REPORT NUMBER 124L-GTL-04-005

H\$# 637147

SAFETY COMPLIANCE TESTING FOR FMVSS 124L ACCELERATOR CONTROL SYSTEMS

NISSAN MOTOR CO., LTD. 2004 NISSAN QUEST, MPV NHTSA NO. C45203

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



MAY 19, 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 6115 (NVS-220)
WASHINGTON, D.C. 20590

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared By:

Approved By:

Approval Date:

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By:

Acceptance Date:

				Techr	nical Report Documentation Page	
_	1. Report No. 124L-GTL-04-005	2. Governme	ent Acce		3. Recipient's Catalog No.	
_	4. Title and Subtitle Final Report of FMVSS 2004 NISSAN QUEST, NHTSA No. C45203		nce Testi	ing of	5. Report Date May 19, 2004 6. Performing Organ. Code GTL	
	7. Author(s) Grant Farrand, Project Debbie Messick, Projec	_			8. Performing Organ. Rep# GTL-DOT-04-124-005	
	9. Performing Organiza General Testing Labo		d Addres	SS	10. Work Unit No. (TRAIS)	
	1623 Leedstown Roa Colonial Beach, Va 2				11. Contract or Grant No. DTNH22-01-C-11025	
	12. Sponsoring Agency U.S. Department of Tra National Highway Trafficenters	nsportation			13. Type of Report and Period Covered Final Test Report May 7, 2004	
_	Office of Vehicle Safety Compliance (NVS-220 400 7th Street, S.W., Room 6115 Washington, DC 20590			0)	14. Sponsoring Agency Code NSA-30	
	15. Supplementary Note	9S				
		Office of Veh IVSS 124 com	icle Safe pliance.	ety Compliance	n Quest MPV in accordance with Test Procedure No. TP-124-06 for	
_	17. Key Words Compliance Testing Safety Engineering FMVSS 124			18. Distribution Statement Copies of this report are available from NHTSA NHTSA Technical Reference Div., Rm. 5108 (NAD-52) 400 7 th St., S.W. Washington, DC 20590 Telephone No. (202) 366-4946		
_	19. Security Classif. (of UNCLASSIFIED	this report)	21. No.	of Pages 39	22. Price	
	20. Security Classif. (of UNCLASSIFIED	,				
	Form DOT F 1700.7 (8-	·72)				

TABLE OF CONTENTS

-	SECTION	77,522 37 3377.2	PAGE
	1	Purpose of Compliance Test	1
	2	Test Procedure and Discussion of Results	2
	3	Compliance Test Data	4
	4	Test Equipment List and Calibration Information	8
	5	Photographs	9
		 5.1 Front View of Vehicle 5.2 Left Side View of Vehicle 5.3 Right Side View of Vehicle 5.4 Vehicle's Certification Label 5.5 Vehicle's Tire Information Label 5.6 View of Throttle Body on Engine 5.7 Location of TPS and TPM 5.8 Accelerator Pedal Assembly 5.9 Accelerator Pedal Assembly Front View 5.10 Accelerator Pedal Assembly Side View 5.11 TPS and TPM Connector 5.12 Accelerator Pedal Connector 5.13 ECM Connectors #1 and #2 5.14 Test Set-up to Provide Open and Ground Wires 5.15 Overall Test Set-up Wiring Vehicle in Test Chamber 5.16 Vehicle in Test Chamber 5.17 124 Test Instrumentation Set-up 	
	6	Plots	27
_	7	Manufacturer's Drawings	32

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 NISSAN QUEST, MPV, NHTSA No. C45203 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 to be conducted to simulate the normal removal of the driver's foot from the accelerator pedal. Return to idle times were to be determined for various throttle plate positions with the accelerator control system complete and with each of the wires to the TPS and TPM acutator motor independently severed and also shorted to ground. Return to idle times were also to be determined for severance of the connectors to the APS, and TPS/TPM actuator motor. Removal of the two springs in the accelerator pedal assembly and the throttle plate motor spring were not to be performed due to the units being non-serviceable. ECM connectors were also to be tested for severance.

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 but due to the vehicle not starting at -40° C, the test temperature was raised to -25° F.

At -25° F the vehicle started with ether sprayed into the air intake and one test was performed from 50% W.O.T. to idle, at which time the engine died and would not restart after repeated tries. The ambient temperature was then slowly raised until the engine would start (60° F). After two test at 60° F (one at 25% and one at 100% W.O.T.) the accelerator failed to operate the engine speed. The engine remained at idle even with the accelerator depressed. After repeated failed attempts to reset the engine computer to get the accelerator working, testing was concluded on this vehicle.

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.							
_								
,irresult								
and the same of th								

_								
_								
_								

DATA SHEET 1 VEHICLE DESCRIPTION

VEHICLE MY/MAKE/MODEL/BODY STYLE:	2004 NISSAN OLIEST M	1D\/	
VEHICLE NHTSA NO.:	C45203	ii v	
VEHICLE VIN:	5N1BV28494N320161		
DATE OF TEST:	MAY 7, 2004		
TEST LAB: GENERAL TESTING LABORAT			
VEHICLE ENGINE TYPE: V6	GVWR:	2586	_ KG
VEHICLE ENGINE SIZE: 3.5 L			
VEHICLE ACCEL. CONTROL SYSTEM (ACS	(Air or Fuel Throttled):	AIR	
MAX. BHP ENGINE SPEED: UNK.	(All of Fact Thomas)	7 (11 (
MFR. IDLE RPM: COMPUTER CONTROLL	ED (850)		
FUEL METERING DEVICE (Carburetor, fuel i		CTION	
TOLL METERING DEVICE (Carbaretor, Iden	rijection, etc). TOLL iivol	.OHON	_
REMARKS:			
REIVIARNS.			
RECORDED BY: January	DATE:	05/07/04	
APPROVED BY: 10 MIMICA			
APPROVED BY: \			

DATA SHEET 2 NORMAL OPERATION TEST

(fully operational system)

