SAFETY COMPLIANCE TESTING FOR
FMVSS 124L
ACCELERATOR CONTROL SYSTEMS

LANDROVER IN THE UK
2004 LANDROVER FREELANDER, MPV
NHTSA NO. C40600

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

AUGUST 17, 2004
FINAL REPORT

PREPARED FOR
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW
ROOM 6118 (NVB-220)
WASHINGTON, D.C. 20590
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Approval Date: 8/17/04

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NHTSA No. C40600  

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May 4, 2004  

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16. Abstract  
Compliance tests were conducted on the subject 2004 Landrover Freelander MPV 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: Throttle Return Times  

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SECTION 1
PURPOSE OF COMPLIANCE TEST

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

Compliance testing was conducted on a 2004 LANDROVER FREELANDER, MPV, NHTSA No. C40600 in accordance with the National Highway Traffic Safety Administration (NHTSA) Laboratory Procedure TP-124-06.

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

Output from the throttle position sensor on the air throttle plate shaft was used to measure throttle position and data was recorded at 1000 HZ with GTL's data acquisition system. Normal operation testing was conducted to simulate the normal removal of the driver's foot from the accelerator pedal. Return to idle times were determined for various throttle plate positions with the accelerator control system complete and with each of the wires to the TPS/TPM actuator and APS motor independently severed and also shorted to ground. Return to idle times were also determined for severance of the connectors to the APS, and TPS/TPM actuator motor. Removal of two springs in the accelerator pedal was also performed and return to idle times individually checked. A motor return spring in the TPM was not removed due to the unit being a non-serviceable unit. The ECM connectors were also tested for severance and affect on throttle return times.

The Laboratory by observation, did not experience any failures which resulted in a runaway engine. System failures were induced approximately simultaneously with release of pedal
force. Some tests were conducted only at 100% W.O.T. as it represented the worst case return time scenario.

This testing was to be performed at low ambient temperature of -40° C (-0, +5° C) in accordance with the NHTSA Test Procedure TP-124-06, however due to the vehicle engine not starting at -40° C, the ambient temperature was raised from -40° C at an approximate rate of 5°/HR. The vehicle started at -9.5° C (15° F) and the test was performed.
SECTION 3
COMPLIANCE TEST DATA

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

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 LANDROVER FREELANDER MPV
VEHICLE NHTSA NO.: C40600
VEHICLE VIN: SALNY22214
DATE OF TEST: MAY 4, 2004
TEST LAB: GENERAL TESTING LABORATORIES

VEHICLE ENGINE TYPE: V6
VEHICLE ENGINE SIZE: 2.5 L
GVWR: 2060 KG

MAX. BHP ENGINE SPEED: 174 HP
MFR. IDLE RPM: COMPUTER CONTROLLED (750)
FUEL METERING DEVICE (Carburetor, fuel injection, etc): FUEL INJECTION

REMARKS:

RECORDED BY: [Signature]  DATE: 05/04/04
APPROVED BY: [Signature]
DATA SHEET 2
NORMAL OPERATION TEST
(fully operational system)

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 LANDROVER FREELANDER MPV
VEHICLE NHTSA NO.: C40600
DATE OF TEST: MAY 4, 2004

Check one:


SYSTEM CONDITION: COMPLETE (no modifications) Normal Operation

<table>
<thead>
<tr>
<th>ACCELERATOR POSITION</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec)</th>
<th>PASS/FAIL</th>
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</thead>
<tbody>
<tr>
<td>% WIDE OPEN THROTTLE (WOT)</td>
<td></td>
<td></td>
<td>ENGINE COOLANT</td>
<td>AMBIENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td>25</td>
<td>5100</td>
<td>15</td>
<td>15</td>
<td>8%</td>
<td>1091</td>
</tr>
<tr>
<td>50%</td>
<td>50</td>
<td>2780</td>
<td>15</td>
<td>15</td>
<td>8%</td>
<td>451</td>
</tr>
<tr>
<td>75%</td>
<td>75</td>
<td>2600</td>
<td>45</td>
<td>15</td>
<td>8%</td>
<td>138</td>
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<td>100</td>
<td>3080</td>
<td>80</td>
<td>15</td>
<td>B</td>
<td>741</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 _______ X _______

REMARKS: AFTER COLD SOAK PERIOD AT -40° THE VEHICLE WOULD NOT START. CHAMBER AND VEHICLE TEMPERATURES WERE RAISED TO -25° PER COTR'S REQUEST. VEHICLE STILL WOULD NOT START AT -25°. THE CHAMBER WAS BROUGHT DOWN TO -15°, NO START, 0° NO START, 10° F NO START. VEHICLE STARTED AT 15° F AND TESTS WERE CONDUCTED.

