Impact Factor (SJIF): 5.301

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 5, Issue 4, April-2018

Hidden Mobile Phone and Metal Detector

[1]S.Renuka,[2]R.Subha, [3]U.Prasannambigai

[1]Associate Professor of ECE Department, AAA College of Engineering & Technology.

[2]Department of ECE, AAA College of Engineering & Technology.

[3]Department of ECE, AAA College of Engineering & Technology.

Abstract: *Mobile phone restrictions are highly encouraged in examination halls, hospitals and other restricted areas. Instead of checking manually, this detector will ease work. Metal detectors are not only used for security purposes but also deployed in food production industries where accidentally food is contained with metal. It can be also used for detection of antiquities. In this work, we have proposed a hybrid detector named Hidden Mobile Phone and Metal Detector(HMPMD) which detects hidden mobile phones as well as metals to enhance safety measures in examination halls, prisons and even for surveillance applications, where the information has to be kept highly confidential.*

Keywords: GSM signals, magnetic field, ATmega328 microcontroller, Arduino IDE.

I. INTRODUCTION

The vast developed and still developing features of mobile phones leads to the usage of mobile phones in a great extent. Although it is user friendly and provides a convenient usage to all age groups there is a need to limit the use of mobile phones in some restricted areas like examination halls, prisons, hospitals etc. Metal detectors are found to be used for security purposes. For diffusing bombs and detecting any harmful metals before producing some serious consequences, metal detectors are often used. HMPMD using Arduino is to make use of the product being used in surveillance applications so that the unauthorized user is observed from a distance by means of this electronic equipment. of this electronic equipment.

II. BLOCK DIAGRAM

The block diagram of HMPMD interfacing with ATmega328 is shown in the figure. The output of NE555 from cell phone detector and the output of NE555 from metal detector are given to the corresponding input pins of ATmega328. The LCD and buzzer interfaced with controller gives indication about the detection.

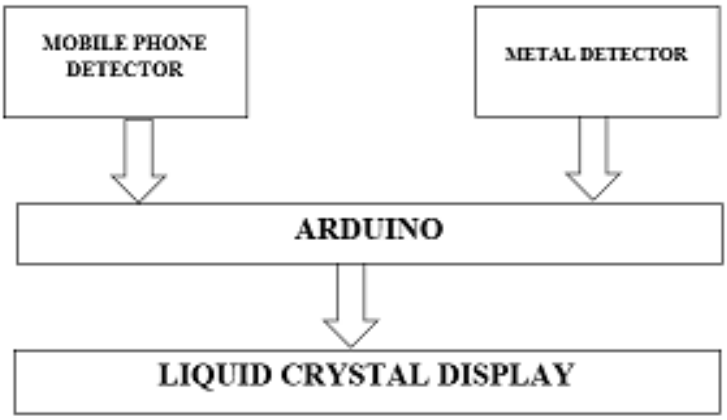

Figure 1. Block Diagram of HMPMD

A. Cell Phone Detector

The cell phone detector comprises of an Op-Amp(CA3130), transistor(BC548), timer(NE555), LED, buzzer and antenna.

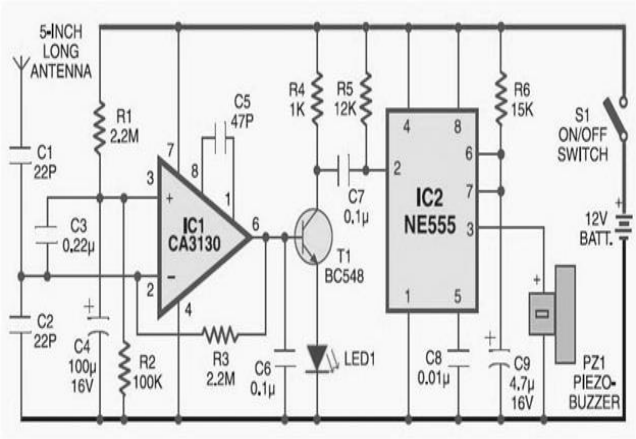

Figure 2. Circuit Diagram of Cell Phone Detector

Antenna will receive GSM signals from mobile phones in frequency range of 0.9 to 3 GHz. Capacitor C3 will collect all those signals and given as an input to either one of the terminals of Op-Amp. The other terminal has given reference signal as an input from 9V battery. Op-Amp will amplify the difference of these two signals and given to BJT. The emitter drains the output to LED and thus it will be glown. The signal from Op-Amp is also given to NE555 timer for buzzer indication. The switch will be used to activate the circuit. If the switch is ON the reference signal from the battery continuously flows through the circuit and if the antenna detects the signal of particular frequency the above operation performs or else no reference signal from battery is generated.

