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REPORT NOS. 208-TRC-94-001

212-TRC-94-001

301-TRC-94-001

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

NISSAN MOTOR COMPANY, LTD.

1994 NISSAN SENTRA

4-DOOR SEDAN

NHTSA NO. CR5200

TRC TEST NO. 930922

TRANSPORTATION RESEARCH CENTER INC.

10820 STATE ROUTE 347

EAST LIBERTY, OHIO 43319



OCTOBER 8, 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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WASHINGTON, DC 20590

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Date 10/22/93

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Date 2/18/94

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9. Performing Organization Name and Address Transportation Research Center Inc. 10820 State Route 347 East Liberty, OH 43319		10. Work Unit No. (TRAIS)	11. Contract or Grant No. DTNH22-90-D-22121
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16. Abstract A 30 mph flat frontal barrier impact test was conducted on a 1994 Nissan Sentra 4-door sedan, NHTSA No. CR5200, at Transportation Research Center Inc. on September 22, 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 17.0 inches. The ambient temperature was 72° F. The driver's head injury criteria (HIC) was 479. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 44.4 g. The driver's left and right femur maximum axial forces were 1800 pounds and 1831 pounds, respectively. The driver dummy's neck was damaged during the impact and was replaced prior to the post-test dummy calibration. The passenger's HIC was 731. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 47.4 g. The passenger's left and right femur maximum axial forces were 1208 pounds and 1790 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

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	meters	m
yd	yards	0.9	kilometers	km
mi	miles	1.6		
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square kilometers	km ²
mi ²	square miles	2.6	hectares	ha
	acres	0.4		
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³

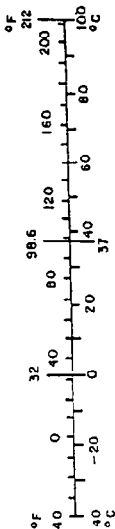
TEMPERATURE (exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
----	------------------------	----------------------------	---------------------	----

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
km	kilometers	1.1	yards	yd
		0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
		1.06	quarts	qt
		0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
		1.3	cubic yards	yd ³

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F
----	---------------------	-------------------	------------------------	----



* 1 in = 2.54 (exact). For other exact conversions and more detailed tables, see NBS Misc. Publ. 216, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10-28p.

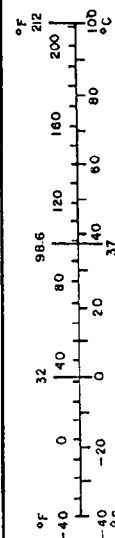
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ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons	0.9	tonnes	t
	(2000 lb)			
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



* 1 in = 2.54 (exact). For other exact conversions and more detailed tables, see NBS Mon. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10.286.

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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 Sentra 4-door sedan, NHTSA No. CR5200, 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 September 22, 1993.

The test vehicle, a 1994 Nissan Sentra 4-door sedan, NHTSA No. CR5200, 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 a motorized 2-point passive safety belt at both the driver and right front passenger positions. The vehicle's test weight was 2785 pounds. The vehicle's impact speed was 29.3 mph. The vehicle's maximum static crush was 17.0 inches.

The driver's head injury criteria (HIC) was 479. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 44.4 g. The driver's left and right femur maximum axial forces were 1800 pounds and 1831 pounds, respectively.

The right front passenger's HIC was 731. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 47.4 g. The right front passenger's left and right femur maximum axial forces were 1208 pounds and 1790 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.

TEST NOTES

The lower rear portion of the driver dummy's neck was cracked during the impact (See Figures A-55 and A-56). The neck was replaced prior to the post-test dummy calibration.

DATA ACQUISITION EXPLANATIONS

The dash panel center accelerometer, DPCXG1, recorded questionable data from 26 milliseconds and after and did not return to zero following the impact event. The data acquisition circuit was checked following the crash test. No cause for the questionable data could be found.

TABLE 1 CRASH TEST SUMMARY

NHTSA NO.:	CR5200	
TEST TYPE:	Frontal Barrier Impact	
TEST DATE:	09/22/93	
TEST TIME:	1503	
BARRIER ROOM TEMPERATURE:	72° F	
VEHICLE YEAR/MAKE/ MODEL/BODY STYLE:	1994/Nissan/Sentra/4-door sedan	
VEHICLE TEST WEIGHT:	2785 LBS.	
IMPACT ANGLE ¹ :	0°	
IMPACT VELOCITY ² :		
PRIMARY:	29.3 MPH	
SECONDARY:	29.3 MPH	
MAXIMUM STATIC CRUSH:	17.0	
AVERAGE REBOUND:	60.7	
NUMBER OF CAMERAS:		
Real-time:	2	
High-speed:	14	
DOOR OPENING DATA:		
LEFT:	Easy	
RIGHT:	Easy	
DUMMIES:	<u>Driver #353</u>	<u>Passenger #354</u>
TYPE:	Part 572 B	Part 572 B
LOCATION:	Left front	Right front
RESTRAINT:	Two-point passive	Two-point passive
NUMBER OF DATA CHANNELS:	8	8
FRONT SEAT DATA:		
SEAT TRACK FAILURE:	None	None
SEAT BACK FAILURE:	None	None
VISIBLE DUMMY CONTACT POINTS:		
HEAD:	Upper steering wheel rim & hub	Chest
CHEST:	Lower steering wheel rim	None
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/Sentra/4-door sedan
COLOR: Gold
VIN: 1N4EB31P3RC703218
NHTSA NO.: CR5200

ENGINE DATA:
PLACEMENT: _____ LONGITUDINAL/INLINE X TRANSVERSE/LATERAL
CYLINDERS: 4
DISPLACEMENT: 1.6 liters
TRANSMISSION DATA: 5 SPEED, X MANUAL, _____ AUTOMATIC, _____ OVERDRIVE
FINAL DRIVE: X FWD, _____ RWD, _____ 4WD

DATE VEHICLE RECEIVED: 09/17/93
ODOMETER READING: 68
DEALER'S NAME Ricart Nissan, Inc.
AND ADDRESS: P. O. Box 27130
Columbus, OH 43227

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	No
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: 07/93
VIN: 1N4EB31P3RC703218
GVWR: 3318 LBS.
GAWR: FRONT: 1918 LBS.
REAR: 1653 LBS.

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

SIZE OF TIRES ON VEHICLE: P175/70R13
TIRE PRESSURE WITH MAXIMUM
CAPACITY VEHICLE LOAD: FRONT: 35 PSI
REAR: 35 PSI
SPARE TIRE: _____ SPACE SAVER _____ X STANDARD
TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P175/70R13 82S
RECOMMENDED COLD TIRE PRESSURE: FRONT: 32 PSI; REAR: 29 PSI
DESIGNATED SEATING CAPACITY: 2 FRONT 3 REAR 5 TOTAL
VEHICLE CAPACITY WEIGHT: 783 LBS.

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

The label was located on the driver's B-pillar.

TEST VEHICLE ATTITUDES:

DELIVERED ATTITUDE:	LF: 25.2;	RF: 25.9;	LR: 25.0;	RR: 25.0
FULLY LOADED ATTITUDE:	LF: 24.9;	RF: 25.1;	LR: 23.9;	RR: 24.0
PRE-TEST ATTITUDE:	LF: 24.6;	RF: 24.9;	LR: 23.0;	RR: 23.8
POST-TEST ATTITUDE:	LF: 24.0;	RF: 25.6;	LR: 24.1;	RR: 24.8

All distance measurements are in inches.

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

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

RIGHT FRONT	773	LBS.	RIGHT REAR	455	LBS.
LEFT FRONT	739	LBS.	LEFT REAR	469	LBS.
TOTAL FRONT WEIGHT	1512	LBS.	(62.1% OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	924	LBS.	(37.9% OF TOTAL VEHICLE WEIGHT)		
TOTAL DELIVERED WEIGHT	2436	LBS.			

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW¹ = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (2436 LBS)

VCW = VEHICLE CAPACITY WEIGHT (783 LBS.)

DSC = DESIGNATED SEATING CAPACITY (5)

RCLW¹ = VCW - 150 (DSC) = 33

TARGET TEST WEIGHT = UDW + RCLW¹ + (NUMBER OF HYBRID II DUMMIES
X 164 LBS. PER DUMMY)

TARGET TEST WEIGHT = 2436 + 33 + 328 = 2797 LBS.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 21 LBS. OF CARGO WEIGHT:

RIGHT FRONT	836	LBS.	RIGHT REAR	558	LBS.
LEFT FRONT	809	LBS.	LEFT REAR	582	LBS.
TOTAL FRONT WEIGHT	1645	LBS.	(59.1% OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1140	LBS.	(40.9% OF TOTAL VEHICLE WEIGHT)		
TOTAL TEST WEIGHT	2785	LBS.	(0.4% UNDER TARGET TEST WEIGHT)		

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA: 0 LBS.

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: Rear bumper, rear door inner panels, rear seat belts

CG: 38.9 INCHES REARWARD OF FRONT WHEEL CENTERLINE

WHEELBASE: 95.0 INCHES

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

TABLE 3 POST-IMPACT DATA

TEST NUMBER: 930922
NHTSA NO.: CR5200
TEST DATE: 09/22/93
TEST TIME: 1503
TEST TYPE: Frontal Barrier Impact
IMPACT ANGLE: 0°
AMBIENT TEMPERATURE
AT IMPACT AREA: 72° F
TEMPERATURE IN
OCCUPANT COMPARTMENT: 69° 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: 166.5; C: 170.2; R: 166.8

POST-TEST: L: 152.2; C: 154.2; R: 151.6

TOTAL CRUSH: L: 14.3; C: 16.0; R: 15.2

AVERAGE CRUSH: 15.2

TEST VEHICLE REBOUND FROM FLAT BARRIER:

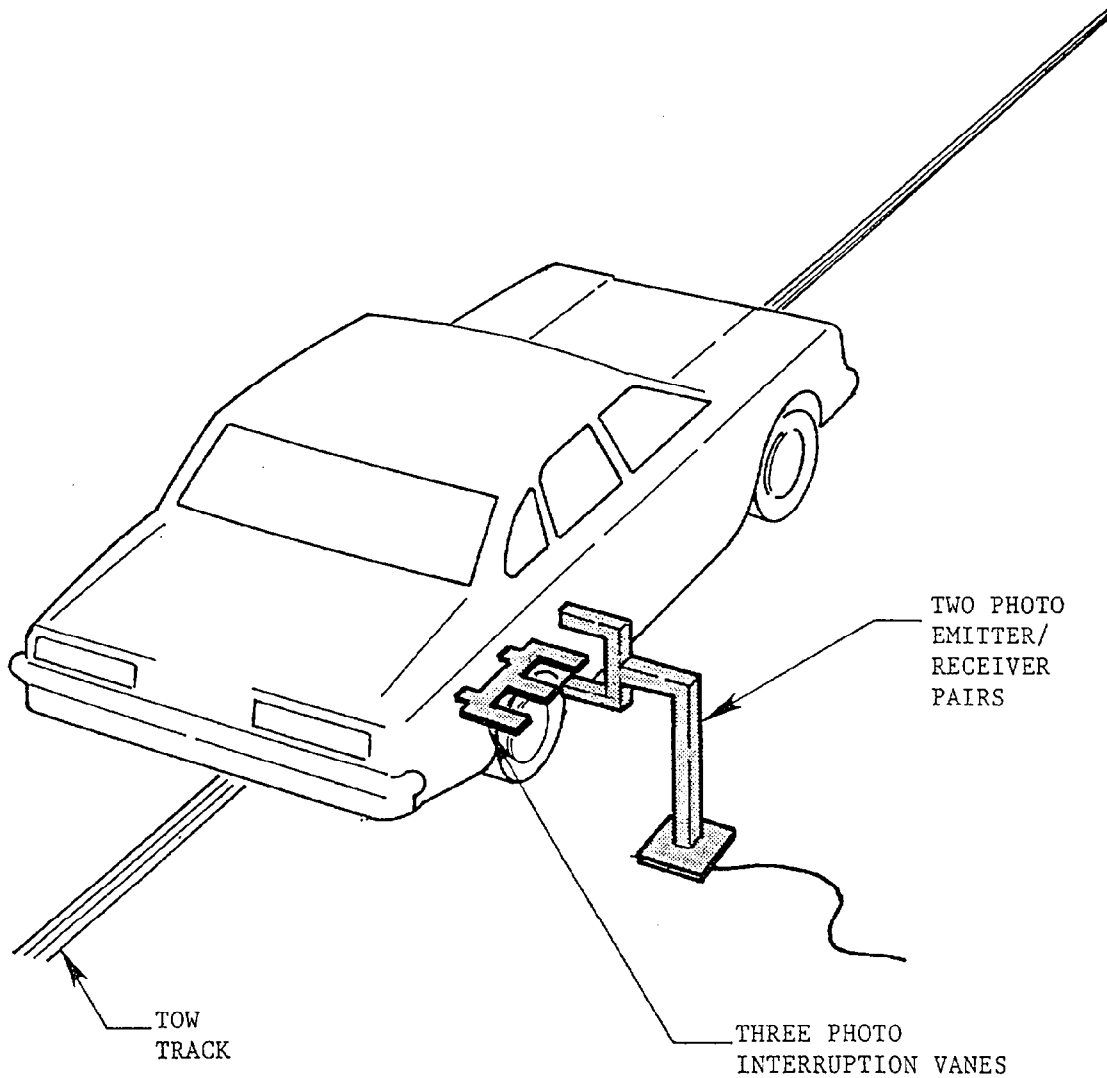
DISTANCE FROM TEST VEHICLE TO BARRIER:

L: 61.0; C: 59.2; R: 62.0

AVG.: 60.7

All distance measurements are in inches.

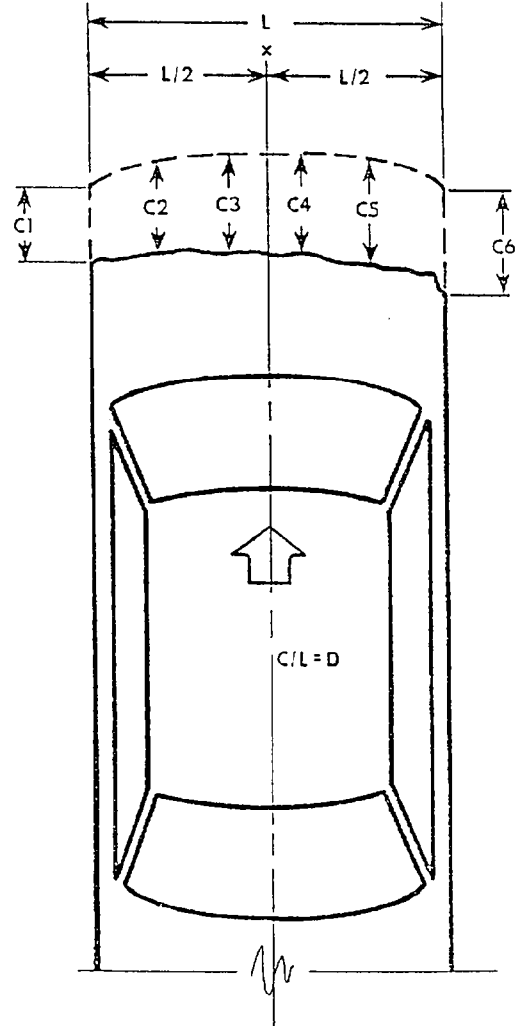
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



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.: CR5200
 TEST DATE: 09/22/93
 VEHICLE YEAR/MAKE/
 MODEL/BODY STYLE: 1994/Nissan/Sentra/4-door sedan
 VEHICLE SIZE CATEGORY: Subcompact
 VIN: 1N4EB31P3RC703218
 BUILD DATE: 07/93
 TEST WEIGHT: 2785 LBS.
 VEHICLE WHEELBASE: 95.0
 MAXIMUM WIDTH: 65.2
 FRONT OVERHANG: 34.4



COLLISION DEFORMATION

CLASSIFICATION (CDC) CODE: 12FDEW2

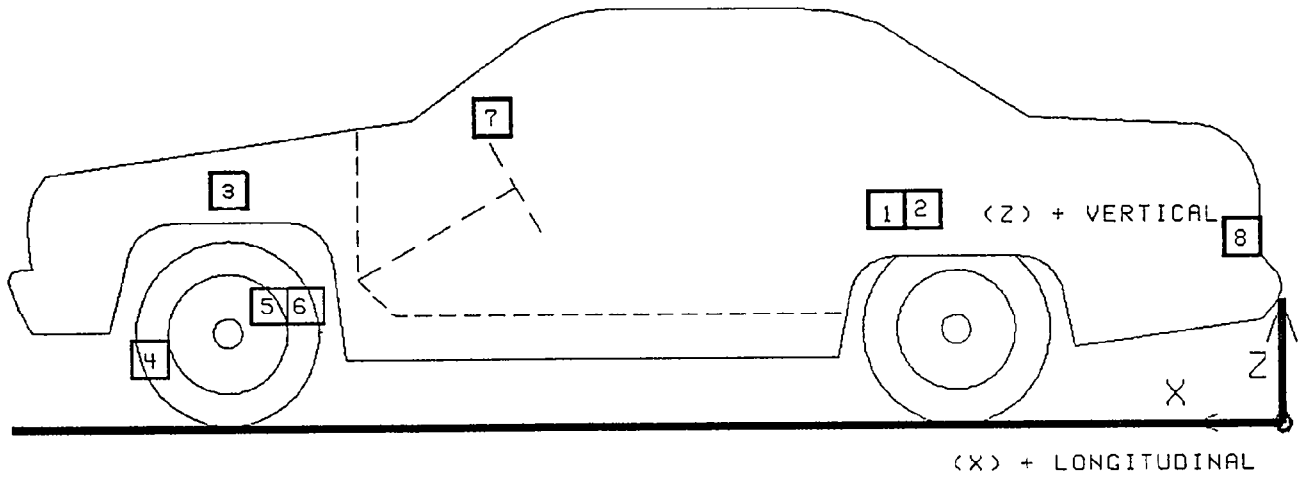
CRUSH DEPTH	C1:	14.3
MEASUREMENTS:	C2:	15.2
	C3:	15.9
	C4:	17.0
	C5:	16.1
	C6:	15.2

MIDPOINT OF DAMAGE: D: Vehicle Longitudinal Centerline

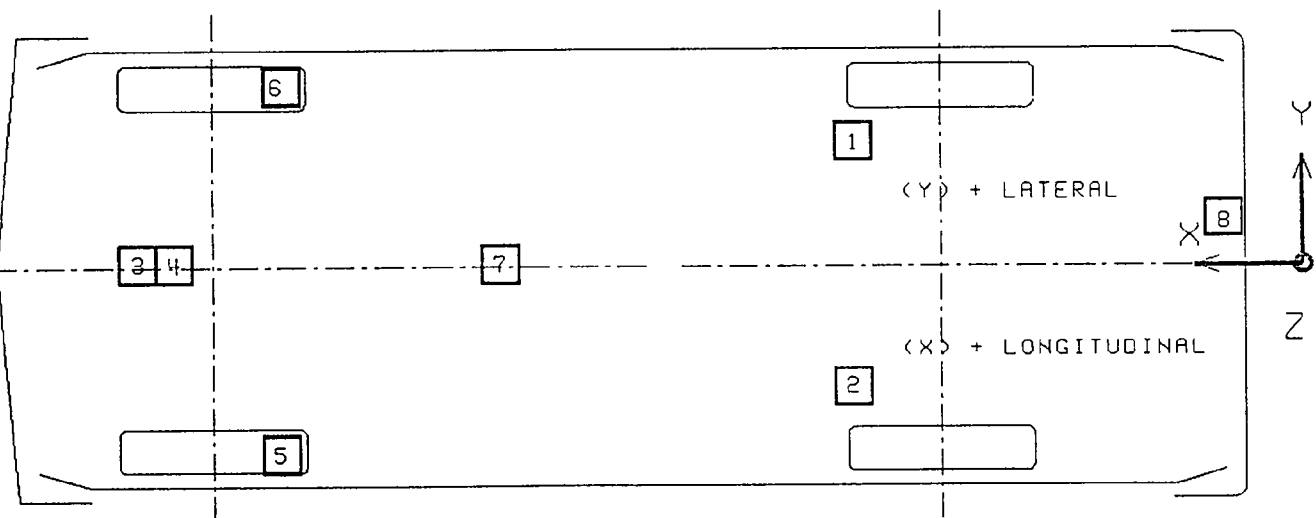
LENGTH OF DAMAGED
 REGION: L: 52.0

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 930922

No. LOCATION			X*	Y*	Z*	POSITIVE		NEGATIVE	
						DIRECTION	MAX G MSEC	DIRECTION	MAX G MSEC
1 LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE	64.8	24.2	15.4					
	POST	64.8	24.2	12.8					
						1.4	146.6	37.1	43.7
2 RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE	64.4	-24.6	15.4					
	POST	64.4	-24.6	13.0					
						2.2	146.2	38.2	45.3
3 ENGINE TOP LONGITUDINAL	PRE	143.5	-7.0	29.5					
	POST	137.2	-7.0	30.2					
						43.5	47.0	91.1	34.3
4 ENGINE BOTTOM LONGITUDINAL	PRE	140.0	-10.5	8.8					
	POST	135.2	-10.5	8.6					
						46.3	46.0	82.1	27.4

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY CONTINUED

TEST NUMBER 930922

No. LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
				MAX G	MSEC	MAX G	MSEC
5 RIGHT BRAKE CALIPER LONGITUDINAL	PRE 139.8	-25.4	11.4				
	POST 139.2	-24.0	11.5				
				11.1	73.4	57.3	50.8
6 LEFT BRAKE CALIPER LONGITUDINAL	PRE 139.9	25.4	11.2				
	POST 138.6	25.5	11.5				
				7.9	73.2	70.1	44.9
7 INSTRUMENT PANEL CENTER LONGITUDINAL ¹	PRE 113.4	1.0	35.5				
	POST 112.8	1.0	36.0				
				---	---	---	---
8 VEHICLE REAR CENTER VERTICAL	PRE 9.0	3.2	15.9				
	POST 9.0	3.2	16.9				
				24.3	92.8	31.7	97.2

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

¹See DATA ACQUISITION EXPLANATIONS

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.: CR5200
VEHICLE YEAR/MAKE/
MODEL/BODY STYLE: 1994/Nissan/Sentra/4-door sedan
BODY COLOR: Gold
VIN: 1N4EB31P3RC703218
ODOMETER (ARRIVAL): 68
ARRIVAL DATE: 09/17/93
ODOMETER (COMPLETION): 73
COMPLETION DATE: 09/22/93
COST: \$11,234.00

AIR CONDITIONER	Yes	CONSOLE	No	BRAKES	POWER
TINTED GLASS	Yes	TACHOMETER	No	FRONT	Disc
POWER STEERING	Yes	SPEED CONTROL	Yes	REAR	Drum
POWER WINDOWS	No	REAR WINDOW DEF.	Yes	FRONT SEATS	Manual
POWER DOOR LOCKS	No	SUN/MOON ROOF	No	SEAT TYPE	Front-bucket
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: 1.6
TRANSMISSION: 5-speed manual
DRIVE TYPE: Front-wheel drive
TIRE SIZE: P175/70R13
GASOLINE TYPE: Unleaded

EQUIPMENT THAT IS NO LONGER ON THE VEHICLE AS NOTED ABOVE: Rear seat,
rear bumper, rear door inner panels, rear seat belts, spare tire

EXPLANATION: Items removed to allow installation of data acquisition system
and to reduce vehicle weight.

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	-27.3	19.2	-65.7	66.6	-44.4	13.2	-11.0
PASSENGER	-42.0	-15.2	-67.6	69.3	-48.4	-9.1	13.5

MAXIMUM FEMUR COMPRESSIVE FORCE (LBS.)		
	LEFT FEMUR	RIGHT FEMUR
DRIVER	1800	1831
PASSENGER	1208	1790

HEAD INJURY CRITERIA ¹			
	HIC	TIME t ₁ (MSEC)	TIME t ₂ (MSEC)
DRIVER	479	64.3	100.3
PASSENGER	731	63.4	99.4

CHEST MAXIMUM RESULTANT ACCELERATION ²			
	ACCEL. (G)	TIME t ₁ (MSEC)	TIME t ₂ (MSEC)
DRIVER	44.4	62.9	65.9
PASSENGER	47.4	56.6	59.6

¹As defined in FMVSS No. 208

²Defined 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 rotated forward impacting the upper steering wheel rim and hub and the driver dummy's chest impacted the lower steering wheel rim as the dummy's torso was restrained by the two-point passive belt. The dummy's head rotated rearward as the dummy rebounded into the seat back. The dummy came to rest seated in the driver's seat, leaning toward the right, restrained by the two-point passive belt.

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 forward and contacted the dummy's chest as the dummy's torso was restrained by the two-point passive belt. The dummy's head rotated rearward as the dummy rebounded rearward into the seat back. The dummy came to rest in the right front passenger's seat, restrained by the two-point passive belt.

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

MAKE/MODEL/BODY STYLE: Nissan/Sentra/4-door sedan
NHTSA NO.: CR5200
VIN: 1N4EB31P3RC703218
DATE OF MANUFACTURE: 07/93

CONVENIENCE HOOKS:

THE TEST VEHICLE IS EQUIPPED WITH A DEVICE TO STOW SEAT BELT WEBBING TO FACILITATE ENTERING OR EXITING THE VEHICLE. THE DEVICE AUTOMATICALLY RELEASES THE WEBBING WHEN THE IGNITION IS TURNED TO THE "ON" OR "START" POSITION.

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 a 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:

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

MAKE/MODEL/BODY STYLE: Nissan/Sentra/4-door sedan

NHTSA NO.: CR5200

VIN: 1N4EB31P3RC703218

DATE OF MANUFACTURE: 07/93

BELT CONTACT FORCE:

BELT CONTACT FORCE ON CHEST OF TEST DUMMY: 0.2 POUNDS

_____ NOT APPLICABLE, THE VEHICLE'S SEAT BELT SYSTEM INCLUDED A
WEBBING TENSION - RELIEVING DEVICE.

TABLE 7 FMVSS 208 SEAT BELT WARNING SYSTEM DATA

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

Duration of audible warning signal = 6 sec.

Duration of reminder light operation = 6 sec.

WITH OCCUPANT IN DRIVER'S POSITION AND LAP BELT 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 = 6 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.

Not applicable, vehicle did not contain a crash-deployed occupant protection
system.

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.

Not applicable, vehicle did not contain a crash-deployed occupant protection system.

FIGURE 4 FMVSS 212 TEST DATA

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

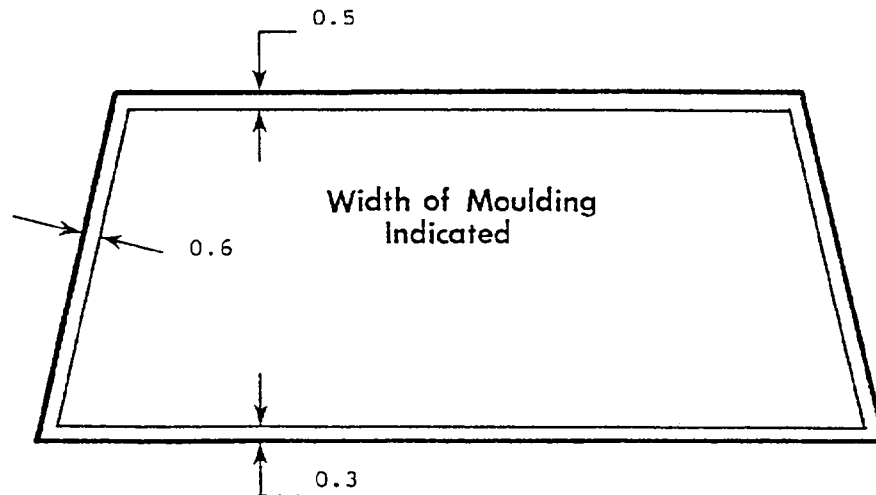
Plastic trim around outer perimeter, adhesive around inner perimeter.

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	76.8	76.8	100
LEFT SIDE	76.8	76.8	100
TOTAL	153.6	153.6	100

PRE-TEST WINDSHIELD MOUNTING MATERIAL TEMPERATURE: 69° 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.

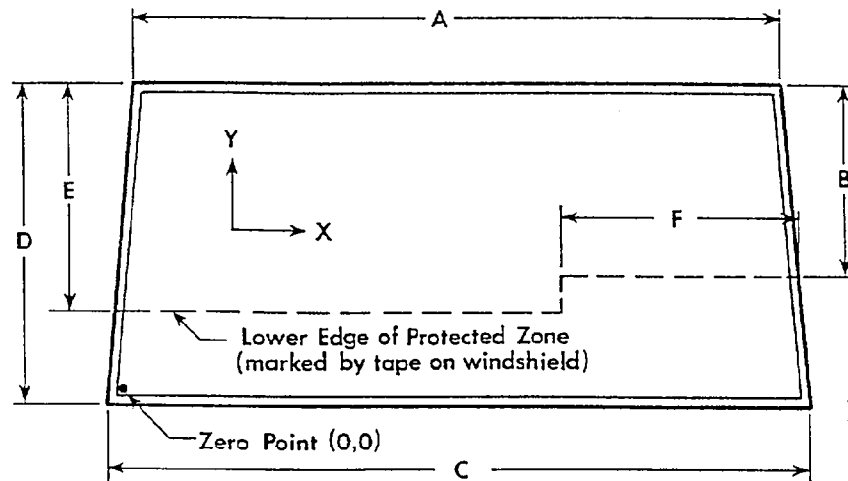
FIGURE 5 FMVSS 219 TEST DATA

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: 43.2
B: 18.8
C: 57.2
D: 29.0
E: 20.0
F: 22.5



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/Sentra
NHTSA NO.: CR5200
FUEL SYSTEM CAPACITY: 13.2 GALLONS (FROM OWNER'S MANUAL)
USABLE CAPACITY: 13.2 GALLONS (FURNISHED BY COTR)
TEST VOLUME RANGE: 12.1 GALLONS TO 12.4 GALLONS (92-94% OF USABLE)
ACTUAL TEST VOLUME: 12.3 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.: CR5200
TEST DATE: 09/22/93
VEHICLE YEAR/MAKE/
MODEL/BODY STYLE: 1994/Nissan/Sentra/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:

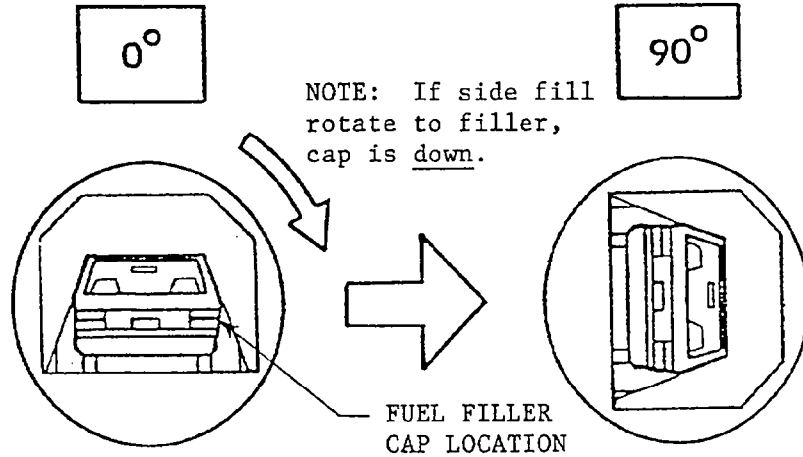
	<u>TEST</u> <u>RESULTS</u>	<u>MAXIMUM</u> <u>ALLOWABLE</u>
1. FROM IMPACT UNTIL VEHICLE MOTION CEASES	0 OZ.	1 OZ.
2. 5-MINUTE PERIOD AFTER VEHICLE MOTION CEASES	0 OZ.	5 OZ.
3. NEXT 25 MINUTES AFTER 5 MINUTE PERIOD	0 OZ.	1 OZ./1 MIN.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 6 FMVSS 301 STATIC ROLLOVER TEST DATA

NHTSA NO.: CR5200
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:

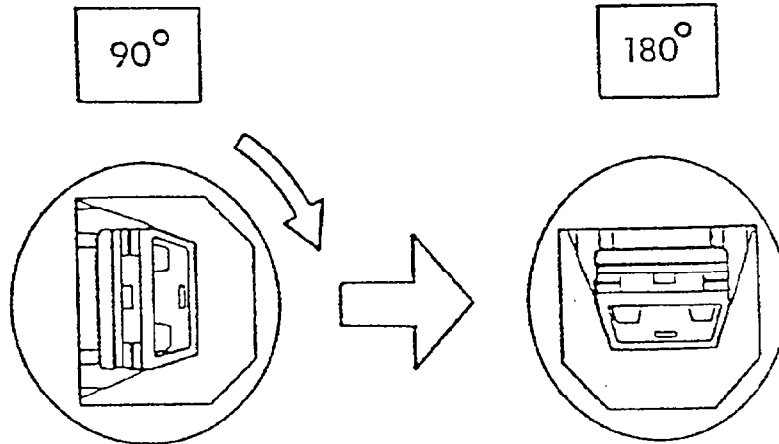
<u>0° TO 90° ROTATION (FUEL FILLER CAP DOWN)</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CR5200
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:

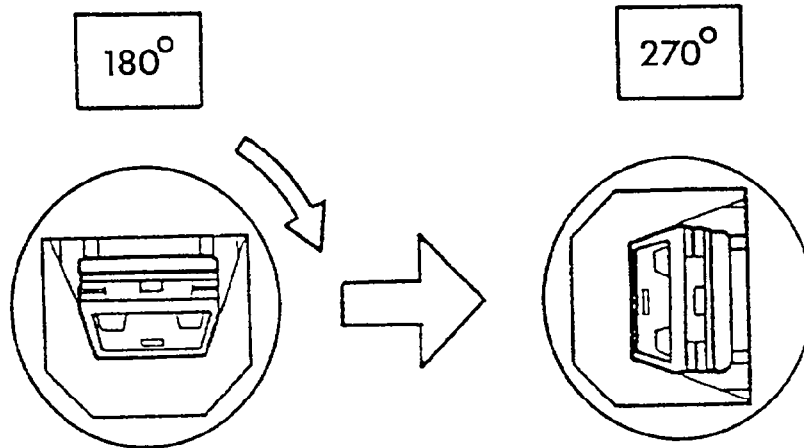
<u>90° TO 180° ROTATION</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CR5200
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:

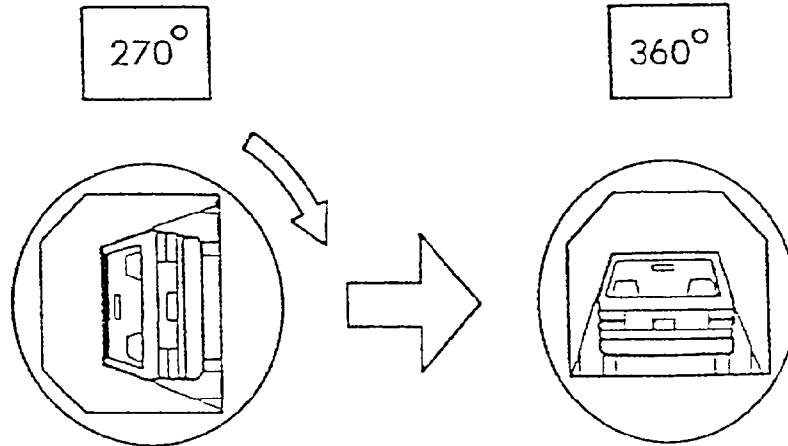
<u>180° TO 270° ROTATION</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CR5200
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

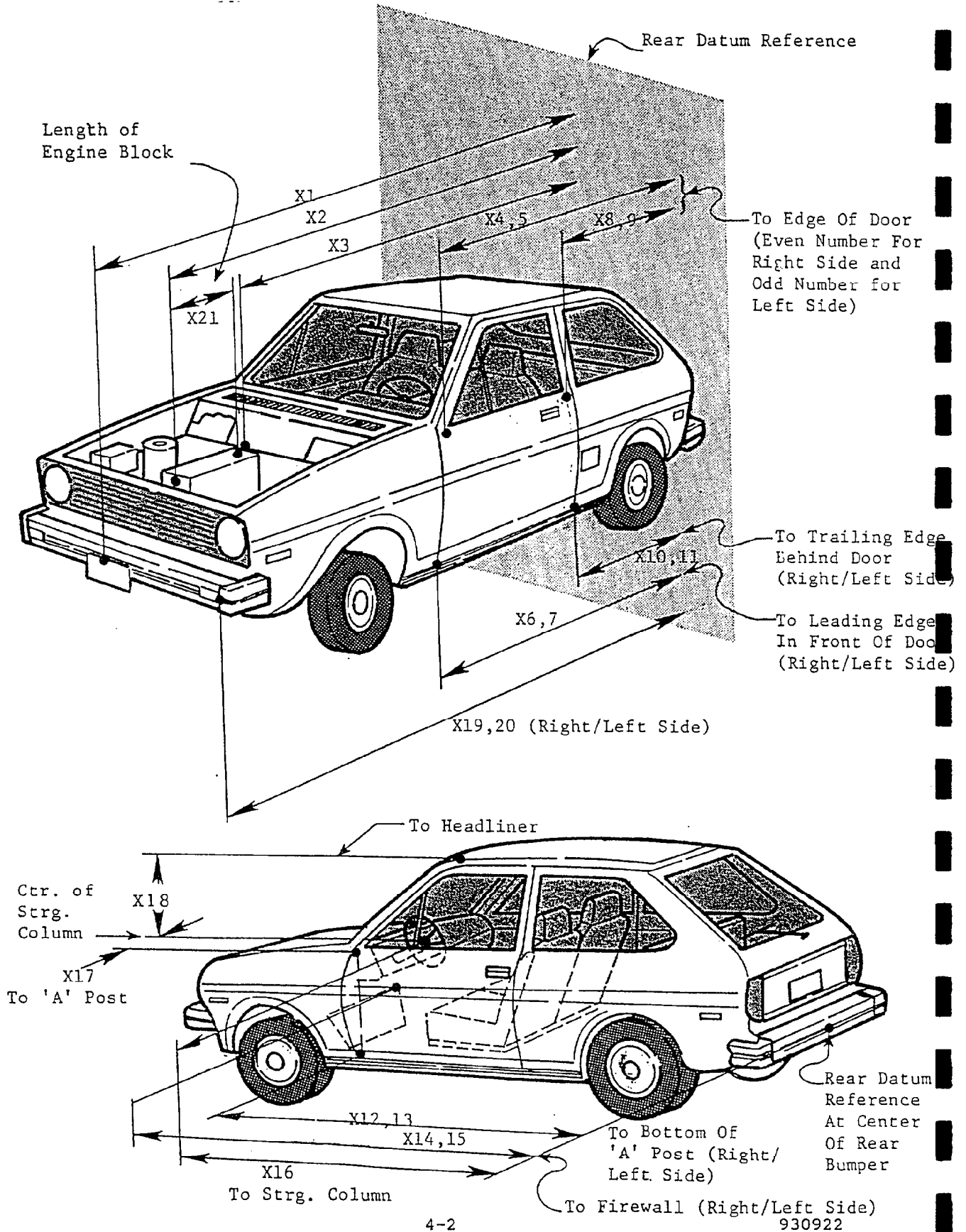


TABLE 12 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Nissan/Sentra TEST NUMBER: 930922

NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	170.2	154.2	16.0
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	147.9	142.9	5.0
X3	REAR SURFACE OF VEHICLE TO FIREWALL	128.5	126.8	1.7
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	116.0	116.2	-0.2
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	116.1	116.5	-0.4
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	116.2	116.2	0.0
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	116.3	116.7	-0.4
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	76.2	76.2	0.0
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	76.2	76.2	0.0
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	76.6	76.5	0.1
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	76.8	76.8	0.0
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	115.2	115.3	-0.1
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	115.0	115.2	-0.2
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	128.1	127.1	1.0
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	127.8	126.8	1.0
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	99.0	99.8	-0.8
X17	CENTER OF STEERING COLUMN TO "A" POST	11.4	13.0	-1.6
X18	CENTER OF STEERING COLUMN TO HEADLINER	17.0	17.2	-0.2
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	166.8	151.6	15.2
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	166.5	152.2	14.3
X21	LENGTH OF ENGINE BLOCK	18.0	18.0	0.0

All distance measurements are in inches.