VEHICLE NHTSA NO.:				YLE: 200- C45	5203	QOLOT, IVII V	
Check one: Mid Temp. Test: Low Temp. Test:X High Temp. Test: SYSTEM CONDITION: COMPLETE (no modifications) Normal Operation ACCELERATOR POSITION POSITION POSITION SENSOR READING ENGINE COOLANT READING (MOT) Wide Open SENSOR READING COOLANT AMBIENT SENSOR READING (MSec) IDLE (BASELINE) 25% 25							
SYSTEM CONDITION: COMPLETE (no modifications) Normal Operation ACCELERATOR POSITION POSITION WIDE OPEN SENSOR THROTTLE READING WIDE OPEN GOOLANT SENSOR READING WOT) SENSOR THROTTLE RPM TEMPERATURE (°F) POSITION SENSOR READING WIDLE (Msec) IDLE (Msec) IDLE (Msec) 100		st· Low	/ Temp. ⁻	Гest: X	н	igh Temp. Tes	t:
ACCELERATOR POSITION POSITION % WIDE OPEN THROTTLE (WOT) 25% 25% 25 50% 50% 75% 75 100% 100 RETURN TIME REQUIREMENTS: 1 second (1000 ms) for vehicles less than 4536 kg. 2 seconds (2000 ms) for vehicles exposed to -18° C or less	wild remp. rea		Tomp.	7 Oot			
POSITION WIDE OPEN THROTTLE (WOT) 25% 25 50% 50% 75 100% 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	SYSTEM COND	ITION: COMPLE	ETE (no	modification	s) Normal C	Operation	
% WIDE OPEN THROTTLE (WOT) SENSOR READING ENGINE COOLANT AMBIENT SENSOR READING (Msec) IDLE (Msec) 25% 25 50% 50 -25 -26 5% 94 75% 75 100% 100 100 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		1	RPM	TEMPERA	ATURE (°F)	l .	i
THROTTLE (WOT) SENDING COOLANT READING (Msec)				FNGINE	AMBIENT		
50% 50 -25 -26 5% 94 75% 75	THROTTLE	1		1		READING @ IDLE	ì
75% 75 100% 100 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	25%	25					
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	50%	50		-25	-26	5%	94
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		7-					
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	75%	/5					
	100%	100	ITC.				
	RETURN TIME 1 secon 2 secon 3 secon	100 E REQUIREMEN Id (1000 ms) for ods (2000 ms) for ods (3000 ms) for ods (3000 ms) for ods (5000 ms) for ods (5000 ms) for ods (5000 ms)	vehicles r vehicles r vehicles	s more than s exposed to	4536 kg. 5 -18º C or l		form norm
REMARKS: After cold soak at -25° F the engine was started with ether to perform norm	RETURN TIME 1 secon 2 secon 3 secon	100 E REQUIREMEN Id (1000 ms) for ods (2000 ms) for ods (3000 ms) for ods (3000 ms) for ods (5000 ms	vehicles r vehicles r vehicles L	s more than s exposed to	4536 kg. 5 -18º C or I	ith ether to pei	form norn
operation testing. After one throttle depression to 50% W.O.T. and return to idle, the e	RETURN TIME 1 secon 2 secon 3 secon PASS REMARKS: Af	100 E REQUIREMEN Id (1000 ms) for ods (2000 ms) for ods (3000 ms	vehicles r vehicles r vehicles L	s more than s exposed to e engine was	4536 kg. 5 -18° C or I as started w 50% W.O.T.	ith ether to per and return to	idle, the e
operation testing. After one throttle depression to 50% W.O.T. and return to idle, the edied and would not restart after repeated tries. The ambient temperature was then raise	RETURN TIME 1 secon 2 secon 3 secon PASS REMARKS: Af operation testi died and would	100 E REQUIREMEN Id (1000 ms) for ods (2000 ms) for ods (3000 ms) for ods (3000 ms) for ods (4000 ms) for ods (5000 ms	vehicles r vehicles r vehicles L25° F th rottle dep r repeate	s more than s exposed to lee engine was pression to 8 ed tries. The	4536 kg. o -18° C or l as started w 50% W.O.T. e ambient te	ith ether to per and return to emperature wa	idle, the e s then rais
operation testing. After one throttle depression to 50% W.O.T. and return to idle, the edied and would not restart after repeated tries. The ambient temperature was then raise the engine started at an ambient temperature of 60° F, at which time normal operation	RETURN TIME 1 secon 2 secon 3 secon PASS REMARKS: Af operation testi died and would the engine sta	100 E REQUIREMEN Id (1000 ms) for ods (2000 ms) for ods (3000 ms	vehicles r vehicles r vehicles L25° F th rottle dependent tempe	s more than s exposed to e engine was pression to 8 ed tries. The erature of 60	4536 kg. o -18° C or l as started w 50% W.O.T. e ambient te o F, at whic	ith ether to per and return to emperature wa h time normal	idle, the e s then rai operation
operation testing. After one throttle depression to 50% W.O.T. and return to idle, the edied and would not restart after repeated tries. The ambient temperature was then raise the engine started at an ambient temperature of 60° F, at which time normal operation	RETURN TIME 1 secon 2 secon 3 secon PASS REMARKS: Af operation testi died and would the engine sta was started. A	Ter cold soak at ng. After a throttle default an ambie After a throttle default.	vehicles r vehicles r vehicles L	s more than s exposed to ee engine wa pression to 8 ed tries. The erature of 60 n to 25% and	4536 kg. o -18° C or l as started w 50% W.O.T. e ambient te o F, at whic	ith ether to per and return to emperature wa h time normal	idle, the e s then rais operation
operation testing. After one throttle depression to 50% W.O.T. and return to idle, the edied and would not restart after repeated tries. The ambient temperature was then raise the engine started at an ambient temperature of 60° F, at which time normal operation was started. After a throttle depression to 25% and 100% W.O.T. with returns to idle the	RETURN TIME 1 secon 2 secon 3 secon PASS REMARKS: Af operation testi died and would the engine sta was started. A accelerator fail	The ter cold soak at ng. After one the not restart after the dat an ambie after a throttle deled to operate the	vehicles r vehicles r vehicles L	s more than s exposed to ee engine wa pression to 8 ed tries. The erature of 60 n to 25% and	4536 kg. o -18° C or l 50% W.O.T. e ambient te o F, at whic d 100% W.C	ith ether to per and return to emperature wa h time normal).T. with returr	idle, the e s then rais operation is to idle th

