iv. Control logic unit

v. Output logic unit

These units work side by side in accord to perform the task. The output control unit is controlled or operated by the control logic unit which possesses different logic function. The control logic unit operates on the incoming infra-rd signal. The output control unit consists of electronics devices for dimming effect on the lamp.

Moreover, on the receiver, the input is the infra-red sensor while it's output is the output control unit along with the loads (lamp). The infra-red remote controller does the command for any operation.

1.3 Scope of the Project

The project is based on a lamp dimmer with output power rating below 300 watts. The dimming effect on the lamp is controlled through an infra-red control method. The effective control range is about two meters the design mostly embodies complimentary metallic oxide semiconductor (CMOS) integrated circuit [10]. The design is also aimed at low power consumption. The devise is not completely shielded from the effect of external interference such as intense light source focusing on the involved sensor such factor might cause flare switching.

1.4 Limitations and Problems of the Project

The most obvious and practical limitation of the project is the fact that only filament bulbs are operational or compactable with the dimmer. A florescent lamp would not work with for with project. The use of semiconductors switching device is attributed to this demerit. Also the device can be subjected to false switching under the influence of high light lamination. The involved dimmer cannot operate heavy loads.

Moreover the project embodies reasonable merits. The design is quite simple. It is attributed to limited power consumption the project merely demonstrates the importance of logic functions or units in electronic designs.

Chapter Two

2.0 Literature Review

One of the earliest examples of remote control was developed in 1893 by Nikola Tesla, and described in his patent, U.S. Patent 613809,[1] named Method of and Apparatus for Controlling Mechanism of Moving Vehicle or Vehicles. The first remote-controlled model airplane flew 1932. The use of remote control technology for military purposes was worked intensively during the Second World War; one result of This was the German Wasserfall missile. The first remote intended to control a television was developed by Zenith Radio Corporation in the early 1950s. The remote — unofficially called "Lazy Bones" — used a wire to connect to the television set. To improve the cumbersome setup, a wireless remote control was created in 1955. The remote called "Flashmatic" worked by shining a beam of light onto a photoelectric cell. Unfortunately, the cells did not distinguish between light from the remote and light from other sources. The Flashmatic also required that the remote control be pointed accurately at the receiver. In the early 1980s, when semiconductors for emitting and receiving infrared radiation were developed, remote controls gradually switched to that technology which, as of 2005, is still widely used. Remotes using radio technologies, such as Bose Audio Systems and those based on Bluetooth also exist.[3]

Most control remotes for electronic appliances use a near infrared diode to emit a beam of light that reaches the device. This light is invisible to the human eye but carries signals that are detected by the appliance. The discovery of infrared radiation is commonly ascribed to William Herschel, the astronomer, in the early 19th century.

Herschel used a prism to refract light from the sun and detected the infrared, beyond the red part of the spectrum, through an increase in the temperature recorded on a thermometer. Simple infrared sensors were used by British, American and German forces in the Second World War as night vision aids for snipers.[4]

2.1 Theoretical background

2.1.1 How Infra Red works

Infra-red remote application was adapted for light dimming for some decades With a single channel remote control the presence of a carrier signal can be used to trigger a function. For multi-channel remote controls more sophisticated procedures are necessary: one consists of modulating the carrier with signals of different frequency. .

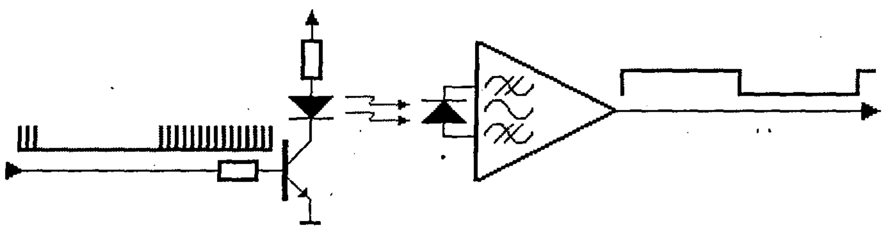

Fig 2.1 transmission of infra-red

In the diagram above you can see a modulated signal driving the IR LED of the transmitter on the left side. The detected signal is coming out of the receiver at the other side[2, 3]

After the demodulation of the received signal, the appropriate frequency filters are applied to separate the respective signals. Nowadays digital procedures are more commonly used.

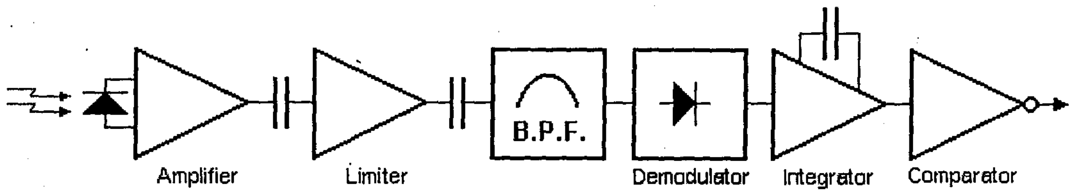

Fig 2.2 block diagram of infra – red receiver

Moreover, early dimmers and lighting controls were directly controlled through the manual manipulation of large dimmer panels, but this meant that all power had to come through the lighting control location, which could be inconvenient and potentially dangerous, especially with systems that had a large number of channels, high power lights or both (such as a stage disco or other similar venues).

When thyristor dimmers came into use, analog remote control systems (often 0-10V lighting control systems) became feasible. The wire for the control systems was much smaller (with low current and lower danger) than the heavy power cables of previous lighting systems. Each dimmer had its own control wires which meant a huge number of wires leaving the lighting control location and running to each individual dimmer. Modern systems use a digital control protocol such as DMX to control a large number Dimmers were also often based on rheostats. These were inefficient; when set to the middle brightness levels, they could dissipate as heat a significant portion of the power rating of the load (up to 25% for resistive loads, more for temperature dependent loads like lamps) so they were physically large and required plenty of cooling air. Also, because their dimming effect depended a great deal on the total load applied to each rheostat. the load needed to be matched fairly carefully to the power rating of the rheostat. Finally, as they relied on mechanical control they were slow and it was difficult to change many channels at a time.

