

**DIGITAL**



***Can*  
OBD2**

**Diagnostic Tool**

# OWNER'S MANUAL

**The Easiest  
And Best Way  
To Troubleshoot  
1996 and  
Newer OBD2  
Vehicles!**



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## WHAT IS OBD?

**The Enhanced OBD2 Diagnostic Tool is designed to work on all OBD2 compliant vehicles. All 1996 and newer vehicles (cars, light trucks and SUVs) sold in the United States are OBD2 compliant.**

One of the most exciting improvements in the automobile industry was the addition of on-board diagnostics (OBD) on vehicles, or in more basic terms, the computer that activates the vehicle's "CHECK ENGINE" light. OBD1 was designed to monitor manufacturer-specific systems on vehicles built from 1981 to 1995. Then came the development of OBD2, which is on all 1996 cars and light trucks sold in the U.S. Like its predecessor, OBD2 was adopted as part of a government mandate to lower vehicle emissions. But what makes OBD2 unique is its universal application for all late model cars and trucks - domestic and import. This sophisticated program in the vehicle's main computer system is designed to detect failures in a range of systems, and can be accessed through a universal OBD2 port, which is usually found under the dashboard. For all OBD systems, if a problem is found, the computer turns on the "CHECK ENGINE" light to warn the driver, and sets a Diagnostic Trouble Code (DTC) to identify where the problem occurred. A special diagnostic tool, such as the Enhanced OBD2 Diagnostic Tool, is required to retrieve these codes, which consumers and professionals use as a starting point for repairs.



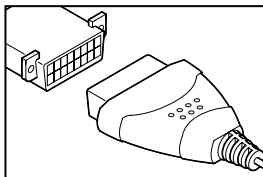
The Enhanced OBD2 Diagnostic Tool provides the additional ability to retrieve *enhanced* DTCs from most Chrysler/Jeep, Ford/Mazda, GM/Isuzu, Honda/Acura and Toyota/Lexus vehicles, as well as vehicle information. The types of enhanced data available depends on the vehicle make.

# You Can Do It!

EASY TO USE - EASY TO VIEW - EASY TO DEFINE

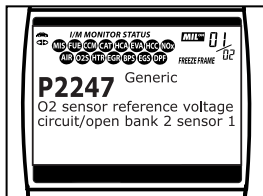
## Easy To Use . . . .

- Connect the Diagnostic Tool to the vehicle's test connector.
- Turn the ignition key "On."
- The tool will automatically link to the vehicle's computer.



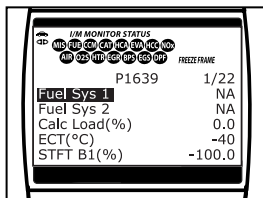
## Easy To View . . . .

- The Diagnostic Tool retrieves stored codes, Freeze Frame data and I/M Readiness status.
- Codes, I/M Readiness status and Freeze Frame data are displayed on the Diagnostic Tool's display screen. System status is indicated by LED indicators.



## Easy To Define . . . .

- Read code definitions from the Diagnostic Tool's display.
- View Freeze Frame data.





### SAFETY FIRST!

**To avoid personal injury, instrument damage and/or damage to your vehicle; do not use the OBD2 Diagnostic Tool before reading this manual.**

This manual describes common test procedures used by experienced service technicians. Many test procedures require precautions to avoid accidents that can result in personal injury, and/or damage to your vehicle or test equipment. Always read your vehicle's service manual and follow its safety precautions before and during any test or service procedure. **ALWAYS** observe the following general safety precautions:



When an engine is running, it produces carbon monoxide, a toxic and poisonous gas. To prevent serious injury or death from carbon monoxide poisoning, operate the vehicle **ONLY** in a **well-ventilated** area.



To protect your eyes from propelled objects as well as hot or caustic liquids, **always** wear **approved** safety eye protection.



When an engine is running, many parts (such as the coolant fan, pulleys, fan belt etc.) turn at high speed. To avoid serious injury, always be aware of moving parts. Keep a safe distance from these parts as well as other potentially moving objects.



Engine parts become very hot when the engine is running. To prevent severe burns, avoid contact with hot engine parts.



Before starting an engine for testing or troubleshooting, make sure the parking brake is engaged. Put the transmission in **park** (for automatic transmission) or **neutral** (for manual transmission). Block the drive wheels with suitable blocks.



Connecting or disconnecting test equipment when the ignition is **ON** can damage test equipment and the vehicle's electronic components. Turn the ignition **OFF** before connecting the Diagnostic Tool to or disconnecting the Diagnostic Tool from the vehicle's Data Link Connector (DLC).

# Safety Precautions

SAFETY FIRST!



To prevent damage to the on-board computer when taking vehicle electrical measurements, always use a digital multimeter with at least 10 megOhms of impedance.



Fuel and battery vapors are highly flammable. To prevent an explosion, keep all sparks, heated items and open flames away from the battery and fuel / fuel vapors. **DO NOT SMOKE NEAR THE VEHICLE DURING TESTING.**



Don't wear loose clothing or jewelry when working on an engine. Loose clothing can become caught in the fan, pulleys, belts, etc. Jewelry is highly conductive, and can cause a severe burn if it makes contact between a power source and ground.

## VEHICLES COVERED

The Enhanced OBD2 Diagnostic Tool is designed to work on all OBD2 compliant vehicles. All 1996 and newer vehicles (cars and light trucks) sold in the United States are OBD2 compliant.



*Federal law requires that all 1996 and newer cars and light trucks sold in the United States must be OBD2 compliant; this includes all Domestic, Asian and European vehicles.*

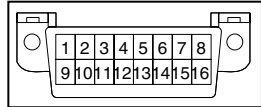
Some 1994 and 1995 vehicles are OBD2 compliant. To find out if a 1994 or 1995 vehicle is OBD2 compliant, check the following:

1. **The Vehicle Emissions Control Information (VECI) Label.** This label is located under the hood or by the radiator of most vehicles. If the vehicle is OBD2 compliant, the label will state “**OBD II Certified.**”

VEHICLE EMISSION CONTROL INFORMATION			
VEHICLE MANUFACTURER	ENGINE FAMILY DISPLACEMENT	EFN2.6YBT2BA 2.6L	OBD II CERTIFIED
	THIS VEHICLE CONFORMS TO U.S. EPA AND STATE OF CALIFORNIA REGULATIONS APPLICABLE TO 1999 MODEL YEAR NEW TLEV PASSENGER CARS.		
REFER TO SERVICE MANUAL FOR ADDITIONAL INFORMATION TUNE-UP CONDITIONS: NORMAL OPERATING ENGINE TEMPERATURE, ACCESSORIES OFF, COOLING FAN OFF, TRANSMISSION IN NEUTRAL			
EXHAUST EMISSIONS STANDARDS CERTIFICATION IN-USE		STANDARD CATEGORY TLEV TLEV INTERMEDIATE	
SPARK PLUG TYPE NGK BPRE-11 GAP: 1.1MM	CATALYST		

**OBD II  
CERTIFIED**

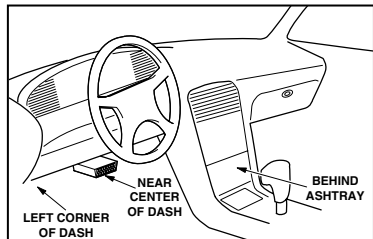
2. Government Regulations require that all OBD2 compliant vehicles **must** have a “common” sixteen-pin **Data Link Connector (DLC)**.



*Some 1994 and 1995 vehicles have 16-pin connectors but are not OBD2 compliant. Only those vehicles with a Vehicle Emissions Control Label stating “OBD II Certified” are OBD2 compliant.*

## Data Link Connector (DLC) Location


The 16-pin DLC is usually located under the instrument panel (dash), within 12 inches (300 mm) of center of the panel, on the driver’s side of most vehicles. It should be easily accessible and visible from a kneeling position outside the vehicle with the door open.





On some Asian and European vehicles the DLC is located behind the “ashtray” (the ashtray must be removed to access it) or on the far left corner of the dash. If the DLC cannot be located, consult the vehicle’s service manual for the location.

## BATTERY REPLACEMENT

Replace batteries when the battery symbol  is visible on display and/or the 3 LEDs are all lit and no other data is visible on screen.



1. Locate the battery cover on the back of the Diagnostic Tool.
2. Slide the battery cover off (use your fingers).
3. Replace batteries with three AA-size batteries (for longer life, use Alkaline-type batteries).
4. Reinstall the battery cover on the back of the Diagnostic Tool.

## Adjustments After Battery Installation


The first time the Diagnostic Tool is turned on, you must select the desired display language (English, French or Spanish) and unit of measurement (USA or metric) as follows:

1. Press the **POWER/LINK**  button to turn the Diagnostic Tool “ON.”



- The Select Language screen displays.

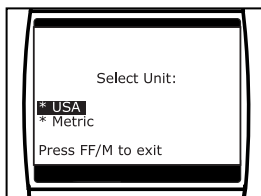
2. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight the desired display language.




3. When the desired display language is selected, press the **ENTER**  button to confirm your selection.

- The Select Unit screen displays.

4. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight the desired unit of measurement.

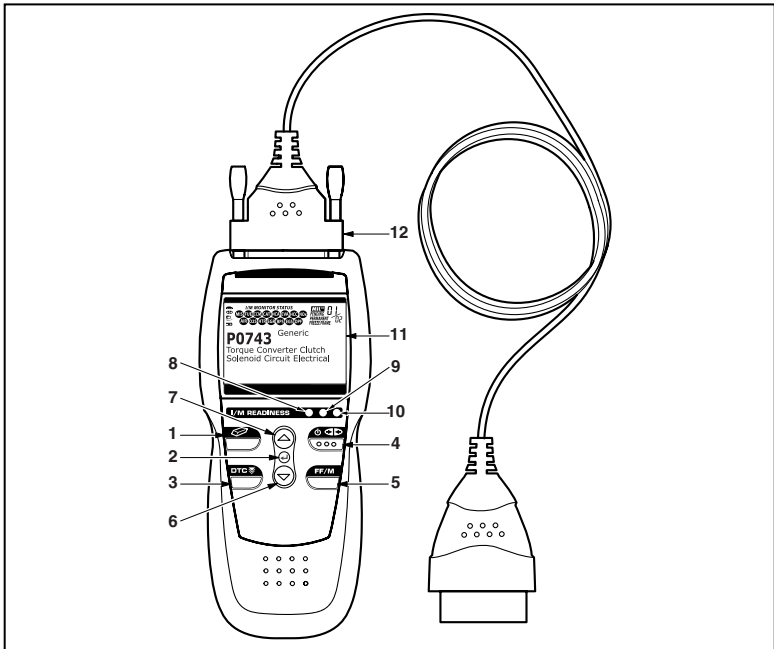


5. When the desired unit of measurement is selected, press the **ENTER**  button to confirm your selection.







After the initial language and unit of measurement selections are performed, these, as well as other settings, can be changed as desired. Proceed to “ADJUSTMENTS AND SETTINGS” on page 104 for further instructions.

## CONTROLS AND INDICATORS





**Figure 1. Controls and Indicators**

See Figure 1 for the locations of items 1 through 12, below.

1.  **ERASE button** - Erases Diagnostic Trouble Codes (DTCs), and “Freeze Frame” data from your vehicle’s computer, and resets Monitor status.
2.  **ENTER button** - When in MENU mode, confirms the selected option or value.
3.  **DTC SCROLL button** - Displays the DTC View screen and/or scrolls the LCD display to view DTCs and Freeze Frame data.
4.  **POWER/LINK button** - When the Diagnostic Tool IS NOT connected to a vehicle, turns the Diagnostic Tool “On” and “Off”. When the Diagnostic Tool is connected to a vehicle, links the Diagnostic Tool to the vehicle’s PCM to retrieve diagnostic data from the computer’s memory.

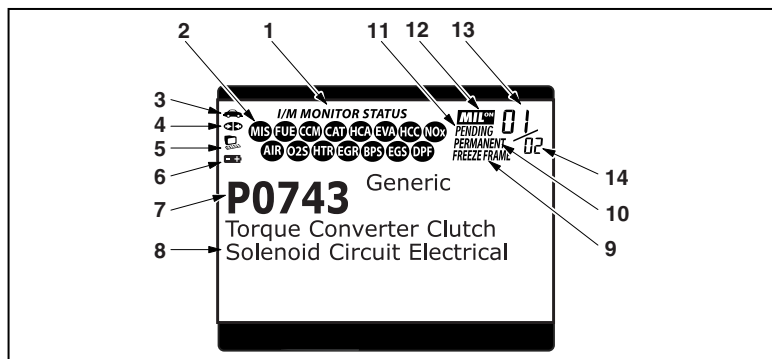


*To turn the Diagnostic Tool “On”, you must press and hold the **POWER/LINK**  button for approximately 3 seconds.*

5.  **FF/M button** – When pressed while linked to a vehicle, places the Diagnostic Tool in “Test Mode.” Three options are available: **Freeze Frame, Vehicle Info** and **Tool Settings**.

6. **DOWN button** - When in MENU mode, scrolls DOWN through the menu and submenu selection options. When LINKED to a vehicle, scrolls DOWN through the current display screen to display any additional data.
7. **UP button** - When in MENU mode, scrolls UP through the menu and submenu selection options. When LINKED to a vehicle, scrolls UP through the current display screen to display any additional data.
8. **GREEN LED** - Indicates that all engine systems are running normally (all Monitors on the vehicle are active and performing their diagnostic testing, and no DTCs are present).
9. **YELLOW LED** - Indicates there is a possible problem. A "Pending" DTC is present and/or some of the vehicle's emission monitors have not run their diagnostic testing.
10. **RED LED** - Indicates there is a problem in one or more of the vehicle's systems. The red LED is also used to show that DTC(s) are present. DTCs are shown on the Diagnostic Tool's display. In this case, the Malfunction Indicator ("Check Engine") lamp on the vehicle's instrument panel will light steady on.
11. **Display** - Displays settings Menu and submenus, test results, Diagnostic Tool functions and Monitor status information. See **DISPLAY FUNCTIONS**, following, for more details.
12. **CABLE** - Connects the Diagnostic Tool to the vehicle's Data Link Connector (DLC).






## DISPLAY FUNCTIONS



**Figure 2. Display Functions**

See Figure 2 for the locations of items 1 through 14, following.

1. **I/M MONITOR STATUS field** - Identifies the I/M Monitor status area.

- 2. Monitor icons** - Indicate which Monitors are supported by the vehicle under test, and whether or not the associated Monitor has run its diagnostic testing (Monitor status). When a Monitor icon is solid, it indicates that the associated Monitor has completed its diagnostic testing. When a Monitor icon is flashing, it indicates that the vehicle supports the associated Monitor, but the Monitor has not yet run its diagnostic testing.
- 3.  Vehicle icon** - Indicates whether or not the Diagnostic Tool is being properly powered through the vehicle's Data Link Connector (DLC). A visible icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- 4.  Link icon** - Indicates whether or not the Diagnostic Tool is communicating (linked) with the vehicle's on-board computer. When visible, the Diagnostic Tool is communicating with the computer. If the Link icon is not visible, the Diagnostic Tool is not communicating with the computer.
- 5.  Computer icon** - When this icon is visible it indicates that the Diagnostic Tool is linked to a personal computer. Optional software is available that makes it possible to upload retrieved data to a personal computer.
- 6.  Diagnostic Tool Internal Battery icon** - When visible, indicates the Diagnostic Tool batteries are "low" and should be replaced. If the batteries are not replaced when the battery symbol  is "on", all 3 LEDs will light up as a last resort indicator to warn you that the batteries need replacement. No data will be displayed on screen when all 3 LEDs are lit.
- 7. DTC Display Area** - Displays the Diagnostic Trouble Code (DTC) number. Each fault is assigned a code number that is specific to that fault.
- 8. Test Data Display Area** - Displays DTC definitions, Freeze Frame data and other pertinent test information messages.
- 9. FREEZE FRAME icon** - Indicates that there is Freeze Frame data from "Priority Code" (Code #1) stored in the vehicle's computer memory.
- 10. PERMANENT icon** - Indicates the currently displayed DTC is a "Permanent" code.
- 11. PENDING icon** - Indicates the currently displayed DTC is a "Pending" code.
- 12. MIL icon** - Indicates the status of the Malfunction Indicator Lamp (MIL). The MIL icon is visible only when a DTC has commanded the MIL on the vehicle's dashboard to light.
- 13. Code Number Sequence** - The Diagnostic Tool assigns a sequence number to each DTC that is present in the computer's memory, starting with "01." This number indicates which code is currently displayed. Code number "01" is always the highest priority code, and the one for which "Freeze Frame" data has been stored.



*If "01" is a "Pending" code, there may or may not be "Freeze Frame" data stored in memory.*

**14. Code Enumerator** - Indicates the total number of codes retrieved from the vehicle's computer.



## COMPUTER ENGINE CONTROLS

### The Introduction of Electronic Engine Controls

***Electronic Computer Control Systems make it possible for vehicle manufacturers to comply with the tougher emissions and fuel efficiency standards mandated by State and Federal Governments.***

As a result of increased air pollution (smog) in large cities, such as Los Angeles, the California Air Resources Board (**CARB**) and the Environmental Protection Agency (**EPA**) set new regulations and air pollution standards to deal with the problem. To further complicate matters, the energy crisis of the early 1970s caused a sharp increase in fuel prices over a short period. As a result, vehicle manufacturers were not only required to comply with the new emissions standards, they also had to make their vehicles more fuel-efficient. Most vehicles were required to meet a miles-per-gallon (MPG) standard set by the U.S. Federal Government.



Precise fuel delivery and spark timing are needed to reduce vehicle emissions. Mechanical engine controls in use at the time (such as ignition points, mechanical spark advance and the carburetor) responded too slowly to driving conditions to properly control fuel delivery and spark timing. This made it difficult for vehicle manufacturers to meet the new standards.

A new Engine Control System had to be designed and integrated with the engine controls to meet the stricter standards. The new system had to:

- Respond instantly to supply the proper mixture of air and fuel for any driving condition (idle, cruising, low-speed driving, high-speed driving, etc.).
- Calculate instantly the best time to “ignite” the air/fuel mixture for maximum engine efficiency.
- Perform both these tasks without affecting vehicle performance or fuel economy.

Vehicle Computer Control Systems can perform millions of calculations each second. This makes them an ideal substitute for the slower mechanical engine controls. By switching from mechanical to electronic engine controls, vehicle manufacturers are able to control fuel delivery and spark timing more precisely. Some newer Computer Control Systems also provide control over other vehicle functions, such as transmission, brakes, charging, body, and suspension systems.

### The Basic Engine Computer Control System

**The Computer Control System consists of an on-board computer and several related control devices (sensors, switches, and actuators).**

The on-board computer is the heart of the Computer Control System. The computer contains several programs with preset reference values for air/fuel ratio, spark or ignition timing, injector pulse width, engine speed, etc. Separate values are provided for various driving conditions, such as idle, low speed driving, high-speed driving, low load, or high load. The preset reference values represent the ideal air/fuel mixture, spark timing, transmission gear selection, etc., for any driving condition. These values are programmed by the vehicle manufacturer, and are specific to each vehicle model.

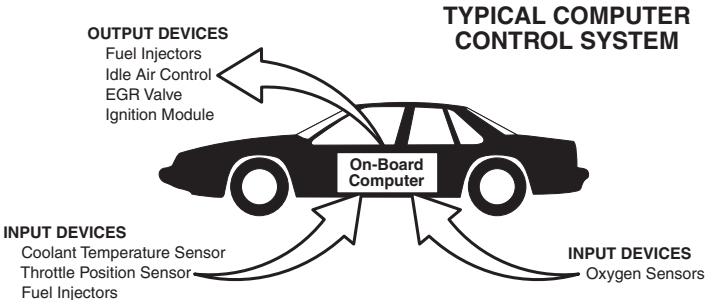


Most on-board computers are located inside the vehicle behind the dashboard, under the passenger's or driver's seat, or behind the right kick panel. However, some manufacturers may still position it in the engine compartment.

Vehicle sensors, switches, and actuators are located throughout the engine, and are connected by electrical wiring to the on-board computer. These devices include oxygen sensors, coolant temperature sensors, throttle position sensors, fuel injectors, etc. Sensors and switches are **input devices**. They provide signals representing current engine operating conditions to the computer. Actuators are **output devices**. They perform actions in response to commands received from the computer.

The on-board computer receives information inputs from sensors and switches located throughout the engine. These devices monitor critical engine conditions such as coolant temperature, engine speed, engine load, throttle position, air/fuel ratio etc.

The computer compares the values received from these sensors with its preset reference values, and makes corrective actions as needed so that the sensor values always match the preset reference values for the current driving condition. The computer makes adjustments by commanding other devices such as the fuel injectors, idle air control, EGR valve or Ignition Module to perform these actions.



Vehicle operating conditions are constantly changing. The computer continuously makes adjustments or corrections (especially to the air/fuel mixture and spark timing) to keep all the engine systems operating within the preset reference values.

### On-Board Diagnostics - First Generation (OBD1)

*With the exception of some 1994 and 1995 vehicles, most vehicles from 1982 to 1995 are equipped with some type of first generation On-Board Diagnostics.*



Beginning in 1988, California's Air Resources Board (**CARB**), and later the Environmental Protection Agency (**EPA**) required vehicle manufacturers to include a self-diagnostic program in their on-board computers. The program would be capable of identifying emissions-related faults in a system. The first generation of Onboard Diagnostics came to be known as **OBD1**.

OBD1 is a set of self-testing and diagnostic instructions programmed into the vehicle's on-board computer. The programs are specifically designed to detect failures in the sensors, actuators, switches and wiring of the various vehicle emissions-related systems. If the computer detects a failure in any of these components or systems, it lights an indicator on the dashboard to alert the driver. The indicator lights **only** when an emissions-related problem is detected.

The computer also assigns a numeric code for each specific problem that it detects, and stores these codes in its memory for later retrieval. These codes can be retrieved from the computer's memory with the use of a "Code Reader" or a "Scan Tool."

### On-Board Diagnostics - Second Generation (OBD2)

In addition to performing all the functions of the OBD1 System, the OBD2 System has been enhanced with new Diagnostic Programs. These programs closely monitor the functions of various emissions-related components and systems (as well as other systems) and make this information readily available (with the proper equipment) to the technician for evaluation.

*The OBD2 System is an enhancement of the OBD1 System.*

The California Air Resources Board (**CARB**) conducted studies on OBD1 equipped vehicles. The information that was gathered from these studies showed the following:

- A large number of vehicles had deteriorating or degraded emissions-related components. These components were causing an increase in emissions.



- Because OBD1 systems only detect failed components, the degraded components were not setting codes.
- Some emissions problems related to degraded components only occur when the vehicle is being driven under a load. The emission checks being conducted at the time were not performed under simulated driving conditions. As a result, a significant number of vehicles with degraded components were passing Emissions Tests.
- Codes, code definitions, diagnostic connectors, communication protocols and emissions terminology were different for each manufacturer. This caused confusion for the technicians working on different make and model vehicles.

To address the problems made evident by this study, CARB and the EPA passed new laws and standardization requirements. These laws required that vehicle manufacturers to equip their new vehicles with devices capable of meeting all of the new emissions standards and regulations. It was also decided that an enhanced on-board diagnostic system, capable of addressing all of these problems, was needed. This new system is known as **“On-Board Diagnostics Generation Two (OBD2).”** The primary objective of the OBD2 system is to comply with the latest regulations and emissions standards established by CARB and the EPA.

The Main Objectives of the OBD2 System are:

- To detect degraded and/or failed emissions-related components or systems that could cause tailpipe emissions to exceed by 1.5 times the Federal Test Procedure (FTP) standard.
- To expand emissions-related system monitoring. This includes a set of computer run diagnostics called Monitors. Monitors perform diagnostics and testing to verify that all emissions-related components and/or systems are operating correctly and within the manufacturer’s specifications.
- To use a standardized Diagnostic Link Connector (DLC) in all vehicles. (Before OBD2, DLCs were of different shapes and sizes.)
- To standardize the code numbers, code definitions and language used to describe faults. (Before OBD2, each vehicle manufacturer used their own code numbers, code definitions and language to describe the same faults.)
- To expand the operation of the Malfunction Indicator Lamp (MIL).
- To standardize communication procedures and protocols between the diagnostic equipment (Scan Tools, Code Readers, etc.) and the vehicle’s on-board computer.

### OBD2 Terminology

The following terms and their definitions are related to OBD2 systems. Read and reference this list as needed to aid in the understanding of OBD2 systems.

- **Powertrain Control Module (PCM)** - The PCM is the OBD2 accepted term for the vehicle's "on-board computer." In addition to controlling the engine management and emissions systems, the PCM also participates in controlling the powertrain (transmission) operation. Most PCMs also have the ability to communicate with other computers on the vehicle (ABS, ride control, body, etc.).
- **Monitor** - Monitors are "diagnostic routines" programmed into the PCM. The PCM utilizes these programs to run diagnostic tests, and to monitor operation of the vehicle's emissions-related components or systems to ensure they are operating correctly and within the vehicle's manufacturer specifications. Currently, up to eleven Monitors are used in OBD2 systems. Additional Monitors will be added as the OBD2 system is further developed.



*Not all vehicles support all eleven Monitors.*

- **Enabling Criteria** - Each Monitor is designed to test and monitor the operation of a specific part of the vehicle's emissions system (EGR system, oxygen sensor, catalytic converter, etc.). A specific set of "conditions" or "driving procedures" must be met before the computer can command a Monitor to run tests on its related system. These "conditions" are known as "**Enabling Criteria.**" The requirements and procedures vary for each Monitor. Some Monitors only require the ignition key to be turned "**On**" for them to run and complete their diagnostic testing. Others may require a set of complex procedures, such as, starting the vehicle when cold, bringing it to operating temperature, and driving the vehicle under specific conditions before the Monitor can run and complete its diagnostic testing.
- **Monitor Has/Has Not Run** - The terms "Monitor has run" or "Monitor has not run" are used throughout this manual. "**Monitor has run,**" means the PCM **has** commanded a particular Monitor to perform the required diagnostic testing on a system to ensure the system is operating correctly (within factory specifications). The term "**Monitor has not run**" means the PCM **has not** yet commanded a particular Monitor to perform diagnostic testing on its associated part of the emissions system.
- **Trip** - A Trip for a particular Monitor requires that the vehicle is being driven in such a way that all the required "Enabling Criteria" for the Monitor to run and complete its diagnostic testing are met. The "Trip Drive Cycle" for a particular Monitor begins when the ignition key is turned "**On.**" It is successfully completed when all the "Enabling Criteria" for the Monitor to run and complete its diagnostic testing are met by the time the ignition key is turned "**Off.**" Since each of the eleven monitors is designed to run diagnostics and testing on a different part of the engine or emissions system, the "Trip Drive Cycle" needed for each individual Monitor to run and complete varies.

- **OBD2 Drive Cycle** - An OBD2 Drive Cycle is an extended set of driving procedures that takes into consideration the various types of driving conditions encountered in real life. These conditions may include starting the vehicle when it is cold, driving the vehicle at a steady speed (cruising), accelerating, etc. An OBD2 Drive Cycle begins when the ignition key is turned “On” (when cold) and ends when the vehicle has been driven in such a way as to have all the “Enabling Criteria” met for all its applicable Monitors. Only those trips that provide the Enabling Criteria for all Monitors applicable to the vehicle to run and complete their individual diagnostic tests qualify as an OBD2 Drive Cycle. OBD2 Drive Cycle requirements vary from one model of vehicle to another. Vehicle manufacturers set these procedures. Consult your vehicle’s service manual for OBD2 Drive Cycle procedures.



*Do not confuse a “Trip” Drive Cycle with an OBD2 Drive Cycle. A “Trip” Drive Cycle provides the “Enabling Criteria” for one specific Monitor to run and complete its diagnostic testing. An OBD2 Drive Cycle must meet the “Enabling Criteria” for all Monitors on a particular vehicle to run and complete their diagnostic testing.*

- **Warm-up Cycle** - Vehicle operation after an engine off period where engine temperature rises at least 40°F (22°C) from its temperature before starting, and reaches at least 160°F (70°C). The PCM uses warm-up cycles as a counter to automatically erase a specific code and related data from its memory. When no faults related to the original problem are detected within a specified number of warm-up cycles, the code is erased automatically.

