SAFETY COMPLIANCE TESTING FOR FMVSS 126
Electronic Stability Control Systems

Nissan Motor Co., Ltd.
2010 Nissan Altima
NHTSA No. CA5206

DYNAMIC RESEARCH, INC.
355 Van Ness Avenue, STE 200
Torrance, California 90501

March 24, 2010
Final Report
Prepared Under Contract No.: DTNH22-08-D-00098

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
1200 New Jersey Avenue, SE
West Building, 4th Floor (NVS-221)
Washington, DC 20590
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<td><strong>1.</strong> Report No.</td>
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<td><strong>3.</strong> Recipient’s Catalog No.</td>
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<td><strong>7.</strong> Author(s)</td>
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<tr>
<td>John F. Lenkeit, Technical Director</td>
<td>DRI-TM-10-02</td>
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<td>Brian Kebschull, Principal Engineer</td>
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<td><strong>10.</strong> Work Unit No.</td>
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<td>Dynamic Research, Inc.</td>
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<td><strong>16.</strong> Abstract</td>
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<td>A test was conducted on a 2010 Nissan Altima, NHTSA No. CA5206, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-126-02 for the determination of FMVSS 126 compliance. Test failures identified were as follows: None</td>
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<td>Compliance Testing</td>
<td>Copies of this report are available from:</td>
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<td>Safety Engineering</td>
<td>NHTSA Technical Information Services (TIS)</td>
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<td>FMVSS 126</td>
<td>(NPO 411)</td>
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<td>Washington, D.C. 20590</td>
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<td></td>
<td>Email: <a href="mailto:tis@nhtsa.dot.gov">tis@nhtsa.dot.gov</a></td>
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<td>FAX: (202) 493-2933</td>
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1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this test is to determine if the test vehicle, a 2010 Nissan Altima, meets the minimum equipment and performance requirements stated in Federal Motor Vehicle Safety Standard (FMVSS) 126, "Electronic Stability Control Systems."

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS

Testing of the 2010 Nissan Altima was conducted at Dynamic Research, Inc (DRI) in accordance with NHTSA TP-126-02, dated November 19, 2008.

The vehicle was inspected to ensure it was equipped with an ESC system that:

- Augments vehicle directional stability by applying and adjusting brake torques individually at each wheel to induce a correcting yaw moment to a vehicle;

- Is computer controlled with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer;

- Has a means to determine the vehicle’s yaw rate and to estimate its side slip or side slip derivative with respect to time;

- Has a means to monitor driver steering inputs;

- Has an algorithm to determine the need, and a means to modify engine torque, as necessary, to assist the driver in maintaining control of the vehicle; and

- Is operational over the full speed range of the vehicle (except at vehicle speeds less than 20 km/h (12.4 mph), when being driven in reverse, or during system initialization).

The vehicle was subjected to a 0.7 Hz sine with dwell steering maneuver to ensure that it would meet the stability and responsiveness requirements of the standard as follows:

- At 1.0 second after completion of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 35 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).
2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS (CONTINUED)

– At 1.75 seconds after completion of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 20 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).

– The lateral displacement of the vehicle center of gravity with respect to its initial straight path must be at least 1.83 m (6 feet) (for vehicles with a GVWR of 3,500kg (7,716 lb) or less) when computed 1.07 seconds after the Beginning of Steer (BOS) at the specified steering wheel angles.

System malfunction simulations were executed to verify vehicle could identify and indicate a malfunction.

The vehicle's ESC System appears to meet the performance and equipment requirements as required by FMVSS 126. The test results are summarized on the following summary sheet.
2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS (CONT'D)

Data Summary Sheet (Page 1 of 2)

Vehicle: 2010 Nissan Altima
NHTSA No. CA5206 VIN: 1N4AL2AP3AN403449
Vehicle Type: Passenger Car Manufacture Date: 9/09
Laboratory: Dynamic Research, Inc.

REQUIREMENTS: PASS/FAIL

ESC Equipment and Operational Characteristics (Data Sheet 2)
The vehicle is to be equipped with an ESC system that meets the equipment and operational characteristics requirements. (S126, S5.1, S5.6) PASS

ESC Malfunction Telltale (Data Sheet 3)
Vehicle is equipped with a telltale that indicates one or more ESC system malfunctions. (S126, S5.3) PASS

“ESC Off” and other System Controls and Telltale (Data Sheet 3, 4)
Vehicle is equipped with an ESC off telltale indicating the vehicle has been put into a mode that renders the ESC system unable to satisfy the performance requirements of the standard, if such a mode exists. (S5.5.1) PASS

If provided, off control and other system controls as well as the ESC off telltale meets the operational requirements (S126, S5.4, S5.4.1, S5.4.2, S5.5.4, and S5.5.9) PASS
2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS (CONT'D)

Data Summary Sheet (Page 2 of 2)

REQUIREMENTS: PASS/FAIL

Vehicle Lateral Stability (Data Sheet 8)
  Yaw Rate Ratio at 1 second after COS is less than 35% of peak value. (S126, S5.2.1)  PASS

  Yaw Rate Ratio at 1.75 seconds after COS is less than 20% of peak value. (S126, S5.2.2)  PASS

Vehicle Responsiveness (Data Sheet 8)
  Lateral displacement at 1.07 seconds after BOS is at least 1.83 m (6 feet) for vehicles with a GVWR of 3,500kg (7,716 lb) or less, and 1.52 m (5 feet) for vehicles with a GVWR greater than 3,500 Kg (7,716 lb). (S126, S5.2.3)  PASS

ESC Malfunction Warning (Data Sheet 9)
  Warning is provided to driver after malfunction occurrence. (S126. S5.3)  PASS

  Malfunction telltale stayed illuminated as long as malfunction existed and must extinguish after malfunction was corrected. (S126, S5.3.7)  PASS
3.0 TEST DATA

Data Sheet 1 (Page 1 of 2)
TEST VEHICLE INSPECTION AND TEST PREPARATION_

Vehicle: 2010 Nissan Altima Passenger Car
NHTSA No. CA5206 Data sheet completion 1/5/2010
VIN 1N4AL2AP3AN403449 Manufacture Date: 9/09
GVWR (kg): 1941 Front GAWR (kg): 1017 Rear GAWR (kg): 993
Seating Positions Front: 2 Mid: 2 Rear: 3
Odometer reading at time of inspection: 13 miles (20.8 km)

DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING:
Front Axle: P215/60 R16 Rear Axle: P215/60 R16

INSTALLED TIRE SIZE(S) ON VEHICLE (from tire sidewall)

<table>
<thead>
<tr>
<th></th>
<th>Front Axle</th>
<th>Rear Axle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tire Manufacturer</td>
<td>Continental</td>
<td>Continental</td>
</tr>
<tr>
<td>Tire Model</td>
<td>ContiProContact</td>
<td>ContiProContact</td>
</tr>
<tr>
<td>Tire Size</td>
<td>P215/60 R16</td>
<td>P215/60 R16</td>
</tr>
</tbody>
</table>

TIN Left Front: A3X8 3WH 3609 Right Front: A3X8 3WH 3609
Left Rear: A3X8 3WH 3609 Right Rear: A3X8 3WH 3609

Are installed tire sizes same as labeled tire sizes? Yes
If no, contact COTR for further guidance

DRIVE CONFIGURATION(S): (mark all that apply)

X Two Wheel Drive (2WD)  X Front Wheel Drive  Rear Wheel Drive

All Wheel Drive (AWD)

Four Wheel Drive Automatic - differential no locked full time (4WD Automatic)

Four Wheel Drive (High Gear Locked Differential 4WD HGLD)

Four Wheel Drive Low Gear (4WD Low)

Other (Describe)
3.0 TEST DATA (CONTD)

Data Sheet 1 (Page 2 of 2)
TEST VEHICLE INSPECTION AND TEST PREPARATION

DRIVE CONFIGURATIONS AND MODES: (ex. default, performance, off)
(For each of the vehicle's drive configurations identify available operating modes)

<table>
<thead>
<tr>
<th>Drive Configuration:</th>
<th>FWD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode:</td>
<td>Standard</td>
</tr>
<tr>
<td>Drive Configuration:</td>
<td></td>
</tr>
<tr>
<td>Mode:</td>
<td></td>
</tr>
<tr>
<td>Drive Configuration:</td>
<td></td>
</tr>
<tr>
<td>Mode:</td>
<td></td>
</tr>
</tbody>
</table>

VEHICLE STABILITY SYSTEMS (Check applicable technologies):

List other systems:

- ESC  
- Traction Control  
- Roll Stability Control  
- Active Suspension  
- Electronic Throttle Control  
- Active Steering  
- ABS

REMARKS:

RECORDED BY:  
P Broen  
DATE RECORDED:  
1/5/2010

APPROVED BY:  
J Lenkeit  
DATE APPROVED:  
1/12/2010
3.0 TEST DATA (CONTD)

Data Sheet 2 (Page 1 of 2)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

Vehicle: 2010 Nissan Altima Passenger Car

NHTSA No CA5206  Data Sheet Completion Date: 1/28/2010

ESC SYSTEM IDENTIFICATION
Manufacturer/Model Bosch ABS/TCS/VDC Unit Bosch ESP8

ESC SYSTEM HARDWARE (Check applicable hardware)

Electronic Control Unit  Hydraulie Control Unit
Wheel Speed Sensors  Steering Angle Sensor
Yaw Rate Sensor  Lateral Acceleration Sensor

List other Components: Stoplamp switch

ESC OPERATIONAL CHARACTERISTICS

System is capable of generating brake torque at each wheel
List and describe Components: ESC controller, master cylinder, individual wheel brake systems, hydraulic modulator,

System is capable of determining yaw rate
List and describe Components: Yaw rate sensor

System is capable of monitoring driver steering input
List and describe Components: Steer angle sensor

System is capable of estimating side slip or side slip derivative
List and describe Components: Observer module block of control system estimates side slip based on yaw rate, steer angle, vehicle speed, lateral acceleration and other vehicle conditions.
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

ESC OPERATIONAL CHARACTERISTICS (continued)

System is capable of modifying engine torque during ESC activation. 
Method used to modify torque: The engine controller module receives the engine torque command from the ESC controller unit and modifies the engine torque by varying the throttle opening and fuel delivery.

