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212-TRC-93-018

301-TRC-93-018

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

ISUZU MOTORS, LTD.

1993 ISUZU TROOPER

MULTI-PURPOSE PASSENGER VEHICLE

NHTSA NO. CP5701

TRC TEST NO. 930421

TRANSPORTATION RESEARCH CENTER INC.

10820 STATE ROUTE 347

EAST LIBERTY, OHIO 43319



MAY 7, 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 1993 Isuzu Trooper multi-purpose passenger vehicle, NHTSA No. CP5701, at Transportation Research Center Inc. on April 21, 1993. 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 29.3 mph. The vehicle's maximum static crush was 16.1 inches. The ambient temperature was 70° F. The driver's head injury criteria (HIC) was 719. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 50.2 g. The driver's chest maximum deflection was 2.3 inches. The driver's left and right femur maximum axial forces were 2024 pounds and 252 pounds, respectively. The passenger's head injury criteria (HIC) was 470. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 48.1 g. The passenger's chest maximum deflection was 2.1 inches. The passenger's left and right femur maximum axial forces were 644 pounds and 1017 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 219P, "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity"			18. Distribution Statement Available from: NHTSA Technical Reference Division Room 5108, (NAD-52) 400 Seventh Street, SW Washington, DC 20590 Attn: Mr. Robert Hornick		
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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 NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10-286.

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
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	1.06	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

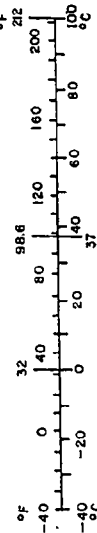


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SECTION 1.0

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 Inc. (TRC) under Contract No. DTNH22-90-C-21003. The purpose of this test was to determine if the subject vehicle, a 1993 Isuzu Trooper multi-purpose passenger vehicle (MPV), NHTSA No. CP5701, 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 April 21, 1993.

The test vehicle, a 1993 Isuzu Trooper MPV, NHTSA No. CP5701, 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 3.2-liter, inline engine, manual transmission, power steering, and power brakes. The vehicle's test weight was 4855 pounds. The vehicle's impact speed was 29.3 mph. The vehicle's maximum static crush was 16.1 inches.

The driver's head injury criteria (HIC) was 719. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 50.2 g. The driver's chest maximum deflection was 2.3 inches. The driver's left and right femur maximum axial forces were 2024 pounds and 252 pounds, respectively.

The right front passenger's HIC was 470. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 48.1 g. The right front passenger's chest maximum deflection was 2.1 inches. The right front passenger's left and right femur maximum axial forces were 644 pounds and 1017 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 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 could be found.

The dash panel center X-axis accelerometer, DPCXG1, 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 could be found.

The left brake caliper X-axis accelerometer, BCLXG1, 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 could be found.

TABLE 1 CRASH TEST SUMMARY

NHTSA NO.: CP5701 TEST TYPE: Frontal Barrier Impact

TEST DATE: 04/21/93 TEST TIME: 1335 AMBIENT TEMP. (°F): 70

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1993/Isuzu/Trooper/MPV

VEHICLE TEST WEIGHT (LBS): 4855

IMPACT ANGLE (DEG)*: 0

IMPACT VELOCITY (MPH)**: PRIMARY = 29.3 SECONDARY = 29.2

MAXIMUM STATIC CRUSH (IN): 16.1

AVERAGE REBOUND (IN): 17.8

DUMMIES: Driver #229 Passenger #314

TYPE: Part 572 E Part 572 E

LOCATION: Left front Right front

RESTRAINT: Three-point unbelt Three-point unbelt

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: Isuzu Motors, Ltd. Japan

MAKE/MODEL: Isuzu/Trooper

VIN: JACDH58V9P7901892

BODY STYLE: multi-purpose passenger vehicle MODEL YEAR: 1993

NHTSA NO.: CP5701

COLOR: Red

ENGINE DATA: TYPE: inline CYLINDERS: 6 DISPLACEMENT: 3.2 liter

TRANSMISSION DATA: 5 SPEED, X MANUAL, AUTOMATIC, FWD, RWD, X 4WD

DATE VEHICLE RECEIVED: 01/15/93

ODOMETER READING: 63

DEALER'S NAME AND ADDRESS: Hatfield Isuzu
1400 Automall Drive
Columbus, OH 43228

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	No
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
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-rear only
CLOCK	Yes	REAR WINDOW DEFROSTER	No
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: Isuzu Motors, Ltd. Japan

DATE OF MANUFACTURE: 10/92

VIN: JACDH58V9P7901892

GVWR: 5510 LBS

GAWR: FRONT: 2755 LBS., REAR: 3085 LBS.

TABLE 2 TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): Goodyear, Wrangler AP, P245/70R16

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 44 PSI
REAR: 44 PSI

SPARE TIRE (MFR., LINE, SIZE): Goodyear, Wrangler AP, P245/70R16

TYPE OF SEATS: FRONT: Bucket
REAR: Split bench

TYPE OF FRONT SEAT BACKS: Manually adjustable

MAXIMUM WIDTH: 68.4 INCHES

WHEELBASE: 108.5 INCHES

LOCATION OF LABEL STATING TIRE & CAPACITY DATA:

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

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: P245/70R16

RECOMMENDED COLD TIRE PRESSURE: FRONT: 30 PSI; REAR: 35 PSI

DESIGNATED SEATING CAPACITY: NA FRONT NA REAR NA TOTAL

VEHICLE CAPACITY WEIGHT: NA LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

DELIVERED ATTITUDE: LF 33.5; RF 33.8; LR 34.0; RR 34.2

FULLY LOADED ATTITUDE: LF 33.6; RF 34.2; LR 32.3; RR 33.2

PRE-TEST ATTITUDE: LF 33.3; RF 33.9; LR 32.4; RR 33.2

POST-TEST ATTITUDE: LF 32.5; RF 33.8; LR 32.8; RR 32.2

TABLE 2 TEST VEHICLE INFORMATION CONT'D

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

RIGHT FRONT	1071 LBS.	RIGHT REAR	1039 LBS.
LEFT FRONT	1065 LBS.	LEFT REAR	1058 LBS.
TOTAL FRONT WEIGHT	2136 LBS.	(50.5% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	2097 LBS.	(49.5% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT 4233 LBS.			

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT*

GVWR = GROSS VEHICLE WEIGHT RATING (5510 LBS)

UDW = UNLOADED DELIVERED WEIGHT (4233 LBS)

VCW = VEHICLE CAPACITY WEIGHT = GVWR - UDW = 5510 - 4233 = 1277

DSC = DESIGNATED SEATING CAPACITY (5) **

RCLW* = GVWR - UDW - 150 (DSC) = 1277 - 150(5) = 527 LBS.

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

TARGET TEST WEIGHT = 4233 + 300* + 334

TARGET TEST WEIGHT = 4867 LBS

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 288 LBS. OF CARGO WEIGHT:

RIGHT FRONT	1261 LBS.	RIGHT REAR	1157 LBS.
LEFT FRONT	1209 LBS.	LEFT REAR	1228 LBS.
TOTAL FRONT WEIGHT	2470 LBS.	(50.9% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	2385 LBS.	(49.1% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	4855 LBS.	(0.2% UNDER TARGET TEST WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE: 100 LBS. in rear passenger foot area;
50 LBS. in rear cargo area

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 53.3 INCHES REARWARD OF FRONT WHEEL CENTERLINE

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

**The designated seating capacity is determined by counting the number of seat belts installed in the vehicle.

TABLE 3 POST-IMPACT DATA

TEST NUMBER: 930421 NHTSA NO.: CP5701
TEST DATE: 04/21/93 TEST TIME: 1335
TEST TYPE: Frontal Barrier Impact IMPACT ANGLE: 0
AMBIENT TEMPERATURE AT IMPACT AREA: 70° F
TEMPERATURE IN OCCUPANT COMPARTMENT: 71° F
IMPACT VELOCITY: PRIMARY = 29.3 MPH SECONDARY = 29.2 MPH

(SPECIFIED RANGE = 28.9 TO 29.9 MPH)

DISTANCE FROM VEHICLE TO BARRIER: ENTERING VELOCITY TRAP = 15.0 IN.

EXITING VELOCITY TRAP = 2.0 IN.

