Jurnal E-KOMTEK (Elektro-Komputer-Teknik)
Vol. 5, No. 1 (2021) pp. 133-141
https://jurnal.politeknik-kebumen.ac.id/index.php/E-KOMTEK
p-ISSN : 2580-3719 e-ISSN : 2622-3066

Car Brake Works as Indicator Tool

Bambang Sudarsono[1], **Hamid Nasrullah**[2], **Fanani Arif Ghozali**[3], **Aji Apri Setiawan**[4]
[1,4]Department of Automotive Technology Vocational Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia, 55166
[2]Department of Atomotive Engine, Politeknik Dharma Patria, Kebumen, Indonesia, 54311
[3]Department of Electronic Engineering Vocational Education, Universitas Ahmad Dahlan, Yogyakarta, Indonesia, 55166

bambang.sudarsono@pvto.uad.ac.id

https://doi.org/10.37339/e-komtek.v5i1.559

Published by Politeknik Dharma Patria Kebumen

Artikel Info
Submitted:
18-04-2021
Revised:
05-06-2021
Accepted:
05-06-2021
Online first :
30-06-2021

Abstract

Accidents caused by malfunctioning of the brake light system are increasing in line with the rise in road facilities. It provides space for drivers to drive vehicles quickly. To overcome this problem, a system that can signal the driver must rapidly identify the damaged brake lights. The purpose of this study was to produce a car brake indicator tool. This tool is an electronic device that functions to determine the brake light when one of the brake lights is off by automatically giving a signal on the car's dashboard. The method used to produce brake work indicator tools consists of designing, manufacturing, and testing. The testing process has been carried out through a lux meter, and the test variables include testing the use of electric current, voltage when the tool is working, and trying the performance of the device on the car. From testing this tool, the results obtained when the current usage of the tool is working, namely before the induction works of 2 amperes and when the induction works it is 0.5 amperes. The magnitude of the voltage when the device is used is 11.8 volts. Based on the experiments that have been carried out, there are no disturbances in the lighting system or other systems on the car when this tool is working. This tool can work well to provide convenience and comfort when driving by car. Based on the experiments that have been carried out, there are no disturbances in the lighting system or other systems on the vehicle when this tool is working. This tool can work well to provide convenience and comfort when driving by car. Based on the experiments that have been carried out, there are no disturbances in the lighting system or other systems on the vehicle when this tool is working. This tool can work well to provide convenience and comfort when driving by car.
Keywords: *Tools, Indicators, Car brake work*

Abstrak

Kecelakan yang disebabkan oleh rusaknya fungsi sistem lampu rem semakin meningkat sejalan dengan meningkatnya fasilitas jalan yang memberikan ruang kepada pengemudi mengendarai kendaraan dengan cepat. Untuk mengatasi permasalahan tersebut diperlukan sistem yang mampu memberikan sinyal kepada pengemudi agar cepat mengidentifikasi kerusakan lampu rem. Tujuan penelitian ini untuk menghasilkan alat bantu indikator kerja rem mobil. Alat bantu ini merupakan suatu perangkat elektronik yang berfungsi mengidentifikasi lampu rem apabila salah satu lampu rem mati dengan cara memberikan sinyal di dashboard mobil secara otomatis. Metode yang digunakan untuk menghasilkan alat bantu indikator kerja rem terdiri dari perancangan, pembuatan dan pengujian. Proses pengujian telah dilakukan melalui lux meter dan variable pengujiannya meliputi pengujian pemakaian arus listrik, tegangan saat alat bekerja, serta pengujian kinerja alat pada mobil. Dari pengujian alat ini, diperoleh hasil pemakaian arus saat alat bekerja yaitu sebelum induksi bekerja sebesar 2 ampere dan saat induksi bekerja sebesar 0,5 ampere. Adapun besar tegangan saat alat terpakai sebesar 11,8 volt. Berdasarkan percobaan yang telah dilakukan tidak terdapat gangguan pada sistem penerangan maupun sistem yang lain pada mobil ketika alat ini bekerja. Alat ini mampu bekerja dengan baik sehingga memberikan kemudahan dan juga kenyamanan tersendiri pada saat berkendara dengan mobil.
***Kata-kata kunci**: Alat bantu, Indikator, Kerja rem mobil*

1. Introduction

The development of increasingly advanced automotive technology demands technological developments to support driving safety [1][2][3]. Driving safety is very important, mainly when it is associated with drivers who drive their vehicles quickly and the number of cars on the road is dense. Cars driven at high speed will be at increased risk of accidents [4][5]. It is caused by one of the cars braking suddenly, then collisions up to 3, 4, 5, etc. Preventing accident risks occur, optimal brake light work is required [6].

