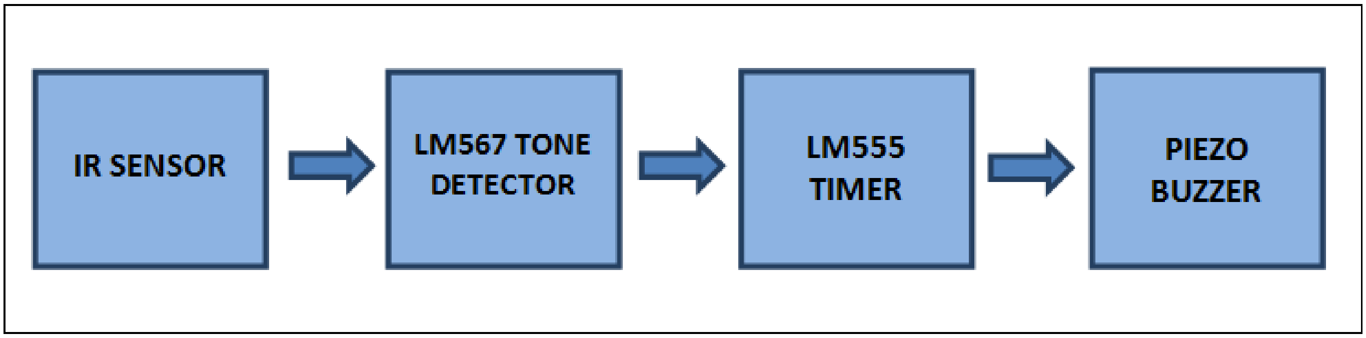
Car Parking Guard Circuit Using Infrared Sensor

Introduction: While parking the car the driver should be more careful because he cannot see the back of the car while parking or taking reverse, if there is any obstacle and ran over it might be get damage to the car. Our project will help the person in the driving seat and give alarm if there is any obstacle or a wall while parking or while driving in reverse.

Block Diagram of Car Parking Guard:



The IR sensor will detect the obstacle with in 100cm, if there is any obstacle it will sense and give information to the tone detector which will enable the LM555 timer to generate a PWM for the buzzer. The LM555 will generate the pulse which helps to buzz the buzzer so driver can understand that there is an obstacle.

Main Component Explanation:

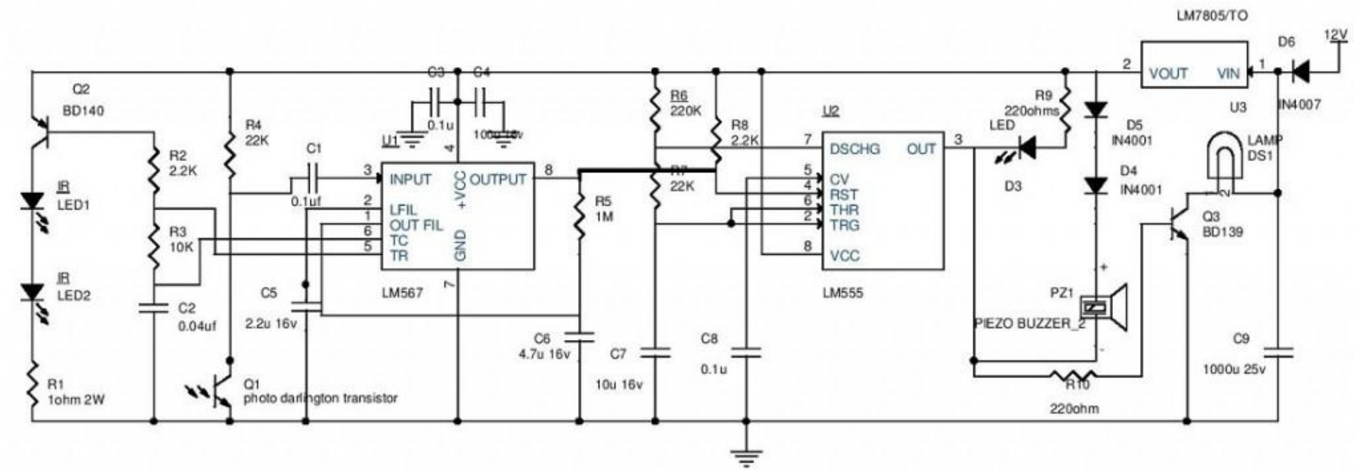
LM567: is a tone detector which can interpret the frequency generated by the other component and give the output according to the application designed by the engineer. For example if a component is attached to the input of LM567 which can generate a 40 kHz signal , but we to function the following circuit when the component has reached to the 40KHz. At this decision making we will use tone detector. The tone detector is mainly used in touch tone decoders, ultrasonic controls, frequency monitoring and control etc.

LM555: is a timer which can generate a PWM signals in various width and duty cycles. The 555 timer is mainly used to control the other peripherals like motors, detectors, regulators etc.

IR Sensor: the main function of the IR sensor is to produce a beam for certain distance (the distance of the beam is always depends on the IR sensor, different IR sensor have different range of beam distance) if the there is any obstacle in the beam it will conduct and give signal.

Photo Darlington Transistor: the photo darlington transistor will act as a photo detectors. They will conduct to the light or electro magnetic signals. The main function of this transistor is to amplify the input signal of the transistor. But it will work slowly when compared to the other transistors. It is having a maximum frequency of 20 KHz.

Circuit Diagram of Car Parking Guard:



Explanation:

- The reverse indicator light supply is given to the 7805 regulator to give 5v to the rest of the circuit. The diode D6 is used to eliminate the reverse current and wrong supply polarity.
- When the car is driving in reverse the car battery will provide DC supply the reverse light indicator at the back of the car when this supply came to the reverse light indicator the circuit will have the power supply.7805 will regulate the DC voltage to 5V and give to the IR Sensors through the transistor with 20 KHz modulating frequency of the LM567 (TONE DETECTOR) available at Pin5. The resistor R1 will resists the IR senor current. At this point the pin8 of LM567 is high which will enable the LM555 timer operating in astable multivibrator mode. The output of the timer is enabled which can be assured by the LED (blinking) and also buzzer will beeps at determined rate given by the resistors R6, R7 and capacitor C7. The timer output also is given to the lamp through a transistor. The lamp will blink as a warning signal because of the PWM signal generated by the timer, transistor will work as a switch and resistor R10 will limit the current. This condition is maintained until the 20 KHz signal is received by the pin3 of the LM567.
- The above condition is when there is no obstacle in the path of the car while taking reverse. If there is a obstacle the IR beam will radiate back to the IR sensor and the 20KHz modulated signal is given to the pin3 of LM567 through photo Darlington transistor, at this point the pin8 of the LM567 is turned to low and also gets locked to detect the 20Khz signal. By this the LM555 is turned low and disabled by this the led will remain lighting and buzzer makes the continuous sound to alert the driver.

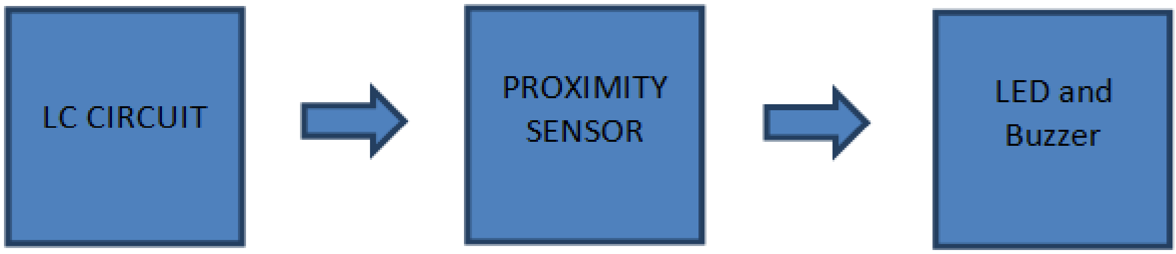
Note: This complete circuitry will be attached to the back bumper and placed at the center. The buzzer and led should be placed on the dash board for visibility of light and hearing purpose for the driver.

Make the connection to the reverse indicator light and the circuit in parallel and beware of the polarity.

Metal Detector Circuit

Metal detector is very common devices for checking the person in shopping malls, hotels, cinema halls to ensure that person is not carrying any explosive metals or illegal things like guns, bombs etc. metal detectors can be created easily and the circuit is not that complex.

Block Diagram of Metal Detector:



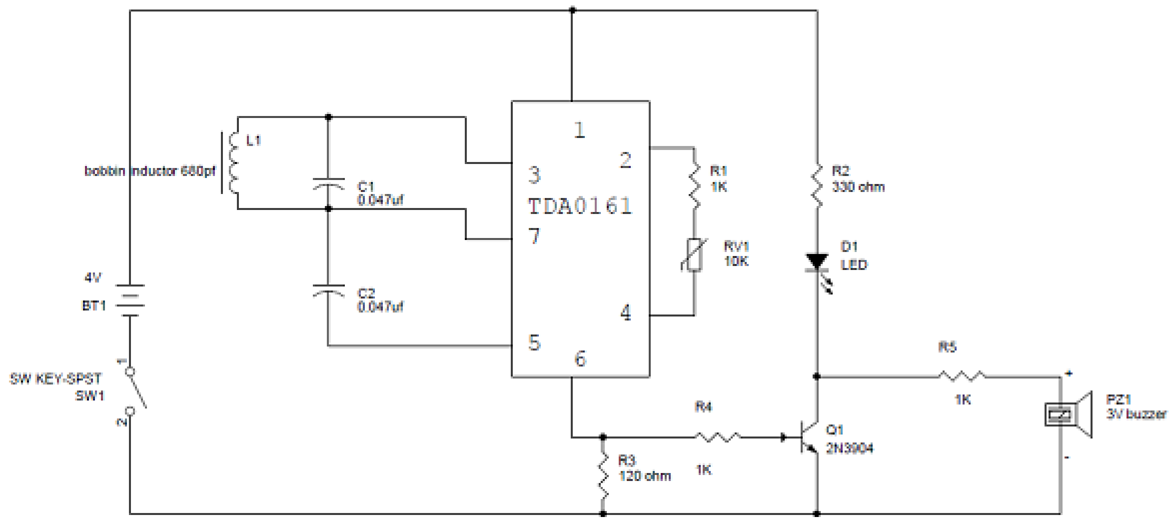
The LC circuit is nothing but inductor and capacitor which is connecter in parallel. The LC circuit will trigger the proximity sensor if it detects any metal near to it. Proximity sensor will give glow the led, and also make the buzz with the help of the buzzer.

Main Components in Metal Detector Circuit:

LC CIRCUIT: LC Circuit is a resonating circuit which will resonate when exact same frequency material comes near. The LC circuit consist of inductor and capacitor connected in parallel , when the capacitor is fully charged the charge of the capacitor will be given to the inductor, here inductor will have improve its magnetic field. After some time the capacitor will have no charge and current from the inductor will be given to the capacitor in a reverse polarity and capacitor will get charge and now the inductor magnetic field and current will become nil. Again charged capacitor will give current to the inductor to improve its magnetic field. Note inductor is a magnetic field storage device and capacitor is electric field storage device.

PROXIMTY SENSOR: The proximity sensor can detect the objects with out any physical interference. The proximity sensor will work same as infrared sensor, proximity also release a signal, it will not give output unless and until there is no change in the reflected back signal, If there is a change in signal it will detect and give the output accordingly. There are different proximity sensors for example to detect plastic material we can use capacitive type proximity and for metals we should use inductive type.

Circuit Diagram of Metal Detector:



Metal Detector Circuit Explanation:

- When the LC circuit that is L1 and C1 has got any resonating frequency from any metal which is near to it, electric field will be created which will lead to induces current in the coil and changes in the signal flow through the coil.
- Variable resistor is used to change the proximity sensor value equal to the LC circuit, it is better to check the value when there is coil not near to the metal. When the metal is detected the LC circuit will have changed signal. The changed signal is given to the proximity detector (TDA 0161), which will detect the change in the signal and react accordingly. The output of the proximity sensor will be of 1mA when there is no metal detected and it will be around 10mA when coil is near to the metal
- When the output pin is high the resistor R3 will provide positive voltage to transistor Q1. Q1 will be turned on and led will glow and buzzer will give the buzz. Resistor r2 is used to limit the current flow.

Wireless Mobile Battery Charger Circuit

Emerging technologies are making our life simpler these days. With the introduction of mobile phones, life has changed rapidly. This is a dream of radio engineering. Mobile phones merged land line telephone systems. These days, many advancements in the mobile phones were introduced. These advancements provide many services such as text, internet etc. But although there are many advancements in the technology, we still rely on the wired battery chargers. Each phone will have its own designed battery charger. Thus the battery chargers are required to carry everywhere to keep the battery backup. Now just think of a battery charger that charges your mobile automatically. When you sit for tea and place your mobile on the table, it simply charges your mobile. This article explains a simple wireless battery charger circuit that charges your mobile when placed near the transmitter. This circuit may be used as wireless power transfer circuit, wireless mobile charger circuit, wireless battery charger circuit, etc.

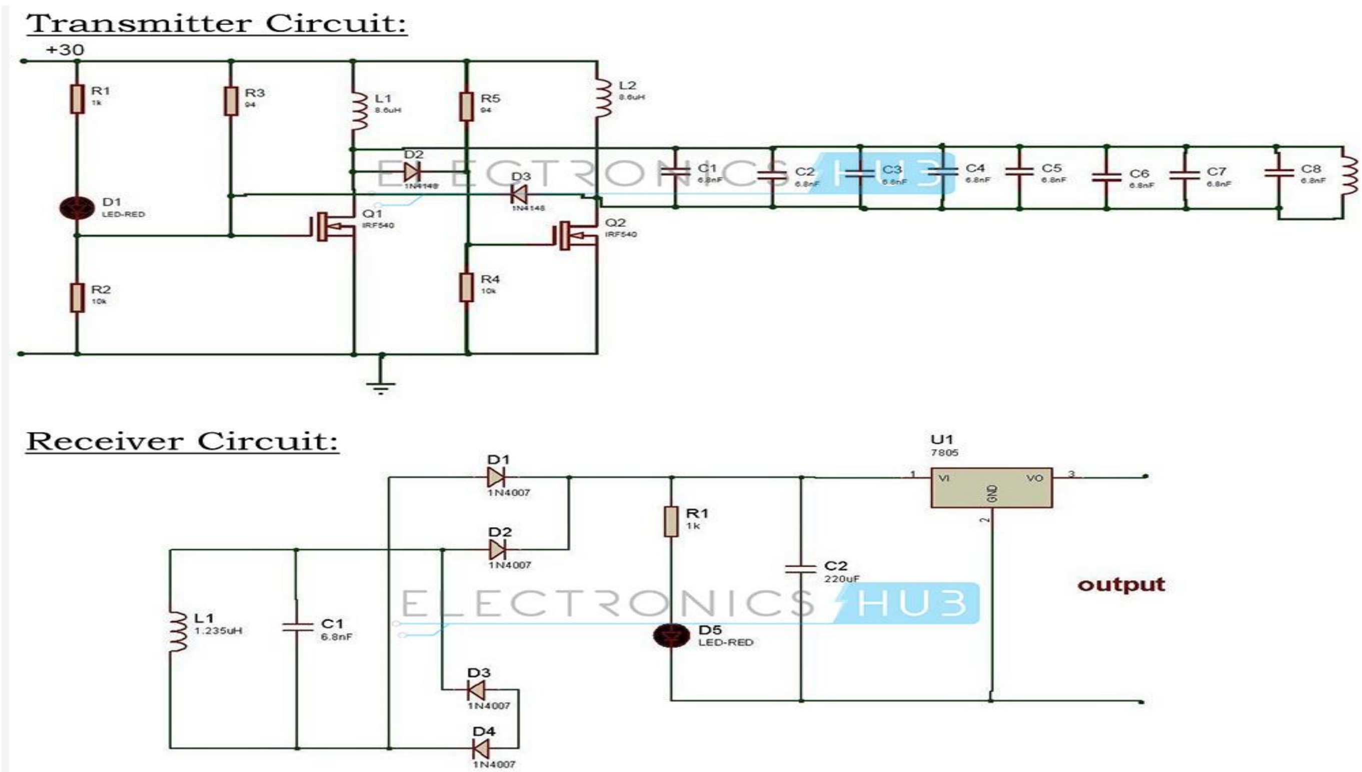
Wireless Battery Charger Circuit Principle:

This circuit mainly works on the principle of mutual inductance. Power is transferred from transmitter to the receiver wirelessly based on the principle of “inductive coupling”.

Inductance is the property of the conductor, in which the current flowing in a conductor induces a voltage or electromotive force in it or in another nearby conductor. There are two types inductance. 1) Self inductance, 2)Mutual Inductance.

“Mutual inductance” is the phenomena in which, when a current carrying conductor is placed near another conductor voltage is induced in that conductor. This is because, as the current is flowing in the conductor, a magnetic flux is induced in it. This induced magnetic flux links with another conductor and this flux induces voltage in the second conductor. Thus two conductors are said to be inductively coupled.

Wireless Power Transfer Circuit Diagram:



Wireless Mobile Charger Circuit Diagram

Wireless Mobile Charger Circuit Design:

Wireless battery charger circuit design is very simple and easy. These circuits require only resistors, capacitors, diodes, Voltage regulator, copper coils and Transformer.

In our Wireless battery charger, we use two circuits. The first circuit is transmitter circuit used to produce voltage wirelessly. The transmitter circuit consists of DC source, oscillator circuit and a transmitter coil. oscillator circuit consists of two n channel MOSFETS IRF 540 , 4148 diodes. When the DC power is given to the oscillator, current starts flowing through the two coils L1, L2 and drain terminal of the transistor. At the same time some voltage is appeared at the gate terminals of the transistors. One of the transistors is in on state while the other is in off state. Thus voltage at drain of transistor which is in off state raises and it fall through the tank circuit made of 6.8nf capacitors and transmitter coil of 0.674. Thus operating frequency is determined by using formula $F=1/[2\pi\sqrt{(LC)}]$.

In the second circuit that is receiver circuit consists of receiver coil, rectifier circuit and regulator. When the receiver coil is placed at a distance near the inductor Ac power is induced in the coil. This is rectified by the rectifier circuit and is regulated to DC 5v using 7805 regulator. The rectifier circuit consists of 1n4007 diode and capacitor of 6.8nf. The output of regulator is connected to the battery.

NOTE: Also get an idea about the [Battery Level Indicator Project Circuit and its Working]

How to operate this Wireless Power Transfer Circuit?

- Initially, connect the circuit as shown in the circuit diagram.
- Switch on the supply.
- Connect the battery charger at the output of the circuit.
- Place the receiver coil near the transmitter coil .
- You can observe the charging of battery.

Wireless Battery Charger Circuit Advantages:

- Usage of separate charger is eliminated.
- Phone can be charged anywhere and anytime.
- It does not require wire for charging.
- Easier than plug into power cable.

Wireless Power Transfer Circuit Applications:

- Wireless chargers can be used to charge mobiles, camera batteries, Bluetooth headsets etc.
- This can also be used in applications like car battery charger with little modification. Go to **Simple Car Battery Charger Circuit** post for more information.
- This can also be used in medical devices.

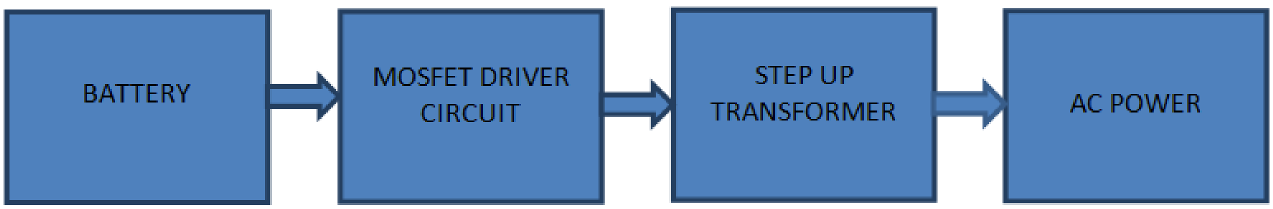
Limitations of the Circuit:

- Power is somewhat wasted due to mutual induction.
- It will work for very short distances only. If you want to use it for long distances, then the number of inductor turns should be high.

Simple 100W Inverter Circuit

Inverter is a small circuit which will convert the direct current (DC) to alternating current (AC). The power of a battery is converted in to' main voltages' or AC power. This power can be used for electronic appliances like television, mobile phones, computer etc. the main function of the inverter is to convert DC to AC and step-up transformer is used to create main voltages from resulting AC.

Block Diagram of Inverter:



BLOCK DIAGRAM OF INVERTER

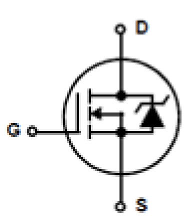
In the block diagram battery supply is given to the MOSFET driver where it will convert DC to AC and the resulting AC is given to the step up transformer from the step up transformer we will the get the original voltage.

Main Components:

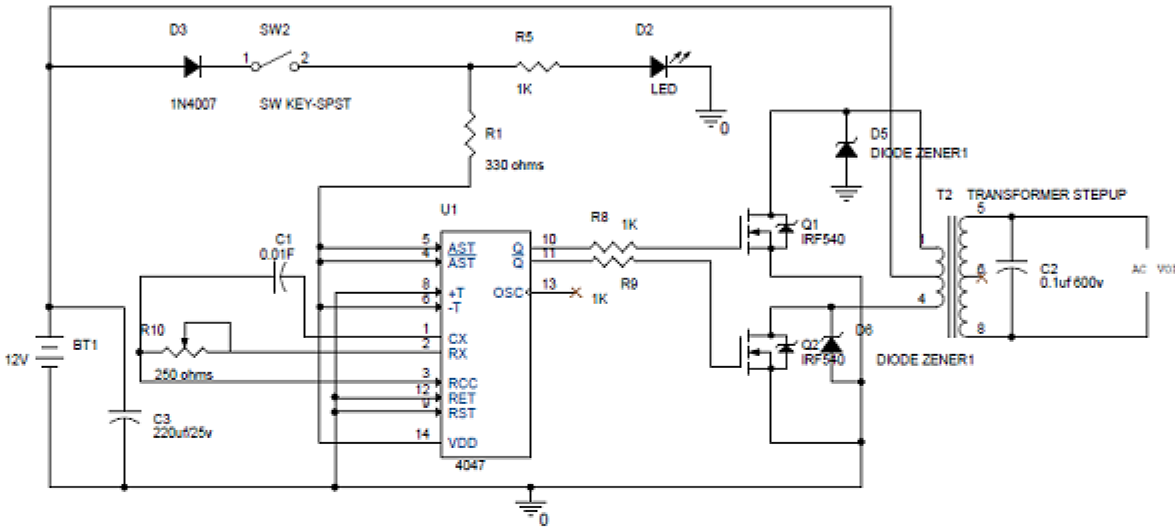
CD4047: CD4047 is a multi vibrator with very low power consumption designed by TEXAS INSTRUMENTS.it can operate in monostable multivibrator and also astable multivibrator.in the astable multivibrator mode it can operate in free running or gatable modes and also provides good astable frequency stability. It can generate 50% duty cycle which will create a pulse, which can be applied for inverter circuit. This is mainly used in frequency discriminators, timing circuits frequency divisions etc.

IRF540: IRF540 is a N-channel enhanced mode silicon gate field effect transistor (MOSFET).they are mainly used in switching regulators, switching converters relay drivers etc. the reason for using them in the INVERTER circuit is the because it is a high switching transistor , can work in very low gate drive power and have high input impedance.

IRF540 Symbol:



Simple 100W Inverter Circuit Diagram:



Explanation:

- In the circuit diagram we can observe that 12V battery is connecter to the diode LED and also connected to the pin8 of the IC 4047 which is VCC or power supply pin and also to pin 4 and 5 which are astable and complement astable of the IC. Diode in the circuit will help not give any reverse current, LED will work as a indicator to the battery is working or not.
- IC CD4047 will work in the astable multivibrator mode. To work it in astable multivibrator mode we need an external capacitor which should be connected between the pin1 and pin3. Pin2 is connected by the resistor and a variable resistor to change the change the output frequency of the IC. Remaining pins are grounded .The pins 10 and 11 are connected to the gate of the mosfets IRF540. The pin 10 and 11 are Q and ~Q from these pins the output frequencies is generated with 50% duty cycle.
- The output frequency is connected to the mosfets through resistor which will help to prevent to the loading of the mosfets. The main AC current is generated by the two mosfets which will act as a two electronic switches. The battery current is made to flow upper half or positive half of the primary coil of transformer through Q1 this is done when the pin 10 becomes high and lower half or negative half is done by opposite current flow through the primary coil of transformer, this is done when pin 11 is high. By switching the two mosfets current is generated.
- This AC is given to the step up transformer of the secondary coil from this coil only we will get the increased AC voltage , this AC voltage is so high; from step up transformer we will get the max voltage. Zenor diode will help avoid the reverse current.

NOTE: The generated AC is not equal to the normal AC mains or house hold current. You cannot use this voltage for pure electric appliances like heater, electric cooker etc. Because of the fast switching of mosfets heat is dissipated which will effect the efficiency, use heat sink to remove this problem.

UP/DOWN Fading LED Lights

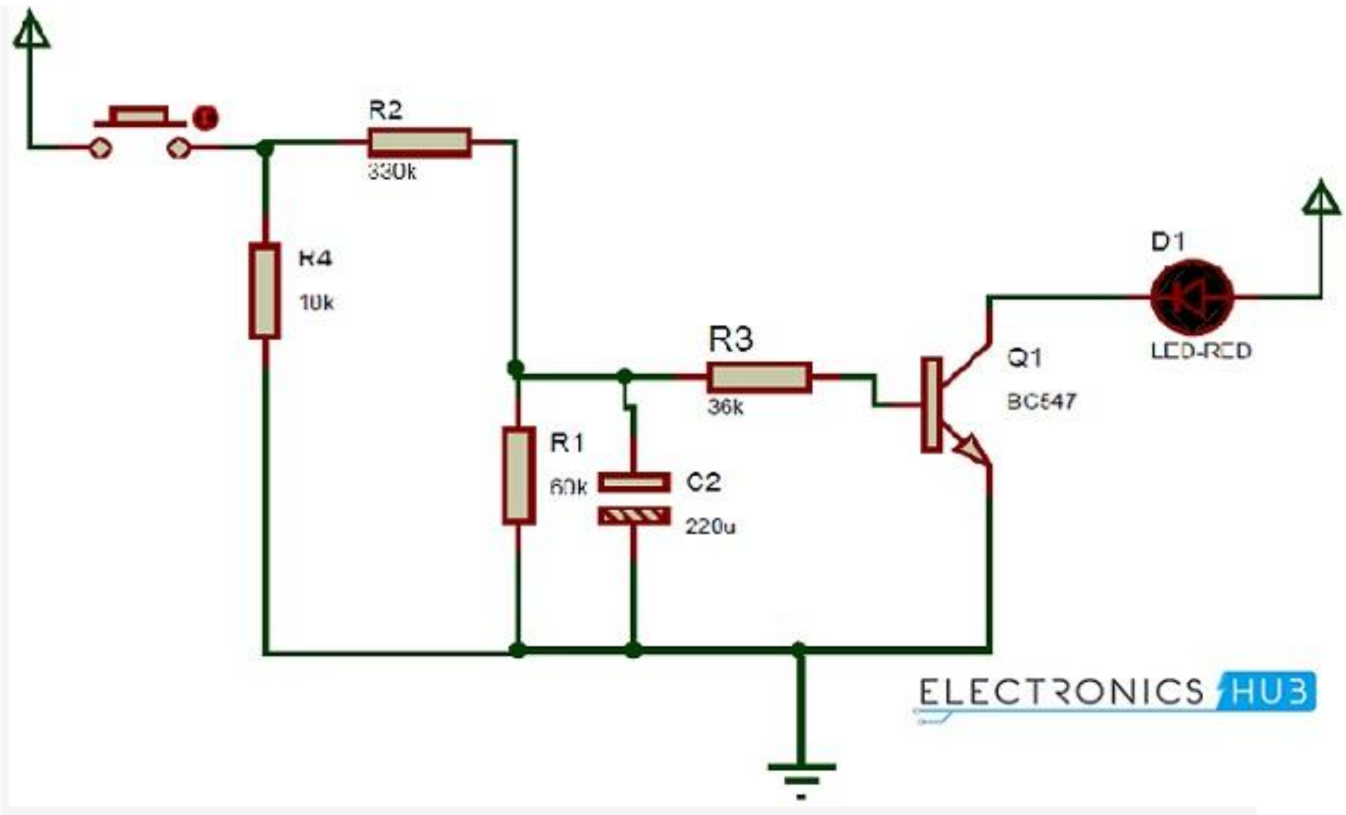
Nowadays LED lights are increasing rapidly because of their reduced cost and long durability. Generally, one can see the LED lights increasing and decreasing their intensities depending on the number of persons entering or leaving at a particular place or a room. It depends on the fading of LEDs. Here is a simple circuit that slowly fades out when it is applied with some voltage. This article explains the circuit that starts fading depending on the incoming voltage.

UP/DOWN Fading LED Lights Circuit Principle:

The circuit mainly consists of a transistor and a capacitor. Light Emitting Diode conducts in forward bias condition i.e. LED glows only when positive terminal is connected to the positive end and negative end is connected to the negative of the battery. In this proposed circuit, LED conducts only when the negative terminal is grounded as the positive terminal is applied with some voltage. When the button is pressed, the capacitor starts charging and discharging which causes the LED to fade up and down.

Also get an idea about how to make LED Christmas lights blink.

UP/DOWN Fading LED Lights Circuit Diagram:



Up-Down Fading LED Lights Circuit Diagram

Circuit Components:

- Capacitor – C2
- Resistors – 4 (R1, R2, R3, R4)
- Transistor (BC 547)
- LED
- ON/OFF switch

UP/DOWN Fading LED Lights Circuit Design:

In this circuit, the power supply is connected to the On/Off switch. A 10k resistor is connected after the button to bring the button to the pull down mode. This makes the button initially low and when it is pressed, it becomes high. Switch is connected to a diode PN junction diode 1N 4007. Diode allows conducting in forward bias condition only. Diode is then connected to a resistor of resistance 330K, which is in series to another resistor of 60kOhms. Another resistor of 36k ohms is connected before the transistor for protection.

Transistor used here is a NPN transistor of series BC547. This NPN transistor is initially in off state i.e. it will not conduct. Voltage from emitter to collector flows, only if the base region is applied with some voltage. The minimum voltage required at the base of the transistor is 0.7v. When this voltage is applied, transistor breakdown occurs and voltage starts flow from emitter to collector. You may get more knowledge on NPN Transistor by reading the post – **Transistor Biasing and Characteristics**

Capacitor is connected in series to the resistor of 60K. The capacitor used is 220uf and 16v rated electrolytic capacitor. This capacitor is required for producing pulses to On/Off the LED.

UP/DOWN Fading LED Lights Circuit Simulation Video:

How UP/DOWN Fading LED Lights Circuit Working?

1. Initially switch on the circuit.
2. Then press the button.
3. You can see the LED fading up. When a button is pressed, voltage flows through the diode and it then flows through a series of resistor having 330k and 60K ohms.
4. A capacitor connected in parallel to the resistor is charged. This gives some voltage to the base of the transistor which starts conducting.
5. Before the transistor, a resistor of 36 kohms is present to protect from over voltage.
6. Thus voltage from collector flows to the emitter, which is connected to the ground.
7. Thus, negative terminal of the LED is connected to the ground.
8. And LED slowly starts glowing, as the capacitor continuously produces the pulses.
9. When the switch is released, the LED starts slowly fading out as the capacitor is discharged.

Applications of UP/DOWN Fading LED Lights Circuit:

- This can be used in the shopping malls for fading out the lights in the places where there is no crowd.
- Fading LEDS can be used in security applications to alert something.
- These can be used in home applications.

- These can be used in cars as indicators with some changes.

Limitations of the Circuit:

- LED lights should be powered correct voltage otherwise they may be damaged.
- LEDs can change color due to age and temperature.

Sun Tracking Solar Panel

As the non renewable energy resources are decreasing, use of renewable resources for producing electricity is increasing. Solar panels are becoming more popular day by day. We have already read a post about **how to install solar panel for home**. Solar panel absorbs the energy from the Sun and is stored in the battery. This energy can be utilized when required. Utilization of the energy stored in batteries is mentioned in below given applications. Solar panels should absorb energy to a maximum extent. This can be done only if the panels are continuously placed towards Sun direction. So solar panel should continuously rotate in the direction of Sun. This article describes about circuit that rotates solar panel.

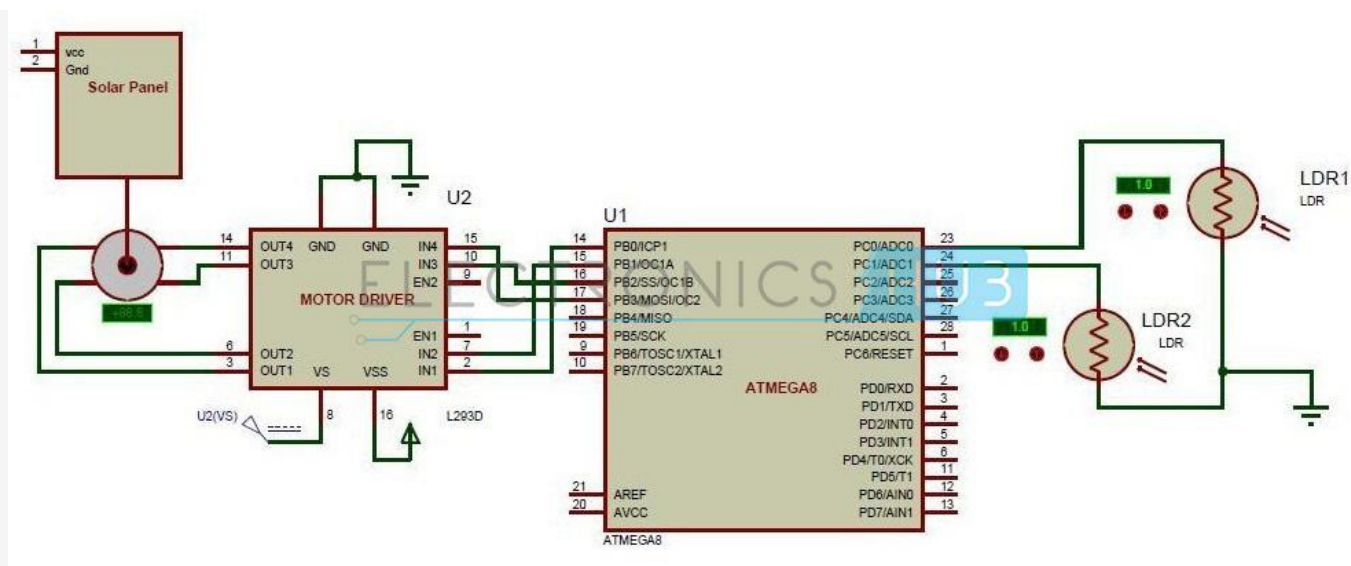
Sun Tracking Solar Panel Principle:

The Sun tracking solar panel consists of two LDRs, solar panel and stepper motor and ATMEGA8 Micro controller.

Two light dependent resistors are arranged on the edges of the solar panel. Light dependent resistors produce low resistance when light falls on them. The stepper motor connected to the panel rotates the panel in the direction of Sun. Panel is arranged in such a way that light on two LDRs is compared and panel is rotated towards LDR which have high intensity i.e. low resistance compared to other. Stepper motor rotates the panel at certain angle.

When the intensity of the light falling on right LDR is more, panel slowly moves towards right and if intensity on the left LDR is more, panel slowly moves towards left. In the noon time, Sun is ahead and intensity of light on both the panels is same. In such cases, panel is constant and there is no rotation.

Sun Tracking Solar Panel Circuit Diagram:



Circuit Diagram of Sun Tracking Solar Panel – Electronics Hub

Components in the Circuit:

- Solar panel
- ATmega8 micro controller
- Light Dependent Resistor.
- Motor driver IC
- Stepper Motor.

Automated Sun Tracking Solar Panel Circuit Design:

The proposed system consists of ATmega8 micro controller, Solar panel, Light Dependent resistors and motor driver IC.

ATmega8 is AVR family micro controller. It is based on advanced RISC architecture. It is an 8 bit controller. It has 4KB Flash memory, 512 bytes of EEPROM and 1Kb of SRAM. It has 23 programmable pins. It supports peripheral features like two 8-bit timers, one 16 bit timer, 6 channel ADC with 10-bit resolution, programmable USART, Serial peripheral interface, 2 wire serial interface, etc.

Solar panel is connected to Stepper motor. Solar panel consists of photovoltaic cells arranged in an order. Photovoltaic cell is nothing but a solar cell. Photo resembles light and voltaic is electricity. Solar cell is made up of semiconductor material silicon. When a light ray from Sun is incident on the solar cell, some amount of energy is absorbed by this material. The absorbed energy is enough for the electrons to jump from one orbit to other inside the atom. Cells have one or more electric field that directs the electrons which creates current. By placing metal contact energy can be obtained from these cells.

Light Dependent Resistors are the resistors whose resistance values depend on intensity of the light. As the intensity of light falling on the LDR increases, resistance value decreases. In dark, LDR will have maximum resistance. LDR will output an analog value which should be converted to digital. This can be done using analog to digital converter. ATmega8 has analog to digital converter internally. It has six ADC channels from ADC0 to ADC5.The two LDRs are connected to ADC pins i.e. PC0 and PC1. ADC conversion is done using successive approximation method.

Stepper motor rotates the panel in a stepwise angle. To drive this motor a driver IC is used. Driver IC amplifies the input voltage and protects the microcontroller from back EMF. Generally, motors generate back EMF. This may damage the controller. The driver IC used is L293D. It has H bridge internally made up of transistors. This IC has 16 pins. Output pins are connected to the stepper motor pins. Input pins are connected to the controller pins as shown in circuit diagram.

By connecting a battery to the solar panel, one can store the energy generated by the solar cells and this energy can be used when required.

How Sun Tracking Solar Panel Works?

- Initially power the circuit.
- Place the set up in dark

- When the two LDRs are in dark, there is no movement in the panel.
- Now place a torch in front of the left LDR. Panels slowly move towards its left.
- Now move light from left to right. You can observe the panel moving slowly with the torch towards right.
- In the middle, when intensity on both LDRs is equal, panel will not move until there is difference between the light intensity falling on the LDRs.

Advantages of Sun Tracking Solar Panel:

- The solar energy can be reused as it is non renewable resource.
- This also saves money as there is no need to pay for energy used.

Sun Tracking Solar Panel Applications:

1. These panels can be used to power the traffic lights and streetlights
2. These can be used in home to power the appliances using solar power.
3. These can be used in industries as more energy can be saved by rotating the panel.

Limitations of Sun Tracking Solar Panel Circuit:

1. Though solar energy can be utilized to maximum extent this may create problems in rainy season.
2. Although solar energy can be saved to batteries, they are heavy and occupy more space and required to change time to time.
3. They are expensive.

Simple LED Blinking Circuits

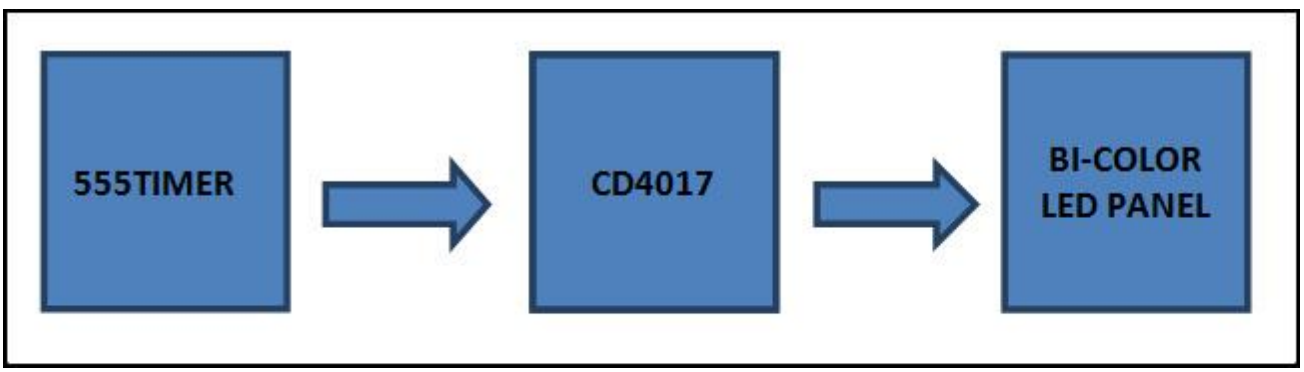
LED (Light Emitting Diode) is a semiconductor light emitting diode. We know that diode allows the current in one direction and does not allow the reverse current which will affect the components in the circuit. LED also do the same function but will emit a small light when it allowed the current, which will give the sign or visual indication to the normal human that circuit is working. There are lots of applications using LEDs. They are mainly used for visual indication in any electronic devices, measuring and interacting with the process, displaying the pictures in TV or in any advertisement hoarding, etc.

Two LED blinking circuits are given below. First one is dancing bi-color LEDs (two different color LEDs) where the two color LED will run in sequence. In the second circuit, we will blink the LEDs in regular period of time.

Dancing Bi – Color LED Circuit:

Generally we use small voltage bulbs in the dancing bulbs. This circuit is mainly used in the occasions, decoration articles or in visual indication sign boards etc. In this project, we use bi-color LEDs for sequential running light.

Block Diagram of Bi-Color LED Circuit:

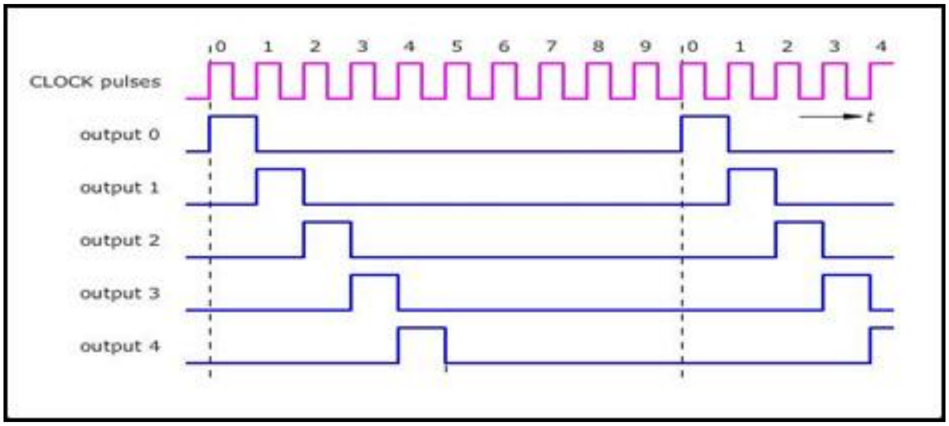


Timer is used for setting the sequential flow rate for the bi-color LED panel. The CD4017 is a decade counter which provides the timing and will make the LED ON/OFF according to the time determined.

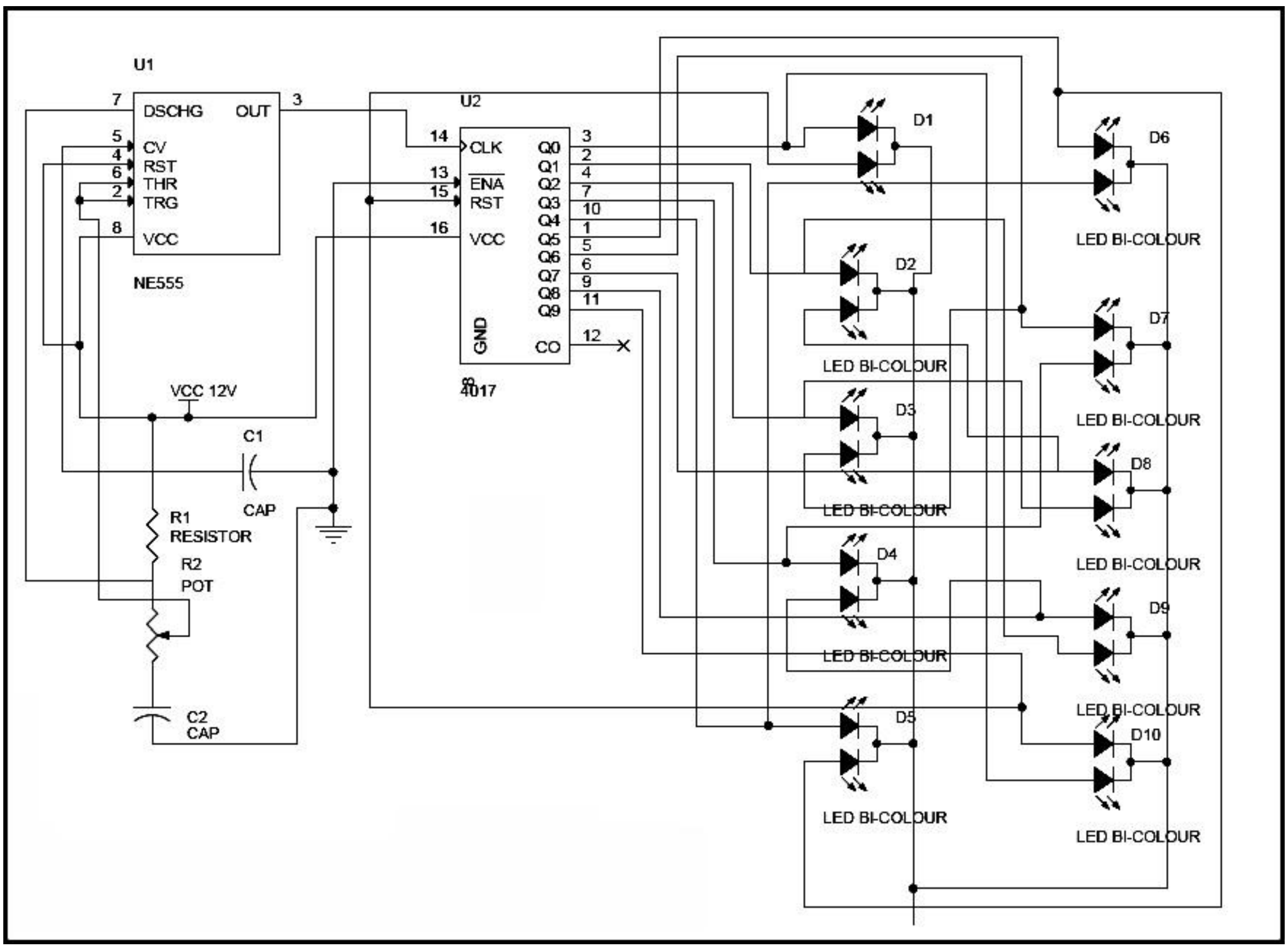
Main Components in this Circuit:

CD4017: CD4017 is a 16 pin decade counter and only 10 pins are used for output. The 4017 will get triggered by the clock pulses. Main operation of the decade counter is as follows: When a clock pulse is taken as an input, only one output is made high for first clock pulse and remaining all output pins will be made low. For the second clock pulse, another output pin is made high and remaining all pins are made low and so on. Time period of the output pin is high according to the width of the pulse. CD4017 is used in many applications where counter is needed.

CD4017 clock pulses from output pins timing diagram is shown below:



Bi-Color LED Dancing Lights Circuit Diagram:



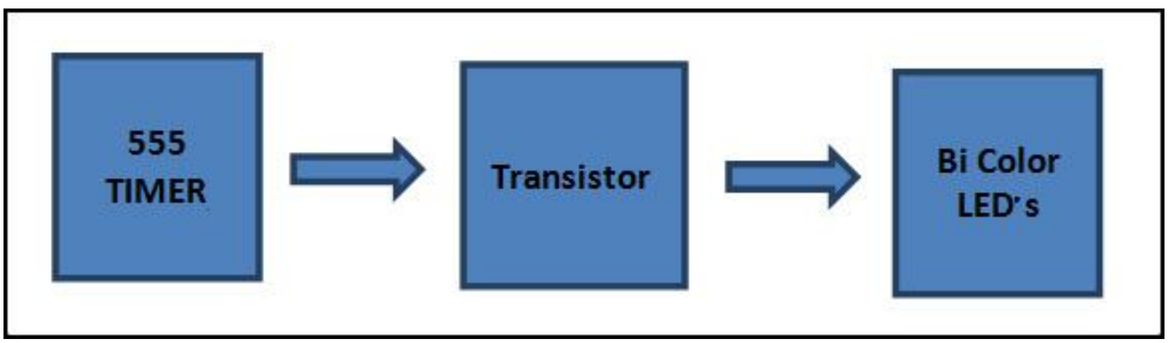
Circuit Diagram Explanation:

- In the Bi-color LED, it should be connected to the counter as shown in the circuit. The anode of first LED in bicolor LED is connected to the anode of second LED of 10^{th} bicolor LED and in the same fashion, the remaining LEDs are connected, only the second anode of first bicolor LED is connected to the reset pin of the CD4017. All the cathode of bicolor LEDs is made ground.
- The main operation of this circuit depends on the 555 timer which is set in astable multivibrator mode and decade counter CD4017; the 555 timer will generate low frequency clock pulse and give input to the decade counter which will make the sequential running of the LEDs.
- Variable resistor can vary the resistance which will change width of the pulse. If pulse width is changed, the time period of running the LEDs will also get changed. We run the LEDs in fast or slow. Running speed can be altered by variable resistor. The first anode of 10^{th} bicolor LED is made short to the reset pin of the decode counter for continuous running of lights.

LED Flasher Circuit:

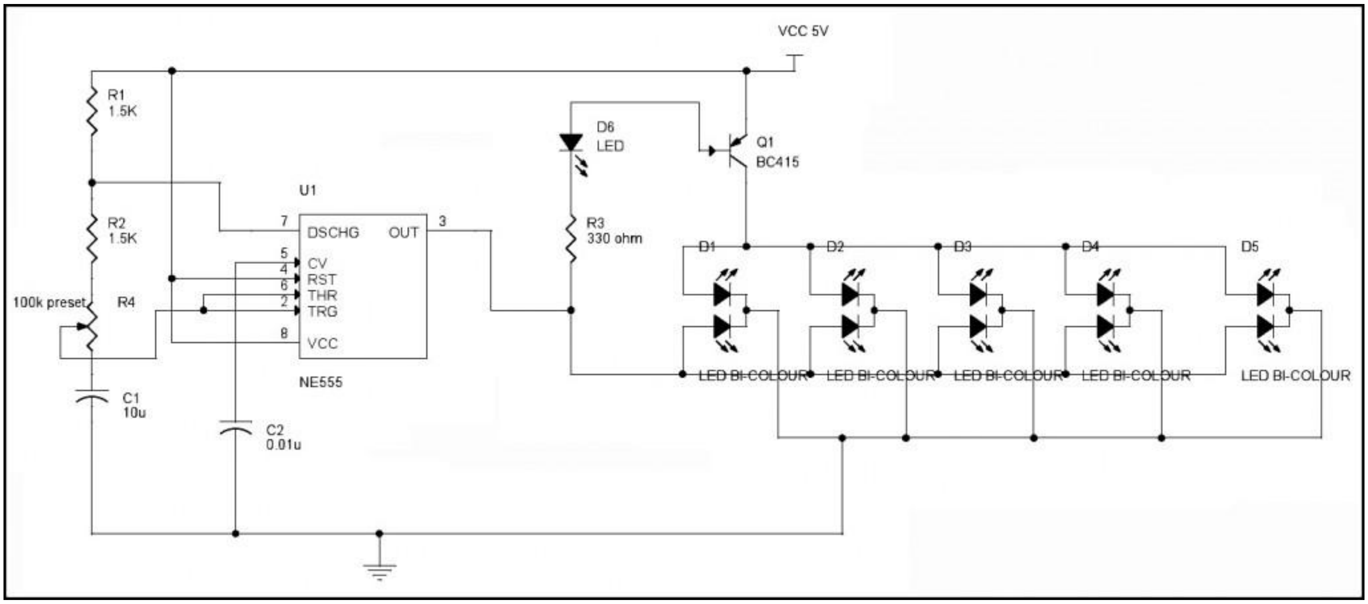
LED Flasher is a simple circuit which will blink the LEDs in regular time period. This circuit can be used for decoration purpose or can be used for a signaling purpose and many more.

Block Diagram of LED Flasher Circuit:



The 555 timer is used to generate the PWM signal which will cause the LEDs to blink. The speed of the blinking by LED is determined by the potentiometer connected to the 555 timer. The PNP transistor is used to flash or blinks the LEDs.

LED Flasher Circuit Diagram:



Circuit Explanation:

- The 555 timer is made to be configured as a astable multivibrator. The potentiometer which is connected to the timer should be preset and also to adjust the blinking or flashing speed of the LEDs.
- The bicolor LEDs are used in this circuit and connected to each other as shown in the schematic. The PWM signal is the output of the 555 timer given to transistor, which acts as an inverter. When the pulse generated by 555 timers is low, transistor will get ON and LEDs will get ON. When the input of transistor is high, transistor will get OFF and LEDs are made OFF. This ON/OFF of LEDs will go for every pulse width signal cycle. This mechanism will make the LEDs flashing.

LED Blinking Circuits Applications:

- Dancing LED circuit can be used for any visual sign indication in any highways or it can be used in advertisement hoarding also.
- LED blinking circuit can be used in signaling purpose (It can be used as signal for help, if you are in danger)
- LED blinking circuit can be used as flashing beacon.
- LED blinking circuit can be used as vehicle indicator when it is broke down in the middle of the road. It can be used in operation theaters or offices as an indication that you are engaged in work.
- There are lots of applications with these two circuits.

Simple Fire Alarm Circuits at Low Cost

Introduction to Fire Alarms:

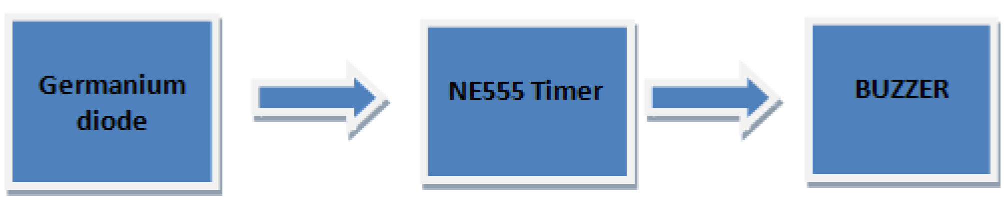
Just imagine when an apartment is caught fire in the second floor! The people in the second floor can easily recognize the fire and can inform to their neighbors and run for their lives; but people in the first, third and fourth floors may not know the fire accident and busy with their work. This will be great danger to the people live and property also. So there should be an alarm to inform to all people in the apartment in which the fire has taken place and act immediately. Here fire alarm plays a key and important role. It will detect the fire automatically and inform to the people with an alarm. Now-a-days, fire alarms are must for the apartments, theaters, hotels, restaurants, coal mines, petrol bunks or gas stations, etc.

Here are two simple fire alarm circuits which will use different concepts and different components for generating the fire alarm. The main basic concept is almost same that sensing the fire or heat by the component and giving that information to the remaining circuit to give alarm.

Fire Alarm Circuit Using Germanium Diode:

This is a simple fire alarm circuit using Germanium Diode and 555 timer. In this circuit Germanium Diode play very important role in detecting the fire. This circuit is very easy to construct, cost effective and implementable.

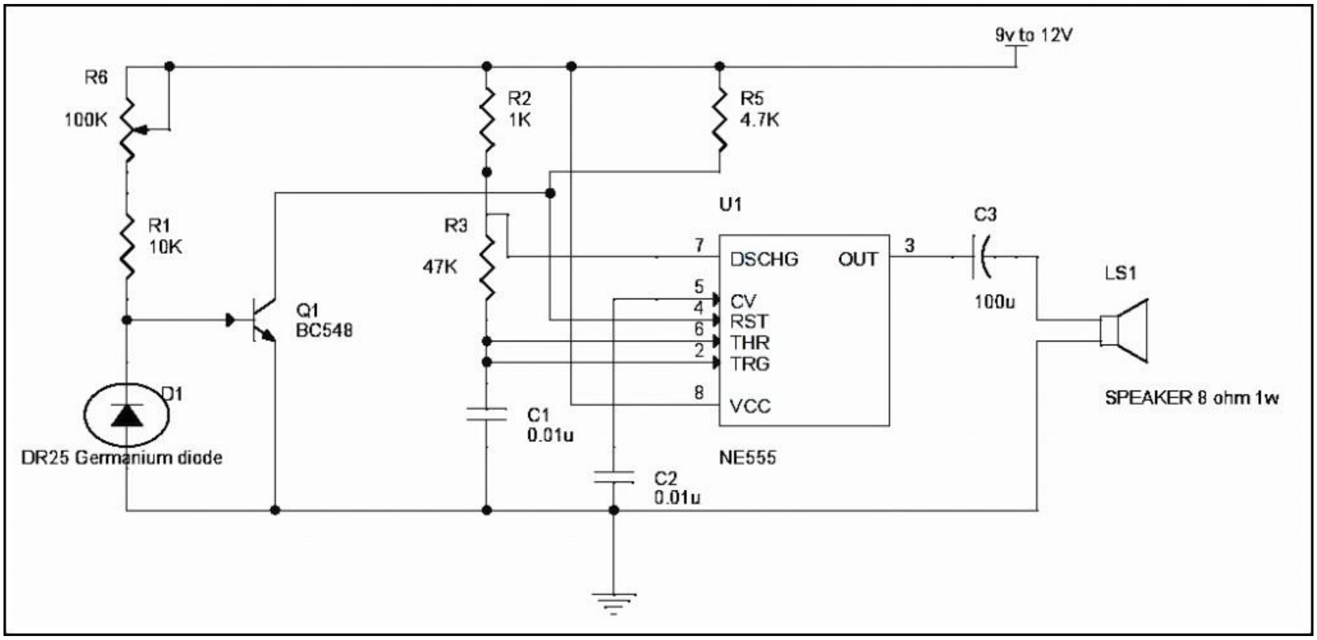
Block Diagram of Fire Alarm Circuit Using Germanium Diode:



Block Diagram of Fire Alarm

Here is the simple fire alarm circuit which costs less than 100 rupees. The key component in the circuit is DR25 (germanium diode) whose resistance will decrease with increase in temperature. The conduction of germanium diode will start at 70 degrees. So we may use germanium diode as a heat sensor. When the temperature is more than 70 degree, the germanium diode will conduct and trigger the NE555 timer through a transistor. The NE555 is configured in astable multivibrator and make the buzzer to alarm when germanium diode conducts. So that we can get alert and act according to the alarm.

Circuit Diagram of Fire Alarm Using Germanium Diode:



Circuit Explanation:

- The DR25 germanium diode is heat sensor which will conduct when temperature is increased at certain point. The DR25 is made reverse biased in the circuit. It will conduct only when it is more than 70degree of room temperature.
- The DR25 is connected to the transistor in reverse bias, which has high reverse resistance (more than 10K ohm) and does not make the transistor to turn off which is connected to the reset pin of 555 timer. The reset pin of 555timer will be in ground level when the transistor is turned off. Here, the 555 timer is configured as astable multivibrator.
- When more than 70degrees in room temperature occurred, the resistance of DR25 diode drops to 1k ohm which will make the transistor to turn off and make the reset pin to go high. This will generate the output at pin3 and make the sound through the alarm.
- We can use 3 or more diodes in reverse bias connected in parallel and placed in different room. If there is fire accident, it will sense and make the alarm.

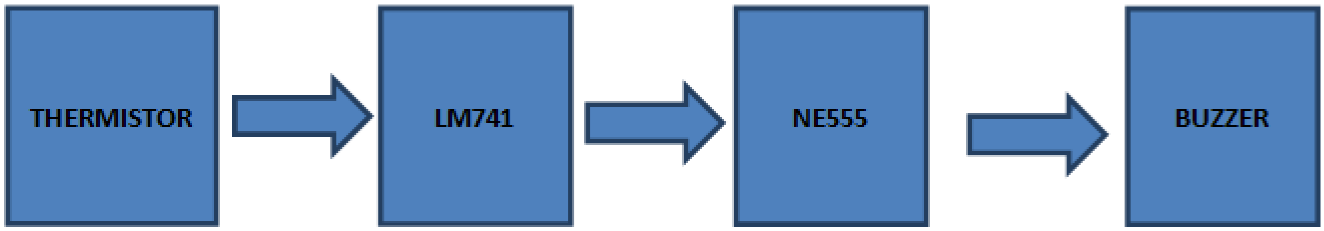
Note:

1. If DR25 germanium diode is available, you can still use AC128, AC188 or 2N360 germanium transistors. Use base and emitter junctions in place of cathode and anode.
2. Diode must be connected to the circuit in reverse bias.

Fire Alarm Circuit Using LM341:

Here is another small project on fire alarm. When a fire accident is happened in home or office, it will detect the fire (intensity of fire in the room) at instant and give the alarm so we can be ready and act accordingly.

Block Diagram of Fire Alarm Circuit Using LM341:



Block Diagram of Firm Alarm Using LM341

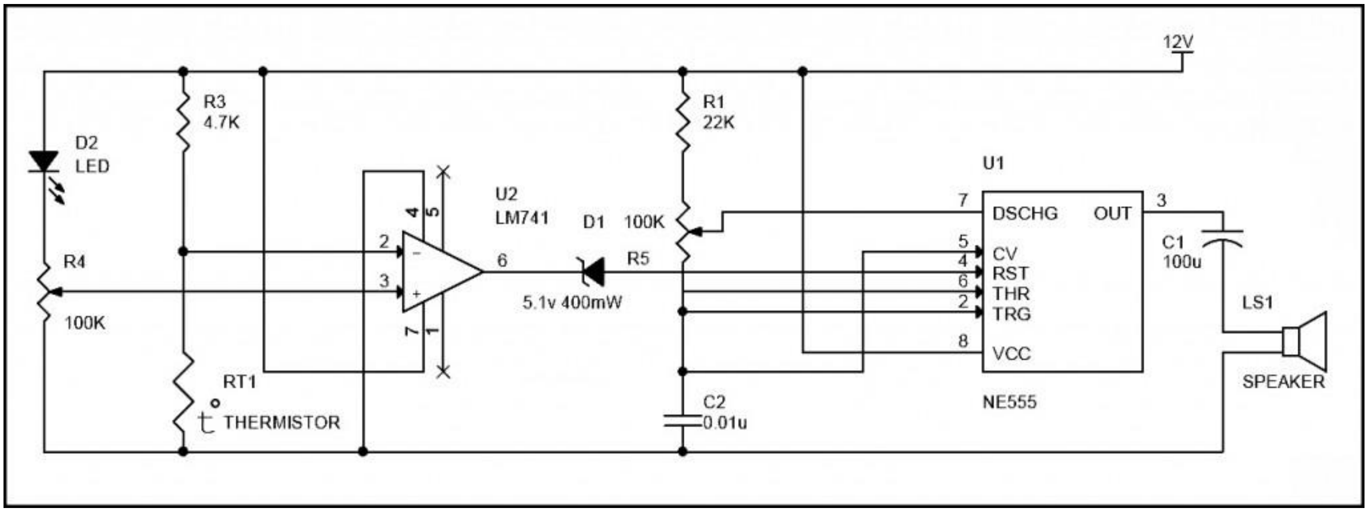
The thermistor is the main component which detects the fire by sudden change in the room temperature because of the heat generated by the fire. The thermistor will detect the heat and give the information to the LM741 OP-AMP. The op-amp will make the NE555 to generate pulse which has been given to a buzzer to buzz.

Main components:

Thermistor: The resistance of the thermistor will change according to the temperature. There are two types of thermistors of which one type of thermistor will increase its resistance with increase in temperature called as positive temperature coefficient and the other type of thermistor will decrease its resistance with increase in temperature called as negative temperature coefficient. In this project, we use the thermistor which will have lower resistance with respect to the temperature (negative temperature coefficient thermistor). Thermistor has large applications in consumer electronics, food preservation sectors etc.

LM741: LM741 is an operational amplifier which will work according to the difference in the input voltages. LM741 has following features like high current driving, voltage gain, noise amplification and also provide low output impedance. LM741 can also used as a short circuit protection.

Circuit Diagram of Fire Alarm Using LM741:



Circuit Explanation: There are two modes in this project:

- Mode 1: How the circuit will work if there is no fire
- Mode 2: How the circuit will work if there is fire.

Let us now study about these 2 modes in detailed way.

- Mode 1 – When there is no fire: The thermistor will have high resistance and there will be no difference in the voltages coming to the LM741 at pin2 and pin3 so there will be no output which will help to trigger the timer.
- Mode 2 – When Fire started: The thermistor resistance will go down to the heat produced by the fire and the resistor R3. And thermistor will act as a potential divider circuit resulting a low voltage at pin2 of LM741 as the temperature goes high. The reference voltage is given by the R4 to the pin3 when there is a difference in the voltage. The pin6 will trigger the timer configured as astable multivibrator. NE555 timer will activate the speaker which makes the alarm. The variable resistor R5 will vary according to the difference in the voltage of the op amp. According to the resistor R5, the timer will generate pulse. If temperature goes high, the speaker will make high noise.

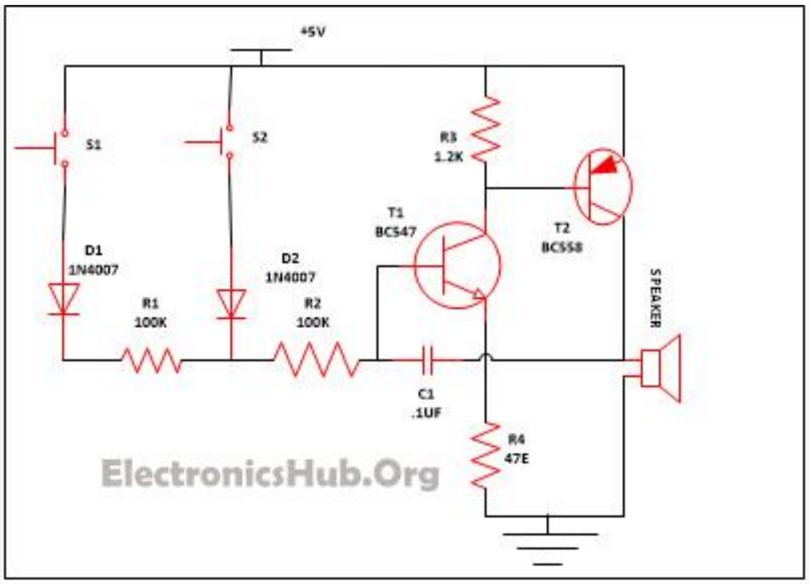
Fire Alarm Applications:

- Fire alarms can be used in any place like parks, theaters, hotels, restaurants, boats, ships, etc.
- Fire alarms can be also used as temperature sensors in some applications, when the temperature goes up abruptly it can inform.
- Fire alarm can be used in our home for safety purpose and it is a very good precautionary measure

Security Alarm Circuit

This circuit will help you to guard your precious documents as well as jewellery from intruders or theft. All you need is just to place this circuit in front of the locker or below the mat so when any unknown person come and walk over the switch, the circuit will trigger and sound of alarm comes. The main benefit of the circuit is that these can be implied in two places at a time as two different switches produces two different sounds.

Circuit Diagram of Security Alarm:



Security Alarm Circuit Diagram – ElectronicsHub.Org

Circuit Components:

- Resistor
- R1, R2 (100K) – 2
- R3 (1.2K) – 1
- R4 (47E) – 1
- T1 (BC547) – 1
- T2 (BC558) – 1
- D1, D2 (1N4007) – 2
- C1 (. 1uf) – 1
- S1, S2 – 2
- Speaker – 1

1. **Resistor:** Resistors are the passive device with two terminals. They are mainly used in the circuit to restrict the flow of current across any of the circuits. The current flow from the resistor is directly proportional to the voltage that is given across the terminals of the resistor. In the market resistors are mainly available in two broad categories:

1. Fixed resistor**-** It actually means that the resistor whose value cannot be change and remain what its mark on it.
2. Variable Resistor- It means that the value of resistance can vary within the range marked over it. For e.g. If the value of 5k is marked on it then it implies that the value of the resistor can vary from 0-5k.
   - The value of the resistor can be calculated either with the help of multimeter or with the help of color code over the resistor.

2. **Diodes** - It is a device with two terminals and have a asymmetric attribute which means that it permit the flow of current in one of the directions while the flow of high resistance is from another direction. Hence in it flow of current is in one way only and block the other way for the current flow. The two terminals in diode named as anode and cathode. AC current can be converted into DC with the help of diode unidirectional behaviour.
3. **Transistor** - transistor is a three terminal electronic device used to amplify weak input signals. A transistor consist of two PN junction diode connected back to back. Transistor are of different type such as bipolar junction transistor, Field effect transistor and photo transistor. They are mostly used in electrical appliances due their smaller size and light weight. In addition they posses less power hence have greater efficiency.
4. **Speake**r- it is a transducer which creates sound in reaction of the electrical auditory signal given in the input.
5. **Capacitor**- Electric charges are being stored by these two terminal components which is passive by nature. A dielectric medium is used which is used to separate two conductors. It started at the time when the potential variation occurs in the conductors polarizes the dipole ions to hold the charge in the medium which is dielectric. There are two varieties of capacitor available in the market –
   1. Polarized capacitor- Capacitor marked with – and + sign. They are mainly used to hold the charge. And before troubleshooting these capacitors carefully discharge them as they hold charges there is a risk of shock.
   2. Non polarized capacitor – Capacitors which do not have any polarity marked over it. They are mainly used to remove the noises appeared while converting AC into DC.

Important Post: ***Pull Pin Security Alarm Circuit***

Working of Security Alarm Circuit:

S1 and S2 are the two switches that are used in the circuit so that both can be put in two different places i.e. one of them can put in front of the locker while another one can be placed on the front door. When the switch S1 is pressed diode D1 which is linked with it starts conducting as the transistor T1 and T2, which is attached with the resistor begin its conduction. For the oscillation purpose Transistor T1 and T2 gets a positive feedback which is provided by capacitor C1. The presence of any intruder is indicated by the low tone frequency which is generated when switch S1 is pressed.

Same kind of condition occurs when switch S2 is pressed. Diode D2 which is linked with the switch S2 begin its conduction and offers power supply the transistor T1 and T2, which is in the waking state and as a result sound comes from the speaker attached to it. But in this instance a high frequency tone comes out which is a sign that there is some intruder present around the locker. The sound that came from the speaker can only be stopped by cut off the power supply.

Reverse Parking Sensor Circuit

If you are a new driver then it is very difficult to judge the distance while parking the car. Reverse parking sensor circuit solves this problem by indicating the distance with the help of three LED's. We can easily arrange this system at the back side of the car. This system operates with 12V rechargeable battery. This article explains you how to design Reverse parking sensor. We can also use the same concept in IR Water Level Detector Circuit also.

The distance between car and obstacle is understood by the group of LED's (D5 to D7). If the distance between car and obstacle is 25cm then D7 will glow. At the distance of 20cm D7 and D6 LEDs turn ON and at a distance of 5cm all LED's (D5, D6, D7) glow. When the distance is more than 25cm then all LED's will turn off.

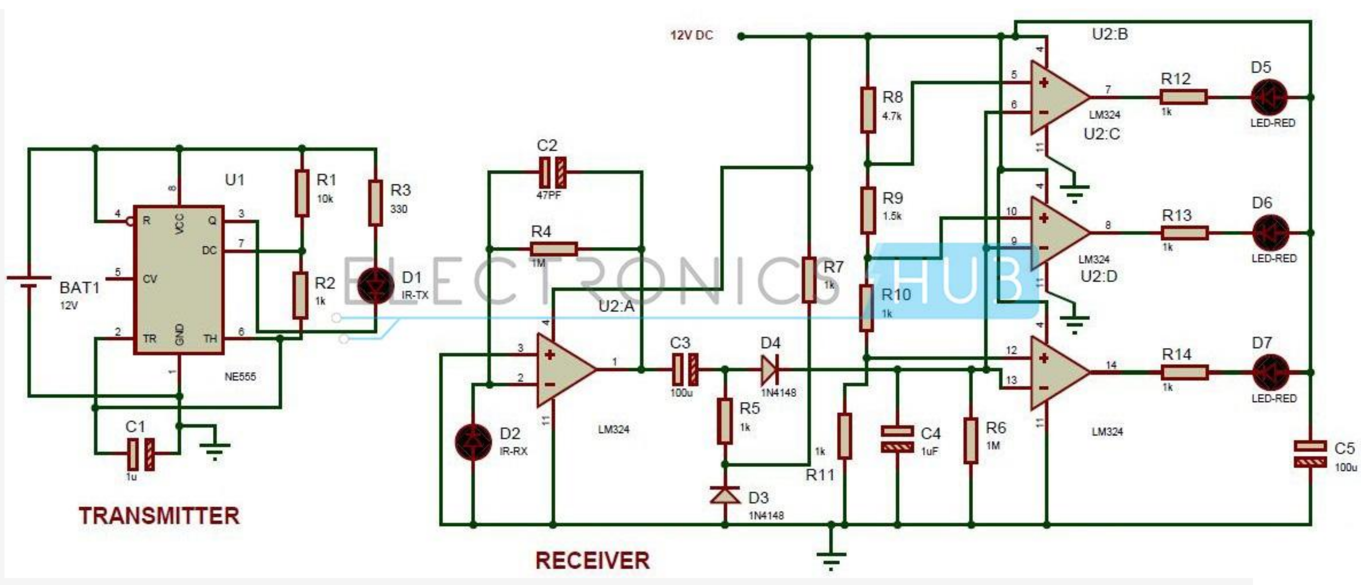
Reverse Parking Sensor Circuit Principle:

Parking sensor circuit mainly consists of two sections, one is transmitter section and the other is receiver section. The transmitter section uses **NE555 timer IC as an astable multivibrator** for driving the IR transmitter. The transmitter frequency is set to be 120Hz.

The IR pulses transmitted by the IR transmitter are reflected back because of the obstacle and received by the IR receiver.

The received signal is amplified by the U2:A. The output voltage of the Peak detector (R4 and c4) is proportional to the distance between car bumper and obstacle. The output voltage of the peak detector is given to the inputs of three comparators U2: B, U2: C and U2:D. These comparators switch the status LED's according to the input voltage and the reference voltage.

Reverse Parking Sensor Circuit Diagram:



Circuit Diagram of Reverse Parking Sensor

Circuit Components:

Transmitter:

- NE555 timer
- IR transmitter
- Electrolytic capacitor – 1uF, 16V
- Resistors – 10k, 1k, 330 ohm

Receiver:

- LM324 IC (low power quad op-amp)
- IR receiver
- 1n4148 diodes – 2
- Electrolytic capacitors – 100u (2), 10u, 47p, 1u
- LED's – 3 (5mm)
- 1k resistors – 7
- 1M ohm resistors – 2
- 4.7k , 1.5k resistors
- 12V DC battery
- Connecting wires

Reverse Parking Sensor Circuit Design:

In transmitter section, 555 timer is operated in astable mode to generate a signal with frequency of 120 Hz. The 4^{th} pin of 555 timer is connected to supply to avoid sudden resets. The output pulse is produced at 3^{rd} pin of 555 timer. Here resistors R1, R2 and C1 set the output frequency of 555 timer.

The received by the IR receiver is amplified the by the operational amplifier U2:A. Resistor R4 and C4 forms peak detector to detect peak of the amplified signal.

Op – amp as Comparator:

Op-amp has two inputs (non-inverting and inverting) and one output. The output of operational amplifier is high when non-inverting voltage is greater than inverting voltage.

The output voltage is low, when inverting voltage is greater than non-inverting voltage.

In the above circuit the voltages at non inverting pins of comparators acts as a reference voltage and inverting input voltages at comparators are compared with reference voltages to produce the output.

Here resistors R8 to R11 are used to set different reference voltages at their non inverting pins.

Resistors R12, R13 and R14 are used to protect the LED’s from high voltages.

Related Post: Car Parking Security Guard Circuit using IR

How to Operate this Reverse Parking Sensor Circuit?

1. Give the connections according to the circuit diagram.
2. Arrange transmitter and receiver in such a way that IR receiver should receive the IR rays when obstacle is present.
3. Switch on the supply and place the obstacle beyond 25cm, now you can observe that no LED will glow.
4. Reduce the obstacle distance to 25 cm, now you can observe that D7 led will glow.
5. Now reduce the distance to below 20 cm, then both D7 and D6 led’s will glow.
6. Still if you reduce the distance to 5 cm, then all LED’s will turn on.

Reverse Parking Sensor Circuit Applications:

- This circuit can be used in auto mobiles to park the vehicle safely.
- We can use this circuit to measure the distance.
- We can also use this circuit as IR Liquid Level Detector by making few modifications.

Limitations of this Circuit:

- IR receiver may receive the normal light. As a result, parking sensor may not work properly.
- We should arrange IR sensors accurately; otherwise they may not detect the obstacle.