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

OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: L 183.0; C 186.3; R 183.1

POST-TEST: L 168.8; C 170.3; R 167.2

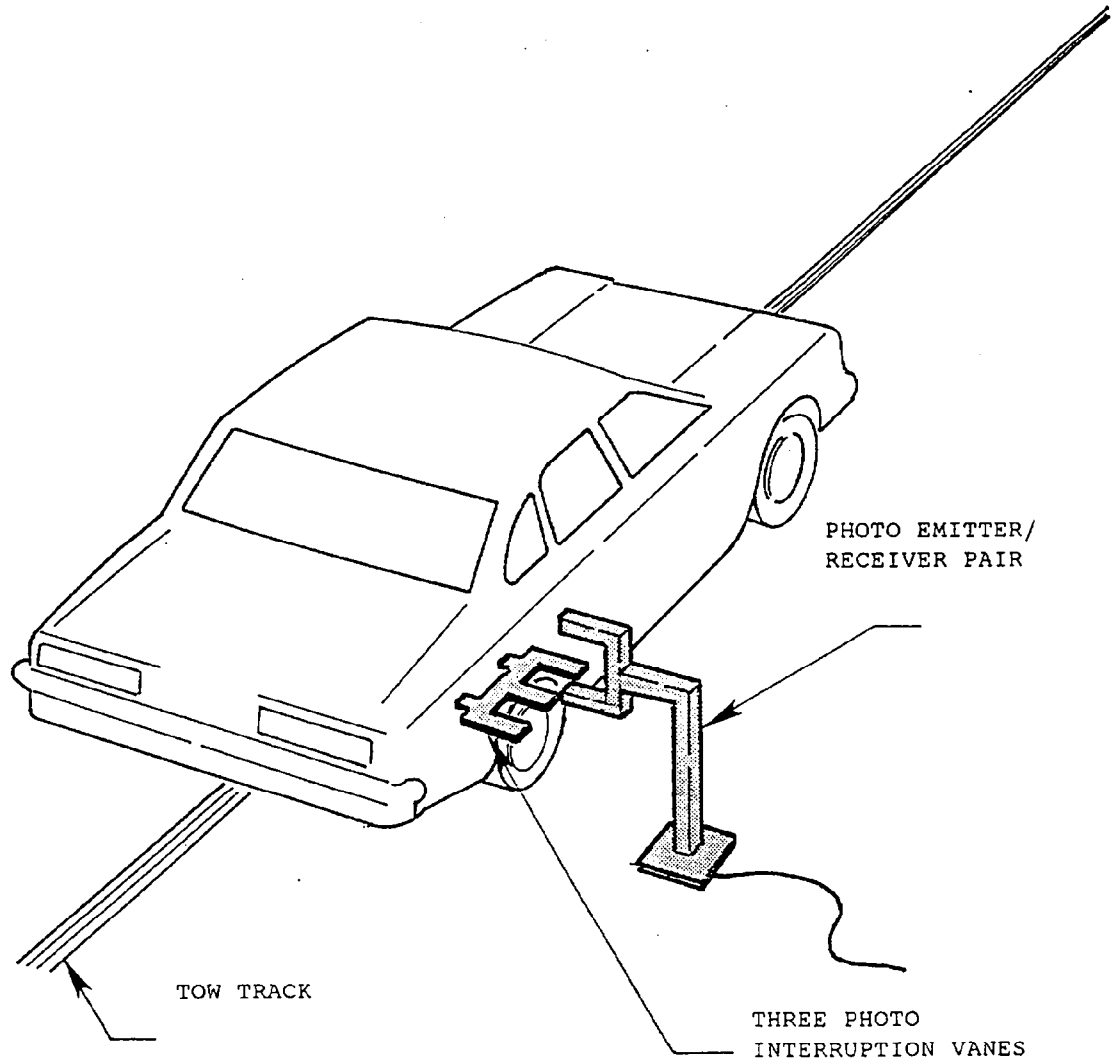
TOTAL CRUSH: L 14.2; C 16.0; R 15.9

AVERAGE CRUSH: 15.4

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

DISTANCE FROM TEST VEHICLE TO BARRIER: L 18.2; C 16.9; R 18.2 AVG. 17.8

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: Isuzu/Trooper/Multipurpose passenger veh.

VEHICLE NHTSA NO.: CP5701; VIN: JACDH58V9P7901892

MODEL YEAR: 1993; BUILD DATE: 10/92; TEST DATE: 04/21/93

VEHICLE SIZE CATEGORY: MPV; TEST WEIGHT: 4855 LBS.

VEHICLE WHEELBASE: 108.5 INCHES

MAXIMUM WIDTH: 68.4 INCHES

FRONT OVERHANG: 31.3 INCHES

COLLISION DEFORMATION

CLASSIFICATION (CDC) CODE: 12FDEW2

CRUSH DEPTH

MEASUREMENTS: C1 = 14.2 INCHES

C2 = 15.9 INCHES

C3 = 15.5 INCHES

C4 = 16.1 INCHES

C5 = 15.0 INCHES

C6 = 15.9 INCHES

VEHICLE CENTERLINE

MIDPOINT OF DAMAGE: D = (LONGITUDINAL)

LENGTH OF DAMAGED

REGION: L = 60.0 INCHES

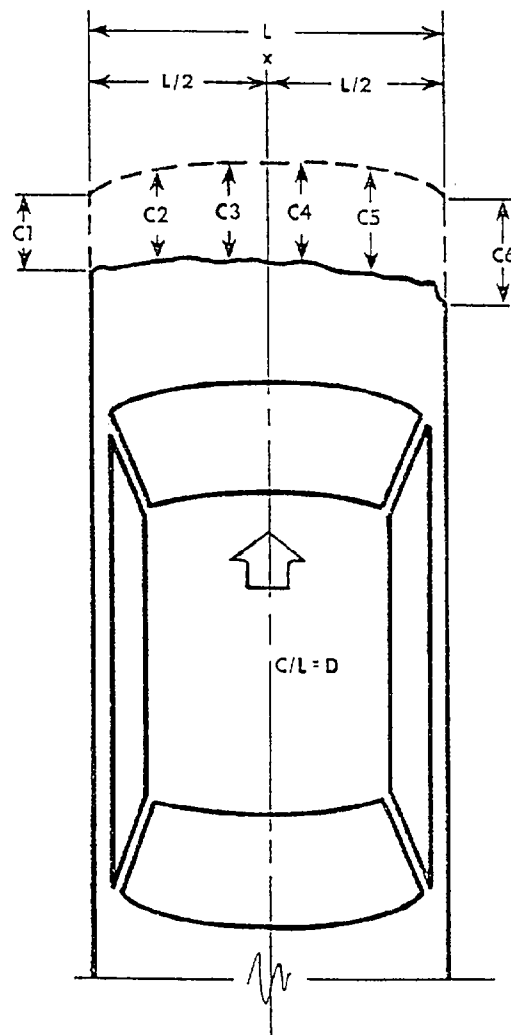
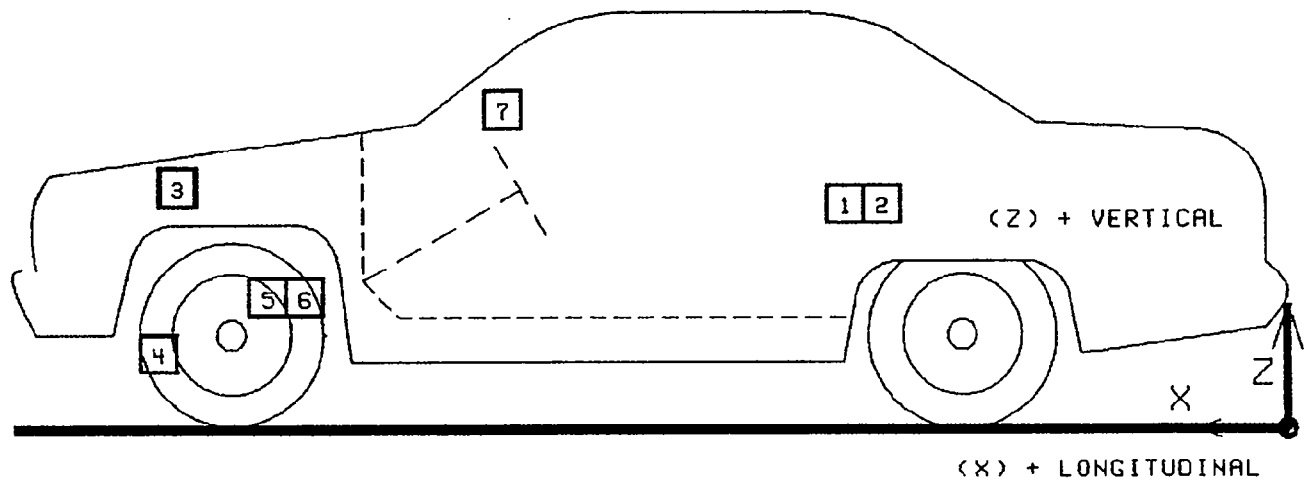
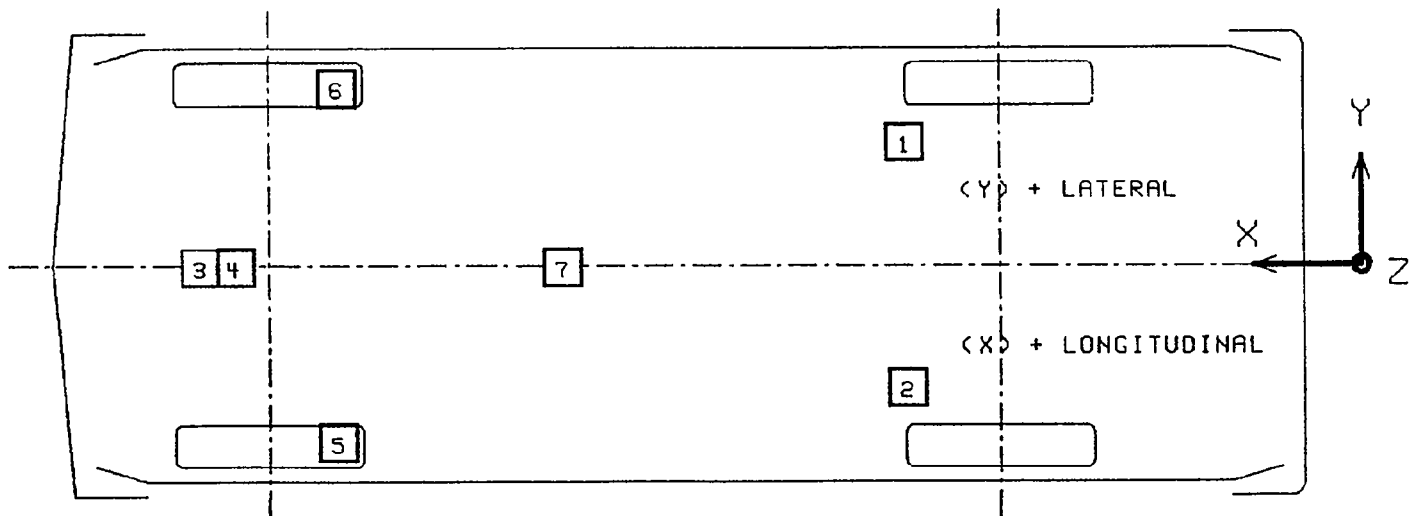


