

Air Fuel Ratio Imbalance Monitor

Overview

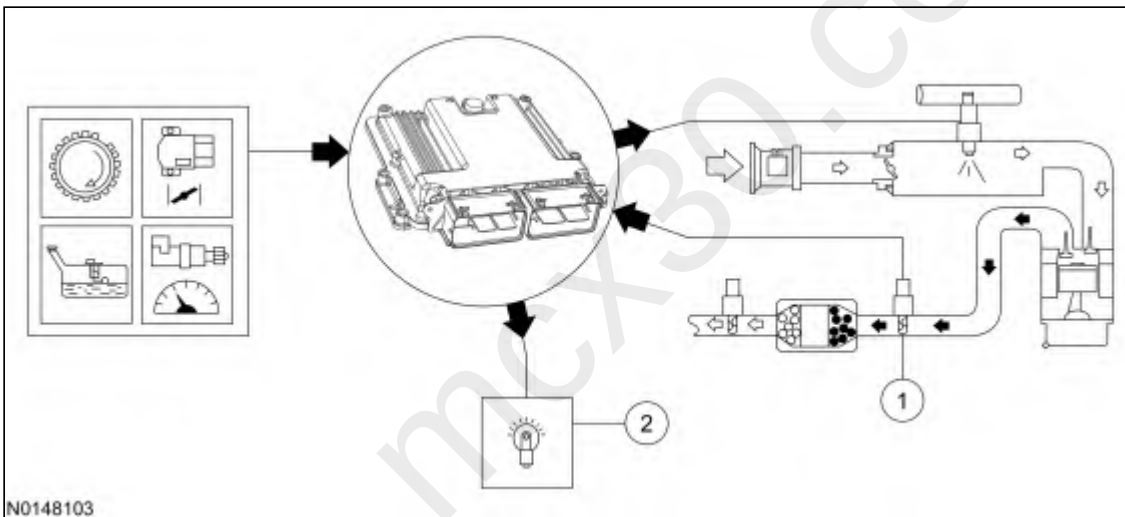
The air fuel ratio imbalance monitor is an on board diagnostic strategy designed to monitor the air fuel ratio.

Air Fuel Ratio Imbalance Monitor — Heated Oxygen Sensor (HO2S) Monitor

1. The air fuel ratio imbalance monitor estimates the cylinder to cylinder air fuel ratio difference using the universal heated oxygen sensor (HO2S) high frequency signal. The high frequency signal is updated at least once per engine combustion event to determine the amount the universal HO2S signal is affected by individual cylinders. The result is a measurement of individual cylinder effect on the universal HO2S.

If the measurement exceeds a calibrated threshold, it is added to a differential signal accumulation window. An accumulation window is at least 50 engine revolutions. The differential signal accumulation is then compared to a calibrated signal threshold. A counter is incremented if the threshold is exceeded. This process is repeated for a calibrated number of total windows. After completing the calibrated number of windows the air fuel ratio imbalance index is calculated. The air fuel ratio imbalance index is a ratio of failed RPM windows over total RPM windows required to complete the monitor. If the air fuel ratio imbalance index exceeds the threshold value the test fails.

2. The malfunction indicator lamp (MIL) is activated after a concern is detected on 2 consecutive drive cycles.



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Air Fuel Ratio Imbalance Monitor — Torque Monitor

1. The air fuel ratio imbalance torque monitor is supplemented by the air fuel ratio imbalance monitor HO2S monitor. The air fuel ratio imbalance monitor torque monitor is used to detect small levels of cylinder to cylinder air fuel ratio imbalance.
2. The monitor uses the crankshaft position sensor (CKP) to calculate an acceleration term during each cylinder firing event. The calculated acceleration value is proportional to engine torque during the firing event. The monitor will modulate each cylinder to generate an air fuel ratio deviation relative to stoichiometric operation. The monitor generates five total torque values for each cylinder. Two torque values richer than stoichiometric, two torque values leaner than stoichiometric and one torque value at stoichiometric. The monitor uses a calibrated torque curve defined by the five generated values compared to an ideal torque curve to estimate each cylinder air fuel ratio deviation. The monitor estimates each cylinder air fuel ratio deviation compared to the other cylinders to determine if a concern exists.
3. The malfunction indicator lamp (MIL) is activated after a concern is detected during a drive cycle.