

REPORT NOS. 208-TRC-94-003

212-TRC-94-003

301-TRC-94-003

VEHICLE SAFETY COMPLIANCE TESTING
FOR OCCUPANT CRASH PROTECTION,
WINDSHIELD MOUNTING, WINDSHIELD ZONE INTRUSION,
AND FUEL SYSTEM INTEGRITY

NISSAN MOTOR COMPANY, LTD.

1994 NISSAN ALTIMA

4-DOOR SEDAN

NHTSA NO. CR5201

TRC TEST NO. 931103

TRANSPORTATION RESEARCH CENTER INC.

10820 STATE ROUTE 347

EAST LIBERTY, OHIO 43319



NOVEMBER 19, 1993

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF VEHICLE SAFETY COMPLIANCE (NEF-31)
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Date 5/26/94

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16. Abstract A 30 mph flat frontal barrier impact test was conducted on a 1994 Nissan Altima 4-door sedan, NHTSA No. CR5201, at Transportation Research Center Inc. on November 3, 1993. This test was conducted to determine compliance with Federal Motor Vehicle Safety Standards: FMVSS 208, "Occupant Crash Protection"; 212, "Windshield Mounting"; 219 (partial), "Windshield Zone Intrusion"; and 301 "Fuel System Integrity." The barrier impact velocity was 29.3 mph. The vehicle's maximum static crush was 16.0 inches. The ambient temperature was 70° F. The driver's head injury criteria (HIC) was 297. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 45.7 g. The driver's left and right femur maximum axial forces were 1469 pounds and 1277 pounds, respectively. The passenger's HIC was 318. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 35.9 g. The passenger's left and right femur maximum axial forces were 968 pounds and 1708 pounds, respectively. The vehicle appears to comply with the applicable requirements of FMVSS 208, 212, 219 (partial), and 301.			
17. Key Words Frontal Impact 30 mph Vehicle Safety Compliance Testing: FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Mounting" FMVSS 219 (partial), "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity"		18. Distribution Statement Available from: NHTSA Technical Reference Division Room 5108, (NAD-52) 400 Seventh Street, S.W. Washington, DC 20590 Attn: Mr. Robert Hornickle	
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures				Approximate Conversions from Metric Measures			
Symbol	When You Know	Multiply by	To Find	Symbol	When You Know	Multiply by	To Find
LENGTH				LENGTH			
in	inches	2.5	centimeters	mm	millimeters	0.04	inches
ft	feet	30	centimeters	cm	centimeters	0.4	inches
yd	yards	0.9	meters	m	meters	3.3	feet
mi	miles	1.6	kilometers	km	kilometers	1.1	yards
						0.5	miles
AREA				AREA			
in ²	square inches	6.5	square centimeters	cm ²	square centimeters	0.16	square inches
ft ²	square feet	0.09	square meters	m ²	square meters	1.2	square yards
yd ²	square yards	0.8	square meters	km ²	square kilometers	0.4	square miles
mi ²	square miles	2.6	square kilometers	ha	hectares (10,000 m ²)	2.5	acres
	acres	0.4	hectares				
MASS (weight)				MASS (weight)			
oz	ounces	28	grams	g	grams	0.035	ounces
lb	pounds	0.45	kilograms	kg	kilograms	2.2	pounds
	short tons (2000 lb)	0.9	tonnes	t	tonnes (1000 kg)	1.1	short tons
VOLUME				VOLUME			
tsp	teaspoons	5	milliliters	ml	milliliters	0.03	fluid ounces
Tbsp	tablespoons	15	milliliters	l	liters	2.1	pints
fl oz	fluid ounces	30	milliliters	l	liters	1.06	quarts
c	cups	0.24	liters	m ³	cubic meters	0.26	gallons
pt	pints	0.47	liters			35	cubic feet
qt	quarts	0.95	liters			1.3	cubic yards
gal	gallons	3.8	liters				
fl ³	cubic feet	0.03	cubic meters				
yd ³	cubic yards	0.76	cubic meters				
TEMPERATURE (exact)				TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature

* 1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 290, Units of Weights and Measures, Price \$2.25, 3D Catalog No. C13.10-286.

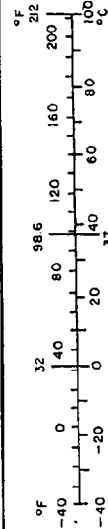


TABLE OF CONTENTS

<u>SECTION</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1.0	PURPOSE & TEST PROCEDURE	1-1
2.0	FRONTAL BARRIER IMPACT TEST SUMMARY	2-1
3.0	FMVSS 208, 212, 219 (PARTIAL), & 301 DATA	3-1
4.0	VEHICLE, OCCUPANT, & CAMERA MEASUREMENTS	4-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	DATA PLOTS	B-1

LIST OF TABLES

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1	CRASH TEST SUMMARY	2-4
2	TEST VEHICLE INFORMATION	2-5
3	POST-IMPACT DATA	2-8
4	VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY	2-12
5	DUMMY INJURY CRITERIA	3-2
6	FMVSS 208 COMFORT AND CONVENIENCE DATA FOR MANUAL SEAT BELTS	3-4
7	FMVSS 208 SEAT BELT WARNING SYSTEM DATA	3-7
8	FMVSS 208 LABELING AND DRIVER'S MANUAL DATA	3-8
9	FMVSS 208 READINESS INDICATOR DATA	3-9
10	FUEL SYSTEM DATA	3-12
11	FMVSS 301 POST-IMPACT TEST DATA	3-13
12	IMPACTED VEHICLE MEASUREMENTS	4-3
13	DUMMY MEASUREMENT DATA FOR FRONT SEAT OCCUPANTS	4-6
14	MOTION PICTURE CAMERA LOCATIONS	4-9

LIST OF FIGURES

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1	IMPACT VELOCITY MEASUREMENT SYSTEM	2-9
2	ACCIDENT INVESTIGATION DIVISION DATA FOR 30 MPH FRONTAL BARRIER IMPACT	2-10
3	VEHICLE ACCELEROMETER PLACEMENT	2-11
4	FMVSS 212 TEST DATA	3-10
5	FMVSS 219 TEST DATA	3-11
6	FMVSS 301 STATIC ROLLOVER TEST DATA	3-14
7	PRE-TEST AND POST-TEST MEASUREMENT POINTS	4-2
8	VEHICLE TARGET LOCATIONS	4-4
9	DUMMY MEASUREMENT LOCATIONS FOR FRONT SEAT OCCUPANTS	4-5
10	CAMERA POSITIONS	4-7

LIST OF PHOTOGRAPHS

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
A-1.	PRE-TEST FRONT VIEW	A-2
A-2.	POST-TEST FRONT VIEW	A-3
A-3.	PRE-TEST LEFT SIDE VIEW	A-4
A-4.	POST-TEST LEFT SIDE VIEW	A-5
A-5.	PRE-TEST REAR VIEW	A-6
A-6.	POST-TEST REAR VIEW	A-7
A-7.	PRE-TEST RIGHT SIDE VIEW	A-8
A-8.	POST-TEST RIGHT SIDE VIEW	A-9
A-9.	PRE-TEST RIGHT FRONT THREE-QUARTER VIEW	A-10
A-10.	POST-TEST RIGHT FRONT THREE-QUARTER VIEW	A-11
A-11.	PRE-TEST LEFT REAR THREE-QUARTER VIEW	A-12
A-12.	POST-TEST LEFT REAR THREE-QUARTER VIEW	A-13
A-13.	PRE-TEST WINDSHIELD VIEW	A-14
A-14.	POST-TEST WINDSHIELD VIEW	A-15
A-15.	PRE-TEST ENGINE COMPARTMENT VIEW	A-16
A-16.	POST-TEST ENGINE COMPARTMENT VIEW	A-17
A-17.	PRE-TEST FUEL FILLER CAP VIEW	A-18
A-18.	POST-TEST FUEL FILLER CAP VIEW	A-19
A-19.	PRE-TEST FUEL FILLER NECK AND FUEL TANK VIEW	A-20
A-20.	POST-TEST FUEL FILLER NECK AND FUEL TANK VIEW	A-21
A-21.	PRE-TEST FRONT UNDERBODY VIEW	A-22
A-22.	POST-TEST FRONT UNDERBODY VIEW	A-23
A-23.	PRE-TEST REAR UNDERBODY VIEW	A-24
A-24.	POST-TEST REAR UNDERBODY VIEW	A-25
A-25.	PRE-TEST DRIVER'S SIDE INSTRUMENT PANEL VIEW	A-26
A-26.	PRE-TEST PASSENGER'S SIDE INSTRUMENT PANEL VIEW	A-27
A-27.	PRE-TEST DRIVER DUMMY POSITION - VIEW 1	A-28
A-28.	POST-TEST DRIVER DUMMY POSITION - VIEW 1	A-29
A-29.	PRE-TEST DRIVER DUMMY POSITION - VIEW 2	A-30
A-30.	POST-TEST DRIVER DUMMY POSITION - VIEW 2	A-31
A-31.	PRE-TEST PASSENGER DUMMY POSITION - VIEW 1	A-32
A-32.	POST-TEST PASSENGER DUMMY POSITION - VIEW 1	A-33

LIST OF PHOTOGRAPHS, CONT'D.

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
A-33.	PRE-TEST PASSENGER DUMMY POSITION - VIEW 2	A-34
A-34.	POST-TEST PASSENGER DUMMY POSITION - VIEW 2	A-35
A-35.	PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1	A-36
A-36.	POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1	A-37
A-37.	PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2	A-38
A-38.	POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2	A-39
A-39.	PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1	A-40
A-40.	POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1	A-41
A-41.	PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2	A-42
A-42.	POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2	A-43
A-43.	POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 1	A-44
A-44.	POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 2	A-45
A-45.	POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1	A-46
A-46.	POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 2	A-47
A-47.	POST-TEST PASSENGER DUMMY HEAD CONTACT - VIEW 1	A-48
A-48.	POST-TEST PASSENGER DUMMY HEAD CONTACT - VIEW 2	A-49
A-49.	POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1	A-50
A-50.	POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2	A-51
A-51.	PRE-TEST VEHICLE CERTIFICATION LABEL VIEW	A-52
A-52.	PRE-TEST VEHICLE RECOMMENDED TIRE PRESSURE LABEL VIEW	A-53
A-53.	POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW	A-54
A-54.	PRE-TEST BALLAST LOCATION VIEW	A-55

SECTION 1.0

PURPOSE & TEST PROCEDURE

PURPOSE

This 30 mph flat frontal barrier impact test is part of the Federal Motor Vehicle Safety Standards (FMVSS) 208, 212, 219 (partial), and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by the Transportation Research Center Inc. (TRC) under Contract No. DTNH22-90-D-22121. The purpose of this test was to determine if the subject vehicle, a 1994 Nissan Altima 4-door sedan, NHTSA No. CR5201, meets the performance requirements of FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Mounting"; FMVSS 219 (partial), "Windshield Zone Intrusion"; and FMVSS 301, "Fuel System Integrity," in the flat frontal barrier impact mode.

TEST PROCEDURE

This test was conducted in accordance with NHTSA's Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-208-08. Data was obtained relative to FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Mounting"; FMVSS 219 (partial), "Windshield Zone Intrusion"; and FMVSS 301, "Fuel System Integrity," performance.

The test vehicle was instrumented with seven (7) accelerometers to measure longitudinal axis accelerations and one (1) accelerometer to measure vertical axis acceleration. The vehicle's specified impact velocity range was 28.9 to 29.9 mph. The vehicle impacted a flat frontal barrier.

The test vehicle contained two (2) Part 572 B 50th percentile adult male anthropomorphic test devices (dummies). The dummies were positioned in the front outboard designated seating positions according to the dummy placement procedure specified in Appendices B and C of the Laboratory Test Procedure.

Both dummies were instrumented with head and chest accelerometers to measure longitudinal, lateral, and vertical accelerations, and with left and right femur load cells to measure axial forces.

The twenty-four (24) data channels were multiplexed and recorded on a 14-track tape drive. The data was digitally sampled at 12,500 samples per second and processed per sections 12.8 and 12.9 of the Laboratory Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and fourteen (14) high-speed motion picture cameras. The pre-test and post-test conditions were recorded by one (1) real-time motion picture camera.

The vehicle and occupant data are summarized in Section 2.0. The FMVSS 208, 212, 219 (partial) and 301 data are presented in Section 3.0. The vehicle, occupant, and camera measurements are presented in Section 4.0. Appendix A contains the still photographic prints. Appendix B contains the dummy and vehicle data plots.

SECTION 2.0

FRONTAL BARRIER IMPACT TEST SUMMARY

TEST RESULTS SUMMARY

This flat frontal barrier test was conducted at TRC on November 3, 1993.

The test vehicle, a 1994 Nissan Altima 4-door sedan, NHTSA No. CR5201, appeared to comply with the performance requirements of FMVSS 208, 212, 219 (partial), and 301 in the flat frontal barrier impact mode. The Head Injury Criteria (HIC) calculations were less than 1000, the chest resultant accelerations did not exceed 60 g's, and the axial forces transmitted through the upper legs did not exceed 2,250 pounds as measured by Part 572 B dummies seated in the front outboard designated seating positions. The vehicle's restraint system met the applicable comfort and convenience requirements. The windshield periphery retention was 100 percent. There was no penetration into any portion of the windshield. No fluid spilled from the vehicle's fuel system following the impact or during the static rollover test.

The test vehicle was equipped with an airbag at both the driver and right front outboard passenger positions. The vehicle's test weight was 3396 pounds. The vehicle's impact speed was 29.3 mph. The vehicle's maximum static crush was 16.0 inches.

The driver's head injury criteria (HIC) was 297. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 45.7 g. The driver's left and right femur maximum axial forces were 1469 pounds and 1277 pounds, respectively.

The right front passenger's HIC was 318. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 35.9 g. The right front passenger's left and right femur maximum axial forces were 968 pounds and 1708 pounds, respectively.

There was no loss of windshield periphery retention.

There was no penetration through the windshield.

Following the impact, no fluid spilled from the vehicle's fuel system prior to the static rollover test or during any portion of the static rollover test.

DATA ACQUISITION EXPLANATIONS

The right front passenger's head X, Y, and Z-axis accelerometers, HEDXG1, HEDYG1, and HEDZG1 all recorded questionable data spikes at 105 milliseconds. The head X-axis accelerometer also recorded a questionable data spike at 108 milliseconds. The data spikes were apparently caused by either two loose bolts in the dummy's skull cavity or by the dummy's head contacting the instrument panel as the airbag deflated. The bolts were found and removed during the post-test dummy inspection. The data spikes affected the head resultant acceleration and 36 millisecond head injury criteria (HIC) calculation.

TABLE 1 CRASH TEST SUMMARY

NHTSA NO.:	CR5201	
TEST TYPE:	Frontal Barrier Impact	
TEST DATE:	11/03/93	
TEST TIME:	1430	
AMBIENT TEMPERATURE AT IMPACT AREA:	70° F	
VEHICLE YEAR/MAKE/ MODEL/BODY STYLE:	1994/Nissan/Altima/4-door sedan	
VEHICLE TEST WEIGHT:	3396 LBS.	
IMPACT ANGLE ¹ :	0°	
IMPACT VELOCITY ² :		
PRIMARY:	29.3 MPH	
SECONDARY:	29.3 MPH	
MAXIMUM STATIC CRUSH:	16.0	
AVERAGE REBOUND:	18.7	
NUMBER OF CAMERAS:		
Real-time:	2	
High-speed:	14	
DOOR OPENING DATA:		
LEFT:	Easy	
RIGHT:	Easy	
DUMMIES:	<u>Driver #354</u>	<u>Passenger #1173</u>
TYPE:	Part 572 B	Part 572 B
LOCATION:	Left front	Right front
RESTRAINT:	Airbag	Airbag
NUMBER OF DATA CHANNELS:	8	8
FRONT SEAT DATA:		
SEAT TRACK FAILURE:	None	None
SEAT BACK FAILURE:	None	None
VISIBLE DUMMY CONTACT POINTS:		
HEAD:	Airbag, sun visor, and windshield	Airbag and sun visor
CHEST:	Airbag	Airbag
ABDOMEN:	None	None
LEFT KNEE:	Instrument panel	Instrument panel
RIGHT KNEE:	Instrument panel	Instrument panel

All distance measurements are in inches.

¹With respect to tow track centerline.

²Speed trap measurement (± .05 mph accuracy)

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE YEAR/MAKE/
MODEL\BODY STYLE: 1994/Nissan/Altima/4-door sedan
COLOR: Black
VIN: 1N4BU31D9RC103693
NHTSA NO.: CR5201

ENGINE DATA:
PLACEMENT: _____ LONGITUDINAL/INLINE X TRANSVERSE/LATERAL
CYLINDERS: 4
DISPLACEMENT: 2.4 liters
TRANSMISSION DATA: 4 SPEED, MANUAL, X AUTOMATIC, OVERDRIVE
FINAL DRIVE: X FWD, RWD, 4WD

DATE VEHICLE RECEIVED: 09/29/93
ODOMETER READING: 114
DEALER'S NAME Graham Nissan
AND ADDRESS: P. O. Box 1268
Zanesville, OH 43702

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	Yes
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	Yes
POWER SEATS	No	TILTING STEERING WHEEL	Yes
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	Yes
RADIO	Yes	ANTI-SKID BRAKE	No
CLOCK	Yes	REAR WINDOW DEFROSTER	Yes
POWER DOOR LOCKS	Yes	OTHER	None

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: Nissan Motor Company, Ltd.
DATE OF MANUFACTURE: 08/93
VIN: 1N4BU31D9RC103693
GVWR: 4047 LBS.
GAWR: FRONT: 2270 LBS.
REAR: 1862 LBS.

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

SIZE OF TIRES ON VEHICLE: P205/60R15
TIRE PRESSURE WITH MAXIMUM
CAPACITY VEHICLE LOAD: FRONT: 44 PSI
REAR: 44 PSI
SPARE TIRE: X SPACE SAVER STANDARD
TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P205/60R15 90H
RECOMMENDED COLD TIRE PRESSURE: FRONT: 29 PSI; REAR: 29 PSI
DESIGNATED SEATING CAPACITY: 2 FRONT 3 REAR 5 TOTAL
VEHICLE CAPACITY WEIGHT: 900 LBS.

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

The label was located on the center console.

TEST VEHICLE ATTITUDES:

DELIVERED ATTITUDE:	LF:	28.0;	RF:	27.9;	LR:	27.6;	RR:	27.5
FULLY LOADED ATTITUDE:	LF:	27.4;	RF:	27.5;	LR:	25.8;	RR:	25.6
PRE-TEST ATTITUDE:	LF:	26.9;	RF:	26.8;	LR:	25.8;	RR:	25.5
POST-TEST ATTITUDE:	LF:	29.5;	RF:	27.4;	LR:	26.6;	RR:	24.7

All distance measurements are in inches.

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

WEIGHT OF TEST VEHICLE AS RECEIVED (WITH MAXIMUM FLUIDS):

RIGHT FRONT	938	LBS.	RIGHT REAR	523	LBS.
LEFT FRONT	938	LBS.	LEFT REAR	537	LBS.
TOTAL FRONT WEIGHT	1876	LBS.	(63.9% OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1060	LBS.	(36.1% OF TOTAL VEHICLE WEIGHT)		
TOTAL DELIVERED WEIGHT	2936	LBS.			

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW¹ = RATED CARGO AND LUGGAGE WEIGHT
UDW = UNLOADED DELIVERED WEIGHT (2936 LBS)
VCW = VEHICLE CAPACITY WEIGHT (900 LBS.)
DSC = DESIGNATED SEATING CAPACITY (5)
RCLW¹ = VCW - 150 (DSC) = 150
TARGET TEST WEIGHT = UDW + RCLW¹ + (NUMBER OF HYBRID II DUMMIES
X 164 LBS. PER DUMMY)
TARGET TEST WEIGHT = 2936 + 150 + 328 = 3414 LBS.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 132 LBS. OF CARGO WEIGHT:

RIGHT FRONT	1018	LBS.	RIGHT REAR	695	LBS.
LEFT FRONT	1003	LBS.	LEFT REAR	680	LBS.
TOTAL FRONT WEIGHT	2021	LBS.	(59.5% OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1375	LBS.	(40.5% OF TOTAL VEHICLE WEIGHT)		
TOTAL TEST WEIGHT	3396	LBS.	(0.5% UNDER TARGET TEST WEIGHT)		

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA: 50 LBS.

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG: 41.5 INCHES REARWARD OF FRONT WHEEL CENTERLINE

WHEELBASE: 102.6 INCHES

¹Cargo weight for multi-purpose passenger vehicles, trucks, and buses is the vehicle's rated cargo and luggage weight from the vehicle's label or 300 pounds, whichever is less.

TABLE 3 POST-IMPACT DATA

TEST NUMBER: 931103
NHTSA NO.: CR5201
TEST DATE: 11/03/93
TEST TIME: 1430
TEST TYPE: Frontal Barrier Impact
IMPACT ANGLE: 0°
AMBIENT TEMPERATURE
AT IMPACT AREA: 70° F
TEMPERATURE IN
OCCUPANT COMPARTMENT: 66° F
IMPACT VELOCITY:
PRIMARY: 29.3 MPH
SECONDARY 29.3 MPH
SPECIFIED RANGE: 28.9 TO 29.9 MPH

DISTANCE FROM VEHICLE TO BARRIER:

ENTERING VELOCITY TRAP: 15.0
EXITING VELOCITY TRAP: 2.0

TEST VEHICLE STATIC CRUSH:

OVERALL LENGTH OF TEST VEHICLE:

PRE-TEST:	L:	174.5;	C:	180.8;	R:	174.3
POST-TEST:	L:	163.4;	C:	164.8;	R:	161.6
TOTAL CRUSH:	L:	11.1;	C:	16.0;	R:	12.7
AVERAGE CRUSH:		13.3				

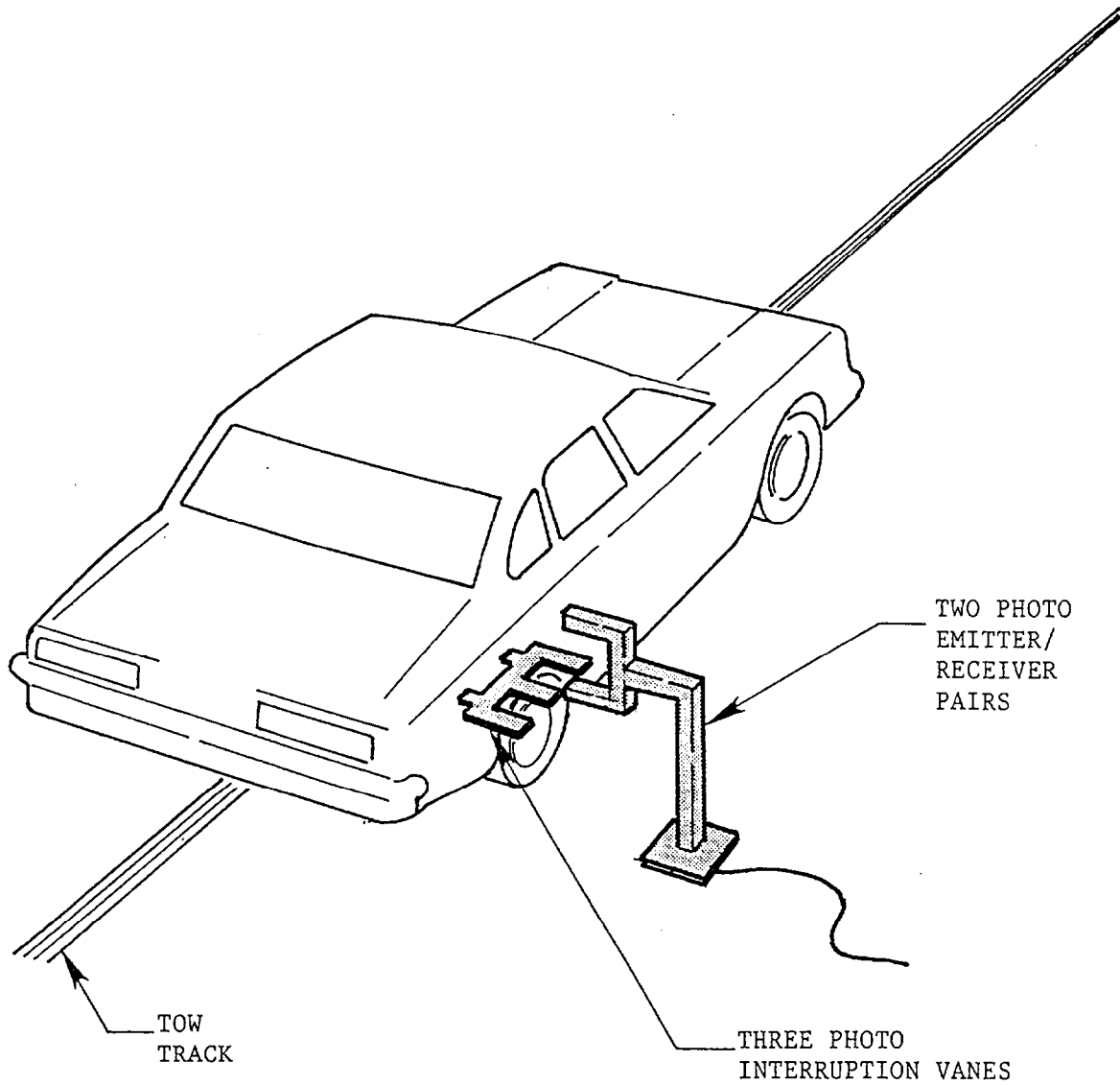
TEST VEHICLE REBOUND FROM FLAT BARRIER:

DISTANCE FROM TEST VEHICLE TO BARRIER:

L:	18.8;	C:	16.9;	R:	20.5
AVG.:	18.7				

All distance measurements are in inches.

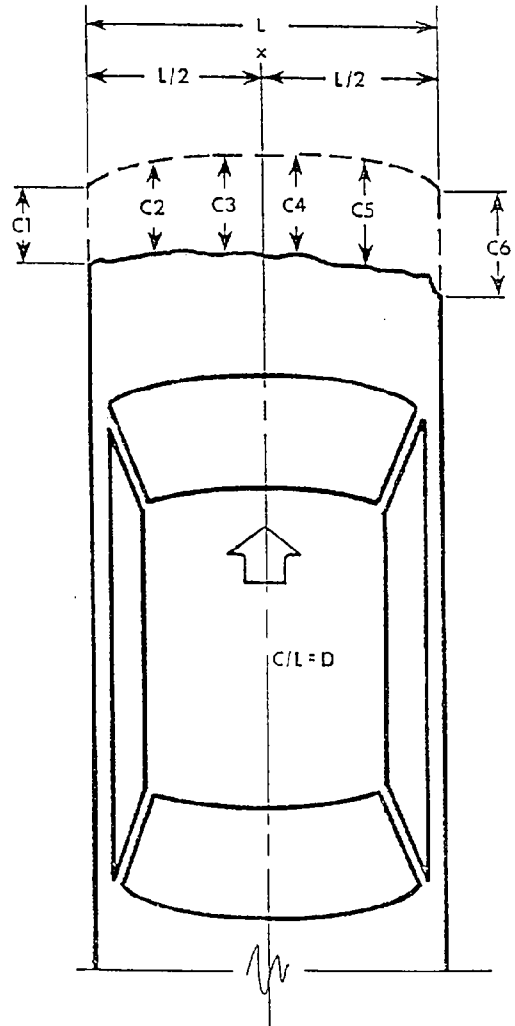
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane clears emitter/receiver two inches before impact.
The vanes have one-foot spacing.

FIGURE 2 ACCIDENT INVESTIGATION DIVISION DATA
FOR 30 MPH FRONTAL BARRIER IMPACT

NHTSA NO.: CR5201
 TEST DATE: 11/03/93
 VEHICLE YEAR/MAKE/
 MODEL/BODY STYLE: 1994/Nissan/Altima/4-door sedan
 VEHICLE SIZE CATEGORY: Compact
 VIN: 1N4BU31D9RC103693
 BUILD DATE: 08/93
 TEST WEIGHT: 3396 LBS.
 VEHICLE WHEELBASE: 102.6
 MAXIMUM WIDTH: 66.6
 FRONT OVERHANG: 36.1



COLLISION DEFORMATION

CLASSIFICATION (CDC) CODE: 12FDEW2

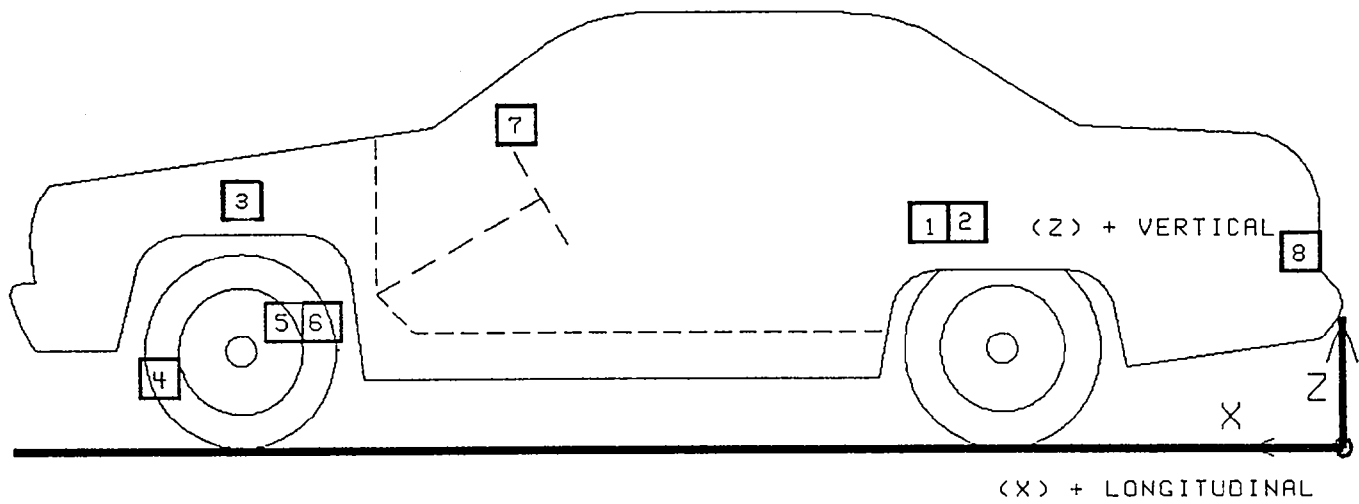
CRUSH DEPTH	C1:	11.1
MEASUREMENTS:	C2:	13.4
	C3:	14.5
	C4:	15.9
	C5:	15.7
	C6:	12.7

MIDPOINT OF DAMAGE: D: Vehicle Longitudinal Centerline

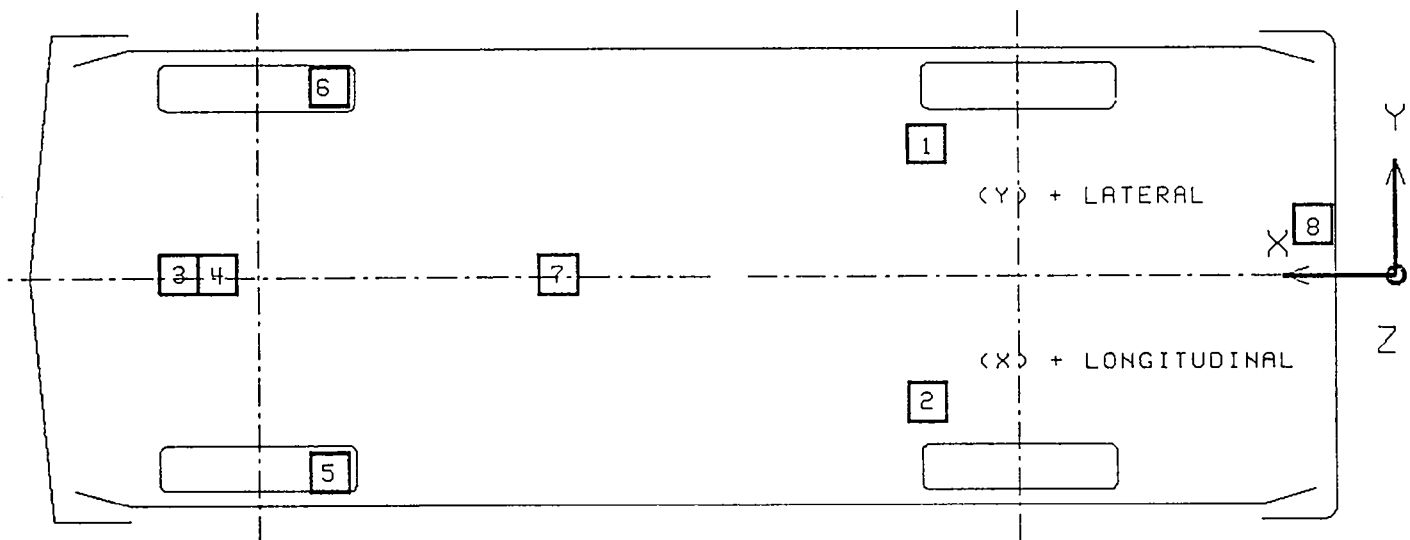
LENGTH OF DAMAGED
 REGION: L: 58.5

All distance measurements are in inches.

FIGURE 3 VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 931103

No. LOCATION		X*	Y*	Z*	POSITIVE		NEGATIVE	
					DIRECTION		DIRECTION	
					MAX G MSEC		MAX G MSEC	
1 LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE	69.4	24.7	11.9				
	POST	69.5	24.7	14.0				
					1.7	123.4	41.7	41.8
2 RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE	69.6	-24.1	11.6				
	POST	69.6	-24.1	12.4				
					2.3	189.6	38.5	43.5
3 ENGINE TOP LONGITUDINAL	PRE	155.9	0.0	31.9				
	POST	149.2	0.0	32.2				
					51.2	45.2	91.0	36.6
4 ENGINE BOTTOM LONGITUDINAL	PRE	152.8	-11.4	6.4				
	POST	147.0	-10.4	6.3				
					43.2	41.8	149.6	31.8

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY CONTINUED

TEST NUMBER 931103

No. LOCATION	X*	Y*	Z*	POSITIVE		NEGATIVE	
				DIRECTION		DIRECTION	
				MAX G MSEC		MAX G MSEC	
5 RIGHT BRAKE CALIPER	PRE 150.4	-25.7	11.4				
	POST 147.4	-25.0	11.6				
LONGITUDINAL			56.5	64.9	105.2	47.2	
6 LEFT BRAKE CALIPER	PRE 150.4	25.7	11.4				
	POST 147.5	24.8	11.0				
LONGITUDINAL			57.9	67.4	96.6	42.9	
7 INSTRUMENT PANEL CENTER	PRE 123.7	0.5	35.9				
	POST 125.2	2.0	37.5				
LONGITUDINAL			18.9	73.7	41.0	79.0	
8 VEHICLE REAR CENTER	PRE 34.2	0.0	19.0				
	POST 34.2	0.0	19.4				
VERTICAL			15.8	53.8	13.8	104.0	

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM REAR BUMPER

Y: + LEFTWARD FROM VEHICLE CENTERLINE

Z: + UPWARD FROM GROUND LEVEL

REPORT OF VEHICLE CONDITION AT THE COMPLETION OF TESTING

CONTRACT NO.: DTNH22-90-D-22121
FROM: Transportation Research Center Inc.
10820 State Route 347
East Liberty, OH 43319

TO: Mr. Charles Case, COTR
Office of Vehicle Safety Compliance

The following vehicle has been subjected to testing for FMVSS 208. The vehicle was inspected upon arrival at the laboratory for the test and found to contain all of the equipment listed below. All variances have been reported within 2 working days of vehicle arrival, by letter, to the NHTSA Industrial Property Manager/NAD-30, with a carbon copy to the responsible testing office. The vehicle is again inspected, after the above test has been conducted, and all changes are noted below. The final condition of the vehicle is also noted in detail.

NHTSA NO.: CR5201
VEHICLE YEAR/MAKE/
MODEL/BODY STYLE: 1994/Nissan/Altima/4-door sedan
BODY COLOR: Black
VIN: 1N4BU31D9RC103693
ODOMETER (ARRIVAL): 114 DATE: 09/29/93
ODOMETER (COMPLETION): 119 DATE: 11/03/93
COST: \$15,326.00

AIR CONDITIONER	Yes	CONSOLE	No	BRAKES	POWER
TINTED GLASS	Yes	TACHOMETER	No	FRONT	Disc
POWER STEERING	Yes	SPEED CONTROL	Yes	REAR	Drum
POWER WINDOWS	Yes	REAR WINDOW DEF.	Yes	FRONT SEATS	Manual
POWER DOOR LOCKS	Yes	SUN/MOON ROOF	No	SEAT TYPE	Front-bucke
RADIO	Yes	T-TOP	No		Rear-bench
CLOCK	Yes	TILT STEERING WHEEL	Yes	NO. OF SEATS	5
ROOF RACK	No	OTHER OPTIONS:	None		
ENGINE:	4 CYLINDERS				
LITERS:	2.4				
TRANSMISSION:	4-speed automatic				
DRIVE TYPE:	Front-wheel drive				
TIRE SIZE:	P205/60R15				
GASOLINE TYPE:	Unleaded				

EQUIPMENT THAT IS NO LONGER ON THE VEHICLE AS NOTED ABOVE: Rear seat,
spare tire

EXPLANATION: Items removed to allow installation of data acquisition
system.

REPORT OF VEHICLE CONDITION AT THE COMPLETION OF TESTING, CONT'D.

VEHICLE CONDITION: Vehicle was subjected to a 30 mph crash test. There is severe structural damage. Various interior and exterior portions of the vehicle have been painted and have had holes drilled to facilitate attachment of instrumentation. Various trim and body parts have been removed including the rear seats. Stoddard solvent replaced the fuel in the fuel system and engine. THE VEHICLE IS FOR SALVAGE ONLY AND IS NOT TO BE REPAIRED FOR HIGHWAY USE.

SECTION 3.0

FMVSS 208, 212, 219 (partial), & 301 DATA

TABLE 5 DUMMY INJURY CRITERIA

MAXIMUM ACCELERATION (G)

	HEAD				CHEST		
	X	Y	Z	R	X	Y	Z
DRIVER	-36.1	-14.0	-58.4	66.9	-50.6	-4.7	-11.0
PASSENGER ¹	-140.0	65.3	191.7	196.8	-34.4	13.6	-34.5

MAXIMUM FEMUR COMPRESSIVE FORCE (LBS.)

	LEFT FEMUR	RIGHT FEMUR
DRIVER	1469	1277
PASSENGER	968	1708

HEAD INJURY CRITERIA²

	HIC	TIME t ₁ (MSEC)	TIME t ₂ (MSEC)
DRIVER	297	76.6	111.1
PASSENGER ¹	318	79.8	115.8

CHEST MAXIMUM RESULTANT ACCELERATION³

	ACCEL. (G)	TIME t ₁ (MSEC)	TIME t ₂ (MSEC)
DRIVER	45.7	79.0	82.0
PASSENGER	35.9	98.6	103.2

¹See DATA ACQUISITION EXPLANATIONS

²As defined in FMVSS No. 208

³Defined as equal to or exceeding 0.003 sec. duration

DUMMY KINEMATIC SUMMARY

Driver Dummy

Upon impact, the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head impacted the airbag and windshield. The dummy's chest impacted the airbag. The driver dummy was restrained by the airbag. The dummy rebounded rearward into the seat back. The dummy's head contacted the driver's sunvisor and then rotated slightly rearward. The dummy came to rest seated in the driver's seat.

Right Front Passenger Dummy

Upon impact, the right front passenger dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated slightly downward impacting the airbag. The dummy's chest impacted the airbag. The right front passenger dummy was restrained by the airbag. The dummy rebounded rearward into the seat back. The dummy's head contacted the passenger side sunvisor and then rotated slightly rearward. The dummy came to rest in the right front passenger's seat.

TABLE 6 FMVSS 208 COMFORT & CONVENIENCE DATA FOR MANUAL SEAT BELTS

MAKE/MODEL/BODY STYLE: Nissan/Altima/4-door sedan
NHTSA NO.: CR5201
VIN: 1N4BU31D9RC103693
DATE OF MANUFACTURE: 08/93

WEBBING TENSION-RELIEVING DEVICE:

DO OUTBOARD SEATING POSITION SEAT BELTS HAVE WEBBING TENSION-RELIEVING DEVICES? (check one): NO

IF YES:

MAXIMUM SLACK RECOMMENDED IN OWNER'S MANUAL: _____ INCHES

DOES OWNER'S MANUAL WARN THAT INTRODUCING SLACK BEYOND THE AMOUNT SPECIFIED CAN SIGNIFICANTLY REDUCE THE EFFECTIVENESS OF THE SHOULDER BELT? _____ YES _____ NO

IF NO, EXPLAIN:

THE WEBBING TENSION-RELIEVING DEVICE IS CANCELLED WHEN

(check one): _____ The adjacent door is opened.
_____ The latch plate is released from the buckle.
_____ A manual means is activated on an open-body vehicle without doors.

OPEN-BODY VEHICLE (without doors): DOES THE MANUAL-MEANS TO CANCEL THE WEBBING TENSION-RELIEVING DEVICE OPERATE PROPERLY? _____ YES

_____ NO

IF NO, EXPLAIN:

BELT CONTACT FORCE:

BELT CONTACT FORCE ON CHEST OF TEST DUMMY: 0.2 POUNDS

TABLE 6 FMVSS 208 COMFORT & CONVENIENCE DATA FOR MANUAL SEAT BELTS, CONT'D.

MAKE/MODEL/BODY STYLE: Nissan/Altima/4-door sedan
NHTSA NO.: CR5201
VIN: 1N4BU31D9RC103693
DATE OF MANUFACTURE: 08/93

LATCHPLATE ACCESS:

ARE THE SEAT BELT LATCHPLATES, IN THEIR NORMAL STOWED POSITION, WITHIN
THE REACH ENVELOPE? YES
DOES THE CLEARANCE TEST BLOCK MOVE UNHINDERED TO THE LATCHPLATE OR
BUCKLE? YES

RETRACTION:

SEAT BELT AUTOMATICALLY RETRACTS WHEN (check one):
 The adjacent vehicle door is open and the seat belt latchplate is
released.
 X The seat belt latchplate is released.

ARE THE STOWED SEAT BELT WEBBING AND HARDWARE PINCHED WHEN THE DOOR IS
CLOSED? NO

OPEN-BODY VEHICLE (without doors): DOES THE SEAT BELT SYSTEM FULLY
RETRACT WHEN THE WEBBING TENSION-RELIEVING DEVICE IS MANUALLY
DEACTIVATED? YES NO

ACCESSIBILITY:

IS THE SEAT CUSHION REMOVABLE SO THE SEAT BACK SERVES A FUNCTION OTHER THAN
SEATING? NO

IS THE SEAT REMOVABLE? NO

IS THE SEAT MOVABLE SO THE SPACE FORMERLY OCCUPIED BY THE SEAT CAN BE USED
FOR A SECONDARY FUNCTION? NO

NOTE: IF ANY OF THE ABOVE ANSWERS ARE "YES", THE ACCESSIBILITY
REQUIREMENTS DO NOT APPLY.

TABLE 6 FMVSS 208 COMFORT & CONVENIENCE DATA FOR MANUAL SEAT BELTS, CONT'D.

MAKE/MODEL/BODY STYLE: Nissan/Altima/4-door sedan
NHTSA NO.: CR5201
VIN: 1N4BU31D9RC103693
DATE OF MANUFACTURE: 08/93

ACCESSIBILITY, CONT'D.

IF WEBBING IS DESIGNED TO PASS THROUGH THE SEAT CUSHION OR BETWEEN THE CUSHION AND SEAT BACK ARE ONE OF THE FOLLOWING PARTS NORMALLY ON TOP OF OR ABOVE THE SEAT CUSHION: LATCHPLATE, BUCKLE, WEBBING?

Not Applicable, the webbing is not designed to pass through the seat cushion or between the cushion and seat back.

ARE THE REMAINING TWO PARTS ACCESSIBLE UNDER NORMAL CONDITIONS?

Not Applicable, the webbing is not designed to pass through the seat cushion or between the cushion and seat back.

DO THE LATCHPLATE AND BUCKLE PASS THROUGH THE GUIDES PROVIDED AND FALL BEHIND THE SEAT WHEN THE BELT IS COMPLETELY RETRACTED (OR DETACHED IF NOT RETRACTABLE); THE SEAT IS MOVED TO ANY POSITION; AND THE SEAT BACK, IF FOLDABLE, IS FOLDED FORWARD AS FAR AS POSSIBLE AND THEN MOVED BACKWARD INTO POSITION?

Not Applicable, the restraint system does not provide guides.

IS THE INBOARD RECEPTACLE END OF THE OUTBOARD SEATING POSITION'S SEAT BELT ACCESSIBLE WITH THE CENTER ARM REST IN ANY POSITION TO WHICH IT CAN BE ADJUSTED WITHOUT MOVING THE ARM REST FOR ACCESS?

