

REPORT NOS. 208-TRC-92-022

212-TRC-92-022

301-TRC-92-022

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

GENERAL MOTORS CORPORATION

1992 OLDSMOBILE ACHIEVA

2-DOOR COUPE

NHTSA NO. CN0131

TRC TEST NO. 920811

TRANSPORTATION RESEARCH CENTER INC.

10820 STATE ROUTE 347

EAST LIBERTY, OHIO 43319



AUGUST 27, 1992

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 1992 Oldsmobile Achieva 2-door coupe, NHTSA No. CN0131, at the Transportation Research Center Inc. on August 11, 1992. This test was conducted to determine compliance with Federal Motor Vehicle Safety Standards: FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Mounting"; FMVSS 219 (partial), "Windshield Zone Intrusion"; FMVSS 301, "Fuel System Integrity." The barrier impact velocity was 29.5 mph. The vehicle's maximum static crush was 18.0 inches. The ambient temperature was 80° F. The driver's head injury criteria (HIC) was 755. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 37.1 g. The driver's chest maximum deflection was 1.7 inches. The driver's left and right femur maximum axial forces were 1106 pounds and 782 pounds, respectively. The passenger's head injury criteria (HIC) was 375. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 35.5 g. The passenger's chest maximum deflection was 1.8 inches. The passenger's left and right femur maximum axial forces were 682 pounds and 947 pounds, respectively. The vehicle appears to comply with the applicable requirements of FMVSS 208, 212, 219 (partial), and 301.					
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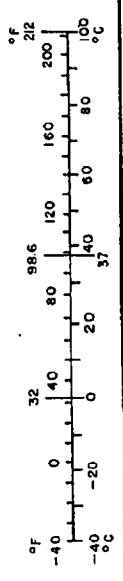
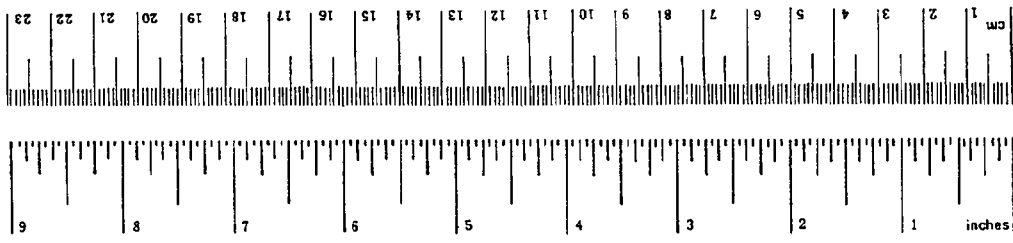
METRIC CONVERSION FACTORS

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
tblsp	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 m = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C1310-286.

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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 Standard (FMVSS) 208, 212, 219 (partial), and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by the Transportation Research Center of Ohio (TRC) under Contract No. DTNH22-90-C-21003. The purpose of this test was to determine if the subject vehicle, a 1992 Oldsmobile Achieva 2-door coupe, NHTSA No. CN0131, 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. 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 E 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 Appendix B and Optional Appendix 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. Each Part 572 E dummy's instrumentation also included a chest potentiometer to measure longitudinal deflection.

The twenty-five (25) data channels were multiplexed and recorded on a 14-track tape drive. The data was digitally sampled at 8000 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 August 11, 1992.

The test vehicle, a 1992 Oldsmobile Achieva 2-door coupe, NHTSA No. CN0131, 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 E dummies seated in the front outboard designated seating positions. For each Part 572 E dummy, the chest deflection did not exceed 3.0 inches. 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 2.3 liter, transverse engine, automatic transmission, power steering, and power brakes. The vehicle's test weight was 3273 pounds. The vehicle's impact speed was 29.5 mph. The vehicle's maximum static crush was 18.0 inches.

The driver's head injury criteria (HIC) was 755. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 37.1 g. The driver's chest maximum deflection was 1.7 inches. The driver's left and right femur maximum axial forces were 1106 pounds and 782 pounds, respectively.

The right front passenger's HIC was 375. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 35.5 g. The right front passenger's chest maximum deflection was 1.8 inches. The right front passenger's left and right femur maximum axial forces were 682 pounds and 947 pounds, respectively.

There was no loss of windshield periphery retention.

There was no intrusion through the windshield.

No fluid spilled from the vehicle's fuel system following the crash test event or during the static rollover test.

TABLE 1 CRASH TEST SUMMARY

NHTSA NO.: CN0131 TEST TYPE: Frontal Barrier Impact
TEST DATE: 08/11/92 TEST TIME: 1432 AMBIENT TEMP. (°F): 80
VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1992/Oldsmobile/Achieva/2-door coupe
VEHICLE TEST WEIGHT (LBS): 3273
IMPACT ANGLE (DEG)*: 0
IMPACT VELOCITY (MPH)**: PRIMARY = 29.5 SECONDARY = 29.5
MAXIMUM STATIC CRUSH (IN): 18.0
AVERAGE REBOUND (IN): 39.0
DUMMIES: Driver #230 Passenger #314
TYPE: Part 572 E Part 572 E
LOCATION: Left front Right front
RESTRAINT: Passive 3-point belt Passive 3-point belt
NUMBER OF DATA CHANNELS: 25
NUMBER OF CAMERAS: HIGH-SPEED 14 REAL-TIME 2

*With respect to tow track centerline.

**Speed trap measurement (\pm .05 mph accuracy)

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: General Motors Corp.

MAKE/MODEL: Oldsmobile/Achieva

VIN: 1G3NL1435NM459127

BODY STYLE: 2-door coupe

MODEL YEAR: 1992

NHTSA NO.: CN0131

COLOR: Red

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: 2.3 liter

TRANSMISSION DATA: 3 SPEED, MANUAL, X AUTOMATIC, X FWD, RWD, 4WD

DATE VEHICLE RECEIVED: 08/04/92

ODOMETER READING: 168.4

DEALER'S NAME AND ADDRESS: Columbia Oldsmobile, Inc.
10981 Montgomery Rd.
Montgomery, OH 45242

ACCESSORIES:

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

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? Yes
2. DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? No
3. DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
4. CONDITION OF THE FRONT/REAR BUMPER AND FRAME: Good

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: General Motors Corp.

DATE OF MANUFACTURE: 06/92

VIN: 1G3NL1435NM459127

GVWR: 3728 LBS

GAWR: FRONT: 2065 LBS., REAR: 1663 LBS.

TABLE 2 TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): Michelin, XZ4, P185/75R14

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 35 PSI
REAR: 35 PSI

SPARE TIRE (MFR., LINE, SIZE): Uniroyal, Hidaway, T115/70D14

TYPE OF SEATS: FRONT: Buckets
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manually adjustable

MAXIMUM WIDTH: 68.5 INCHES

WHEELBASE: 102.8 INCHES

LOCATION OF LABEL STATING TIRE & CAPACITY DATA: THE LABEL WAS LOCATED ON THE DRIVER'S DOOR.

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P185/75R14

RECOMMENDED COLD TIRE PRESSURE: FRONT: 35 PSI; REAR: 35 PSI

DESIGNATED SEATING CAPACITY: 2 FRONT 3 REAR 5 TOTAL

VEHICLE CAPACITY WEIGHT: 882 LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

DELIVERED ATTITUDE: LF 26.9; RF 27.1; LR 28.1; RR 28.2

FULLY LOADED ATTITUDE: LF 26.5; RF 26.5; LR 26.4; RR 26.2

PRE-TEST ATTITUDE: LF 27.6; RF 26.5; LR 26.8; RR 26.2

POST-TEST ATTITUDE: LF 27.0; RF 26.7; LR 26.8; RR 25.7

TABLE 2 TEST VEHICLE INFORMATION CONT'D

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

RIGHT FRONT	905 LBS.	RIGHT REAR	492 LBS.
LEFT FRONT	934 LBS.	LEFT REAR	490 LBS.
TOTAL FRONT WEIGHT	1839 LBS.	(65.2% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	982 LBS.	(34.8% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT 2821 LBS.			

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT*

UDW = UNLOADED DELIVERED WEIGHT (2821 LBS)

VCW = VEHICLE CAPACITY WEIGHT (882 LBS)

DSC = DESIGNATED SEATING CAPACITY (5)

RCLW* = VCW - 150 (DSC) = 132

TARGET TEST WEIGHT = UDW + RCLW* + (NO. OF HYBRID III DUMMIES X 167 LBS/DUMMY)

TARGET TEST WEIGHT = 2821 + 132 + 334

TARGET TEST WEIGHT = 3287 LBS

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 118 LBS. OF CARGO WEIGHT:

RIGHT FRONT	982 LBS.	RIGHT REAR	668 LBS.
LEFT FRONT	984 LBS.	LEFT REAR	639 LBS.
TOTAL FRONT WEIGHT	1966 LBS.	(60.1% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1307 LBS.	(39.9% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3273 LBS.	(0.4% UNDER TARGET TEST WEIGHT)	

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

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 41.1 INCHES REARWARD OF FRONT WHEEL CENTERLINE

*Cargo 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: 920811 NHTSA NO.: CN0131
TEST DATE: 08/11/92 TEST TIME: 1432
TEST TYPE: Frontal Barrier Impact IMPACT ANGLE: 0
AMBIENT TEMPERATURE AT IMPACT AREA: 80° F
TEMPERATURE IN OCCUPANT COMPARTMENT: 70° F
IMPACT VELOCITY: PRIMARY = 29.5 MPH SECONDARY = 29.5 MPH
(SPECIFIED RANGE = 28.9 TO 29.9 MPH)

DISTANCE FROM VEHICLE TO BARRIER: ENTERING VELOCITY TRAP = 26.0 IN.
EXITING VELOCITY TRAP = 2.0 IN.

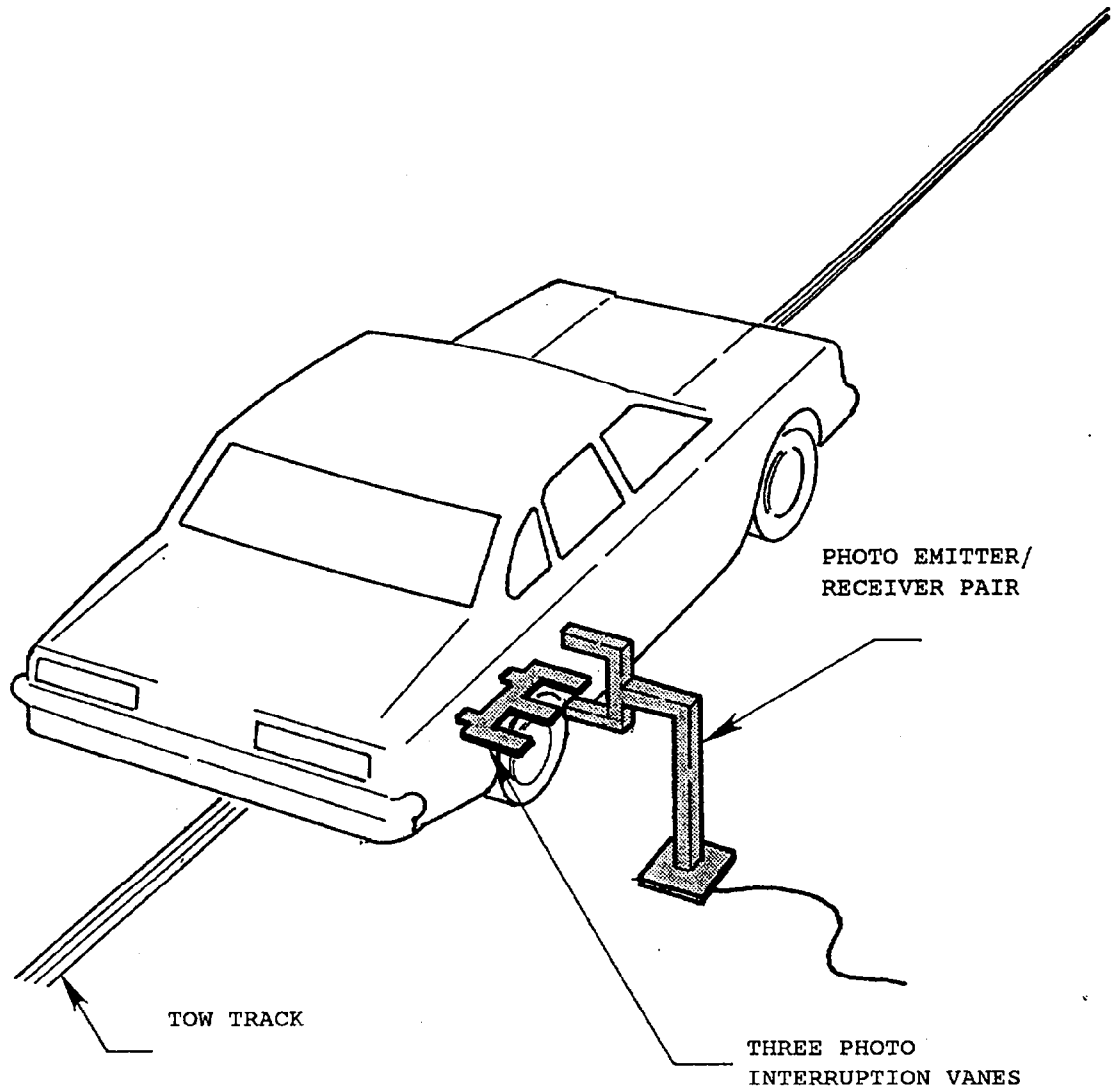
TEST VEHICLE STATIC CRUSH (ALL MEASUREMENTS ARE IN INCHES):

OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: L 179.4; C 188.3; R 179.0
POST-TEST: L 165.3; C 170.9; R 162.8
TOTAL CRUSH: L 14.1; C 17.4; R 16.2
AVERAGE CRUSH: 15.9

TEST VEHICLE REBOUND FROM FLAT BARRIER (ALL MEASUREMENTS ARE IN INCHES):

DISTANCE FROM TEST VEHICLE TO BARRIER: L 40.2; C 34.5; R 42.2; AVG. 39.0

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

VEHICLE MAKE/MODEL/BODY STYLE: Oldsmobile/Achieva/2-door coupe

VEHICLE NHTSA NO.: CN0131; VIN: 1G3NL1435NM459127

MODEL YEAR: 1992; BUILD DATE: 06/92; TEST DATE: 08/11/92

VEHICLE SIZE CATEGORY: Compact; TEST WEIGHT: 3273 LBS.

VEHICLE WHEELBASE: 102.8 INCHES

MAXIMUM WIDTH: 68.5 INCHES

FRONT OVERHANG: 42.2 INCHES

COLLISION DEFORMATION
 CLASSIFICATION (CDC) CODE: 12FDEW2

CRUSH DEPTH
 MEASUREMENTS:

C1 =	<u>14.1</u>	INCHES
C2 =	<u>15.3</u>	INCHES
C3 =	<u>17.4</u>	INCHES
C4 =	<u>18.0</u>	INCHES
C5 =	<u>17.6</u>	INCHES
C6 =	<u>16.2</u>	INCHES

MIDPOINT OF DAMAGE: D = VEHICLE CENTERLINE (LONGITUDINAL)

LENGTH OF DAMAGED
 REGION: L = 58.2 INCHES

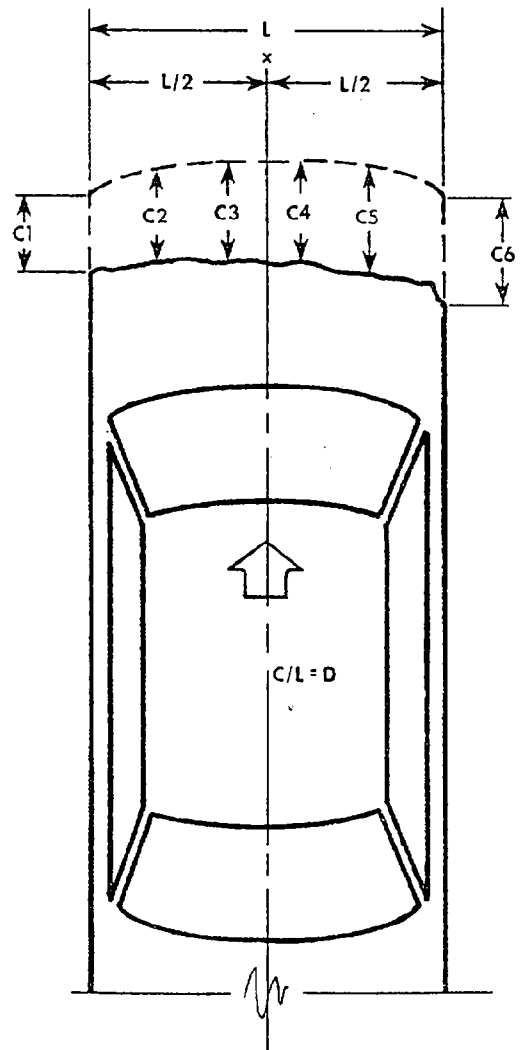
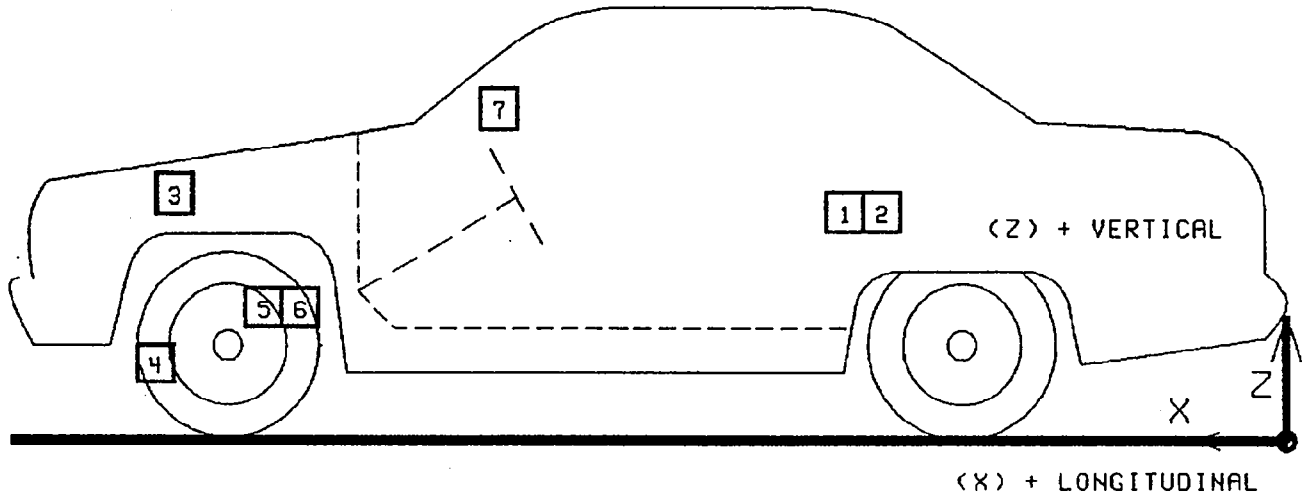
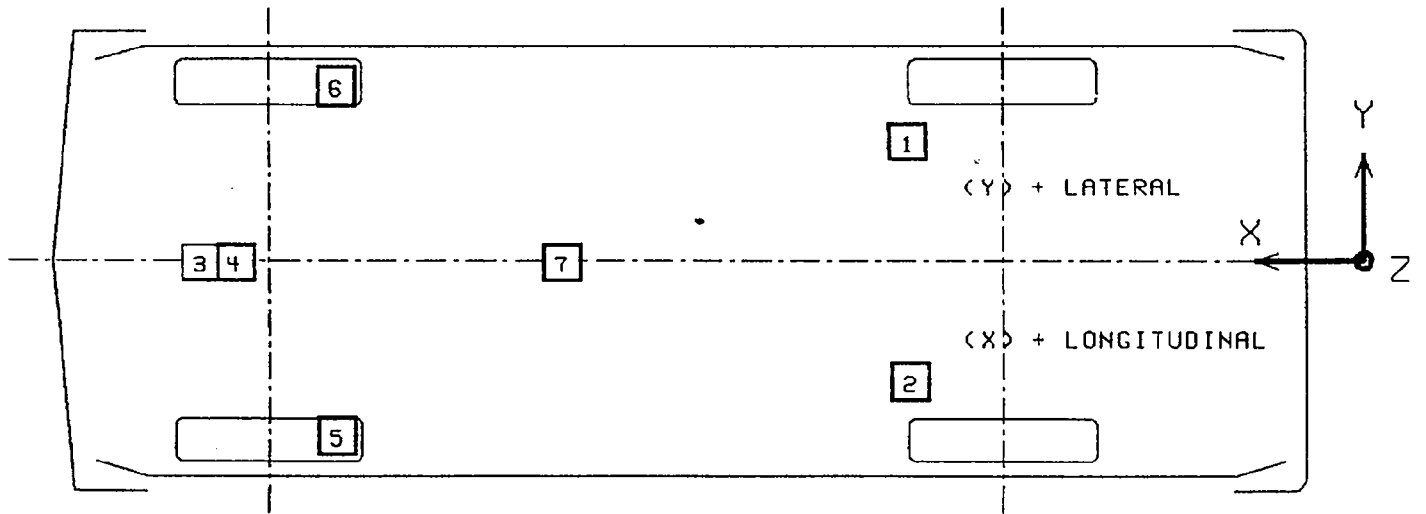


FIGURE 3

VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 920811

No.	LOCATION		X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
						MAX G	MSEC	MAX G	MSEC
1	LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE	76.5	25.9	10.4				
		POST	76.4	22.9	13.5				
						1.2	218.9	25.7	74.9
2	RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE	76.3	-22.9	10.5				
		POST	76.2	-22.9	13.8				
						1.0	218.5	26.9	77.1
3	ENGINE TOP LONGITUDINAL	PRE	152.3	-1.0	32.2				
		POST	143.4	-0.2	32.2				
						59.4	79.6	104.8	65.0
4	ENGINE BOTTOM LONGITUDINAL	PRE	157.0	-1.5	6.3				
		POST	151.5	-0.8	5.2				
						43.0	79.6	82.1	68.1
5	RIGHT BRAKE CALIPER LONGITUDINAL	PRE	140.0	-24.3	13.2				
		POST	140.5	-25.6	12.2				
						16.5	106.4	71.8	78.4
6	LEFT BRAKE CALIPER LONGITUDINAL	PRE	139.9	24.3	13.1				
		POST	139.0	25.0	12.1				
						10.0	110.4	39.1	92.4
7	INSTRUMENT PANEL CENTER LONGITUDINAL	PRE	123.4	0.0	36.7				
		POST	121.9	0.0	36.4				
						19.7	130.4	76.0	83.0

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

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

REPORT OF VEHICLE CONDITION AT THE
COMPLETION OF TESTING

CONTRACT NO.: DTNH22-90-C-21003
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.: CN0131
MAKE/MODEL/BODY STYLE: Oldsmobile/Achieva/2-door coupe
MODEL YEAR: 1992 BODY COLOR: Red
VIN: 1G3NL1435NM459127
ODOMETER (ARRIVAL): 168 DATE: 08/04/92
ODOMETER (COMPLETION): 174 DATE: 08/11/92
COST: \$13,501.44

<input checked="" type="checkbox"/> AIR CONDITIONER	<input type="checkbox"/> CONSOLE	BRAKES: <input checked="" type="checkbox"/> POWER
<input checked="" type="checkbox"/> TINTED GLASS	<input type="checkbox"/> TACHOMETER	FRONT: Disc ABS
<input checked="" type="checkbox"/> POWER STEERING	<input checked="" type="checkbox"/> SPEED CONTROL	REAR: Drum ABS
<input type="checkbox"/> POWER WINDOWS	<input checked="" type="checkbox"/> REAR WINDOW DEF.	
<input type="checkbox"/> POWER DOOR LOCKS	<input type="checkbox"/> SUN/MOON ROOF	FRONT SEATS: <input type="checkbox"/> POWER
<input checked="" type="checkbox"/> RADIO	<input type="checkbox"/> T-TOP	SEAT TYPE: Bucket
<input checked="" type="checkbox"/> CLOCK	<input checked="" type="checkbox"/> TILT STEERING WHEEL	NO. OF SEATS: 5
<input type="checkbox"/> ROOF RACK	<input type="checkbox"/> OTHER OPTIONS: _____	

ENGINE: 4 CYLINDERS; 2.3 LITERS
TRANSMISSION: automatic; DRIVE TYPE: FWD
TIRE SIZE: P185/75R14
GASOLINE TYPE: Unleaded

EQUIPMENT THAT IS NO LONGER ON THE VEHICLE AS NOTED ABOVE: None

EXPLANATION: NA

VEHICLE CONDITION: Vehicle has been subjected to a 30 mph frontal
barrier crash test.

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	R*
DRIVER	-88.7	12.3	-50.8	91.8	-38.4	-7.9	-9.4	37.1
PASSENGER	48.1	-6.0	-39.0	51.6	-36.8	11.5	10.7	35.5

MAXIMUM FEMUR COMPRESSIVE FORCE (LBS)

	LEFT FEMUR	RIGHT FEMUR
DRIVER	1106	782
PASSENGER	682	947

HEAD INJURY CRITERIA**

	HIC	TIME t_1 (MSEC) ¹	TIME t_2 (MSEC) ²
DRIVER	755	99.0	135.0
PASSENGER	375	104.4	140.4

MAXIMUM CHEST DEFLECTION (IN.)

DRIVER	1.7
PASSENGER	1.8

*Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

TABLE 6 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #230	PASSENGER #314
HEAD	<u>Upper steering wheel rim & hub</u>	<u>Dummy's chest</u>
CHEST	<u>Lower steering wheel rim</u>	<u>None</u>
ABDOMEN	<u>None</u>	<u>None</u>
LEFT KNEE	<u>Instrument panel</u>	<u>Instrument panel</u>
RIGHT KNEE	<u>Instrument panel</u>	<u>Instrument panel</u>

DOOR OPENING:

	LEFT	RIGHT
FRONT	<u>Easy</u>	<u>Easy</u>
REAR	<u>NA</u>	<u>NA</u>

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	<u>None</u>	<u>Both front seats moved 0.5 inch forward</u>
REAR	<u>NA</u>	<u>NA</u>

GLAZING DAMAGE:

None

OTHER NOTABLE IMPACT EFFECTS:

None

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 then contacted the steering wheel lower rim as the dummy's head rotated slightly downward impacting the steering wheel upper rim and hub. The driver dummy was restrained by the three-point passive belt. The dummy then rebounded rearward into the seat back as the dummy's head rotated rearward into the head restraint. The driver dummy came to rest in the driver's seat restrained by the three-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 then rotated downward contacting the dummy's chest. The right front passenger dummy was restrained by the three-point passive belt. The dummy rebounded rearward into the seat back as the dummy's head rotated rearward into the head restraint. The right front passenger dummy came to rest in the right front passenger's seat restrained by the three-point passive belt.

TABLE 7 FMVSS 208 COMFORT & CONVENIENCE DATA FOR AUTOMATIC SEAT BELTS

MAKE/MODEL: Oldsmobile/Achieva

VIN: 1G3NL1435NM459127

BODY STYLE: 2-door coupe

NHTSA NO.: CN0131

DATE OF MANUFACTURE: 06/92

CONVENIENCE HOOKS:

DEVICE TO STOW SEAT BELT WEBBING TO FACILITATE ENTERING OR EXITING THE VEHICLE AUTOMATICALLY RELEASES THE WEBBING WHEN THE IGNITION IS TURNED TO THE "ON" OR "START" POSITION AND (check one):

- The vehicle's drivetrain is engaged
 The vehicle's parking brake is in the released mode
 Not applicable, the vehicle's restraint system does not include convenience hooks or devices to stow seat belt webbing.

WEBBING TENSION - RELIEVING DEVICE:

DO OUTBOARD SEATING POSITION SEAT BELTS HAVE WEBBING TENSION - RELIEVING DEVICES?(check one): YES 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:

IS THE WEBBING TENSION - RELIEVING DEVICE CANCELLED EACH TIME THE ADJACENT DOOR IS OPENED? YES NO

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 8 FMVSS 208 SEAT BELT WARNING SYSTEM DATA

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

Duration of audible warning signal = 7 sec.

Duration of reminder light operation = continuous sec.

WITH OCCUPANT IN DRIVER'S POSITION AND PASSIVE 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 = 0 sec.

WORDING OF VISUAL WARNING:

- Fasten Seat Belt
- Fasten Belt
- Symbol 101-80
- Other: _____

TABLE 9 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:

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

TABLE 10 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.:

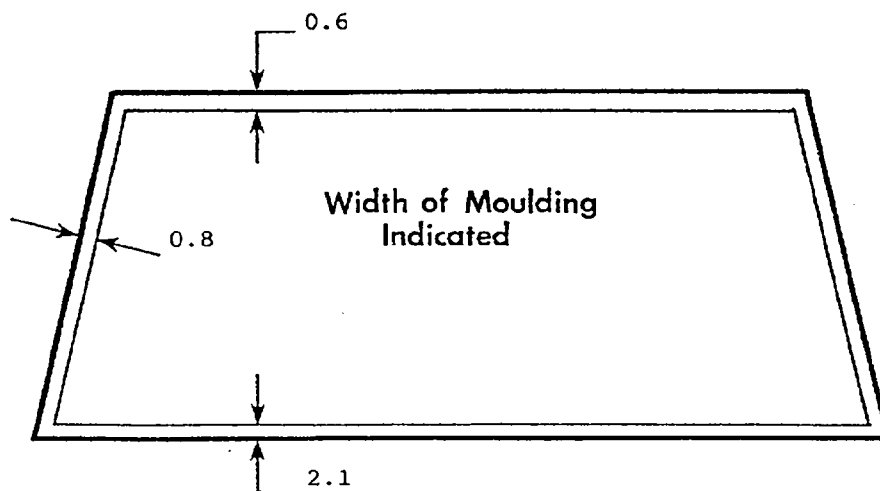
Plastic trim around outer perimeter, adhesive around inner perimeter.

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	79.0	79.0	100
LEFT SIDE	79.0	79.0	100
TOTAL	158.0	158.0	100

PRE-TEST WINDSHIELD MOUNTING MATERIAL TEMPERATURE: 70° F



FRONT VIEW OF WINDSHIELD*

LOSS OF WINDSHIELD RETENTION LENGTHS: None

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

*INDICATE AREAS OF LOSS OF RETENTION, IF ANY, ON WINDSHIELD DIAGRAM.

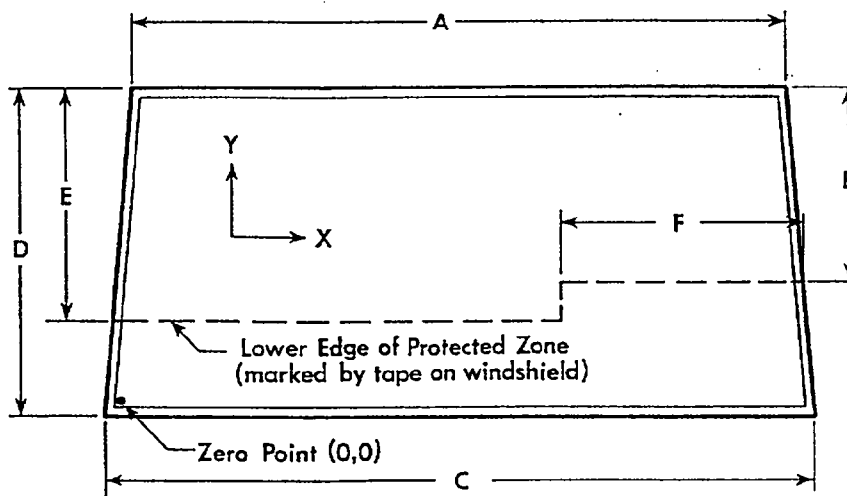
FIGURE 5 FMVSS 219 TEST DATA

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 = 42.5
- B = 17.3
- C = 61.4
- D = 31.2
- E = 21.5
- F = 18.5



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 11 FUEL SYSTEM DATA

MAKE/MODEL: Oldsmobile/Achieva
NHTSA NO.: CN0131
FUEL SYSTEM CAPACITY: 15.2 GALLONS (FROM OWNER'S MANUAL)
USABLE CAPACITY: 15.2 GALLONS (FURNISHED BY COTR)
TEST VOLUME RANGE: 14.0 GALLONS TO 14.3 GALLONS (92-94% OF USABLE)
ACTUAL TEST VOLUME: 14.1 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 in front of the rear axle.
The fuel lines run along the left side to the front. The fuel filler
neck is located on the right side.

ELECTRIC FUEL PUMP: Yes FUEL INJECTION: Yes

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

TABLE 12 FMVSS 301 POST-IMPACT TEST DATA

TEST VEHICLE NHTSA NO.: CN0131 ; TEST DATE: 08/11/92
VEHICLE MAKE/MODEL/BODY STYLE: Oldsmobile/Achieva/2-door coupe

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:

- 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:

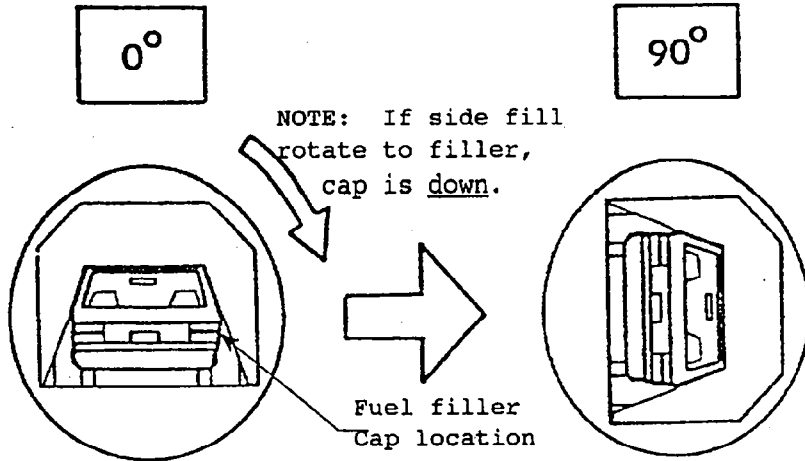
	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FROM IMPACT UNTIL VEHICLE MOTION CEASES - - -	0 OZ.	1 OZ.
2. 5 MINUTE PERIOD AFTER VEHICLE MOTION CEASES -	0 OZ.	5 OZ.
3. NEXT 25 MINUTES AFTER 5 MINUTE PERIOD - - - -	0 OZ.	1 OZ./1 MIN.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 6 FMVSS 301 STATIC ROLLOVER TEST DATA

NHTSA NO.: CN0131
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.

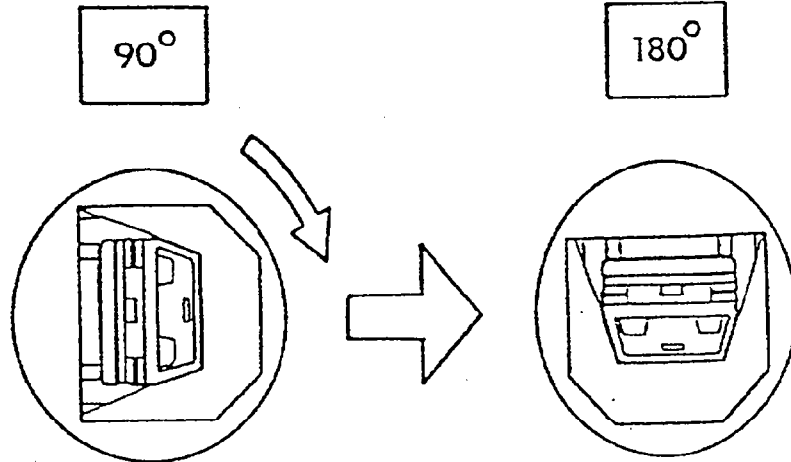
FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CN0131

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.

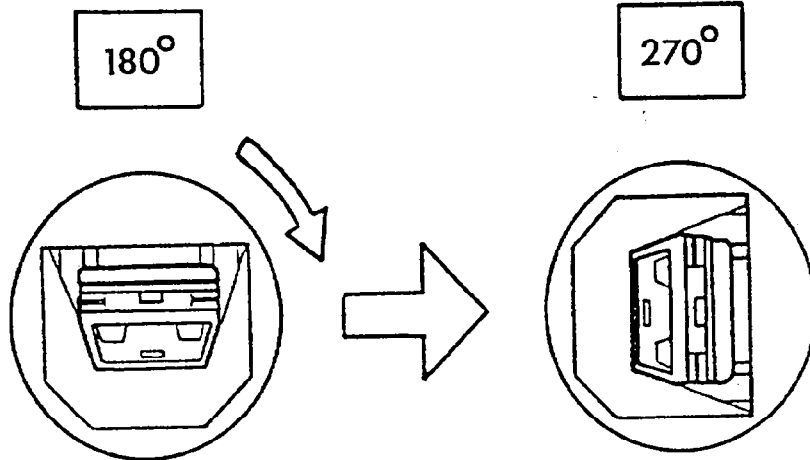
FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CN0131

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.

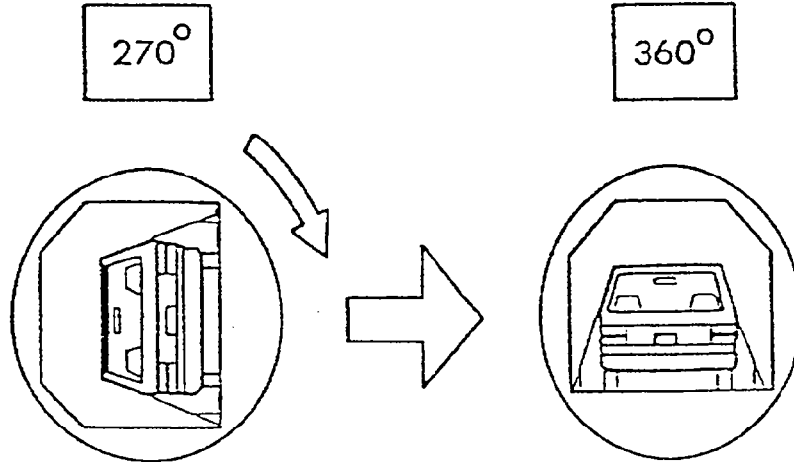
FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CN0131

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

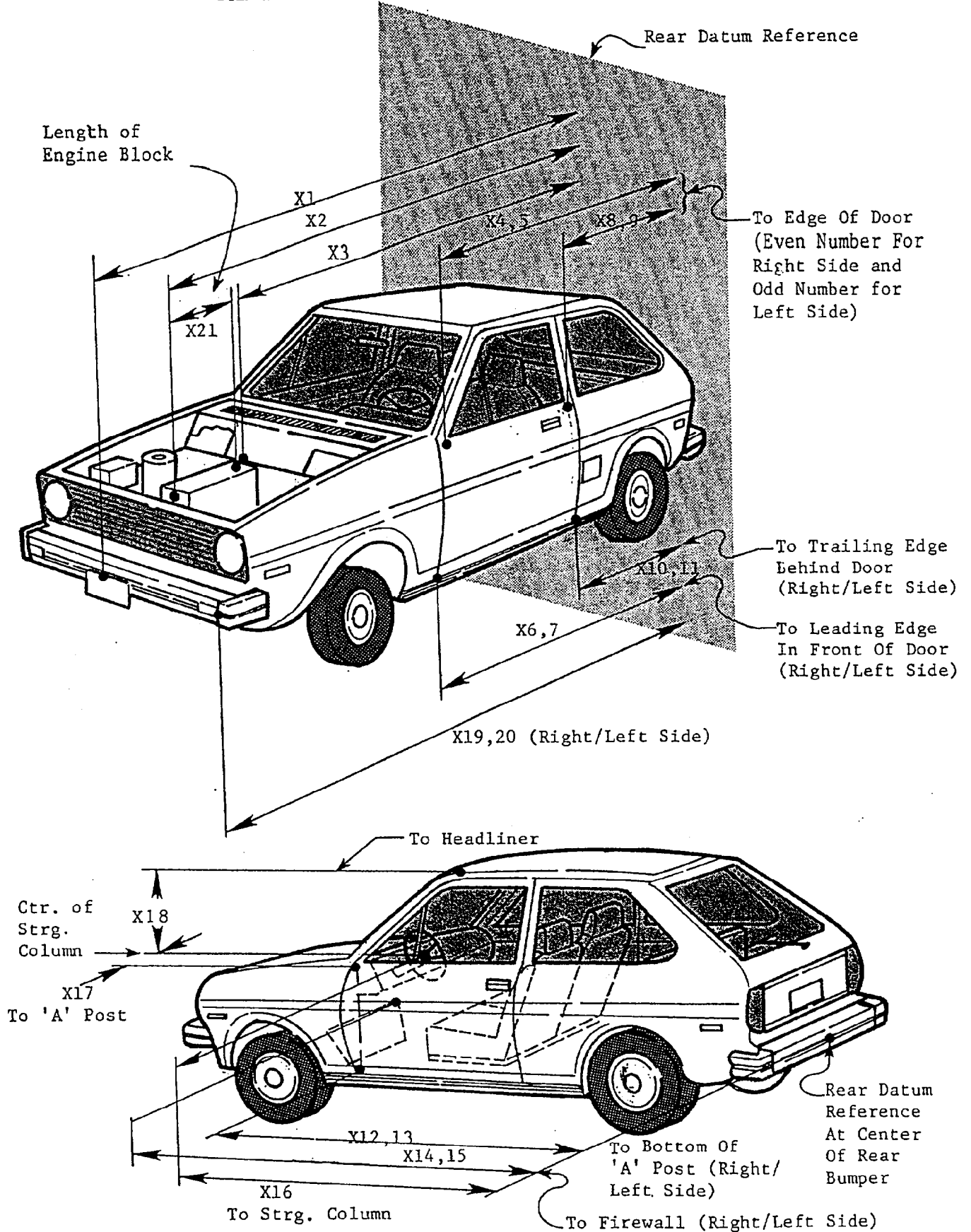
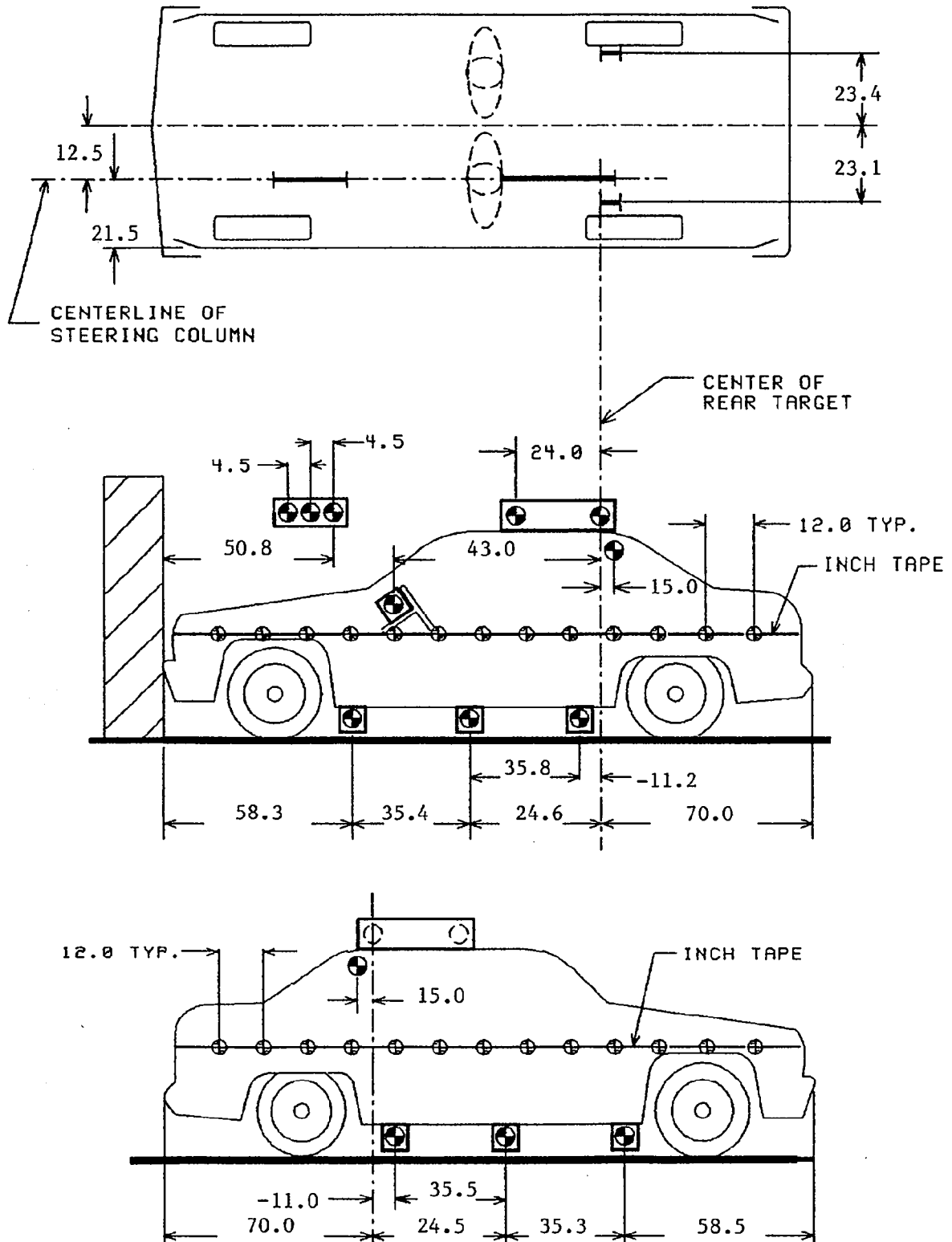


TABLE 13 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Oldsmobile/Achieva		TEST NUMBER: 920811		ALL MEASUREMENTS ARE IN INCHES		
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.		
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	188.3	170.9	17.4		
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	156.2	148.5	7.7		
X3	REAR SURFACE OF VEHICLE TO FIREWALL	136.1	135.9	0.2		
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	125.3	125.6	-0.3		
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	125.5	126.0	-0.5		
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	125.2	124.9	0.3		
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	125.5	125.1	0.4		
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	73.5	74.1	-0.6		
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	73.6	74.2	-0.6		
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	72.2	72.4	-0.2		
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	72.6	72.8	-0.2		
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	123.9	123.0	0.9		
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	123.9	123.6	0.3		
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	131.5	132.8	-1.3		
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	136.0	135.2	0.8		
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	108.9	107.9	1.0		
X17	CENTER OF STEERING COLUMN TO "A" POST	11.2	10.2	1.0		
X18	CENTER OF STEERING COLUMN TO HEADLINER	16.5	16.8	-0.3		
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	179.0	162.8	16.2		
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	179.4	165.3	14.1		
X21	LENGTH OF ENGINE BLOCK	18.5	18.5	0.0		

FIGURE 8
VEHICLE TARGET LOCATIONS



ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 9 DUMMY AND SEAT POSITIONING DATA

PRE-IMPACT DATA:

MAKE/MODEL: Oldsmobile/Achieva
 BODY STYLE: 2-door coupe MODEL YEAR: 1992
 NHTSA NO.: CN0131 COLOR: Red

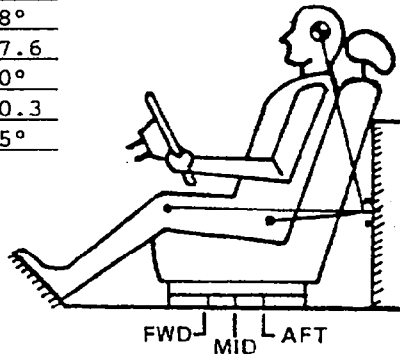
DATA FROM CERTIFICATION LABEL:

VEHICLE MANUFACTURER: General Motors Corporation
 DATE OF MANUFACTURE: 06/92 VIN: 1G3NL1435NM459127
 GVWR: 3728 LBS.; GAWR: FRONT = 2065 LBS.; REAR = 1663 LBS.

