HSNO. 637340

REPORT NUMBER 104-GTL-04-005

SAFETY COMPLIANCE TESTING FOR FMVSS NO. 104 WINDSHIELD WIPING AND WASHING SYSTEMS

TOYOTA MOTOR CORPORATION
2004 TOYOTA PRIUS, PASSENGER CAR
NHTSA NO. C45107

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

SEPTEMBER 14, 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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Final Report of FMVSS 104 Compliance Testing of 2004 TOYOTA PRIUS, PASSENGER CAR NHTSA No. C45107	September 14, 2004
	6. Performing Organ. Code GTL
7. Author(s) Grant Farrand, Project Engineer Debbie Messick, Project Manager	8. Performing Organ. Rep# GTL-DOT-04-104-005
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	14. Sponsoring Agency Code NVS-220

15. Supplementary Notes

16. Abstract

Compliance tests were conducted on the subject 2004 Toyota Prius Passenger Car in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-104-08 for the determination of FMVSS 104 compliance.
Test failures identified were as follows:
NONE

17. Key Words	18. Distribution Statement
Compliance Testing Safety Engineering FMVSS 104	Copies of this report are available from NHTSA Technical Information Services (TIS) Room 2336 (NPO-405) 400 7th St., S.W. Washington, DC 20590 Telephone No. (202) 366-4947

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SECTION 1

PURPOSE OF COMPLIANCE TEST

1.0 PURPOSE OF COMPLIANCE TEST

A 2004 Toyota Prius Passenger Car was subjected to Federal Motor Vehicle Safety Standard (FMVSS) No. 104 testing to determine if the vehicle was in compliance with the requirements of the standard. All tests were conducted in accordance with NHTSA, Office of Vehicle Safety Compliance (OVSC) Laboratory Procedure, TP-104-08 dated 26 June 1996 and General Testing Laboratories, Inc. (GTL) Test Procedure, TP-104-08A dated 4 April 1997.

1.1 The test vehicle was a 2004 Toyota Prius Passenger Car. Nomenclature applicable to the test vehicle are:

A. Vehicle Identification Number: JTDKB20U040041316

B. NHTSA No.: C45107

C. Manufacturer: TOYOTA MOTOR CORPORATION

D. Manufacture Date: 01/04

1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 104 testing on August 23, 2004.

SECTION 2

COMPLIANCE TEST PROCEDURE AND SUMMARY OF RESULTS

2.0 GENERAL

The 2004 Toyota Prius 4-door passenger car, NHTSA No. C45107 was subjected to FMVSS No. 104 tests on August 23, 2004. The selected portions of FMVSS No. 104 tests used were as amplified in the following subparagraphs. The test vehicle was positioned in the test system with three water spray nozzles suspended in line with the center of the longitudinal axis of the windshield and horizontal left/right center of the windshield to provide an even distribution of spray to the entire windshield. The height of the nozzles was approximately 22 inches above the glazing surface.

2.1 WIPER FREQUENCY TEST

The wiper frequency test was performed with the engine operating and with a minimum of 50 cubic inches per minute of water from the spray nozzles. The wiper frequency was measured at the low and high wiper speed settings with the engine operating at idle RPM and 2,000 RPM.

2.2 WIPED AREA TEST

The test was conducted with the windshield wiper system operating at the high speed setting, engine at idle RPM and the spray nozzles spraying water at a minimum of 50 cubic inches per minute. The wiper blade wipe pattern was outlined on the glazing surface and then transferred to a windshield pattern. The wiped area was determined for areas A, B and C from the windshield pattern.

2.3 CAPABILITY TEST

The windshield glazing surface was coated with a mixture of water and fine grade test dust. Within 15 seconds following application of the water-dust mixture, the windshield wiper and washing system was activated in the high speed mode for ten complete cycles. The vehicle's engine was operating at idle RPM. The cleared areas of the windshield were marked on the inside windshield surface. After ten complete cycles the system was deactivated and the wiped area transferred to a windshield pattern.

The glazing surface was cleaned and dried. The water dust mixture was re-applied and the test repeated.

The windshield patterns were used subsequently to determine the cleared area percentages.

2.4 SUMMARY OF RESULTS

Based on the test performed, the test vehicle's windshield wiping and washing system appears to meet the requirements of FMVSS 104.

SECTION 3

COMPLIANCE TEST DATA

3.0 TEST RESULTS

The following data sheets document the results of testing on the 2004 Toyota Prius.

SUMMARY OF DATA
FMVSS 104, WINDSHIELD WIPING AND WASHING SYSTEMS

VEH. MOD YR/MAKE/MODEL/BODY: 2004 TOYOTA PRIUS PASSENGER CAR
VEH. NHTSA NO: C45107; VIN: JTDKB20U040[redacted]
VEH. BUILD DATE: 01/04 TEST DATE: AUGUST 23, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

WIPER TYPE: 2 SPEED ELECTRIC WITH DELAY

WASHER TYPE: HIGH PRESSURE ELECTRIC PUMP

WINDSHIELD AREAS: A = 1143.8 in^2 B = 847.2 in^2 C = 280.8 in^2

MANUFACTURER'S WINDSHIELD PATTERN USED: Yes X No

ACCESSIBILITY:

(1)	Washer Control Accessible:	Yes X	No
(2)	Wiper Control Accessible:	Yes X	No
(3)	Washer Reservoir Filler Accessible:	Yes X	No

DESCRIBE UNUSUAL FEATURES OF WIPING AND WASHING SYSTEMS: NONE

PERFORMANCE:

TEST	PASS	FAIL
WIPER FREQUENCY	X	
WIPED AREA	X	
WASHER CAPABILITY	X	

RECORDED BY: _____ DATE: 08/23/04

APPROVED BY: _____

FREQUENCY TEST DATA
FMVSS 104 – WINDSHIELD WIPER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2004 TOYOTA PRIUS PASSENGER CAR
VEH. NHTSA NO: C45107; VIN: JTDKB20U040[redacted]
VEH. BUILD DATE: 01/04 ; TEST DATE: AUGUST 23, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

Water Hardness: 7.0 grains/gallon (12 max.); Date Certified: 02/23/04

Water Spray Flow Rate: 70.7 in^3/min. (specified range = 50 to 100 in^3/min.)

Ambient Air Temp.: 72 °F (50-100°F); Water Temp.: 72 °F (100°F max.)

Manufacturer's Recommended Engine Idle Speed: 0-1000* rpm (Note: * Computer controlled gas/electric hybrid vehicle. Engine only runs when needed)

RUN 1, MAXIMUM WIPER FREQUENCY TEST:

TIME	ENGINE SPEED	TOTAL CYCLES	AVG. CYCLES/MIN. (45 MINIMUM)
1ST 3 minutes	0-1000 (Idle ± 50 rpm)	212	70.6
2nd 3 minutes	1200 -2000 (2000 rpm ± 50 rpm)	210	70.0

Frequency at least 45 cycles/minute regardless of engine speed: Yes X No ___

RUN 2, LOWER WIPER FREQUENCY TEST:

TIME	ENGINE SPEED	TOTAL CYCLES	AVG. CYCLES/MIN. (20 MINIMUM)
1ST 3 minutes	0-1000 (idle ± 50 rpm)	140	46.6
2nd 3 minutes	1200-2000 (2000 rpm ± 50 rpm)	140	46.6

Highest and lower frequency differ by at least 15 cycles/minute, and lower frequency is at least 20 cycles/minute regardless of engine speed: Yes X No ___

REMARKS:

RECORDED BY: _____ DATE: 08/23/04

APPROVED BY: _____

WIPED AREA TEST DATA
FMVSS 104 – WINDSHIELD WIPER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2004 TOYOTA PRIUS PASSENGER CAR
VEH. NHTSA NO: C45107; VIN: JTDKB20U040[redacted]
VEH. BUILD DATE: 01/04 ; TEST DATE: AUGUST 23. 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

Air Temperature in test area = 72 °F (specified range of 50 to 100°F)

Air Velocity at windshield = 1.0 mph (specified range of 0 to 1 mph)

Engine speed = 0 rpm (manufacturer's recommended idle ± 50 rpm)

Temperature of water spray = 72 °F (100° F maximum)

Water spray flow rate = 70.7 in^3/min. (specified range of 50 to 100 in^3/min.)

