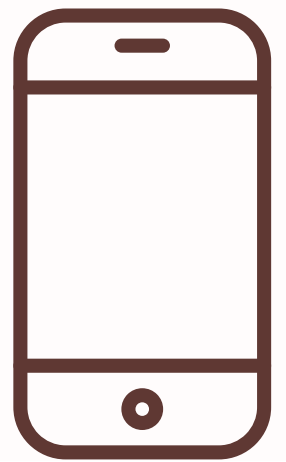
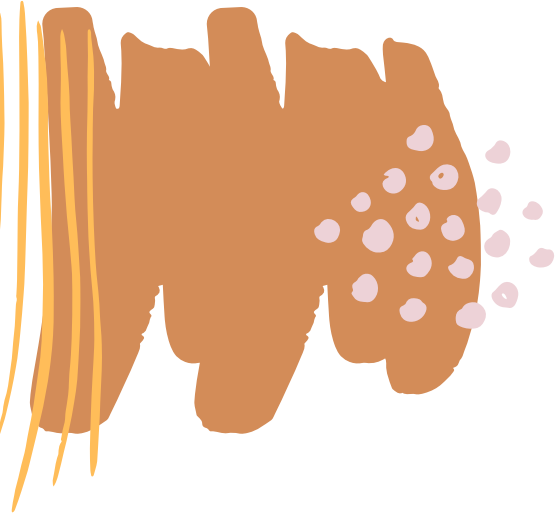




Cell Phone Detector Circuit



CONTENTS



1

INTRODUCTION

2

BASIC PRINCIPLE

3

COMPONENTS USED

4

PURPOSE OF

COMPONENTS

5

CIRCUIT DIAGRAM

6

WORKING

7

APPLICATION

8

SUMMARY

9

REFERENCES





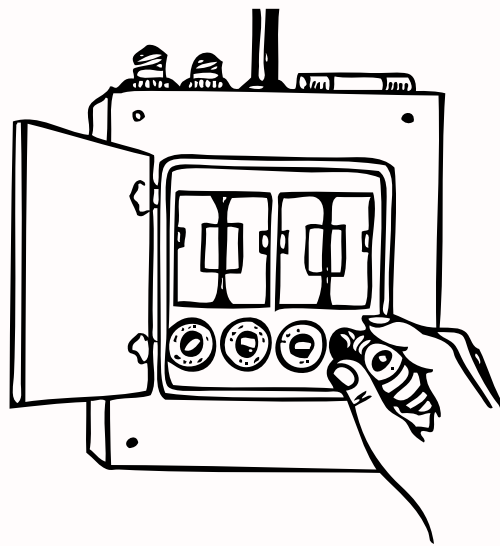
INTRODUCTION:

The most common electronic equipment used nowadays is a Mobile Phone. With advancements in communication technology, the requirement for cell phones has increased dramatically.

A cell phone typically transmits and receives signals in the frequency range of 0.9 to 3GHz.

We are thinking of designing a circuit that acts as a Cell Phone Detector Circuit, using a BiCMOS Op-Amp. The Op-amp part of the circuit acts as the RF Signal Detector, while the Transistor part of the circuit act as the indicator.

The capacitors collection and the antenna are used to detect RF Signals when a cell phone makes (or receives) a phone call or send (or receives) a text message.





BASIC PRINCIPLE OF MOBILE DETECTOR

The basic principle of cell phone or mobile detector is to detect the RF signal frequencies. These circuits are designed in such a way that it rectifies low signal frequencies with very low noise of rate. When an inductor is placed near a RF signal frequency source it receives the signal through the principle of mutual induction. And the low power signals are amplified and transmit the power to any indicator which shows the response as we have used LED in our experiment.

