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**RX-0706**

## MRP DATASHEET: ABS WHEEL SPEED SENSOR

### What it does and how it works

The sensor measures road-wheel speed and direction. This information is used for anti-lock brake (ABS), traction control (TCS) or vehicle stability (ASP) system ECUs to prevent the vehicle's wheels from locking or spinning. This increases the driver's control of the vehicle. **There are two basic types of wheel speed sensor, passive and active.**



### Passive sensors

These are similar in operation to Inductive cam/crank sensors; they consist of a soft iron, permanent magnetic pin around which is wound a fine copper wire coil. The unit fits in close proximity to a rotating trigger wheel. The trigger wheel is mounted onto a rotating assembly, such as the disc, drum or hub. When the trigger-wheel rotates past the pick-up assembly the alternating teeth generate a small inductive voltage in the copper windings. This voltage signal is used by the ECU as wheel speed information. Passive sensors generally only have two wires, one signal and one earth/shield.

### Active sensors

The operation of the active sensor can be likened to the Hall type sensor found in distributors etc. The pick-up assembly has an inbuilt amplifier and thus relies on a supply voltage, normally 5v but it can be 12v.

The rotating element consists of a multi-pole (north-south, north-south) magnetic ring, which can be located onto a rotating assembly as with the passive sensor. There is an increasing trend to incorporate it into the wheel bearing seal and to use magnetic powder instead of fixed magnets.

The rotating, alternating, magnetic poles generate a magnetic flux within the sensor element, which then amplifies and regulates the signal for the ECU to use as wheel speed information. The output of an active sensor is digital with a square wave signal, it is capable of sending wheel speed information down to 0mph, whereas the passive sensor's accuracy is usually dubious below, 25mph. Active sensors generally have three wires; one power supply, one signal and one earth/shield.

### Caution:

**Active sensor wheel bearings can be installed backwards rendering the sensor inoperative. Pay particular attention to the instructions enclosed with this type of sensor.**

**Reasons for failure:**

The principle cause of failure is the same as most other automotive sensors, the environment in which it operates. Wheel speed sensors operate in harsh conditions; they have to cope with extreme vibration, water, temperature fluctuations and dirt. The connecting wires have to cope with the demands brought by suspension and steering movements. All in all it's not good news.

**Note:**

Some manufacturers use active sensors that have small aeriels built in, to transmit information to the ECU via radio waves.

**Testing:**

The principle tool in diagnosing wheel speed sensor failures is the on-board diagnostic power of the ECU. Failure of the sensor generally lights "MIL" lamp on the dashboard. All that we have to do then is to pinpoint the one that failed.

A visual check should be the first step. Look for damaged wires, sensors or a build up of road dirt etc. The next step is to test the sensors individually. Use an oscilloscope, connected to the sensor, and spin the wheel. Check the output pattern for interference and the correct "shape" (passive = sine wave, active = square wave). Passive sensors can be disconnected and tested as "stand alone" units. Active sensors, due to their required voltage input, have to be connected with the ignition on when testing.

**Caution:**

Ensure that the correct type of sensor is fitted.