HSNO. 637422

REPORT NUMBER 103-GTL-04-004

SAFETY COMPLIANCE TESTING FOR FMVSS NO. 103 WINDSHIELD DEFROSTING AND DEFOGGING 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
400 SEVENTH STREET, SW
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Prepared By: Debra Musick

Approved By: [signature]

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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. 103 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-103-13 dated 26 June 1996 and General Testing Laboratories, Inc. (GTL) Test Procedure, "Windshield Defrosting and Defogging Systems – Passenger Vehicles, Multipurpose Vehicles, Trucks and Buses".

1.1 TEST VEHICLE

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. 103 testing on August 13, 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. 103 tests on August 13, 2004. Photographs of the test vehicle are shown in Figures 5.1 through 5.4. The manufacturer's certification and tire information labels are shown in Figures 5.5 and 5.6. The test instrumentation and instrument panel setups are depicted in Figures 5.7 and 5.8. Figures 5.9 through 5.18 depict the windshield pre and post test defrost conditions.

2.1 TEST PROCEDURE

Prior to test the test vehicle was inspected for completeness, systems operability, and appropriate fuel and liquid levels, i.e., oil and coolant to include antifreeze protection. The vehicle was then photographically documented as required by the DOT/NHTSA test procedure. The windshield patterns for areas A, B and C had been furnished prior to testing and these areas were outlined on the windshield with a marker. The vehicle was then installed in the cold chamber and pre-conditioned for a 14-hour minimum, 0° ±5° F temperature soak for the first test run. After the pre-condition, the hood was raised to assure engine coolant and lubricant were stabilized within the test temperature range for a minimum of 2 hours.

At the end of the 2-hour minimum stabilization period, the entire windshield was sprayed evenly with 0.010 ounces of water per square inch of glass area. Refer to Section 3, Compliance Test Data, for test specifics such as total amount of water sprayed, spray gun identification, and air pressure regulation. The vehicle soak continued for an additional 30 minutes minimum but no more than 40 minutes after the windshield was sprayed.

At the conclusion of the additional soak time the vehicle's engine was started and operated at a target speed of 1500-1600 rpm or at the manufacturer's specification if different as noted on data sheets. The defroster blower was turned on to the high speed setting with the heater selector in the de-ice (defrost) position, and the temperature control in the maximum temperature position. All doors and windows were closed. The heater air intake was fully open and the vehicle's hood closed. At no time during the test were the windshield wipers used.

SECTION 2 continued

At start of testing and during test, at each 5-minute interval after engine start, cold chamber, engine coolant, heater coolant in and defroster air left/defroster air right temperatures were recorded. Likewise at each 5-minute interval the boundary of the defrosted area was marked on the inside surface of the windshield. The test was run for a maximum of 40 minutes from engine start, or until such time as 100 percent windshield clearance was achieved. Photographs were made of the windshield at the pre-test frosted state and 20-minute and 25-minute intervals. Post test actions included placing a vellum pattern on the windshield and tracing the windshield's 5-minute interval defrosted area boundary lines onto the vellum pattern.

After the traces were obtained, the windshield was again thoroughly cleaned and the vehicle engine coolant and lubricant stabilization period at 0° ±5° F temperature commenced for the second test which entailed a repeat of the procedure discussed. The windshield patterns for both tests were used subsequently to determine the cleared area percentages.

2.2 SUMMARY OF RESULTS

Based on the test performed, the test vehicle appears to be in compliance with the requirements of FMVSS 103.

SECTION 3

COMPLIANCE TEST DATA

3.0 TEST RESULTS

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

SUMMARY DATA SHEET
FMVSS 103, WINDSHIELD DEFROSTING AND DEFOGGING SYSTEMS

VEH. MOD YR/MAKE/MODEL/BODY: 2004 TOYOTA PRIUS PASSENGER CAR
VEH. NHTSA NO: C45107; VIN: JTDKB20U040041316
VEH. BUILD DATE: 01/04 TEST DATE: AUGUST 13, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

WINDSHIELD AREA: 1626 in^2 AREA C = 280.8 in^2 AREA D = 280.8 in^2 AREA A = 1143.8 in^2

MANUFACTURER'S WINDSHIELD PATTERN USED: Yes X No

ENGINE THERMOSTAT NOMINAL REGULATING TEMPERATURE: 180 °F

HEATER-DEFROSTER SYSTEM INCLUDES AIR CONDITIONER: YES X NO

DESCRIBE UNUSUAL FEATURES OF DEFROSTING SYSTEM: NONE

DESCRIBE UNUSUAL FEATURES OF TEST CAR: GAS/ELECTRIC HYBRID

DESIGNATION	AREA PERCENT DEFROSTED					
	TEST 1	TEST 2	AVG	REQ'D	PASS	FAIL
CRITICAL AREA C AT 20 MINUTES	85.3%	92.5%	88.9%	80% MINIMUM	PASS	
PASSENGER AREA D AT 25 MINUTES	100%	100%	100%	80% MINIMUM	PASS	
TOTAL AREA A AT 40 MINUTES	100%	100%	100%	95% MINIMUM	PASS	

REMARKS:

RECORDED BY: [signature] DATE: 08/19/04

APPROVED BY: [signature]

FMVSS 103 TEST DATA RECORD – TEST RUN NO. 1

VEH. MOD YR/MAKE/MODEL/BODY: 2004 TOYOTA PRIUS PASSENGER CAR
VEH. NHTSA NO: C45107; VIN: JTDKB20U040041316
VEH. BUILD DATE: 01/04 ; TEST DATE: AUGUST 13, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

If 1st Test Run, chamber conditioned 14 hours @ 0° ±5° F (14 hrs. min.)

Cold Soak Period: 14 HOURS

Time engine coolant and lubricant remained stabilized at 0° F: 12 hrs. 0 minutes

Water Spray Gun and Nozzle Type: BINKS #66

Spray Gun Pressure: 50 psi (50 psi ± 3 psi)

Water used: 16.3 fluid oz. (0.010 ounces per square inch of windshield area)

Soak Period Between Ice Application and Test Start: 39 minutes (30 to 40 minutes)

Engine Speed: Engine speed was 2500 rpm for first 5 minutes, then it dropped to between 1300 and 1600 rpm for the remainder of the test. The engine computer overrides accelerator depending on vehicle battery state of charge. (Target engine speed 1500 to 1600 rpm)

Wind at specified location in front of windshield: 1.1 mph (0 to 2 mph)

Number of Vehicle Occupants: 2 (2 maximum)

Describe window openings, if any: NONE

TIME FROM START (minutes)	MOTOR VOLTAGE (volts)	TEMPERATURE, °F					DEFROSTED AREA, %		
		TEST ROOM	ENGINE WATER	HEATER WATER IN	DEFROSTER AIR DRVR	DEFROSTER AIR PSGR	A	C	D
0	13.5	-5.0	-5.0	-4.4	-1.7	-2.0	0%	0%	0%
5	13.9	-4.0	9.1	58.7	68.8	74.6	0%	0%	0%
10	13.9	-3.6	57.0	67.8	80.6	87.0	18.1%	5.2%	1.0%
15	13.9	-2.7	100.4	86.4	104.1	112.2	47.1%	40.0%	47.8%
20	13.9	-1.6	122.7	96.8	115.3	124.0	77.2%	86.3	88.9
25	13.9	0.0	138.8	106.1	123.1	131.6	93.3%	100%	100%
30	13.9	1.7	135.5	104.7	121.3	129.8	100%	100%	100%
35	13.9	2.7	140.6	115.5	135.8	145.2	100%	100%	100%

REMARKS: Due to inaccessibility of heater hose connections, the thermocouple was placed on the outside of the heater hose.

RECORDED BY: [signature] DATE: 08/13/04
APPROVED BY: [signature]

FMVSS 103 TEST DATA RECORD – TEST RUN NO. 2

VEH. MOD YR/MAKE/MODEL/BODY: 2004 TOYOTA PRIUS PASSENGER CAR
VEH. NHTSA NO: C45107; VIN: JTDKB20U040041316
VEH. BUILD DATE: 01/04 ; TEST DATE: AUGUST 13, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

If 1st Test Run, chamber conditioned N/A hours @ 0° ±5° F (14 hrs. min.)

Cold Soak Period: 7 HOURS

Time engine coolant and lubricant remained stabilized at 0° F: 2 hrs. 10 minutes

Water Spray Gun and Nozzle Type: BINKS #66

Spray Gun Pressure: 50 psi (50 psi ± 3 psi)

Water used: 16.3 fluid oz. (0.010 ounces per square inch of windshield area)

Soak Period Between Ice Application and Test Start: 38 minutes (30 to 40 minutes)

Engine Speed: Engine speed was 2500 rpm for first 5 minutes, then it dropped to between 1300 and 1800 rpm for the remainder of the test. The engine computer overrides accelerator depending on vehicle battery state of charge. (Target engine speed 1500 to 1600 rpm)

Wind at specified location in front of windshield: 1.0 mph (0 to 2 mph)

Number of Vehicle Occupants: 2 (2 maximum)

Describe window openings, if any: NONE

TIME FROM START (minutes)	MOTOR VOLTAGE (volts)	TEMPERATURE, °F					DEFROSTED AREA, %		
		TEST ROOM	ENGINE WATER	HEATER WATER IN	DEFROSTER AIR DRVR	DEFROSTER AIR PSGR	A	C	D
0	13.5	-5.0	-5.0	-4.5	-2.5	-3.2	0%	0%	0%
5	13.9	-4.9	-4.0	58.0	70.9	79.8	0%	0%	0%
10	13.9	-4.2	20.55	79.6	94.8	102.8	28.9%	15.5%	15.1%
15	13.9	-2.5	64.5	89.1	105.9	113.6	60.3%	55.2%	67.3%
20	13.9	-1.3	87.4	96.7	115.9	124.3	90.7%	92.5%	99.8%
25	13.9	0.2	98.6	99.6	116.5	124.6	96.6%	100%	100%
30	13.9	1.8	106.8	101.2	118.9	126.4	100%	100%	100%

REMARKS: Due to inaccessibility of heater hose connections, the thermocouple was placed on the outside of the heater hose.