Windshield wiper frequency = 70.6 cycles/min. (45 cpm minimum)

TEST RESULTS:

PERCENT WIPED				
WINDSHIELD AREA	ACTUAL	REQUIRED	PASS	FAIL
A	89.5%	80%	X	
B	94.1%	94%	X	
C	100%	99%	X	

REMARKS:

RECORDED BY: [signature] DATE: 08/23/04

APPROVED BY: [signature]

CAPABILITY TEST DATA
FMVSS 104 – WINDSHIELD WASHER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2004 TOYOTA PRIUS PASSENGER CAR
VEH. NHTSA NO: C45107; VIN: JTDKB20U040[redacted]
VEH. BUILD DATE: 01/04 ; TEST DATE: AUGUST 23. 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

Air Temperature in test area = 72 °F (specified range of 70 to 80°F)

Washer reservoir fluid temperature = 72 °F (specified range of 70 to 80°F)

Air Velocity at windshield = 1.0 mph (specified range of 0 to 1 mph)

Engine speed = 0 rpm (manufacturer's recommended idle ± 50 rpm)

Number of windshield washer nozzles on the vehicle = 8

Windshield washer system activation coordinated with components of the wiper system:
Yes X No

TEST RESULTS:

CLEARED AREA PERCENTAGES						
WINDSHIELD AREA	TEST 1	TEST 2	AVG	REQ'D*	PASS	FAIL
A	92.8	92.7	92.7	75%	X	
B	94.2	94.0	94.1	75%	X	
C	100	100	100	75%	X	

*NOTE FOR REFERENCE ONLY: SAE 942b, revised Jul72, recommends capability to clear 80% of the total wash area and 90% of the wash area included in AREA C.

REMARKS:

RECORDED BY: [signature] DATE: 08/23/04

APPROVED BY: D. Mesick

SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

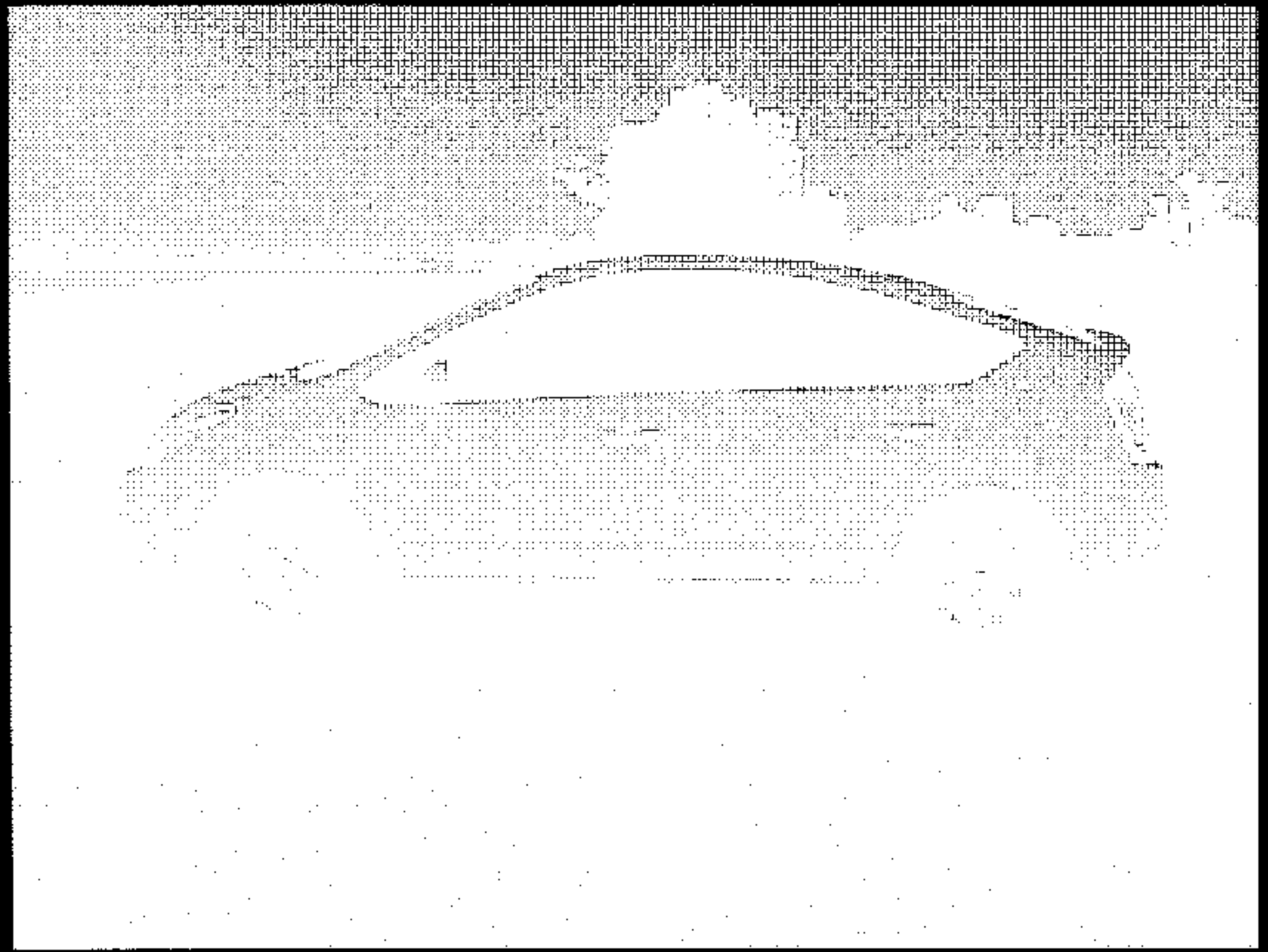
TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

EQUIPMENT	DESCRIPTION	MODEL/ SERIAL NO.	CAL. DATE	NEXT CAL. DATE
TIMER	ACCU-SPLIT	ACT2	07/04	07/05
TEMPERATURE READOUT	OMEGA	43P	03/04	03/05
TEMPERATURE RECORDER	OMEGA	CT91	03/04	03/05
SPRAY SYSTEM	GTL	N/A	BEFORE USE	BEFORE USE
ANEMOMETER	HASTINGS	RM-1, 46	05/04	05/05
CYCLE COUNTER	GTL	GTL	BEFORE USE	BEFORE USE
SOFT WATER	N/A	N/A	02/04	02/05
TACHOMETER	MONARCH	ACT-3	07/04	07/05
TEST DUST	AC	GM FINE	CALIBRATED DUST	CALIBRATED BY VENDOR*
EVENT RECORDER	COMPUTER	GEO1	BEFORE USE	BEFORE USE

*AC Inspection #503, Batch #1943, Measured with particle size roller analyzer.