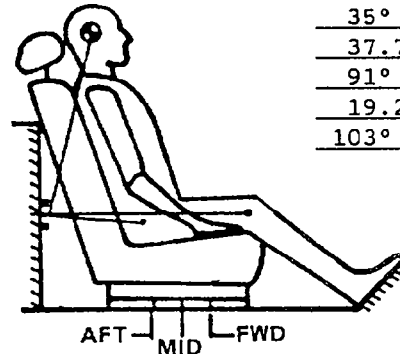
POST-IMPACT DATA:

DATE OF TEST: 08/11/92 TIME: 1432 TEMPERATURE: 80° F
 IMPACT VELOCITY: PRIMARY = 29.5 MPH SECONDARY = 29.5 MPH
 REQUIRED IMPACT VELOCITY RANGE: 28.9 TO 29.9 MPH
 SEAT TYPE: Bucket ADJUSTER TYPE: Manual
 FRONT SEAT BACK TYPE: Manually adjustable
 TECHNICIANS: S. Ericksen, B. Fishbaugh

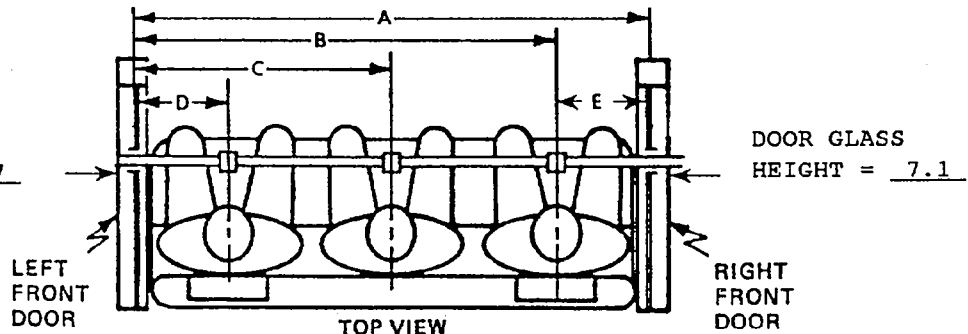
DRIVER DUMMY # 230 TYPE: HIII
 HEAD 25.3
 TARGET 38°
 KNEE 37.6
 JOINT 90°
 APPROX-
 IMATE 105°
 "H"
 POINT



PASSENGER DUMMY # 314 TYPE: HIII
 HEAD 24.6 HEAD
 TARGET 35° TARGET
 KNEE 37.7 KNEE
 JOINT 91° JOINT
 APPROX-
 IMATE 103° IMATE
 "H"
 POINT



A = 52.9
 B = 39.1
 C = NA
 D = 13.0
 E = 13.8
 DOOR GLASS
 HEIGHT = 7.7



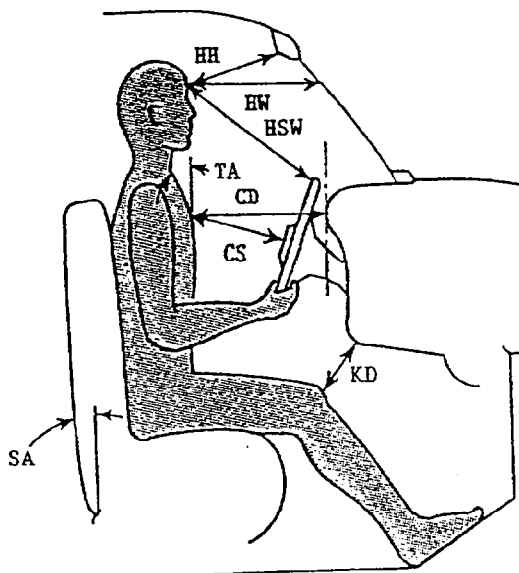
DRIVER
DUMMY

PASSENGER
DUMMY

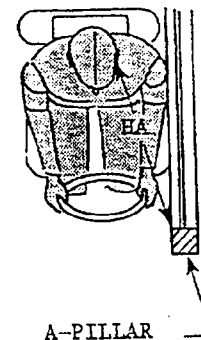
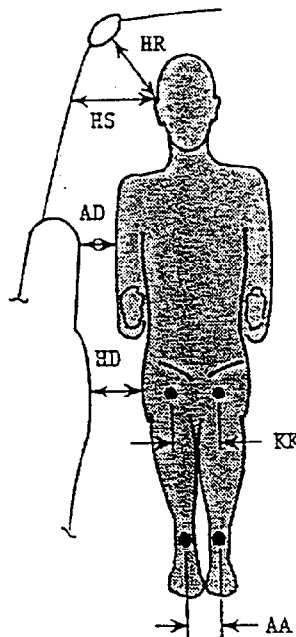
ALL ANGLES ARE RELATIVE TO VERTICAL PLANE THROUGH DOOR STRIKER.
 ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 10 DUMMY IN VEHICLE POSITIONING DATA

	DRIVER	PASSENGER
HH	10.9	11.6
HW	19.4	18.7
CD	18.9	20.1
CS	11.9	NA
KDL	3.8	4.5
KDR	4.4	3.6
TA	20°	15°
SA	21°	21°
HSW	16.1	NA



	DRIVER	PASSENGER
HR	5.6	6.1
HS	10.0	11.0
AD	3.6	4.0
HD	4.2	4.1
KK	8.0	7.1
AA	8.9	6.0
HA	17.4	17.8



KNEE OUTER CLEVIS TO OUTER CLEVIS SPACING:

DRIVER = 10.6
 PASSENGER = 10.6

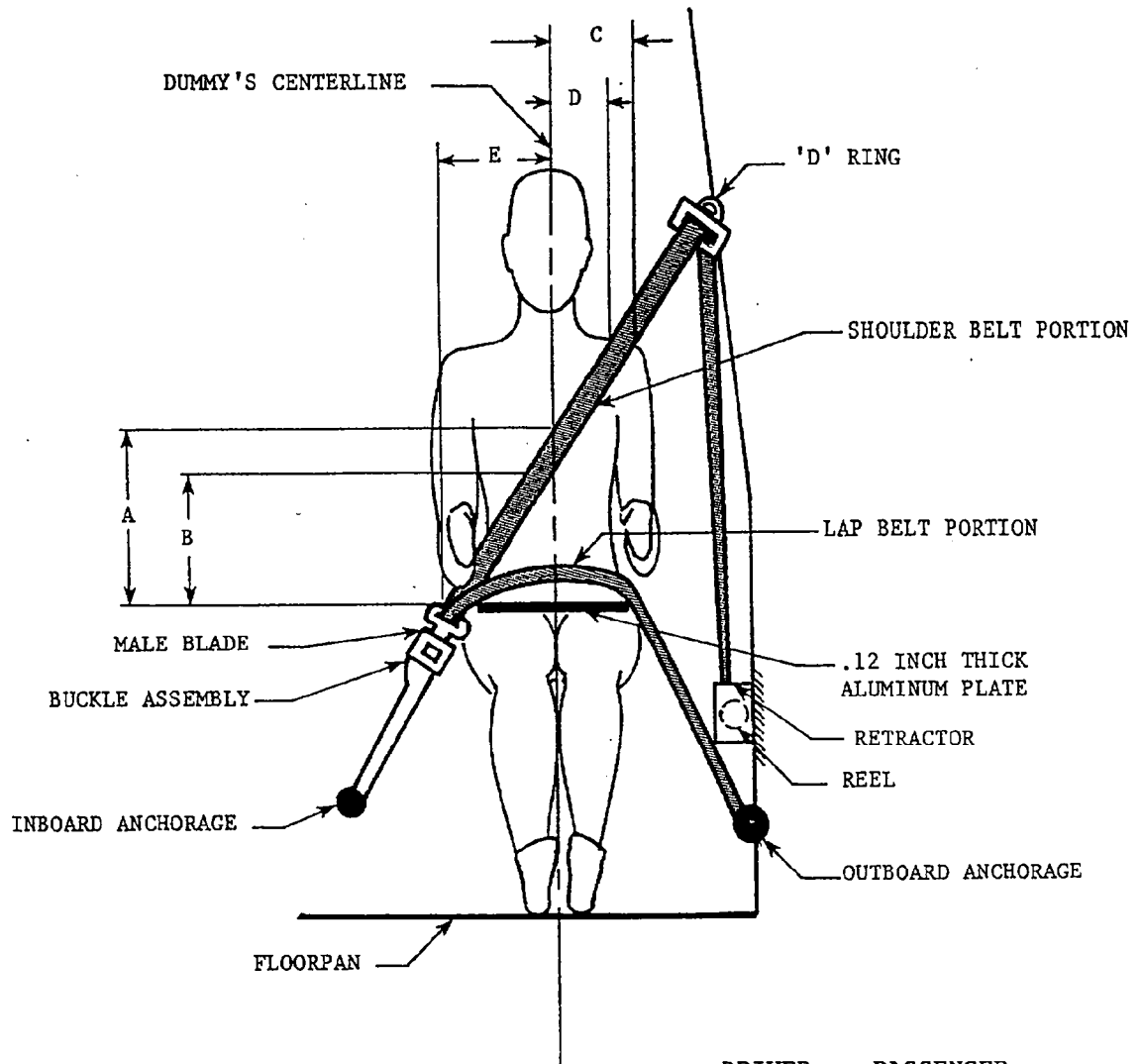
PELVIS ANGLE:

DRIVER = 23°
 PASSENGER = 25°

- | | |
|--------------------------------|---|
| HH = HEAD TO WINDSHIELD HEADER | HR = HEAD C.G. TARGET TO SIDE ROOF HEADER |
| HW = HEAD TO WINDSHIELD | HS = HEAD C.G. TARGET TO SIDE WINDOW |
| CD = CHEST TO DASH | AD = ARM TO DOOR |
| CS = CHEST TO STEERING WHEEL | HD = HIP TO DOOR |
| KD = KNEE TO DASH | KK = KNEE TO KNEE |
| TA = TORSO ANGLE | AA = ANKLE TO ANKLE |
| SA = SEAT BACK ANGLE | HA = HEAD C.G. TARGET TO A-PILLAR |
| HSW = HEAD TO STEERING WHEEL | |

TORSO AND SEAT BACK ANGLES ARE RELATIVE TO VERTICAL.
 ALL DISTANCE MEASUREMENTS ARE IN INCHES.

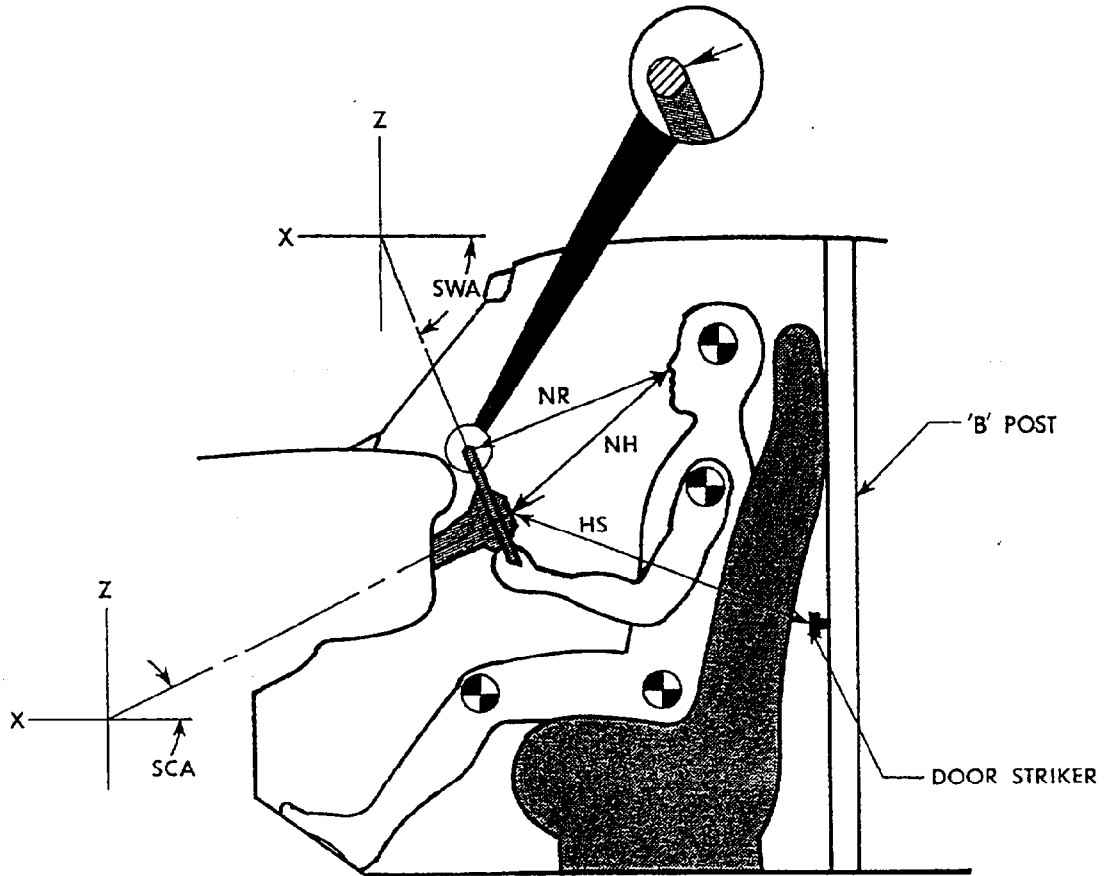
FIGURE 11 SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - TOP SURFACE OF ALUM. PLATE TO BELT UPPER EDGE	11.8	13.5
B - TOP SURFACE OF ALUM. PLATE TO BELT LOWER EDGE	8.6	9.6
C - DUMMY CENTERLINE TO OUTER EDGE OF BELT AT CHEST FLESH TOP	5.1	4.4
D - DUMMY CENTERLINE TO INNER EDGE OF BELT AT CHEST FLESH TOP	3.0	2.1
E - DUMMY CENTERLINE TO INTERSECTION OF UPPER TORSO BELT AND LAP BELT	8.0	10.0

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 12 DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY DATA



POSITION OF STEERING COLUMN TILTING AND TELESCOPING ADJUSTMENTS, IF ANY:
 The steering column was placed in the third of the possible five
 adjustment locations.

MEASUREMENTS

NR - DISTANCE FROM TIP OF DUMMY'S NOSE TO TOP REAR SURFACE OF STEERING WHEEL RIM.	14.2
NH - DISTANCE FROM TIP OF DUMMY'S NOSE TO CENTER OF STEERING COLUMN HUB.	15.9
HS - DISTANCE FROM CENTER OF STEERING COLUMN HUB TO THE FORWARD SURFACE OF THE DOOR LOCK STRIKER PIN.	35.9
SCA - ANGLE OF STEERING COLUMN RELATIVE TO THE HORIZONTAL X AXIS	17°
SWA - ANGLE OF STEERING WHEEL RELATIVE TO THE HORIZONTAL X AXIS	70°

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 13

4, 7, 8
CAMERA POSITIONS

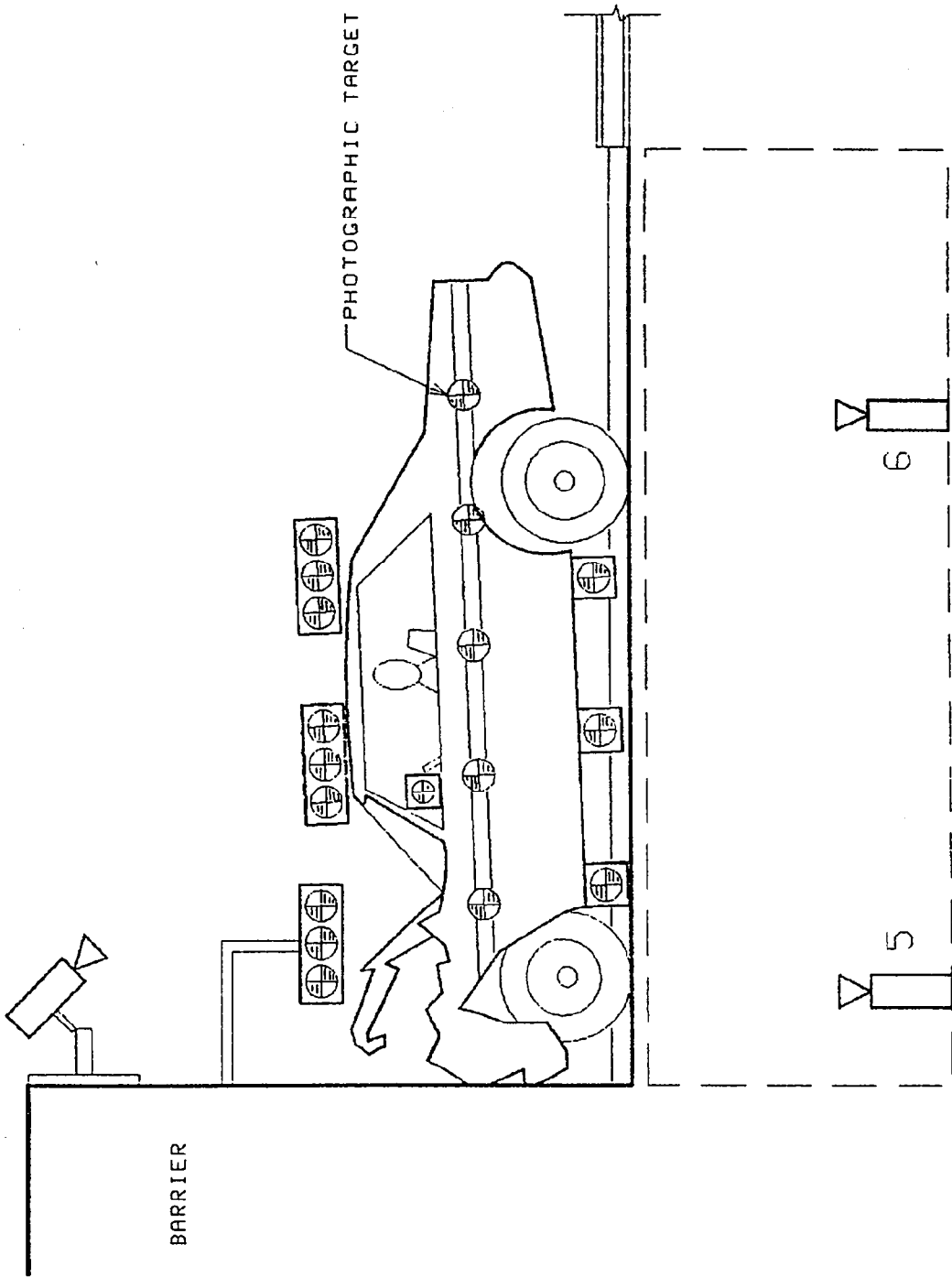


FIGURE 13

CAMERA POSITIONS, CONTINUED

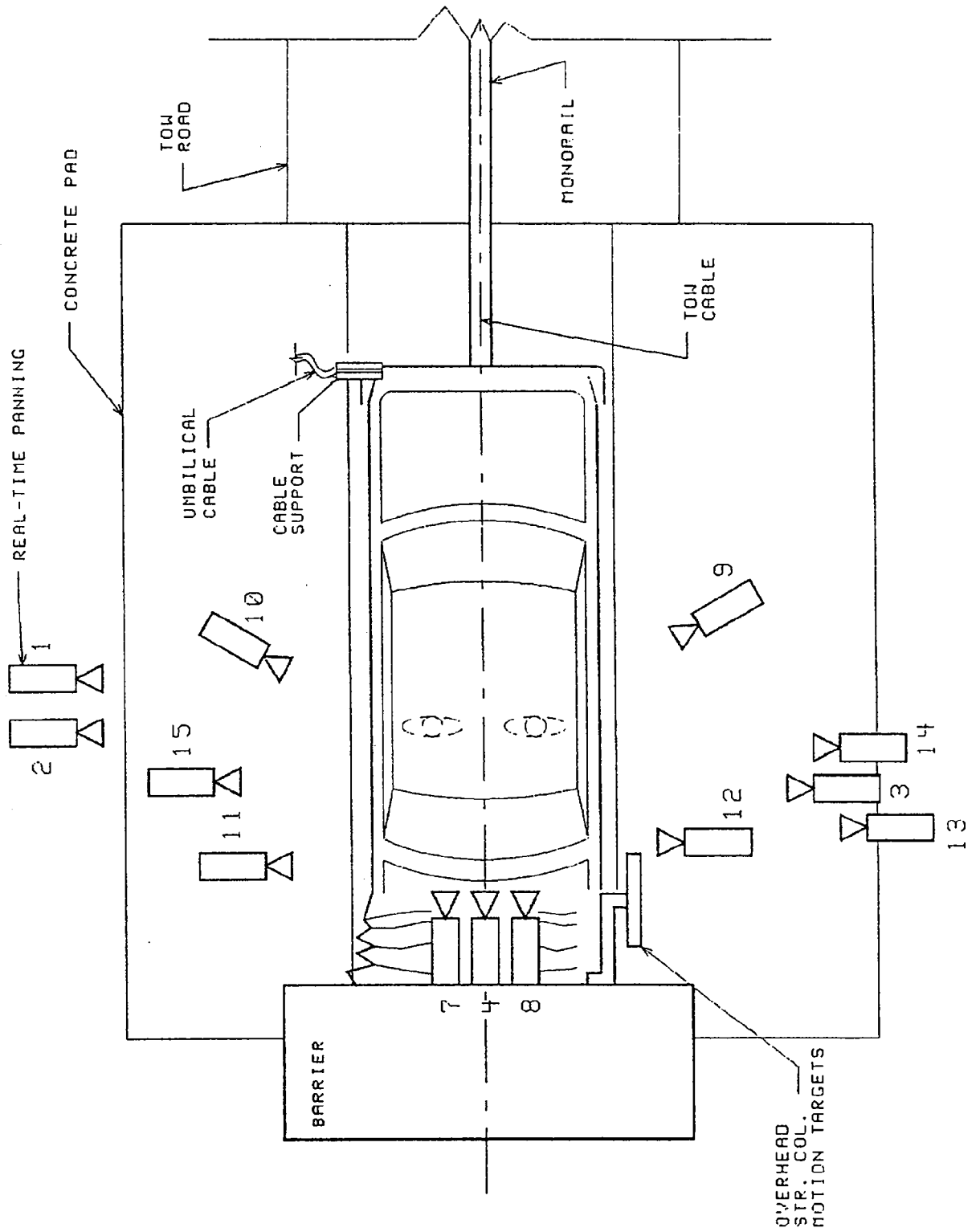


TABLE 14 MOTION PICTURE CAMERA LOCATIONS

CAMERA NO.	VIEW	CAMERA POSITIONS (IN)*			ANGLE** (DEG)	FILM PLANE		FILM SPEED (FPS)
		X	Y	Z		TO HEAD TARGET(IN)	LENS (MM)	
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	498
3	Left vehicle crush	-41.5	295.0	44.0	-4	229.0	25	1005
4	Windshield front view	-6.0	0.0	88.0	-40	NA	13	498
5	Pit-left subframe sidemember	-8.0	29.0	-16.0	90	NA	13	1005
6	Pit-right subframe sidemember	-7.0	30.0	-12.0	90	NA	13	1000
7	Passenger front view	-4.5	-13.8	93.0	-50	NA	17	498
8	Driver front view	-6.8	14.5	93.0	-50	NA	17	498
9	Driver kinematics	-157.3	116.0	87.0	-27	108.0	25	505
10	Passenger kinematics	-152.1	-116.0	87.0	-26	87.0	25	508
11	Right windshield intrusion	-38.1	-306.1	44.0	0	NA	50	482
12	Left windshield intrusion	-53.0	309.4	42.3	0	NA	50	500
13	Steering column motion	-108.0	285.0	103.0	-14	NA	25	505
14	Steering column motion	-108.0	285.0	75.1	-9	NA	25	498
15	Passenger kinematics	-38.8	-293.0	45.3	-4	256.0	25	1050
16	Real-time documentation	NA	NA	NA	NA	NA	12-120	24