FIGURE 3

VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 930421

No. LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
				MAX G	MSEC	MAX G	MSEC
1 LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE 71.0	26.2	19.4				
	POST 71.0	26.2	20.0				
				---	---	X	---
						66.5	31.9
2 RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE 71.2	-26.2	19.9				
	POST 71.2	-26.2	19.1				
				2.4	122.4	38.2	33.3
3 ENGINE TOP LONGITUDINAL	PRE 151.6	-2.2	41.0				
	POST 148.2	-1.6	41.1				
				22.6	50.0	108.6	36.6
4 ENGINE BOTTOM LONGITUDINAL	PRE 150.8	1.0	11.2				
	POST 148.5	1.6	11.2				
				16.9	53.1	116.4	24.9
5 RIGHT BRAKE CALIPER LONGITUDINAL	PRE 147.6	-23.9	13.4				
	POST 147.5	-23.9	12.3				
				9.1	66.6	68.7	22.0

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY CONTINUED

TEST NUMBER 930421

No. LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
				MAX G	MSEC	MAX G	MSEC
6 LEFT BRAKE CALIPER	PRE 147.2	24.4	13.4				
	POST 147.1	24.4	12.2				
LONGITUDINAL				2.9	67.8 γ	88.7	40.8 γ
7 INSTRUMENT PANEL CENTER	PRE 134.4	0.0	50.4				
	POST 134.3	0.0	48.2				
LONGITUDINAL				44.1	67.5 γ	41.6	28.8 γ

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

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

 γ No positive value in the time interval of interest. γ See DATA ACQUISITION EXPLANATIONS

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.: CP5701
MAKE/MODEL/BODY STYLE: Isuzu/Trooper/MPV
MODEL YEAR: 1993 BODY COLOR: Red
VIN: JACDH58V9P7901892
ODOMETER (ARRIVAL): 63 DATE: 01/15/93
ODOMETER (COMPLETION): 68 DATE: 04/21/93
COST: \$19,900.00

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

ENGINE: 6 CYLINDERS; 3.2 LITERS
TRANSMISSION: 5-speed manual; DRIVE TYPE: Four-wheel drive
TIRE SIZE: P245/70R16
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
DRIVER	-113.1	13.7	-47.0	113.9	-70.6	40.2	22.0
PASSENGER	-46.3	-9.5	-53.1	58.4	-49.3	6.6	13.7

MAXIMUM FEMUR COMPRESSIVE FORCE (LBS)

	LEFT FEMUR	RIGHT FEMUR
DRIVER	2024	252
PASSENGER	644	1017

HEAD INJURY CRITERIA*

	HIC	TIME t_1 (MSEC)	TIME t_2 (MSEC) ²
DRIVER	719	68.5	104.5
PASSENGER	470	61.6	97.6

CHEST MAXIMUM RESULTANT ACCELERATION**

	ACCEL. (G)	TIME t_1 (MSEC)	TIME t_2 (MSEC) ²
DRIVER	50.2	66.1	69.2
PASSENGER	48.1	71.8	74.8

MAXIMUM CHEST DEFLECTION (IN.)

DRIVER	2.3
PASSENGER	2.1

*As defined in FMVSS No. 208

**Defined as equal to or exceeding 0.003 sec. duration

TABLE 6 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #229	PASSENGER #314
HEAD	<u>Steering</u> <u>wheel upper rim</u>	<u>Chest</u>
CHEST	<u>Steering</u> <u>wheel lower 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>Easy</u>	<u>Easy</u>

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	<u>None</u>	<u>None</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 impacted the steering wheel lower rim as the dummy's head rotated downward impacting the steering wheel upper rim. The driver dummy was restrained by the three-point unbelt. The dummy rebounded rearward into the seat back as the dummy's head rotated rearward contacting the head restraint. The driver dummy came to rest in the driver's seat restrained by the three-point unbelt.

Right Front Passenger Dummy

Upon impact, the right front passenger dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated downward impacting the dummy's chest. The right front passenger dummy was restrained by the three-point unbelt. The dummy rebounded rearward into the seat back as the dummy's head rotated rearward contacting the head restraint. The right front passenger dummy came to rest in the right front passenger's seat restrained by the three-point unbelt.

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

MAKE/MODEL: Isuzu/Trooper
BODY STYLE: MPV
DATE OF MANUFACTURE: 10/92

VIN: JACDH58V9P7901892
NHTSA NO.: CP5701

WEBBING TENSION - RELIEVING DEVICE:

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

IF YES:

MAXIMUM SLACK RECOMMENDED IN OWNER'S MANUAL: _____ INCHES

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

IF NO, EXPLAIN:

THE WEBBING TENSION - RELIEVING DEVICE IS CANCELLED WHEN

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

OPEN-BODY VEHICLE (without doors): DOES THE MANUAL MEANS TO CANCEL THE WEBBING TENSION - RELIEVING DEVICE OPERATE PROPERLY? _____ YES
_____ NO

IF NO, EXPLAIN:

BELT CONTACT FORCE:

BELT CONTACT FORCE ON CHEST OF TEST DUMMY: 0.2 POUNDS

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

TABLE 7 FMVSS 208 COMFORT & CONVENIENCE DATA FOR MANUAL SEAT BELTS, CONT'D

MAKE/MODEL: Isuzu/Trooper

VIN: JACDH58V9P7901892

BODY STYLE: MPV

NHTSA NO.: CP5701

DATE OF MANUFACTURE: 10/92

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 7 FMVSS 208 COMFORT & CONVENIENCE DATA FOR MANUAL SEAT BELTS, CONT'D

MAKE/MODEL: Isuzu/Trooper

VIN: JACDH58V9P7901892

BODY STYLE: MPV

NHTSA NO.: CP5701

DATE OF MANUFACTURE: 10/92

ACCESSIBILITY, CONT'D:

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

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

ARE THE REMAINING TWO PARTS ACCESSIBLE UNDER NORMAL CONDITIONS?

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

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

Not applicable, the restraint system does not provide guides.

