

TRANSMITTER AND RECEIVER FOR INTELLIGENT SPEED LIMITER SYSTEM

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This report is submitted in partial fulfillment of the requirement for the award of Bachelor of
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BORANG PENGESAHAN STATUS LAPORAN
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 SPEED LIMITER
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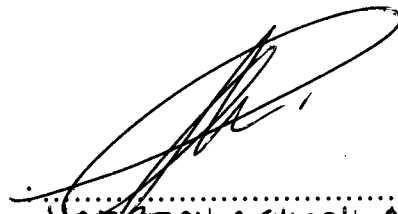
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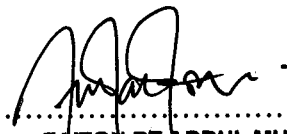
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DEDICATION

Alhamdulillah, I would like to express gratitude to Allah Subhanawata'ala the Almighty for giving me the guidance and strength in making this final project success.

Above of all, I would like to extend my deepest gratitude and sincere appreciation to my advisor, Pn. Zaiton Abdul Mutalip for her constructive ideas, guidance and advice.

I am also thankful to all UTeM lab staff for providing technical assistance and to all those people who had given moral support and constant encouragement throughout studies in UTeM they are always in mind.

Lastly this appreciation also goes to my beloved family for being very supportive and helpful.

ABSTRACT

The main objectives of this project are to build a transmitter and receiver for Intelligent Speed Limiter. A transmitter is designed with suitable frequency and produced a desired range of the frequency area. Then, a receiver is designed that will successfully received and transform the signal to activate the control unit. The purpose of Intelligent Speed Limiter was to reduce accident rating in our country. Thus, a safe environment and journey was existed. The function of transmitter and receiver in Intelligent Speed Limiter is to located the transmitter in a fixed location and create it's own transmission area. Then, the receiver will be fixed in the vehicle and received the signal as entered the transmission area. Received signal is then analyzed and activated the control unit. The control unit is developed by other student and the discussion about it will not be included in this report.

ABSTRAK

Objektif utama projek ini adalah untuk menghasilkan sebuah alat pemancar dan alat penerima bagi sistem Had Laju Pintar. Alat pemancar direka dengan menggunakan frekuensi yang sesuai bagi menghasilkan keluasan kawasan frekuensi yang diinginkan. Kemudian, penerima direka supaya mampu untuk menerima isyarat dengan baik dan mengubah isyarat tersebut untuk mengaktifkan unit kawalan. Tujuan pembinaan sistem Had Laju Pintar adalah untuk mengurangkan kadar kemalangan di negara kita. Seterusnya, mewujudkan kawasan dan perjalanan yang selamat. Alat pemancar dan penerima didalam sistem Had Laju Pintar beroperasi dengan menempatkan pemancar dikedudukan yang tetap dan mewujudkan kawasan pemancarnya. Penerima pula akan ditempatkan di dalam kenderaan dan akan menerima isyarat apabila memasuki kawasan pemancar. Kemudian penerima akan menganalisis data dan mengaktifkan unit kawalan. Unit kawalan merupakan bahagian yang direka oleh pelajar lain dan perbincangan mengenainya tidak akan dimuatkan didalam laporan ini.

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CHAPTER I

INTRODUCTION

The main purpose of producing this document is to precisely report the development process of Intelligent Speed Limiter. This chapter includes the project introduction, objectives, problem statement, scope, methodology, and report structure of the project.

1.1 Project Introduction

Nowadays, road safety was one of the government important issues. A lot of methods were introduced by government to improved road safety such as road block, compulsory for back passenger to wear safety seat belt and speed trap. Accident happened because of many factors which are sleepy driver, speeding, lost control, and mechanical error in the vehicle. Attitude of the driver that not felt responsibility about safety on the road and other road user also cause this tragedy. Therefore, government introduced several systems that can help to arrest the illegal driver such as black box, traffic light camera and speed trap. However, all the systems not practical or not giving optimum solution to prevented the accident and improved road safety.

