



**Technical Service
BULLETIN**

December 17, 2003

Title:

O2S TEST RESULTS (MODE 05)

Models:

All '96 – '03 & '04 RX 330

SS002-03
SPECIAL SERVICE TOOLS

Introduction This Service Bulletin contains Oxygen Sensor (O2S) Monitor threshold values for all models from 1996 to 2003 and some 2004 models. Starting in 2004, the O2S Monitor threshold values can be found in the repair manual. These values are used when analyzing the O2S test results to determine the O2S condition.

- Applicable Vehicles**
- All 1996 – 2003 model year **Lexus** vehicles.
 - 2004 model year **RX 330** vehicles.



Function Description **Checking O2S Test Results**

To view O2S test results, the O2S Monitor must be completed and the test results must be checked within the same key cycle. If the ignition key is cycled OFF, the O2S test results will be set to the minimum or maximum limits, and all test results will be erased. The O2S test results are stored in the ECU (SAE term: Powertrain Control Module/PCM) when the monitor is complete. The test results are static and will not change once the monitor is complete.

The process for checking O2S test results is described in the following three basic steps:

1. Completing the O2S Readiness Monitor (page 2).
2. Accessing O2S Test Results (page 3).
3. Comparing O2S Test Results to Failure Thresholds (page 4).

Required SSTs

| SPECIAL SERVICE TOOLS (SSTs) | PART NUMBER | QUANTITY |
|--|--------------|----------|
| Lexus Diagnostic Tester Kit* (or any OBDII Scantool)  | 01001270 | 1 |
| 12 Megabyte Diagnostic Tester Program Card with version 10.1a Software (or later)*  | 01002593-005 | 1 |

* Essential SSTs.

NOTE:
Additional Diagnostic Tester Kits, Program Cards or other SSTs may be ordered by calling SPX/OTC at 1-800-933-8335.

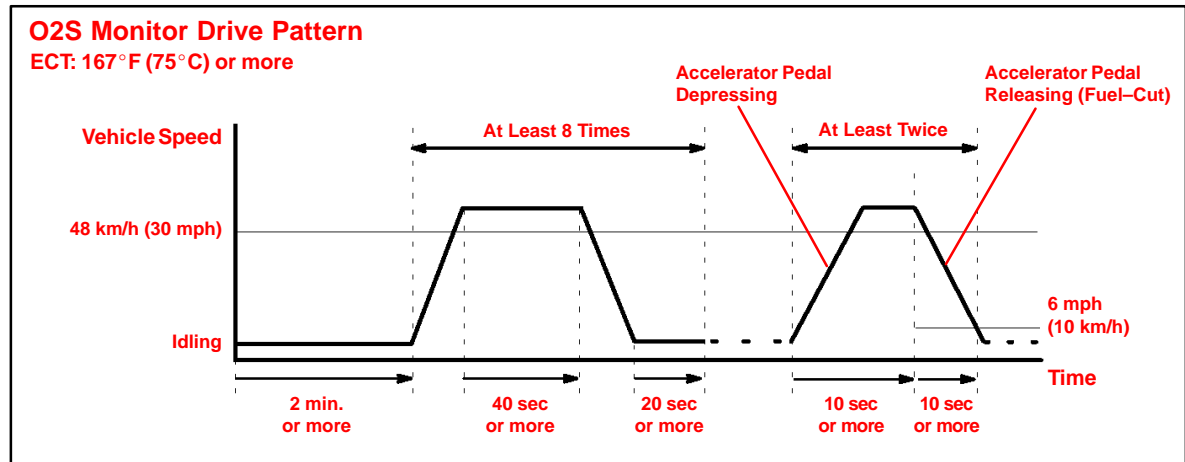
Warranty Information

| OP CODE | DESCRIPTION | TIME | OFF | T1 | T2 |
|---------|----------------------------|------|-----|----|----|
| N/A | Not Applicable to Warranty | – | – | – | – |



**Completing
O2S
Readiness
Monitor**

1. Clear any stored Diagnostic Trouble Codes (DTCs) using the Lexus Diagnostic Tester.
2. Start the engine.
3. Perform the drive pattern below to run and complete the Oxygen Sensor (O2S) Monitor.



