

# Portable Automated Test System for Automotive Industry

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**Abstract** - The idea of this project is to design and develop a desktop simulator for VED brake systems using low cost and powerful solutions available in the market today. This simulator will be a software controlled open loop simulator which communicates with a host PC through USB. The user friendly windows compatible GUI in the host PC will allow the user to configure the simulator based on project specific requirements. The target users will be software module test engineers or software module developers. The possibility of test automation and semi-closed loop testing is also possible with the use of the application interfaces which are developed as DLLs (Dynamic Link Libraries). These interfaces will be compatible with various scripting languages such as Python, Perl, and VB Script etc. So the simulator can be flawlessly integrated with a wide variety of test environments.

**Keywords** - Vehicle Dynamics, Electronic control unit, Wheel Speed Sensor, Bus Master, Project Manager.

## I. INTRODUCTION

In the recent years the automotive segments have become sophisticated, the instrument cluster which assists the driver with information of driving condition has become more complex, so in the process of manufacturing it should be tested to ensure its proper functioning. In some automobile companies testing is performed manually, using traditional instruments. As the number of functions in the cluster increases testing becomes tedious. These days people search for ways to reduce their time and effort to do any job. Automation in testing is more efficient and reliable, and it is less prone to human errors due to negligence and fatigue. Hardware parts increase the risk of errors during the production, thus the testing of the system has to be carefully performed. For this reason, automated testing in production lines is important to reduce the risk of hardware fault. This has led to the implementation of this project.

The importance of electronics for the automotive industry is steadily increasing. Electronics and software are significant innovating factors in automotive technology. On the other hand, the amount of software and functionality is also increasing, and so is its complexity.

However, assuring the required quality of such complex systems is one of the main challenges in automotive development today. Testing plays a key role in quality

assurance. In this paper testing means executing different test cases to find failures in the system. The most common testing method for electronic control units is hardware-in-the-loop (HIL) simulation. This means that one or more ECUs (units under test) are connected to a simulation system running models of the physical environment of the ECUs such as engine, transmission, vehicle dynamics etc. in real-time. This enables entire test scenarios for the ECUs to run in a software controlled manner, e.g. in a laboratory.

Electronic control units in cars take over more and more complex tasks. Errors in the ECU's software can result in enormous costs. Therefore the aim is, to find as many errors as possible by testing. In practice dynamic testing is the mostly used analytical quality assurance method. A complete test is in practice not feasible, because of the huge number of possible test cases.

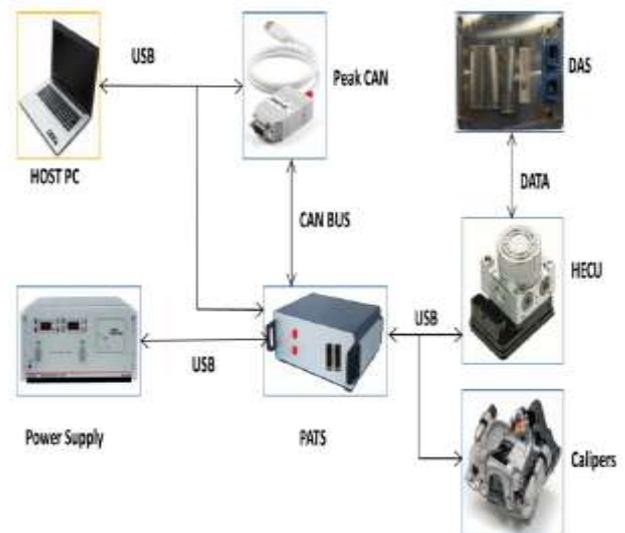


Fig-1: System Design.

## II. PROPOSED SYSTEM

A new low cost user friendly test system concept was necessary to improve the quality and efficiency at the module level testing of brake system software. So the idea of a portable low cost test system with user friendly windows based software control came up. This test system is named as PATS (Portable Automated Test System).

PATS it's a user friendly Windows based GUI developed in C#.Net to communicate with the low cost simulator hardware over a USB communication line. It uses a custom protocol to control the various modules in the simulator hardware.