* +X = Film plane forward of barrier face

+Y = Film plane to left of monorail centerline

+Z = Film plane above ground level

** +Angle = Film plane angled upward from horizontal plane

APPENDIX A

PHOTOGRAPHS

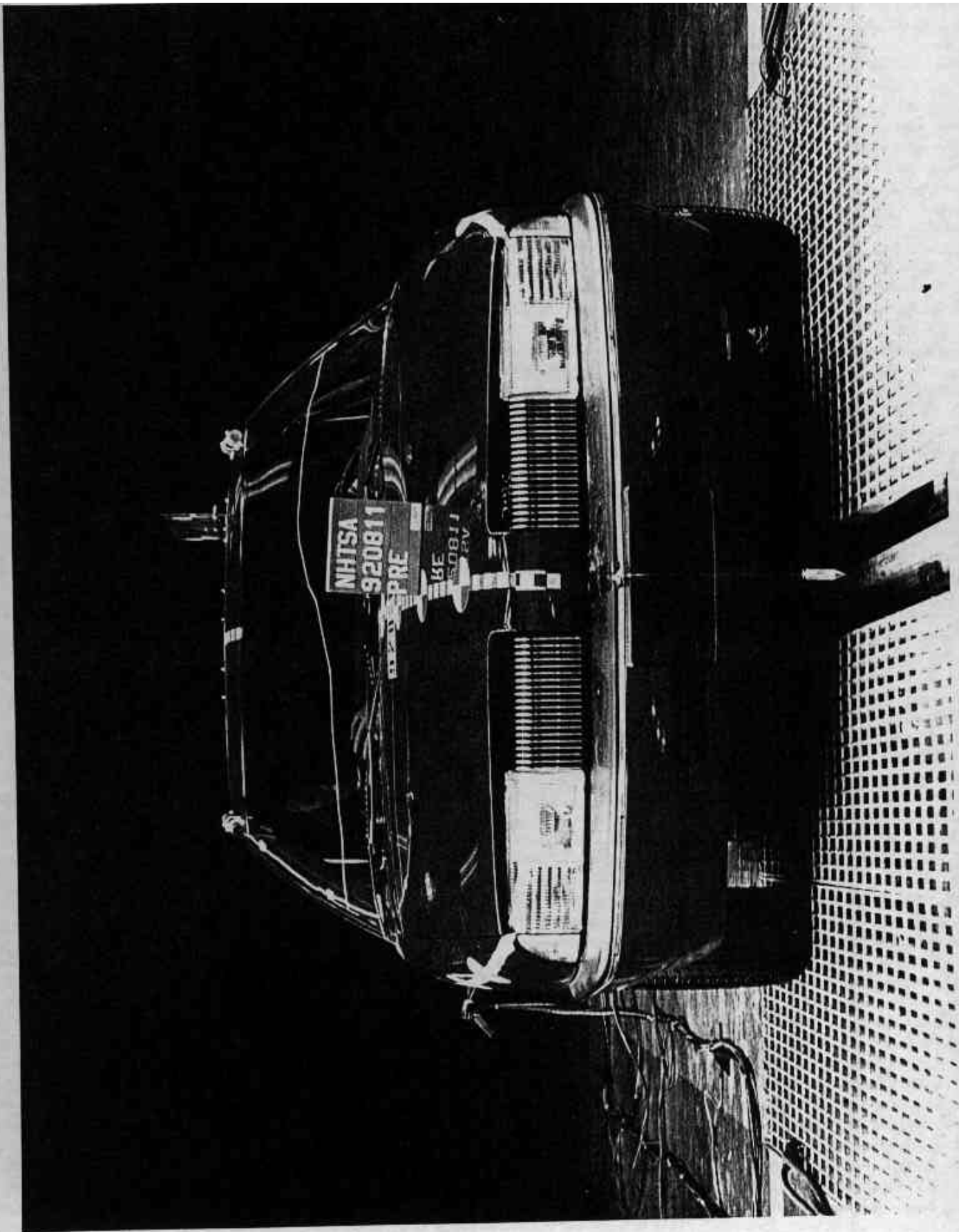


FIGURE A-1. PRE-TEST FRONT VIEW

A-2

920811

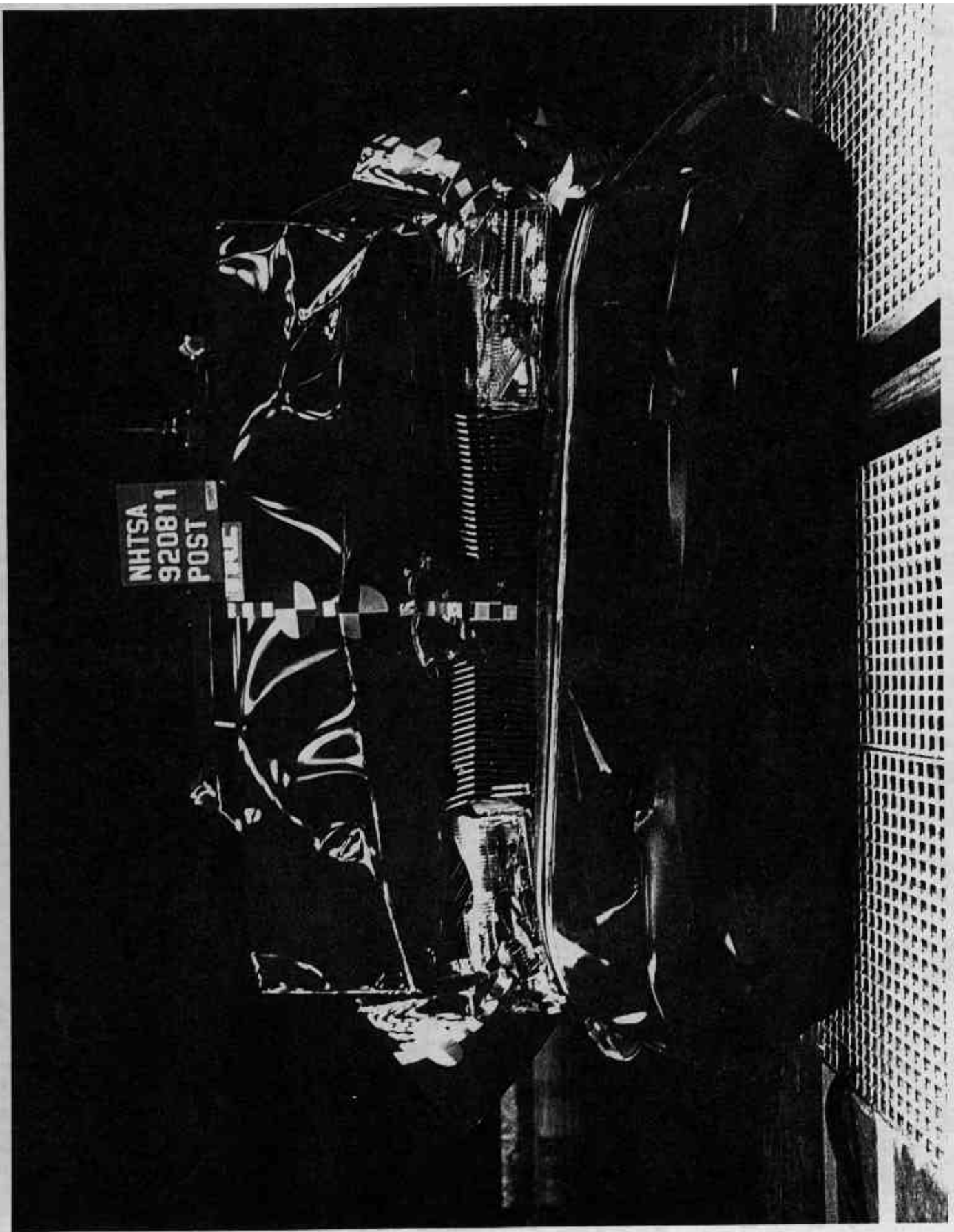


FIGURE A-2. POST-TEST FRONT VIEW

A-3

920811

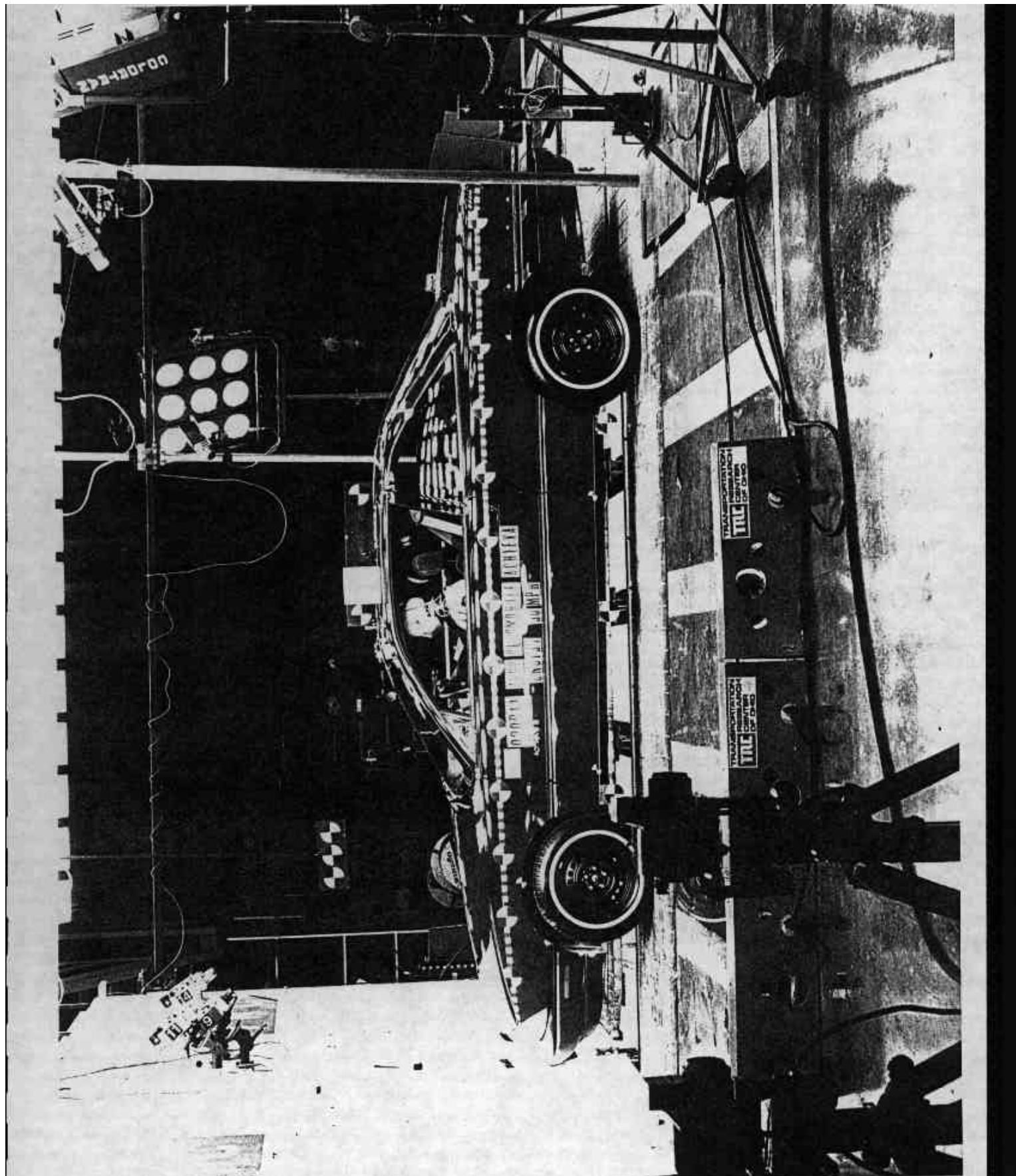


FIGURE A-3. PRE-TEST LEFT SIDE VIEW
A-4

920811

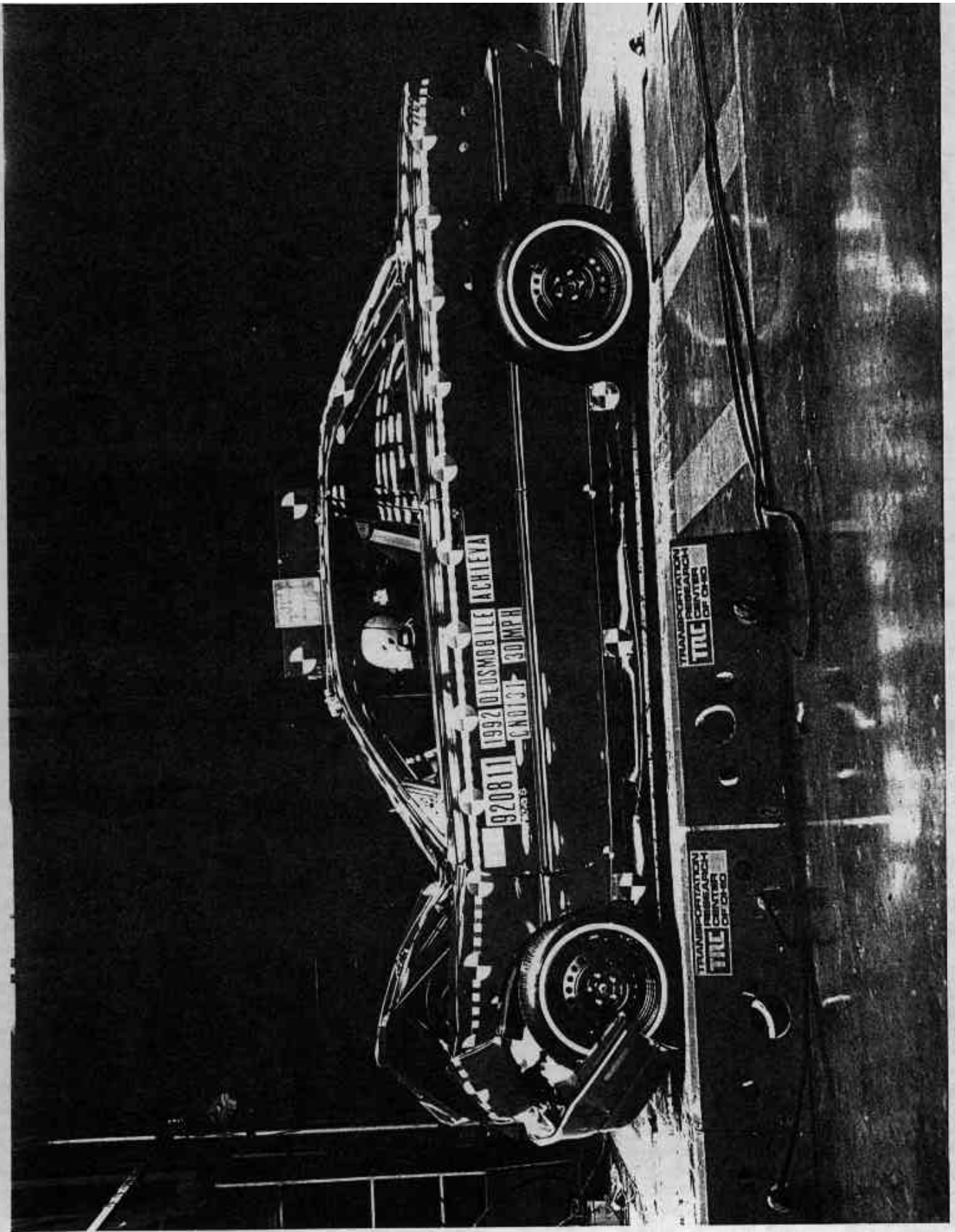


FIGURE A-4, POST-TEST LEFT SIDE VIEW
A-5

920811

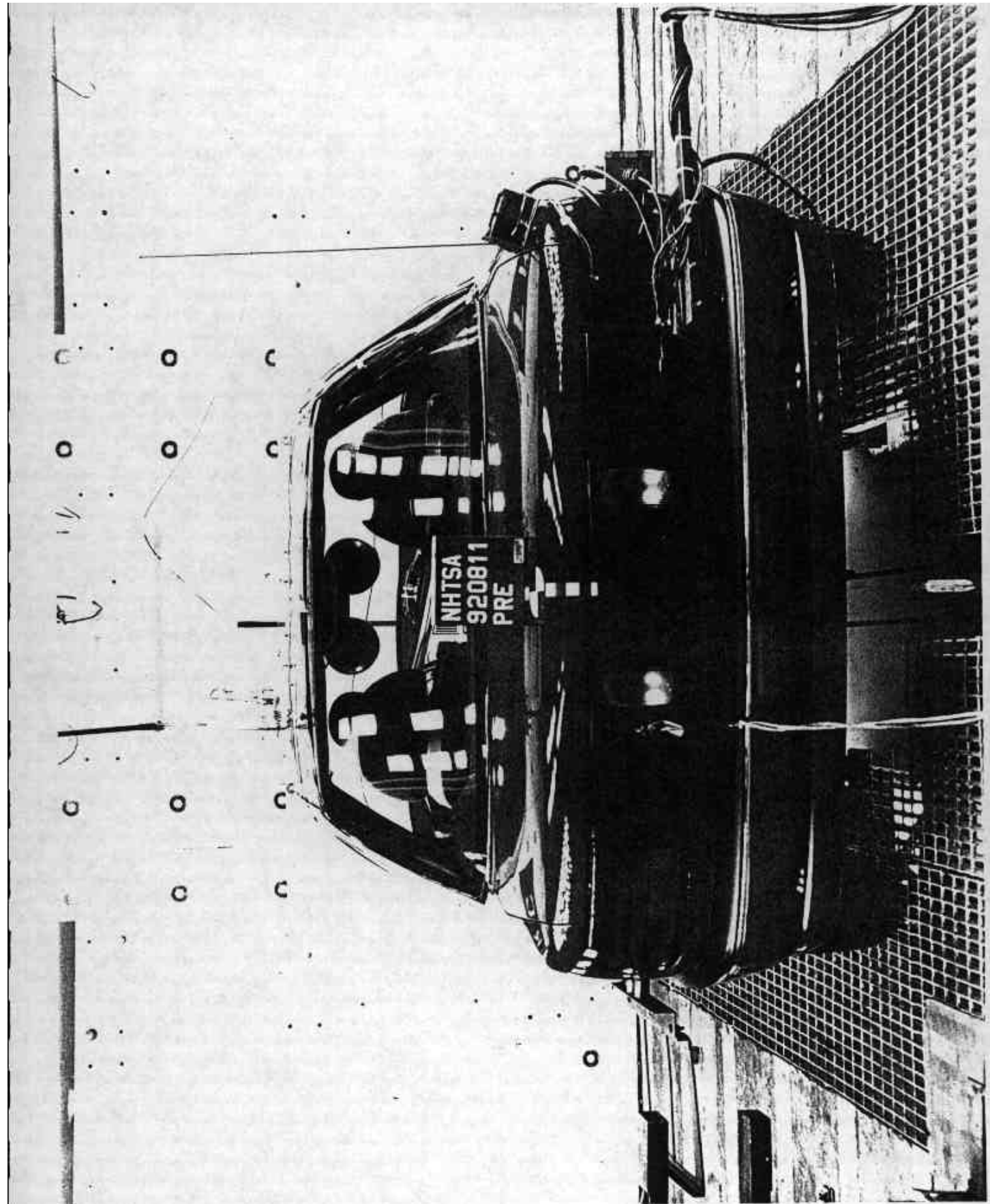


FIGURE A-5. PRE-TEST REAR VIEW

A-6

920811

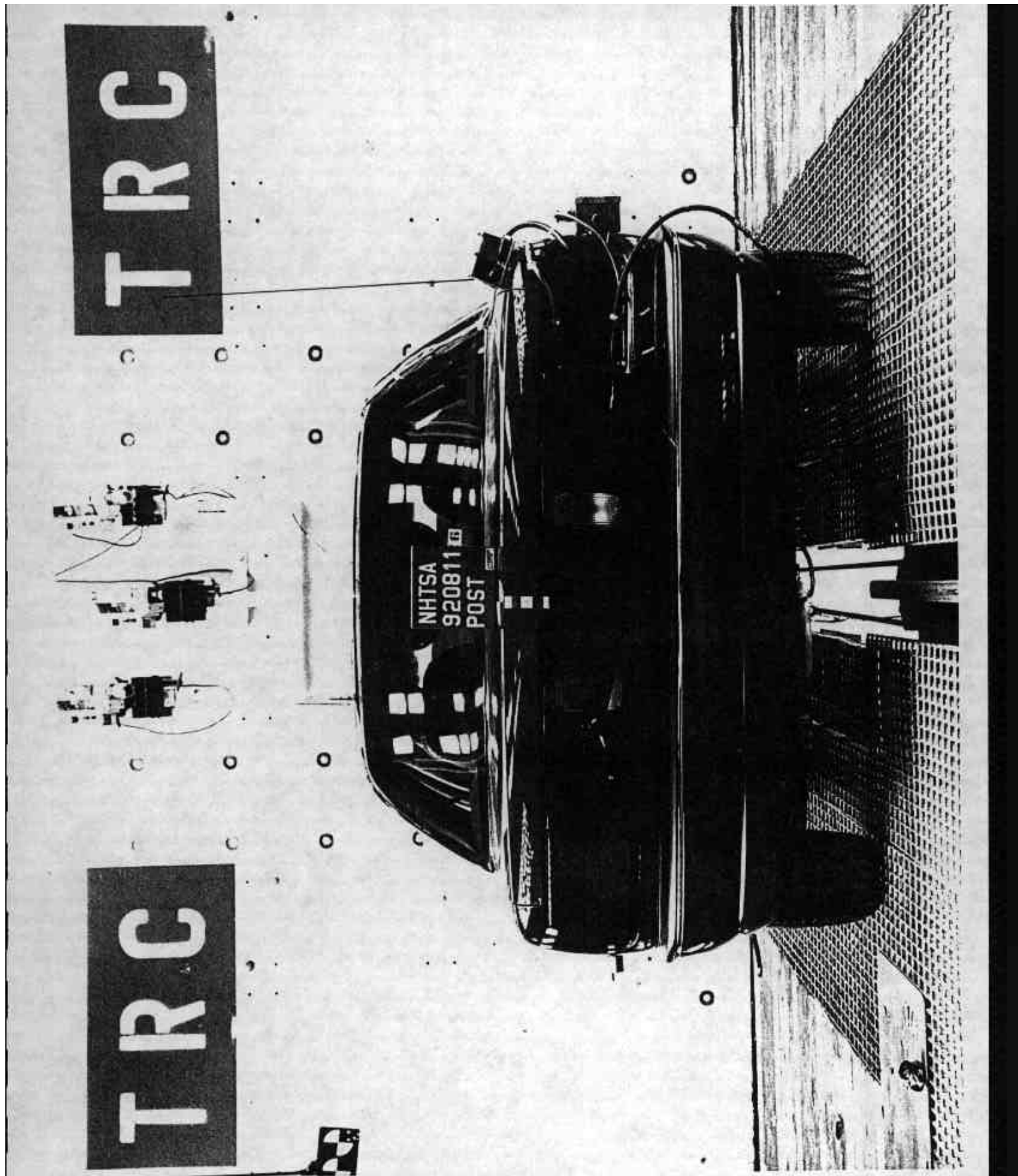


FIGURE A-6. POST-TEST REAR VIEW

A-7

920811

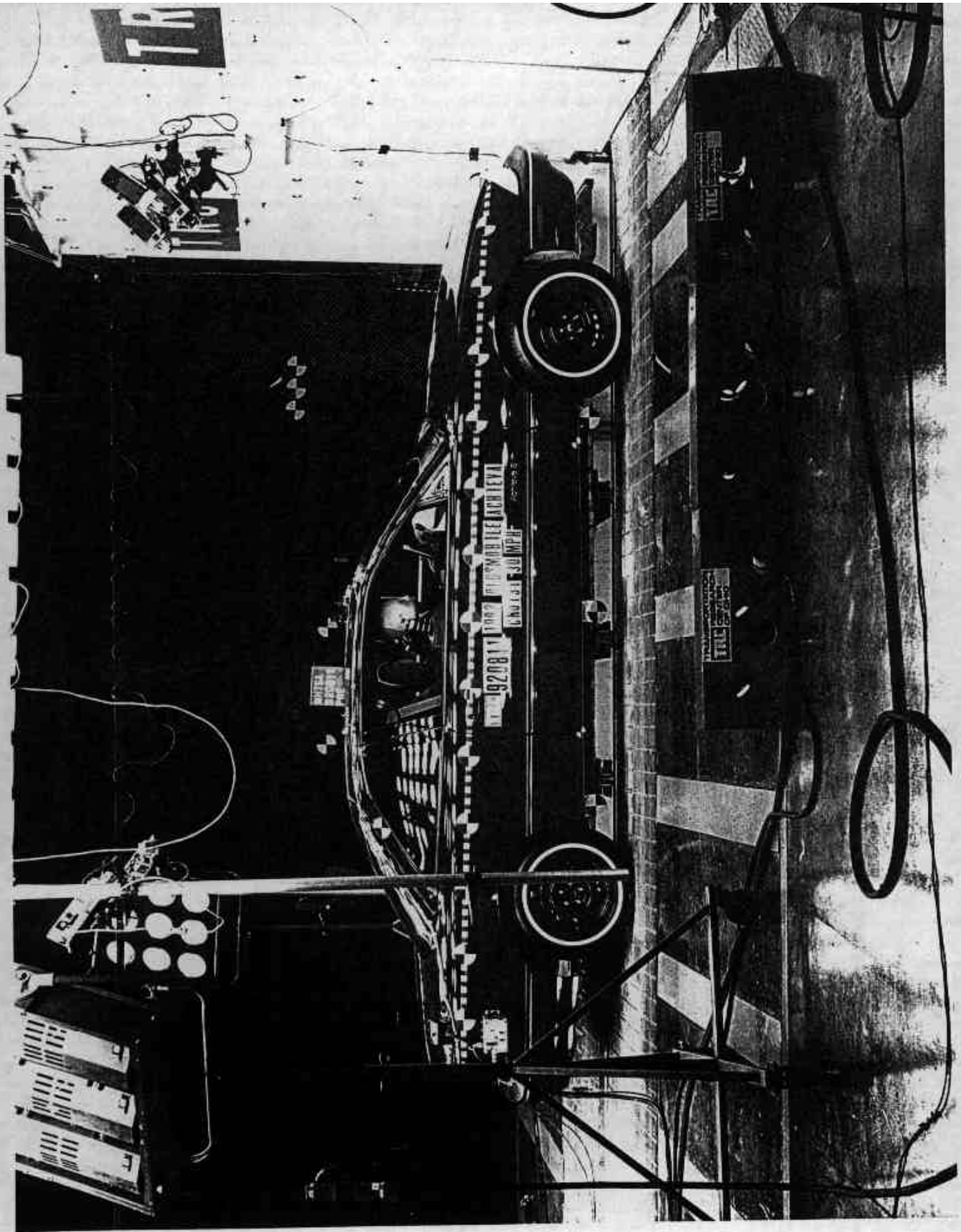


FIGURE A-7. PRE-TEST RIGHT SIDE VIEW
A-8

920811

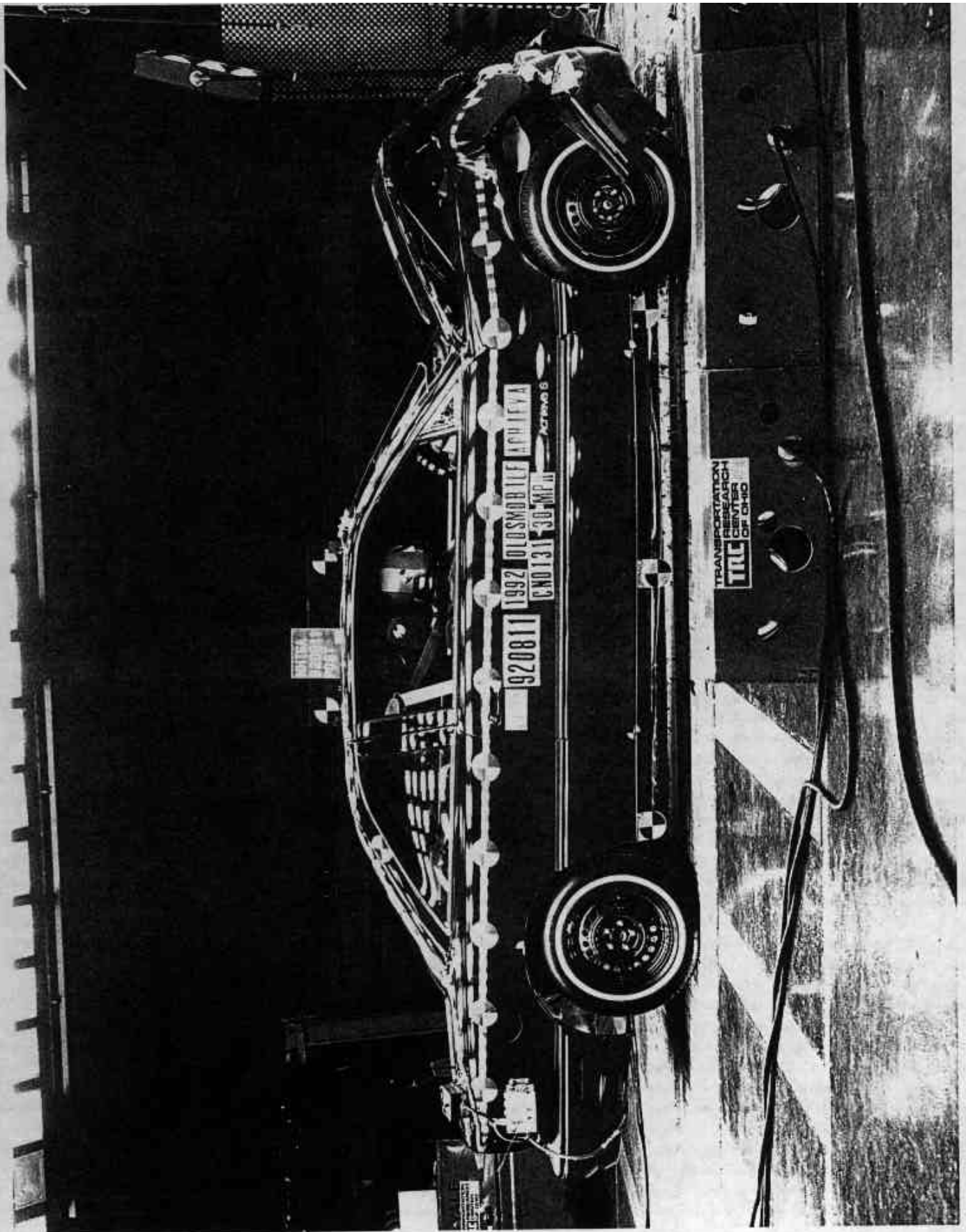


FIGURE A-8. POST-TEST RIGHT SIDE VIEW
A-9

920811

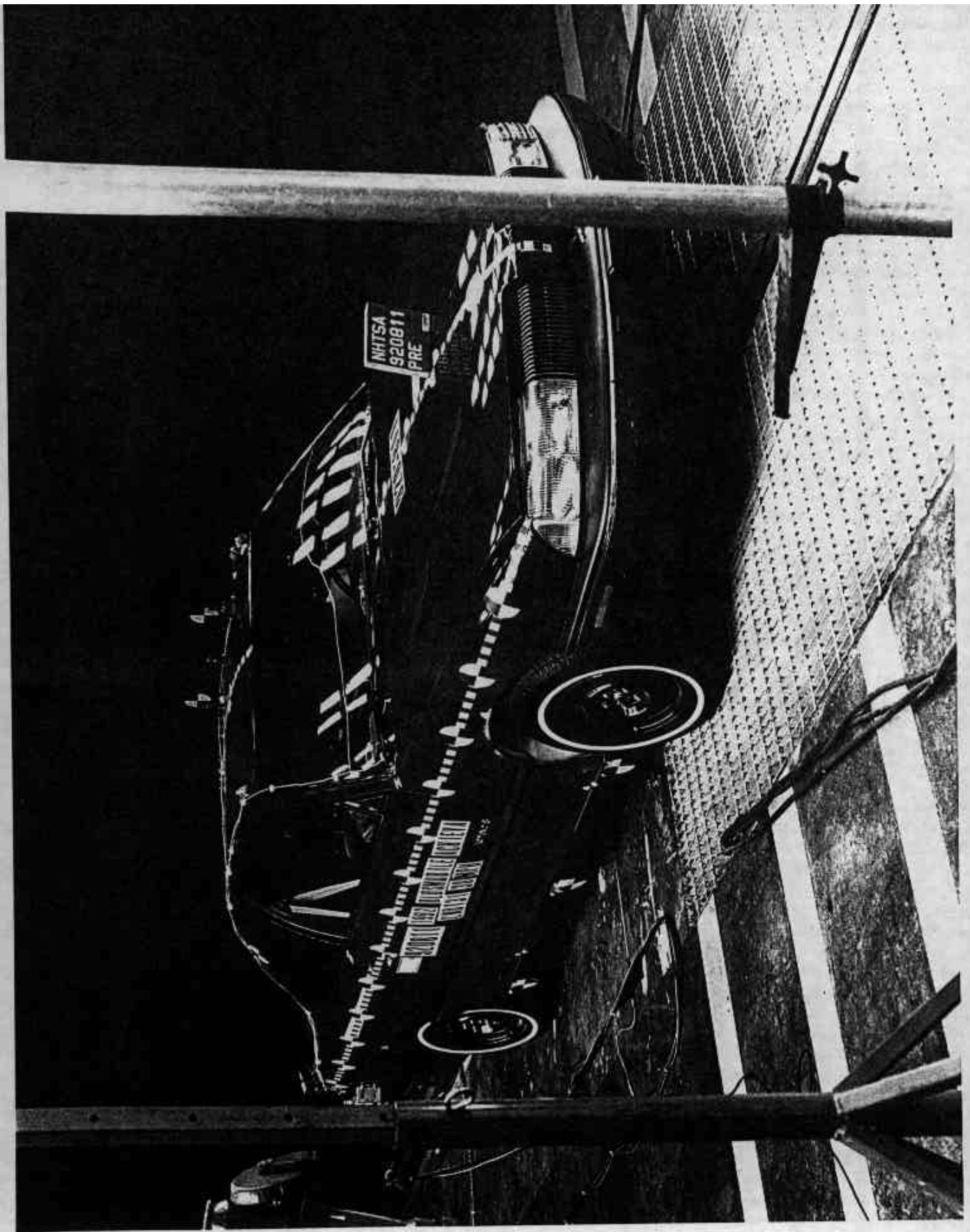


FIGURE A-9. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW
A-10

920811

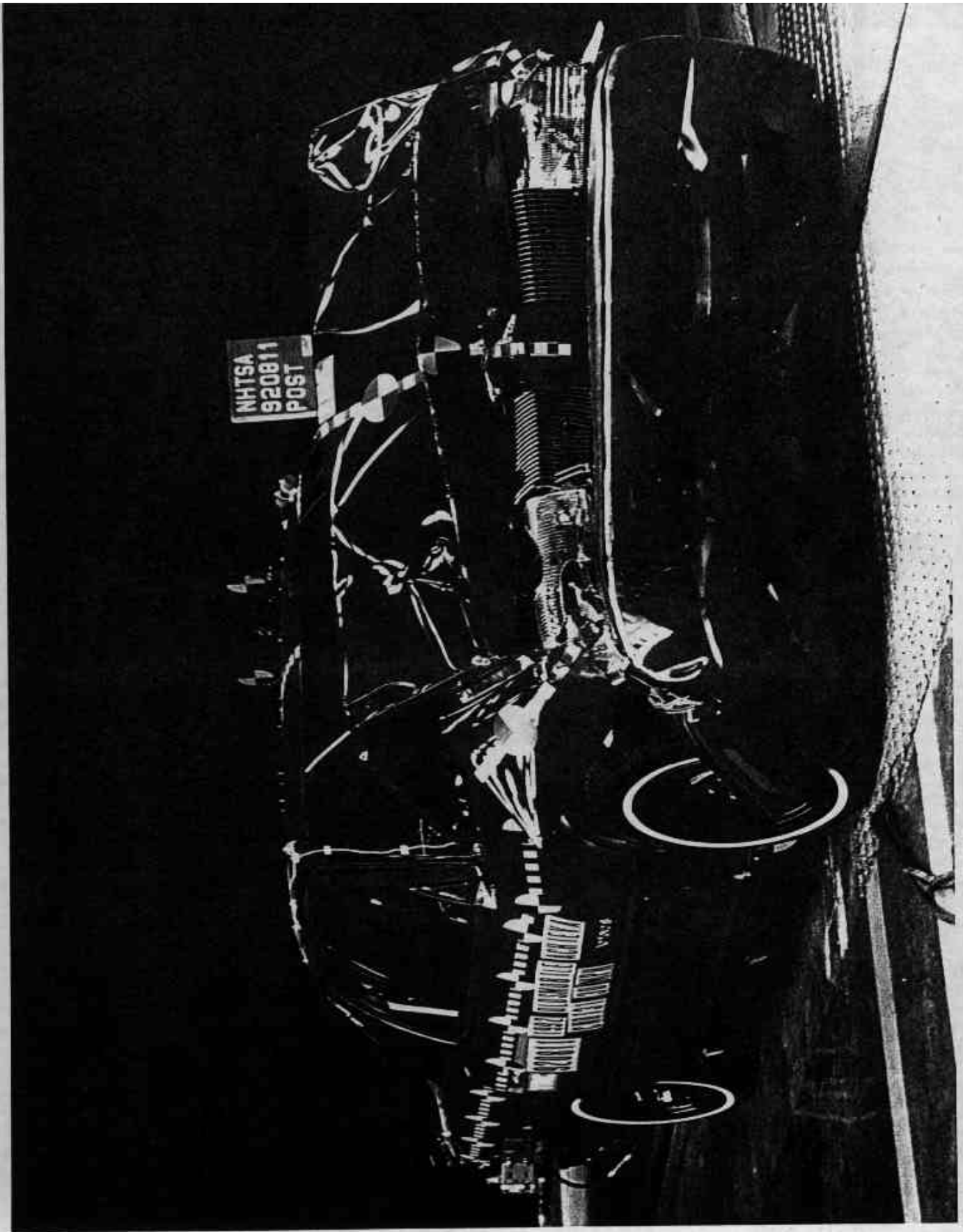


FIGURE A-10. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-11

920811

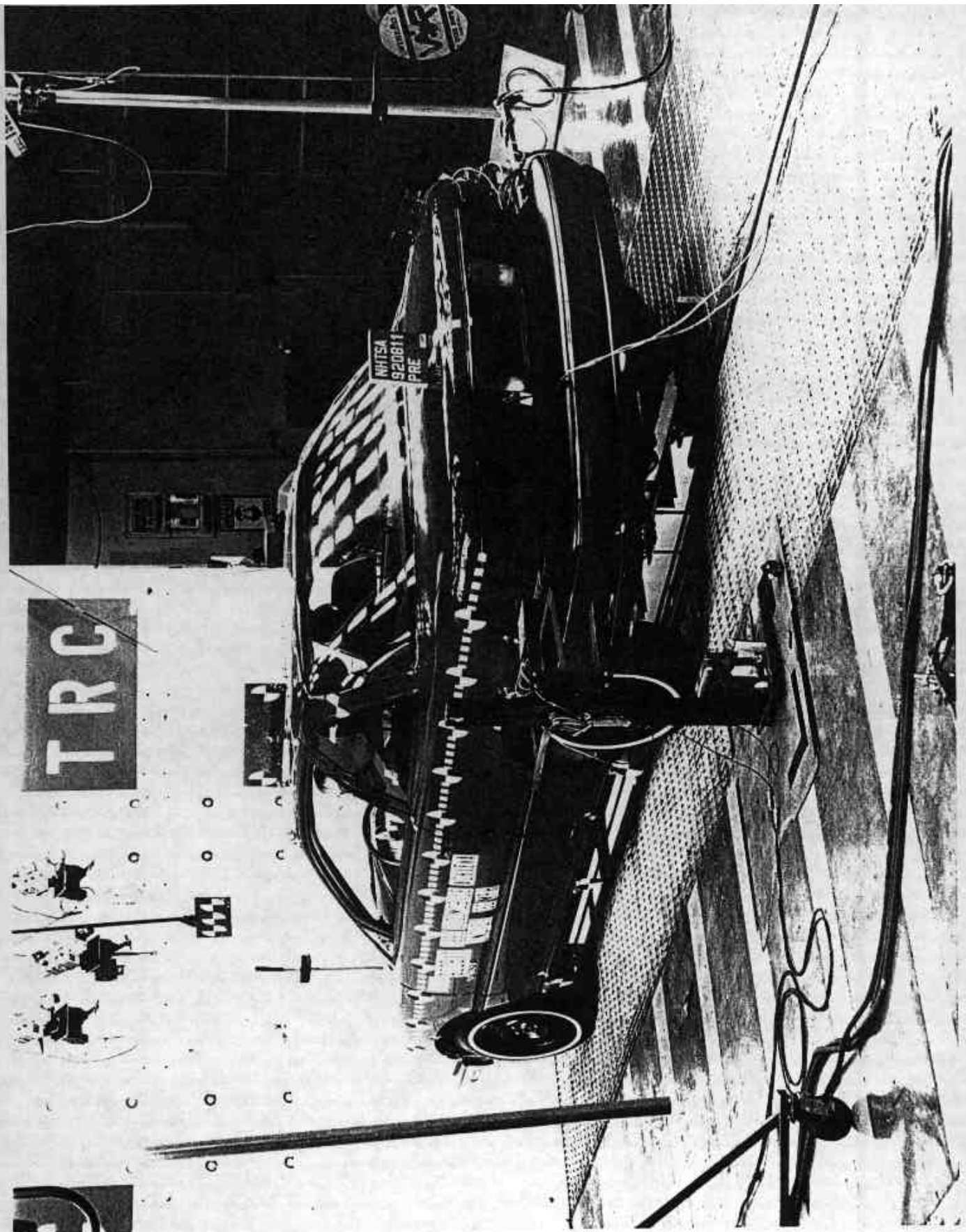


FIGURE A-11. PRE-TEST LEFT REAR THREE-QUARTER VIEW
A-12

920811

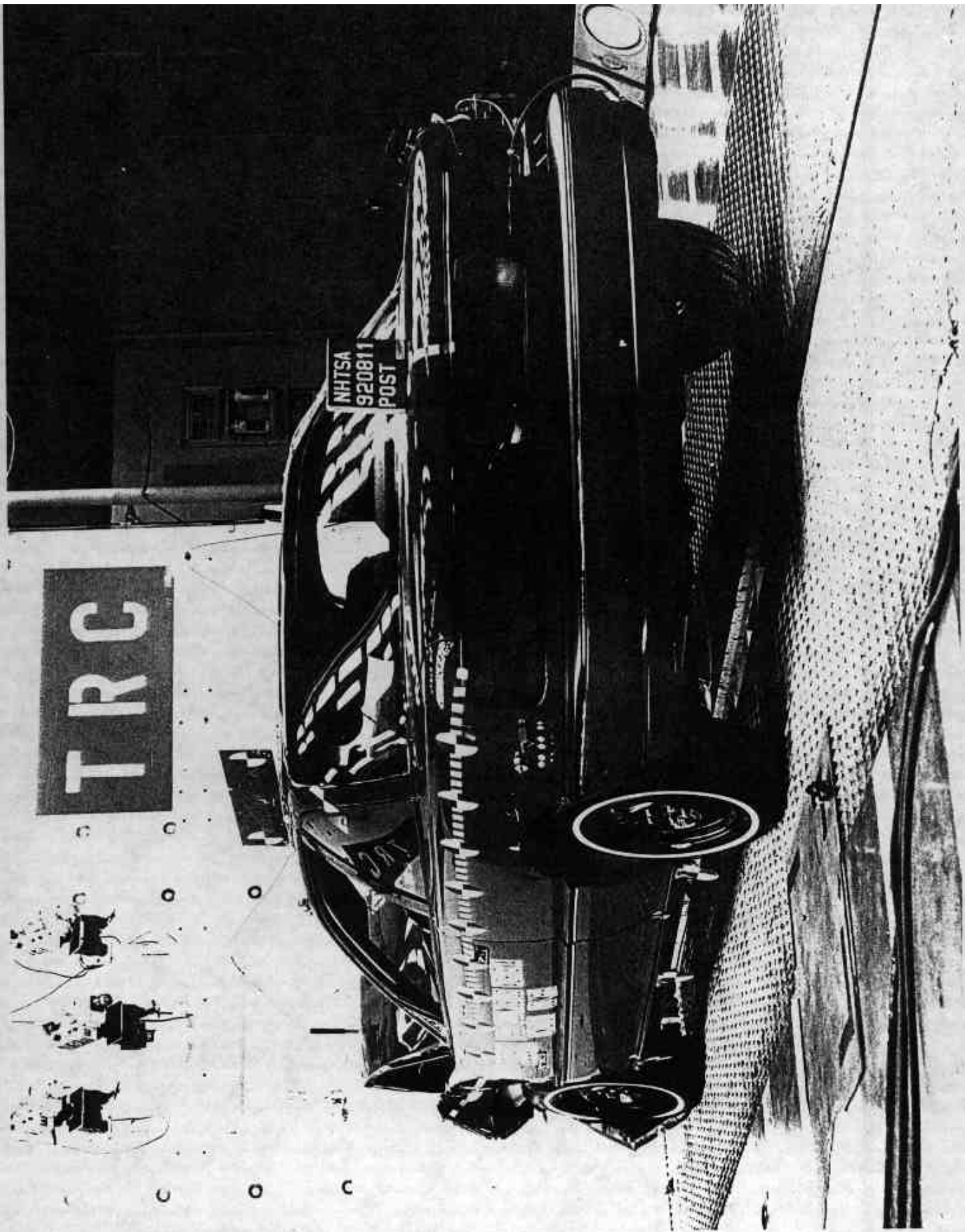


FIGURE A-12. POST-TEST LEFT REAR THREE-QUARTER VIEW

A-13

920811

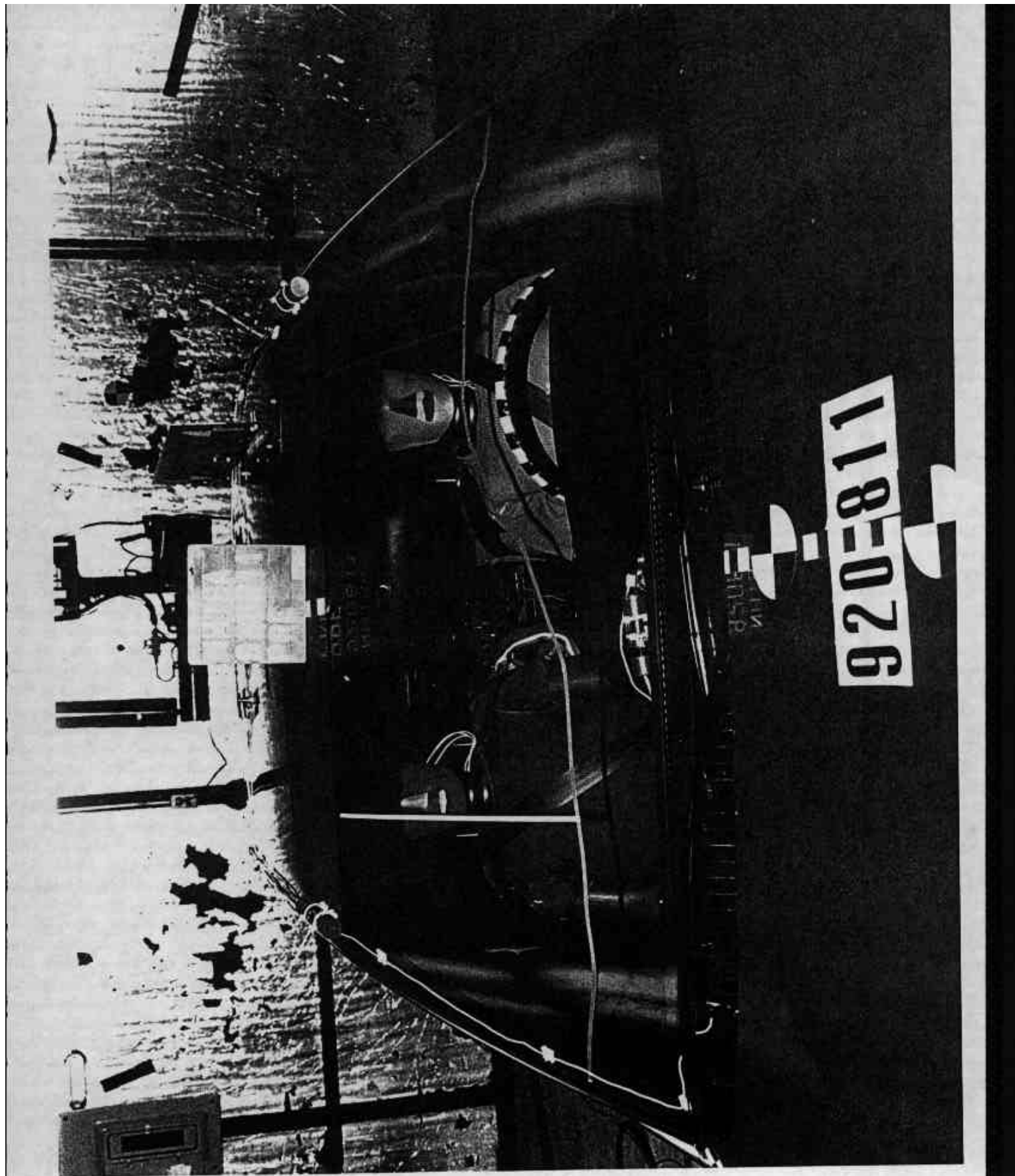


FIGURE A-13. PRE-TEST WINDSHIELD VIEW
A-14

920811

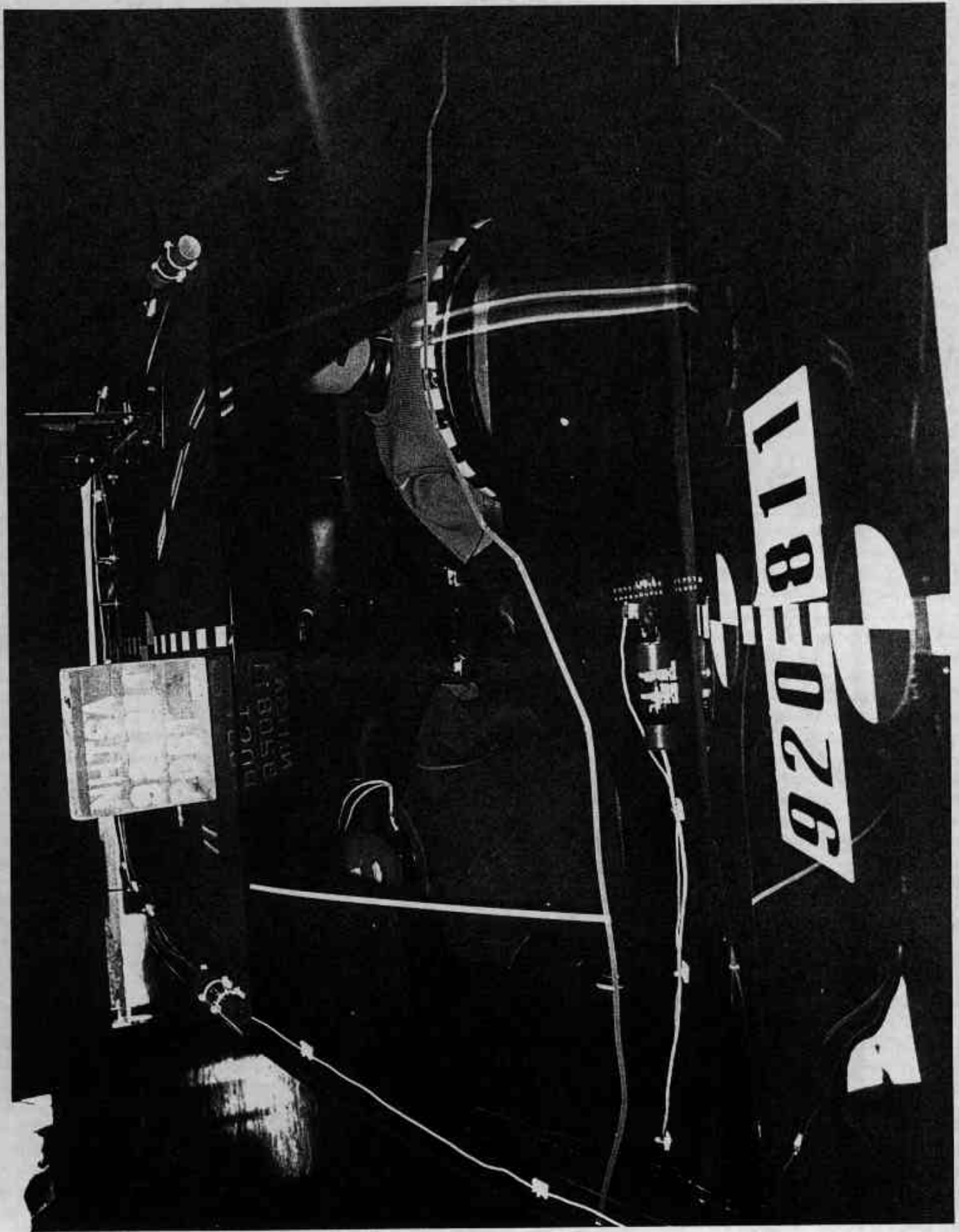


FIGURE A-14. POST-TEST WINDSHIELD VIEW
A-15

920811

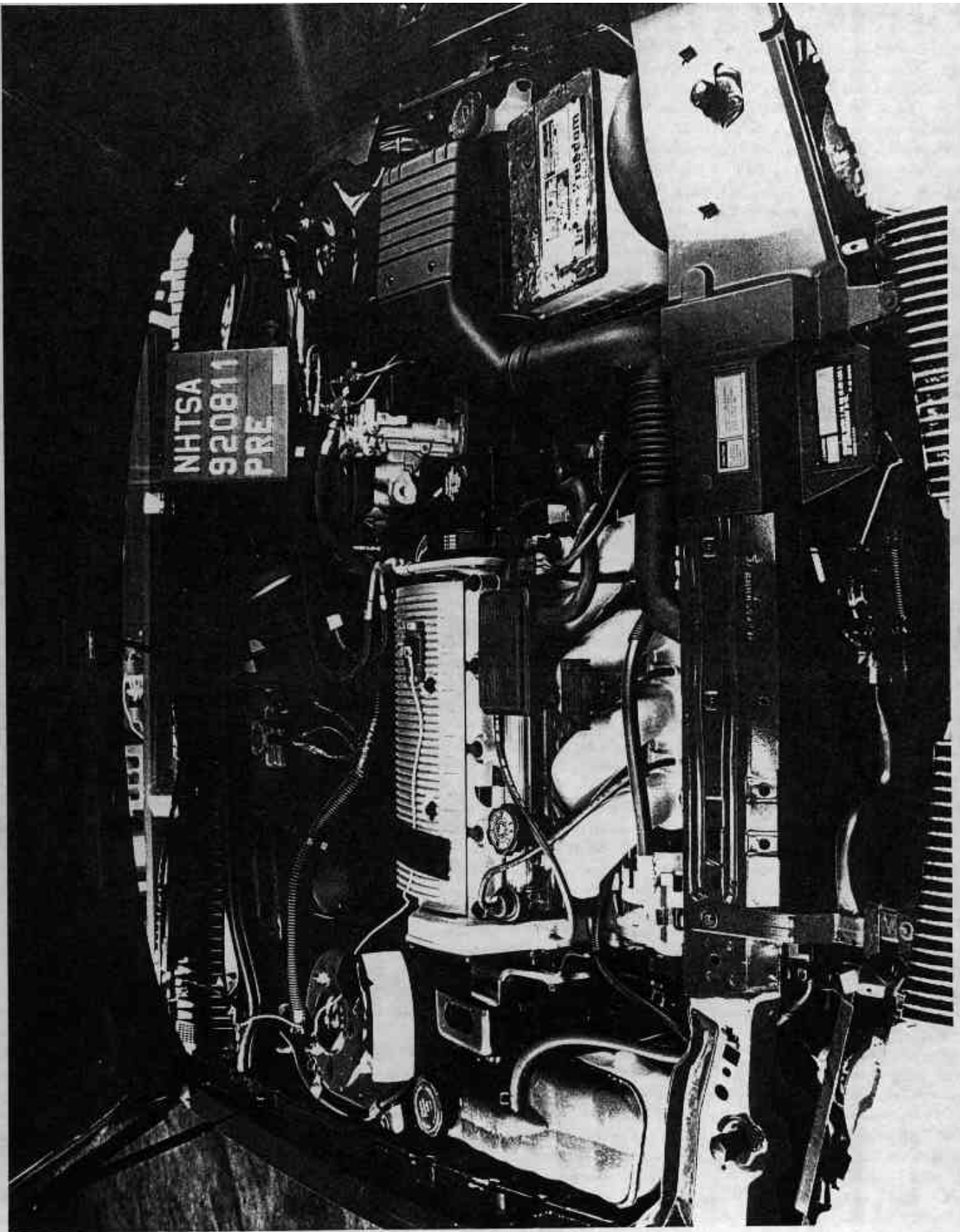


FIGURE A-15, PRE-TEST ENGINE COMPARTMENT VIEW

A-16

920811

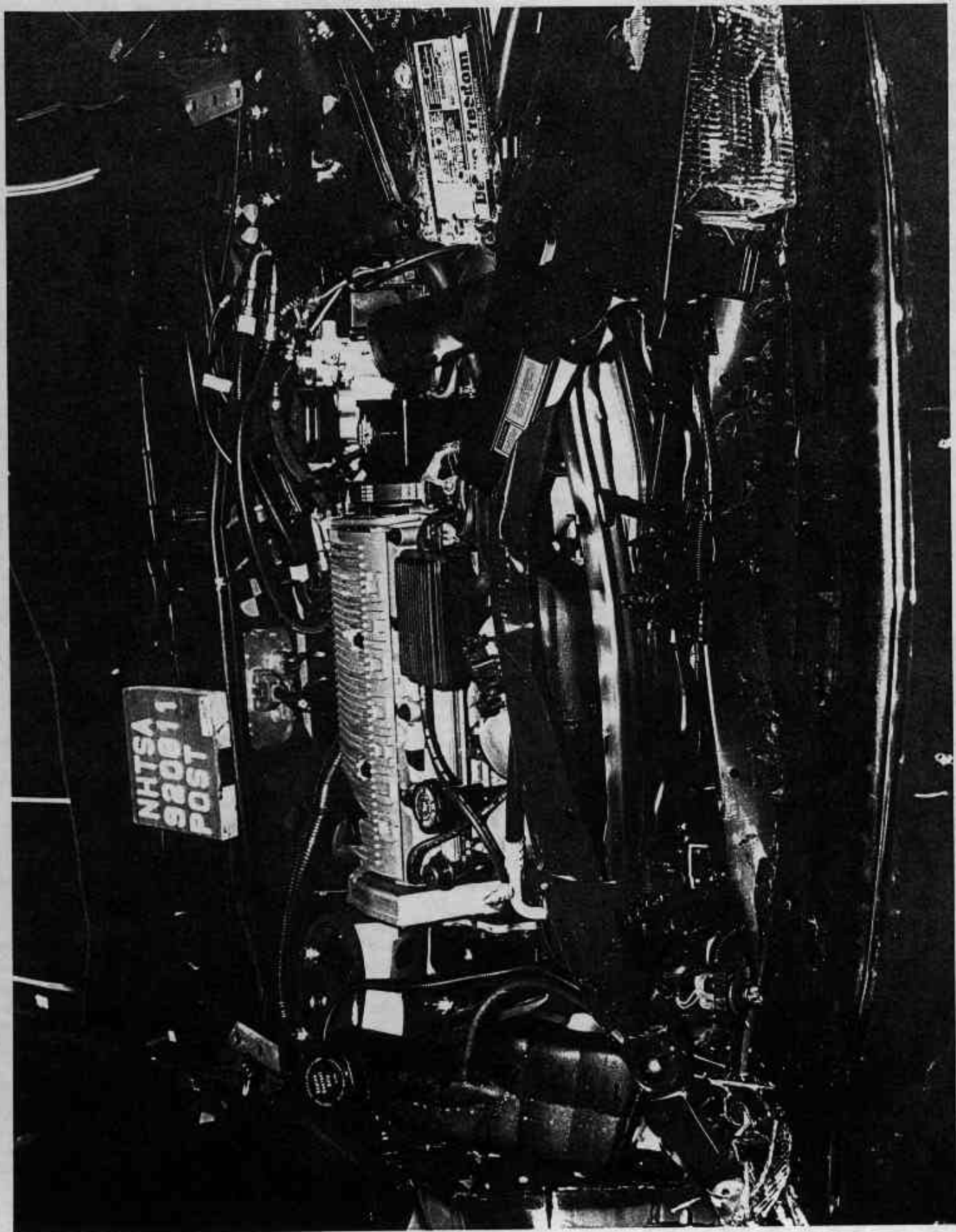


FIGURE A-16. POST-TEST ENGINE COMPARTMENT VIEW
A-17

920811



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

