



**Green University of Bangladesh**  
**Department of Computer Science and Engineering (CSE)**

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**Project Title: Non-Contact AC Line Checker**

**PROJECT REPORT**

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**Student Details**

<b>Name</b>	<b>Id</b>
<b>Md.Miadul Islam Nizzan</b>	<b>231902032</b>
<b>Md Rahul Shaikh</b>	<b>231902055</b>
<b>Md Mahabub Hasan Mahin</b>	<b>231902056</b>
<b>Promod Chandra Das</b>	<b>231002005</b>
<b>Samia Islam</b>	<b>231902051</b>

**Course Teacher's Name : Meherun Nesa**

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<b><u>Lab Report Status</u></b>	
<b>Marks: .....</b>	<b>Signature:.....</b>
<b>Comments:.....</b>	<b>Date:.....</b>

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### ➤ **Abstract**

This project presents the design and construction of a non-contact AC line checker, a device capable of detecting the presence of AC voltage without the need for physical contact with live wires. This ensures a safer and more convenient way to check for AC voltage in various applications, reducing the risk of electrical shocks.

### ➤ **Project Name**

Non-Contact AC Line Checker

### ➤ **Objective**

- \* To design and construct a device that can detect AC voltage without physical contact.
- \* To enhance safety in electrical testing and troubleshooting.
- \* To explore the principles of non-contact voltage detection.

### ➤ **Learning Outcomes**

- \* Understanding of Electromagnetic Fields.
- \* Gained experience in project planning, execution, and completion.
- \* Worked collaboratively with team members to leverage diverse skills and expertise.
- \* Understanding the principles of AC voltage detection.
- \* Familiarity with electronic components and circuit design.
- \* Hands-on experience in building electronic devices.

\* Awareness of electrical safety practices.

## ➤ **Theory**

### **Electromagnetic Field Detection:**

- The fundamental principle behind the Non-Contact AC Line Checker is based on the detection of electromagnetic fields produced by alternating current (AC) voltage sources.
- AC voltage generates an alternating electromagnetic field that radiates into the surrounding space.

### **Sensor Technology:**

- The device is equipped with a specialized sensor designed to capture and interpret changes in the electromagnetic field.
- This sensor is sensitive to variations in the intensity and frequency of the electromagnetic field generated by live AC wires.

### **Microcontroller Processing:**

- Once the sensor detects changes in the electromagnetic field, it sends signals to a microcontroller, such as an Arduino or similar processing unit.
- The microcontroller processes the incoming signals and interprets them to determine the presence and strength of the AC voltage.

### **Indicator Activation:**

- Based on the processed information, the microcontroller triggers the activation of indicators, such as LEDs or a buzzer, to alert the user.
- The type and intensity of the indicator response may vary depending on the strength or proximity of the detected AC voltage.

### **Adjustable Proximity:**

- The device is designed to allow users to adjust its proximity to the potential AC voltage source.
- This feature enables users to determine not only the presence of voltage but also the relative distance from the live wires.

**Capacitive Coupling:** A non-contact AC line checker contains a small internal capacitor. When the checker's tip is brought near a live wire, the alternating electromagnetic field induces a small alternating current in the capacitor through capacitive coupling.

**Voltage Power Source:** Usually, a battery powers the circuitry of the tester.

**Distance:** The closer the tester's tip is to the live wire, the stronger the signal and the more sensitive the detection.

