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SOUND HEARD DIMMING LIGHT CIRCUIT WITH THREE STATES USED FOR DOMESTIC ALERTS, ROOFINGS IN HOTELS, KIDS CORNER

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Abstract: **In this paper the circuit in which the light activated by sound turns ON for a short duration When any external sound is heard like claps, dog sound etc.. Which gives an feel that occupants have been alerted. The monitoring is done by the microphone which is fitted in a place and generates AC signals, that passes through DC blocking capacitor C1 to the base of transistor BC 549(T1). Along with the transistor T2 that amplifies the sound signals and provides current pulses from the collector of T2. When sound amplifies the sound signals and provides current pulses from the collector of T2. When sound is produced near the condenser mic,tiac1(BT136) fires, activates, lights and the bulb(B1) glows for about two minutes. Fix the unit lose to the sound monitoring spot, with the lamp inside or outside as desired. This also can be used in some restaurants, hotels, and some kids corners are also for the domestic purposes. Connect the microphone to the sound activated lights circuit using a short length of shielded wire. Close the microphone inside a tube to increase its sensitivity.**

Keywords: **sound sensor, three state.**

I. INTRODUCTION

Scope of the Project

The project is entitled as Sound activated light circuit. This project has been selected since it is applicable in our day today life as monitoring also some entertaining, visualizing effects mainly for potential to conserve power at home and in the workplace.

The project is so excited because it will give us an opportunity to understand how related products in the market work and redesign what we can obtain to realize the ideas we have for our lighting system. We also see the future vision that this project has and are excited about the way it can affect and influence our everyday lives.

II. OBJECTIVES

The objective of this project is to create a lighting system that can automatically adjust its brightness according to its surroundings. This is so as to reduce the redundancy of having a very bright light when the environment is bright but not bright enough for comfort. This lighting system will also save power and make manual adjustments by the user obsolete. Further more, should the brightness of the light be unsuitable for the user, he will be able to adjust the brightness level of the light by clapping. The user will also be able to switch the lights on and off by clapping. Finally, the current settings of the lighting system are displayed on a digital display screen to allow the user to monitor the system’s brightness.

The user will be able to Switch the lights on and off by clapping Adjust the brightness of the lights by clapping Rest assure that the brightness of the room is appropriate given the brightness of the surroundings Monitor the brightness of the lights via a digital display screen Adjust the brightness of the lights manually by using a turn knob.

The product will be able to Switch on and off the light upon “hearing” the sound. Adjust its brightness upon “hearing” the sound.

Automatically adjust its brightness to its surroundings, dimming and brightening when necessary

Display its current brightness settings on a digital display screen Adjust its brightness accordingly when a knob is turned

III. EXISTING SYSTEM

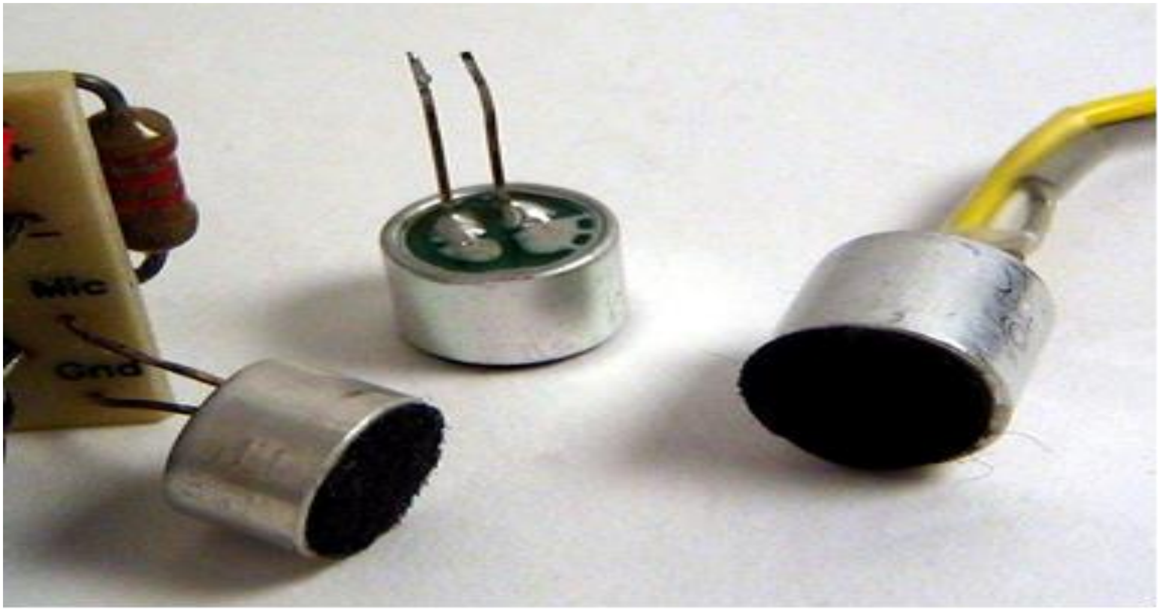
- Now a days we are using sound activated system using clapping sound.
- This method had more cost and need very complicated wired facilities.
- It only receives the selected decibel of sound.
- Connection in bread board will be damaged due to high voltage.

