

REPORT NOS. 208-TRC-94-004
212-TRC-94-004
301-TRC-94-004

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

FORD MOTOR COMPANY
1994 LINCOLN TOWN CAR
4-DOOR SEDAN
NHTSA NO. CR0202
TRC TEST NO. 931201

PREPARED BY:
TRANSPORTATION RESEARCH CENTER INC.
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DECEMBER 17, 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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16. Abstract A 30 mph flat frontal barrier impact test was conducted on a 1994 Lincoln Town Car 4-door sedan, NHTSA No. CR0202, at Transportation Research Center Inc. on December 1, 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 29.6 mph. The vehicle's maximum static crush was 21.5 inches. The ambient temperature was 66° F. The driver's head injury criteria (HIC) was 289. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 48.8 g. The driver's left and right femur maximum axial forces were 1393 pounds and 783 pounds, respectively. The passenger's HIC was 175. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 28.4 g. The passenger's left and right femur maximum axial forces were 1030 pounds and 1251 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 Hornickie		
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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	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

* 1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NIST Metric, Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C131-0-286.

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
l	liters	1.05	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

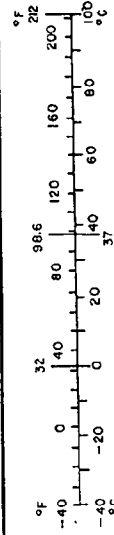


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SECTION 1.0

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 Lincoln Town Car 4-door sedan, NHTSA No. CR0202, 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 December 1, 1993.

The test vehicle, a 1994 Lincoln Town Car 4-door sedan, NHTSA No. CR0202, 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 passenger positions. The vehicle's test weight was 4562 pounds. The vehicle's impact speed was 29.6 mph. The vehicle's maximum static crush was 21.5 inches.

The driver's head injury criteria (HIC) was 289. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 48.8 g. The driver's left and right femur maximum axial forces were 1393 pounds and 783 pounds, respectively.

The right front passenger's HIC was 175. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 28.4 g. The right front passenger's left and right femur maximum axial forces were 1030 pounds and 1251 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 Y- and Z-axis accelerometers, HEDYG2 and HEDZG2, recorded a questionable data spike at 85 milliseconds. The data spike affected the head resultant acceleration calculation. The data acquisition circuits were checked after the test. No cause for the data spikes could be found.

The right brake caliper X-axis accelerometer, BCRXG1, recorded questionable data spikes at 35, 52, and 84 milliseconds as a result of the accelerometer's cable being pinched by the vehicle's crush on impact.

The left rear seat X-axis accelerometer, TLRXG1, did not return to zero following the impact event. The data acquisition circuit was checked after the test. No cause for the data not returning to zero was found.

TABLE 1 CRASH TEST SUMMARY

NHTSA NO.:	CR0202	
TEST TYPE:	Frontal Barrier Impact	
TEST DATE:	12/01/93	
TEST TIME:	1452	
BARRIER ROOM TEMPERATURE:	66° F	
VEHICLE YEAR/MAKE/ MODEL/BODY STYLE:	1994/Lincoln/Town Car/4-door sedan	
VEHICLE TEST WEIGHT:	4562 LBS.	
IMPACT ANGLE ¹ :	0°	
IMPACT VELOCITY ² :		
PRIMARY:	29.6 MPH	
SECONDARY:	29.6 MPH	
MAXIMUM STATIC CRUSH:	21.5	
AVERAGE REBOUND:	27.4	
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:	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 and sun visor	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/Lincoln/Town Car/4-door sedan
COLOR: Green
VIN: 1LNLM81WXY645459
NHTSA NO.: CRO202

ENGINE DATA:
PLACEMENT: X LONGITUDINAL/INLINE TRANSVERSE/LATERAL
CYLINDERS: 8
DISPLACEMENT: 4.6 liters
TRANSMISSION DATA: 3 SPEED, MANUAL, X AUTOMATIC, X OVERDRIVE
FINAL DRIVE: FWD, X RWD, 4WD

DATE VEHICLE RECEIVED: 11/02/93
ODOMETER READING: 224
DEALER'S NAME: Delaware Ford Sales, Inc.
AND ADDRESS: Route 23 South
Delaware, Ohio 43015

ACCESSORIES:

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

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: Ford Motor Company
DATE OF MANUFACTURE: 09/93
VIN: 1LNLM81WXY645459
GVWR: 5465 LBS.
GAWR: FRONT: 2631 LBS.
REAR: 2878 LBS.

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

SIZE OF TIRES ON VEHICLE: P215/70R15
TIRE PRESSURE WITH MAXIMUM
CAPACITY VEHICLE LOAD: FRONT: 35 PSI
REAR: 35 PSI
SPARE TIRE: X SPACE SAVER STANDARD
TYPE OF SEATS: FRONT: Split bench
REAR: Bench

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P215/70R15
RECOMMENDED COLD TIRE PRESSURE: FRONT: 30 PSI; REAR: 34 PSI
DESIGNATED SEATING CAPACITY: 3 FRONT 3 REAR 6 TOTAL
VEHICLE CAPACITY WEIGHT: 1100 LBS.

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

The label was located on the right rear door.

TEST VEHICLE ATTITUDES:

DELIVERED ATTITUDE:	LF: 29.5;	RF: 29.0;	LR: 28.3;	RR: 28.0
FULLY LOADED ATTITUDE:	LF: 29.1;	RF: 28.5;	LR: 28.4;	RR: 28.1
PRE-TEST ATTITUDE:	LF: 28.4;	RF: 28.3;	LR: 28.5;	RR: 27.9
POST-TEST ATTITUDE:	LF: 29.8;	RF: 29.8;	LR: 27.6;	RR: 28.8

All distance measurements are in inches.

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

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

RIGHT FRONT	1076	LBS.	RIGHT REAR	932	LBS.
LEFT FRONT	1156	LBS.	LEFT REAR	881	LBS.
TOTAL FRONT WEIGHT	2232	LBS.	(55.2% OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	1813	LBS.	(44.8% OF TOTAL VEHICLE WEIGHT)		
TOTAL DELIVERED WEIGHT	4045	LBS.			

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW¹ = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (4045 LBS)

VCW = VEHICLE CAPACITY WEIGHT (1100 LBS.)

DSC = DESIGNATED SEATING CAPACITY (6)

RCLW¹ = VCW - 150 (DSC) = 200

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

TARGET TEST WEIGHT = 4045 + 200 + 328 = 4573 LBS.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 189 LBS. OF CARGO WEIGHT:

RIGHT FRONT	1171	LBS.	RIGHT REAR	1117	LBS.
LEFT FRONT	1242	LBS.	LEFT REAR	1032	LBS.
TOTAL FRONT WEIGHT	2413	LBS.	(52.9% OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	2149	LBS.	(47.10% OF TOTAL VEHICLE WEIGHT)		
TOTAL TEST WEIGHT	4562	LBS.	(0.2% UNDER TARGET TEST WEIGHT)		

WEIGHT OF BALLAST SECURED IN VEHICLE: 150 LBS. - rear passenger's footwell

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG: 54.9 INCHES REARWARD OF FRONT WHEEL CENTERLINE

WHEELBASE: 116.6 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: 931201
NHTSA NO.: CR0202
TEST DATE: 12/01/93
TEST TIME: 1452
TEST TYPE: Frontal Barrier Impact
IMPACT ANGLE: 0°
AMBIENT TEMPERATURE
AT IMPACT AREA: 66° F
TEMPERATURE IN
OCCUPANT COMPARTMENT: 69° F
IMPACT VELOCITY:
PRIMARY: 29.6 MPH
SECONDARY: 29.6 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: 213.2;	C: 218.5;	R: 214.5
POST-TEST:	L: 201.2;	C: 200.8;	R: 193.0
TOTAL CRUSH:	L: 12.0;	C: 17.7;	R: 21.5
AVERAGE CRUSH:	17.1		

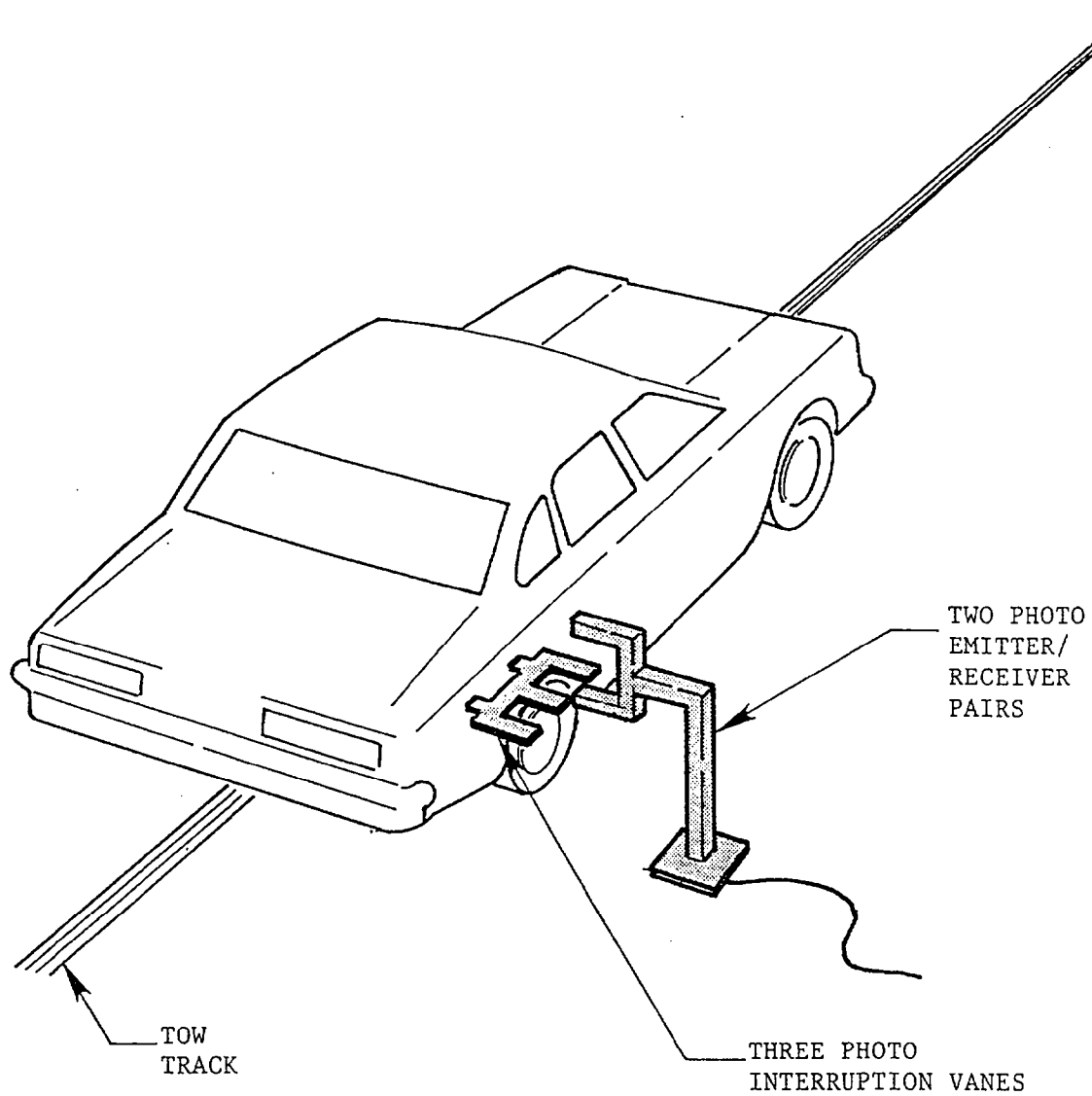
TEST VEHICLE REBOUND FROM FLAT BARRIER:

DISTANCE FROM TEST VEHICLE TO BARRIER:

L:	24.1;	C: 25.6;	R: 32.6
AVG.:	27.4		

All distance measurements are in inches.

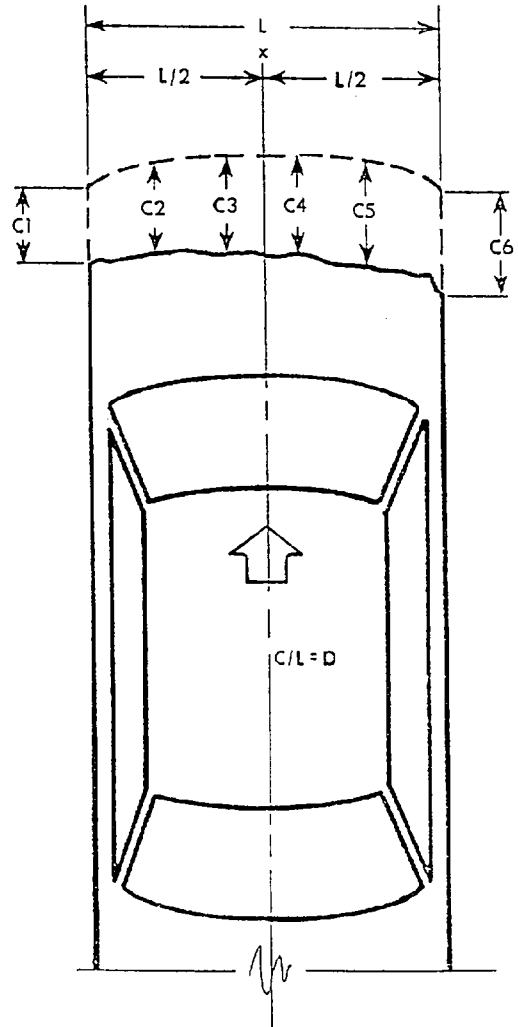
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



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.: CR0202
 TEST DATE: 12/01/93
 VEHICLE YEAR/MAKE/
 MODEL/BODY STYLE: 1994/Lincoln/Town Car/4-door sedan
 VEHICLE SIZE CATEGORY: Large
 VIN: 1LNLM81WXRY645459
 BUILD DATE: 09/93
 TEST WEIGHT: 4562 LBS.
 VEHICLE WHEELBASE: 116.6
 MAXIMUM WIDTH: 73.6
 FRONT OVERHANG: 33.5



COLLISION DEFORMATION

CLASSIFICATION (CDC) CODE: 12FDEW2

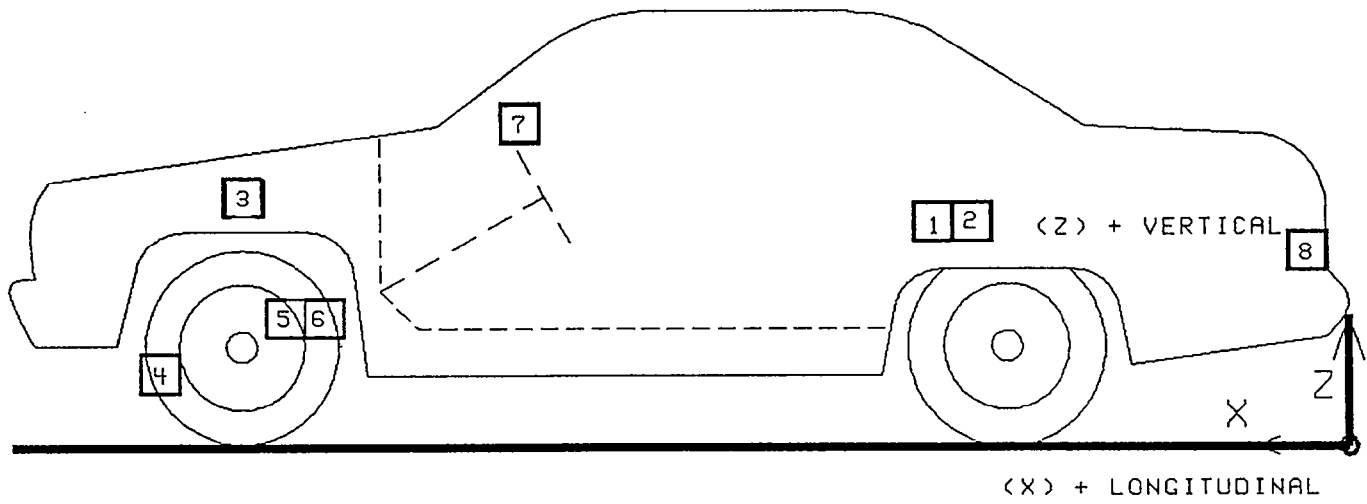
CRUSH DEPTH	C1:	12.0
MEASUREMENTS:	C2:	14.4
	C3:	16.8
	C4:	19.2
	C5:	20.8
	C6:	21.5

MIDPOINT OF DAMAGE: D: Vehicle Longitudinal Centerline

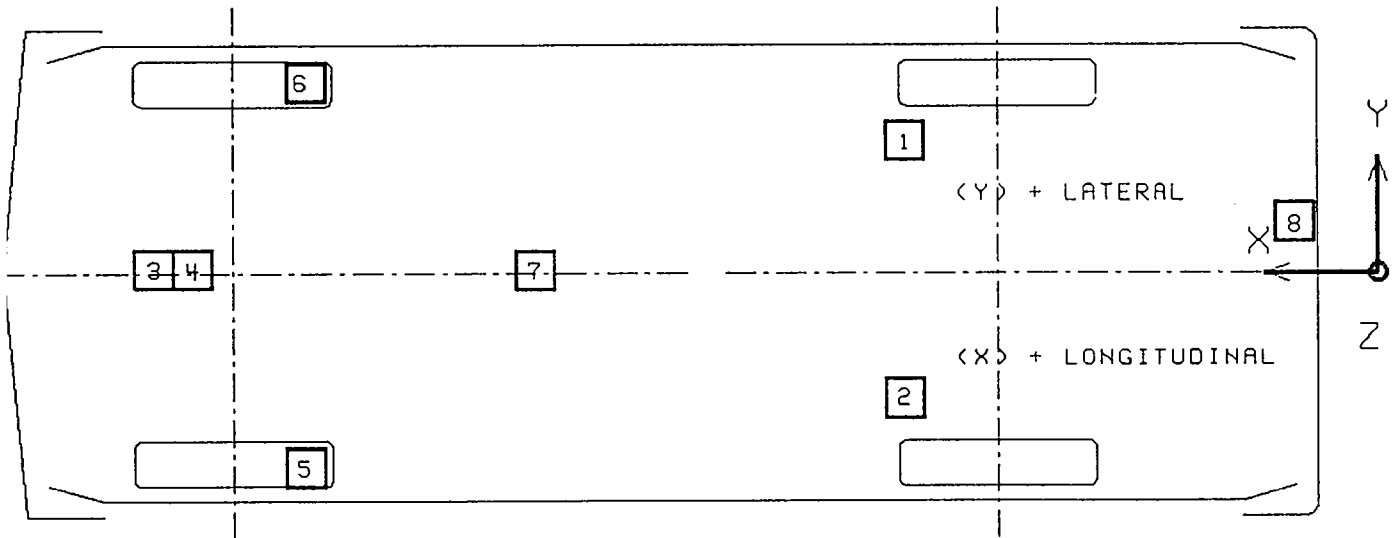
LENGTH OF DAMAGED
 REGION: L: 59.4

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 931201

No. LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
				MAX G	MSEC	MAX G	MSEC
1 LEFT REAR SEAT CROSSMEMBER LONGITUDINAL ¹	PRE 88.2	19.5	15.4				
	POST 88.7	19.7	15.4				
				0.0	2.9	35.5	79.7
2 RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE 88.0	-20.0	15.4				
	POST 88.4	-20.0	15.5				
				1.7	171.4	28.2	78.7
3 ENGINE TOP LONGITUDINAL	PRE 174.8	-13.0	27.8				
	POST 170.2	-14.2	30.2				
				12.5	101.2	36.6	70.2
4 ENGINE BOTTOM LONGITUDINAL	PRE 166.2	3.0	10.2				
	POST 164.0	3.4	10.8				
				1.9	109.7	29.3	75.2

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY CONTINUED

TEST NUMBER 931201

No. LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
				MAX G MSEC		MAX G MSEC	
5 RIGHT BRAKE CALIPER LONGITUDINAL ¹	PRE 172.5	-24.0	14.7				
	POST 168.5	-23.0	12.2				
			50.5	36.0	52.8	30.8	
6 LEFT BRAKE CALIPER LONGITUDINAL	PRE 172.6	24.0	14.7				
	POST 166.1	24.8	13.8				
			60.9	35.9	70.1	73.6	
7 INSTRUMENT PANEL CENTER LONGITUDINAL	PRE 144.9	0.0	40.0				
	POST 146.1	0.5	40.8				
			26.2	75.8	62.1	38.1	
8 VEHICLE REAR CENTER VERTICAL	PRE 14.0	0.0	16.0				
	POST 14.0	0.0	21.5				
			11.8	91.8	20.6	113.6	

* 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.: CRO202
VEHICLE YEAR/MAKE/
MODEL/BODY STYLE: 1994/Lincoln/Town Car/4-door sedan
BODY COLOR: Green
VIN: 1LNLM81WXY645459
ODOMETER (ARRIVAL): 224 DATE: 11/02/93
ODOMETER (COMPLETION): 230 DATE: 12/01/93
COST: \$31,791.00

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	Power
POWER DOOR LOCKS	Yes	SUN/MOON ROOF	No	SEAT TYPE	Front-split
RADIO	Yes	T-TOP	No		Rear-bench
CLOCK	Yes	TILT STEERING WHEEL	Yes	NO. OF SEATS	6
ROOF RACK	No	OTHER OPTIONS:	None		

ENGINE: 8 CYLINDERS
LITERS: 4.6
TRANSMISSION: 3-speed automatic
DRIVE TYPE: Rear-wheel drive
TIRE SIZE: P215/70R15
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	-69.8	-19.3	-37.7	78.2	-50.6	-10.4	-15.6
PASSENGER ¹	-60.5	-32.5	-30.7	62.7	-27.2	4.3	-13.4

MAXIMUM FEMUR COMPRESSIVE FORCE (LBS.)		
	LEFT FEMUR	RIGHT FEMUR
DRIVER	1393	783
PASSENGER	1030	1251

HEAD INJURY CRITERIA ²			
	HIC	TIME t ₁ (MSEC)	TIME t ₂ (MSEC)
DRIVER	289	80.3	93.2
PASSENGER ¹	175	93.9	105.5

CHEST MAXIMUM RESULTANT ACCELERATION ³			
	ACCEL. (G)	TIME t ₁ (MSEC)	TIME t ₂ (MSEC)
DRIVER	48.8	99.0	102.0
PASSENGER	28.4	107.9	110.9

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 chest impacted the airbag. The dummy's head impacted the airbag and then rotated upwards contacting the sun visor. The driver dummy was restrained by the airbag. The dummy rebounded rearward into the seat back as the dummy's head rotated downward and then rearward contacting the head restraint. The driver dummy came to rest 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 and chest impacted the airbag as the dummy's head rotated rearward contacting the sun visor. The right front passenger dummy was restrained by the airbag. The dummy rebounded rearward and to the left into the seat back as the dummy's head rotated rearward again contacting the sun visor. The right front passenger dummy came to rest in the right front passenger's seat leaning to the left.

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

MAKE/MODEL/BODY STYLE: Lincoln/Town Car/4-door sedan
NHTSA NO.: CR0202
VIN: 1LNLM81WXRY645459
DATE OF MANUFACTURE: 09/93

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: Lincoln/Town Car/4-door sedan
NHTSA NO.: CR0202
VIN: 1LNLM81WXRY645459
DATE OF MANUFACTURE: 09/93

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: Lincoln/Town Car/4-door sedan
NHTSA NO.: CR0202
VIN: 1LNLM81WXRY645459
DATE OF MANUFACTURE: 09/93

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? YES

ARE THE REMAINING TWO PARTS ACCESSIBLE UNDER NORMAL CONDITIONS? YES

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? NO

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? YES

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 = 6 sec.

Duration of reminder light operation = 6 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 = 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 PROTECTON SYSTEM:

The label was located on the driver's sun visor.

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

 Replace

 Repair

X Other: No maintenance needed unless the airbag lamp flashes or stays lit, the airbag lamp does not light when the key is turned on, or groups of five beeps are heard.

This system: (check one)

 a. by month, year

___b. by ___ miles

____c. or after a time interval of _____ months or _____ years.

 d. other: _____

WERE APPROPRIATE INSTRUCTIONS CONCERNING MAINTENANCE AND/OR REPLACEMENT OF THIS SYSTEM PROVIDED? YES, owner's manual, pages 46 and 47

WAS A DESCRIPTION OF THE FUNCTIONAL OPERATION OF THE SYSTEM PROVIDED?

YES, owner's manual, pages 46 and 47

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, pages 46 and 47

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 at left side 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, pages 46 and 47

FIGURE 4 FMVSS 212 TEST DATA

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

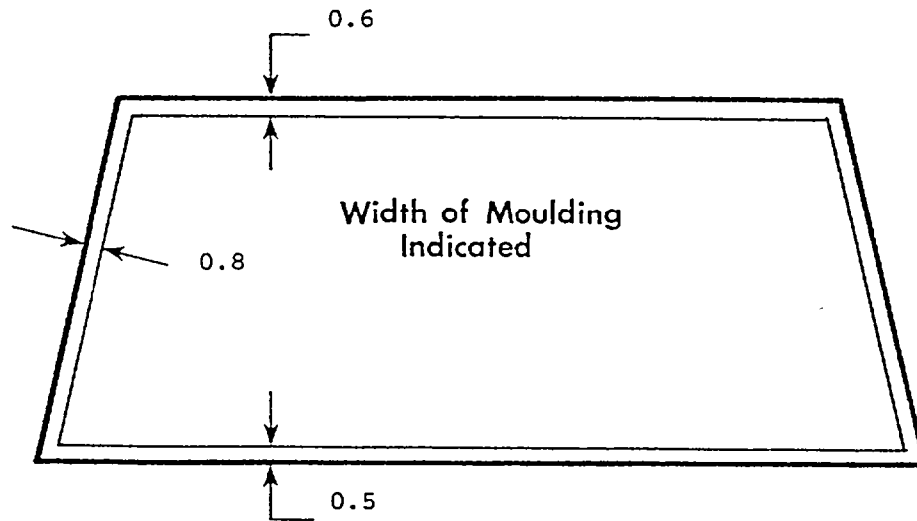
Metal/plastic trim around outer perimeter, adhesive around inner perimeter.

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	87.5	87.5	100
LEFT SIDE	87.5	87.5	100
TOTAL	175.0	175.0	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.

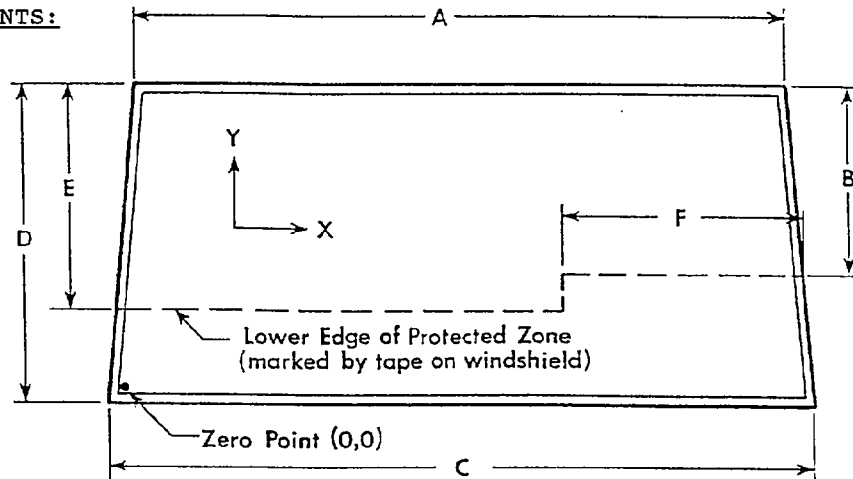
FIGURE 5 FMVSS 219 TEST DATA

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: 55.1
B: 15.4
C: 70.6
D: 28.5
E: 15.2
F: NA



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: Lincoln/Town Car
NHTSA NO.: CR0202
FUEL SYSTEM CAPACITY: 20.0 GALLONS (FROM OWNER'S MANUAL)
USABLE CAPACITY: 20.0 GALLONS (FURNISHED BY COTR)
TEST VOLUME RANGE: 18.4 GALLONS TO 18.8 GALLONS (92-94% OF USABLE)
ACTUAL TEST VOLUME: 18.6 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 behind 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.: CR0202
TEST DATE: 12/01/93
VEHICLE YEAR/MAKE/
MODEL/BODY STYLE: 1994/Lincoln/Town Car/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:

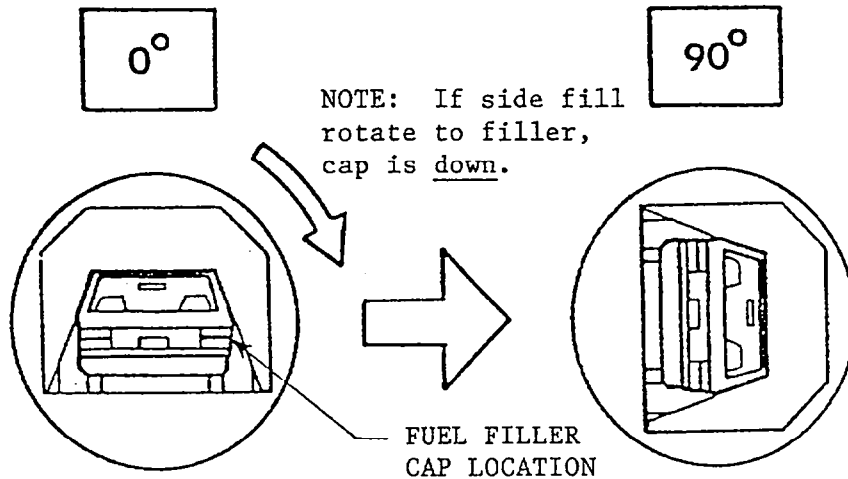
	<u>TEST</u> <u>RESULTS</u>	<u>MAXIMUM</u> <u>ALLOWABLE</u>
1. FROM IMPACT UNTIL VEHICLE MOTION CEASES	0 OZ.	1 OZ.
2. 5-MINUTE PERIOD AFTER VEHICLE MOTION CEASES	0 OZ.	5 OZ.
3. NEXT 25 MINUTES AFTER 5 MINUTE PERIOD	0 OZ.	1 OZ./1 MIN.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 6 FMVSS 301 STATIC ROLLOVER TEST DATA

NHTSA NO.: CR0202
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:

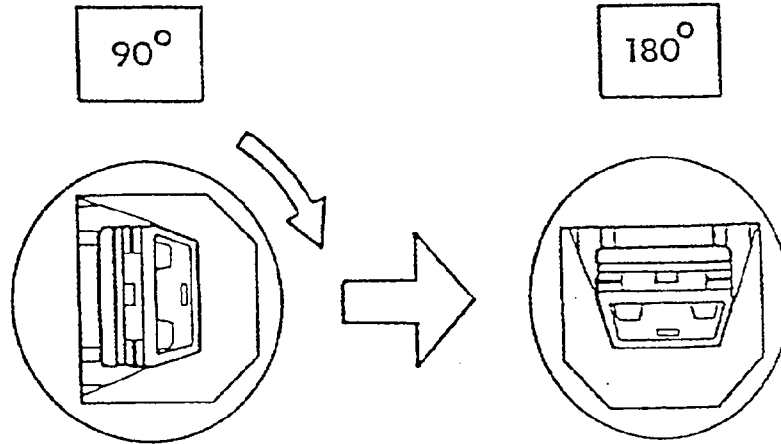
<u>0° TO 90° ROTATION (FUEL FILLER CAP DOWN)</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CR0202
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.

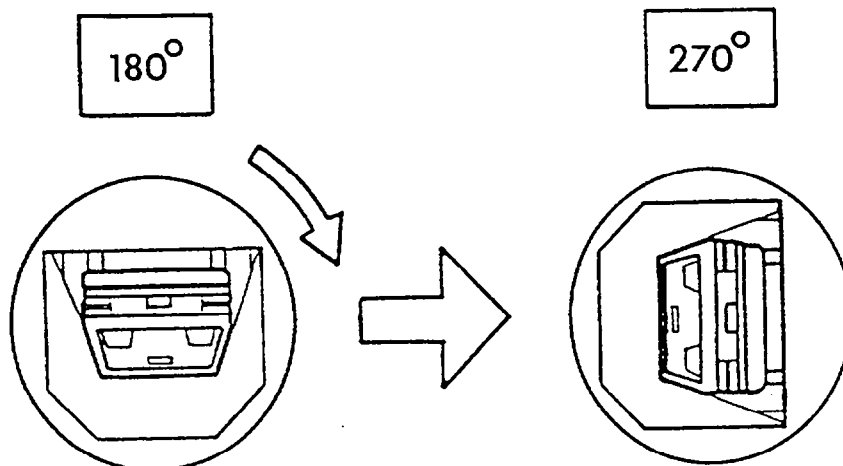
FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CR0202

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:

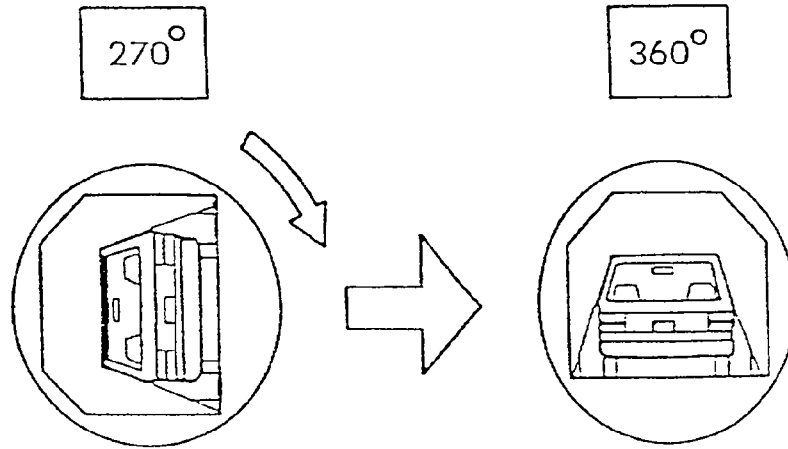
<u>180° TO 270° ROTATION</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CR0202
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

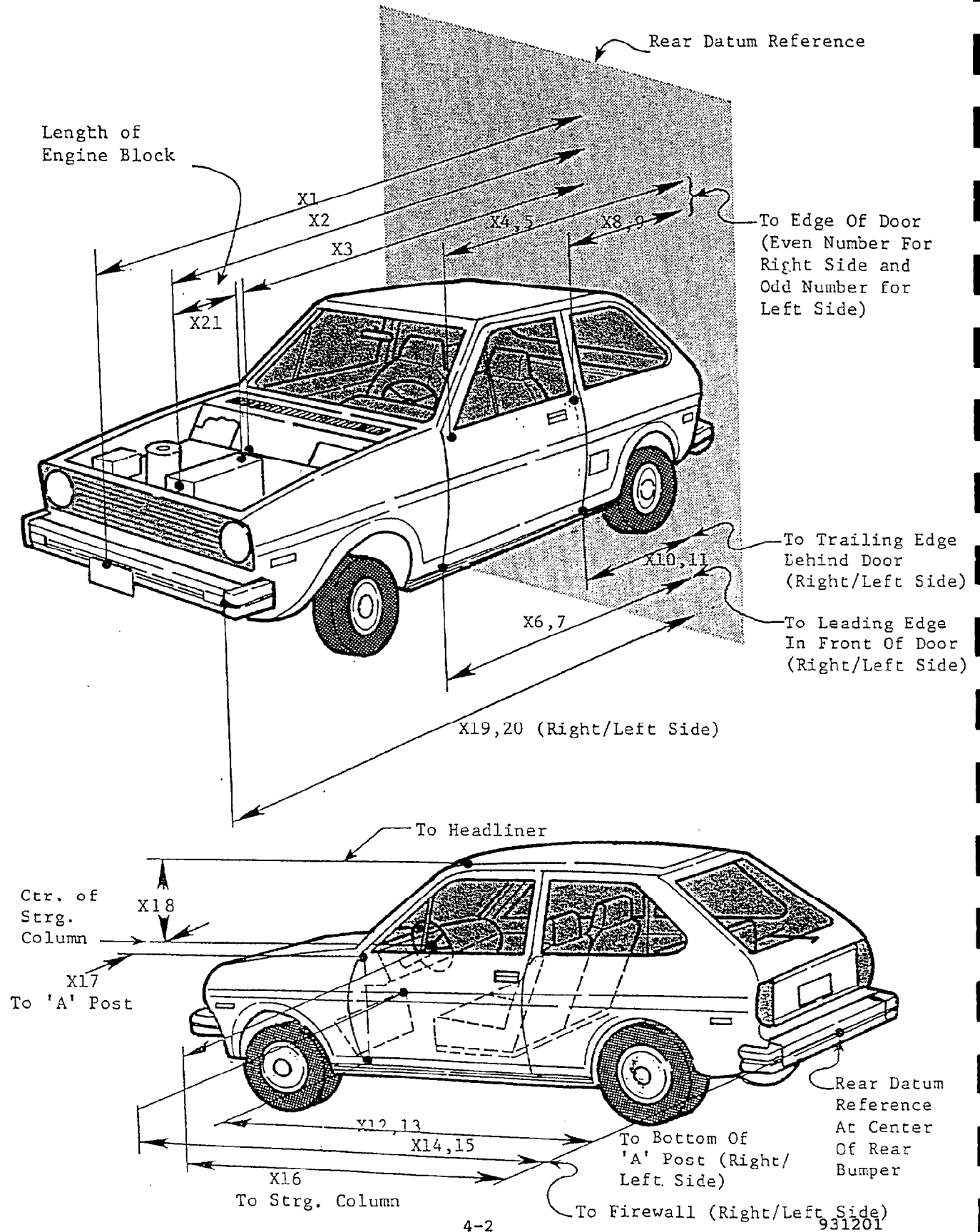


TABLE 12 IMPACTED VEHICLE MEASUREMENTS

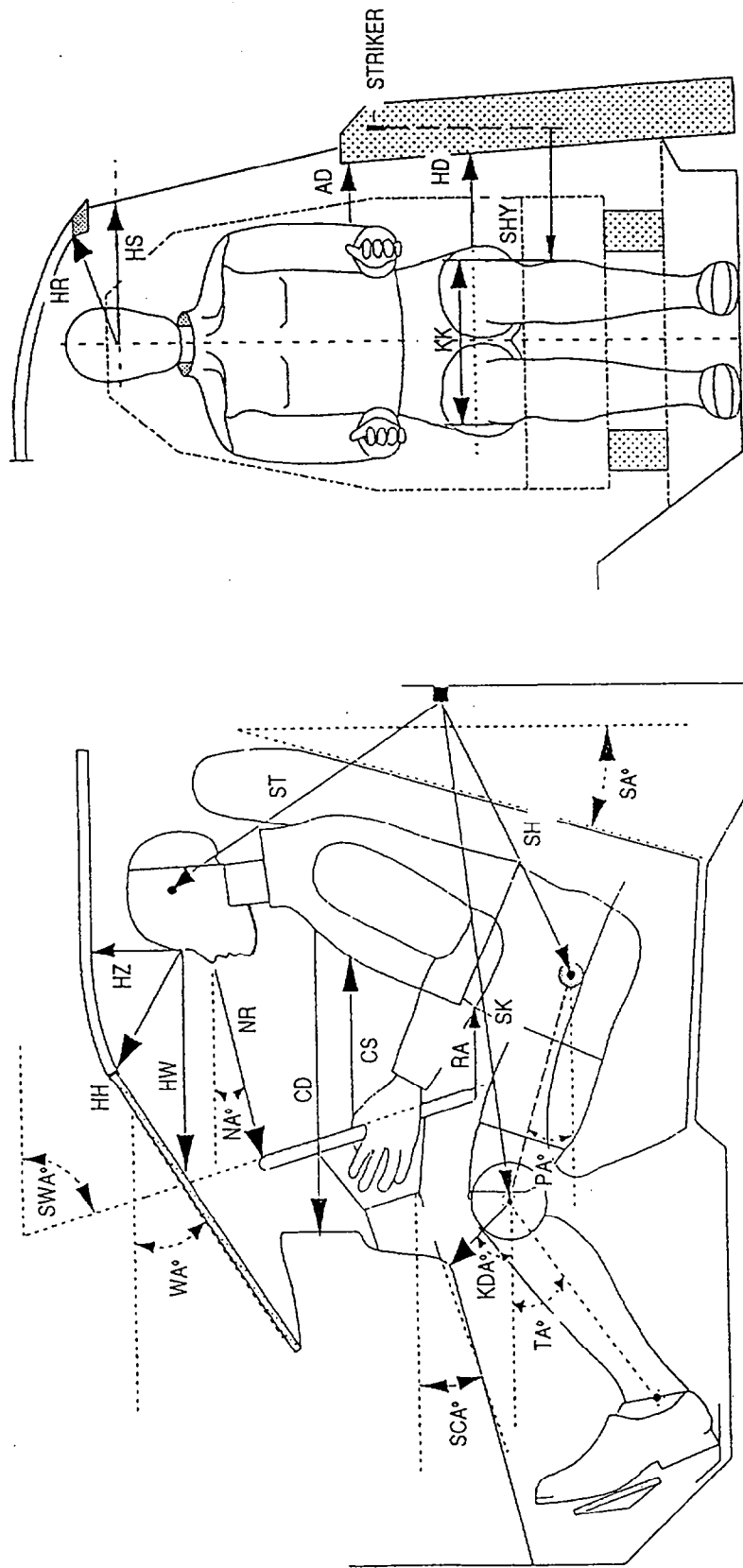
VEHICLE MAKE/MODEL: Lincoln Town Car		TEST NUMBER: 931201		
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	218.5	200.8	17.7
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	182.2	178.0	4.2
X3	REAR SURFACE OF VEHICLE TO FIREWALL	155.1	153.8	1.3
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	149.2	149.6	-0.4
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	149.2	149.6	-0.4
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	146.6	146.2	0.4
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	147.0	146.8	0.2
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	105.4	106.0	-0.6
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	105.5	106.0	-0.5
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	102.1	101.8	0.3
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	102.5	102.5	0.0
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	145.0	145.0	0.0
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	145.3	145.0	0.3
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	168.8	157.0	11.8
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	165.8	155.2	10.6
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	130.5	130.2	0.3
X17	CENTER OF STEERING COLUMN TO "A" POST	13.6	13.4	0.2
X18	CENTER OF STEERING COLUMN TO HEADLINER	17.0	16.0	1.0
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	214.5	193.0	21.5
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	213.2	201.2	12.0
X21	LENGTH OF ENGINE BLOCK	22.0	22.0	0.0

All distance measurements are in inches.