System is capable of activation at speeds of 20 km/h (12.4 mph) and higher

Speed system becomes active: 2.8 km/h

System is capable of activation during the following driving phases:
– acceleration
– braking
– coasting

Driving phases during which ESC is capable of activation:
ESC is capable of activation under most critical conditions in the forward driving direction - at full (ABS-control) and partial braking, coasting, drive and acceleration (including TCS), engine drag, gear shift and transients from drive to drag

Vehicle manufacturer submitted documentation explaining how the ESC mitigates understeer

DATA INDICATES COMPLIANCE:

REMARKS:

RECORDED BY: J Lenkeit DATE RECORDED: 1/28/2010
APPROVED BY: B Kebschull DATE APPROVED: 1/28/2010
3.0 TEST DATA (CONT'D)

Data Sheet 3 (Page 1 of 2)
ESC MALFUNCTION AND OFF TELLTALES

Vehicle: 2010 Nissan Altima Passenger Car
NHTSA No. CA5206 Data sheet completion date: 1/5/2010

ESC Malfunction Telltale

Vehicle is equipped with malfunction telltale? Yes
Telltale Location: Inside tachometer on left side of instrument cluster (See Figure 5.6)
Telltale Color: Amber

Telltale symbol or abbreviation used

X

Vehicle uses this symbol
Vehicle uses this abbreviation
Neither symbol or abbreviation is used

If different than identified above, make note of any message, symbol or abbreviation used.

"VDC OFF" "SLIP"; both are continuously illuminated to indicate failure

Is telltale part of a common space? No
Is telltale also used to indicate activation of the ESC system? Yes

If yes explain telltale operation during ESC activation:

"SLIP" indicator blinks
3.0 TEST DATA (CONT'D)

Data Sheet 3 (Page 2 of 2)
ESC MALFUNCTION AND OFF TELLTALES

"ESC OFF" Telltale (if provided)

Vehicle is equipped with "ESC OFF" telltale? Yes

Is "ESC Off" telltale combined with "ESC Malfunction" telltale utilizing a two part telltale? No

Telltale Location: Inside tachometer on left side of instrument cluster (See Figure 5.6)

Telltale Color: Amber

Telltale symbol or abbreviation used

![Car Icon] or ESC OFF

☑️ Vehicle uses this symbol
☑️ Vehicle uses this abbreviation
☒ Neither symbol or abbreviation is used

If different than identified above, make note of any message, symbol or abbreviation used. "VDC OFF"; amber color

Is telltale part of a common space? No

DATA INDICATES COMPLIANCE

(Vehicle is compliant if equipped with a malfunction telltale)

Remarks:

RECORDED BY: P Broen DATE RECORDED: 1/5/2010
APPROVED BY: B Kebschull DATE APPROVED: 1/6/2010
3.0 TEST DATA (CONTD)

Data Sheet 4 (Page 1 of 3)
ESC AND ANCILLARY SYSTEM CONTROLS

Vehicle: 2010 Nissan Altima Passenger Car
NHTSA No. CA5206 Data sheet completion date: 1/6/2010

"ESC OFF" Controls Identification and Operational Check:

Is the vehicle equipped with a control or controls whose purpose is to deactivate the ESC system or place the ESC system in a mode or modes that may no longer satisfy the performance requirements of the standard?  **X** Yes  ____ No

Type of control or controls provided?
- **X** Dedicated “ESC Off” Control
- [] Multi-functional control with an “ESC Off” mode
- [] Other (describe)

Identify each control location, labeling and selectable modes.

First Control: Location: **On dashboard, left of steering wheel (Figure 5.7)**
Labeling: VDC OFF
Modes: ESC off/on

Second Control: Location: __________________________________________
Labeling: __________________________________________
Modes: __________________________________________

Identify standard or default drive configuration **FWD Standard**
Verify standard or default drive configuration selected  **X** Yes  ____ No

Does the “ESC Off” telltale illuminate upon activation of the dedicated ESC off control or selection of the “ESC Off” mode on the multi-function control?  **X** Yes  ____ No (Fail)

Does the “ESC Off” telltale extinguish when the ignition is cycled from “on” (“Run”) to “Lock” or “Off” and then back again to the “On” (“Run”) position?  **X** Yes  ____ No (Fail)

If no, describe how the “Off” control functions
3.0 TEST DATA (CONTD)

Data Sheet 4 (Page 2 of 3)
ESC AND ANCILLARY SYSTEM CONTROLS

If a multi-function control is provided, cycle through each mode setting on the control and record which modes illuminate the “ESC Off” telltale. Also, for those modes that illuminate the ESC Off” telltale identify if the telltale extinguishes upon cycling the ignition system.

<table>
<thead>
<tr>
<th>Control Mode</th>
<th>&quot;ESC Off&quot; telltale illuminates upon activation of control? (Yes/No)</th>
<th>&quot;ESC Off&quot; telltale extinguishes upon cycling ignition? (Yes/No)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCS off (ESC on)</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>ESC and TCS off</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

For each mode that illuminates the “ESC Off” telltale, did the telltale extinguish when the ignition was cycled from “On” (“Run”) to “Lock” or “Off” and then back again to the “On” (“Run”) position?

X Yes  No

Other System Controls that have an ancillary effect on ESC Operation:
Is the vehicle equipped with any ancillary controls that upon activation may deactivate the ESC system or place the ESC system in a mode or modes that may no longer satisfy the performance requirements of the standard?

Yes  No

Ancillary Control: System __________________________________________
Control Description __________________________________________
Labeling __________________________________________

Ancillary Control: System __________________________________________
Control Description __________________________________________
Labeling __________________________________________

Ancillary Control: System __________________________________________
Control Description __________________________________________
Labeling __________________________________________
3.0 TEST DATA (CONTD)

Data Sheet 4 (Page 3 of 3)
ESC AND ANCILLARY SYSTEM CONTROLS

Activate each control listed above and record whether the control illuminates the "ESC Off" telltale. Also, record warnings or messages provided regarding the ESC system.

<table>
<thead>
<tr>
<th>Ancillary Control</th>
<th>Control Activates “ESC Off” Telltale? (Yes/No)</th>
<th>Warnings or Messages Provided</th>
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</thead>
<tbody>
<tr>
<td>None</td>
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</tbody>
</table>

For those controls that illuminate the “ESC Off” telltale above identify if the “ESC Off” telltale extinguishes upon cycling the ignition system.

<table>
<thead>
<tr>
<th>Ancillary Control</th>
<th>“ESC Off” telltale extinguishes upon cycling ignition? (Yes/No)</th>
</tr>
</thead>
</table>

For each control that illuminates the “ESC Off” telltale, did the telltale extinguish when the ignition is cycled from “On” (“Run”) to “Lock” or “Off” and then back again to the “On” (“Run”) position? If activating the control places the vehicle into a low-range four-wheel drive configuration designed for low-speed, off-road driving, the ESC system may remain turned off after the ignition has been cycled off and then back on and therefore the “ESC Off” telltale may not extinguish.

DATA INDICATES COMPLIANCE: PASS

Remarks:

______________________________

RECORDED BY: B Kebschull   DATE RECORDED: 1/6/2010
APPROVED BY: J Lenkeit      DATE APPROVED: 1/10/2009
3.0 TEST DATA (CONTD)

Data Sheet 5 (Page 1 of 3)
TEST TRACK AND VEHICLE DATA

Vehicle: 2010 Nissan Altima Passenger Car
NHTSA No. CA5206   Data sheet completion date: 1/6/2010

Test Track Requirements:  
Test surface slope (0-1%): 0.5%  
Peak Friction Coefficient (at least 0.9) 0.96  
Test track data meets requirements: Yes  If no, explain:

Full Fluid Levels:  
Fuel Yes    Other Yes  
Coolant Yes    (specify) washer, power steering, brakes

Tire Pressures:  
Required; Front Axle 220 KPA   Rear Axle 220 KPA  
Actual; LF 220 KPA   RF 220 KPA  
LR 220 KPA   RR 220 KPA

Vehicle Dimensions:  
Front Track Width 154.9 cm   Wheelbase 267.5 cm  
Rear Track Width 155.4 cm

Vehicle Weight Ratings:  
GAWR Front 1017 KG   GAWR Rear 993 KG

Unloaded Vehicle Weight (UVW):  
Front axle 862.7 KG   Left Front 438.1 KG   Right Front 424.6 KG  
Rear axle 577.9 KG   Left Rear 291.7 KG   Right Rear 286.2 KG

Total UVW 1440.6 KG

Baseline Weight and Outrigger Selection (only for MPVs, Trucks, Buses)  
Calculated baseline weight (UVW + 73kg) 1513.6 KG

Outrigger size required ("Standard" or "Heavy") none

Standard - Baseline weight under 2772 kg (6000 lb)  
Heavy - Baseline weight equal to or greater than 2772 kg (6000 lb)
3.0 TEST DATA (CONTD)