Variable auto-transformers (often referred to as variacs) were then introduced. While they were still nearly as large as rheostat dimmers, they were highly efficient devices and their dimming effect was independent of the load applied so it was far easier to design the lighting that would be attached to each autotransformer channel. Remote control of the dimmers was still impractical, although some dimmers (typically, for "house light" use) were equipped with motor drives that could slowly and steadily reduce or increase the brightness of the attached lamps. Whilst variacs have fallen out of use for lighting they are still used in other applications such as under/over- voltage testing of equipment due to the fact they deliver a reasonably pure sine wave output and produce no radio frequency noise, another alternative to normal leading-edge dimming is trailing edge dimmer where the falling part of the waveform is cut rather than the raising part, this is most often used in devices that use a switched-mode power supplies that need the front of the wave from complete so that it may cut it itself.[11]

The project involves infra-red remote control lighting control with the use of limited number and high efficiency devices. The design is quite a modification of early related project because of the application of Complementary Metallic Oxide Semiconductor (CMOS) integrated circuits. They are attributed wide voltage supply, low cost, low power consumption and high flexibility.[10]

2.1.2 How a Dimmer Switch Works

Most homes have lamps or fixtures that can be made brighter or dimmer by rotating or sliding a control on their on-off switch. Years ago this was done using a device called a rheostat--a large variable resistor. This method wasted electricity and generated a lot of heat. To control the amount of energy going to the light the rheostat had to throw a lot away, turning it into heat. For example, at half brightness a 100 watt bulb would waste about 20 watts to heat in the rheostat.

Modern dimmer switches work an entirely different way. They use a transistor like device called a TRIAC to switch the electricity on and off very rapidly--120 times each second. Because they sort of 'chop up' the electrical power this way they are sometimes called 'chopper switches. [3]

One cycle of household 60 hertz or 60 cycle AC electrical power is shown in the figure. (Hertz means cycles-per-second and AC means alternating current.) It's called alternating current because, for one-half of the cycle (1/120 second) it's positive and, the other half it's negative or, half the time it's flowing one way and half the other. And, as you see from the curved shape, it doesn't change suddenly. It rises and falls or, undulates.

The red line indicates the point in each half-cycle that the dimmer switch turns on. It turns off each time it reverses direction/sign/polarity, that is, each time it crosses the blue line. The rotating or sliding control on the switch moves the red line left and right. As the line moves to the left the light is on more of the time and thus, brighter. As the red line moves to the right, the light is on less and less of the time and thus gets dimmer and dimmer. Said another way, the area labeled "on" represents the total power/voltage going to the light and as the red line moves to the right this area gets smaller.

Actually the knob or slider is also a variable resistor but, in this case it's just used as a signal to move the turn-on point (red line)--it's not redirecting the flow of current as the old time rheostat was. With the dimmer circuitry very little energy is wasted. A typical modern dimmer control is more than 99 percent efficient--less than 1 watt is wasted controlling a 100 Watt bulb.

Non domestic dimmers are usually controlled remotely by means of various protocols. Analogue dimmers usually require a separate wire for each channel of dimming carrying a voltage between 0 and 10V. Some analogue circuitry then derives a control signal from this and the mains supply for the switches. As more channels are added to the system more wires are needed between the lighting controller and the dimmers.[4]

In the late 70's serial analogue protocols were developed. These multiplexed a series of analogue levels onto a single wire, with embedded clocking signal similar to a composite video signal (in the case of Strand Lighting's European D54 standard, handling 384 dimmers) or separate clocking signal (in the case of the US standard AMX192).

Digital protocols, such as DMX512 have proved to be the answer since the late 80's. In early implementations a digital signal was sent from the controller to a de-multiplexer, which sat next to the dimmers. This converted the digital signal into a collection of 0 to

+10V or 0 to -10V signals which could be connected to the individual analogue control circuits.

Modern dimmer designs use microprocessors to convert the digital signal directly into a control signal for the switches. This has many advantages, giving closer control over the dimming, and giving the opportunity for diagnostic feedback to be sent digitally back to the lighting controller.

A TRIAC, or TRIode for Alternating Current is an electronic component approximately equivalent to two silicon-controlled rectifiers (SCRs/thyristors) joined in inverse parallel (paralleled but with the polarity reversed) and with their gates connected together. These results in a bidirectional electronic switch which can conduct current in either direction when it is triggered (turned on). It can be triggered by either a positive or a negative voltage being applied to its gate electrode. Once triggered, the device continues to conduct until the current through it drops below a certain threshold value, such as at the end of a half-cycle of alternating current (AC) mains power. This makes the TRIAC a very convenient switch for AC circuits, allowing the control of very large power flows with mill-ampere-scale control currents. In addition, applying a trigger pulse at a controllable point in an AC cycle allows one to control the percentage of current that flows through the TRIAC to the load (so-called phase control).

Low power TRIACs are used in many applications such as light dimmers, speed controls for electric fans and other electric motors, and in the modern computerized control circuits of many household small and major appliances. However, when used with inductive loads such as electric fans, care must be taken to assure that the TRIAC will turn off correctly at the end of each half-cycle of the ac power.[2,3]

Chapter Three

3.0 Design Implementation

The circuit of the project is divided into these modules

- infra – red transmitter
- Power supply unit
- infra – red receiver
- control logic unit
- output unit

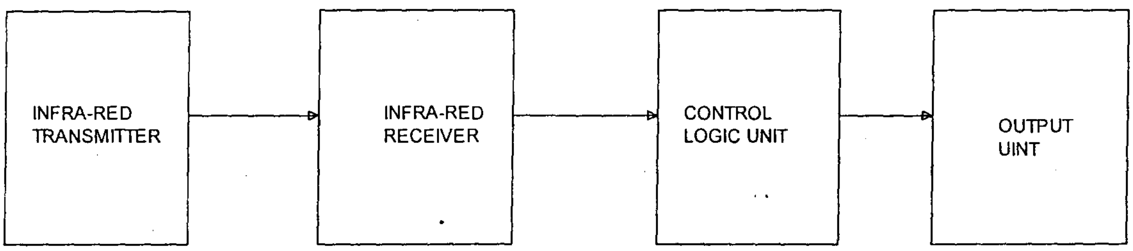

fig 3.1 block diagram of an infra red remote controlled dimmer

3.1 The Infra Red Transmitter

The infrared transmitter device involves two units they are listed below

I. pulse generator

II. infra red transmitter and switching unit

The infra red transmitter involves an infra red emitting diode which is powered through a pulsed controlled method and the pulse is generated by a 4060B integrated circuit

