SAFETY COMPLIANCE TESTING FOR
FMVSS 124L
ACCELERATOR CONTROL SYSTEMS

NISSAN MOTOR CO., LTD.
2004 NISSAN QUEST, MPV
NHTSA NO. C45203

GENERAL TESTING LABORATORIES, INC.
1623 LEEDSTOWN ROAD
COLONIAL BEACH, VIRGINIA 22443

MAY 19, 2004
FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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SECTION 1
PURPOSE OF COMPLIANCE TEST

FMVSS 124 specifies requirements for the return of a vehicle’s throttle to the idle position when the driver removes the actuating force from the accelerator control, or in the event of a severance or disconnection in the accelerator control system. The purpose of FMVSS 124 is to reduce deaths and injuries resulting from engine overspeed caused by malfunctions in the accelerator control system. This standard applies to passenger cars, multipurpose passenger vehicles (MPV’s), trucks and buses.
SECTION 2
TEST PROCEDURES AND DISCUSSION OF RESULTS

Compliance testing was conducted on a 2004 NISSAN QUEST, MPV, NHTSA No. C45203 in accordance with the National Highway Traffic Safety Administration (NHTSA) Laboratory Procedure TP-124-06.

The drive-by wire vehicle was equipped with an Accelerator Pedal Position Sensor (APS), Throttle Plate Position Sensor (TPS), Electronic Control Module (ECM), and Air Throttle Plate Actuator Motor (TPM).

Output from the throttle position sensor on the air throttle plate shaft was used to measure throttle position and data was recorded at 1000 HZ with GTL’s data acquisition system.

Normal operation testing was to be conducted to simulate the normal removal of the driver’s foot from the accelerator pedal. Return to idle times were to be determined for various throttle plate positions with the accelerator control system complete and with each of the wires to the TPS and TPM acuator motor independently severed and also shorted to ground. Return to idle times were also to be determined for severance of the connectors to the APS, and TPS/TPM actuator motor. Removal of the two springs in the accelerator pedal assembly and the throttle plate motor spring were not to be performed due to the units being non-serviceable. ECM connectors were also to be tested for severance.

This testing was to be performed at low ambient temperature of -40° C (-0 +5° C) in accordance with the NHTSA Test Procedure TP-124-06 but due to the vehicle not starting at -40° C, the test temperature was raised to -25° F.
At -25° F the vehicle started with ether sprayed into the air intake and one test was performed from 50% W.O.T. to idle, at which time the engine died and would not restart after repeated tries. The ambient temperature was then slowly raised until the engine would start (60° F).

After two test at 60° F (one at 25% and one at 100% W.O.T.) the accelerator failed to operate the engine speed. The engine remained at idle even with the accelerator depressed. After repeated failed attempts to reset the engine computer to get the accelerator working, testing was concluded on this vehicle.
SECTION 3
COMPLIANCE TEST DATA

Test data for this test can be found on the following pages. Photographs are found in Section 5 and Test Plots are found in Section 6.
DATA SHEET 1
VEHICLE DESCRIPTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 NISSAN QUEST MPV
VEHICLE NHTSA NO.: C45203
VEHICLE VIN: 5N1BV28494N320161
DATE OF TEST: MAY 7, 2004
TEST LAB: GENERAL TESTING LABORATORIES

VEHICLE ENGINE TYPE: V6

GVWR: 2586 KG

VEHICLE ENGINE SIZE: 3.5 L

VEHICLE ACCEL. CONTROL SYSTEM (ACS) (Air or Fuel Throttled): AIR

MAX. BHP ENGINE SPEED: UNK.

MFR. IDLE RPM: COMPUTER CONTROLLED (850)

FUEL METERING DEVICE (Carburetor, fuel injection, etc): FUEL INJECTION

REMARKS:

RECORDED BY: DATE: 05/07/04

APPROVED BY:

D. M.
DATA SHEET 2
NORMAL OPERATION TEST
(fully operational system)

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 NISSAN QUEST, MPV
VEHICLE NHTSA NO.: C45203
DATE OF TEST: MAY 7, 2004

Check one:

SYSTEM CONDITION: COMPLETE (no modifications) Normal Operation

<table>
<thead>
<tr>
<th>ACCELERATOR POSITION</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec)</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>% WIDE OPEN THROTTLE (WOT)</td>
<td></td>
<td></td>
<td>ENGINE COOLANT</td>
<td>AMBIENT</td>
<td>5%</td>
<td>94</td>
</tr>
<tr>
<td>25%</td>
<td>25</td>
<td></td>
<td>-25</td>
<td>-26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75%</td>
<td>75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RETURN TIME REQUIREMENTS:

1 second (1000 ms) for vehicles less than 4536 kg.
2 seconds (2000 ms) for vehicles more than 4536 kg.
3 seconds (3000 ms) for vehicles exposed to -18° C or less

PASS ___ X ___ FAIL ___________

REMARKS: After cold soak at -25° F the engine was started with ether to perform normal operation testing. After one throttle depression to 50% W.O.T. and return to idle, the engine died and would not restart after repeated tries. The ambient temperature was then raised until the engine started at an ambient temperature of 60° F, at which time normal operation testing was started. After a throttle depression to 25% and 100% W.O.T. with returns to idle the accelerator failed to operate the engine.

RECORDED BY: ___________________________ DATE: 05/07/04

APPROVED BY: ___________________________
DATA SHEET 2 continued
NORMAL OPERATION TEST
(fully operational system)

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 NISSAN QUEST, MPV
VEHICLE NHTSA NO.: C45203
DATE OF TEST: MAY 7, 2004

Check one:


SYSTEM CONDITION: COMPLETE (no modifications) Normal Operation

<table>
<thead>
<tr>
<th>ACCELERATOR POSITION</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec)</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>% WIDE OPEN THROTTLE (WOT)</td>
<td></td>
<td></td>
<td>ENGINE COOLANT</td>
<td>AMBIENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td>25</td>
<td>2500</td>
<td>80</td>
<td>60</td>
<td>4%</td>
<td>65</td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>75%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>100%</td>
<td>100</td>
<td>7000</td>
<td>60</td>
<td>60</td>
<td>4%</td>
<td>637</td>
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</table>

RETURN TIME REQUIREMENTS:

1 second (1000 ms) for vehicles less than 4536 kg.
2 seconds (2000 ms) for vehicles more than 4536 kg.
3 seconds (3000 ms) for vehicles exposed to -18° C or less

PASS ___ FAIL _________

REMARKS: *Vehicle started at 60° F ambient temperature and normal condition tests were started but accelerator electronic control failed and accelerator would no longer operate and control engine RPM.

RECORDED BY: ___________________________ DATE: 05/07/04

APPROVED BY: ___________________________
### SECTION 4
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>DESCRIPTION</th>
<th>MODEL/ SERIAL NO.</th>
<th>CAL. DATE</th>
<th>NEXT CAL. DATE</th>
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</thead>
<tbody>
<tr>
<td>CONTINUOUS RECORDER</td>
<td>OMEGA</td>
<td>55662</td>
<td>03/04</td>
<td>03/05</td>
</tr>
<tr>
<td>ENGINE RECORDING</td>
<td>FLUKE</td>
<td>7471026</td>
<td>03/04</td>
<td>03/05</td>
</tr>
<tr>
<td>ENGINE RECORDING</td>
<td>MONARCH</td>
<td>1444664</td>
<td>01/04</td>
<td>07/05</td>
</tr>
<tr>
<td>SOFTWARE</td>
<td>GTL</td>
<td>N/A</td>
<td>BEFORE USE</td>
<td>BEFORE USE</td>
</tr>
<tr>
<td>CHAMBER</td>
<td>GTL</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>EXHAUST DUCT</td>
<td>GTL</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
SECTION 5
PHOTOGRAPHS
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.1
FRONT VIEW OF VEHICLE
FIGURE 5.4
CLOSE-UP VIEW OF VEHICLE'S CERTIFICATION LABEL
### Tire and Loading Information

<table>
<thead>
<tr>
<th>Seating Capacity</th>
<th>Total</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nombre de Places</td>
<td>Total</td>
<td>Avant</td>
<td>Arrière</td>
</tr>
</tbody>
</table>
| **The combined weight of occupants and cargo should never exceed 546 kg or 1204 lbs.**<br>**Le poids combiné d'occupants et de cargaison ne devrait jamais excéder 546 kg ou 1204 lbs.**

**Recommended Cold Tire Inflation Pressure**

<table>
<thead>
<tr>
<th>Original Tire Size</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAILLE DU PNEU D'ORIGINE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P225/60R17</td>
<td>240 kPa (35 psi)</td>
<td></td>
</tr>
<tr>
<td>SPARE TIRE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROUE DE SECOURS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T135/80D16</td>
<td>420 kPa (60 psi)</td>
<td></td>
</tr>
</tbody>
</table>

