

Engine OBD-2 Terminology

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Absolute Throttle Position Sensor

A sensor that reads the throttle opening. Throttle position at idle will usually indicate greater than 0%. Throttle position at wide open throttle (WOT) will usually indicate less than or equal to 100%.

Air Conditioning System Refrigerant Monitor

This non-continuous monitor checks the functioning of R-12 air conditioning systems. Note: air conditioning systems that use R-134 are not required to implement this monitor.

Ambient Temperature Sensor

A sensor that measures the temperature of the air outside the engine compartment.

Bank

The group of cylinders which feed an oxygen sensor. Bank 1 contains the number 1 cylinder.

Calculated Load Value

An indication of the current airflow divided by peak airflow, where peak airflow is corrected for altitude, if available. Mass airflow and barometric pressure sensors are not required for this calculation. This definition provides a unitless number that is not engine specific, and provides the service technician with an indication of the percentage of engine capacity that is being used (with wide open throttle being 100%).

Cam Position Sensor

The position of a specific camshaft. This can be determined directly by using magnetic or optical sensors, or indirectly by computing it from the crankshaft. See also Crankshaft.

CAT or Catalytic Converter

Burns off any unburned fuel (hydrocarbons-HC) or partially burned fuel (carbon monoxide-CO) through simple chemical reactions before sending it through the rest of the exhaust. Two common catalytic converters used today are: 1) Oxidizing; and, 2) Three-way. An Oxidizing Catalytic Converter uses extra oxygen (See Secondary Air) to increase the rate of the chemical reaction. The Three-Way Catalytic uses special materials (platinum, palladium, rhodium, alumina, and cerium) to increase the rate of the chemical reaction.

Catalyst Monitor

This monitor tests the performance of the catalytic converter. Before the monitor will run, certain criteria must be met: 1) the engine must be warm; 2) the throttle must be open; 3) the fuel status must be in a closed loop; 4) the engine RPM must be within a certain range; and, 5) the MAP must be at a specified voltage. This does not guarantee that monitor's test will run (i.e., an O2 sensor DTC is stored, or a Fuel Trim to Rich/Lean is stored). The actual test is accomplished by comparing the pre-CAT oxygen sensor's switching frequency, and after the post-CAT oxygen sensor's readings. If the ratio between the oxygen sensor's switches is outside of a manufacturer specific threshold, the catalytic converter is considered faulty. Catalytic converters generally don't go bad. If the vehicle's catalytic converter is considered faulty, an effort should be made to determine if something else is at fault. Typically, if an engine misfires excessive heat or fuel contamination (i.e., blown head gasket, or ring blow-by, etc), oil or coolant can bond with the catalytic converter's materials and cause premature failure. This is a «Two-Trip» monitor. See also Catalytic Converter.

Closed Loop

When the monitored sensors feed back into the system the actual and desired values, the engine computer can use the difference as an input to reduce the error to zero. Typically when a vehicle is at operating temperature, the fuel system is operating in a closed loop.

Continuously Monitored

A monitor that runs continuously during normal operations. This monitor looks at a set of components that could make the engine run out of its emissions range. The sampling rate for OBD-II, under this definition, is no less than two samples per second.

Comprehensive Component Monitor

A continuously run monitor that performs checks on the OBD-II sensors, actuators, and switches. The current values are compared against «known-good» values to determine if the sensor, actuator, or switch is functional and is rationally operating.

Crankshaft Position Sensor

The crankshaft position sensor has many other tasks besides telling the engine computer what position the crankshaft is in. This sensor is also used to determine the speed of the engine, and it is used to determine if the engine misfired.

DLC or Data Link Connector

The OBD-II standard physical connector on the vehicle side. This 16-pin female connector mates to the scan tool.

DTC or Diagnostic Trouble Code

Diagnostic Trouble Code are how OBD-II identifies and communicates to technicians about what on-board problems exist. The first number in the DTC indicates whether the code is an SAE standard code (applies to all OBD-II systems) or is specific to the vehicle manufacturer. The remaining three numbers provide information regarding the specific vehicle system and circuit.