Data Sheet 5 (Page 2 of 3)
TEST TRACK AND VEHICLE DATA

UVW with Outriggers: (only for MPVs, Trucks, Buses)

<table>
<thead>
<tr>
<th>Axle</th>
<th>Front</th>
<th>Left Front</th>
<th>Right Front</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Total UVW with outriggers = \(N/A\) KG

Loaded Vehicle Weight w/Driver and Instrumentation (no Ballast)

<table>
<thead>
<tr>
<th>Axle</th>
<th>Front</th>
<th>Left Front</th>
<th>Right Front</th>
</tr>
</thead>
<tbody>
<tr>
<td>938.3 KG</td>
<td>483</td>
<td>455.3 KG</td>
<td></td>
</tr>
<tr>
<td>650.8 KG</td>
<td>335.6</td>
<td>315.2 KG</td>
<td></td>
</tr>
</tbody>
</table>

Vehicle Weight = 1589.1 KG

Ballast Required = 

\[
\begin{array}{c}
\text{[Total UVW with Outriggers (if applicable)]} \\
+ 168 \text{ KG} \\
- \text{[Loaded Weight w/Driver and Instrumentation]} \end{array}
\]

\[
= 1440.6 \text{ KG} + 168 \text{ KG} - 1589.1 \text{ KG}
\]

= 19.5 KG

Total Loaded Vehicle Weight w/Driver and Instrumentation and Ballast

<table>
<thead>
<tr>
<th>Axle</th>
<th>Front</th>
<th>Left Front</th>
<th>Right Front</th>
</tr>
</thead>
<tbody>
<tr>
<td>946.9 KG</td>
<td>483.4 KG</td>
<td>463.5 KG</td>
<td>662.1 KG</td>
</tr>
<tr>
<td>946.9 KG</td>
<td>483.4 KG</td>
<td>463.5 KG</td>
<td>1609.0 KG</td>
</tr>
</tbody>
</table>

Total UVW = 1609.0 KG
3.0 TEST DATA (CONTD)

Data Sheet 5 (Page 3 of 3)
TEST TRACK AND VEHICLE DATA

Center of Gravity and Inertial Sensing System Location at Loaded Vehicle Condition:

x-distance (longitudinal)  Point of reference is the front axle centerline.  
(Positive from front axle toward rear of vehicle.)
y-distance (lateral)  Point of reference is the vehicle centerline.  
(Positive from the center toward the right.)
z-distance (vertical)  Point of reference is the ground plane.  
(Positive from the ground up.)

Locations:

<table>
<thead>
<tr>
<th></th>
<th>Center of Gravity</th>
<th>Inertial Sensing System</th>
</tr>
</thead>
<tbody>
<tr>
<td>x-distance</td>
<td>43.3 in 110.1 cm</td>
<td>66.9 in 170.0 cm</td>
</tr>
<tr>
<td>y-distance</td>
<td>-0.7 in -1.7 cm</td>
<td>-0.6 in -1.5 cm</td>
</tr>
<tr>
<td>z-distance</td>
<td>21.9 in 55.5 cm</td>
<td>17.0 in 43.1 cm</td>
</tr>
<tr>
<td>Roof Height</td>
<td>57.52 in 146.1 cm</td>
<td></td>
</tr>
<tr>
<td>Distance between ultrasonic sensors</td>
<td>87.8 in 223.0 cm</td>
<td></td>
</tr>
</tbody>
</table>

Remarks:

______________________________________________________________________________

RECORDED BY: B Kebschull DATE RECORDERD: 1/6/2010
APPROVED BY: J Lenkeit DATE APPROVED: 1/10/2011
### 3.0 TEST DATA (CONTD)

**Data Sheet 6 (Page 1 of 3)**  
**BRAKE AND TIRE CONDITIONING**

Vehicle: *2010 Nissan Altima Passenger Car*  
NHTSA No. *CA5206*

<table>
<thead>
<tr>
<th>Measured tire pressure:</th>
<th>LF 220 KPA</th>
<th>RF 220 KPA</th>
<th>LR 220 KPA</th>
<th>RR 220 KPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Speed</td>
<td>1.5 m/s</td>
<td>(10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ambient Temperature (7°C (45°F) - 40°C (104°F))  
7.1 °C

Brake Conditioning  
Time: *8:40:00 AM*  
Date: *1/6/2010*

56 km/h (35 mph) Brake Stops

- Number of stops executed (10 required)  
  - 10 Stops
- Observed deceleration rate range (.5g target)  
  - 0.45 - 0.55 g

72 km/h (45 mph) Brake Stops

- Number of stops executed (3 required)  
  - 3 Stops
- Number of stops ABS activated (3 required)  
  - 3 Stops
- Observed deceleration rate range  
  - 0.9 - 0.095 g

72 km/h (45 mph) Brake Cool Down Period

- Duration of cool down period (5 minutes min.)  
  - 5 Minutes
### 3.0 TEST DATA (CONTD)

**Data Sheet 6 (Page 2 of 3)**

**BRAKE AND TIRE CONDITIONING**

---

**Tire Conditioning series No. 1**

- **Time:** 8:55:00 AM
- **Date:** 1/6/2010

**Measured cold tire pressure**

- **LF:** 235 KPA
- **RF:** 241 KPA
- **LR:** 230 KPA
- **RR:** 230 KPA

**Wind Speed:** 1.9 m/s

(10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)

**Ambient Temperature (7°C (45°F) - 40°C (104°F))**

**7.2°C**

---

#### 30 meter (100 ft) Diameter Circle Maneuver

<table>
<thead>
<tr>
<th>Test Run</th>
<th>Steering Direction</th>
<th>Target Lateral Acceleration (g)</th>
<th>Observed Lateral Acceleration (g)</th>
<th>Observed Vehicle Speed (Km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>Clockwise</td>
<td>0.5 – 0.6</td>
<td>0.5 - 0.6</td>
<td>32.8 - 33.6</td>
</tr>
<tr>
<td>4-6</td>
<td>Counterclockwise</td>
<td>0.5 – 0.6</td>
<td>0.5 - 0.6</td>
<td>32 - 33.6</td>
</tr>
</tbody>
</table>

#### 5-1 Hz Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle for 0.5-0.6 g Lateral Acceleration

<table>
<thead>
<tr>
<th>Test Run</th>
<th>Data File</th>
<th>Vehicle Speed Km/h(mph)</th>
<th>Steering Wheel Angle (degrees)</th>
<th>Target Peak Lateral Acceleration (g)</th>
<th>Observed Peak Lateral Acceleration (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>56 ± 2 (35 ± 1)</td>
<td>60</td>
<td>0.5 - 0.6</td>
<td>0.41</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>56 ± 2 (35 ± 1)</td>
<td>80</td>
<td>0.5 - 0.6</td>
<td>0.54</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>56 ± 2 (35 ± 1)</td>
<td></td>
<td>0.5 - 0.6</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>56 ± 2 (35 ± 1)</td>
<td></td>
<td>0.5 - 0.6</td>
<td></td>
</tr>
</tbody>
</table>

**Steering wheel angle that corresponds to a peak 0.5-0.6 g lateral acceleration:** 80 degrees

#### 10-1 Hz Cycle Sinusoidal Steering Maneuver

<table>
<thead>
<tr>
<th>Test Run</th>
<th>Data File</th>
<th>Vehicle Speed Km/h(mph)</th>
<th>Steering Wheel Angle (degrees)</th>
<th>Target Peak Lateral Acceleration (g)</th>
<th>Observed Peak Lateral Acceleration (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>4-6</td>
<td>56 ± 2 (35 ± 1)</td>
<td>80 (cycles 1-10)</td>
<td>0.5 - 0.6</td>
<td>0.54</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>56 ± 2 (35 ± 1)</td>
<td>80 (cycles 1-9)</td>
<td>0.5 - 0.6</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>160 (cycle10)*</td>
<td>NA</td>
<td>0.85</td>
</tr>
</tbody>
</table>

* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.
3.0 TEST DATA (CONTD)

Data Sheet 6 (Page 3 of 3)
BRAKE AND TIRE CONDITIONING

Tire Conditioning series No. 2

<table>
<thead>
<tr>
<th>Measured cold tire pressure</th>
<th>Time: 11:22:00 AM</th>
<th>Date: 1/6/2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>LF 236 KPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF 243 KPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LR 230 KPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR 229 KPA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Wind Speed 0.5 m/s

Ambient Temperature (7°C (45°F) - 40°C (104°F)) 7.9 °C

30 meter (100 ft) Diameter Circle Maneuver

<table>
<thead>
<tr>
<th>Test Run</th>
<th>Steering Direction</th>
<th>Target Lateral Acceleration (g)</th>
<th>Observed Lateral Acceleration (g)</th>
<th>Observed Vehicle Speed (Km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>Clockwise</td>
<td>0.5 - 0.6</td>
<td>0.5 - 0.6</td>
<td>32.8 - 33.6</td>
</tr>
<tr>
<td>4-6</td>
<td>Counterclockwise</td>
<td>0.5 - 0.6</td>
<td>0.5 - 0.6</td>
<td>32.8 - 33.6</td>
</tr>
</tbody>
</table>

Steering wheel angle that corresponds to a peak 0.5-0.6 g lateral acceleration: 80 Degrees

10-1 Hz Cycle Sinusoidal Steering Maneuver

<table>
<thead>
<tr>
<th>Test Run</th>
<th>Data File</th>
<th>Vehicle Speed Km/h (mph)</th>
<th>Steering Wheel Angle (degrees)</th>
<th>Target Peak Lateral Acceleration (g)</th>
<th>Observed Peak Lateral Acceleration (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>17-19</td>
<td>56 ± 2 (35 ± 1)</td>
<td>80 (cycles 1-10)</td>
<td>0.5 - 0.6</td>
<td>0.54</td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>56 ± 2 (35 ± 1)</td>
<td>80 (cycles 1-9)</td>
<td>0.5 - 0.6</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>160 (cycle 10)*</td>
<td>NA</td>
<td>0.85</td>
</tr>
</tbody>
</table>