RECORDED BY: ______________ DATE: 05/04/04

APPROVED BY: ______________
DATA SHEET 3 (1 of 9)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 LANDROVER FREELANDER, MPV
VEHICLE NHTSA NO.: C40600
DATE OF TEST: MAY 4, 2004

Check one:


SYSTEM CONDITION: #1 SPRING DISCONNECTED IN APS

<table>
<thead>
<tr>
<th>ACCELERATOR POSITION</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec)</th>
<th>PASS/FAIL</th>
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<tbody>
<tr>
<td>% WIDE OPEN THROTTLE (WOT)</td>
<td></td>
<td></td>
<td>ENGINE COOLANT</td>
<td>AMBIENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25%</td>
<td>25</td>
<td>3540</td>
<td>44</td>
<td>16</td>
<td>8%</td>
<td>291</td>
</tr>
<tr>
<td>50%</td>
<td>50</td>
<td>2518</td>
<td>44</td>
<td>16</td>
<td>8%</td>
<td>114</td>
</tr>
<tr>
<td>75%</td>
<td>75</td>
<td>2800</td>
<td>44</td>
<td>17</td>
<td>8%</td>
<td>106</td>
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<td>2670</td>
<td>50</td>
<td>17</td>
<td>8%</td>
<td>165</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:

RECORDED BY: [Signature] DATE: 05/04/04
APPROVED BY: [Signature]
DATA SHEET 3 (2 of 9)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 LANDROVER FREELANDER, MPV
VEHICLE NHTSA NO.: C40800
DATE OF TEST: MAY 4, 2004

Check one:

SYSTEM CONDITION: #2 SPRING DISCONNECTED IN APS

<table>
<thead>
<tr>
<th>ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F) 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>25%</td>
<td>25</td>
<td>6050</td>
<td>52</td>
<td>17</td>
<td>8%</td>
<td>667</td>
<td>P</td>
</tr>
<tr>
<td>50%</td>
<td>50</td>
<td>2600</td>
<td>65</td>
<td>17</td>
<td>8%</td>
<td>129</td>
<td>P</td>
</tr>
<tr>
<td>75%</td>
<td>75</td>
<td>3435</td>
<td>70</td>
<td>17</td>
<td>8%</td>
<td>38</td>
<td>P</td>
</tr>
<tr>
<td>100%</td>
<td>100</td>
<td>4000</td>
<td>73</td>
<td>17</td>
<td>8%</td>
<td>405</td>
<td>P</td>
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</table>

RETURN TIME REQUIREMENTS:

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

PASS ______ FAIL ________

REMARKS:

RECORDED BY: ___________________________ DATE: 05/04/04
APPROVED BY: ___________________________
DATA SHEET 3 (3 of 9)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 LANDROVER FREELANDER, MPV
VEHICLE NHTSA NO.: C40600
DATE OF TEST: MAY 4, 2004

Check one:


SYSTEM CONDITION: TPS/TPM CONNECTOR DISCONNECT

<table>
<thead>
<tr>
<th>ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec)</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75%</td>
<td></td>
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<td></td>
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<tr>
<td>100%</td>
<td>100</td>
<td>6550</td>
<td>88</td>
<td>16</td>
<td>8%</td>
<td>9 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 -18° C or less

PASS ___ X ___ FAIL

REMARKS:

RECORDED BY: [Signature] DATE: 05/04/04
APPROVED BY: [Signature]
DATA SHEET 3 (4 of 9)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 LANDROVER FREELANDER, MPV
VEHICLE NHTSA NO.: C40800
DATE OF TEST: MAY 4, 2004

Check one:


SYSTEM CONDITION: APS CONNECTOR DISCONNECT

<table>
<thead>
<tr>
<th>ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F) ENGINE COOLANT</th>
<th>TEMPERATURE (°F) 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>25%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
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<td>6550</td>
<td>105</td>
<td>16</td>
<td>8%</td>
<td>16</td>
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</tbody>
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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:

RECORDED BY: [Signature] DATE: 05/04/04
APPROVED BY: [Signature]
### Data Sheet 3 (5 of 9)
#### Fail-Safe Operation Disconnection

**Vehicle Make/Model/Body Style:** 2004 Land Rover Freelander, MPV  
**Vehicle NHTSA No.:** C40600  
**Date of Test:** May 4, 2004

Check one:  
- Mid Temp. Test:  
- Low Temp. Test: **X**  
- High Temp. Test: __________

**System Condition: ECM Connector Disconnect**

<table>
<thead>
<tr>
<th>Conn. No.</th>
<th>Accelerator Position % Wide Open Throttle (WOT)</th>
<th>Throttle Position Sensor Reading</th>
<th>RPM</th>
<th>Temperature (°F)</th>
<th>Throttle Position Sensor Reading @ Idle (Baseline)</th>
<th>Return Time to Idle (Msac) or Limp Mode</th>
<th>Pass/Fail</th>
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<tbody>
<tr>
<td>1</td>
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<td>100</td>
<td>6760</td>
<td>40</td>
<td>17</td>
<td>8%</td>
<td>156</td>
</tr>
<tr>
<td>2</td>
<td>100%</td>
<td>100</td>
<td>6760</td>
<td>55</td>
<td>17</td>
<td>8%</td>
<td>15</td>
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<tr>
<td>3</td>
<td>100%</td>
<td>100</td>
<td>6800</td>
<td>85</td>
<td>18</td>
<td>8%</td>
<td>1806</td>
</tr>
<tr>
<td>4</td>
<td>100%</td>
<td>100</td>
<td>6800</td>
<td>88</td>
<td>18</td>
<td>8%</td>
<td>1331</td>
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<td>5</td>
<td>100%</td>
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<td>6675</td>
<td>96</td>
<td>18</td>
<td>8%</td>
<td>13</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** _______  **Fail** _______ **X**

**Remarks:**

**Recorded By:** ______________________  **Date:** 05/04/04  
**Approved By:** ______________________
DATA SHEET 3 (6 of 9)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 LANDROVER FREELANDER, MPV
VEHICLE NHTSA NO.: C40600
DATE OF TEST: MAY 4, 2004

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

SYSTEM CONDITION: TPS/TPM INDIVIDUAL WIRES SEVERED

<table>
<thead>
<tr>
<th>WIRE NO.</th>
<th>ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec) OR LIMP MODE</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100%</td>
<td>100</td>
<td>6870</td>
<td>72</td>
<td>17</td>
<td>8%</td>
<td>1609 F</td>
</tr>
<tr>
<td>2</td>
<td>100%</td>
<td>100</td>
<td>6850</td>
<td>90</td>
<td>17</td>
<td>8%</td>
<td>1384 F</td>
</tr>
<tr>
<td>3</td>
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<td>100</td>
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<td>17</td>
<td>8%</td>
<td>36 P</td>
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<tr>
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<td>6850</td>
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<td>17</td>
<td>8%</td>
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<td>6</td>
<td>100%</td>
<td>100</td>
<td>6850</td>
<td>102</td>
<td>18</td>
<td>8%</td>
<td>13 P</td>
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</table>

RETURN TIME REQUIREMENTS:

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

PASS _______    FAIL _______ X _______

REMARKS:

RECORDED BY: D. F. Entered DATE: 05/04/04
APPROVED BY: D. Messick
DATA SHEET 3 (7 of 9)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 LANDROVER FREELANDER, MPV
VEHICLE NHTSA NO.: C40500
DATE OF TEST: MAY 4, 2004

Check one:

SYSTEM CONDITION: TPS/TPM INDIVIDUAL WIRES SHORTED TO GROUND

<table>
<thead>
<tr>
<th>WIRE NO.</th>
<th>ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec) OR LIMP MODE</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100%</td>
<td>100</td>
<td>6680</td>
<td>62</td>
<td>17</td>
<td>8%</td>
<td>402</td>
</tr>
<tr>
<td>2</td>
<td>100%</td>
<td>100</td>
<td>6680</td>
<td>66</td>
<td>17</td>
<td>8%</td>
<td>2128</td>
</tr>
<tr>
<td>3</td>
<td>100%</td>
<td>100</td>
<td>6680</td>
<td>77</td>
<td>18</td>
<td>8%</td>
<td>181</td>
</tr>
<tr>
<td>4</td>
<td>100%</td>
<td>100</td>
<td>6680</td>
<td>86</td>
<td>18</td>
<td>8%</td>
<td>72</td>
</tr>
<tr>
<td>5</td>
<td>100%</td>
<td>100</td>
<td>6680</td>
<td>92</td>
<td>18</td>
<td>8%</td>
<td>2271</td>
</tr>
<tr>
<td>6</td>
<td>100%</td>
<td>100</td>
<td>6680</td>
<td>99</td>
<td>18</td>
<td>8%</td>
<td>15</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 ___ X ___

REMARKS: * Throttle only returned to 9% idle state

RECORDED BY: [Signature] DATE: 05/04/04
APPROVED BY: [Signature]
DATA SHEET 3 (8 of 9)
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 LANDROVER FREELANDER, MPV
VEHICLE NHTSA NO.: C40900
DATE OF TEST: MAY 4, 2004

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

SYSTEM CONDITION: APS INDIVIDUAL WIRES SEVERED

<table>
<thead>
<tr>
<th>WIRE NO.</th>
<th>ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec) OR LIMP MODE</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>100%</td>
<td>100</td>
<td>6800</td>
<td>61</td>
<td>17</td>
<td>8%</td>
<td>3396</td>
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<tr>
<td>12</td>
<td>100%</td>
<td>100</td>
<td>6800</td>
<td>62</td>
<td>17</td>
<td>8%</td>
<td>3632</td>
</tr>
<tr>
<td>13</td>
<td>100%</td>
<td>100</td>
<td>6800</td>
<td>64</td>
<td>17</td>
<td>8%</td>
<td>3082</td>
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<tr>
<td>14</td>
<td>100%</td>
<td>100</td>
<td>6800</td>
<td>69</td>
<td>17</td>
<td>8%</td>
<td>2343</td>
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<tr>
<td>15</td>
<td>100%</td>
<td>100</td>
<td>6800</td>
<td>78</td>
<td>18</td>
<td>8%</td>
<td>2582</td>
</tr>
<tr>
<td>16</td>
<td>100%</td>
<td>100</td>
<td>6800</td>
<td>85</td>
<td>18</td>
<td>8%</td>
<td>2204</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 ______  X  

REMARKS:

RECORDED BY: ____________________________  DATE: 05/04/04  
APPROVED BY: ____________________________
DATA SHEET 3 (9 of 9)  
FAIL-SAFE OPERATION DISCONNECTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 LANDROVER FREELANDER, MPV  
VEHICLE NHTSA NO.: C40600  
DATE OF TEST: MAY 4, 2004

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

SYSTEM CONDITION: APS INDIVIDUAL WIRES SEVERED

<table>
<thead>
<tr>
<th>WIRE NO.</th>
<th>ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)</th>
<th>THROTTLE POSITION SENSOR READING</th>
<th>RPM</th>
<th>TEMPERATURE (°F)</th>
<th>THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)</th>
<th>RETURN TIME TO IDLE (Msec) OR LIMP MODE</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>100%</td>
<td>100</td>
<td>6850</td>
<td>91</td>
<td>18</td>
<td>8%</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>100%</td>
<td>100</td>
<td>6850</td>
<td>92</td>
<td>18</td>
<td>8%</td>
<td>2051</td>
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<tr>
<td>13</td>
<td>100%</td>
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<td>14</td>
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<td>8%</td>
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<td>15</td>
<td>100%</td>
<td>100</td>
<td>6850</td>
<td>107</td>
<td>19</td>
<td>8%</td>
<td>1535</td>
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<tr>
<td>16</td>
<td>100%</td>
<td>100</td>
<td>6850</td>
<td>110</td>
<td>19</td>
<td>8%</td>
<td>2036</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 X

REMARKS:

RECORDED BY: [Signature]  
DATE: 05/04/04

APPROVED BY: [Signature]
## 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>55662</td>
<td>03/04</td>
<td>03/05</td>
</tr>
<tr>
<td>ENGINE RECORDING</td>
<td>FLUKE</td>
<td>7471026</td>
<td>03/04</td>
<td>03/05</td>
</tr>
<tr>
<td>ENGINE RECORDING</td>
<td>MONARCH</td>
<td>1444664</td>
<td>01/04</td>
<td>07/06</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 6
PLOTS
FMVSS 124 THROTTLE RETURN TEST
124 COLD/NORMAL/25% WOT
10:40:44 PM 5/3/04

NHTSA C40600 FREELANDER

V % RPM

TRIGGER

THROTTLE POSITION %

RPM

12:37:02.5 22:37:03.0 22:37:03.5 22:37:04.0 22:37:04.5

Channel: Throttle Position

Y1: 51.731 %  Y2: 6.849 %
T1: -43820.848 ms  T2: -42729.846 ms
da: 1.091 s  f: 0.917 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/NORMAL/50% WOT 10:42:39 PM 5/3/04

NHTSA C40600 FREELANDER

V  %  RPM


--- TRIGGER [V] --- Throttle Position [%] --- Engine RPM [RPM]

Channel: Throttle Position

Y1: 66.272 %  Y2: 8.862 %
t1: -33314.646 ms  t2: -32683.846 ms
dt: 0.451 s  f: 2.217 Hz
NHTSA C40800 FREELANDER

FMVSS 124 THROTTLE RETURN TEST
124 COLD/NORMAL/75% WOT 10:48:44 PM 5/3/04

Channel: Throttle Position

Y1: 89.402 %
t1: -22077.545 ms
dt: 0.136 s

Y2: 8.758 %
t2: -21839.544 ms
t: 7.248 Hz
FMVSS 124 THROTTLE RETURN TEST

124 GOLDSPRING 1/25% WOT

11:04:27 PM 5/3/04

NHTSA 040800 FREELANDER

V  %  RPM

5.00
3.75
2.50
1.25
0.00
100
75
50
25
0

TRIGGER

THROTTLE POSITION %

RPM

23:01:12.0  23:01:12.5  23:01:13.0  23:01:13.5

h:min:s

Channel: Throttle Position

Y1: 43.825 %  YZ: 6.828 %
F1: -3888.539 ms  t2: -33326.539 ms
dt: 0.291 s  f: 3.438 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/SPRING 1/50% WOT  11:06:19 PM  5/3/04

NHTSA G40600 FREELANDER

V % RPM

3:01:21.5 23:01:22.0 23:01:22.5 23:01:23.0 23:01:23.5

Channel: Throttle Position

V1: 86.856 %  V2: 8.653 %
t1: 24005.536 ms  t2: 23971.539 ms
dt: 0.114 s  f: 8.772 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/SPRING 1/100% WOT 11:12:02 PM 5/3/04

NHTSA C40600 FREELANDER

V % RPM

23:01:41.5 23:01:42.0 23:01:42.5 23:01:43

TRIGGER

THROTTLE POSITION %

RPM

Channel: Throttle Position
Y1: 100.497 %
Y2: 8.882 %
T1: -4155335 μs
T2: 3983.535 μs
dt: 0.165 s
f: 6.081 Hz
FMVSS 124 THROTTLE RETURN TEST
124 GOLD/SPRING 2/25% WOT 11:18:38 PM 5/3/04

NHTSA C40800 FREELANDER

V  %  RPM

23:14:57.0 23:14:57.5 23:14:58.0 23:14:58.5 23:14:59.0 23:14:59.5 23:15:00

--- TRIGGER [V] --- Throttle Position [%] --- Engine RPM [RPM] h:min:s

Channel: Throttle Position
Y1: 42.154 %  Y2: 8.651 %
11: -32262.182 ms 12: -32256.182 ms
dt: 0.867 s  f: 1.400 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/SPRING 2/50% WOT 11:21:09 PM 5/3/04

NHTSA C4000 FREELANDER

V  %  RPM
5.00
3.75
2.50
1.25
0.00

THROTTLE POSITION %


TRIGGER [V]  Throttle Position [%]  Engine RPM [RPM] h:min:s

Channel: Throttle Position
Y1: 71.896 %  Y2: 8.954 %
T1: -24219.182 ms  T2: -24080.182 ms
dt: 0.129 s  f: 7.752 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/SPRING 2/100% WOT 11:29:58 PM 5/3/04