FIGURE 8 VEHICLE TARGET LOCATIONS

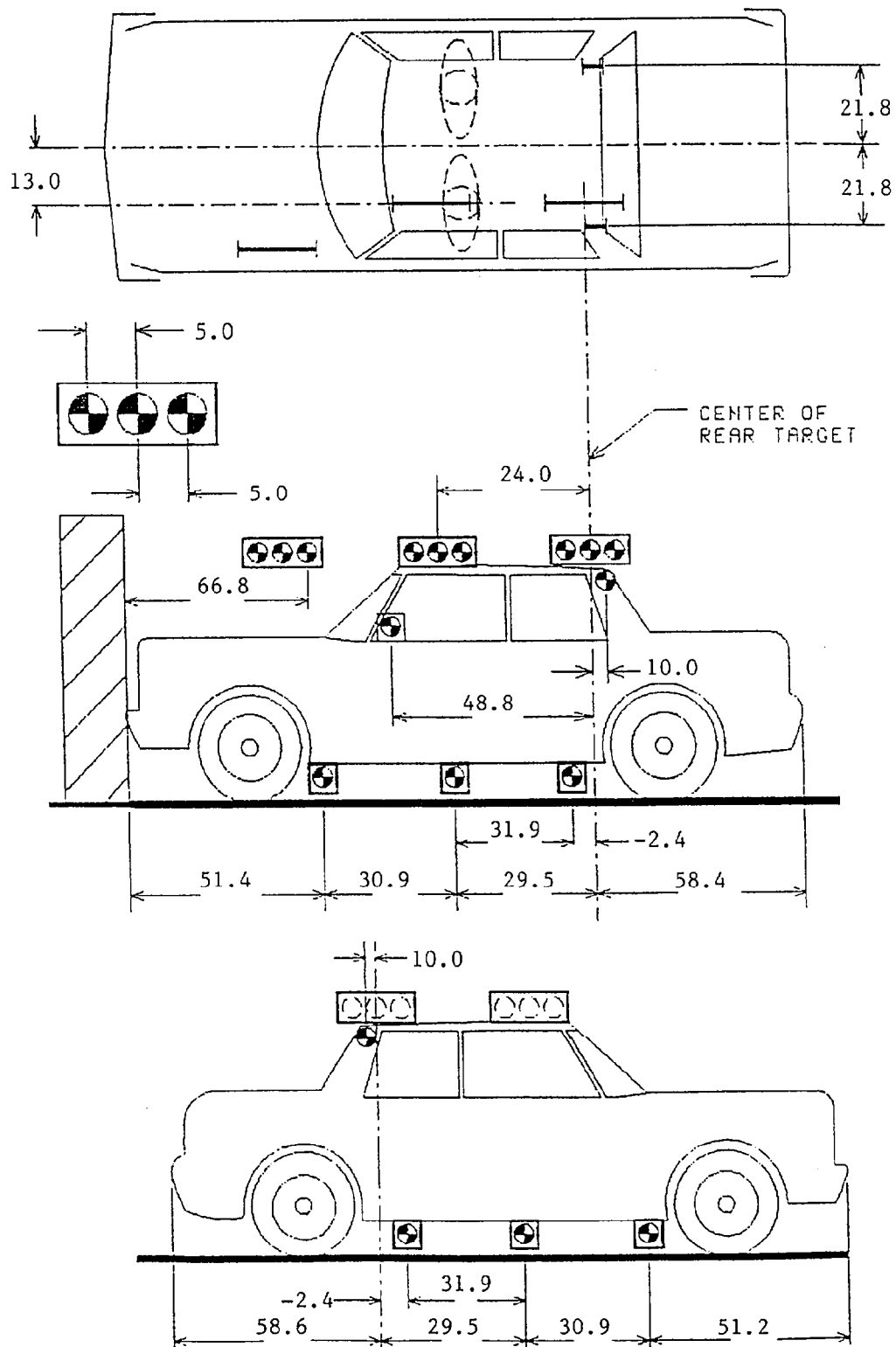
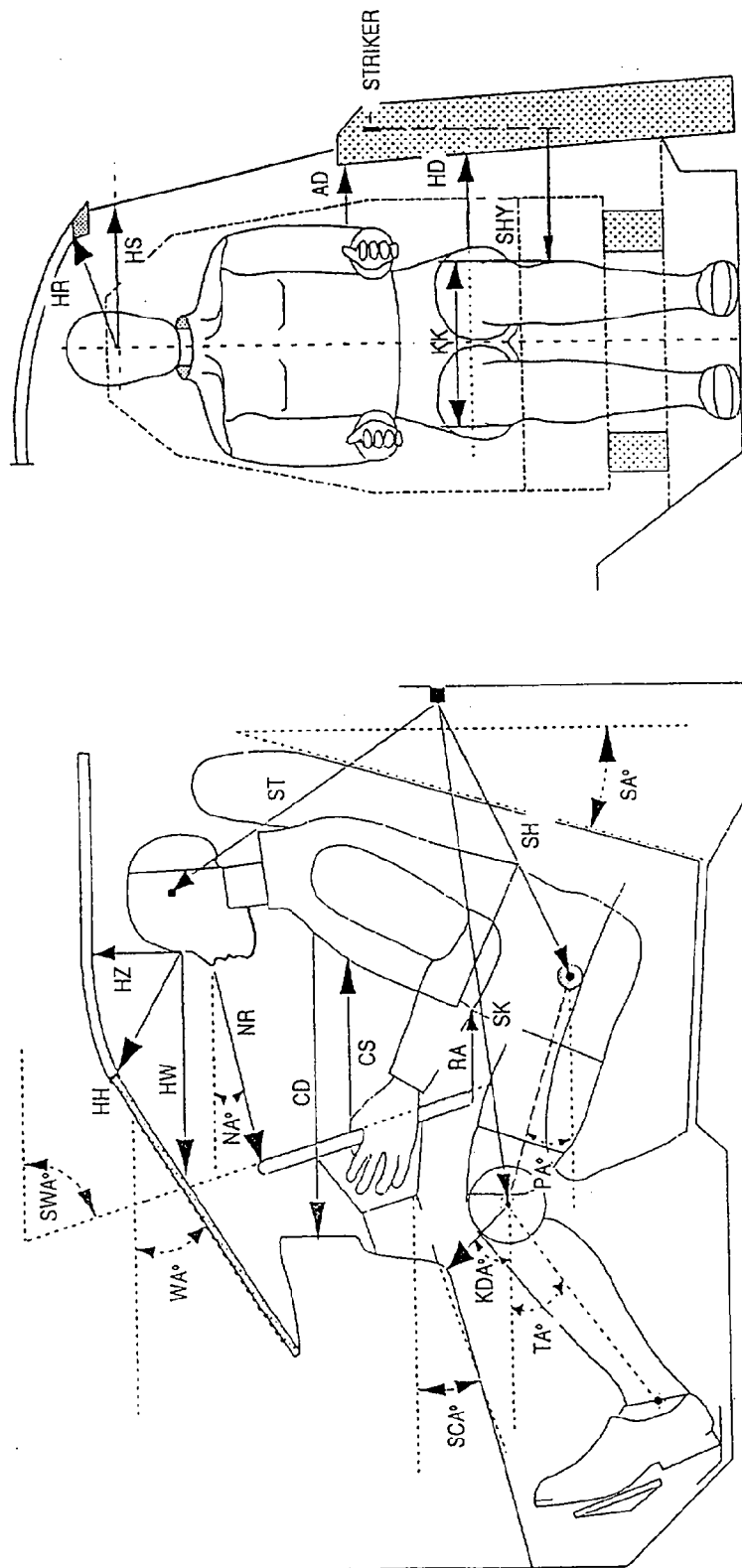
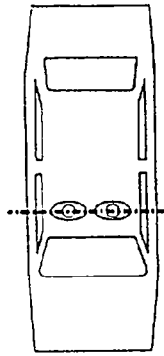


FIGURE 9

DUMMY MEASUREMENT LOCATIONS FOR FRONT SEAT OCCUPANTS



VERTICAL TRANSVERSE PLANE



VERTICAL LONGITUDINAL PLANE

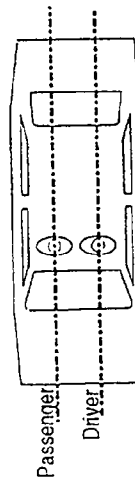


TABLE 13 DUMMY MEASUREMENT DATA FOR FRONT SEAT OCCUPANTS

DESIGNATION	TYPE OF MEASUREMENT	DRIVER (SERIAL #353)	PASSENGER (SERIAL #354)
WA	WINDSHIELD ANGLE	32	32
SWA	STEERING WHEEL ANGLE	66	NA
SCA	STEERING COLUMN ANGLE	24	NA
SA	SEAT BACK ANGLE	23	21
HZ	HEAD TO ROOF	3.1	2.9
HH	HEAD TO HEADER	15.4	14.9
HW	HEAD TO WINDSHIELD	22.1	20.4
HR	HEAD TO SIDE HEADER	7.2	6.4
NR	NOSE TO RIM	18.6	NA
NA	NOSE TO RIM ANGLE	15	NA
CD	CHEST TO DASH	23.4	23.8
CS	STEERING WHEEL TO CHEST	13.8	NA
RA	RIM TO ABDOMEN	8.9	NA
KDL	LEFT KNEE TO DASH	9.5	9.2
KDR	RIGHT KNEE TO DASH	9.3	9.4
KDA	OUTBOARD KNEE TO DASH ANGLE	21	25
PA	PELVIC ANGLE	12	15
TA	TIBIAL ANGLE	35	34
KK	KNEE TO KNEE	13.8	11.8
ST ¹	STRIKER TO HEAD	20.2	20.2
	STRIKER TO HEAD ANGLE	-90	-95
SK ¹	STRIKER TO KNEE	21.0	20.5
	STRIKER TO KNEE ANGLE	4	4
SH ¹	STRIKER TO H-POINT	6.6	7.8
	STRIKER TO H-POINT ANGLE	45	44
SHY	STRIKER TO H-POINT (Y DIR.)	8.6	9.2
HS	HEAD TO SIDE WINDOW	12.5	11.6
HD	H-POINT TO DOOR	4.9	5.2
AD	ARM TO DOOR	4.3	1.8

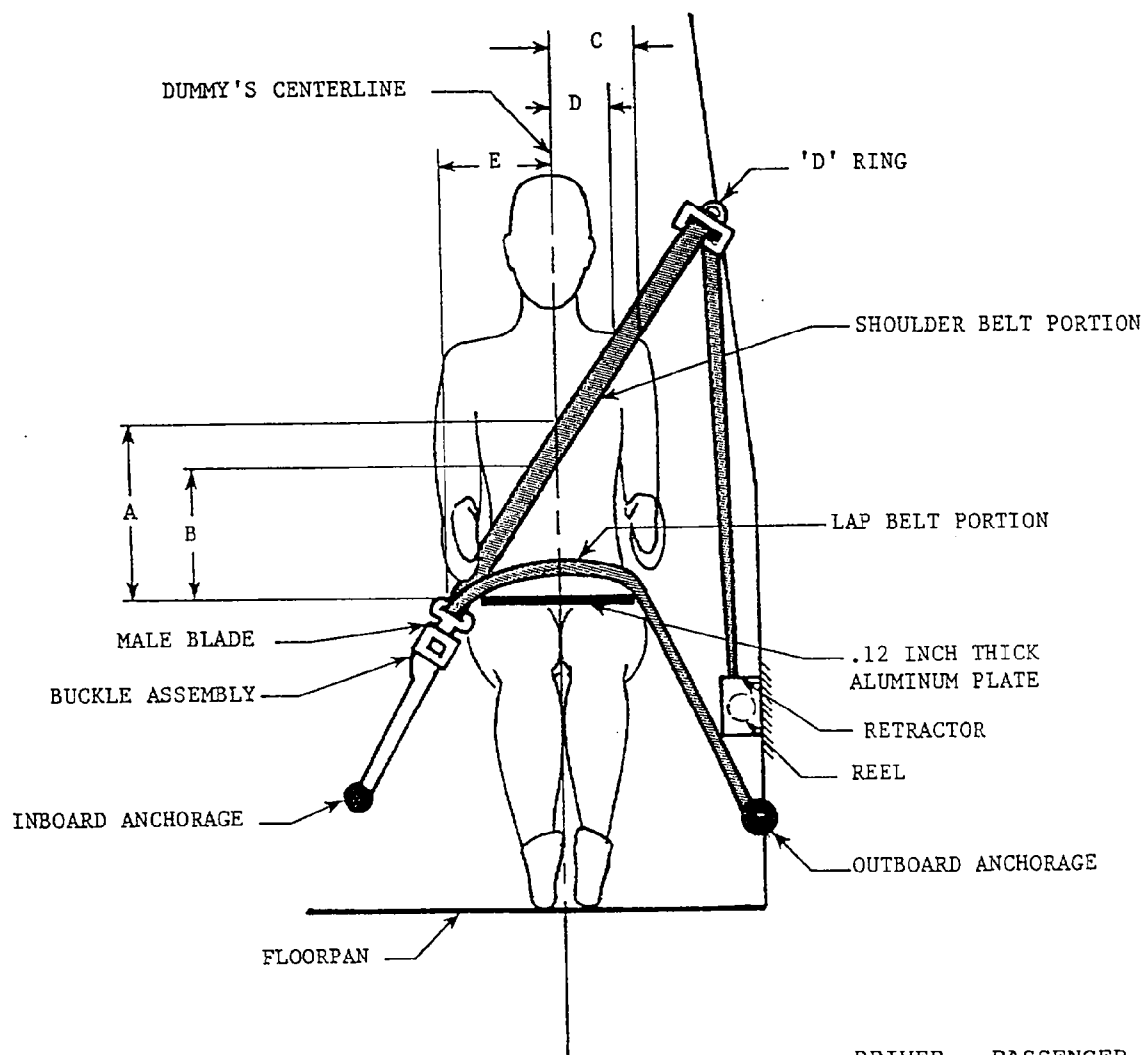
The seat back angle (SA°) is measured relative to vertical, all other angles are measured relative to horizontal.

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 SEAT BELT POSITIONING DATA



	DRIVER	PASSENGER
A - TOP SURFACE OF ALUM. PLATE TO BELT UPPER EDGE	14.0	14.2
B - TOP SURFACE OF ALUM. PLATE TO BELT LOWER EDGE	11.0	11.2
C - DUMMY CENTERLINE TO OUTER EDGE OF BELT AT CHEST FLESH TOP	8.9	7.8
D - DUMMY CENTERLINE TO INNER EDGE OF BELT AT CHEST FLESH TOP	6.0	4.8
E - DUMMY CENTERLINE TO INTERSECTION OF UPPER TORSO BELT AND LAP BELT	NA	NA

All distance measurements are in inches.

FIGURE 11 CAMERA POSITIONS

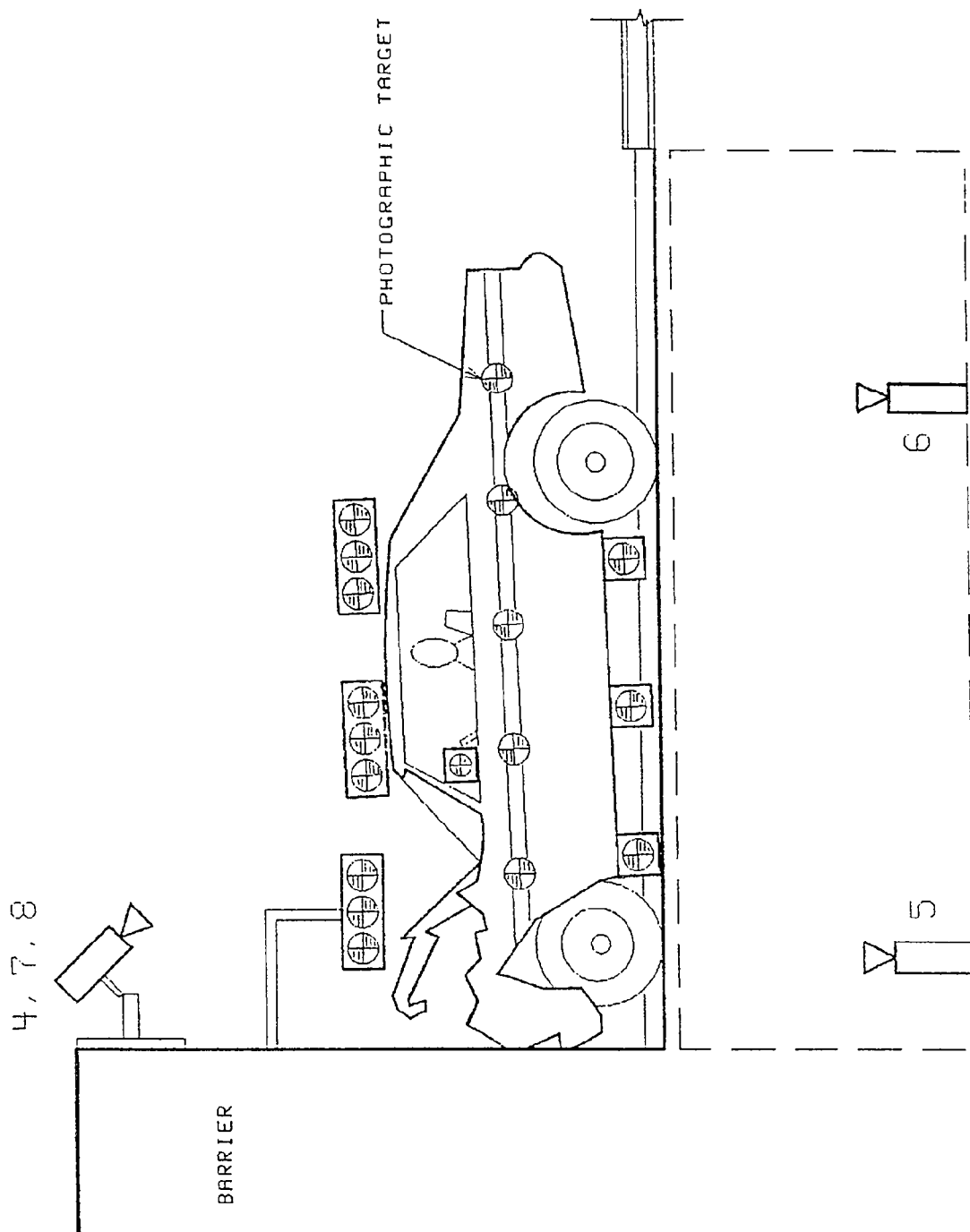


FIGURE 11 CAMERA POSITIONS, CONT'D.

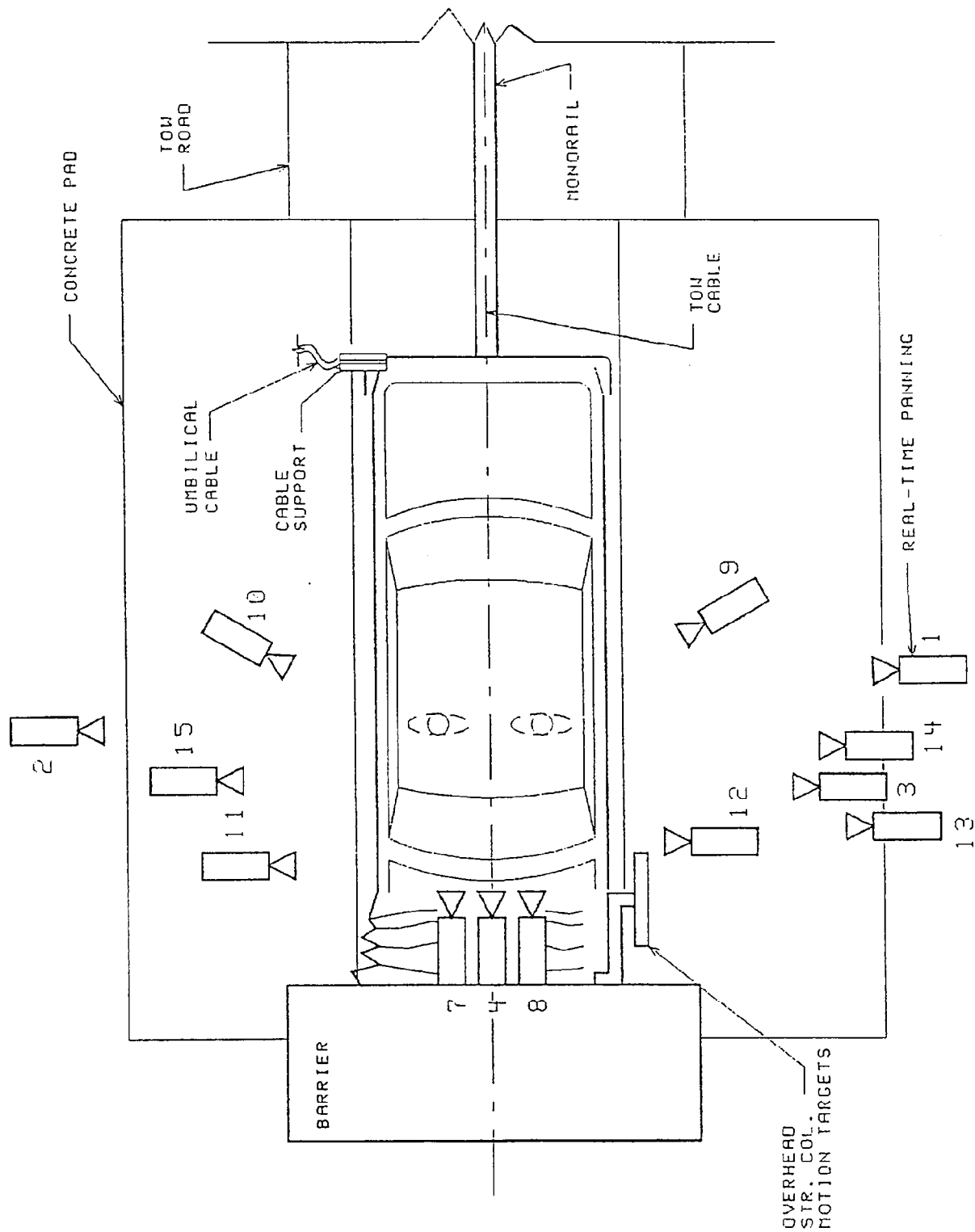


TABLE 14 MOTION PICTURE CAMERA LOCATIONS

TEST NO.: 930922		VEHICLE: 1994 Nissan Sentra 4-door sedan					FILM PLANE		
CAMERA NO.	VIEW	CAMERA POSITIONS (IN.) ¹			ANGLE ² (DEG)	TO HEAD TARGET (IN.)	LENS (MM)	FILM SPEED (FPS)	
		X	Y	Z					
1	Real-time panning	-142.0	504.0	61.0	NA	NA	16	24	
2	Right overall	-81.3	-266.4	37.1	-2	NA	13	1002	
3	Left vehicle crush	-41.5	295.0	44.0	-4	334.0	25	1008	
4	Windshield front view	-6.0	0.0	85.0	-40	NA	13	1005	
5	Pit - front position	-50.5	0.0	-92.4	90	NA	13	998	
6	Pit - rear position	-99.3	0.0	-99.0	90	NA	13	998	
7	Passenger - front view	-4.5	-13.8	93.0	-50	NA	17	998	
8	Driver - front view	-6.8	14.5	93.0	-50	NA	17	1012	
9	Driver kinematics	-157.3	116.0	87.0	-27	111.0	25	995	
10	Passenger kinematics	-152.1	-116.0	87.0	-26	108.0	25	983	
11	Right windshield intrusion	-38.1	-306.1	44.0	0	NA	50	1018	
12	Left windshield intrusion	-53.0	309.4	42.3	0	NA	50	1002	
13	Steering column motion	-107.0	286.0	103.0	-14	NA	25	1005	
14	Steering column motion	-107.0	286.0	75.1	-9	NA	25	1000	
15	Passenger kinematics	-38.8	-293.0	45.3	-4	322.0	25	1048	
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

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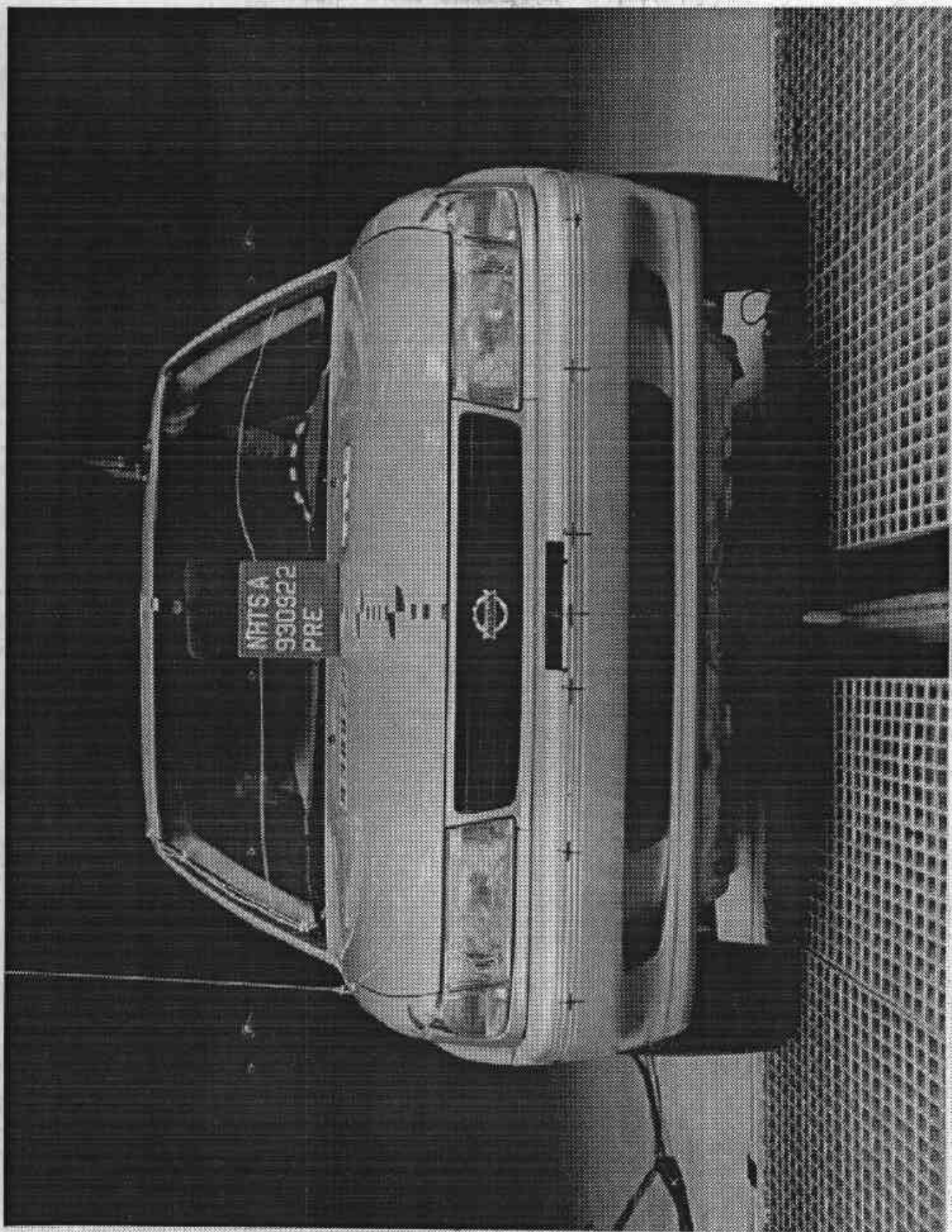