## DIAGNOSTIC TROUBLE CODES (DTCs)

Diagnostic Trouble Codes (DTCs) are meant to guide you to the proper service procedure in the vehicle’s service manual. **DO NOT** replace parts based only on DTCs without first consulting the vehicle’s service manual for proper testing procedures for that particular system, circuit or component.

**Diagnostic Trouble Codes (DTCs) are codes that identify a specific problem area.**

DTCs are alphanumeric codes that are used to identify a problem that is present in any of the systems that are monitored by the on-board computer (PCM). Each trouble code has an assigned message that identifies the circuit, component or system area where the problem was found.

OBD2 diagnostic trouble codes are made up of five characters:

- The 1st character is a **letter**. It identifies the “main system” where the fault occurred (Body, Chassis, Powertrain, or Network).
- The 2nd character is a **numeric digit**. It identifies the “type” of code (Generic or Manufacturer-Specific).



***Generic DTCs** are codes that are used by all vehicle manufacturers. The standards for generic DTCs, as well as their definitions, are set by the Society of Automotive Engineers (SAE).*



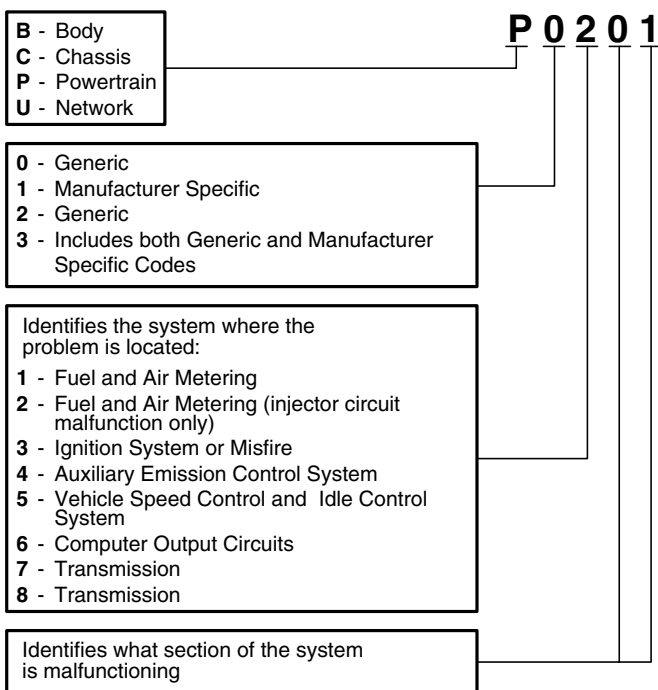


**Manufacturer-Specific DTCs** are codes that are controlled by the vehicle manufacturers. The Federal Government does not require vehicle manufacturers to go beyond the standardized generic DTCs in order to comply with the new OBD2 emissions standards. However, manufacturers are free to expand beyond the standardized codes to make their systems easier to diagnose.

- The 3rd character is a **numeric digit**. It identifies the specific system or sub-system where the problem is located.
- The 4th and 5th characters are **numeric digits**. They identify the section of the system that is malfunctioning.

### OBD2 DTC EXAMPLE

P0201 - Injector Circuit Malfunction, Cylinder 1



### DTCs and MIL Status

When the vehicle's on-board computer detects a failure in an emissions-related component or system, the computer's internal diagnostic program assigns a diagnostic trouble code (DTC) that points to the system (and subsystem) where the fault was found. The diagnostic program saves the code in the computer's memory. It records a "Freeze Frame" of conditions present when the fault was found, and lights the Malfunction Indicator Lamp (MIL). Some faults require detection for two trips in a row before the MIL is turned on.



*The "Malfunction Indicator Lamp" (MIL) is the accepted term used to describe the lamp on the dashboard that lights to warn the driver that an emissions-related fault has been found. Some manufacturers may still call this lamp a "Check Engine" or "Service Engine Soon" light.*

There are two types of DTCs used for emissions-related faults: Type "A" and Type "B." Type "A" codes are "One-Trip" codes; Type "B" DTCs are usually Two-Trip DTCs.

When a **Type "A"** DTC is found on the First Trip, the following events take place:

- The computer commands the MIL "On" when the failure is first found.
- If the failure causes a severe misfire that may cause damage to the catalytic converter, the MIL "flashes" **once per second**. The MIL continues to flash as long as the condition exists. If the condition that caused the MIL to flash is no longer present, the MIL will light "steady" On.
- A DTC is saved in the computer's memory for later retrieval.
- A "Freeze Frame" of the conditions present in the engine or emissions system when the MIL was ordered "On" is saved in the computer's memory for later retrieval. This information shows fuel system status (closed loop or open loop), engine load, coolant temperature, fuel trim value, MAP vacuum, engine RPM and DTC priority.

When a **Type "B"** DTC is found on the First Trip, the following events take place:

- The computer sets a Pending DTC, but the MIL is not ordered "On." "Freeze Frame" data may or may not be saved at this time depending on manufacturer. The Pending DTC is saved in the computer's memory for later retrieval.
- If the failure **is found** on the second consecutive trip, the MIL is ordered "On." "Freeze Frame" data is saved in the computer's memory.
- If the failure **is not found** on the second Trip, the Pending DTC is erased from the computer's memory.

The MIL will stay lit for both Type "A" and Type "B" codes until one of the following conditions occurs:



- If the conditions that caused the MIL to light are no longer present for the next three trips in a row, the computer automatically turns the MIL “Off” if no other emissions-related faults are present. However, the DTCs remain in the computer’s memory as a history code for 40 warm-up cycles (80 warm-up cycles for fuel and misfire faults). The DTCs are automatically erased if the fault that caused them to be set is not detected again during that period.
- Misfire and fuel system faults require three trips with “similar conditions” before the MIL is turned “Off.” These are trips where the engine load, RPM and temperature are similar to the conditions present when the fault was first found.



*After the MIL has been turned off, DTCs and Freeze Frame data stay in the computer’s memory.*

- Erasing the DTCs from the computer’s memory can also turn off the MIL. See ERASING DIAGNOSTIC TROUBLE CODES (DTCs) on page 48, before erasing codes from the computer’s memory. If a Diagnostic Tool or Scan Tool is used to erase the codes, Freeze Frame data will also be erased.

## OBD2 MONITORS

To ensure the correct operation of the various emissions-related components and systems, a diagnostic program was developed and installed in the vehicle’s on-board computer. The program has several procedures and diagnostic strategies. Each procedure or diagnostic strategy is made to monitor the operation of, and run diagnostic tests on, a specific emissions-related component or system. These tests ensure the system is running correctly and is within the manufacturer’s specifications. On OBD2 systems, these procedures and diagnostic strategies are called “Monitors.”

Currently, fifteen Monitors are supported by OBD2 systems. Additional monitors may be added as a result of Government regulations as the OBD2 system grows and matures. Not all vehicles support all fifteen Monitors. Additionally, some Monitors are supported by “spark ignition” vehicles only, while others are supported by “compression ignition” vehicles only.

Monitor operation is either “**Continuous**” or “**Non-Continuous**,” depending on the specific monitor.








### Continuous Monitors

Three of these Monitors are designed to constantly monitor their associated components and/or systems for proper operation. Continuous Monitors run constantly when the engine is running. The Continuous Monitors are:

- **CCM** Comprehensive Component Monitor (CCM)
- **MIS** Misfire Monitor
- **FUE** Fuel System Monitor






### Non-Continuous Monitors

The other twelve Monitors are “non-continuous” Monitors. “Non-continuous” Monitors perform and complete their testing once per trip. The “non-continuous” Monitors are:


-  O2S Oxygen Sensor Monitor
-  HTR Oxygen Sensor Heater Monitor
-  CAT Catalyst Monitor
-  HCA Heated Catalyst Monitor
-  EGR EGR System Monitor
-  EVA EVAP System Monitor
-  AIR Secondary Air System Monitor



*The following Monitors became standard beginning in 2010. The majority of vehicles produced before this time will not support these Monitors*

-  HCC NMHC Monitor
-  NOx NOx Adsorber Monitor
-  BPS Boost Pressure System Monitor
-  EGS Exhaust Gas Sensor Monitor
-  DPF PM Filter Monitor

The following provides a brief explanation of the function of each Monitor:

-  **Comprehensive Component Monitor (CCM)** - This Monitor continuously checks all inputs and outputs from sensors, actuators, switches and other devices that provide a signal to the computer. The Monitor checks for shorts, opens, out of range value, functionality and “rationality.”



**Rationality:** Each input signal is compared against all other inputs and against information in the computer’s memory to see if it makes sense under the current operating conditions. Example: The signal from the throttle position sensor indicates the vehicle is in a wide-open throttle condition, but the vehicle is really at idle, and the idle condition is confirmed by the signals from all other sensors. Based on the input data, the computer determines that the signal from the throttle position sensor is not rational (does not make sense when compared to the other inputs). In this case, the signal would fail the rationality test.

The CCM is supported by both “spark ignition” vehicles and “compression ignition” vehicles. The CCM may be either a “One-Trip” or a “Two-Trip” Monitor, depending on the component.

**FUE Fuel System Monitor** - This Monitor uses a Fuel System Correction program, called Fuel Trim, inside the on-board computer. Fuel Trim is a set of positive and negative values that represent adding or subtracting fuel from the engine. This program is used to correct for a lean (too much air/not enough fuel) or rich (too much fuel/not enough air) air-fuel mixture. The program is designed to add or subtract fuel, as needed, up to a certain percent. If the correction needed is too large and exceeds the time and percent allowed by the program, a fault is indicated by the computer.

The Fuel System Monitor is supported by both "spark ignition" vehicles and "compression ignition" vehicles. The Fuel System Monitor may be a "One-Trip" or "Two-Trip" Monitor, depending on the severity of the problem.

**MIS Misfire Monitor** - This Monitor continuously checks for engine misfires. A misfire occurs when the air-fuel mixture in the cylinder does not ignite. The misfire Monitor uses changes in crankshaft speed to sense an engine misfire. When a cylinder misfires, it no longer contributes to the speed of the engine, and engine speed decreases each time the affected cylinder(s) misfire. The misfire Monitor is designed to sense engine speed fluctuations and determine from which cylinder(s) the misfire is coming, as well as how bad the misfire is. There are three types of engine misfires, Types 1, 2, and 3.

- Type 1 and Type 3 misfires are two-trip monitor faults. If a fault is sensed on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The MIL is not commanded on at this time. If the fault is found again on the second trip, under similar conditions of engine speed, load and temperature, the computer commands the MIL "On," and the code is saved in its long term memory.
- Type 2 misfires are the most severe type of misfire. When a Type 2 misfire is sensed on the first trip, the computer commands the MIL to light when the misfire is sensed. If the computer determines that a Type 2 misfire is severe, and may cause catalytic converter damage, it commands the MIL to "flash" once per second as soon as the misfire is sensed. When the misfire is no longer present, the MIL reverts to steady "On" condition.

The Misfire Monitor is supported by both "spark ignition" vehicles and "compression ignition" vehicles.

**CAT Catalyst Monitor** - The catalytic converter is a device that is installed downstream of the exhaust manifold. It helps to oxidize (burn) the unburned fuel (hydrocarbons) and partially burned fuel (carbon monoxide) left over from the combustion process. To accomplish this, heat and catalyst materials inside the converter react with the exhaust gases to burn the remaining fuel. Some materials inside the catalytic converter also have the ability to store oxygen, and release it as needed to oxidize hydrocarbons and carbon monoxide. In the process, it reduces vehicle emissions by converting the polluting gases into carbon dioxide and water.

The computer checks the efficiency of the catalytic converter by monitoring the oxygen sensors used by the system. One sensor is located before (upstream of) the converter; the other is located after (downstream of) the converter. If the catalytic converter loses its ability to store oxygen,

the downstream sensor signal voltage becomes almost the same as the upstream sensor signal. In this case, the monitor fails the test.

The Catalyst Monitor is supported by “spark ignition” vehicles only. The Catalyst Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On” and saves the code in its long-term memory.



**Heated Catalyst Monitor** - Operation of the “heated” catalytic converter is similar to the catalytic converter. The main difference is that a heater is added to bring the catalytic converter to its operating temperature more quickly. This helps reduce emissions by reducing the converter’s down time when the engine is cold. The Heated Catalyst Monitor performs the same diagnostic tests as the catalyst Monitor, and also tests the catalytic converter’s heater for proper operation.

The Heated Catalyst Monitor is supported by “spark ignition” vehicles only. This Monitor is also a “Two-Trip” Monitor.



**Exhaust Gas Recirculation (EGR) Monitor** - The Exhaust Gas Recirculation (EGR) system helps reduce the formation of Oxides of Nitrogen during combustion. Temperatures above 2500°F cause nitrogen and oxygen to combine and form Oxides of Nitrogen in the combustion chamber. To reduce the formation of Oxides of Nitrogen, combustion temperatures must be kept below 2500°F. The EGR system recirculates small amounts of exhaust gas back into the intake manifold, where it is mixed with the incoming air/fuel mixture. This reduces combustion temperatures by up to 500°F. The computer determines when, for how long, and how much exhaust gas is recirculated back to the intake manifold. The EGR Monitor performs EGR system function tests at preset times during vehicle operation.

The EGR Monitor is supported by both “spark ignition” vehicles and “compression ignition” vehicles. The EGR Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.



**Evaporative System (EVAP) Monitor** - OBD2 vehicles are equipped with a fuel Evaporative system (EVAP) that helps prevent fuel vapors from evaporating into the air. The EVAP system carries fumes from the fuel tank to the engine where they are burned during combustion. The EVAP system may consist of a charcoal canister, fuel tank cap, purge solenoid, vent solenoid, flow monitor, leak detector and connecting tubes, lines and hoses.

Fumes are carried from the fuel tank to the charcoal canister by hoses or tubes. The fumes are stored in the charcoal canister. The computer controls the flow of fuel vapors from the charcoal canister to the engine via a purge solenoid. The computer energizes or de-energizes the purge solenoid (depending on solenoid design). The purge solenoid opens a valve to allow engine vacuum to draw the fuel vapors from the canister

into the engine where the vapors are burned. The EVAP Monitor checks for proper fuel vapor flow to the engine, and pressurizes the system to test for leaks. The computer runs this Monitor once per trip.

The EVAP Monitor is supported by “spark ignition” vehicles only. The EVAP Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the PCM commands the MIL “On,” and saves the code in its long-term memory.



### **Oxygen Sensor Heater Monitor** - The Oxygen Sensor Heater

Monitor tests the operation of the oxygen sensor's heater. There are two modes of operation on a computer-controlled vehicle: “open-loop” and “closed-loop.” The vehicle operates in open-loop when the engine is cold, before it reaches normal operating temperature. The vehicle also goes to open-loop mode at other times, such as heavy load and full throttle conditions. When the vehicle is running in open-loop, the oxygen sensor signal is ignored by the computer for air/fuel mixture corrections. Engine efficiency during open-loop operation is very low, and results in the production of more vehicle emissions.

Closed-loop operation is the best condition for both vehicle emissions and vehicle operation. When the vehicle is operating in closed-loop, the computer uses the oxygen sensor signal for air/fuel mixture corrections.

In order for the computer to enter closed-loop operation, the oxygen sensor must reach a temperature of at least 600°F. The oxygen sensor heater helps the oxygen sensor reach and maintain its minimum operating temperature (600°F) more quickly, to bring the vehicle into closed-loop operation as soon as possible.

The Oxygen Sensor Heater Monitor is supported by “spark ignition” vehicles only. The Oxygen Sensor Heater Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.



### **Oxygen Sensor Monitor** - The Oxygen Sensor monitors how

much oxygen is in the vehicle's exhaust. It generates a varying voltage of up to one volt, based on how much oxygen is in the exhaust gas, and sends the signal to the computer. The computer uses this signal to make corrections to the air/fuel mixture. If the exhaust gas has a large amount of oxygen (a lean air/fuel mixture), the oxygen sensor generates a “low” voltage signal. If the exhaust gas has very little oxygen (a rich mixture condition), the oxygen sensor generates a “high” voltage signal. A 450mV signal indicates the most efficient, and least polluting, air/fuel ratio of 14.7 parts of air to one part of fuel.

The oxygen sensor must reach a temperature of at least 600-650°F, and the engine must reach normal operating temperature, for the computer to enter into closed-loop operation. The oxygen sensor only functions when the computer is in closed-loop. A properly operating oxygen sensor reacts quickly to any change in oxygen content in the

exhaust stream. A faulty oxygen sensor reacts slowly, or its voltage signal is weak or missing.

The Oxygen Sensor Monitor is supported by “spark ignition” vehicles only. The Oxygen Sensor Monitor is a “Two-Trip” monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.



**Secondary Air System Monitor** - When a cold engine is first started, it runs in open-loop mode. During open-loop operation, the engine usually runs rich. A vehicle running rich wastes fuel and creates increased emissions, such as carbon monoxide and some hydrocarbons. A Secondary Air System injects air into the exhaust stream to aid catalytic converter operation:

1. It supplies the catalytic converter with the oxygen it needs to oxidize the carbon monoxide and hydrocarbons left over from the combustion process during engine warm-up.
2. The extra oxygen injected into the exhaust stream also helps the catalytic converter reach operating temperature more quickly during warm-up periods. The catalytic converter must heat to operating temperature to work properly.

The Secondary Air System Monitor checks for component integrity and system operation, and tests for faults in the system. The computer runs this Monitor once per trip.

The Secondary Air System Monitor is a “Two-Trip” monitor. If a fault is found on the first trip, the computer temporarily saves this fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.



**Non-Methane Hydrocarbon Catalyst (NMHC) Monitor** - The non-methane hydrocarbon catalyst is a type of catalytic converter. It helps to remove non-methane hydrocarbons (NMH) left over from the combustion process from the exhaust stream. To accomplish this, heat and catalyst materials react with the exhaust gases to convert NMH to less harmful compounds. The computer checks the efficiency of the catalyst by monitoring the quantity of NMH in the exhaust stream. The monitor also verifies that sufficient temperature is present to aid in particulate matter (PM) filter regeneration.

The NMHC Monitor is supported by “compression ignition” vehicles only. The NMHC Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.

**NOx** **NOx Aftertreatment Monitor** - NOx aftertreatment is based on a catalytic converter support that has been coated with a special washcoat containing zeolites. NOx Aftertreatment is designed to reduce oxides of nitrogen emitted in the exhaust stream. The zeolite acts as a molecular "sponge" to trap the NO and NO<sub>2</sub> molecules in the exhaust stream. In some implementations, injection of a reactant before the aftertreatment purges it. NO<sub>2</sub> in particular is unstable, and will join with hydrocarbons to produce H<sub>2</sub>O and N<sub>2</sub>. The Nox Aftertreatment Monitor monitors the function of the Nox aftertreatment to ensure that tailpipe emissions remain within acceptable limits.

The Nox Aftertreatment Monitor is supported by "compression ignition" vehicles only. The Nox Aftertreatment Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On," and saves the code in its long-term memory.

**BPS** **Boost Pressure System Monitor** - The boost pressure system serves to increase the pressure produced inside the intake manifold to a level greater than atmospheric pressure. This increase in pressure helps to ensure complete combustion of the air-fuel mixture. The Boost Pressure System Monitor checks for component integrity and system operation, and tests for faults in the system. The computer runs this Monitor once per trip.

The Boost Pressure System Monitor is supported by "compression ignition" vehicles only. The Boost Pressure System Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On," and saves the code in its long-term memory.

**EGS** **Exhaust Gas Sensor Monitor** - The exhaust gas sensor is used by a number of systems/monitors to determine the content of the exhaust stream. The computer checks for component integrity, system operation, and tests for faults in the system, as well as feedback faults that may affect other emission control systems.

The Exhaust Gas Sensor Monitor is supported by "compression ignition" vehicles only. The Exhaust Gas Sensor Monitor is a "Two-Trip" Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL "On," and saves the code in its long-term memory.



**PM Filter Monitor** - The particulate matter (PM) filter removes particulate matter from the exhaust stream by filtration. The filter has a honeycomb structure similar to a catalyst substrate, but with the channels blocked at alternate ends. This forces the exhaust gas to flow through the walls between the channels, filtering the particulate matter out. The filters are self-cleaning by periodic modification of the exhaust gas concentration in order to burn off the trapped particles (oxidizing the particles to form CO<sub>2</sub> and water). The computer monitors the efficiency of the filter in trapping particulate matter, as well as the ability of the filter to regenerate (self-clean).

The PM Filter Monitor is supported by “compression ignition” vehicles only. The PM Filter Monitor is a “Two-Trip” Monitor. If a fault is found on the first trip, the computer temporarily saves the fault in its memory as a Pending Code. The computer does not command the MIL on at this time. If the fault is sensed again on the second trip, the computer commands the MIL “On,” and saves the code in its long-term memory.

### OBD2 Reference Table

The table below lists current OBD2 Monitors, and indicates the following for each Monitor:

- A. Monitor Type (how often does the Monitor run; Continuous or Once per trip)
- B. Number of trips needed, with a fault present, to set a pending DTC
- C. Number of consecutive trips needed, with a fault present, to command the MIL “On” and store a DTC
- D. Number of trips needed, with no faults present, to erase a Pending DTC
- E. Number and type of trips or drive cycles needed, with no faults present, to turn off the MIL
- F. Number of warm-up periods needed to erase the DTC from the computer’s memory after the MIL is turned off



# Onboard Diagnostics

## OBD2 MONITORS

Name of Monitor	A	B	C	D	E	F
Comprehensive Component Monitor	Continuous	1	2	1	3	40
Misfire Monitor (Type 1 and 3)	Continuous	1	2	1	3 - similar conditions	80
Misfire Monitor (Type 2)	Continuous		1		3 - similar conditions	80
Fuel System Monitor	Continuous	1	1 or 2	1	3 - similar conditions	80
Catalytic Converter Monitor	Once per trip	1	2	1	3 trips	40
Oxygen Sensor Monitor	Once per trip	1	2	1	3 trips	40
Oxygen Sensor Heater Monitor	Once per trip	1	2	1	3 trips	40
Exhaust Gas Recirculation (EGR) Monitor	Once per trip	1	2	1	3 trips	40
Evaporative Emissions Controls Monitor	Once per trip	1	2	1	3 trips	40
Secondary Air System (AIR) Monitor	Once per trip	1	2	1	3 trips	40
NMHC Monitor	Once per trip	1	2	1	3 trips	40
Nox Adsorber Monitor	Once per trip	1	2	1	3 trips	40
Boost Pressure System Monitor	Once per trip	1	2	1	3 trips	40
Exhaust Gas Sensor Monitor	Once per trip	1	2	1	3 trips	40
PM Filter Monitor	Once per trip	1	2	1	3 trips	40



**WHEN DID YOU FIRST NOTICE THE PROBLEM:**

- Just Started
- Started Last Week
- Started Last Month
- Other:

**LIST ANY REPAIRS DONE IN THE PAST SIX MONTHS:**


**PROBLEMS STARTING**

- No symptoms
- Will not crank
- Cranks, but will not start
- Starts, but takes a long time

**ENGINE QUITS OR STALLS**

- No symptoms
- Right after starting
- When shifting into gear
- During steady-speed driving
- Right after vehicle comes to a stop
- While idling
- During acceleration
- When parking

**IDLING CONDITIONS**

- No symptoms
- Is too slow at all times
- Is too fast
- Is sometimes too fast or too slow
- Is rough or uneven
- Fluctuates up and down

**RUNNING CONDITIONS**

- No symptoms
- Runs rough
- Lacks power
- Bucks and jerks
- Poor fuel economy
- Hesitates or stumbles on accelerations
- Backfires
- Misfires or cuts out
- Engine knocks, pings or rattles
- Surges
- Dieseling or run-on

### AUTOMATIC TRANSMISSION PROBLEMS (if applicable)

- No symptoms
- Shifts too early or too late
- Changes gear incorrectly
- Vehicle does not move when in gear
- Jerks or bucks

### PROBLEM OCCURS

- Morning
- Afternoon
- Anytime

### ENGINE TEMPERATURE WHEN PROBLEM OCCURS

- Cold
- Warm
- Hot

### DRIVING CONDITIONS WHEN PROBLEM OCCURS

- Short - less than 2 miles
- 2 - 10 miles
- Long - more than 10 miles
- Stop and go
- While turning
- While braking
- At gear engagement
- With A/C operating
- With headlights on
- During acceleration
- Mostly driving downhill
- Mostly driving uphill
- Mostly driving level
- Mostly driving curvy roads
- Mostly driving rough roads

### DRIVING HABITS

- Mostly city driving
- Highway
- Park vehicle inside
- Park vehicle outside
- Drive less than 10 miles per day
- Drive 10 to 50 miles per day
- Drive more than 50 miles per day

### GASOLINE USED

- 87 Octane
- 89 Octane
- 91 Octane
- More than 91 Octane

### WEATHER CONDITIONS WHEN PROBLEM OCCURS

- 32 - 55° F (0 - 13° C)
- Below freezing (32° F / 0° C)
- Above 55° F (13° C)

### CHECK ENGINE LIGHT / DASH WARNING LIGHT

- Sometimes ON
- Always ON
- Never ON

### PECULIAR SMELLS

- "Hot"
- Sulfur ("rotten egg")
- Burning rubber
- Gasoline
- Burning oil
- Electrical

### STRANGE NOISES

- Rattle
- Knock
- Squeak
- Other

## BEFORE YOU BEGIN

The Enhanced OBD2 Diagnostic Tool aids in monitoring electronic- and emissions-related faults in your vehicle and retrieving fault codes related to malfunctions in these systems. Mechanical problems such as low oil level or damaged hoses, wiring or electrical connectors can cause poor engine performance and may also cause a fault code to set. Fix any known mechanical problems before performing any test. See your vehicle's service manual or a mechanic for more information.



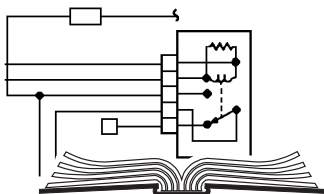
Check the following areas **before** starting any test:

- Check the engine oil, power steering fluid, transmission fluid (if applicable), engine coolant and other fluids for proper levels. Top off low fluid levels if needed.
- Make sure the air filter is clean and in good condition. Make sure all air filter ducts are properly connected. Check the air filter ducts for holes, rips or cracks.
- Make sure all engine belts are in good condition. Check for cracked, torn, brittle, loose or missing belts.
- Make sure mechanical linkages to engine sensors (throttle, gearshift position, transmission, etc.) are secure and properly connected. See your vehicle's service manual for locations.
- Check all rubber hoses (radiator) and steel hoses (vacuum/fuel) for leaks, cracks, blockage or other damage. Make sure all hoses are routed and connected properly.
- Make sure all spark plugs are clean and in good condition. Check for damaged, loose, disconnected or missing spark plug wires.
- Make sure the battery terminals are clean and tight. Check for corrosion or broken connections. Check for proper battery and charging system voltages.
- Check all electrical wiring and harnesses for proper connection. Make sure wire insulation is in good condition, and there are no bare wires.
- Make sure the engine is mechanically sound. If needed, perform a compression check, engine vacuum check, timing check (if applicable), etc.