HINT:

The O2S Monitor is completed when the following conditions are met:

- Two (2) minutes or more passed after the engine start.
- The Engine Coolant Temperature (ECT) is 167°F (75°C) or more.
- Cumulative running time at 30 mph (48 km/h) or more exceeds 6 minutes.
- Vehicle is in closed loop.
- The fuel-cut is operated for 8 seconds or more (for Rear O2S Monitor).

- A. Allow the engine to idle for two minutes.
- B. Warm up the engine until the Engine Coolant Temperature (ECT) reaches 167°F (75°C).
- C. Drive the vehicle over 30 mph (48 km/h) for more than 40 seconds.
- D. Stop the vehicle and allow the engine to idle for more than 20 seconds.
- E. Repeat steps C and D at least 8 times in one driving cycle.
(Do not cycle the ignition key.)

In addition, perform the following steps for the Rear O2S Readiness Monitor:

- A. Select second gear.
- B. Allow the vehicle to run at 30 mph (48 km/h) or more.
- C. Keep the accelerator pedal "off-idle" for more than 10 seconds.
- D. Immediately after step C, release the accelerator pedal for at least 10 seconds without depressing the brake pedal (to execute the fuel-cut).
- E. Decelerate the vehicle until the vehicle speed reaches less than 6 mph (10 km/h).
- F. Repeat steps B – E at least twice in one driving cycle.

**Accessing
O2S Test
Results**

1. On the Diagnostic Tester* screen, select the following menus:
 - DIAGNOSTICS
 - CARB OBD II
 - O2S TEST RESULTS
 A list of the available oxygen sensors will be displayed.
2. Select the desired oxygen sensor and press Enter.

NOTE:

The monitor result of the A/F sensor will not be displayed. If you select "Bank 1–Sensor 1" or Bank 2–Sensor 1" for a vehicle equipped with an A/F sensor, the Diagnostic Tester will display "No parameter to display."

3. Compare the test results with the values listed in the Failure Threshold Chart.

O2S TEST RESULT Screen

01 BANK 1 – SENSOR 1
01 BANK 1 – SENSOR 2
01 BANK 2 – SENSOR 1
01 BANK 2 – SENSOR 2

TEST DATA Screen

LOW SW V 0.400 V
HIGH SW V 0.550 V
MIN O2S V 0.100 V
MAX O2S V 0.900 V
TIME \$81 17

* Although this procedure references the Lexus Diagnostic Tester, the O2S test results can be checked using a generic OBDII scantool. Refer to your OBDII scantool operator's manual for specific procedures.

**Comparing
O2S Test
Results to
Failure
Thresholds**

1. Determine the correct O2S Failure Threshold Chart for your vehicle by looking in the "O2S Application Table," pages 5 – 6 in this bulletin.
2. Select appropriate year, model, and engine for specified O2S Failure Threshold Chart.
3. Compare O2S test results with the specified O2S Failure Threshold Chart. It may be necessary to convert O2S test results to a specific measurement unit using the conversion factor that is supplied in the specified table. See example below:

Example:

- A. The Diagnostic Tester displays "17" as a value of the "Time \$81" (see illustration).
- B. Find the Conversion Factor value of "Time \$81" in the O2S Failure Threshold chart below.
0.3906 is specified for Time \$81 in this chart.
- C. Multiply "17" in step "A" by 0.3906 (Conversion Factor) in step "B."
17 x 0.3906 = 6.6 %
- D. If the answer is within the Standard Value of TEST LIMIT, the "Time \$81" can be confirmed to be normal.