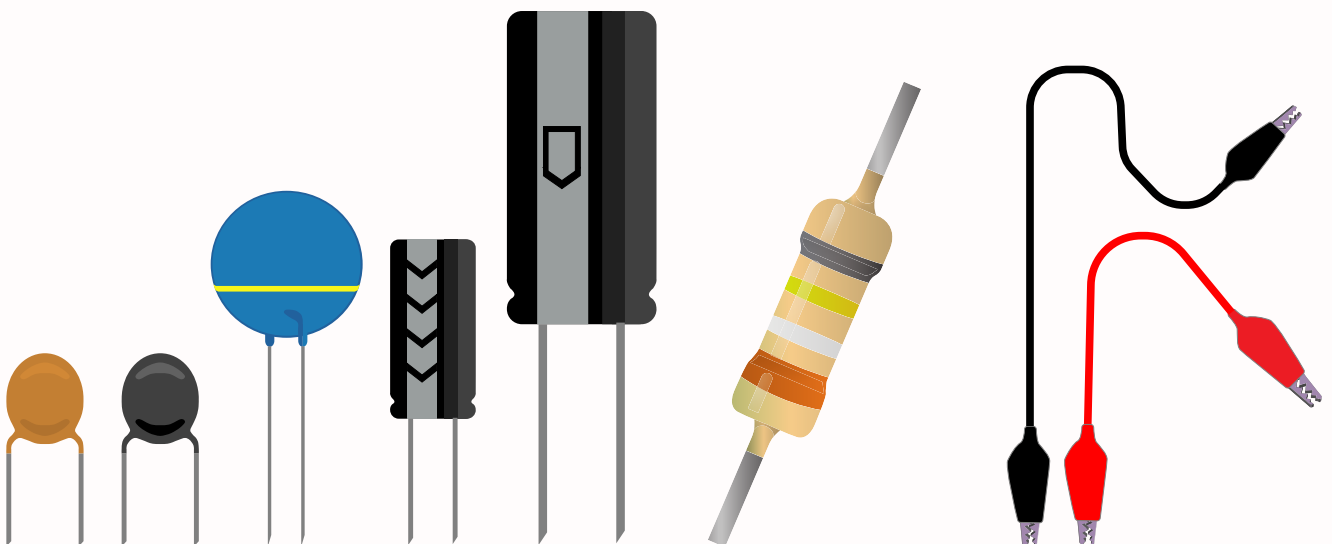
This can be really a fun project, using this small electronics circuit we can detect if someone is sending or receiving a message, or call is coming or someone is trying to call someone. As you can see in the picture above just a few electronic components are required for this project. Nothing expensive is used in this project. This project is ideal for school students and anyone can build this amazing small project in the lab.

After the basic working principle is understood, then the led can be replaced with a transistor to control a relay which can then control a buzzer. So, when anyone sends a message or receives a message the buzzer will turn ON.

THE COMPONENTS USED ARE:

CA3130 Op-Amp : Operational amplifiers are linear devices that have all the properties required for nearly ideal DC amplification and are therefore used extensively in signal conditioning, filtering or to perform mathematical operations such as add, subtract, integration and differentiation. An Operational Amplifier, or op-amp for short, is fundamentally a voltage amplifying device designed to be used with external feedback components such as resistors and capacitors between its output and input terminals.

Resistors : Resistance is a measure of the opposition to current flow in an electrical circuit. Resistance is measured in ohms, symbolized by the Greek letter omega (Ω). Ohms are named after Georg Simon Ohm (1784-1854), a German physicist who studied the relationship between voltage, current and resistance. He is credited for formulating Ohm's Law.