SECTION 5

PHOTOGRAPHS

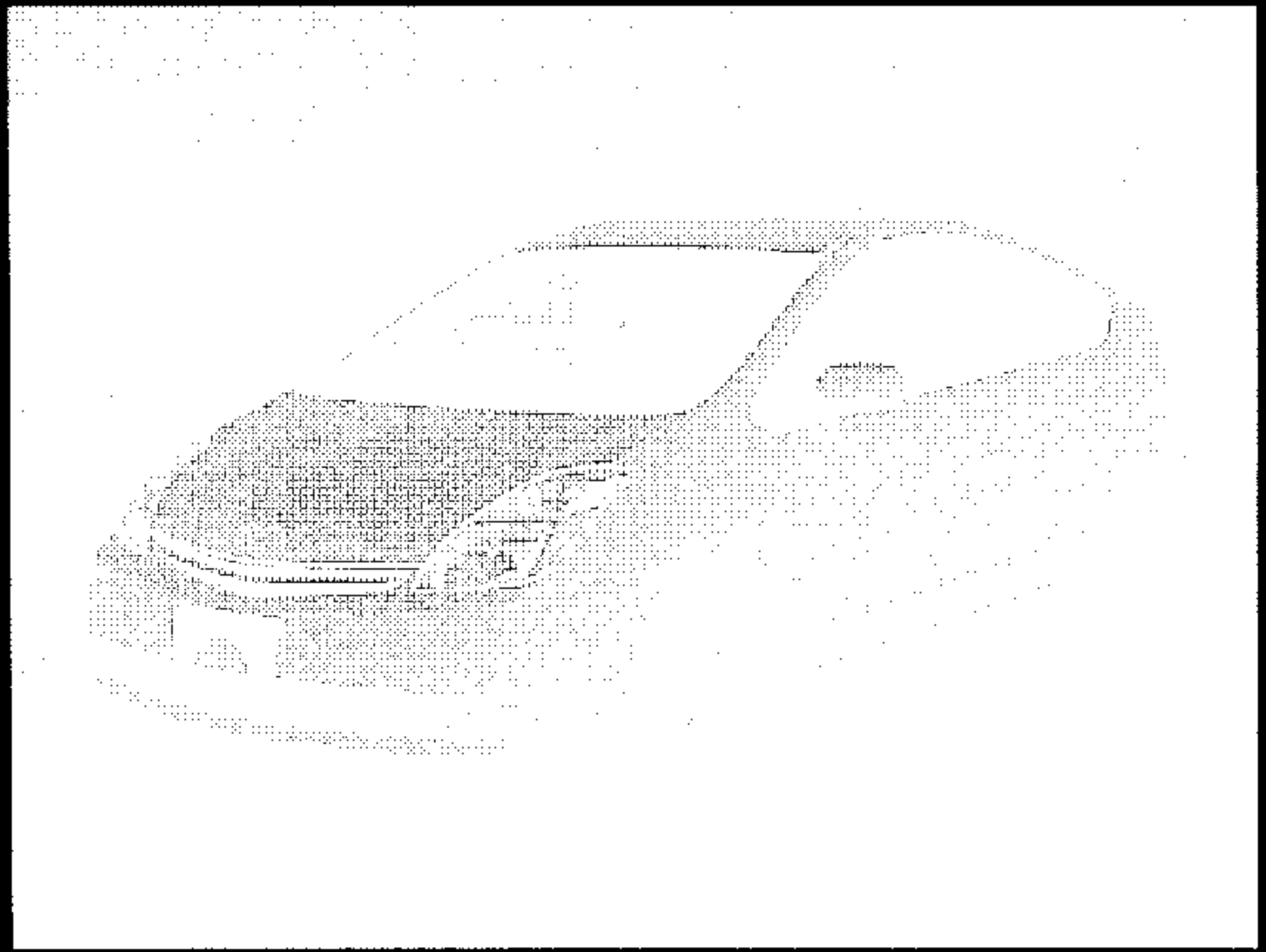


2004 TOYOTA PRIUS
NHTSA NO. C45107
FMVSS NO. 104

FIGURE 5.1
LEFT SIDE VIEW OF VEHICLE

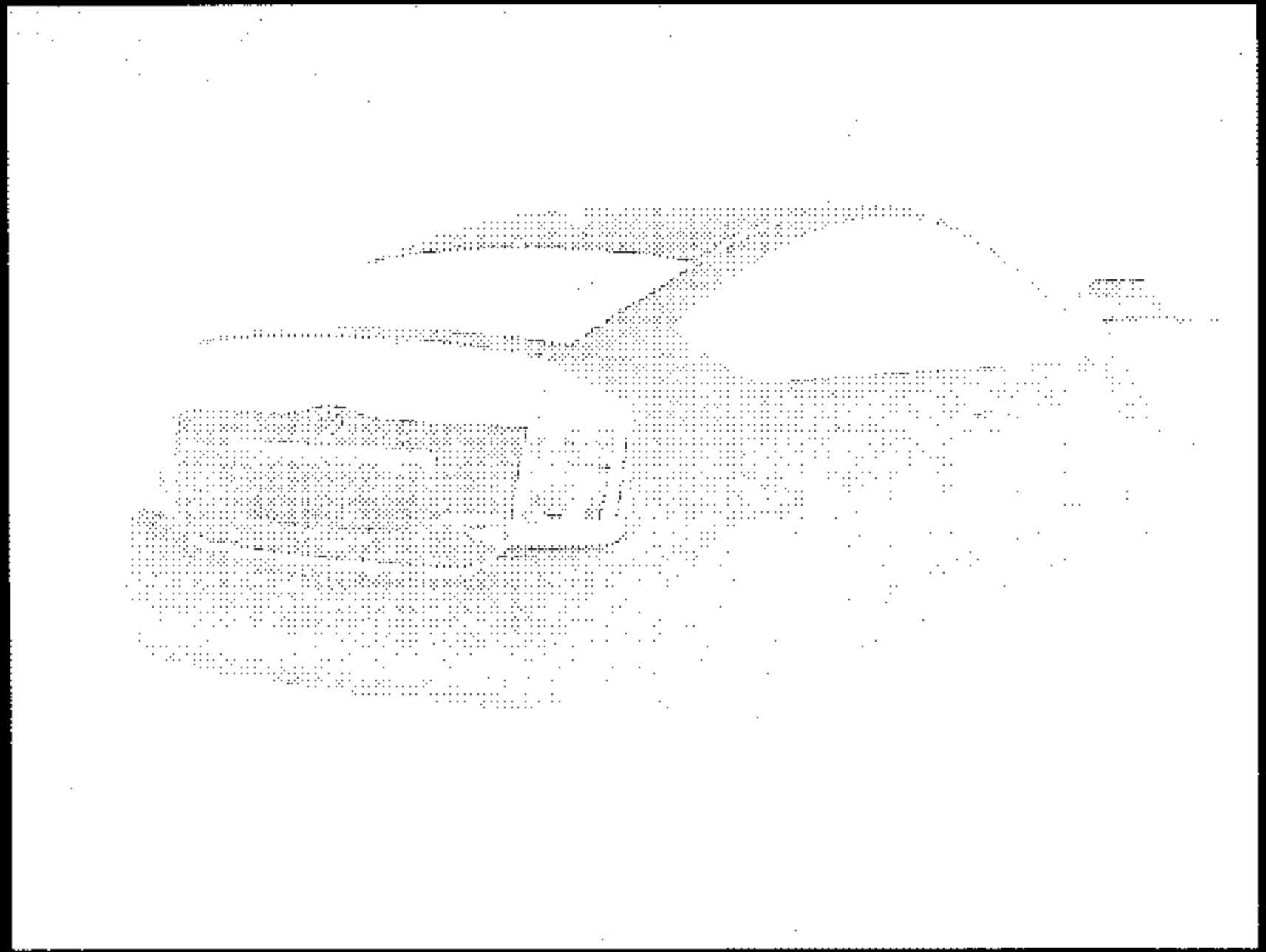
2004 TOYOTA PRIUS
NHTSA NO. C45107
FMVSS NO. 104