Not Applicable, the vehicle does not contain a center arm rest.

TABLE 7 FMVSS 208 SEAT BELT WARNING SYSTEM DATA

WITH OCCUPANT IN DRIVER'S POSITION AND UNIBELT IN STOWED POSITION AND IGNITION SWITCH PLACED IN "START/ON" POSITION:

Duration of audible warning signal = 7 sec.

Duration of reminder light operation = continuous sec.

WITH OCCUPANT IN DRIVER'S POSITION AND UNIBELT IN USE AND THE IGNITION SWITCH PLACED IN "START/ON" POSITION:

Duration of audible warning signal = 0 sec.

(NOTE: audible warning should not operate)

Duration of reminder light operation = 0 sec.

WORDING OF VISUAL WARNING:

 Fasten Seat Belt

 Fasten Belt

 X Symbol from Table 2 of FMVSS 101

 Other:

TABLE 8 FMVSS 208 LABELING AND DRIVER'S MANUAL DATA

DESCRIBE LOCATION OF LABEL WHICH DESCRIBES MANUFACTURER'S MAINTENANCE OR REPLACEMENT SCHEDULE FOR CRASH-DEPLOYED OCCUPANT PROTECTION SYSTEM:

The labels were located on the driver's and right front passenger's sun visors.

THE MANUFACTURER'S RECOMMENDED SCHEDULE IS TO: (check one)

☐ Replace

☐ Repair

☒ Other: Inspect system

This system: (check one)

☐ a. by ☐ month, ☐ year

☐ b. by ☐ miles

☒ c. or after a time interval of ☐ months or 10 years.

☐ d. other: _____

WERE APPROPRIATE INSTRUCTIONS CONCERNING MAINTENANCE AND/OR REPLACEMENT OF THIS SYSTEM PROVIDED? YES, owner's manual, page 2-16

WAS A DESCRIPTION OF THE FUNCTIONAL OPERATION OF THE SYSTEM PROVIDED?
YES, owner's manual, page 2-14 through 2-16

IS THERE A REFERENCE TO THE INSTRUCTIONS AND DESCRIPTION OF THE SYSTEM ON THE LABEL? YES

WAS AN OWNER'S MANUAL PROVIDED? YES

DID THE OWNER'S MANUAL CONTAIN APPROPRIATE INFORMATION CONCERNING MAINTENANCE AND/OR REPLACEMENT AND A DESCRIPTION OF THE FUNCTIONAL OPERATION OF THE SYSTEMS? YES, page 2-14 through 2-16

TABLE 9 FMVSS 208 READINESS INDICATOR DATA

AN OCCUPANT RESTRAINT SYSTEM THAT DEPLOYS IN THE EVENT OF A CRASH SHALL HAVE A MONITORING SYSTEM WITH A READINESS INDICATOR. A TOTALLY MECHANICAL SYSTEM IS EXEMPT FROM THIS REQUIREMENT.

IS THE SYSTEM TOTALLY MECHANICAL? NO

IF NO:

DESCRIBE THE LOCATION OF THE READINESS INDICATOR:

The readiness indicator was located in the lower, mid-right portion of the instrument cluster.

IS THE READINESS INDICATOR CLEARLY VISIBLE TO THE DRIVER? YES

IS A LIST OF THE ELEMENTS IN THE OCCUPANT RESTRAINT SYSTEM, BEING MONITORED BY THE READINESS INDICATOR, PROVIDED?

YES, owner's manual, page 2-16

FIGURE 4 FMVSS 212 TEST DATA

DETAILS OF WINDSHIELD MOUNTING SUCH AS RETENTION METHOD, TRIM TYPE, ETC.:

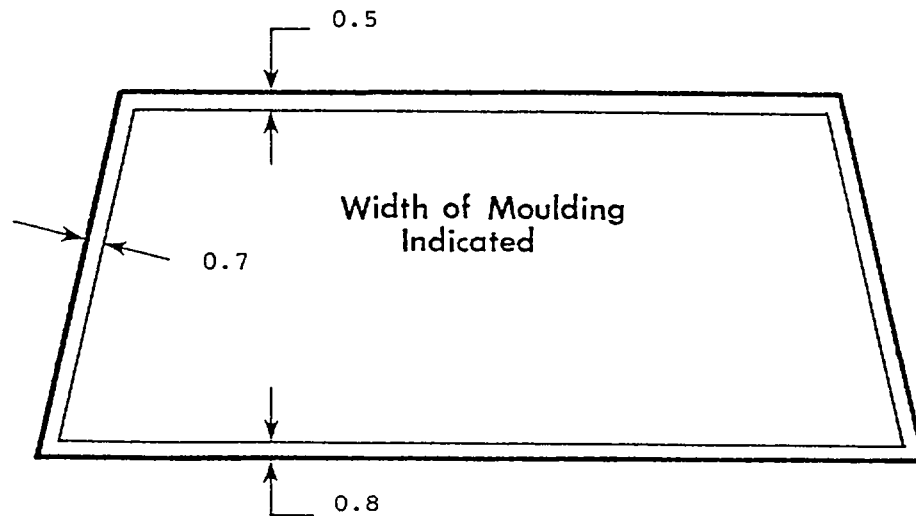
Plastic trim around outer perimeter, adhesive around inner perimeter.

FMVSS 212 REQUIREMENTS: The post-test periphery retention amount must be at least 75% of the pre-test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

WINDSHIELD PERIPHERY MEASUREMENTS:

	PRE-TEST	POST-TEST	PERCENT RETENTION
RIGHT SIDE	81.5	81.5	100
LEFT SIDE	81.5	81.5	100
TOTAL	163.0	163.0	100

PRE-TEST WINDSHIELD MOUNTING MATERIAL TEMPERATURE: 66° F



FRONT VIEW OF WINDSHIELD¹

LOSS OF WINDSHIELD RETENTION LENGTHS: None

All distance measurements are in inches.

¹Indicate areas of loss of retention, if any, on windshield diagram.

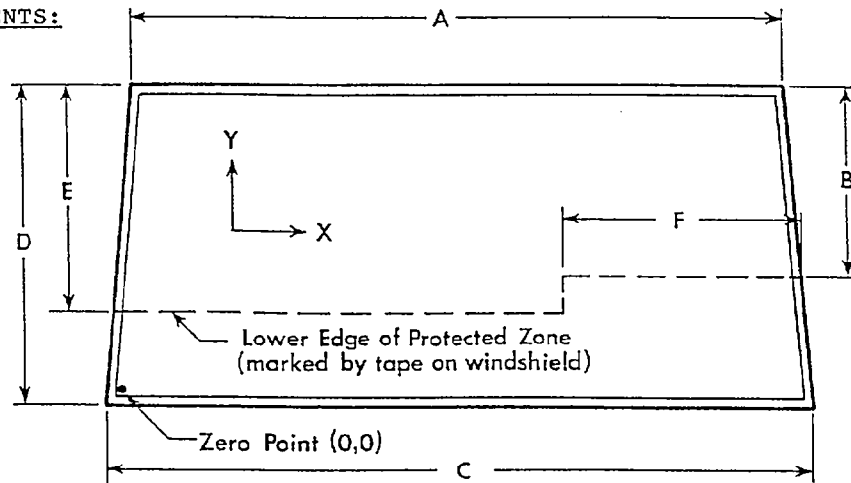
FIGURE 5 FMVSS 219 TEST DATA

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5 inch diameter rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. Draw the locus of points on the inner surface of the windshield contactable by the sphere across the width of the instrument panel. From the outermost contactable points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and 0.5 inch from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection onto the outer surface of the windshield of this line.

WINDSHIELD MEASUREMENTS:

A: 45.4
B: 19.1
C: 58.8
D: 33.2
E: 24.0
F: 33.5



FRONT VIEW

METHOD OF ADHERING PROTECTED ZONE TEMPLATE TO WINDSHIELD: NA

AREAS OF WINDSHIELD TEMPLATE PENETRATION
GREATER THAN 0.25 IN.: NA

COORDINATES
X Y
1.
2.
3.

AREAS OF WINDSHIELD PENETRATION, BELOW THE PROTECTED ZONE,
THROUGH THE INNER SURFACE OF THE WINDSHIELD: None

1.
2.
3.

All measurements are in inches.

TABLE 10 FUEL SYSTEM DATA

MAKE/MODEL: Nissan/Altima
NHTSA NO.: CR5201
FUEL SYSTEM CAPACITY: 15.9 GALLONS (FROM OWNER'S MANUAL)
USABLE CAPACITY: 15.3 GALLONS (FURNISHED BY COTR)
TEST VOLUME RANGE: 14.1 GALLONS TO 14.4 GALLONS (92-94% OF USABLE)
ACTUAL TEST VOLUME: 14.4 GALLONS (WITH ENTIRE FUEL SYSTEM FILLED)
TEST FLUID TYPE: STODDARD SOLVENT
SPECIFIC GRAVITY: 0.764
KINEMATIC VISCOSITY: 0.99 CENTISTOKES
TEST FLUID COLOR: PURPLE

DETAILS OF FUEL SYSTEM: The fuel tank is located in front of the rear
axle. The fuel filler is on the left side. The fuel lines run along
the left side to the front.

ELECTRIC FUEL PUMP: Yes

FUEL INJECTION: Yes

DOES ELECTRIC FUEL PUMP OPERATE WITH IGNITION SWITCH "ON" AND THE ENGINE NOT
OPERATING? No

TABLE 11 FMVSS 301 POST-IMPACT TEST DATA

NHTSA NO.: CR5201
TEST DATE: 11/03/93
VEHICLE YEAR/MAKE/
MODEL/BODY STYLE: 1994/Nissan/Altima/4-door sedan

TEST REQUIREMENTS:

Test vehicle fuel tank filled to 92 to 94% of manufacturer's usable capacity and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

TEST VEHICLE IMPACT TYPE:

 X FRONTAL (30 MPH)
 OBLIQUE (30 MPH) WITH ° BARRIER FACE
FIRST CONTACTING (DRIVER/PASS.) SIDE.
 REAR MOVING BARRIER (30 MPH)
 LATERAL MOVING BARRIER (20 MPH)

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

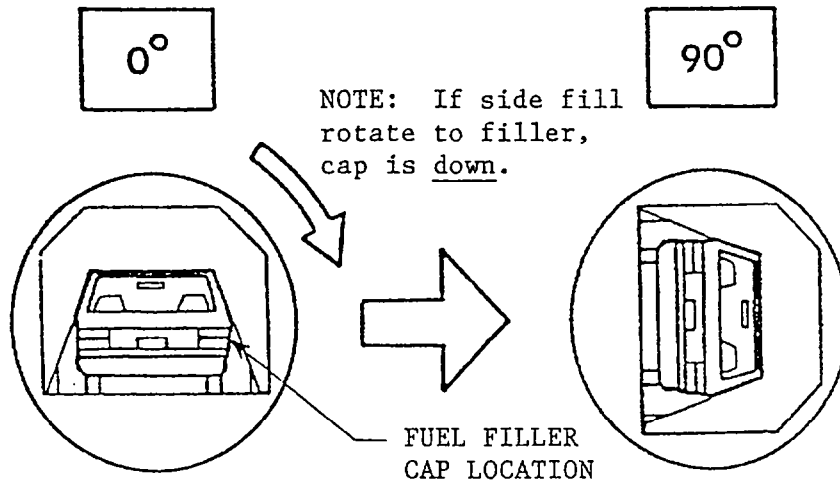
	<u>TEST</u> <u>RESULTS</u>	<u>MAXIMUM</u> <u>ALLOWABLE</u>
1. FROM IMPACT UNTIL VEHICLE MOTION CEASES	0 OZ.	1 OZ.
2. 5-MINUTE PERIOD AFTER VEHICLE MOTION CEASES	0 OZ.	5 OZ.
3. NEXT 25 MINUTES AFTER 5 MINUTE PERIOD	0 OZ.	1 OZ./1 MIN.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 6 FMVSS 301 STATIC ROLLOVER TEST DATA

NHTSA NO.: CR5201
TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

TIME REQ. FOR MACHINE TO ROTATE 90° = 2 minutes, 00 seconds

FMVSS 301 POSITION HOLD TIME = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

NEXT WHOLE MINUTE INTERVAL - - - - = 7 minutes

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

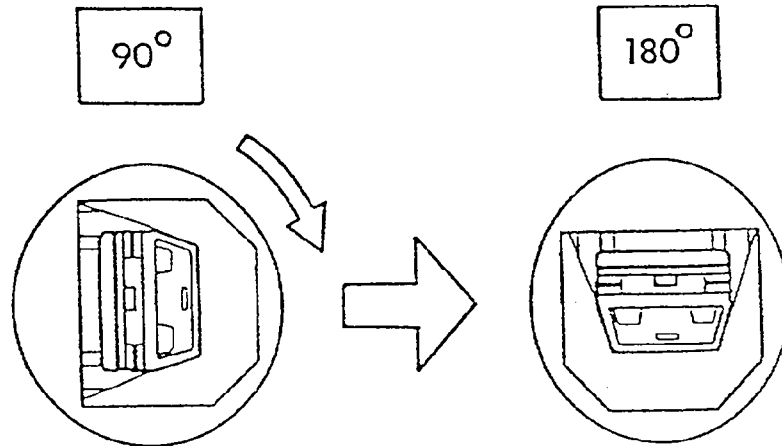
<u>0° TO 90° ROTATION (FUEL FILLER CAP DOWN)</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 6 FMVSS 301 STATIC ROLLOVER TEST DATA, CONT'D.

NHTSA NO.: CR5201
TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

TIME REQ. FOR MACHINE TO ROTATE 90° = 2 minutes, 00 seconds

FMVSS 301 POSITION HOLD TIME = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

NEXT WHOLE MINUTE INTERVAL - - - - = 14 minutes

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

<u>90° TO 180° ROTATION</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

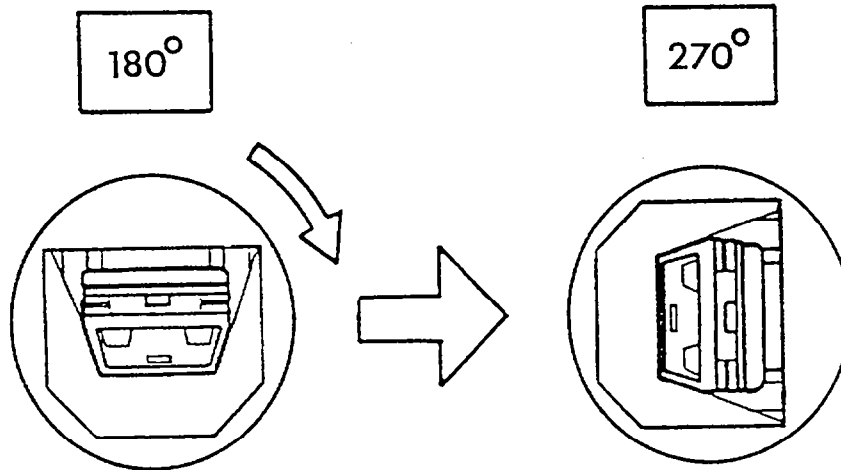
FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 6 FMVSS 301 STATIC ROLLOVER TEST DATA, CONT'D.

NHTSA NO.: CR5201

TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

TIME REQ. FOR MACHINE TO ROTATE 90° = 2 minutes, 00 seconds

FMVSS 301 POSITION HOLD TIME = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

NEXT WHOLE MINUTE INTERVAL - - - - = 21 minutes

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

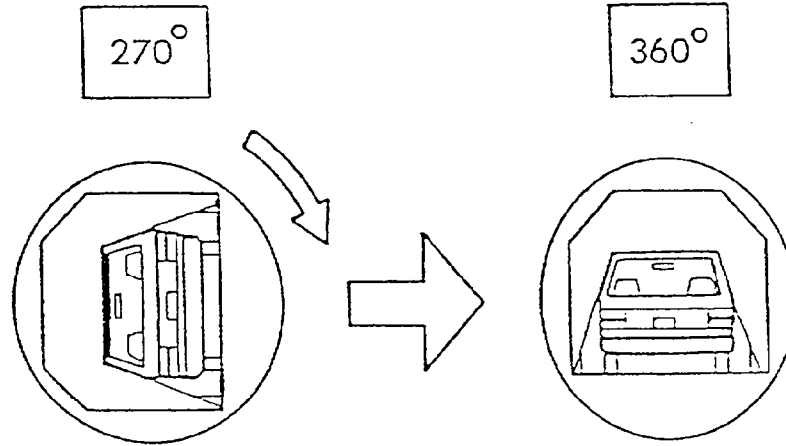
<u>180° TO 270° ROTATION</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 6 FMVSS 301 STATIC ROLLOVER TEST DATA, CONT'D.

NHTSA NO.: CR5201
TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

TIME REQ. FOR MACHINE TO ROTATE 90° = 2 minutes, 00 seconds
 FMVSS 301 POSITION HOLD TIME = 5 minutes, 00 seconds
 TOTAL - - - - - = 7 minutes, 00 seconds
 NEXT WHOLE MINUTE INTERVAL - - - - = 28 minutes

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

<u>270° TO 360° ROTATION</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

SECTION 4.0

VEHICLE, OCCUPANT, AND CAMERA MEASUREMENTS

FIGURE 7 PRE-TEST AND POST-TEST MEASUREMENT POINTS

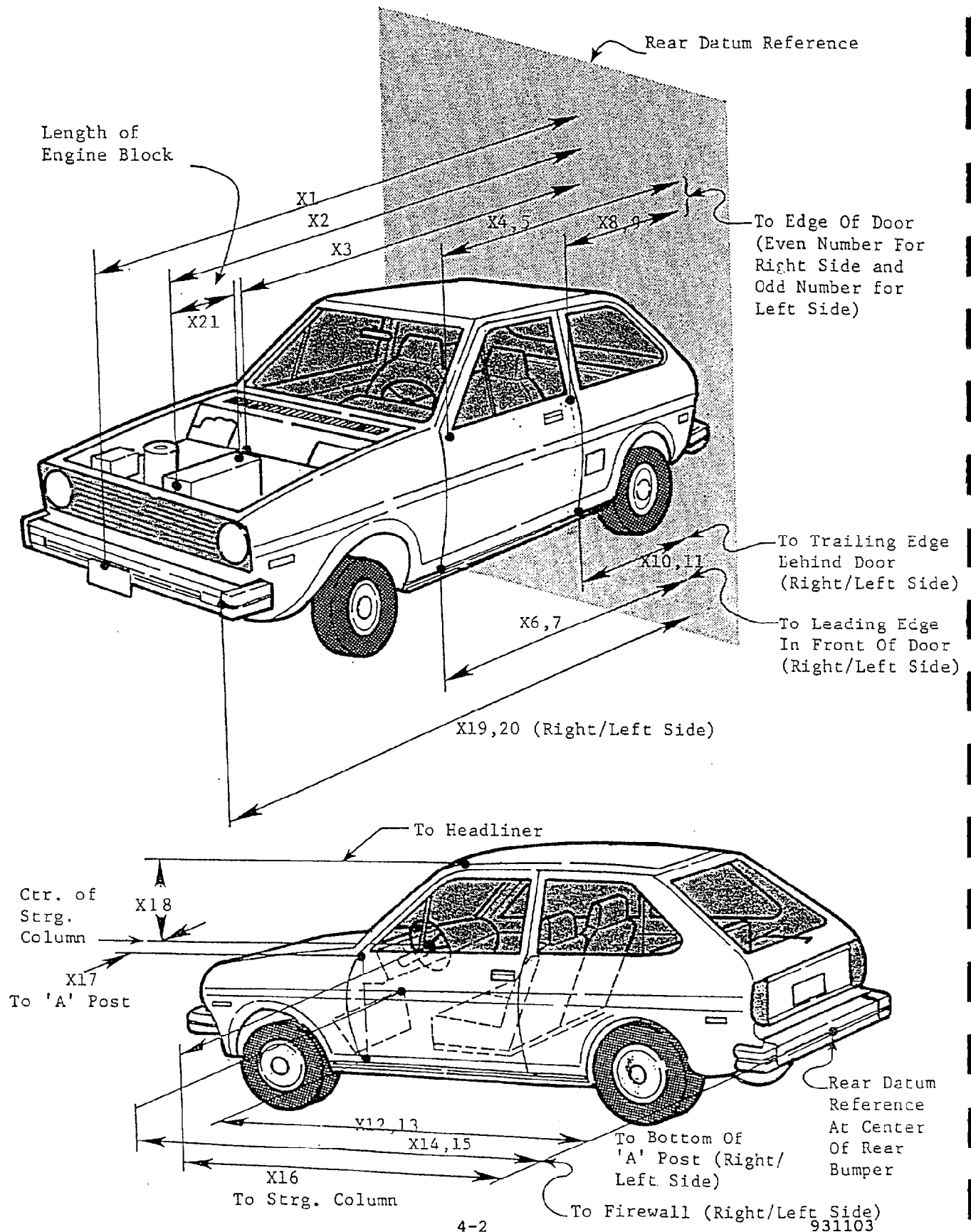


TABLE 12 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: <u>Nissan/Altima</u>		TEST NUMBER: <u>931103</u>		
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	180.8	164.8	16.0
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	156.4	149.5	6.9
X3	REAR SURFACE OF VEHICLE TO FIREWALL	137.5	136.0	1.5
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	125.0	125.6	-0.6
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	125.0	125.5	-0.5
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	124.1	124.2	-0.1
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	124.3	124.5	-0.2
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	82.9	83.4	-0.5
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	83.0	83.4	-0.4
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	82.3	82.5	-0.2
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	82.5	82.6	-0.1
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	124.3	124.1	0.2
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	123.0	124.5	-1.5
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	135.0	135.6	-0.6
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	135.0	133.6	1.4
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	108.4	110.8	-2.4
X17	CENTER OF STEERING COLUMN TO "A" POST	10.6	11.9	-1.3
X18	CENTER OF STEERING COLUMN TO HEADLINER	16.7	16.6	0.1
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	174.3	161.6	12.7
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	174.5	163.4	11.1
X21	LENGTH OF ENGINE BLOCK	20.7	20.7	0.0

All distance measurements are in inches.

FIGURE 8 VEHICLE TARGET LOCATIONS

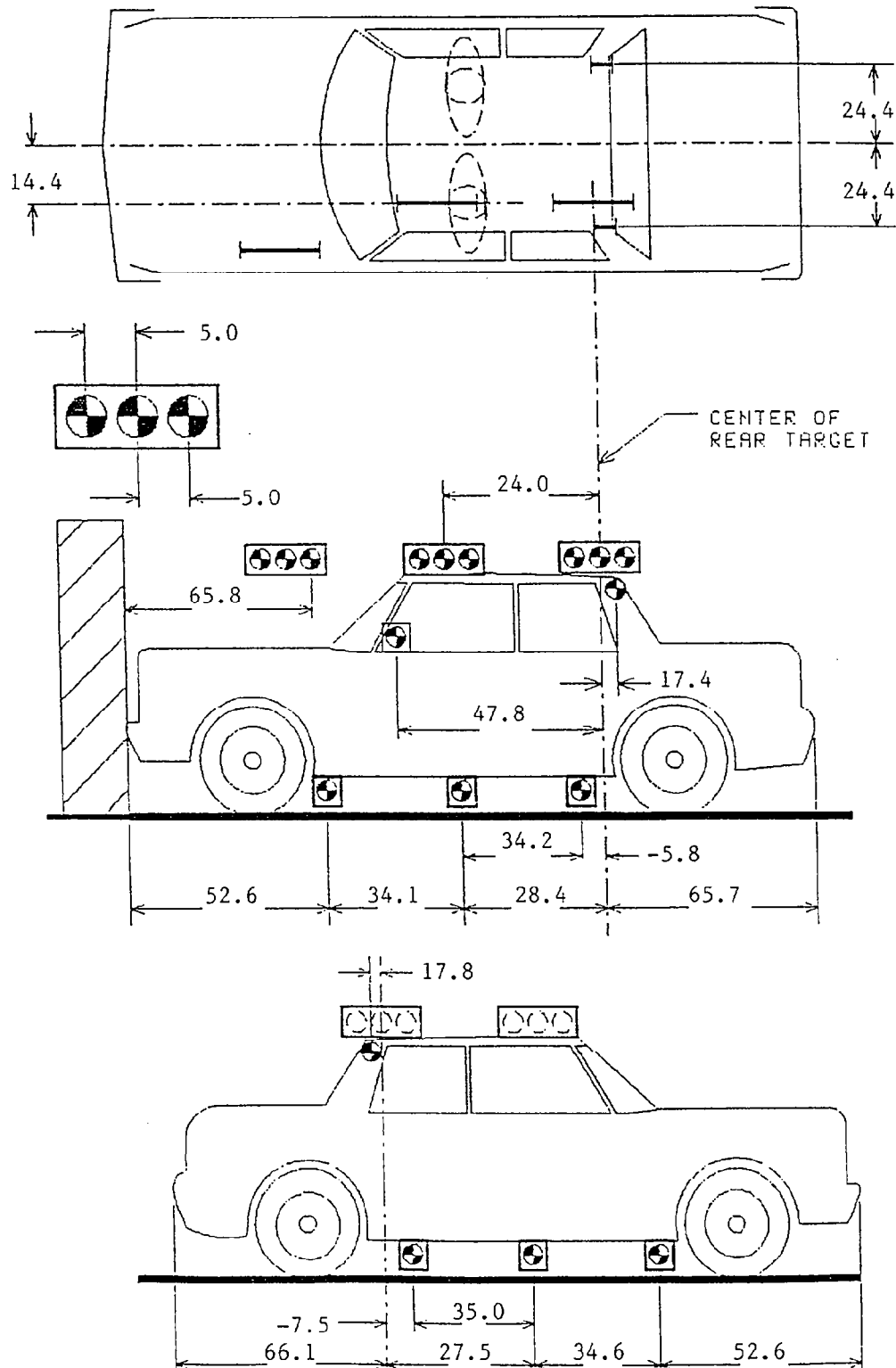
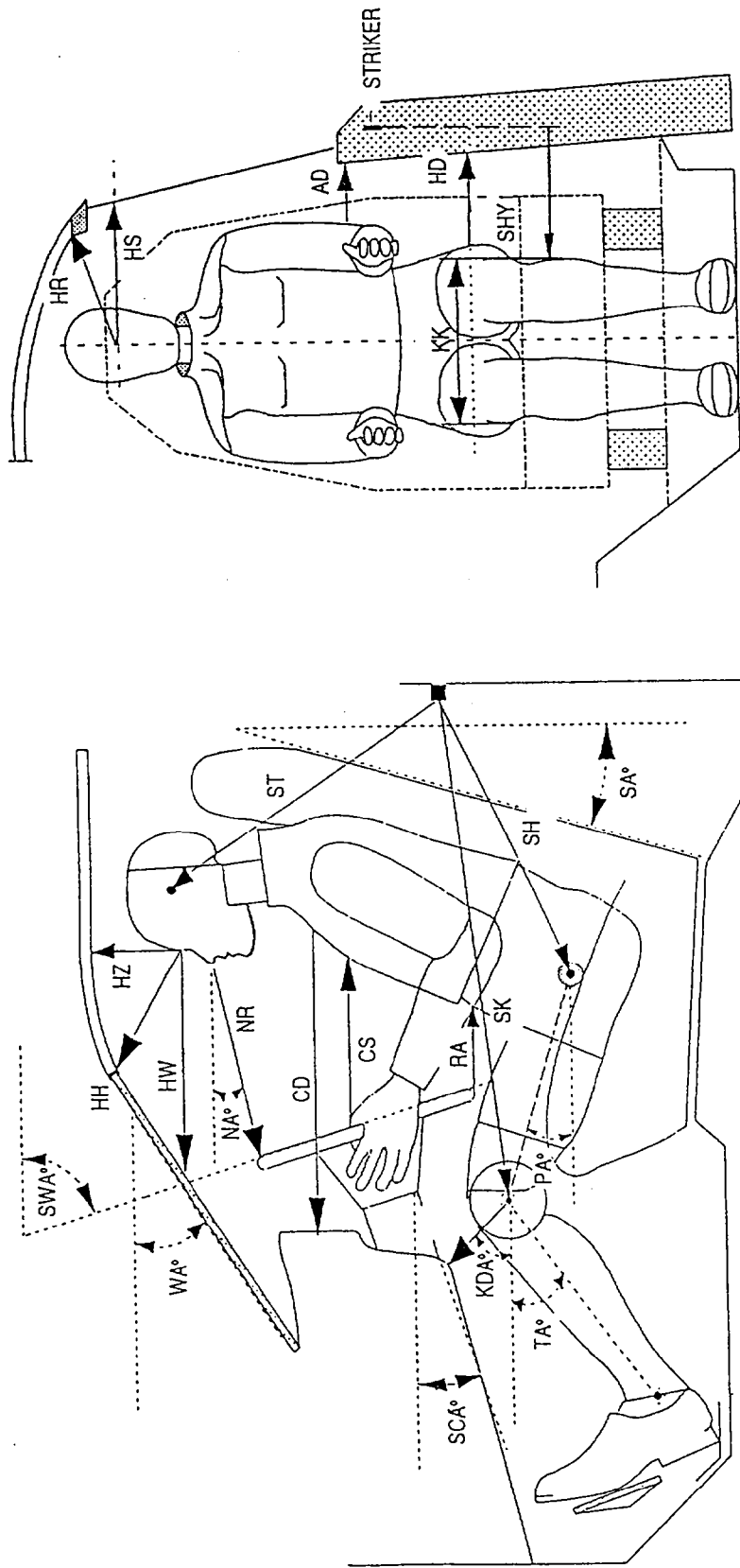


FIGURE 9

DUMMY MEASUREMENT LOCATIONS FOR FRONT SEAT OCCUPANTS



VERTICAL TRANSVERSE PLANE

VERTICAL LONGITUDINAL PLANE

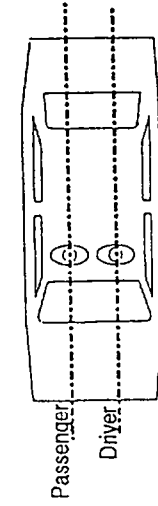
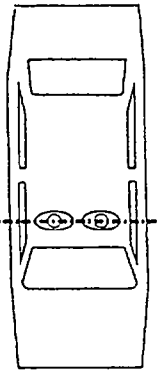


TABLE 13 DUMMY MEASUREMENT DATA FOR FRONT SEAT OCCUPANTS

DESIGNATION	TYPE OF MEASUREMENT	DRIVER (SERIAL #354)	PASSENGER (SERIAL #1173)
WA	WINDSHIELD ANGLE	28	NA
SWA	STEERING WHEEL ANGLE	22	NA
SCA	STEERING COLUMN ANGLE	67	NA
SA	SEAT BACK ANGLE	22	22
HZ	HEAD TO ROOF	6.2	6.2
HH	HEAD TO HEADER	14.6	15.8
HW	HEAD TO WINDSHIELD	22.2	22.9
HR	HEAD TO SIDE HEADER	7.2	6.2
NR	NOSE TO RIM	19.4	NA
NA	NOSE TO RIM ANGLE	16	NA
CD	CHEST TO DASH	23.8	25.6
CS	STEERING WHEEL TO CHEST	15.8	NA
RA	RIM TO ABDOMEN	8.6	NA
KDL	LEFT KNEE TO DASH	8.1	6.8
KDR	RIGHT KNEE TO DASH	7.6	7.2
KDA	OUTBOARD KNEE TO DASH ANGLE	40	44
PA	PELVIC ANGLE	14	11
TA	TIBIAL ANGLE	59	59
KK	KNEE TO KNEE	15.1	11.0
ST ¹	STRIKER TO HEAD	20.6	20.9
	STRIKER TO HEAD ANGLE	-94	-96
SK ¹	STRIKER TO KNEE	21.6	22.8
	STRIKER TO KNEE ANGLE	0	1
SH ¹	STRIKER TO H-POINT	7.9	7.7
	STRIKER TO H-POINT ANGLE	30	23
SHY	STRIKER TO H-POINT (Y DIR.)	8.6	8.9
HS	HEAD TO SIDE WINDOW	11.1	10.8
HD	H-POINT TO DOOR	6.7	6.8
AD	ARM TO DOOR	3.6	2.8

The seat back angle (SA°) is measured relative to vertical, all other angles are measured relative to horizontal.

All angle measurements are in degrees.

All distance measurements are in inches.

¹A negative angle indicates the measurement point was located above the striker.

FIGURE 10 CAMERA POSITIONS

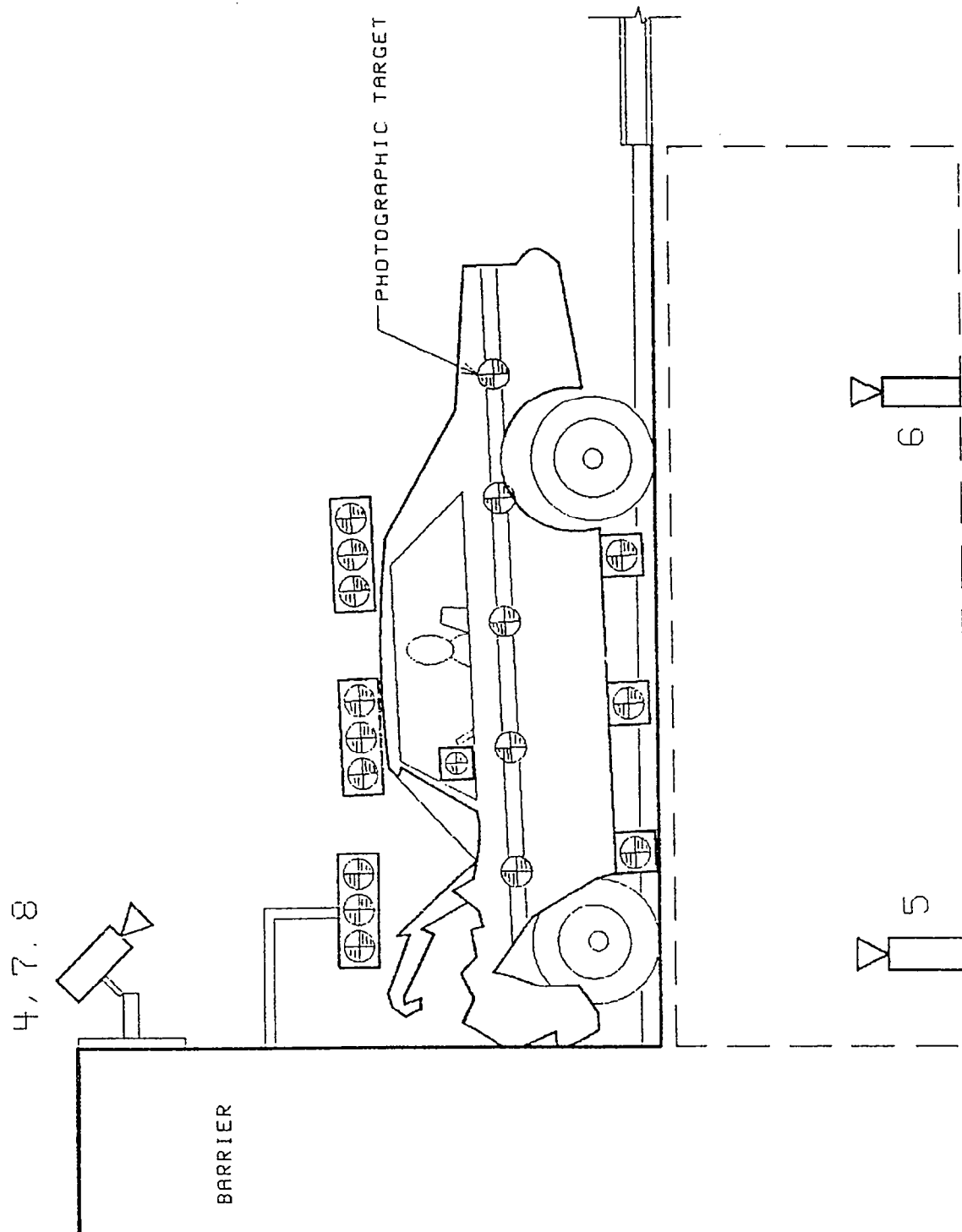


FIGURE 10 CAMERA POSITIONS, CONT'D.

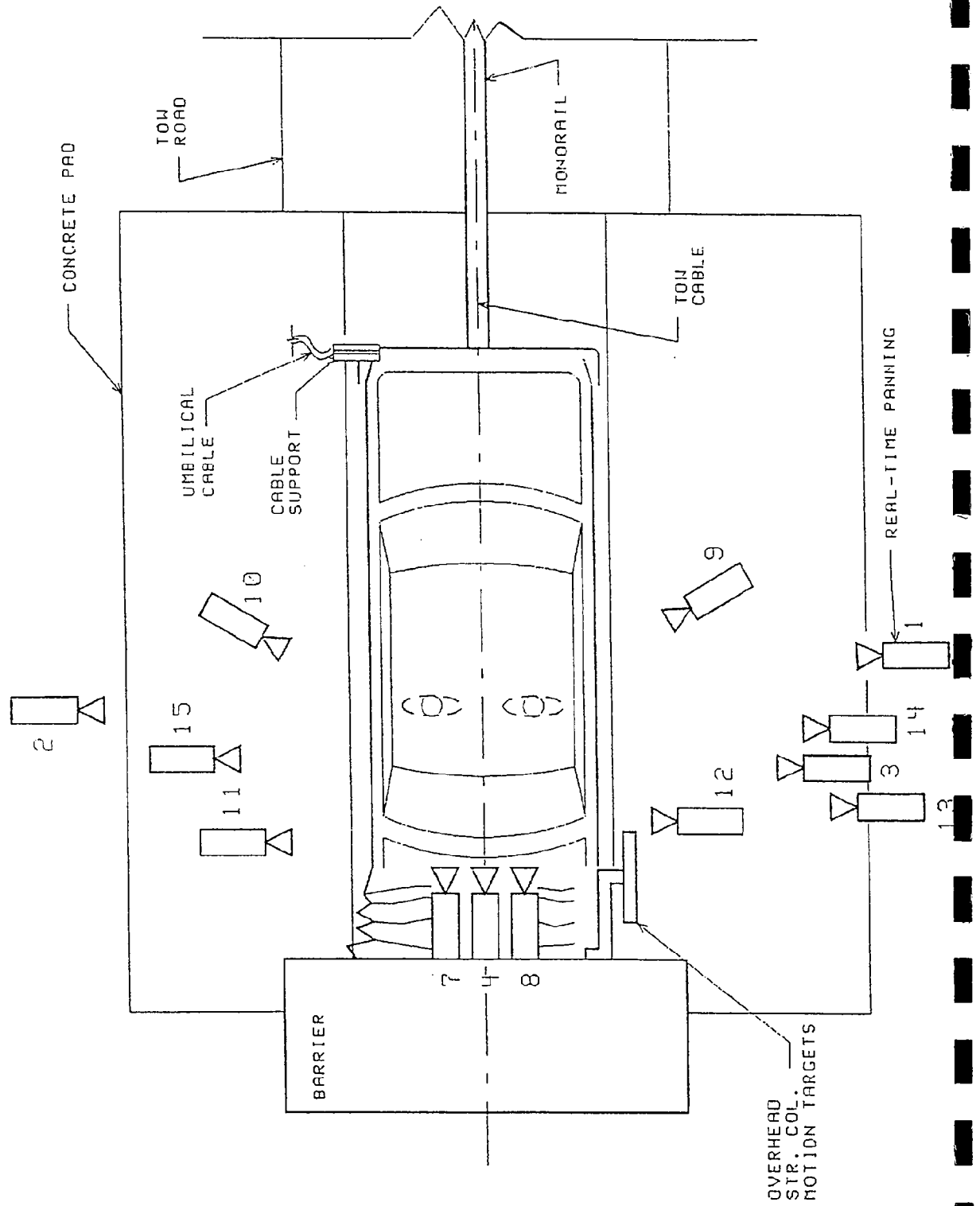


TABLE 14 MOTION PICTURE CAMERA LOCATIONS

TEST NO.: 931103		VEHICLE: 1994 Nissan Altima 4-door sedan		CAMERA POSITIONS (IN.) ¹			ANGLE ² (DEG)		FILM PLANE TO HEAD TARGET (IN.)		LENS (MM)		FILM SPEED (FPS)	
CAMERA NO.	VIEW	X	Y	Z										
1	Real-time panning	-142.0	504.0	61.0	NA	NA			NA		16		24	
2	Right overall	-81.3	-266.4	37.1	-2				NA		13		995	
3	Left vehicle crush	-41.5	295.0	44.0	-4				314.0		25		992	
4	Windshield front view	-6.0	0.0	89.0	-40				NA		13		1000	
5	Pit - front position	-50.5	0.0	-92.4	90				NA		13		1000	
6	Pit - rear position	-99.3	0.0	-99.0	90				NA		13		1002	
7	Passenger - front view	-4.5	-13.8	93.0	-50				NA		17		1002	
8	Driver - front view	-6.8	14.5	93.0	-50				NA		17		998	
9	Driver kinematics	-157.3	116.0	87.0	-27				96.0		25		995	
10	Passenger kinematics	-152.1	-116.0	87.0	-26				82.0		25		990	
11	Right windshield intrusion	-38.1	-306.1	44.0	0				NA		50		1002	
12	Left windshield intrusion	-53.0	309.4	42.3	0				NA		50		1002	
13	Steering column motion	-87.0	286.0	103.0	-14				NA		25		1002	
14	Steering column motion	-87.0	286.0	75.1	-9				NA		25		1018	
15	Passenger kinematics	-38.8	-293.0	45.3	-4				285.0		25		1022	
16	Real-time documentation	NA	NA	NA	NA				NA		12-120		24	