920811

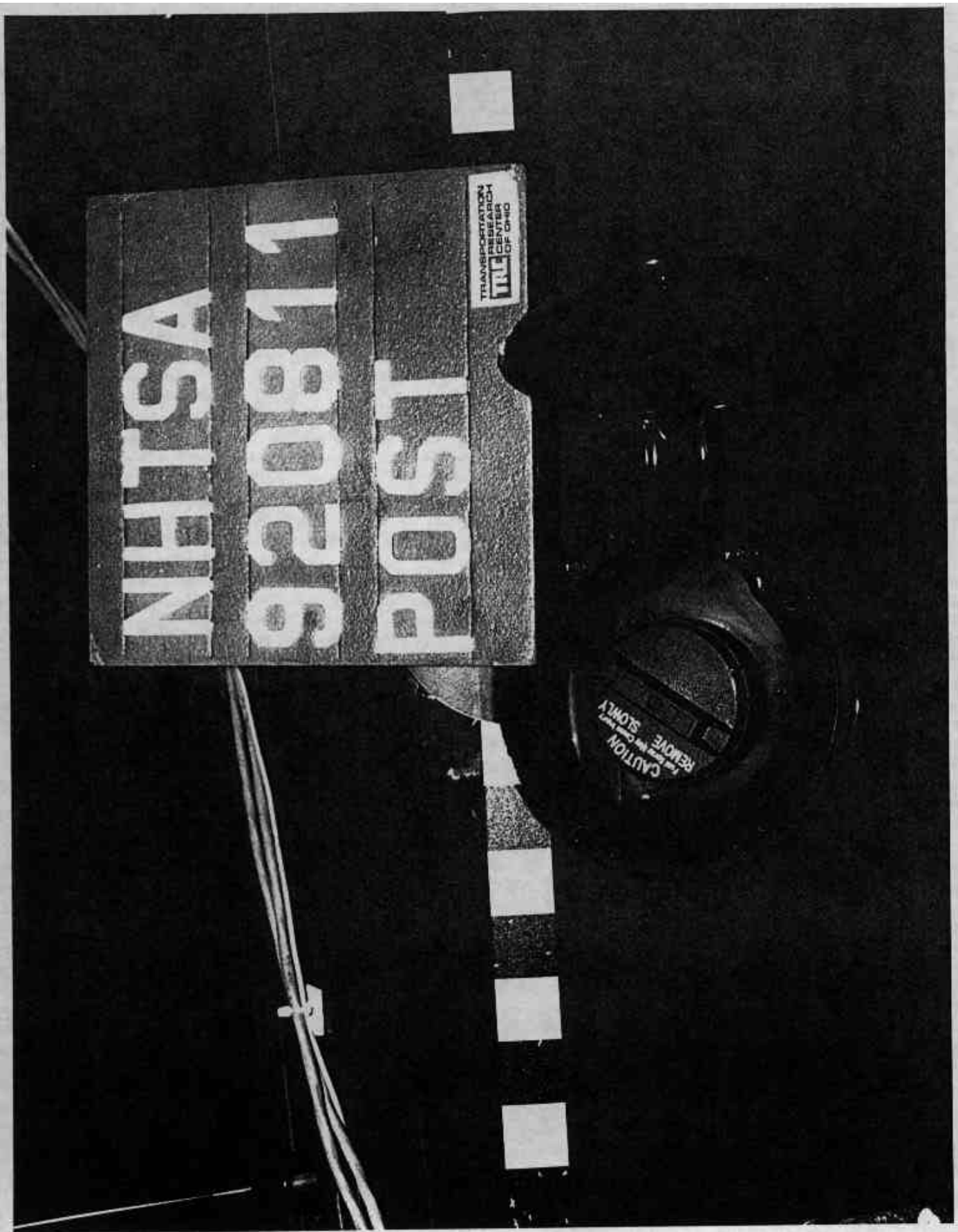


FIGURE A-18. POST-TEST FUEL FILLER CAP VIEW

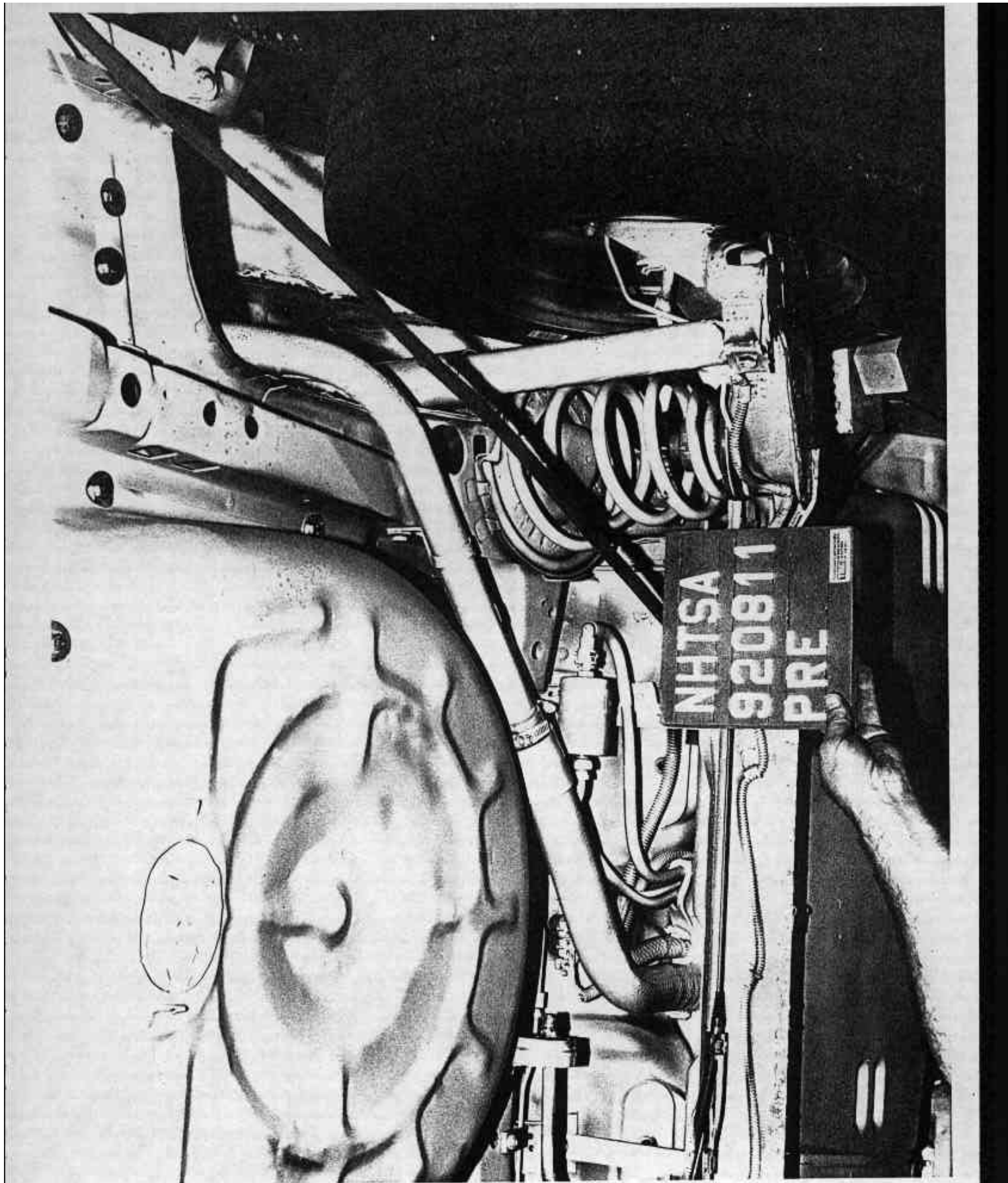


FIGURE A-19. PRE-TEST FUEL FILLER NECK VIEW

A-20

920811

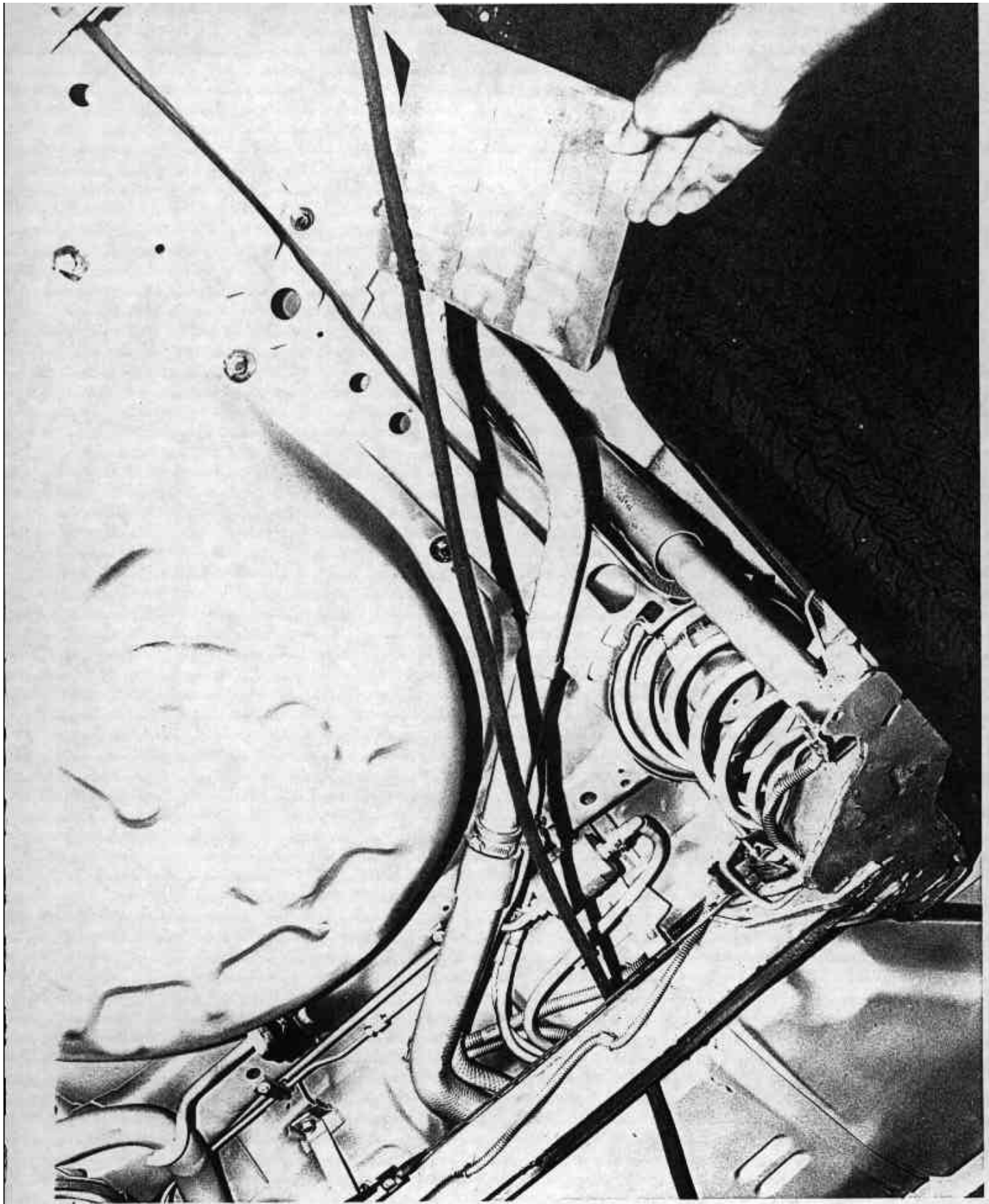


FIGURE A-20. POST-TEST FUEL FILLER NECK VIEW
A-21

920811

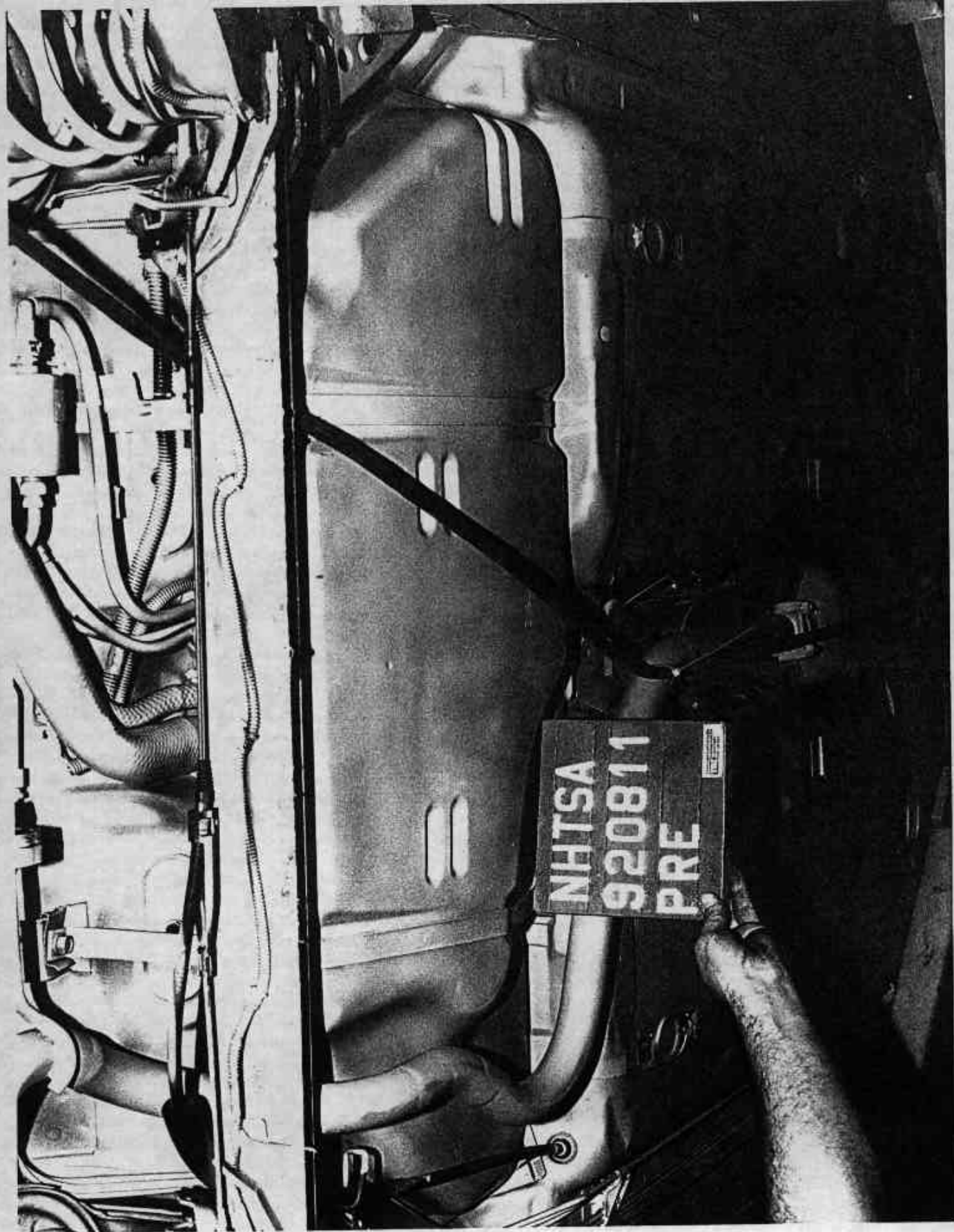


FIGURE A-21. PRE-TEST FUEL TANK VIEW
A-22

920811

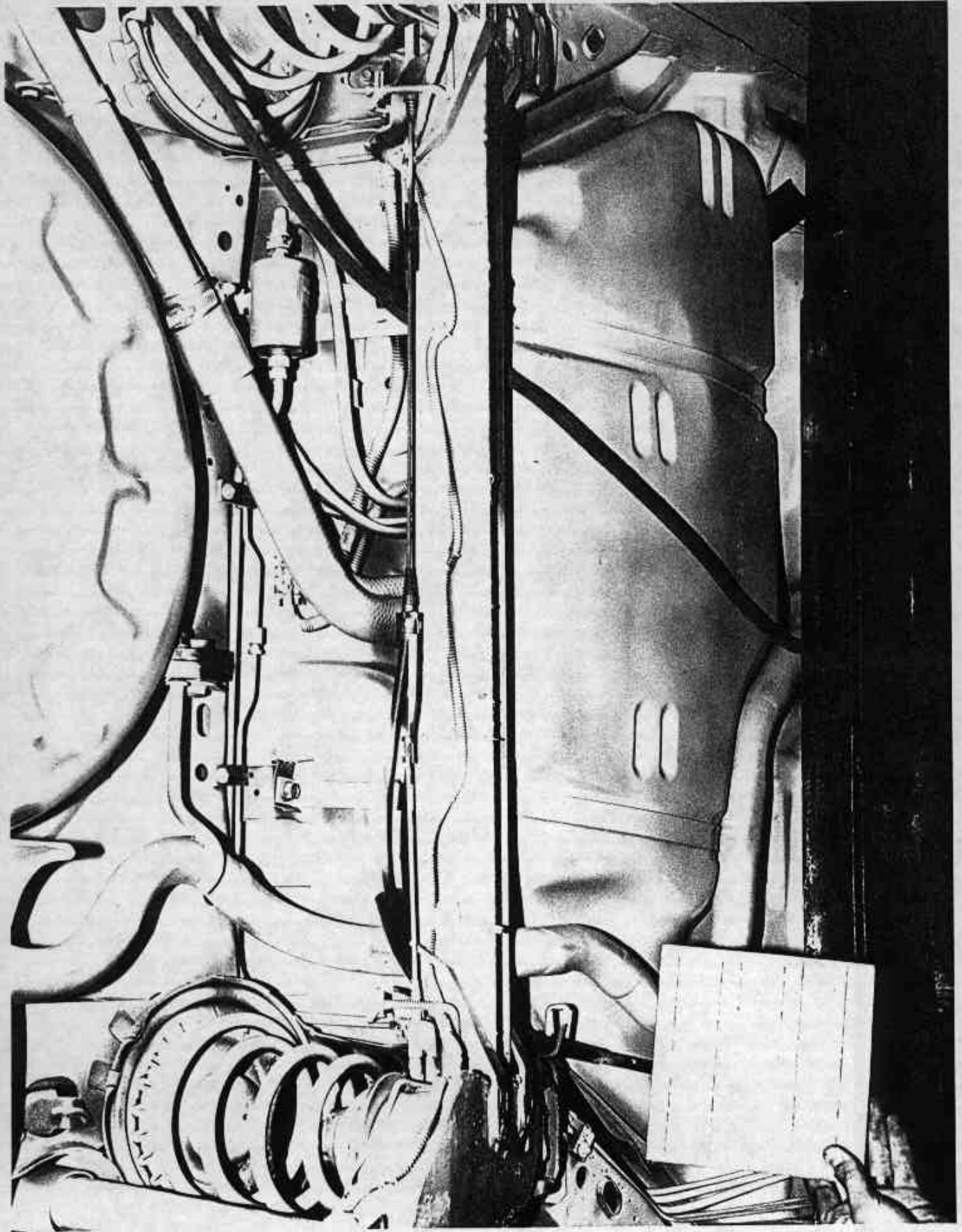


FIGURE A-22. POST-TEST FUEL TANK VIEW
A-23

920811

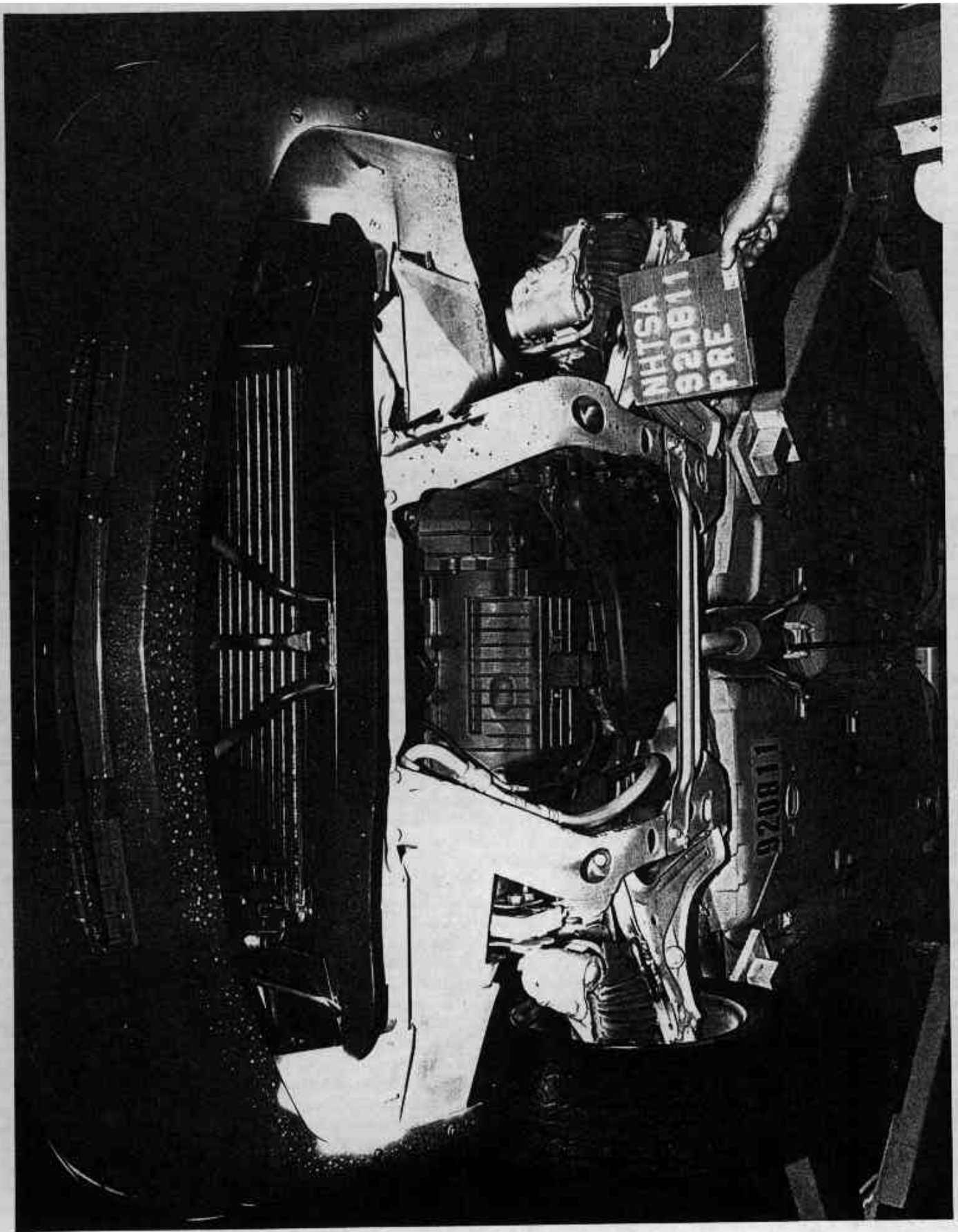


FIGURE A-23. PRE-TEST FRONT UNDERBODY VIEW

A-24

920811

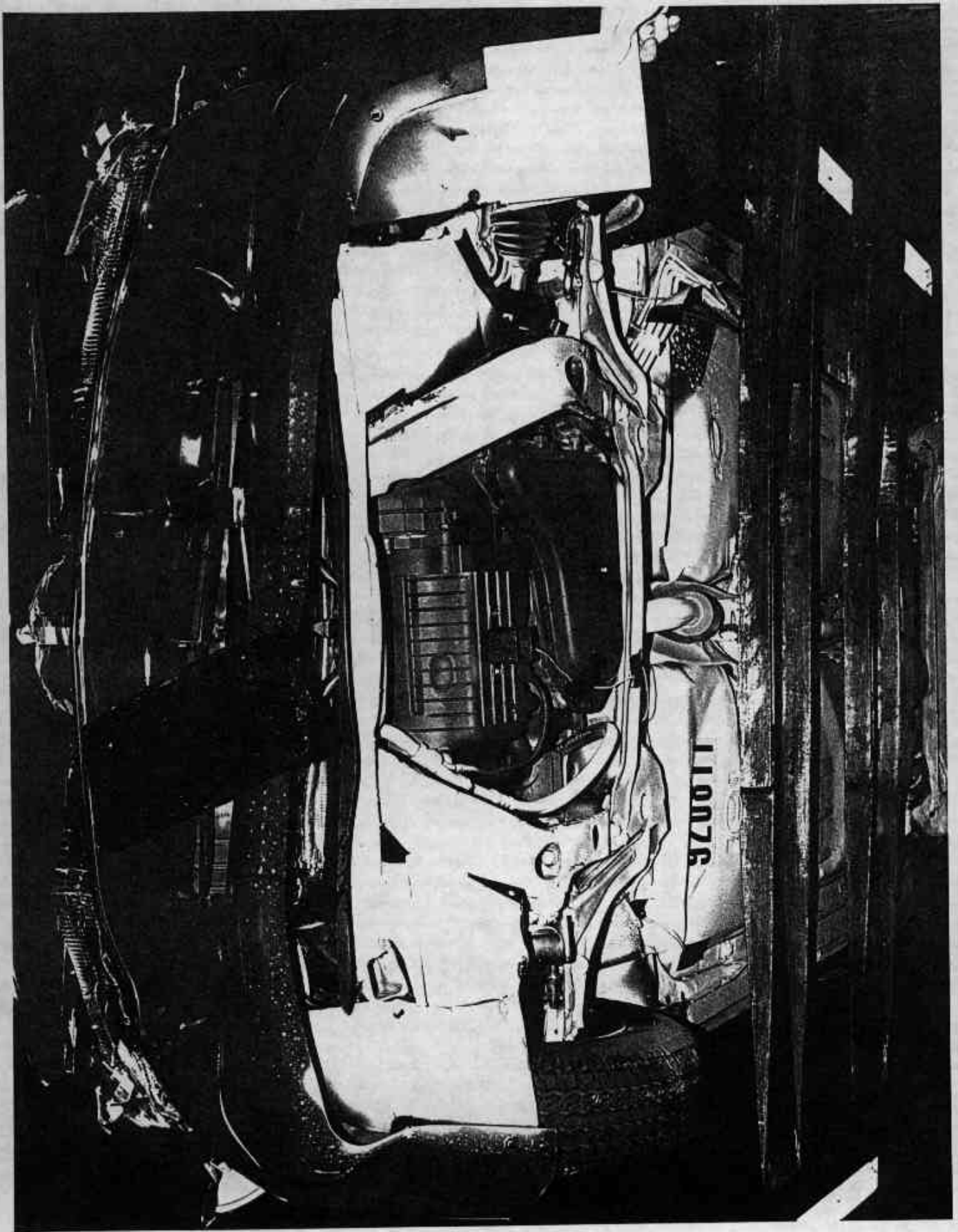


FIGURE A-24, POST-TEST FRONT UNDERBODY VIEW
A-25

920811

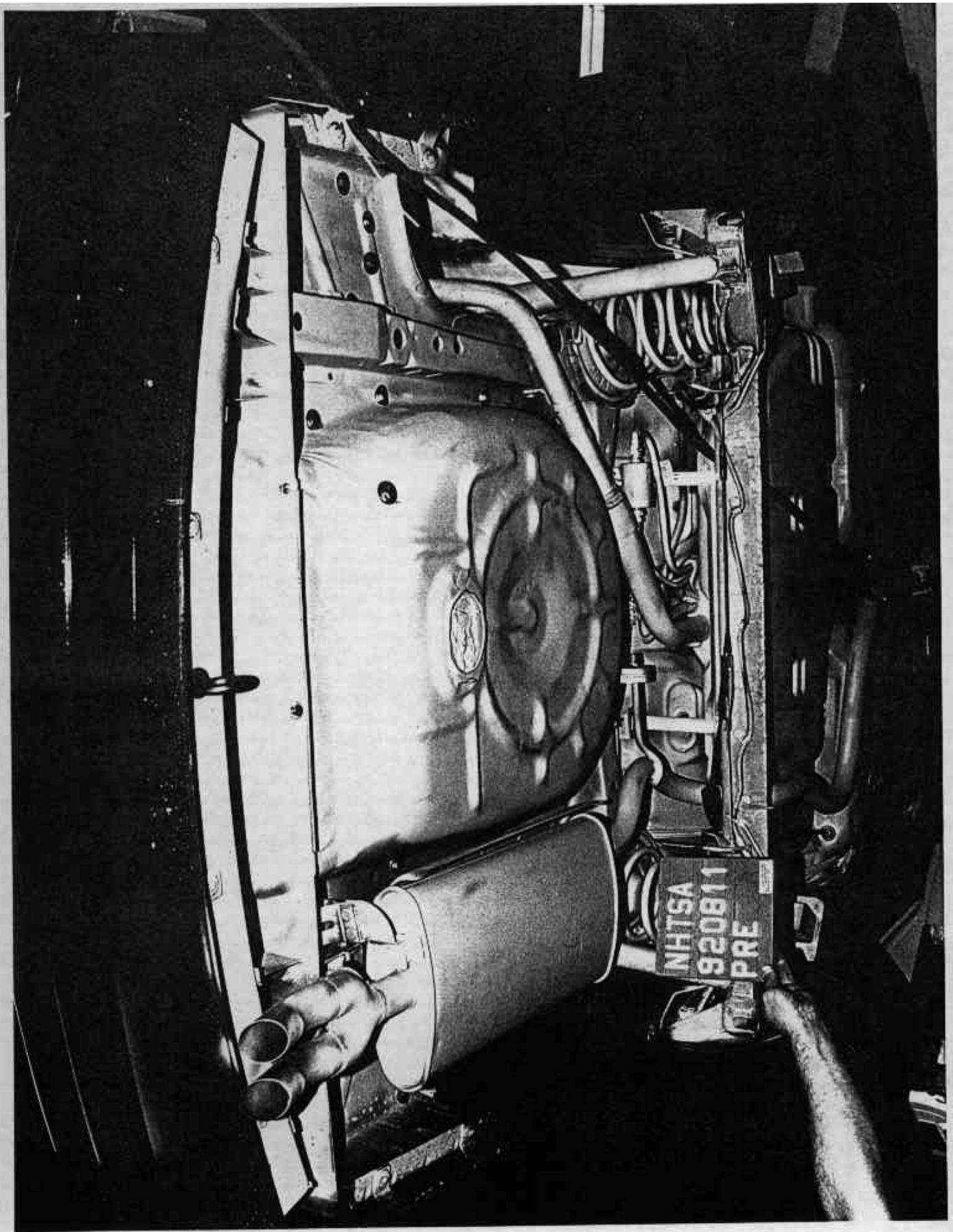


FIGURE A-25. PRE-TEST REAR UNDERBODY VIEW
A-26

920811

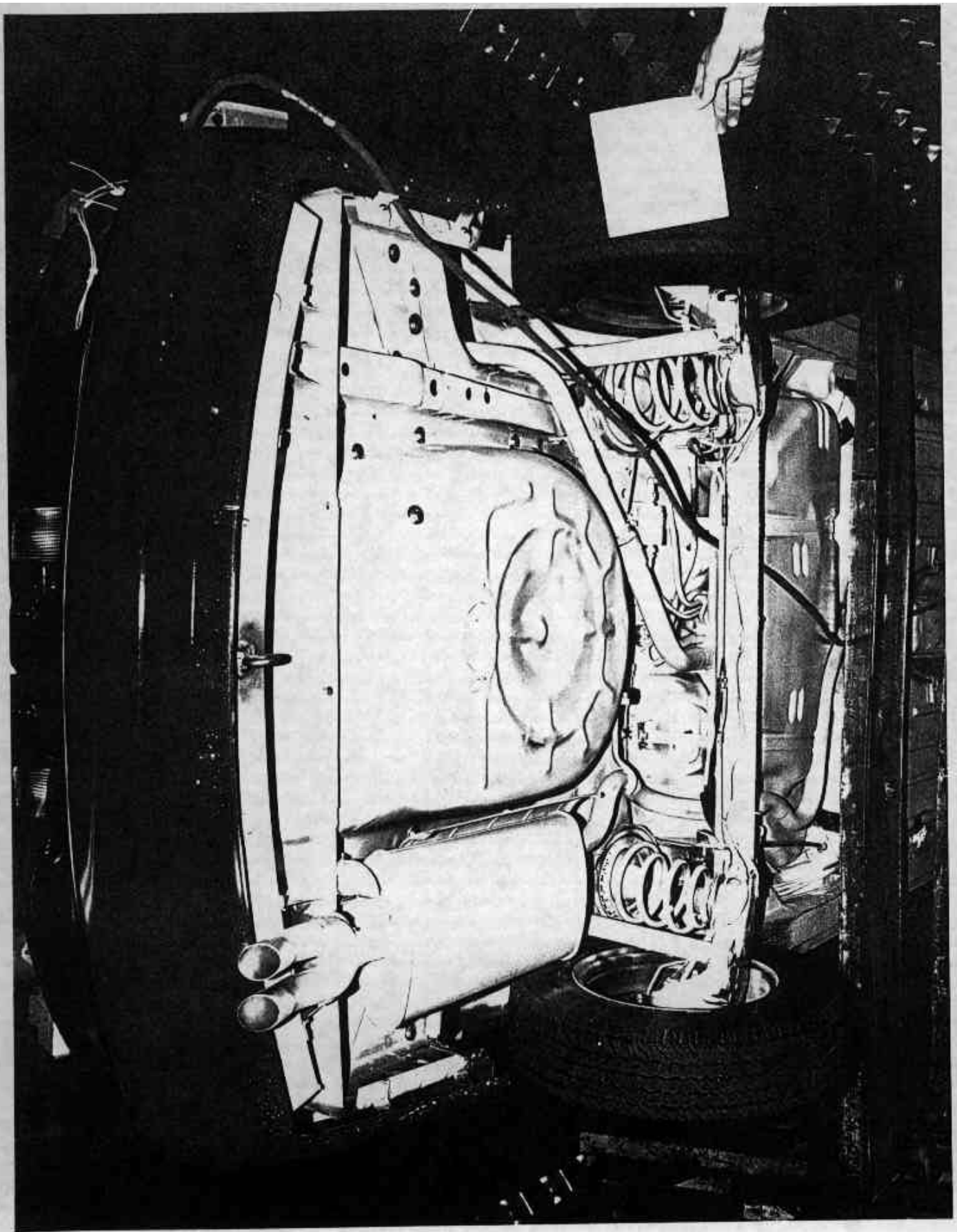


FIGURE A-26. POST-TEST REAR UNDERBODY VIEW
A-27

920811

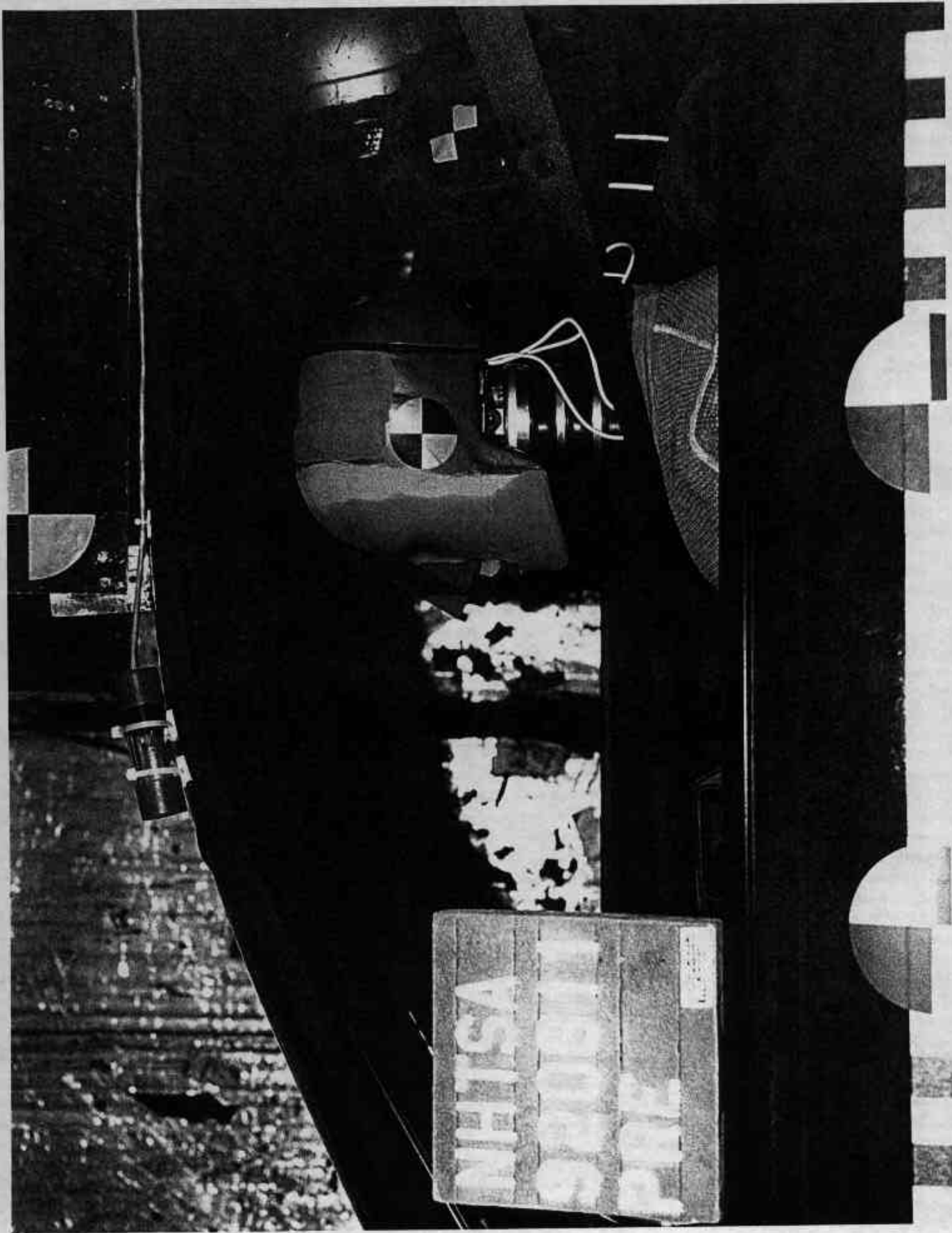


FIGURE A-27. PRE-TEST DRIVER DUMMY POSITION VIEW

A-28

920811

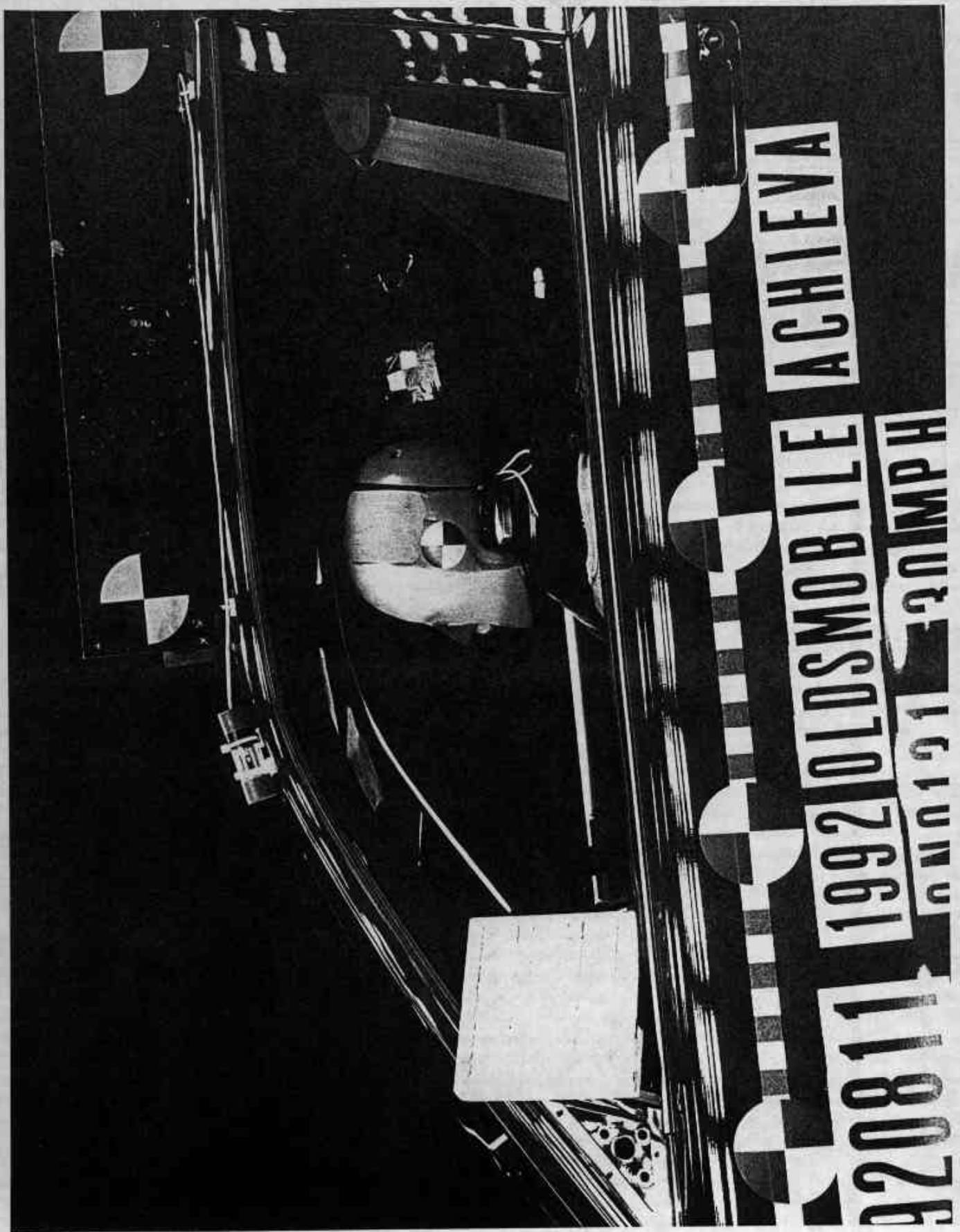


FIGURE A-28. POST-TEST DRIVER DUMMY POSITION VIEW

A-29

920811

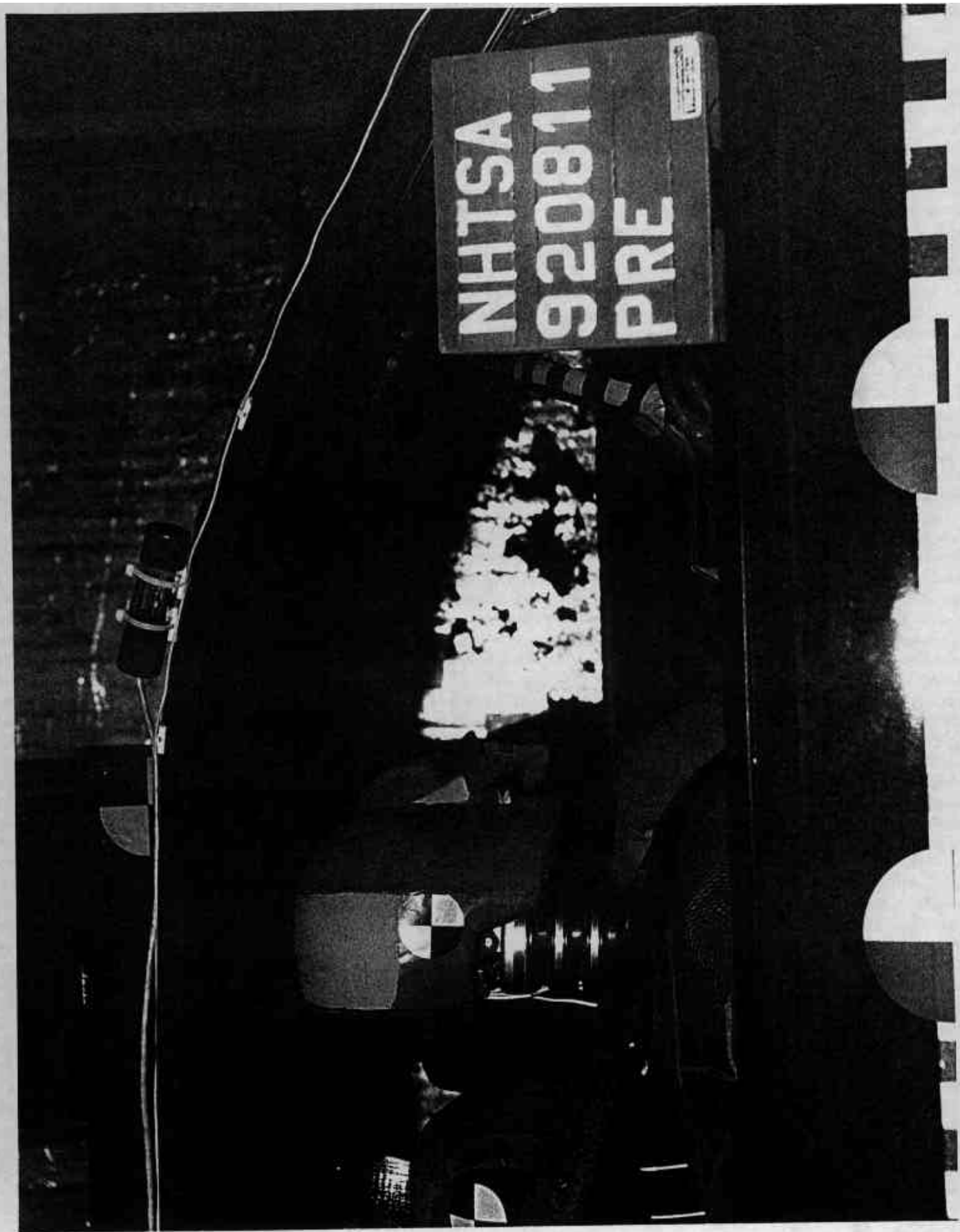


FIGURE A-29. PRE-TEST PASSENGER DUMMY POSITION VIEW
A-30

920811

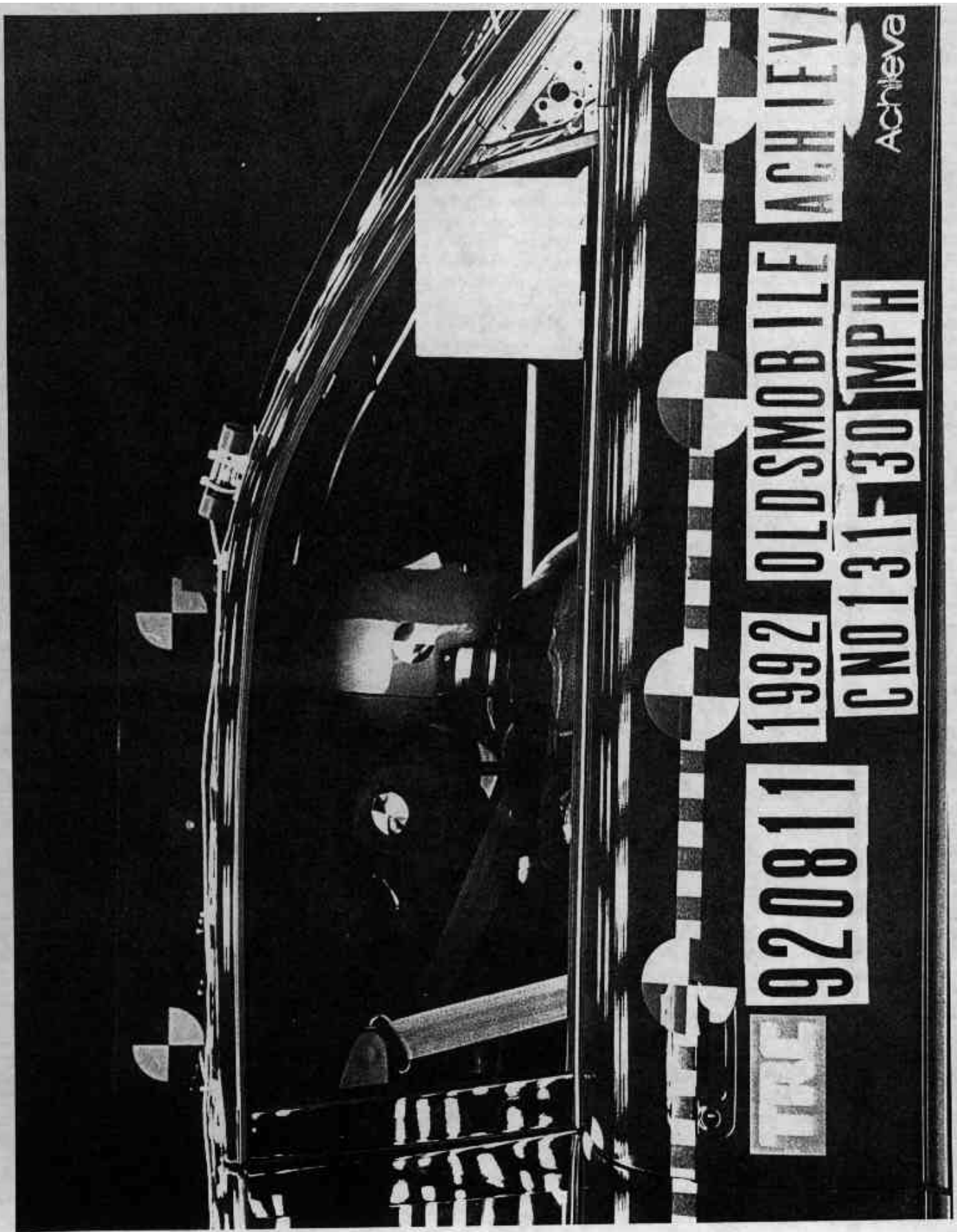


FIGURE A-30. POST-TEST PASSENGER DUMMY POSITION VIEW

A-31

920811

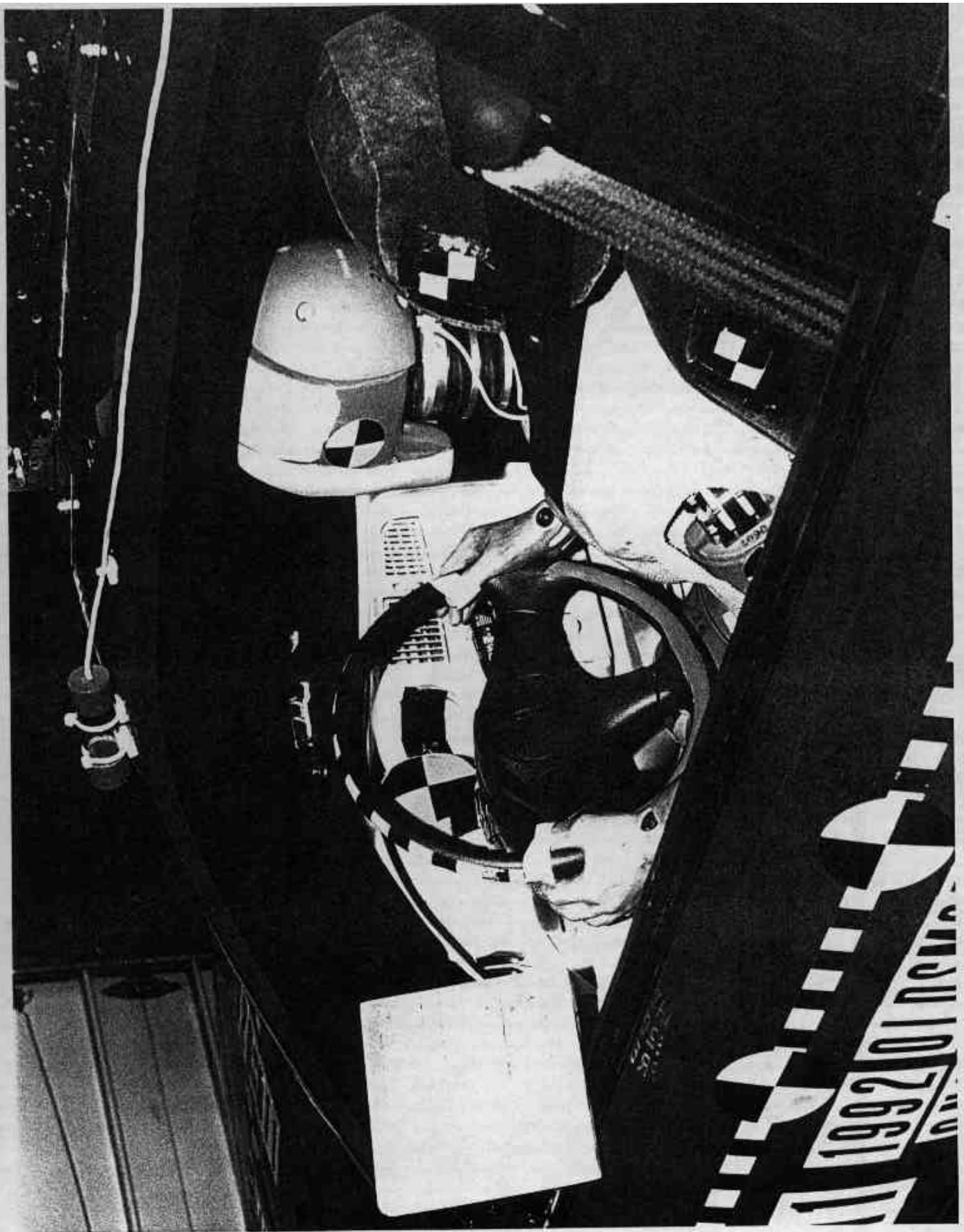


FIGURE A-31. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW

A-32

920811

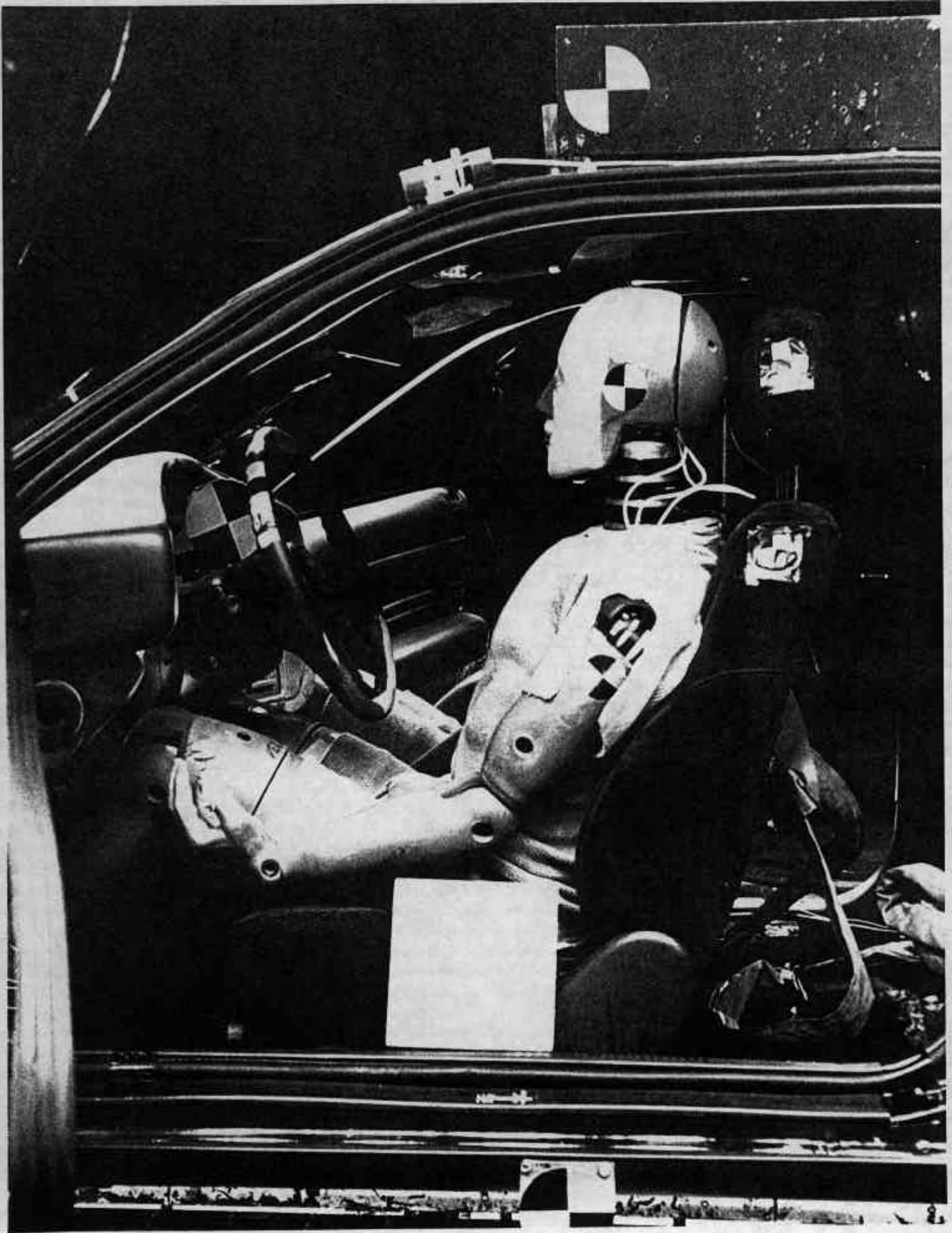


FIGURE A-32. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

A-33

920811

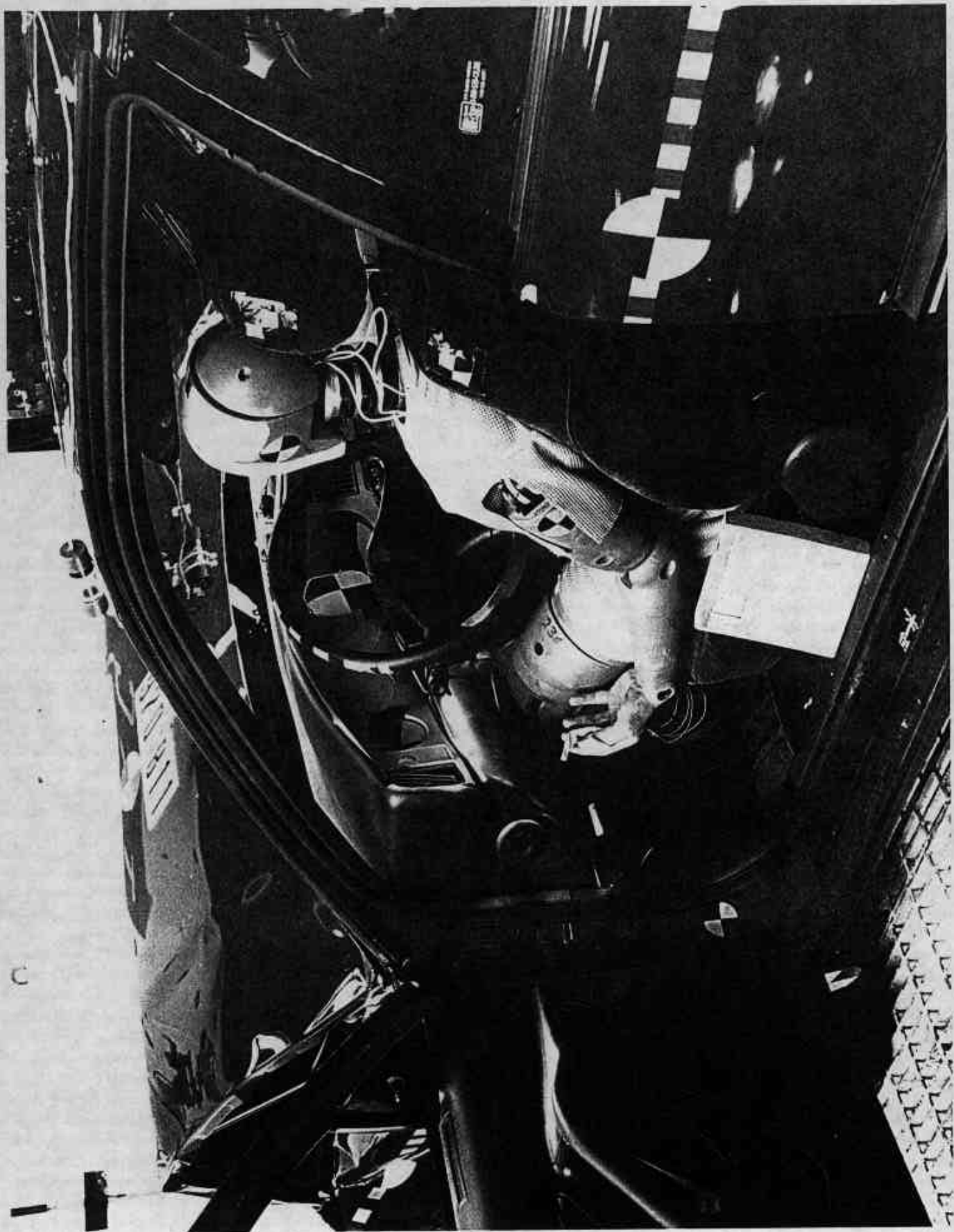


FIGURE A-33. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

A-34

920811

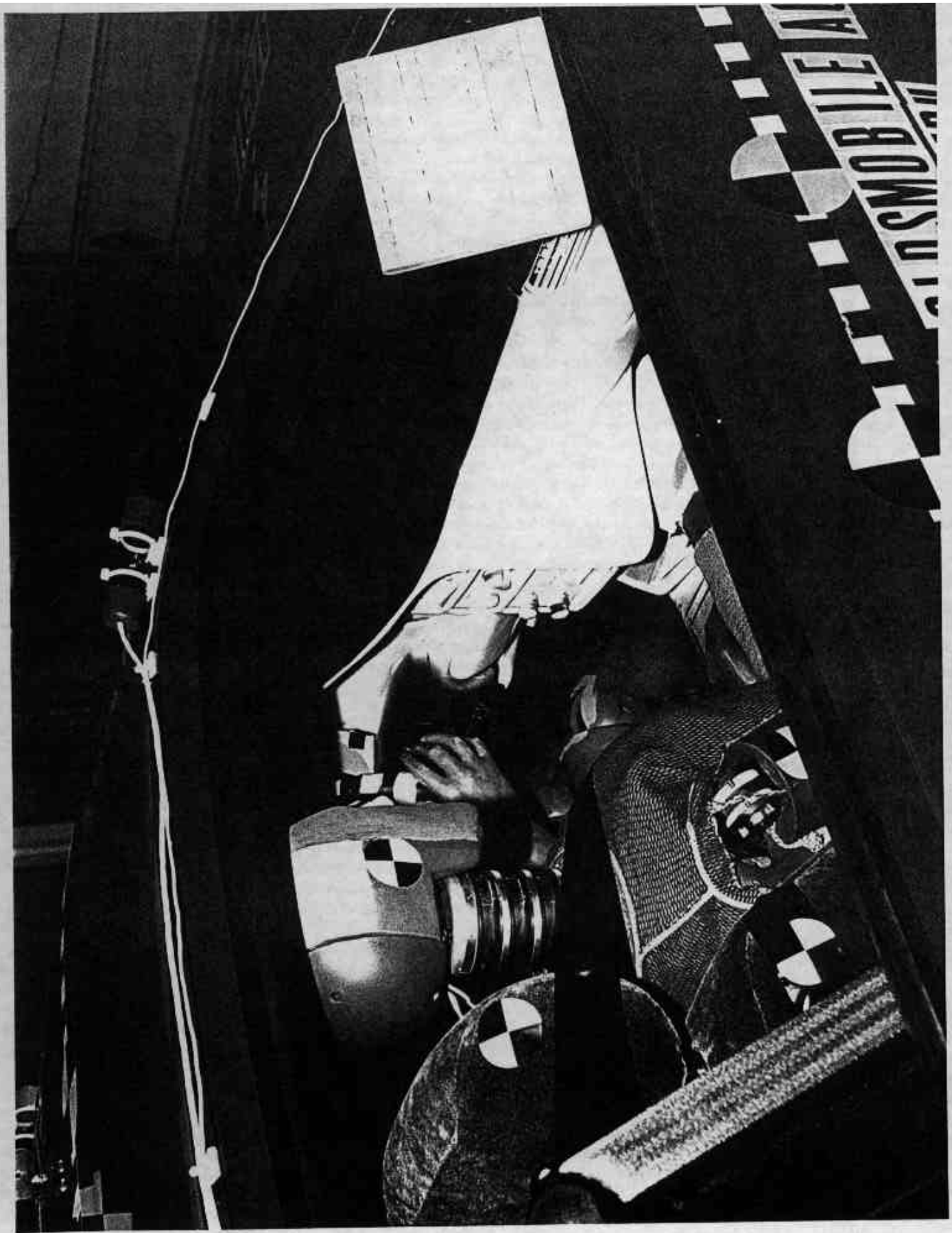


FIGURE A-34. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR VIEW
A-35

920811