NHTSA C40600 FREELANDER

V % RPM


- TRIGGER [V] - Throttle Position [%] - Engine RPM [RPM]

Channel: Throttle Position

Y1: 100.527 %
Y2: 9.374 %
t1: -627.182 ms
t2: -122.182 ms
dt: 0.405 s
t: 2.469 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/TPS/TPM, DISC/100% WOT 10:27:25 PM 5/3/04

NHTSA C40600 FREELANDER

V % RPM

TRIGGER

THROTTLE POSITION %

RPM

22:12:43.5  22:12:44.0  22:12:44.5  22:12:45.0  22:12:45

--- TRIGGER [V] --- Throttle Position [%] --- Engine RPM [RPM]

Channel: Throttle Position

Y1: -7.286 %  Y2: -12.040 %
H1: -15622.104 ms  H2: -15617.104 ms
dt: 0.005 s  f: 111.111 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/APS DISC/100% WOT

NHTSA C40600 FREELANDER

V % RPM

TRIGGER

THROTTLE POSITION%

RPM


TRIGGER [ms] Throttle Position [%] Engine RPM [RPM]

h:min:s

Channel/Throttle Position

Y1: 100.527 %  
Y2: -0.175 %  

t1: -5294.104 ms  
t2: 4273.104 ms  

dt: 0.018 s  
f: 62.500 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/ECM CONNECTOR 2/100% WOT

11:54:22 PM 5/3/04

NHTSA C40690 FREELANDER

Channel: Throttle Position

Y1: 13.289 %  
T1: -45440.923 ms  
dt: 0.015 s

Y2: -4.448 %  
T2: -45425.923 ms  
f: 66.987 Hz
FMVSS 124  THROTTLE RETURN TEST
124 COLD/ECM CONNECTOR 3/100% WOT  11:56:30 PM  5/3/04

NHTSA C49889 FREELANDER

V  %  RPM

--- TRIGGER [V]  --- Throttle Position [%]  --- Engine RPM [RPM]  

Channel: Throttle Position

Y1:  97.532 %  
Y2:  8.530 %  

f1:  25425.923 ms  
f2:  23619.823 ms  
f:  1.805 s  
f:  0.554 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/ECM CONNECTOR 4/100% WOT
11:58:19 PM 5/3/04

NHTSA C40800 FREELANDER

V % RPM

THROTTLE POSITION %


TRIGGER [V] Throttle Position [%] Engine RPM [RPM]

Channel: Throttle Position

Y1: 96.351 % Y2: 8.331 %
T1: -16173.823 ms T2: -14645.923 ms
dt: 1.331 s f: 0.751 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/ECM CONNECTOR 5/ 100% WOT 0:00:02 AM 5/4/04

NHTSA C40600 FREELANDER

---

Channel: Throttle Position

<table>
<thead>
<tr>
<th>Y1</th>
<th>Y2</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.85%</td>
<td>-10.773%</td>
</tr>
</tbody>
</table>

T1: -5995.523 ms  T2: -5947.523 ms
dt: 0.013 s  f: 76.923 Hz
FMVSS 124  THROTTLE RETURN TEST
124 COLD/TPS/TPM WIRE 1/100% WOT  0:08:19 AM  5/4/04

NHTSA C40600 FREELANDER

V % RPM

TRIGGER

THROTTLE POSITION %

RPM

00:03:50.0  00:03:51.0  00:03:52.0  00:03:53.0

Y1:  87.398 %  
Y2:  8.728 %  

t1:  -54217.192 ms  
t2:  -52861.192 ms  
dt:  1.600 s  
f:  0.622 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/TPS/TPM WIRE 3/100% WOT

0:12:22 AM 5/4/04

NHTSA O4600 FREELANDER

V % RPM

- TRIGGER [V]
- Throttle Position [%]
- Engine RPM [RPM]

Channel: Throttle Position

Y1: 51.392 %
Y2: 1.888 %
t1: -34942.192 ms
t2: -34906.192 ms
dt: 0.038 s
f: 27.778 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/TPS/TPM WIRE 4/100% WOT