¹ +X: Film plane forward of barrier face

+Y: Film plane to left of monorail centerline

+Z: Film plane above ground level

² +Angle: Film plane angled upward from horizontal plane

APPENDIX A

PHOTOGRAPHS

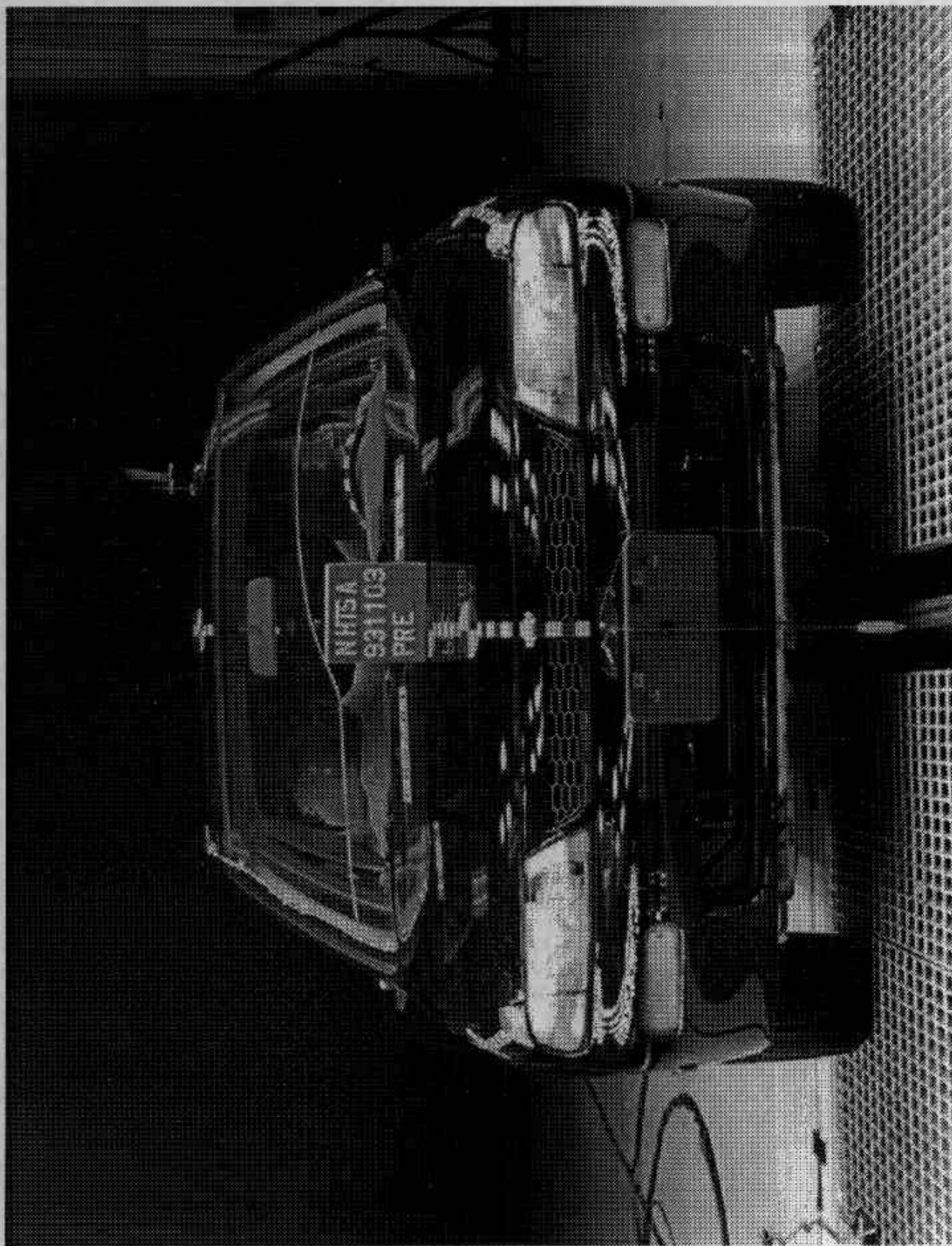


Figure A-1. PRE-TEST FRONT VIEW
A-2

931103

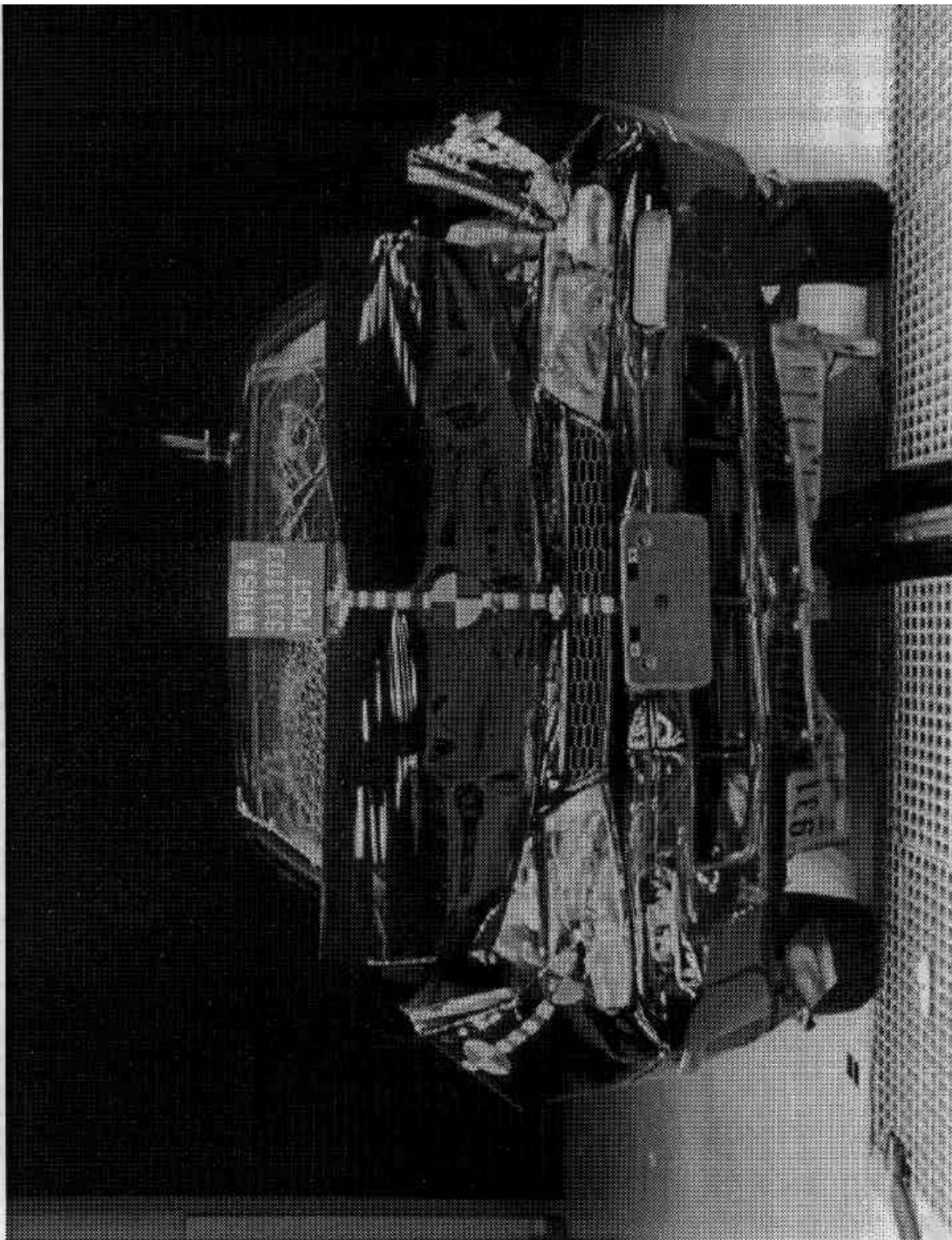


Figure A-2. POST-TEST FRONT VIEW
A-3

931103

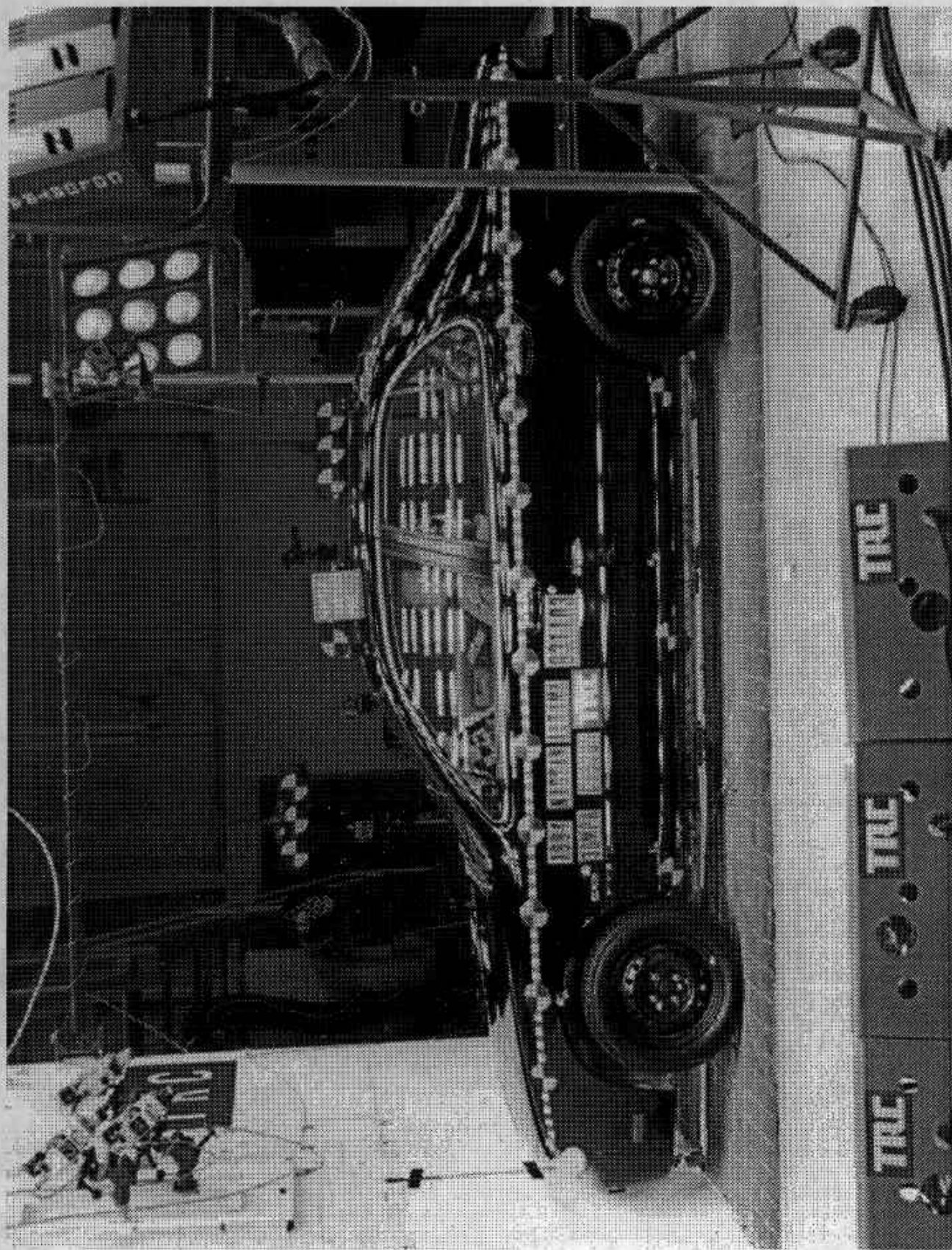


Figure A-3. PRE-TEST LEFT SIDE VIEW

A-4

931103

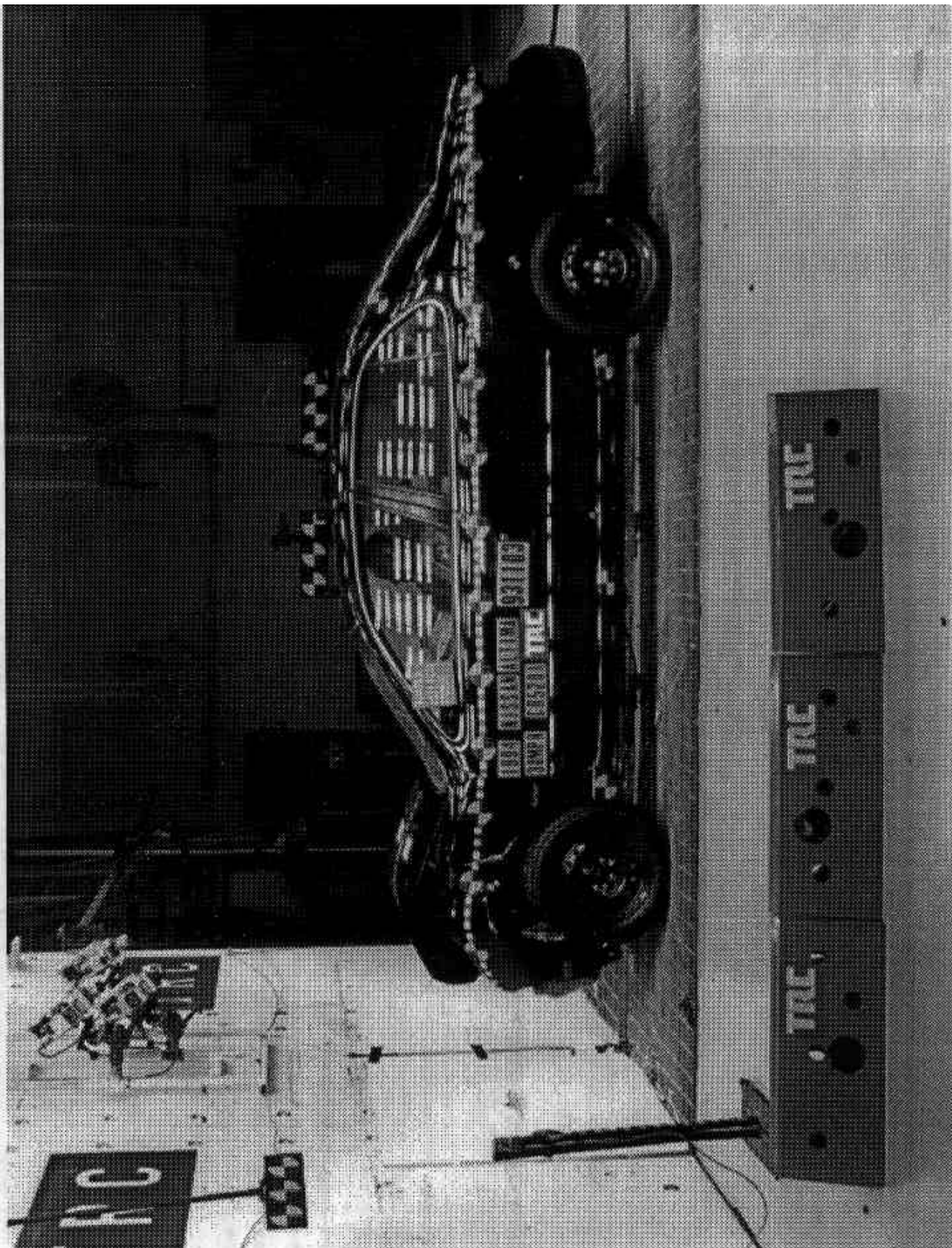


Figure A-4. POST-TEST LEFT SIDE VIEW
A-5

931103

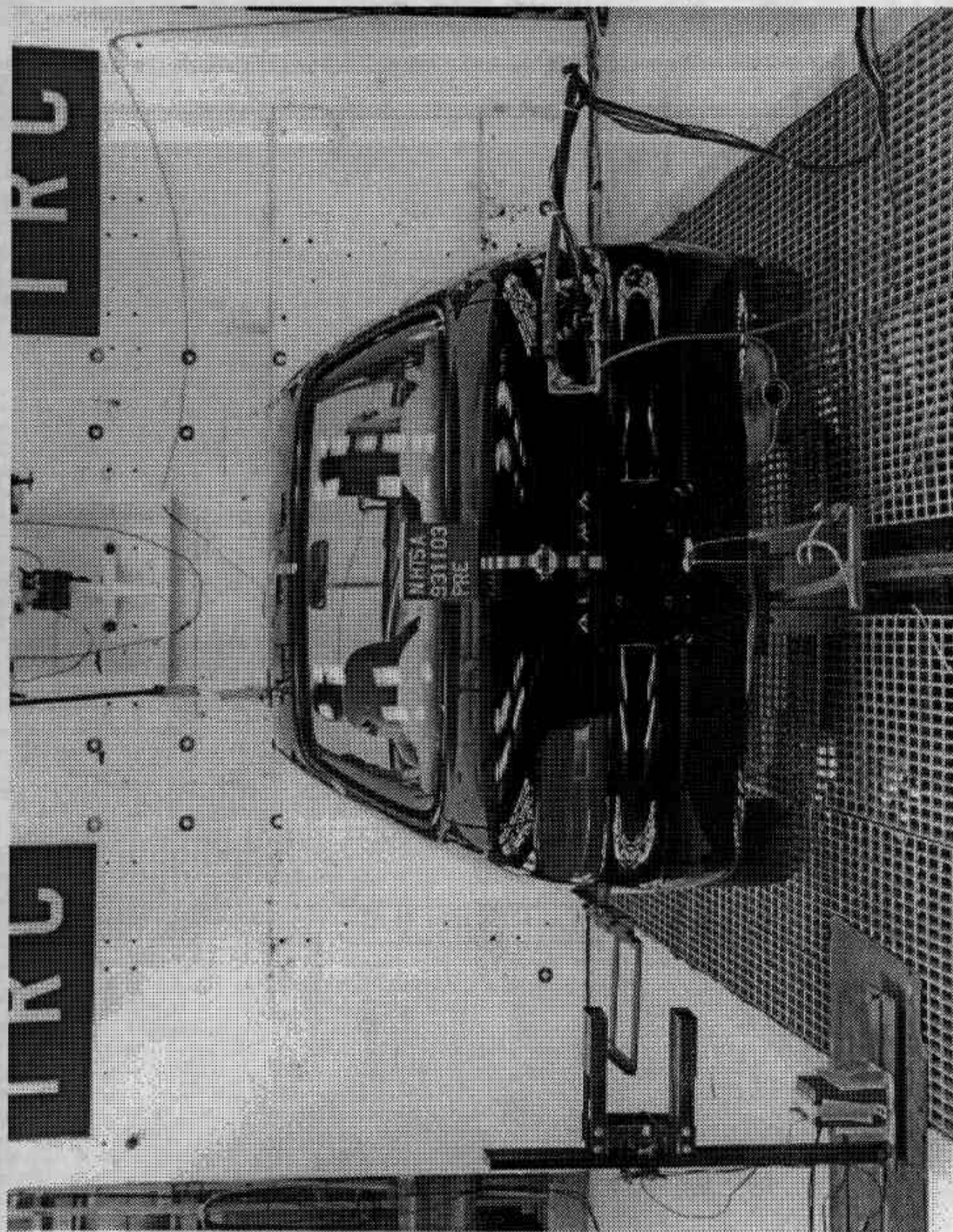


Figure A-5. PRE-TEST REAR VIEW
A-6

931103

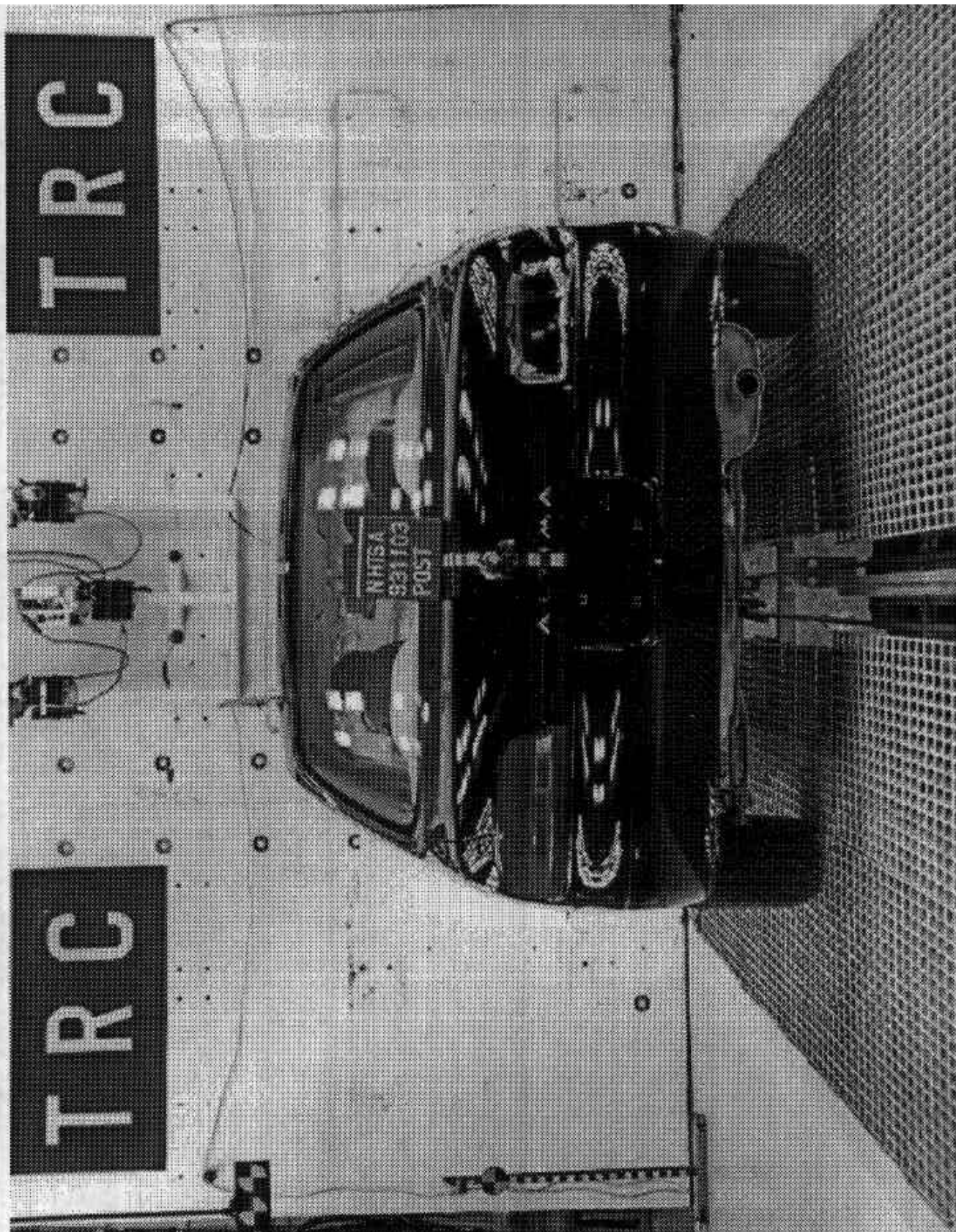


Figure A-6. POST-TEST REAR VIEW
A-7

931103

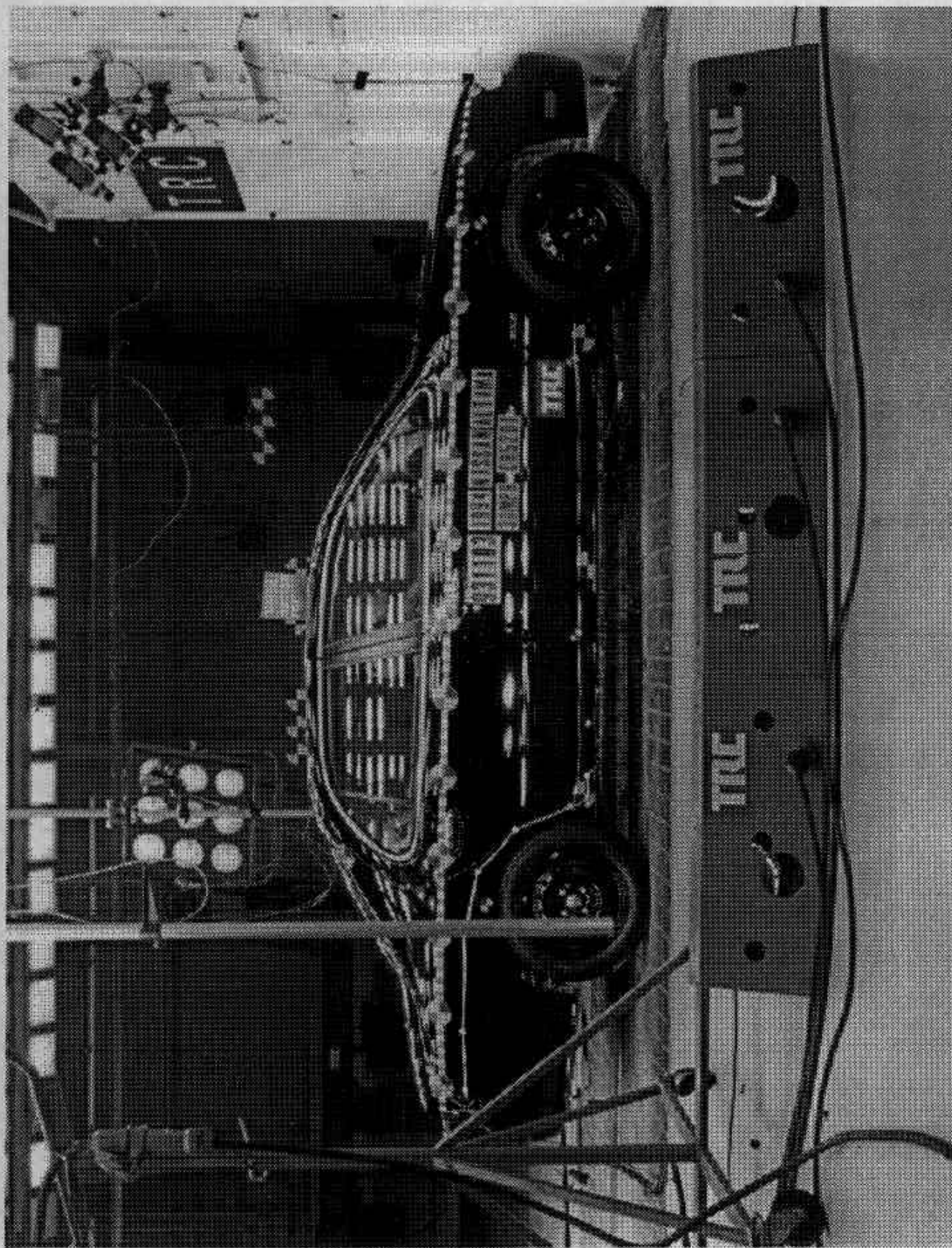


Figure A-7. PRE-TEST RIGHT SIDE VIEW

A-8

931103

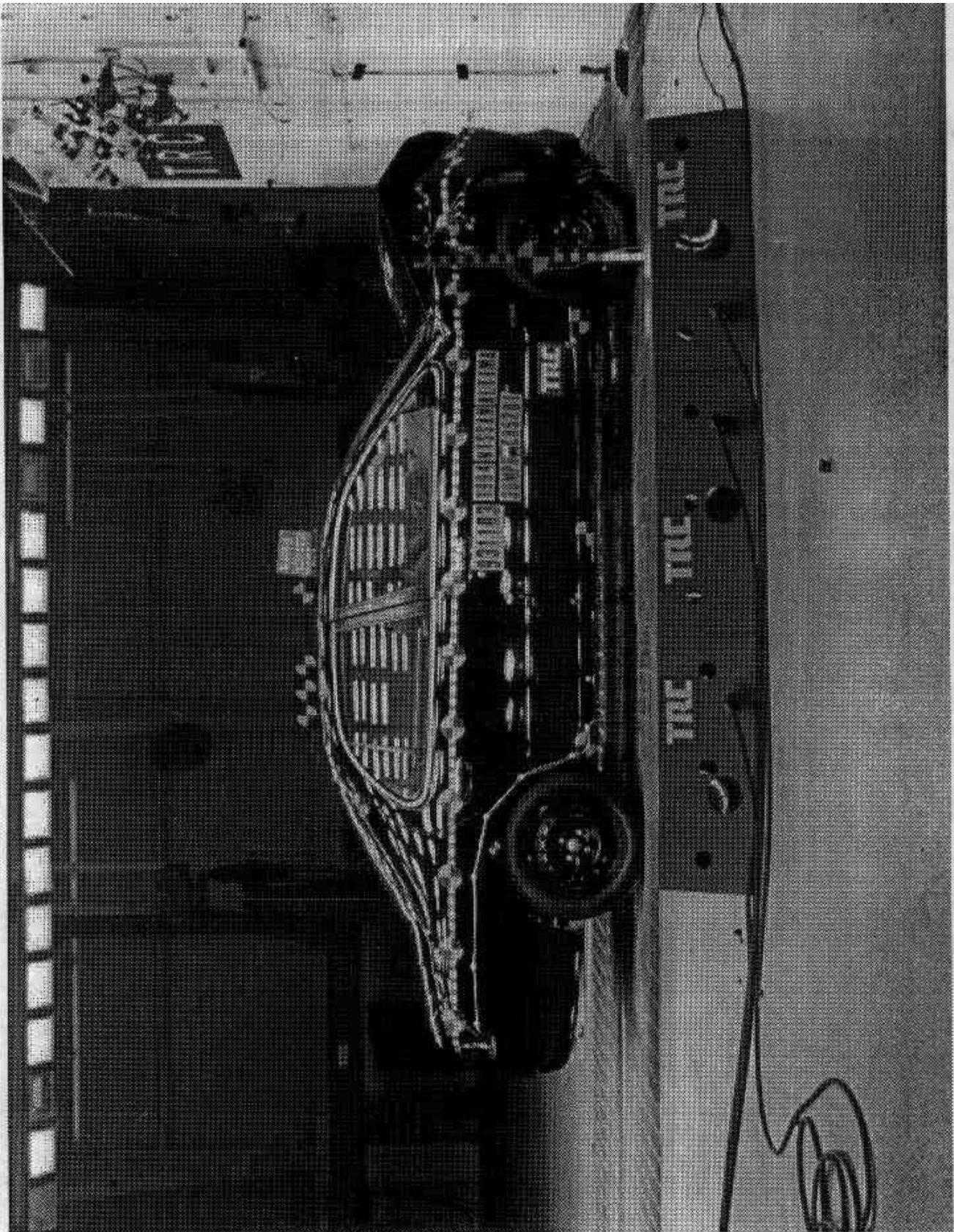


Figure A-8. POST-TEST RIGHT SIDE VIEW
A-9

931103

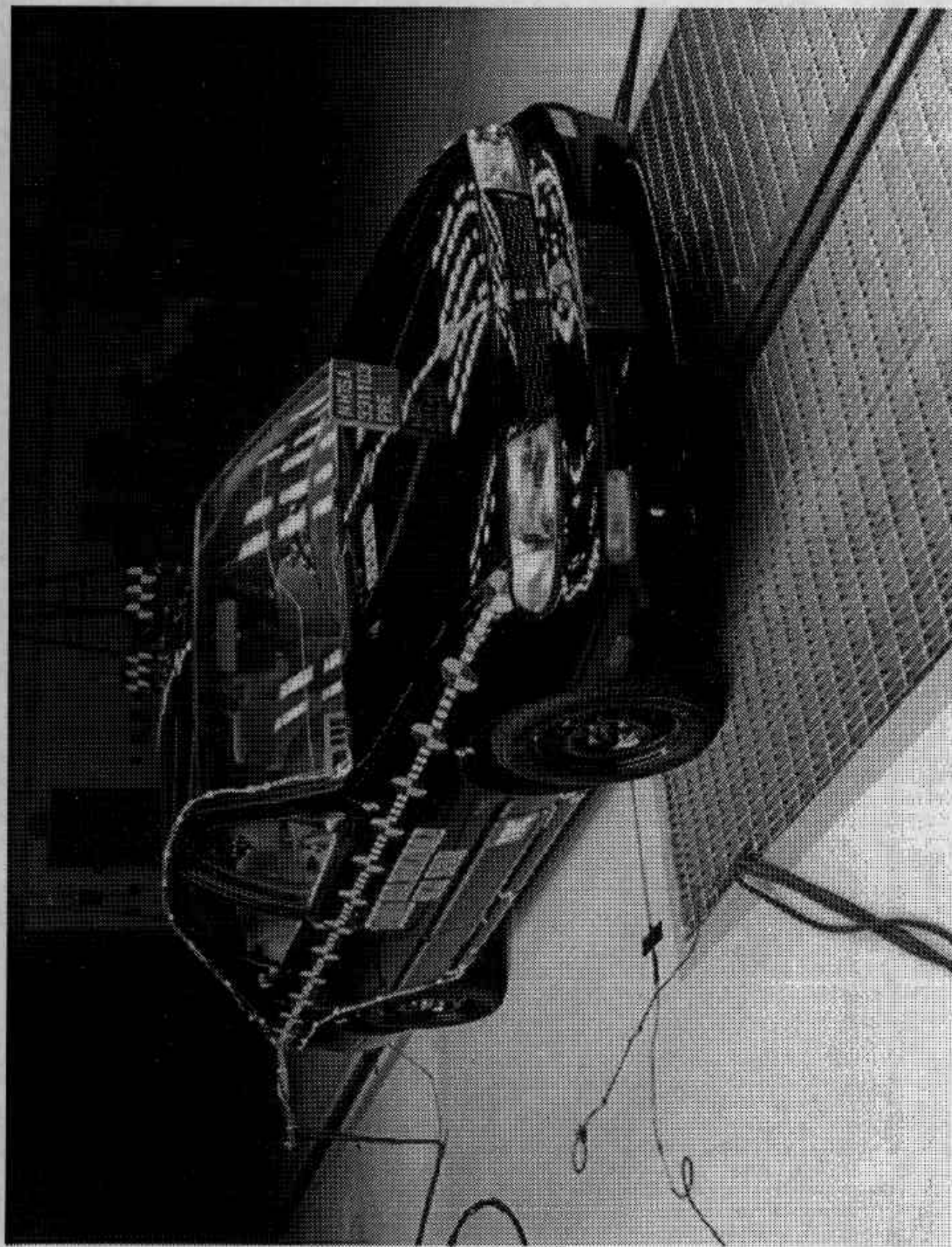


Figure A-9. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-10

931103

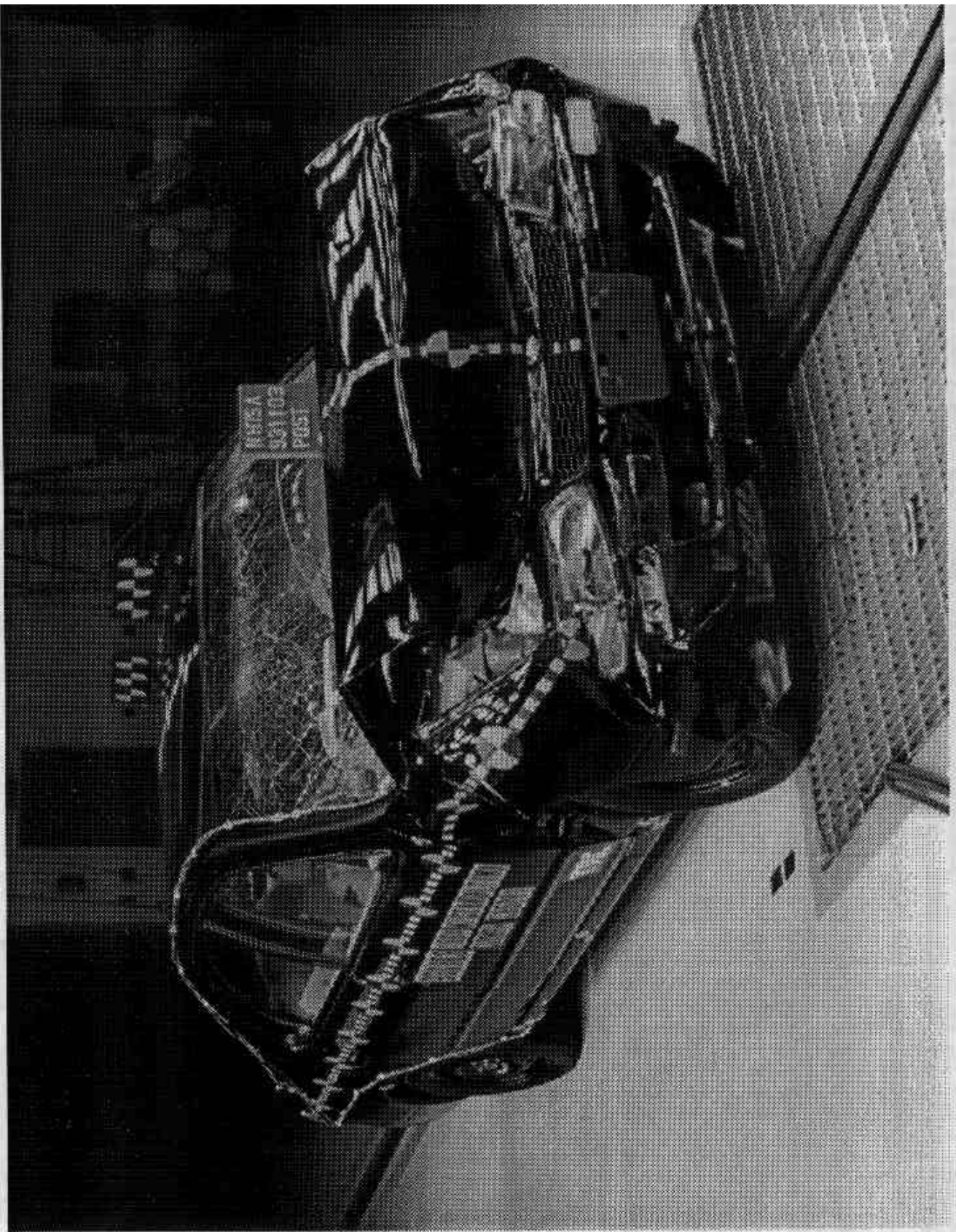


Figure A-10. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-11

931103

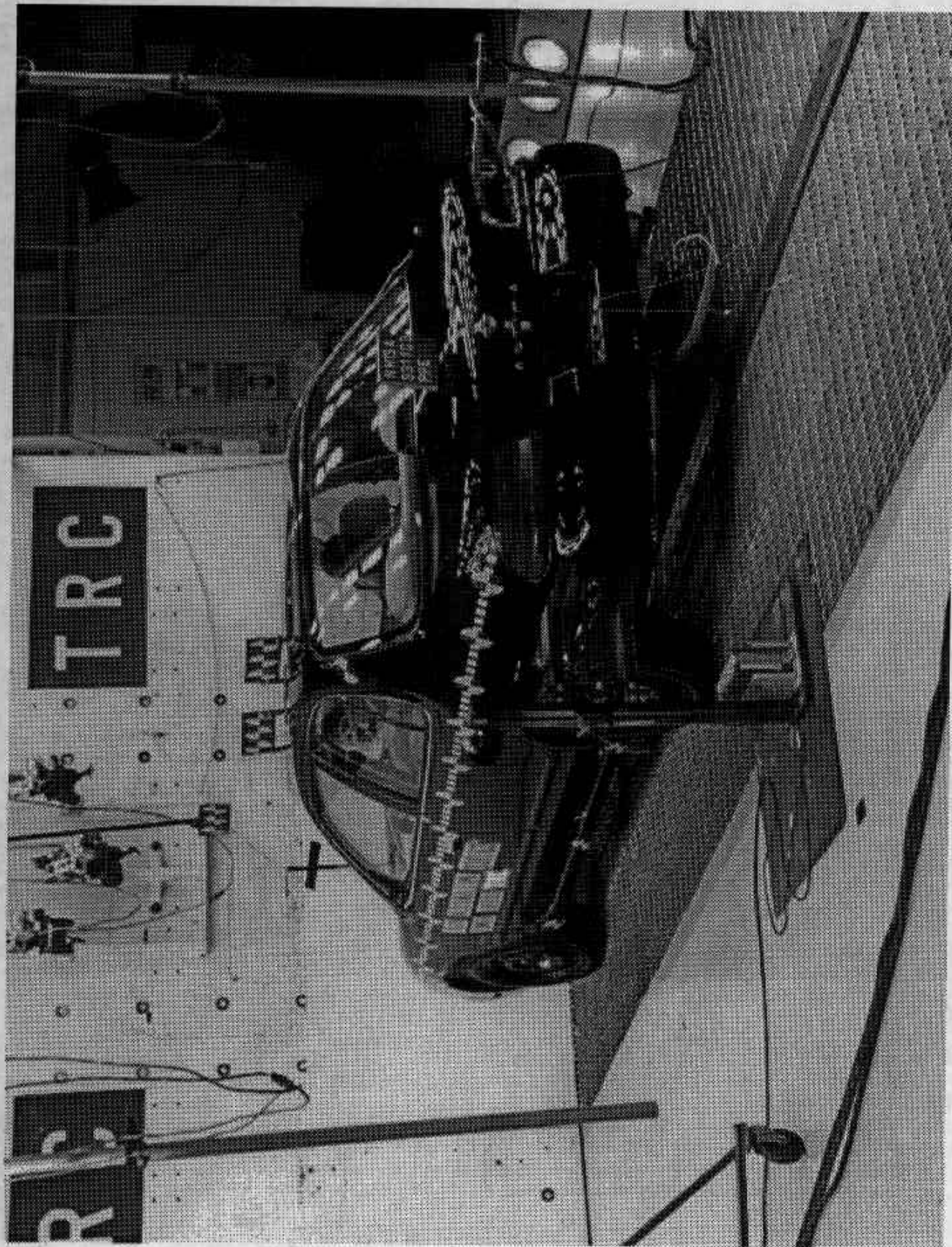


Figure A-11. PRE-TEST LEFT REAR THREE-QUARTER VIEW

A-12

931103

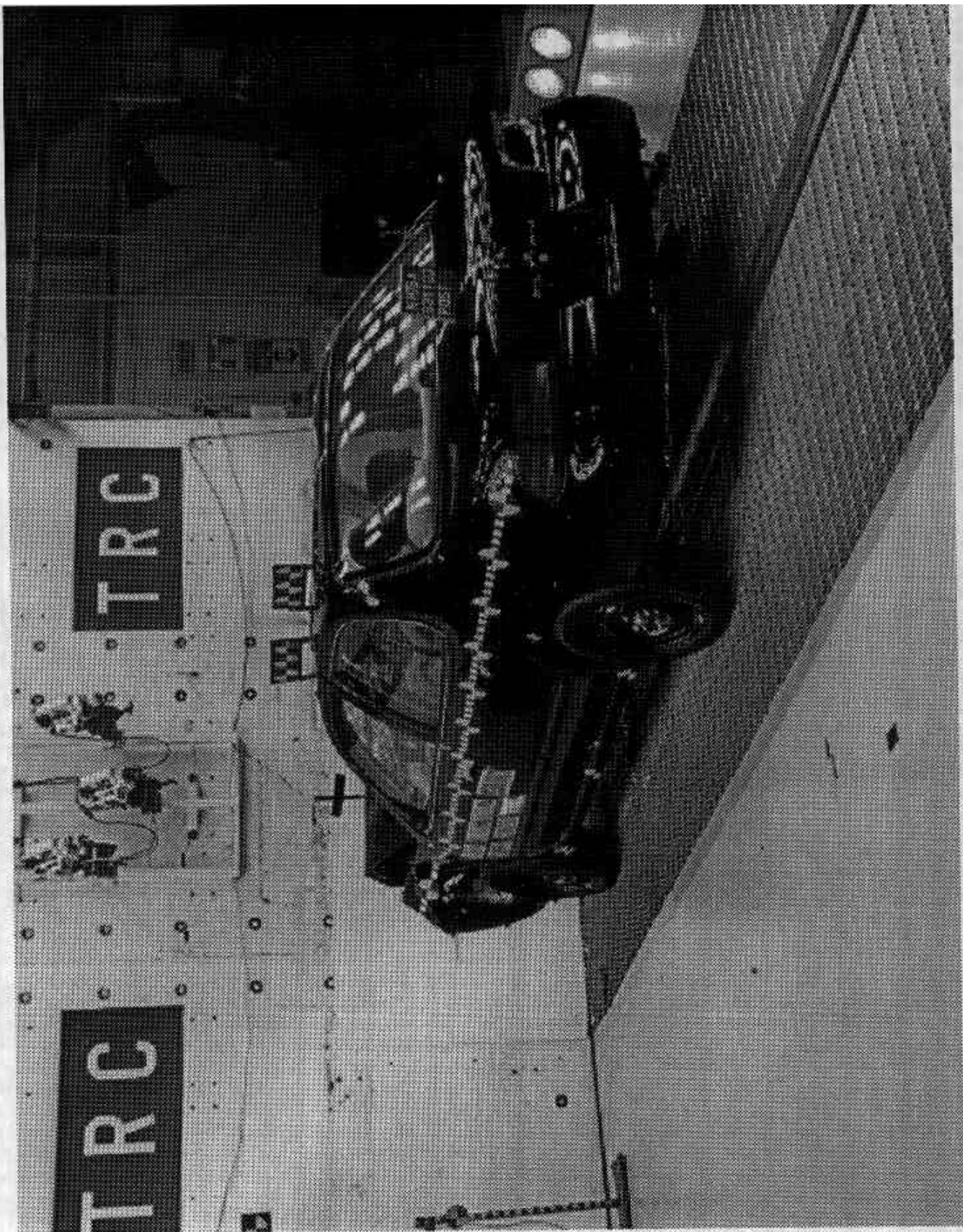


Figure A-12. POST-TEST LEFT REAR THREE-QUARTER VIEW

A-13

931103

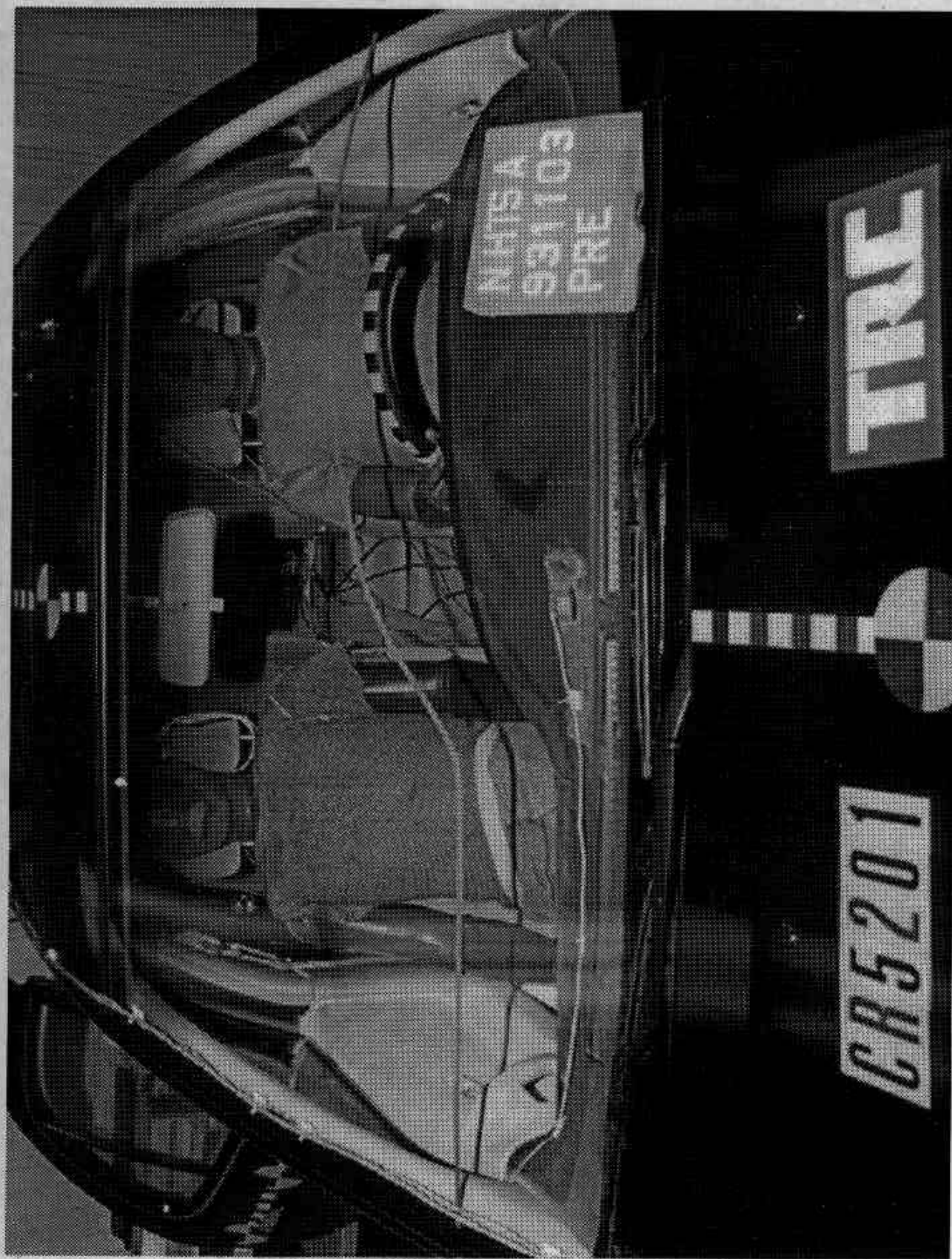


Figure A-13. PRE-TEST WINDSHIELD VIEW
A-14

931103

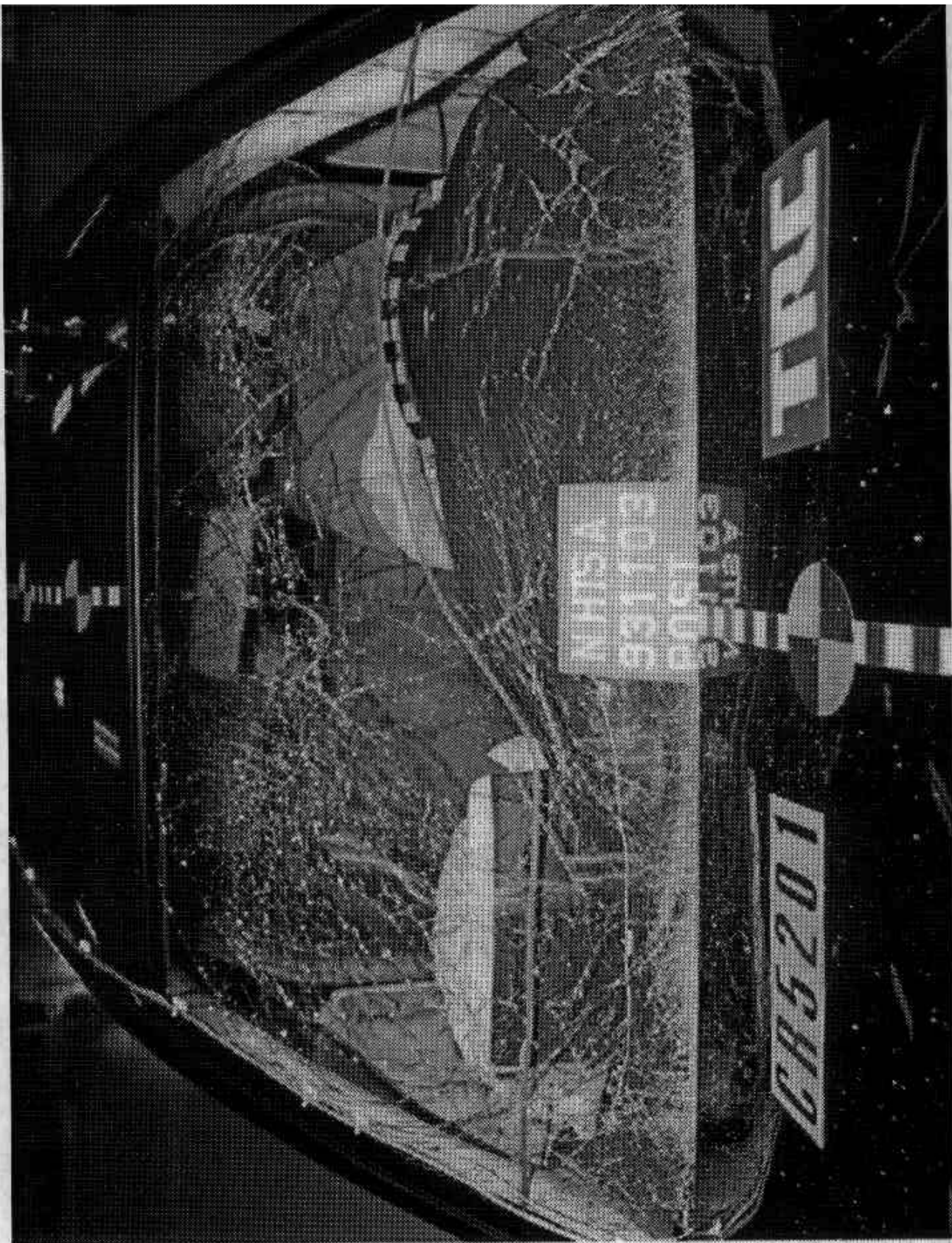


Figure A-14. POST-TEST WINDSHIELD VIEW
A-15

931103

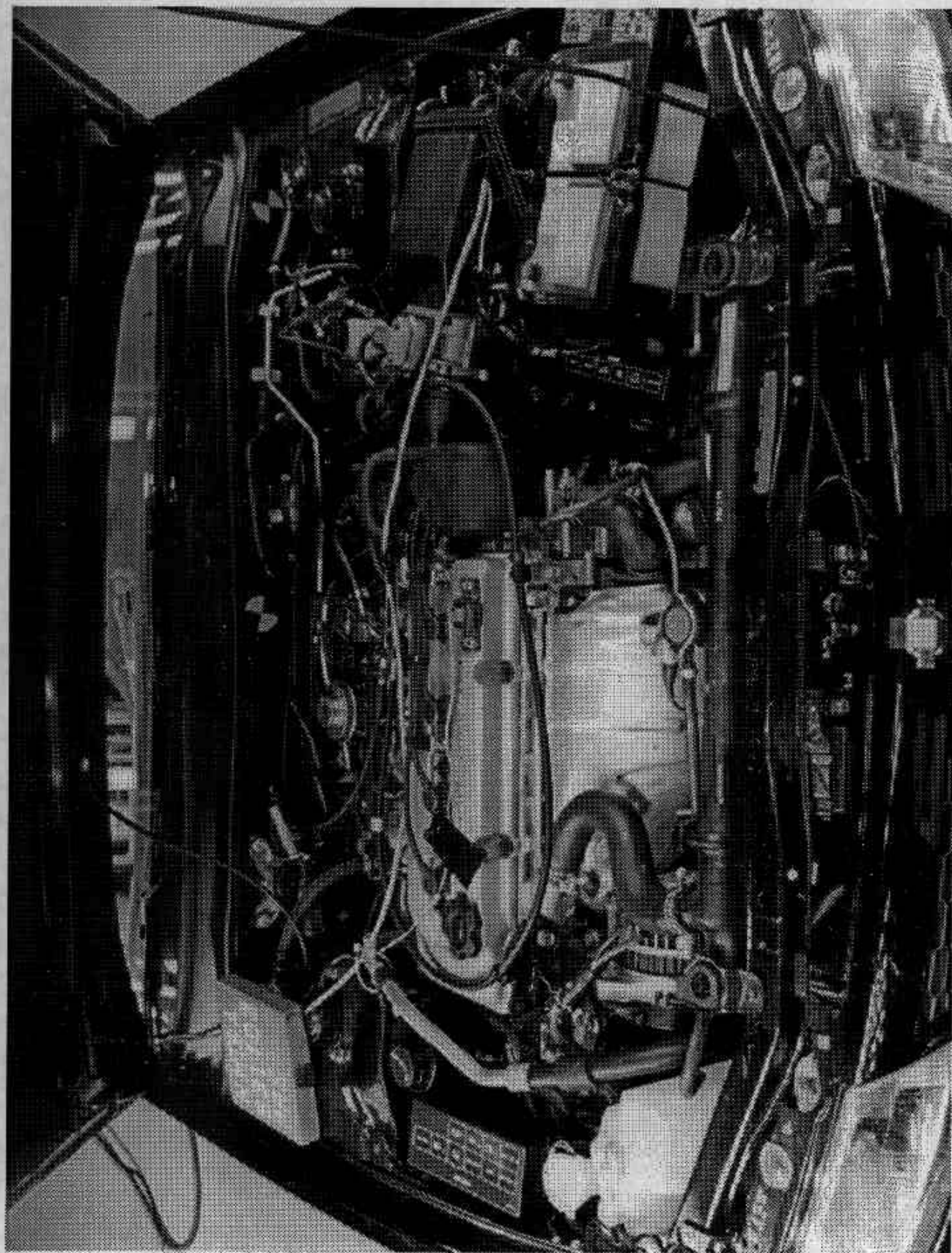


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW

A-16

931103

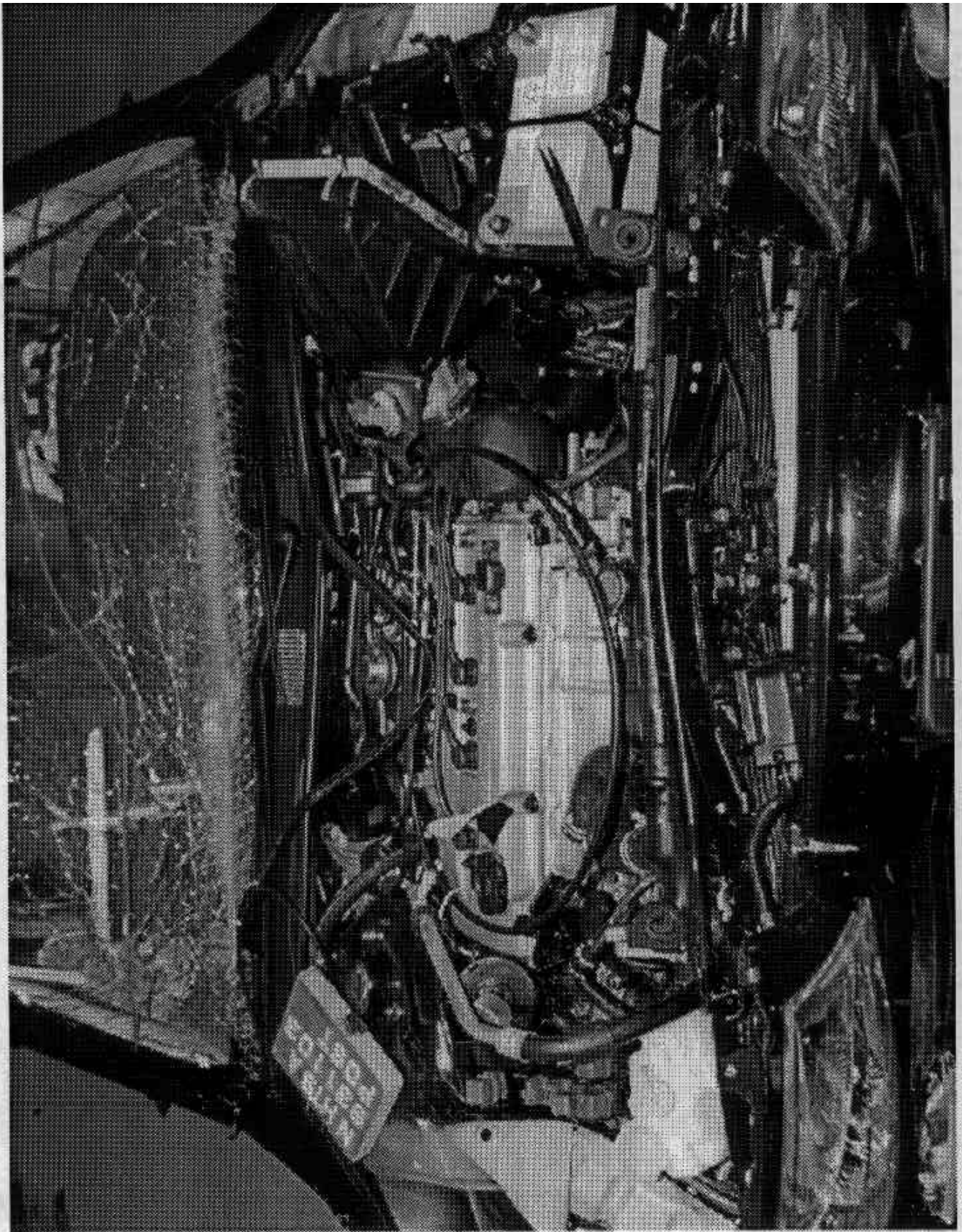


Figure A-16. POST-TEST ENGINE COMPARTMENT VIEW

A-17

931103

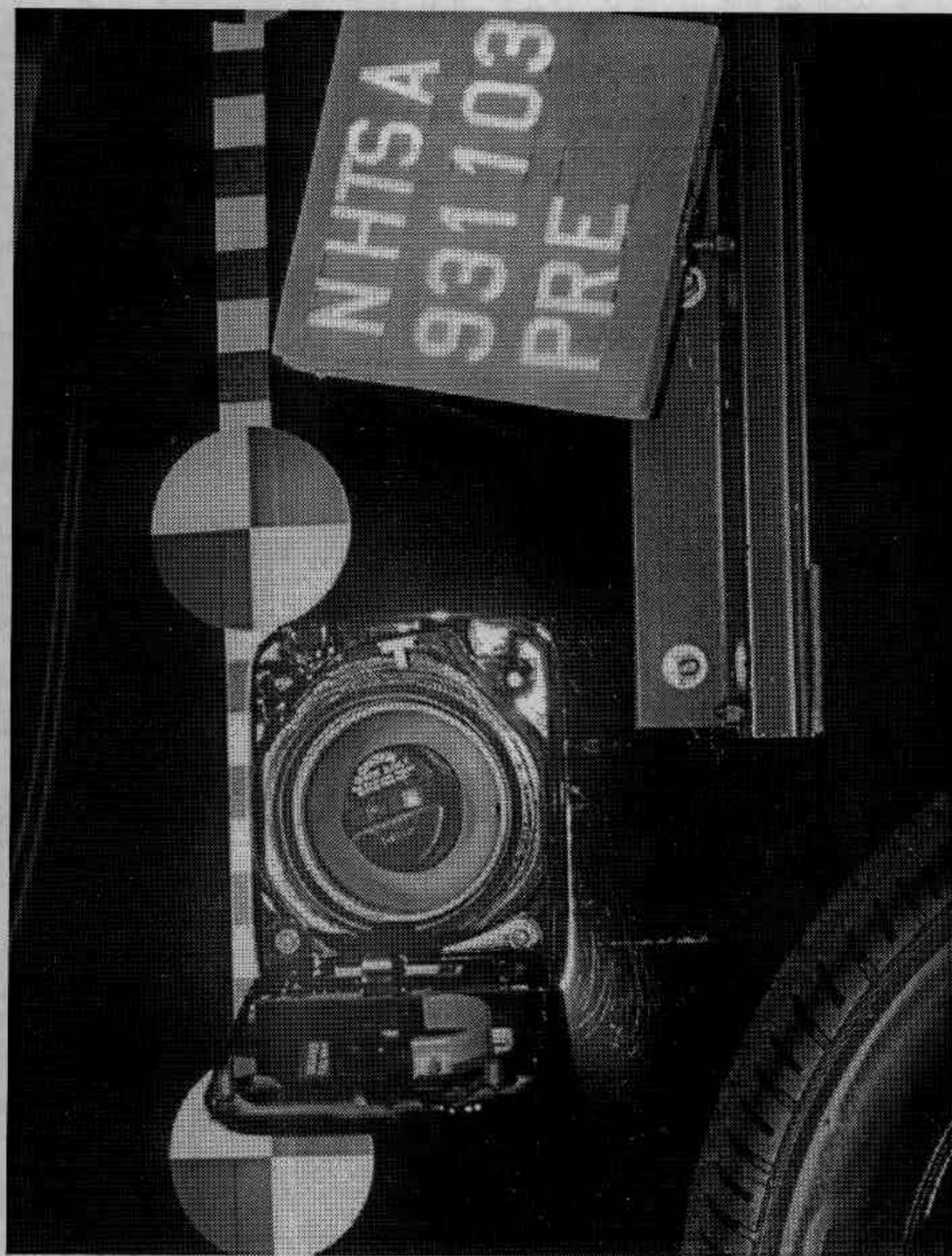


Figure A-17. PRE-TEST FUEL FILLER CAP VIEW
A-18

931103



Figure A-18. POST-TEST FUEL FILLER CAP VIEW
A-19

931103

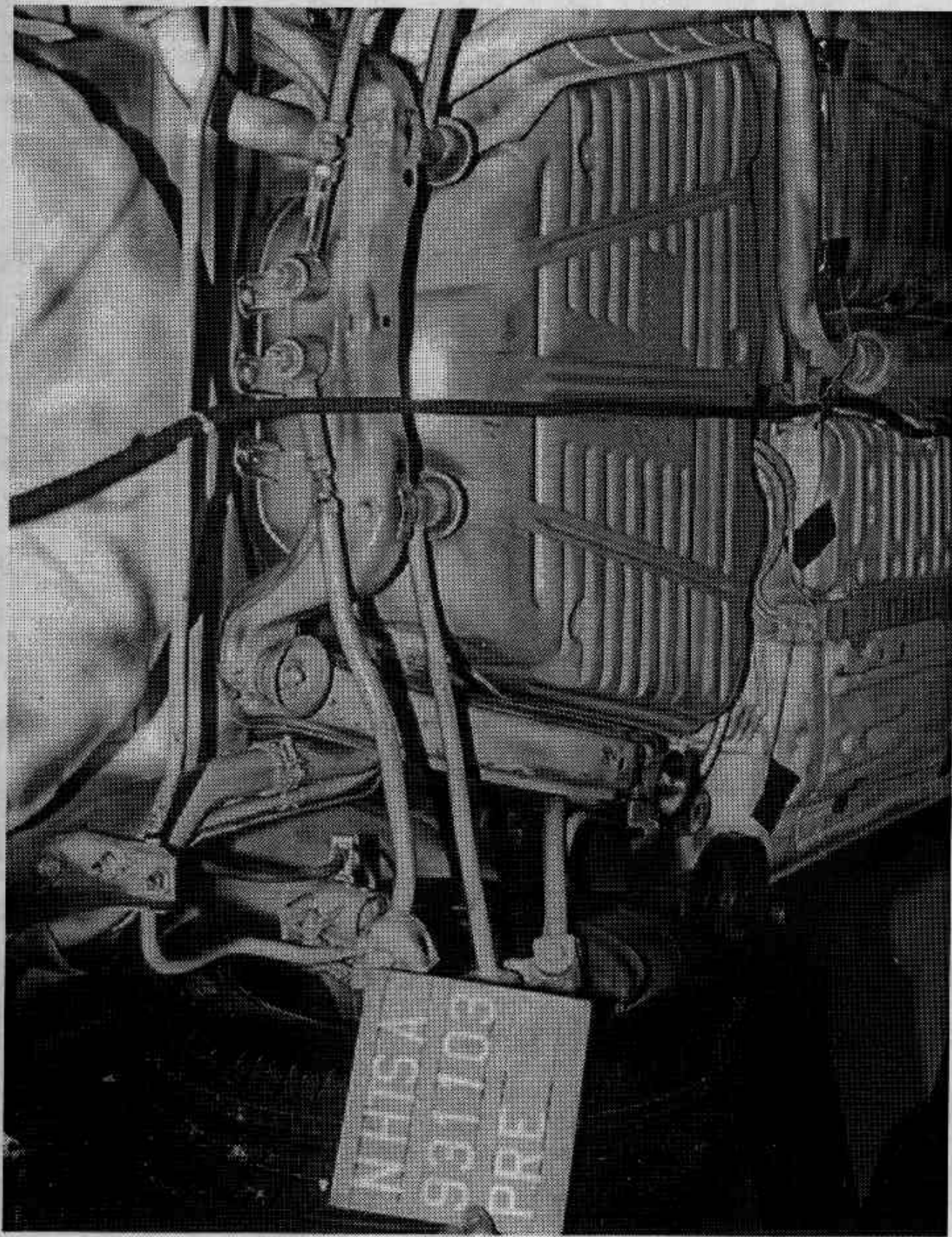


Figure A-19. PRE-TEST FUEL FILLER NECK AND FUEL TANK VIEW
A-20 931103

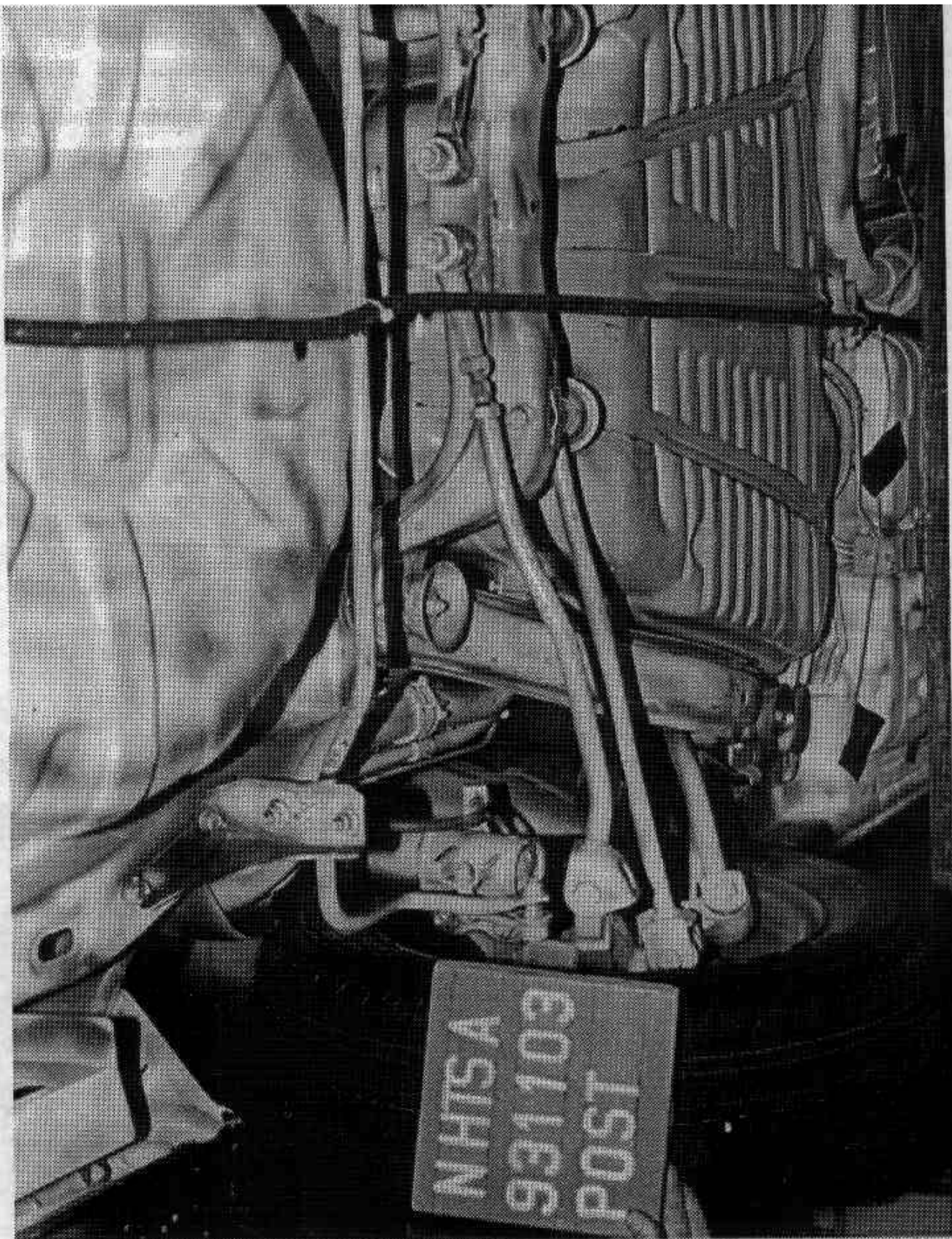


Figure A-20. POST-TEST FUEL FILLER NECK AND FUEL TANK VIEW

A-21

931103

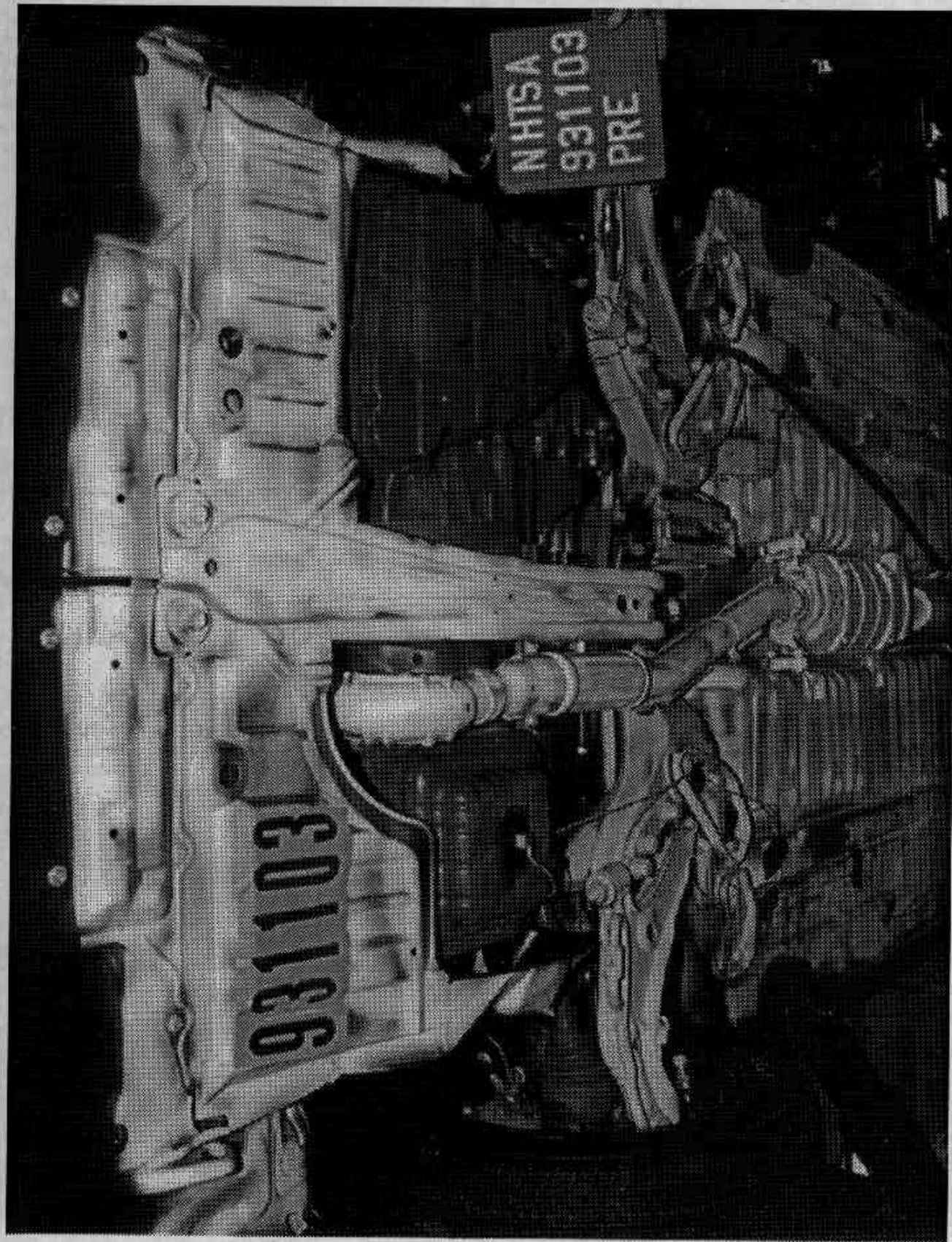


Figure A-21. PRE-TEST FRONT UNDERBODY VIEW

A-22

931103

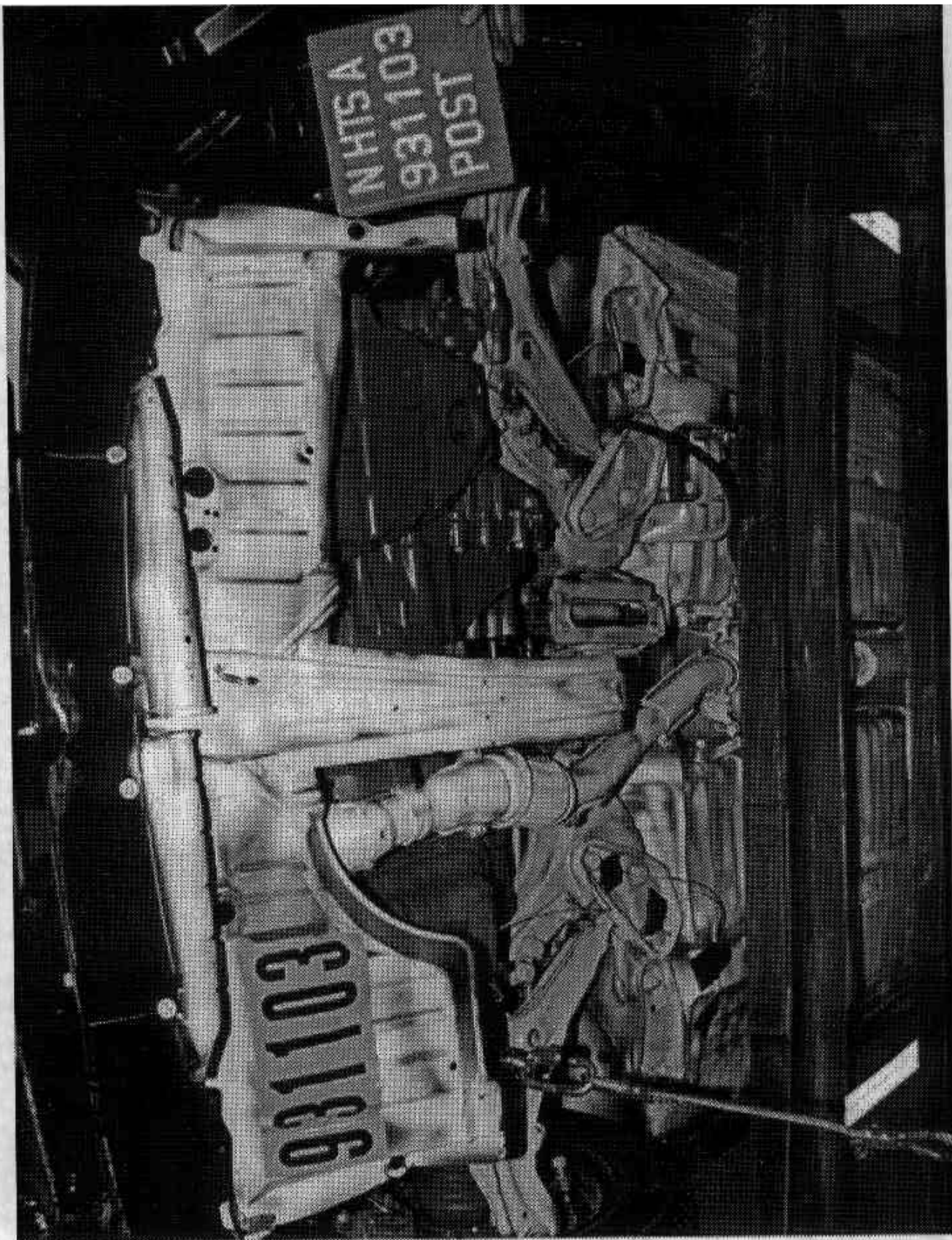


Figure A-22. POST-TEST FRONT UNDERBODY VIEW
A-23

931103

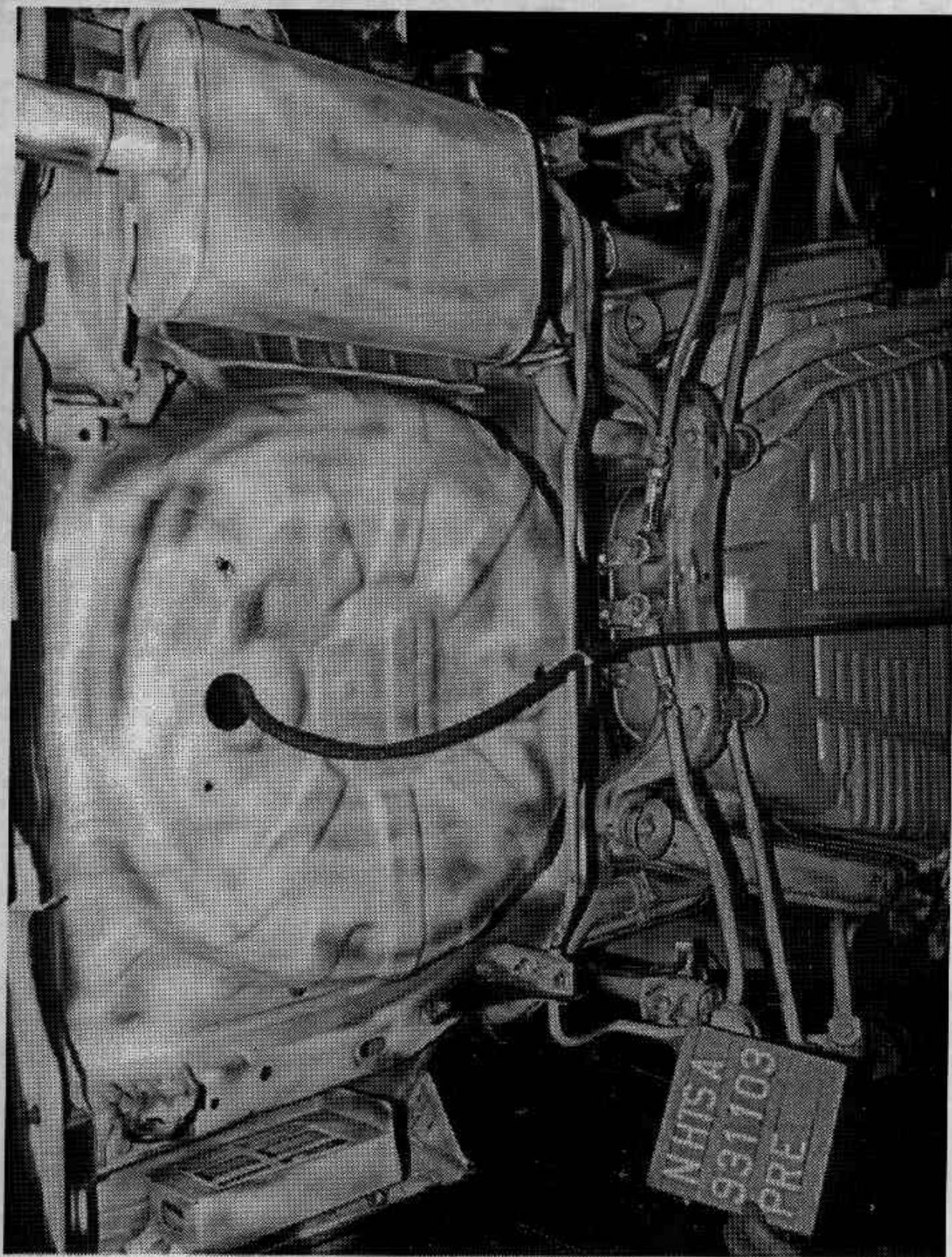


Figure A-23. PRE-TEST REAR UNDERBODY VIEW

A-24

931103

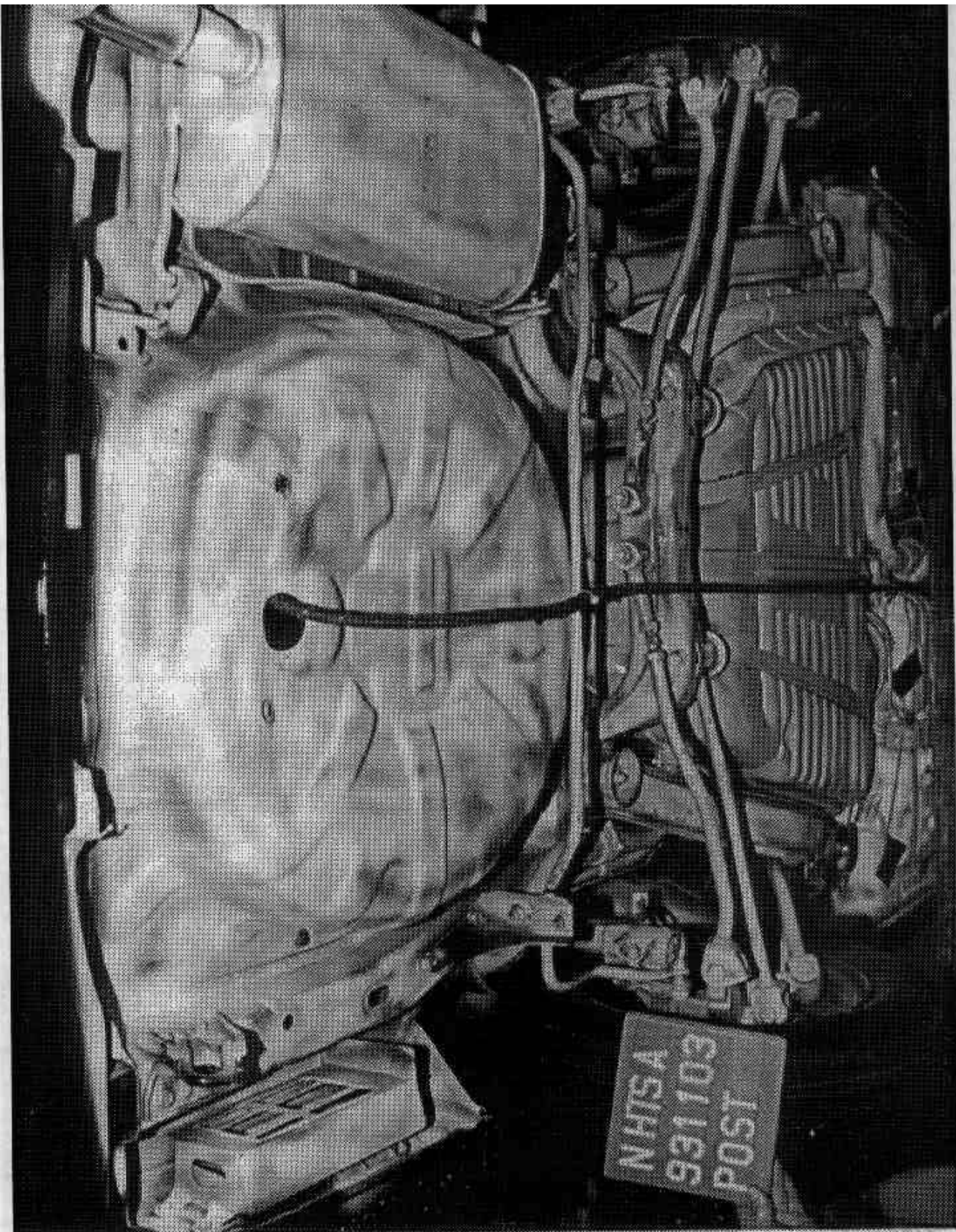


Figure A-24. POST-TEST REAR UNDERBODY VIEW

A-25

931103

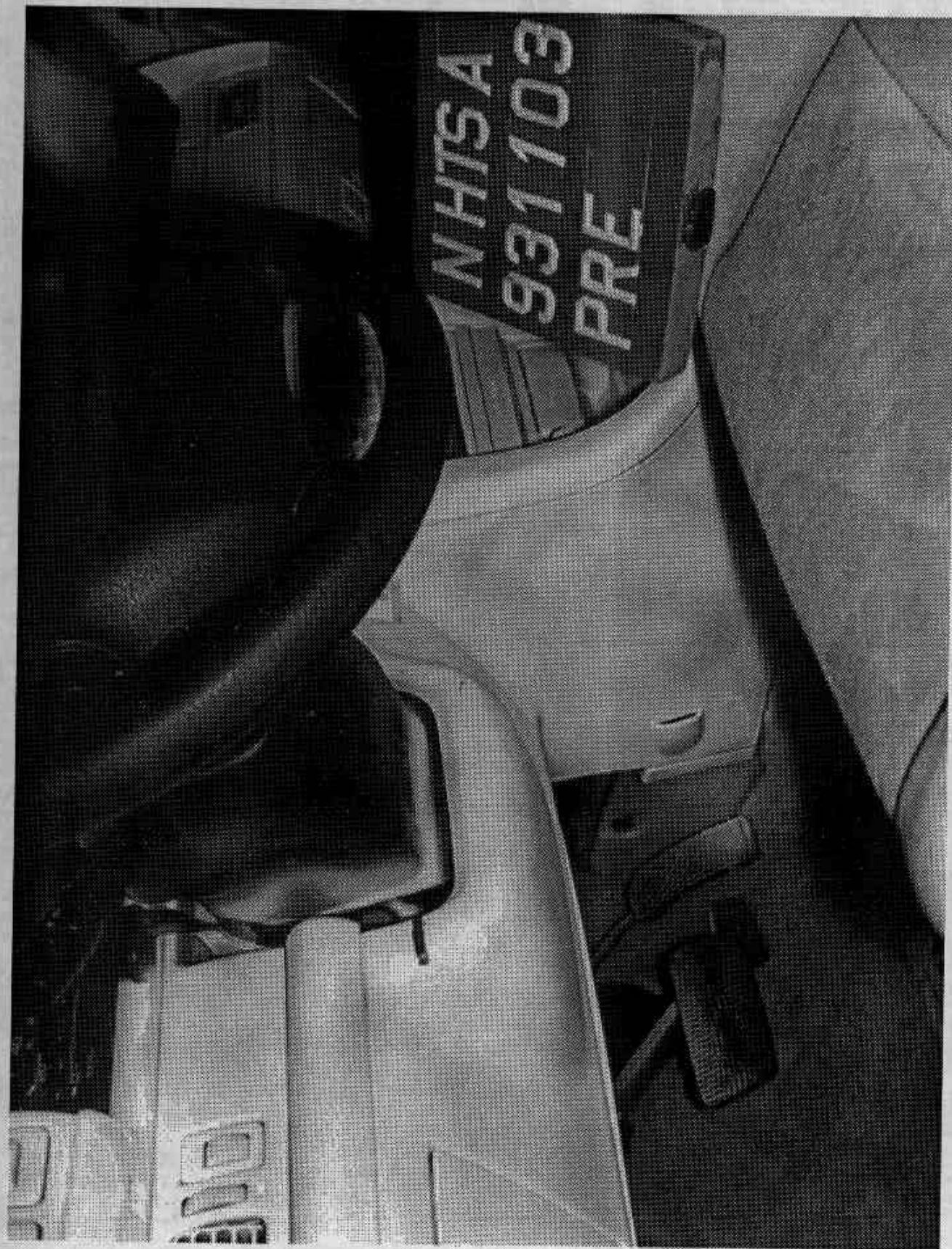


Figure A-25. PRE-TEST DRIVER'S SIDE INSTRUMENT PANEL VIEW

A-26

931103

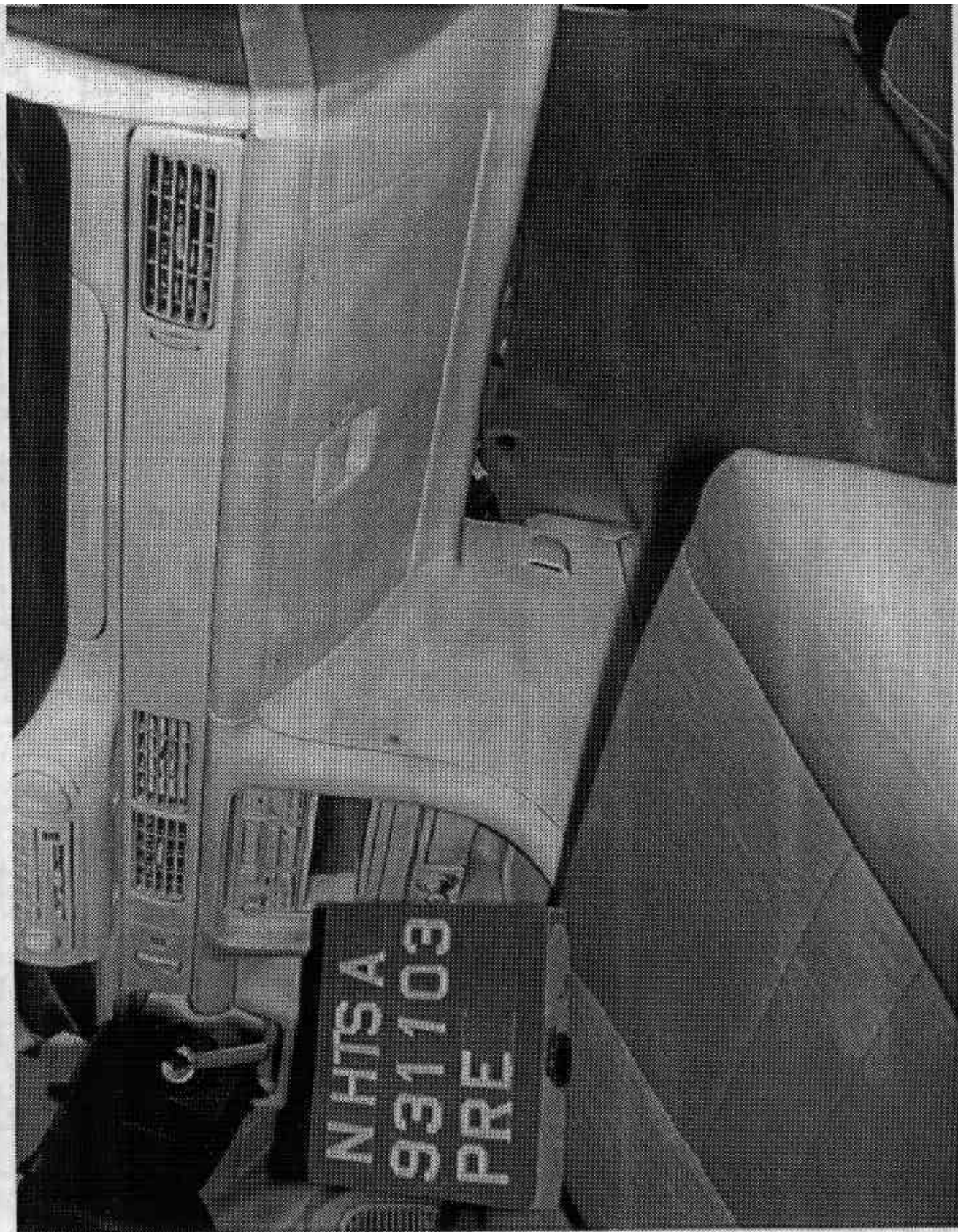


Figure A-26. PRE-TEST PASSENGER'S SIDE INSTRUMENT PANEL VIEW

A-27

931103



Figure A-27. PRE-TEST DRIVER DUMMY POSITION - VIEW I

A-28

931103

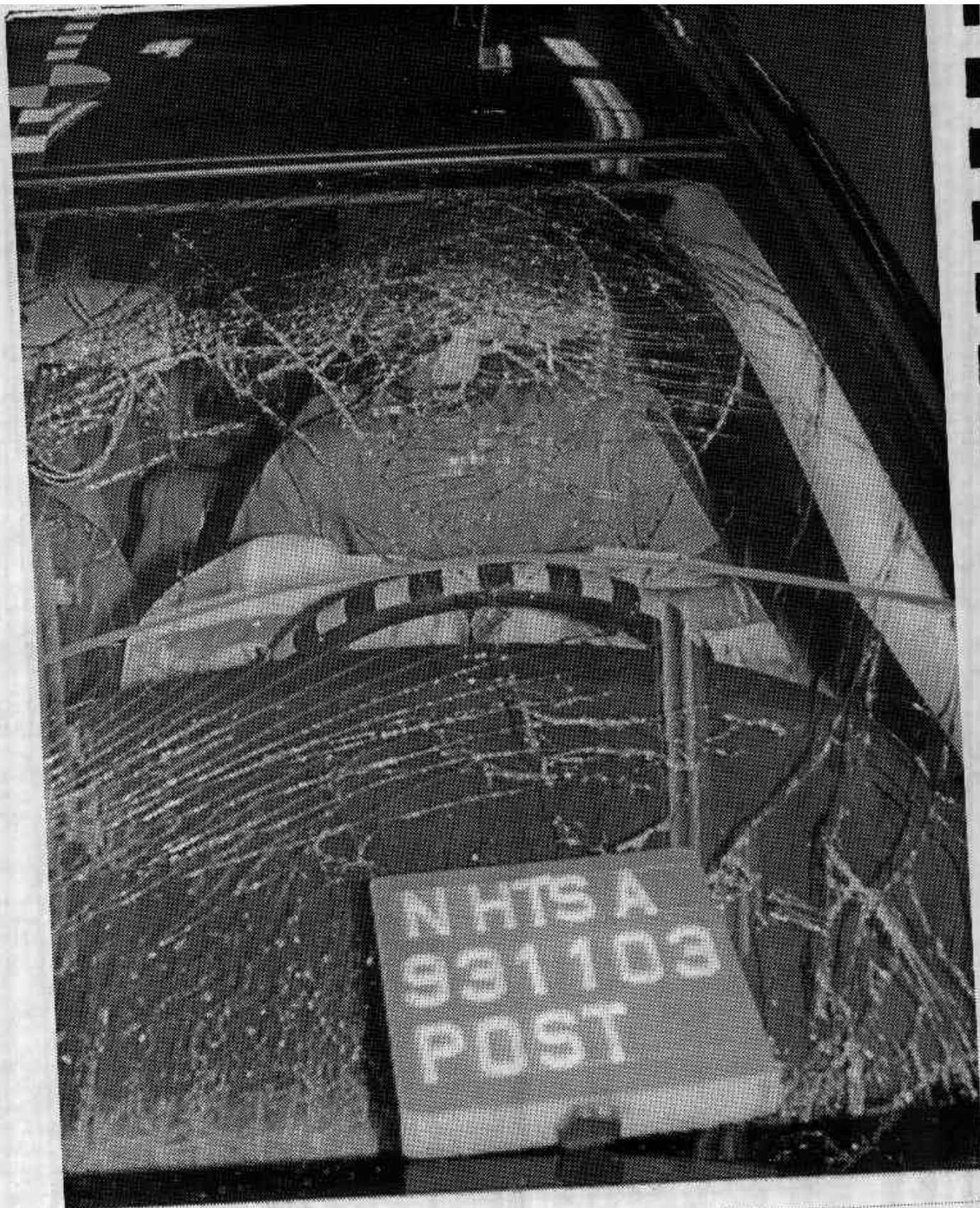


Figure A-28. POST-TEST DRIVER DUMMY POSITION - VIEW 1

A-29

931103

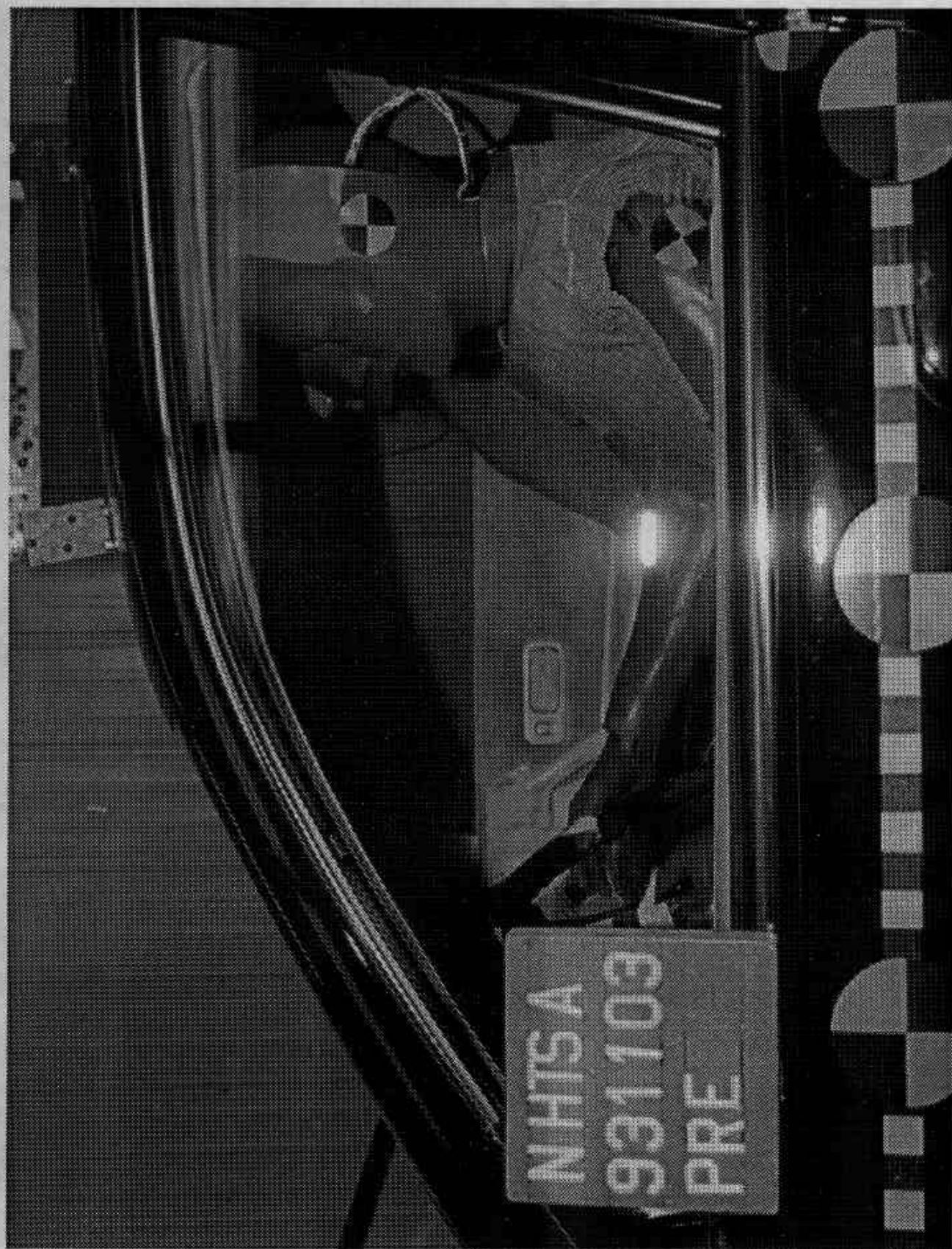


Figure A-29. PRE-TEST DRIVER DUMMY POSITION - VIEW 2

A-30

931103

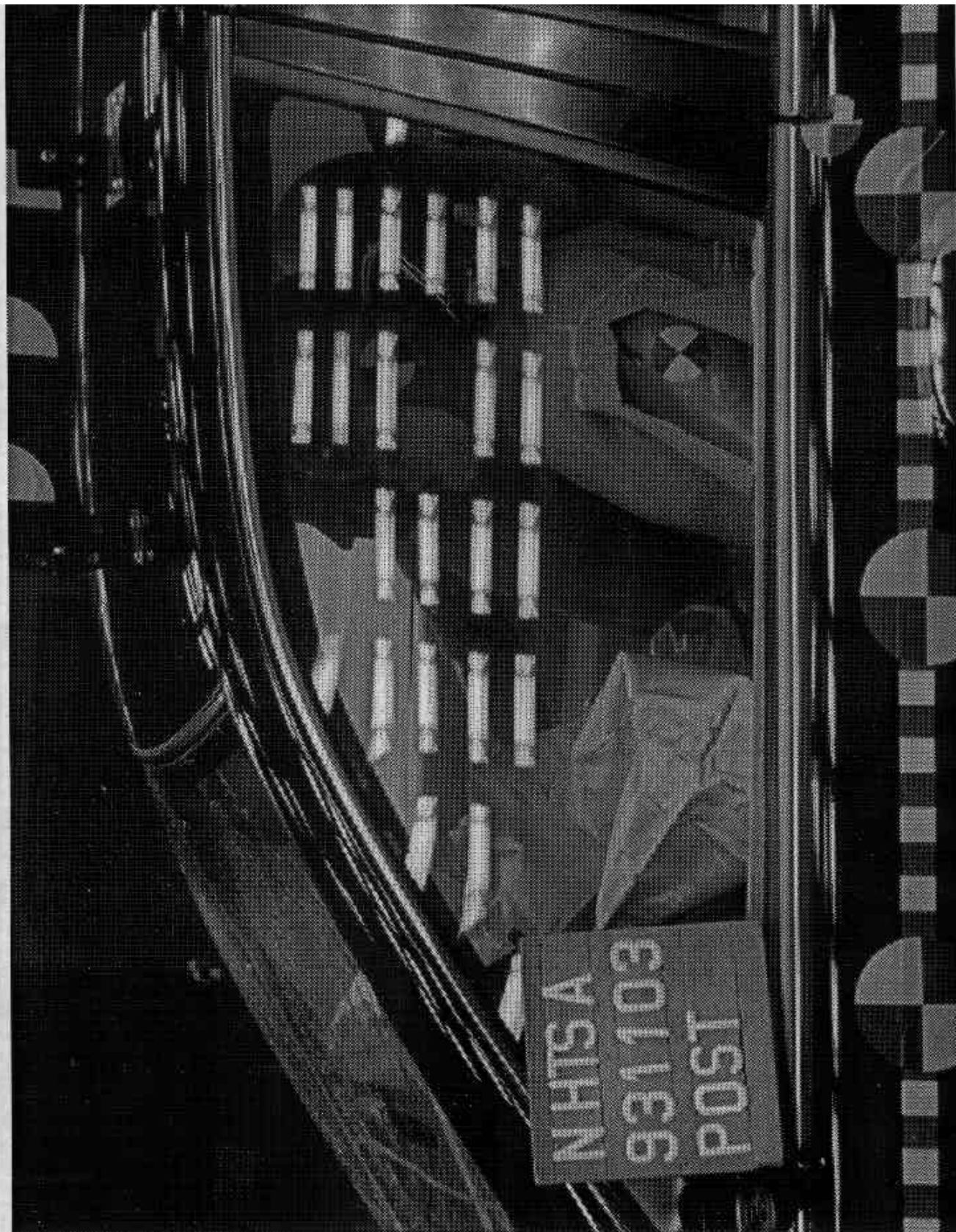


Figure A-30. POST-TEST DRIVER DUMMY POSITION - VIEW 2

A-31

931103

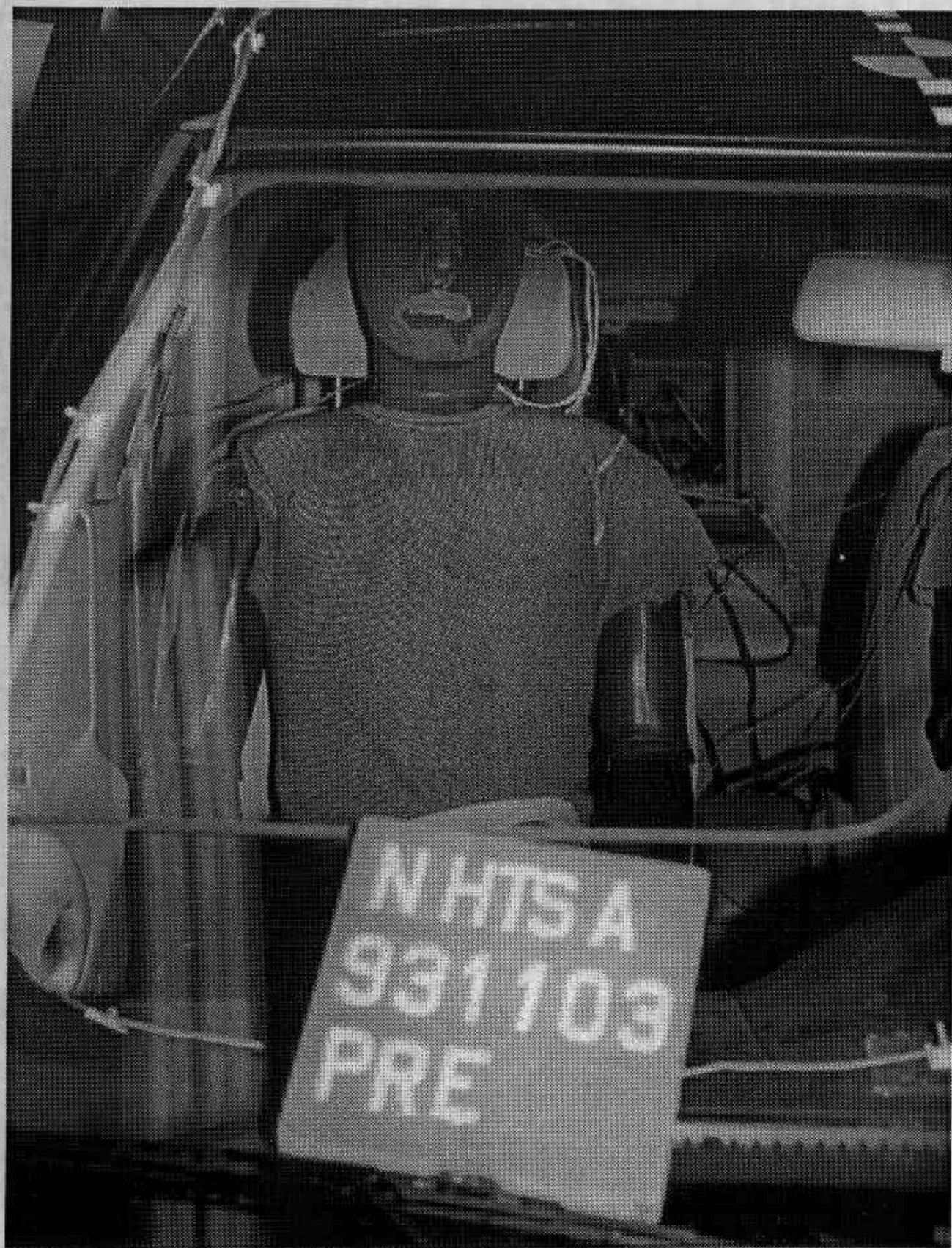


Figure A-31. PRE-TEST PASSENGER DUMMY POSITION - VIEW 1

A-32

