HSNO 637298

REPORT NUMBER 104-GTL-04-001

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

## FORD MOTOR CO. IN U.S.A.
## 2004 LINCOLN LS, PASSENGER CAR
## NHTSA NO. C40210

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

JULY 30, 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 6111 (NVS-220)**
**WASHINGTON, D.C. 20590**

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Approved By:

Approval Date: 7/30/04

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Accepted By:

Acceptance Date: 8/19/04

Technical Report Documentation Page

| | | |
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| 4. Title and Subtitle<br>Final Report of FMVSS 104 Compliance Testing of 2004 LINCOLN LS, PASSENGER CAR<br>NHTSA No. C40210 | | 5. Report Date<br>July 30, 2004<br>6. Performing Organ. Code<br>GTL |
| 7. Author(s)<br>Grant Farrand, Project Engineer<br>Debbie Messick, Project Manager | | 8. Performing Organ. Rep#<br>GTL-DOT-04-104-001 |
| 9. Performing Organization Name and Address<br>General Testing Laboratories, Inc.<br>1623 Leedstown Road<br>Colonial Beach, Va 22443 | | 10. Work Unit No. (TRAIS)<br>N/A<br>11. Contract or Grant No.<br>DTNH22-01-C-11025 |
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| 15. Supplementary Notes | | |

16. Abstract

Compliance tests were conducted on the subject 2004 Lincoln LS 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<br>Compliance Testing<br>Safety Engineering<br>FMVSS 104 | 18. Distribution Statement<br>Copies of this report are available from NHTSA<br>Technical Information Services (TIS)<br>Room 2336 (NPO-405)<br>400 Seventh Street S.W.<br>Washington, DC 20590<br>Telephone No. (202) 366-4947 |

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Form DOT F 1700.7 (8-72)

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SECTION 1

PURPOSE OF COMPLIANCE TEST

## 1.0 PURPOSE OF COMPLIANCE TEST

A 2004 Lincoln LS 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 Lincoln LS Passenger Car. Nomenclature applicable to the test vehicle are:

A. Vehicle Identification Number: 1LNHM86S44Y632047

B. NHTSA No.: C40210

C. Manufacturer: FORD MOTOR CO. IN U.S.A.

D. Manufacture Date: 11-03

## 1.2 TEST DATE

The test vehicle was subjected to FMVSS No. 104 testing on July 13, 2004.

# SECTION 2

# COMPLIANCE TEST PROCEDURE AND SUMMARY OF RESULTS

## 2.0 GENERAL

The 2004 Lincoln LS 4-door passenger car, NHTSA No. C40210 was subjected to FMVSS No. 104 tests on July 13, 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 Lincoln LS.

# SUMMARY OF DATA
## FMVSS 104, WINDSHIELD WIPING AND WASHING SYSTEMS

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LINCOLN LS PASSENGER CAR
VEH. NHTSA NO: C40210; VIN: 1LNHM86S44Y632047
VEH. BUILD DATE: 11-03 TEST DATE: JULY 13, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

WIPER TYPE: 2 SPEED ELECTRIC WITH DELAY

WASHER TYPE: ELECTRIC PRESSURE PUMP

WINDSHIELD AREAS: A = 1310.7 $in^2$ B = 794.1 $in^2$ C = 269.7 $in^2$

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:

PERFORMANCE:

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

RECORDED BY: _____ DATE: 07/15/04

APPROVED BY: _____

# FREQUENCY TEST DATA
## FMVSS 104 – WINDSHIELD WIPER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LINCOLN LS PASSENGER CAR
VEH. NHTSA NO: C40210; VIN: 1LNHM86S44Y632047
VEH. BUILD DATE: 11-03 ; TEST DATE: JULY 13, 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.: 87 °F (50-100°F); Water Temp.: 73 °F (100°F max.)

Manufacturer's Recommended Engine Idle Speed: 750 rpm

RUN 1, MAXIMUM WIPER FREQUENCY TEST:

| TIME | ENGINE SPEED | TOTAL CYCLES | AVG. CYCLES/MIN. (45 MINIMUM) |
|---|---|---|---|
| 1ST 3 minutes | 750 (idle ± 50 rpm) | 212 | 70.6 |
| 2nd 3 minutes | 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. (45 MINIMUM) |
|---|---|---|---|
| 1ST 3 minutes | 750 (idle ± 50 rpm) | 142 | 47.3 |
| 2nd 3 minutes | (2000 rpm ± 50 rpm) | 148 | 49.3 |

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: 07/13/04

APPROVED BY: _____

# WIPED AREA TEST DATA
## FMVSS 104 – WINDSHIELD WIPER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LINCOLN LS PASSENGER CAR
VEH. NHTSA NO: C40210; VIN: 1LNHM86S44Y632047
VEH. BUILD DATE: 11-03 ; TEST DATE: JULY 13, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

Air Temperature in test area = 87 °F (specified range of 50 to 100°F)

Air Velocity at windshield = .2 mph (specified range of 0 to 1 mph)

Engine speed = 750 rpm (manufacturer's recommended idle ± 50 rpm)

Temperature of water spray = 73 °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 = 48 cycles/min. (45 cpm minimum)

TEST RESULTS:

| PERCENT WIPED | | | | |
|---|---|---|---|---|
| WINDSHIELD AREA | ACTUAL | REQUIRED | PASS | FAIL |
| A | 94.6% | 80% | X | |
| B | 99.8% | 94% | X | |
| C | 100% | 99% | X | |

REMARKS:

RECORDED BY: _____ DATE: 07/14/04

APPROVED BY: _____

# CAPABILITY TEST DATA
## FMVSS 104 – WINDSHIELD WASHER SYSTEM

VEH. MOD YR/MAKE/MODEL/BODY: 2004 LINCOLN LS PASSENGER CAR
VEH. NHTSA NO: C40210; VIN: 1LNHM86S44Y632047
VEH. BUILD DATE: 11-03 ; TEST DATE: JULY 13, 2004
TEST LABORATORY: GENERAL TESTING LABORATORIES
OBSERVERS: GRANT FARRAND, JIMMY LATANE

Air Temperature in test area = 87 °F (specified range of 70 to 80°F)

Washer reservoir fluid temperature = 75 °F (specified range of 70 to 80°F)

Air Velocity at windshield = .2 mph (specified range of 0 to 1 mph)

Engine speed = 750 rpm (manufacturer's recommended idle ± 50 rpm)

Number of windshield washer nozzles on the vehicle = 2

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 | 94.1 | 94.3 | 94.2 | 75% | X | |
| B | 98.0 | 97.9 | 97.95 | 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: _____ DATE: 07/14/04

APPROVED BY: _____

## SECTION 4
## INSTRUMENTATION AND EQUIPMENT LIST

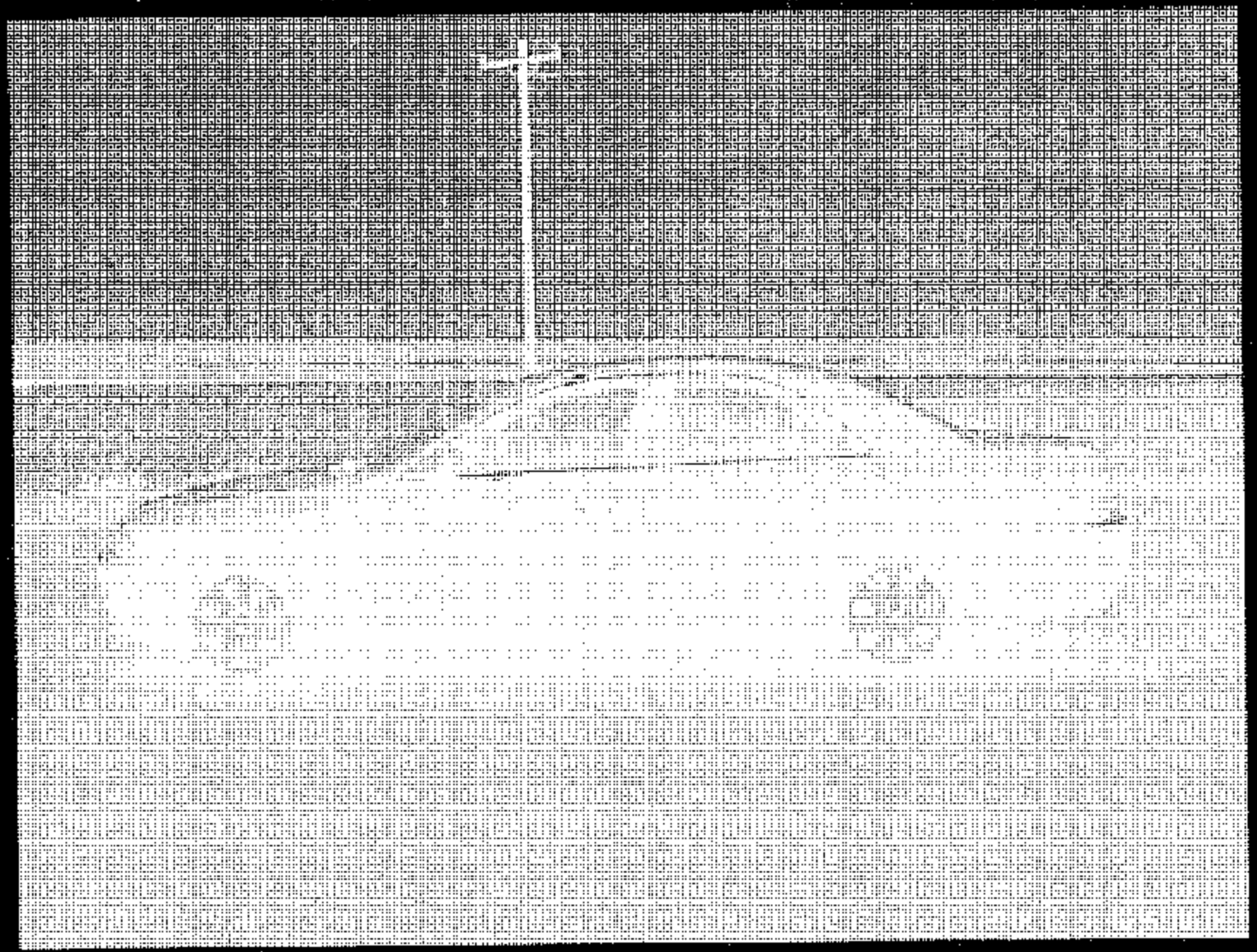
TABLE 1 - INSTRUMENTATION & EQUIPMENT LIST