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

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

TABLE 8 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 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.:

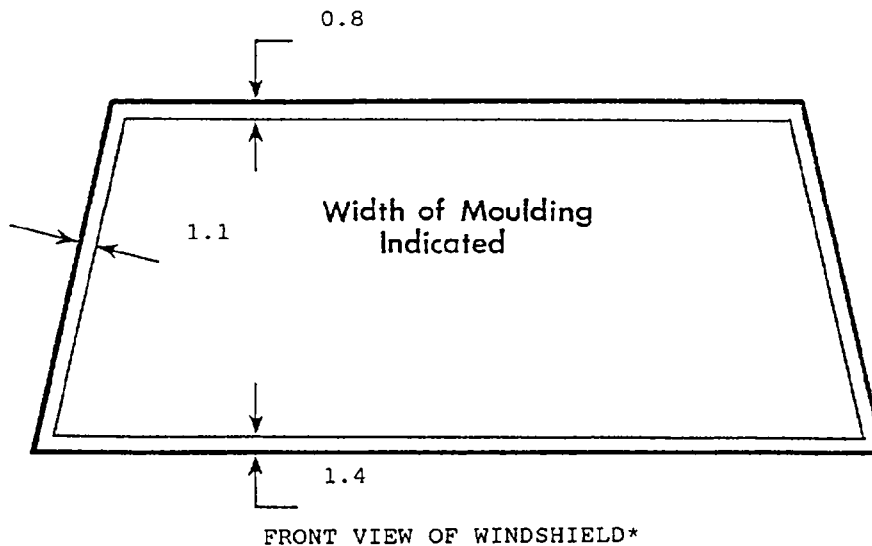
Plastic trim around outer perimeter, adhesive around inner perimeter.

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	81.5	81.5	100
LEFT SIDE	81.5	81.5	100
TOTAL	163.0	163.0	100

PRE-TEST WINDSHIELD MOUNTING MATERIAL TEMPERATURE: 71° F



LOSS OF WINDSHIELD RETENTION LENGTHS: None

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

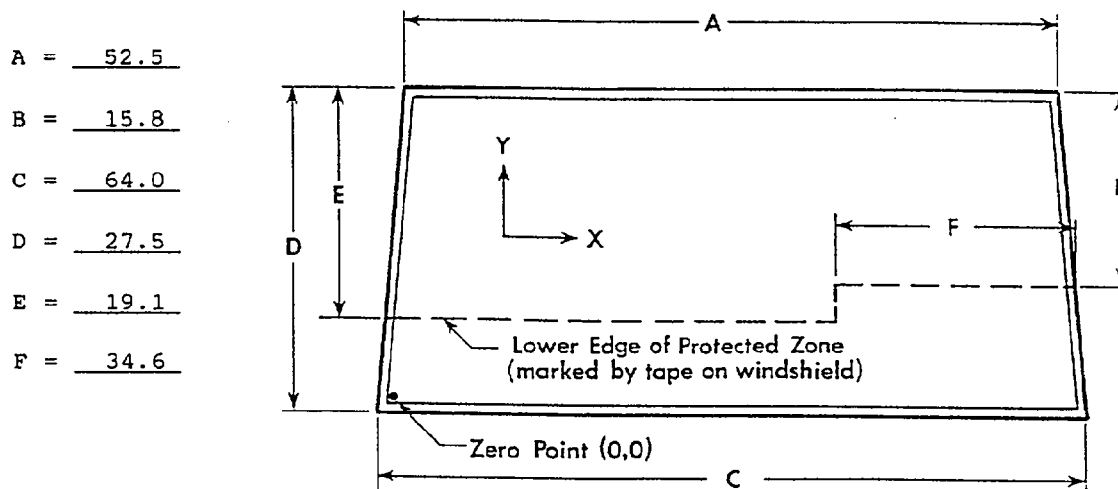
*INDICATE AREAS OF LOSS OF RETENTION, IF ANY, ON WINDSHIELD DIAGRAM.

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:



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: Isuzu/Trooper
NHTSA NO.: CP5701
FUEL SYSTEM CAPACITY: 22.5 GALLONS (FROM OWNER'S MANUAL)
USABLE CAPACITY: 22.2 GALLONS (FURNISHED BY COTR)
TEST VOLUME RANGE: 20.4 GALLONS TO 20.9 GALLONS (92-94% OF USABLE)
ACTUAL TEST VOLUME: 20.6 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 right side. The fuel lines run along the
right frame rail 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 12 FMVSS 301 POST-IMPACT TEST DATA

TEST VEHICLE NHTSA NO.: CP5701; TEST DATE: 04/21/93

VEHICLE MAKE/MODEL/BODY STYLE: Isuzu/Trooper/MPV

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.

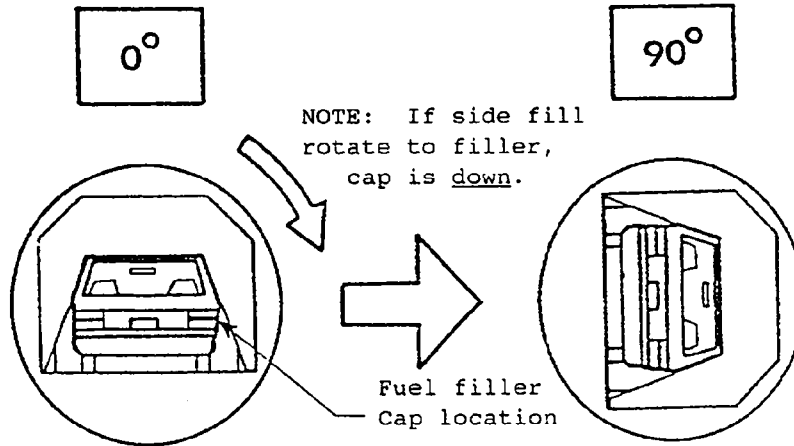
FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 6 FMVSS 301 STATIC ROLLOVER TEST DATA

NHTSA NO.: CP5701

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:

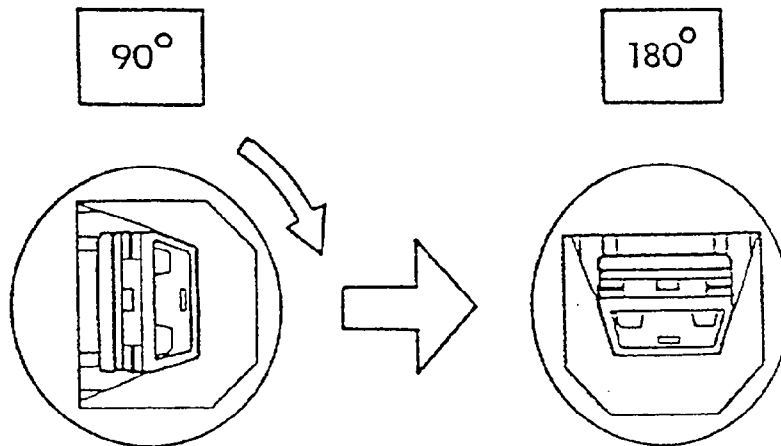
<u>0° TO 90° ROTATION (FUEL FILLER CAP DOWN)</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CP5701
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:

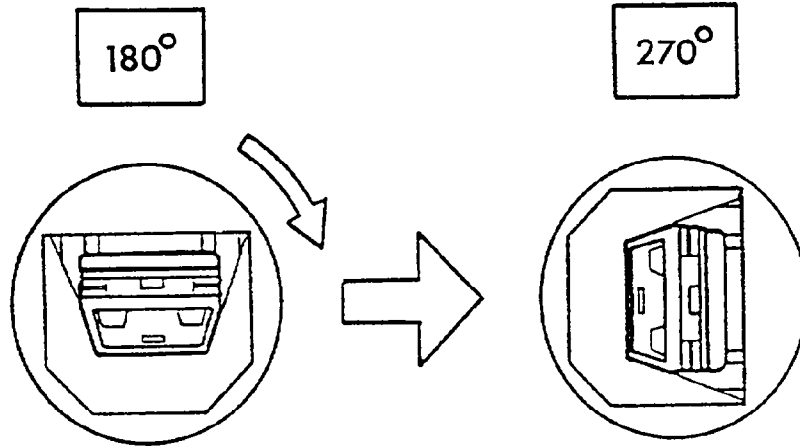
<u>90° TO 180° ROTATION</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CP5701
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:

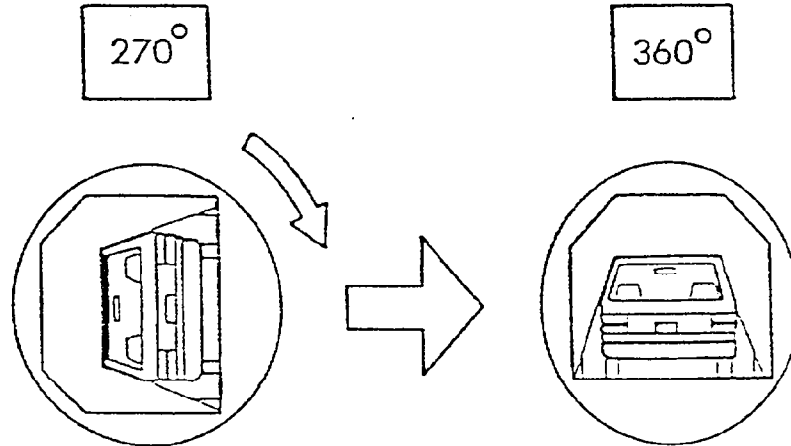
<u>180° TO 270° ROTATION</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 oz.	5 oz.
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 oz.	1 oz.

