

REPORT NUMBER 110(IND)-GTL-03-007

**SAFETY COMPLIANCE TESTING FOR
FMVSS NO. 110(INDICANT)
TIRE SELECTION AND RIMS**

**TOYOTA MOTOR CORPORATION
2003 TOYOTA HIGHLANDER, MPV
NHTSA NO. C35103**

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



SEPTEMBER 9, 2003

FINAL REPORT

PREPARED FOR

**U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
SAFETY ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, SW
ROOM 6111 (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: Debbie Murrell
Approved By: M. A. Baker
Approval Date: 09/09/03

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: Jim Penner
Acceptance Date: 9/15/03

1. Report No. 110(IND)-GTL-03-007	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Final Report of FMVSS 110 (Indicant) Test of 2003 TOYOTA HIGHLANDER MPV NHTSA No. C35103		5. Report Date September 9, 2003
		6. Performing Organ. Code GTL
7. Author(s) Grant Farrand, Project Engineer Debbie Messick, Project Manager		8. Performing Organ. Rep# GTL-DOT-03-110(INDICANT)-007
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. Safety Enforcement Office of Vehicle Safety Compliance (NVS-220) 400 7 th Street, S.W., Room 6111 Washington, DC 20590		13. Type of Report and Period Covered Final Test Report May 23, 2003
		14. Sponsoring Agency Code NVS-120 & NVS 220
15. Supplementary Notes		
16. Abstract This test was conducted on the subject, 2003 Toyota Highlander MPV in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-110-02 (partial), to gather data relating to the normal load requirements specified in FMVSS 110. NHTSA's Office of Safety Performance Standards requested this data to support the agency's TREAD tire rulemaking efforts.		
17. Key Words Vehicle Testing Safety Engineering FMVSS 110		18. Distribution Statement Copies of this report are available from NHTSA NHTSA Technical Reference Div., Rm. 5108 (NPO-230) 400 7 th St., S.W. Washington, DC 20590 Telephone No. (202) 366-4946
19. Security Classif. (of this report) UNCLASSIFIED	21. No. of Pages 25	22. Price
20. Security Classif. (of this page) UNCLASSIFIED		

TABLE OF CONTENTS

SECTION		PAGE
1	Introduction	1
2	Test Procedure and Summary of Results	2
3	Test Data	3
4	Test Equipment List	10
5	Photographs	11
	5.1 ¾ Frontal View of Vehicle	
	5.2 Vehicle's Certification Label	
	5.3 Vehicle's Tire Information Label	
	5.4 Tire Showing Brand	
	5.5 Tire Showing Model	
	5.6 Tire Showing Size, Load Index, Speed Symbol and Serial Number	
	5.7 Tire Showing Max Load Rating	
	5.8 Tire Showing Max Inflation Pressure	
	5.9 Vehicle Ballasted to Simulate Normal Load Condition	

APPENDIX – Normal Load Occupation Distribution

SECTION 1

INTRODUCTION

1.0 PURPOSE OF INDICANT TEST

A 2003 Toyota Highlander MPV was subjected to a FMVSS No. 110 (Indicant) test intended to gather data relating to the normal load requirements specified in FMVSS 110. NHTSA's Office of Safety Performance Standards requested this data to support the agency's TREAD tire rulemaking efforts.

1.1 TEST VEHICLE

The test vehicle was a 2003 Toyota Highlander MPV. Nomenclature applicable to the test vehicle are:

A. Vehicle Identification Number: JTEGD21A530058515

B. NHTSA No.: C35103

C. Manufacturer: TOYOTA MOTOR CORPORATION

D. Manufacture Date: 01/03

1.2 TEST DATE

The test vehicle was subjected to testing on May 23, 2003.

SECTION 2

TEST PROCEDURE AND SUMMARY OF RESULTS

2.0 TEST PROCEDURE

The vehicle was inspected, photographed and filled with fuel. It was then weighed to establish total curb weight and the weights of all wheels were measured and recorded. The vehicle was then ballasted to its normal load condition (refer to appendix) and the weights of all wheels were measured and recorded. Tire information labeling data and tire sidewall data were recorded.

This indicant test did not include any other requirements in FMVSS 110.

2.1 SUMMARY OF RESULTS

Currently FMVSS 110 applies only to passenger cars. The subject Toyota Highlander is a multipurpose passenger vehicle (MPV) and therefore it is not required to meet FMVSS 110 requirements. It was subjected to the normal load testing as executed for FMVSS 110 compliance verification for information only.

SECTION 3 TEST DATA

DATA SHEET 1
SUMMARY

VEHICLE MAKE/MODEL/BODY STYLE: 2003 TOYOTA HIGHLANDER MPV
VEHICLE NHTSA NO.: C35103 ; VIN: JTEGD21A530058515
LABORATORY: GENERAL TESTING LABORATORIES
TEST DATE: 05/23/03

REQUIREMENT

YES/NO

The vehicle is equipped with tires that meet the requirements of FMVSS 109 or FMVSS 119.

YES

The vehicle normal load on the tire is not greater than the high speed performance test load specified in FMVSS 109 paragraph S5.5 or FMVSS 119 paragraph S7.4.

YES

For passenger cars, the tire information placard is permanently affixed to the glove compartment door or equally accessible location; and displays the required information (FMVSS 110, S4.3).

N/A

For vehicles other than passenger cars, a combined certification/ tire information label or separate tire information label is permanently affixed to either the hinge pillar, door-latch post or to the inward-facing surface of the door next to the driver's seating position (FMVSS 120, S5.3).