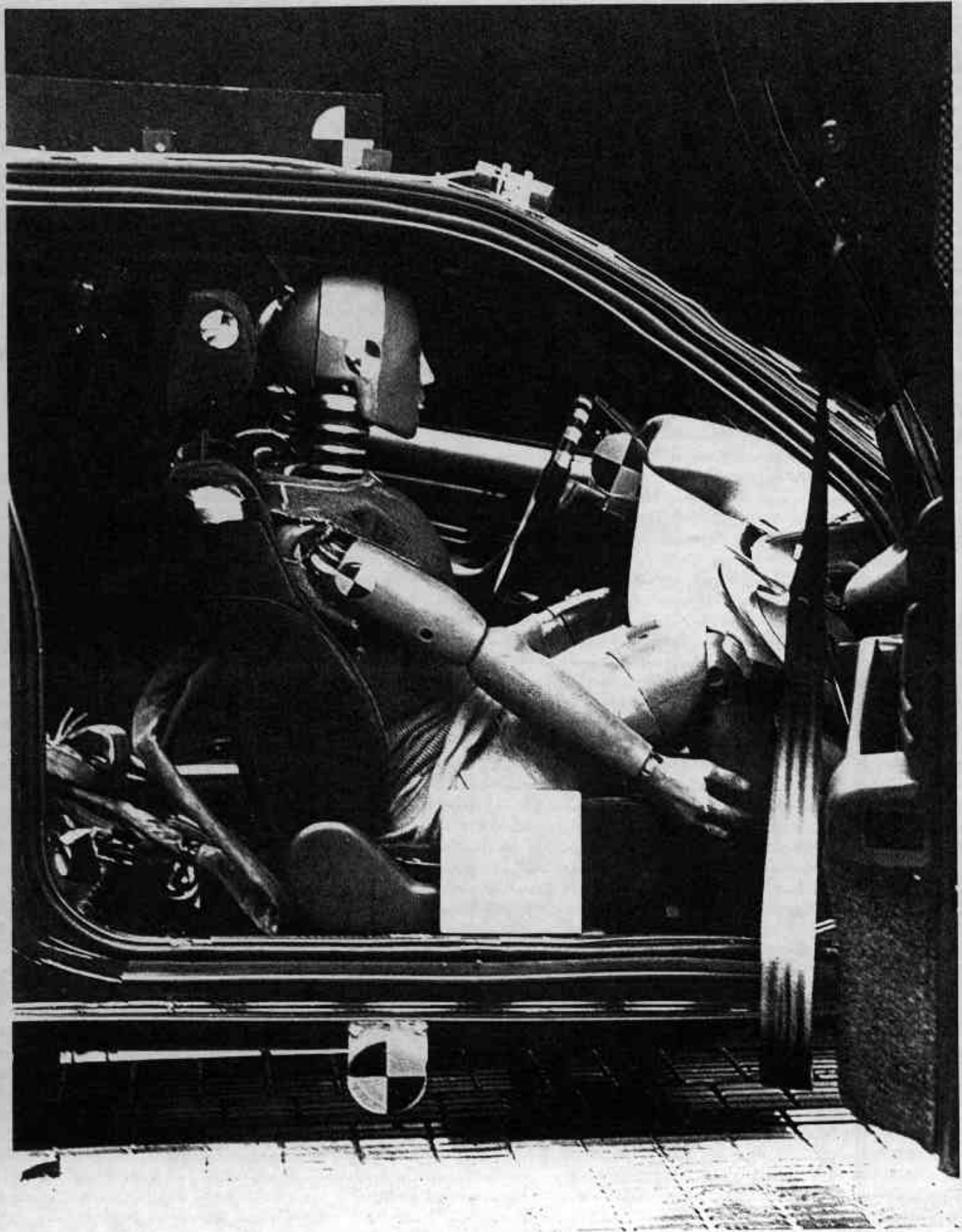


FIGURE A-35. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
A-36 920811

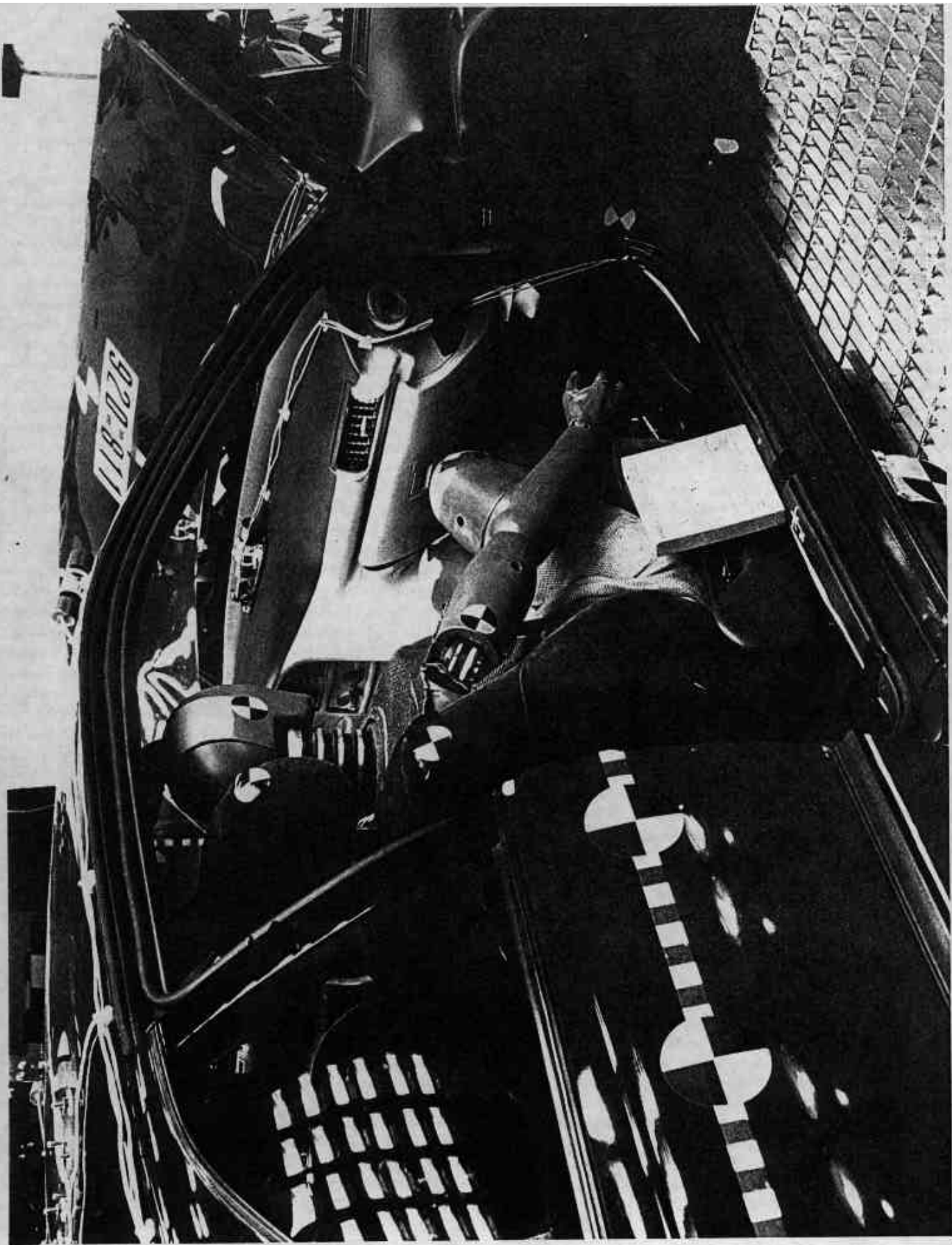


FIGURE A-36. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2
A-37 920811

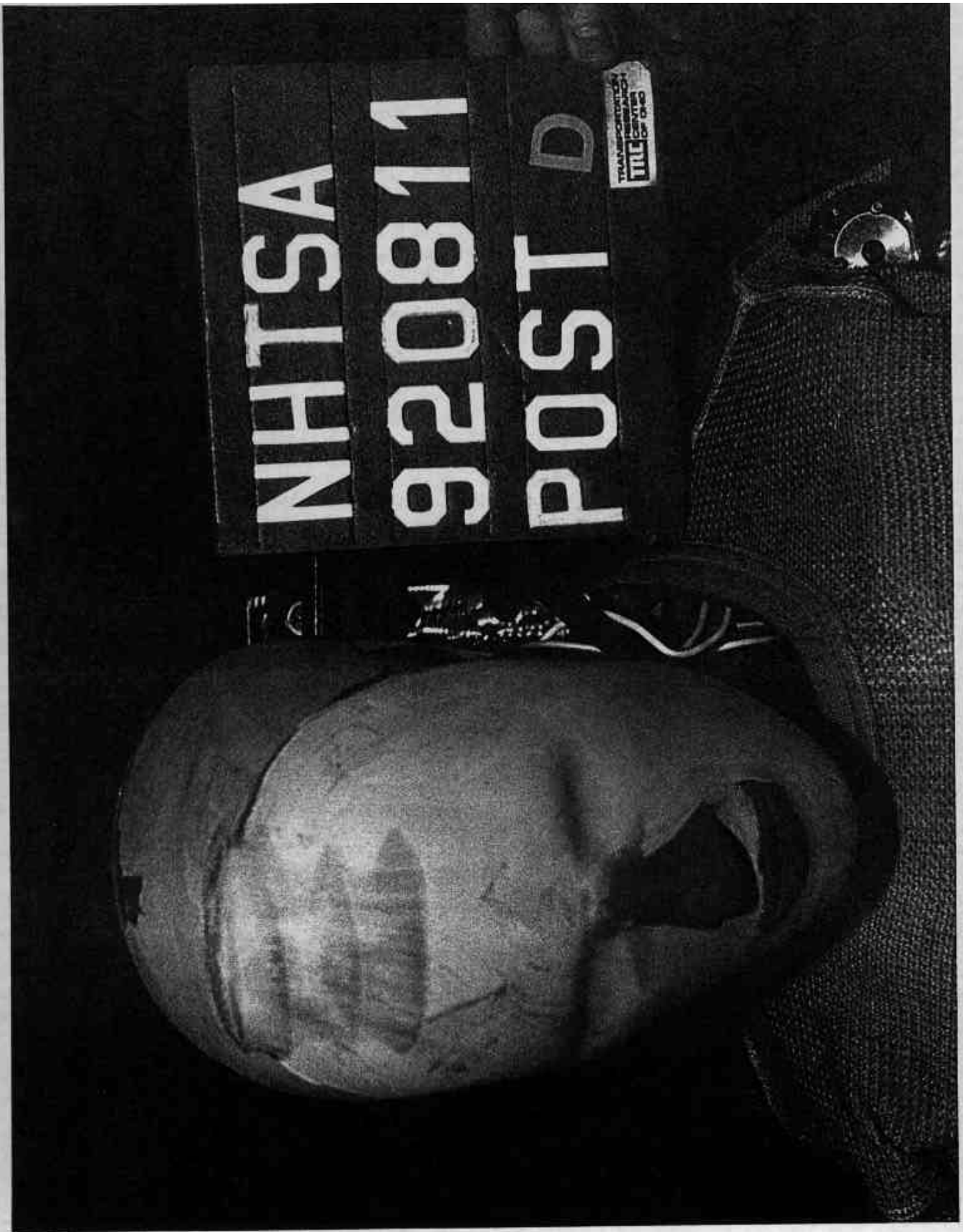


FIGURE A-37. POST-TEST DRIVER DUMMY HEAD CONTACT VIEW

A-38

920811

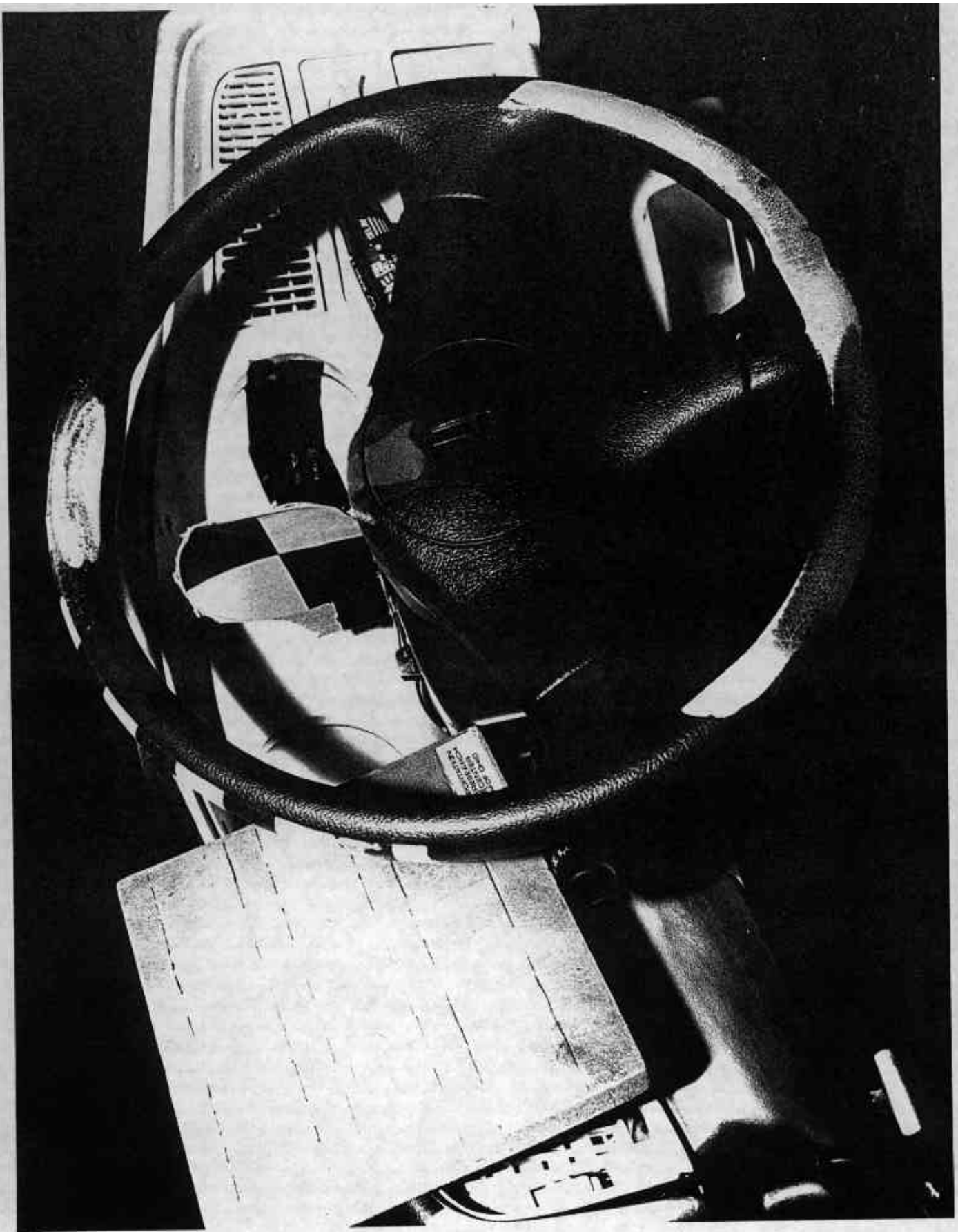


FIGURE A-38. POST-TEST DRIVER DUMMY HEAD & CHEST CONTACT VIEW

A-39

920811

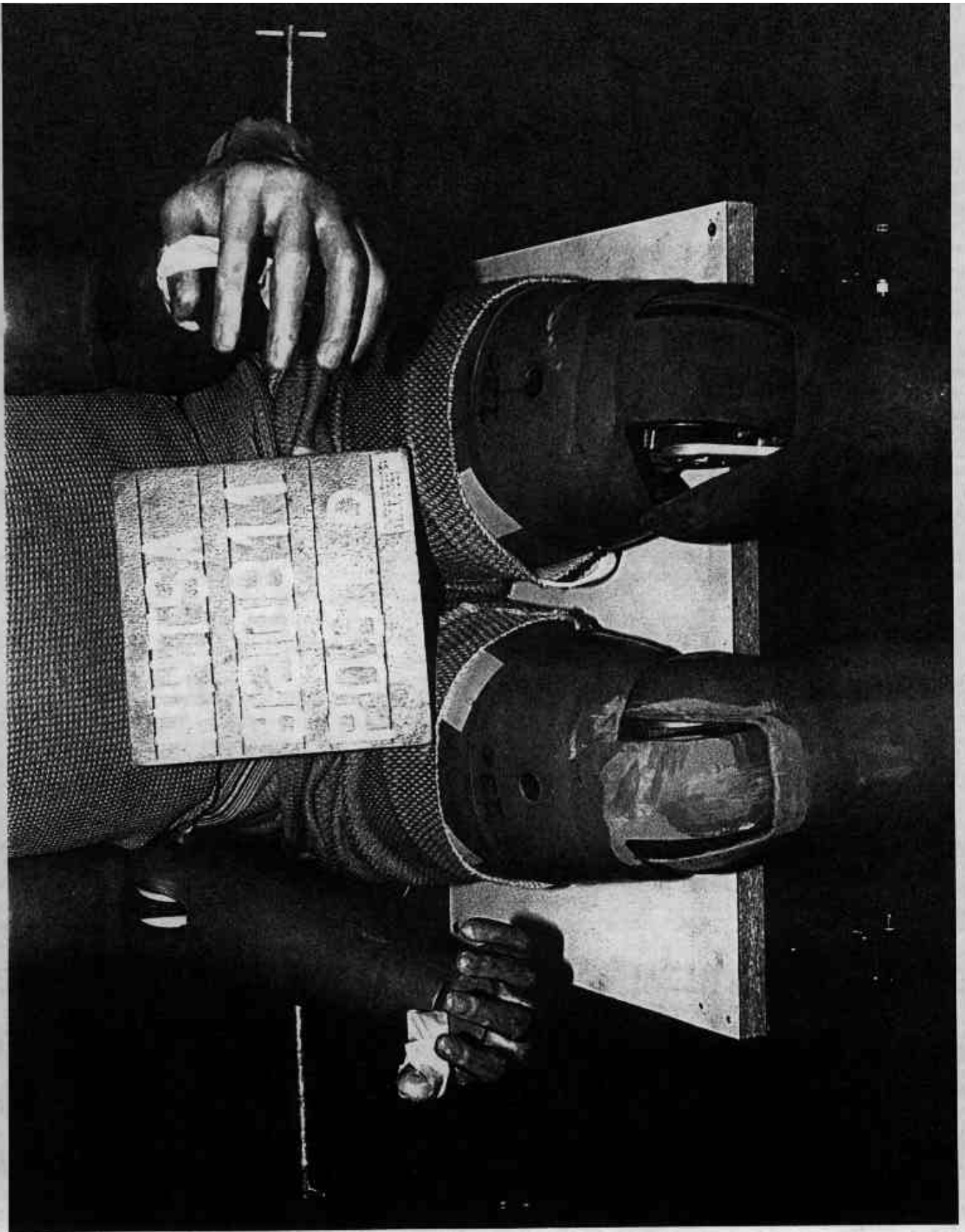


FIGURE A-39. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1

A-40

920811

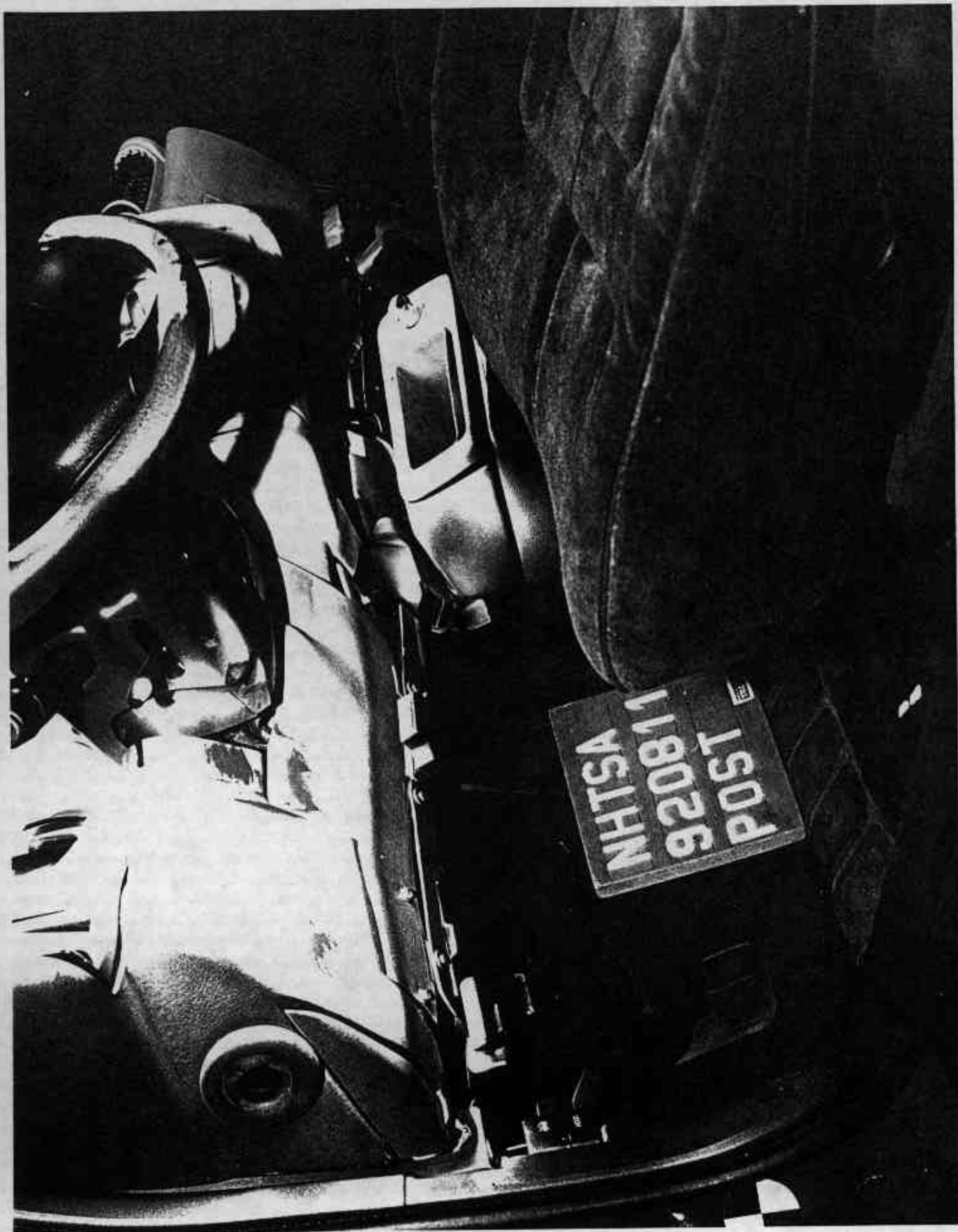


FIGURE A-40. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 2

A-41

920811

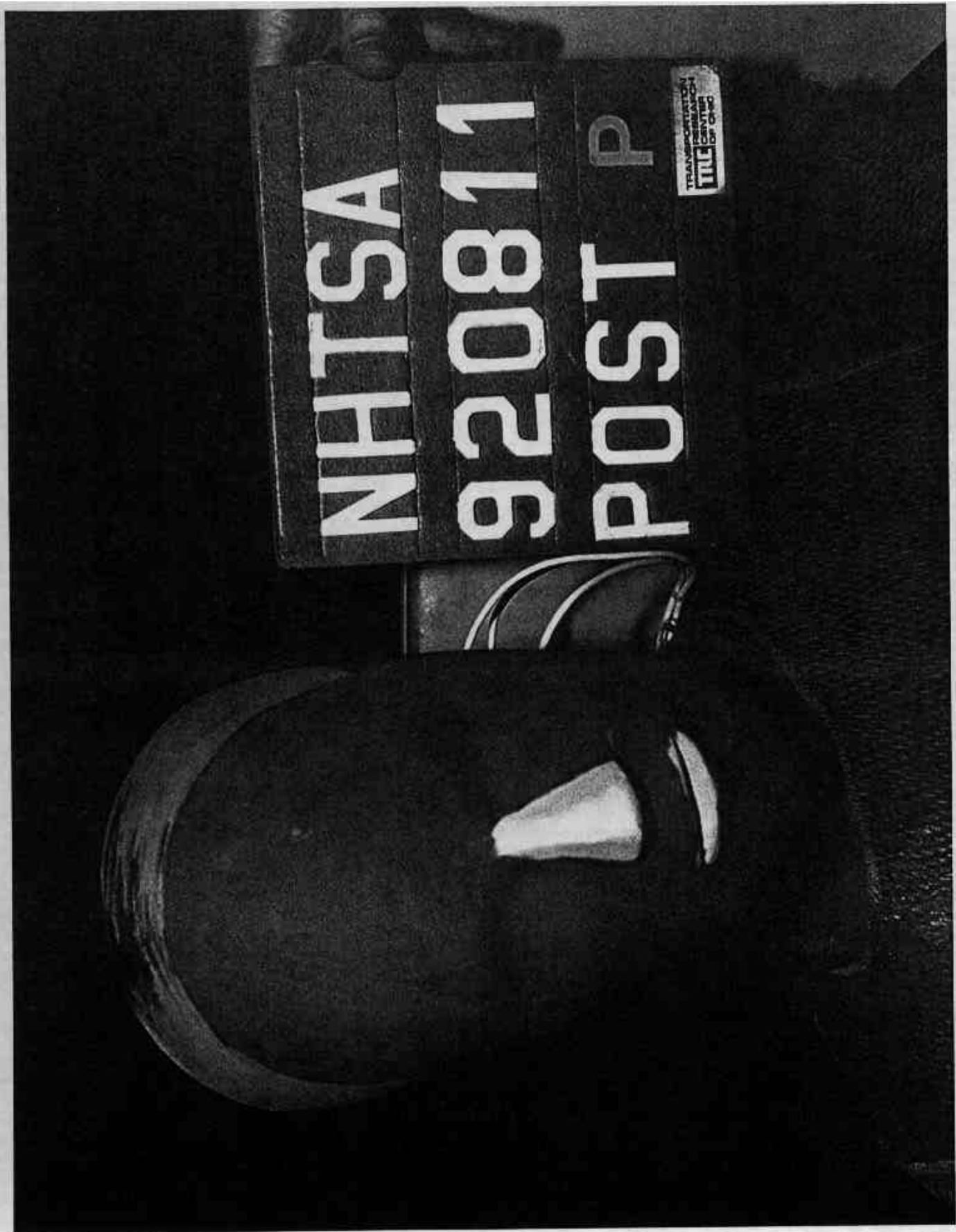


FIGURE A-41. POST-TEST PASSENGER DUMMY HEAD CONTACT VIEW

A-42

920811

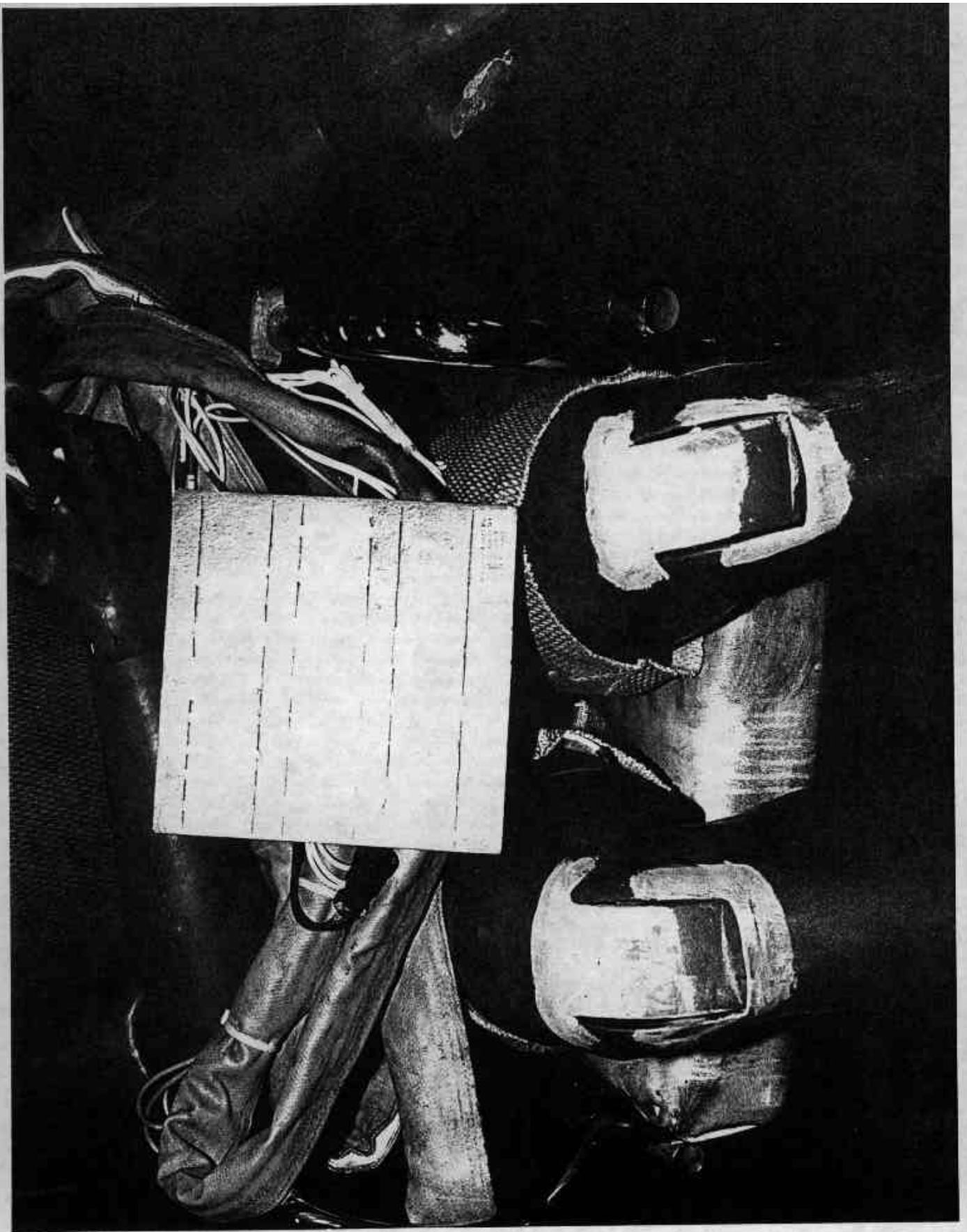


FIGURE A-42. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1

A-43

920811

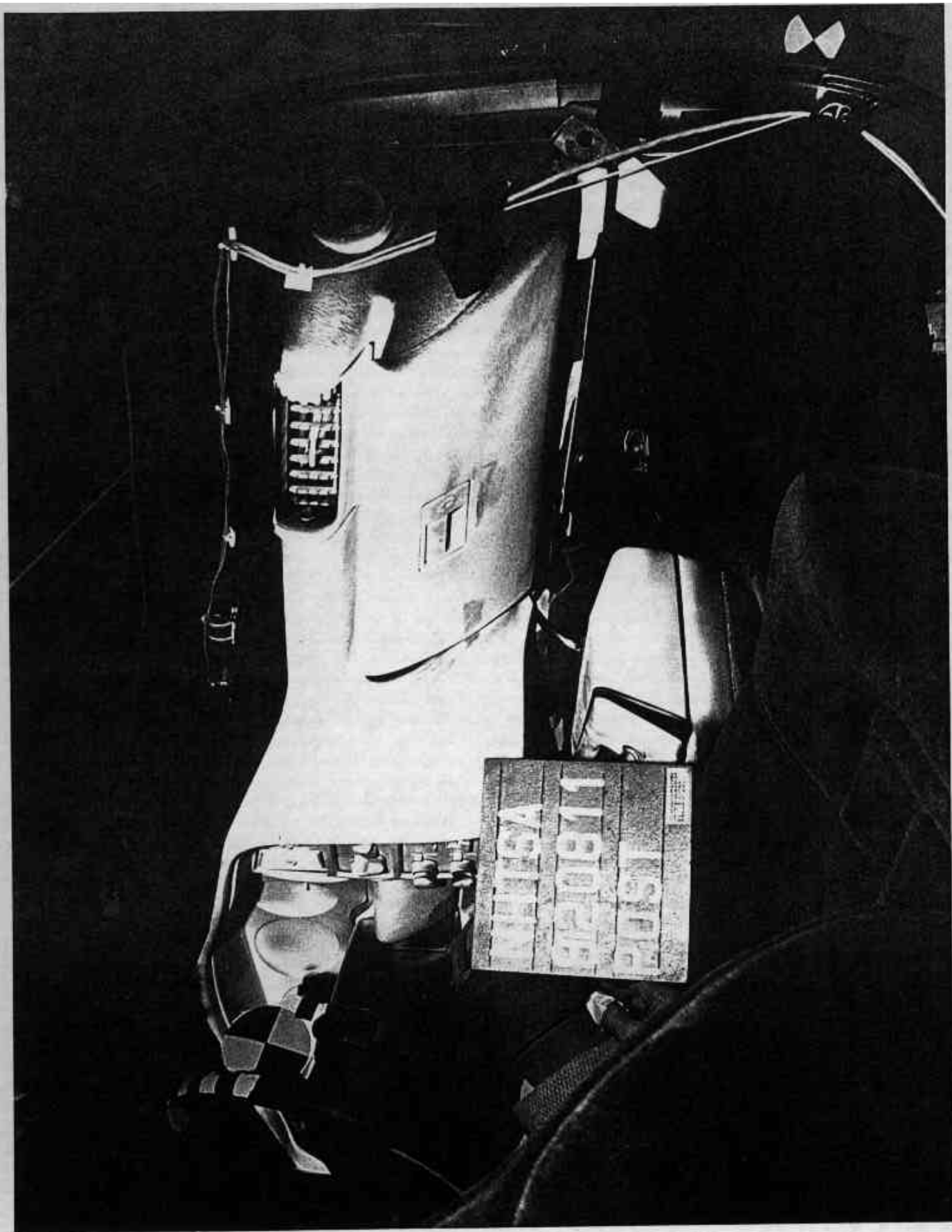






FIGURE A-43. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2

A-44

920811


 MADE BY GENERAL MOTORS CORP.
 DATE GVWR GAWF FRT GAWF RR
 06/97 3720LB 2065LB 1670LB
 1691KG 937KG 754KG
 THIS VEHICLE CONFORMS TO ALL APPLI-
 CABLE U.S. FEDERAL MOTOR VEHICLE
 SAFETY, RUMBLE, AND THEFT PREVENTION
 STANDARDS IN EFFECT ON THE DATE OF
 MANUFACTURE SHOWN ABOVE.
 IC3PL143ENM459127 PASS CAR


10135543-A


 TIRE-LOADING INFORMATION
 OCCUPANTS VEHICLE CAP. WT.
 FRT. CTR. RR. TOTAL LBS KG
 2 0 3 5 882 400
 MAX. LOADING @ GVWR SAME AS VEHICLE
 CAPACITY WEIGHT. NEA COLD TIRE
 MODEL: NL37 SPEED PRESSURE
 TIRE SIZE FTG PSI/KPA
 FRT F1R5/75R14 S 35/240
 RR F1R5/75R14 S 35/240
 SPA T115/70D14 M 60/420
 IF TIRES ARE HOT, ADD 4PSI/28KPA
 SEE OWNER'S MANUAL FOR ADDITIONAL
 INFORMATION.


10135543-B