Referred to surveyed done by PLUS Berhad there were 33.4% accident caused by speeding. A system to prevent the accident happened is still not existed. The existed system such as black box is used as evidence of an accident, traffic light camera for captured a picture of red traffic light runner and speed trap by using speed detector to arrest illegal driver still not working to prevent an accident. The solution for this problem is to develop a system that can control the speed of the vehicle.

The idea of this project was developed a system that gave information or alert to driver about the speed limit at an area. Alert the driver about speed limit at an area is used for educate driver to obey the rule by keep remembering them with alarm. After several second, if the speed of the vehicle is still over speed limit a data of the vehicle registration will be transfer to the government department council by using GSM. The advantages of this system are driver were educated to follow the rule and a safe environment will exist. Besides, the government department council can take action on the speedy driver and always control the road user speed.

1.2 Project Objectives

The main objectives of this project are to build a prototype that can transmit and receives data at the transmission area. At the same time, it can transfer data using 351MHz in a range of 200m.

1.3 Problem Statement

Table 1.1 shows that the accident rating from year 1997 until 2007 in our country. According to the table, number of death accident is increasing year by year. Although there is an effort from government such as speed trap and camera traffic light but this problem still occurs. From survey by PLUS Express Berhad, there is 33.4% of accident cause by a driver who drove over a speed limit. Preventing an accident was not only a

government effort and responsibility, but public also must cooperate to follow the rules set by government and changed their attitude while driving. Moreover, the previous systems not prevent the accident happened such as black box. According to this surveyed and researched, the idea to solve this problem was by developed a system that can helped driver to alert them about a speed limit at an area and directly link with department council through GSM to take action on illegal driver.

Table 1.1 General Road Accident Statistics and Fatality Index in Malaysia

| Year | Vehicles Registered | Road Length (km) | Number of | | Fatality Index | | |
|------|---------------------|------------------|-----------|-------|---------------------|------------------------|-----------------|
| | | | Accidents | Death | Per 10,000 Vehicles | Per 100,000 Population | Per Billion VKT |
| 1997 | 8,550,469 | 63,382 | 215,632 | 6,302 | 7.37 | 29.1 | 33.57 |
| 1998 | 9,141,357 | 63,382 | 211,037 | 5,740 | 6.28 | 25.3 | 28.75 |
| 1999 | 9,929,951 | 64,981 | 223,166 | 5,794 | 5.83 | 25.5 | 26.79 |
| 2000 | 10,589,804 | 64,981 | 250,417 | 6,035 | 5.70 | 26.0 | 26.25 |
| 2001 | 11,302,545 | 64,981 | 265,175 | 5,849 | 5.17 | 25.1 | 23.93 |
| 2002 | 12,068,144 | 64,981 | 279,237 | 5,887 | 4.88 | 25.3 | 22.71 |
| 2003 | 12,868,934 | 71,814 | 298,651 | 6,282 | 4.88 | 25.1 | 22.77 |
| 2004 | 13,801,297 | 71,814 | 326,815 | 6,228 | 4.51 | 24.3 | 21.10 |
| 2005 | 14,816,407 | 72,400 | 328,268 | 6,200 | 4.18 | 23.7 | 19.58 |
| 2006 | 15,790,732 | 72,400 | 341,252 | 6,287 | 3.98 | 23.6 | 18.69 |
| 2007 | 16,825,150 | 72,400 | 363,314 | 6,282 | 3.73 | 22.8 | 17.60 |

1.4 Work Scope

The work scope of this project was developed a prototype of a transmitter and receiver for Intelligent Speed Limiter. First, a suitable frequency is selected for transmitter and receiver to communicate. Researched is done to gained knowledge about the transmitter and receiver circuit. After that, the circuit is designed based on desired frequency and distance. The main component was transmitter and receiver module that operated in frequency 315MHz and can communicate in a range of 300m is used. Then, the circuit is tested on the test board in order to get the required result. The last part is to fabricate of the circuit through etching process and soldered of component on PCB. The

measurement of the frequency and distance of the transmitter and receiver is done experimentally in laboratory.