IV. PROPOSED SYSTEM

In this sound activated system, Triac(BT136) is used.
The condenser microphone is fitted to monitor and generates AC signal.
The AC signal which passes through DC blocking capacitor C1 to base transistor (BC549). When TRIAC fires, it activates the Bulb (B1) glows.

V. HARDWARE DESCRIPTION

Condensar Mic



An electret is a stable dielectric material with a permanently embedded static electric charge (which, due to the high resistance and chemical stability of the material, will not decay for hundreds of years). The name comes from electrostatic and magnet; drawing analogy to the formation of a magnet by alignment of magnetic domains in a piece of iron. Electrets are commonly made by first melting a suitable dielectric material such as a plastic or wax that contains polar molecules, and then allowing it to re-solidify in a powerful electrostatic field. The polar molecules of the dielectric align themselves to the direction of the electrostatic field,
Producing a permanent electrostatic "bias". Modern electret microphones use PTFE plastic, either in film or solute form, to form the electret

VI. TYPES

There are three major types of electret microphone, differing in the way the electret material is used

Foil-Type or Diaphragm-Type

A film of electret material is used as the diaphragm itself. This is the most common type, but also the lowest quality, since the electret material does not make a particularly good diaphragm.

Back electret

An electret film is applied to the back plate of the microphone capsule and the diaphragm is made of an uncharged material, which may be mechanically more suitable for the transducer design being realized.

Front electret

In this newer type, the back plate is eliminated from the design, and the condenser is formed by the diaphragm and the inside surface of the capsule. The electret film is adhered to the inside front cover and the metalized diaphragm is connected to the input of the FET. It is equivalent to the back electret in that any conductive film may be used for the diaphragm.

Unlike other condenser microphones, electret types require no polarizing voltage, but they normally contain an integrated preamplifier, which does require a small amount of power (often incorrectly called polarizing power or bias). This preamp is frequently phantom powered in sound reinforcement and studio applications. Other types simply include a 1.5 V battery in the microphone housing, which is often left permanently connected as the current drain is usually very small.