Drive Cycle

A series of conditions required before all non-continuous system monitors can complete their tests. Some drive cycle requirements are manufacturer specific and involve such things as certain ambient temperatures, as well as driving conditions. See Appendix C for further details. See also Trip.

Emissions

Byproducts of the combustion engine that are regulated by the Environmental Protection Agency (EPA). Modern vehicles must be able to reduce emissions to a federally regulated level to be able to operate on United States roadways. Three exhaust gases are specifically regulated: HC, CO, and NO.

ETS or Engine Temperature Sensor

Measure of the engine's internal temperature.

EVAP or Evaporative Emissions System

This system works to prevent the escape of fuel vapors into the atmosphere. The system works by drawing fumes from the fuel tank into the engine for combustion. Several components can make up this system, including charcoal canisters, a purge solenoid, fuel cap, and connecting tubes.

Evaporative System Monitor

This non-continuous monitor checks the EVAP system. The EVAP monitor checks the proper fuel vapor flow to the engine and pressurizes the system to check for leaks. If you have an EVAP fault, or the system has failed its test, the gas cap should be the first place you check. This is a «Two-Trip» monitor. See also EVAP.

EGR or Exhaust Gas Recirculation Valve

The EGR valve recirculates small amounts of exhaust gas back into the intake manifold, where it is mixed with the incoming air/fuel mixture. This process reduces combustion temperatures by up to 500°F. By reducing the temperature in the combustion chamber, NOx emissions can be reduced.

Exhaust Gas Recirculation (EGR) Valve Monitor

This non-continuous monitor checks the EGR valve for low and high flow rates among other parameters. The components of the EGR Valve Monitor are EGR Valve, EGR solenoid, EGR backpressure transducer, and connecting hoses. This is a «Two-Trip» monitor. See also EGR.

Freeze Frame

A snapshot of the vehicle's sensor data when the engine computer determined that a fault has occurred. Freeze frame gives the data as to what the engine was doing when the DTC responsible for the freeze frame was triggered. This extra insight can help determine what conditions contributed in creating the fault.

Fuel System Monitor

A continuously run monitor that checks the short- and long-term fuel trim. Should either fuel trim stay in or reach their limits for too long, a stored DTC will record and the MIL will illuminate. The severity of the fault determines whether this is a «One-Trip» or «Two-Trip» monitor.

Fuel System Status

This system status indicates whether the fuel system is open or closed. Typically, when the vehicle starts, the fuel system is open. When the oxygen sensors warm up and start reporting stably, the fuel system is closed.

Fuel Trim

Feedback adjustments to the base fuel schedule. Short-term fuel trim refers to dynamic or instantaneous adjustments. Long-term fuel trim refers to much more gradual adjustments to the fuel calibration schedule than short-term adjustments. Long-term adjustments compensate for vehicle differences and gradual changes that occur over time.

General Circuit Malfunction

Fixed value or no response from the system.

Heated Catalyst Monitor

A non-continuous monitor that checks the efficiency of the way the catalytic converter heats up. If this monitor does not complete, check the oxygen sensor heaters, air injection system, and the catalytic converter. This is a «Two-Trip» monitor.

HO2S or Heated Oxygen Sensor

An oxygen sensor that is electrically heated to decrease the time it takes for the oxygen sensor reach operating temperature. See Oxygen Sensor.

High Input

Circuit voltage, frequency, or other signal measured at the control module input terminal or pin, that is at or near full scale for the particular signal being measured. It is measured with the external circuit, component, or system connected.

IAC or Idle Air Control Motor

This is a motor, or sometimes a valve, that controls how the engine idles.

IAT or Intake Air Temperature

Ambient temperature taken from as far away from the engine as possible to get an accurate reading. It is used to help determine the fuel mixture and manifold pressure.

