International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 4, Issue 10, October-2018

ANALYSIS OF DETECTING THE DIAGNOSTIC TROUBLE CODES IN AUTOMOBILES BY USING DIAGNOSIS SCAN TOOLS

G.Satish[1], C.Chandrasekhar Reddy[2], Dr.V.Venugopal Reddy[3]

[1]*Mechanical department, JNTUACEP*
[2]*Mechanical department, JNTUACEP*
[3]*Department of Mechanical Engineering, JNTUACEP*

Abstract— In today's fast growing world, the automobile sector is growing rapidly over the decades. Now a day's all the cars are computerized electronic cars. The vehicle should suddenly breakdown the roadside; the electronic components are shown the fault DTC's (Diagnostic Trouble Codes) in the car dashboard. These DTC's will help the technician to understand the fault and easily diagnose with the help of vehicle diagnosis programming scan tools. When a faults occurs in a vehicle for every time to take the vehicles to go nearest workshops, it is very difficult and most expensive process. Generally the mechanics can charge more money (lack of awareness) to each DTC codes separately for the troubleshooting of the faults. In some cases one DTC troubleshoot can diagnose the group DTC's. So, we can buy a normal scanner for detecting the simple DTC's in a vehicle and to eliminate the un-necessary replacement of the spare parts. In this paper provides some group DTC's analysis working examples and also gives a better knowledge about the scanning and diagnosis. So, finally this project will help to reduce the cost and time factor of the faults in a vehicle with the help of OBD-II (ON-BOARD DIAGNOSIS-II).

Keywords— OBD-II, Diagnosis scan tools, DLC connectors, CAN network, ECU's, Sensors, DTC's.

I. INTRODUCTION

Automobile sector is bond to develop according to the changes primarily focusing particularly on eco-friendliness, safety and comfort. The recognition of the fault in a vehicle and it is solved by using different diagnostic scan tools. This process is called "Vehicle diagnosis". Generally two types of vehicle diagnosis processes used in present automobiles. They are on-board diagnosis and off-board diagnosis. The new standard introduced in automobiles which provides a complete information about engine, chassis, body and other necessary components with the help of electronic components (such as CAN network, ECU's and Sensors) and diagnosis scan tools. When the vehicle emissions increased 1.5 times the legislated levels, it indicates "check engine lamp" on car dashboard. The driver has to report to a workshop, where the technician can plug in a scanner and pull out the DTC's from the ECU memory and do corrective action as required. This process is called "ON-BOARD DIAGNOSIS". However, the identification of the exact nature of the fault is done through the equipment like scanners and analysers etc.., even the shape of the sensor outputs can be viewed in a graphical form for better understanding. This process is called "OFF-BOARD DIAGNOSIS". These processes can keep a vehicle in good condition to avoid the accidents. Vehicle diagnosis is strictly focusing on performance, efficiency and emissions of the vehicle.

II. LITERATURE SURVEY

[1]. From "Development of engine fault diagnostic system" Hwa-seon Kim, Seong-jin jang and Jong-wook jang from Dong Eui University, Republic of Korea. It is pragmatic that to executed a mobile based OBD-II diagnostic system for the industrial CRDI (Common Rail Direct Fuel Injection) engine. This system can detect the engine parameters and subsistence of malfunctions with the assist of Bluetooth communication amid the ECU's using OBD-II protocol. Technicians may also check the engine condition before working. But it sometimes create a additional malfunctions in the system and also not appropriate for all the areas to giving a superior monitoring results.

[2]. From "OBD-II system for vehicles" D.Nandhini, R.Nandhini, M.Nandhini and R.Vidhya we understood that on-board diagnostics plays a crucial role in the generation of all new model cars. In this paper they are advises the improvement of on-board diagnostic system in vehicles using wireless sensor network by using Zigbee. This OBD system equipped with a ARDUINO board which consists of a ATMEGA microcontroller which acts as a processing unit where the program using ARDUINO software. The sensors are positioned at various parts on the vehicle to sense different parameters in vehicle like as Fuel level, Coolant temperature, Voltages are sensed. This system senses limited parameters of the vehicle. So we can go for sensed more parameters it is not possible.

III. PROBLEM STATEMENT

In olden days all the vehicles are equipped with a large amount of electrical circuits. If suddenly the vehicle should be breakdown on the roadside, the driver has to report the closest workshop. The mechanic facing a problem to identify the fault and also he can take too much time to solving the fault. It is most difficult and expensive (cost) process.

IV. PROBLEM SOLUTION

Now a day's all the cars are computerized electronic cars, if any problem occurred in the vehicle. The electronic components are shown the fault DTC on car dashboard and diagnosis process also simple with the help of vehicle diagnosis programming scan tools. This OBD-II system can reduce cost and time of the vehicle faults.

V. EXISTED PROJECT

OBD-II system was originally developed by SAE (U.S. Society of Automotive Engineers), EPA (Environment Protection Agency) and CARB (California Air Resources Board) in 1996. In U.S.A after 1996 majority of the automobiles were introduced with this system. It has become a standard for all the vehicles. This system monitors various parameters of the vehicle and store information in its memory. Whenever a fault happens in the vehicle, the system senses it and notifies the user of warnings a MIL (Malfunction Indication Lamp). A handheld scan tool can be connected to DLC (Data link Connector) which communicates with the OBD-II system, then resulting to indicate a DTC on screen. It will help a technician to identify the faults. OBD scanner is a expensive device and it is owned by workshop owners.

VI. PROPOSED PROJECT

Vehicle diagnosis scan tools are pulled out the DTC's in a vehicle with the help of diagnosis scan tools. These scan tools are heavier cost and it is owned by workshop owners. So, the normal drivers can't buy the scan tools and also don't know about the DTC's (lack of awareness) in a vehicle. This proposed project provides detailed information about the DTC's and diagnosis process. It will also provide a repeated DTC's list and group DTC's troubleshooting examples.

