SAFETY COMPLIANCE TESTING FOR FMVSS 124
ACCELERATOR CONTROL SYSTEMS

HYUNDAI MOTOR COMPANY
2007 HYUNDAI ELANTRA
4-DOOR PASSENGER CAR
NHTSA NO. C70502

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

OCTOBER 12, 2007
FINAl REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
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### Abstract
Compliance tests were conducted on the subject 2007 Hyundai Elantra 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

### Key Words
Compliance Testing  
Safety Engineering  
FMVSS 124
# TABLE OF CONTENTS

<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</td>
</tr>
<tr>
<td>5.7</td>
<td>Accelerator Pedal Assembly Showing Spring #1</td>
</tr>
<tr>
<td>5.8</td>
<td>Spring #1 Close-Up View</td>
</tr>
<tr>
<td>5.9</td>
<td>Throttle Plate Return Springs #2 and #3 (View #1)</td>
</tr>
<tr>
<td>5.10</td>
<td>Throttle Plate Return Springs #2 and #3 (View #2)</td>
</tr>
<tr>
<td>5.11</td>
<td>Throttle Plate Position Sensor</td>
</tr>
<tr>
<td>5.12</td>
<td>Accelerator Cable Hook-Up (View #1)</td>
</tr>
<tr>
<td>5.13</td>
<td>Accelerator Cable Hook-Up (View #2)</td>
</tr>
<tr>
<td>5.14</td>
<td>Overall Test Set-Up</td>
</tr>
<tr>
<td>5.15</td>
<td>Accelerator Pedal Test Set-Up</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.
SECTION 2
TEST PROCEDURES AND DISCUSSION OF RESULTS

Compliance testing was conducted on a 2007 Hyundai Elantra Passenger Car, NHTSA No. C70502 in accordance with the National Highway Traffic Safety Administration (NHTSA) Laboratory Procedure TP-124-06.

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. Testing was performed with the vehicle in park and the engine running. Return to idle times were determined for four throttle plate positions with the accelerator control system complete and with each of the two throttle return springs on the throttle plate shaft independently disconnected and the accelerator return spring on the accelerator pedal disconnected. The severed linkage test was also performed by disconnecting the throttle cable from the throttle body and replacing the cable with another cable which could be quickly severed to simulate a broken throttle cable. The cable was then activated to the required amount of throttle opening and the cable was severed to simulate cable failure. As the air throttle plate was mechanically linked to the accelerator pedal, no electrical disconnections were required.

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 MY/MAKE/MODEL/BODY STYLE: 2007 HYUNDAI ELANTRA PASSENGER CAR
VEHICLE NHTSA NO.: C70502
VEHICLE VIN: KMHDU46D97U035111
DATE OF TEST: APRIL 14-15, 2007
TEST LAB: GENERAL TESTING LABORATORIES

VEHICLE ENGINE TYPE: GAS
GVWR: 1755 KG

VEHICLE ENGINE SIZE: 2.5 L 4CYL.

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

MAX. BHP ENGINE SPEED: UNKNOWN

MFR. IDLE RPM: 660 RPM ±100

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

REMARKS: None

RECORDED BY: G. FARRAND
DATE: 08/14/07

APPROVED BY: D. MESSICK
DATA SHEET 2
NORMAL OPERATION TEST
(fully operational system)

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 HYUNDAI ELANTRA PASSENGER CAR
VEHICLE NHTSA NO.: C70502
DATE OF TEST: AUGUST 15, 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)</th>
<th>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>
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<tbody>
<tr>
<td>5741</td>
<td>25%</td>
<td>21%</td>
<td>660</td>
<td>82</td>
<td>28</td>
<td>1%</td>
<td>20</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>5742</td>
<td>50%</td>
<td>48%</td>
<td>660</td>
<td>82</td>
<td>28</td>
<td>1%</td>
<td>30</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>5743</td>
<td>75%</td>
<td>76%</td>
<td>660</td>
<td>82</td>
<td>29</td>
<td>1%</td>
<td>30</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>5744</td>
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<td>660</td>
<td>82</td>
<td>30</td>
<td>1%</td>
<td>40</td>
<td>P</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: None

RECORDED BY: G. FARRAND DATE: 08/15/07
APPROVED BY: D. MESSICK
VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 HYUNDAI ELANTRA PASSENGER CAR
VEHICLE NHTSA NO.: C70502
DATE OF TEST: AUGUST 15, 2007

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

SYSTEM CONDITION: #1 SPRING DISCONNECTED

<table>
<thead>
<tr>
<th>GTL #</th>
<th>ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)</th>
<th>ACCELERATOR POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°C)</th>
<th>TEMPERATURE (°C)</th>
<th>TEMPERATURE (°C)</th>
<th>RETURN TIME TO IDLE (Msec)</th>
<th>PASS/FAIL</th>
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<td>5745</td>
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<td>21%</td>
<td>660</td>
<td>82</td>
<td>32</td>
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<tr>
<td>5746</td>
<td>50%</td>
<td>53%</td>
<td>660</td>
<td>82</td>
<td>32</td>
<td>1%</td>
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<tr>
<td>5747</td>
<td>75%</td>
<td>73%</td>
<td>660</td>
<td>82</td>
<td>32</td>
<td>1%</td>
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<td>5748</td>
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<td>100%</td>
<td>660</td>
<td>82</td>
<td>32</td>
<td>1%</td>
<td>20</td>
<td>P</td>
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</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: None

RECORDED BY: G. FARRAND             DATE: 08/15/07
APPROVED BY: D. MESSICK
DATA SHEET 3 (2 of 3)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 HYUNDAI ELANTRA PASSENGER CAR
VEHICLE NHTSA NO.: C70502
DATE OF TEST: AUGUST 15, 2007

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

SYSTEM CONDITION: #2 SPRING DISCONNECTED

<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 (ºC) 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>5749</td>
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<td>29%</td>
<td>660</td>
<td>82</td>
<td>32</td>
<td>1%</td>
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<td>P</td>
</tr>
<tr>
<td>5750</td>
<td>50%</td>
<td>52%</td>
<td>660</td>
<td>82</td>
<td>32</td>
<td>1%</td>
<td>30</td>
<td>P</td>
</tr>
<tr>
<td>5751</td>
<td>75%</td>
<td>73%</td>
<td>660</td>
<td>82</td>
<td>32</td>
<td>1%</td>
<td>40</td>
<td>P</td>
</tr>
<tr>
<td>5752</td>
<td>100%</td>
<td>100%</td>
<td>660</td>
<td>82</td>
<td>32</td>
<td>1%</td>
<td>50</td>
<td>P</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 -18º C or less

PASS X FAIL 

REMARKS: None

RECORDED BY: G. FARRAND DATE: 08/15/07
APPROVED BY: D. MESSICK
VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 HYUNDAI ELANTRA PASSENGER CAR
VEHICLE NHTSA NO.: C70502
DATE OF TEST: AUGUST 15, 2007

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

SYSTEM CONDITION: #3 SPRING DISCONNECTED

<table>
<thead>
<tr>
<th>GTL #</th>
<th>ACCELERATOR POSITION</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (ºC)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec)</th>
<th>PASS/FAIL</th>
</tr>
</thead>
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<tr>
<td>5753</td>
<td>25%</td>
<td>26%</td>
<td>660</td>
<td>84</td>
<td>32</td>
<td>1%</td>
<td>40 P</td>
</tr>
<tr>
<td>5754</td>
<td>50%</td>
<td>48%</td>
<td>660</td>
<td>84</td>
<td>32</td>
<td>1%</td>
<td>40 P</td>
</tr>
<tr>
<td>5755</td>
<td>75%</td>
<td>70%</td>
<td>660</td>
<td>84</td>
<td>32</td>
<td>1%</td>
<td>100 P</td>
</tr>
<tr>
<td>5756</td>
<td>100%</td>
<td>100%</td>
<td>660</td>
<td>84</td>
<td>32</td>
<td>1%</td>
<td>60 P</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 -18º C or less

PASS X FAIL

REMARKS: None

RECORDED BY: G. FARRAND DATE: 08/15/07
APPROVED BY: D. MESSICK
VEHICLE MY/MAKE/MODEL/BODY STYLE: 2007 HYUNDAI ELANTRA PASSENGER CAR
VEHICLE NHTSA NO.: C70502
DATE OF TEST: AUGUST 15, 2007

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

SYSTEM CONDITION: SEVERANCE OF THROTTLE CABLE

<table>
<thead>
<tr>
<th>GTL #</th>
<th>ACCELERATOR POSITION</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (ºC)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec)</th>
<th>PASS/FAIL</th>
</tr>
</thead>
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<td>5757</td>
<td>25%</td>
<td>25%</td>
<td>660</td>
<td>84</td>
<td>32</td>
<td>1%</td>
<td>20</td>
</tr>
<tr>
<td>5758</td>
<td>50%</td>
<td>50%</td>
<td>660</td>
<td>84</td>
<td>32</td>
<td>1%</td>
<td>30</td>
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<tr>
<td>5759</td>
<td>75%</td>
<td>75%</td>
<td>660</td>
<td>84</td>
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<td>5760</td>
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<td>100%</td>
<td>660</td>
<td>84</td>
<td>32</td>
<td>1%</td>
<td>40</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 -18º C or less