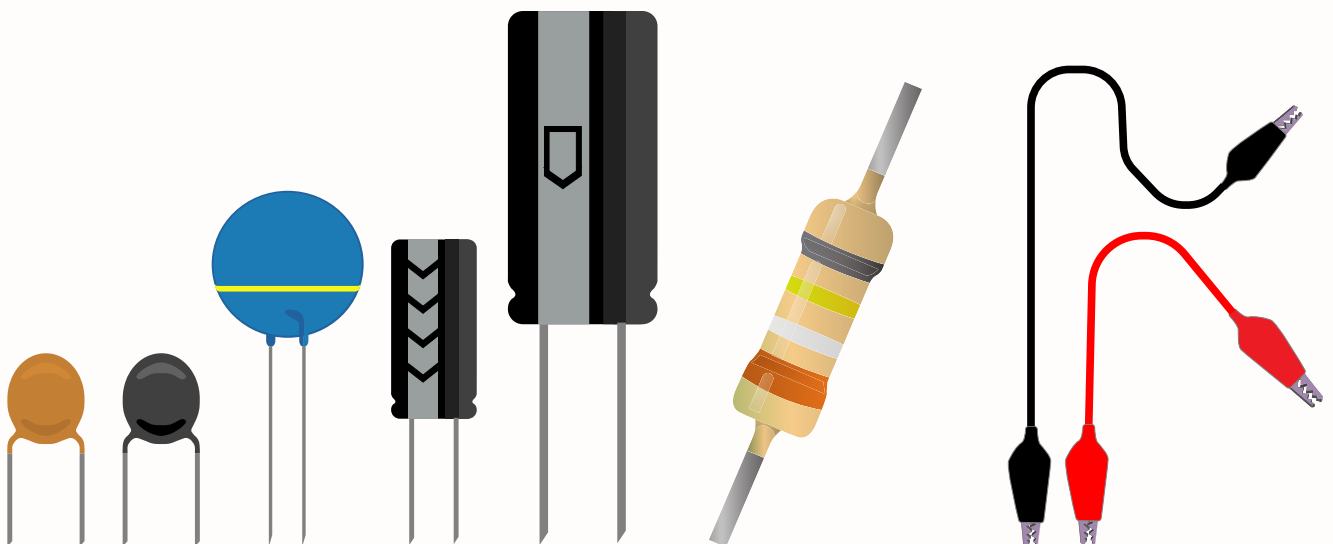




Capacitors : capacitor is a device that stores electrical energy in an electric field. It is a passive electronic component with two terminals.

The effect of a capacitor is known as capacitance. While some capacitance exists between any two electrical conductors in proximity in a circuit, a capacitor is a component designed to add capacitance to a circuit.

BC548 NPN Transistor : A transistor is a semiconductor device used to amplify or switch electronic signals and electrical power. Transistors are one of the basic building blocks of modern electronics.[1] It is composed of semiconductor material usually with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals controls the current through another pair of terminals. Because the controlled (output) power can be higher than the controlling (input) power, a transistor can amplify a signal. Today, some transistors are packaged individually, but many more are found embedded in integrated circuits.