931103

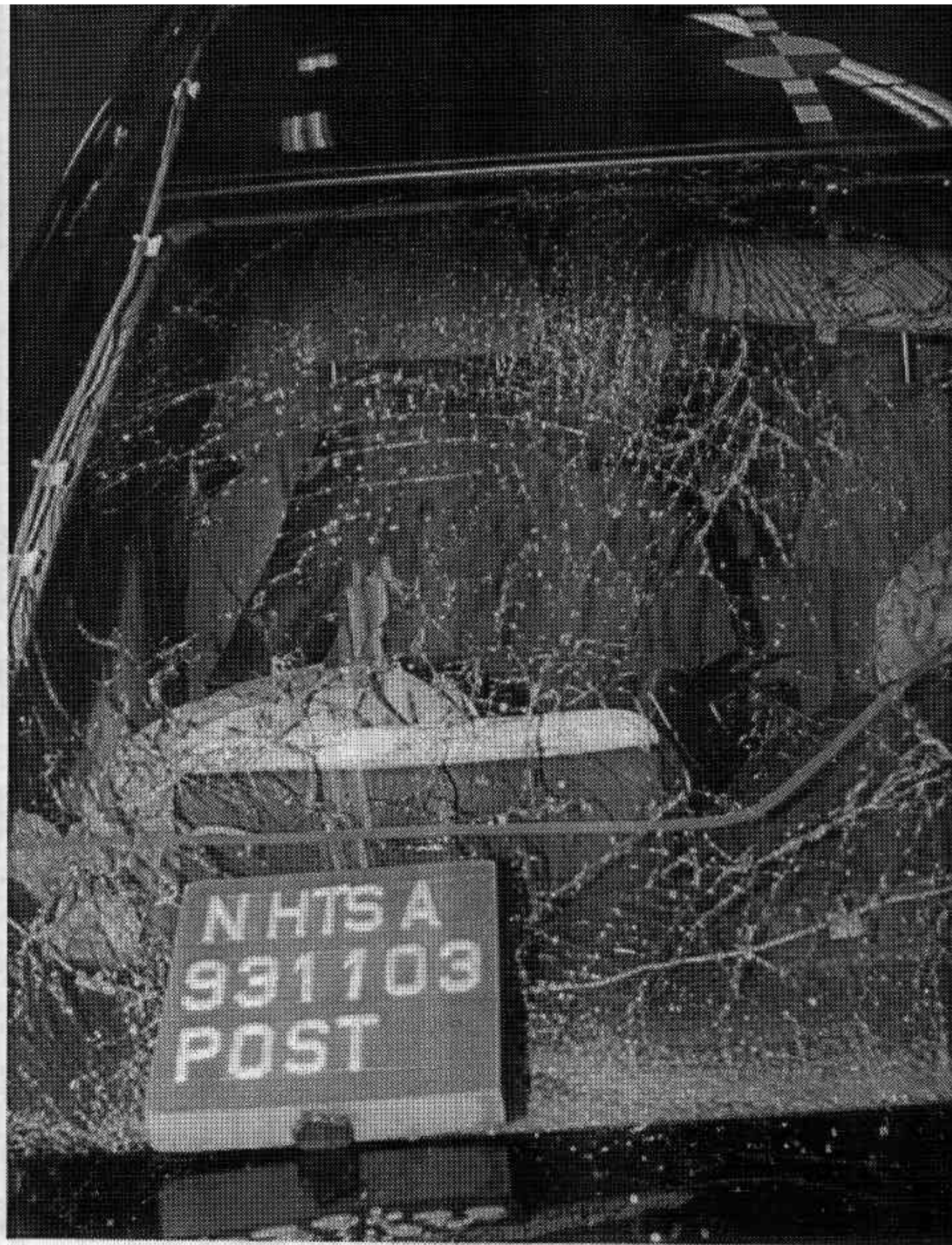


Figure A-32. POST-TEST PASSENGER DUMMY POSITION - VIEW 1

A-33

931103



Figure A-33. PRE-TEST PASSENGER DUMMY POSITION - VIEW 2

A-34

931103



Figure A-34. POST-TEST PASSENGER DUMMY POSITION - VIEW 2

A-35

931103



Figure A-35. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1
A-36 931103

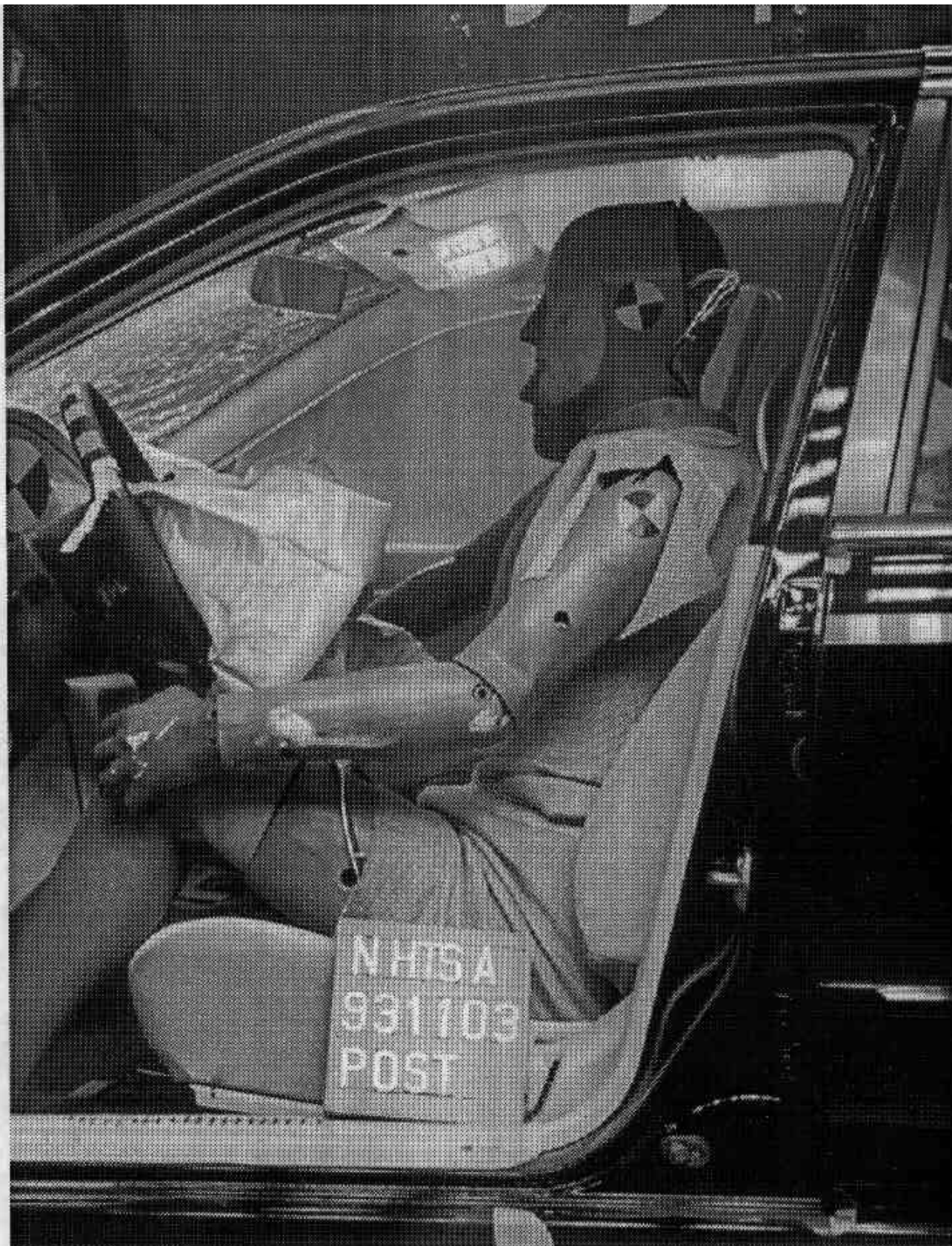


Figure A-36. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1
A-37 931103

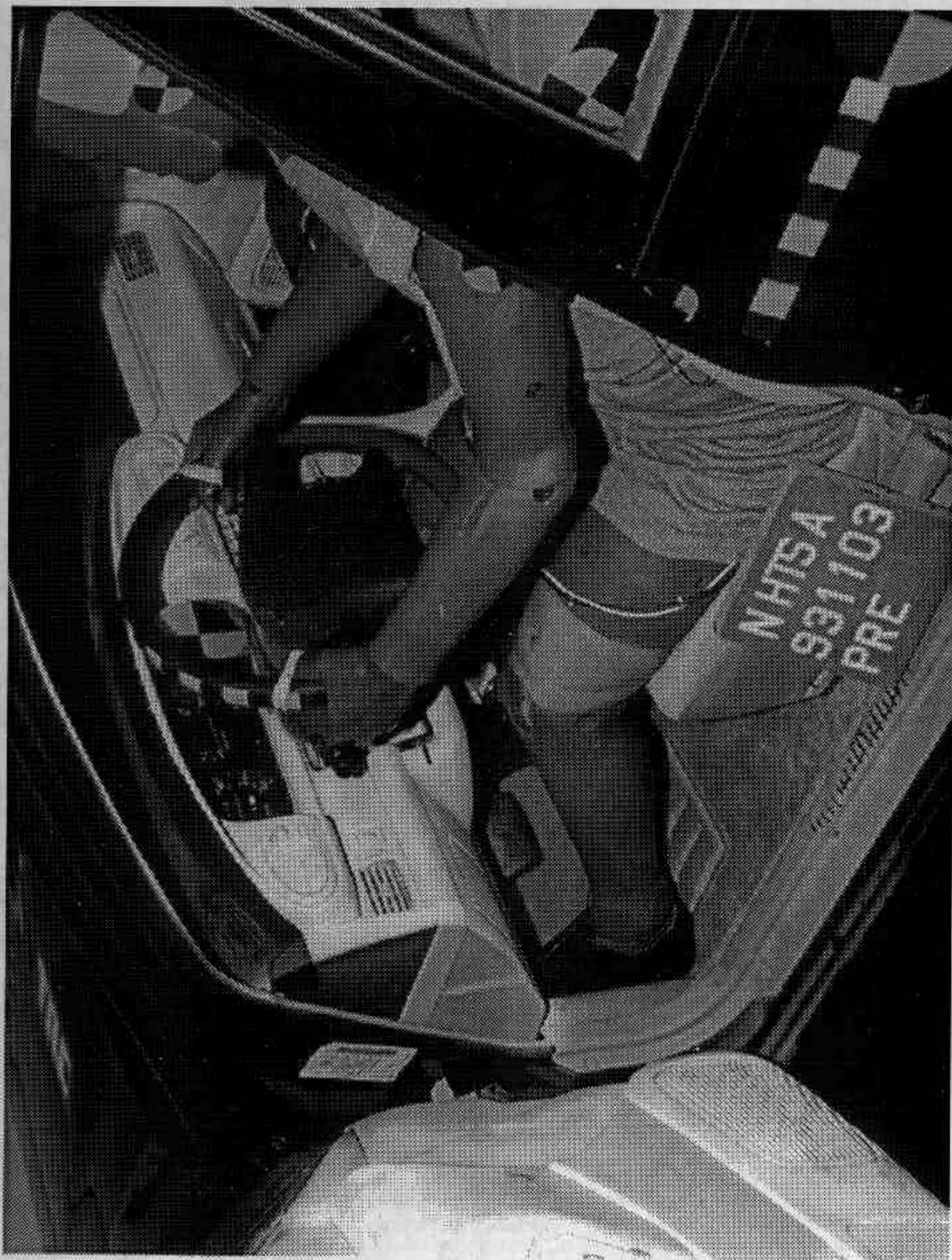


Figure A-37. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2
A-38 931103



Figure A-38. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2
A-39 931103

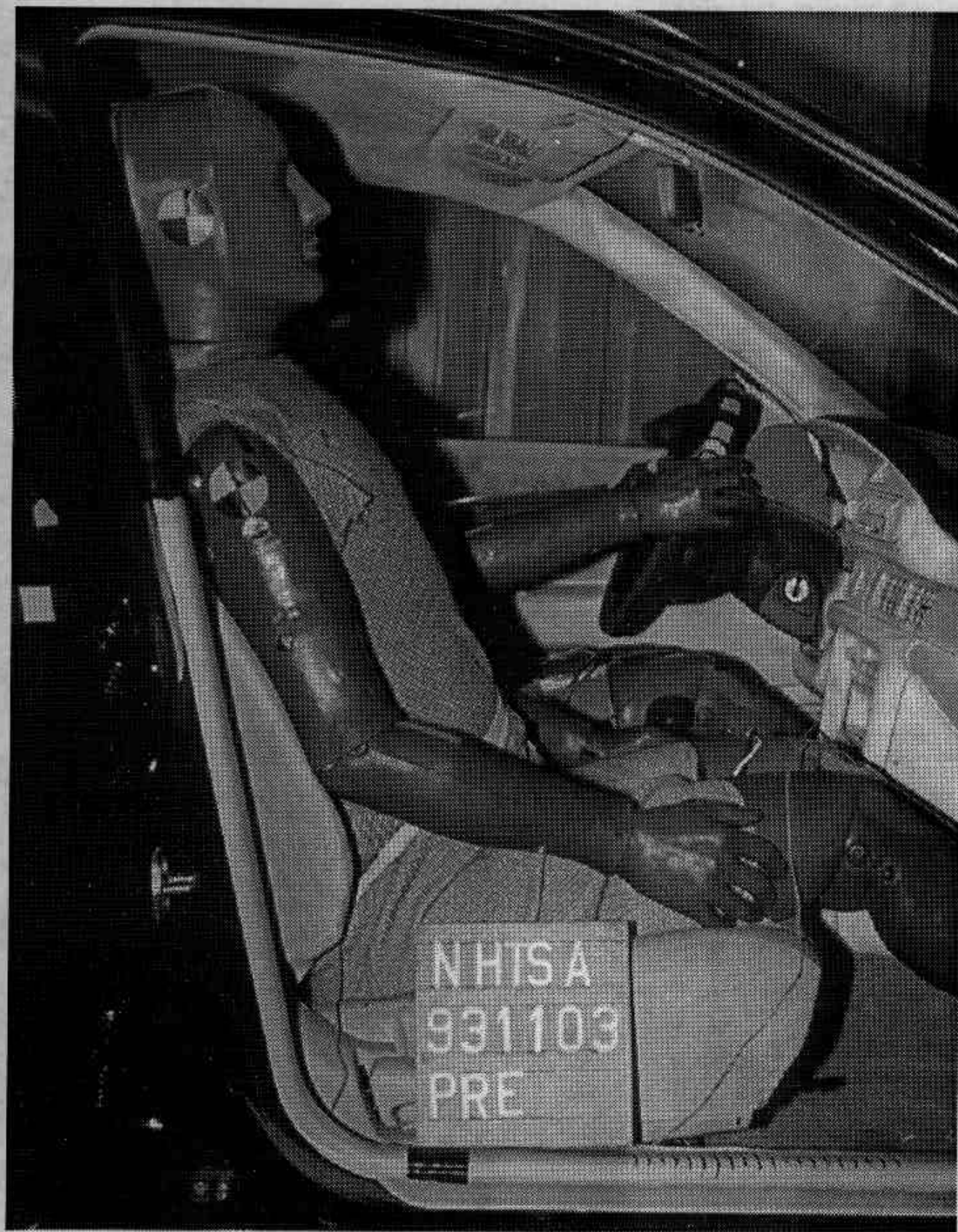


Figure A-39. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
A-40 931103



Figure A-40. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
A-41 931103

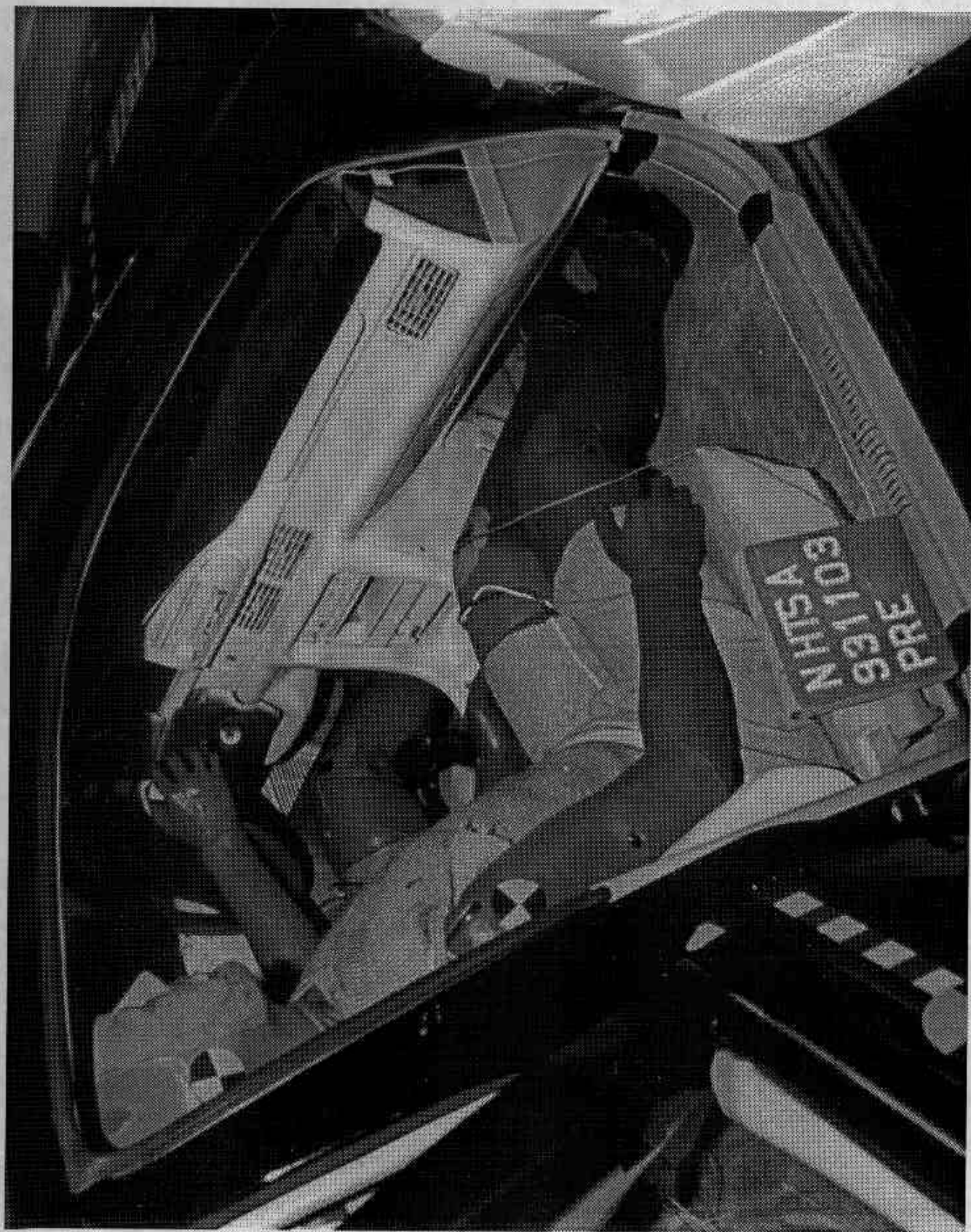


Figure A-41. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2
A-42 931103



Figure A-42. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2
A-43 931103

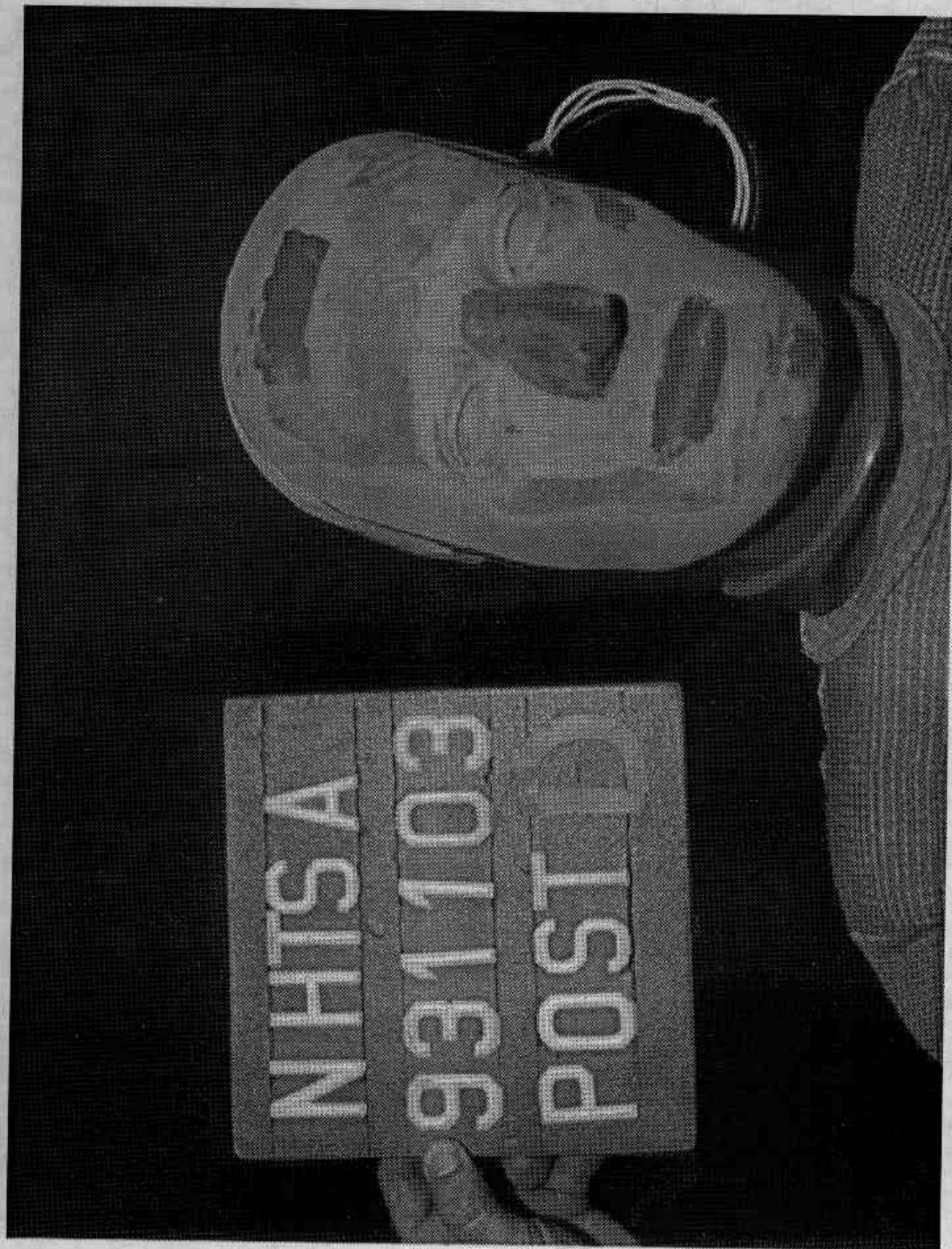


Figure A-43. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 1
A-44 931103

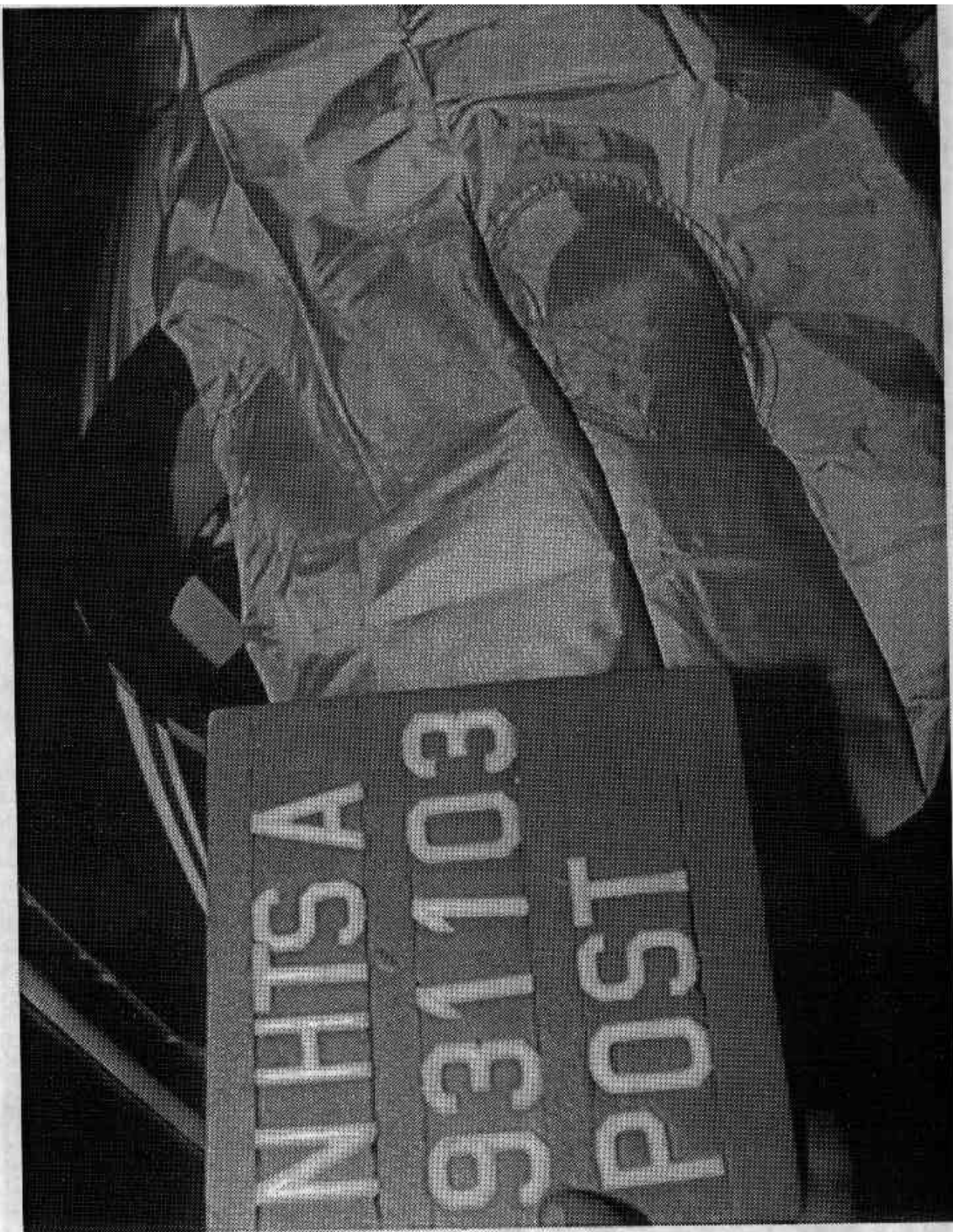


Figure A-44. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 2
A-45 931103



Figure A-45. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1

A-46

931103

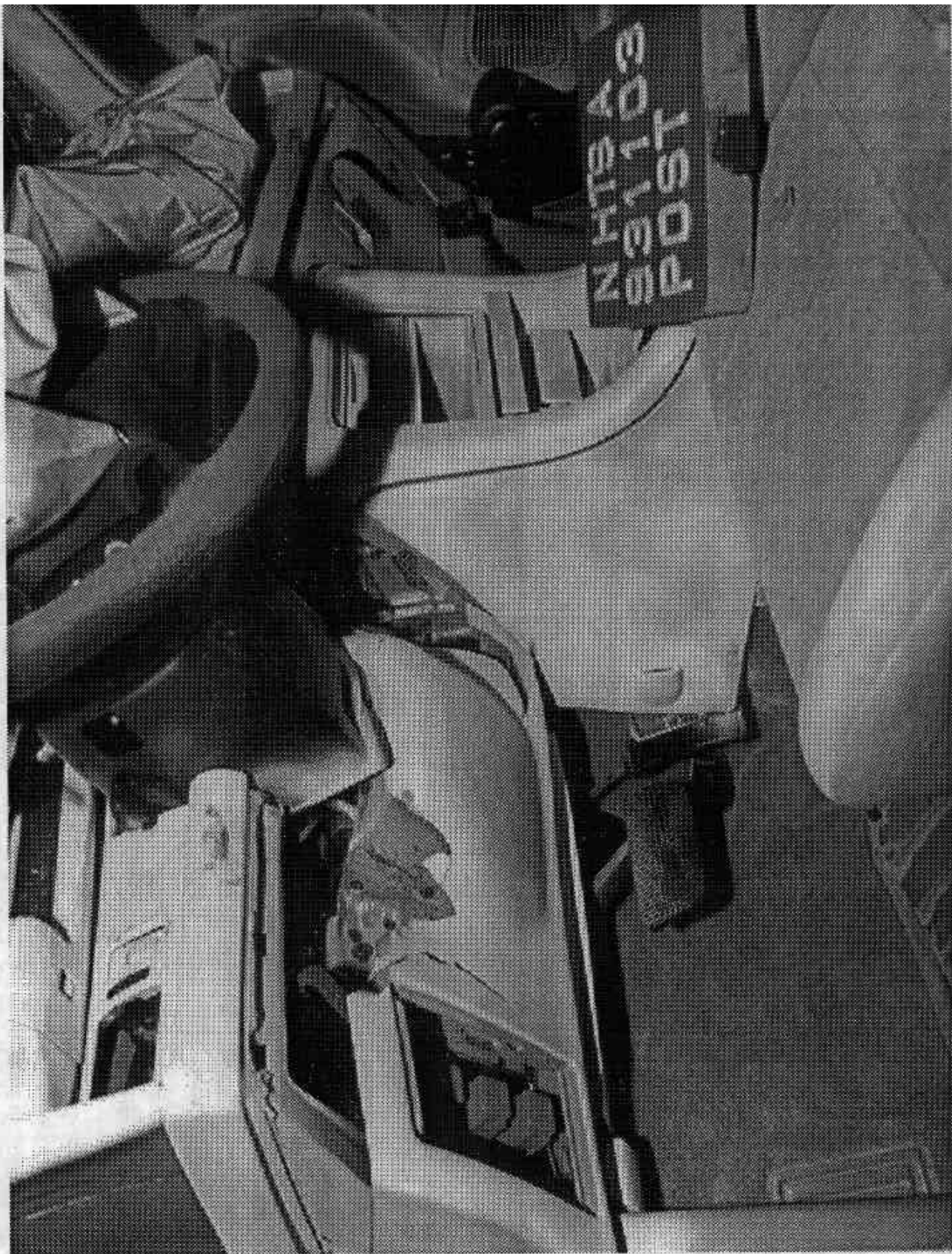


Figure A-46. POST-TEST DRIVER DUMMY KNEE CONTACT- VIEW 2
A-47 931103

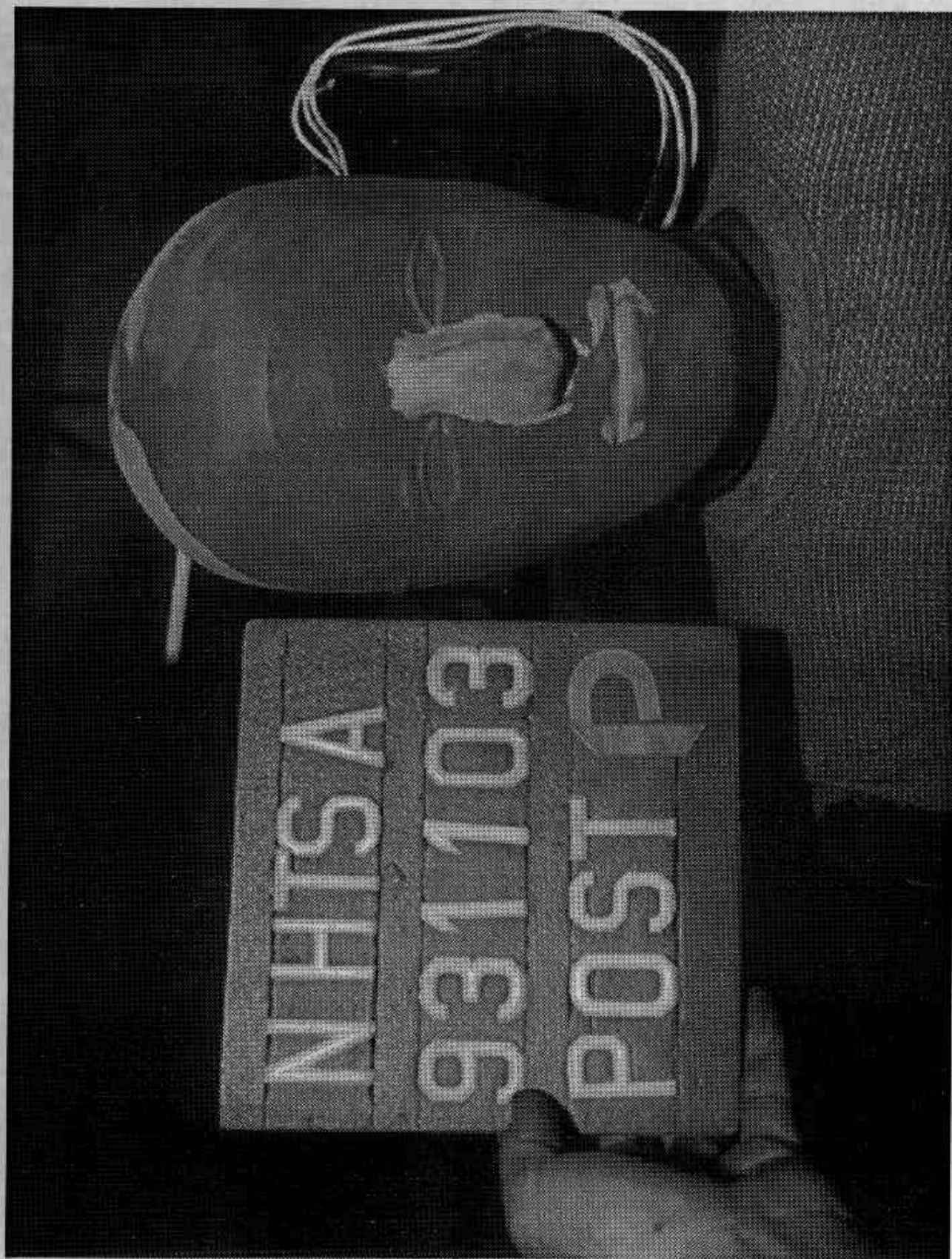


Figure A-47. POST-TEST PASSENGER DUMMY HEAD CONTACT - VIEW 1
A-48 931103