**See owner's manual for additional information.**

**Pour d'autres détails, se reporter au manuel du conducteur.**

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**Figure 5.5**

Close-up view of vehicle's tire information label.
THROTTLE CONTROL COVER AND THROTTLE POSITION SENSOR

2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.7
LOCATION OF TPS AND TPM
FIGURE 5.11
TPS AND TPM CONNECTOR

2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L
FIGURE 5.13
ECM CONNECTORS #1 AND #2
FIGURE 5.14
TEST SET-UP TO PROVIDE OPEN AND GROUND WIRES
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.15
OVERALL TEST SET-UP WIRING
VEHICLE IN TEST CHAMBER
FIGURE 5.16
VEHICLE IN TEST CHAMBER

2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L
SECTION 6
PLOTS
FMVSS 124 THROTTLE RETURN TEST
124 COLD/NORMAL/BASE IDLE@-32C

NHTSA C45203 NISSAN QUEST

V % RPM


Channel: Throttle Position
Y1: 5.162 %
t1: -13828.278 ms
dt: 0.049 s
Y2: 5.236 %
t2: -13779.278 ms
f: 20.408 Hz
FMVSS 124 THROTTLE RETURN TEST
124 MID/NORMAL/100% WOT
2:31:29 PM 5/7/04

NHTSA C46203 NISSAN QUEST

Channel: Throttle Position
Y1: 95.320 %  Y2: 4.508 %
t1: -36788.649 ms  t2: -36131.649 ms
dt: 0.637 s  f: 1.570 Hz
SECTION 7
MANUFACTURER’S DRAWINGS
Vehicle Information/Test Specifications
FMVSS 124 - Accelerator Control Systems

Requested Information:

1.) A sketch of the driver operated accelerator control system (ACS) starting from the accelerator pedal up to and including the fuel metering device (carburetor, fuel injectors, fuel distributor, or fuel injection pump).

Ans.

2.) For Normal ACS operation, the method utilized to determine the engine idle state (air throttle plate position, fuel delivery rate, other).

Ans. Air throttle plate position

3.) For Fail-Safe operation of the ACS (disconnection or severance), the method utilized to determine return of engine power to the idle state (air throttle plate position, fuel delivery rate, air intake, engine rpm, other)

Ans. Air throttle plate position

4.) Is the vehicle ACS equipped with any of the following:
   A. Accelerator Pedal Position Sensor (APS)
   B. Throttle Plate Position Sensor (TPS)
   C. Electronic Control Module (ECM)
   D. Air throttle plate actuator motor

Ans. A-D all.
5.) If air throttle plate equipped, is there a procedure which can be utilized by the test laboratory to measure the position of the throttle plate by tapping into the TPS or ECM? If so, please describe.

Ans. Throttle plate position can be utilized by measuring the voltage of TPS output.

6.) Point(s) chosen to demonstrate compliance with FMVSS 124 for single point disconnect and severance.

Ans.
For severances: (each tested separately)

1. Accel Pedal Inner Spring
2. Accel Pedal Outer Spring
3. Throttle Motor Return Spring (motor power off)
4. Throttle Motor only (return spring removed)

For Disconnections (each tested separately - wiring disconnected)

1. Throttle Control Motor Asy
   a. Monitor Sensor 1
   b. Disconnect Sensor 2
2. Throttle Position Sensor Asy
   a. Monitor Sensor 1
   b. Disconnect Sensor 2
3. Accelerator Pedal Position Sensor Asy
   a. Monitor Sensor 1
   b. Disconnect Sensor 2

7.) Where applicable, were connections in the ACS beyond the ECM such as the fuel injectors tested for disconnection and severance. If yes, provide details.

Ans. No.

8.) Where applicable, were idle return times tested for electrical severance accompanied by shorting to ground? If yes, please provide details.

Ans. No.

9.) All sources of return energy (springs) for the accelerator pedal and if applicable, the air throttle plate.

Ans. The accelerator Pedal has 2 (redundant) return springs.

10.) If fuel delivery rate is used to demonstrate return to idle state, provide:
A. The method used to measure this signal i.e. connection to standard SAE J1587 data bus.
B. Equipment required to measure signal.
C. Fuel rate signal output range at the idle state.

Ans. Not applicable.
11.) Is the ACS equipped with a limp home mode? If yes, provide operation description.

Ans. ACS has a limp home mode.
If ACS detects the failure, the system turns throttle motor off and return throttle plate to default position.

12.) Please describe a method by which the test laboratory can measure the engine RPM by tapping into the ECM, OBD connector, etc.

Ans. We could take a signal from the ECM via a CONSULT (Nissan’s diagnostic system), or from the meter signal.