DATA SHEET 2 continued NORMAL OPERATION TEST (fully operational system)

VEHICLE MY/M VEHICLE NHTS			C45	203			
DATE OF TEST	·		MAY	7, 2004			
Check one: Mid Temp. Test	: Low	√Temp.∃	Гest:X	Hi	igh Temp. Tes	t:	
SYSTEM CONDI	TION: COMPLI	ETE (no i	modification	s) Normal C	peration		
ACCELERATOR POSITION	THROTTLE POSITION	RPM	TEMPERA ENGINE	TURE (°F)	THROTTLE POSITION	RETURN TIME TO	PA FA
% WIDE OPEN THROTTLE (WOT)	SENSOR READING		COOLANT	AIVIDIENT	SENSOR READING @ IDLE (BASELINE)	IDLE (Msec)	
25%	25	2500	80	60	4%	65	
50%							
75%							
100%	100	7000	60	60	4%	637	
2 second	l (1000 ms) for ls (2000 ms) fo ls (3000 ms) fo	vehicles r vehicles	s more than s exposed to	4536 kg.	ess		
REMARKS: *Ve started but acce control engine f	elerator electroi	t 60° F ar nic contro	mbient temp ol failed and	erature and accelerator	i normal condit would no long	tion tests v ger operate	/ere : and
RECORDED B	Y: S. 40	nan	<u></u>	0)ATE: 05	5/07/04	_

SECTION 4 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO.	CAL. DATE	NEXT CAL. DATE
CONTINUOUS RECORDER	OMEGA	55662	03/04	03/05
ENGINE RECORDING	FLUKE	7471026	03/04	03/05
ENGINE RECORDING	MONARCH	1444664	01/04	07/05
SOFTWARE	GTL	N/A	BEFORE USE	BEFORE USE
CHAMBER	GTL	N/A	N/A	N/A
EXHAUST DUCT	GTL	N/A	N/A	N/A

SECTION 5 PHOTOGRAPHS



2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.1 FRONT VIEW OF VEHICLE



2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.2 LEFT SIDE VIEW OF VEHICLE



2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.3 RIGHT SIDE VIEW OF VEHICLE



FIGURE 5.4 CLOSE-UP VIEW OF VEHICLE'S CERTIFICATION LABEL

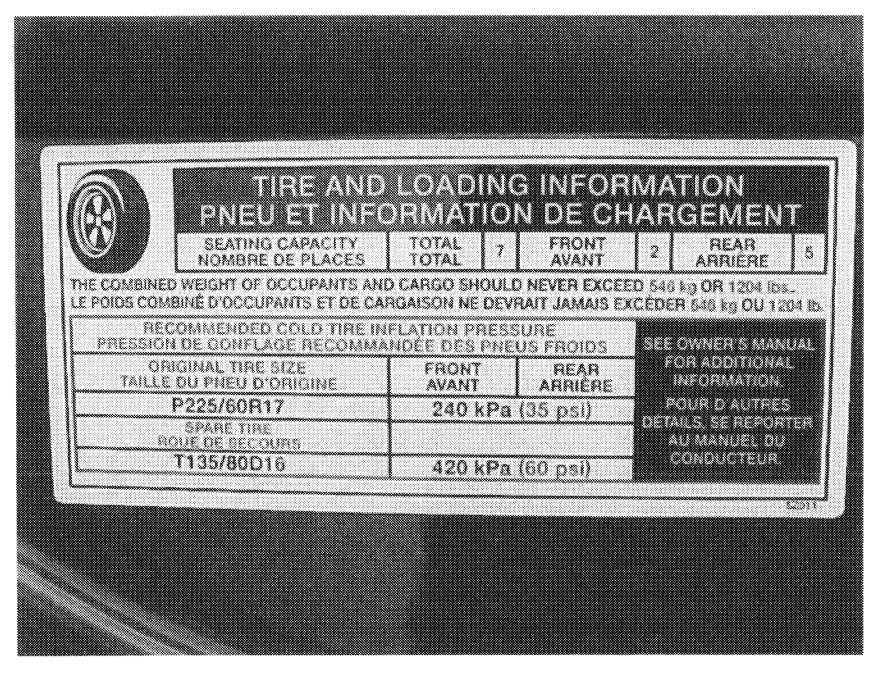
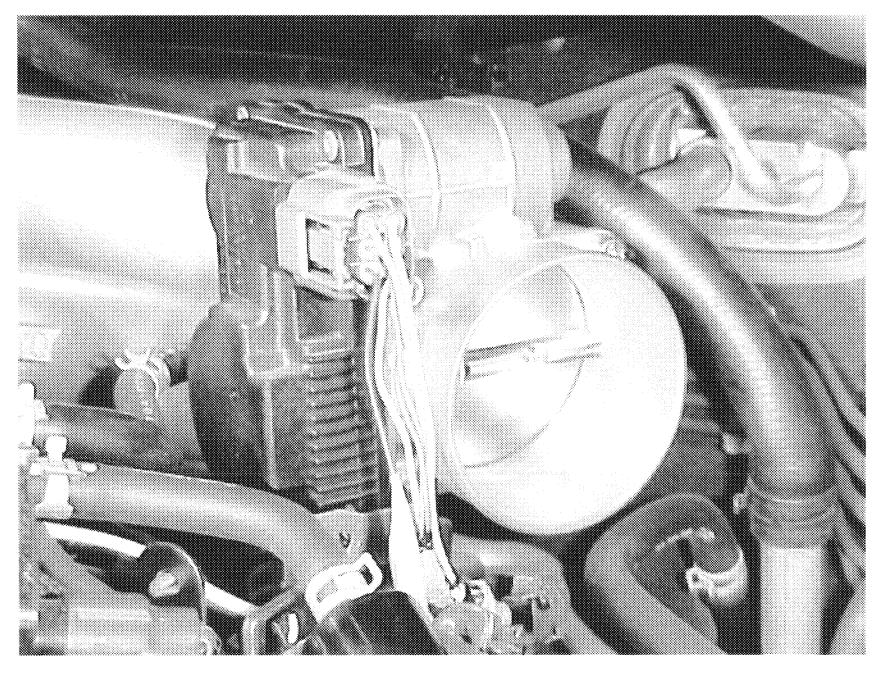
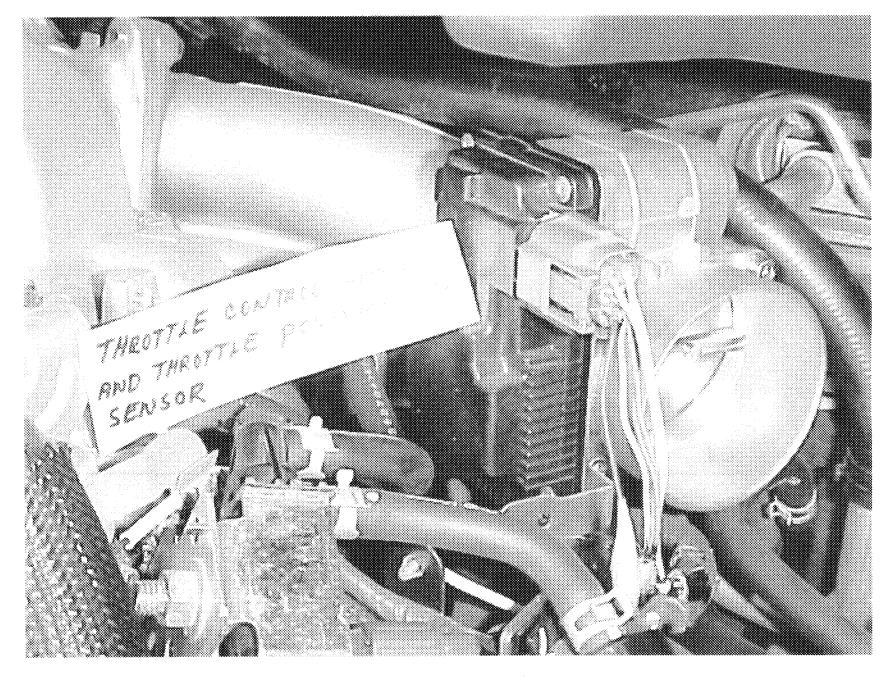