Example

| | |
|------------------|----------------|
| LOW SW V | 0.400 V |
| HIGH SW V | 0.550 V |
| MIN O2S V | 0.035 V |
| MAX O2S V | 0.835 V |
| Time \$81 | 17 |
| Time \$84 | 84 |
| Time \$85 | 79 |

NOTE:

- "LOW SW V" indicates the O2S voltage when the O2S status changes from rich to lean.
- "HIGH SW V" indicates the O2S voltage when the O2S status changes from lean to rich.
- If the O2S voltage is lower than "LOW SW V," the O2S status is lean.
- If the O2S voltage is higher than "HIGH SW V," the O2S status is rich.

Example of O2S Failure Threshold Chart:

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|------|------------------------------|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.05V | Multiply 0.3906 | % | Within 60% |

NOTE:

Before the O2S Monitor completes or after the ignition switch is turned OFF, the Diagnostic Tester displays the viewable upper limit or a lower limit of the test value (example: 0 V, 1.275 V, 0 s [seconds], 10.2 s, 0 and 255).

**O2S
Application
Table**

| MODEL YEAR | MODEL | ENGINE | CERTIFICATION | SEE CHART NO. (TSB PAGE) |
|------------|--------|----------|---------------|-----------------------------|
| 1996 | ALL | | 50-State | 1 (p. 7) |
| 1997 | ALL | | 50-State | 1 (p. 7) |
| 1998 | ES 300 | 1MZ-FE | California | 3 (p. 9) |
| | | | Federal | 1 (p. 7) |
| | GS 300 | 2JZ-GE | 50-State | 2 (p. 8) |
| | GS 400 | 1UZ-FE | 50-State | |
| | LS 400 | 1UZ-FE | 50-State | |
| | LX 470 | 2UZ-FE | 50-State | |
| | SC 300 | 2JZ-GE | 50-State | |
| SC 400 | 1UZ-FE | 50-State | | |
| 1999 | ES 300 | 1MZ-FE | 50-State | 3 (p. 9) |
| | GS 300 | 2JZ-GE | 50-State | 2 (p. 8) |
| | GS 400 | 1UZ-FE | 50-State | |
| | LS 400 | 1UZ-FE | 50-State | |
| | LX 470 | 2UZ-FE | 50-State | |
| | RX 300 | 1MZ-FE | 50-State | 3 (p. 9) |
| | SC 300 | 2JZ-GE | 50-State | 2 (p. 8) |
| SC 400 | 1UZ-FE | 50-State | | |
| 2000 | ES 300 | 1MZ-FE | 50-State | 3 (p. 9) |
| | GS 300 | 2JZ-GE | 50-State | 2 (p. 8) |
| | GS 400 | 1UZ-FE | 50-State | |
| | LS 400 | 1UZ-FE | 50-State | |
| | LX 470 | 2UZ-FE | 50-State | |
| | RX 300 | 1MZ-FE | 50-State | 3 (p. 9) |
| | SC 300 | 2JZ-GE | 50-State | 2 (p. 8) |
| | SC 400 | 1UZ-FE | 50-State | |
| 2001 | ES 300 | 1MZ-FE | 50-State | 3 (p. 9) |
| | GS 300 | 2JZ-GE | 50-State | 1 (p. 7) |
| | GS 430 | 3UZ-FE | 50-State | |
| | IS 300 | 2JZ-GE | 50-State | |
| | LS 430 | 3UZ-FE | 50-State | |
| | LX 470 | 2UZ-FE | 50-State | |
| | RX 300 | 1MZ-FE | 50-State | 4 (p. 9) |