Reaction Timer Game Circuit

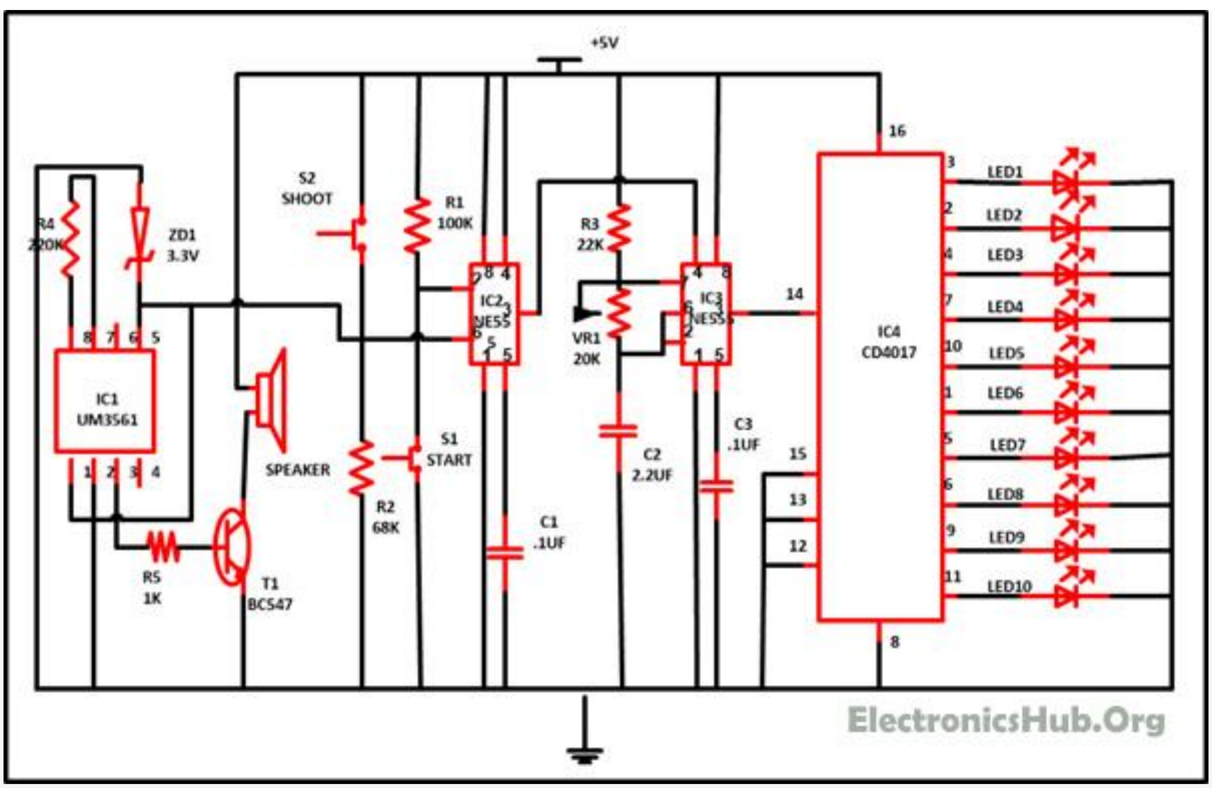
Nowadays, video games are very much popular with the kids. The circuit which is portrayed below is more like of shooting video game. You can play this game with your friends to know their reaction time.

This is very simple game in which 10 LEDs are moving in a arbitrary fashion. And you have to target a particular LED given by your challenger. And if he or she hits the correct one, 10 points will be given. In this circuit, one of the contenders has to hit the target that was given by the other opponent. If the contender hit the target, then he gets 10 points for that. And in the end, out of all the participants who have got the highest score will be the champion.

The plus point of this circuit designed is that, it does not harm the eyes of kids, even they play games for longer duration. The reason is that in the place of video screen, LEDs are used in the circuit for display. The circuit can be easily assembled as the components are less and easily obtainable. Kids get the sense of playing a genuine video game, as the circuit generates sound when the target is hit by any participant. With the help of easily obtainable adapters in the bazaar, you can power the circuit. Any number of contenders can take part in the game at a time.

Now let us look at the circuit diagram and working of this game.

Reaction Timer Game Circuit Diagram:



Reaction Timer Game Circuit Diagram – ElectronicsHub.Org

Circuit Components:

- IC
- NE55 – 2
- CD4017 – 1
- UM3561 – 1
- Resistor
- R1(100K) – 1
- R2(68K) – 1
- R3(22K) – 1
- R4(220K) – 1
- R5(1K)
- VR1(20K) – 1
- C1,C3(.1uf) – 2
- C2(2.2uf) – 1
- T1(BC547) – 1
- Speaker – 1
- S1,S2 – 2
- ZD1(3.3V) – 1

Working of Reaction Timer Game Circuit:

IC2 is worked in bistable mode i.e. it remains stable in the high or low state till the time an external pulse is applied to it. That is the reason it is also known as flip flop and able to store one bit of data if needed. When the circuit is on the voltage is given to IC2 at pin number 2 and the given voltage is 2/3 times less than Vcc , due to this the voltage stays high and stay in that condition till the time threshold voltage of the IC2 at pin 6 is more than 2/3 of Vcc. So when the participant press S2 switch (which is a shoot switch) the output of IC2 goes to low state which in result reset the IC3 and IC4.

NE555 timer IC3 is worked like an astable oscillator. Clock pulse for the circuit is generated by the NE555, it is used as an oscillating wave for IC4 output pin 3. By the support of the resistor R2 the speed of the oscillation may change.

The oscillation frequency of timer 555 calculated by using the formula f = 1. 44/(R1+2* (VR1) *C1)

To start the counter pin 14 of IC4 receive the clock signal and each time the counter is increased by 1 when the pin 14 of IC4 reaches at high state same as the first when the output is get from pin 3 ie Qo which in turns on the LED1 than from 2 which is Q1 which glow's LED2 and so on in the same manner.You can also find from the circuit that pin number 4 of IC3 is attached to pin number 3 of IC2 so each time when the shoot switch (S2) is pressed by the participant it will seize that output which in turn glow the singled LED. And when the start switch S1 is again pressed, its counter is started from 0 to 10.

IC UM3561 is used to build sound generating circuit and it is joined with an S2 shoot switch so that whenever a shoot switch (S2) is pressed IC1 receives power supply and sound of a gun is heared. Need to be careful while giving power supply to UM3561 as voltage higher than 3.3V may damage the IC . To avoid this problem you can use a Zenner diode in your circuit same as we used in this circuit.

Different sounds like ambulance, fire force as well as a police siren can be produced by making by making minute changed with pin 1 and 6 as described in the table below.

Sound	Pin 1	Pin 6
Police Siren	Unconnected	Unconnected
Fire Force	Unconnected	Supply
Ambulance	Unconnected	Ground
Gun Sound	Supply	Unconnected

How to Play the Game?

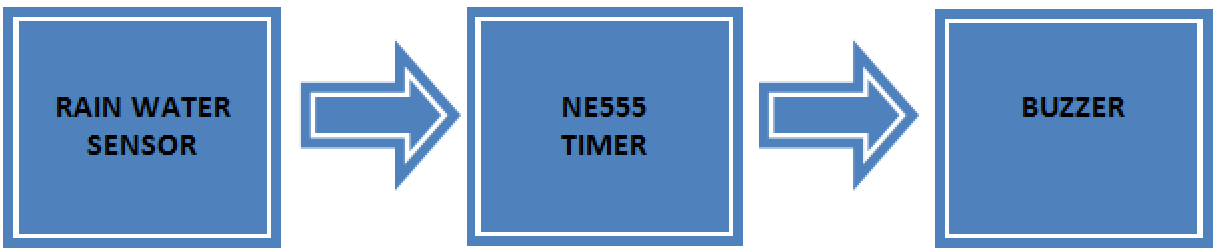
Accumulate the circuit after supplying the power in the circuit. LEDs that are in the circuit are arbitrarily ON and OFF. With the help of the VR1 (Variable Resistor), you can change the time period for the LEDs ON and OFF. Now one of the contestant will give the target to shoot to another participant to shoot, suppose LED number 4. Then the shooter has to press the button which is switch S2 in such a way that only LED4 have to glow. If the shooter is succeed than got 10 points otherwise no points. To restart the game participants have to press the start button S1 and once more all the LED starts glowing. Repeat the same process all the time and at the end of the game one who got the highest point win the game.

In the front of LED players, we can use stickers of airplanes that will make the game more interesting, as it will provide you a visibility of shooting planes.

Rain Alarm Project

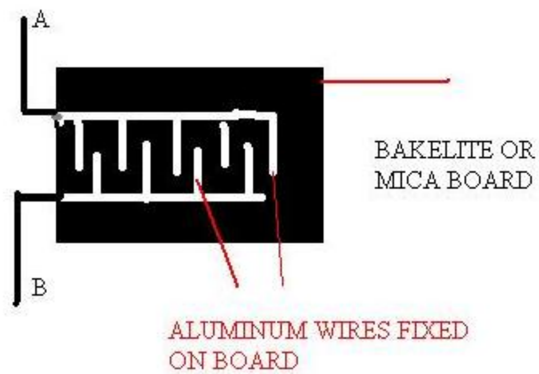
Water is basic need in every one's life. Saving and proper usage of water is very important. Here is an easy project which will give the alarm when there is rain, so that we can make some actions and save the rain water. As a result, we can increase the water levels of underground water by using underwater recharge technique. Rain water detector will detect the rain and make an alert; rain water detector is used in the irrigation field, home automation, communication, automobiles etc. Here is the simple and reliable circuit of rain water detector which can be constructed at low cost.

Rain Alarm Project Block Diagram:



Rain water sensor is the main component in the circuit. For this rain sensor, no need to go and buy in the market or online. We can do it ourselves just by taking the piece of Bakelite or mica board and aluminum wire. Bakelite or mica board should be made completely flat and aluminum wire should be pasted on the flat board as shown in the figure below of rain water sensor. Care should be taken that there should be no spaces between the wire and board. When the rain water sensor is completed, it should get connected to the circuit and voltage should be passed through the wires.

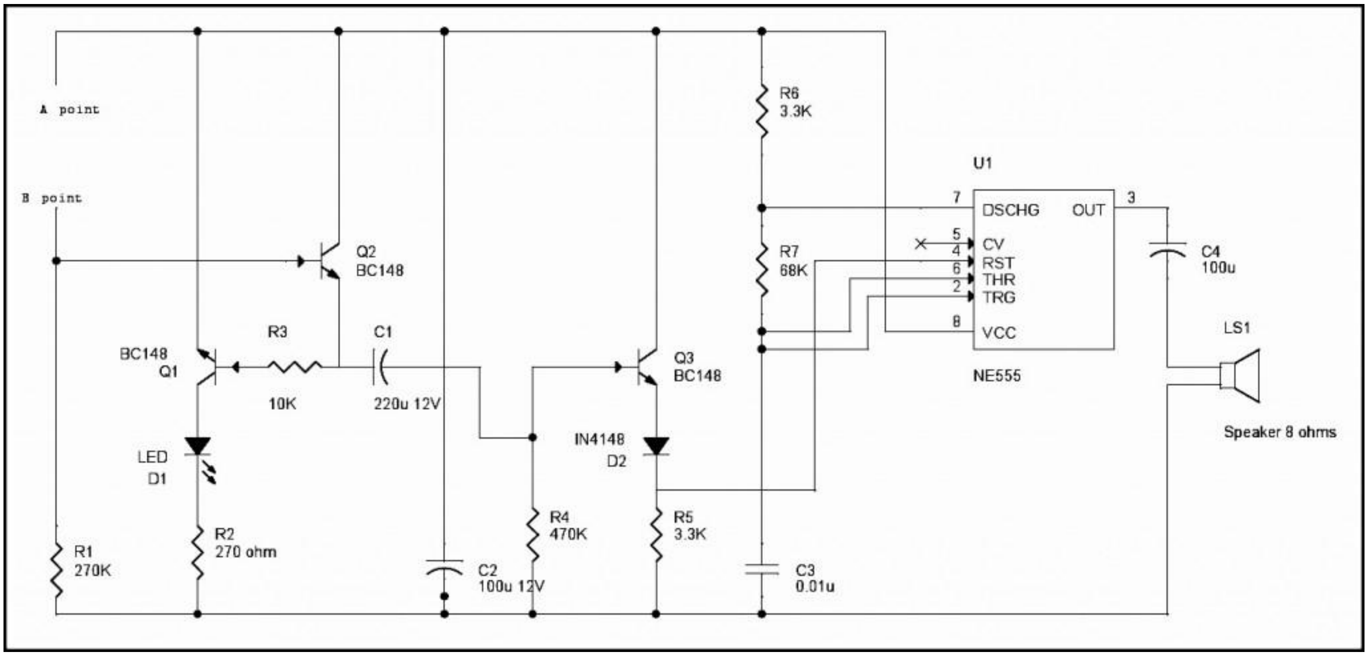
Rain water sensor diagram is shown below:



If there is no rain, the resistance between the wires will be very high and there will be no conduction between the wires in the sensor. If there is rain, the water drops will fall on the rain sensor which will also decrease the resistance between the wires and wires on the sensor board will conduct and trigger the NE555 timer through the transistors circuitry. Once NE555 is triggered, it will make the output pin high and which will make the buzzer to make alarm.

Rain Alarm Project Circuit Diagram:

Rain water detector alarm circuit is shown below.



Circuit Explanation:

- The points A and B of the circuit are connected to the points A and B of the rain sensor respectively. When rain is falling, the rain water will fall on the rain sensor which has aluminum wires on mica or Bakelite sheet. Due to the water on sensor, the aluminum wire 'w' develops resistance and gets conducted because of battery connector, the sensor and also to the circuit.
- When the aluminum wires are connected, the transistor Q1will get turned on and make LED to glow and also Q2 will also be turned ON. When the Q2 is saturated, the capacitor C1 will be shorted and make the transistor Q3 to be turned ON. C1 will get charged by the resistor R4. The reset pin of 555timer which is connected to the emitter of Q3 will be made positive when Q3 reaches to the saturation mode.
- The 555 timer is configured in astable mode. When the reset pin of the 555 timer is made positive because of saturation mode of Q3, it will generate the pulse at the pin 3 and make speaker to ring alarm. Capacitor is connected in between the pin 3 of 555 timer and speaker because to block the DC signal and allow only the variations in the signal which make the speaker to make sound. The diode D2 will not allow any reverse current from the timer.
- Because of the resistor R4 and capacitor C1, Q3 will get in cut-off after sometime and make the reset pin of 555timer in negative and speaker will stops making sound. The time for 555timer to make speaker sound depends on the values of C1 and R4.
- When there is no rain, the aluminum wire of the sensor will not have any resistance or conduction cannot trigger the circuit.

Note:

- Rain senor should be kept in the open place at 30 to 40 degrees from the ground. As a result, rain water will not present on the sensor for long time.
- This circuit will automatically switch of the alarm after sometime and LED will glow continuously until the rain stops.

Rain Alarm Project Circuit Applications:

1. In the irrigation, it will detect the rain and immediately alert the farmer.
2. In automobiles, when the rain detector detects the rain it will immediately active the wipers and inform to the driver.
3. In communications, it will boost the power of the antenna and increase the signal strength to send or receive the signals.
4. In normal house hold, with the help of rain water detector we can automatically save the rain water. (This can be done only when home automation is done and equipment to save the rain water. In this, rain water detector will detect the rain and helps to switch ON the equipment which will automatically save rain water for different purposes).
5. This can also be used if there is a chemical rain also. This is very common in industrial areas.

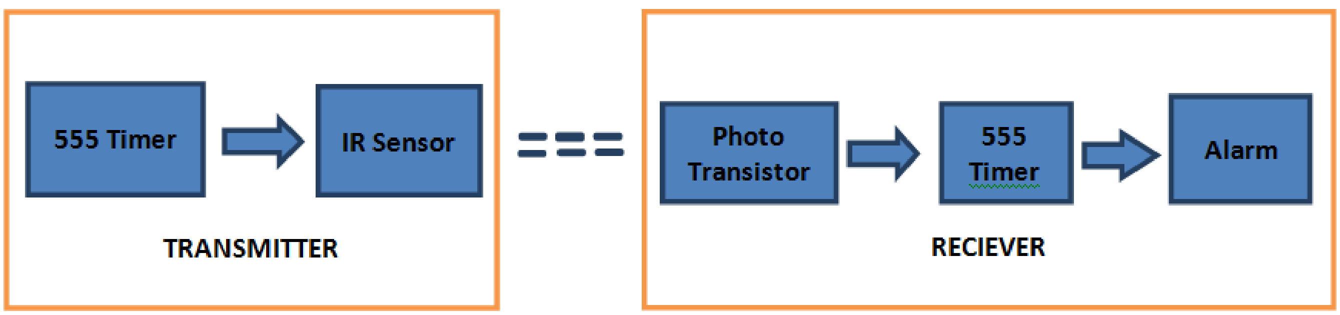
Motion Detector Circuit

Introduction to Motion Detector:

The motion detector is not only used as intruder alarm but also used in many applications like home automation system, energy efficiency system, etc. The motion detector will detect the motion of the people or objects and give the appropriate output according to the circuit. In general, motion detector uses different types of sensors like Passive infrared sensor (which will detect the motion of the person using the person body heat), microwave sensor (Microwave sensor will detect the motion of person by measuring the change in frequency from the produced beam), ultrasonic sensor (It produces acoustic signals which will detect the motion of a person) etc. There are some motion detectors which will use different technology and include number of sensors (PIR, microwave sensor, ultrasonic sensor, etc.) to reduce the false triggering and increase the accuracy in motion detection.

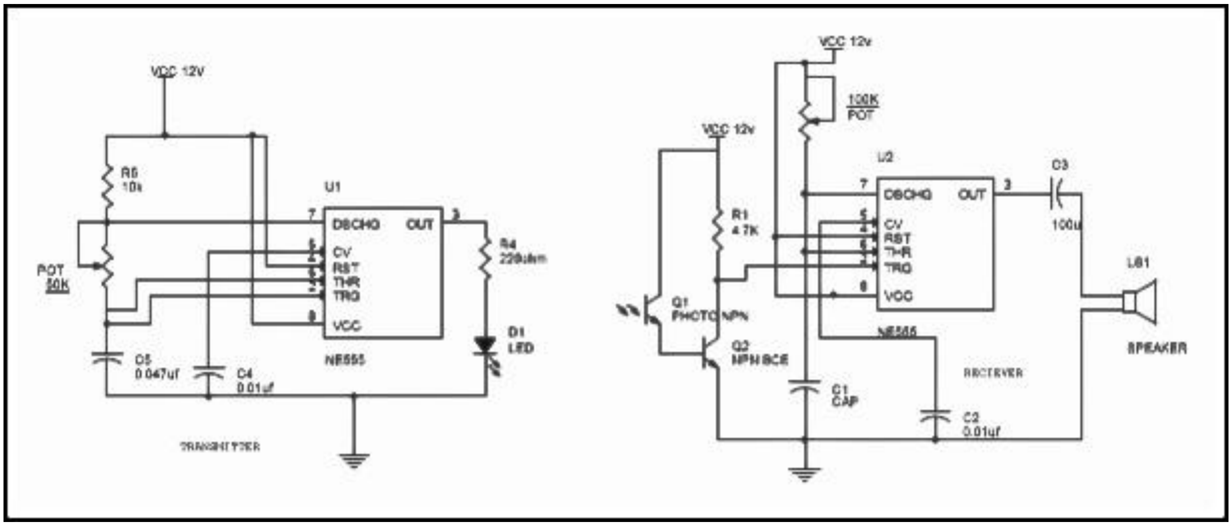
Here is the simple and reliable circuit which uses IR sensor for transmitting the IR beam and photo transistor for receiving the IR beam. If there is any disturbance or interference in between the transmitting and receiving of the beam, it will justify that there is an intrusion and makes the alert through alarm. This is circuit is easy to construct and cost of circuit is very low when compared to normal motion detector.

Block Diagram of Motion Detector:



IR sensor will produce the high frequency beam which is projected on the photo transistor with the help of 555timer at the transmitter. When this high frequency beam has got any interruption, the photo transistor will trigger the 555 timer of receiver section and gives alert through the alarm.

Motion Detector Circuit Diagram:



Motion Detector Circuit Explanation:

- The IR sensor will make the high frequency beam of 5 kHz with the help of 555timer which is set to astable multivibrator mode at the transmitter section.
- The IR sensor will produce the high frequency beam which is received by the photo resistor at the receiver section. This frequency will be in one phase when there is no interruption between the IR sensor and photo transistor. Total circuit will not give any output in this phase. When there is an interruption between IR sensor and photo transistor, the beam produced by the IR sensor will be in different phase. This different phase will be immediately detected by the photo resistor and make the 555 timer to give alarm through speaker.
- When there is no intrusion, the photo transistor will make the pin2 high of 555timer which is set in monostable mode, and there will be no output given in this configuration. When there is intrusion, the pin 2 of monostable timer is made low which will make the alarm to alert. The alarm time depends on the capacitor C1 and variable resistor POT.

Main Components in Motion Detector Circuit:

IR sensor: the main concept of IR sensor is to produce a beam of infrared light (whose wave wavelength is longer than visible rays and shorter than microwaves, in normal infrared wave length should be greater than 6µm). IR sensors are based on three different laws they are planks radiation law, Stephan Boltzmann law and Wien's displacement law.

- **Planks Radiation Law** states that the energy of electromagnetic radiation is confined to indivisible packets (quanta), each of which has energy equal to the product of the Planck constant and the frequency of the radiation (planks constant = $6.62606957 \times 10^{-34}$ m^2 kg /s).
- **Stephan Boltzmann Law** states that total energy radiated per unit on a black body using all wavelengths per unit time J* is directly proportional to the fourth power of the black body's thermodynamic temperature *T*:

$$J^* = \sigma T^4$$

$$\text{Where } \sigma = \frac{2\pi^5 k^4}{15c^2h^3} = 5.670400 \times 10^{-8}\, \mathrm{J\,s^{-1}m^{-2}K^{-4}},$$

- **Wien's Displacement Law:** the wavelength of maximum emission of any body is inversely proportional to its absolute temperature (measured in Kelvin). As a result, as the temperature rises, the maximum (peak) of the radiant energy shifts toward the shorter wavelength (higher frequency and energy) end of the spectrum.

Peak intensity occurs at this wavelength ƛ =(0.0029 meter.K)/Temperature in Kelvin

In IR sensor the infrared source and transmission of infrared are two important parts. In infrared source, there are different sources like black body radiators, tungsten lamps, silicon carbide in IR sensors. They will use infrared wavelength LED as infrared source. In transmission media it will be different like air, optical fiber etc.

Photo Transistor: Photo transistors are the detectors of IR radiation or any photo radiation. They will convert this IR radiation into current or voltage.

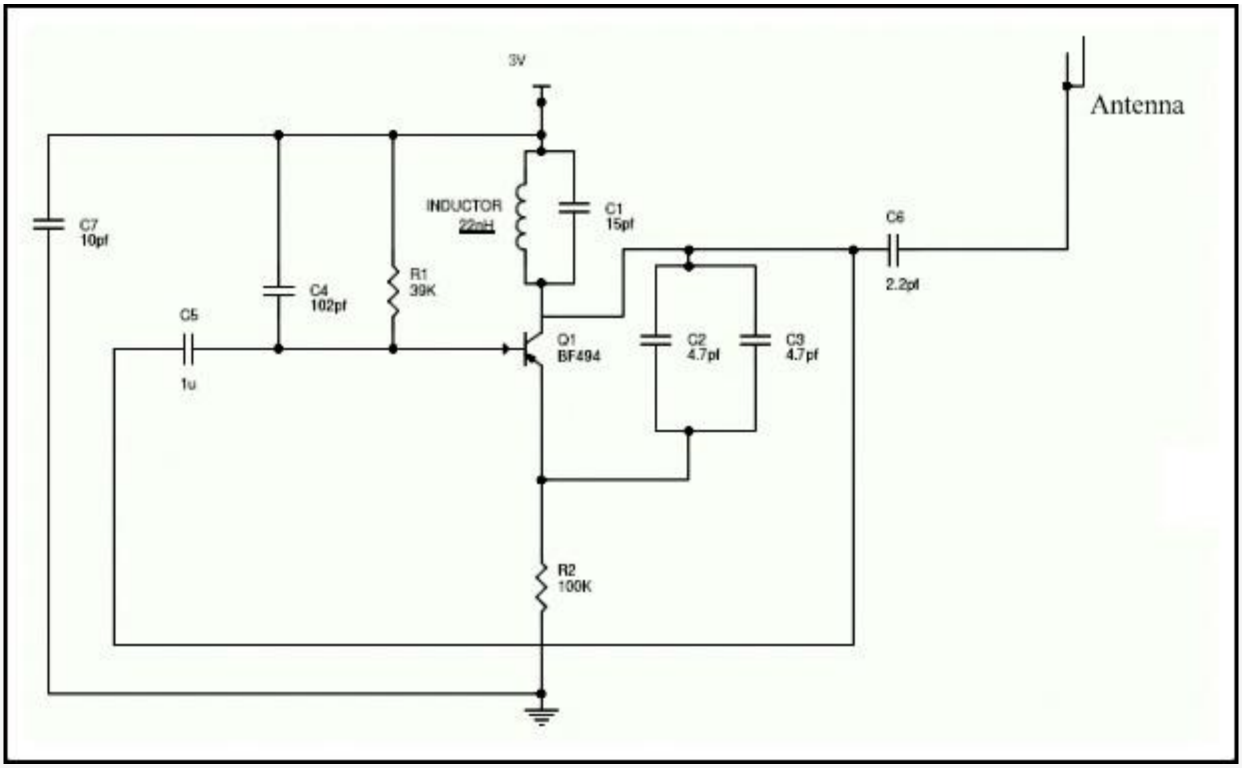
Applications of Motion Detection:

- Motion detectors can be used as an intruder alarm in home, offices, banks, shopping malls etc.
- They can be used as counting machines, automatic light control etc.
- They can be used in energy efficient systems, home automation system and control systems.

Mobile Jammer Circuit

In the earlier post, we have studied about **Simple FM Radio Jammer Circuit** and its applications. Now, let us learn about one more interesting concept i.e. Cell Phone or Mobile Phone Jammer Circuit.

Simple Mobile Jammer Circuit Diagram:



Simple Mobile Jammer Circuit Diagram

Cell Phone Jammer Circuit Explanation:

- If you understand the above circuit, this circuit analysis is simple and easy. For any jammer circuit, remember that there are three main important circuits. When they are combined together, the output of that circuit will work as a jammer. The three circuits are
  1. RF amplifier.
  2. Voltage controlled oscillator.
  3. Tuning circuit.
- So the transistor Q1, capacitors C4 & C5 and resistor R1 constitute the RF amplifier circuit. This will amplify the signal generated by the tuned circuit. The amplification signal is given to the antenna through C6 capacitor. Capacitor C6 will remove the DC and allow only the AC signal which is transmitted in the air.
- When the transistor Q1 is turned ON, the tuned circuit at the collector will get turned ON. The tuned circuit consists of capacitor C1 and inductor L1. This tuned circuit will act as an oscillator with zero resistance.
- This oscillator or tuned circuit will produce the very high frequency with minimum damping. The both inductor and capacitor of tuned circuit will oscillate at its resonating frequency.

- The tuned circuit operation is very simple and easy to understand. When the circuit gets ON, the voltage is stored by the capacitor according to its capacity. The main function of capacitor is to store electric energy. Once the capacitor is completely charged, it will allow the charge to flow through inductor. We know that inductor is used to store magnetic energy. When the current is flowing across the inductor, it will store the magnetic energy by this voltage across the capacitor and will get decreased, at some point complete magnetic energy is stored by inductor and the charge or voltage across the capacitor will be zero. The magnetic charge through the inductor will decreased and the current will charge the capacitor in opposite or reverse polarity manner. Again after some period of time, capacitor will get completely charged and magnetic energy across the inductor will be completely zero. Again the capacitor will give charge to the inductor and becomes zero. After some time, inductor will give charge to capacitor and become zero and they will oscillate and generate the frequency.
- This circle run upto the internal resistance is generated and oscillations will get stop. RF amplifier feed is given through the capacitor C5 to the collector terminal before C6 for gain or like a boost signal to the tuned circuit signal. The capacitors C2 and C3 are used for generating the noise for the frequency generated by the tuned circuit. Capacitors C2 and C3 will generate the electronic pulses in some random fashion (technically called noise).
- The feedback back or boost given by the RF amplifier, frequency generated by the tuned circuit, the noise signal generated by the capacitors C2 and C3 will be combined, amplified and transmitted to the air.
- Cell phone works at the frequency of 450 MHz frequency. To block this 450MHz frequency, we also need to generate 450Mhz frequency with some noise which will act as simple blocking signal, because cell phone receiver will not be able to understand to which signal it has been received. By this, we can able to block the cell phone signal from reaching the cell phones.
- So here in the above circuit, we generated the 450 MHz frequency to block the actual cell phone signal. That's what the above circuit will act as a jammer for blocking the actual signal.

You can also get good idea about another jammer circuit i.e. How TV Remote Control Jammer Circuit Works?

Note:

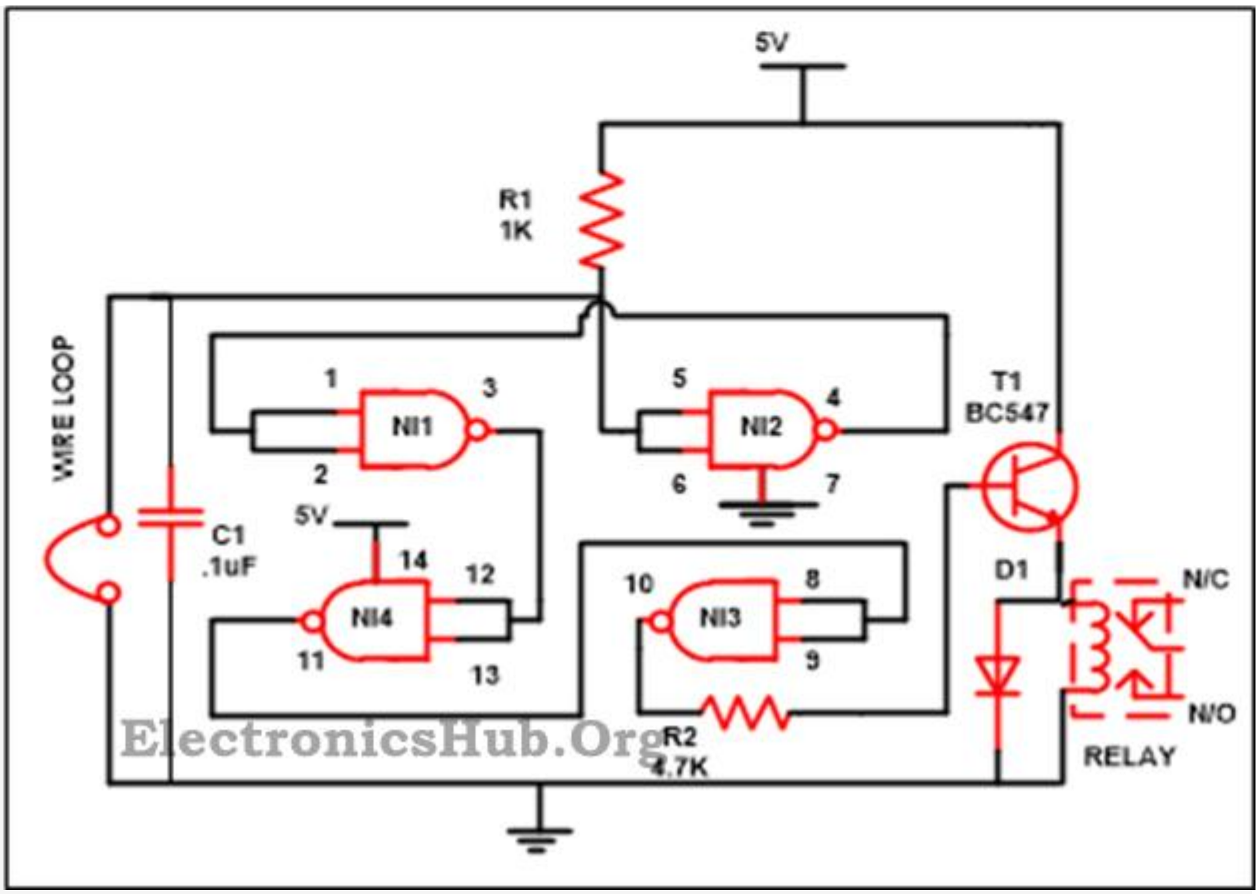
- This circuit will work in the range of 100 meters i.e. it can block the signals of cell phones with in 100 meters radius.
- Usage of this type of circuits is banned in most of the countries. Usage of this circuit is illegal and if you caught by using this circuit, you can be imprisoned and also should pay large amount in the form of fine.
- This circuit can be used in TV transmission and also for remote controlled toys or play things.
- If the circuit is not working, just increase the resistor and capacitors values in the circuit. Increase the frequency of tuned circuit by using this formula F= 1/ (2*pi*sqrt (L*C)). Increase the inductor capacitor circuit components value for increasing the frequency.

Luggage Security Alarm Project Circuit

During our journey through train and bus, we carry many important things and all the time we have fear that someone might lift our luggage. So to protect our baggage, we normally lock our baggage through old ways by the help of chain and lock. After all locks, we still remain in fear that someone may slash the chain and take away our valuable material. To overcome with these fear, here is an easy circuit which is based on the NAND gate. In this circuit, when someone tries to lift your luggage, it will generate a warning alarm which is very much helpful during your travel in the bus or train even at the night time as it can also produces audio visual indication attached to the relay.

Another application of this circuit is that you can employ these into your house so to avoid the attempt of robbery in your house with the help of this alarm circuit. When anyone tries to open the door of your house, loop break down and sound from the alarm produce.

Luggage Security Alarm Circuit Diagram:



Luggage Security Alarm Circuit Diagram – ElectronicsHub.Org

Circuit Components:

- IC
  - IC1(CD4011) – 1
- Resistor

- R1(1K) – 1
- R2(4.7K) – 1

- Capacitor
  - C1(.1uF) – 1
- Miscellaneous
  - Relay – 1
  - T1(BC547) – 1
  - D1(1N4007) – 1

Luggage Security Alarm Circuit Description:

The basic building block of this circuit is CD4011 along with some other components viz. resistors, capacitor along with transistor and relay which is used to save your important things from robbery with the help of this easy circuit. It produces a warning beep, when someone tries to unlock the lock as an effect of its wire loop will split and alarm is produced.

To get familiar with the working, you should get aware with the NAND gate truth table which is shown below -

Input		Output
A	B	Y= $\overline{A.B}$
0	0	1
0	1	1
1	0	1
1	1	0

NAND Gate – Truth Table

When any of the input states or both the input states go to the low state in the NAND gate, then the output will be high and if both the inputs are at high state, then the output will be low in that case.

CD4011 is the mainly used CMOS (Complementary Metal Oxide Semiconductor) chip. It arrives in a Dual Inline Package (DIP) of 14 pin. There is a small notch present on the chip at one of the corner which is recognized as pin 1. In a single chip, it is a group of 4 NAND Gate which are independent of each other. Each gate is a three terminal device with 2 terminals for the input purpose and one is for the output purpose. 5V to 16V is the working voltage range of the IC. Approximately 10mA of current at 12 V is been deliver by the IC which can be trim down with the reduction of the power supply voltage.

Related Post: Also Read the Interesting Post – Pull Pin Security Alarm System

Functioning of these circuits is very easy when we will receive; output is based on the voltage on pin 5. At the time when power supply is attached to the circuit pin 5, voltage is at zero as loop is unbroken. Hence at pin 4, voltage is high which is coupled with pin1 and pin 2 which is also at high state. As you can also find from the truth table of the NAND gate that if both the inputs are at high state, then the output is low hence at the pin 3 of gate 1, we get low which is once more attached to pin 12 as well as 13 moving them also to the low which in turn makes the pin 11 to switch at high switching pin 8 as well as pin 9 also at high and low voltage at pin 10 due to this transistor linked to it via a resistor will not boost the base of it and the alarm will not receive by us. This implies that our baggage is secure.

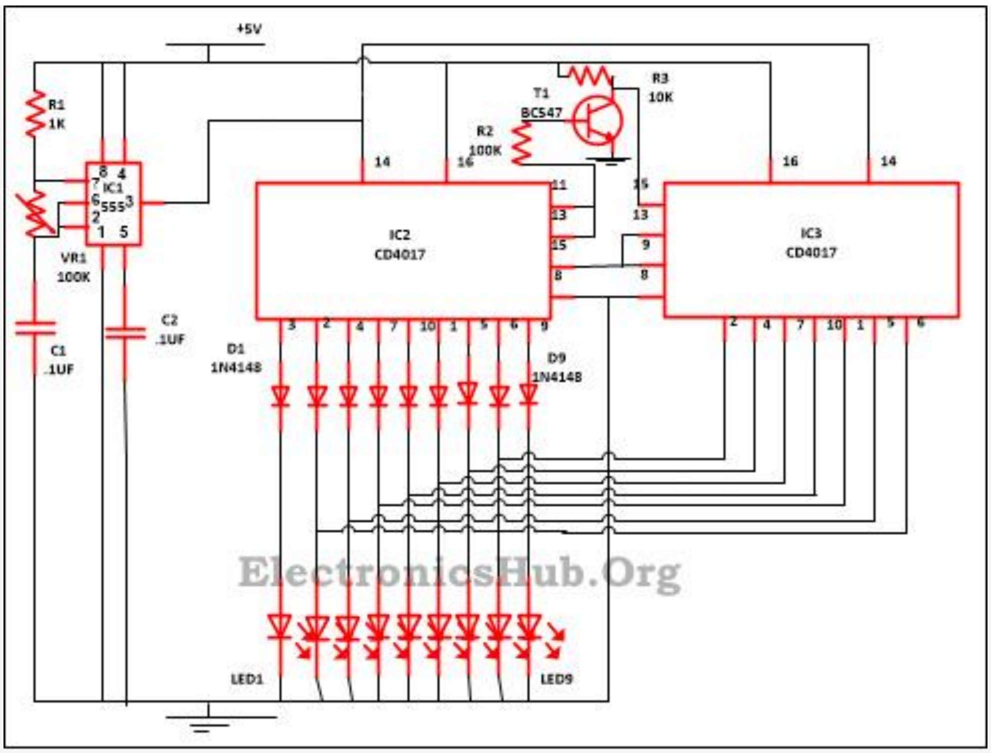
Now suppose that someone attempt to take your baggage then the loop attached to it broken down. At the time loop break down, pin 5 as well as pin 6 shift to high and just opposite work will take place which we will explained above due to which pin 10 reaches to high state and transistor begin its conduction and alarm is receive by us.

And the alarm will not stop till the time we once again interact with the loop. Based on the rating of the relay that you are using in your circuit value of the battery will vary in the range of 6-15V. If you wish, you can directly fix the buzzer without using relay. We are using the relay in our circuit because if anybody wants to connect the alarm directly with the AC, then also it will work without making any damage. Diode is also fixed in our circuit because if there any spikes of the reverse voltage, then it will be short-circuited at the source itself and there will be no damage done by it.

LED Running Lights Circuit

This easy circuit complies 9 LED attached like a "knight rider scanner mode". This circuit can employ in the front side of a car. It will present an eye catching look as the LED initially travel in the one way and then travel reverse in the similar direction. It means same as a pendulum it travels back and forth. This circuit can be utilized for the beautification of the car or it can be helpful at the time of crisis when your car broke down and you need help.

Circuit Diagram of LED Knight Rider Circuit Diagram:



LED Running Lights – LED Knight Rider Circuit Diagram

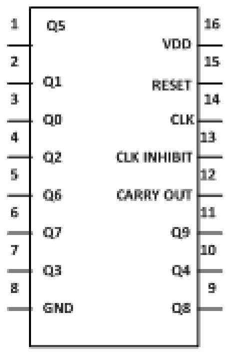
Components Required for the Circuit:

- IC
- NE555 – 1
- CD4017 – 2
- Resistor
  - R1 (1K) – 1
  - R2 (100K) – 1
  - R3 (10K) – 1
- VR1 (100K) – 1
- C2, C1 (.1uf) – 2

- D1-D9 (1N4148) – 9
- Transistor (BC547) – 1
- LED1-LED9 – 9

Description:

In order to get familiar with the working layout of the circuit it is important to get familiar with individual pin. This IC has 16 pins out of which 3 are input pin, 10 is for output purpose and for ground one pin is assigned and one power supply and rest one left is for Carry out. As shown below pin diagram of IC CD4017.



1. Input Pin:

- **Reset Pin (Pin 15)** – The counter is reset to zero by this pin. Suppose you wish that the counter starts counting from the third pin then you need to attached fourth output with 15 pin. So after each third output the counting automatically begins with zero.
- **Clock Pin (Pin 14)** – The output will be provided each time the pin 14 of the IC move to high. Like for the initial pulse of the clock pin 3 will give you output likewise for the next clock pulse arrive the output will be provided by pin2 and so on. After 10 clock pulse it will once more begins from Q0 output.
- **Clock Inhibit Pin (Pin 13)** – This pin is used to change the state of the counter from ON to OFF and vice versa. Pin 13 should reach the highest state if you wish to switch off the counter. If it is at high state then it will not pay attention on the clock pulse no issues that you press the switch how many of times, implies that the count will not go forward. Pin 13 in our circuit is grounded.

2. Output Pin (Pin Q0 – Q9) – In the sequential manner the output is received from these pins. Like pin 3 will give you output for the first pulse and so on.

3. Ground Pin (Pin 8) and Supply Pin (Pin 16) – For the working of the IC pin 8 provide ground while power supply is provided by pin16.

4. Carryout Pin (Pin 12) – With the help of this pin one or more than one IC CD4017 can linked. Suppose you desire to attaché one more CD4017 then attach pin 12 with input clock of its descendant. The carry pin of primary CD4017 is coupled with the second clock input similarly the second carry pin is coupled with the third clock input and so on. You can see this in circuit diagram.

NE555 and CD4017 are the two IC on which the circuit is based along with some other components. In this circuit IC 555 timer is used like an astable oscillator.

IC CD4017 is used as a CMOS counter/driver. Every time when it gets to clock pulse , it fetches the clock pulse through clock input and all 10 outputs turn on in sequence. It is well known IC and it is very much useful in various other projects viz Light Chaser, Matrix Die.

IC NE555 in this circuit is used as an astable mode , used to produce a clock pulse for the circuit. This is used to give an oscillating waveto pin 3 of the IC1 which is for output. By the help of VR1 the speed of oscillation can be alter. 555 timer oscillation frequency can be calculated by-

$$f=1.44/(R1+2*(VR1)*C1)$$

In this circuit, the counting will start from 0 till 16 since we have employed two decade counters. IC2 in the circuit done the counting 0 to 9 while with the help of diodes the rest of the counting will done by IC3.

In the instance when 555 timer gets the power supply, pin 3 of IC1 output is given to CD4017 pin 14 of decade count, which in turn give clock pulse for the IC2 working. CD4017 begins its counter value from zero (since it has inbuilt counter) after getting the clock input. And after pin 14 moves to high it forwarded one by one to every pin. Like at the primary stage output Q0 will receive at pin 3 and LED1 will blink and LED2 will glow from pin4 and so on.

When the counter arrives at the pin 11 i.e ninth output it will create it temporary high, which is coupled to pin 13 (clock inhibit). The clock pulse will be disregarded from pin 14 if the pin is at high and the counting stop by IC2.

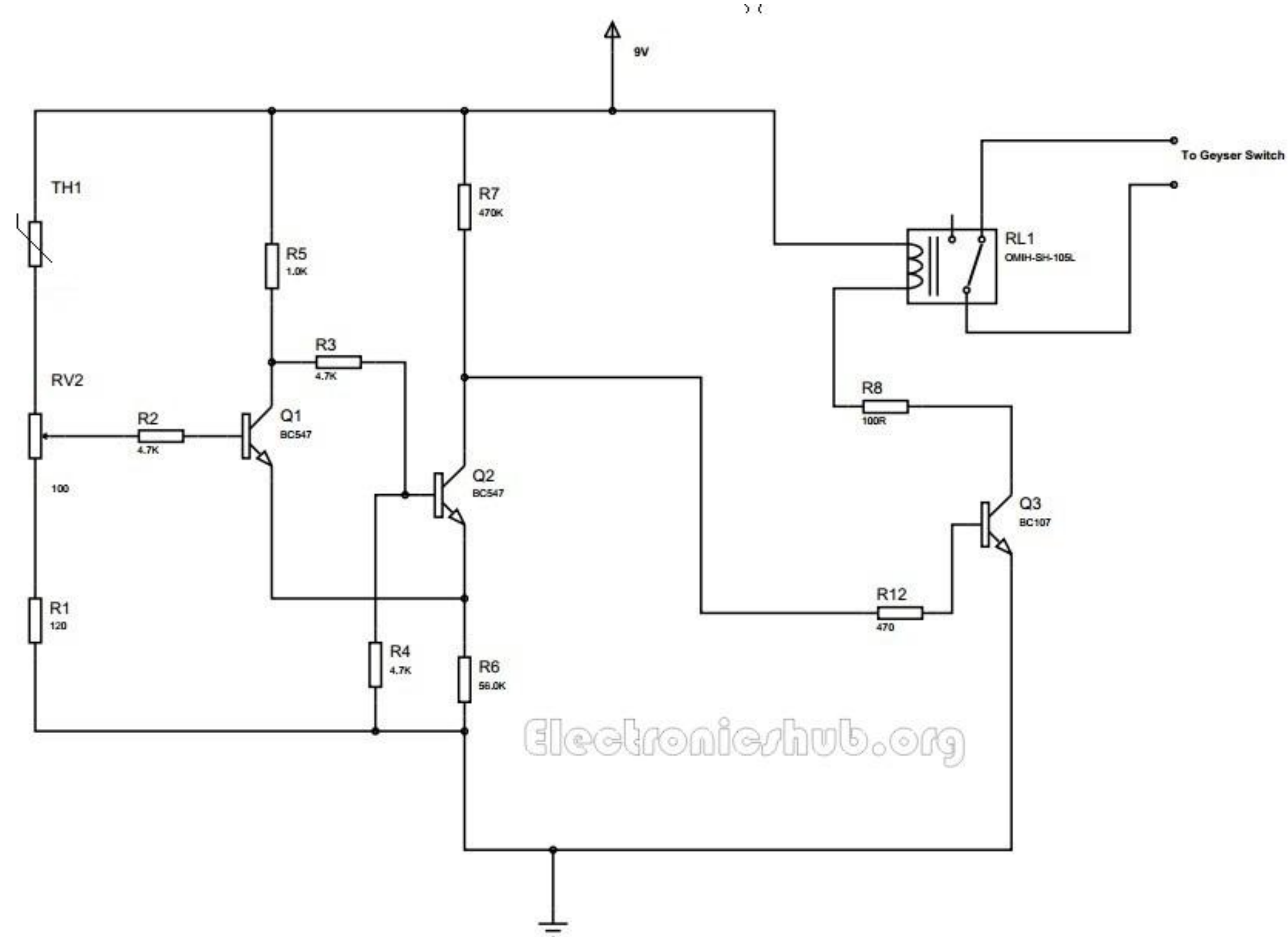
And in return of these IC3 pin 15 became low because earlier transistor BC547 is a high state. And pin15 of IC3 reset to low state due to this low signal for a short moment and the output of IC3 stats counter from Q0 (pin3) and move forward one by one. When it arrives at Q8 which is pin 9 which is yet again connected with pin13 of IC3 due to stop counting of IC3 irrespective of the input signal. Pin 14 disregard the clock pulse if pin13 is at high which implies IC3 stop counting.

And this will once more given to reset pin 15 of IC2 and counting is now begin by IC2, counting of IC3 disabled. It also means that when the output counting is done by IC2 from IC3 is stop similarly IC2 stop when IC3 counts. Hence output signals approaching from IC3 are transmitted in reverse direction to IC2.

Hot Water Geyser Controller Circuit

This circuit is made to turn OFF geysers as soon as our water gets hot and are ready for bathing. Although modern domestic geysers have an inherent ability to detect the temperature and turn On or Off automatically, this circuit helps us to gain insight regarding how this is one in the geysers.

Hot Water Geyser Controller Circuit Diagram:



This circuit has a thermistor which is a temperature sensing element that helps the circuit to determine the temperature of the water. The thermistor is kept in contact with the water while assembling the circuit on field. The property of the thermistor is that its resistance is inversely proportional to the temperature applied to it. It means that if the temperature in its surroundings increases, the resistance offered by the thermistor decreases. Similarly, if the temperature in the surroundings decreases, the resistance offered by the thermistor increases. The name thermistor is derived from thermal and resistor the meaning of which is implied and the functionality of which can be easily understood from its name.

Related Link: ***Thermistor Temperature Sensing Alarm***

The thermistor in the circuit is arranged in a voltage divider arrangement using which the variations in the resistance of the thermistor is converted into the variations in voltage values. These voltages are then used to switch a transistor to ON state when the thermistor detects the water are sufficiently hot and are ready to use.

The output voltage of the potentiometer arrangement is given to the base of transistor BC547. The transistor BC547 is a general purpose NPN transistor which is used as an electronic switch in this circuit. When the thermistor senses a low temperature, then the voltage divider arrangement provides a low voltage to the switching transistor. Due to this, the transistor is in the off mode. If the temperature reaches a value greater than a specific threshold, then the transistor gets turned on. As we have discussed earlier, the transistor acts as a switch which in turn turns on another transistor which drives the relay. When the driving transistor turns on, the DC current gets passed through the relay which turns the relay ON.

The relay is connected in the normally closed mode in which it is normally closed and the circuit is opened when the relay is turned ON. The circuit is closed means that the geyser is turned on and the circuit is open means that the relay is turned off. When the temperature is below the threshold value, the relay is off and so the geyser will remain on. When the temperature reaches the value equal to or exceeding the threshold value, then the relay turns on which further breaks the connection and so the geyser turns off.

Ding Dong Sound Generator Circuit

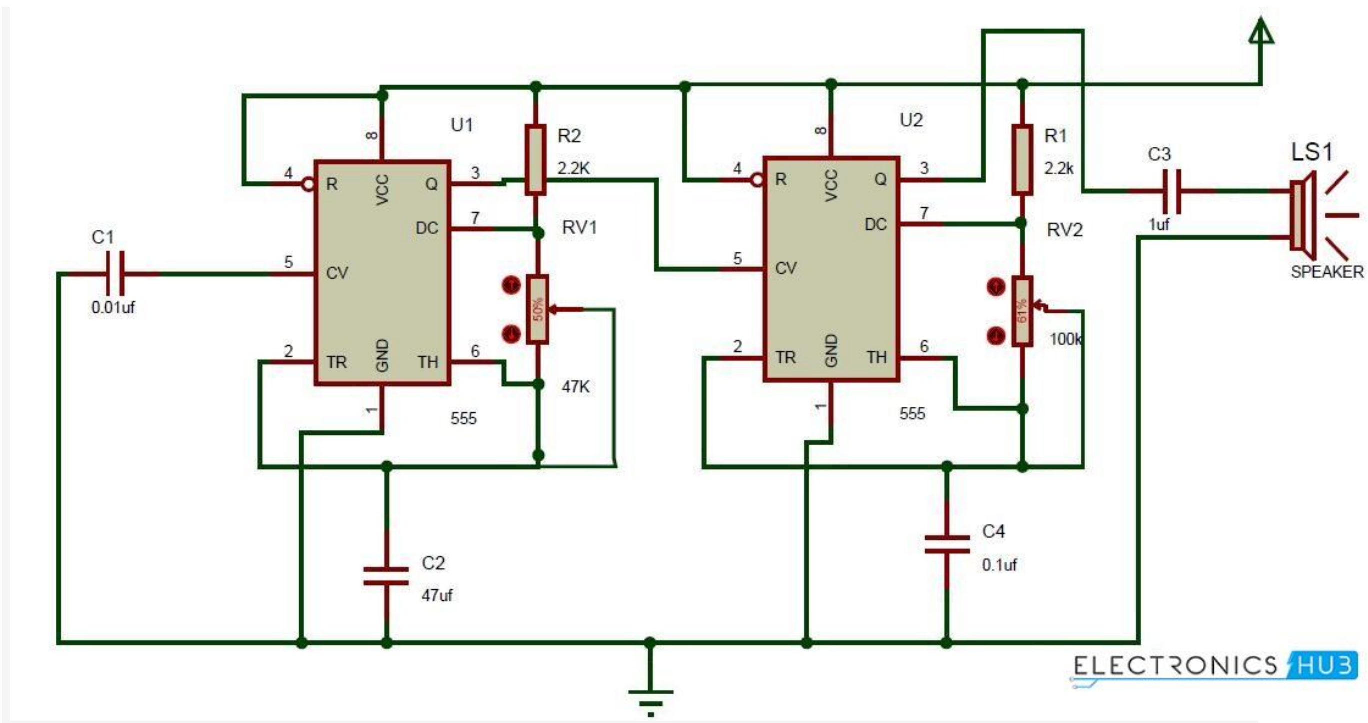
Nowadays, door bells are very common in every house. We daily observe different types of door bells are available in the market and they produce different types of music depending on their functionality. One can design their own door bell using simple electronic components**.** This article explains a simple circuit that produces “ding dong” sound using 555 timer.

Ding Dong Bell Sound Generator Circuit Principle:

This circuit mainly consists of two 555 timer ICs. First timer IC is operated in astable mode and the frequency of the second is modulated by the first timer. For that, output pin of first IC is connected to the 5th pin of second IC. The first timer IC is operated at a frequency of 1Hz.

Astable mode is a free running mode of the 555 timer IC. The 555 timer IC can be operated at required frequency by tuning the RC circuit. In astable mode, no external triggering is required. This has no stable state.

Ding Dong Bell Sound Generator Circuit Diagram:



Circuit Diagram of Ding Dong Sound Generator

Circuit Components:

- Two 555 timer ICs – U1 and U2.
- Two Variable resistors – RV1 and RV2
- 4 Capacitors – C1, C2, C3 and C4.

- 2 Resistors – R1and R2

Ding Dong Bell Sound Generator Circuit Design:

The circuit consists of two 555 timer ICs arranged as shown in the circuit diagram. The first timer IC is connected in astable mode to produce pulse of frequency 1Hz. The 4^{th} and 8^{th} pins are shorted and connected to the resistor of 2.2K whose other end is connected to the pin of the timer IC. Sixth and seventh pins are connected to the variable resistor. Sixth and second pins are shorted and connected to the ground of 9v through a capacitor of 47uf. Fifth pin is connected to the ground through a capacitor of 0.01uf. First pin of the IC is connected to the ground.

Related Post: Automatic Doorbell Ringing Circuit with Object Detection.

The output pin of the first IC is connected to the control pin i.e. Fifth pin of the second IC. The second IC is also operated in astable mode again. 4^{th} and 8^{th} pins are shorted and connected to resistor of 2.2 k ohms whose other end is connected to the seventh pin of the IC. A variable resistor 100K is connected between sixth and seventh pins of the IC. Sixth pin and second pin are shorted and connected to the ground through a capacitor of 0.1uf. First pin is directly connected to the ground of 9v.Output pin of the IC is connected to the speaker through a capacitor of 1uf.

How Ding Dong Sound Generator Circuit works?

- Initially power the circuit.
- The "Ding Dong " sound can be heard from the speaker.
- When the power is on the circuit is operated in the astable mode.
- As the voltage is applied to the timer, the capacitor starts charging through the resistors R1 and R2.
- When it reaches 2/3 of VCC, it is detected by the sixth pin and seventh pin is connected to the ground.
- Thus capacitor starts discharging, through the RV1 resistor.
- When voltage of 1/3 VCC is detected it again starts charging, thus this process continuously produces the pulse of frequency 1Hz.
- This is applied to the second timer through its control pin.
- Thus the frequency of the second timer is modulated and is applied to the speaker through a capacitor.
- The external RC circuit decides the time delay with which the waveform should be produced.
- Hence one can hear the "ding dong" sound produced.

Ding Dong Sound Generator Project Output Video:

Ding Dong Bell Sound Generator Circuit Applications:

- The circuit can be used as a door bell by connecting the supply to a switch.
- With some modifications it can be used to produce different sounds.

Digital Temperature Sensor Circuit

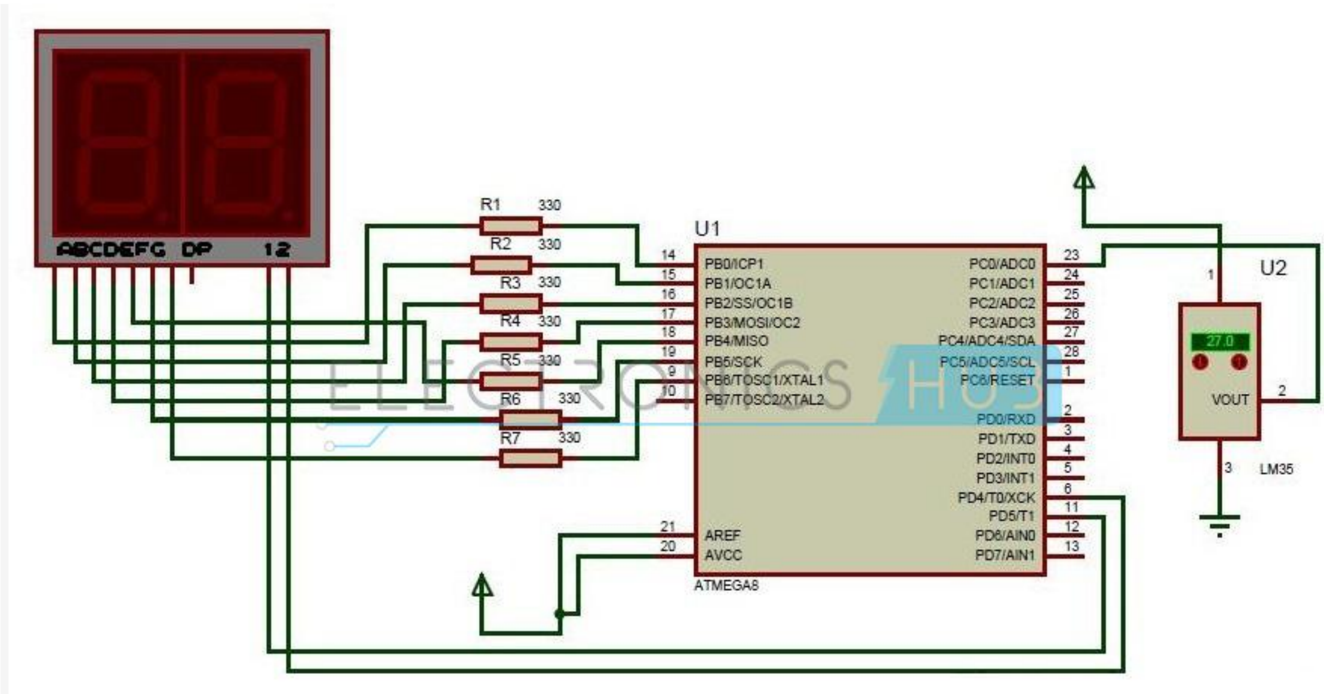
Temperature sensors are widely used in electronic equipments to display the temperature. You can see the digital clock displaying the room temperature value. It is due to the temperature sensor embedded in it. Generally, temperature value is analog. It is converted to digital value and then it is displayed. This article describes the same converting analog value to a digital value

Digital Temperature Sensor Circuit Principle:

The main principle of this circuit is to display the digital temperature value. Here, ATmega8 microcontroller is used. The ATmega8 has inbuilt analog to digital converter with six multiplexed channels. This reduces interfacing of external analog to digital converter IC. The analog temperature value is directly applied to input ADC channels of microcontroller. Successive approximation method is used for Analog to digital conversion internally.

Related Post: ***[Celsius Scale Thermometer using AT89C51 Microcontroller]***

Digital Temperature Sensor Circuit Diagram:



Digital Temperature Sensor Circuit Diagram

Circuit Components:

- Resistors – R1 to R7 having the value of 330 Ohms each.
- LM35 Temperature sensor
- ATmega8 Microcontroller

- 7 Segment Display

Digital Temperature Sensor Circuit Design:

The digital temperature circuit consists of ATmega8 microcontroller, LM35 temperature sensor, 7 segment display. The temperature sensor Lm35 is connected to one of the ADC channels of microcontroller.

ATmega8 has six ADC channels at Port C. PC0-PC5 pins of Atmega8 act as ADC channels. This shows that one can interface six analog values. But only one conversion is done at a time depending on the priority of the input channels. The resolution of ADC is 10 bit. Remember that for conversion Vref and Avcc are externally connected as shown in circuit.

Generally, all the port pins of ATmega8 microcontroller act as normal input /output pins until their special functions are declared. ADC registers inside the controller have to be declared in order make Port C to act as ADC channel.

Lm35 temperature sensor has three terminals. Placing the flat surface towards you first pin is Vcc, Second pin is Output and the third pin is Ground. Output pin of temperature sensor is connected to the first ADC channel i.e. PC0 pin of microcontroller.

Seven segment display has eight pins and one common pin. Leaving Dp, connect all the seven pins to port B. Connect A to PB0, B to PB1,_____, G to PB6. Seven segment display used here is common cathode display. Current limiting resistors were used between controller and the display.

Digital Temperature Sensor Circuit Simulation Video:

How to Operate Digital Temperature Sensor Circuit?

Initially power the circuit. The micro controller continuously checks for input at ADC channel. It converts the analog temperature to digital value and is displayed on the seven segments. Increment or decrement the temperature value by clicking on the arrow marks below the display in temperature sensor. Whenever there is a change, the ADC channel converts the input and displays on the seven segment. The temperature value displayed is twice the original value .This is because of variations in the step size. So, before displaying the value divide the value by 2 and subtract 1 from it to display accurate value.

Algorithm for Programming to Microcontroller:

The following steps explain you to set the internal ADC registers of ATmega8 microcontroller and displaying value on seven segment display.

- Initially select one channel from six ADC channels to which temperature sensor is connected and select source for reference voltage using ADMUX register.

Ex: ADMUX=01000000.
If ADC0 is the channel selected and Avcc with external capacitor at Aref pin is selected

- Enable ADC and select prescalar value using ADCSRA register.

Ex: ADCSRA = (1<<ADEN)|(1<<ADPS0)|(1<<ADPS1)|(1<<ADPS2)
If prescalar value of 128 is selected and enabling ADC. ADPS0, ADPS1, ADPS2, ADPS3 are pre scalar bits.

- Check for the flag bit in ADCSRA register which sets after completion of the conversion.
- Read the value from ADC register and assign value to port B which displays on seven segments.
- The two digit value obtained can be displayed on two seven segments.

Applications of Digital Temperature Sensors:

1. The digital temperature sensors are widely used in day-to-day life
2. They are used in environmental applications.
3. Digital temperature sensors can be found in air conditioners where it adjusts the temperature according to the room temperature.
4. They can be seen in digital clocks displaying room temperature along with time.
5. It can be used in dash boards in the car to display temperature of the engine, to avoid stopping suddenly due to overheat.
6. No need of external ADC IC for conversion.

Digital Temperature Sensor Project Output Video:

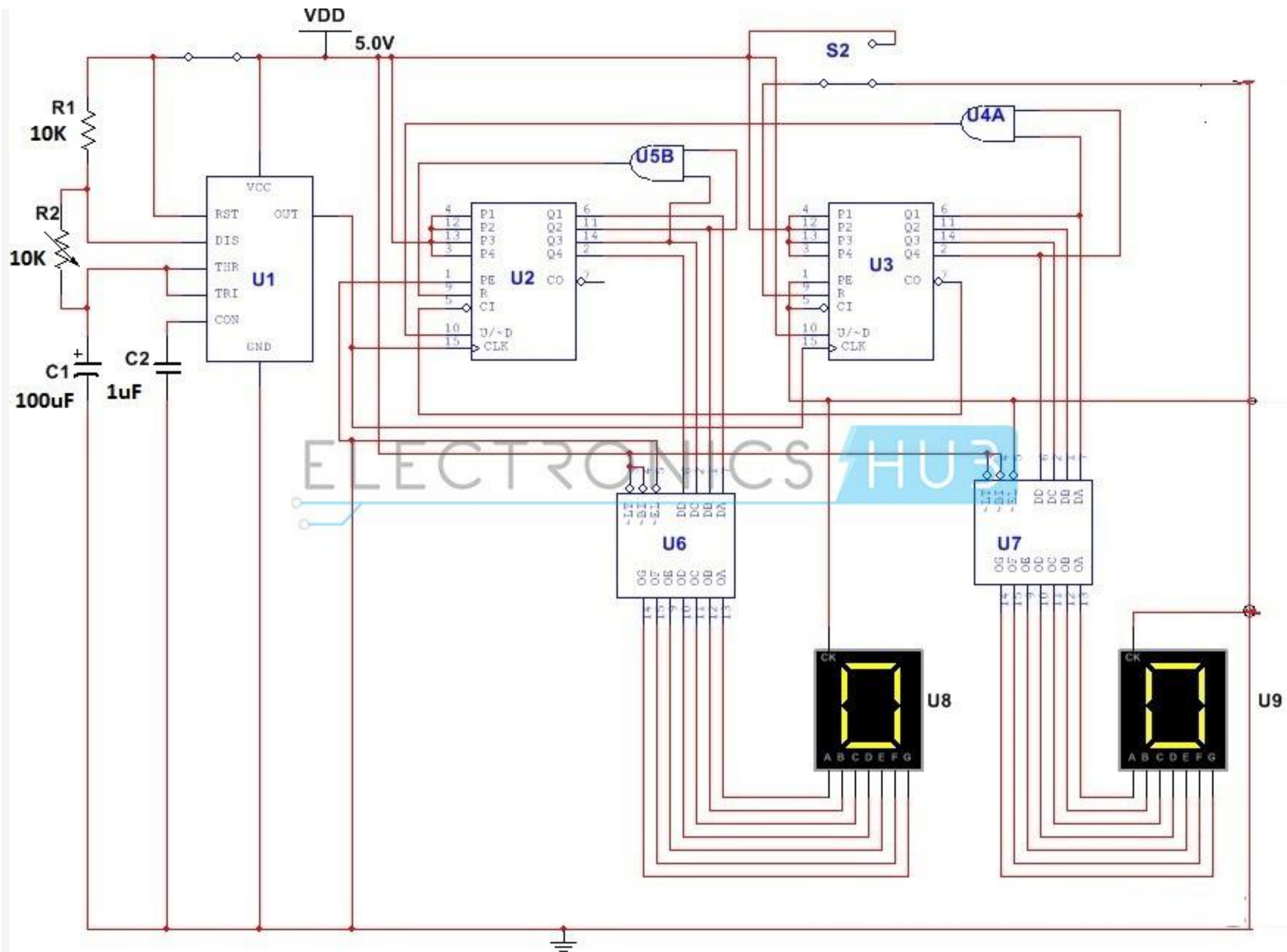
Digital Stopwatch Circuit

This article describes the principle, design and operation of a digital stopwatch circuit. A digital stopwatch can be a circuit displaying the actual time in minutes, hours and seconds or a circuit displaying the number of clock pulses. Here we design the second type wherein the circuit displays count from 0 to 59, representing a 60 second time interval. In other words here the circuit displays the time in seconds only. This is a simple circuit consisting of a 555 timer to produce the clock pulses and two counter ICs to carry out the counting operation.

Digital Stopwatch Circuit Principle:

This circuit is based on the principle of 2 stage counter operation, based on synchronous cascading. The idea is to display clock pulses count from 0 to 59, representing a 60 second time interval. This is done by using a 555 Timer IC connected in astable mode to produce the clock pulses of 1 second interval each. While the first counter counts from 0 to 9, the second counter starts its counting operation every time the count value of first counter reaches 9. The counter ICs connected in cascading format and each counter output is connected to **BCD to 7 segment decoder** used to drive the 7 segment displays.

Digital Stopwatch Circuit Diagram:



Circuit Diagram of Digital Stop Watch

Digital Stopwatch Circuit Design:

First part of design involves designing the **astable multivibrator arrangement of 555 Timer**. Here the required time period is 1 second. With the frequency of output signal given by f = 1.44/ (Ra+Rb) C, we can calculate the values of C, assuming values of Ra and Rb to be around 10K. Here we get a 100uF electrolyte capacitor.

Second part of designing involves connecting the two counters IC – 4510 in synchronous cascading arrangement. This is achieved by connecting the clock pins of the counter ICs to the output of 555 Timer, resulting in parallel clock input signals. The carry out pin of one of the IC is connected to the carry in pin of another IC.

Since our concern is to start the second counter once the first counter reaches the count value of 9, we accomplish this by designing a simple combinational logic circuit. Recalling from the counter truth table, for a clock pulse count of 9, the corresponding binary count or status of counter output signal is 1001. In other words for a count of 9, Q1 and Q4 are at high logic signals. Here we are using an AND gate IC 7408 whose inputs are connected to pins Q1 and Q4 of the first counter and output is connected to the U/D pin of second counter.

Here our requirement is to display the clock pulses till count of 60. This can be done by ensuring the second counter resets once the count reaches a value of 5. We achieve again by designing a simple logic circuit consisting of another AND gate IC, whose inputs are connected to pins Q3 and Q2 of the second counter.

The third part involves designing the display circuits. This is done by connecting the outputs of each counter IC to the inputs of BCD to 7 Segment Decoder. The outputs of each Decoder ICs 4511 are connected to the 7 Segment display.

Working of Digital Stopwatch Circuit:

The circuit operation begins once the normally open switch is changed to closed position. The Timer 555 produces high and low signals at frequent intervals, resulting in oscillating signal whose frequency is based on the values of two resistors and the charging capacitor. In other words, the timer 555 IC produces the clock pulses of required time period. This clock signal is fed to the two stage arrangement of BCD counters CD4510. The IC CD4510 consists of four synchronously clocked D- Flip-flops, which are connected together to enable the counting operation. The clock pulses are counted by the two stage synchronous cascaded arrangement of two CD4510 counters. As IC U3 receives the clock pulses, it starts counting from 0 to 9. Once the count reaches 9, the AND gate IC U4A produces a high logic output, which is fed to the U/D pin of IC U2. IC U2 starts the count operation. The IC U2 continues its counting operation and so does the IC U3 every time U3 reaches its end count. However once the IC U2 count reaches count of 6, the reset pin is set to high level by the AND gate U5B. The count is displayed on the 7 segment displays driven by the BCD to 7 segment decoders CD4511. The circuit thus displays the clock pulses from 0 to 60.

Digital Stopwatch Applications:

1. This circuit can be used as an indicator at quiz competitions.

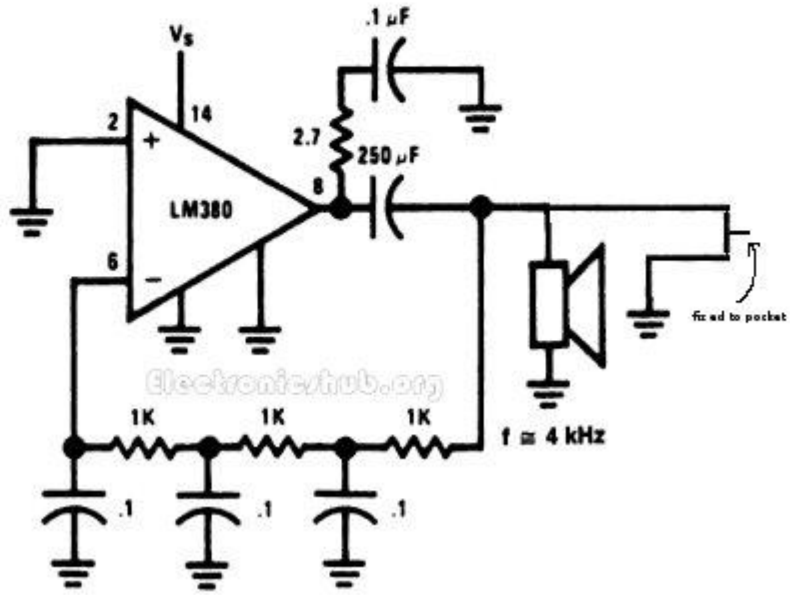
Digital Stopwatch Limitations:

1. The circuit does not display the actual time, but rather the count of clock pulses.
2. The use of digital counter ICs produces a time delay in the whole operation, because of the propagation delay.
3. This is a theoretical circuit and may require changes.

Pull Pin Security Alarm System

This circuit helps us to get alerted when anybody picks our pockets or bags. The circuit is very helpful to prevent our goods getting pick pocketed. The circuit is called a pull pin **security alarm circuit** because it gets activated as soon as the pin is pulled.

Pull Pin Security Alarm Circuit Diagram:



Description:

The arrangement of the circuit is as follows. The circuit has a pin which is fixed to the pocket and the other end is attached to the circuit. The circuit remains inactive until the wallet is in your pocket as the circuit gets activated when the wallet is pulled from your pocket.

When the wallet is in the pocket, the circuit has the pin attached thereby the circuit remains inactive. Whereas when the wallet is removed from the pocket, the pin gets detached from the circuit thereby the circuit gets activated. When the circuit gets activated, the circuit turns ON the mini loudspeaker. The mini loudspeaker is fed with an alternating signal of audio frequency. This signal vibrates the loud speaker at an audio frequency so that it is well heard to us.

Related Post: ***Luggage Security Alarm Project using Logic Gates***

This can also be used to protect our purses, carry bags, and any other things. The applications of this are not just limited to this but there can be many other applications which you may get on imagining and when you face a problem. The circuit is made to be portable in size so that it can be carried easily with us. It uses a battery power supply.

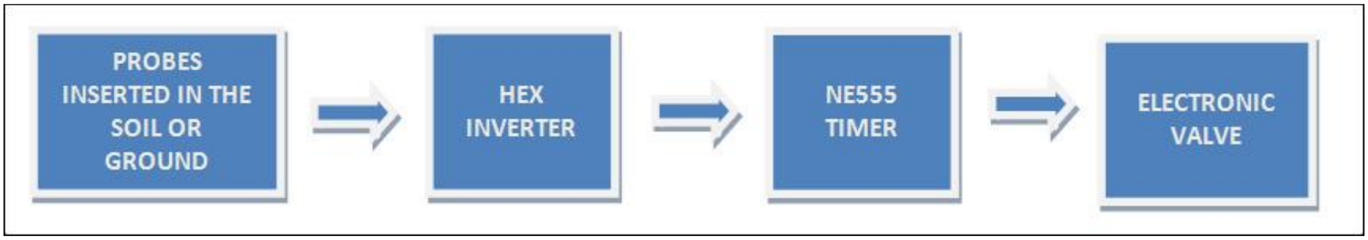
The main component of the circuit is an oscillator which generates a sine wave of definite frequency. The oscillator which is used is an RC phase shift oscillator which produces the sine wave of definite frequency. The frequency of the RC phase shift oscillator is determined by the three stages of resistance and capacitance. Each stage of the resistor capacitor circuit consists of a resistor of 1 K-ohm and a capacitor of 0.1uF. Each of these RC stages theoretically produce a value of 90 degrees phase shift but practically they produce a phase shift lesser than that. In general, they are expected to produce a phase shift of about 60 degrees practically. That is why we have placed three such similar RC stages each of which produce about 60 degree phase shift and thereby combinedly produce a phase shift of 180 degrees. The amplifier circuit produces an additional phase shift of about 180 degrees. So, the total phase shift of the loop is the combination of phase shifts of the phase shift offered by the amplifier as well as the phase shift offered by the three RC stages which combinedly amounts to 360 degree phase shift. As you all know, this is one of the criterion's of Barkhausen criterion's for the circuit to function as an oscillator. The circuit should be provided a voltage of about 6V power supply.

The loud speaker which is used as a load at the output generates sound in audio frequencies. It is a mini loud speaker with an internal resistance of about 8 ohms. When the circuit is activated, the signal from the audio oscillator is fed to the mini loud speaker which then generated a beep sound of that specific audio frequency.

Automatic Plant Irrigation System

Here is a simple project more useful in watering plants automatically without any human interference. We may call it as Automatic plant irrigation system. We know that people do not pour the water on to the plants in their gardens when they go to vacation or often forget to water plants. As a result, there is a chance to get the plants damaged. This project is an excellent solution for such kind of problems.

