SAFETY COMPLIANCE TESTING FOR FMVSS 124 ACCELERATOR CONTROL SYSTEMS

NISSAN MOTOR CO., LTD.
2007 NISSAN VERSA,
4-DOOR PASSENGER CAR
NHTSA NO. C75201

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

NOVEMBER 27, 2007
FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
1200 NEW JERSEY AVE, SE
WASHINGTON, D.C. 20590
Compliance tests were conducted on the subject 2007 Nissan Versa 4-door Passenger Car in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-124-06 for the determination of FMVSS 124 compliance.

Test failures identified were as follows: None.
<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Purpose of Compliance Test</td>
</tr>
<tr>
<td>2</td>
<td>Test Procedure and Discussion of Results</td>
</tr>
<tr>
<td>3</td>
<td>Compliance Test Data</td>
</tr>
<tr>
<td>4</td>
<td>Test Equipment List and Calibration Information</td>
</tr>
<tr>
<td>5</td>
<td>Photographs</td>
</tr>
<tr>
<td>5.1</td>
<td>Front View of Vehicle</td>
</tr>
<tr>
<td>5.2</td>
<td>Left Side View of Vehicle</td>
</tr>
<tr>
<td>5.3</td>
<td>Right Side View of Vehicle</td>
</tr>
<tr>
<td>5.4</td>
<td>Close-Up View of Vehicle’s Certification Label</td>
</tr>
<tr>
<td>5.5</td>
<td>Close-Up View of Vehicle Placard</td>
</tr>
<tr>
<td>5.6</td>
<td>Accelerator Pedal Assembly (APS)</td>
</tr>
<tr>
<td>5.7</td>
<td>Accelerator Pedal Assembly (APS)</td>
</tr>
<tr>
<td>5.8</td>
<td>Accelerator Pedal Assembly (APS)</td>
</tr>
<tr>
<td>5.9</td>
<td>Throttle Body Assembly</td>
</tr>
<tr>
<td>5.10</td>
<td>Throttle Body Assembly</td>
</tr>
<tr>
<td>5.11</td>
<td>Throttle Body Assembly</td>
</tr>
<tr>
<td>5.12</td>
<td>Throttle Body Assembly</td>
</tr>
<tr>
<td>5.13</td>
<td>Close-Up View of Throttle Position Sensor Assembly</td>
</tr>
<tr>
<td>5.14</td>
<td>Test Set-Up for Throttle Body</td>
</tr>
<tr>
<td>5.15</td>
<td>Test Set-Up for Throttle Body</td>
</tr>
<tr>
<td>5.16</td>
<td>Overall Test Set-Up</td>
</tr>
<tr>
<td>5.17</td>
<td>Test Set-Up for Accelerator</td>
</tr>
<tr>
<td>6</td>
<td>Plots</td>
</tr>
<tr>
<td>7</td>
<td>Manufacturer's Drawings</td>
</tr>
</tbody>
</table>
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 the number of 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.
Compliance testing was conducted on a 2007 Nissan Versa Passenger Car, NHTSA No. C75201 in accordance with the National Highway Traffic Safety Administration (NHTSA) Laboratory Procedure TP-124-06.

The vehicle is equipped with an electronic throttle control system with an Accelerator Pedal Position Sensor (APS), a Throttle Plate Position Sensor (TPS), an Electronic control Module (ECM) and an Air Throttle Plate Actuator Motor.

Output from the vehicle throttle position sensor on the air throttle plate shaft was used to measure throttle position and data was recorded at 100 HZ with GTL’s data acquisition system. Testing was conducted to simulate the normal removal of the driver's foot from the accelerator pedal. This was performed by depressing the accelerator with a gloved hand which incorporated an electrical contact strip in the depressing forefinger. The accelerator was depressed to the required amount and then the forefinger was quickly removed from the pedal, releasing the accelerator and activating the contact strip for time zero. Failures were induced simultaneously with release of the accelerator pedal. Testing was performed with the vehicle in park and the engine running. Return to idle times were determined for four throttle plate positions (25%, 50%, 75% and 100%) with the accelerator control system complete. With each of the wires to the APS and throttle plate position sensor disconnected and shorted to ground, return to idle times were determined at the worst case condition – wide open throttle (100%).
SECTION 2 (Continued)

Some system faults resulted in no data output as the TPS used for throttle position data was itself disconnected for that part of the test. For these cases, return to idle state was determined by laboratory personnel observation. A number of induced failures resulted in the throttle plate return to or below the idle state then shifting to a Limp-Home mode position which allows the vehicle to be removed from the roadway.

The return times for some normal operation and fault conditions resulted in return times greater than 1 second. In these cases, throttle angle position decreased rapidly followed by a controlled ramp down to the original idle position. Manufacturers sometimes use this ramp-down strategy for improved emission control which may be the case here. No engine “racing” was observed at any point in the testing.