### VEHICLE SERVICE MANUALS

Always refer to the manufacturer's service manual for your vehicle before performing any test or repair procedures. Contact your local car dealership, auto parts store or bookstore for availability of these manuals. The following companies publish valuable repair manuals:

- **Haynes Publications**  
861 Lawrence Drive  
Newbury Park, California 91320  
Phone: 800-442-9637  
Web: [www.haynes.com](http://www.haynes.com)
- **Mitchell 1**  
14145 Danielson Street  
Poway, California 92064  
Phone: 888-724-6742  
Web: [www.m1products.com](http://www.m1products.com)
- **Motor Publications**  
5600 Crooks Road, Suite 200  
Troy, Michigan 48098  
Phone: 800-426-6867  
Web: [www.motor.com](http://www.motor.com)



### FACTORY SOURCES

Ford, GM, Chrysler, Honda, Isuzu, Hyundai and Subaru Service Manuals

- **Helm Inc.**  
14310 Hamilton Avenue  
Highland Park, Michigan 48203  
Phone: 800-782-4356  
Web: [www.helminc.com](http://www.helminc.com)

### CODE RETRIEVAL PROCEDURE

*Retrieving and using Diagnostic Trouble Codes (DTCs) for troubleshooting vehicle operation is only one part of an overall diagnostic strategy.*

**Never** replace a part based only on the DTC definition. Each DTC has a set of testing procedures, instructions and flow charts that must be followed to confirm the location of the problem. This information is found in the vehicle's service manual. Always refer to the vehicle's service manual for detailed testing instructions.



*Check your vehicle thoroughly before performing any test. See **BEFORE YOU BEGIN** on page 31 for details.*




**ALWAYS** observe safety precautions whenever working on a vehicle. See **SAFETY PRECAUTIONS** on page 3 for more information.

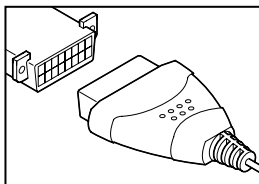
1. Turn the ignition off.
2. Locate the vehicle's 16-pin Data Link Connector (DLC). See page 5 for connector location.



*Some DLCs have a plastic cover that must be removed before connecting the Diagnostic Tool cable connector.*



*If the Diagnostic Tool is ON, turn it OFF by pressing the **POWER/LINK**  button **BEFORE** connecting the Diagnostic Tool to the DLC.*



3. Connect the Diagnostic Tool cable connector to the vehicle's DLC. The cable connector is keyed and will only fit one way.
  - If you have problems connecting the cable connector to the DLC, rotate the connector 180° and try again.
  - If you still have problems, check the DLC on the vehicle and on the Diagnostic Tool. Refer to your vehicle's service manual to properly check the vehicle's DLC.
4. Turn the ignition on. **DO NOT** start the engine.
5. When the Diagnostic Tool's cable connector is properly connected to the vehicle's DLC, the unit automatically turns ON.

- If the unit does not power on automatically when connected to the vehicle's DLC connector, it usually indicates there is no power present at the vehicle's DLC connector. Check your fuse panel and replace any burned-out fuses.
  - If replacing the fuse(s) does not correct the problem, consult your vehicle's repair manual to identify the proper computer (PCM) fuse/circuit, and perform any necessary repairs before proceeding.
6. The Diagnostic Tool will automatically start a check of the vehicle's computer to determine which type of communication protocol it is using. When the Diagnostic Tool identifies the computer's communication protocol, a communication link is established. The protocol type used by the vehicle's computer is shown on the display.

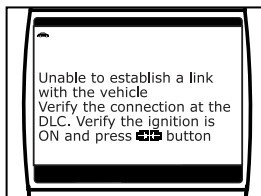


*A **PROTOCOL** is a set of rules and procedures for regulating data transmission between computers, and between testing equipment and computers. As of this writing, five different types of protocols (ISO 9141, Keyword 2000, J1850 PWM, J1850 VPW and CAN) are in use by vehicle manufacturers. The Diagnostic Tool automatically identifies the protocol type and establishes a communication link with the vehicle's computer.*




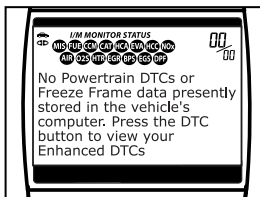
7. After approximately 10–60 seconds, the Diagnostic Tool will **retrieve** and **display** any Diagnostic Trouble Codes, Monitor Status and Freeze Frame Data retrieved from the vehicle's computer memory.

- If the Diagnostic Tool fails to link to the vehicle's computer a "Linking Failed" message shows on the Diagnostic Tool's display.
  - Verify the connection at the DLC, and verify the ignition is ON.
  - Turn the ignition OFF, wait 5 seconds, then turn back ON to reset the computer.
  - Ensure your vehicle is OBD2 compliant. See VEHICLES COVERED on page 5 for vehicle compliance verification information.





- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, the message "No Powertrain DTCs or Freeze Frame Data presently stored in the vehicle's computer. Press the DTC button to view your Enhanced DTC's display. Press the **DTC SCROLL**  button to enter the "enhanced" mode (see THE ENHANCED MAIN MENU on page 38).





- The Diagnostic Tool is capable of retrieving and storing up to 32 codes in memory, for immediate or later viewing.

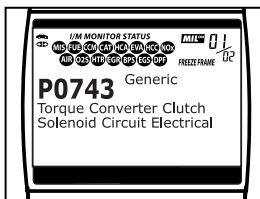
### 8. To read the display:



*Refer to DISPLAY FUNCTIONS on page 8 for a description of display elements.*



- A visible  icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- A visible  icon indicates that the Diagnostic Tool is linked to (communicating with) the vehicle's computer.
- The I/M Monitor Status icons indicate the type and number of Monitors the vehicle supports, and provides indications of the current status of the vehicle's Monitors. A **solid** Monitor icon indicates the associated Monitor **has run** and completed its testing. A **blinking** Monitor icon indicates the associated Monitor **has not** run and completed its testing.

- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved, and whether or not the displayed code commanded the MIL on. If the code being displayed is a PENDING code, the PENDING icon is shown. If the code being displayed is a PERMANENT code, the PERMANENT icon is shown.



- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the display.



*In the case of long code definitions, a small arrow is shown in the upper/lower right-hand corner of the Diagnostic Tool display area to indicate the presence of additional information. Use the  and  buttons, as necessary, to view the additional information.*



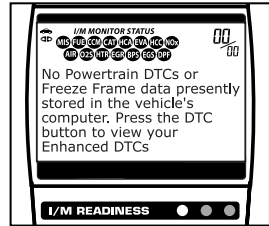
*If a definition for the currently displayed code is not available, an advisory message shows on the Diagnostic Tool's display.*

### 9. Read and interpret Diagnostic Trouble Codes/system condition using the display and the green, yellow and red LEDs.



The green, yellow and red LEDs are used (with the display) as visual aids to make it easier to determine engine system conditions.

- **Green LED** – Indicates that all engine systems are “OK” and operating normally. All monitors supported by the vehicle have run and performed their diagnostic testing, and no trouble codes are present. All Monitor icons will be solid.

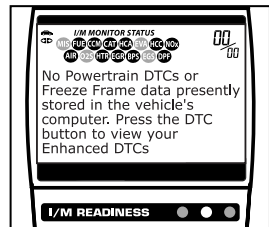


- **Yellow LED** – Indicates one of the following conditions:

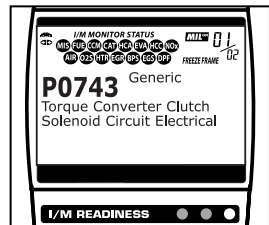
- A. **A PENDING CODE IS PRESENT** – If the yellow LED is illuminated, it may indicate a Pending code is present. Check the Diagnostic Tool's display for confirmation. A Pending code is confirmed by the presence of a numeric code and the word PENDING on the Diagnostic Tool's display.



- B. **MONITOR NOT RUN STATUS** – If the Diagnostic Tool's display shows a zero (indicating there are no DTC's present in the vehicle's computer memory), but the yellow LED is illuminated, it may be an indication that some of the Monitors supported by the vehicle have not yet run and completed their diagnostic testing. Check the Diagnostic Tool's display for confirmation. All Monitor icons that are **blinking** have not yet run and completed their diagnostic testing; all Monitor icons that are **solid** have run and completed their diagnostic testing.

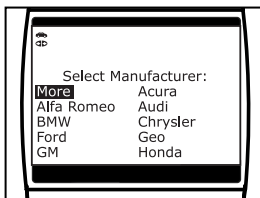


- **Red LED** – Indicates there is a problem with one or more of the vehicle's systems. The red LED is also used to indicate that DTC(s) are present (displayed on the Diagnostic Tool's screen). In this case, the Malfunction Indicator (Check Engine) lamp on the vehicle's instrument panel will be illuminated.

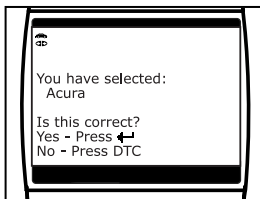


- DTC's that start with “P0”, “P2” and some “P3” are considered Generic (Universal). All Generic DTC definitions are the same on all OBD2 equipped vehicles. The Diagnostic Tool automatically displays the code definitions (if available) for Generic DTC's.

- DTC's that start with "P1" and some "P3" are Manufacturer specific codes and their code definitions vary with each vehicle manufacturer. When a Manufacturer specific DTC is retrieved, the LCD display shows a list of vehicle manufacturers. Use the **UP** (↑) and **DOWN** (↓) buttons, as necessary, to highlight the appropriate manufacturer, then press the **ENTER** (↵) button to display the correct code definition for your vehicle. A confirmation message shows on the LCD display.



- If the correct manufacturer is shown, press the **ENTER** (↵) button to continue.
- If the correct manufacturer is not shown, press the **DTC SCROLL** (DTC) button to return to the list of vehicle manufacturers.



If the manufacturer for your vehicle is not listed, use the **UP** (↑) and **DOWN** (↓) buttons, as necessary, to select **Other manufacturer** and press the **ENTER** (↵) button for additional DTC information.



If the definition for the currently displayed code is not available, an advisory message shows on the Diagnostic Tool's LCD display.

10. If more than one DTC was retrieved, and to view Freeze Frame Data, press and release the **DTC SCROLL** (DTC) button, as necessary.




- Each time the **DTC SCROLL** (DTC) button is pressed and released, the Diagnostic Tool will scroll and display the next DTC in sequence until all DTCs in its memory have displayed.
- In OBD2 systems, when an emissions-related engine malfunction occurs that causes a DTC to set, a record or snapshot of engine conditions at the time that the malfunction occurred is also saved in the vehicle's computer memory. The record saved is called Freeze Frame data. Saved engine conditions include, but are not limited to: engine speed, open or closed loop operation, fuel system commands, coolant temperature, calculated load value, fuel pressure, vehicle speed, air flow rate, and intake manifold pressure. See VIEWING FREEZE FRAME DATA on page 101.




If more than one malfunction is present that causes more than one DTC to be set, only the code with the highest priority will contain Freeze Frame data. The code designated "01" on the Diagnostic Tool display is referred to as the **PRIORITY** code, and Freeze Frame data always refers to this code. The priority code is also the one that has commanded the MIL on.




Retrieved information can be uploaded to a Personal Computer (PC) with the use of optional software (see instructions included with the software for more information).

11. When the last retrieved DTC has been displayed and the **DTC SCROLL**  button is pressed, the Diagnostic Tool enters the “enhanced” mode.

- See VIEWING ENHANCED DTCs on page 39 to view enhanced DTCs for your vehicle.
- If you do not wish to view enhanced DTCs, press the **FF/M**  button to return to the OBD2 DTC screen.




If a Manufacturer specific DTC was retrieved during the code retrieval process, and the manufacturer selected for the code **was not** Chrysler/Jeep, Ford/Mazda, GM/Isuzu, Honda/Acura, or Toyota/Lexus, pressing the **DTC SCROLL**  button after display of the **last** retrieved DTC returns the screen to the **first** retrieved DTC (the Enhanced DTC menu **is not** displayed).




12. Determine engine system(s) condition by viewing the Diagnostic Tool's display for any retrieved Diagnostic Trouble Codes, code definitions and Freeze Frame data, interpreting the green, yellow and red LEDs.

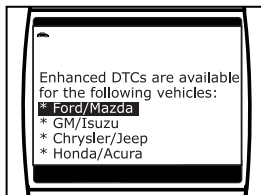
- If DTC's were retrieved and you are going to perform the repairs yourself, proceed by consulting the Vehicle's Service Repair Manual for testing instructions, testing procedures, and flow charts related to retrieved code(s).
- If you plan to take the vehicle to a professional to have it serviced, complete the PRELIMINARY VEHICLE DIAGNOSTIC WORKSHEET on page 28 and take it together with the retrieved codes, freeze frame data and LED information to aid in the troubleshooting procedure.
- To prolong battery life, the Diagnostic Tool automatically shuts “Off” approximately three minutes after it is disconnected from the vehicle. The DTCs retrieved, Monitor Status and Freeze Frame data (if any) will remain in the Diagnostic Tool's memory, and may be viewed at any time by turning the unit “On”. If the Diagnostic Tool's batteries are removed, or if the Diagnostic Tool is re-linked to a vehicle to retrieve codes/data, any prior codes/data in its memory are automatically cleared.


## THE ENHANCED MAIN MENU





Following the code retrieval procedure (see CODE RETRIEVAL PROCEDURE on page 33), when the last retrieved DTC has been displayed and the **DTC SCROLL**  button is pressed, the Diagnostic Tool enters the “enhanced” mode. The “enhanced” mode provides the ability to retrieve *enhanced* DTCs from most Chrysler/Jeep, Ford/Mazda, GM/Isuzu, Honda/Acura and Toyota/Lexus vehicles. The types of enhanced data available depends on the vehicle make.

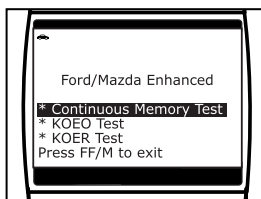
The screen shown when the Diagnostic Tool enters the “enhanced” mode depends on the type(s) of DTC(s) returned during the code retrieval process:

- If *no* DTCs were retrieved, or *only* generic DTCs were retrieved, the Enhanced Main Menu displays. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight the desired option, then press the **ENTER**  button to view the selected information.



*If the manufacturer of the vehicle from which codes were retrieved is not listed, press the **FF/M**  button to return to the OBD2 DTC screen. Enhanced data is not available for your vehicle.*

- If a Manufacturer specific DTC was retrieved, and the manufacturer selected for the code was Chrysler, Jeep, Ford, Mazda, General Motors, Isuzu, Honda, Acura, Toyota or Lexus, the Select Data menu displays. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight the desired option, then press the **ENTER**  button to view the selected information, or, press the **FF/M**  button to return to the OBD2 DTC screen.



- If a Manufacturer specific DTC was retrieved, and the manufacturer selected for the code was *not* Chrysler, Jeep, Ford, Mazda, General Motors, Isuzu, Honda, Acura, Toyota or Lexus the “enhanced” mode is bypassed, and the OBD2 DTC screen shows the *first* code retrieved. Enhanced data is not available for your vehicle.




## VIEWING ENHANCED DTCs

Refer to the appropriate paragraph to view enhanced data for your vehicle:

- Chrysler/Jeep..... page 39
- Ford/Mazda..... page 41
- GM/Isuzu..... page 43
- Honda/Acura ..... page 45
- Toyota/Lexus ..... page 46


### Chrysler/Jeep Enhanced DTCs

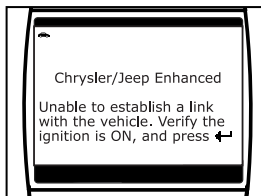
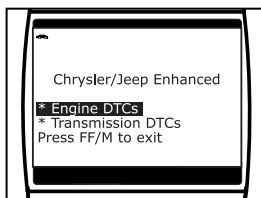
When the Diagnostic Tool enters the “enhanced” mode (and **Chrysler/Jeep** is selected, if prompted), the Chrysler Enhanced menu displays. You may view either “Engine DTCs” or “Transmission DTCs.”

1. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight the desired option, then press the **ENTER**  button.



**Transmission DTCs are not supported on most Chrysler/Jeep vehicles manufactured prior to 2002.**


- A “One moment please” message displays while the Diagnostic Tool retrieves the selected DTCs.
- If the Diagnostic Tool fails to link to the vehicle’s computer, a “Linking Failed” message shows on the Diagnostic Tool’s display.
  - Verify the ignition is ON, then press the **ENTER**  button to continue.

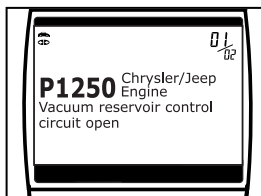


2. To read the display:





**Refer to DISPLAY FUNCTIONS on page 8 for a description of LCD display elements.**


- A visible  icon indicates that the Diagnostic Tool is being powered through the vehicle’s DLC connector.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.









**I/M MONITOR STATUS icons are not displayed when viewing enhanced DTCs.**



**In the case of long code definitions, or when viewing Freeze Frame data, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the  and  buttons, as necessary, to view the additional information.**

- The Diagnostic Tool will display a code only if codes are present in the vehicle’s computer memory. If no codes are present, a “No Enhanced DTC’s are presently stored in the vehicle’s computer” is displayed. Press the **FF/M**  button to return to the Chrysler Enhanced menu.






- If more than one code was retrieved press the **DTC SCROLL**  button, as necessary, to display additional codes one at a time.
  - Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK**  button again.
- When the last retrieved DTC has been displayed and the **DTC SCROLL**  button is pressed, the Diagnostic Tool returns to the Chrysler Enhanced menu.
  - To view *additional* enhanced DTCs, repeat steps 1 through 4, above.
  - To exit the enhanced mode, use the **UP**  and **DOWN**  buttons, as necessary, to select **Exit** from the Chrysler Enhanced menu, then press the **ENTER**  button. The Diagnostic Tool returns to the OBD2 DTC screen.

## Ford/Mazda Enhanced DTCs




*Mazda Enhanced DTCs are available for **Mazda-branded Ford vehicles only.***

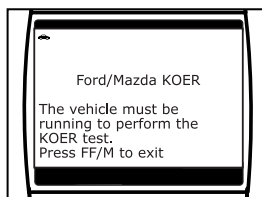
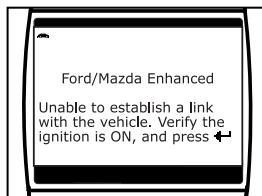
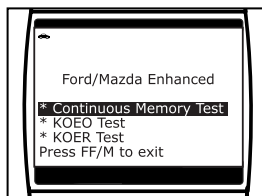
When the Diagnostic Tool enters the “enhanced” mode (and **Ford/Mazda** is selected, if prompted), the Ford/Mazda Enhanced menu displays. You may view DTCs for either the “Continuous Memory Test”, “KOE0 (Key On Engine Off) Test” or “KOER (Key On Engine Running) Test.”


- Use the **UP**  and **DOWN**  buttons, as necessary, to highlight the desired option, then press the **ENTER**  button.




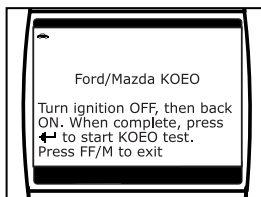
*When choosing to view **KOER Test** DTCs, start the vehicle's engine before making your selection.*

- A “One moment please” message displays, while the Diagnostic Tool retrieves the selected DTCs.
- If the Diagnostic Tool fails to link to the vehicle's computer, a “Linking Failed” message shows on the Diagnostic Tool's Display.
  - Verify the ignition is ON, then press the **ENTER**  button to continue.
- If the KOER Test was selected, and the vehicle's engine *is not* running, an advisory message shows on the Diagnostic Tool's display.




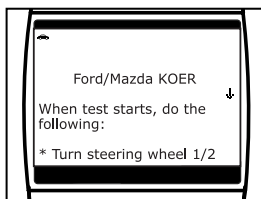
- Press the **FF/M**  button to return to the Ford/Mazda Enhanced menu.
2. An “instructional” message shows on the Diagnostic Tool’s display. Perform test procedures as appropriate.

- If the Continuous Memory or KOEO test was selected, turn the ignition OFF, then back ON. Press the **ENTER**  button to start the test.



- A “One moment please” message displays while the test is in progress.

- If the KOER test was selected, press the **ENTER**  button to continue.




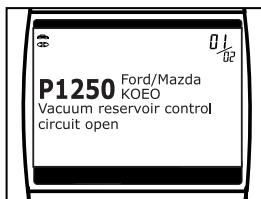
- A “One moment please” message displays while the test is in progress.
- Turn the steering wheel to the right, then release.
- Press and release the brake pedal.
- Cycle the overdrive switch (if equipped).

3. To read the display:





Refer to **DISPLAY FUNCTIONS** on page 8 for a description of LCD display elements.

- A visible  icon indicates that the Diagnostic Tool is being powered through the vehicle’s DLC connector.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.




*I/M MONITOR STATUS* icons are not displayed when viewing enhanced DTCs.









*In the case of long code definitions, or when viewing Freeze Frame data, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the  and  buttons, as necessary, to view the additional information.*







- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No Enhanced DTC's are presently stored in the vehicle's computer" is displayed. Press the **FF/M**  button to return to the Ford/Mazda Enhanced menu.

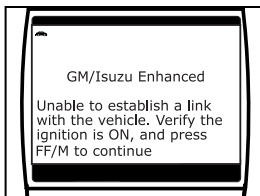
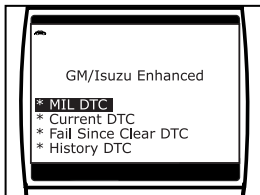


4. If more than one code was retrieved press the **DTC SCROLL**  button, as necessary, to display additional codes one at a time.
  - Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK**  button again.
5. When the last retrieved DTC has been displayed and the **DTC SCROLL**  button is pressed, the Diagnostic Tool returns to the Ford/Mazda Enhanced menu.
  - To view *additional* enhanced DTCs, repeat steps 1 through 5, above.
  - To exit the enhanced mode, use the **UP**  and **DOWN**  buttons, as necessary, to select **Exit** from the Ford/Mazda Enhanced menu, then press the **ENTER**  button. The Diagnostic Tool returns to the OBD2 DTC screen.

### General Motors/Isuzu Enhanced DTCs

When the Diagnostic Tool enters the "enhanced" mode (and **General Motors/Isuzu** is selected, if prompted), the GM/Isuzu Enhanced menu displays. You may view the "MIL DTC", "Current DTC", "Fail Since Clear DTC" or "History DTC."


1. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight the desired option, then press the **ENTER**  button.
  - A "One moment please" message displays while the Diagnostic Tool retrieves the selected DTCs.
  - If the Diagnostic Tool fails to link to the vehicle's computer, a "Linking Failed" message shows on the Diagnostic Tool's display.
    - Verify the ignition is ON, then press the **FF/M**  button to continue.

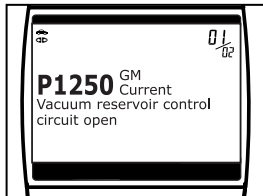


### 2. To read the display:





Refer to **DISPLAY FUNCTIONS** on page 8 for a description of LCD display elements.


- A visible  icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.









**I/M MONITOR STATUS** icons are not displayed when viewing enhanced DTCs.



In the case of long code definitions, or when viewing Freeze Frame data, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the  and  buttons, as necessary, to view the additional information.

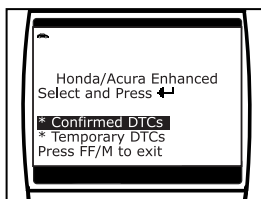
- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No Enhanced DTC's are presently stored in the vehicle's computer" is displayed. Press the **FF/M**  button to return to the GM Enhanced menu.



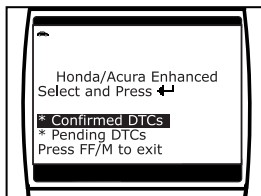
- If more than one code was retrieved press the **DTC SCROLL**  button, as necessary, to display additional codes one at a time.
  - Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK**  button again.
- When the last retrieved DTC has been displayed and the **DTC SCROLL**  button is pressed, the Diagnostic Tool returns to the GM/Isuzu Enhanced menu.
  - To view *additional* enhanced DTCs, repeat steps 1 through 4, above.
  - To exit the enhanced mode, use the **UP**  and **DOWN**  buttons, as necessary, to select **Exit** from the GM/Isuzu Enhanced menu, then press the **ENTER**  button. The Diagnostic Tool returns to the OBD2 DTC screen.

## Honda/Acura Enhanced DTCs

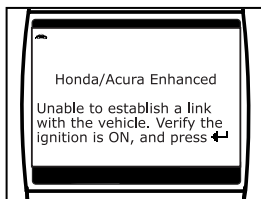
When the Diagnostic Tool enters the “enhanced” mode (and **Honda/Acura** is selected, if prompted), the Honda Acura Enhanced menu displays. Depending on the protocol used to communicate with your vehicle, the Honda/Acura Enhanced menu provides options to view:



- Confirmed DTCs or Temporary DTCs
  - Confirmed DTCs or Pending DTCs
1. Use the **UP** (↑) and **DOWN** (↓) buttons, as necessary, to highlight the desired option, then press the **ENTER** (↵) button.




- A “One moment please” message displays while the Diagnostic Tool retrieves the selected DTCs.
- If the Diagnostic Tool fails to link to the vehicle’s computer, a “Linking Failed” message shows on the Diagnostic Tool’s display.
  - Verify the ignition is ON, then press the **ENTER** (↵) button to continue.

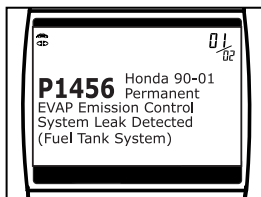


2. To read the display:



*Refer to DISPLAY FUNCTIONS on page 8 for a description of LCD display elements.*


- A visible  icon indicates that the Diagnostic Tool is being powered through the vehicle’s DLC connector.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.

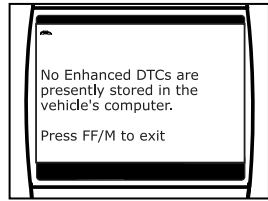








*I/M MONITOR STATUS icons are not displayed when viewing enhanced DTCs.*



*In the case of long code definitions, or when viewing Freeze Frame data, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the (↑) and (↓) buttons, as necessary, to view the additional information.*




- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No Enhanced DTC's are presently stored in the vehicle's computer" is displayed. Press the **FF/M**  button to return to the Honda/Acura Enhanced menu.

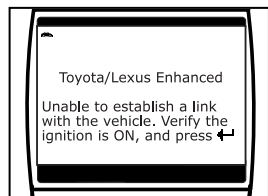
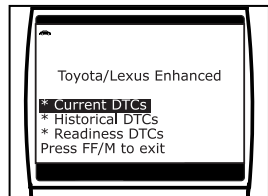
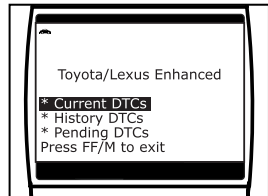



3. If more than one code was retrieved press the **DTC SCROLL**  button, as necessary, to display additional codes one at a time.
  - Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK**  button again.
4. When the last retrieved DTC has been displayed and the **DTC SCROLL**  button is pressed, the Diagnostic Tool returns to the Honda/Acura Enhanced menu.
  - To view *additional* enhanced DTCs, repeat steps 1 through 4, above.
  - To exit the enhanced mode, use the **UP**  and **DOWN**  buttons, as necessary, to select **Exit** from the Honda/Acura Enhanced menu, then press the **ENTER**  button. The Diagnostic Tool returns to the OBD2 DTC screen.

### Toyota/Lexus Enhanced DTCs

When the Diagnostic Tool enters the "enhanced" mode (and **Toyota/Lexus** is selected, if prompted), the Toyota/Lexus Enhanced menu displays. Depending on the protocol used to communicate with your vehicle, the Toyota/Lexus Enhanced menu provides options to view:

- Current DTCs, History DTCs or Pending DTCs
  - Current DTCs, Historical DTCs or Readiness DTCs
1. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight the desired option, then press the **ENTER**  button.
    - A "One moment please" message displays, while the Diagnostic Tool retrieves the selected DTCs.
    - If the Diagnostic Tool fails to link to the vehicle's computer, a "Linking Failed" message shows on the Diagnostic Tool's Display.




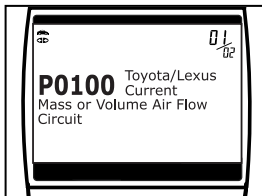
- Verify the ignition is ON, then press the **ENTER**  button to continue.