Block Diagram of Automatic Plant Irrigation System:

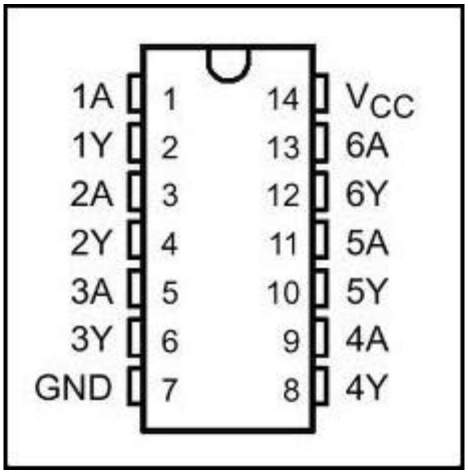


Explanation:

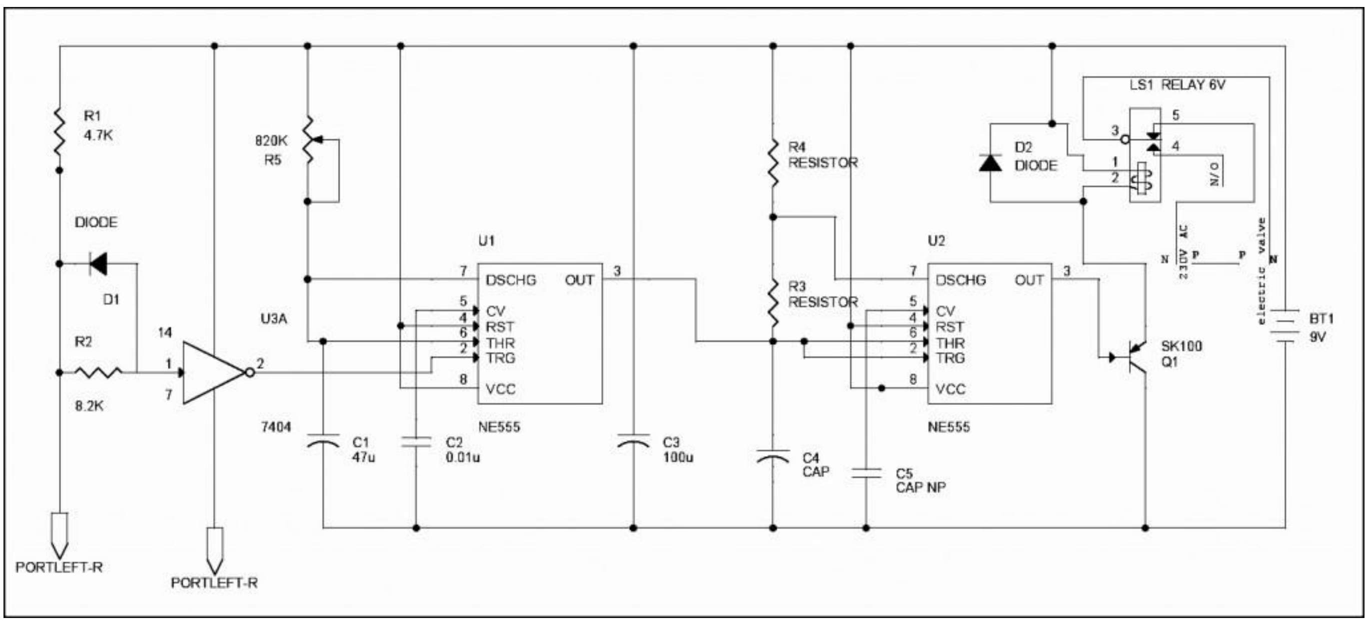
- Circuit is not that much complicated. We use the basic concept in this circuit i.e. soil have high resistance when it is dry and has very low resistance when it is wet.
- By using this concept we will make the system work. We insert two probes in the soil in such a way that that they will conduct when the soil is wet and they will not conduct when the soil is dry. So, when the probes do not conduct, system will automatically detect this condition with the help of HEX inverter which will become high when the input is low.
- HEX inverter will trigger the NE555 Timer and this NE555 timer will trigger another **NE555** which is connected to the output of first NE555. Now the second NE555 which is configured as astable multivibrator will help to switch on the Electric valve and as result, it will allow the water to flow to the soil.
- When the water wet the soil, probes will again conduct and make the output of 7404 low which will make the first NE555 to low and also drive remaining circuit to low. So, automatically it will switch off the valve.

Main Components in Automatic Plant Irrigation System:

Hex Inverter 7404: the main function of the inverter is to give the complemented output for its input i.e. it will give output which is opposite to input. For example, if the input is low to the inverter, then the output will be high. Just like the normal inverter which gives high output when the input is low and gives low output when the input is high. 7404 IC will be having six independent inverters; Operating supply voltage is around 4.75V minimum to 5.5V maximum, normal supply voltage is 5V. They are used in different applications like inverting buffers, drivers, hex inverters etc. 7404 IC will be available in different packages like DIP (dual inline package), QFP (Quad Flat Package) etc. The pin configuration of Hex Inverter 7404 is shown below.



Circuit Diagram of Automatic Plant Irrigation System:



Circuit Explanation:

- We are all well aware that the plants will die due to lack of water in the soil. Soil will have high resistance when it is dry and it will have very low resistance when soil is wet. We use this simple logic to water the plants and make the circuit work.
- Two probes which are connected to the circuit are placed into the soil. The two probes will conduct only when soil is wet (resistance is low) and they cannot conduct when soil is dry due to high resistance. The voltage is given to the probes to conduct is given from the battery connected to the circuit.
- When the soil is dry it will produce large voltage drop due to high resistance. This is sensed by 7404 hex inverter and makes the first NE555 timer trigger which is configured as monostable multivibrator with the help of a electrical signal.

- When the first NE555 is triggered at pin 2, it will generate the output at pin 3 which is given to the input of second NE555 timer. The second 555 timer is configured as astable multivibrator which got triggered by the first 555 timer and will generate the output and drive the relay which is connected to the electrically operated value through the transistor SK100. You can use a heat sink for SK100 transistor if it is dissipating more heat.
- The output of second NE555 timer will switch on the transistor SK100 which will drive the relay. Relay which is connected to the input of electrical value and output of value is given to the plant plots through the pipe.
- When transistor has turned on relay, it will open the valve and water is poured on to the plants pot. When the water content in the soil is increased, the resistance in the soil will get decreased and conduction of the probes will get started which will make the 7404 Inverter to stop the triggering of first 555 timer. Ultimately it will stop the electrical valve which is connected to the relay. Variable resistor (R5) and capacitor (C1) are used to adjust the valve when to we want to conduct the probes.
- The capacitor C5 (0.01uf) is used to ground, the CV pin of second NE555 timer. C3 will remove the AC noise and allow only DC to the remaining circuit. C4 and R3 will constitute to configure the NE555 in astable multivibrator.

Values of the Components in the Circuit:

- Capacitor (C4) = 10u 16V.
- Capacitor (C5) = 0.01u.
- Resistor (R3) = 27K
- Resistor (R4) = 27K
- Diode (D1 and D2) = IN4148
- Relay = 6V, 150 ohms

Note:

- Battery should be continuously monitored from power outage or simply you can use 9V DC supply adaptor.
- Probes must be inserted into the soil. They should not be kept on the soil.
- Electric valve should be used for best result.

STRESS METER

This stress monitor lets you assess your emotional pain. If the stress is very high, it gives visual indication through a light-emitting diode (LED) display along with a warning beep. The gadget is small enough to be worn around the wrist.

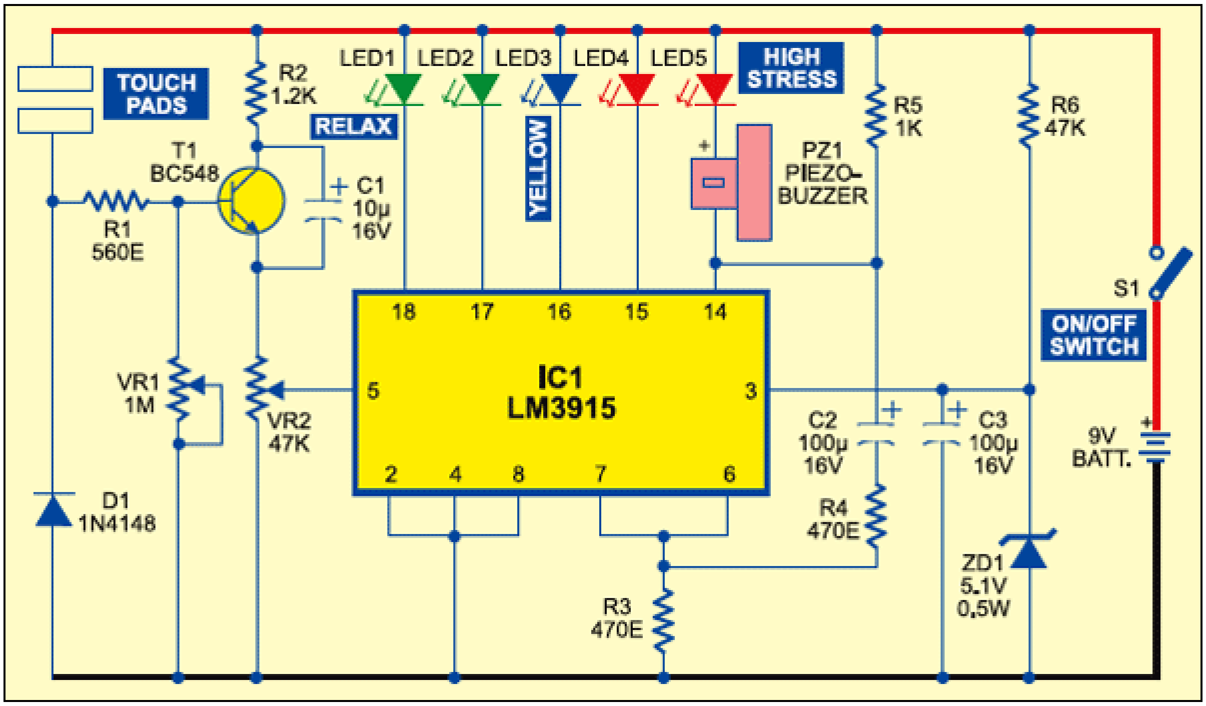


Fig. 1: Circuit of the stress meter

The gadget is based on the principle that the resistance of the skin varies in accordance with your emotional states. If the stress level is high the skin offers less resistance, and if the body is relaxed the skin resistance is high. The low resistance of the skin during high stress is due to an increase in the blood supply to the skin. This increases the permeability of the skin and hence the conductivity for electric current.

This property of the skin is used here to measure the stress level. The touch pads of the stress meter sense he voltage variations across the touch pads and convey the same to the circuit. The circuit is very sensitive and detects even a minute voltage variation across the touch pads.

The circuit comprises signal amplifier and analogue display sections. Voltage variations from the sensing pads are amplified by transistor BC548 (T1), which is configured as a common-emitter amplifier. The base of T1 is connected to one of the touch pads through resistor R1 and to the ground rail through potmeter VR1. By varying VR1, the sensitivity of T1 can be adjusted to the desired level. Diode D1 maintains proper biasing of T1 and capacitor C1 keeps the voltage from the emitter of T1 steady.

The amplified signal from transistor T1 is given to the input of IC LM3915 (IC1) through VR2. IC LM3915 is a monolithic integrated circuit that senses analogue voltage levels at its pin 5 and displays them through LEDs providing a logarithmic analogue display. It can drive up to ten LEDs one by one in the dot/bar mode for each increment of 125 mV in the input.Here, we've used only five LEDs connected at pins 14 through 18 of IC1. LED1 glows when input pin 5 of IC1 receives 150 mV. LED5 glows when the voltage rises to 650 mV and LED5 flashes and piezobuzzer PZ1 beeps when the stress level is high.

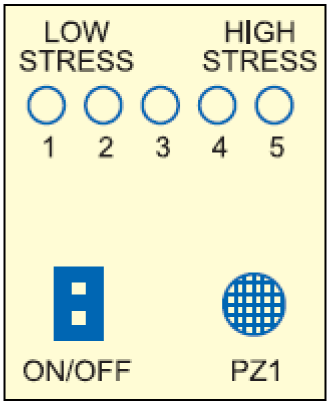


Fig. 2: Display panel

Resistors R4 and R5 and capacitor C2 form the flashing elements. Resistor R3 maintains the LED current at around 20 mA. Capacitor C3 should be placed close to pin 3 for proper functioning of the IC. Zener diode ZD1 in series with resistor R6 provides regulated 5V to the circuit.

The circuit can be assembled on a small piece of perforated board. Use transparent 3mm LEDs and a small piezobuzzer for audio-visual indications. Enclose the circuit in a small plastic case with touch pads on the back side. Two self-locking straps can be used to tie the unit around your wrist.

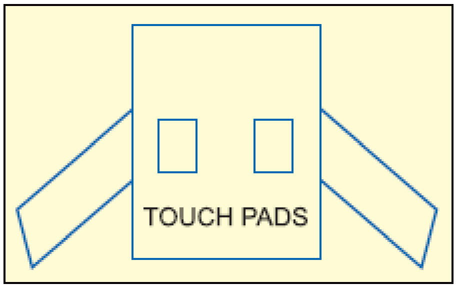


Fig. 3: Self-locking straps

After tying the unit around your wrist (with touch pads in contact with the skin), slowly vary VR1 until LED1 glows (assuming that you are in relaxed state). Adjust VR2 if the sensitivity of IC1 is very high. The gadget is now ready for use.

Cell Phone Detector Circuit

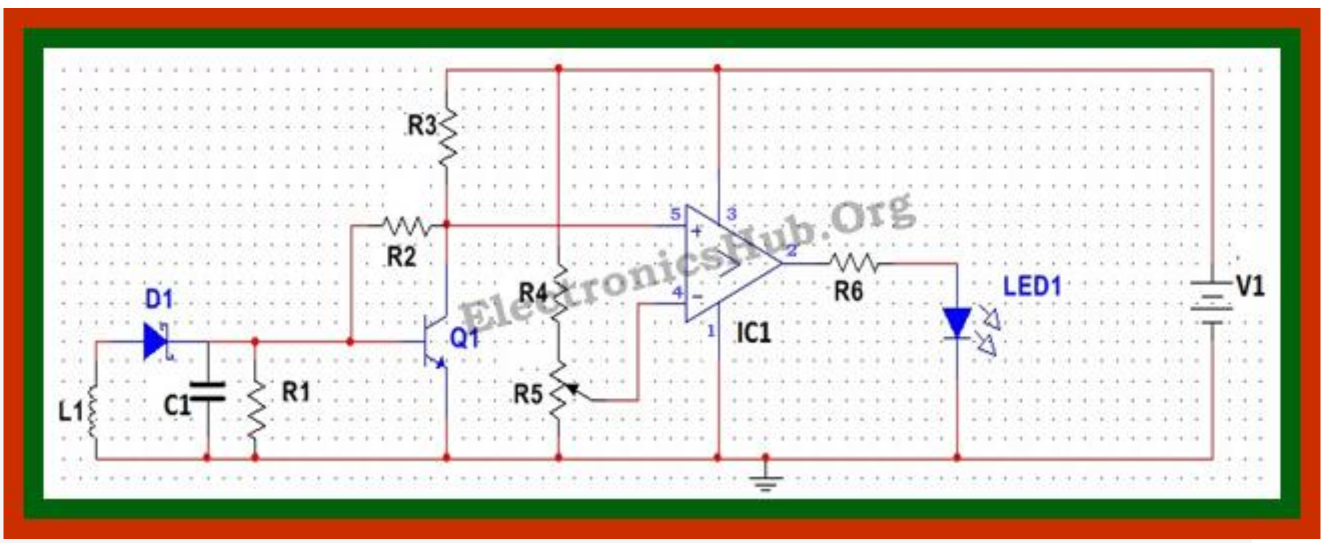
The most common electronic equipment used is cell phones. With advancement in communication technology, the requirement of cell phones has increased manifold. A cell phone typically transmits and receives signals in the frequency range of 0.9 to 3GHz. This article provides a simple circuit to detect the presence of an activated cell phone by detecting these signals

Basic Principle of Mobile Phone Detector Circuit:

The basic principle behind this circuit is the idea of using a Schottky diode to detect the cell phone signal. Mobile phone signal is in the frequency range of 0.9 to 3GHZ. Schottky diodes have a unique property of being able to rectify low frequency signals, with low noise rate. When an inductor is placed near the RF signal source, it receives the signal through mutual induction. This signal is rectified by the Schottky diode. This low power signal can be amplified and used to power any indicator like an LED in this case.

Also Read the Post: Mobile Phone Jammer Circuit

Circuit Diagram of Cell Phone Detector:



Circuit Diagram of Cell Phone Phone Detector – ElectronicsHub.Org

Circuit Components:

- V1 = 12V
- L1 = 10uH
- R1 = 100Ohms
- C1 = 100nF
- R2 = 100K
- R3 = 3K

- Q1 = BC547
- R4 = 200 Ohms
- R5 = 100 Ohms
- IC1= LM339
- R6 = 10 Ohms
- LED = Blue LED

Cell Phone Detector Circuit Design:

Detector Circuit Design:

The detector circuit consists of an inductor, diode, a capacitor and a resistor. Here an inductor value of 10uH is chosen. A Schottky diode BAT54 is chosen as the detector diode, which can rectify low frequency AC signal. The filter capacitor chosen in a 100nF ceramic capacitor, used to filter out AC ripples. A load resistor of 100 Ohms is used.

Amplifier Circuit Design:

Here a simple BJT BC547 is used in common emitter mode. Since the output signal is of low value, the emitter resistor is not required in this case. The collector resistor value is determined by the value of battery voltage, collector emitter voltage and collector current. Now the battery voltage is chosen to be 12 V (since maximum open source collector emitter voltage for BC 547 is 45V), operating point collector emitter voltage is 5 V and collector current is 2 mA. This gives a collector resistor of approx 3 K. Thus a 3 K resistor is used as Rc. The input resistor is used to provide bias to the transistor and should be of larger value, so as to prevent the flow of maximum current. Here we chose a resistor value of 100 K.

Comparator circuit Design:

Here LM339 is used as comparator. The reference voltage is set at the inverting terminal using a potential divider arrangement. Since output voltage from the amplifier is quite low, the reference voltage is set low of the order of 4V. This is achieved by selecting a resistor of 200 Ohms and a potentiometer of 330 Ohms. An output resistor of value 10 Ohms is used as a current limiting resistor.

Mobile Phone Tracking Circuit Operation:

In normal condition, when there is no RF signal, the voltage across the diode will be negligible. Even though this voltage is amplified by the transistor amplifier, yet the output voltage is less than the reference voltage, which is applied to the inverting terminal of the comparator. Since the voltage at non inverting terminal of the OPAMP is less than the voltage at the inverting terminal, the output of the OPAMP is low logic signal.

Now when a mobile phone is present near the signal, a voltage is induced in the choke and the signal is demodulated by the diode. This input voltage is amplified by the common emitter transistor. The output voltage is such that it is more than the reference output voltage. The output of the OPAMP is thus a logic high signal and the LED starts glowing, to indicate the presence of a mobile phone. The circuit has to be placed centimeters away from the object to be detected.

Also Read the Interesting Post: [USB Mobile Phone Travel Charger Circuit]

Theory Behind Cell Phone Tracking System:

Mobile Phone Signal Detection using Schottky Diode:

The signal from mobile phone is a RF signal. When a mobile phone is present near the circuit, the RF signal from the mobile induces a voltage in the inductor via mutual induction. This AC signal of high frequency of the order of GHz is rectified by the Schottky diode. The output signal is filtered by the capacitor. Schottky diodes are special diodes formed by combining N type semiconductor material with a metal and are typically low noise diodes, operating at a high frequency. These diodes have a unique property of conducting at a very low forward voltage between 0.15 to 0.45V. This enables the diode to provide high switching speed and better system efficiency. The low noise is due to the very low reverse recovery time of about 100 per sec.

Signal Amplifier using BJT:

BJT or bipolar junction transistor in its common emitter form is the most common amplifier used. A transistor amplifier works on the fact that the input base current is amplified to the output collector current by a factor of β. Here the emitter is the common terminal. The circuit is biased using a voltage divider circuit formed by combination of two resistors. When a transistor is biased in active region, i.e. the emitter base junction is forward biased and the collector base junction is reverse biased, a small base current results in a larger collector current.

LM339 as Comparator:

LM339 is a comparator IC containing 4 comparators. Here we are using only one comparator. When the voltage at non inverting (+) terminal is higher than the voltage at inverting terminal, the output voltage goes high. When the voltage at inverting terminal is higher, the output voltage goes low.

Cell Phone Detector Circuit Applications:

1. This circuit can be used at examination halls, meetings to detect presence of mobile phones and prevent the use of cell phones.
2. It can be used for detecting mobile phones used for spying and unauthorized transmission of audio and video.
3. It can be used to detect stolen mobile phones.

Limitations of Mobile Phone Detector Circuit:

1. It is a low range detector, of the order of centimetres.
2. The Schottky diode with higher barrier height is less sensitive to small signals.

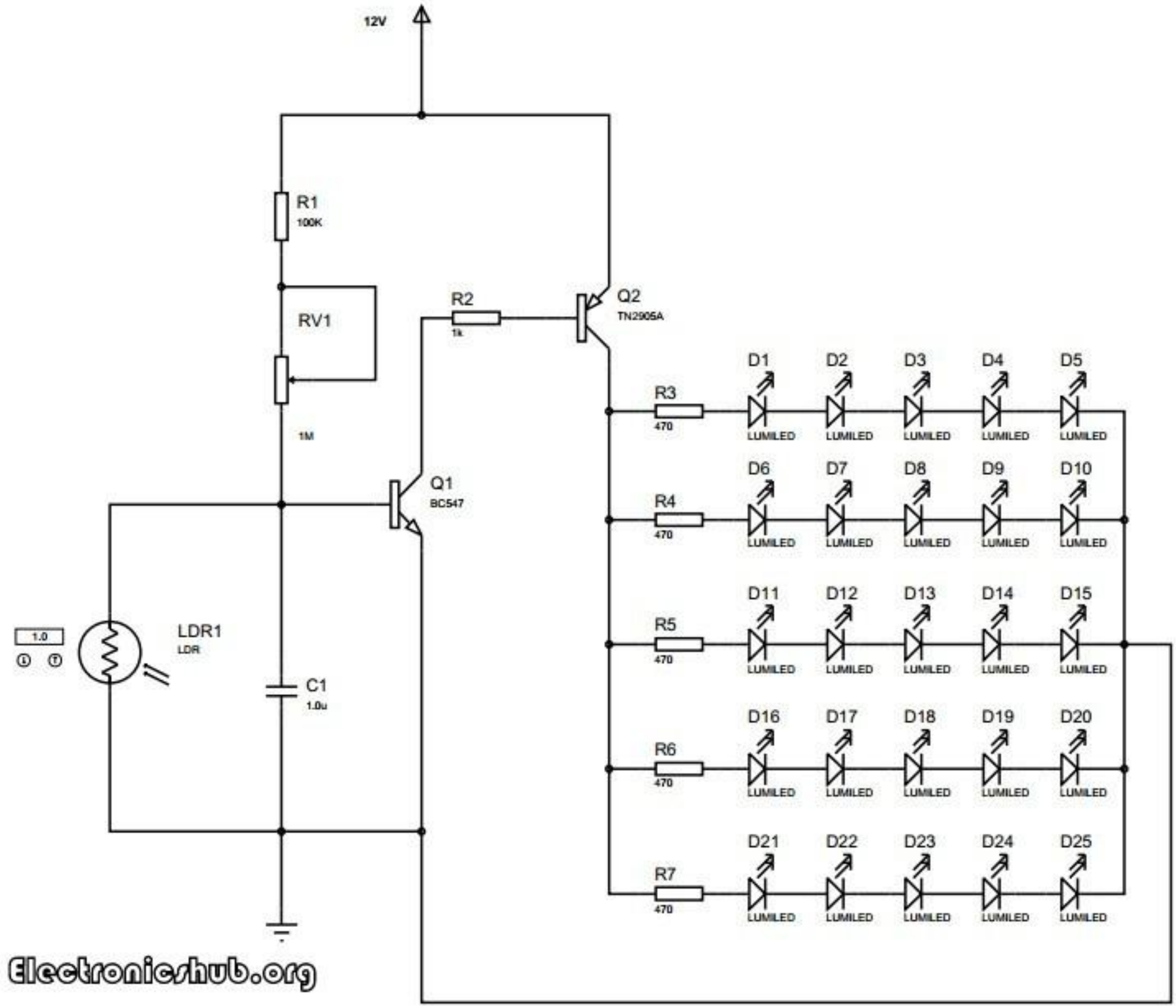
Auto Night Lamp Using High Power LED

Auto Night Lamp Using High Power LEDs is a circuit which turns ON the LED lights interfaced to it at night time and it turns OFF the lights automatically when it is day. Usage of LEDs is growing day by day due to the advantages they provide compared to the conventional filament bulbs or fluorescent lamps. They provide good quality of white light with a better intensity compared to others. They also consume less power compared to their alternatives. These are the advantages which the LEDs encourage us to use them compared to their alternatives

In this article, we shall see the circuit and the working of turning on or off of high power LEDs with light intensity. The element which is used for sensing light in the circuit is the light dependent resistor. The resistance of the light dependent resistor depends on the light incident on it. If the intensity of light incident on it is more, then the resistance of the circuit decreases. If the intensity of light incident on it decreases, then the resistance of the device increases. We are making use of this property of the light dependent resistor to detect the light and thereby operate the LEDs. We are arranging twenty five light emitting diodes in an array such that five LEDs are in series and five such series LEDs are arranged in parallel.

Do you know about How a Light Activated Switch Circuit Works?

Circuit Diagram of Auto Intensity Control of LED Lights:



The transistors are used in saturation mode. They are used as electronic switches in this mode. The transistor BC547 is a general purpose NPN transistor which is used to further switch the LEDs. This is a power transistor with a heat sink. The heat sink helps the transistor to dissipate the generated heat into air so that the transistor can handle higher power loads than it can do without the heat sink.

The entire circuit along with the LEDs is powered by a 12V DC power supply. A battery based DC power supply is usually preferred. However, you can use a ac rectified and regulated power supply.

The LEDs used in the circuit are high powered white LEDs. The intensity of light produced by these LEDs equals an ordinary fluorescent bulb. The lighting produced is sufficient for reading or to do any other daily activity. The circuit can be assembled on a printed circuit board with all the components neatly arranged and the LEDs placed in order. Try to place the LEDs maintaining a distance of about 1 cm between the LEDs so that the the lighting will be well distributed in your room.

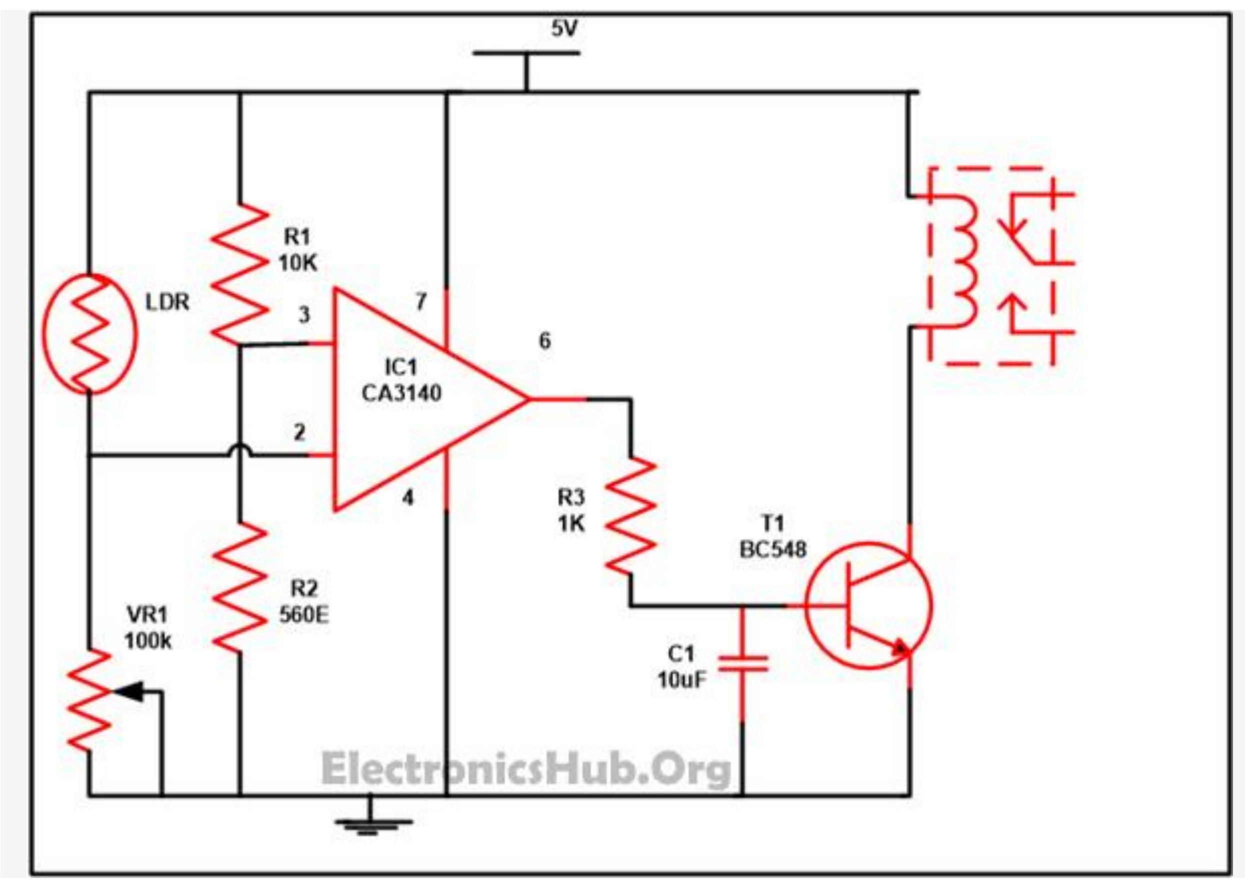
Automatic Street Light Controller Circuit Using Relays and LDR

Did you ever think that how the street lights automatically turn ON in the night and turn OFF automatically at morning? Is there any person who comes to ON/OFF these lights? The following circuit that described below which perform this job automatically. This circuit employed the output from an uncomplicated light/dark activated circuit and oblige a relay in its output which can be further attached to switch ON/OFF a street light and electrical application in a household also.

Many of the people have a phobia of darkness, so to assist them in such situation, we have explained a simple circuit. It will automatically turn on street light in the way of LEDs or bulb coupled with relay, it is well enough to see the object nearby. This circuit is very much easy to work and also the battery power consumed by the circuit is very low because of the very few components used in the circuit.

The whole circuit is based on IC CA3140 which is basically an operational amplifier which can unite the voltage PMOS transistors to the high voltage bipolar transistor on particular chip. LDR (Light depending resistor) whose resistance is based upon the quantity of the light declining on it along with a few more components.

Circuit Diagram of Automatic Street Light Controller Switch Circuit using Relays and LDR:



Automatic Street Light Controller Switch Circuit – ElectronicsHub.Org

Components Used in this Circuit:

- IC
- CA3140 – 1
- Resistor
- R1 (100k) – 1
- R2 (560E) – 1
- R3 (1K) – 1
- R4, R5 (100K) – 2
- VR1 (100K) – 1
- C1 (10uF) – 1
- LDR – 1
- T1 (BC548) – 1

Note: This circuit can also be built using microcontroller. To get an idea about the circuit built using microcontroller, read the post: Street Lights that Glow on Detecting Vehicle Movement.

Components Description:

LDR: LDR is a device whose sensitivity depends upon the intensity of light falling on it. When the strength of the light falling on LDR increases the LDR resistance decreases, while if the strength of the light falls on LDR is decreased resistance increased. In the time of darkness or when there is no light, the resistance of LDR is in the range of mega ohms, while in the presence of light or in brightness in decrease by few hundred ohms.

Testing of LDR- Before mounting any component in the circuit it is a good practice to check whether a component works properly or not so that you can avoid consumption of time in troubleshooting. For testing LDR set the range of multimeter in resistance measurement. After that put the lids on the legs of LDR (as LDR have no polarity so you can connect any lid with leg). Measure the resistance of LDR in the light or brightness, resistance must be low. Now cover LDR properly so that no light beam fall in it, again measure the resistance it must be high. If you got the same result means that LDR is good.

Resistor: It is a passive component having two terminals that are used to manage the current flow in the circuit. A current that flows via a resistor is directly proportional to the voltage that appeared into the resistor.

Resistors are of two types -

i) Fixed Resistor – having a fixed value of resistance
ii) Variable Resistor – whose value of resistance can be changed for example if we have a resistor of 5K then the value of resistance will vary from 0 to 5 k.

Value of resistance can be calculated with the help of multimeter or with the color code that is visible on the resistor.

Capacitor: It is a passive component with two terminals and used to store charges. Capacitors are mad up of two conductors which are separated by the dielectric medium flows in between. It works when potential difference applied across the conductors polarize the dipole ions to store the charge in the dielectric medium.

There are two types of capacitors -

i) Polarized – They have polarity means + and- sign marked on it. It is mainly used to store the charges. Before troubleshooting the circuit capacitors must be fully discharged as they have charges store in it.
ii) Non-polarized – They don't have a polarity and can be mounted in any of the way. They are generally used to remove the noises present during the conversion of AC into DC.

Relay: It provides isolation between the controller and the device because as we know devices may work on AC as well as on DC but they receive signals from microcontroller which works on DC hence we require a relay to bridge the gap. The relay is extremely useful when you need to control a large amount of current or voltage with the small electrical signal.

Factors for Selecting an Appropriate Relay:

- The voltage and current required to strengthen the coil.
- The utmost voltage which we will acquire in the output.
- Amount of the armature.
- Amount of contacts for the armature.
- Number of electrical associates (N/O and N/C).

Automatic Street Light Controller – Circuit Simulation Video:

Working of Automatic Street Light Controller Switch Circuit:

The working of circuit is very much easy to understand. In this circuit, we used IC CA3140 which is basically an operational amplifier. Pins 2 and 3 of these IC are used to compare the voltage and give us the output in return ie it works as a potential divider in its inverting and non-inverting inputs (pins 2 and 3). In this LDR and VR1 form one potential divider which is used to provide a variable voltage at the inverting input (that is 2) and the second potential divider is built around non-inverting input (pin 3) with the help of R1 and R2 which will grant half of the supply voltage to non inverting pin.

As we know property of LDR that during the time of day resistance is low therefore voltage at the inverting input (IE pin 2) is higher than the voltage at the non-inverting input (pin3) hence the output at the pin6 is low so the transistor goes into the cutoff state which means LED or bulb will not glow.

But in dimness or in night we know that resistance of LDR is high hence voltage at inverting input pin 2 of the IC CA3140 decreases than the non inverting input pin 3 as a result output pin 6 moves to high state which make transistor to conduct and the LED or bulb associated to it start simmering.

We need to pay attention while connecting relay with bulb. As different bulbs have different wattage, so it must support the relay or else relay will not energize.

Check out the output video of this project

High and Low Voltage Cutoff with Delay and Alarm

This circuit protects the costly equipment like TVs, air conditioners, Refrigerators, etc. from high voltages as well as low voltages. If the supplied voltage is abnormal (High or low) then the circuit automatically turns of the load. This circuit also produces sound when main power resumes.

Generally voltage stabilizers are used in this type of applications to maintain constant AC voltage. However due to the abnormal AC supply, relays in voltage stabilizer switches ON and OFF continuously. The frequent energization or de-energization of relays leads to the shortening the life time of appliances and the stabilizer itself. Hence it is better to use this project in order to control the appliances instead of costly stabilizers.

Related Post:* *Variable Voltage Power Supply from Fixed Voltage Regulator

High and Low Voltage Cutoff with Delay and Alarm Principle:

When supply voltage is high, the DC voltage at the cathode of zener diode D4 becomes greater than 5.6V. As a result, transistor Q1 is in ON and transistor Q2 gets switched off. Hence the relay RL1 de-energizes and load would be in OFF condition.

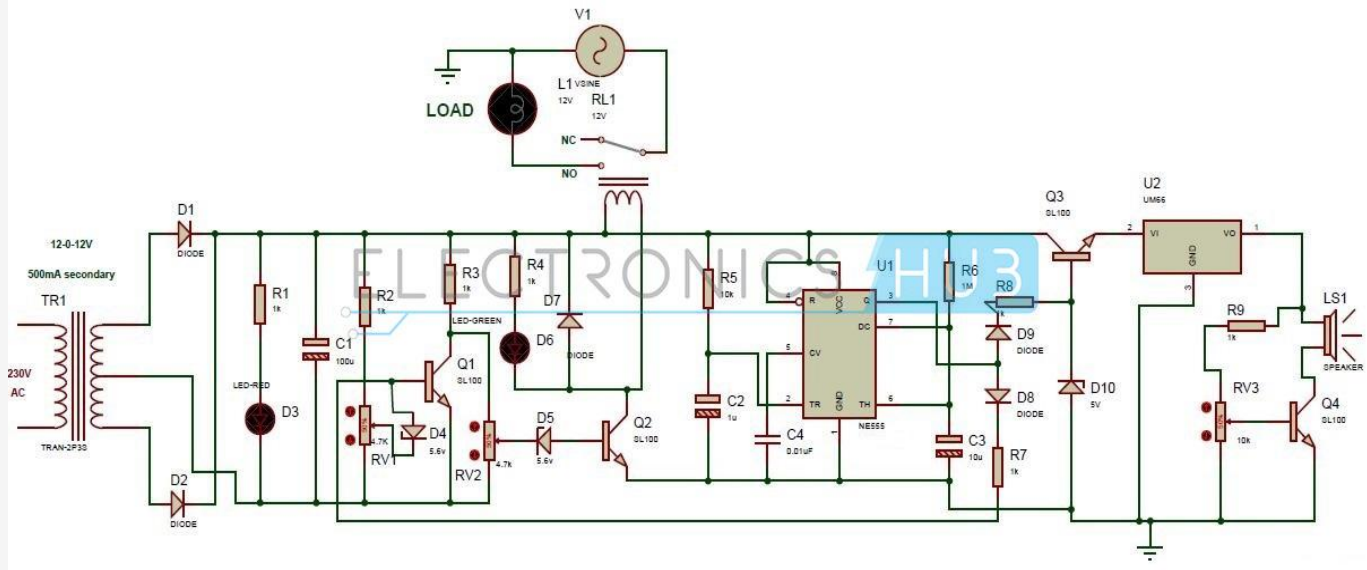
Under low supply voltage condition, transistor Q1 switches to ON condition and as a result transistor Q2 switches off, making the load OFF.

When normal AC supply voltage is applied, the DC voltage at the cathode of zener diode D4 is less than 5.6V, now transistor Q1 is off condition. As a result, transistor Q2 is in ON condition, hence load switches to ON by indicating the green LED.

Supply voltage	Q1 state	Q2 state	Relay	Load
High	ON	OFF	De-energises	OFF
Low	ON	OFF	De-energises	OFF
Normal	OFF	ON	Energises	ON
Resume	ON	OFF	De-energises	OFF

When supply is resumed after a break, 555 timer IC goes low and this triggers the 555 timer IC. The output of 555 timer IC makes sound IC to operate through the transistor Q3, at the same time, transistor Q1 switches to ON condition as the output 555 timer is connected to the base of Q1 and results transistor Q2 OFF. Thus the relay switches off the load.

High and Low Voltage Cutoff with Delay and Alarm Circuit Diagram:



High and Low Voltage Cut-off with Delay Alarm Circuit Diagram

Circuit Components:

- Center tapped Transformer (12-0-12V, 500mA)
- NE 555 timer
- UM66 IC
- Speaker
- 12V Relay
- 4 Transistors – SL100
- 2 Zener diodes – 5.6V
- Zener diode – 5V
- LED's – red, green
- 5 Diodes – 1n4001
- 16V Electrolytic capacitors – 100uF, 10uF, 1uF
- Ceramic capacitor – 0.01uF
- Potentiometers – 4.7k, 4.7k, 10k
- 7 Resistors – 1k
- Resistors – 10k, 1M

High and Low Voltage Cutoff with Delay and Alarm Circuit Design:

In this circuit, 555 timer is configured to operate in monostable mode. In this circuit, pin4 and pin8 are shorted to avoid sudden resets. The pulse width of the 555 timer output signal is about 10 seconds. This output signal drives the speaker.

Speaker gives melodious sound when power is resumed because of UM66 IC. The volume of the speaker can be controlled by using POT RV3.

Green LED indicates normal AC supply voltage. Red LED is used for power indication.

Here zener diode D4 along with transistor Q1 is used for comparing the input voltage. Transistor Q2 switches the load based on the output of transistor Q1. Diodes D1 and D2 are used for rectification purpose. Capacitor C1 filters the input AC ripples.

How to Operate this Circuit?

1. Give the connections according to the circuit Diagram
2. While giving the supply, make sure that there is no common connection between AC and DC supplies.
3. Switch ON the input AC supply.
4. Make the input supply voltage low or high. Now, you can observe that load is automatically switches off.
5. Apply normal supply voltage. Now, you can observe that load will run by indicating the green LED.
6. Now resume the power. You can listen melodious sound.
7. Switch off the supply.

High and Low Voltage Cutoff with Delay and Alarm Circuit Advantages and Applications:

1. Cost is less as compared to voltage stabilizers
2. Consumes less power.
3. This circuit is used in homes and offices to protect equipments from high voltages and low voltages.

Solar Inverter for Home

Introduction to Solar Inverter:

We see many people using Solar inverters these days which proves that its necessity has been increased in the current years. A Solar inverter is similar to a normal electric inverter but uses the energy of the Sun i.e. Solar energy. A solar inverter helps in converting the direct current into alternate current with the help of solar power. Direct power is that power which runs in one direction inside the circuit and helps in supplying current when there is no electricity. Direct currents are used for small appliance like mobile e phones, MP3 players, IPod etc. where there is power stored in the form of battery. In case of alternative current it is the power that runs back and forth inside the circuit. The alternate power is generally used for house hold appliances. A solar inverter helps devices that run on DC power to run in AC power so that the user makes use of the AC power. If you are thinking why to use solar inverter instead of the normal electric one then it is because the solar one makes use of the solar energy which is available in abundant from the Sun and is clean and pollution free.

Solar inverters are also called as photovoltaic solar inverters. These devices can help you save lot of money. The small-scale grid one have just two components i.e. the panels and inverter while the off grid systems are complicated and consists of batteries which allows users to use appliances during the night when there is no Sunlight available. The solar panel and the batteries that are placed on rooftops attract Sun rays and then convert the Sunlight into electricity. The batteries too grab the extra electricity so that it can then be used to run appliances at night.

Get an idea about [Inverter for Home] also.

Working of Solar Inverter:

Now after knowing what a solar inverter is, let’s talk about its working. Solar panels produce direct electricity with the help of electrons that are moving from negative to positive direction. Most of the appliances that we use at home work on alternative current. This AC is created by the constant back and forth of the electrons from negative to positive. In AC electricity the voltage can be adjusted according to the use of the appliance. As solar panels only produce Direct current the solar inverter is used to convert the DC to AC.

An inverter produces square waves or a sine wave which can be used for running lights, televisions, lights, motors etc. However these inverters also produce harmonic distortion. Expensive inverters make use of lots of steps to produce a sine wave and thus are found in residential solar inverters. Basically inverters should be a large one so that it supplies enough power to all the necessary appliances.

An inverter s easy to buy but choosing the right solar inverter for your appliance is more important. Thus you must always consult a solar professional before buying on. We know that the energy derived from sun is solar energy which is one of the cleanest sources of energy. Also it can be used to provide lighting to houses.

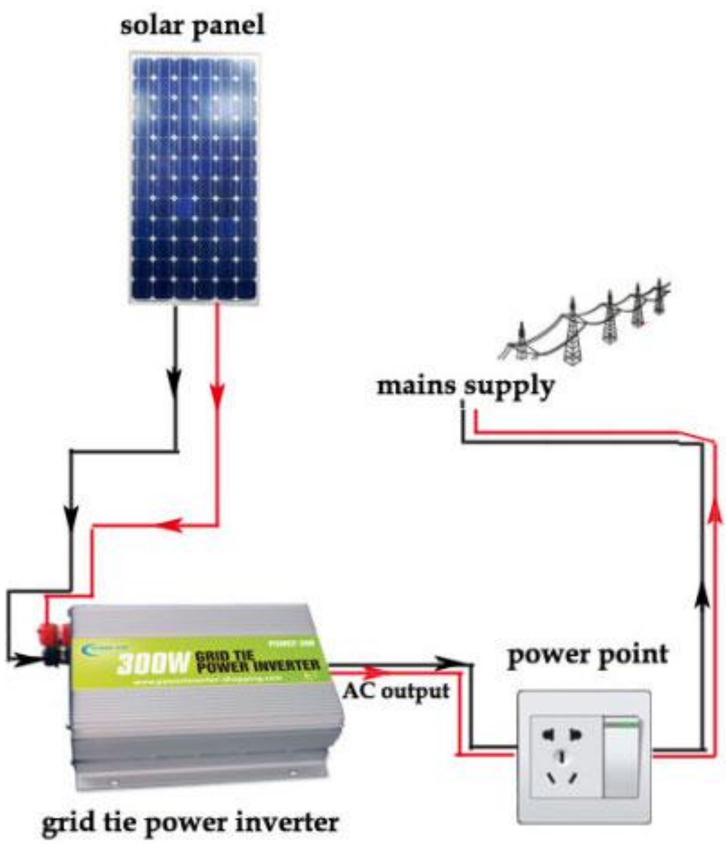
You can make us of the photovoltaic tiles that attract energy from Sun and converts it into a clean form of electricity which can be used to light, houses, industries and companies. The cells of photovoltaic consist of positive and negative silicon that is placed underneath a slice of glass. When the protons of the Sunlight hit the

PV cells they knock the neutrons present in the silicon. Now the negative charged neutrons get attracted to the silicon but then are held inside a magnetic field. The wires attached on the silicon catch hold of these neutrons and while connecting to the circuit, current is formed. This then gives space for direct electricity and for converting that into alternate electricity an inverter is used so that the house appliances can run. As mentioned before major of the house appliances work on alternate current hence an inverter is used to convert DC to AC.

Solar power apart from making your home appliances work can also be used to heat water and swimming pools too.

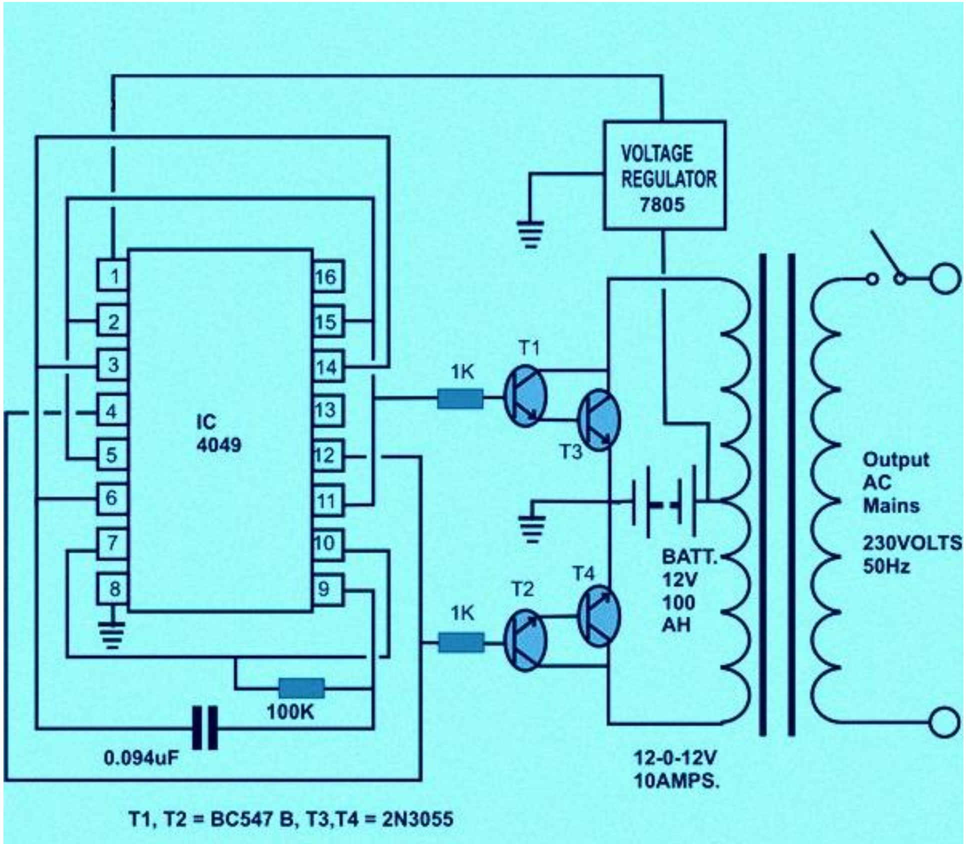
How to Make a Solar Inverter?

The energy derived from Sun is a renewable one and is totally free of cost. We have learnt how the solar inverter helps in providing electricity and now we shall learn how a solar inverter is made. A solar panel is capable enough to convert the heat or energy of the Sun into direct current.



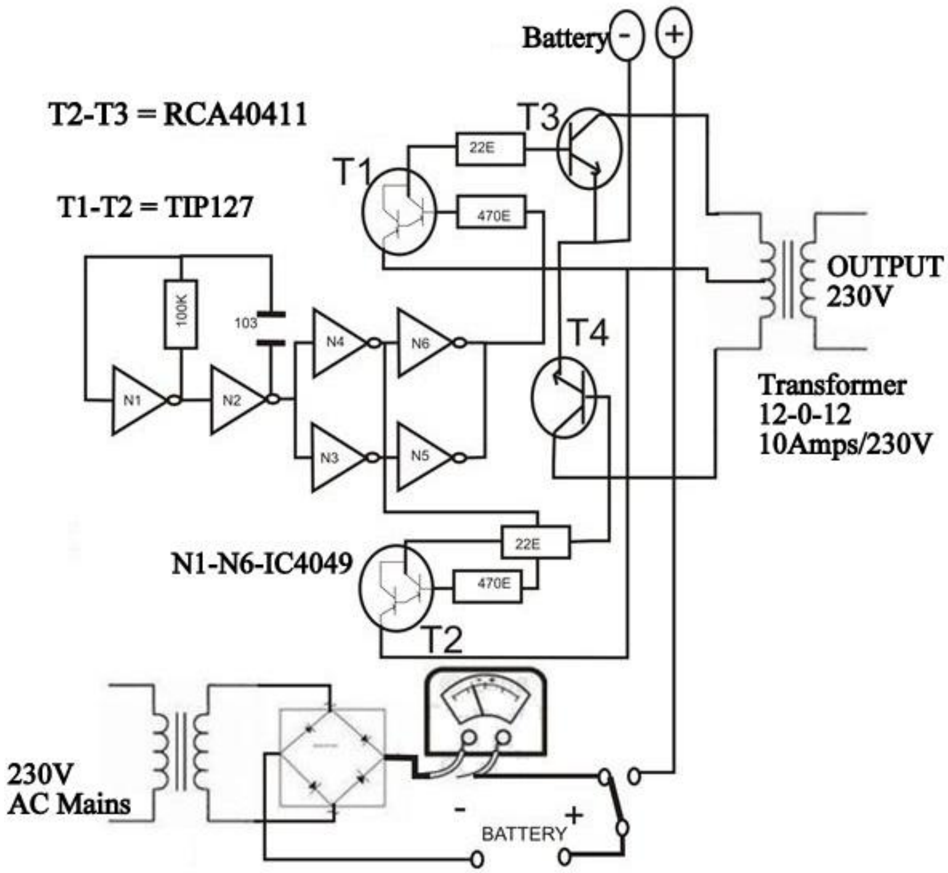
Solar Inverter Design:

To easily understand the construction of a solar inverter lets discuss the following construction sample:-



1. According to the circuit diagram initially do the assembling of the oscillator part which consist of the small components & IC. It is finely completed by interrelating the part leads itself and fusing the joints.
2. Now place the power transistors into the acutely pierced aluminum heat sinks. This is crafted by cutting aluminum sheet into specified sizes and bending their sides, so that it can be hold tightly.
3. Make use of mica isolation kit to fix transistors in the aluminum heat sink, evade short circuiting & direct contact of the transistors from ground & each other.
4. Fasten the heat sink congregation to the bottom of a properly ventilated, strong, thick gauge metal enclosed space.
5. Also fasten the power transformer next to the aluminum heat sinks by making use of screw & bolts.
6. Now join the suitable points of the assembled circuit board & power transistors on the aluminum heat sinks.
7. At last connect the power transistor's productions to the subsequent winding of the power transformer.
8. End the assembly by fastening and interlocking the outer electrical fittings such as switches, mains cord, fuses, sockets, and the battery inputs.
9. A voluntary solar power supply circuit and a transformer may be added within to charge the battery when necessary (check diagram).

Solar Inverter Circuit Diagram:



To understand well how to construct a solar inverter, it is vital to study how the circuit operates through with the help of following steps:

- N1 & N2 gates of IC 4049 are employed as an oscillator. It carries out the key role of providing square waves to the inverter division.
- N3 to N6 gates are employed as buffers so that the circuit is not dependent on load.
- Continuously changing voltage from the buffer phase is useful to the bottom of the current amplifier transistors T1 & T2. These transistors perform in harmony with the practical changing voltage and boost it to the bottom of the output transistors T3 & T4.
- These producing power transistors swing at a full oscillation, providing the total battery voltage.
- This energy produced is from solar panel & is employed to power the output load.

Solar Inverter Advantages:

After knowing in detail what a solar inverter is and how different useful it is to make appliances work at residential and industrial levels we must discuss about the many advantages of the device.

- Solar energy has always helped in reducing global warming and green house effect.

- Also use of solar energy helps in saving money many people have started using solar based devices
- A solar inverter helps in converting the Direct current into batteries or alternative current. This helps people who use limited amount of electricity.
- There is this synchronous solar inverter that helps small homeowners and power companies as they are large in size
- Then there is this multifunction solar inverter which is the best among all and works efficiently. It converts the DC power to AC very carefully which is perfect for commercial establishments
- This inverter is cost effective i.e. less expensive than generators
- Apart from solar inverters there are other devices too that make use of solar energy namely, solar cooker, heater.
- Solar inverters are the best way and they are better than the normal electric ones. Also their maintenance does not cost much money

Solar Inverter Disadvantages:

- Initially you need to shell out a lot of money for buying a solar inverter
- It will work effectively and produce direct current only when the Sunlight is strong.
- The solar panels that are used to attract Sunlight requires lots of space
- The device can work efficiently only if the presence of the Sun is strong.
- Solar Inverters can work when there is no Sunlight but provided their battery is charged fully with the help of Sunlight.

After counting on some of the disadvantages of solar inverter we can state that when a device is very useful at some point of time it too requires proper maintenance and when it comes to a solar device the equipment of solar energy is must. So buy a solar device only if you have plenty of solar energy available.

Read the post **Solar Inverter Manufacturers in India** to know about Solar Inverters providing dealers details.

Electronic Eye Controlled Security System

Electronic eye is also called magic eye. As the automation is emerging technology these days, just imagine a door bell that automatically rings when a person visit your home. This also provides security when any person is trying to enter into your home without your permission. Electronic eye is the electronic device that continuously watches if anyone is visiting your home. This article presents the circuit of electronic eye. Before going to know complete details about this circuit, get an idea about Light Activated Switch Circuit using LDR**.**

Electronic Eye Controlled Security System Circuit Principle:

The main principle of the circuit is to ring the door bell when there is any person at the entrance. Light on the LDR determines whether a person is present or not. When there is any object at the entrance, LDR is in dark and buzzer starts ringing and the LED starts glowing.

Circuit Diagram of Electronic Eye Controlled Security System:

Electronic Eye Controlled Security System Circuit Diagram

Circuit Components:

- 7805 regulator U1
- Resistors R1
- 1N4007 diode D1
- Capacitors C1,C2
- BC 547 transistors Q1,Q2
- 7404 IC U2
- Light Dependent Resistor
- Buzzer BUZ1

- Light Emitting Diode D2.
- Bread board
- Connecting wires
- DC 9V battery.

Electronic Eye Controlled Security System Circuit Simulation Video:

Electronic Eye Controlled Security System Circuit Design:

This circuit can be divided into two parts. One is the power supply and the other is logic circuit. In the power supply 9v supply is converted to the 5v .The logic circuit operates the buzzer when any shadow falls on it.

Power supply circuit consists of battery, diode, regulators and capacitors. Initially a 9v battery is connected to the diode. Diode used here is a P-N junction diode of 1N4007 series. In this circuit 1N4007 is connected in the forward bias condition .The main purpose of the diode in this circuit is to protect the circuit from negative voltages .There is a chance of connecting battery with reverse polarities which damages the circuit. So P-N junction diode connected in the forward bias allows the current to flow only in one direction and thus the circuit can be protected .There is some voltage drop across the diode. A voltage of 0.7V is dropped across the diode.

A regulator is used for regulating the output voltage of the circuit .The regulator IC used here is 7805.78 represents the series and 05 represents the output voltage .Thus a voltage of 5v is produced at the output of the regulator .Two capacitors are used before and after the regulator .These two capacitors eliminate the ripples .Thus a constant voltage is produced at the output of the regulator, which is applied to the logic circuit.

Also Read the Post: Automatic LED Emergency Light Circuit using LDR

The logic circuit mainly consists of Light Dependent Resistor, transistors,Op-amp IC and a buzzer. A 220KOhm resistor is connected in series to the LDR. Light dependent resistor will have resistance in mega ohms when it is placed in dark. This resistance value will decrease gradually when it is placed in the light. Thus there is a variation in the series resistances. When the LDR is in dark it has high resistance and produces the logic high value at the output .When the LDR is in light, the resistance value of the LDR decreases and at the not gate it gives logic low voltage.

The op-amp IC used is LM 358.This IC compares the two inputs and produces an output which is applied to the transistor. Two transistor are connected to the buzzer from these resistances. The first transistor inverts the input from the op-amp. The second transistor drives the buzzer. The diode is placed for protection.

Buzzer used here is a 5v magnetic buzzer. It has two pin at the output. One pin is connected to the not gate and the other pin is connected to the Light Emitting Diode.LED is used for indication only. When the output from logic gate is high buzzer starts ringing. Led also starts blinking.

Electronic Eye Controlled Security System Project Output Video:

How to Operate this Electronic Eye Controlled Security System Circuit?

- Initially, connect the circuit as shown in the circuit diagram on the bread board.
- Now connect the supply voltage of 9v using battery.
- Place the Light Dependent Resistor in light .You can observe no sound is produced from the buzzer.
- Place the LDR in dark buzzer starts ringing. LED connected to the buzzer also starts blinking.
- As the intensity falling on the LDR increases sound produced by the buzzer increases.

Electronic Eye Controlled Security System Applications:

- This can be used in door bell circuits.
- This can be used in garage door opening circuits.
- Electronic eye can be used in security applications.

Biometric Attendance System Circuit

Biometrics is the emerging technology used for identification. Biometric refers to automatic identification of a person based on biological characters such as finger print, iris, facial recognition, etc. In this article finger print based attendance system is proposed. Attendance in educational institutions, industries will require more paper work and time. To reduce this, automatic attendance system using finger print was developed. We also call it as Biometric Attendance System. We have already seen how to used RFID Based Attendance System using AVR Microcontroller. **Here, we are going to explain how to design the biometric attendance system circuit using AVR Microcontroller.**

Biometric Attendance System Circuit Principle:

The main aim of this circuit is to take the attendance and display when requested.

Finger print identification is based on the fact that no two persons will have the same finger print in this world. This is because of the peculiar genetic code of DNA in each person. Finger print module differentiates between two fingers based on the ridges and valleys on finger print. When the finger print is given it stores the points where there are changes in the direction of ridges and valleys using some algorithms. Inside the finger print module a DSP processor is present to implement and analyze the algorithm.

Main heart of the circuit is finger print module. This sends commands to the controller when ever finger print is matched. Microcontroller receives these commands from the finger print module and uses the internal EEPROM to store the attendance. Keypad is used to send the requests to the controller either enroll the new one or to save the attendance or to exit.LCD display displays the messages related to the commands received.

Biometric Attendance System Circuit Diagram:

Circuit Diagram of Biometric Attendance System

Circuit Components:

- AVR microcontroller development board.
- Fingerprint module R305.
- Keypad (4*3).
- Atmega8 microcontroller
- RS232 Serial cable.
- DC Battery or Adaptor (12V, 1Amp).
- 16*2 Alpha Numeric LCD.
- Single pi connecting wires.

Biometric Attendance System Circuit Design:

Here, we used an ATmega8 microcontroller which is an AVR family microcontroller. It is 8 bit microcontroller and has 23 programmable input and output pins. It has 8 KB of flash memory, 512 bytes of EEPROM, 1KB of SRAM.

Biometric module used here is R305 series finger print module. It supports USART communication protocol. Here, USART protocol is used for communicating with the micro controller. USART is universal synchronous and asynchronous receiver and transmitter. This module has four pins out 1) Transmit, 2) Receive, 3) Vin, 4) GND. Transmit pin is connected to the receive pin of the microcontroller. Receive pin should be connected to the transmit pin of the microcontroller. Vin is applied with a voltage of 5V and GND is connected to ground. Data can be transmitted or received using serial communication.

Finger print processing involves two steps.1) finger enrollment and 2) finger matching. Initially, to enroll the finger user must give his finger print twice to the module. Module checks these two images and generates a template image and stores it. In the second step of finger matching, for 1:1 matching input finger print is matched with the template image generated and it generates an acknowledgement. For 1: N matching input is matched with the images in the library. It gives the matched image, a page id of the matched image is generated.

Keypad used in this project is 4*3 keypad i.e. it has four rows and three columns. Columns of the keypad are connected to the PORT D pins of the microcontroller. PD5 to PD7 pins are connected to the three columns of the keypad. Rows are connected to the PORT C of the microcontroller. PC0 to PC3 pins are connected to the rows of the keypad. To give attendance, press 1 from the keypad and to enroll press 2 from the keypad, to clear all the data press 3 from the keypad.

Liquid crystal display is used for displaying the messages. This is interfaced to PORTB of the micro controller. LCD in 4bit mode is connected to the micro controller. D4-D7 pins are connected to the PB0-PB3 pins of the microcontroller. RS pin is connected to the PB4, RW pin is connected to the PB5 and Enable pin is connected to the PB6 pin.

Working of Fingerprint Based Attendance System Circuit:

1. Power the AVR development board.
2. Burn the code into the microcontroller using serial cable.
3. While burning the code make sure that slide switch is in programming mode.
4. After burning the code switch off the supply and disconnect the serial cable.
5. Now connect the circuit as shown in the diagram.
6. LCD will display “Biometric Attendance System”.
7. After sometime it will display a message “1.Attendance, 2.Save, 3.Clear”.
8. Now press 1 from the keypad. It will take the attendance if you place your finger on the module. If your finger is not matched it will indicate the same.
9. If you want to save your roll number press 2 from the keypad. It will ask you to enter the roll number and asks you to place your finger. After saving successfully your details it displays a message saved.
10. To enroll again press 1 from the keypad and press 2 to exit.
11. If you want to clear the data press 3 from keypad and enter the password.

Biometric Attendance System Circuit Applications:

1. This can be used in educational institutions.
2. Biometric attendance system can be used in industries.

3. Biometrics can be used in ATM for authentication.
4. Finger print authentication can be used in access control.

Limitations of the Circuit:

- There is a chance of misusing the technology by placing a fake finger print.
- Modules are sensitive and they need to be handled carefully.

Battery Level Indicator

Battery level indicator indicates the status of the battery just by glowing LED's. For example six LED's are glowing means battery capacity 60% remains. This article explains you how design battery level indicator. You can use this circuit to check car battery or inverter. So by using this circuit, we can increase the lifetime of battery.

This circuit is designed based on lm3914 IC (Integrated chip). This IC is LED dot/bar display driver.

Battery Level Indicator Circuit Principle:

The heart of this battery level indicator circuit is LM3914 IC. This IC takes input analog voltage and drives 10 LED's linearly according to the input analog voltage. In this circuit there is no need of resistors in series with led's because current is regulated by the IC.

Get an idea about the related post – How Automatic Battery Charger Circuit Works using LM317?

Battery Level Indicator Circuit Diagram:

Battery Level Indicator Circuit Diagram

Circuit Components:

- Lm3914 IC
- LED’s -10
- SPST switch
- Resistors -18k,4.7k, 56k
- Potentiometer – 10k
- 12V battery
- Connecting wires

Battery Charge Indicator Circuit Design:

In this circuit LED's (D1-D10) displays the capacity of the battery in either dot mode or display mode. This mode is selected by the external switch sw1 which is connected to 9^{th} pin of IC. 6^{th} and 7^{th} pins of IC are connected to the ground through a resistor. This resistor controls the brightness of LED's. Here resistor R3 and POT RV1 forms potential divider circuit. Here pot RV1 is used for calibration. There is no need of any external power supply to this circuit.

The circuit is designed to monitor 10V to 15V DC. The circuit will work even if the battery voltage is 3V. The operating voltage of this IC is 3v to 25v DC. Lm3914 drives led's, LCDs and vacuum fluorescents. The IC contains adjustable reference and accurate 10-steps divider. This IC can also acts as sequencer.

Lm3914 Features:

- Internal voltage reference from 1.2 to 12v DC.
- Programmable output current 2mA to 30mA.
- LED driver outputs are current regulated.
- No multiplexing interaction between outputs.
- It supports wide range of temperature from 0 to 70 degree Celsius.
- For bar graph display – connect 9^{th} pin of IC to the supply
- For dot display – leave the 9^{th} pin of IC

We can also connect different color led's to indicate the status. Connect D1 to D3 red LED's which indicates shut down stage of your battery and use D8-D10 green color LED's which indicates 80 to 100 percentage of the battery and use yellow color for remaining.

Do you know about the concept – How a Wireless Power Transfer Circuit Works?

With a little modification we can use this circuit to measure other voltage ranges also. For this remove the resistor R2 and connect upper voltage level to the input. Now vary the resistance of Pot RV1 till the D10 LED glows. Now remove upper voltage level at the input and connect lower voltage level. Connect a high value variable resistor in the place of resistor R2 and vary it till the D1 LED glows. Now disconnect the pot, measure the resistance across it and connect resistor of same value in place of R2. Now the circuit is ready to monitor other voltage ranges.

This circuit is most suitable for indicating 12V battery level. In this circuit each led indicates 10 percent battery level. We can extend this circuit to 100 steps by cascading lm3914 IC's.

Battery Level Indicator Project Output Video:

How to Operate Battery Level Indicator Circuit?

- Connect 12V DC battery to the input.

- Now adjust the pot RV1 so that LED D1 just starts glowing.
- Now increase the input Dc voltage slowly and observe the LED's
- First led will glow for 1.2V and second LED is for 2.4 V and so on.

Below table shows the status of LED's with input voltage level.

Battery Level	Percentage	Status of LED's
1.2V	10	D1 - ON
2.4V	20	D1, D2 - ON
3.6V	30	D1, D2, D3 - ON
4.8V	40	D1, D2, D3, D4 - ON
6.0V	50	D1, D2, D3, D4, D5 - ON
7.2V	60	D1, D2, D3, D4, D5, D6 - ON
8.4V	70	D1, D2, D3, D4, D5, D6, D7 - ON
9.6V	80	D1, D2, D3, D4, D5, D6, D7, D8 - ON
10.8V	90	D1, D2, D3, D4, D5, D6, D7, D8, D9 - ON
12V	100	ALL LED's - ON

Battery Charge Level Indicator Circuit Applications:

- We can use this circuit to measure car battery level.
- This circuit is used to calibrate inverter status.

Limitations of the Circuit:

- This battery level indicator works only for small voltages.
- This circuit is theoretical and may require some changes to work in practical.

Automatic Battery Charger Circuit

Have you ever tried to design a battery charger which charges the battery automatically when battery voltage is below the specified voltage? This article explains you how to design an automatic battery charger. This charger automatically shut off the charging process when battery attains full charge. This prevents the deep charge of the battery. If the battery voltage is below the 12V, then circuit automatically charges the battery.

Automatic Battery Charger Circuit Principle:

If the battery voltage is below 12V, then the current from LM317 IC flows through the resistor R5 and diode D5 to the battery. At this time zener diode D6 will not conduct because battery takes all the current for charging.

When the battery voltage rises to 13.5V, the current flow to the battery stops and zener diode gets the sufficient breakdown voltage and it allows the current through it. Now the base of the transistor gets the sufficient current to turn on so that the output current from LM317 voltage regulator is grounded through the transistor Q1. As a result Red LED indicates the full of charge.

Also get an idea about <u>how to design a battery charger circuit using SCR</u>

Automatic 12v Portable Battery Charger Circuit Diagram:

Circuit Diagram of Automatic Battery Charger

Circuit Components:

- 15-0-15V, 1A center tapped transformer
- LM317T voltage regulator
- 12V DC battery
- BD139 NPN transistor
- LED's – red, green

- 8.2V zener diode
- 1n4007 diodes – 3
- electrolytic capacitor – 470uF
- pot – 10k
- resistors (1/2 watt) – 100, 240 ohms
- 2 Resistors – 1k
- Resistor – 2.2k
- connecting wires

Automatic Battery Charger Circuit Design:

This **automatic battery charger circuit** design mainly involves two sections – power supply section and load comparison section.

The main supply voltage 230V, 50Hz is connected to the primary winding of the center tapped transformer to step down the voltage to 15-0-15V.

The output of the transformer is connected to the Diodes D1, D2. Here diodes D1, D2 are used to convert low AC voltage to pulsating DC voltage. This process is also called as rectification. The pulsating DC voltage is applied to the 470uF capacitor to remove the AC ripples. Thus the output of the capacitor unregulated Dc voltage. This unregulated DC voltage is now applied to the LM317 variable voltage regulator to provide regulated DC voltage. The output voltage of this voltage regulator is variable from 1.2V to 37V and the maximum output current from this IC is 1.5A. The output voltage of this voltage regulator is varied by varying the pot 10k which is connected to the adjust pin of LM317.

Lm317 voltage regulator output is applied to the battery through the diode D5 and resistor R5. Here diode D5 is used to avoid the discharge of battery when main supply fails. When battery charges fully, the zener diode D6 which connected in reverse bias conducts. Now base of BD139 NPN transistor gets the current through the zener so that the total current is grounded. In this circuit green LED is used for indicating the charge of the battery. Resistor R3 is used to protect the green LED from high voltages.

Charger settings:

The output voltage of the battery charger should be less than 1.5 times of the battery and the current of the charger should be 10% of the battery current. Battery charger should have over voltage protection, short circuit protection and reversed polarity protection.

NOTE: Also get an idea about [how to build a battery charging level indicator circuit?]()

How to Operate this Automatic Battery Charger Circuit?

1. Initially give the connection as shown in the circuit diagram.

2. While giving the connections, take care of connections in such a way that there is no common connection between AC and DC supplies.
3. Now connect a fully charged battery as a load to the circuit, then red LED glows to indicate that the battery is full and charger can be left unattended.
4. Connect discharged battery as a load, now you can observe that green LED will glow to indicate that battery is charging.
5. Switch off the main supply.

Automatic Battery Charger Circuit Advantages:

- The battery charger circuit is simple and cost effective.
- Over voltage and current protection.
- Over temperature protection.
- The system is easily portable.
- Automatically charges the battery and stops charging when battery is fully charged.
- Avoids battery discharge when power failed.

Automatic Battery Charger Applications:

1. This automatic battery charger is used to charge 12V Lead-acid batteries. (**Related Post** – **Lead Acid Battery Charger using LM317**)
2. Used to charge car batteries since IC output voltage is variable.
3. Used to charge toy auto mobile batteries with a little modification.

Limitations of this Circuit:

- It takes long time for charging the battery
- This circuit is tested in simulation software and may require some practical changes.

Super Sensitive Intruder Alarm

This circuit is designed to alert the user when an intruder enters into the home. If there is any obstacle in front of IR sensor, it generates an interrupt signal. This interrupt signal is given to the speaker to alert the user

Super Sensitive Intruder Alarm Circuit Principle:

IR transmitter always emits the IR (Infrared) rays which have to be received by IR receiver. When there is an obstacle in front of IR sensor, the transmitted IR rays are reflected back to the IR receiver. The output of Op-Amp is high when IR receiver receives the reflected IR rays. This output of operational amplifier is connected to the RESET pin of 555 timer.

Related Post: Security Alarm Circuit without using 555 Timer IC

The output of 555 timer is low when input voltage applied at pin 4 of 555 timer is low.

When input voltage at pin 4 is high, then 555 timer produces the frequency which can be adjusted by the different value combinations of resistors R1, R2 and capacitor C3.

- Obstacle Present → IR Receiver Receives IR Rays → Op-amp Output High → 555 RST Pin High → Speaker Produces the Sound.
- No Obstacle → IR Receiver does not Receive the Rays → Op-amp Output Low → RST Pin Low → No Sound

The output of NE555 is filtered by the 1uF capacitor and fed to the speaker.

Many IR sensors are arranged in house at different locations. The outputs of all these sensors are given to RESET pin of common 555 timer. When any sensor detects the intruder, the reset pin of 555 timer becomes high and speaker will produce the sound.

Super Sensitive Intruder Alarm Circuit Diagram:

Super Sensitive Intruder Alarm Circuit Diagram

Circuit Components:

- NE555 timer
- LM358 op-amp
- Pot – 10k, 4.7k
- IR transmitter
- IR receiver
- Red led
- Ceramic capacitors – 0.1uF, 0.01uF
- Electrolytic capacitor – 1uF, 16v
- Resistors – 10k, 100, R4,R5
- 2 resistors – 330 ohm
- Speaker
- Battery

Super Sensitive Intruder Alarm Circuit Design:

555 Timer: Here 555 timer acts as a free running oscillator. It will generate the frequency when high pulse is applied at RESET pin. The generated frequency of 555 timer varied by varying resistor values R4, R5 or by varying the capacitor value C3.

Here Pin 2 and pin 6 of 555 timer are shorted to allow the triggering after every timing cycle. In this circuit, capacitor C3 charges through the resistors R4, R5 and discharges through the resistor R5.

LM358 Op-Amp:

LM358 Op-Amp

IF V1>V2 then OP = HIGH

IF V2>V1 then OP = LOW

LM358 IC consists of two operational amplifiers. Each Op- amp has two inputs (inverting and non – inverting) and one output. The op – amp output is high when non-inverting voltage is greater than the inverting voltage and it is low when inverting voltage is greater than non inverting voltage.

IR Transmitter: The operating voltage of transmitter is around 2 to 3V, to drop the remaining voltage we connect a resistor in series with IR led.

IR Receiver: It is always used in reverse bias. It almost acts as a closed circuit when it receives IR rays and it has high resistance when it does not receive any IR rays.

Intruder Alarm Project Circuit Simulation Video:

How to Operate Super Sensitive Intruder Alarm Circuit?

- Give the connections according to the circuit diagram.
- Connect 5V supply to the circuit.
- Now place the obstacle in front of IR sensor then speaker produces the sound.
- Remove the obstacle now you will not get any sound.
- Disconnect the battery from the circuit.

Super Sensitive Intruder Alarm Circuit Applications:

- This circuit is used in homes and offices for security purpose.

Circuit Limitations:

- This circuit produces the sound even if there is any non-living thing in front of IR sensor.

Checkout the project output video -

Bike Turning Signal Circuit

We know the use of bike indicators. These are used to indicate left turn or right turn. Have you ever tried to design bike turning indicators. This article explains you how to design these bike turning indicators.

Bike Turning Signal Circuit Principle:

The objective of this circuit is to indicate left or right turn for bike/vehicle. Two identical circuits are needed, one is for left and the other is for right. The main heart of this circuit is 555 timer. Here, this 555 timer acts as an astable multi vibrator. It generates the pulse signal with variable width. Using this variable width of the pulse, we can set different time delays for the LEDs (ON and OFF for LEDs).

The circuit consists of two 47k resistors, which are connected to 555 timer and these are used to set the time delay for LEDs. 1n4148 signal diode is connected in reverse bias at the output to maintain constant current at the output. BC547 (NPN) Transistor switches the LED's ON and OFF based on the base currents. 330 ohm resistors are used to drop the voltage otherwise LEDs may get damaged. Here we can vary the time width of output pulse by varying the resistance or capacitance value.

Bike Turning Signal Circuit Diagram:

Bike Turning Signal Circuit Diagram

Circuit Components:

- Resistors – 3 (47 k ohm)
- Resistors – 5 (10 k ohm)

- Resistors -5 (330 ohm)
- Capacitors – 2 (100uF)
- Transistors – 5 (BC547)
- LED's – 10 (5 mm)
- IC – 1 (NE555)
- Diodes – 2 (1n4148)
- Battery – 1 (12V)
- wires

Bike Turning Signal Indicator Circuit Design:

In this circuit, 555 timer produces pulse signal with variable width. The pulse width is varied by varying resistance or capacitance value (R2, R1). 2 and 6 pins are shorted to allow triggering after every timing cycle. Fourth pin is reset, it is shorted with VCC (8^{th} pin) to avoid sudden resets. 7^{th} pin is discharging pin, it is connected to 6^{th} pin through a 47k resistor. The below figure explains you the **operation of 555 timer**. In this circuit capacitor C charges through resistors Ra and Rb. Now because of internal op-amps, capacitor C discharges through resistor Rb. 555 timer internally consist of 2 operational amplifiers, one D flip flop and one NPN transistor.

555 Timer in Astable Mode

In the above circuit, the pulse is generated at the 3^{rd} pin of the 555 timer. By varying the values of Ra, Rb, C we can vary the pulse width. The total time period of the pulse is given as

$$\mathbf{T = T_{HIGH} + T_{LOW} = 0.693\ (R_A + 2R_B)\ C}$$

Frequency of the pulse is given as

$$\mathbf{f = 1/T = 1.44/\ (R_A + 2R_B)C}$$

percentage of duty cycle is given as

$$\mathbf{\%\ duty\ cycle,\ D = t_c / T * 100 = (R_A + R_B) / (R_A + 2R_B) * 100}$$

The obtained pulse from the 555 timer is applied to the transistors to switch the LEDs ON and OFF with some delay. Here the operating voltage of LEDs is around 2 to 3v but from battery, we get 12v supply. So, we need to drop the remaining voltage. To drop this voltage, we are using resistors in series with LEDs.

How to Operate the Circuit?

- Initially feed 12v power supply to the circuit.
- Now observe the LED's they will glow with some delay.
- If you want, set the different time delays for LEDs, and then vary the resistance or capacitance value.
- Now you can see the change in time delay.
- By varying the capacitance value also you can see the in time delay of LEDs.

Bike Turning Signal Project Output Video:

Applications of Bike Turning Signal Indicator Circuit:

- It is used to indicate left turn or right turn for a motor bike or vehicle.
- We can also use this **circuit as an LED knight rider circuit**.
- We can give it as a gift for the children.