Transistors: BC547

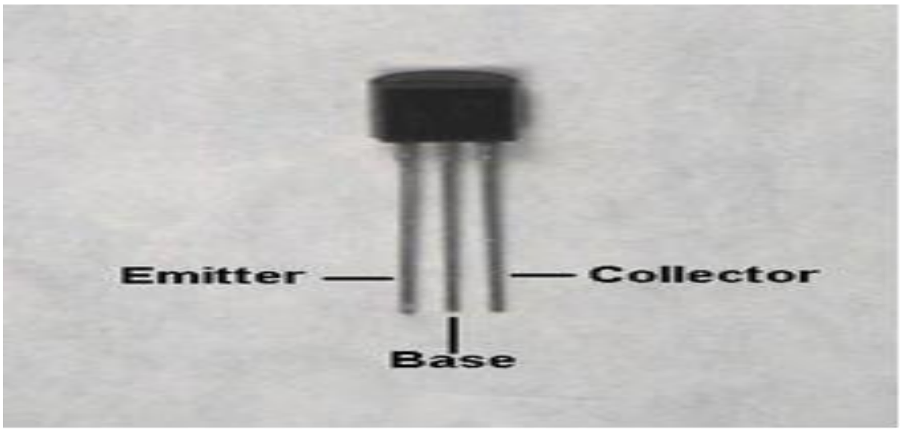


Fig. BC 547

A BC547 transistor is a negative-positive-negative (NPN) transistor that is used for many purposes. Together with other electronic components, such as resistors, coils, and capacitors, it can be used as the active component for switches and amplifiers. Like all other NPN transistors, this type has an emitter terminal, a base or control terminal, and a collector terminal. In a typical configuration, the current flowing from the base to the emitter controls the collector current. A short vertical line, which is the base, can indicate the transistor schematic for an NPN transistor, and the emitter, which is a diagonal line connecting to the base, is an arrowhead pointing away from the base.
There are various types of transistors, and the BC547 is a bipolar junction transistor (BJT). There are also transistors that have one junction, such as the junction field-effect transistor, or no junctions at all, such as the metal oxide field-effect transistor (MOSFET). During the design and manufacture of transistors, the characteristics can be predefined and achieved. The negative (N)-type material inside an NPN transistor has an excess of electrons, while the positive (P)-type material has a lack of electrons, both due to a contamination process called doping.
The BC547 transistor comes in one package. When several are placed in a single package, it is usually referred to as a transistor array. Arrays are commonly used in digital switching. Eight transistors may be placed in one package to make layout much easier.

BC 548

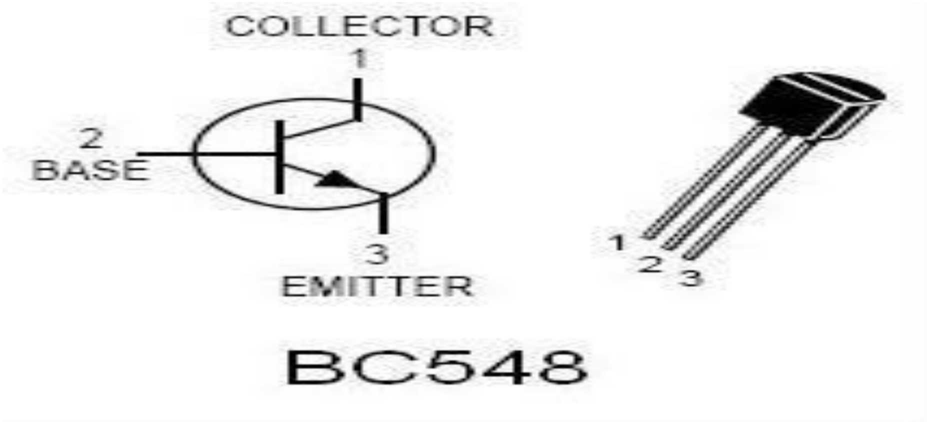


Fig. BC 548

The BC548 transistor is a semiconductor that works to switch electronic signals, and in some cases amplify them. Transistors are one of the most important circuit board components, and replaced vacuum tubes in the mid-20th century, allowing for the true miniaturization of electronics. To the untrained eye, a circuit board simply looks like a green piece of plastic with innumerable small electronic chips, wires and other parts. In reality each component plays a vital role in making a circuit, and electronic devices as a whole, work.

BC548 transistor are mainly used in Europe. They are fairly common there, used typically in lower power household electronics such as netbook processors and plasma televisions. In the United States and Canada, a similar transistor is named 2N3904. Japan's near-equivalent is the 2SC1815. The BC548 can be replaced with similar BC transistors without the danger of burning out or failing.

The strengths and weaknesses of the BC548 transistor are derived mainly from its design. A transistor at its most basic consists of a semiconductor material, a number of terminals referred to as leads, and an overall packaging or enclosure. Like many similar designs, the BC548 transistor has three leads that connect to the rest of a circuit. This makes it a bipolar junction transistor; the other main types of transistors are known as field-effect transistors.