Figure A-1. PRE-TEST FRONT VIEW

A-2

930922

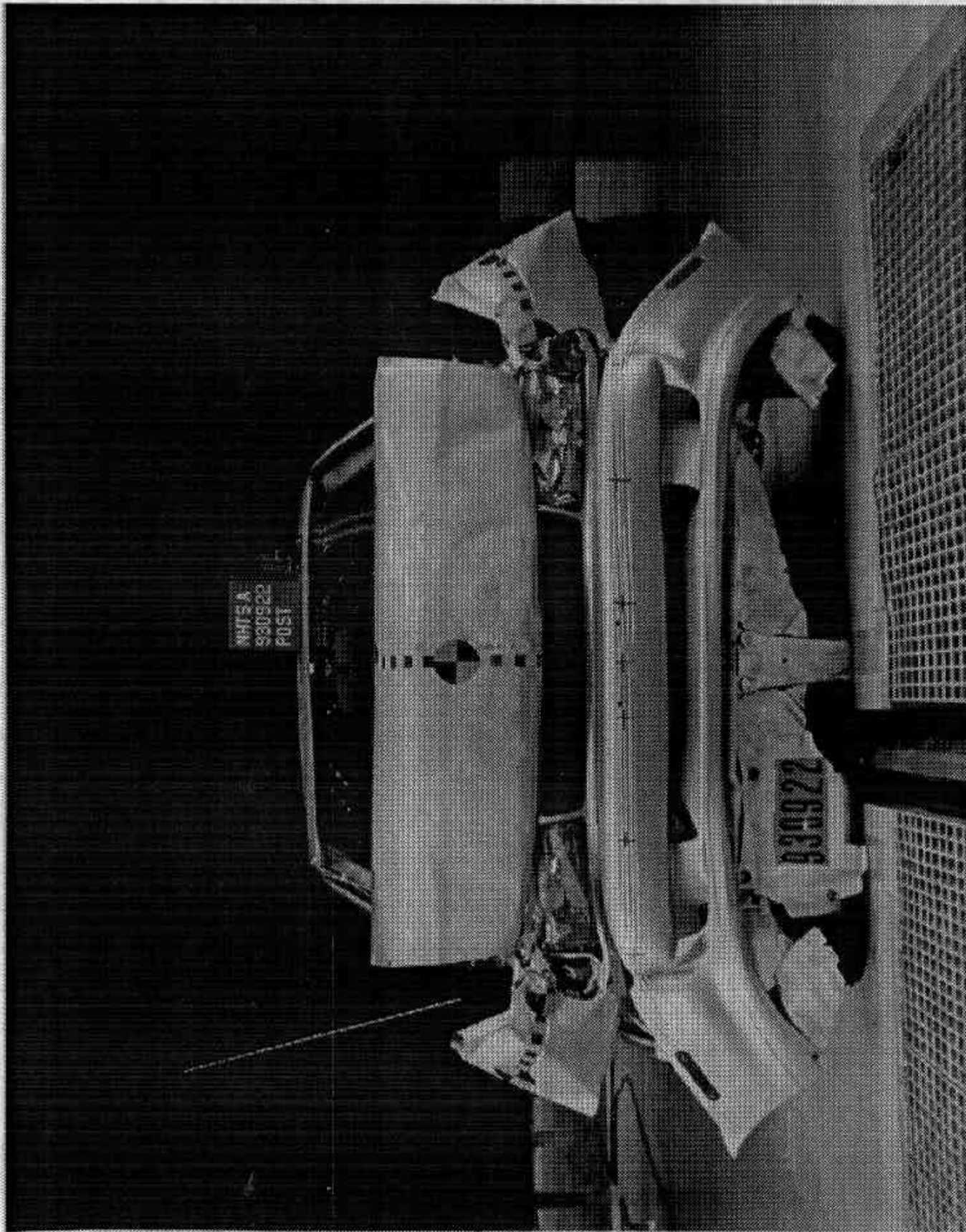


Figure A-2. POST-TEST FRONT VIEW

A-3

930922

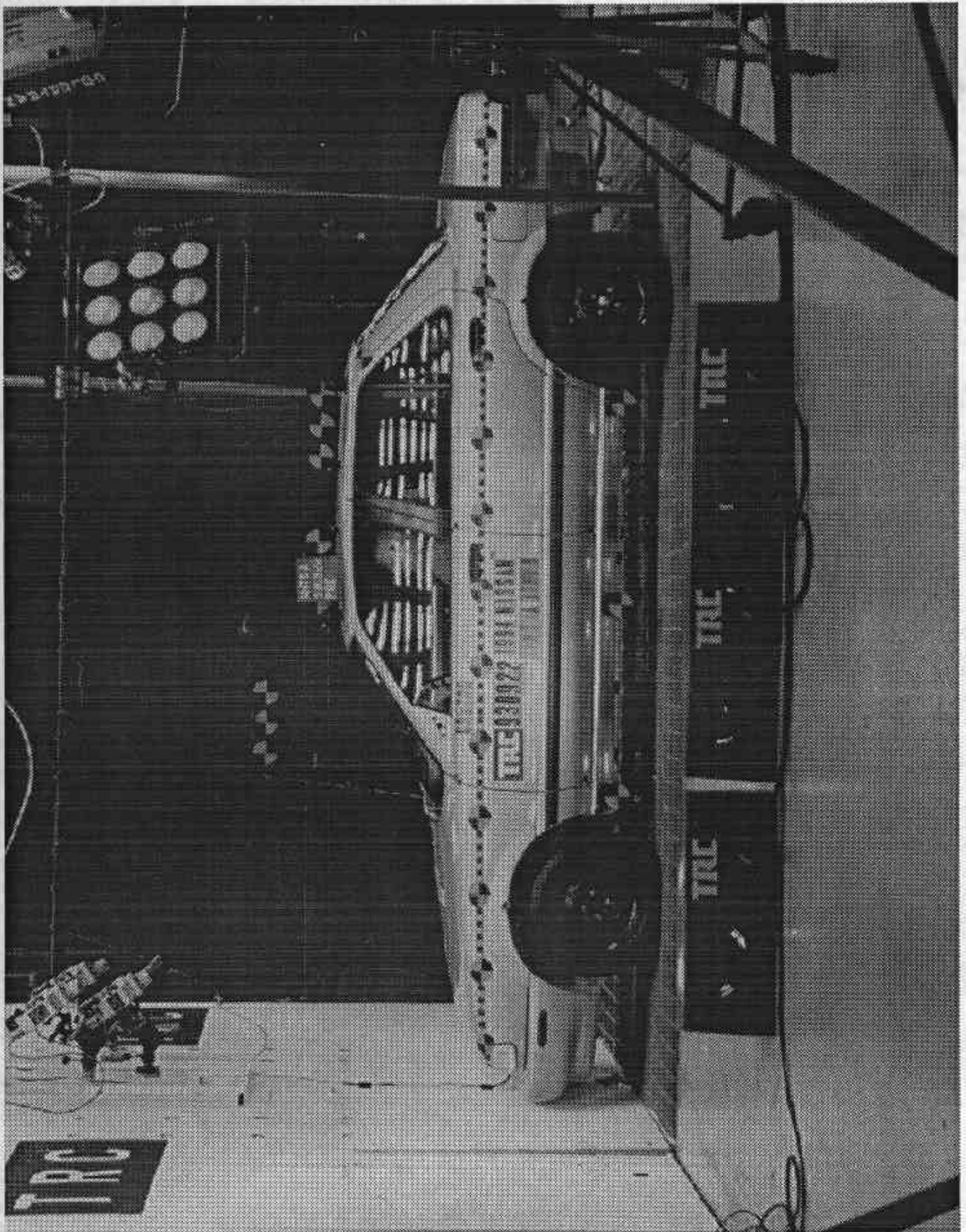


Figure A-3. PRE-TEST LEFT SIDE VIEW
A-4

930922

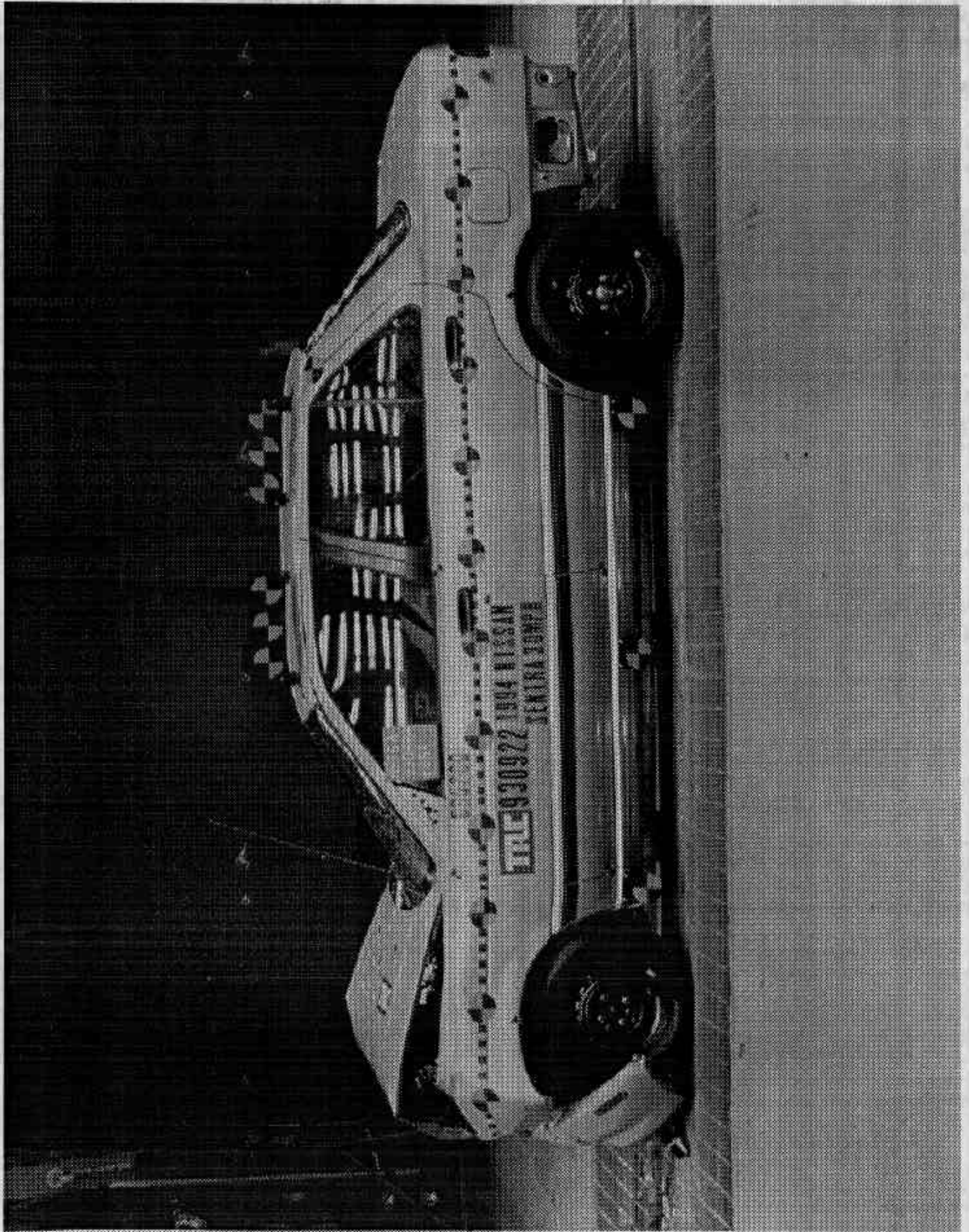


Figure A-4. POST-TEST LEFT SIDE VIEW
A-5

930922

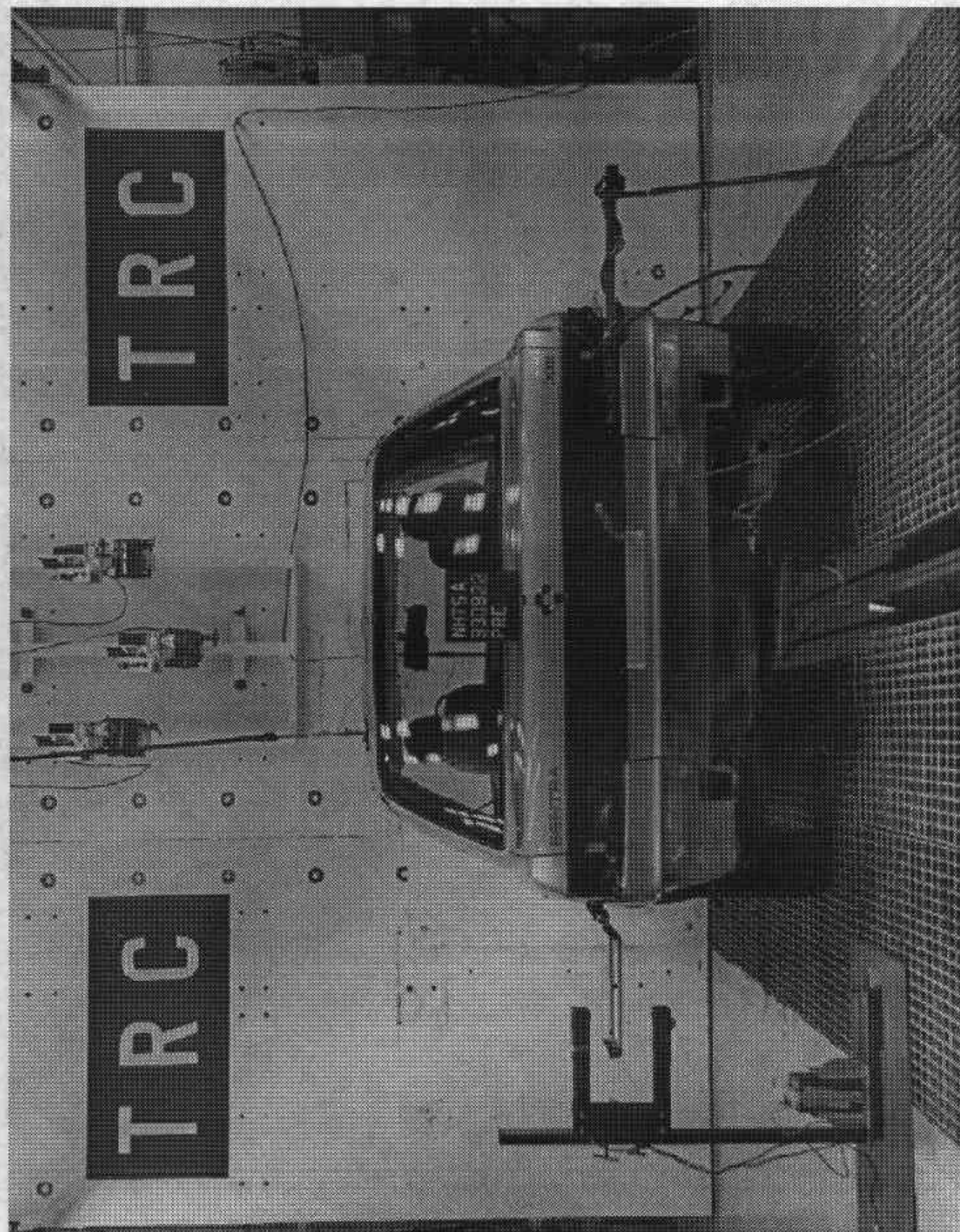


Figure A-5. PRE-TEST REAR VIEW

A-6

930922

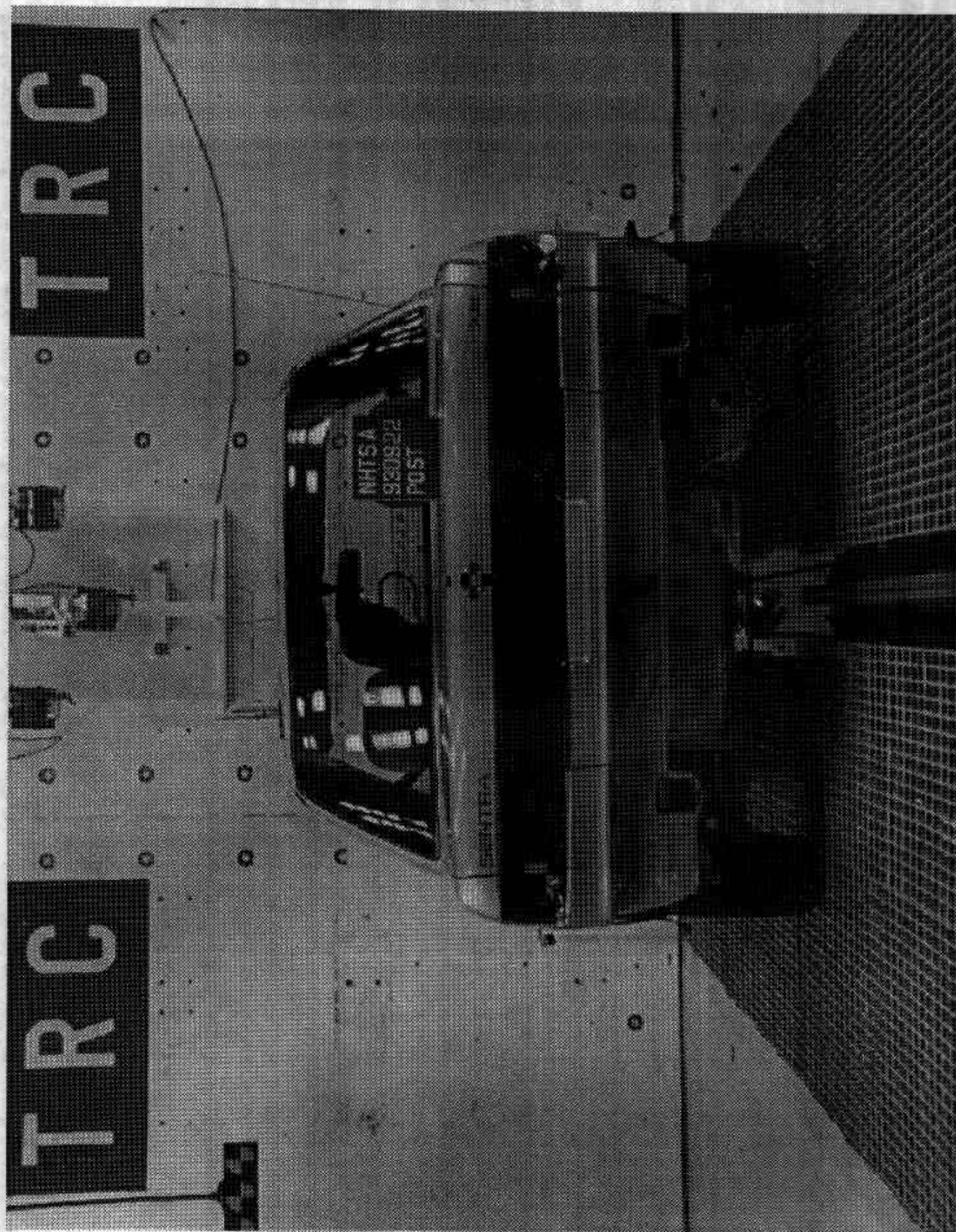


Figure A-6. POST-TEST REAR VIEW
A-7

930922

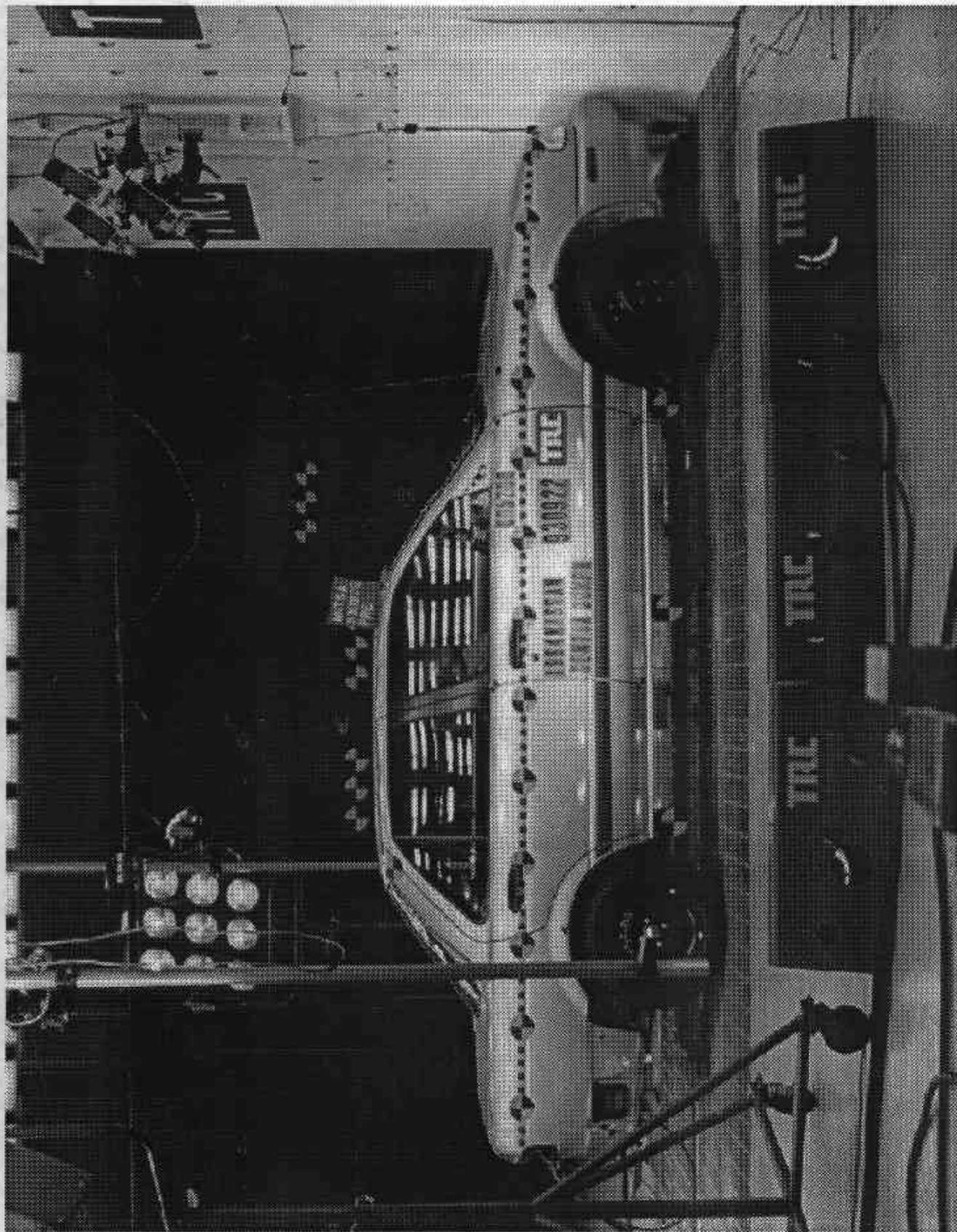


Figure A-7. PRE-TEST RIGHT SIDE VIEW

A-8

930922

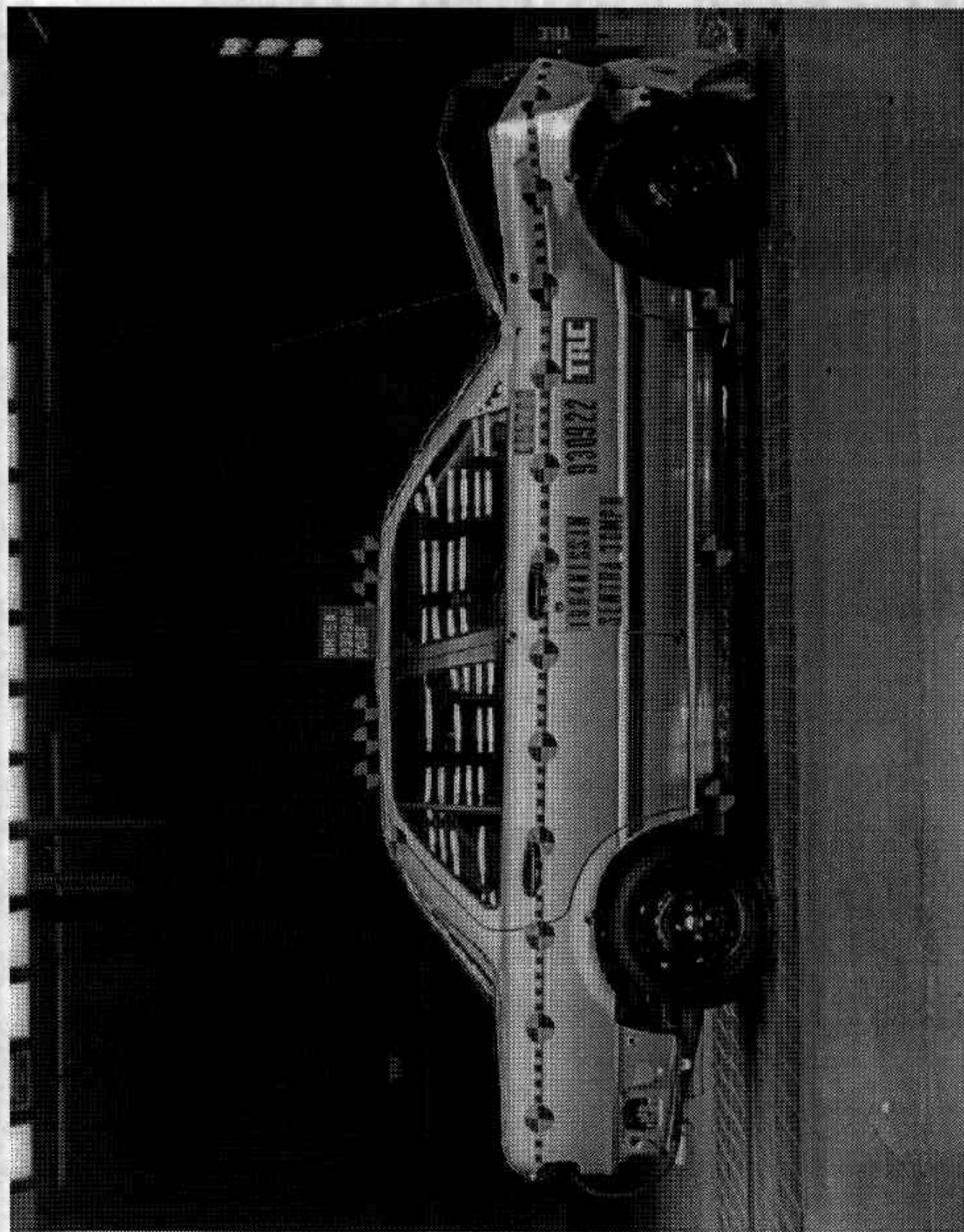


Figure A-8. POST-TEST RIGHT SIDE VIEW

A-9

930922



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

A-10

930922

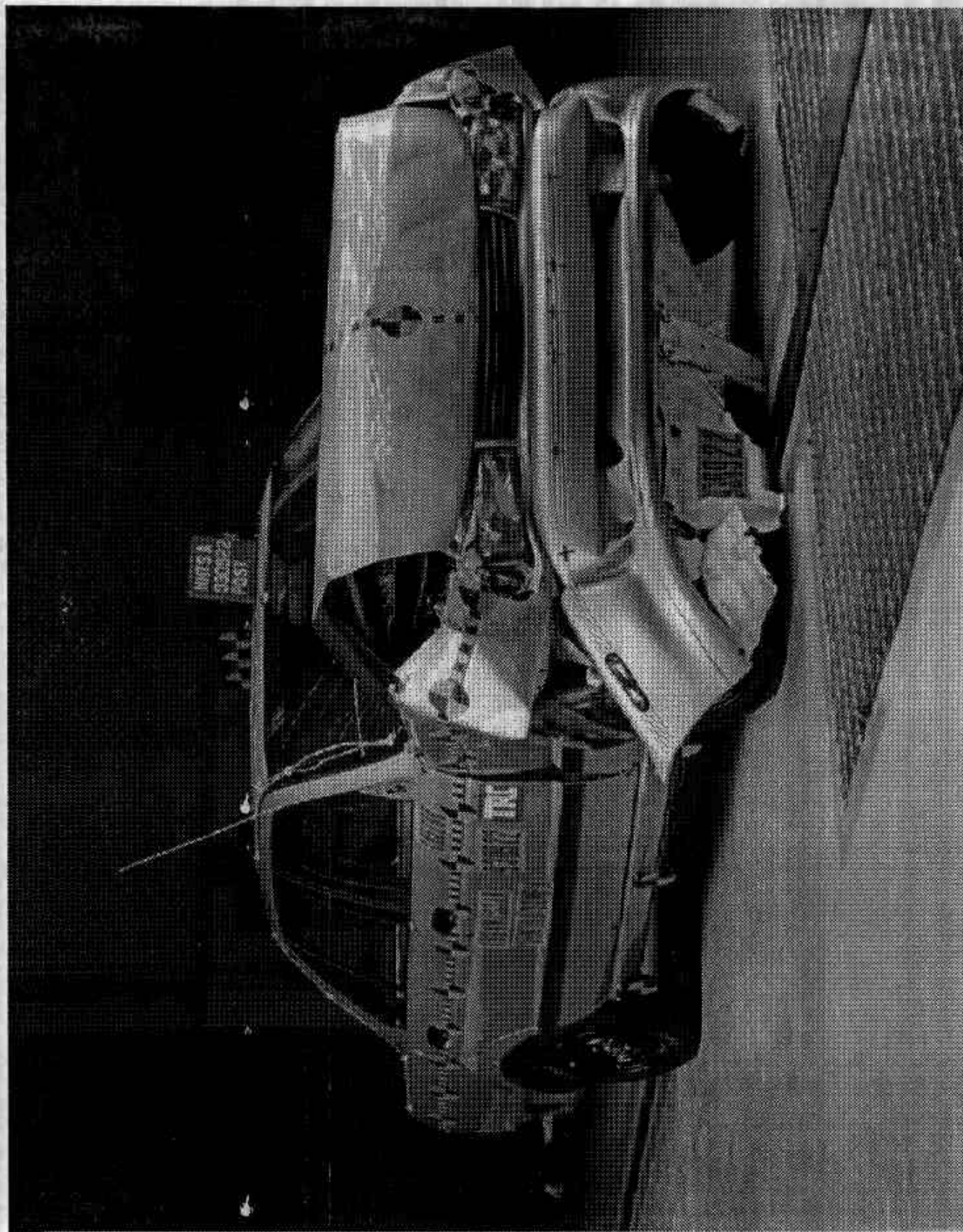


Figure A-10. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-11

930922

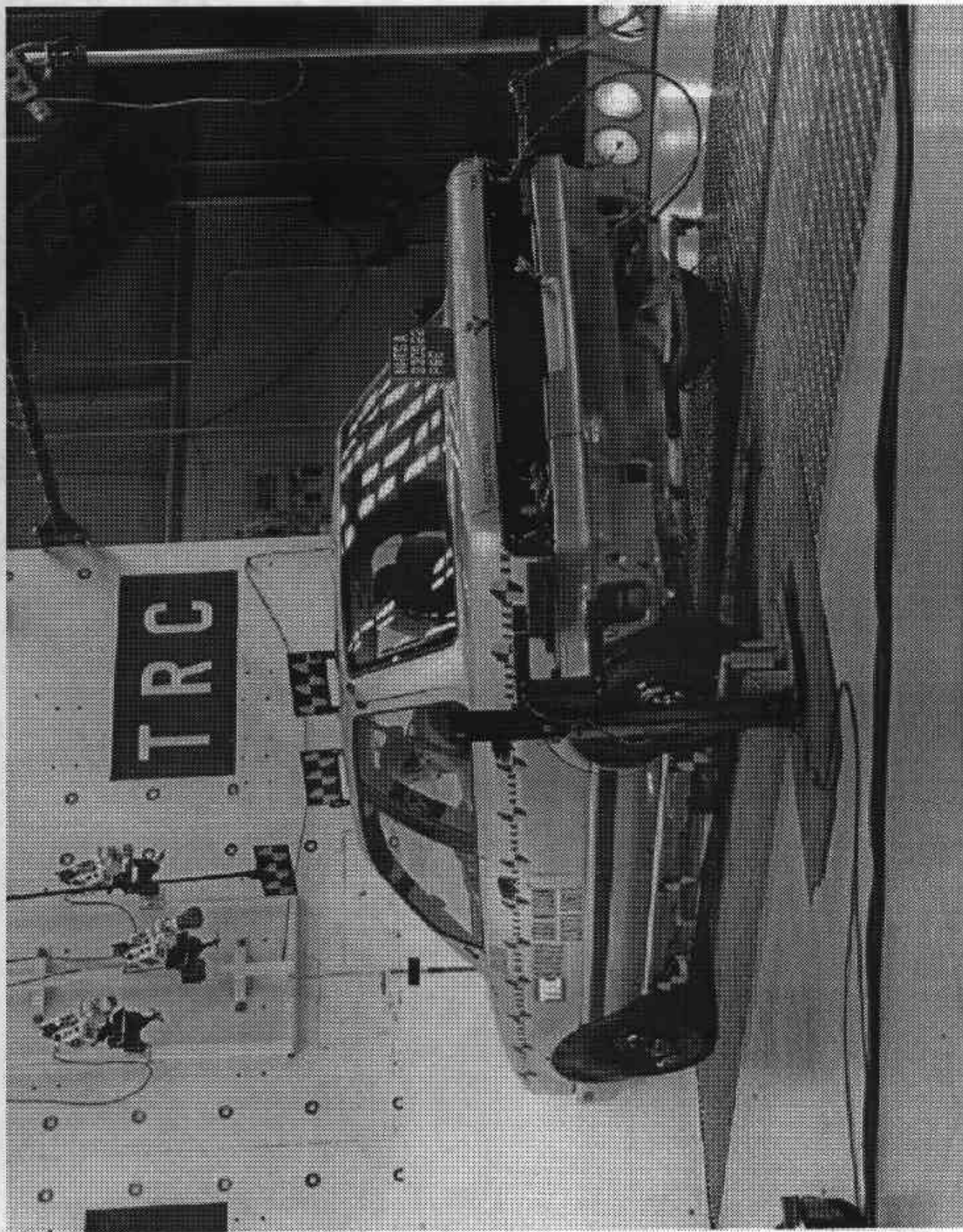


Figure A-11. PRE-TEST LEFT REAR THREE-QUARTER VIEW

A-12

930922

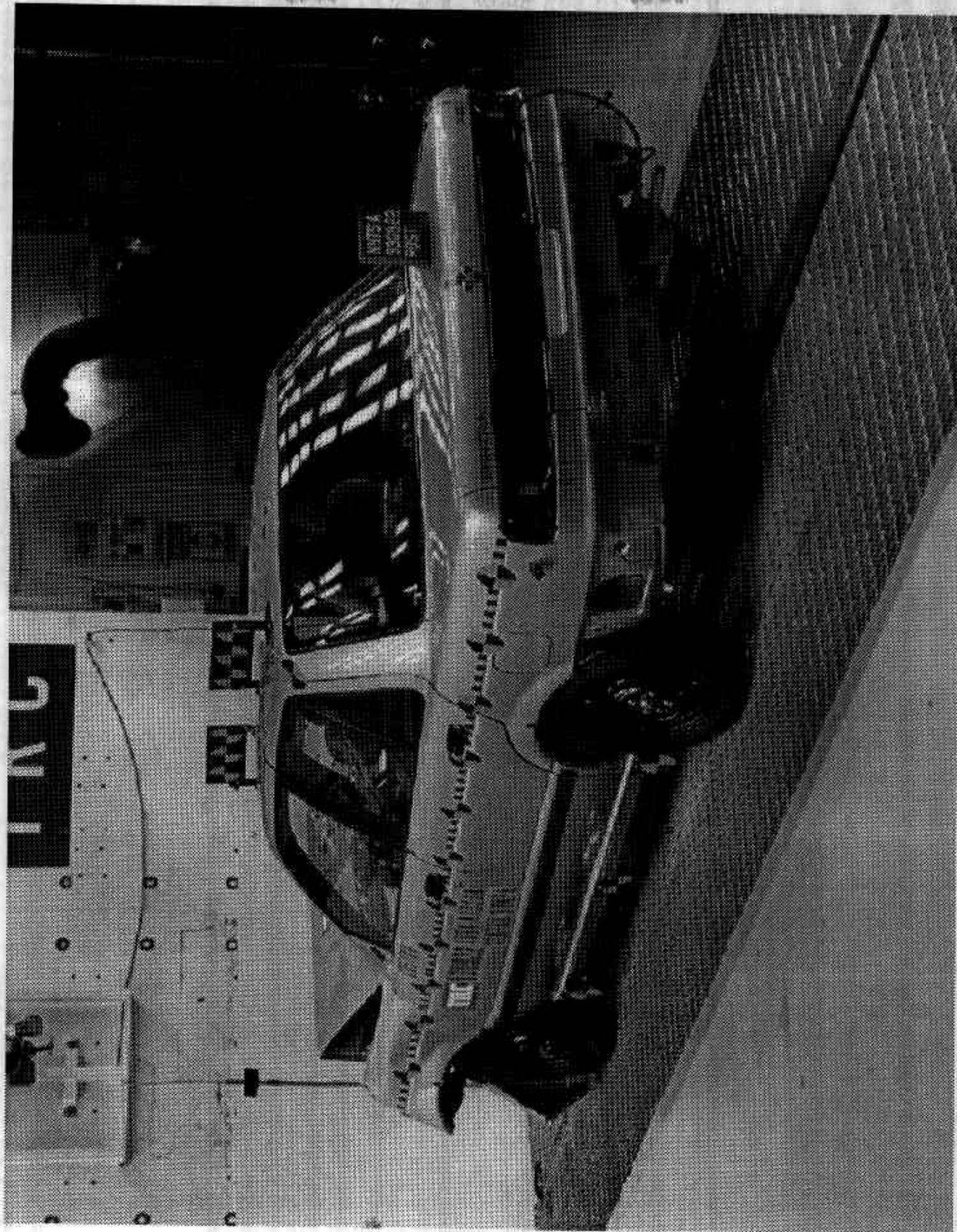


Figure A-12. POST-TEST LEFT REAR THREE-QUARTER VIEW

A-13

930922



Figure A-13. PRE-TEST WINDSHIELD VIEW

A-14

930922



Figure A-14. POST-TEST WINDSHIELD VIEW

A-15

930922

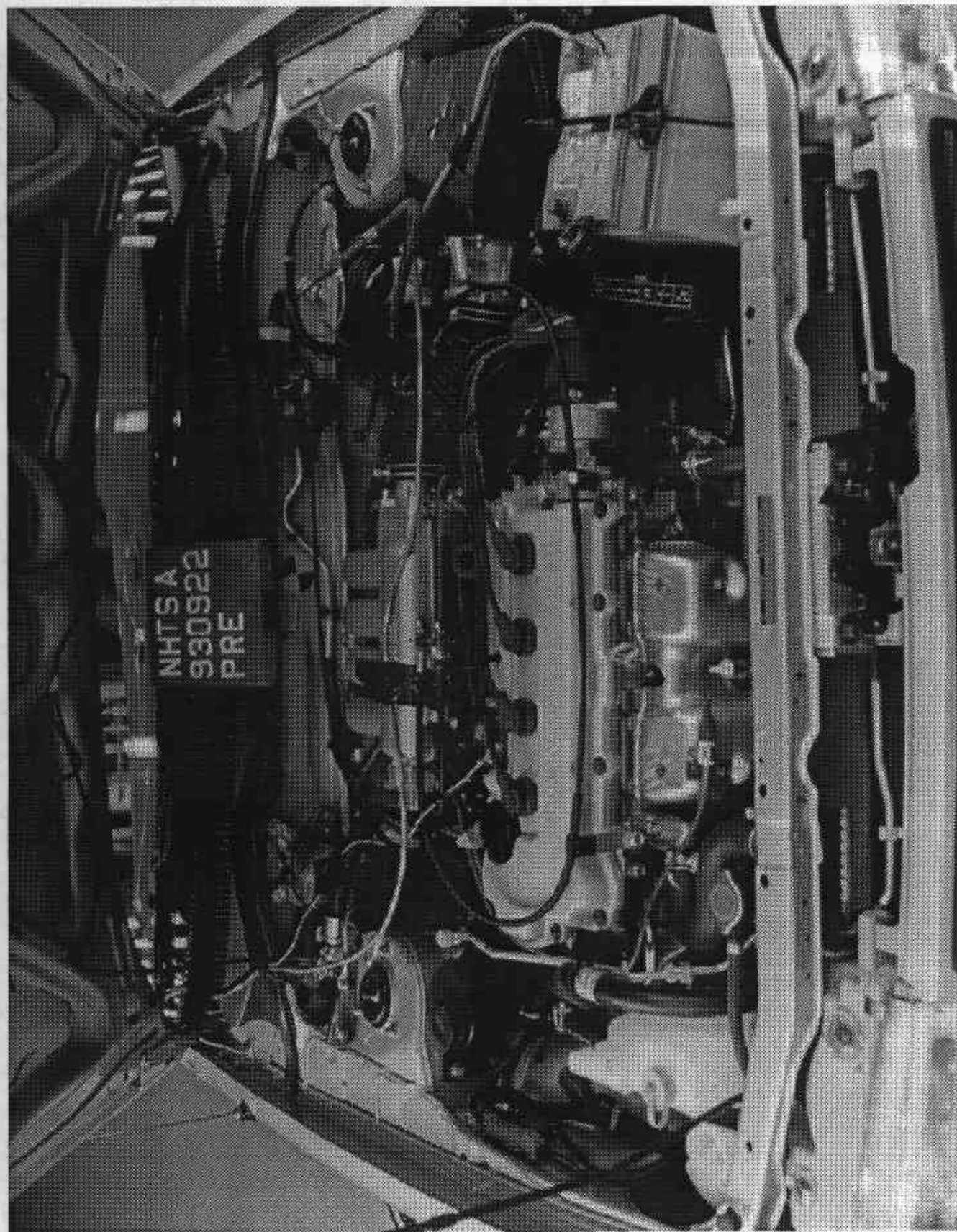


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW
A-16

930922

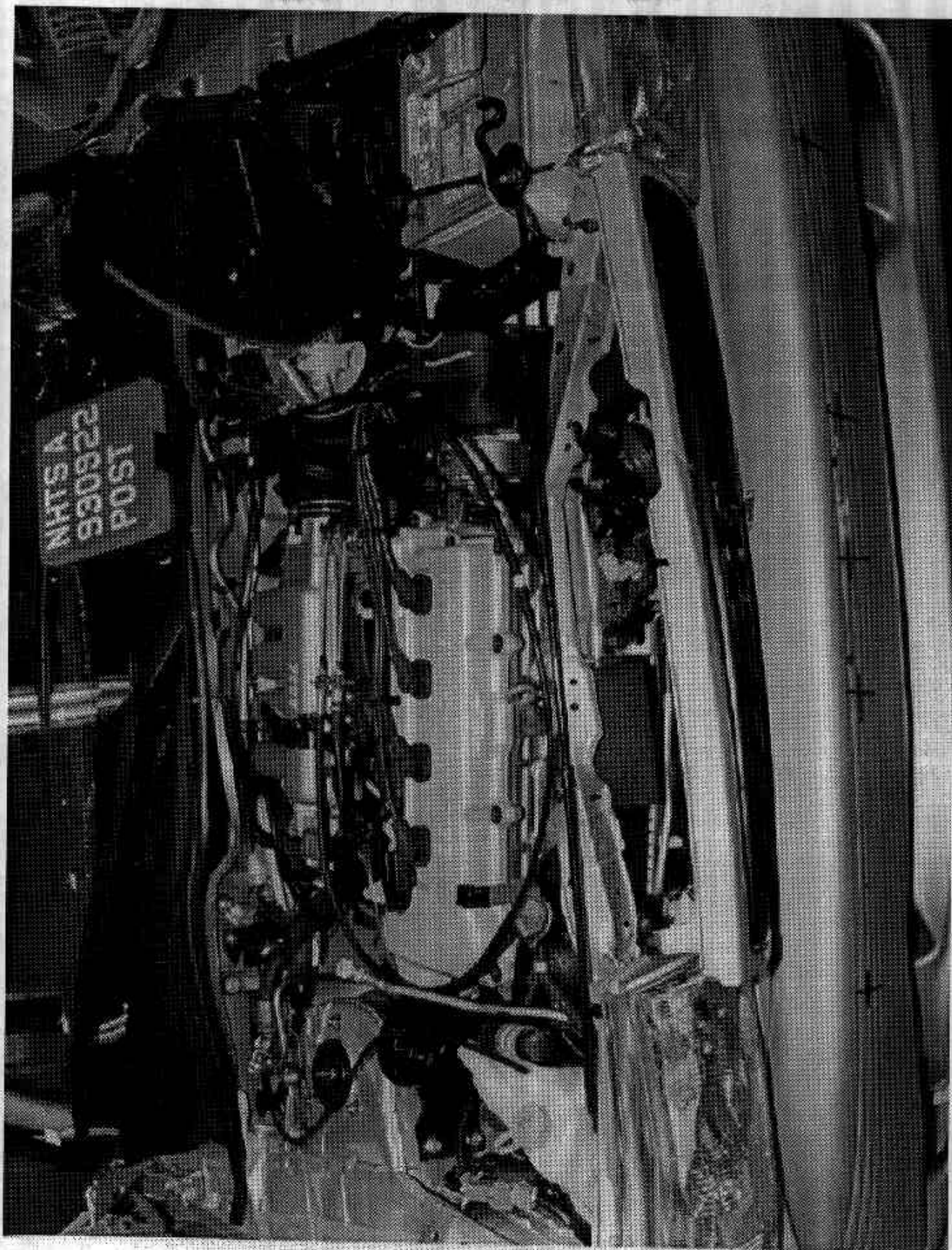


Figure A-16. POST-TEST ENGINE COMPARTMENT VIEW

A-17

930922

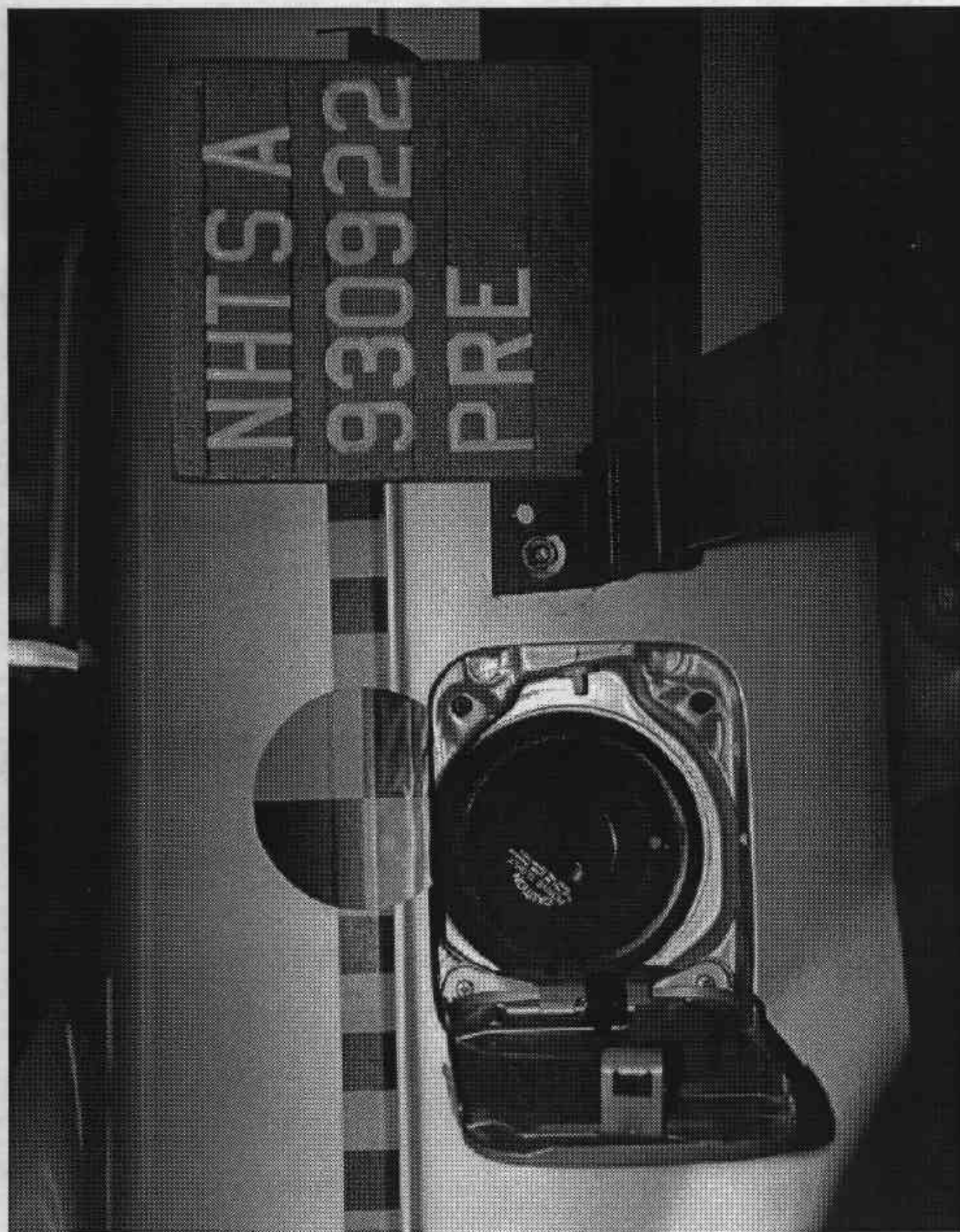


Figure A-17. PRE-TEST FUEL FILLER CAP VIEW
A-18

930922



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

A-19

930922



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

A-20

930922

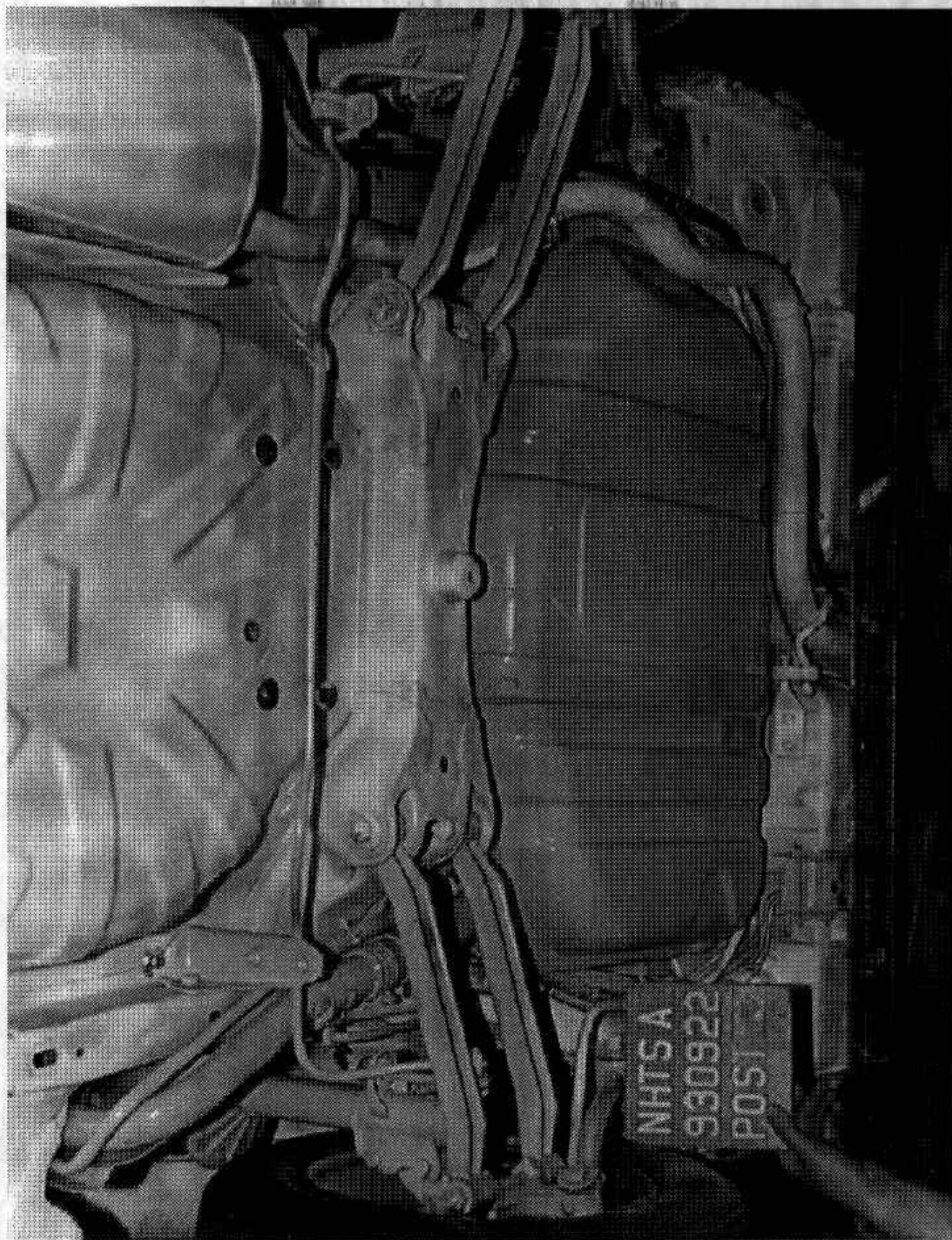


Figure A-20. POST-TEST FUEL FILLER NECK AND FUEL TANK VIEW