* The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9

Remarks:

RECORDED BY: B. Kebschull DATE RECORDED: 1/6/2010
APPROVED BY: J Lenkeit DATE APPROVED: 1/10/2010
### 3.0 TEST DATA (CONT'D)

**Data Sheet 7 (Page 1 of 2)**

**SLOWLY INCREASING STEER (SIS) MANEUVER**

Vehicle: _2010 Nissan Altima Passenger Car_

NHTSA No. _CA5206_

Measured tire pressure: 

<table>
<thead>
<tr>
<th></th>
<th>LF</th>
<th>KPA</th>
<th>RF</th>
<th>KPA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>234</td>
<td>KPA</td>
<td>239</td>
<td>KPA</td>
</tr>
<tr>
<td></td>
<td>227</td>
<td>KPA</td>
<td>226</td>
<td>KPA</td>
</tr>
</tbody>
</table>

Wind Speed: _0.6_ m/s

(10 m/sec (22 mph) max for passenger cars; 5m/sec (11 mph) max for MPVs and trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) _7.2_ °C

Selected drive configuration _FWD_

Selected Mode: _Normal_

**Preliminary Left Steer Maneuver:**

Lateral Acceleration measured at 30 degrees steering wheel angle

\[ a_{y,30\text{degrees}} = 0.3 \text{ g} \]

Assuming a linear relationship the following ratio should be used to calculate the steering wheel angle at 0.55g:

\[ \frac{30\text{ degrees}}{a_{y,30\text{degrees}}} = \frac{\delta_{\text{SIS}}}{0.55 \text{ g}} \]

\[ \delta_{\text{SIS}} = 55.0 \text{ degrees (@0.55g)} \]

\[ \delta_{\text{SIS}} = 60 \text{ degrees (rounded)} \]

**Steering Wheel Angle at Corrected 0.3g Lateral Acceleration:**

<table>
<thead>
<tr>
<th>Maneuver</th>
<th>Initial Steer Direction</th>
<th>Time Clock (5 min max between runs)</th>
<th>Steering Wheel Angle to nearest 0.1° (degrees)</th>
<th>Data Run</th>
<th>Good/NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Left</td>
<td>9:57:00 AM</td>
<td>-30.1</td>
<td>9</td>
<td>Good</td>
</tr>
<tr>
<td>2</td>
<td>Left</td>
<td>10:02:00 AM</td>
<td>-29.2</td>
<td>10</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Left</td>
<td>10:06:00 AM</td>
<td>-30.9</td>
<td>11</td>
<td>Good</td>
</tr>
<tr>
<td>4</td>
<td>Left</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Left</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Right</td>
<td>10:11:00 AM</td>
<td>30.0</td>
<td>12</td>
<td>Good</td>
</tr>
<tr>
<td>2</td>
<td>Right</td>
<td>10:16:00 AM</td>
<td>29.6</td>
<td>13</td>
<td>Good</td>
</tr>
<tr>
<td>3</td>
<td>Right</td>
<td>10:21:00 AM</td>
<td></td>
<td>14</td>
<td>NG</td>
</tr>
<tr>
<td>4</td>
<td>Right</td>
<td>11:04:00 AM</td>
<td>29.9</td>
<td>16</td>
<td>Good</td>
</tr>
<tr>
<td>5</td>
<td>Right</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.0 TEST DATA (CONTD)

Data Sheet 7 (Page 2 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER

Average Overall Steering Wheel Angle:

\[
\delta_{0.3 \text{ g, overall}} = \left( \left| \delta_{0.3 \text{ g, left (1)}} \right| + \left| \delta_{0.3 \text{ g, left (2)}} \right| + \left| \delta_{0.3 \text{ g, left (3)}} \right| + \delta_{0.3 \text{ g, right (1)}} + \delta_{0.3 \text{ g, right (2)}} + \delta_{0.3 \text{ g, right (3)}} \right) / 6
\]

\[
\delta_{0.3 \text{ g, overall}} = 29.9 \text{ degrees}
\]

[to nearest 0.1 degree]

Remarks:

RECORDED BY:  B Kebschull  DATE RECORDED:  1/6/2010
APPROVED BY:  J Lenkeit  DATE APPROVED:  1/10/2010
### Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction

<table>
<thead>
<tr>
<th>Maneuver #</th>
<th>Clock Time</th>
<th>Commanded Steering Wheel Angle¹</th>
<th>Yaw Rates (degrees/sec)</th>
<th>YRR at 1.0 sec after COS [&lt; 35%]</th>
<th>YRR at 1.75 sec after COS [&lt; 20%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11:42 AM</td>
<td>1.5</td>
<td>12.6</td>
<td>-0.2</td>
<td>-1.3</td>
</tr>
<tr>
<td>2</td>
<td>11:47 AM</td>
<td>2.0</td>
<td>16.2</td>
<td>-0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>3</td>
<td>11:51 AM</td>
<td>2.5</td>
<td>19.8</td>
<td>-0.2</td>
<td>-0.2</td>
</tr>
<tr>
<td>4</td>
<td>11:54 AM</td>
<td>3.0</td>
<td>23.6</td>
<td>-0.2</td>
<td>-0.2</td>
</tr>
<tr>
<td>5</td>
<td>11:57 AM</td>
<td>3.5</td>
<td>26.5</td>
<td>-0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>6</td>
<td>12:00 PM</td>
<td>4.0</td>
<td>29.6</td>
<td>-0.3</td>
<td>-0.1</td>
</tr>
<tr>
<td>7</td>
<td>12:04 PM</td>
<td>4.5</td>
<td>33.4</td>
<td>-0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>8</td>
<td>12:06 PM</td>
<td>5.0</td>
<td>37.0</td>
<td>-0.3</td>
<td>0.0</td>
</tr>
<tr>
<td>9</td>
<td>12:09 PM</td>
<td>5.5</td>
<td>39.3</td>
<td>-0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>10</td>
<td>12:12 PM</td>
<td>6.0</td>
<td>42.6</td>
<td>0.4</td>
<td>-0.1</td>
</tr>
<tr>
<td>11</td>
<td>12:15 PM</td>
<td>6.5</td>
<td>44.4</td>
<td>0.4</td>
<td>-0.6</td>
</tr>
<tr>
<td>12</td>
<td>12:18 PM</td>
<td>7.0</td>
<td>47.3</td>
<td>0.8</td>
<td>0.0</td>
</tr>
<tr>
<td>13</td>
<td>12:21 PM</td>
<td>7.5</td>
<td>48.6</td>
<td>0.4</td>
<td>-0.2</td>
</tr>
<tr>
<td>14</td>
<td>12:25 PM</td>
<td>8.0</td>
<td>49.3</td>
<td>0.7</td>
<td>-0.3</td>
</tr>
<tr>
<td>15</td>
<td>12:28 PM</td>
<td>8.5</td>
<td>52.8</td>
<td>3.0</td>
<td>-0.1</td>
</tr>
<tr>
<td>16</td>
<td>12:32 PM</td>
<td>9.0</td>
<td>52.7</td>
<td>1.0</td>
<td>-0.1</td>
</tr>
<tr>
<td>17</td>
<td>12:36 PM</td>
<td>270.0</td>
<td>55.2</td>
<td>1.0</td>
<td>-0.3</td>
</tr>
</tbody>
</table>

1. Maneuver execution should continue until a steering wheel angle magnitude factor of 6.5°δ0.3 g, overall or 270 degrees is utilized, whichever is greater provided the calculated magnitude of 6.5°δ0.3 g, overall is less than or equal to 300 degrees. If 6.5°δ0.3 g, overall is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of 0.5°δ0.3 g, overall without exceeding the 270 degree steering wheel angle.
### 3.0 TEST DATA (CONTD)