BC 549

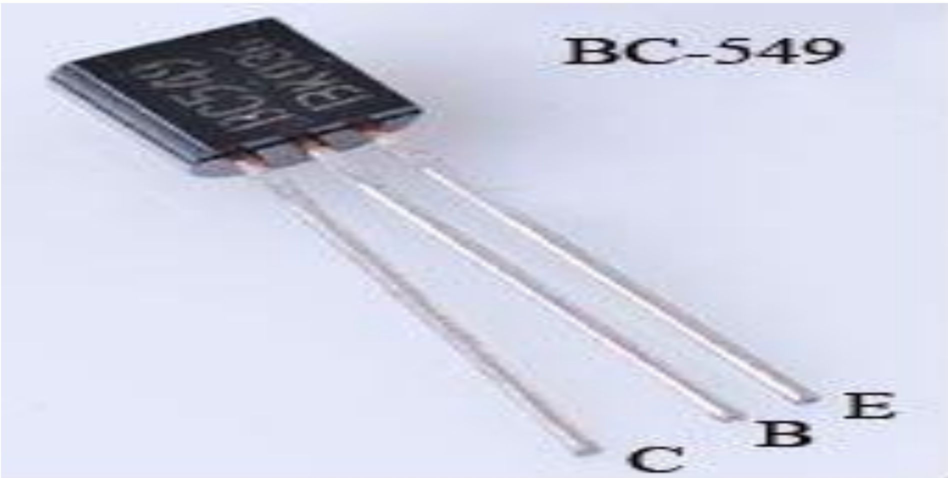


Fig. BC 549

The BC549 is a general purpose epitaxial silicon NPN bipolar junction transistor found commonly in European electronic equipment, and part of an historically significant series of transistors that began in 1966 with Philips' introduction of the BC108 and its high-voltage BC107and low-noise BC109 variants. The BC107/8/9 devices became the most used transistors in Australia and

Europe and subsequent members of the series in plastic packages (such as the BC547, BC548 and BC549) retained the specifications of the metal-cased BC107/8/9 essentially unchanged except for improvements - in thermal resistance and reliability for example.

The part number is assigned by Pro Electron, which allows many manufacturers to offer electrically and physically interchangeable parts under one identification. The BC548 is commonly available in European Union countries. It is often the first type of bipolar transistor young hobbyists encounter, and is often featured in circuit diagrams and designs published in hobby electronics magazines.

BC548 is one of a series of related transistors: BC546 to BC550. These have broadly similar ratings and the same collector current and hfe, but their breakdown voltage ratings VCEO and VCBO vary across the range. -548 has a 30V VCBO, the -547 50V and the -546 80V. The -549 and -550 variants are low-noise versions.

The pinout for the TO-92 package used for the BC546 to BC560 has pin 1 (the leftmost pin in the diagram above, i.e. when the flat face of the package faces the viewer with leads at the bottom) attached to the collector, pin 2 connected to the base, and pin 3 connected to the emitter. Note that not all transistors with TO-92 cases follow this pinout arrangement.

Capacitor

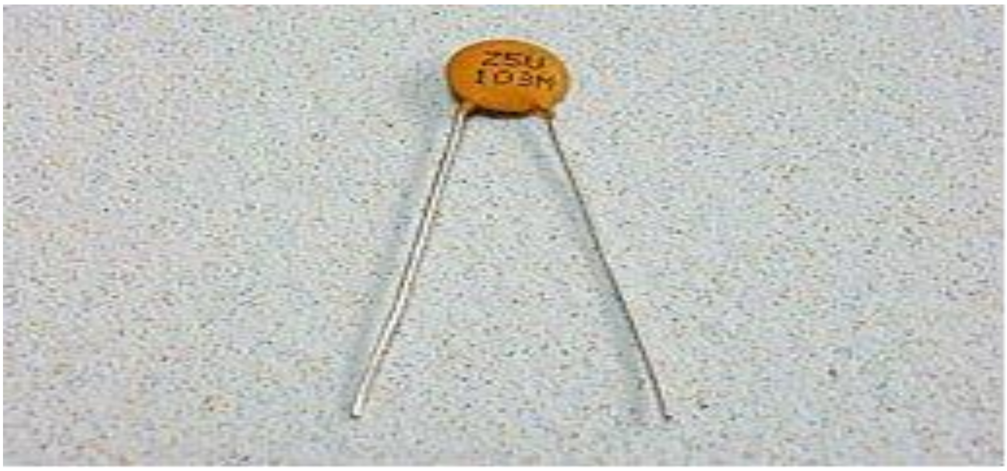


Fig. capacitor o.1µf

A capacitor (originally known as a condenser) is a passive two-terminal electrical component used to store energyelectrostatically in an electric field. The forms of practical capacitors vary widely, but all contain atleast two electrical conductors (plates) separated by a dielectric (i.e., insulator). The conductors can be thin films of metal, aluminum foil or disks, etc. The 'nonconducting' dielectric acts to increase the capacitor's charge capacity. A dielectric can be glass, ceramic, plastic film, air, paper, mica, etc. Capacitors are widely used as parts of electrical circuits in many common electrical devices. Unlike a resistor, a capacitor does not dissipate energy. Instead, a capacitor stores energy in the form of an electrostatic field between its plates.

