

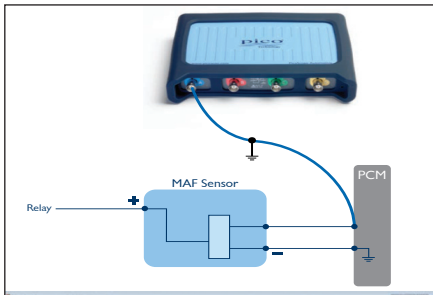
Fundamental scope tests part 3

An oscilloscope is a versatile tool that can be used in a variety of ways. PicoScope has details on some of these diagnostic tests, where a scope can be used to help you in everyday tasks.

Mass Air Flow Sensor (MAF) Test

Used to check the operation of the MAF Sensor. Guided test AT008 and AT095.

Locate sensors with the help of your vehicle's technical data. We recommend you

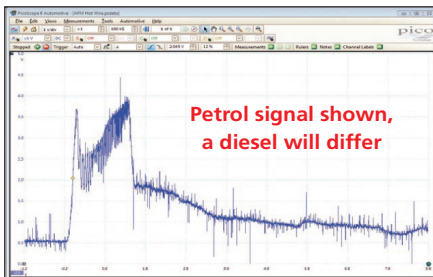


use either back-pinning probes or breakout leads to make the connection. Use the technical data to identify the signal wire. You can choose to check multiple terminals to obtain a signal.

Start PicoScope, and snap the throttle quickly from idle to full throttle to capture the waveform.

We suggest a timebase of 1 s/div to capture 10 seconds of data in one frame.

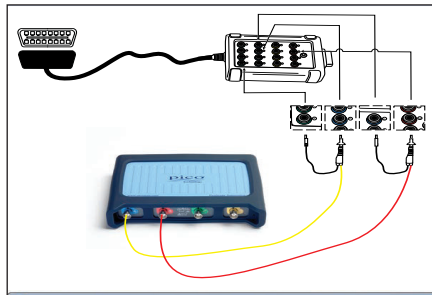
The voltage output from the Air Flow



Meter (AFM) should be proportional to airflow. The waveform should show approximately 0.5 volt when the engine is at idle, but this voltage will rise as the engine is accelerated, to around 4.0 to 4.5 volts. This voltage will, however, depend on how hard the engine is accelerated, and a lower voltage is not necessarily a fault within the MAF Sensor. On deceleration, the voltage will initially fall as the throttle is closed, reducing the airflow as the engine returns to idle speed. Further details are covered in our Guided Tests.

Testing CANBus Network (High & Low)

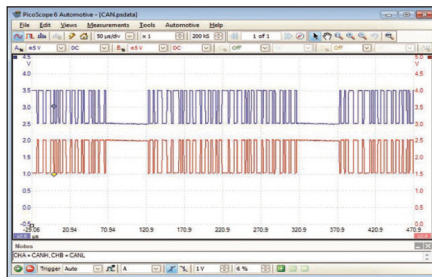
We recommend using our CAN Test Breakout box to make a secure connection to the vehicle's communication signals. When it is connected to the vehicle's EOB socket, the



LEDs on the breakout box will light up to indicate that communication is established. Connect the YELLOW lead to Channel A of the scope and to pin 6, then the black pin to pin 4 (Chassis GND).

Connect the RED lead to Channel B of the scope and to pin 14.

Note: Some vehicles can have multiple CAN connections on the 16-pin connector, and some vehicles may use pin 5 (Signal GND) instead of pin 4.



Start PicoScope and turn on the vehicle ignition. You should now see a waveform. The CAN signal may not be present at the OBD socket until a scan tool is connected.

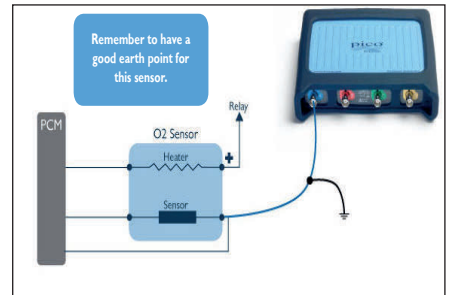
The waveform should reveal to you that data is being exchanged continuously along the CAN bus. The signals should be mirror images of each other and there should always be two signals present.

It is also possible, of course, to check that the peak voltages are correct. The workshop

manual should be referred to for precise waveform values.

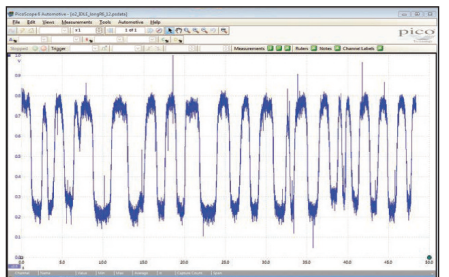
Lambda (Oxygen) Sensor Test

Used to check the operation of the Lambda (O₂) Sensor. Guided test AT022 and AT023.



Locate the sensors with the help of your vehicle's technical data. We recommend you use either back-pinning probes or breakout leads to make the connection. Use the technical data to identify the output signal wire from the lambda sensor harness connector.

Note: The engine is required to be at normal operating temperature in order to produce a valid signal. Start PicoScope



when you are ready to capture the signal.

Depending on the type of lambda sensor, the signal will be seen to cycle high and low in a consistent manner with curved edges. These sensors generally switch high and low once per second. We have included Guided Tests for measuring different types of lambda sensors, so please read these for further information.