FIGURE 5.2
RIGHT SIDE VIEW OF VEHICLE



2004 TOYOTA PRIUS
NHTSA NO. C45107
FMVSS NO. 104

FIGURE 5.3
¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE



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FMVSS NO. 104

FIGURE 5.4
¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE

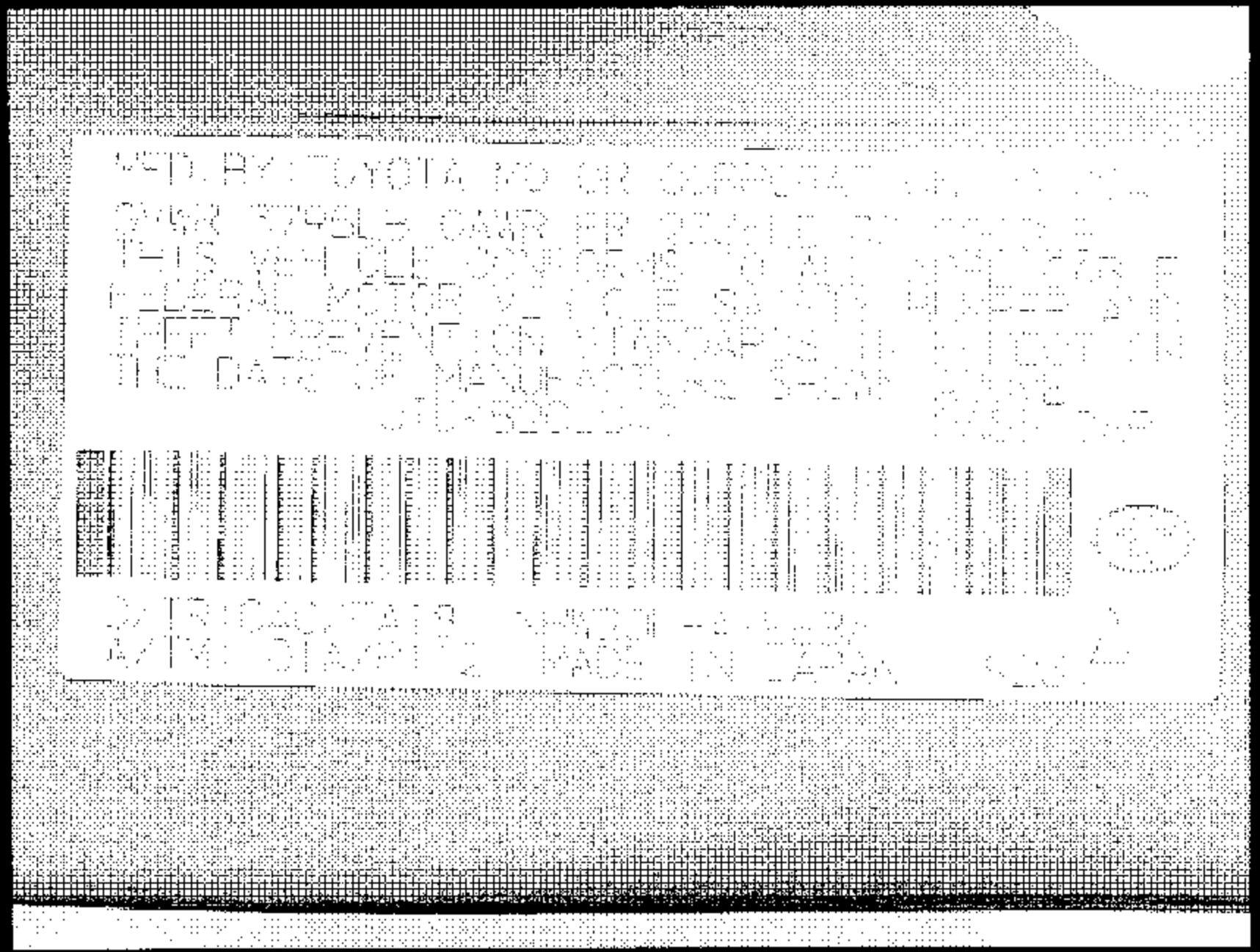

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FIGURE 5.5
VEHICLE CERTIFICATION LABEL

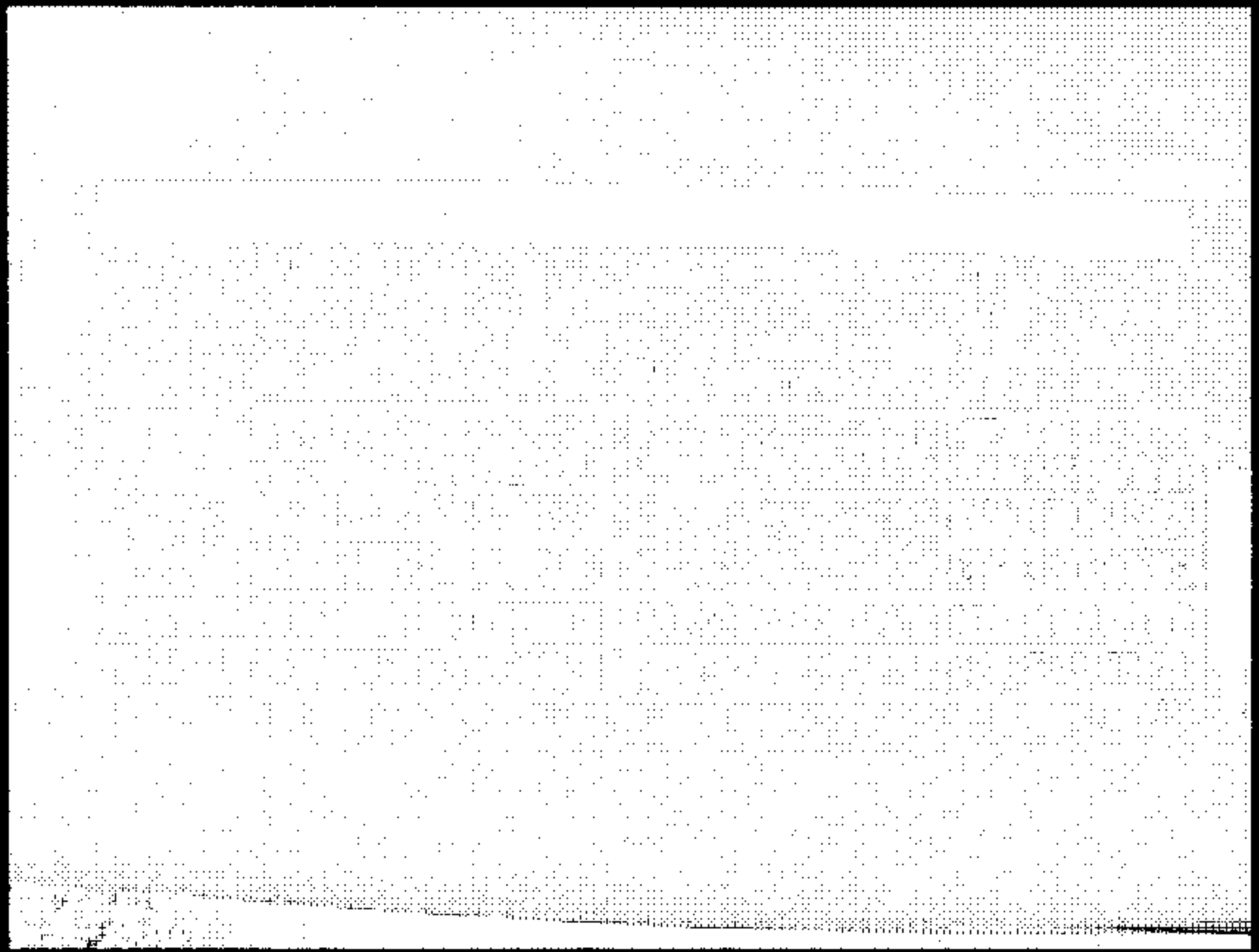

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FIGURE 5.6
VEHICLE TIRE INFORMATION LABEL