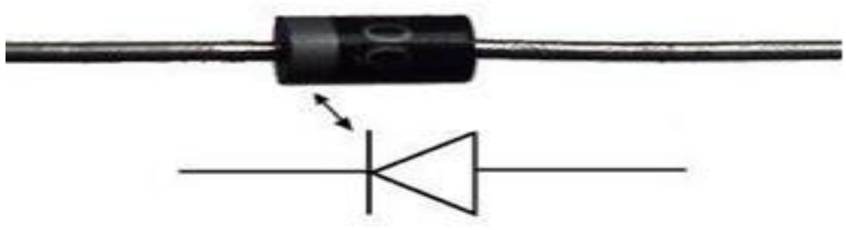
When there is a potential difference across the conductors (e.g., when a capacitor is attached across a battery), an electric field develops across the dielectric, causing positive charge (+Q) to collect on one plate and negative charge (-Q) to collect on the other plate. If a battery has been attached to a capacitor for a sufficient amount of time, no current can flow through the capacitor. However, if an accelerating or alternating voltage is applied across the leads of the capacitor, a displacement current can flow.

An ideal capacitor is characterized by a single constant value for its capacitance. Capacitance is expressed as the ratio of the electric charge (Q) on each conductor to the potential difference (V) between them. The SI unit of capacitance is the farad (F), which is equal to one coulomb per volt (1 C/V). Typical capacitance values range from about 1 pF (10^{-12} F) to about 1 mF (10^{-3} F).

The capacitance is greater when there is a narrower separation between conductors and when the conductors have a larger surface area. In practice, the dielectric between the plates passes a small amount of leakage current and also 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.

Didode



The most common function of a diode is to allow an electric current to pass in one direction (called the diode's forward direction), while blocking current in the opposite direction (the reverse direction). Thus, the diode can be viewed as an electronic version of a check valve. This unidirectional behavior is called rectification, and is used to convert alternating current to direct current, including extraction of modulation from radio signals in radio receivers— these diodes are forms of rectifiers.

However, diodes can have more complicated behavior than this simple on–off action, due to their nonlinear current-voltage characteristics. Semiconductor diodes begin conducting electricity only if a certain threshold voltage or cut-in voltage is present in the forward direction (a state in which the diode is said to be forward-biased). The voltage drop across a forward-biased diode varies only a little with the current, and is a function of temperature; this effect can be used as a temperature sensor or voltage reference.

Semiconductor diodes' current–voltage characteristic can be tailored by varying the semiconductor materials and doping, introducing impurities into the materials. These are exploited in special-purpose diodes that perform many different functions. For example, diodes are used to regulate voltage (Zener diodes), to protect circuits from high voltage surges (avalanche diodes), to electronically tune radio and TV receivers (varactor diodes), to generate radio frequency oscillations (tunnel diodes, Gunn diodes, IMPATT diodes), and to produce light (light emitting diodes). Tunnel diodes exhibit negative resistance, which makes them useful in some types of circuits.

VII. BLOCK DESCRIPTIONS

Noise Detection Unit

The noise detecting block provides the sound activation part of the project. It includes the circuit for sensing each clap and a state machine that will help in determining the number of claps in order to interpret the desired response from the lighting system.

The circuit that senses the claps will switch on or off on "hearing" a clap. The user can clap 1 time, 2 times, or 3 times at any moment. Taking these as input, the final output from the state machine will determine whether or not the lights should be switched on, switched off, brighter or dimmer. Shown below is the way the clapping should work:

1. Circuit is closed (lights are on)

a. 1 clap – lights off

b. 2 claps – lights become brighter

c. 3 claps – lights become dimmer

2. Circuit is opened (lights are off)

a. 1 clap – lights on

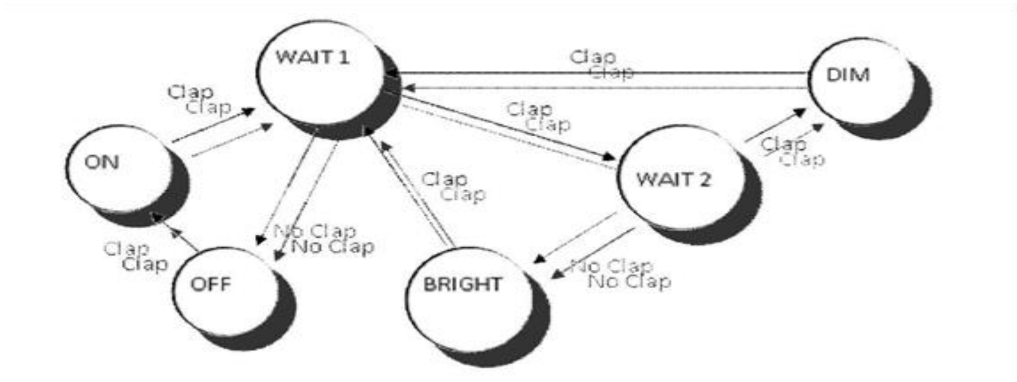
The circuit will also take as input the current state of the state machine. The way the state machine works is shown below in Fig.2. The states are described in Table 1 and the action needed to be taken corresponding to the output is shown in Table 2.