| 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 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.

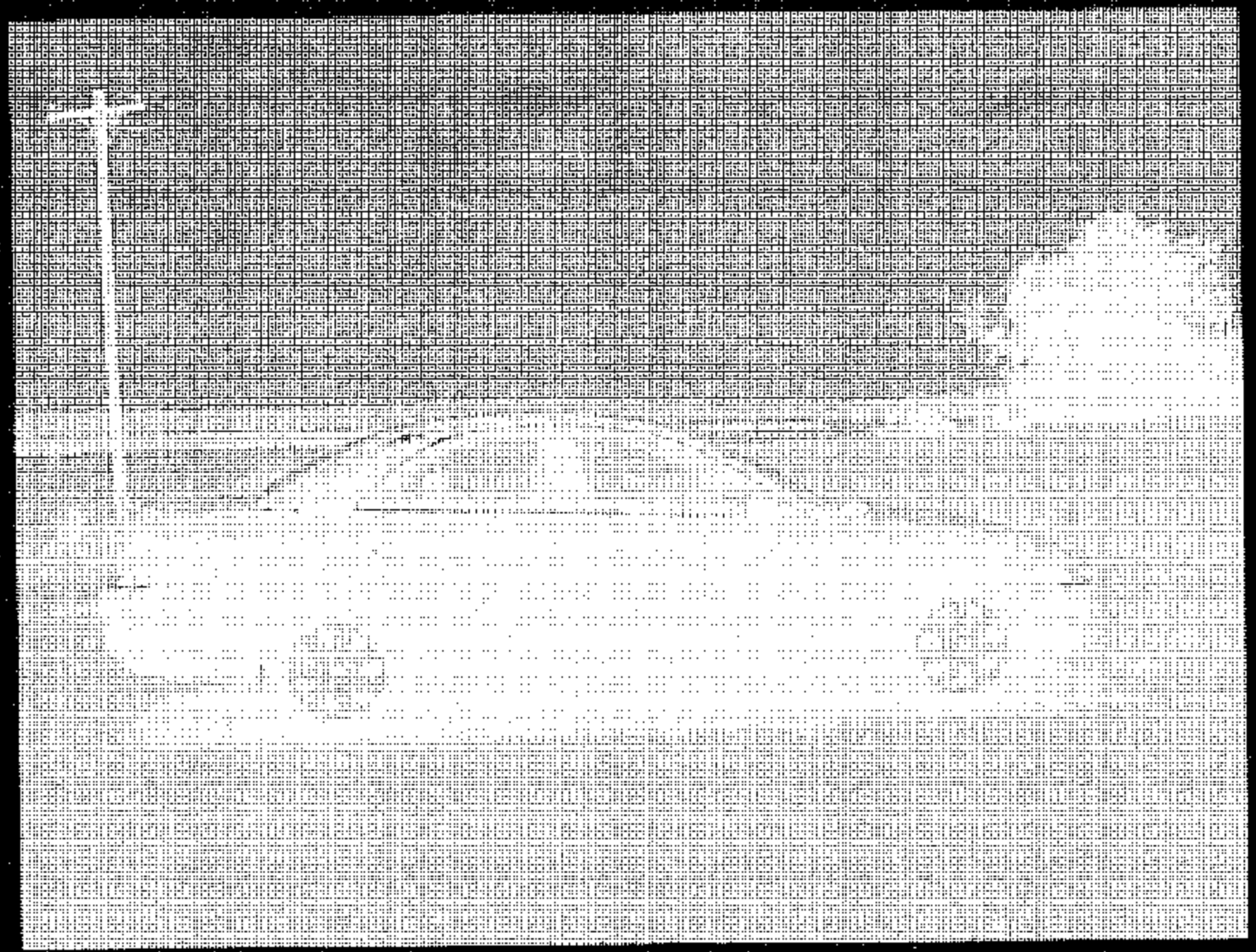
# SECTION 5

# PHOTOGRAPHS



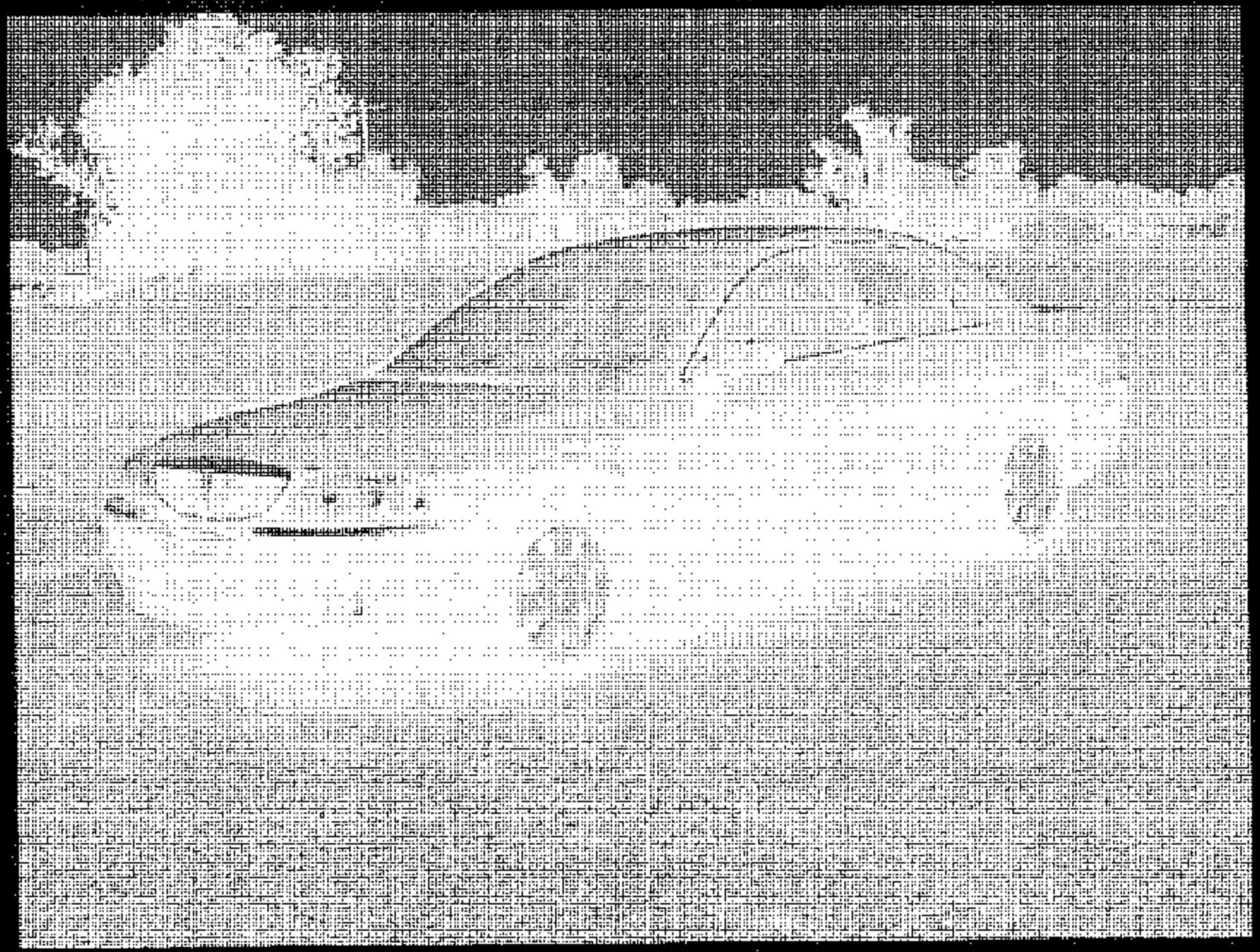
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.1
LEFT SIDE VIEW OF VEHICLE



