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REPORT NUMBER 124L-GTL-04-005

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

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Approved By: [signature]

Approval Date: 5/19/04

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: [signature]

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Technical Report Documentation Page

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9. Performing Organization Name and Address General Testing Laboratories, Inc. 1623 Leedstown Road Colonial Beach, Va 22443		10. Work Unit No. (TRAIS) 11. Contract or Grant No. DTNH22-01-C-11025
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Admin. Enforcement Office of Vehicle Safety Compliance (NVS-220) 400 7th Street, S.W., Room 6115 Washington, DC 20590		13. Type of Report and Period Covered Final Test Report May 7, 2004 14. Sponsoring Agency Code NSA-30
15. Supplementary Notes		
16. Abstract Compliance tests were conducted on the subject 2004 Nissan Quest 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:		
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 7th St., S.W. Washington, DC 20590 Telephone No. (202) 366-4946	
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TABLE OF CONTENTS

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.

DATA SHEET 1
VEHICLE DESCRIPTION

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 NISSAN QUEST MPV
VEHICLE NHTSA NO.: C45203
VEHICLE VIN: 5N1BV28494N320161
DATE OF TEST: MAY 7, 2004
TEST LAB: GENERAL TESTING LABORATORIES
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.
MFR. IDLE RPM: COMPUTER CONTROLLED (850)
FUEL METERING DEVICE (Carburetor, fuel injection, etc): FUEL INJECTION

REMARKS:

RECORDED BY: [signature] DATE: 05/07/04

APPROVED BY: [signature]

DATA SHEET 2
NORMAL OPERATION TEST
(fully operational system)

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 NISSAN QUEST, MPV
VEHICLE NHTSA NO.: C45203
DATE OF TEST: MAY 7, 2004

Check one:

Mid Temp. Test:___ Low Temp. Test: X High Temp. Test:___

SYSTEM CONDITION: COMPLETE (no modifications) Normal Operation

ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)	THROTTLE POSITION SENSOR READING	RPM	TEMPERATURE (°F)		THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)	RETURN TIME TO IDLE (Msec)	PASS/ FAIL
			ENGINE COOLANT	AMBIENT			
25%	25						
50%	50		-25	-26	5%	94	P
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

PASS X FAIL ____

REMARKS: After cold soak at -25° F the engine was started with ether to perform normal operation testing. After one throttle depression to 50% W.O.T. and return to idle, the engine died and would not restart after repeated tries. The ambient temperature was then raised until the engine started at an ambient temperature of 60° F, at which time normal operation testing was started. After a throttle depression to 25% and 100% W.O.T. with returns to idle the accelerator failed to operate the engine.

RECORDED BY: _____ DATE: 05/07/04

APPROVED BY: D. Messina

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

VEHICLE MY/MAKE/MODEL/BODY STYLE: 2004 NISSAN QUEST, MPV
VEHICLE NHTSA NO.: C45203
DATE OF TEST: MAY 7, 2004

Check one:

Mid Temp. Test:___ Low Temp. Test: X High Temp. Test:___

SYSTEM CONDITION: COMPLETE (no modifications) Normal Operation

ACCELERATOR POSITION % WIDE OPEN THROTTLE (WOT)	THROTTLE POSITION SENSOR READING	RPM	TEMPERATURE (°F)		THROTTLE POSITION SENSOR READING @ IDLE (BASELINE)	RETURN TIME TO IDLE (Msec)	PASS/ FAIL
			ENGINE COOLANT	AMBIENT			
25%	25	2500	80	60	4%	65	P
50%							*
75%							*
100%	100	7000	60	60	4%	637	P

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: *Vehicle started at 60° F ambient temperature and normal condition tests were started but accelerator electronic control failed and accelerator would no longer operate and control engine RPM.

