



## « 1A: Description and Operation »

### On Board Diagnostics II Monitors

#### Overview

The California Air Resources Board (ARB) began regulation of On Board Diagnostic (OBD) systems for vehicles sold in California beginning with the 1988 model year. The first phase, OBD I, required monitoring of the fuel metering system, Exhaust Gas Recirculation (EGR) system, and additional emission-related components. The malfunction indicator lamp (MIL) was required to light and alert the driver of the malfunction and the need for service of the emission control system. The MIL must be labeled CHECK ENGINE or SERVICE ENGINE SOON. A fault code or Diagnostic Trouble Code (DTC) is associated with the MIL identifying the specific area of the fault.

The OBD system was proposed by the California ARB to improve air quality by identifying vehicles exceeding emission standards. Passage of the federal Clean Air Act Amendments in 1990 has also prompted the Environmental Protection Agency (EPA) to develop on board diagnostic requirements. California ARB OBD II regulations will be followed until 1999 when the federal regulations will be used.

The OBD II system meets government regulations by monitoring the emission control system. When a system or component exceeds emission thresholds or a component operates outside of tolerance, a DTC will be stored and the MIL will be illuminated.

The OBD II Monitors detect system faults and initiate DTC setting and MIL activation. Fault detection strategy and MIL operation are associated with drive cycles. A DTC is stored in the powertrain control module (PCM) keep alive random access memory when a fault is first detected. In most cases the MIL is turned on after two consecutive drive cycles with the fault. The DTC is cleared after 40 engine warm-up cycles without the fault being detected once the MIL is turned off. Once a Monitor turns on the MIL, it will require three consecutive drive cycles without a fault for the MIL to turn off. The operation of each of the OBD II Monitors is discussed in detail within this section.

The On Board Diagnostic computer program in the PCM coordinates the OBD II self-monitoring system. This program controls all the monitors and interactions, DTC and MIL operation, Freeze Frame data and scan tool interface.

Freeze Frame data describes stored engine conditions such as state of the engine, state of fuel control, spark, rpm, load, and warm-up status at the point the first fault is detected. Previously stored conditions will be replaced only if a fuel or misfire fault is detected. This data is accessible with the scan tool to assist in repairing the vehicle.

OBD II Inspection Maintenance (IM) Readiness DTC P1000 indicates that not all of the OBD II monitors have been completed since the PCM's keep alive random access memory (RAM) was last cleared. In certain states, it may be necessary to operate the vehicle until DTC P1000 is erased from the PCM in order to purchase a vehicle license.

This section provides a general description of each OBD II monitor. In these descriptions, the monitor strategy, hardware, testing requirements and methods are presented together to provide an overall understanding of each monitor operation. An illustration for each monitor is also provided to aid in the description. These illustrations should be used as typical examples and are not intended to represent all the possible configurations.

Each illustration depicts the PCM as the main focus with the primary inputs and outputs for each monitor. The icons to the left of the PCM represent the inputs used by each of the monitor strategies to enable or activate the monitor. The components and subsystems to the right of the PCM represent the hardware and signals used while performing the tests and the systems being tested. The Comprehensive Component Monitor illustration has numerous components and signals involved and is shown generically. When referring to the illustrations, match the numbers to the corresponding numbers in the monitor descriptions for a better comprehension of the monitor and associated DTCs.

These monitor descriptions are intended as general information only. Refer to «Drive Cycles» in Section 2A for detailed testing instructions for each monitor.

These icons are used in the illustrations of the OBD II monitors and throughout this section.