**DATA SHEET 8 (2 of 3)**

**VEHICLE LATERAL STABILITY AND RESPONSIVENESS**

---

**LATERAL STABILITY TEST SERIES NO. 2 – Clockwise Initial Steer Direction**

<table>
<thead>
<tr>
<th>Maneuver #</th>
<th>Clock Time</th>
<th>Commanded Steering Wheel Angle¹</th>
<th>Yaw Rates (degrees/sec)</th>
<th>YRR at 1.0 sec after COS [&lt; 35%] % Pass/Fail</th>
<th>YRR at 1.75 sec after COS [&lt; 20%] % Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Scalar (* (\delta_{0.3g}))</td>
<td>(\dot{\psi}_{\text{Peak}})</td>
<td>(\dot{\psi}_{1.0\text{sec}})</td>
<td>(\dot{\psi}_{1.75\text{sec}})</td>
</tr>
<tr>
<td>1</td>
<td>12:40 PM</td>
<td>1.5</td>
<td>44.9</td>
<td>-12.2</td>
<td>0.1</td>
</tr>
<tr>
<td>2</td>
<td>12:46 PM</td>
<td>2.0</td>
<td>59.8</td>
<td>-16.4</td>
<td>0.0</td>
</tr>
<tr>
<td>3</td>
<td>12:50 PM</td>
<td>2.5</td>
<td>74.8</td>
<td>-20.3</td>
<td>0.2</td>
</tr>
<tr>
<td>4</td>
<td>12:52 PM</td>
<td>3.0</td>
<td>89.7</td>
<td>-24.6</td>
<td>0.2</td>
</tr>
<tr>
<td>5</td>
<td>12:55 PM</td>
<td>3.5</td>
<td>104.7</td>
<td>-28.8</td>
<td>0.2</td>
</tr>
<tr>
<td>6</td>
<td>12:59 PM</td>
<td>4.0</td>
<td>119.6</td>
<td>-30.9</td>
<td>0.2</td>
</tr>
<tr>
<td>7</td>
<td>1:02 PM</td>
<td>4.5</td>
<td>134.6</td>
<td>-35.6</td>
<td>0.2</td>
</tr>
<tr>
<td>8</td>
<td>1:05 PM</td>
<td>5.0</td>
<td>149.5</td>
<td>-38.0</td>
<td>0.1</td>
</tr>
<tr>
<td>9</td>
<td>1:08 PM</td>
<td>5.5</td>
<td>164.5</td>
<td>-42.7</td>
<td>0.2</td>
</tr>
<tr>
<td>10</td>
<td>1:11 PM</td>
<td>6.0</td>
<td>179.4</td>
<td>-46.4</td>
<td>0.4</td>
</tr>
<tr>
<td>11</td>
<td>1:14 PM</td>
<td>6.5</td>
<td>194.4</td>
<td>-48.1</td>
<td>0.0</td>
</tr>
<tr>
<td>12</td>
<td>1:18 PM</td>
<td>7.0</td>
<td>209.3</td>
<td>-51.5</td>
<td>-0.4</td>
</tr>
<tr>
<td>13</td>
<td>1:21 PM</td>
<td>7.5</td>
<td>224.3</td>
<td>-52.6</td>
<td>0.1</td>
</tr>
<tr>
<td>14</td>
<td>2:24 PM</td>
<td>8.0</td>
<td>239.2</td>
<td>-54.6</td>
<td>-0.1</td>
</tr>
<tr>
<td>15</td>
<td>2:27 PM</td>
<td>8.5</td>
<td>254.2</td>
<td>-55.9</td>
<td>0.1</td>
</tr>
<tr>
<td>16</td>
<td>2:30 PM</td>
<td>9.0</td>
<td>269.1</td>
<td>-57.0</td>
<td>0.1</td>
</tr>
<tr>
<td>17</td>
<td>2:33 PM</td>
<td>-</td>
<td>270.0</td>
<td>-56.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

1. Maneuver execution should continue until a steering wheel angle magnitude factor of 6.5 * \(\delta_{0.3g}\) overall or 270 degrees is utilized, whichever is greater provided the calculated 6.5 * \(\delta_{0.3g}\) overall is less than or equal to 300 degrees. If 6.5 * \(\delta_{0.3g}\) overall is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of 0.5 * \(\delta_{0.3g}\) overall without exceeding the 270 degree steering wheel angle.

During execution of the sine with dwell maneuvers were any of the following events observed?

- Rim-to-pavement contact
  - Yes [X] No
- Tire debeading
  - Yes [X] No
- Loss of pavement contact of vehicle tires
  - Yes [X] No
- Did the test driver experience any vehicle loss of control or spinout?
  - Yes [X] No

If “Yes” explain the event and consult with the COTR.
### Responsiveness – Lateral Displacement

<table>
<thead>
<tr>
<th>Maneuver #</th>
<th>Initial Steer Direction</th>
<th>Commanded Steering Wheel Angle (5.0^\circ, 0.3 g) or greater</th>
<th>Calculated Lateral Displacement¹</th>
<th>Distance (m)</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Counter Clockwise</td>
<td>5.0 149.5</td>
<td></td>
<td>-3.1</td>
<td>PASS</td>
</tr>
<tr>
<td>9</td>
<td>Counter Clockwise</td>
<td>5.5 164.5</td>
<td></td>
<td>-3.1</td>
<td>PASS</td>
</tr>
<tr>
<td>10</td>
<td>Counter Clockwise</td>
<td>6.0 179.4</td>
<td></td>
<td>-3.3</td>
<td>PASS</td>
</tr>
<tr>
<td>11</td>
<td>Counter Clockwise</td>
<td>6.5 194.4</td>
<td></td>
<td>-3.3</td>
<td>PASS</td>
</tr>
<tr>
<td>12</td>
<td>Counter Clockwise</td>
<td>7.0 209.3</td>
<td></td>
<td>-3.3</td>
<td>PASS</td>
</tr>
<tr>
<td>13</td>
<td>Counter Clockwise</td>
<td>7.5 224.3</td>
<td></td>
<td>-3.4</td>
<td>PASS</td>
</tr>
<tr>
<td>14</td>
<td>Counter Clockwise</td>
<td>8.0 239.2</td>
<td></td>
<td>-3.4</td>
<td>PASS</td>
</tr>
<tr>
<td>15</td>
<td>Counter Clockwise</td>
<td>8.5 254.2</td>
<td></td>
<td>-3.4</td>
<td>PASS</td>
</tr>
<tr>
<td>16</td>
<td>Counter Clockwise</td>
<td>9.0 269.1</td>
<td></td>
<td>-3.4</td>
<td>PASS</td>
</tr>
<tr>
<td>17</td>
<td>Counter Clockwise</td>
<td>- 270.0</td>
<td></td>
<td>-3.4</td>
<td>PASS</td>
</tr>
<tr>
<td>25</td>
<td>Clockwise</td>
<td>5.0 149.5</td>
<td></td>
<td>3.0</td>
<td>PASS</td>
</tr>
<tr>
<td>26</td>
<td>Clockwise</td>
<td>5.5 164.5</td>
<td></td>
<td>3.1</td>
<td>PASS</td>
</tr>
<tr>
<td>27</td>
<td>Clockwise</td>
<td>6.0 179.4</td>
<td></td>
<td>3.1</td>
<td>PASS</td>
</tr>
<tr>
<td>28</td>
<td>Clockwise</td>
<td>6.5 194.4</td>
<td></td>
<td>3.2</td>
<td>PASS</td>
</tr>
<tr>
<td>29</td>
<td>Clockwise</td>
<td>7.0 209.3</td>
<td></td>
<td>3.3</td>
<td>PASS</td>
</tr>
<tr>
<td>30</td>
<td>Clockwise</td>
<td>7.5 224.3</td>
<td></td>
<td>3.3</td>
<td>PASS</td>
</tr>
<tr>
<td>31</td>
<td>Clockwise</td>
<td>8.0 239.2</td>
<td></td>
<td>3.3</td>
<td>PASS</td>
</tr>
<tr>
<td>32</td>
<td>Clockwise</td>
<td>8.5 254.2</td>
<td></td>
<td>3.3</td>
<td>PASS</td>
</tr>
<tr>
<td>33</td>
<td>Clockwise</td>
<td>9.0 269.1</td>
<td></td>
<td>3.4</td>
<td>PASS</td>
</tr>
<tr>
<td>34</td>
<td>Clockwise</td>
<td>- 270.0</td>
<td></td>
<td>3.4</td>
<td>PASS</td>
</tr>
</tbody>
</table>

1. Lateral displacement should be \(\geq 1.83\) m (6 ft) for vehicle with a GVWR of 3,500 kg (7,716 lb) or less; and \(\geq 1.52\) m (5 ft) for vehicles with GVWR greater than 3,500 kg (7,716 lb).

DATA INDICATES COMPLIANCE: ☑ PASS ☐ FAIL

Remarks:

---

RECORDED BY: B Kebschull
APPROVED BY: J Lenkeit
DATE RECORDED: 1/6/2010
DATE APPROVED: 1/10/2010
3.0 TEST DATA (CONTD)

Data Sheet 9 (Page 1 of 2)
MALFUNCTION WARNING TESTS

Vehicle: 2010 Nissan Altima Passenger Car:
NHTSA No. CA5206

Data Sheet Completion Date: 1/6/2010

TEST 1

MALFUNCTION SIMULATION: Describe method of malfunction simulation

Disconnected steering angle sensor

MALFUNCTION TELLTALE ILLUMINATION:

Telltale illuminates and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes as specified in section 13.12.B.

X Yes □ No

Time for telltale to illuminate after ignition system is activated and vehicle speed of $48 \pm 8 \text{ km/h}$ ($30 \pm 5 \text{ mph}$) is reached.

0 Seconds (must be within 2 minutes)

X Pass □ Fail

ESC SYSTEM RESTORATION

Telltale extinguishes after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes as specified in section 13.12.B

X Yes □ No

Time for telltale to extinguish after ignition system is activated and vehicle speed of $48 \pm 8 \text{ km/h}$ ($30 \pm 5 \text{ mph}$) is reached.

0 Seconds (must be within 2 minutes)

X Pass □ Fail

TEST 1 DATA INDICATES COMPLIANCE: PASS

Remarks: Both "VDF OFF" and "SLIP" telltales illuminate immediately after malfunction is simulated and ignition is activated.

After system is restored, both telltales extinguish immediately when ignition is activated

RECORDED BY: B Kebschull DATE RECORDED: 1/6/2010

APPROVED BY: J Lenkeit DATE APPROVED 1/10/2010
3.0 TEST DATA (CONTD)

Data Sheet 9 (Page 2 of 2)
MALFUNCTION WARNING TESTS

Vehicle: 2010 Nissan Altima Passenger Car:
NHTSA No. CA5206 Data Sheet Completion Date: 1/6/2010

TEST 2

MALFUNCTION SIMULATION: Describe method of malfunction simulation

Disconnected LF wheel speed sensor

MALFUNCTION TELLTALE ILLUMINATION:
Telltales illuminate and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes as specified in section 13.12.B.