Brake lights are helpful when the vehicle is braking suddenly. The brake light gives a signal to the car's driver so that it is easy and fast to see the vehicle's condition in front of him. However, the incident in the field proves that the performance of the brake lights is not entirely appropriately considered. The results of observations and interviews with several car repair shops concluded that the performance of brake lights is rarely noticed [7]. Lights off or lights on unstable are the main problems with brake lights, and most drivers do not know and are left alone [8]. From the above review, a simple and efficient tool is needed that functions to monitor the work of the brake light easily, safely and does not interfere with driving comfort [9][10][11].

2. Method

2.1 Tool Design

a. Current rectifier

Current rectifiers are usually used with semiconductor diodes or diodes. The semiconductor diode symbol is shown in **Figure 1.**

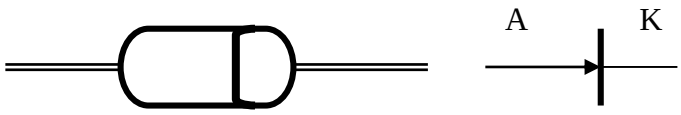

Figure 1. Semiconductor Diode Symbol

The brake work indicator tool uses four diodes to channel the resulting current to other circuits quickly. As shown in **Figure 2.**

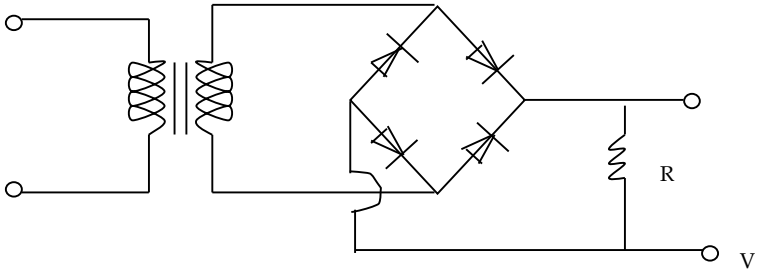

Figure 2. Full Wave Rectifier

b. *SCR (Silicon Controlled Resistor)*

SCRon, the auxiliary brake work indicator, works as a relay by using a weak electric current. The brake work indicator tool uses an electric magnet to carry out its function. The legs on the SCR are coded A (anode), G (gate), K (cathode). The SCR on the brake work indicator tool functions as an automatic switch to turn on the signal on the dashboard. **Figure 3** shows SCR forms and their symbols.

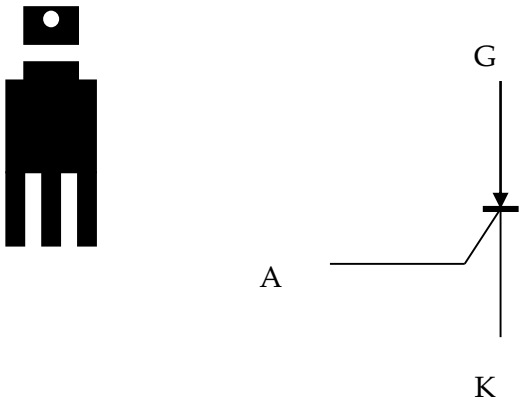

Figure 3. SCR Forms and Their Symbols

c. Condenser

A capacitor, often referred to as a capacitor, denoted by the letter C, functions to store an electric charge for a certain period without chemical reactions. A condenser on the brake work indicator tool serves to keep the induction from the magnetic field to produce a current to amplify the signal on the dashboard, which is more sensitive to light. Types of the condenser are presented in **Figure 4.**