[illegible]

FIGURE 9

DUMMY MEASUREMENT LOCATIONS FOR FRONT SEAT OCCUPANTS



VERTICAL TRANSVERSE PLANE

VERTICAL LONGITUDINAL PLANE

Passenger

Driver

TABLE 13 DUMMY MEASUREMENT DATA FOR FRONT SEAT OCCUPANTS

DESIGNATION	TYPE OF MEASUREMENT	DRIVER (SERIAL #353)	PASSENGER (SERIAL #354)
WA	WINDSHIELD ANGLE	35	NA
SWA	STEERING WHEEL ANGLE	65	NA
SCA	STEERING COLUMN ANGLE	26	NA
SA	SEAT BACK ANGLE	23	23
HZ	HEAD TO ROOF	5.6	5.2
HH	HEAD TO HEADER	15.4	16.9
HW	HEAD TO WINDSHIELD	20.0	20.2
HR	HEAD TO SIDE HEADER	9.6	8.7
NR	NOSE TO RIM	17.1	NA
NA	NOSE TO RIM ANGLE	18	NA
CD	CHEST TO DASH	23.0	22.8
CS	STEERING WHEEL TO CHEST	10.6	NA
RA	RIM TO ABDOMEN	6.1	NA
KDL	LEFT KNEE TO DASH	6.2	6.5
KDR	RIGHT KNEE TO DASH	6.5	6.4
KDA	OUTBOARD KNEE TO DASH ANGLE	47	35
PA	PELVIC ANGLE	11	11
TA	TIBIAL ANGLE	33	34
KK	KNEE TO KNEE	14.5	11.8
ST ¹	STRIKER TO HEAD	20.0	19.8
	STRIKER TO HEAD ANGLE	-97	-90
SK ¹	STRIKER TO KNEE	24.6	24.9
	STRIKER TO KNEE ANGLE	6	6
SH ¹	STRIKER TO H-POINT	11.8	11.8
	STRIKER TO H-POINT ANGLE	36	32
SHY	STRIKER TO H-POINT (Y DIR.)	11.2	11.0
HS	HEAD TO SIDE WINDOW	10.8	11.2
HD	H-POINT TO DOOR	5.7	5.2
AD	ARM TO DOOR	5.9	5.5

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

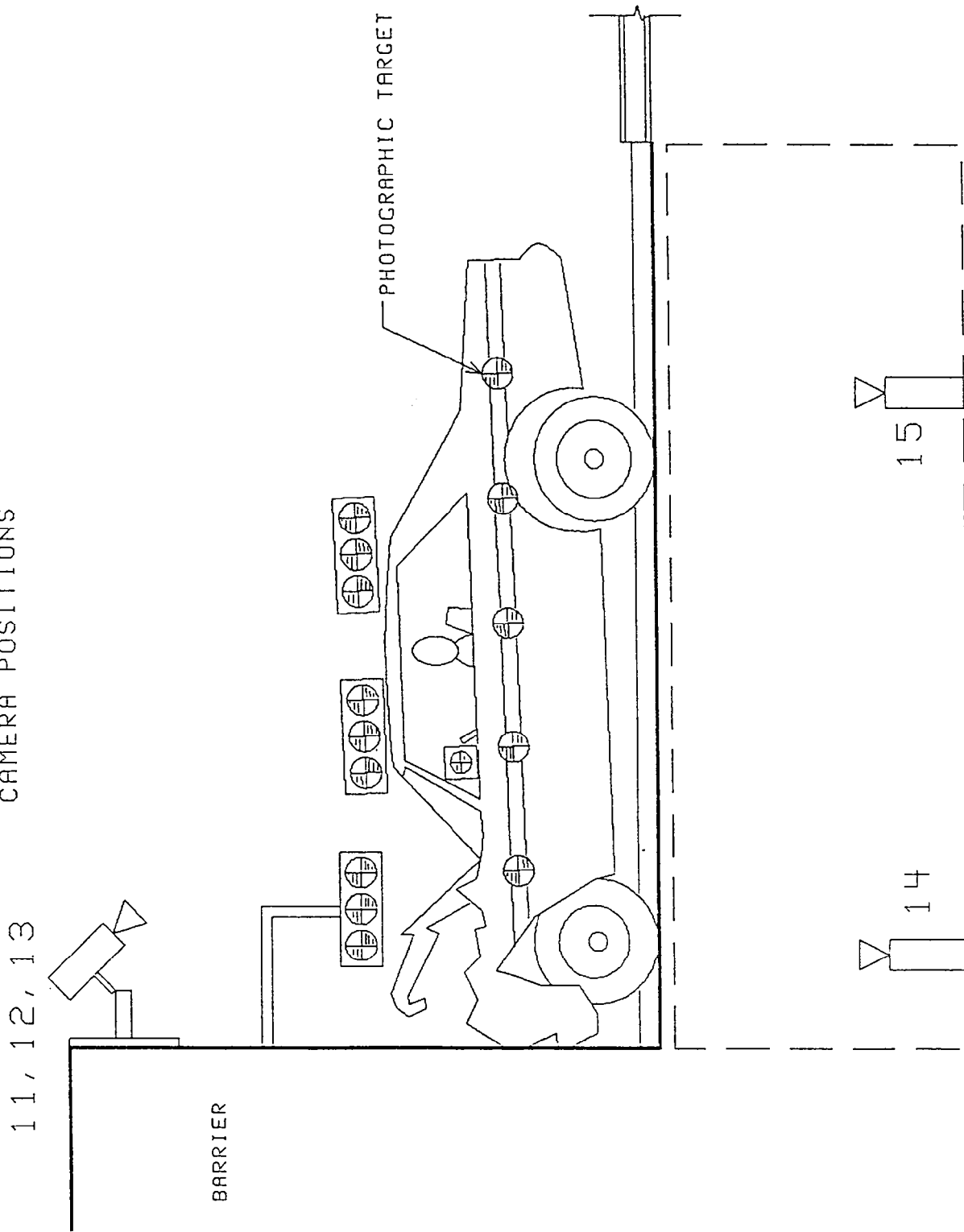


FIGURE 10
CAMERA POSITIONS, CONTINUED

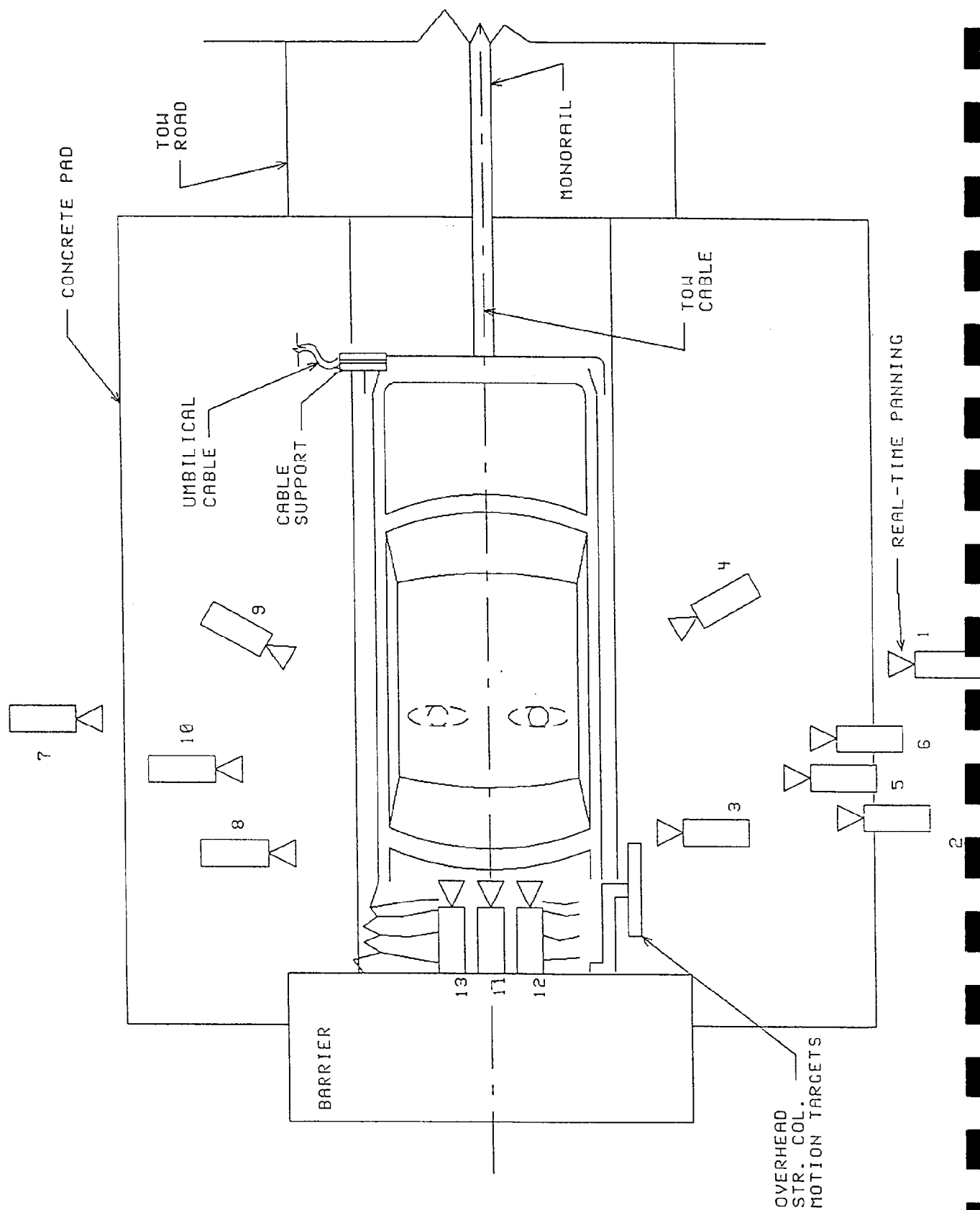


TABLE 14 MOTION PICTURE CAMERA LOCATIONS

TEST NO.: 931201		VEHICLE: 1994 Lincoln Town Car 4-door sedan		FILM PLANE			FILM SPEED (FPS)
CAMERA NO.	VIEW	CAMERA POSITIONS (IN.) ¹			TO HEAD TARGET (IN.)	LENS (MM)	
		X	Y	Z	ANGLE ² (DEG)		
1	Real-time panning	-142.0	504.0	61.0	NA	16	24
2	Right overall	-81.3	-266.4	37.1	-2	13	990
3	Left vehicle crush	-41.5	295.0	44.0	-4	25	998
4	Windshield front view	-6.0	0.0	89.0	-40	13	1000
5	Pit - front position	-50.5	0.0	-92.4	90	13	1002
6	Pit - rear position	-99.3	0.0	-99.0	90	13	975
7	Passenger - front view	-4.5	-13.8	93.0	-50	17	1000
8	Driver - front view	-6.8	14.5	93.0	-50	17	1015
9	Driver kinematics	-157.3	116.0	87.0	-27	25	995
10	Passenger kinematics	-152.1	-116.0	87.0	-26	25	980
11	Right windshield intrusion	-38.1	-306.1	44.0	0	50	1010
12	Left windshield intrusion	-53.0	309.4	42.3	0	50	1005
13	Steering column motion	-88.0	286.0	103.0	-14	25	1008
14	Steering column motion	-88.0	286.0	75.1	-9	25	1000
15	Passenger kinematics	-38.8	-293.0	45.3	-4	25	1022
16	Real-time documentation	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