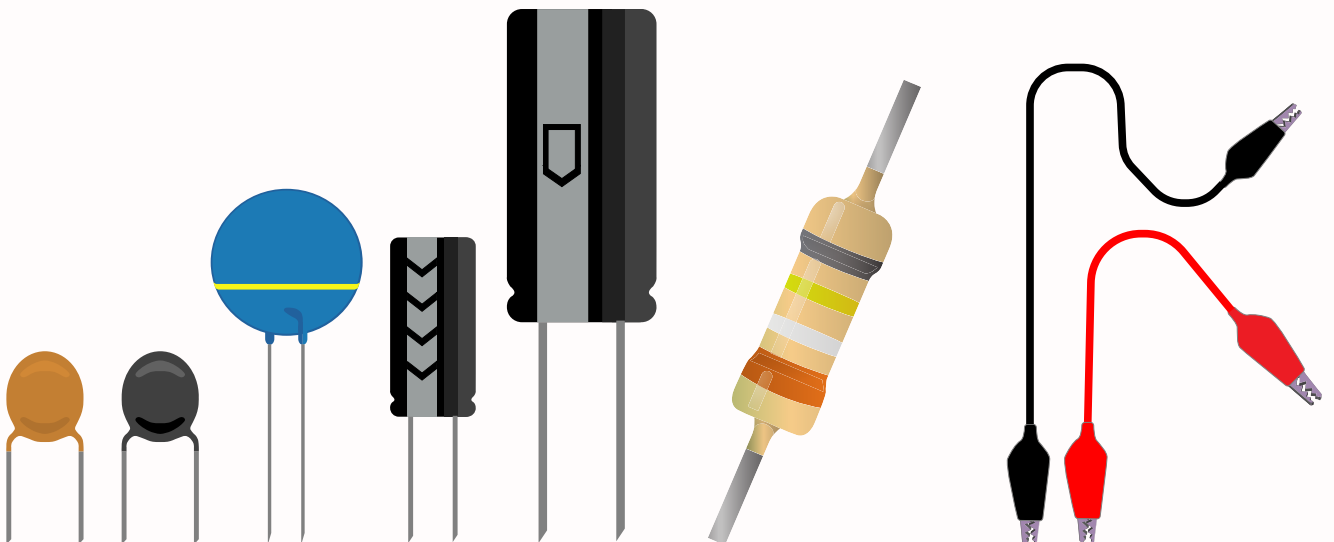




LED : A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons.

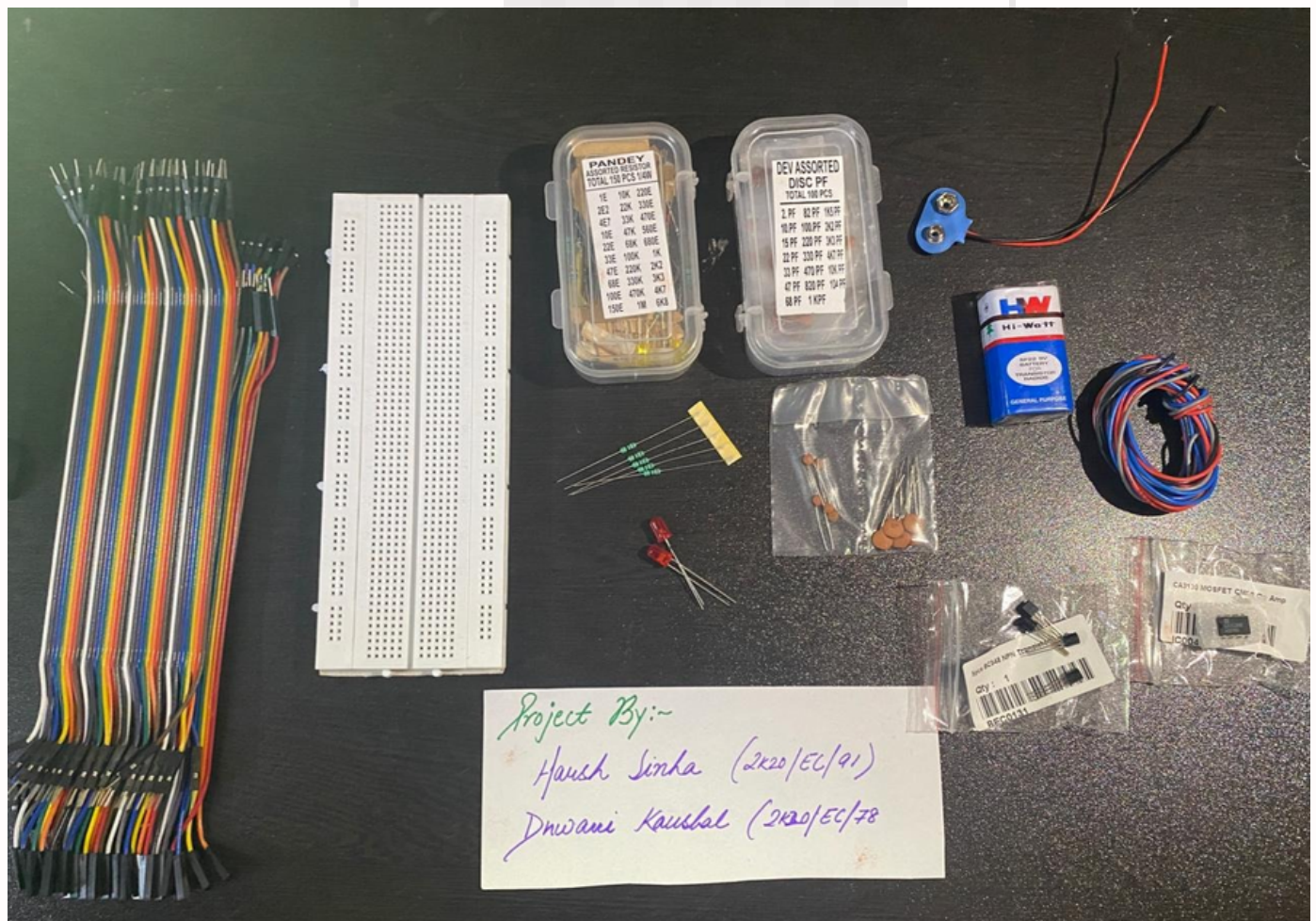
Antenna : In radio engineering, an antenna or aerial is the interface between radio waves propagating through space and electric currents moving in metal conductors, used with a transmitter or receiver.[1] In transmission, a radio transmitter supplies an electric current to the antenna's terminals, and the antenna radiates the energy from the current as electromagnetic waves (radio waves).