Street Lights that Glow on Detecting Vehicle Movement

Generally, street lights are switched on for whole night and during the day, they are switched off. But during the night time, street lights are not necessary if there is no traffic. Saving of this energy is very important factor these days as energy resources are getting reduced day by day. Alternatives for natural resources are very less and our next generations may face lot of problems because of lack of these natural resources. We have already seen the circuit diagram and working of **Auto Intensity Control of Street Lights** circuit in the earlier post. This article describes about the circuit that switches the street lights on detecting vehicle movement and remains off after fixed time.

Principle Behind this Circuit:

The proposed system consists of Atmega8 microcontroller, LDR, PIR sensor and RTC. This system controls the street lights using light dependent resistor and PIR sensor.

Street lights are switched on depending on the intensity of the Sun light on LDR. If the intensity of Sunlight on light dependent resistor is low, its resistance value is high. This value increases and becomes high when it is completely in dark. This resistance value decides when the street lights are required to switch ON.

As the resistance value is maximum in the midnights, real time clock comes into the play. The controller checks peak time during which there is no traffic and switch OFF the lights. When there is any vehicle on the road, it is detected by the PIR sensor.

Whenever PIR sensor is detected it just indicates the microcontroller to switch on the street lights. Then lights are switched on for 2 to 3minutes and switched off automatically.

Another way to this approach is, one can maintain minimum intensity without completely switching off the lights by using PWM and switch them on to maximum intensity whenever it detects the vehicle. But in this article the circuit is designed in such a way that lights are completely switched OFF and will be switched ON only when there is any vehicle.

Circuit Diagram of Street Lights that Glow on Detecting Vehicle Movement Project:

Circuit Diagram of Street Lights That Glow on Vehicle Movement – Electronics Hub

Circuit Components:

- ATmega8 microcontroller
- DS1307 IC
- PIR sensor
- LDR
- LCD
- LED array

Street Lights that Glow on Detecting Vehicle Movement Circuit Design:

The proposed circuit consists of ATmega8 microcontroller, PIR sensor, light dependent resistor and real time clock, Liquid Crystal Display.

Passive Infrared sensor, also called as PIR sensor is connected to the PD0 pin of the microcontroller. PIR sensor senses the motion of the objects.

The PIR sensor internally will have an IR detector. Every object in the world radiates some IR rays. These are invisible to the human eye but electronic components can detect them. Different objects will emit IR rays of different wavelength. These rays were detected by the PIR sensor. PIR is initially high and is set to low automatically after sometime. Whenever it detects the motion of any object, it becomes low.

LDR is connected to the ADC pin – ADC0 of the microcontroller as LDR will produce analog value which is converted to digital by the ADC.

Light dependent resistors will have low resistance in light and high resistance in dark. The resistance of Light dependent resistor in dark is in range of ohms and in dark its resistance is in the range of mega ohms. When the light falls on LDR it resistance is reduced to a great extent.

Real time clock IC used is DS1307, which is I2C compatible. Real time clock has 8 pins.1 and 2 pins are connected to the crystal oscillator.3rd pin is connected to a battery.6th pin of RTC is connected to PC5 pin of microcontroller.5th pin is connected to PC4 pin of microcontroller.

I2C is inter integrated circuit. This is two wire interface protocol in which only two signals were used to transmit the data between two devices.

LCD is used for displaying time. LCD interfacing in 4bit mode is shown in the circuit diagram. Time from RTC is read and displayed on the LCD.

Street Lights that Glow on Detecting Vehicle Movement Circuit Simulation Video:

How to Operate this Circuit?

1. Initially power the circuit.
2. LCD displays the time read from RTC.
3. Place the LDR in darkness. Now street light is switched ON.
4. Now micro controller continuously checks the time. Street Light is switched on for fixed timings written in the code.
5. After this time, they are switched of automatically.
6. Place your hand in front of PIR sensor, this switches the street lights again, indicating that on the detection of any object street light is ON.
7. After 2-3 seconds delay, lights are again switched of automatically.

Also Read the Related Post – Automatic Street Light Controller using Relays and LDR

Street Lights that Glow on Detecting Vehicle Movement Circuit Applications:

1. This circuit can be used in real time street lights and highways also.
2. This can be used for lights in parking areas of industries, hotels, restaurants, etc.

Auto Intensity Control of Street Lights

Street lights are controlled manually in olden days. These days automation of street lights has emerged. But one can observe that there is no need of high intensity in peak hours i.e. when there is no traffic and even in early mornings. By reducing the intensity in these times, energy can be saved to some extent. We have already published a post about **Automatic Street Light Controller** circuit which was designed using Relays and LDRs. This article explains the circuit that automatically controls the intensity of street lights which is designed using microcontroller and LEDs.

Auto Intensity Control of Street Lights Circuit Principle:

The circuit consists of ATmega8 controller, Real time clock and LDR. Depending on the time and LDR value, micro controller automatically adjusts the intensity of the street lights using pulse width modulation. In this article, Pulse width modulation signal is generated in ATmega8 micro controller using timer/counter-2 at OCR2 i.e. PB3 pin.

Real time clock IC used is DS1307. It is compatible to I2C protocol. RTC acts as a slave. Time is read from RTC IC and micro controller automatically adjusts the intensity of light by generating PWM signal.

Light Dependent Resistor (LDR) is used in this project to check the intensity of light. Depending on the intensity, lights can be switched ON or OFF. Both light dependent resistor and real time clock are required for this project. Because, using Light dependent resistor alone may lead to wastage of energy. Using RTC alone may cause the lights to be switched on even when there is light.

Auto Intensity Control of Street Lights Circuit Diagram:

Circuit Diagram of Auto Intensity Control of Street Lights – Electronics Hub

Circuit Components:

- ATmega8 micro controller
- DS1307 IC
- Light Dependent Resistor
- LED array.
- LCD display

Related Post – Street Lights that Glow on Detecting Vehicle Movement

Auto Intensity Control of Street Lights Circuit Design:

The auto intensity control of street lights circuit is simple but it requires more coding part. This circuit consists of Atmega8 controller, DS1307, LDR, Relay and LEDs. The light dependent resistor is connected to ADC1 (PC1) pin of the micro controller. The analog light value is converted to digital value using ADC.

Real time clock has 8 pins out of which SCL and SDA are connected toPC5 and PC4 pins respectively. SCL is serial clock while SDA is serial data. As said before, RTC is I2C compatible, where I2C means inter integrated circuit. One bit of data is transmitted on data bus for each clock cycle. I2C protocol allows one to connect 128 devices. Data can be transferred between devices, using only two bi-directional buses. Each device can act as a slave or master. The slave devices will have one address and these devices can be accessed using this address.

LCD is the display used for displaying time which is read from RTC IC. Interfacing of LCD in 4bit mode is shown in circuit diagram. D4-D7 pins of LCD are connected to PD0-PD3 pins of microcontroller. RS pin of LCD is connected to PD4 pin of micro controller. RW and Enable pins are connected to PD5 and PD6 pins of controller.

LED array is number of high power LEDs connected in series. It is connected to PWM pin of the microcontroller.

I2C Protocol:

I2c is a communication protocol invented by Philips Company. This is well suited for communication between integrated circuits and pheripherals. This uses two lines to transfer data.

- Serial Data – SDA
- Serial Clock – SCL.

1. This can connect up to 128 devices using two wires. Each device connected will have an address. The device which initiates the data transfer is called Master.
2. Every device will have 7 bit address.
3. Master initially sends the START bit on the data line.

4. Then it sends the address of the device with which wants to communicate and the mode of operation i.e. read or write.
5. The slave devices listen to the incoming data and checks if its address matches to the received data. The device whose address matches send an acknowledgement signal.
6. Then master starts transmitting or receiving the data from the slave.
7. After completion of the transmission, Master sends a STOP bit.
8. Data on SDA can be changed only if SCL pin is low.

Auto Intensity Control of Street Lights Circuit Simulation Video:

How Auto Intensity Control of Street Lights Circuit Works?

1. Initially power the circuit.
2. Time is displayed on the LCD display.
3. Place the LDR in darkness as the street lights switches on only when there is no light on LDR.
4. Now check the time if the time is between 9 pm to 2 am street light glows with full intensity.
5. Change the time by writing time to RTC and dump the code again.
6. Now switch on the circuit check the intensity. From 2pm intensity of the lights slowly starts decreasing and finally in early morning it glows with least intensity. When the light is sensed by the LDR lights are switched off automatically.

Code is written in such a way that up to 2 am lights will glow with full intensity. From then it slowly starts decreasing and finally it drops to zero in the morning.

Auto Intensity Control of Street Lights Circuit Advantages:

- Power wastage can be reduced.
- Using LED array reduces the cost.
- Using of RTC and LDR produces accurate results.

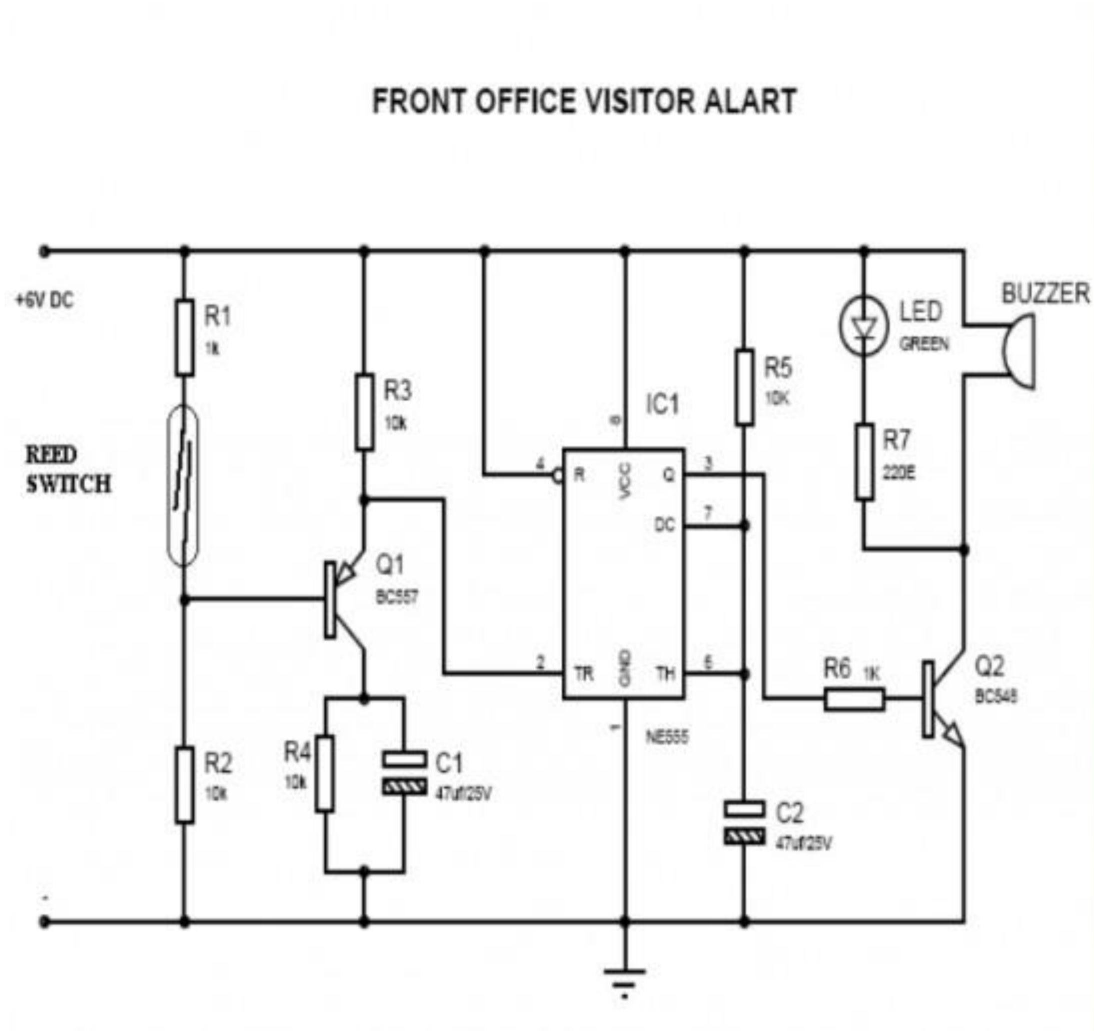
Limitations of this Circuit:

- Even though energy is saved if there are any vehicles after fixed time, intensity of the light is low.
- Maximum energy cannot be saved.

Door Opening Alarm with Sound Alert

The door opening alarm circuit or “Front Office Visitor Alert” is used for alerting you when a customer is at your office/shop. It will produce a beep sound when each new customer or visitor is entering, and will automatically switch OFF after few seconds.

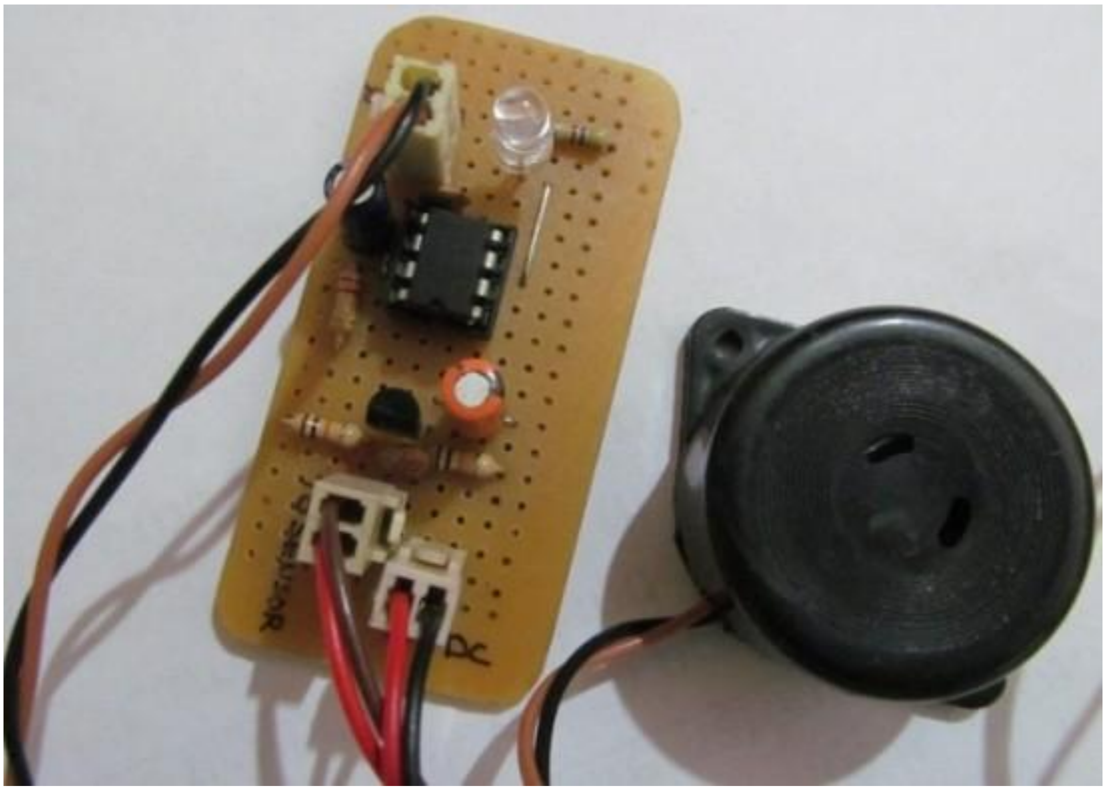
Schematic of the Door Opening Alert Circuit



[555 datasheet]

In this circuit timer IC NE555 is used as monostable mode. Initially when the door is closed; reed switch (normally open type) near the magnet is closed. When the door is opened by someone, the reed switch near the magnet is open and the base of Transistor Q1 goes low through the 10k Resistor R2, and so Transistor Q1 is ON. At this time trigger pin 2 of the IC1 go low, it triggers the monostable built around IC NE555. Once triggered, output pin 3 of IC1 goes high, and both Buzzer and LED are turned on.

At this time the Capacitor C1 starts charging through the Transistor Q1. After few seconds the Buzzer and LED will automatically switched OFF. When the door is closed the T ransistor base become high, Transistor Q1 goes OFF and the Capacitor C1 starts discharging through the Resistor R4 is connected parallel with the capacitor C1. You can change the time period of IC1 by changing the values of resistor R5 and capacitor C2.

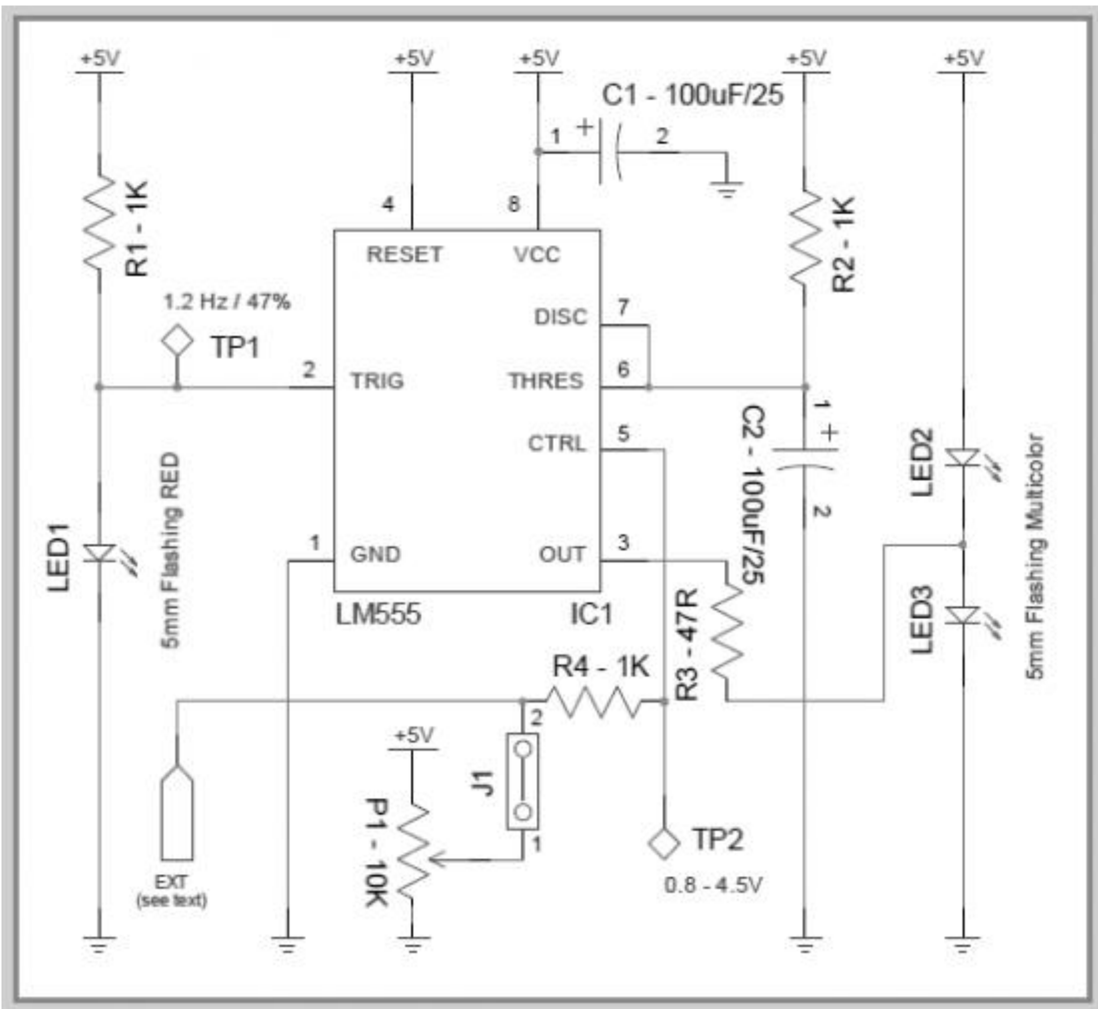


Assemble the circuit on a general-purpose PCB, enclose in a suitable cabinet and the magnet is fixed on the door frame and the reed switch is fixed on the door, near the magnet. The circuit can be powered from a 6V battery or from mains by using a 6V power adaptor.

Crazy Multicolor Flashing LED Globe!

Nowadays, single-color and multi-color flashing LEDs are easily available, which obviates the requirement of external chips to produce fascinating lighting effects. What can we do with one piece of such a single color flashing LED, and two pieces of multicolor flashing LEDs? Here is an ultrasimple circuit of an LED Globe wired around the evergreen timer chip IC 555. One advantage of this LED Globe is that it is a voltage-controllable flashing device, ready to work together with any microcontroller chip. This allows you to control the light pattern to a certain extent in tune with the output signal from an external microcontroller, too!

Schematic of the Multicolor Flashing LED Circuit



[LM555 datasheet]

Nothing new, here the 555IC (IC1-LM555) is wired as a monostable multivibrator (MMV) working on regulated DC5V supply. RC components R2(1K) and C2 (100uF) sets the monotime period. At the front end of the circuit, one single-color flashing LED (LED1-5mm Red) is connected across the power rail through a current limiting resistor (R1-1K). The pulse output available from this LED is directly fed to the trigger input (pin 2) of the 555 IC. The control voltage is driven to the control voltage terminal (pin 5) of IC1 through a resistor (R4-1K). For normal use, the control voltage can be generated from a

10K multi-turn potentiometer (P1-10K) as shown in the circuit diagram. Actually, any kind of DC voltage level generator can be used to control this circuit. It could come from a photoresistor voltage divider, sound to voltage converter,from a microcontroller,etc etc. The IC1 output (from pin 3) is then extended to two 5mm multi-color flashing LEDs (LED2&LED3) through a single current limiting resistor (R3-47R).

As you may well know, 555 IC turns on when its pin 2 is below 1/3VCC, and turns off when its pin 6 goes above 2/3VCC. These levels can be shifted either higher or lower than the nominal levels by applying a voltage at its pin 5. For example if we apply a higher +ve voltage, the turn off threshold is higher than the normal 2/3VCC. This trick is used in this circuit to produce pleasing (and fairly unpredictable) light patterns from the three LEDs. Try to enclose the finished circuit in a translucent globe for better attraction. Or try an artistic arrangement with the help of suitable light diffusers!

Note

- Set jumper J1 in open position when you are using an external control voltage
- R2-C2 values used here is not very critical. Start your own experiments with various values
- If you want to use multiple LEDs at the output, try to use suitable driver circuits based on bipolar transistors/mosfets
- If you have another simple solution for achieving this effect I'd love to see it. Please use the comment box

Test Report

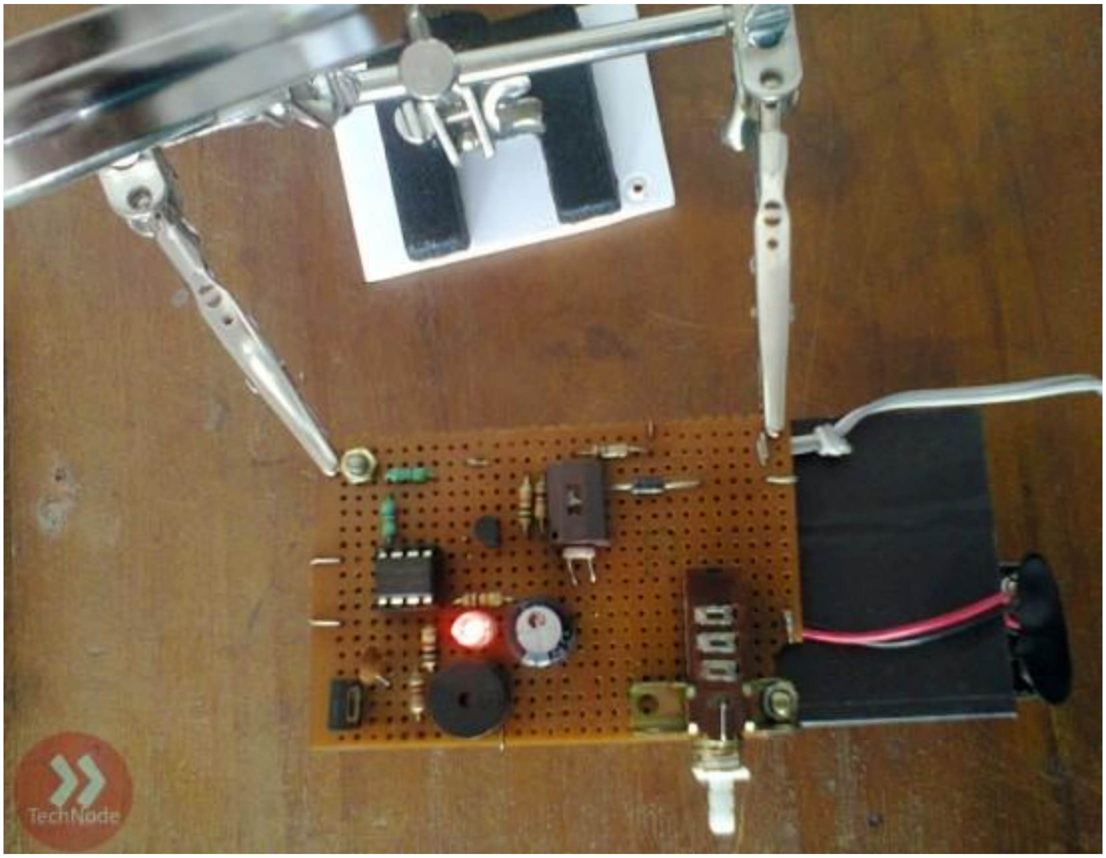
- During testing, pulse reached at pin 2 of IC1 is of 1.2Hz frequency with near 47% dutycycle. The voltage swinging is in 1.4V to 2.1 V range (not very accurate measurement)
- Voltage available at pin 5 of IC1 is from 0.8V (P1 fully counter clockwise) to 4.5V (P1 fully clockwise)
- When P1 is in fully counterclokwise , LED2 is ON and LED3 is OFF. When P1 travels beyond its mechanical centre position LED3 also turned to ON state. When P1 is in fully clockwise, both

LEDs are in ON state but now with a different pattern. Amazing visual effects created by the three LED combination is very difficult to describe in detail. Get ready to watch it yourself!

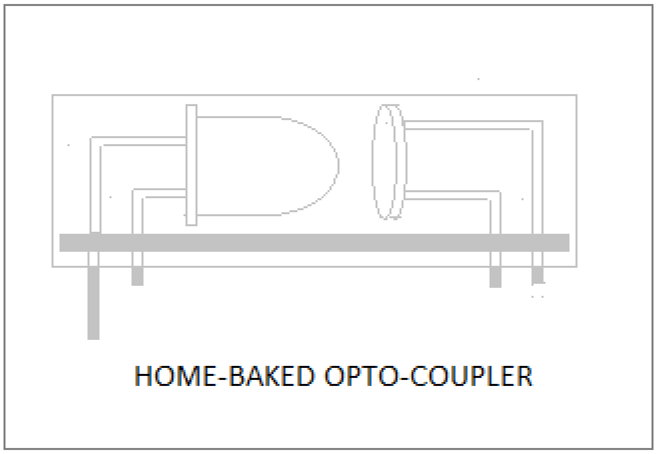
Power Failure Alarm

This minuscule power failure alarm circuit is a power supply monitoring device that will set off a piezo-speaker when the ac mains mains supply cuts off. It is very helpful to indicate the loss of power supply to some power-critical instruments such as a lifecare device installed in a hospital. Alarm activation at the right time is helpful as it signals that there is a power outage and urgent action should taken to recover the situation by providing an alternative power supply.

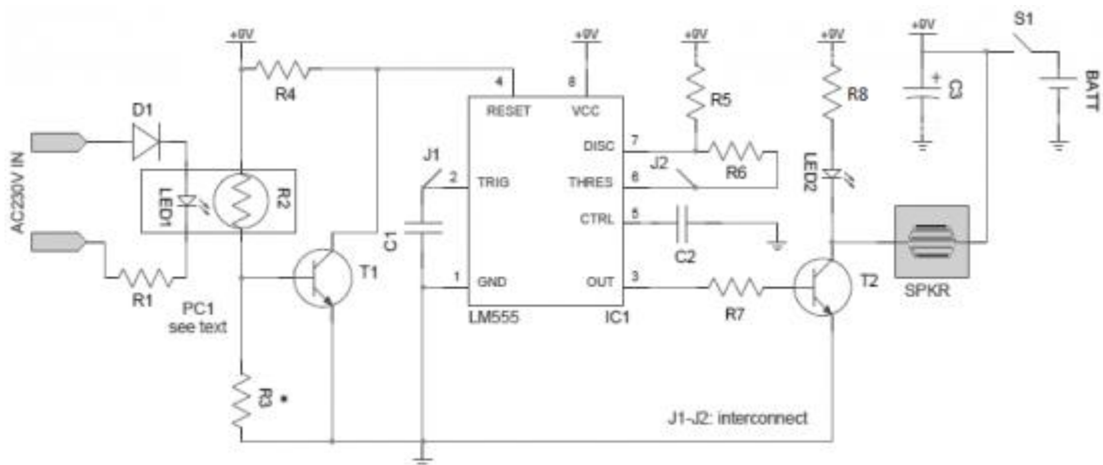
This is a 9V battery operated, low component count, and light weight circuit which can be safely connected to any AC230V outlet. At its heart is the famed little timer chip LM555 (IC1) configured as an astable multivibrator. Another important component is the "home-baked" opto-coupler (PC1). No bulky power transformer is used here, hence the circuit is "noise-free" (no electromagnetic interference). Further, this makes the enfolding task very simple!



Although a variety of opto-couplers are available in the market but it may so happen that you may not have one ready at hand when you get a spark and want to check the idea as soon as possible. Fortunately, it is easy to construct one at home using an LED and a phototransistor/photo resistor. Just take a small piece of common circuit board and solder the components as indicated here. Keep an eye on the spacing of the components; it should be as close as possible with a slight gap between them. In the prorotype one 5mm white LED + 5mm LDR combination was used. After the construction, enclose the optocoupler in a suitable opaque tube, or cover the whole unit using short-length of heatshrink tube.



The circuit is straight forward. As stated, IC1 is here wired as a gated-astable producing an audio-frequency (AF) output (~1KHz) to drive a standard ordinary/piezo-speaker. Switching of the astable is controlled by the power status detection circuitry built around PC1 and associated components. Switch S1 (SPST) is the system on/off switch, and LED2 (5mm Red) is an optional visual indicator.



LM555 datasheet

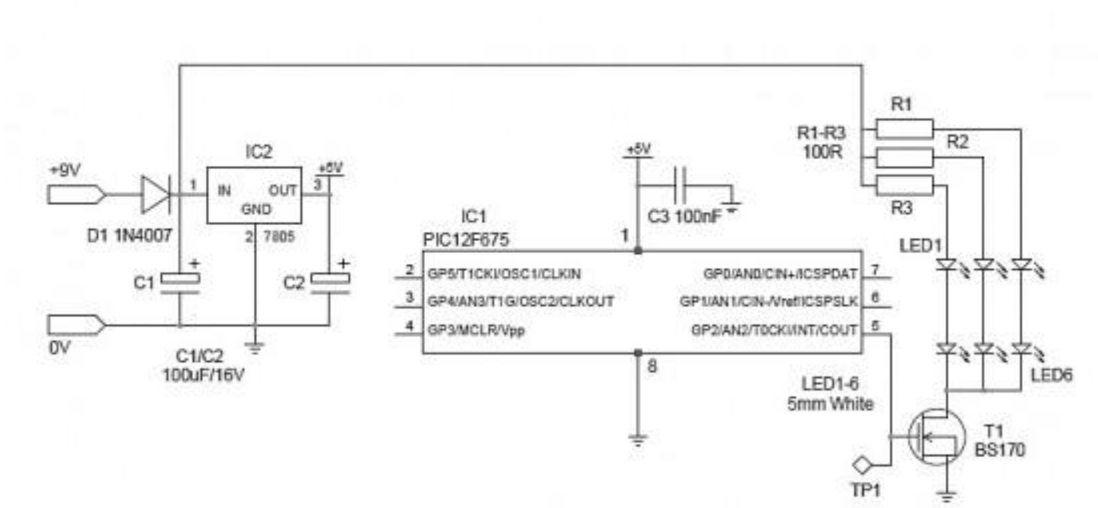
Parts: IC1: LM555, T1: BC547, T2: BD139, D1: 1N4007, LED1: White 5mm, LED 2: Red 5mm, R1: 100K, R2: 5mm LDR, R3: 1K, R4: 10K, R5,R6: 4K7, R7,R8: 1K, C1,C2: 100nF, C3: 470uF/16V, S1: SPST switch, BATT: 9V battery, SPKR: Ordinary/Piezo-Speaker (not active buzzer).

Lab Note: Value of R3 test selected. Use theoretical/empirical method to find the exact value suitable for your home-made opto-coupler.

Twinkling LED Christmas Star

Xmas is just round the corner, and this is the right time to build your own festival lights using LEDs. Presented here is a simple LED-based Xmas light/star circuit which can be constructed using inexpensive components. At the heart of this battery operated circuit is a tiny microcontroller PIC12F675 (IC1). Here, brightness and oscillation of the white LEDs (LED1-LED6) are digitally controlled using Pulse Width Modulation (PWM) signal generated by IC1. The trick of using a random number generator for light modulation will create a credible simulation of the sparkling starlight.

Twinkle Christmas Lights Schematic



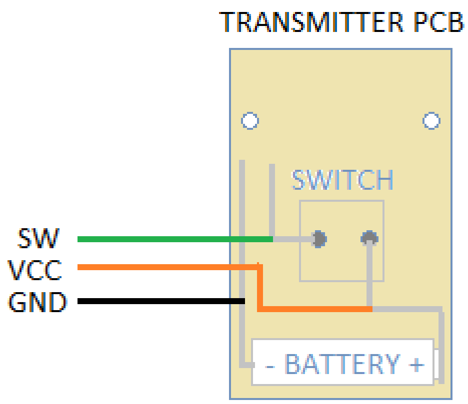
Notes:

- Can be powered from any regulated/unregulated 9V dc supply source
- For compactness, replace IC2 (LM7805) with 78L05 available in TO92 package
- Each output pin of the IC1 is limited to source or sink only 25mA of current
- BS170 (T1) can handle a maximum current of 500mA
- White LEDs are used deliberately. It is easy to convert white light into different colors (using additional stuff like LED caps)

Wireless Cashbox Security Alarm

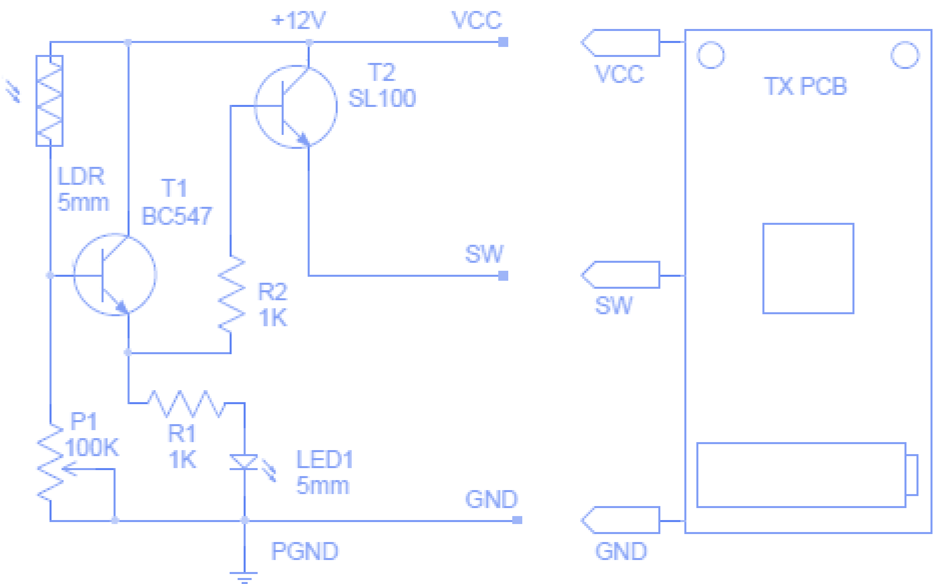
Here is an inexpensive circuit of a wireless cashbox security alarm realized using generally available low-cost components. Why it is inexpensive when compared to readily available wireless security alarms? The answer is simple. Here, a wireless door bell is hacked (and tweaked) to rig up the system. Needless to say, the prototype is wired around a cheap (chinese-made) wireless door bell.

First of all, note that there is nothing to do with the "Receiver"box of the wireless door bell. Just insert two AA (1.5V x2) cells in the battery compartment and keep it handy. Now carefully open the "transmitter" box (ie doorbell switch), and remove the PCB from the enclosure. Now lift the push switch from the PCB as it is not necessary for the project,and extend three wires from the suggested PCB points as shown in Fig 2. Next, follow the schematic diagram to complete the security alarm. The transmitter section uses a 12V (A23 type) battery as its power source. Fortunately, we can power the whole circuit from this single battery.



After finishing up the construction,house it in a small tamper-proof box leaving a little window for the LDR. Now fit the unit inside the cash box with the LDR pointing towards the door of the cash box. Working of the circuit is simple. If the cash box is closed, the interior will be dark and transitor T1 (BC547) is disabled by the high resistance of the LDR (threshold determined by P1). If someone tries to open the door of the cash box, light-most probably from the burglar's pen torch falls on LDR fitted into the cash box. As a result, LDR conducts and T1 is forward biased. This switches the next transistor T2 (SL100B) and +12V supply is extended to the transmitter through T2. Finally, an aural indication (a chime with a fixed duration) is avaiable at the remotely located (10 to 100 metres) wireless receiver (doorbell) box.

Schematic of the Wireless Security Alarm Circuit

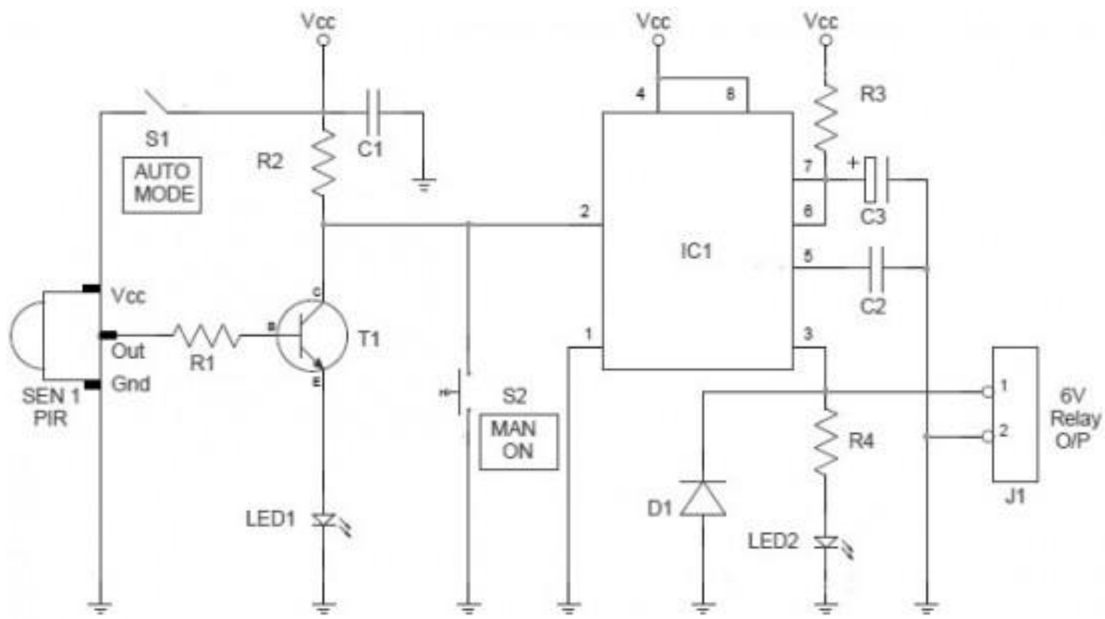


Automatic Water Tap (Faucet/Valve) Controller

As you may well know, automatic control for a water tap can significantly reduce water consumption to some extent. Besides, automatic faucets can eliminate cross-contamination by keeping hands and germs away from commonly-used surfaces.

Presented here is a simple electronic circuit which can control the valve operation by sensing valid-movements with the help of a Passive Infrared (PIR) motion sensing module. In practice, automatic taps are presence sensors and not motion sensors. They employ "Active Infrared" technology which senses "presence" and not "movement" of objects. However, here an unorthodox "Passive Infrared" technology is used to realize the 6VDC powered smart faucet controller circuit!

Schematic of the Water Valve Controller Circuit

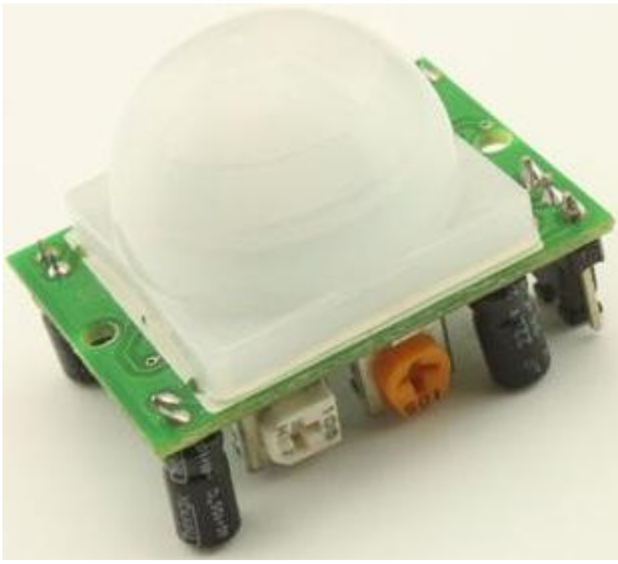


[555 datasheet]

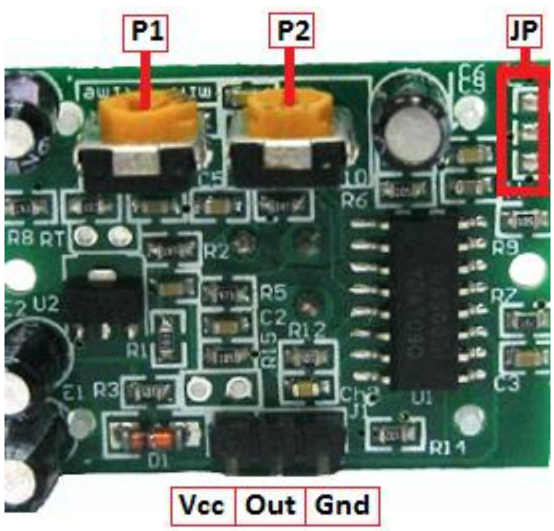
Smart Valve Controller is a combination of four key components:

- motion sensor with control electronics
- solenoid valve
- power source
- and the faucet

As stated, at the heart of the circuit is a Passive Infrared (PIR) module. PIR sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects. Pyroelectric devices, such as the PIR sensor, have elements made of a crystalline material that generates an electric charge when exposed to infrared radiation. The changes in the amount of infrared striking the element change the voltages generated, which are measured by an onboard amplifier.



The device contains a special filter called a Fresnel lens, which focuses the infrared signals onto the element. The PIR Sensor requires a 'warmup' time in order to function properly. This is due to the settling time involved in 'learning' its environment. this could be anywhere from 10 to 60 seconds. During this time there should be as little motion as possible in the sensors field of view. There is a variable resistor (P1) on the PIR sensor module to control the 'ON' delay time for the sensor. Turning this variable resistor clockwise will give longer 'ON' delay time while turning anticlockwise will reduce the 'ON' delay time. The PIR sensor has distance range of approximately 3 to 7 meters. It is possible to adjust distance of detection with the help of the second variable resistor (P2) on the PIR sensor module.



Likewise, there is a 2-position jumper point (JP) is included in the PIR sensor module. The sensor is active HIGH (LOW in idle state) when jumper is in either position. In "retrigger" (H) position, output remains HIGH when sensor is triggered repeatedly. In "normal" (L) position, output goes HIGH then LOW when triggered. Continuous motion results in repeated HIGH/LOW pulses.

The motion sensor with control electronics circuitry is very simple and self-explanatory. Output of the PIR sensor module (SEN1) is here connected to a 'traditional' monostable multivibrator (MMV) wired around the ubiquitous timer chip NE555 (IC1) . Output of IC1 controls the solenoid valve through a 6V electromagnetic relay attached to J1.

Two LEDs (LED 1 & LED2) are added as system status indicators. SPDT switch S1 is the "Auto/Manual" Mode Selector. "Push – to – On" switch S2 can be used for manual operation of the faucet. Prototype tested with four 1.5V AA cells (1.5Vx4 = 6V).

Note:

Remember to set delay time & detection range of the system as low as possible by adjusting the preset pots P1 & P2 of the PIR sensor module. Removing the fresnel lens, collimation and screening by means of a piece of a suitable electrical conduit with a length of 2 to 3 cm is not a bad idea to reduce the field of view of the PIR sensor module. Place the jumper (JP) in "Normal" mode!

Why a PIR sensor based design? PIR sensor is small, inexpensive, low power, rugged,is easy to interface with, and is easy to use. When motion is detected the PIR sensor outputs a high signal on its output pin, which can either be read by an MCU or drive a transistor to switch a higher current load. Their best feature is that they don't wear out!

Parts:

SEN 1: PIR sensor module
T1: BC547
LED1: 5mm Green
LED2: 5mm Red
D1: 1N4007
IC1: NE555
R1, R2: 1K
R3: 100K
R4: 470R
C1,C2: 100nF
C3: 100uF/16V

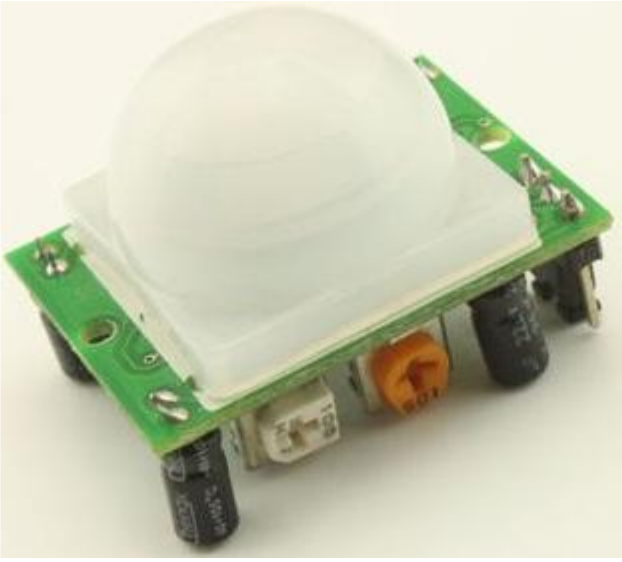
S1: SPST On/Off
S2: Push -To – On
J1: 2-Pin male header
Relay: 6VDC /SPST Electromagnetic Relay

Automatic Pest Repellent

Automatic Pest Repellent is a non-chemical, clean, harmless and effective solution to unwanted pests. The circuit described here is nothing but a passive infrared (PIR) motion sensor activated water spray to deter animals from your lawn and/or garden. Needless to say, this system is ideal for repelling deer, dogs, raccoons, groundhogs, opossum, skunks, cats, rabbits, squirrels, and geese

At the heart of the circuit is one readily-available passive infrared (PIR) motion sensor module. PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects. PIR sensor have elements made of a crystalline material that generates an electric charge when exposed to infrared radiation. The changes in the amount of infrared striking the element change the voltages generated, which are measured by an on-board electronics circuit. The device contains a special filter called a Fresnel lens, which focuses the infrared signals onto the element. As the ambient infrared signals change rapidly, the on-board amplifier activates the output to indicate a valid-motion.

The PIR Sensor has a range of approximately 20 feet. This can vary with environmental conditions. The sensor is designed to adjust to slowly changing conditions that would happen normally as the day progresses and the environmental conditions change, but responds by making its output active when sudden changes occur, such as when there is a "real" motion.



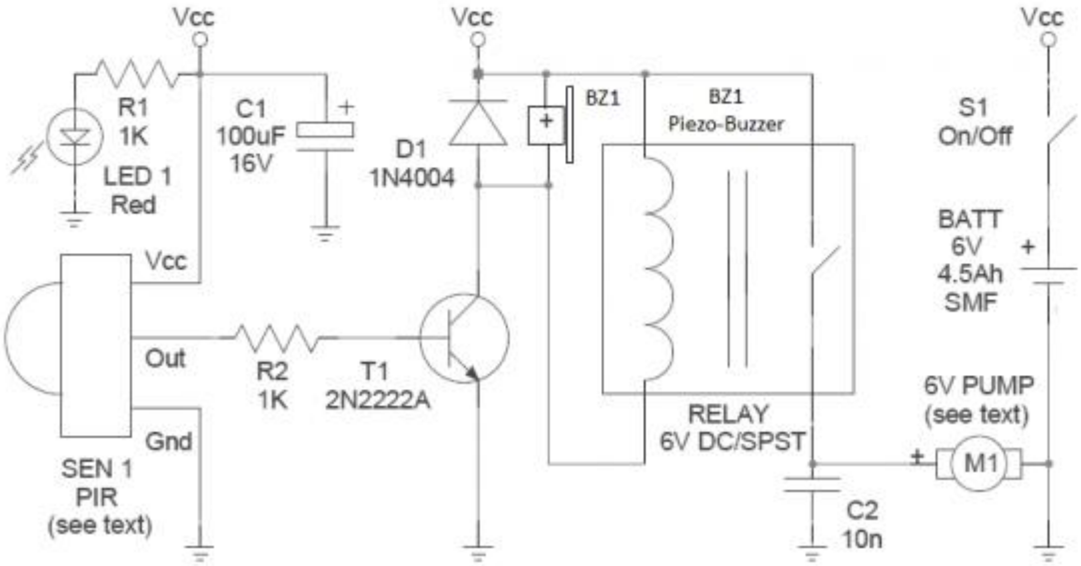
The PIR sensor module have a 3-pin connection: Vcc, Output and GND. The pin-out may vary, so it is suggested to check manufacturer's datasheet in order to confirm the pins. Sometimes, they have markings on the PCB next to the pins. As well, PIR sensor modules also have a 2-pin jumper selection for single or continuous trigger output mode. The two positions are labelled as 'H' and 'L.' When the jumper is at "Retrigger" position 'H,' the output remains high whenever the sensor is retriggered repeatedly. In position 'L,' the output goes high and low every time the sensor is triggered. So a continuous motion will give repeated high/low pulses in this "Normal" mode.

The circuit has three parts – the first for for driving a 6VDC /SPST electro-magnetic relay with the help of the PIR sensor module, and the second is a 6V DC selfpriming water pump for automated water spray function. Final part is the 6VDC power supply. The built in re-chargeable battery pack (6V/4.5 Ah SMF Battery) of the power supply can be charged using any suitable AC mains adaptor and/or a Solar Panel.

In the circuit, switch S1 is the system on/off switch and the LED 1 is a "power status" indicator. In standby mode, if the PIR sensor module (SEN 1) detects a valid movement it will give a high (3.3V) output of variable width. This signal output goes to the relay driver transistor 2N2222A (T1) through R2. The 6V relay then activates the 6V water pump. One active piezo-buzzer (BZ1) is added for effective aural indication. For best results, try to attach a small sprinkler head at the outlet of the water pump.

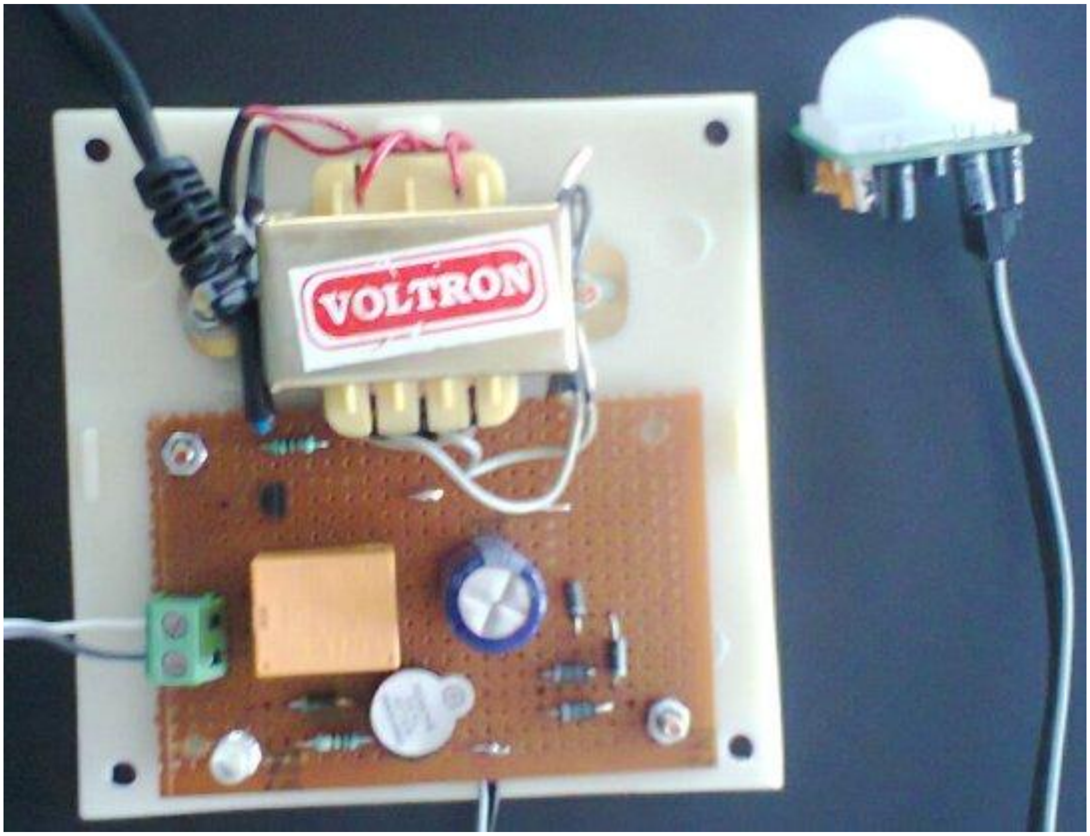
Note: The PIR Sensor requires a 'warm-up' time in order to function properly. This is due to the settling time involved in 'learning' its environment. This could be anywhere from 10-60 seconds. During this time there should be as little motion as possible in the sensors field of view.

Schematic of the Pest Repellent Circuit



Parts:

PIR Sensor Module – 1
1K ¼ W resistor – 2
100uF/16V Capacitor – 1
10nF/100V Capacitor – 1
Red LED 5mm – 1
1N4004 diode – 1
6VDC SPST Electro Magnetic Relay – 1
6V/4.5 Ah SMF Battery – 1
SPST On/Off Switch – 1
6VDC Water Pump – 1
Piezo Buzzer – 1



Lab Note:

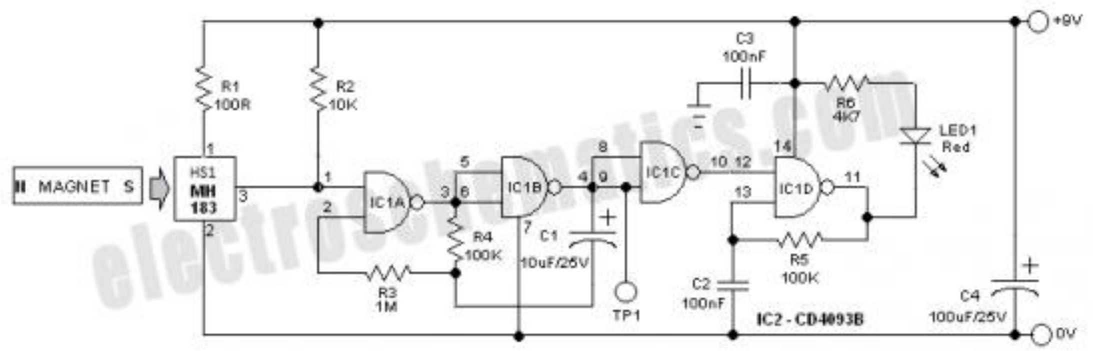
In my lab, the prototype was first tested with 6VDC power supply available from a power unit consists of AC230V to 6V step-down transformer and associated parts. Partial view of the prototype is included here!

Low Cost Door Sensor

This compact and affordable door sensor mechanism uses a Hall-effect sensor fixed at the corner of the door frame and a standard bar magnet fixed on the door panel close to the Hall-effect sensor. When the door is opened, the magnet moves away from the sensor to generate a wake-up signal to the rest of the electronics. This sensitive and reliable door sensor can be powered from a 9V alkaline battery pack.

At the heart of the circuit is one Unipolar Hall effect sensor MH183 (HS1). It incorporates advanced chopper stabilization technology to provide accurate and stable magnetic switch points. The internal output transistor of MH183 will be switched on in the presence of a sufficiently strong South pole magnetic field facing the marked side of the package. Similarly, the output will be switched off in the presence of a weaker South field and remain off with "0" field. A Hall-effect sensor IC (contactless & magnetically activated) is more efficient and effective than reed, inductive or opto-electronic sensors, and is virtually immune to environmental contaminants.

Schematic of the Door Sensor Circuit



[4093 datasheet](#)

Working of the circuit is simple and straight forward. As per the mechanical arrangement,when the door is closed, the bar magnet is very near to HS1 (MH183) and as a result it is turned to on state and disables the first oscillator formed by the two gates (A &B) of IC1 (CD4093-Quad 2-Input NAND Schmitt Trigger). This condition is indicated by the steadily lit red LED (LED1). Note that here LED1 is pulsed by the relaxation oscillator wired around one gate (D) of IC1. But the frequency here is comparatively high (set by C2 and R5) and hence LED1 appears to be lit continuously. Resistor R6 limits the LED current to a safe value. When the door is opened, the magnet moves away from IC1. Now HS1 turns off to enable the Two-gate oscillator (IC1A & IC1B) through resistor R2. The low frequency pulses from this oscillator are inverted by IC1C to gate the LED oscillator (IC1D) on and off.

Assemble the circuit on a small PCB and enclose in a suitable box. Fix the Hall sensor (HS1) at the corner of door frame and the magnet on the door, keeping its south pole (S) oriented towards the marked side of HS1. Align the Hall sensor and magnet such that when the door is closed, LED1 lits steadily.

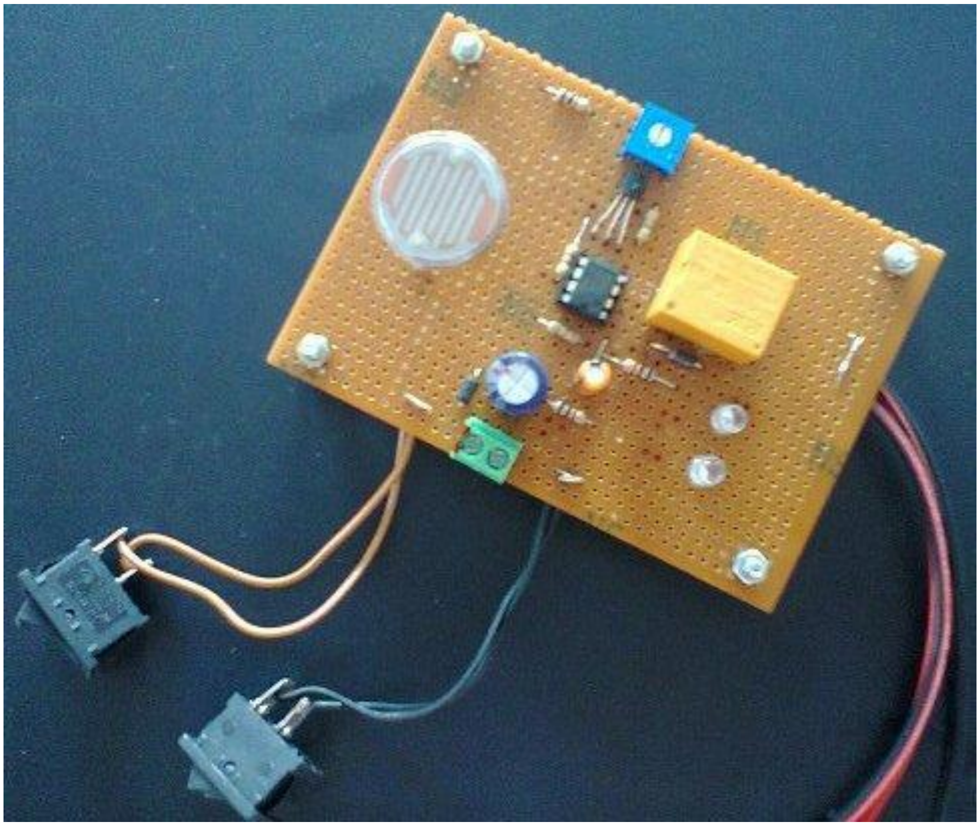
Notes:

- A transistor based relay driver may be driven off the output of IC1B(TP1). This allows switching of high-power loads such as flashers,sirens or hooters working on the AC mains supply.
- Resistor R1 (100 Ohm) is not a very crucial component. It's added for reverse voltage protection (refer MH183 datasheet).
- This circuit (combines "door-closed" and "door-opened" indication) has a very low current drain and can be operated long time with a standard 9V Alkaline battery.
- It is possible to replace HS1 with any other unipolar (not a linear one) type having similar characteristics.

Adaptive Lighting System for Automobiles

When a vehicle is driven on the highway at night, it is required that light beam should be of high density and should illuminate the road at a distance sufficiently ahead. However, when a vehicle coming in the opposite direction approaches the vehicle with a high-beam headlight, driver of that vehicle will experience a glare, which may blind him. This dazzle effect is one of the major problems faced by a driver in night driving. To avoid this impermanent blindness, a separate filament is usually fitted in the "dual-filament" headlight bulb in a position such that light beam from this second filament is deflected both down and sideways so that the driver of the oncoming car is not blinded. In practice, one mechanical dimmer switch is used by the driver to manually select high (bright) or low (dim) headlight beam. However, this is an awkward task for the driver especially during peak traffics.

Our project "Adaptive Lighting System for Automobiles" is a smart solution for safe and convenient night driving without the intense dazzling effect and aftermaths. Adaptive Lighting System for Automobiles needs no manual operation for switching ON and OFF headlight/downlight (Bright/Dim) when there is a vehicle coming from front at night. It detects itself whether there is light from the front coming vehicle or not. When there is light from front coming vehicle, it automatically switches to the downlight and when the vehicle passes it automatically switch back to headlight. The user can adjust the light detection sensitivity of this Adaptive Lighting System.



Prominent Features

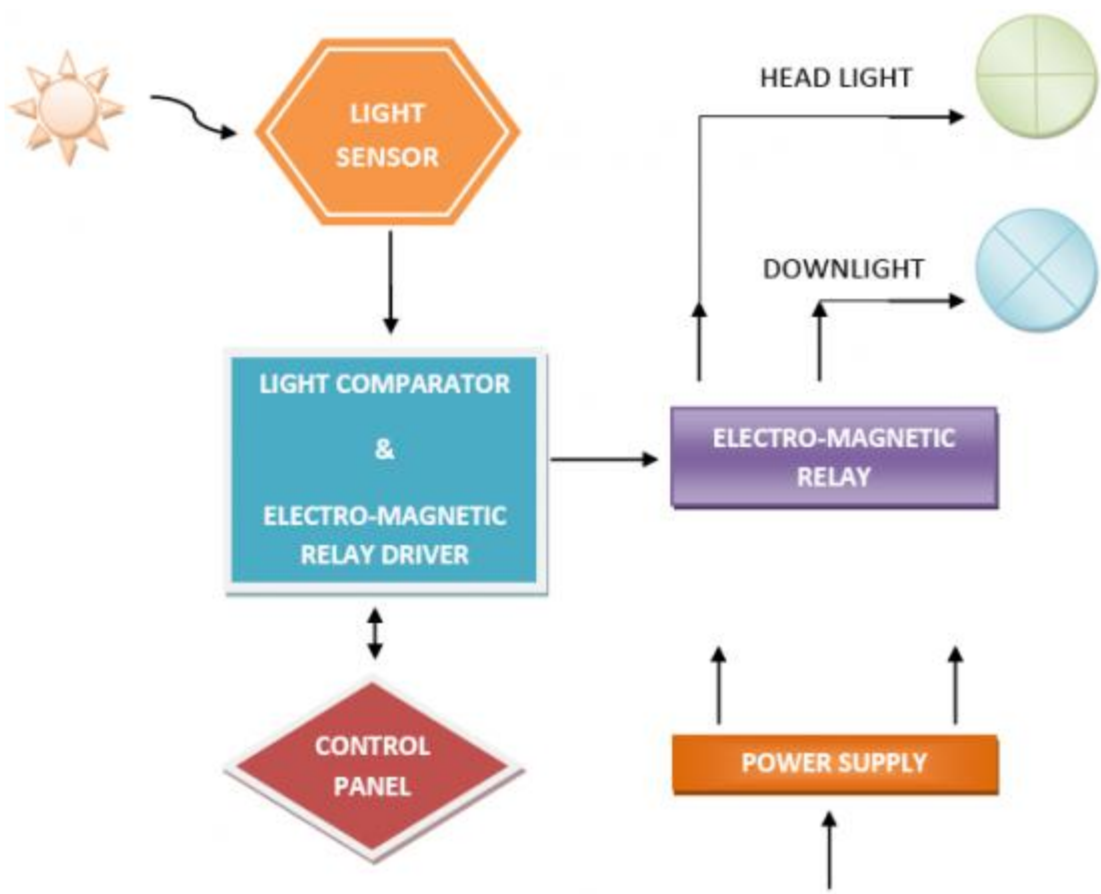
- 12V automobile battery powered automatic switching circuit with negligible current consumption in standby mode

- Reliable and weatherproof light sensor module (Cds photocell)
- Independent variable control to set the "light detection sensitivity to avoid false triggering caused by the influence of other light sources like streetlights
- Optional selector switch for "Automatic Signaling Mode" (ASM). In this mode, dim/bright control of headlight is in pulsed, i.e. headlight automatically changes to dim level from bright level and vice versa in a rhythmic style (like a signal to the other motorists) when light from the front coming vehicle is detected by the light sensor module
- "Energy Saving Mode" – If the circuit is in active state, by default, headlights automatically goes off when the vehicle enters in a well-lighted area.

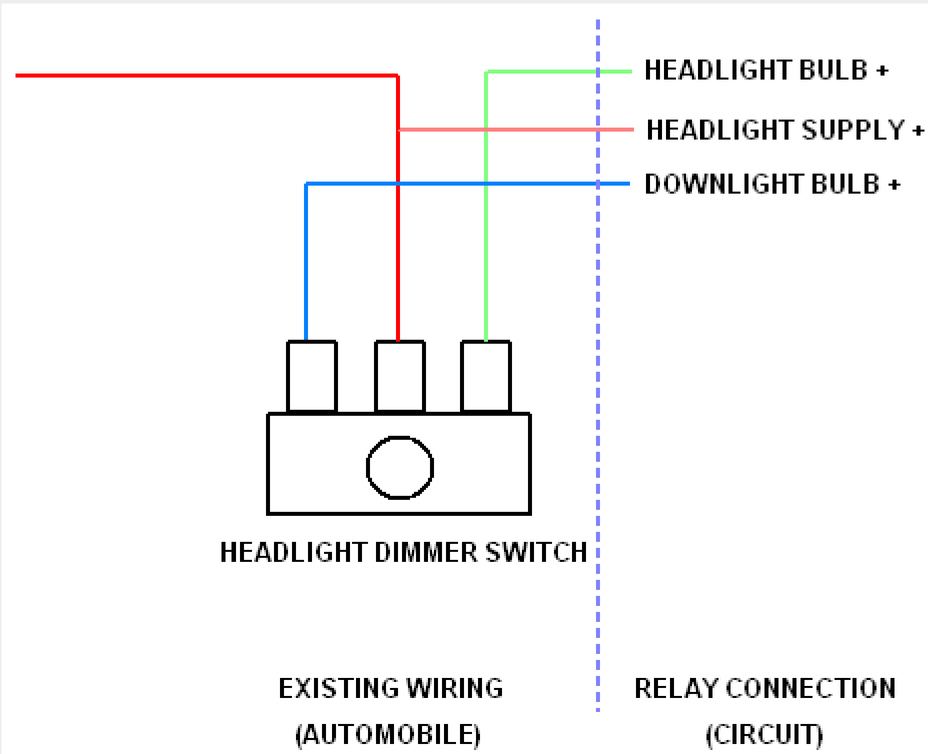
Troxler Effect

A study by Dr. Alan Lewis, who runs the College of Optometry at Ferris State University in Big Rapids, Michigan, found that during nighttime driving, headlight glare from the vehicles traveling with you could be blinding. Even after the source of the glare is removed, an after-image remains on the eye's retina that creates a blind spot. Known as the Troxler Effect, this phenomenon increases driver reaction time by up to 1.4 seconds. That means that if driving at 60 mph, a motorist would travel 123 feet before reacting to a hazard. Normal reaction time to a change in driving conditions is .5 seconds and the distance travelled before applying the brakes is 41 feet when traveling at the same speed!

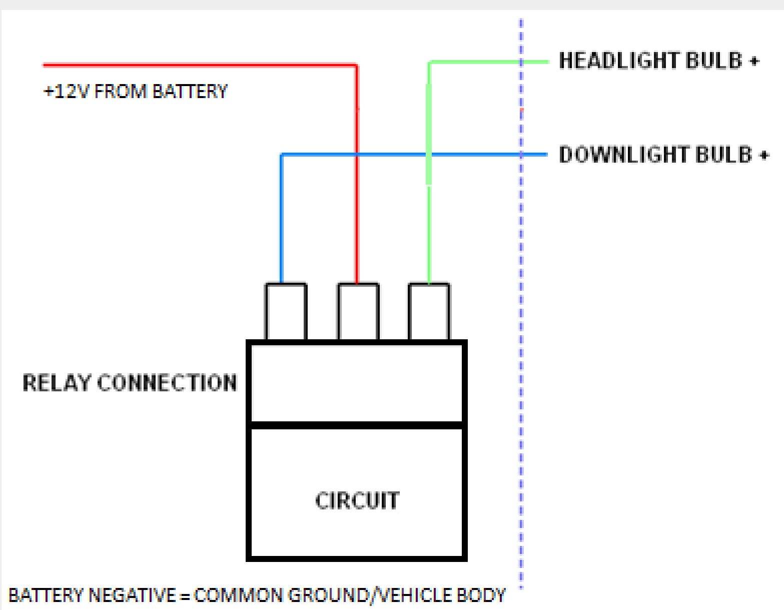
Functional Block Diagram



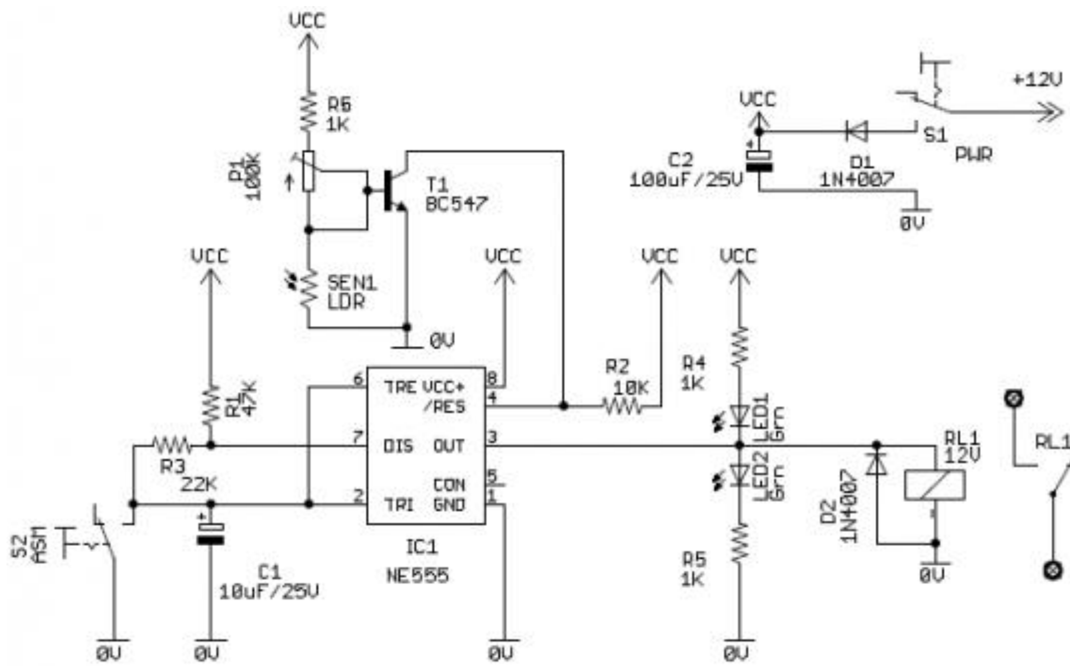
Proposed electrical wiring diagram for existing connection



Proposed electrical wiring diagram for new connection



Schematic Circuit Diagram



Parts list

- IC: NE555 – 1
- IC Socket 8 Pin – 1
- Transistor: BC547 – 1
- Diode: 1N4007 – 2
- Resistors: 100K Trimpot – 1, 47K 1/4W – 1 ,22K 1/4W – 1 ,10K 1/4W – 1 , 1K 1/4W – 2
- Capacitors: 10uF/25V – 1, 100uF/25V – 1
- LEDs: 5mm Red /Green – 2
- LDR: 20mm Encapsulated Type – 1
- Relay: 12VDC SPDT – 1
- Switch: SPST Rocker Switch – 2

Working of the circuit

This circuit is built around the popular timer chip NE555 (IC1). Here IC1 is configured as a gated-astable multivibrator running at a frequency of about 1.5 Hertz (duty cycle 75%),determined by the values of components R1, R3 and C1. The whole circuit can be directly powered from the 12V automobile battery.

When power switch S1 is turned to “on” position, 12VDC supply from the battery is fed to the whole circuit through polarity guard diode 1N4007 (D1). Capacitor C3 (100uF/25V) is a traditional buffer capacitor to improve the circuit stability. Initially, astable built around IC1 is disabled by the light sensor circuit realized using the 20mm – Light Dependent Resistor (LDR),100K trimpot (P1) and

BC547 (T1) transistor. As a result output (pin 3) of IC1 is at a "low" level, and the 12V electro-magnetic relay (RL1) connected at the output of IC1 is in "off "state. The first LED (LED1) indicates this condition. As per the wiring (+ve supply is routed to headlights through the N/C contacts of RL1), headlights are in now in "on" condition.

However, when a strong light falls on the LDR, IC1 is enabled immediately and as a result its output goes "high" to energize the relay. Now the downlights are powered by the N/O contacts of the relay and stays in this condition until the light level on LDR is reversed. The second LED (LED2) indicates this condition. Note that, switch for the ASM mode (S2), directly grounds pin 6 and 2 of IC1, when it is in "on" mode and hence the astable function of IC1 is in disabled state. If S2 is in "off" mode, the "ASM" function turns to "on" and this flashes headlights and downlights rapidly, as long as strong light level (from another headlight) is detected by the LDR.

Notes

- Switching contact of the relay (RL1) can directly be connected in parallel with the existing dim/bright selector switch. It is also possible to route + 12V through the relay contacts to Headlights (Bright) and Downlights (Dim)
- One 20 mm encapsulated LDR is recommended for this circuit. The LDR should be fitted at the front side of the vehicle in an appropriate position

Automatic Bike Headlight Switch

Improved bike headlight switch circuit presented here has been designed to switch bike headlight on (or similar loads) at a presettable ambient light level. The circuit is based on the renowned timer chip LM555 (IC1), here triggered by a decrement in ambient light level. Here is a 220V **automatic light switch**, just in case you need one.

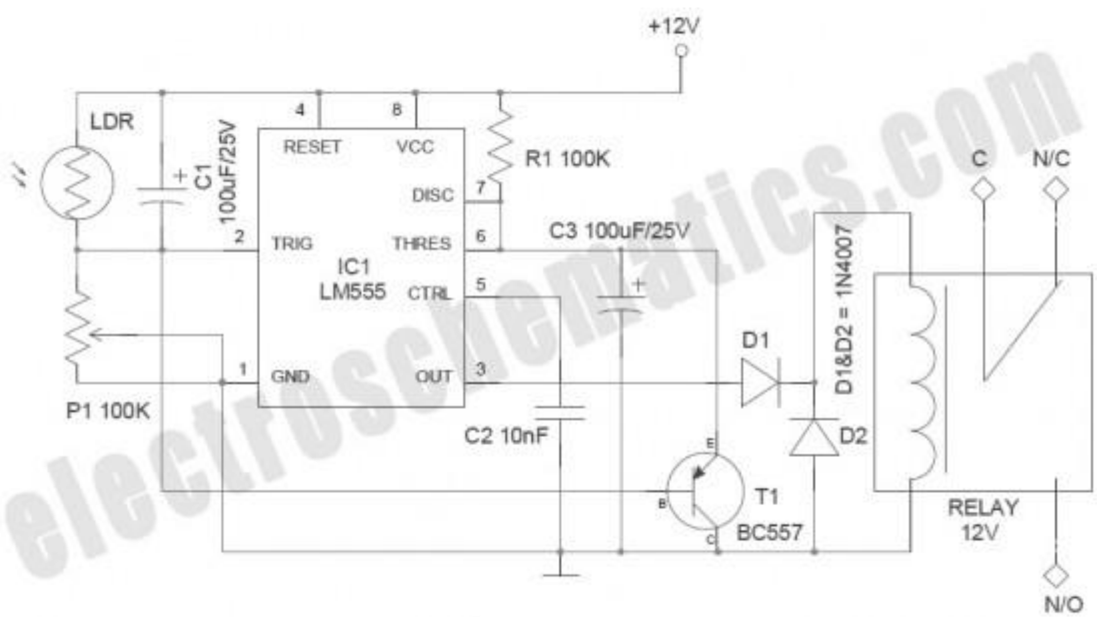
how does the automatic headlight switch works?