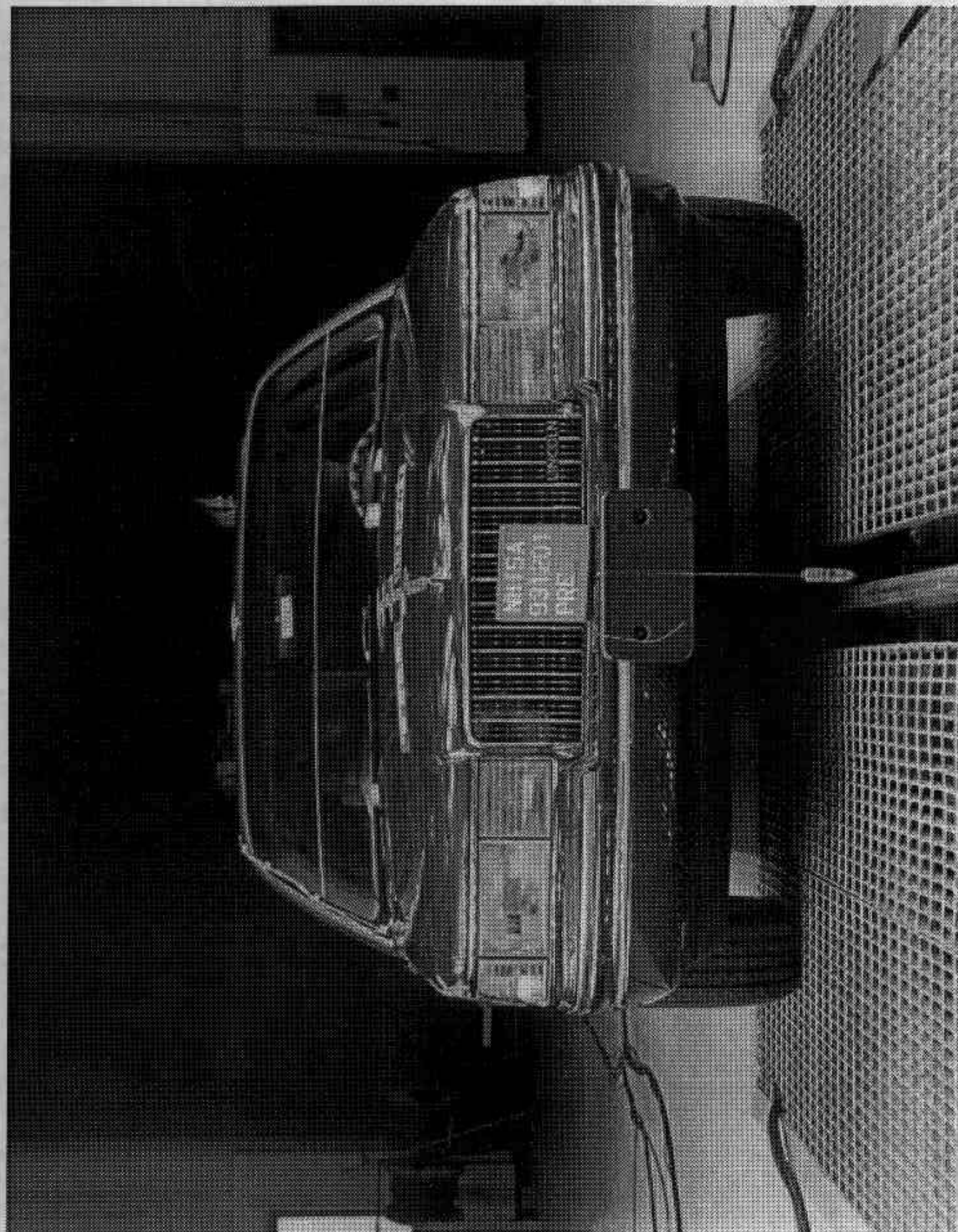


Figure A-1. PRE-TEST FRONT VIEW
A-2

931201

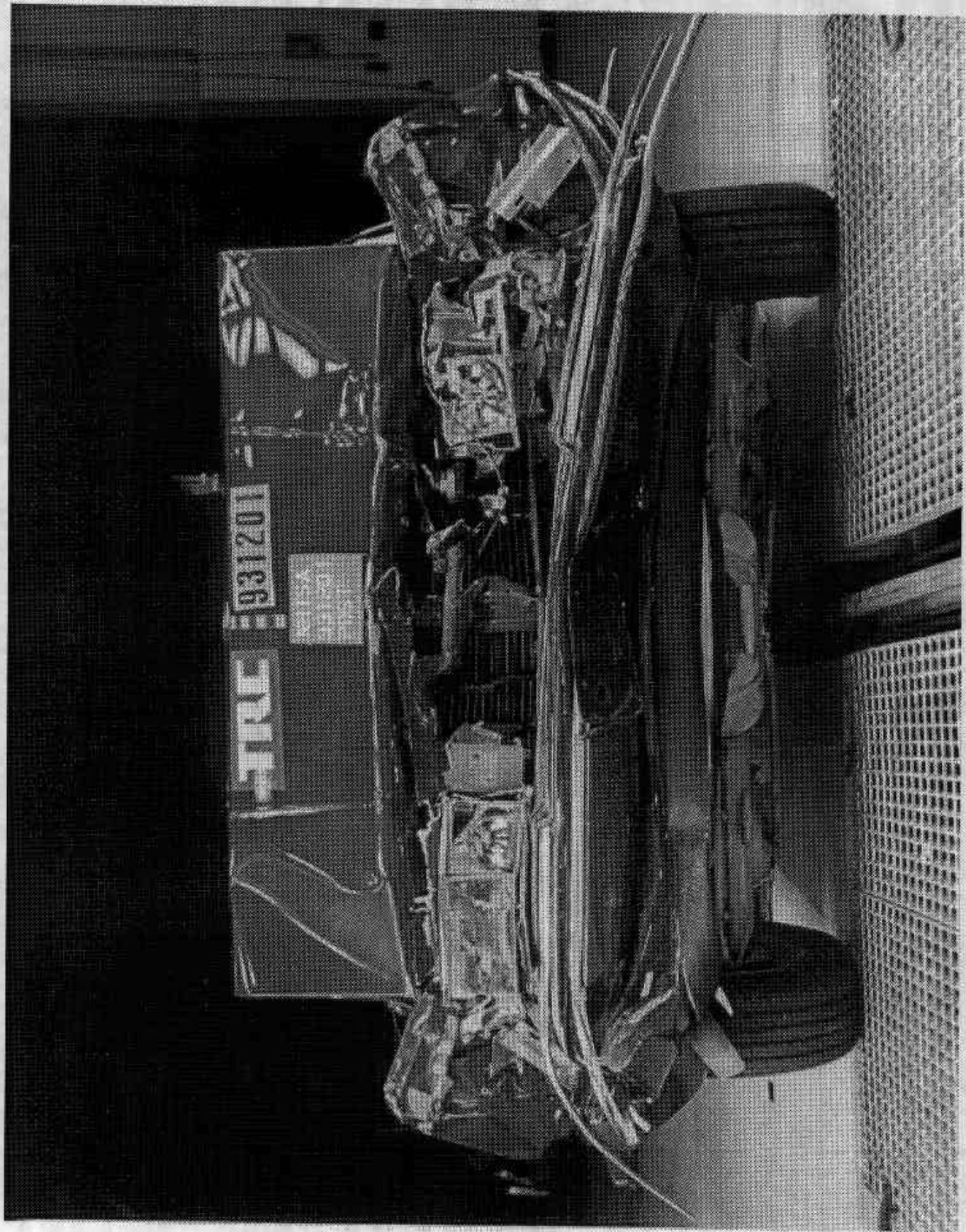


Figure A-2. POST-TEST FRONT VIEW
A-3

931201

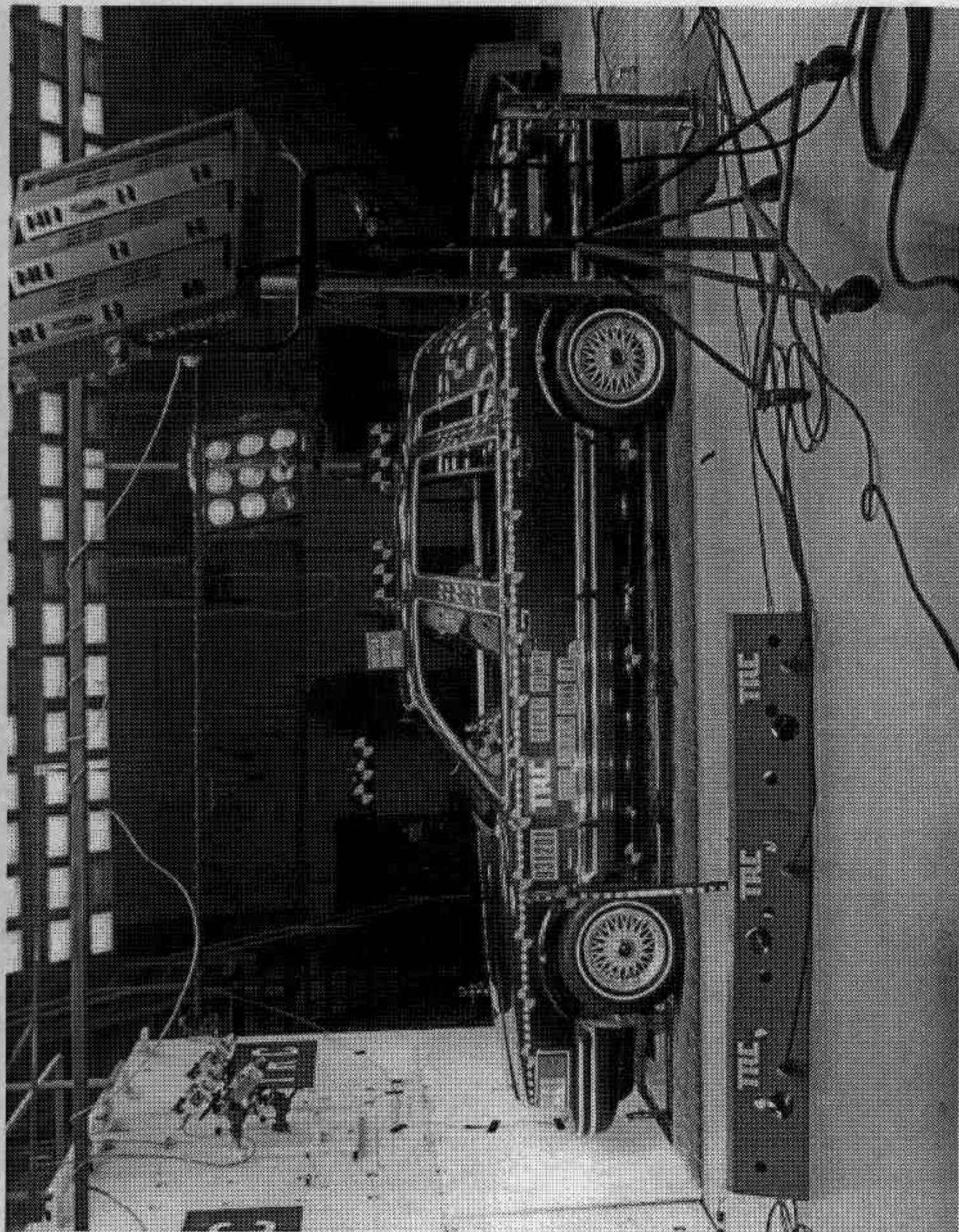


Figure A-3. PRE-TEST LEFT SIDE VIEW

A-4

931201

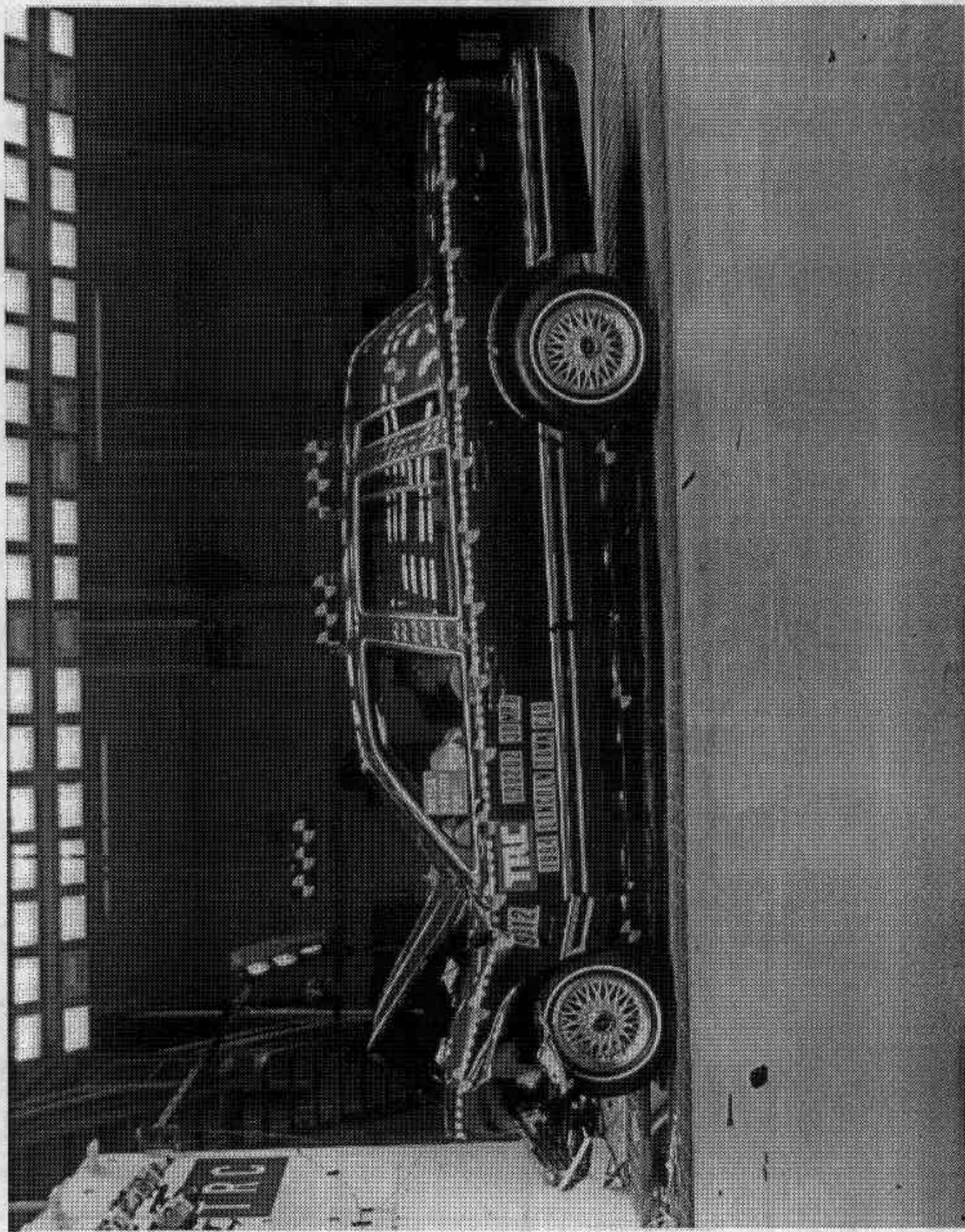


Figure A-4. POST-TEST LEFT SIDE VIEW

A-5

931201

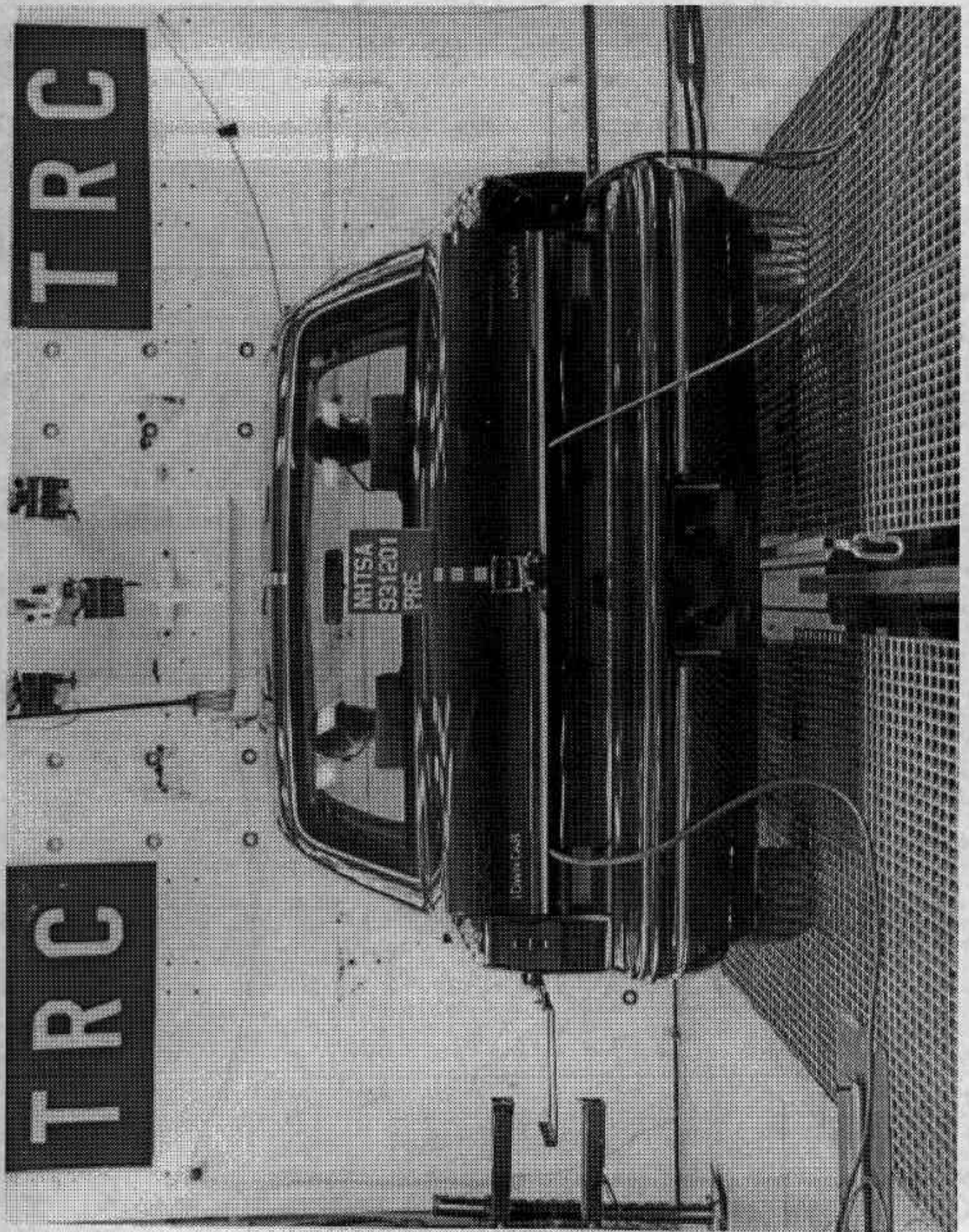


Figure A-5. PRE-TEST REAR VIEW
A-6

931201

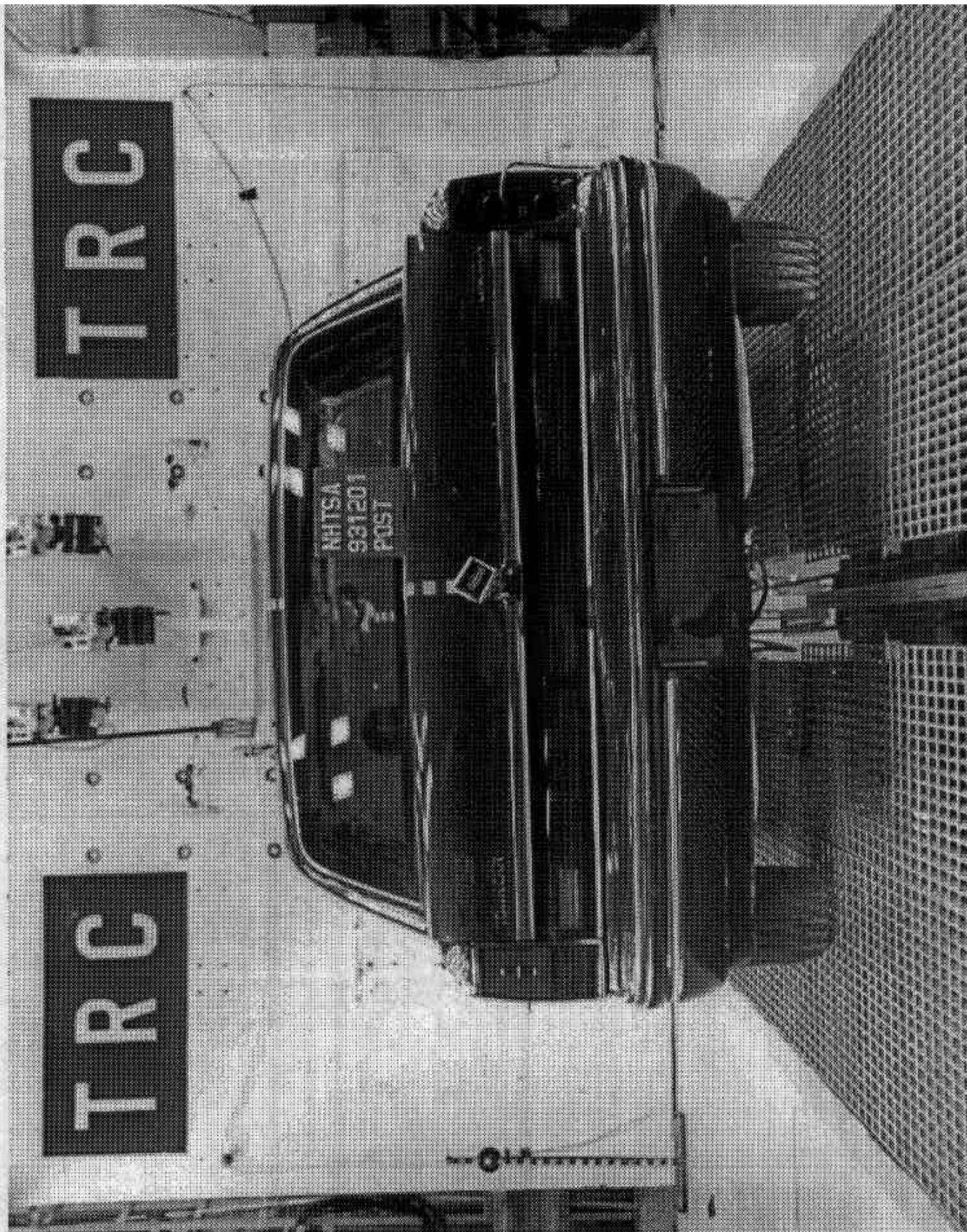


Figure A-6. POST-TEST REAR VIEW
A-7

931201

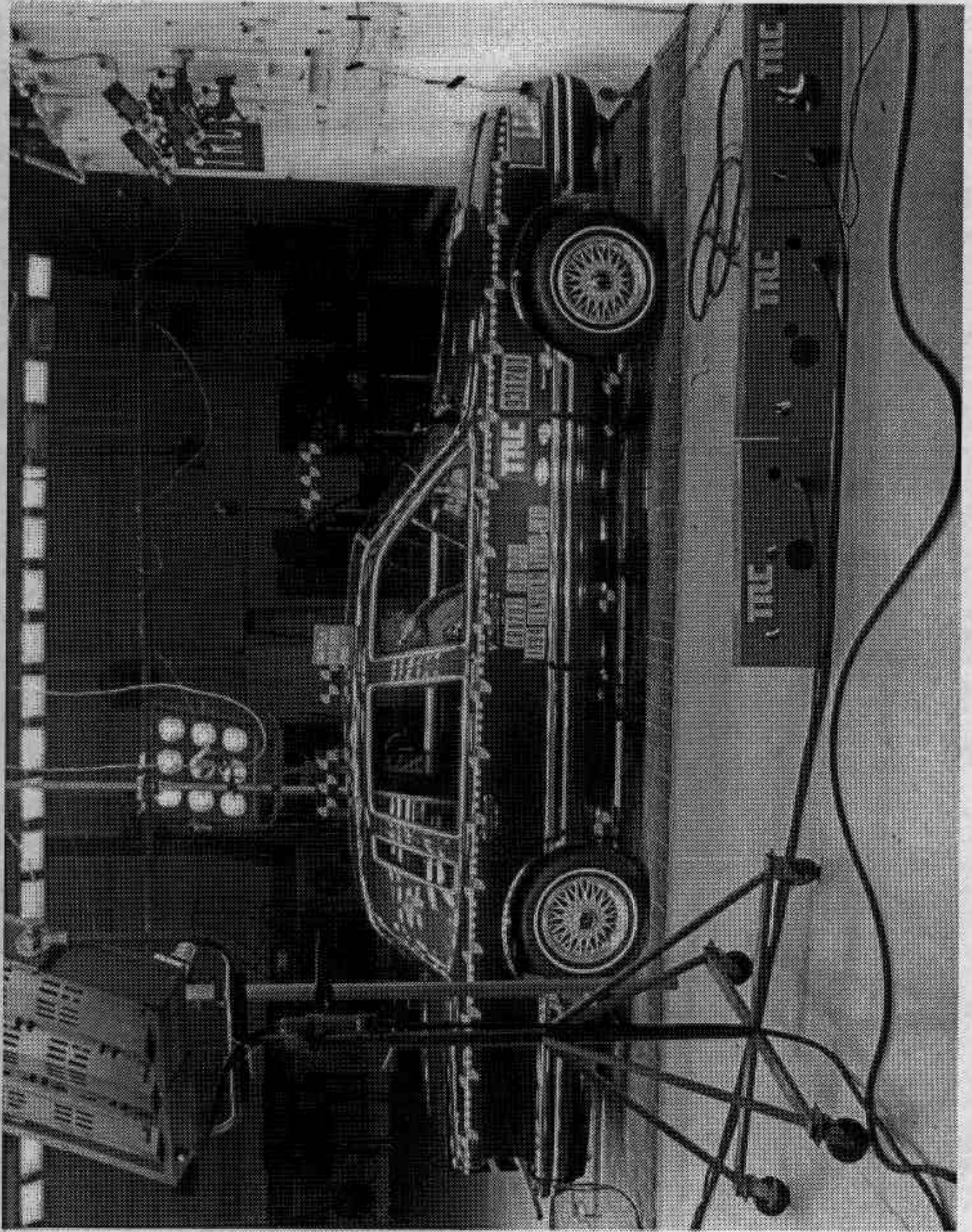


Figure A-7. PRE-TEST RIGHT SIDE VIEW

A-8

931201

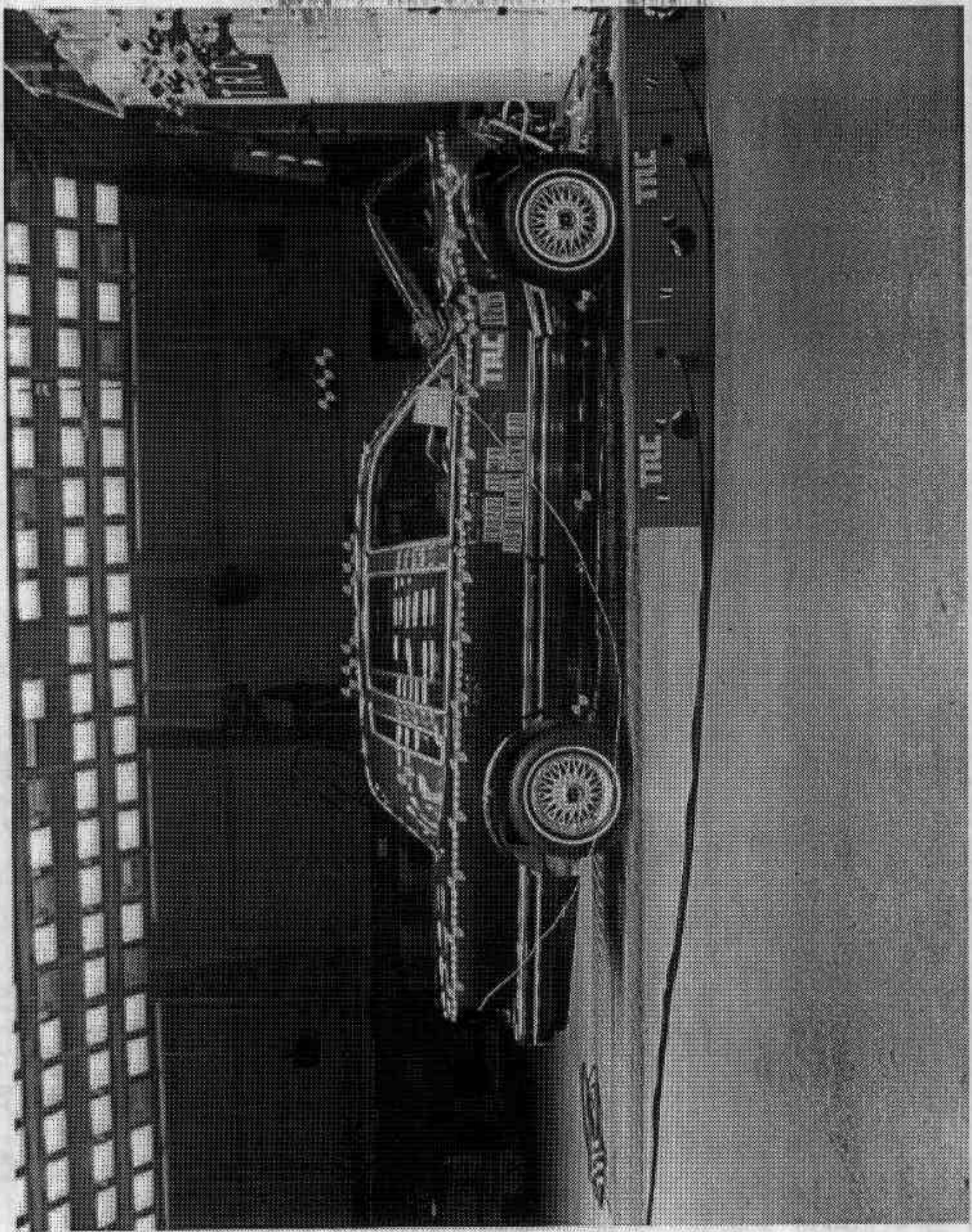


Figure A-8. POST-TEST RIGHT SIDE VIEW

A-9

931201

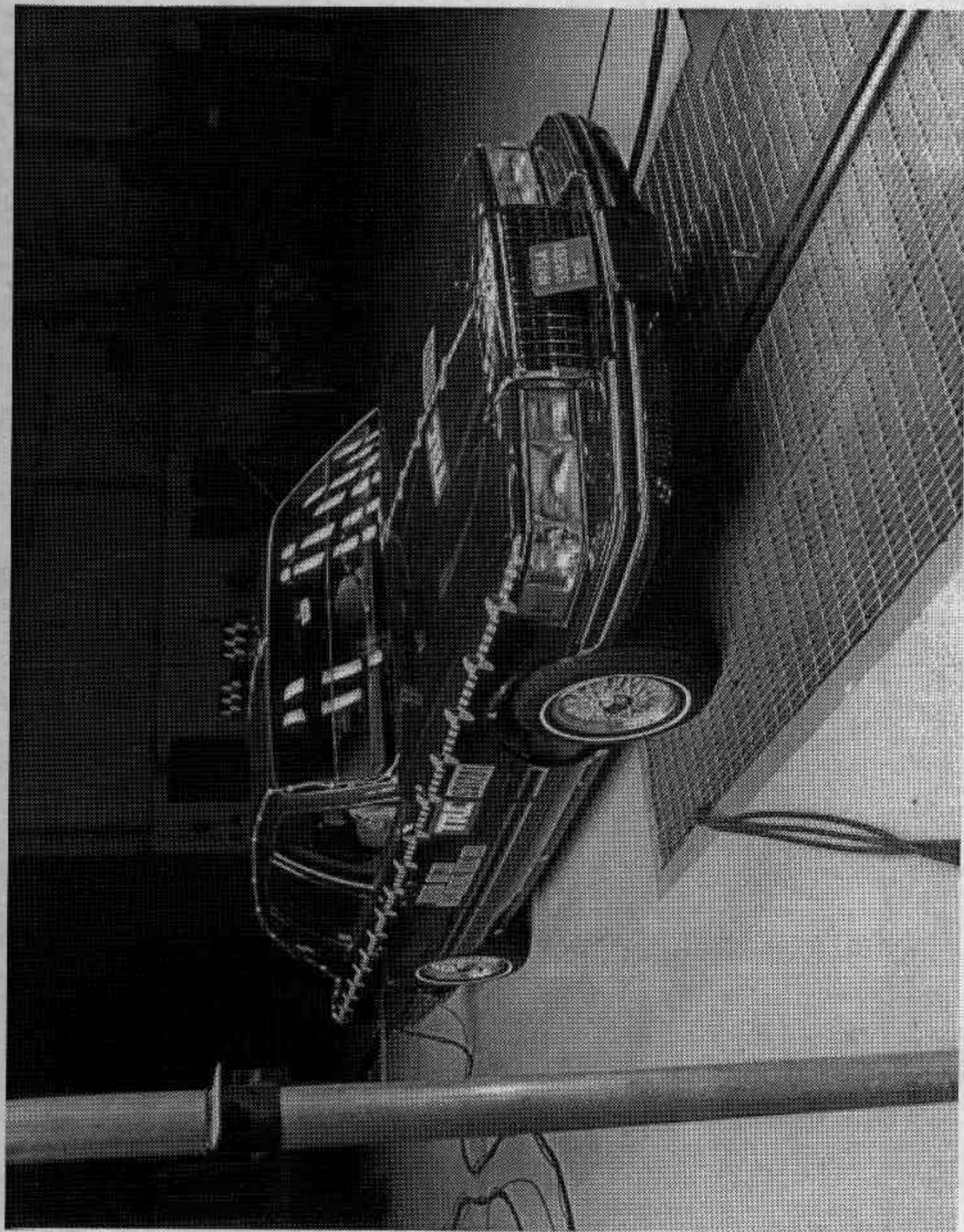


Figure A-9. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-10

931201

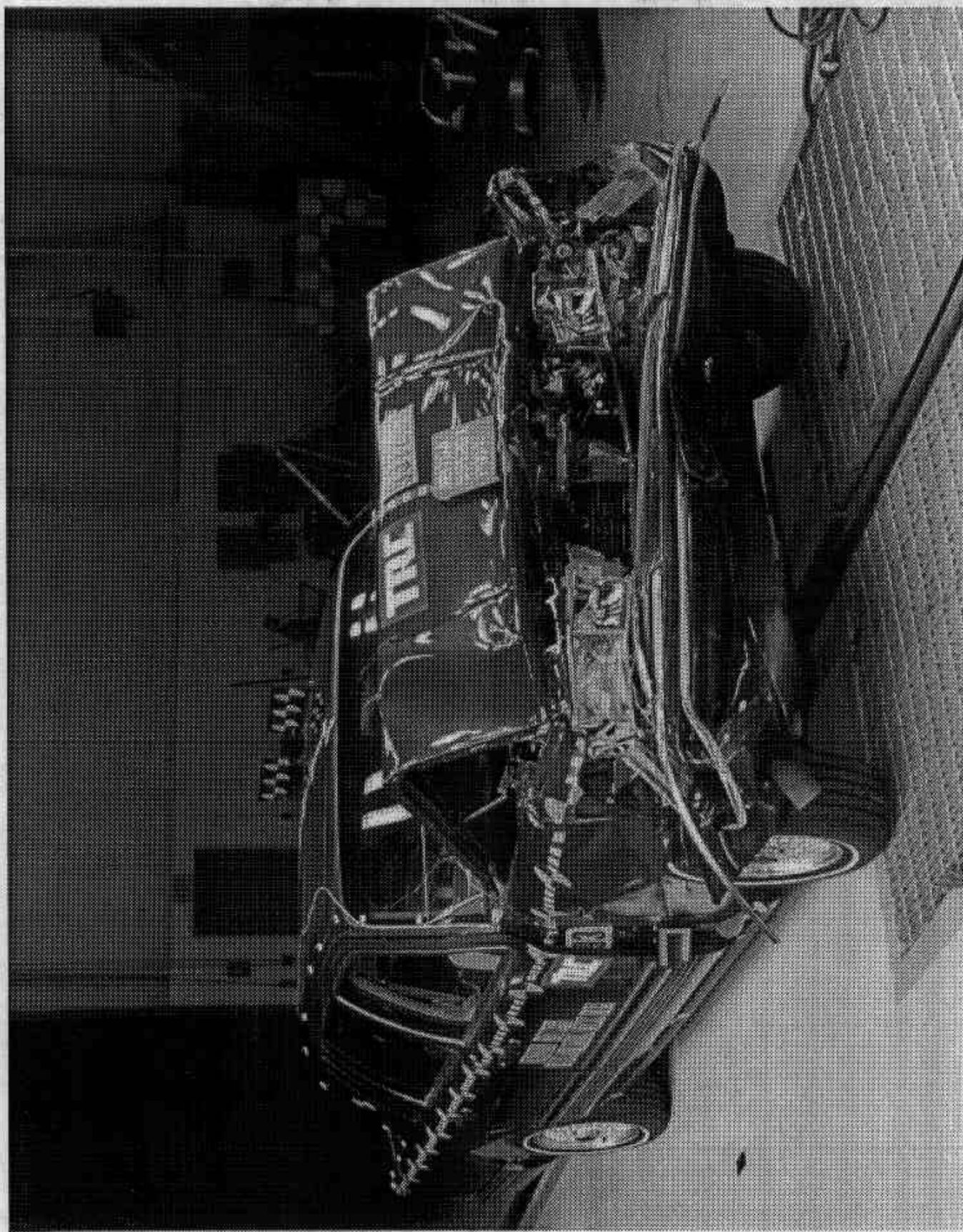


Figure A-10. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-11

931201

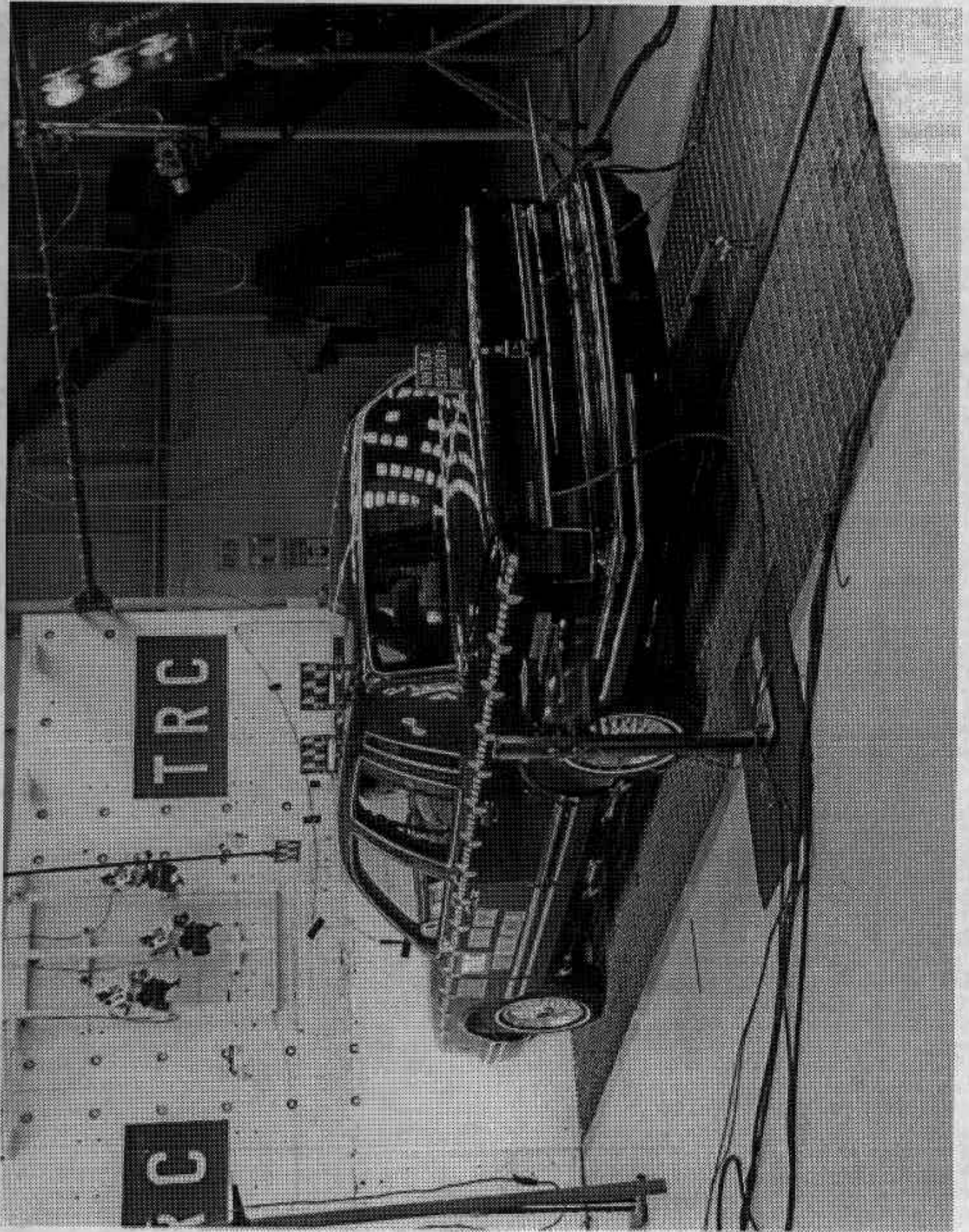


Figure A-11. PRE-TEST LEFT REAR THREE-QUARTER VIEW

A-12

931201

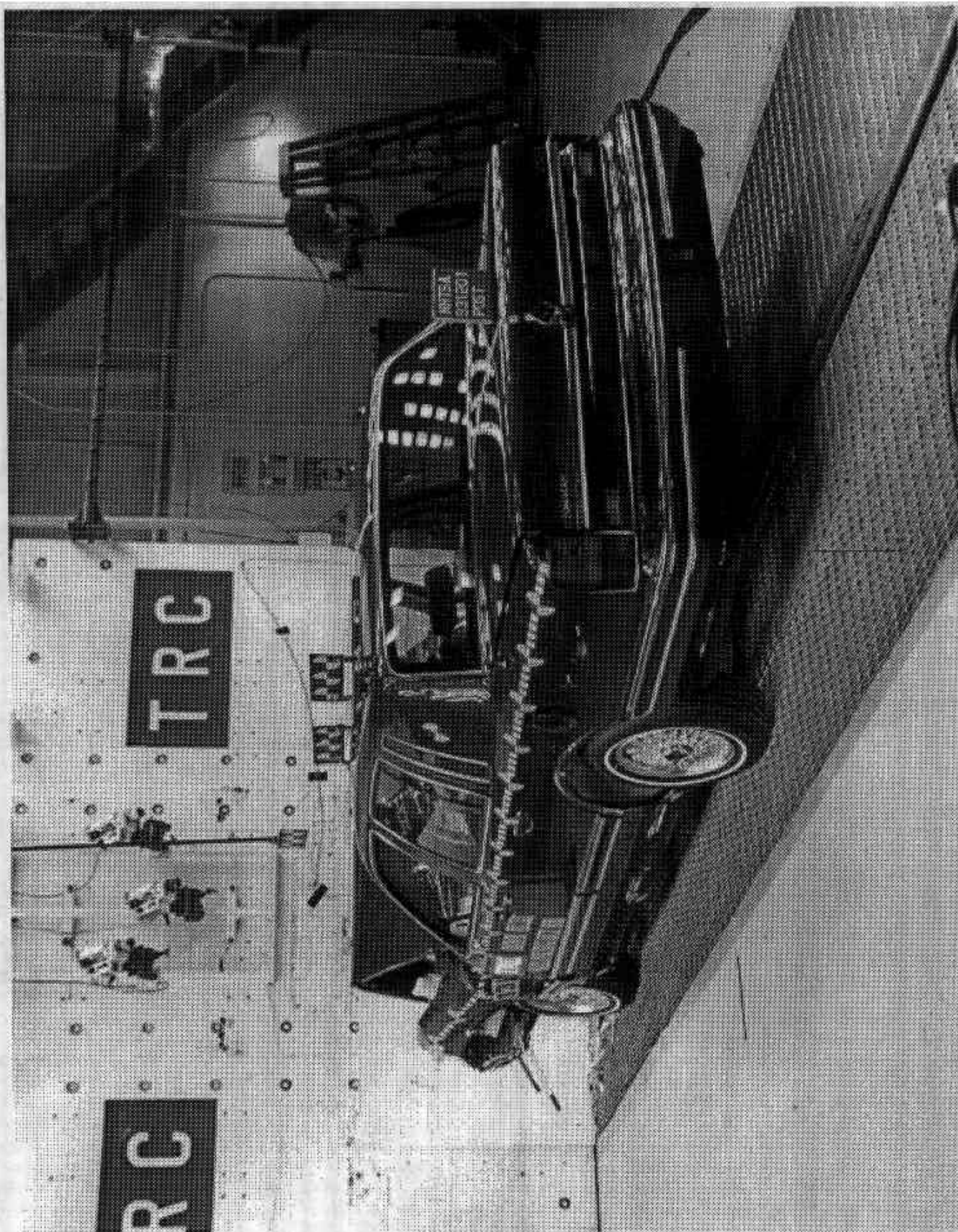


Figure A-12. POST-TEST LEFT REAR THREE-QUARTER VIEW

A-13

931201

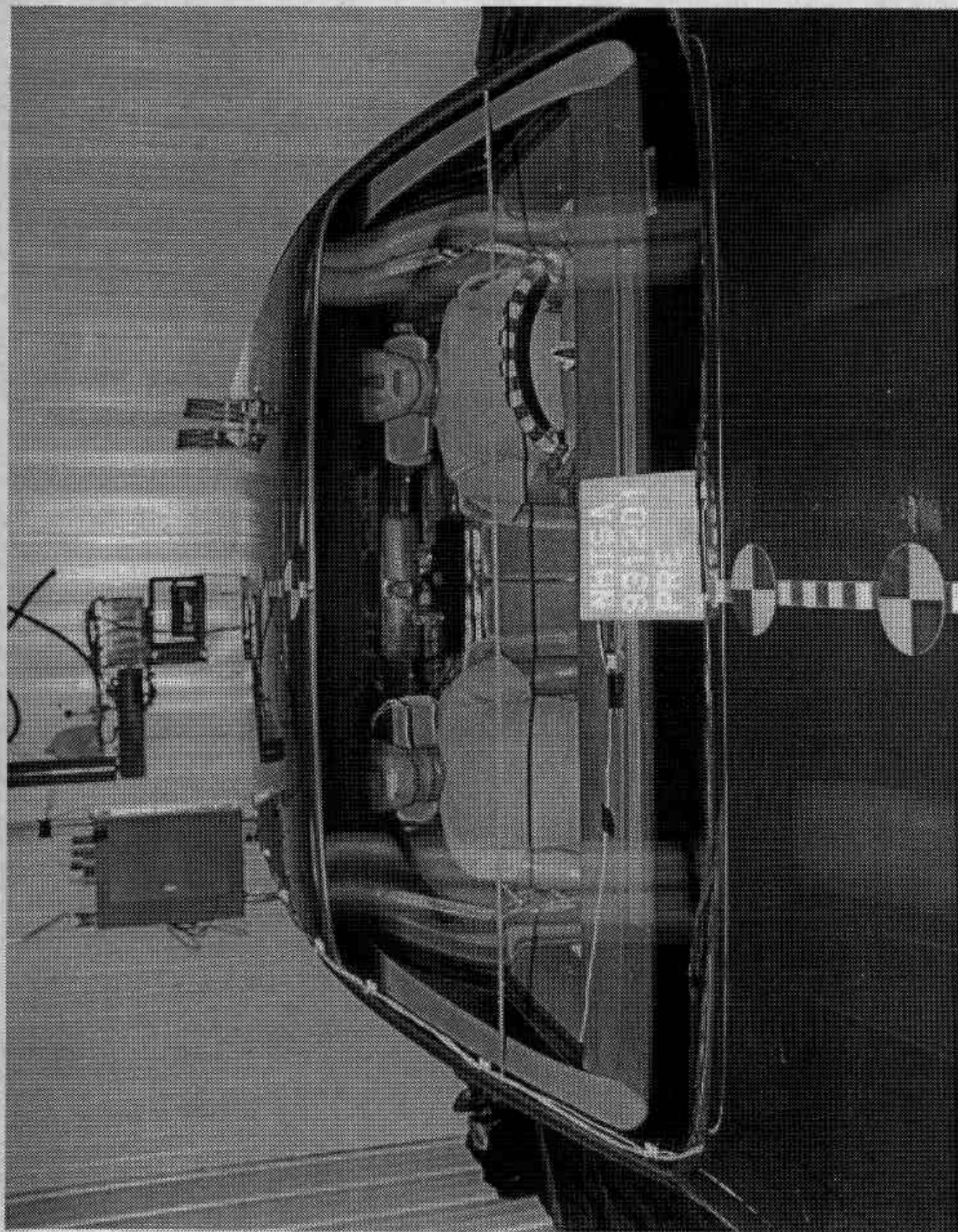


Figure A-13. PRE-TEST WINDSHIELD VIEW

A-14

931201

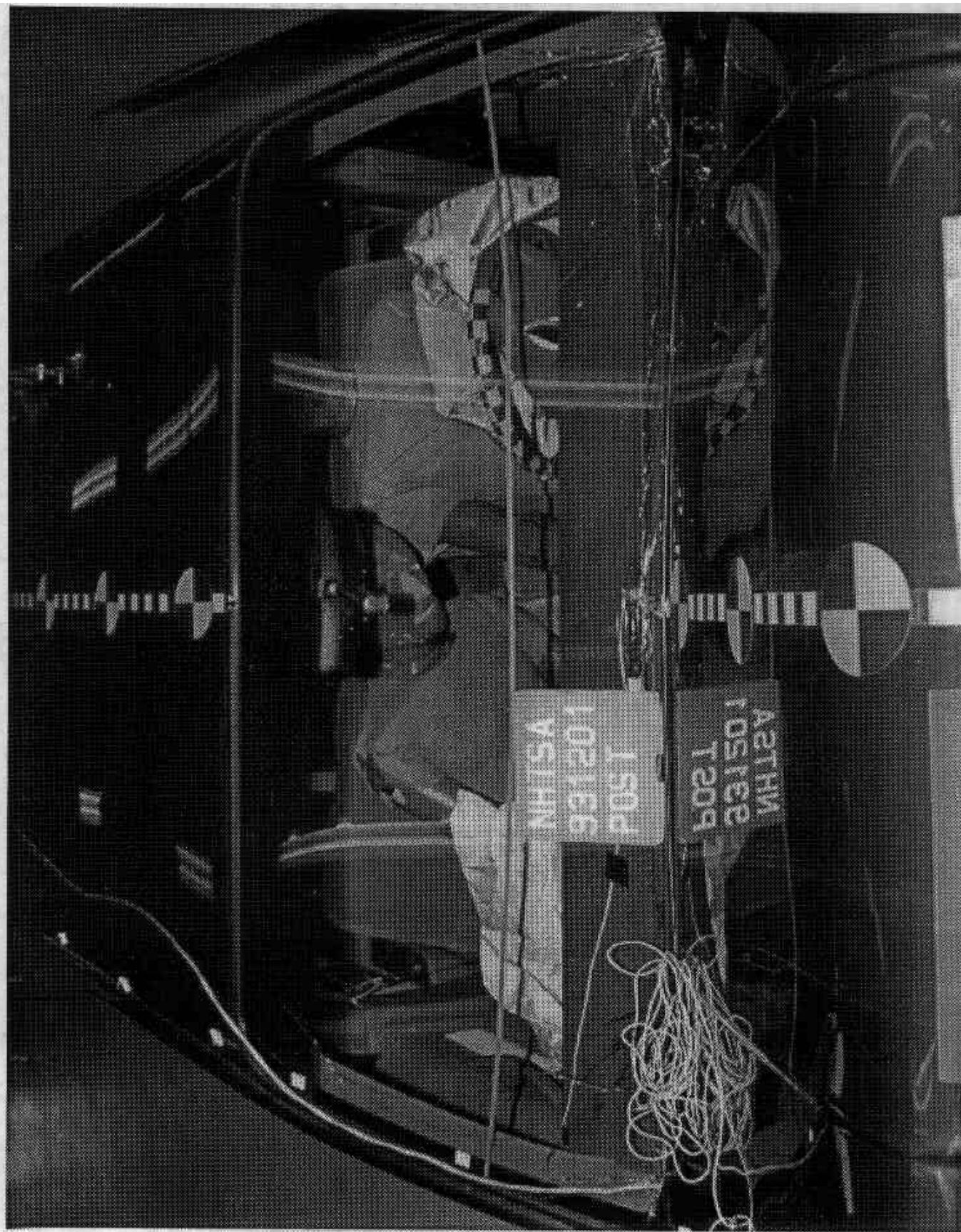


Figure A-14. POST-TEST WINDSHIELD VIEW
A-15

931201

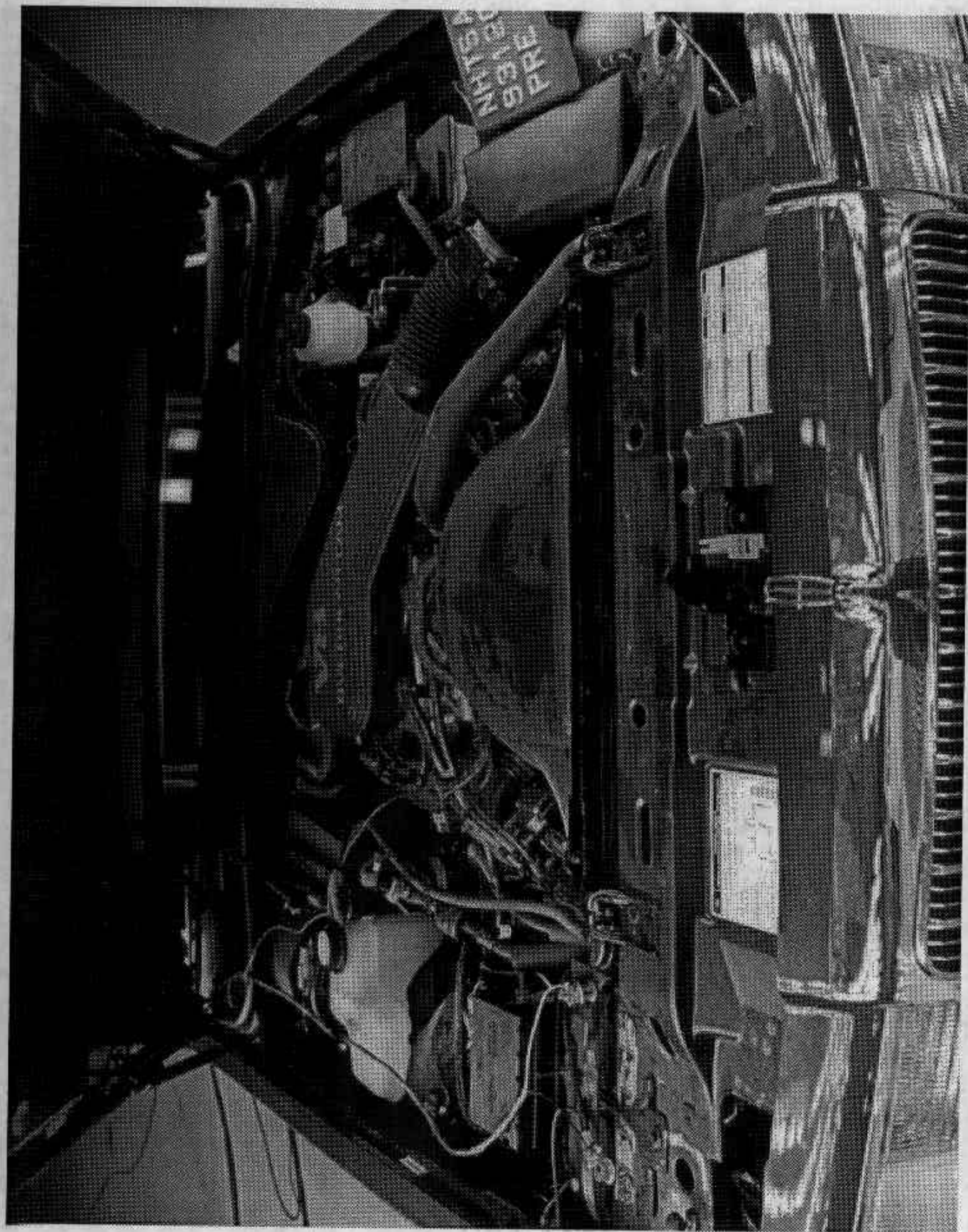


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW

A-16

931201



Figure A-16. POST-TEST ENGINE COMPARTMENT VIEW

A-17

931201

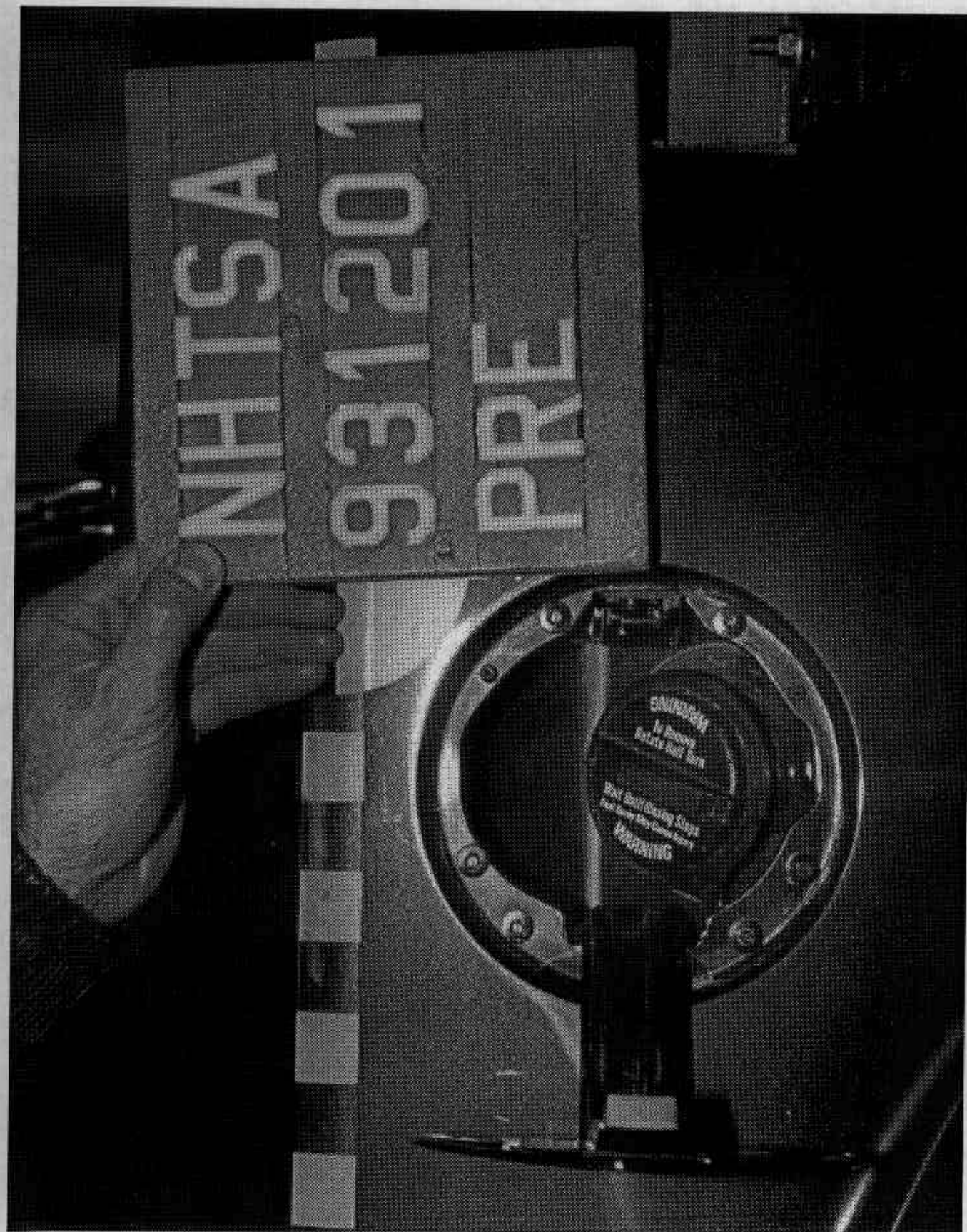


Figure A-17. PRE-TEST FUEL FILLER CAP VIEW

A-18

931201

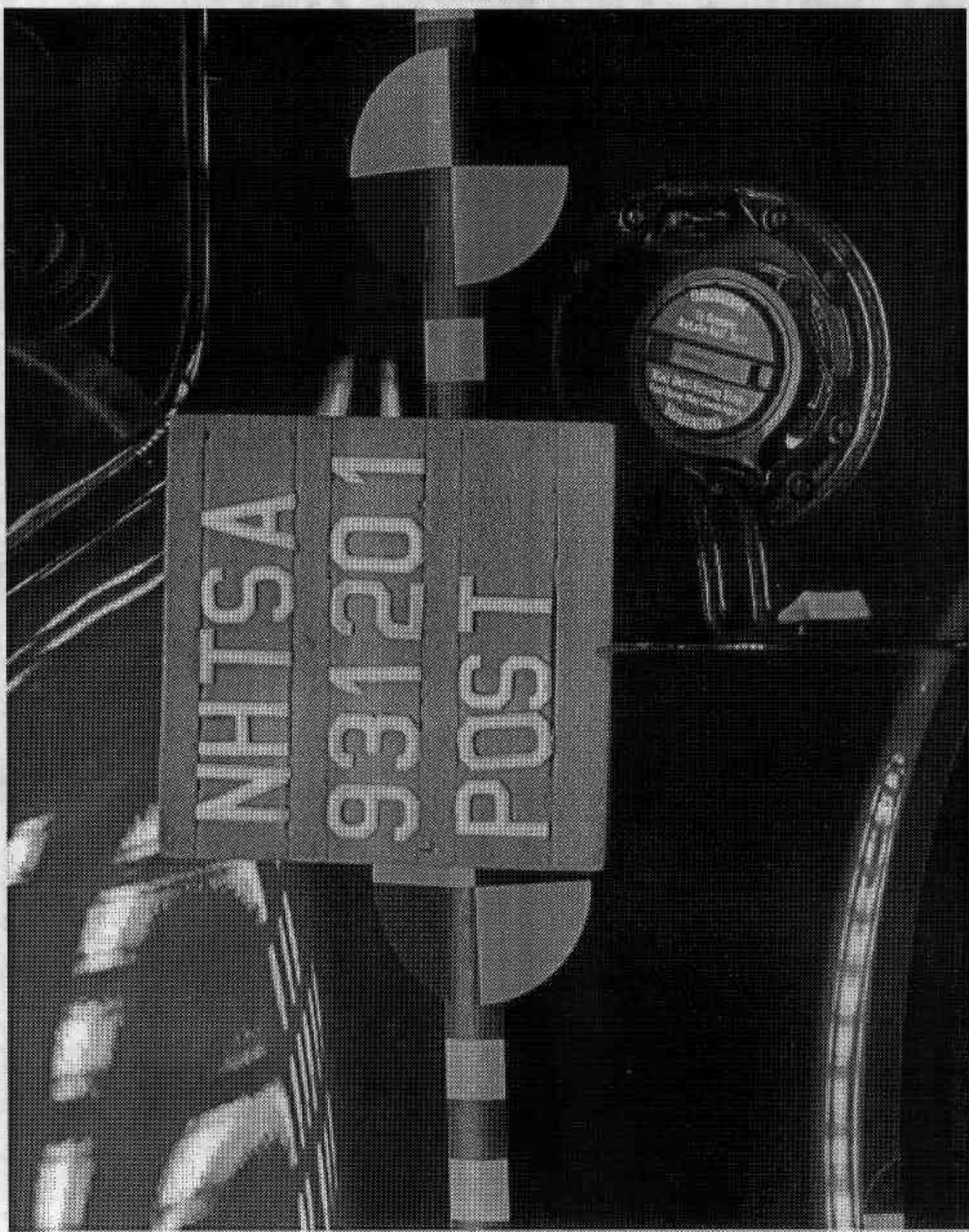