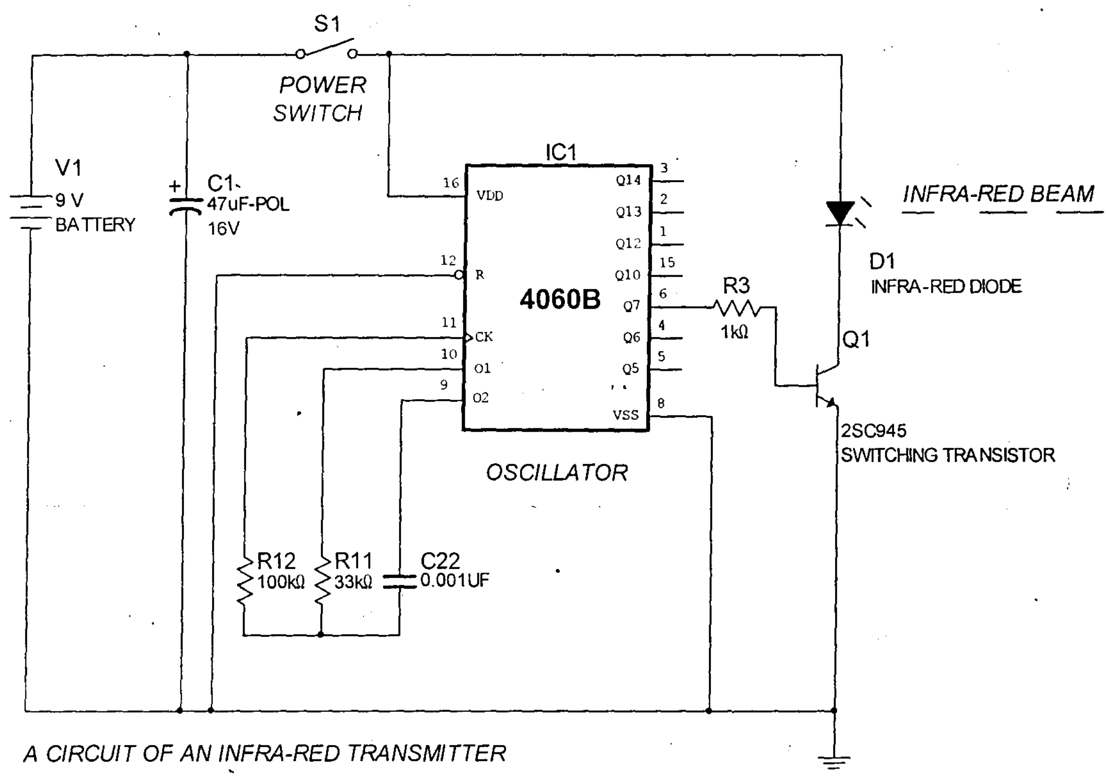

Fig 3.2 circuit of an infra red tramnsmitter

3.1.1 Pulse Generator

The circuit is designed to generate continuous pulse infra red radiation. The circuit is hence powered by a 9v battery. The 4060B generates ten frequencies at once only one is in use

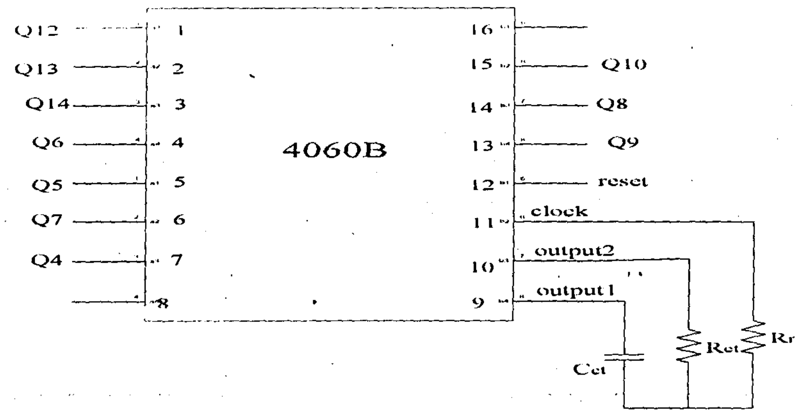

Fig 3.3 The Functional Diagram of The 4060B

The oscillator is configured at the R C mode the output frequencies are derived from a main frequency which depends on the resistors and capacitors at pin 9 , 10, 11,and of the device pin 12 is always low for the device to be operational the device has fourteen stage dividers that break the main frequency into fourteen smaller ones ten of these outputs are fed out from the device through same particular pins

The integrated circuits operation is based on the following relationships

The main frequency of operation = $f_m = 1/(2.3\ Rct * Cct)$

$10\ Rct \geq Rs \geq 2\ Rct$

The main frequency output of a particular output terminal is given by

$F_m / 2x$

Where x is the Q value of a a particular output for the infra red transmitter circuit

$F_m = 1 / (2.3 * 33 * 10^3 * 0.0001 * 10^{-6})$

$= 13.2$ khz

The frequency output from pin 6 is given below

$F_Q = F_m / 2^7$

$= 13.2 * 10^3 / 2^7$

$= 103.125$ Hz

Therefore the infra red emitting diode is expected to be modulated with 103.125Hz signal from the oscillator [9]

3.1.2 The Transmitters Switching Unit

The unit is designed to switch on off an infra red emitting diode in response to the output of the 4060B a 25C945 transistor is in use the switching device has a typical current gain of 100 it is commonly used for low speed switching application assuming the transistor is switched at the base through a peak voltage of 9v which is not really so the base current can be calculated through a 1 k base resistance

$I_B = (9 - 0.7) / 1000 = 0.0083A$

$I_C = 0 .0083 * 100 = 0.83$ A

In real situation the current is below 1A due to the pulse nature of the switching signal

