

Quick guide to engine sensors and terminology

Absolute Throttle Position sensor

A sensor that reads how wide the throttle is currently open. This will range from 0 to 100% - the reading being closer to 0 at idle, and closer to 100% at full throttle.

Ambient Air Temperature sensor

A temperature sensor measuring the air temperature outside the vehicle.

Calculated Load

A calculation of the load on the engine itself. The value indicates the percentage of engine capacity actually being used.

Camshaft Position Sensor

A sensor measuring the position of the camshaft. The camshaft causes the valves to open and close on the cylinders.

Check Engine Light (CEL)

See Malfunction Indicator Lamp (MIL)

Exhaust Gas Recirculation (EGR)

A small amount of exhaust gas is recirculated into the intake system. This is mixed with the incoming air/fuel mixture. This process can significantly reduce combustion temperatures, which in turn can reduce the NOx emissions from the engine.

Fuel loops

The engine is either using information from the Oxygen Sensors to control the fuel mixture (**closed loop**), or using preset values from built-in tables within its memory (**open loop**).

Open loop is used when the Oxygen Sensors (and engine) have not reached their operating temperature, or a component within the fuel control system is not operating correctly. The engine therefore uses internally stored values.

Closed loop is used when the Oxygen Sensors (and engine) are at operating temperature. The feedback from the exhaust system is used to control the fuel/air mixture.

Fuel trims (short-term and long-term)

These are temporary (short-term) and more-permanent (long-term) adjustments that the engine is making to the fuel mixture. These adjustments are with reference to the original base fuel mixtures programmed for the engine.

The long-term adjustments are those made for the specific engine characteristics and are gradual adjustments that occur over time. Short-term are the adjustments made instantly while the engine is running.

The adjustments made will compensate for the differences in components fitted to a particular engine, and for general wear on the engine.

Intake air temperature (IAT)

The air temperature of the air coming into the engine through the air intake system.

Knock Sensor

A sensor measuring discrepancies in the firing of the engine cylinders. The sensor detects sensors firing incorrectly (e.g. too early or too late). The engine computer uses this information to adjust the engine timing accordingly.

Mass Air Flow sensor (MAF)

A sensor measuring the volume of air flowing into the air intake system on the engine.

Manifold Absolute Pressure sensor (MAP)

A sensor measuring the difference in pressure between surrounding atmospheric pressure and that inside the air intake system. This information is used in the calculation of engine load.

Malfunction Indicator Light (MIL)

The dashboard warning light used to alert the vehicle driver that an engine or emissions fault has occurred. The MIL also indicates that a fault code is stored in memory.

If the MIL is on permanently, the vehicle has detected that a component is not operating correctly, e.g. a sensor value out of range.

If the MIL is flashing (once per second), the vehicle has detected a more-serious fault. This type of fault could be damaging the catalytic converter on the car. Vehicles should not be driven if the MIL is flashing.

Misfire

Failure of the air/fuel mixture to ignite.

Oxygen Sensor

Also known as Exhaust Gas Oxygen sensor (EGO) or Lambda sensor. These sensors are very important in engine control. They are located in the exhaust pipe – normally before and after the catalytic converter.

The sensors measure the exhaust gases, providing a voltage reading to the engine. The engine can then adjust the fuel/air mixture to correct the mixture if it is too lean or too rich.

The sensors located before the catalytic converter should show a wave pattern as the mixture moves between lean and rich (normally between 0.1V and 1V).

The sensors located after the catalytic converter should show a relatively flat signal.

The sensors are generally numbered as follows: 1 = before the catalytic converter, 2 = after the catalytic converter

Throttle Position Sensor (TPS)

A sensor measuring the position of the throttle itself. The throttle determines the amount of air coming into the engine – the engine then adjusts the fuel accordingly.

System monitors

The car has a number of built-in tests that are run to confirm the operation of key components. These tests are either running continuously (continuous monitors) or are run over a number of drive cycles (non-continuous monitors).

Continuous Monitors	Non-continuous monitors
Misfire monitor Monitor checking for misses in the engine firing process.	Catalyst monitor Monitor checking the operation of the catalytic converter. This is based on the differences in readings between the pre-cat and post-cat oxygen sensors.
Fuel System monitor Monitor checking long and short-term fuel trims to ensure they do not reach/exceed their limits for too long.	Heated Catalyst monitor Monitor checking the efficiency of the way the catalytic converter heats up.
Components monitor Monitor checking that the main engine components (sensors and actuators) are operating within pre-set limits.	Evaporative System monitor Monitor checking the fuel vapour flow to the engine, and pressurises the system to test for leaks.
	Secondary Air System monitor Monitor checking the air pump system used to assist the catalytic converter in burning off additional emissions.
	A/C Refrigerant monitor Monitor checking the functioning of the air conditioning system components.
	Oxygen Sensor monitor Monitor checking the operation of the oxygen sensors – including operating voltages, switching frequency, response rates etc.
	Oxygen Sensor Heater monitor Monitor checking the operation of the heaters within the oxygen sensors.
	EGR System monitor Monitor checking the operation of the components of the Exhaust Gas Recirculation (EGR) system.