A-21

930922

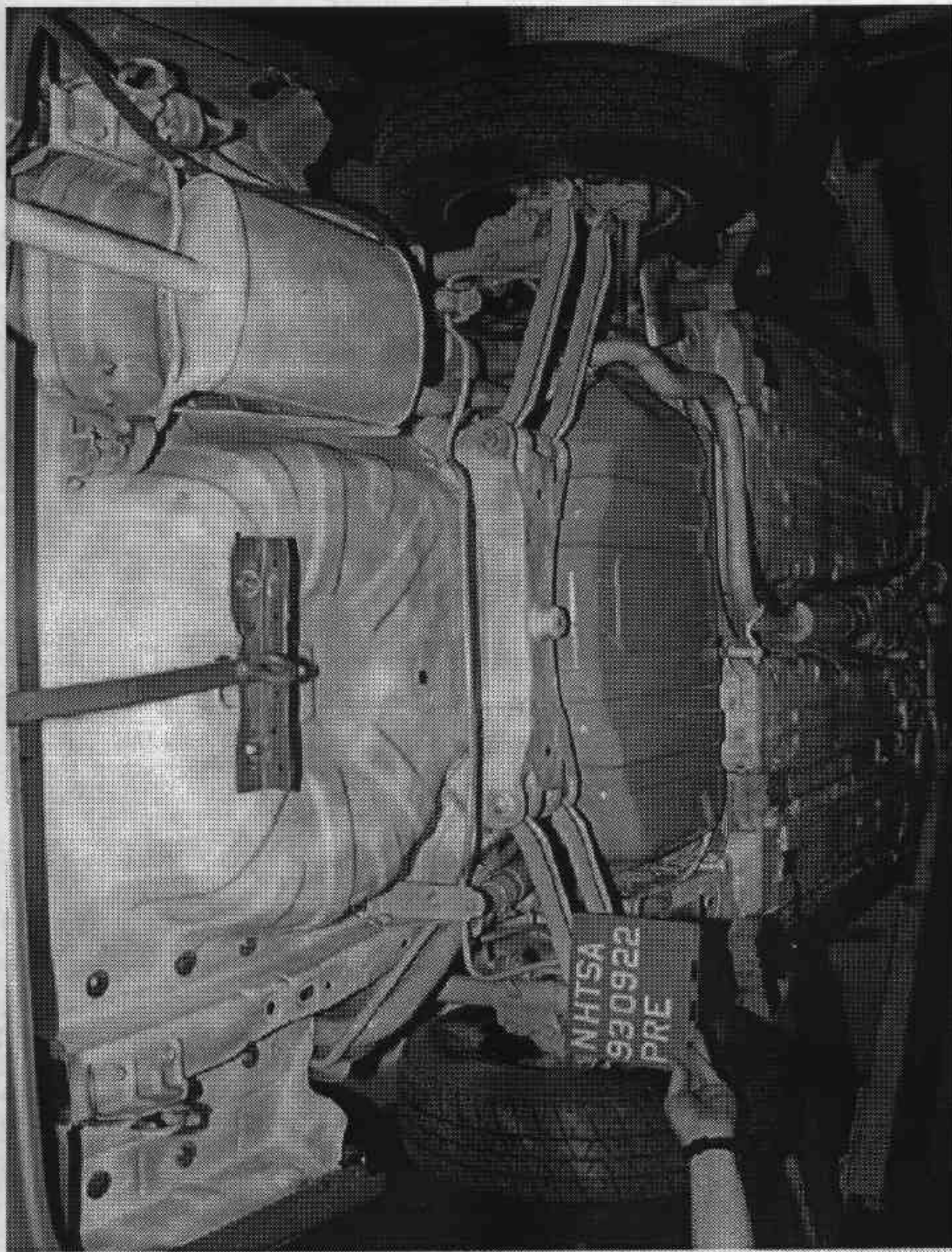


Figure A-23. PRE-TEST REAR UNDERBODY VIEW

A-24

930922

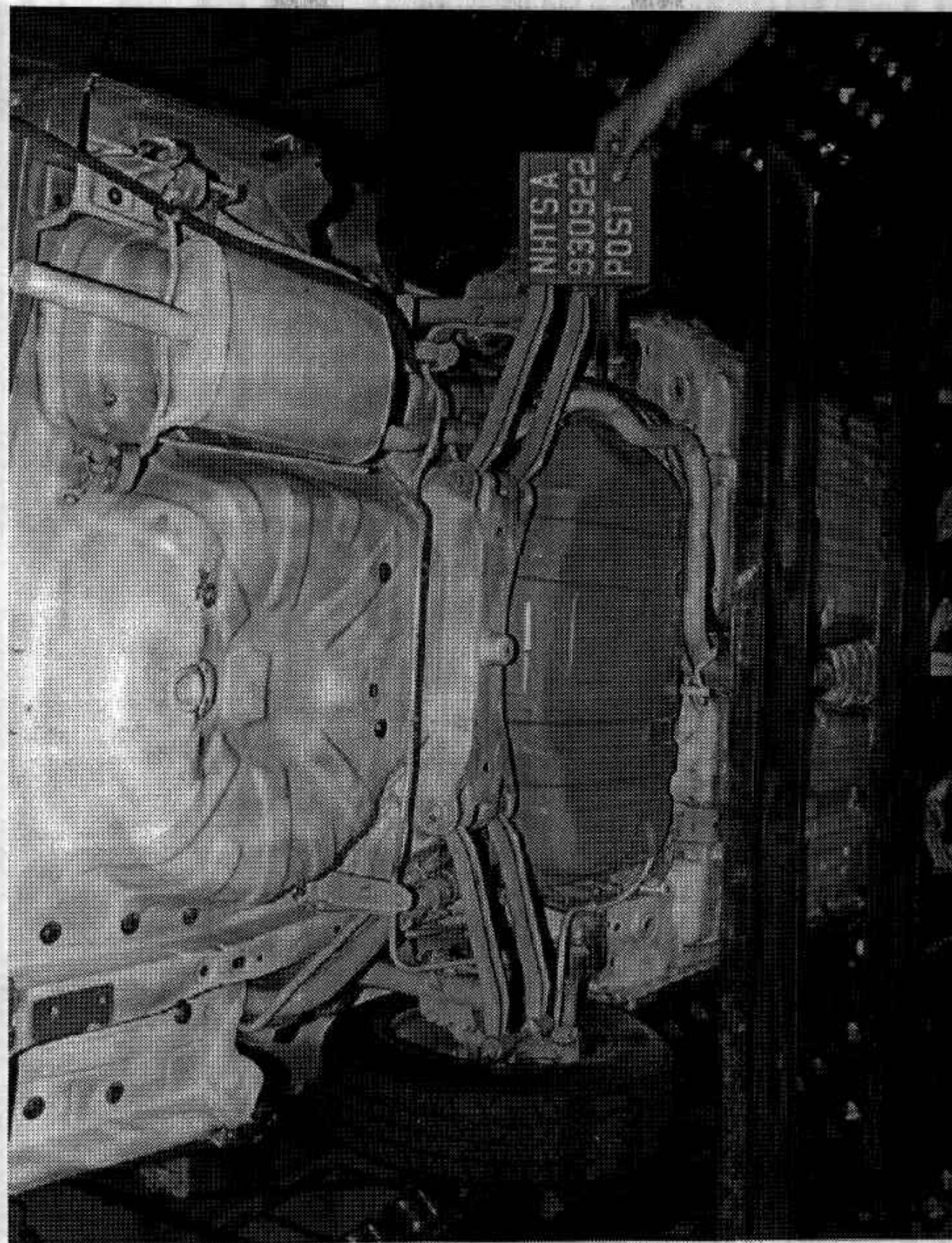


Figure A-24. POST-TEST REAR UNDERBODY VIEW
A-25

930922

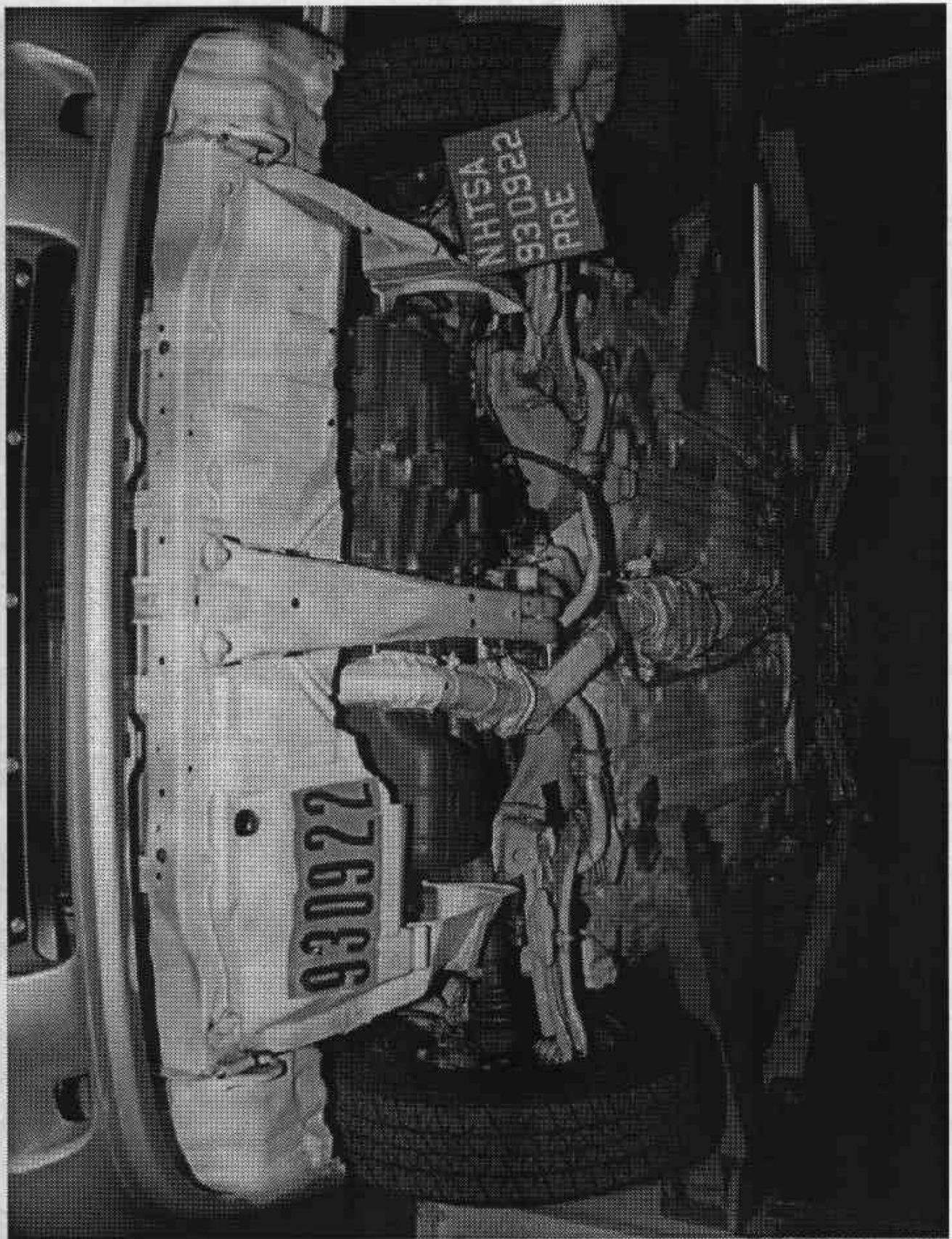


Figure A-21. PRE-TEST FRONT UNDERBODY VIEW

A-22

930922

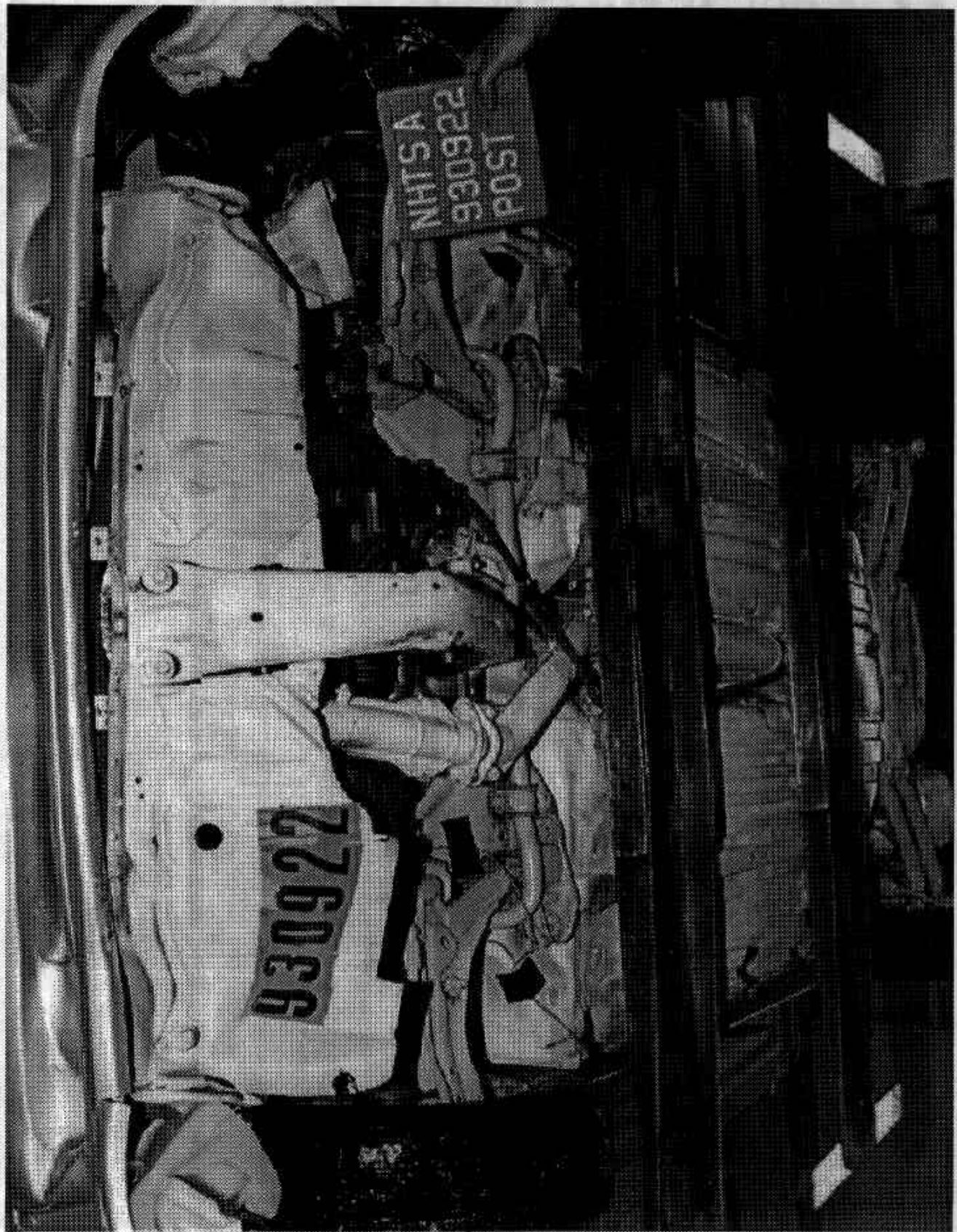


Figure A-22. POST-TEST FRONT UNDERBODY VIEW

A-23

930922



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

A-26

930922



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

A-27

930922



Figure A-27. PRE-TEST STEERING COLUMN AT FIRE WALL VIEW

A-28

930922



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

A-29

930922

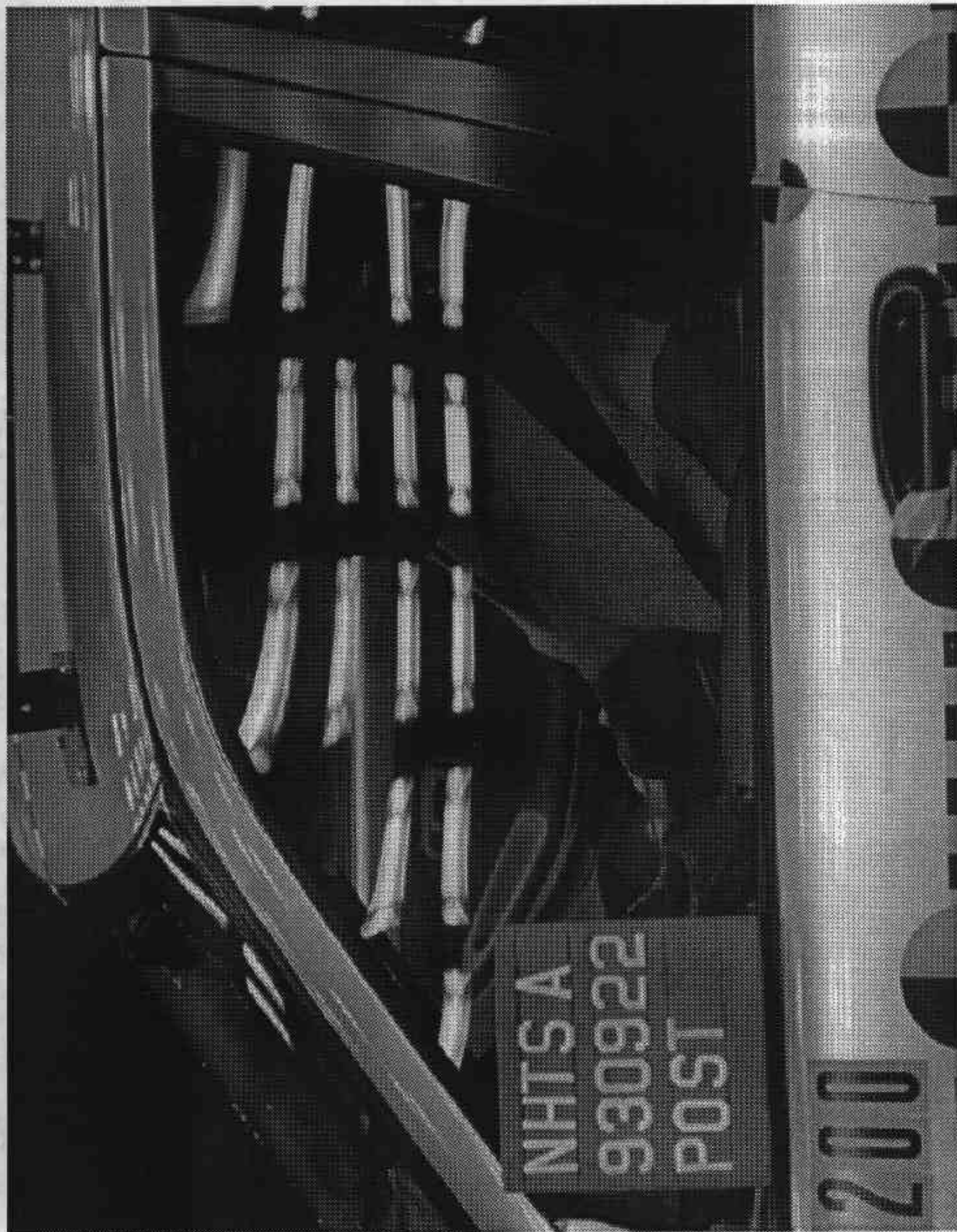


Figure A-29. POST-TEST DRIVER DUMMY POSITION - VIEW I

A-30

930922

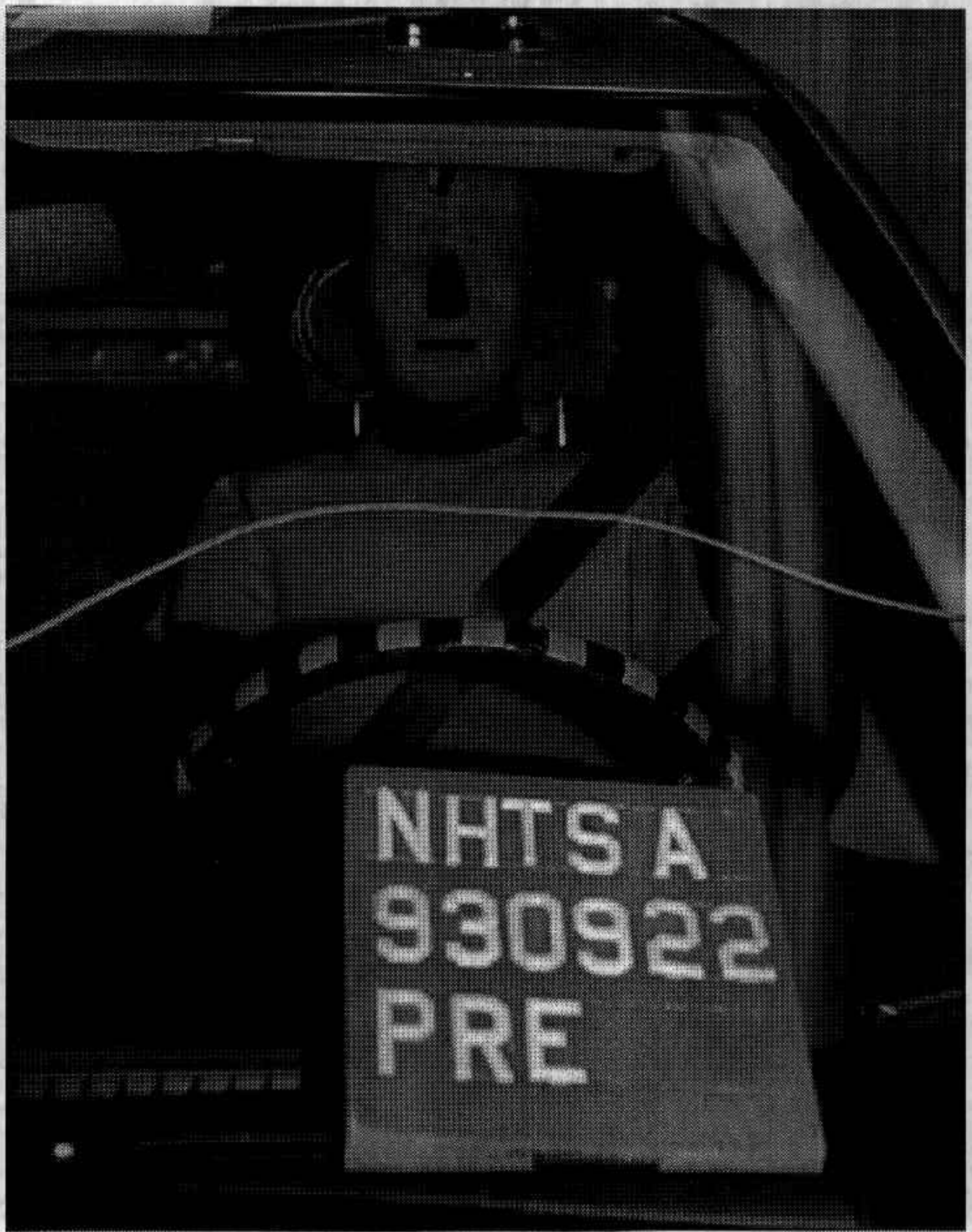


Figure A-30. PRE-TEST DRIVER DUMMY POSITION - VIEW 2

A-31

930922

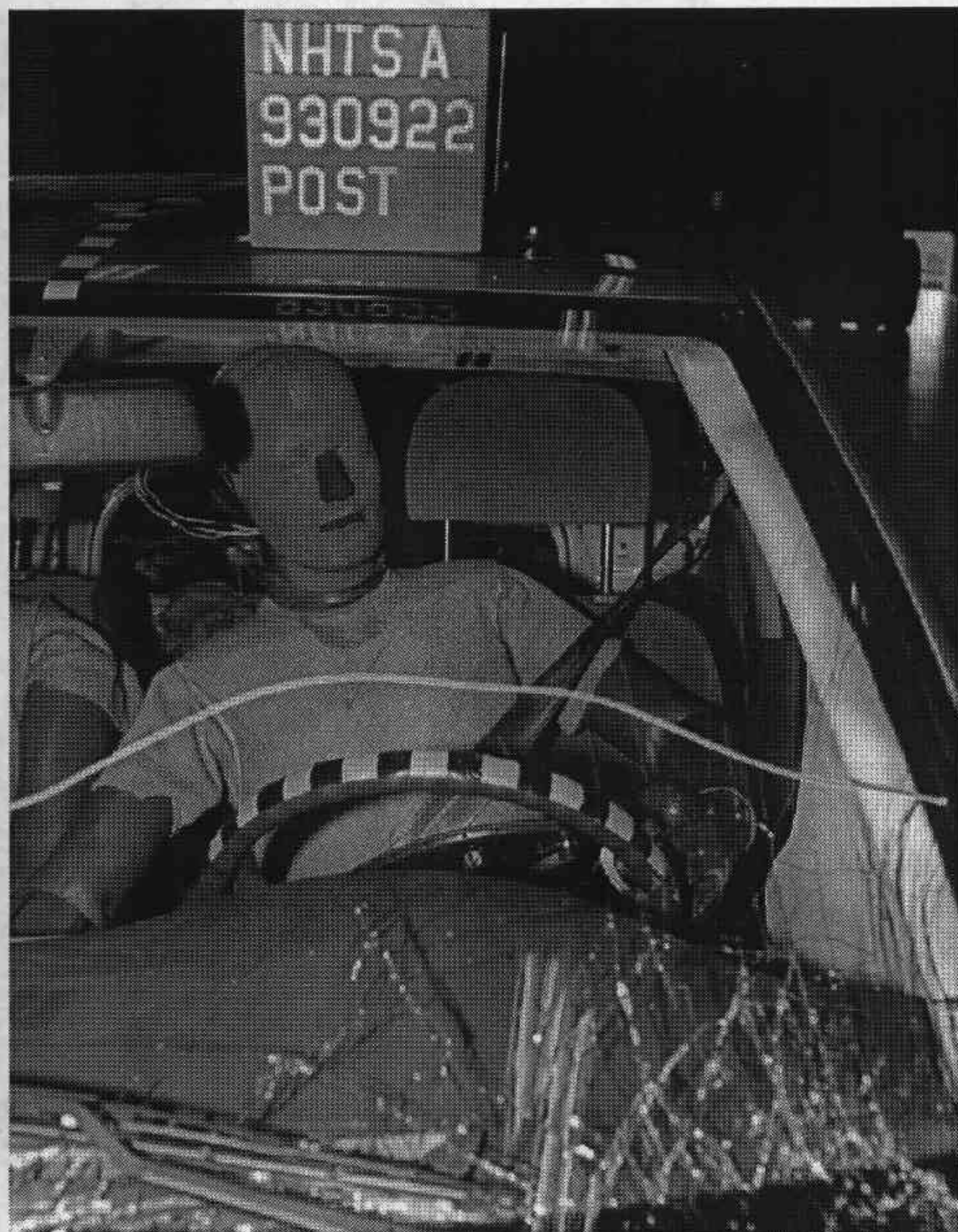


Figure A-31. POST-TEST DRIVER DUMMY POSITION - VIEW 2

A-32

930922



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

A-33

930922



Figure A-33. POST-TEST PASSENGER DUMMY POSITION - VIEW 1

A-34

930922

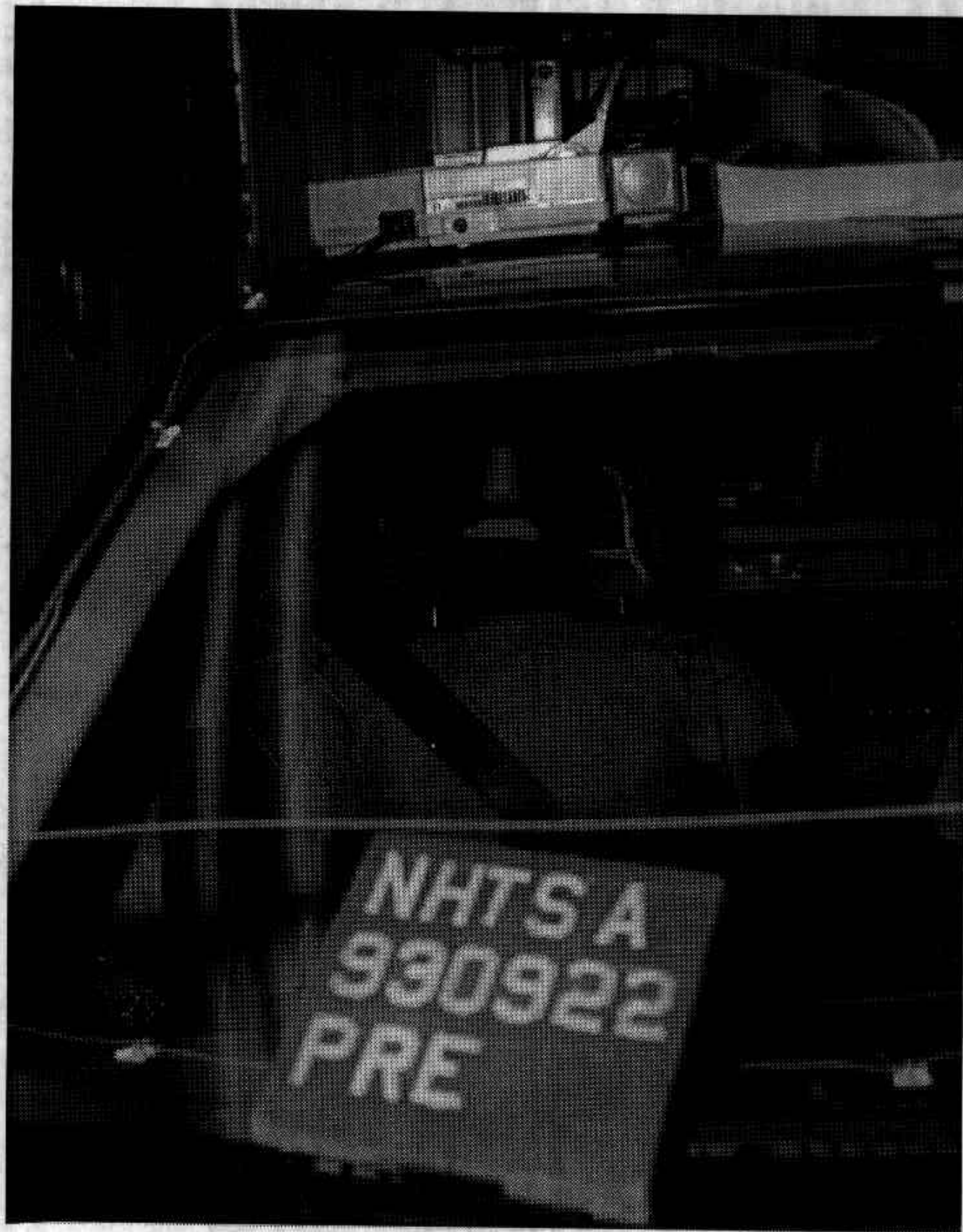


Figure A-34. PRE-TEST PASSENGER DUMMY POSITION - VIEW 2

A-35

930922

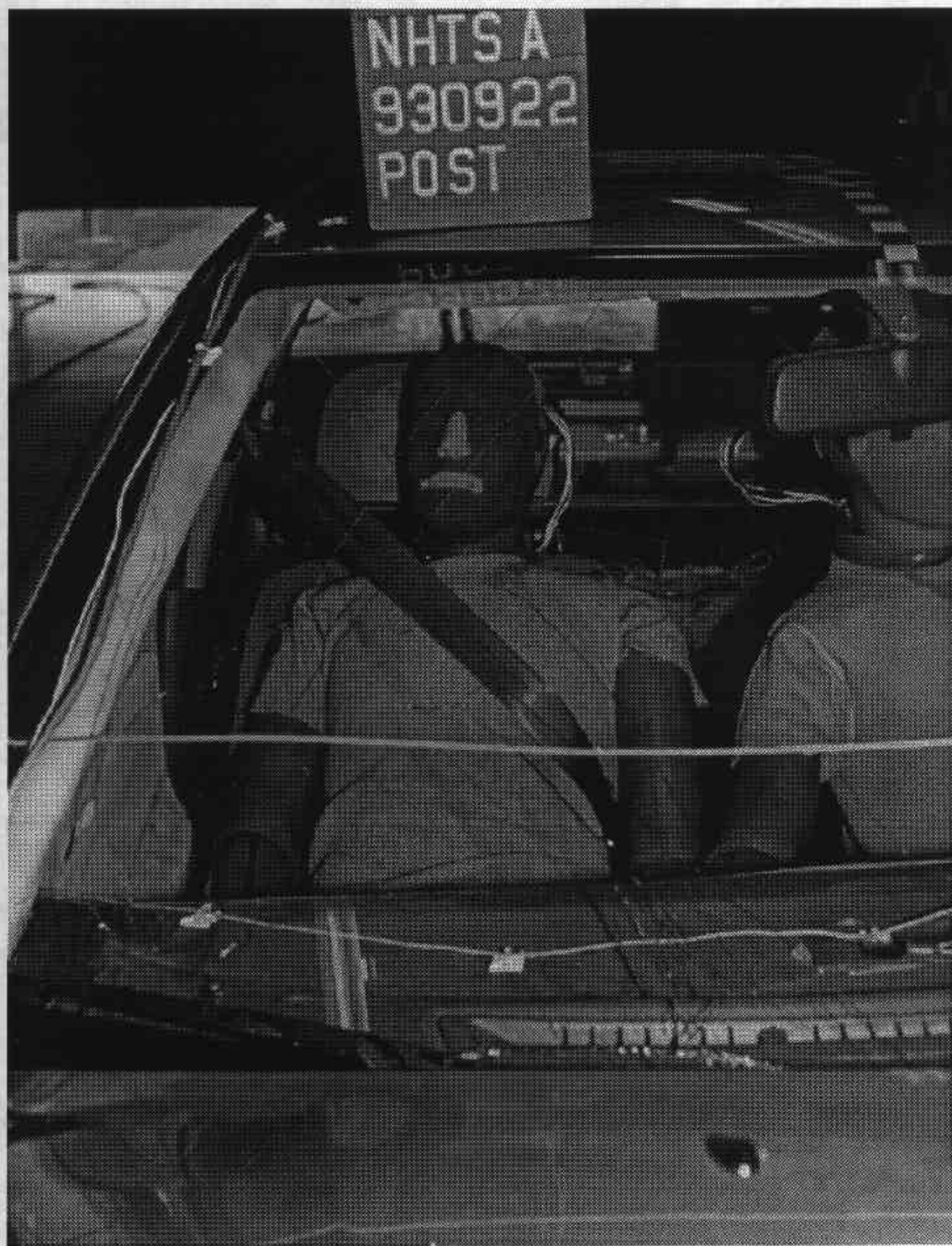


Figure A-35. POST-TEST PASSENGER DUMMY POSITION - VIEW 2

A-36

930922

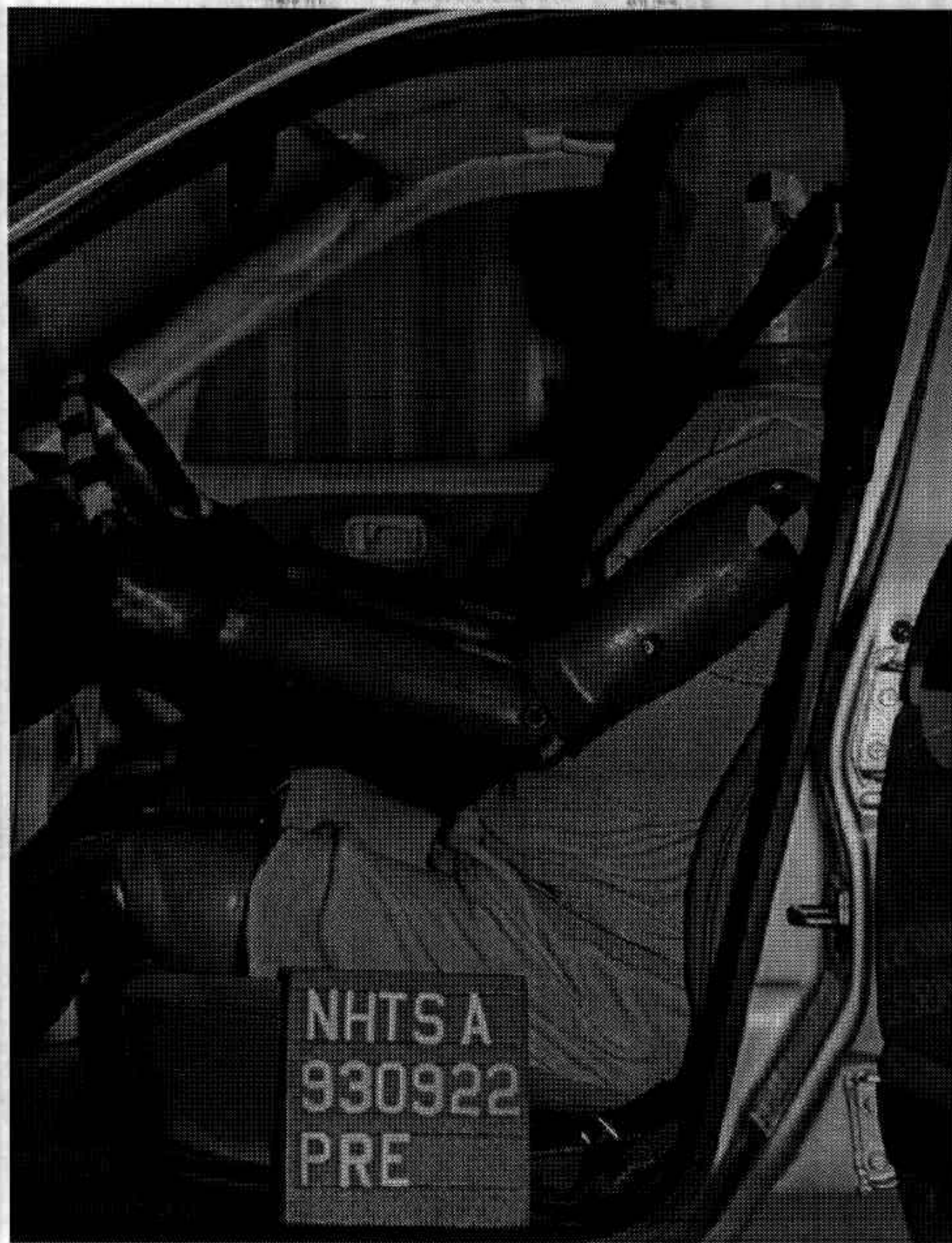


Figure A-36. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1
A-37 930922

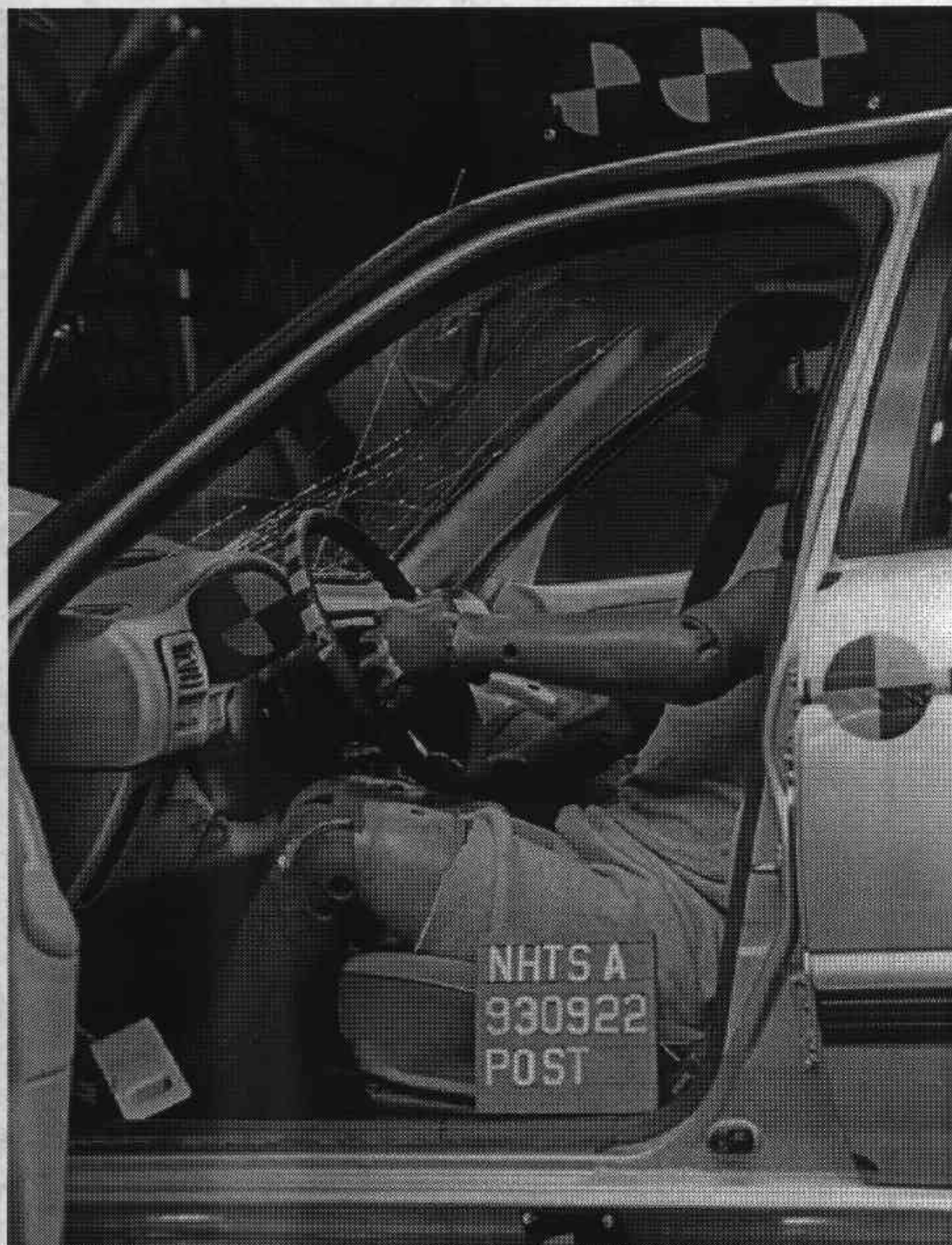


Figure A-37. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

A-38

930922

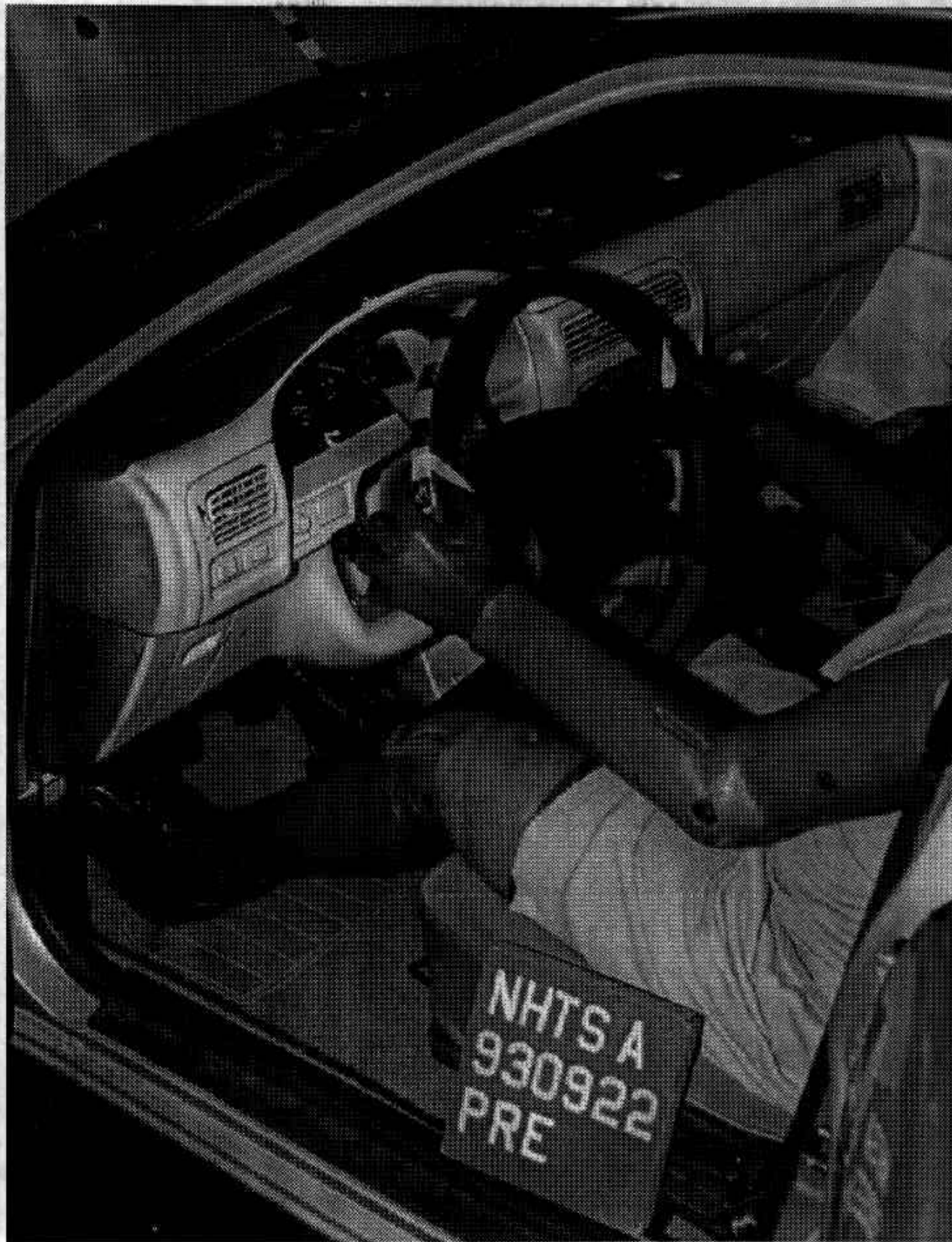


Figure A-38. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2