0:13:36 AM 5/4/04

NHTSA C40600 FREELANDER

V % RPM

Channel: Throttle Position

Y1: 103.505 %
Y2: -12.352 %
t1: -25345.192 ms
t2: -25260.192 ms
dt: 0.085 s
t: 10.526 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/TPS/TPM WIRE 8/100% WOT
0:17:38 AM 5/4/04

NHTSA C40600 FREELANDER

V % RPM

00:04:38.0 00:04:38.0 00:04:40.0 00:04:41.0

- TRIGGER [V] - Throttle Position [%] - Engine RPM [RPM]

Channel: Throttle Position

Y1: -2.340 %  Y2: -10.664 %
T1: -5882.192 ms  T2: -6348.192 ms
dt: 0.013 s  f: 76.323 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/TPS/TPM WIRE 1 GND/ 100% WOT 0:27:50 AM 5/4/04

NHTSA C40600 FREELANDER

V % RPM

Channel: Throttle Position
Y1: 102.917 %  Y2: 9.871 %
H: -65030.733 ms  t2: -54928.733 ms
dt: 0.402 s  f: 2.488 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/TPS/TPM WIRE 2GND/ 100% WOT
0:30:41 AM 5/4/04

NHTSA C40600 FREELANDER

V % RPM

- TRIGGER (V)
- Throttle Position [%]
- Engine RPM (RPM)

Channel: Throttle Position

Y1: 103.006 %

Y2: 8.986 %

t1: -46297.733 ms

t2: -43169.733 ms

dt: 2.128 s

t: 0.470 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/TPS/TPM WIRE 3 GND/ 100% WOT
0:32:07 AM 5/4/04

NHTSA C408500 FREELANDER

V % RPM

00:20:35.0 00:26:35.5 00:20:36.0

Channel: Throttle Position

Y1: 102.473 %
Y2: -0.532 %
T1: 36864.733 ms
t2: 36864.733 ms
dt: 0.181 s
f: 6.525 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/TPS/TPM WIRE 5 GND/ 100% WOT 0:35:23 AM 5/4/04

NHTSA C40600 FREELANDER

V % RPM

TRIGGER

THROTTLE POSITION %

RPM

0:53.5 00:20:54.5 00:20:55.5 00:20:59.5 00:20:57.5

h:min:s

Channel: Throttle Position

Y1: 103.022 %  Y2: 8.970 %
T1: 16352.733 ms  T2: 14034.733 ms
dt: 2.271 s  f: 0.440 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/APS WIRE 12 GND/100% WOT 0:57:36 AM 5/4/04

NHTSA C40600 FREELANDER

V % RPM

TRIGGER

THROTTLE POSITION %

RPM

1:46.0 00:40:49.0 00:40:50.0 00:40:51.0

Channel: Throttle Position

Y1: 90.622 % Y2: 8.946 %
H: -45358.106 ms L2: -43904.108 ms
dt: 2.051 s f: 0.486 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/APS WIRE 14 GND/ 100% WOT 1:02:01 AM 5/4/04

NHTSA C40800 FREELANDER

V % RPM

TRIGGER

THROTTLE POSITION %

RPM

Channel: Throttle Position

Y1: 102.645 %
Y2: 8.738 %

t1: -22974.106 ms
t2: -22742.106 ms
t: 2.232 s
f: 0.449 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/APS WIRE 15 GND/100% WOT 1:04:18 AM 5/4/04

NHTSA C40600 FREELANDER

![Graph showing throttle position and RPM over time.](image)

Channel: Throttle Position

Y1: 102.663 %
Y2: 7.780 %
T1: 15670.106 ms
t2: 14356.106 ms
dt: 1.535 s
t: 0.681 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/APS WIRE 12 SEVERED/ 100% WOT 1:25:44 AM 5/4/04

NHTSA 040000 FREELANDER

Channel: Throttle Position

Y1: 105.694 %  
Y2: 7.525 % 

t1: -46042.923 ms  
t2: -42410.923 ms 

dt: 3.632 s  
f: 0.276 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/APS WIRE 13 SEVERED/100% WOT 1:28:04 AM 5/4/04