Figure A-48. POST-TEST PASSENGER DUMMY HEAD CONTACT - VIEW 2

A-49

931103

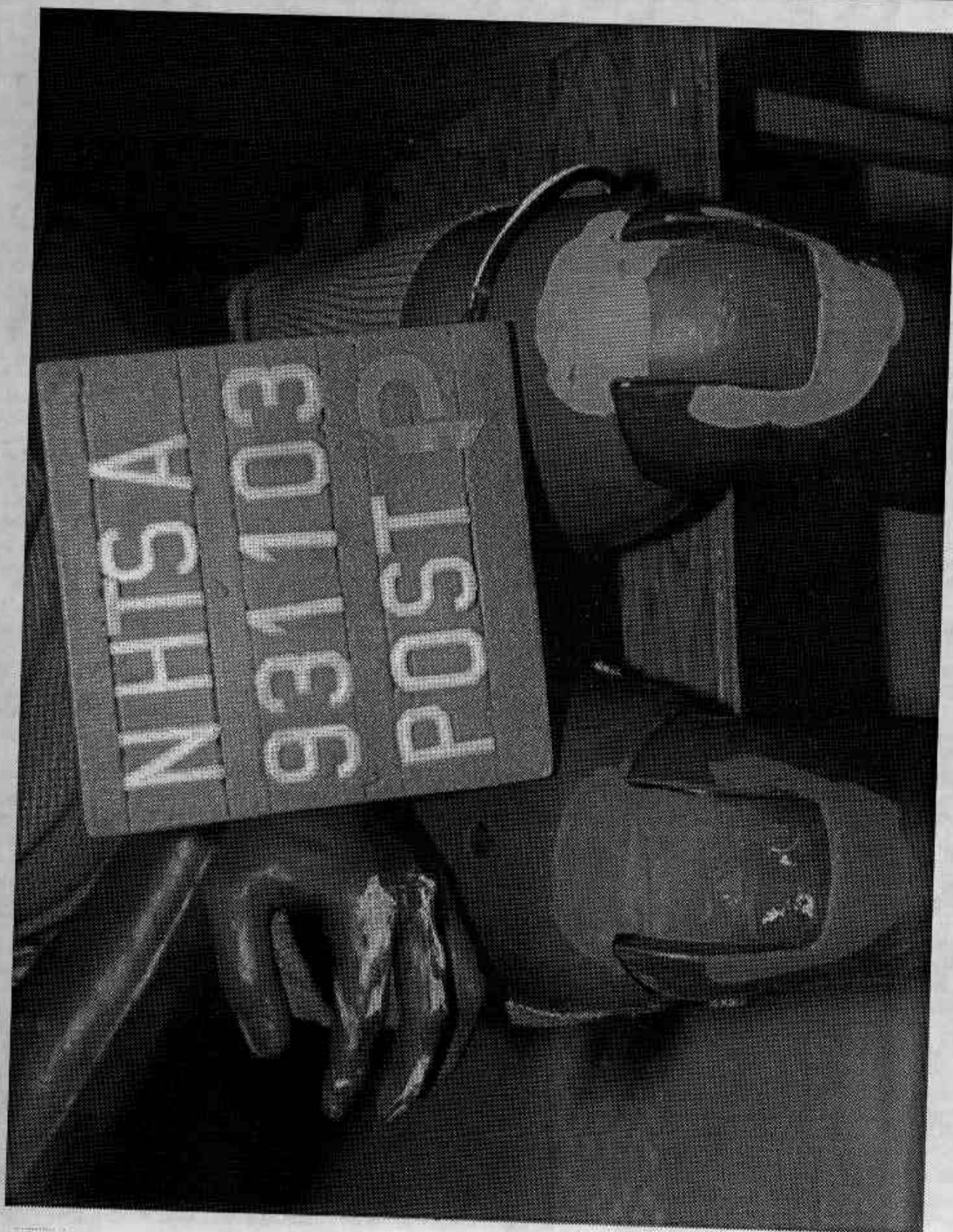


Figure A-49. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1
A-50 931103

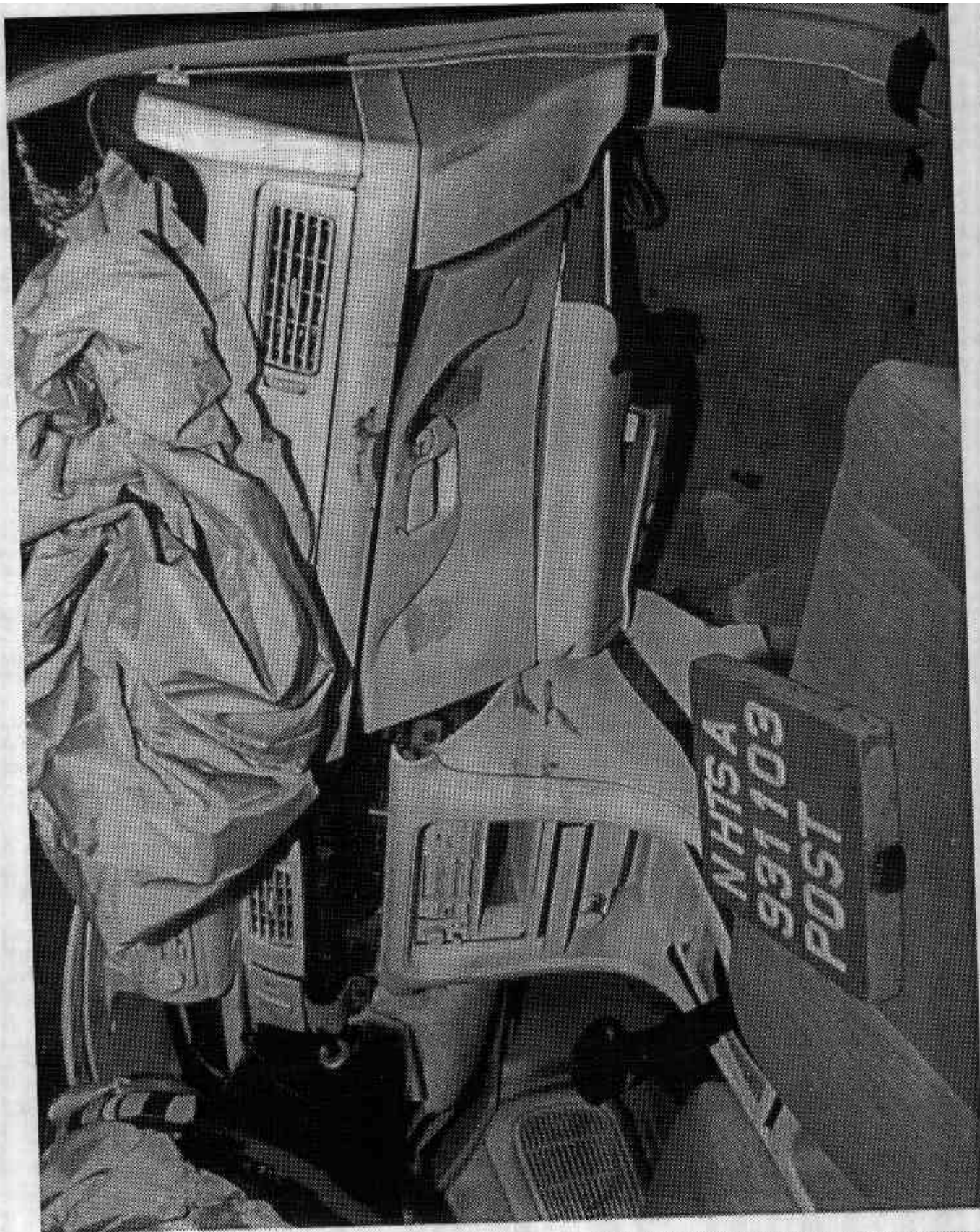


Figure A-50. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2
A-51 931103

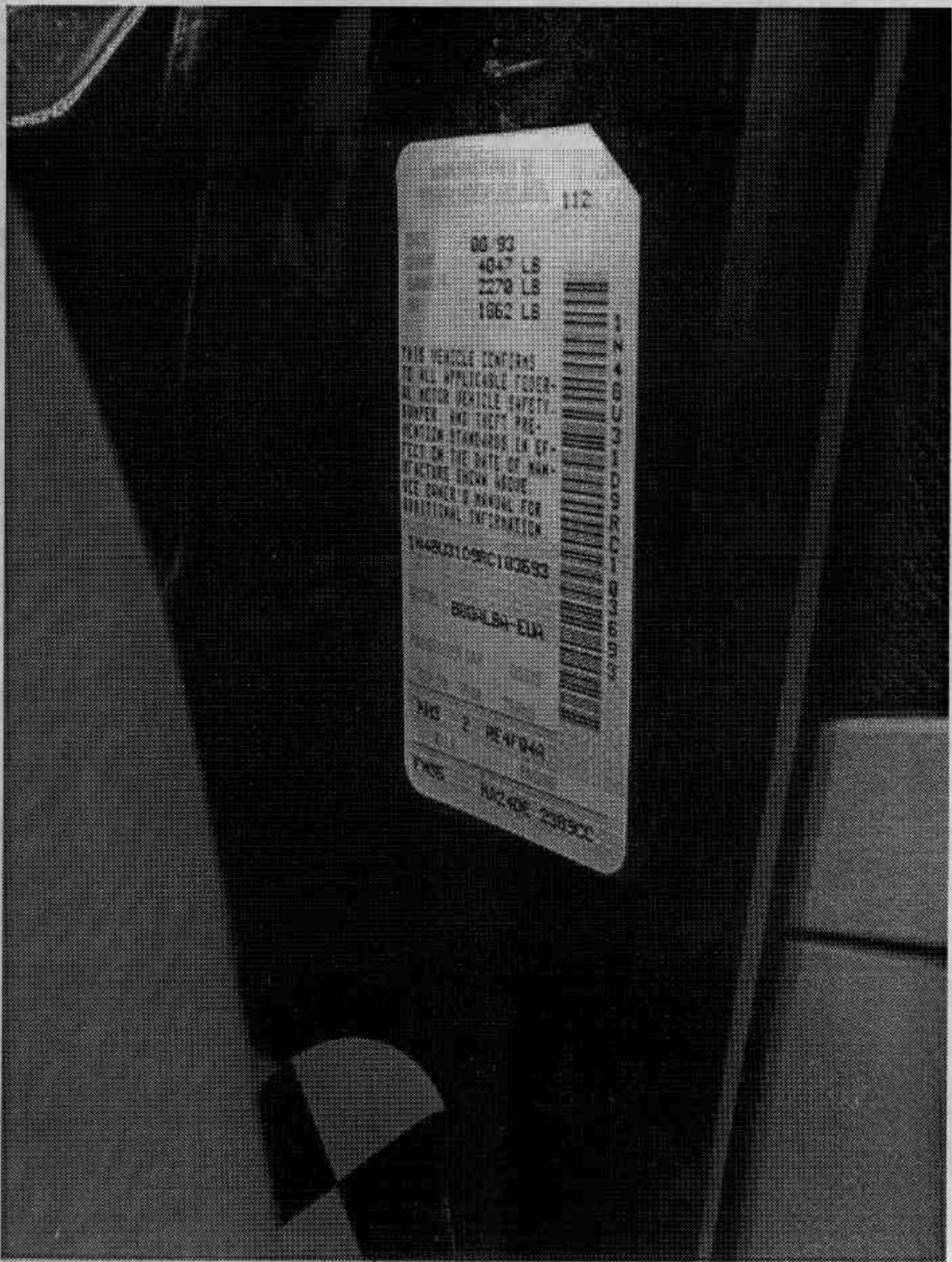


Figure A-51. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW

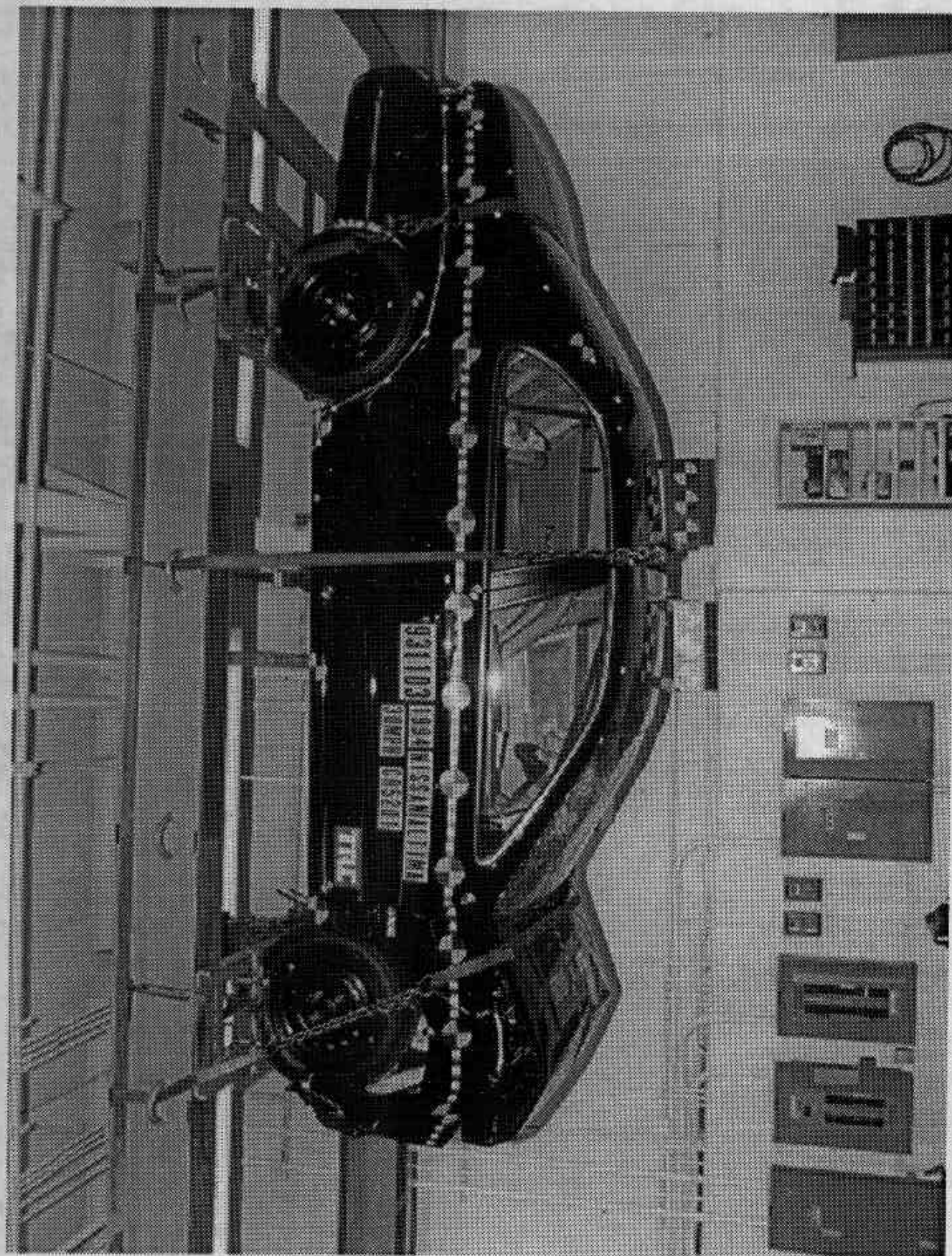


Figure A-53. POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW

A-54

931103

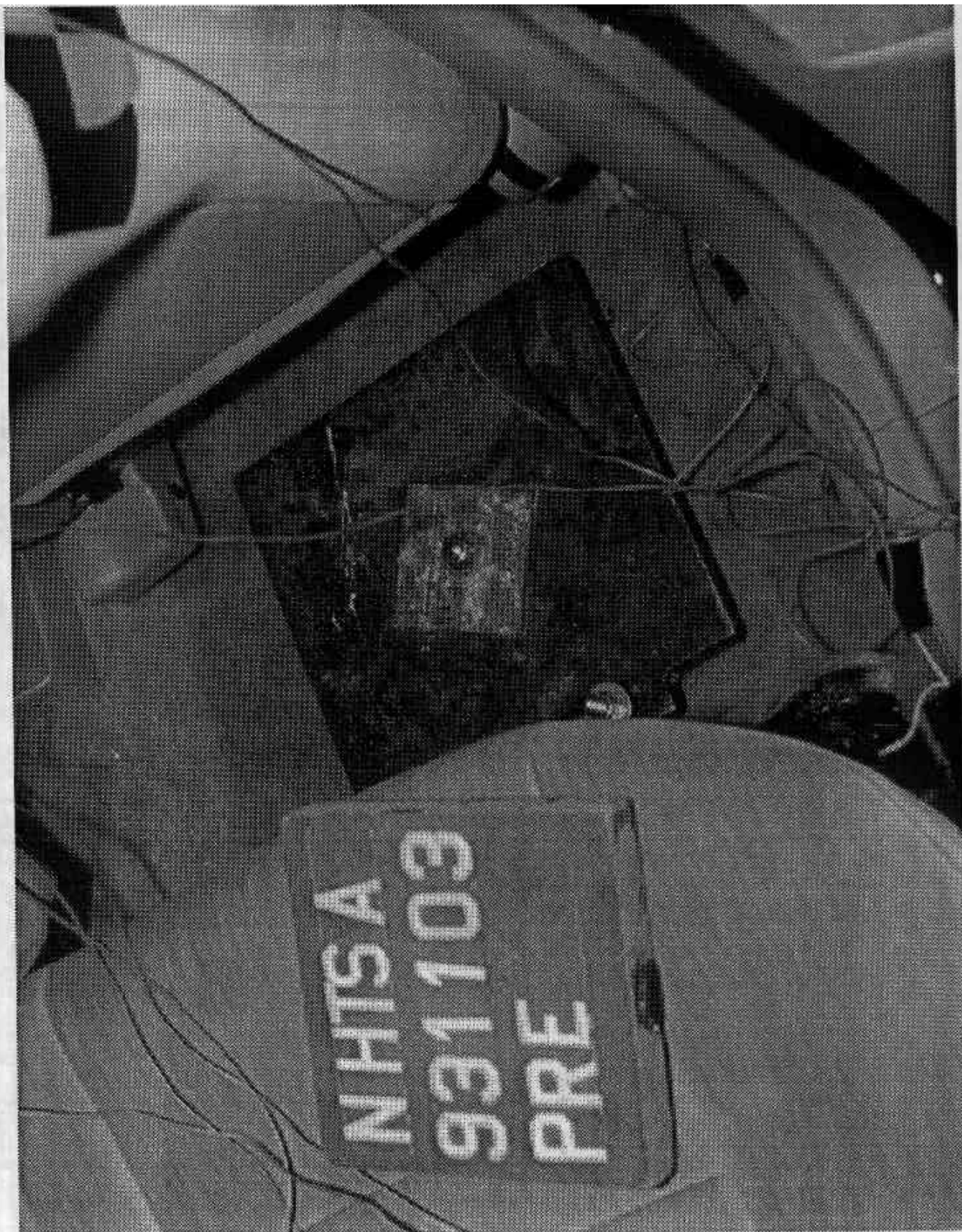


Figure A-54. PRE-TEST BALLAST LOCATION VIEW
A-55

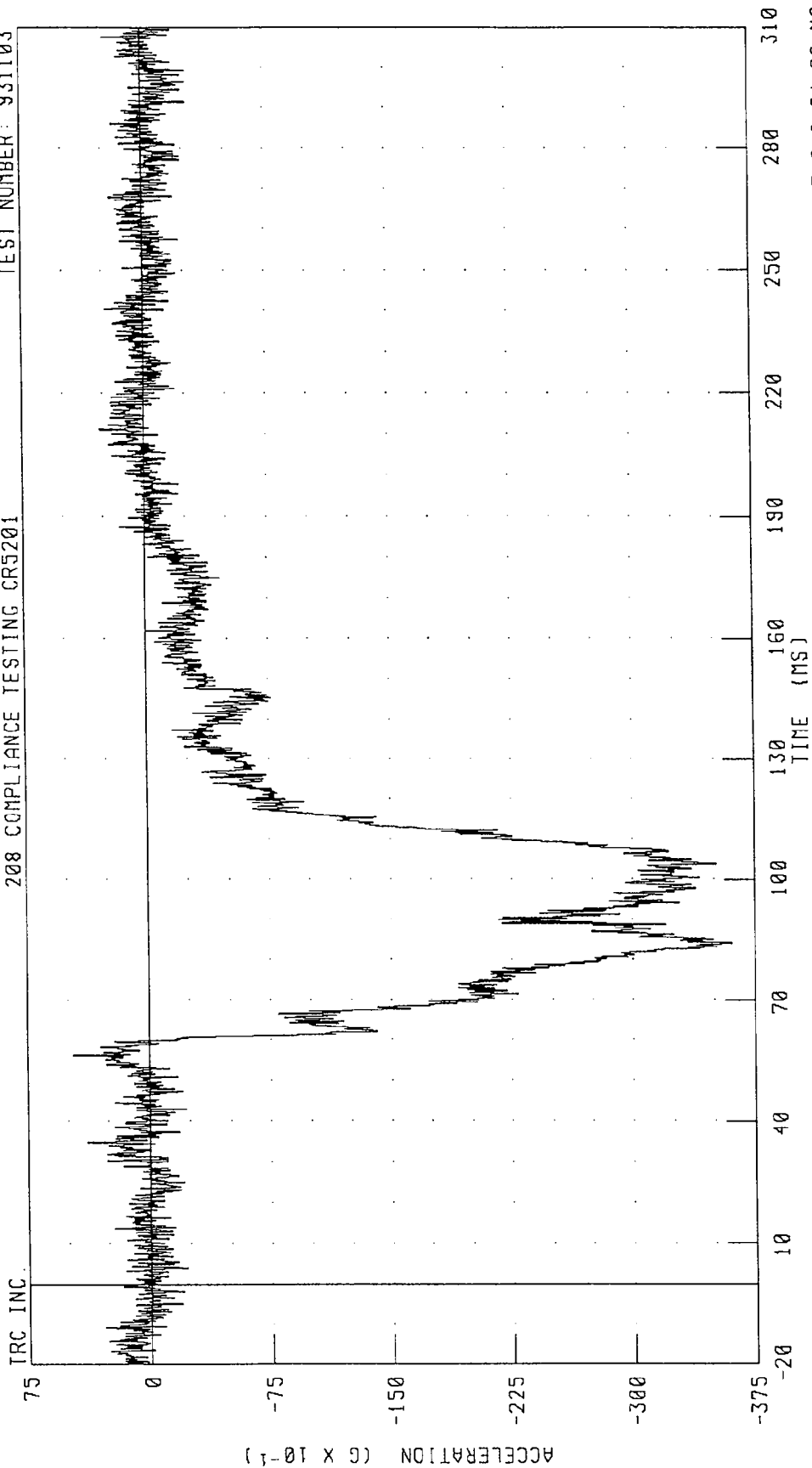
931103

APPENDIX B

DATA PLOTS

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 DRIVER HEAD X-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

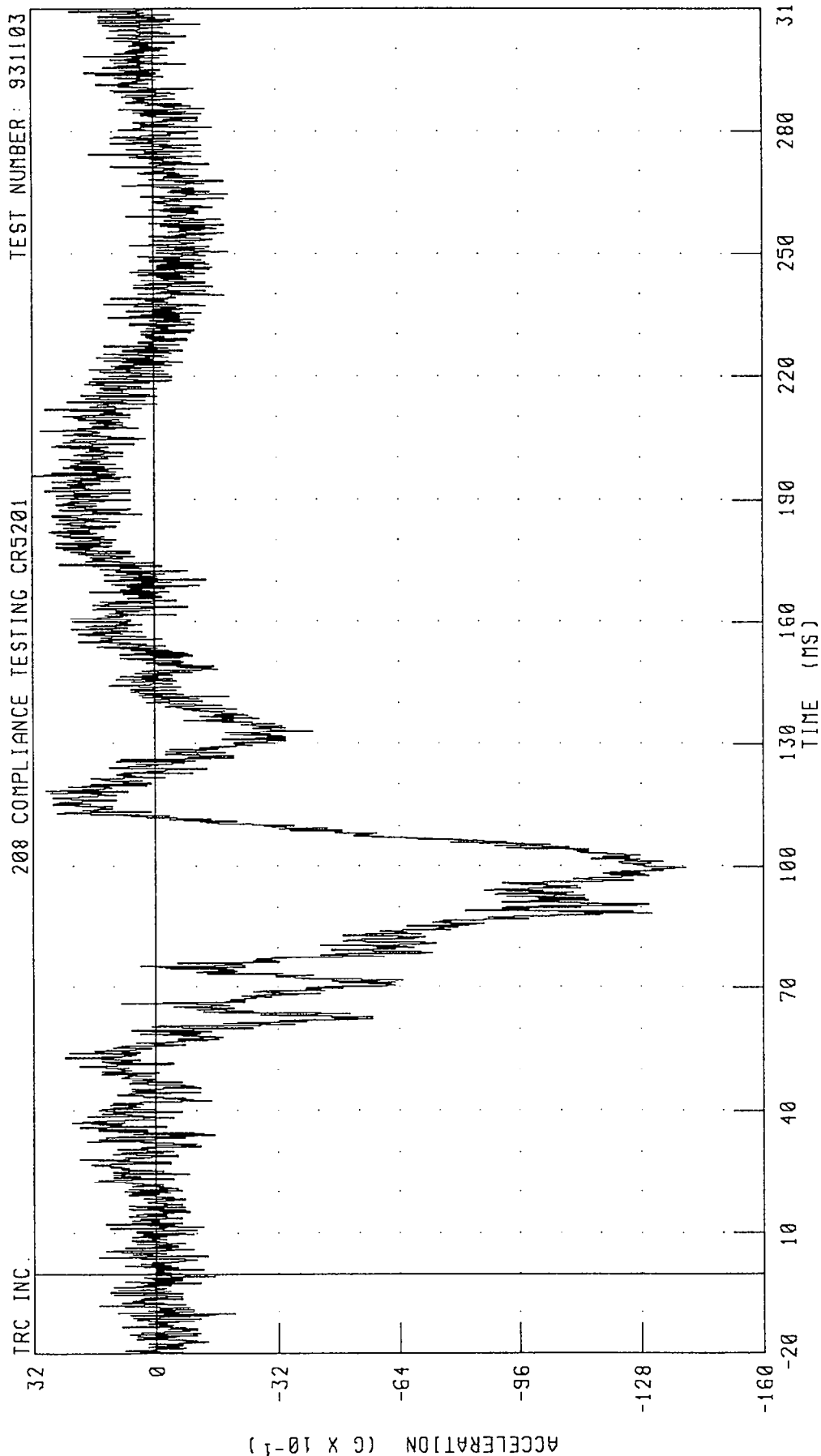


PEAK DATA: 4.67 G @ 56.16 MS, -36.07 G @ 84.08 MS

CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Y-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

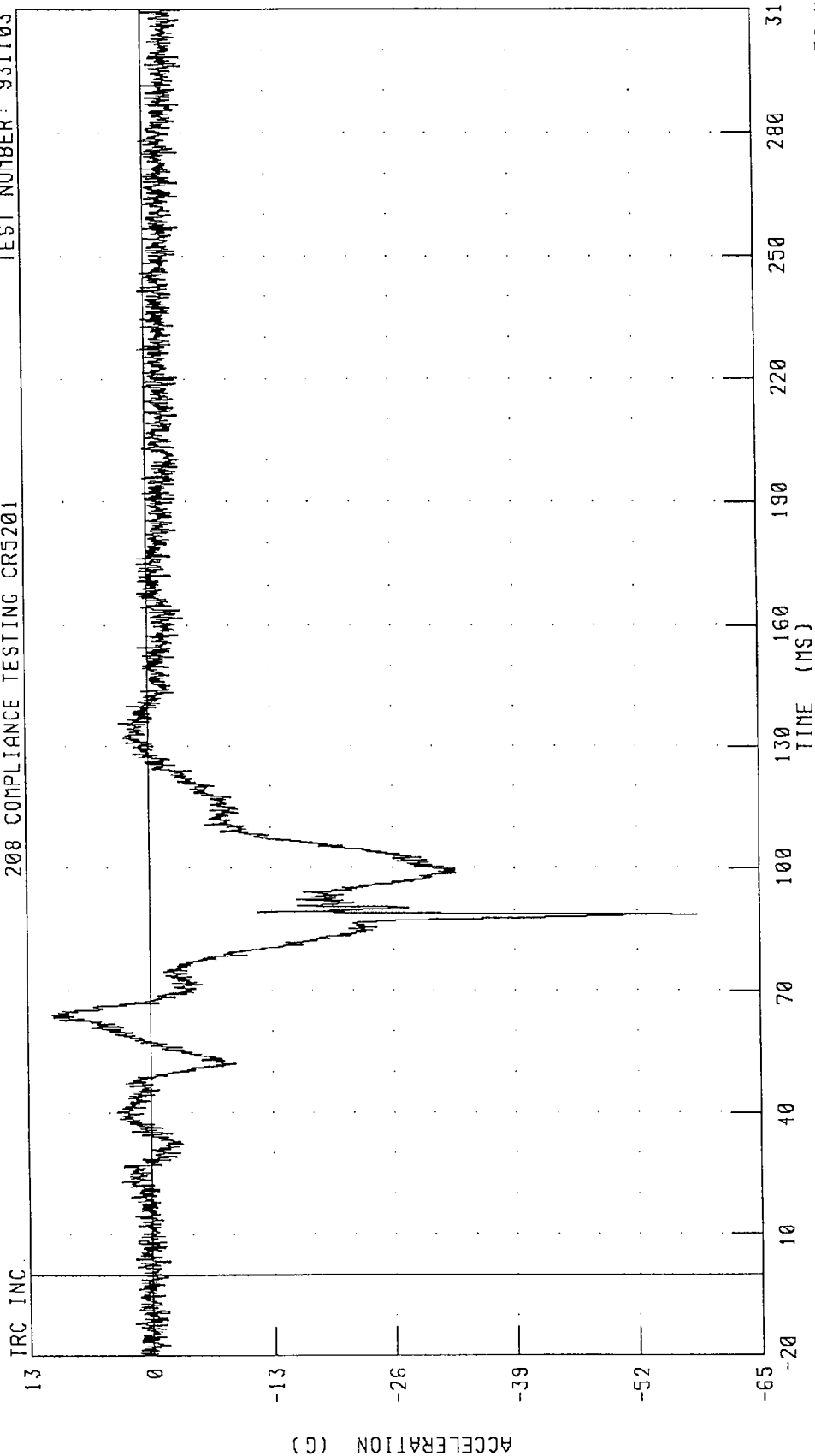


PEAK DATA: 3.16 G @ 195.76 MS; -13.96 G @ 99.68 MS

CHANNEL: HEDYG1 FILTER: CH. CLASS 1000

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

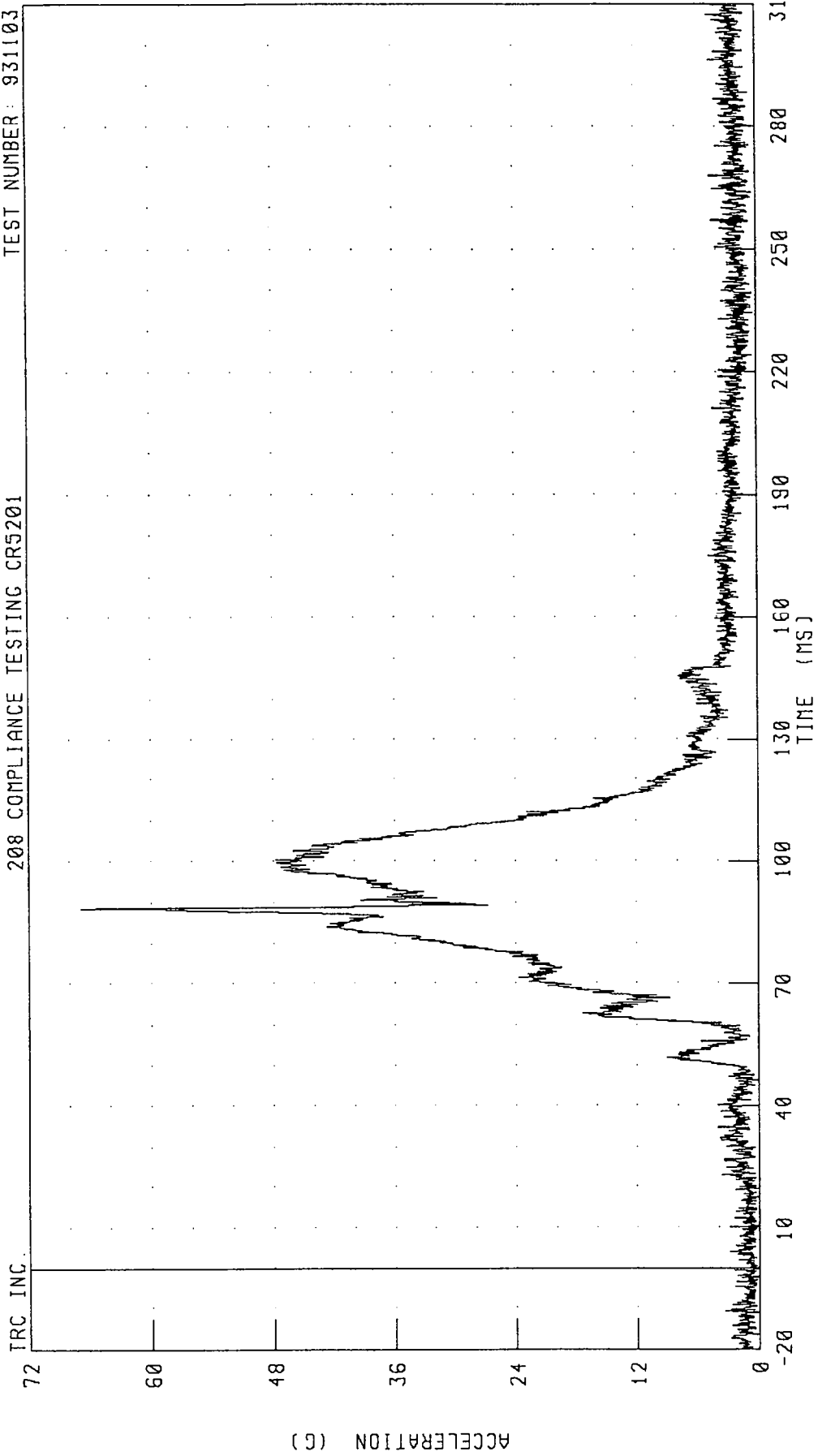


CHANNEL: HEDZG1 FILTER: CH. CLASS 1000

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 DRIVER HEAD RESULTANT ACCELERATION

TEST NUMBER: 931103

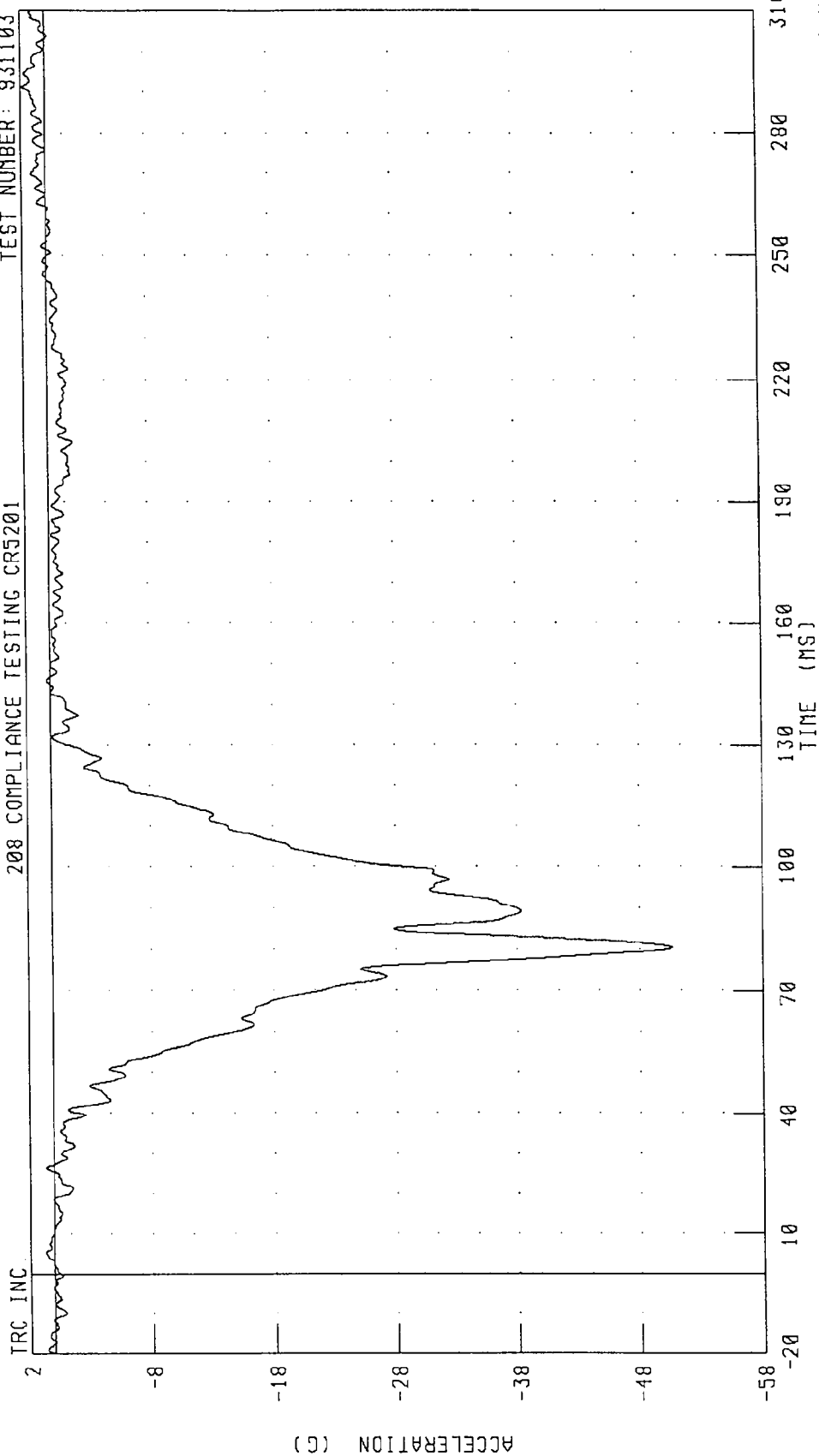
208 COMPLIANCE TESTING CR5201



CHANNEL: HEDRG1 FILTER: CH. CLASS 1000

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
DRIVER CHEST X-AXIS ACCELERATION
208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