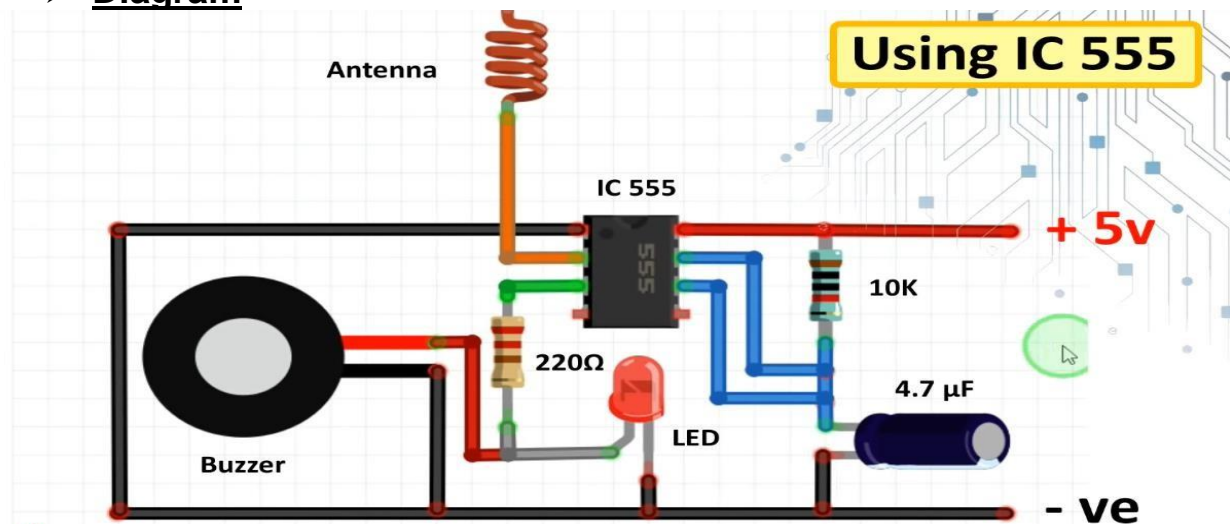
**Voltage Level:** Higher voltage levels generate stronger electromagnetic fields, making detection easier.

**Interference:** Nearby electrical devices or strong electromagnetic fields can interfere with the tester's readings.

**Insulation:** Thicker insulation around wires can reduce the strength of the detected signal.

Understanding these principles ensures the effective and safe use of non-contact AC line checkers, promoting electrical safety in various applications

➤ **Diagram**



### ➤ **Apparatus**

1 x 555 Timer IC

4.7  $\mu$ f Capacitor

1 x 10k $\Omega$  Resistor

1 x 220k $\Omega$  Resistor

LED

Buzzer

Copper Wires

9V Battery

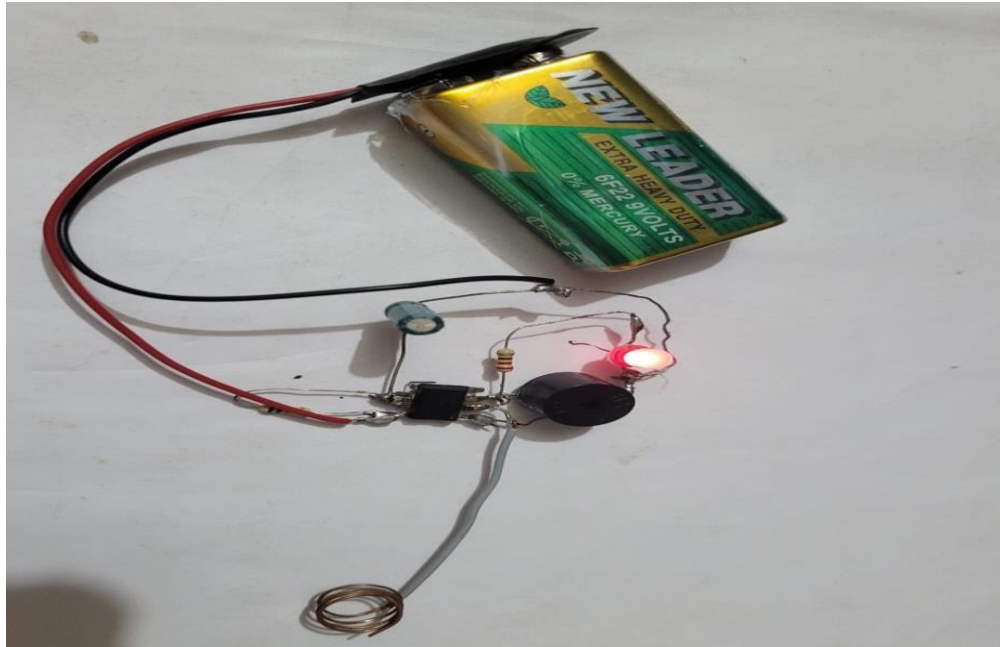
Clipper

### ➤ **Working Procedure**

1. Construct the circuit on the breadboard or PCB, following the diagram.
2. Connect the power source.
3. Bring the sensor or antenna near a live AC wire.
4. Observe the indication (LED or buzzer) to confirm voltage detection.
5. The sensor continuously monitors its surroundings for electromagnetic fields.
6. When an AC voltage source is detected, the sensor triggers the microcontroller.
7. The microcontroller processes the sensor data and activates the indicator, alerting the user about the presence of AC voltage.
8. The device can be moved closer or farther from the voltage source to determine its proximity.