When 12VDC supply is applied to the circuit, the voltage at pin 2 of IC1 is set by the voltage divider built around the Light Dependent Resistor (LDR) and trimpot P1 (100K). If the ambient light level (presetted by P1) is sufficient, pin 2 of IC1 is at a high potential and as a result IC1 is disabled. Capacitor C1 (100uF/25V) added across the LDR eliminates possible unwanted circuit functioning which may caused by sudden fluctuations in the light level.

However, when ambient light level drops, the resistance of LDR increases and the voltage level at pin 2 of IC1 drops to trigger the monostable circuit. Simultaneously, the base of transistor T1 (BC557) is pulled low and discharges the timing capacitor C3 (100uF/25V). Next, output (pin 3) of IC1 goes high to turn on the electromagnetic relay (12V/SPDT). The RC time constants (R1 and C3) sets this on time for a period of near 5 seconds. But if the light level stays low, T1 holds C3 in the discharged state and the relay stay on. Common (C) and Normally-Opened (N/O) contacts of the relay can be used to switch the headlight.

The timeout of five seconds is introduced deliberately to avoid erratic switching of the headlight due to other strong light reflections. This also allows the headlight to stay on for a finite time after the ambient light level restoration.

Automatic Light Switch Circuit Schematic

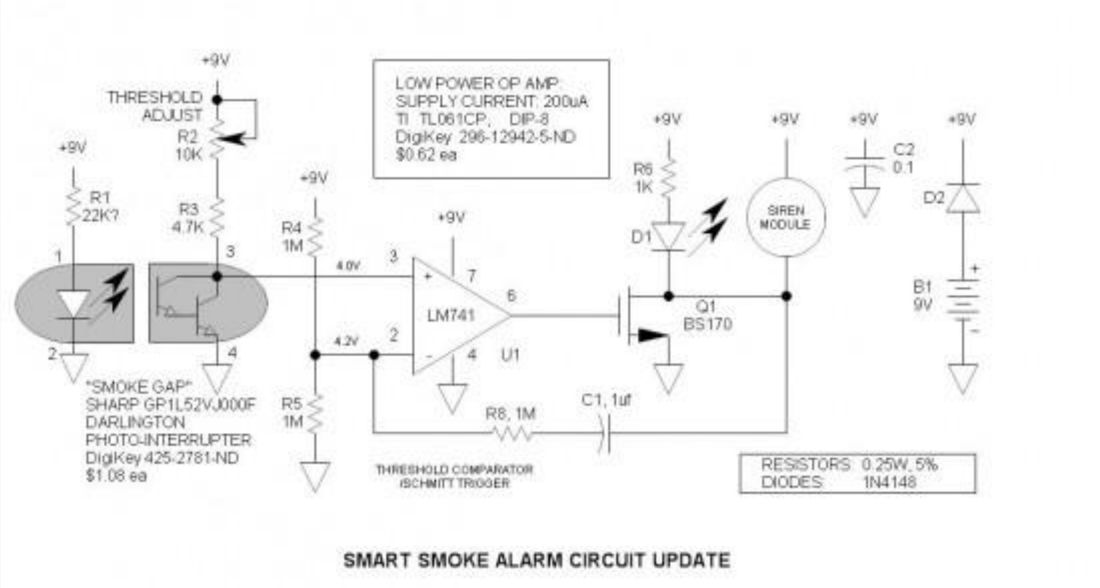


Bike Headlight Switch Notes

- The whole circuit should be powered from the 12V bike battery
- Slight intervention in the existing electrical wiring of the vehicle may become necessary to add this circuit
- Use of a medium-size encased LDR is recommended for reliable operation. Fit the LDR at the front side of the bike in an appropriate position
- The relay used in the prototype draws near 37.5 mA. 555 IC output can switch up to 100mA, which is adequate for driving the relay
- 555 IC will only rise to near 10v for the 12V input supply and the diode D1 will drop 0.7Volt. As a result the 12V relay will only get about 9.3Volt. However, pick-up voltage of a standard 12V relay is 9V, this is not a problem. D1 is added intentionally to avoid episodic timer latch up

Smoke Alarm Circuit

Smoke Alarm Circuit Schematic



Smart Smoke Alarm Circuit Update 1

Photo-interrupter module

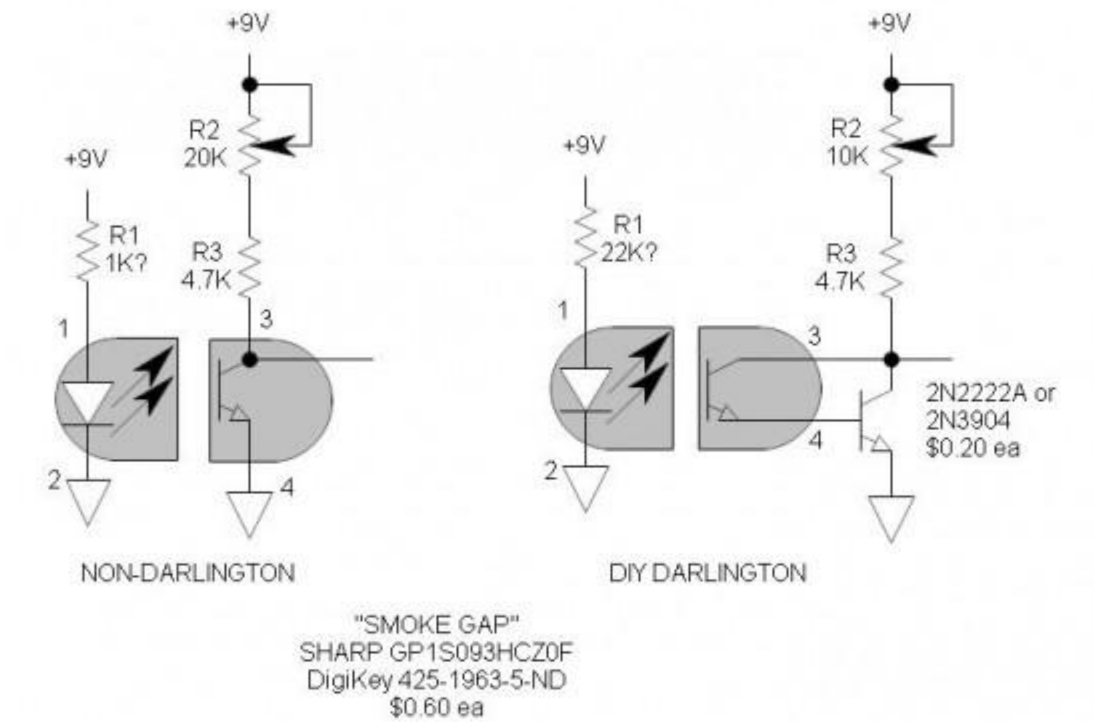
The photo-interrupter is simply an optical coupler with the elements separated with a slot. Anything that enters this slot reduces the current transfer ratio (output current /input current). I used the H21B1 Darlington device since I did not have the H21A1 on hand. I am glad I did, because I learned that it is a better device, requiring far less LED current. Since the H21A1 /H21B1 series is no longer available from DigiKey, I selected a currently available, more inexpensive device—the Sharp GP series—see schematic(s) for details. Sharp appears to be the leader in this product.
I did not test the circuit with these devices.

Datasheets

Sharp GP1L52VJ000F Darlington photo-interrupter:
http://www.sharpsma.com/download/GP1L52VJ000Fpdf-0

Sharp GP1S093HCZ0F photo-interruptor:
http://www.sharpsma.com/webfm_send/1555

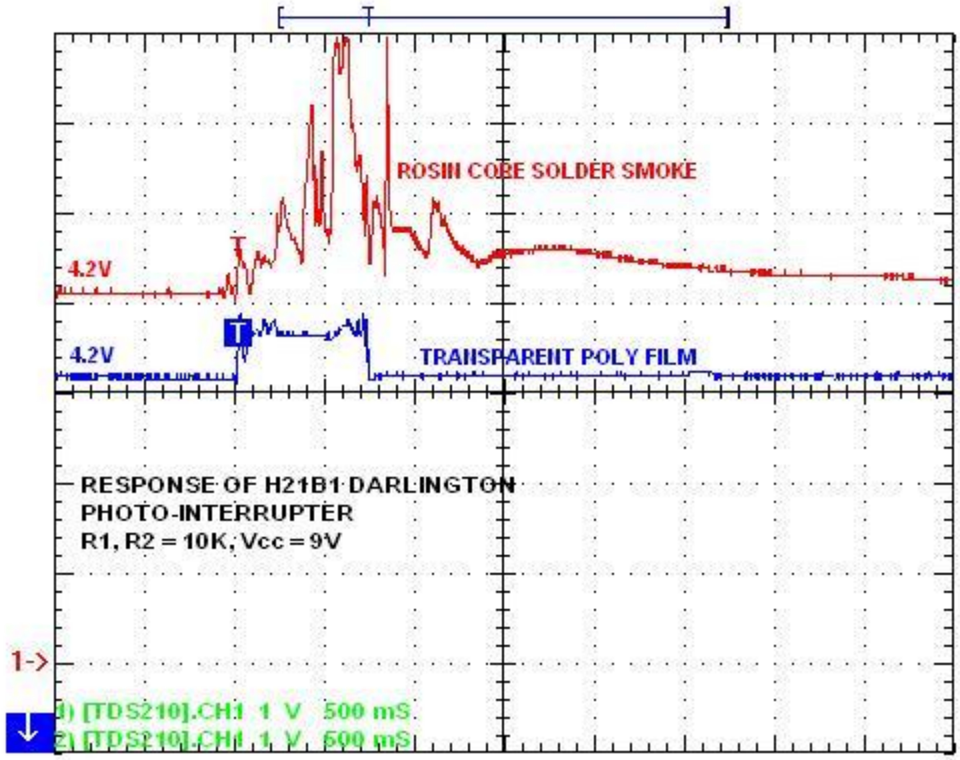
Schematic, Alternative Photo Interrupter



ALTERNATE PHOTO-INTERRUPTOR CIRCUITS

Although, I recommend the Darlington device, do not despair if you have the non-Darlington version. See the smoke alarm schematic for alternative devices /circuits. These were not tested, but I see no reason why they are not viable.

Initial evaluation



I had my doubts as to the effectiveness of the technique, so I tested a photo-interrupter with smoke. The oscillograph demonstrates what happens to the photo-transistor collector voltage when the gap is obscured with smoke from my soldering iron as it melted rosin core solder. Cool! It does work.

The oscillograph also has a trace showing what happens when a transparent poly film is inserted into the gap. It has a lower signature. I figured if it could see this effectively, it is an easier test, so the remaining testing is with film rather than smoke.

Ambient light also affects the output voltage. In my case, it was only about ±0.1V, but the sensor may need to be shielded from outside light sources if it is a problem.

Op amp selection

The old LM741 is a good choice, but I also found a low power substitute (TI TL061) that reduces battery current—see schematic for details. As it is, battery load is only 1.1mA—not bad!

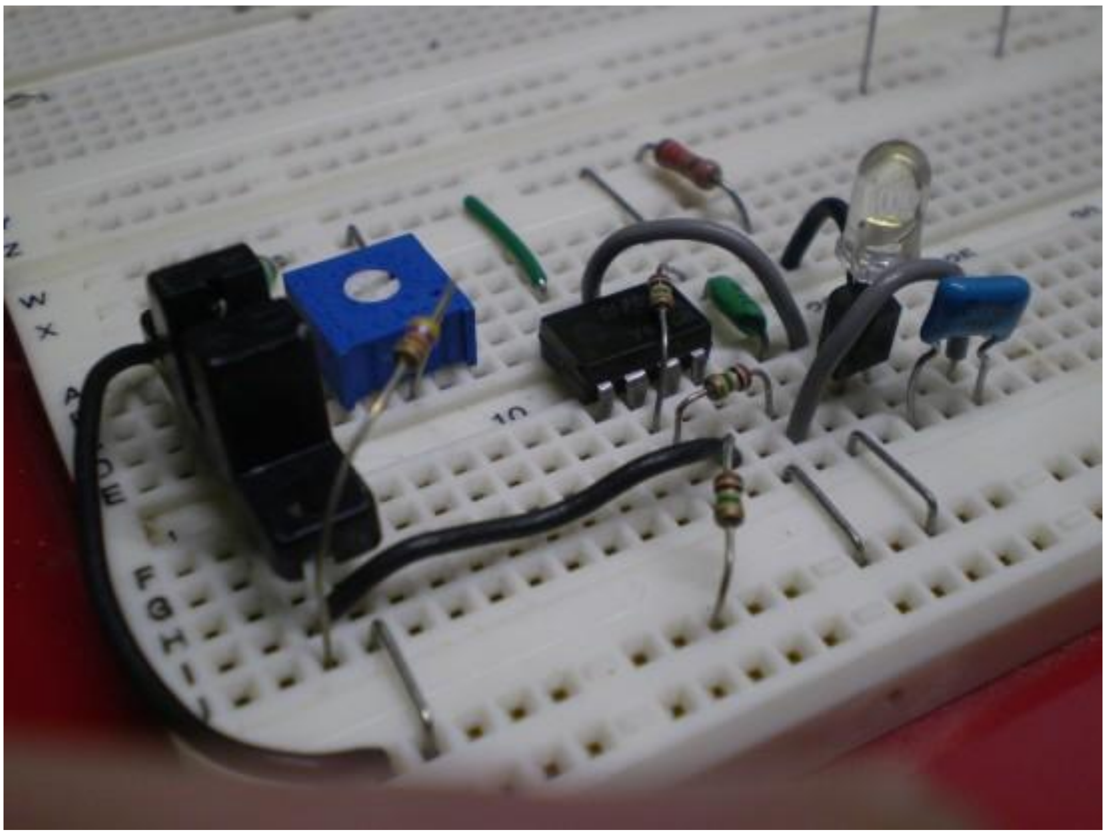
Smoke Alarm Circuit Operation

The LM741 is applied as a comparator /Schmitt trigger. The voltage on the inverting input is biased at 4.2V (half of Vcc). The collector of the photo-transistor is adjusted via R2 for 4.0V. Any reduction of the current transfer ratio causes the collector voltage to increase beyond 4.2V. At this point, the output voltage of the op amp goes positive and turns on the MOSFET. The drain of the MOSFET drops to zero volts and C1 couples a positive feedback signal to the inverting input via R8. The R*C of R8 & C1 causes the LED & siren to stay on for at least 1sec after the smoke has cleared. C1 has to be either film or ceramic because the voltage polarity reverses.

Adjusting R1?

R1 must be selected to provide approx 4V at the collector of the photo-transistor with R2 centered. Its resistance is a function of photo-interrupter transfer ratio and may vary as much as 40:1. When this is selected, R2 will be within range of making operational adjustments. The question marks on the schematics are for this purpose—actual resistance must be determined. In my smoke alarm circuit, one device required 10K while the other required 22K.

Protoboard photo



Note that I did not have a siren module on hand—only the LED.

Search

Bicycle Anti-Theft Alarm Circuit

I hate to suggest the specific application 'bicycle' because it may be use to protect many items from theft. This anti-theft alarm project is built around the inexpensive Measurement Specialties DT piezo film sensor. Every now and then everything seems to work out perfectly as in the Yin and Yang of the cosmos, and this is one of them.
It is simple, inexpensive and practical…

Anti-Theft Alarm Schematic

Bill of Material

anti-theft BOM.xls

Piezo sensor

I received this DT piezo film sensor as a sample years ago. It was attached to the application page via a round sticker. I never removed the sticker, but used it to attach #6 nut to increase inertia at the tip of the device—I could have experimented with other small masses, but this worked well from the git-go, so I left it that way. When the film is flexed, it produces a voltage at the terminals.
http://www.meas-spec.com/downloads/DT_Series.pdf

Initial experiments with the sensor were disappointing—I observed voltage and connected it to a charge pump type detector—yes, it functioned, but sensitivity was poor.

Single JFET transistor charge amplifier

Then I read up on charge amplifiers. One good discussion is "Signal Conditioning Piezoelectric Sensors"**http://www.ti.com/lit/an/sloa033a/sloa033a.pdf**

The paper discussed using FET input op amps in such a way that the sensor develops no voltage at the output terminals—only generates a current that is then amplified by the charge amplifier. This is important because the sensor has significant capacitance (e.g. 500pf) and any voltage generated by the sensor is swamped by this capacitance thus greatly attenuating the output voltage.

Then the wheels started turning—and I thought up a means of using a single JFET as a charge amplifier. This I bread boarded and tested—performance was phenomenal! The source feedback resistor doubles as a negative feedback device depending upon the position of the trim pot adjustment.

JFET selection

Unfortunately, the selection of TO-92 style JFETs is now limited, but the J111, J112 & J113 seem to be going strong. These three vary mainly in the Idss parameter (drain current with gate shorted to source). The J113 has a min Idss of 2mA that is best for our application because one goal is to minimize battery current. Since I did not have one of these devices on hand, I used an ancient MPF-106. I experimented with a total of (7) JFET devices, and only one would not work and that was because its Idss was so high that it turned itself fully on—I could have used this device by reducing the value of R3, but that would have increased battery drain. As it was, this stage consumed 160uA—similar to a low power op amp. NXP has the best J113 datasheet:
http://www.nxp.com/documents/data_sheet/J111_112_113_CNV.pdf

Charge pump detector

The charge pump detector is essentially the same as a cascade voltage doubler rectifier that is used for signal applications. It detects the peak to peak voltage of the AC input voltage waveform (minus the diode drops). In this circuit C2, C3, D1 & D2 perform this function. Additional sensitivity adjustment is possible via adjusting the value of C2. The value of C3 effects both attack and decay time.

Anti-Theft Alarm Oscillograph

Anti-Theft Alarm Protoboard

555 voltage threshold detector/pulse generator

You may recall that in a previous article, I did not recommend using pin 4 as a level detector.
http://www.electroschematics.com/7195/quirky-555-timer-reset-function/

However, I should have qualified it to allow the TLC555 CMOS device manufactured by TI. This device works well in this application with its low reset threshold (1.1V) and very high input impedance.

Wired as an astable multivibrator, the external components draw no additional current when in the reset condition. With a repetition rate of 2hZ, it gets maximum attention.

The TLC 555 is unable to source the required load of 28mA, so a 2N4401 provides the additional drive capability.

Battery operation

Idle current is about 300uA. Theft alarm mode current is about 28mA. This lends itself well to long 9V alkaline battery life. Furthermore, when the key switch is off, drain is zero.

Physical construction

Note this is something that I did not build, but this is how I would do it. The plastic box is indicated on the BOM. It may be attached to the bicycle frame via two cable ties that pass through holes in the box (either cover or box may be made stationary). If higher security is desired, cut slots in the box and use small stainless steel hose clamps with the buckle located inside the box where it is inaccessible—getting it all to fit may be a challenge.

The LEDs are located on the left and right sides to obtain maximum attention—with the correct hole diameter, the LEDs are a press fit.

The key switch may be scavenged from an old desktop computer (if you can locate one with the key). They are also available on eBay at a very reasonable price (new)—used ones are expensive.

Glossary of undocumented words and idioms (for our ESL friends)

git-go –idiom, noun, variation of get-go –from the beginning or outset—although not indicated, I think that it was derived from the old animal handling (horse) phrase “giddy up”

wheels started turning –idiom, started to think

Electronic Mosquito Repellent Circuit

Mosquito repellents like coils, mats, liquid vaporizers, creams are often used at various places. However they are prone to be fatal and can cause harm to human beings. For instance, mosquito repellent creams and oils can cause adverse affects on the skin like allergic reactions. Coils, mats can produce toxic fumes when heated and cause breathing trouble, whereas liquid vaporizers can also produce fumes when heated.

For efficient results without any side effects, the most optimum solution is building a simple electronic circuit with minimal components which can produce output so as to repel the mosquitoes. In plain words, this article is going to describe a simple mosquito repellent circuit.

Principle Behind Mosquito Repellent Circuit:

Human beings can hear sound in the range of 20 Hz to 20 kHz. Sound of any frequency above 20 kHz is termed as ultrasonic sound. Several animals like cats, dogs, insects, mosquitoes have the feature of being able to hear this ultrasonic sound. In mosquitoes, this feature is attributed to the presence of sensory structures in their antennae. Usually ultrasound is transmitted by male mosquitoes and received by female mosquitoes. However after breeding, female mosquitoes generally avoid the ultrasound and this fact can be used to produce ultrasound in a range similar to that produced by male mosquitoes and repel away the mosquitoes. The ultrasound produces a stress on the antennae of the mosquitoes and repels them away.

In other words, a simple circuit is designed which can produce ultrasound in the frequency range of 20 kHz to 38 kHz, which can scare away mosquitoes.

Mosquito Repellent Circuit Design:

The basic idea behind developing the circuit is to use a buzzer to produce ultrasound. The buzzer is driven by an oscillator circuit. Here, we are using a **555 Timer based astable multivibrator circuit** as the oscillator circuit.

Designing the circuit involves designing an astable multivibrator circuit. Generally, frequency of output signal produced by a 555 astable multivibrator is given by:

$$F = 1.44((Ra+Rb*2)*C)$$

Here Ra is the value of resistor between pin 7 and Vcc, Rb is value of resistor between pins 7 and 6 and C is value of capacitor between pin 6 and ground.

Let C = 0.01 microFarad

F = 38 kHz

Let Duty Cycle, D = 60% (It is not possible to get 555 timers to produce signal with 50% duty cycle.

This gives,

Ra = 1.44(2D-1)/(F*C)

And Rb=1.44(1-D)/(F*C)

Substituting values of C, F and D, we get

Ra = 0.758 K Ohms, i.e. 758 Ohms and Rb = 1.52 K Ohms

Thus, we can use a resistor of 760 Ohms and another resistor of 1.5 K. Here a potentiometer of 1.5 K is used.

So, these are the components we required

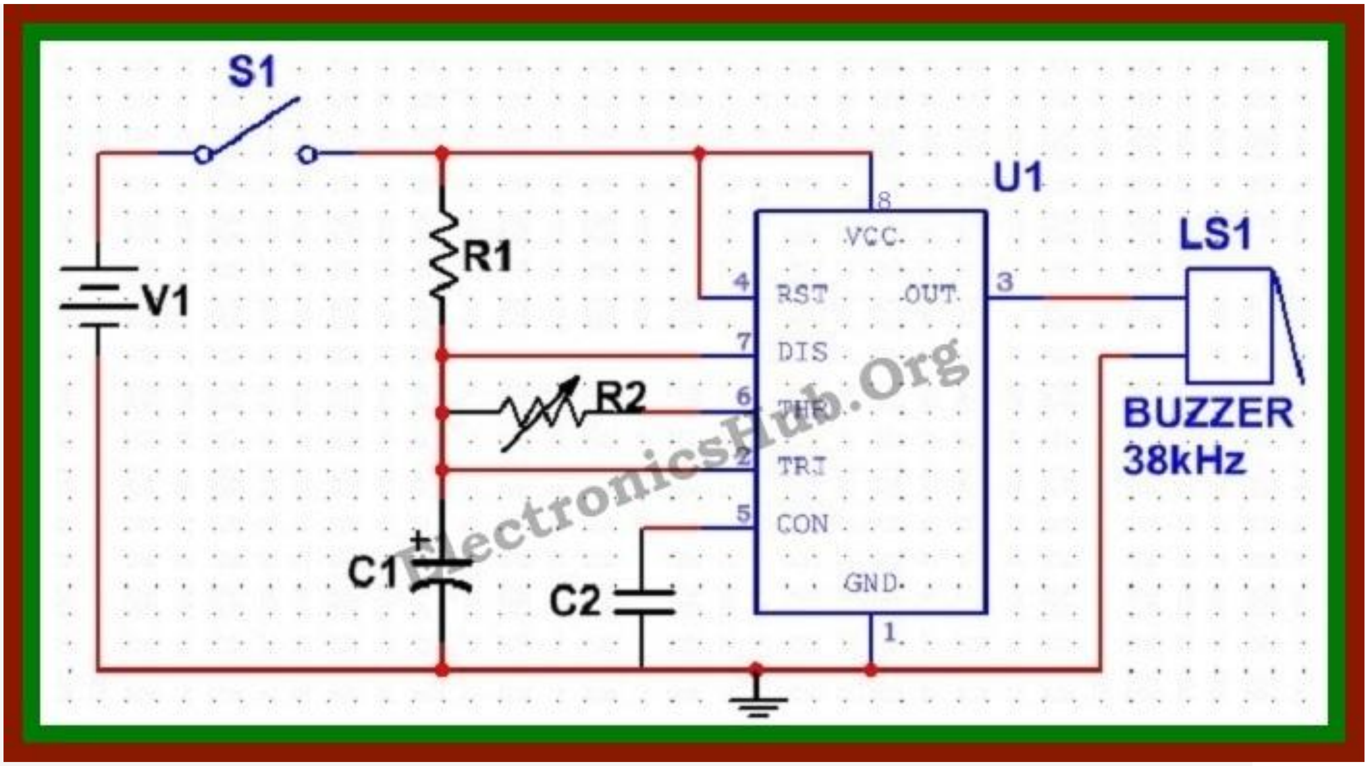
1. An electrolyte capacitor of 0.01 micro Farad
2. A ceramic capacitor of 0.01 micro Farad
3. A resistor of 760 Ohms
4. Another resistor of 1.5 K
5. A 38 kHz piezo buzzer
6. A SPST switch
7. A 5 V battery

Theory Behind the Circuit:

- A multivibrator is an electronic circuit producing a pulsed output signal. Generally multivibrators are classified based on the nature of stability of output.
- A multivibrator with one stable state is known as monostable multivibrator and is used as a pulse generator.
- A multivibrator with no stable state is known as an astable multivibrator and is used as an oscillator.
- A multivibrator with two stable states is known as a bistable multivibrator and is used as a Schmitt Trigger.

Here we are mainly concerned about Astable multivibrator. Astable multivibrators do not require any external triggering and hence can be used as oscillators. They are realized using transistors, operational amplifiers or ICs.

Circuit Diagram of Electronic Mosquito Repellent Circuit:



Electronic Mosquito Repellent Circuit Diagram – ElectronicsHub.Org

The most common form of Astable multivibrator is **555 Timer IC**. It is basically an 8 pin IC with the following pin description:

- Pin1 – Ground pin, which is directly connected to the negative terminal of the battery.
- Pin2- Trigger Pin. It is an active low pin. The timer is triggered when signal at this pin is less than one third of supply voltage. For astable operation this pin is connected directly to pin no.6
- Pin 3 – It is the output pin.
- Pin 4 – It is the reset pin. It is an active low pin. It is usually connected to positive rail of the battery.
- Pin 5 – It is the control pin and is seldom used. For safety purpose, this pin is connected to ground through a 0.01microFarad ceramic capacitor.
- Pin 6 – It is the threshold pin. The timer output is back to its stable state when voltage at this pin is greater than or equal to two-third of supply voltage. For astable operation, this pin is shorted to pin 2 and connected to pin 7 using a resistor.
- Pin 7 – It is the discharge pin and provides the discharge path for the capacitor.

Mosquito Repellent Circuit Operation:

Once the switch is closed, the 555 timer gets the power supply. As per the inner circuit, initially the capacitor voltage will be zero and hence voltage at threshold and trigger pin will be zero. As the capacitor charges through resistors Ra and Rb, at a certain point voltage at threshold pin is less than the capacitor voltage. This causes a change in timer output. The capacitor now starts discharging through resistor Rb, i.e. the discharge pin and continues so until the output voltage is back to the original. Thus the output signal is an oscillating signal with frequency 38 KHz. The output from this astable multivibrator circuit drives a 38 KHz piezo buzzer, producing ultrasound at regular repetitions. On varying the value of potentiometer, the output frequency can also be varied.

Applications of Mosquito Repellent Circuit:

As described, this circuit can be used as a mosquito repellent. By certain modifications and changes in the value of resistors and capacitor, the circuit can also be used as other insect repellent. Further, it can also be used as a simple buzzer alarm circuit.

Mosquito Repellent Circuit Limitations:

- It requires a lot of frequency setting.
- Ultrasound signals travel at an angle of 45 degrees from the source. In case of any obstacles in the path, the signals get reflected or diverted.
- It shows effect for lesser mosquito population.

Automatic Railway Gate Controller with High Speed Alerting System

The main aim of this project is to operate and control the unmanned railway gate in the proper manner in order to avoid the accidents in the unmanned railway crossing. In a country like ours where there are many unmanned railway crossings, accidents are increasing day by day. These train accidents are due to the absence of human power in the railway. In order to overcome the accidents due to the above problem we have planned to design the project.

Automatic Railway Gate Control System with High Speed Alerting System is an innovative circuit which automatically controls the operation of railway gates detecting the arrival and departure of trains at the gate. It has detectors at the far away distance on the railway track which allows us to know the arrival and departure of the train. These detectors are given to microcontroller which activates the motors which open/close the railway gate correspondingly.

Another feature of this circuit is that it has an intelligent alerting system which detects the speed of the train that is arriving. If the speed is found to be higher than the normal speed, then the microcontroller automatically activates the alarm present at the gate. This alerts the passengers at the railway crossing on the road about this. Also This circuit has the feature for Identification of train from other intruders i.e, animals etc .This can be implemented in manned level crossings also, as manual errors can be eliminated by automation.

Circuit Diagram of Automatic Railway Gate Controller:

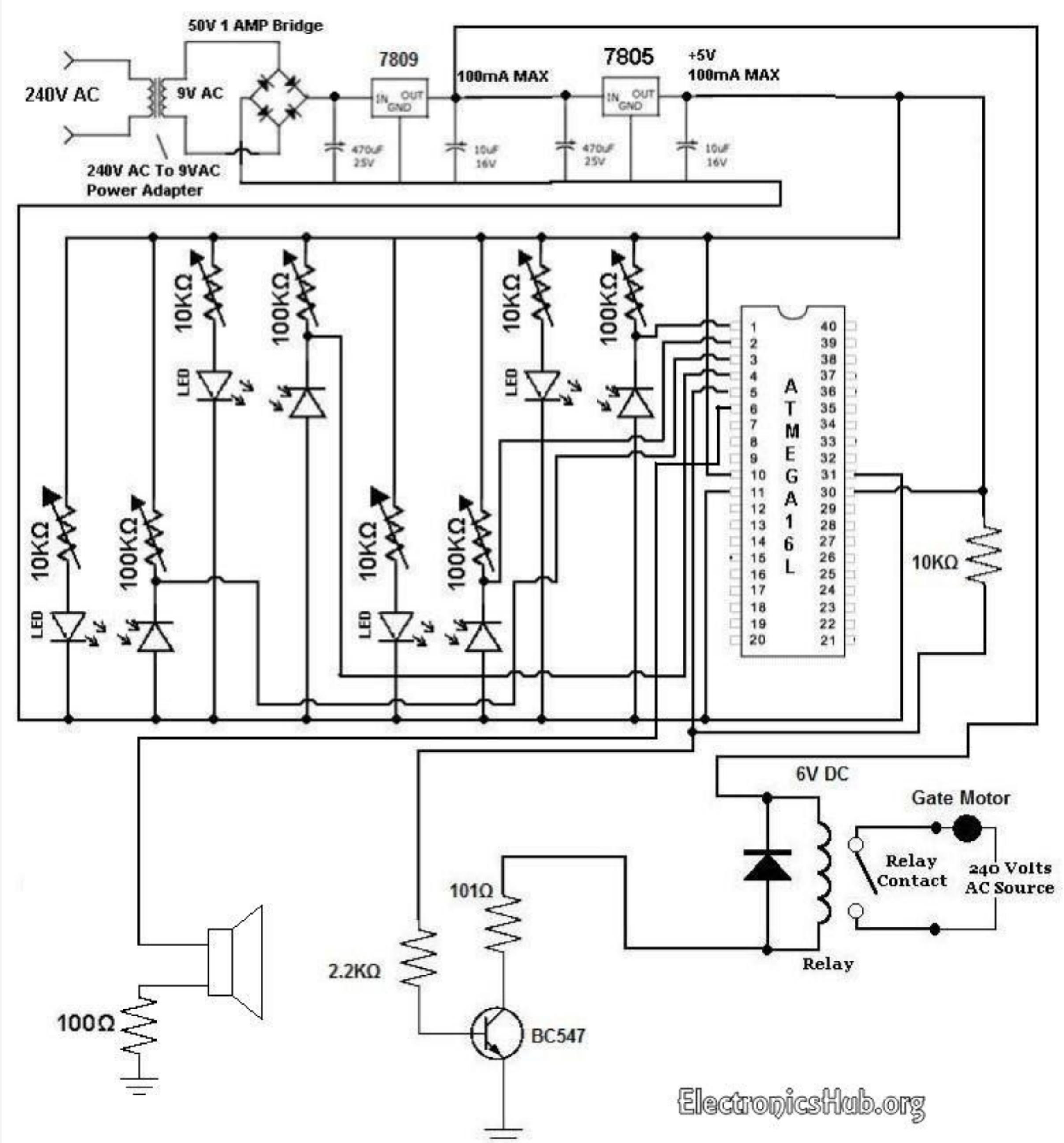


Fig. 2.2: Circuit Diagram of Automatic Railway Gate Controller – ElectronicsHub.Org

Circuit Operation:

The operation of the circuit can be clearly explained as follows. Basically the circuit consists of four IR LED-Photodiode pairs arranged on either side of the gate such that IR LED and photodiodes are on either side of the track as shown in the figure below.

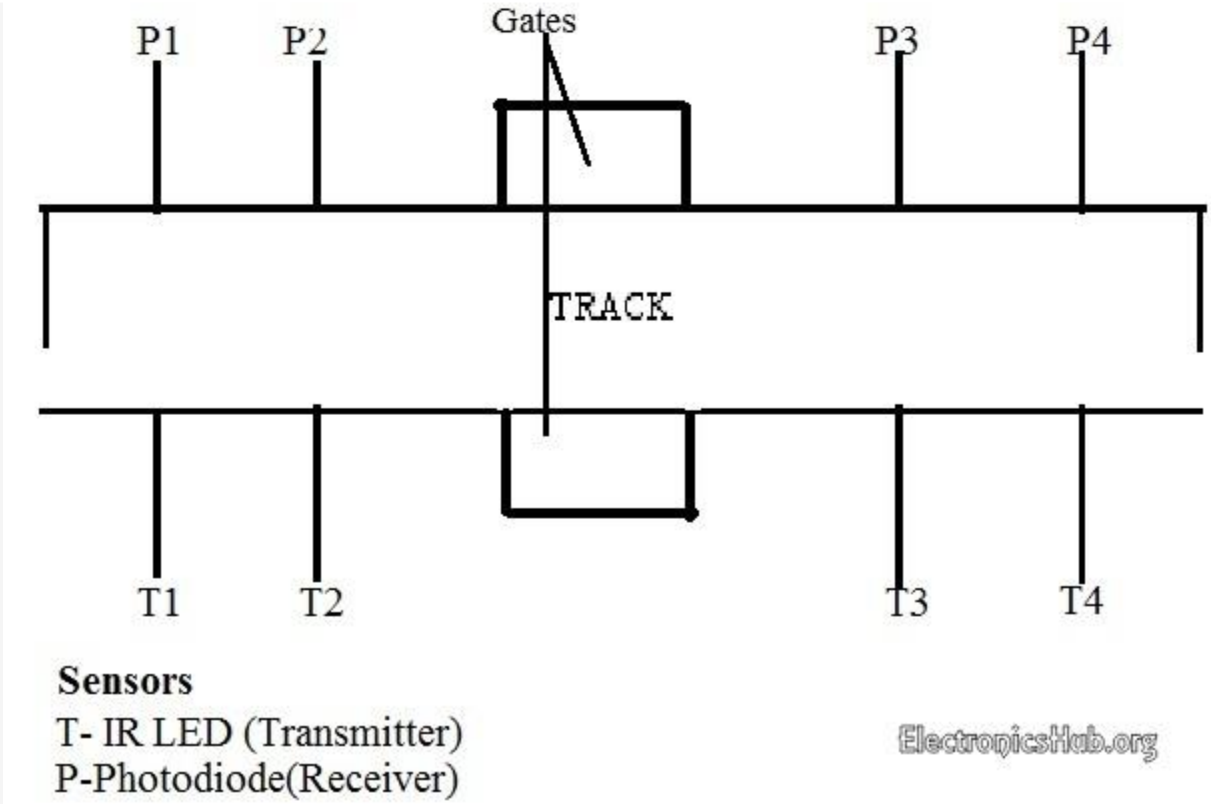


Figure 2.3: Sensor Arrangement – ElectronicsHub.Org

Initially transmitter is continuously transmitting the IR light which is made to fall on the receiver. When the train arrives it cuts the light falling on receiver. Let us assume the train is arriving from left to right, now when the train cuts the 1st sensor pair a counter is activated and when it crosses 2nd sensor pair the counter is stopped. This counter value gives the time period which is used to calculate the velocity of the train.

The sensor2 output is sent to microcontroller which makes the relay activate which causes the gate to be closed. Now when the last carriage of the train cuts the sensor4 microcontroller de-activates the relay and gates are opened.

How does the sensor know the last carriage?

Here as previously mentioned the counter value is used to calculate the velocity of the train, which means that every wheel of the carriage cuts the sensor pair within small fraction of time based on its velocity. After the last carriage is passed there is no obstacle to the sensor pair within that fraction of time hence it knows that the train has left.

One more feature of this circuit is detecting a train accurately i.e, there may be a chance that some obstacle (for e.g some animal) may cut the sensor then in such a case the counter is made to run for certain period of time (this time period is set considering the possible lowest speed of train) if the obstacle does not cut the 2nd sensor before this predefined time then this obstacle is not considered as train and gates remain opened.

One more advantage of calculating the velocity of train is, if the speed of the train crosses a limit i.e, if it is traveling at an over speed then the passengers are alerted using a by activating a buzzer.

The system basically comprises two IR LED – Photodiode pairs, which are installed on the railway track at about 1 meter apart, with the transmitter and the photodiode of each pair on the opposite sides of the track. The installation is as shown in the block diagram. The system displays the time taken by the train in crossing this distance from one pair to the other with a resolution of 0.01 second from which the speed of the vehicle can be calculated as follows:

Speed (kmph) = Distance/Time

As distance between the sensors is known and constant, the time is counted by the microcontroller and from this information, we can calculate the speed.

This circuit has been designed considering the maximum permissible speed for trains as per the traffic rule.

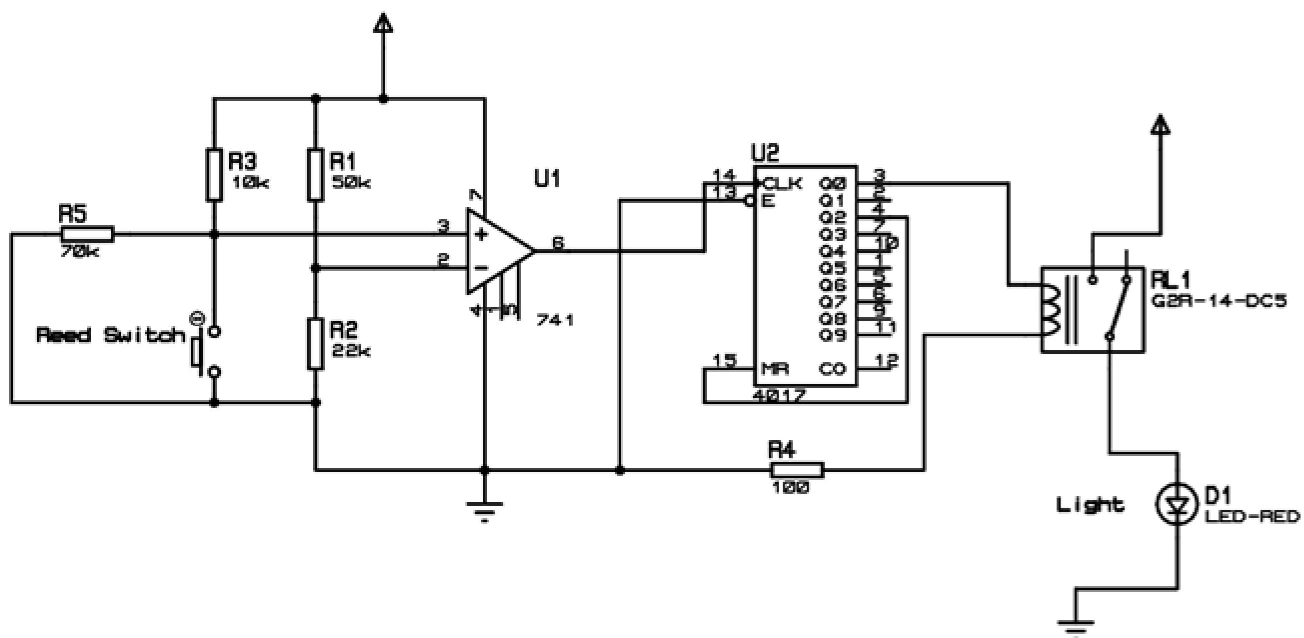
The microcontroller is used to process the inputs that are provided by the sensors and generate the desired outputs appropriately.

Automatic Washroom Light Switch

We turn On the lights in our washroom when we enter it and turn them off when we leave. We sometimes forget to turn Off the lights after leaving the washroom. This may lead to power wastage and also the lifetime of the lights may decrease. To avoid these problems, we are going to make a circuit which automatically turns On the lights when a person enters the washroom and it automatically turns it Off when he leaves it.

By automating this, there are many advantages like, the person need not care to turn On the light always when he is using the washroom. The circuit which we are doing does it automatically for that person. Also, the person need not turn it off after using the washroom. There is no fear that he forgets to turn it Off. The circuit is also designed to consume lesser power so that the circuit can be used in any household or public washrooms without worrying about the power bills.

Automatic Washroom Light Switch Circuit Diagram:



The operation of the circuit is as follows. When the door of the washroom is opened and closed, the circuit turns switches On the light using a relay. When the door opens and closes for the second time, the circuit turns Off the light by turning off the relay.

Read good post on [Automatic Door Bell With Object Detection]

The element which is used to detect the opening and closing of the door is a reed switch. There are two types of reed switches. We are using the one which will be closed in normal state and open when there is a magnetic field nearby. A reed switch electrically is just a relay kind of component but unlike a relay which activates when a coil voltage is supplied, the reed switch activates when a magnetic field is detected in the vicinity. The circuit is given a power supply of 9V. The pin-16 of IC 4017 is given 9V. The pin-8 of 4017 is given to ground.

The circuit uses IC 741 op-amp as a comparator arranged such that its output is high by default when the door is closed. The circuit is attached to the door frame whereas a permanent magnet is attached to the door in such a way that it comes closer to the reed switch when it is closed. The IC 4017 is made to alternate between each door open and door close. When the door is opened and closed for one time, the circuit turns On the relay and the the Light turns ON. When the door is opened and closed for the next time, the circuit turns Off the relay and the light turns off. The IC 4017 is capable of counting upto nine counts but we are restricting it to count only two and reset back. The ability of this IC to adjust the count value as desired helped us in this project to use it as a one bit counter.

When the door is closed, the reed switch opens and hence the op-amp output which is the 6th pin of IC 741 is HIGH. When the door is closed, the pin-6 of IC 741 is turned Off. When the door is closed back, it triggers the IC 4017 decade counter and hence the relay toggles ON and OFF for each door open and close operation.

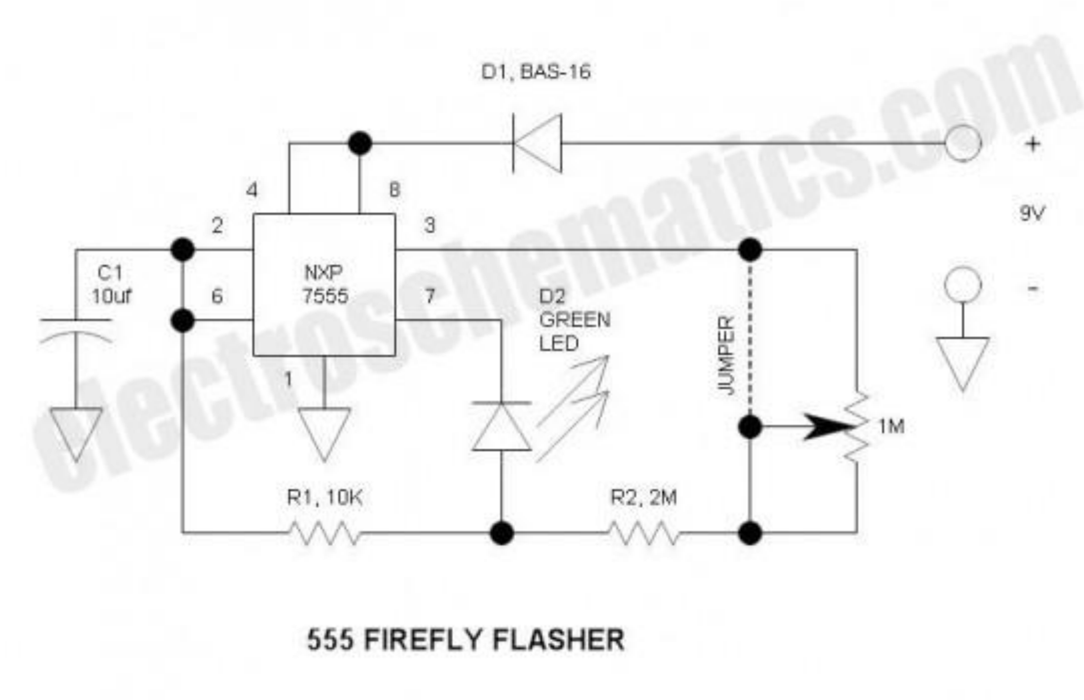
Firefly Lights Circuit

This firefly lights flasher is an easy, fun project.
It can be built on the tiny circuit board, or on perf board.

Specifications

- Battery life: approx 1 year using the NXP 7555 CMOS timer IC & standard alkaline battery, or about 6 months using the more common TI TLC555
- Flash rate: approx 0.25 Hz (unless using optional potentiometer)
- Dimensions: 14.5mm^2
- Minimum voltage: approx 6V

Schematic of the Firefly Flasher Circuit



download the firefly pcb

555 datasheet

Bill of Materials
(if on perf board, use standard through-hole rather than SMT components)

- PCB ExpressPCB.com
- U1 NXP 7555 or TI TLC555 Timer IC, SOIC-8
- R1 10K, 0805
- R2 2M, 0805

- R3 Potentiometer, 1M , 0.2” lead spacing (optional)
- C1 10uF, 25V, X7R, Ceramic, 0805
- D1 Diode, BAS16, or MMBD4148, SO23-3
- D2 LED, Green, High Brightness, 0805
- Battery Standard 9V

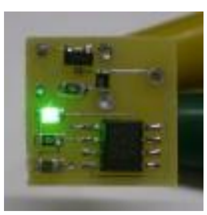
How the firefly lights works

It functions like almost any 555 astable timer, except that the LED is inserted into the capacitor reset path so that when pin 7 discharges C1 to common, this relatively high current must pass through the LED. In this way, the average battery current is only about 100μA. When battery voltage becomes very low, the LED threshold voltage prevents discharging C1 down to the lower threshold – when this happens, R2 finishes off the discharge because the output switches to ground potential the same time pin 7 turns on – you will find that this works on almost dead batteries that may be useless for other applications. D1 protects against accidental reverse battery voltage.

Background

Fireflies are common through Northeastern US and also in many other parts of the world. This green LED has the same color, flashes at about the same duration and has a similar repetition rate just like a real firefly (lightning bug). Put a number or these around your grounds and they will truly resemble fireflies – there will be no synchronization of the flashes. The only thing this cannot do is to fly – fireflies ascend as they flash, and they do not flash when perched to protect from predators. Also, this is much larger than the tiny firefly beetle that measures about 3 x 20mm.

Photographs

Visible on the photo is a wire jumper connecting R2 to IC pin 3. This was an afterthought when I found that low voltage operation was poor. The PCB file is updated to fix this. The optional resistor is not used in this case, but is easy to add if desired. You may adjust component values to obtain desired results.

For the Future

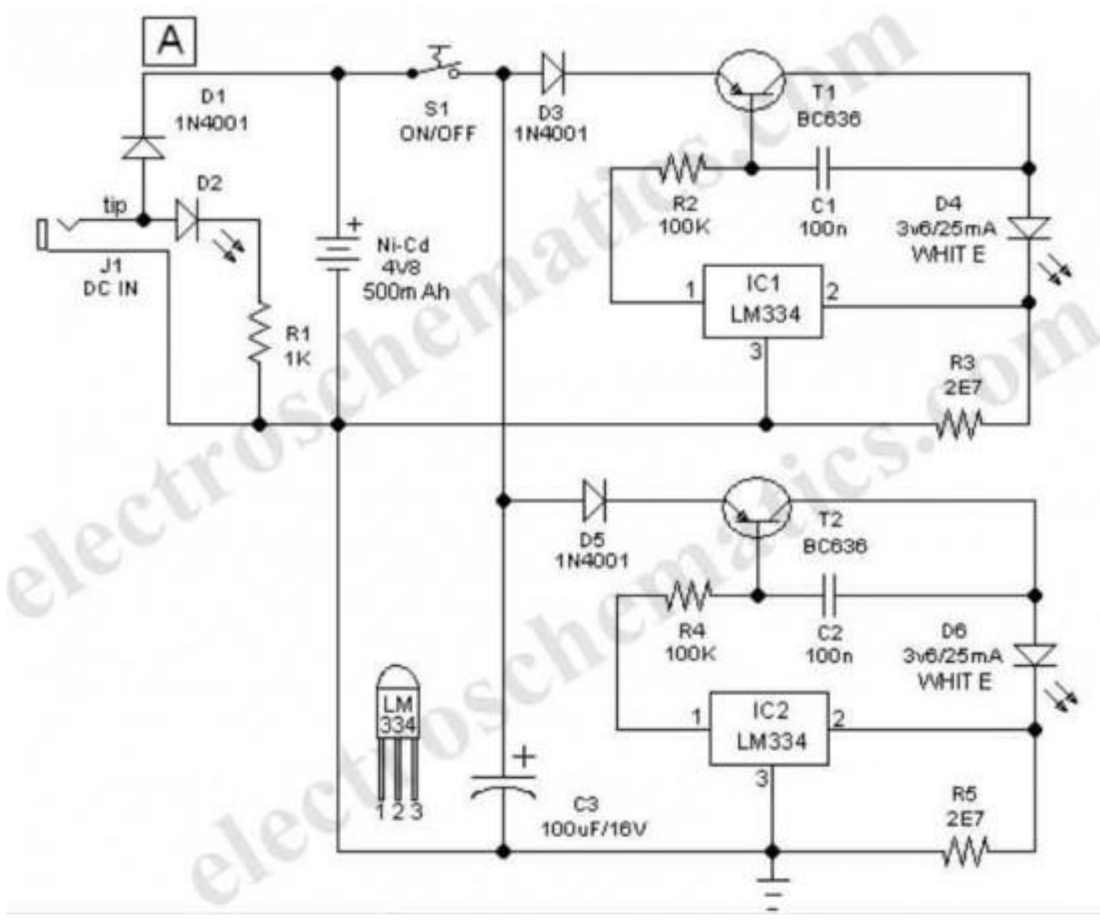
Make it extinguish during daylight hours thus dou

Handy Pen Torch Circuit

This easy to construct "Handy pen torch" electronic circuit and low component count, uses two power white LEDs for lighting. Low volt (4.8V dc) supply available from the built in rechargeable Ni-Cd battery pack is first converted into two channel (independent) constant current sources by two pieces of the renowned precision adjustable shunt regulator chip LM334 (IC1 and IC2).

Around 25 mA at 3.6 volt dc is available at the output of these ICs. This regulated dc supply is used to drive two power white LEDs D4 and D6. Resistors R3 and R5 limlits the output current (and hence the light output) of IC1 and IC2 circuits respectively.
Besides these components, one red color LED (D2) is included in the main circuit which works as a battery charging supply input indicator.
Resistor R1 limits the operating current of this LED .

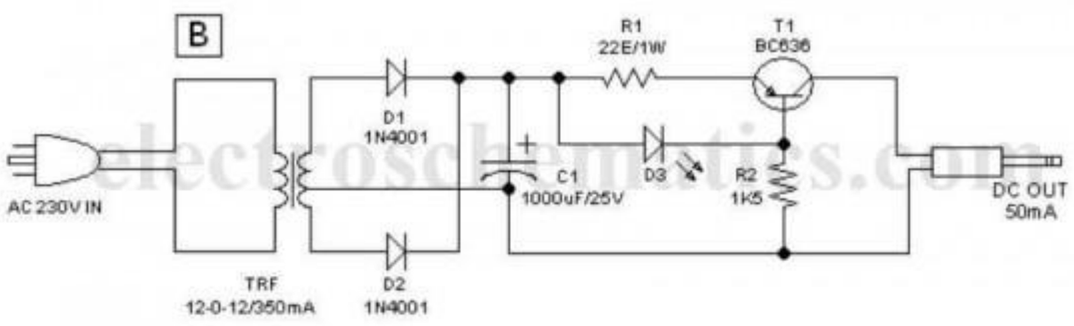
Pen Torch Electronic Circuit Schematic



Diode D1 works as an input polarity guard cum reverse current flow preventer. Capacitor C1 is a simple buffer for circuit stabilization. After succesful construction, preferably on a small piece of general purpose PCB, enclose the whole circuit in a suitable and attractive pen torch cabinet. If necessary, drill suitable holes in the cabinet to attatch the dc socket, on/off switch and the input indicator etc. In prototype,commonly available 4.8 volt/500mah Ni-Cd battery pack (for cordless telephones) is used.

One very simple but reliable ac mains powered battery charger circuit for the handy pen torch is also included here. **Basically the pen torch circuit is a constant current charger** wired around Transistor T1 (BC636), powered by a 12v/350mA step down transformer and associated componentsD1, D2 and C1.

AC mains powered battery charger for the pen torch



Unregulated 12 volt dc available from the input power convereter circuit, comprising step down transformer(TRF), rectifier diodes (D1,D2) and filter capacitor (C1), is fed to T1 through a current limiting resistor R1. Grounded base PNP transistor T1 here works as a constant current generator. With 22 ohm resistor for R1, the charging current available at the output of the charger is near 50 mA.

Red LED (D3) provides a fixed voltage reference to the base of T1, with the help of resistor R2. (During charging process, Diode D1 in the main circuit prevent reverse current flow from the battery pack when charging input supply is absent.) After construction of the pen torch circuit, fit the assembled unit inside a small plastic enclosure for safety and convenience.

Clock Alarm Controlled Light Switch

Here is an ultra simple automatic light switch circuit for bedrooms.
After construction, connect the input terminals of this circuit in parallel to the internal buzzer terminals of a Quartz-Alarm Clock. When the clock alarm is activated at a time set by the user, electromagnetic relay in the circuit is energised for a short duration, controlled by the timer IC 555.

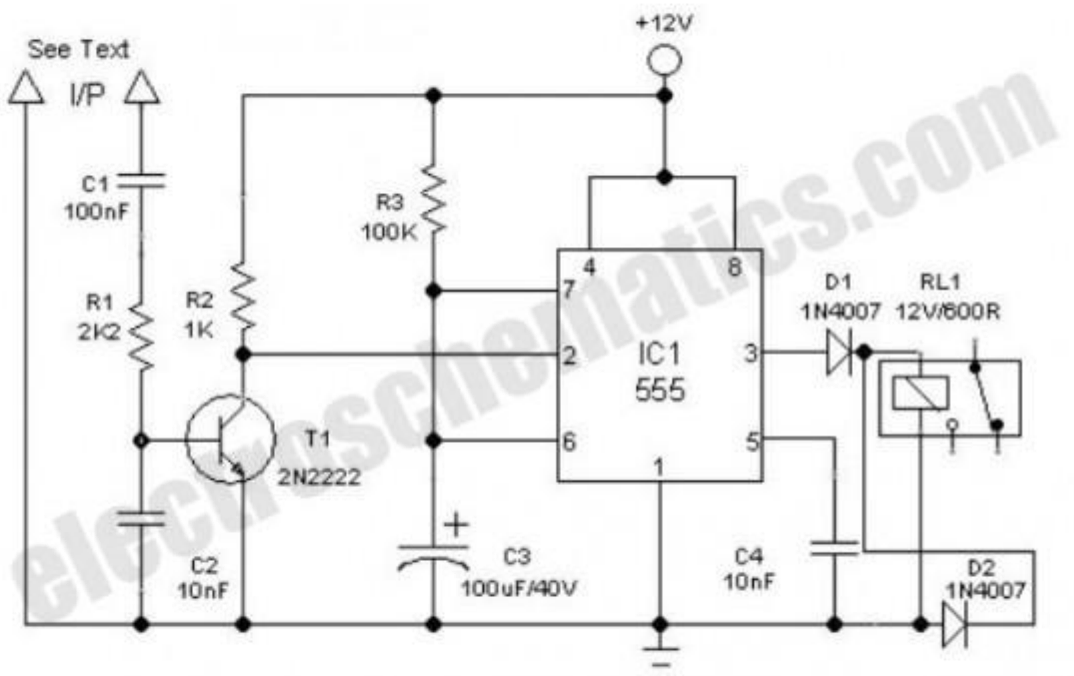
Contacts of the relay can be used to switch on a bedlamp, table lamp or similar electric light loads.
The circuit works off unregulated 12V.U se any12VDC/500mA rated standard ac mains adaptor.

When the clock alarm rings, input pulses are fed to the trigger input point (T1+Pin2) of IC1, through an RC filter (C1, R1&C2).

Here IC1 is wired as a monostable and dc voltage at its output (Pin 3) terminal goes high instantly after receiving a trigger,and remains in the condition for about 10 seconds, as configured by the components values of R3 and C3. Output from IC1 directly drives the low current relay RL1 through diode D1.

Note that diode D2 is here used as a freewheeling diode to suppress the counter emf generated during relay switching.

clock Alarm Light Switch Circuit Schematic



Light Fence Security Beeper

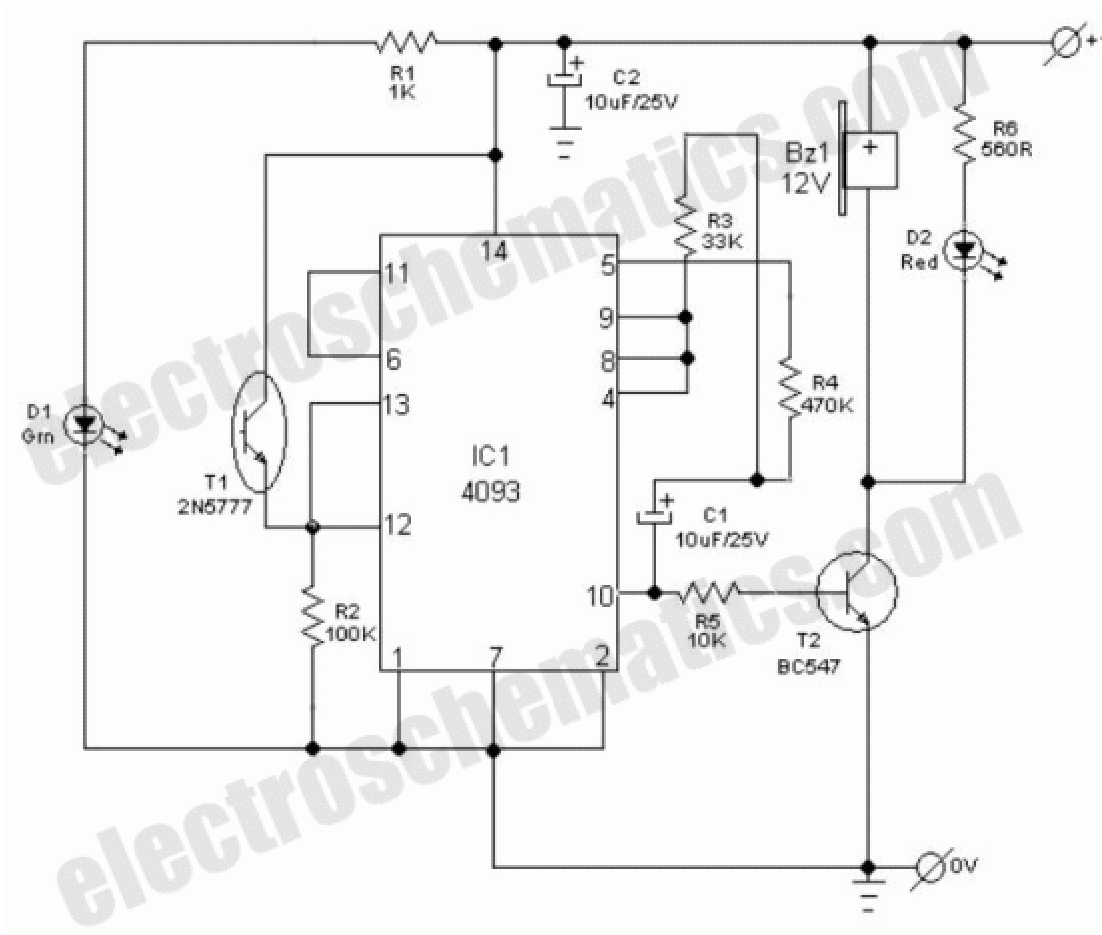
General purpose hobby circuit of a simple light fence security beeper is presented here. This circuit can be used as a door alarm, gate alarm, pathway alarm, etc. Any 12 Volt dc power supply can power the whole circuit

Working of this circuit is straight forward. In standby mode photo transistor T1 receives light from the green LED (D1) and T1 conducts to disable the gated low-frequency astable built around IC1(4093).

When this light path is interrupted by any object in the path, T1 stops conducting and IC1 is switched by the low level at its input point (pins 12&13). As a result the piezo-buzzer starts beeping at a slow rate determined by the in circuit values of R3, R4 & C1. Red LED (D2) is a visual warning indicator.

With the help of suitable reflector and lens assembly, length of the light path can be increased. A minimum of 1 to 2 metres is possible with a high-bright green LED as D1. A laser pointer can also be used as the light source.

Light Fence Alarm Circuit Schematic



Door Timer Circuit with Alarm

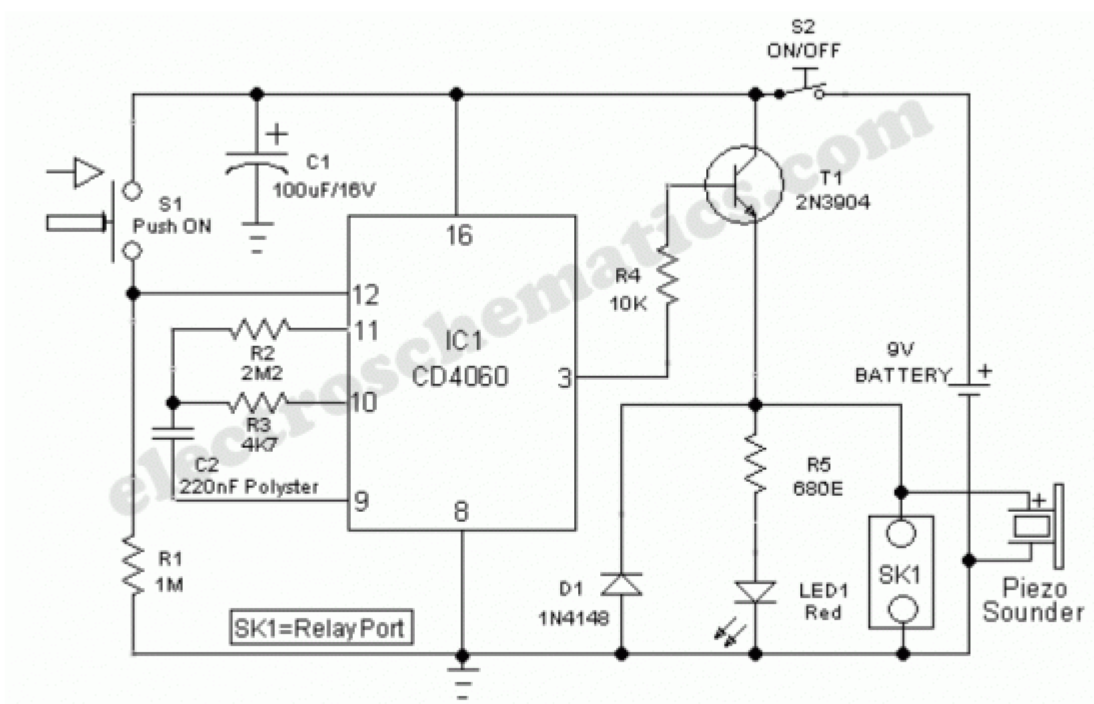
We are in a digital era! Now we can add some intelligence to our doors and gates without too much investments. Just assemble this little door timer circuit built around a few cheap and simple components and link it to any door/gate as per your requirement and taste. If the door/gate remains in open condition for a prefixed time an acoustic sounder starts beeping to raise an alert.

At the heart of the circuit is CD4060, which is a 14-stage ripple-carry binary counter/divider plus oscillator. Here CD4060 is configured as an independent timer. In standy by state, ie when switch S1 is in closed condition, the reset terminal (pin12) of CD4060 is at a high level and the timer is in inactive mode. When the door is opened, S1 also opened as per the mechanical arrangement and CD4060 gets activated.
After a short period,transistor T1 conducts to power the active piezo-sounder. Red LED in parallel with the piezo-buzzer also lights up instantly. When the door(and hence S1) is closed, circuit returns to standby state automatically.

The open door alarm circuit works off 9V (PP3/6F22) battery supply. Assemble the circuit on a small PCB and enclose in a plastic box of appropriate size. Mount the switch S1 in the door/gate frame and connect it to the circuit through external cable. If possible use a key-lock type switch for power on/off function (S2).

Note: Preset delay time can be changed by changing the value of timing resistor R3. SK1 is an optimised connection terminal for attaching a standard 6-9Volt electromagnetic relay.

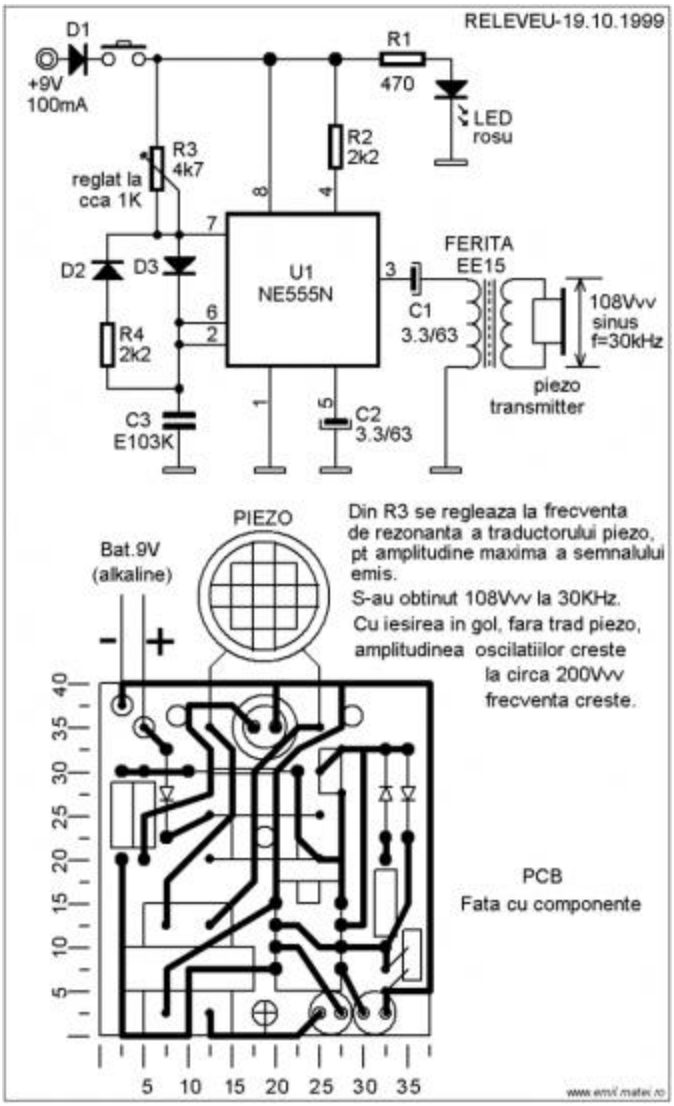
Door Timer Circuit Schematic



Ultrasonic Dog Repeller Circuit

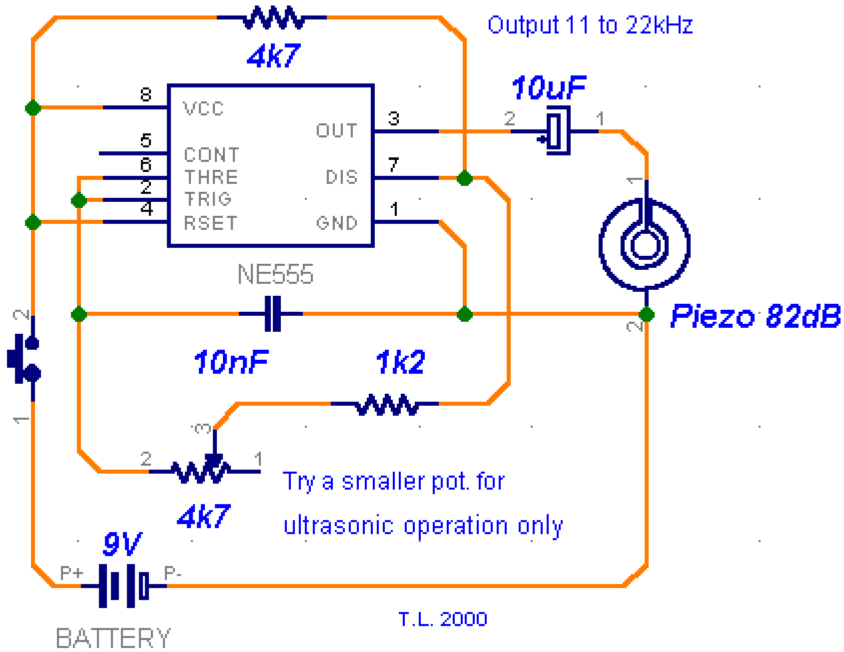
This ultrasonic dog repeller circuit will chase away angry dogs. It is build with the all known 555 circuit, a buzzer and a little ferrite transformator. The ultrasonic frequency must be set with a dog nearby.

Dog Repeller Schematic no 1

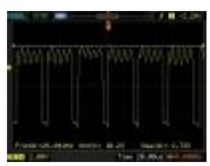


Circuit number 1 uses the well known NE555 IC, couple of components and a EE15 ferrite transformer. Adjust R3 at resonance frequency of the piezo transducer for maximum aplitude of the repeller ultrasonic sound. At 30 KHz this can reach a value of 108 Vpp. Without the piezo the output voltage is around 200 Vpp.

Dog Repeller Schematic no 2



breadboard and oscilloscope screen captures

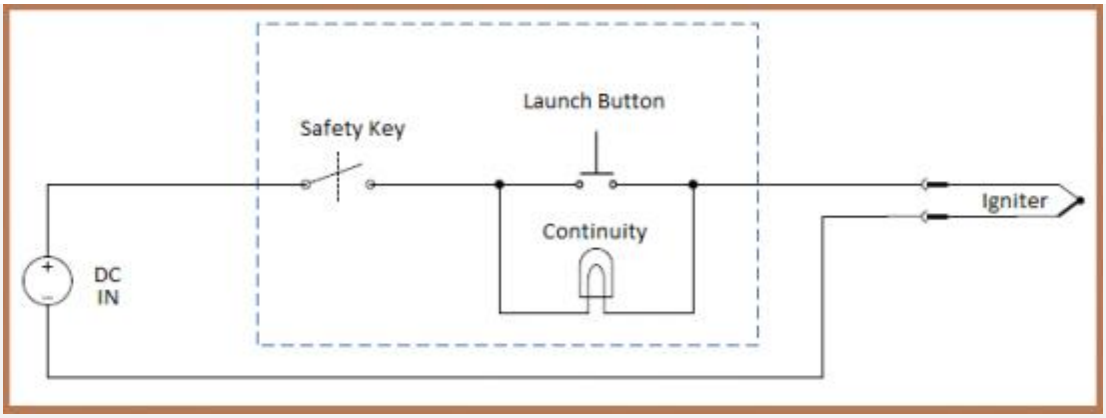


I have replaced the 10nF capacitor with a 6.8nF one so it can cover a frequency range between 11kHz and 25kHz, but in your case it might work with the 10nF. The output voltage has a value of 10Vpp and the buzzer is a passive one (without generator).

Model Rocket Launch Controller

Model rocketry is an amusing hobby! Model rocket launcher circuit presented here is carefully designed to avoid accidental ignition, and is capable of delivering battery power to the igniter in an efficient manner. This will avoid launch failure and maximize the battery life. A model rocket launch controller is designed to do just one thing – ignite the rocket motors. An igniter is electrically initiated which in turn ignites the black powder or composite propellant.

In practice, if the safety key is removed from the Safety Key Switch of a model rocket launch controller, neither the igniter nor the continuity indicator can touch both ends of the input dc supply. But when the key is in place, electricity is passed through the components, including the continuity indicator light bulb. If the igniter is connected and good, the light bulb illuminates to indicate the continuity. When the safety key is in place and the Push – To – Launch button is pressed, electricity goes through the igniter to heat it up and start the rocket motor. This seems simple enough to be sure, and the major prospects of launch controllers that everyone concerns themselves with are simplicity and cost. In many simple and low cost launch controllers, there is a hidden compromise on safety to favour the simplicity.



model rocket launch controller – generic wiring diagram

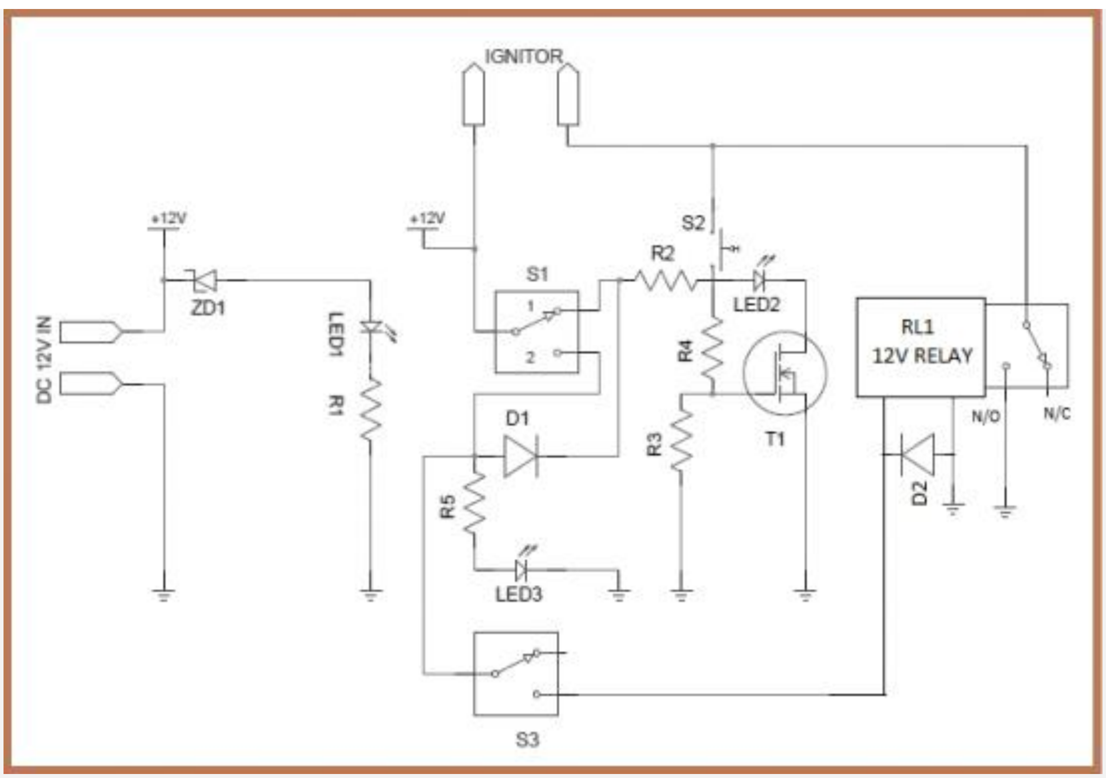
In principle, a model rocket igniter is no different than any other piece of wire. The tip of the rocket igniter consists of a very thin wire (bridge wire) coated with a chemical compound that heats up (pyrogen/pyrotechnic). The bridge wire heats up when sufficient electric current flows through it, which causes the pyrogen to combust, which initiates the burning of the solid rocket motor propellant. The thin wire is melted in the process, which usually breaks the circuit, stopping the flow of electricity.

