

Testing ABS Sensors

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Difficulty Rating: 2/5 - Easy checks to do.



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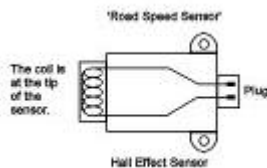
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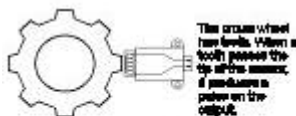
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Revision 1

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A basic diagram of a Hall Effect sensor.



The output signal is a square wave pulse on or off.

How a speed sensor produces an output to the ABS computer.

Most, if not all modern cars, now days come with ABS (Anti -lock Braking System) as standard. A small computer monitors the rotation of each road wheel (depending on ABS system) and if the brakes are applied and a wheel stops moving, the computer knows that a wheel has locked up. In a instant the computer regulates the brakes to that wheel and eases off a bit until it sees it rotating again. The process is very quick and all that you know about it is that the brake pedal vibrates and you don't lock up. However the ABS system isn't 100% fail safe.

As a MOT requirement, the ABS warning light on the dash should illuminate at power up and extinguish after a few seconds. This means the ABS computer is doing a quick self test on all the sensors. If the ABS light stays on at power up or the ABS warning light comes on during your journey, there is a problem.

But where?

Fortunately on most ABS systems you can read the fault codes it stores either by a TECH1 reader or by the free DIY method. Most sensors of the ABS system are 'hall effect' sensors. These are little robust sensors that have no moving parts or maintenance required. Hence they are usually very reliable. A hall effect sensor is bolted to every road wheel, to monitor the movement of each wheel. These are commonly know as 'road speed sensors'



ABS road speed sensor sitting beside the crown wheel.

What do I need to test these 'road speed sensors' ?

To test these sensors, you need a DMM (Digital Multi -Meter) and some metal. A oscilloscope is an advantage as you can 'see' the sensors return signal to the ABS system.

How do these 'road speed sensors' work ?

A hall effect sensor 'sees' iron. It works on magnetism. When a metal containing iron passes by the sensor, it cuts 'flux' on the coil of the hall effect sensor. In this sensor is a coil of wire, with a current flowing through it. When you 'cut' the flux, it varies the current flow. The ABS computer is monitoring this change and can tell when metal is passing its path. On the wheel hub is a crown wheel, with lots of gaps in a metal ring.



Simply disconnect the ABS road speed sensor ready for testing.

The road speed sensor is bolted near to this crown wheel and when one of the teeth comes spinning past, it cuts the flux on the hall effect sensor winding. This is how the ABS computer knows if the wheel is rotating or not. If the wheel stops, the teeth stop passing by and hence stops sending a signal back to the computer. The ABS system now knows that the wheel has stopped rotating.

How do I test these 'road speed sensors' ?

There are several methods on testing the sensor. Most will tell you



Measure the resistance of the road speed sensor.

straight away if there is a problem with the sensor. But first you must make the basic checks first before pointing blame at a sensor: -

- Check any fuses for the ABS system.
- Check that the ABS warning bulb is NOT blown on the dash. If it is, the system is inhibited as a fail safe procedure.
- Check that the cable form leading to the sensors are in good condition with no cuts, burns or splits.

After these simple checks, the following test methods can be applied.



Typical ABS computer.

Parts & Costs:



Digital Multi-Meter	£20-£200	<ul style="list-style-type: none"> • DMM vary in cost significantly, depending on quality and features. For testing hall effect sensors, only Volts and Ohms are required. • A oscilloscope is a luxury and they can cost hundreds, if not thousands of pounds. A 2 channel scope is adequate.
Bit of metal	£FREE	
Oscilloscope	£200+	

Method 1- Check Resistance:



Jack up the car and take off the road wheel. The ABS road speed sensor cable should be visible within the wheel arch. Locate the connector (usually 2-pin) and disconnect it. Behind the wheel hub should be the road speed sensor, which is bolted on and near the crown wheel.