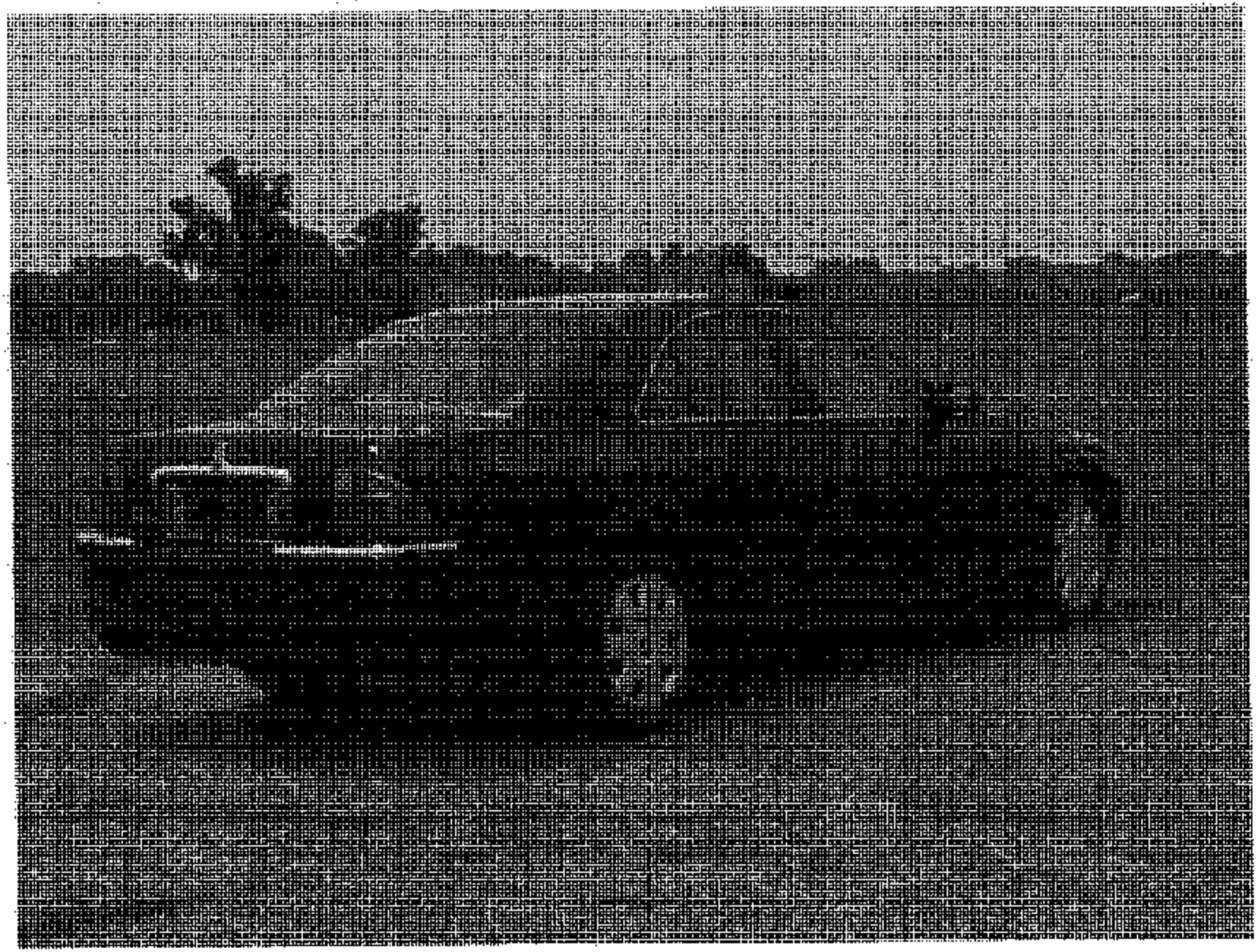
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.2
RIGHT SIDE VIEW OF VEHICLE



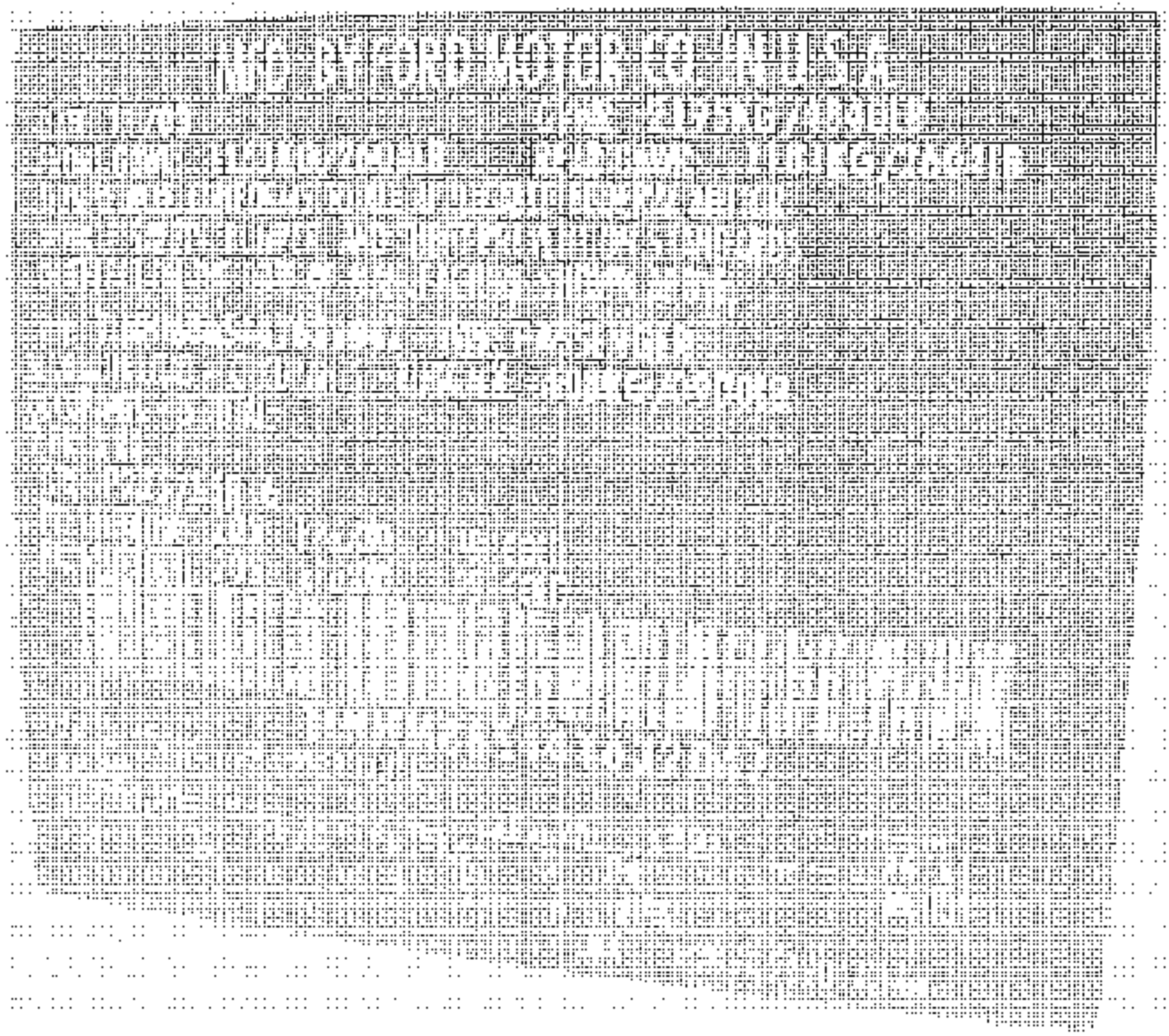
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.3
¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE



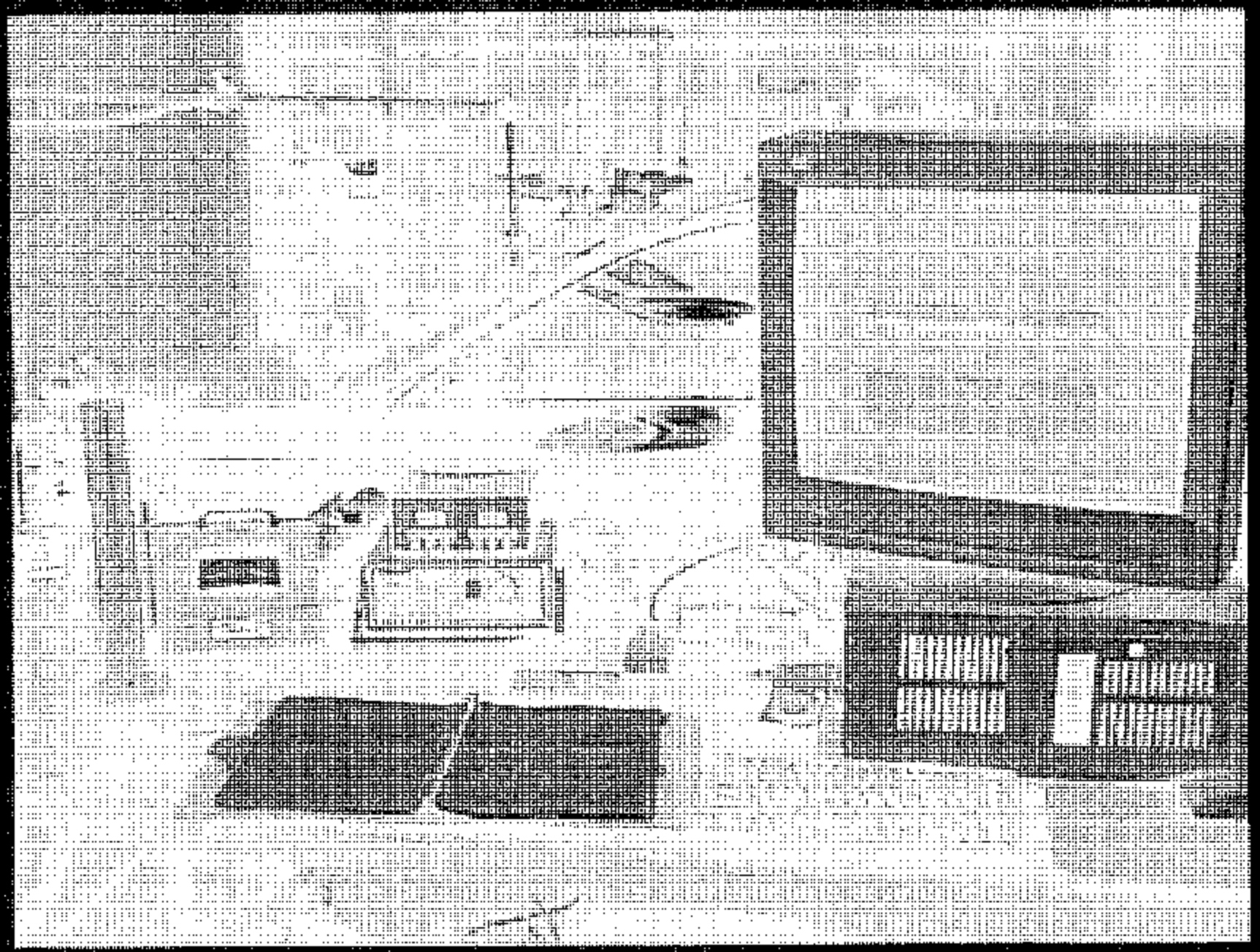
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.4
¾ REAR VIEW FROM RIGHT SIDE OF VEHICLE



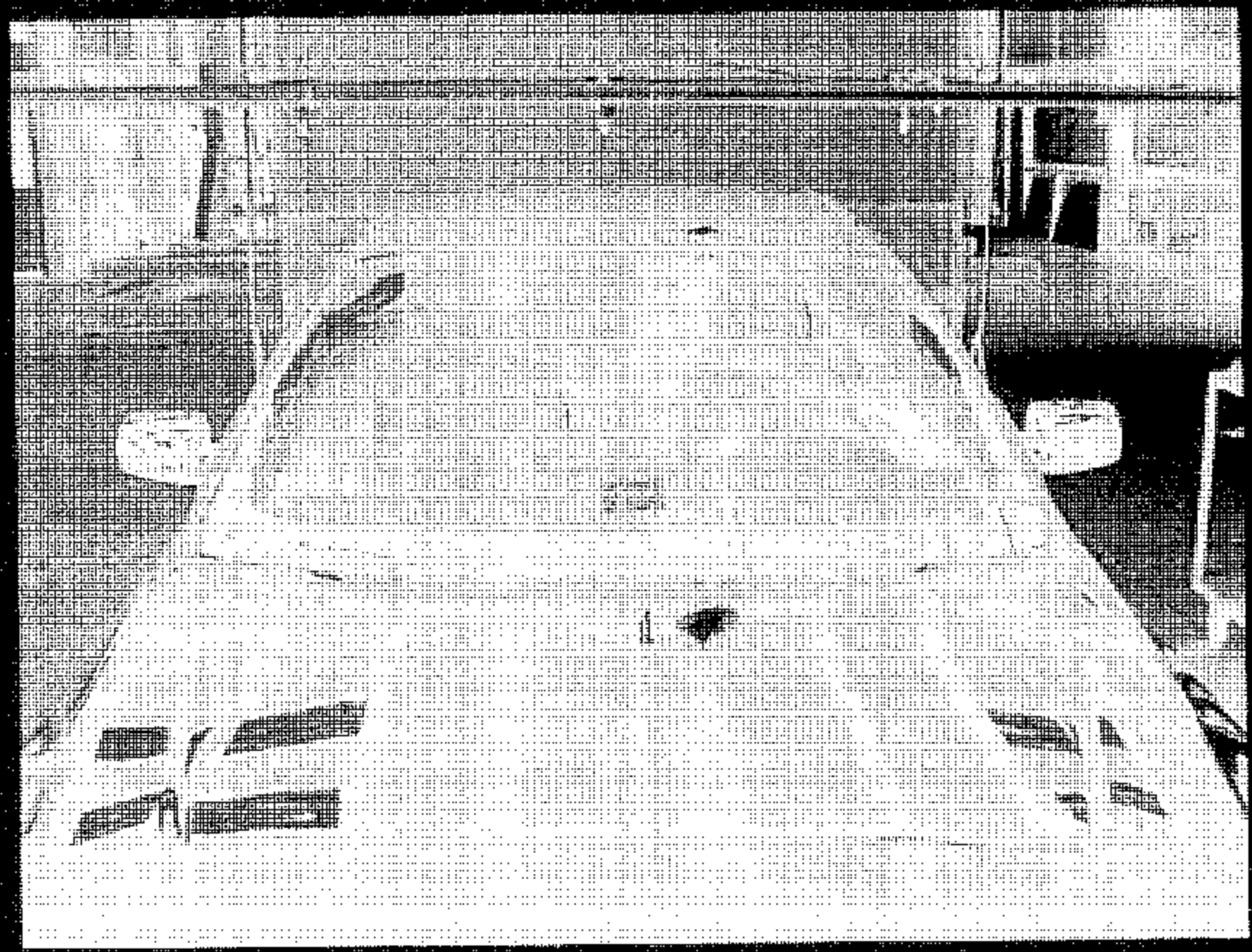
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.5
VEHICLE CERTIFICATION AND TIRE INFORMATION LABEL