Figure A-18. POST-TEST FUEL FILLER CAP VIEW
A-19

931201

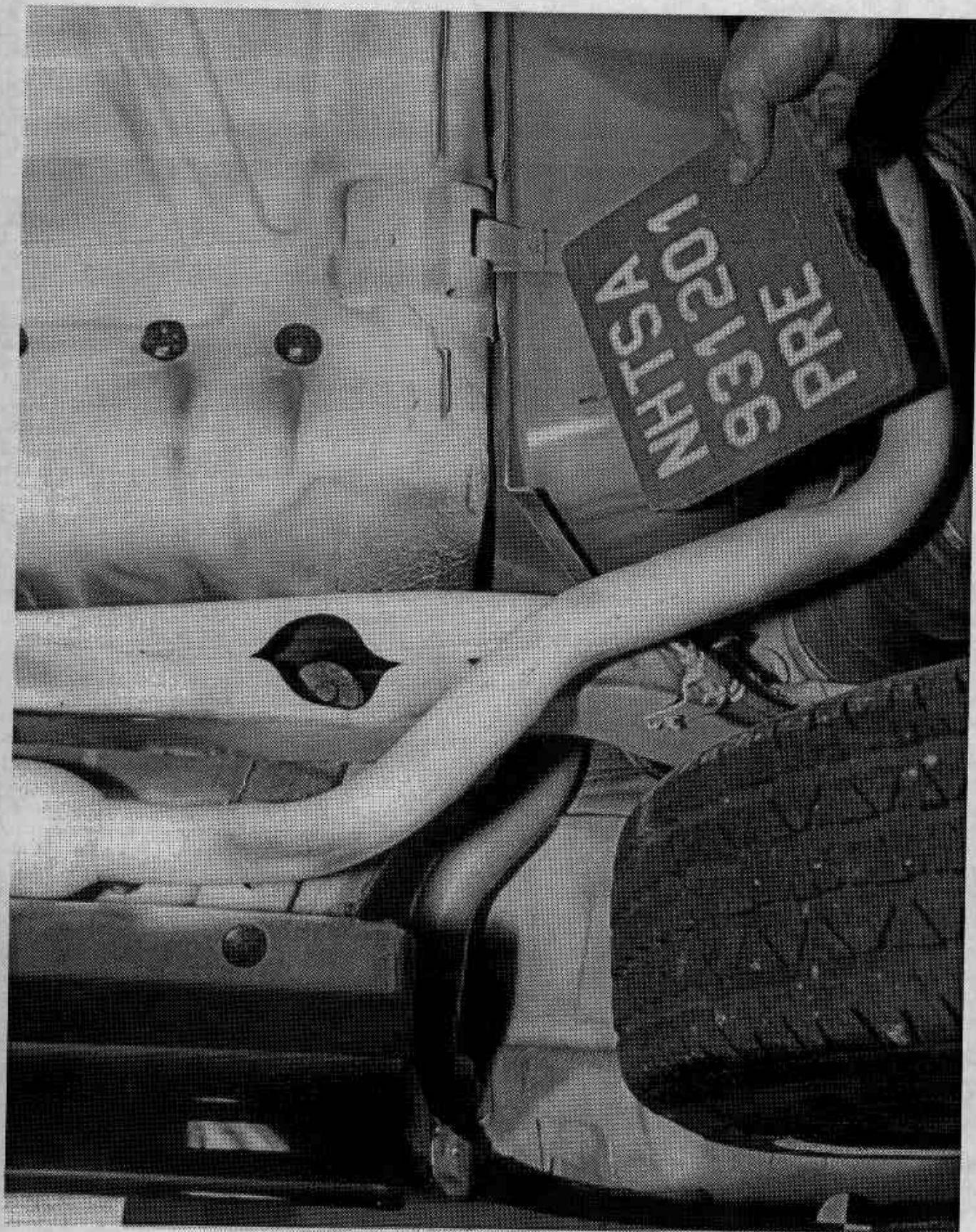


Figure A-19. PRE-TEST FUEL FILLER NECK VIEW

A-20

931201

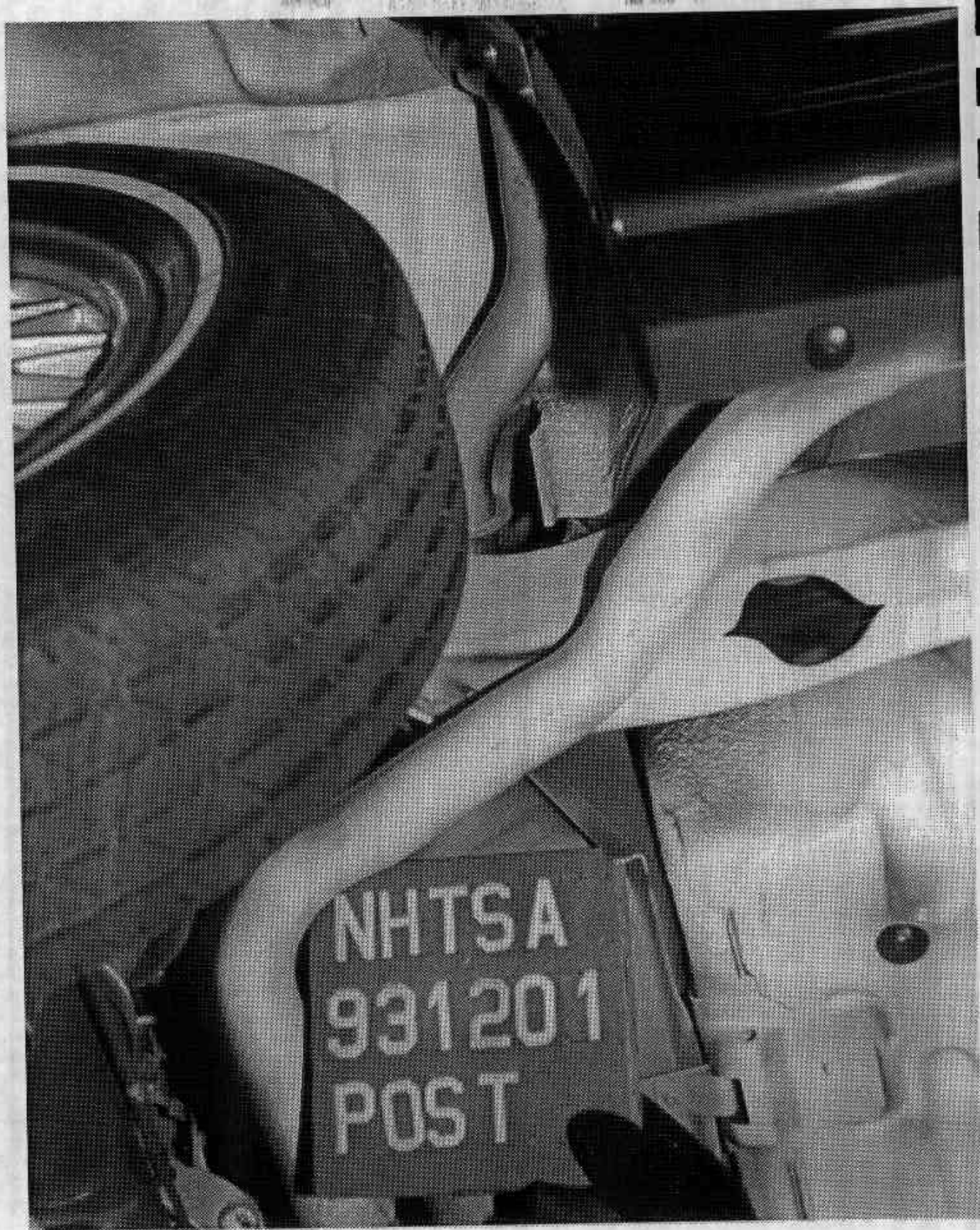


Figure A-20. POST-TEST FUEL FILLER NECK VIEW
A-21

931201



Figure A-21. PRE-TEST FUEL TANK VIEW
A-22

931201

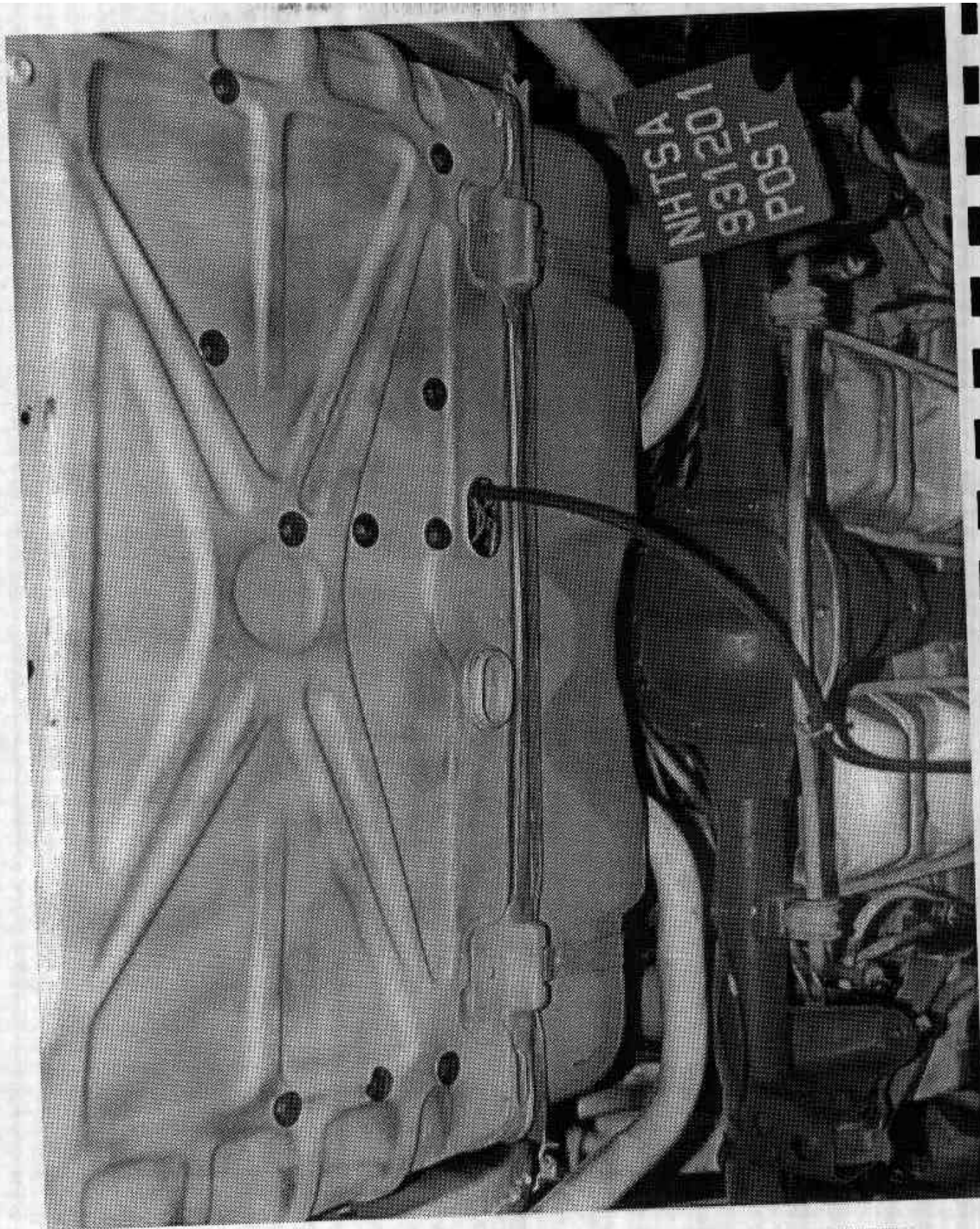


Figure A-22. POST-TEST FUEL TANK VIEW
A-23

931201

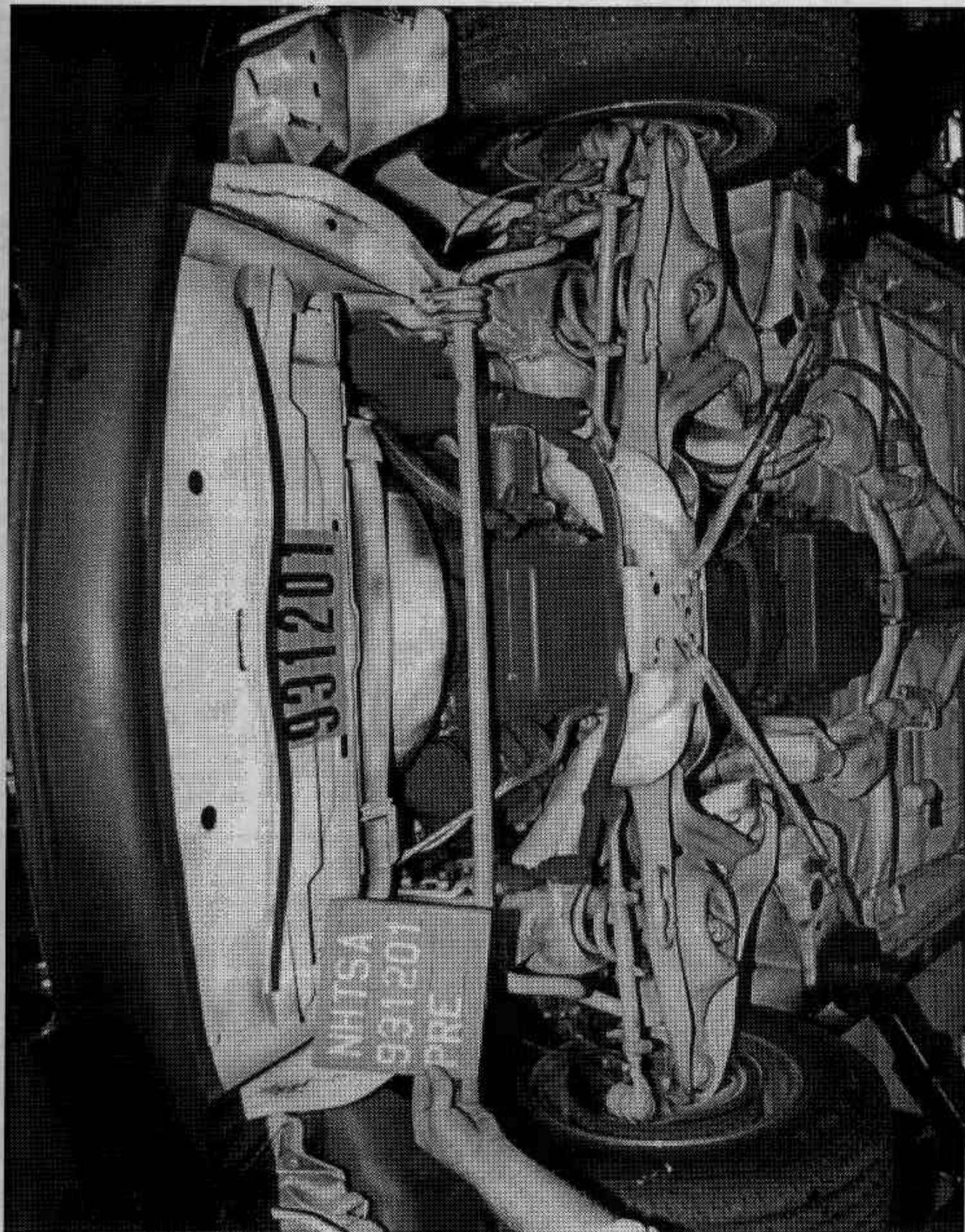


Figure A-23. PRE-TEST FRONT UNDERBODY VIEW

A-24

931201

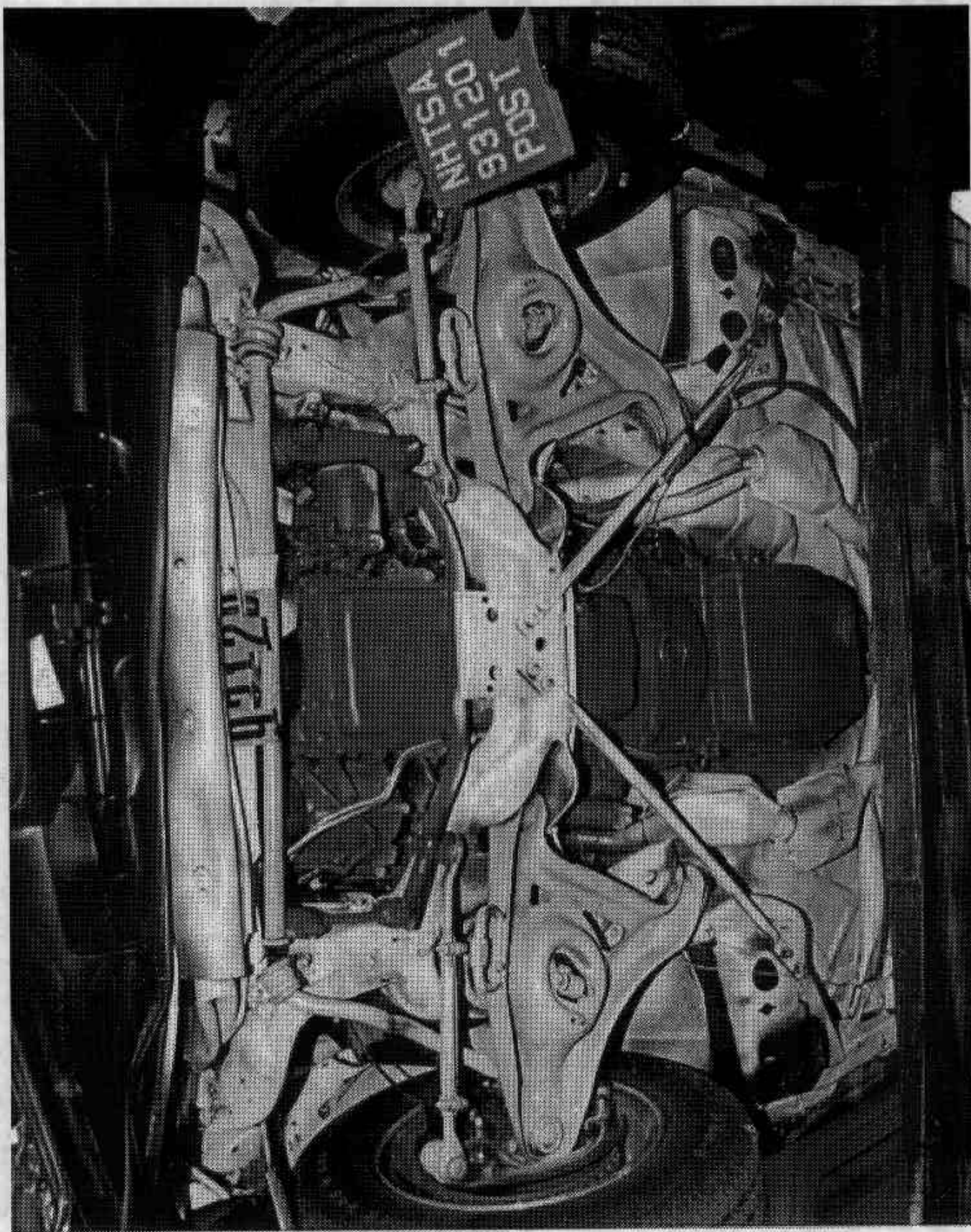


Figure A-24. POST-TEST FRONT UNDERBODY VIEW

A-25

931201

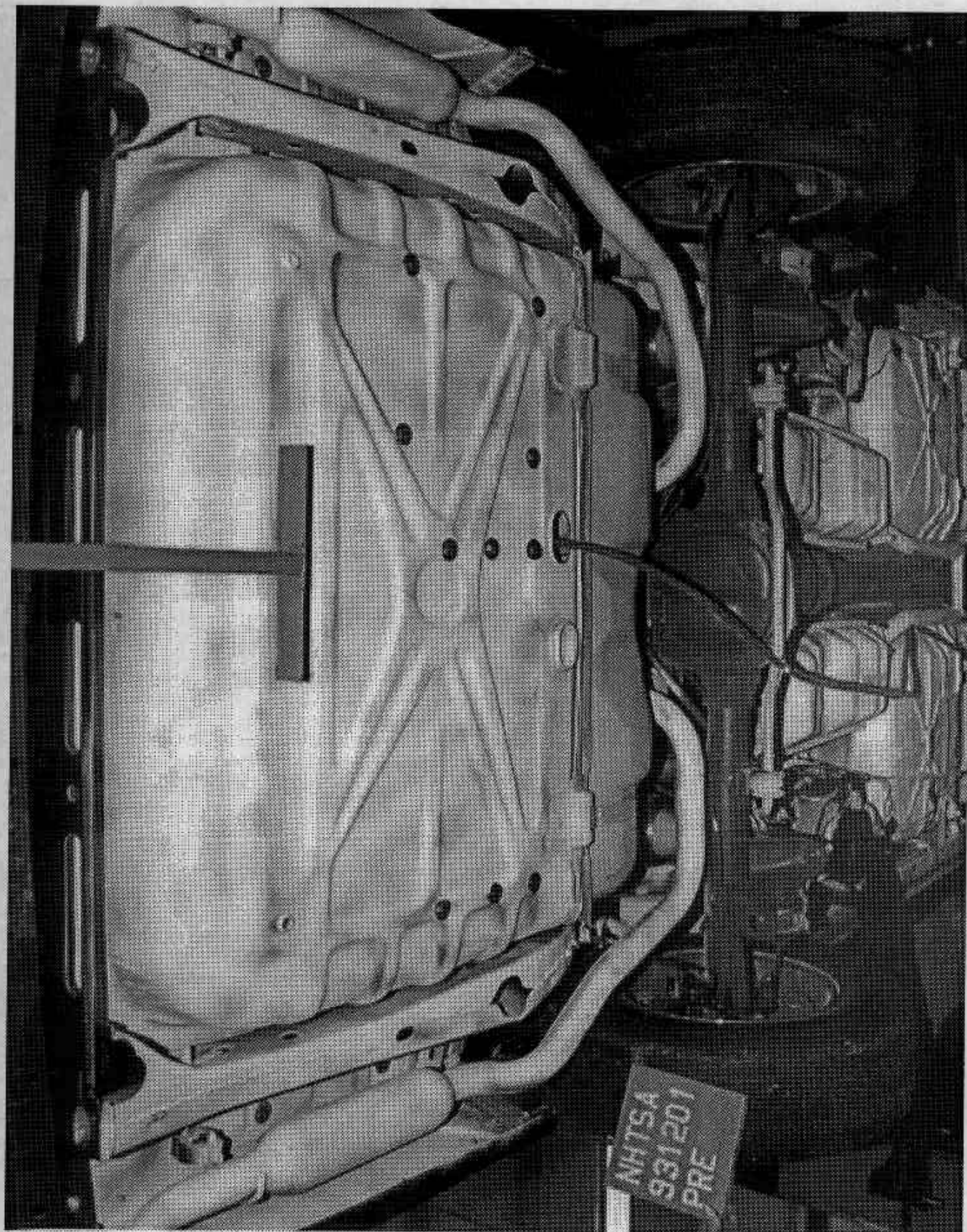


Figure A-25. PRE-TEST REAR UNDERBODY VIEW

A-26

931201

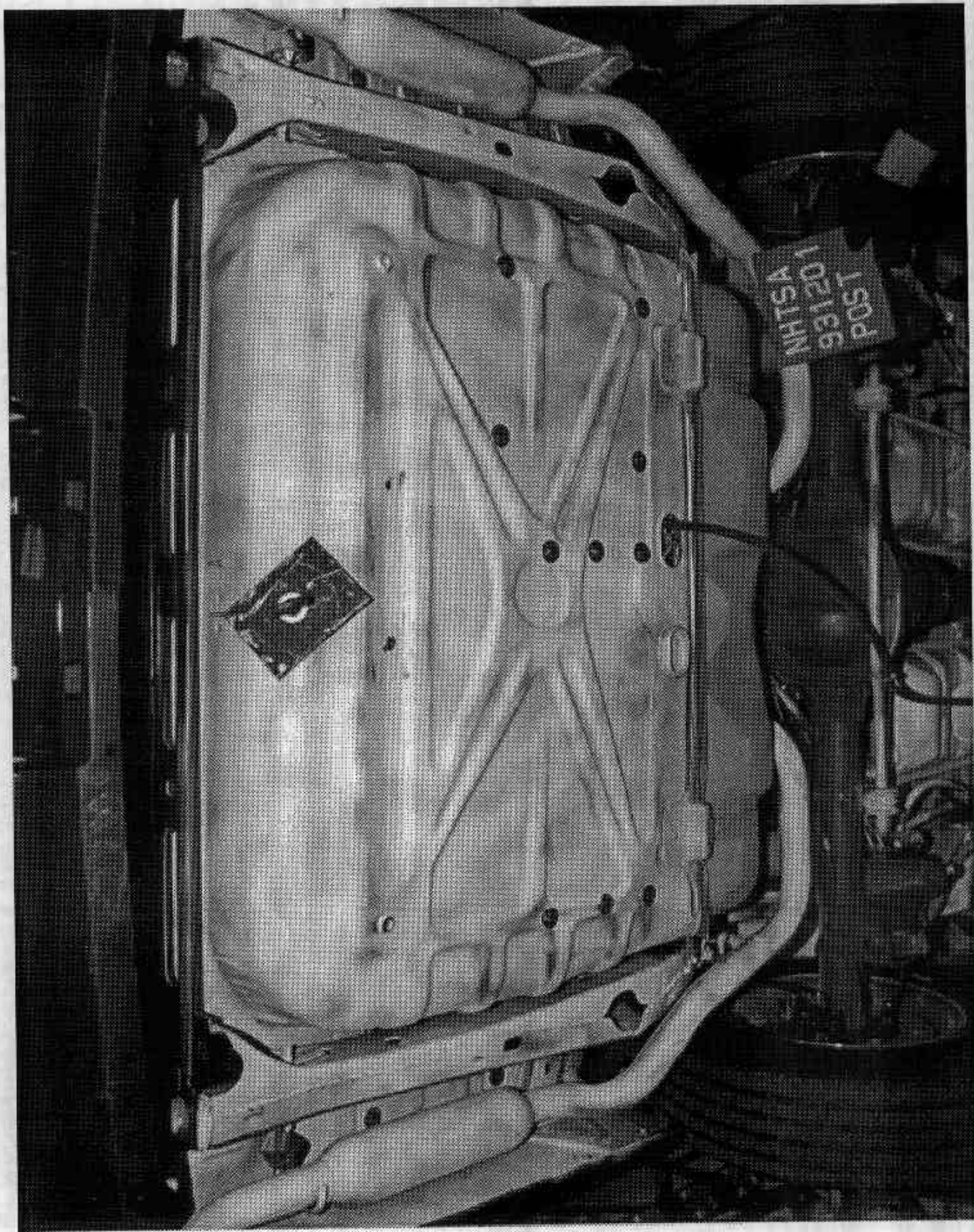


Figure A-26. POST-TEST REAR UNDERBODY VIEW

A-27

931201

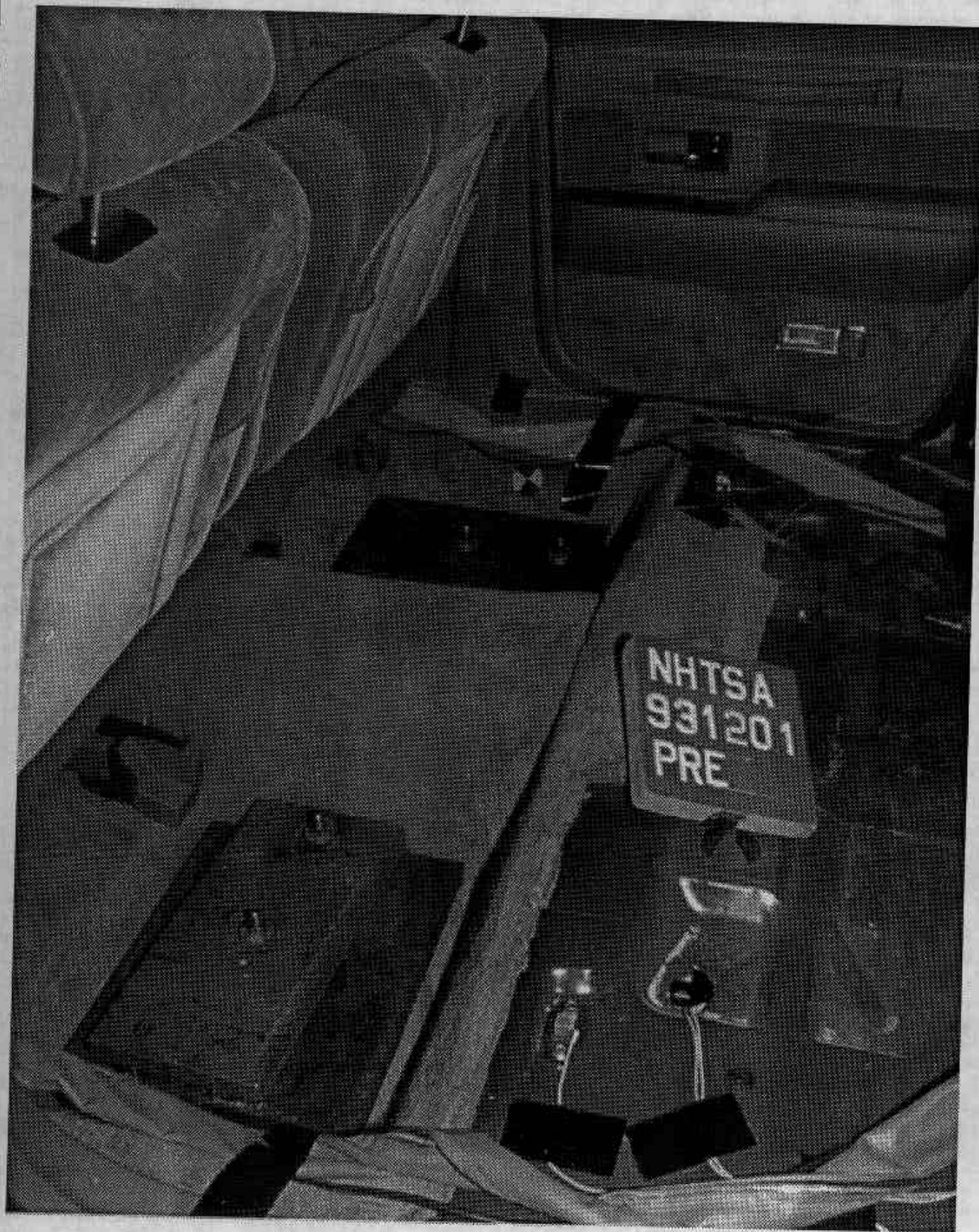


Figure A-27. PRE-TEST BALLAST LOCATION
A-28

931201



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

A-29

931201

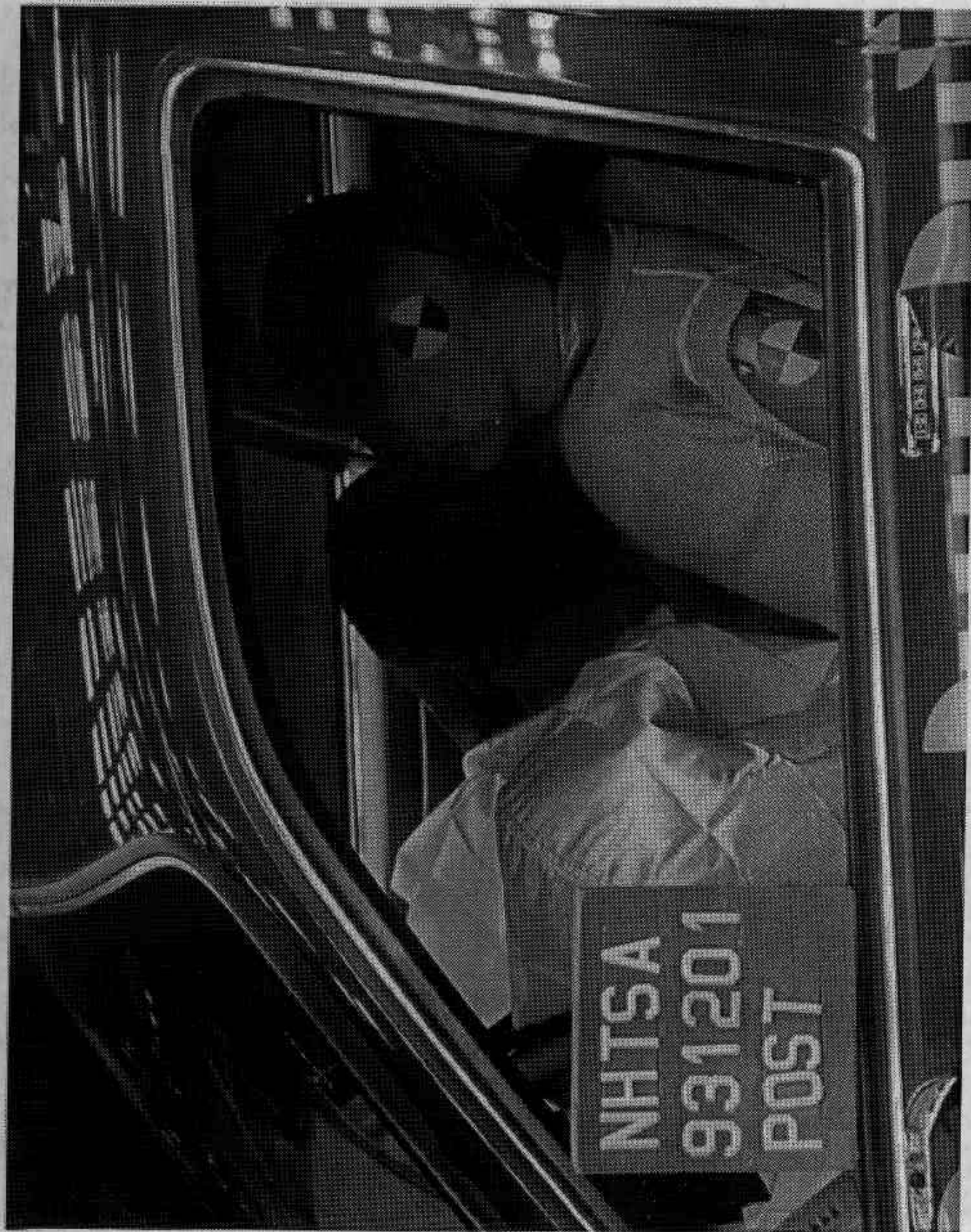


Figure A-29. POST-TEST DRIVER DUMMY POSITION VIEW

A-30

931201

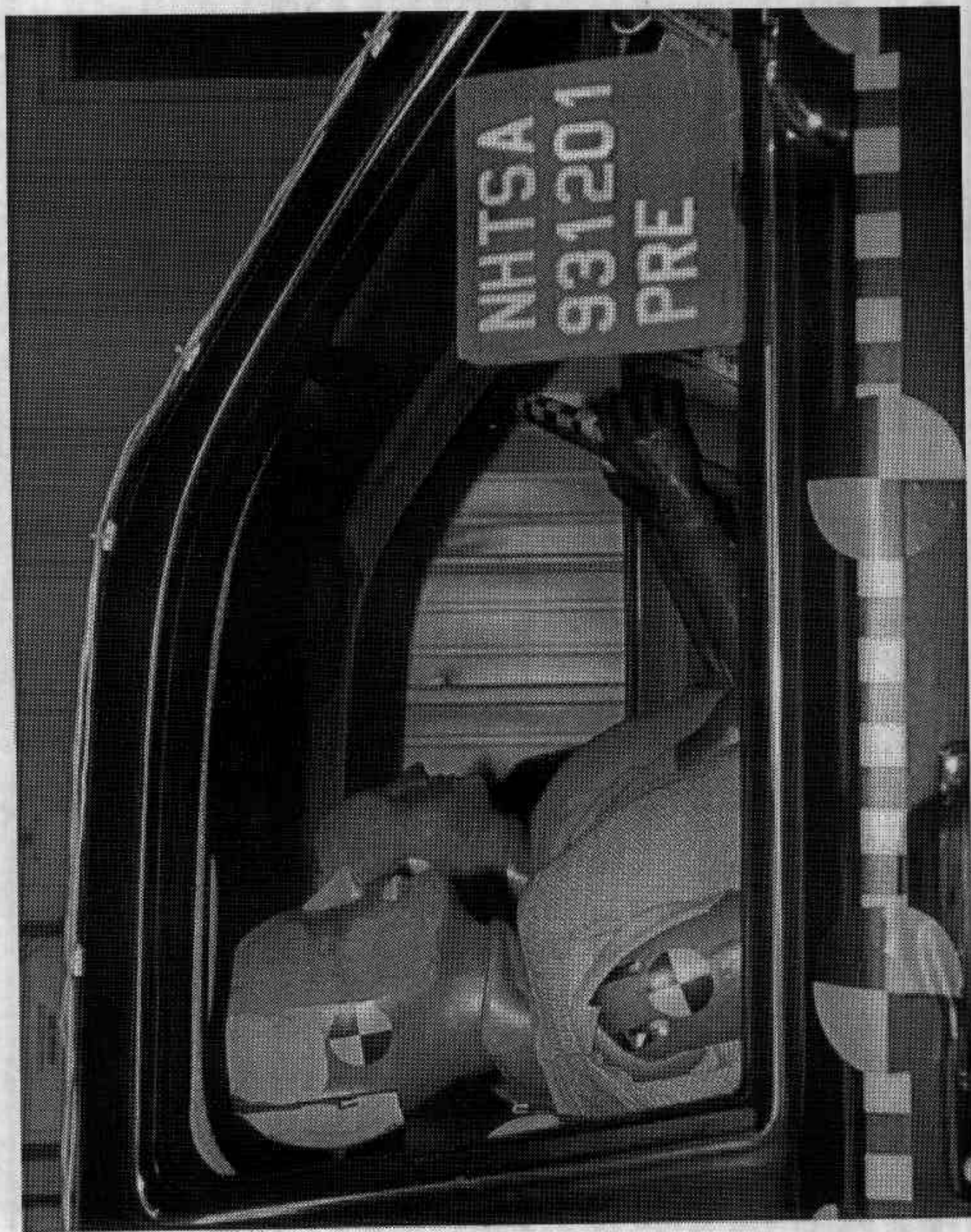


Figure A-30. PRE-TEST PASSENGER DUMMY POSITION VIEW

A-31

931201

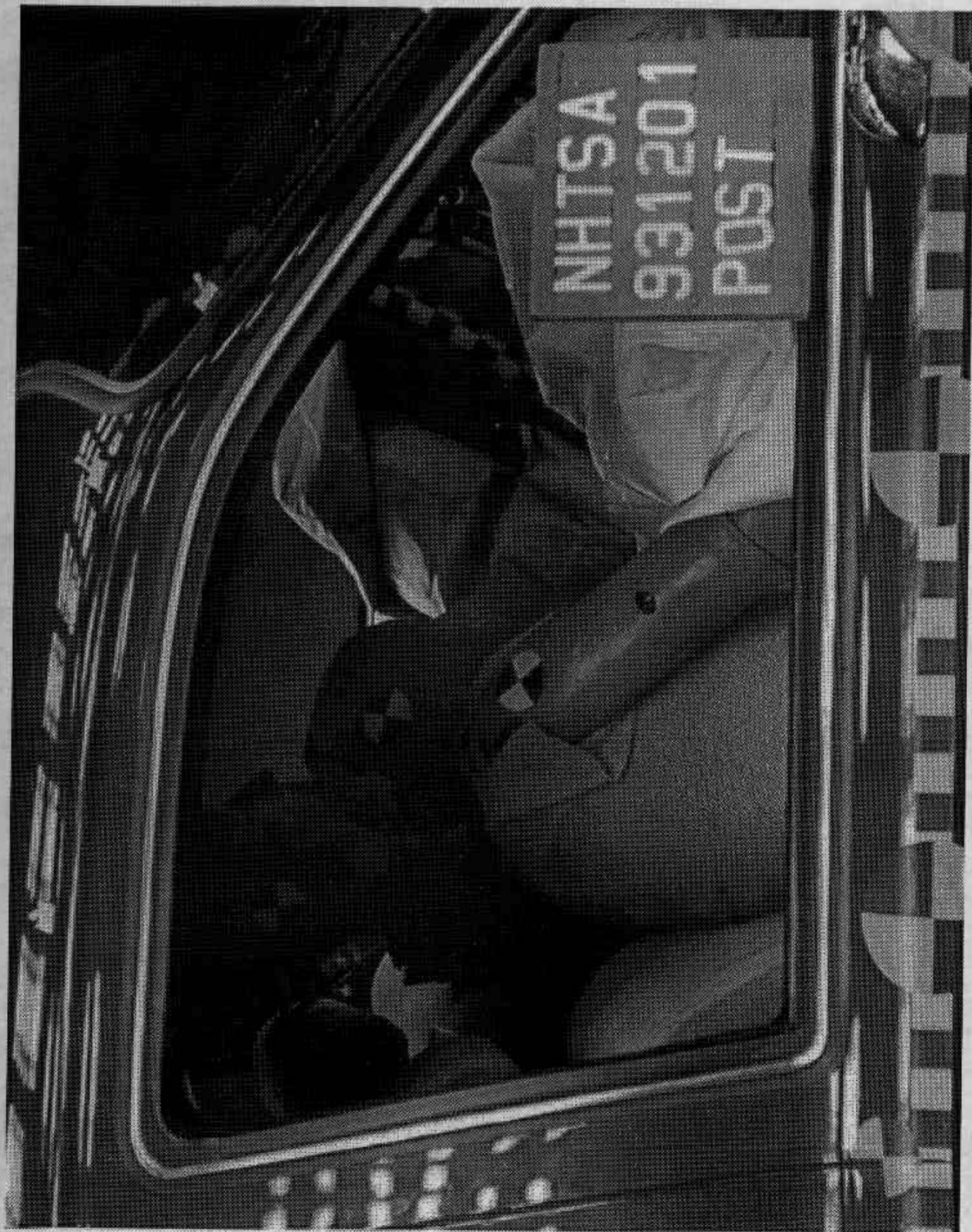


Figure A-31. POST-TEST PASSENGER DUMMY POSITION VIEW

A-32

931201

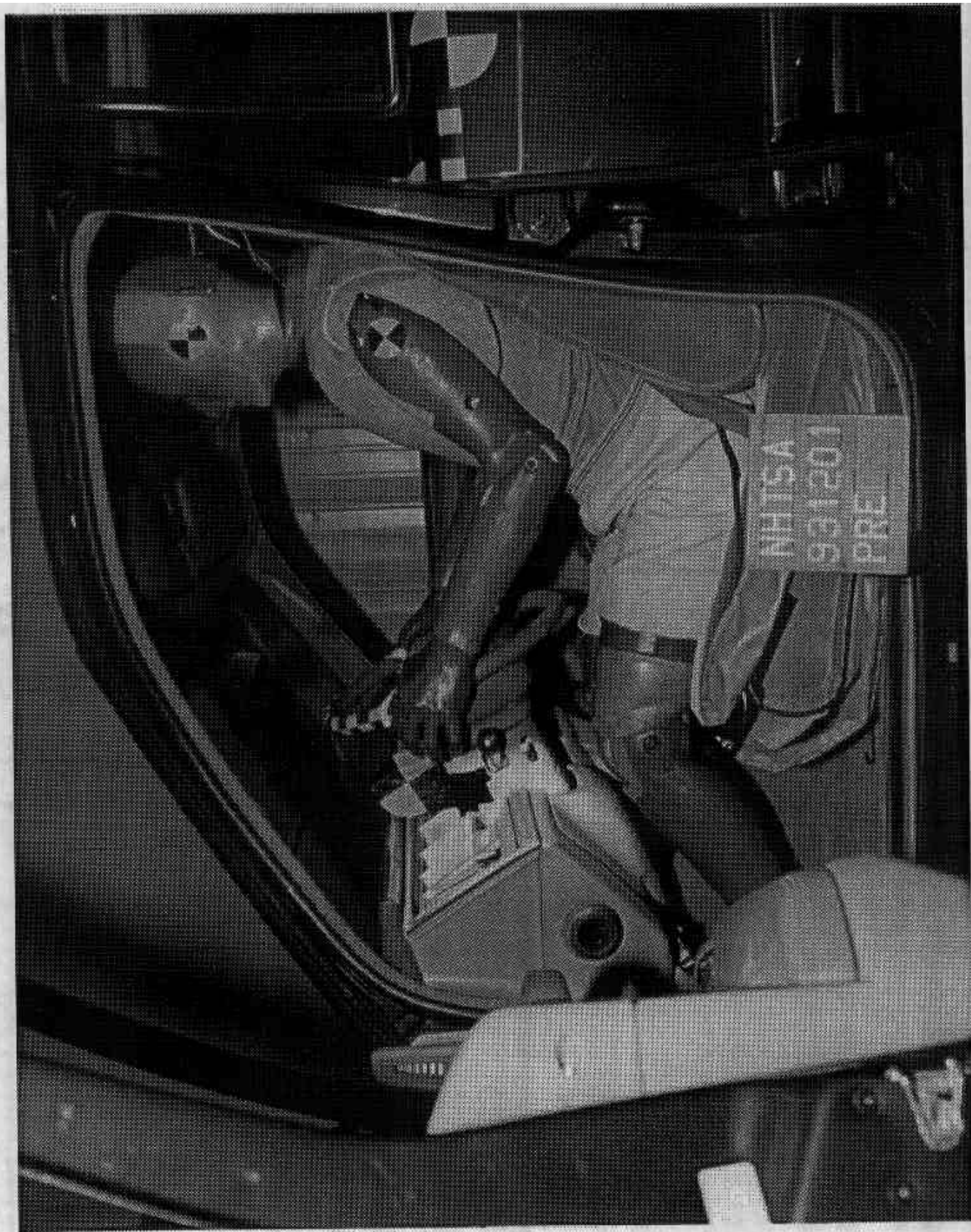


Figure A-32. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1
A-33 931201

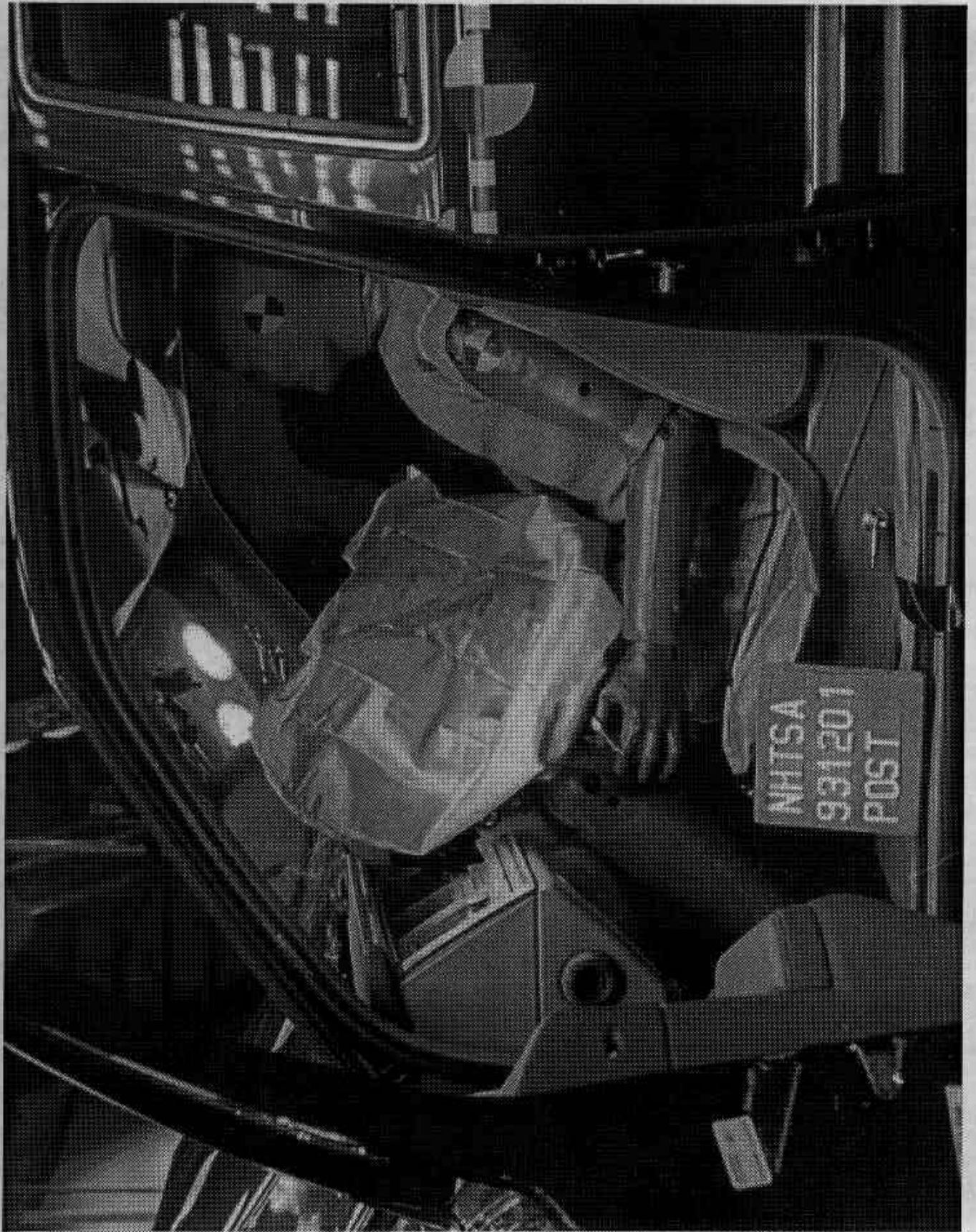


Figure A-33. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

A-34

931201

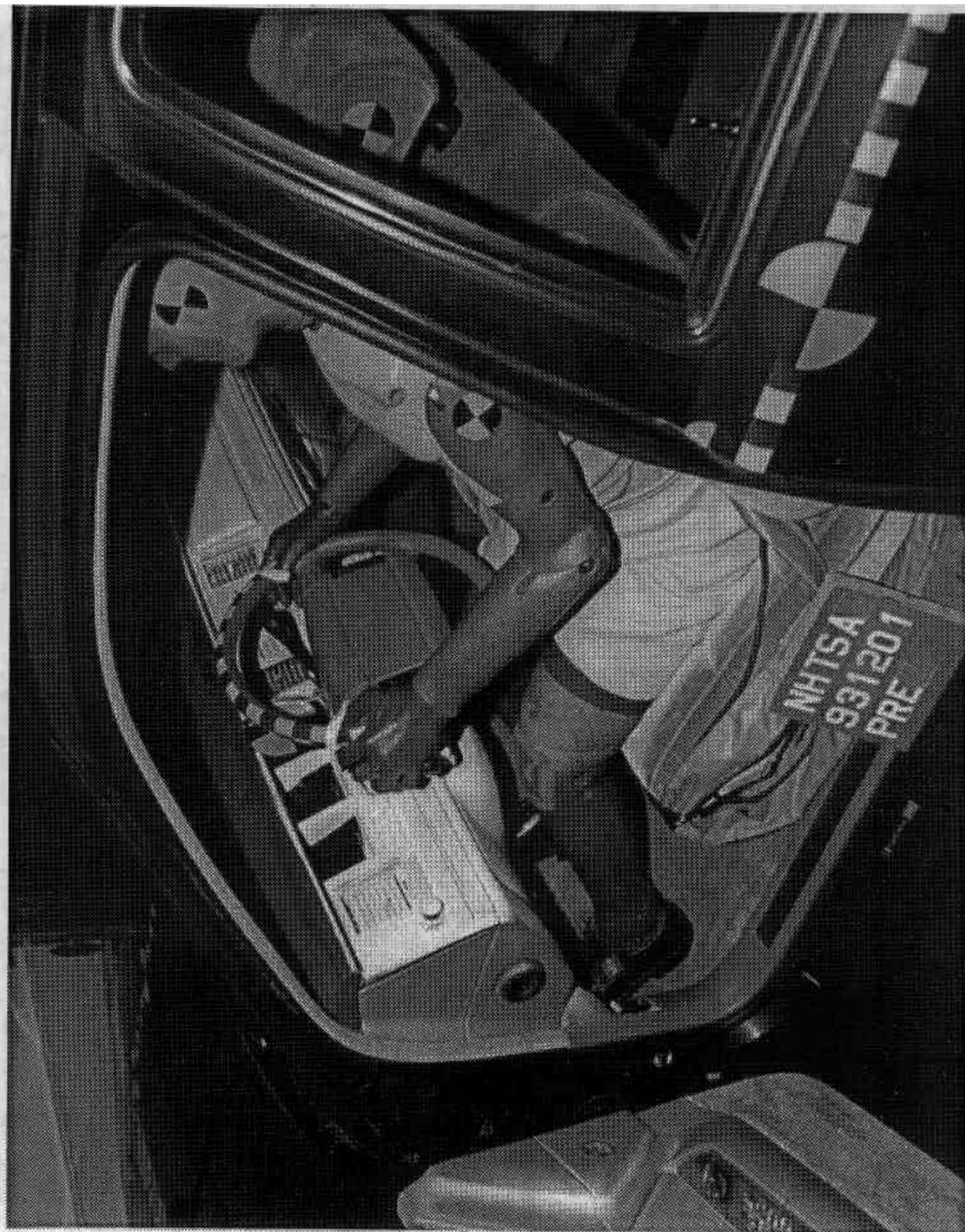


Figure A-34. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2