### III. Implementation

#### A. Car Dashboard

Dashboard is control panel which is located in front of driver in the car it is control the vehicle operation. It's indicate about speed, fuel, control steering wheel, air conditioning and now modern days it also indicates about oil pressure, weather, lights and in dashboard LED screen are gives information of parking, So we can see the whole working and movement of vehicle and it's parts to control them.

#### B. Project Manager

PM is a part in suite which gives the information about the project details. These cards are used in PATS.

Master Card.

- Wheel Speed Card
- Switches Card
- Digital Card
- Analog Card

Master Car used for control the power and ignition, Wheel speed card user for generates the four wheel signals, which sends the ECU and display in car dashboard. CAN protocol used to communicate electronic device and PC.

#### C. Test Manager

All the maneuvers for testing functionalities of EBS system are stored in a common location. Test manager help loads these maneuver one after other automatically which helps achieving automation in PATS tool. Maneuvers contain information about what needs to be performed in testing. For example if activation of ABS needs to tested then maneuvers steps will be

- Switch on KL30v supply and IGN supply
- Initialize parameters like vehicle acceleration, start velocity, throttle flap angle etc.
- Call the interface start\_driver () which starts the vehicle.
- Call the interface brake apply() when velocity reaches maximum.

Activation of ABS can be verified from DAS measurement, where variable for ABS activation will be seen set.

#### D. Open Loop Simulation

In automation environment all the test cases will be loaded by test manager and in the middle of execution to update/change any parameter will be not possible. Open loop simulation is the solution for above scenario.

Apart from the above case it can also be used for failure insertion while vehicle is driving, parameter configuration and to set initial values for Bus signals.

#### D. Bus Master

Bus Simulation in testing environment only the ecu under test will be present and all the connected ecu's are simulated .since communication between ecu happens over bus all the signals received by ecu under test are simulated. This process is called rest bus simulation.

Bus Configuration steps.

- User creating new configuration file into ".cfx" file or the last loaded configuration file will be loaded automatically when the tool is run for the next session.
- If the configuration file is not found then, the application will load the default configuration settings and the status of the loaded configuration filename will be shown on the status bar.
- The configuration file will be displayed on the top of MRU configuration file list.

### IV. EXPERIMENTAL RESULTS AND SCREENSHOTS



**Fig-2:** Shows the PATS Software Suite V1.0

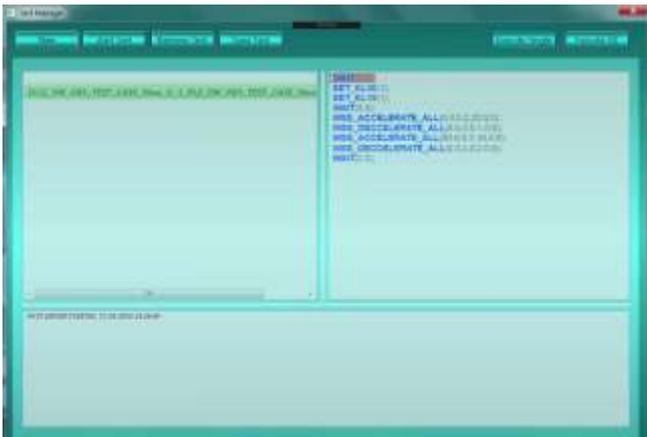
Click on Dash Board it automatically loaded and Display on window. The Figure-3 shows the Car Dashboard which is used to control PATS tool. Here its display on Battery condition, Fuel Gauge, Speedometer and different warning lamp switch.

Instrument Clusters provide basic driving information like speedometer, tachometer, temperature fuel, battery, and warnings. Additional information is presented via display, e.g. on-board computer, internet, navigation, rear or front view wheel speed sensor signals and driver assistance systems information.



**Fig- 3: Car Dashboard**

The Fig-4 shows Test Manager Details. On click of new tab select project script once select project Test Case gets loaded with the Datalyser then on click of execute all. It automatically runs the Test Cases and data will be loaded into open loop simulator.



**Fig-4: Test Manager**

## V. CONCLUSION

Main reason is to check whether installed embedded software code is working as per test cases on ECU by PATS system. PATS GUI Software is used to handle PATS hardware systems. PATS is remote enabled device from anywhere in the same network anybody can remotely do the testing by connecting using Microsoft telnet software.

## VI. REFERENCES

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