YES

REMARKS:

RECORDED BY:



DATE:

05/23/03

APPROVED BY:



DATA SHEET 2

TEST VEHICLE INFORMATION/RECEIVING INSPECTION

LABORATORY: GENERAL TESTING LABORATORIES DATE: 05/23/03

VEHICLE MODEL YEAR/MAKE/MODEL/BODY STYLE: 2003 TOYOTA HIGHLANDER MPV

MANUFACTURE DATE: 01/03 NHTSA NO.: C35103 BODY COLOR: MILLENNIUM SILVER

VIN: JTEGD21A530058515 VEHICLE TYPE: MPV

GVWR 2260 kg (4985 lbs) GAWR(Fr) 1300 kg (2865 lbs) GAWR(Rr) 1240 kg (2735 lbs)

BELTED SEATING POSITIONS: FRONT 2 MID N/A REAR 3 OTHER N/A

ENGINE DATA: 4 Cylinders 2.4 Liters Cubic Inches

TRANSMISSION DATA: X Automatic Manual 4 No. of Speeds

FINAL DRIVE DATA: Rear Drive X Front Drive 4 Wheel Drive

INSTALLED TIRE DATA: Size - P225/70R16 Mfr. - GOODYEAR

CHECK APPROPRIATE BOXES FOR VEHICLE EQUIPMENT/MAKE SURE ALL OPTIONS ON WINDOW STICKER ARE LISTED:

☒	Air Conditioning	☐	Traction Control	☐	Clock
☒	Tinted Glass	☐	All Wheel Drive	☐	Roof Rack
☐	Power Steering	☒	Cruise Control	☐	Conso-e
☒	Power Windows	☒	Rear Window Defroster	☒	Driver Air Bag
☒	Power Door Locks	☐	Sun Roof or T-Top	☒	Passenger Air Bag
☐	Power Seat(s)	☒	Tachometer	☒	Front Disc Brakes
☒	Power Brakes	☒	Tilt Steering Wheel	☒	Rear Disc Brakes
☒	Antilock Brake System	☒	AM/FM/CD	☐	Other -

ARE ALL OPTIONS LISTED ON "WINDOW STICKER" PRESENT ON THE TEST VEHICLE:
(YES/NO) Yes

REMARKS:

RECORDED BY: *M. A. Gha*

DATE: 05/23/03

APPROVED BY: *D. M. S. S. S.*

DATA SHEET 3
CURB WEIGHT WITH OPTIONS AND NORMAL LOAD

VEHICLE MAKE/MODEL/BODY STYLE: 2003 TOYOTA HIGHLANDER MPV
 VEHICLE NHTSA NO.: C35103 ; VIN: JTEGD21A530058515
 LABORATORY: GENERAL TESTING LABORATORIES
 TEST DATE: 05/23/03

Full Fluid Levels:

Fuel Full ; Coolant Full ; Other Fluids Full

Tire Pressure: LF 210 KPA (30 psi) LR 210 KPA (30 psi)
 RF 210 KPA (30 psi) RR 210 KPA (30 psi)

A. MEASURED CURB WEIGHT WITH INSTALLED OPTIONS AND ACCESSORIES

LF <u>455</u> KG (1003 LB)	LR <u>342</u> KG (753 LB)
RF <u>450</u> KG (992 LB)	RR <u>334</u> KG (737 LB)
Front Axle <u>905</u> KG (1995 LB)	
Rear Axle <u>676</u> KG (1490 LB)	
Total Vehicle <u>1581</u> KG (3485 LB)	

B. MEASURE VEHICLE WEIGHT IN NORMAL LOAD CONDITION

(1) Seating Capacity (from Tire Information Placard) = 5
 Seating Capacity (# of belted seating positions) = 5

(2) Normal Load # of Occupants from Appendix
 Occupant Distribution: Front Seat- 2 Second Seat- 1
 Third Seat- N/A Fourth Seat- N/A

(3) Total Normal Occupant Load 204 KG (450 LB)
 (# of occupants x 68 KG per occupant)

(4) Measured Normal Load on each Wheel and Axles (Sum)

LF <u>503</u> KG (1108 LB)	LR <u>394</u> KG (869 LB)
RF <u>499</u> KG (1099 LB)	RR <u>390</u> KG (859 LB)
Frt Axle <u>1002</u> KG (2207 LB)	
Rr Axle <u>784</u> KG (1728 LB)	
Total Vehicle <u>1785</u> KG (3935 LB)	

DATA SHEET 3 – CONTINUED

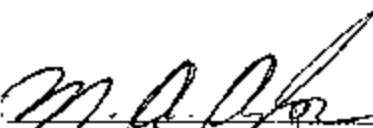
- (5) Calculated Vehicle Normal Load on the Tire
 Front Tires (measured front axle normal load/2) = 501 KG (1104 LB)
 Rear Tires (measured front axle normal load/2) = 392 KG (864 LB)
- (6) High Speed Test Load from () FMVSS 109 (S5.5), or (X) FMVSS 119 (S7.4)

	Front	Rear
(a) Installed Tire Size	<u>P225/70R16</u>	<u>P225/70R16</u>
Max. Load Rating on Sidewall	<u>825 KG(1819 LBS)</u>	<u>825 KG(1819 LBS)</u>
Reduced Sidewall Load Rating (if applicable)*	<u>750 KG(1654 LBS)</u>	<u>750 KG(1654 LBS)</u>
High Speed Test Load (88% of sidewall max. load rating)	<u>660 KG(1456 LBS)</u>	<u>660 KG(1456 LBS)</u>
(b) Optional Tire Size(s)	<u>NONE</u>	<u>NONE</u>

* If a passenger car tire is installed on a multipurpose passenger vehicle (MPV), truck or bus, the tire's load rating shall be reduced by dividing by 1.10.

REMARKS: The Vehicle Normal Load on the Tire is not greater than the High Speed Test Load.