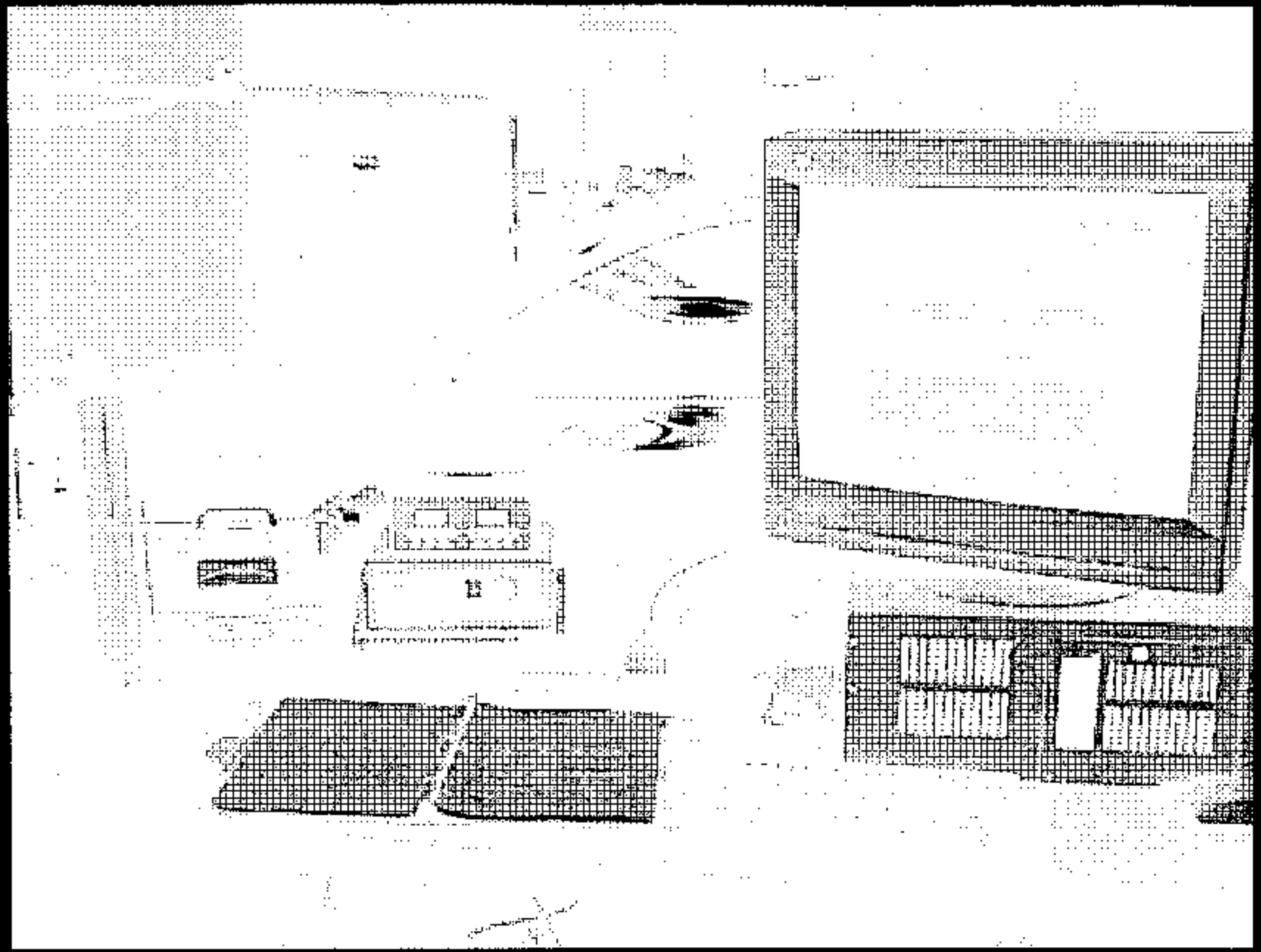

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FIGURE 5.7
INSTRUMENTATION SET-UP

