Magnetic-Resistive Sensor Wiring

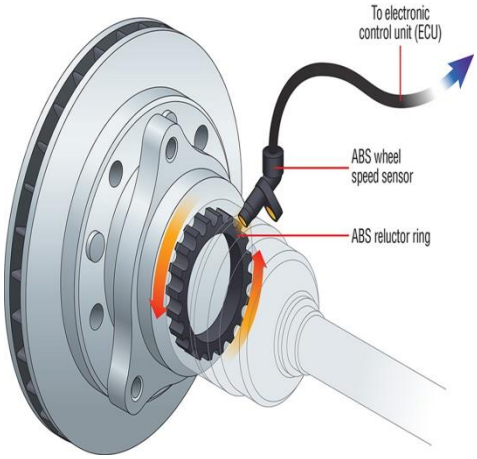
WIRING

Rev 1.0

EMtron Australia

Magneto-Resistive Sensors

Magneto-resistive (MR) sensors are commonly used in driver assistance systems such as ABS, TCS and ESP to measure wheel speed, the frequency being proportional to the rotational speed of the wheel. These sensors detect a magnetic field and because there is no electrical contact the sensor can operate across a relatively large air gap. The amplitude of the output signal does not depend on speed.



These are active sensors which means they become "active" when a power supply is connected to it and a digital output waveform is then generated. However, the signal does not switch to ground like a conventional Hall sensor. Instead the signal swings between a high and low voltage, with the swing voltage dependant on the current passing through the sensor, i.e. the value of the pullup or pulldown current limiting resistor. Typical currents required to make to the sensor operate are 4 – 8mA.

Two important checks must be completed.

1) The polarity of the sensor must be correct.
2) The pullup/pulldown resistor might need adjustment to ensure it the digital signal swings within the correct levels.

Sensor Polarity

The sensor polarity can be determined by measuring the diode voltage drop across the sensor, (sensor resistance cannot be used) using a Multimeter. The direction with the highest voltage drop is the correct polarity. See Table 1.0 as an example. Pin 1 should be connected to the pullup resistor and pin 2 should be connected the ground.

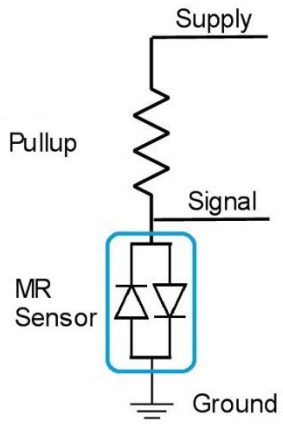
Diode Voltage Drop	Pin 1	Pin 2	Notes	
1.781 V	Positive	Negative	Correct Polarity	✓
0.637 V	Negative	Positive	Incorrect Polarity	✗

Table 1.0

Device Connection

A Magneto-resistive sensor can be connected directly to an Emtron ECU and the internal Scope function can be used to view the signal. Once you have the signal image, the arming threshold can be set correctly.

Sensor Supply and Wiring



The sensor is powered through a pullup resistor. The minimum supply voltage is 8V, ideally a regulated supply should be used to ensure consistent readings. This figure illustrates how the sensor should be wired.

NOTE: If the pullup resistor is too big there will be insufficient current to make the output switch. Typical Pullup resistor range is 330 Ohms to 1000 Ohms. The ECU has a 4k7 pullup resistor which may not activate the sensor. In this situation an external pullup will need to be fitted.

The Low and High outputs levels will vary with different sensors, so for signal integrity each sensor output should be checked using an oscilloscope. Table 1.1 show some typical results from a Toyota Sensor. Figure 1.0 shows a scope trace of a MR Sensor with 330R pullup supplied at 8V. The High Output level is 5.9V and the Low Output Level is 3.6V.

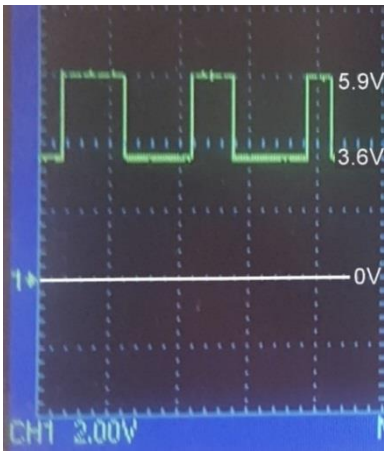


Figure 1.0 Scope of MR Sensor

Supply	Pullup Resistance	Low Output	High Output	Switching Range	Comments
5V	330 Ohms	5.2V	5.2V	0.0V	✗ Insufficient Current
8V	330 Ohms	3.6V	5.9V	2.3V	✓ (see Figure 1.0)
12V	330 Ohms	7.6V	9.9V	2.3V	✓
8V	470 Ohms	5.25V	5.25V	0.0V	✗ Insufficient Current
12V	470 Ohms	6.3V	9.45V	3.15V	✓

Table 1.1

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