RECORDED BY:


DATE: 05/23/03

APPROVED BY:



DATA SHEET 4
TIRE INFORMATION LABEL OR PLACARD

VEHICLE MAKE/MODEL/BODY STYLE: 2003 TOYOTA HIGHLANDER MPV
 VEHICLE NHTSA NO.: C35103 ; VIN: JTEGD21A530058515
 LABORATORY: GENERAL TESTING LABORATORIES
 TEST DATE: 05/23/03

A. Vehicle Type from Certification Label: MPV

B. Identify Vehicle Labeling:

Vehicle has a combined Certification Tire Information Label ☒ Yes ☐ No
 Is Label Permanently Affixed: ☒ Yes ☐ No
 Label Location: Driver's Side Lower "B" Pillar
 Description of Label: Black/White Sticker

Vehicle has a separate Tire Information Label or Placard ☒ Yes ☐ No
 Is Label Permanently Affixed: ☒ Yes ☐ No
 Label Location: Driver's Side Lower "B" Pillar
 Description of Label: Black/White Sticker

C. Enter Information from Combined or Separate Tire Information Label/Placard

Vehicle Capacity Weight - 420 KG (925 LBS)

Designated Seating Capacity (DSC) - 5 (2 Front, 3 Rear)
 Expressed In—

(1) Total No. of Occupants ☒ Yes ☐ No

(2) Terms of Occupants for Each Seat Location ☒ Yes ☐ No

Manufacturer's Recommended Tire Size(s) and Cold Tire Inflation Pressure(s) for
 Maximum Load Vehicle Weight:

P225/70R16 FRONT - 210 kPa (30 psi)
 REAR - 210 kPa (30 psi)

Manufacturer's Recommended Tire Size(s) and Cold Tire Inflation Pressure(s) for Other
 Load Conditions: None

REMARKS: The Highlander is equipped with an FMVSS 110 type label even though it is an
 MPV required to meet the requirements of FMVSS 120.

RECORDED BY: [Signature]

DATE: 05/23/03

APPROVED BY: [Signature]

DATA SHEET 5 VEHICLE TIRE DATA

VEHICLE MAKE/MODEL/BODY STYLE: 2003 TOYOTA HIGHLANDER MPV
 VEHICLE NHTSA NO.: C35103 ; VIN: JTEGD21A530058515
 LABORATORY: GENERAL TESTING LABORATORIES
 TEST DATE: 05/23/03

All tires on the vehicle are the same size: (Yes/No) Yes

INFORMATION FROM TIRE SIDEWALL:

Right Front Tire

Tire Size Designation	<u>P225/70R16</u>
Tire Load Index/Speed Symbol	<u>101S</u>
Maximum Inflation Pressure	<u>300 kPa (44 psi)</u>
Maximum Load Rating	<u>825 KG (1819 LBS)</u>
Mfr. Name or Brand & Code	<u>GOODYEAR INTEGRITY</u>
Tube or Tubeless	<u>TUBELESS</u>
Treadwear/Traction/Temp. Grades	<u>460/A/B</u>
Sidewall (Plies & Composition)	<u>2 PLY POLYESTER</u>
Tread (Plies & Composition)	<u>2 PLY POLYESTER</u> <u>2 PLY STEEL</u>
Serial Number; Right Front -	<u>DOT-M65L B3DR 4102</u>

Tire has "DOT" markings: (X) YES () NO () UNDETERMINED

REMARKS:

RECORDED BY:

DATE: 05/23/03

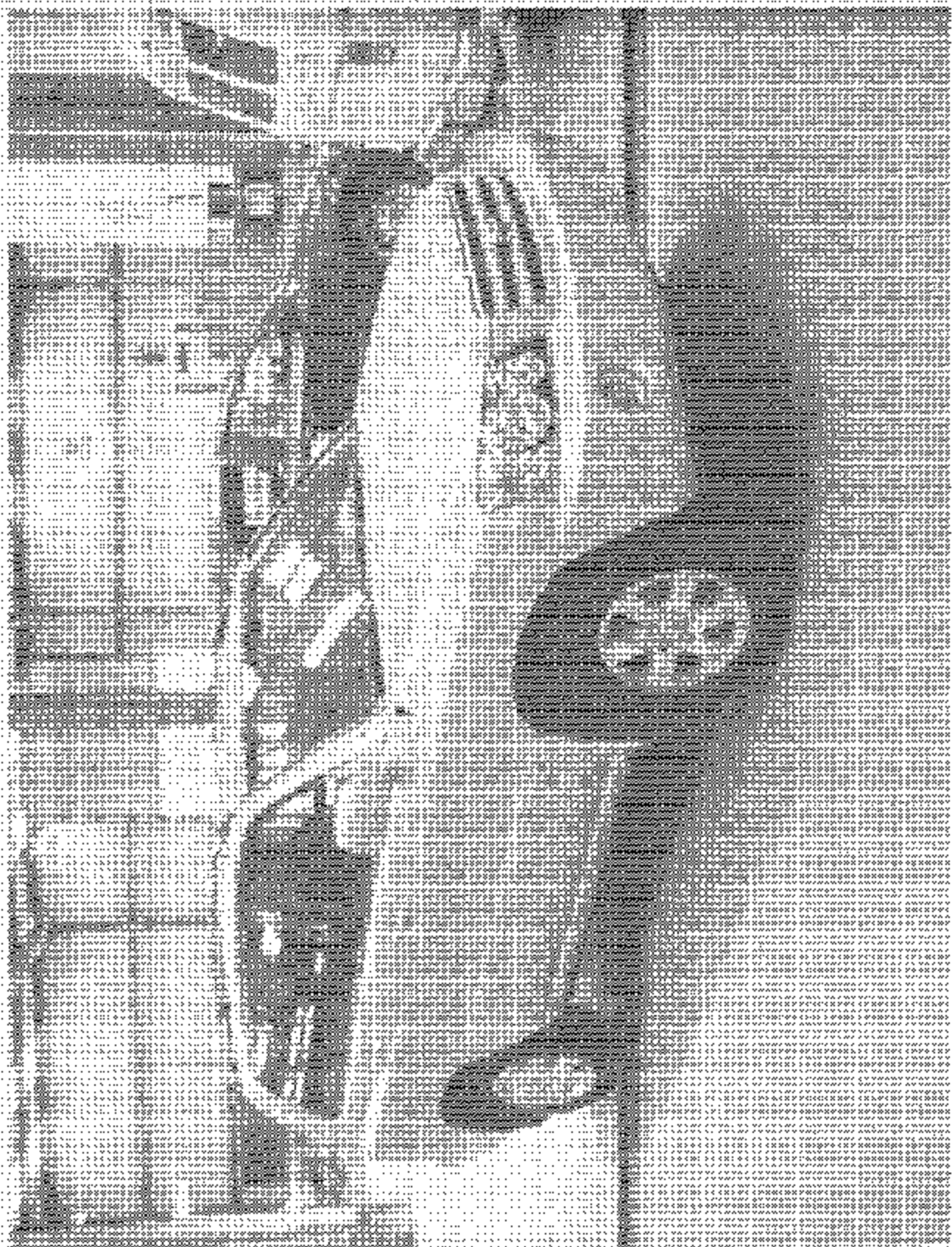
APPROVED BY:

SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO.	CAL. DATE	NEXT CAL. DATE
PAD SCALES	#1 199744LF	199744LF	06/02	06/03
	#2 199744RF	199744RF	06/02	06/03
	#3 199744LR	199744LR	06/02	06/03
	#4 199744RR	19974RR	06/02	06/03
PRESSURE GAGE	WESKLER	0-100	05/03	05/04
SURFACE LEVEL	GTL	N/A	BEFORE USE	BEFORE USE

SECTION 5 PHOTOGRAPHS



2003 TOYOTA HIGHLANDER
NHIS# NO. 026153
FMVSS# NO. 110 (INDICANT)

FIGURE 5.1
3/4 FRONTAL VIEW OF VEHICLE

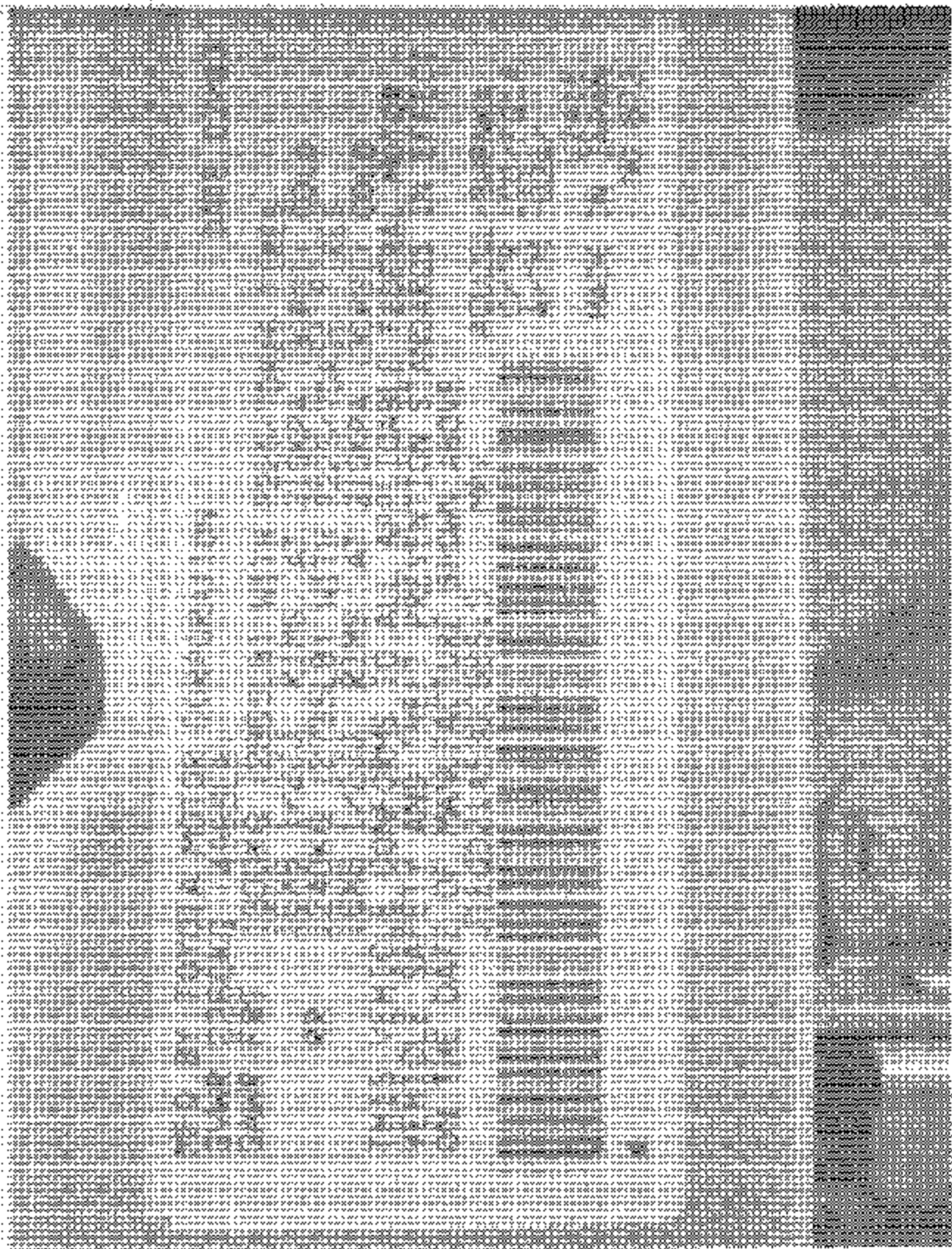


FIGURE 6.2
VEHICLE & CERTIFICATION LABEL

2003 TOYOTA HIGHLANDER
NHTSA NO. C66183
EPA/SS NO. 110 (INDICANT)

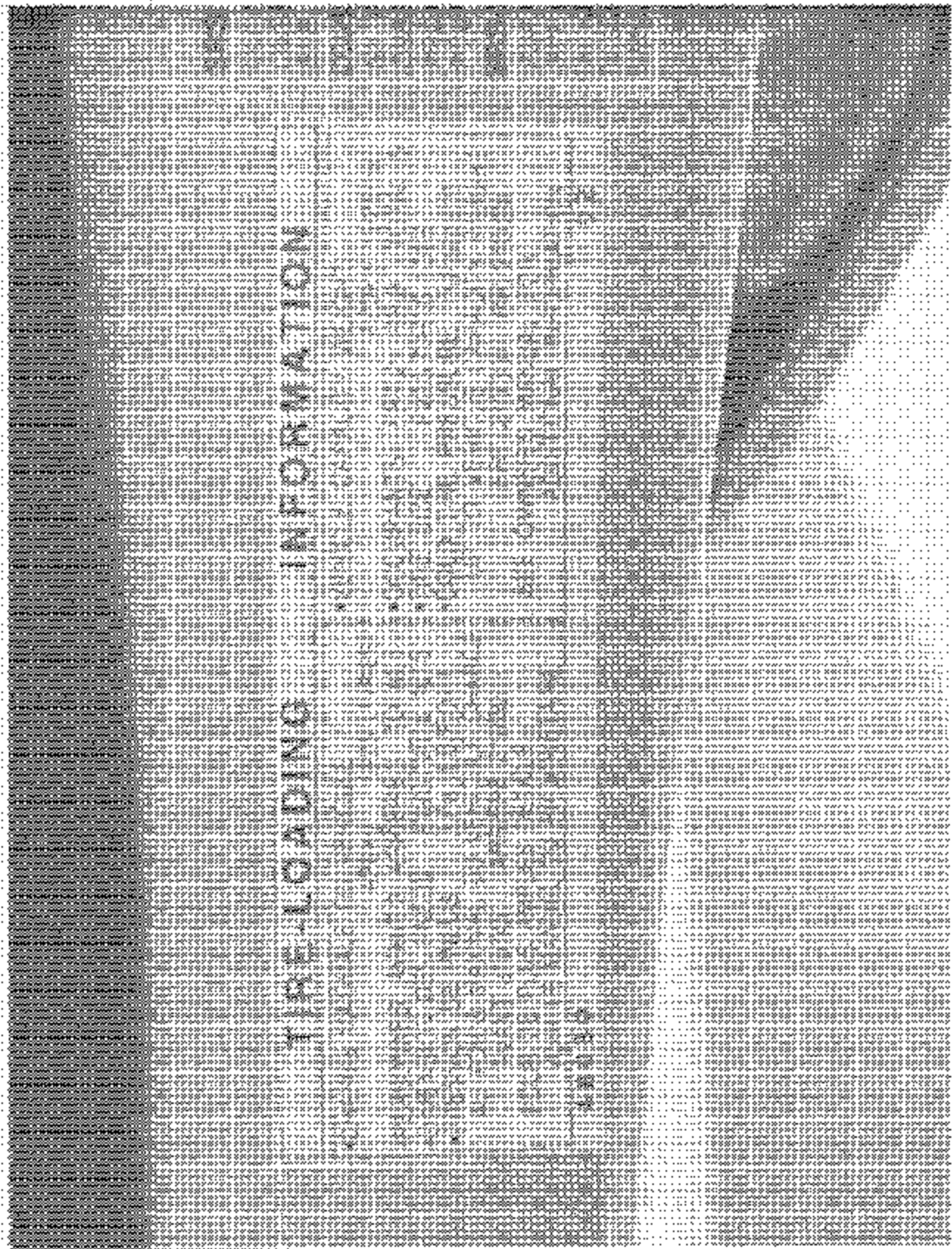


FIGURE 50