**O2S
Application
Table**
(Continued)

| MODEL YEAR | MODEL | ENGINE | CERTIFICATION | SEE CHART NO. (TSB PAGE) |
|------------|--------|----------|---------------|-----------------------------|
| 2002 | ES 300 | 1MZ-FE | 50-State | 8 (p. 13) |
| | GS 300 | 2JZ-GE | 50-State | 5 (p. 10) |
| | GS 430 | 3UZ-FE | 50-State | 6 (p. 11) |
| | IS 300 | 2JZ-GE | 50-State | 5 (p. 10) |
| | LS 430 | 3UZ-FE | 50-State | 6 (p. 11) |
| | LX 470 | 2UZ-FE | 50-State | 7 (p. 12) |
| | RX 300 | 1MZ-FE | 50-State | 13 (p. 22) |
| | SC 430 | 3UZ-FE | 50-State | 6 (p. 11) |
| 2003 | ES 300 | 1MZ-FE | 50-State | 8 (p. 13) |
| | GS 300 | 2JZ-GE | 50-State | 9 (p. 14-15) |
| | GS 430 | 3UZ-FE | 50-State | 10 (p. 16-17) |
| | GX 470 | 2UZ-FE | 50-State | 11 (p. 18-19) |
| | IS 300 | 2JZ-GE | 50-State | 9 (p. 14-15) |
| | LS 430 | 3UZ-FE | 50-State | 10 (p. 16-17) |
| | LX 470 | 2UZ-FE | 50-State | 12 (p. 20-21) |
| | RX 300 | 1MZ-FE | 50-State | 13 (p. 22) |
| SC 430 | 3UZ-FE | 50-State | 10 (p. 16-17) | |
| 2004 | RX 330 | 3MZ-FE | 50-State | 14 (p. 23) |

O2S Failure
Threshold
Charts

CHART 1:

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Voltage Monitor

Related DTCs: P0130, P0150, P2195, P2196, P2197 and P2198

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.55 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Response Monitor

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$31 | Time to change from Lean (≤ 0.4 V) to Rich (≥ 0.55 V) | N/A | Second | Between 0 and 1 second |
| Time \$32 | Time to change from Rich (≥ 0.55 V) to Lean (≥ 0.4 V) | N/A | Second | Between 0 and 1 second |

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.5 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 2:**Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Voltage Monitor**

Related DTCs: P0130, P0150, P2195, P2196, P2197 and P2198

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.35 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.55 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Response Monitor

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|------------------------------|
| Time \$31 | Time to change from Lean (≤ 0.35 V) to Rich (≥ 0.55 V) | N/A | Second | Between 0 and 1.1 seconds |
| Time \$32 | Time to change from Rich (≥ 0.55 V) to Lean (≥ 0.35 V) | N/A | Second | Between 0 and 1.1 seconds |

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.5 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

**O2S Failure
Threshold
Charts**
(Continued)

CHART 3:**Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor**

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.45 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.6 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

CHART 4:**Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor**

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.5 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.6 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 5:**Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Voltage Monitor**

Related DTCs: P0130, P0150, P2195, P2196, P2197 and P2198

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.55 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Response Monitor

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$31 | Time to change from Lean (≤ 0.4 V) to Rich (≥ 0.55 V) | N/A | Second | Between 0 and 0.9 seconds |
| Time \$32 | Time to change from Rich (≥ 0.55 V) to Lean (≤ 0.4 V) | N/A | Second | Between 0 and 0.9 seconds |

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.5 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Element Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|--|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.05 V | Multiply 0.3906 | % | Between 0 and 80% (A/T) Between 0 and 90% (M/T) |
| Time \$84 | Percentage of monitoring time where Oxygen Sensor voltage is 0.70 V or more | Multiply 0.3906 | % | Between 20 and 100% |
| Time \$85 | Maximum Rich (≤ 0.45 V) time | Multiply 0.2621 | Second | Between 20 and 66.8 seconds |

If all the values (Time \$81, Time \$84 and Time \$85) are out of the standard values, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 6:**Rear O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Voltage Monitor**

Related DTCs: P0130, P0150, P2195, P2196, P2197 and P2198

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.55 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Response Monitor

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$31 | Time to change from Lean (≤ 0.4 V) to Rich (≥ 0.55 V) | N/A | Second | Between 0 and 0.9 seconds |
| Time \$32 | Time to change from Rich (≥ 0.55 V) to Lean (≤ 0.4 V) | N/A | Second | Between 0 and 0.9 seconds |

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.5 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Element Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.05 V | Multiply 0.3906 | % | Between 0 and 60% |
| Time \$84 | Percentage of monitoring time where Oxygen Sensor voltage is 0.70 V or more | Multiply 0.3906 | % | Between 20 and 100% |
| Time \$85 | Maximum Rich (≤ 0.45 V) time | Multiply 0.2621 | Second | Between 20 and 66.8 seconds |

If all the values (Time \$81, Time \$84 and Time \$85) are out of the standard values, the ECM interprets this as a malfunction.