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CP5701
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

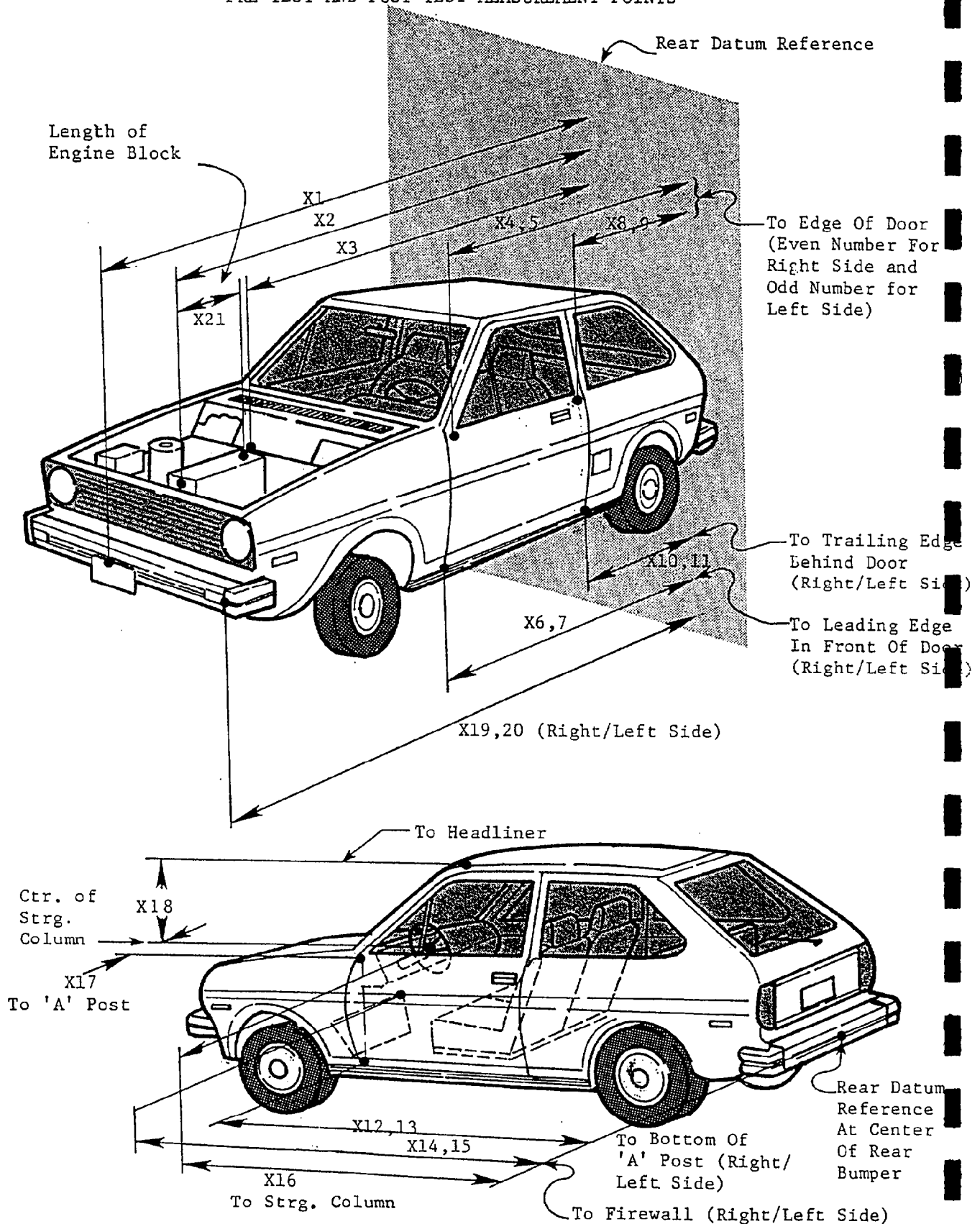
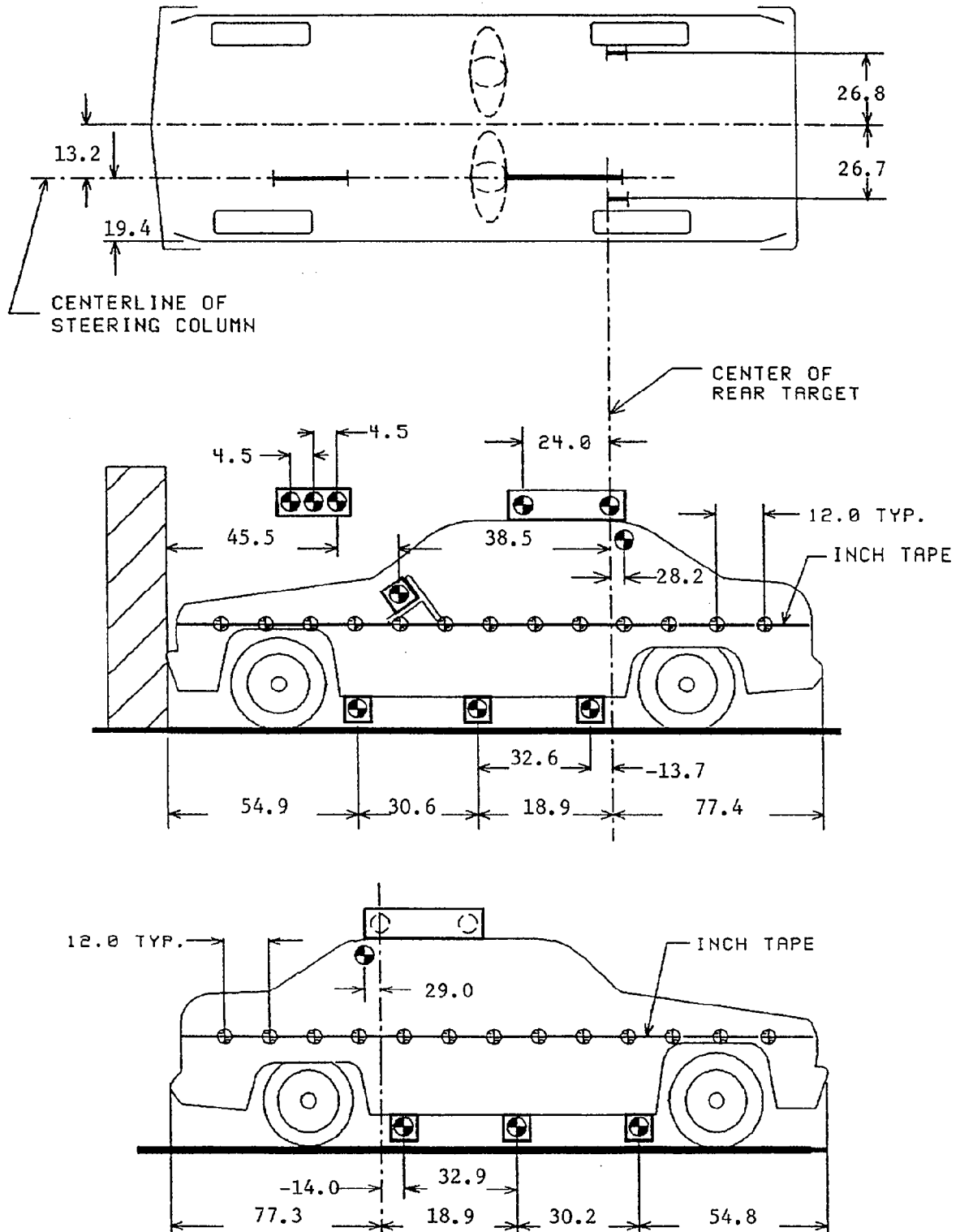