Table 1. Output table

Output	State	1 Clap	No Clap
000	On	Wait 1	On
001	Wait 1	Wait 2	Off
010	Wait 2	Dim	Bright
011	Off	On	Off
100	Bright	Wait 1	Bright
101	Dim	Wait 1	Dim

The outputs shown in the table above will be taken as an input for the microprocessor, which will then adjust the brightness of the lights accordingly.

The State Diagram:



Assemble the sound activated lights circuit on a general purpose PCB (circuit board) and enclose in a plastic cabinet. Power to the sound activated switch circuit can be derived from a 12V, 500mA step-down transformer with rectifier and smoothing capacitor. Solder the triac ensuring sufficient spacing between the pins to avoid short circuit.

Table 2

Output	Action
000	On
001	Off
010	Bright
011	Off
100	Bright
101	Dim

Graph of the Output Voltage of the Sensor

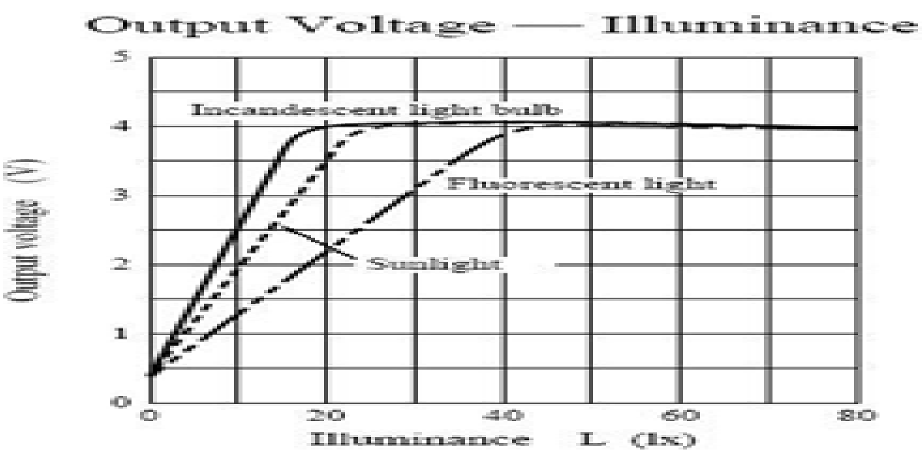


Fig. graph of output

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Table 3

Voltage	Bit Pattern	Brightness Level of Room
0V – 1V	000	Dark
1V – 2V	001	Dim
2V – 3V	010	Medium
3V – 4V	011	Medium-High
4V – 5V	100	Bright

Buttons Unit

The buttons unit allows the user to physically change the preset level. When the buttons are pressed, it sends data to the PIC. There is a button each for On/Off, Increase Brightness, and for Decreasing Brightness. These buttons allow physical interfacing with the device.

Testing Procedures

For the clapping device, the range of distances from the origin of the sound to the sensor circuit needs to be tested. This will be done by clapping from a number of slightly increasing distances from the circuit and observing whether the circuit is able to respond to the clap consistently by measuring the output voltage. The results will be tabulated in a table. The state machine also needs to be tested. This can be tested by using light emitting diodes (LEDs) to verify the accuracy of the digital output.

To test the light detection part of the circuit, we can place the sensor PNA4603H in rooms of varying amounts of brightness and, using an oscilliscope, measure its output voltage. Other parameters that also need to be tested are the output of the ADC (with multiple scopes), the output of the PIC microprocessor, and the output of the DCA. Finally, by observation, we can test the brightness of the light bulb to verify that it is the appropriate level of brightness determined by the light sensor.

We can test the PIC by forcing inputs and making sure the proper outputs come out. MPLAB is a debugger that we can use to test and debug the PIC.

The final product as a whole can be tested by changing the level of brightness detected by the sensor and measuring the voltage produced by the light output. The results can then be plotted on a graph with voltage of sensor vs. voltage of light output to determine the response of the system. Also, the noise activated switch can be tested by clapping and measuring the voltage of the light output to ensure that the desired output is produced.