**O2S Failure
Threshold
Charts**
(Continued)

CHART 7:**Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Voltage Monitor**

Related DTCs: P0130, P0150, P2195, P2196, P2197 and P2198

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.55 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Response Monitor

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$31 | Time to change from Lean (≤ 0.4 V) to Rich (≥ 0.55 V) | N/A | Second | Between 0 and 0.9 seconds |
| Time \$32 | Time to change from Rich (≥ 0.55 V) to Lean (≤ 0.4 V) | N/A | Second | Between 0 and 0.9 seconds |

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.5 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Element Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.05 V | Multiply 0.3906 | % | Between 0 and 90% |
| Time \$84 | Percentage of monitoring time where Oxygen Sensor voltage is 0.70 V or more | Multiply 0.3906 | % | Between 20 and 100% |
| Time \$85 | Maximum Rich (≤ 0.45 V) time | Multiply 0.2621 | Second | Between 20 and 66.8 seconds |

If all the values (Time \$81, Time \$84 and Time \$85) are out of the standard values, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 8:**Front O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor**

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.5 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.6 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Element Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.05 V | Multiply 0.3906 | % | Between 0 and 95% |
| Time \$84 | Percentage of monitoring time where Oxygen Sensor voltage is 0.70 V or more | Multiply 0.3906 | % | Between 20 and 100% |
| Time \$85 | Maximum Rich (≤ 0.45 V) time | Multiply 0.2621 | Second | Between 20 and 66.8 seconds |

If all the values (Time \$81, Time \$84 and Time \$85) are out of the standard values, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 9:**Rear O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Voltage Monitor**

Related DTCs: P0130, P0150, P2195, P2196, P2197 and P2198

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.55 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Response Monitor

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$31 | Time to change from Lean (≤ 0.4 V) to Rich (≥ 0.55 V) | N/A | Second | Between 0 and 1 second |
| Time \$32 | Time to change from Rich (≥ 0.55 V) to Lean (≤ 0.4 V) | N/A | Second | Between 0 and 1 second |

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Frequency Monitor During Engine Idling

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|---|
| Time \$33 | Average Lean (≤ 0.4 V) time of one waveform cycle | N/A | Second | Bank 1: Between 0 and 3.45 seconds Bank 2: Between 0 and 3.7 seconds |
| Time \$34 | Average Rich (≥ 0.55 V) time of one waveform cycle | N/A | Second | Bank 1: Between 0 and 3.45 seconds Bank 2: Between 0 and 3.7 seconds |

If the sum of Time \$33 and Time \$34 is out of the standard value, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 9 (Continued):

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Frequency Monitor During Vehicle Running

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|--|
| Time \$35 | Average Lean (≤ 0.4 V) time of one waveform cycle | N/A | Second | Bank 1: Between 0 and 0.73 seconds Bank 2: Between 0 and 0.75 seconds (varies depending on feedback compensation factor) |
| Time \$36 | Average Rich (≥ 0.55 V) time of one waveform cycle | N/A | Second | Bank 1: Between 0 and 0.73 seconds Bank 2: Between 0 and 0.75 seconds (varies depending on feedback compensation factor) |

If the sum of Time \$35 and Time \$36 is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.5 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Element Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.05 V | Multiply 0.3906 | % | Between 0 and 90% |
| Time \$84 | Percentage of monitoring time where Oxygen Sensor voltage is 0.70 V or more | Multiply 0.3906 | % | Between 20 and 100% |
| Time \$85 | Maximum Rich (≤ 0.45 V) time | Multiply 0.2621 | Second | Between 20 and 66.8 seconds |

If all the values (Time \$81, Time \$84 and Time \$85) are out of the standard values, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 10:**Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Voltage Monitor**

Related DTCs: P0130, P0150, P2195, P2196, P2197 and P2198

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.55 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Response Monitor