With your DMM set to ohms, connect the probes to the connector, road speed sensor side (so it measures the sensor and not the ABS system). Take note of the value with the road wheel stationary. Now rotate the wheel hub and you should observe the resistance changing. It may not be a smooth transition, but it should change.



If the resistance value does change, then the sensor is OK. If it doesn't, then you may be looking at a new sensor, or there is a broken wire in the small amount of cable form leading to the sensor.

Method 2 - Check Voltage:



Jack up the car and take off the road wheel. The ABS road speed sensor cable should be visible within the wheel arch. Locate the connector (usually 2-pin) and disconnect it. Behind the wheel hub should be the road speed sensor, which is bolted on and near the crown wheel.

The method here is to monitor the voltage going to the sensor and its



return signal. To do this you need to monitor the voltage with the connector connected, flying leads are required. Fit thin flying leads onto the end of the DMM probes. Fit the flying leads onto the connector pins so that when the connector is plugged back together, they still make a connection (but don't short each other out).



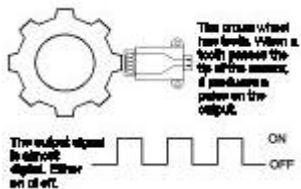
With you DMM set to voltage (10v max), turn on the ignition (to supply power to the ABS system and sensors). You should see a voltage reading (you are reading the voltage difference between the two pins). The norm voltage is +5v or +12v (depending on ABS model). Rotate wheel hub slowly and you should see the voltage difference change. This means the sensor is working and its sending a signal back to the ABS computer.

If the voltage doesn't change, then you may be looking at a new sensor, or there is a broken wire in the small amount of cable form leading to the sensor. If there is no voltage reading to begin with, then the ABS system isn't supplying a voltage source to the sensor. Locate the ABS computer in the car and check the mating connector, ensure it is securely on.

Method 3 - Monitor Voltage Signal:



Jack up the car and take off the road wheel. The ABS road speed sensor cable should be visible within the wheel arch. Locate the connector (usually 2-pin) and disconnect it. Behind the wheel hub should be the road speed sensor, which is bolted on and near the crown wheel.



The method here is to monitor the return signal supplied by the sensor with a oscilloscope. The scope allows you to 'see' the signal, and it should look like a square wave. To do this you need to monitor the voltage with the connector connected, flying leads are required. Fit thin flying leads onto the end of the scope probe. Fit the flying lead onto the signal connector pin so that when the connector is plugged back together, they still make a connection (but don't short each other out). Connect the ground part of the scope lead to a earth point on the car, anything metal should suffice.

With the scope set up, turn on the ignition (to supply power to the ABS system and sensors). You should see a constant voltage reading (you are reading the voltage coming from the sensor). Rotate the wheel hub quite quickly and you should see the voltage alternating up and down. This means the sensor is working and its sending a signal back to the ABS computer.

If the voltage doesn't change, then you may be looking at a new sensor, or there is a broken wire in the small amount of cable form leading to the sensor. If there is no voltage reading to begin with, then the ABS system isn't supplying a voltage source to the sensor. Locate the ABS computer in the car and check the mating connector, ensure it is securely on.

FAQ:



How much does a new ABS road speed sensor cost?

Depends on the model of the car, but don't expect much change from £50. Most sensors are only available from a Vauxhall dealer. There aren't many pattern part items available.

How easy is it to change one?

According to the Haynes book, the sensor should be bolted to the back of the hub. Simply by removing the bolts, the road speed sensor should come off the hub. Then by unplugging the connector, fitting a new one is the reverse or removal. However, due to personal experiences, the bolts come out easily enough but the road speed sensor appears to be (or rather feels like) its welded to the hub :) I've never managed to remove one with out totally destroying the old speed sensor.

Can I fit a second hand one from another car?

Yes you can so long as its the same type (i.e. for the same model as your car). As previously mentioned, hall effect sensors are very reliable items. If you do get a second hand one, you can follow the simple checks above to see if the sensor is working or not. Just this time wave a metal bolt or screw driver blade past the head of the sensor and see if the sensor detected it or not. They either work, or they don't.



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