NHTSA C40800 FREELANDER

Channel: Throttle Position
Y1: 103.543 %  Y2: 8.886 %
t1: -36342.023 ms  t2: -35390.923 ms
dt: 3.082 s  f: 0.324 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/APS WIRE 15 SEVERED/100% WOT

NHTSA C40600 FREELANDER

Channel: Throttle Position

Y1: 102.800 %
Y2: 8.729 %

tt: -16398.923 ms
t2: -13798.923 ms
t: 2.552 s
t: 0.387 Hz
FMVSS 124 THROTTLE RETURN TEST
124 COLD/APS WIRE 16 SEVERED/100% WOT

NHTSA C40660 FREELANDER

V % RPM

TRIGGER

THROTTLE POSITION %

RPM

Channel: Throttle Position

Y1: 99.474 %
T1: -8543.923 ms
dt: 2.204 s

Y2: 8.555 %
T2: -4239.923 ms
f: 0.454 Hz
SECTION 7
MANUFACTURER'S DRAWINGS
VEHICLE INFORMATION/TEST SPECIFICATIONS
FMVSS 124 - Accelerator Control Systems

Requested Information:

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

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

- A setpoint idle speed is determined and the ECM tries to achieve this
setpoint primarily through throttle opening angle, with adjustments to
ignition angle and fuelling to suit momentary changes in load and mass
airflow.

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)
- The first reaction to a fault as described above is reversible Fuel Cut-off, also known as reversible SAS, until the throttle plate has arrived at the Limp Home position through spring activation.

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

- All of the above.

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.

   Measure voltage across pins 3-19 (TPS1 signal) and 3-20 (TPS ground) at the ECM or the corresponding pins at the TPS sensor. The absolute throttle angle is then given by;

   \[
   \text{TPS} = \left( \frac{\text{measured value}}{5V} \right) \times 100\%
   \]

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

   See items under 7.)

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.

   - CAM (Camshaft) sensor: fault reaction test at start, Idle and Part Load with and without engine speed fault.
   - CRK (Crankshaft ) sensor: fault reaction test at start, idle and Part Load with and without engine speed fault.
   - MAF sensor: fault reaction test for MAF signal line break at start and Part Load.
   - Throttle control motor: fault reaction test for break in supply line to Air Throttle plate actuator motor.
   - APS sensors: fault reaction test for disconnection of each line (supply, ground, signal) separately and the whole plug of each pot.
   - ECT sensor: fault reaction test for signal line disconnection at start and Part Load.
   - TPS sensors: fault reaction test for disconnection of each line (supply, ground, signal) separately and the whole plug of each pot.
8.) Where applicable, were idle return times tested for electrical severance accompanied by shorting to ground? If yes, please provide details.

   - Data available, but not analyzed to this purpose.

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

   - Limp home position return spring used for air throttle plate. Accelerator pedal spring loaded to return to uppermost position.

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

   N/A

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

   When a failure that requires limp home mode is detected, the ECM deactivates, when possible, the air throttle plate motor whilst reversible fuel cut-off is activated. The throttle plate acquires it’s limp home position through spring action. When appropriate, fuel injection is reinstated when the throttle plate has assumed the limp home position.
Please target pin 17 in this region.
SECTION 8
NOTICE OF POSSIBLE NON-COMPLIANCE
LABORATORY NOTICE OF TEST FAILURE TO OVSC

FMVSS NO.: 124L TEST DATE: 05/04/04

LABORATORY: General Testing Laboratories, Inc.

CONTRACT NO.: DTNH22-01-C-11025 ; DELV. ORDER NO.: 

LABORATORY PROJECT ENGINEER'S NAME: Grant Farrand

TEST VEHICLE MAKE/MODEL/BODY STYLE: 2004 Landrover Freelander MPV

VEHICLE NHTSA NO.: C40600 VIN: SALNY22214A

VEHICLE MODEL YEAR: 2004 BUILD DATE: 10/03

TEST FAILURE DESCRIPTION: During various failure modes of the accelerator control system, return time to base idle exceeds the allowed 1 second maximum.

S124 REQUIREMENT, PARAGRAPH S5.3: Except as provided below, maximum time to return to idle position shall be 1 second for vehicles of 4536 kg or less GVWR.

NOTIFICATION TO NHTSA (COTR): Stu Seigel

DATE: 08/17/04 BY: Grant Farrand

REMARKS: