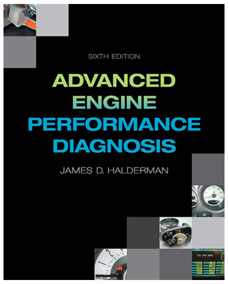
# ADVANCED ENGINE PERFORMANCE DIAGNOSIS

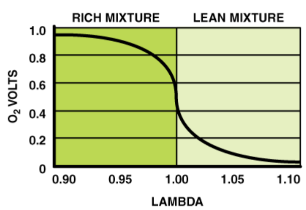



**CHAPTER 20**

Wide-Band Oxygen Sensors




## Figure 20.1 A conventional zirconia oxygen sensor can only reset to exhaust mixtures that are richer or leaner than 14.7:1 (lambda 1.00).







## Figure 20.2A When the exhaust is lean, the output of a zirconia oxygen sensor is below 450 mV.

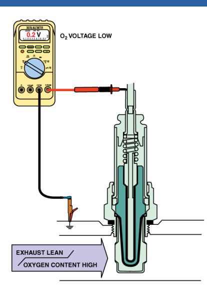


**Figure 20.2B** When the exhaustis rich, the output of a zirconia oxygen sensor is above 450 mV.

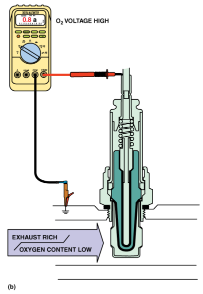






**Figure 20.3** Most conventional zirconia oxygen sensors and some wide-band oxygen sensors use the cup-type design.

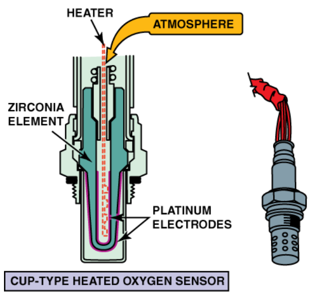






**Figure 20.4** A typical heated zirconia oxygen sensor, showing the sensor signal circuit that uses the outer (exhaust) electrode as negative and the ambient air side electrode as the positive.

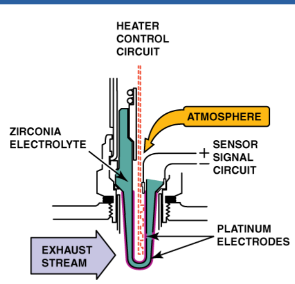


**Figure 20.5** A planar design zirconia oxygen sensor places all of the elements together, which allows the sensor to reach operating temperature quickly.

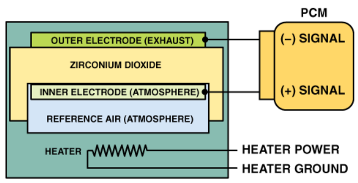
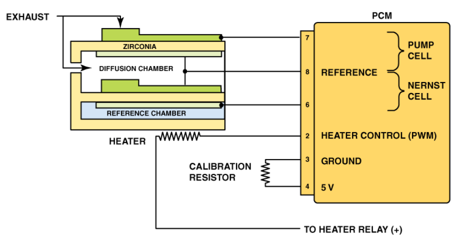


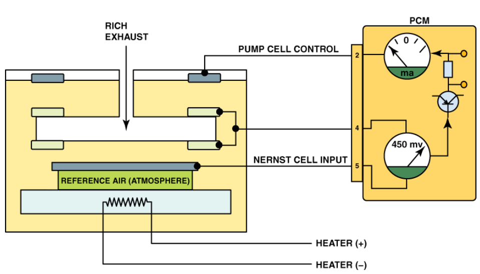



**Figure 20.6** The reference electrodes are shared by the Nernst cell and the pump cell.




ALWAYS LEARNING Advanced Engine Performance Diagnosis, 6e James D. Halderman Copyright © 2016 by Pearson Education, Inc. All Rights Reserved PEARSON

**Figure 20.7** When the exhaust is rich, the PCM applies a negative current into the pump cell.




ALWAYS LEARNING Advanced Engine Performance Diagnosis, 6e James D. Halderman Copyright © 2016 by Pearson Education, Inc. All Rights Reserved PEARSON

**Figure 20.8** When the exhaust is lean, the PCM applies a positive current into the pump cell.

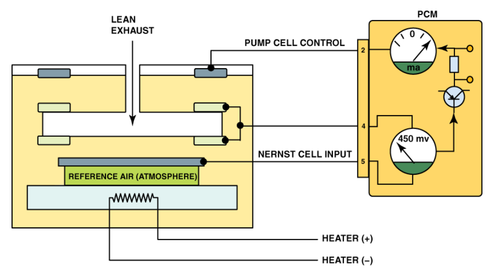
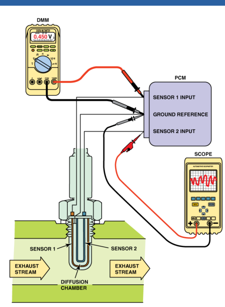


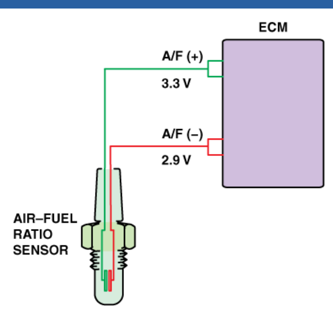



**Figure 20.9** Testing a dual-cell wide-band oxygen sensor can be done using a voltmeter or a scope.




ALWAYS LEARNING *Advanced Engine Performance Diagnosis, 6e* James D. Halderman Copyright © 2016 by Pearson Education, Inc. All Rights Reserved PEARSON

**Figure 20.10** A single-cell wide-band oxygen sensor has four wires with two for the heater and two for the sensor itself.




ALWAYS LEARNING *Advanced Engine Performance Diagnosis, 6e* James D. Halderman Copyright © 2016 by Pearson Education, Inc. All Rights Reserved PEARSON

**Figure 20.11** The scan tool can display various voltages but will often show 3.3 volts because the PCM is controlling the sensor by applying a low current to the sensor to achieve balance.