1.5 Methodology

This project flow was start from July 2008 until the completion of the project in 30 April 2009. Development of project was started with background study or literature review about other system that related to road safety. This is done by find out the journal, articles and books that relate with this project. After understood all the related concepts, innovation of previous system is designed. Then, the circuit of transmitter and receiver is designed. After all the designing process is done, the circuit design is tested on test board. Simulation process cannot be done for these circuits because of there are several components were not included in the circuit software. After the test is satisfied, the circuit is fabricated. Lastly, the prototype is tested and measured in laboratory.

1.6 Report Structure

| | |
|----------------|---|
| Chap ter I: | Introduction Consists of introduction of the project, objective to build the project, problem statement that yield the idea of the project, work scope, methodologies and report structure of the project. |
|----------------|---|

| | |
|-----------------|---|
| Chap ter II: | Literature Review Background study of the overall system and comparison with existed system such as black box. The innovation of this project was explained in this chapter. |
|-----------------|---|

| | |
|------------------|---|
| Chap ter III: | Methodologies The step involved to develop this system will be explained in this |
|------------------|---|

chapter. Consists of project idea, circuit designed, circuit fabrication and circuit testing.

Chap
ter IV: Result and Discussion
 This chapter contains result analyze and discussion between
 obtained result and desired result.

Chap
ter V: Conclusion and Recommendation
 Conclusion concludes the overall project development and achievement
 encountered. Recommendations for future research and innovation of the
 project are also included.

CHAPTER II

LITERATURE REVIEW

This chapter discussed background research related to this project. The purposed of background research was to gain theory or idea that can be implemented in this project. Comparisons between other systems will also being discussed in this chapter that shows the innovation, advantage and disadvantage of Intelligent Speed Limiter. Another part was literature review discussed the transmission medium for this project.

2.1 Background Study

2.1.1 Speed Limit Signboard

National Speed Limits in Figure 2.1 was a signboard of speed limits that can be seen on Malaysian expressways, federal roads, state roads and municipal roads. Like any other countries, failed to obey the speed limit on Malaysian roads and expressways is an offence as subject to Malaysian Road Safety Act 1987, which can be fined up to RM300, depending on the differences between the speed limit and the driven speed.

Speed Limit signboard is used to give information to driver about the maximum speed at the area. However, driver always ignored the warning sign. So, from this signboard information and the problem occur a new system based on speed limit is developed to enforce the driver to follow the rule.



Figure 2.1 Speed Limit Signboard

2.1.2 RADAR/LASER Speed Detector(Speed Trap)

RADAR/ LASER speed detector as shown in Figure 2.2 is a gun used to detect the speed of vehicle by using wave reflection. The operation for both devices was similar where gun was focused to a vehicle and propagation wave produced is used to determined the speed of the vehicle

However there was an inaccuracy in measuring the speed of a vehicle because the vehicle's speed was determined from reflected waves. So, if the gun inaccurately focuses to the vehicle; other vehicle or object will influence the wave propagation that produced fault in speed reading. Other disadvantage was the system cannot be operated independently, where it must operated by a man. An automatic system is useful to reduce

man power and to have continues supervision on the road by government department council.



Figure2.2 LASER and RADAR Speed Detector.

2.1.3 Traffic Light Camera

Traffic light with camera (Figure 2.4) was a system that used to capture a picture of the driver when running their car at red traffic light. The high speed camera captures the picture automatically. However this system is suitable to be located at the junction with traffic light and need frequent maintenance.

The operation of traffic light camera is activated when the light changed from yellow to red. The camera is then triggered by any vehicle passing over the sensors. The cameras are set to detect red light runners and do not detect those who enter intersections when the signal is yellow.



Figure2.3 Traffic Light Camera

2.1.4 Black Box Event Data Recorder

Black box data recorder is a system that record information about the conditions of the vehicle such as engine speed, brake applications, throttles position, vehicle speed, safety-belt usage, air-bag readiness, air-bag performance data, and the severity of a collision. All this information is used to improved vehicle crash performance of future vehicle and driving safety. It also being used as evidence in court, the recorded data is used as a witness for victim in crash. The recorded data in a black box was being analyzed and shows whether the accident is caused by human or the mechanical failures.