This testing was performed at mid ambient temperature of 10º C to 46º C, in accordance with the NHTSA Test Procedure TP-124-06.
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.
Vehicle Description:

Vehicle Make/Model/Body Style: 2007 Nissan Versa PSGR. Car
Vehicle NHTSA No.: C75201
Vehicle VIN: 3N1BC11E57L394885
Date of Test: April 27-28, 2007
Test Lab: General Testing Laboratories
Vehicle Engine Type: Gas
GVWR: 1710 KG
Vehicle Engine Size: 1.8 L 4 CYL.
Vehicle Acceleration Control System (ACS) (Air or Fuel Throttled): Air
Max. BHP Engine Speed: 122 HP
MFR. Idle RPM: 675 RPM
Fuel Metering Device (Carburetor, fuel injection, etc): Fuel Injection

Remarks: The failed return spring tests were not performed on this vehicle as the accelerator pedal assembly and throttle body units are sealed, non-serviceable and cannot be taken apart.

Recorded By: G. Farrand
Date: 08/27/07
Approved By: D. Messick
DATA SHEET 2
NORMAL OPERATION TEST
(fully operational system)

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 NISSAN VERSA PSGR. CAR
VEHICLE NHTSA NO.: C75201
DATE OF TEST: AUGUST 28, 2007

Check one:
Mid Temp. Test: X     Low Temp. Test:  High Temp. Test:

SYSTEM CONDITION: COMPLETE (no modifications) Normal Operation

<table>
<thead>
<tr>
<th>GTL #</th>
<th>ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°C) ENGINE COOLANT</th>
<th>AMBIENT</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>5799</td>
<td>25%</td>
<td>28%</td>
<td>715</td>
<td>87</td>
<td>26</td>
<td>0-2%</td>
<td>130</td>
<td>P</td>
</tr>
<tr>
<td>5800</td>
<td>50%</td>
<td>61%</td>
<td>715</td>
<td>87</td>
<td>26</td>
<td>0-2%</td>
<td>1210</td>
<td>*</td>
</tr>
<tr>
<td>5801</td>
<td>75%</td>
<td>68%</td>
<td>710</td>
<td>87</td>
<td>26</td>
<td>0-2%</td>
<td>1420</td>
<td>*</td>
</tr>
<tr>
<td>5802</td>
<td>100%</td>
<td>88%</td>
<td>710</td>
<td>87</td>
<td>26</td>
<td>0-2%</td>
<td>2150</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  FAIL

REMARKS: * See Section 2 – Discussion of Results

RECORDED BY: G. FARRAND                     DATE: 08/28/07
APPROVED BY: D. MESSICK
# FMVSS 124

**VEHICLE MY/MAKE/MODEL/BODY STYLE:** 2007 NISSAN VERSA PSGR. CAR  
**VEHICLE NHTSA NO.:** C75201  
**DATE OF TEST:** AUGUST 28, 2007