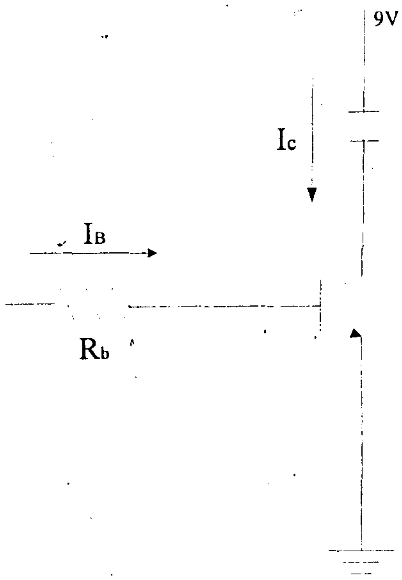

Fig 3.4 The Infra-red Switching Circuit

3. 2 Power Supply Unit

The power supply comprises a 12V1A transformer, a 7805 regulator, a packaged full wave bridge rectifier, ant two electrolytic capacitors connected as shown below:

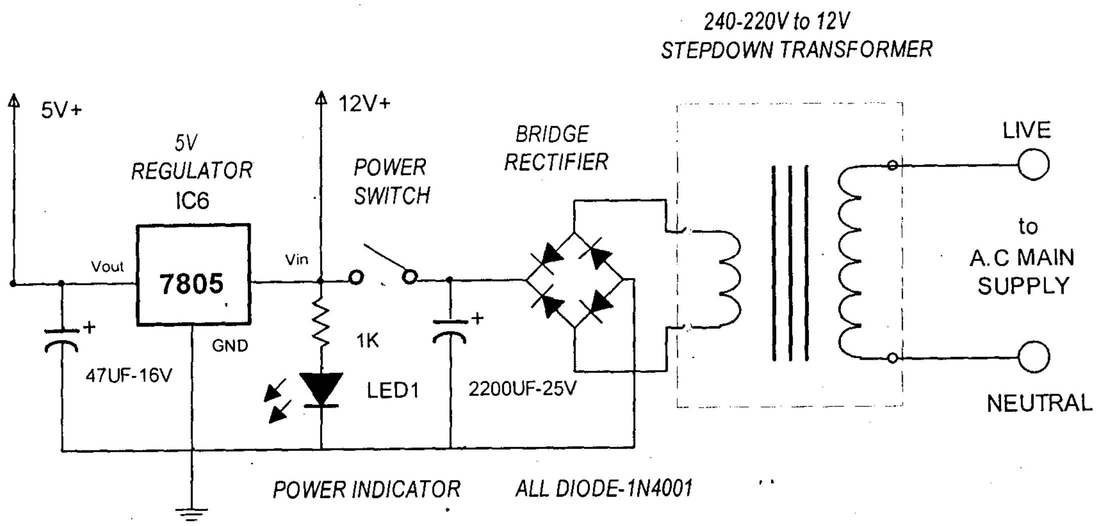

Fig 3.5 the power supply circuits diagram

The output voltage of the rectifier is given by the expression:

$$Vout = Vrms\sqrt{2}\ (1-1/4FRLC)$$

Where Vrms = secondary voltage of the transformer

F = Frequency of rectified DC = 2 * line frequency = 2* 50 = 100Hz

RL = Total circuit resistance

C = Capacitance on the power line.

Discounting 1/4FRLC, the output voltage is approximately given by

$$Vout = Vrms\sqrt{2}.$$

Thus, for a 12Vrms transformer, Vrectified = $12\sqrt{2}. \approx 16.97$V.

This voltage is present at the input of the 7805 regulator. The regulated output is held stabilized against fluctuations by a 16V 2200µF capacitor.[7,8]

3.3 The Receiver Device

The above infra red transmitter is directed to an infrared sensor incorporated into this device the infra red sensor converts the loading infra red into corresponding electric signals. The signal is quite weak and required considerable amplification for reasonable use

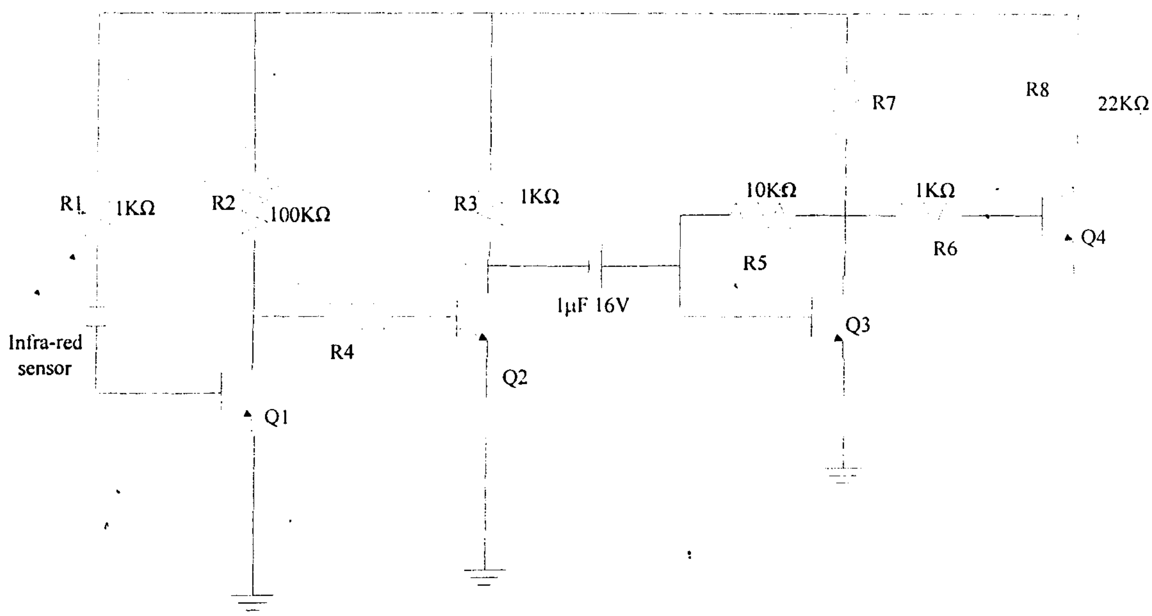

Fig 3.6 the receiver circuit

3.3.1 The signal amplifier

The signal amplifier for increasing the strength of the receiver infra red signal is designed using four NPN transistor at the common emitter configuration. Due to the