VII. DIAGNOSIS PROCESS

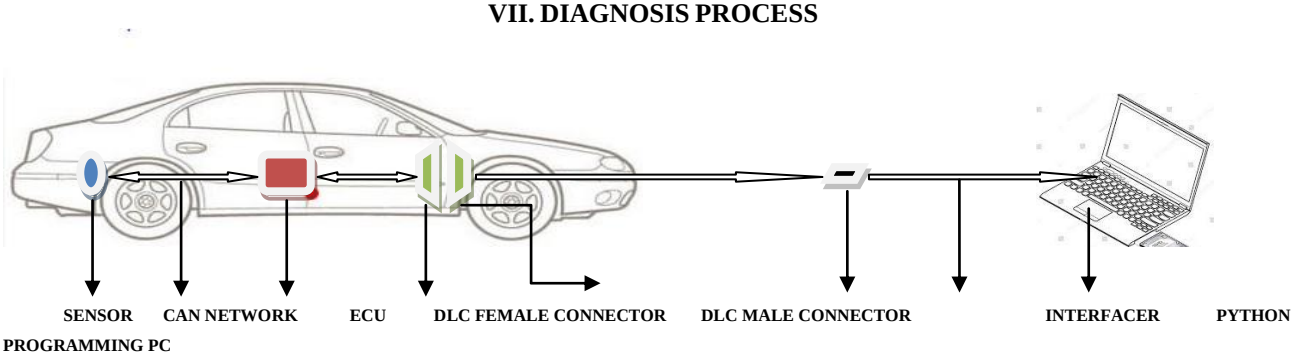


Figure1. Diagnosis process overview

When a MIL indicated on car dashboard then go to diagnosis process. This will helps to detect and diagnose the faults.

1). Check the battery is good condition or not (12.50 volts)
2). Ignition ON. To prepare a diagnosis scan tools. When a DLC male connector connected to the DLC female connector the entire vehicle information is available in the DLC.
3). The ECU receives this information from the DLC to check either the sensor (mounted on any component) is properly working or not.
4). If any fault occurred in the components the sensors sends the signal to the ECU. It can also send this information to DLC, with the help of electronic components. Through the python hardware scan tool can detect the DTC on your PC.
5).This DTC will help the technician for better troubleshooting of the faults. These diagnostic tests can keep a vehicle in good condition. The diagnosis process requirements are PC, python cables, interface, DLC connectors, ECU, Sensors, Can network and diagnosis scan tools.

CAN NETWORK

CAN network is formerly developed in 1983 at Robert Bosch. CAN communication is a serial data communication and multiplex communication with high speed. All the nodes (ECU's and sensors) which are in the CAN network to transmit and receive huge quantities of data at high speed. When more and more electronic devices were implemented into modern vehicles to progress the behaviour of the vehicles even further to utilize CAN network. CAN is a message based protocol. It was initially developed for automobiles for sinking the point to point wiring connections. But now also used in other areas.

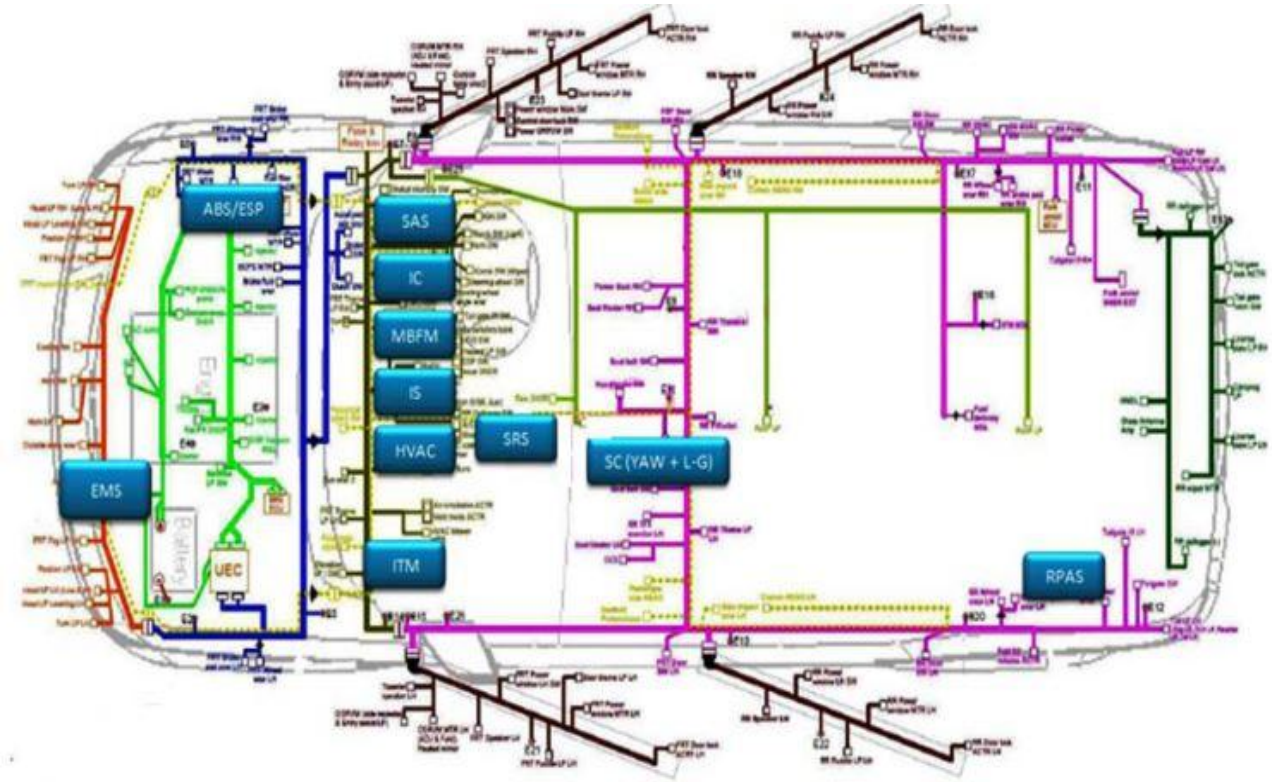


Figure2. CAN network overview

SENSORS

A sensor is a device which determines a physical quantity and transfers it into a signal can be read by an viewer or by an instrument. Sensor can play a crucial role in the vehicle diagnosis. It will need 3volts to 5volts supply for operating the system.

MAIN SENSORS USED IN VEHICLES**:**

I INTAKE SYSTEM.
1. Air monitoring.

i). HFM/IAT sensor.
ii). MAP sensor.
iii). Boost pressure sensor.

2. Fuel monitoring.
i). Water in Fuel level sensor.
ii). Fuel temperature sensor.
iii). Rail pressure sensor.

II ENGINE MANAGEMENT SYSTEM.
1. Crankshaft position sensor.
2. Camshaft position sensor.
3. Engine coolant temperature sensor.
4. Knock sensor.

III EMISSION SYSTEM.
1. Lambda sensor (O2 sensor).