The easy-to-use circuit described here is simple, flexible and safe to a great extent. As well, the design contains all basic elements like safety interlock, visual indicators, etc. The whole circuit can be powered from an external 12V/7Ah SMF battery (or from any dc source with ample voltage and current demanded by an odd igniter, after desirable circuit modification).

special hardwares for the project

Circuit Description

Initially, when 12VDC supply is fed to the circuit, the green indicator (LED1) lights up to signal that input power is of right polarity and the battery is healthy. When the key lock switch (S1) is turned to position 1 (from its off position), input dc supply is extended to only some parts of the circuit. Now it is possible to do a continuity test by depressing the continuity test push button switch (S2). If the connected igniter is okay, then the yellow indicator (LED2) lights up. Moving S1 to position 2 will "arm" the launch controller. This condition is indicated by the red indicator (LED3). What's next? If you are ready, just lift the launch switch (S3) cover and flip the switch to the up position. Yes, the rocket flight begins!



schematic of the rocket launc controller circuit

Parts

- T1: BS170
- D1, D2: 1N4007
- ZD1: 8V2
- LED 1, 2, 3: 5mm Green, 5mm Yellow, 5mm Red
- R1, R2, R5 : 1K
- R3, R4: 10K
- RL1: 12V SPDT Relay
- S1: Key Lock Switch
- S2: Push Button Switch N/O
- S3: Launch Switch

Notes

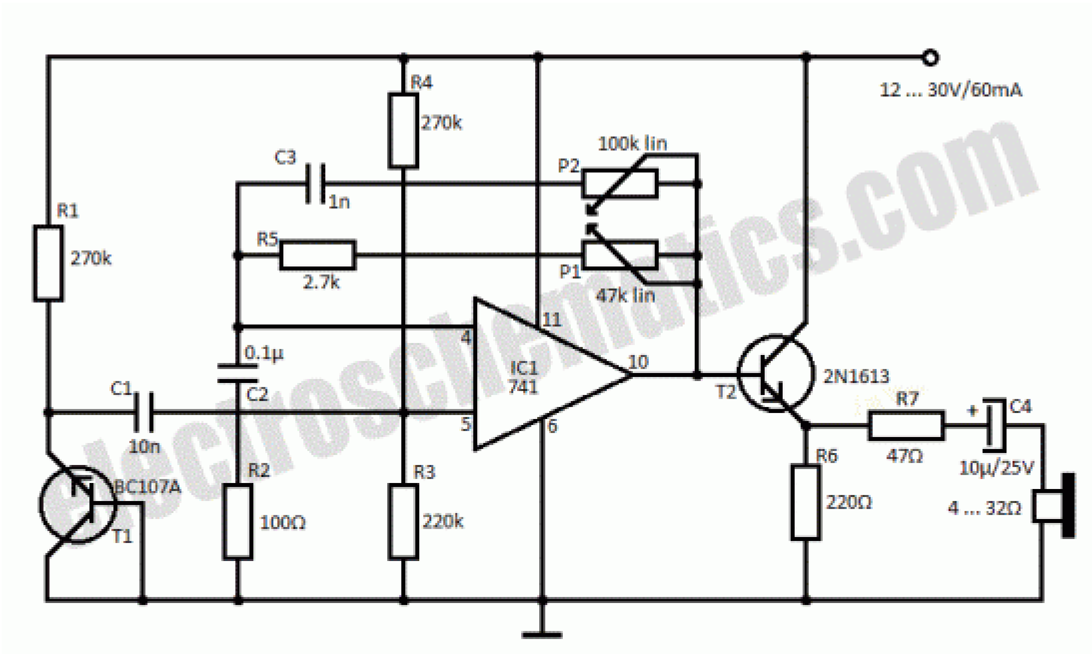
- Model rocket ignition needs as little as 50 milliamps to as much as 50 amps, depending on the igniter
- Since powerful electricity is going to flow through switches and cables, you need to make sure to use switches and cables that are rated for such currents. If you fail to use properly rated materials, they could melt
- The igniter is usually connected to the launch controller using alligator clips, but some odd igniters have custom connectors. Banana plugs and sockets would be a good choice for interconnection with our rocket launcher
- When testing the launch controller, you don't want to burn off real igniters. A 12V automobile bulb is enough (protoype tested with a 12V/12W bulb @ 12V/7 Ah SMF battery supply)
- Power through the relay rather than through an ordinary (low-current) switch will deliver a larger percentage of the energy to the igniter.
  Launch failure rate will be low!

Rain Sound Generator – Sleep Aid in Case of Insomnia

Insomnia treatment consist mostly of sleeping pills consumption but this circuit is an alternative for that and consists of a simple circuitry that generates a rain sound effect. The japanese researches were the first to discover that sound of rain has a relaxing effect. With the help of this simple circuit we can generate the rain sound which can be a sleep aid in case of insomnia.

T1 is used as a noise generator and its signal is amplified by the 741 IC and thru T2, R7 and C4 goes to a headset with low resistance. If you do not want to use the headphones then use a speaker with impedance between 4 and 16 Ω. With the help of P1 can adjust sound level and with P2 the tone.

Schematic of Rain Sound Generator Circuit

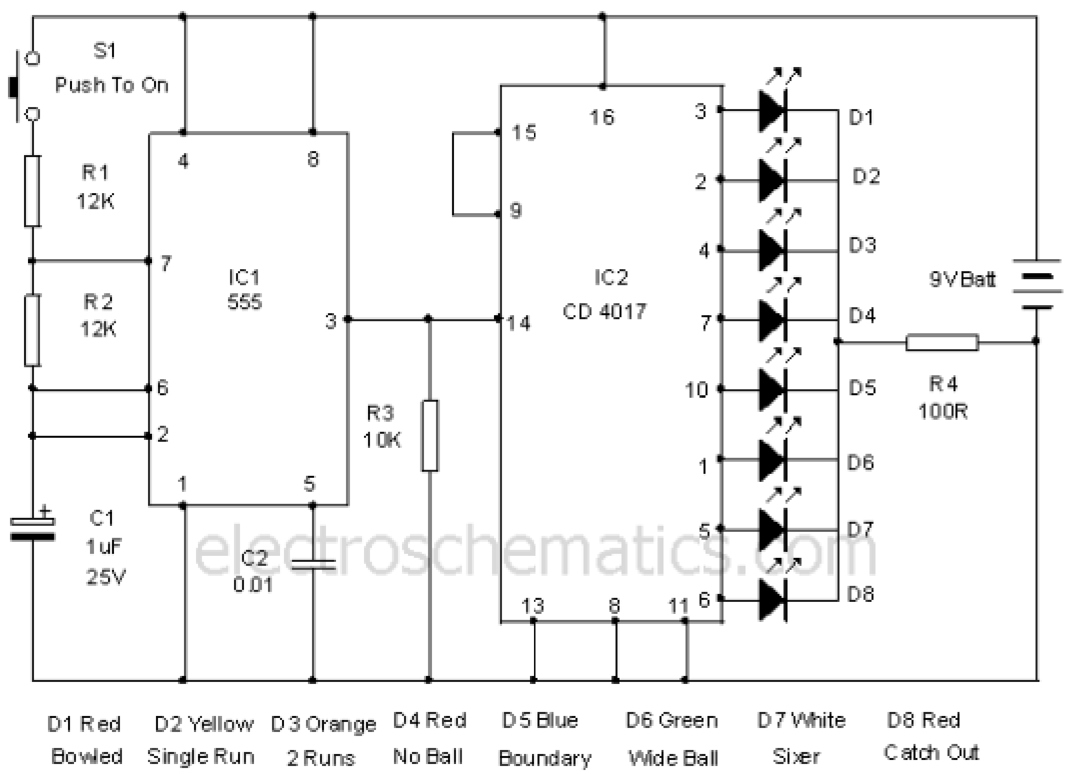


Electronic Cricket Match Game

This electronic cricket is a present for Kids. This simple battery powered circuit can be used to play Cricket Match with your friends. Each LED in the circuit indicates various status of the cricket match like Sixer, Run out, Catch etc.

The Circuit uses two ICs ,one in the Astable mode and the second in the display driver mode. IC1 is wired as an Astable Multivibrator with the timing elements R1, R2 and C1. With the shown values of these components very fast output pulses are generated from the Astable. Output from IC1 passes into the input of IC2 which is the popular Johnson Decade counter CD4017. It has 10 outputs. Of these 8 outputs are used. Output 9 (pin9) is tied to the reset pin 15 to repeat the cycle. When the input pin 14 of IC2 gets low to high pluses, its output turns high one by one. Resistor R3 keeps the input of IC2 low in stand by state to avoid false indications.

Electronic Cricket Circuit Diagram



When the Push Switch S1 is pressed momentarily, the Astable operates and all the LEDs run very fast sequentially. When S1 is released, any one of the LED stands lit which indicates the status of the match. For example, if LED D7 remains lit, it indicates Sixer and if LED 8 remains lit, it indicates Catch out.

Label each LED for its status as shown in the diagram. Pressing of S1 simulates Bowling and Running LEDs indicates running of Batsman.

Electronic Head or Tail Circuit

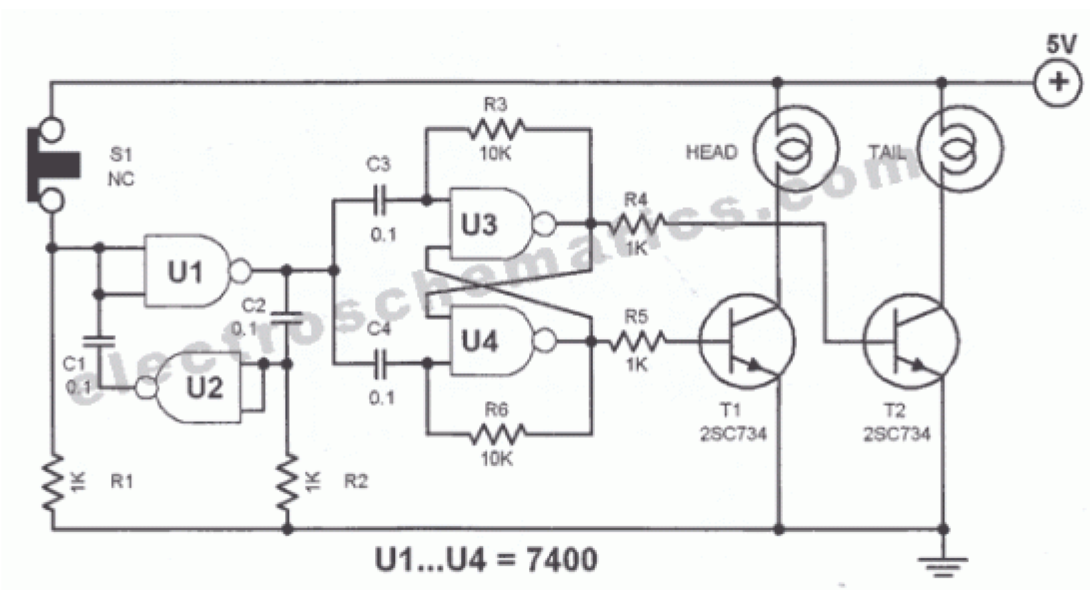
The principle used in this electronic head or tail circuit is simple: a multivibrator controls a flip flop. The multivibrator oscillates as long as the buton S1 is pressed and the flip flop switches on and off with a frequency of several kilohertz. When the button is released, a +5 volts is set at one of the two gates that makes up th multivibrator. The flip flop latches on at one of the two possible states: "head" or "tail".

The state of the flip flop is dependent on the exact time when the button S1 was released. because the speed of the flip flop's switch overs and the relative inertia of the human reaction, the state at which the flip flop latch is random.

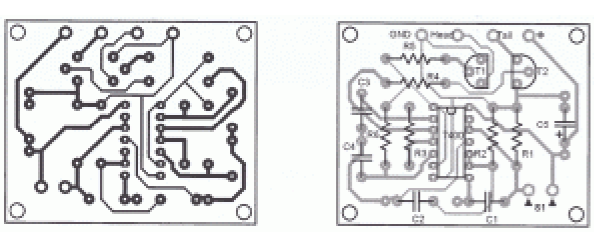
The entire circuit is made up of a single 7400 IC. It is important to decouple the circuit and the display bulbs very well to avoid reverse voltages and currents that appear during the switching off of the display bulbs.

The capacitor C5 (not shown in the schematic diagram) is a 250 uF electrolytic capacitor rated at 10 volts.

Electronic head or tail circuit schematic



Head or tail PCB layout

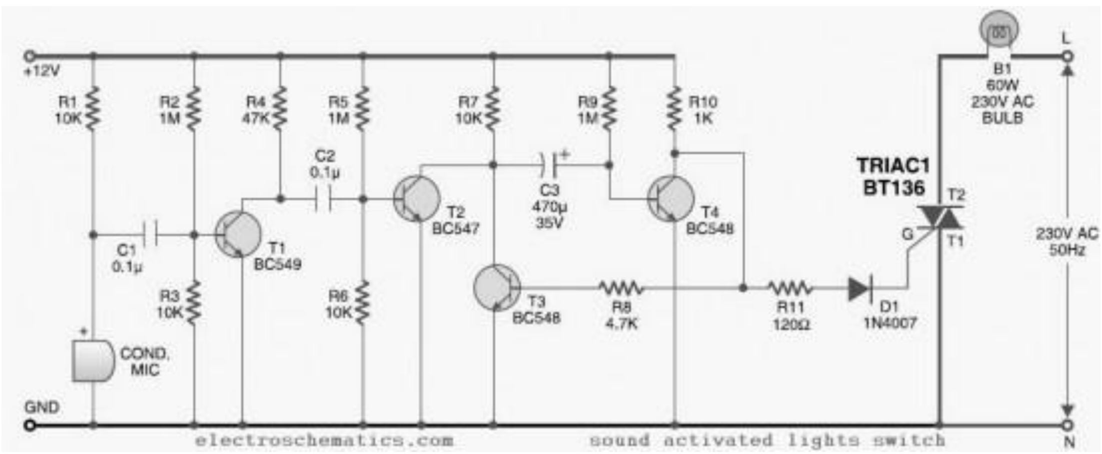


Sound Activated Lights Circuit

This diy 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 so it can be very useful

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.

Schematic of the sound activated lights circuit



Assemble the circuit on a general purpose PCB (circuit board) and enclose in a plastic cabinet. Power 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. Fix the unit in the dog's cage or close to the sound monitoring spot, with the lamp inside or outside as desired. Connect the microphone to the sount activated lights circuit using a short length of shielded wire. Enclose the microphone in a tube to increase its sensitivity.

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.

Alcohol Level Tester

A lot of accidents happen every day due to drunk driving. This is a very useful circuit for testing whether a driver is drunk or not. The circuit is easy to use, inexpensive and indicates various levels of alcohol consumption through LEDs.

Circuit and working

Fig. 1 shows circuit of the alcohol level tester. Alcohol sensor MQ3 is used here to detect the alcohol fumes' concentration.

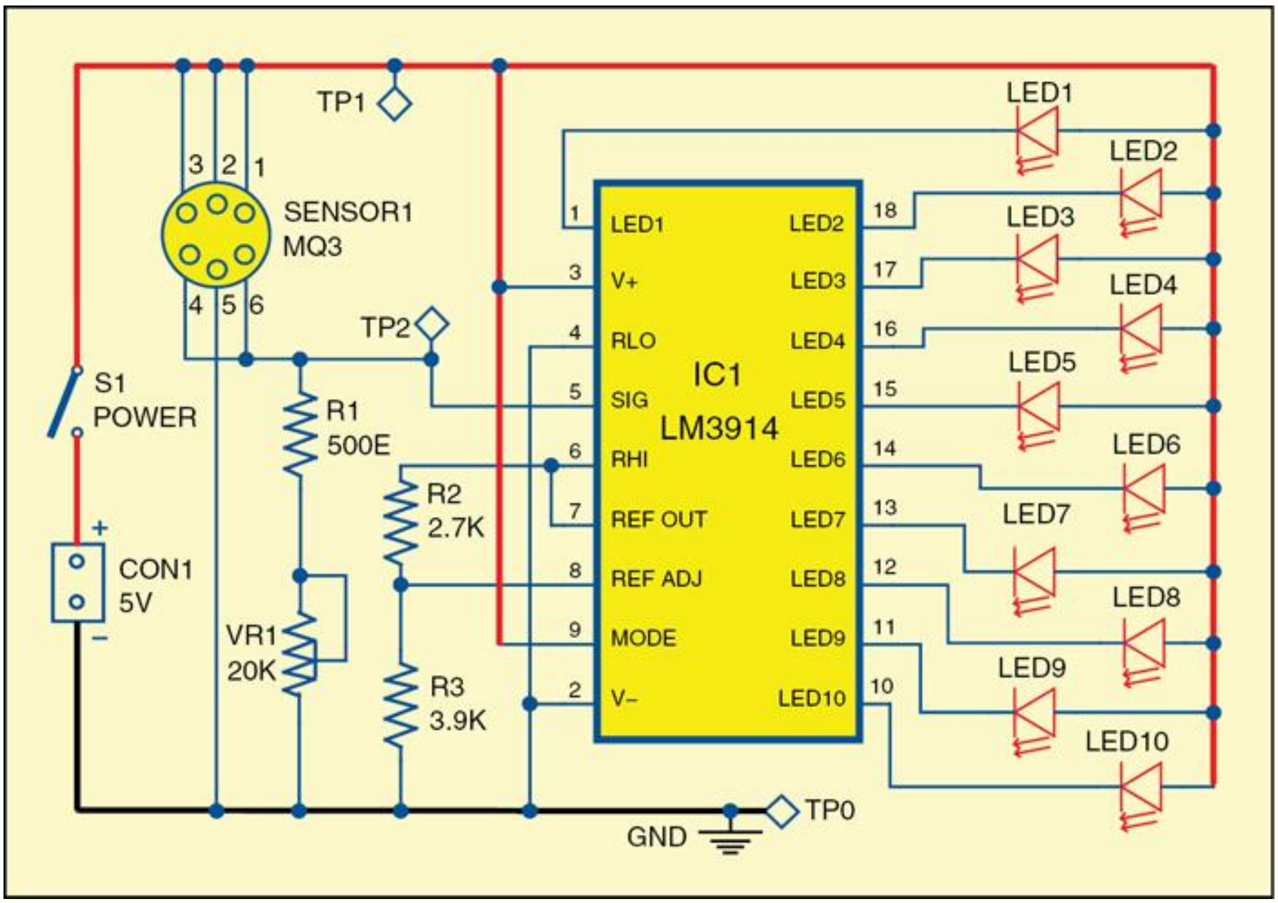


Fig. 1: The alcohol level tester's circuit diagram

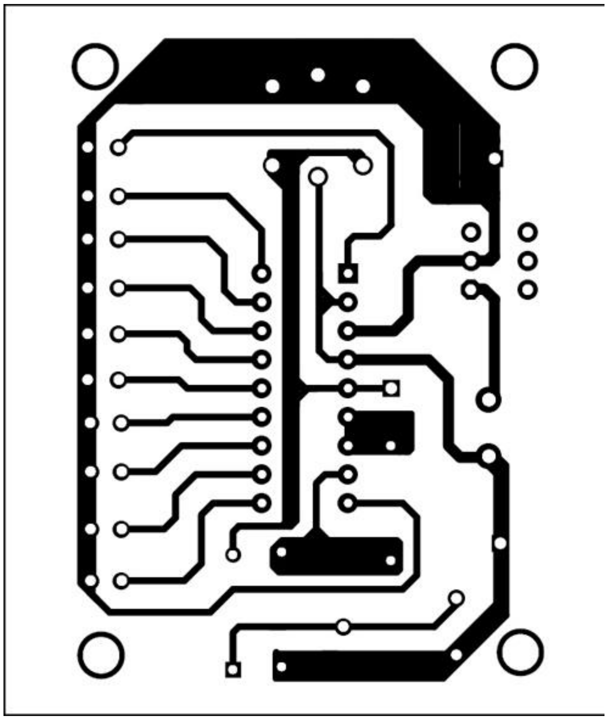


Fig. 2: An actual-size, single-side PCB layout for the circuit

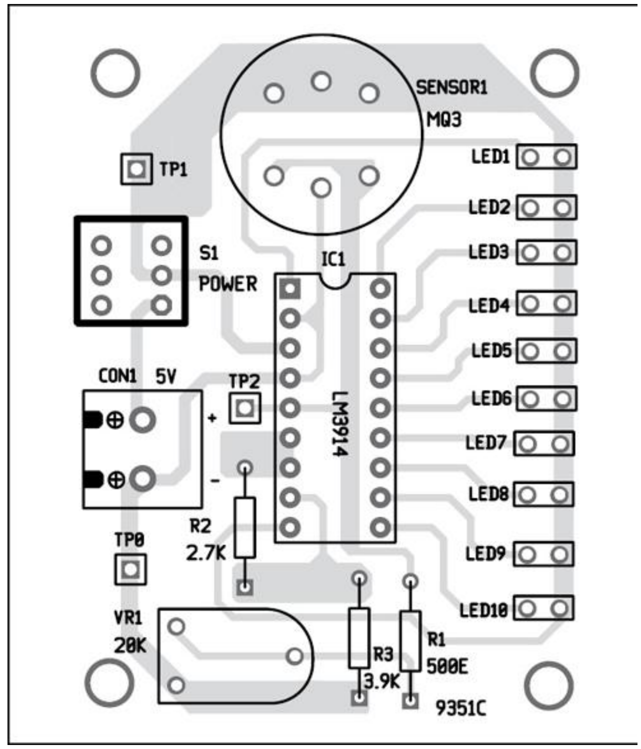


Fig. 3: Component layout for the PCB

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Pins 2 and 5 of MQ3 are connected to 5V power supply and the ground, respectively, as shown in the circuit. These pins are actually the heating-coil pins of the sensor. The input pins 1 and 3 of the sensor are also connected to 5V. Pins 4 and 6 are connected to input pin 5 of LM3914 (IC1).

The number of glowing LEDs indicates the concentration level of alcohol detected by the sensor. Resistor R1 and preset VR1 are used to calibrate the output voltage from the sensor.

PARTS LIST

Semiconductors:	
IC1	- LM3914 bar graph
LED1-LED10	- Flat LED
Resistors (all 1/4-watt, ±5% carbon):	
R1	- 500-ohm
R2	- 2.7-kilo-ohm
R3	- 3.9-kilo-ohm
VR1	- 20-kilo-ohm preset
Miscellaneous:	
CON1	- 2-pin terminal connector
S1	- On/off switch
SENSOR1	- MQ3 alcohol sensor

When a drunk breathes out near sensor1, the alcohol vapours come in contact with MQ3 sensor and its resistance changes. This raises signal level at pin 5 of IC1 a larger number of LEDs start glowing than the two that were glowing before.

Construction and testing

An actual-size, single-side PCB for the alcohol level tester is shown in Fig. 2 and its component layout in Fig. 3. After assembling the circuit on PCB, enclose it in a suitable case.

Switch on the circuit and verify the test points mentioned in the table. Before using the circuit, vary VR1 until LED1 and LED2 glow when the sensor is in normal environment. Now open the cork of an alcohol bottle and bring it near sensor1. You will notice that LED3, LED4 and LED5 also start glowing. As you bring the alcohol bottle's open mouth very close to sensor1, all the LEDs (LED1 through LED10) will start glowing.

Test Points

Test point	Details
TP0	0V
TP1	5V
TP2	MQ3 sensor output

We do not recommend that you actually consume some alcohol to test the circuit. The above test with a bottle of alcohol, or its sample in a small glass, should suffice for most purposes. Until you find a drunk, of course!

Distance Counter

Presented here is a simple pedometer circuit. It measures the distance covered by you while walking. It may not work very well for running!

Circuit and working
Fig. 1 shows circuit diagram of the distance counter. The circuit is built around quad 2-input Schmitt trigger CD4093 (IC1), CMOS ripple carry binary counter/divider CD4024 (IC2), decade counter/divider CD4026 (IC3 and IC4), two transistors BC327 (T1, T2) and some other components.

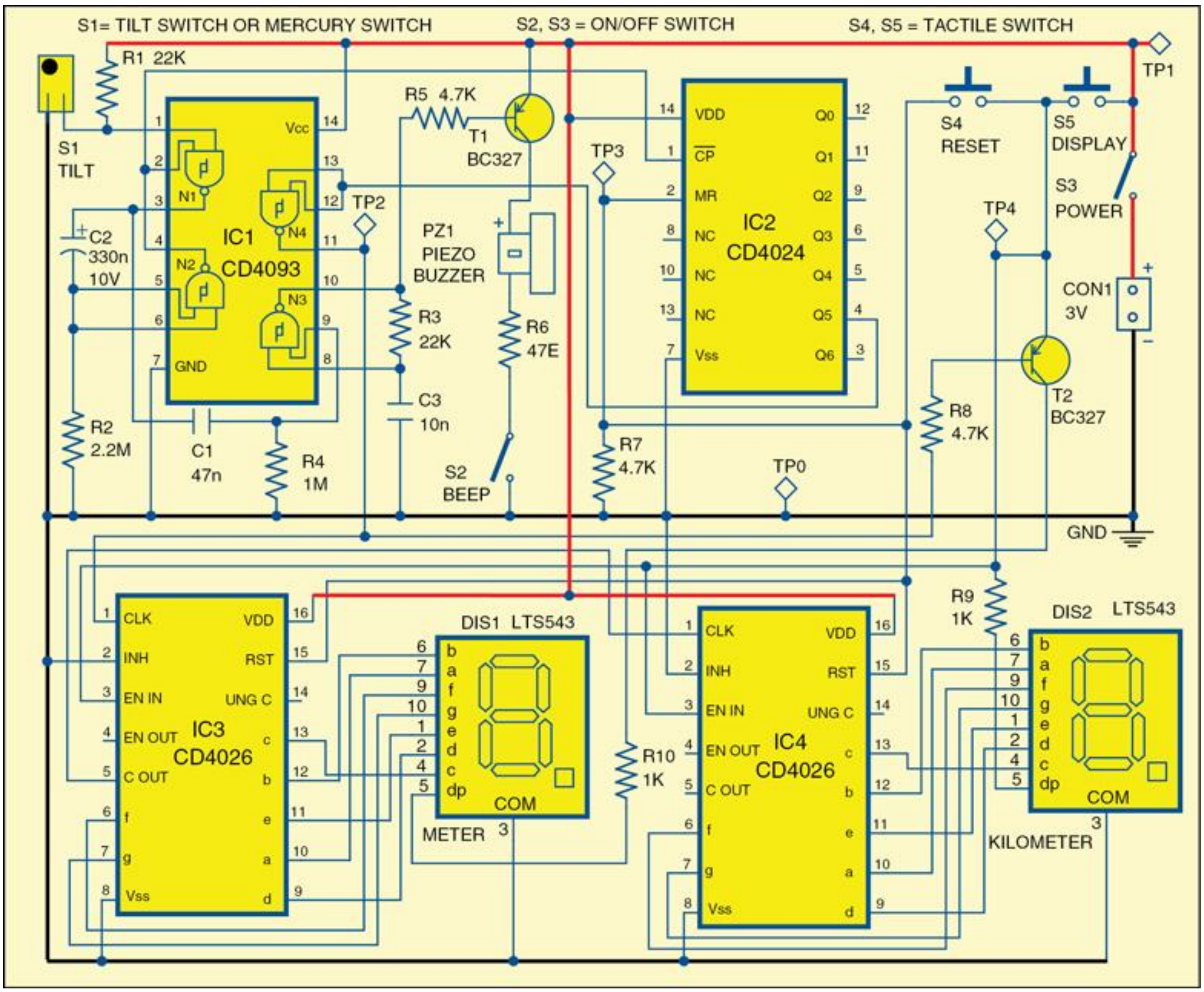


Fig. 1: Circuit diagram of the distance counter

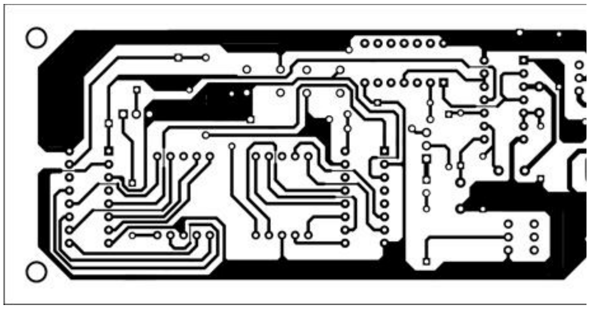


Fig. 3: An actual-size, single-side PCB for the distance counter

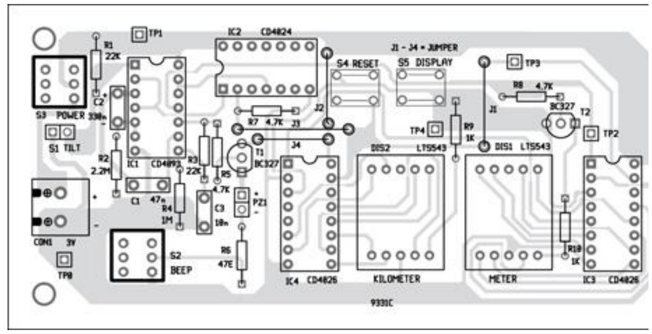


Fig. 4: Component layout for the PCB

Download:http://www.electronicsforu.com/electronicsforu/circuitarchives/my_documents/my_files/Distance_Counter.zip

Gates N1 and N2 of IC1 form a monostable multivibrator that receives trigger input from tilt or mercury switch S1. When you lift your foot up and touch the ground back during walking, the mercury inside the switch makes a contact with its two metallic leads as shown in Fig. 2. This makes the current to flow between the metallic leads and a pulse is generated at pin 4 of IC1.

This pulse is fed to pin 1 of IC2 that produces a divide-by-64 counter. Its output is given to inputs of gate N4 of IC1 and the output of N4 is fed to the base of transistor T2 through resistor R8. Transistor T2 drives the decimal point segment of common cathode 7-segment display (DIS1).

IC3 and IC4 are configured as decade counters to drive the 7-segment displays DIS1 and DIS2, respectively. Switch S4 resets these two counters and switch S5 enables DIS1 and DIS2 displays.

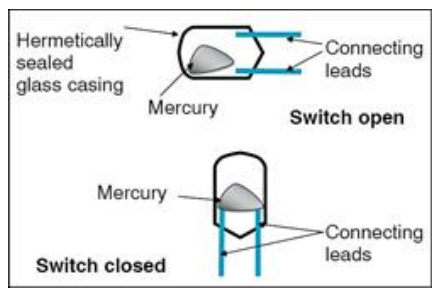


Fig. 2: Open-close operation of mercury switch

Transistor T1 drives the piezobuzzer (PZ1), which beeps after every two steps (one stride), provided switch S2 is closed. DIS1 and DIS2 displays indicate the distance covered in metre (m) and kilometre (km) units, respectively.

Generally, walking step of each individual is slightly different. Here, we assume that a single step is 78cm long, which is the average. According to this, 64 strides equal 100m (that is, 2×0.78×64=99.84m or 100m (approx.)) or 128 steps equal 100m.

DIS1 increments the digit after every 100m distance. That is, DIS1 displays 1 when distance covered is 100m and 2 when distance covered is 200m, and so on. After digit 9 in DIS1, DIS2 increments from 0 to 1 digit. The decimal point (dot) of DIS2 always glows to indicate separation of kilometre from the metre unit.

Test Points

Test point	Details
TP0	GND, 0V
TP1	+3V when power switch S3 is closed
TP2	High when reset and remains high till 64 counts and low for the next 64 counts
TP3	Low to high when both S4 and S5 are pressed simultaneously
TP4	High when S5 is pressed to display the reading

To save battery power consumption, DIS1 and DIS2 displays illuminate only when you push S5. If you want to reset the counter circuit, both switches S4 and S5 must be pressed simultaneously.

If you want to continuously illuminate DIS1 and DIS2 displays, remove switch S5 and connect the junction of S4 and emitter of transistor T2 to 3V.

Construction and testing

An actual-size, single-side PCB for the distance counter is shown in Fig. 3 and its component layout in Fig. 4.

Mount DIS1 to the right of DIS2 as shown in the PCB so that you get proper readings. For example, if DIS2 shows 5 and DIS1 shows 2, the reading will be 5km and 200m. It means the distance travelled is 5200m.

After assembling the circuit on PCB, enclose it in a suitable plastic case so that you can keep it in your trouser's pocket or attach it to your belt.

PARTS LIST

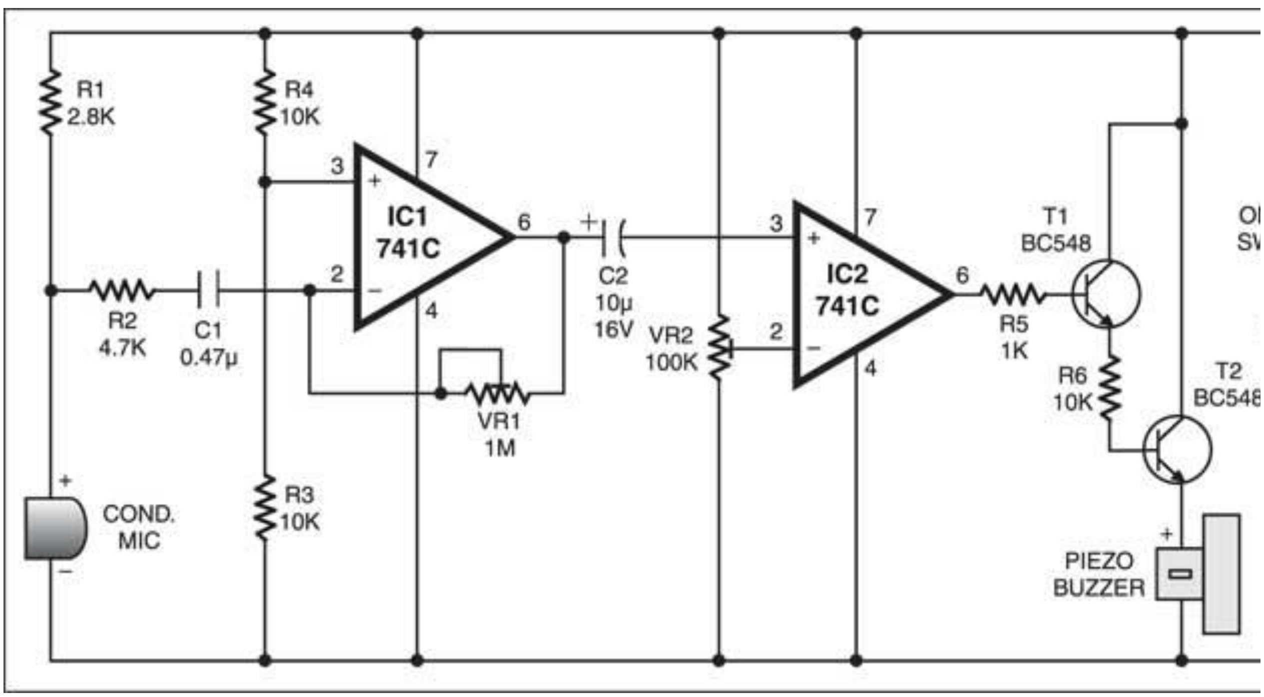
Semiconductors:	
IC1	- CD4093 quad 2-input NAND Schmitt trigger
IC2	- CD4024 counter/divider
IC3, IC4	- CD4026 decade counter/divider
T1, T2	- BC327 pnp transistor
Resistors (all 1/4-watt, ±5% carbon):	
R1, R3	- 22-kilo-ohm
R2	- 2.2-mega-ohm
R4	- 1-mega-ohm
R5, R7, R8	- 4.7-kilo-ohm
R6	- 47-ohm
R9, R10	- 1-kilo-ohm
Capacitors:	
C1	- 47nF ceramic disk
C2	- 330nF tantalum
C3	- 10nF ceramic disk
Miscellaneous:	
DIS1, DIS2	- LTS543, 7-segment CC display
PZ1	- Piezo buzzer
S1	- Tilt/mercury switch
S2, S3	- On/off switch
S4, S5	- Tactile switch
CON1	- 2-pin terminal
	- 3V battery

Use 2-pin connector CON1 for 3V battery in the PCB. Also fix switches S2 through S5 on the front side of the case.

Sound Scanner

This novel sound scanner sweeps all sound vibrations in its vicinity and converts them into audible beeps. It can sense sound vibrations up to a distance of 6 metres and can be used to monitor sitouts, car porchs, and other places of your house. The sound scanner operates a beeper whenever the microphone detects a sound.

Sound vibrations are sensed by the input section comprising the condenser microphone and op-amp IC 741C (IC1). Resistor R1 determines the sensitivity of the microphone. Condenser microphone picks up sound vibrations and converts them into electrical signals, which are fed to the input (pin 2) of IC1 via coupling capacitor C1. Amplified signals from IC1 are taken to the non-inverting input pin 3 of IC2 (IC 741C) through C2. IC2 is configured as a comparator.



A reference voltage controlled by VR2 is applied to the inverting input pin 2 of IC2. The output of IC2 is used to trigger Darlington pair transistors T1 and T2. A piezobuzzer connected to the emitter of T2 produces audible beeps as the microphone senses sound.

The circuit can be easily assembled on a common PCB or Veroboard. Adjust VR1 to get the maximum gain of IC1. Adjust VR2 to get the maximum sensitivity of IC2.

If a continuous beep is heard through the piezobuzzer, adjust the wiper of VR2 towards the ground line. Keep the piezobuzzer inside the room and the sensor in the place that is to be monitored. Connect the condenser microphone using a two-core shielded wire and enclose it in a small case to increase its sensitivity. Battery operation is recommended as the circuit may pick up noise from AC mains.

This circuit costs around Rs 60.

Alarm using your own Voice

Naga Babu Araya

This alarm plays your prerecorded voice message. It is built around the readily available quartz clock. Take the buzzer out of the quartz clock and connect its positive terminal to pin 1 and negative terminal to pin 2 of optocoupler IC MCT2E (IC2). Pin 4 of IC2 is grounded and pin 5 is connected to trigger pin 2 of monostable multivibrator IC 555 (IC3) as shown in Fig. 2.

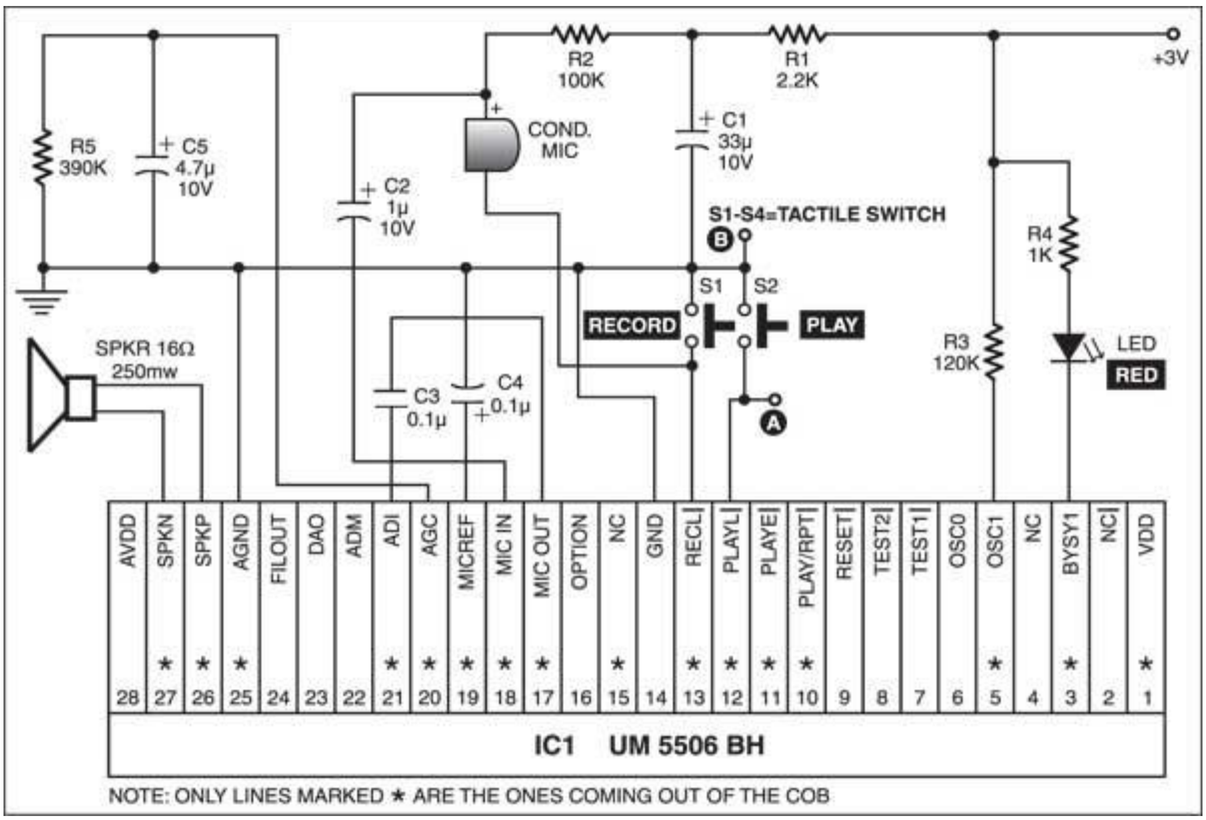


Fig. 1: Voice recording circuit

Fig. 1 shows the circuit for recording your voice message. When you press switch S2, it plays the meassage. The control circuit shown in Fig. 2 avoids the need for pressing switch S2 and thereby sounding the voice alarm automatically at the preset time.

Connect points A and B of the recording circuit to the corresponding points A and B of the control circuit. After making the connections, press record switch S1 to record your 6-second voice message through condenser microphone. Set the desired alarm time in quartz clock. At the time of alarm, buzzer terminals provide voltage to the internal LED of optocoupler IC2. This results in conduction of internal transistor of IC2, and its collector voltage at pin 5 drops to trigger IC3. The output of IC3 goes high for approximately 6 seconds. During this period, the prerecorded message is heard continuously. The message repeats every 6 seconds. The sound is loud enough in a room.

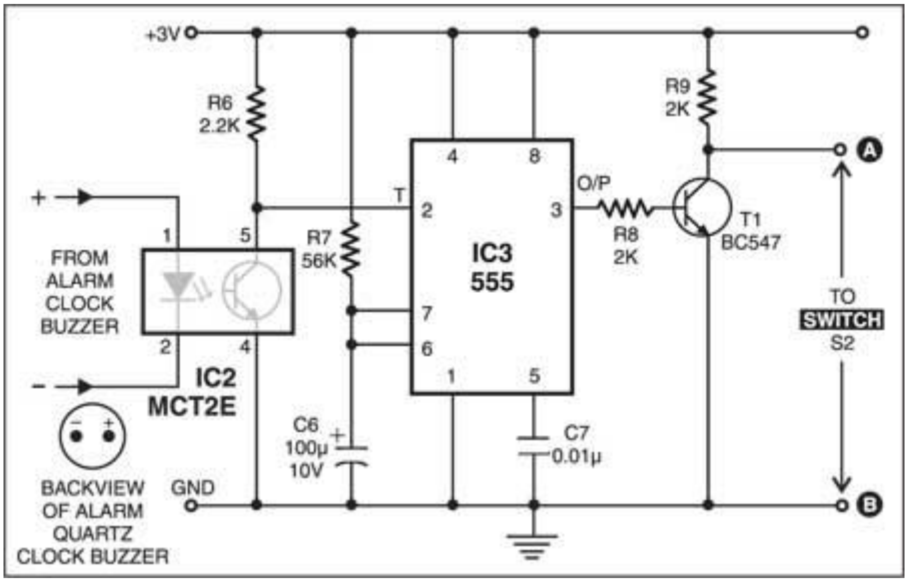


Fig. 2: Voice control circuit

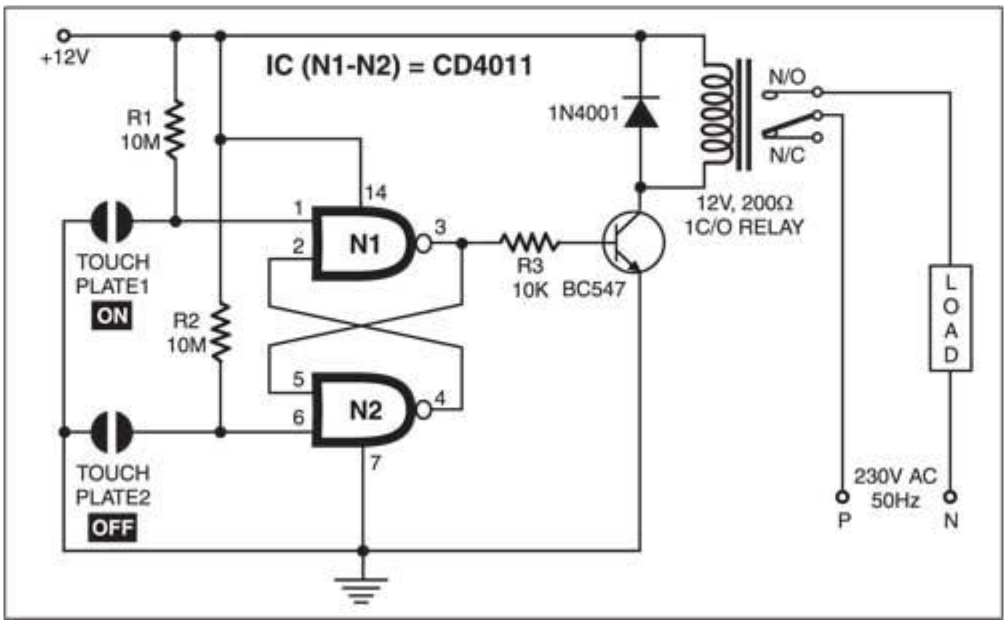
The circuit operates off 3 volts and it can be easily fitted in a small box and fixed on the back side of the alarm quartz clock.

Simple Touch-Sensitive Switch

Raj K. Gorkhali

This touch-sensitive switch is built around NAND gate IC CD4011 and transistor BC547.

When someone touches plate 1 (which is connected between pin 1 of gate N1 and ground), the RS flip-flop comprising gates N1 and N2 is set. The resulting high output at pin 3 of gate N1 energises the relay via relay driver transistor. The relay, in turn, switches on the load operating on mains.



On the other hand, when someone touches plate 2 (which is connected between pin 6 of gate N2 and ground), the RS flip-flop is reset. The resulting low output at pin 3 of gate N1 de-energises the relay via relay driver transistor. The relay, in turn, switches off the load operating on mains. The diode across the relay coil protects the transistor from back e.m.f induced in the relay when it de-energises.

The circuit works off a 12V power supply. If you want to control heavier loads, the current rating of the relay should be increased accordingly.

Visitors Counter

Yugal Sethiya

Presented here is a simple counter that counts the number of visitors entering or exiting an auditorium or any other place where you have installed this circuit at the gates. On receiving an interrupt from light-dependent resistor (LDR) sensors, the circuit increments the count and shows it on a 7-segment display.

With these units installed at the entrance and exit gates, you can calculate the number of visitors present in the room by subtracting the count at the exit gate from the count at the entrance gate. The system should be installed on a door such that only one person can cross through at a time, interrupting the light falling on the LDR sensor.

Test Points

Test point	Details
TP0	0V, GND
TP1	6V
TP2	6V (when S1 pressed)
LED1	Blinks when a visitor is detected

Circuit and working

The circuit is built around popular CD4026 counter ICs (IC1 and IC2), light-dependent resistor (LDR1), transistor BC547 (T1), common-cathode seven-segment displays (DIS1 and DIS2) and a few other components. The advantage of using CD4026 counter IC is that it drives a 7-segment display without the need of a driver IC.

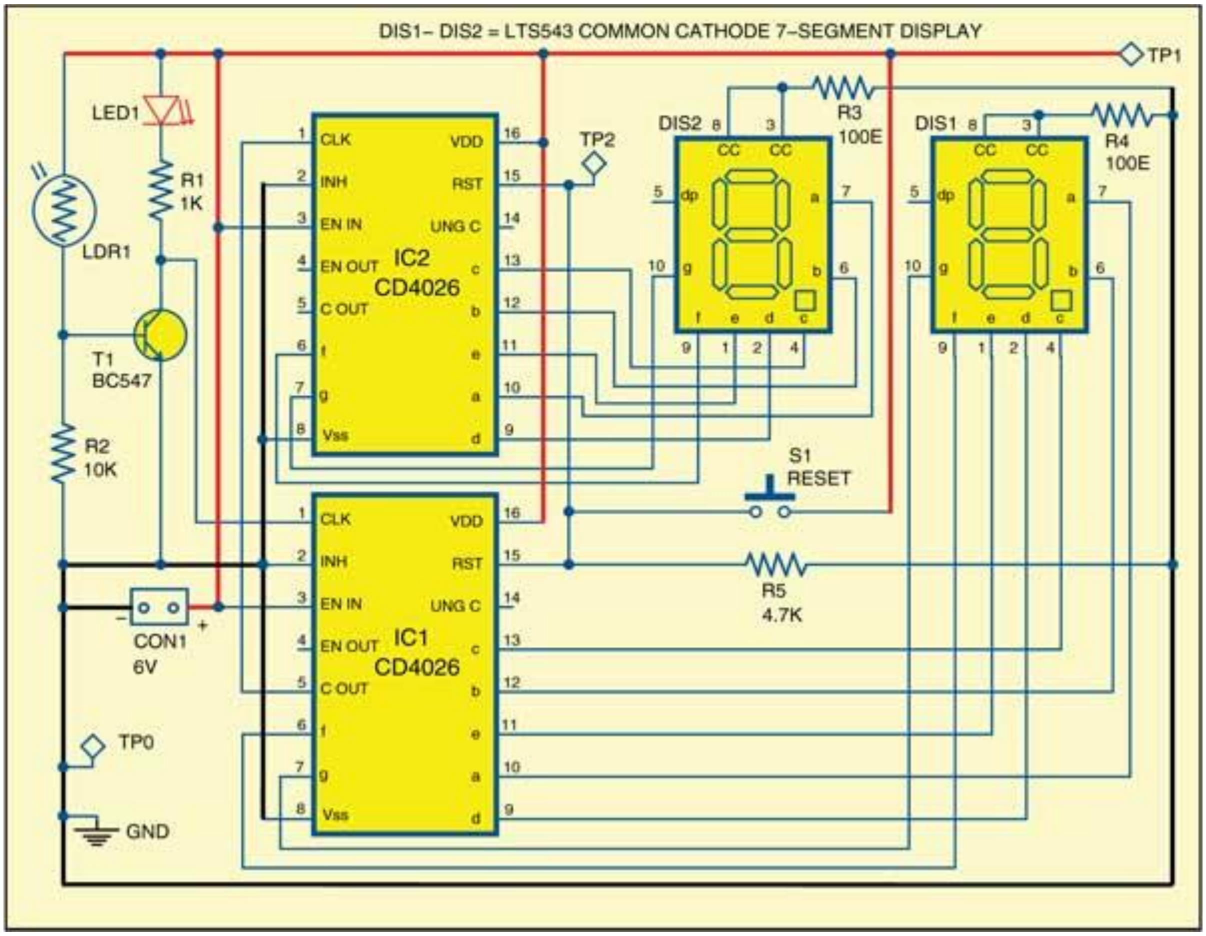


Fig. 1: Circuit of visitor counter

The resistance of LDR1 decreases when the intensity of light falling on it increases and vice versa. In dark or absence of light, the LDR exhibits a resistance in the range of mega-ohms, which decreases to a few hundred ohms in presence of bright light.

In this circuit, the amount of light falling on LDR1 decreases as a person crosses the entrance/exit gate and his shadow falls on LDR1. Consequently, the resistance of LDR1 increases to provide a clock pulse to pin 1 of IC1 through transistor T1. During this time, LED1 stops glowing momentarily, indicating that someone is entering or exiting the hall.

PARTS LIST

Semiconductors:	
IC1, IC2	- CD4026 counter
T1	- BC547 npn transistor
LED1	- 5mm red LED
DIS1-DIS2	- LTS543 common-cathode 7-segment display
Resistors (all ¼-watt, ±5% carbon):	
R1	- 1-kilo-ohm
R2	- 10-kilo-ohm
R3, R4	- 100-ohm
R5	- 4.7-kilo-ohm
LDR1	- Light-dependent resistor
Miscellaneous:	
S1	- Push-to-on switch
CON1	- 2-pin connector
	- 6V battery/6V adaptor

ICI consists of a Johnson decade counter and an output decoder that converts the Johnson code into a 7-segment decoded output for driving one stage in a numerical display. When it receives a clock at pin 1, it advances the count on display DIS1 by 'one.' Similarly, the count on the display advances by 'one' with each person entering through the gate. When the count reaches '9,' one cycle completes.

Carry-out pin 5 of IC1 is connected to clock pin 1 of IC2 to cascade another counter. On the next clock after count '9,' it goes high to provide a clock pulse to IC2, advancing its counter by one. Now IC1 starts all over again.

DIS1 shows the unit's digit and DIS2 shows the ten's digit of the count. After completion of each cycle, ten's digit advances by one. You can add more CD4026 counters with 7-segment displays for further extending the display to three digits, four digits, etc. For this, you have to connect carry-out pin 5 of each CD4026 to clock pin 1 of the next CD4026 as shown in the circuit diagram. Pin 15 of both IC1 and IC2 are connected to ground through resistor R5. A reset switch (S1) is connected to 6V for resetting the display to '00.'

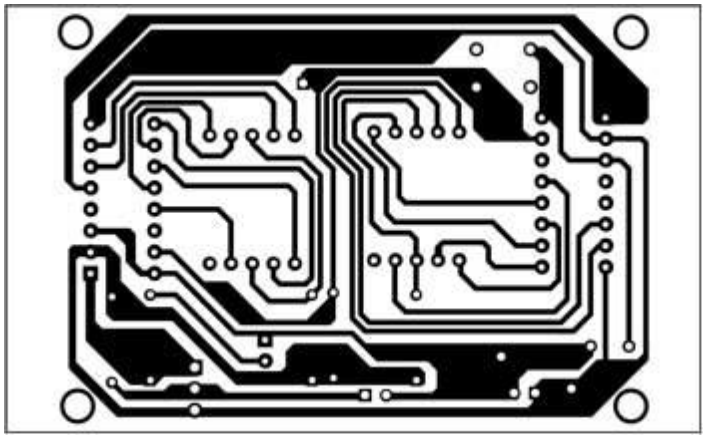


Fig. 2: An actual-size, single-side PCB for the visitor counter

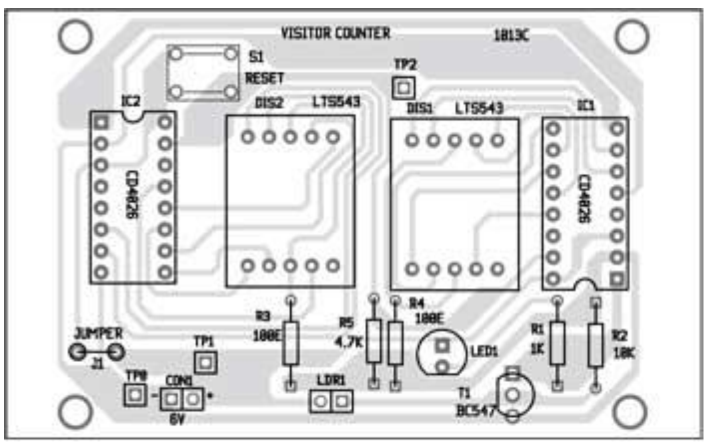


Fig. 3: Component layout for the PCB

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Construction and testing

An actual-size, single-side PCB for the visitor counter is shown in Fig. 2 and its component layout in Fig. 3. After assembling the circuit on a PCB, enclose it in a suitable case. Fix LED1, DIS1 and DIS2 on the front panel. Use a two-pin connector for connecting the power supply to the PCB.

This is a simple circuit and should work immediately after assembly. To check the circuit for proper functioning, verify voltage levels on various test points as per the test point table.

Proper installation is very important. Mount LDR1 on the gate such that light falling on it is interrupted when somebody passes through the gate. We have used a fixed resistor here but, if necessary, you can use a preset in place of R2 for tuning the system to your environment.

Earth Fault Indicator

D. Mohankumar

In mains-powered equipment, exposed metal parts are connected to earth wire in order to prevent users from contact with high voltages if electrical insulation fails. Connections to ground through earth connection also limit the build-up of static electricity when handling electrostatic-sensitive devices. Earth in a mains electrical wiring system is a conductor that provides a low-impedance path to the earth to prevent hazardous voltages from appearing on equipment and hence the name.

Here is a simple tester to find whether the mains wiring is correct or not. This tester can be used to check sockets periodically before connecting appliances like heater and electric iron. It indicates the status of the mains wiring through two LEDs as shown in Fig. 1.

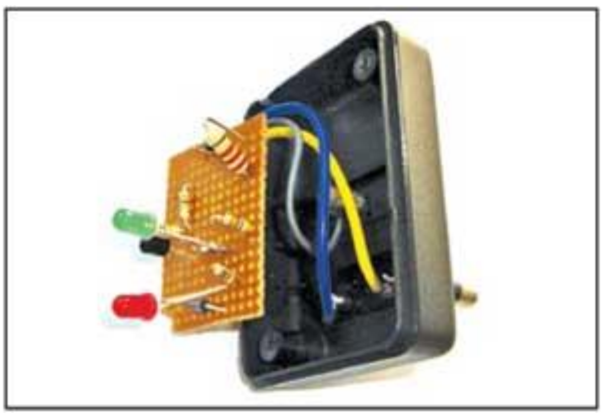


Fig. 1: Author's prototype

Circuit and working

Fig. 2 shows the circuit of earth fault indicator. The circuit is built around a BC547 transistor (T1), two LEDs (LED1 and LED2), two 1N4007 diodes (D1 and D2) and five resistors (R1 through R5).

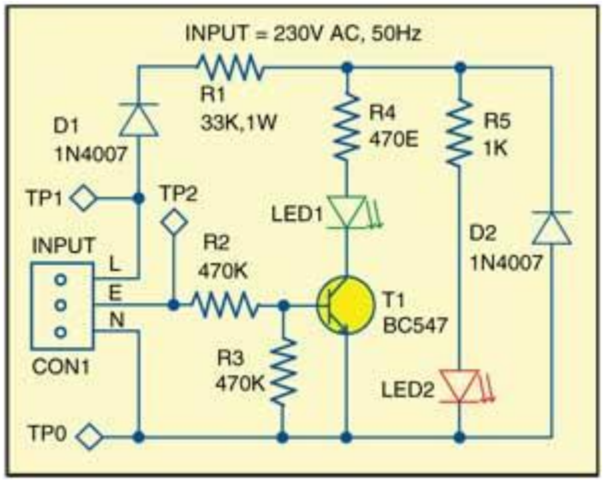


Fig. 2: Circuit of earth fault detector

The circuit takes advantage of the voltage that appears across the earth and neutral terminals. Neutral-to-earth voltage as measured at the load for a single-phase circuit is a function of the load current and the impedance of the neutral wire. Various standards limit this voltage drop in a branch circuit to 3 per cent (5 per cent total for feeder and branch circuit) for a reasonable efficiency of operation. Based on this, the neutral-to-earth voltage limit for a single-phase 120V AC circuit is 3.6V AC and for a single-phase 230V AC circuit 6.6V AC.

There is no additional power supply used to operate this circuit. The circuit is directly powered from the 230V AC mains supply. The combination of diode D1 and resistor R1 reduces the 230V AC mains to a low voltage for the circuit. A transistor switch is provided to light up the green LED (LED1) if earth is correctly connected. The base of T1 is connected to earth pin of the mains supply through a network of resistors R2 and R3 as shown in Fig. 2.

Test Points

Test point	Details
Across TP0 and TP1	Around 230V AC
Across TP0 and TP2	4V AC (depends on the load current and impedance of neutral wire)

PARTS LIST

Semiconductors:	
LED1	- 5mm green LED
LED2	- 5mm red LED
D1, D2	- 1N4007 rectifier diode
T1	- BC547 npn transistor
Resistors (all ¼-watt, ±5% carbon, unless stated otherwise):	
R1	- 33-kilo-ohm, 1W
R2, R3	- 470-kilo-ohm
R4	- 470-ohm
R5	- 1-kilo-ohm
Miscellaneous:	
CON1	- 3-pin connector for mains

Working of the circuit is simple. The red LED (LED2) lights up if there is power in the socket and phase (L) and neutral (N) lines are connected correctly. Diode D2 protects the green LED (LED1) from damage when the polarity changes. Resistors R4 and R5 limit current through LED1 and LED2, respectively.

When the mains wiring is proper, a potential difference develops between the neutral (N) and earth (E) lines and transistor T1 turns on to light up the green LED (LED1). This indicates that the earth connection is perfect. At the same time, the red LED also glows, indicating that the phase (L) and neutral (N) lines are connected properly. In brief, if the phase, neutral and earth connections are proper, both the red and green LEDs light up. When the earth connection is broken, the red LED2 glows but green LED1 does not.

Construction and testing

An actual-size, single-side PCB for the earth fault indicator is shown in Fig. 3 and its component layout in Fig. 4. After assembling the circuit on a PCB, enclose it in a suitable plastic case. The circuit can be housed in an adaptor box with three pins (see Fig. 1).

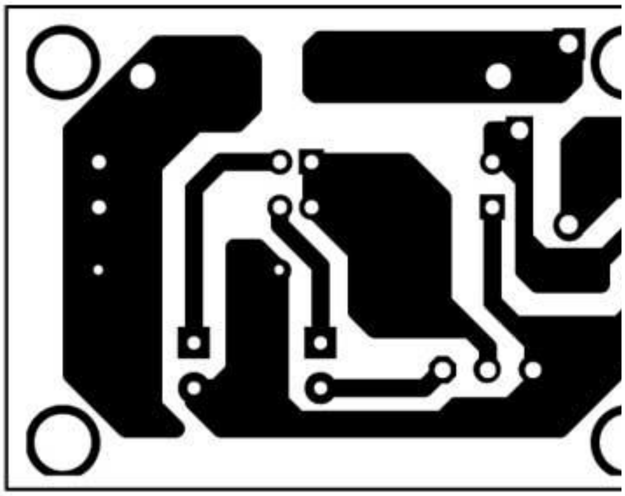


Fig. 3: An actual-size, single-side PCB for the earth fault indicator

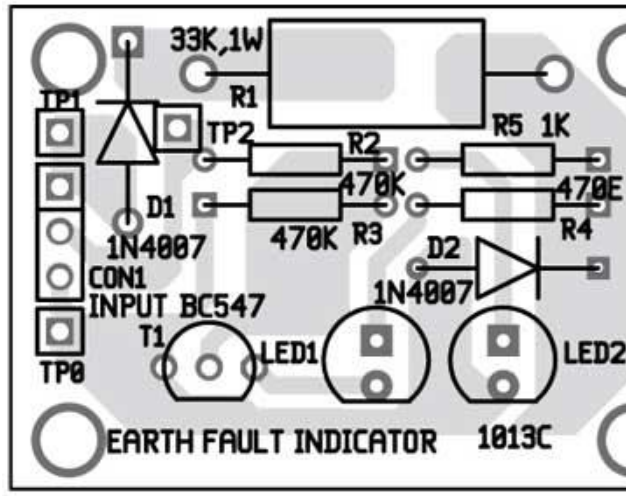


Fig. 4: Component layout for the PCB

http://www.electronicsforu.com/electronicsforu/circuitarchives/my_documents/my_files/142_EarthFaultIndicator.zip

To test the circuit for proper functioning, check input supply at TP1 with respect to TP0. Also check the voltage difference across neutral and earth pins as per the test point table.

EFY note. As the circuit is operated directly from the mains voltage, it should be assembled only by experienced persons. To avoid lethal shock, do not touch or troubleshoot the circuit when it is connected to mains power.

RPM Meter for Automobiles

Ashok K. Doctor

An efficient way to measure the RPM of a vehicle is through its ignition pulses. RPM of a vehicle is directly proportional to the rate of its ignition pulses. An ignition coil (also called spark coil) is an induction coil in an automobile's ignition system that transforms the battery's low voltage to the thousands of volts needed to create an electric spark in the spark plugs for igniting the fuel. Here we measure the rate of ignition pulses with a sensor system attached to the spark coil and thus indicate the RPM using a bar graph comprising 20 LEDs.

Test Points

Test point	Details
TP0	0V, GND
TP1	12V
TP2	9V
TP3	Pulses (frequency proportional to RPM)
TP4	Voltage proportional to frequency

Circuit and working

Fig. 1 shows the circuit for RPM meter. The circuit is built around frequency-to-voltage converter LM2917N-8 (IC1), bar display drivers LM3914 (IC2 and IC3), 20 LEDs (LED1 through LED20) and some other components.

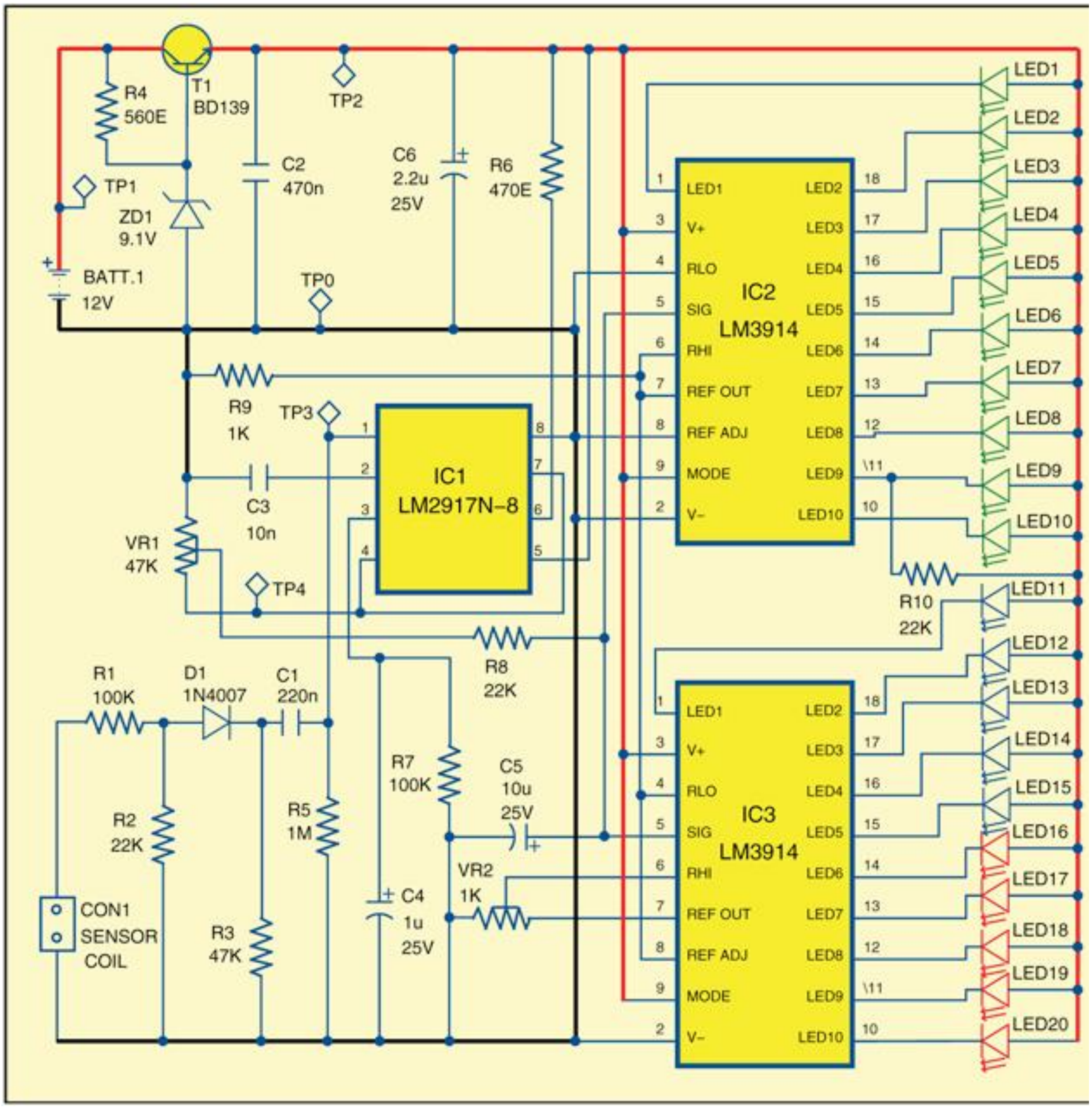


Fig. 1: RPM meter circuit

The circuit has three stages—pulse detection, frequency-to-voltage conversion and display of voltage by the LED bar graph. To sense the pulses from the ignition coil, 18SWG PVC-covered household wire is wrapped around LT side of the ignition coil. The number of turns should be around 50. Induction pulses from the sensor coil must be reduced, rectified and filtered. Resistor R1 reduces their voltage level, diode D1 rectifies them and capacitor C1 filters them.

These filtered pulses are fed at pin 1 of frequency-to-voltage converter IC1. Voltage output corresponding to the frequency of pulses is available at pin 4 of IC1. The level of this output voltage can be controlled by preset VR1. LM2917N-8 (IC1) is available in 8-pin and 14-pin versions; we have used 8-pin version here. The output of IC1 is fed at pins 5 of IC2 and IC3 through a filter formed by resistor R8 and capacitor C5. This filter removes any variations in the output and provides stable reading. IC2 and IC3 are connected to each other in cascade mode. Pin 9 of both these ICs are held at high voltage to select bar mode.

PARTS LIST

Semiconductors:	
IC1	- LM2917N-8 frequency-to-voltage converter
IC2, IC3	- LM3914 bar/dot frequency display
T1	- BD139 npn transistor
LED1-LED10	- 5mm green LED
LED11-LED15	- 5mm blue LED
LED16-LED20	- 5mm red LED
D1	- 1N4007 rectifier diode
ZD1	- 9.1V zener diode
Resistors (all ¼-watt, ±5% carbon):	
R1, R7	- 100-kilo-ohm
R2, R8, R10	- 22-kilo-ohm
R3	- 47-kilo-ohm
R4	- 560-ohm
R5	- 1-mega-ohm
R6	- 470-ohm
R9	- 1-kilo-ohm
VR1	- 47-kilo-ohm preset
VR2	- 1-kilo-ohm preset
Capacitors:	
C1	- 220nF ceramic disk
C2	- 470nF ceramic disk
C3	- 10nF ceramic disk
C4	- 1µF, 25V electrolytic
C5	- 10µF, 25V electrolytic
C6	- 2.2µF, 25V electrolytic
Miscellaneous:	
CON1	- 2-pin connector
BATT.1	- 12V, 7AH chargeable battery
	- Ignition coil

The number of LEDs glowing will be directly proportional to the input voltage at pin 5, which, in turn, is dependent on the frequency of pulses. This implies that the number of LEDs glowing will be in accordance with the RPM of the vehicle.

The overall system can be calibrated as per one's liking (see last paragraph). We calibrated it such that each LED indicates about 1200 revolutions. LEDs should be of three different colours so that these can indicate normal (green), medium (blue) and high (red) speed zones.

Power supply is taken from the vehicle's battery. Car battery's 12V DC is reduced to 9V so that the display's brightness remains the same, irrespective of whether the battery is less charged or overcharged.

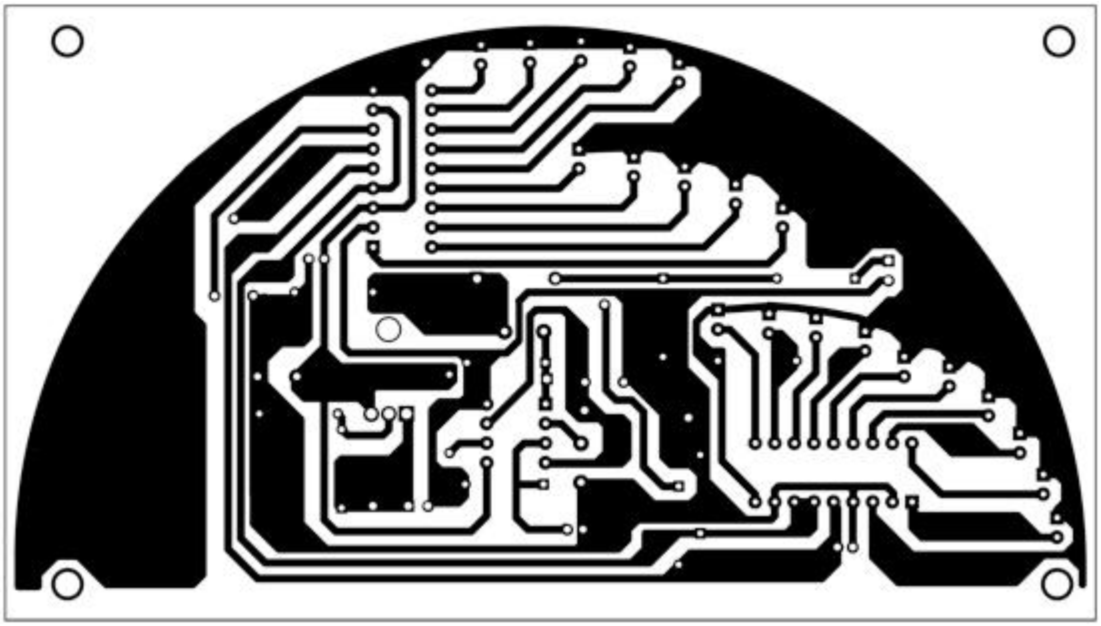


Fig. 2: An actual-size, single-side PCB for the RPM meter

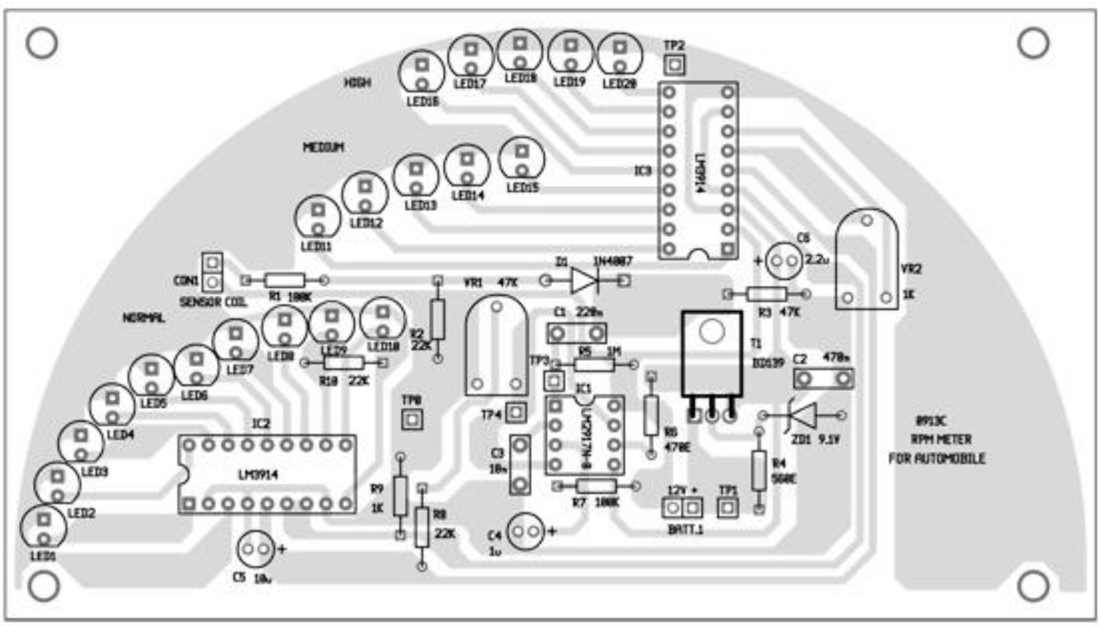


Fig. 3: Component layout for the PCB

Download:http://www.electronicsforu.com/electronicsforu/circuitarchives/my_documents/my_files/7A7_RPMMeterForAutomobiles.zip

Construction and testing

An actual-size, single-side PCB for the RPM meter is shown in Fig. 2 and its component layout in Fig. 3. After assembling the circuit on PCB, enclose it in a suitable box. Use two-pin connectors on the PCB for connecting the sensor coil and the battery terminals.

To check the circuit for proper functioning, verify input supply at TP1 with respect to TP0. This supply is reduced to 9 V, which can be checked at TP2. Check the sensed pulses from the ignition coil at TP3 using an oscilloscope. The voltage at TP4 will vary as per frequency of pulses.