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$31 | Time to change from Lean (≤ 0.4 V) to Rich (≥ 0.55 V) | N/A | Second | Between 0 and 0.9 seconds |
| Time \$32 | Time to change from Rich (≥ 0.55 V) to Lean (≤ 0.4 V) | N/A | Second | Between 0 and 0.9 seconds |

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Frequency Monitor During Engine Idling

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|------------------------------|
| Time \$33 | Average Lean (≤ 0.4 V) time of one waveform cycle | N/A | Second | Between 0 and 3 seconds |
| Time \$34 | Average Rich (≥ 0.55 V) time of one waveform cycle | N/A | Second | Between 0 and 3 seconds |

If the sum of Time \$33 and Time \$34 is out of the standard value, the ECM interprets this as a malfunction.

**O2S Failure
Threshold
Charts
(Continued)**

CHART 10 (Continued):

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Frequency Monitor During Engine Idling

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|---|
| Time \$35 | Average Lean (≤ 0.4 V) time of one waveform cycle | N/A | Second | Between 0 and 0.75 seconds (varies depending on feedback compensation factor) |
| Time \$36 | Average Rich (≥ 0.55 V) time of one waveform cycle | N/A | Second | Between 0 and 0.75 seconds (varies depending on feedback compensation factor) |

If the sum of Time \$35 and Time \$36 is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.5 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Element Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.05 V | Multiply 0.3906 | % | Between 0 and 60% |
| Time \$84 | Percentage of monitoring time where Oxygen Sensor voltage is 0.70 V or more | Multiply 0.3906 | % | Between 20 and 100% |
| Time \$85 | Maximum Rich (≤ 0.45 V) time | Multiply 0.2621 | Second | Between 20 and 66.8 seconds |

If all the values (Time \$81, Time \$84 and Time \$85) are out of the standard values, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 11:**Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Voltage Monitor**

Related DTCs: P0130, P0150, P2195, P2196, P2197 and P2198

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.55 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Response Monitor

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$31 | Time to change from Lean (≤ 0.4 V) to Rich (≥ 0.55 V) | N/A | Second | Between 0 and 0.9 seconds |
| Time \$32 | Time to change from Rich (≥ 0.55 V) to Lean (≤ 0.4 V) | N/A | Second | Between 0 and 0.9 seconds |

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Frequency Monitor During Engine Idling

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|------------------------------|
| Time \$33 | Average Lean (≤ 0.4 V) time of one waveform cycle | N/A | Second | Between 0 and 2.8 seconds |
| Time \$34 | Average Rich (≥ 0.55 V) time of one waveform cycle | N/A | Second | Between 0 and 2.8 seconds |

If the sum of Time \$33 and Time \$34 is out of the standard value, the ECM interprets this as a malfunction.

**O2S Failure
Threshold
Charts
(Continued)**

CHART 11 (Continued):

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Frequency Monitor During Vehicle Running

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|---|
| Time \$35 | Average Lean (≤ 0.4 V) time of one waveform cycle | N/A | Second | Between 0 and 0.75 seconds (varies depending on feedback compensation factor) |
| Time \$36 | Average Rich (≥ 0.55 V) time of one waveform cycle | N/A | Second | Between 0 and 0.75 seconds (varies depending on feedback compensation factor) |

If the sum of Time \$35 and Time \$36 is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.5 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Element Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.05 V | Multiply 0.3906 | % | Between 0 and 60% |
| Time \$84 | Percentage of monitoring time where Oxygen Sensor voltage is 0.70 V or more | Multiply 0.3906 | % | Between 20 and 100% |
| Time \$85 | Maximum Rich (≤ 0.45 V) time | Multiply 0.2621 | Second | Between 20 and 66.8 seconds |

If all the values (Time \$81, Time \$84 and Time \$85) are out of the standard values, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 12:**Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Voltage Monitor**

Related DTCs: P0130, P0150, P2195, P2196, P2197 and P2198

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.55 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Response Monitor

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|--------|------------------------------|
| Time \$31 | Time to change from Lean (≤ 0.4 V) to Rich (≥ 0.55 V) | N/A | Second | Between 0 and 0.9 seconds |
| Time \$32 | Time to change from Rich (≥ 0.55 V) to Lean (≤ 0.4 V) | N/A | Second | Between 0 and 0.9 seconds |

If the time required to change is out of the standard value, the ECM interprets this as a malfunction.