<table>
<thead>
<tr>
<th>GTL #</th>
<th>CONNECTOR</th>
<th>WIRE/PIN DESCRIPTION</th>
<th>FAULT CONDITION</th>
<th>ENGINE TEMP. °C</th>
<th>% THROTTLE/RETURN TIME (MS)</th>
<th>PASS/FAIL/NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>5803</td>
<td>TPS</td>
<td>#1/BLUE OPEN</td>
<td>87</td>
<td>100/230</td>
<td>P</td>
<td>Limp Home @6%</td>
</tr>
<tr>
<td>5804</td>
<td>TPS</td>
<td>#2/PINK OPEN</td>
<td>87</td>
<td>100/200</td>
<td>P</td>
<td>Limp Home @6%</td>
</tr>
<tr>
<td>5805</td>
<td>TPS</td>
<td>#3/YELLOW OPEN</td>
<td>87</td>
<td>100/10</td>
<td>P</td>
<td>Limp Home @6%</td>
</tr>
<tr>
<td>5806</td>
<td>TPS</td>
<td>#4/ORANGE OPEN</td>
<td>87</td>
<td>100/1930</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5807</td>
<td>TPS</td>
<td>#5/PURPLE OPEN</td>
<td>87</td>
<td>100/10</td>
<td>P</td>
<td>Limp Home @6%</td>
</tr>
<tr>
<td>5808</td>
<td>TPS</td>
<td>#6/GREEN OPEN</td>
<td>87</td>
<td>100/1830</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5809</td>
<td>APS</td>
<td>#7/GRAY OPEN</td>
<td>87</td>
<td>100/2030</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5810</td>
<td>APS</td>
<td>#8 LT. BLUE OPEN</td>
<td>87</td>
<td>100/2000</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5811</td>
<td>APS</td>
<td>#9/PINK OPEN</td>
<td>87</td>
<td>100/1760</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5812</td>
<td>APS</td>
<td>#10/GREEN OPEN</td>
<td>87</td>
<td>100/2180</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5813</td>
<td>APS</td>
<td>#11/RED OPEN</td>
<td>87</td>
<td>100/2050</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5814</td>
<td>APS</td>
<td>#12/YELLOW OPEN</td>
<td>87</td>
<td>100/2140</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5815</td>
<td>TPS</td>
<td>#1/BLUE SHORT</td>
<td>87</td>
<td>100/2480</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5816</td>
<td>TPS</td>
<td>#2/PINK SHORT</td>
<td>87</td>
<td>100/340</td>
<td>P</td>
<td>Limp Home @6%</td>
</tr>
<tr>
<td>5817</td>
<td>TPS</td>
<td>#3/YELLOW SHORT</td>
<td>87</td>
<td>100/4020</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5818</td>
<td>TPS</td>
<td>#4/ORANGE SHORT</td>
<td>87</td>
<td>100/0</td>
<td>**P</td>
<td>No Data after Short</td>
</tr>
<tr>
<td>5819</td>
<td>TPS</td>
<td>#5/PURPLE SHORT</td>
<td>87</td>
<td>100/0</td>
<td>**P</td>
<td>No Data after Short</td>
</tr>
<tr>
<td>5820</td>
<td>TPS</td>
<td>#6/GREEN SHORT</td>
<td>87</td>
<td>100/2240</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5821</td>
<td>APS</td>
<td>#7/GRAY SHORT</td>
<td>87</td>
<td>100/1420</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5822</td>
<td>APS</td>
<td>#8/LT. BLUE SHORT</td>
<td>87</td>
<td>100/0</td>
<td>P</td>
<td>Engine Stopped</td>
</tr>
<tr>
<td>5823</td>
<td>APS</td>
<td>#9/PINK SHORT</td>
<td>87</td>
<td>100/0</td>
<td>**P</td>
<td>No Data</td>
</tr>
<tr>
<td>5824</td>
<td>APS</td>
<td>#10/GREEN SHORT</td>
<td>87</td>
<td>100/2060</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5825</td>
<td>APS</td>
<td>#11/RED SHORT</td>
<td>87</td>
<td>100/2470</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5826</td>
<td>APS</td>
<td>#12/YELLOW SHORT</td>
<td>87</td>
<td>100/2540</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>5827</td>
<td>TPS</td>
<td>CONNECTOR DISCONNECT</td>
<td>87</td>
<td>100/10</td>
<td>P</td>
<td>Limp Home</td>
</tr>
<tr>
<td>5828</td>
<td>APS</td>
<td>CONNECTOR DISCONNECT</td>
<td>87</td>
<td>100/90</td>
<td>P</td>
<td>Engine Stopped</td>
</tr>
</tbody>
</table>

**REMARKS:**  
* See Section 2 – Discussion of Results

** By Lab Observation, engine returns to idle and in some cases shifts to Limp-Home mode.

**RECORDED BY:** G. FARRAND  
**DATE:** 08/28/07

**APPROVED BY:** D. MESSICK
<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>DESCRIPTION</th>
<th>MODEL/ SERIAL NO.</th>
<th>CAL. DATE</th>
<th>NEXT CAL. DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTINUOUS RECORDER</td>
<td>OMEGA</td>
<td>CT485</td>
<td>06/07</td>
<td>06/08</td>
</tr>
<tr>
<td>ENGINE RECORDING</td>
<td>GTL COMPUTER</td>
<td>CPU1</td>
<td>BEFORE USE</td>
<td>BEFORE USE</td>
</tr>
<tr>
<td>ENGINE RECORDING</td>
<td>MONARCH</td>
<td>1444664</td>
<td>08/07</td>
<td>08/08</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
2007 NISSAN VERSA
NHTSA NO. C75201
FMVSS NO. 124

FIGURE 5.3
RIGHT SIDE VIEW OF VEHICLE
The combined weight of occupants and cargo should never exceed 390 kg or 860 lbs.