IV OTHER SYSTEMS.
1. Accelerator pedal position sensor.
2. Brake switch sensor.
3. Clutch pedal sensor.

Figure3. Different types of sensors

***HFM/IAT SENSOR** (Hot Film Air Mass Meter/Intake Air Temperature Sensor)**:** This sensor is utilizes to find out the mass flow rate of air entering fuel-injected internal combustion engine. The air mass information is essential for the engine control unit (ECU) to steadiness and distributes the exact fuel mass to the engine.

***MAP SENSOR** (Manifold Air Pressure Sensor)**:** The MAP sensor changes engine manifold pressure to an electrical signal so the computer identifies how much load the engine is under. This data is the basis for fuel release and timing control. It is usually placed in the air cleaner, fender wall, firewall, intake manifold or under the dash.

***BOOST PRESSURE SENSOR:** It controls the boost level created in the intake manifold of a turbocharged or supercharged engine. They influence the pressure delivered to the pneumatic and mechanical actuator.

***WATER IN FUEL LEVEL SENSOR:** This sensor shows the presence of water in the fuel. It is mounted in the fuel filter and when the water level in the water separator arrives at the warning level, the WIF transmits an electrical signal to the ECU.

***FUEL TEMPERATURE SENSOR:** It employs a thermostat variable voltage to the ECU which is converts into a temperature reading by the ECU. Suppose the fuel temperature sensor senses a rise in temperature of the fuel. That the hot fuel has become less dense.
***RAIL PRESSURE SENSOR:** This sensor value is utilized by the ECM to manage the fuel-pump rotational speed and injection. It calculates the fuel pressure at the injectors. Here are the facts about the fuel rail pressure sensor.
***CRANKSHAFT POSITION SENSOR:** The crankshaft position sensor (CKP sensor or CPS) is one of numerous sensors that maintain your engine running efficiently. The ECU uses that information, along with inputs from other sensors, to manage systems like ignition timing and fuel injection.
***CAMSHAFT POSITION SENSOR:** The CAM sensor or camshaft position sensor's role is to signal the ECM the camshaft position. The crank and cam sensors work in sync with each other. The CAM sensor is mainly used to resolve which injector to fire in a sequential system and for COP or coil on-plug ignition systems coil firing event.
***ENGINE COOLANT TEMPERATURE SENSOR:** This sensor is confined to the engine of a vehicle. This device determines the temperature of the vehicle's engine coolant. The ECU then reacts to adjust in the temperature variation and read immediately the engines fuel injection.
***LAMBDA SENSOR (O2):** The precise control necessary to control this system is provided by the use of an exhaust gas oxygen (Lambda) sensor installed upstream of the catalyst. A Lambda sensor has the capacity to accurately determine the air/fuel ratio present in exhaust gases.

ECU (ELECTRONIC CONTROL UNIT)

ECU is an embedded electronic device, essentially a digital computer. It understands signals coming from the sensors located at different components of the car, using this information to control various units of the car. ECU is a closed-loop control system. ECU sends the entire information to the DLC connector in the vehicle.

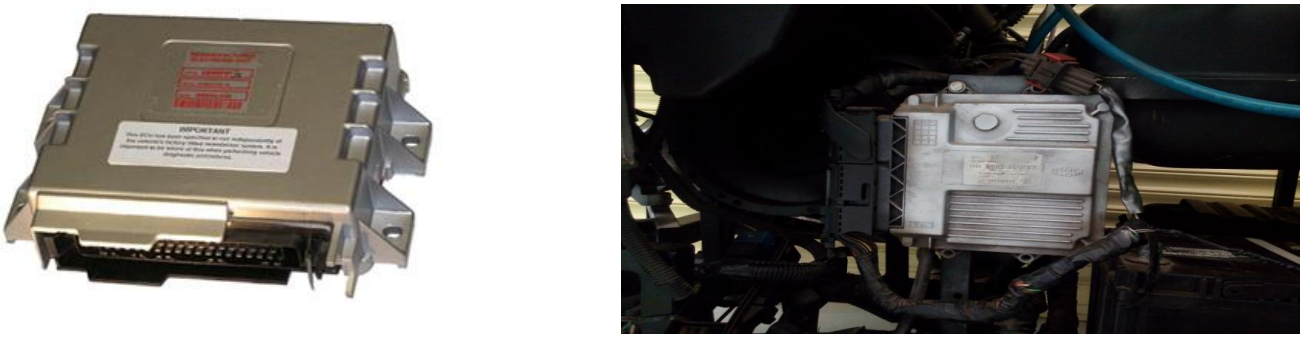


Figure4. Electronic Control Unit in vehicle.

DATA LINK CONNECTOR (OBD-II DLC)

This 16 pin OBD-2 port is current in vehicle; position of this port is varying from one vehicle to another. By connecting to this OBD-II port, the diagnosis scan tool is corresponds with vehicle's ECU (Engine Control Unit). After communicating with ECU, it reads the all error codes in ECU. These error codes are called as DTC (Diagnostic Trouble Code).

PIN	FUNCTION	PIN	FUNCTION
1	Manufacturer's discretion	9	Manufacturer's discretion
2	Bus+ Line, SAE J1850	10	Bus- Line, SAE J1850
3	Manufacturer's discretion	11	Manufacturer's discretion
4	Chassis ground	12	Manufacturer's discretion
5	Signal ground	13	Manufacturer's discretion
6	2002–earlier: Manufacturer's discretion 2003–later: ISO 15765-4 CAN	14	2002–earlier: Manufacturer's discretion 2003–later: ISO 15765-4 CAN
7	K-line, ISO 9141	15	L-line, ISO 9141
8	Manufacturer's discretion	16	Vehicle battery positive

Figure5. DLC location in a car

DIAGNOSTIC TROUBLE CODE (DTC)

Before OBD-II, each manufacturer had their own definite trouble code list and code descriptions. Under the OBDII requirements, all the manufacturers must conform with standardized rules for DTC's. The universal DTC format consists

of a 5-character alphanumeric code, consisting of a single letter character followed by four numbers. These DTC's will help the technician to identify the fault in the fault in the system, when he tries to diagnose and solve the errors.