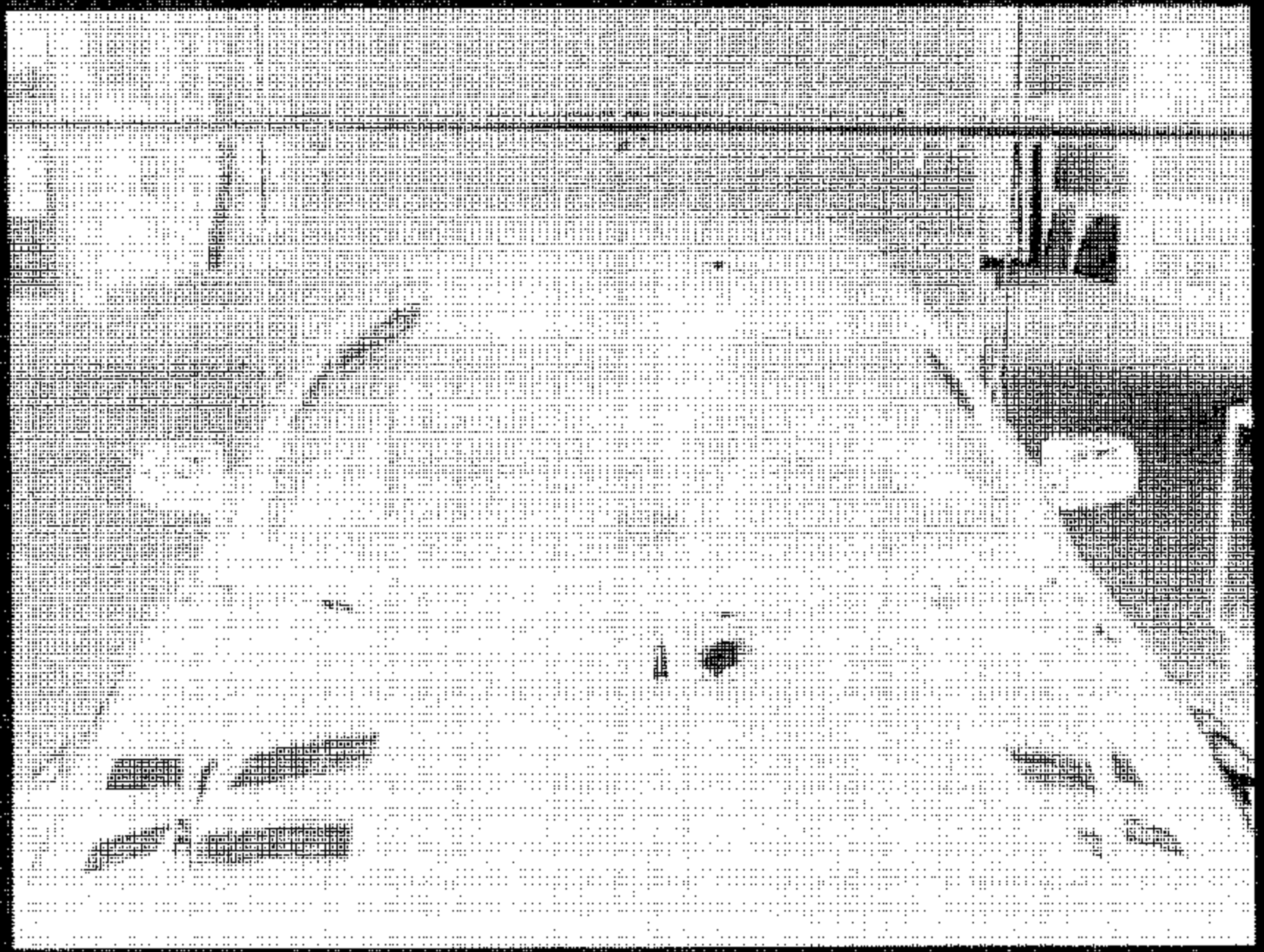
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.6
INSTRUMENTATION SET-UP



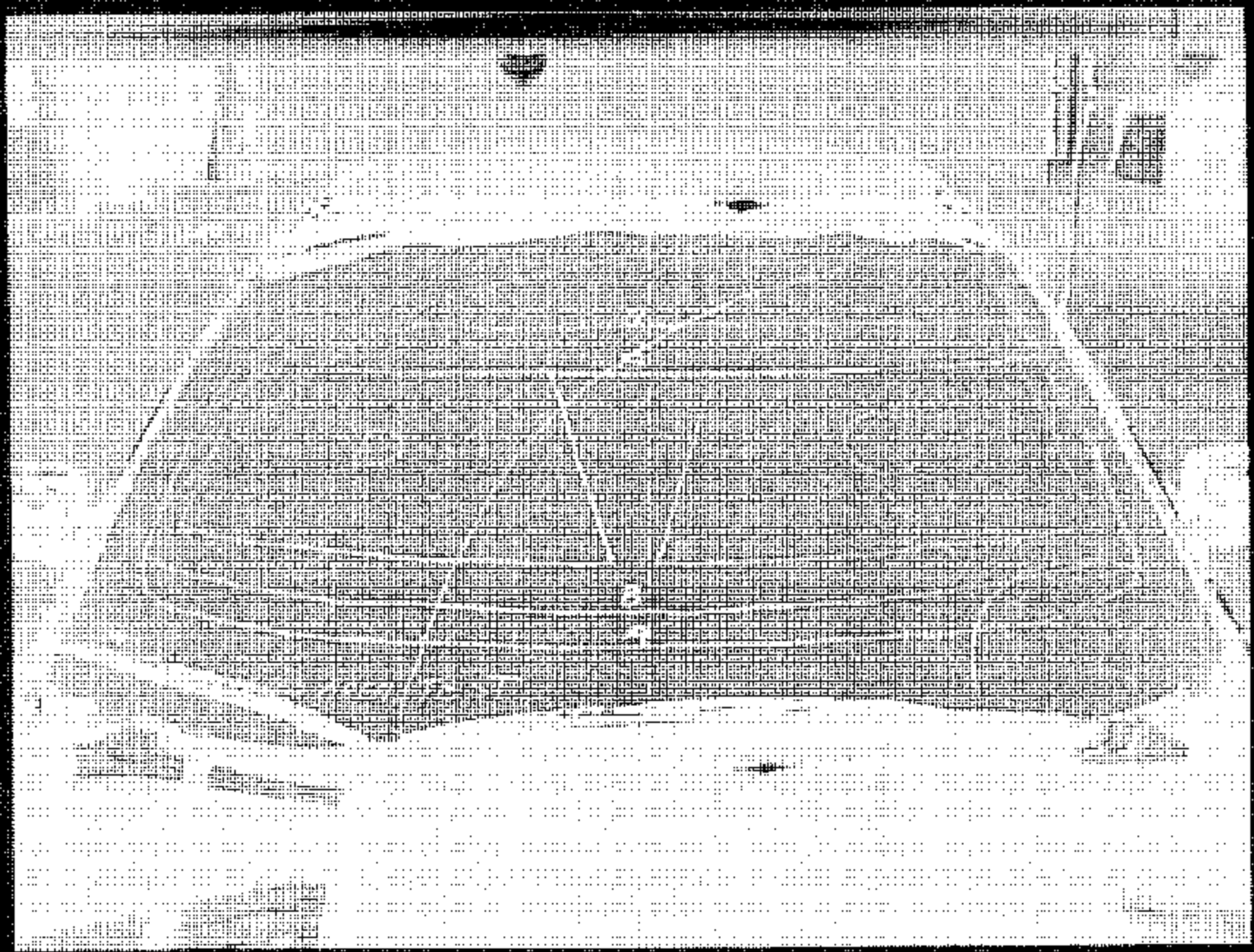
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.7
EQUIPMENT SET-UP



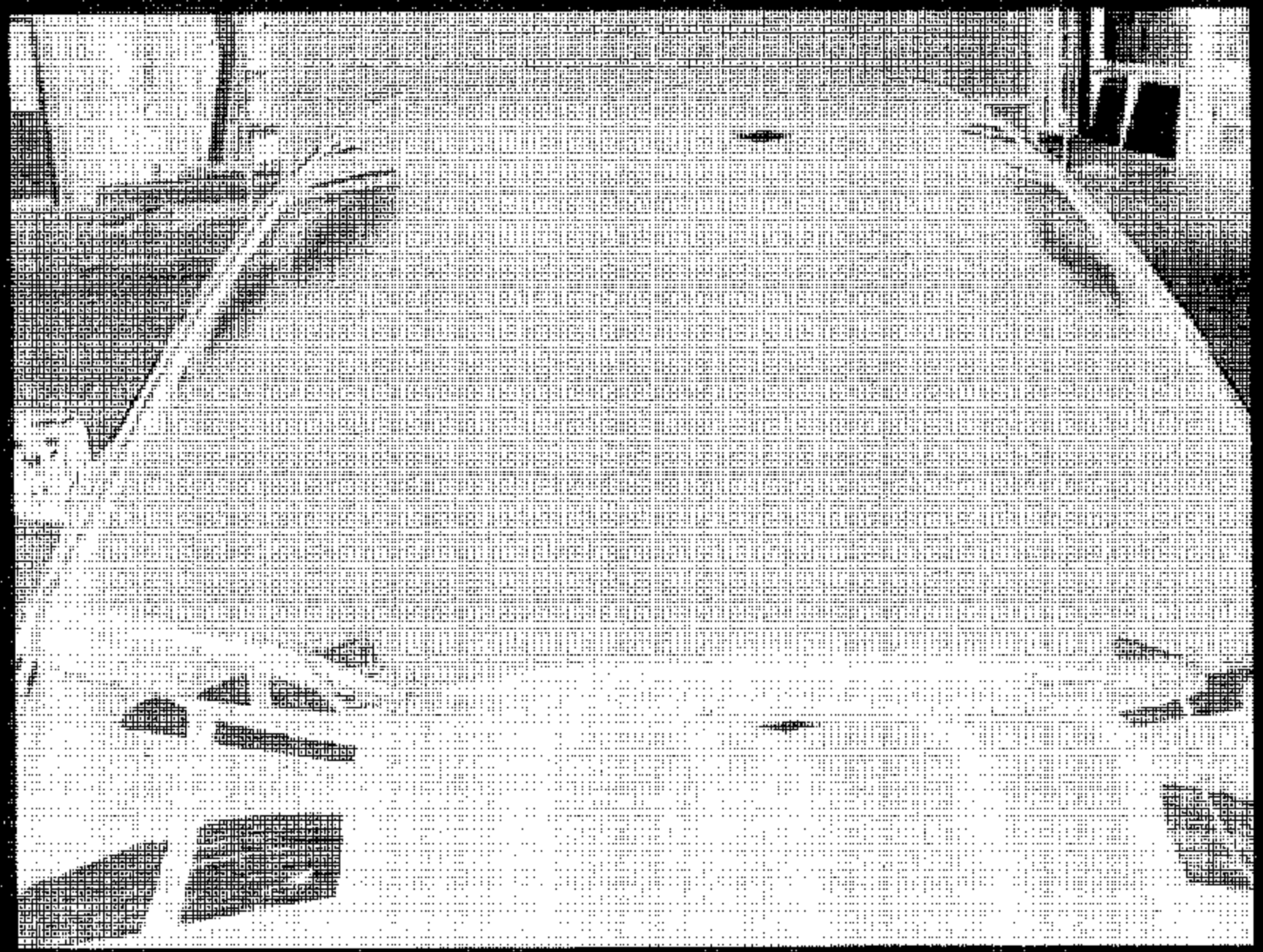
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.8
WIPED AREA TEST



