

**A
Project Report
on**

“Automobile Brake Failure Indicator”

Submitted By

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ABSTRACT

This paper has been designed to build a Automobile Brake Failure Indicator using TIMER_555 to indicate brake failure in a vehicle. Brake Failure in a vehicle is very dangerous as accidents may occur due to brake failure. If there is a problem in connection of ignition switch, the system will indicate us by turning ON the buzzer and Red LED. Automobile Brake Failure Indicator alarms us about the brake failure in a vehicle, while greatly reducing the probability of accidents,

ACKNOWLEDGEMENT

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Lastly, we would like to thank our friends and family members for their help, support and motivation for making this project.

CHAPTER 1

1. Introduction

According to National Crime Records Bureau 2021, more than 155,622 fatalities happened in the year 2021. This is a very big and alarming number. Reports suggested that around 30% of these fatalities were solely due to over speeding and negligence of the driver. Hence it's very important to reduce this number, and hence taking this theme, we have designed a project, titled "Automobile Brake Failure Indicator", which typically focusses on how to reduce the count of these accidents. Also, make the driver aware about the brake failure prior only, with the help of an alarming buzzer.

1.1. Background

Everyone tries to avoid accidents while travelling but sometimes it is unavoidable. Accidents are happening at each nook of the streets around the world. Lakhs of life results in death as an aspect of these accidents. As the population is increasing, the number of vehicles are increasing in the same proportion which results in increase in number of accidents as well.

1.2. Motivation

Many accidents occur due to brake failure issue, which is a very serious problem and which in turn leads to death of hundreds of innocent people across the globe. The main purpose of this project is to provide such a device to vehicle operator so that any harmful damage and accidents caused by failure of brake switch can be easily prevented by proper indication of working condition of brake switch.

1.3. Problem Description

Nowadays, as we know, the hydraulic brake system is implemented in the vehicle, so a brake switch is mounted on a brake cylinder and that will glow the rear brake lamps. This brake switch works on when pressure is maintained and if the pressure drops due to leakage, the brake switch is not operated and do not perform any functions.

This project is used for avoiding accidents. If the brake system is intact, then Green LED blinks and when the brake fails, due to some internal problems in the connections, then the RED LED blinks and the Buzzer also starts the beep, indicating brake failure.

1.4. Objectives

The objectives of the project are:

- To make the vehicle driving more safe with the help of Automobile Brake Failure Indicator.
- To alert the driver about Brake Failure.
- To adjust the buzzer sound frequency based on the type of the vehicle in which this system is being fitted upon.

1.5. Methodology

a) Basic Information related to the circuitry:

- In this project, we have used Timer 555, Resistors, Buzzer, Switch, Capacitors, LEDs.
- Timer 555 is used for providing a delay to the Buzzer and based on the type of vehicle being used, the buzzer will be producing a beeping sound based on that.
- Brake Switch (SPST) and Ignition Switch (SPDT) are used and are connected to +9V Power Supply.

b) If there is a Brake Failure:

- If there is fault in the internal circuitry, and when the Brake Switch is applied, then we see that Alarming LED glows and the Buzzer beeps and will alert the driver regarding the same. The Frequency with which the buzzer beeps depending on the type of vehicle used.

c) If there is no Brake Failure:

- If there is no fault in the internal circuitry, and when the Brake Switch is applied, then we see that Signaling LED glows, indicating that there is no fault and the internal brake circuitry is working perfectly fine.

1.6. Limitations

The system has restricted to the following limitation.

- The circuit will only in vehicle with negative grounding.
- The brake switch is fluid operated and doesn't function if the fluid pressure drops to leakage.
- It is very unusual for vehicle to suffer total failure of braking system.

CHAPTER 2

2. Technology and Literature Survey

There are several limits that must be kept in mind while driving a vehicle. The Automobile Brake Failure Indicator System contains many electrical as well as electronic equipment such as an LED, sensors, piezo buzzers, ICs, transistors, etc. The Brake Failure Indicators are used to avoid a major damage. This system is user friendly and easy to use.

2.1. Basic Operation

The basic operations of the Automobile Brake Failure Indicator are as follows:

- If the brake is not applied, then there is no indication in the circuit.
- If the brake is applied and the ignition switch is connected, then Signalling LED will glow.
- If the brake is applied and the ignition switch is connected, then Alarming LED will glow and the buzzer will beep.