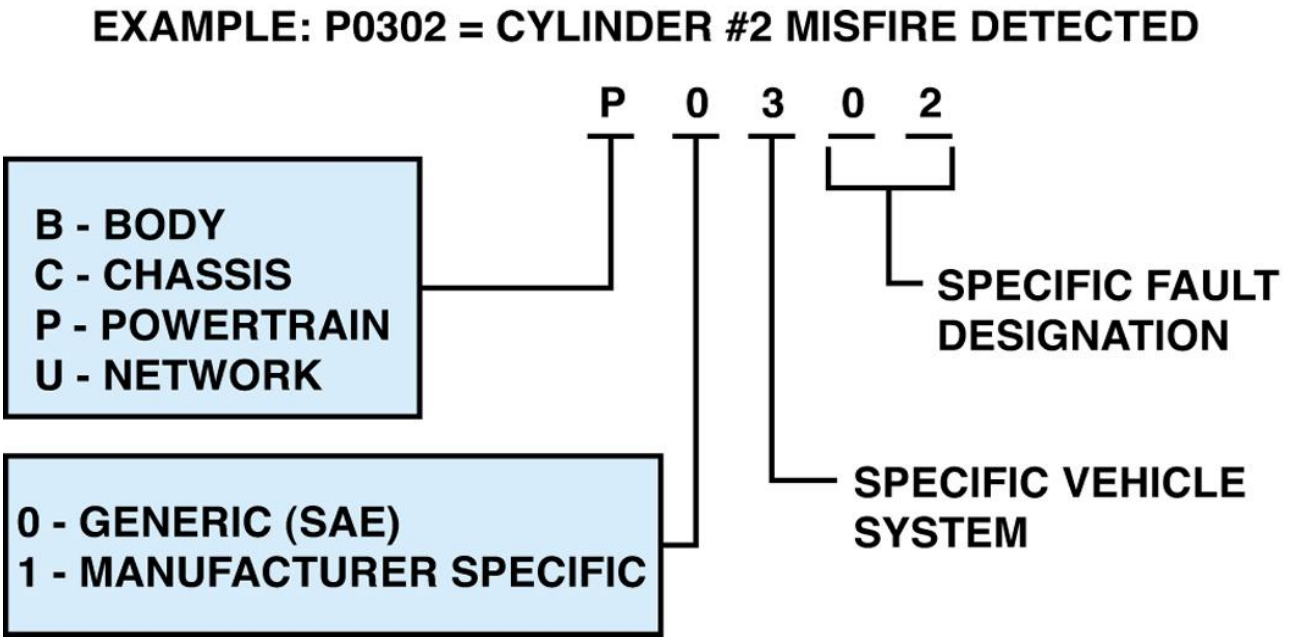


Figure6. DTC code description

VIII. DIAGNOSIS SCAN TOOLS

An automotive diagnostic scan tool is used to interface and diagnose the vehicle. This scan tools can plays a vital role in the vehicle diagnosis DTC analysis. By using this scan tools we can easily pulled-out the DTC's in a vehicle. Each manufacturer had their-own diagnosis scan tools. A feature of diagnosis scan tools depends on the makers and its versions. Different scan tools were studied in this project in order to get most effective performance in economical prices.

Figure7. OBD-II diagnostic scan tool

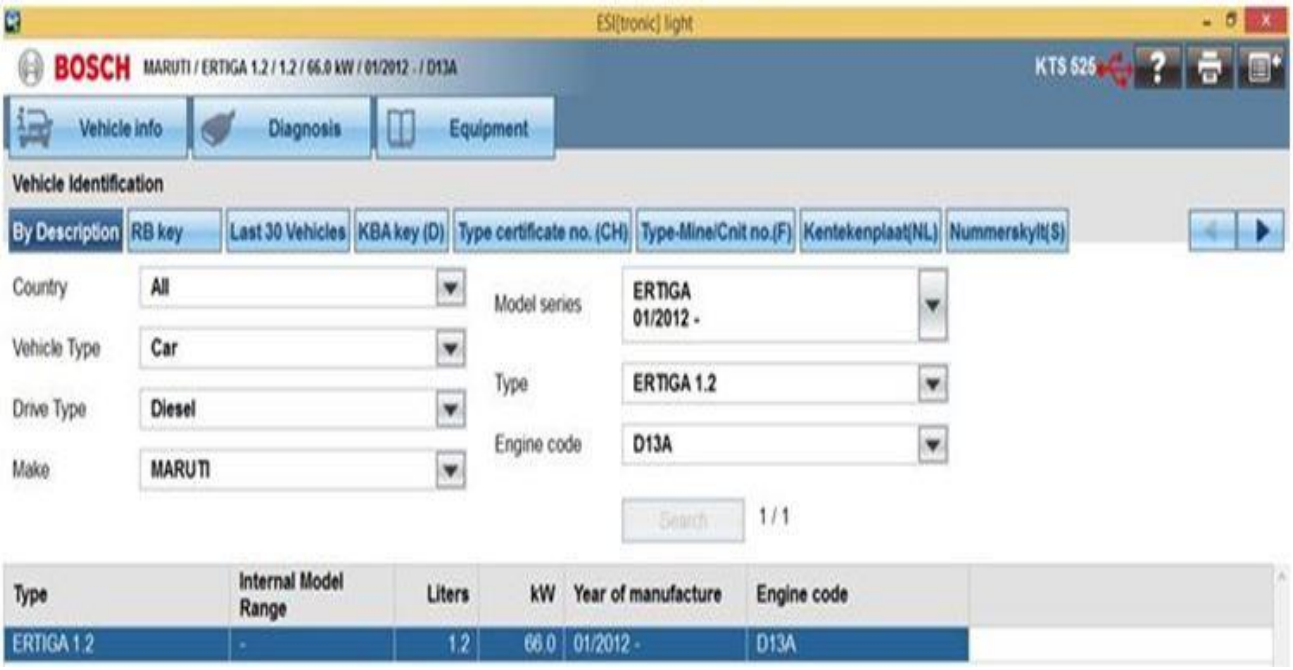
Different types of scan tools used to detecting the errors. At BOSCH automotive diagnostic centres several types of scan tools available such as KTS-510, KTS-520, KTS-570, KTS-590 and Scan master ELM-327. Among these all variants KTS-590 is the advanced version and it has number of upgrade features like actuators testing, immobilizer unlocking and control various units through the KTS-590. In this analysis KTS-525 is used to scan and detecting the errors in a vehicles. The working process of KTS-525 is given below.

After connecting the scan tool in vehicle OBD-II port, after switching on the ignition key of the vehicle and connect the scan tool to the PC through Wi-Fi or Bluetooth communication. Selecting the required software icons a window appears like shown below.

By clicking on the icon KTS-525 ESI (tronic) 2.O is opened and some options are appeared.

