

## 2003 and 2004 MY A/F Sensor Monitor (P1130, P1150, P2195 to P2256)

To return to monitor description, see page [As-12](#).

### MONITOR STRATEGY

|                             |                        |                                                                                                                        |
|-----------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------|
| Required sensors/Components | Main                   | A/F sensor                                                                                                             |
|                             | Sub                    | Rear oxygen sensor, Throttle position sensor, ECT sensor                                                               |
| Frequency of operation      | Continuous             | <ul style="list-style-type: none"> <li>A/F sensor voltage stuck LEAN/RICH</li> <li>A/F sensor slow response</li> </ul> |
|                             | Once per driving cycle | A/F sensor circuit is open/short                                                                                       |
| Duration                    | Within 30 sec.         |                                                                                                                        |
| MIL operation               | 2 driving cycles       |                                                                                                                        |
| Sequence of operation       | None                   |                                                                                                                        |

### TYPICAL ENABLING CONDITIONS

| Item                                                             | Specification                  |         |
|------------------------------------------------------------------|--------------------------------|---------|
|                                                                  | Minimum                        | Maximum |
| The monitor will run whenever the following DTCs are not present | See page <a href="#">In-39</a> |         |
| Case 1: A/F sensor voltage stuck LEAN/RICH                       |                                |         |
| Time after engine start                                          | 30 sec.                        | –       |
| A/F sensor status                                                | Activated                      |         |
| Fuel system status                                               | Closed Loop                    |         |
| Sub-feedback status                                              | Executing                      |         |
| Case 2: Open circuit between AF+ and AF–                         |                                |         |
| Time after the following conditions are met                      | 20 sec.                        | –       |
| Battery voltage                                                  | 10.5 V                         | –       |
| Time after after engine start                                    | 120 sec.                       | –       |
| ECT                                                              | 20°C (68°F)                    | –       |
| Fuel system status                                               | Closed Loop                    |         |
| Fuel cut                                                         | Not operating                  |         |
| Time after fuel cut OFF                                          | 5 sec.                         |         |
| A/F sensor heater                                                | Operating                      |         |
| Time after A/F sensor heater ON                                  | 20 sec.                        |         |
| Case 3: A/F sensor slow response                                 |                                |         |
| Time after throttle valve closed                                 | –                              | 10 sec. |
| Time after after engine start                                    | 30 sec.                        | –       |
| Fuel system status                                               | Closed Loop                    |         |
| Case 4: Short circuit between AF+ and GND                        |                                |         |
| Case 5: Short circuit between AF+ and +B (or VCC)                |                                |         |
| Case 6: Short circuit between AF+ and AF–                        |                                |         |
| Case 7: Short circuit between AF– and GND                        |                                |         |
| Case 8: Short circuit between AF– and +B (or VCC)                |                                |         |
| Time after ignition switch ON                                    | 5 sec.                         |         |
| Battery voltage                                                  | 10.5 V                         | –       |

## TYPICAL MALFUNCTION THRESHOLDS

| Engine Family                                                         | Detection Criteria                                                                  | Threshold (Duration)                                         |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------|
| Case 1-1: A/F sensor stuck LEAN                                       |                                                                                     |                                                              |
| –                                                                     | A/F sensor voltage when rear oxygen sensor voltage is 0.15 V or more                | More than 3.8 V (for 10 sec.)                                |
| Case 1-2: A/F sensor stuck RICH                                       |                                                                                     |                                                              |
| –                                                                     | A/F sensor voltage when rear oxygen sensor voltage is less than 0.85 V              | Less than 2.8 V (for 10 sec.)                                |
| Case 2: Open circuit between AF+ and AF–                              |                                                                                     |                                                              |
| 1AZ–FE                                                                | A/F sensor conductance (1/Ohm)                                                      | Less than 0.016 (for 5 sec.)                                 |
|                                                                       |                                                                                     | 0.159 or more (for 5 sec.)                                   |
| 2AZ–FE (Highlander)                                                   | A/F sensor conductance (1/Ohm)                                                      | Less than 0.022 (for 5 sec.)                                 |
|                                                                       |                                                                                     | 0.079 or more (for 5 sec.)                                   |
| 2AZ–FE (Camry, Solara) and 5VZ–FE                                     | A/F sensor conductance (1/Ohm)                                                      | Less than 0.016 (for 5 sec.)                                 |
| 1GR–FE, 1MZ–FE (Camry, ES300) and 3MZ–FE                              | A/F sensor conductance (1/Ohm)                                                      | Less than 0.022 (for 5 sec.)                                 |
| Case 3: A/F sensor slow response                                      |                                                                                     |                                                              |
| 1MZ–FE (Avalon, Highlander, RX300, Sienna, Solara), 2RZ–FE and 3RZ–FE | • Change amount of sum of A/F sensor voltage<br>• Change amount of sum of fuel trim | Less than 0.005 V (for 30 sec.)<br>2 % or more (for 30 sec.) |
| Case 4: Short circuit between AF+ and GND                             |                                                                                     |                                                              |
| 1AZ–FE                                                                | AF+ terminal voltage                                                                | Less than 2.6 V (for 5 sec.)                                 |
| 2AZ–FE, 1GR–FE, 1MZ–FE (Camry, ES300), 3MZ–FE and 5VZ–FE              | AF+ terminal voltage                                                                | Less than 0.5 V (for 5 sec.)                                 |
| Case 5: Short circuit between AF+ and +B (or VCC)                     |                                                                                     |                                                              |
| 1AZ–FE, 2AZ–FE, 1GR–FE, 1MZ–FE (Camry, ES300), 3MZ–FE and 5VZ–FE      | AF+ terminal voltage                                                                | 4.5 V or more (for 5 sec.)                                   |
| Case 6: Short circuit between AF+ and AF–                             |                                                                                     |                                                              |
| 2AZ–FE (Camry, Solara), 1GR–FE , 1MZ–FE (Camry, ES300) and 3MZ–FE     | Difference between AF+ and AF–                                                      | 0.1 V or less (for 5 sec.)                                   |
|                                                                       |                                                                                     | More than 0.8 V (for 5 sec.)                                 |
| Case 7: Short circuit between AF– and GND                             |                                                                                     |                                                              |
| 2AZ–FE (Camry, Solara), 1GR–FE , 1MZ–FE (Camry, ES300) and 3MZ–FE     | AF– terminal voltage                                                                | Less than 0.5 V (for 5 sec.)                                 |
| Case 8: Short circuit between AF– and +B (or VCC)                     |                                                                                     |                                                              |
| 2AZ–FE (Camry, Solara), 1GR–FE , 1MZ–FE (Camry, ES300) and 3MZ–FE     | AF– terminal voltage                                                                | 4.5 V or more (for 5 sec.)                                   |

## OBD MONITOR DRIVE PATTERNS

See page [In-13](#)

## MODE 06 DATA (MONITOR RESULT)

- Checking monitor status (See page [In-43](#))
- Detecting Mode 06 data (See page [In-44](#))