RECORDED BY: _____ DATE: 08/19/04
APPROVED BY: _____

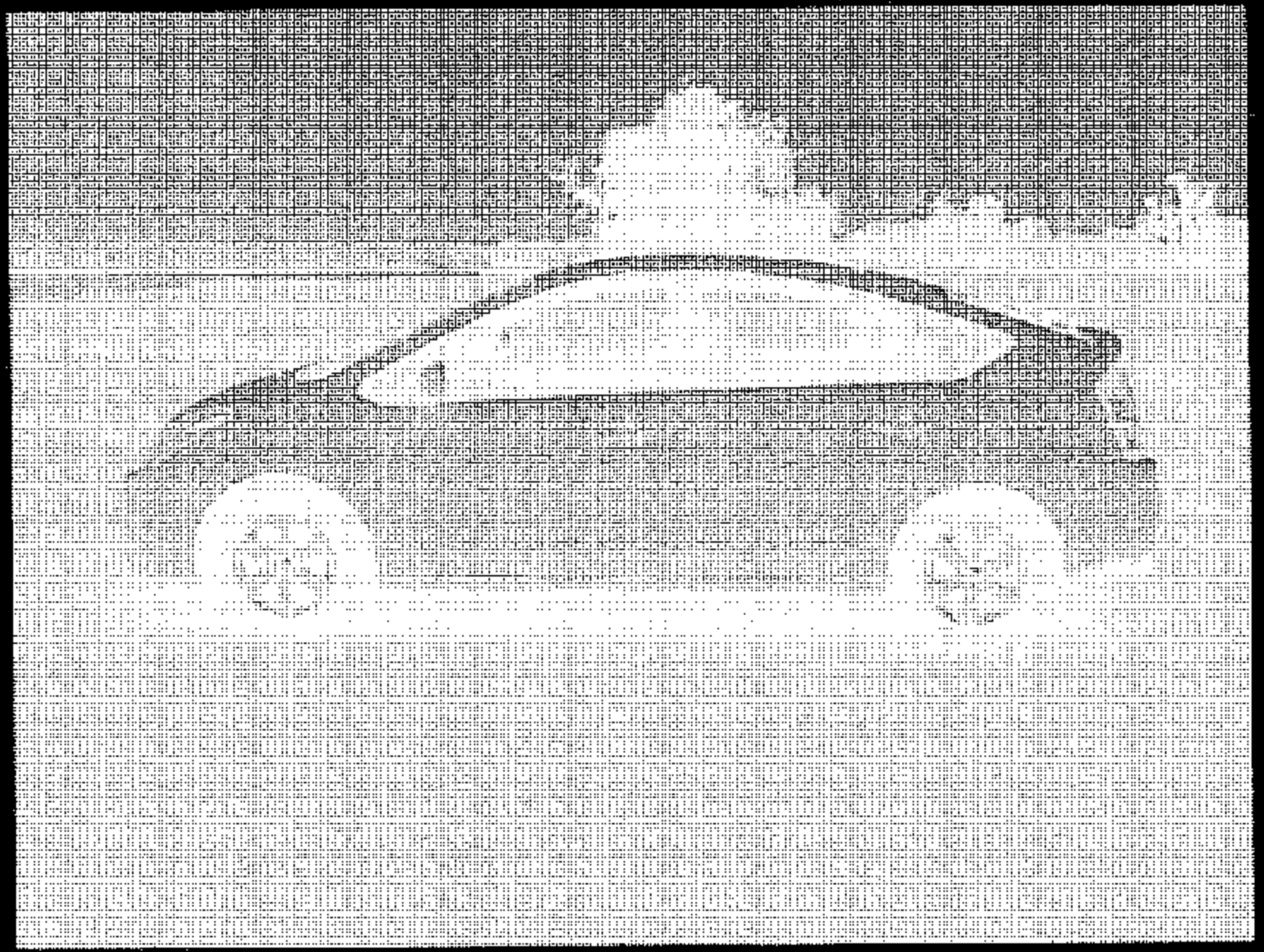
SECTION 4
INSTRUMENTATION AND EQUIPMENT LIST

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 GUN	BINKS	6655	BEFORE USE	BEFORE USE
ANEMOMETER	HASTINGS	RM-1, 46	05/04	05/05
AIR PRESSURE GAGE	BINKS	0-160	02/04	02/05
SCALE	METTLER	200A4M	02/04	02/05
TACHOMETER	MONARCH	ACT-3	07/04	07/05
GRADUATED BEAKER	PHOTAX	N/A	N/A	N/A
EVENT RECORDER	COMPUTER	GEO1	BEFORE USE	BEFORE USE
DATA LOGGER	FLUKE	7471026	03/04	03/05

SECTION 5

PHOTOGRAPHS



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FMVSS NO. 103

FIGURE 5.1
LEFT SIDE VIEW OF VEHICLE

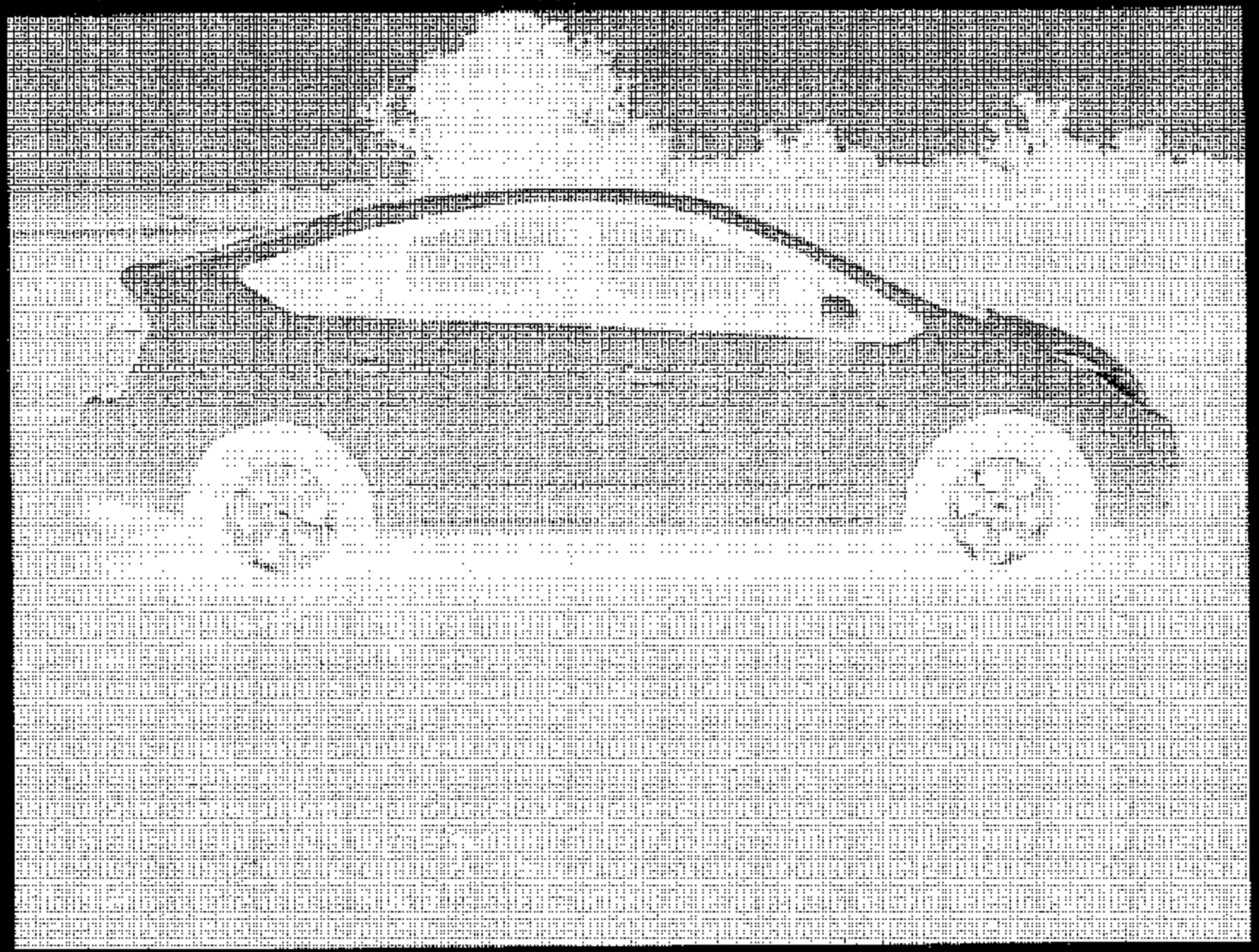

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FIGURE 5.2
RIGHT SIDE VIEW OF VEHICLE

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FIGURE 5.3
¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE

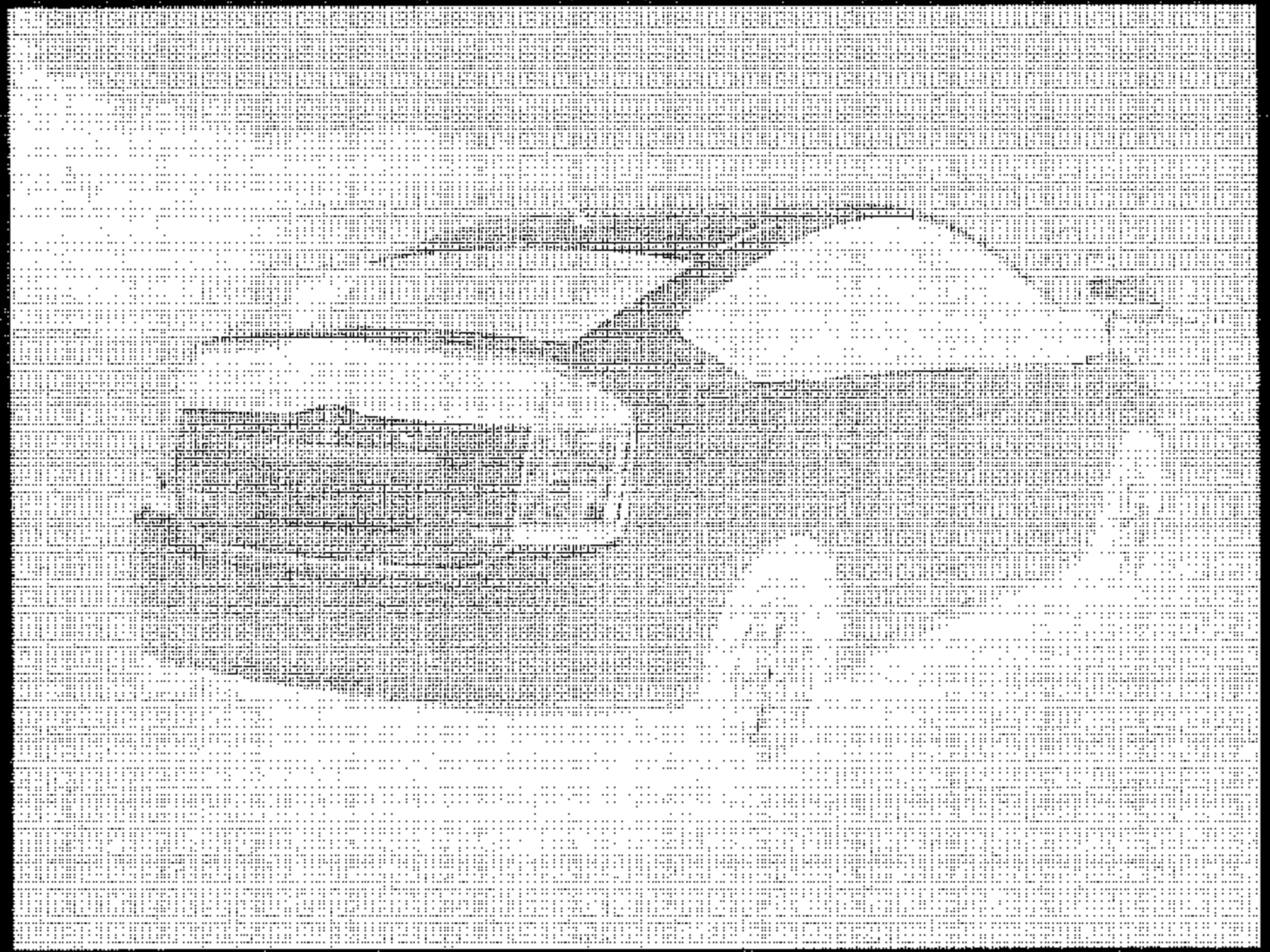

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FIGURE 5.4
¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE

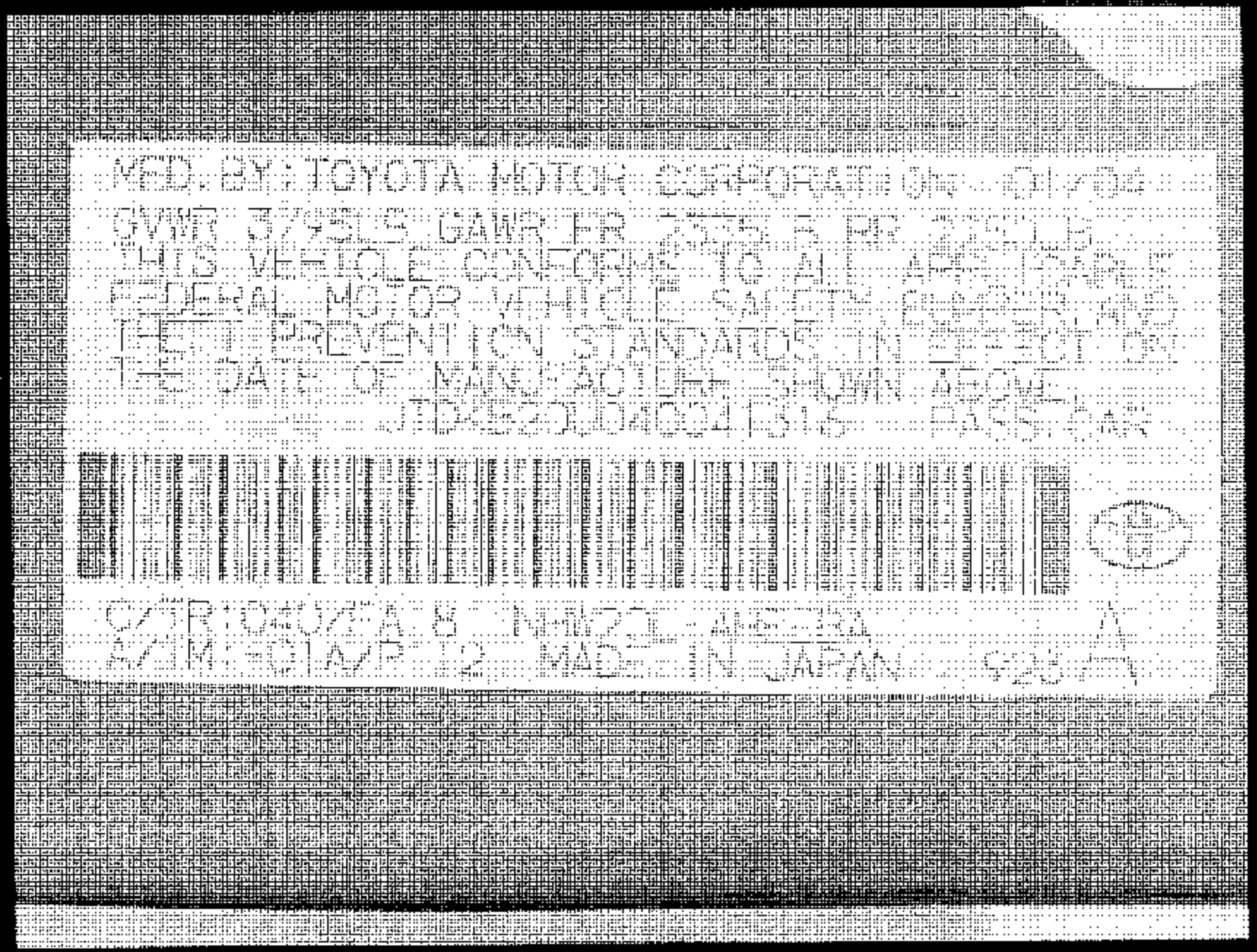

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FIGURE 5.5
VEHICLE CERTIFICATION LABEL

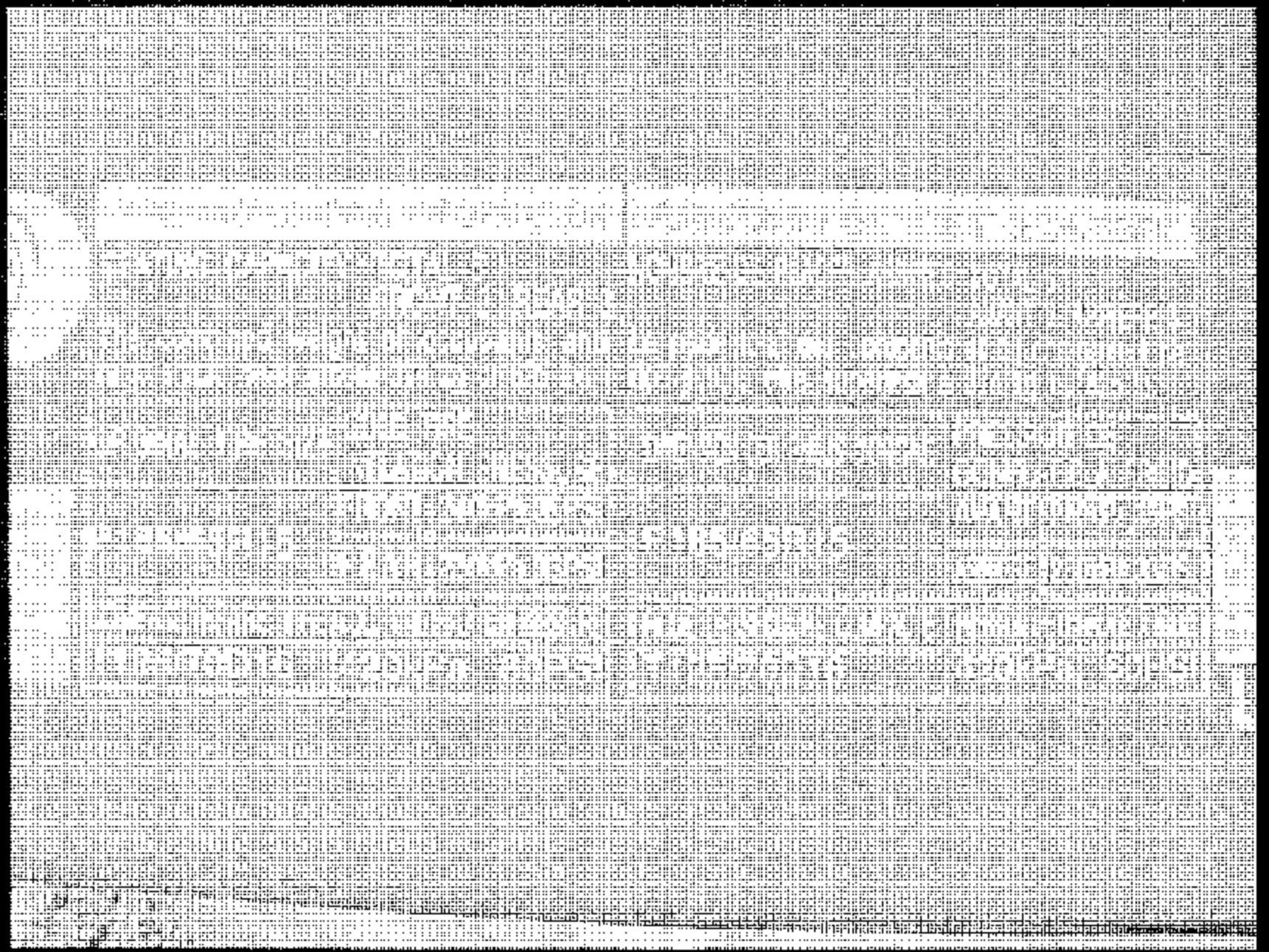

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FIGURE 5.6
VEHICLE TIRE INFORMATION LABEL