TABLE 13 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Isuzu/Trooper		TEST NUMBER: 930421		ALL MEASUREMENTS ARE IN INCHES		
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.		
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	186.3	170.3	16.0		
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	163.7	158.6	5.1		
X3	REAR SURFACE OF VEHICLE TO FIREWALL	143.4	143.7	-0.3		
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	132.1	131.8	0.3		
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	132.2	131.2	1.0		
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	130.9	129.6	1.3		
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	131.4	129.5	1.9		
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	91.6	90.8	0.8		
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	91.7	90.8	0.9		
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	91.4	89.8	1.6		
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	91.8	89.4	2.4		
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	131.3	130.0	1.3		
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	131.7	129.8	1.9		
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	143.0	142.0	1.0		
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	143.2	144.0	-0.8		
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	114.2	114.4	-0.2		
X17	CENTER OF STEERING COLUMN TO "A" POST	12.6	12.8	-0.2		
X18	CENTER OF STEERING COLUMN TO HEADLINER	20.0	19.4	0.6		
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	183.1	167.2	15.9		
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	183.0	168.8	14.2		
X21	LENGTH OF ENGINE BLOCK	16.0	16.0	0.0		

FIGURE 8

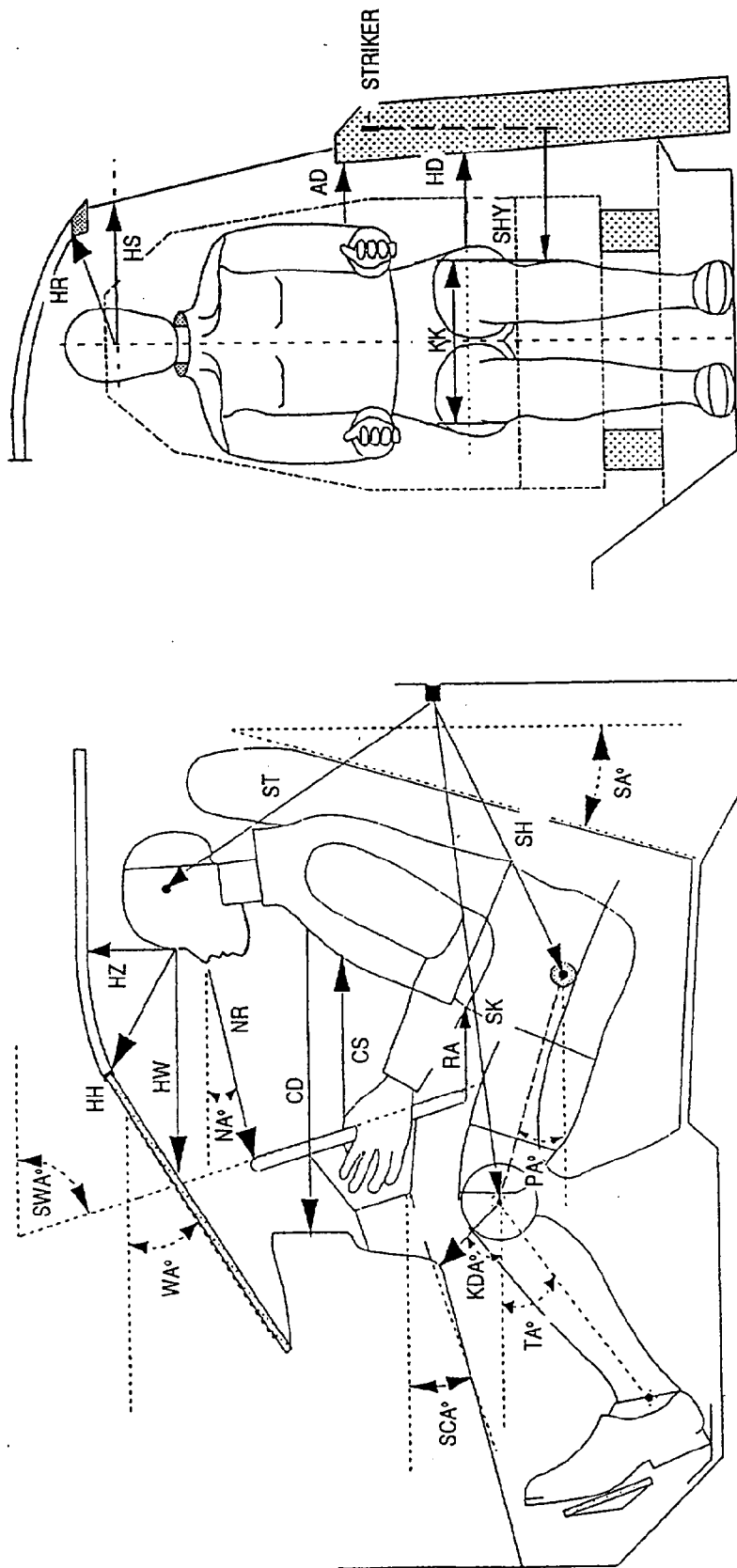
VEHICLE TARGET LOCATIONS



ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 9

DUMMY MEASUREMENT LOCATIONS FOR FRONT SEAT OCCUPANTS



VERTICAL TRANSVERSE PLANE

VERTICAL LONGITUDINAL PLANE

Passenger

Driver

TABLE 14 DUMMY MEASUREMENT DATA FOR FRONT SEAT OCCUPANTS

DESIGNATION	TYPE OF MEASUREMENT	DRIVER (SERIAL #229)	PASSENGER (SERIAL #314)
WA	WINDSHIELD ANGLE	41	NA
SWA	STEERING WHEEL ANGLE	62	NA
SCA	STEERING COLUMN ANGLE	28	NA
SA	SEAT BACK ANGLE	22	22
HZ	HEAD TO ROOF	8.9	8.2
HH	HEAD TO HEADER	16.1	15.6
HW	HEAD TO WINDSHIELD	22.5	21.4
HR	HEAD TO SIDE HEADER	10.4	10.1
NR	NOSE TO RIM	16.0	NA
NA	NOSE TO RIM ANGLE	17	NA
CD	CHEST TO DASH	20.3	22.6
CS	STEERING WHEEL TO CHEST	11.3	NA
RA	RIM TO ABDOMEN	6.2	NA
KDL	LEFT KNEE TO DASH	6.4	6.3
KDR	RIGHT KNEE TO DASH	6.2	6.5
KDA	OUTBOARD KNEE TO DASH ANGLE	15	20
PA	PELVIC ANGLE	10	5
TA	TIBIAL ANGLE	48	47
KK	KNEE TO KNEE	10.9	10.6
ST*	STRIKER TO HEAD	25.7	25.6
	STRIKER TO HEAD ANGLE	-82	-84
SK*	STRIKER TO KNEE	24.8	25.0
	STRIKER TO KNEE ANGLE	7	3
SH*	STRIKER TO H-POINT	8.8	9.5
	STRIKER TO H-POINT ANGLE	1	8
SHY	STRIKER TO H-POINT (Y DIR.)	8.5	8.5
HS	HEAD TO SIDE WINDOW	13.7	13.6
HD	H-POINT TO DOOR	6.2	6.2
AD	ARM TO DOOR	4.1	4.4