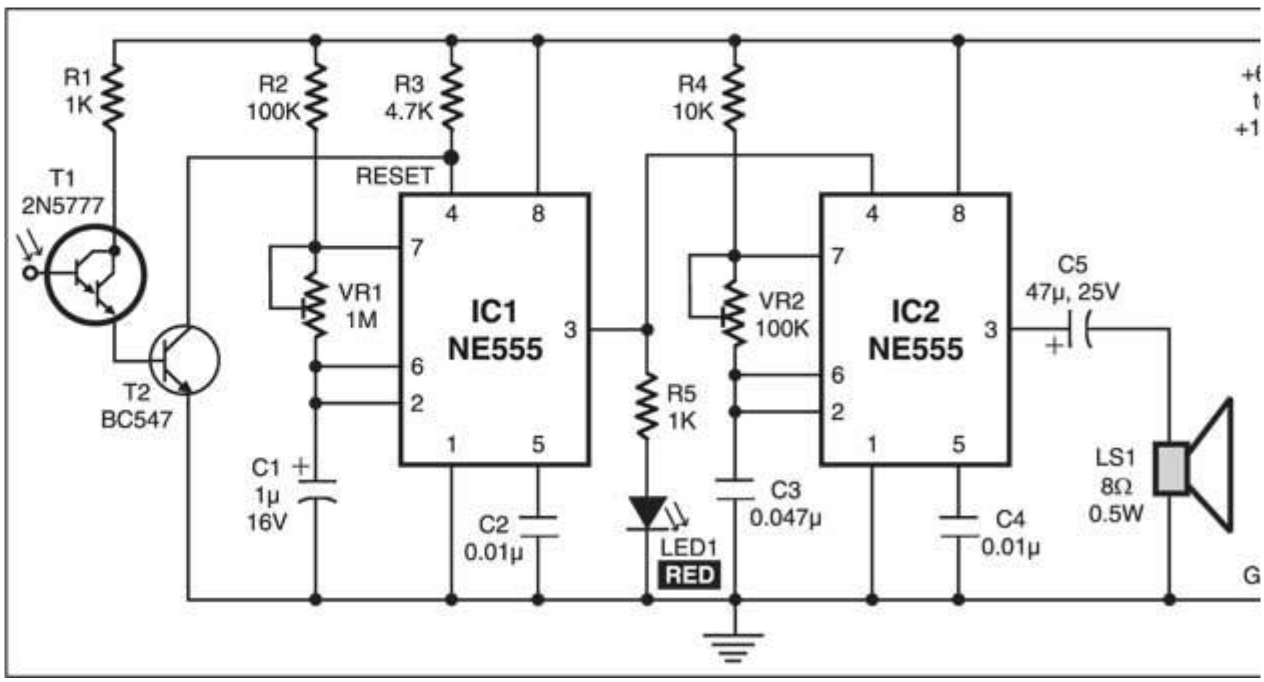
To calibrate the system, as we did, use a function generator. Give 20Hz signal at TP3 and, using preset VR1, set its amplitude such that only LED1 glows. When you increase the frequency, you will see more LEDs glowing. Your system is now ready to use. Use preset VR2 to define the frequency range for each LED bar display.

Sensitive Optical Burglar Alarm

Pradeep G.

This optical burglar alarm uses two 555 timer ICs. Both the ICs are wired as astable multivibrators. The first astable multivibrator built around IC1 produces low frequencies, while the second astable multivibrator built around IC2 produces audio frequencies.

General-purpose Darlington photo-transistor 2N5777 (T1) is used as the light sensor. To increase the sensitivity of the circuit, npn transistor BC547 (T2) is used.



Place phototransistor T1 where light falls on it continuously. Phototransistor T1 receives light to provide base voltage to transistor T2 . As a result, transistor T2 conducts to keep reset pin 4 of IC1 at low level. This disables the first multivibrator (IC1) and hence the second multivibrator (IC2) also remains reset so the alarm (loudspeaker LS1) does not sound.

When light falling on Darlington phototransistor T1 is obstructed, transistor T2 stops conducting and reset pin 4 of IC1 goes high. This enables the first multivibrator (IC1) and hence also the second multivibrator (IC2). As a result, a beep tone is heard from speaker LS1. The beep rate can be varied by using preset VR1, while the output frequency of IC2 can be varied by using another preset VR2.

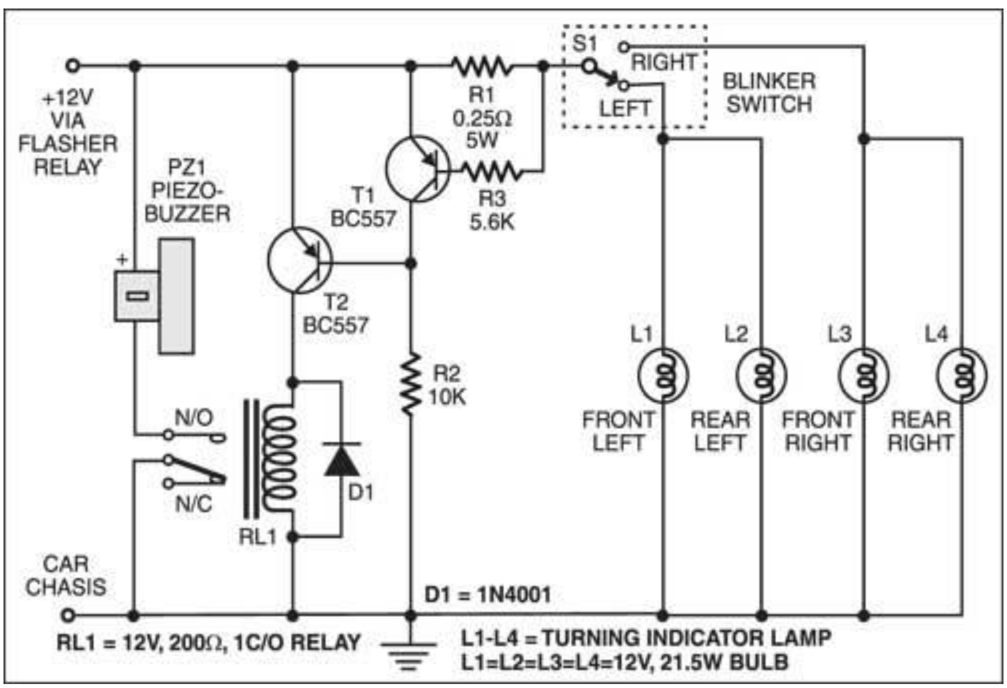
The circuit works off a simple 6V-12V DC power supply.

Faulty Car Indicator Alarm

Debaraj Keot

Before taking a turn, either left or right, car drivers need to switch on the car's turn-indicator lamps so that the approaching vehicle drivers can take precaution accordingly. An accident is likely to occur in case your car's turn-indicator lamps fail to glow due to some reason or the other. Here's a circuit that sounds an alarm if your turn-indicator lamps don't glow, helping you to safeguard against any accident.

When both the the front and rear turn-indicator lamps (either right or left) glow, the current through the lamps (L1-L2 or L3-L4) causes a voltage drop across series resistor R1. This voltage drives pnp transistor T1 into saturation. In this condition, pnp transistor T2 does not conduct and hence relay RL1 does not energise. No sound from piezobuzzer PZ1 (connected to normally-opened (N/O) contacts of relay RL1) means that the turn-indicator lamps are working satisfactorily.



When one or both of the turn-indicator bulbs are fused, the voltage drop across R1 is insufficient and pnp transistor T1 remains cut-off. In this condition, pnp transistor T2 conducts to energise relay RL1 and piezobuzzer PZ1 sounds to indicate that one or both the turn-indicator bulbs are fused.

Install the circuit (excluding turn-indicator lamps L1 through L4, which are already fitted in your car) near the driver's seat so that the driver has easy access to blinker switch S1. To turn left, the driver needs to connect blinker switch S1 to left position to flash front and back left-turn-indicator lamps (L1 and L2). Similarly, to turn right, he needs to connect blinker switch S1 to right position to flash front and back right-turn indicator lamps (L3 and L4).

The value of resistor R1 is to be changed according to the bulb wattages.

Noise Meter

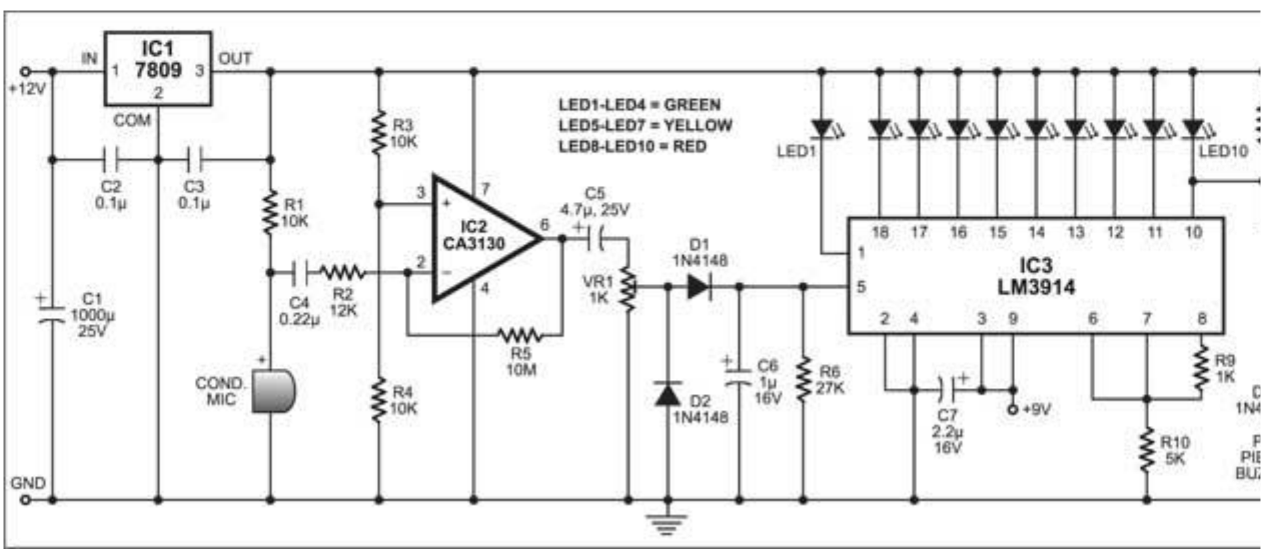
D. Mohan Kumar

Normally, sound intensity up to 30 dB is pleasant. Above 80 dB, it becomes annoying. And if it goes beyond 100 dB, it may affect your psychomotor performance, detracting your attention and causing stress. Noise pollution may also affect your hearing ability.

Noise intensity level in households is around 47 dB. But hi-fi music systems and TV sets operated at high volumes add to this sound, posing a health hazard.

Here’s a simple circuit that senses and displays the noise intensity level in your room. It also gives a warning beep when noise crosses the safe level of 30 dB.

The circuit comprises a sound intensity sensor and a display unit. The regulator circuit built around regulator IC 7809 (IC1) provides regulated 9V power supply to the circuit.



The sound intensity sensor is built around a condenser microphone, op-amp IC CA3130 (IC2) and associated components. Op-amp IC2 is configured as a high-gain inverting amplifier. The voltage supply to IC2 at its non-inverting pin 3 is divided to half by resistors R3 and R4, which is also used as the reference voltage. Resistor R1 determines the sensitivity of the condenser microphone.

The microphone picks up sound vibrations and converts them into the corresponding electric pulses, which are fed to the inverting input of IC2 (pin 2) via capacitor C4 and resistor R2. Capacitor C4 block sany DC entering the op-amp, since it may affect the functioning of the op-amp. The output of IC2 is connected to the inverting input through resistor R5 (10 mega-ohms) for negative feedback. Since the input impedance of IC2 is very high, even a small current can activate the op-amp.

The output of IC2 is given to preset VR1 via capacitor C5, which is used to control the volume. Capacitor C5 blocks DC, allowing only AC to pass through preset VR1. The AC signals from the wiper of VR1 are fed to a diode pump comprising diodes Dl and D2. The diode pump rectifies the AC and maintains it at the output level of IC2. Capacitor C6 acts as a reservoir capacitor for DC and resistor R6 provides the path for its discharge.

The display circuit is built around monolithic IC LM3914 (IC3), which senses the analogue voltage and drives ten LEDs to provide a logarithmic analogue display. Current through the LEDs is regulated by the internal resistors of IC3, eliminating the need for external resistors. The built-in low-bias input buffer of IC3 accepts signals down to ground potential and drives ten individual comparators inside IC3. The outputs of IC3 go low in a descending order from 18 to 10 as the input voltage increases.

Each LED connected to the output of IC3 represents the sound level of 3 dB, so when all the ten LEDs glow, it means the sound intensity is 30 dB.

Pin 9 of IC3 is connected to 9V to get the dot-mode display. In the dot-mode display, there is a small amount of overlap between segments. This assures that at no time will all LEDs be 'off.'

When output pin 10 of IC3 goes low, pnp transistor T1 gets base bias (normally cut-off due to resistor R7) to sound the piezobuzzer (PZ1) connected to its collector.

The circuit can be constructed on any general-purpose PCB. Condenser microphone should be connected using a shield wire and enclosed in a tube to increase its sensitivity. For audiovisual indications, use a small DC piezobuzzer and transparent LEDs. Adjust preset VR1 until only the first LED (LED1) lights up. Keep the circuit near the audio equipment or TV set to monitor the audio level.

Inexpensive car Protection Unit

M. Venkateswaran and T.E. Parthasarathy

For car protection, custom-made units are available but they are costly.

Here’s a circuit to protect car stereo, etc from pilferage that costs less and requires no adjustments in the car but a good car cover.

Place the circuit at your bedside and bring the two wires from the unit to the car (parked outside your home) and connect one wire-end to the cover and the other to the ground, with both wire-ends shorted by some weight such as a brick. So outwardly the mechanism is not visible.

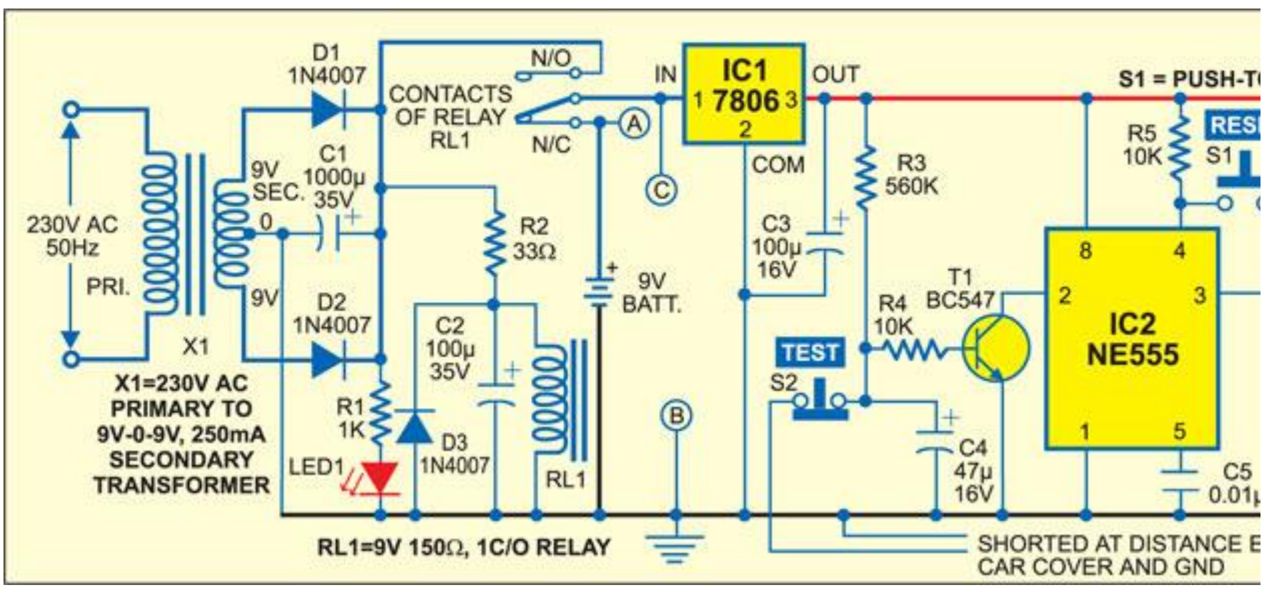


Fig. 1: Circuit of car protection unit with alarm

If someone tries to remove the cover, the alarm of the circuit starts sounding to alert you. The alarm can be switched off by resetting it using switch S1.

The car protection circuit comprises two timer ICs: one for the alarm circuit (see IC2 in Fig.1) and the other to indicate that the battery has taken over as the power source (see IC3 in Fig. 2). Normally, the protector operates off AC mains and the battery takes over only when mains fail. As the battery current is not high, the battery will last long.

As long as the two wires remain shorted, transistor T1 remains cut off. When shorting is removed, transistor T1 gets forward biased and its collector voltage drops to trigger IC2 and the piezobuzzer starts sounding.

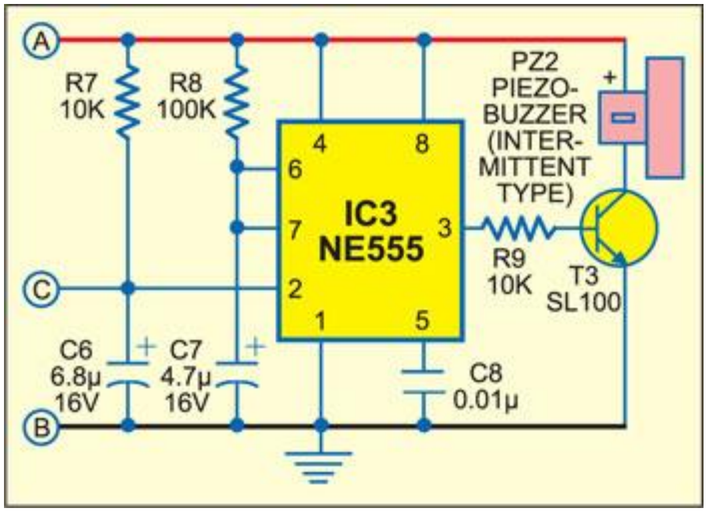


Fig. 2: Battery takeover indicator

If mains fails, the battery-takeover indicator (shown in Fig. 2 and connected to points A, B and C in Fig. 1) immediately gets triggered at pin 2 of IC3. Its high output activates the battery-operation alarm for a couple of seconds. IC1 draws power from the battery to activate the protection unit.

After setting up the unit properly and shorting both the wires, press test switch S2. If there is no fault in the circuit, the alarm will sound. Now release test switch S2 and momentarily press reset switch S1 to switch off the alarm.

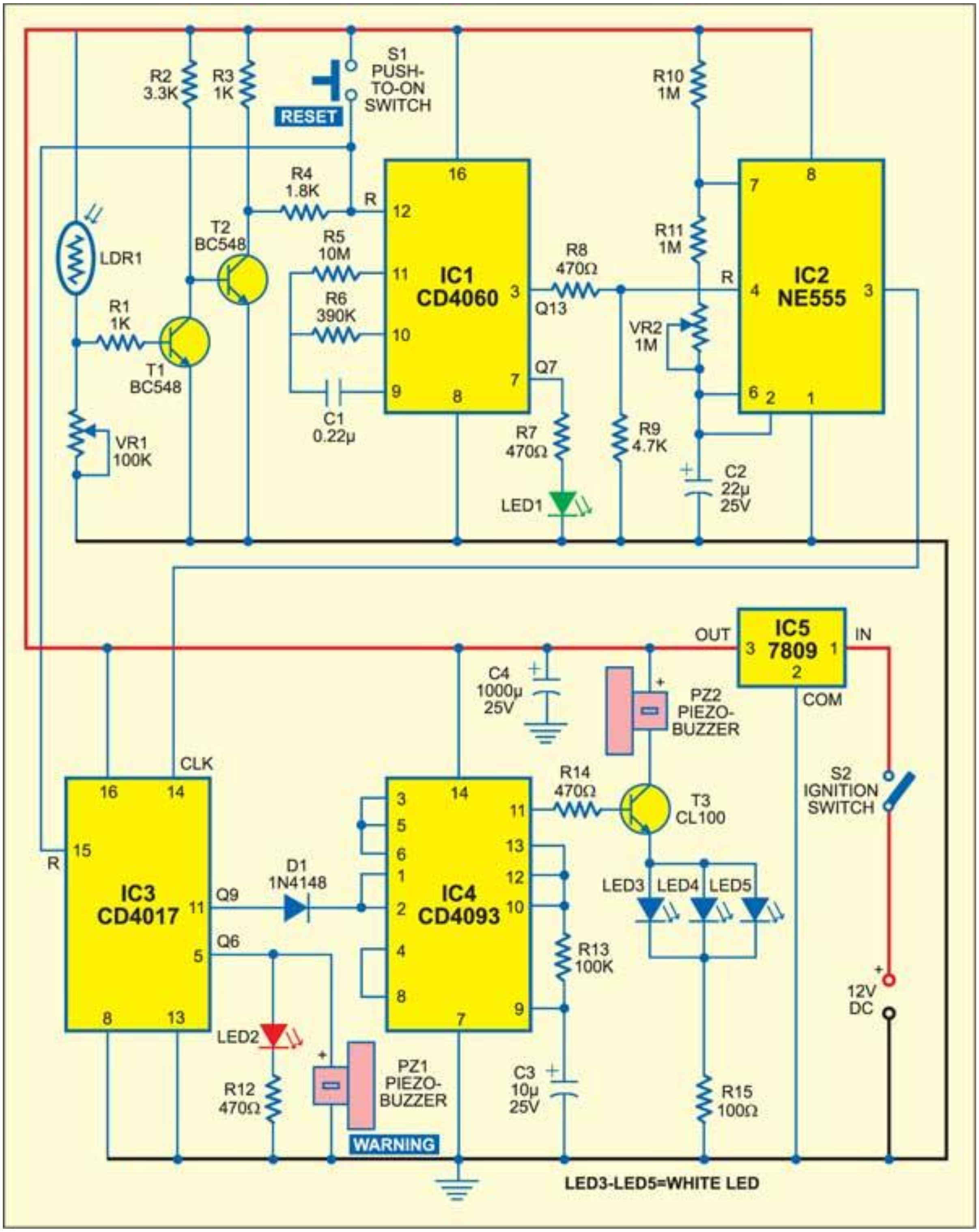
Anti-Sleep Alarm

D. Mohan Kumar

Most of the accidents on highways during night occur due to drivers' poor vision caused by the continuous exposure of their eyes to the bright light from the headlamps of approaching vehicles. The poor vision is due to exhaustion of the visual pigment in the eyes, which induces sleep to restore the pigment.

This circuit keeps you vigilant by sounding intermittent beeps and emitting flashing light so as to remind you that you are not on the bed but driving a vehicle. It works only at night due to the control of a light-dependent resistor (LDR) based switch.

The LDR along with two BC548 transistors (T1 and T2) forms the light switch to inhibit the oscillation of IC1 during daytime. As the LDR is exposed to light during daytime, T1 conducts to keep T2 out of conduction. This makes the reset pin (pin 12) of IC1 high to prevent it from oscillation. So the remaining part of the circuit remains in the standby mode.



At night, T1 remains non-conducting as the LDR is in dark. Transistor T2 conducts to pull the reset pin (pin 12) of IC1 to ground. This starts the oscillations of IC1, which is indicated by the flashing of LED1. The internal oscillator of binary counter IC CD4060 oscillates at a frequency based on the values of R5, R6 and C1. Its Q13 output becomes high and low alternately for 15 minutes each. Using potmeter VR1, you can adjust the sensitivity of the LDR.

When the Q13 output of IC1 becomes high, the reset pin (pin 4) of NE555 astable (IC2) becomes high and it starts oscillating. For the selected values of R10, R11, VR2 and C2, there will be one pulse every 50 seconds. Using VR2, you can slightly adjust the pulse rate. The pulsed output from IC2 is fed to the clock input of IC CD4017 (IC3).

IC CD4017 is a decade counter with ten outputs, but only one of its output is high at a time and all the other outputs remain low. The output from IC2 serves as clock for IC3. As a result, the Q1 output of IC3 becomes high at the first positive edge from IC2 after 50 seconds. After 6 minutes, the Q6 output goes high and LED2 glows for one minute and the warning buzzer sounds.

If the circuit is not reset using push-to-switch S1 after hearing the warning beep from PZ1, the counting of IC3 continues and at the end of the 10th minute, the Q9 output becomes high to activate IC CD4093 (IC4).

IC4 is wired as a simple oscillator using its two NAND gates 3 and 4. Gate 1 of IC4 is controlled by the status of its input pins 1 and 2. When these pins receive a high output from IC3, the output of gate 1 goes low and the output of gate 2 becomes high. This starts the oscillator built around gates 3 and 4. The frequency of oscillation depends on the values of R13 and C3.

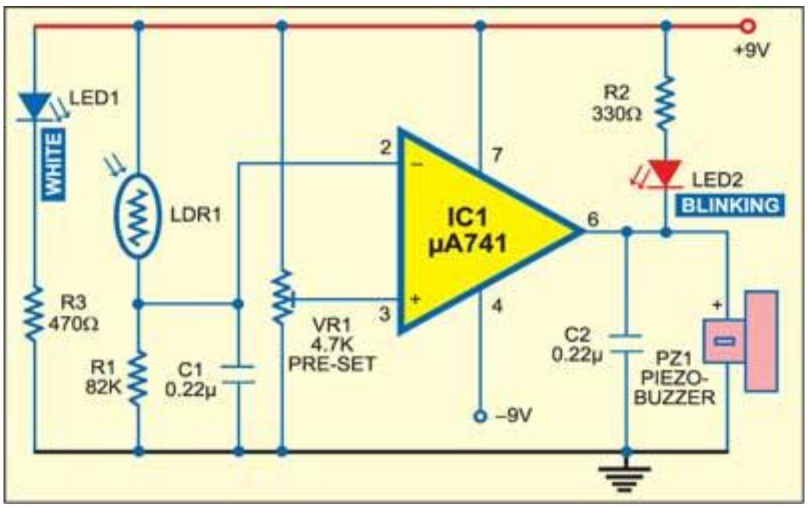
As long as Q9 output of IC3 remains high (i.e., for 15 minutes), IC4 oscillates and the piezobuzzer beeps and the white LEDs flash with a frequency determined by the values of R13 and C3. Thereafter IC4 stops oscillating and the piezobuzzer and the LEDs turn off for another 15 minutes. The cycle repeats every 15 minutes. This is sufficient to alert the napping driver. IC5 and C4 provide regulated 12V DC to the circuit.

The circuit can be constructed on a perforated board and powered from the vehicle's battery. The assembled unit should be placed in front of the driver seat preferably on the dashboard. Keep LDR1 away from LEDs to allow it to hibernate at night. The power to the circuit should be tapped from the ignition switch so that the circuit functions only when the vehicle is on the road.

Door Guard

Yogesh Kataria

This door guard uses operational amplifier µA741 and a light-dependent resistor (LDR). Operational amplifier µA741 is used as a sensitive voltage comparator. Preset VR1 provides reference voltage to the non-inverting terminal (pin 3) of µA741. LDR1 and resistor R1 are connected to inverting pin 2 of IC1. LED1 and LDR1 are installed at opposite sides of entry such that light from LED1 falls on LDR1.



When LED light is falling on LDR1, its resistance goes low in comparison to R1 and as a result pin 2 of IC1 goes high. Consequently, output pin 6 of IC1 goes low and LED2 blinks while piezobuzzer PZ1 stops sounding. This indicates that the gate is closed.

When anyone opens the gate to enter or exit, the light from LED1 falling on LDR 1 is obstructed and its resistance goes very high. As a result, pin 2 of IC1 goes low and output pin 6 of IC1 goes high. LED2 stops blinking while the piezobuzzer sounds. This indicates that the gate is open.

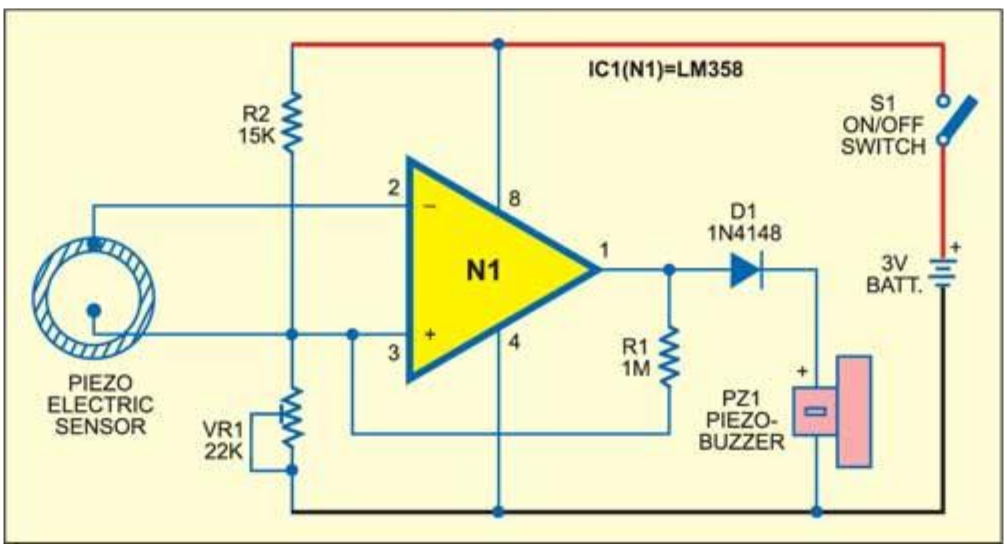
Briefcase Alarm

D. Mohan Kumar

This miniature alarm unit protects your valuables from theft by sounding an alarm when somebody attempts to pick up your briefcase. It is a battery-operated gadget that can be hidden in a corner inside the briefcase. The circuit uses few components and is simple to fabricate.

The main component of the circuit is a piezo-element used in buzzers. The piezo-element generates electric signals in response to pressure or vibration. It has capacitance of a few tens of nanofarads (nF). Like a capacitor, the piezo-element readily charges when a potential is applied and holds the charge until it is mechanically disturbed. Any mechanical vibration will rearrange the charge on the piezo-electric material with the release of energy.

The voltage developed across the piezo-sensor triggers IC LM358, which is used as a low-power transducer amplifier. IC LM358 works off 9 volts and has two independent high-gain op-amps with large DC gain of 100 dB.



Here the IC is configured as an inverting Schmitt trigger to convert input signals into a shaped output waveform. Preset VR1 sets a threshold voltage at the non-inverting input threshold of IC1. One end of feedback resistor R1 is connected to the output of the IC and the other end to the non-inverting input (pin 3) while the piezo-sensor is connected between the inverting and non-inverting pins.

When the signal from the piezo-sensor is low (standby mode), the output of IC1 is also low. Feedback resistor R1 pulls the non-inverting input voltage above the upper threshold voltage (UTV) of around 1.8 volts.

When the piezo-sensor is touched momentarily, it discharges the stored charge and the inverting input voltage exceeds the positive input and the output goes low. When this happens, the voltage at the positive input falls through VR1 to reach the lower threshold voltage (LTV). At this moment, the voltage at the inverting input is low due to the absence of the input signal. This causes the output to go high and the buzzer beeps.

The output of the IC falls when the input exceeds the UTV and rises when the input drops below the LTV. The difference between the UTV and the LTV is the hysteresis of the Schimdt trigger.

When the piezo-sensor is touched, the buzzer beeps for a few seconds even if the hand is withdrawn. This is because once the output swings high, any slight decrease in voltage at the negative input has no effect. Once begun, the change in state cannot be easily reversed.

Assemble the circuit on a general-purpose PCB as compact as possible and house in a small case. The piezo-sensor should be the smallest one with 10-15mm diameter. Connect it to the unit using a thin, shielded wire and glue on the lower side of the handle of the briefcase. A 3V battery is sufficient to power the circuit.

Electronic Door Key

T.K. Hareendran

This circuit is basically a short-range, infrared remote-controlled electromagnetic relay driver. It can be used to control door motors or solenoid-based locks using a compact and handy remote handset.

The circuit comprises the IR transmitter and the receiver-cum-relay-driver circuits. Fig. 1 shows the tiny transmitter circuit that works off a 6V (2x3V) battery. Two CR2032 Lithium button cells serve the purpose here. Push-to-on switch S1 is the trigger key. Resistor R1 and zener diode ZD1 form the traditional shunt regulator circuit. Resistor R3 limits the operating current of response-indicator LED1.

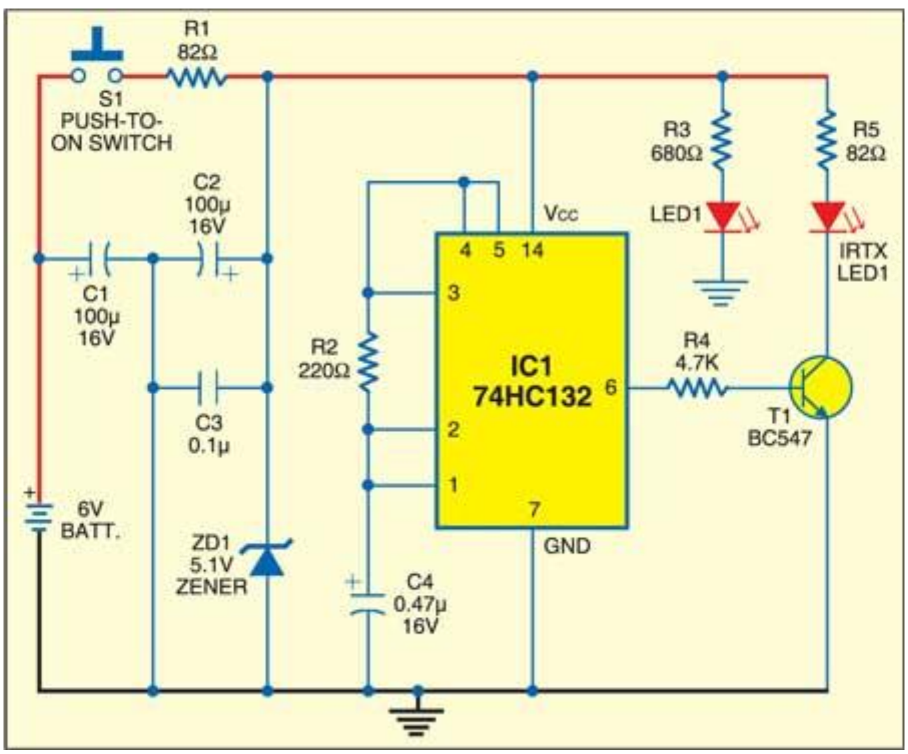


Fig. 1: IR transmitter

Two of the four gates of IC1 are used here. The first gate (with pins 1 and 2 as inputs and pin 3 as output) is a 10kHz oscillator. Timing components R2 and C4 determine the frequency of oscillations. The second gate (with pins 4 and 5 as inputs and pin 6 as output) is used as a buffer. The 10kHz signal for the infrared is produced by this oscillator built around the first gate. Transistor T1 is the IR transmitting LED1 driver and resistor R5 limits the current through the infrared LED. Any general-purpose IR-transmitting LED can be used here. After construction, enclose the circuit in a keychain-type plastic cabinet.

Fig. 2 shows the IR receiver-cum-relay driver circuit. It works off 6V regulated power supply. Use a suitable AC mains adaptor (max. 500 mA at 6V) for powering this unit. When the IR signal is received, phototransistor T2 conducts briefly at 10kHz rate and a pulse train with 10kHz frequency appears across resistor R6. This signal is fed to the input terminal (pin 3) of PLL chip LM567 (IC2) through capacitor C5. When the amplitude and frequency of the input signal are within the capture range of the PLL decoder, its output pin 8 goes low. Resistor R8 limits the sinking current.

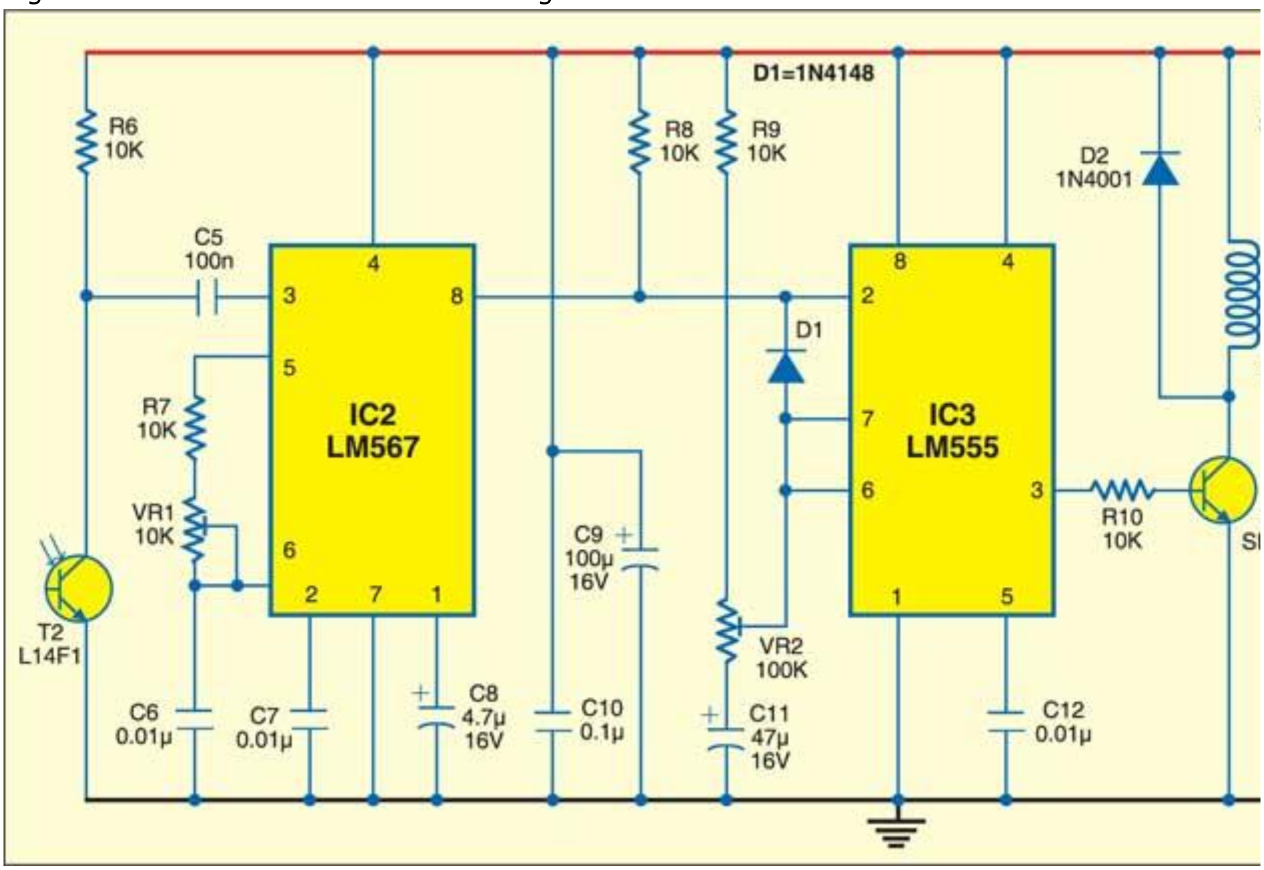


Fig. 2: IR receiver-cum-relay driver

As a result, the monostable built around the timer chip (IC3) is triggered and relay RL1 energises for a finite time (1 to 5 seconds) determined by VR2 setting. The relay contacts allow switching of the door motor/lock solenoid.
The initial setting is to be done as follows: Push switch S2 of the IR receiver circuit to 'on' state and activate the transmitter. Now slowly vary preset VR1 until relay RL1 energises. Lock preset VR1 in this position by applying some sealant such as wax. Now connect the door motor/lock solenoid to the relay contacts with proper power supply.

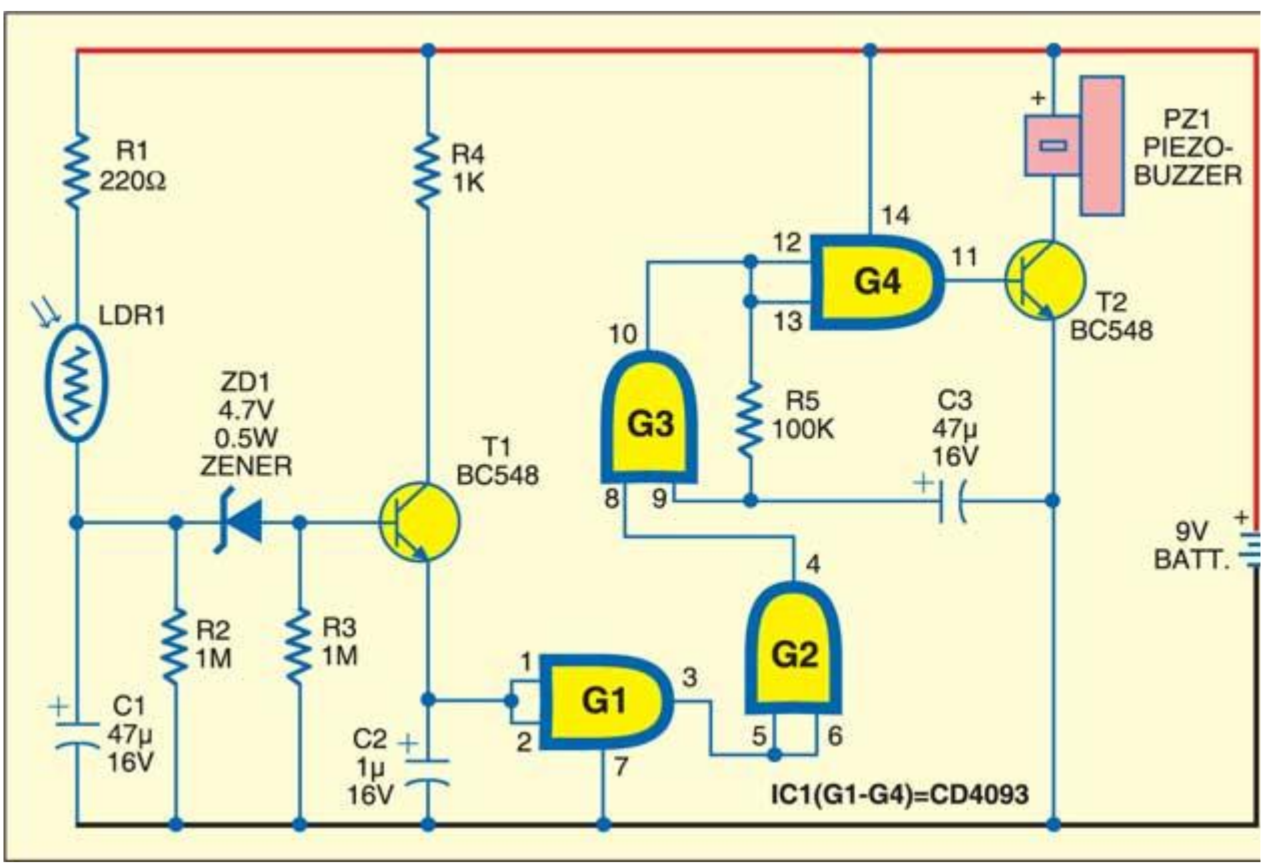
The circuit has been designed to work over a very short range (max. 10 cm) to prevent its misuse.

Locker Guard

D. Mohan Kumar

Protect your valuables from burglary using this simple circuit. It generates warning beeps when someone attempts to open the locked safe. The warning alarm sounds at an interval of a few seconds, so it is not annoying. Even after closing the door, the alarm will continue sounding for a few seconds.

The circuit uses a light-dependent resistor (LDR) to detect the ambient light when the door of the locker is opened. When light falls on LDR1, it conducts and capacitor C1 charges. When the voltage across capacitor C1 increases to about 4.7 volts, zener diode ZD1 conducts to provide base current to transistor T1. Resistor R1 reduces the sensitivity of LDR1 to provide the time delay to charge capacitor C1. Resistor R2 provides the discharge path for capacitor C1 and resistor R3 keeps the base of transistor T1 at the ground potential when the zener diode stops conducting.



When door of the locker is opened, transistor T1 conducts and input pins 1 and 2 of gate G1 become high. The low output from gate G1 is fed to gate G2, whose output goes high to activate the oscillator built around gates G3 and G4. The output from gate G4 is used to bias transistor T2 and the buzzer connected to its collector sounds when it conducts. Capacitor C3 and resistor R5 determine the frequency of oscillation.

When door of the locker is closed, transistor T1 does not conduct and as a result, the output of gate G2 remains low. This deactivates the oscillator built around gates G3 and G4. The low output of gate G4 makes transistor T2 non-conducting and the buzzer remains silent.

Assemble the circuit on a common PCB as compact as possible and enclose in a small plastic case with holes for LDR1 and buzzer PZ1. LDR1 should be oriented such that light directly falls on it when the door of the locker is opened. In other words, when the door is closed, light should not fall on LDR1.

Delay time can be increased or decreased by changing the value of C1. In the standby mode, current consumption is very low, so a 9V battery is sufficient to power the circuit for long periods.

ELECTRONIC HORN

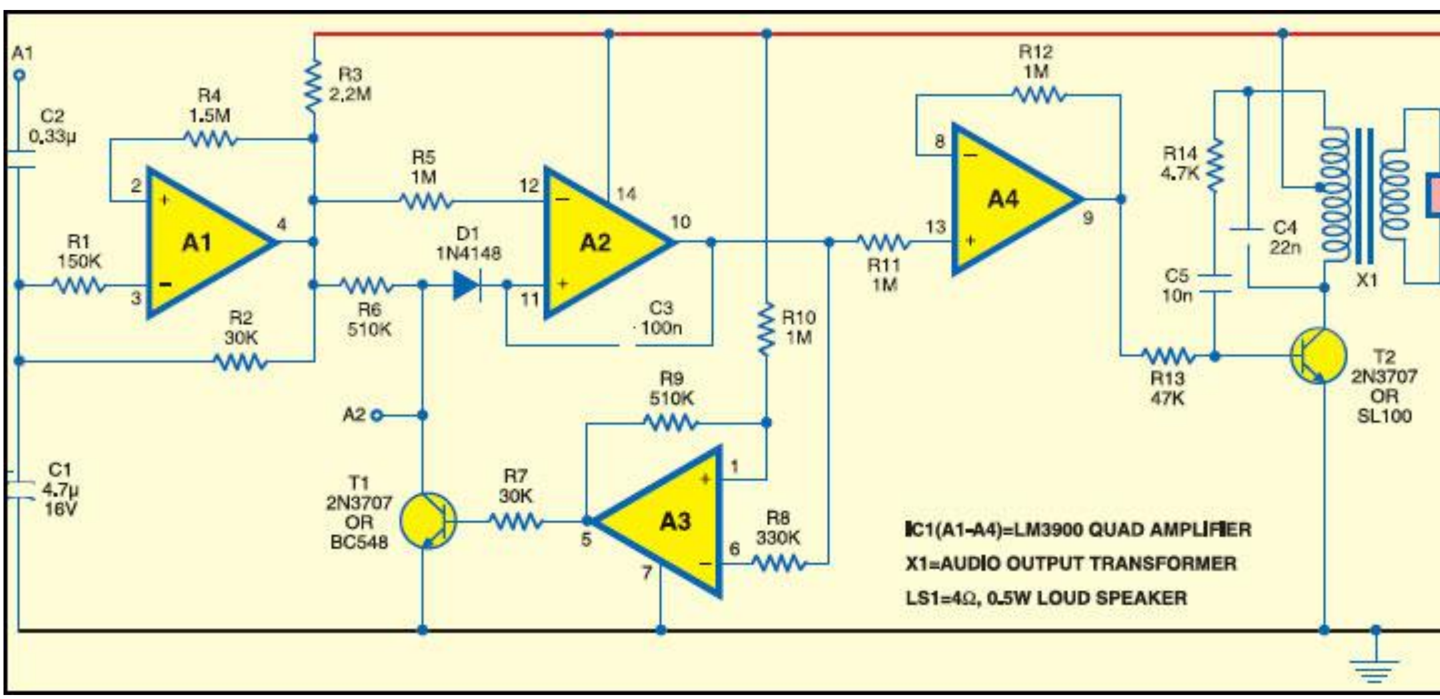
ASHOK K. DOCTOR

Here's a simple circuit of an electronic horn that is built around quadruple op-amp IC LM3900 (IC1). IC LM3900 has four independent op-amps (A1 through A4) with a large output voltage swing. It can work at up to 32V DC.

The first op-amp (A1) is wired as a low-frequency squarewave generator. Op-amp A2 works as an integrator, while op-amp A3 works as a comparator. A2 and A3 together work as a 'wandering voltage generator' op-amp. Op-amp A4 is wired as a buffer and its output provides base current to npn transistor T2. npn transistor T2 and audio output transformer X1 form a voltage-controlled oscillator.

When power is switched on, a basic tone is generated by transistor T2 and transformer X1, which is frequency-modulated by the wandering voltage generator, which, in turn, is influenced by the low-frequency squarewave generator. The circuit works off regulated 9V. To generate several different tones, connect its point A1 to pins 1, 3, 4, 5, 8, 9, 10, 11, 12 and 13 of IC1 and point A2 to pins 1, 2, 3, 6, 8, 11 and 13.

The circuit can be used as an automobile horn by using about 10W audio amplifier.

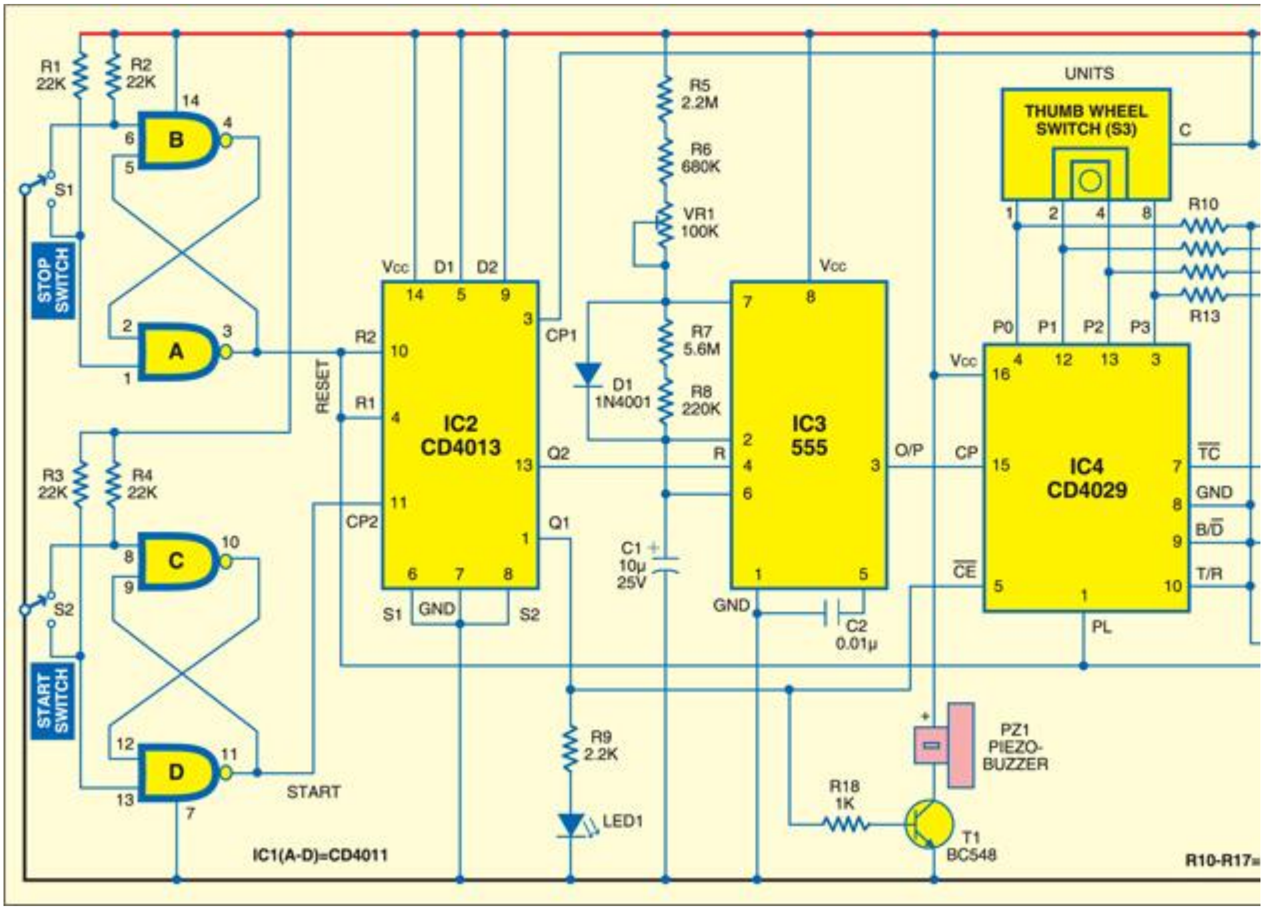


Electronic Reminder

Raj K. Gorkhali

This easy-to-build electronic alarm will remind you of an impotant task after a preset time. It is particularly useful for housewives and busy professionals. All you have to do is set the time in minute swith the help of two thumbwheel switches (S3 and S4) and press and release start switch. Precisely after the time set by you is over, there is an audio as well as visual indication to remind you that the time you set has elapsed. The gadget is portable and operates off a 9V battery.

At the heart of this circuit are two counter ICs CD4029 (IC4 and IC5). These are programmable up/down 4bit binary/decade counters belonging to CMOS family of digital integrated circuits. The information present on them is fed to inputs P0 through P3 in parallel. It is loaded into the counter when the PL input is high, independent of the clock pulse input. In this circuit, IC4 and IC5 count in up/down mode when the up/down input is high/low. These have been wired as 4-bit binary counters in countdown mode with B/D input low. The counter advances by one count on every low-to-high transition of the clock pulse.



The output terminal TC, which is associated with counting, is usually high. It goes low when the counter reaches its maximum count (if wired in 'up' mode) or minimum count (if wired in 'down' mode), and goes high again immediately following clock transition. The clock-enable (CE) input is an active-'low' input as indicated by the bar, i.e., the clock pluses will be enabled only when this input is low.

IC2 (CD4013) is a dual D-type flip-flop with each D flip-flop inside it having independent data, clock, set and reset inputs. The data bit (low or high) on the D-input is transferred to the output on low-to-high transition of the clock input. Set and reset are asynchronous inputs and activated with a high on these lines. This implies that when the set input is high, the Q output is high irrespective of the logic status of the 'D' input and clock transitions. Similarly, when reset is high, it overrides all other information and forces the Q output to low state.

IC3 (timer 555) is wired as an astable multivibrator with its output waveform having a time period of one minute. For timing accuracy and stability, resistors R5 and R6 should preferably be metal-film resistors and C1 a tantalum capacitor.

IC1 (CD4011B) is a quad 2-input NAND gate. Two of these four NAND gates (A and B) with pull-up resistors R1 and R2 constitute the de-bouncing circuit for micro-switch S1, which generates the master reset pulse every time it is pressed and released. The remaining two NAND gates (C and D) along with resistors R3 and R4 make up the other debouncing circuit for micro-switch S2, which generates the start pulse when it is pressed and released.

The circuit operates as follows: Initially, the position of micro-switches S1 and S2 is such that both reset and start outputs are low. First, set the timing (in minutes) with the help of two BCD switches, also known as thumbwheel switches, S3 and S4. If you select '5' through thumbwheel switch S3 and '6' through thumbwheel switch S4, the time delay is set at 65 minutes. The second step is to press and release micro-switch S1. A positive-going pulse resets flip-flop IC2 and also loads the programmed time delay information into counters IC4 and IC5. Since Q2 output of IC2 is initially low, when we press and release start switch S2, IC2 gets clocked and its Q2 output goes high. Reset pin 4 of timer IC3 gets supply to activate it. This is the time when the time delay begins to count-down.

To summarise, in order to use the reminder gadget, set the time delay after which you would like to be reminded, press and release switch S1 followed by a similar operation of switch S2.

TC output of IC5 is normally high and goes low when start switch S2 is pressed. It would go high only after 65 minutes if the time set by thumbwheel switches S4 and S5 is 65 minutes. This is basically a 65-clock cycle. Remember that the time period of IC3 is approximately one minute. This pulse appearing at the output (TC) of IC5 clocks at CP1 of IC2, whose output goes from low to high and drives both LED1 and piezobuzzer PZ1 to 'on' state.

The Q1 output of IC2 also forces clock-enable (CE) input of IC4 to go high and disable the clock. LED1 and piezobuzzer PZ1 remain 'on' unless you reset the system through switch S5. After the system is reset, the gadget is ready for a fresh time setting.

The counters have been wired in count-down mode as only then the counter IC completes its count cycle in a number of clock cycles equal to the number set by thumbwheel switches.

The time can be set in steps of one minute. If the clock period is changed to, say, 2 minutes, time resolution becomes 2 minutes, whereas the maximum settable time delay increases from 99 to 198 minutes. In essence, the maximum time delay that is achievable with this circuit is 99 clock cycles with a time resolution equal to the duration of one clock cycle.

NUMBER GUESSING GAME

PRIYANK MUDGAL

This number guessing game is quite simple. In this game the player thinks of any number between 1 and 99. Then he scans the eight groups of numbers given in the eight boxes in the table. Each group corresponds to a specific switch (indicated on the top of each group) on an 8-way DIP switch. The person scans the numbers in each box and slides the switch corresponding to a box to 'on' position if he finds his number in that box. After having scanned all the eight boxes and switching on the relevant DIP switches, he is required to press switch S9 and the number thought of by the person is displayed on the 7-segment displays. After this, all switches on the 8-way DIP switch need to be turned off to try display of another number in a similar fashion.

The circuit (Fig. 1) comprises two BCD-to-7-segment decoder/driver CD4511 ICs (IC1 and IC2). IC1 generates the number for tens position and IC2 generates the number for units position. Input pins 7, 1, 2, and 6 of both the ICs are connected to ground through 1-kilo-ohm resistors. The common-cathode terminals of both the displays are connected to push-to-on switch S9. Suppose you want to display 47. For this, 4 is to be displayed in tens position and 7 in units position.

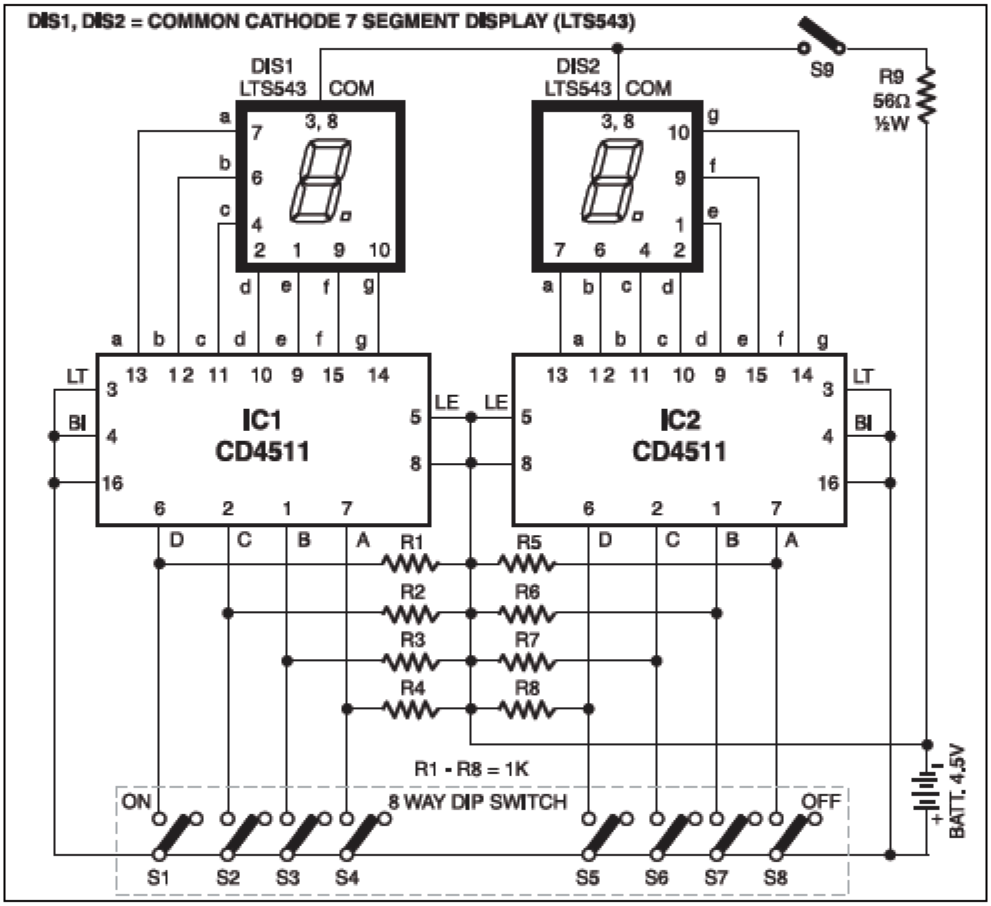


Fig. 1: Number guessing game circuit

In order to generate 4 (binary 100) on the display (DIS1), switch S2 is to be turned on. To display 7 (binary 111) on the display (DIS2), switches S6, S7, and S8 are to be turned on. Thus to generate 47, switches S2, S6, S7, and S8 are to be turned on. The number 47 is placed in groups 6, 7, 8, and 2. So when you spot 47 in these groups, switch on the same combination of switches. On depressing switch S9, 47 appears on the display. Other numbers can be generated using the same procedure.In order to make the circuit compact, a DIP switch has been used here. As it may be difficult to turn the small switches on and off, you may use SPDT toggle switches in place of the DIP switch. The circuit can be placed inside a plastic case with appropriate cuts made for displays and switches (Fig. 2). A strip of paper containing groups of numbers can be stuck just under the 8-way DIP switch (or under the row of SPDT switches used in place of DIP switch). The proposed cabinet with front-panel layout is shown in the figure.

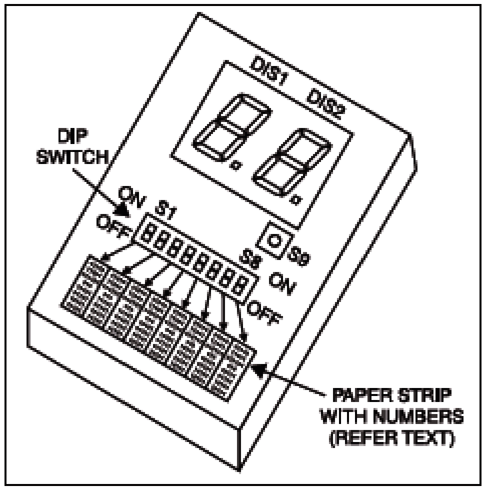


Fig. 2: Suggested case

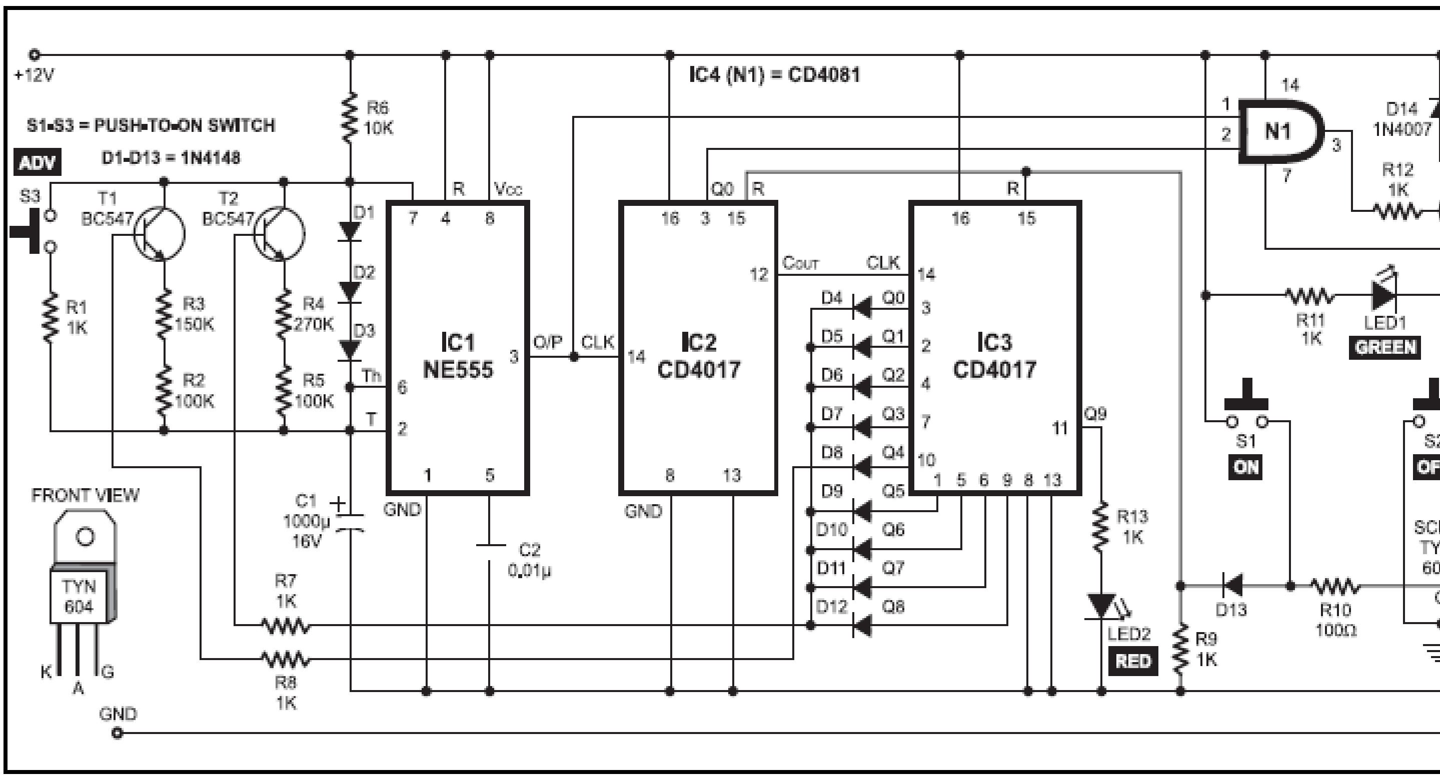
This circuit smoothly runs on two pen torch batteries. Thus current-limiting resistors are not necessary for displays.

Eight Groups of Numbers and Their Respective Switches			
Switch 1 80, 81, 82, 83, 84, 85, 86, 87, 88, 89 90, 91, 92, 93, 94, 95, 96, 97, 98, 99	**Switch 2** 40, 41, 42, 43, 44, 45, 46, 47, 48, 49 50, 51, 52, 53, 54, 55, 56, 57, 58, 59 60, 61, 62, 63, 64, 65, 66, 67, 68, 69 70, 71, 72, 73, 74, 75, 76, 77, 78, 79	**Switch 3** 20, 21, 22, 23, 24, 25, 26, 27, 28, 29 30, 31, 32, 33, 34, 35, 36, 37, 38, 39 60, 61, 62, 63, 64, 65, 66, 67, 68, 69 70, 71, 72, 73, 74, 75, 76, 77, 78, 79	**Switch 4** 10, 11, 12, 13, 14, 15, 16, 17, [illegible] 30, 31, 32, 33, 34, 35, 36, 37, [illegible] 50, 51, 52, 53, 54, 55, 56, 57, [illegible] 70, 71, 72, 73, 74, 75, 76, 77, [illegible] 90, 91, 92, 93, 94, 95, 96, 97, [illegible]
Switch 5 8, 9, 18, 19, 28, 29, 38, 39 48, 49, 58, 59, 68, 69, 78, 79 88, 89, 98, 99	**Switch 6** 4, 5, 6, 7, 14, 15, 16, 17, 24, 25, 26, 27 34, 35, 36, 37, 44, 45, 46, 47, 54, 55 56, 57, 64, 65, 66, 67, 74, 75, 76, 77 84, 85, 86, 87, 94, 95, 96, 97	**Switch 7** 2, 3, 6, 7, 12, 13, 16, 17, 22, 23, 26, 27 32, 33, 36, 37, 42, 43, 46, 47, 52, 53, 56, 57, 62, 63, 66, 67, 72, 73, 76, 77, 82, 83, 86, 87, 92, 93, 96, 97	**Switch 8** 1, 3, 5, 7, 9, 11, 13, 15, 17, 19 21, 23, 25, 27, 29, 31, 33, 36, [illegible] 41, 43, 45, 47, 49, 51, 53, 55, [illegible] 61, 63, 65, 67, 69, 71, 73, 75, [illegible] 81, 83, 85, 87, 89, 91, 92, 93, [illegible]

AUTOMATIC SCHOOL BELL

RAJ KUMAR MONDAL

Consider that a school has a total of eight periods with a lunch break after the fourth period. Each period is 45 minutes long, while the duration of the lunch break is 30 minutes.



To ring this automatic school bell to start the first period, the peon needs to momentarily press switch S1. Thereafter, the bell sounds every 45 minutes to indicate the end of consecutive periods, except immediately after the fourth period, when it sounds after 30 minutes to indicate that the lunch break is over. When the last period is over, LED2 glows to indicate that the bell circuit should now be switched off manually.

In case the peon has been late to start the school bell, the delay in minutes can be adjusted by advancing the time using switch S3. Each pushing of switch S3 advances the time by 4.5

minutes. If the school is closed early, the peon can turn the bell circuit off by momentarily pressing switch S2.The bell circuit contains timer IC NE555 (IC1), two CD4017 decade counters (IC2 and IC3) and AND gate CD4081 (IC4). Timer IC1 is wired as an astable multivibrator, whose clock output pulses are fed to IC2. IC2 increases the time periods of IC1 (4.5 and 3 minutes) by ten times to provide a clock pulse to IC3 every 45 minutes or after 30 minutes, respectively. When the class periods are going on, the outputs of IC3 switch on transistors T1 and T2 via diodes D4 through D12.

Resistors R4 and R5 connected in series to the emitter of npn transistor T2 decide the 4.5-minute time period of IC1. The output of IC1 is further connected to pin 14 of IC2 to provide a period with a duration of 45 minutes. Similarly, resistors R2 and R3 connected in series to the emitter of npn transistor T1 decide the 3-minute time period of IC1, which is further given to IC2 to provide the lunch-break duration of 30 minutes.

Initially, the circuit does not ground to perform its operation when 12V power supply is given to the circuit. When switch S1 is pressed momentarily, a high enough voltage to fire silicon-controlled resistor SCR1 appears at its gate. When SCR1 is fired, it provides ground path to operate the circuit after resetting both decade counters IC2 and IC3. At the same time, LED1 glows to indicate that school bell is now active.

When switch S2 is pressed momentarily, the anode of SCR1 is again grounded and the circuit stops operating. In this condition, both LED1 and LED2 don’t glow.

When the eighth period is over, Q9 output of IC3 goes high. At this time, transistors T1 and T2 don’t get any voltage through the outputs of IC2. As a result, the astable multivibrator (IC1) stops working.

The school bell sounds for around 8 it sounds after 30 minutes to indicate that the lunch break is over. When the last period is over, LED2 glows to indicate that the bell circuit should now be switched off manually.

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When the eighth period is over, Q9 output of IC3 goes high. At this time, transistors T1 and T2 don't get any voltage through the outputs of IC2. As a result, the astable multivibrator (IC1) stops working.

The school bell sounds for around 8 seconds at the end of each period. One can increase/decrease the ringing time of the bell by adding/removing diodes connected in series across pins 6 and 7 of IC1.

The terminals of the 230V AC electric bell are connected to the normally-open (N/O) contact of relay RL1. The circuit works off a 12V regulated power supply. However, a battery source for back-up in case the power fails is also recommended.

PARROT-SOUNDING AC DOOR BELL

SANI THEO

Here is a mains-operated door-bell that produces parrot-like sweet voice without requiring any musical IC. The circuit is cheap and easy to construct. The AC mains is fed to the circuit without using any step-down transformer.

The complete circuit is shown in Fig. 1. The main components of the circuit are a resistor-capacitor network, transistor BC337 and audio output transformer X1. The oscillation frequency depends on the combination of resistors R4 and R5 and capacitors C3, C4 and C5. When switch S1 is closed, the audio signal generated due to oscillations is amplified by transistor BC337 and parrot-like sound is reproduced from loudspeaker LS1 connected across the secondary of transformer X1.

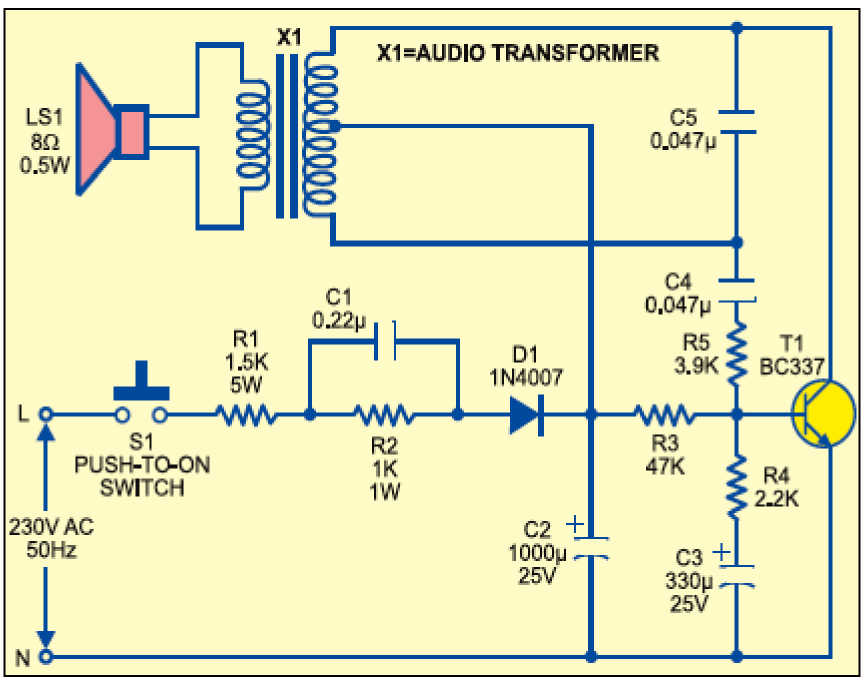


Fig. 1: Circuit of parrot-sounding doorbell

Here we have used an 8-ohm, 0.5W loudspeaker. The audio output transformer (X1) is normally used in transistor radio. The function of the audio output transformer is to transform the high impedance of the output amplifier to match the much lower impedance of the speaker. This is necessary to get an efficient transfer of the audio signal to the speaker. If a wrong audio transformer is used, the result can be low output and loss of tone quality. The audio frequency tone across the speaker terminal is about 3 kHz. The dimensions of the audio transformer used in the experimental setup are shown in Fig. 2.

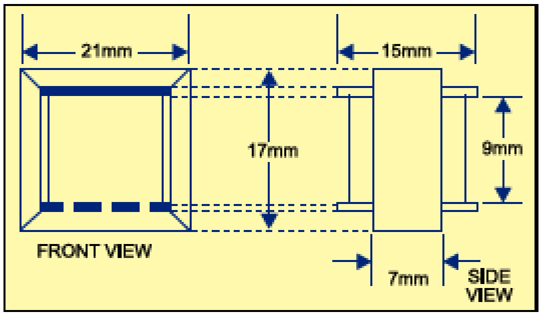


Fig. 2: Dimensions of audio transformer

The circuit is powered directly from 220V AC mains. The operating DC voltage obtained at the cathode of diode D1 is about 6V. However, if you press switch S1 continuously for a few seconds, the maximum voltage developed at this point may go up to 20 volts, which must be avoided to prolong the life of the circuit. R1 limits surge current in the circuit. The parallel combination of resistor R1 and capacitor C1 limits the circuit current to a safe level for circuit operation. R2 across C1 provides DC path for the current as well as a discharge path when the circuit is switched off. This is to prevent a possible shock to the operator by charged capacitor C1.

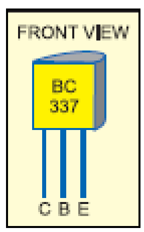


Fig. 3: Pin configuration of BC337

ELECTRONIC CANDLES

RAJ K. GORKHALI

Here is a simple circuit that can produce the effect of candle light in a normal electric bulb. A candle light, as we all know, resembles a randomly flickering light. So, the objective of this project activity is to produce a randomly flickering light effect in an electric bulb.

To achieve this, the entire circuit can be divided into three parts. The first part comprises IC1 (555), IC2 (74LS164), IC3 (74LS86), IC4 (74LS00) and the associated components. These generate a randomly changing train of pulses.

The second part of the circuit consists of SCR1 (C106), an electric bulb connected between anode of SCR1 and mains live wire, and gate trigger circuit components. It is basically half-wave AC power being supplied to the electric bulb.

The third part is the power supply circuit to generate regulated 5V DC from 230V AC for random signal generator.

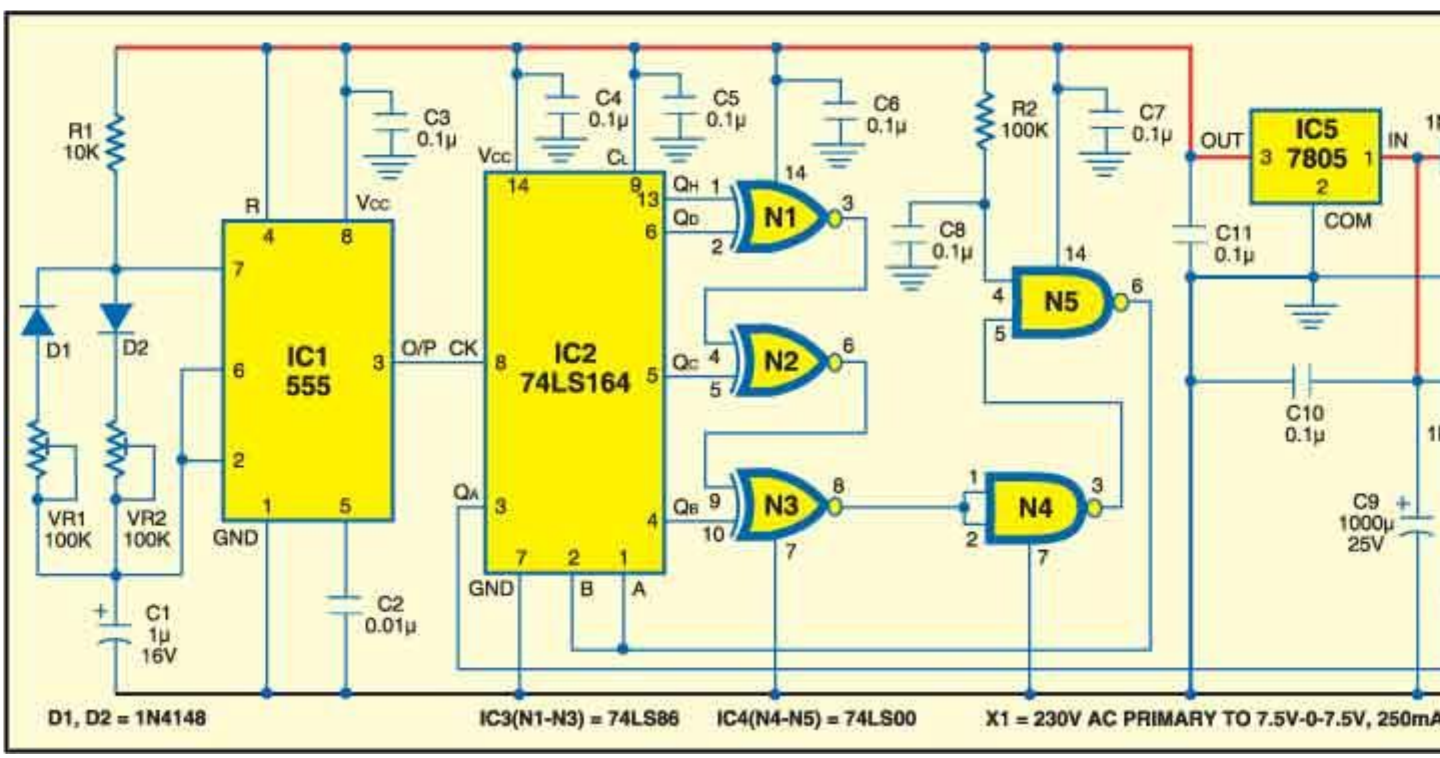


Fig. 1: Circuit diagram for electronic candle

It comprisesastep down transformer (X1), full-wave rectifier (diodes D3 and D4), filter capacitor (C9), followed by a regulator (IC5).The random signal generator of the circuit is built around an 8-bit serial in/parallel out shift register (IC2). Different outputs of the shift register IC pass through a set of logic gates (N1 through N5) and final output appearing at pin 6 of gate N5 is fed back to the inputs of pins 1 and 2 of IC2. The clock signal appears at pin 8 of IC2, which is clocked by an astable multivibrator configured around timer (IC1). The clock frequency can be set using preset VR1 and VR2. It can be set around 100 Hz to provide better flickering effect in the bulb.

The random signal triggers the gate of SCR1. The electric bulb gets AC power only for the period for which SCR1 is fired. SCR1 is fired only during the positive half cycles. Conduction of SCR1 depends upon the gate triggering pin 3 of IC2, which is random. Thus, we see a flickering effect in the light output.

Assemble the circuit on a general-purpose PCB and enclose it in a suitable case. Fix bulb and neon bulb on the front side of the cabinet. Also, connect a power cable for giving AC mains supply to the circuit for operation. The circuit is ready to use.

Warning. Since the circuit uses 230V AC, care must be taken to avoid electric shock.

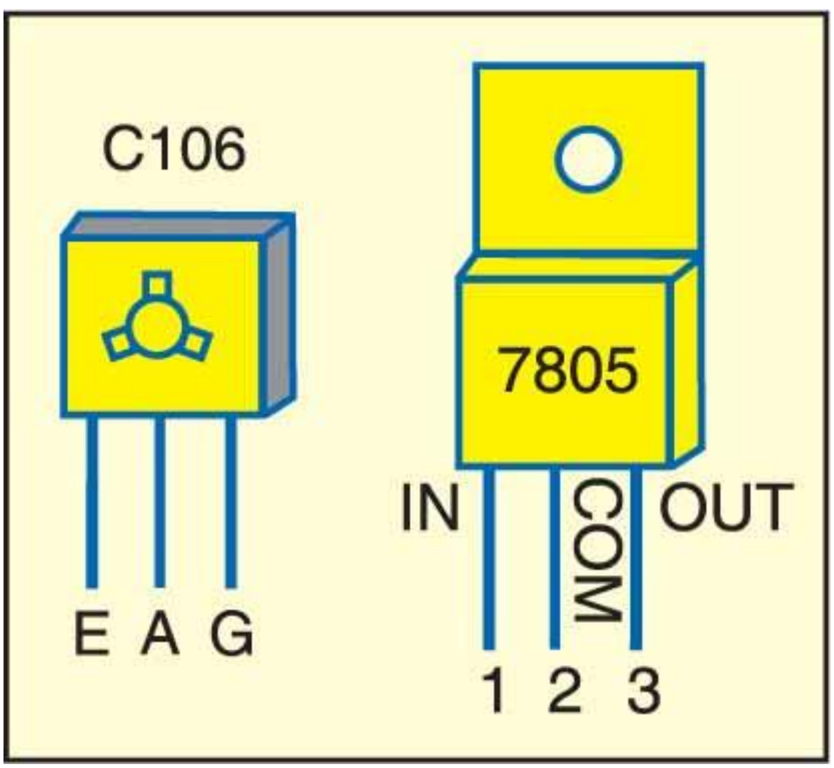
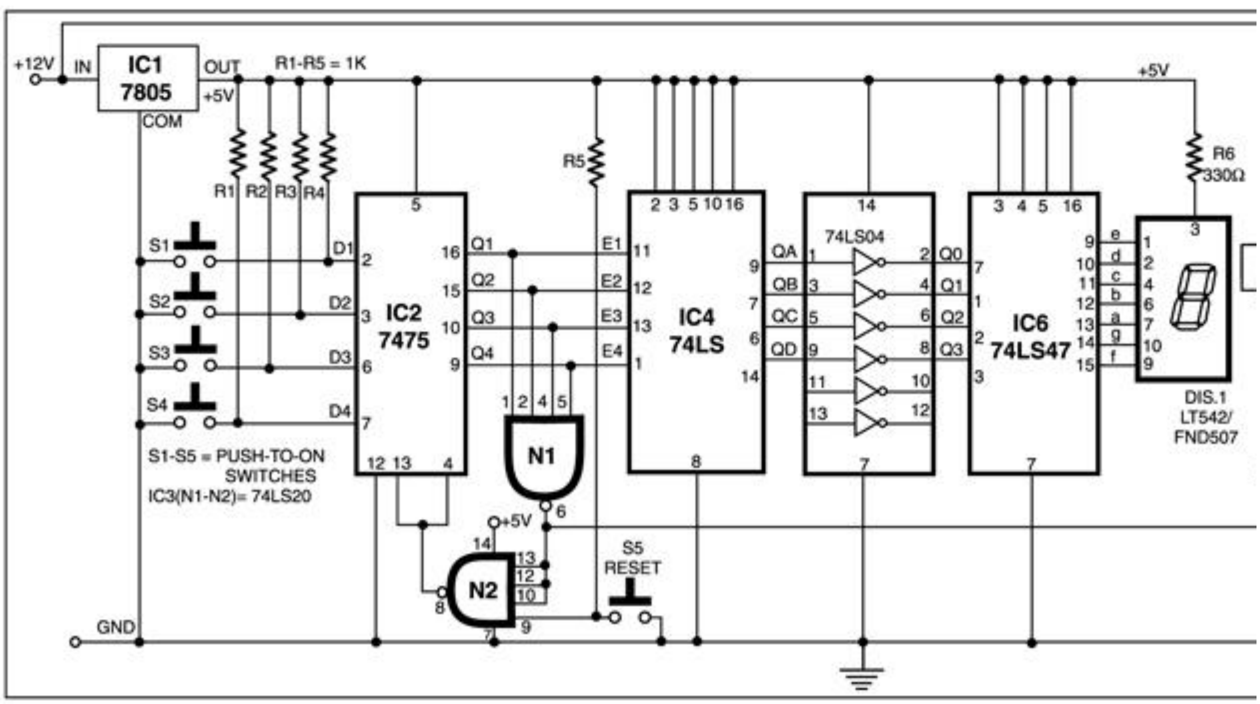


Fig. 2: Pin configurations of C106 and 7805

FASTEST FINGER FIRST INDICATOR

P. RAJESH BHAT

Quiz-type game shows are increasingly becoming popular on television these days. In such games, fastest finger first indicators (FFFIs) are used to test the player's reaction time. The player's designated number is displayed with an audio alarm when the player presses his entry button.



The circuit presented here determines as to which of the four contestants first pressed the button and locks out the remaining three entries. Simultaneously, an audio alarm and the correct decimal number display of the corresponding contestant are activated.

When a contestant presses his switch, the corresponding output of latch IC2 (7475) changes its logic state from 1 to 0. The combinational circuitry comprising dual 4-input NAND gates of IC3 (7420) locks out subsequent entries by producing the appropriate latch-disable signal.

Priority encoder IC4 (74147) encodes the active-low input condition into the corresponding binary coded decimal (BCD) number output. The outputs of IC4 after inversion by inverter gates inside hex inverter 74LS04 (IC5) are coupled to BCDto- 7-segment decoder/display driver IC6 (7447). The output of IC6 drives common anode 7-segment LED display (DIS.1, FND507 or LT542).

The audio alarm generator comprises clock oscillator IC7 (555), whose output drives a loudspeaker. The oscillator frequency can be varied with the help of preset VR1. Logic 0 state at one of the outputs of IC2 produces logic 1 input condition at pin 4 of IC7, there by enabling the audio oscillator.

IC7 needs +12V DC supply for sufficient alarm level. The remaining circuit operates on regulated +5V DC supply, which is obtained using IC1 (7805).

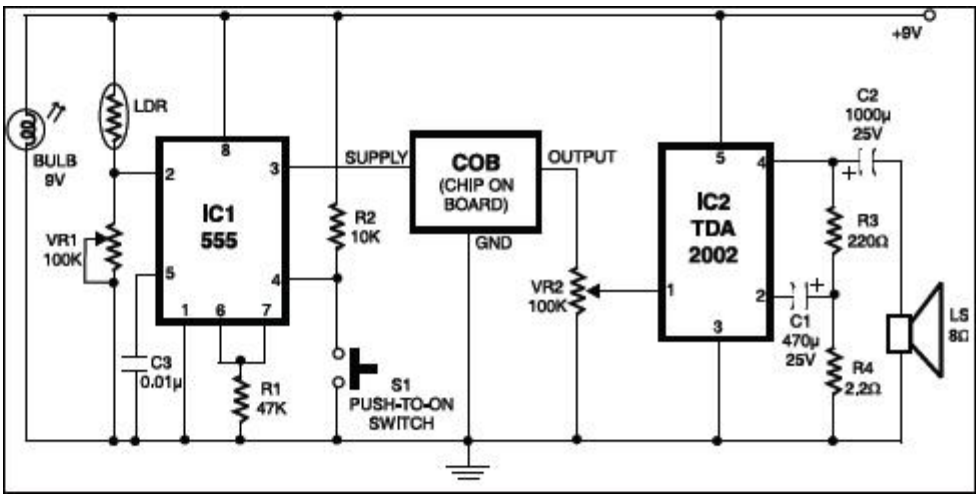
Once the organiser identifies the contestant who pressed the switch first, he disables the audio alarm and at the same time forces the digital display to ‘0’ by pressing reset push button S5.

With a slight modification, this circuit can accommodate more than four contestants.

FIRE ALARM

AJEET K. MALL

With the onset of summer, chances of fire accidents increase. Such fire accidents can be prevented if timely alarms are available. The circuit presented here warns the user against such fire accidents. The circuit should be placed in fire-prone areas such as a kitchen.



Everyone is aware that when anything catches fire, smoke is produced. When this smoke passes between a bulb and an LDR, the amount of light falling on the LDR decreases. This causes the resistance of LDR to increase and the voltage at pin 2 of IC 555 goes below 1/3 Vcc. thus triggering IC 555 which is used here in bistable mode. As a result the voltage of pin 3 goes high. This high voltage (approximately +9V) completes the supply to the COB (chip-on-board).

Different COBs are available in the market to generate different sounds. However, one may select a COB which generates sound such as 'aag lag gai hai'. The signal generated by COB is amplified by an audio amplifier. In this circuit, the audio power amplifier is wired around IC2 TDA 2002.

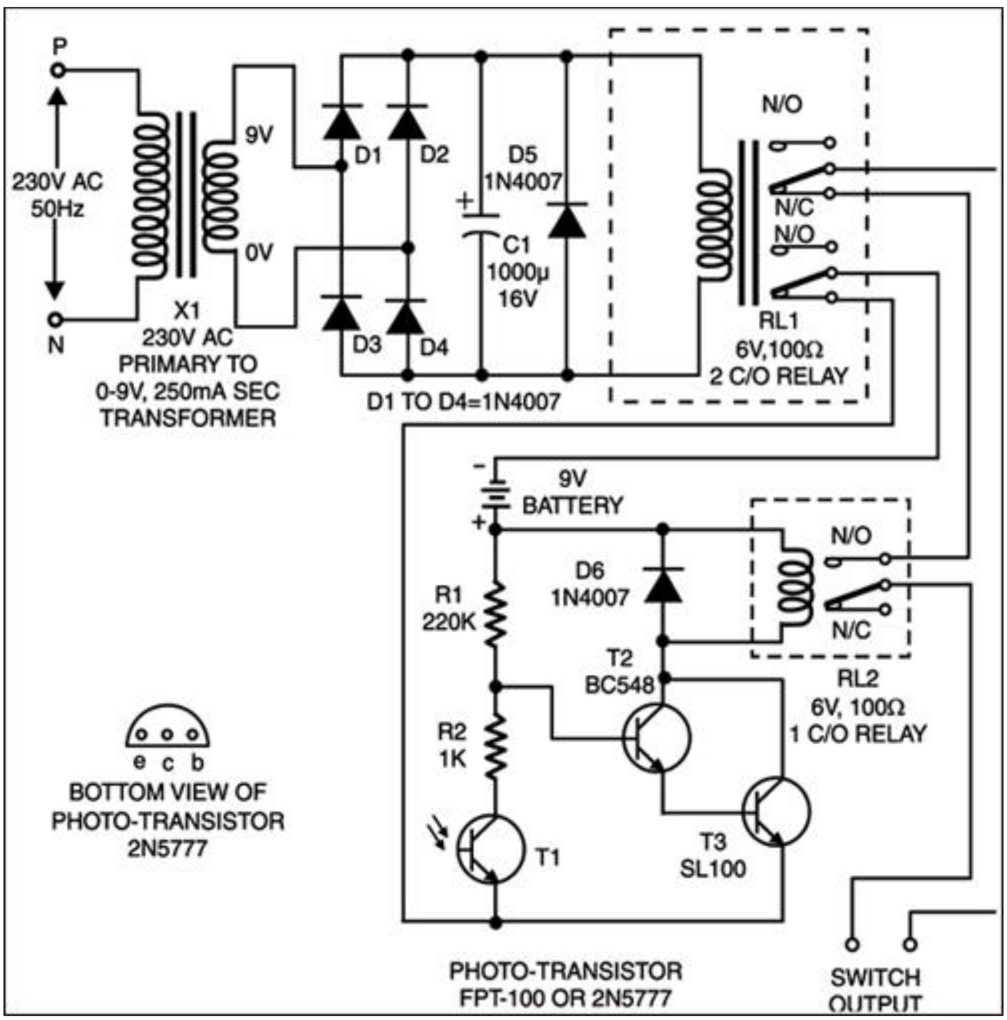
The sensitivity of the circuit depends on the distance between bulb and LDR as well as setting of preset VR1. Thus by placing the bulb and the LDR at appropriate distances, one may vary preset VR1 to get optimum sensitivity.

Reset switch S1 is provided in the circuit to switch off the alarm after the fire has been noticed by the user.

INTELLIGENT SWITCH

VIJAY D.SATHE

This intelligent switch circuit enables automatic, switching on of an emergency light system during darkness in the event of mains failure. The mains power failure condition is detected by the section consisting of mains step-down transformer X1 followed by bridge rectifier comprising diodes D1 through D4 and smoothing capacitor C1. If the mains is available then it causes energisation of relay RL1 which has two sets of changeover contacts.



The light/darkness condition is detected by the circuit comprising photo transistor FPT100/2N5777 followed by Darlington pair comprising transistors T2 and T3. However, this section will function only when mains supply is not available (i.e. when relay RL1 is in de-energised state) since battery supply (negative lead) path gets completed via lower N/C contact of relay RL1.

During daylight, photo transistor conducts and places transistor T2 base near ground potential. Thus Darlington pair remains cut-off and relay RL2 remains de-energised. However, during darkness, photo transistor is cut-off and therefore transistor T2 receives forward base bias via resistor R1 (connected to positive rail), as resistor R2 is no more grounded (via photo-transistor T1). As a result, relay RL2 gets energised.

Thus it would be observed that when mains is absent (relay RL1 de-energised) and it is dark (relay RL2 energised), the switch output path is complete. In any other condition switch output path would get broken. The switch output terminals can be used (in series with supply) to control a lighting system directly or indirectly through another contactor heavy-duty relay depending upon the load.

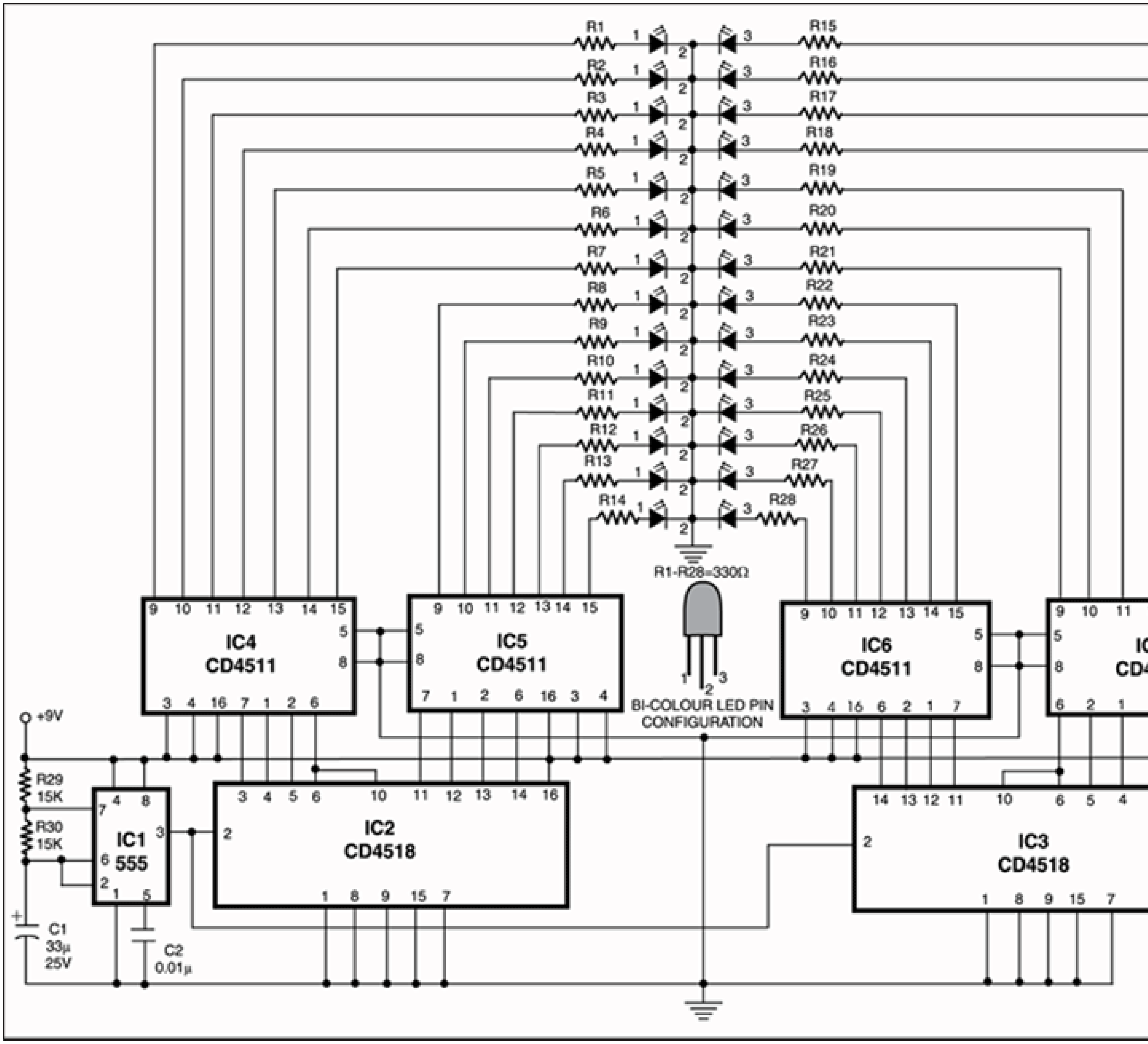
The working of the intelligent switch is summarised in the table.

Period	Conditions	Switch status
During daylight	(when mains is present (when mains is absent)	intelligent switch is 'off'.
During night darkness	(when mains is present)	intelligent switch is 'off'.
	(when mains is absent)	intelligent switch is 'on'.

MAGIC LIGHTS

VIJAY D.SATHE

The circuit as shown in the figure employs 14 bi-colour (red and green) LEDs having three terminals each. Different dancing colour patterns are produced using this circuit since each LED can produce three different colours. The middle terminal (pin 2) of the LEDs is the common cathode pin which is grounded. When a positive voltage is applied to pin 1, it emits red light. Similarly, when positive voltage is applied to pin 3. it emits green light. And when positive voltage is simultaneously applied to its pins 1 and 3, it emits amber light. The circuit can be used for decorative lights.



IC1 (555) is used in astable mode to generate clock signal for IC2 and IC3 (CD4518) which are dual BCD counters. Both counters of each of these ICs have been cascaded to obtain 8 outputs from each. The outputs from IC2 and IC3 are connected to IC4 through IC7 which are BCD to 7-segment latch/decodor/driver ICs. Thus we obtain a total of 14 segment outputs from each of the IC pairs consisting of IC4 plus IC5 and IC6 plus IC7. While outputs from former pair are connected to pin No. 1 of all the 14 bi-colour LEDs via current limiting resistors, the ouputs of the latter pair are similarly connected to pin No.3 of all the bi-colour LEDs to get a magical dancing lights effect.

Ball Speed Checker

Muzamil Rasool Sofi

This circuit measures the speed of a cricket ball based on the time taken by the ball to travel the distance from the bowling crease to the batting crease.

As shown in Fig. 1, the circuit is built around two NE555 timer ICs (IC1 and IC2), 74C926 (IC3), LTS543 (display) and a few discrete components.

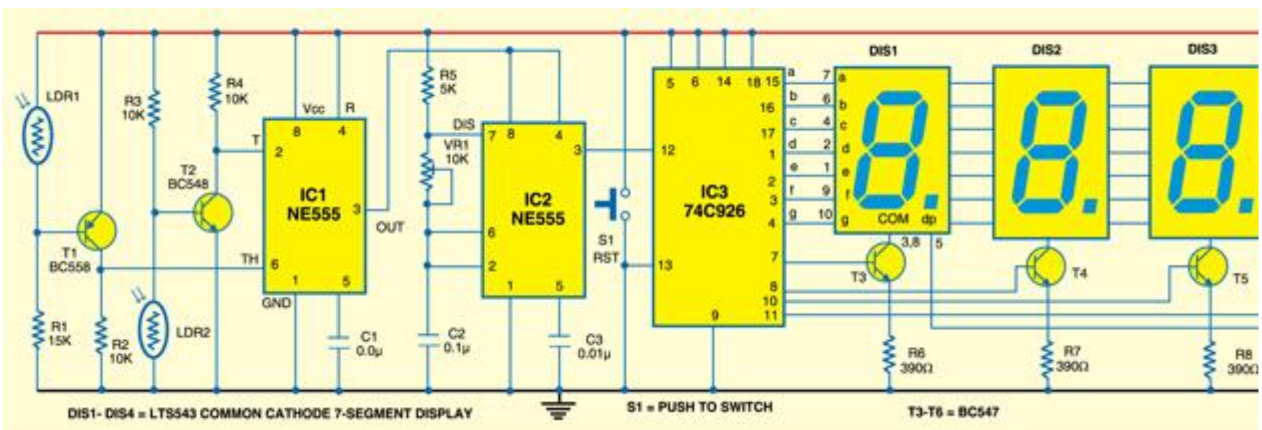


Fig. 1: Speed checker circuit

The first NE555 timer (IC1) is wired in bistable mode. The output of IC1 is fed to pins 4 and 8 of the second NE555 timer (IC2), which is wired as an astable multivibrator and produces a frequency of 1 kHz. The output of IC2 is counted and displayed by IC3. There are two light barriers built around LDR1 and LDR2, which produce signals when the ball interrupts the laser beam falling on LDRs while passing from the bowling crease to the batting crease.

When the ball crosses the bowling crease, it momentarily interrupts the IR beam falling on LDR2. This produces a pulse at pin 2 of IC1, which, in turn, sets IC1. The output of IC1 goes high and provides +5V to enable IC2 and it starts oscillating. These pulses are counted by IC3 and shown on 7-segment displays (DIS1 through DIS4).

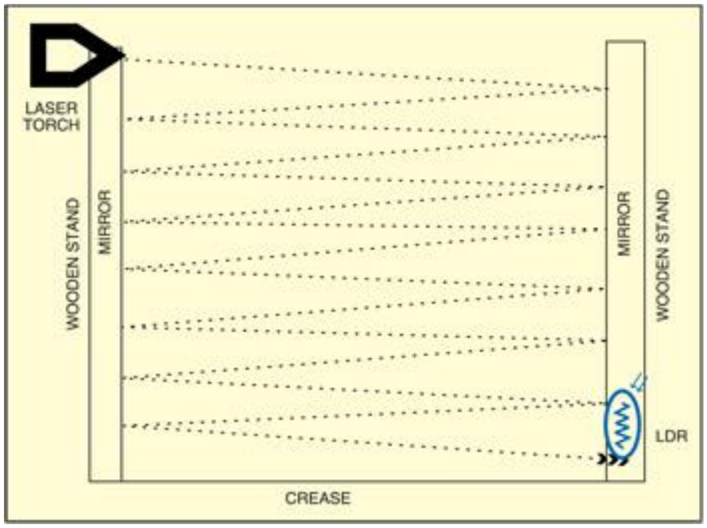


Fig. 2: Sensor fitting at the crease

When the ball crosses the batting crease, it again interrupts the laser beam falling on LDR1.This produces a pulse at pin 6 of IC1 and resets it. The output of IC1 goes low and stops +5V to IC2 to disable it. IC2 stops oscillating, and IC3 also stops counting.

Time is displayed on 7-segment displays. The counter counts from 0 to 9999, i.e., 10 seconds. The distance from the bowling to batting crease is approximately 18 metres. You can now calculate the speed of the bowling ball by substituting the value of distance and time taken by the ball from bowling to batting crease in the following relationship:

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{18}{\text{Time}} \times 3.6 \text{ km/hour}$$

The sensor can be made by pasting two reflective mirrors on wooden bases. The mirrors must be placed face to face on the sides of the bowling crease as shown in Fig. 2. Fix a laser torch on top of one mirror. The laser beam must make a small angle after falling on the mirror placed in front of it so that the beam reflects back and forth between the mirrors until it reaches the LDR placed at the bottom of the mirror. This way the laser beam forms a light barrier. When the ball interrupts the beam, it produces a pulse. Place another such sensor at the batting side.

Assemble the circuit on a general-purpose PCB and enclose in a small cabinet. Wire the clock buzzer to the circuit and keep this alarm watch at a convenient place. In place of a 6V battery, you can use a 6V adaptor for powering the circuit. Mount each of the LEDs and the pushbutton on the front panel, and connect them up to the board.

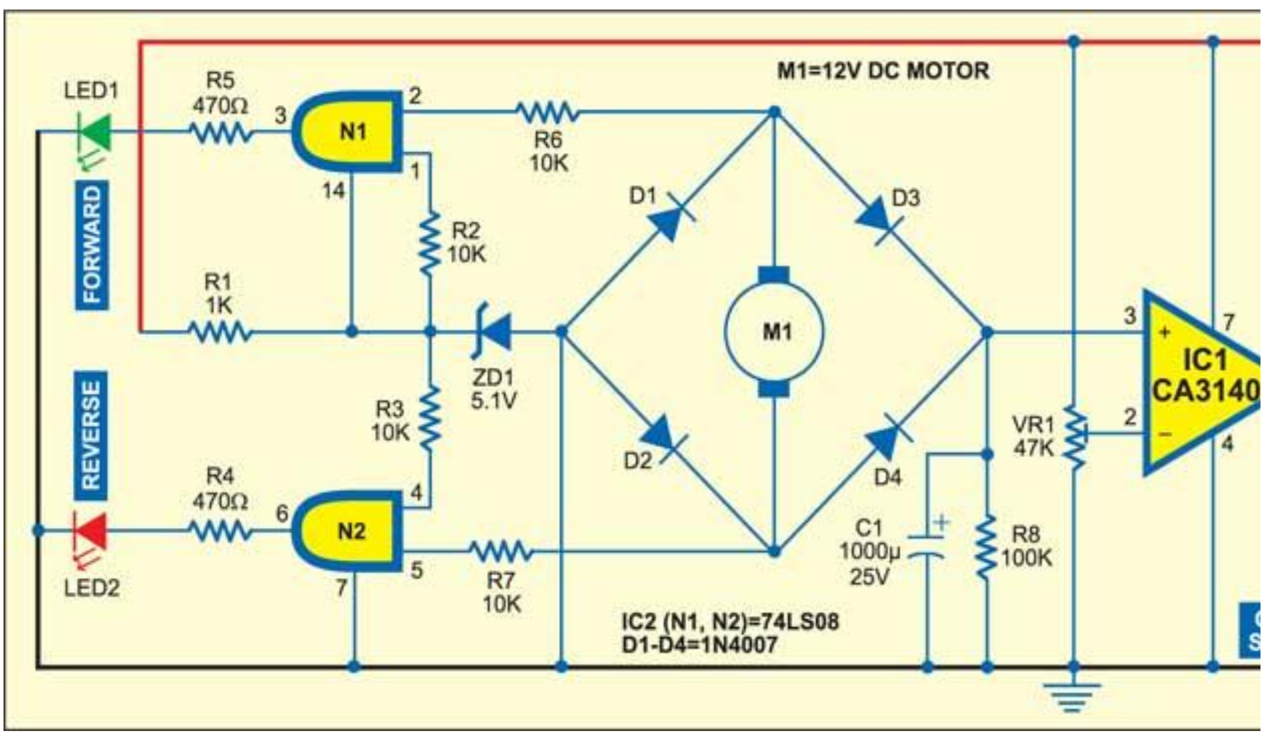
Over-Speed Indicator

V. David

This circuit is designed for indicating over-speed and direction of rotation of the motor used in mini hand tools, water pump motors, toys and other appliances.

A 12V DC motor (M1) is coupled to the rotating part of the appliance with a suitable fixing arrangement. When the motor rotates, it develops a voltage.

This over-speed indicator is built around operational amplifier CA3140 (IC1). Set the reference voltage (depending on the desired speed) by adjusting preset VR1 at pin 2 of IC1. When the voltage developed at pin 3 of IC1 is higher than the reference voltage at pin 2, output pin 6 of comparator IC1 goes high to sound piezobuzzer PZ1 and light up LED3.



The rotation indicator circuit is built around AND gate 74LS08 (IC2). Pin 2 of gate N1 goes high when the motor rotates in forward direction, while pin 1 of gate N1 is pulled high via resistor R2. When both pins 1 and 2 are high, output pin 3 of gate N1 goes high to light up LED1. Similarly, pin 5 of gate N2 goes high when the motor rotates in reverse direction. When both pins 4 and 5 are high, output pin 6 of gate N2 goes high to light up LED2.

Speed Checker for Highways

Dipanjan Bhattacharjee

While driving on highways, motorists should not exceed the maximum speed limit permitted for their vehicle. However, accidents keep occurring due to speed violations since the drivers tend to ignore their speedometers.

This speed checker will come handy for the highway traffic police as it will not only provide a digital display in accordance with a vehicle's speed but also sound an alarm if the vehicle exceeds the permissible speed for the highway.

The system basically comprises two laser transmitter-LDR sensor pairs, which are installed on the highway 100 metres apart, with the transmitter and the LDR sensor of each pair on the opposite sides of the road. The installation of lasers and LDRs is shown in Fig. 1. The system displays the time taken by the vehicle in crossing this 100m distance from one pair to the other with a resolution of 0.01 second, from which the speed of the vehicle can be calculated as follows:

$$\text{Speed (kmph)} = \frac{\text{Distance}}{\text{Time}}$$

$$= \frac{0.1 \text{ km}}{(\text{Reading} \times 0.01)/3600}$$

or,

$$\text{Reading (on display)} = \frac{36000}{\text{Speed}}$$

As per the above equation, for a speed of 40 kmph the display will read 900 (or 9 seconds), and for a speed of 60 kmph the display will read 600 (or 6 seconds). Note that the LSB of the display equals 0.01 second and each succeeding digit is ten times the preceding digit. You can similarly calculate the other readings (or time).

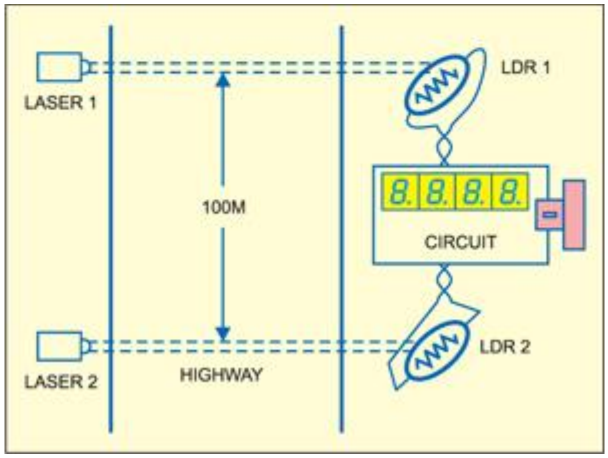


Fig. 1: Installation of lasers and LDRs on highway

Circuit description

Fig. 2 shows the circuit of the speed checker. It has been designed assuming that the maximum permissible speed for highways is either 40 kmph or 60 kmph as per the traffic rule.

The circuit is built around five NE555 timer ICs (IC1 through IC5), four CD4026 counter ICs (IC6 through IC9) and four 7-segment displays (DIS1 through DIS4). IC1 through IC3 function as monostables, with IC1 serving as count-start mono, IC2 as count-stop mono and IC3 as speed-limit detector mono, controlled by IC1 and IC2 outputs. Bistable set-reset IC4 is also controlled by the outputs of IC1 and IC2 and it (IC4), in turn, controls switching on/off of the 100Hz (period = 0.01 second) astable timer IC5.

The time period of timer NE555 (IC1) count-start monostable multivibrator is adjusted using preset VR1 or VR2 and capacitor C1. For 40kmph limit the time period is set for 9 seconds using preset VR1, while for 60kmph limit the time period is set for 6 seconds using preset VR2. Slide switch S1 is used to select the time period as per the speed limit (40 kmph and 60 kmph, respectively). The junction of LDR1 and resistor R1 is coupled to pin 2 of IC1.

Normally, light from the laser keeps falling on the LDR sensor continuously and thus the LDR offers a low resistance and pin 2 of IC1 is high. Whenever light falling on the LDR is interrupted by any vehicle, the LDR resistance goes high and hence pin 2 of IC1 goes low to trigger the monostable. As a result, output pin 3 goes high for the preset period (9 or 6 seconds) and LED1 glows to indicate it. Reset pin 4 is controlled by the output of NAND gate N3 at power-on or whenever reset switch S2 is pushed.

PARTS LIST

Semiconductors:	
IC1-IC5	- NE555 timer
IC6- IC9	- CD4026 decade counter/7-segment decoder
IC10	- CD4011 NAND gate
IC11	- 7812 12V regulator
D1, D2	- 1N4148 switching diode
D3-D6	- 1N4007 rectifier diode
LED1	- Green LED
LED2, LED3	- Red LED
DIS1-DIS4	- LTS543 common-cathode, 7-segment display
Resistors (all ¼-watt, ±5% carbon):	
R1, R4	- 100-kilo-ohm
R2, R5, R6, R8, R10, R11, R14	- 10-kilo-ohm
R3, R7, R13, R16-R19	- 470-ohm
R9	- 470-kilo-ohm
R12, R15	- 1-kilo-ohm
VR1, VR2	- 100-kilo-ohm preset
VR3	- 20-kilo-ohm preset
Capacitors:	
C1	- 100µF, 25V electrolytic
C2, C4, C6, C8, C11	- 0.01µF ceramic disk
C3, C13, C15	- 0.1µF ceramic disk
C5	- 10µF, 25V electrolytic
C7	- 0.47µF, 25V electrolytic
C9	- 0.2µF ceramic disk
C10	- 1µF, 25V electrolytic
C12	- 47µF, 25V electrolytic
C14	- 1000µF, 35V electrolytic
Miscellaneous:	
X1	- 230V AC primary to 0-15V, 500mA secondary transformer
PZ1	- Piezobuzzer
LDR1, LDR2	- LDR
S1, S2	- Push-to-on switch
S3	- On/Off switch
	- Pointed laser light

For IC2, the monostable is triggered in the same way as IC1 when the vehicle intersects the laser beam incident on LDR2 to generate a small pulse for stopping the count and for use in the speed detection. LED2 glows for the duration for which pin 3 of IC2 is high.

The outputs of IC1 and IC2 are fed to input pins 2 and 1 of NAND gate N1, respectively. When the outputs of IC1 and IC2 go high simultaneously (meaning that the vehicle has crossed the preset speed limit), output pin 3 of gate N1 goes low to trigger monostable timer IC3. The output of IC3 is used for driving piezobuzzer PZ1, which alerts the operator of speed-limit violation. Resistor R9 and capacitor C5 decide the time period for which the piezobuzzer sounds.

The output of IC1 triggers the bistable (IC4) through gate N2 at the leading edge of the count-start pulse. When pin 2 of IC4 goes low, the high output at its pin 3 enables astable clock generator IC5. Since the count-stop pulse output of IC2 is connected to pin 6 of IC4 via diode D1, it resets clock generator IC5. IC5 can also be reset via diode D2 at power-on as well as when reset switch S2 is pressed.

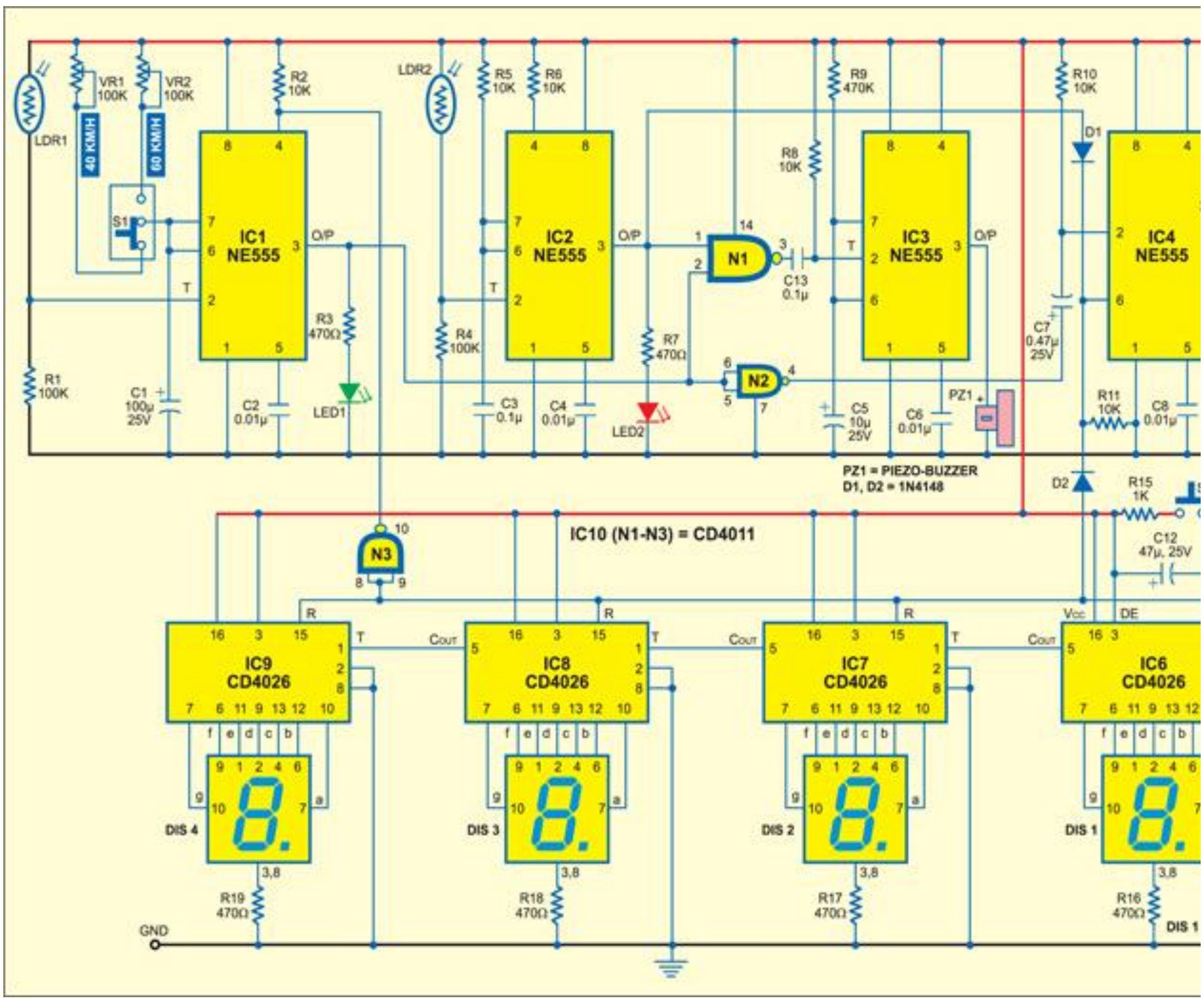


Fig. 2: Circuit of speed checker for highway

IC5 is configured as an astable multivibrator whose time period is decided by preset VR3, resistor R12 and capacitor C10. Using preset VR1, the frequency of the astable multivibrator is set as 100 Hz. The output of IC5 is fed to clock pin 1 of decade counter/7-segment decoder IC6 CD4026.

IC CD4026 is a 5-stage Johnson decade counter and an output decoder that converts the Johnson code into a 7-segment decoded output for driving DIS1 display. The counter advances by one count at the positive clock signal transition.

The carry-out (Cout) signal from CD4026 provides one clock after every ten clock inputs to clock the succeeding decade counter in a multidecade counting chain. This is achieved by connecting pin 5 of each CD4026 to pin 1 of the next CD4026.

A high reset signal clears the decade counter to its zero count. Pressing switch S2 provides a reset signal to pin 15 of all CD4026 ICs and also IC1 and IC4. Capacitor C12 and resistor R14 generate the power-on-reset signal.

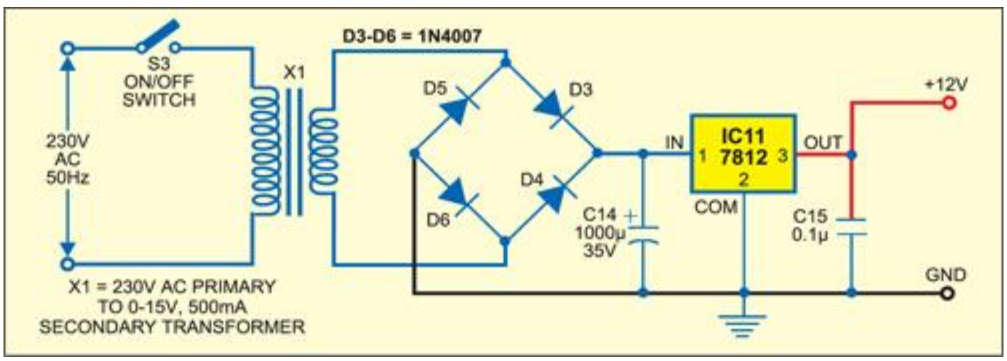


Fig. 3: Power supply

The seven decoded outputs 'a' through 'g' of CD4026s illuminate the proper segment of the 7-segment displays (DIS1 through DIS4) used for representing the decimal digits '0' through '9.' Resistors R16 through R19 limit the current across DIS1 through DIS4, respectively.

Fig. 3 shows the circuit of the power supply. The AC mains is stepped down by transformer X1 to deliver the secondary output of 15 volts, 500 mA. The transformer output is rectified by a bridge rectifier comprising diodes D3 through D6, filtered by capacitor C14 and regulated by IC11 to provide regulated 12V supply. Capacitor C15 bypasses any ripple in the regulated output. Switch S3 is used as the 'on'/'off' switch. In mobile application of the circuit, where mains 230V AC is not available, it is advisable to use an external 12V battery. For activating the lasers used in conjunction with LDR1 and LDR2, separate batteries may be used.

Construction and working

Assemble the circuit on a PCB. An actual-size, single-side PCB layout for the speed checker is shown in Fig. 4 and its component layout in Fig. 5.

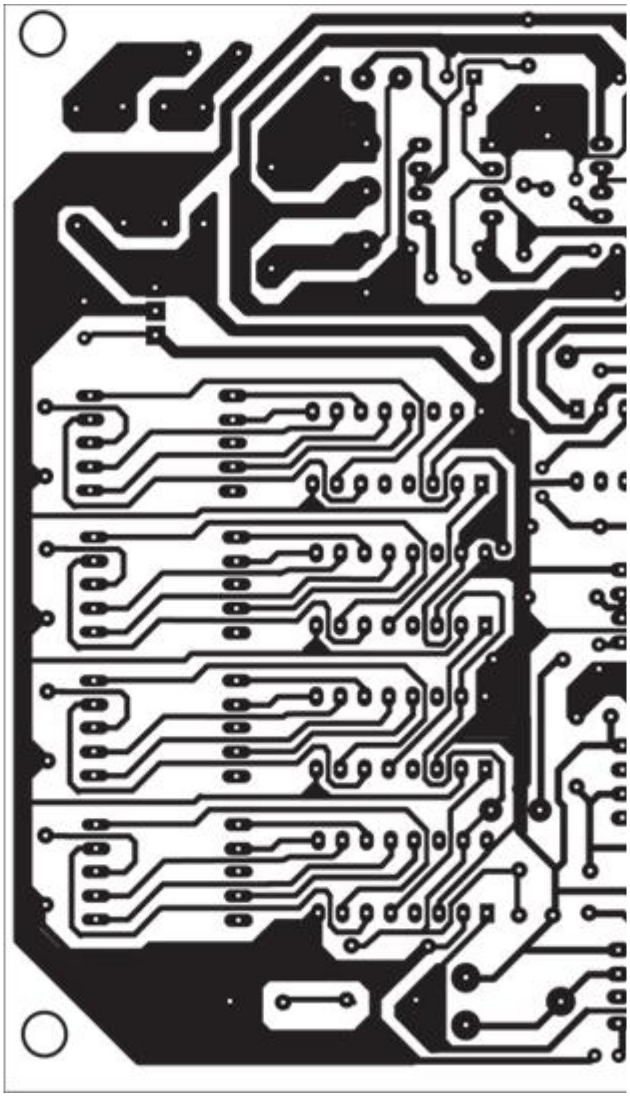


Fig. 4: *Actual-size, single-side PCB layout for the speed checker*

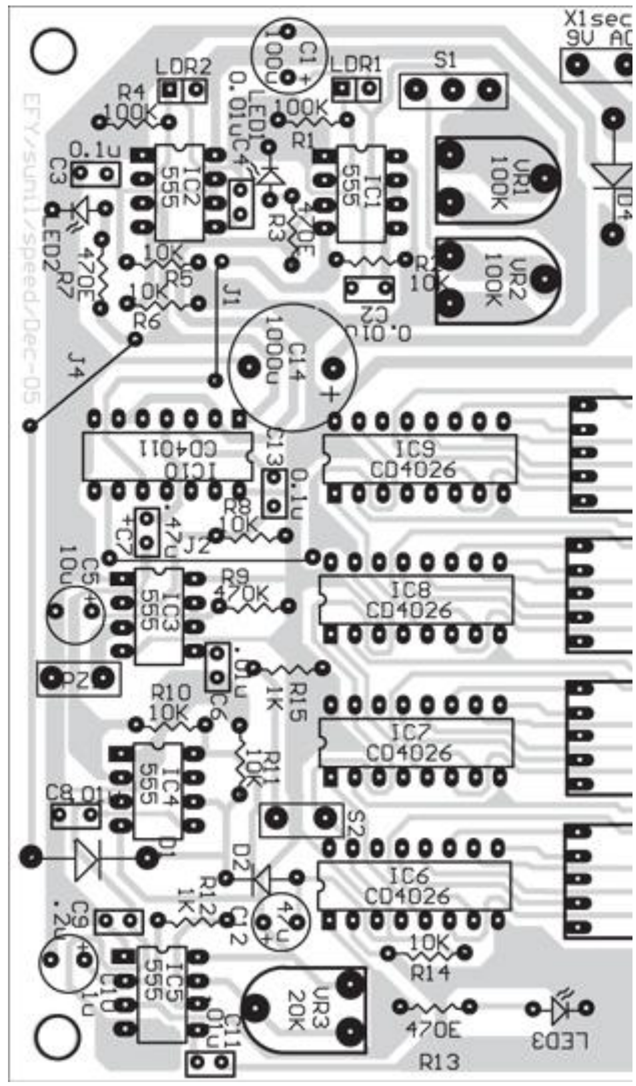


Fig. 5: *Component layout for the PCB*

http://www.electronicsforu.com/electronicsforu/circuitarchives/my_documents/my_files/9BB_Archive.zip

Before operation, using a multimeter check whether the power supply output is correct. If yes, apply power supply to the circuit by flipping switch S3 to 'on.' In the circuit, use long wires for connecting the two LDRs, so that you can take them out of the PCB and install on one side of the highway, 100 metres apart. Install the two laser transmitters (such as laser torches) on the other side of the highway exactly opposite to the LDRs such that laser light falls directly on the LDRs. Reset the circuit by pressing switch S2, so the display shows '0000.' Using switch S1, select the speed limit (say, 60 kmph) for the highway. When any vehicle crosses the first laser light, LDR1 will trigger IC1. The output of IC1 goes high for the time set to cross 100 metres with the selected speed (60 kmph) and LED1 glows during for period. When the vehicle crosses the second laser light, the output of IC2 goes high and LED2 glows for this period.

Piezobuzzer PZ1 sounds an alarm if the vehicle crosses the distance between the laser set-ups at more than the selected speed (lesser period than preset period). The counter starts counting when the first laser beam is intercepted and stops when the second laser beam is intercepted. The time taken by the vehicle to cross both the laser beams is displayed on the 7-segment display. For 60kmph speed setting, with timer frequency set at 100 Hz, if the display count is less than '600,' it means that the vehicle has crossed the speed limit (and simultaneously the buzzer sounds). Reset the circuit for monitoring the speed of the next vehicle.

Note. This speed checker can check the speed of only one vehicle at a time.

Digitally Adjustable Dancing Lights

Abhishek Kumar Singh

You might have come across several types of adjustable dancing lights (flickering LEDs). Most of them use presets (variable resistors) to adjust the rate of switching. Being a mechanical component, the preset easily wears out with use and also introduces noise in the circuit. The circuit presented here selects different values of resistors to control the frequency of an astable multivibrator using timer IC 555.

The circuit is built around decade counter IC 4017, quad bilateral switch IC 4066 (to select the desired resistance) and timer 555. The decade counter output selects one of the resistors at the output of IC 4066. The selected resistor changes the time period of the 555 timer circuit, whose 'on' and 'off' timings are given by:

t_{on} = 0.693(R9+Rx)C3

t_{off} = 0.693RxC3

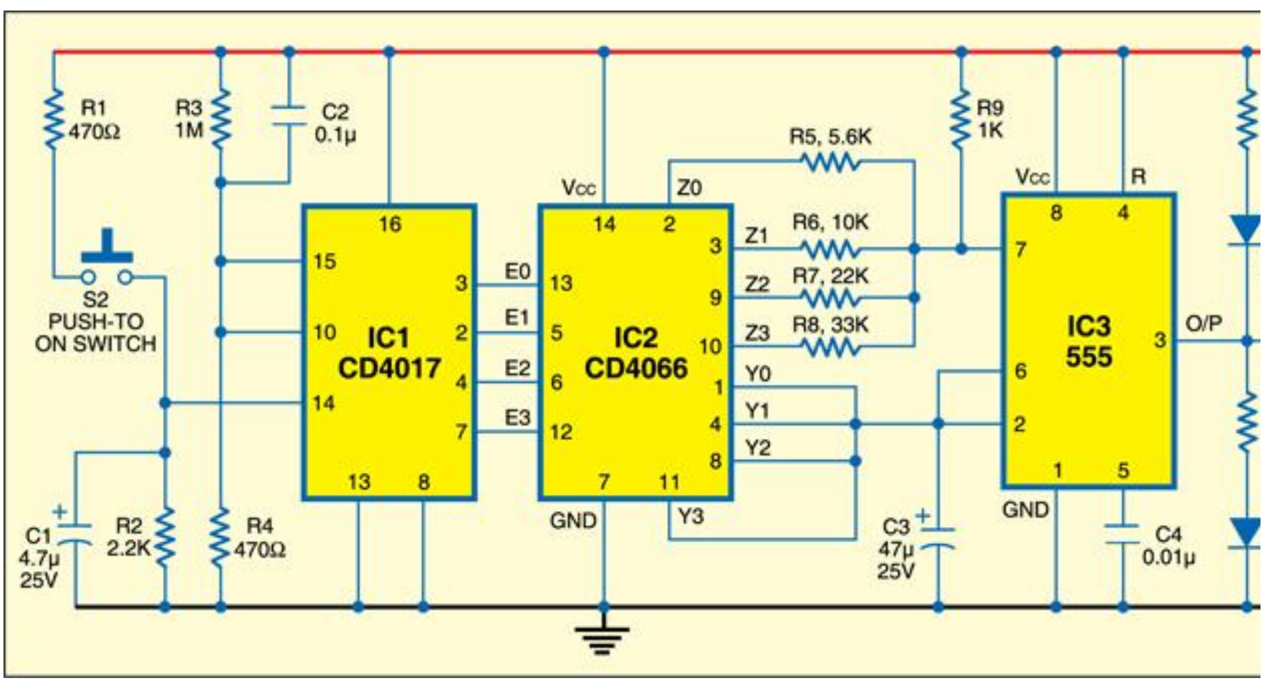


Fig. 1: Circuit for digitally adjustable dancing lights

In the present design, R9 = 1 kilo-ohm, C3 = 47 µF and Rx varies according to the output of IC1 (CD4017), which changes by pressing the switch S2 one by one.

When

Rx=R5=5.6 kilo-ohms, t_{on}=0.214969 second, t_{off}=0.182398 second

Rx=R6=10 kilo-ohms, t_{on}=0.358281 second, t_{off}=0.325710 second
Rx=R7=22 kilo-ohms, t_{on}=0.749133 second, t_{off} =0.716562 second
Rx=R8=33 kilo-ohms, t_{on}=1.107414 second, t_{off}=1.074843 second

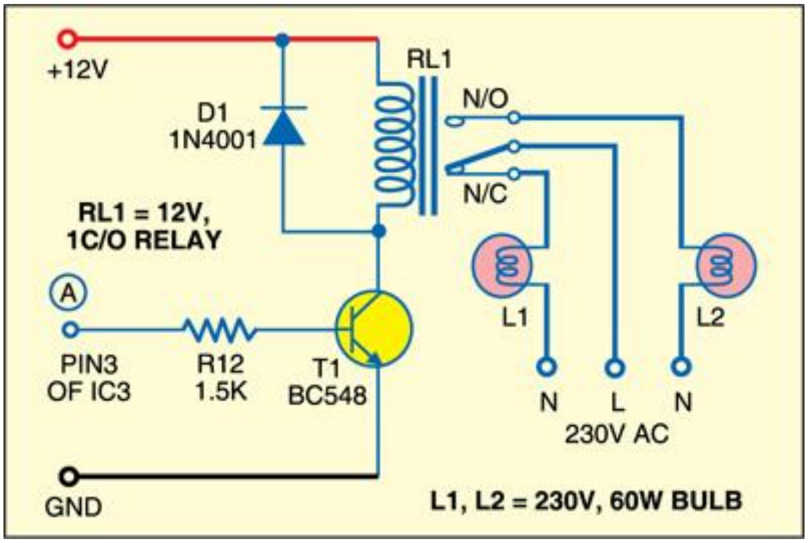


Fig. 2: Optional circuit

Whenever you momentarily press switch S2, the output of the decade counter advances to select a higher value of resistor Rx in IC 4066, which changes the switching time of the astable multivibrator. LED1 and LED2 indicate switching 'off' and 'on,' respectively, of the multivibrator.

Assemble the circuit on a general-purpose PCB and enclose in a suitable case. Fix LEDs and switches on the front panel. Connect the optional circuit shown in Fig. 2 if higher intensity of light is needed.

Electronic Combination Lock

Raj K. Gorkhali

This 7-digit combination lock can be easily hard-wired for any combination that you choose. The circuit uses a 4-bit, divide-by-8 Johnson counter (IC1), ten pushbutton switches and npn transistor T1.

At power-'on,' capacitor C2 connected to pin 15 of IC1 charges to high level through 820-kilo-ohm resistor, holding the counter in the reset state. In this condition, output O_0 (pin 2) of counter IC1 is high, while all other outputs are low.

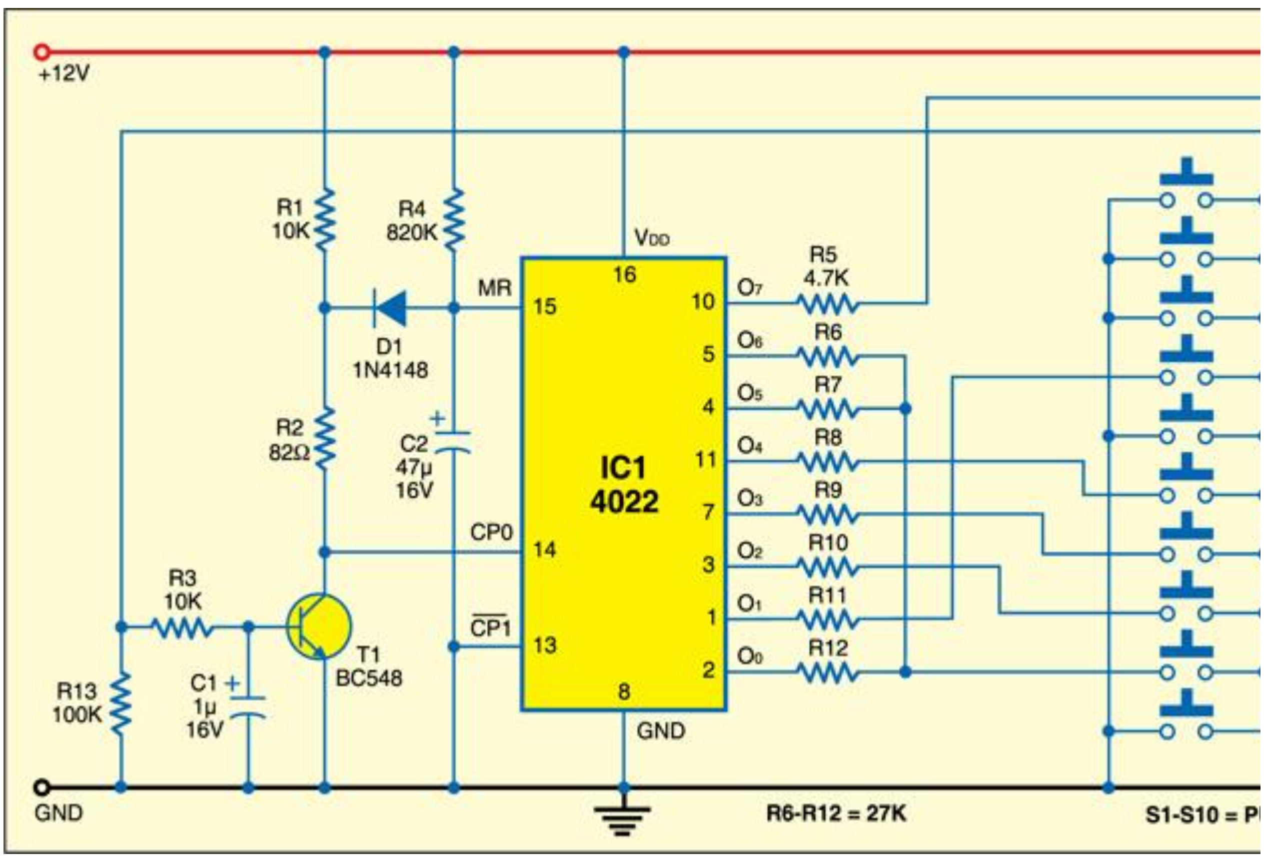


Fig. 1: Electronic combination lock circuit

When switch S2 is pressed, transistor T1 conducts and capacitor C2 discharges via diode D1 and resistor R2, releasing the counter's reset input. When S2 is released, T1 cuts off and its collector is pulled high, generating a rising edge on the counter's input clock pin 14. Capacitor C1 and resistor R3 in the base circuit of transistor T1 form a simple filter to prevent switch contact bounce from generating multiple clock pulses on pin 14 of IC1.

The clock pulse advances IC1's count by one, so O_0 goes low and O_1 goes high. Therefore press switch S7 next, as it's wired to output O_1. The time required for capacitor C1 to charge to logic high level is the maximum time that can lapse between switches pressed. Otherwise, the counter will reset. When all switches have been pressed in the correct sequence (S2-S7-S3-S4-S5-S2-S2 as shown), output O7 (pin 10) of the counter goes high for about ten seconds. This output is fed to driver transistor T2 to drive the solenoid valve and open the lock.

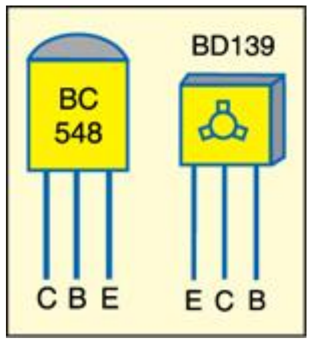


Fig. 2: Pin configurations of BC548 and BD139

Assemble the circuit on a common PCB and enclose in a plastic cabinet. Connect the solenoid valve to the circuit using a flexible wire. While soldering, take care to avoid shortings. Use IC base for ease of troubleshooting. Connect the switches for opening the lock at the top of the plastic case.

School/College Quiz Buzzer

GOVINDA RAJU TEKUMUDI

Manual buzzers used for quiz competitions in schools and colleges create a lot of confusion in identifying the first respondent. Although there are circuits using PCs and discrete ICs, they are either too expensive or limited to only a few number of players.

The quiz buzzer circuit given here can be used for up to eight players, which is maximum in any quiz competition. The circuit uses IC 74LS373 and a few passive components that are readily available in the market.

The circuit can be divided into two sections: power supply and quiz buzzer. Fig. 1 shows the power supply section. The regulated 5V power supply for the quiz buzzer section is derived from AC mains. The 230V AC mains is stepped down to 7.5V AC by transformer X1, rectified by bridge rectifier BR1, filtered by C1 and regulated by regulator IC1. Capacitor C2 bypasses ripples in the regulator output.

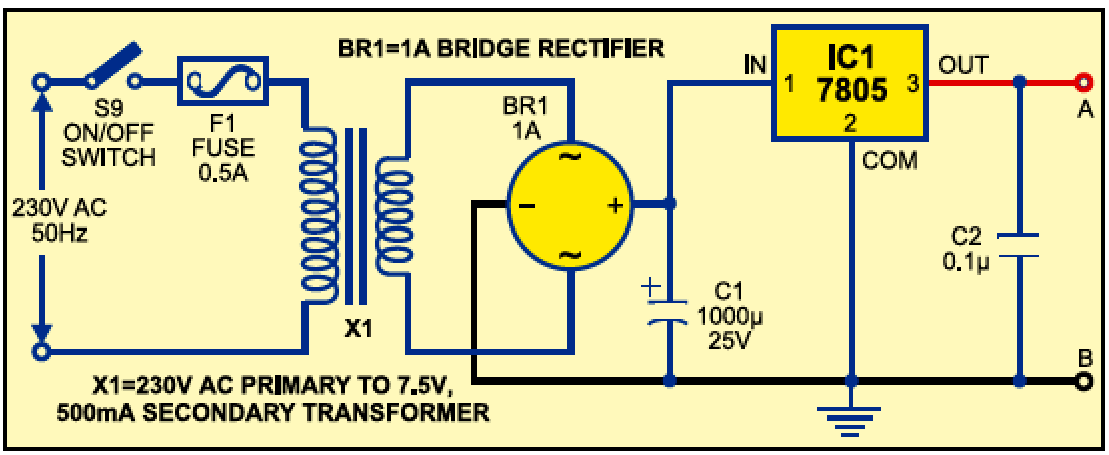


Fig. 1: Power supply

Fig. 2 shows the quiz buzzer section. At the heart of this section is IC 74LS373, an octal latch that is used to transfer the logic state at data input pins D0 through D7 to the corresponding Q0 through Q7 outputs. Data pins D0 through D7 are normally pulled low by resistors R1 through R8, respectively.

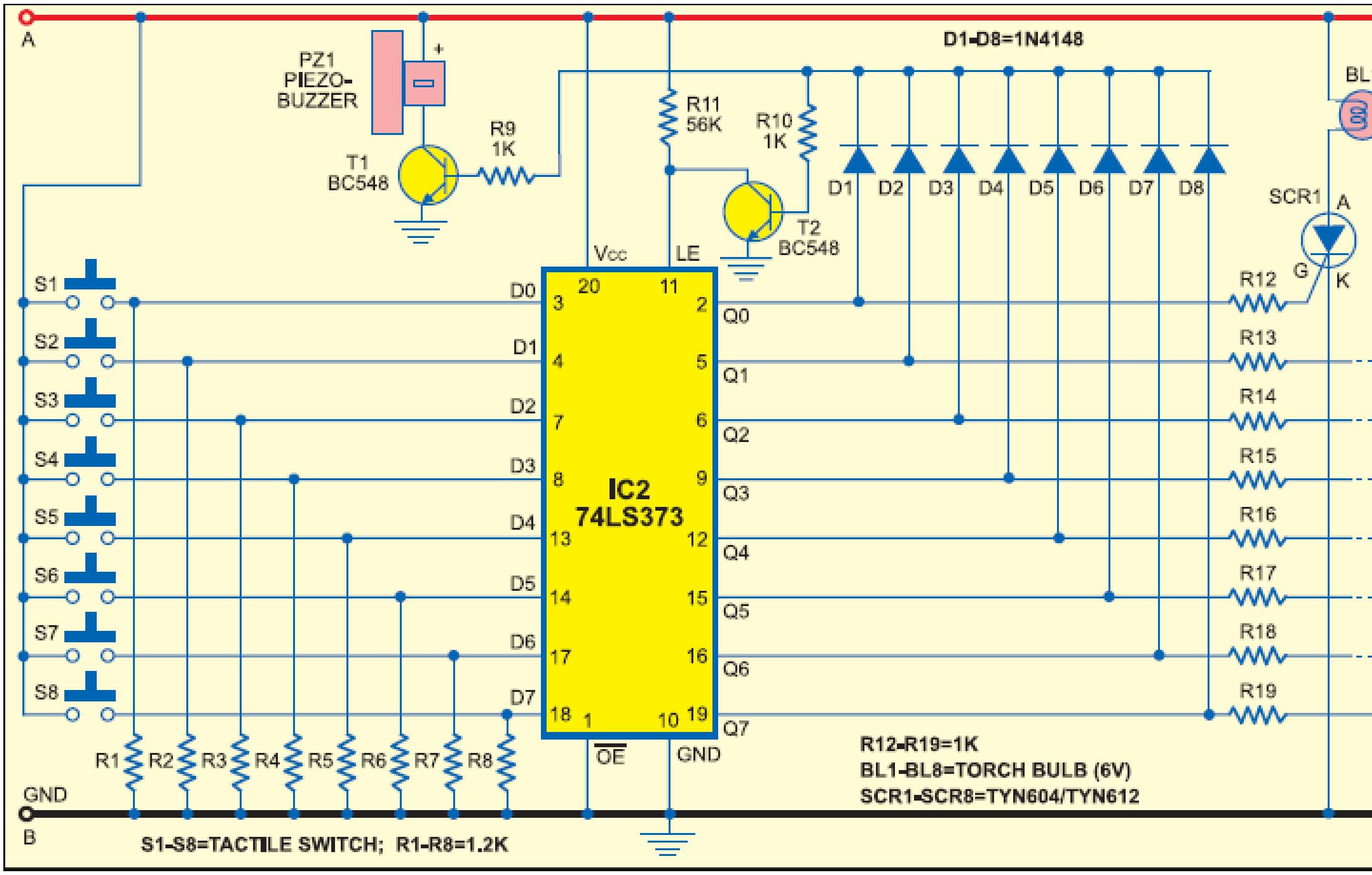


Fig. 2: Circuit of school/college quiz buzzer

One terminal of push-to-on switches S1 through S8 is connected to +5V, while the other terminal is connected to the respective data input pins. The switches are to be extended to the players through cord wire. The torch bulbs BL1 through BL8 can be housed in boxes with the front side of the boxes covered with a white paper having the name or number of the contestant written over it for easy identification. Place the boxes above the head level so that these can be seen by the audience also.

When the power is switched on using switch S9 (provided terminals 'A' and 'B' of both the power supply and quiz buzzer sections are interconnected), the circuit is ready to use. Now all the switches (S1 through S8) are open and Q0 through Q7 outputs of IC 74LS373 are low. As a result, the gates of silicon-controlled rectifiers SCR1 through SCR8 are also low.

As soon as a contestant momentarily presses his respective switch, the corresponding output data pin goes high. This triggers the corresponding SCR and the respective bulb glows. At the same time, the piezobuzzer (PZ1) sounds as transistor T1 conducts.

Simultaneously, the base of transistor T2 becomes high to make it conduct. Latch-enable (LE) pin 11 of IC2 is tied to ground to latch all the Q0 through Q7 outputs. This restricts further change in the output state due to any change in the state of switches S1 through S8 by any other contestant. Only one of the eight torch bulbs glows until the circuit is reset by on/off switch S9.

Note. The complete kit is available at Kits 'n' Spares outlet.

Motorbike Alarm

T.A. BABU

This simple-to-build alarm can be fitted in bikes to protect them from being stolen. The tiny circuit can be hidden anywhere, without any complicated wiring. Virtually, it suits all bikes as long as they have a battery. It doesn't drain out the battery though as the standby current is zero.

The hidden switch S1 can be a small push-to-on switch, or a reed switch with magnet, or any other similar simple arrangement. The circuit is designed around a couple of low-voltage MOSFETs configured as monostable timers. Motorbike key S2 is an ignition switch, while switch S3 is a tilt switch.

Motorbike key S2 provides power supply to the gate of MOSFET T2, when turned on. When you turn ignition off using key S2, you have approximately 15 seconds to get off the bike; this function is performed by resistor R6 to discharge capacitor C3. Thereafter, if anyone attempts to get on the bike or move it, the alarm sounds for approximately15 seconds and also disconnects the ignition circuit.

During parking, hidden switch S1 is normally open and does not allow triggering of mosfet T1. But when someone starts the motorbike through ignition switch S2, MOSFET T2 triggers through diode D1 and resistor R5. Relay RL1 (12V, 2C/O) energises to activate the alarm (built around IC1) as well as to disconnect the ignition coil from the circuit. Disconnection of the ignition coil prevents generation of spark from the spark plug. Usually, there is a wire running from the alternator to the ignition coil, which has to be routed through one of the N/C1 contacts of relay RL1 as shown in Fig.1 Fig.2 shows the pin configurations of SCR BT169, MOSFET BS170 and transistor BC548.

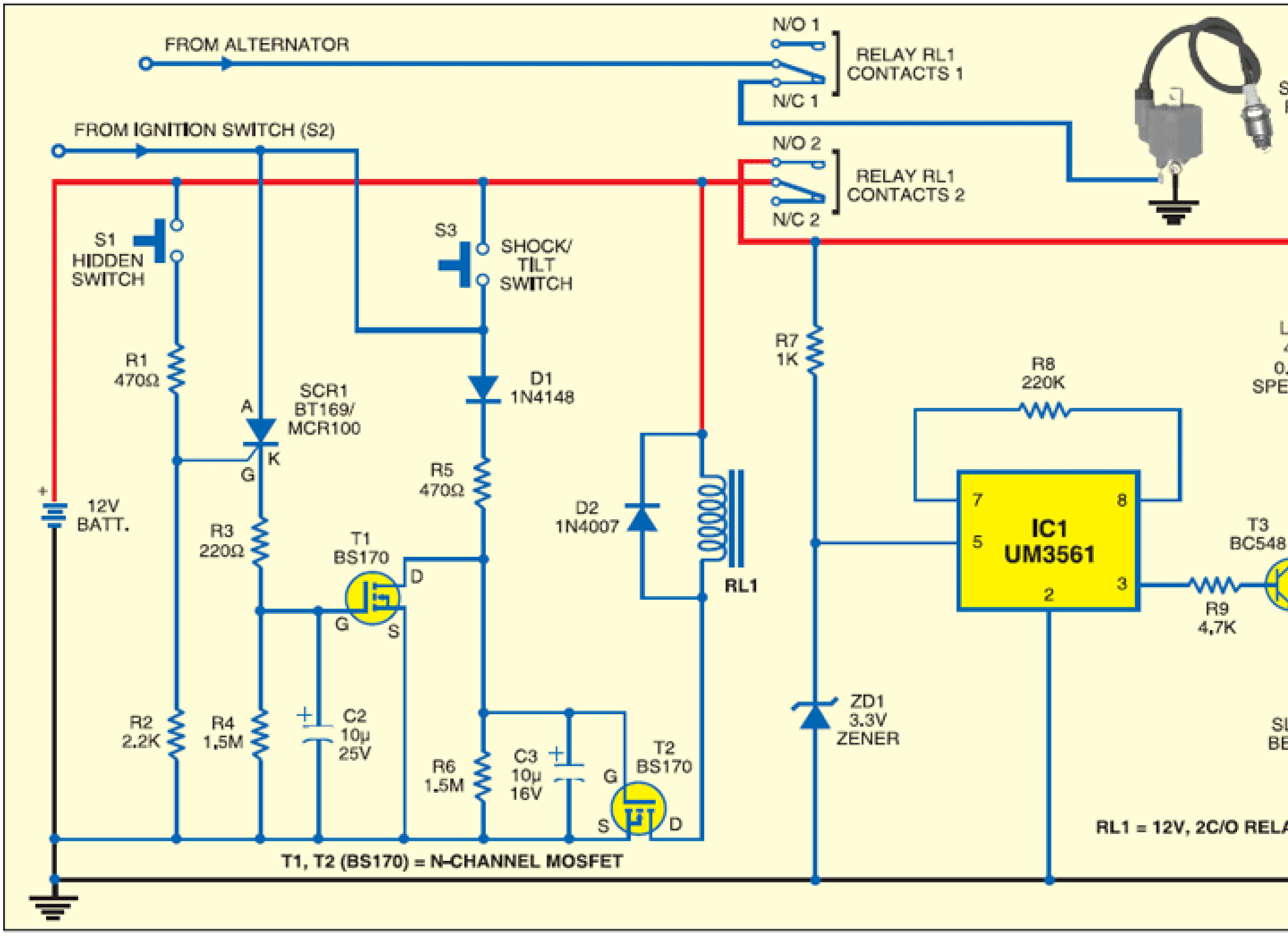


Fig. 1: Cheap motorbike alarm

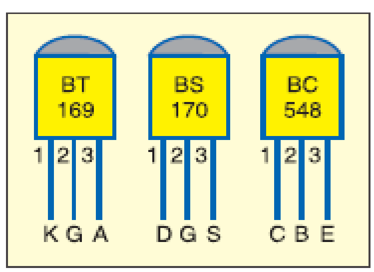


Fig. 2: Pin configurations of BT169, BS170 and BC548

Also, on disconnection of the coil, sound generator IC UM3561 (IC1) gets power supply through N/O2 contact of relay RL1. This drives the darlington pair built around T3 and T4 to produce the siren sound through loudspeaker LS1.

To start the vehicle, both hidden switch S1 and ignition key S2 should be switched on. Otherwise, the alarm will start sounding. Switching on S1 triggers SCR1, which, in turn, triggers MOSFET T1. MOSFET T1 is configured to disable MOSFET T2 from functioning. As a result, MOSFET T2 does not trigger and relay RL1 remains de-energised, alarm deactivated and ignition coil connected to the circuit.

Connection to the ignition coil helps in generation of spark from the spark plug. Keeping hidden switch S1 accessible only to the owner prevents the bike from pillaging.

Tilt switch S3 prevents attempt to move the vehicle without starting it. Glass-and metal-bodied versions of the switch offer bounce-free switching and quick break action even when tilted slowly. Unless otherwise stated, the angle by which the switch must be tilted to ensure the contact operation (operating angle), must be approximately 1.5 to 2 times the stated differential angle. The differential angle is the measure of the 'just closed' position to the 'just open' position.

The tilt switch has characteristics like contacts make and break with vibration, return to the open state at rest, non-position sensitivity, inert gas and hermetic sealing for protection of contacts and tin-plated steel housing. If you find difficulty in getting the tilt switch, you may replace it with a reed switch (N/O) and a piece of magnet. The magnet and the reed switch should be mounted such that the contacts of the switch close when the bike stand is lifted up from rest.

EFY note. Make sure that while driving, the two internal contacts of the Tilt switch don't touch each other.