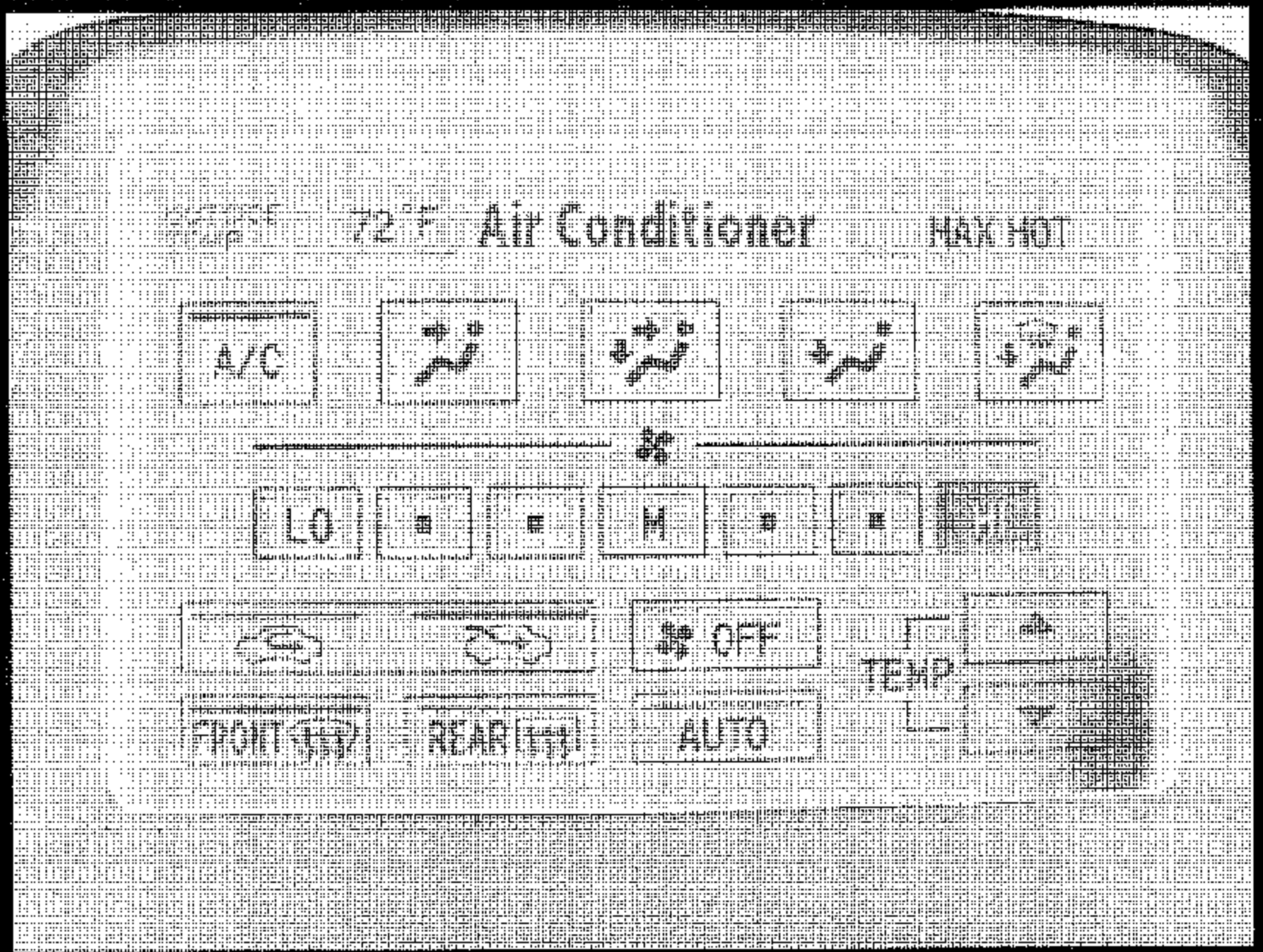

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FIGURE 5.7
CLOSE-UP VIEW OF DEFROSTER CONTROL
SETTING ON DASH

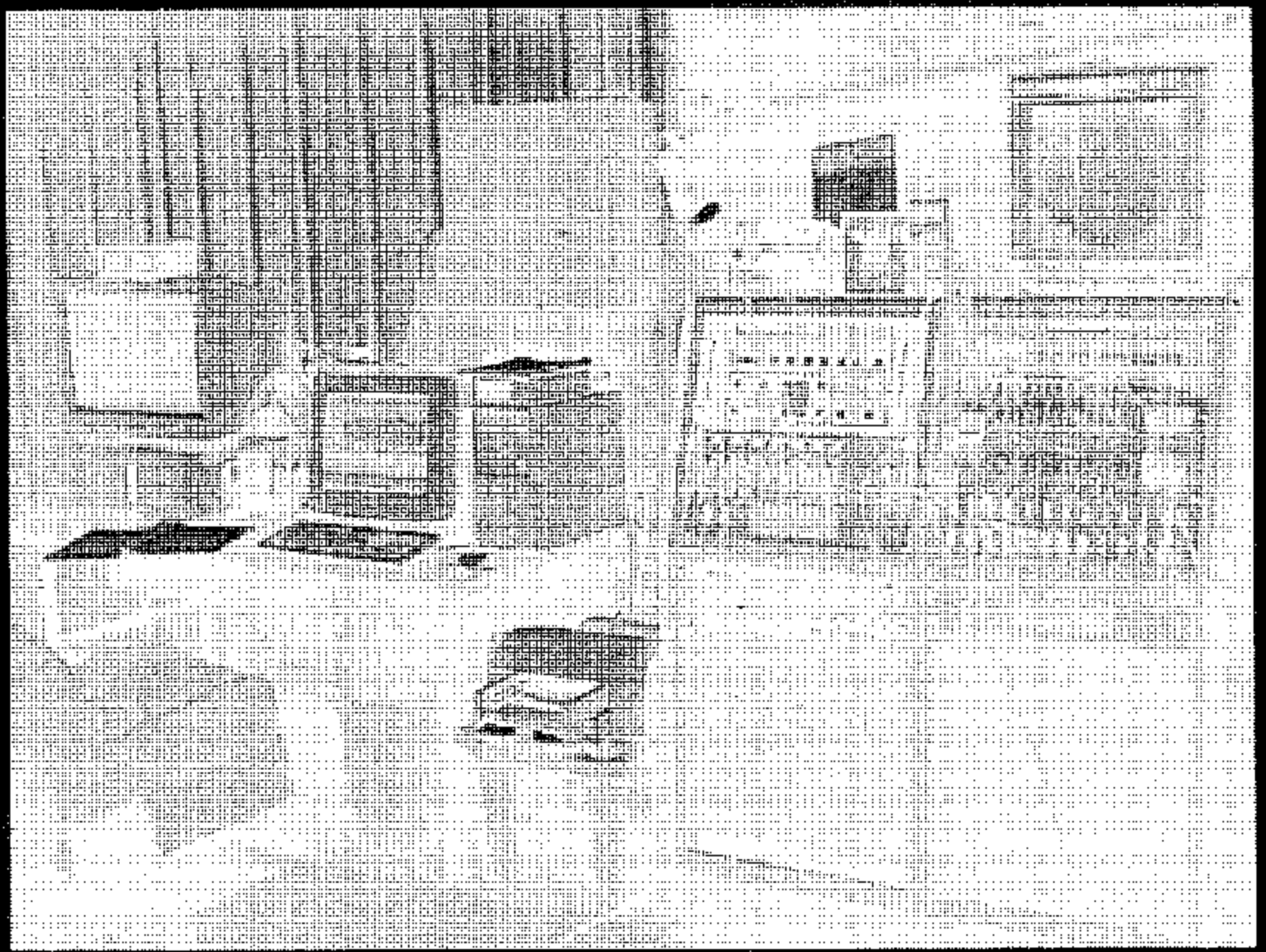

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FIGURE 5.6
INSTRUMENTATION SET-UP