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Frequency Monitor During Engine Idling

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|------------------------------|
| Time \$33 | Average Lean (≤ 0.4 V) time of one waveform cycle | N/A | Second | Between 0 and 2.8 seconds |
| Time \$34 | Average Rich (≥ 0.55 V) time of one waveform cycle | N/A | Second | Between 0 and 2.8 seconds |

If the sum of Time \$33 and Time \$34 is out of the standard value, the ECM interprets this as a malfunction.

**O2S Failure
Threshold
Charts
(Continued)**

CHART 12 (Continued):

Front O2S (Bank 1 Sensor 1 and Bank 2 Sensor 1) Frequency Monitor During Vehicle Running

Related DTCs: P0133 and P0153

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|---|
| Time \$35 | Average Lean (≤ 0.4 V) time of one waveform cycle | N/A | Second | Between 0 and 0.75 seconds (varies depending on feedback compensation factor) |
| Time \$36 | Average Rich (≥ 0.55 V) time of one waveform cycle | N/A | Second | Between 0 and 0.75 seconds (varies depending on feedback compensation factor) |

If the sum of Time \$35 and Time \$36 is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.5 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Element Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|------------------------------|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.5 V | Multiply 0.3906 | % | Between 0 and 90% |
| Time \$84 | Percentage of monitoring time where Oxygen Sensor voltage is 0.70 V or more | Multiply 0.3906 | % | Between 20 and 100% |
| Time \$85 | Maximum Rich (≥ 0.45 V) time | Multiply 0.2621 | Second | Between 20 and 66.8 seconds |

If all the values (Time \$81, Time \$84 and Time \$85) are out of the standard values, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 13:**Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor**

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.4 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.6 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Element Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|------------------------------|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.5 V | Multiply 0.3906 | % | Between 0 and 60% |
| Time \$84 | Percentage of monitoring time where Oxygen Sensor voltage is 0.70 V or more | Multiply 0.3906 | % | Between 20 and 100% |
| Time \$85 | Maximum Rich (≥ 0.45 V) time | Multiply 0.2621 | Second | Between 20 and 66.8 seconds |

If all the values (Time \$81, Time \$84 and Time \$85) are out of the standard values, the ECM interprets this as a malfunction.

O2S Failure
Threshold
Charts
(Continued)

CHART 14:**Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Voltage Monitor**

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|---|-------------------|------|------------------------------|
| Time \$07 | The minimum voltage during O2S monitoring | N/A | V | Between 0 and 0.45 V |
| Time \$08 | The maximum voltage during O2S monitoring | N/A | V | Between 0.5 and 1.275 V |

If the sensor voltage is out of the standard value, the ECM interprets this as a malfunction.

Rear O2S (Bank 1 Sensor 2 and Bank 2 Sensor 2) Element Monitor

Related DTCs: P0136 and P0156

| TEST ID | DESCRIPTION OF TEST DATA | CONVERSION FACTOR | UNIT | STANDARD VALUE OF TEST LIMIT |
|-----------|--|-------------------|--------|------------------------------|
| Time \$81 | Percentage of monitoring time where Oxygen Sensor voltage is less than 0.5 V | Multiply 0.3906 | % | Between 0 and 80% |
| Time \$84 | Percentage of monitoring time where Oxygen Sensor voltage is 0.70 V or more | Multiply 0.3906 | % | Between 20 and 100% |
| Time \$85 | Maximum Rich (≥ 0.45 V) time | Multiply 0.2621 | Second | Between 20 and 66.8 seconds |

If all the values (Time \$81, Time \$84 and Time \$85) are out of the standard values, the ECM interprets this as a malfunction.