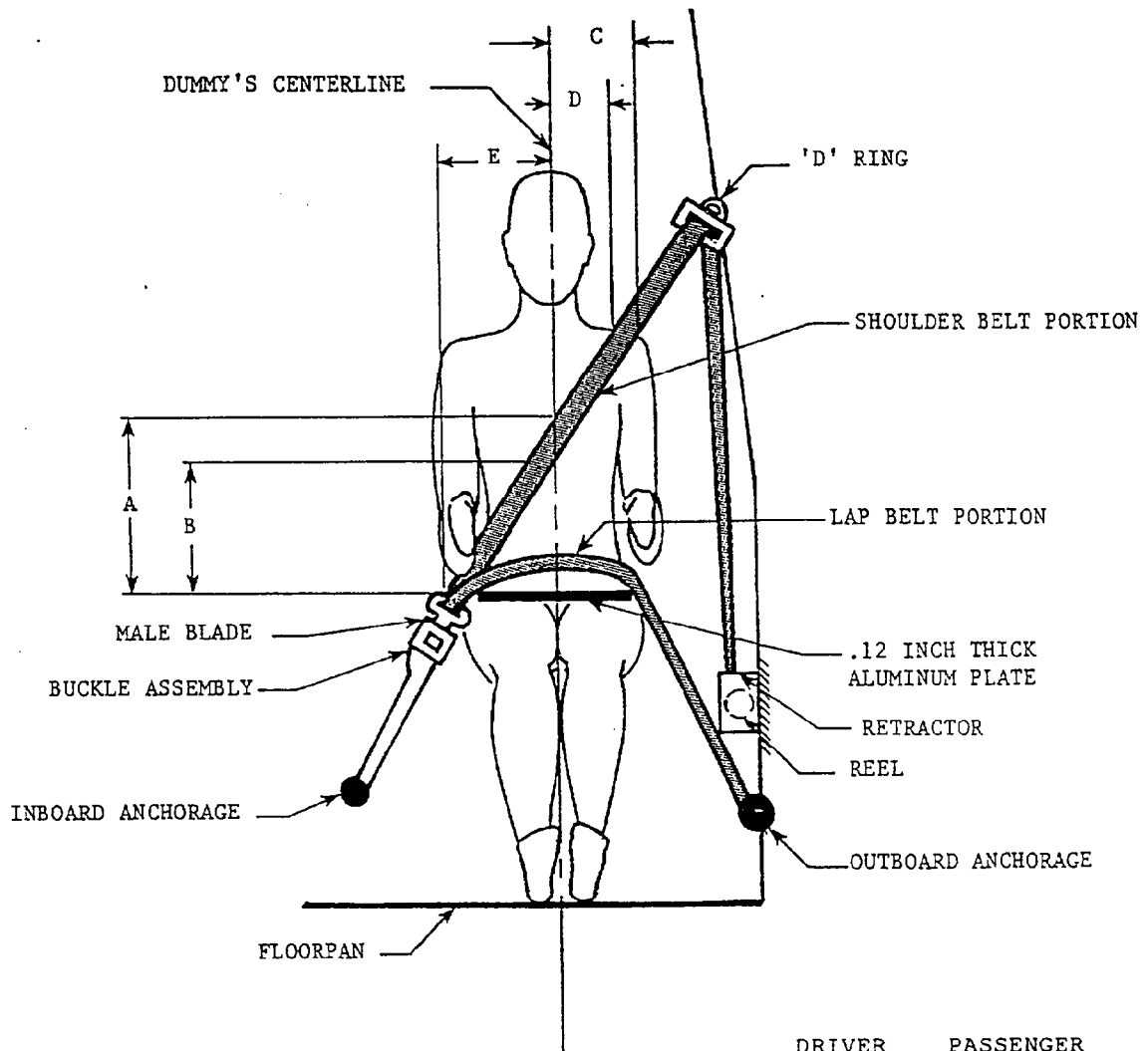
THE SEAT BACK ANGLE (SA°) IS MEASURED RELATIVE TO VERTICAL, ALL OTHER ANGLES ARE MEASURED RELATIVE TO HORIZONTAL.

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

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

ALL ANGLE MEASUREMENTS ARE IN DEGREES.

FIGURE 10 SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - TOP SURFACE OF ALUM. PLATE TO BELT UPPER EDGE	13.5	13.2
B - TOP SURFACE OF ALUM. PLATE TO BELT LOWER EDGE	10.5	10.0
C - DUMMY CENTERLINE TO OUTER EDGE OF BELT AT CHEST FLESH TOP	5.1	5.9
D - DUMMY CENTERLINE TO INNER EDGE OF BELT AT CHEST FLESH TOP	2.8	3.5
E - DUMMY CENTERLINE TO INTERSECTION OF UPPER TORSO BELT AND LAP BELT	8.8	8.9

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 11 CAMERA POSITIONS

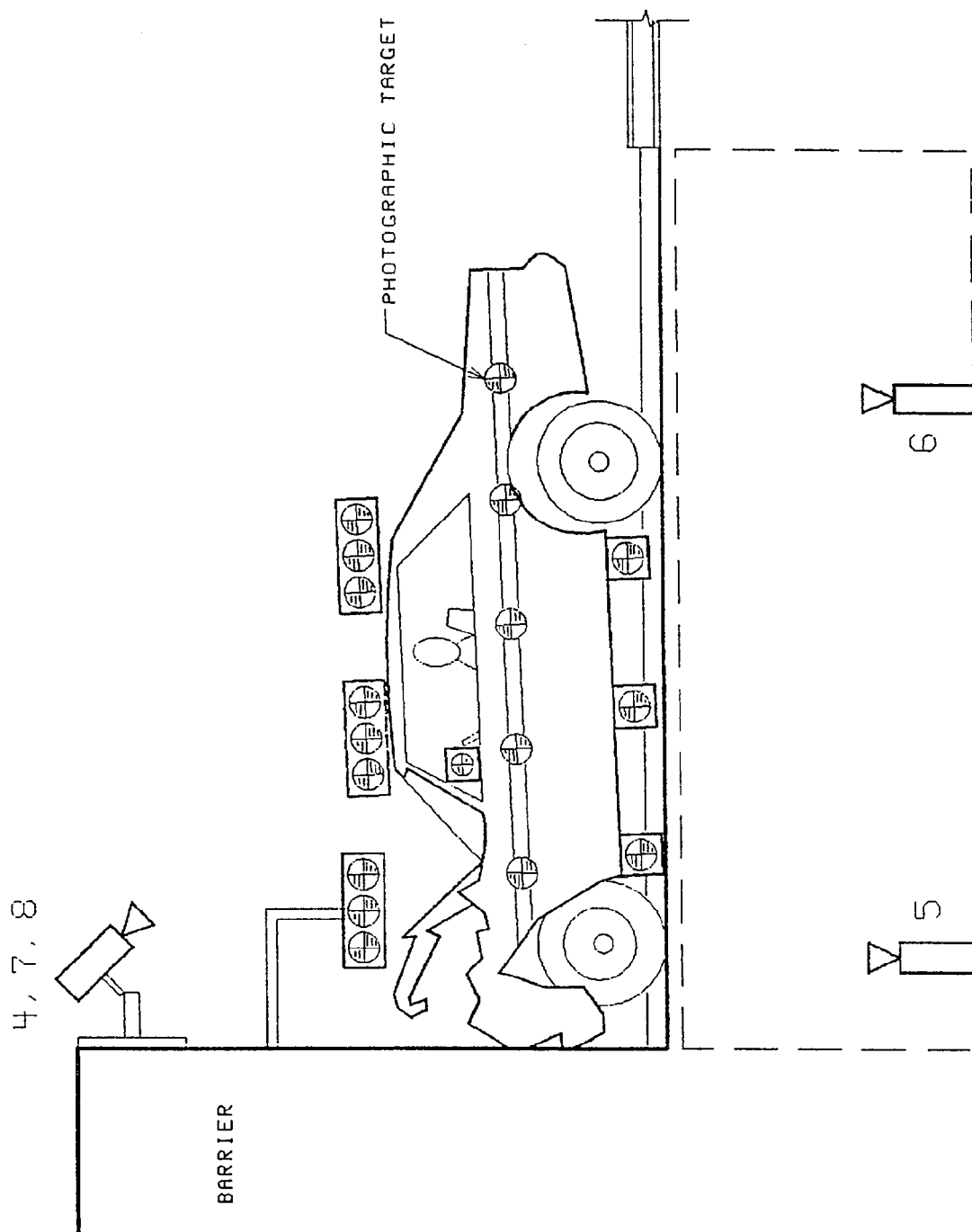


Diagram illustrating a vehicle motion picture system setup. The system includes a vehicle (car) positioned on a track, connected to a TOW CABLE and MONORAIL. A CONCRETE PAD is shown. Various numbered components (1-15) represent cameras and sensors. Labels include: REAL-TIME PANNING, UNIBILICAL CABLE, CABLE SUPPORT, TOW ROAD, BARRIER, and OVERHEAD STR. COL. MOTION TARGETS.