VEHICLE'S TIRE INFORMATION LABEL

2003 TOYOTA HIGHLANDER
#HTSA NY 035 (63)
#MVSS NO. 110 (INDICANT)

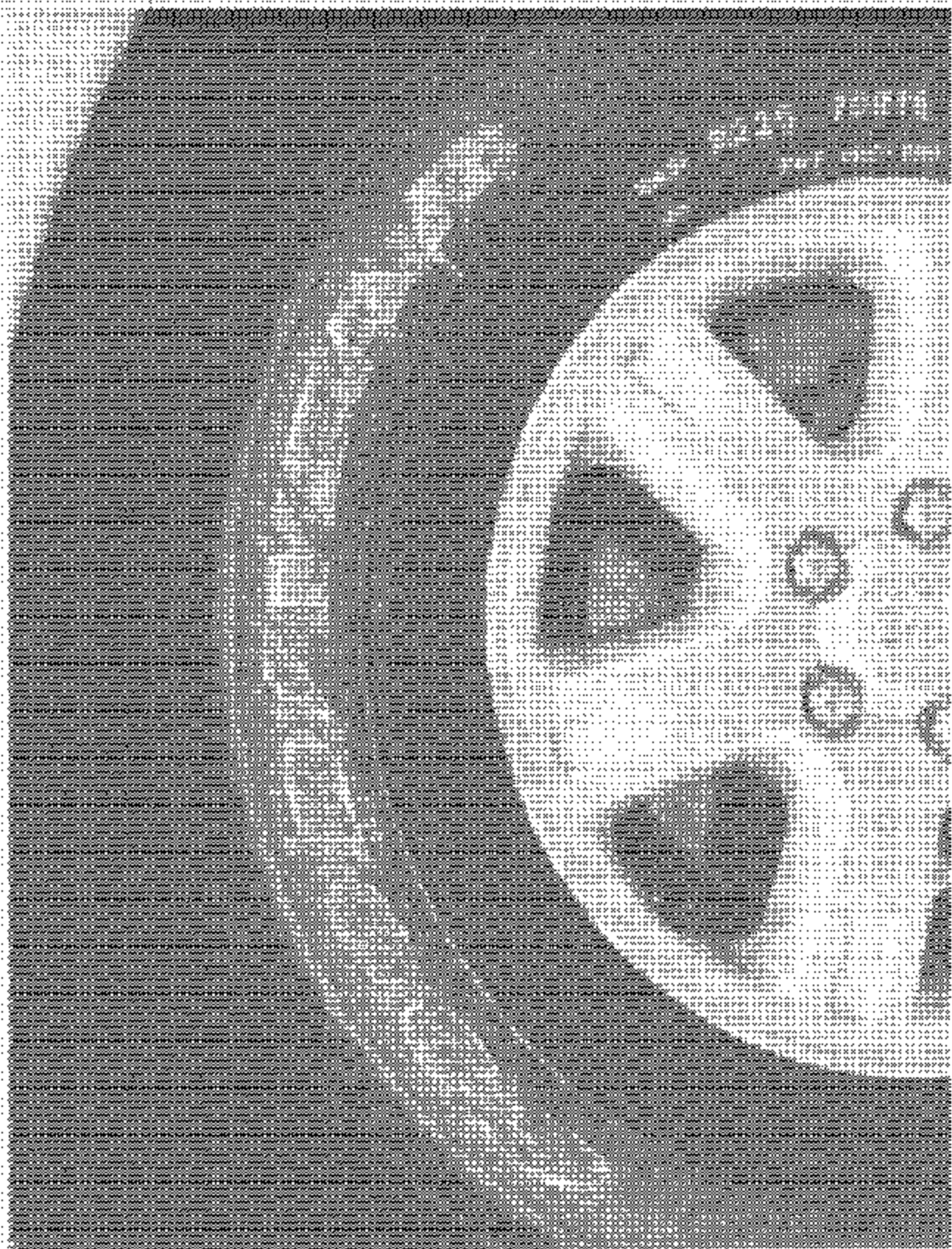


FIGURE 5A
TIRE SHOWING BRAND

2003 TOYOTA HIGHLANDER
#H15A NX7 058101
#MVSS NO. 110 (INDICANT)

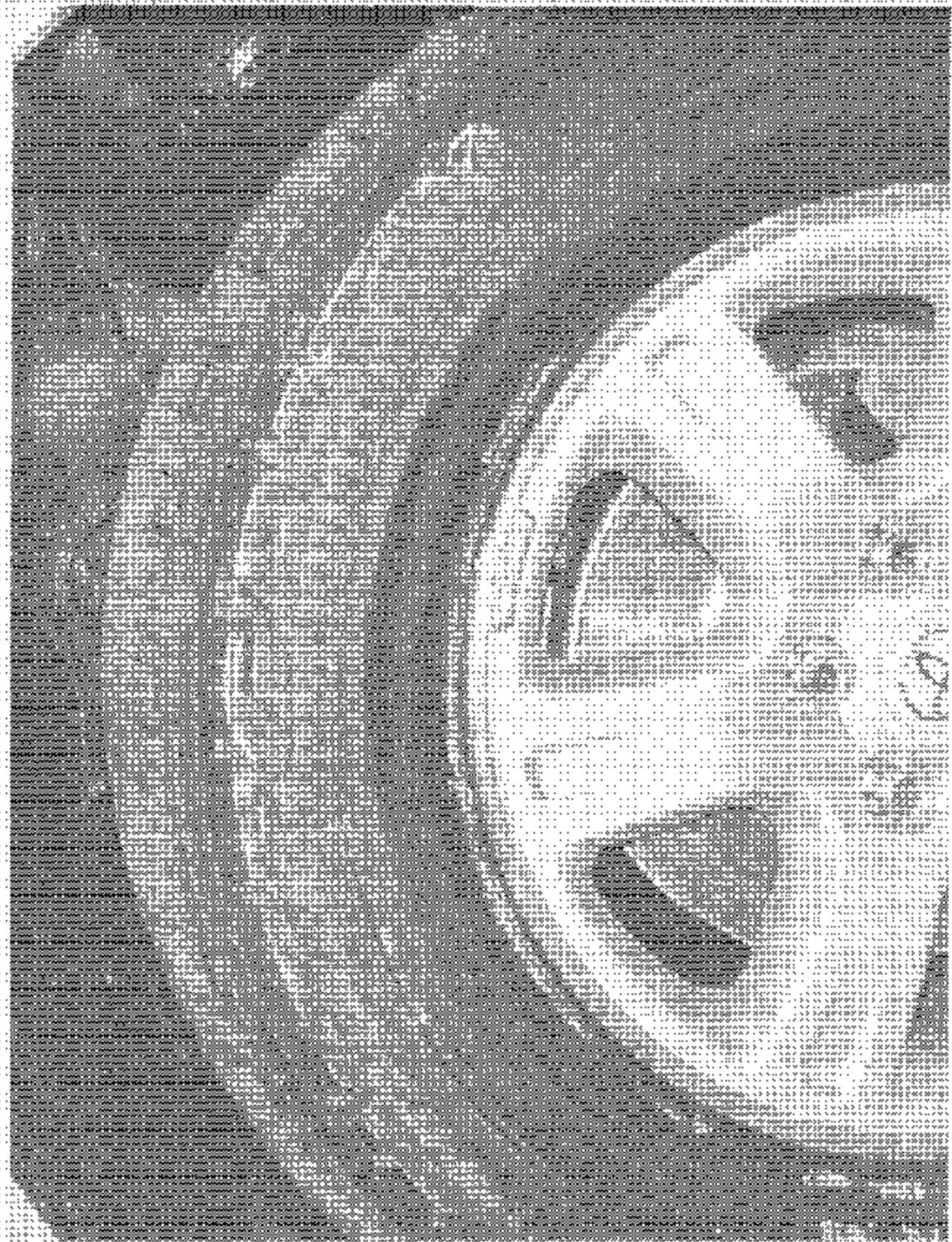
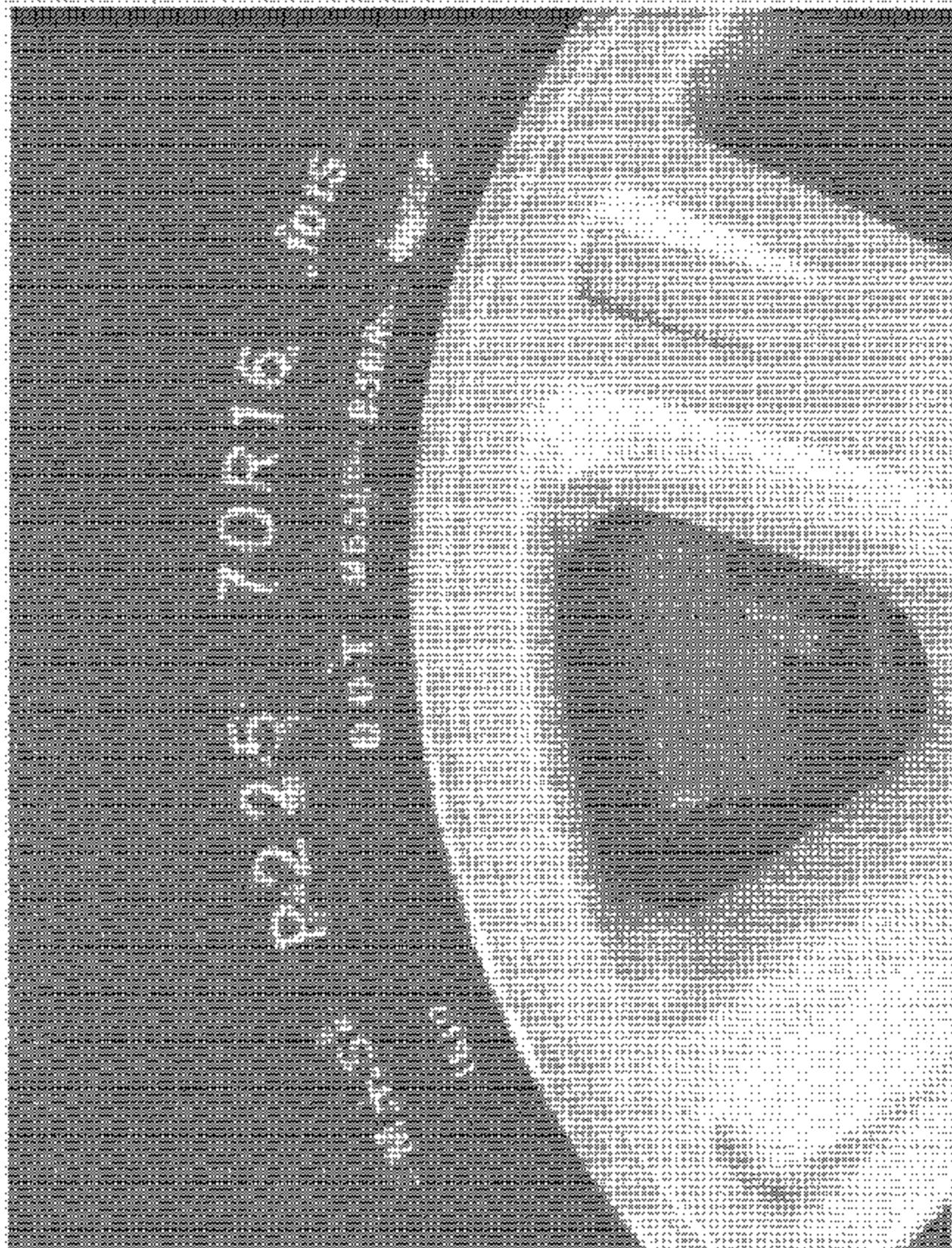