A-39 930922

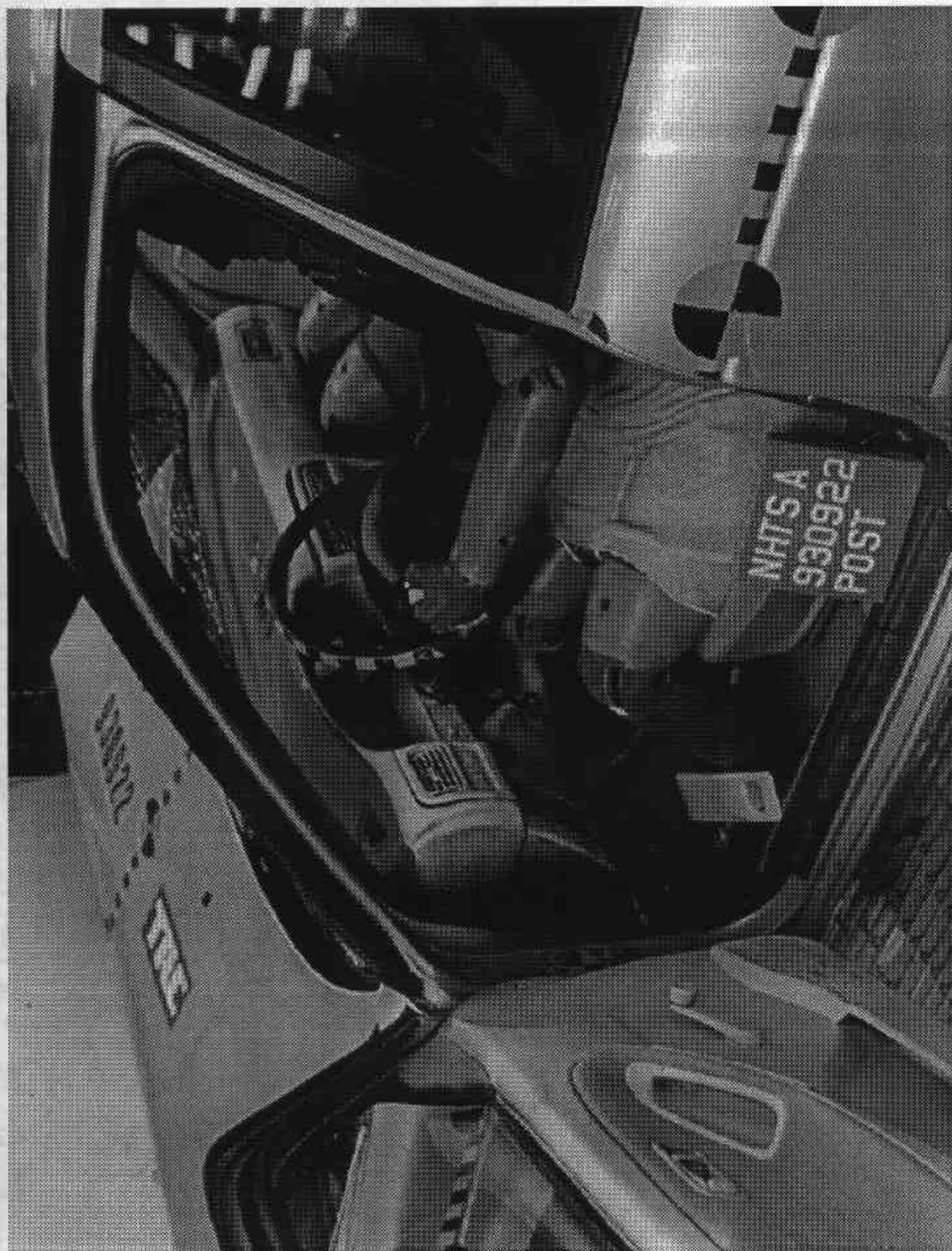


Figure A-39. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

A-40

930922

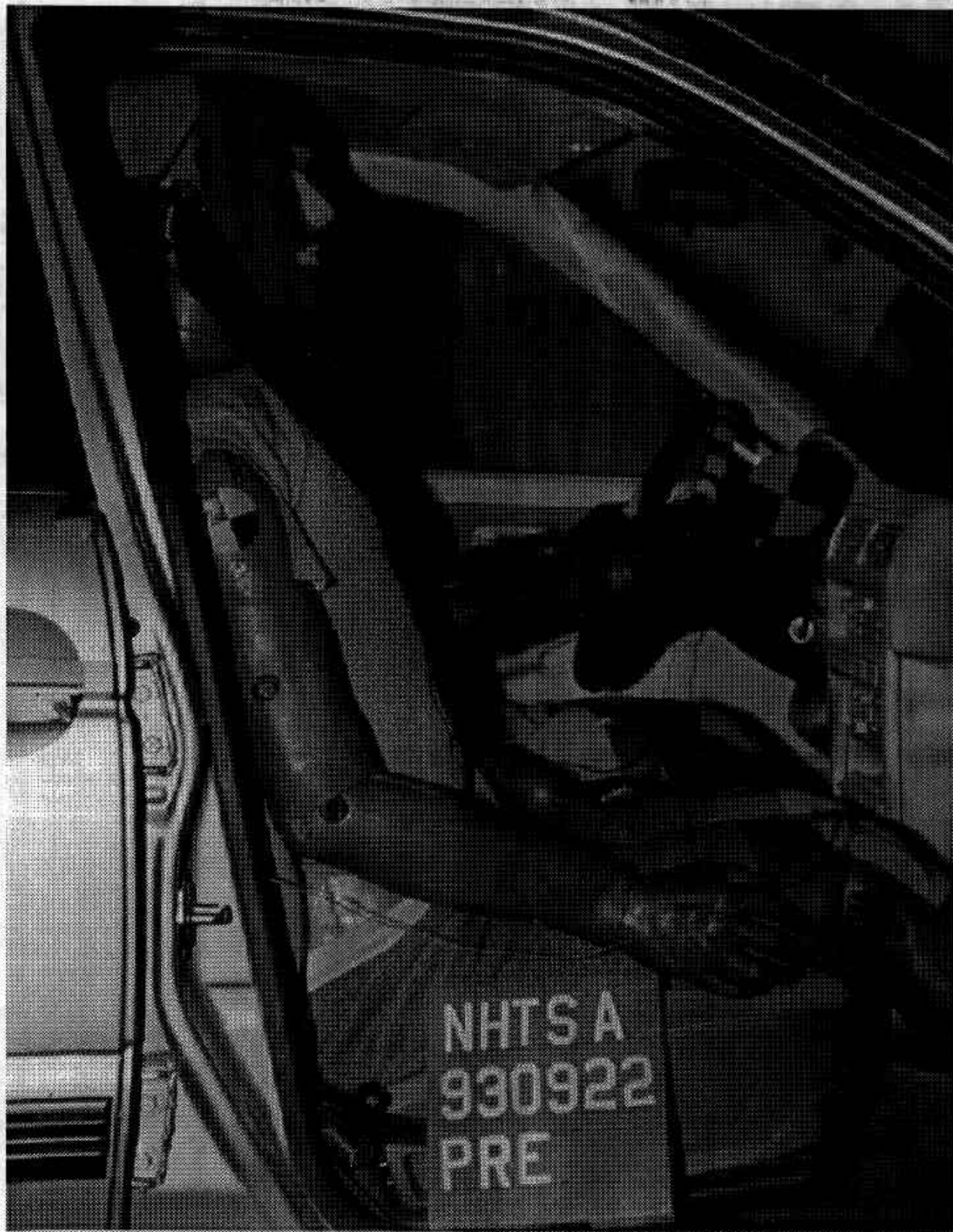


Figure A-40. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
A-41 930922



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

A-42

930922

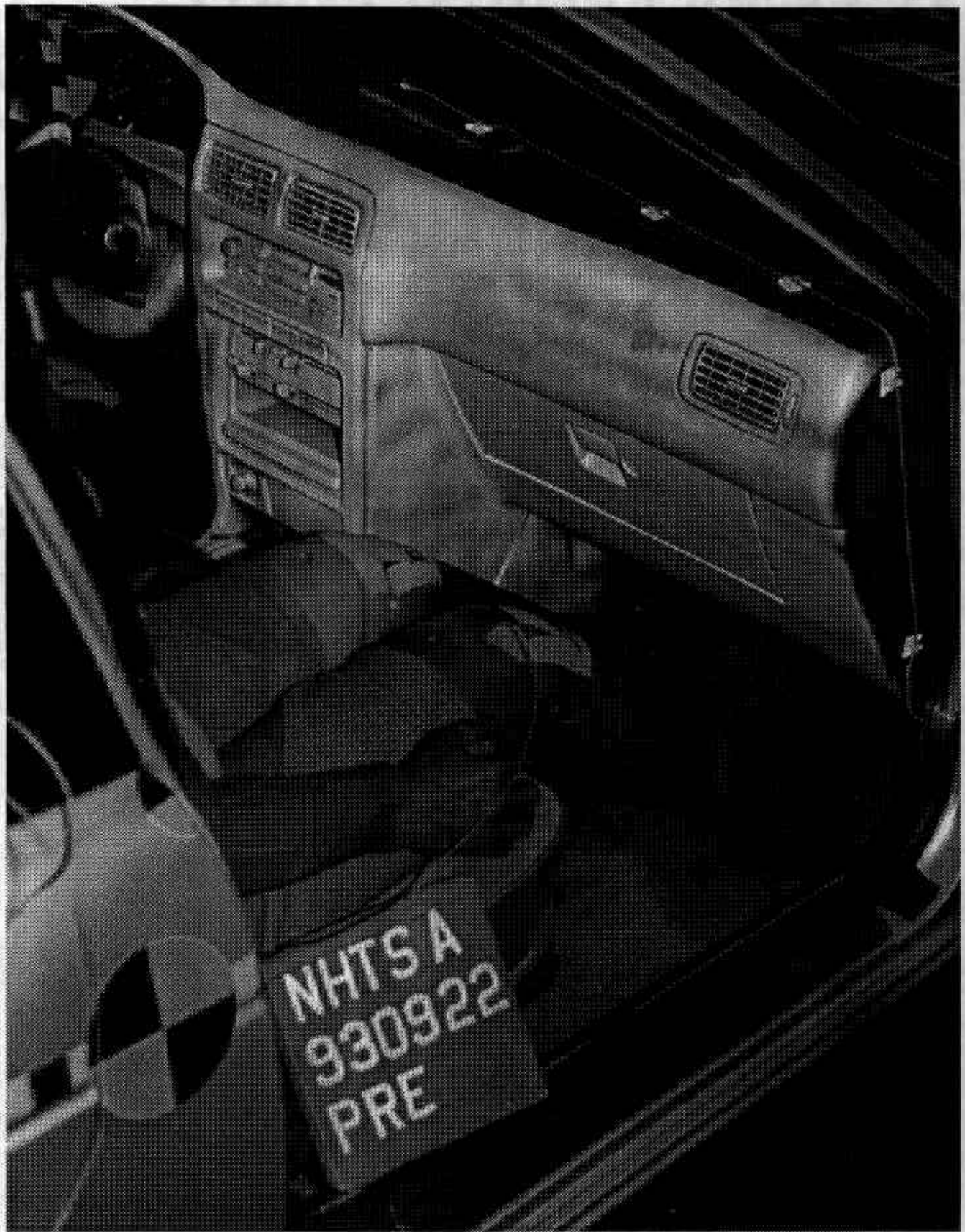


Figure A-42. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2
A-43 930922



Figure A-43. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2
A-44 930922

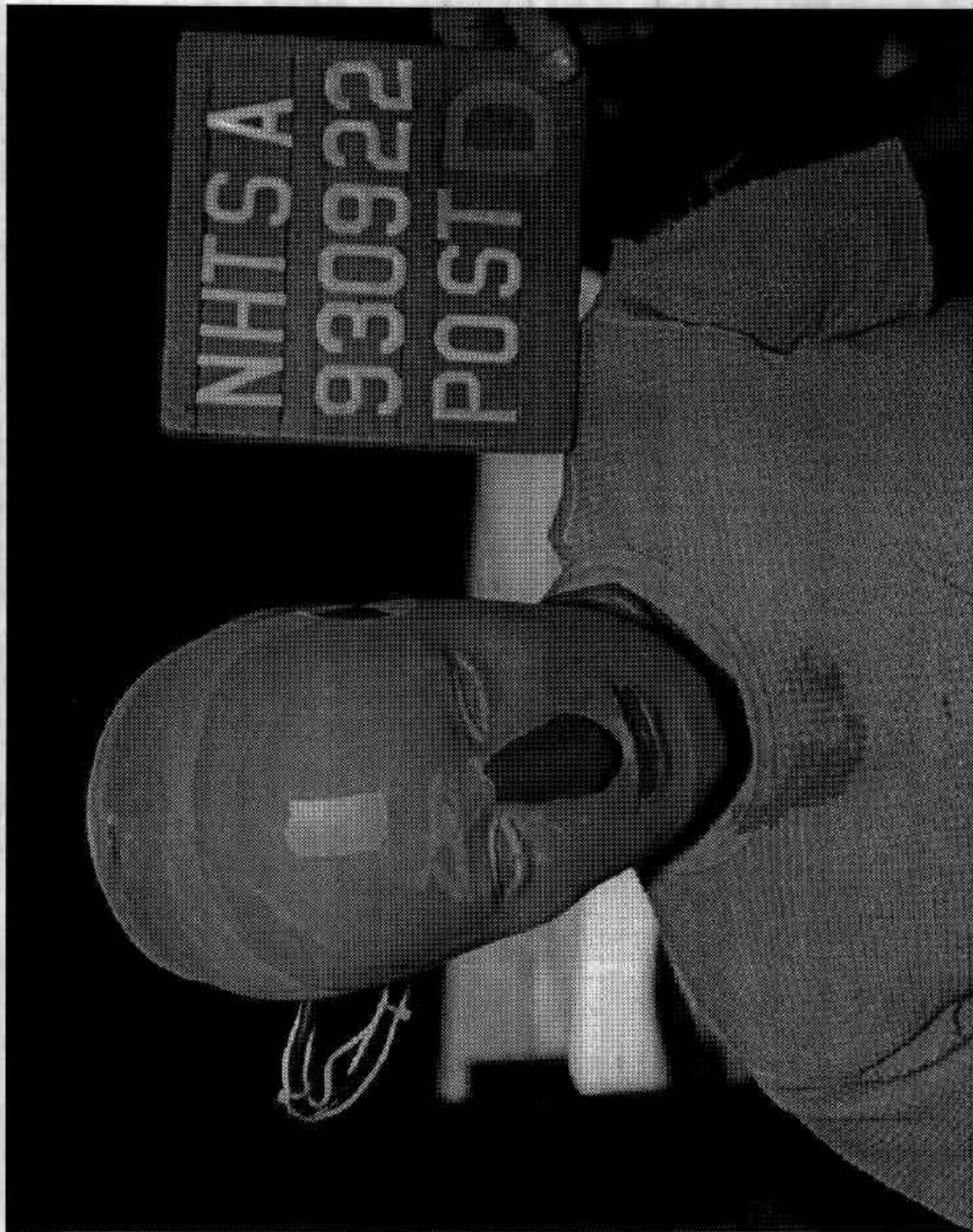


Figure A-44. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 1

A-45

930922

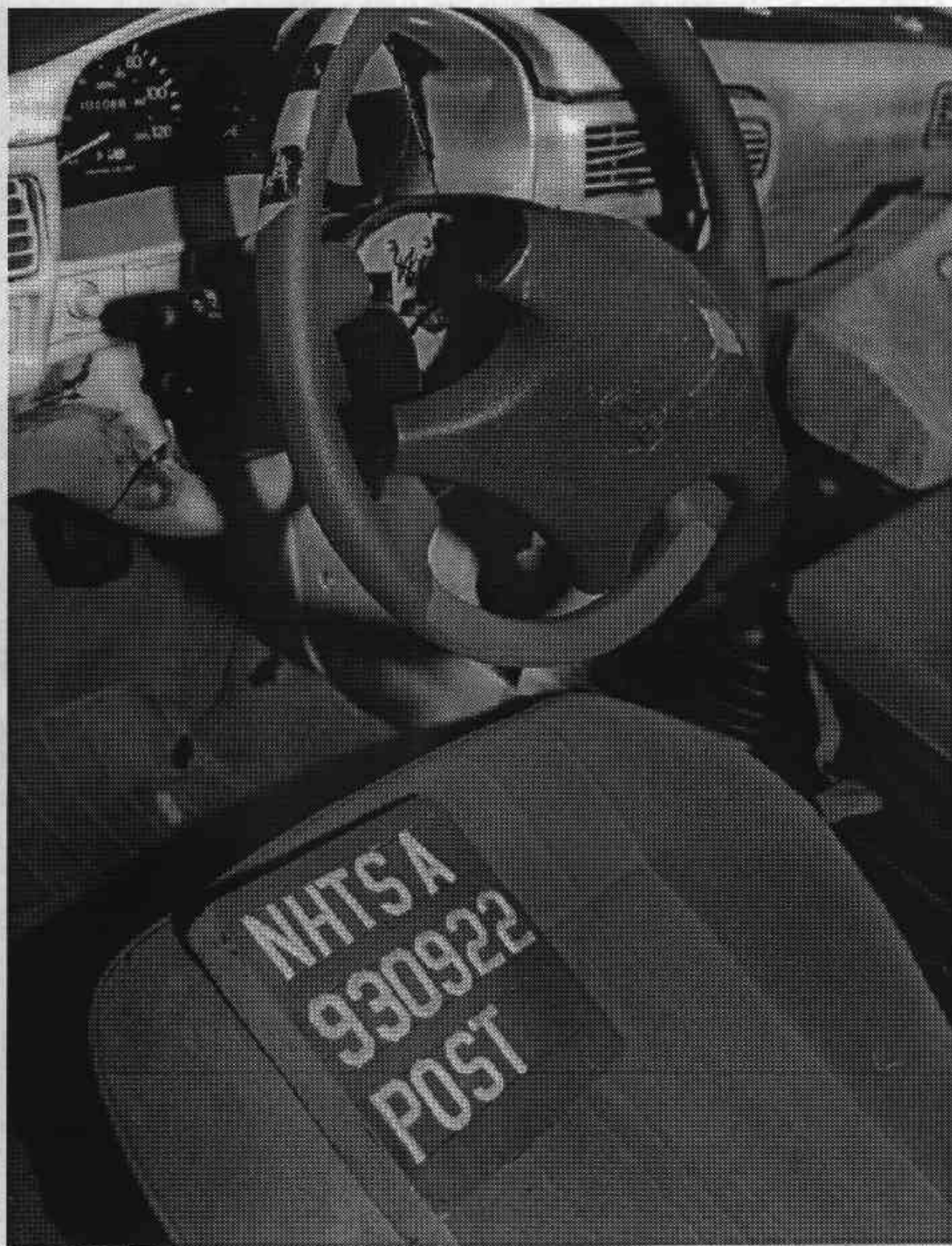


Figure A-45. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 2

A-46

930922

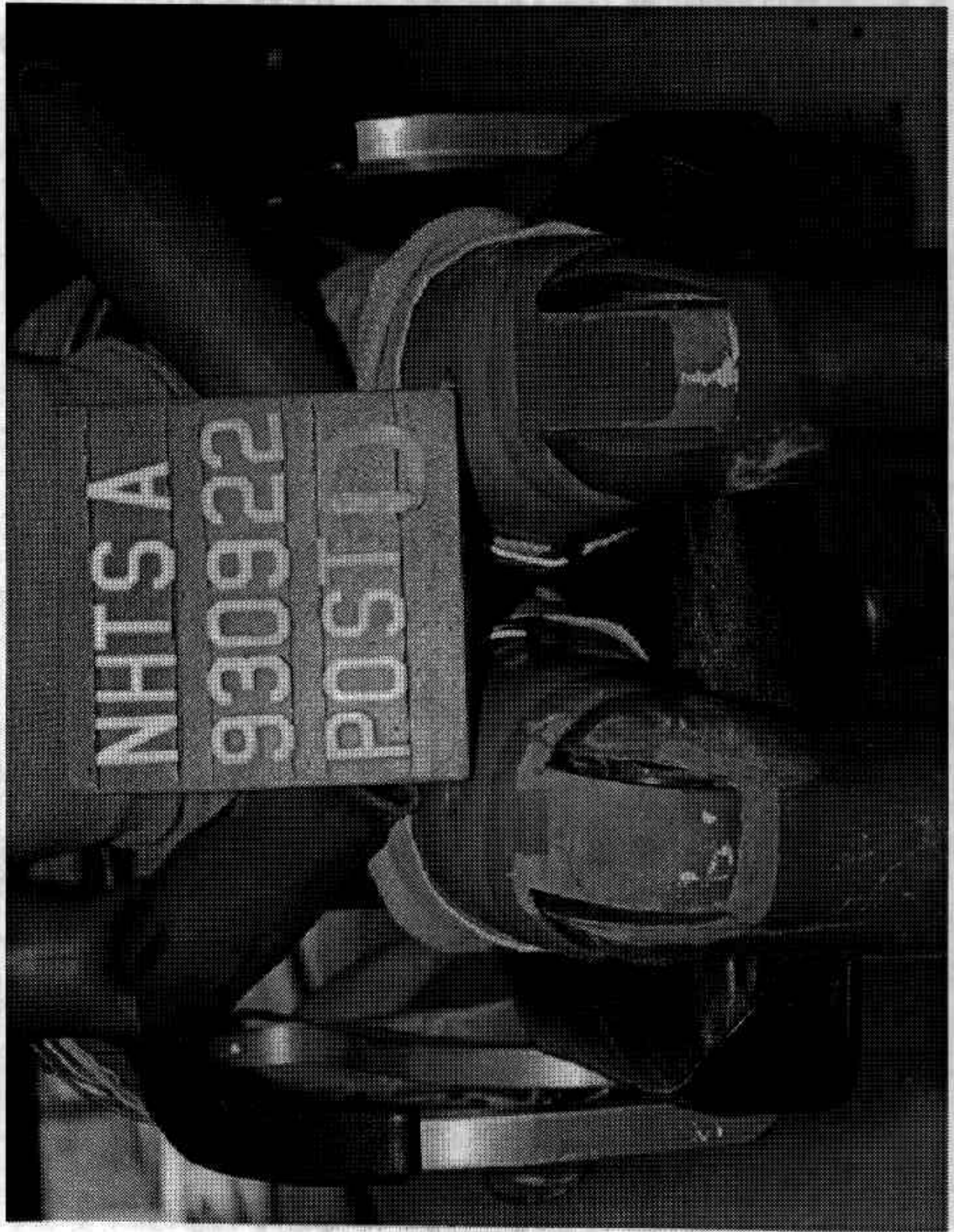


Figure A-46. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1

A-47

930922

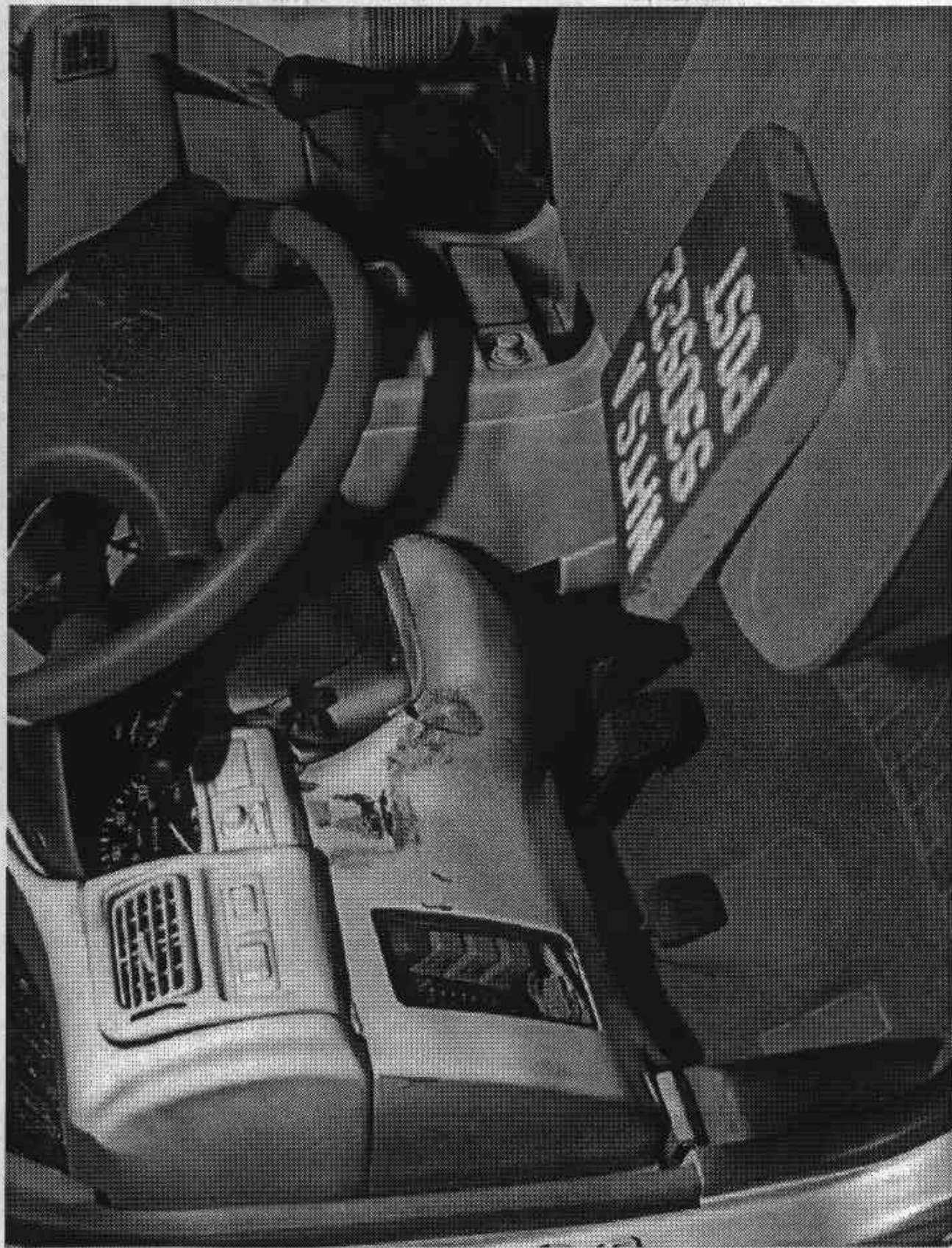


Figure A-47. POST-TEST DRIVER DUMMY KNEE CONTACT- VIEW 2

A-48

930922

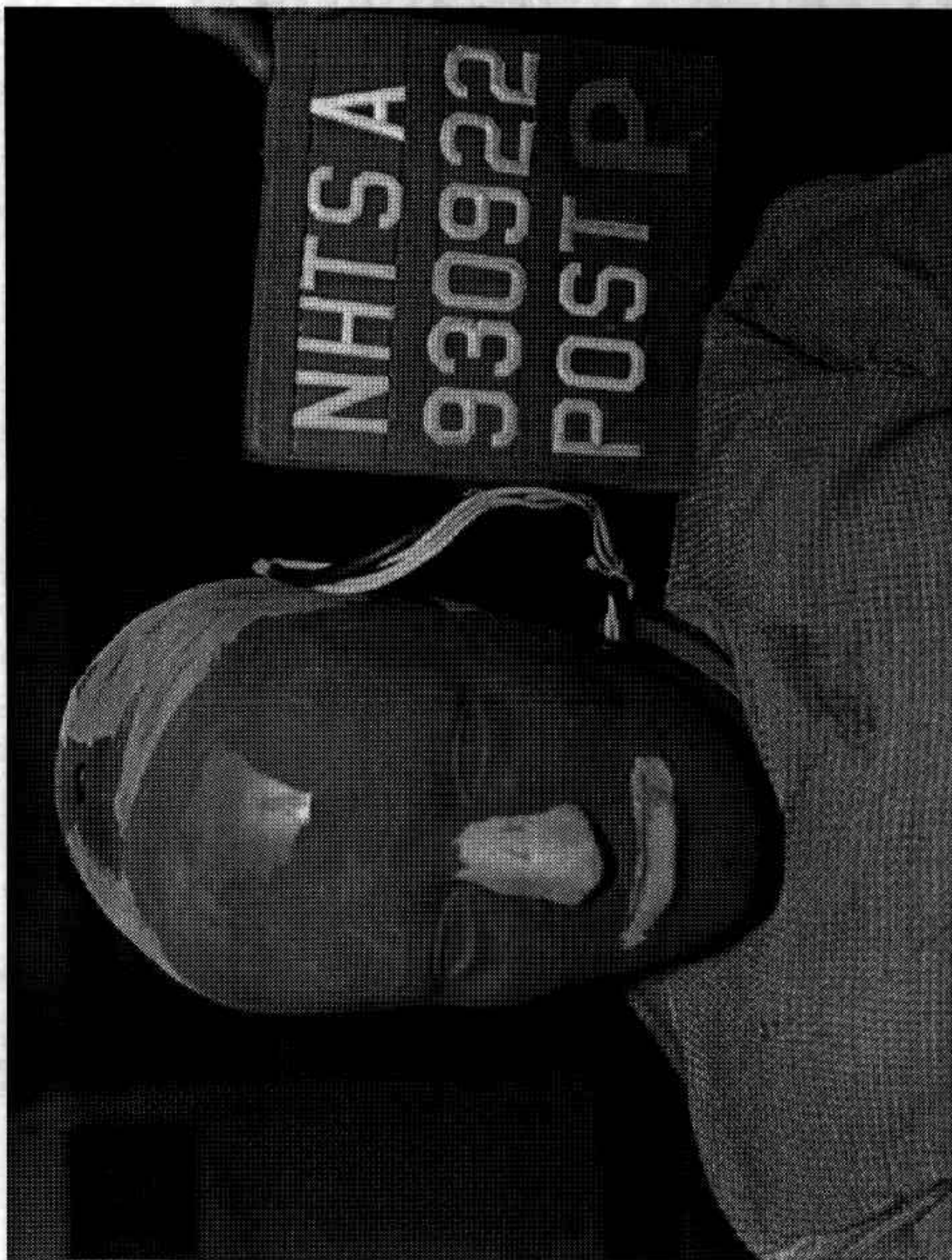


Figure A-48. POST-TEST PASSENGER DUMMY HEAD CONTACT - VIEW 1

A-49

930922

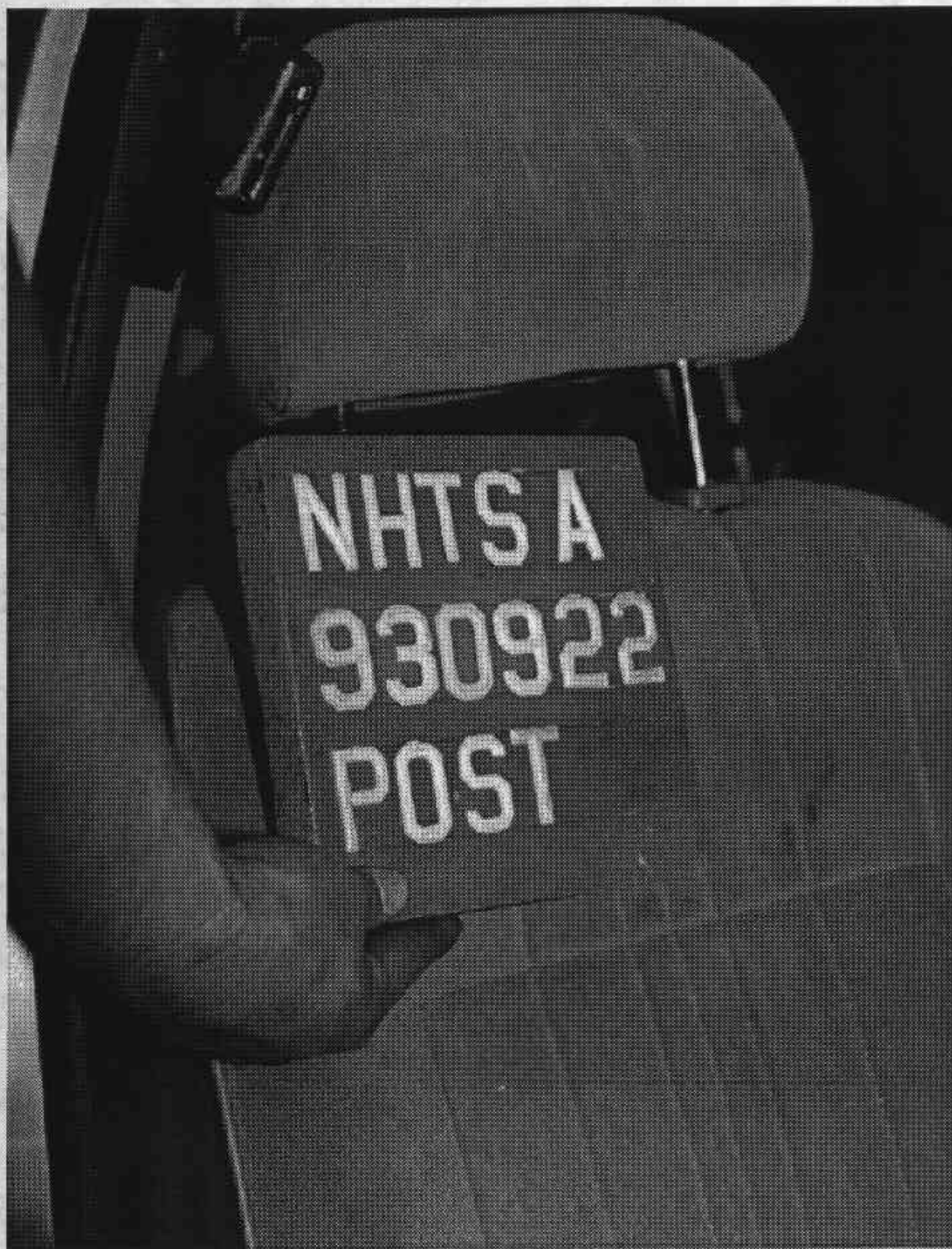


Figure A-49. POST-TEST PASSENGER DUMMY HEAD CONTACT - VIEW 2

A-50

930922

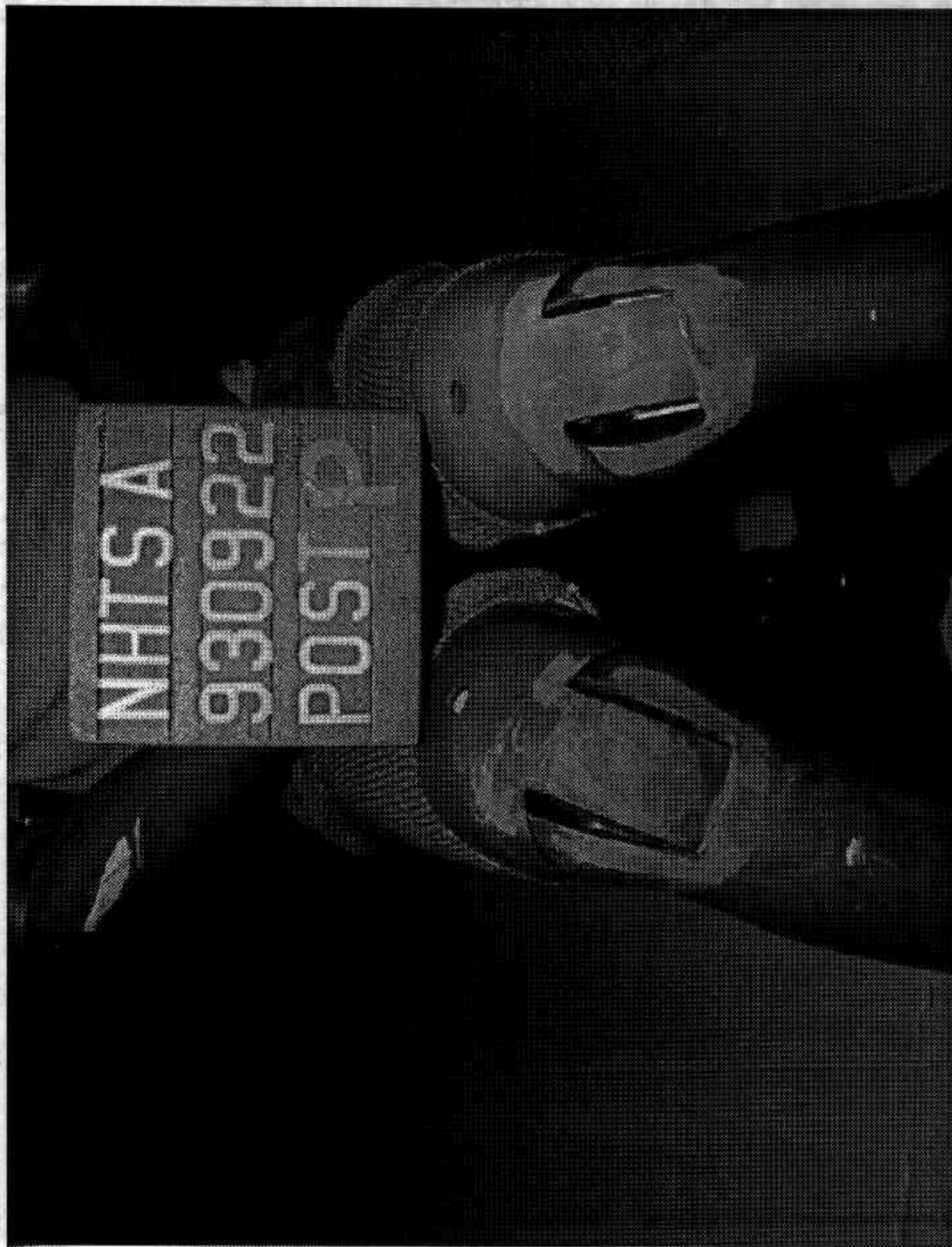


Figure A-50. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1
A-51 930922



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

A-52

930922

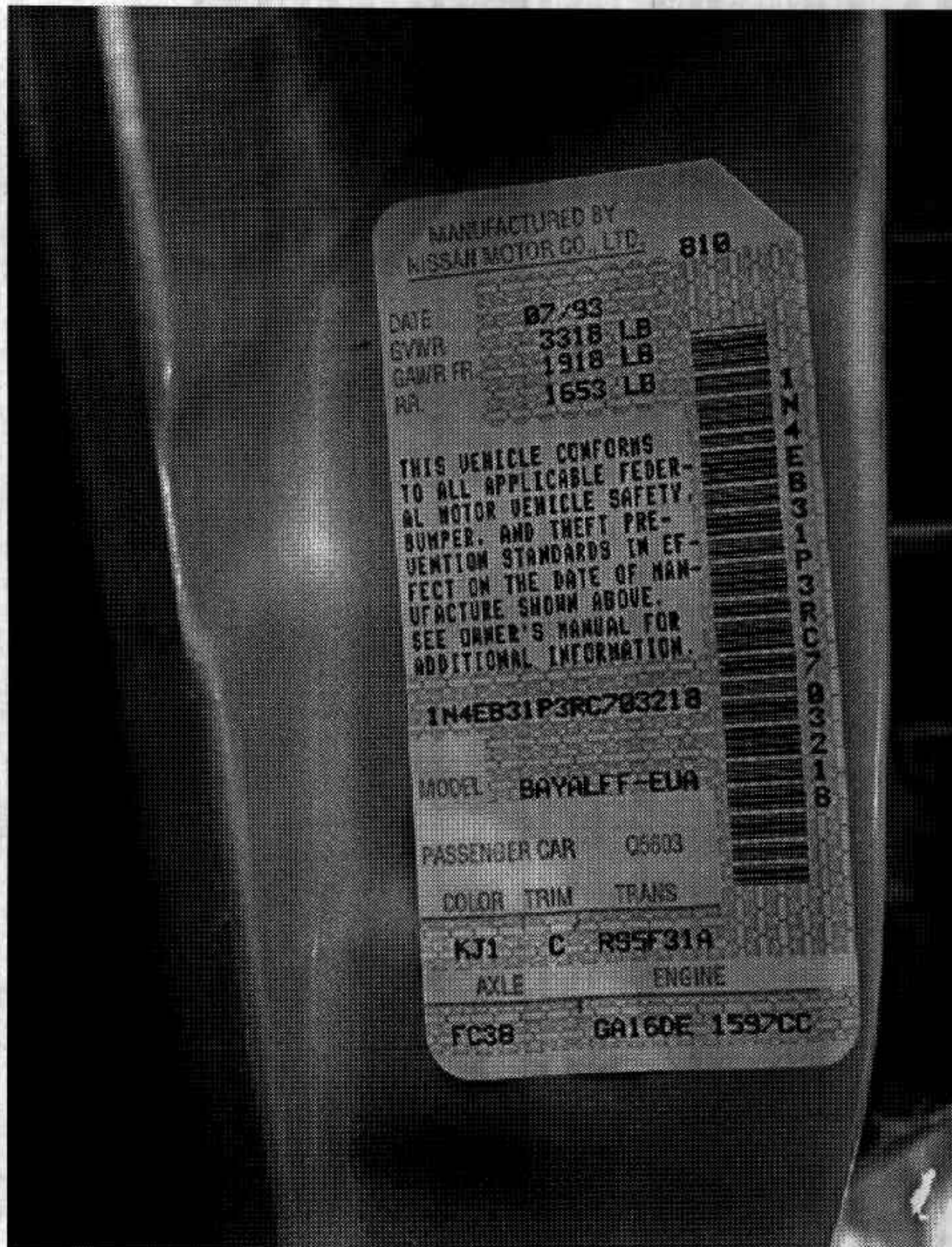


Figure A-52. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW

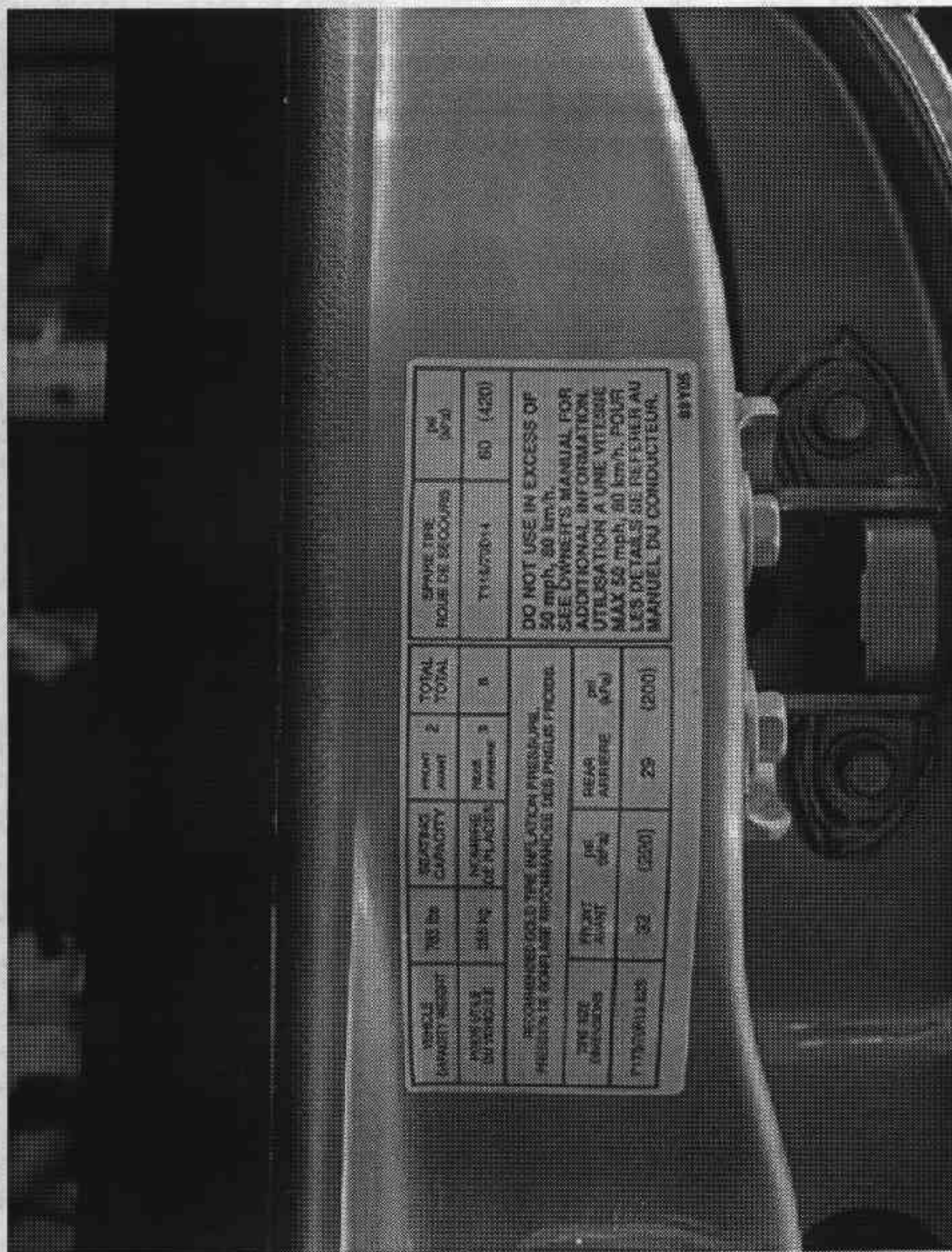


Figure A-53. PRE-TEST RECOMMENDED TIRE PRESSURE LABEL VIEW

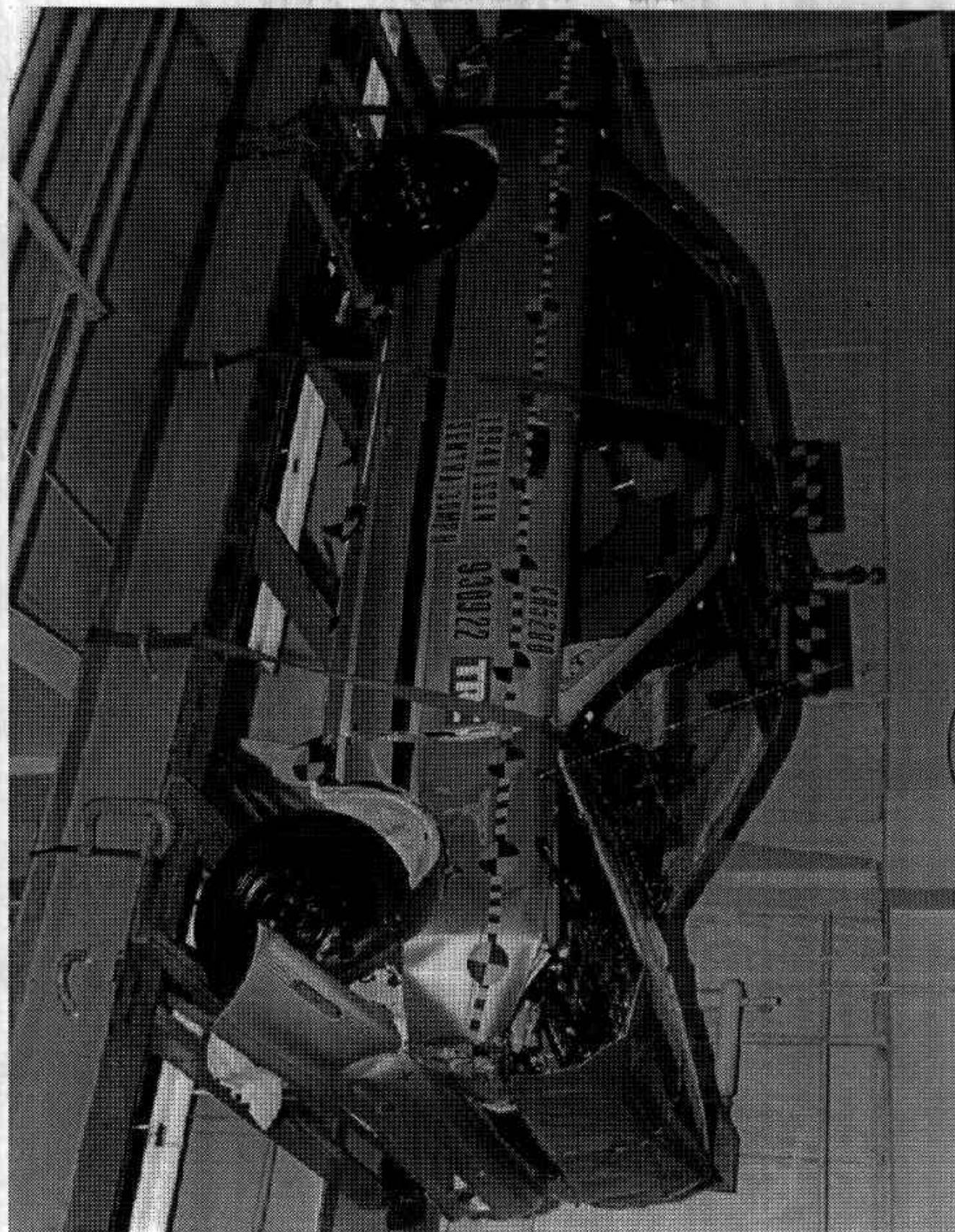


Figure A-54. POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW

A-55

930922

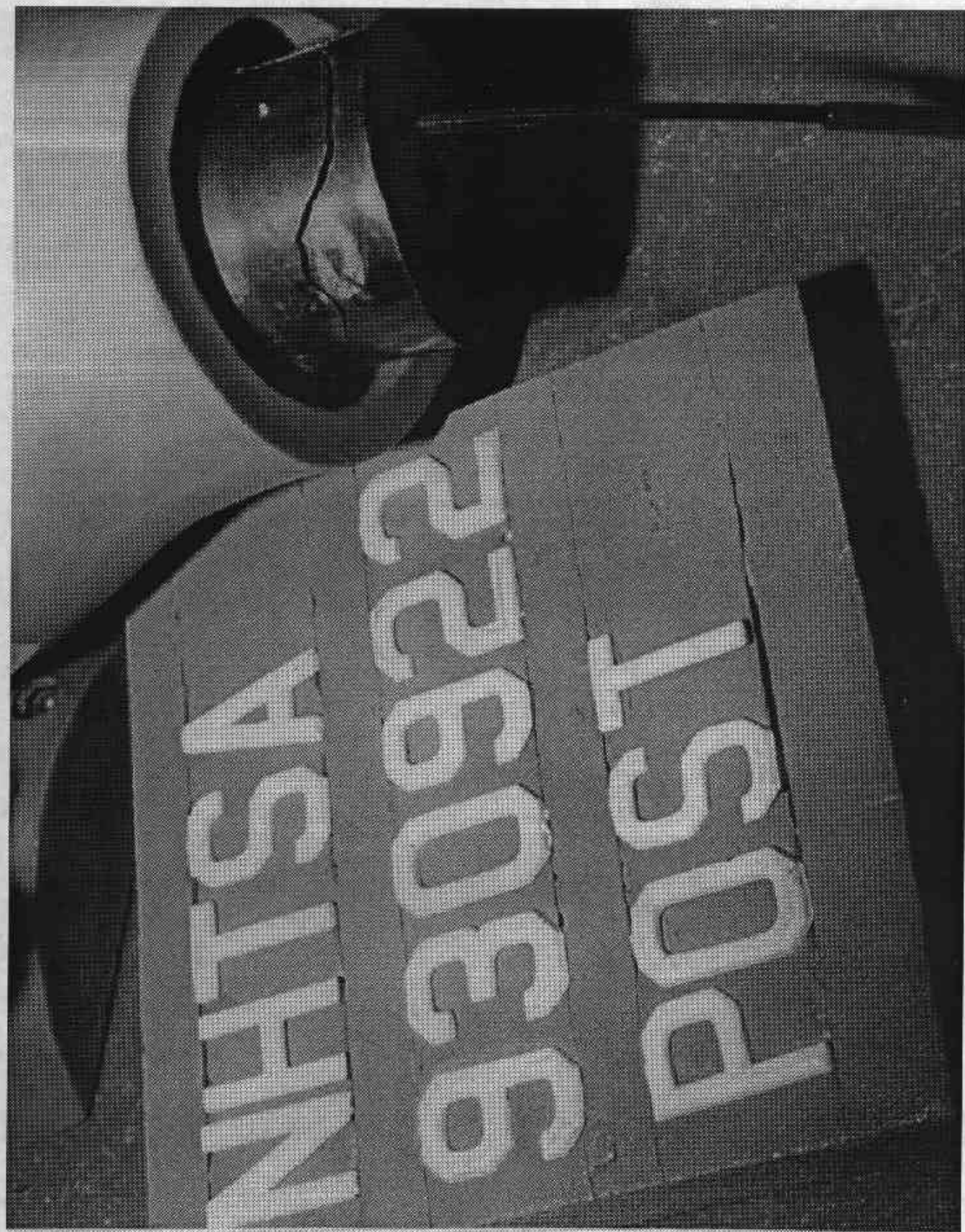


Figure A-55. POST-TEST DRIVER DUMMY NECK DAMAGE - VIEW 1

A-56

930922

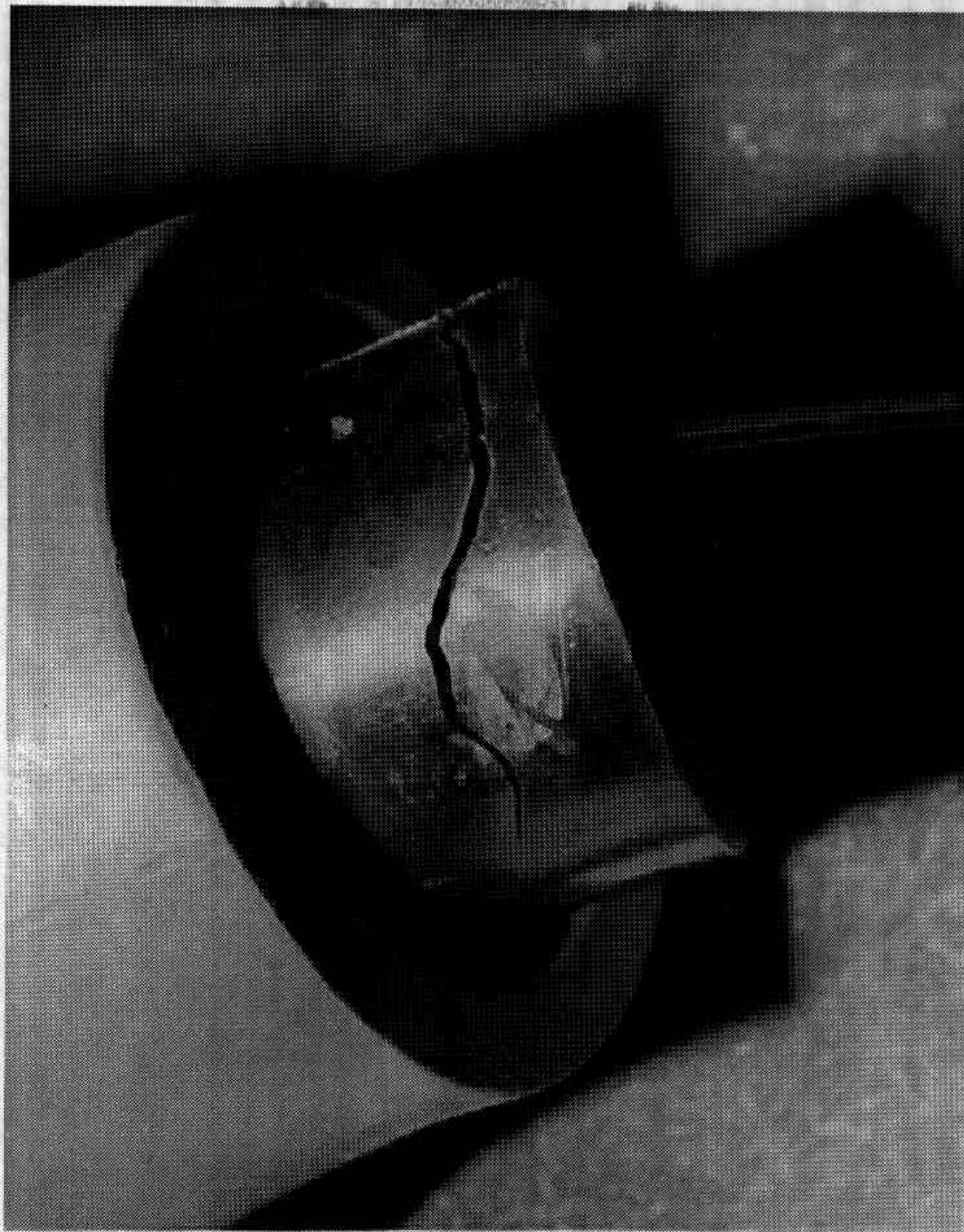


Figure A-56. POST-TEST DRIVER DUMMY NECK DAMAGE - VIEW 2

A-57

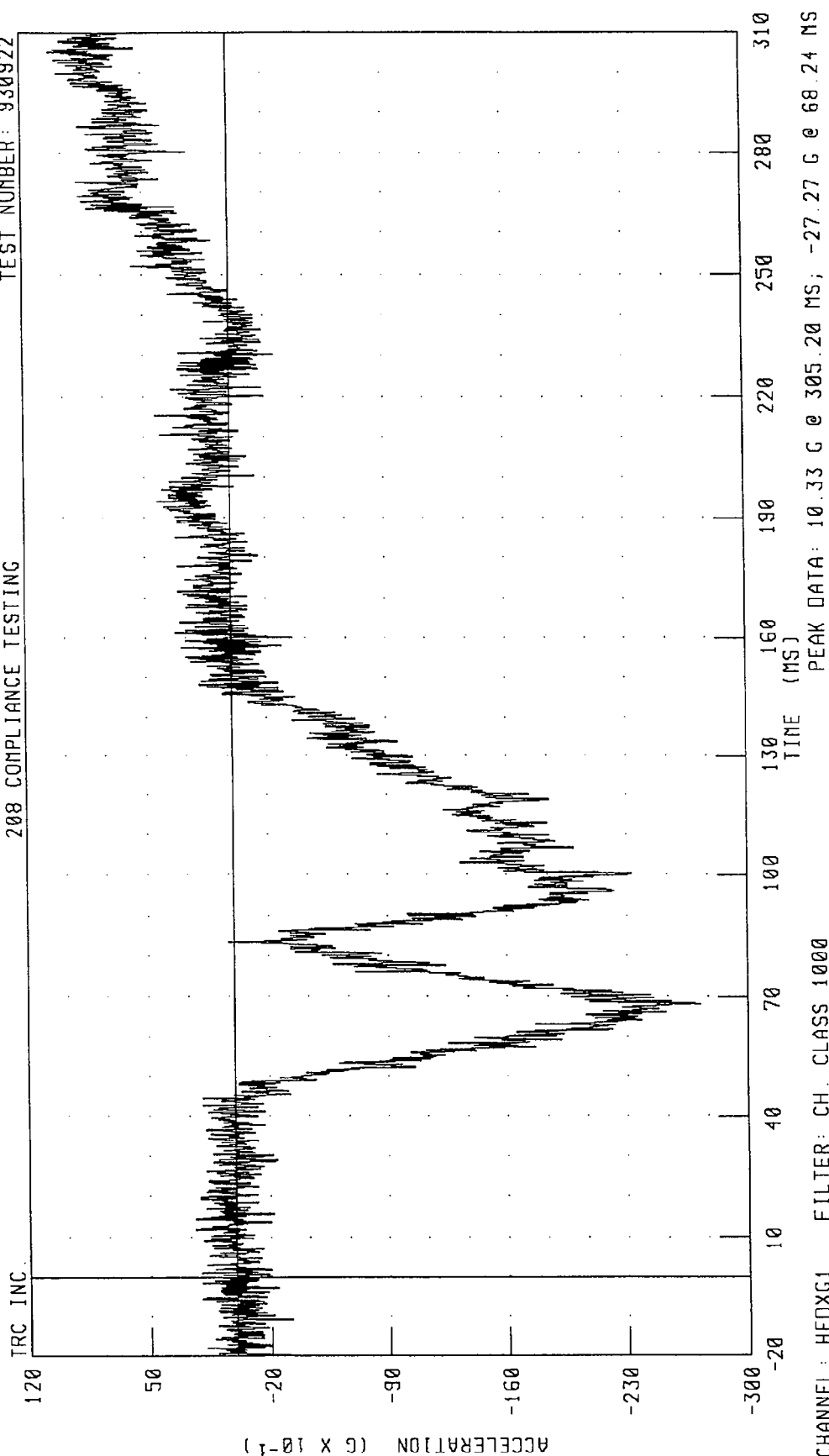
930922

APPENDIX B

DATA PLOTS

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

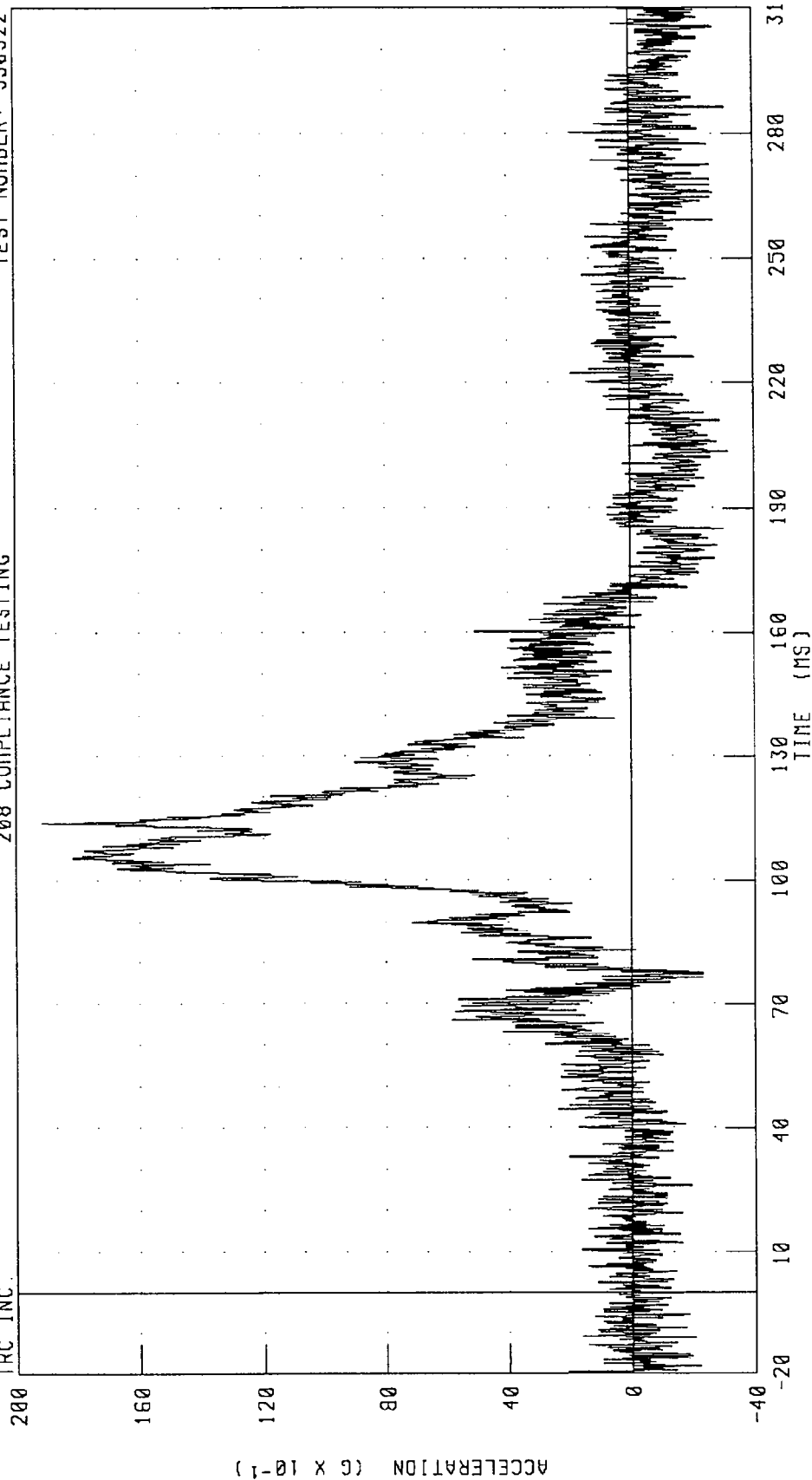
TEST NUMBER: 930922



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

TEST NUMBER: 930922

TRC INC.

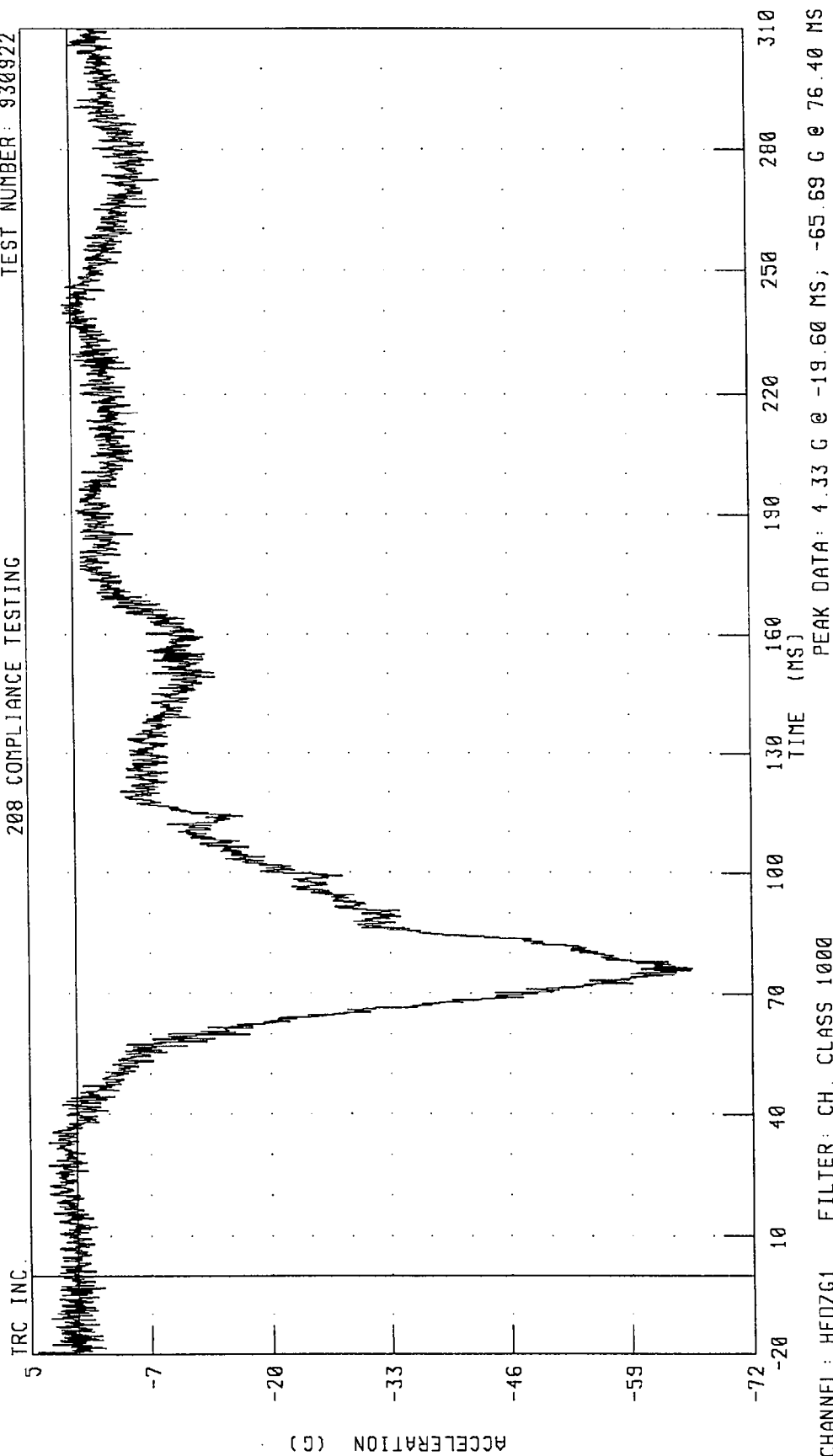


PEAK DATA: 19.15 G @ 113.84 MS, -3.19 G @ 203.52 MS

CHANNEL: HEDYG1 FILTER: CH. CLASS 1000

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

TEST NUMBER: 930922

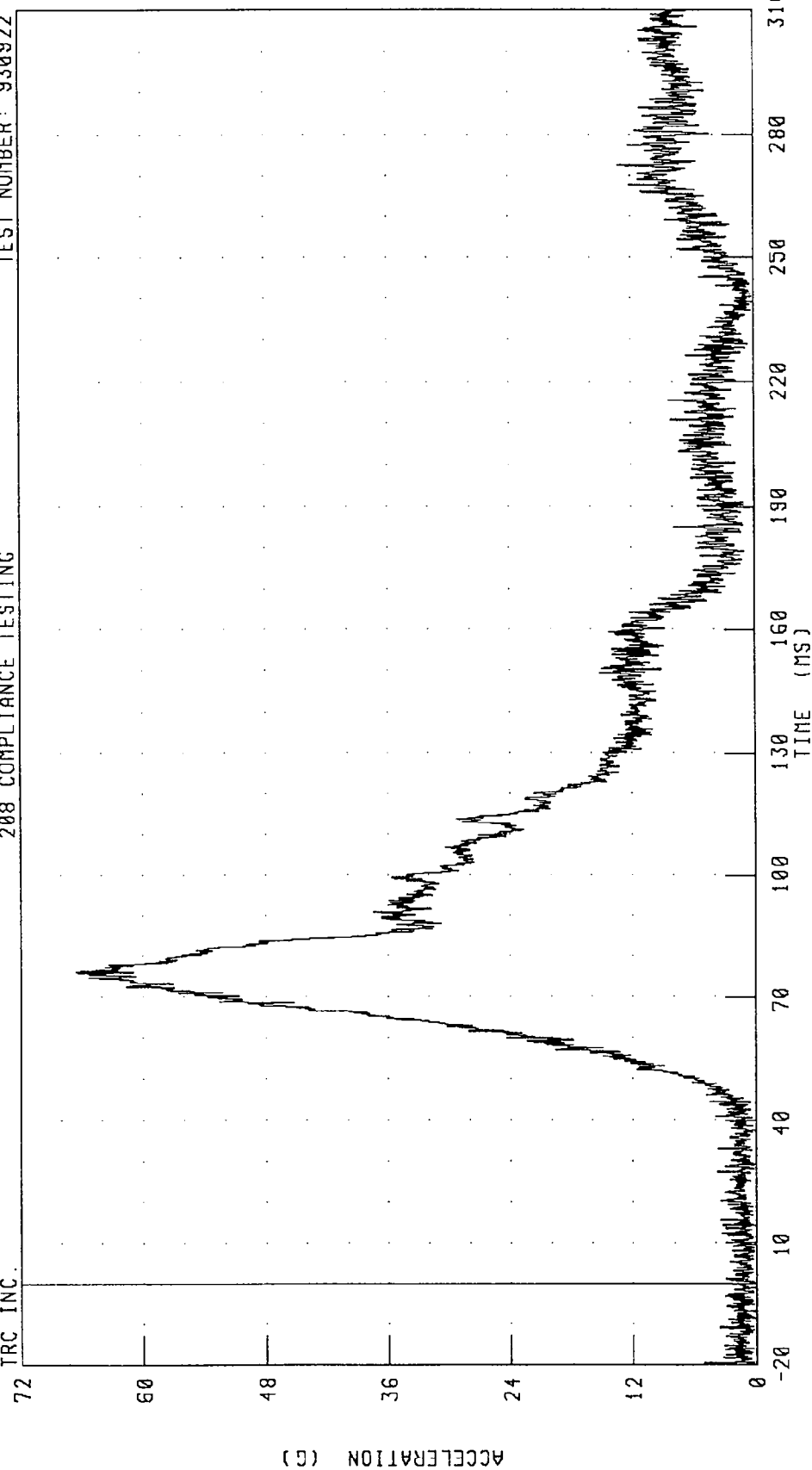


1984 NISSAN SENTRA INTO FLAT FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

TEST NUMBER: 930922

208 COMPLIANCE TESTING

TRC INC.

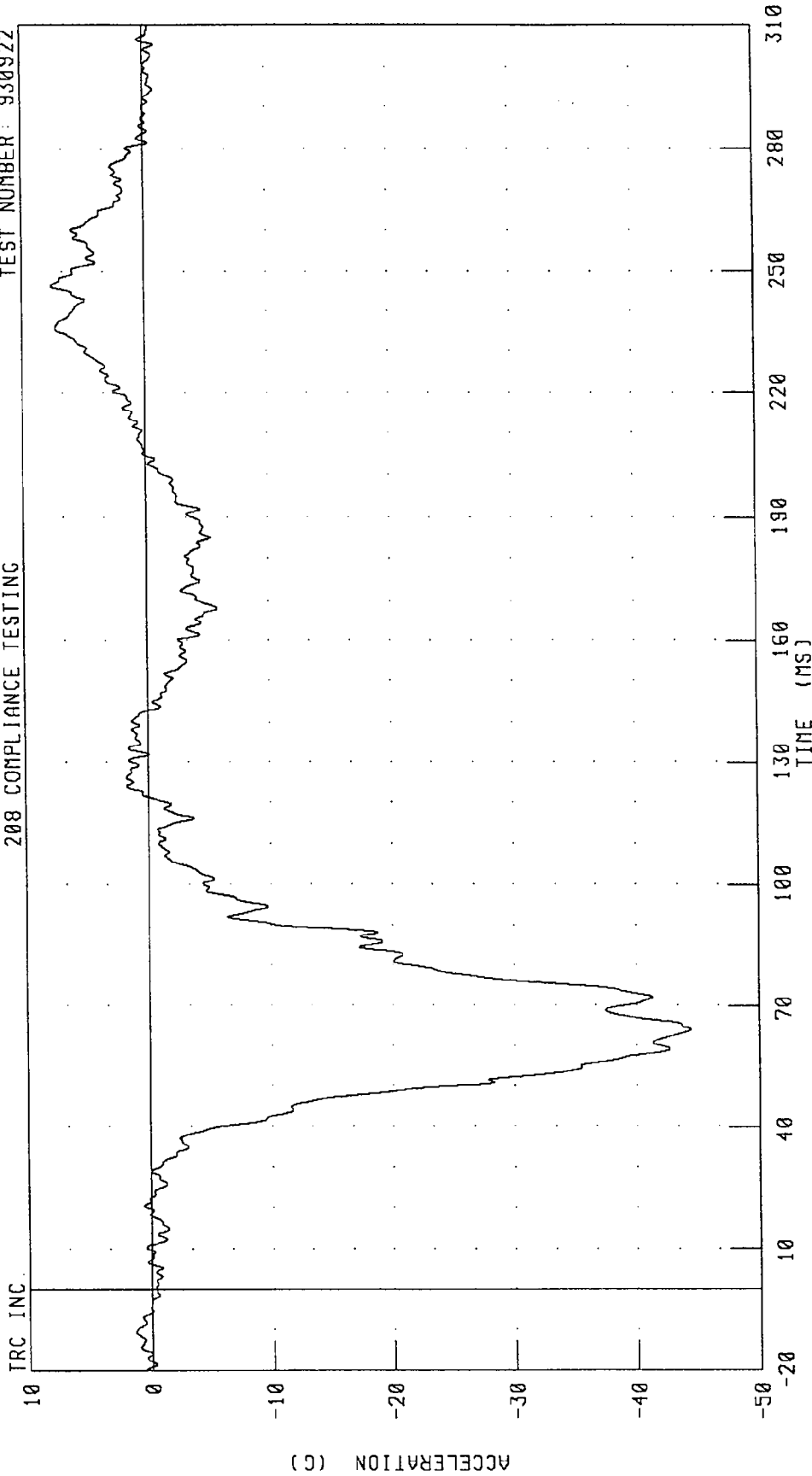


CHANNEL: HEDRG1 FILTER: CH. CLASS 1000

PEAK DATA: 66.62 G @ 76.40 MS; 0.08 G @ 239.12 MS

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

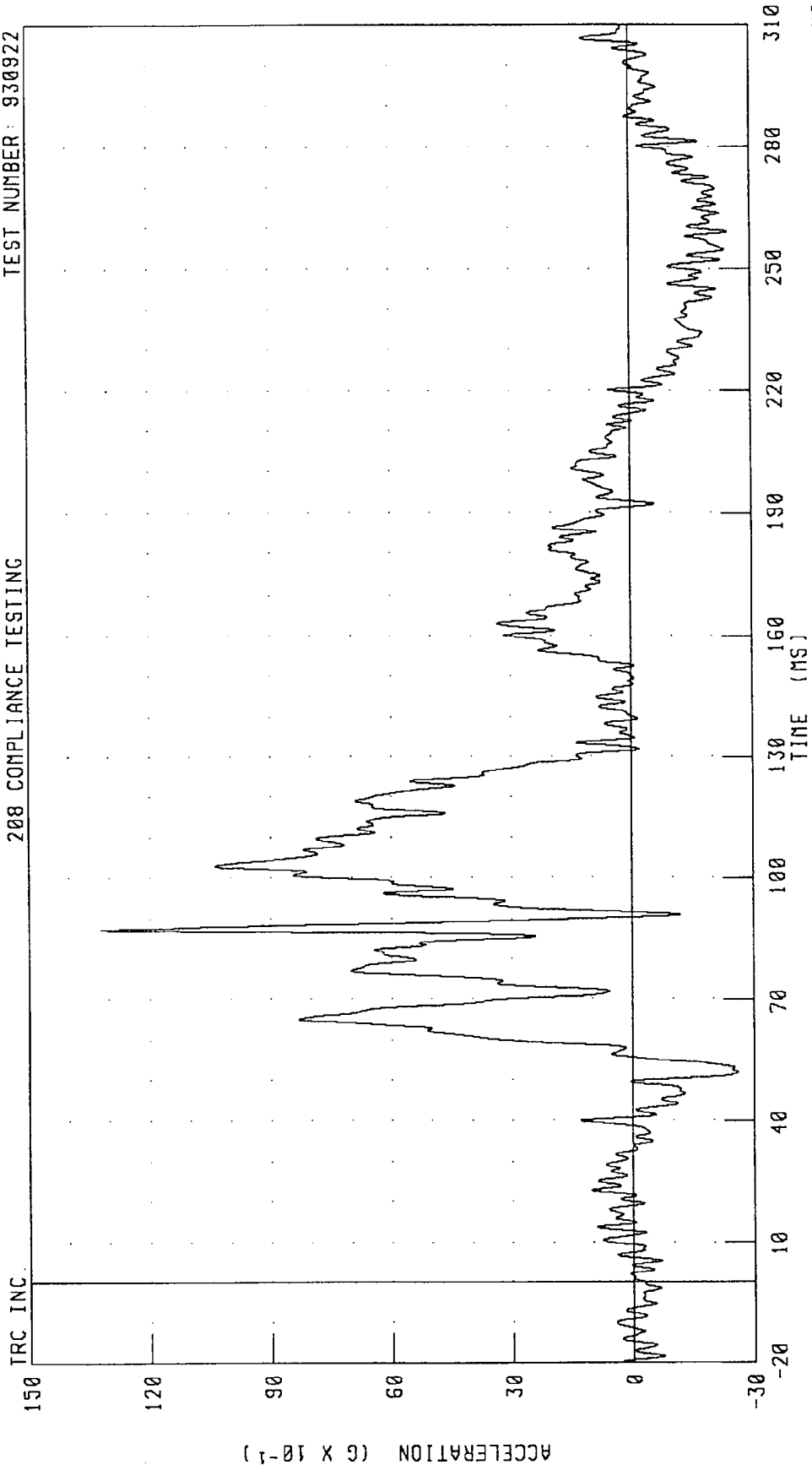
TEST NUMBER: 930922



CHANNEL: CSTXG1 FILTER: CH. CLASS 180

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

TEST NUMBER: 930922

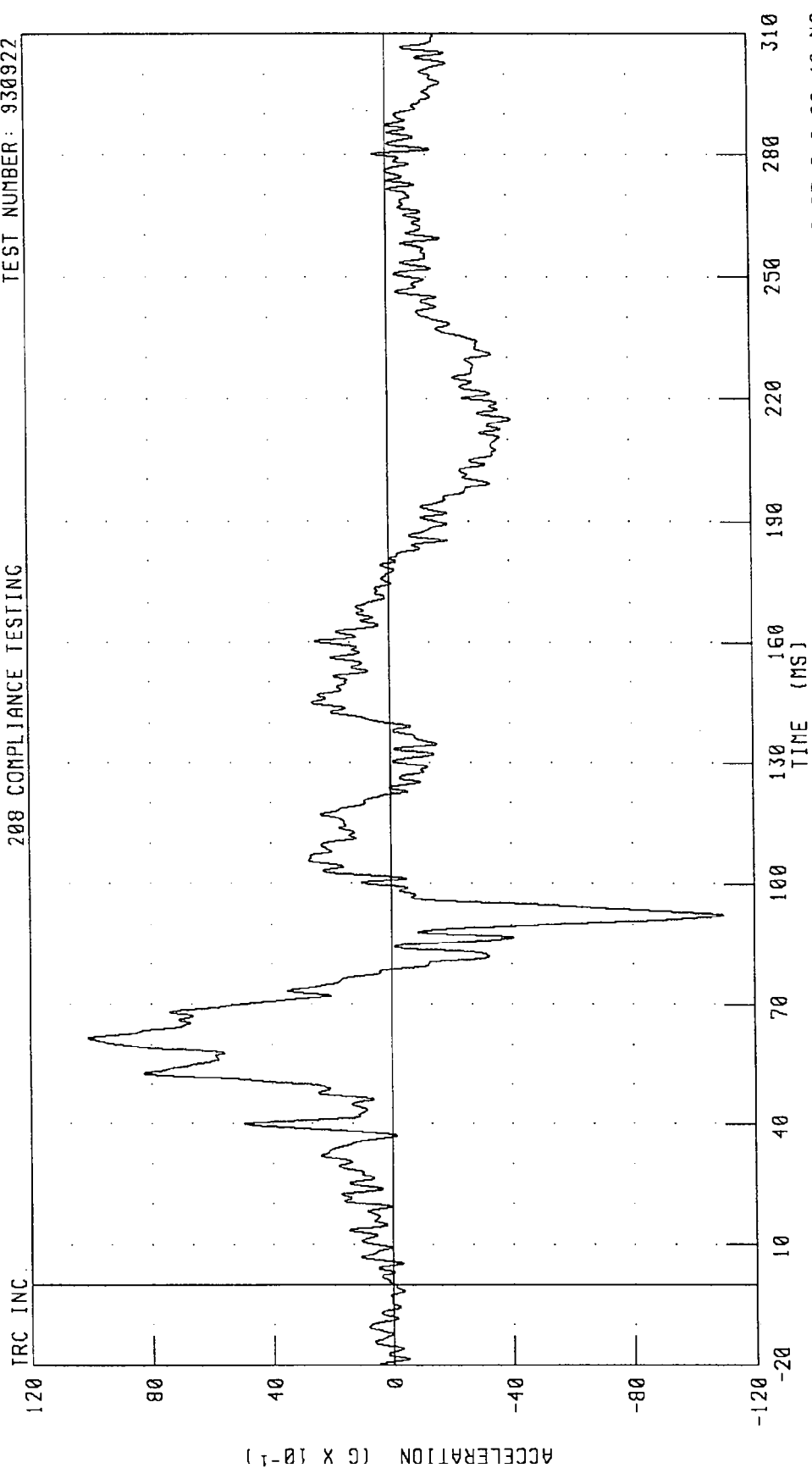


CHANNEL: CSTYG1 FILTER: CH. CLASS 180

PEAK DATA: 13.20 G @ 87.20 MS; -2.62 G @ 51.84 MS

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

TEST NUMBER: 930922

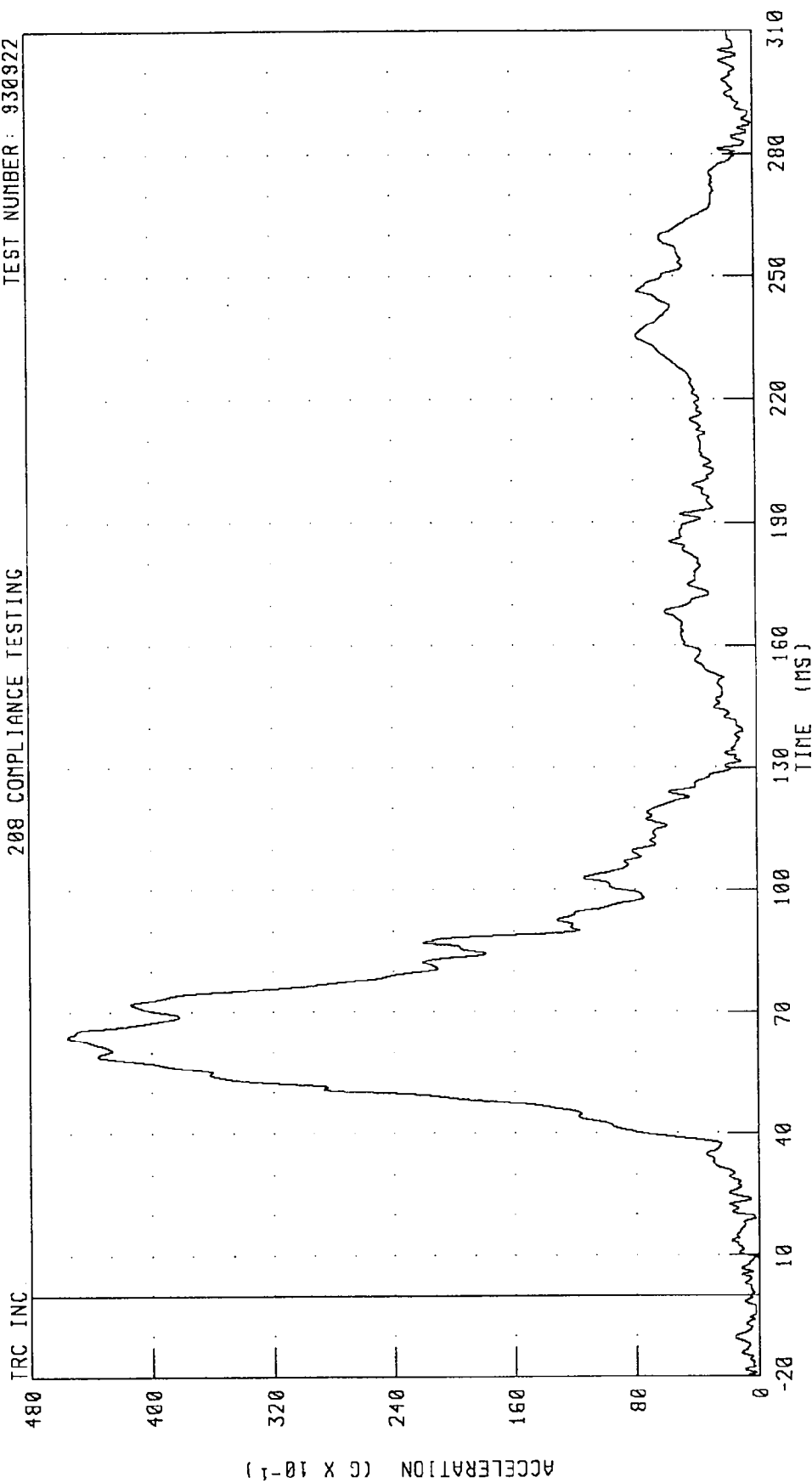


CHANNEL: CSTZG1 FILTER: CH. CLASS 180

PEAK DATA: 10.10 G @ 61.68 MS; -10.97 G @ 92.40 MS

1994 NISSAN SENTRA INTO FLAT FRONTAL BARRIER
 DRIVER CHEST RESULTANT ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 930922