### 2. To read the display:





Refer to **DISPLAY FUNCTIONS** on page 8 for a description of LCD display elements.


- A visible  icon indicates that the Diagnostic Tool is being powered through the vehicle's DLC connector.
- The upper right hand corner of the display shows the number of the code currently being displayed, the total number of codes retrieved.
- The Diagnostic Trouble Code (DTC) and related code definition are shown in the lower section of the LCD display.







**I/M MONITOR STATUS** icons are not displayed when viewing enhanced DTCs.



In the case of long code definitions, or when viewing Freeze Frame data, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the  and  buttons, as necessary, to view the additional information.

- The Diagnostic Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No Enhanced DTC's are presently stored in the vehicle's computer" is displayed. Press the **FF/M**  button to return to the Toyota/Lexus Enhanced menu.



3. If more than one code was retrieved press the **DTC SCROLL**  button, as necessary, to display additional codes one at a time.
  - Whenever the Scroll function is used to view additional codes, the Diagnostic Tool's communication link with the vehicle's computer disconnects. To re-establish communication, press the **POWER/LINK**  button again.
4. When the last retrieved DTC has been displayed and the **DTC SCROLL**  button is pressed, the Diagnostic Tool returns to the Toyota/Lexus Enhanced menu.
  - To view *additional* enhanced DTCs, repeat steps 1 through 4, above.
  - To exit the enhanced mode, press the **FF/M**  button. The Diagnostic Tool returns to the OBD2 DTC screen.

### ERASING DIAGNOSTIC TROUBLE CODES (DTCs)



*When the Diagnostic Tool's ERASE function is used to erase DTCs from the vehicle's on-board computer, "Freeze Frame" data and manufacturer-specific enhanced data are also erased.*

If you plan to take the vehicle to a Service Center for repair, **DO NOT** erase the codes from the vehicle's computer. If the codes are erased, valuable information that might help the technician troubleshoot the problem will also be erased.

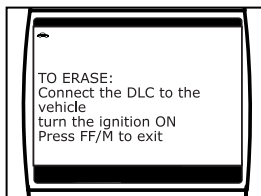
Erase DTCs from the computer's memory as follows:



*When DTCs are erased from the vehicle's computer memory, the I/M Readiness Monitor Status program resets the status of all Monitors to a not run "flashing" condition. To set all of the Monitors to a DONE status, an OBD2 Drive Cycle must be performed. Refer to your vehicle's service manual for information on how to perform an OBD2 Drive Cycle for the vehicle under test.*

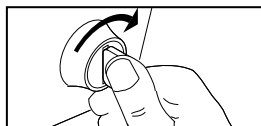
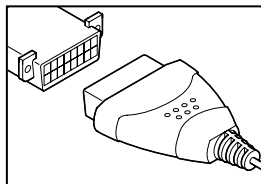


*The Diagnostic Tool must be connected to the vehicle's DLC to erase the codes from the computer's memory. If you press the **ERASE** button when the Diagnostic Tool is not connected to the vehicle's DLC, the erase instruction screen displays.*






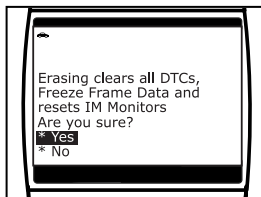
*The Erase function can be performed **only** from the OBD2 DTC screen. The Erase function **cannot** be performed while the Diagnostic Tool is in "enhanced" mode.*




1. If not connected already, connect the Diagnostic Tool to the vehicle's DLC, and turn the ignition "On." (If the Diagnostic Tool is already connected and linked to the vehicle's computer, proceed directly to step 3. If not, continue to step 2.)
2. Perform the CODE RETRIEVAL PROCEDURE as described on page 33. Wait until the codes are displayed on the Diagnostic Tool's LCD and then proceed to step 3.




3. Press and release the **ERASE**  button. A confirmation message shows on the LCD display.

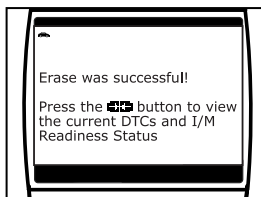
- If you are sure you want to proceed, use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Yes**, then press the **ENTER**  button to erase DTCs from the vehicle's computer.



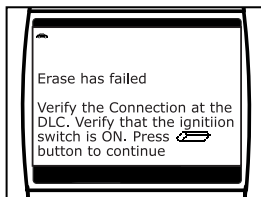
- If you do not want to continue with the erase process, use the **UP**  and **DOWN** , as necessary, to highlight **No**, then press the **ENTER**  button to exit the erase mode.

4. If you chose to erase DTCs, a progress screen displays while the erase function is in progress.

- If the erase was successful, a confirmation message shows on the display. Press the **POWER/LINK**  button to return to the DTC screen.



- If the erase was not successful, an advisory message shows on the display. Verify that the Diagnostic Tool is properly connected to the vehicle's DLC and that the ignition is on, then repeat steps 2 and 3, above.



*Erasing DTCs does not fix the problem(s) that caused the code(s) to be set. If proper repairs to correct the problem that caused the code(s) to be set are not made, the code(s) will appear again (and the check engine light will illuminate) as soon as the vehicle is driven long enough for its Monitors to complete their testing.*

## I/M READINESS TESTING

I/M is an Inspection and Maintenance program legislated by the Government to meet federal clean-air standards.

The program requires that a vehicle be taken periodically to an Emissions Station for an "Emissions Test" or "Smog Check," where the emissions-related components and systems are inspected and tested for proper operation. Emissions Tests are generally performed once a year, or once every two years.

On OBD2 systems, the I/M program is enhanced by requiring vehicles to meet stricter test standards. One of the tests instituted by the Federal Government is called I/M 240. On I/M 240, the vehicle under test is driven under different speeds and load conditions on a dynamometer for 240 seconds, while the vehicle's emissions are measured.



*Emissions tests vary depending on the geographic or regional area in which the vehicle is registered. If the vehicle is registered in a highly urbanized area, the I/M 240 is probably the type of test required. If the vehicle is registered in a rural area, the stricter "dynamometer type" test may not be required.*

### I/M Readiness Monitors

I/M Readiness shows whether the various emissions-related systems on the vehicle are operating properly and are ready for Inspection and Maintenance testing.

State and Federal Governments enacted Regulations, Procedures and Emission Standards to ensure that all emissions-related components and systems are **continuously** or **periodically** monitored, tested and diagnosed whenever the vehicle is in operation. It also requires vehicle manufacturers to automatically detect and report any problems or faults that may increase the vehicle's emissions to an unacceptable level.

The vehicle's emissions control system consists of several components or sub-systems (Oxygen Sensor, Catalytic Converter, EGR, Fuel System, etc.) that aid in reducing vehicle emissions.

To have an efficient Vehicle Emission Control System, all the emissions-related components and systems must work correctly whenever the vehicle is in operation.

To comply with State and Federal Government regulations, vehicle manufacturers designed a series of special computer programs called "Monitors" that are programmed into the vehicle's computer. Each of these Monitors is specifically designed to run tests and diagnostics on a specific emissions-related component or system (Oxygen Sensor, Catalytic Converter, EGR Valve, Fuel System, etc.) to ensure their proper operation. Currently, there are a maximum of eleven Monitors available for use.



*Each Monitor has a specific function to test and diagnose only its designated emissions-related component or system. The names of the Monitors (Oxygen Sensor Monitor, Catalyst Monitor, EGR Monitor, Misfire Monitor, etc.) describe which component or system each Monitor is designed to test and diagnose.*

### Emissions Inspection and Maintenance (I/M) Readiness

#### Monitor Status Information

I/M Readiness Monitor Status shows which of the vehicle's Monitors have run and completed their diagnosis and testing, and which ones have not yet run and completed testing and diagnosis of their designated sections of the vehicle's emissions system.

- If a Monitor was able to meet all the conditions required to enable it to perform the self-diagnosis and testing of its assigned engine system, it means the monitor "HAS RUN."



- If a Monitor has not yet met all the conditions required for it to perform the self-diagnosis and testing of its assigned engine system; it means the Monitor "HAS NOT RUN."



***The Monitor Run/Not Run status does not show whether or not a problem exists in a system. Monitor status only indicates whether a particular Monitor has or has not run and performed the self-diagnosis and testing of its associated system.***

### **Performing I/M Readiness Quick Check**



***When a vehicle first comes from the factory, all Monitors indicate a "HAVE RUN" status. This indicates that all Monitors have run and completed their diagnostic testing. The "HAVE RUN" status remains in the computer's memory, unless the Diagnostic Trouble Codes are erased or the vehicle's computer memory is cleared.***

The Diagnostic Tool allows you to retrieve Monitor/System Status Information to help you determine if the vehicle is ready for an Emissions Test (Smog Check). In addition to retrieving Diagnostic Trouble Codes, the Diagnostic Tool also retrieves Monitor Run/Not Run status. This information is very important since different areas of the state/country have different emissions laws and regulations concerning Monitor Run/Not Run status.

Before an Emissions Test (Smog Check) can be performed, your vehicle must meet certain rules, requirements and procedures legislated by the Federal and state (country) governments where you live.

1. In most areas, one of the requirements that must be met before a vehicle is allowed to be Emissions Tested (Smog Checked) is that the vehicle does not have any Diagnostic Trouble Codes present (with the exception of PENDING Diagnostic Trouble Codes).
2. In addition to the requirement that no Diagnostic Trouble Codes be present, some areas also require that all the Monitors that a particular vehicle supports indicate a "Has Run" status condition before an Emissions Check may be performed.
3. Other areas may only require that some (but not all) Monitors indicate a "Has Run" status before an Emissions Test (Smog Check) may be performed.



***Monitors with a "Has Run" status indicate that all the required conditions they needed to perform diagnosis and testing of their assigned engine area (system) have been met, and all diagnostic testing has completed successfully.***

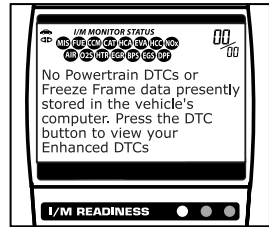
***Monitors with a "Has Not Run" status have not yet met the conditions they need to perform diagnosis and testing of their assigned engine area (system), and have not been able to perform diagnostic testing on that system.***

The green, yellow and red LEDs provide a quick way to help you determine if a vehicle is ready for an Emissions Test (Smog Check). Follow the instructions below to perform the Quick Check.

Perform the CODE RETRIEVAL PROCEDURE as described on page 33, then interpret the LED indications as follows:

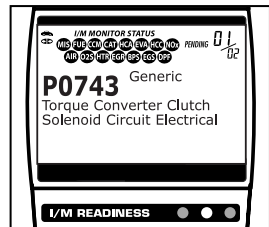
### Interpreting I/M Readiness Test Results

- GREEN LED** - Indicates that all engine systems are "OK" and operating normally (all Monitors supported by the vehicle have run and performed their self-diagnostic testing). The vehicle is ready for an Emissions Test (Smog Check), and there is a good possibility that it can be certified.

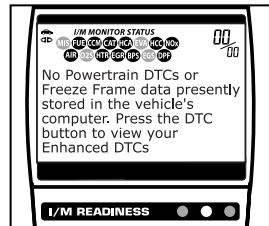


- YELLOW LED** - Determine from the CODE RETRIEVAL PROCEDURE (page 33) which of the two possible conditions is causing the yellow LED to light.

- If a "PENDING" Diagnostic Trouble Code is causing the yellow LED to light, it is possible that the vehicle will be allowed to be tested for emissions and certified. Currently, most areas (states / countries) will allow an Emissions Test (Smog Check) to be performed if the only code in the vehicle's computer is a "PENDING" Diagnostic Trouble Code.

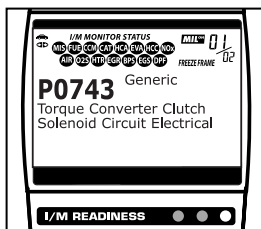


- If the illumination of the Yellow LED is being caused by monitors that "have not run" their diagnostic testing, then the issue of the vehicle being ready for an Emissions Test (Smog Check) depends on the emissions regulations and laws of your local area.



- Some areas require that all Monitors indicate a "Has Run" status before they allow an Emissions Test (Smog Check) to be performed. Other areas only require that some, but not all, Monitors have run their self-diagnostic testing before an Emissions Test (Smog Check) may be performed.
- From the code retrieval procedure, determine the status of each Monitor (a solid Monitor icon shows Monitor "Has Run" status, a flashing Monitor icon indicates "Has Not Run" status). Take this information to an emissions professional to determine (based on your test results) if your vehicle is ready for an Emissions Test (Smog Check).

3. **RED LED** - Indicates there is a problem with one or more of the vehicle's systems. A vehicle displaying a red LED is definitely not ready for an Emissions Test (Smog Check). The red LED is also an indication that there are Diagnostic Trouble Code(s) present (displayed on the Diagnostic Tool's screen). The Malfunction Indicator (Check Engine) Lamp on the vehicle's instrument panel will light steady. The problem that is causing the red LED to light must be repaired before an Emissions Test (Smog Check) can be performed. It is also suggested that the vehicle be inspected/repaired before driving the vehicle further.



If the Red LED was obtained, there is a definite problem present in the system(s). In these cases, you have the following options.

- Repair the vehicle yourself. If you are going to perform the repairs yourself, proceed by reading the vehicle service manual and following all its procedures and recommendations.
- Take the vehicle to a professional to have it serviced. The problem(s) causing the red LED to light must be repaired before the vehicle is ready for an Emissions Test (Smog Check).

### Using the I/M Readiness Monitor Status to Confirm a Repair

The I/M Readiness Monitor Status function can be used (after repair of a fault has been performed) to confirm that the repair has been performed correctly, and/or to check for Monitor Run Status. Use the following procedure to determine I/M Readiness Monitor Status:

1. Using retrieved Diagnostic Trouble Codes (DTCs) and code definitions as a guide, and following manufacturer's repair procedures, repair the fault or faults as instructed.
2. After the fault or faults have been repaired, connect the Diagnostic Tool to the vehicle's DLC and erase the code or codes from the vehicle's computer memory.
  - See page 48 for procedures for ERASING DIAGNOSTIC TROUBLE CODES (DTCs) from the vehicle's on-board computer.
  - Write the codes down on a piece of paper for reference before erasing.
3. After the erase procedure is performed, most of the Monitor icons on the Diagnostic Tool's display will be flashing. Leave the Diagnostic Tool connected to the vehicle, and perform a Trip Drive Cycle for each "flashing" Monitor:



*Misfire, Fuel and Comprehensive Component Monitors run continuously and their icons will always be on solid, even after the erase function is performed.*

- Each DTC is associated with a specific Monitor. Consult the vehicle's service manual to identify the Monitor (or Monitors) associated with the faults that were repaired. Follow the manufacturer's procedures to perform a Trip Drive Cycle for the appropriate Monitors.
- While observing the Monitor icons on the Diagnostic Tool's display, perform a Trip Drive Cycle for the appropriate Monitor or Monitors.



***If the vehicle needs to be driven in order to perform a Trip Drive Cycle, ALWAYS have a second person help you. One person should drive the vehicle while the other person observes the Monitor icons on the Diagnostic Tool for Monitor RUN status. Trying to drive and observe the Diagnostic Tool at the same time is dangerous, and could cause a serious traffic accident.***

4. When a Monitor's Trip Drive Cycle is performed properly, the Monitor icon on the Diagnostic Tool's display changes from "flashing" to "solid," indicating that the Monitor has run and finished its diagnostic testing.
  - If, after the Monitor has run, the MIL on the vehicle's dash is not lit, and no stored or pending codes associated with that particular Monitor are present in the vehicle's computer, the repair was successful.
  - If, after the Monitor has run, the MIL on the vehicle's dash lights and/or a DTC associated with that Monitor is present in the vehicle's computer, the repair was unsuccessful. Refer to the vehicle's service manual and recheck repair procedures.

## CHRYSLER/JEEP OBD1 SYSTEMS

### Chrysler Motors On-Board Computer Systems

Chrysler Motors introduced its first electronic fuel injected vehicle in late 1983. The on-board computer management systems used on Chrysler vehicles have evolved over the years, and their names have changed accordingly.

**1983-87:** The on-board computer used in these vehicles is a split-system, composed of two separate units: the Logic Module and the Power Module. The Logic Module contains a microprocessor which processes data received from sensors located throughout the vehicle and makes decisions (based on these inputs) which effect engine operation. The Logic Module is usually located on the right-hand side, behind the kick panel. The Power Module supplies operating power to the Logic Module, and contains the circuits which control the high-current devices. Power Module operation is controlled by the Logic Module. The Power Module is located in the engine compartment, near the vehicle's battery.

**1987-90:** This system is called a Single Module Engine Controller (SMEC). This system still uses two separate circuit boards (Logic Module and Power Module). However, both circuit boards are located in a common enclosure.

**1989-95:** This system is called a Single Board Engine Controller (SBEC). On this system, the Logic Module and Power Module circuit boards are integrated on a single circuit board.

**1993-97:** Beginning in 1993, the computer was renamed the Powertrain Control Module (PCM). In addition to controlling the engine management system and emission system, the computer also takes an active role in controlling powertrain (transmission system) operation.



*Unless otherwise specified, all references to "computer" within this manual also apply to "Logic Module/ Power Module", "SMEC", "SBEC" or "PCM".*

### Jeep On-Board Computer Systems

**1993-95:** In 1993, Jeep on-board computer systems (fuel injected vehicles only) were converted to the Chrysler on-board computer systems. All 1993 through 1995 fuel injected Jeep and Chrysler vehicles are equipped with similar on-board computer systems.

### VEHICLES COVERED

This section covers Chrysler fuel injected vehicles from 1983-1995.

Type	Model Year	Model
Passenger Cars	1983-1995	Chrysler, Dodge and Plymouth Fuel Injected Models Only (Excluding Lasor/Talon 1.8L, 2.0L (ALL YEARS), 1990 Monaco/Premier, 1993-1995 Intrepid, LHS, Concorde and Vision, 1995 Avenger, Stealth (ALL YEARS) and Cirrus 2.5L (ALL YEARS))
Light Truck and Vans	1987-1995	Chrysler, Dodge and Plymouth Fuel Injected Models Only
	1992-1995	Diesel Models
Jeep	1993-1995	Jeep Fuel Injected Models Only

### INSTRUMENT PANEL INDICATOR LIGHTS

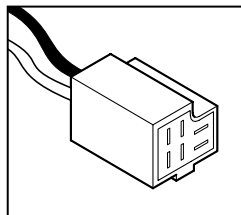
Your vehicle's instrument panel has either a "Power Loss", "Check Engine" or "Malfunction Indicator Lamp", depending on the year of the vehicle. These lights are designed to warn you of component malfunctions.



*If your instrument panel indicator lights do not come on when you turn on the ignition, please refer to your vehicle's service manual. You may have problems in the car's circuitry. It is recommended that you fix these problems before retrieving DTC's from your vehicle's computer.*

### DATA LINK CONNECTOR (DLC)

Chrysler vehicles are equipped with special test connectors that make it possible to connect specialized testing equipment that communicates with the vehicle's on-board computer. Chrysler's vehicle test connectors are usually dark in color (BLACK or GREY) and are located under the hood.



## CODE RETRIEVAL PROCEDURE

**Retrieving and using Diagnostic Trouble Codes (DTCs) for troubleshooting vehicle operation is only one part of an overall diagnostic strategy.**

**Never** replace a part based only on the DTC definition. Each DTC has a set of testing procedures, instructions and flow charts that must be followed to confirm the location of the problem. This information is found in the vehicle's service manual. Always refer to the vehicle's service manual for detailed testing instructions.




*Check your vehicle thoroughly before performing any test. See **BEFORE YOU BEGIN** on page 31 for details.*

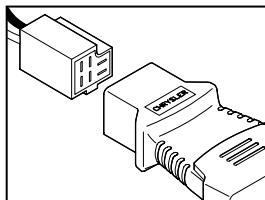
**ALWAYS** observe safety precautions whenever working on a vehicle. See *Safety Precautions* on page 3 for more information.

1. Locate the vehicle's Data Link Connector (DLC). See **Data Link Connector (DLC)** on page 56 for connector location.



*Some DLCs have a plastic cover that must be removed before connecting the Tool's cable connector.*

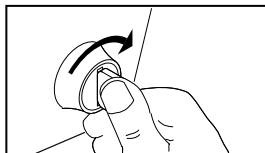
2. Connect the Tool cable (with the Chrysler Connector Cable Adaptor attached) to the Tool, then connect the adaptor to the vehicle's DLC. Press the **POWER/LINK**  button to turn the Tool ON.






- Set the parking brake, and make sure all vehicle accessories are turned off.

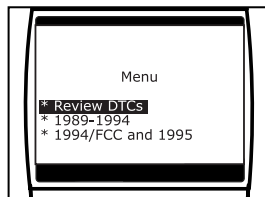
3. Turn the ignition ON. **DO NOT** start the engine.

- The Chrysler OBD1 Menu displays.



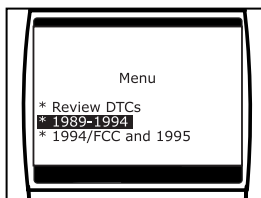
4. To view codes in the Diagnostic Tool's memory:

- Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Review DTCs**, then press the **ENTER**  button.



5. To retrieve codes from the vehicle's computer:

- Use the **UP** (▲) and **DOWN** (▼) buttons, as necessary, to highlight the model year of the vehicle, then press the **ENTER** (⊞) button.



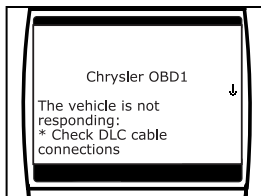
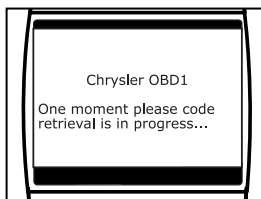
6. Prepare the vehicle to retrieve codes:

- **For 1988-1995 Chrysler/Jeep vehicles:** The Tool will automatically begin the code retrieval process. Proceed to step 6 to continue.
- **For 1984-1988 Chrysler vehicles ONLY:** WITHOUT starting the engine, turn ignition ON, OFF, ON, OFF and ON again within 5 seconds to activate the code retrieval process. Proceed to step 6 to continue.

7. When the Tool is in the process of retrieving codes, a "One Moment Please..." message shows on the Tool's LCD display.

- If the Tool fails to link to the vehicle's computer, a "Vehicle is not responding" message shows on the Tool's LCD display. Do the following:

- Verify the ignition is ON.
- Check the cable connections at the Tool and at the vehicle's DLC.
- Turn the ignition OFF, wait 10-12 seconds, then turn back ON to reset the computer.



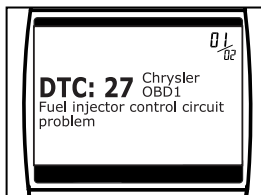
- Press the **ENTER** (⊞) button and repeat steps 4 through 7 as necessary.

- If the Diagnostic Tool **cannot** link to the vehicle's computer, the message "Contact Technical Support" displays.

- Press The **FF/M** (FF/M) button to return to the Chrysler OBD1 Menu.
- Turn the ignition off, and disconnect the Diagnostic Tool.
- Contact Technical Support for assistance.




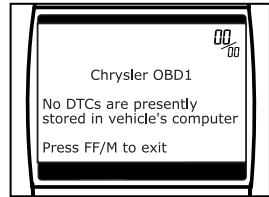
8. If the Tool was able to link to the vehicle successfully a "Code retrieval was successful..." message shows temporarily on the Tool's LCD display followed by any retrieved DTCs.







- The Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No DTC's are presently stored in the vehicle's computer" message is displayed.

9. If more than one code was retrieved press the **DTC SCROLL**  button, as necessary, to display additional codes one at a time.



*In the case of long code definitions, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the  and  buttons, as necessary, to view the additional information.*

10. Disconnect the Tool from the vehicle and turn the ignition key OFF.
11. To prolong battery life, the Tool automatically shuts "Off" after approximately three minutes of no button activity. The DTCs retrieved will remain in the Tool's memory, and may be viewed at any time. If the Tool's batteries are removed, or if the Tool is re-linked to a vehicle to retrieve codes, any prior codes in its memory are automatically cleared.
12. Follow the testing and repair procedures outlined in the vehicle's service repair manual to correct "hard" DTCs. Codes should be addressed and eliminated in the order they were received, erasing (see **SERVICING DTCs - OBD I** on page 97) and retesting after each repair is made to be sure the fault was eliminated.



*The green, yellow and red LEDs are used (with the LCD display) as visual aids to make it easier to determine engine system conditions. See **SERVICING DTCs - OBD I** on page 97 for information on interpreting LEDs and servicing DTCs.*

### FORD COMPUTER SYSTEM OVERVIEW



The Enhanced OBD2 & 1 Tool is compatible **only** with **EEC-IV** Computer Control systems.



**IMPORTANT:** When the computer is in Self-Test mode (is testing the sensors or actuators for proper operation), it relies on voltage signals that it sends to and / or receives from the sensors or actuators to determine whether or not these components are operating properly. The sensors and actuators are all connected to the computer by wires. If any defects are present in any part of the circuit that connects these devices to the computer (such as defective connectors or wires, faulty grounds, improper voltage, shorts etc.), the voltage signal that the computer receives from these devices will be affected. The computer has no way of determining if the improper voltage signal is being caused by a defect in the circuit or by the sensors or actuators themselves. Keep this in mind when servicing fault codes, and do not replace any devices (sensors or actuators) before checking the complete circuit (or circuits) that are part of the device from which the code was generated.

### VEHICLES COVERED

#### CAR - Ford, Lincoln, Mercury Computer System/Tool Application Table

The following table lists the year and model of all the cars that are covered by the OBD2 & 1 Tool.

