MAP Sensor - Analogue

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How to connect the oscilloscope when testing:- an analogue MAP sensor

Plug a **BNC test lead** into **channel A** on the **PicoScope**, place a **large black crocodile clip** on the black (negative) plug and an **acupuncture or multitester probe** on the coloured (positive) plug.

Place the **black crocodile clip** onto the battery negative terminal and probe the MAP sensor's output connection with the **acupuncture or multitester probe** as illustrated in *Figure 24.1*. If you cannot reach the terminal or plug with a probe, then you may be able to use a breakout box or lead if you have one available

Figure 24.1

The three electrical connections consist of a supply voltage, an earth and a variable voltage output. The waveform on this page is monitoring the variable output voltage.

When testing the MAP sensor, it may take several attempts to 'centralise' the waveform when capturing the output.

With the example waveform displayed on the screen you can now hit the space bar to start looking at live readings. Snap the accelerator quickly from idle to full throttle and observe the waveform.

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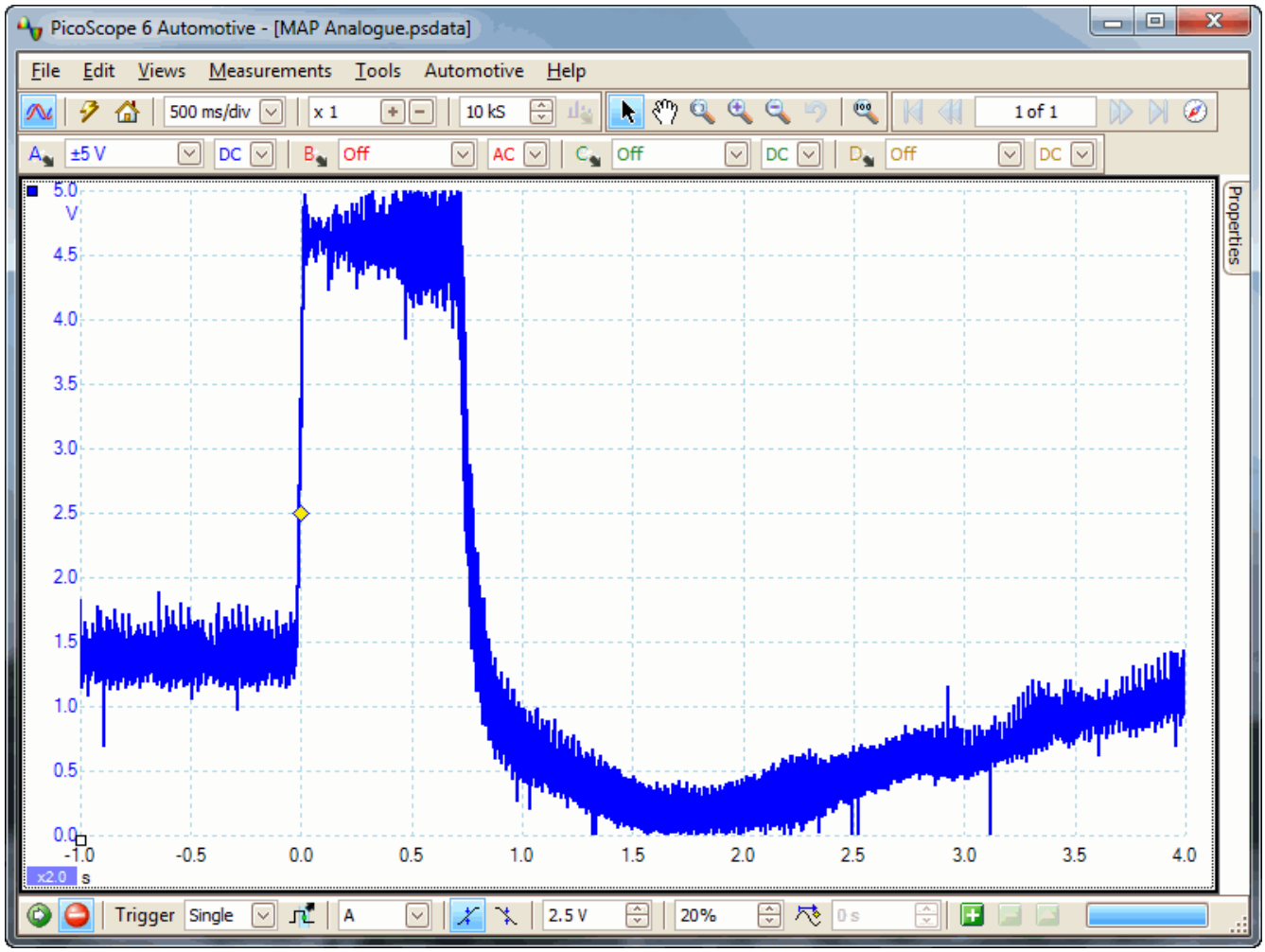
Example analogue MAP sensor waveform



MAP sensor (analogue) waveform notes

The Manifold Absolute Pressure (MAP) sensor measures the vacuum in the inlet manifold.

This output, when sent back to the engine management system, determines either the fuelling or the amount of vacuum (or light load) advance.

The sensor is a three-wire device with:-

- A 5 volt supply voltage
- An earth connection
- A varying analogue output
- A vacuum connection to the inlet manifold

This component can be either an integral part of the electronic control module or an individual component. The output from the external sensor shows voltage that rises and falls depending upon the vacuum.

When the engine is stationary or the throttle is wide open, zero vacuum is present and the sensor output is about 5 volts. As a vacuum is applied, the voltage drops. The example waveform shows that, at idle, the output is about 1 volt. As the throttle is opened, the vacuum in the manifold drops and the output voltage rises. In this case the voltage rises to almost 5 volts.

The 'hash' on the waveform is due to the vacuum change from the induction pulses as the engine is running.

Voltages are similar between different manufacturers and a lower-than-anticipated voltage will produce a loss of power due to fuel starvation. Conversely a higher voltage will cause overfuelling and could eventually result in

the failure of the catalytic converter if allowed to persist. This high voltage could result from any number of problems but may be as simple as a split vacuum hose or incorrectly adjusted tappet clearances. The voltage from an integral MAP sensor can only be evaluated by a Fault Code Reader (FCR) due to the lack of access to the output voltage.

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Technical information - MAP sensors

The Manifold Absolute Pressure (MAP) measures the pressure in the inlet manifold, and is sent back into the engine management system to determine either the fuelling or the amount of vacuum (light load) ignition timing advance. The MAP sensor in most cases measures a negative pressure, but can also be used to measure a positive boost pressure on a vehicle equipped with a turbo charger.

The sensor is a 3-wire device that has:-

- A 5 volt supply
- An earth connection
- A varying output that can be either analogue or digital
- A vacuum connection to the inlet manifold

This component can be either an integral part of the Electronic Control Module (ECM), or an individual component.

The output from the analogue version rises and falls depending upon the vacuum. When the engine is stationary or the throttle is wide open, zero vacuum is present and the output is about 5 volts. As a vacuum is applied this voltage will drop.

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