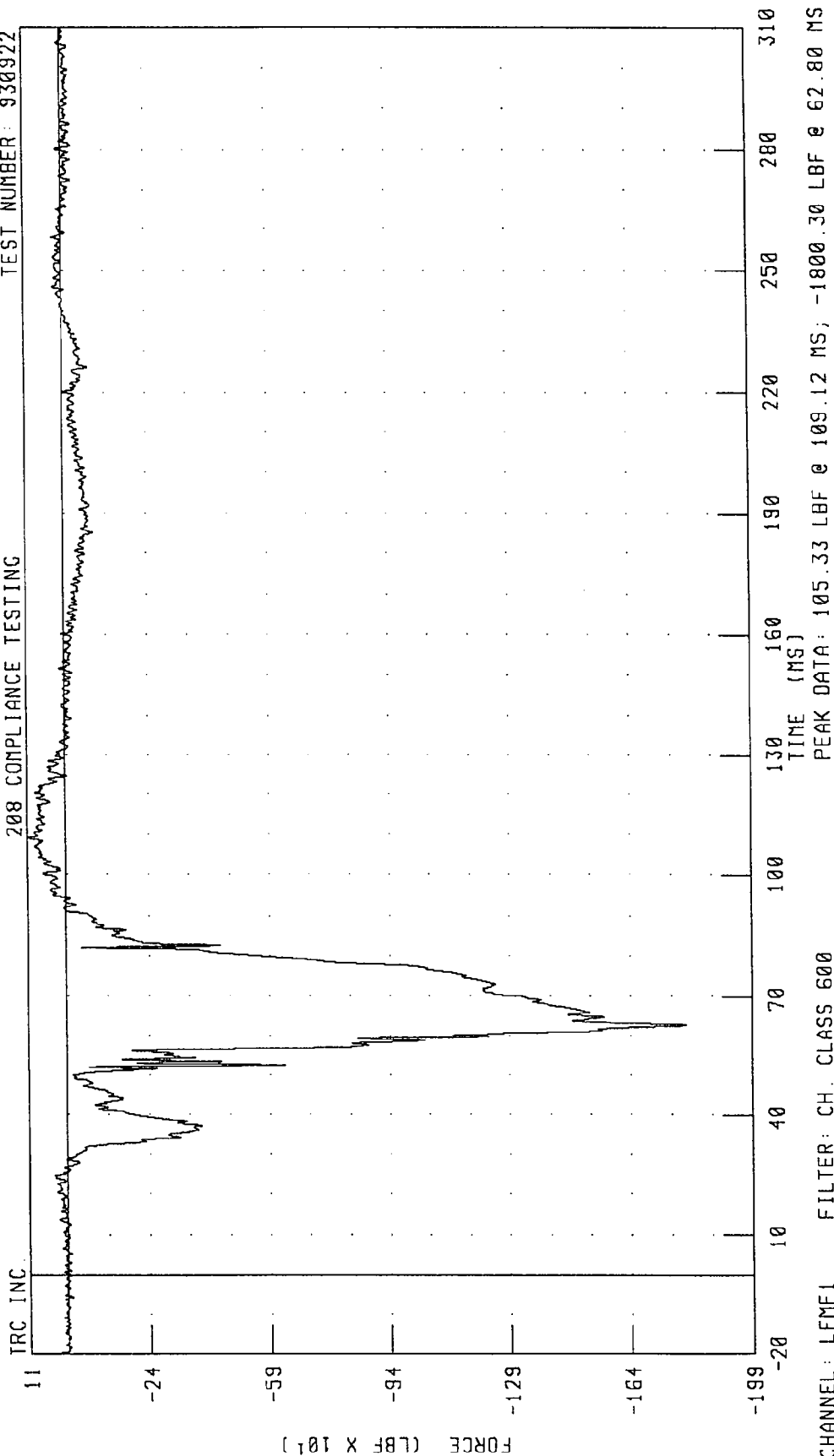


PEAK DATA: 45.53 G @ 64.08 MS; 0.12 G @ -20.00 MS

CHANNEL: CSTRG1 FILTER: CH. CLASS 180

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

TEST NUMBER: 930922

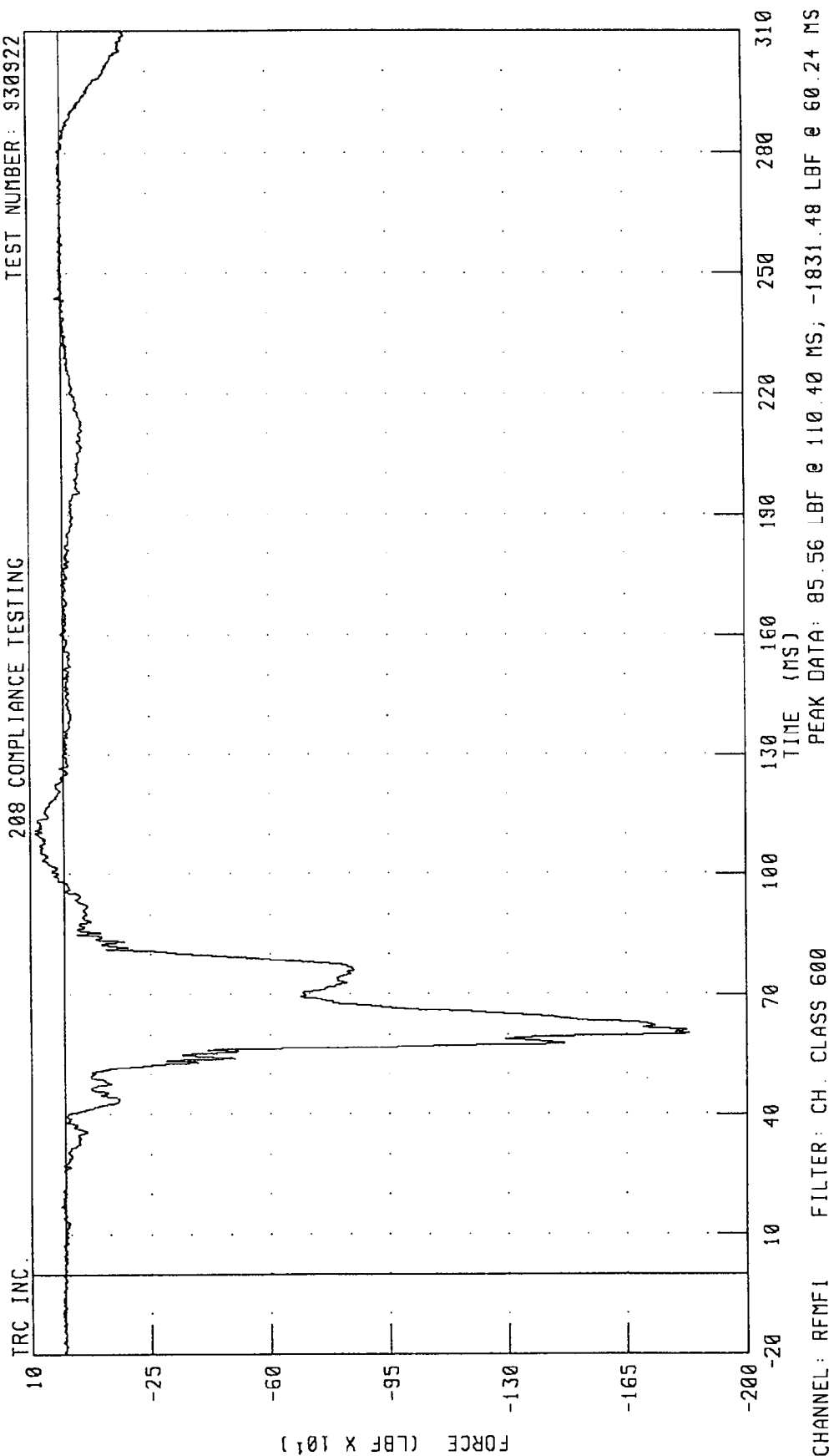


CHANNEL: LFMF1 FILTER: CH. CLASS 600

PEAK DATA: 105.33 LBF @ 109.12 MS; -1800.30 LBF @ 62.80 MS

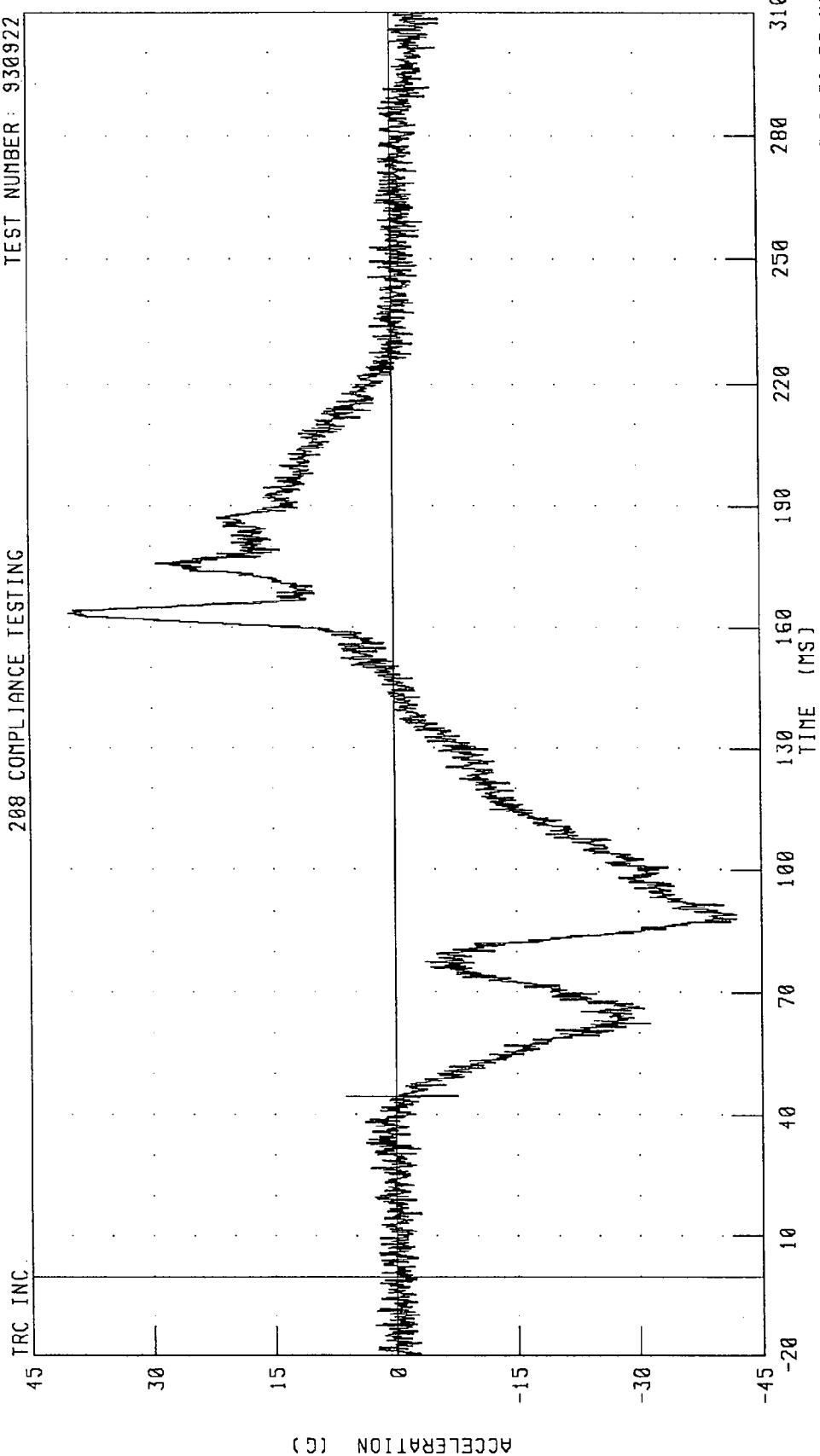
1994 NISSAN SENTRA INTO FLAT FRONTAL BARRIER
DRIVER RIGHT FEMUR FORCE
208 COMPLIANCE TESTING

TEST NUMBER: 930922



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

TEST NUMBER: 930922



PEAK DATA: 40.12 G @ 163.36 MS; -41.96 G @ 89.36 MS

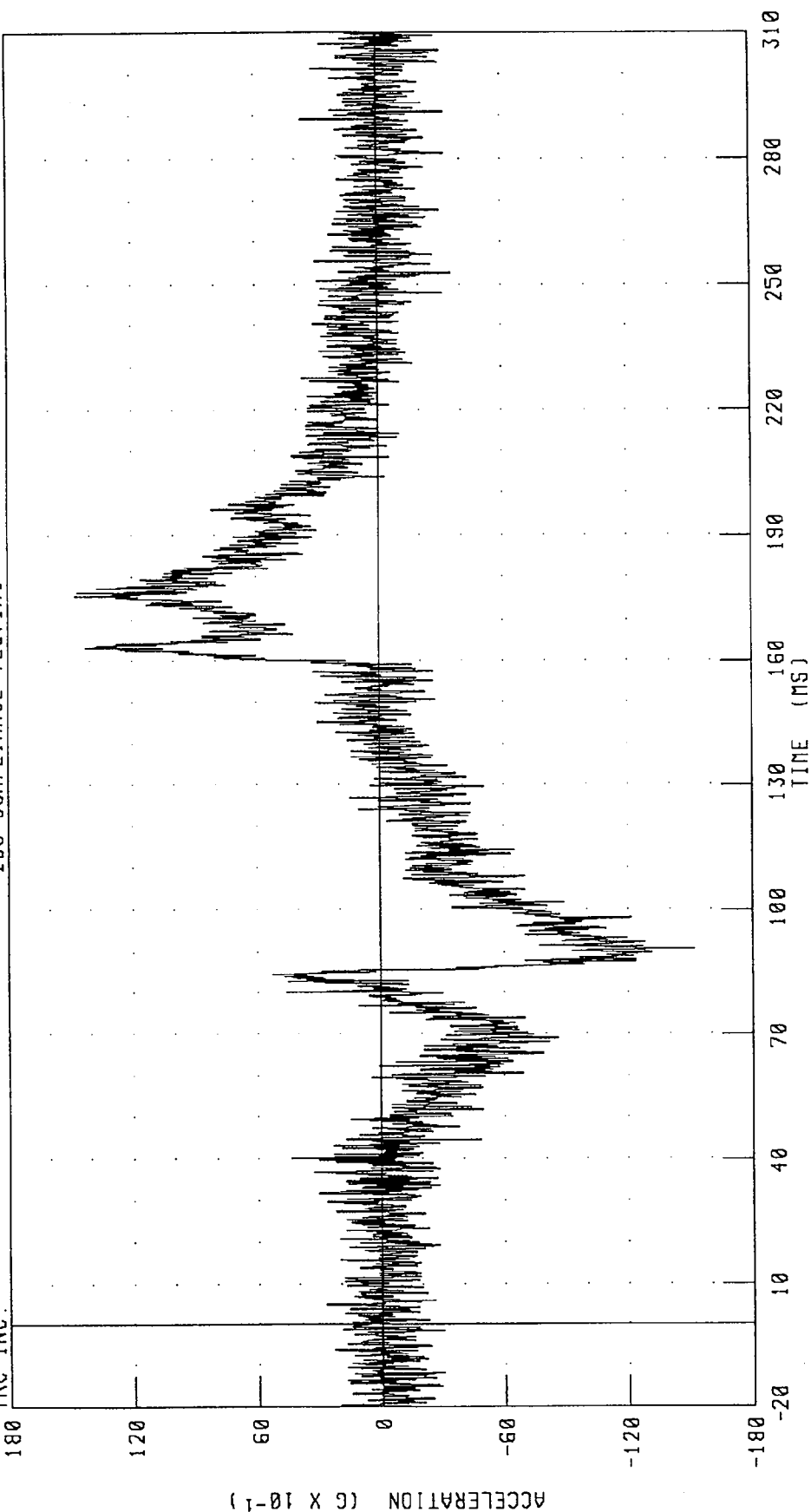
CHANNEL: HEDXG2 FILTER: CH. CLASS 1000

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

TEST NUMBER: 930922

208 COMPLIANCE TESTING

TRC INC.



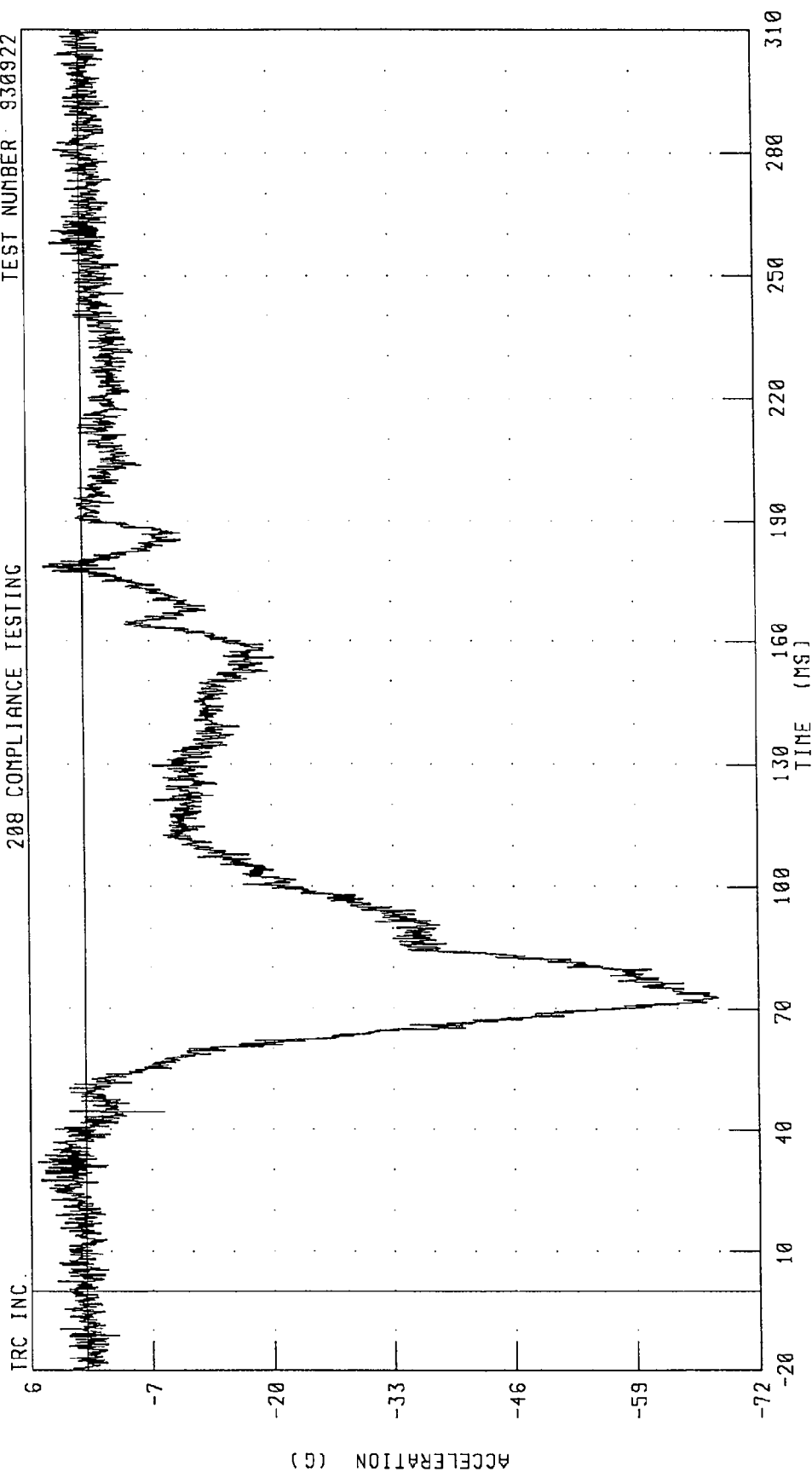
PEAK DATA: 14.74 G @ 175.68 MS; -15.17 G @ 90.72 MS

CHANNEL: HEDYG2 FILTER: CH. CLASS 1000

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

208 COMPLIANCE TESTING

TEST NUMBER 930922

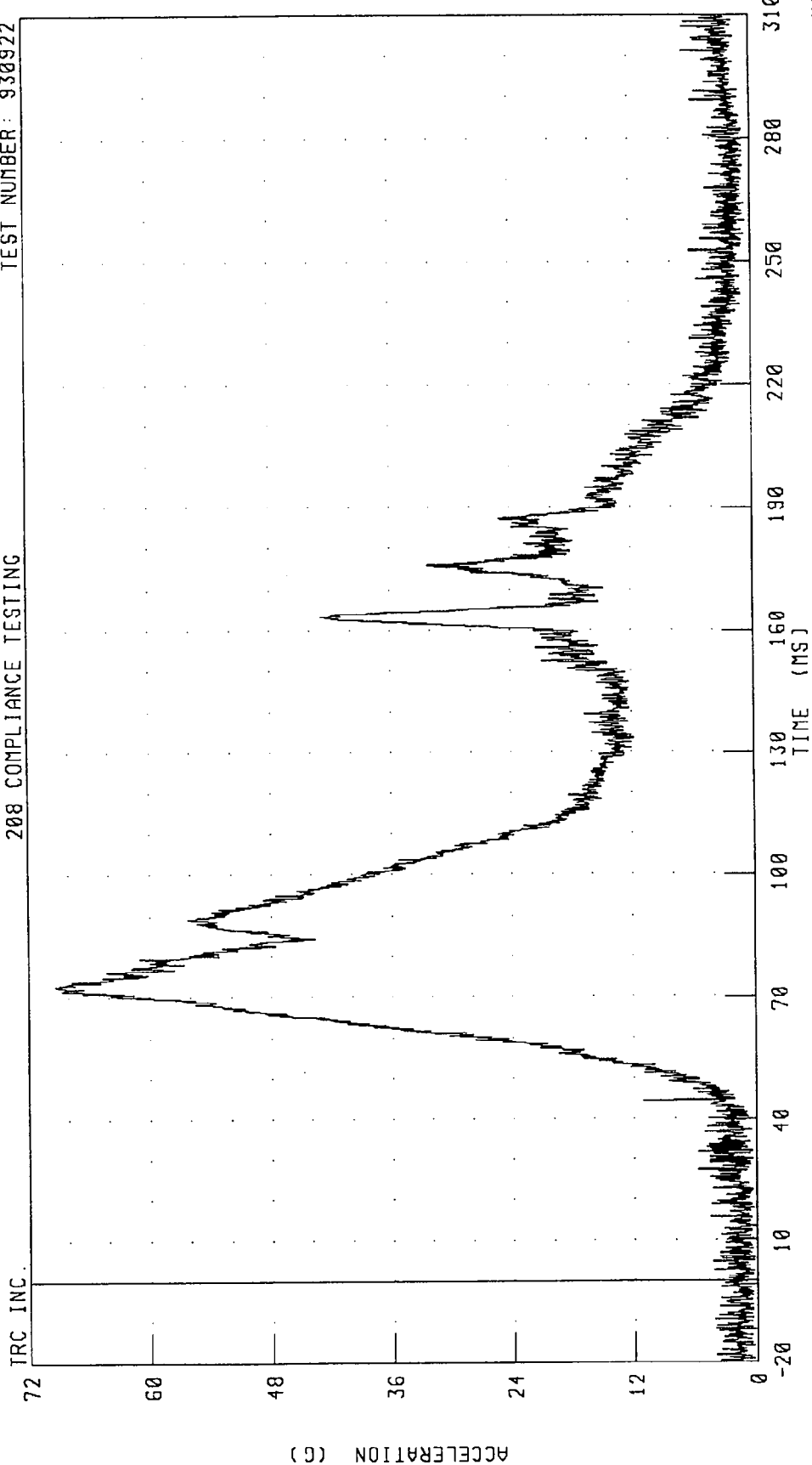


CHANNEL: HEDZG2 FILTER: CH. CLASS 1000

PEAK DATA: 5.19 G @ 31.84 MS; -67.64 G @ 72.80 MS

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

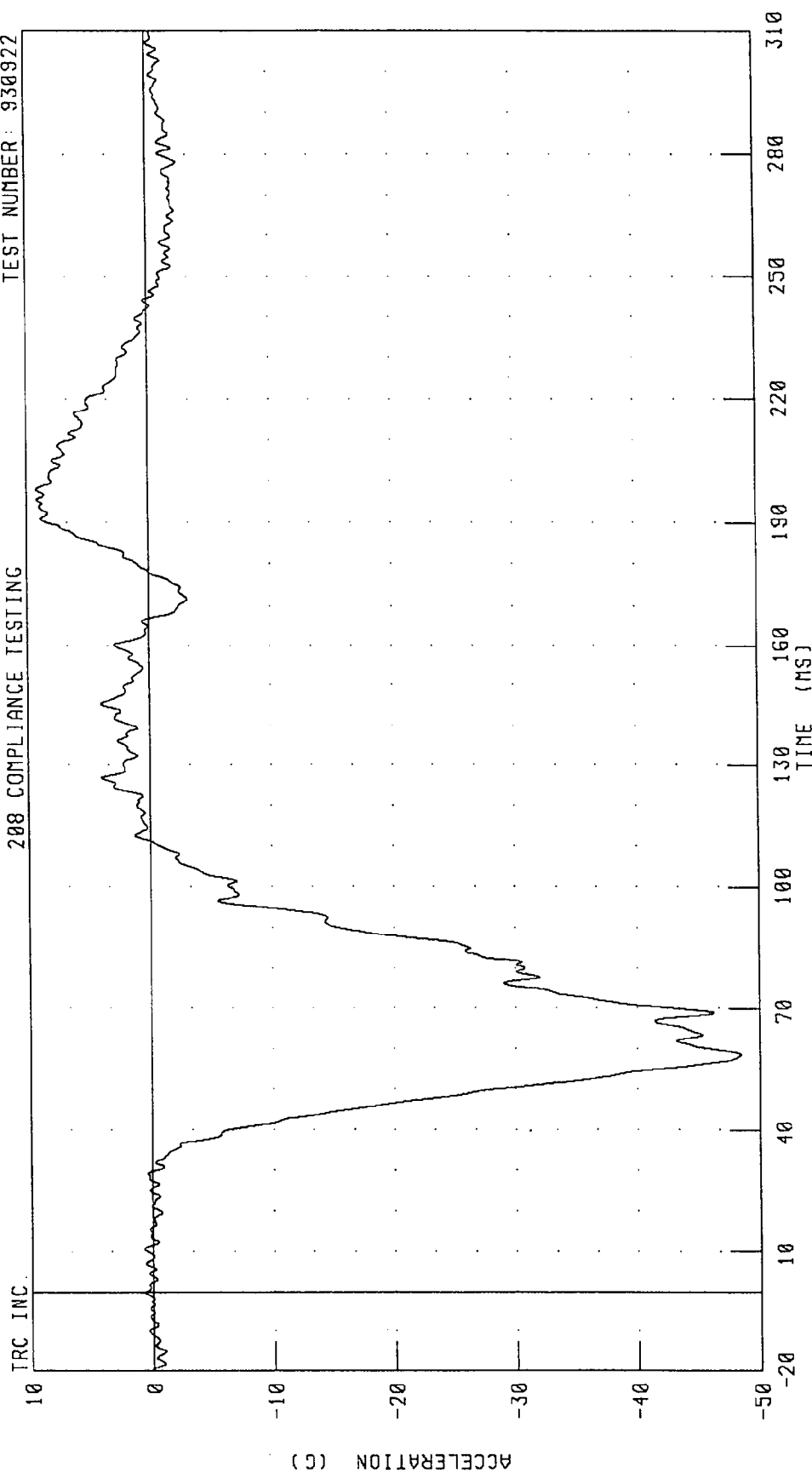
TEST NUMBER: 930922



CHANNEL: HEDRC2 FILTER: CH. CLASS 1000

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

TEST NUMBER: 930922



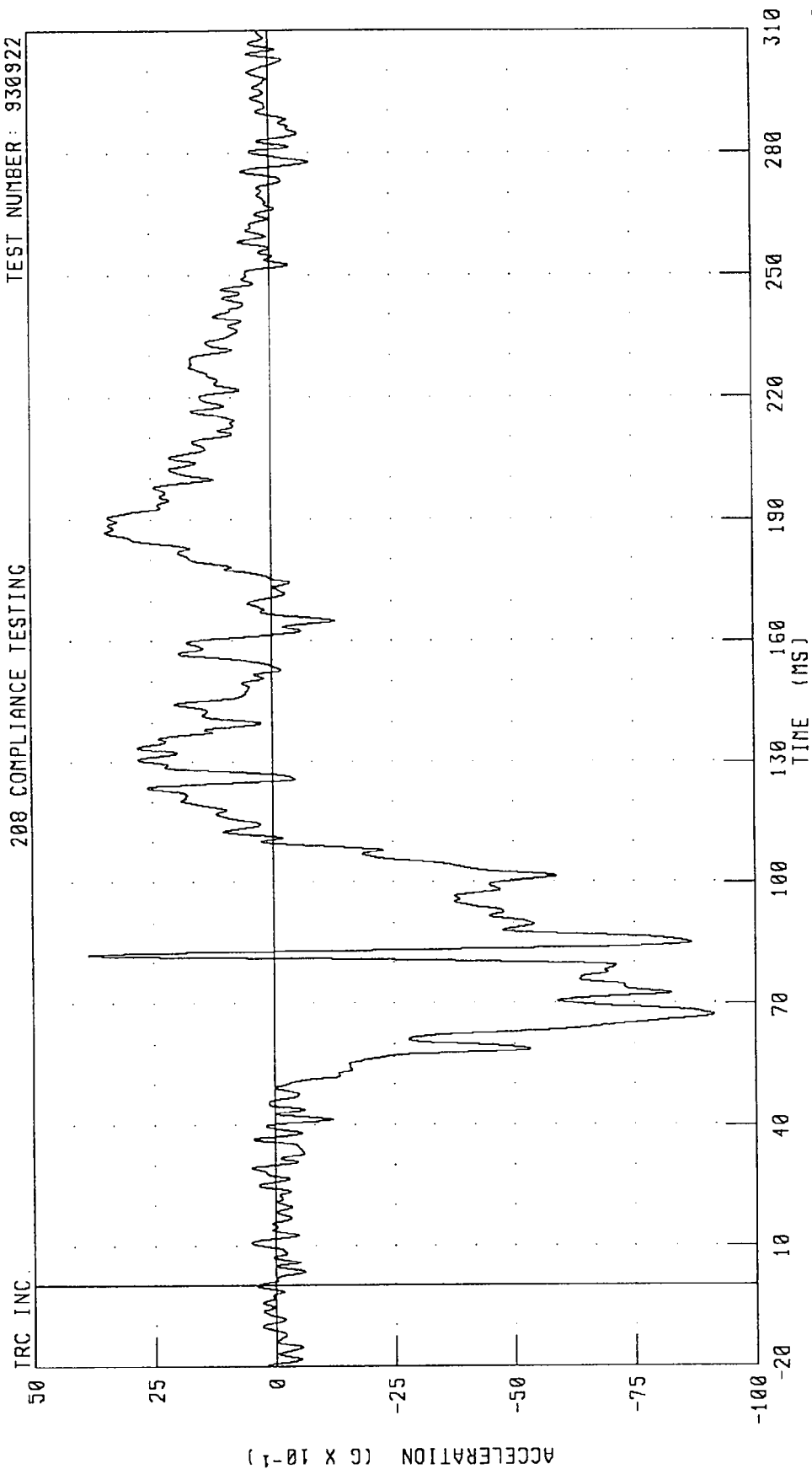
PEAK DATA: 9.19 G @ 198.16 MS; -48.42 G @ 58.48 MS

CHANNEL: CSTX62 FILTER: CH. CLASS 180

1994 NISSAN SENTRA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION

TEST NUMBER: 930922

208 COMPLIANCE TESTING



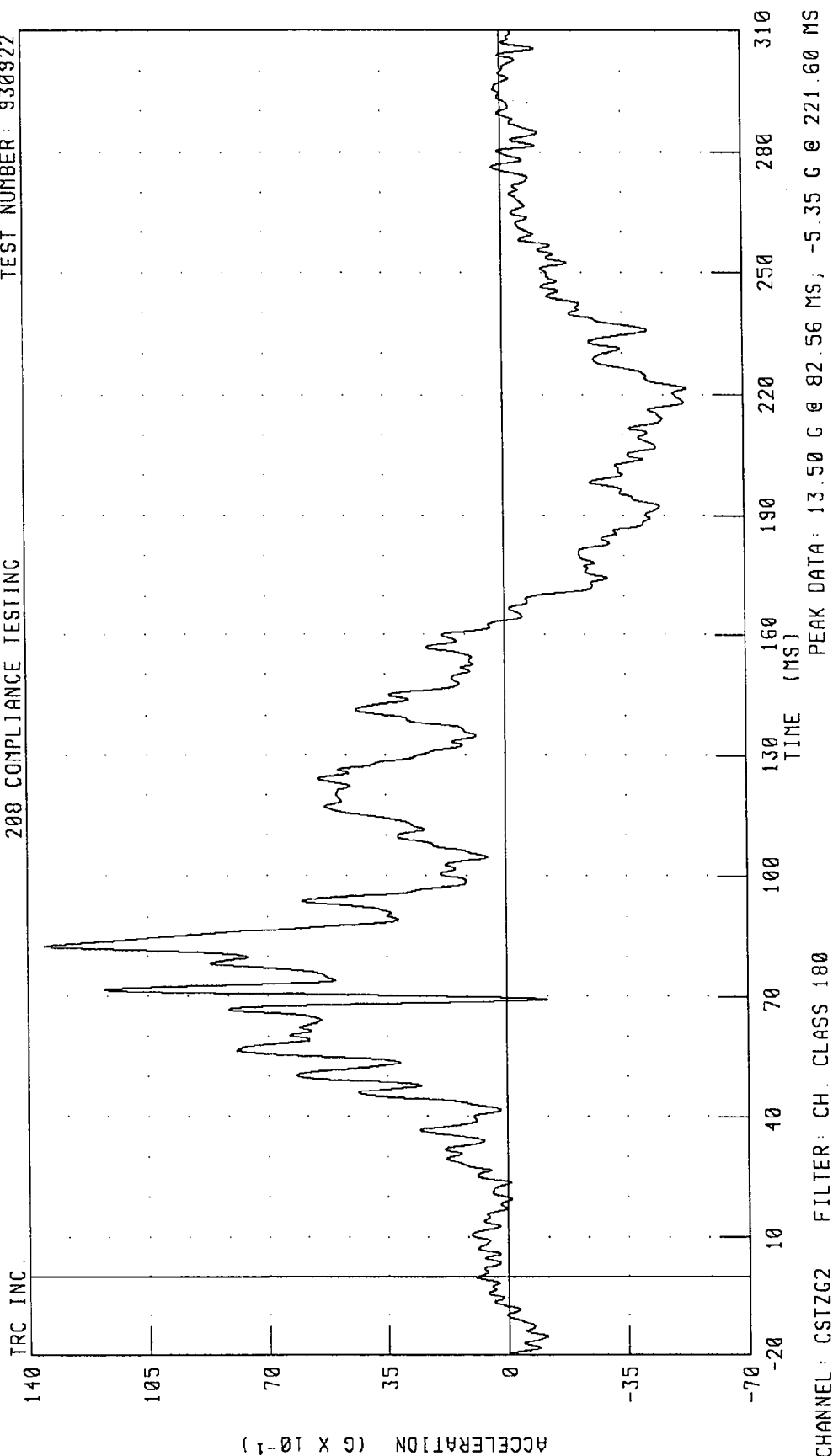
PEAK DATA: 3.85 G @ 82.00 MS; -9.14 G @ 67.20 MS