Engine	8th VIN Digit**	Fuel Systems (Carburetor Model)	Application/Special Notes	Computer System
<b>1981-1982</b>				
1.6L I-4	5, 2	EFI, EFI Turbo	Escort, EXP, LN7, Lynx	EEC-IV
2.3L I-4	5	EFI Turbo	Capri, Cougar, Mustang, T-Bird	
2.3L I-4 HSC	R, J	FBC (6149)*	Capri, Fairmont, LTD, Marquis, Mustang, Tempo, Topaz, Zephyr	
<b>1984-1986</b>				
1.6L I-4	4, 5, 8	EFI EFI Turbo	Escort, EXP, Lynx	EEC-IV
2.3L I-4	A, J, R	FBC (YFA)* (6149)*	Capri, Cougar, LTD, Marquis, Mustang, Tempo, Topaz	
2.3L I-4	T, W	EFI Turbo	Capri, Cougar, Merkur XR4Ti, Mustang, T-Bird	
2.3L I-4 HSC	S, X	CFI	Tempo, Topaz	
3.8L V-6	3	CFI	Capri, Cougar, LTD, Marquis, Mustang, T-Bird	

# Ford OBD1 Systems

VEHICLES COVERED - CARS

Engine	8th VIN Digit**	Fuel Systems (Carburetor Model)	Application/Special Notes	Computer System
<b>1984-1986 (Cont)</b>				
5.0L V-8	F, M	CFI, SEFI	Capri, Continental, Colony Park, Cougar, Country Squire, Crown Victoria, Grand Marquis, LTD, Mark VII, Marquis, Mustang, T-Bird, Town Car	EEC-IV
<b>1987-1993</b>				
1.9L I-4	J, 9	EFI, CFI, SFI	Escort, EXP, Lynx, Tracer	EEC-IV
2.0L I-4	A	SEFI	Probe (1993 manual transmission only)	
2.3L I-4	A	FBC (YFA)*	Capri, LTD, Marquis, Mustang (1996 models)	
2.3L I-4 OHC	A, M	EFI	Mustang	
2.3L I-4	T, W	EFI Turbo	Capri, Cougar, Merkur, Mustang, T-Bird, XR4Ti	
2.3L I-4 HSC	S, X	CFI, EFI, SEFI	Tempo, Topaz	
2.5L I-4	D	EFI, CFI	Sable, Taurus	
3.0L V-6 3.0L V-6 SHO	1, U, Y	EFI, SEFI, SFI	Probe, Sable, Taurus, Tempo, Topaz (VIN 1 Taurus models are Flexible Fuel)	
3.8L V-6	3, 4, C, R	CFI, EFI, SFI	Capri, Continental, Cougar, LTD, Marquis, Mustang, Sable, T-Bird, Taurus	
4.6L V-8	W, V	SEFI	Crown Victoria, Grand Marquis, Mark VII, Town Car	
5.0L V-8	F, M, E, T, D, 4	SEFI	Capri, Continental, Cougar, Crown Victoria, Grand Marquis, Mark VII, Mustang, Mustang Cobra, T-Bird, Town Car	
<b>1994</b>				
1.9L I-4	J	SFI	Escort, Topaz, Tracer	EEC-IV
2.0L I-4	A	SFI	Probe	
3.0L V-6	1, U, Y	SFI	Sable, Taurus, Tempo (VIN 1 Taurus models are Flexible Fuel)	
3.8L V-6 3.8L V-6 SC	4 R	SFI	Continental, Cougar, Sable, Taurus, T-Bird	
4.6L V-8	W, V	SFI	Crown Victoria, Grand Marquis, Mark VIII, Town Car	
5.0L V-8	T, D	SFI	Mustang, Mustang Cobra	
<b>1995</b>				
1.9L I-4	J	SFI	Escort, Tracer	EEC-IV
2.0L I-4	A, 3	SFI	Contour, Mystique, Probe	
2.5L V-6	L	SFI	Contour, Mystique	
3.0L V-6	1, U	SFI	Sable, Taurus (VIN 1 Taurus models are Flexible Fuel)	
3.0L V-6 SHO	Y			
3.8L V-6	4	SFI	Cougar, Sable, Taurus, T-Bird	
3.8L V-6 SC	R			

# Ford OBD1 Systems

## VEHICLES COVERED - TRUCKS/VANS

Engine	8th VIN Digit**	Fuel Systems (Carburetor Model)	Application/Special Notes	Computer System
<b>1995 (Cont)</b>				
4.6L V8 DOHC	V	SFI	Mark VIII	EEC-IV
5.0L V-8 HO	T	SFI	Mustang	
5.0L V-8 SHP	D			
<b>NOTES</b>				
* <b>Carburetor Model.</b> Carburetor model numbers are usually stamped on top of the carburetor, or on a metal tab attached to the carburetor. Consult your vehicle's repair manual for proper identification.				
** <b>VIN Number.</b> The VIN number(s) used in this column identify the vehicle's engine type. This number is the 8th digit of the VIN (Vehicle Identification Number). Consult your vehicle's repair manual for details.				
<b>Application Table Definitions.</b> CFI = Central Fuel Injection; DOHC = Dual Overhead Cam; EFI = Electronic Fuel Injection; FBC = Feedback Carburetor; HSC = High Swirl Combustion; MFI = Multiport Fuel Injection; OHC = Overhead Cam; SC = Super Charged; SEFI = Sequential Electronic Fuel Injection; SFI = Sequential Fuel Injection; SHO = Super High Output				

### TRUCKS/VANS - Ford Computer System Tool Application Table

The following table lists the year and model of all the trucks and vans that are covered by the OBD2 & 1 Tool.

Engine	8th VIN Digit**	Fuel Systems (Carburetor Model)	Application/Special Notes	Computer System
<b>1983</b>				
2.8L V-6	S	FBC (2150A)*	Bronco II and Ranger Pickup	EEC-IV
<b>1984</b>				
2.8L V-6	S	FBC (2150A)*	Bronco II, Ranger Pickup	EEC-IV
4.9L I-6	Y	FBC (YFA)*	Bronco, E and F Series Trucks/Vans (8500 lb. GVW or less only)	
5.0L V-8	F	FBC (2150A)*		
5.8L V-8	G	FBC (2150A)*		
<b>1985-1990</b>				
2.3L I-4 OHC	A	EFI	Aerostar, Bronco II, Ranger (excluding Diesel)	EEC-IV
2.9L V-6	T	EFI		
2.8L V-6	S	FBC (2150A)*	Bronco, E and F Series Trucks/Vans (8500 lb. GVW or less only)	
4.9L I-6	Y, 9	FBC (YFA)*, EFI		
5.0L V-8	F	FBC (2150A)*		
5.0L V-8	N	EFI	E and F Series Trucks/Vans (8500 lb. GVW or less only)	
5.8L V-8	G	FBC (2150A)*		
7.3L V-8	M	Diesel		
7.5L V-8	G	EFI		
<b>1991-1994</b>				
2.3L I-4 OHC	A	EFI, MFI	Ranger	EEC-IV
2.9L V-6	T	EFI		
3.0L V-6	U	EFI, SEFI, SFI	Aerostar, Ranger	

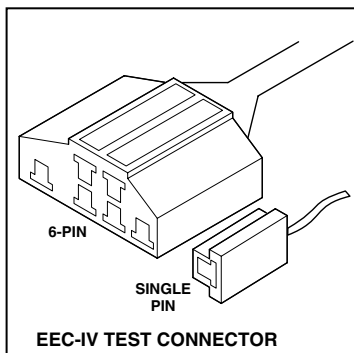
# Ford OBD1 Systems

## VEHICLES COVERED - TRUCKS/VANS - TEST CONNECTORS

Engine	8th VIN Digit**	Fuel Systems (Carburetor Model)	Application/Special Notes	Computer System
<b>1991-1994 (Cont)</b>				
4.0L V-6	X	EFI, MFI	Aerostar, Explorer, Ranger	EEC-IV
4.9L I-6	Y, H	EFI, MFI, SFI	Bronco, E and F Series Trucks/Vans (8500 lb. GVW or less only)	
5.0L V-8	N	EFI, MFI, SFI		
5.8L V-8	H, R	EFI, MFI, SFI	E and F Series Trucks/Vans (Excludes 1994 diesel models)	
7.3L V-8	M	Diesel		
7.3L V-8	K	Turbo Diesel		
7.5L V-8	G	EFI, MFI		
<b>1995</b>				
3.0L V-6	U	SFI	Aerostar (Excludes Explorer, Ranger and Windstar)	EEC-IV
4.0L V-6	X	SFI	E and F series Trucks and Vans (Excludes Natural Gas equipped vehicles)	
4.9L I-6	Y	SFI		
5.0L V-8	N	SFI	Bronco, E and F series Trucks and Vans	
5.8L V-8	H, R	MFI		
7.5L V-8	G	MFI	E-350; F-250-350 (Excludes California ); F-Super Duty (Excludes Diesel)	
<b>NOTES</b>				
* <b>Carburetor Model.</b> Carburetor model numbers are usually stamped on top of the carburetor, or on a metal tab attached to the carburetor. Consult your vehicle's repair manual for proper identification.				
** <b>VIN Number.</b> The VIN number(s) used in this column identify the vehicle's engine type. This number is the 8th digit of the VIN (Vehicle Identification Number). Consult your vehicle's repair manual for details.				
<b>Application Table Definitions.</b> EFI = Electronic Fuel Injection; FBC = Feedback Carburetor; MFI = Multiport Fuel Injection; OHC = Overhead Cam; SC = Super Charged; SEFI = Sequential Electronic Fuel Injection; SFI = Sequential Fuel Injection				

## TEST CONNECTORS

Ford vehicles are equipped with special test connectors that make it possible to connect specialized testing equipment that communicates with the vehicle's onboard computer. Ford's vehicle test connectors are usually dark in color (BLACK or GREY). Sometimes they have a plastic cover over them or are labeled EEC Test. The connectors can be found in the following general locations in the engine compartment:



- Near the front corner (right or left).
- Near the fender well (right or left).
- Near the fire wall (right or left).

### CONNECTING THE TOOL

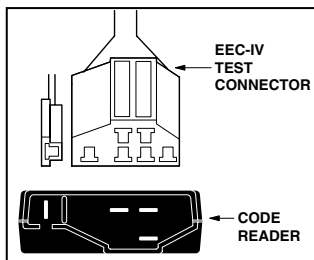


The Tool's Ford Connector Cable Adaptor is designed to match the vehicle's computer DLC. When properly connected, the vehicle's DLC should match the pre-molded guides around the adaptor. Make sure the adaptor and the vehicle's DLC mate properly before applying force. Forcing the adaptor onto the DLC improperly may result in damage to the adaptor and/or Tool, and possible damage to the vehicle's computer system.

- Connect the Tool to BOTH.
1. large, six pin female connector with molded housing
  2. small, single pin female connector



1988 and newer vehicles may have more than one similar connector for other systems (i.e. Anti-Lock Brakes). Only the connector with an extra single pin is the correct test connector for computer service codes use. If you have any questions about the correct connector, please refer to your vehicle's service manual for detailed information.



### DIAGNOSTIC TROUBLE CODES (DTCs)

Diagnostic Trouble Codes, or Fault Codes, can be used to identify engine systems or components that are malfunctioning. The computer records codes for two types of problems:

#### ■ "Hard" Diagnostic Trouble Codes

"Hard" DTCs represent problems which are happening now and cause the instrument panel Malfunction Indicator Lamp (MIL) or Check engine light to illuminate and remain on until the failure is repaired. A DTC is stored in the vehicle's computer memory for each fault detected. A Tool or Scanner can be used to retrieve DTCs that are stored in the vehicle's computer memory.

#### ■ Intermittent/History DTCs

Intermittent/History DTCs are stored in the computer's memory for problems that occur intermittently, or for problems that happened in the past but are not currently present. Intermittent DTCs may cause the Malfunction Indicator light to flicker or stay on until the intermittent malfunction goes away. However, the corresponding

fault code will be stored in memory as a history DTC. If the malfunction that caused the history DTC to set does not recur within a predetermined length of time (usually within 40-80 ignition key start cycles), the computer will automatically erase the related fault code from its memory.

## CODE RETRIEVAL PROCEDURES

### Overview of Ford Code Retrieval Process

Ford's computer self-diagnostic system is divided into four main sections:

1. "Key On Engine Off" (KOEO) Self-Test
2. "Continuous Memory" (CM) Self-Test
3. "Key On Engine Running" (KOER) Self-Test
4. Other EEC-IV System tests

These Self-Tests are specially designed to monitor and/or test the various components and circuits that are controlled by the vehicle's computer, and to save and/or transmit diagnostic test results to the Tool in the form of numerical fault codes.

The "Continuous Memory" Self-Test is designed to run continuously whenever the vehicle is in normal operation. If a fault is detected by the "Continuous Memory" Self-Test, a fault code is saved in the vehicle's computer memory for later retrieval.

Ford's On-Board Diagnostic Self-Tests are designed in such a way that in order to properly diagnose a problem, you must perform all the Self-Tests, in the proper sequence.

As described previously, some tests are designed to detect problems only when the vehicle is in normal operation. Some tests are designed to activate components and detect problems only with the Key On and Engine Off. Other tests are designed to activate components and test their operation only with the Key On and Engine Running. Do not take short cuts. If you fail to perform a test, or you perform a test out of sequence, you might miss a problem that is only detected during that part of the test.



### Reviewing DTCs

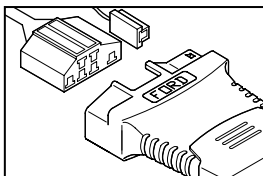
To view codes in the Diagnostic Tool's memory:

1. Locate the vehicle's Data Link Connector (DLC). See TEST CONNECTORS on page 63 for connector location.






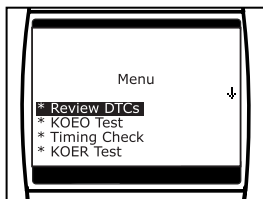
*Some DLCs have a plastic cover that must be removed before connecting the Tool's cable connector.*

2. Connect the Tool cable (with the Ford Connector Cable Adapter attached) to the Tool, then connect the adapter to the vehicle's DLC. Press the **POWER/LINK**  button to turn the Tool ON, then press the **ENTER**  button to continue.



- The Ford OBD1 Menu displays.

3. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Review DTCs**, then press the **ENTER**  button.



### Key On Engine Off (KOEO) Test

During the KOEO Self-Test, two groups of codes are retrieved by the Tool.

- *The first group of codes retrieved by the Tool are called "KOEO codes". A "KOEO" icon will show in the upper right corner of the LCD display to indicate that the code retrieved is a "KOEO" code.*
- *The second group of codes are called "Continuous Memory" codes. A "CM" icon will show in the upper right corner of the LCD display to indicate that the code retrieved is a "Continuous Memory" code.*





*Check your vehicle thoroughly before performing any test. See **BEFORE YOU BEGIN** on page 31 for details.*

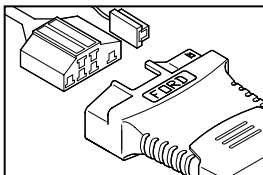
**ALWAYS** observe safety precautions whenever working on a vehicle. See **Safety Precautions** on page 3 for more information.

1. Locate the vehicle's Data Link Connector (DLC). See **TEST CONNECTORS** on page 63 for connector location.





*Some DLCs have a plastic cover that must be removed before connecting the Tool's cable connector.*

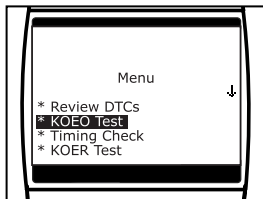
2. Connect the Tool cable (with the Ford Connector Cable Adaptor attached) to the Tool, then connect the adaptor to the vehicle's DLC. Press the **POWER/LINK**  button to turn the Tool ON, then press the **ENTER**  button to continue.




- The Ford OBD1 Menu displays.



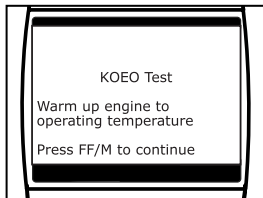
*Use the  and  buttons, as necessary, to make menu selections.*







3. From the Ford OBD1 Menu, highlight **KOEO Test**, then press the **ENTER**  button.

- The LCD display shows instructions to prepare the vehicle for the KOEO Test.



4. Start and warm-up engine to normal operating temperature. Press the **FF/M**  button to continue.

5. Turn ignition key OFF and wait for the on screen prompt. If you wish to exit the KOEO test at this time, press the **FF/M**  button.

6. Turn the ignition ON. DO NOT start the engine. If your vehicle is equipped with one of the following engine types, perform the added procedures described below:

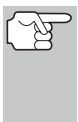
- **For 4.9L engines with standard transmission:** Press and hold the clutch until all codes are sent (steps 7 through 9).
- **For 7.3L diesel engines:** Press and hold accelerator until all codes are sent (steps 7 through 9).
- **For 2.3L turbo engines with octane switch:** Put switch in premium position.

7. Press the **FF/M**  button to continue.

8. While codes are being retrieved, a "One moment please KOEO test is in progress..." message shows on the Tool's LCD display.



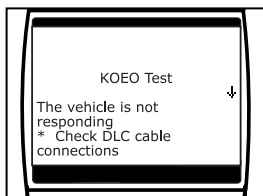
*As soon as the ignition is turned "on", the vehicle's computer enters the Self-Test mode. Clicking sounds will be heard coming from the engine. This is normal. It indicates that the vehicle's computer is activating relays, solenoids, and other components to check their operation.*



**WARNING:** *On some vehicles equipped with an Electric Cooling Fan, the computer activates the cooling fan to check its operation. To avoid injury, keep hands or any part of your body a safe distance from the engine during this test.*

- If the Tool fails to link to the vehicle's computer, a "Vehicle is not responding" message shows on the Tool's LCD display. Do the following:

- Verify the ignition is ON.
- Check the cable connections at the Tool and at the vehicle's DLC.



- Turn the ignition OFF, wait 10 seconds, then turn back ON to reset the computer.



*BE SURE to perform the added procedures in step 6, if appropriate for your vehicle, BEFORE turning the ignition ON.*

- Press **ENTER**  button to continue.

- If the Diagnostic Tool **cannot** link to the vehicle's computer, the message "Contact Technical Support" displays.

- Press The **FF/M**  button to return to the Chrysler OBD1 Menu.

- Turn the ignition off, and disconnect the Diagnostic Tool.

- Contact Technical Support for assistance.

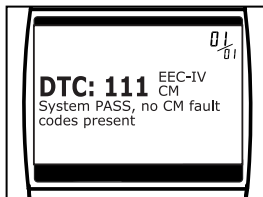
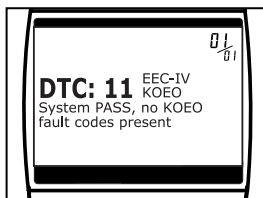


9. If the Tool was able to link to the vehicle successfully a "Code retrieval was successful..." message shows temporarily on the Tool's LCD display followed by any retrieved DTCs.


- The Tool will display a code only if codes are present in the vehicle's computer memory.

- If no problems are found during the KOEO Self-Test, the computer sends a "PASS" code (code 11 or 111) to the Tool.



- If no Continuous Memory codes are present in the vehicle's computer memory, the Tool will display a "PASS" code (code 11 or 111).



*Most Ford EEC-IV vehicle computers up to 1991 use a two-digit code system. From 1991 to 1995 most use a three digit code system.*

10. If more than one code was retrieved, press **DTC SCROLL**  button, as necessary, to display additional codes one at a time.



*In the case of long code definitions, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the  and  buttons, as necessary, to view the additional information.*

11. Disconnect the Tool from the vehicle and turn the ignition key OFF.

12. To prolong battery life, the Tool automatically shuts "Off" after approximately three minutes of no button activity. The DTCs retrieved will remain in the Tool's memory, and may be viewed at any time. If the Tool's batteries are removed, or if the Tool is re-linked to a vehicle to retrieve codes, any prior codes in its memory are automatically cleared.

13. Follow the testing and repair procedures outlined in the vehicle's service repair manual to correct "hard" DTCs. Codes should be addressed and eliminated in the order they were received, erasing (see **SERVICING DTCs - OBD I** on page 97) and retesting after each repair is done to be sure the fault was eliminated.



**IMPORTANT:** DO NOT service "Continuous Memory" codes at this time. Before "Continuous Memory" codes can be serviced, both the KOEO and the KOER Self-Tests must pass (a PASS code 11 or 111 is obtained). After both of these tests have passed, erase the vehicle's computer memory (see **SERVICING DTCs - OBD I** on page 97), take the vehicle for a short drive, then repeat the KOEO Self-Test. If any Continuous Memory faults are present, service them all this time. Consult the vehicle's service repair manual for servicing Continuous Memory Fault Codes.



The green, yellow and red LEDs are used (with the LCD display) as visual aids to make it easier to determine engine system conditions. **SERVICING DTCs - OBD I** on page 97 for information on interpreting LEDs and servicing DTCs.



Do not proceed to the ignition timing check procedure or the KOER test until a PASS code (code 11 or 111) for KOEO test is obtained.

## Engine Timing Check



Before performing the KOER Self-Test, the vehicle's Ignition Base Timing and the computer's ability to electronically control timing advance must be checked for proper operation. Maladjustment of ignition timing, or a problem in the advance circuit, might generate false fault codes when performing the KOER Self-Test that would cause the test to be invalid. Use the following procedures to check for proper ignition timing and to verify the computer's ability to electronically advance ignition timing.



The following "Timing Check" procedure is only applicable to 1992 and older vehicles (excluding diesel engines). For 1993 and newer vehicles, refer to the vehicle's service repair manual for procedures to check and adjust timing. **DO NOT ATTEMPT TO ADJUST TIMING ON THESE VEHICLES WITHOUT MANUFACTURER'S SPECIFICATIONS AND PROCEDURES.**

For 1992 and older vehicles, the Tool can be used in combination with a timing light to check ignition timing and the vehicle computers ability to advance ignition timing.





Check your vehicle thoroughly before performing any test. See **BEFORE YOU BEGIN** on page 31 for details.

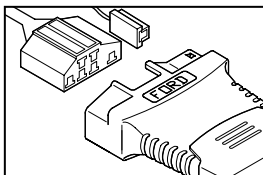
**ALWAYS** observe safety precautions whenever working on a vehicle. Read and follow Safety Precautions on page 3 before performing this test.

- A timing light is required to perform this test.
  - The vehicle must pass the KOEO Test (page 66) before performing this test.
1. Locate the vehicle's Data Link Connector (DLC). See TEST CONNECTORS on page 63 for connector location.





*Some DLCs have a plastic cover that must be removed before connecting the Tool's cable connector.*


2. Connect the Tool cable (with the Ford Connector Cable Adaptor attached) to the Tool, then connect the adaptor to the vehicle's DLC. Press the **POWER/LINK**  button to turn the Tool ON, then press **ENTER**  button to continue.

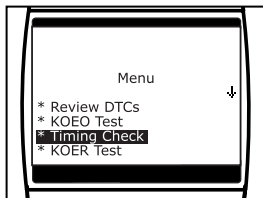


- The Ford OBD1 Menu displays.




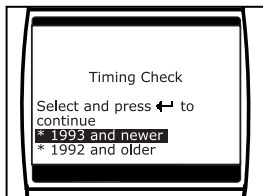
*Use the  and  buttons, as necessary, to make menu selections.*


3. From the Ford OBD1 Menu, highlight **Timing Check**, then press the **ENTER**  button.

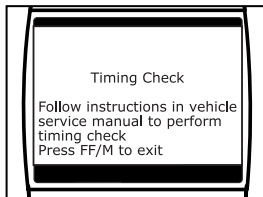


- The Select Model Year screen displays.


4. From the Select Model Year screen, highlight the vehicle model year, then press the **ENTER**  button.

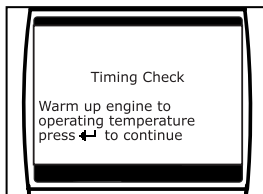



- **For 1993 and newer vehicles:** The message "Follow instructions in vehicle service manual to perform timing check" displays. Press the **FF/M**  button to exit. Refer to the vehicle's service manual for timing check procedures.




- **For 1992 and older vehicles:** The message "Warm up engine to operating temperature" displays

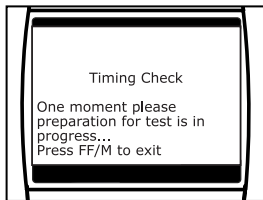
5. Start and warm-up engine to normal operating temperature. Press the **ENTER**  button to continue.



6. When prompted, turn off all vehicle accessories, turn ignition key OFF and wait for the on screen prompt. If you wish to exit the Timing Check procedure at this time, press the **FF/M**  button.

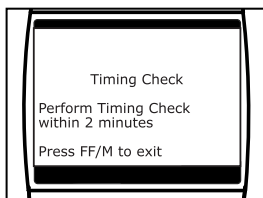
7. When instructed by the message on the Tool's display, start the engine and press the **ENTER**  button.

- A "One moment please preparation for test is in progress" message shows temporarily on the Tool's LCD display, followed by the message "Perform Timing Check within two minutes."



8. When "Perform Timing Check within 2 minutes" displays, perform the Timing Check as follows:

- The vehicle's computer is programmed to advance ignition timing  $20^{\circ}$  ( $\pm 3^{\circ}$ ) above the vehicle's "base timing" value, and to freeze this setting for two minutes from the time the "Perform Timing Check within 2 minutes" message displays. This allows the user to check the computer's ability to advance ignition timing.



- Within this two-minute period, follow instructions in the vehicle's service repair manual to check the ignition timing with a timing light and ensure that it is  $20^{\circ}$  above the specified base timing value ( $\pm 3^{\circ}$ ).

**Example:** If base timing specification is  $10^{\circ}$  BTDC, the acceptable timing light reading should be in the range of  $27^{\circ}$  to  $33^{\circ}$  BTDC.



*Base-timing specifications can be found on the Vehicle Emission Control Information (VECI) decal. The decal is located under the hood or near the radiator. If the VECI decal is missing or damaged, refer to your vehicle's service repair manual for specifications.*

9. If timing light readings are within the acceptable range:
- Base timing and the vehicle computer's ability to advance timing are working properly.
  - Proceed to the KOER Self-Test below.
10. If timing light readings are not within the acceptable range:
- Base timing may be out of adjustment, or the computer may have problems with the timing advance circuit.
  - Refer to the vehicle's service repair manual for procedures on adjusting and/or repairing ignition timing. Repairs to ignition timing must be made before proceeding to the KOER Test.

### Key on Engine Running (KOER) Self-Test



**IMPORTANT:** The KOEO Self-Test (page 66) must be performed first, and a "pass code" (code 11 or 111) must be obtained before performing the KOER Self-Test; otherwise, results of the KOER Self-Test may be invalid.



Ignition timing and timing advance must be operating properly in order for the KOER Self-Test results to be considered valid. Perform an Engine Timing check (page 69) before performing the KOER Self-Test.



Check your vehicle thoroughly before performing any test. See **BEFORE YOU BEGIN** on page 31 for details.

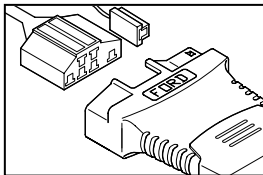
**ALWAYS** observe safety precautions whenever working on a vehicle. Read and follow Safety Precautions on page 3 before performing this test.

1. Locate the vehicle's Data Link Connector (DLC). See **TEST CONNECTORS** on page 63 for connector location.





Some DLCs have a plastic cover that must be removed before connecting the Tool cable connector.


2. Connect the Tool cable (with the Ford Connector Cable Adaptor attached) to the Tool, then connect the adaptor to the vehicle's DLC. Press the **POWER/LINK**  button to turn the Tool ON, then press the **ENTER**  button to continue.

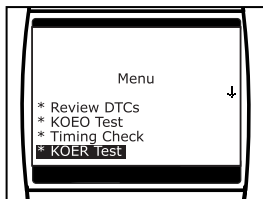




- The Ford OBD1 Menu displays.




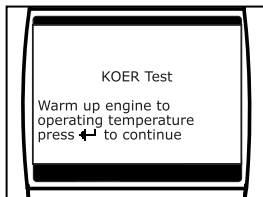
Use the  and  buttons, as necessary, to make menu selections.




3. From the Ford OBD1 Menu, highlight **KOER Test**, then press the **ENTER**  button.

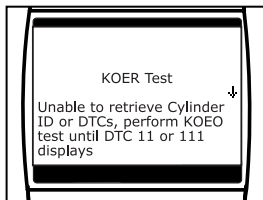
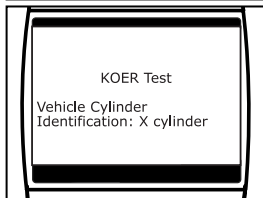


- The message "Make sure ignition timing is within factory specifications" displays. If necessary, press the **FF/M**  button to exit, and perform an Engine Timing Check (page 69). Otherwise, press the **ENTER**  button to continue.

4. The message "Warm up engine to operating temperature" displays. Start and warm-up engine to normal operating temperature. Press the **ENTER**  button to continue.

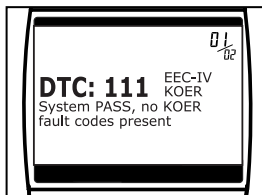


5. When prompted, turn off all vehicle accessories, turn ignition key OFF and wait for the on screen prompt. If you wish to exit the KOER test at this time, press the **FF/M**  button.
6. When instructed by the message on the Tool's display, start the engine and press the **ENTER**  button to continue. A "One moment please KOER test is in progress..." message shows temporarily on the Tool's LCD display.
7. The Tool will retrieve the Cylinder Identification (ID) Code. The Cylinder ID Code identifies the number of cylinders for the vehicle under test.
  - If the Tool cannot retrieve the Cylinder ID Code, an advisory message displays. Press the **FF/M**  button to exit and repeat the Key On Engine Off (KOEO) test (page 66) until DTC 11 or 111 displays.
8. Perform the following procedures when prompted by the message on the Tool's display.
  - Turn the steering wheel 1/2 turn to right, hold for four seconds and release.
  - Press the brake pedal to the floor and then release it.
  - Cycle the Overdrive Switch (if equipped).
  - Quickly press the accelerator pedal to the floor and then release it.
9. After the above procedures are performed a "One moment please KOER test is in progress..." message shows temporarily on the Tool's LCD display, followed by a "Retrieving codes" message.