FIGURE A-44. PRE-TEST VEHICLE CERT. & RECOMMENDED TIRE PRES. LABEL
 A-45 920811

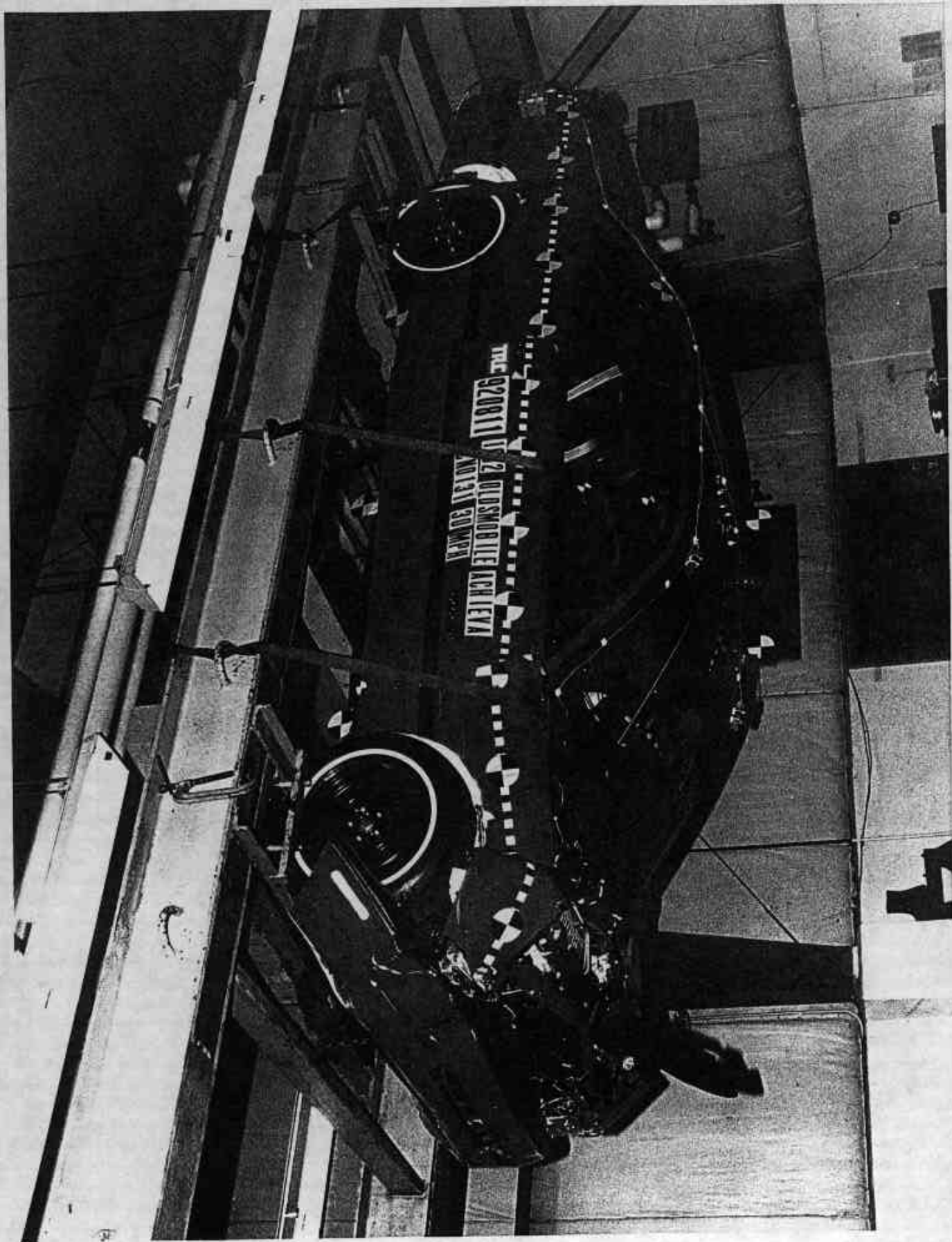


FIGURE A-45. POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW

A-46

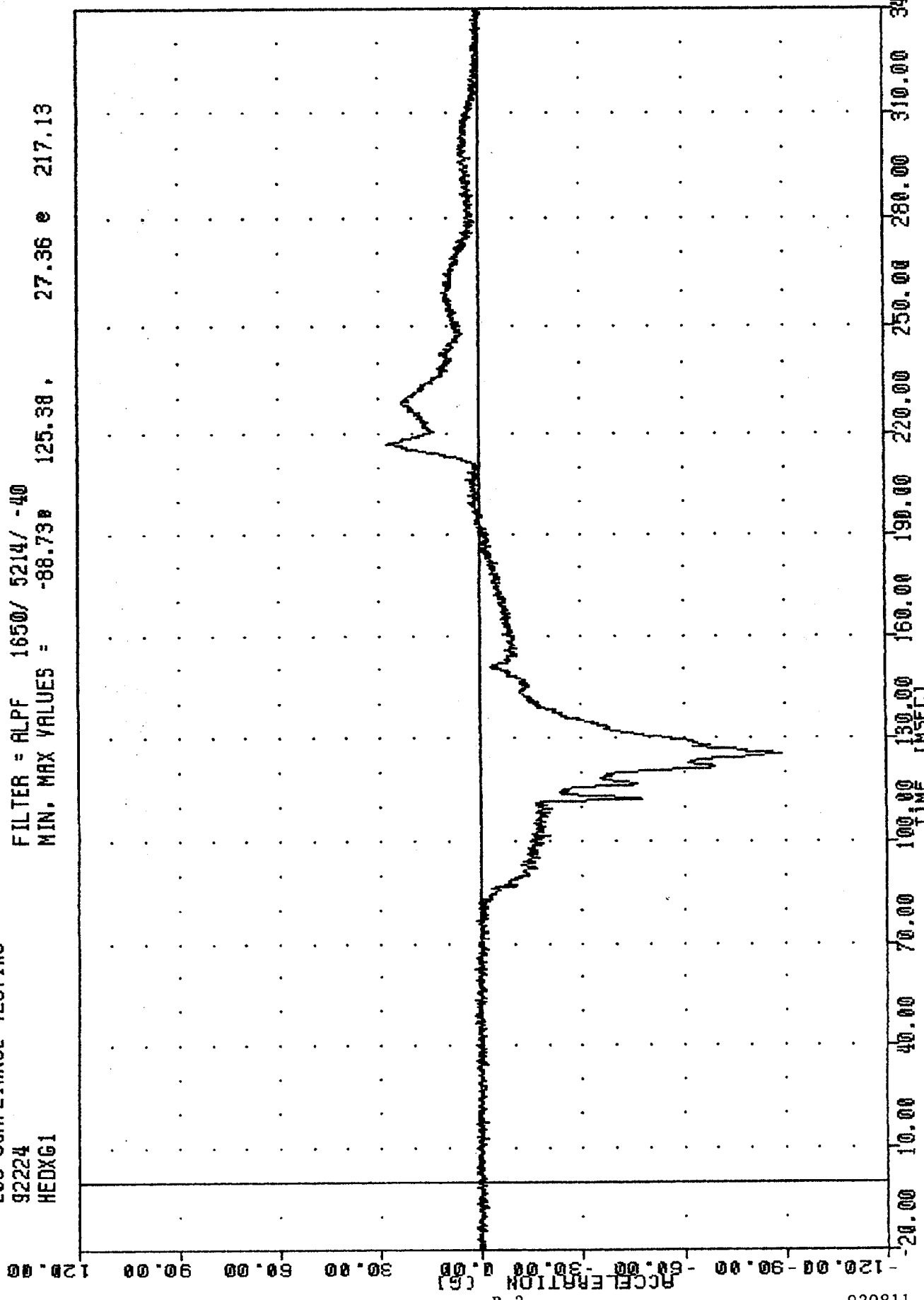
920811

APPENDIX B

DATA PLOTS

INC 920811
208 COMPLIANCE TESTING
92224
HEDXG1

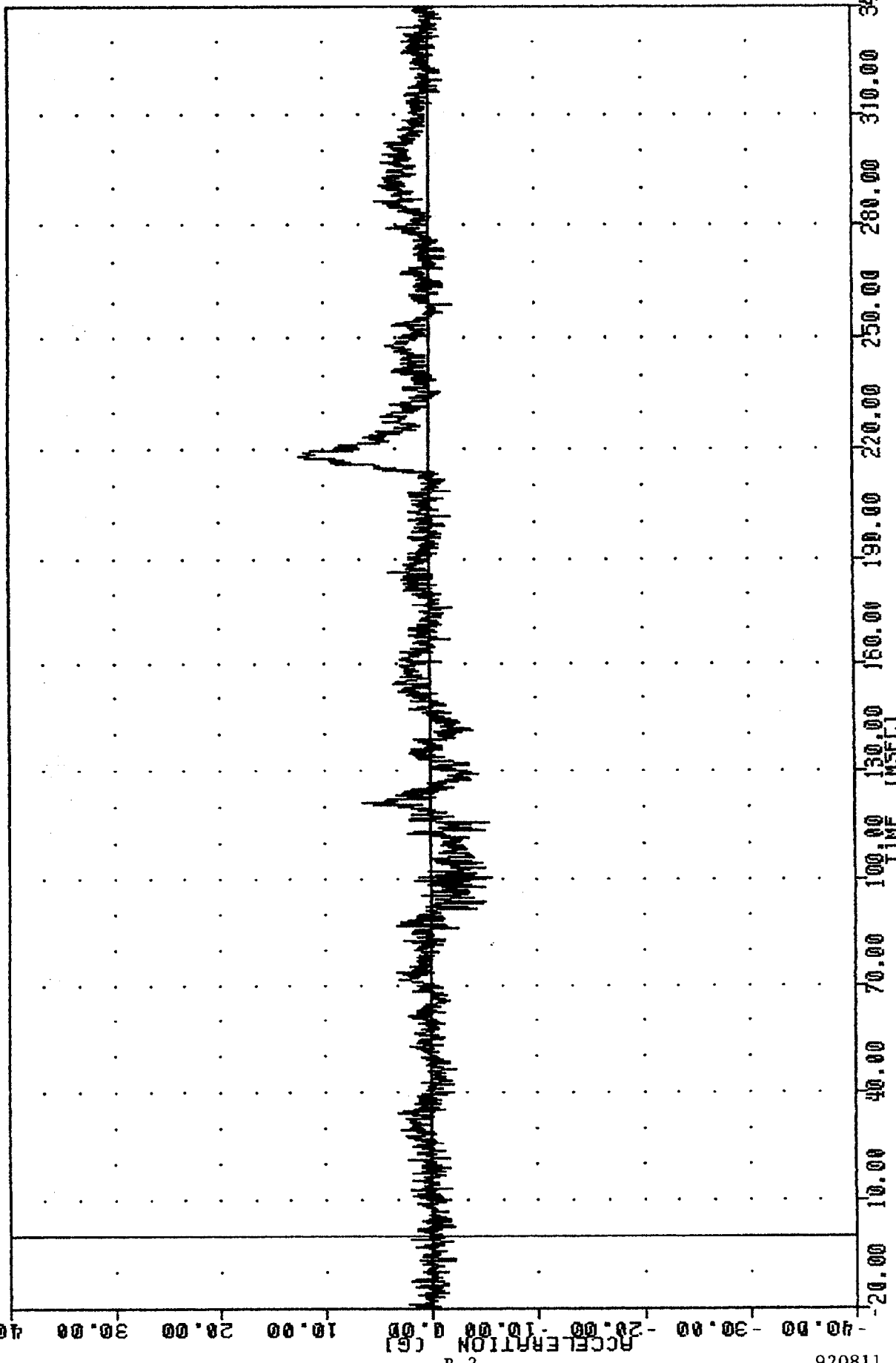
FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -88.738 125.38 27.36 e 217.13



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
DRIVER HEAD X-AXIS ACCELERATION

TMC 920811
208 COMPLIANCE TESTING
92224
HEDYG1

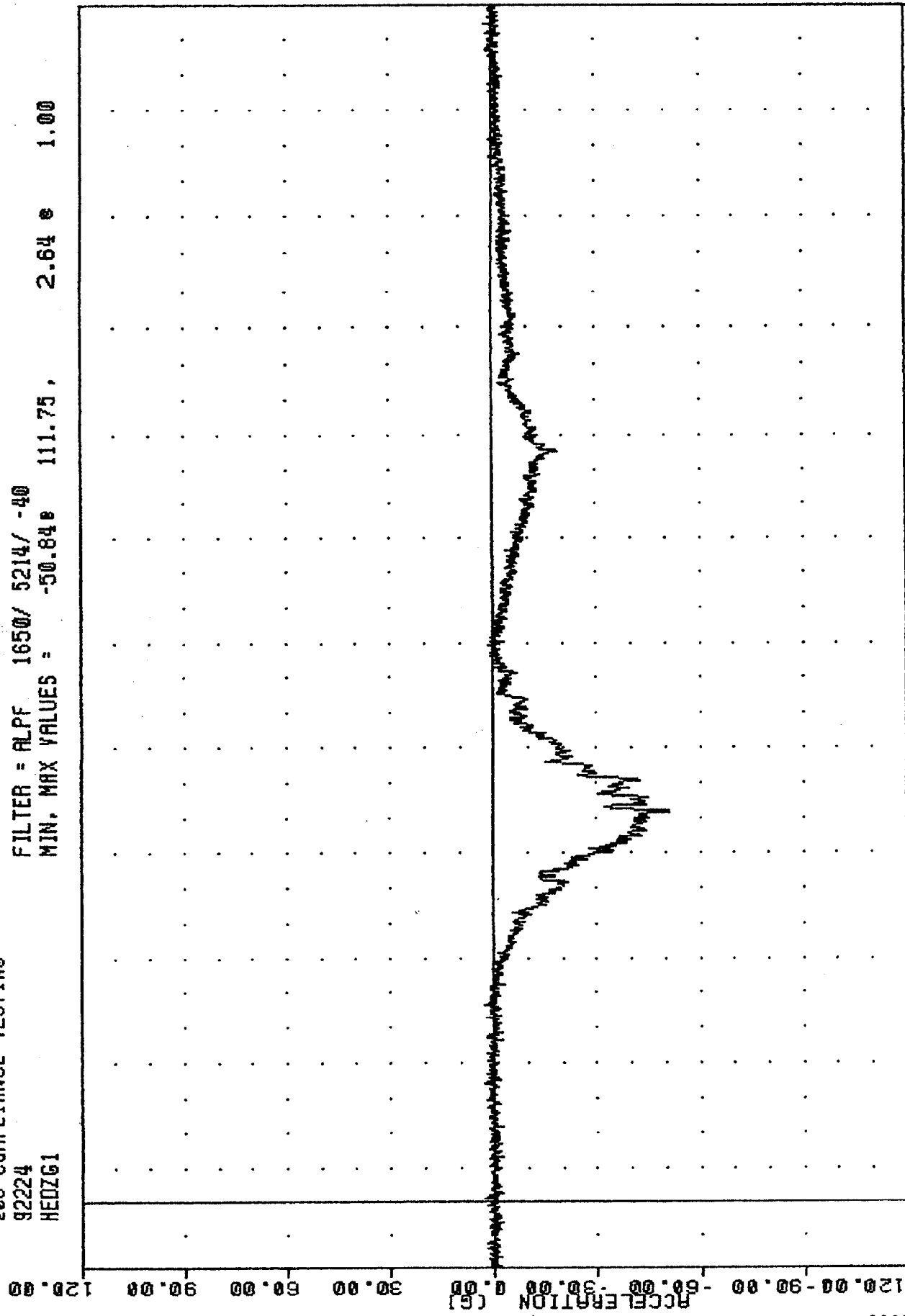
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -5.72# 100.63, 12.31 @ 217.75



1992 OLDSMOBILE ACHEVA INTO FLAT FRONTAL BARRIER
DRIVER HEAD Y-AXIS ACCELERATION

INC 920811
208 COMPLIANCE TESTING
92224
HEDZG1

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -50.84g 111.75, 2.64g 1.00

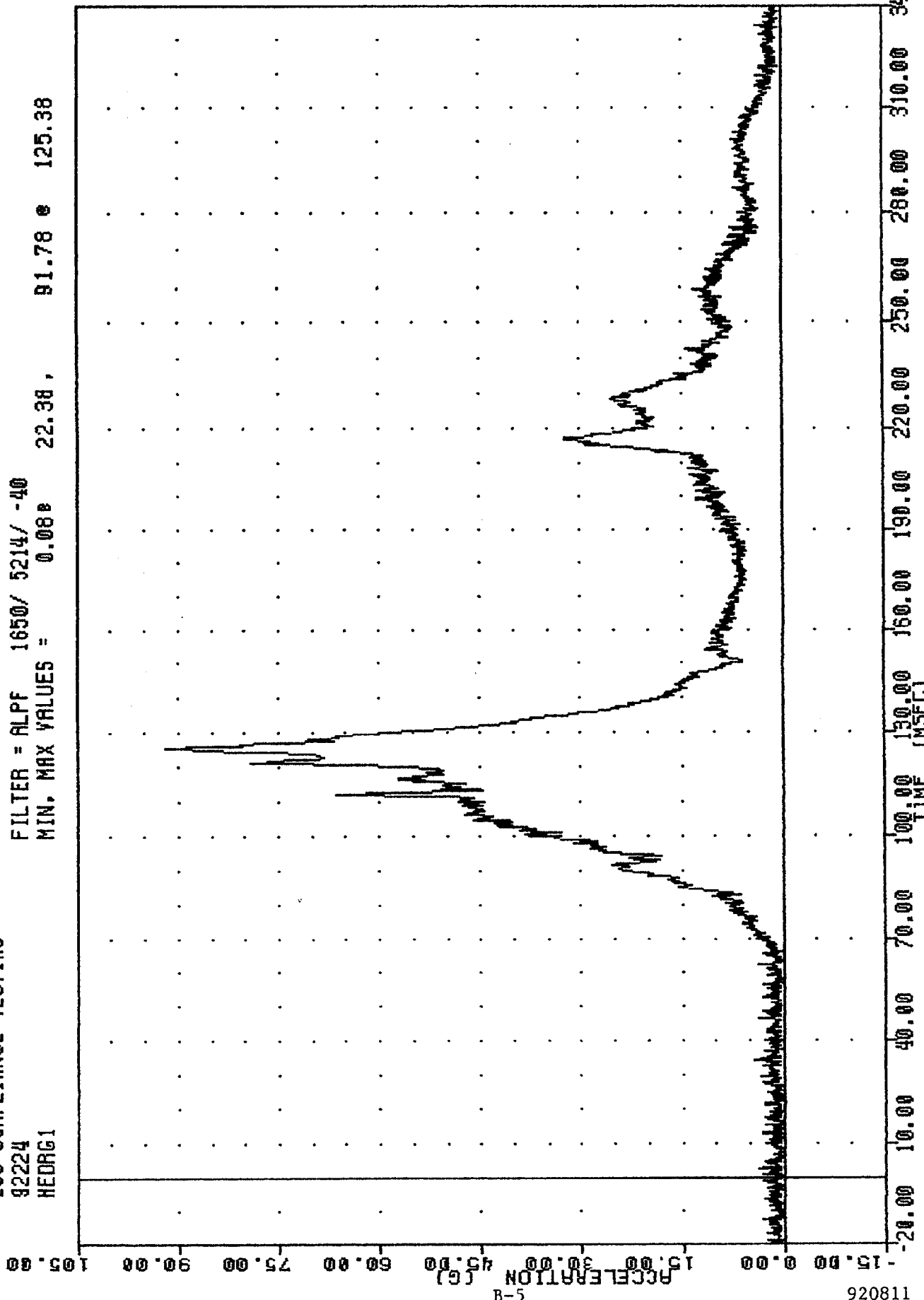


20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
DRIVER HEAD Z-AXIS ACCELERATION

INC 920811
208 COMPLIANCE TESTING
92224
HEDRG1

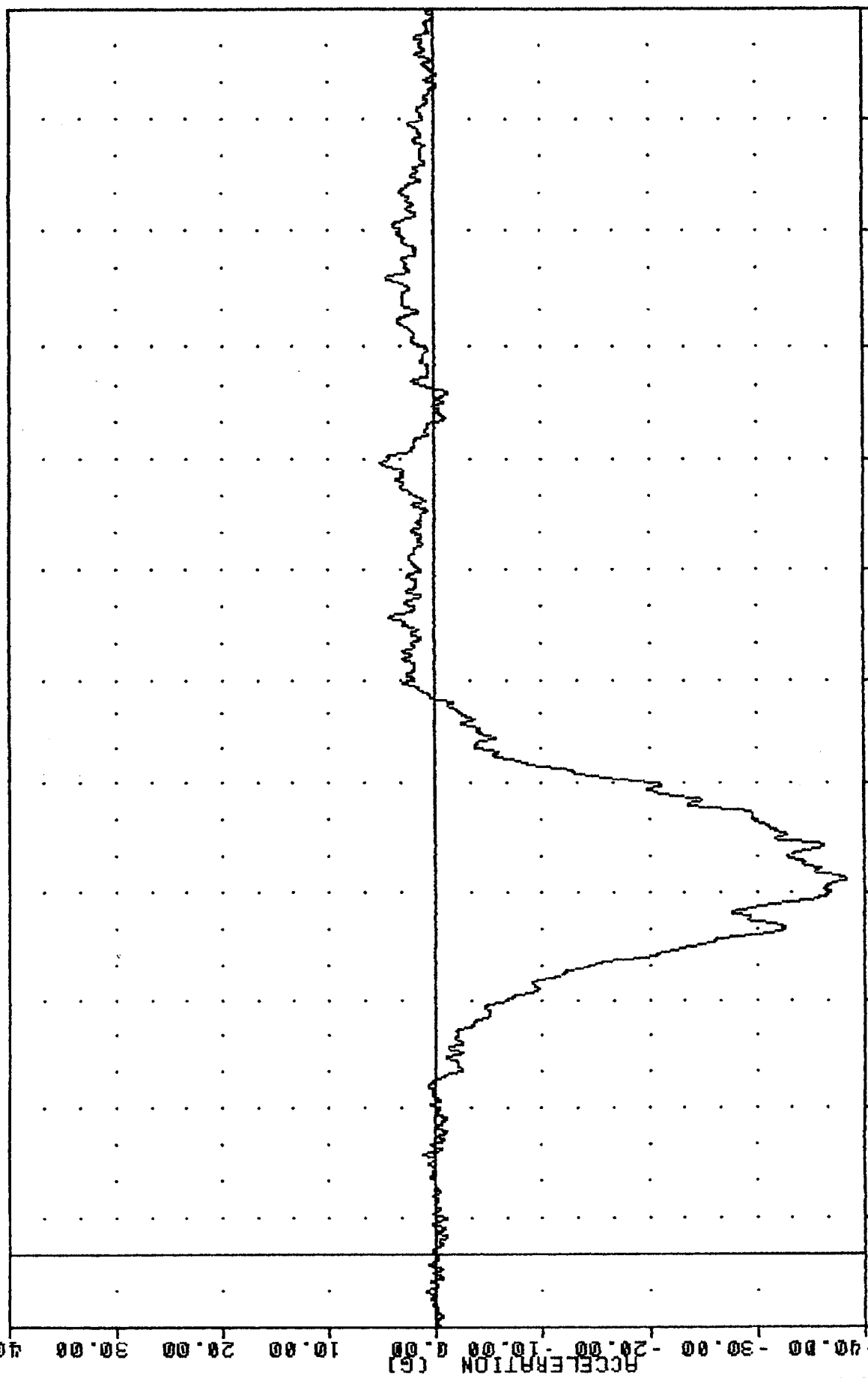
FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = 0.08e 22.38, 91.78 e 125.38



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

INC 920811
208 COMPLIANCE TESTING
92224
CSTXG1

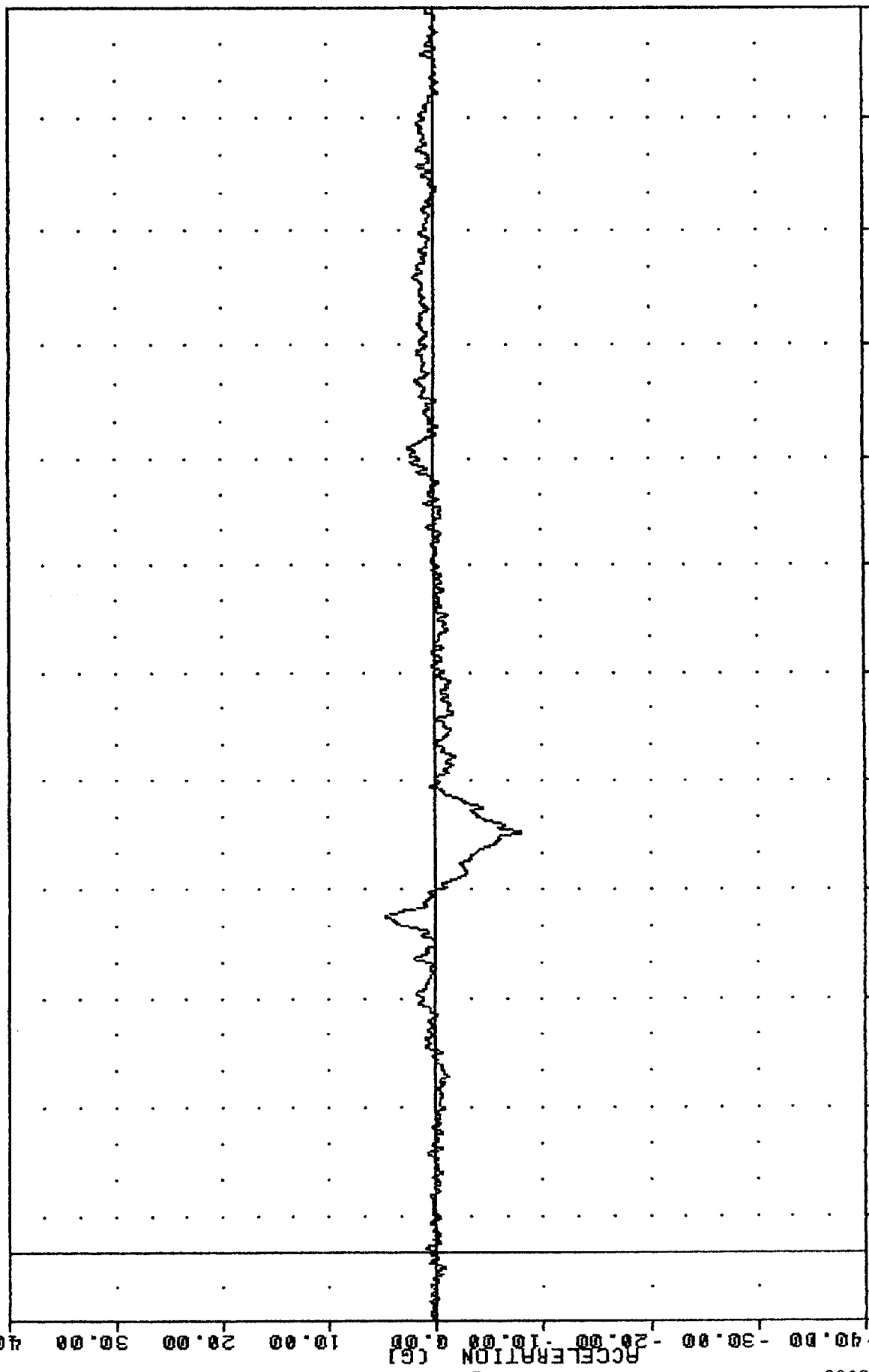
FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -38.36e 103.63, 5.04 e 218.88



920811
1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
DRIVER CHEST X-AXIS ACCELERATION

TMC
920811
200 COMPLIANCE TESTING
92224
CSTY61

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -7.94 115.63 4.79 e 92.38

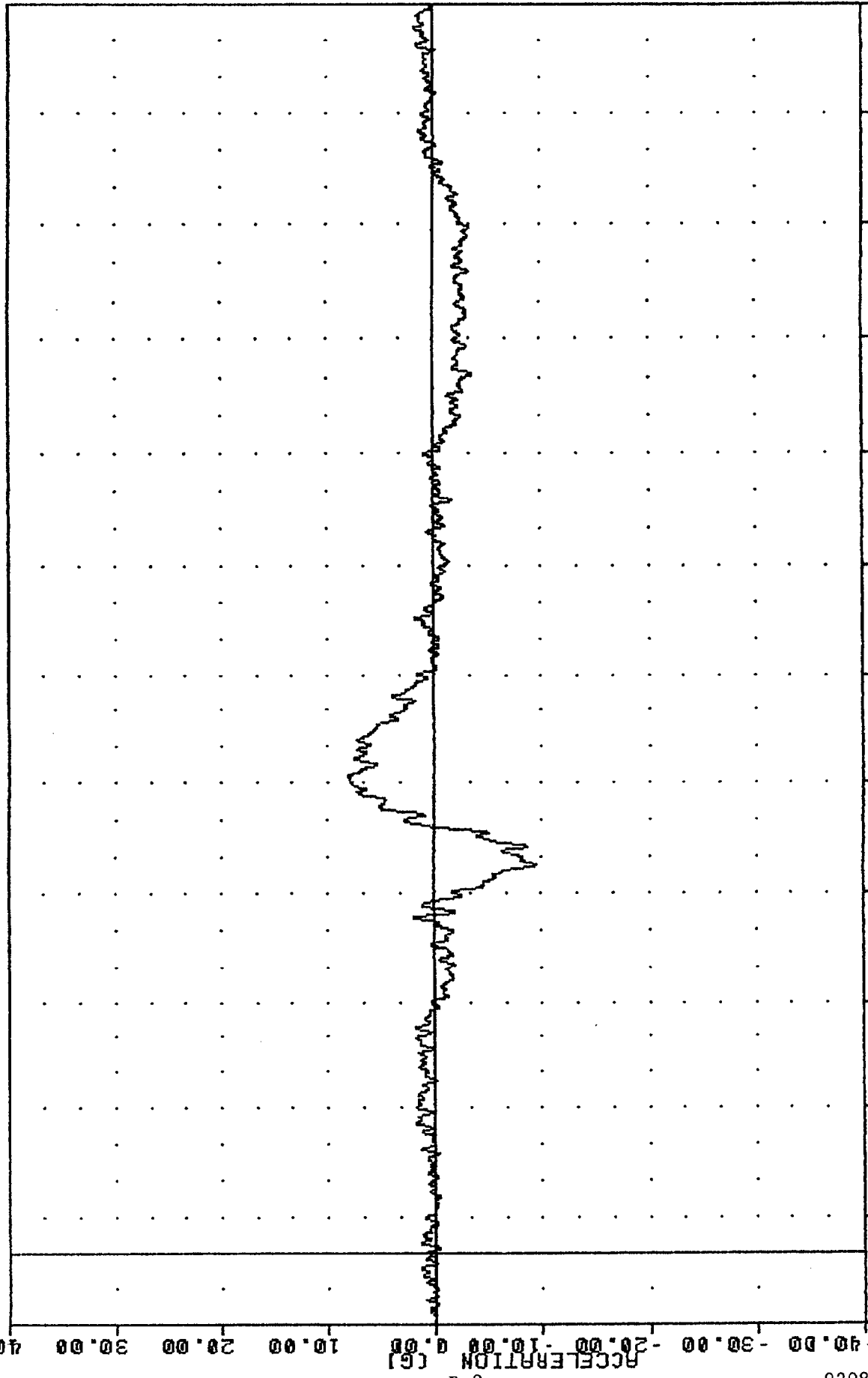


-40.00
-30.00
-20.00
-10.00
0.00
10.00
20.00
30.00
40.00
-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
DRIVER CHEST Y-AXIS ACCELERATION