3.3.1 The signal amplifier

The signal amplifier for increasing the strength of the receiver infra red signal is designed using four NPN transistor at the common emitter configuration. Due to the complexity of the circuit each transistor is surely analyzed for a comprehensive result. Also the circuit is powered with a 9v supply from a battery

The first stage amplifier consists of a single NPN transistor its collector is loaded wit 100k such high resistance is required due to the high impedance nature of infra red sensors

The collector current SC1 for full saturation condition is given below

$Ic_1 = V / R_b$

$Ic_1 = (0.9 / 100 * 10^3) = 0,09mA$

$I_{B1} = (0.09 / 100 * 10^3) = 0.0009mA$

The above is the small current the expected incoming current due to the infra red exposure of the involved sensor this shows the necessity of amplifying the electric current

3.3.2 Signal detector

The signal detector is described to indicate the reception of the received infra red signal from the transmitter. It is also comprises of 4060B integrated

The 4060B is configured in the same mode as each one in the transmitter .the signal detector works with the nature of its pin 12 the pin requires low level for normal operation whenever the pin has something to do with high level logical the device is disabled. When the device is enabled the pins 3 and 5 give out some specific pulses pin 3 involves a very low frequency or blocking signal hence it is use to show infra red detection

Therefore a connected LED blinks whenever the infra red transmitter and sensor ae out of line and whenever the two infra red devices are in line the 4060B is disabled and the light indicator stops working

3.4 Control Logic Unit

The control logic unit is designed to respond to the output of the signal amplifier unit in controlling of lamp the unit consists of the control logic unit comprises of the following

a. The sampler(latch)
b. The control stepper(4017B)
c. The control oscillator

3.4.1 The sampler

The sampler or latch as often called consists of the 4013B integrated circuit. It is incorporated into the design to hold the unstable input to the device from the infra-red transmitter. It is a dual type latch which posses both set and reset inputs

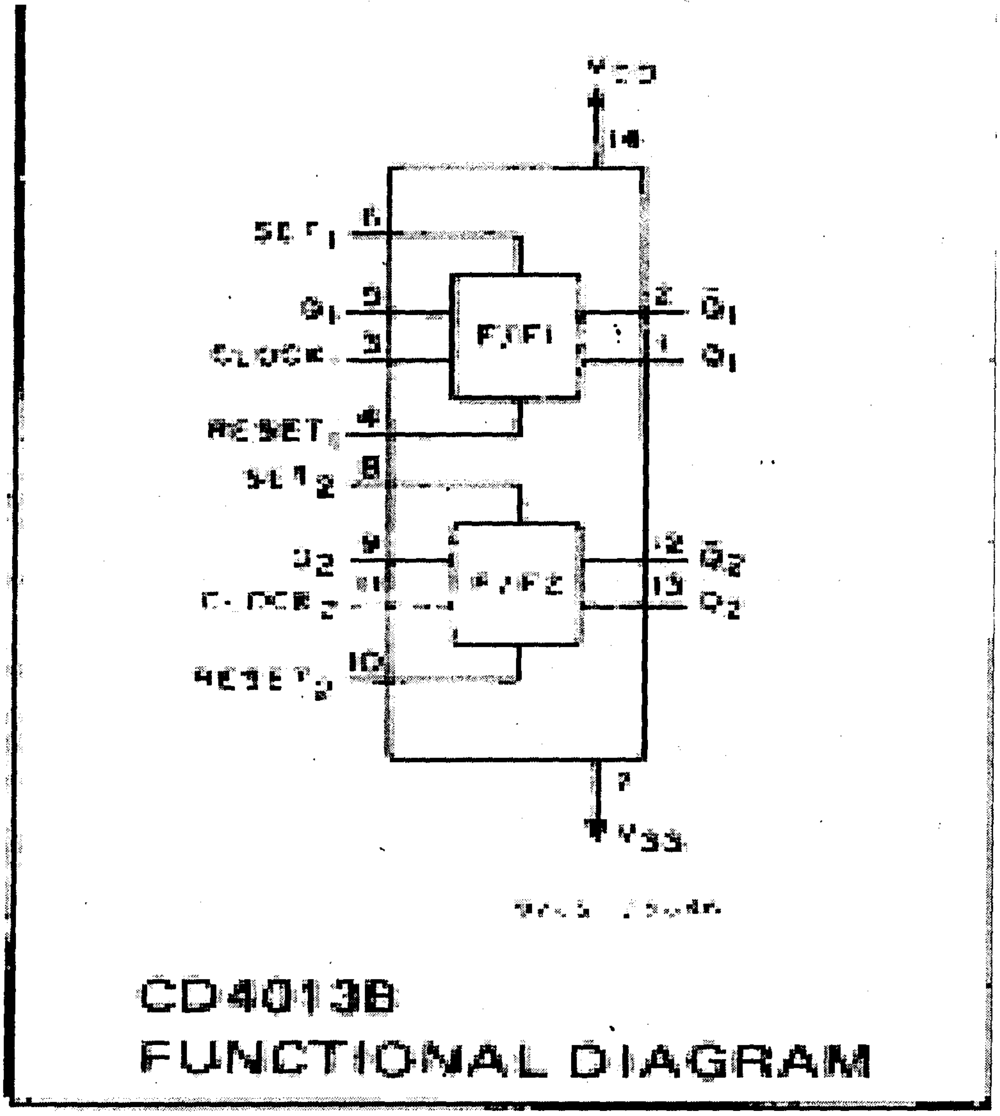

Fig 3.7 functional diagram of the 4013B

Table 3.1 truth table of the 4013B

S	R	Q	Q
0	1	0	1
1	0	1	0

3.4.2 The control stepper

The control stepper consists of the 4017B integrated circuit. These counters are advanced on the positive edge. The 4017B is a 5-stage divide-by-10 Johnson counter with 10 decoded outputs and a carry out bit. .These counters are cleared to their zero count by a logical"1" on their reset line. These counters are advanced on the positive edge of the clock signal when the clock enable signal is in the logical "0" state. The configuration of the 4017B permits medium speed operation and assures a hazard free counting sequence. The 10/8 decoded outputs are normally in the logical "0" state and go to the logical "1" state only at their respective time slot. Each decoded output remains high for 1 full clock cycle. The carry-out signal completes a full cycle for every 10/8 clock input cycles and is used as a ripple carry signal to any succeeding stages.