FIGURE 5.5 CLOSE-UP VIEW OF VEHICLE'S TIRE INFORMATION LABEL



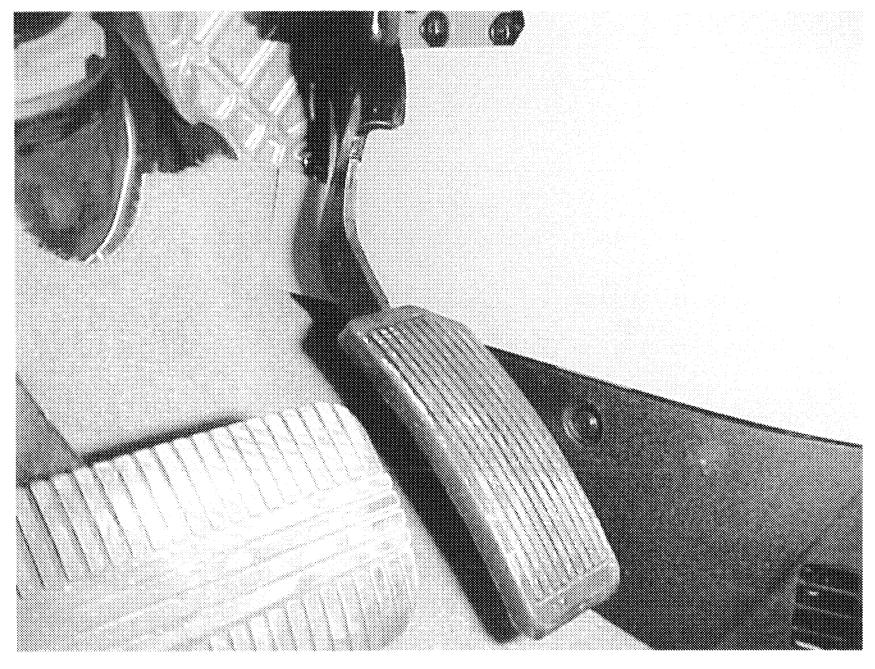
2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.6 VIEW OF THROTTLE BODY ON ENGINE



2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.7 LOCATION OF TPS AND TPM



2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.8 ACCELERATOR PEDAL ASSEMBLY