Connecting wires : Connecting wires allows an electrical current to travel from one point on a circuit to another because electricity needs a medium through which it can move. Most of the connecting wires are made up of copper or aluminum.



Breadboard : A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype (meaning to build and test an early version of) an electronic circuit, like this one with a battery, switch, resistor, and an LED (light-emitting diode).

Battery : A battery is a source of electric power consisting of one or more electrochemical cells with external connections[1] for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.[2] The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal.





THE PURPOSE OF COMPONENTS

- The CA3130 IC is an op-amplifier that combines the advantages of bipolar and CMOS.
- Each resistor is used to control the current throughout the circuit.
- Each capacitor is used to store energy and provide the circuit with energy when it is necessary.
- Transistors are used to switch electronic signals and electrical power.
- Light-emitting diode is used to provide light for the final output.
- Power Supply is used to provide the circuit with a proper amount of voltage.
- The digital multimeter is used to set the power supply to the required voltage amount.
- Wires are used to connect each component within the circuit together.
- Breadboard is needed to construct the circuit.
- Anode is the positive end of the capacitor and transistor.
- Cathode is the negative end of the capacitor and transistor.
- The base of the transistor is the second terminal of the transistor.
- Anode, as well as, the collector is the first terminal of the transistor.
- Cathode, as well as, the emitter is the third terminal of the transistor.