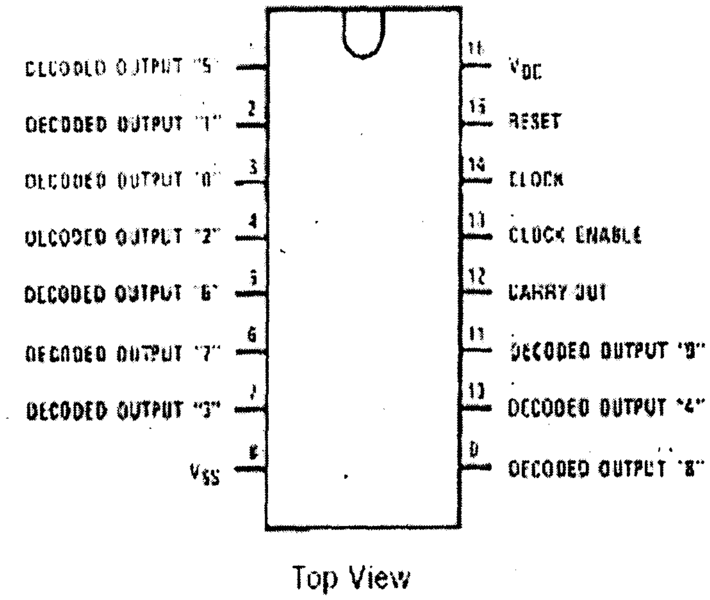

fig 3.8 connection diagram of the 4017b

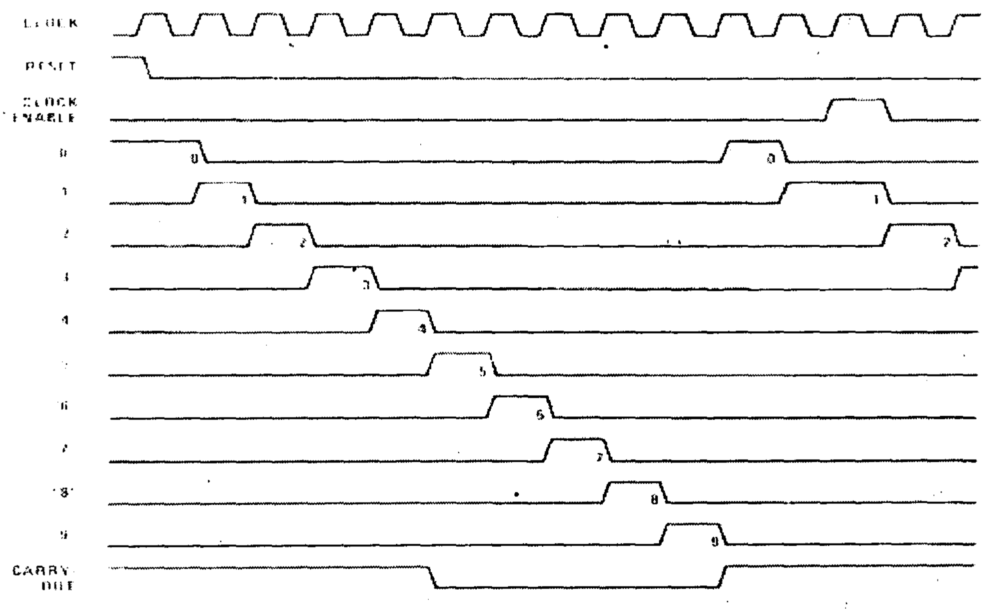

Fig 3.9 timing diagram of the 4017b

3.4.3 The Control Oscillator

The control oscillator in the circuit works to ensure smooth flow of the inputs at their respective intervals and to clear or reset the last input for the new one to achieve this the 4060B is used The 4060B is a 14–stage binary ripple counter with an on–chip oscillator buffer. The oscillator configuration allows design of either RC or crystal oscillator circuits. Also included on the chip is a reset function which places all outputs into the zero state and disables the oscillator. A negative transition on Clock will advance the counter to the next state. Schmitt trigger action on the input line permits very slow input rise and fall times. Applications include time delay circuits, counter controls, and frequency dividing circuits.

Table 3.2 truth table of the 4060B as an oscillator

Clock	Reset	Output State
_/‾	L	No Change
‾_	L	Advance to next state
X	H	All Outputs are low

X = Don't Care

3.5 **Output Unit**

The output unit comprises of the lm124 op – amp, the LDR, and TRIACS.

The resistance network is to vary the intensity of light of the LED so that when a particular intensity is selected it is effected. It achieved wit the aid of the LM 124 op – amp connected to it. The LM124 series consists of four independent, high gain, internally frequency compensated operational amplifiers 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. Application areas include transducer amplifiers, DC gain blocks and all the conventional op amp circuits which now can be more easily implemented in single power supply systems. For example, the LM124 series can be directly operated off of the standard +5V power supply voltage which is used in digital systems and will easily provide the required interface electronics without requiring the additional ±15V power supplies.