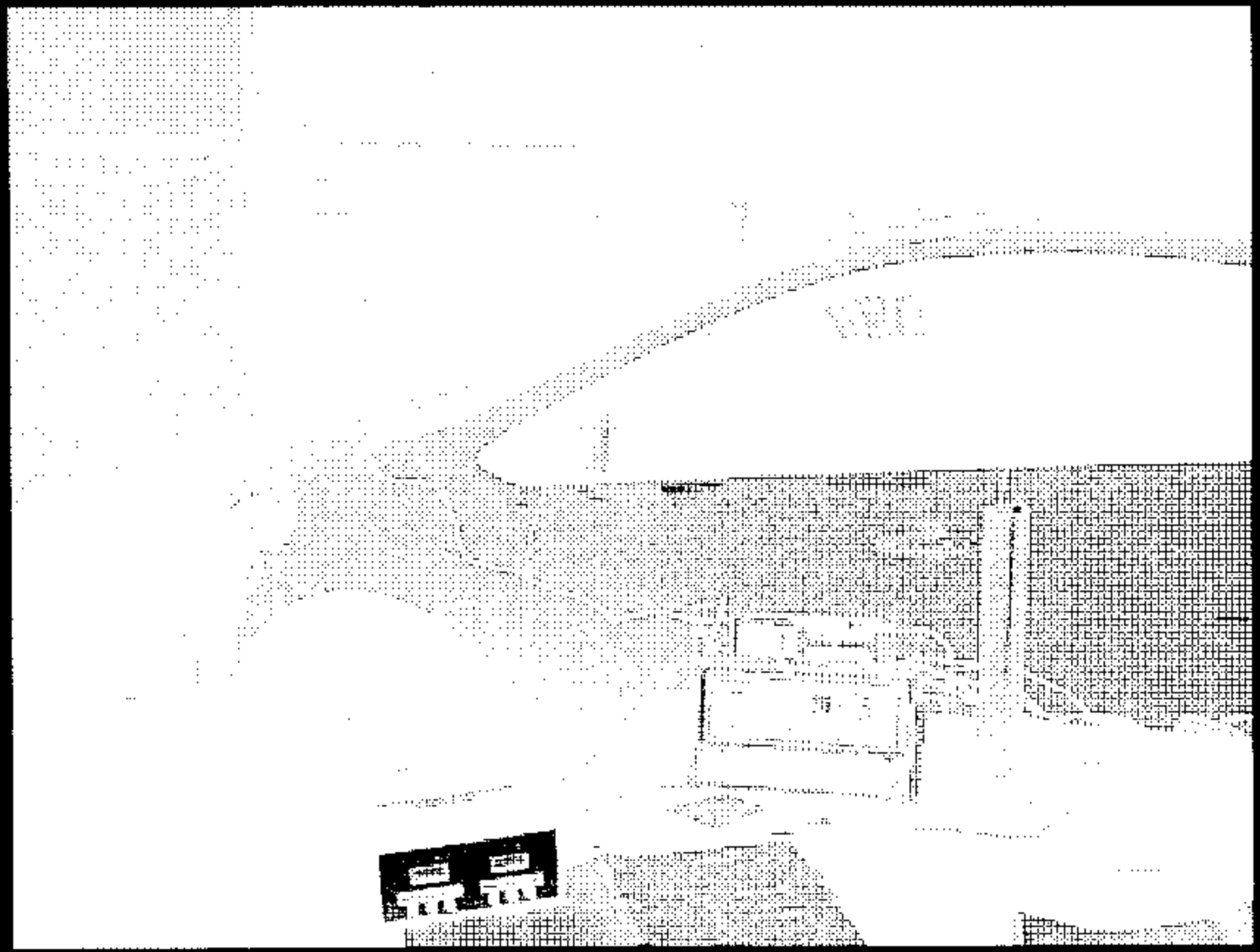

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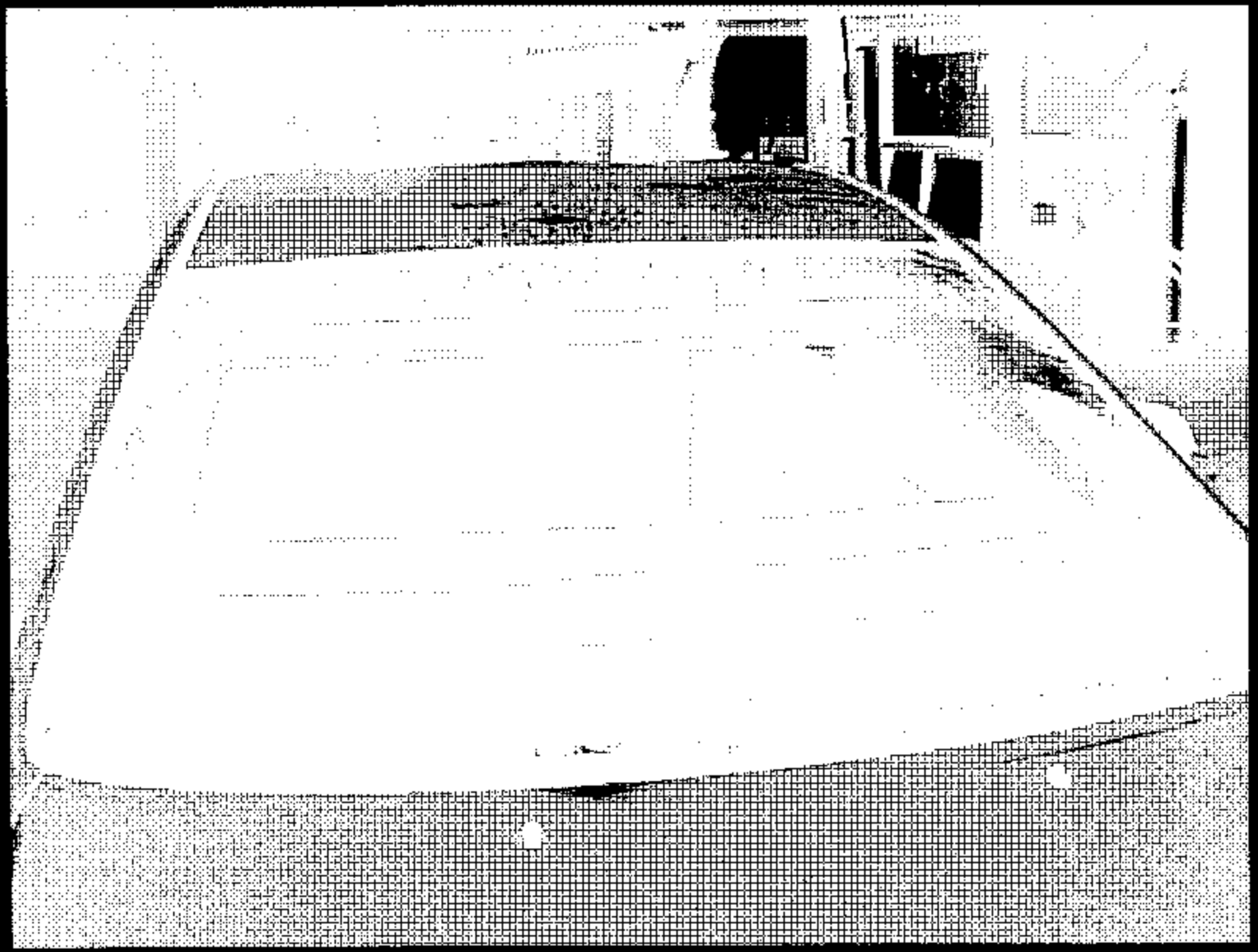
FIGURE 5.8
EQUIPMENT SET-UP



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NHTSA NO. C45107
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FIGURE 5.9
WIPED AREA TEST

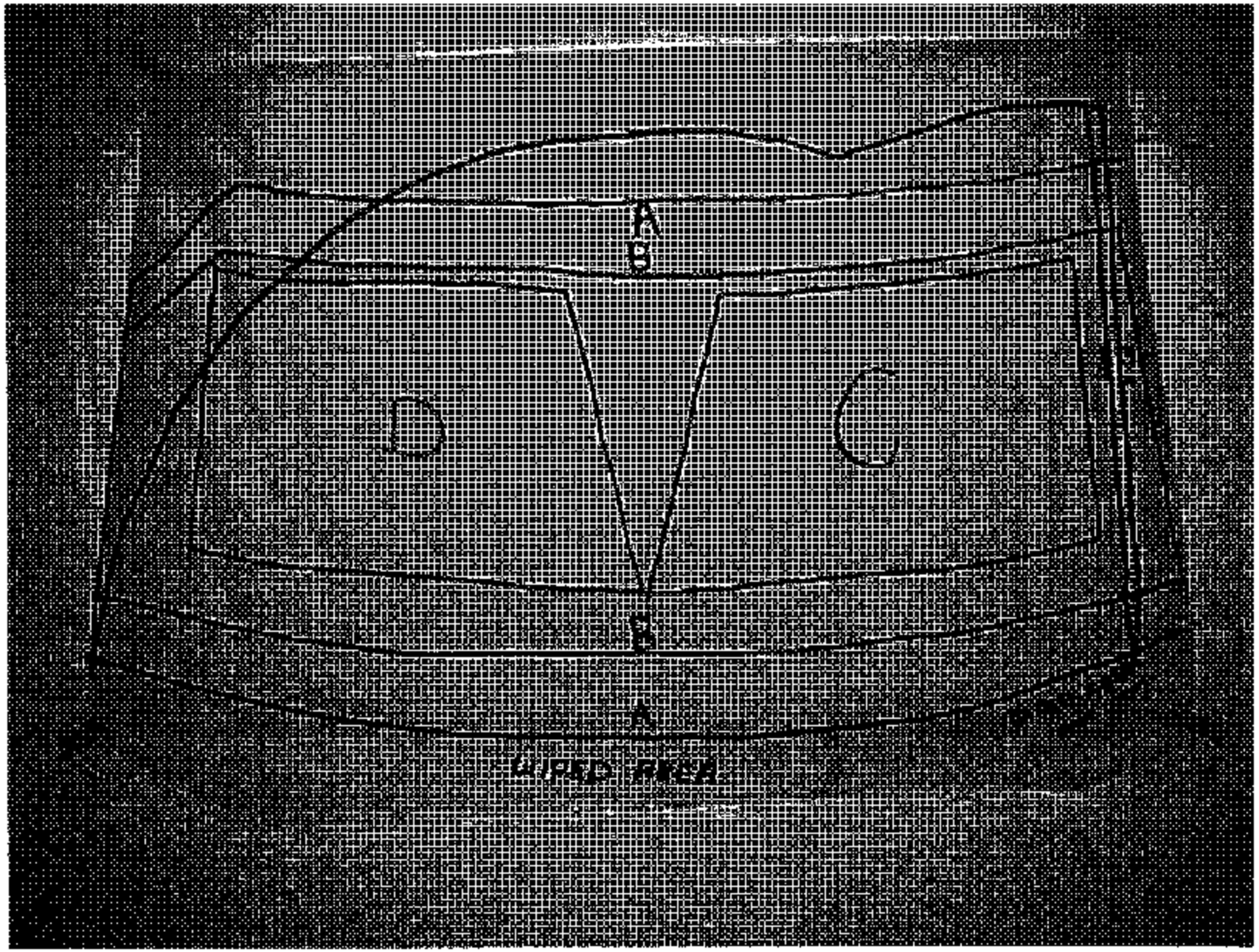

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FIGURE 5.10
WIPED AREA TEST PATTERN