INC 920811
200 COMPLIANCE TESTING
92224
CSTZG1

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES : -9.41e 107.75, 8.02 e 131.88



920811

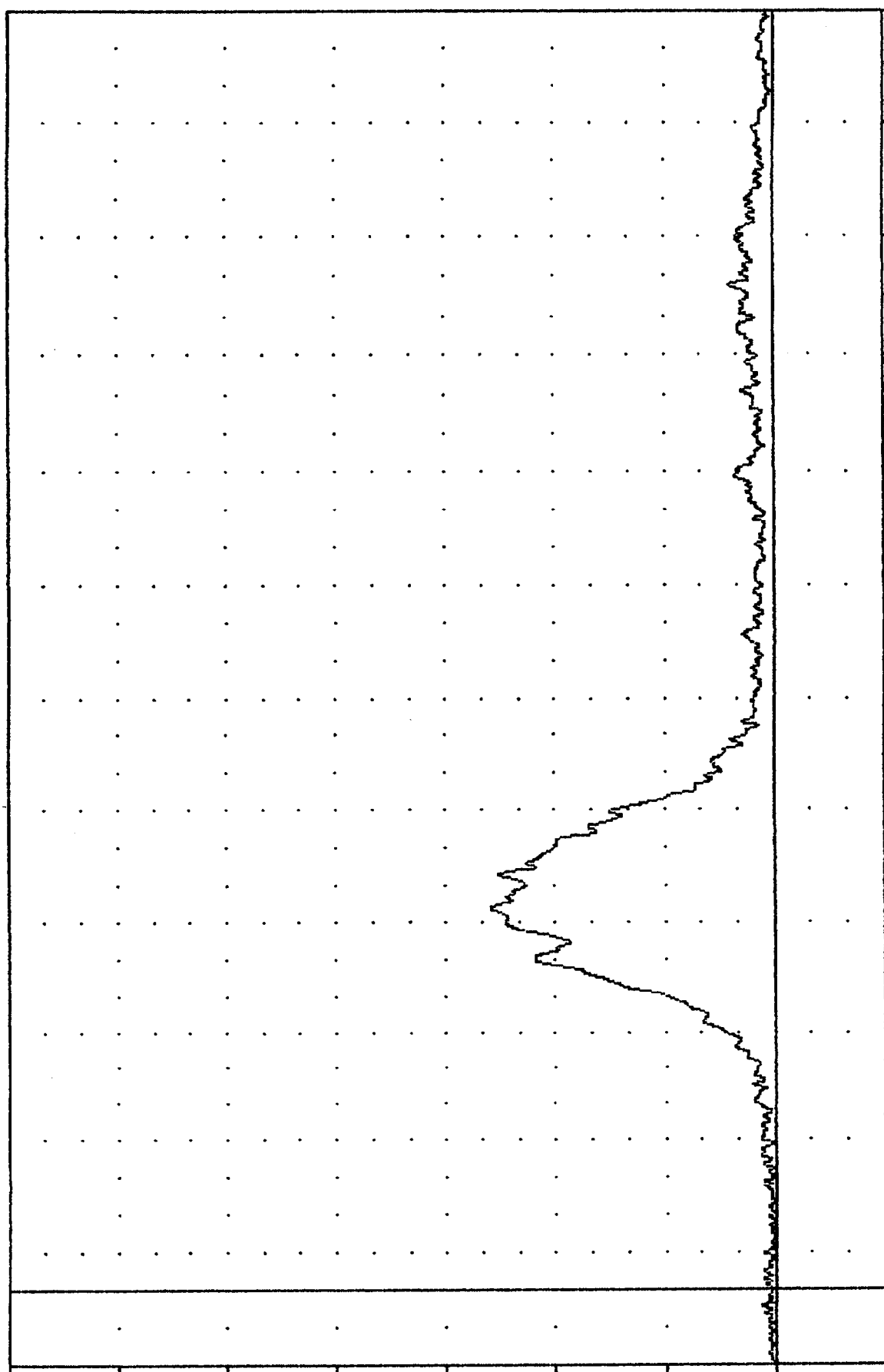
B-8

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
DRIVER CHEST Z-AXIS ACCELERATION

INC 920811
 208 COMPLIANCE TESTING
 92224
 CSTRG1

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = 0.07 e -20.00 , 38.79 e 103.63

105.00
 90.00
 75.00
 60.00
 45.00
 30.00
 15.00
 0.00
 -15.00



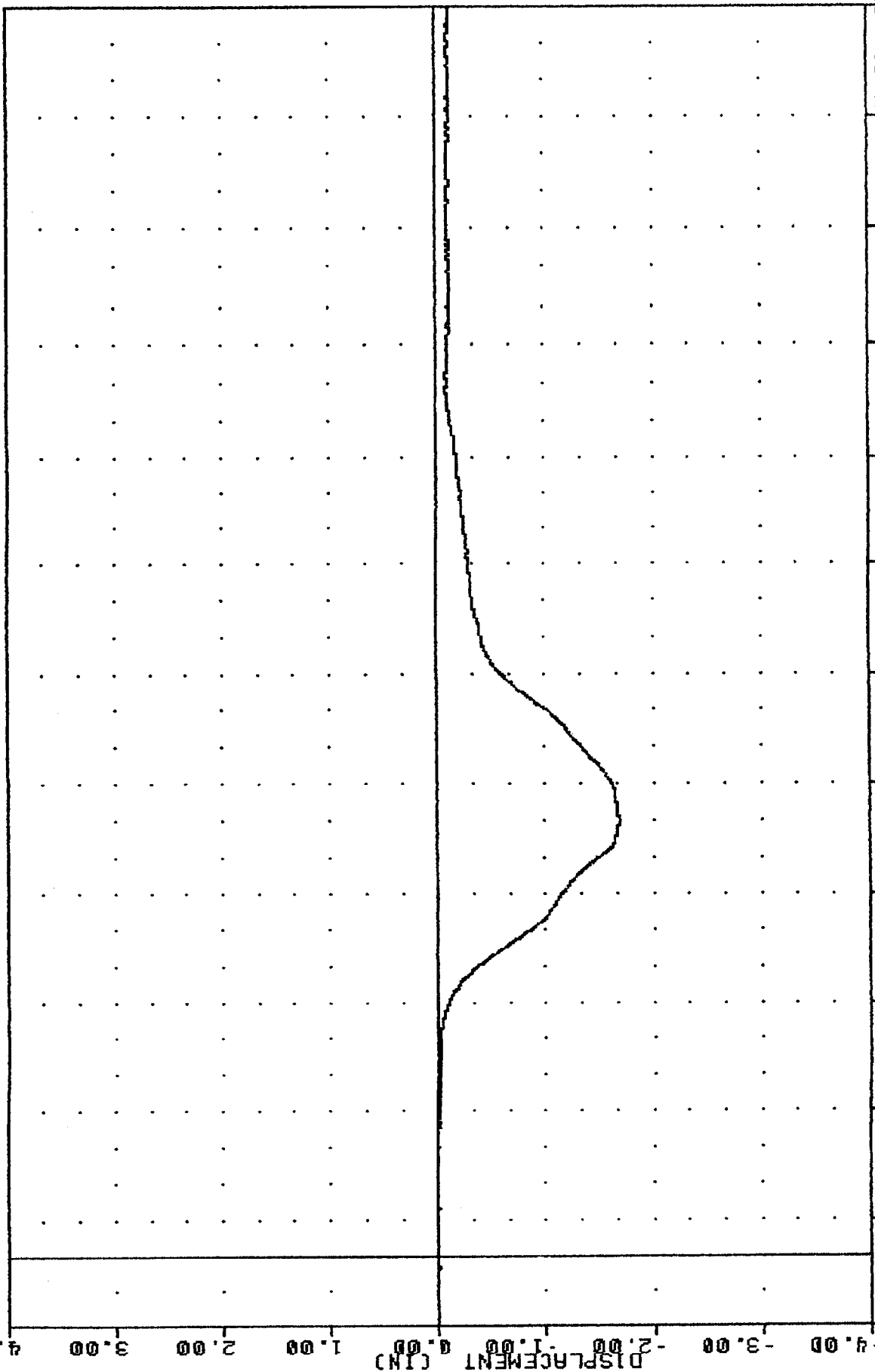
920811

B-9

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
 DRIVER CHEST RESULTANT ACCELERATION

920811
208 COMPLIANCE TESTING
92224
CSTXD1

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -1.698 119.50 0.01 31.75



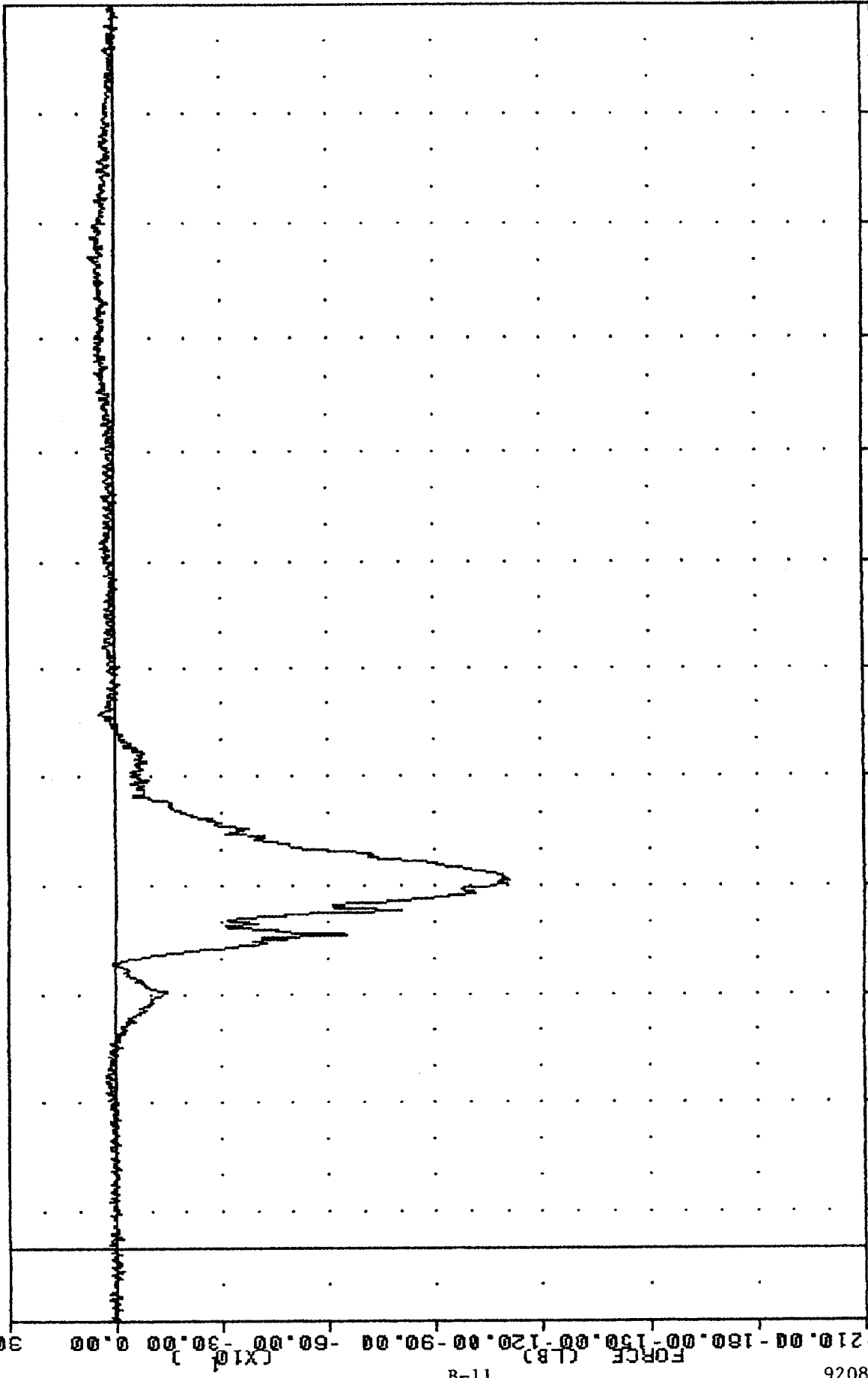
920811

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
DRIVER CHEST DEFLECTION

INC
92224
LFMF1

200 COMPLIANCE TESTING

FILTER = BLPP 1000/ 2500/ -16
MIN. MAX VALUES = -1106.24e 101.75. 66.46 e 270.75



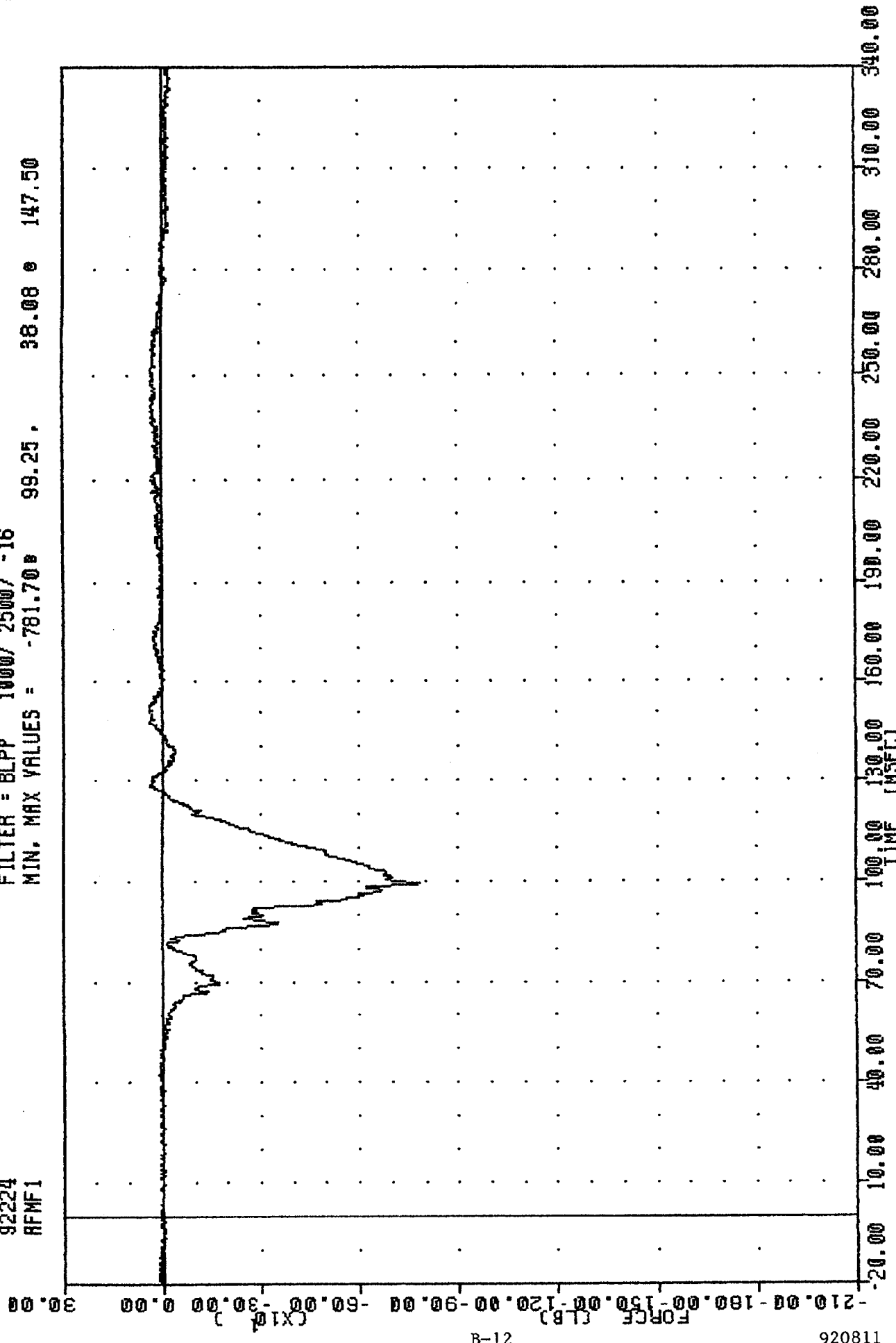
920811

B-11

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
DRIVER LEFT FEMUR FORCE

920811
208 COMPLIANCE TESTING
92224
AFMF1

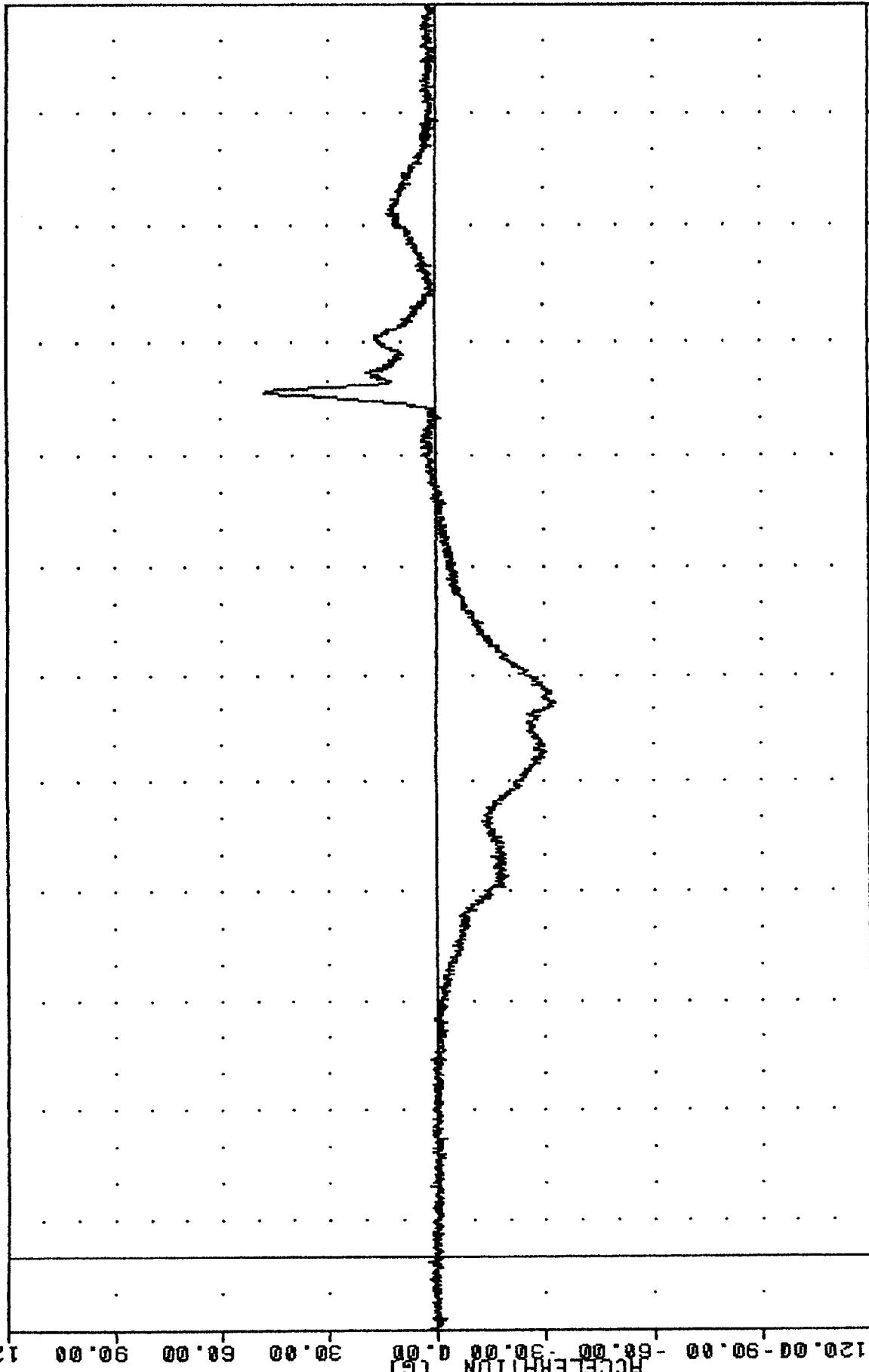
FILTER = BLPP 1000/ 2500/ -16
MIN. MAX VALUES = -781.70 99.25 38.08 147.50



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
DRIVER RIGHT FEMUR FORCE

920811
208 COMPLIANCE TESTING
92224
HEDXG2

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -32.62g 151.88g 48.13 e 237.25

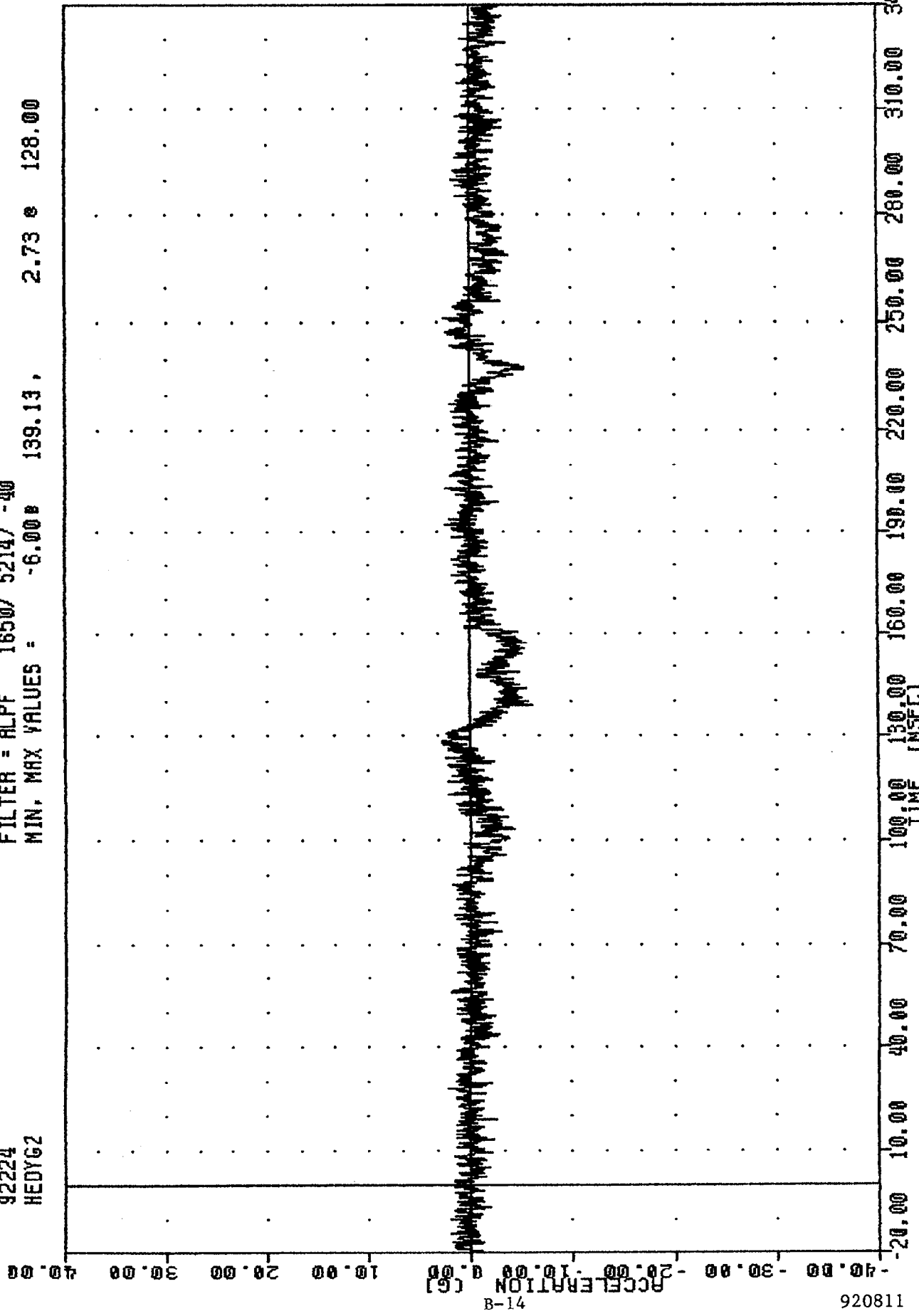


-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION

920811
208 COMPLIANCE TESTING
92224
HEDYG2

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -6.00E 139.13, 2.73E 128.00



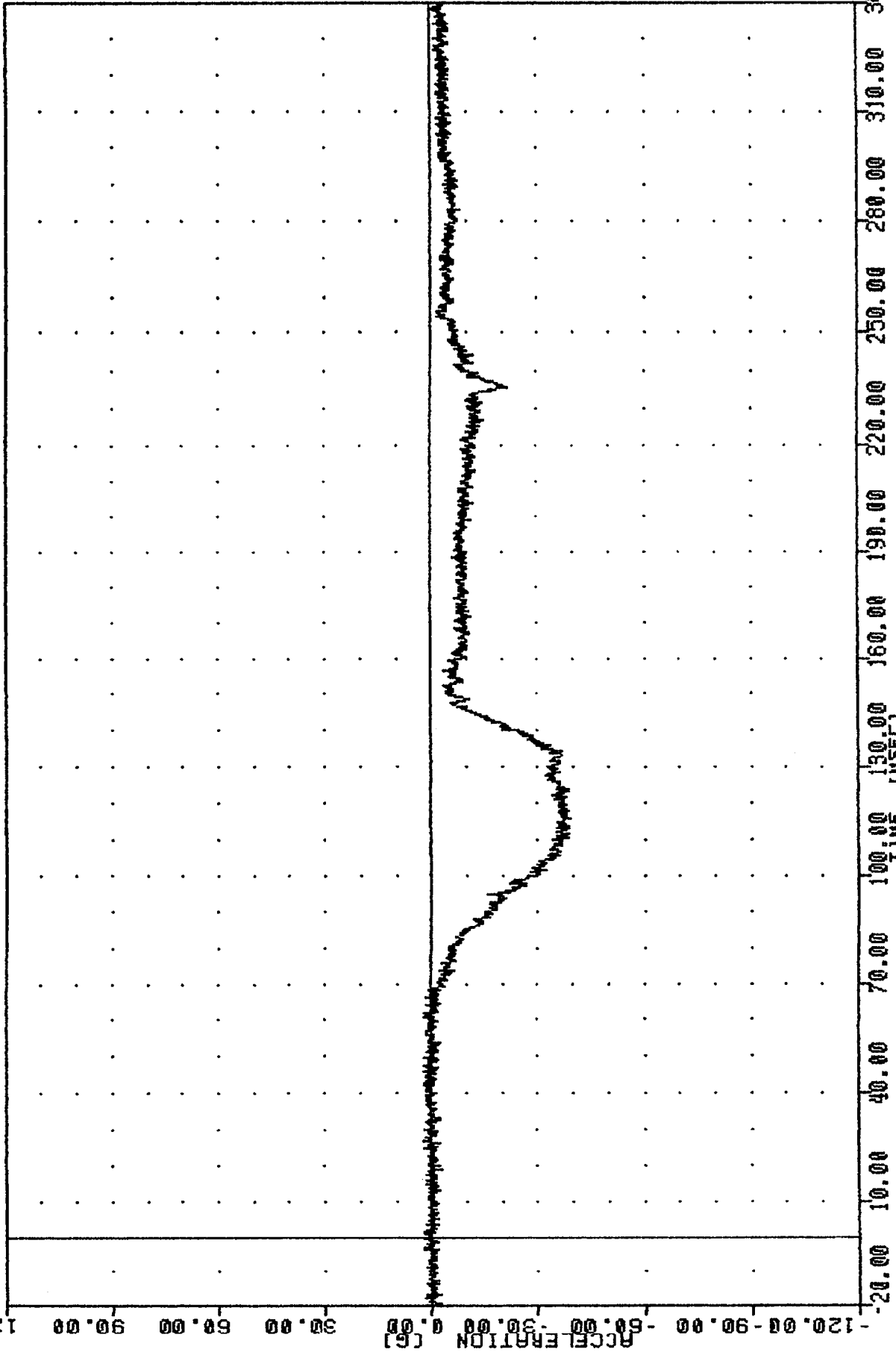
920811

B-14

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION

7320811
208 COMPLIANCE TESTING
92224
HEDZG2

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -38.97 115.88 . 2.16 1.75



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION

IRC 920811

208 COMPLIANCE TESTING

92224

HEDRG2

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = 0.078 53.13, 51.64 @ 237.25

105.00

90.00

75.00

60.00

45.00

30.00

15.00

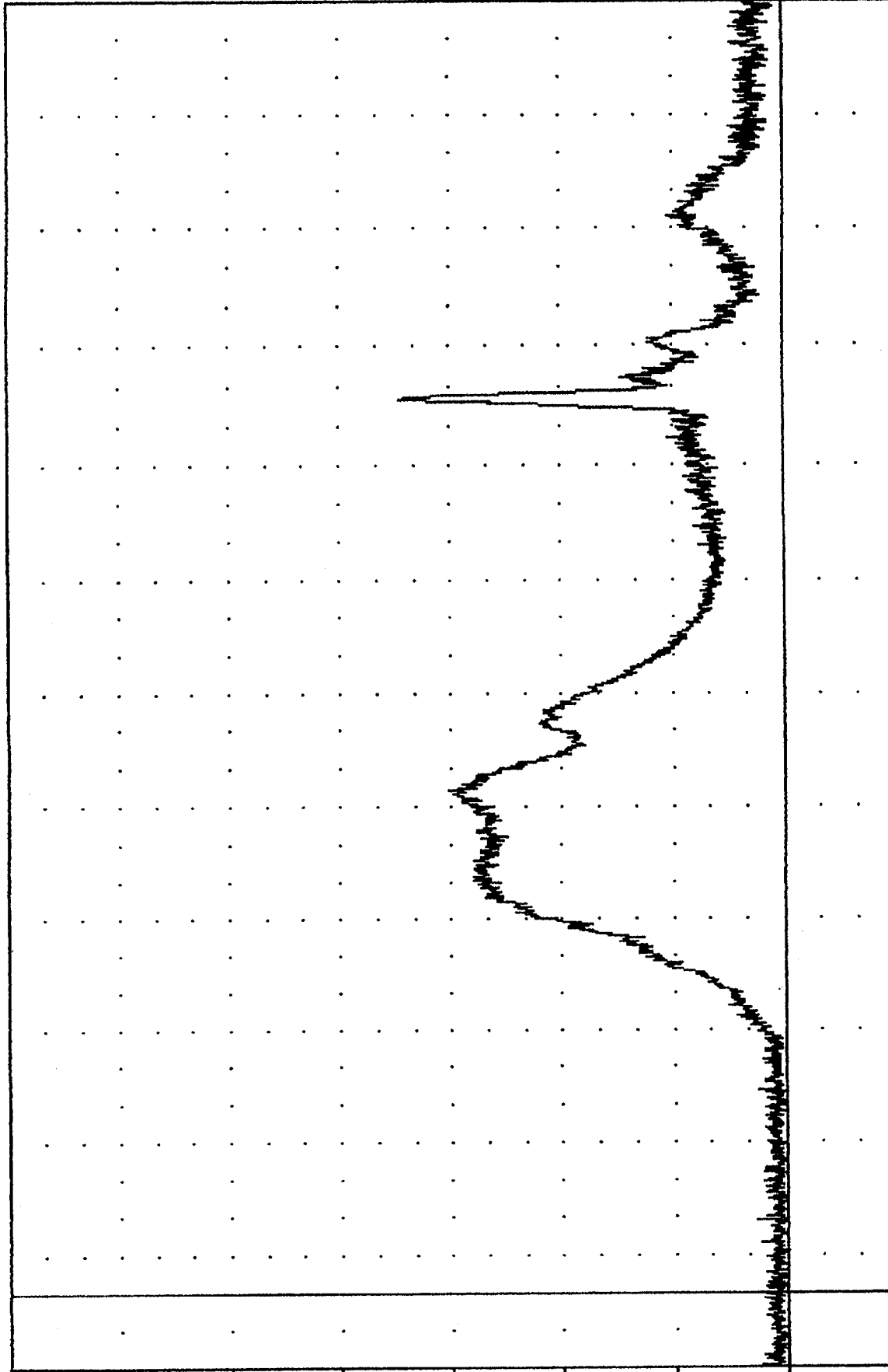
0.00

-15.00

ACCELERATION (G)

B-16

920811

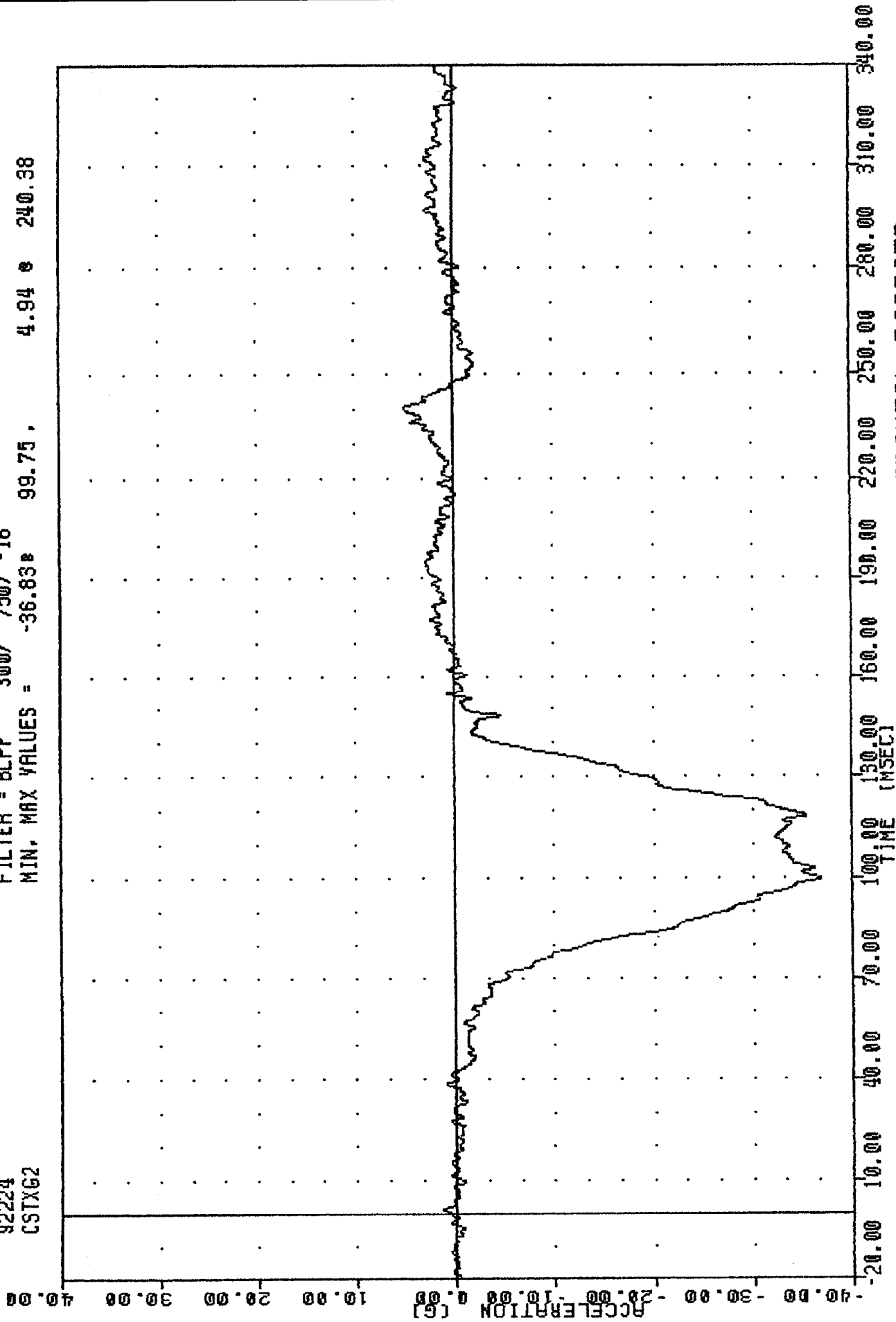


-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
TIME (MSEC)

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION

THC
920811
208 COMPLIANCE TESTING
92224
CSTXG2

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -36.63g 99.75, 4.94 g 240.38



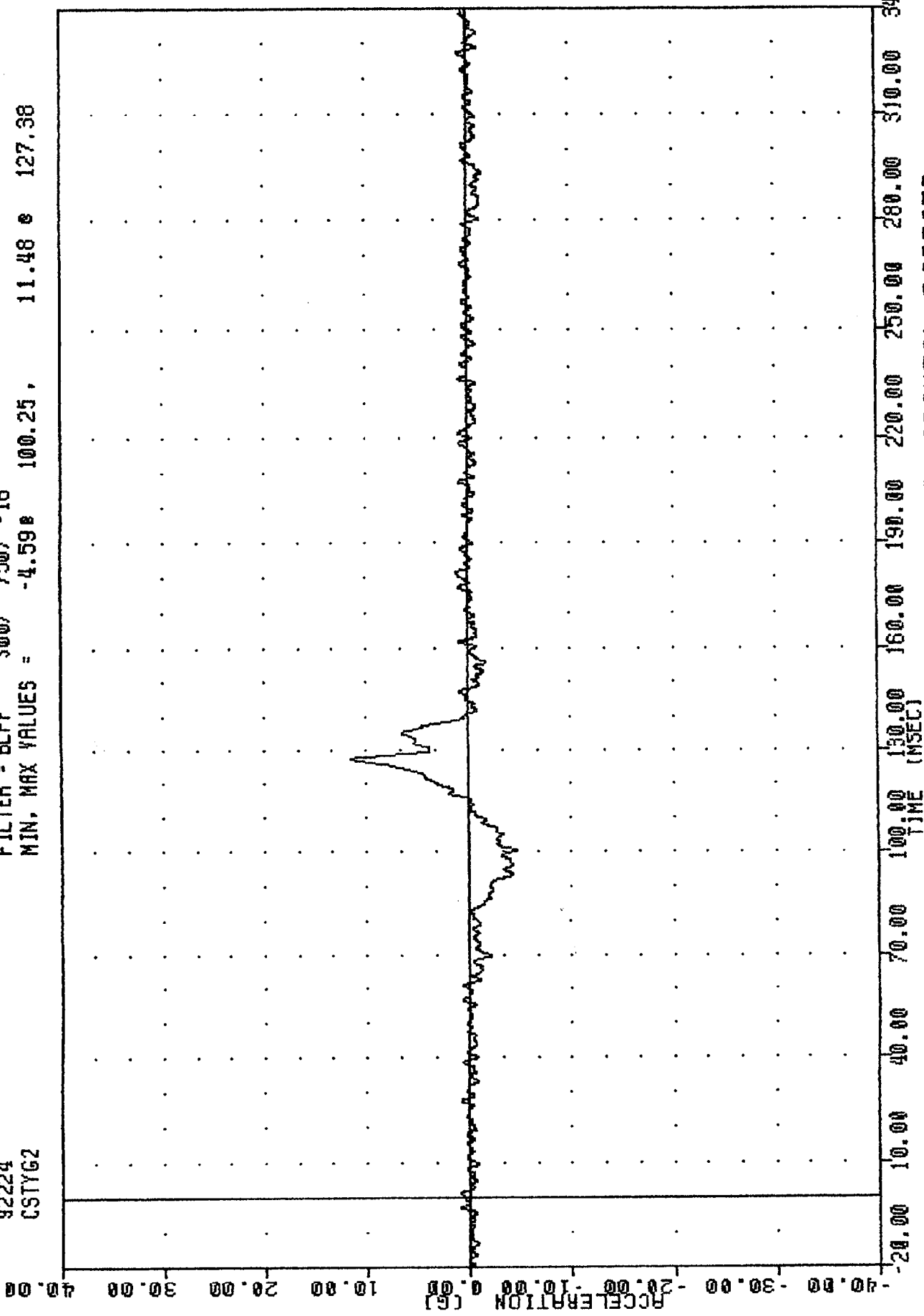
B-17

920811

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION

TRC 920811
208 COMPLIANCE TESTING
92224
CSTYG2

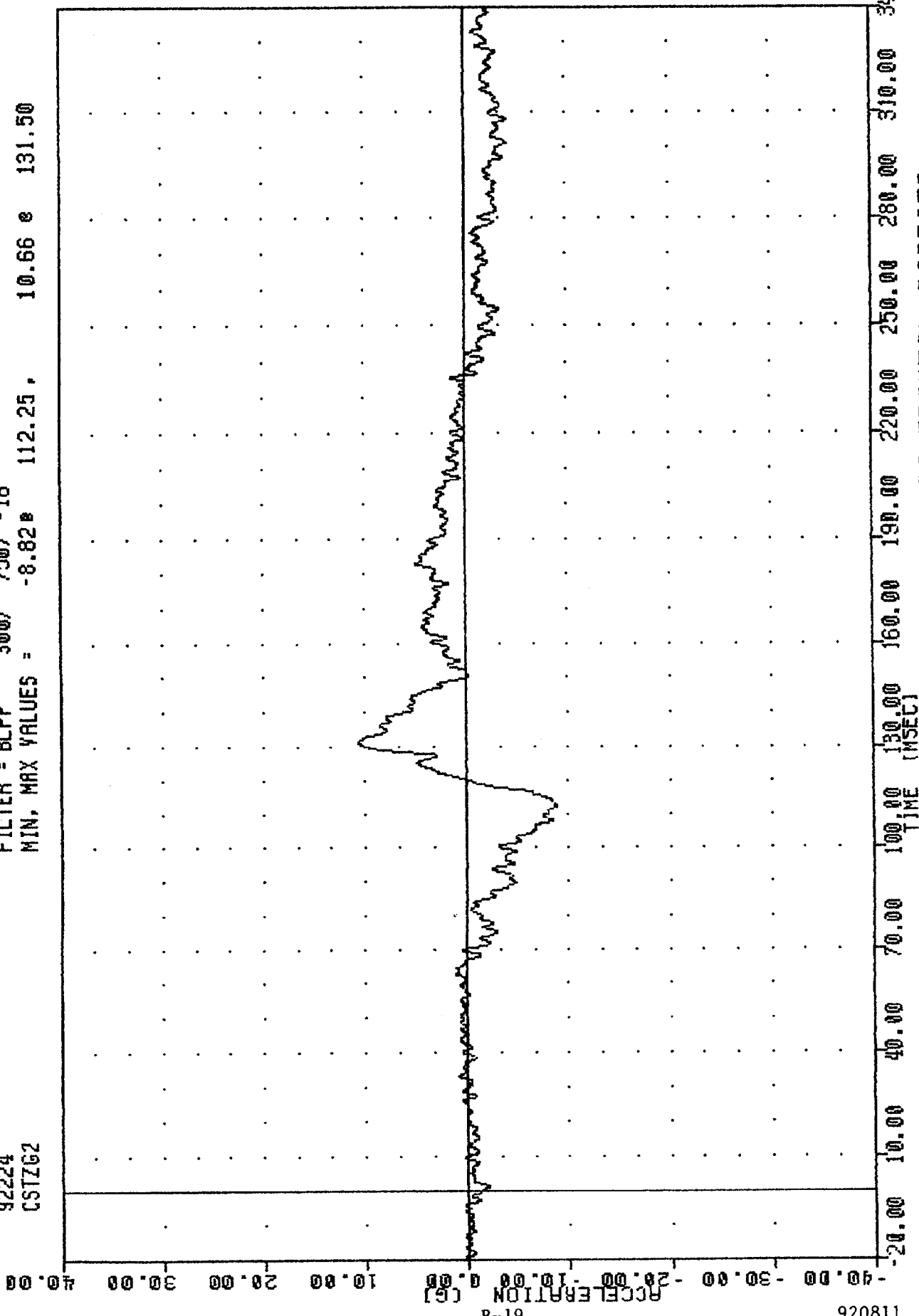
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -4.59e 100.25, 11.48 e 127.38