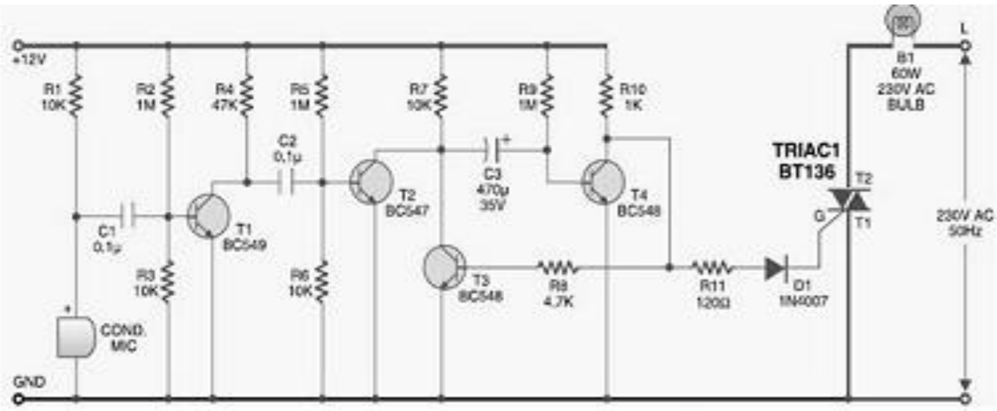
■ Absolute Maximum Ratings $T_a = 25°C$

Parameter	Symbol	Rating	Unit
Collector supply voltage	V_{CC}	7	V
Power dissipation	P_D	200	mW
Operating ambient temperature	T_{opr}	−20 to +75	°C
Storage temperature	T_{stg}	−40 to +100	°C

Tolerance Analysis

The critical part of the circuit is the PNA4603H sensor. It might not work under extreme conditions such as extreme cold or extreme hot. Also, it might not respond to different light sources in the same way. Thus, it should be tested in various environments of varying levels of brightness and sources of light. For example, this sensor can be tested under direct sunlight, fluorescent light, and incandescent light. The sensor should also be tested under different temperatures from freezing temperature to room temperature to a heated room temperature to ensure that the sensor will work under any of these conditions. Figure shows the range of parameters of the sensor.

VIII. IMPLEMENTATION AND WORKING CIRCUIT DIAGRAM



It processes multiple inputs, performs computation, updates the output display, and adjusts the brightness level of the light. First and foremost, it takes the analog output of the photo detecting sensor to the analog to digital converter (ADC), where the digital data is then interpreted. Based on the preset level desired by the user, one of five levels of brightness will be outputted to the light source as bits, and then converted to an analog signal through a digital to analog converter (DAC). The PIC then updates the LCD display to reflect the current level of brightness. The PIC also interprets data coming in from the noise detecting unit. It raises the preset brightness, lowers it, or turns the lights on and off depending on the sequence of claps detected. Lastly, the PIC takes input from knob buttons to manually adjust the preset brightness level or turn the lights on and off.

Light Output and DAC

The microprocessor outputs a three bit signal to a DAC which connects to the light output. For example, we could use the bit pattern as shown in Table 4 to translate into the following levels of brightness for the light bulb. The output of this converter is then sent to the voltage source of the light, controlling the brightness of the light bulb.

Table 4: Example of interpreting the level of brightness required

Bit Pattern	Brightness Level of Light Bulb
000	Brightest
001	Medium-High
010	Medium
011	Dim
100	Off

Performance Requirement

The final product should be able to light up a room with a level of brightness that depends on the detected level of brightness of the room.

The PIC unit should be able to adjust the outputs, such as On/Off, the brightening and dimming of the lights, and displaying to the LCD without a noticeable delay. All the I/O tasks should seem to happen instantaneously to the user.

The lighting system should be controllable by clapping and by a knob. Different numbers of claps should be able to switch the lights on and off, brighten it, and dimmer it.

For The Clapping Sensor:

1. Clapping is to be done within a 2 seconds window
2. There should be at least a 5 seconds wait before the next command is given
3. User should clap only once when the lights are off, and only once, 2 times, or 3 times when the lights are on

IX. TRANSMITTER

Data signals transmitted through pin 3 of 9 pin D connector of RS232 COM1 port are sent to pin 8 of MAX232 and it converts these EIA (Electronics Industry Association) RS232 compatible levels of 9 volts to 0/5 volt TTL levels. The output pin of MAX 232 TC (pin 9) drives the BC547 npn transistors and powers the base of the transistor. Now depending on the input at pin 8 of IC MAX232, the transistor goes in active region or in cut off.