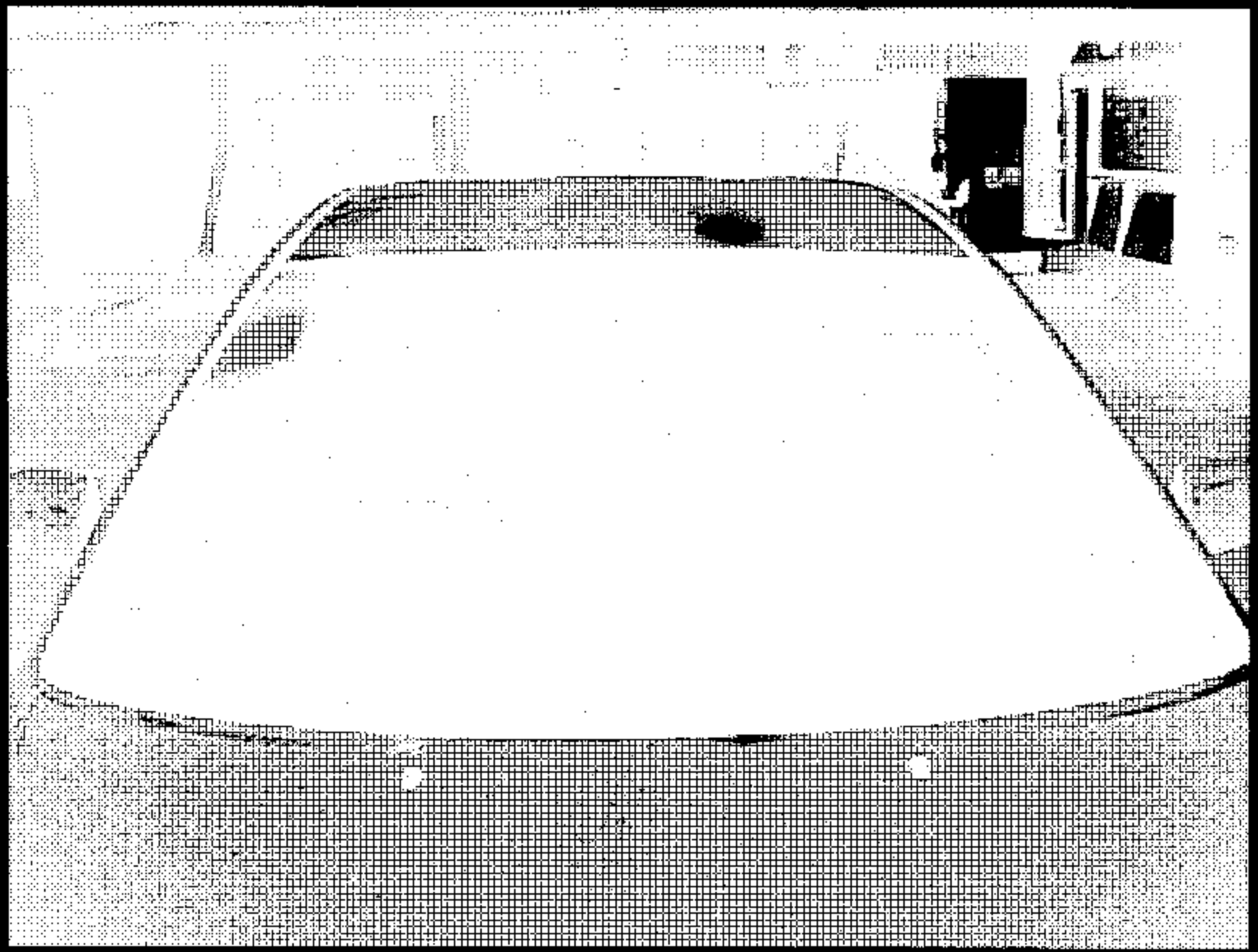

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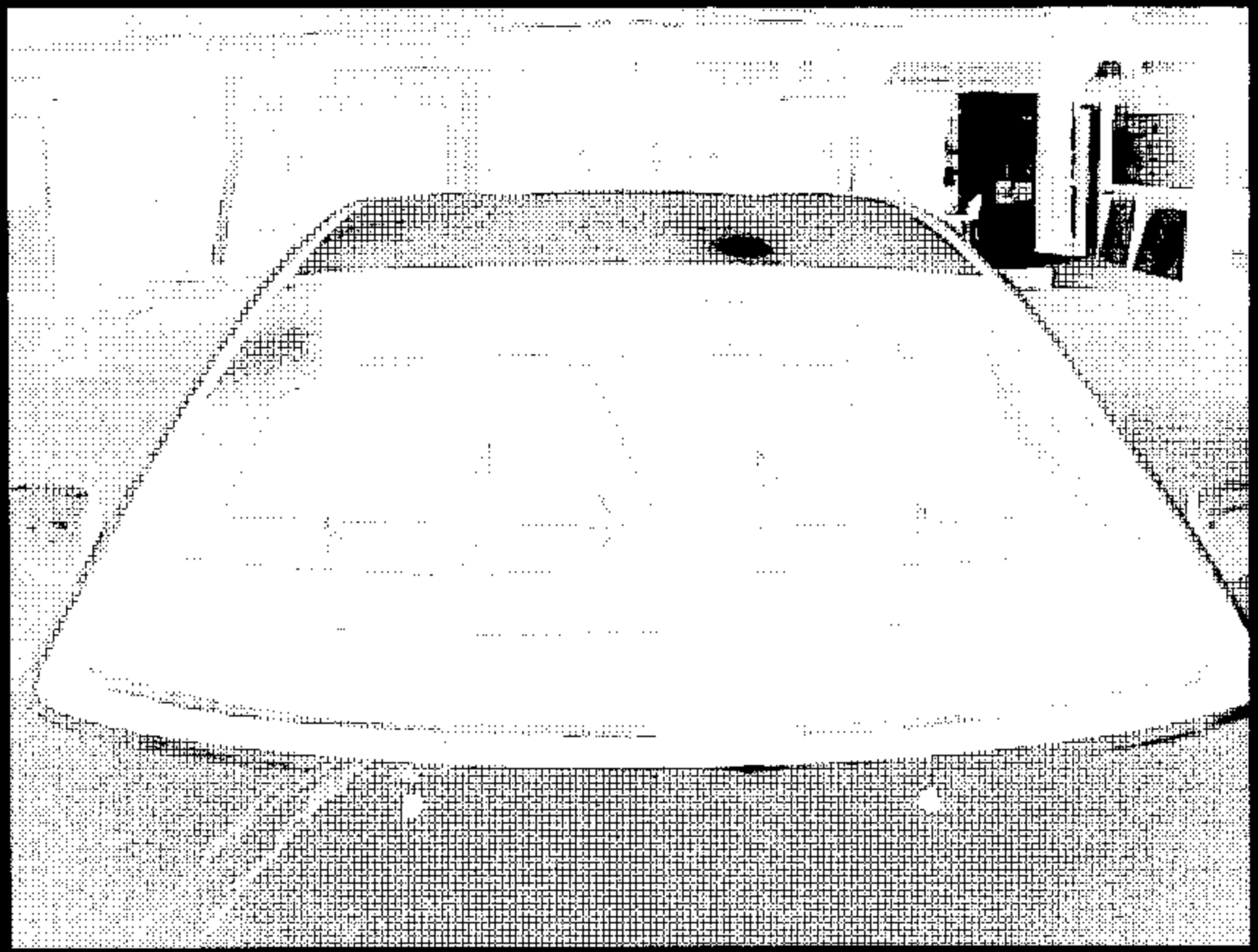
FIGURE 5.11
CAPABILITY TEST #1 PRE-COATED
WINDSHIELD



2004 TOYOTA PRIUS
NHTSA NO. C45107
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FIGURE 5.12
CAPABILITY TEST #1 IN PROGRESS