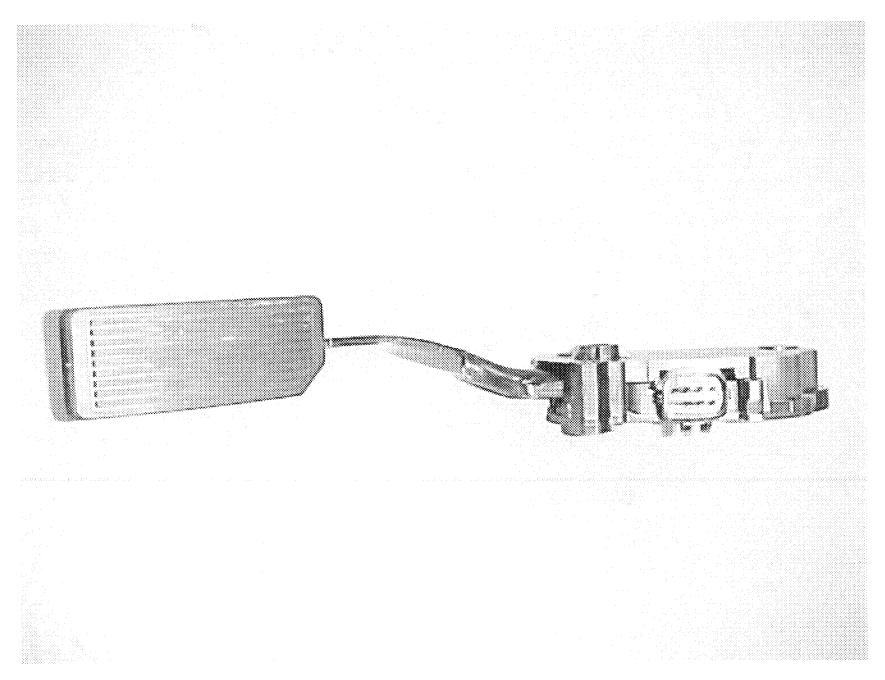
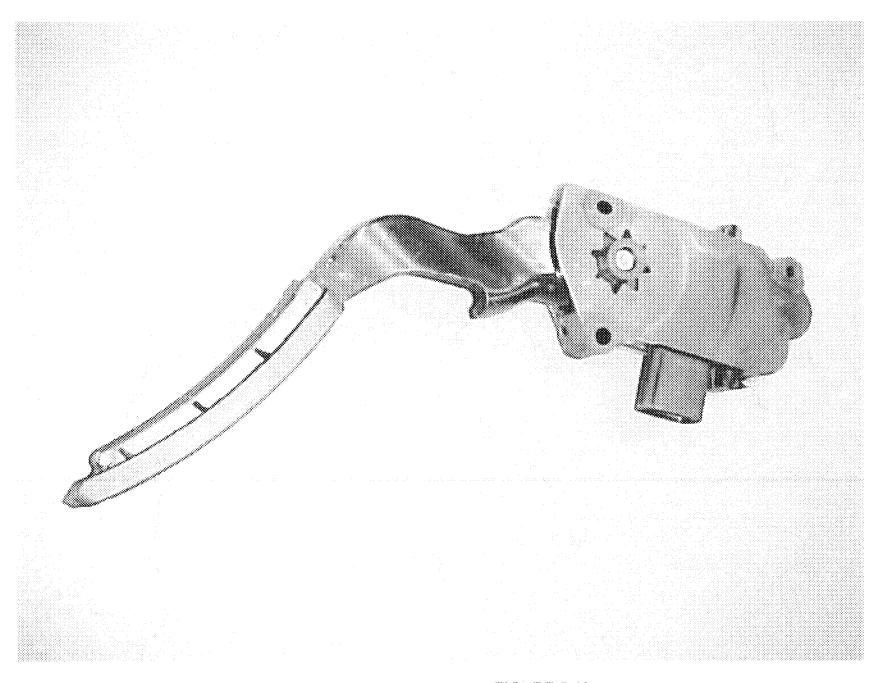
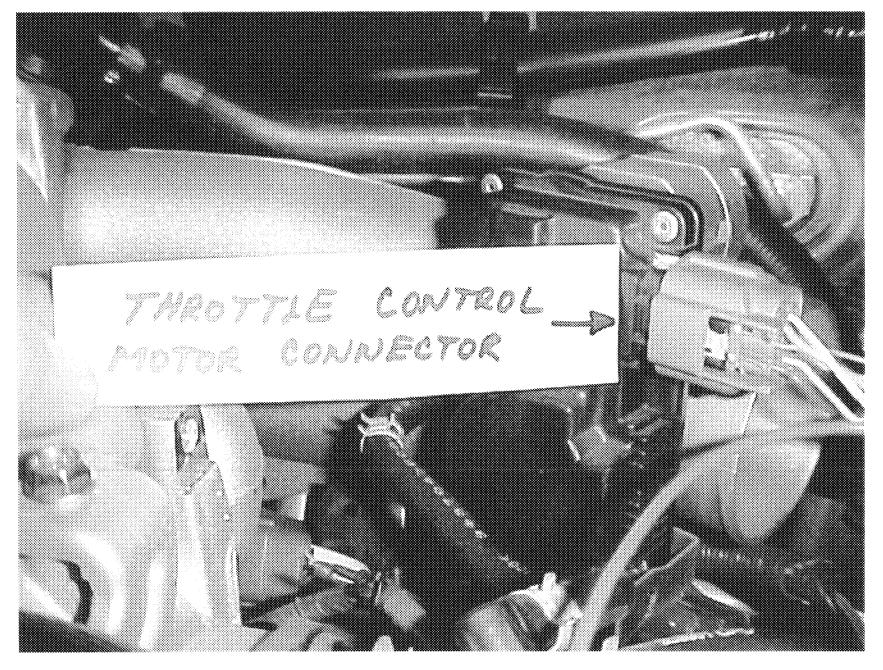


