**REPORT NUMBER TR-P29009-01-NC**

# SAFETY COMPLIANCE TESTING FOR FMVSS 124
# ACCELERATOR CONTROL SYSTEMS

**FORD MOTOR CORPORATION**

**2009 FORD EDGE**

**5-DOOR MPV**

**NHTSA NUMBER: C90203**

**PREPARED BY:**

**KARCO ENGINEERING, LLC.**

**9270 HOLLY ROAD**

**ADELANTO, CALIFORNIA 92301**

**JUNE 25, 2009**

**FINAL REPORT**

**PREPARED FOR:**

**U.S. DEPARTMENT OF TRANSPORTATION**

**NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION**

**ENFORCEMENT**

**OFFICE OF VEHICLE SAFETY COMPLIANCE**

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**WASHINGTON, D.C. 20590**

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**15. Supplementary Notes**

**16. Abstract**

Compliance tests were conducted on the subject 2009 Ford Edge 5-Door MPV on June 25, 2009 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

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

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# SECTION 1

# PURPOSE OF COMPLIANCE TEST

## 1.1 PURPOSE OF COMPLIANCE TEST

Tests were conducted on a 2009 Ford Edge 5-Door MPV manufactured by Ford Motor Corporation, to determine if the tested vehicle meets the minimum performance requirements of Federal Motor Vehicle Safety Standard (FMVSS) 124, “Accelerator Control Systems”. FMVSS 124 establishes requirements for the return of a vehicle’s throttle to the idle position when the actuating force is removed from the accelerator control or in the event of a severance or disconnection in the accelerator control system.

All tests were conducted in compliance with current National Highway Traffic Safety Administration (NHTSA), Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures, specifically, TP-124-06, dated April 2000. Detailed procedures for receiving, inspecting, testing and reporting of test results are described in the test procedures and are not repeated in this report.

## SECTION 2

## TEST PROCEDURE

### 2.1 COMPLIANCE TEST PROCEDURE

A 2009 Ford Edge 5-Door MPV was subjected to FMVSS 124 compliance testing. The tests were conducted at KARCO Engineering, LLC. in Adelanto, California on June 25, 2009. The following tests were performed:

- Inspection
- Time to Return to Idle Position (Complete Normal Operation)
- Time to Return to Idle Position (APS Spring 1 Removed)
- Time to Return to Idle Position (APS Spring 2 Removed)
- Time to Return to Idle Position (APS Disconnect)
- Time to Return to Idle Position (Individual APS Wires Open and Short-to-Ground)
- Time to Return to Idle Position (TPS Spring 1 Removed)
- Time to Return to Idle Position (TPS Disconnect)
- Time to Return to Idle Position (Individual TPS Wires Open and Short-to-Ground)

The vehicle is equipped with an electronic throttle control system with an accelerator pedal position sensor (APS), a throttle position sensor (TPS), an electronic control module (ECM), and a throttle plate actuator motor.

Throttle return time requirements of FMVSS 124 are as follows:

| Test Vehicle GVWR | Maximum Throttle Return Time |
|---|---|
| ≤4536 kg | 1 second |
| >4536 kg | 2 seconds |

### 2.2 TEST SETUP

Each series of tests were conducted in the following manner: Throttle plate position was measured using the test vehicle's throttle position sensor (TPS) and a TDAS data acquisition system. The time base of the TDAS was used to determine throttle return time where possible. Engine coolant temperature was monitored by placing a thermocouple in the engine coolant, coupled to a digital temperature readout. Engine RPM was monitored using the vehicle's tachometer. Accelerator demand was measured at the accelerator pedal sensor (APS) using a digital voltmeter. Voltage readings were recorded for zero demand, as well as 100% demand (WOT), and then points were calculated for 25%, 50% and 75% demand. Time zero for each test was the instant that accelerator pedal demand was removed, which in the case of an induced

electrical fault (APS or TPS individual wire open or grounding, APS or TPS disconnect) was simultaneous to the induced fault condition.

## SECTION 3

## SUMMARY OF COMPLIANCE TEST

### 3.1 TEST DATA SUMMARY

Testing was performed on the subject 2009 Ford Edge 5-Door MPV on June 25, 2009 to determine compliance with FMVSS 124 “Accelerator Control Systems”. The subject vehicle was equipped with a “Drive-By-Wire” accelerator control system. Tests were conducted in the normal operating condition as well as in the following induced system failure modes: throttle return energy removal (TPS Spring 1, APS Spring 1 and 2), electrical system disconnects (APS and TPS electrical connectors), electrical system open circuits (TPS and APS wires), and electrical system circuits shorted to ground (TPS and APS wires).

The return times for some normal operation and fault conditions were greater than one second. In these cases, throttle angle position decreased rapidly followed by a controlled ramp down to the original idle position. Manufacturers sometimes use this ramp down strategy to improve emission control, which may be the cause here. No engine “racing” was observed at any point during the test. Complete data on the testing performed is available in Data Sheet No. 3 of this report.

**SECTION 4**

**COMPLIANCE TEST DATA**

Test Vehicle: 2009 Ford Edge 5-Door MPV NHTSA No.: C90203

Test Program: FMVSS 124 Accelerator Control Systems Test Date: 6/25/09

**CONVERSION FACTORS USED IN THIS REPORT***

| Quantity | Typical Application | Std Units | Metric Unit | Multiply By |
|---|---|---|---|---|
| Mass | Vehicle Weight | lb | kg | 0.4536 |
| Linear Velocity | Impact Velocity | mile/h | km/h | 1.609344 |
| Length or Distance | Measurements | in | mm | 25.4 |
| Volume | Fuel Systems | gal | liter | 3.785 |
| Volume | Small Fluids | oz | mL | 29.573 |
| Pressure | Tire Pressures | $lbf/in^2$ | kPa | 7.0 |
| Volume | Liquid | gal | liter | 3.785 |
| Temperature | General Use | $^oF$ | $^oC$ | =(tf -32)/1.8 |
| Force | Dynamic Forces | lbf | N | 4.448 |
| Moment | Torque | lbf/ft | Nm | 1.355 |

## DATA SHEET NO. 1

## GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2009 Ford Edge 5-Door MPV NHTSA No.: C90203

Test Program: FMVSS 124 Accelerator Control Systems Test Date: 6/25/09

### TEST VEHICLE INFORMATION AND OPTIONS

| | | | |
|---|---|---|---|
| NHTSA No. | C90203 | Anti-Lock Brakes | Yes |
| Make | Ford | All Wheel Drive | No |
| Model | Edge | Power Steering | Yes |
| Body Style | 5-Door MPV | Driver Front Airbag | Yes |
| Vin No. | 2GMDK36C89BA34371 | Driver Side Torso Airbag | Yes |
| Color | White | Driver Side Head Airbag | No |
| Delivery Date | 4/13/2009 | Driver Curtain/Airbag | Yes |
| Odometer (Miles) | 2153.6 | Rear Pass. Airbag | No |
| Dealer | Jim Bass Ford | Rear Pass. Side Airbag | No |
| Transmission | Automatic | Rear Pass. Head Airbag | No |
| Final Drive | Front | Rear Pass. Curtain/Airbag | Yes |
| Type/No. Cyl. | 6 Cylinder | Pre-Tensioners | Yes |
| Engine Disp. (L) | 3.5 | Load Limiters | Yes |
| Engine Placement | Transverse | Bucket Seats | Yes |
| Roof Rack | Yes | Air Cond. | Yes |
| Sunroof/T-Top | No | AM/FM CD | Yes |
| Tinted Glass | Yes | Tilt Steering | Yes |
| Traction Control | No | Automatic Door Locks | Yes |
| Power Brakes | Yes | Power Windows | Yes |
| Front Disc | Yes | Power Seats | No |
| Rear Disc | Yes | Other | N/A |

| | |
|---|---|
| Does Owners Manual provide instructions to turn off automatic door locks. | No |

### DATA FROM CERTIFICATION LABEL

| | | | |
|---|---|---|---|
| Manufactured By | Ford Motor Corporation | GVWR (kg) | 2422 |
| | | GAWR Front (kg) | 1288 |
| Date of Manufacture | Oct-09 | GAWR Rear (kg) | 1148 |

### VEHICLE SEATING AND CAPACITY WEIGHT INFORMATION

| Measured Parameter | Front | Rear | Third | Total |
|---|---|---|---|---|
| Type of Seats | Bucket | Bench | | |
| Number of Occupants | 2 | 3 | | 5 |
| Capacity Weight (VCW) (kg) | | | | 412.0 |

**DATA SHEET NO. 2**

**VEHICLE THROTTLE CONTROL DATA**

Test Vehicle: 2009 Ford Edge 5-Door MPV NHTSA No.: C90203

Test Program: FMVSS 124 Accelerator Control Systems Test Date: 6/25/09

**THROTTLE CONTROL SYSTEM INFORMATION**

| Throttle Control System Description | Drive by Wire |
|---|---|
| Describe sources of energy to return throttle to idle position | 2 Springs on APS, 1 Spring on TPS |
| Accelerator Throttle Position Sensor | Yes |
| Electronic Control Module | Yes |
| Throttle Plate Actuator Motor | Yes |
| Throttle Plate Position Sensor | Yes |

**DATA SHEET NO. 2**
**SUMMARY OF TEST REQUIREMENTS AND RESULTS**

Test Vehicle: 2009 Ford Edge 5-Door MPV NHTSA No.: C90203

Test Program: FMVSS 124 Accelerator Control Systems Test Date: 06/25/09

| Test Description / Connector | Engine Temp. (F) | Idle RPM / Throttle Position % | Return Time (msec) | Pass/Fail |
|---|---|---|---|---|
| Throttle Position (Normal Operation) | 220 | 700 / 25% | 920.0 | Pass |
| Throttle Position (Normal Operation) | 220 | 700 / 50% | 1880.0 | See note 1 |
| Throttle Position (Normal Operation) | 220 | 700 / 75% | 2150.0 | See note 1 |
| Throttle Position (Normal Operation) | 220 | 700 / 100% | 2160.0 | See note 1 |
| (APS Spring 1 Removed) | 220 | 700 / 25% | 230.0 | See note 1 |
| (APS Spring 1 Removed) | 220 | 700 / 50% | 1500.0 | See note 1 |
| (APS Spring 1 Removed) | 220 | 700 / 75% | 1870.0 | See note 1 |
| (APS Spring 1 Removed) | 220 | 700 / 100% | 2290.0 | See note 1 |
| (APS Spring 2 Removed) | 220 | 700 / 25% | 350.0 | Pass |
| (APS Spring 2 Removed) | 220 | 700 / 50% | 1390.0 | See note 1 |
| (APS Spring 2 Removed) | 220 | 700 / 75% | 1780.0 | See note 1 |
| (APS Spring 2 Removed) | 220 | 700 / 100% | 2090.0 | See note 1 |
| (APS Blue/White Open) | 220 | 700 / 100% | 2790.0 | See note 1 |
| (APS Blue/Gray Open) | 220 | 700 / 100% | 2610.0 | See note 1 |
| (APS Green/White Open) | 220 | 700 / 100% | 2630.0 | See note 1 |
| (APS Yellow/Orange Open) | 220 | 700 / 100% | 2620.0 | See note 1 |
| (APS Yellow/Green Open) | 220 | 700 / 100% | 2490.0 | See note 1 |
| (APS Purple/Green Open) | 220 | 700 / 100% | 2430.0 | See note 1 |
| (APS Green/Orange Open) | 220 | 700 / 100% | 2510.0 | See note 1 |

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

**DATA SHEET NO. 2…(Continued)**
**SUMMARY OF TEST REQUIREMENTS AND RESULTS**

Test Vehicle: 2009 Ford Edge 5-Door MPV NHTSA No.: C90203

Test Program: FMVSS 124 Accelerator Control Systems Test Date: 06/25/09

| Test Description / Connector | Engine Temp. (F) | Idle RPM / Throttle Position % | Return Time (msec) | Pass/Fail |
|---|---|---|---|---|
| (APS Blue/White Short) | 220 | 700 / 100% | 2970.0 | See note 1 |
| (APS Blue/Gray Short) | 220 | 700 / 100% | 180.0 | Pass |
| (APS Green/White Short) | 220 | 700 / 100% | 2660.0 | See note 1 |
| (APS Yellow/Orange Short) | 220 | 700 / 100% | 2700.0 | See note 1 |
| (APS Yellow/Green Short) | 220 | 700 / 100% | 2660.0 | See note 1 |
| (APS Purple/Green Short) | 220 | 700 / 100% | 2690.0 | See note 1 |
| (APS Green/Orange Short) | 220 | 700 / 100% | 110.0 | Pass |
| (APS Disconnect) | 220 | 700 / 100% | 2870.0 | See note 3 |
| (TPS Spring 1 Removed) | 220 | 700 / 100% | N/A | See note 2 |
| (TPS Green/Blue Open) | 220 | 700 / 100% | N/A | See note 4 |
| (TPS Brown Open) | 220 | 700 / 100% | 2050.0 | See note 1 |
| (TPS Yellow/Brown Open) | 220 | 700 / 100% | N/A | See note 4 |
| (TPS Yellow Open) | 220 | 700 / 100% | 120.0 | Pass |
| (TPS Blue/Orange Open) | 220 | 700 / 100% | N/A | See note 5 |
| (TPS Green/Brown Open) | 220 | 700 / 100% | N/A | See note 6 |
| (TPS Green/Blue Short) | 220 | 700 / 100% | N/A | See note 5 |
| (TPS Brown Short) | 220 | 700 / 100% | 2180.0 | See note 3 |
| (TPS Yellow/Brown Short) | 220 | 700 / 100% | 2050.0 | See note 3 |
| (TPS Yellow Short) | 220 | 700 / 100% | 90.0 | Pass |

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

(2) No data collected. Removal of the TPS Spring would not allow any engine control by the accelerator pedal.

(3) Limp Mode after returning to its idle state. RPM dropped to 1100 and disabled APS (Accelerator Pedal).

(4) Limp Mode at approximate 27% throttle position. RPM dropped to 1100 and disabled APS (Accelerator Pedal). Throttle never returned to baseline position.

(5) Limp Mode. Induced wire fault causes loss or throttle position sensor reading. RPM Dropped to 1100 but the APS (Accelerator Pedal) is still functional. The RPM is limited between 1100 and 2700 RPM with a 100% WOT. Throttle never returned to baseline position.

(6) Induced wire fault causes loss of throttle position sensor reading. The motor shut off.

**DATA SHEET NO. 2…(Continued)**
**SUMMARY OF TEST REQUIREMENTS AND RESULTS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2009 Ford Edge 5-Door MPV | NHTSA No.: | C90203 |
| Test Program: | FMVSS 124 Accelerator Control Systems | Test Date: | 06/25/09 |

| Test Description / Connector | Engine Temp. (F) | Idle RPM / Throttle Position % | Return Time (msec) | Pass/Fail |
|---|---|---|---|---|
| (TPS Blue/Orange Short) | 220 | 700 / 100% | N/A | See note 4 |
| (TPS Green/Brown Short) | 220 | 700 / 100% | 110.0 | Pass |
| (TPS/ Throttle Plate Motor Disconnect) | 220 | 700 / 100% | 120.0 | Pass |

(4) Limp Mode at approximate 27% throttle position. RPM dropped to 1100 and disabled APS (Accelerator Pedal). Throttle never returned to baseline position.

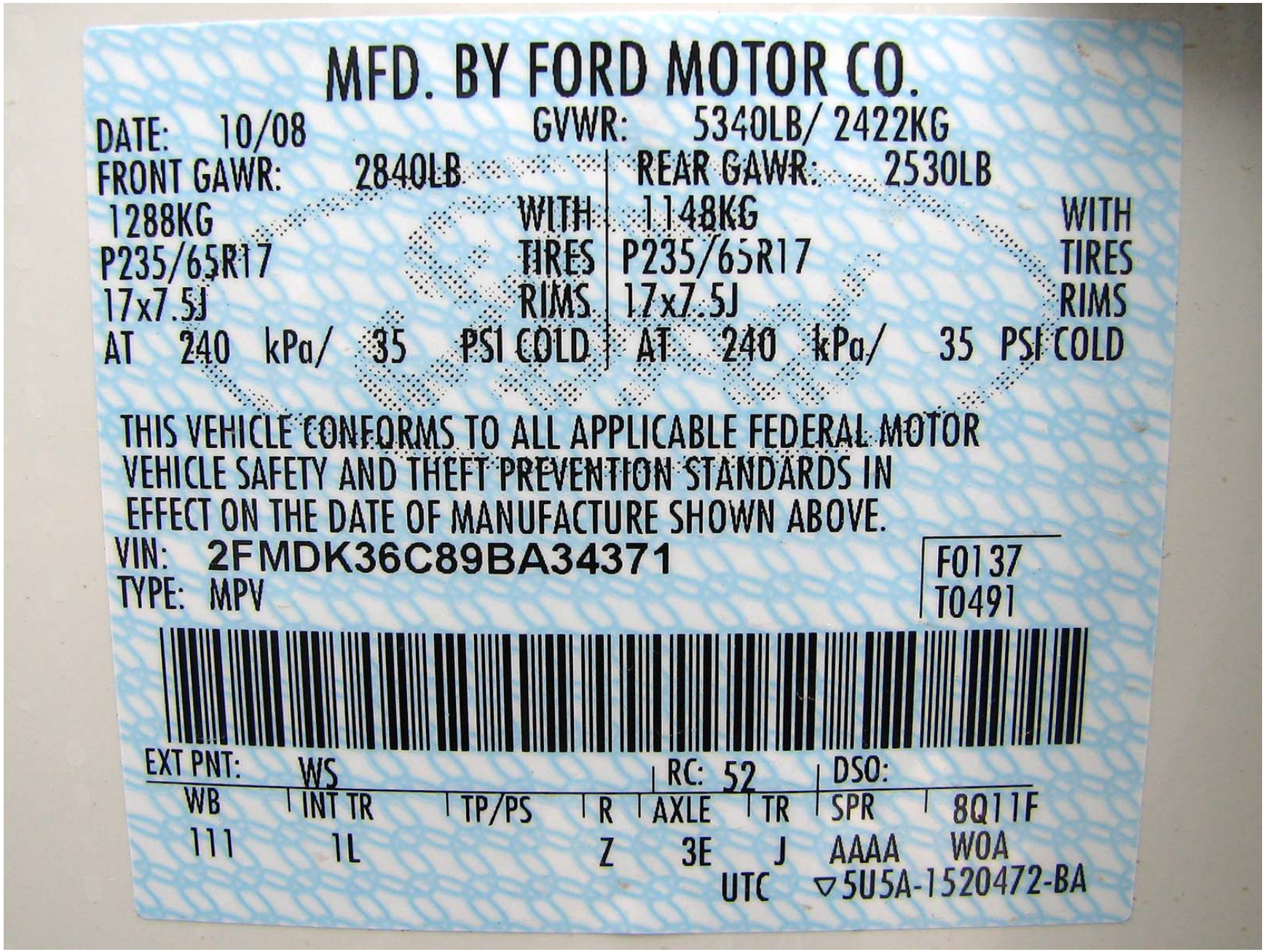
# APPENDIX A
# PHOTOGRAPHS


Figure A-1: Front View of Vehicle

Figure A-2: Left Side View of Vehicle

2009 FORD EDGE
NHTSA NO. C90203
FMVSS NO. 124

Figure A-3: Right Side View of Vehicle




2009 FORD EDGE
NHTSA NO. C90203
FMVSS NO. 124

Figure A-4: Vehicle's Certification Label

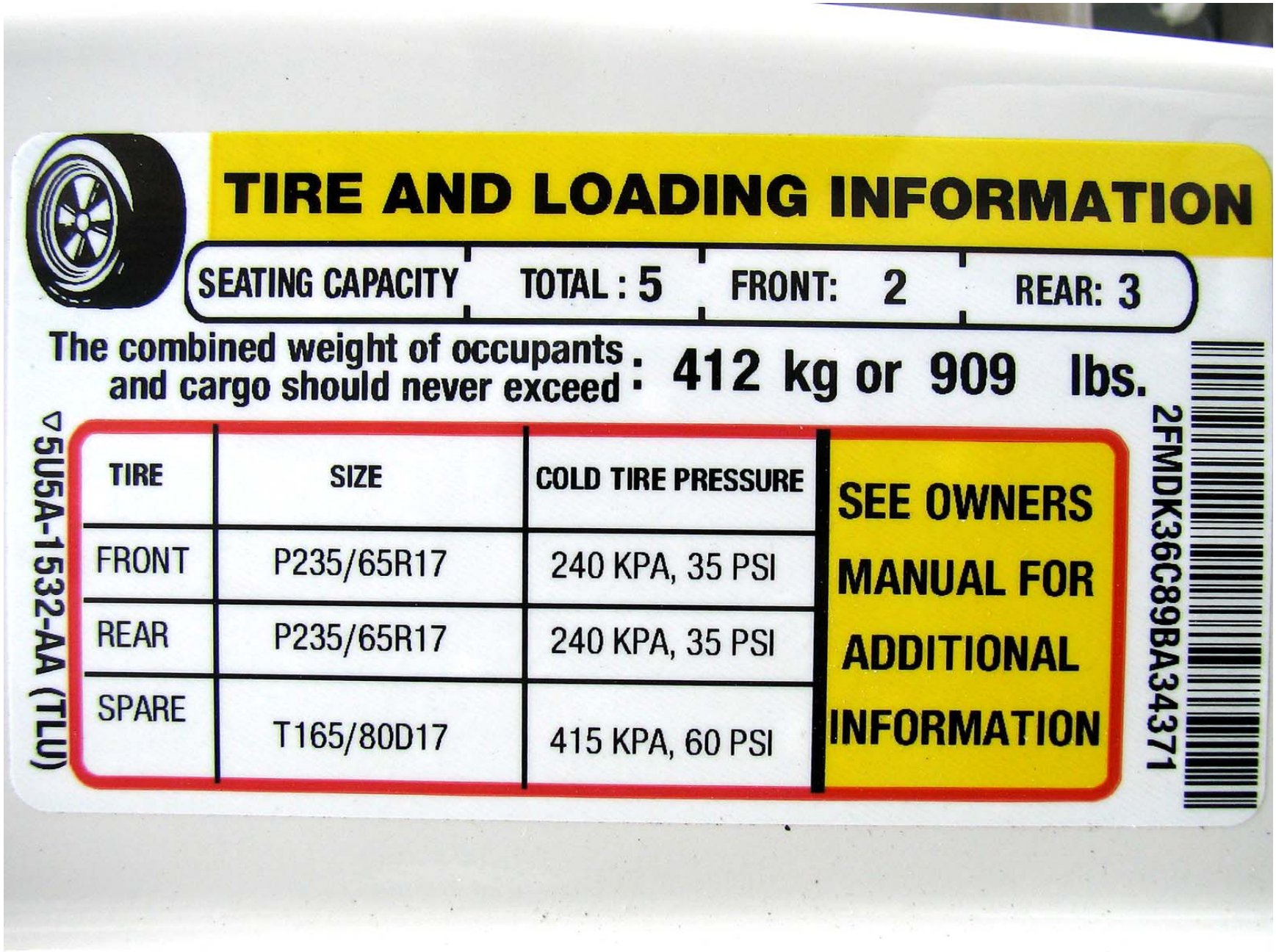
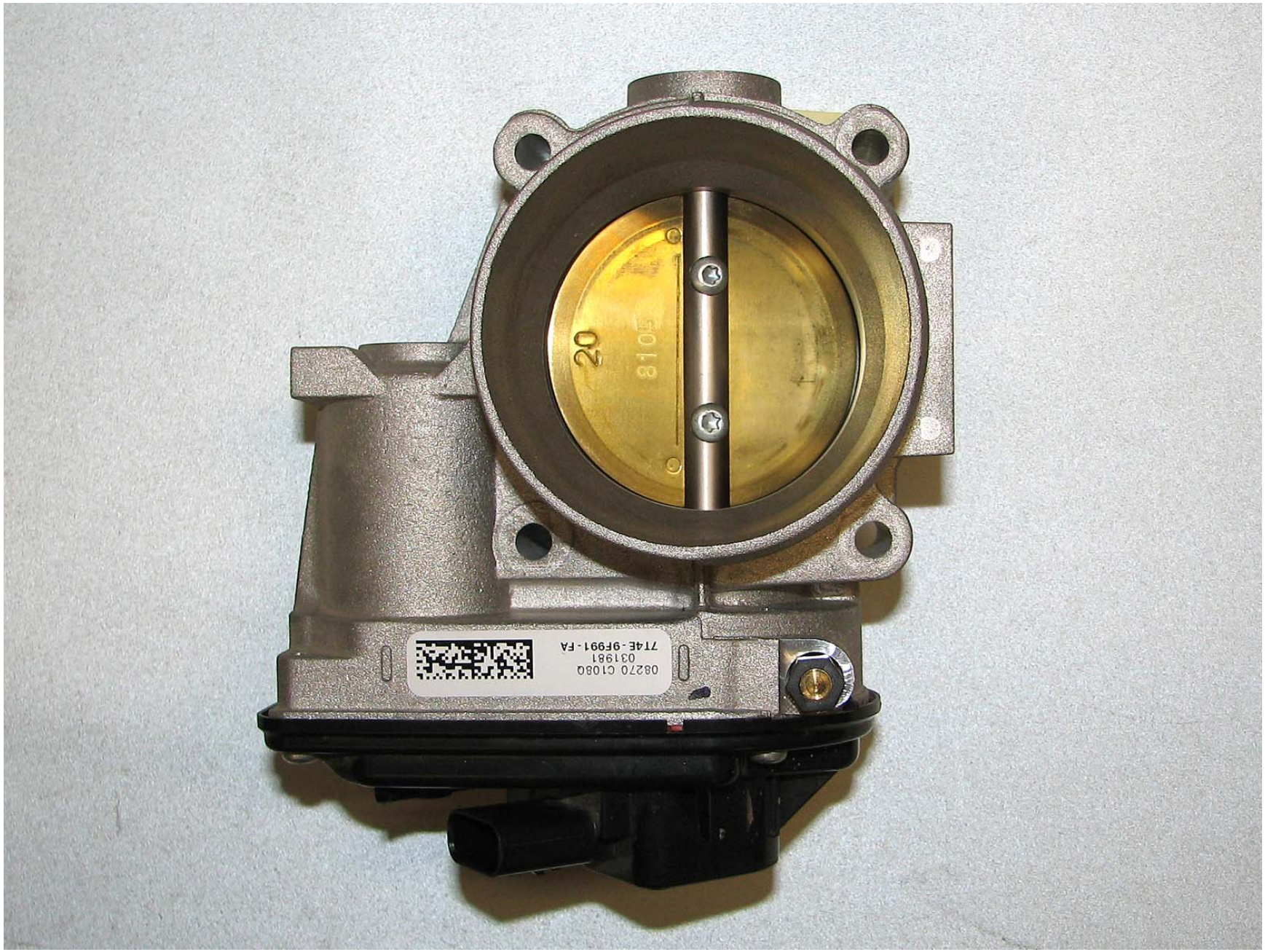



Figure A-5: Vehicle's Tire Placard




2009 FORD EDGE
NHTSA NO. C90203
FMVSS NO. 124

Figure A-6: Throttle Body Assembly

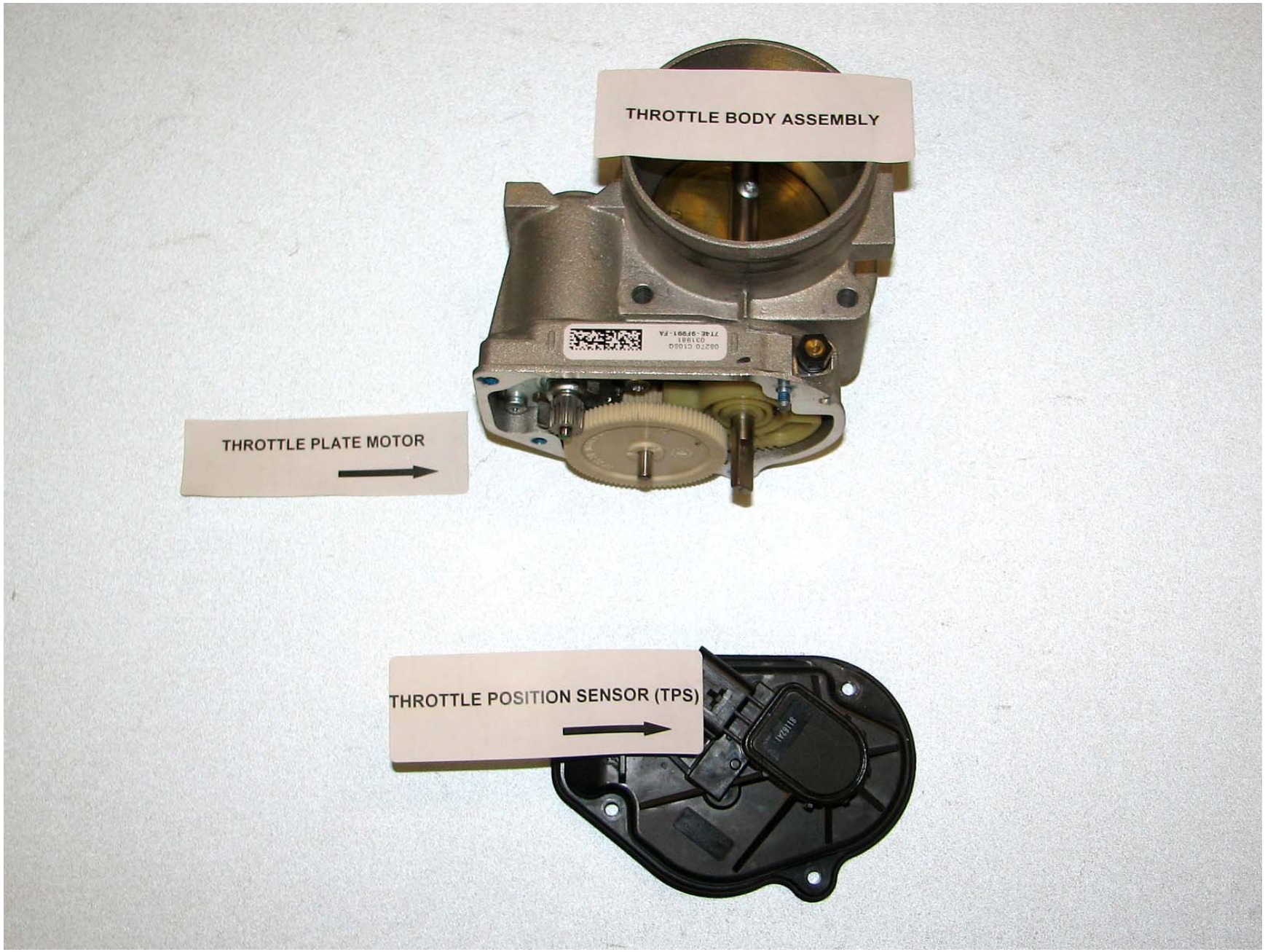



Figure A-7: Throttle Body Assembly, Motor, and Position Sensor

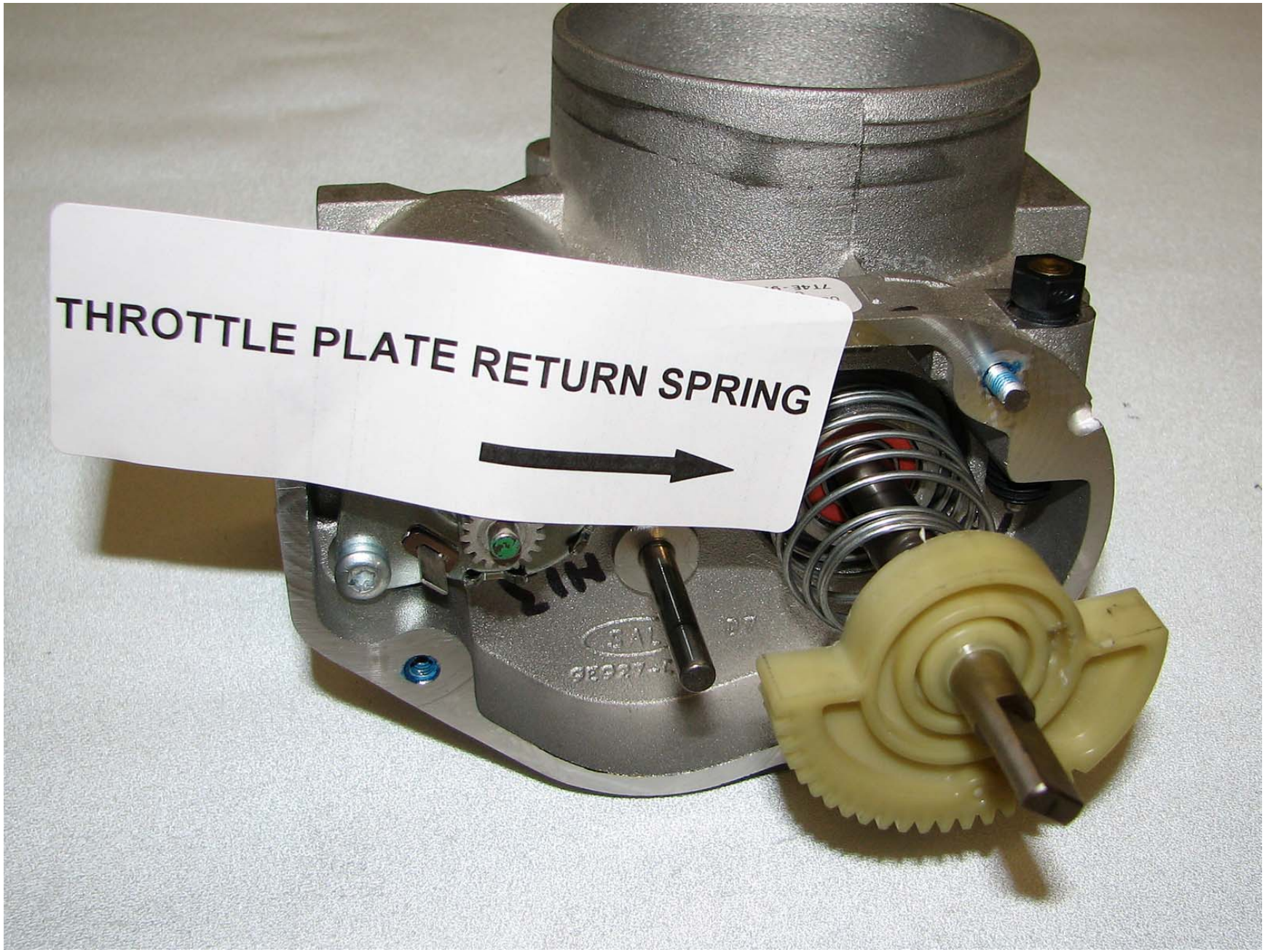



Figure A-8: Throttle Plate Return Spring

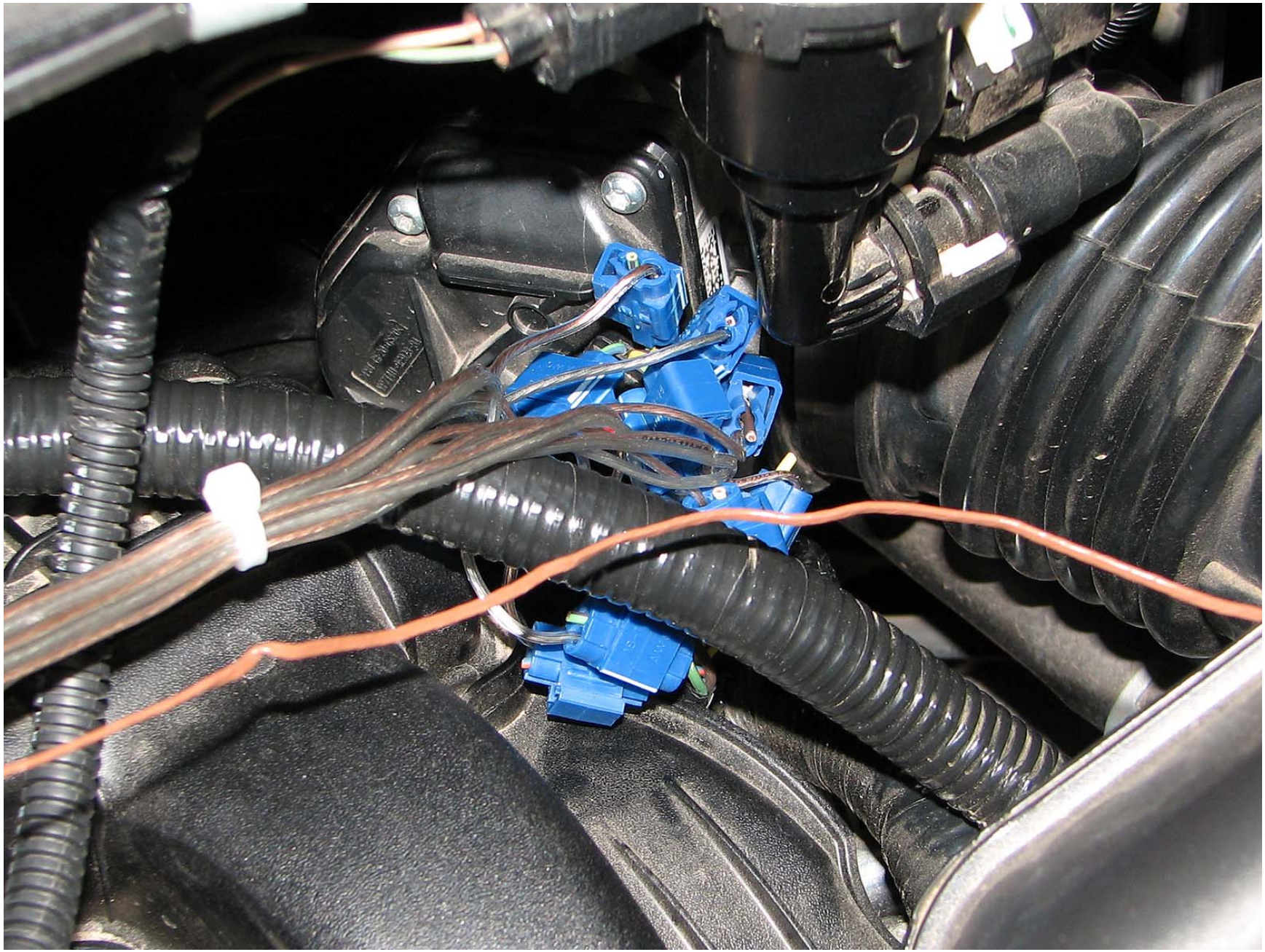
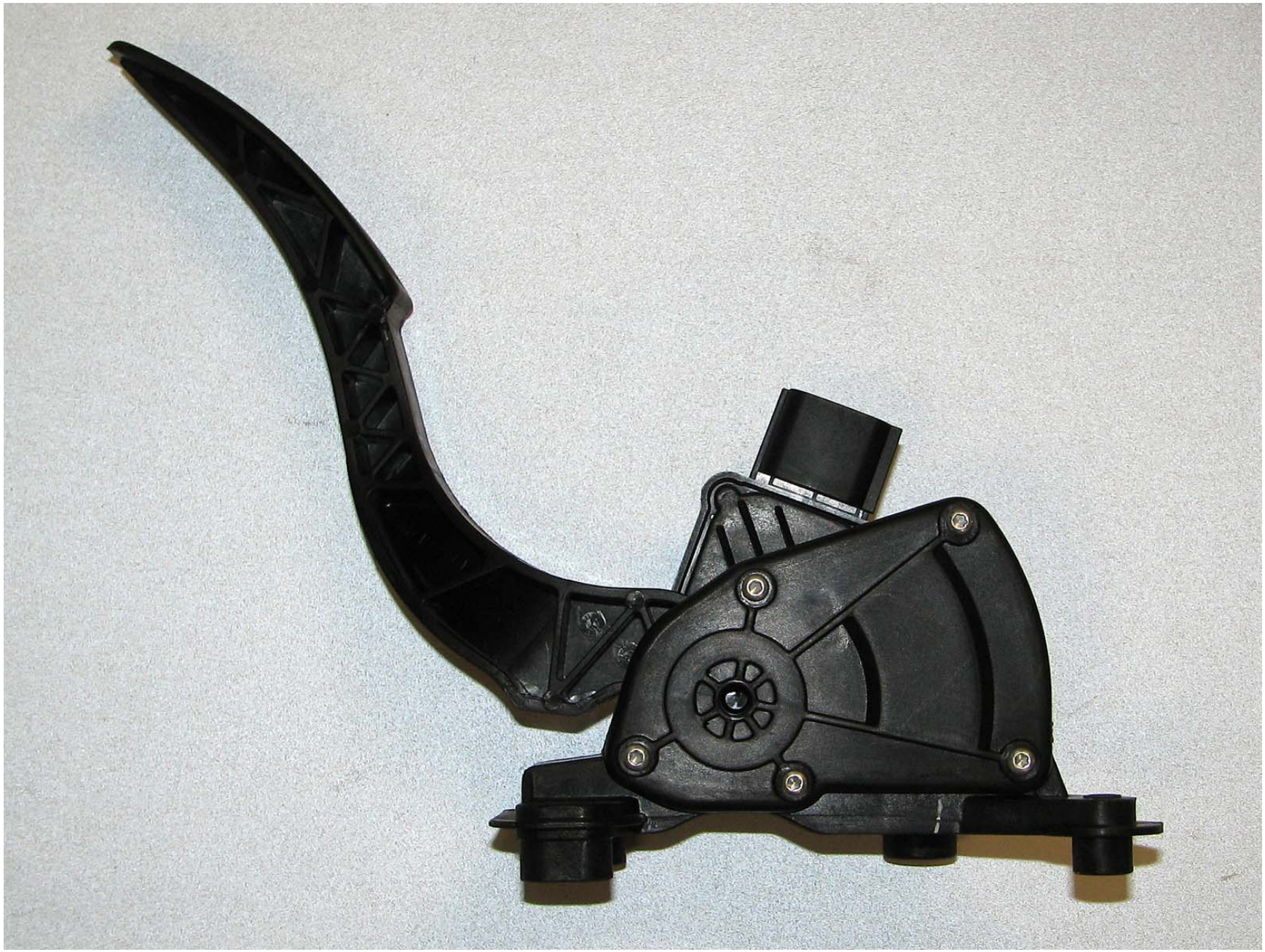


Figure A-9: Throttle Body Test Setup



2009 FORD EDGE
NHTSA NO. C90203
FMVSS NO. 124

Figure A-10: Accelerator Pedal Assembly


Figure A-11: Accelerator Return Springs



2009 FORD EDGE
NHTSA NO. C90203
FMVSS NO. 124

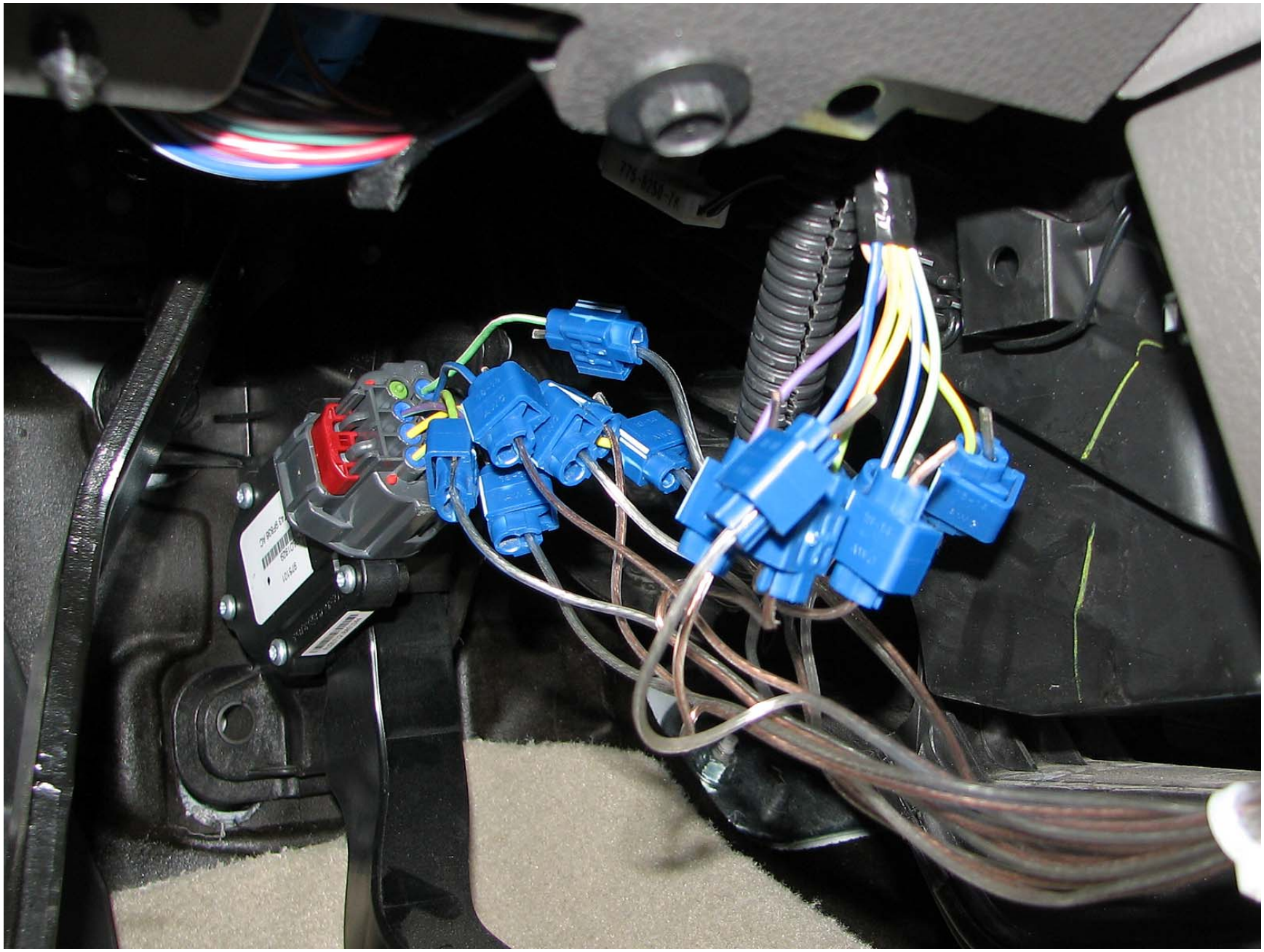


Figure A-12: Accelerator Pedal Test Setup


2009 FORD EDGE
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FMVSS NO. 124

Figure A-13: Vehicle Test Setup

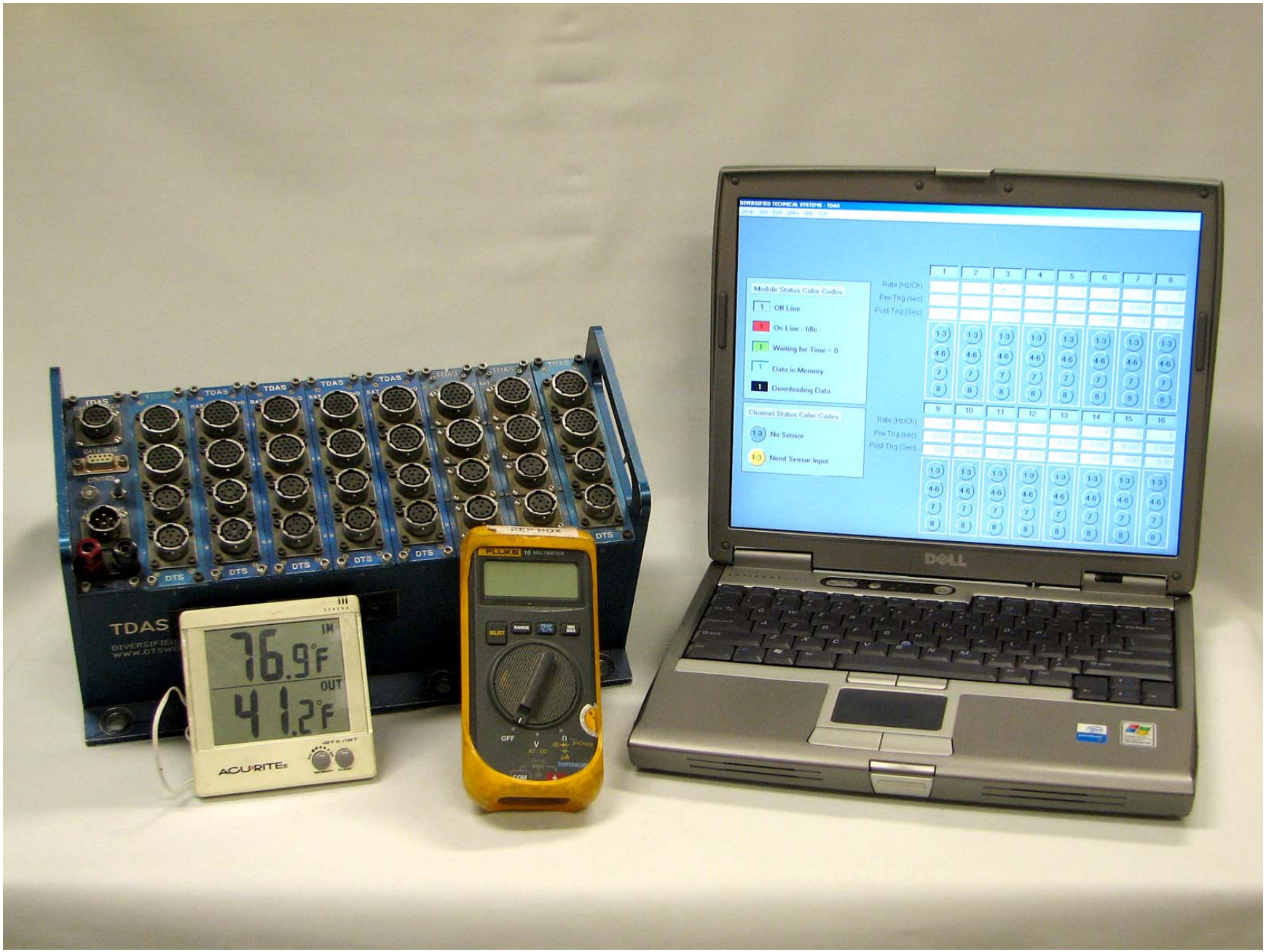



Figure A-14: Instrumentation



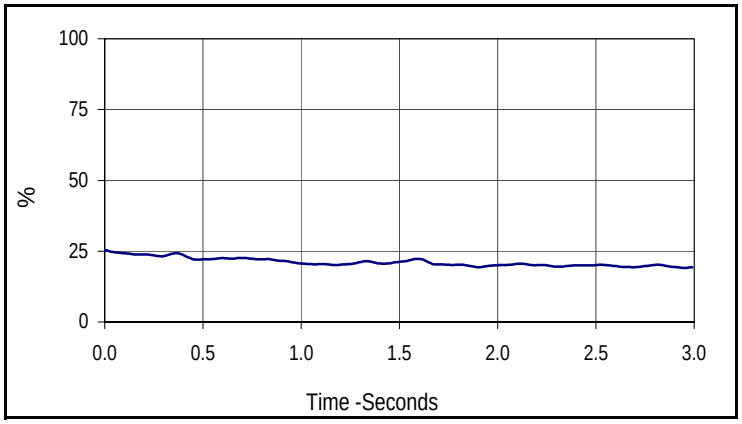


2009 FORD EDGE
NHTSA NO. C90203
FMVSS NO. 124

**APPENDIX B**

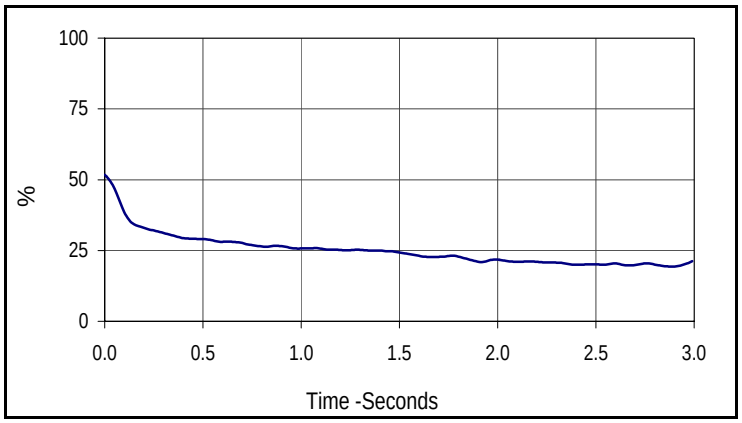
**DATA PLOTS**

| | | | |
|---|---|---|---|
| Test Vehicle: | 2009 Ford Edge 5-Door MPV | Test Date: | 6/25/09 |
| Test Program: | FMVSS 124 Accelerator Control Systems | NHTSA No.: | C90203 |



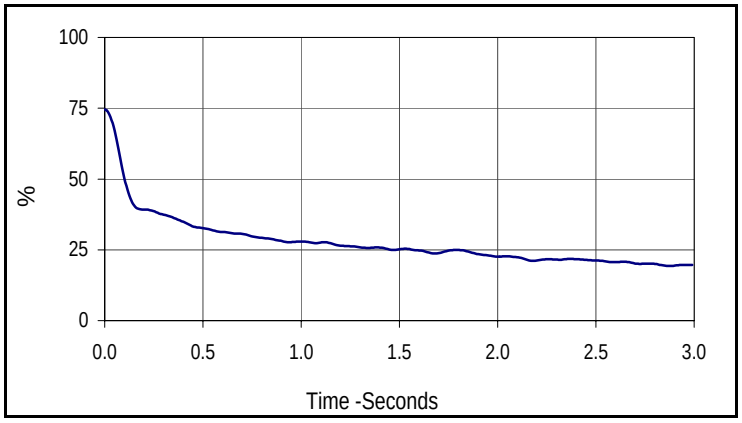

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (Normal Operation) | | | |
| CURNO | Type | SAE Class | Units |
| 001 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 25.4 | 0.0 | 920.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



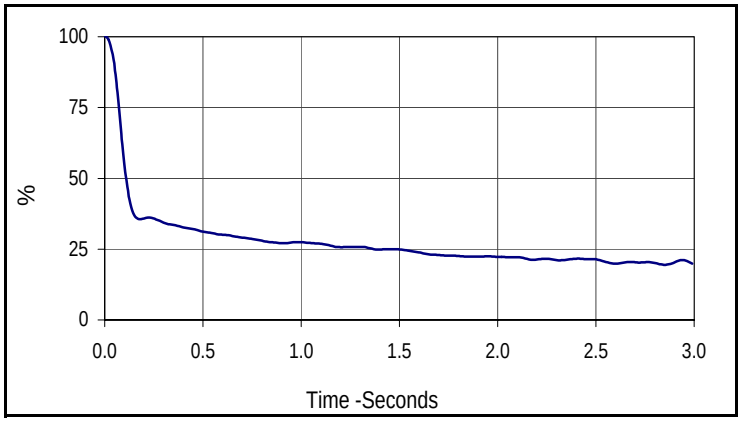

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (Normal Operation) | | | |
| CURNO | Type | SAE Class | Units |
| 002 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 51.8 | 0.0 | 1880.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (Normal Operation) | | | |
| CURNO | Type | SAE Class | Units |
| 003 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 74.6 | 0.0 | 2150.0 | |

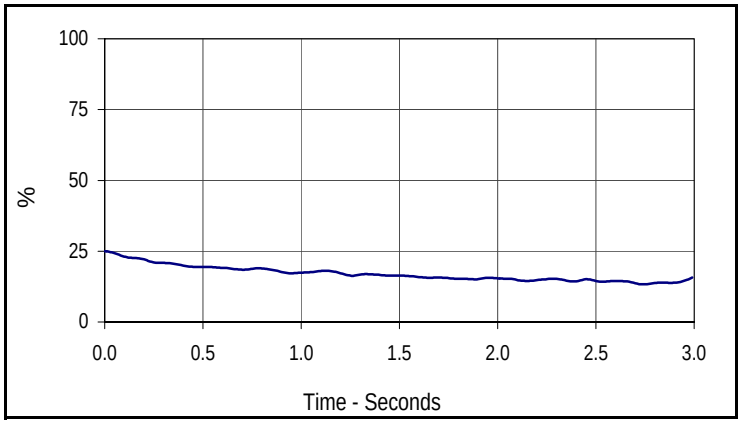
Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (Normal Operation) | | | |
| CURNO | Type | SAE Class | Units |
| 004 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.2 | 0.0 | 2160.0 | |

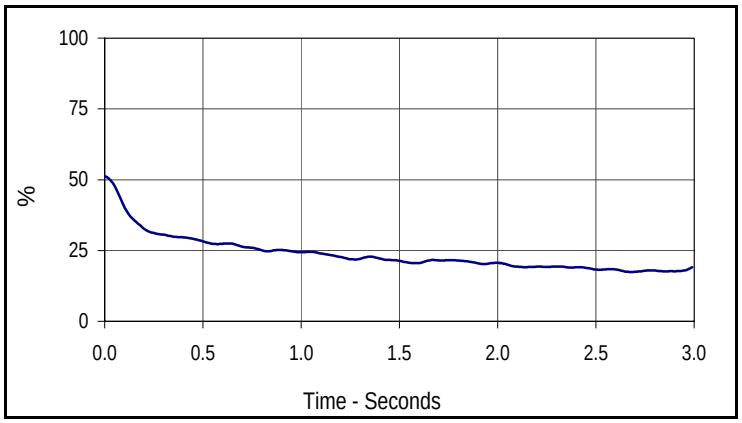
Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%

| | | | |
|---|---|---|---|
| Test Vehicle: | 2009 Ford Edge 5-Door MPV | Test Date: | 6/26/09 |
| Test Program: | FMVSS 124 Accelerator Control Systems | NHTSA No.: | C90203 |



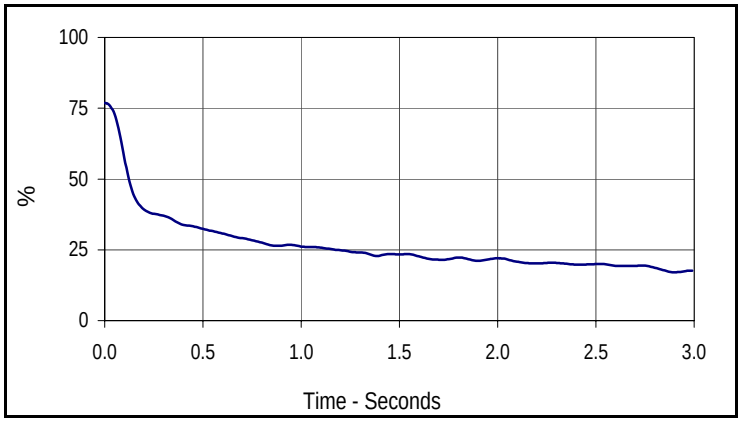

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Spring 1 Removed) | | | |
| CURNO | Type | SAE Class | Units |
| 005 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 25.0 | 0.0 | 230.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



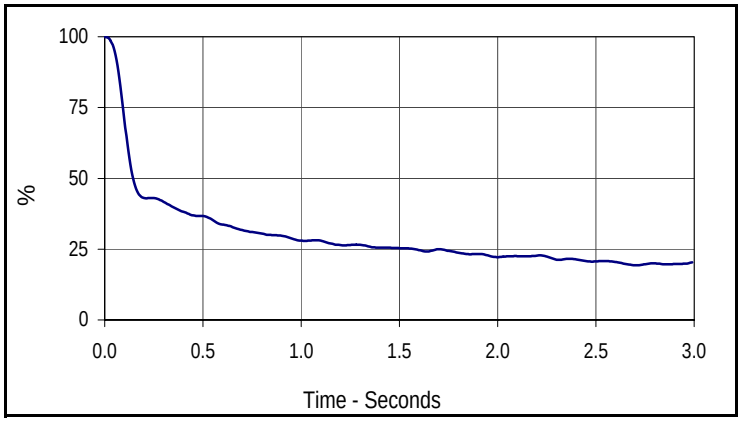

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Spring 1 Removed) | | | |
| CURNO | Type | SAE Class | Units |
| 006 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 51.2 | 0.0 | 1500.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



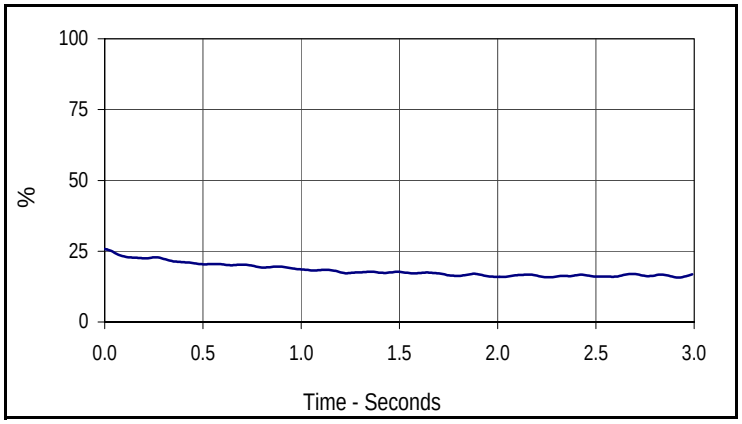

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Spring 1 Removed) | | | |
| CURNO | Type | SAE Class | Units |
| 007 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 76.9 | 0.0 | 1870.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



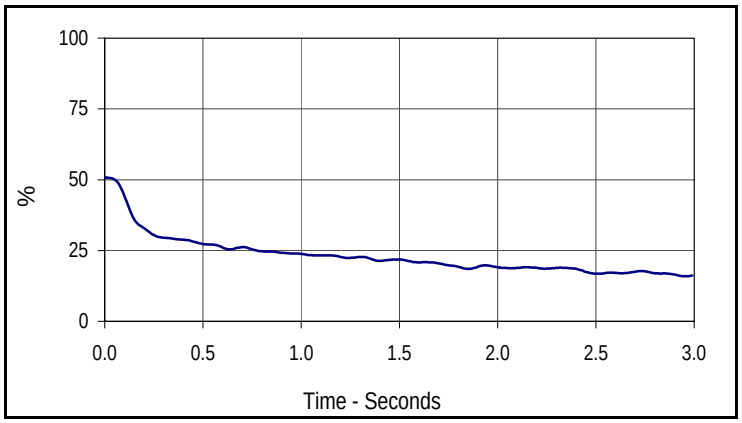

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Spring 1 Removed) | | | |
| CURNO | Type | SAE Class | Units |
| 008 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 99.9 | 0.0 | 2290.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



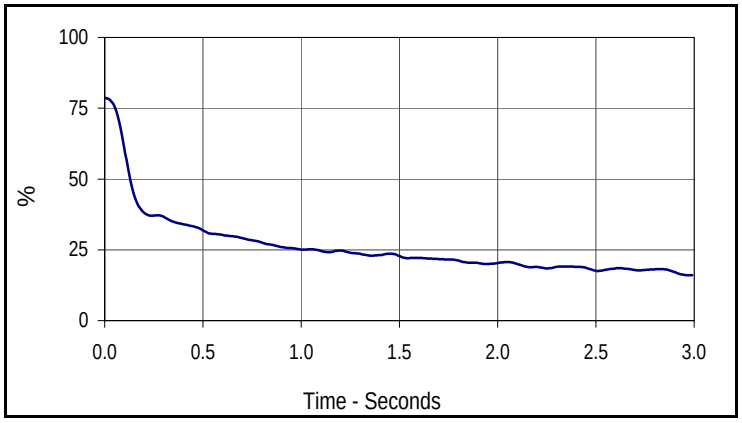

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Spring 2 Removed) | | | |
| CURNO | Type | SAE Class | Units |
| 009 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 25.7 | 0.0 | 350.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



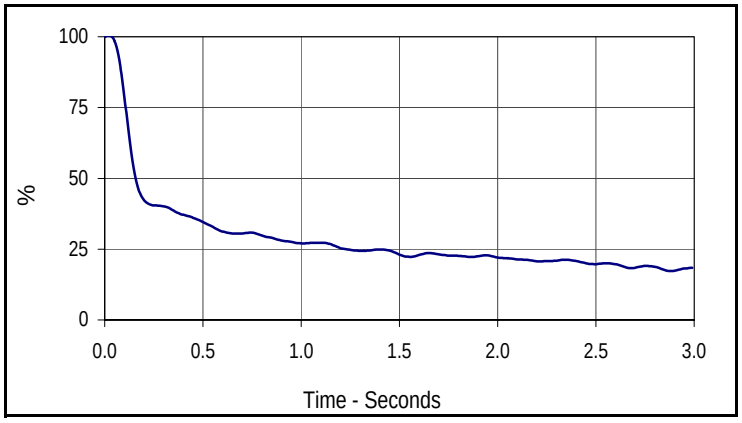

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Spring 2 Removed) | | | |
| CURNO | Type | SAE Class | Units |
| 010 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 50.7 | 0.0 | 1390.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



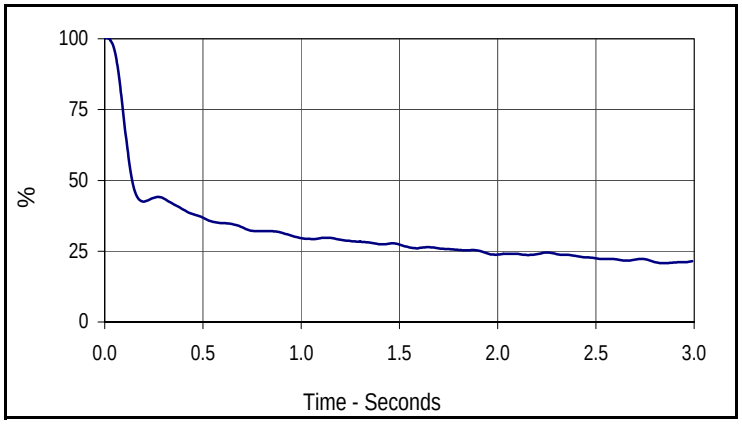

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Spring 2 Removed) | | | |
| CURNO | Type | SAE Class | Units |
| 011 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 78.6 | 0.0 | 1780.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



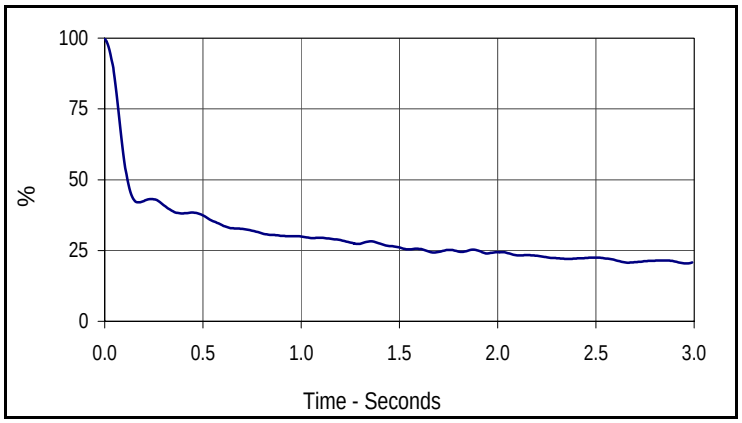

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Spring 2 Removed) | | | |
| CURNO | Type | SAE Class | Units |
| 012 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.5 | 0.0 | 2090.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



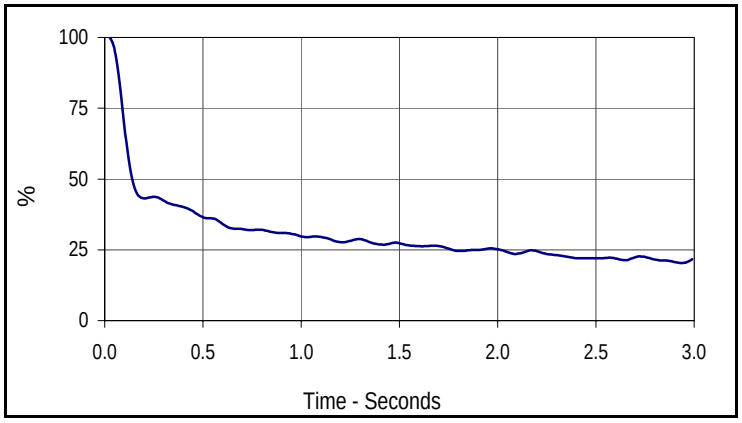

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Blue/White Open) | | | |
| CURNO | Type | SAE Class | Units |
| 013 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.4 | 0.0 | 2790.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



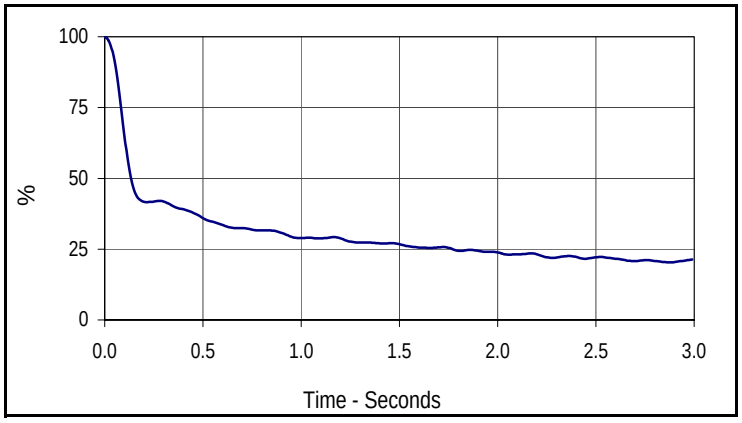

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Blue/Gray Open) | | | |
| CURNO | Type | SAE Class | Units |
| 014 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 99.9 | 0.0 | 2610.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



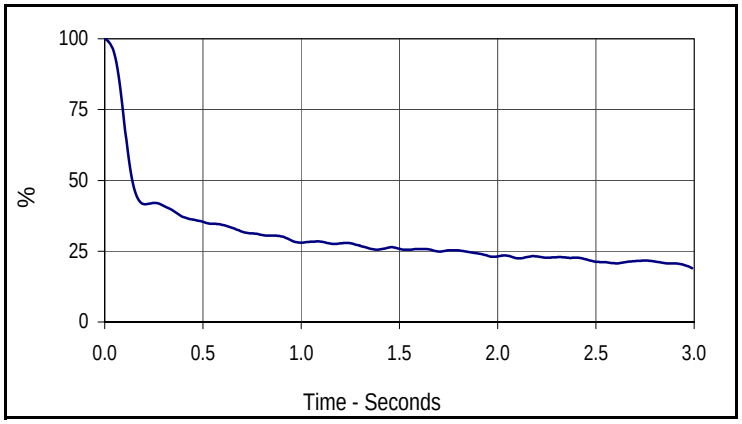

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Green/White Open) | | | |
| CURNO | Type | SAE Class | Units |
| 015 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.5 | 0.0 | 2630.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



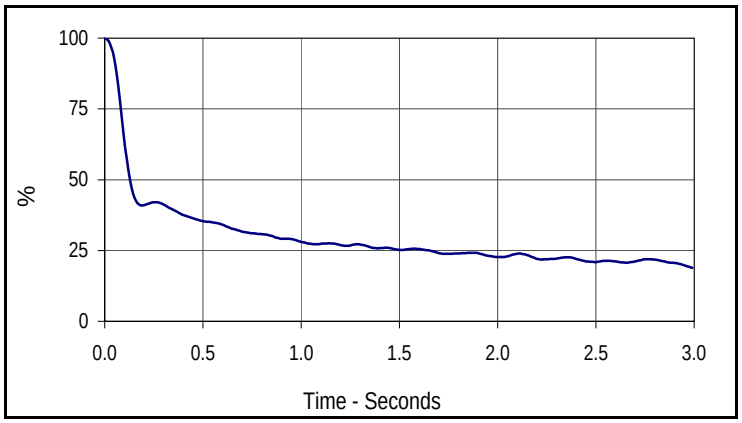

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Yellow/Orange Open) | | | |
| CURNO | Type | SAE Class | Units |
| 016 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.0 | 0.0 | 2620.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



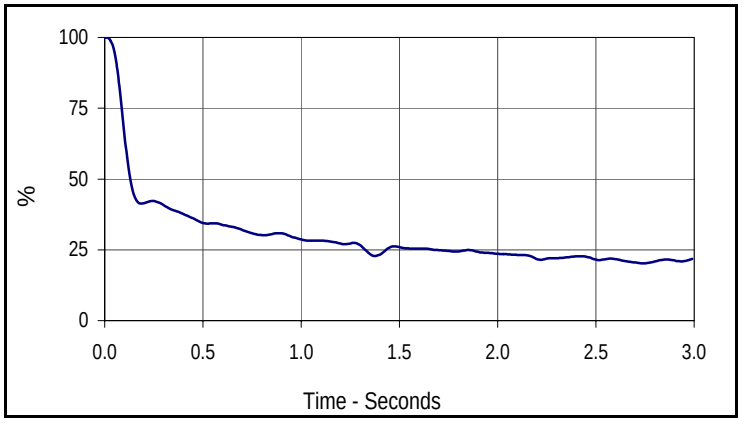

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Yellow/Green Open) | | | |
| CURNO | Type | SAE Class | Units |
| 017 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.0 | 0.0 | 2490.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



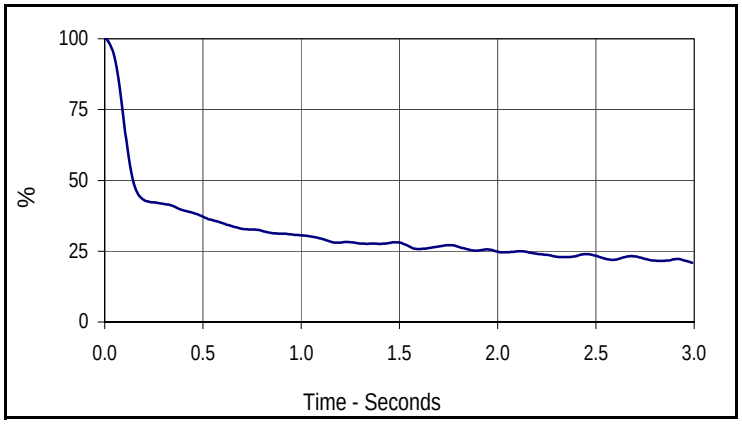

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Purple/Green Open) | | | |
| CURNO | Type | SAE Class | Units |
| 018 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.0 | 0.0 | 2430.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



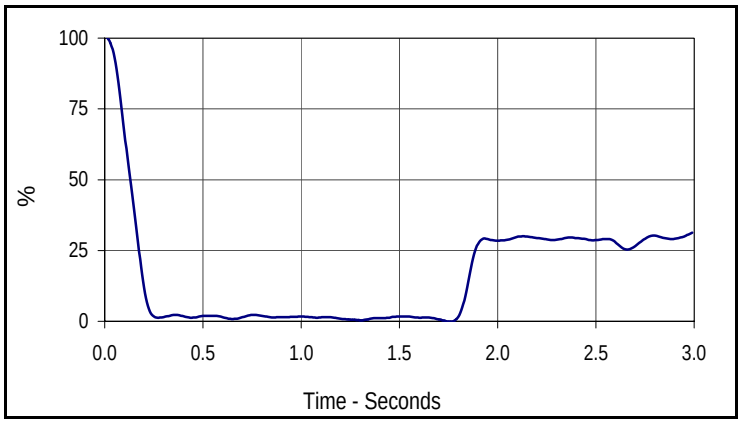

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Green/Orange Open) | | | |
| CURNO | Type | SAE Class | Units |
| 019 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.0 | 0.0 | 2510.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



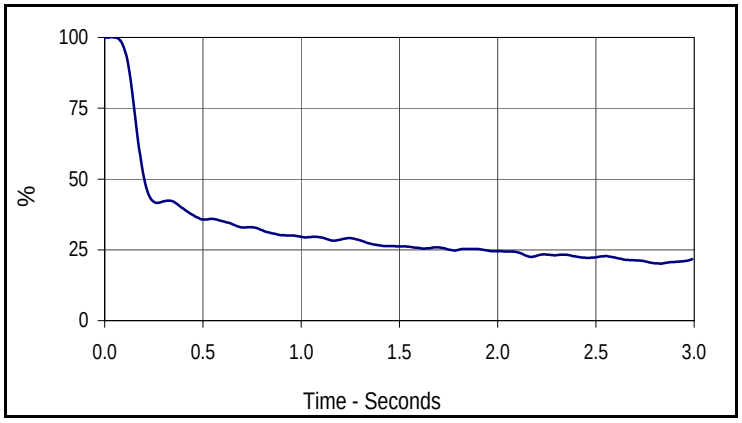

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Blue/White Short) | | | |
| CURNO | Type | SAE Class | Units |
| 020 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.6 | 0.0 | 2970.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



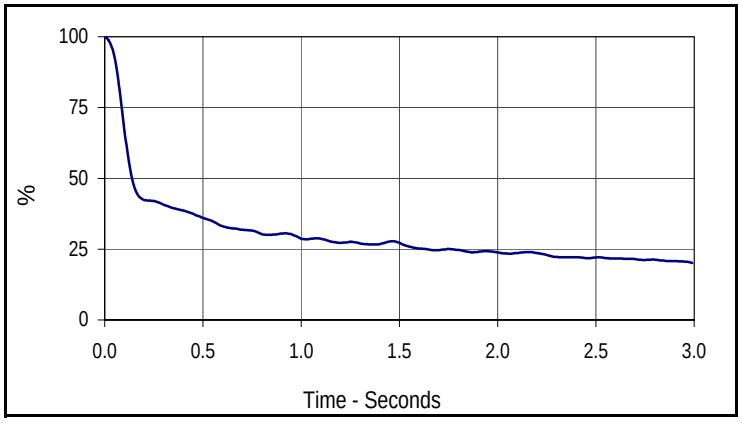

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Blue/Gray Short) | | | |
| CURNO | Type | SAE Class | Units |
| 021 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.7 | 0.0 | 180.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



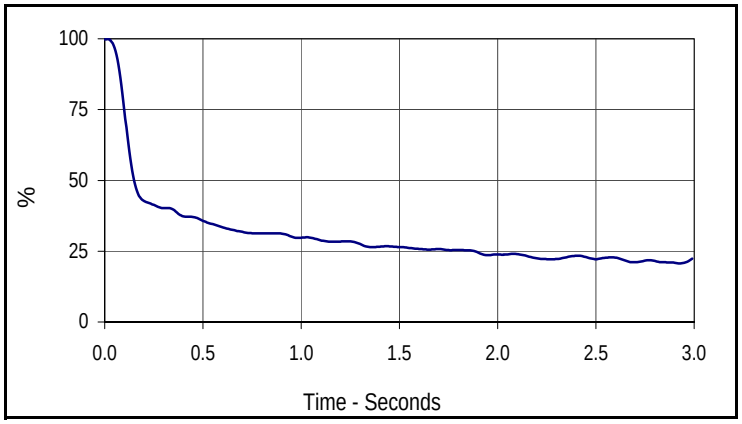

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Green/White Short) | | | |
| CURNO | Type | SAE Class | Units |
| 022 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.1 | 0.0 | 2660.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



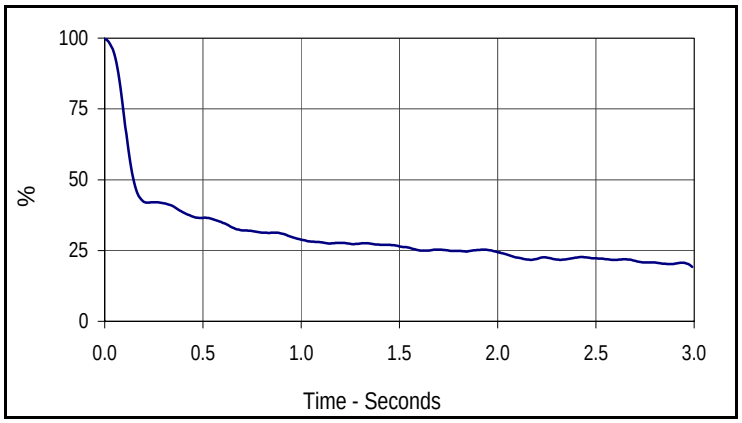

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Yellow/Orange Short) | | | |
| CURNO | Type | SAE Class | Units |
| 023 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.0 | 0.0 | 2700.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



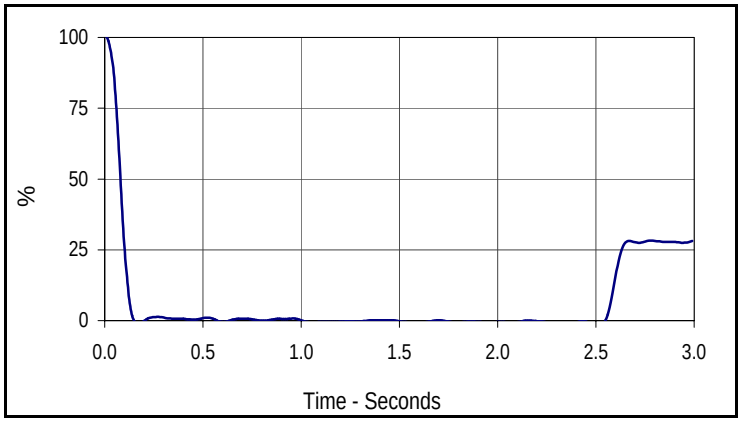

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Yellow/Green Short) | | | |
| CURNO | Type | SAE Class | Units |
| 024 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 99.9 | 0.0 | 2660.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



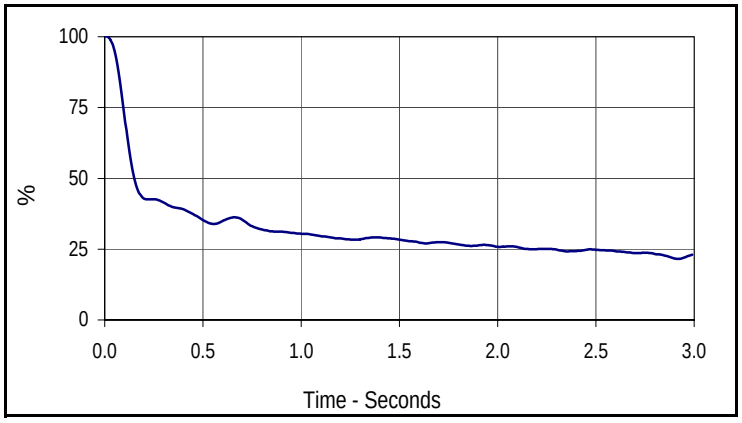

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Purple/Green Short) | | | |
| CURNO | Type | SAE Class | Units |
| 025 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 99.9 | 0.0 | 2690.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



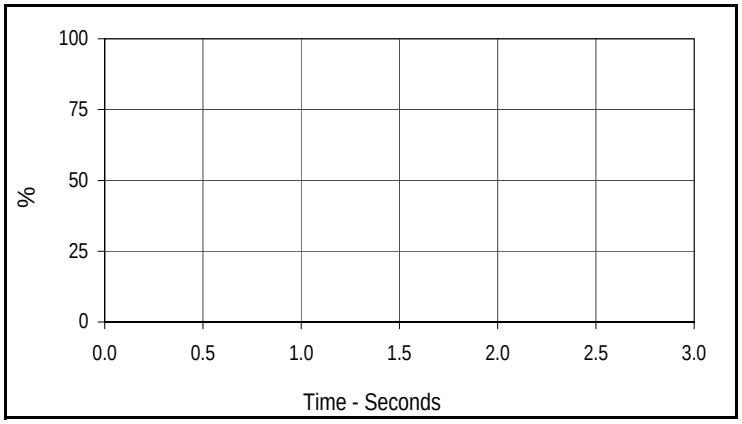

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Green/Orange Short) | | | |
| CURNO | Type | SAE Class | Units |
| 026 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.7 | 0.0 | 110.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%



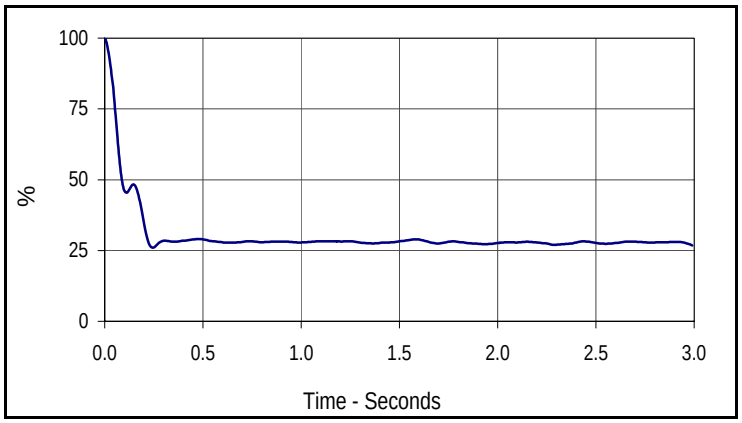

| Curve Description | | | |
|---|---|---|---|
| Throttle Position (APS Disconnect) | | | |
| CURNO | Type | SAE Class | Units |
| 027 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.2 | 0.0 | 2870.0 | |

Throttle % reading at baseline (idle) is 19-21%
All return times were calculated at a return to 21%




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Spring 1 Removed) | | | |
| CURNO | Type | SAE Class | Units |
| 028 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 0.0 | 0.0 | 0.0 | |

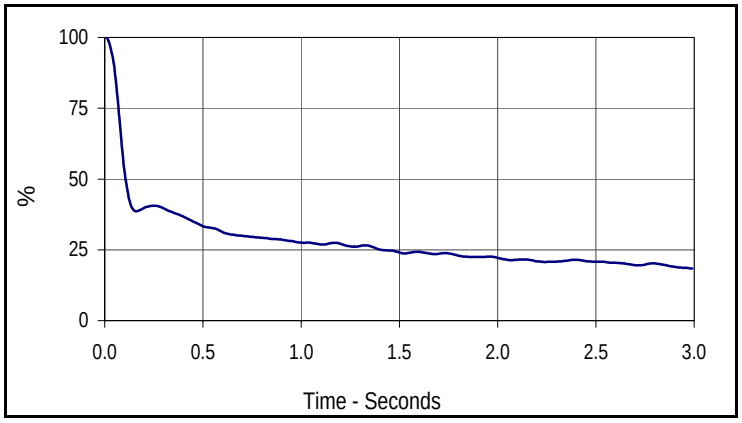
No data collected. Removal of the TPS Spring would not allow any engine control by the accelerator pedal.




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Green/Blue Open) | | | |
| CURNO | Type | SAE Class | Units |
| 029 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.6 | 0.0 | * | |

Throttle % reading at baseline (idle) is 19-21%

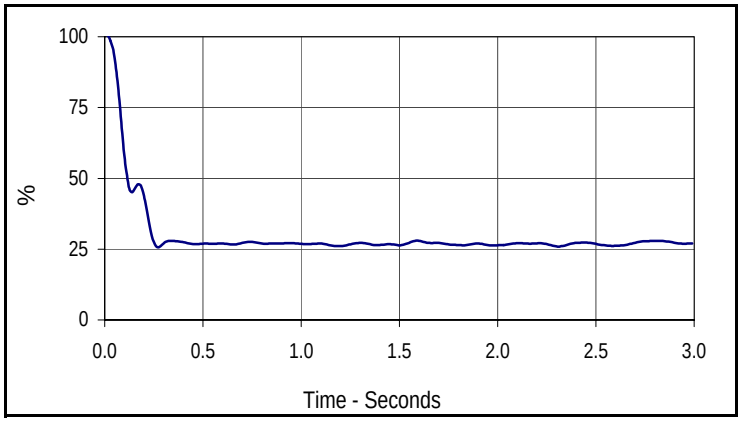
* Throttle never returned to baseline position.




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Brown Open) | | | |
| CURNO | Type | SAE Class | Units |
| 030 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.5 | 0.0 | 2050.0 | |

Throttle % reading at baseline (idle) is 19-21%

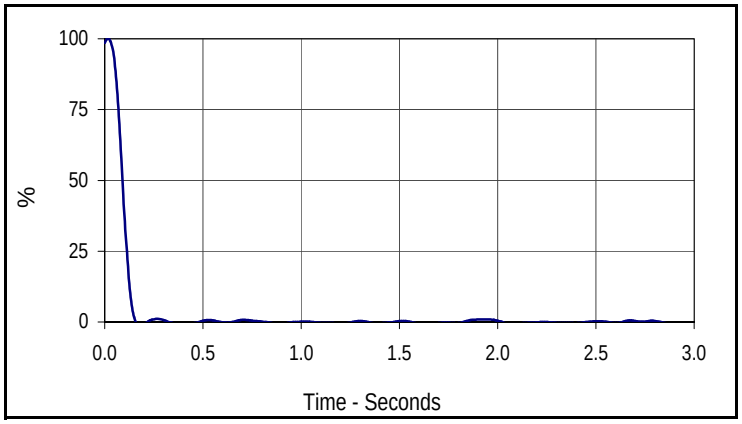
All return times were calculated at a return to 21%




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Yellow/Brown Open) | | | |
| CURNO | Type | SAE Class | Units |
| 031 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 101.1 | 0.0 | * | |

Throttle % reading at baseline (idle) is 19-21%

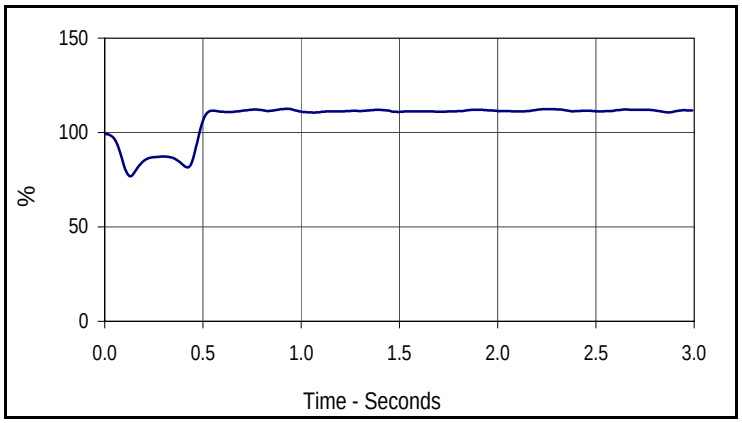
* Throttle never returned to baseline position.




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Yellow Open) | | | |
| CURNO | Type | SAE Class | Units |
| 032 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.1 | 0.0 | 120.0 | |

Throttle % reading at baseline (idle) is 19-21%

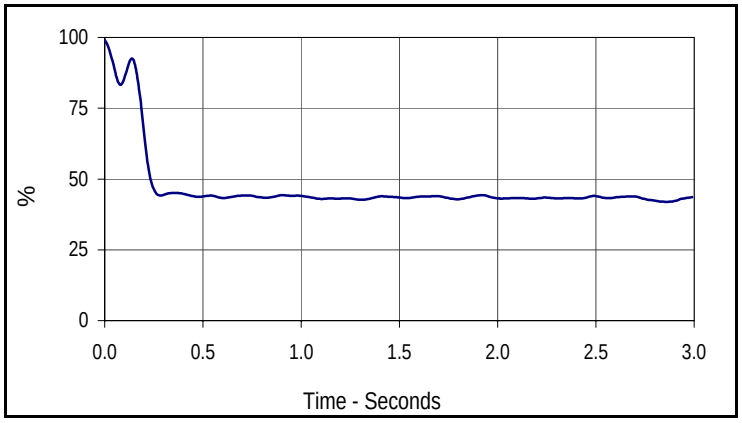
All return times were calculated at a return to 21%




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Blue/Orange Open) | | | |
| CURNO | Type | SAE Class | Units |
| 033 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 112.5 | 0.9 | * | |

Throttle % reading at baseline (idle) is 19-21%

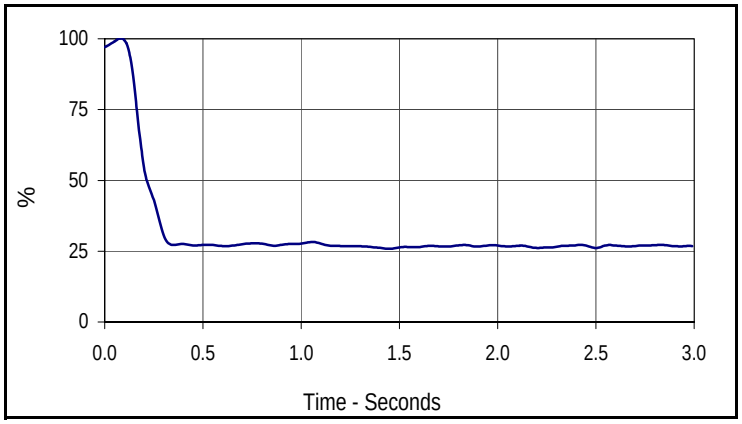
* Induced wire fault caused loss of the throttle position sensor reading




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Green/Brown Open) | | | |
| CURNO | Type | SAE Class | Units |
| 034 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 99.1 | 0.0 | * | |

Throttle % reading at baseline (idle) is 19-21%

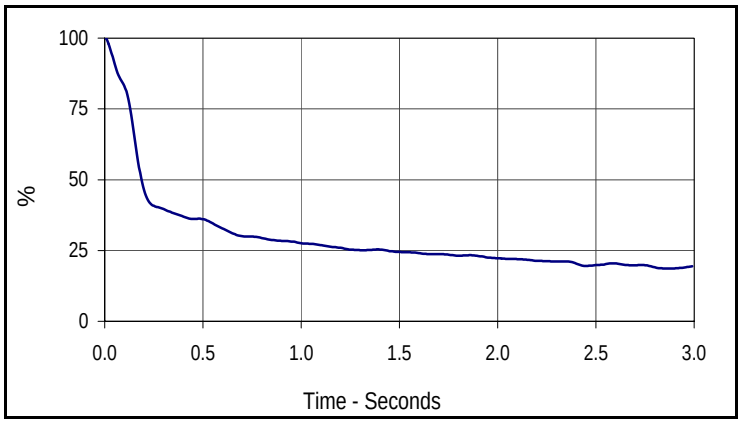
* Induced wire fault caused loss of the throttle position sensor reading




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Green/Blue Short) | | | |
| CURNO | Type | SAE Class | Units |
| 035 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.2 | 0.1 | * | |

Throttle % reading at baseline (idle) is 19-21%

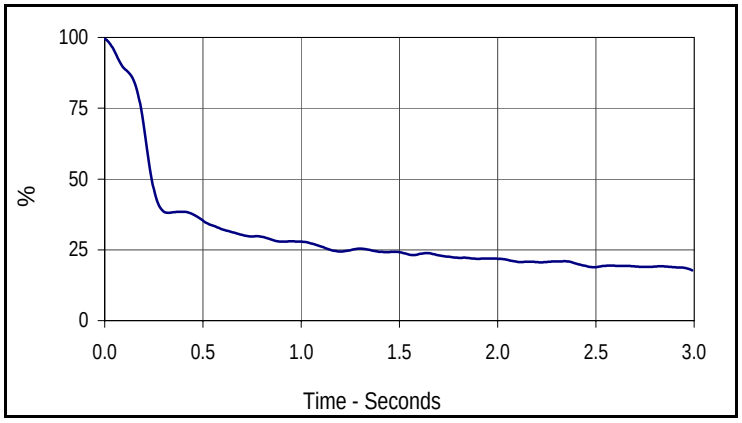
* Throttle never returned to baseline position.




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Brown Short) | | | |
| CURNO | Type | SAE Class | Units |
| 036 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.8 | 0.0 | 2180.0 | |

Throttle % reading at baseline (idle) is 19-21%

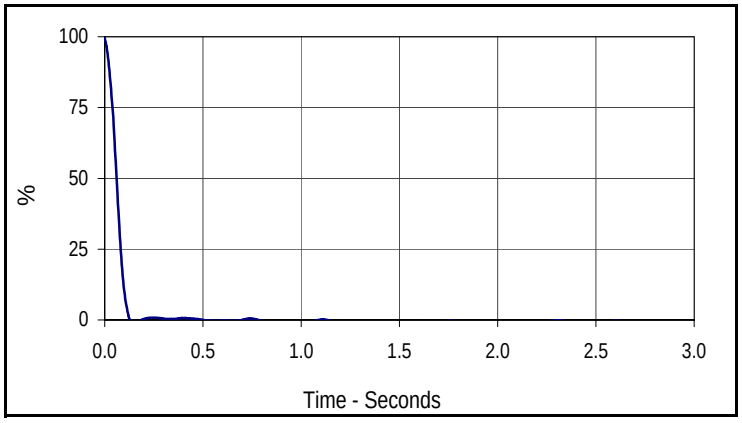
All return times were calculated at a return to 21%




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Yellow/Brown Short) | | | |
| CURNO | Type | SAE Class | Units |
| 037 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 99.5 | 0.0 | 2050.0 | |

Throttle % reading at baseline (idle) is 19-21%

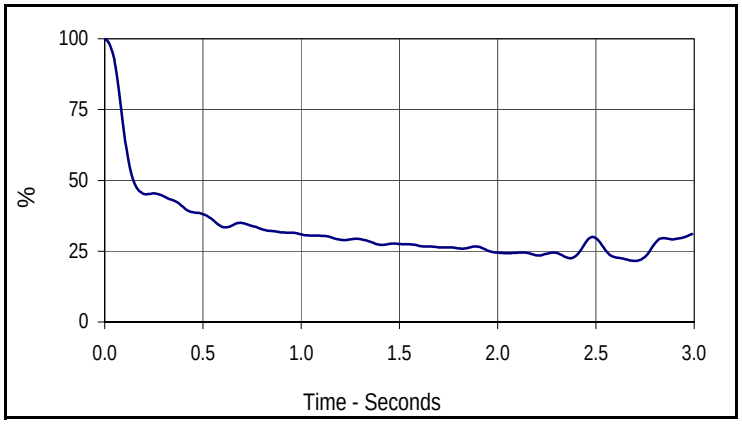
All return times were calculated at a return to 21%




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Yellow Short) | | | |
| CURNO | Type | SAE Class | Units |
| 038 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 99.6 | 0.0 | 90.0 | |

Throttle % reading at baseline (idle) is 19-21%

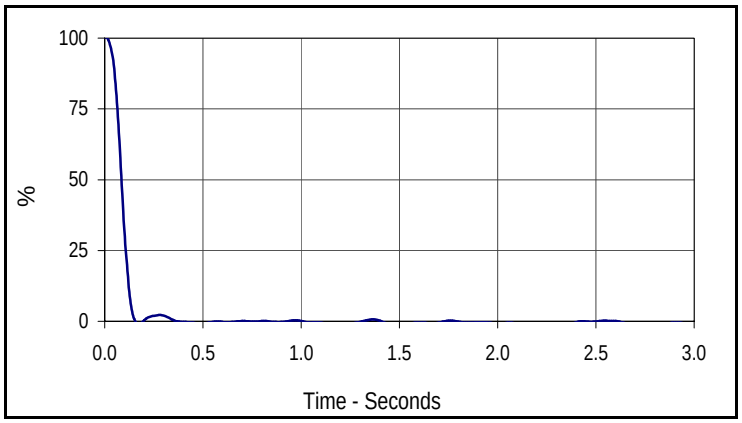
All return times were calculated at a return to 21%




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Blue/Orange Short) | | | |
| CURNO | Type | SAE Class | Units |
| 039 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 99.8 | 0.0 | * | |

Throttle % reading at baseline (idle) is 19-21%

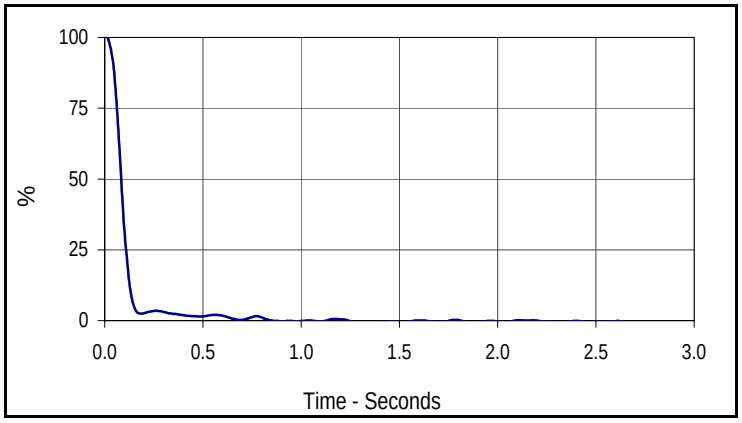
* Throttle never returned to baseline position.




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS Green/Brown Short) | | | |
| CURNO | Type | SAE Class | Units |
| 040 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.3 | 0.0 | 110.0 | |

Throttle % reading at baseline (idle) is 19-21%

All return times were calculated at a return to 21%




| Curve Description | | | |
|---|---|---|---|
| Throttle Position (TPS/ Throttle Plate Motor Disconnect) | | | |
| CURNO | Type | SAE Class | Units |
| 041 | FIL | 5 | % |
| Max | Time | Return Time (msec) | |
| 100.6 | 0.0 | 120.0 | |

Throttle % reading at baseline (idle) is 19-21%

All return times were calculated at a return to 21%

**APPENDIX-C**

**TEST EQUIPMENT AND CALIBRATION INFORMATION**

**FMVSS 124 Accelerator Control Systems**

**Test Equipment List and Calibration Information**

**6/25/09**

**2009 Ford Edge 5-Door MPV**

| Description | Manufacturer | Model No. | Serial No. | Limit | Accuracy | Cal. Date | Due Cal. |
|---|---|---|---|---|---|---|---|
| TDAS | DTS | TDAS | DM0101 | N/A | SAE J211 | 11/14/08 | 11/14/09 |
| Computer | Toshiba | PAS4014 | X8065355A | N/A | N/A | N/A | N/A |

**APPENDIX-D**

**MANUFACTURER SUBMITTED INFORMATION**

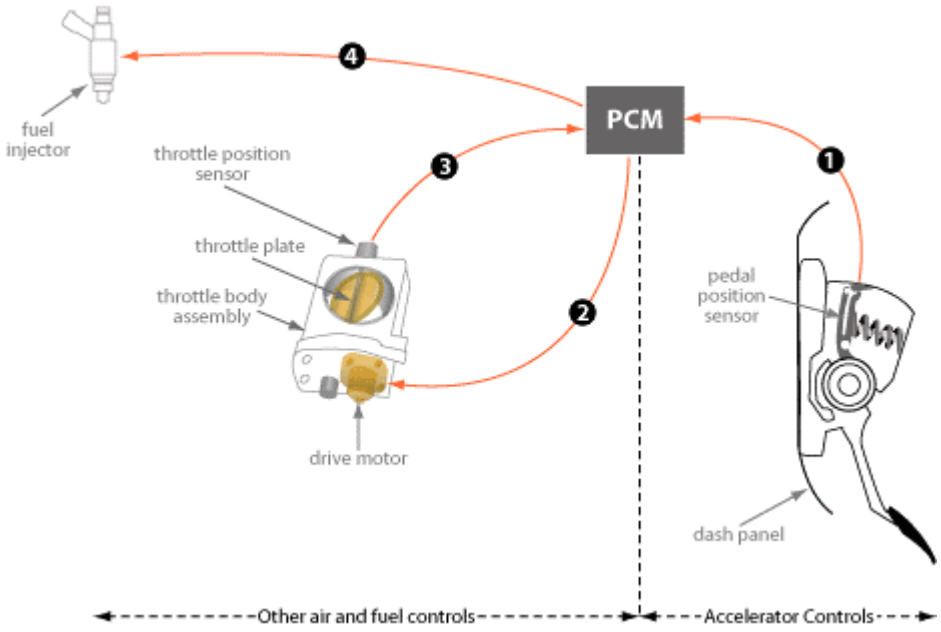
FORM – 124
Rev. 10/10/08

# VEHICLE INFORMATION / TEST SPECIFICATIONS

FMVSS No. 124

Requested Information: **2009 Model Year Ford Edge.**

**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).




**With electronic controls, a gasoline engine controls air and fuel by transmitting signals as shown above: 1) from the accelerator pedal position sensor to the Powertrain Control Module (PCM), 2) from the PCM to the drive motor on the throttle body assembly (which controls air flow via the throttle plate position), 3) from the throttle position sensor back to the PCM, and 4) from the PCM to the fuel injector (injector pulse length controls fuel quantity).**

**2.** For Normal ACS operation, the method utilized to determine the engine idle state (air throttle plate position, fuel delivery rate, other).
**Throttle plate position (assessment that controller has sufficiently returned the throttle to idle control).**

**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)
**Throttle plate position (assessment that controller has sufficiently returned the throttle to idle control).**

**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

**Yes, to 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.
**Yes, the wires can be directly tapped by a high impedance probe (minimum 1 MHz impedance, 5 KHz filter) or the signals can be monitored via the PCM using an OBD II compatible service tool plugged into the service diagnostic port. The SAE J1979 Throttle Position PIDS are:**
**Throttle Position 1: 11(hex)**
**Throttle Position 2: 47(hex)**

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

1) **Accelerator Pedal Position Sensors (all three tested individually: APP1 / Pin C-25, APP2 / Pin C-26, APP3 / Pin C-27)**
2) **Accelerator Pedal Position Sensor Vrefs (both tested individually: ETCREF / Pin C-21, ETCREF / Pin C-28. Vref is internally bussed in the pedal sensor so potentially only one needs to be tested)**
3) **Accelerator Pedal Position Sensor Grounds (One tested individually: Pin C-59, One not tested, Pin C-65. Ground is internally bussed in the pedal sensor, so it shouldn't matter which one is tested).**
4) **Throttle Position Sensors (both tested individually: TP1-NS / Pin E-61, TP2-PS / Pin E-60)**
5) **Throttle Position Sensor Vref (ETCREF / Pin E-66)**
6) **Throttle Position Sensor Ground (ETCRTN / Pin E-59)**
7) **Throttle Body Motor Power Supply '+' (TACM+ / Pin E-34)**
8) **Throttle Body Motor Power Supply '-' (TACM- / Pin E-51)**
9) **Throttle Body Motor Return Spring – Broken (actual part change)**

**10) Accelerator Pedal Return Spring – 1 Spring Broken (actual part change)**

**7.** Where applicable, were connections in the ACS beyond the ECM such as the fuel injectors tested for disconnection and severance. If yes, provide details.
**No, all power to engine is controlled via throttle controller.**

**8.** Where applicable, were idle return times tested for electrical severance accompanied by shorting to ground? If yes, please provide details.
**No, PCM has same response whether signals are opened or shorted to ground.**

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

**Accelerator Pedal – 2 springs**
**Throttle Body (Throttle Plate) – 1 DC Motor, 1 return spring**

**10.** If fuel delivery rate is used to demonstrate return to idle state, provide:

A. The method used to measure this signal i.e. connection to standard SAE J1587 data bus.
B. Equipment required to measure signal.

**Not applicable**

**11.** Fuel rate signal output range at the idle state.
**Fuel delivery rate is not used.**

**12.** Is the ACS equipped with a limp home mode? If yes, provide operation description.
**Yes. Throttle springs return throttle plate to approximately 7-7.8 degrees from fully closed throttle when failure prevents motor from controlling throttle plate. Under this condition, RPM control is used to disable fuel injectors to limit engine RPM.**

**13.** Method by which the test laboratory can record engine RPM by connection to ECM, OBD connector, etc.
**Engine RPM may be measured via a diagnostic scan tool connected to the OBD II connector. The SAE J1979 PID for Engine RPM is Engine RPM: 0C (hex)**