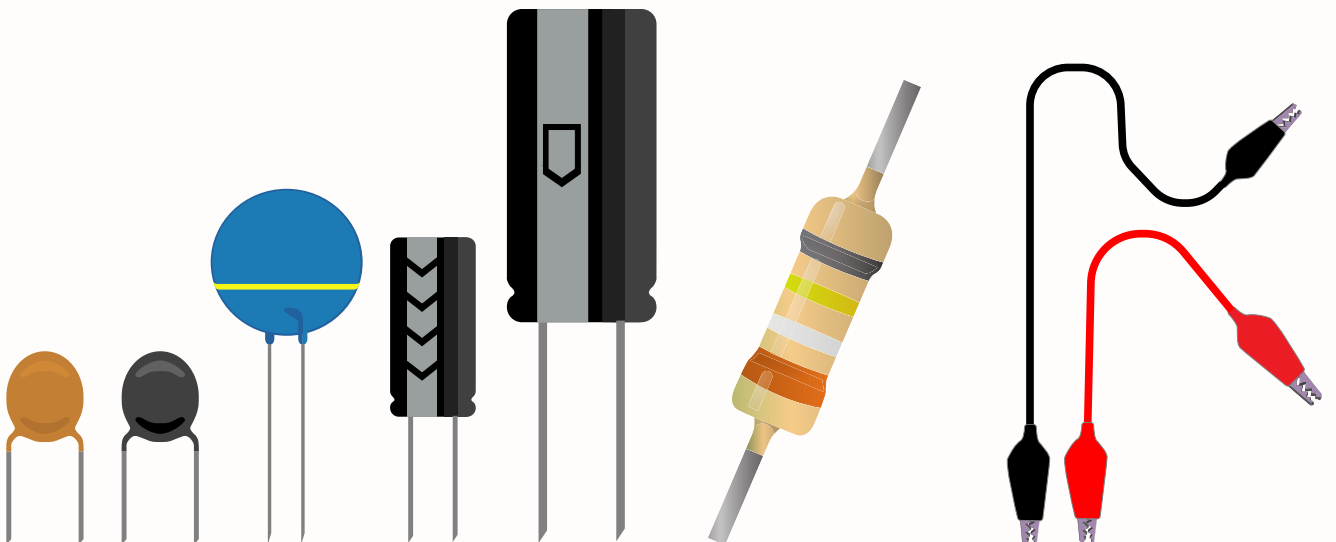
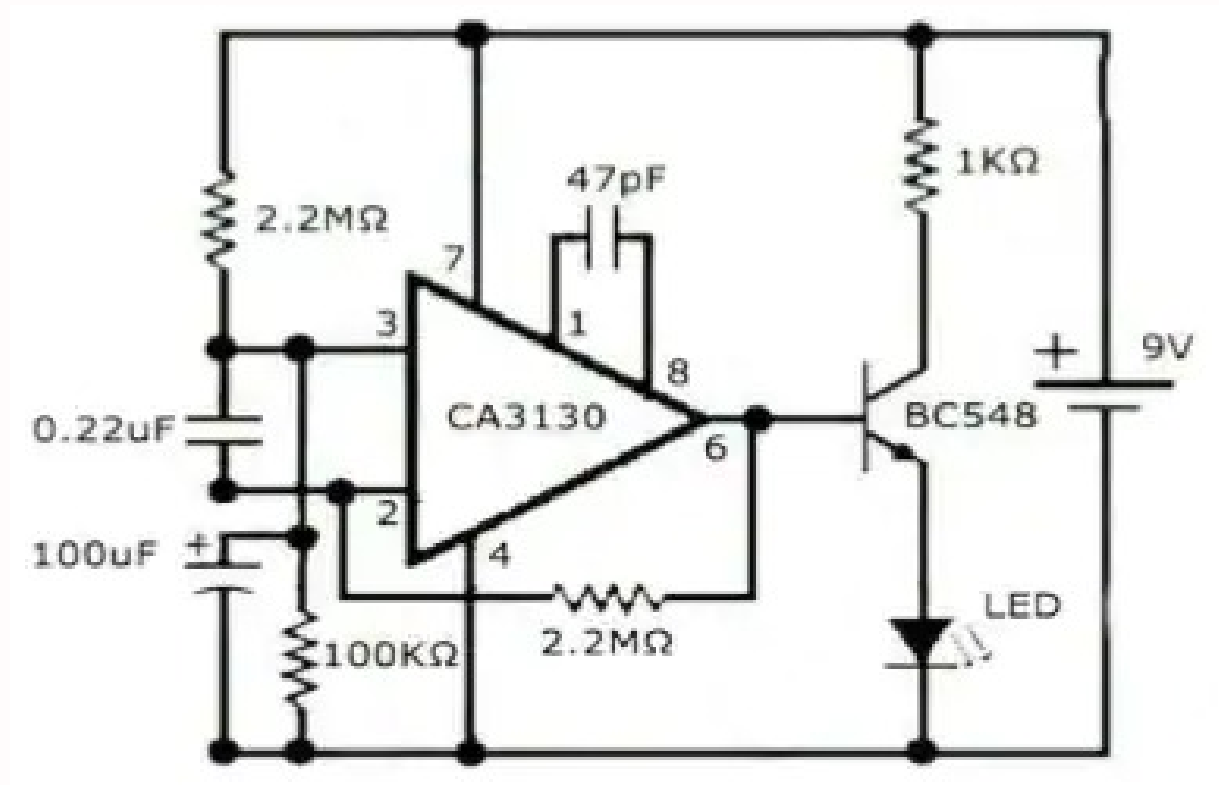