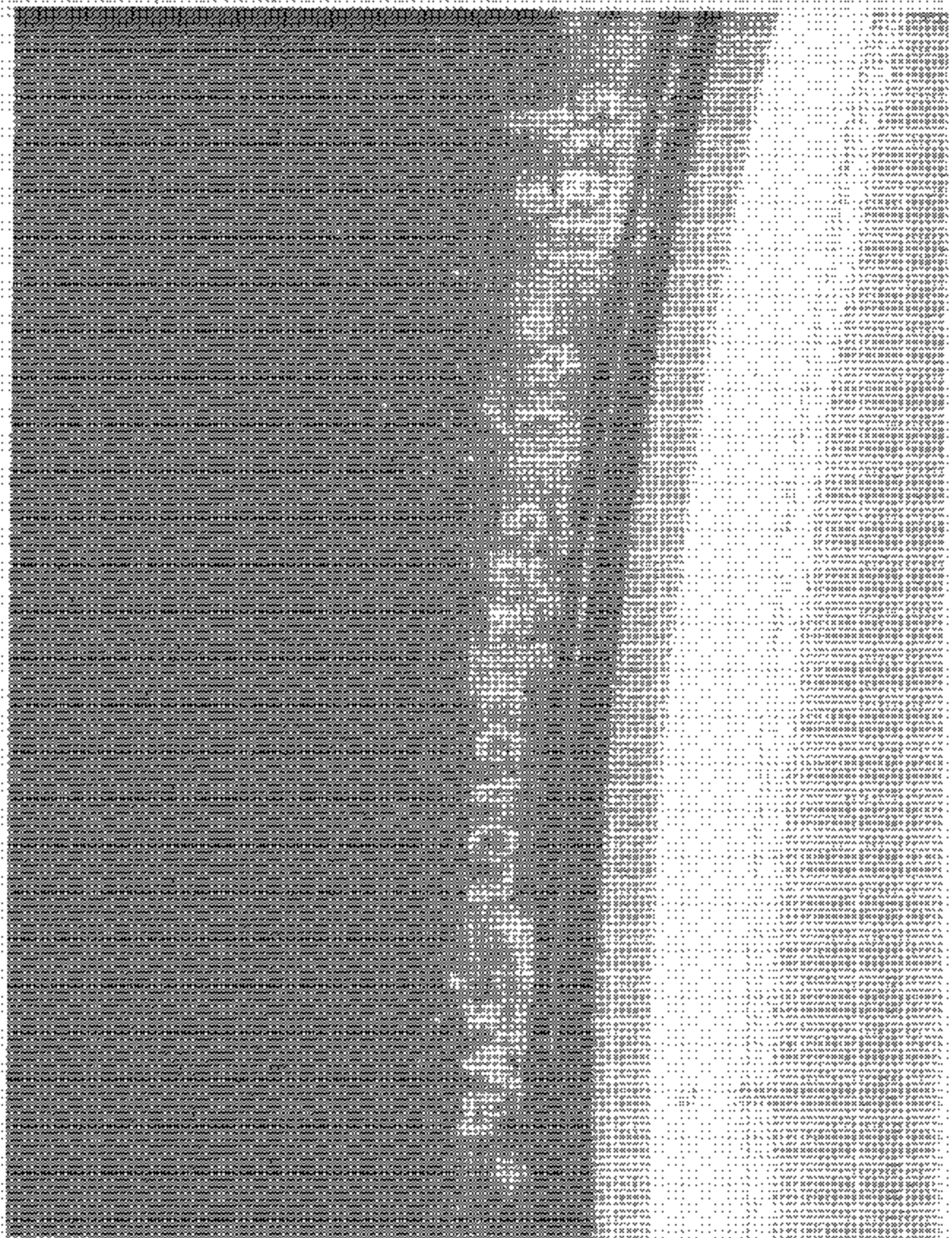
FIGURE 3-5
TIRE SHOWING SKID

2003 TOYOTA HIGHLANDER
NHTSA NO. C36103
FMVSS NO. 110 (INDICANT)



2003 TOYOTA HIGHLANDER
RHTSA NO. 026103
FMVSS NO. 110 (INDICANT)

FIGURE 5.9
TIRE SHOWING SIZE, LOAD INDEX, SPEED
SYMBOL AND SERIAL NUMBER



2003 TOYOTA HIGHLANDER
NHTSA NO. C36183
FMVSS NO. 110 (INDICANT)

FIGURE 5.7
TIRE SHOWING MAX LOAD RATING

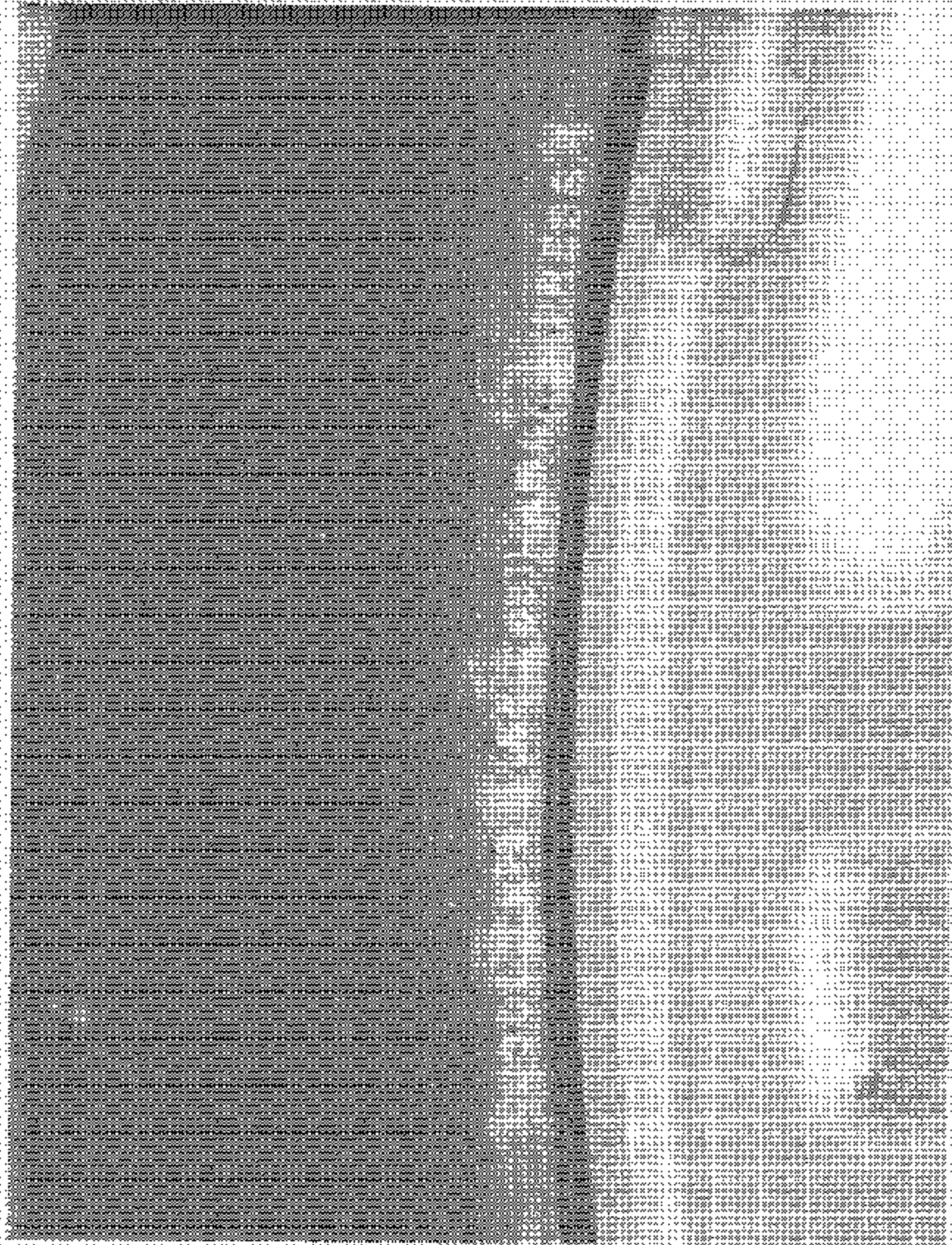


FIGURE 5.18
TIRE SHOWING MAXIMUM INFLATION PRESSURE

2003 TOYOTA HIGHLANDER
SUITS NO. C35113
EINSS NO. 110 (INDICANT)



FIGURE 5.9
VEHICLE BALLASTED TO SIMULATE NORMAL
LOAD CONDITION

2003 TOYOTA HIGHLANDER
NHTSA NO. C35103
FAY88 NO. 110 (INDICANT)

APPENDIX

Table 1 – Occupant Loading and Distribution for Vehicle Normal Load for
Various Designated Seating Capacities

Designated Seating Capacities, numbers of Occupants	Vehicle normal load, number of occupants	Occupant distribution in a normally loaded vehicle
2 through 4	2	2 in front
5 through 10	3	2 in front, 1 in second seat
11 through 15	5	2 in front, 1 in second seat, 1 in third seat, 1 in fourth seat
16 through 22	7	2 in front, 2 in second seat, 2 in third seat, 1 in fourth seat

NOTE: For the indicant test each seat was adjusted to its full down and mid forward to aft position with the seat back adjusted to a 25° reclined angle. Each designated seat position was ballasted with 54 KG (120 LBS) in the seat and 14 KG (30 LBS) on the floor directly in front of the respective seat position.