

ELECTRONICS CE-231

Semester Project



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Submitted to:

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Metal Detector Circuit

Objective:

To design and implement a simple metal detector circuit on a breadboard using basic electronic components such as the TDA0161 proximity detector IC, resistors, capacitor, potentiometer (POT), buzzer, transistor, and AWG wire. The circuit is intended to detect the presence of metal objects within proximity.

Components Used:

- TDA0161 (Proximity Detector IC)
- Resistors (various values)
- Potentiometer (POT)
- Capacitor (100nF or per datasheet specs)
- Transistor (e.g., BC547 or similar)
- Buzzer (3V–5V)
- AWG wire (for the detection coil)
- Breadboard
- Power supply (6V–12V battery or regulated DC source)

Working Principle:

The TDA0161 is an integrated circuit designed for proximity detection using inductive principles. When a metal object enters the detection field of the coil connected to the IC, the inductance changes. This variation is detected by the IC and it drives an output signal. A transistor is used to amplify this output to drive a buzzer, which sounds when metal is detected.

Circuit Description:

- The AWG wire is used to create a search coil, which serves as the sensing component of the circuit.
- The coil is connected to the TDA0161 IC, which processes changes in inductance.
- A potentiometer is used to adjust the sensitivity of the circuit.
- The output from the IC is connected to a transistor to amplify the signal.
- The transistor drives the buzzer, providing an audible indication when metal is detected.
- Proper decoupling and biasing components (resistors, capacitor) are used according to the TDA0161 datasheet.

Construction:

- All components were assembled on a breadboard to allow for easy prototyping and adjustment.

- The coil was made by winding AWG wire (approximately 20–50 turns) into a circular shape with a diameter of ~3–5 cm.
- The sensitivity was adjusted using the potentiometer.
- The circuit was powered by a 9V battery.

Testing and Results:

- The device was tested with different metal objects including coins, keys, and small metal tools.
- The buzzer activated when a metal object was brought near the coil.
- The detection range was approximately 1–3 cm, depending on the object size and circuit tuning.

Applications:

- Entry-level metal detection applications
- Proximity-based switching
- Educational and hobbyist electronics projects

Conclusion:

This project successfully demonstrates the working of a basic metal detector using the TDA0161 IC and commonly available electronic components. It highlights inductive sensing and basic analog signal amplification. With further tuning and enclosure, the circuit can be made into a portable handheld metal detector.