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## Sound indicators as safety of motorcycle

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## Sound indicators as safety of motorcycle

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**Abstract.** Motorbikes are popular of transportation with high usage rates. Safeguarding motorbikes are a necessity for users to provide security. Researchers offer motorcycle safety using sound indicators. The working principle of motorcycle safety offered, is after the main key, or contact is in position and the Mic sound indicator is blown, amplifier circuit works to drive the relay driver that connects the CDI unit. The motorcycle safety circuit system will live and if there is no blow, the motorcycle safety circuit will not function. Research on the motorcycle safety circuit can be used to input indicator sound. Components needed include Mic condenser, driver relay circuit, power supply. Measurement of the relay driver circuit and condenser mic aims to find out which circuit can work as planned. The measurement results obtained testing the motorcycle safety circuit with the following explanation: When the sound indicator and driver get a touch simultaneously, which gives a signal that the signal from the sound indicator is connected to the amplifier driver, so that the signal is detected, will provide input to the relay (on) and CDI unit when the motorcycle will work. With an indication the LED will turn on.

### 1. Introduction

The level of motor vehicle use in Indonesia is increasing per year, this can cause accidents to occur. Potential characteristics of motor vehicle accidents: the biggest accident is 85.9% on Monday 20: 00-21: 00 in the area of Ahmad Yani Surabaya, the city of Makassar in 2011-2015 the biggest accident was dominated by motorized users 64,35% [1-3]. The cause of the occurrence of motor vehicle accidents is one of them because the driver's speed is too fast. So there is a need for safety devices to limit the speed of motorized vehicles [4,5]. One of the motorized vehicle safety devices can use mechanical relays with the on-off algorithm and ATmega16 microcontroller as control [4,6,7]. Safety rate of motorized vehicles can use the ATMEGA 16 microcontroller, light sensor (Light Dependent Resistor) and Laser as a detector of passing vehicles [8,9]. Safety of motorized vehicles between motorized vehicles can use blind spot detection based on the Atmega 168 microcontroller [9-12]. This research is for securing motorized vehicles using a Condenser Mic to convert sound signals into electrical signals. The relay is used to On-Off electric current to the CDI [13]. The purpose of this study is to use sound indicators as a motorcycle safety using 12V CDI.



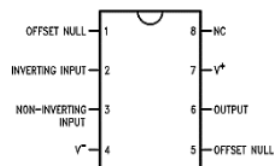
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## 2. Material and method

### 2.1. IC LM741

IC LM 741 is an OpAmp IC (operational amplifier) that functions as an amplifier. All amplifier circuits have one feature in the form of a feedback resistance, which is connected to the output terminal and input terminal. This type of circuit is called a negative feedback circuit. The feedback circuit is negative based on the statement that the display circuit is no longer dependent on the open strand gain of OpAmp. The OpAmp circuit is in the form of IC LM 741 shown in figure 1 [14].



**Figure 1.** IC LM741.

The rules that apply to the Opamp 741 IC Input:

- If the pin 3 voltage is higher (more positive) than the pin2 voltage, the output voltage is positive
- If the pin voltage 2 is higher (more positive) than the pin 3 voltage, the output voltage is negative.

So by giving a more positive voltage on pin 3 it causes the output voltage to be positive. This input terminal is called non inversion. When a more positive voltage is given at pin 2, it causes a negative output voltage. This input terminal is called input inversion [15].

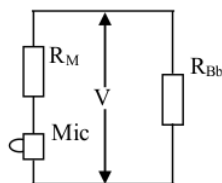
### 2.2. Condensor Mic (CM)

CM is a device that functions as a converter of sound signals into electrical signals. And it has an output power that depends on the distance between the sound source of the microphone. The principle of working the microphone is because of the pieces that move by verification from the air pressure of the human voice so that changes in capacity result in changes in voltage. The Condensor Mic output power comes out if there is a match between the load ( $R_{Bb}$ ) and the impedance of the mic ( $R_M$ ), so effective output power level according to the equation (1). The shape of the CM series is shown in figure 2.

$$P_0 = 1000 \cdot \frac{E}{4 \cdot R_M} \text{ (mwatt)} \quad (1)$$

Where:

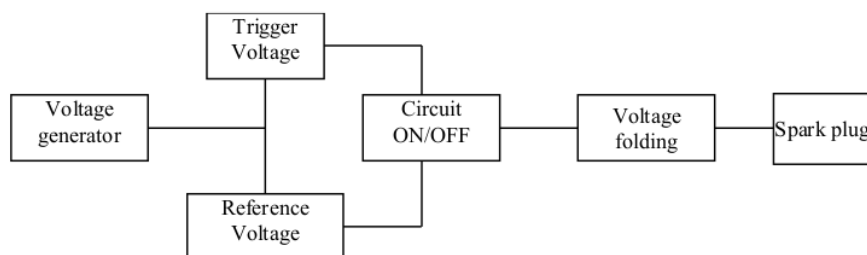
- $E$  = Output voltage, no load, Volt  
 $R_M$  = Nominal impedance of the microphone, ohm  
 $P_0$  = Output power is expressed in ohm.



**Figure 2.** CM output power circuit.

### 2.3. CDI (Capacitor Discharge Ignition)

Ignition in a gasoline engine uses spark plugs. The spark sparks on this spark plug occur because there is a transient voltage or sudden voltage change between the two electrodes on the spark plug. This sudden voltage change occurs when the discharge of the charge stored by the capacitor quickly. For charging capacitors and discharging the load, an on / off switch is needed. As a result of the wear of platinum this result the ignition on the engine no longer like platinum which is still good. And motorized vehicles often become fussy because the combustion is no longer good. The basic use of CDI is the same as platinum using transient voltage. This CDI has many advantages compared to platinum. Among the power losses due to spark jumps on switching devices are almost non-existent, also the equipment will not wear out, and can last for long periods of time. The block diagram of the CDI Generating is shown in Figure 3.

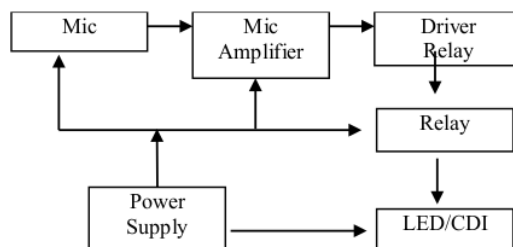


**Figure 3.** Block diagram of the CDI generator

## 3. Method

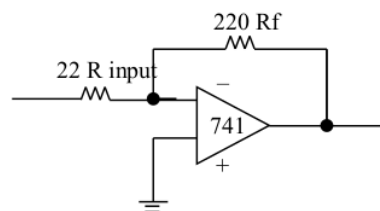
This research is a developmental descriptive / research method. The steps in this study began to compile a block diagram of motorcycle safety with sound, design a series of motorized vehicle safety systems with sound, circuit system testing followed by the installation of components as a whole

### 3.1. Block diagram



**Figure 4.** Block circuit diagram.

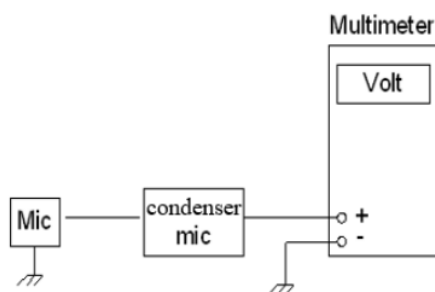
In accordance with the circuit diagram block figure 4. Describes the main components used in the form of IC LM741 as a Mic amplifier circuit that will amplify electrical signals. BC 548 transistor as a relay driver circuit. The amount of reinforcement is 10 times, this is because the output of the Condensor Mic signal is so weak that it is unable to drive the relay driver, the reinforcement system used is the reversing model because the input from the Condenser Mic output is inserted in foot No. 2 IC 741. Figure 5. Explaining the circuit gain by using IC LM 741 to produce 10 times the input voltage.



**Figure 5.** Electrical signal strengthening circuit.

#### 4. Result and discussion

The measurement of Condensor Mic gain input is done by using a digital multimeter in the setting at the DC volt position. Black jumper connected to ground and red jumper at foot 2 IC LM741 then the voltage generated by the amplifier circuit will be seen in the Multimeter, shown in figure 6.



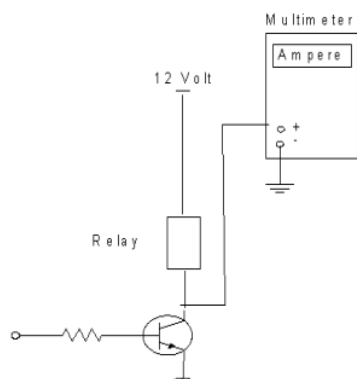
**Figure 6.** Testing of amplifiers.

From tests such as Figure 6 Voltage measurements can be generated shown in table 1 If the input on the Condensor Mic before being blown produces a voltage of 0.288 Volts and the condenser mic after being blown produces a voltage of 0.95 Volt. Whereas the condenser mic output produced before being blown produces a voltage of 0.670 Volt and the condenser mic after being blown produces a voltage of 0.774 Volt.

**Table 1.** Input-output measurement results of Mic amplifier circuit.

NO	Condenser Mic before blowing	Condenser Mic after blowing
Input	0,288 volts	0,95 volts
Output	0,670 volts	0,774 volts

Relay driver circuit aims to determine whether the component or circuit can work as planned. The measurements here include measurements of current and voltage in the circuit that has been made and designed, shown in figure 7 and the measurement results of the input output driver relay in table 2.



**Figure 7.** Testing the relay driver circuit.

**Table 2.** Measurement results of relay driver input-output.

NO	Condenser Mic before blowing	Condenser Mic after blowing
1. Input	0,686 volts	0,774 volts
2. Output	0,624 volts	12 volts

The description of the data measured by the motorcycle safety circuit on the CDI is shown in table 3.

**Table 3.** Test results for motorcycle safety circuits.

No	Input (Voice)		Output	
	Mic	Amplifier circuit	On LED	Relay
1.	—	—	0	OFF
2.	V	—	0	OFF
3.	—	V	0	OFF
4.	V	V	1	ON

In Table 3 the steps of the test can be explained as follows:

- In test number 1, the initial condition of the engine has not been turned on, the whole circuit has not been working, the LED is off
- In test number 2, the engine on and on the indicator gets a sound, but the signal produced by the driver is not detected by the motorbike safety amplifier circuit, so the LED does not turn on.
- In test No. 3, the engine is on and the driver gets an indicator, the signal is not detected by the safety control circuit, the LED goes out so it does not provide input signals on the relay (off) and the CDI unit will not work.
- In testing No. 4, the engine on, indicator and driver get touch simultaneously, which gives a signal that the signal from the sound indicator is connected to the driver so that the signal is detected, it will provide input to the relay (on) and the CDI unit on the motorbike will work.

With an indication the LED will turn on. To want the engine off, then just return the ignition key to the off position

## 5. Conclusion

The use of LM 741 IC of the control of a motorcycle safety circuit, when the main key of the On position to the sound of blowing on the Mic, the amplifier circuit becomes active. The circuit system can be



packaged more efficiently with hidden placement without reducing circuit work and guaranteed safety. The DPDT switch changes the position of the switch from Off to give an input signal to the amplifier circuit, then disconnects the connection from the relay to Off with a motorcycle CDI unit.

### Acknowledgments

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