

## Frequently Asked Questions

### Question

MAF Sensor

### Answer

MAF (Mass Airflow Sensor).

Mass Air Flow Sensors provide a voltage signal, corresponding to the air mass entering the engine.

The electrical signal is transmitted to the engine control module and is used to determine the required fueling for petrol engines and for exhaust gas recirculation (EGR) control on diesel engines.

It is typically mounted inside the clean air duct (usually at the exit of the air cleaner).

### What it does

It measures electronically the mass of air entering the engine and signals the ECU accordingly. The ECU uses this information to calculate the engine's ignition/fuel needs.

### How it works:

ECU supplies a voltage to the meter which heats up either a small wire (Platinum filament) or element (Platinum film resistor) to a certain temperature. The wire or element sits in the incoming air stream and is consequently cooled. The ECU needs to maintain the temperature of the wire by applying a higher or lower voltage/current. The greater the cooling effect of the incoming air, the higher the voltage that is required to heat it.

This varying voltage forms the basis of the signal back to the ECU which is used to calculate the engine's ignition/fuel system requirements. Some meters are equipped with an additional intake air temperature sensor built in. The unit is fitted between the air filter assembly and the throttle housing.

### Reasons for failure;

One of the original weaknesses of this type of meter was foreign bodies on the sensing element. This was countered by the manufacturers with the addition of a circuit within the ECU that applies a high voltage to the meter, for a few seconds, after the ignition is turned off. This heats the element to red hot which burns off any foreign bodies. This cured the problem but brought another with it. Any wire when repeatedly heated and cooled will anodise, consequently the meter's accuracy diminishes over time.

Although it will still function it will be out of tolerance and can cause high fuel consumption, MOT emissions failure and poor performance. The self diagnose function of the ECU may or may not detect the fault as the

meter will still function. Other failures are caused by connector or wiring failure and electrical interference.

## **Testing:**

There are two methods of testing air mass meters;

Firstly, using a conventional fault code reader and relying on the ECUs stored fault codes. This is not a very reliable method as it can pick up air mass meter failures but will not highlight a meter that is simply out of tolerance. It can be a quick guide to point you in right direction .

Secondly, specific testing with an oscilloscope, this is very accurate, the meter can be tested dynamically but it can still be difficult to highlight slight out of tolerance failures. Testing this way will show any interference or connection problems. Check the rise and fall of the output curve in direct response to revving the engine. You can also test the meter under load with the help of a rolling road or an on-road test with the oscilloscope in the car.

## **Note:**

It is always useful to keep a library of scope patterns for comparison, test some good ones and keep a print out for reference.

## **Caution:**

Replacing just the element out of an air mass meter assembly is not always a good policy. There are many varieties of meter (differences include connector shape, output signal, physical dimensions, etc and there are very few replacement elements so the possibility of error is high. The unit may fit but is the output accurate?

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## **Details**

*Info 07 October 2009 by C6Dave*