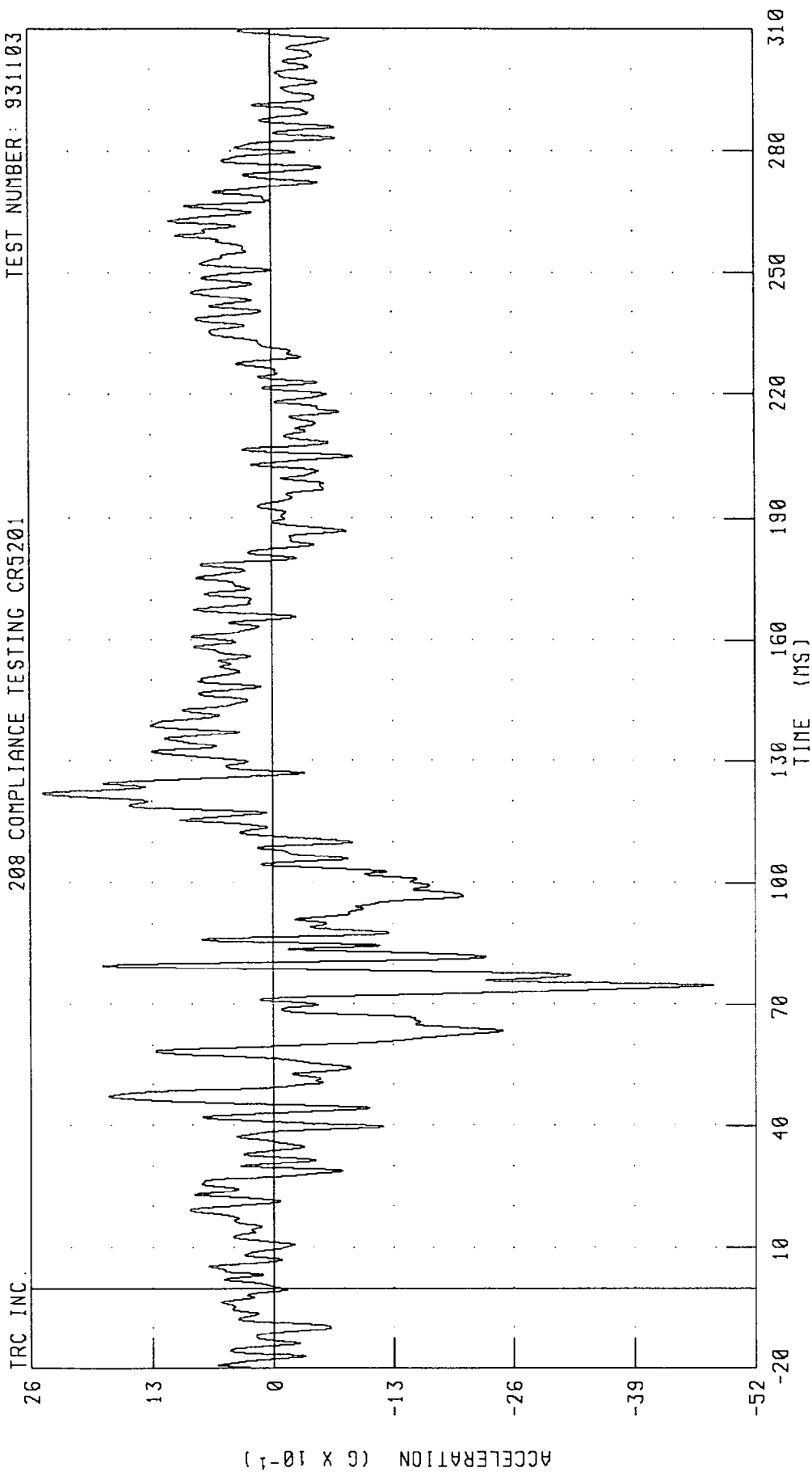


CHANNEL: CSTXG1 FILTER: CH. CLASS 180

PEAK DATA: 1.86 G @ 291.20 MS; -50.60 G @ 80.48 MS

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Y-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

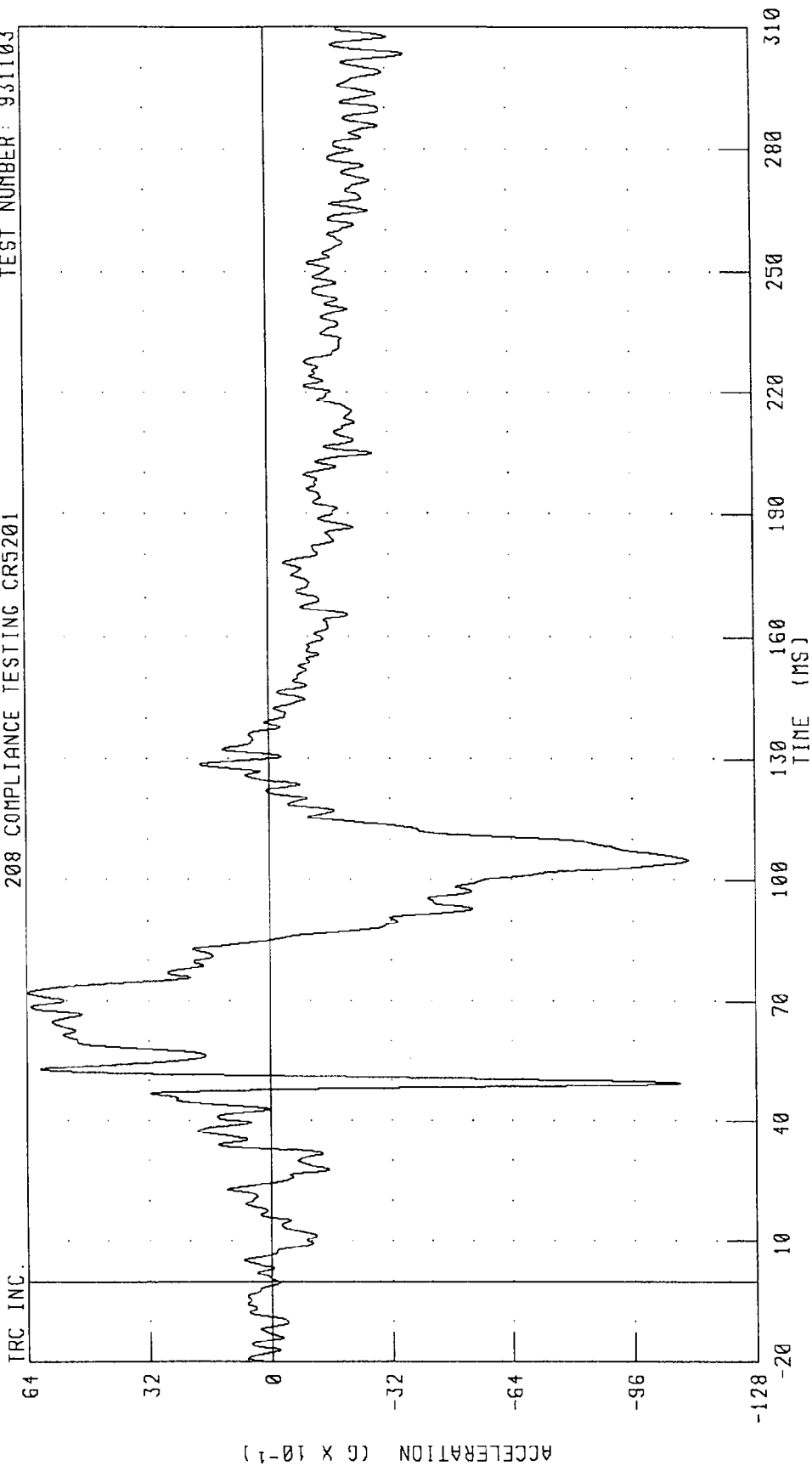


CHANNEL: CSTYG1 FILTER: CH. CLASS 180

PEAK DATA: 2.46 G @ 122.08 MS, -4.74 G @ 74.88 MS

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103



PEAK DATA: 6.38 G @ 72.08 MS; -11.05 G @ 104.88 MS

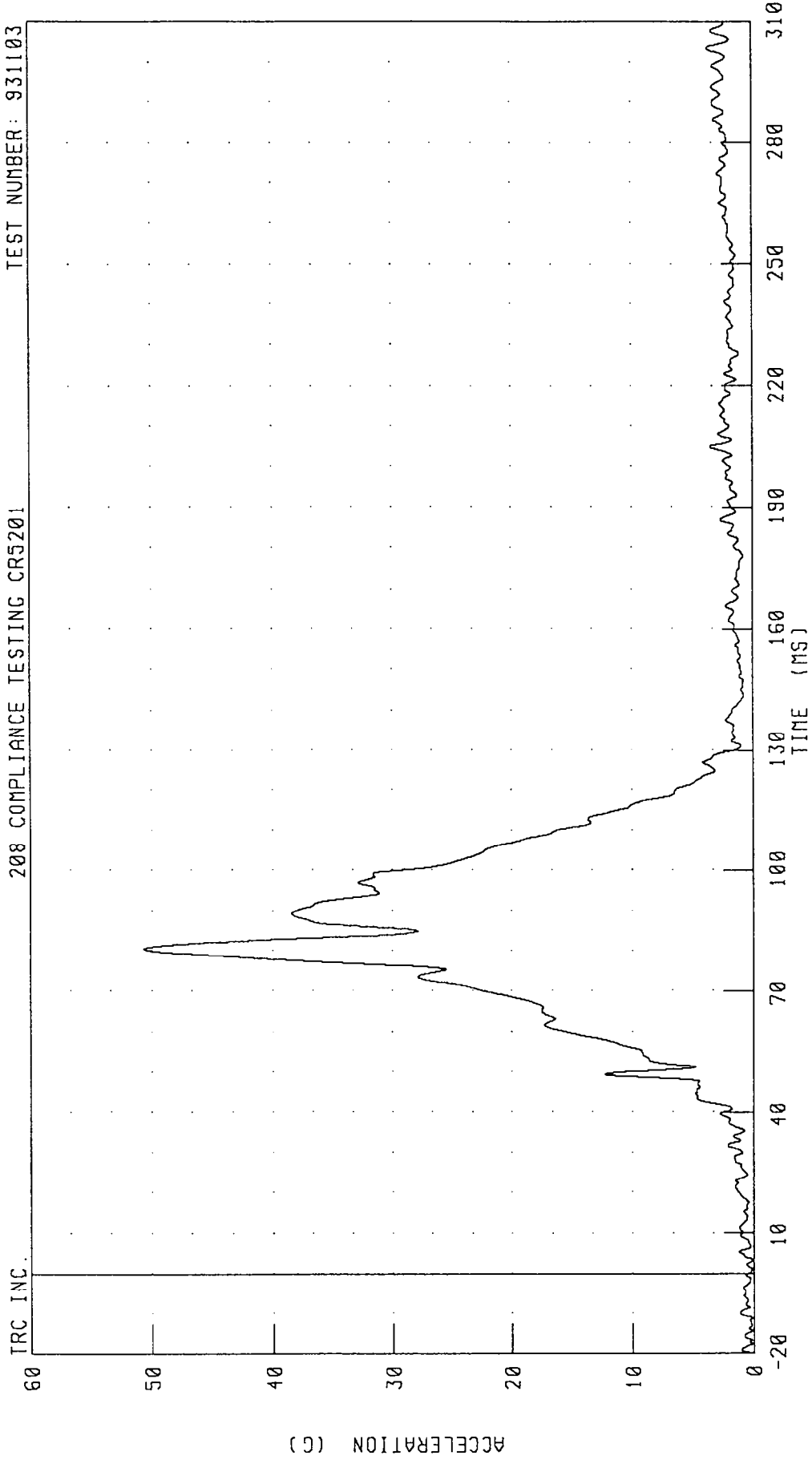
CHANNEL: CSTZG1 FILTER: CH CLASS 180

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER

DRIVER CHEST RESULTANT ACCELERATION

208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

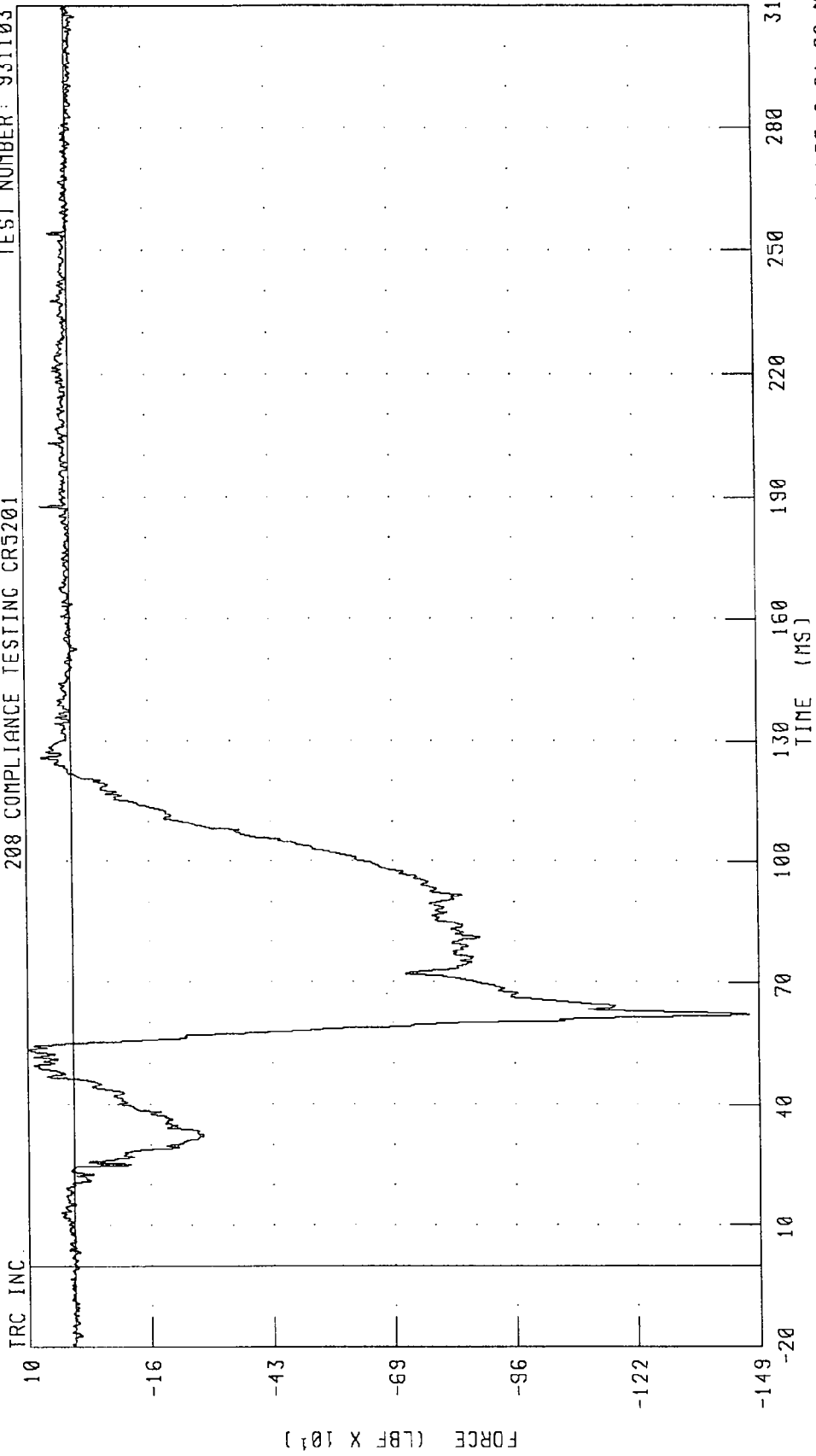


CHANNEL: CSTRG1 FILTER: CH. CLASS 180

PEAK DATA: 50.63 G @ 80.48 MS; 0.10 G @ -20.00 MS

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
DRIVER LEFT FEMUR FORCE
208 COMPLIANCE TESTING CR5201

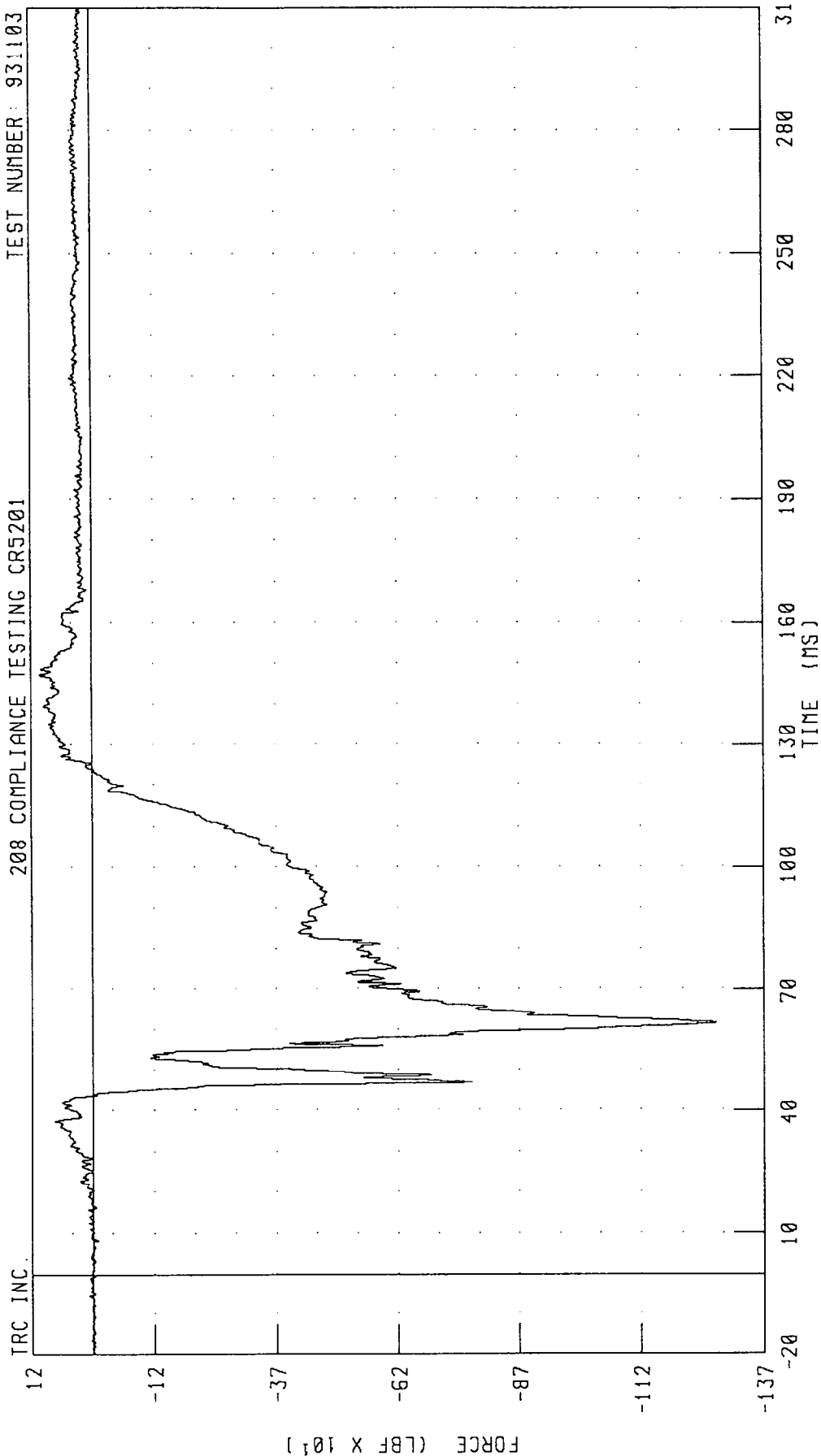
TEST NUMBER: 931103



CHANNEL: LFMFI FILTER: CH. CLASS 600

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
DRIVER RIGHT FEMUR FORCE
208 COMPLIANCE TESTING CR5201

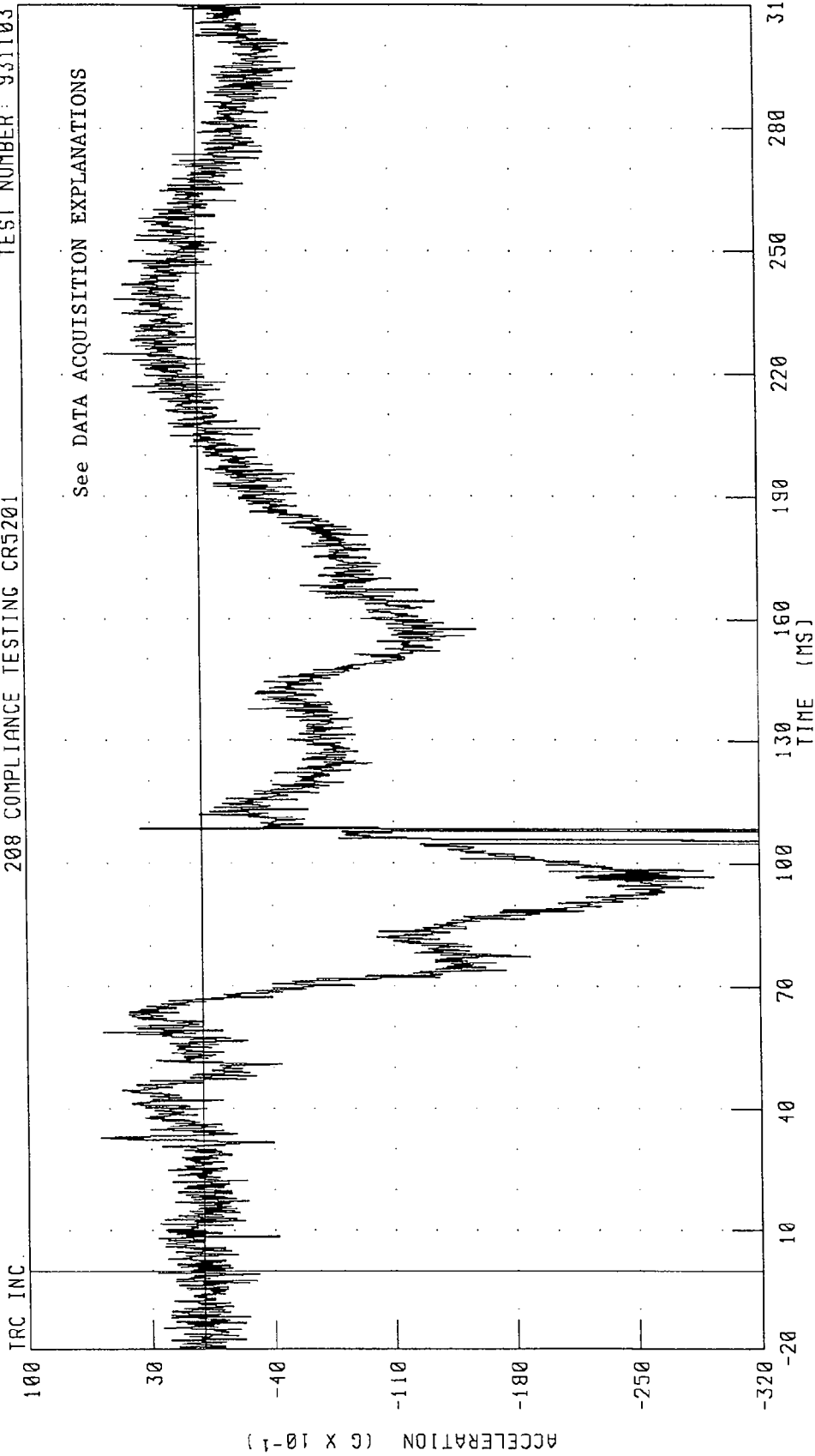
TEST NUMBER: 931103



CHANNEL: RFMFI FILTER: CH. CLASS 600

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION
208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

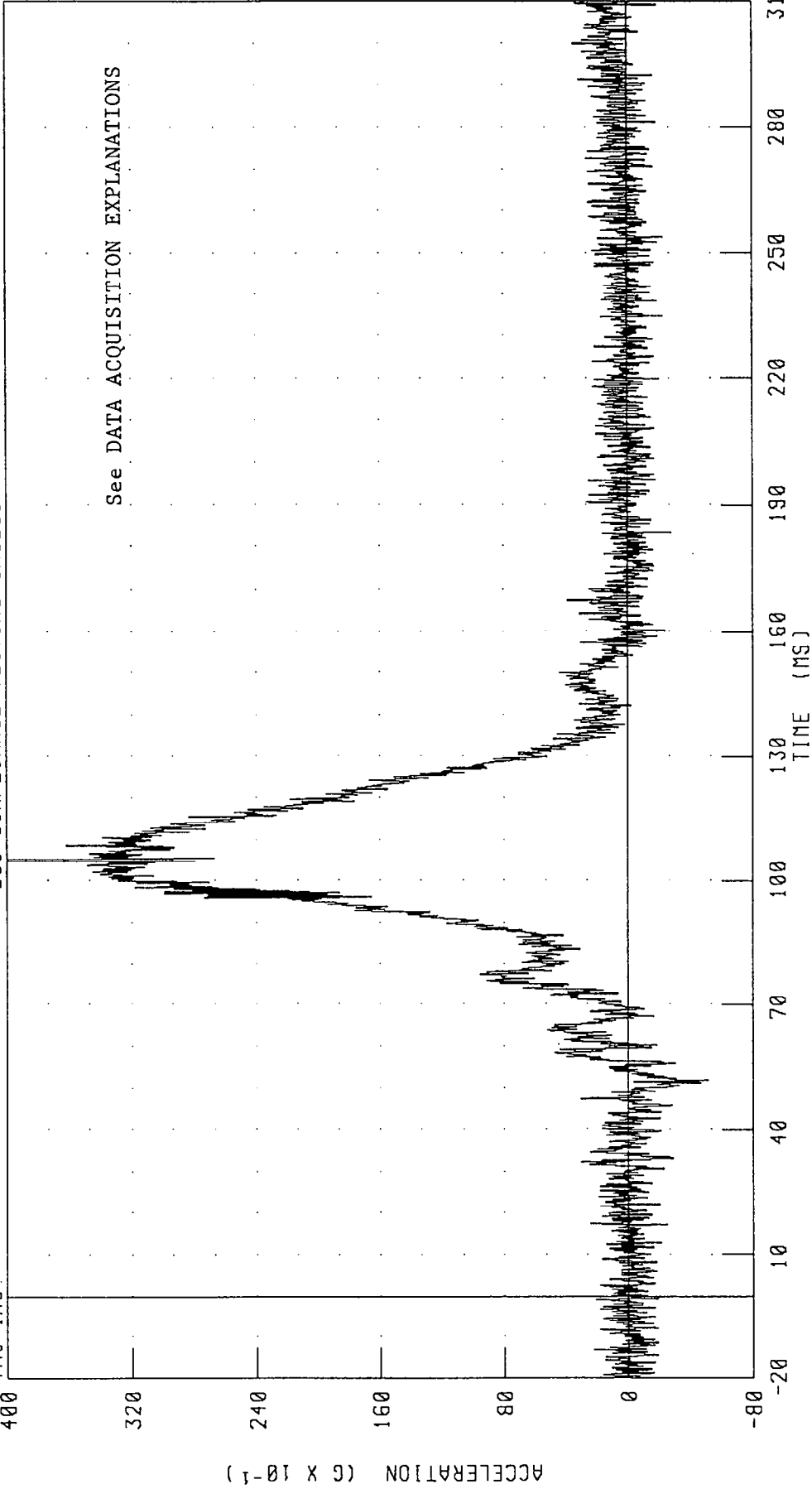


1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION

TEST NUMBER: 931103

208 COMPLIANCE TESTING CR5201

TRC INC.



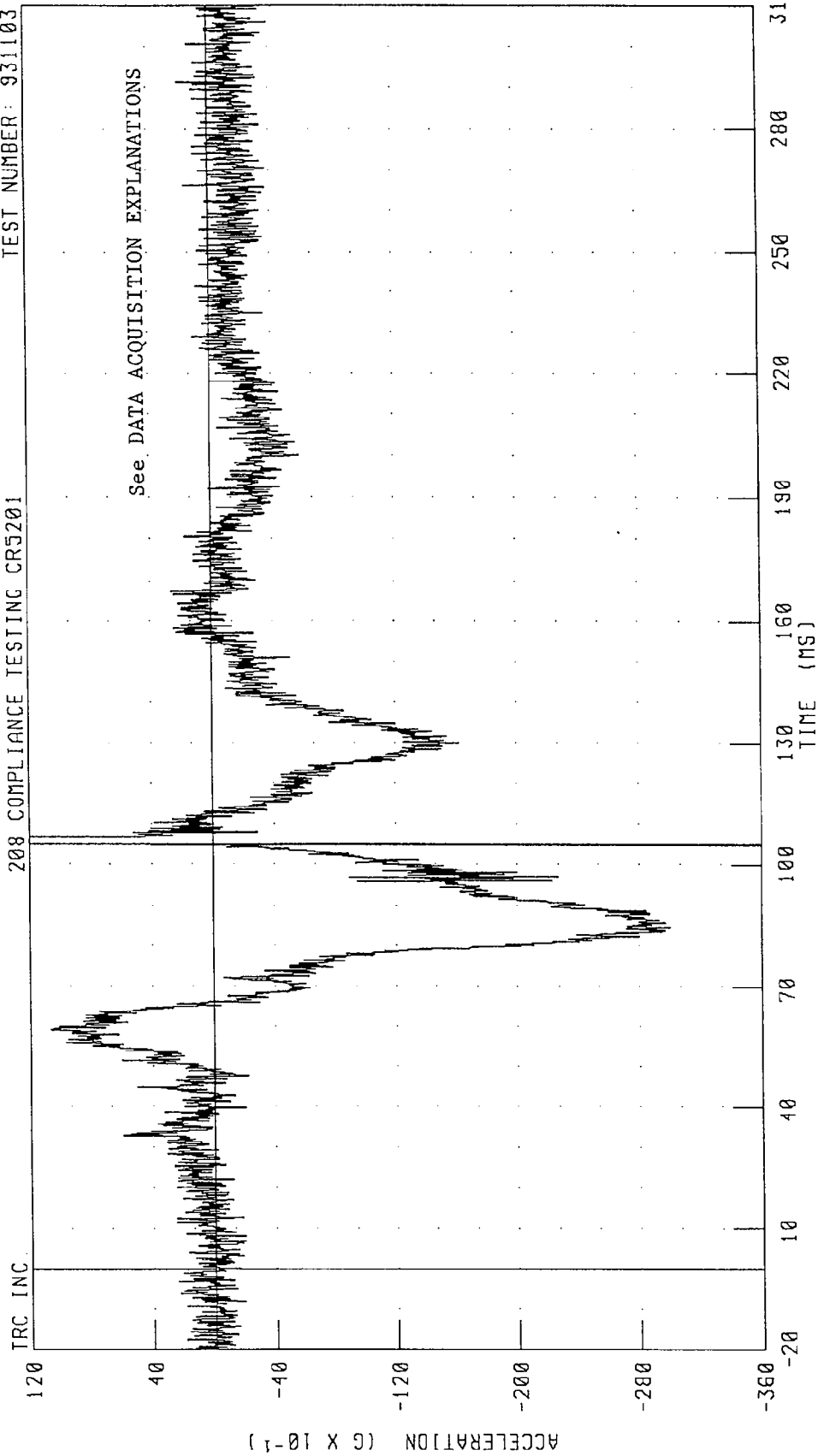
CHANNEL: HEDYG2 FILTER: CH. CLASS 1000

PEAK DATA: 65.27 G @ 105.12 MS; -5.13 G @ 51.92 MS

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION

TEST NUMBER: 931103

208 COMPLIANCE TESTING CR5201

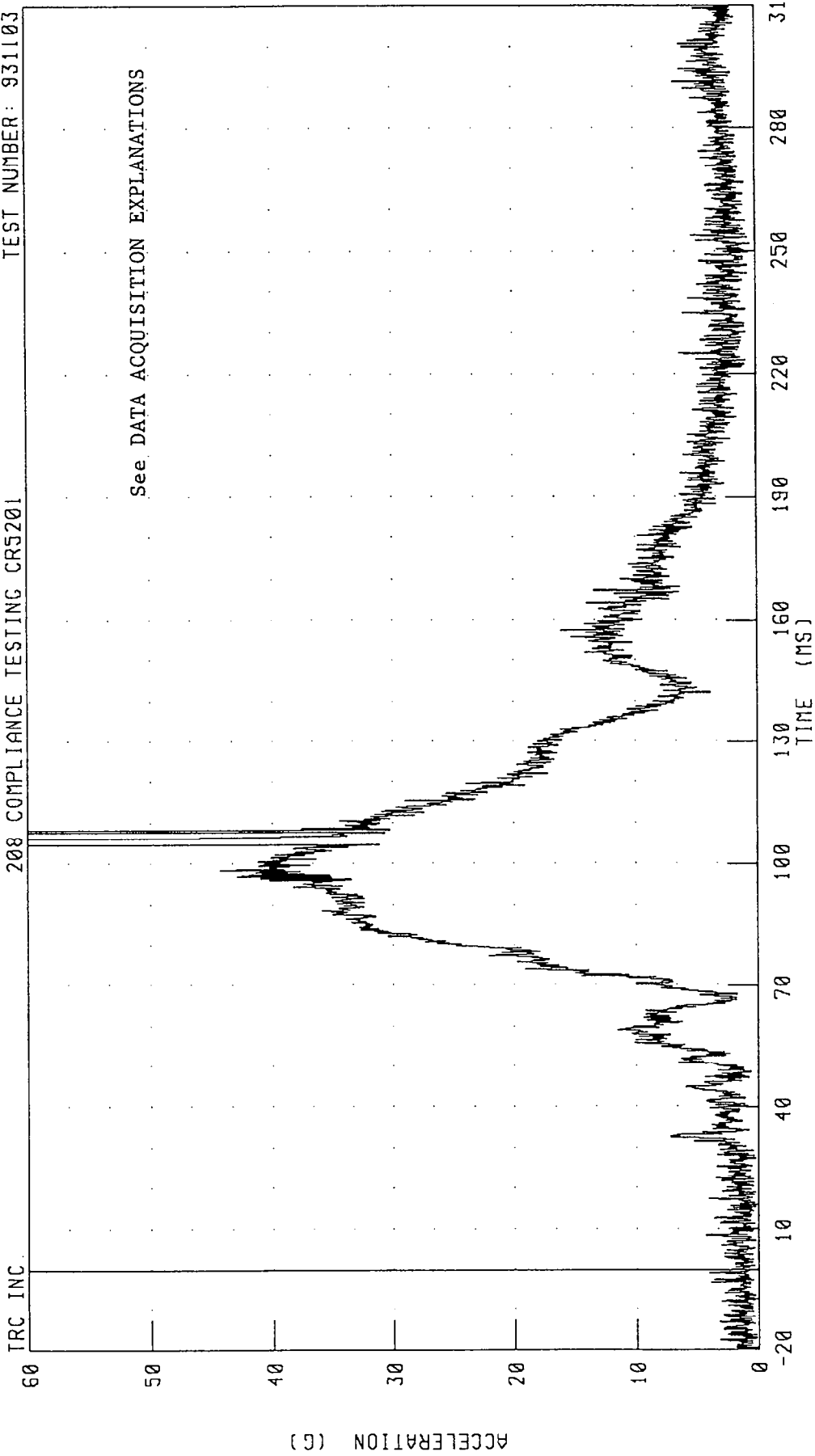


PEAK DATA: 191.70 G @ 105.52 MS; -46.48 G @ 104.96 MS

CHANNEL: HEDZG2 FILTER: CH. CLASS 1000

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION
208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

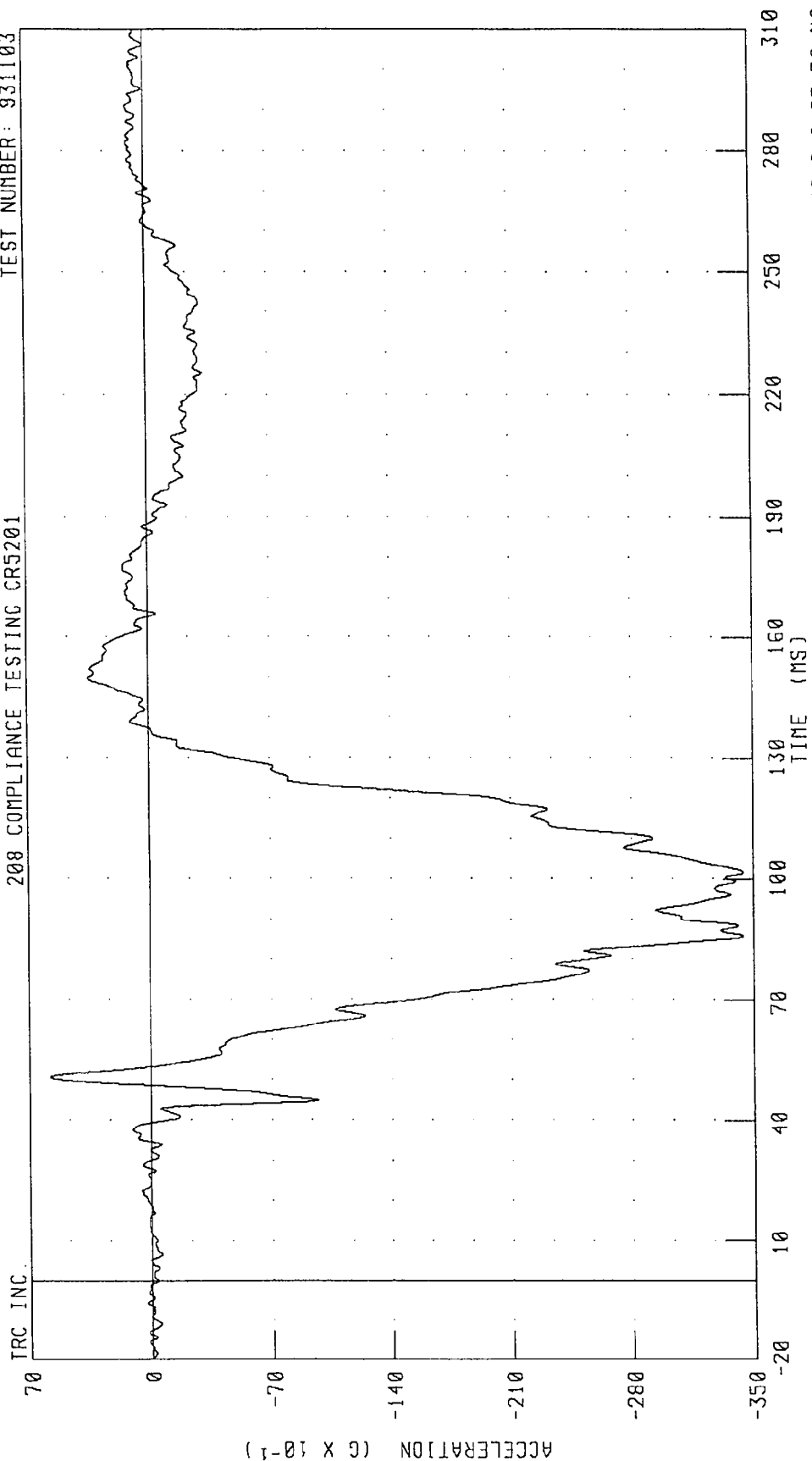


CHANNEL: HEDRG2 FILTER: CH. CLASS 1000

PEAK DATA: 196.82 G @ 105.52 MS; 0.15 G @ -19.60 MS

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

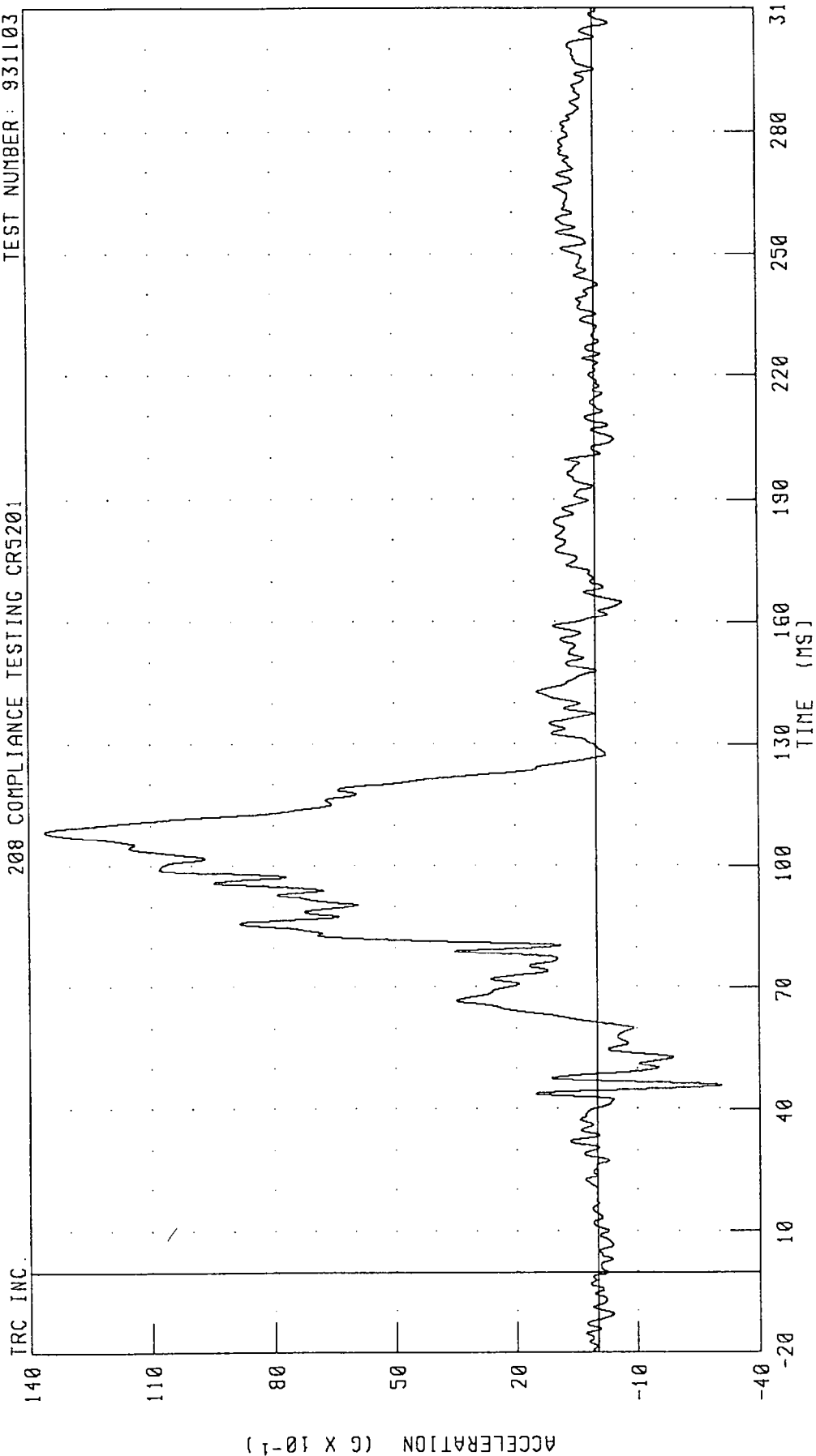


CHANNEL: CSTXG2 FILTER: CH. CLASS 180

PEAK DATA: 5.82 G @ 50.64 MS, -34.40 G @ 85.76 MS

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

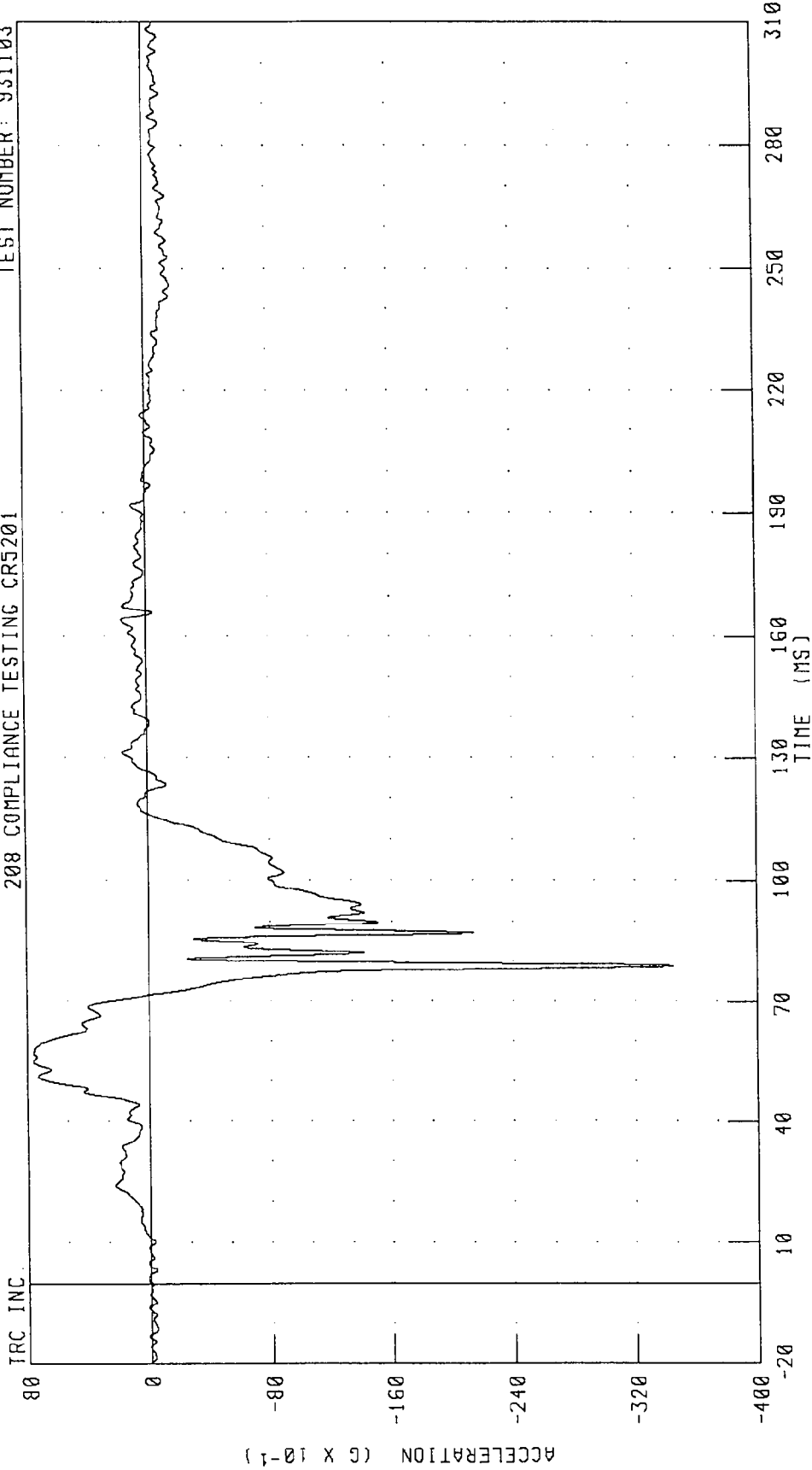


PEAK DATA: 13.61 G @ 108.56 MS; -3.05 G @ 45.84 MS

CHANNEL: CSTYG2 FILTER: CH. CLASS 180

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION
208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