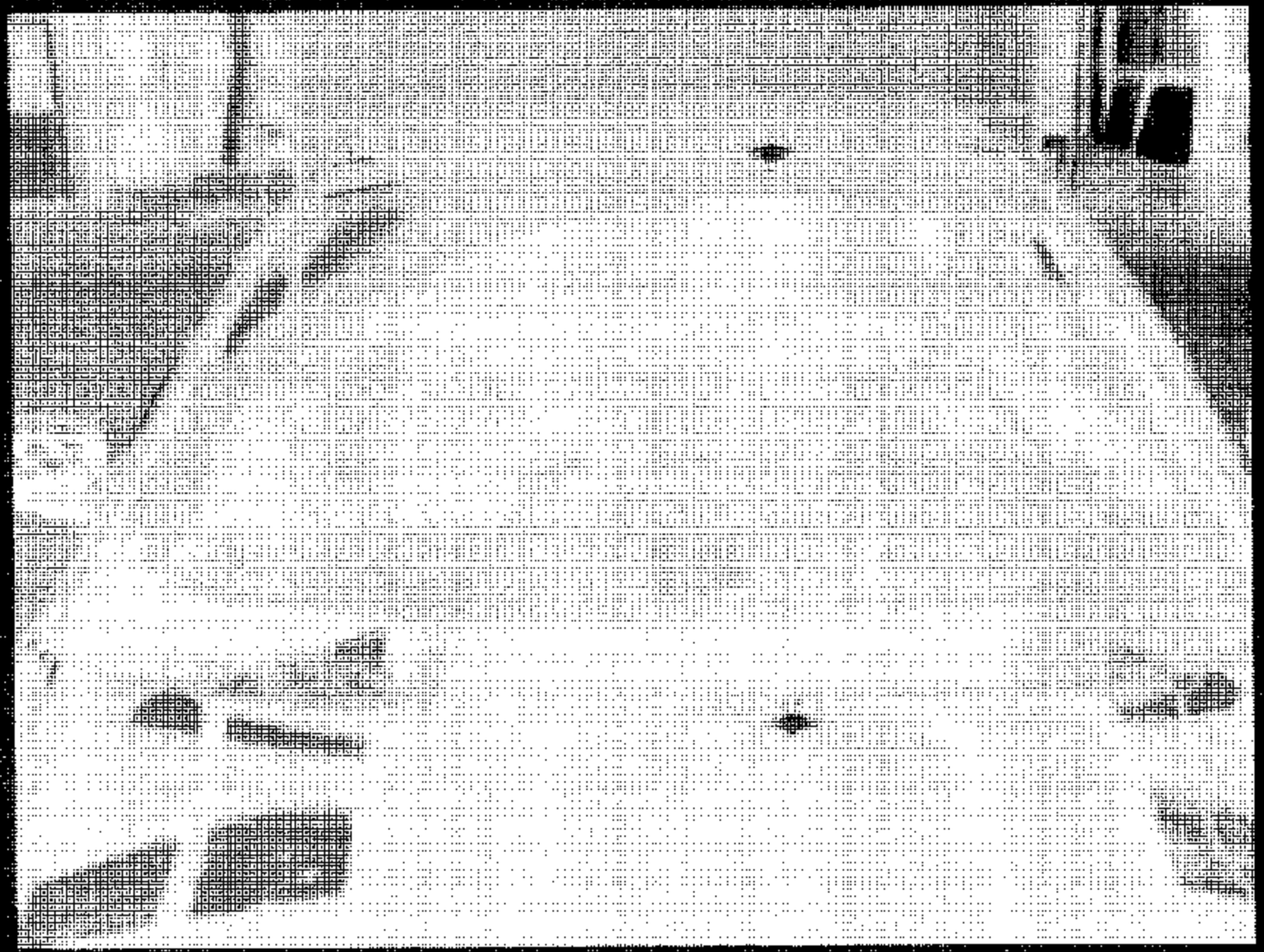
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 6.9
WIPED AREA TEST PATTERN



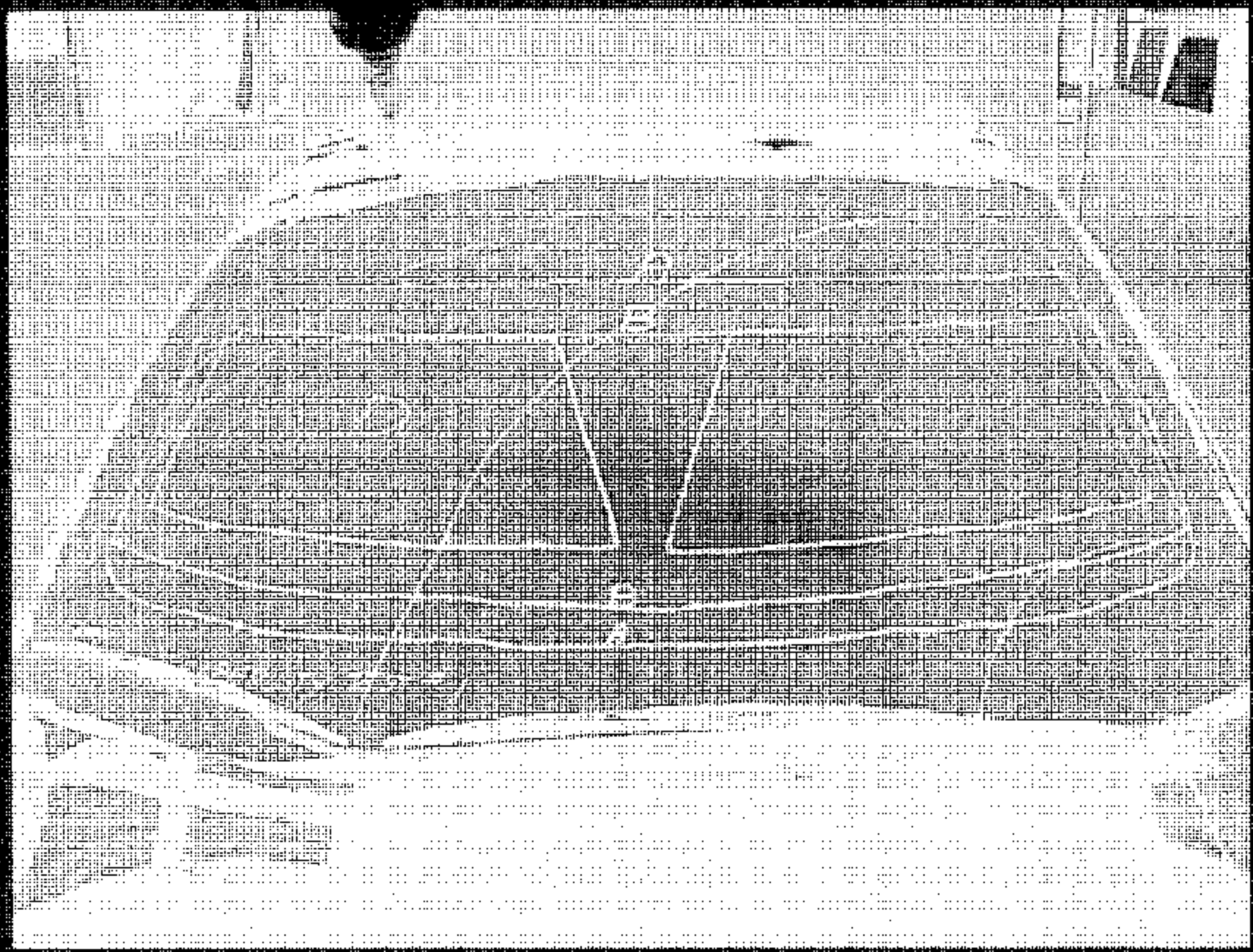
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.10
CAPABILITY TEST #1 – PRE-COATED WINDSHIELD