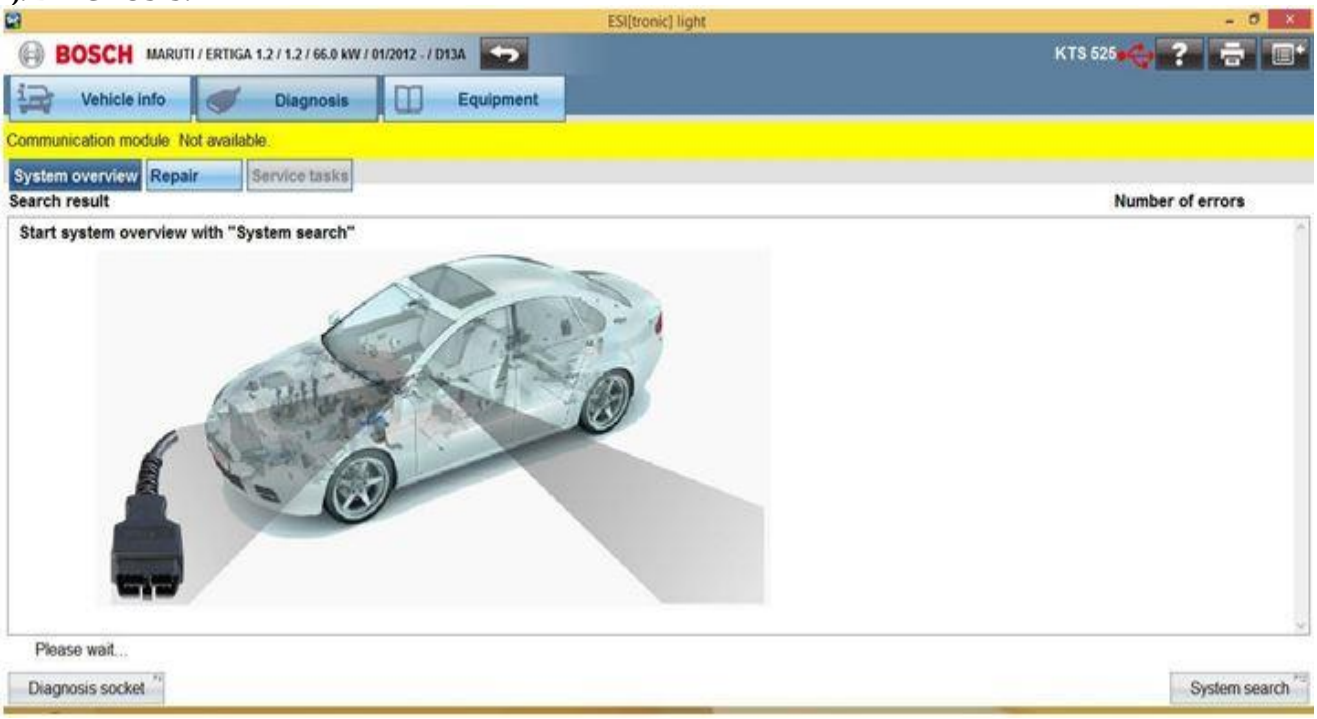
1). Vehicle Information.
2). Diagnosis.
3). Equipment.

1). VEHICLE INFORMATION:



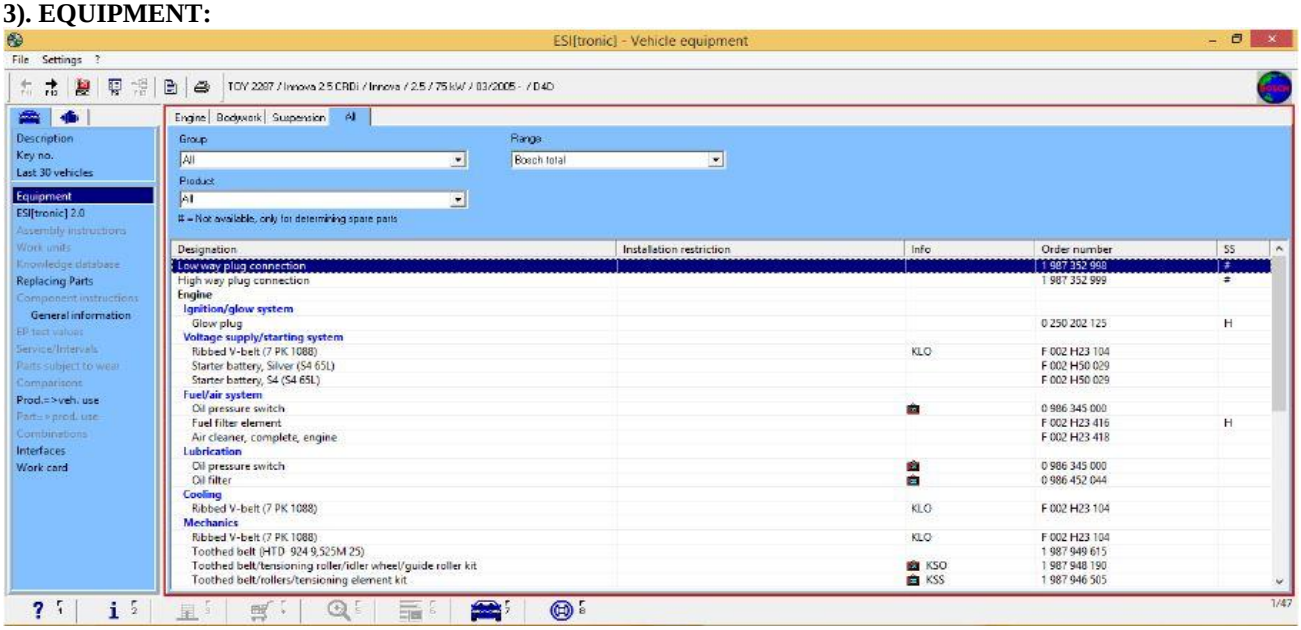
The vehicle identification or information takes 8 ways as follows.
i). By Description.
ii). RB key.
iii). Last 30 vehicles.
iv). KBA key [D].
v). Type certificate no [CH].
vi). Type mine/cnitno [F].
vii). Kentekeplaat [NL].
viii). Nummerskylt [S].

2). DIAGNOSIS:



In Diagnosis option also again three sub options as follows.
i). System overview.
ii). Repair.
iii). Service tasks.

3). EQUIPMENT:



All the vehcile monitoring functions are appeared in the equipment window such as engine system, fuel/air system, lubrication, cooling, ignition and various systems.

The above processes are will facilitate to find the vehicles faults and diagnosis procedure. When a "Malfunction Indication Lamp (MIL)" shown on the vehicle dashboard, then go to vehicle daignosis process. Some various types of warning symbols are shown below:

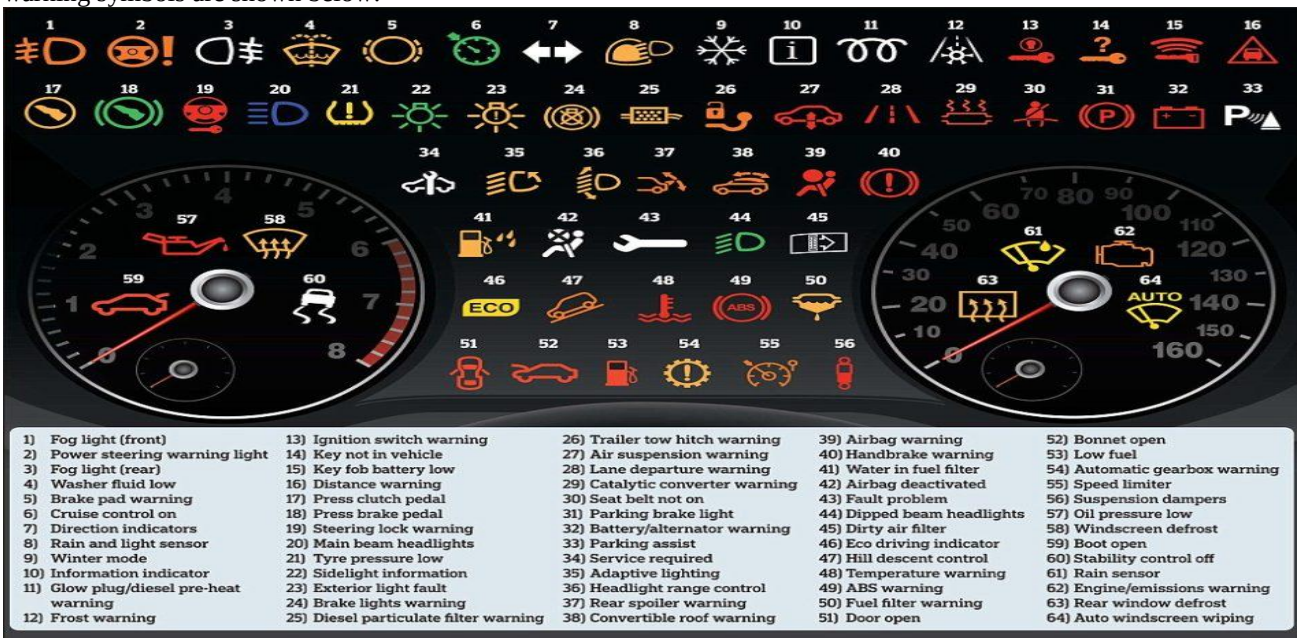
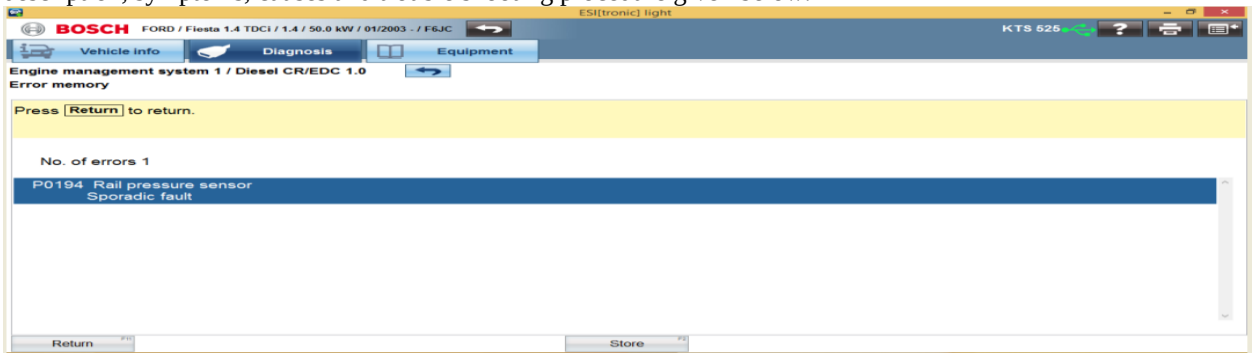


Figure8. Warning symbols on car dashboard

IX. DTC'S WORKING EXAMPLES

Bosch KTS-525 used to testing various vehicles DTC's. whatever the codes occurred in a vehicle, a few codes description, symptoms, causes and trouble shooting procedure given below.



P0194: Rail pressure sensor sporadic fault

DECSRIPTION: The engine control module (PCM) uses a fuel rail pressure sensor to know how much pressure is going to the fuel injectors. This is so the PCM can effectively control the amount of fuel going through the fuel injectors to maintain desired power and fuel efficiency. If the PCm detects an erratic signal from the fuel pressure sensor, it will set the code P0194.

SYMPTOMS:

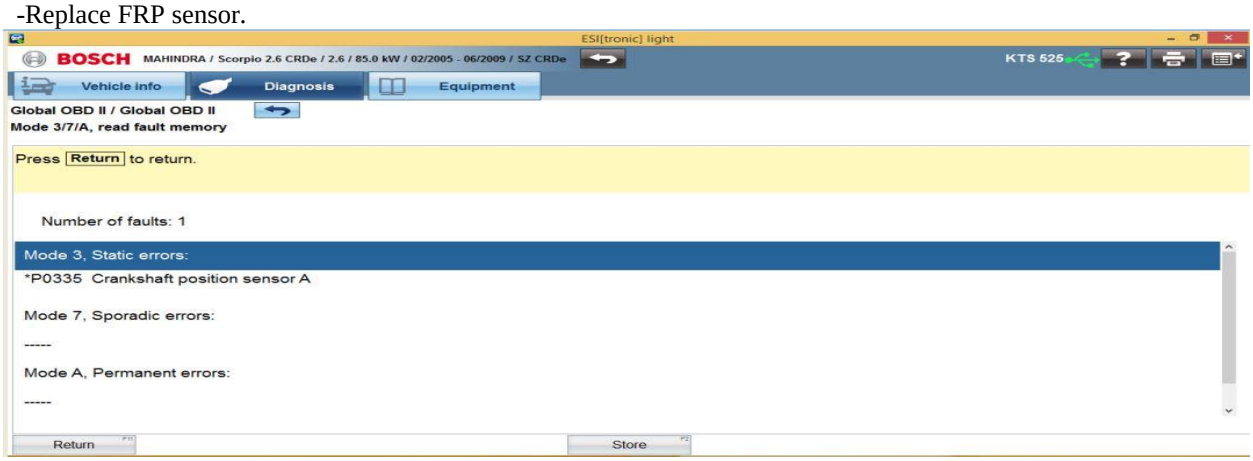
-Hesitation and surging.
-Check engine light and hard cold start.

CAUSES:

-Fuel pressure sensor and fuel pressure regulator.
-Harness issues ususally where the harness enters the valve cover.
-A faulty PCM.

TROUBLE SHOOTING:

-Checking of the fuel level and refilling the tank if necessary.
-Repair or replace corroded connectors or wirings.
-Repair or replace broken or shorted wires.
-Replace clogged fuel filter or fuel pump or fuse or relay.
-Replace FRP sensor.



P0335: Crankshaft position sensor circuit A malfunction.

DESCRIPTION: P0335 is a OBD-II generic trouble code DTC indicating a malfunction in the crankshaft position circuit.

SYMPTOMS:

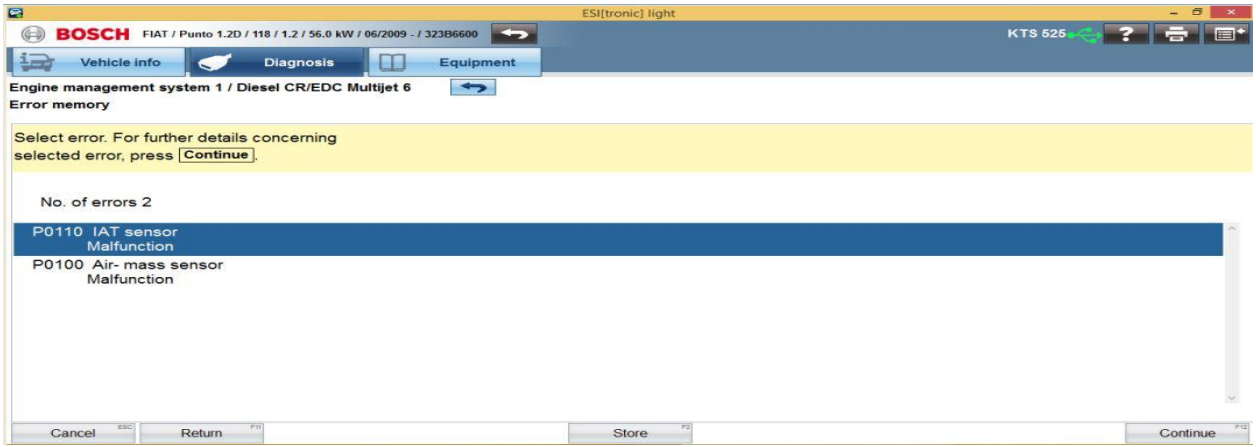
-Vehicle may not start.
-Vehcile may run roughly or misfire.
-MIL illumination.

CAUSES:

-Open or short in the wiring harness and faulty PCM.
-Poor electrical connnections and damaged signal plate.
-Crankshaft position sensor failure and broken timing belt or chain.

TROUBLE SHOOTING:

A mechanic will begin by using a scan tool to check for any codes stored in the PCM. There may be current, history, and pending codes found, and all must be looked at along with the freeze frame data. Codes will then be cleared and a road test performed to try to duplicate the symptoms. After, a visual inspection will be done of the crankshaft position sensor and its wiring. The scan tool will be used to monitor the crankshaft position sensor readings and RPM signal. If both of those are within range, then the wiring will need to be tested. Lastly, the PCM will be tested under manufacturer specific testing procedures.



P0110: IAT sensor malfunction.

DESCRIPTION:
P0110 is a general code for a problem with the Intake Air Temperature (IAT) electrical circuit sensor sending the incorrect voltage input signals to the ECU. This means the voltage input to the ECu is incorrect, which then means that it is not in the correct range and causes the ECU to incorrectly manage the fuel system.
SYMPTOMS:
-Check engine light will illuminate.
-In a few cases, the engine may be hard starting or get poor fuel economy.
-Poor engine performance on acceleration.
CAUSES:
-IAT sensor shifted out ofairflow.
-Bad IAT sensor and PCM.
-Shorted to ground or open on signal circuit to IAT.
-Poor connection at IAT sensor.
TROUBLE SHOOTING:
-Verifying there is 5 volts input to the IAT sensor or not.
-The technician must check the wiring and connectors of the circuit.
-Check the IAT sensor and ECU if any short or ground.
-To check all the terminals os the battery.
-If all the connections are ok, then it will needs a replacement of IAT sensor or ECU.

P0100: Air-mass sensor malfunction.
DESCRIPTION:
The mass airflow sensor (MAF) indicates the amount of air entering the engine. This is imporatant information that the ECM needs to calculate the proper amunt of fuel quantity and ignition timing. The P0100 trouble code is set when the ECM senses a troubles in the electrical circuit between the ECM and the MAF sensor. When the data output from this critical sensor becomes erratic or disappers.
SYMPTOMS:
-Inconsistent idle.
-Poor engine performance, rough running.
-Stall or hesitate upon acceleration.
-Poor fuel mileage.
-Excessive smoke.
CAUSES:
-Defective or damaged MAF sensor.
-Corroded or loose electrical terminals in MAF sensor circuit.
TROUBLE SHOOOTING:
The simplest fix for this error code is to reset the code and see if it comes back in your test drive. From there, you can start with the easy repairs. The most common repairs for this error code are as follows.Check all the electrical connector s and wirings to the MAF sensor and make sure everything is attached to their designed ports. Then, disconnect and reconnect connector to refresh electrical connection of the MAF wiring harness. Repair any broken or frayed wirings on the connector. Check MAF sensor voltage. Refer to the vehicle's manual for specific information. Replace the MAF sensor.