Intake Manifold

Is the final conduit for getting the air, and sometimes the fuel, to the intake valve. The design of the intake manifold has a great deal to do with the creation and control of horsepower and torque.

Knock Sensor

Measures how each cylinder is firing. If one cylinder is firing too soon or too late, or even if it fires twice, a knock or ping is produced. The sensor sends a signal to the computer, which will either adjust the timing on the ignition or the camshaft. "Knocking" is not common, but the special conditions under which it will most commonly occur are with high manifold pressure, bad fuel, bad spark advance, or improper engine cooling.

KOEO

Key On Engine Off, a specific state of the vehicle where the ignition key is turned to the "ON" position but the engine is not started.

KOER

Key On Engine Running, a state of the vehicle where the engine has been started and allowed to run. OBD-II system download and a visual check of the MIL occurs during the KOER state.

Low Input

Circuit voltage, frequency, or other signal measured at the control module input terminal or pin that is at or near zero. It is measured with the external circuit, component, or system connected.

LTFT or Long Term Fuel Trim

The engine computer is always learning how your vehicle is being driven. If you drive slowly, it stores that information; and, if you drive fast, it also stores that. In addition, the engine computer will compensate or adapt for a part of the engine that has become defective. This is called Adaptation or Fuel Trim. LTFT values represent the average of Short Term Fuel Trim fuel corrections.

MAF or Mass Air Flow Sensor

Normally mounted as part of the air cleaner assembly, it measures air flow into the intake manifold. The MAF sensor generates a continuous signal that varies nearly linearly with true mass air flow.

MAP or Manifold Absolute Pressure Sensor

Senses the difference between the atmospheric pressure and the pressure (or vacuum) inside the intake manifold. It is also used to calculate the engine load.

MIL or Malfunction Indicator Light

Check Engine or Service Engine Soon indicator light is used to alert the vehicle operator that a fault has occurred. The MIL is only used to indicate problems in the emissions control system. It is not intended to be used as a maintenance reminder, e.g., change oil. When the vehicle's engine computer senses that a part or component is operating outside of the normal range or not reporting at all, a fault is recorded in the stored DTC area of memory. When a severe misfire occurs that could damage the catalytic converter, the MIL is will flash on and off once per second. A flashing MIL is intended to discourage vehicle operation until repairs have been performed.

Misfire

A miss in the ignition firing process of cylinder combustion due to the failure of the fuel/air mixture to ignite.

Misfire Monitor

A continuously run monitor that checks for a miss in the ignition firing process of cylinder combustion. If the misfire is small, a Pending DTC will be recorded. If the misfire is large enough to cause damage or allow emissions to exceed 1.5 times the EPA standard, a stored DTC is recorded immediately and the MIL is illuminated. If the misfire is severe and capable of causing damage to the catalytic converter, the MIL will flash once per second as long as the misfire is detected and then illuminate normally. This is a «One-Trip» monitor. See also Misfire.

Non-Continuous Monitor

A monitor that runs a specific test at the manufacturer's designated interval. See also One- or Two-Trip Monitor.

One-Trip Monitor

A non-continuous monitor that requires only a single fault to be detected before the engine computer illuminates the MIL and places a DTC in the stored DTC area of the engine computer's memory. See also Two-Trip Monitor or Trip.

Open Loop

When some or all of the components of the engine computer are not in their normal operational condition, the engine computer will use pre-determined, or default, values to regulate the fuel mixture and spark advance. Typically, this happens when a vehicle starts as certain components are not yet up to operating temperature (i.e., oxygen sensors).