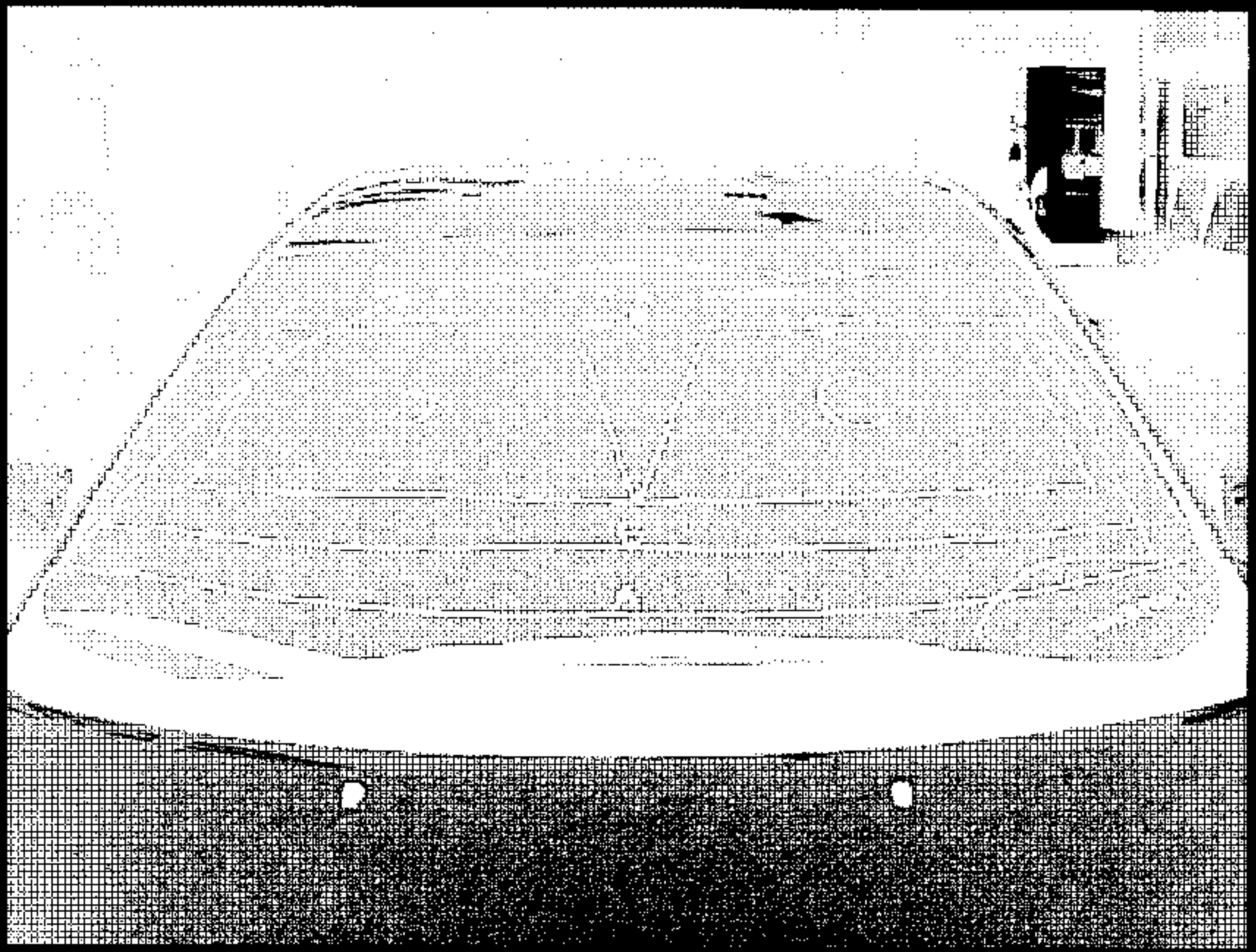

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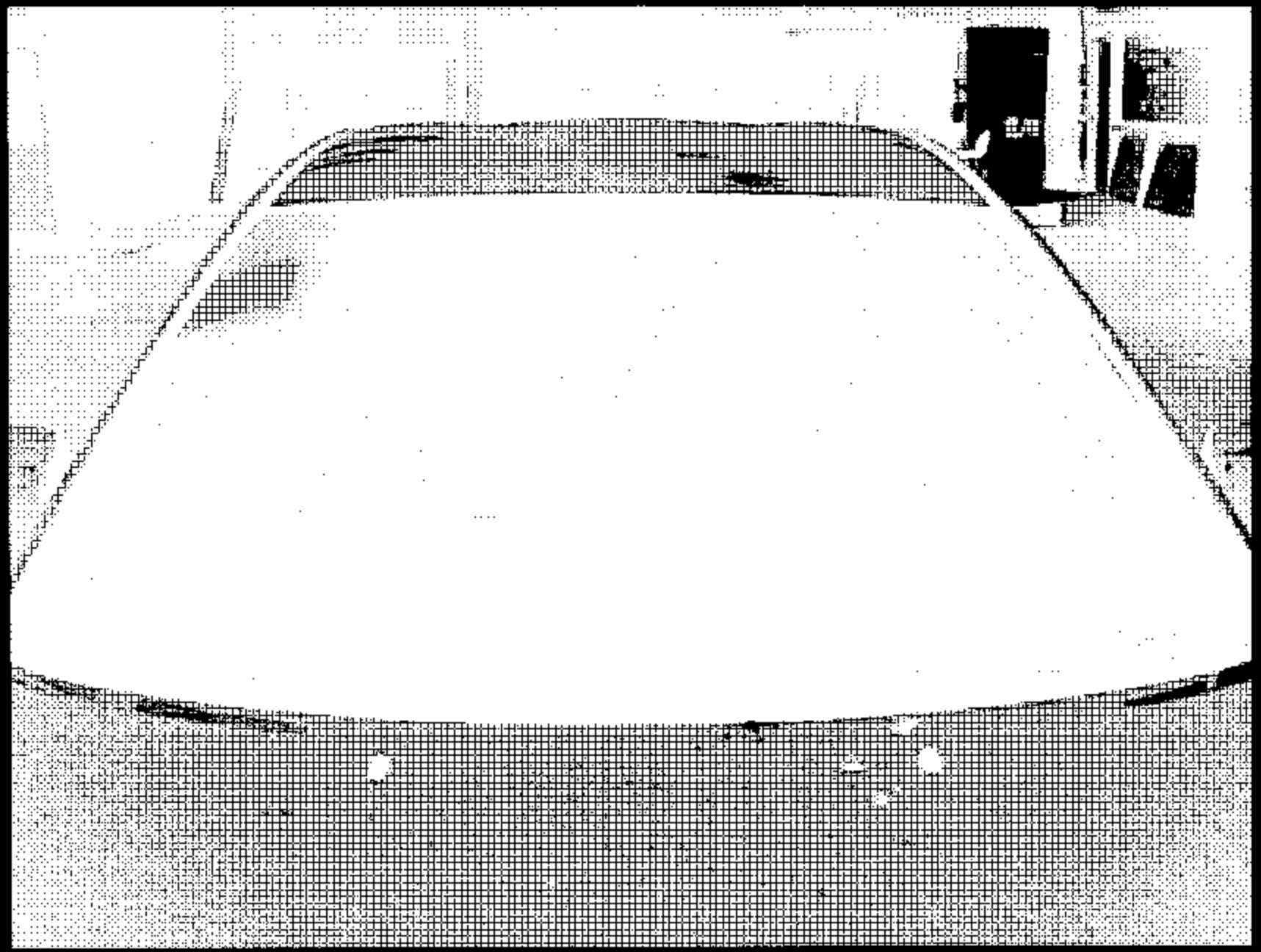
FIGURE 5.13
CAPABILITY TEST #1 PATTERN



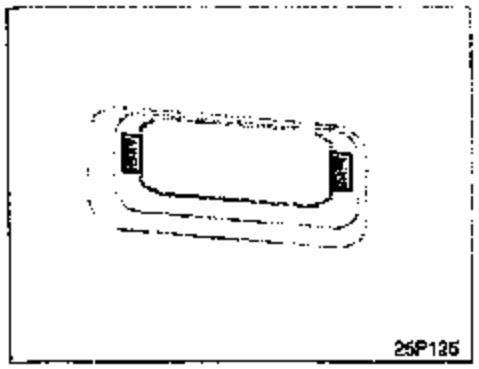
2004 TOYOTA PRIUS
NHTSA NO. C45107
FMVSS NO. 104

FIGURE 5.14
CAPABILITY TEST #2 PRE-COATED
WINDSHIELD

SECTION 6

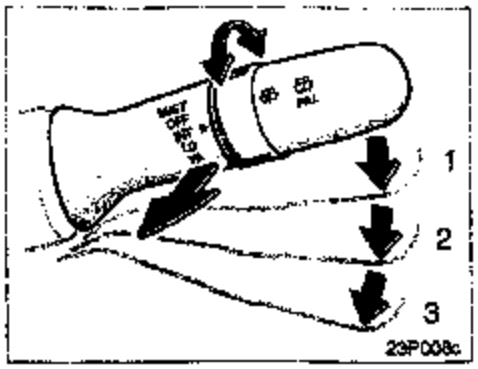
OWNER'S MANUAL INFORMATION

Key slot light



For easy access to the key slot, the key slot light comes on while the interior light is on.

Windshield wipers and washer



To turn on the windshield wipers, move the lever to the desired setting.

The hybrid system must be in the "IG-ON" mode.

Lever position	Speed setting
Position 1	Intermittent
Position 2	Slow
Position 3	Fast

For a single sweep of the windshield, push the lever up and release it.

Twist the interval adjuster upward to increase the wiping time interval between sweeps, and downward to decrease it.

The wiper lever must be in the "INT" position.

To squirt washer fluid, pull the lever toward you and release it.

If the windshield wipers are off, they will operate a couple of times after the washer squirts.

For instructions on adding washer fluid, see "Adding washer fluid" on page 902.

In freezing weather, warm the windshield with the defroster before using the washer. This will help prevent the washer fluid from freezing on your windshield, which can block your vision.

NOTICE
Do not operate the wipers if the windshield is dry. It may scratch the glass.