A-35 931201

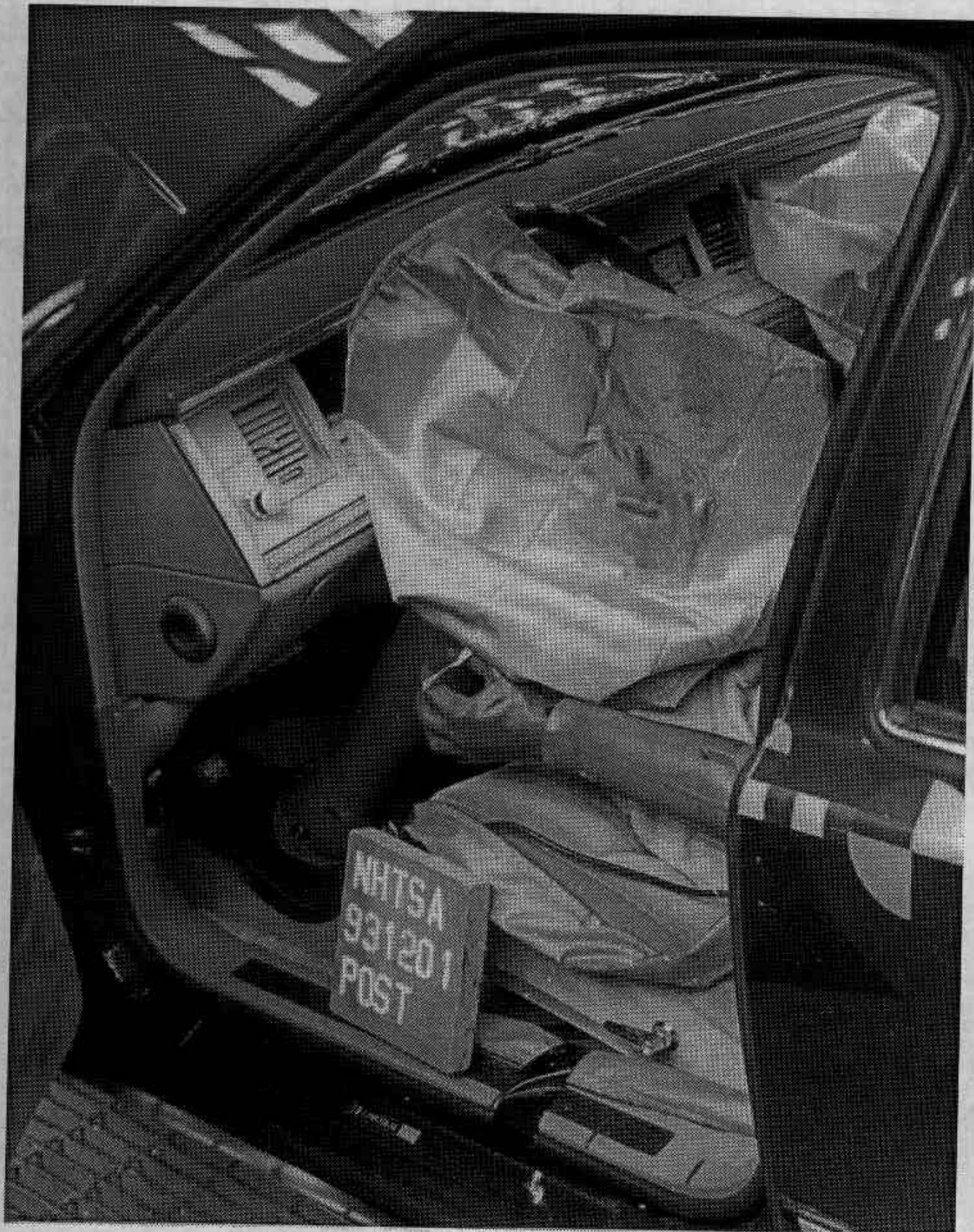


Figure A-35. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

A-36

931201

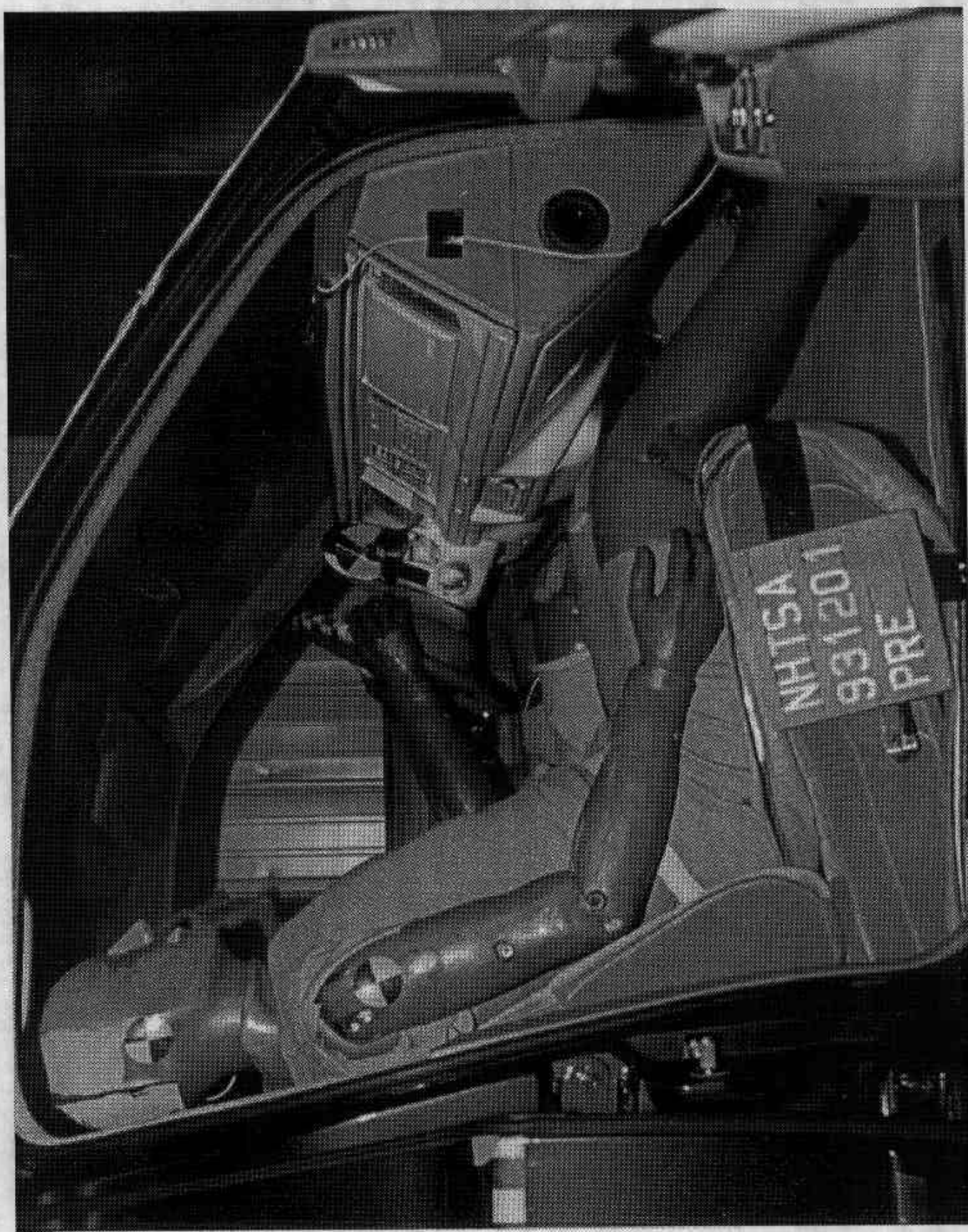


Figure A-36. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
A-37 931201



Figure A-37. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
A-38 931201



Figure A-38. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2
A-39 931201



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

A-40

931201

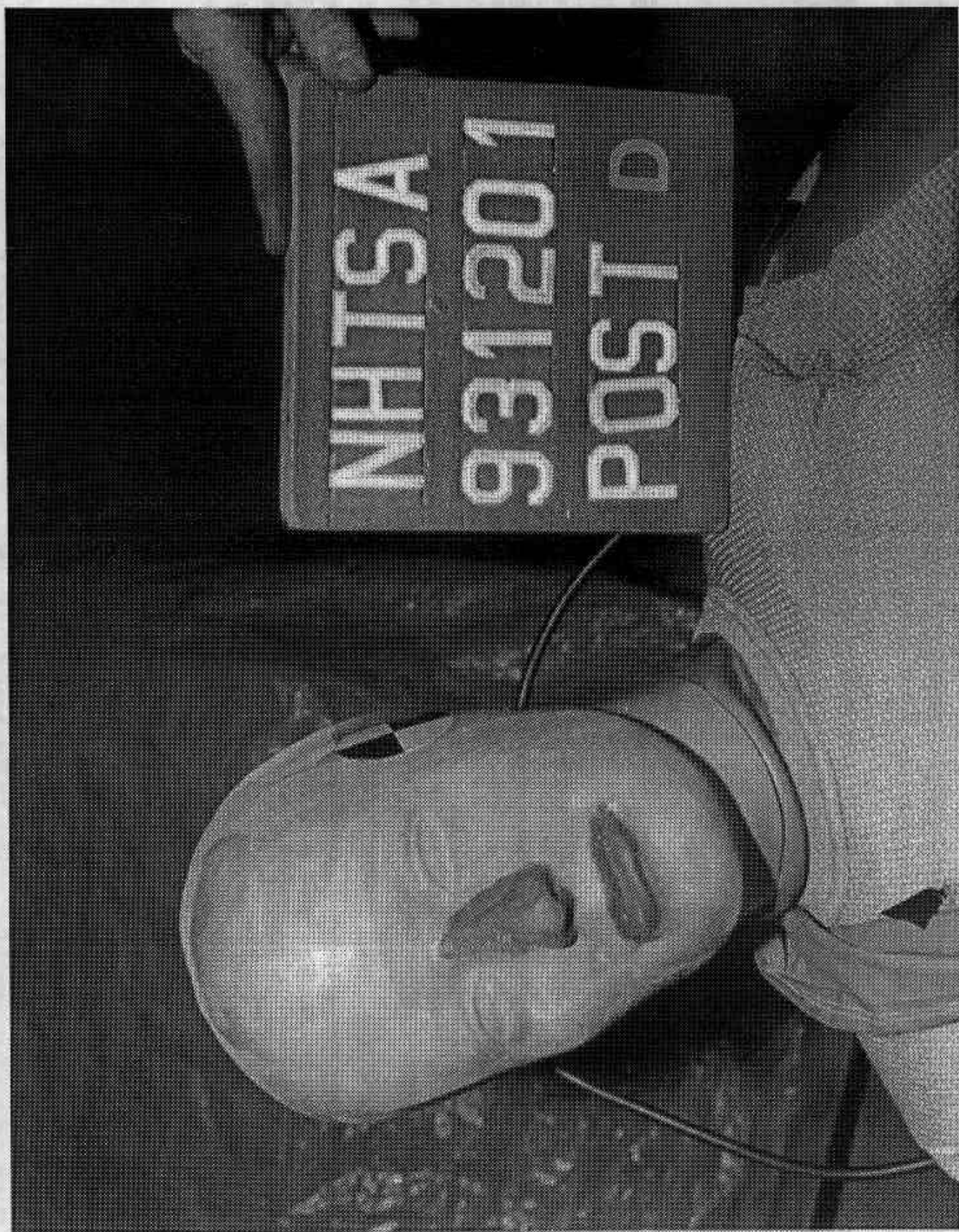


Figure A-40. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 1

A-41

931201



Figure A-41. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 2

A-42

931201

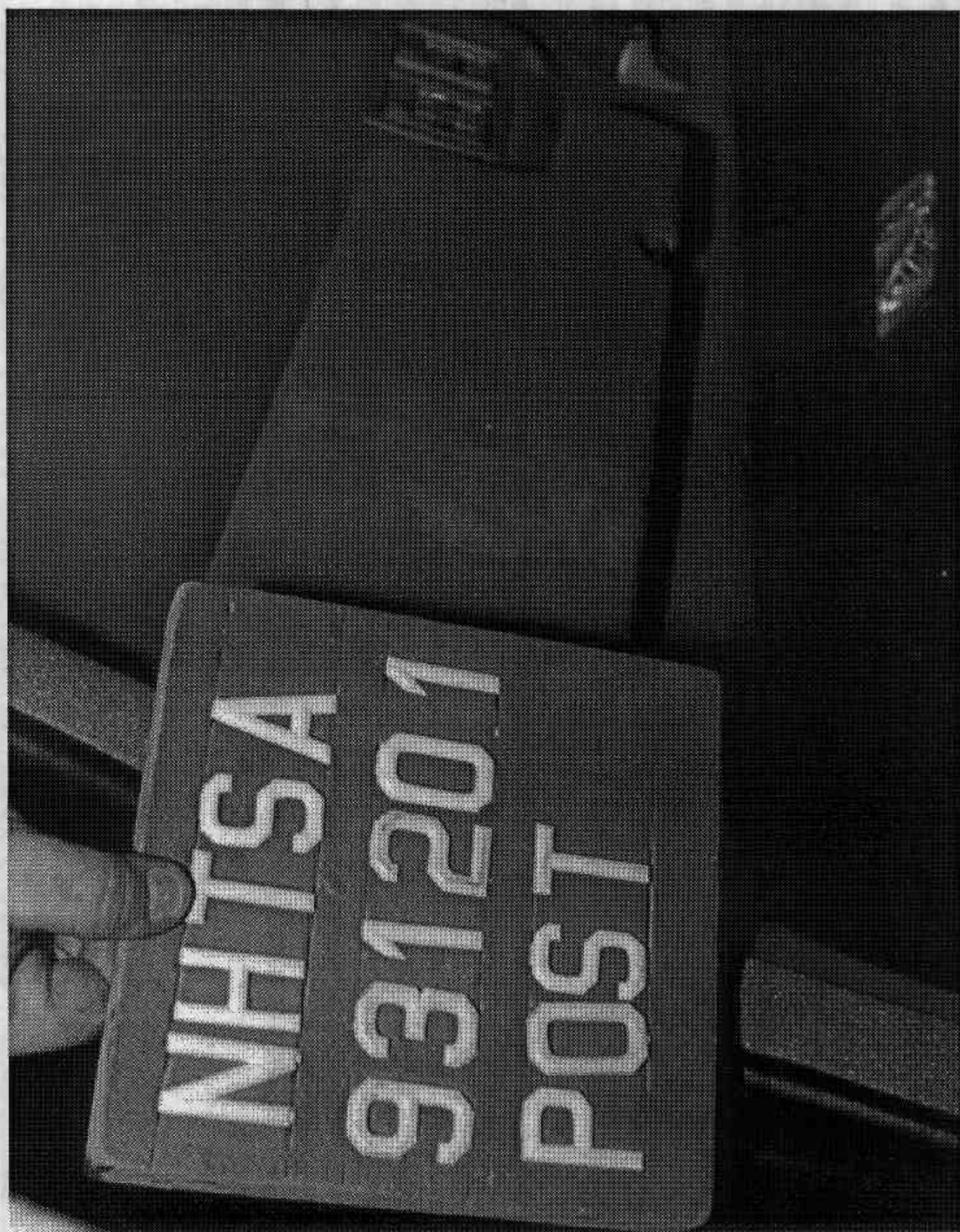


Figure A-42. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 3
A-43 931201

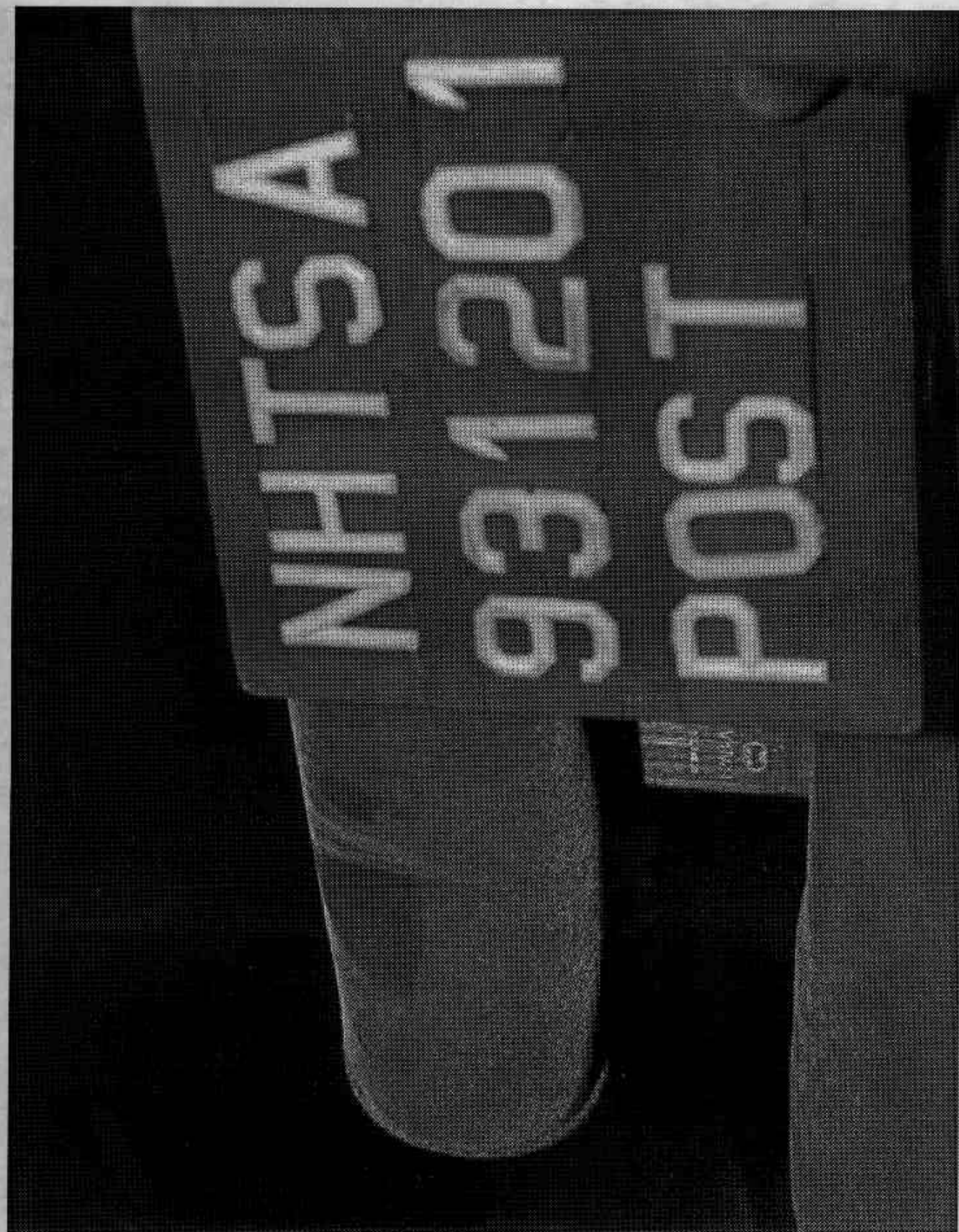


Figure A-43. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 4

A-44

931201

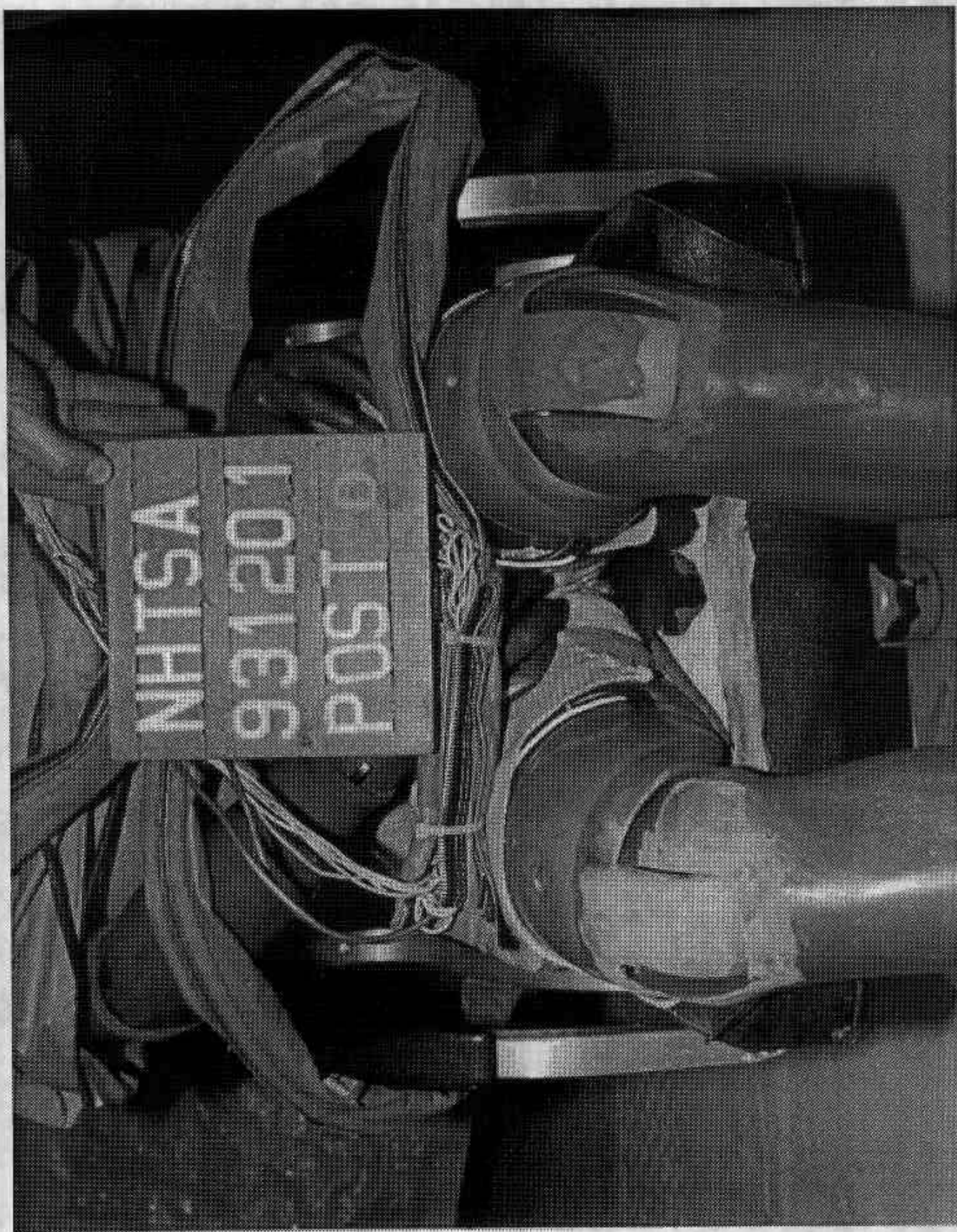


Figure A-44. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1

A-45

931201

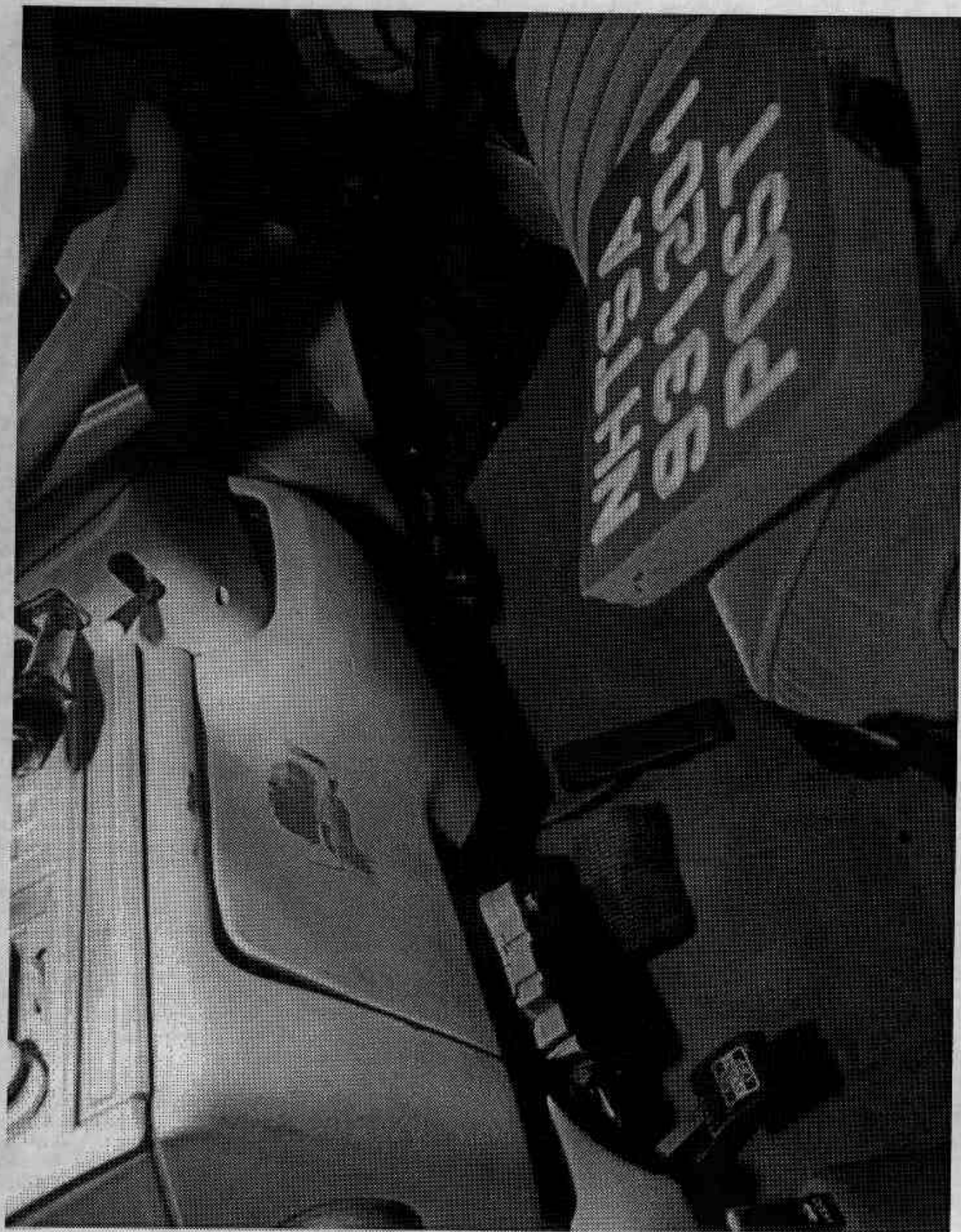


Figure A-45. POST-TEST DRIVER DUMMY KNEE CONTACT- VIEW 2

A-46

931201



Figure A-46. POST-TEST DRIVER DUMMY KNEE CONTACT- VIEW 3

A-47

931201

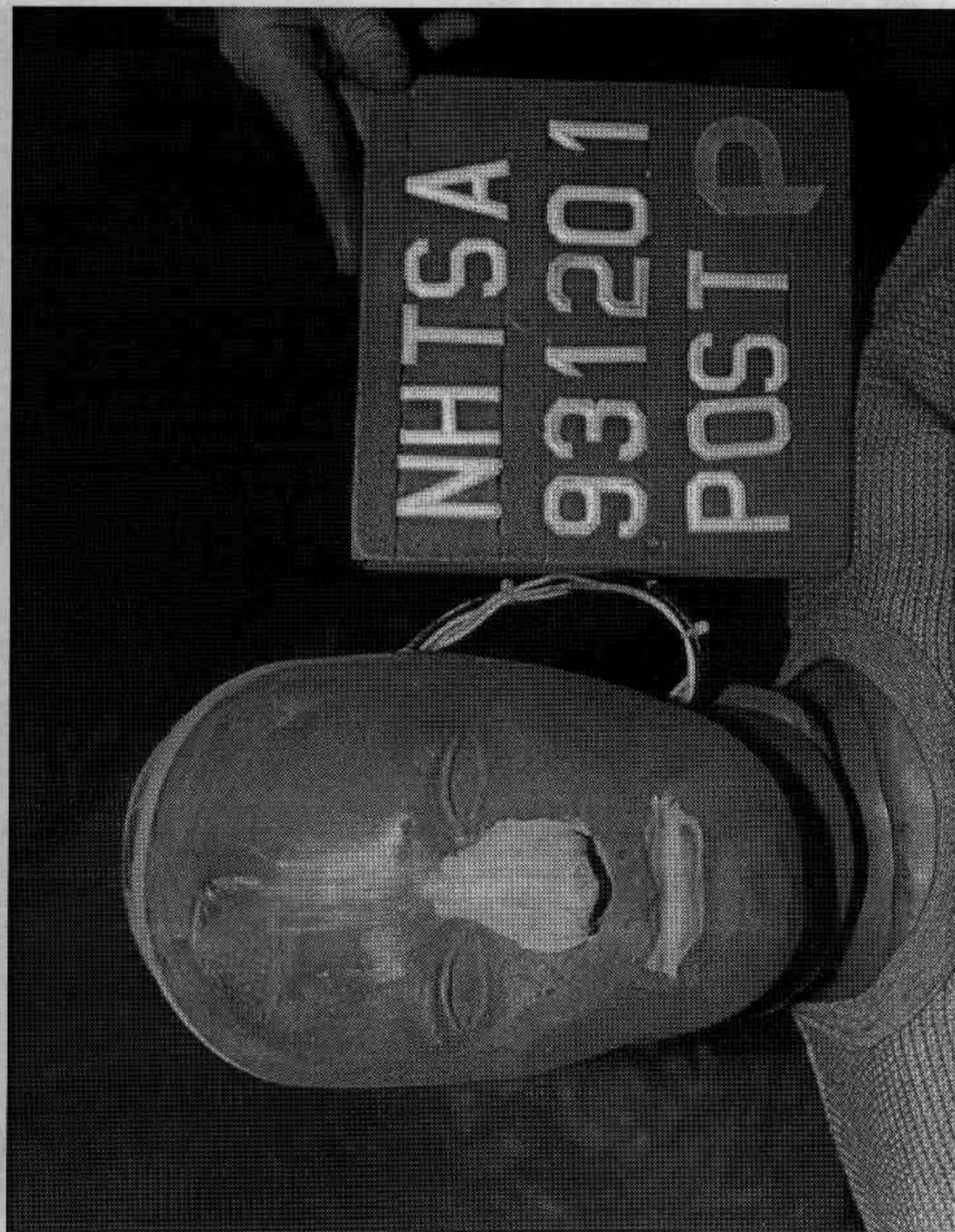


Figure A-47. POST-TEST PASSENGER DUMMY HEAD CONTACT - VIEW 1

A-48

931201

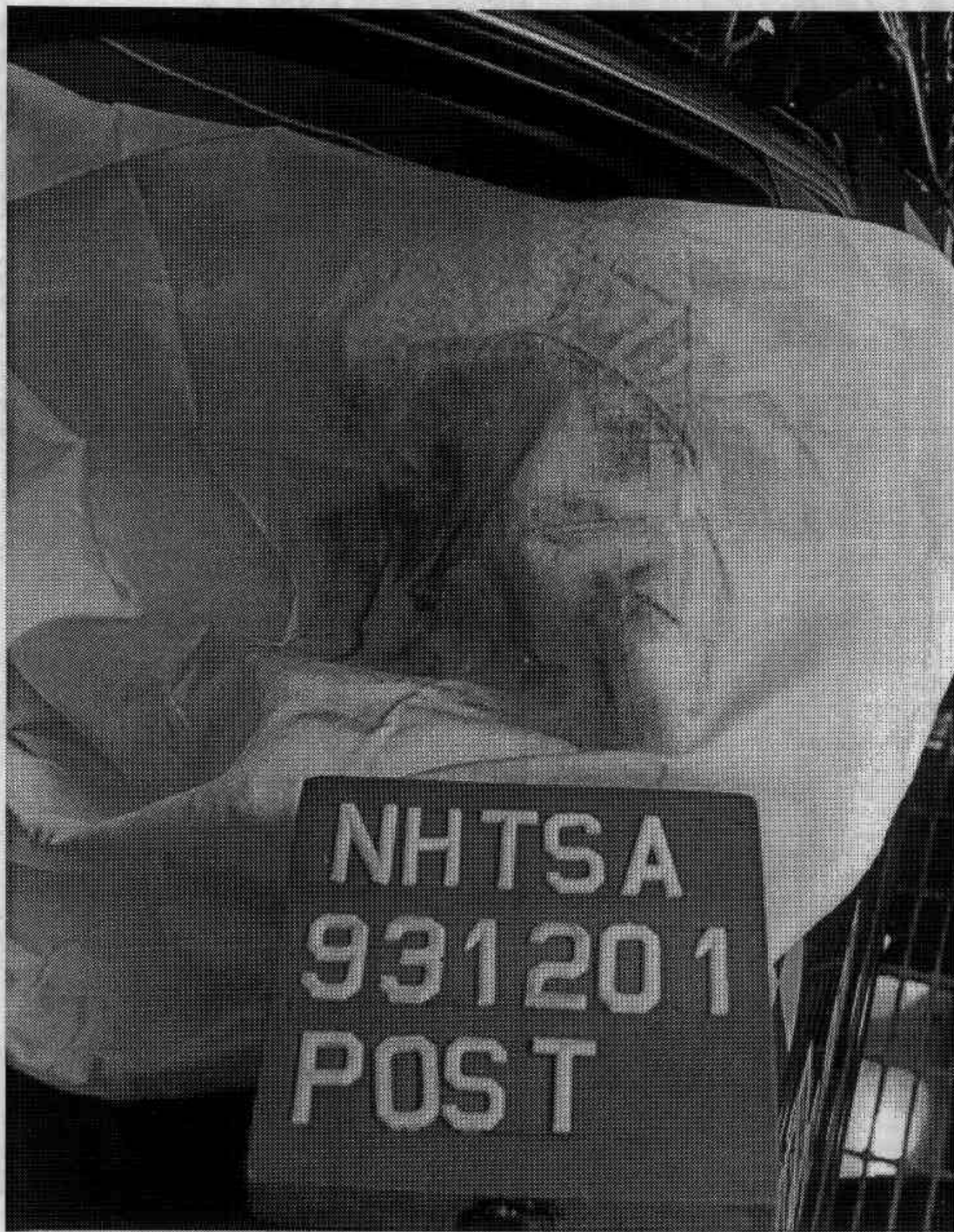


Figure A-48. POST-TEST PASSENGER DUMMY HEAD CONTACT - VIEW 2
A-49 931201

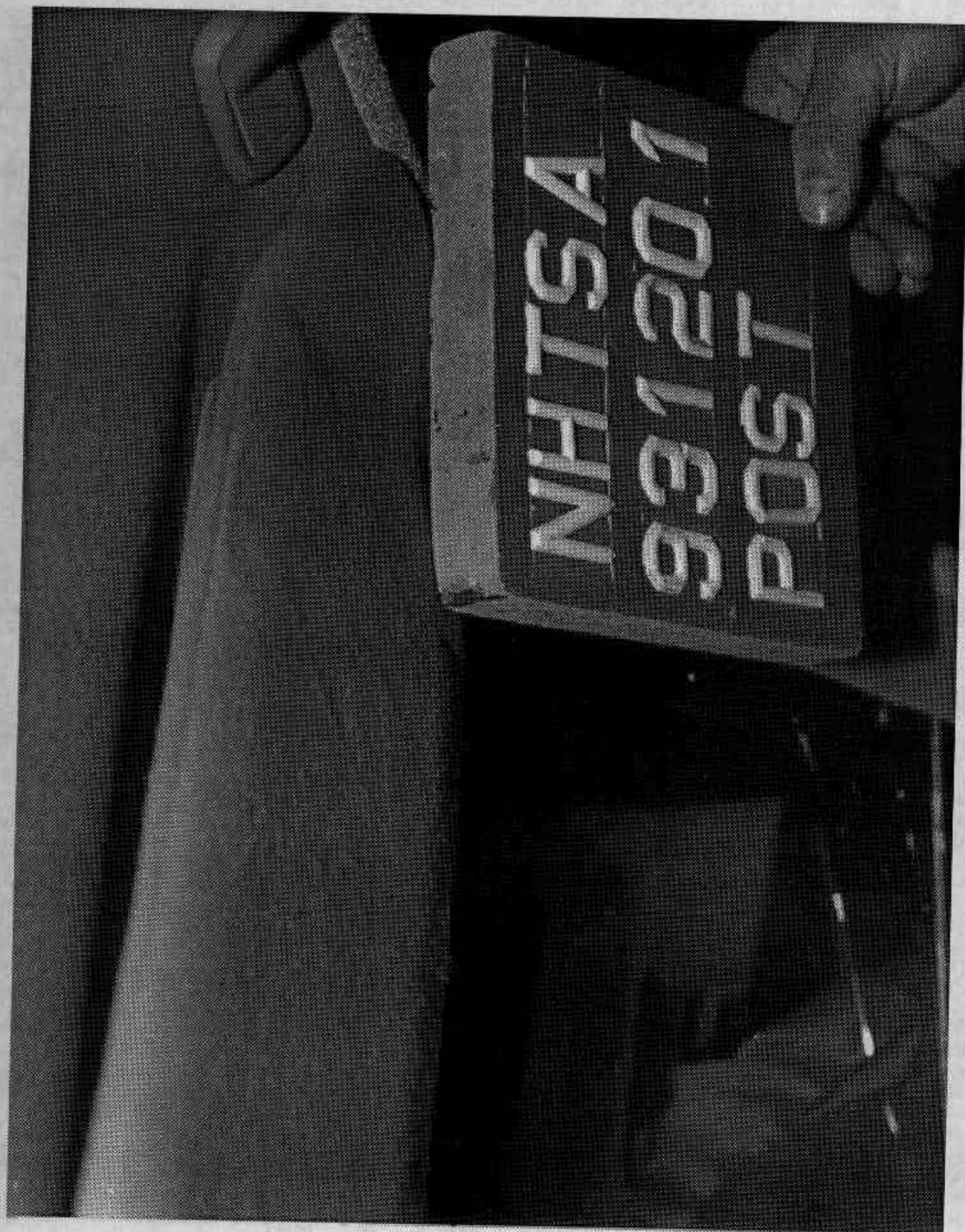


Figure A-49. POST-TEST PASSENGER DUMMY HEAD CONTACT - VIEW 3
A-50 931201



Figure A-50. POST-TEST PASSENGER DUMMY HEAD CONTACT - VIEW 4