### ➤ **Project Image**

**After exposure to electricity**



## ➤ Sustainability

The device design emphasizes the utilization of durable and environmentally friendly materials, ensuring a prolonged product life cycle. Furthermore, the device's low power consumption in standby mode contributes significantly to energy efficiency and sustainability.

\* By providing a reliable method for detecting live wires or active electrical systems without physical contact, the Non-Contact AC Line Checker significantly enhances electrical safety protocols. Its ability to identify potential hazards preemptively reduces the risk of accidents, electrocution, or equipment damage that could result from undetected live wires. It promotes electrical safety, potentially reducing accidents and equipment damage.

The device offers a reusable solution for voltage checks in various electrical systems. Its non-contact nature allows for repetitive usage without wearing down physical components or requiring recalibration between uses. Users can employ the device multiple times across different electrical environments, facilitating regular safety checks without compromising accuracy or effectiveness.

The Non-Contact AC Line Checker is designed with a focus on utilizing electronic components known for their durability and reusability. The selection process prioritizes components with extended lifecycle ratings and robust build quality, ensuring that the device remains operational for an extended period.

## ➤ Environmental Effect

While these handy tools provide a valuable safety advantage, certain environmental factors can affect the accuracy and sensitivity of non-contact AC line checkers. Humidity, Temperature, Electromagnetic Interference (EMI), Dust and dirt.

### **Humidity**

- **Impact:** High humidity levels can affect the device's electronics, potentially leading to inaccurate readings or reduced sensitivity.
- **Mitigation:** Using components rated for higher humidity levels and implementing protective measures to shield sensitive parts from moisture can help maintain the device's accuracy.

### **Temperature**

- **Effect:** Extreme temperatures, whether excessively hot or cold, can impact the components' functionality, affecting the device's accuracy.
- **Solution:** Employing temperature-resistant materials and selecting components with wider operating temperature ranges can mitigate these effects.

### **Electromagnetic Interference (EMI)**

- **Influence:** EMI from nearby equipment or electromagnetic fields can interfere with the device's ability to detect voltage accurately.
- **Addressing EMI:** Employing shielding techniques or using components designed to resist interference helps maintain the

device's reliability.

#### **Dust and Dirt**

- **Effect:** Accumulation of dust or dirt on the device's sensors can hinder accurate voltage detection and reduce sensitivity.
- **Preventive Measures:** Regular cleaning, using protective coverings, or incorporating self-cleaning mechanisms can mitigate this issue.

#### **Moisture Resistance**

- **Consideration:** Designing the device with moisture-resistant materials or coatings ensures its functionality even in environments prone to moisture or condensation.

#### **Environmental Testing**

- **Validation:** Subjecting the device to environmental testing ensures it meets performance standards under varying conditions, including humidity, temperature fluctuations, and exposure to dust.

#### **Robust Design**

- **Engineering Solutions:** Designing the device to withstand environmental challenges, including humidity, temperature variations, and exposure to EMI, ensures its reliability in different settings.

## ➤ **Discussion**

Non-contact AC line checkers, also known as voltage testers or voltage detectors, are essential tools for electrical professionals and DIY enthusiasts to ensure safety when working with electrical systems. Safety First, Principle of Operation ,Application and Versatility ,False Positives and Negatives ,Quality and Reliability ,Additional Features ,Limitations ,Training and Proper Uses should know. Non-contact AC line checkers are valuable tools for quickly and safely identifying the presence of voltage in electrical circuits. However, users should be aware of their limitations and use them as part of a comprehensive electrical safety strategy. Regular maintenance and calibration, along with adherence to safety protocols, contribute to the effectiveness of these tools in preventing electrical accidents.