



## **Project Report**

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## **FIRE ALARM CIRCUIT**

### **Introduction:**

Engineering is the creative application of science, mathematical methods, and empirical evidence to the innovation, design, construction, and maintenance of structures, machines, materials, devices, systems, processes, and organizations. The creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behavior under specific operating conditions; all as respects an intended function, economics of operation and safety to life and property.

### **Project Overview:**

A fire alarm is a unit made of several devices, which uses visual and audio signalization to warn people about a possible fire, smoke, or carbon monoxide occurrence in the area of coverage. Automatic fire alarm systems are activated through fire detectors, such as smoke or heat sensors. Fire alarm sounders can be set to certain frequencies and different tones including low, medium and high, depending on the country and manufacturer of the device

### **Component of the circuit:**

1. IR Sensor
2. LED
3. TR c945
4. Buzzer
5. Vero board
6. Connecting wire
7. Battery
8. Safety gloves
9. Soldering wire
10. Soldering station
11. Solder pull
12. Toolkit

### **IR Sensor:**

An infrared optical detector is a device that locates flame by deploying a high-tech infrared sensor to accurately identify their unique spectral pattern emitted by live fire. These detectors use optical sensors, working in a special range and record radiation at a selected wavelength. The signals recorded by each sensor are carefully analyzed using some special techniques

### Use:

IR detectors are suitable for areas where combustion sources can produce intense and smoky fires. IR detectors can be used in both indoor and outdoor environments. IR detectors are immune to radiation produced by sunlight, welding, and other hot objects that might be present in the environment where it is installed in.



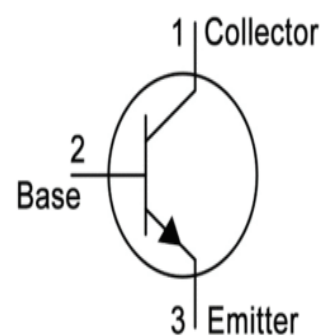
### LED:

The purpose of led in fire alarm is that when there is a fire on some places and fire alarm is installed in that place then the led blink and indicate there is a fire. When voltages pass through it it glow.



### TR c945:

**C945** is a Negative Positive Negative (NPN) bipolar junction transistor. It has three regions emitter, base and collector. Its base is doped with P type semiconductor material. Emitter and collector are doped with N type semiconducting material. Its a low cost device and is very popular in the market due to its large range of applications. Its applications include fast switching, amplification, low power electronic circuits and many more.



### Use of transistor c945:

This transistor has a good DC current gain and low noise due to this it is suitable to use in audio amplifier circuits stages or for the amplification of other electronic circuits. Saturation voltage of mostly BJT transistors is 0.6V DC but the C945 has only a transistor which has

0.3V saturation voltage due to this feature it can perform well in low voltage circuits or in any circuit where low base voltage is available.

### **TR c945 datasheet:**

The C945 is an age old Japanese Bipolar audio frequency NPN transistor. It has a decent gain value (hfe) of maximum 700 and is highly linear. ... It is also used as oscillators with is complementary A733 PNP transistor. When used as a switch it can easily be controlled by a MCU/MPU since it has a base voltage of only 5V

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS (  $T_a=25^{\circ}\text{C}$  )

PARAMETERS	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
Collector-Emitter Breakdown Voltage	$BV_{ce0}$	50			V	$I_c=1\text{mA}$
Collector-Base Breakdown Voltage	$BV_{cb0}$	60			V	$I_c=5\mu\text{A}$
Emitter-Base Breakdown Voltage	$BV_{eb0}$	5			V	$I_e=50\mu\text{A}$
Collector-Base Leakage	$I_{cbo}$			0.1	$\mu\text{A}$	$V_{cb}=60\text{V}$
Emitter-Base Leakage	$I_{ebo}$			0.1	$\mu\text{A}$	$V_{eb}=5\text{V}$
Collector-Emitter Saturation Voltage	$V_{ce(sat)}$		0.18	0.3	V	$I_c=100\text{mA}, I_b=10\text{mA}$
DC Current Gain	$h_{fe}$	90	200	600		$V_{ce}=6.0\text{V}, I_c=1.0\text{mA}$
Collector Current	$I_c$		100		mA	
Current Gain Bandwidth	$f_T$	100	180		MHz	$V_{ce}=6\text{V}, I_c=10\text{mA}$
Output Capacitance	$C_{ob}$	4.5	6.0		pF	$V_{cb}=10\text{V}, I_c=0, f=1\text{MHz}$
Power Dissipation	$P_c$			0.25	W	
Junction Temperature	$T_j$			125	$^{\circ}\text{C}$	
Storage Temperature	$T_{stg}$	-55		125	$^{\circ}\text{C}$	

Classification of  $h_{fe}$

Rank	R	Q	P	K
Range	90-180	135-270	200-400	300-600

### **BUZZER:**

A buzzer is a device that produced sound signal. The purpose of buzzer in fire alarm is it produced sound when there is a fire or smoke near by. It is widely used in many electronic device such as fire alarm, computer, laptop and many other devices where we require sound.

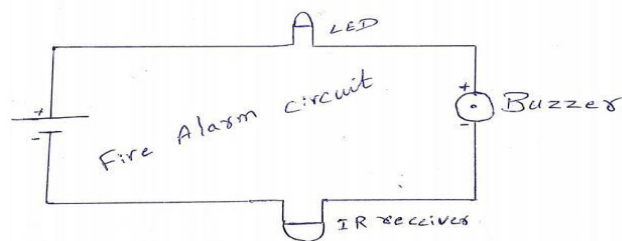


### **Working of fire alarm:**

Fire alarm works on simple principle. An IR sensor is an electronic device that is used to detect infrared radiation falling on it.

