

The application of “Mechatronics on Fault Detection and Diagnosis” in Vehicles



————— V310 CAR DIAGNOSTIC TOOL —————

Safety precautions and Warnings

To prevent personal injury or damage to vehicles and/or the code reader. read this instruction manual first and observe the following safety precautions at a minimum whenever working on a vehicle:

Always perform automotive testing in safe environment.

Wear safety eye protection that meets ANSI standards.

The **American National Standards Institute - ANSI** - facilitates and coordinates the U.S. voluntary standards and conformity assessment system.

Keep clothing, hair, hands, tools, test equipment etc. away from all moving hot engine parts.

Operate the vehicle in a well ventilated work area: Exhaust gases are poisonous.

Put blocks in front of the drive wheels and never leave the vehicle unattended while running tests.

Use extreme caution when working around the ignition coil distributor cap ignition wires and spark plugs. These components create hazardous voltages when the engine is running.

Put the transmission in PARK (for automatic transmission) or NEUTRAL (for manual transmission) and make sure the parking brake is engaged. Keep a fire extinguisher suitable for gasoline/chemical electrical fires nearby.

Don't connect or disconnect any test equipment while the ignition is on or the engine is running.

Keep the code reader dry, clean, free from oil/water or grease. Use a mild detergent on a clean cloth to clean the outside of the code reader, when necessary.



1. OBD II CONNECTOR- Connects the code reader to the vehicle's Data Link Connector (DLC).

2. LCD DISPLAY- Indicates test result

3. Vehicle ID Number- Vehicle identification code

4. UP SCROLL BUTTON- Moves up through menu and submenu items in menu mode. When more than one DT is retrieved moves up through the current screen to the previous screens for additional DTCS and definitions

5. RETURN BUTTON- Cancels a selection (or action) from a menu or return to the menu. It also used to set up the unit when being pressed and held for at least 3 seconds

6. DTC BUTTON-Trouble Codes

7. OK BUTTON- Confirms a selection (or action) from a menu When a DTC'S defirms covers more then one screen. it is used to move down to the next screen for additional data

8. DOWN UP/-DOWN BUTTON Moves up through menu and submenu items in menu mode. When more than one dT is retrieved moves up through the current screen to the previous screens for additional DTCS and definitions.

OBD II Diagnostics

When more than one vehicle control module is detected by the scan tool, you will be prompted to select the module where the data may be retrieved. The most often to be selected are the Powertrain Control Module [PCM] and Transmission Control Module [TCM].

CAUTION: Don't connect or disconnect any test equipment with ignition on or engine running.

- 1) Turn the ignition off.
- 2) Locate the vehicle's 16-pin Data Link Connector (DLC).
- 3) Plug into the OBD II cable to the vehicle's DLC.
- 4) Turn the ignition on. Engine can be off or running.
- 5) Press RETURN/OK button to enter Diagnostic Menu. A sequence of messages displaying the OBD2 protocols will be observed on the display until the vehicle protocol is detected.

If the code reader fails to communicate with the vehicle's ECU (Engine Control Unit), a "LINKING ERROR!" message shows up on the display.

Verify that the ignition is ON;

Check if the code reader's OBD II connector is connected to the vehicle's DLC;

Verify that the vehicle is OBD2 compliant;

Turn the ignition off and wait for about 10 seconds. Turn the ignition back to on and repeat the procedure from step 5.

If the "LINKING ERROR" message does not go away, then there might be problems for the code reader to communicate with the vehicle. Contact your local distributor or the manufacturer's customer service department for assistance.

- 6) After the system status is displayed (MIL status, DTC counts Monitor status), wait a few seconds or press any key for Diagnostic Menu to come up.

System Status

Codes Found 9

Monitors N/A 0

Monitors OK 11

Monitors INC 0

Erasing Codes

CAUTION: Erasing the Diagnostic Trouble Codes may allow the code reader to delete not only the codes from the vehicle's on-board computer, but also "Freeze Frame" data and manufacturer enhanced data. Further, the I/M Readiness Monitor Status for all vehicle monitors is reset to Not Ready Not Complete status. Do not erase the codes before the system has been checked completely by a technician.

This function is performed with key on engine of (KOEO). Do not start the engine.

If you decide to erase the DTCs, use UP/DOWN button to select Erase Codes from Diagnostics Menu and press RETURN/OK button.

Viewing Freeze Frame Data

The term "freeze frame" derives from the fact that when a fault occurs that has the potential to illuminate the CEL "Check Engine" light, the OBD II system records the engine operating conditions that obtained when the fault occurred

How to interpret freeze frame data

Fuel SYS 1 CL = Indicates the fuel management system was in closed loop operation at the time the code was set

Closed-loop systems are designed to automatically achieve and maintain the desired output condition by comparing it with the actual condition. ... In other words, a "closed-loop system" is a fully automatic control system in which its control action being dependent on the output in some way. The control system which uses its feedback signal to generate output is called "closed loop control system". Examples: **An Air Conditioner etc.**

Fuel SYS 2 N/A = Indicates a non V-type engine i.e., a single bank of cylinders

Load (%) 92.1 = Indicates the averaged value of the mass of the intake air per intake stroke as a percentage, with about 95% being normal for normally aspirated engines

ECT (OC) 101.6 = Indicates engine coolant temperature when the code was set

Shrt FT 1 (%) 2.2 = Indicates the percentage of fuel trim correction at the moment the code was set

Long FT 1 (%) -3.1 = Indicates the ECU (Electronics Control Unit) was subtracting fuel when the code was set

MAP (kPa) 26.7 = Indicates the manifold absolute pressure in kPa at the time the code was set

RPM (min) 2035 = Indicates the engine speed when the code was set. RPM- REVOLUTION PER MINUTE

VSS (k/ph) 74 = Indicates the vehicle speed when the code was set

IAT (OC) 28 = Indicates the intake air temperature when the code was set

Retrieving I/M Readiness Status

I/M Readiness function is used to check the operations of the Emission System on OBD2 compliant vehicles. It is an excellent function to use prior to having a vehicle inspected for compliance to a state emissions program.

Some latest vehicle models may support two types of I/M Readiness tests:

- A. Since DTCs Cleared-indicates status of the monitors since the DTCs are erased.
- B. This Drive Cycle-indicates status of monitors since the beginning of the current drive cycle.

An I/M Readiness Status result of "NO" does not necessarily indicate that the vehicle being tested will fail the state I/M inspection. For some states, one or more such monitors may be allowed to be "Not Ready" to pass the emissions inspection.

“OK”--Indicates that a particular monitor being checked has completed its diagnostic testing.

“INC”--Indicates that a particular monitor being checked has not completed its diagnostic testing.

“N/A”--The monitor is not supported on that vehicle.

Use UP/DOWN button to select I/M Readiness from Diagnostic Menu and press RETURN/OK.

Terms & Abbreviations

1. OBD – On Board Diagnostics
2. PCM – Powertrain Control Module – is your vehicles brain. It manages the engine transmission and other systems based on the information it receives from various sensors around the vehicle
3. DTC – Diagnostic Trouble Code
4. VIN – Vehicle Identification Number
5. TCM – Transmission Control Module – a gearbox control unit, a type of Automotive ECU (Electronics Control Unit) used to control electronic Automatic transmission
6. LCD – Liquid Crystal Display
7. MIL – Malfunction Indicator Lamp
8. KOEO – Key On, Engine Off
9. Monitor INC – INC incomplete
10. PID – Parameter ID – codes used to request data from a vehicle used as a diagnostic tools

EGR – Exhaust Gas Recirculation is a nitrogen oxide emission reduction technique used in petrol/gasoline engine

What is Fuel Trim? Fuel trims are **what engine control system use to compensate for all problems relating to air-fuel ratios** (known as λ or lambda,)

and combustion. The Electronic Control Module (ECM) or Powertrain Control Module (PCM) uses a few sensors to determine how much air is flowing into the engine