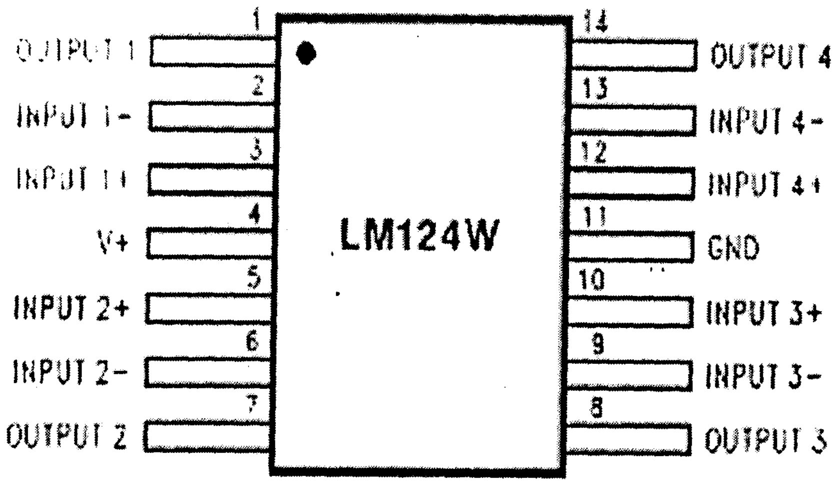

Fig 3.10 connection diagram of the lm 124

3.5.1 Triacs

A TRIAC or TRIode for Alternating Current is an electronic component approximately equivalent to two silicon-controlled rectifiers (SCRs/thyristors) joined in inverse parallel (paralleled but with the polarity reversed) and with their gates connected together. These results in a bidirectional electronic switch which can conduct current in either direction when it is triggered (turned on). It can be triggered by either a positive or a negative voltage being applied to its gate electrode. Once triggered, the device continues to conduct until the current through it drops below a certain threshold value, such as at the end of a half-cycle of alternating current (AC) mains power. This makes the TRIAC a very convenient switch for AC circuits, allowing the control of very large power flows with milliampere-scale control currents. In addition, applying a trigger pulse at a controllable point in an AC cycle allows one to control the percentage of current that flows through the TRIAC to the load (so-called phase control).

Low power TRIACs are used in many applications such as light dimmers,

CHAPTER FOUR

TESTS, RESULTS, AND DISCUSSION

4.1 CONSTRUCTION PROCEDURE

The construction of the project was done as follows:

(i) First, , after the design of the project was completed, the circuit was simulated using electronic workbench software "multisim" and the result obtained from the simulation shows that the device designed will work if constructed.

(ii) Secondly was the purchase of the needed components from the market

(iii) The third step , the construction was carried out with substitution of some components in the design that are not available with possible substitute

(iv) The next step was the laying out of the circuit on the Vero board. During the soldering of the circuit on the Vero board, the following points were carefully noted:

a) The Vero board was clean properly to avoid overall failure of the design and short circuit

b) Care was taken to avoid shorting or bridging two conducting points especially those needed to be separate.

c) Conducting points needed to be in the same potential level were put together.

d) No excess traces of the soldering were allowed to remain on the Vero board.

e) Hatching separated the stages from one another.

f) Care was taken to avoid shorting or bridging two conducting points especially those needed to be separate.

The following tools and materials were used during the construction:

(i) Soldering iron

(ii) Cello tape

(iii) Soldering lead

(iv) Scissors

(v) digital Multimeter

(vi) Pliers

4.2 TESTING

The simulation and testing of the work was done with the aid of electronic work bench software and the digital multimeter. Also in the course of carrying out the tests, the NPN transistor's pins were tested to determine which were the emitter, base and collector. The transistor test was carried out with the aid of the digital multimeter and this was achieve by the following steps below

(i) A multimeter was used to ensure that the collector was more positive than the emitter.

(ii) Since the base-emitter and base-collector circuits behave like diodes, the base-emitter diode was made to be forward conducting while the base-collector diode was reverse-biased, i.e., the applied voltage was in the opposite direction to the easy current flow.

(iii) Again, the multimeter was used to ensure that the maximum values of IC, IB, and VCE for the transistor were not exceeded.

Also, after the connections were made, the transmitter unit was tested to ensure the emission of the infra-red beam by directing the transmitter to the receiver unit, this was are affirmed by the blinking of the LED initially and stopping of the LED light which indicates that line of sight has been achieved.

4.3 CASING

The casing involves a remote model. The model holds the receiver and power unit in square shape,. The circuit itself is cased with a plastic package. It is rectangular in shape. It's constructed in such a way that, there is enough space at the top, sides and front parts of the case, so that there is enough room ventilation especially the transformer.

Length = 8cm

Breath = 15cm

Height = 10cm

The total volume of the casing is:

Volume = Length * Breath * Height

= 8 * 15 * 10 =1200cm3

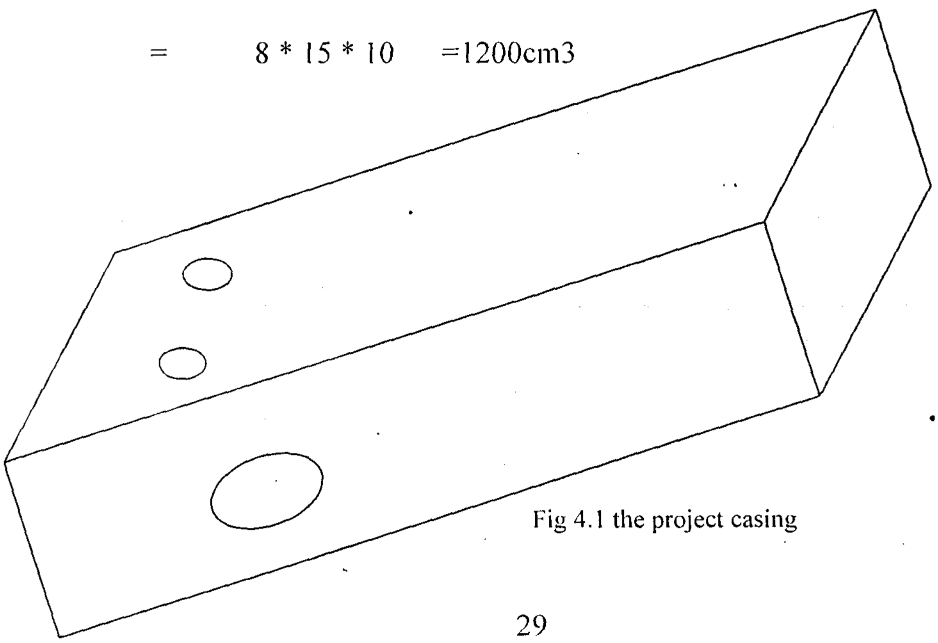

Fig 4.1 the project casing

4.4 DISCUSSION

The uniqueness of this particular project lies in its simplicity in that the circuit causes dimmer each time the toggling switch is pushed to produce the desire effect or intensity of light desired

Chapter Five

5.0 Conclusion

This project report covers extensively, the design and construction of remote controlled dimming device. The tests carried out have shown that the project will be able to provide a means of dimming lights at homes, offices, and theaters if integrated.