RECORDED BY: _____ DATE: 05/07/04

APPROVED BY: _____

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

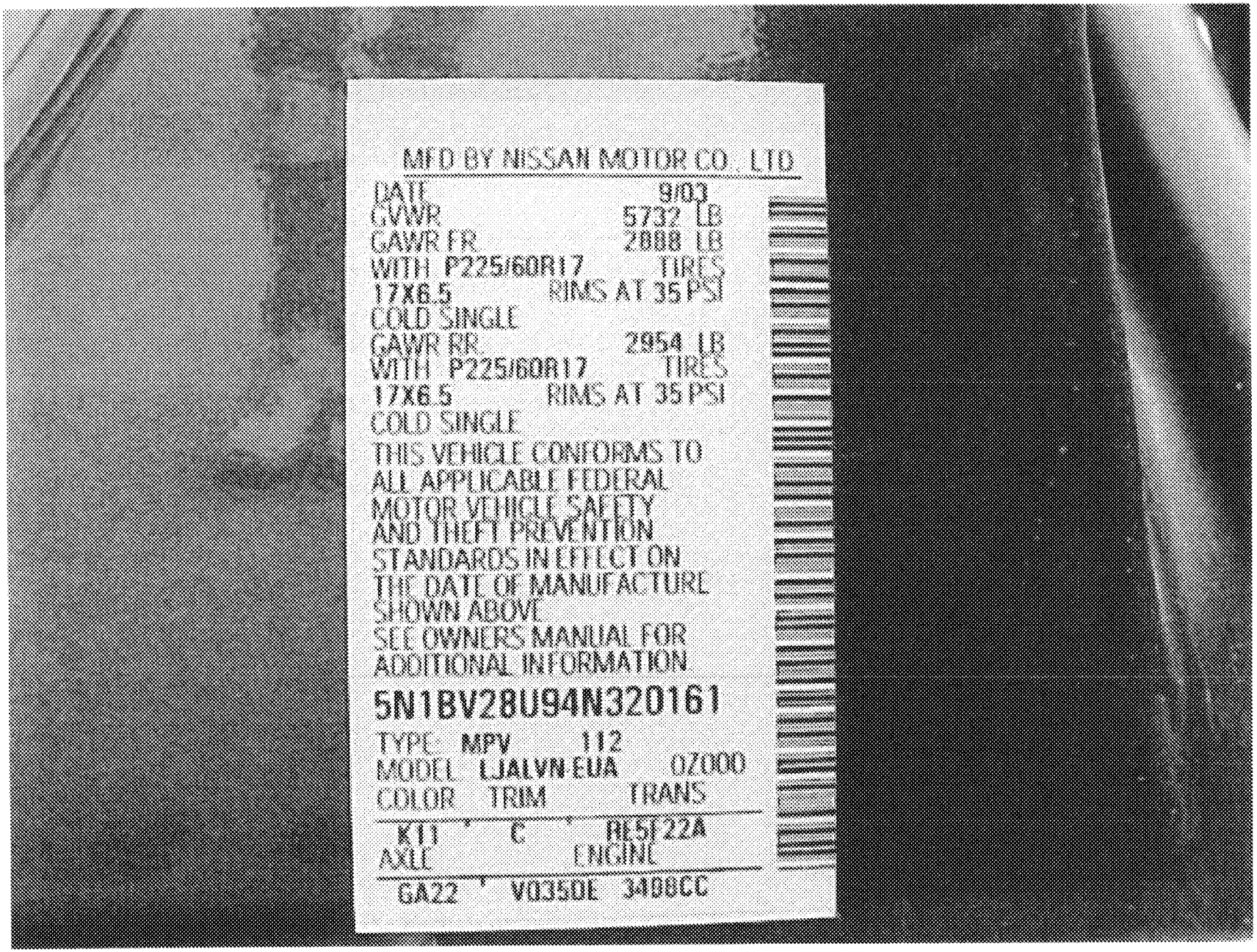
FIGURE 5.1
FRONT VIEW OF VEHICLE

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

FIGURE 5.2
LEFT SIDE VIEW OF VEHICLE

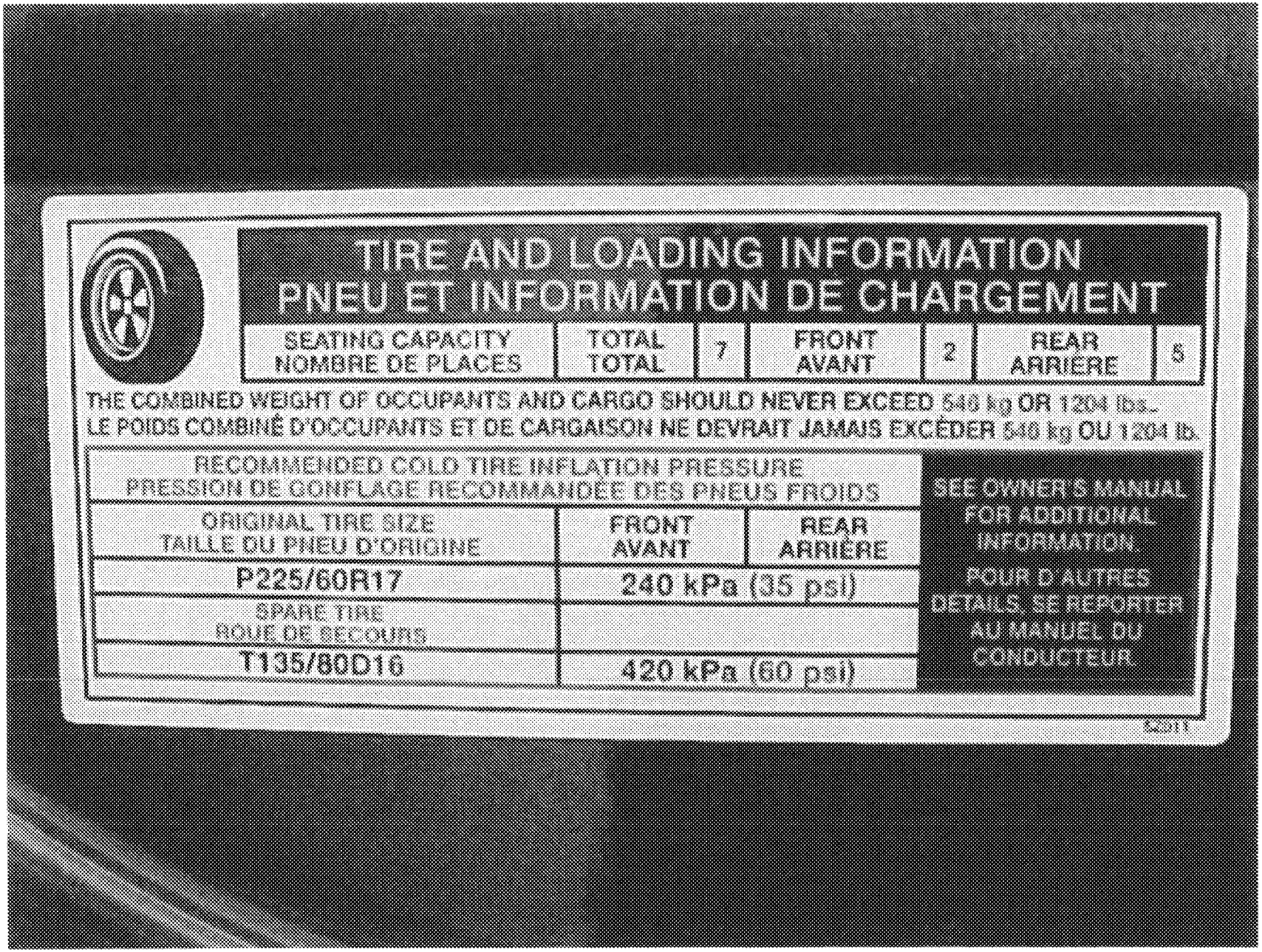
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.3
RIGHT SIDE VIEW OF VEHICLE



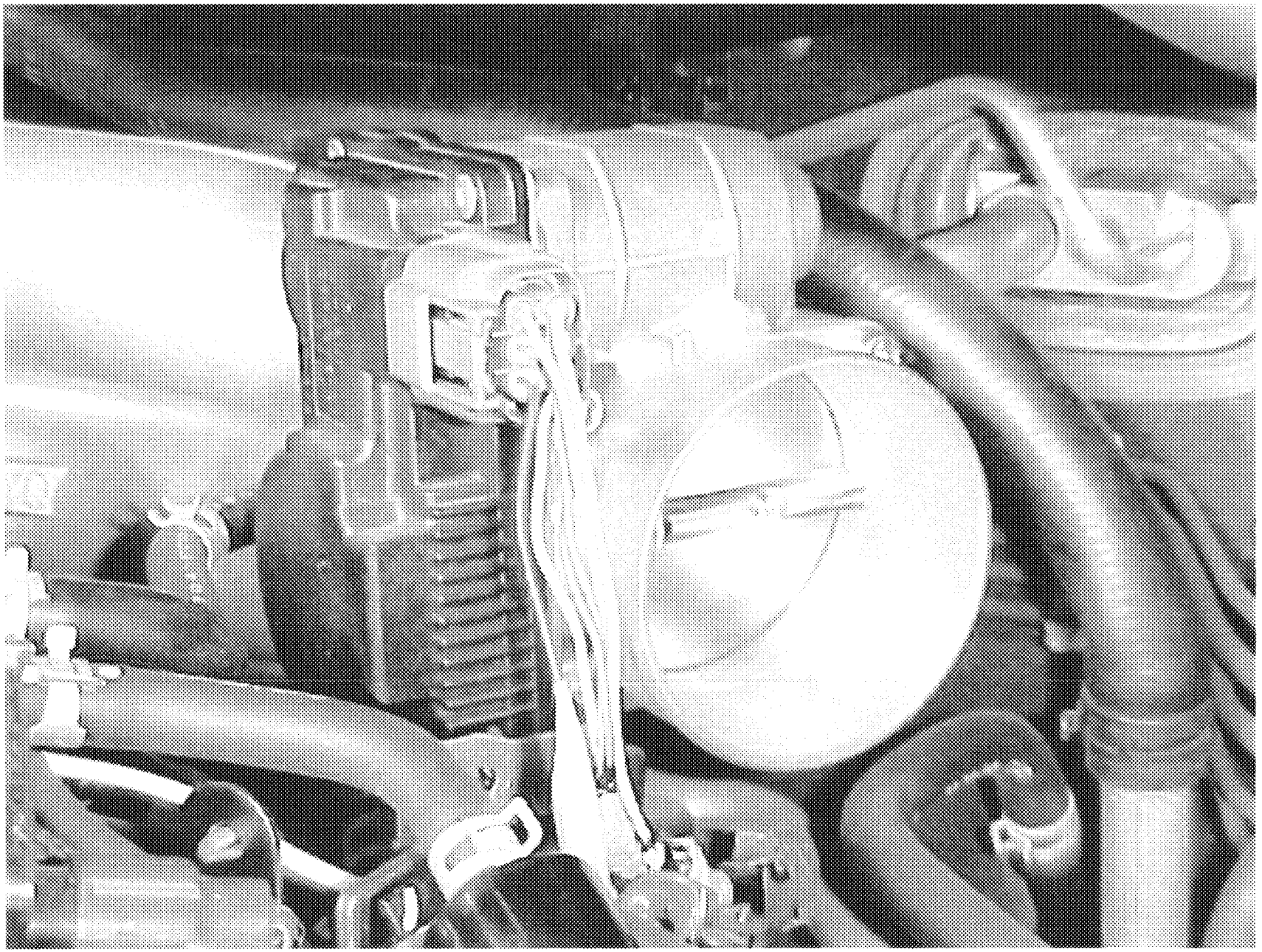
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

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



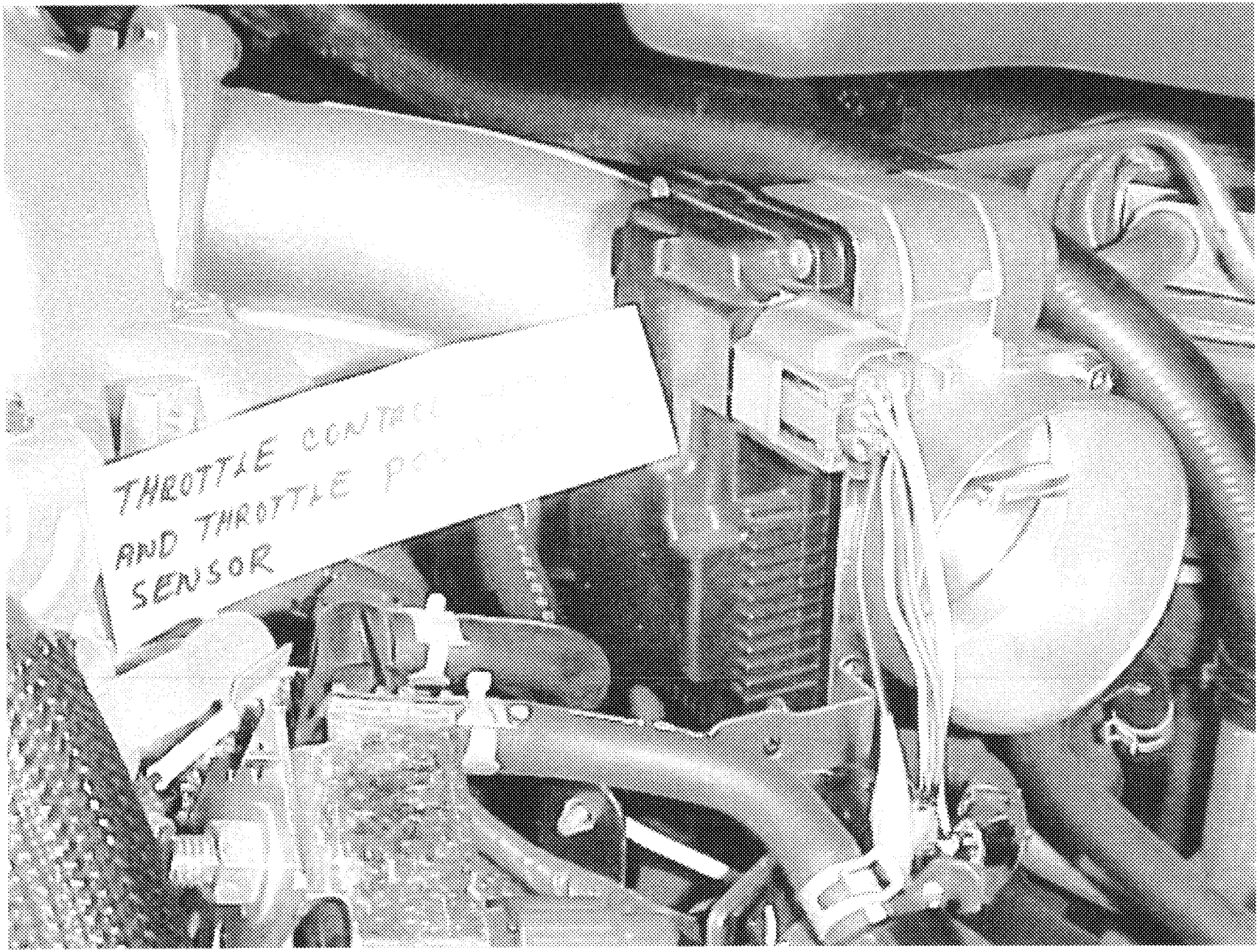
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