*Most Ford EEC-IV vehicle computers up to 1991 use a two-digit code system. From 1991 to 1995 most use a three-digit code system.*

10. If no problems are found during the KOER Self-Test, the computer sends a "PASS code" (code 11 or 111) to the Tool. Code 11 or 111 indicates that all the relays and actuators and their related circuits that were tested during the KOER Self-Test are OK, and no faults were found.



11. After the Tool retrieves all the KOER Self-Test DTCs, turn the engine off, and disconnect the Tool from the vehicle's test connectors. The DTCs retrieved are now stored in the Tool's memory.



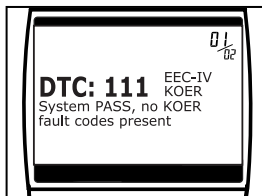
*All retrieved DTCs will remain in the Tool's memory. If the KOER Test procedure is performed again, DTC's from a prior test will automatically clear and will be replaced by the most current DTCs retrieved.*

12. All KOER codes that are retrieved by the Tool during the KOER Self-Test represent problems that are present now (at the time the test is performed). The related vehicle problems that caused the codes to be sent must be repaired using the procedures described in the vehicle's repair manual.



*The green, yellow and red LEDs are used (with the LCD display) as visual aids to make it easier to determine engine system conditions. See **SERVICING DTCs - OBD I** on page 97 for information on interpreting LEDs and servicing DTCs.*

13. After all repairs have been completed, repeat the KOER Self-Test.
14. If a "pass code" (code 11 or 111) is received, it indicates that the repairs were successful and all the related systems are working properly.



15. If a "pass code" (code 111 or 111) is not received, the repair was unsuccessful. Consult the vehicle's service manual and recheck repair procedure.

## ADDITIONAL TESTS FOR EEC-IV SYSTEMS



*These tests are additional, supplemental tests, and are not needed to retrieve Diagnostic Trouble Codes. Ford has included them to further assist the technician / do-it-yourselfer in the troubleshooting of vehicle problems.*

### Cylinder Balance Test (Vehicles equipped with Sequential Electronic Fuel Injected (SEFI) systems only)

The Cylinder Balance Test assists in finding a weak or noncontributing cylinder. The computer shuts off fuel (cuts off power to injectors) to each cylinder, in sequence, and monitors for RPM changes (drop). Based on this information, the computer determines if all the cylinders are contributing power equally (for proper engine operation), or if some cylinders are only contributing partially or not contributing at all.



### SEFI Introduction

Sequential Electronic Fuel Injection (SEFI) belongs to a family of fuel injection systems called "Multi-port/Multipoint Fuel Injection". Multi-port (MFI) fuel injection systems contain one fuel injector per cylinder, and the vehicle's computer electronically controls their operation. On some multi-port fuel injection systems, the injectors all fire at the same time and at every engine revolution. On other systems the injectors fire in groups and/or at every other engine revolution. What distinguishes Sequential Electronic Fuel Injection systems from other multi-port fuel injection systems is that each injector is independently energized and fires sequentially one after the other in the proper firing order. This gives the vehicle's computer more control to cut the fuel to one injector at a time (this can't be accomplished on the other systems because they fire in groups of two or more injectors).

### Cylinder Balance Test Procedure





*Check your vehicle thoroughly before performing any test. See **BEFORE YOU BEGIN** on page 31 for details.*

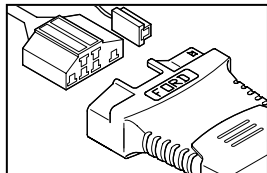
*ALWAYS observe safety precautions whenever working on a vehicle. Read and follow Safety Precautions on page 3 before performing this test.*

1. Locate the vehicle's Data Link Connector (DLC). See **TEST CONNECTORS** on page 63 for connector location.





*Some DLCs have a plastic cover that must be removed before connecting the Tool cable connector.*


2. Connect the Tool cable (with the Ford Connector Cable Adaptor attached) to the Tool, then connect the adaptor to the vehicle's DLC. Press the **POWER/LINK**  button to turn the Tool ON, then press the **ENTER**  button to continue.

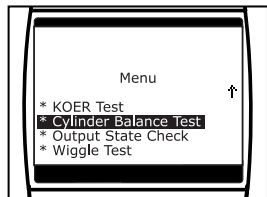




- The Ford OBD1 Menu displays.






*Use the  and  buttons, as necessary, to make menu selections.*

3. From the Ford OBD1 Menu, highlight **Cylinder Balance Test**, then press the **ENTER**  button.



- An advisory message displays. If the vehicle is **not** equipped with Sequential Electronic Fuel Injection (SEFI), press the **FF/M**  button to exit. Otherwise, press the **ENTER**  button to continue.

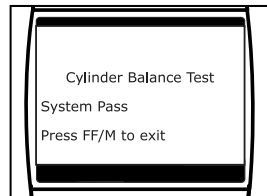
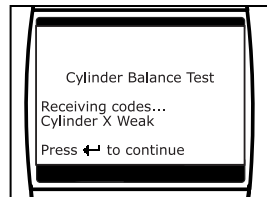
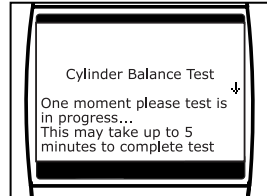
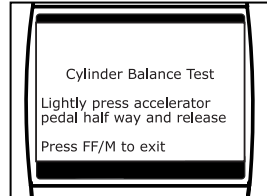
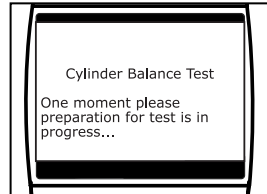
4. Start and warm-up engine to normal operating temperature. Press the **ENTER**  button to continue.

5. When prompted, turn off all vehicle accessories, turn ignition key OFF and wait for the on screen prompt. If you wish to exit the Cylinder Balance test at this time, press the **FF/M**  button.
6. When instructed by the message on the Tool's display, start the engine and press the **ENTER**  button.
  - A "One moment please preparation for test is in progress..." message shows temporarily on the Tool's LCD display.
7. When prompted by the message on the Tool's display, lightly press the accelerator pedal half way and release to activate the cylinder balance test.



**For 1986 models ONLY: Fully press accelerator once and release.**

- The computer is now in Cylinder Balance Test mode, and will start cutting fuel to each cylinder in sequence to determine if all the cylinders are contributing equally. **It may take up to five minutes before the test results are transmitted to the Tool.**
8. If the vehicle's computer fails to enter Cylinder Balance Test mode, do the following:
    - Lightly press the accelerator pedal again as described in step 7 above.
  9. After the Cylinder Balance Test is completed, the test results are sent to the Tool.
    - The computer compares the power contribution that each cylinder makes to engine operation.
  10. If all cylinders are contributing equally, the computer determines that power distribution is normal and a "System Pass" message will display.



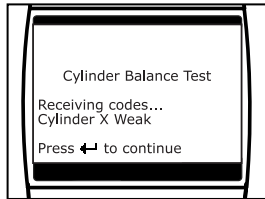


If the computer detects a problem with a cylinder(s) when performing the initial Cylinder Balance Test, it needs to repeat the test two more times to properly determine which cylinder or cylinders are malfunctioning. If this is the case, the Tool will display the "Lightly press the accelerator half way and release" message again instead of the "System Pass". Proceed to step 11.

11. If a cylinder is not contributing at the same level as the other cylinders, the computer prompts you to repeat the test two more times by displaying the "Lightly press the accelerator half way and release" message again. Each time the message displays, perform the procedures as instructed.

12. After the repeat Cylinder Balance tests have completed, the computer will identify which cylinder (or cylinders) are not contributing equally, and will send this information to the Tool's LCD display.

- If any weak cylinders are identified, consult the vehicle's service repair manual to perform further testing and/or repairs.



### Relay and Solenoid Test (Output State Check)

The "Output State Check" is a special program in the vehicle's computer that allows the user to energize (turn ON) and de-energize (turn OFF), on command, most of the actuators (relays and solenoids) that are controlled by the computer.

Use this test to check computer output voltages and relay/solenoid operation.



The fuel injectors and fuel pump are not energized during this test. Check your vehicle thoroughly before performing any test. See **BEFORE YOU BEGIN** on page 31 for details.



**ALWAYS** observe safety precautions whenever working on a vehicle.

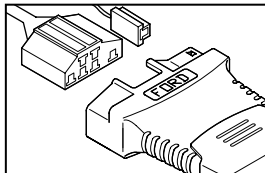
Read and follow Safety Precautions on page 3 before performing this test.

1. Locate the vehicle's Data Link Connector (DLC). See TEST CONNECTORS on page 63 for connector location.



Some DLCS have a plastic cover that must be removed before connecting the Tool cable connector.


2. Connect the Tool cable (with the Ford Connector Cable Adaptor attached) to the Tool, then connect the adaptor to the vehicle's DLC. Press the **POWER/LINK**  button to turn the Tool ON, then press the **ENTER**  button to continue.

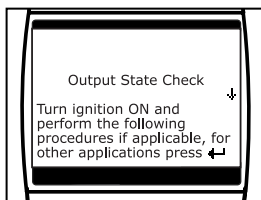
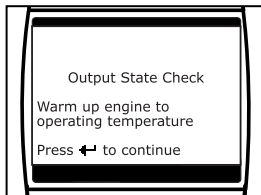
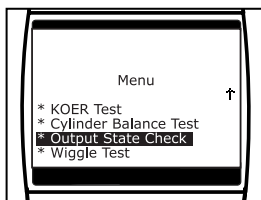


- The Ford OBD1 menu displays.



Use the  $\uparrow$  and  $\downarrow$  buttons, as necessary, to make menu selections.

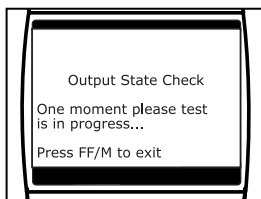
3. From the Ford OBD1 menu, highlight **Output State Check**, then press the **ENTER**  $\rightarrow$  button.
4. The message "Warm up engine to operating temperature" displays. Start and warm-up engine to normal operating temperature. Press the **ENTER**  $\rightarrow$  button to continue.
5. When prompted, turn ignition key OFF and wait for the on screen prompt. If you wish to exit the Output State Check at this time, press the **FF/M**  button.
6. Turn ignition ON. **DO NOT** start the engine. If your vehicle is equipped with one of the following engine types, perform the added procedures described below:



- **For 4.9L engines with standard transmission:** Press and hold the clutch until the "Output State Check Active" screen displays.
  - **For 7.3L diesel engines:** Press and hold accelerator until the "Output State Check Active" screen displays
  - **For 2.3L turbo engines with octane switch:** Put switch in premium position.
7. Press the **ENTER**  $\rightarrow$  button to continue.
  8. A "One moment please test is in progress..." message shows on the Tool's LCD display.



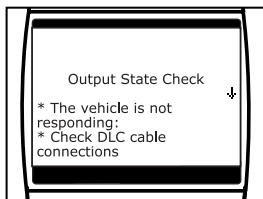
As soon as the ignition is turned "on", the vehicle's computer enters the Self-Test mode. Clicking sounds will be heard coming from the engine. This is normal.



**WARNING:** On some vehicles equipped with an Electric Cooling Fan, the computer activates the cooling fan to check its operation. To avoid injury, keep hands or any part of your body a safe distance from engine during the test.

- If the Tool fails to link to the vehicle's computer, a "Vehicle is not responding" message shows on the Tool's LCD display. Do the following:


- Verify the ignition is ON.
- Check the cable connections at the Diagnostic Tool and at the vehicle's DLC.
- Turn the ignition OFF, wait 10 seconds, then turn back ON to reset the computer.



*BE SURE to perform the added procedures in step 6, if appropriate for your vehicle, BEFORE turning the ignition ON.*

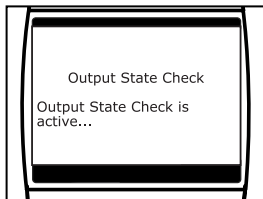
- Press the **ENTER**  button to continue.

- If the Diagnostic Tool **cannot** link to the vehicle's computer, the message "Contact Technical Support" displays.

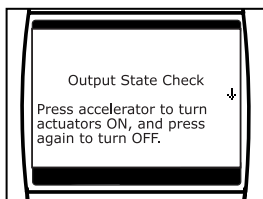
- Press the **FF/M**  button to return to the Ford OBD1 Menu.
- Turn the ignition OFF, and disconnect the Diagnostic Tool.
- Contact Technical Support for assistance.



9. If the Tool was able to link to the vehicle successfully an "Output State check active..." message shows temporarily on the Tool's LCD display. This message is followed by a display that instructs you how to perform the test.



10. When prompted, press the accelerator pedal once, then release. This activates the Output State Check and energizes most of the actuators (relays and solenoids) that are controlled by the vehicle's computer.



*If your vehicle is equipped with an Integrated Vehicle Speed Control, disconnect the vacuum supply hose from the speed control servo before pressing the accelerator. Reconnect vacuum hose after test.*

11. To de-energize the actuators, press the accelerator pedal again and release, the actuators are now de-energized.
12. The procedure can be repeated as many times as desired by pressing and releasing the accelerator pedal to energize and de-energize the actuators.

13. Consult the vehicle's service repair manual for a list of actuators (solenoids and relays) controlled by the computer that apply to the vehicle under test, and which actuators should energize and de-energize when performing the Output State Check. All applicable actuators should be on when energized and off when de-energized.
14. If an actuator is not responding to the Output State Check, follow the procedures described in the vehicle's service manual to check computer actuator output circuit voltages and/or grounds.
15. The Output State Check will stay active as long as desired. To quit the Output State Check, turn the ignition OFF and disconnect the Tool from the vehicle.

### Wiggle Test



*Since any DTC's from Wiggle Test results are saved in Continuous Memory, it is suggested that you clear any DTC's in Continuous Memory before performing Wiggle Test (see SERVICING DTCs - OBD I on page 97 for procedures). This way you start with a clean slate, and any faults detected during the procedure will be related to that particular circuit tested.*

Use this test to check for intermittent faults in some circuits.

#### Circuits Tested:

**1984 & Newer** - Air Charge Temp Sensor (ACT), Barometer Pressure Sensor (BP), Engine Coolant Temp Sensor (ECT), Exhaust Gas Oxygen Sensor (EGO), EGR Valve Position Sensor (EVP), Manifold Absolute Pressure (MAP), Throttle Position Sensor (TP), Vane Air Temp Sensor (VAT)

**1985 & Newer** - Vane Air Flow Sensor (VAF)

**1986 & Newer** - Pressure Feedback EGR Sensor (PFE)

**1990 & Newer** - Exhaust Gas Oxygen Sensor (EGO), Ignition Diagnostic Monitor (IDM) (DIS or Dual Plug DIS only), Idle Tracking Switch (ITS), Mass Air Flow Sensor (MAF)





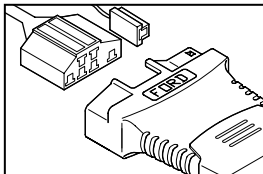
**ALWAYS** observe safety precautions whenever working on a vehicle. Read and follow Safety Precautions on page 3 before performing this test.

1. Locate the vehicle's Data Link Connector (DLC). TEST CONNECTORS on page 63 for connector location.



*Some DLCs have a plastic cover that must be removed before connecting the Tool cable connector.*


2. Connect the Tool cable (with the Ford Connector Cable Adaptor attached) to the Tool, then connect the adaptor to the vehicle's DLC. Press the **POWER/LINK**  button to turn the Tool ON, then press the **ENTER**  button to continue.

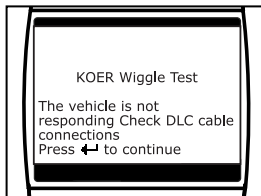
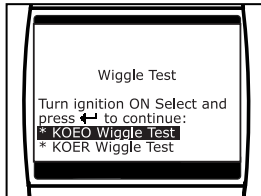
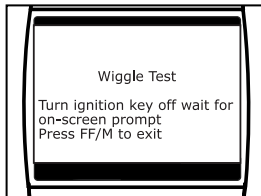
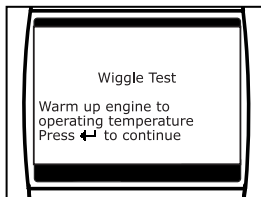
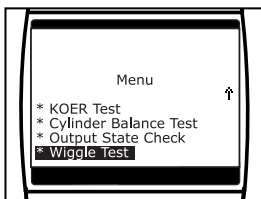


- The Ford OBD1 menu displays.



Use the  $\ominus$  and  $\oplus$  buttons, as necessary, to make menu selections.

3. From the Ford OBD1 menu, highlight **Wiggle Test**, then press the **ENTER**  $\oplus$  button.
4. The message "Warm up engine to operating temperature" displays. Start and warm-up engine to normal operating temperature. Press the **ENTER**  $\oplus$  button to continue.
5. When prompted, turn ignition key OFF and wait for the on screen prompt. If you wish to exit the KOEO test at this time, press the **FF/M**  button.
6. Select the desired Wiggle Test from the menu displayed.
  - To perform the KOEO Wiggle Test:
    - Highlight **KOEO Wiggle Test**.
    - Turn ignition ON. DO NOT START THE ENGINE.
    - Press the **ENTER**  $\oplus$  button to continue.
  - To perform the KOER Wiggle Test:
    - Highlight **KOER Wiggle Test**.
    - Turn the ignition ON and start the engine.
    - Press the **ENTER**  $\oplus$  button to continue.
7. A "One moment please test is in progress" message shows temporarily on the Tool's LCD display.



### For KOEO Wiggle Test:

- Verify the ignition is ON.
- Turn the ignition OFF, wait 10 seconds, then turn back ON to reset the computer. Press the **ENTER**  $\oplus$  button to continue.

### For KOER Wiggle Test:

- Turn the engine OFF, wait 10 seconds, then turn back ON. Press the **ENTER**  $\oplus$  button to continue.



*BE SURE to perform the added procedures in step 6, if appropriate for your vehicle, BEFORE turning the ignition ON.*

- Press **ENTER**  button to continue.

■ If the Diagnostic Tool **cannot** link to the vehicle's computer, the message "Contact Technical Support" displays.

- Press the **FF/M**  button to return to the Ford OBD1 menu.

- Turn the ignition OFF, and disconnect the Diagnostic Tool.

- Contact Technical Support for assistance.

8. If the Tool was able to link to the vehicle successfully, a "Wiggle test is active..." message shows temporarily on the Tool's LCD display. This is followed by a message instructing you how to perform the test.

■ Press the **FF/M**  button if you wish to exit the Wiggle Test at this time.

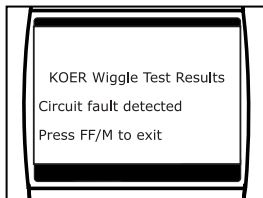
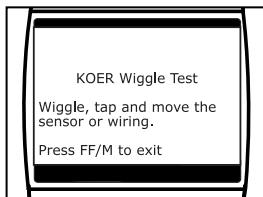
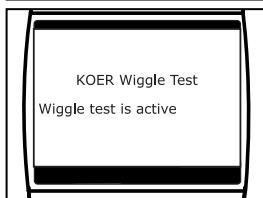
9. Wiggle, tap and move the suspected sensor or wiring.

■ If no faults are detected when performing the Wiggle Test, a "System Pass" message displays.

■ If a fault is detected when performing the Wiggle Test, a "Circuit Fault detected" message displays.



*If the Wiggle Test detects any problems, the related DTC will be stored by the computer in "Continuous Memory". To view any Wiggle Test DTC's you must perform the KOEO Test. See page 66 for KOEO Test procedures.*



10. Follow the procedures in the vehicle's service repair manual to perform troubleshooting and repairs for Wiggle Test results.

11. The Wiggle Test will stay active as long as desired. To quit the Wiggle Test, turn the ignition OFF and disconnect the Tool from the vehicle.



**YOUR VEHICLE'S COMPUTER SYSTEM**

Today's vehicles are equipped with computer self-testing abilities that can locate problems in your vehicle and store them as Diagnostic Trouble Codes (DTC's) in the vehicle's onboard computer. The Tool allows you access to the computer's memory and retrieves the DTC's.

**VEHICLES COVERED**

This Tool may be used to retrieve engine service codes from most General Motors (GM) domestic cars and trucks (EXCEPT Geo, Nova, Saturn and Sprint).

<b>Model Year</b>	<b>Make</b>	<b>Model</b>
1982-93	Buick	Century, Electra, Electra Wagon, Estate Wagon, Le Sabre, Le Sabre Wagon, Park Avenue, Reatta, Regal, Grand National, Riviera, Roadmaster, Skyhawk, Skylark, Somerset
	Cadillac	De Ville, El Dorado, Fleetwood, Seville
	Chevrolet	Berreta, Camaro, Caprice, Cavalier, Celebrity, Chevette, Citation, Corisca, Corvette, El Camino, Impala, Lumina, Monte Carlo
	Oldsmobile	Achieva, Calais, Custom Cruiser, Cutlass Calais, Ciera, Cutlass Cruiser, Cruiser Wagon, Cutlass Supreme, Supreme Classic, Delta 88, Eighty-eight, Firenze, Ninety-eight, Omega, Toronado, Touring Sedan, Trofeo
	Pontiac	6000, 6000 STE, Bonneville, Fiero, Firebird, Grand Am, Grand Prix, J 2000, Lemans, J Parisienne, Phoenix, Safari, Safari Wagon, Sunbird, T 1000
	Trucks and Vans	All one ton capacity or less with gas engines
1994	Buick	Roadmaster 5.7 liter
	Chevrolet	Camaro 3.4 liter/5.7 liter, Caprice 5.7 liter, Caprice 5.7 liter, Cavalier 3.1 liter, Lumina 3.1 liter
	Pontiac	Firebird 3.4 liter/5.7 liter, Sunbird 2.0 liter/3.1 liter
	Trucks and Vans	All one ton capacity or less with gas engines
1995	Chevrolet	Caprice 4.3 liter
	Trucks and Vans	All one ton capacity or less with gas engines (EXCEPT S/T Series vehicles)



*In addition to the list on the previous page, this Tool IS ALSO COMPATIBLE with OBD1 GM models that are equipped with "Climate Control Computers".*



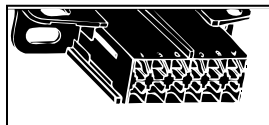
*For 1994 and 1995 vehicles, only the models listed above are compatible with the Tool.*

## ABOUT THE TOOL

The Tool is a device that connects to your vehicle's Data Link Connector to retrieve any Diagnostic Trouble Codes that are stored in the vehicle's on-board computer.

## DATA LINK CONNECTOR (DLC)

Your vehicle test connector is known as the Assembly Line Data Link (ALDL) connector, Assembly Line Communication Link (ALCL) Connector or the Data Link Connector (DLC). The GM DLC connector contains 12 pins and is usually black in color. On most GM vehicles, the connector is found under the left side of the dashboard.



## MALFUNCTION INDICATOR LIGHT (MIL)

Your vehicle's instrument panel has a Malfunction Indicator Light (MIL) also called the "Check Engine" or "Service Engine soon" light. The MIL is an indicator to warn the vehicle operator of a problem in the computer control system.



*If your instrument panel indicator lights do not come on when you turn on the ignition, please refer to your vehicle's service manual. You may have problems in the vehicle's circuitry.*

## DIAGNOSTIC TROUBLE CODES (DTC's)

The service codes are also called "fault codes", "Diagnostic Trouble Codes" (DTC's) or "trouble codes". These codes can be used to identify systems or components that are malfunctioning. The computer records codes for two types of problems:

### ■ "Hard" Diagnostic Trouble Codes

"Hard" DTCs represent problems that are occurring now and cause the instrument panel Malfunction Indicator Lamp (MIL) or Check Engine light to illuminate and remain on until the failure is repaired. A DTC is stored in the vehicle's computer memory for each fault detected. A Tool or Scanner can be used to retrieve DTCs that are stored in the vehicle's computer memory.

■ **Intermittent/History DTCs**

Intermittent/History DTCs are stored in the computer's memory for problems that occur intermittently, or for problems that happened in the past but are not currently present. Intermittent DTCs may cause the Malfunction Indicator light to flicker or stay on until the intermittent malfunction goes away. However, the corresponding fault code will be stored in memory as a history DTC. If the malfunction that caused the history DTC to set does not recur within a predetermined length of time (usually within 40-80 ignition key start cycles), the computer will automatically erase the related fault code from its memory.

**CODE RETRIEVAL PROCEDURE**

*Retrieving and using Diagnostic Trouble Codes (DTCs) for troubleshooting vehicle operation is only one part of an overall diagnostic strategy.*

Never replace a part based only on the DTC definition. Each DTC has a set of testing procedures, instructions and flow charts that must be followed to confirm the location of the problem. This information is found in the vehicle's service manual. Always refer to the vehicle's service manual for detailed testing instructions.





*Check your vehicle thoroughly before performing any test. See **BEFORE YOU BEGIN** on page 31 for details.*

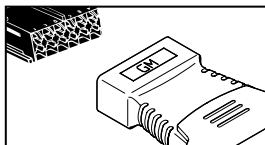
**ALWAYS** observe safety precautions whenever working on a vehicle. See **Safety Precautions** on page 3 for more information.

1. Locate the vehicle's Data Link Connector (DLC). See **DATA LINK CONNECTOR (DLC)** on page 84 for connector location.



*Some DLCs have a plastic cover that must be removed before connecting the Tool's cable connector.*

2. Connect the Tool cable (with the GM Connector Cable Adaptor attached) to the Tool, then connect the adaptor to the vehicle's DLC. Press the **POWER/LINK**  button to turn the Tool ON, then press the **ENTER**  button to continue.

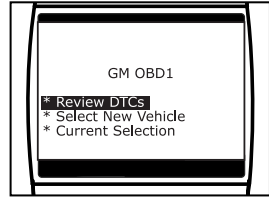


- The GM OBD1 menu displays.

3. To view codes in the Diagnostic Tool's memory:

- Use the **UP** (▲) and **DOWN** (▼) buttons, as necessary, to highlight **Review DTCs**, then press the **ENTER** (↵) button.

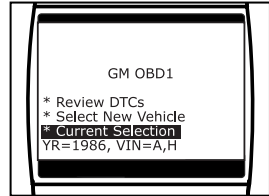
- To retrieve codes from the vehicle's computer:



Use the (▲) and (▼) buttons, as necessary, to make menu selections.

- To retrieve DTCs from the vehicle selection currently in the Tool's memory:

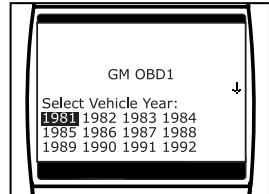
- From the GM OBD1 menu, highlight **Current Selection**, turn ignition key ON (DO NOT start engine) and press the **ENTER** (↵) button.



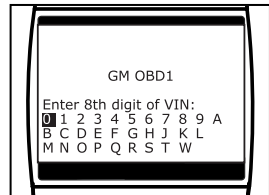
- Proceed to step 5 to continue.

- To retrieve DTCs from a new vehicle:

- From the GM OBD1 menu, highlight **Select New Vehicle** and press the **ENTER** (↵) button; the "Select Vehicle Year" menu displays.



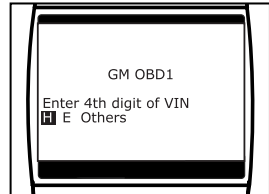
- Highlight the desired year, then press the **ENTER** (↵) button; the "Enter the 8th digit of VIN" menu displays.



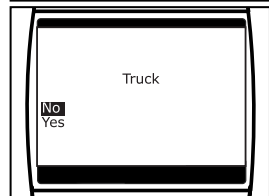
- Highlight the 8th digit of the vehicle's VIN, then press the **ENTER** (↵) button.




If the "Enter 4th VIN Digit" screen displays (not applicable to all vehicles), highlight the 4th digit of the vehicle's VIN, then press the **ENTER** (↵) button.




If the "Truck" screen displays (not applicable to all vehicles), highlight **Yes** or **No**, as appropriate, then press the **ENTER** (↵) button.