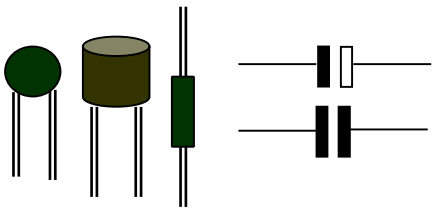

Figure 4. Types of Condenser

d. Resistor

The resistor is an electrical resistance that serves to limit the electric current flowing. In the manufacture of brake work indicator tools, resistors are used to connect the work of the magnet with the light-emitting diode (LED). Resistor and resistance symbols are shown in **Figure 5.**

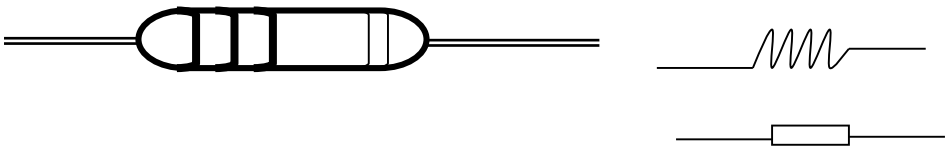

Figure 5. Resistors and Resistance Symbols

e. Circuit voltage sensor

The sensor used in the brake work indicator tool is a circuit sensor where when one of the brake lights goes out, induction occurs then flows to the SCR (silicon controlled resistor) and connects the current and turns on the LED (Light Emitting Diode) as a signal on the dashboard. The LED (Light Emitting Diode) nature will emit light if it gets an extended forward voltage and cannot withstand high voltages of 1.5 – 20 volts. The shape of the LED (Light Emitting Diode) and its symbol is presented in **Figure 6.**

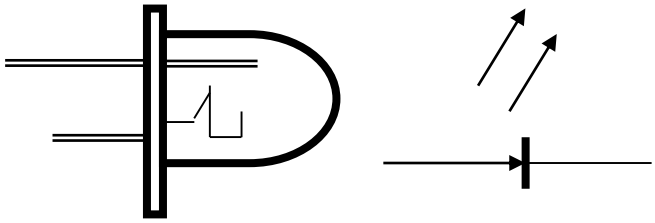

Figure 6. The shape of the LED (Light Emitting Diode) and its symbol

f. Tools app

The brake work indicator tool that is made is a tool designed to provide convenience in its use, namely, monitoring brake lights. So far, when the brake light goes out in the middle of the road, the driver cannot see and know. The brake work indicator tool works by making an indicator so that when the brake light does not work, the LED (Light Emitting Diode) light is on. The indicator circuit uses one of the brakes when the lights do not work present in **Figure 7**.

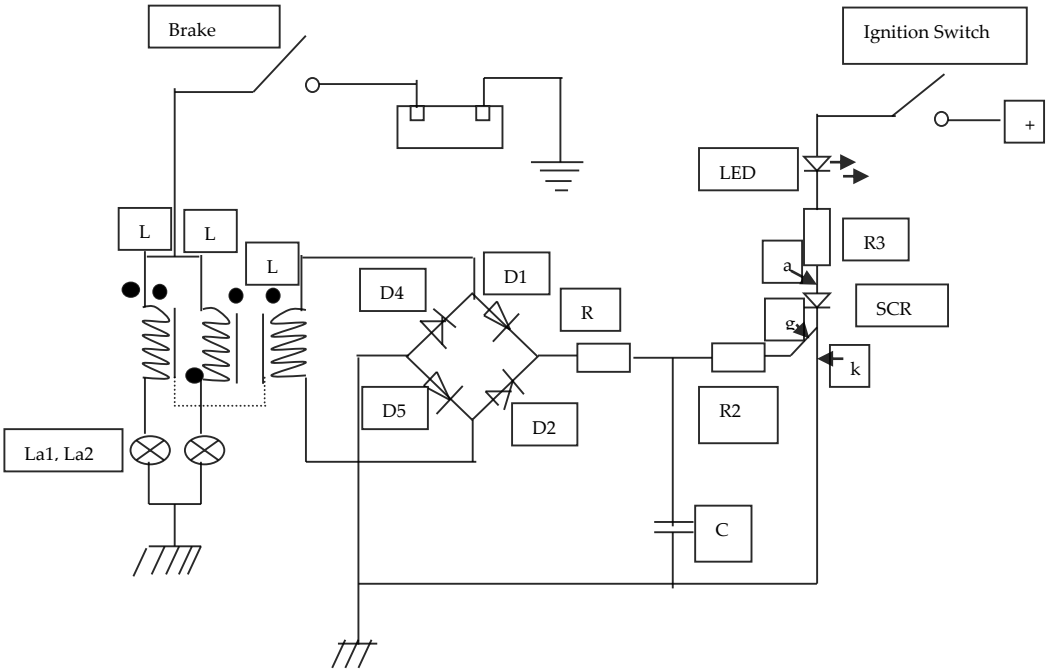

Figure 7. Indicator Circuit, One of the Brake, Lights Not Working

Component list:

a. R1, R2 = 120,
b. R3 = 390 ,
c. D1, D2, D3,.D4 = 1N4002,
d. LED = 6 watts,
e. 10. SCR = C106 M
f. Toroid ferrite with 11 turns
g. La1, La2 = 25 watts, 12. L3 = 20 turns

2.2 How the Tool Works

When the brake light is working correctly, the winding L1 and L2 coils conduct the same current so that the magnetic field does not work. When the brake light is not working correctly, the magnetic field caused by the wind in the lamp by one of the brakes induces a voltage in the L3 coil. SCR (silicon controlled resistor) ON to turn on the LED (Light Emitting Diode). Increasing the sensitivity of the indicator, R1, C2, R2 are needed to increase the sensitivity of the magnetic field.

3. Results and Discussion

3.1 Testing Tool

a. Testing the ignition of the brake light through the circuit

Tests and observations using a lux meter can be seen in **Table 1.**

Table 1. Observation Method

No.	Measurement Type	Measurement results	Conclusion
1.	Turn on the light with the brake light indicator circuit	105 Lux (night) 255 Lux (day)	Standard 150 Lux
2.	Light on without a circuit (directly from the battery)	140 Lux (night) 290 Lux (day)	

From the results of the tests and observations above, it can be concluded that the results of the brake lights with a circuit and without a course (direct battery) are not nearly the same, which is around 150 Lux. It indicates that when the brake light is on, it does not significantly affect other drivers.

b. Testing the installation of the tool on the car

The arrangement of cable to be installed on the car present in **Figure 8.**

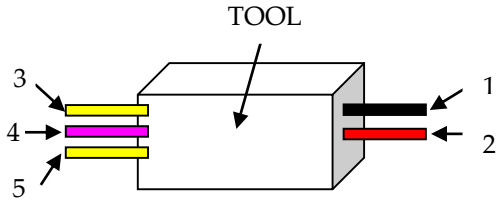

Figure 8. The colour of the cable to be installed on the car

Information:

1. black cable = negative battery
2. red wire = Turn off the LED switch and to the battery positive
3. Yellow wire = Positive brake light
4. Orange wire = brake pedal switch
5. Yellow wire = Positive brake light