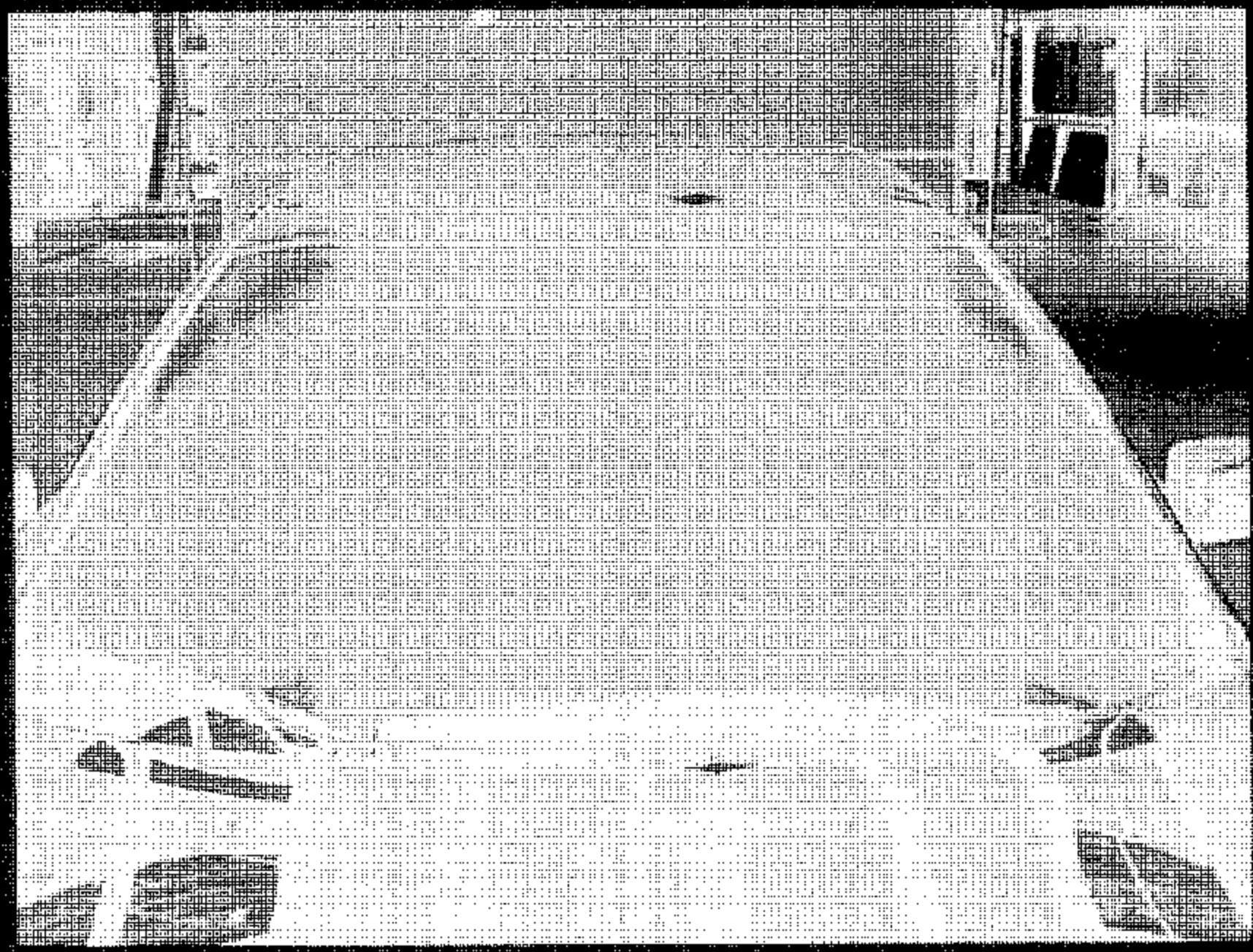
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.11
CAPABILITY TEST #1 – IN PROGRESS



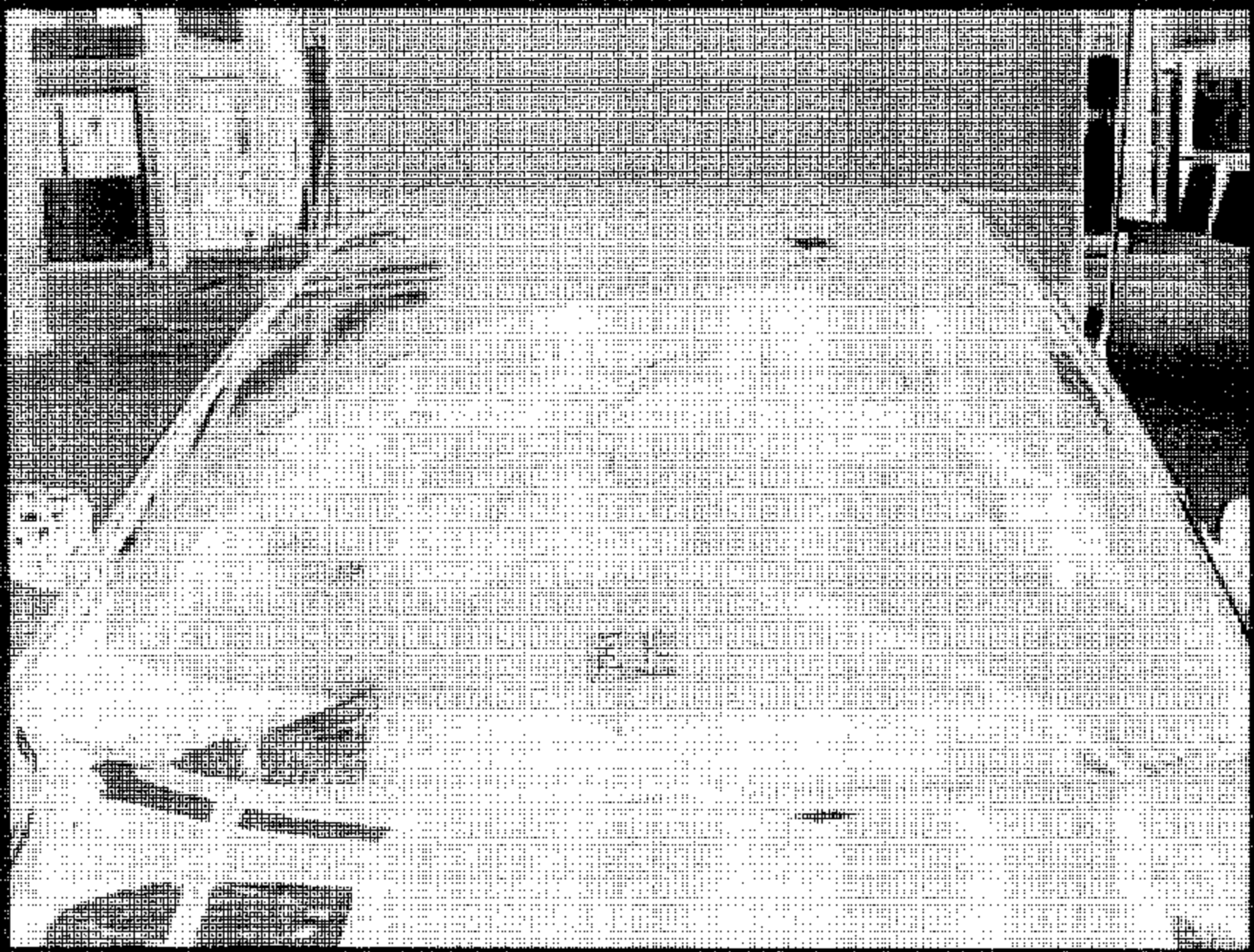
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.12
CAPABILITY TEST #1 - PATTERN