Le poids combiné d'occupants et de cargaison ne devrait jamais excéder 390 kg ou 860 lbs.
2007 NISSAN VERSA
NHTSA NO. C75201
FMVSS NO. 124

FIGURE 5.6
ACCELERATOR PEDAL ASSEMBLY (APS)
FIGURE 5.7
ACCELERATOR PEDAL ASSEMBLY (APS)
2007 NISSAN VERSA
NHTSA NO. C75201
FMVSS NO. 124

FIGURE 5.8
ACCELERATOR PEDAL ASSEMBLY (APS)
2007 NISSAN VERSA
NHTSA NO. C75201
FMVSS NO. 124

FIGURE 5.9
THROTTLE BODY ASSEMBLY
2007 NISSAN VERSA
NHTSA NO. C75201
FMVSS NO. 124

FIGURE 5.11
THROTTLE BODY ASSEMBLY
2007 NISSAN VERSA
NHTSA NO. C75201
FMVSS NO. 124

FIGURE 5.12
THROTTLE BODY ASSEMBLY
FIGURE 5.13
CLOSE-UP VIEW OF THROTTLE POSITION SENSOR ASSEMBLY
2007 NISSAN VERSA
NHTSA NO. C75201
FMVSS NO. 124

FIGURE 5.15
TEST SET-UP FOR THROTTLE BODY
FIGURE 5.17
TEST SET-UP FOR ACCELERATOR
GTL 5801, FMVSS 124
Normal Operation, 75% Throttle.

% Throttle & Foot Release.

Time in Seconds
GTL 5802, FMVSS 124
Normal Operation, 100% Throttle.

% Throttle & Foot Release.

Time in Seconds
GTL 5803, FMVSS 124
TPS Wire 1 Open, 100% Throttle.

% Throttle & Foot Release.

Time in Seconds
GTL 5806, FMVSS 124
TPS Wire 4 Open, 100% Throttle.

% Throttle & Foot Release.

Time in Seconds
GTL 5807, FMVSS 124
TPS Wire 5 Open, 100% Throttle.

% Throttle & Foot Release.

Time in Seconds
GTL 5810, FMVSS 124
APS Wire B Open, 100% Throttle.

Time in Seconds

% Throttle & Foot Release.
GTL 5813, FMVSS 124

APS Wire 11 Open, 100% Throttle.

% Throttle & Foot Release

Time in Seconds
GTL 5816, FMVSS 124
TPS Wire 2 Shorted, 100% Throttle.

% Throttle & Foot Release

Time in Seconds
GTL 5819, FMVSS 124
TPS Wire 5 Shorted, 100% Throttle.
GTL 5820, FMVSS 124
TPS Wire 6 Shorted, 100% Throttle.

% Throttle & Foot Release

Time in Seconds

0 10 20 30 40 50 60 70 80 90 100
-0.5 0 0.5 1 1.5 2 2.5
GTL 5824, FMVSS 124
TPS Wire 10 Shorted, 100% Throttle.

% Throttle & Foot Release.

Time in Seconds
MANUFACTURER'S DRAWINGS
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).

![Diagram of electronically controlled accelerator pedal]

**Fig 1-2 Outline of electronically controlled accelerator pedal**

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

The engine idle state can be determined by monitoring the Throttle Position Sensor (TPS) output voltage. This information provides throttle plate position data in the form of TPS output voltage (TPS output voltage at idle is available for both TPS sensors, see Nissan service manual for Versa). The engine idle state can also be monitored through the On-Board Diagnostic System (OBD) using the Nissan Consult-3 equipment. This information will be given in the form of engine speed (RPM). The value for engine RPM at idle is available in the Nissan Versa service manual.
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)

For Fail-Safe operation of the ACS (disconnection or severance), the method utilized to determine return of engine power to the idle state is by monitoring the TPS voltage output, which provides the air throttle plate position as a function of TPS output voltage.

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

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.

   Yes, there is a means to measure throttle plate position by tapping onto the TPS. Procedure: Splice into the TPS signal at the Throttle Control Motor Connector (located on the throttle body- engine compartment; see service manual for correct wiring termination). Monitor the TPS signal voltage output at the sensor output.

6. Point(s) chosen to demonstrate compliance with FMVSS No. 124 for single point disconnect and severance. See sketch below
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.

No.

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

No.

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

Sources of Throttle Return Energy:

1. Throttle Control Motor
2. Throttle Motor Return Springs:
   a. Inner Spring
   b. Outer Spring
3. Accelerator Pedal Return Springs:
   a. Inner Spring
   b. Outer Spring
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.

Fuel delivery rate is not used to demonstrate return to idle state.

11. Fuel rate signal output range at the idle state.

N/A

12. Is the ACS equipped with a limp home mode? If yes, provide operation description.

Yes. Upon disconnection or severance of any part of the ACS system the air throttle plate is returned to within $\pm 10^\circ$ of idle position. At the same time, the fuel delivery rate is deceased to slightly above the idle rate. "Service Engine Soon" light is turned on. Acceleration is poor.

13. Method by which the test laboratory can record engine RPM by connection to ECM, OBD connector, etc.

Install Nissan diagnostic equipment (Nissan Consult-3) into the OBD connector of a Nissan vehicle. Engine RPM can be monitored and recorded by Consult-3.