CIRCUIT DIAGRAM EXPLANATION

In this circuit we have used a CA3130 OP-Amp IC for detecting incoming or outgoing signal around it. Op-amp non-inverting end is connected to Vcc through 2.2M resistor and it is also connected to the ground through 100K resistor and 100uF Capacitor. Its inverting terminal is feedback from its output through a 2.2M resistor for amplify the signal. Two 100nF capacitors are connected between inverting and non-inverting terminal, working as loop antenna for the system. Two 100nF capacitors are connected in series between Pin 1 and 8 of op-amp to boost the gain of the current to voltage converter at its output pin.

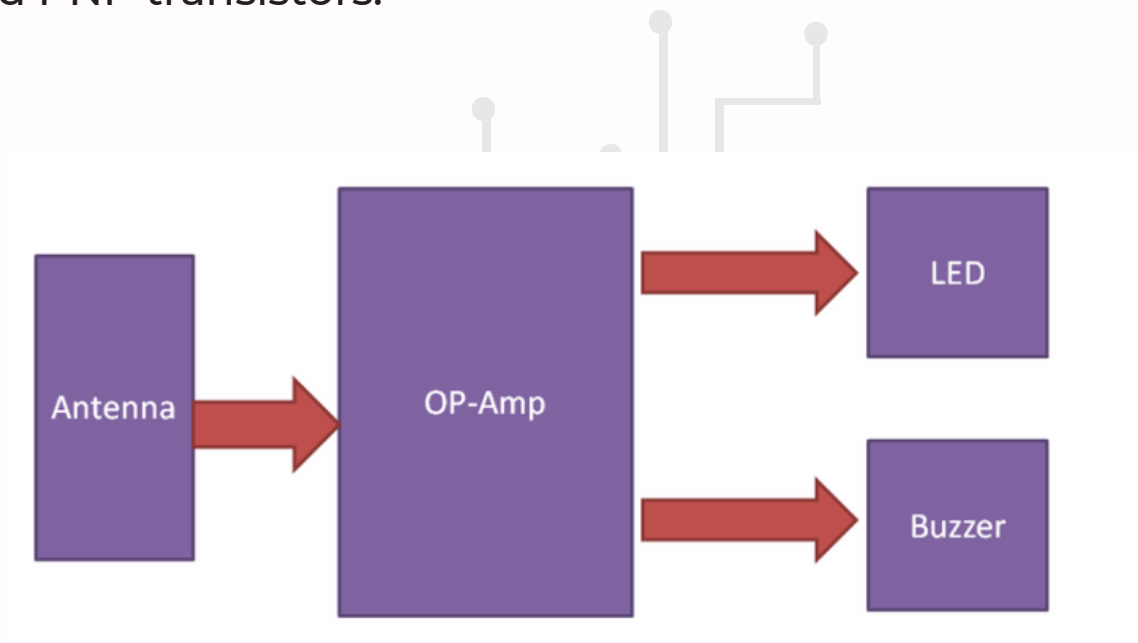
Output of this op-amp is connected at the base of NPN transistor namely BC547 through a 1k resistor and a LED is connected at its emitter for indication. A buzzer is also used for sound indication by using a PNP transistor namely BC557. And a 9 volt battery is used for powering the circuit.

CIRCUIT DIAGRAM



WORKING OF THE MOBILE DETECTOR

This circuit consists of an op-amp with some active and passive components. A LED and buzzer are used for indication of the presence of a cellphone. The op-amp is configured as a Frequency Detector or Current to Voltage Converter and its output is connected to a LED and buzzer using NPN and PNP transistors.