- The GM OBD1 menu displays for your confirmation.

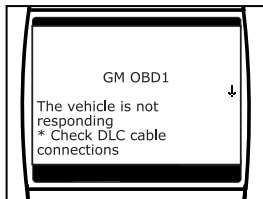
- If the information shown in the "Current Selection" field is correct, highlight **Current Selection**, turn ignition key ON (DO NOT start engine) and press the **ENTER**  button. Proceed to step 4 to continue.




If the year shown is not correct, highlight **Select New Vehicle** and press the **ENTER**  button to return to the "Select Vehicle Year" menu to make your corrections.

5. When the Tool is in the process of retrieving codes, a "One moment please..." message shows on the Tool's LCD display.


- If the Tool fails to link to the vehicle's computer, a "Vehicle is not responding" message shows on the Tool's LCD display. Do the following:



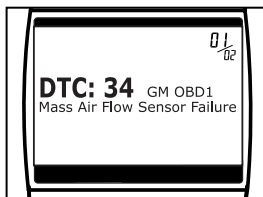
- Verify the ignition is ON.
- Check the cable connections at the Tool and at the vehicle's DLC.
- Turn the ignition OFF, wait 10-12 seconds, then turn back ON to reset the computer.
- Press the **ENTER**  button and repeat steps 4 and 5 as necessary.

- If the Diagnostic Tool **cannot** link to the vehicle's computer, the message "Contact Technical Support" displays.




- Press the **FF/M**  button to return to the Ford OBD1 menu.
- Turn the ignition OFF, and disconnect the Diagnostic Tool.
- Contact Technical Support for assistance.



6. If the Tool was able to link to the vehicle successfully, a "Code retrieval was successful..." message shows temporarily on the Tool's LCD display, followed by any retrieved DTCs.



- The Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No DTC's are presently stored in the vehicle's computer" is displayed.

7. If more than one code was retrieved, press the **DTC SCROLL**  button, as necessary, to display additional codes one at a time.



*In the case of long code definitions, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the  and  buttons, as necessary, to view the additional information.*

Code 12 will always be present and it has one of the following meanings:

- If code 12 is the only DTC retrieved and your vehicle "STARTS OK" then code 12 indicates system "PASS" and all computer control systems are functioning properly.
  - If code 12 is present and your vehicle "DOES NOT START", then it may indicate a problem with the ignition control system.
8. Disconnect the Tool from the vehicle and turn the ignition key OFF.
  9. To prolong battery life, the Tool automatically shuts "Off" after approximately three minutes with no button activity. The DTCs retrieved will remain in the Tool's memory, and may be viewed at any time. If the Tool's batteries are removed, or if the Tool is re-linked to a vehicle to retrieve codes, any prior codes in its memory are automatically cleared.
  10. Follow the testing and repair procedures outlined in the vehicle's service repair manual to correct "hard" DTCs. Codes should be addressed and eliminated in the order they were received, erasing (see SERVICING DTCs - OBD I on page 97) and retesting after each repair is made to be sure the fault was eliminated. Code 12 will appear alone when no other fault codes are present.
    - It may be necessary to test drive the vehicle to reset "hard" fault codes 13, 15, 24, 44, 45, and 55 after they have been erased.



*Whenever codes 51, 52, 54, or 55 are displayed with other codes, troubleshoot and eliminate the "50 Series" codes first, then proceed with the lower numbered codes.*

*The green, yellow and red LEDs are used (with the LCD display) as visual aids to make it easier to determine engine system conditions. See SERVICING DTCs - OBD I on page 97 for information on interpreting LEDs and servicing DTCs.*

## ON-BOARD VEHICLE DIAGNOSTICS (OBD1)

- Beginning in 1988, California's Air Resources Board (CARB), and later, the Federal Government's Environmental Protection Agency (EPA), **required** vehicle manufacturers to include a self diagnostic program capable of identifying an emissions-related fault via the vehicles On-Board Computers (some manufacturers used OBD before it was required). The first generation of Onboard Diagnostics came to be known as **OBD I**.
- OBD I is a set of self-testing or self-diagnosing instructions that are programmed into the vehicle's on-board computer.
- The program is specifically designed to detect failures in the sensors, actuators, switches and wiring of the various vehicle emissions-related systems (fuel injection system, ignition system, EGR system, catalytic converter, etc.). If the computer detects a failure in any one of these components or systems, it alerts the driver by illuminating the "Check Engine" light on the dash.
- The computer also assigns a numeric code (OBD I systems utilized a 2 or 3 digit code) for each specific problem that it detects, and stores these codes in it's memory for later retrieval. The codes can be retrieved from the computer's memory with the use of a device called a "Diagnostic Tool" or a "Scan Tool".



*With the exception of some 1994 and 1995 vehicles, most vehicles from about 1982 to 1995 are equipped with **OBD I** systems.*

## VEHICLES COVERED

The following tables identify the Toyota and Lexus OBD1 vehicles that are covered by the Enhanced OBD2 & 1 Tool.

### DLC 1 Cars

Year	Model	Eng. Size	Eng. Code	DOHC/ SOHC	Other	DLC Type
1995	Camry Coupe	2.2L	5S-FE	DOHC		1
1992	Camry Sedan	2.2L	5S-FE	DOHC		1
1992	Camry Sedan	3.0L	2VZ-FE	DOHC		1
1993	Camry Sedan	3.0L	3VZ-FE	DOHC		1
1993	Camry Sedan	2.2L	5S-FE	DOHC		1
1994	Camry Sedan	2.2L	5S-FE	DOHC		1
1993	Celica	2.0L	3S-GTE	DOHC	Turbo	1
1993	Celica	2.2L	5S-FE	DOHC		1
1994	Celica	1.8L	7A-FE	DOHC		1
1994	Celica	2.2L	5S-FE	DOHC		1

# Toyota/Lexus OBD1 Systems

## VEHICLES COVERED

Year	Model	Eng. Size	Eng. Code	DOHC/ SOHC	Other	DLC Type
1992	Celica Convertible	2.2L	5S-FE	DOHC	A/T	1
1992	Celica Coupe	1.6L	4A-FE	DOHC		1
1992	Celica Coupe	2.2L	5S-FE	DOHC	A/T	1
1993	Celica Coupe	1.6L	4A-FE	DOHC		1
1995	Celica Coupe	1.8L	7A-FE	DOHC		1
1992	Celica Liftback	2.0L	3S-GTE	DOHC	Turbo	1
1992	Celica Liftback	2.2L	5S-FE	DOHC		1
1993	Corolla Sedan	1.6L	4A-FE	DOHC		1
1993	Corolla Sedan	1.8L	7A-FE	DOHC		1
1994	Corolla Sedan	1.6L	4A-FE	DOHC		1
1994	Corolla Sedan	1.8L	7A-FE	DOHC		1
1993	ES-300	3.0L	3VZ-FE	DOHC		1
1993	GS-300	3.0L	2JZ-GE	DOHC		1
1993	LS-400	4.0L	1UZ-FE	DOHC		1
1993	MR2	2.0L	3S-GTE	DOHC	Turbo	1
1993	MR2	2.2L	5S-FE	DOHC		1
1994	MR2	2.0L	3S-GTE	DOHC	Turbo	1
1994	MR2	2.2L	5S-FE	DOHC		1
1994	Paseo	1.5L	5E-FE	DOHC		1
1995	Paseo	1.5L	5E-FE	DOHC		1
1995	SC-300	3.0L	2JZ-GE	DOHC		1
1991	Supra	3.0L	7M-GTE	DOHC	Turbo	1
1991	Supra	3.0L	7M-GE	DOHC		1
1992	Supra	3.0L	7M-GTE	DOHC	Turbo	1
1992	Supra	3.0L	7M-GE	DOHC		1
1993	Tercel Sedan	1.5L	3E-E	SOHC		1
1994	Tercel Sedan	1.5L	3E	SOHC		1

### DLC 2 Cars

Year	Model	Eng. Size	Eng. Code	DOHC/ SOHC	Other	DLC Type
1989	Cressida	3.0L	7M-GE	DOHC		2
1990	Cressida	3.0L	7M-GE	DOHC		2
1991	Cressida	3.0L	7M-GE	DOHC		2
1992	Cressida	3.0L	7M-GE	DOHC		2
1993	Camry	3.0L	3VZ-FE	DOHC		2



# Toyota/Lexus OBD1 Systems

VEHICLES COVERED

Year	Model	Eng. Size	Eng. Code	DOHC/ SOHC	Other	DLC Type
1993	Supra	3.0L	2JZ-GTE	DOHC	Turbo	2
1993	Supra	3.0L	2JZ-GE	DOHC		2
1994	Camry	3.0L	3VZ-FE	DOHC		2
1994	Supra	3.0L	2JZ-GTE	DOHC	Turbo	2
1994	Supra	3.0L	2JZ-GE	DOHC		2
1995	Supra	3.0L	2JZ-GTE	DOHC	Turbo	2
1995	Supra	3.0L	2JZ-GE	DOHC		2
1992	SC-300	3.0L	2JZ-GE	DOHC		2
1990	ES-250	2.5L	2VZ-FE	DOHC		2
1991	ES-250	2.5L	2VZ-FE	DOHC		2
1992	ES-300	3.0L	3VZ-FE	DOHC		2
1992	SC-400	4.0L	1UZ-FE	DOHC		2
1991	LS-400	4.0L	1UZ-FE	DOHC		2
1992	LS-400	4.0L	1UZ-FE	DOHC		2
1993	SC-400	4.0L	1UZ-FE	DOHC		2
1994	SC-400	4.0L	1UZ-FE	DOHC		2
1994	SC-300	3.0L	2JZ-GE	DOHC		2
1993	SC-400	4.0L	1UZ-FE	DOHC		2
1994	GS-300	3.0L	2JZ-GE	DOHC		2
1993	SC-300	3.0L	2JZ-GE	DOHC		2

## DLC 1 Light Trucks

Year	Model	Eng. Size	Eng. Code	DOHC/ SOHC	Other	DLC Type
1992	Previa	2.4L	2TZ-FE	DOHC		1
1993	Previa	2.4L	2TZ-FE	DOHC		1
1994	Previa	2.4L	2TZ-FE	DOHC		1
1994	T100	3.0L	3VZ-FE	SOHC		1
1995	4 Runner	2.4L	22R-E	SOHC		1
1995	4 Runner	3.0L	3VZ-FE	SOHC		1
1995	Pickup	2.4L	22R-E	SOHC		1
1995	Pickup	3.0L	3VZ-FE	SOHC		1
1995	Previa	2.4L	2TZ-FE	DOHC		1

### DATA LINK CONNECTOR (DLC)

Toyota vehicles are equipped with special Test Connectors that make it possible to connect specialized testing equipment that communicates with the vehicle's onboard computer. This Tool is designed for use with two types of Toyota DLC connectors; DLC Number 1 and DLC Number 2, as described below.

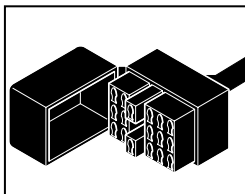


*The Tool's Toyota Connector Cable Adaptor is designed to match the vehicle's DLC. Make sure the adaptor mates properly before applying any force when making the connection. Applying force to the connector when not mated properly may cause damage to the connectors.*

1. Type 1 connector is also known as Data Link Connector Number 1. The type 1 DLC connector is a rectangular connector and is usually black or gray in color. The connector is located under the hood (engine compartment) in the following general locations:

- Front corner (right or left)
- Front corner (right or left)
- Fender well (right or left)
- Fire wall (right or left)

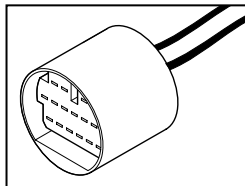
It has a cover labeled "DIAGNOSTIC", "DIAGNOSIS", or "CHECK CONN". Use the square head of the Toyota Connector Cable Adaptor on vehicles with this type of connector.



2. Type 2 connector is also known as Data Link Connector (DLC) Number 2. The type 2 DLC connector is a round connector and is usually black or gray in color.

- The connector is located "under the dash" on the left hand side.

It may have a protective cap that needs to be removed before connecting the Tool's DLC. Use the round head of the Toyota Connector Cable Adaptor on vehicles with this type of connector.



### INSTRUMENT PANEL MALFUNCTION INDICATOR LIGHTS (MIL)

Your vehicle's instrument panel has a Malfunction Indicator Light (MIL) also called the "Check Engine" or "Service Engine soon" light. The MIL is an indicator to warn the vehicle operator of a problem in the computer control system.

**CHECK ENGINE**

**SERVICE  
ENGINE  
SOON**



*If your instrument panel indicator lights do not come on when you turn on the ignition, please refer to your vehicle's service manual. You may have problems in the car's circuitry. It is recommended that you fix these problems before retrieving DTCs from your vehicle's computer.*

## DIAGNOSTIC TROUBLE CODES

Diagnostic Trouble Codes, or Fault Codes, can be used to identify engine systems or components that are malfunctioning. The computer records codes for the following two types of engine problems:

### ■ "Hard" Diagnostic Trouble Codes

"Hard" DTCs represent problems that are occurring now and cause the instrument panel Malfunction Indicator Lamp (MIL) or Check Engine light to illuminate and remain on until the failure is repaired. A DTC is stored in the vehicle's computer memory for each fault detected. A Tool or Scanner can be used to retrieve DTCs that are stored in the vehicle's computer memory.

### ■ Intermittent/History DTCs

Intermittent/History DTCs are stored in the computer's memory for problems that occur intermittently, or for problems that happened in the past but are not currently present. Intermittent DTCs may cause the Malfunction Indicator light to flicker or stay on until the intermittent malfunction goes away. However, the corresponding fault code will be stored in memory as a history DTC. If the malfunction that caused the history DTC to set does not recur within a predetermined length of time (usually within 40-80 ignition key start cycles), the computer will automatically erase the related fault code from its memory.

## CODE RETRIEVAL PROCEDURE

*Retrieving and using Diagnostic Trouble Codes (DTCs) for troubleshooting vehicle operation is only one part of an overall diagnostic strategy.*

**Never** replace a part based only on the DTC definition. Each DTC has a set of testing procedures, instructions and flow charts that must be followed to confirm the location of the problem. This information is found in the vehicle's service manual. Always refer to the vehicle's service manual for detailed testing instructions.






Check your vehicle thoroughly before performing any test. See **BEFORE YOU BEGIN** on page 31 for details.

**ALWAYS** observe safety precautions whenever working on a vehicle. See *Safety Precautions* on page 3 for more information.

1. Locate the vehicle's Data Link Connector (DLC). See **DATA LINK CONNECTOR (DLC)** on page 92 for connection location.






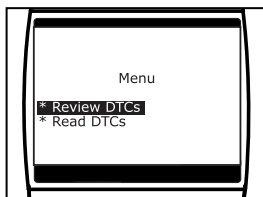
Some DLCs have a plastic cover that must be removed before connecting the Tool's cable connector.

2. Connect the Tool cable (with the Toyota Connector Cable Adaptor attached) to the Tool, then connect the adaptor to the vehicle's DLC. Press the **POWER/LINK**  button to turn the Tool ON.




- The Toyota OBD1 menu displays.

3. To view codes in the Diagnostic Tool's memory:

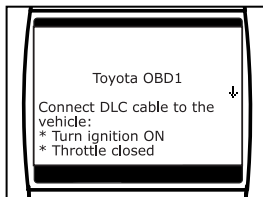
- Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Review DTCs**, then press the **ENTER**  button.



4. To retrieve codes from the vehicle's computer:


- Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Read DTCs**, then press the **ENTER**  button.

- The LCD display shows instructions to prepare the vehicle to retrieve codes.

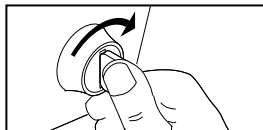


5. Do the following before proceeding to step 4:

- Turn ignition ON and start engine. Warm engine to operating temperature. (Shut engine off after warm up).
- Make sure throttle is closed.
- Set gear lever in "park" (for automatic transmissions) or "neutral" for manual transmissions.
- Turn off all accessories.


6. Turn ignition ON. **DO NOT** start the engine. Press the **ENTER**  button to continue.

- The Tool will begin the code retrieval process.




7. When the Tool is in the process of retrieving codes, a "One moment please..." message shows on the Tool's LCD display.

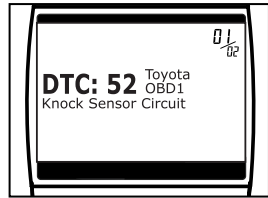
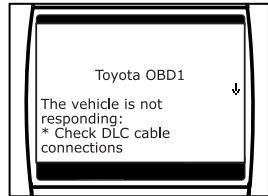
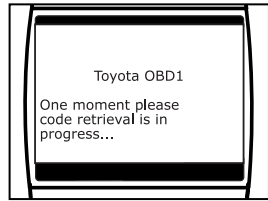
- If the Tool fails to link to the vehicle's computer a "Vehicle is not responding" message shows on the Tool's LCD display. Do the following:



- Verify the ignition is ON.
- Check the cable connections at the Tool and at the vehicle's DLC.
- Turn the ignition OFF, wait 10-12 seconds, then turn back ON to reset the computer.
- Press the **ENTER**  button and repeat steps 3 and 4 as necessary.

8. If the Tool was able to link to the vehicle successfully a "Code retrieval was successful..." message shows temporarily on the Tool's LCD display followed by any retrieved DTCs.

- The Tool will display a code only if codes are present in the vehicle's computer memory. If no codes are present, a "No DTC are presently stored in the vehicle's computer" message is displayed.

9. If more than one code was retrieved press the **DTC SCROLL** , as necessary, to display additional codes one at a time.



*In the case of long code definitions, a small arrow is shown in the upper/lower right-hand corner of the code display area to indicate the presence of additional information. Use the  and  buttons, as necessary, to view the additional information.*

10. Disconnect the Tool from the vehicle and turn the ignition key OFF.
11. To prolong battery life, the Tool automatically shuts "Off" after approximately three minutes with no button activity. The DTCs retrieved will remain in the Tool's memory, and may be viewed at any time. If the Tool's batteries are removed, or if the Tool is re-linked to a vehicle to retrieve codes, any prior codes in its memory are automatically cleared.

12. Follow the testing and repair procedures outlined in the vehicle's service repair manual to correct "hard" DTCs. Codes should be addressed and eliminated in the order they were received, erasing (see **SERVICING DTCs - OBD I** on page 97) and retesting after each repair is made to be sure the fault was eliminated.



*The green, yellow and red LEDs are used (with the LCD display) as visual aids to make it easier to determine engine system conditions. See **SERVICING DTCs - OBD I** on page 97 for information on interpreting LEDs and servicing DTCs.*

## SERVICING DTCs - OBD I

**Retrieving and using Diagnostic Trouble Codes (DTCs) for troubleshooting vehicle operation is only one part of an overall diagnostic strategy.**

**Never** replace a part based only on the DTC definition. Each DTC has a set of testing procedures, instructions and flow charts that must be followed to confirm the location of the problem. This information is found in the vehicle's service manual. Always refer to the vehicle's service manual for detailed testing instructions.



1. Determine engine system(s) condition by viewing the Tool's LCD display for any retrieved Diagnostic Trouble Codes, code definitions and interpreting the green, yellow and red LEDs.

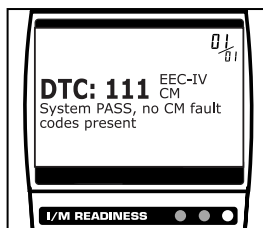


*The green, yellow and red LEDs are used (with the LCD display) as visual aids to make it easier to determine engine system conditions.*

2. **Green LED** - Indicates that all engine systems are "OK" and operating normally. No trouble codes are present. If you are not experiencing any vehicle problems **NO FURTHER TESTING IS REQUIRED.**

- If you are still experiencing vehicle problems even through the green LED illuminates, the problem is not in the computer control systems.

See the **NO CODES** troubleshooting section of your vehicle's repair manual for further troubleshooting instructions.

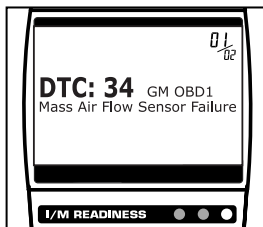


3. **Yellow LED** - Indicates an Intermittent or History DTC is present.

Intermittent/History DTCs are stored in the computer's memory for problems that occur intermittently, or for problems that happened in the past but are not currently present. Intermittent DTCs may cause the Malfunction Indicator light to flicker or stay on until the intermittent malfunction goes away. However, the corresponding fault code will be stored in memory as a history DTC. If the malfunction that caused the history DTC to set does not recur within a predetermined length of time (usually within 40-80 ignition key start cycles), the computer will automatically erase the related fault code from its memory.

- **HISTORY DTC** - On some vehicles, the computer will keep a record or history of DTCs that relate to problems that happened in the past but are no longer present. These DTCs will not command the MIL or Check Engine light "On", but the yellow LED will be illuminated.

4. **Red LED** - Indicates there is a problem with one or more of the vehicle's systems. The red LED is also used to indicate that DTC(s) are present (displayed on the Tool's screen). In this case, the MIL or Check Engine light on the vehicle's instrument panel will be illuminated.



- If DTC's were retrieved and you are going to perform the repairs yourself, proceed by consulting the vehicle's service repair manual for testing instructions, testing procedures, and flow charts related to retrieved code(s).
- If you plan to take the vehicle to a professional to have it serviced, complete the PRELIMINARY VEHICLE DIAGNOSTIC WORKSHEET on page 28 and take it, together with the retrieved codes and LED information, to aid in the Troubleshooting procedure.



*Retrieved information can be uploaded to a Personal Computer (PC) with the use of optional software. For more information, see instructions included with the optional software.*




## ERASING DTCs (OBD I SYSTEMS)



*When the Tool's ERASE function is used to erase DTCs from the vehicle's on-board computer, manufacturer specific data (where applicable) is also erased.*

If you plan to take the vehicle to a service center for repair, DO NOT erase the codes from the vehicle's computer. If the codes are erased, valuable information that might help the technician troubleshoot the problem will also be erased.


### Erase DTC's from the computer's memory as follows:


1. Connect the Tool to the vehicle's DLC. Press the **ENTER**  button to continue.
2. Turn the ignition ON. DO NOT start the engine.




*For FORD systems only, first perform step 3 below, then turn ignition "ON" and press the **ENTER**  button to continue.*

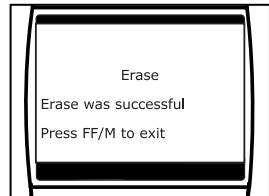
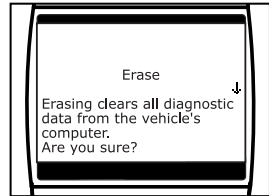
3. Press and release the **ERASE**  button. A confirmation message shows on the LCD display.

- If you are sure you want to proceed, press the **ERASE**  button again to erase DTCs from the vehicle's computer.

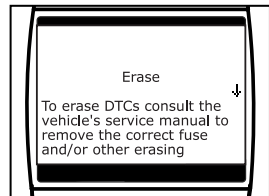
- If you do not want to continue with the erase process, press the **FF/M**  button to exit the erase function.

4. If you chose to erase DTCs, a status screen displays while the erase function is in progress.

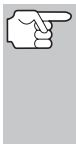
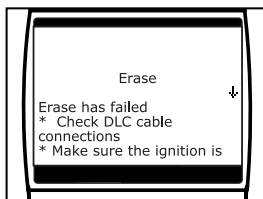
- If the erase was successful, a confirmation message shows on the Tool's LCD display. press the **ENTER**  button to exit.



*Due to the differences in computer systems, the Tool can be used to erase codes for some vehicles, while others require codes to be erased manually. If the "To erase DTC's consult the vehicle's service repair manual..." screen displays, you must consult the vehicle's service repair manual for procedures to erase DTCs.*



- If the erase was not successful, an advisory message shows on the LCD display. Verify that the Tool is properly connected to the vehicle's DLC and that the ignition is ON. If the erase process still does not complete, turn the ignition OFF, wait 10 seconds, then turn back ON and repeat steps 2 and 3.



*FORD systems will not display an erase was not successful message. If the "One moment please erase in progress" message on the display does NOT change after 3 minutes, it indicates that the erase function has failed. Check the DLC connections and make sure the ignition key is "ON". Perform the ERASE function again.*



*Erasing DTCs does not fix the problem(s) that caused the code(s) to be set. If proper repairs to correct the problem that caused the code(s) to be set are not made, the code(s) will appear again and the check engine light will illuminate as soon as the problem that cause the DTC to set manifests itself.*




In addition to retrieving Diagnostic Trouble Codes (DTCs), you can use the Diagnostic Tool to perform additional diagnostic tests, to view diagnostic and vehicle information stored in your vehicle's on-board computer, and to configure the Diagnostic Tool for your particular needs.

### VIEWING FREEZE FRAME DATA

In OBD2 systems, when an emissions-related engine malfunction occurs that causes a DTC to set, a record or snapshot of engine conditions at the time that the malfunction occurred is also saved in the vehicle's computer memory. The record saved is called Freeze Frame data.

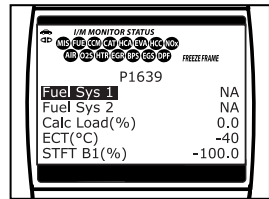
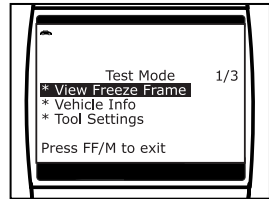
1. While linked to the vehicle, press and release the **FF/M**  button.

- The "Test Modes" Menu displays.



2. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **View Freeze Frame**, then press the **ENTER**  button.


- The Freeze Frame screen displays.

- Saved engine conditions include but are not limited to: engine speed, open or closed loop operation, fuel system commands, coolant temperature, calculated load value, fuel pressure, vehicle speed, air flow rate and intake manifold pressure.



*If more than one malfunction is present that causes more than one DTC to be set, only the code with the highest priority will contain Freeze Frame data. The code designated "01" on the Diagnostic Tool's display is referred to as the PRIORITY code, and Freeze Frame data always refers to this code. The priority code is also the one that has commanded the MIL on.*

- Use the **UP**  and **DOWN**  buttons, as necessary, to view all available Freeze Frame data.

3. When finished, press and release the **FF/M**  button to return to the OBD2 DTC screen.

### VIEWING VEHICLE INFORMATION

The **Vehicle Info** function offers three options for retrieving reference information for the vehicle under test; **Vehicle ID**, **Available Modules** and **IPT** (In-Use Performance Tracking).

### Retrieving Vehicle ID Information






The Vehicle ID function is applicable to model year 2000 and newer OBD2-compliant vehicles.

The Diagnostic Tool can retrieve a list of information (provided by the vehicle manufacturer), unique to the vehicle under test, from the vehicle's on-board computer. This information may include:




- The vehicle's VIN number
- The control module identification number
- The vehicle's calibration ID(s). These IDs uniquely identify the software version(s) for the vehicle's control module(s).
- The Vehicle's Calibration Verification Number(s) (CVNs) required by OBD2 regulations. CVNs are used to determine if emission-related calibrations for the vehicle under test have been changed. One or more CVNs may be returned by the vehicle's computer.

1. While linked to the vehicle, press and release the **FF/M**  button.

- The "Test Modes" Menu displays.

2. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Vehicle Info**, then press the **ENTER**  button.



- The Vehicle Info Menu displays.


3. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Vehicle ID**, then press the **ENTER**  button.

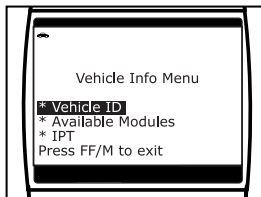
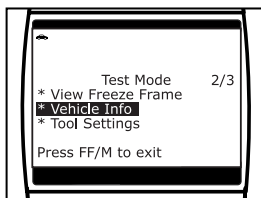
4. A "One moment please..." message displays while the requested information is retrieved from the vehicle's computer.



The first time the **Vehicle ID** function is used, it may take several minutes to retrieve the information from the vehicle's computer.