5.1 Problems encountered

1. Availability of materials especially compatible infrared and Interference of the ray with other light sources
2. Short circuit that rises through de-soldering of concerned.
3. Readjustment or redesigning of the circuit to fit the real target.
4. Unavailability of some components, which resulted in looking for substitutes

5.2 Recommendation

A more powerful TRIAC could be used for greater number of loads and enhance performance Hence the design can be improved upon, since there is always room for improvement on ideas. Moreover, the design will serve as a stepping stone for whoever is interested in design and construction of a remote light dimmer either for domestic or industrial use with additional steps of dimming. Thus, it is hoped also that it will provide a solution to the difficulty of life in several places of work, houses and industries.

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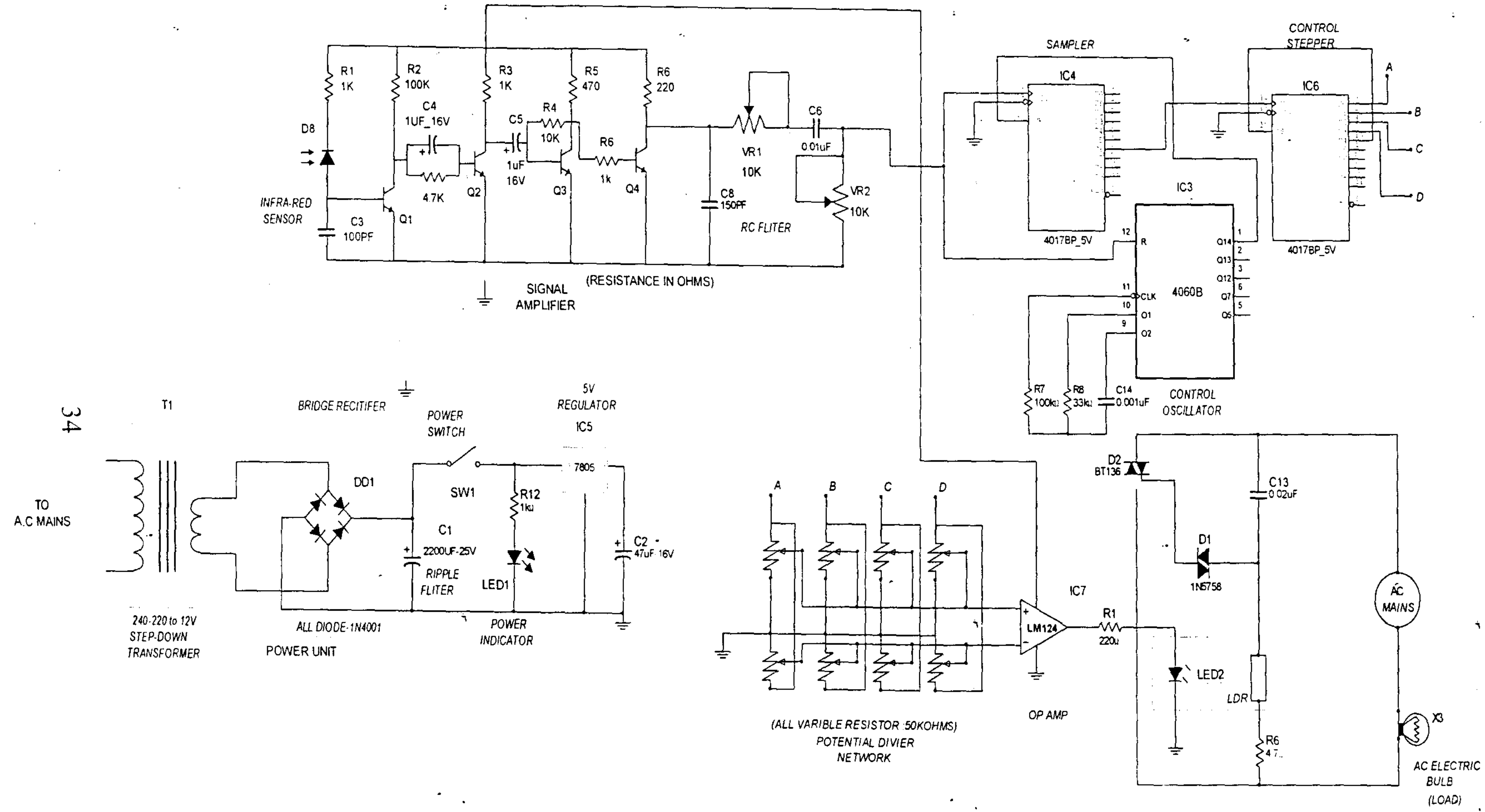
APPENDIX



R1 1K
R2 100K
R3 1K
R5 470
R6 220
C4 1UF_16V
C5 1uF 16V
R4 10K
R6 1k
D8
INFRA-RED SENSOR
C3 100PF
4.7K
Q1
Q2
Q3
Q4
VR1 10K
C6 0.01uF
VR2 10K
C8 150PF
RC FLITER
SIGNAL AMPLIFIER
(RESISTANCE IN OHMS)
SAMPLER
IC4
4017BP_5V
CONTROL STEPPER
IC6
4017BP_5V
A
B
C
D
IC3
4060B
R
CLK
O1
O2
Q14
Q13
Q12
Q7
Q6
R7 100kΩ
R8 33kΩ
C14 0.001uF
CONTROL OSCILLATOR
TO A.C MAINS
T1
240-220 to 12V STEP-DOWN TRANSFORMER
BRIDGE RECITIFER
DD1
ALL DIODE-1N4001
POWER UNIT
POWER SWITCH
SW1
C1 2200UF-25V
RIPPLE FLITER
R12 1kΩ
LED1
POWER INDICATOR
5V REGULATOR
IC5
7805
C2 47uF 16V
(ALL VARIBLE RESISTOR 50KOHMS)
POTENTIAL DIVIER NETWORK
IC7
LM124
OP AMP
R1 220Ω
LED2
D2 BT136
C13 0.02uF
D1 1N5758
LDR
R6 4.7
AC MAINS
X3
AC ELECTRIC BULB (LOAD)