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



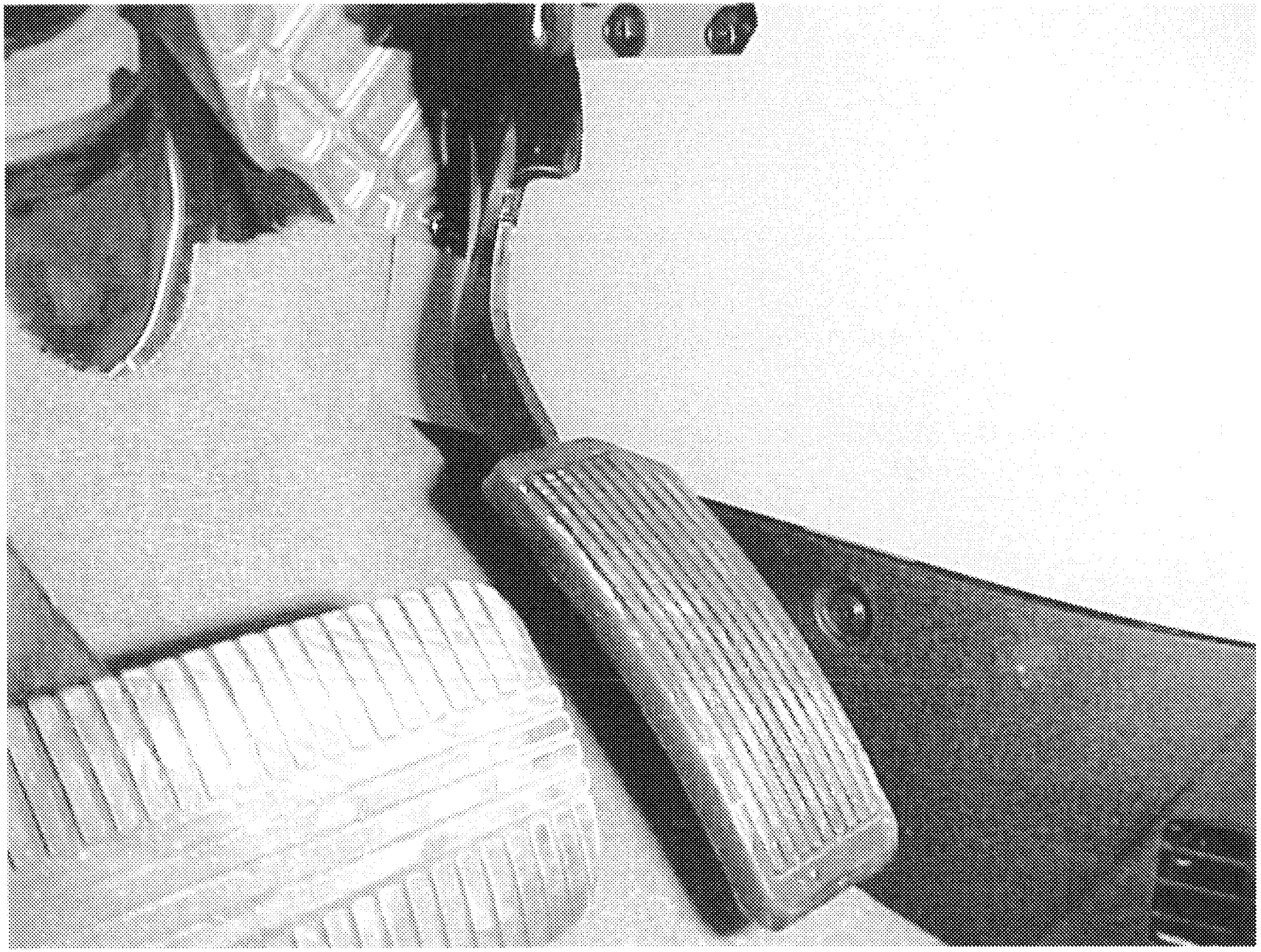
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.6
VIEW OF THROTTLE BODY ON ENGINE



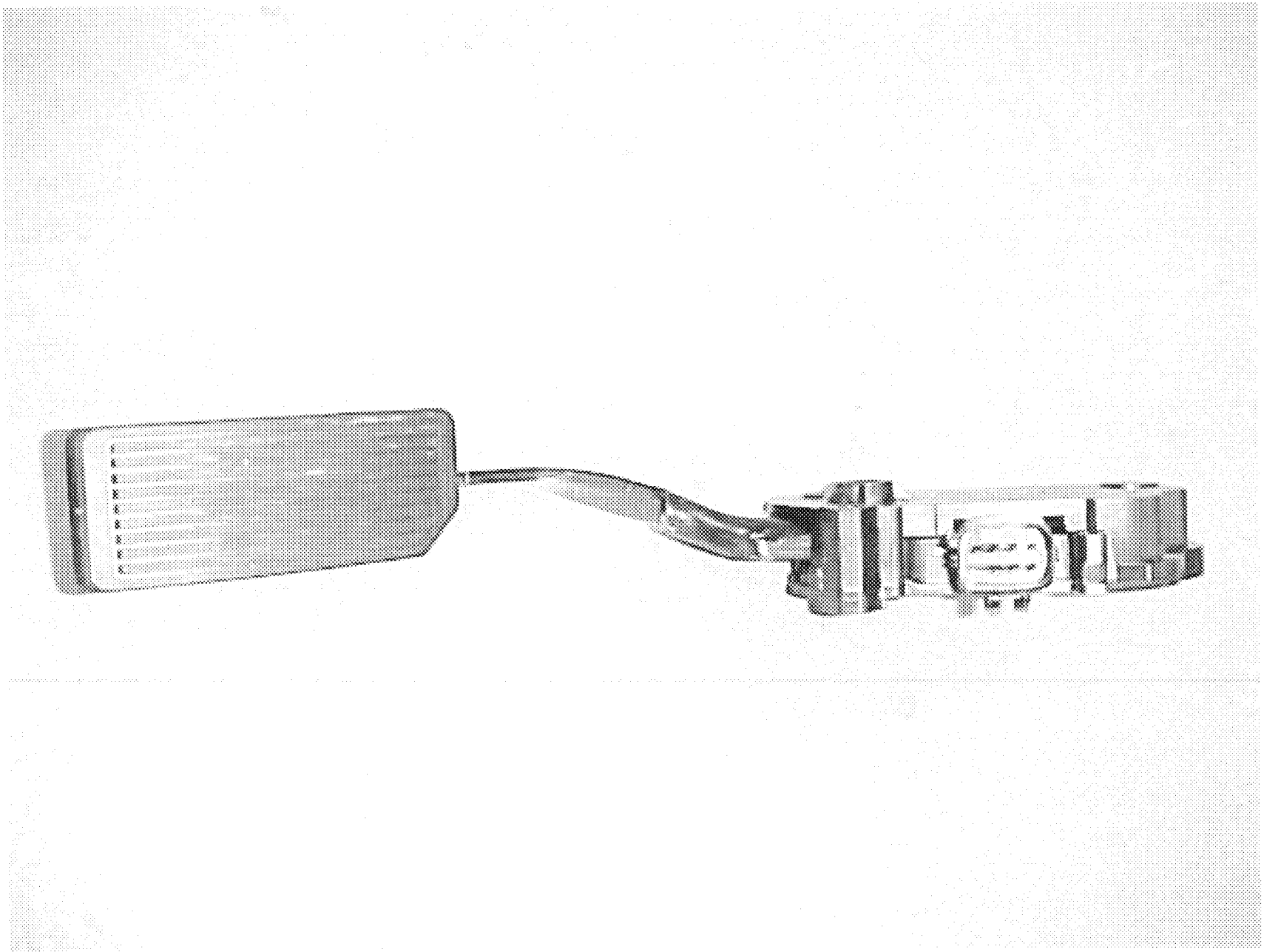
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.7
LOCATION OF TPS AND TPM