A-51 931201



Figure A-51. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1
A-52 931201



Figure A-52. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2

A-53

931201

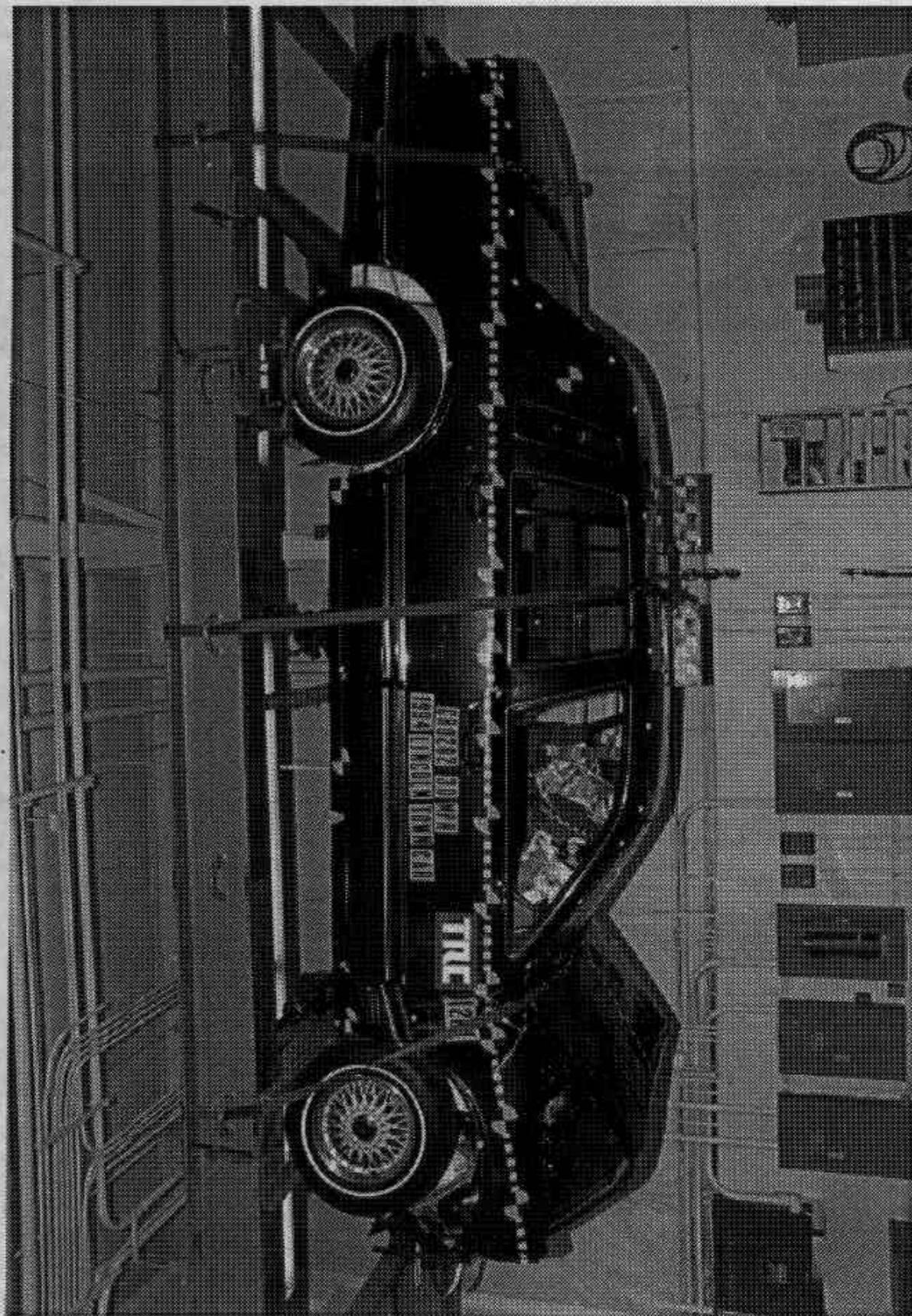


Figure A-55. POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW
A-56 931201



Figure A-56. PRE-TEST DRIVER'S KNEE BOLSTER VIEW

A-57

931201



Figure A-57. PRE-TEST PASSENGER'S KNEE BOLSTER VIEW

A-58

931201

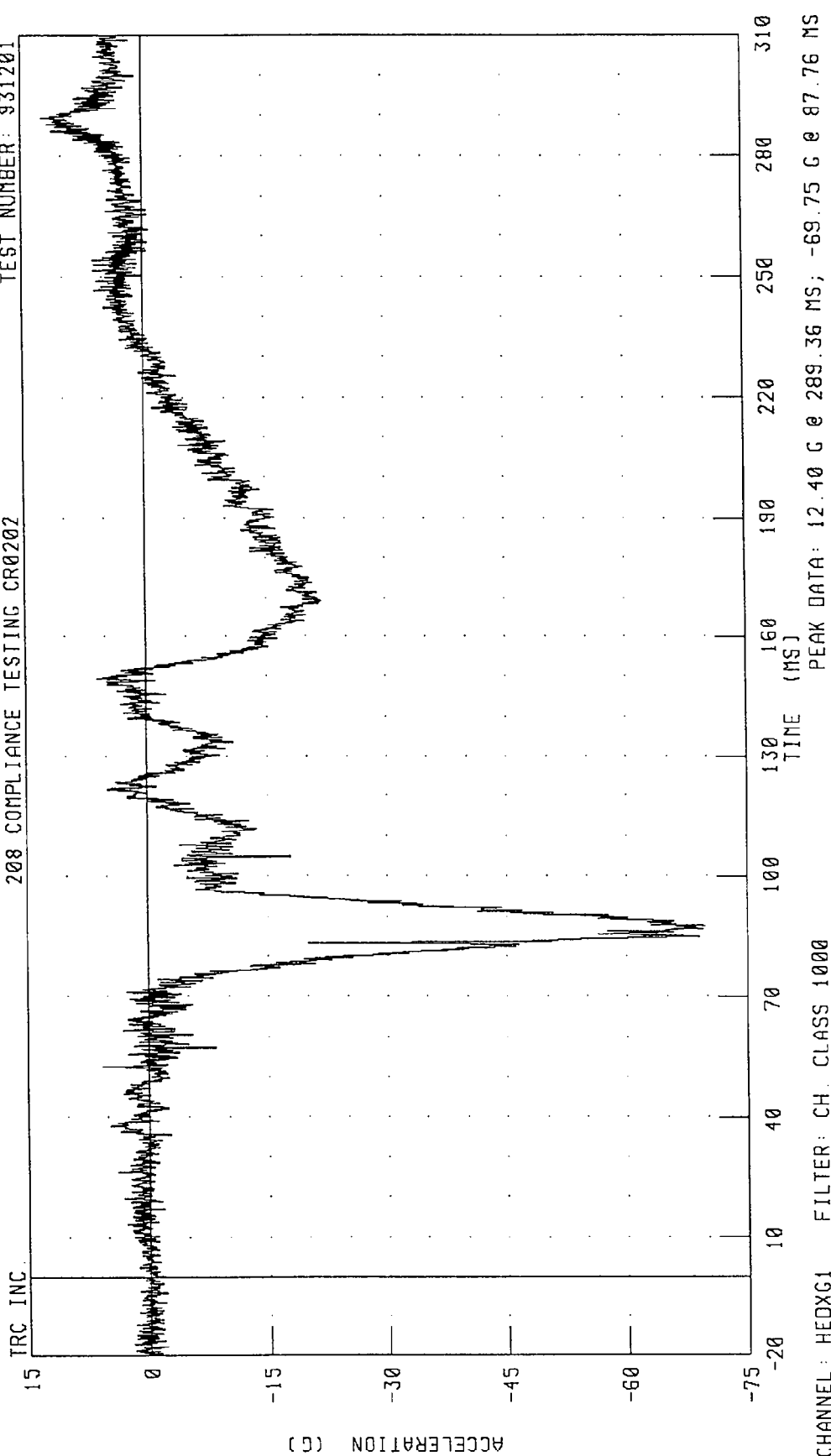
Intentionally Left Blank

APPENDIX B

DATA PLOTS

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
DRIVER HEAD X-AXIS ACCELERATION
208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201



CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

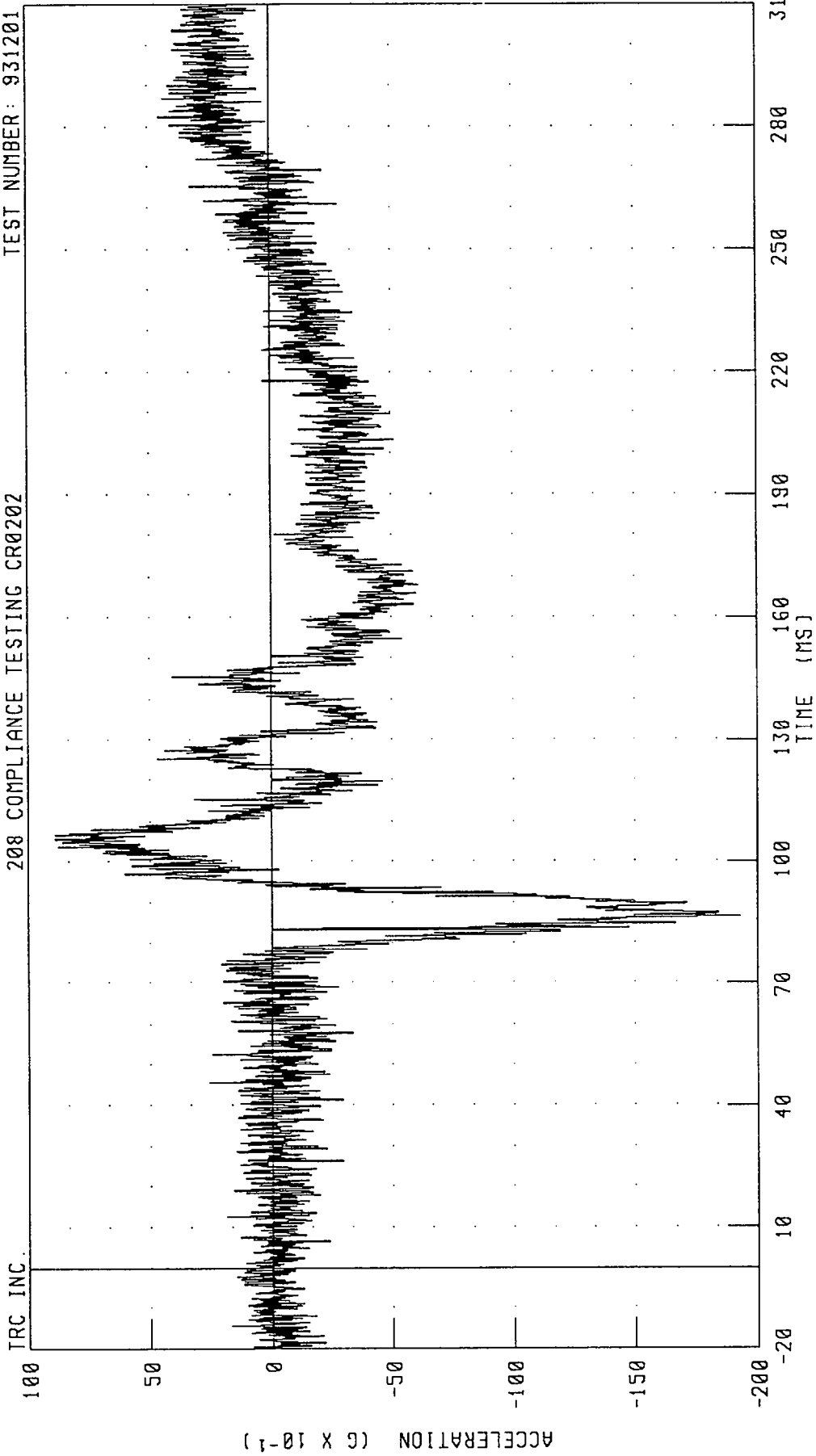
PEAK DATA: 12.40 G @ 289.36 MS; -69.75 G @ 87.76 MS

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER

DRIVER HEAD Y-AXIS ACCELERATION

208 COMPLIANCE TESTING CR0202

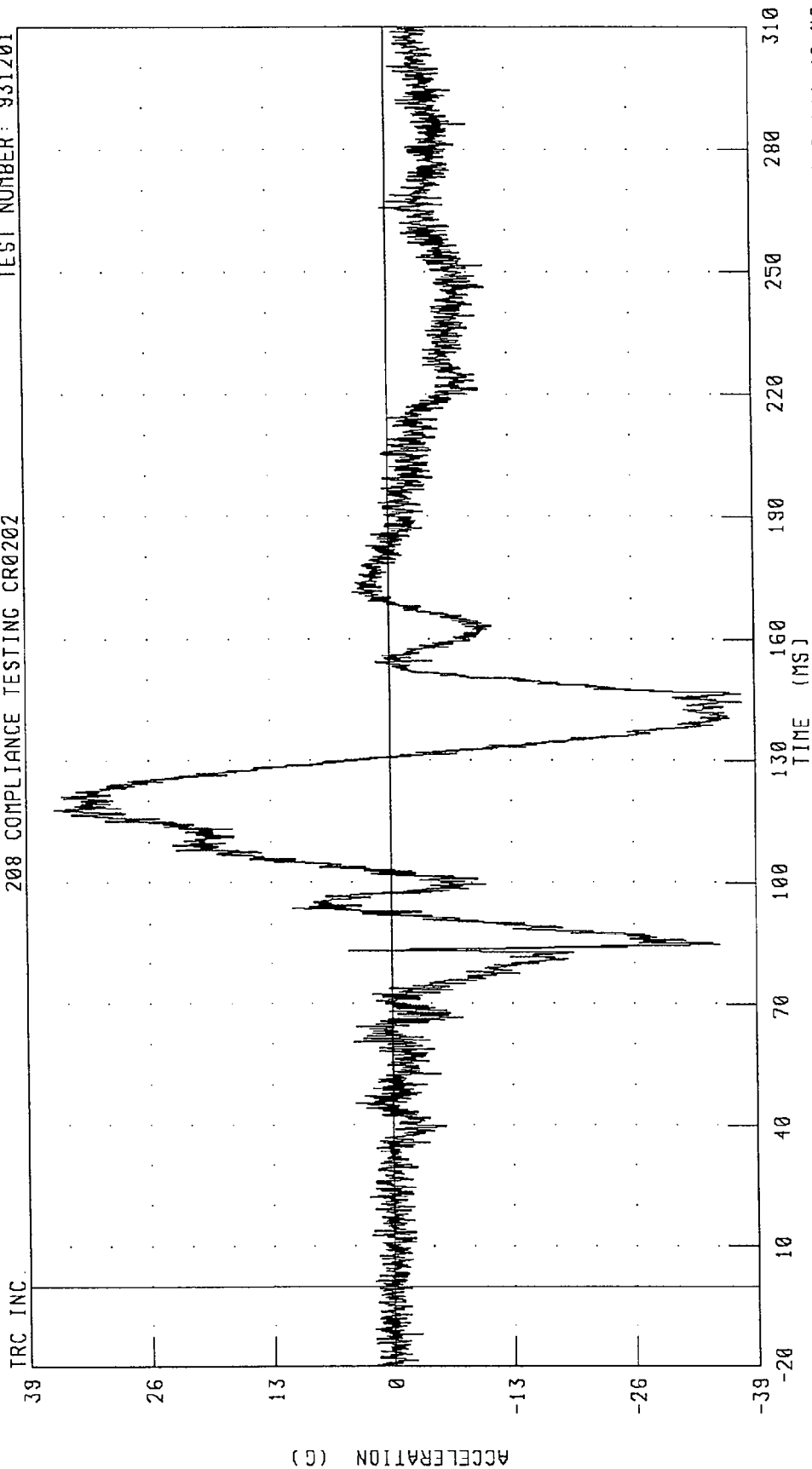
TEST NUMBER: 931201



CHANNEL: HEDYG1 FILTER: CH. CLASS 1000

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201

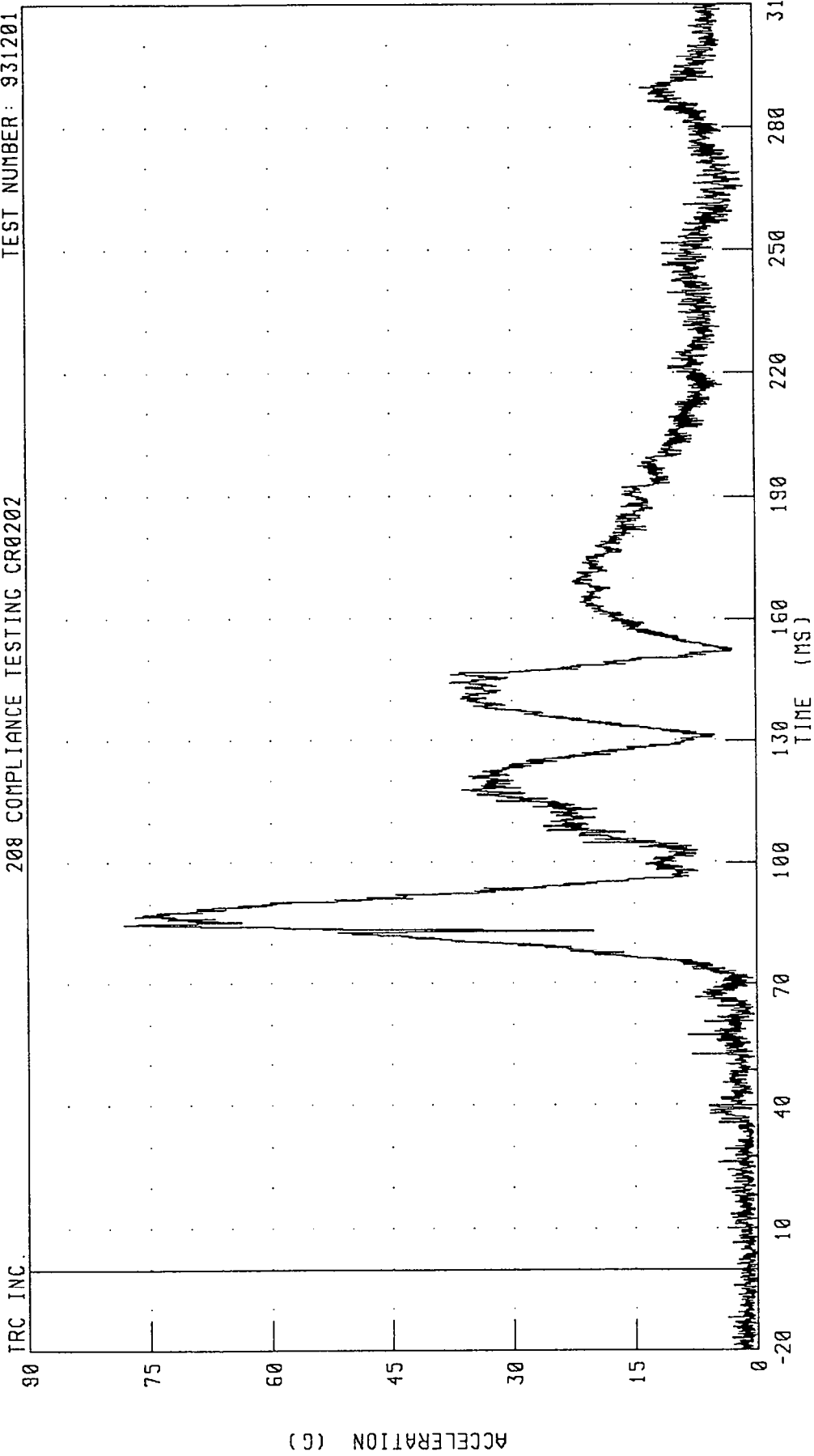


PEAK DATA: 36.01 G @ 117.92 MS, -37.69 G @ 144.40 MS

CHANNEL: HDZG1 FILTER: CH. CLASS 1000

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
 DRIVER HEAD RESULTANT ACCELERATION
 208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201

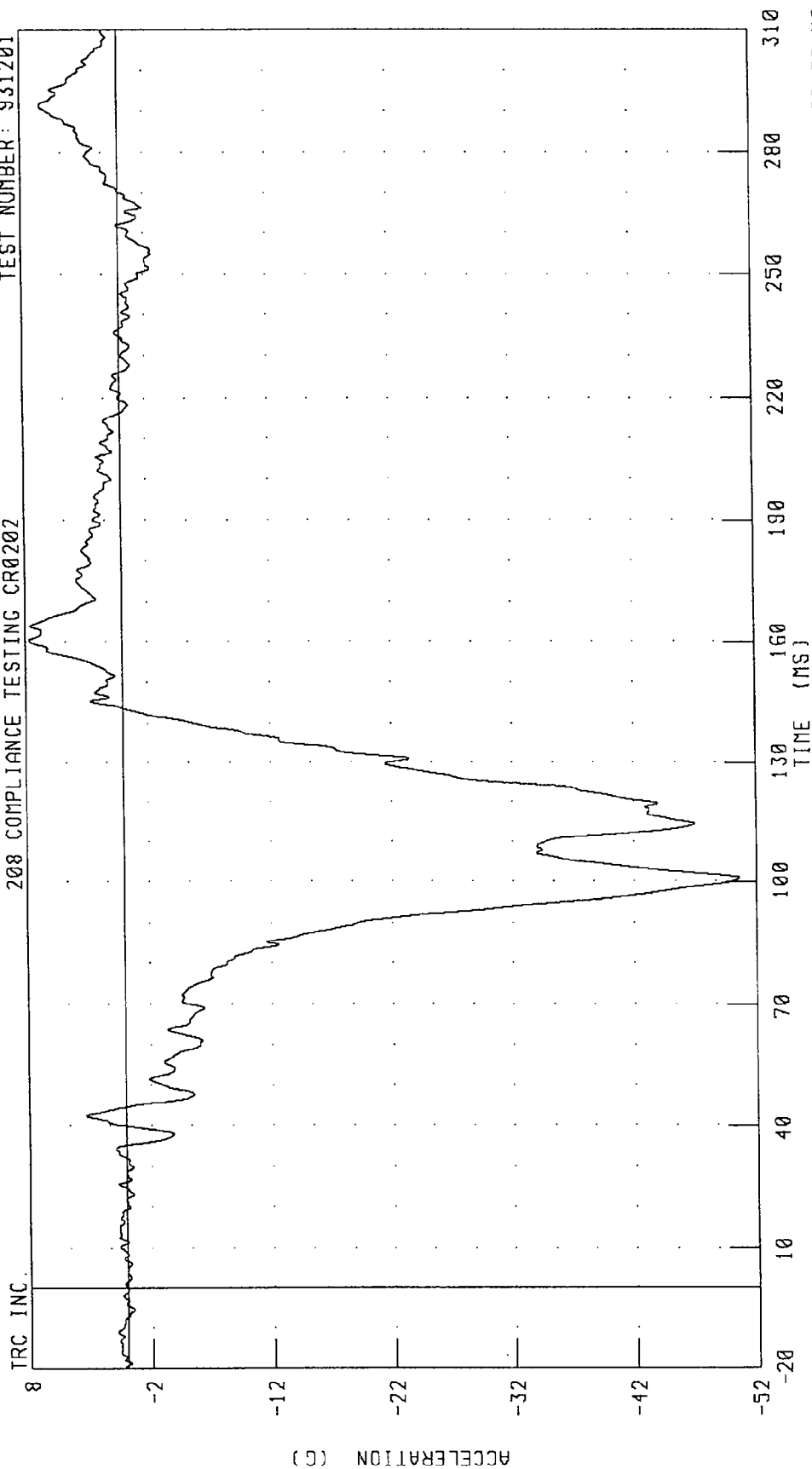


PEAK DATA: 78.19 G @ 85.04 MS, 0.10 G @ -5.92 MS

CHANNEL: HEDRG1 FILTER: CH. CLASS 1000

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
DRIVER CHEST X-AXIS ACCELERATION
208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201