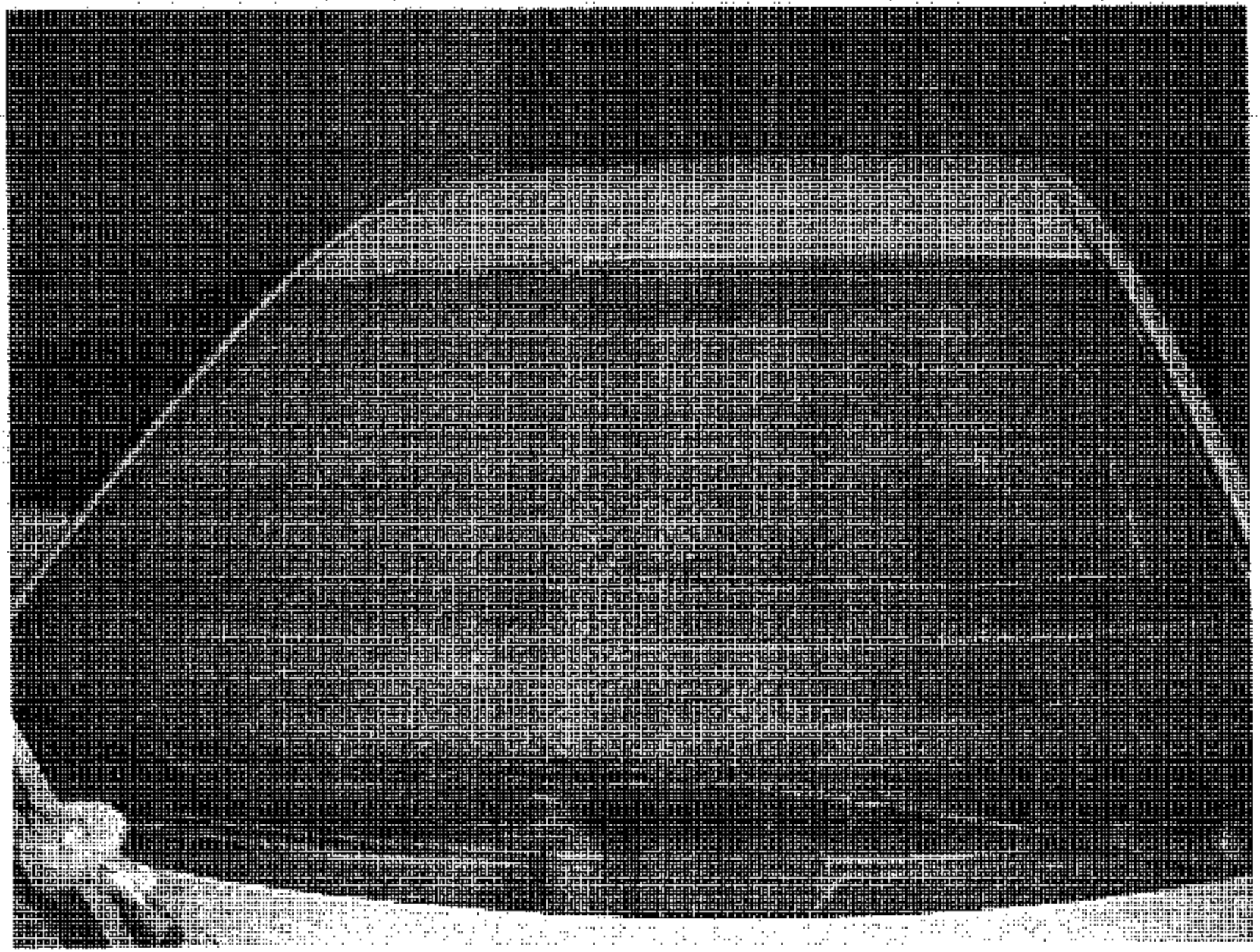

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FIGURE 5.9
WINDSHIELD, PRE-TEST FROSTED STATE
TEST #1

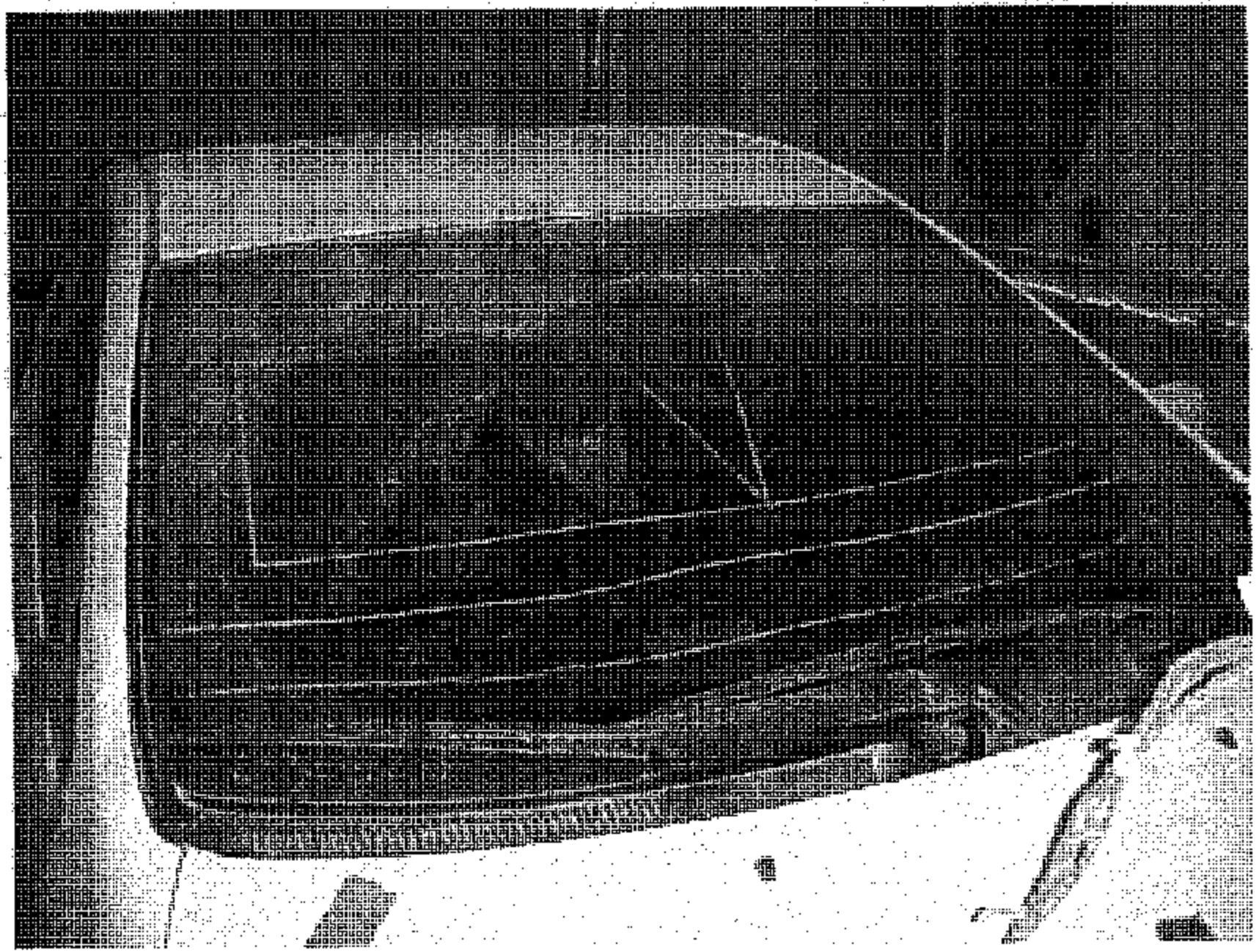

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FIGURE 5.10
DEFROSTED AREA AT 20 MINUTES TEST #1

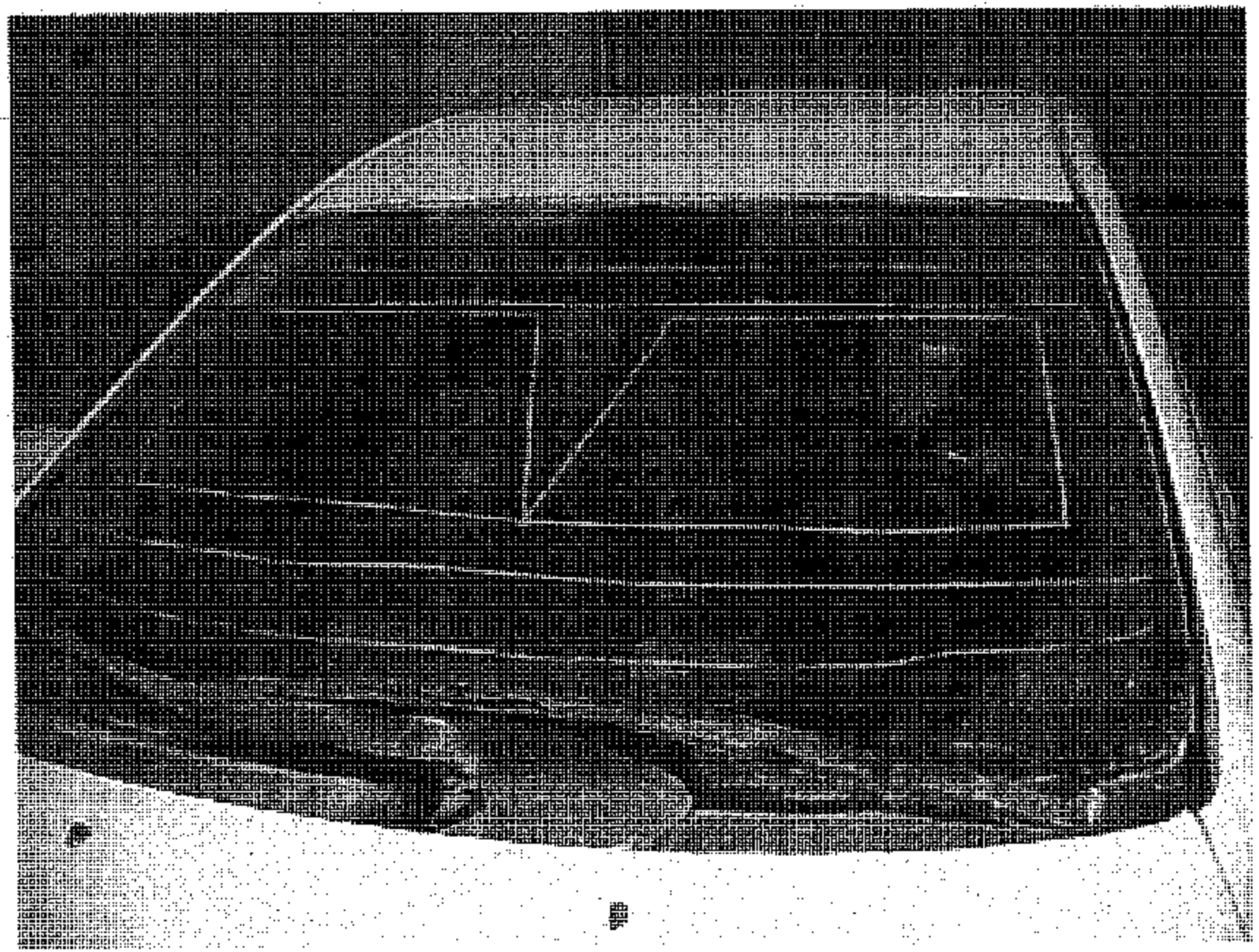

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FIGURE 5.11
DEFROSTED AREA AT 25 MINUTES TEST #1