FIGURE 5.9 ACCELERATOR PEDAL ASSEMBLY FRONT VIEW



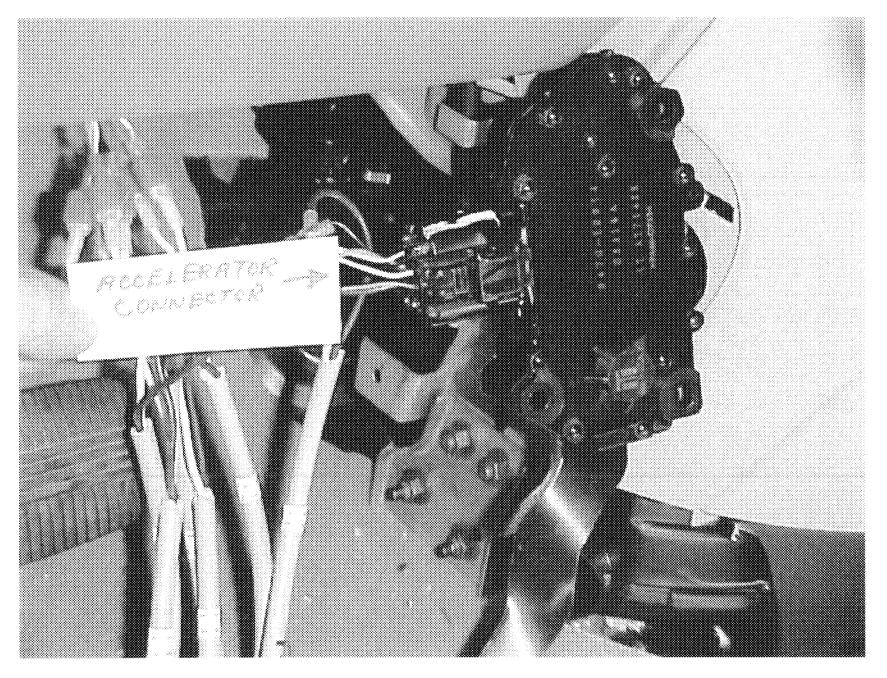
2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.10 ACCELERATOR PEDAL ASSEMBLY SIDE VIEW



2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.11
TPS AND TPM CONNECTOR



2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.12 ACCELERATOR PEDAL CONNECTOR

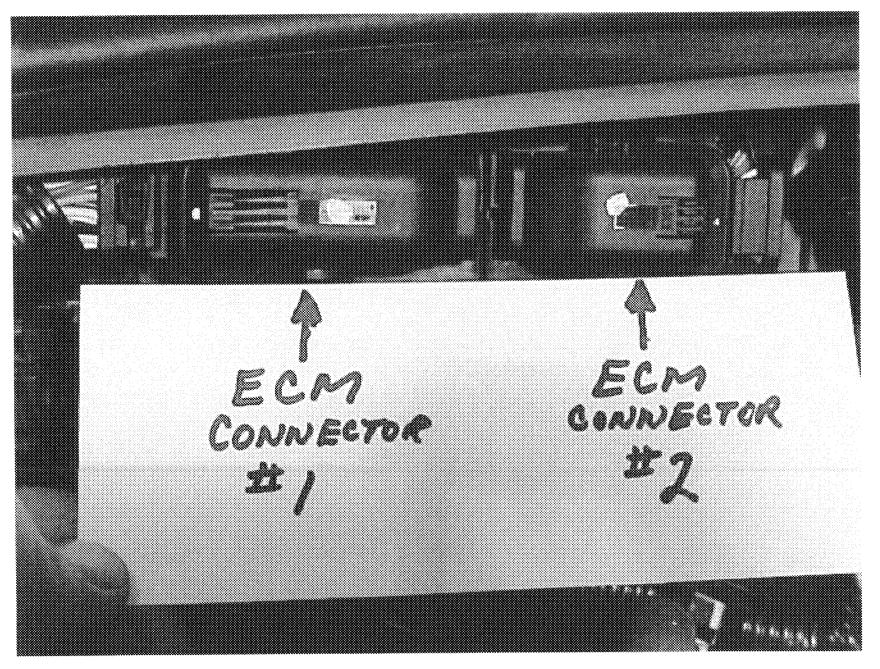
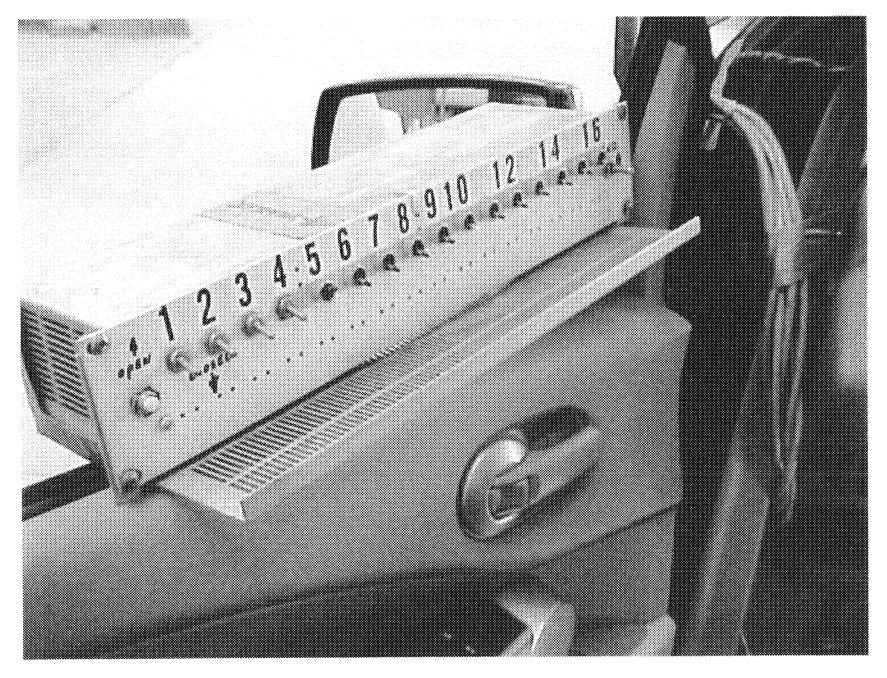