5. When the retrieval process is completed, the vehicle ID information is shown on the Diagnostic Tool's display. Use the **UP**  and **DOWN**  buttons, as necessary, to view the entire list.

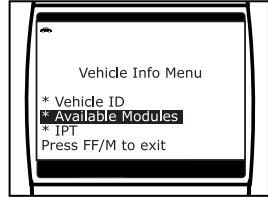
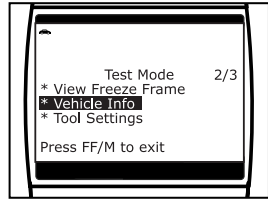
6. When you have finished viewing the retrieved vehicle ID information, press the **FF/M**  button to exit.



### Viewing Available Modules





The Diagnostic Tool can retrieve a list of modules supported by the vehicle under test.

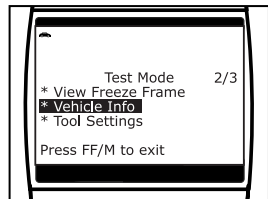
1. While linked to the vehicle, press and release the **FF/M**  button.
  - The "Test Modes" Menu displays.
2. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Vehicle Info**, then press the **ENTER**  button.
  - The Vehicle Info Menu displays.
3. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Available Modules**, then press the **ENTER**  button.
4. A "One moment please..." message displays while the requested information is retrieved from the vehicle's computer.
5. When the retrieval process is completed, a complete list of modules supported by the vehicle under test is shown on the Diagnostic Tool's display. Use the **UP**  and **DOWN**  buttons, as necessary, to view the entire list.
6. When you have finished viewing the list of available modules, press the **FF/M**  button to return to the "System Test Menu."










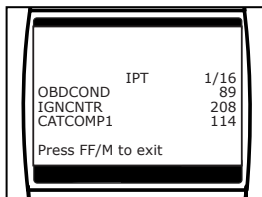
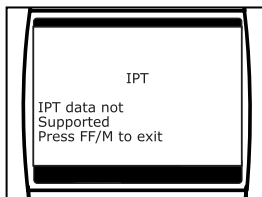
### Viewing In-use Performance Tracking (IPT)

The Scam Tool can retrieve In-use Performance Tracking (IPT) statistics for monitors supported by the vehicle under test. Two values are returned for each monitor; the number of times that all conditions necessary for a specific monitor to detect a malfunction have been encountered (XXXCOND), and the number of times that the vehicle has been operated under the specific conditions for the monitor (XXXCOMP). Statistics are also provided for the number of times the vehicle has been operated in OBD monitoring conditions (OBDCOND), and the number of times the vehicle's engine has been started (IGNCNTR).

1. While linked to the vehicle, press and release the **FF/M**  button.
  - The "Test Modes" Menu displays.
2. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Vehicle Info**, then press the **ENTER**  button.



- The Vehicle Info Menu displays.
3. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **IPT**, then press the **ENTER**  button.
  4. A “One moment please . . .” message displays while the requested information is retrieved from the vehicle’s computer.
    - If In-use Performance Tracking is not supported by the vehicle under test, an advisory message shows on the Diagnostic Tool’s display. Press the **FF/M**  button to exit.
  5. When the retrieved process is completed, In-use Performance Tracking statistics for monitors supported by the vehicle under test are shown on the Diagnostic Tool’s display. Use the **UP**  and **DOWN**  buttons, as necessary, to view the entire list.
  6. When you have finished viewing the statistics, press the **FF/M**  button to exit.



## ADJUSTMENTS AND SETTINGS





The Diagnostic Tool lets you make several adjustments and settings to configure the Diagnostic Tool to your particular needs. It also contains an OBD2 DTC Library that allows you to search for DTC definitions. The following functions, adjustments and settings can be performed when the Diagnostic Tool is in “MENU Mode”:

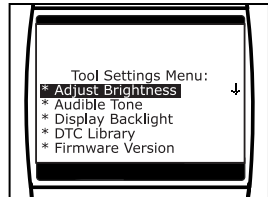
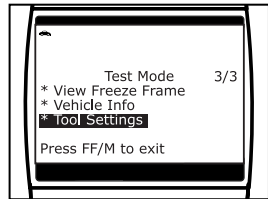
- **Adjust Brightness:** Adjusts the brightness of the display screen.
- **Audible Tone:** Turns the Diagnostic Tool’s audible tone “on” and “off.” When turned “on,” a tone sounds each time a button is pressed.
- **Display Backlight:** Turns the display backlight on and off.
- **DTC Library** - Library of OBD2 DTC definitions.
- **Firmware Version:** Displays the Diagnostic Tool’s firmware version.
- **Select Language:** Sets the display language for the Diagnostic Tool to English, French or Spanish.
- **Unit of Measurement:** Sets the Unit of Measurement for the Diagnostic Tool’s display to USA or metric.









*Adjustments and settings can be made only when the Diagnostic Tool is NOT connected to a vehicle.*

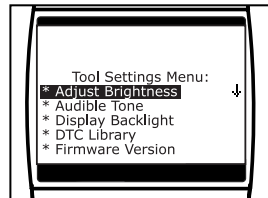
### To enter the MENU Mode:

1. With the Diagnostic Tool on the Code Retrieval screen, press and release the **FF/M**  button.
  - The “Test Modes” Menu displays.
2. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Tool Settings**, then press the **ENTER**  button.
  - The Tool Setting Menu displays.
3. Make adjustments and settings as described in the following paragraphs.









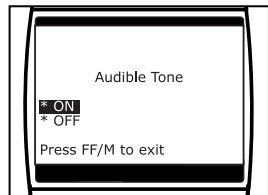
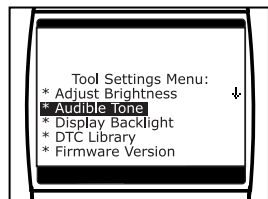
### Adjusting Display Brightness

1. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Adjust Brightness** in the **Menu**, then press the **ENTER**  button.
  - The Adjust Brightness screen displays.
  - The **Brightness** field shows the current brightness setting, from 1 to 4.
2. Press the **UP**  button to decrease the brightness of the display (make the display darker).
3. Press the **DOWN**  button to increase the brightness of the display (make the display lighter).
4. When the desired brightness is obtained, press the **ENTER**  button to save your changes and return to the **Menu**.



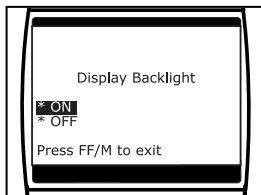
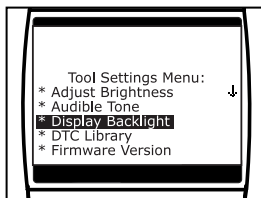
### Enabling the Audible Tone

1. Use the **UP**  and **DOWN**  buttons, as necessary, to highlight **Audible Tone** in the **Menu**, then press the **ENTER**  button.
  - The Audible Tone screen displays.
2. Press the **UP**  or **DOWN**  button, as necessary, to highlight **ON** or **OFF** as desired.
3. When the desired option is selected, press the **ENTER**  button to save your changes and return to the **Menu**.



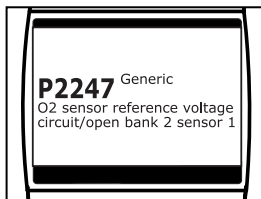
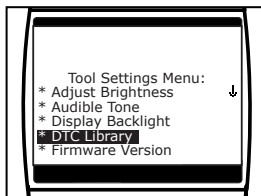
### Using the Backlight

1. Use the **UP** (▲) and **DOWN** (▼) buttons, as necessary, to highlight **Display Backlight** in the **Menu**, then press the **ENTER** (↵) button.
  - The Display Backlight screen displays.
2. Press the **UP** (▲) or **DOWN** (▼) button, as necessary, to select the desired backlight mode, either **ON** or **OFF**.
3. When the desired backlight mode is selected, press the **ENTER** (↵) button to save your changes.
  - The display returns to the **Menu**, and the backlight turns “on” or “off” as selected.



### Searching for a DTC Definition Using the DTC Library

1. Use the **UP** (▲) and **DOWN** (▼) buttons, as necessary, to highlight **DTC Library** in the **Menu**, then press the **ENTER** (↵) button.
  - The Enter DTC screen displays. The screen shows the code “P0001”, with the “P” highlighted.
2. Use the **UP** (▲) and **DOWN** (▼) buttons, as necessary, to scroll to the desired DTC type (P=Powertrain, U=Network, B=Body, C=Chassis), then press the **DTC SCROLL** (DTC) button.
  - The selected character displays “solid”, and the next character is highlighted.
3. Select the remaining characters in the DTC in the same way, pressing the **DTC SCROLL** (DTC) button to confirm each character. When you have selected all the DTC characters, press the **ENTER** (↵) button to view the DTC definition.
  - If you entered a “Generic” DTC (DTCs that start with “P0”, “P2” and some “P3”):
    - The selected DTC and DTC definition (if available) show on the Diagnostic Tool’s display.

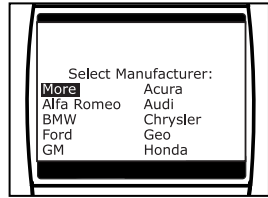






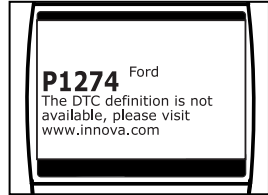
If a definition for the DTC you entered is not available, an advisory message shows on the Diagnostic Tool's display.

- If you entered a "Manufacturer-Specific" DTC (DTCs that start with "P1" and some "P3"):
  - The "Select Manufacturer" screen displays.
  - Use the **UP** (▲) and **DOWN** (▼) buttons, as necessary, to highlight the appropriate manufacturer, then press the **ENTER** (↵) button to display the correct DTC for your vehicle.



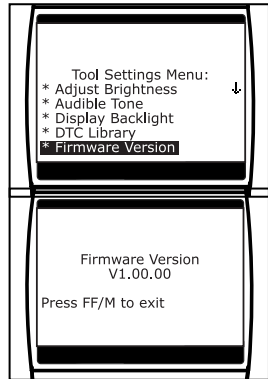
If a definition for the DTC you entered is not available, an advisory message shows on the Diagnostic Tool's display.

4. If you wish to view definitions for additional DTCs, press the **ENTER** (↵) button to return to the Enter DTC screen, and repeat steps 2 and 3.
5. When all desired DTCs have been viewed, press the **FF/M** (FF/M) button to exit the DTC Library.



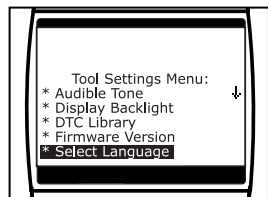
### Viewing the Firmware Version

1. Use the **UP** (▲) and **DOWN** (▼) buttons, as necessary, to highlight **Firmware Version** in the **Menu**, then press the **ENTER** (↵) button.
  - The Firmware Version screen displays.
  - The screen shows the Diagnostic Tool's current firmware version.
2. Press the **ENTER** (↵) button to return to the **Menu**.

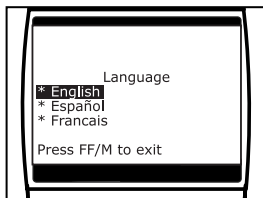


### Selecting the Display Language

1. Use the **UP** (▲) and **DOWN** (▼) buttons, as necessary, to highlight **Select Language** in the **Menu**, then press the **ENTER** (↵) button.
  - The Select Language screen displays.

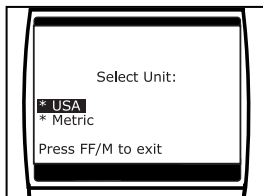
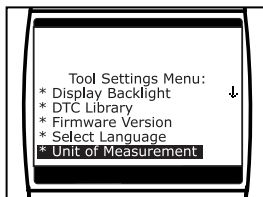


- The currently selected display **Language** is highlighted.
2. Press the **UP** (▲) or **DOWN** (▼) button, as necessary, to highlight the desired display language.
3. When the desired display language is highlighted, press the **ENTER** (↵) button to save your changes and return to the **Menu** (shown in the selected display language).



### Setting the Unit of Measurement

1. Use the **UP** (▲) and **DOWN** (▼) buttons, as necessary, to highlight **Unit of Measurement** in the **Menu**, then press the **ENTER** (↵) button.
2. Press the **UP** (▲) or **DOWN** (▼) button, as necessary, to highlight the desired **Unit of Measurement**.
3. When the desired **Unit of Measurement** value is selected, press the **ENTER** (↵) button to save your changes and return to the **Menu**.



### Exiting the MENU Mode

1. Press the **FF/M** (FF/M) button.
  - The LCD display returns to the DTC screen (if data is currently stored in the Diagnostic Tool's memory) or the "To Link" screen (if no data is stored).

# Generic (Global) OBD2 PID List

The following is a list of Generic (Global) PIDs and their descriptions.

<b>Tool Display</b>	<b>Unit</b>	<b>Value</b>	<b>PID Description</b>
ACC Pedal D	%	XXX.X	Accelerator Pedal Position D
ACC Pedal E	%	XXX.X	Accelerator Pedal Position E
ACC Pedal F	%	XXX.X	Accelerator Pedal Position F
Air Status	-	UPS, DNS, OFF	Commanded Secondary Air Status
Ambient	*C / *F	XXX	Ambient Air Temperature
Aux Input Status	-	On / Off	Auxiliary Input Status
BARO	kPa /inHg	XXX / XX.X	Barometric Pressure
Calc LOAD	%	XXX.X	Calculated LOAD Value
CAT Temp 11	*C / *F	XXXX.X	Catalyst Temperature Bank 1- Sensor 1
CAT Temp 12	*C / *F	XXXX.X	Catalyst Temperature Bank 1- Sensor 2
CAT Temp 21	*C / *F	XXXX.X	Catalyst Temperature Bank 2- Sensor 1
CAT Temp 22	*C / *F	XXXX.X	Catalyst Temperature Bank 2- Sensor 2
Command EGR	%	XXX.X	Commanded EGR
Command EVAP	%	XXX.X	Commanded Evaporative Purge
Command TAC	%	XXX.X	Commanded Throttle Actuator
Dist DTC Clr	km /mile	XXXXX	Distance since DTC Cleared
Dist MIL ON	km /mile s	XXXXX	Distance Traveled while MIL ON
ECT	*C / *F	XXX / XXX	Engine Coolant Temp
ECU Volts	V	XX.XXX	Control Module Voltage
EGR Error	%	XXX.X	EGR Error
Eng RPM	min	XXXXXX	Engine RPM
EQ Ratio	-	X.XXX	Commanded Equivalence Ratio
EQ Ratio 11	-	X.XXX	Bank 1 - Sensor 1 Equivalence Ratio
EQ Ratio 12	-	X.XXX	Bank 1 - Sensor 2 Equivalence Ratio
EQ Ratio 13	-	X.XXX	Bank 1 - Sensor 3 Equivalence Ratio
EQ Ratio 14	-	X.XXX	Bank 1 - Sensor 4 Equivalence

# Generic (Global) OBD2 PID List

Tool Display	Unit	Value	PID Description
			Ratio
EQ Ratio 21	-	X.XXX	Bank 2 - Sensor 1 Equivalence Ratio
EQ Ratio 22	-	X.XXX	Bank 2 - Sensor 2 Equivalence Ratio
EQ Ratio 23	-	X.XXX	Bank 2 - Sensor 3 Equivalence Ratio
EQ Ratio 24	-	X.XXX	Bank 2 - Sensor 4 Equivalence Ratio
EVAP Press	Pa /in H2O	XXXX.XX /XX.XXX	Evap System Vapor Pressure
FP / Vac	kPa /PSI	XXXX.XXX /XXX.X	Fuel Rail Pressure relative toVacuum
Fuel Level	%	XXX.X	Fuel Level Input
Fuel Press	kPa /PSI	XXX / XX.X	Fuel Rail Pressure
Fuel Press	kPa /PSI	XXXXXX /XXXX.X	Fuel Rail Pressure
Fuel Sys 1	-	OL	Fuel System 1 Status
Fuel Sys 1	-	CL	Fuel System 1 Status
Fuel Sys 1	-	OL-Drive	Fuel System 1 Status
Fuel Sys 1	-	OL-Fault	Fuel System 1 Status
Fuel Sys 1	-	CL-Fault	Fuel System 1 Status
Fuel Sys 2	-	OL	Fuel System 2 Status
Fuel Sys 2	-	CL	Fuel System 2 Status
Fuel Sys 2	-	OL-Drive	Fuel System 2 Status
Fuel Sys 2	-	OL-Fault	Fuel System 2 Status
Fuel Sys 2	-	CL-Fault	Fuel System 2 Status
IAT	*C / *F	XXX / XXX	Intake Air Temperature
LOAD Value	%	XXX.X	Absolute Load Value
LTFT B1	%	XXX.X	Long Term Fuel Trim-Bank 1
LTFT B2	%	XXX.X	Long Term Fuel Trim-Bank 2
LTFT B3	%	XXX.X	Long Term Fuel Trim-Bank 3
LTFT B4	%	XXX.X	Long Term Fuel Trim-Bank 4
MAF	g/s ;l b/min	XXX.XX /XXXX.X	Air Flow Rate from Mass Air Flow Sensor
MAP	kPa /PSI	XXX / XX.X	Intake Manifold Absolute Pressure
MIL On Time	hrs, min	XXXX, XX	Engine Run Time while MIL ON
Monitor Status	-	ICONS on Display	Monitor Status this Driving Cycle
O2S B1 S1	V	X.XXX	Bank 1 - Sensor 1
O2S B1 S1	mA	X.XXX	Bank 1 - Sensor 1 O2S Current

# Generic (Global) OBD2 PID List

Tool Display	Unit	Value	PID Description
mA			
O2S B1 S1 V	V	X.XXX	Bank 1 - Sensor 1 O2S Voltage
O2S B1 S2	V	X.XXX	Bank 1 - Sensor 2
O2S B1 S2 mA	mA	X.XXX	Bank 1 - Sensor 2 O2S Current
O2S B1 S2 V	V	X.XXX	Bank 1 - Sensor 2 O2S Voltage
O2S B1 S3	V	X.XXX	Bank 1 - Sensor 3
O2S B1 S3 mA	mA	X.XXX	Bank 1 - Sensor 3 O2S Current
O2S B1 S3 V	V	X.XXX	Bank 1 - Sensor 3 O2S Voltage
O2S B1 S4	V	X.XXX	Bank 1 - Sensor 4
O2S B1 S4 mA	mA	X.XXX	Bank 1 - Sensor 4 O2S Current
O2S B1 S4 V	V	X.XXX	Bank 1 - Sensor 4 O2S Voltage
O2S B2 S1	V	X.XXX	Bank 2 - Sensor 1
O2S B2 S1 mA	mA	X.XXX	Bank 2 - Sensor 1 O2S Current
O2S B2 S1 V	V	X.XXX	Bank 2 - Sensor 1 O2S Voltage
O2S B2 S2	V	X.XXX	Bank 2 - Sensor 2
O2S B2 S2 mA	mA	X.XXX	Bank 2 - Sensor 2 O2S Current
O2S B2 S2 V	V	X.XXX	Bank 2 - Sensor 2 O2S Voltage
O2S B2 S3	V	X.XXX	Bank 2 - Sensor 3
O2S B2 S3 mA	mA	X.XXX	Bank 2 - Sensor 3 O2S Current
O2S B2 S3 V	V	X.XXX	Bank 2 - Sensor 3 O2S Voltage
O2S B2 S4	V	X.XXX	Bank 2 - Sensor 4
O2S B2 S4 mA	mA	X.XXX	Bank 2 - Sensor 4 O2S Current
O2S B2 S4 V	V	X.XXX	Bank 2 - Sensor 4 O2S Voltage
O2S Location	-	O2S11	Oxygen Sensor, Bank 1, Sensor 1
O2S Location	-	O2S12	Oxygen Sensor, Bank 1, Sensor 2
O2S Location	-	O2S13	Oxygen Sensor, Bank 1, Sensor 3
O2S Location	-	O2S14	Oxygen Sensor, Bank 1, Sensor 4
O2S Location	-	O2S21	Oxygen Sensor, Bank 2, Sensor 1
O2S Location	-	O2S22	Oxygen Sensor, Bank 2, Sensor 1
O2S Location	-	O2S23	Oxygen Sensor, Bank 2, Sensor 3
O2S Location	-	O2S24	Oxygen Sensor, Bank 2, Sensor 4
O2S Location	-	O2S11	Oxygen Sensor, Bank 1, Sensor 1
O2S Location	-	O2S12	Oxygen Sensor, Bank 1, Sensor 2
O2S Location	-	O2S21	Oxygen Sensor, Bank 2, Sensor 1
O2S Location	-	O2S22	Oxygen Sensor, Bank 2, Sensor 2
O2S Location	-	O2S31	Oxygen Sensor, Bank 3, Sensor 1
O2S Location	-	O2S32	Oxygen Sensor, Bank 3, Sensor 2
O2S Location	-	O2S41	Oxygen Sensor, Bank 4, Sensor 1
O2S Location	-	O2S42	Oxygen Sensor, Bank 4, Sensor 2

# Generic (Global) OBD2 PID List

Tool Display	Unit	Value	PID Description
OBD Support	-	OBD2	OBD Requirements
OBD Support	-	OBD	OBD Requirements
OBD Support	-	OBD and OBD2	OBD Requirements
OBD Support	-	OBD1	OBD Requirements
OBD Support	-	No OBD	OBD Requirements
OBD Support	-	EOBD	OBD Requirements
OBD Support	-	EOBD and OBD2	OBD Requirements
OBD Support	-	EOBD and OBD	OBD Requirements
OBD Support	-	EOBD, OBD and OBD2	OBD Requirements
OBD Support	-	JOBD	OBD Requirements
OBD Support	-	JOBD and OBD2	OBD Requirements
OBD Support	-	JOBD and EOBD	OBD Requirements
OBD Support	-	JOBD, EOBD and OBD2	OBD Requirements
PTO Status	-	On / Off	Power Take Off Status
Rel TPS	%	XXX.X	Relative Throttle Position
Spark Adv	deg	XX	Ignition Timing Advance #1 Cylinder
STFT B1	%	XXX.X	Short Term Fuel Trim-Bank 1
STFT B1 S1	%	XXX.X	Bank 1 - Sensor 1
STFT B1 S2	%	XXX.X	Bank 1 - Sensor 2
STFT B1 S3	%	XXX.X	Bank 1 - Sensor 3
STFT B1 S4	%	XXX.X	Bank 1 - Sensor 4
STFT B2	%	XXX.X	Short Term Fuel Trim-Bank 2
STFT B2 S1	%	XXX.X	Bank 2 - Sensor 1
STFT B2 S2	%	XXX.X	Bank 2 - Sensor 2
STFT B2 S3	%	XXX.X	Bank 2 - Sensor 3
STFT B2 S4	%	XXX.X	Bank 2 - Sensor 4
STFT B3	%	XXX.X	Short Term Fuel Trim-Bank 3
STFT B4	%	XXX.X	Short Term Fuel Trim-Bank 4
Time DTC Clr	hrs, min	XXXX, XX	Time since DTC Cleared
Time Since Start	sec	XXXX	Time Since Engine Start
TPS	%	XXX.X	Absolute Throttle Position
TPS B	%	XXX.X	Absolute Throttle Position B
TPS C	%	XXX.X	Absolute Throttle Position C

## Generic (Global) OBD2 PID List

<b>Tool Display</b>	<b>Unit</b>	<b>Value</b>	<b>PID Description</b>
Veh Speed	km/h / mph	XXX / XXX	Vehicle Speed Sensor
Warm-up DTC Clr	-	XXX	# Warm-ups since DTC Cleared

### GLOSSARY OF TERMS AND ABBREVIATIONS

**CARB** – California Air Resources Board

**CCM** – Central Control Module

**Computer Control System** – An electronic control system, consisting of an on-board computer and related sensors, switches and actuators, used to ensure peak performance and fuel efficiency while reducing pollutants in the vehicle's emissions.

**DIY** – Do-It-Yourself

**DLC** – Data Link Connector

**Drive Cycle** – An extended set of driving procedures that takes into consideration the various types of driving conditions encountered in real life.

**Driving Condition** – A specific environmental or operation condition under which a vehicle is operated; such as starting the vehicle when cold, driving at steady speed (cruising), accelerating, etc.

**DTC(s)** – Diagnostic Trouble Code(s)

**EGR** – Exhaust Gas Recirculation

**EPA** – Environmental Protection Agency

**EVAP** – Evaporative Emissions System

**Fault Code** – See DTCs

**Freeze Frame** – A digital representation of engine and/or emissions system conditions present when a fault code was recorded.

**FTP** – Fuel Tank Pressure

**Generic Code** – A DTC that applies to all OBD2 compliant vehicles.

**I/M Readiness** – An indication of whether or not a vehicle's emissions-related system are operating properly and are ready for Inspection and Maintenance testing.

**I/M Test / Emissions Test / Smog Check** – A functional test of a vehicle to determine if tailpipe emissions are within Federal/State/Local requirements.

**LCD** – Liquid Crystal Display

**LED** – Light Emitting Diode

**LTFT** – Long Term Fuel Trim, is a program in the vehicle's computer designed to add or subtract fuel from the vehicle to compensate for operating conditions that vary from the ideal A/F ratio (long term).

**Manufacturer Specific Code** – A DTC that applies only to OBD2 compliant vehicles made by a specific manufacturer.

**MIL** – Malfunction Indicator Lamp (also referred to as "Check Engine" light)

**OBD1** – On-Board Diagnostics Version 1 (also referred to as "OBD I")



**OBD2** – On-Board Diagnostics Version 2 (also referred to as “OBD II”)

**On-Board Computer** – The central processing unit in the vehicle’s computer control system.

**PCM** – Powertrain Control Module

**Pending Code** – A code recorded on the “first trip” for a “two-trip” code. If the fault that caused the code to be set is not detected on the second trip, the code is automatically erased.

**PID** – Parameter Identification

**STFT** – Short Term Fuel Trim, is a program in the vehicle’s computer designed to add or subtract fuel from the vehicle to compensate for operating conditions that vary from the ideal A/F ratio. The vehicle uses this program to make minor fuel adjustments (fine tune) on a short-term basis.

**Trip Drive Cycle** – Vehicle operation that provides the necessary driving condition to enable a vehicle Monitor to run and complete its diagnostic testing.

**VECI** – Vehicle Emission Control Information Decal



## LIMITED ONE YEAR WARRANTY

The Manufacturer warrants to the original purchaser that this unit is free of defects in materials and workmanship under normal use and maintenance for a period of one (1) year from the date of original purchase.

If the unit fails within the one (1) year period, it will be repaired or replaced, at the Manufacturer's option, at no charge, when returned prepaid to the Service Center with Proof of Purchase. The sales receipt may be used for this purpose. Installation labor is not covered under this warranty. All replacement parts, whether new or remanufactured, assume as their warranty period only the remaining time of this warranty.

This warranty does not apply to damage caused by improper use, accident, abuse, improper voltage, service, fire, flood, lightning, or other acts of God, or if the product was altered or repaired by anyone other than the Manufacturer's Service Center.

The Manufacturer, under no circumstances shall be liable for any consequential damages for breach of any written warranty of this unit. This warranty gives you specific legal rights, and you may also have rights, which vary from state to state. This manual is copyrighted with all rights reserved. No portion of this document may be copied or reproduced by any means without the express written permission of the Manufacturer. **THIS WARRANTY IS NOT TRANSFERABLE.** For service, send via U.P.S. (if possible) prepaid to Manufacturer. Allow 3-4 weeks for service/repair.

## SERVICE PROCEDURES

If you have any questions, require technical support or information on UPDATES and OPTIONAL ACCESSORIES, please contact your local store, distributor or the Service Center.

### **USA & Canada:**

(800) 544-4124 (6:00 AM-6:00 PM, 7 days a week PST)

**All others:** (714) 241-6802 (6:00 AM-6:00 PM, 7 days a week PST)

**FAX:** (714) 432-3979 (24 hr.)

**Web:** [www.innova.com](http://www.innova.com)



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