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION

TRC 920811
208 COMPLIANCE TESTING
92224
CSTZG2

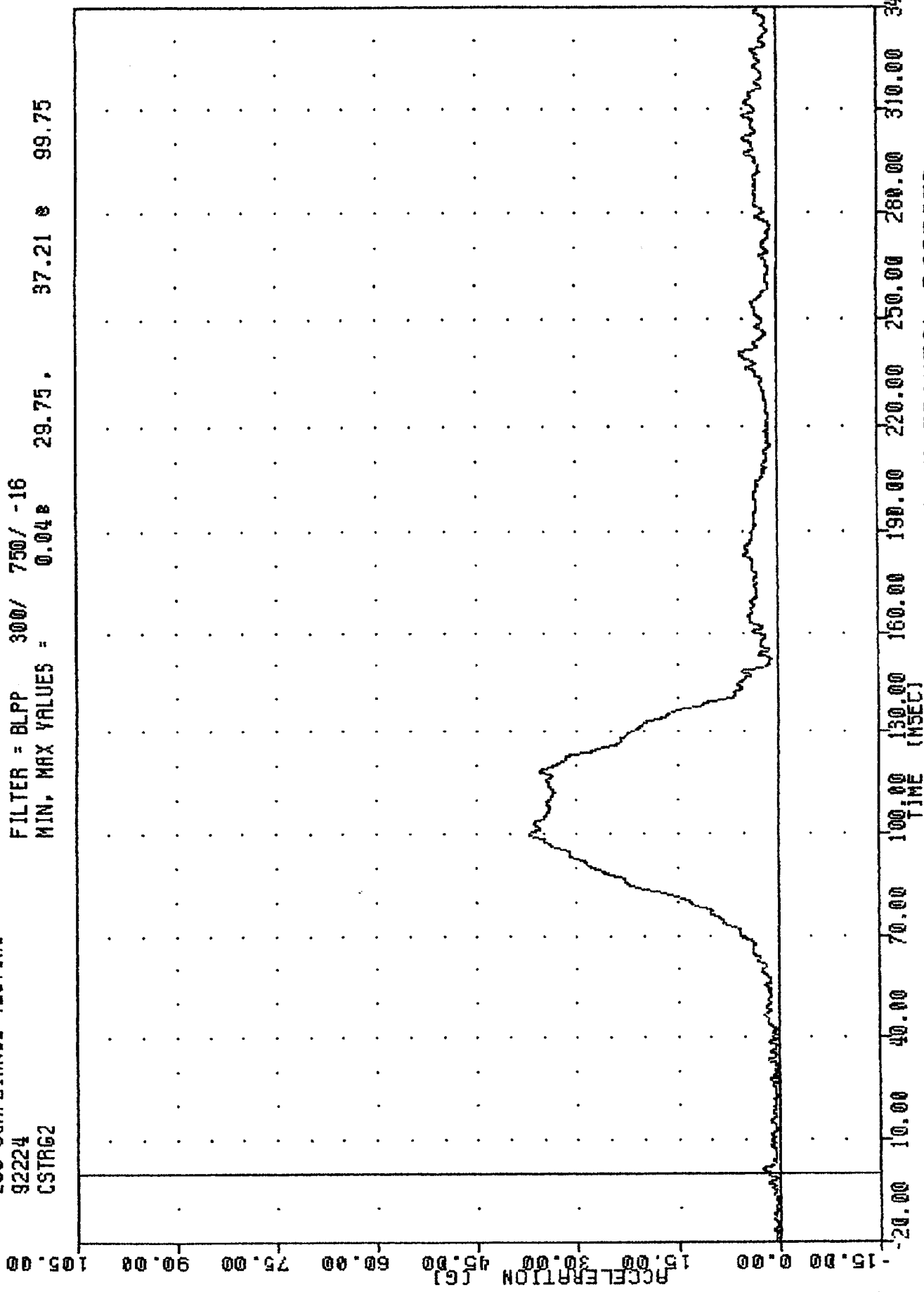
FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -8.82 112.25, 10.66 e 131.50



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION

TRC 920811
 208 COMPLIANCE TESTING
 92224
 CSTR62

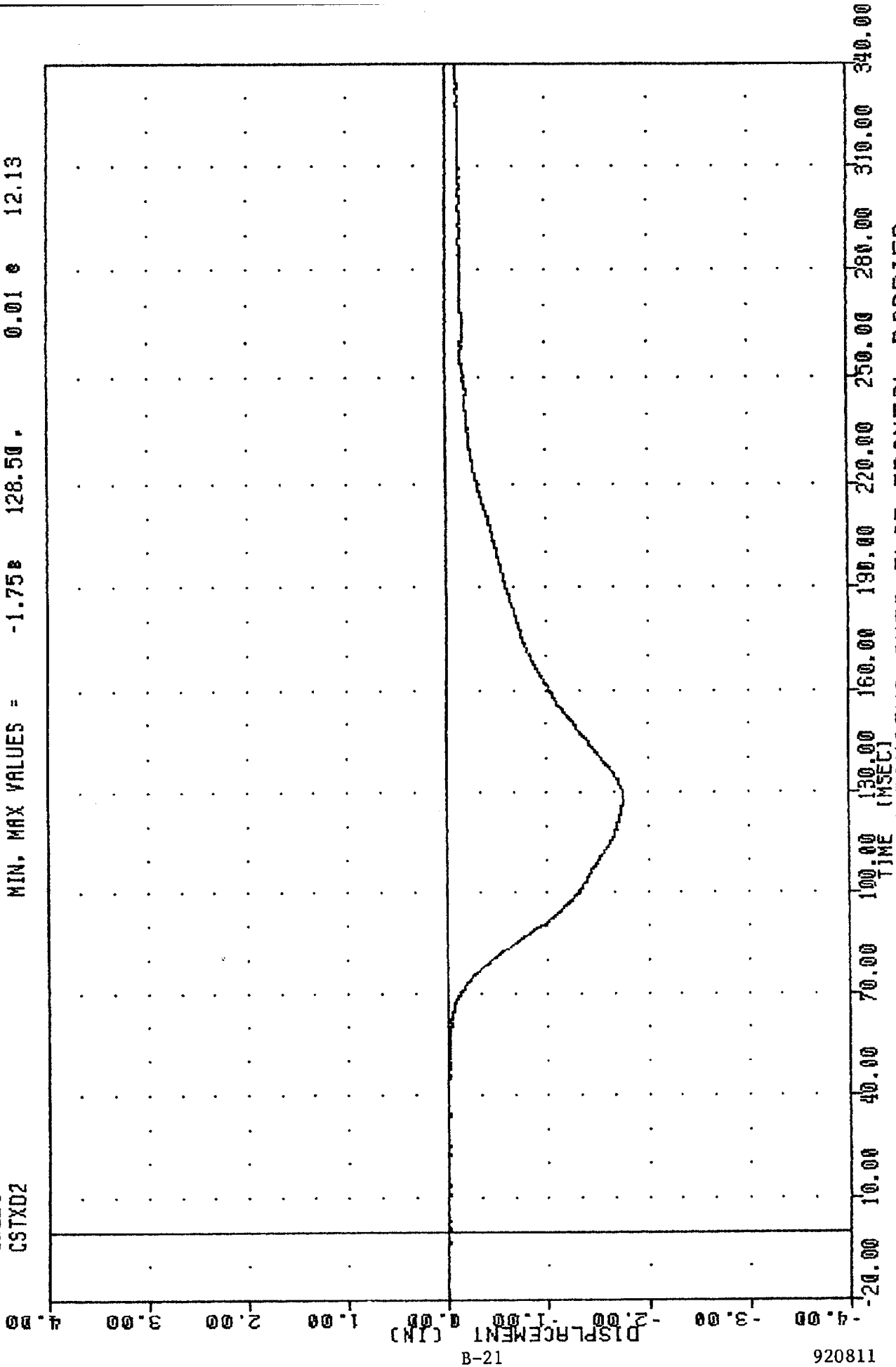
FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = 0.048 29.75. 37.21 @ 99.75



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION

IRC 920811
208 COMPLIANCE TESTING
92224
CSTXD2

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -1.75e 128.50. 0.01 e 12.13



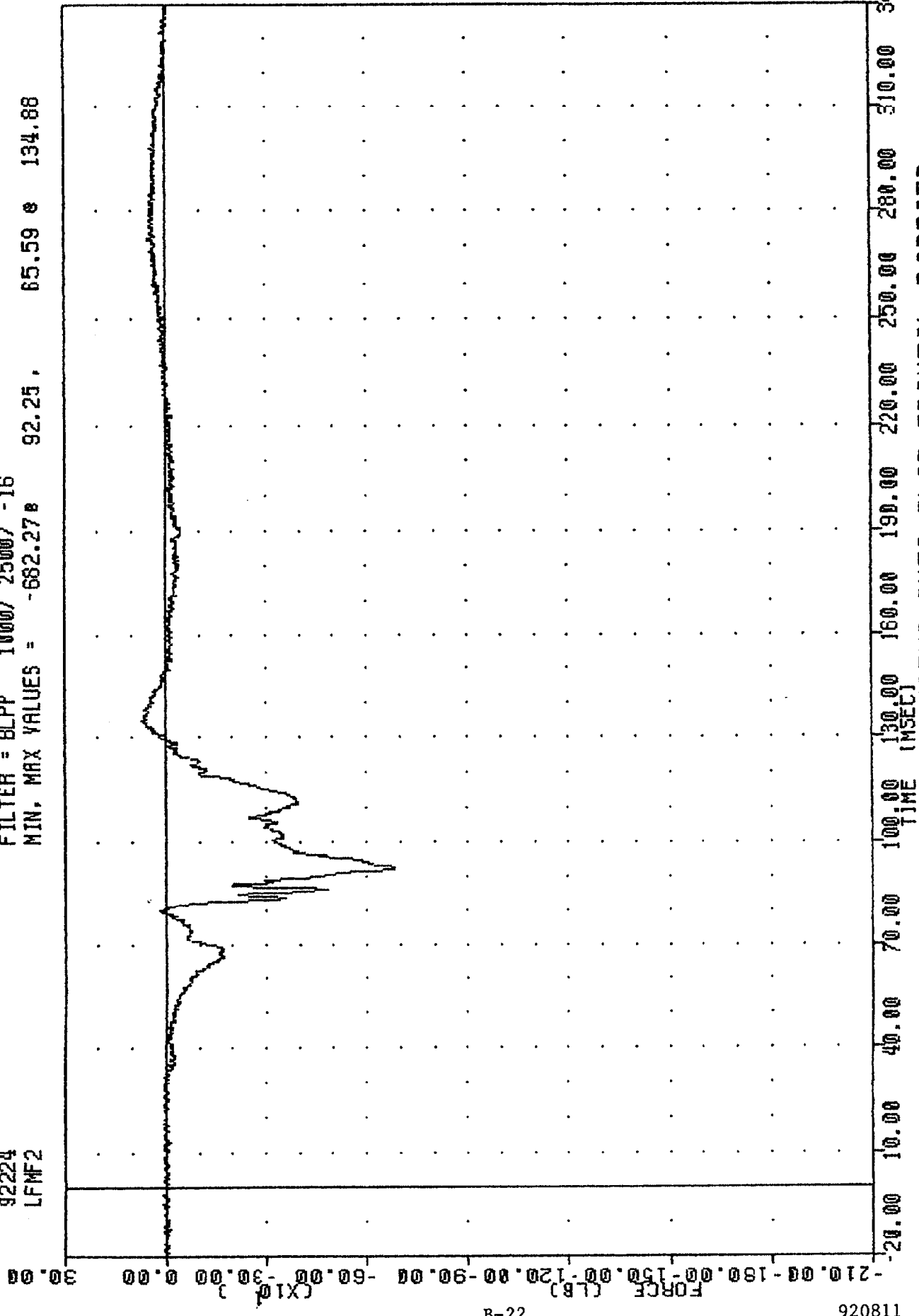
B-21

920811

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST DEFLECTION

TRC
920811
208 COMPLIANCE TESTING
92224
LFMF2

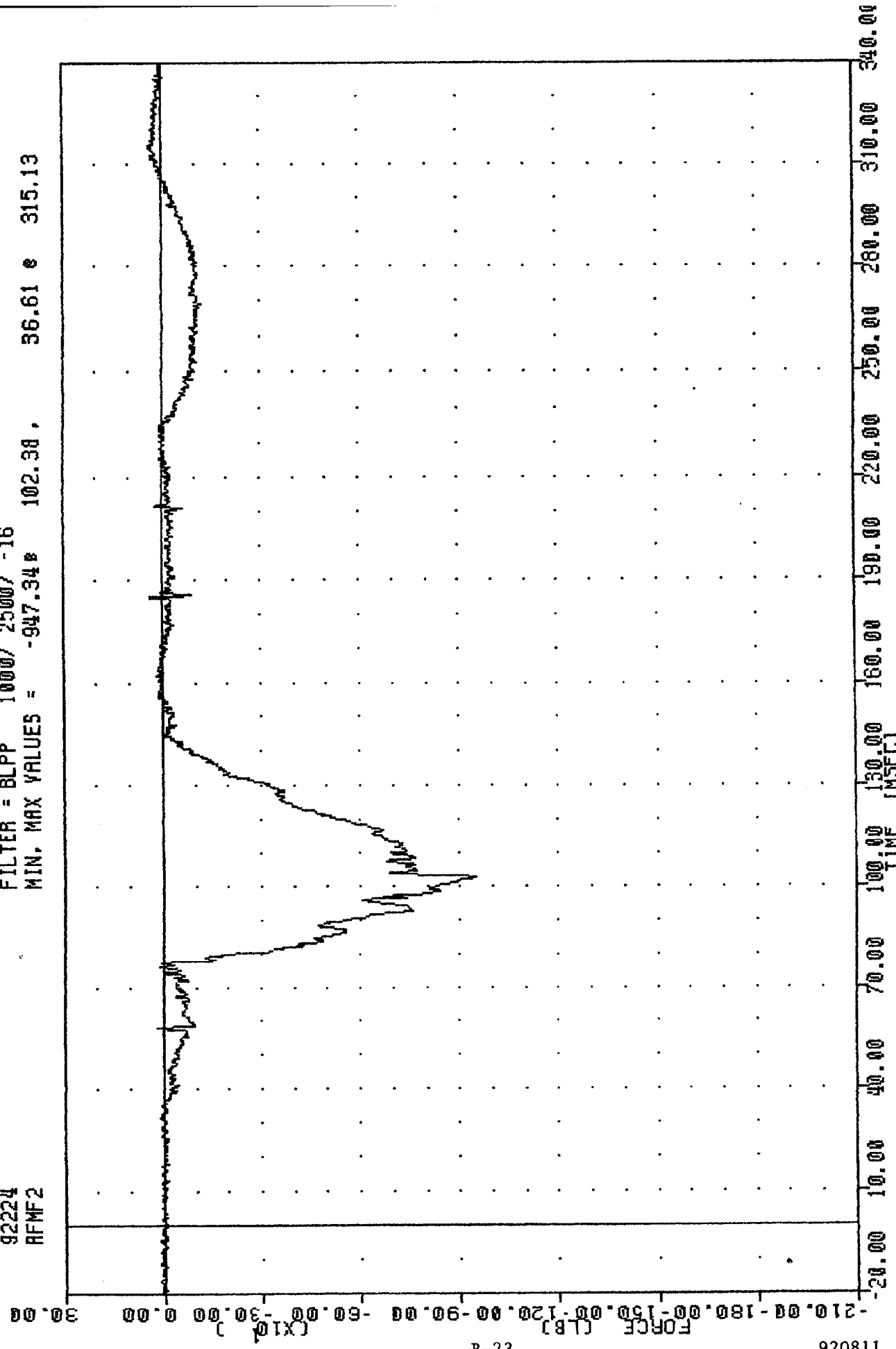
FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -682.27 92.25, 65.59 134.88



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER LEFT FEMUR FORCE

TRC
208 COMPLIANCE TESTING
92224
RFMF2

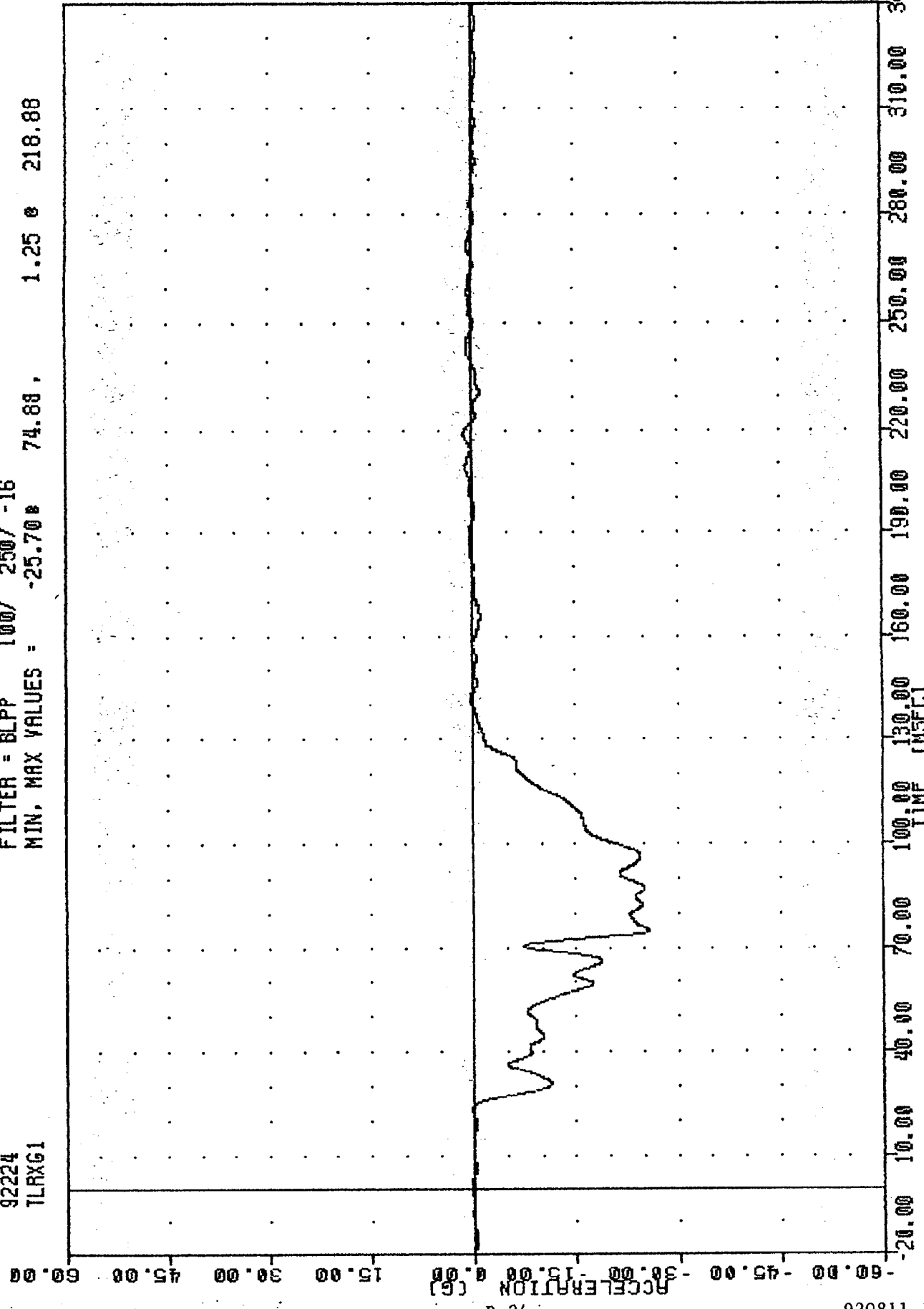
FILTER = BLPP 1000/ 2500/ -16
MIN. MAX VALUES = -947.34# 102.38 , 56.61 e 315.13



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

TRC
920811
208 COMPLIANCE TESTING
92224
TLRXG1

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -25.70 74.88, 1.25 @ 218.88



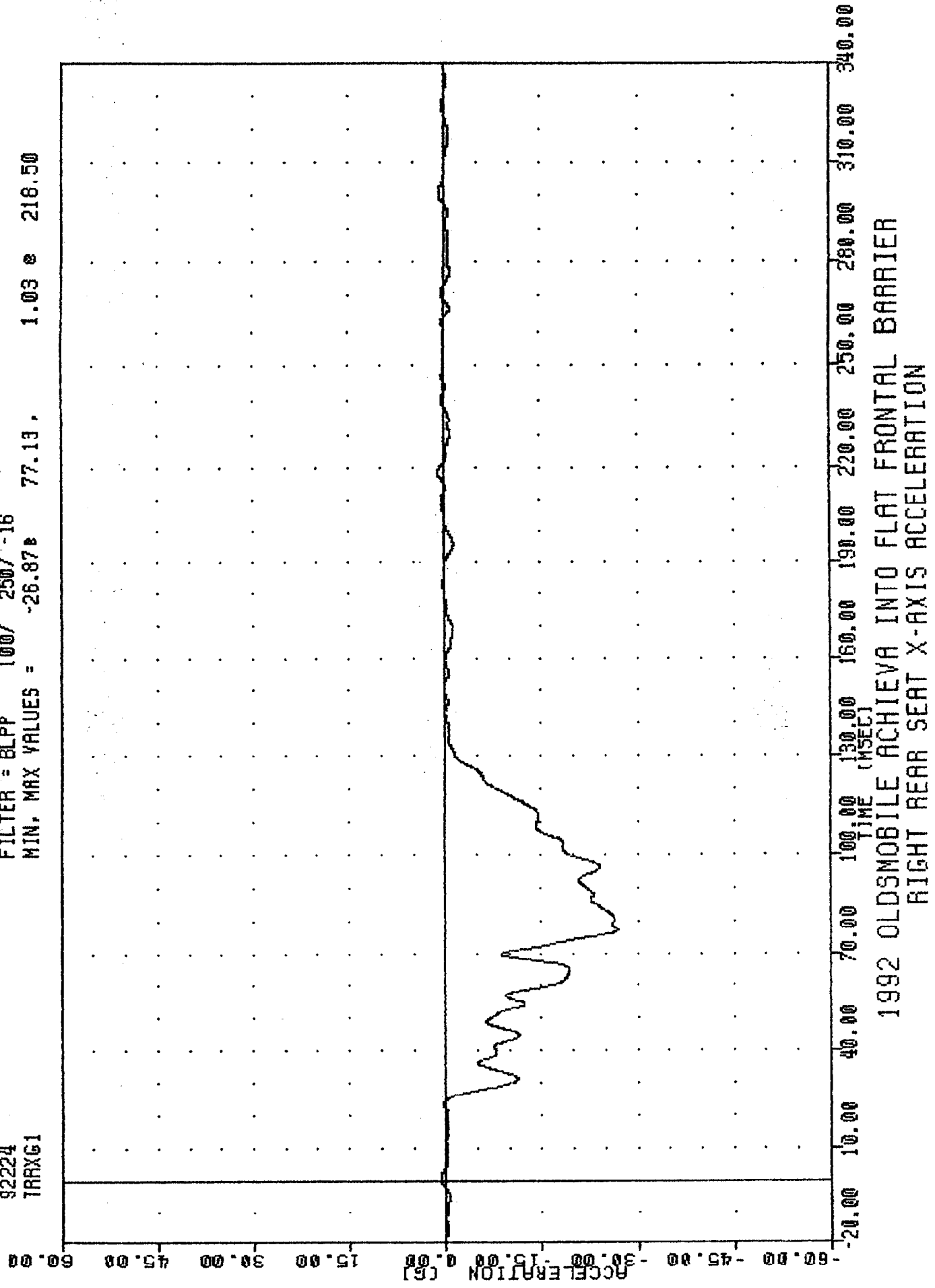
B-24

920811

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
LEFT REAR SEAT X-AXIS ACCELERATION

TRC
208 COMPLIANCE TESTING
92224
TRRXG1

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -26.87 77.13, 1.03 @ 218.50



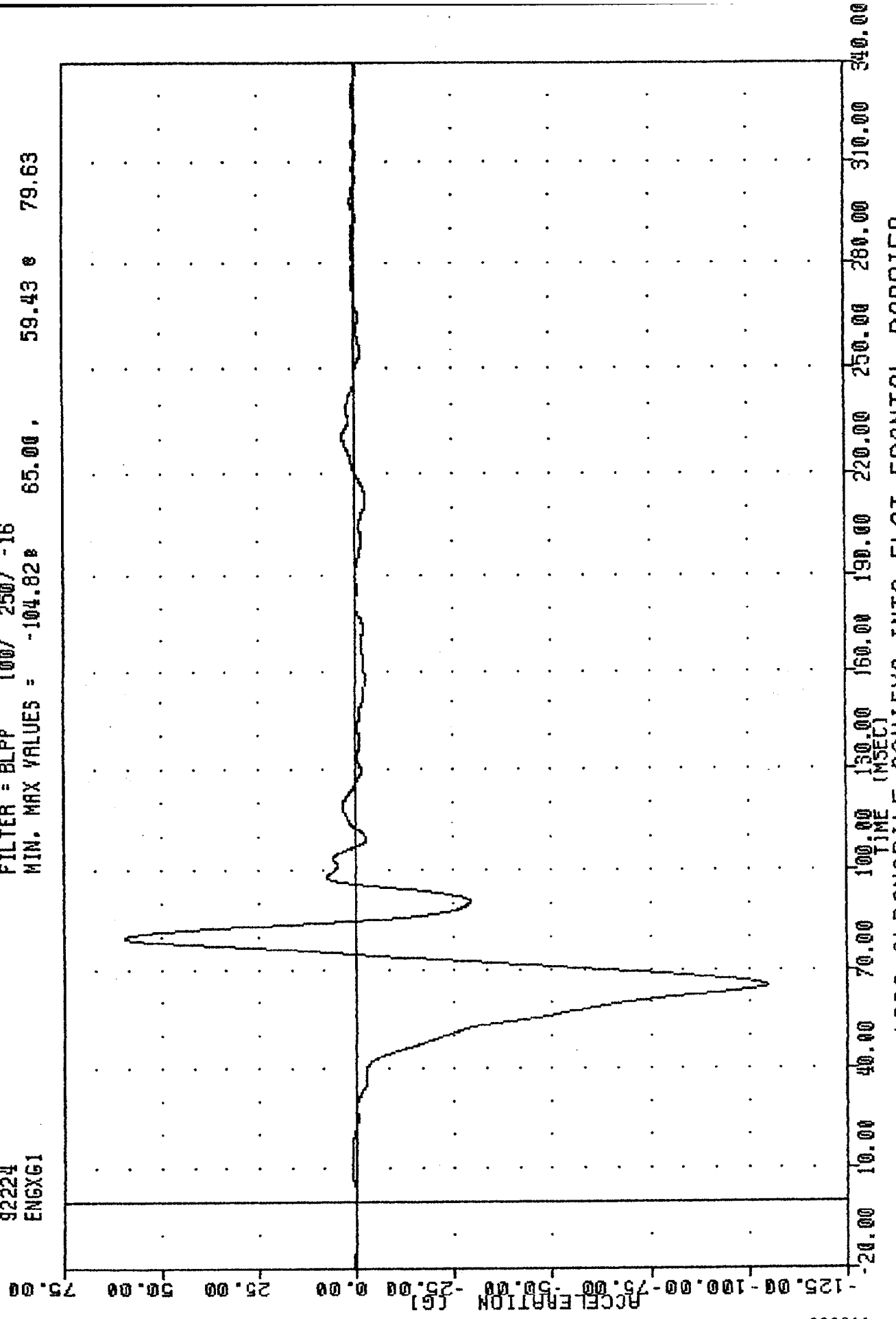
920811

B-25

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT REAR SEAT X-AXIS ACCELERATION

TRC 920811
208 COMPLIANCE TESTING
92224
ENGXG1

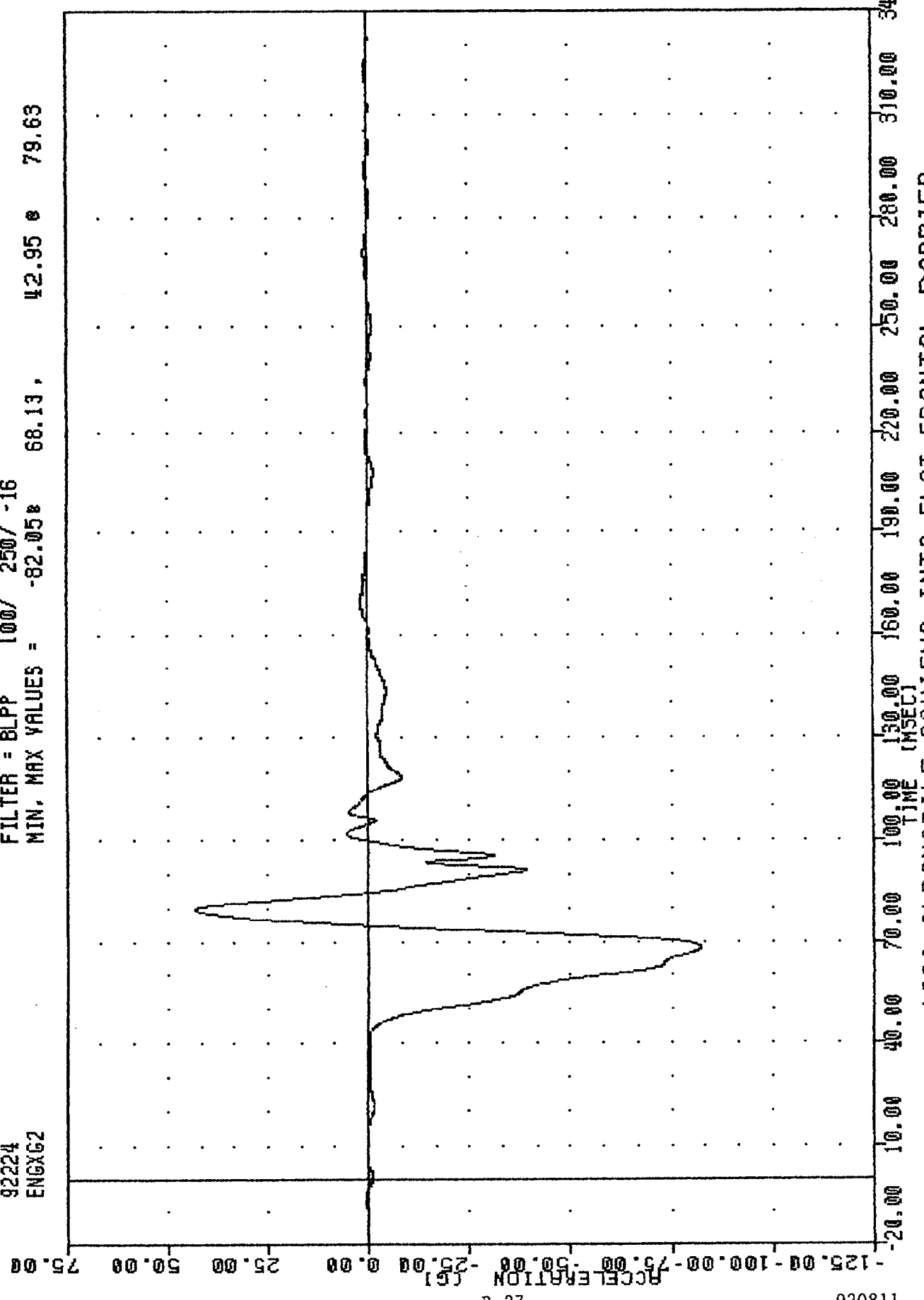
FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -104.82 65.00 , 59.43 79.63



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
ENGINE TOP X-AXIS ACCELERATION

TRC
920811
208 COMPLIANCE TESTING
92224
ENGX62

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -82.05 68.13, 42.95 79.63



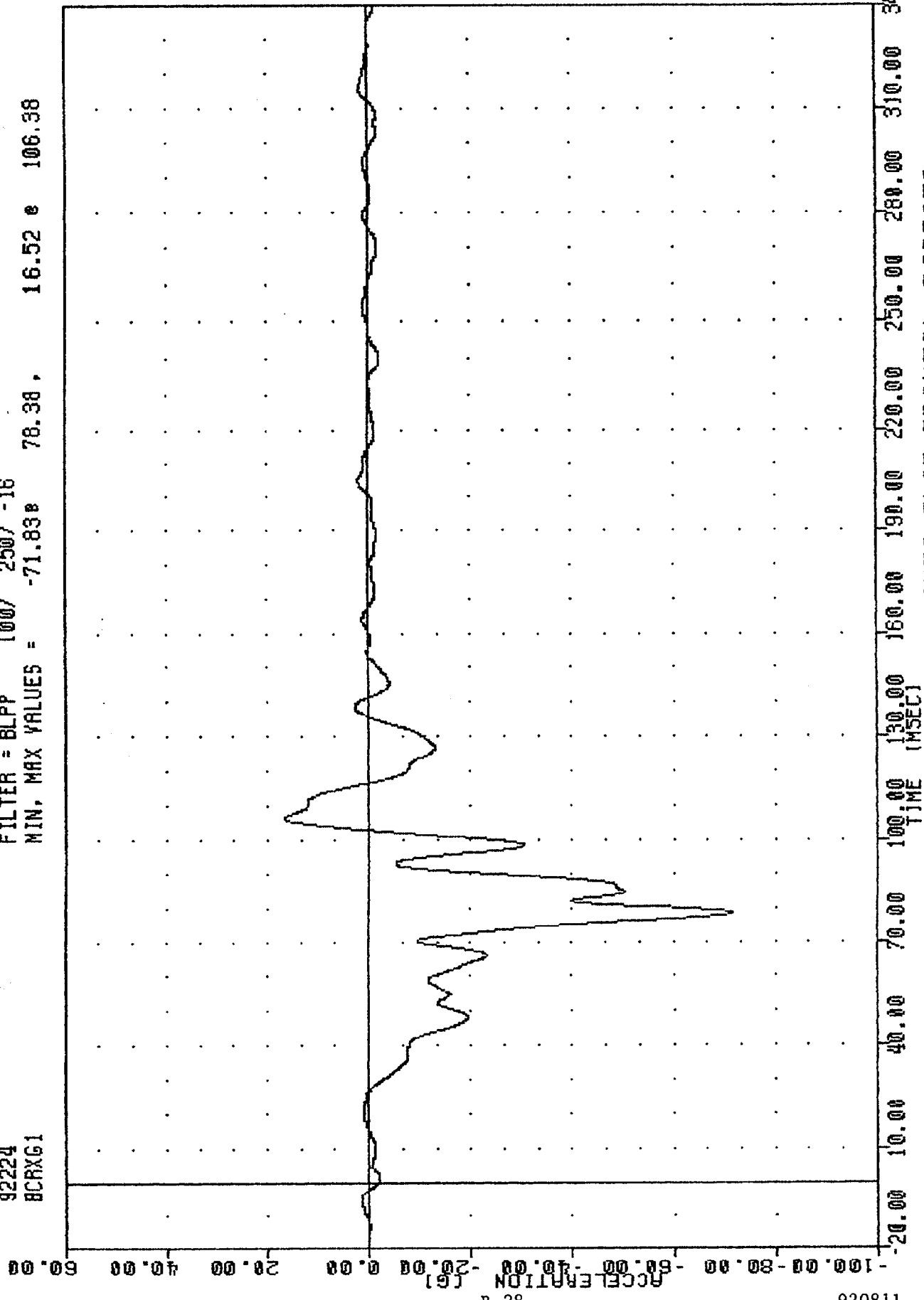
118026

B-27

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
ENGINE BOTTOM X-AXIS ACCELERATION

TRC
920811
208 COMPLIANCE TESTING
92224
BCRXG1

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -71.838 78.38, 16.52 e 106.38



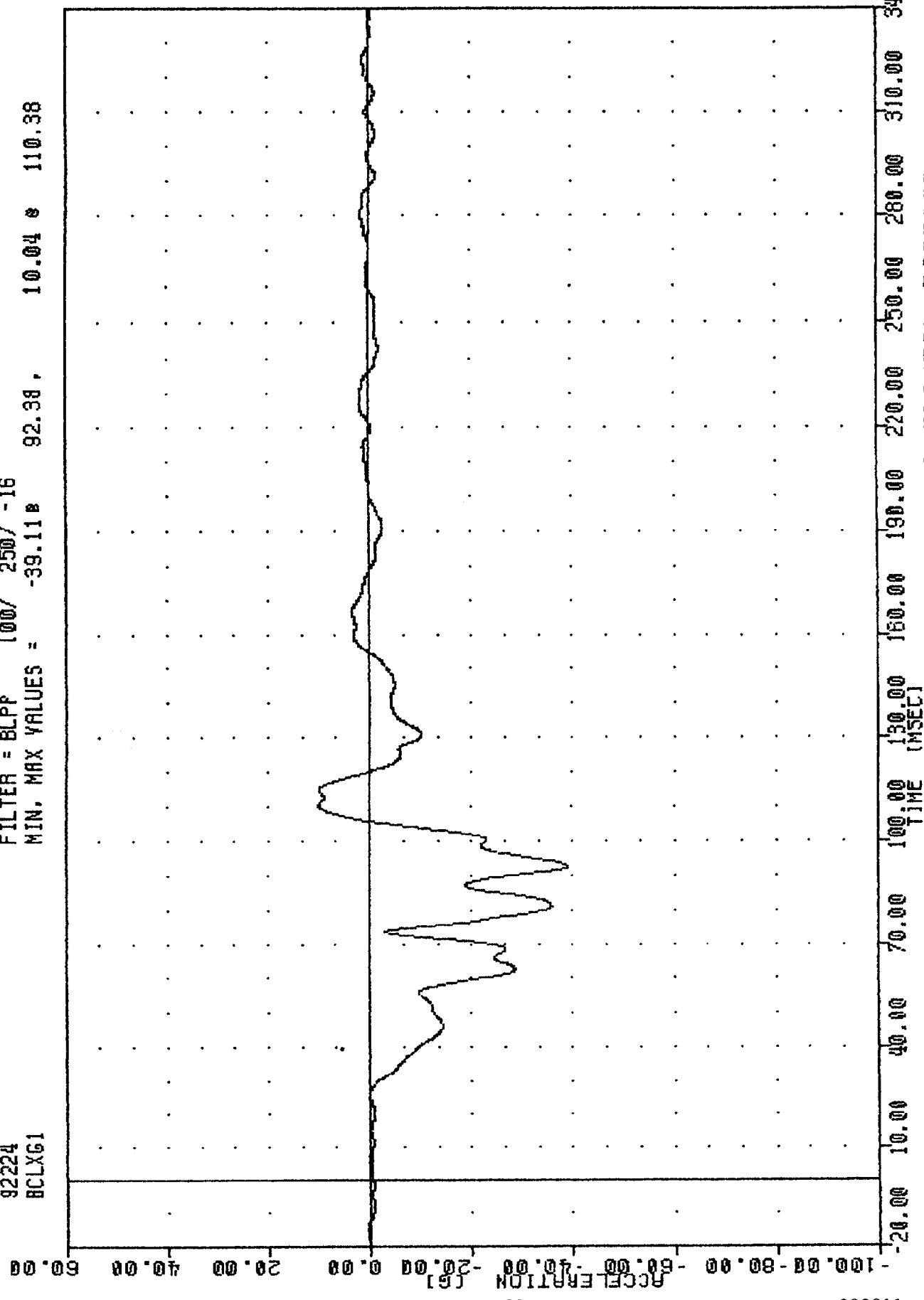
920811

B-28

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
RIGHT BRAKE CALIPER X-AXIS ACCELERATION

TRC 920811
208 COMPLIANCE TESTING
92224
BCLXG1

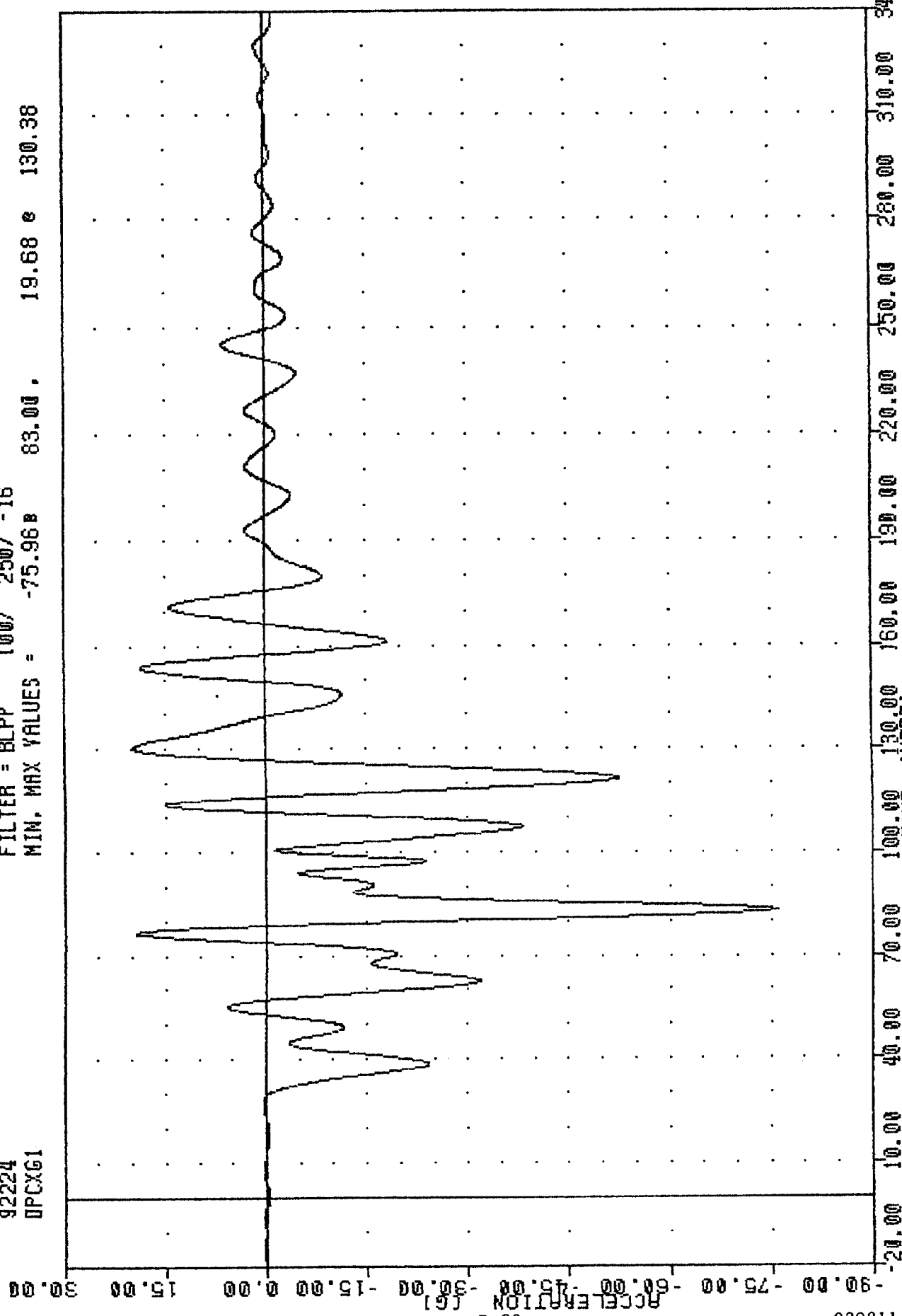
FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -39.118 92.38 , 10.04 & 110.38



1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
LEFT BRAKE CALIPER X-AXIS ACCELERATION

TRC 920811
208 COMPLIANCE TESTING
92224
DPCXG1

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -75.968 83.001, 19.68 e 130.38



920811

B-30

1992 OLDSMOBILE ACHIEVA INTO FLAT FRONTAL BARRIER
INSTRUMENT PANEL CENTER X-AXIS ACCELERATION