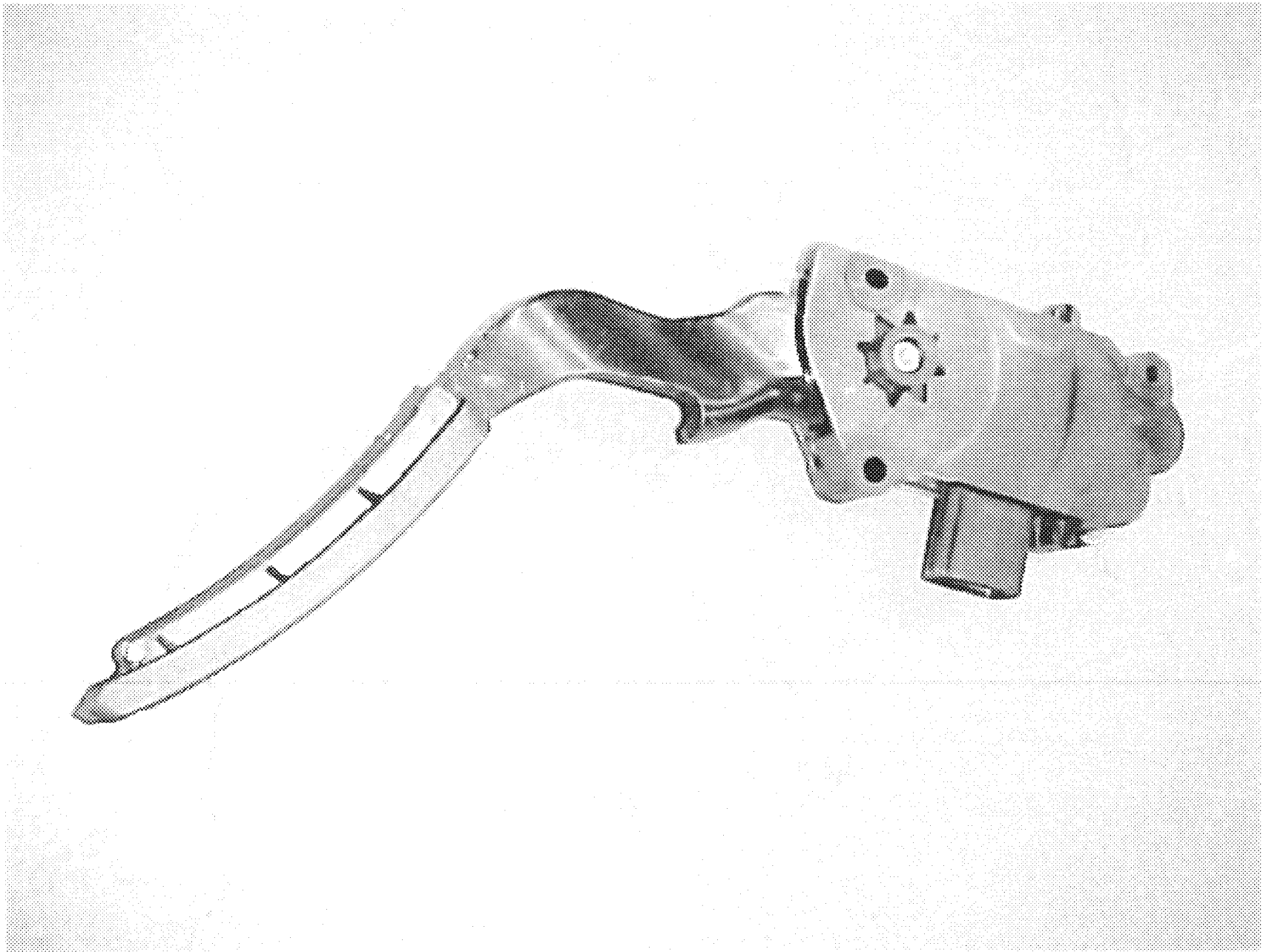
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.8
ACCELERATOR PEDAL ASSEMBLY



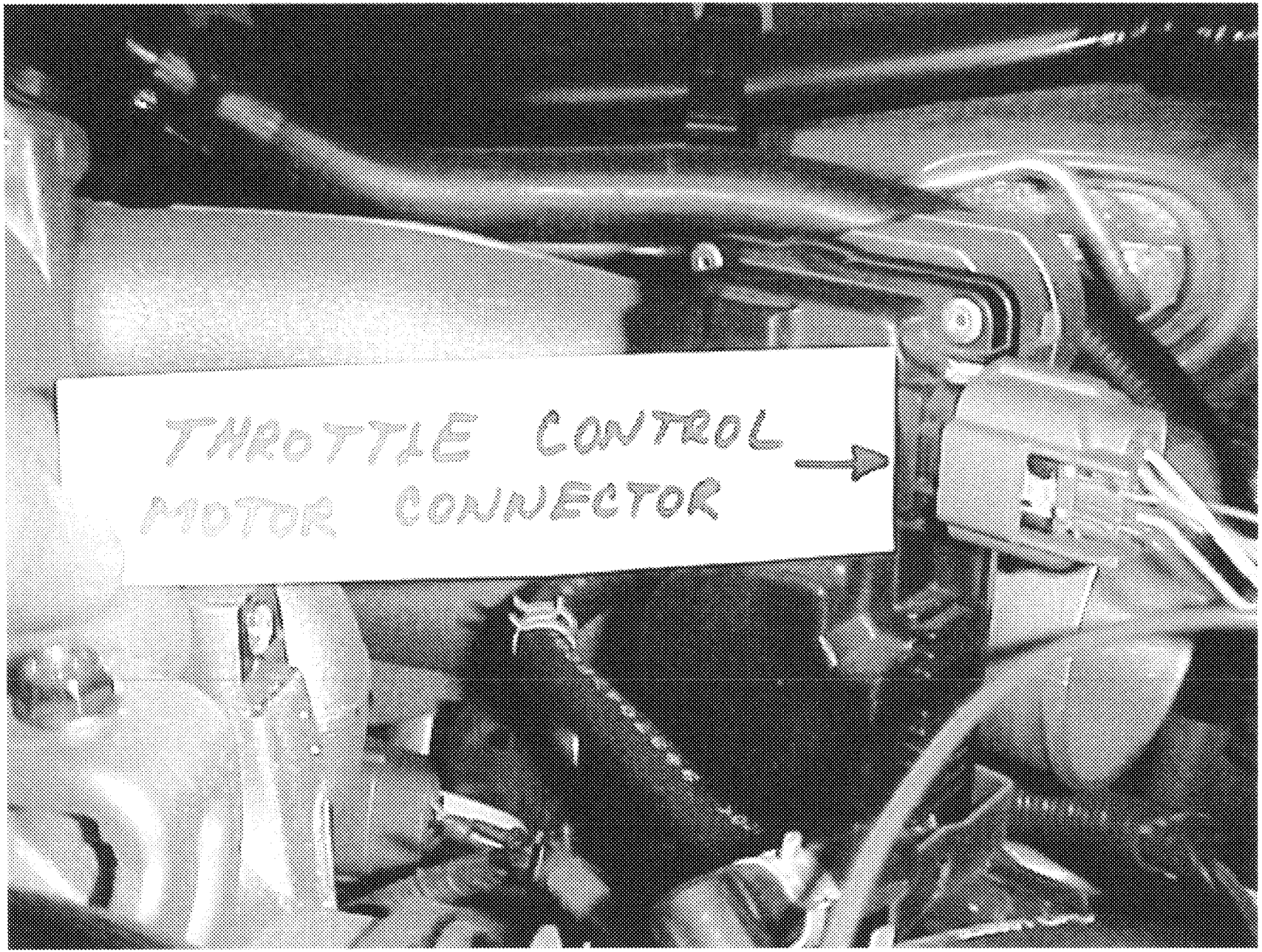
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.9
ACCELERATOR PEDAL ASSEMBLY FRONT VIEW