<table>
<thead>
<tr>
<th>X</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

Time for telltale to illuminate after ignition system is activated and vehicle speed of 48 ± 8 km/h (30 ± 5mph) is reached.

0 Seconds (must be within 2 minutes) | X | Pass | Fail |

ESC SYSTEM RESTORATION

Telltales extinguish after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes as specified in section 13.12.B

<table>
<thead>
<tr>
<th>X</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

Time for telltale to extinguish after ignition system is activated and vehicle speed of 48 ± 8 km/h (30 ± 5mph) is reached.

0 Seconds (must be within 2 minutes) | X | Pass | Fail |

TEST 2 DATA INDICATES COMPLIANCE: PASS

Remarks: "VDF OFF", "SLIP" and "ABS" telltales illuminate immediately after malfunction is simulated and ignition is activated.

After system is restored, both telltales extinguish immediately when ignition is activated.

RECORDED BY: B Kebschull DATE RECORDED: 1/6/2010
APPROVED BY: J Lenkeit DATE APPROVED: 1/10/2010
### TABLE 1. TEST INSTRUMENTATION

<table>
<thead>
<tr>
<th>Type</th>
<th>Output</th>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
<th>Specifics</th>
<th>Serial Number</th>
<th>Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tire Pressure Gauge</td>
<td>Vehicle Tire Pressure</td>
<td>0-100 psi, 0-690 kPa</td>
<td>1 psi, 6.89 kPa</td>
<td>0.5 psi, 3.45 kPa</td>
<td>Ashcroft D1005PS</td>
<td>1039350</td>
<td>By: Innocal, Date: 1/15/09, Due: 1/15/10</td>
</tr>
<tr>
<td>Platform Scales</td>
<td>Vehicle Total, Wheel, and Axle Load</td>
<td>8000 lb, 35.6 kN</td>
<td>0.5 lb, 2.2 N</td>
<td>± 1.0% of applied load</td>
<td>Intercomp Model SWII</td>
<td>24032361</td>
<td>By: Intercomp, Date: 1/29/09, Due: 1/29/10</td>
</tr>
<tr>
<td>Automated Steering Machine with Steering Angle Encoder</td>
<td>Handwheel Angle</td>
<td>± 800 deg</td>
<td>0.25 deg</td>
<td>± 0.25 deg</td>
<td>Heitz Automotive Testing Model: Sprint 3</td>
<td>60304</td>
<td>By: Heitz, Date: 1/29/09, Due: 1/29/10</td>
</tr>
<tr>
<td>Multi-Axis Inertial Sensing System</td>
<td>Longitudinal, Lateral, and Vertical Acceleration Roll, Yaw, and Pitch Rate</td>
<td>Accelerometers: ±2 g, Angular Rate Sensors: ± 100 deg/s</td>
<td>Accelerometers: ±10 ug, Angular Rate Sensors: ≤ 0.004 deg/s</td>
<td>Accelerometers: ±0.05% of full range, Angular Rate Sensors: 0.05% of full range</td>
<td>BEI Technologies Model: MotionPAK MP-1</td>
<td>0767</td>
<td>By: Systron Donner, Date: 11/18/09, Due: 11/18/10</td>
</tr>
<tr>
<td>Radar Speed Sensor and Dashboard Display</td>
<td>Vehicle Speed</td>
<td>0-125 mph, 0-200 km/h</td>
<td>0.009 mph, 0.014 km/h</td>
<td>± 0.25% of full scale</td>
<td>A-DAT Corp. Radar Model: DRS-6 Display Model: RD-2</td>
<td>1400.604</td>
<td>By: ADAT, Date: 1/5/09, Due: 1/5/10*</td>
</tr>
<tr>
<td>Ultrasonic Distance Measuring System</td>
<td>Left and Right Side Vehicle Height</td>
<td>5-24 inches, 127-610 mm</td>
<td>0.01 inches, 0.254 mm</td>
<td>± 0.25% of maximum distance</td>
<td>Massa Products Corporation Model: M-5000/220</td>
<td>DOT-NHTSA D2646</td>
<td>By: DRI, Date: 3/16/09, Due: 3/16/10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Massa Products Corporation Model: M-5000/220</td>
<td>DOT-NHTSA D2647</td>
<td>By: DRI, Date: 3/16/09, Due: 3/16/10</td>
</tr>
</tbody>
</table>

* Speed sensor was checked and verified on the test track prior to test.
### 4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION (2 OF 2)

**TABLE 1. TEST INSTRUMENTATION (CONTD)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Output</th>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
<th>Specifics</th>
<th>Serial Number</th>
<th>Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Acquisition System [Includes amplification, anti-aliasing, and analog to digital conversion.]</td>
<td>Record Time; Velocity; Distance; Lateral, Longitudinal, and Vertical Accelerations; Roll, Yaw, and Pitch Rates; Steering Wheel Angle.</td>
<td>Sufficient to meet or exceed individual sensors</td>
<td>200 Hz</td>
<td>Sufficient to meet or exceed individual sensors</td>
<td>SoMat eDaq ECPU processor</td>
<td>MSHLB.03-2476</td>
<td>By: Somat Date: 1/13/09 Due: 1/14/10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SoMat High level Board EHLS</td>
<td>MSHLS.03-3182</td>
<td>By: Somat Date: 1/14/09 Due: 1/15/10</td>
</tr>
<tr>
<td>Load Cell</td>
<td>Vehicle Brake Pedal Force</td>
<td>0-300 lb 0-1.33 kN</td>
<td>1 lb 4.44 N</td>
<td>±0.05% of full scale</td>
<td>Lebow 3663-300</td>
<td>767</td>
<td>By: Davis Date: 2/3/09 Due: 2/3/10</td>
</tr>
<tr>
<td>Coordinate Measurement Machine</td>
<td>Inertial Sensing System Coordinates</td>
<td>0-8 ft 0-2.4 m</td>
<td>±.0020 in. ±.051 mm (Single point articulation accuracy)</td>
<td>±.0020 in. ±.051 mm (Single point articulation accuracy)</td>
<td>Faro Arm Fusion</td>
<td>UO8-05-08-06636</td>
<td>By: Faro Date: 8/18/09 Due: 8/18/10</td>
</tr>
<tr>
<td>Outriggers</td>
<td>No output. Safety Item.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>DRI manufactured Aluminum meeting the weight and MOI specifications of Docket 2007-27662-11</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Figure 5.1. Front View of Test Vehicle as Delivered
Figure 5.2. Rear View of Test Vehicle as Delivered

2010 Nissan Altima
FMVSS No. 126
NHTSA NO.: CA5206
February 2010
Figure 5.3. Vehicle Certification Label
Figure 5.4. Vehicle Placard
Figure 5.5. Window Sticker (Monroney Label)
Figure 5.6. Telltale for ESC Malfunction and ESC Off
Figure 5.7. ESC Off Control Switch
Figure 5.8. Front View of Vehicle as Tested
Figure 5.9. Rear View of Vehicle as Tested

2010 Nissan Altima
FMVSS No. 126
NHTSA NO.: CA5206
February 2010
Figure 5.10. Ultrasonic Height Sensor Mounted on Left side of Vehicle for Determining Body Roll Angle
Figure 5.11. Rear Bumper Mounted Speed Sensor
Figure 5.12. Steering Controller and Data Acquisition Computer
Figure 5.13. Inertial Measurement Unit Mounted in Vehicle
Figure 5.14. Brake Pedal Load Cell
Figure 6.1. Steering Wheel Angle, Yaw Rate and Lateral Displacement for L-R Series
Figure 6.2. Steering Wheel Angle, Yaw Rate and Lateral Displacement for R-L Series
Figure 6.3. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for L-R Series
Figure 6.4. Steering Wheel Angle, Lateral Acceleration and Longitudinal Acceleration for R-L Series
7.0 OTHER DOCUMENTATION

7.1 OWNER’S MANUAL PAGES
7.2 VEHICLE ARRIVAL CONDITION REPORT
7.3 VEHICLE COMPLETION CONDITION REPORT
7.4 SINE WITH DWELL TEST RESULTS
7.5 SLOWLY INCREASING STEER TEST RESULTS
7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES
7.1 OWNER’S MANUAL PAGES

WARNING/INDICATOR LIGHTS AND AUDIBLE REMINDERS

<table>
<thead>
<tr>
<th>Light</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>Anti-lock Braking System (ABS) warning light</td>
</tr>
<tr>
<td>BRAKE</td>
<td>Brake warning light</td>
</tr>
<tr>
<td>BATTERY</td>
<td>Battery warning light</td>
</tr>
<tr>
<td>CRUISE</td>
<td>Cruise main switch indicator light</td>
</tr>
<tr>
<td>ENGINE</td>
<td>Engine oil pressure warning light</td>
</tr>
<tr>
<td>HIGH BEAM</td>
<td>High beam indicator light (blue)</td>
</tr>
<tr>
<td>MALFUNCTION</td>
<td>Malfunction Indicator Light (MIL)</td>
</tr>
<tr>
<td>SECURITY</td>
<td>Security indicator light</td>
</tr>
<tr>
<td>SPARE TIRE</td>
<td>Spare tire warning light</td>
</tr>
<tr>
<td>SLIP</td>
<td>Slip indicator light</td>
</tr>
<tr>
<td>SYSTEMS</td>
<td>Systems indicator light</td>
</tr>
</tbody>
</table>

CHECKING BULBS

With all doors closed, apply the parking brake and place the ignition switch in the ON position without starting the engine. The following lights will come on:

ABS or CRUISE or SEAT BELT | Seat belt warning light and chime |

The following lights come on briefly and then go off:

ABS or CRUISE or SET | Supplemental air bag warning light |

If any light fails to come on, it may indicate a burned-out bulb or an open circuit in the electrical system. Have the system repaired promptly.