The heart of the fire alarm circuit is an infrared receiver and infrared transmitter. In default operating conditions when infrared light is shining from the infrared transmitter it will have low impedance. So the voltage at the base will be very low and the transistor will remain in off position. In case when a fire is

detected by the infrared beam will not be able to pass to a receiver. The resistance of the receiver rises and the voltage at the base will become positive and the transistor turns on. Buzzer and LED are connected with the transistor will also be on.



### **Advantages:**

1. We can place fire alarm on that places where is the risk of fire such that kitchen etc.
2. It prevent us from major losses
3. Once installed it is easy to used and not very expensive.

4. It require little maintance after long time.
5. Fire alarms provide constant protection, whether you're at home, asleep for the night, or anywhere.
6. The earlier a fire is detected, the faster it will be that firefighters will respond

### **Application:**

Fire alarm are used in many places

1. Bank
2. Home
3. Security department
4. Hospital
5. Industries

### **Fire alarm used in bank:**

Most of the bank have installed fire alarm to prevent from major losses. The fire alarm system detects smoke or heat and sounds a loud alarm to alert the occupants. Along with this, the control panel of the alarm system relays an emergency message to the central monitoring system which will in turn, alert the emergency services such as fire brigade and bank into action.



### **Fire alarm used in hospital:**

It helps determine where in the building, a potential fire emergency is taking place. It also aids the fire department in locating the origin of the fire. When it comes to the zoning of fire alarm systems in hospitals and patient-care facilities, the best approach is to integrate the fire alarm zones with the smoke compartments.



### **Fire alarm used in industries:**

A fire alarm system has a number of devices working together to detect and warn people through visual and audio appliances when smoke, fire. In workplace people installed fire

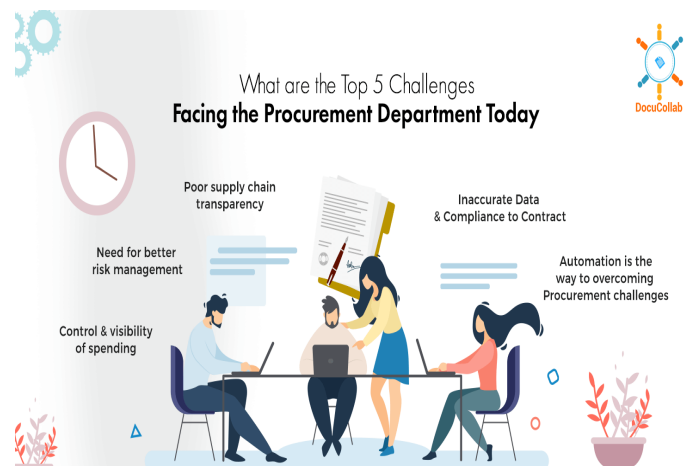
alarm to protect worker from fire and minimize the losses.  
With the help of fire alarm we can stop the fire on spreading on large scale .



## **MY CONTRIBUTION IN THIS PROJECT:**

### **1. Procurement:**

Our project is fire alarm circuit. To make it, we require some components. therefore we (zaki, owais, arham) went to Islamabad Rashid market. we picked a car and headed toward market. unfortunately we could not find anything. Then we moved toward sadder from Islamabad for components. But again, we find nothing there. On someone suggestion, we went to college road and found components from a local shop there. But the quality of components was not good and some of them were faulty too so we requested shopkeeper to change them. He brought good quality components from his other shop and at last we succeeded in getting what we were searching for two days.



### **2. Project execution:**

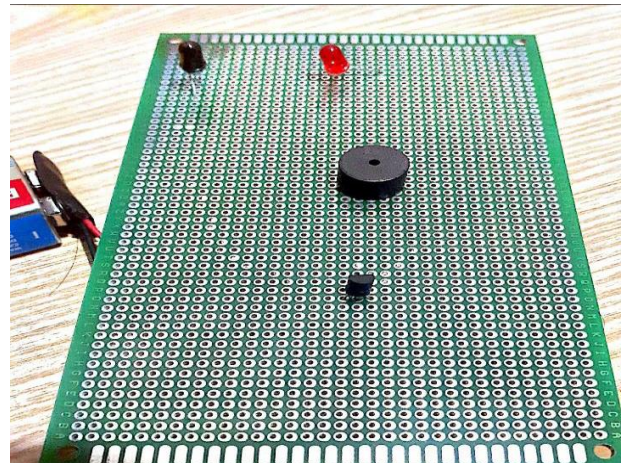


We came back home with all components .we thought of making a rough circuit first .we took buzzer and attached its positive terminal with IR and LED positive terminal and attached buzzer negative terminal with transistor variable terminal .we attached transistor fixed end with IR fixed terminal .other fixed end of transistor was attached to battery .battery other end was attached to transistor.After its success ,we made circuit on veroboard with same pattern as described above.



### 3. Testing:

To test the circuit,we attached battery positive terminal with buzzer negative terminal and battery negative terminal with TR c945 fixed end.then we ignited matchstick and brought that near to IR.then we saw LED blinked and heard sound of buzzer.Finally our project was a success.



### 4. Troubleshooting:

We faced many problems while making firearm circuit. At first we could not understand how to start making circuit. Then we watched video on YouTube to get an idea of fire alarm circuit. After getting basic concept, we tried again and made a circuit according to that video. We could not understand how to attach components so unfortunately, circuit did not work then we switched to another video on YouTube that was worth watching as it explained every point clearly. Then we made another circuit following basic points .and finally succeeded in making it.

### REFERENCES:

<https://youtu.be/0RwQbS9Yyig>

<https://www.electronicshub.org/simple-fire-alarm-circuit/>

<https://www.circuitstoday.com/fire-alarm-circuit>

<https://www.youtube.com/watch?v=cgsB6VmNGXo>