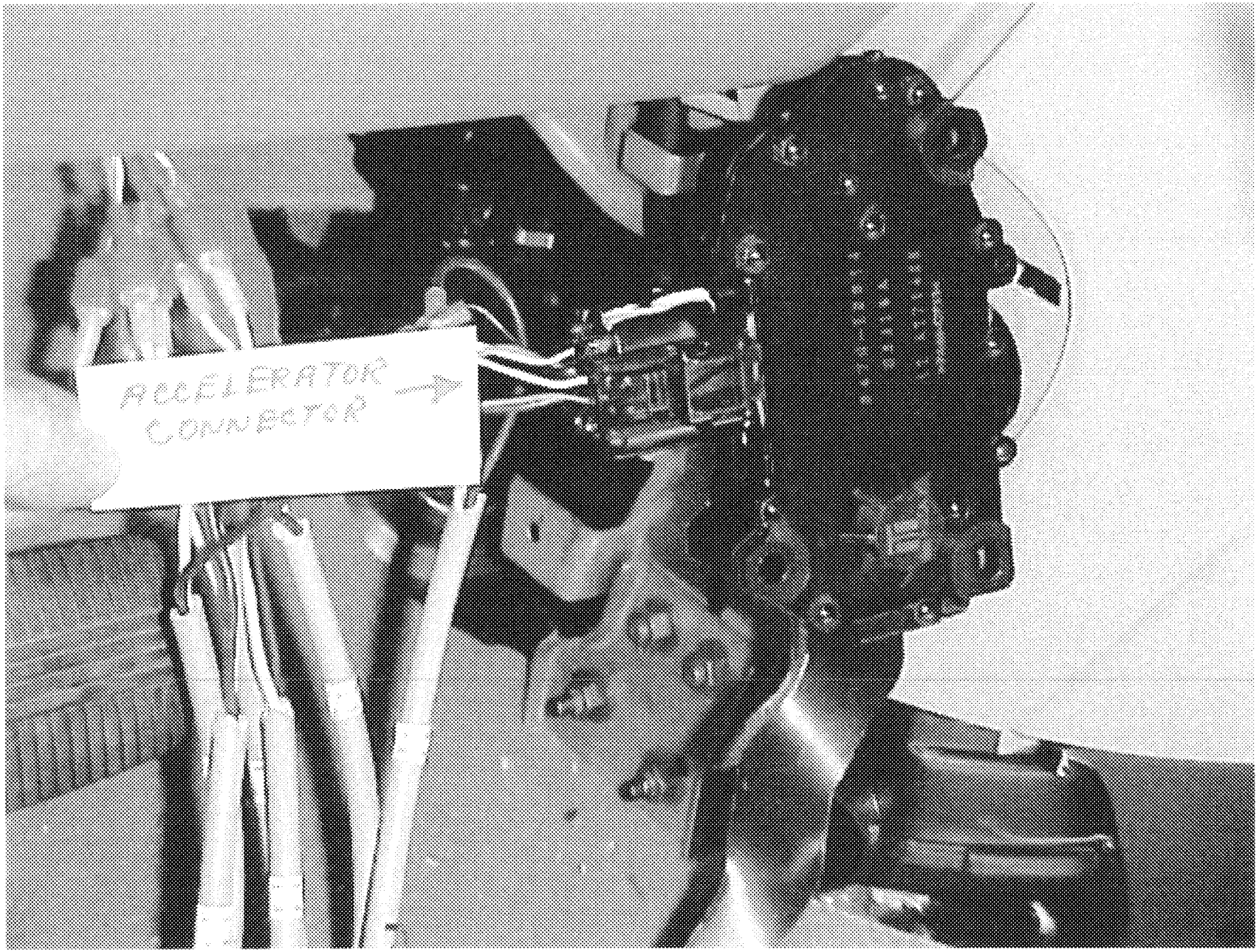
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.10
ACCELERATOR PEDAL ASSEMBLY SIDE VIEW



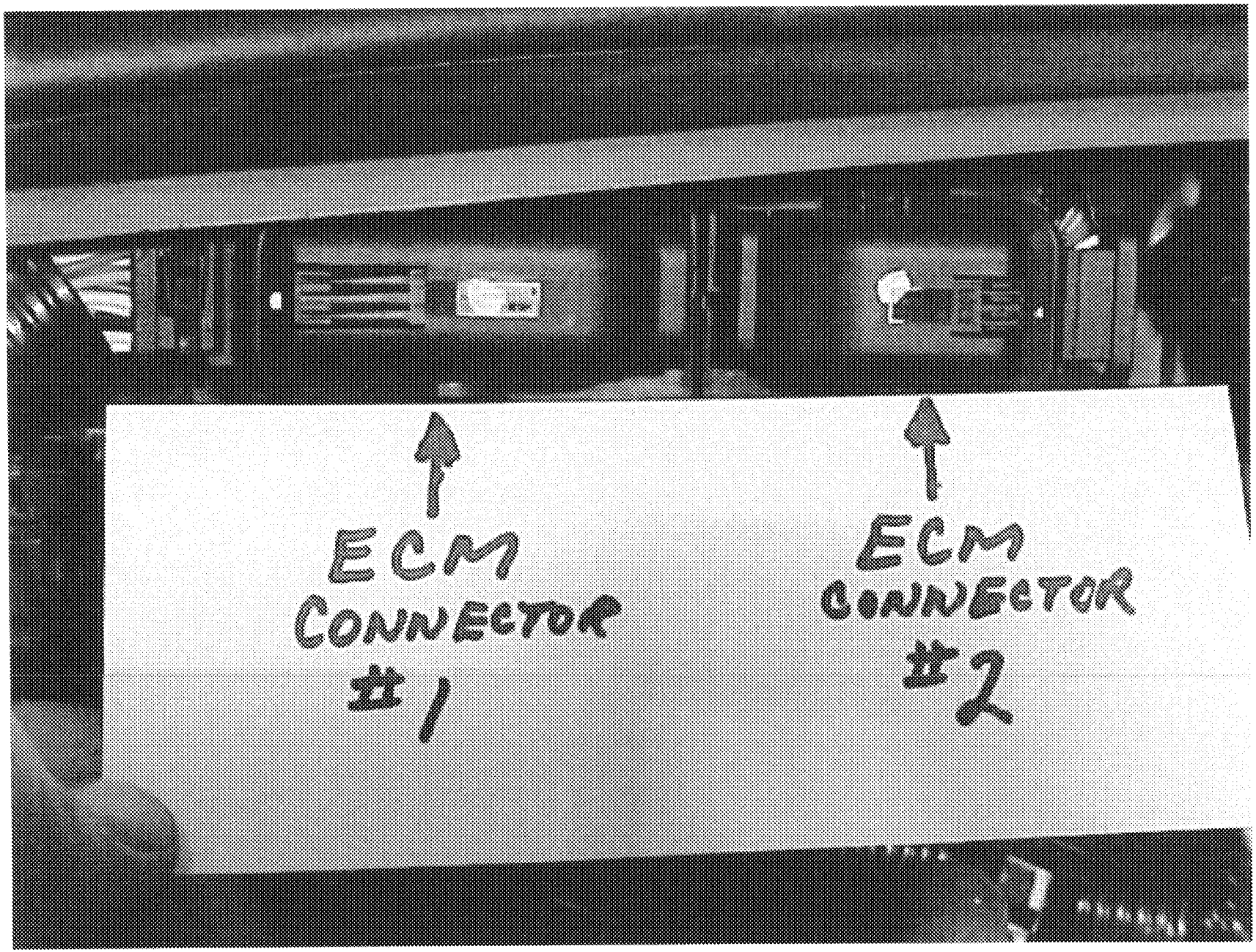
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.11
TPS AND TPM CONNECTOR



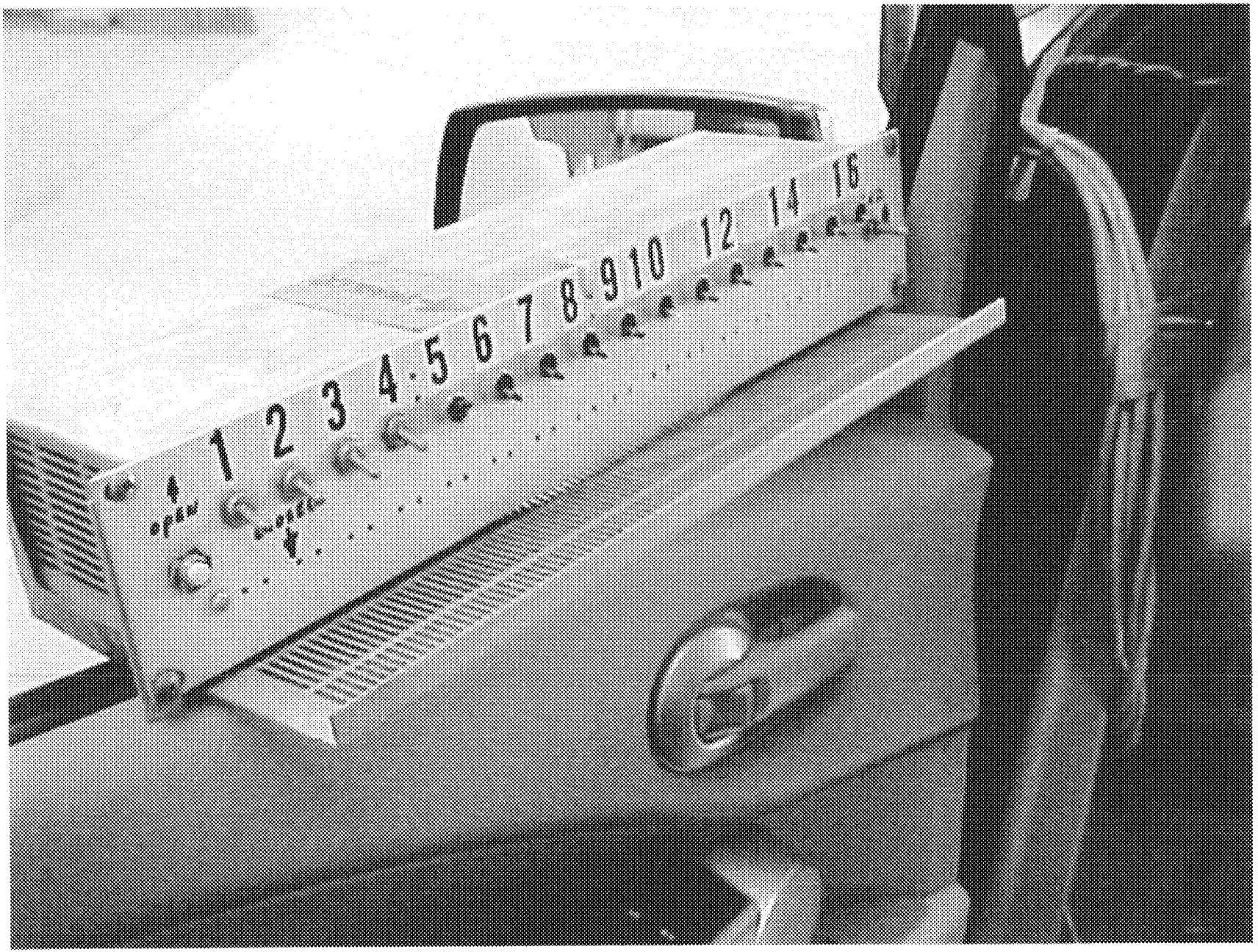
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