2.1.4.1 Black Box System

Black box is used to investigate in determining vehicle condition before and during collision. Figure 2.4 shows the system included in Black Box. This system is under control by Electronic Control Unit (ECU). ECU will produce all data based on cooperation system. If any collision happens, all data will be saved into Electrically Erasable Programmable Read Only Memory (EEPROM). Then, after collision EEPROM is scanned to extract the saved data.

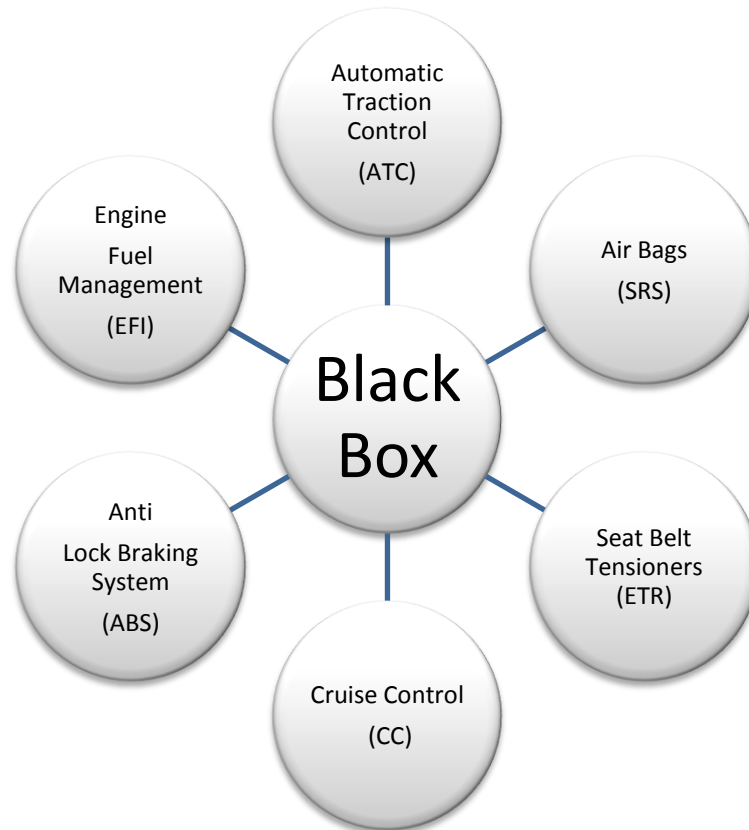


Figure 2.4 System Include in Black Box [7]

Figure 2.5 shows example of ABS system in vehicle. When accident happened in front of the car, the sensor will detect the error and start to transfer data to EEPROM. At the same time the air bag is blow up. Data is obtained using SRS scanner. Figure 2.6 shows time line of ABS system before, during and after the collision happen. It shows how the driver will be safe during the collision with ABS which include in Black Box. Figure 2.7 is another example of ECU which ETR. ETR will detect whether the driver or the passenger buckle the seat belt and save it in EEPROM. From Figure2.7A it shows that driver seat belt is unbuckled and the passenger seat belt is buckled. While, Figure2.7B it shows both driver and passenger buckled their seat belt.