1. with input at pin 8 is +9v:

The output at pin 9 of MAX232 will be at 0v and thus the transistor T1 will be in cut off. This supply voltage(+5v) will thus appear on collector of transistor T1 and the 555 timer (reset pin). This output goes to logic 1 at pin 3 of 555 timer and IR LEDs will glow.

2. With input at pin 8 is -9v:

The output in this case on pin 9 of MAX232 will be +5v thus driving the transistor T1 in active region. The voltage at pin 4 of 555 timer will go to zero and output at pin 3 of 555 timer goes low thus the LEDs will not glow. The electrical pulses sent by the COM port are now converted into corresponding modulated pulses of IR light.

The astable multivibrator is set to generate square wave of 38KHZ as the IR module used in the circuit is tuned to 38KHZ. The range 38KHZ is widely used in practical purpose as most Television remote controls operates on this frequency thus providing extra.

X. RECEIVER

A visible LED 1 at pin 7 indicates that the signals are being received. Pin is also connected to pin 2 (receiving pin) D connector used for serial port in that the data may be read. The optical signals received by reciever are in fact converted to electrical pulses and both “think” that there is a null modem cable connected between them. In some of the serial port is terminated it to an 9 pin D connector and in some others into a 25 pin D connector. The module used works in active low and thus when receives TR radiation gives output low. With logic low at the base of transistor T2 the emitter of it will be at low voltage level and then the received low voltage level signal is converted

XI. RESULTS

Photo of the Kit

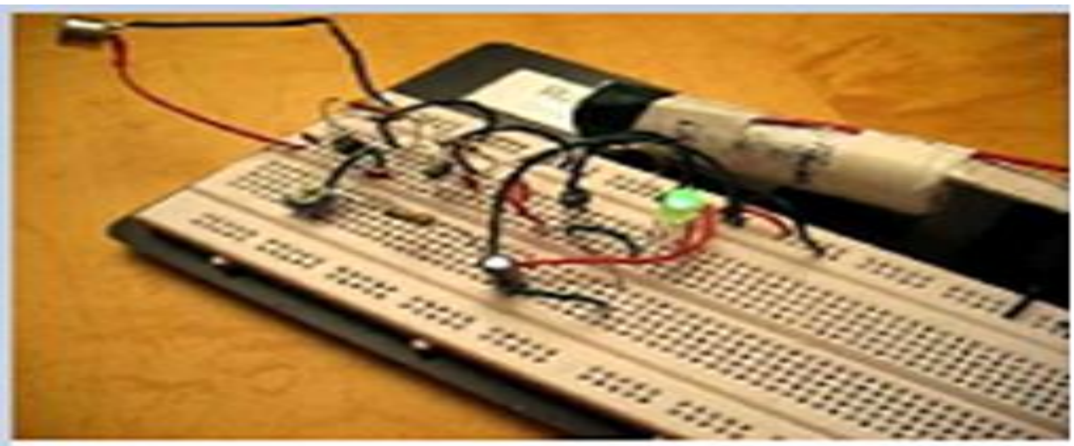


Fig. Output of the kit

The sound activated lights circuit turns a lamp ON for a short duration when the dog barks (or a relatively strong sound) giving an impression that the occupants have been alerted. The condenser microphone fitted in a place to monitor sound and generates AC signals, which pass through DC blocking capacitor C1 to the base of transistor BC549 (T1). Transistor T1 along with transistor T2 amplifies the sound signals and provides current pulses from the collector of T2. When sound is produced in front of the condenser mic, triac1 (BT136) fires, activates lights and the bulb (B1) glows for about two minutes.

Fix the unit in the dog's cage or close to the sound monitoring spot or in entertainment areas like hotels restaurants, kids spot with the lamp inside or outside as desired. Connect the microphone to the sound activated lights circuit using a short length of shielded wire. Enclose the microphone in a tube to increase its sensitivity.

XII. CONCLUSION

A simple sound activated lights have been designed constructed and tested While living in rent or in hostel the problem like stealing is often in absent time. Here is the circuit of simple and inexpensive sound- operated light to overcome this type of problem which can turn on the light when someone clap, or tries to open your or even inserts a key in the door lock. The switch of light is alternately i.e. light on by one sound pulse and off by another.

Caution:
Since the sound activated lights uses 230V AC, many of its points are at AC mains voltage. It could give you lethal shock if you are not careful. So if you don't know much about working with line voltages, do not attempt to construct this circuit. We will not be responsible for any kind of resulting loss or damage

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