WARNING LIGHTS

ABS or CRUISE | Anti-lock Braking System (ABS) warning light |

When the ignition switch is placed in the ON position, the Anti-lock Braking System (ABS) warning light illuminates and then turns off. This indicates the ABS is operational.

If the ABS warning light illuminates while the engine is running, or while driving, it may indicate the ABS is not functioning properly. Have the system checked at a NISSAN dealer.

If an ABS malfunction occurs, the anti-lock function is turned off. The brake system then operates normally, but without anti-lock assistance. See "Brake system" in the "Starting and driving" section.

BRAKE or CRUISE | Brake warning light |

This light functions for both the parking brake and the foot brake systems.

Parking brake indicator

When the ignition switch is placed in the ON position, the light comes on when the parking brake is applied.

Low brake fluid warning light

When the ignition switch is placed in the ON position, the light warns of a low brake fluid level. If the light comes on while the engine is running with the parking brake not applied, stop the vehicle and perform the following:

1. Check the brake fluid level. Add brake fluid as necessary. See "Brake fluid" in the "Maintenance and do-it-yourself" section of this manual.

2. If the brake fluid level is correct, have the warning system checked by a NISSAN dealer.

WARNING

- Your brake system may not be working properly if the warning light is on. Driving could be dangerous. If you judge it to be safe, drive carefully to the nearest service station for repairs. Otherwise, have your vehicle towed because driving it could be dangerous.

- Pressing the brake pedal with the engine stopped and/or a low brake fluid level may increase your stopping distance and braking will require greater pedal effort as well as pedal travel.

Anti-lock Braking System (ABS) warning indicator

When the parking brake is released and the brake fluid level is sufficient, if both the brake warning light and the Anti-lock Braking System (ABS) warning light illuminate, it may indicate the ABS is not functioning properly. Have the brake system checked, and if necessary repaired by a NISSAN dealer promptly. Avoid high-speed driving and abrupt braking. (See "Anti-lock Braking System (ABS) warning light" in this section.)

Charge warning light

If this light comes on while the engine is running, it may indicate the charging system is not functioning properly. Turn the engine off and check the generator belt. If the belt is loose, broken, missing, or if the light remains on, see a NISSAN dealer immediately.

Instruments and controls 2-11
The high beam indicator light also comes on when the passing signal is activated.

**Malfunction Indicator Light (MIL)**

If the indicator light comes on steadily or blinks while the engine is running, it may indicate a potential emission control malfunction. The Malfunction Indicator Light may also come on steadily if the fuel-filler cap is loose or missing, or if the vehicle runs out of fuel. Check to make sure the fuel-filler cap is installed and closed tightly, and that the vehicle has at least 3 gallons (11.4 liters) of fuel in the fuel tank.

After a few driving trips, the MIL should turn off if no other potential emission control system malfunction exists. If this indicator light comes on steadily for 20 seconds and then blinks for 10 seconds when the engine is not running, it indicates that the vehicle is not ready to an emission control system inspection/maintenance test. See "Readiness for inspection/maintenance (O/M) test" in the "Technical and consumer information" section of this manual.

**Operation**

The Malfunction Indicator Light will come on in one of two ways:

- **Malfunction Indicator Light on steadily** — An emission control system malfunction has been detected. Check the fuel-filler cap. If the fuel-filler cap is loose or missing, tighten or install the cap and continue to drive the vehicle. The MIL light should turn off after a few driving trips. If the MIL light does not turn off after a few driving trips, have the vehicle inspected by a NISSAN dealer. You do not need to have your vehicle towed to the dealer.

- **Malfunction Indicator Light blinking** — An engine misfire has been detected which may damage the emission control system. Reduce or avoid emission control system damage:
  - do not drive at speeds above 45 MPH (72 km/h)
  - avoid hard acceleration or deceleration.
  - avoid steep uphill grades.
  - if possible, reduce the amount of cargo being hauled or towed.

The Malfunction Indicator Light may stop blinking and come on steadily. Have the vehicle inspected by a NISSAN dealer. You do not need to have your vehicle towed to the dealer.

**CAUTION**

Continued vehicle operation without having the emission control system checked and repaired as necessary could lead to poor driveability, reduced fuel economy, and possible damage to the emission control system.

**Security indicator light**

This light blinks when the ignition switch is placed in the OFF, LOCK or ACC position. The blinking security indicator light indicates that the security system equipped on the vehicle are operational.

For additional information, see "Security systems" later in this section.

**SLIP** Slip indicator light

This indicator will blink when the VDC system is operating, thus alerting the driver to the fact that the road surface is slippery and the vehicle is nearing its traction limits.

**Instruments and controls** 2-15

You may feel or hear the system working; this is normal.

The light will blink for a few seconds after the VDC system stops limiting wheel spin.

The SLIP indicator light also comes on when you place the ignition switch in the ON position. The light will turn off after approximately 2 seconds if the system is operational. If the light does not come on, have the system checked by a NISSAN dealer or qualified workshop.

Turn signal/hazard indicator lights

The appropriate light flashes when the turn signal switch is activated.

Both lights flash when the hazard switch is turned on.

**VDC OFF** Vehicle Dynamic Control (VDC) OFF indicator light

This indicator light comes on when the Vehicle Dynamic Control OFF switch is pushed to OFF. This indicates the Vehicle Dynamic Control has been turned off.

Push the Vehicle Dynamic Control OFF switch again or restart the engine and the system will operate normally. See "Vehicle Dynamic Control (VDC) system" in the "Starting and driving" section of this manual.

The Vehicle Dynamic Control light also comes on when you push the push-button ignition switch to the ON position. The light will turn off after about 2 seconds if the system is operational. If the light stays on or comes on along with the SLIP indicator light while you are driving, have the Vehicle Dynamic Control system checked by a NISSAN dealer.

While the Vehicle Dynamic Control system is operating, you might feel slight vibration or hear the system working when starting the vehicle or accelerating, but this is normal.

**AUDIBLE REMINDERS**

**Brake pad wear warning**

The disc brake pads have audible wear warnings. When a disc brake pad requires replacement, it makes a high pitched scraping sound when the vehicle is in motion, whether or not the brake pedal is depressed. Have the brakes checked as soon as possible if the warning sound is heard.

**Key reminder chime**

A chime sounds if the driver's door is opened while the ignition switch is placed in the ACC or OFF position or placed in the OFF or LOCK position with the Intelligent Key left in the Intelligent Key port. Make sure the ignition switch is placed in the LOCK position, and take the Intelligent Key with you when leaving the vehicle.

**Light reminder chime**

With the ignition switch placed in the OFF position, a chime sounds when the driver's door is opened if the headlights or parking lights are on. Turn the headlight control switch off before leaving the vehicle.

**NISSAN Intelligent Key® door buzzer**

The Intelligent Key door buzzer sounds if the Intelligent Key is left inside the vehicle when locking the doors. When the buzzer sounds, be sure to check both the vehicle and the Intelligent Key. See "NISSAN Intelligent Key®” in the "Pre-driving checks and adjustments" section.
HEATED SEAT (if so equipped)

The front seats are warmed by built-in heaters.

1. Start the engine.
2. Push the low or high position of the switch, as desired, depending on the temperature. The indicator light in the switch will illuminate.
   The heater is controlled by a thermostat, automatically turning the heater on and off. The indicator light will remain on as long as the switch is on.
3. When the seat is warmed or before you leave the vehicle, be sure to turn the switch off.

2-34 Instruments and controls

To dry the brakes, drive the vehicle at a safe speed while lightly pressing the brake pedal to heat up the brakes. Do this until the brakes return to normal. Avoid driving the vehicle at high speeds until the brakes function correctly.

ANTI-LOCK BRAKING SYSTEM (ABS)

WARNING
- The Anti-lock Braking System (ABS) is a sophisticated device, but it cannot prevent accidents resulting from careless or dangerous driving techniques. It can help maintain vehicle control during braking on slippery surfaces. Remember that stopping distances on slippery surfaces will be longer than on normal surfaces even with ABS. Stopping distances may also be longer on rough, gravel or snow covered roads, or if you are using tire chains. Always maintain a safe distance from the vehicle in front of you. Ultimately, the driver is responsible for safety.
- Tire type and condition may also affect braking effectiveness.

5-24 Starting and driving

VEHICLE DYNAMIC CONTROL (VDC) OFF SWITCH

The vehicle should be driven with the Vehicle Dynamic Control (VDC) system on for most driving conditions.

If the vehicle is stuck in mud or snow, the VDC system reduces the engine output to reduce wheel spin. The engine speed will be reduced even if the accelerator is depressed to the floor. If maximum engine power is needed to free a stuck vehicle, turn the VDC system off.

To turn off the VDC system, push the VDC OFF switch. The indicator will come on.

Push the VDC OFF switch again or restart the engine to turn on the system. See "Vehicle Dynamic Control (VDC) system in the "Starting and driving" section.

DO NOT remove the tire for service without replacing it with the specified tire. Replacing the tire with a used tire may result in increased stopping distances.

WARNING
- Do not pump the brake pedal. Doing so may result in increased stopping distances.

Self-test feature
The ABS includes electronic sensors, electric pumps, hydraulic solenoids and a computer. The computer has a built-in diagnostic feature that tests the system each time you start the engine and move the vehicle at a low speed in forward or reverse. When the self-test occurs, you may hear a "clunk" noise and/or feel a pulsation in the brake pedal. This is normal and does not indicate a malfunction. If the computer senses a malfunction, it switches off and illuminates the ABS warning light on the instrument panel. The brake system then operates normally, but without anti-lock assistance.