FIGURE 5.12
ACCELERATOR PEDAL CONNECTOR



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

FIGURE 5.13
ECM CONNECTORS #1 AND #2

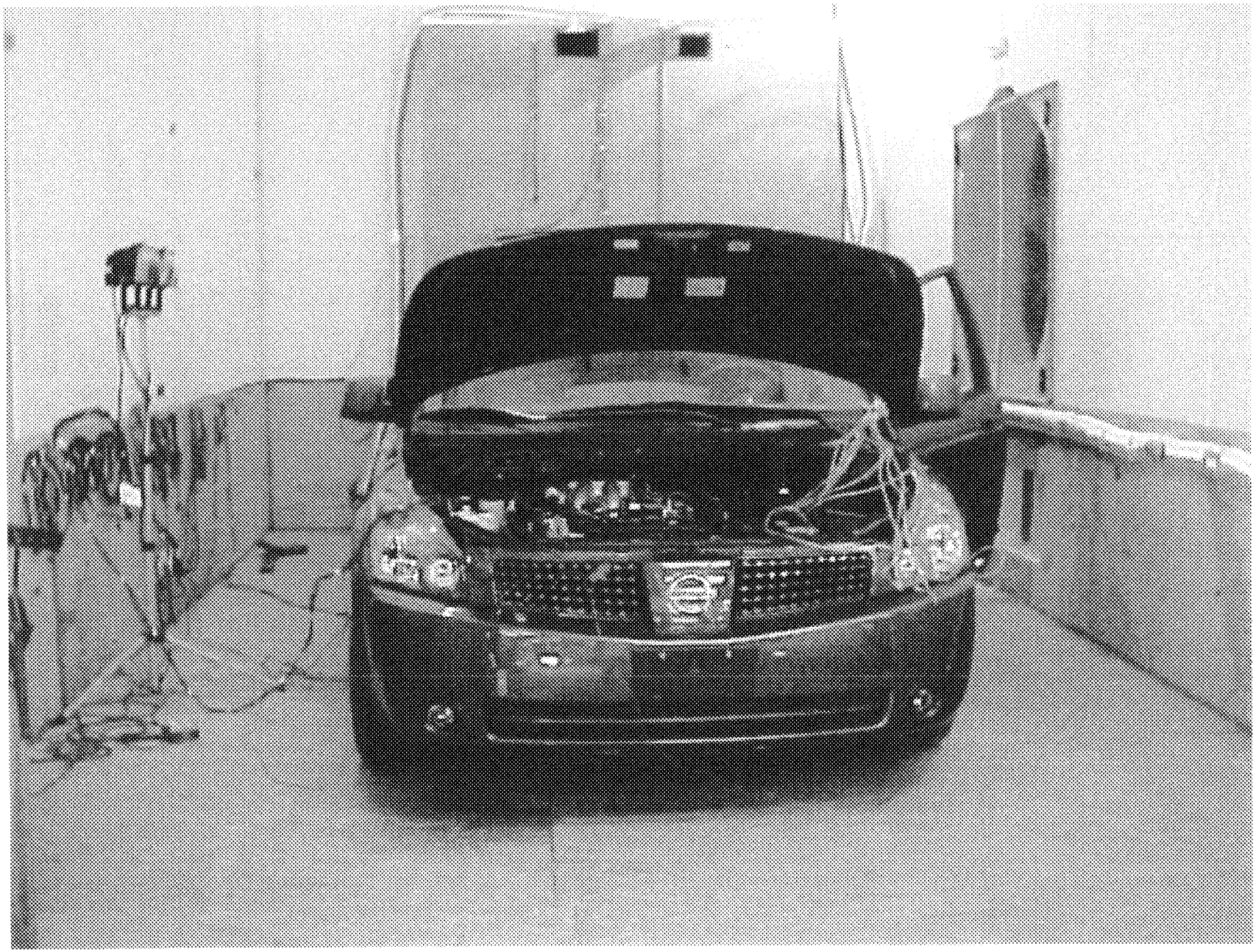


2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

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

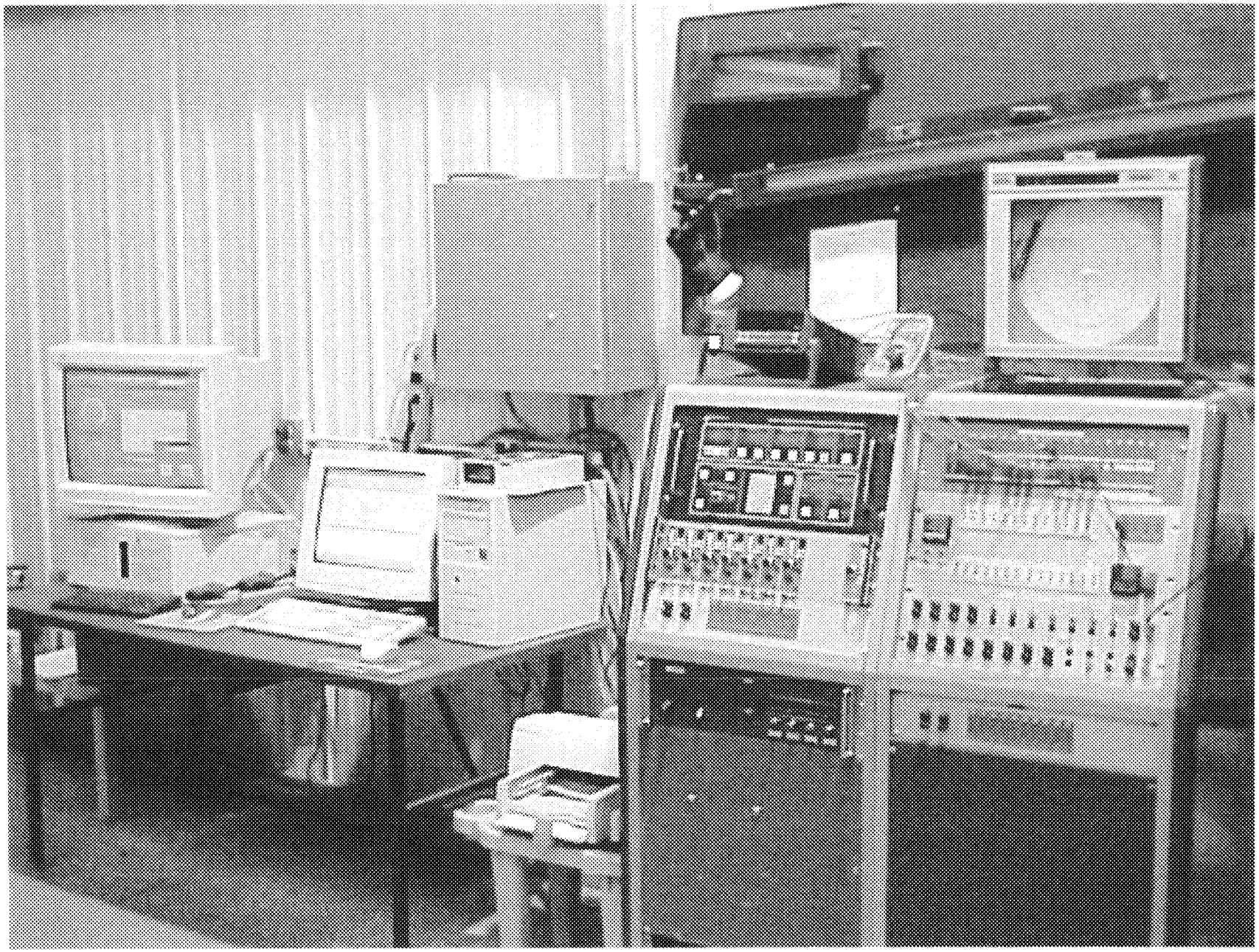
2004 NISSAN QUEST
NHTSA NO. C45203
FMVSS NO. 124L

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

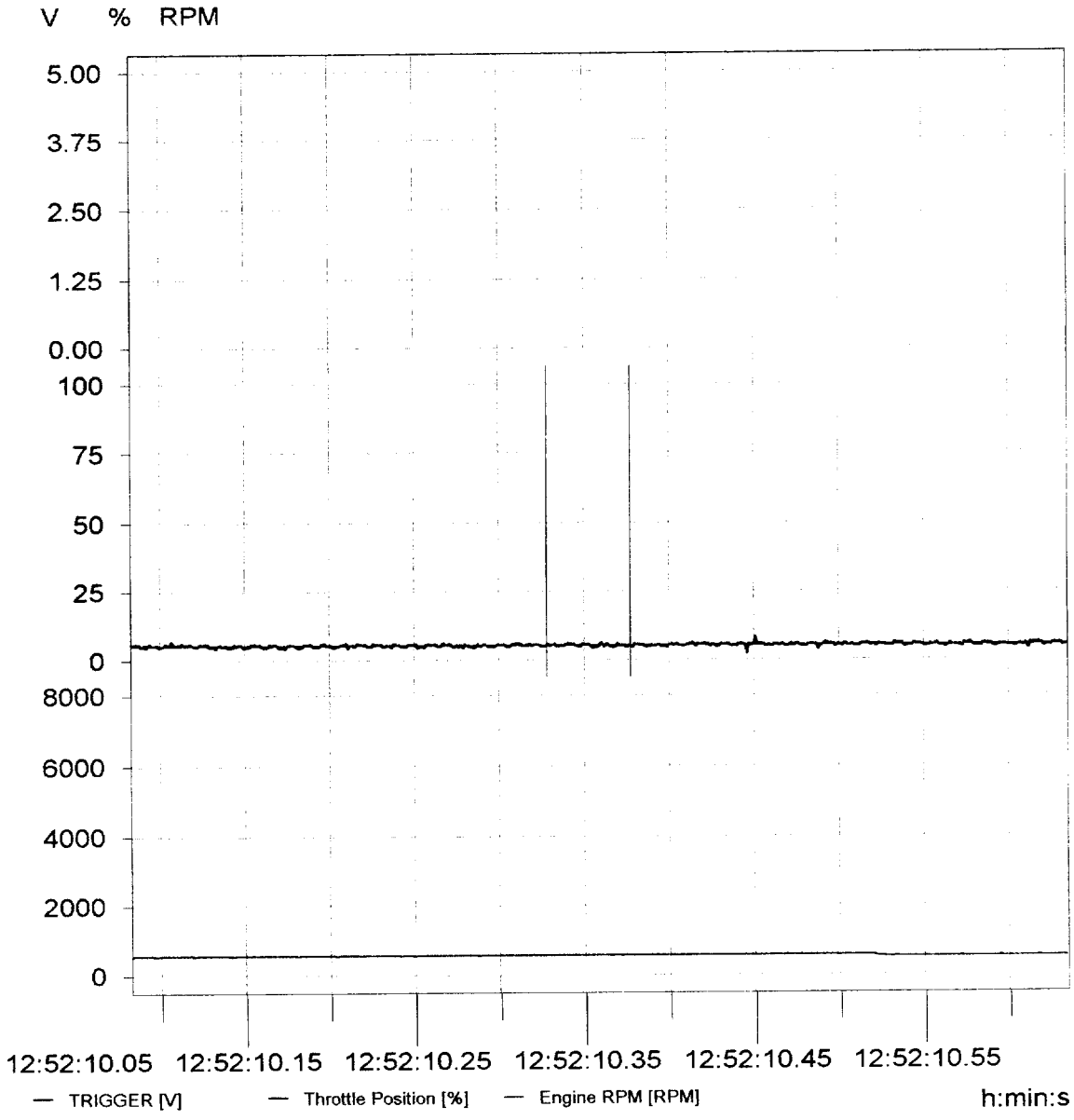
FIGURE 5.17
124 TEST INSTRUMENTATION SET-UP