O2 or Oxygen Sensor

The oxygen sensor is the heart and soul of the fuel system. It is sometimes referred to as the Exhaust Gas Oxygen or Lambda sensor. Typically oxygen sensors are positioned before and after the catalytic converter in the exhaust pipe. The oxygen sensors sample the exhaust and report back a value in terms of voltage. The engine computer looks at the voltage to determine if the fuel/air mixture is lean or rich, and adjusts the amount of fuel entering the engine accordingly. Because of the time delay for the engine computer to correct the fuel mixture, and the time it takes for the oxygen sensor to report, the oxygen sensor switches from lean to rich frequently. Oxygen sensors located before the catalytic converter will exhibit the most switching (crosscounts). The oxygen sensors located after the catalytic converter should exhibit flat or relatively low signal amplitude. The OBD-II standard allows oxygen sensors that do not influence the lean to rich fuel trim to not report their data. A good pre-catalytic oxygen sensor should switch between the values of 1 volt for a rich mixture, and .1 volt for a lean mixture.

Oxygen Sensor Heater Monitor

This non-continuous monitor evaluates the working state of all oxygen sensor heaters in the vehicle. A vehicle will operate in an open loop until the oxygen sensors are up to operating temperature. It will use the default parameters stored in the engine computer to regulate fuel trim. When an oxygen sensor heats up to around 600° F the engine computer switches to a closed loop and uses the values from the oxygen sensor to influence the fuel trim. To allow for a quick transition between the open and closed loop state, oxygen sensors are heated. This is a «Two-Trip» monitor. See also Oxygen Sensor.

Oxygen Sensor Monitor

This monitor evaluates the working state of all oxygen sensors in the vehicle. It monitors the minimum and maximum voltage levels, switching frequency (crosscounts), the response rate of each oxygen sensor, etc. The testing threshold and ranges can be exported to the ScanTool and viewed in the Oxygen Sensor Test Results area of the O2 Sensor window. This is a «Two-Trip» monitor. See also Oxygen Sensor.

PCM or Powertrain Control Module

The onboard computer controlling the engine systems. Some vehicles may have electronic transmission functions as part of the PCM responsibilities.

PID or Parameter Identification

An OBD-II standard term for a sensor and its respective functionality.

Secondary Air System

This system is used to assist the catalytic converter in burning off emissions related gases. When a cold engine is started, several components necessary for emissions regulation will not be up to operating temperature. The engine

computer operates in an open loop. In this case, the catalytic converter has oxygen forced into the exhaust stream by way of a of the secondary air system to assist in burning off all of the unburned or partially burned fuel. The secondary benefit of the oxygen being injected into the catalytic converter is that the catalytic converter heats up quicker.

Secondary Air System Monitor

This non-continuous monitor checks the air pump and all its components.

This is a «Two-Trip» monitor. See also Secondary Air System.

STFT or Short Term Fuel Trim

Like the LTFT, STFT adapts the fuel inputs to keep the engine performing to the current style of driving.

TPS or Throttle Body

Monitors the throttle value position (which determines how much air goes into the engine) so that the engine computer can respond quickly to changes, increasing or decreasing the fuel rate as necessary.

Trip

A specific series of steps required in order to have a single monitor run its test and complete. If your vehicle manufacturer details the specific requirements to initiate and complete a single monitor test, then a repair technician can prevent a lengthy drive cycle. Sometimes a monitor is referred to as a «One-Trip» or «Two-Trip». A «One-Trip» monitor means that if a fault is detected the engine computer will illuminate the MIL and a DTC will be placed as a stored DTC. A «Two-Trip» monitor means that if a fault is detected on the first trip, the engine computer will temporarily save this fault in its memory as a pending DTC (the MIL will be off). If the fault is detected again on a second consecutive trip, the engine computer will illuminate the MIL and a DTC will be placed as a stored DTC. The Fuel System Monitor and Misfire Monitor are the only «One-Trip» monitors. See also Drive Cycle.

Two-Trip Monitor

A non-continuous monitor that requires atleast two faults in two seperate trips to be detected before the engine computer illuminates the MIL and places a DTC in the stored DTC area of the engine computer's memory. See also One-Trip Monitor or Trip.

WOT or Wide-Open Throttle

Throttle depressed to its fully extended position.