c. Tool performance testing

1. The process of installing tools on the car

   Placement of equipment in the car shown in **Figure 9.**

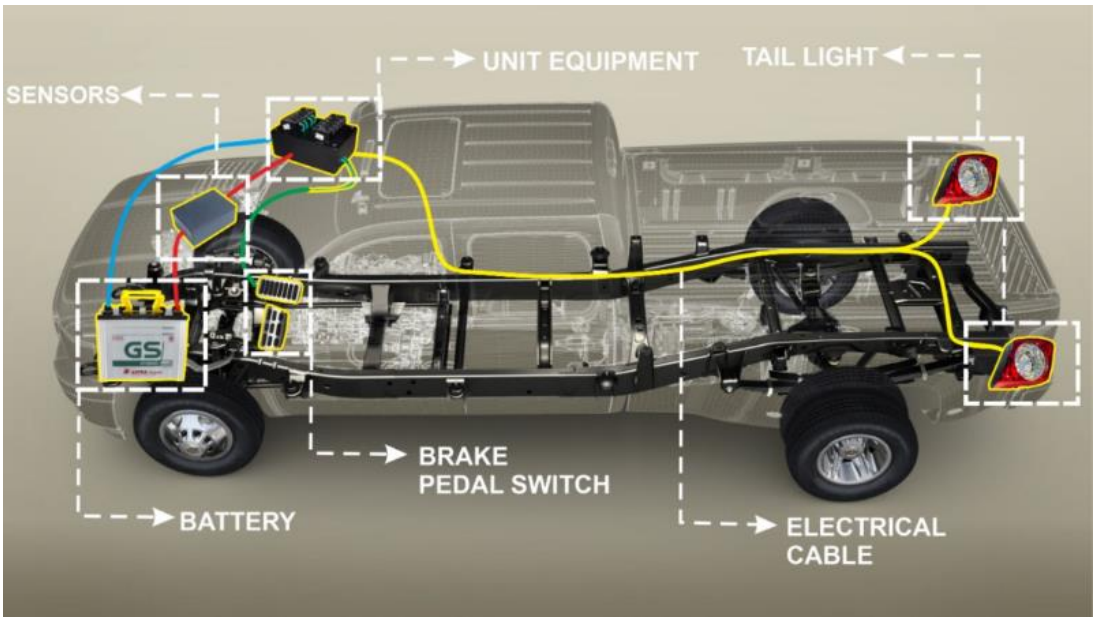

Figure 9. Placement of the Tool on the Car in View from above

The current source of the brake work indicator tool uses a 12-volt battery. In the installation, this tool is placed on the dashboard of the car. It makes it easier when connecting cables so that the distance obtained is close and can be reached when connecting cables. The picture above showed the tool unit placed in front of the dashboard. Then the sensor is placed on the car dashboard. The installation method is as follows:

a. Connect the cable from the appliance unit to the positive wire of the brake light.
b. Connect the LED lighter wire then to the battery positive.
c. Connect the pedal switch cable.
d. Check the cables that have been installed to anticipate the occurrence of errors or short circuits.

2. Performance test:

a. Depress the brake pedal about five times

b. Then turn off one of the brake lights

c. See if the signal is on or not. If it is on, it means the tool is working correctly.

d. If the signal is on, it will continue to burn until the LED light is turned off so that the signal light goes out.

The measurement and test results present in **Table 2.**

Table 2. Measurement and Test Results

Test	Measurement Type	Measurement results	Information
1.	Current use before induction works (before the signal turns on)	2 Ampere	Does not interfere with battery current consumption.
2.	Current consumption when induction is working (signal is on)	0.5 Ampere	Please do not use excessive current from the battery to not interfere with the electric current from the storm.
3.	Total working voltage when the tool is working.	11.8 volts	The battery voltage is still in good condition because it is close to 12 volts.
4.	LED light signal voltage	1, 81 volts	LED lamps are safe because they are less than 3 volts.

3.2 Discussion

a. Current Usage

Based on the tool testing result that has been carried out, the current consumption of the tool before the induction works (before the signal turns on) is measured at 2 amperes. The induction is working (when the signal is working), the current consumption in the device is estimated at 0.5 amperes. With the current usage as measured, it can be seen that this brake work indicator tool is quite efficient in using the electric current from the battery. It hoped that the presence of this tool in the car does not interfere with the work of other systems that also use batteries as a current source, such as horns, lights. Turn signal, headlights, and others. Weaknesses that occur when adding systems

Several relevant research results support that the auxiliary brake work indicator should pay attention to the driver's safety function. The addition of new electrical parts should not interfere with the performance of other electrical systems **[12][13]**.

b. Tool Performance Capability

The brake work indicator tool has been installed and tested on the car. The installation process is easy and can be done yourself so that it is more effective and efficient. The workability in this tool does not show symptoms or problems that interfere with the function of the lighting and other electrical systems in the car. In addition to providing comfort in driving, this tool also plays a significant role in driving safety and safety.

The brake work indicator tool is placed in a safe place, one of which is on the front of the car dashboard, considering that this place is closed so that the car still looks neat and protected from water either when it rains or when it rains it is washed. However, this tool may be installed in other parts of the car while still referring to safety and comfort considerations **[14][15]**.

4. Conclusion

The brake work indicator tool works if in the middle of the trip suddenly the brakes do not work correctly. The brake work indicator tool automatically sends a signal to the LED lights on the dashboard. Judging by how it works, this tool also does not interfere with the lighting and electrical functions of the car. In addition to providing comfort in driving, this tool is also quite a role in the safety and driving safety factor. The brake work indicator tool works well and is economical with four testing processes.