B. Metal Detector

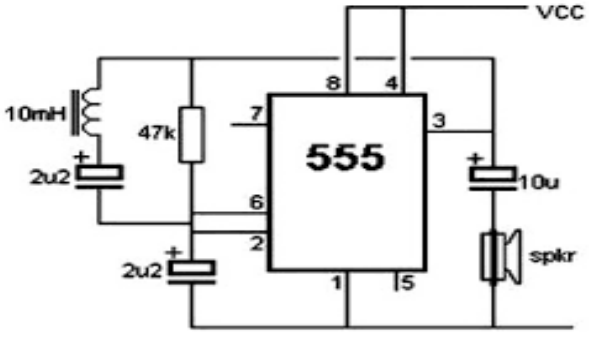

Figure 3. Circuit Diagram of Metal Detector

The metal detector circuit comprises of a coil, an oscillator, a timer(NE555) and a buzzer or speaker. Oscillator generates an AC current and make it flows through the coil thereby inducing magnetic field in it. When the metal is detected by the coil it produces eddy current in the detected metal. Thus, another magnetic field will be produced in the metal. The detector comprises the coil receives the retransmitted field and triggers the timer. The train of pulses generated from the timer will alarm the user by buzzer sound.

III. METHODOLOGY

The output of HMPMD are given to Arduino board. The LCD is interfaced with the Arduino board to display the detection messages. The program is loaded from monitor to Arduino if the output from HMPMD is obtained.

Software Used: Arduino IDE

Microcontroller: ATmega328

ATmega328 has 28 pins and LCD has 14 pins. Arduino IDE allows the user to use LCD in 4bit mode. The data lines used are D4 to D7. The 8-bit data is divided into two parts and are sent sequentially through the data lines. ATmega328 has 14 digital I/O lines. The operating voltage is 1.8 to 5.5v.4 pins are used as data lines that is pins D4 to D7.

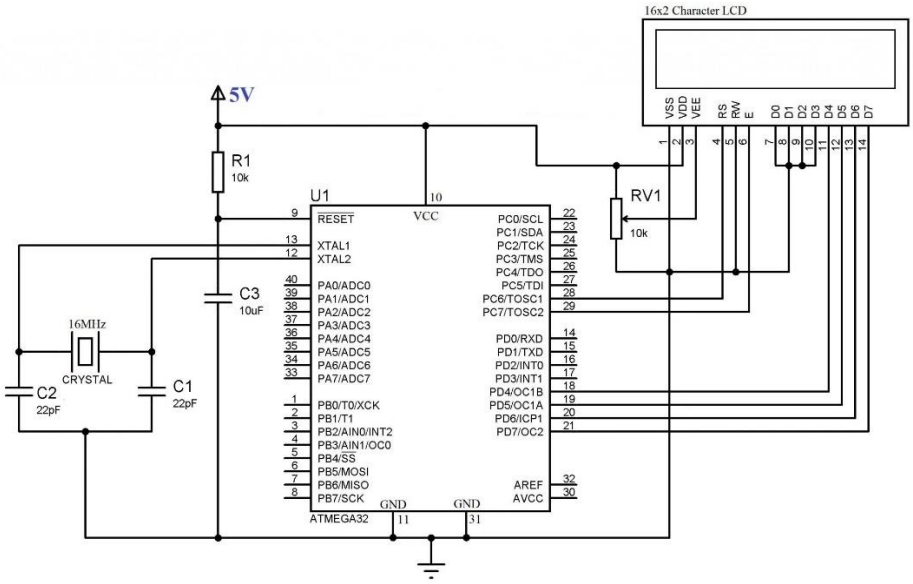

Figure 4. Interfacing LCD with ATmega328

The connections from LCD to Controller is

i. PIN1 or Vss to Ground
ii. PIN2 or Vdd or Vcc to +5V power supply
iii. PIN3 or Vee to Ground
iv. PIN4 or RS to PIN0 of ATmega328
v. PIN5 or RW to Ground
vi. PIN6 or E to PC7 of ATmega328
vii. PIN11 or D4 to PD4 of ATmega328
viii. PIN12 or D5 to PD5 of ATmega328
ix. PIN13 or D6 to PD6 of ATmega328
x. PIN14 or D7 to PD7 of Atmega328

The purpose of the external crystal oscillator in the Arduino board is to generate the clock signals with frequency range of 16MHz. ATmega has also a built-in oscillator which has frequency of 1MHz. External oscillator is connected to PIN13 and PIN12. The speed of the microcontroller depends on the speed of clock. By knowing the number of clock pulses we can easily predict which operation takes place at a particular time.

Buzzer can also be interfaced with ATmega328 for alarm indication. The base of transistor(BC547) is connected to PIN1 that is PB0 of ATmega328. At the collector end, buzzer is connected. The emitter terminal is grounded. By interfacing LCD and buzzer with controller warns the officials about the cell phone detection or metal detection or the both.

IV. CONCLUSION

The designed HMPMD works well to detect mobile phones up to 1.5 meters and metals such as coins or weapon depending on the diameter of the coil used. HMPMD can also be used to help searching the mine locations. HMPMD can even detect the switch off mobile phones by detecting the metals used in mobile phones. It can also be deployed in prisons where the cell phones and harmful metal usage are highly restricted.

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