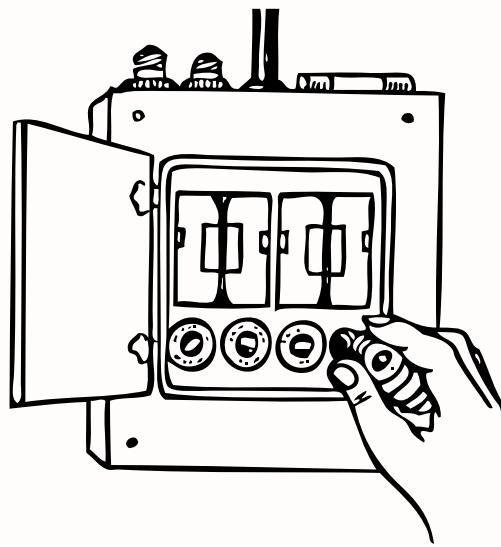


Working of Mobile Detector is simple. The 0.22nF capacitor is used for detecting RF signal from Mobile Phone. This capacitor is working as loop antenna for the system. When there is any call or SMS then capacitors in parallel detect the data transmission frequencies or RF signal and output of op-amp goes high or low (fluctuating) due to generated current at the input side of op-amp. Due to these fluctuations, LED turns on and off through NPN transistor according to the signal's frequency. Now PNP transistor is also triggered with the same frequency and led starts glowing until data transmission gets finished.



Applications of cell phone detector circuit :

- It can be used to detect cell phones in examination halls , classes and important seminars.
- It is useful in detecting phones with unauthorized purpose.
- It can be used to track mobile phones or to find stolen mobile phones .
- It can also be used to find out the location of a phone which is kept on silent mode .





INDUSTRY APPLICATIONS

Mobile phone detector is important to industry due to its ability to add safety to many businesses, offices, classrooms, etc. For prison for example, individuals smuggle phones into prisons on a day-to-day basis, due to inmates using the mobile device to orchestrate an escape plan, orchestrating ways to smuggle more contraband into the prison, and much more that is not good for the prison system. On top of that, individuals use mobile devices in classrooms to cheat on example and to send the answer around, so many schools implemented mobile devices to restrict cheating from occurring. Also, within classrooms mobile devices can be a huge distraction from a student receiving his or her education. Lastly, for offices it can restrict distraction so that employees can focus the importance of each meeting he/she attends. There are various places on Earth where mobile devices are restricted. A company's like Bastille created mobile phone detectors because even though they believe that "cellphones are a great business productivity tool," they also believe that "they are also the most ubiquitous security and compliance threat faced by financial services organizations." (1) On top of that, "Financial services firms want to track both the authorized and unauthorized phones that enter and move around their environments to alert on potential security threats and compliance issues in real time." (1) Also, a company named "CellBusters" has a device name "Zone Protector™" which detects cellular activity such as short text messages and phone registrations pulses which are common for correctional facilities. (2) CellBusters also created Zone Manager™ which keeps logs, as well as, display alerts activity on a map of a facility which helps make finding devices in a correctional facility easier to find. (2)



SUMMARY

A mobile phone detector can detect the activation of a mobile phone such as; incoming and ongoing phone calls, messages, and things in that nature.

Mobile

phone detectors can be used for spying on someone and for unauthorized video transmission. Whenever when the phone is on silent mode, a mobile phone detector can detect various things from a mobile device. Overall, mobile phone detectors can prevent the use of mobile phones in prisons, movie theaters, classrooms, and in any facility that individuals do not allow cellphone usage.



REFERENCES

- <https://www.wikipedia.org/>
- <https://www.electronicclinic.com/wp-content/uploads/2020/01/ca3130-a.pdf>
- <https://circuitdigest.com/electronic-circuits/cell-phone-detector-circuit>
- <https://www.elprocus.com/ca3130-cmos-op-amp/>