FIGURE 5.13 ECM CONNECTORS #1 AND #2



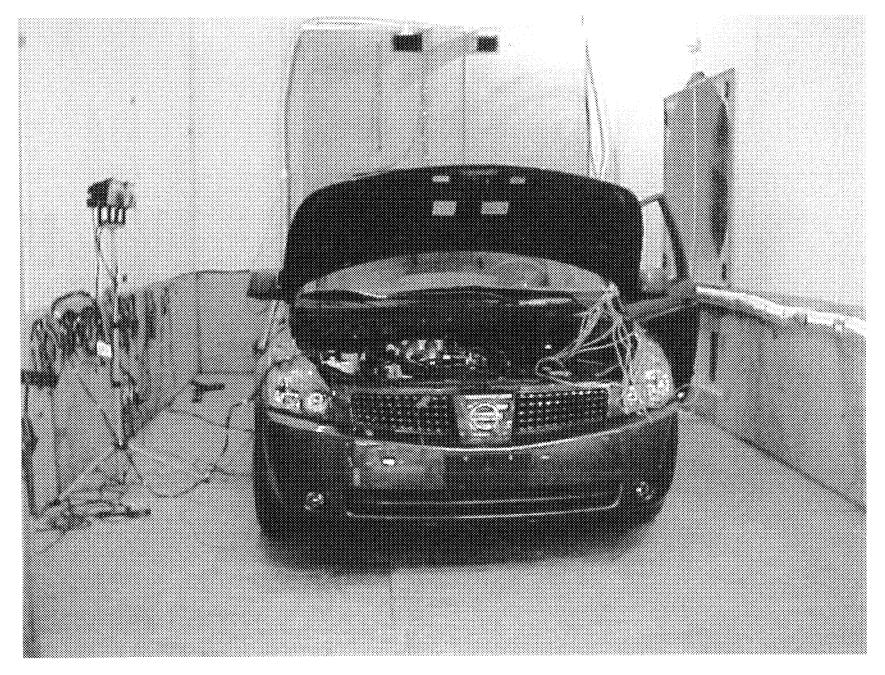
2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.14
TEST SET-UP TO PROVIDE OPEN AND GROUND WIRES



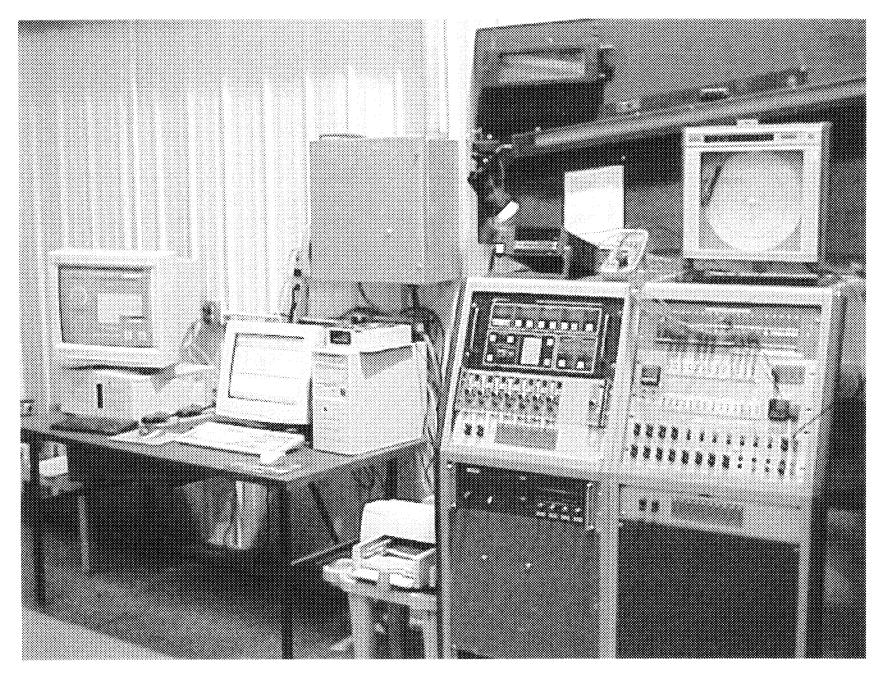
2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.15 OVERALL TEST SET-UP WIRING VEHICLE IN TEST CHAMBER



2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

FIGURE 5.16 VEHICLE IN TEST CHAMBER



2004 NISSAN QUEST NHTSA NO. C45203 FMVSS NO. 124L

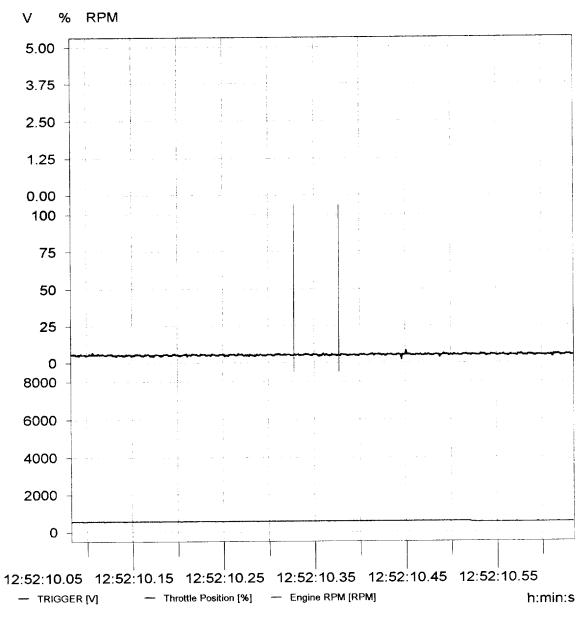
FIGURE 5.17 124 TEST INSTRUMENTATION SET-UP

SECTION 6 PLOTS

FMVSS 124 THROTTLE RETURN TEST 124 COLD/NORMAL/BASE IDLE@-32C 1:12:36

1:12:36 PM 5/7/04

NHTSA C45203 NISSAN QUEST



Channel:Throttle Position

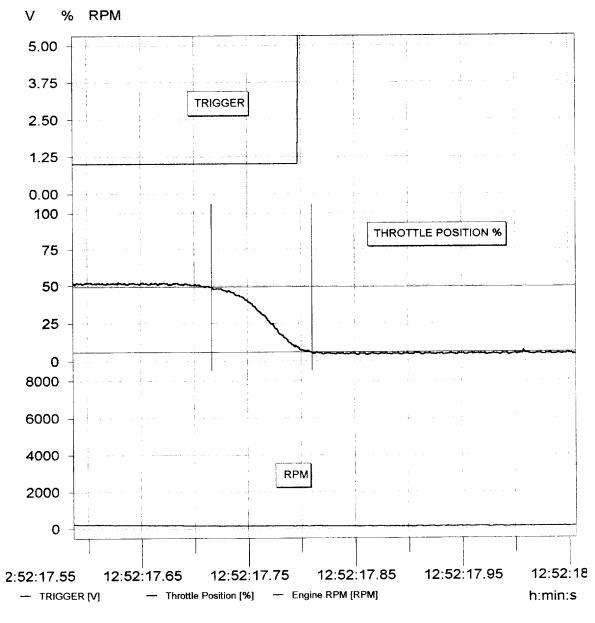
Y1: 5.162 % t1: -13828.278 ms dt: 0.049 s Y2: 5.236 % t2: -13779.278 ms f: 20.408 Hz