References

[1] V. Sima, I. G. Gheorghe, J. Subić, and D. Nancu, "Influences of the industry 4.0 revolution on the human capital development and consumer behavior: A systematic review," Sustain., vol. 12, no. 10, 2020, DOI: 10.3390/SU12104035.

[2] C. Chan, "International Journal of Transportation Advancements , prospects , and impacts of automated driving systems," Int. J. Transp. Sci. Technol., vol. 6, no. 3, pp. 208–216, 2017, DOI: 10.1016/j.ijtst.2017.07.008.

[3] B. Sudarsono, "Industrial-based practical learning development for teacher competence of automobile technology Industrial-based practical learning development for teacher competence of automobile technology," J. Phys. Conf. Ser., vol. 144, no. 012062, pp. 1–8, 2020, DOI: 10.1088/1742-6596/1446/1/012062.

[4] A. Virga, M. Gulino, D. Vangi, A. Virga, and M. Gulino, "ScienceDirect Combined activation of of braking and and steering for for automated driving systems : adaptive intervention by injury risk-based criteria," Procedia Struct. Integr., vol. 24, no. 2019, pp. 423–436, 2020, DOI: 10.1016/j.prostr.2020.02.039.

[5] A. Pinchuk, P. Dadoenkov, A. Pinchuk, P. Dadoenkov, D. Halutin, and I. Korago, "ScienceDirect Improved rolling system of railway stock on brake shoe," Procedia Comput. Sci., vol. 149, pp. 258–263, 2019, DOI: 10.1016/j.procs.2019.01.132.

[6] M. Grottoli, F. Celiberti, Y. Lemmens, R. Happee, M. P. Hagenzieker, and J. C. F. De

Winter, "Emergency braking at intersections : A motion-base motorcycle simulator study Nat a," Appl. Ergon. J., vol. 82, no. August 2018, 2020, DOI: 10.1016/j.apergo.2019.102970.

[7] J. Rusama, "Developing a car maintenance service concept for business customers - a case study of Veho Autotalot Oy," Laurea University of Applied Sciences, 2012.

[8] G. Li, W. Wang, S. E. Li, B. Cheng, and P. Green, "Effectiveness of Flashing Brake and Hazard Systems in Avoiding Rear-End Crashes," Adv. Mech. Eng., vol. 2014, p. 12, 2014, DOI: 10.1155/2014/792670.

[9] U. Akadike, S. B. Hassan, F. Asuke, and J. O. Agunsoye, "Development of Asbestos - Free Brake Pad Using Bagasse," Tribol. Ind., vol. 32, no. 1, pp. 12–18, 2010.

[10] W. Li, X. Yang, S. Wang, J. Xiao, and Q. Hou, "Comprehensive Analysis on the Performance and Material of Automobile Brake Discs," Metals (Basel)., vol. 10, no. 377, pp. 1–18, 2020.

[11] G. Li, "The Design of the Automobile Brake Cooling System," Open Access Libr. J., vol. 5, no. 4567, pp. 1–9, 2018, DOI: 10.4236/oalib.1104567.

[12] O. A. Towoju, "Braking Pattern Impact on Brake Fade in an Automobile Brake System Braking Pattern Impact on Brake Fade in an Automobile Brake System 2 Literature Review," J. Eng. Sci. ·, vol. 6, no. February, pp. 10–16, 2020, DOI: 10.21272/jes.2019.6(2).e2.

[13] A. Ricardo, "Dynamic analysis of three autoventilated disc brakes Análisis dinámico de tres frenos de disco autoventilados," Ing. e Investig., vol. 37, no. 3, pp. 102–114, 2017, doi: 10.15446/ing.investig.v37n3.63381.

[14] D. Khorasani-zavareh, S. Shoar, and S. Saadat, "Antilock braking system effectiveness in prevention of road traffic crashes in Iran," Khorasani-Zavareh al. BMC Public Heal., vol. 13, no. 439, pp. 2–7, 2015.

[15] A. Rahim, A. Rahman, M. M. Rahman, A. T. Asyhari, Z. Alam, and D. Ramasamy, "Evolution of IoT-enabled connectivity and applications in automotive industry : A review," Veh. Commun., vol. 1, p. 100285, 2020, DOI: 10.1016/j.vehcom.2020.100285.