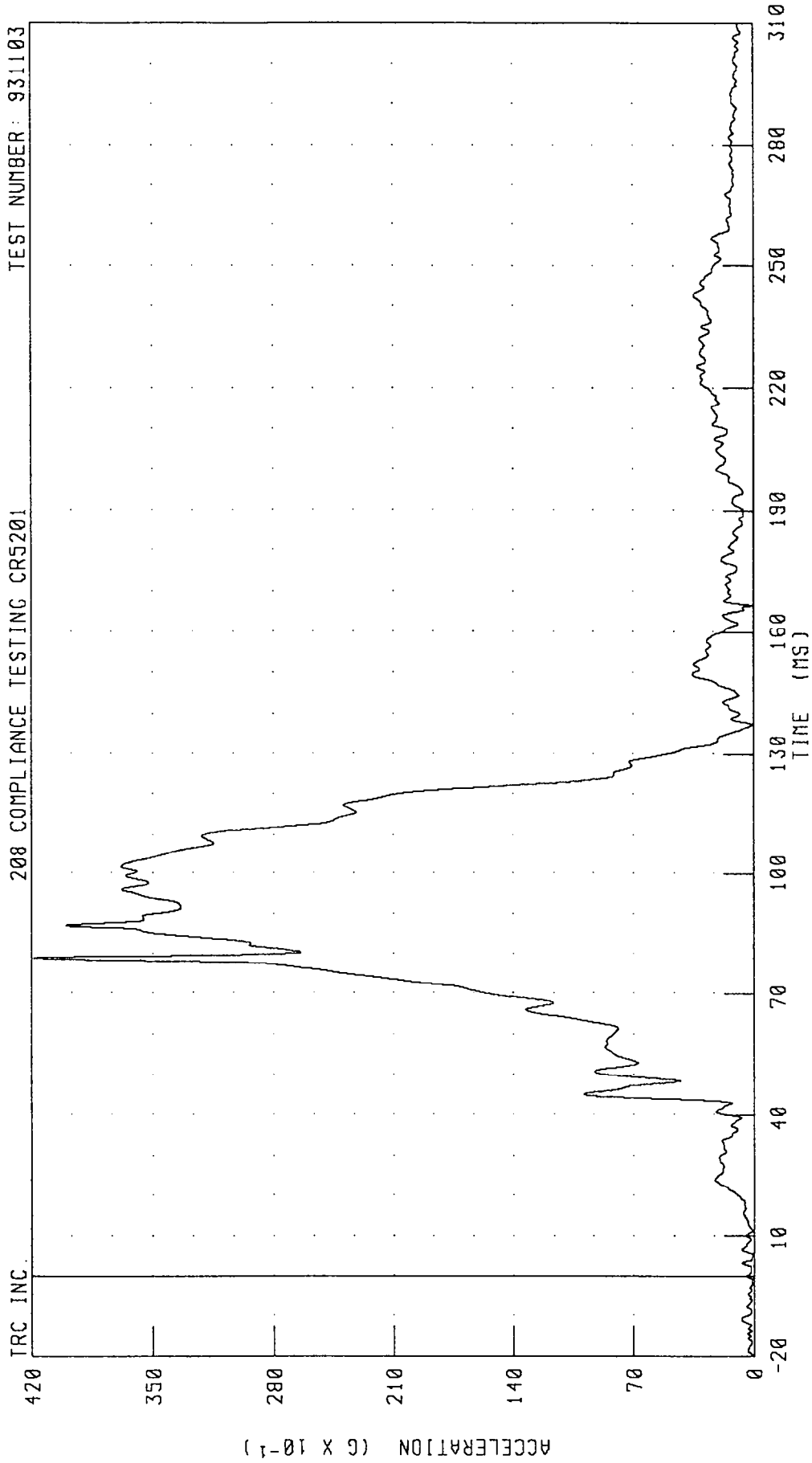


CHANNEL: CSTZG2 FILTER: CH. CLASS 180

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION

208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

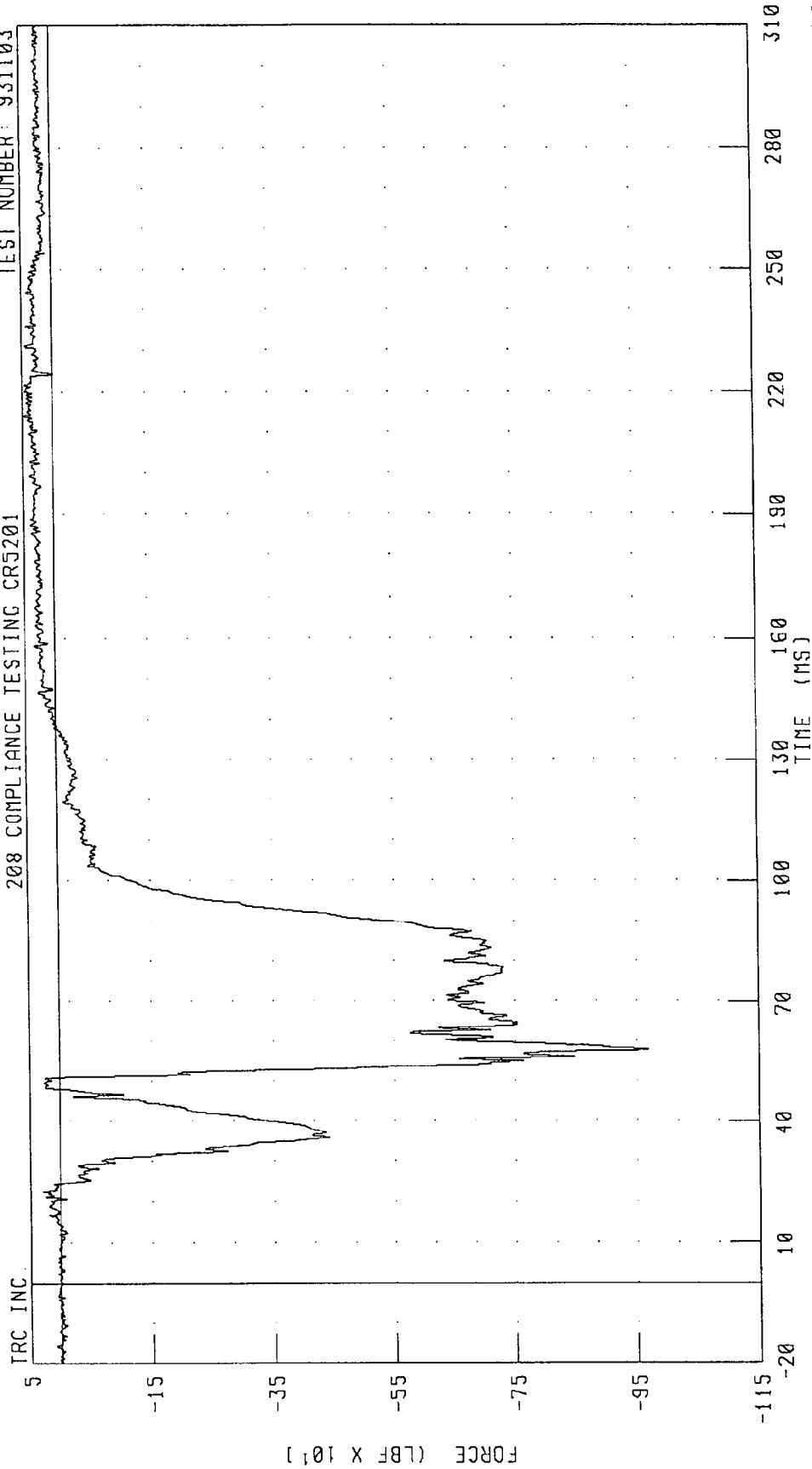


CHANNEL: CSTRG2 FILTER: CH. CLASS 180

PEAK DATA: 41.86 G @ 78.88 MS; 0.05 G @ -19.92 MS

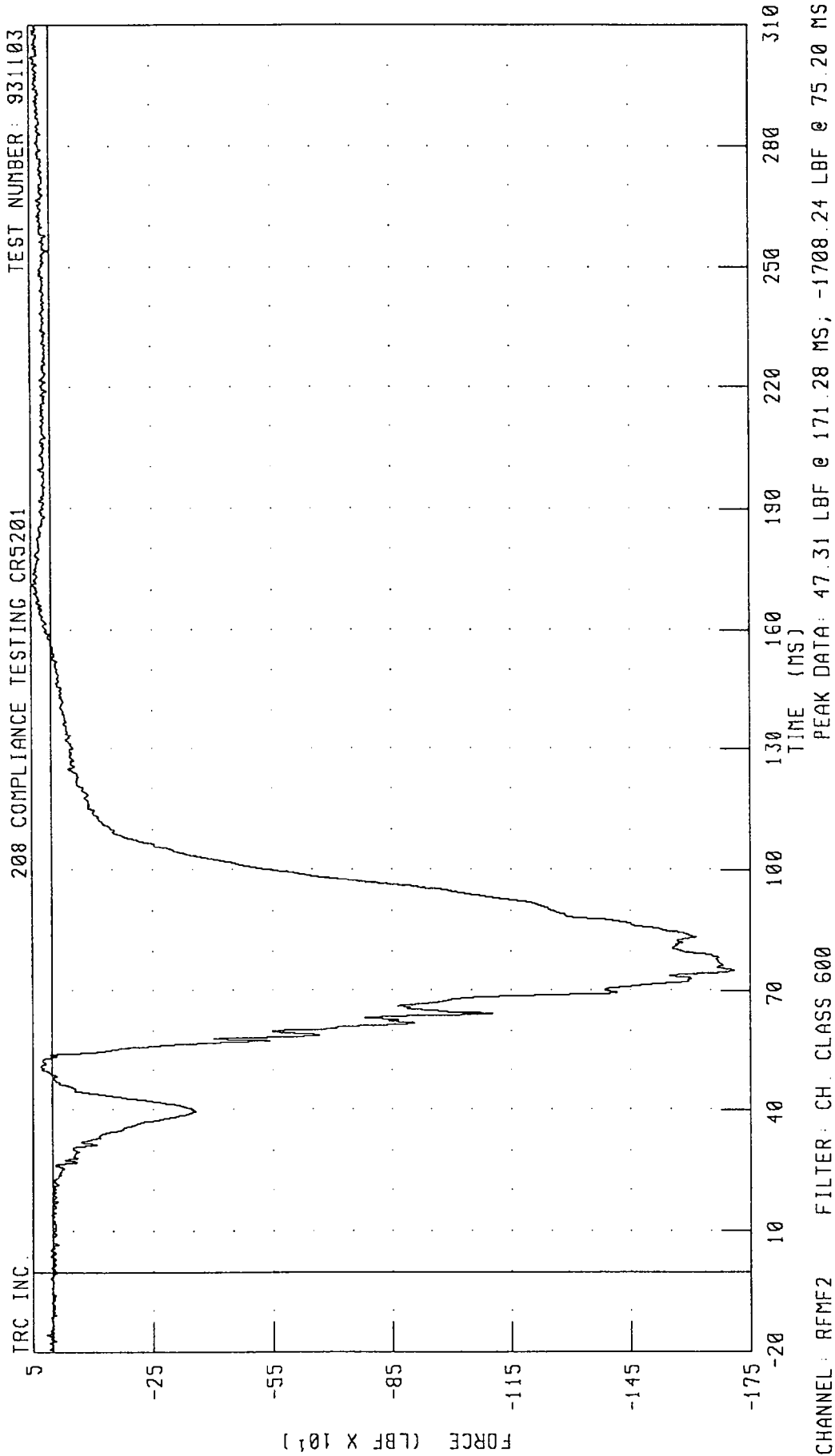
1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER LEFT FEMUR FORCE

208 COMPLIANCE TESTING CR5201 TEST NUMBER: 931103



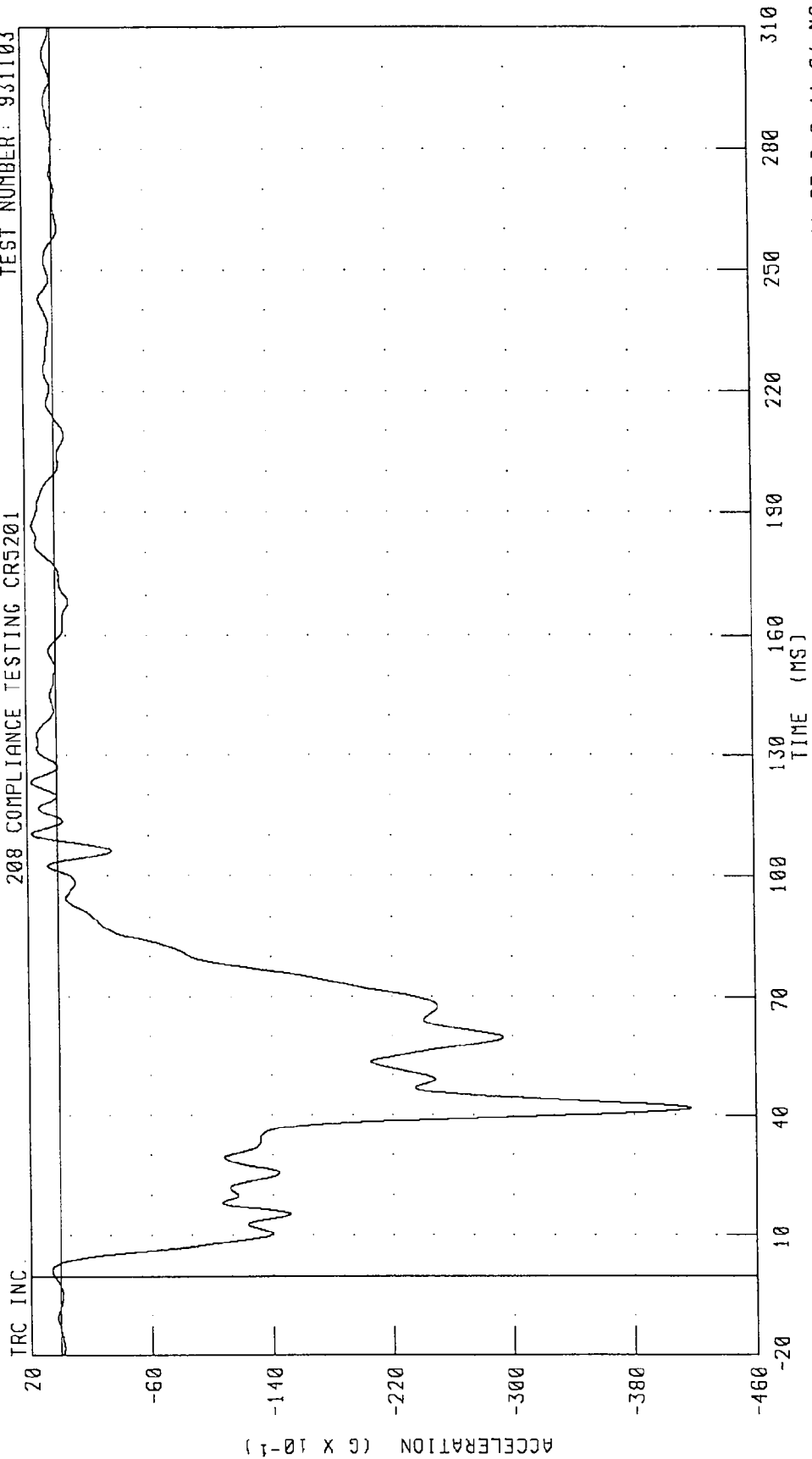
CHANNEL: LFMF2 FILTER: CH. CLASS 600

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER RIGHT FEMUR FORCE



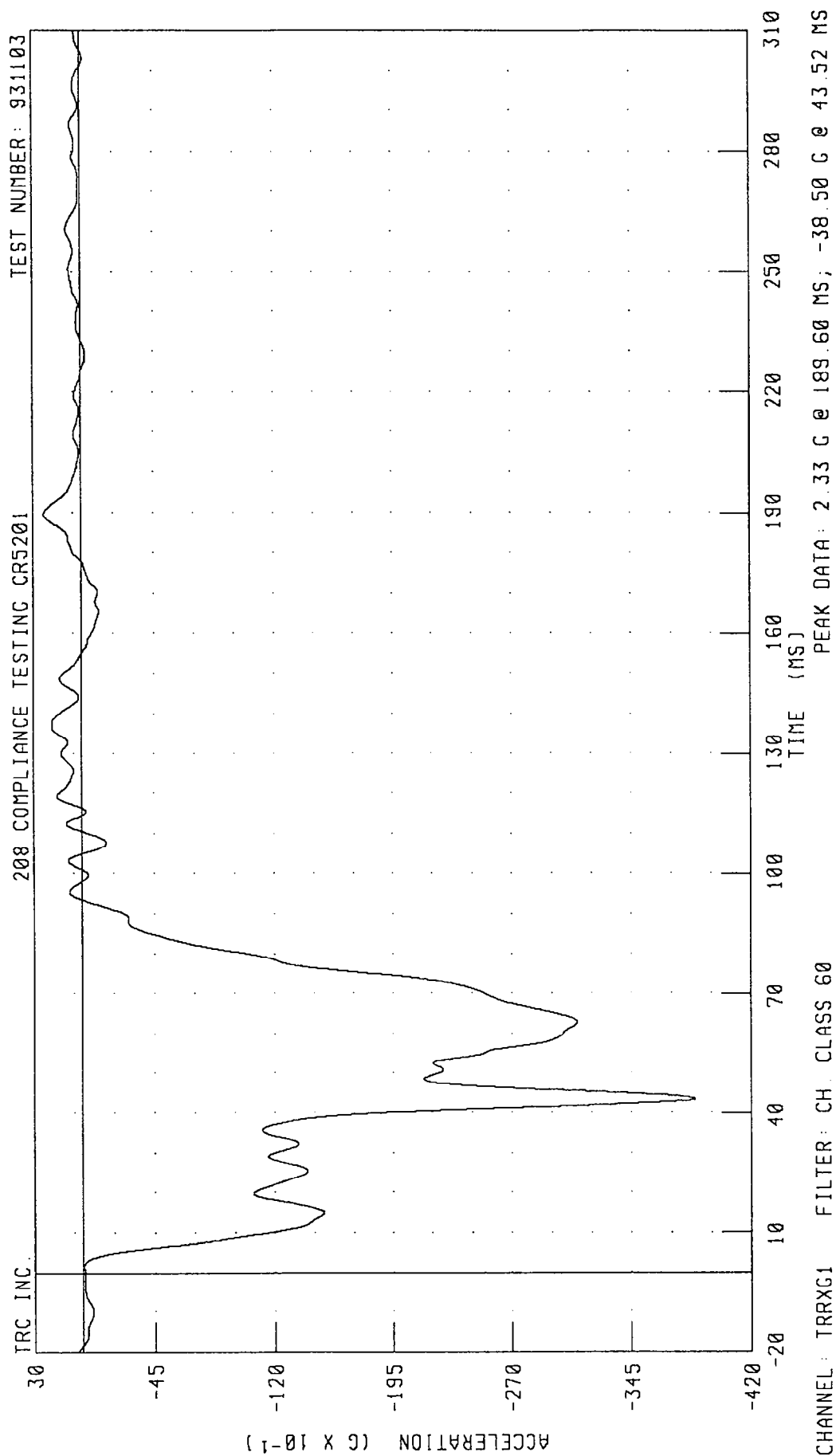
1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 LEFT REAR SEAT X-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103



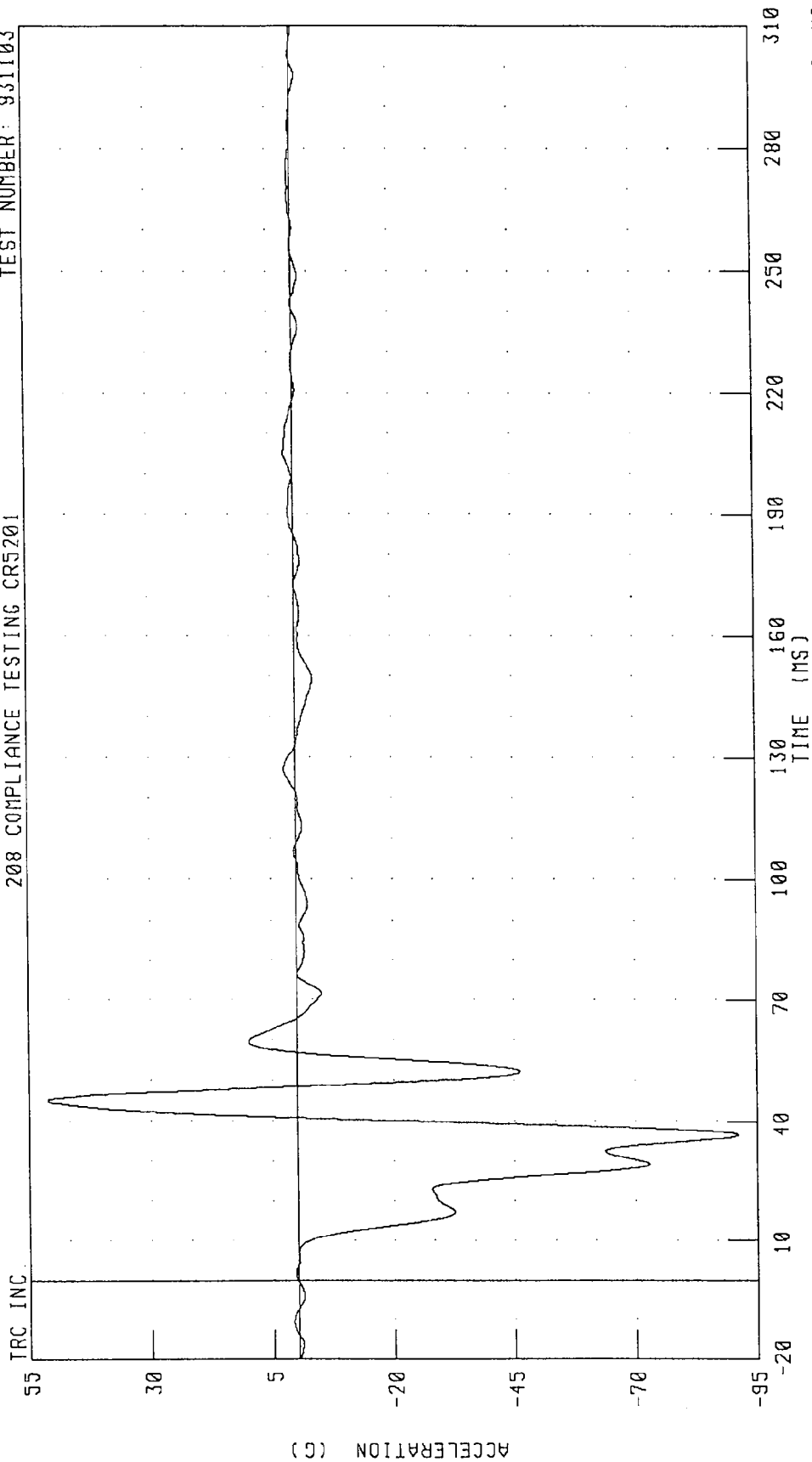
CHANNEL: TLRXG1 FILTER: CH. CLASS 60

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 RIGHT REAR SEAT X-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR5201



1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
ENGINE UPPER BLOCK X-AXIS ACCELERATION
208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

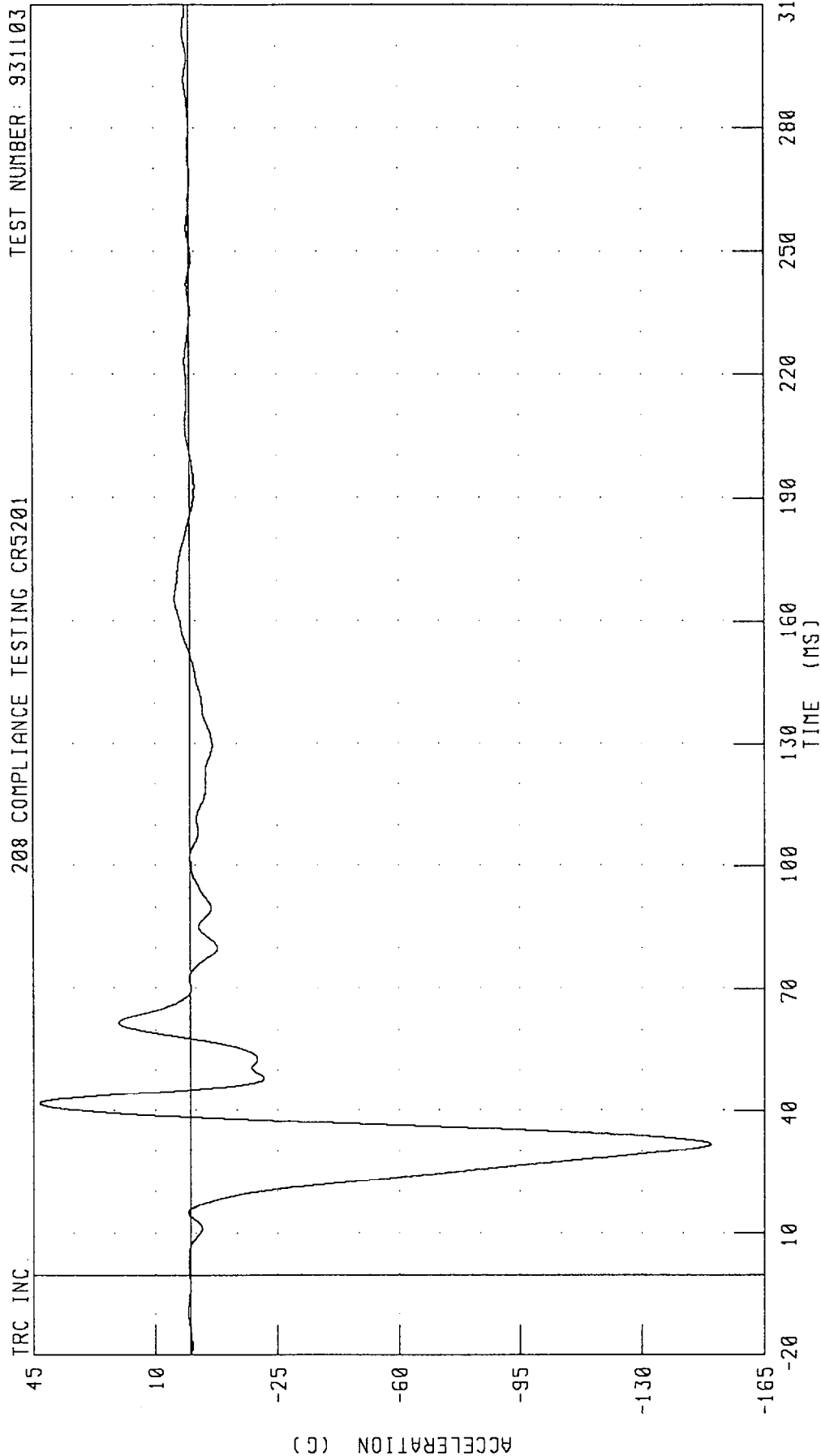


PEAK DATA: 51.17 G @ 45.20 MS; -91.03 G @ 36.64 MS

CHANNEL: ENGXG1 FILTER: CH CLASS 60

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 ENGINE BOTTOM BLOCK X-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR5201

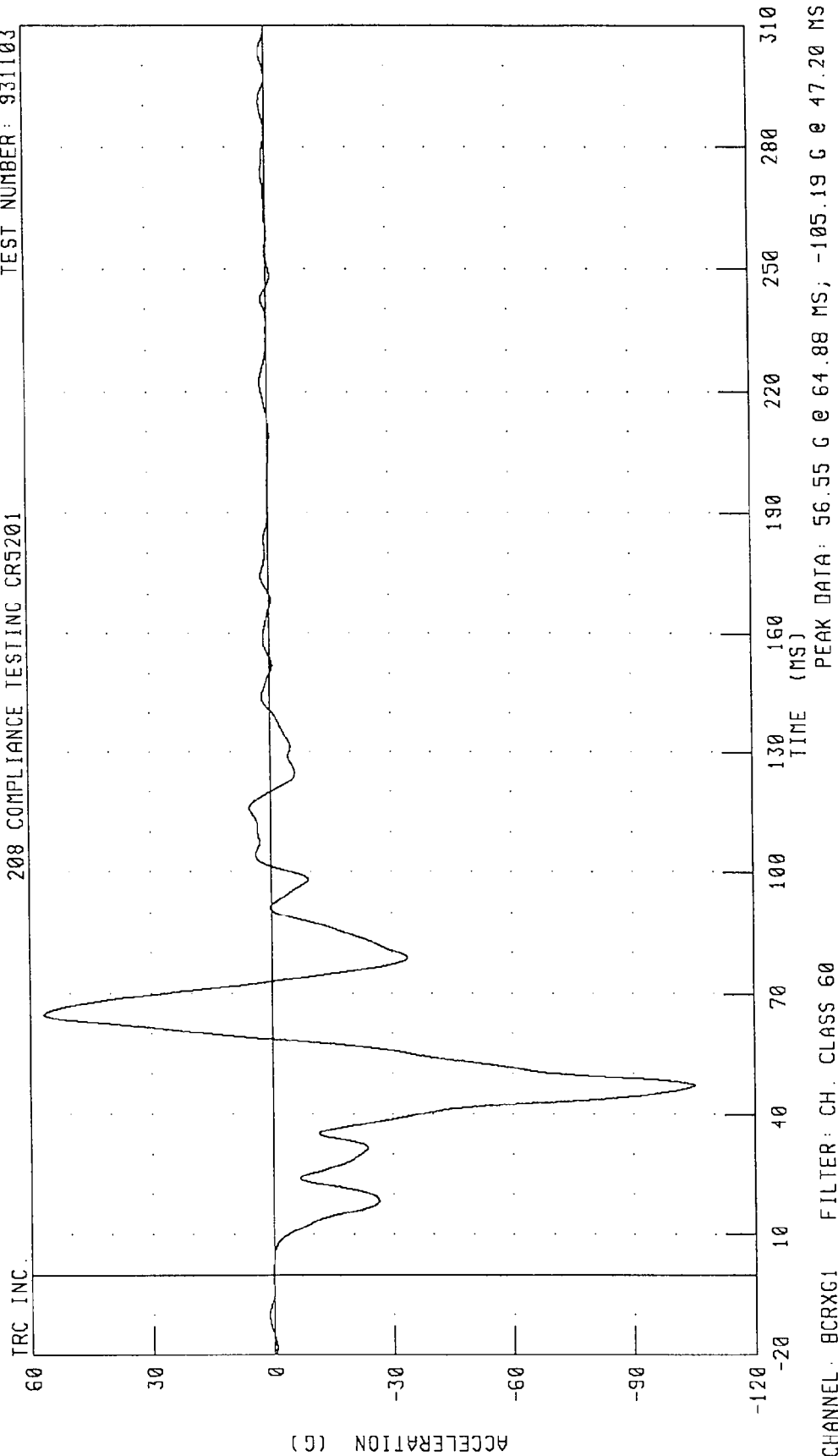
TEST NUMBER: 931103



CHANNEL: ENGXC2 FILTER: CH CLASS 60

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
RIGHT BRAKE CALIPER X-AXIS ACCELERATION
208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

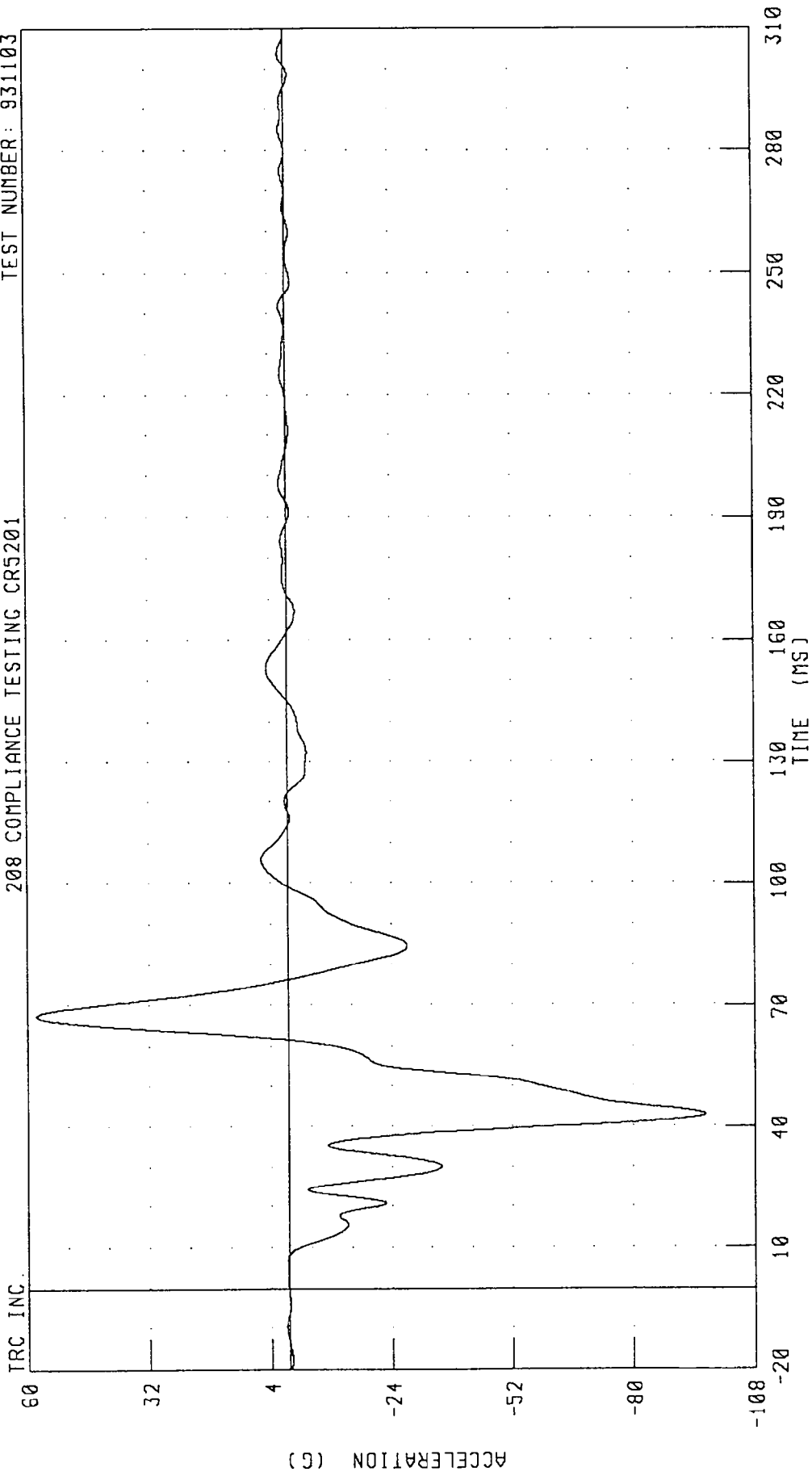


CHANNEL: BCRXC1 FILTER: CH. CLASS 60

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
LEFT BRAKE CALIPER X-AXIS ACCELERATION

208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

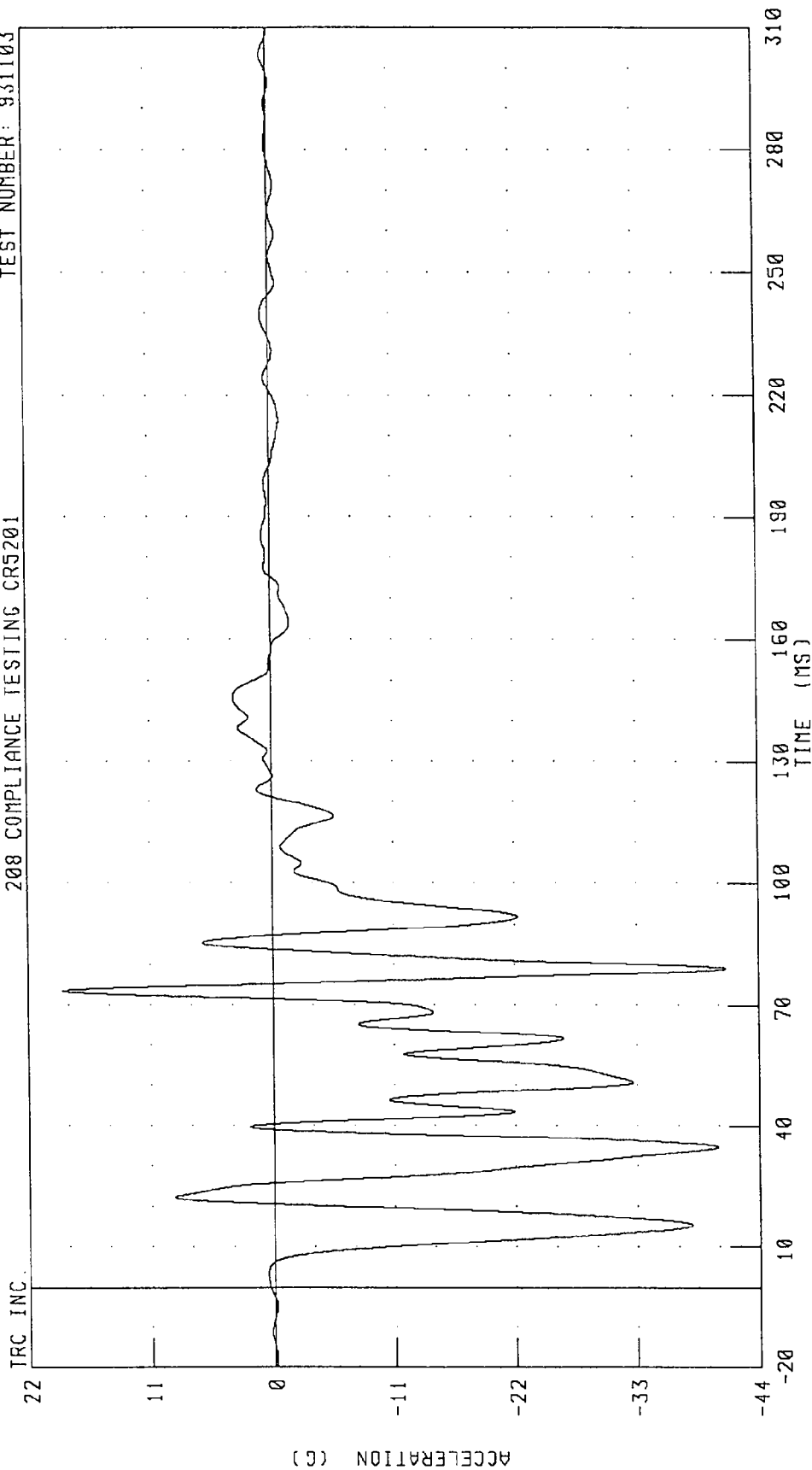


CHANNEL: BCLXG1 FILTER: CH. CLASS 60

PEAK DATA: 57.94 G @ 67.36 MS; -96.61 G @ 42.88 MS

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
DASH PANEL CENTER X-AXIS ACCELERATION
208 COMPLIANCE TESTING CR5201

TEST NUMBER: 931103

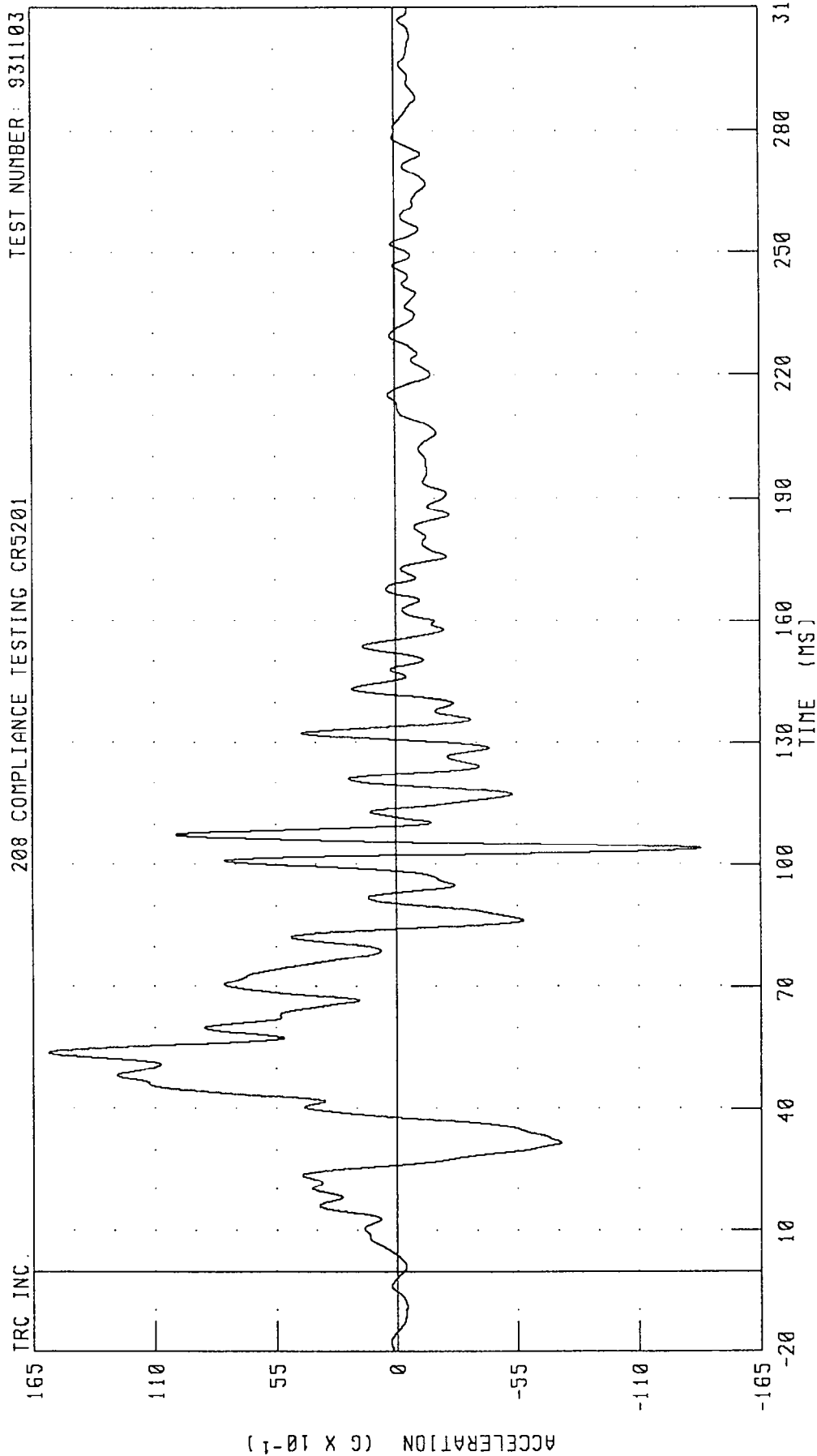


CHANNEL: DPCXG1 FILTER: CH. CLASS 60

1994 NISSAN ALTIMA INTO FLAT FRONTAL BARRIER
 VEHICLE REAR CENTER Z-AXIS ACCELERATION

TEST NUMBER: 931103

208 COMPLIANCE TESTING CR5201



CHANNEL: RDKZG1 FILTER: CH. CLASS 60

PEAK DATA: 15.77 G @ 53.84 MS; -13.83 G @ 104.00 MS