FMVSS 124 THROTTLE RETURN TEST

124 COLD/NORMAL/50% WOT

1:09:33 PM 5/7/04

NHTSA C45203 NISSAN QUEST



Channel:Throttle Position

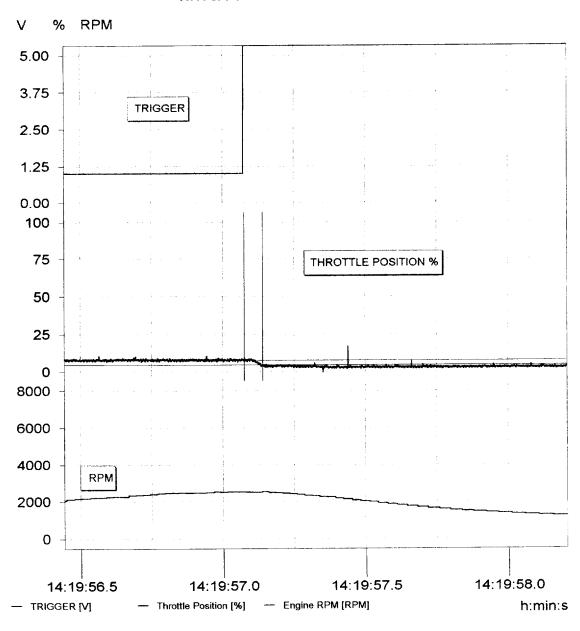
Y1: 49.112 % t1: -6440.278 ms dt: 0.094 s Y2: 5.807 % t2: -6346.278 ms f: 10.638 Hz

FMVSS 124 THROTTLE RETURN TEST

124 MID/NORMAL/25% WOT

2:34:17 PM 5/7/04

NHTSA C45203 NISSAN QUEST



Channel:Throttle Position

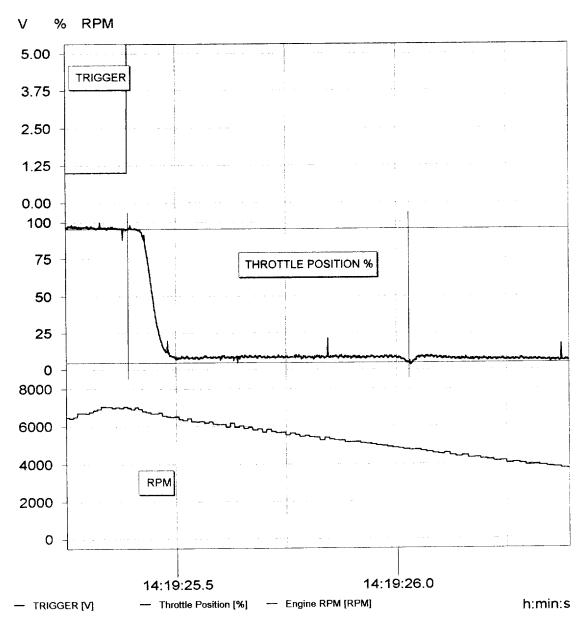
Y1: 7.428 % t1: -5084.649 ms dt: 0.065 s Y2: 4.393 % t2: -5019.649 ms f: 15.385 Hz

FMVSS 124 THROTTLE RETURN TEST

124 MID/NORMAL/100% WOT

2:31:29 PM 5/7/04

NHTSA C45203 NISSAN QUEST



Channel:Throttle Position

Y1: 95.320 % t1: -36768.649 ms dt: 0.637 s Y2: 4.508 % t2: -36131.649 ms f: 1.570 Hz

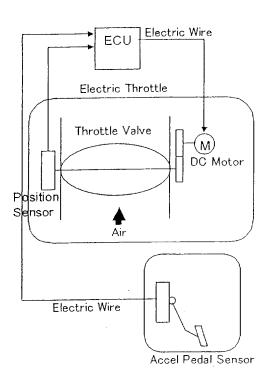
SECTION 7 MANUFACTURER'S DRAWINGS

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).

Ans.



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

Ans. Air throttle plate position

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)

Ans. Air throttle plate position

- 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

Ans. A-D all.

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.

Ans. Throttle plate position can be utilized by measuring the voltage of TPS output.

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

Ans.

For severances: (each tested separately)

- 1. Accel Pedal Inner Spring
- 2. Accel Pedal Outer Spring
- 3. Throttle Motor Return Spring (motor power off)
- 4. Throttle Motor only (return spring removed)

For Disconnections (each tested separately - wiring disconected)

- 1. Throttle Control Motor Asy
 - a. Monitor Sensor 1
 - b. Disconnect Sensor 2
- 2. Throttle Position Sensor Asy
 - a. Monitor Sensor 1
 - b. Disconnect Sensor 2
- 3. Accelerator Pedal Position Sensor Asy
 - a. Monitor Sensor 1
 - b. Disconnect Sensor 2
- 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.

Ans. No.

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

Ans. No.

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

Ans. The accelerator Pedal has 2 (redundant) return springs.

- 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.

Ans. Not applicable.

11.) Is the ACS equipped with a limp home mode? If yes, provide operation description. Ans. ACS has a limp home mode. If ACS detects the failure, the system turns throttle motor off and return throttle plate to default position. 12.) Please describe a method by which the test laboratory can measure the engine RPM by tapping into the ECM, OBD connector, etc. Ans. We could take a signal from the ECM via a CONSULT (Nissan's diagnostic system), or from the meter signal.