SECTION 6
PLOTS

FMVSS 124 THROTTLE RETURN TEST

124 COLD/NORMAL/BASE IDLE@-32C 1:12:36 PM 5/7/04

NHTSA C45203 NISSAN QUEST



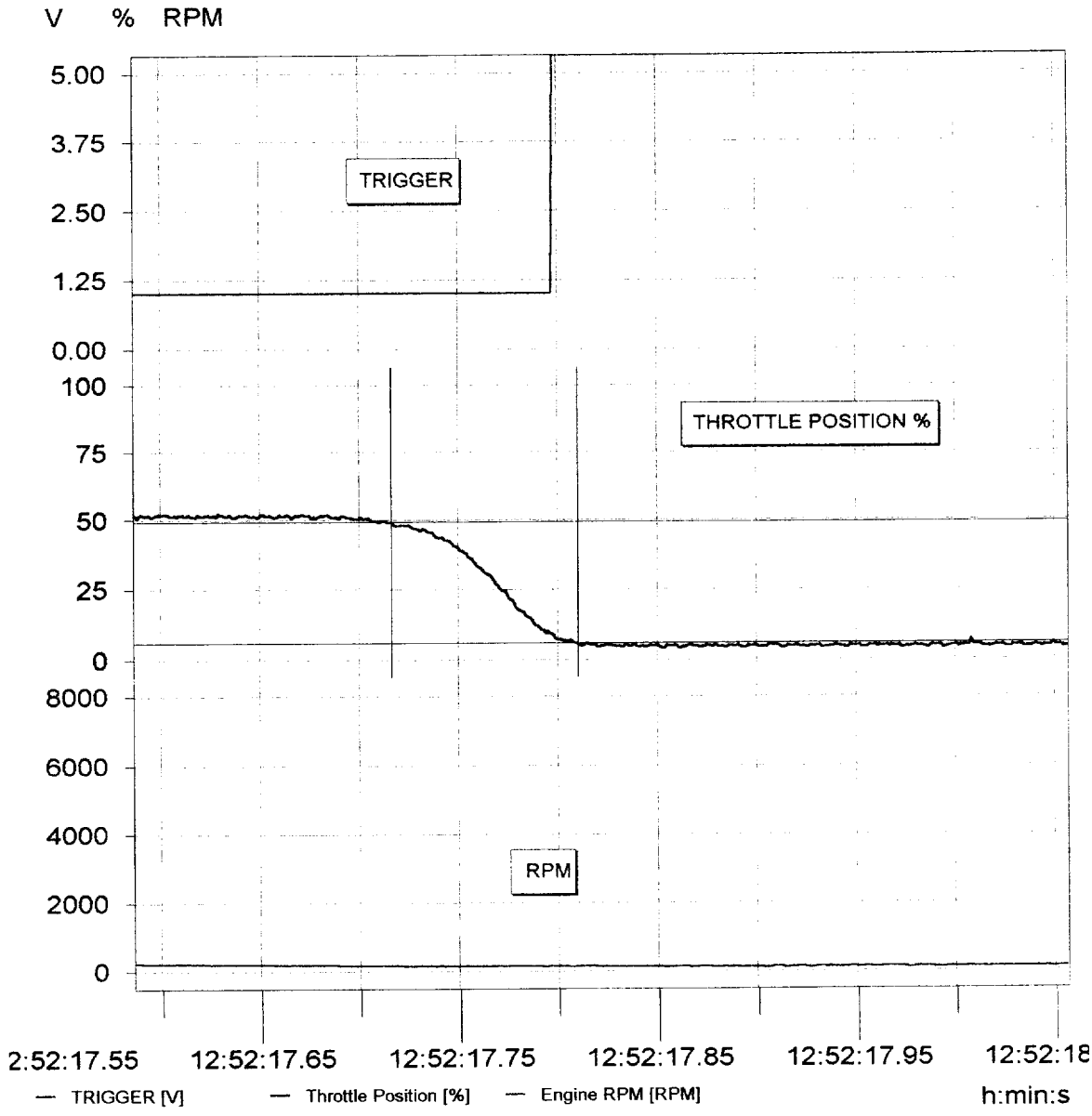
Channel: Throttle Position

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



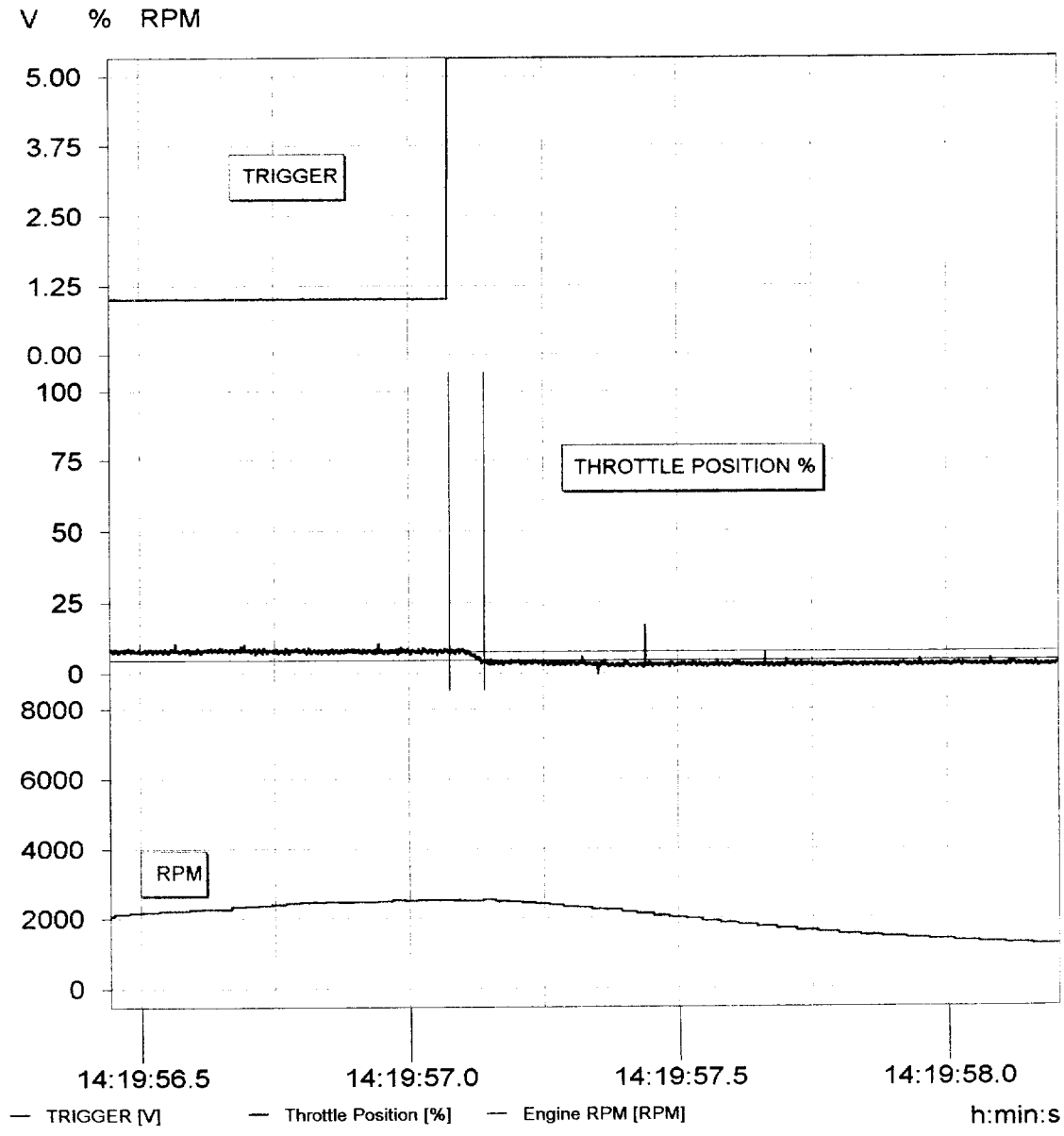
Channel:Throttle Position

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



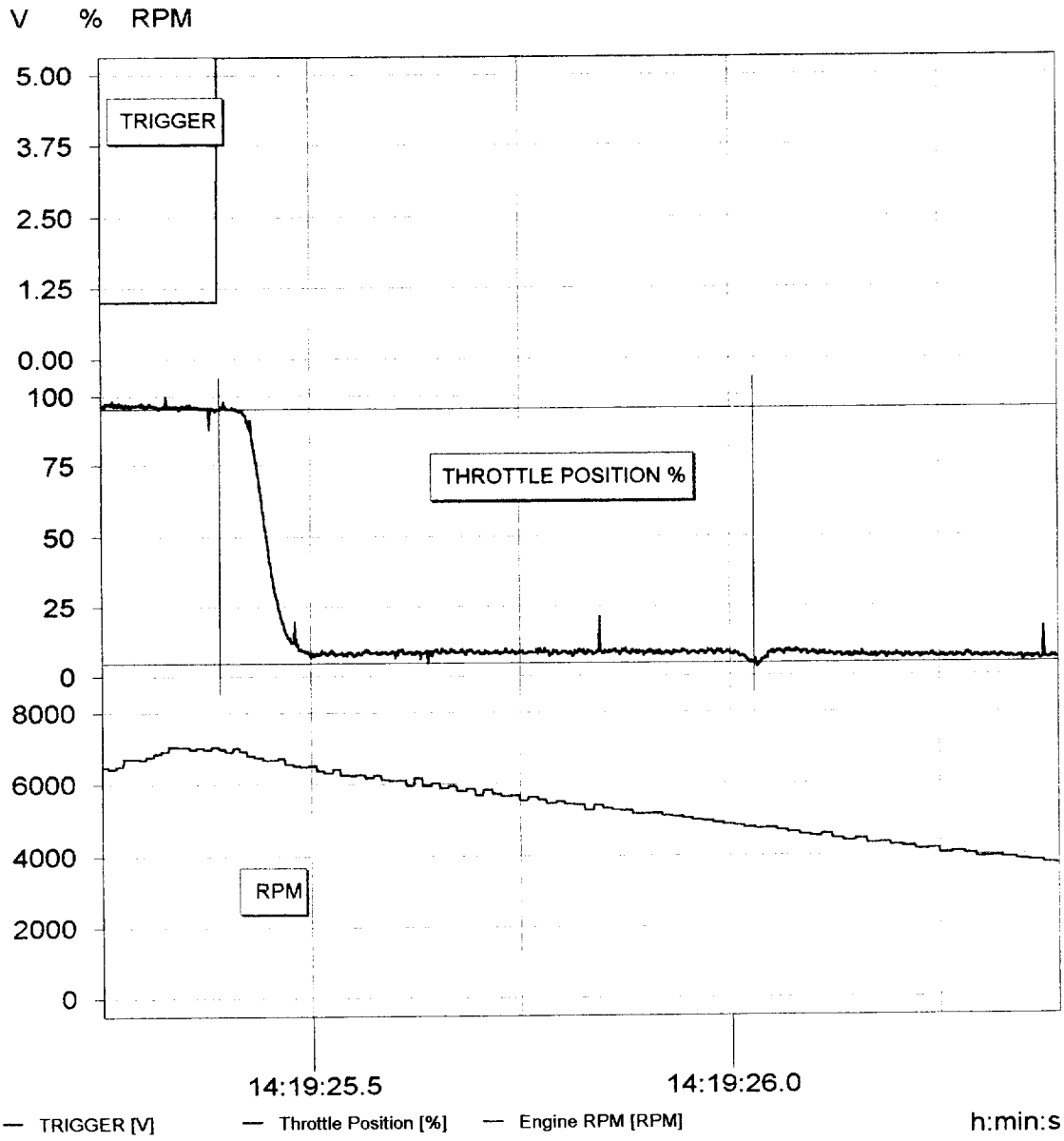
Channel:Throttle Position

Y1:	7.428 %	Y2:	4.393 %
t1:	-5084.649 ms	t2:	-5019.649 ms
dt:	0.065 s	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 %	Y2:	4.508 %
t1:	-36768.649 ms	t2:	-36131.649 ms
dt:	0.637 s	f:	1.570 Hz

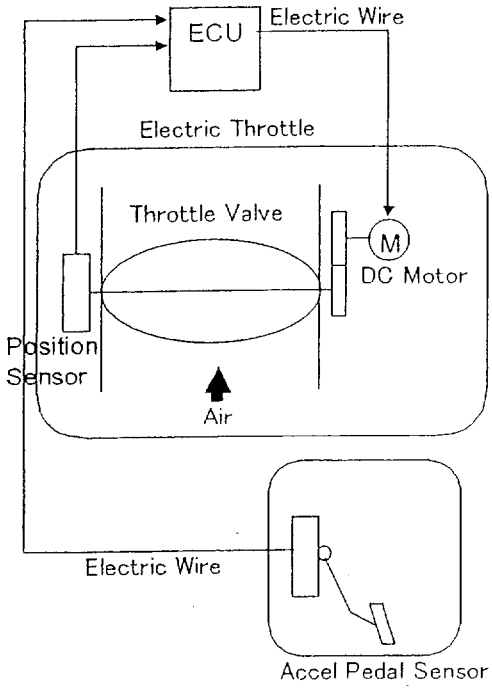
SECTION 7
MANUFACTURER'S DRAWINGS

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.