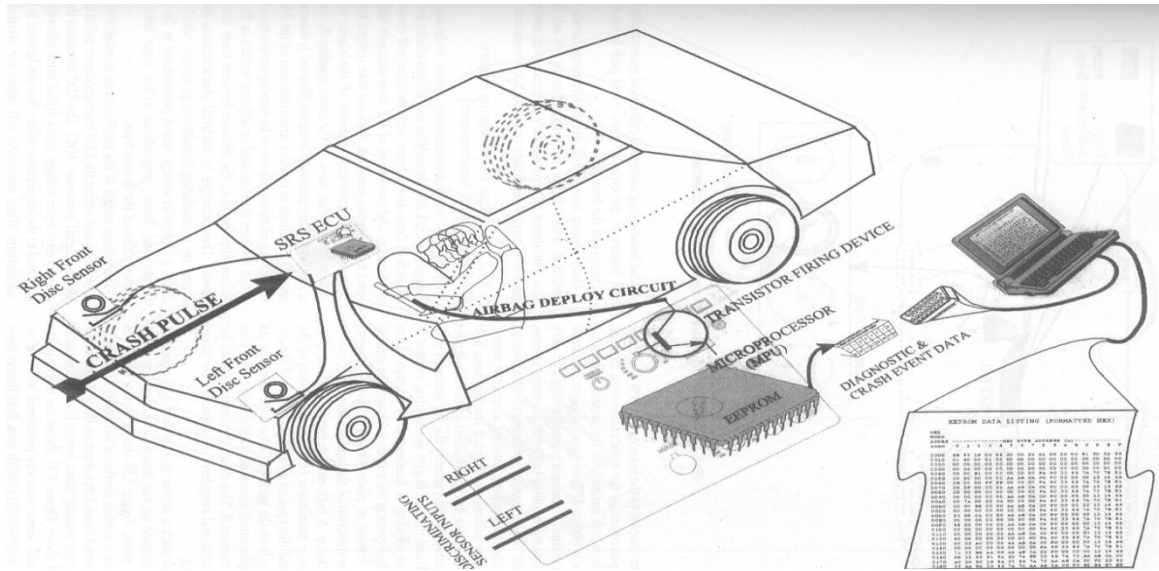


Figure 2.5 ABS Systems in Vehicle [7]

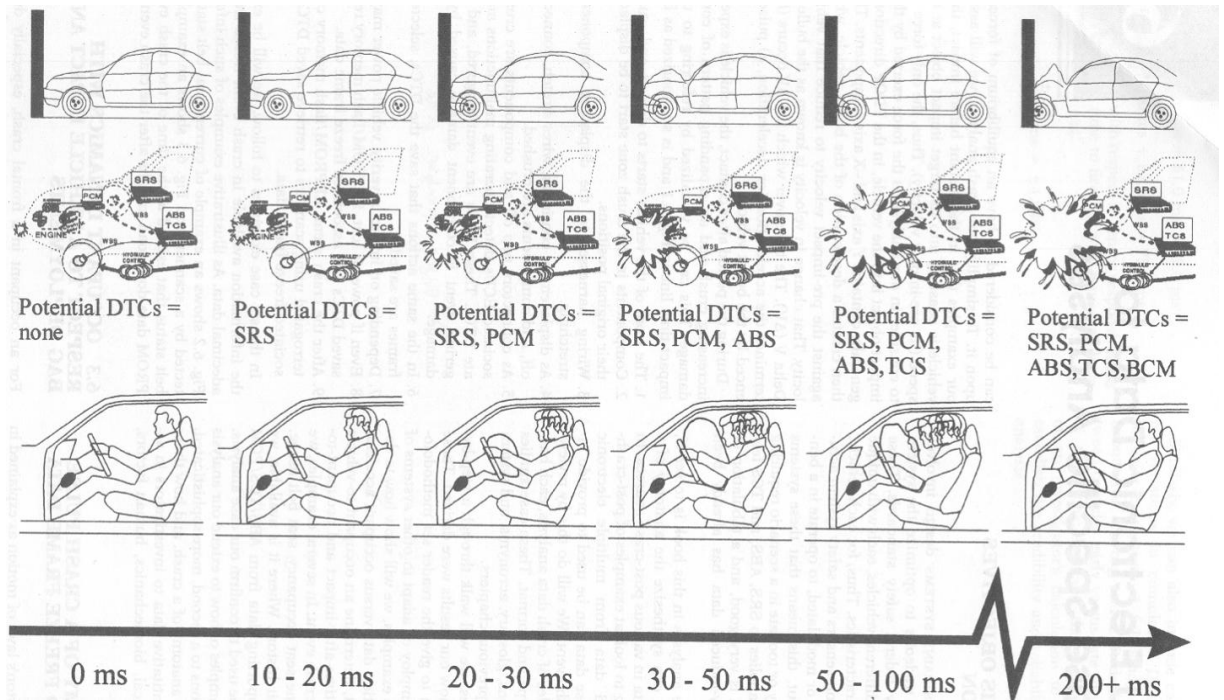


Figure 2.6 Crash Timeline [7]