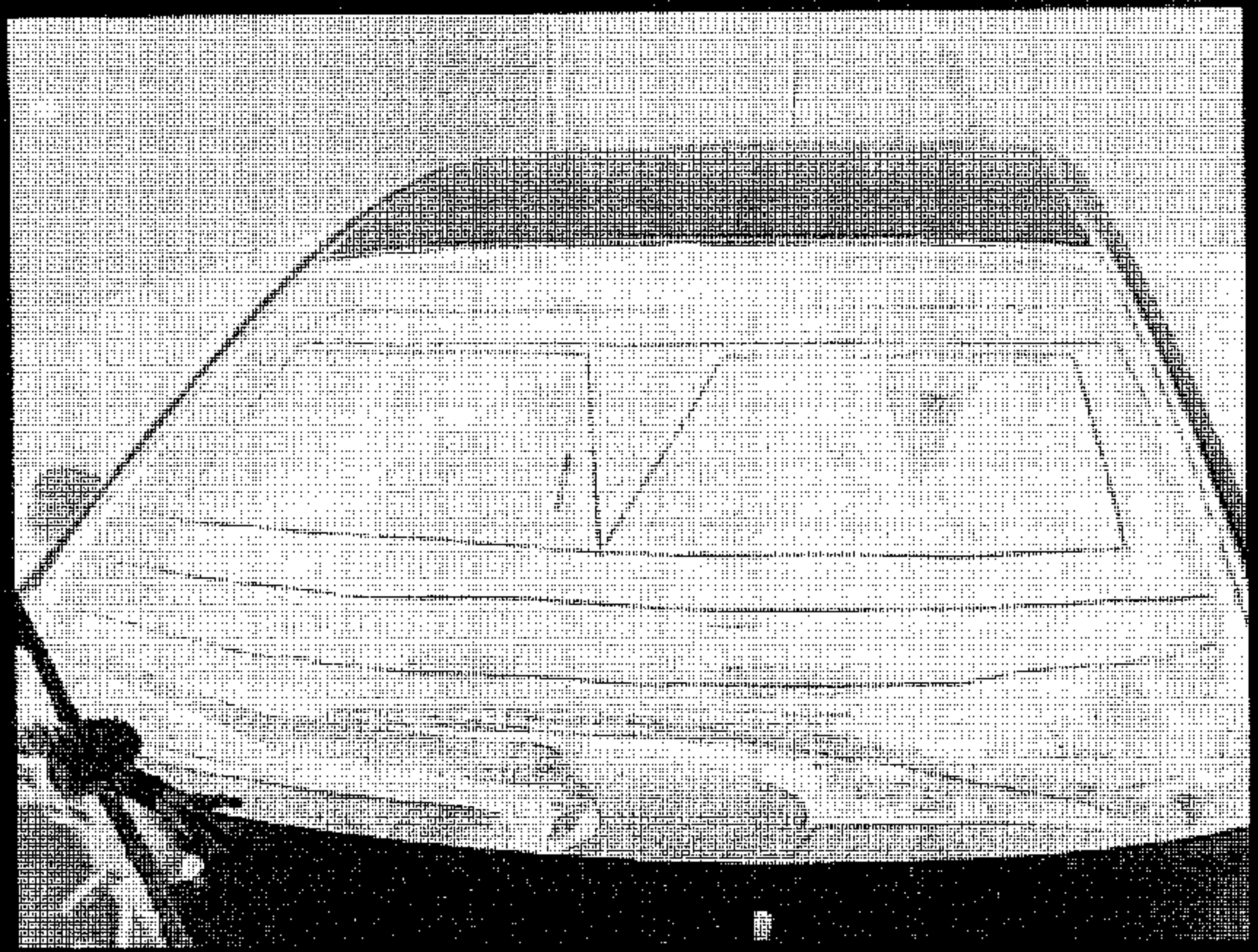

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FIGURE 5.12
DEFROSTED AREA AT 36 MINUTES TEST #1
END OF TEST

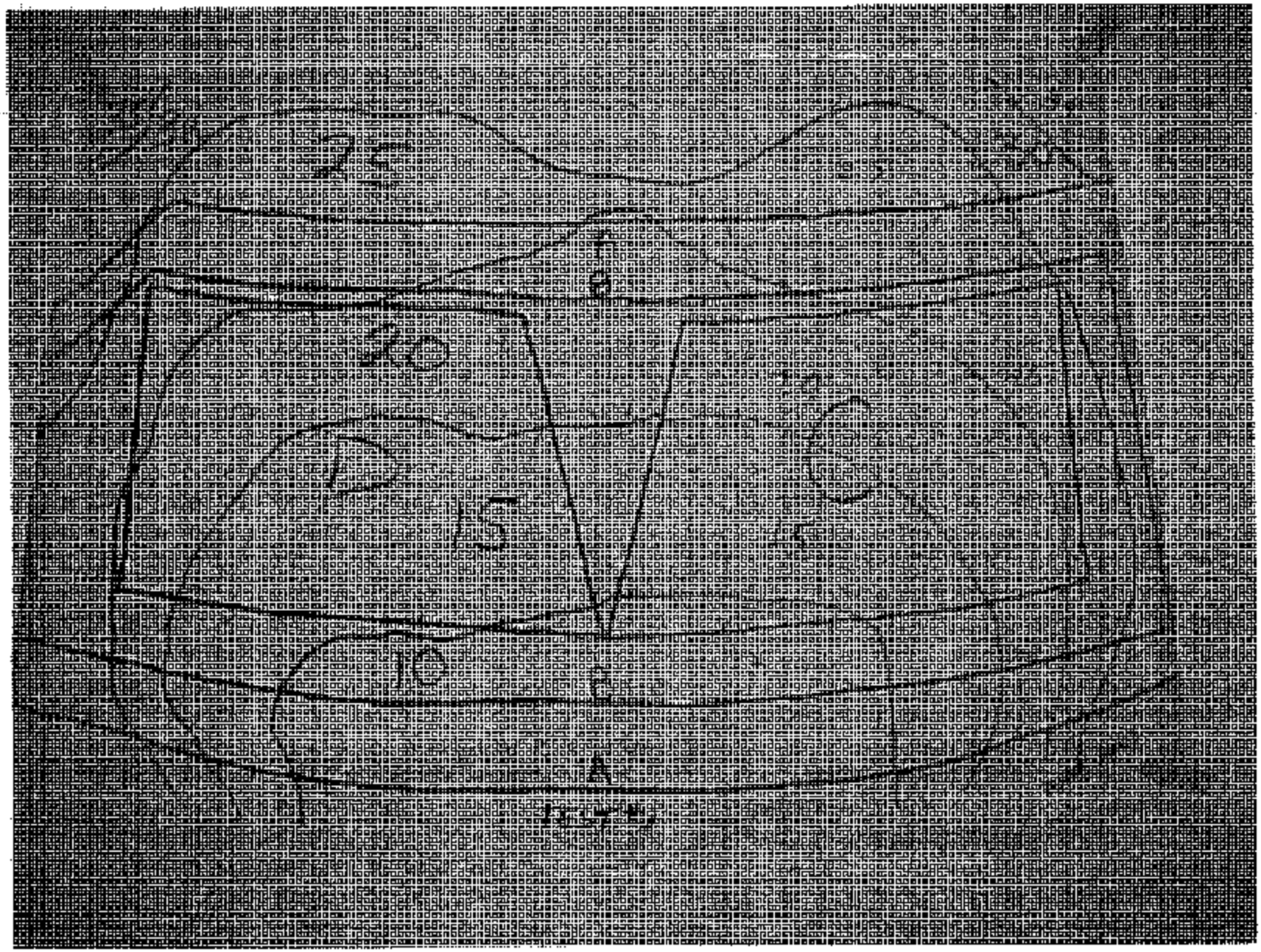

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FIGURE 6.13
WINDSHIELD VELLUM PATTERN, POST TEST #1

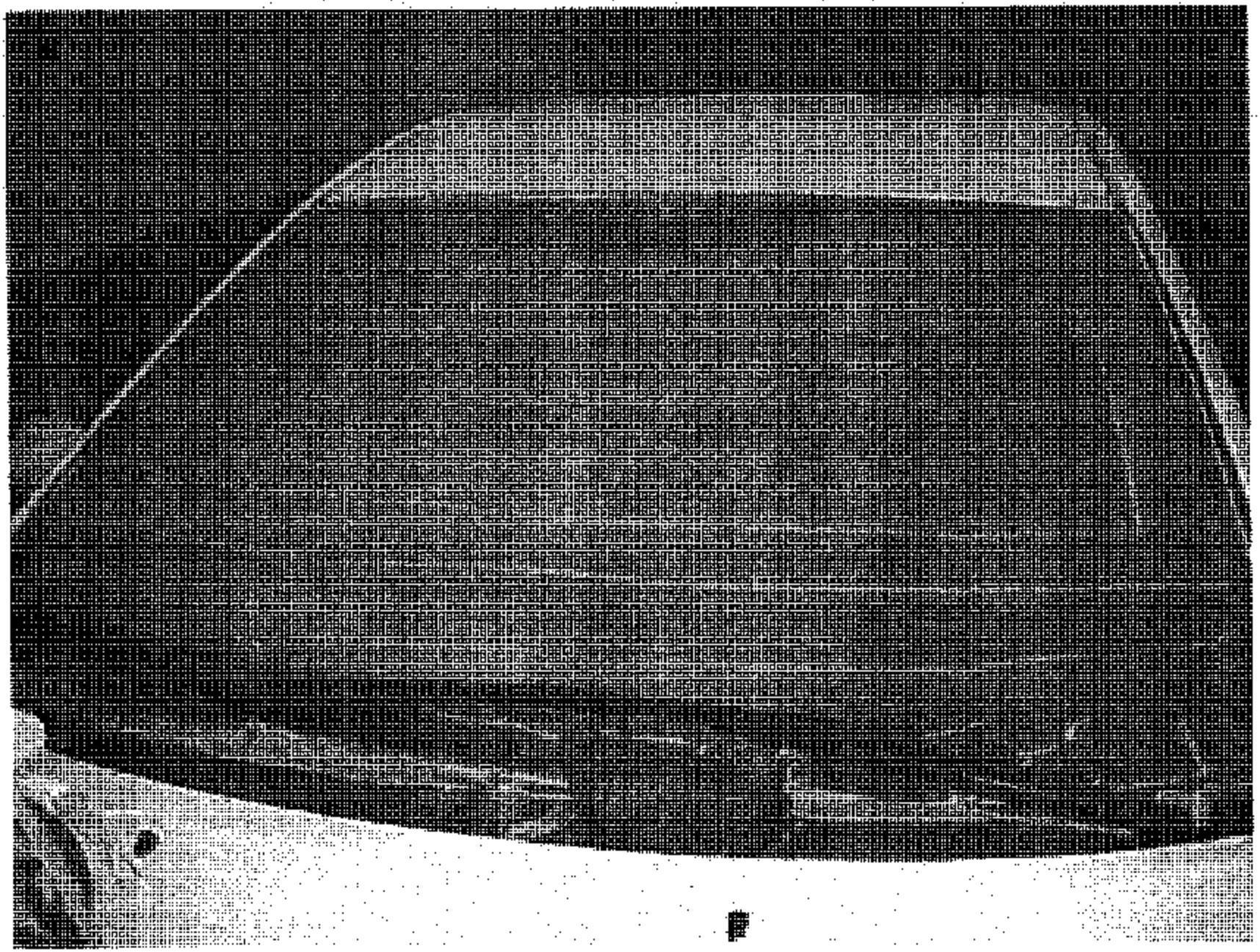