2.2. Block Diagram

The above Block Diagram typically indicates the schematic representation of the Automobile Brake Failure Structure. Here in, we have two switches, Brake Switch and Ignition Switch.

- Brake Switch (SPST): Indicates whether the brakes are applied by the Driver or not.
- Ignition Switch (SPDT): Indicates whether the brake related circuitry is working properly or not.

Also, we have 2 LEDs:

- Alarming LED (Red): Blinks when there is a Brake Failure.
- Signaling LED (Green): Blinks when the Brakes are working properly.

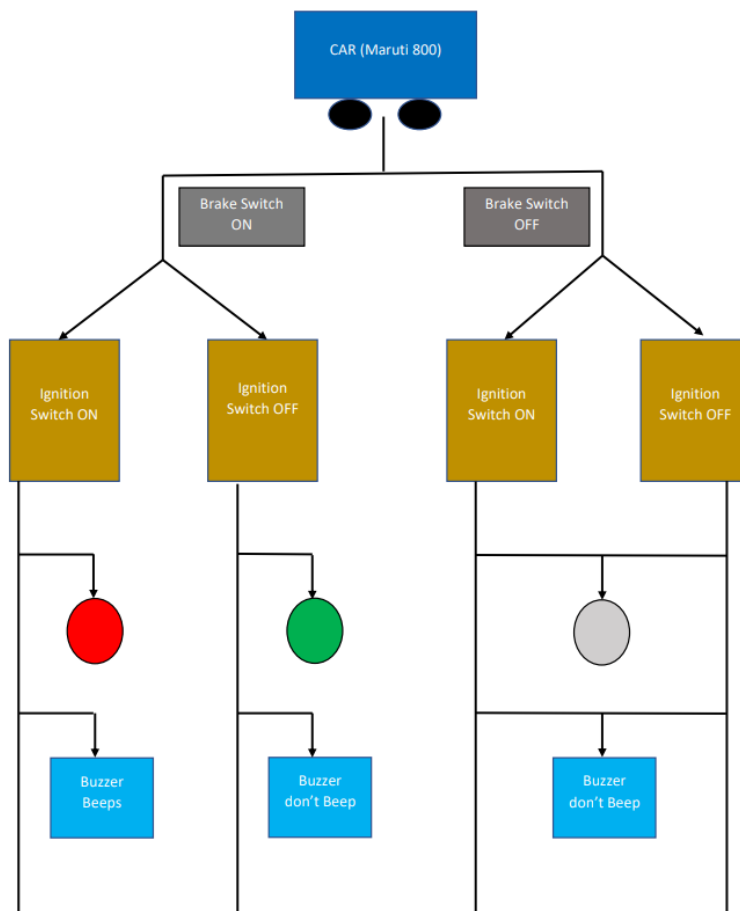


Figure 2.1: Block Diagram of Automobile Brake Failure Indicator

2.3. Hardware Required

2.3.1. NE555 Timer

The 555 Timer IC is a very cheap, popular and useful precision timing device which can act as either a simple timer to generate single pulses or long time delays, or as a relaxation oscillator producing a string of stabilized waveforms of varying duty cycles from 50 to 100%..

The 555 Timer operates in Astable Mode to produce clock pulse and the BC557 PNP transistor monitors the Brake wire and decides which LED should glow. The 555 Timers in Astable Mode is used for Blinking LEDs or to do some periodic Turn ON and turn OFF actions.

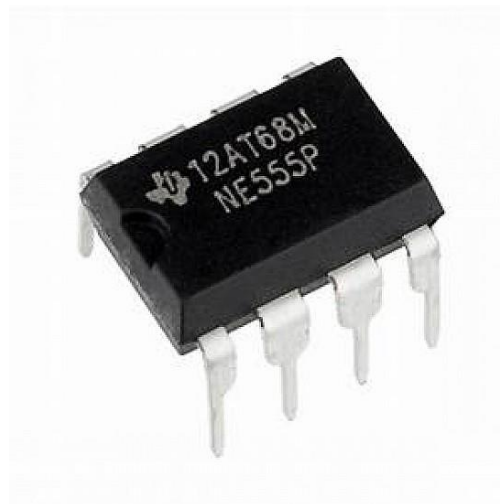


Figure 2.2: Timer NE555

2.3.2. SPST (Button Switch)

A Button Switch is a type of switch which consists of a simple electric mechanism or air switch mechanism to turn something ON or OFF. Depending on model, they could operate with momentary or latching action functions. The button itself is usually constructed of a strong durable material such as a metal or plastic. A Button switch is used mainly to display data on screens, turn ON a LED, run a script, reset your board and for many other electronic applications.



Figure 2.3: SPST (Button Switch)

2.3.3. SPDT

A Switch that has a single input and two dissimilar output is known as SPDT. The term SPDT stands for Single Pole Double Throw, which is used to control two dissimilar circuits through a similar single input. The operating of this switch can be done manually or included through the electromagnetic coil.



Figure 2.4: SPDT

2.3.4. LED

A Light Emitting Diode (LED) is a semiconductor device that emits a light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons. The LED have many advantages over incandescent light sources, including power consumption, longer life time, improved physical robustness, smaller size, and faster switching capabilities.



Figure 2.4: LED

2.3.5. Buzzer

A Buzzer or a Beeper is an audio signaling device which may be mechanical, electromechanical or piezoelectric (piezo for short). Typical uses of buzzer and beepers include alarm devices, timers, train and confirmation of user input such as a mouse click or keystroke. While technological advancements have caused buzzers to be impractical and undesirable, there are still instances in which buzzers and a similar circuit may be used. Present day applications include Novelty uses, judging panels, Annunciator Panel, Educational Purpose, Electronic Metronomes and many more.



Figure 2.5: Buzzer

2.4. Software Required

For the simulation of the circuit, Proteus software is used.

2.5. Flow Chart

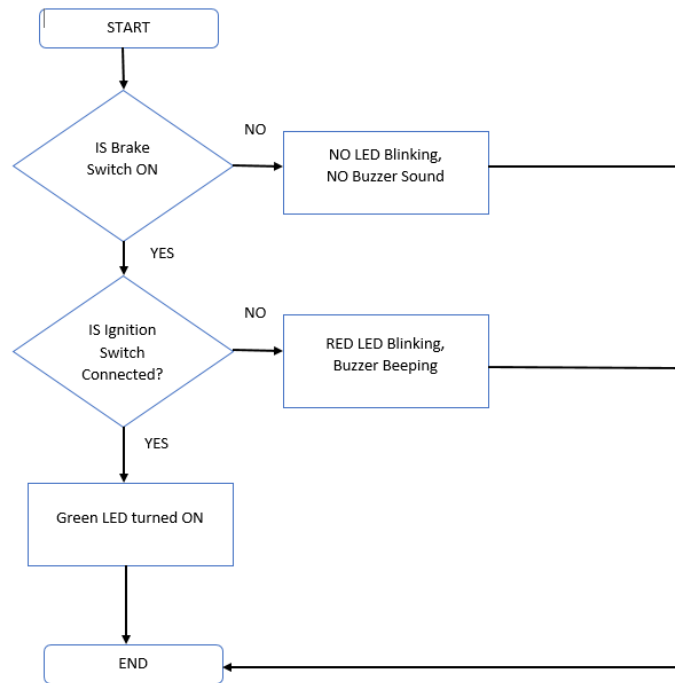


Figure 2.7: Flow Chart of Project

CHAPTER 3

3. Design and Implementation

3.1. Schematic

The schematic of the “Automobile Brake Failure Indicator” is shown in the figure. The main component is the NE555. Schematics is drawn by using Proteus.

The Components used while designing the hardware is as follows;

- NE555
- SPST Switch
- SPDT Switch
- LED (Red, Green)
- Buzzer
- Resistors
- Capacitors

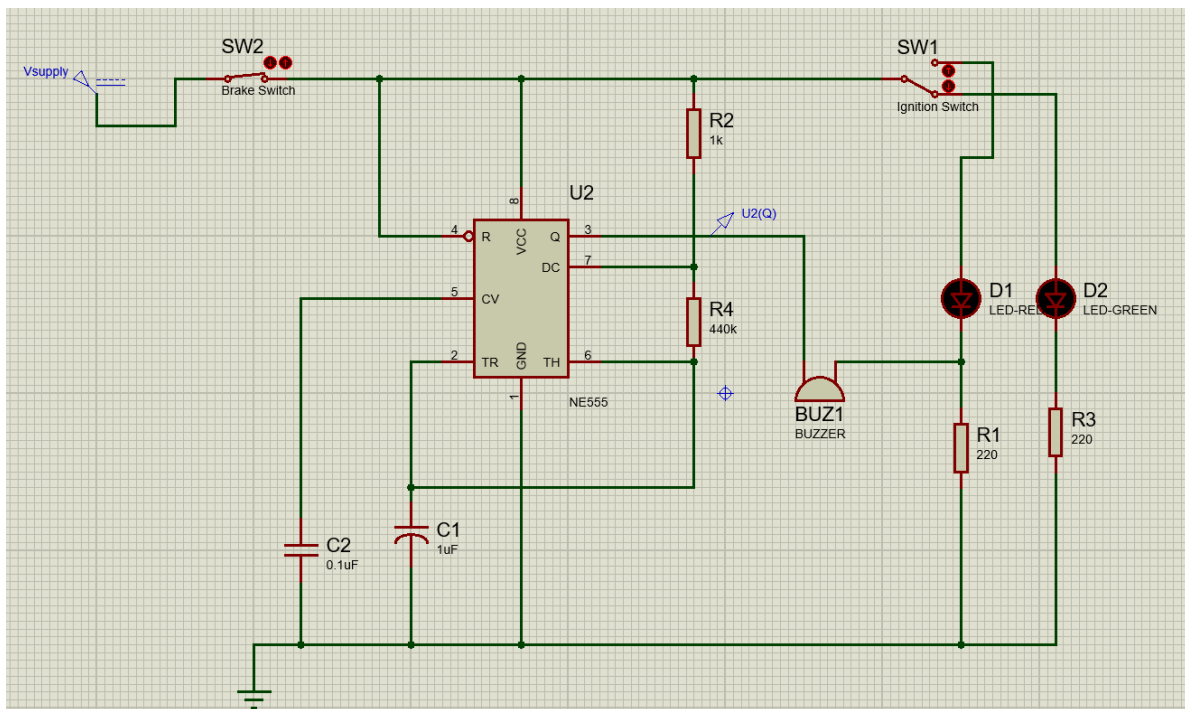


Figure 3.1: Circuit Diagram

3.2. Circuit Explanation

The whole Automobile Brake Failure Indicator contains following sections. Here in, we have two switches: Brake Switch and the Ignition Switch. Brake Switch is used to indicate whether the brakes are being applied by the driver or not. Ignition Switch is used to check whether the internal circuitry associated with brake circuitry is working properly or not. Also, we have two LEDs, Alarming LED and the Signaling LED.

The Timer NE555 is being used to change the frequency of the beeping buzzer. It is done with the help of resistors connected across the timer. This phenomenon can be used by drivers with different vehicles. Means a heavily loaded vehicle driver will be able to hear more sound of the buzzer and the light vehicle driver will be able to hear comparatively less beeping sound, if brake failure occurs.

3.3. Working of Automobile Brake Failure Indicator:

If there is a Brake Failure:

If there is fault in the internal circuitry, and when the brake switch is applied, then we see that the Alarming LED glows and the Buzzer beeps and will alert the driver regarding the same. The frequency with which the buzzer beeps depends on the type of vehicle used.

If there is no Brake Failure:

If there is no fault in the internal circuitry, and when the Brake Switch is applied, then we see that Signaling LED glows, indicating that there is no fault and the internal brake circuitry is working perfectly.

CASE 1: When both the Brake Switch and Ignition Switch are not disconnected.

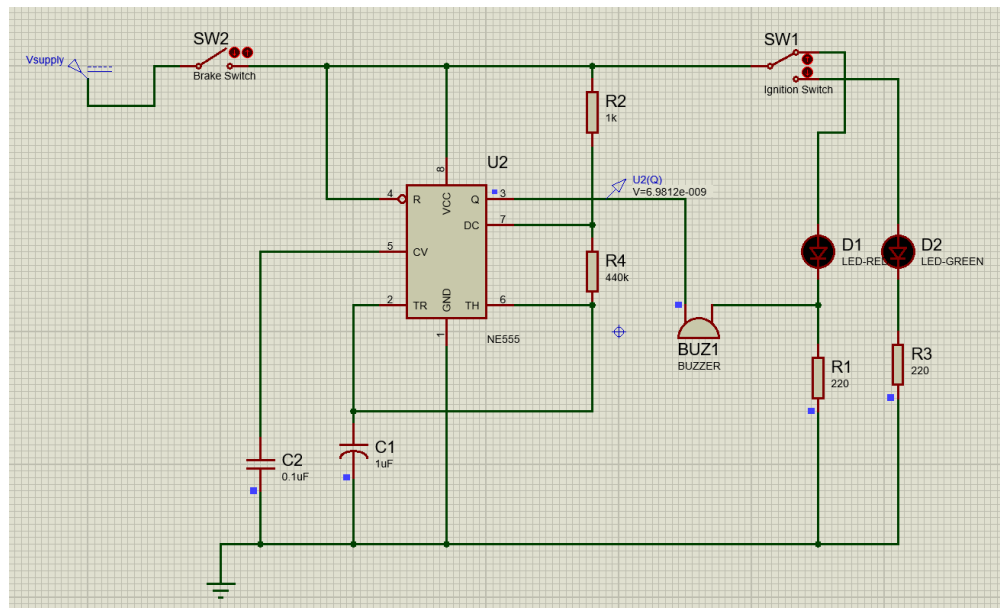
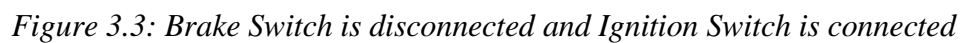
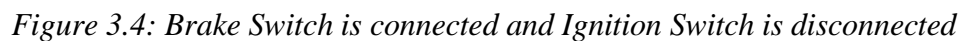
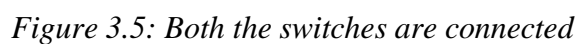


Figure 3.2: Both Switches Disconnected



CASE 3: When the Brake Switch is connected and Ignition Switch is disconnected.





The Tabular Representation of the above is as follows:

Table 1: Logic Table for Automobile Brake Failure Indicator

CHAPTER 4

4.1. Applications

- Automated Cars.
- Used in mechanical cranes and machines.
- Can be used in high sensitivity pressure sensor.
- It can also be used in trains and boats.

4.2. Advantages

- Economical.
- Circuit is very simple.
- Very less power consumption.
- No necessity of an external battery.
- Constantly monitors the condition of brake.
- Gives auto visual indication.

4.3. Disadvantages

- This system cannot be used for positive grounded vehicle.
- As battery is used for both car and brake failure indication circuit, battery charge may reduce.
- By chance circuit gets damaged, then there is no indication of brake failure.

4.4. Conclusion

The main purpose of this project is to provide such a device to vehicle operator so that any harmful damage and accidents caused by failure of the brake switch can be easily prevented by proper indication of working condition of brake switch, which in turn is very lethal in significantly reducing the count of accidents happening in our country.

COST ESTIMATION

Sr. No.	Name of Component	Quantity	Price Rs.
1)	NE555	1	35 x 1
2)	Resistors (440K and 1K)	8	5 x 4
3)	Capacitors (1uF and 0.1uF)	4	18 x 2 5 x 2
4)	SPST Switch	1	10 x 1
5)	SPDT Switch	1	30 x 1
6)	Buzzer	1	24 x 1
7)	LEDs	4	4 x 4
Total Rs.			Rs. 181/-

Table 2: Cost of Project

References

Articles and Magazines:

1. *"Traffic Accidents: Causes and Outcomes?"*, by Grahman P. Bartley
2. *Electric Vehicle Engineering*", by Nick Enge, Per Enge & Stephen Zoef
3. *"Electronics for You – Projects and Ideas 2000"*, EFY Magazine

Useful Links:

1. <https://bestengineeringprojects.com/automobile-brake-failure-indicator/>
2. <https://youtu.be/ZqxrqzNYP6U/>
3. <https://morth.nic.in/road-accident-in-india/>
4. <https://www.circuits-diy.com/brake-failure-indicator-using-555-timer-ic/>
5. <https://www.hackster.io/circuits-diy/brake-failure-indicator-b3a0c3/>