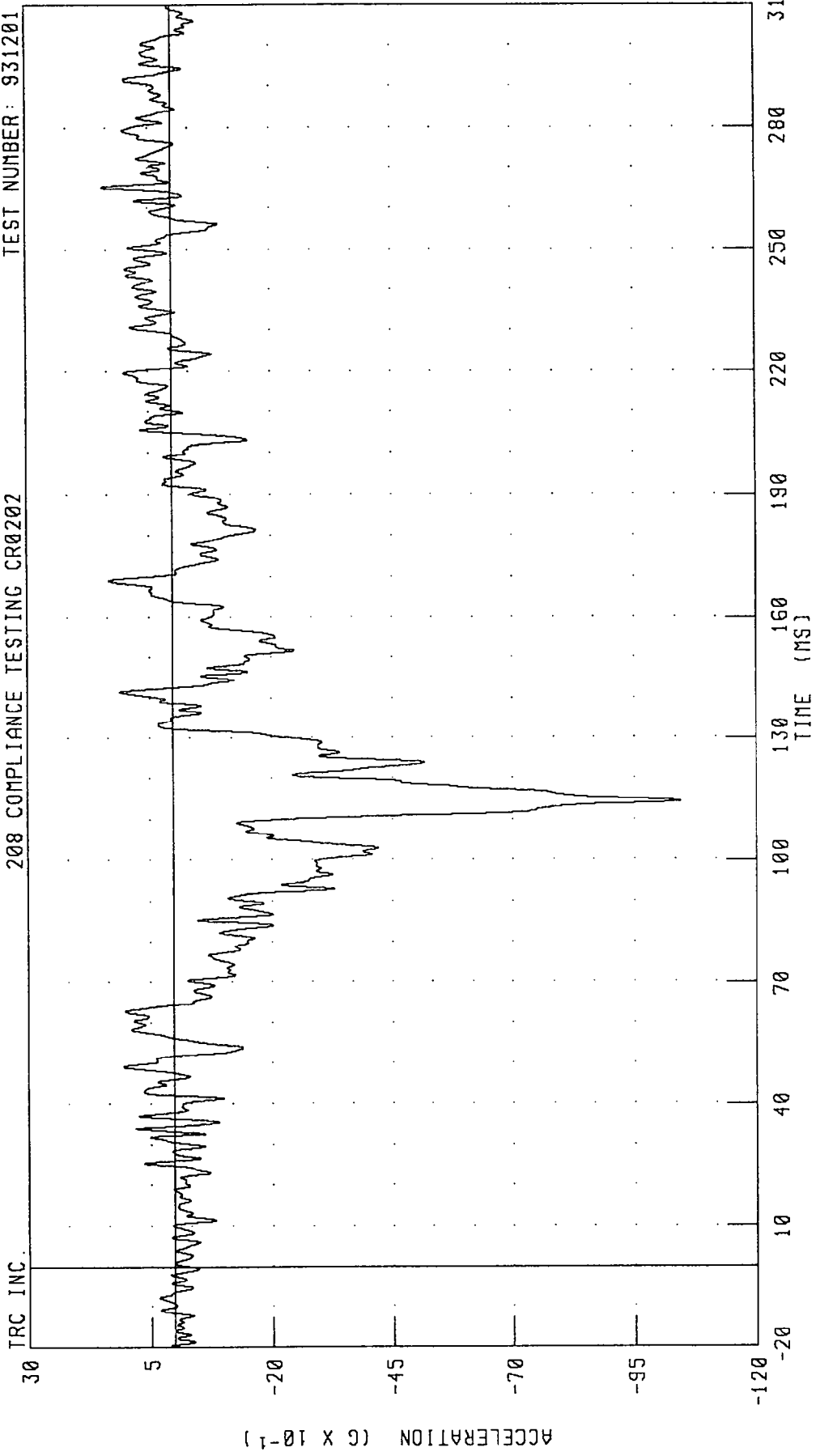


CHANNEL: CSTXG1 FILTER: CH. CLASS 180

PEAK DATA: 7.64 G @ 160.32 MS; -50.61 G @ 100.88 MS

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
DRIVER CHEST Y-AXIS ACCELERATION
208 COMPLIANCE TESTING CR0202

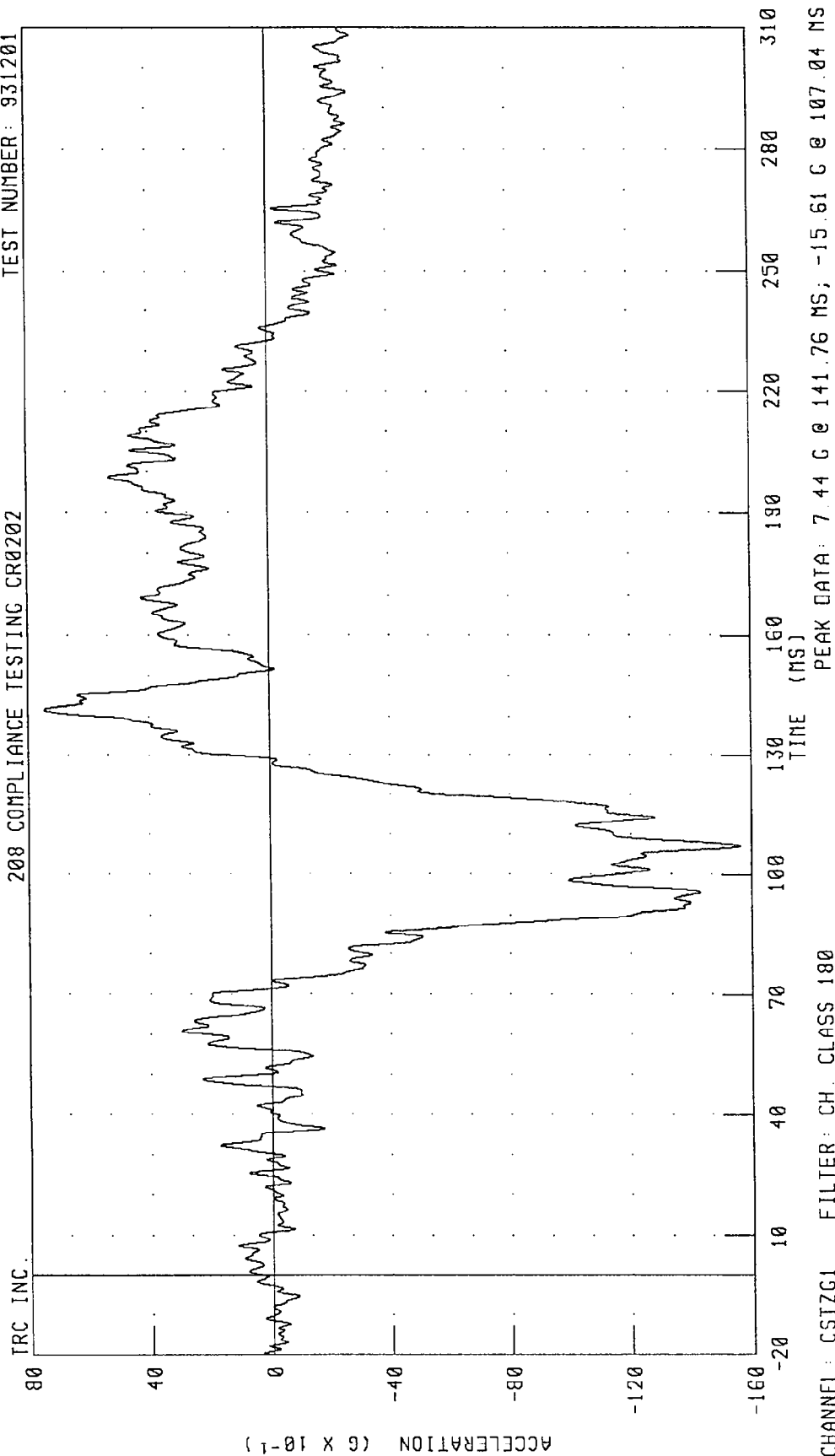
TEST NUMBER: 931201



CHANNEL: CSTYC1 FILTER: CH. CLASS 180

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR0202

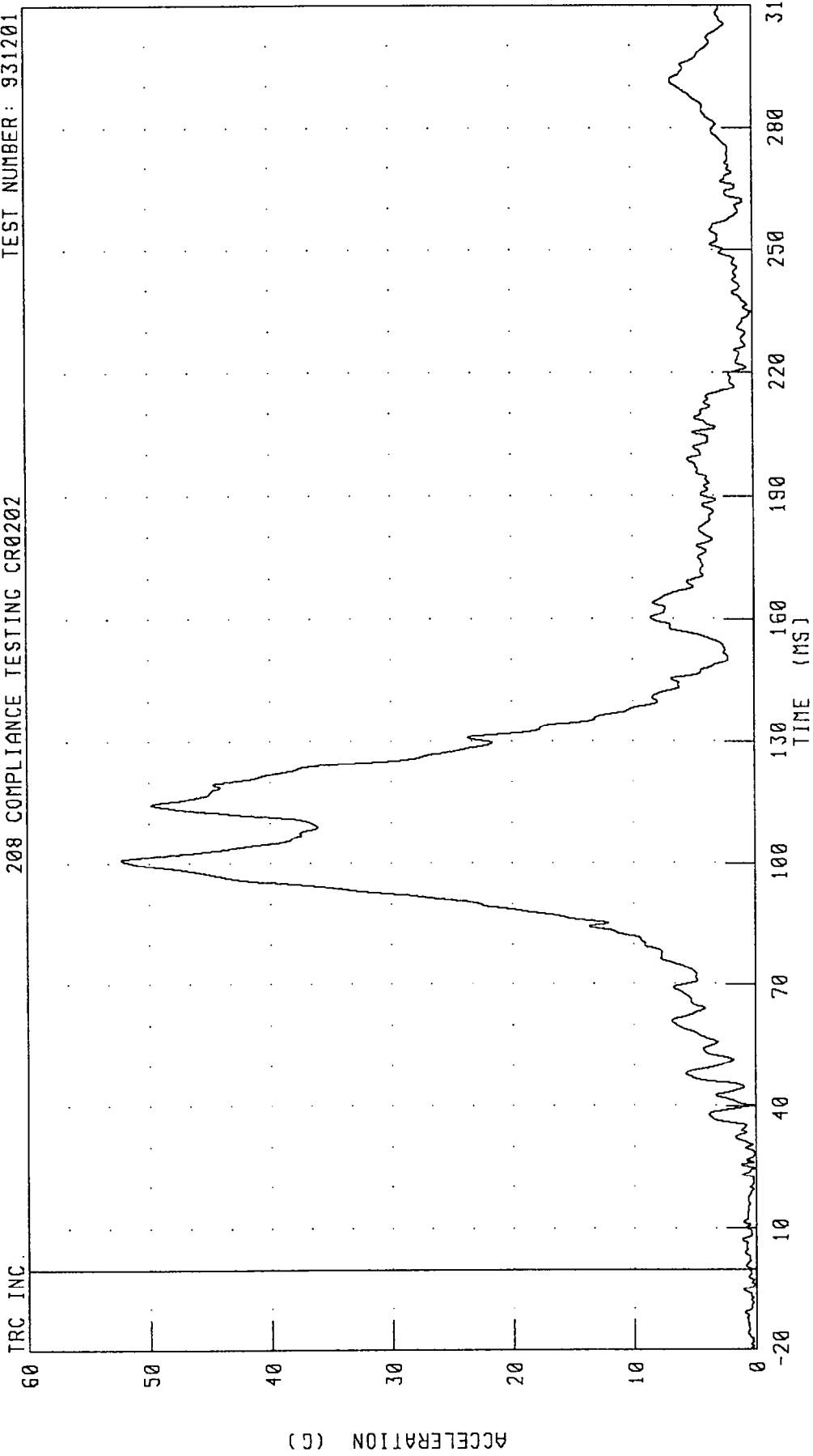
TEST NUMBER: 931201



CHANNEL: CSTZG1 FILTER: CH. CLASS 180

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
DRIVER CHEST RESULTANT ACCELERATION
208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201

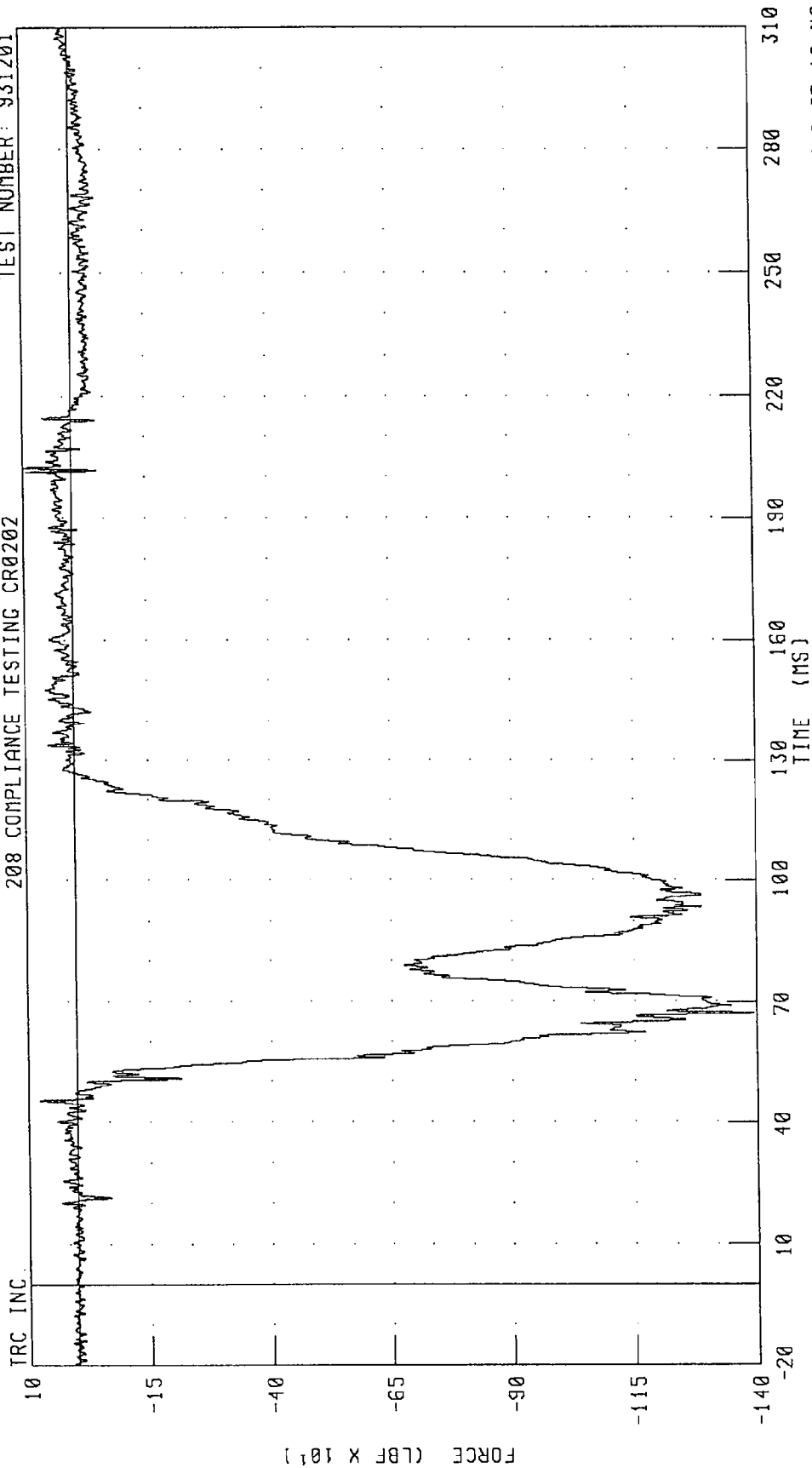


CHANNEL: CSTRG1 FILTER: CH. CLASS 180

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
DRIVER LEFT FEMUR FORCE

208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201



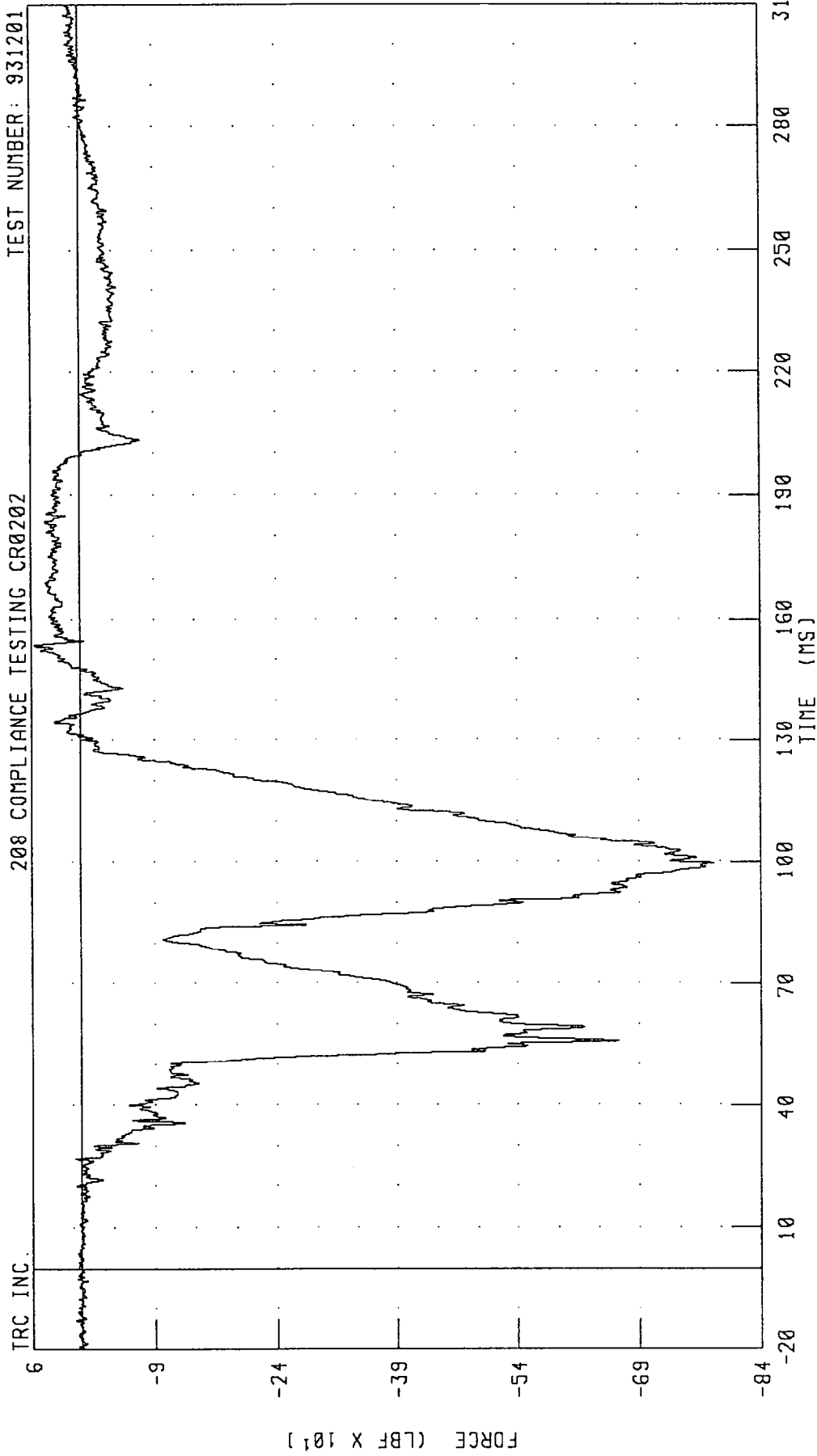
CHANNEL: LFMFI FILTER: CH. CLASS 600

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER

DRIVER RIGHT FEMUR FORCE

208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201



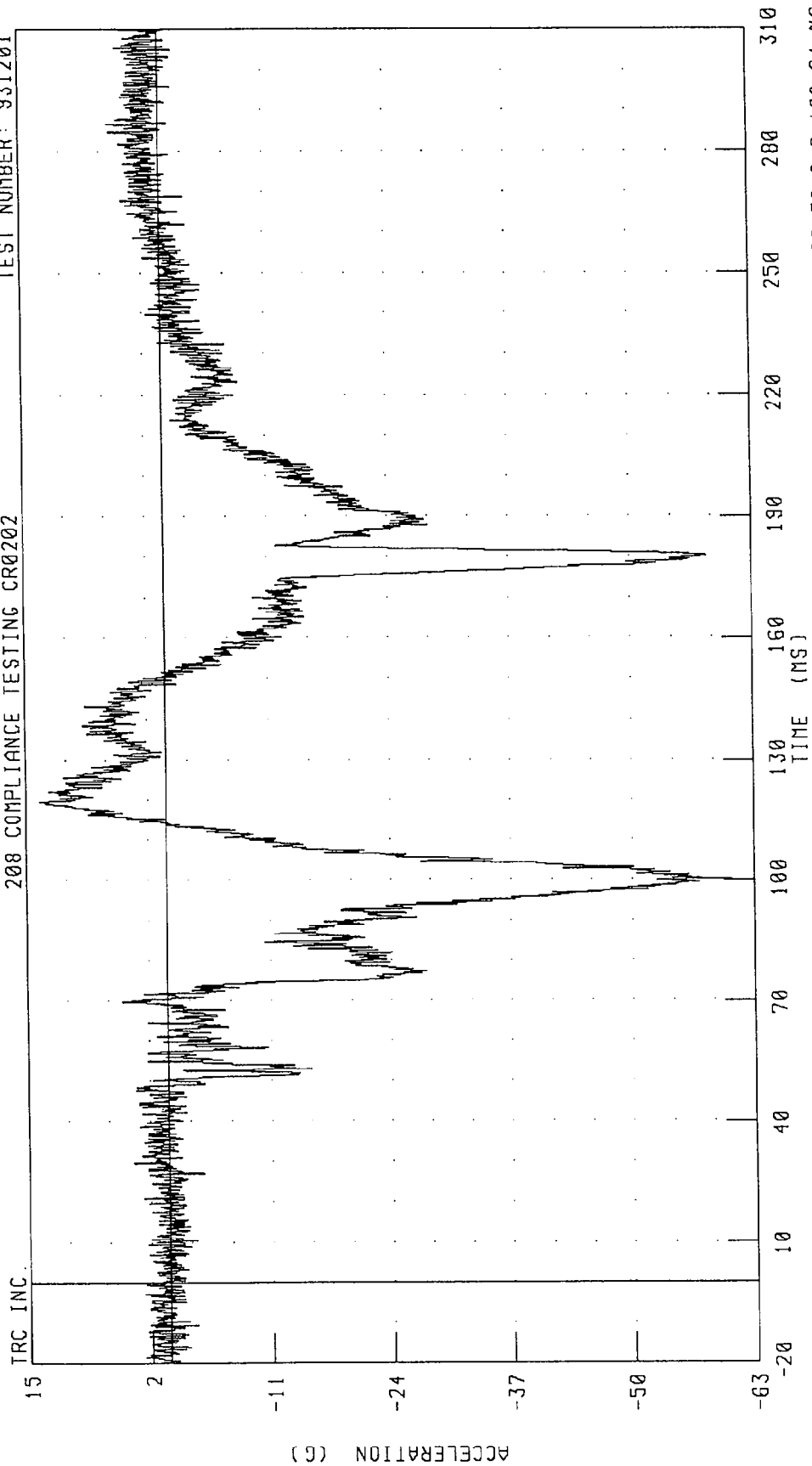
PEAK DATA: 56.17 LBF @ 153.60 MS, -782.73 LBF @ 99.76 MS

CHANNEL: RFMF1 FILTER: CH. CLASS 600

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION

TEST NUMBER: 931201

208 COMPLIANCE TESTING CR0202

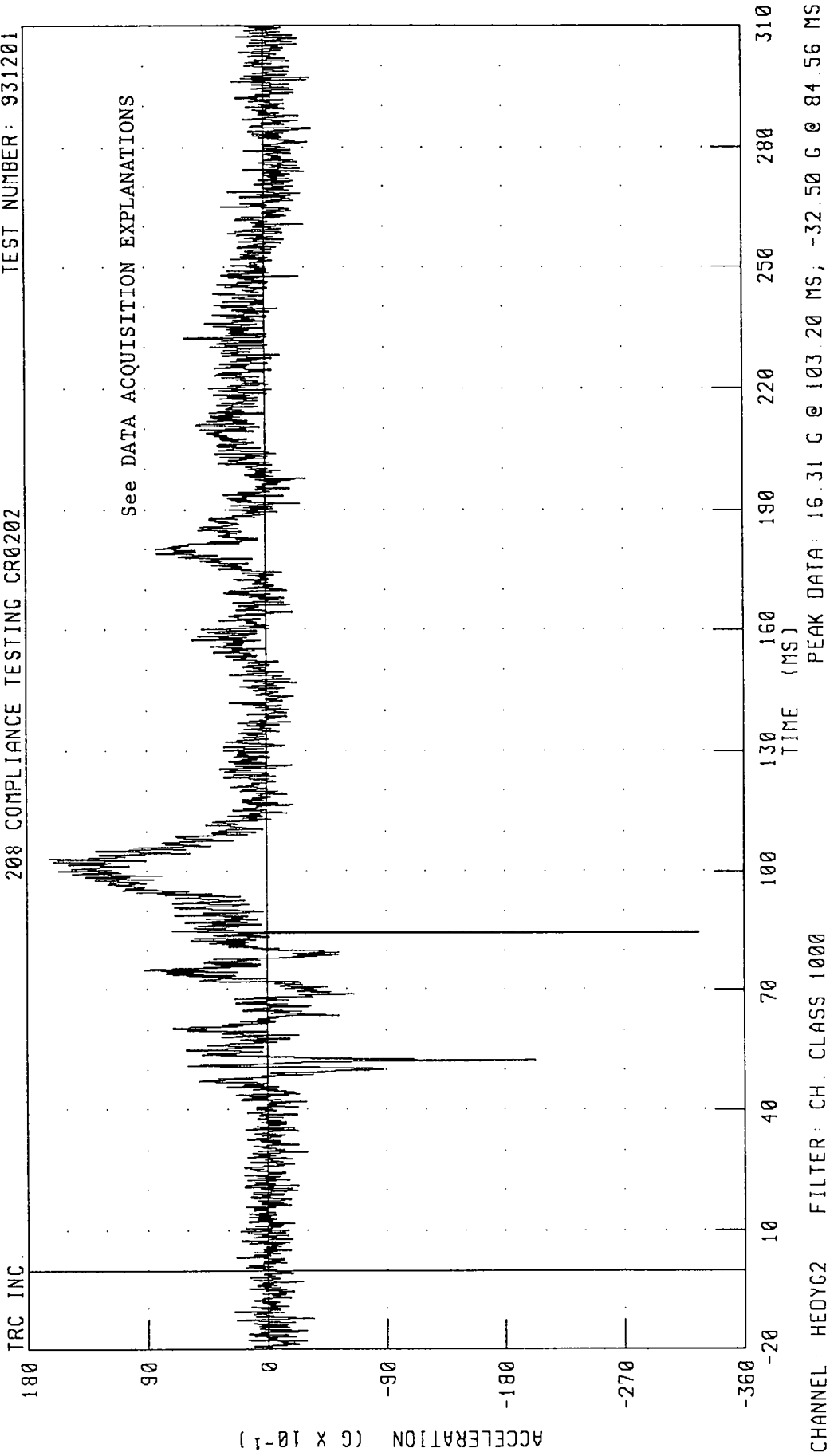


CHANNEL: HEDXG2 FILTER: CH CLASS 1000

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION

208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201



1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION

TEST NUMBER: 931201

208 COMPLIANCE TESTING CR0202

TRC INC.

140

60

-20

-100

-180

-260

-340

-20

10

40

70

100

130

160

190

220

250

280

310

TIME (MS)

ACCELERATION (G X 10⁻¹)

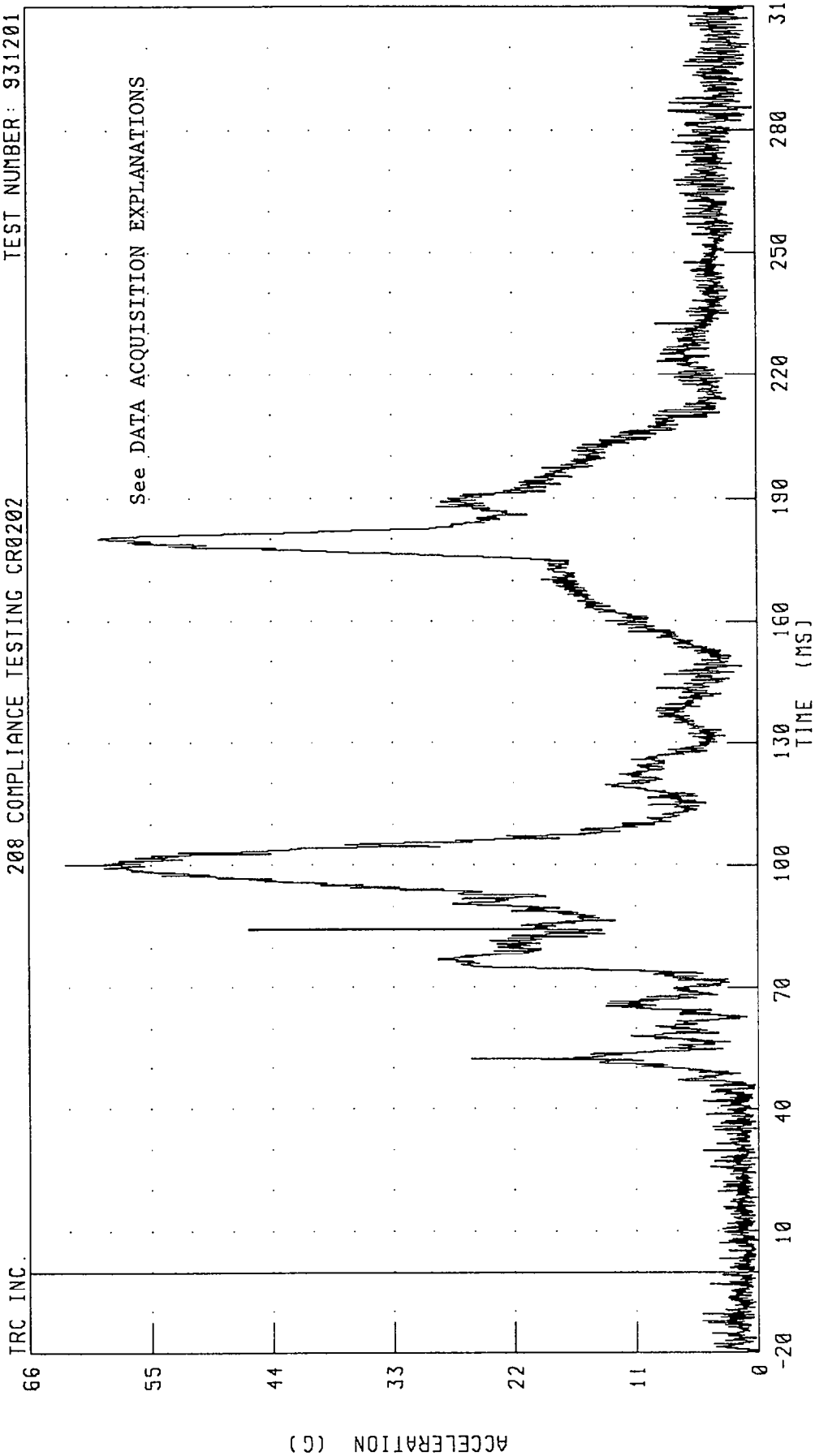
See DATA ACQUISITION EXPLANATIONS

CHANNEL: HE0ZG2 FILTER: CH. CLASS 1000

PEAK DATA: 12.82 G @ 65.52 MS; -30.66 G @ 84.56 MS

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION
 208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201



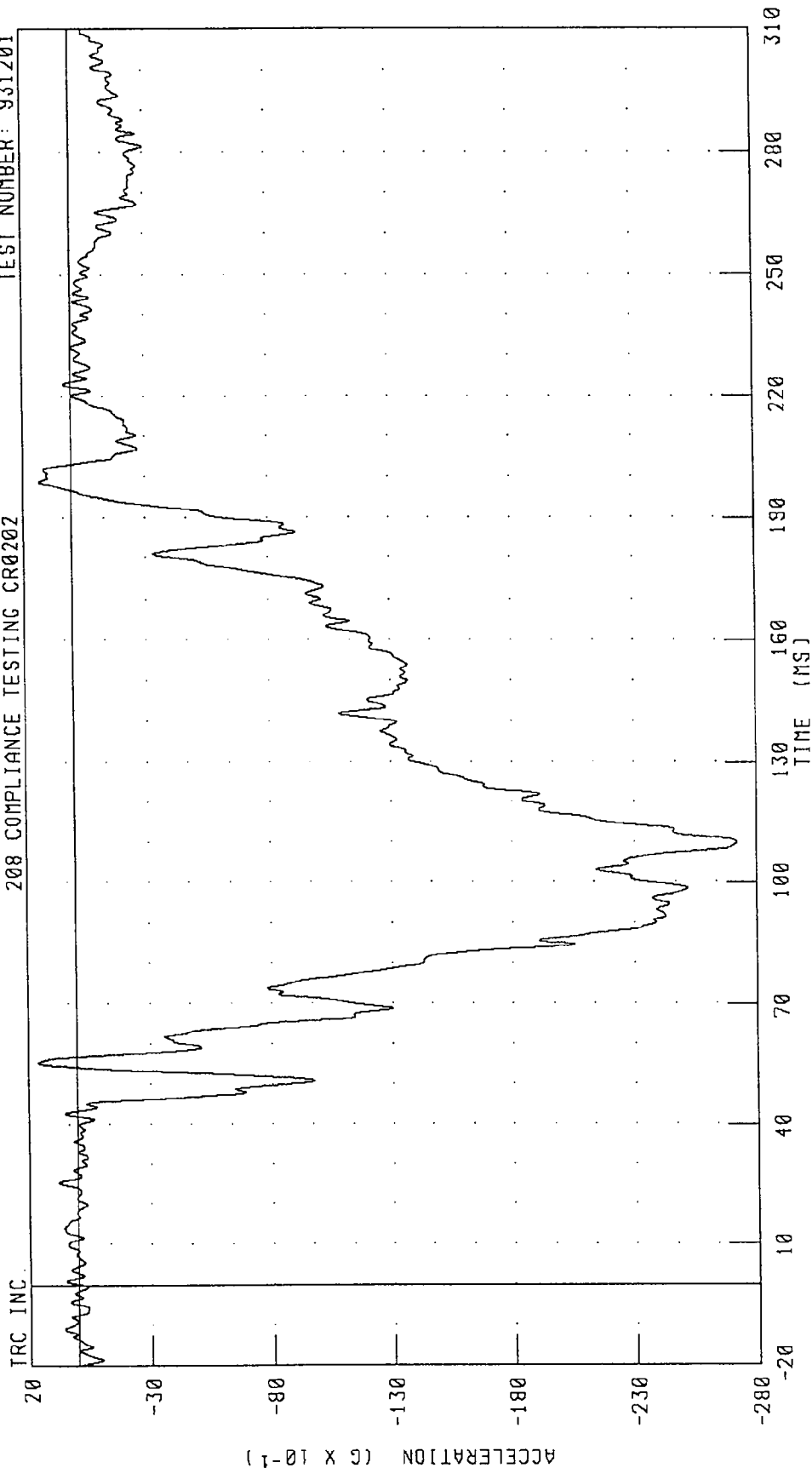
PEAK DATA: 62.68 G @ 100.24 MS; 0.18 G @ -19.92 MS

CHANNEL: HEDRC2 FILTER: CH. CLASS 1000

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION

TEST NUMBER: 931201

208 COMPLIANCE TESTING CR0202



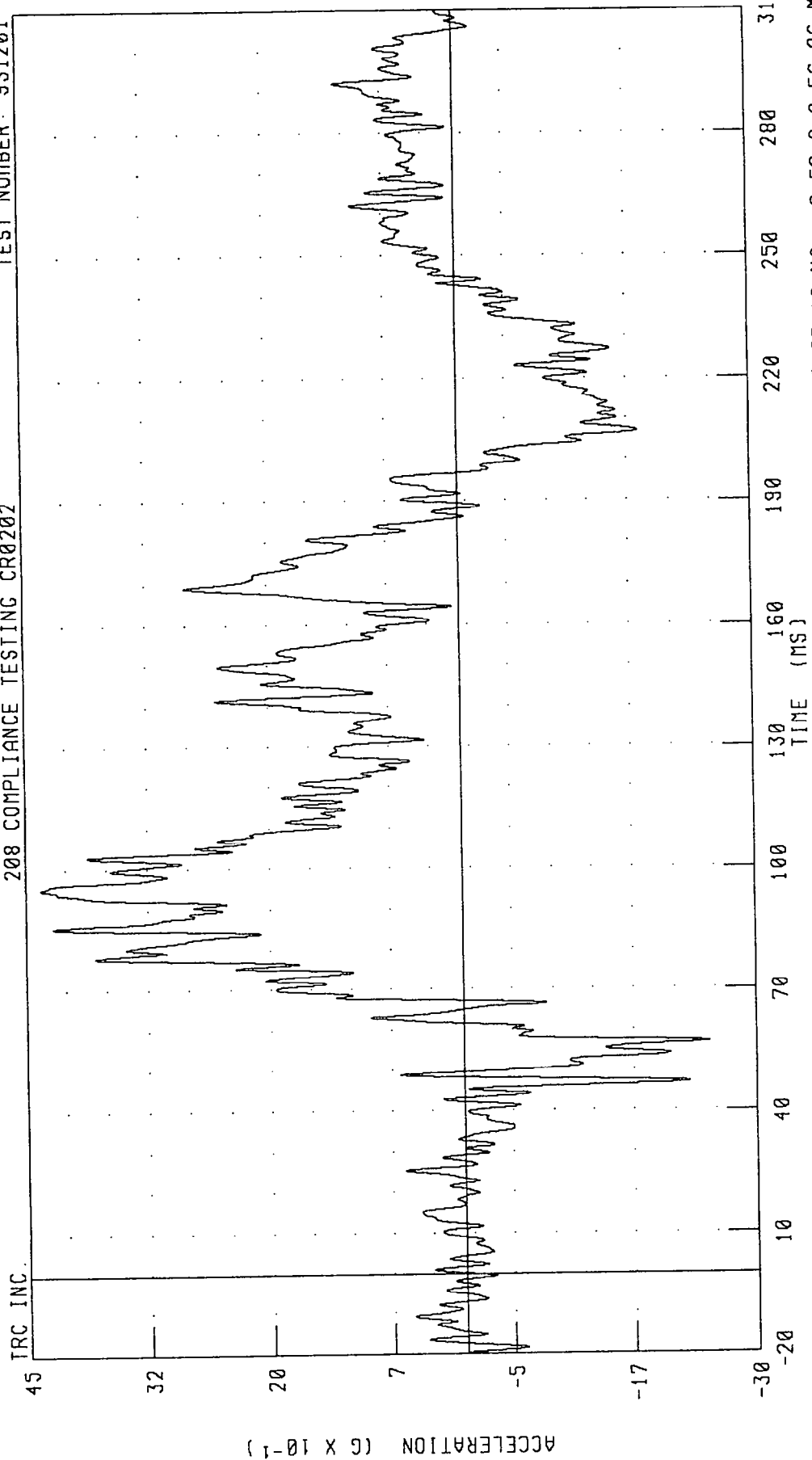
PEAK DATA: 1.61 G @ 55.28 MS; -27.18 G @ 109.84 MS

CHANNEL: CSTXG2 FILTER: CH. CLASS 180

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION

TEST NUMBER: 931201

208 COMPLIANCE TESTING CR0202



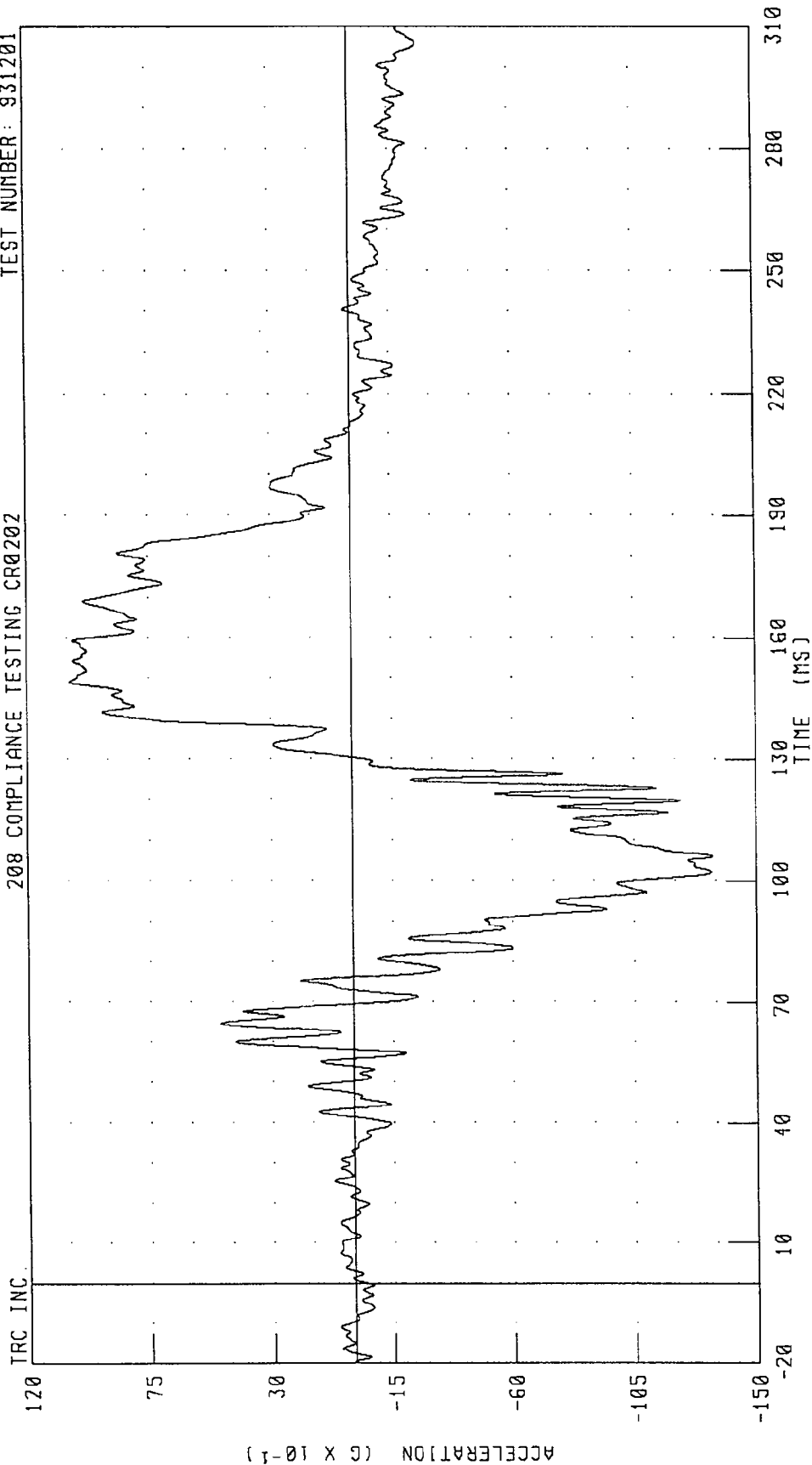
PEAK DATA: 4.34 G @ 95.12 MS; -2.52 G @ 56.96 MS