If the ABS warning light illuminates during the self-test or while driving, have the vehicle checked by a NISSAN dealer.
Normal operation

The ABS operates at speeds above 3 - 6 MPH (5 - 10 km/h). The speed varies according to road conditions.

When the ABS senses that 1 or more wheels are close to locking up, the actuator rapidly applies and releases hydraulic pressure. This action is similar to pumping the brakes very quickly. You may feel a pulsation in the brake pedal and hear a noise from the brake or feel a vibration from the actuator when it is operating. This is normal and indicates that the ABS is operating properly. However, the pulsation may indicate that road conditions are hazardous and extra care is required while driving.

VEHICLE DYNAMIC CONTROL (VDC) SYSTEM

The Vehicle Dynamic Control (VDC) system uses various sensors to monitor driver inputs and vehicle motion. Under certain driving situations, the system will control braking and engine output to help keep the vehicle on its intended path.

- When the Vehicle Dynamic Control (VDC) system is operating, the SLIP indicator in the instrument panel blinks.
- If the SLIP indicator blinks, the road conditions may be slippery. Be sure to adjust your speed and driving to these conditions. See “Slip indicator light”, and “Vehicle Dynamic Control (VDC) off indicator light” in the “Instruments and controls” section.
- Indicator light
  If a malfunction occurs in the system, the SLIP and VDC indicator lights come on in the instrument panel.

As long as these indicator lights are on, the traction control function is canceled.

When the vehicle is operated with the Vehicle Dynamic Control system off using the VDC OFF switch, VDC and the Traction Control System (TCS) functions will be turned off. The SLIP indicator will flash if a malfunction is detected. The ABS will still operate with the VDC system off.

When the VDC system is operating, you may feel a pulsation in the brake pedal and hear a noise or vibration from under the hood. This is normal and indicates that the VDC system is working properly.

The computer has a built-in diagnostic feature that tests the system each time you start the engine and move the vehicle forward or in reverse at a slow speed. When the self-test occurs, you may hear a chack noise and/or feel a pulsation in the brake pedal. This is normal and is not an indication of a malfunction.

WARNING

- The Vehicle Dynamic Control system is designed to help improve driving stability but does not prevent accidents due to abrupt steering operation at high speeds or by careless or dangerous driving techniques. Reduce vehicle speed and be especially careful when driving and coming on slippery surfaces and always drive carefully.

COLD WEATHER DRIVING

FREEING A FROZEN DOOR LOCK

To prevent a door lock from freezing, apply deicer through the key hole. If the lock becomes frozen, have the key before inserting it into the key hole or use the remote keyless entry function on the intelligent key.

ANTI-FREEZE

In the winter when it is anticipated that the temperature will drop below 32°F (0°C), check the anti-freeze to assure proper winter protection. For details, see “Engine cooling system” in the “Maintenance and do-it-yourself” section of this manual.

BATTERY

If the battery is not fully charged during extremely cold weather conditions, the battery fluid may freeze and damage the battery. To maintain maximum efficiency, the battery should be checked regularly. For details, see “Battery” in the “Maintenance and do-it-yourself” section of this manual.
7.2 VEHICLE ARRIVAL CONDITION REPORT

CONTRACT NO.: DTNH22-08-D-00098
DATE: 12/7/2009

From: Competitive Vehicle Services  Purpose: Initial Receipt
Received via Transfer

To: Dynamic Research, Inc  Present Vehicle

VehicleVIN: 1N4AL2AP3AN403449 NHTSA NO.: CA5206
Model Year: 2010 Odometer Reading: 13 Miles
Make: Nissan Body Style: Passenger Car
Model: Altima Body Color: Black
Manufacture Date: 9/09 Dealer: Competitive Vehicle Services
GVWR (kg/lb) 1941/4279 Price: Leased

☒ All options listed on the "Window Sticker" are present on the test vehicle
☒ Tires and wheel rims are new and the same as listed
☒ There are no dents or other interior or exterior flaws
☒ The vehicle has been properly prepared and is in running condition
☒ The glove box contains an owner’s manual, warranty document, consumer information, and extra set of keys
☒ Proper fuel filler cap is supplied on the test vehicle
☒ Place vehicle in storage area
☒ Inspect the vehicle’s interior and exterior, including all windows, seats, doors, etc., to confirm that each system is complete and functional per the manufacturer’s specifications. Any damage, misadjustment, or other unusual condition that could influence the test program or test results shall be recorded. Report any abnormal condition to the NHTSA COTR before beginning any test.

NOTES:

RECORDED BY: J Lenkeit DATE RECORDED: 12/7/2009
APPROVED BY: P Broen DATE APPROVED: 12/7/2009
7.3 VEHICLE COMPLETION CONDITION REPORT

CONTRACT NO.: DTNH22-08-D-00098
DATE: 1/14/2010

Vehicle VIN: 1N4AL2AP3AN403449 NHTSA NO.: CA5206
Model Year: 2010 Odometer Reading: 66 Miles
Make: Nissan Body Style: Passenger Car
Model: Altima Body Color: Black
Manufacture Date: 9/09 Dealer: Competitive Vehicle Services
GVWR (kg/lb) 1941 (4279) Price: Leased

LIST OF FMVSS TESTS PERFORMED BY THIS LAB: 126

☒ THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS

☒ THE VEHICLE HAS BEEN PROPERLY MAINTAINED AND IS IN RUNNING CONDITION

☒ THE GLOVE BOX CONTAINS AN OWNER’S MANUAL, WARRANTY DOCUMENT, CONSUMER INFORMATION, AND EXTRA SET OF KEYS

☒ PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

REMARKS:

Equipment that is no longer on the test vehicle as noted on Vehicle Arrival Condition Report:

None

Explanation for equipment removal:

NA

Test Vehicle Condition:

Like New

RECORDED BY: J Lenkeit DATERecorded: 1/14/2010
APPROVED BY: B Kebschull DATE APPROVED: 1/14/2010
### 7.4 SINE WITH DWELL TEST RESULTS

**2010 Nissan Altima Passenger Car**

NHTSA No.: CA5206

Date of Test: 1/6/2010

Date Created: 1/6/2010

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**Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction**

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### 7.4 SINE WITH DWELL TEST RESULTS

**2010 Nissan Altima Passenger Car**

NHTSA No.: **CA5206**  
Date of Test: **1/6/2010**  
Date Created: **1/6/2010**

#### Lateral Stability Test Series No. 2 – Clockwise Initial Steer Direction

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### 7.5 SLOWLY INCREASING STEER TEST RESULTS

2010 Nissan Altima Passenger Car

NHTSA No.: CA5206

Date of Test: 1/6/2010

Date Created: 1/6/2010

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**Averages**

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Scalars | Steering Angles (deg)
--------|----------------------
1.5     | 45                   
2.0     | 60                   
2.5     | 75                   
3.0     | 90                   
3.5     | 105                  
4.0     | 120                  
4.5     | 135                  
5.0     | 150                  

Scalars | Steering Angles (deg)
--------|----------------------
5.5     | 164                  
6.0     | 179                  
6.5     | 194                  
7.0     | 209                  
7.5     | 224                  
8.0     | 239                  
8.5     | 254                  
9.0     | 269                  
    | 270                  

56
7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES

Vehicle: 2010 Nissan Altima Passenger Car
Wheelbase: 105.3 Inches
Measurement date: 1/5/2010

NHTSA No.: CA5206
Faro Arm S/N: U08-05-08-06636
Certification date: 8/18/2009

CMM Measurements

Coordinate system: SAE (X,Y,Z positive forward, to the right, and downward, respectively)
Origin defined at 48" point on lateral arm of measurement fixture, projected onto the ground plane

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Motion Pak reference point taken from mid height of unit left side

Motion Pak Width = 3.05"  ==>  1/2 W = 1.525

Motion_PAK_Location 3.784 47.413 -16.967

Measurement Notes

1. The Faro arm is positioned just to the left of the vehicle, near the rear door.
2. A "centerline jig" is used in the Faro arm measurement. The jig consists of a long beam with a 4 ft lateral arm that is perpendicular to the beam. The jig is placed on the ground underneath the vehicle with the long beam positioned along the centerline of the vehicle, such that the lateral arm extends to the left, slightly forward of the left rear tire. The lateral arm has a marked indentation point which is located 48.00" from the edge of the centerline beam.
3. The Faro arm is used to make the following measurements:
   - Three points on the ground, which establishes the ground plane.
   - Two points along the lateral arm, and projected onto the ground plane. This establishes the y axis.
   - One point at the 48 inch reference point on the lateral arm. This establishes the origin.
   - Three points on the left rear wheel or wheel cover. The Faro arm then computes the center point of the wheel.
   - One point to establish the height of the highest point on the roof of the vehicle.

Coordinate Measurements Calculated for S7D (Matlab Program)

Coordinate system: X,Y,Z positive rearward, to the right, and upward, respectively
Origin defined as follows: X axis: front axle, Y axis: vehicle centerline, Z axis: ground plane

Motion_PAK_Location in S7D (Matlab program) coordinate system

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Calculation Notes:

1. X axis value is the difference between the wheelbase and the calculated distance from the rear axle centerline to the IMU (the value must be positive and less than the wheelbase).
2. Y axis value is -48.00 (the Y axis offset of the measurement origin in the S7D coordinate system) plus the measured Y axis value (a negative value indicates the IMU is to the left of the vehicle centerline, and a positive value indicates it is to the right)
3. Z axis value is from the ground plane up to the center of the IMU (value must be positive).