PASS X FAIL

REMARKS: None

RECORDED BY: G. FARRAND DATE: 08/15/07
APPROVED BY: D. MESSICK
## 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>
</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>
2007 HYUNDAI ELANTRA
NHTSA NO. C70502
FMVSS NO. 124

FIGURE 5.1
FRONT VIEW OF VEHICLE
Close-up view of vehicle certification label.

**Figure 5.4**

Manufactured in Korea by Hyundai Motor Company.

- **SEP/13/06**
- **GVWR 3869 lbs**
- **PAINT 2X**
- **GAWR FRONT 2227 lbs**
- **GAWR REAR 2094 lbs**
- **TRIM 9Y**

This vehicle conforms to all applicable U.S.A. federal motor vehicle safety, bumper, and theft prevention standards in effect on the date of manufacture shown above.

**V.IN** KMHDU46D97U035111

**Passenger Car**
<table>
<thead>
<tr>
<th>TIRE</th>
<th>SIZE</th>
<th>COLD TIRE PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRONT</td>
<td>P195/65R15</td>
<td>220 KPA, 32 PSI</td>
</tr>
<tr>
<td>REAR</td>
<td>P195/65R15</td>
<td>220 KPA, 32 PSI</td>
</tr>
<tr>
<td>SPARE</td>
<td>P125/80D15</td>
<td>420 KPA, 60 PSI</td>
</tr>
</tbody>
</table>

The combined weight of occupants and cargo should never exceed 385 kg or 850 lbs.
ACCELERATOR PEDAL RETURN SPRING #1
2007 HYUNDAI ELANTRA
NHTSA NO. C70502
FMVSS NO. 124

FIGURE 5.9
THROTTLE PLATE RETURN SPRINGS #2 AND #3 (VIEW #1)
THROTTLE PLATE RETURN SPRINGS #2 AND #3 (VIEW #2)
FIGURE 5.13
ACCELERATOR CABLE HOOK-UP (VIEW #2)
GTL 5742, FMVSS 124
Normal Operation, 50% Throttle.

% Throttle & Foot Release.

Time in Seconds
GTL 5748, FMVSS 124
No Spring 1 Operation, 100% Throttle.
GTL 5750, FMVSS 124
No Spring 2 Operation, 50% Throttle.

% Throttle & Foot Release.

Time in Seconds
GTL 5752, FMVSS 124
No Spring 2 Operation, 100% Throttle.
GTL 5755, FMVSS 124
No Spring 3 Operation, 75% Throttle.
1. Injection system diagram
2. Injector drawing
3. Throttle body drawing

THROTTLE PLATE RETURN SPRING (2)

THROTTLE PLATE POSITION SENSOR
1. Air throttle plate position

The air throttle plate position is 5° at the close condition.

2. Idle rpm: 660±100 [RPM at P or N range after engine warm up]
3. Ignition timing: 7°±10°[BTDC @ IDLE]
4. HMC ask you using special scan tool for HMC vehicle (HI-SCAN or HI-DS), Idle status will be seen on the scan tool.
1. THROTTLE POSITION SENSOR CONNECTOR PIN ARRANGEMENT

23(1): TPS SUPPLY(5V)
41(3): THROTTLE POSITION SENSOR SIGNAL
42(2): TPS GROUND

PIN ARRANGEMENT OF THE ECM

2. THROTTLE POSITION SENSOR OUTPUT CHARACTERISTIC CURVE

Output/Input [Vp/pV]

Criterion characteristic curve
slope: 0.00927

Measuring angle A: Opening angle of throttle valve [degree]
Measuring angle B: 180°
Electrically assured rotation angle (95°)
Mechanically assured rotation angle

ATTACHMENT 3
1. RETURN SPRING DRAWING (2 PICES ON A THROTTLE BODY)
(1) Spring #1

(2) Spring #2

2. SPRING FORCE OF THROTTLE LEVER OPERATION
1. RETURN SPRING DRAWING (2 PIECES ON A THROTTLE BODY)

2. SPRING FORCE OF THROTTLE LEVER OPERATION

ATTACHMENT 4