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FIGURE 5.14
WINDSHIELD, PRE-TEST FROSTED STATE
TEST #2

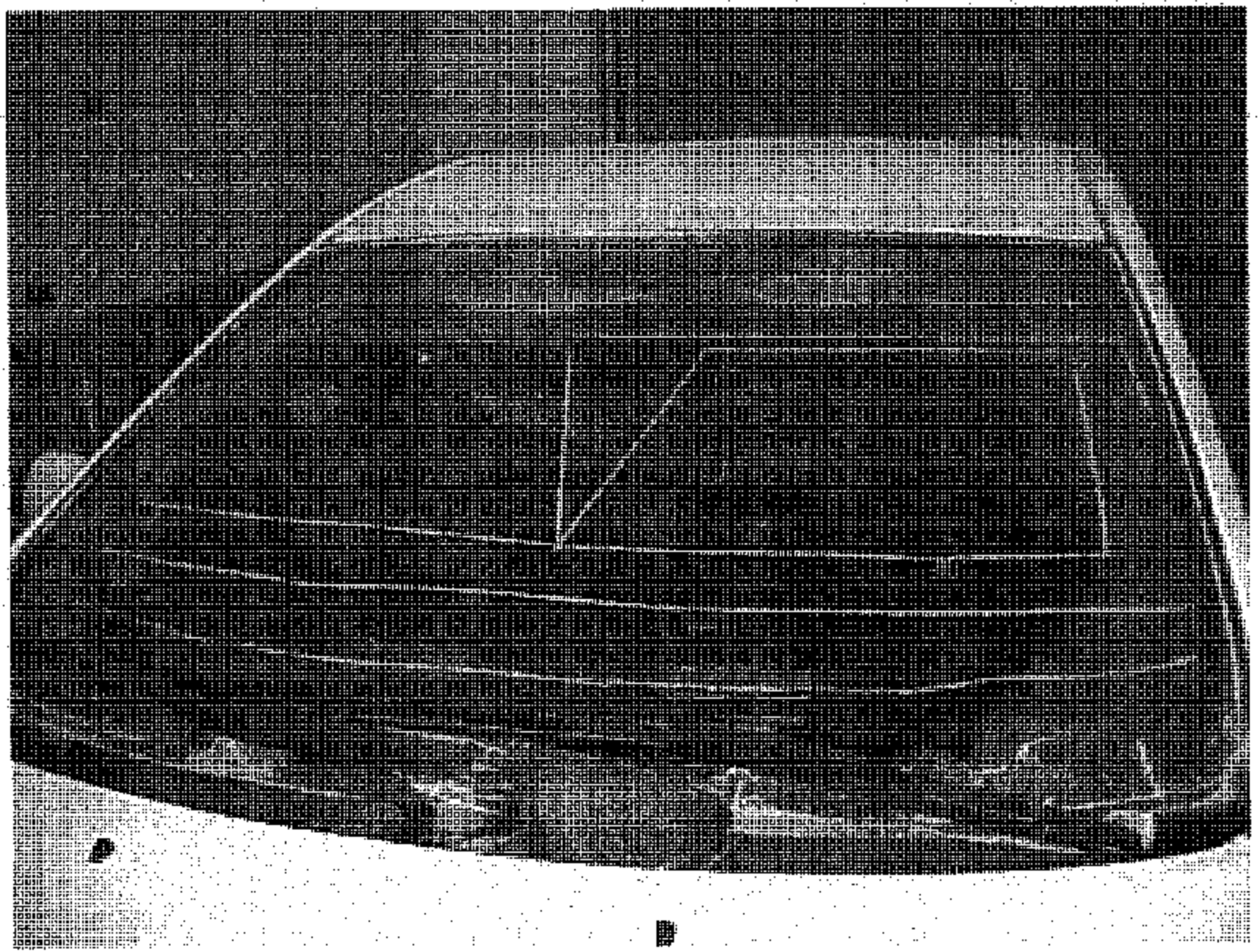

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FIGURE 5.15
DEFROSTED AREA AT 20 MINUTES TEST #2

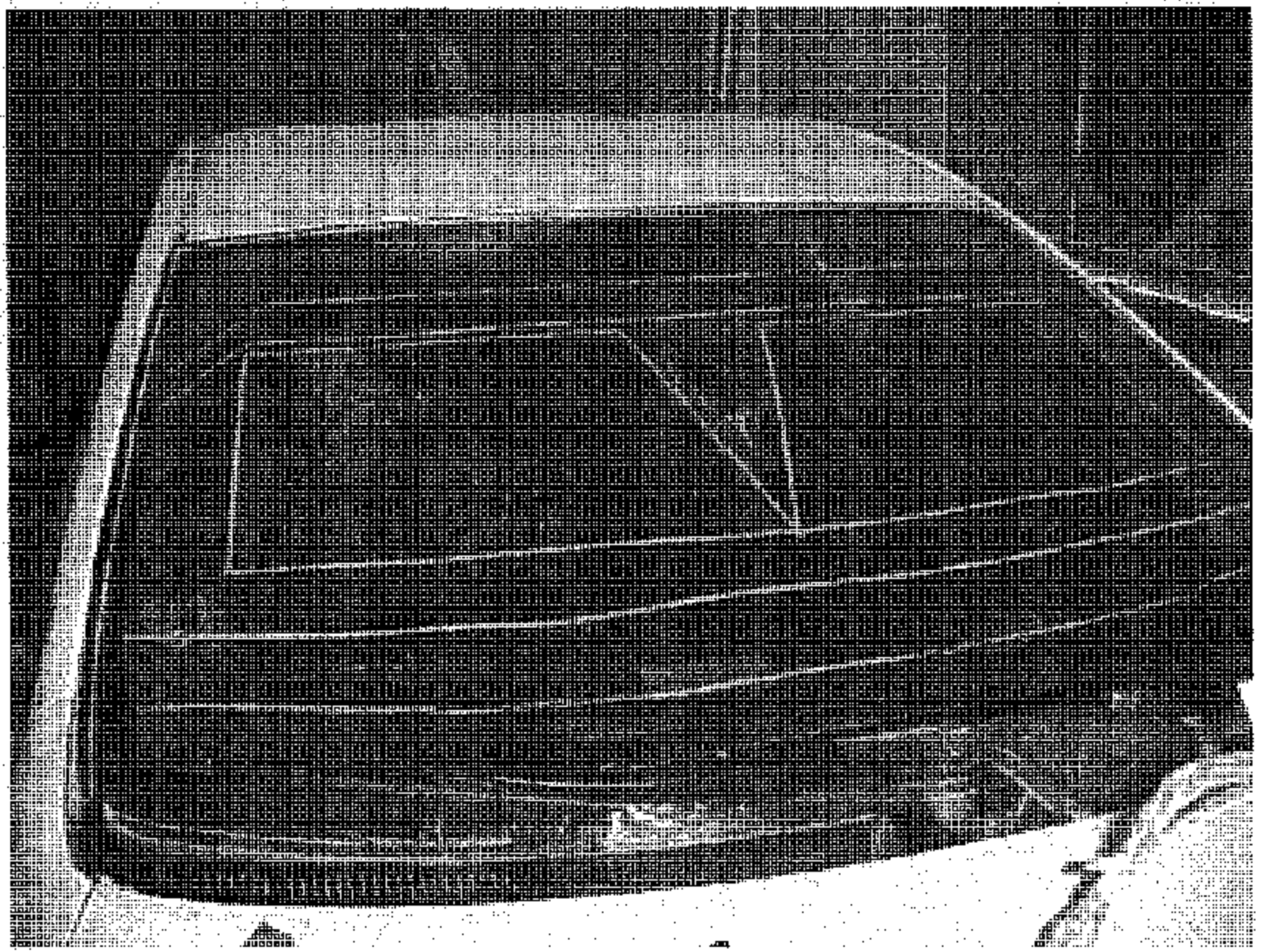

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FIGURE 5.16
DEFROSTED AREA AT 25 MINUTES TEST #2