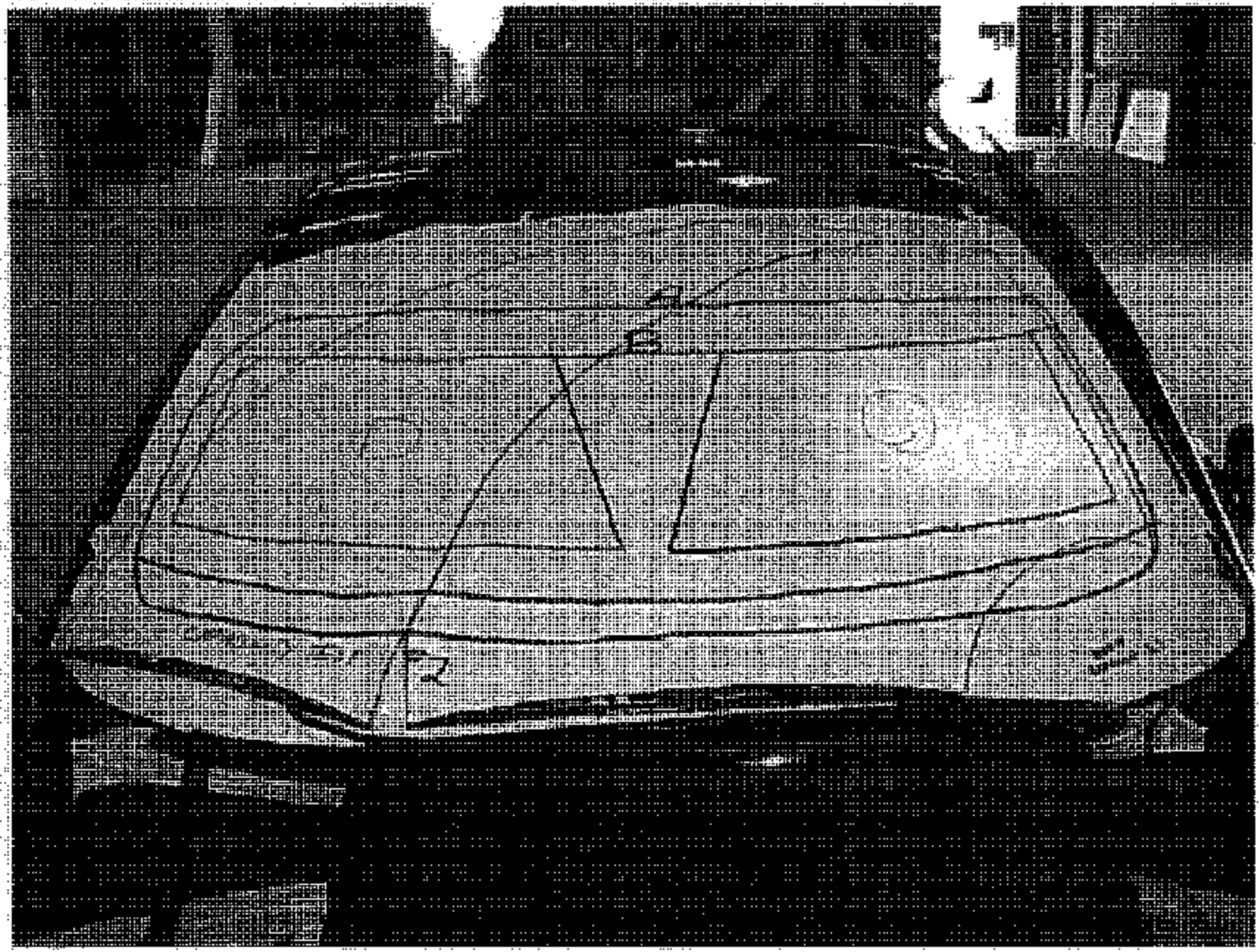
2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.13
CAPABILITY TEST #2 – PRE-COATED WINDSHIELD



2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

FIGURE 5.14
CAPABILITY TEST #2 – IN PROGRESS



2004 LINCOLN LS
NHTSA NO. C40210
FMVSS NO. 104

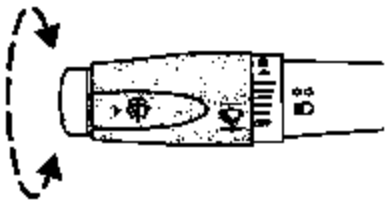
FIGURE 5.15
CAPABILITY TEST #2 - PATTERN

# SECTION 6

# OWNER'S MANUAL INFORMATION

## MULTI-FUNCTION LEVER

**Windshield wiper:** Rotate the end of the control away from you to increase the speed of the wipers; rotate towards you to decrease the speed of the wipers.



**Windshield washer:** Push the end of the stalk:

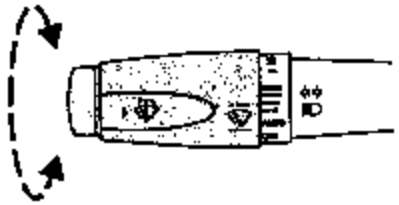
- Quickly pressing the end of the stalk switch causes a single wipe without washer fluid.
- Push and hold the end of the stalk to activate the washer. The wash cycle will continue for up to ten seconds or until released. After release, there will be three clearing wipes.

**Note:** The windshield wiper will not automatically cycle if the washer fluid is low, refer to *Windshield washer fluid* in the *Maintenance and Specifications* chapter.

### Moisture sensitive wipers (If equipped)

The moisture sensitive wipers will automatically activate when moisture is present on the windshield and the multifunction switch is set to one of five Auto sensitivity settings. The five Auto sensitivity settings determine how often the wipers will wipe based upon the moisture on the windshield. Rotating the knob from the Auto position towards the windshield selects a higher sensitivity and more wipes will occur. For fewer wipes, select a lower setting.

The wipers will continue to wipe as long as the presence of moisture is detected on the windshield. The number of wipes that occur will vary based on the amount of moisture detected on the windshield and the Auto setting. The sensitivity to moisture is automatically increased at night. When the ignition is turned ON, the wipers will perform one wipe if one of the five Auto settings is selected.



More or less wiping may occur under the following conditions:

- on cool mornings with high humidity
- in very light mist or rain
- salty water/mist
- hydrophobic coating applied to the windshield such as Rain-X or wax (use of these types of coatings are not recommended)

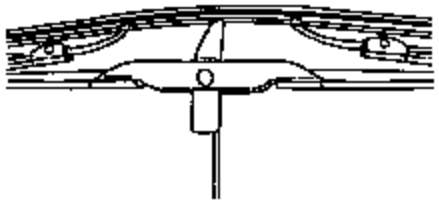
You can override the moisture sensitive wiper function by selecting HIGH, LOW and OFF.

The moisture sensitive wiper feature should be turned OFF prior to entering a car wash.

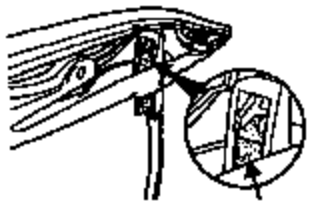
### Changing the wiper blades

To replace the wiper blades:

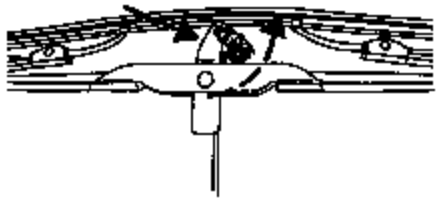
1. Pull the passenger side wiper arm away from the windshield into the service position. Turn the blade at an angle from the wiper arm.



2. Firmly press the release tab from the bottom side of the wiper arm to unlock wiper blade from wiper arm.



3. Pull the wiper blade down toward the windshield to remove it from the arm.

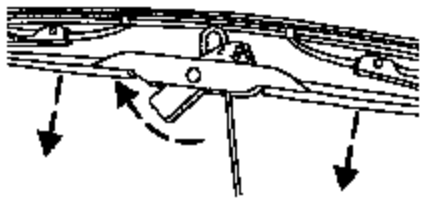






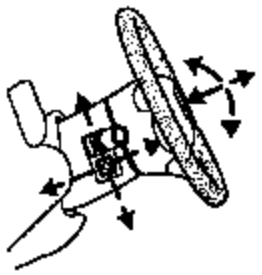
4. Attach the new wiper to the wiper arm and reposition the clip until it locks.

Repeat for driver's side wiper arm.



### POWER TILT/TELESCOPE STEERING COLUMN

The steering column can be adjusted manually by moving the four-way rocker adjustment control located below the turn signal/wiper control stalk. Hold the control to adjust.



The telescope function is adjusted by moving the control toward the driver to telescope out and toward the instrument panel to telescope in.

The tilt function is adjusted by moving the control up or down.

**Easy entry/exit feature**

When you remove the key, the column will move, if this feature is activated through the Message Center, to the full in and up position, refer to the *Message Center* in the *Driver Controls* chapter. When the key is inserted into the ignition, the column will return to the previous setting.

**Note:** The easy entry/exit feature will prevent the steering wheel from returning to the memory position until the key is inserted into the ignition.

**Memory feature**

The steering column positions are saved when doing a memory set function and can be recalled along with the vehicle personality features when a memory position is selected through the remote entry transmitter, keyless entry keypad or memory switch on the driver's door (if equipped with memory feature). Refer to *Memory seats/steering column/mirrors/adjustable pedals* in the *Seating and Safety Restraints* chapter.