X. FREQUENTLY OCCURED DTC'S IN AUTOMOBILES

Different types of diagnostic scan tools used to find a various trouble codes in vehicles. These codes are useful to the technician to easily identify the repeated faults in a vehicle. The frequently occurred codes or getting DTC's in different vehicles are listed below.
P0110 – IAT sensor malfunction.
P0100 – Air-mass sensor malfunction.
P2138 – Throttle-valve/pedal position sensor D/E voltage correlation.
P2122 – Throttle-valve/pedal position sensor D signal too small.
P0538 – Air conditioner evaporator temperature sensor signal too large.
P0686 – main relay short to earth.
P2264 – Fuel water content sensor open circuit/short circuit.
P0193 – Rail pressure sensor signal too large.
P0642 – Reference voltage (sensor 1) signal too low.
P0194 – Rail pressure sensor sporadic fault.
P0683 – Glow duration control outside specified range.
P0335 – crankshaft position sensor A circuit malfunction.
P0401 – Exhaust gas re-circulation amount insufficient.
P0603 – Control unit, memory management internal fault.
P2282 – Leaking air between throttle valve control unit and inlet valve.
P0504 – Brake pedal signal information not plausible.
P0562 – System power supply too low.

P0685 – Main relay open/short, or pius or earth short.
P0336 – Crankshaft position sensor outside specified range.
C1207 – Wheel speed sensor rear LH range/performance/intermittent.
P0236 – Turbocharge/supercharger boost sensor circuit range/performance.
P0351 – Ignition coil A primary /secondary circuit.
P0091 – Fuel pressure regulator control circuit low.
P0118 – Engine coolant temperature sensor circuit high.
P0113 – Intake air temperature sensor circuit high.
P0123 – Throttle/pedal position sensor/switch A circuit high.
U0121 – Lost communication with ABS/ESP control module.
P0230 – Fuel pump primary circuit.
P0135 – O2 sensor heater circuit.
P0645 – A/C clutch relay control circuit.
P0089 – Fuel pressure regulator performance.
P0444 – Evaporative emission system purge control valve circuit open.
P2238 – O2 sensor positive current control circuit low.
P0108 – Manifold absolute pressure circuit high input.
B2799 – Engine immobiliser system.
C0210 – Rear speed sensor RH circuit.
C0215 – Rear speed sensor LH circuit.
C1241 – Low battery psitive voltage .
P2176 – Throttle actuator control system.
P3497 – Cylinder deactivation system.
P0405 – Exhaust gas recirculation Sensor A circuit low.
P0103 – Mass or volume Air flow A circuit high.
P0089 – Fuel pressure regulator control circuit low.
P0002 – Fuel volume regulator control circuit range/performance.
P0102 – Signal range check of airmass voltage below lower limit.
P0328 – Knock sensor circuit high.
P0122 – Signal range check for APP pedal sensor below minimum limit.
P0371 – Crankshaft teeth too close.
P0341 – Camshaft sensor signal error.
P0117 – Signal range check for coolant temperature sensor below minimum limit.
U1201 – CAN bus off error.

XI. ANALYSIS OF GROUP DTC'S

Generally the technicians can charge each DTC code separately from the customers. In some cases a group code to be deleted the probable error code generation. A few vehicles group DTC's analysis list is given below.

PROBABLE ERROR CODE GENERATED ANALYSIS	GROUP CODE TO BE DELETED ANALYSIS
P2269-Water in fuel condition is detected. P2266-WIF sensor short or ground. P2264-WIF sensor open circuit/short to bettery.	P2266 – WIF sensor short or ground.
P0340-No camshaft signal. P0341-Wrong camshaft signal.	P0341 – Wrong camshaft signal.
C1207-WSS rear LH range/performance/intermittent. C1208-WSS rear LH invalid/nosignal.	C1207 – Wheel speed sensor no signal.
P0236-Turbo/supercharger boost sensor circuit range. P0238-TC/SC boost sensor A circuit high.	P0236 – Boost sensor circuit range/performance.
P0351-Ignition coil A primary/secondary circuit. P0352-Ignition coil B primary/secondary circuit.	P0352 – Ignition coil primary/secondary circuit range.

P0089-FPR regulator performance. P0091-FPR control circuit low.	P0089 – Fuel pressure regulator circuit performance
P0222-ISC motor position sensor circuit low voltage. P2119-ISC system performance.	P2119 – Idle speed control system performance.
P0113-IAT sensor circuit high input. P0114-IAT sensor intermittent failure.	P0113 – Intake air temperature sensor circuit high input.
C1111-Main torque sensor malfunction. C1113-Main torque sensor signal not identical.	C1111 – Main torque sensor malfunction.
C1141-Monitoring voltage system malfunction. C1142-Monitoring current system malfunction.	C1142 – Monitoring current system malfunction.
U0151-Lost communication with inflatable restraint sensing and diagnostic module. U0155-Lost communication with instrument cluster.	U 0155 – Lost communication with instrument cluster.
P1505-Idle speed control actuator circuit-1 low. P1507-Idle speed control actuator circuit-2 low.	P1505 – Idle speed control actuator circuit low range.
P0117-Engine coolant temperature circuit low. P0118-Engine coolant temperature circuit high.	P0117 – Engine coolant temperature circuit performance.
P0193-Rail pressure sensor signal too large. P0194-Rail pressure sensor sporadic fault.	P0194 – Rail pressure sensor sporadic fault.

XII. CONCLUSION

Annual check up from your physician keeps you in good health, a regular diagnostic test will detect if there are any problems in your vehicle. It is good idea to have a qualified technician make repairs before there's extensive damage that could lead to an engine failure or breakdown on the road, leaving you stranded and paying much more for repairs. Car diagnostics can quickly and accurately determine any issues in the vehicle. This project gives efficient knowledge about the scanning and diagnosing the vehicle DTC's with effortless scan tools like i-smart, Bosch KTS. To avoid needless alternates of spare components is eliminated. Good diagnosis system outcomes in decrease emissions and fuel consumption. The technicians can charge each DTC code separately, so by using this group DTC's analysis we can reduce the time and cost of the faults in your vehicle. Vehicle diagnosis is not only used for detecting the faults in a vehicle, it can also control the various parameters like performance, efficiency and emissions.

XIII. REFERENCES

[1]. A study on development of engine fault diagnostic system - Hwa-seon kim, Seong-jin jang and Jong-wook jang from Dong Eui University, Republic of Korea.
[2]. Navet, Y.song, F.Simonot Lion, C.wilwert, "Trends in automotive communication systems", proceedings of IEEE vol.93, pp 1204-1233, 2005.
[3]. ISO-15765, Road vehicles diagnostics on controller area network.
[4]. Bosch, "CAN specification version 2.O" 1991.