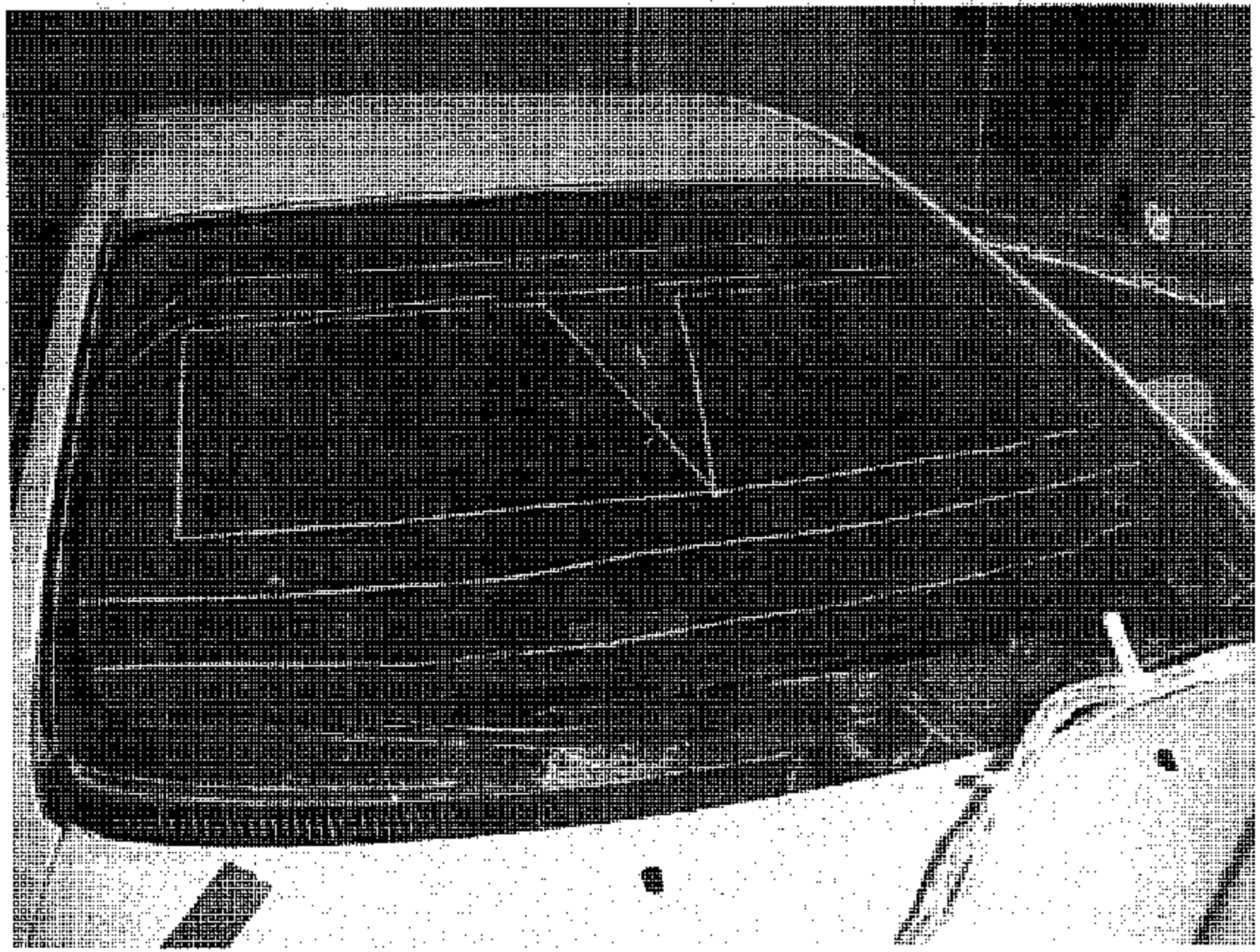

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FIGURE 5.17
DEFROSTED AREA AT 30 MINUTES TEST #2
END OF TEST

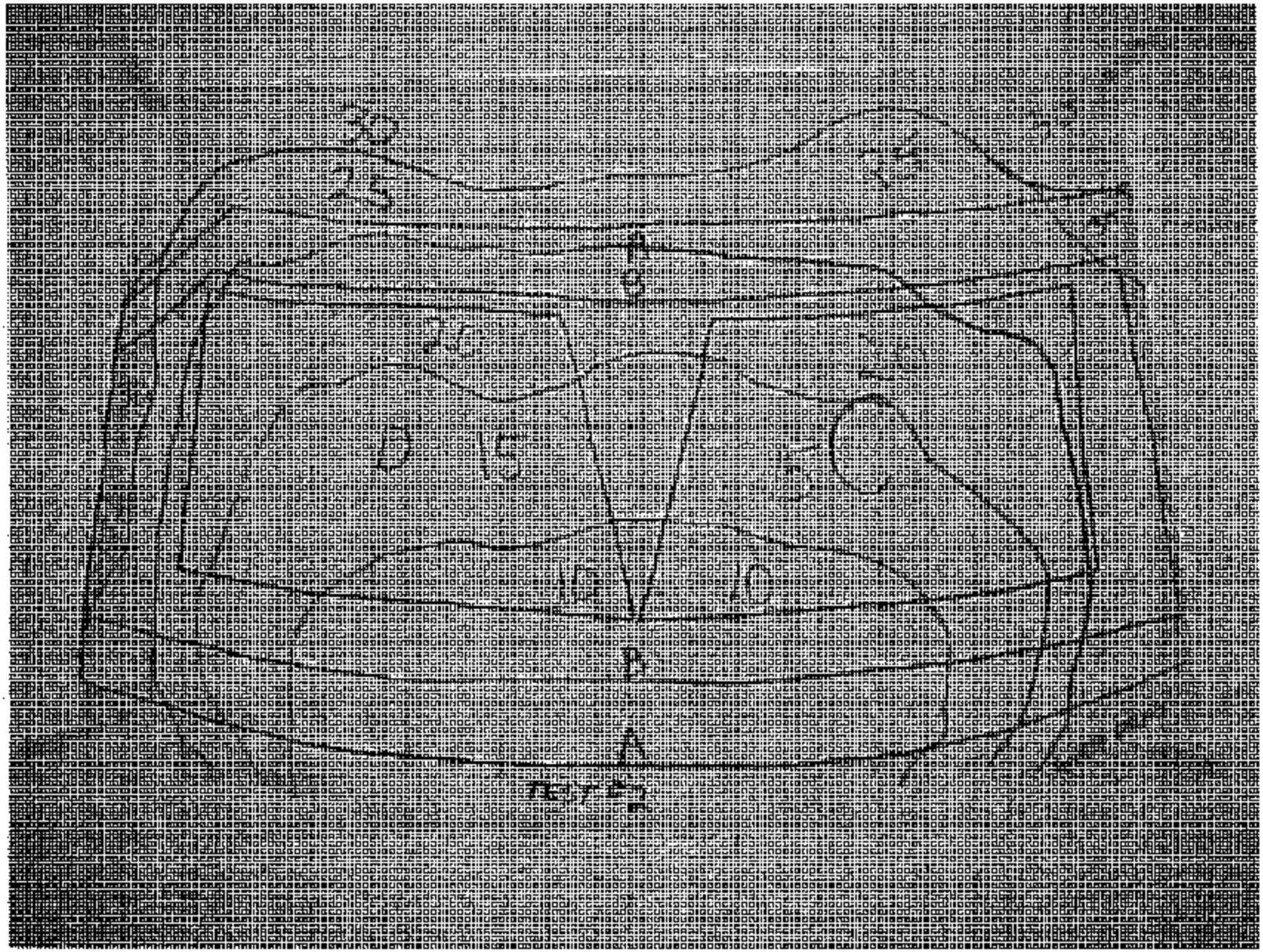

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FIGURE 5.18
WINDSHIELD VELLUM PATTERN, POST TEST #2

SECTION 6

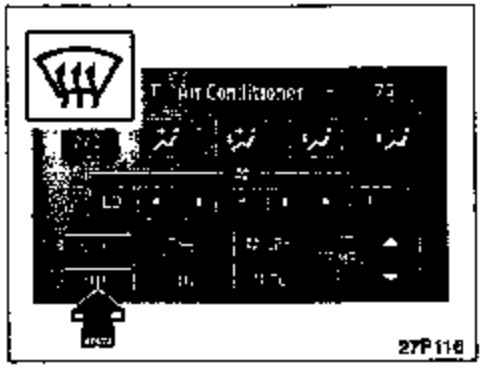
OWNER'S MANUAL DEFROSTER INSTRUCTIONS

If manual on–off of the air conditioning is desired—

Touch the "A/C" switch to turn the air conditioning on and touch it again to turn the air conditioning off.

If the system is used for ventilation, heating in dry weather or removing frost or exterior fog on the windshield, turn the air conditioning off once it is no longer required. This will improve fuel economy. The air conditioning can be used for year–round automatic temperature control including cooling and dehumidifying operation.

(b) Windshield defogging and defrosting



To remove interior fog on the windshield—

Touch the front windshield switch.

To remove frost or exterior fog on the windshield—

1. Touch the upper side of the temperature control switch until maximum figure appears on the temperature display.
2. Touch the front windshield switch.
3. Push the "HI" of the air flow control switch to obtain a maximum air flow.
4. Leave the air conditioning on–off button off.

When the front windshield switch is touched, the air conditioning is set to operate and the OUTSIDE AIR mode is set.

If you touch the front windshield switch once again while in the FRONT WINDSHIELD mode, the mode then returns to the last mode used.

The indicator will come on in the instrument cluster while the FRONT WINDSHIELD mode is on.

⚠ CAUTION

Do not use the front windshield switch during cooled air operation in extremely humid weather. The difference between the temperature of the outside air and that of the windshield could cause the outer surface of the windshield to fog up blocking your vision.