CHANNEL: CSTYG2 FILTER: CH. CLASS 180

1994 NISSAN SENTRA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION

208 COMPLIANCE TESTING

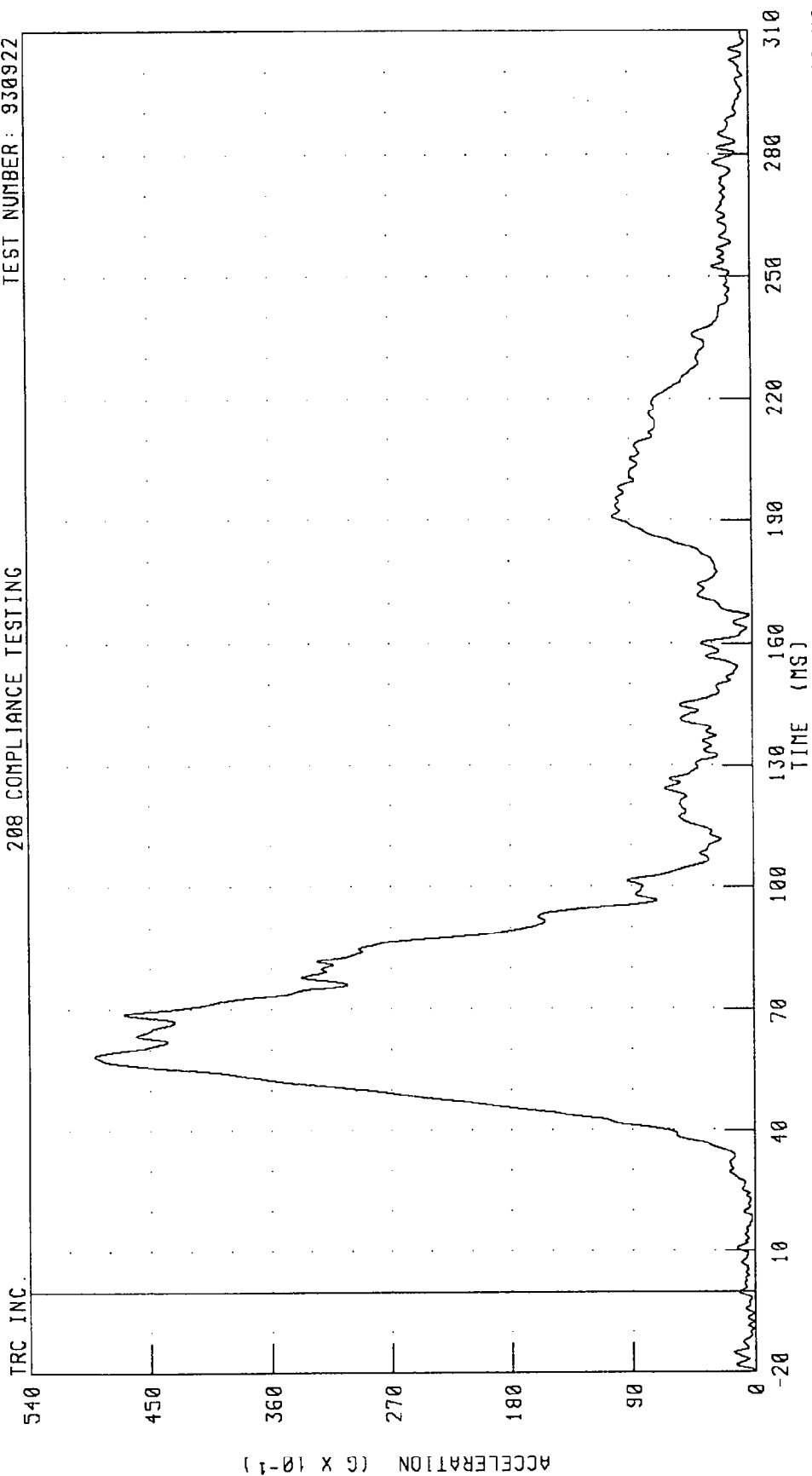
TEST NUMBER: 930922



CHANNEL: CSTZG2 FILTER: CH. CLASS 180

1994 NISSAN SENTRA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 930922

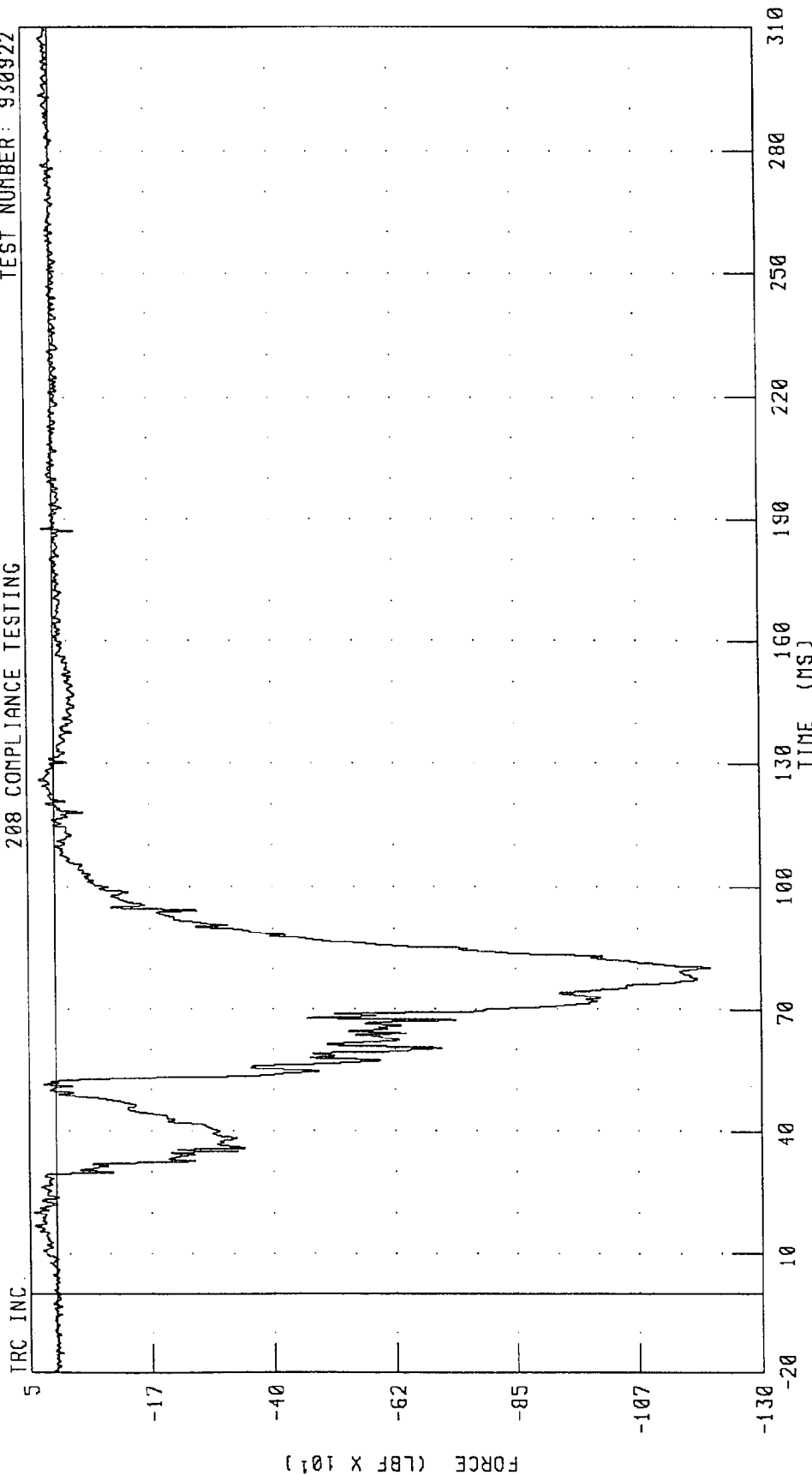


CHANNEL: CSTRG2 FILTER: CH. CLASS 180

PEAK DATA: 49.10 G @ 58.40 MS; 0.02 G @ -20.00 MS

1994 NISSAN SENTRA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT FEMUR FORCE
 208 COMPLIANCE TESTING

TEST NUMBER: 930922



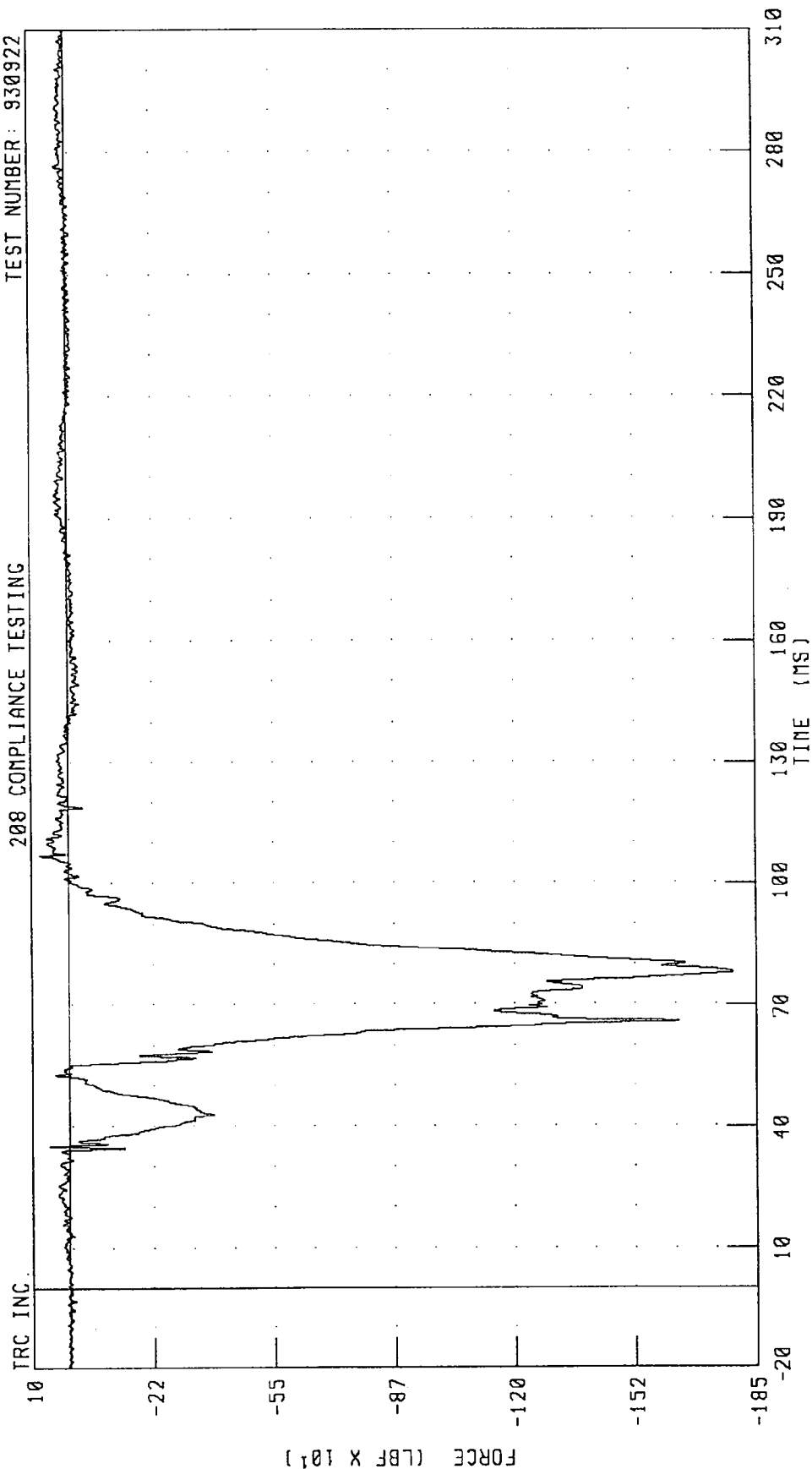
PEAK DATA: 41.86 LBF @ 20.32 MS, -1207.60 LBF @ 80.32 MS

CHANNEL: LFMF2 FILTER: CH. CLASS 600

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

TEST NUMBER: 930922

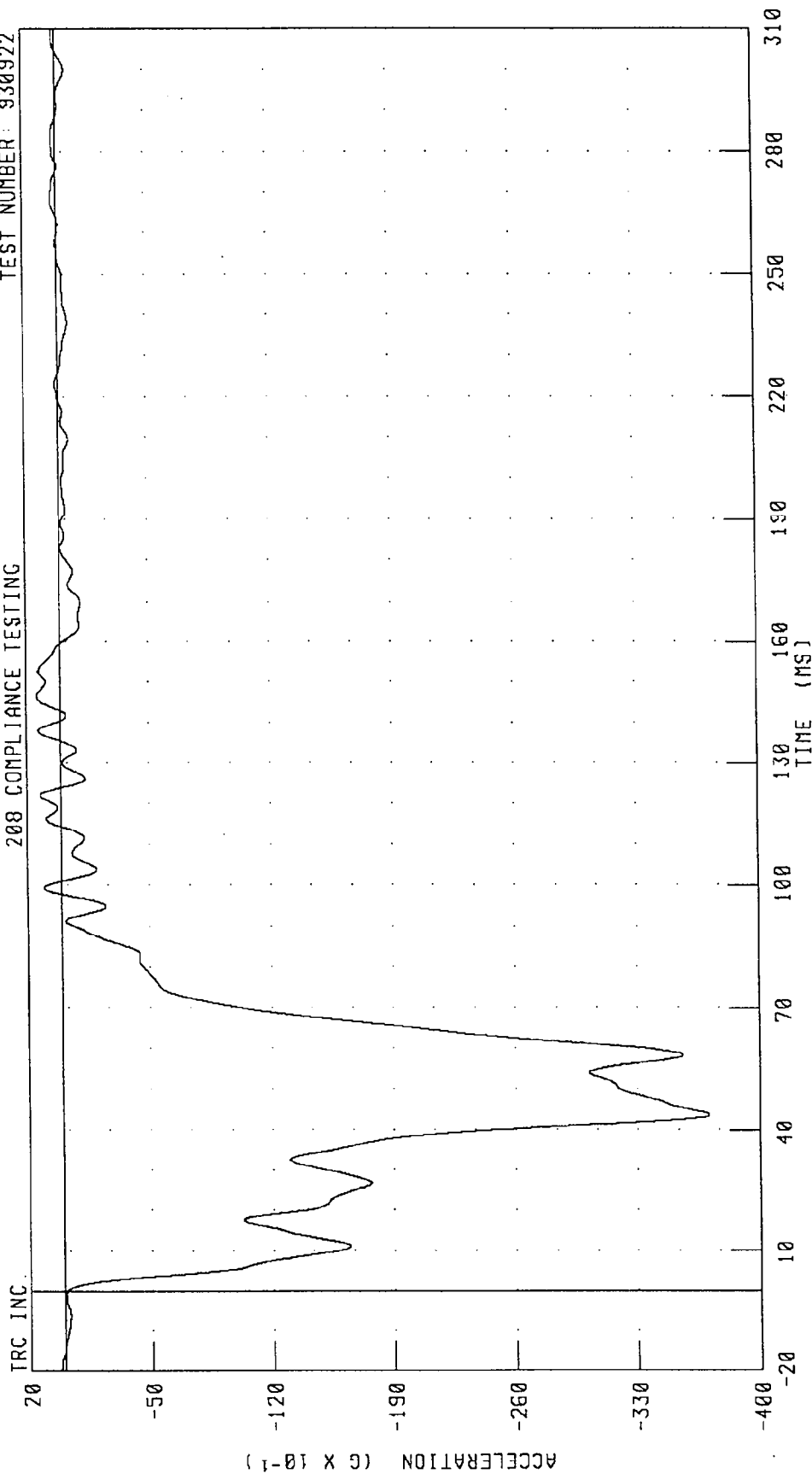
208 COMPLIANCE TESTING



CHANNEL: RFMF2 FILTER: CH. CLASS 600

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

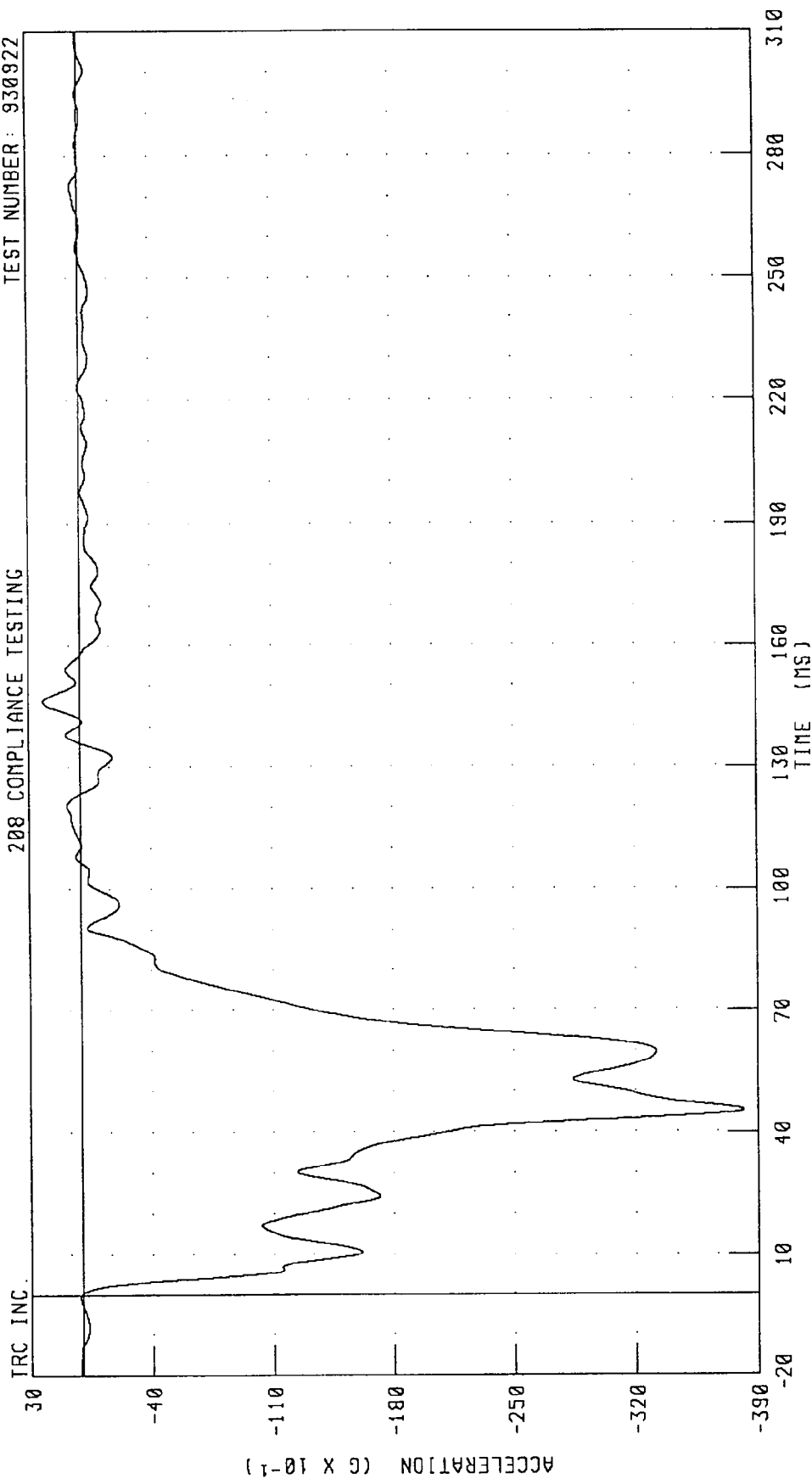
TEST NUMBER: 930922



CHANNEL: TLRXG1 FILTER: CH. CLASS 60

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

TEST NUMBER: 930922

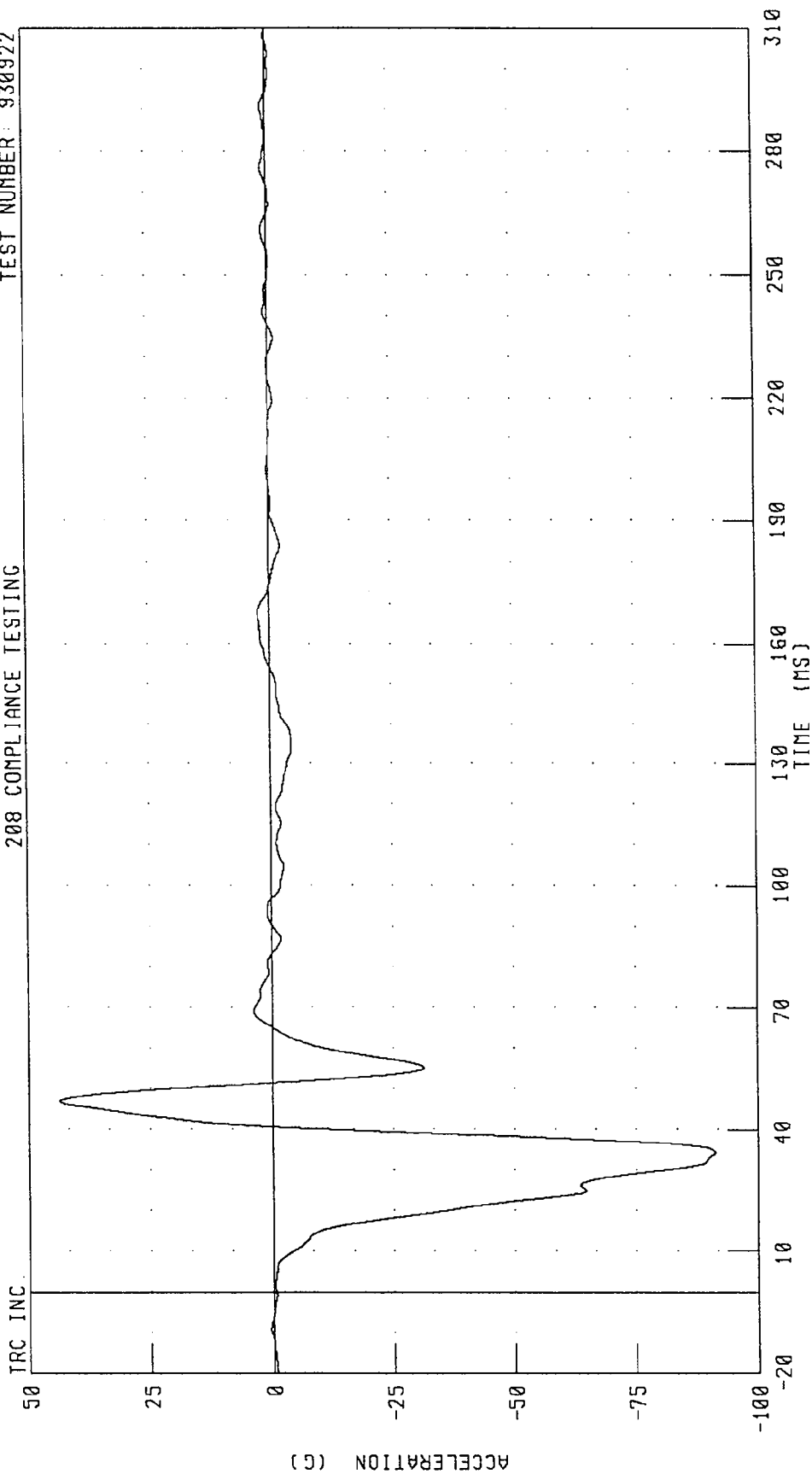


PEAK DATA: 2.17 G @ 146.24 MS; -38.16 G @ 45.28 MS

CHANNEL: TRRXG1 FILTER: CH. CLASS 60

1994 NISSAN SENTRA INTO FLAT FRONTAL BARRIER
ENGINE UPPER BLOCK X-AXIS ACCELERATION
200 COMPLIANCE TESTING

TEST NUMBER: 930922

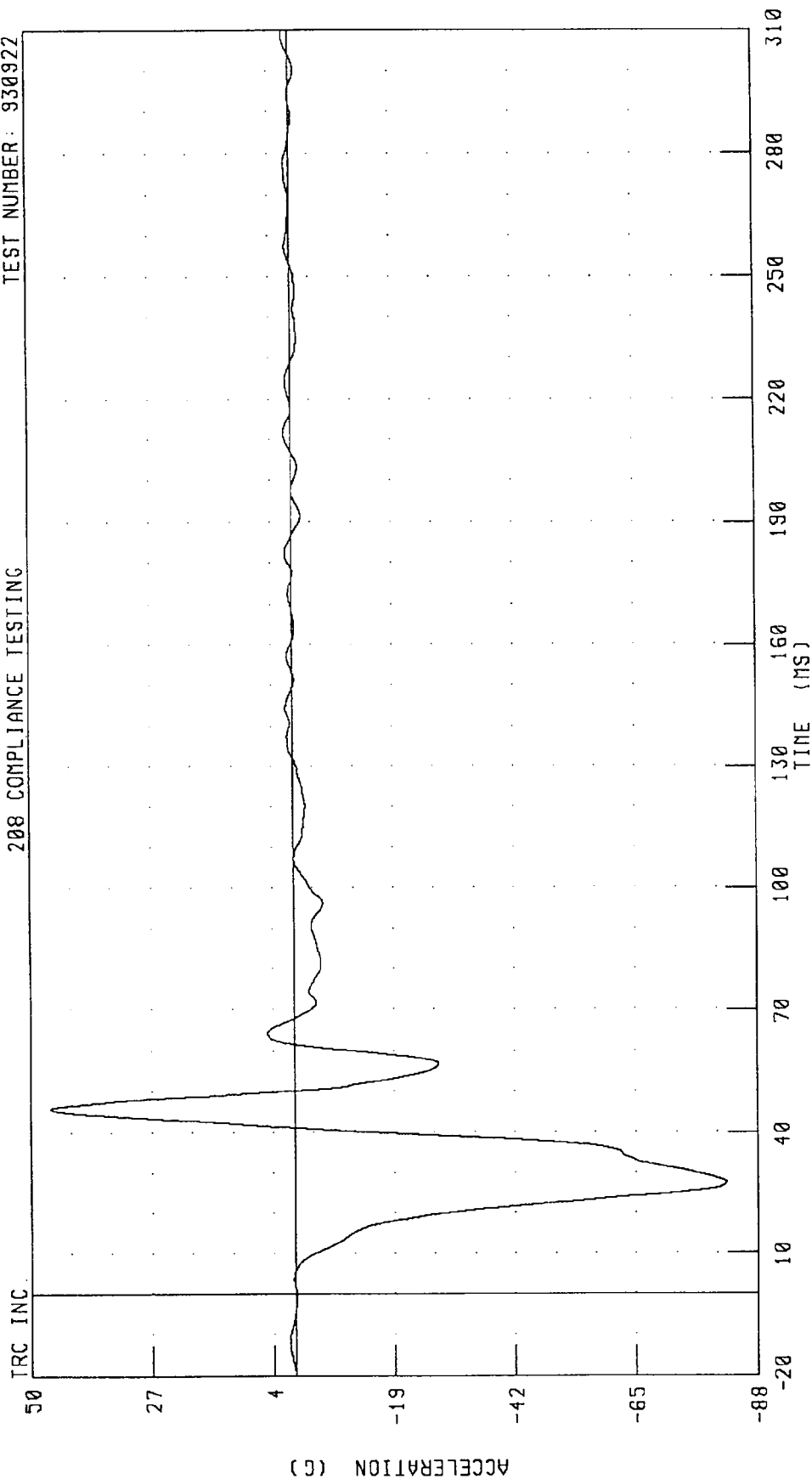


PEAK DATA: 43.50 G @ 46.96 MS; -91.14 G @ 34.32 MS

CHANNEL: ENGCG1 FILTER: CH. CLASS 60

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

TEST NUMBER: 930922

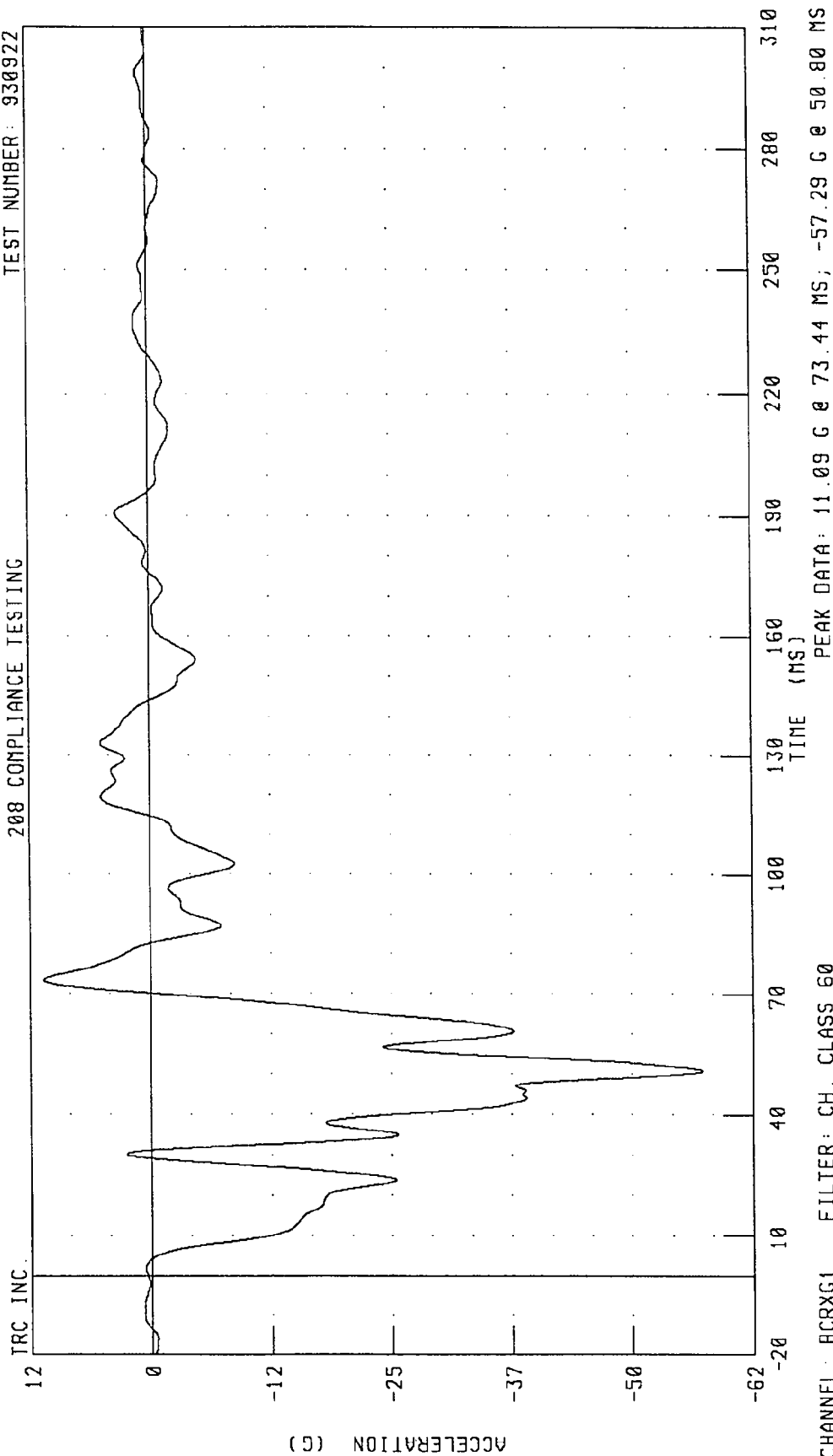


PEAK DATA: 46.32 G @ 46.00 MS; -82.09 G @ 27.44 MS

CHANNEL: ENGCG2 FILTER: CH. CLASS 60

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

TEST NUMBER: 930922

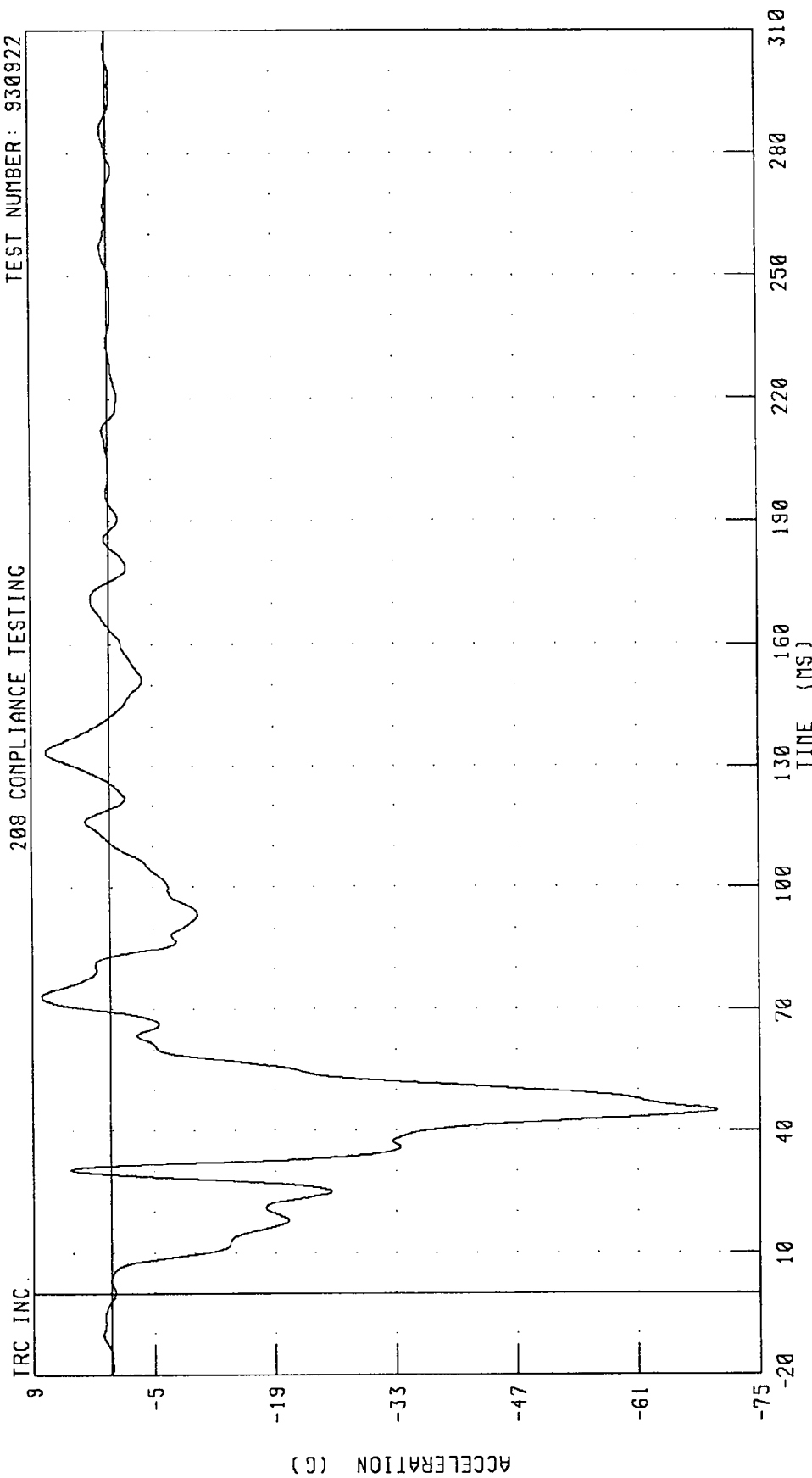


CHANNEL: BCRXG1 FILTER: CH. CLASS 60

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

TEST NUMBER: 930922

200 COMPLIANCE TESTING

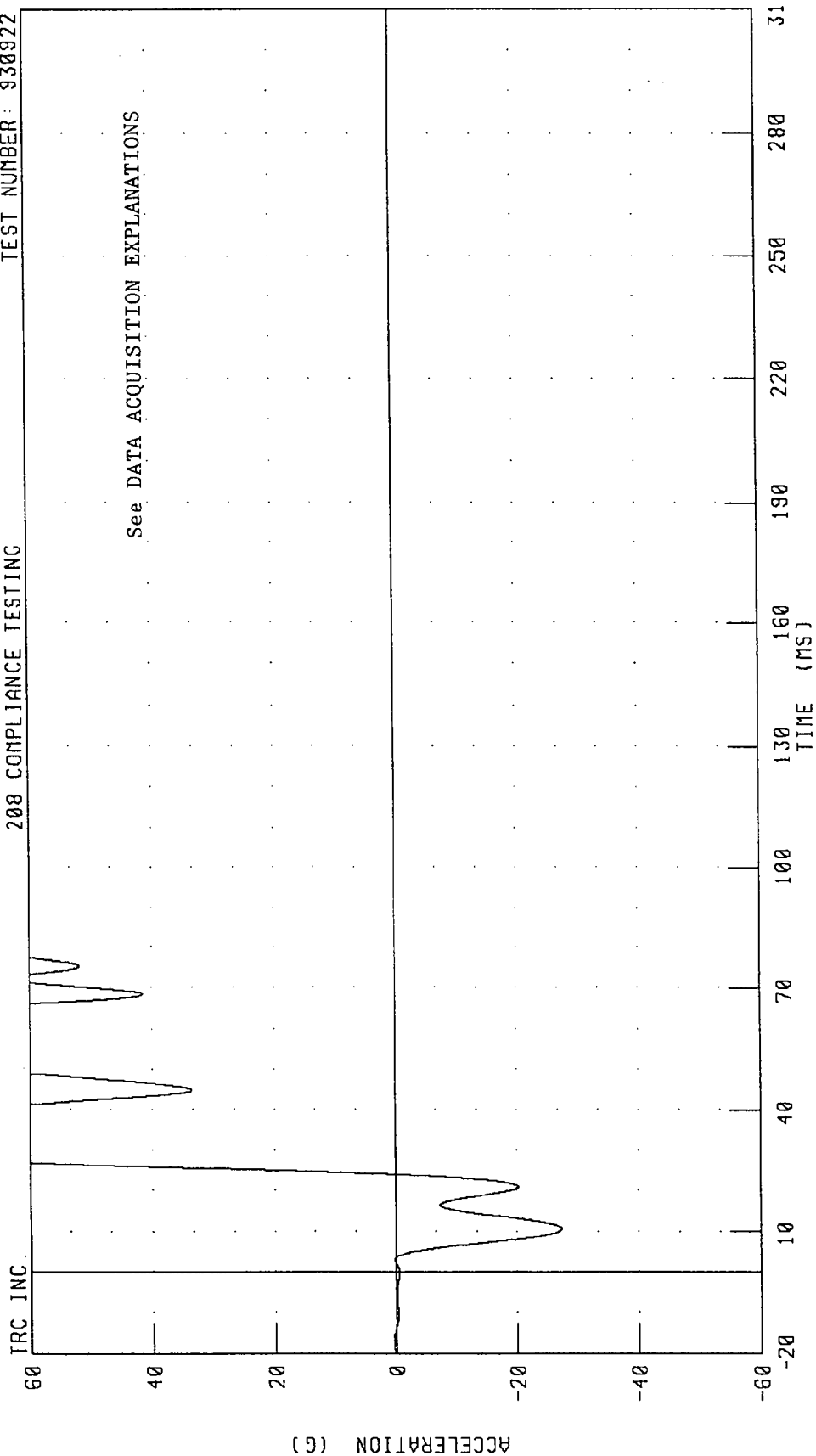


PEAK DATA: 7.94 G @ 73.20 MS, -70.11 G @ 44.88 MS

CHANNEL: BCLXG1 FILTER: CH. CLASS 60

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

TEST NUMBER: 930922



PEAK DATA: 101.58 G @ 60.48 MS; -27.34 G @ 10.64 MS

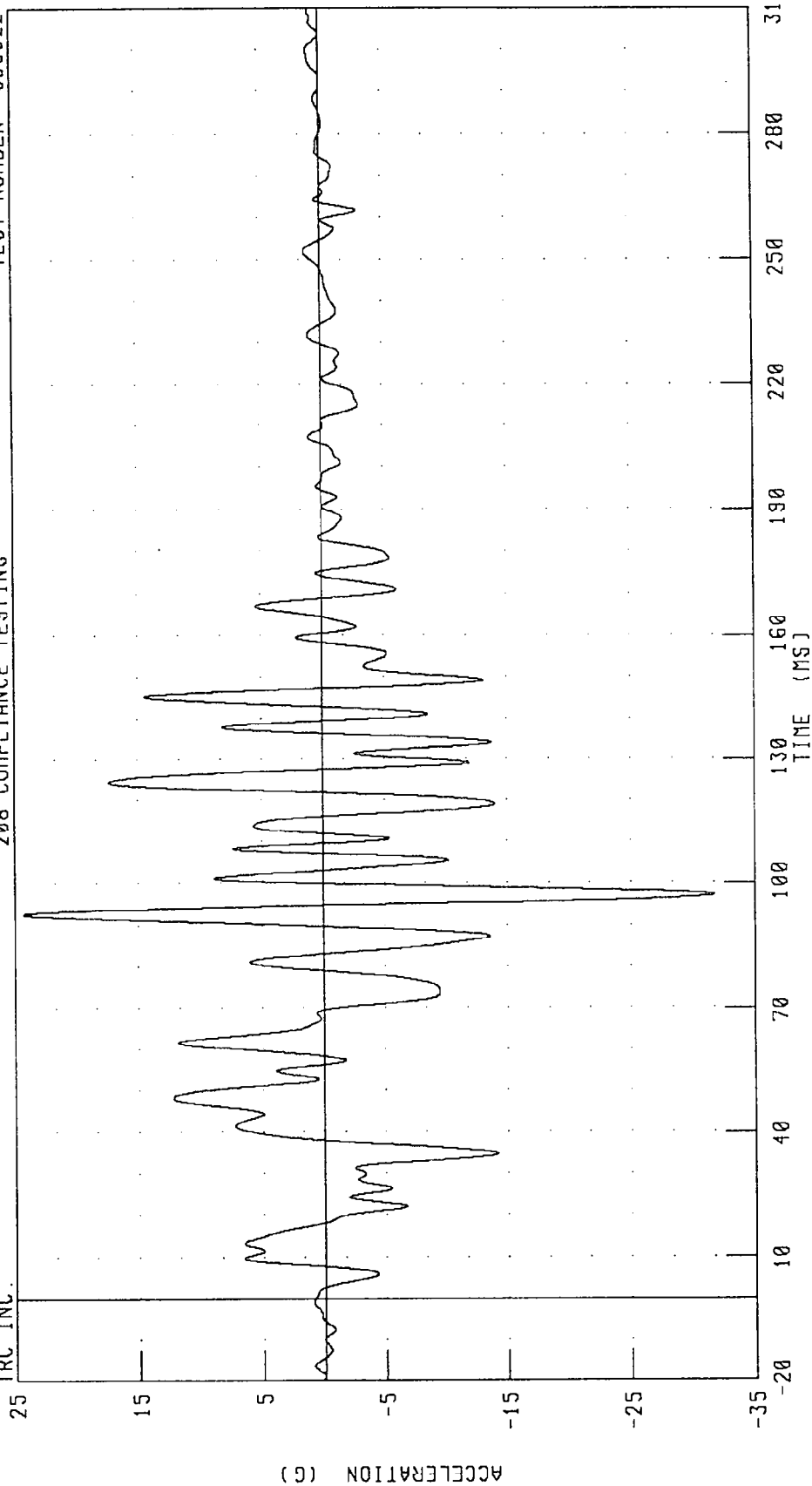
CHANNEL: DPCXG1 FILTER: CH. CLASS 60

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

TEST NUMBER: 930922

208 COMPLIANCE TESTING

TRC INC.



CHANNEL: ROKZG1 FILTER: CH. CLASS 60

PEAK DATA: 24.32 G @ 92.80 MS, -31.70 G @ 97.20 MS