CHANNEL: CSTYC2 FILTER: CH. CLASS 180

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION

TEST NUMBER: 931201

208 COMPLIANCE TESTING CR0202

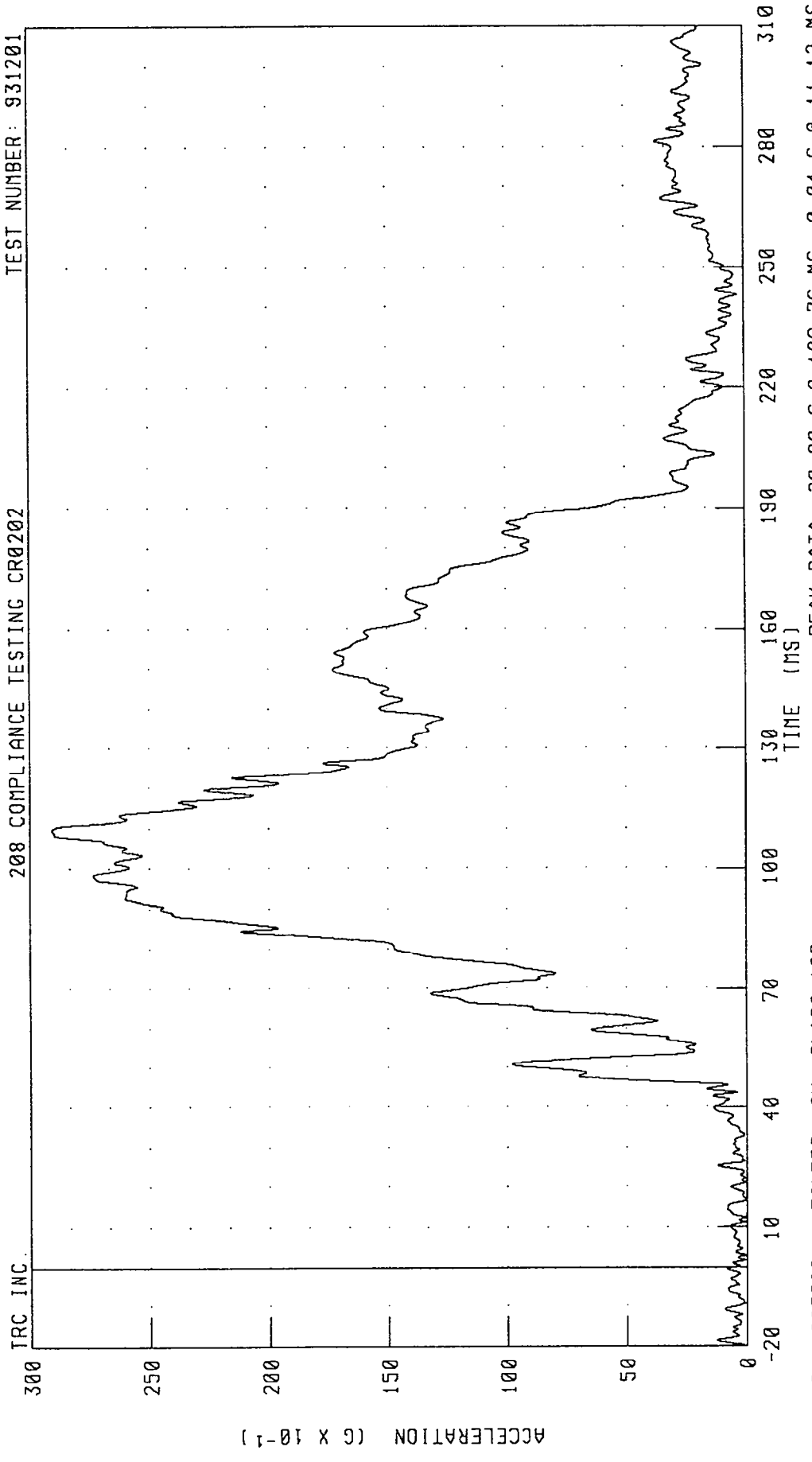


PEAK DATA: 10.41 G @ 149.12 MS; -13.38 G @ 106.08 MS

CHANNEL: CSTZG2 FILTER: CH. CLASS 180

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION
208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201

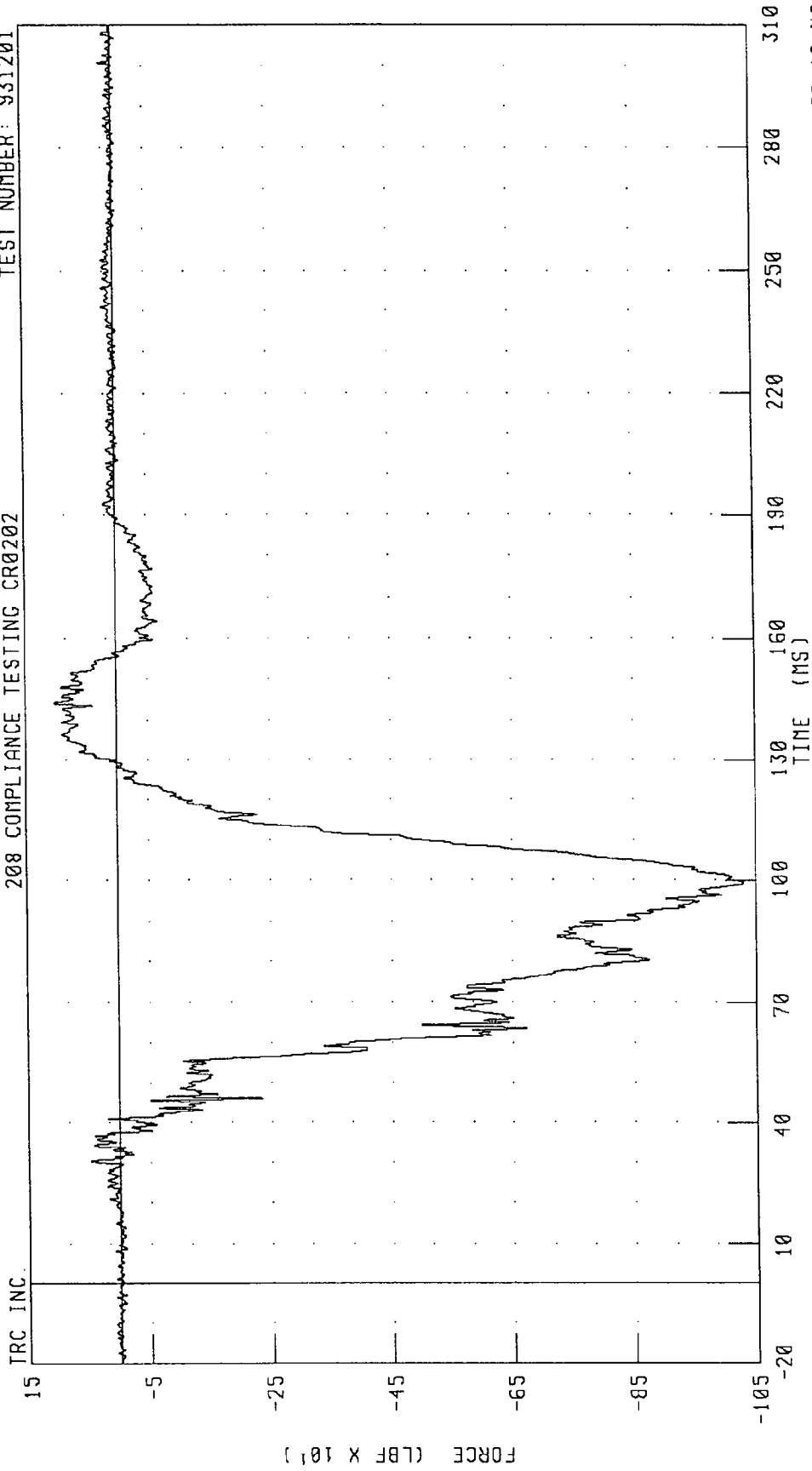


CHANNEL: CSTRG2 FILTER: CH. CLASS 180 PEAK DATA: 29.08 G @ 109.76 MS; 0.04 G @ 11.12 MS

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT FEMUR FORCE

208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201



CHANNEL: LFMF2 FILTER: CH. CLASS 600

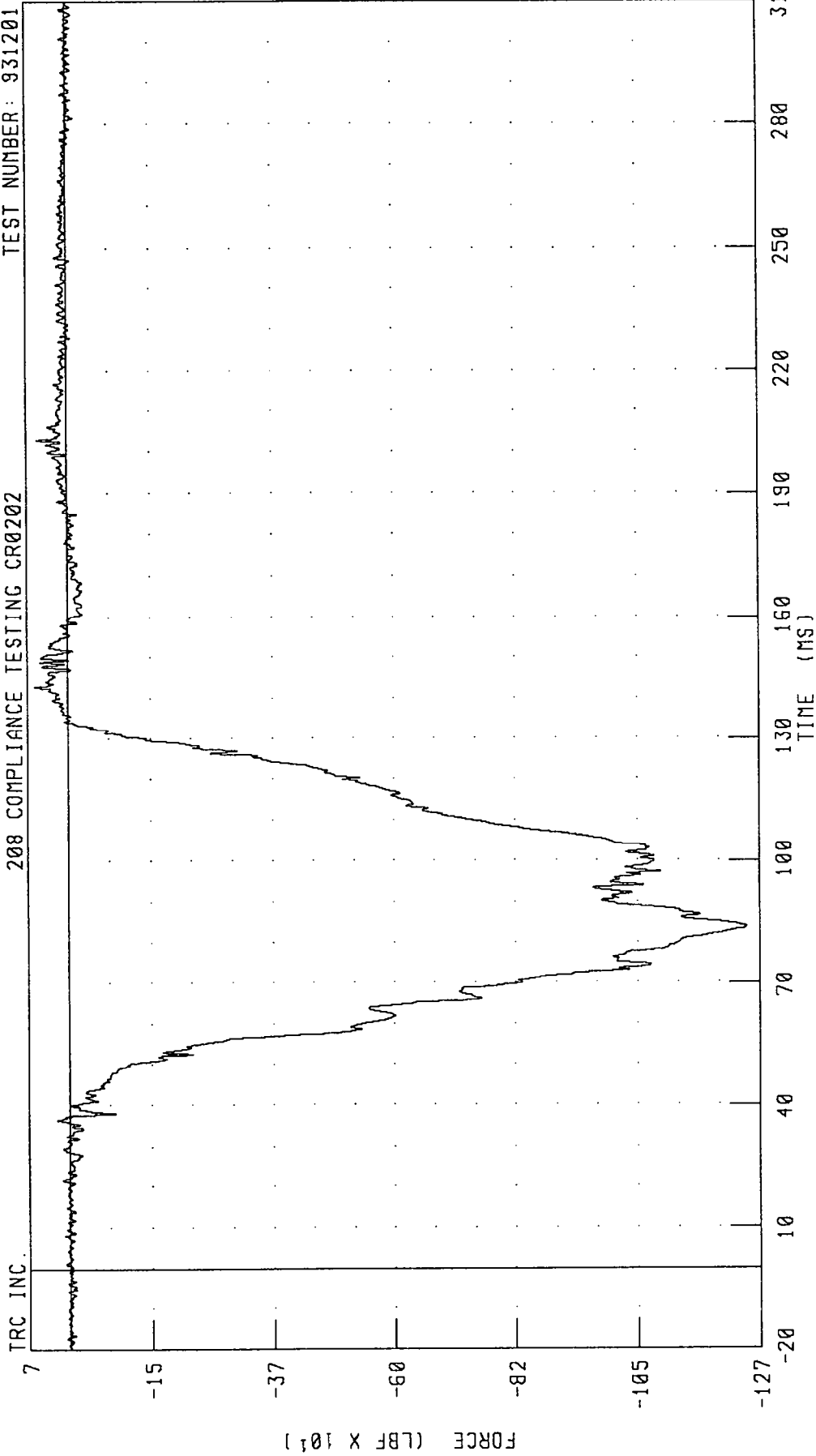
PEAK DATA: 101.75 LBF @ 144.32 MS; -1029.83 LBF @ 99.12 MS

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER

RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201

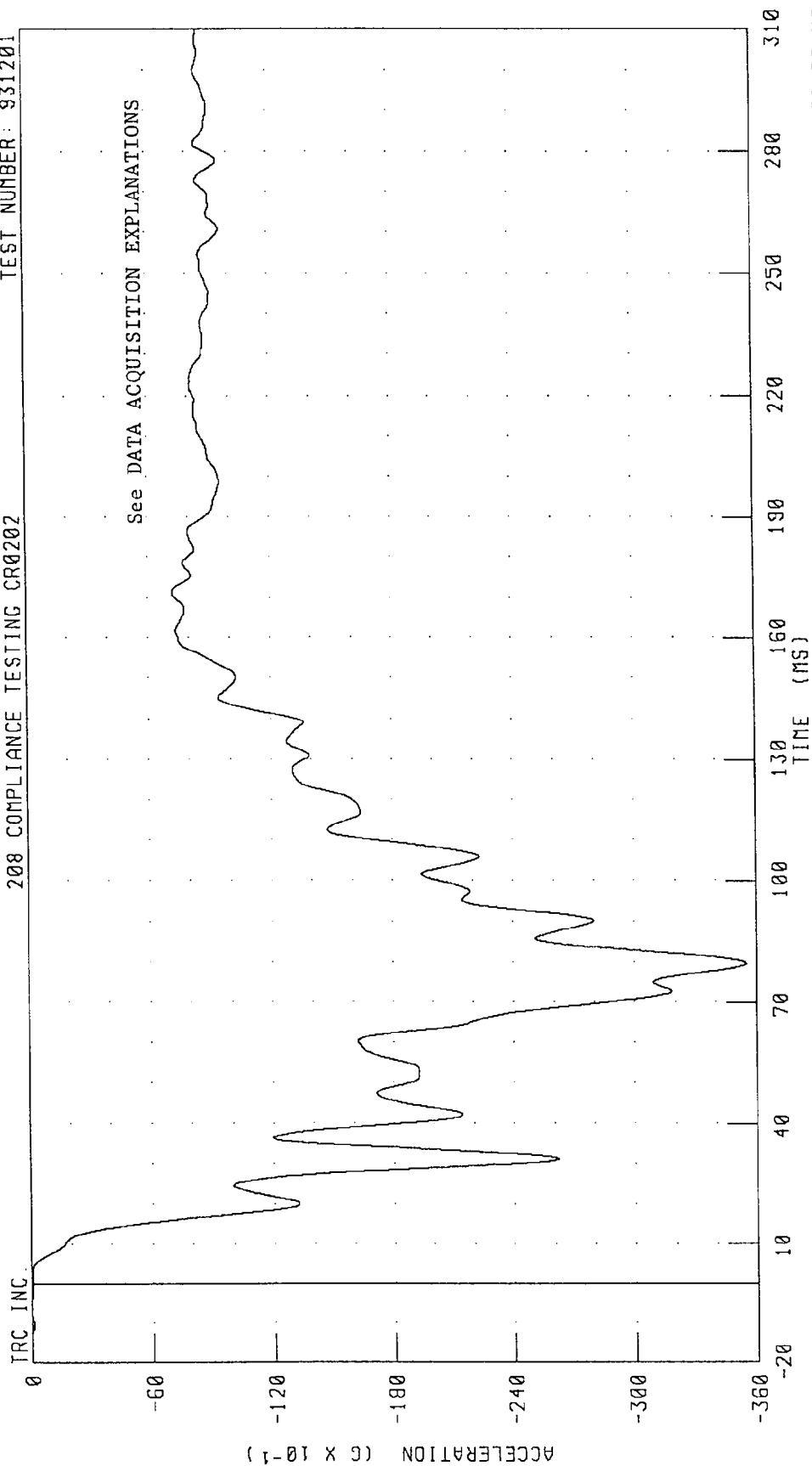


CHANNEL: RFMF2 FILTER: CH. CLASS 600

PEAK DATA: 61.27 LBF @ 142.96 MS; -1250.60 LBF @ 83.92 MS

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
LEFT REAR SEAT X-AXIS ACCELERATION
200 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201



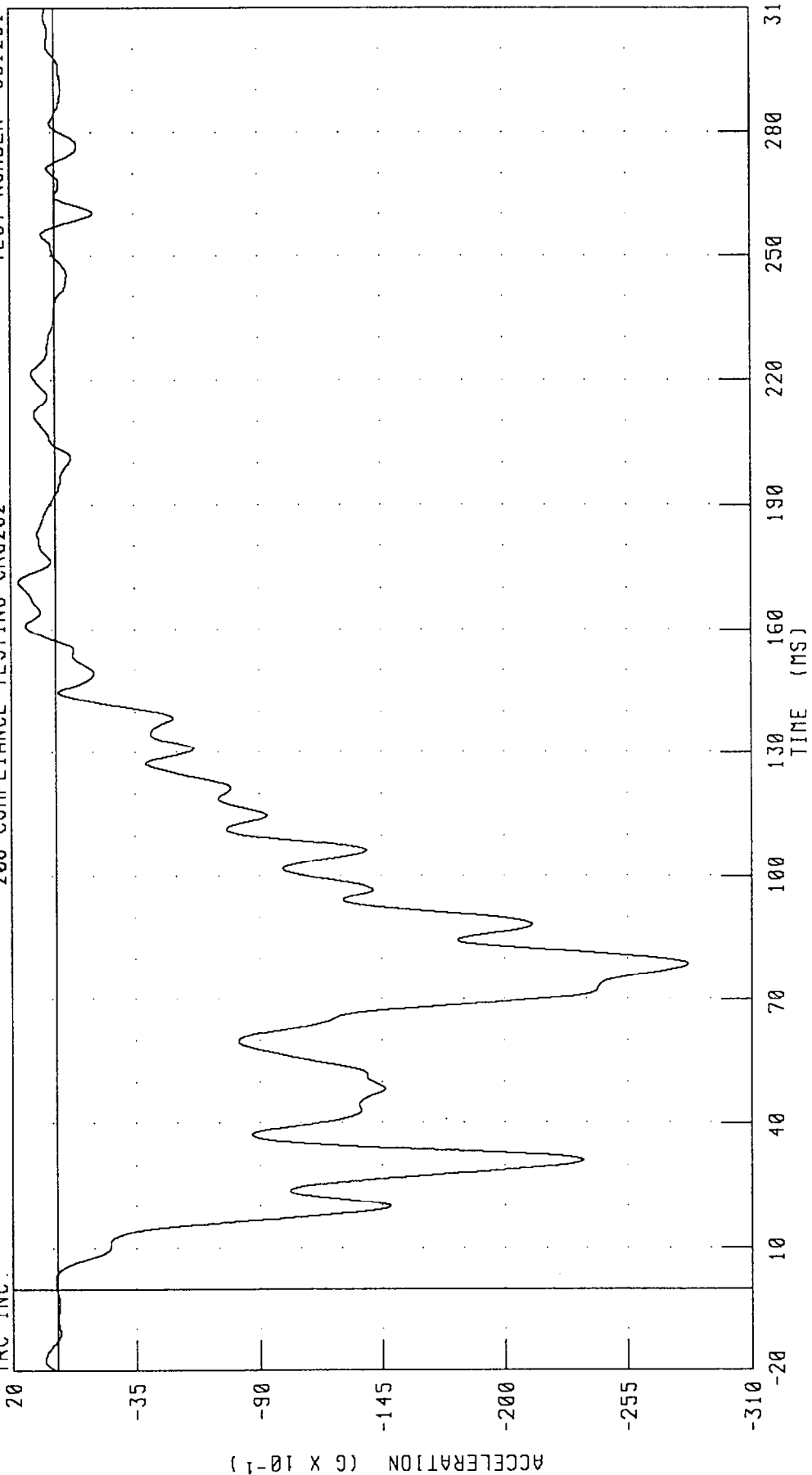
PEAK DATA: 0 33 G @ -17.60 MS; -35.50 G @ 79.68 MS

CHANNEL: TLRXG1 FILTER: CH. CLASS 60

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
 RIGHT REAR SEAT X-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201

TRC INC.

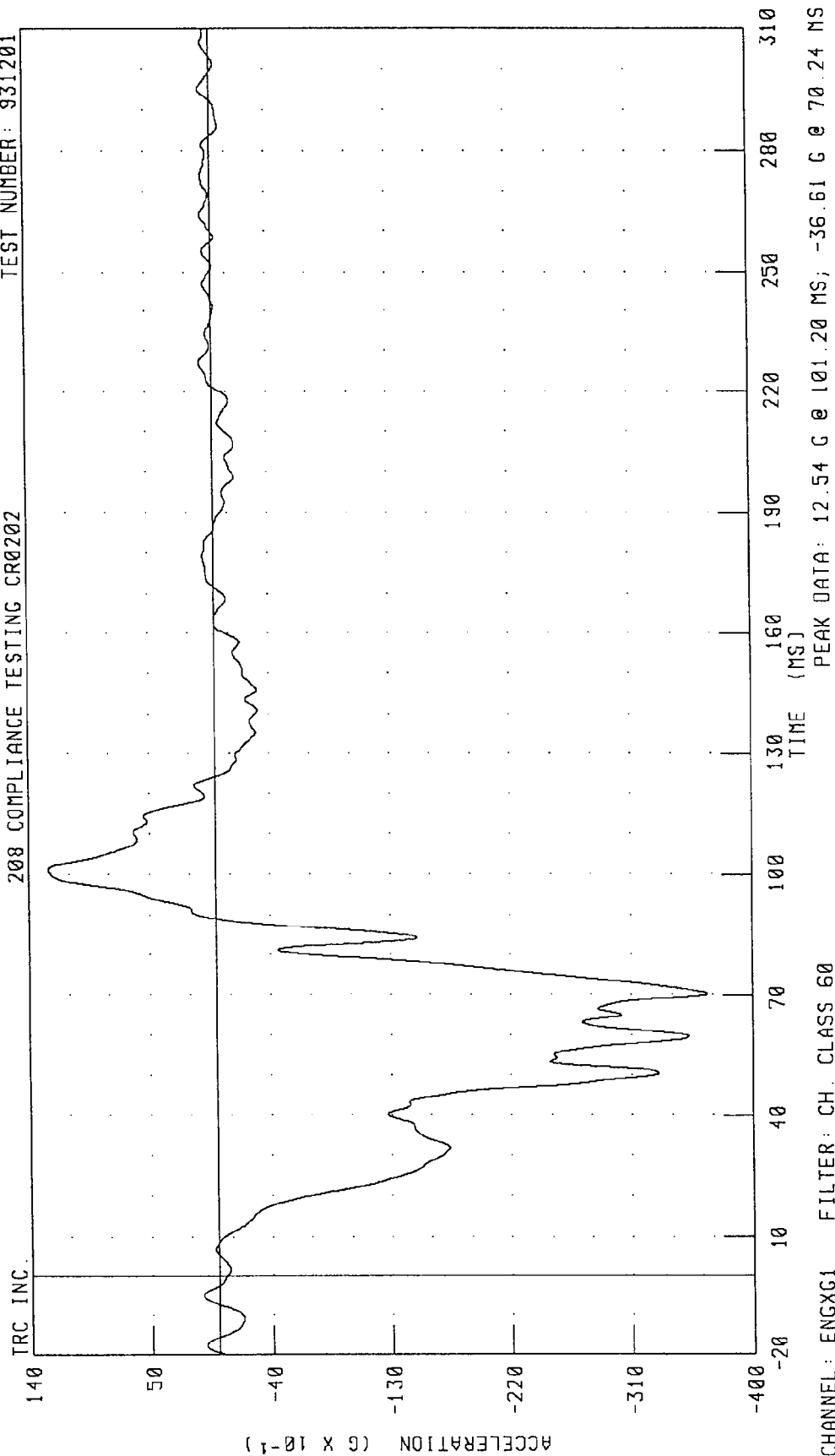


CHANNEL: TRRXG1 FILTER: CH. CLASS 60

PEAK DATA: 1.65 G @ 171.44 MS; -28.19 G @ 78.72 MS

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
ENGINE UPPER BLOCK X-AXIS ACCELERATION
208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201

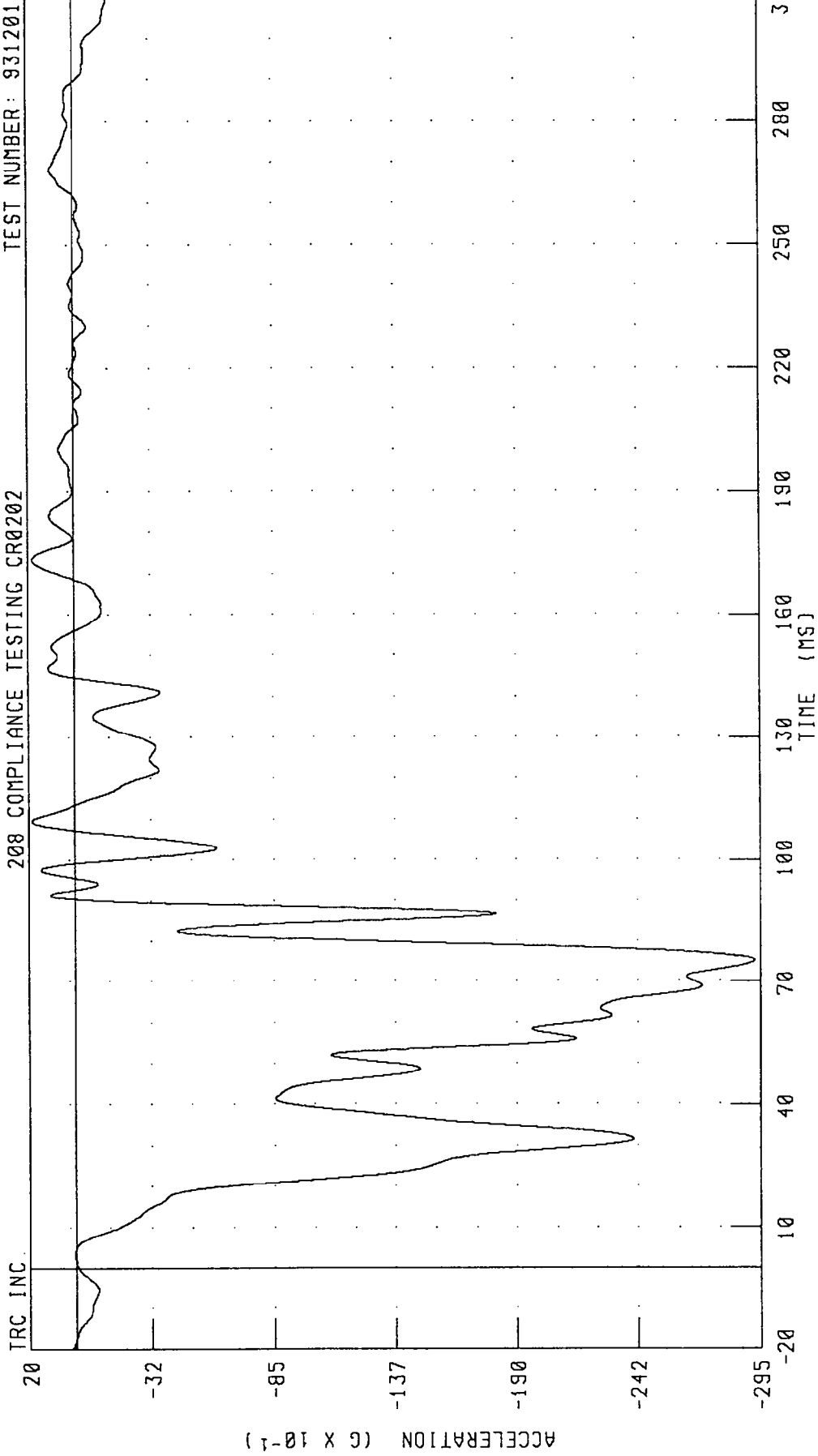


CHANNEL: ENGXC1 FILTER: CH. CLASS 60

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
ENGINE BOTTOM BLOCK X-AXIS ACCELERATION

TEST NUMBER: 931201

208 COMPLIANCE TESTING CR0202

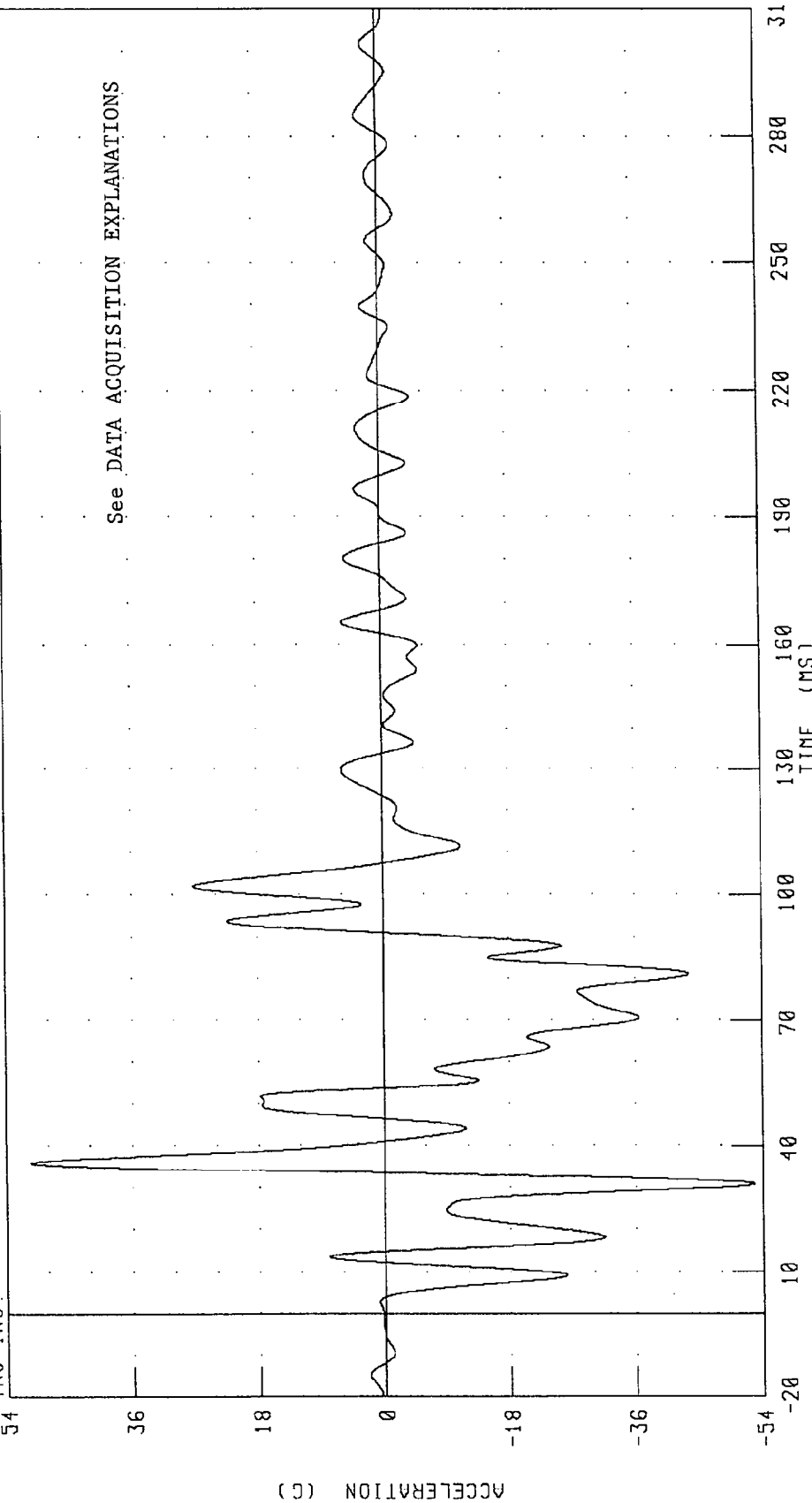


CHANNEL: ENGXC2 FILTER: CH. CLASS 60

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
RIGHT BRAKE CALIPER X-AXIS ACCELERATION
208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201

TRC INC.

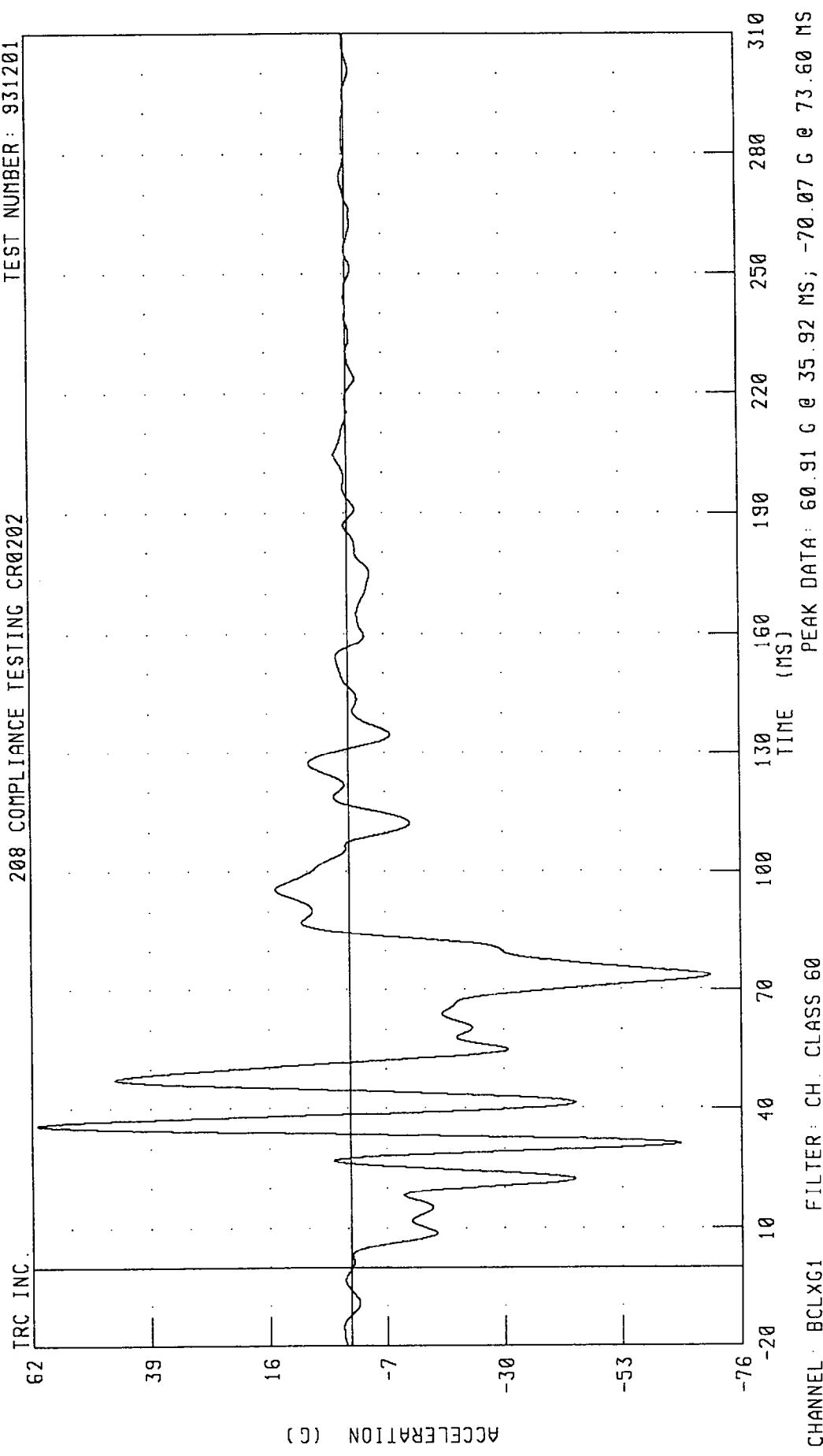


CHANNEL: BCRXG1 FILTER: CH. CLASS 60

PEAK DATA: 50.45 G @ 36.00 MS; -52.76 G @ 30.80 MS

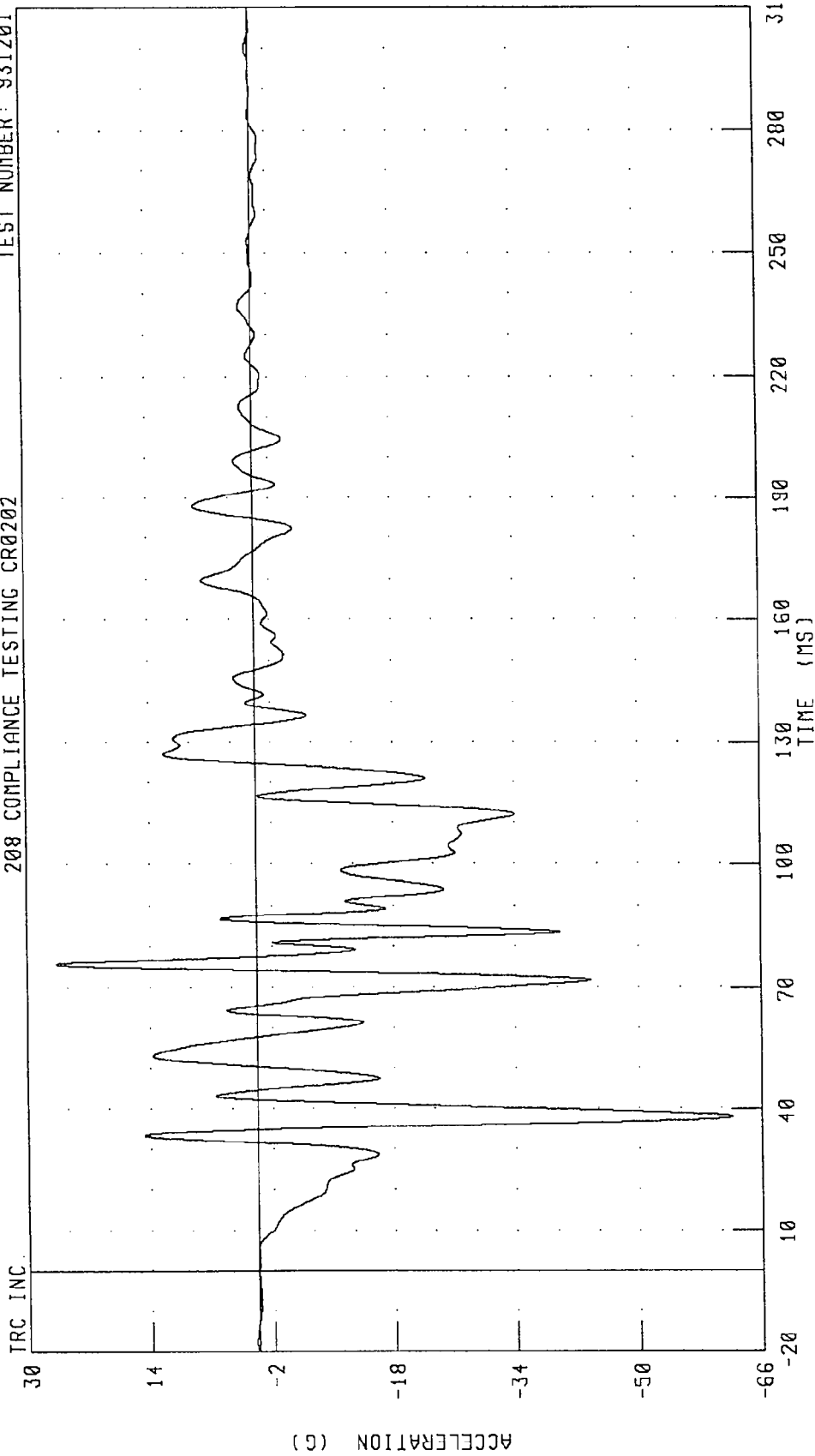
1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
 LEFT BRAKE CALIPER X-AXIS ACCELERATION
 208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201



1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
DASH PANEL CENTER X-AXIS ACCELERATION
208 COMPLIANCE TESTING CR0202

TEST NUMBER: 931201



PEAK DATA: 26.16 G @ 75.76 MS; -62.11 G @ 38.08 MS

CHANNEL: OPCXG1 FILTER: CH. CLASS 60

1994 LINCOLN TOWN CAR INTO FLAT FRONTAL BARRIER
 VEHICLE REAR CENTER Z-AXIS ACCELERATION