TABLE 15 MOTION PICTURE CAMERA LOCATIONS

TEST NO.:	CAMERA NO.	VIEW	CAMERA POSITIONS (IN)*			ANGLE** (DEG)	FILM PLANE		FILM SPEED (FPS)
			X	Y	Z		TO HEAD TARGET (IN)	LENS (MM)	
			VEHICLE: Isuzu Trooper multi-purpose passenger vehicle						
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	520
3		Left vehicle crush	-41.5	295.0	44.0	-4	218.0	25	998
4		Windshield front view	-6.0	0.0	85.0	-40	NA	13	490
5		Pit-left subframe sidemember	-8.0	29.0	-16.0	90	NA	13	1002
6		Pit-right subframe sidemember	-7.0	30.0	-12.0	90	NA	13	995
7		Passenger front view	-4.5	-13.8	93.0	-50	NA	17	500
8		Driver front view	-6.8	14.5	93.0	-50	NA	17	498
9		Driver kinematics	-157.3	116.0	87.0	-27	94.0	25	502
10		Passenger kinematics	-152.1	-116.0	87.0	-26	101.0	25	505
11		Right windshield intrusion	-38.1	-306.1	44.0	0	NA	50	500
12		Left windshield intrusion	-53.0	309.4	42.3	0	NA	50	505
13		Steering column motion	-97.0	286.0	103.0	-14	NA	25	505
14		Steering column motion	-97.0	286.0	75.1	-9	NA	25	510
15		Passenger kinematics	-38.8	-293.0	45.3	-4	236.0	25	1015
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

930421

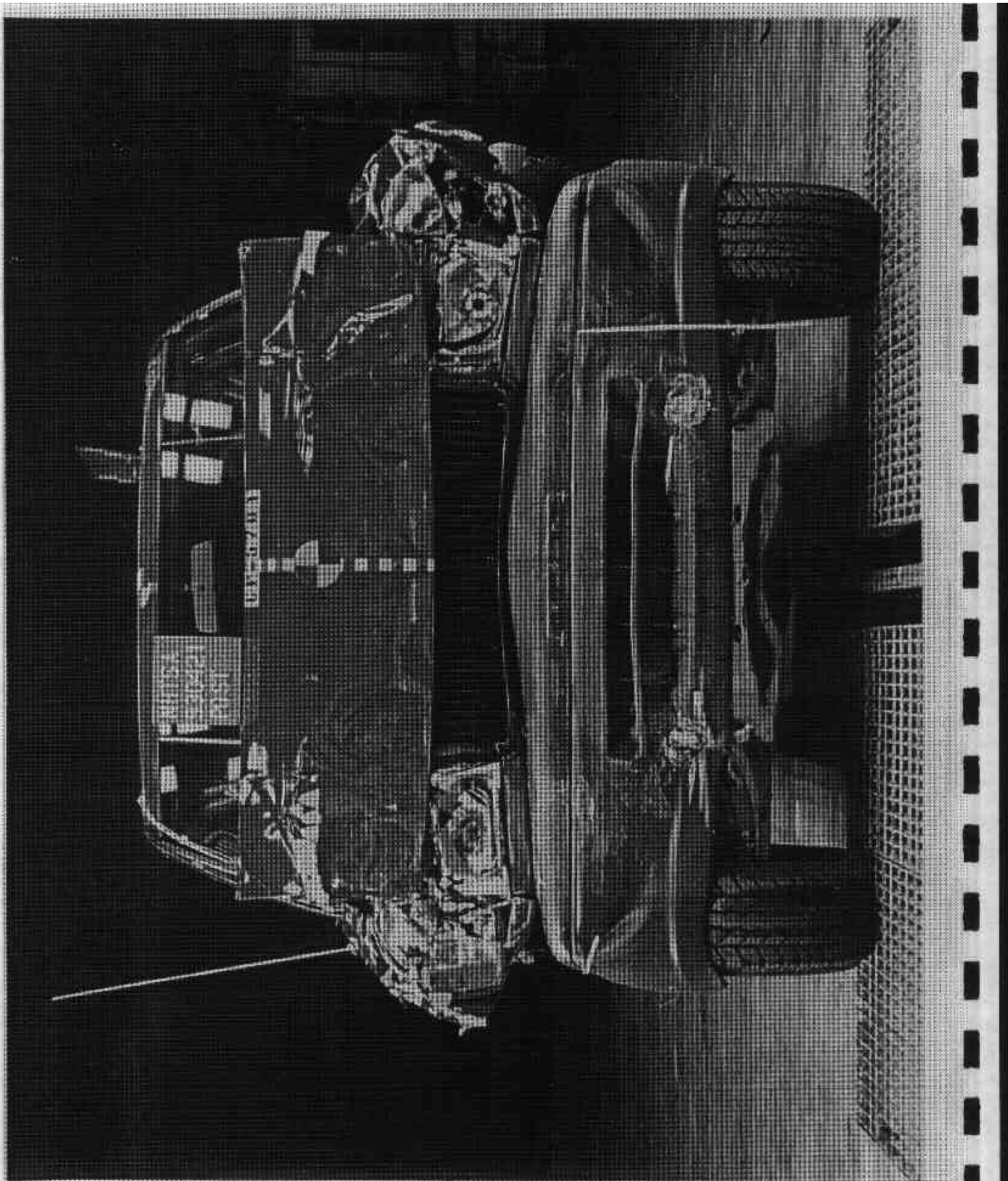


Figure A-2. POST-TEST FRONT VIEW
A-3

930421

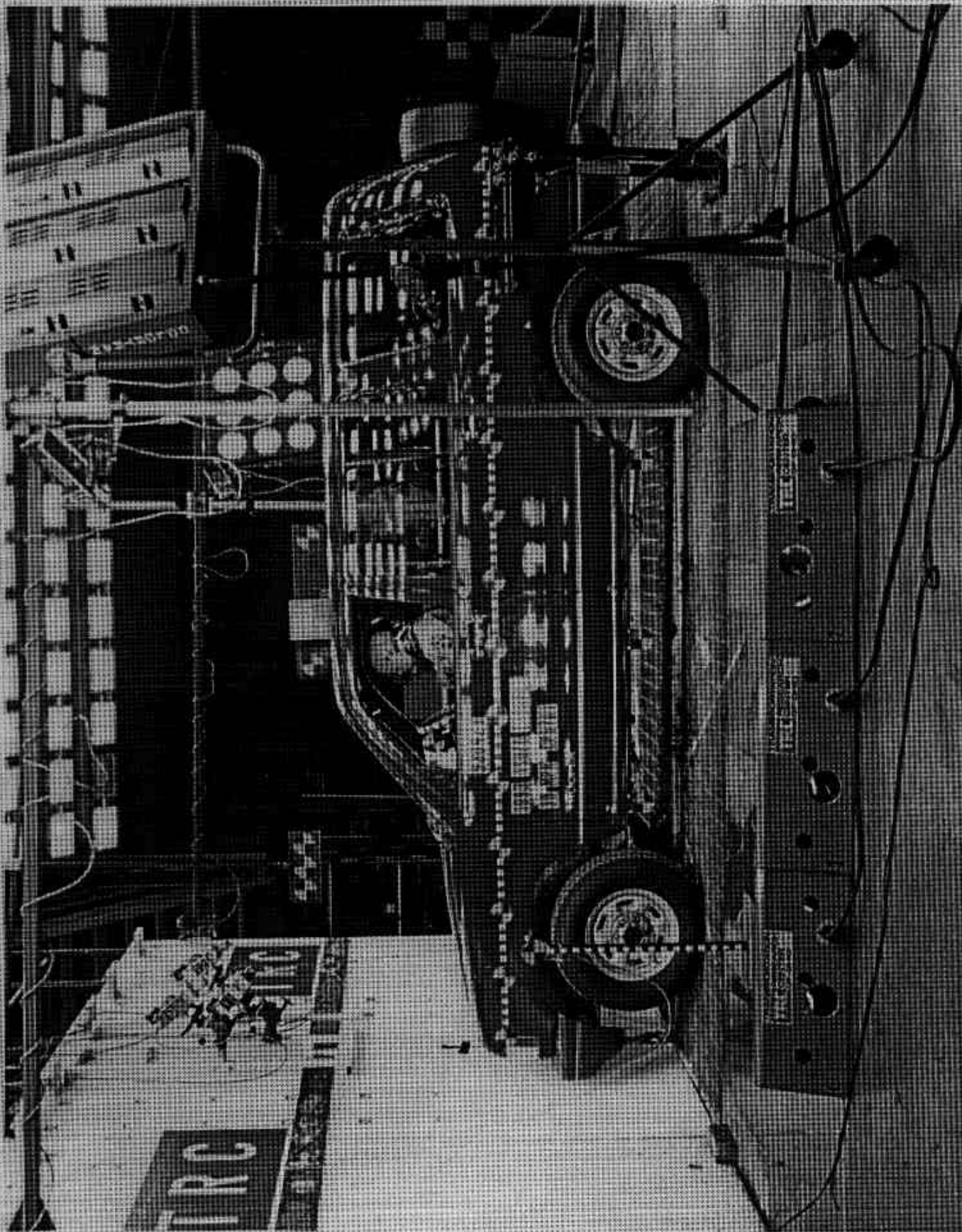


Figure A-3. PRE-TEST LEFT SIDE VIEW

A-4

930421

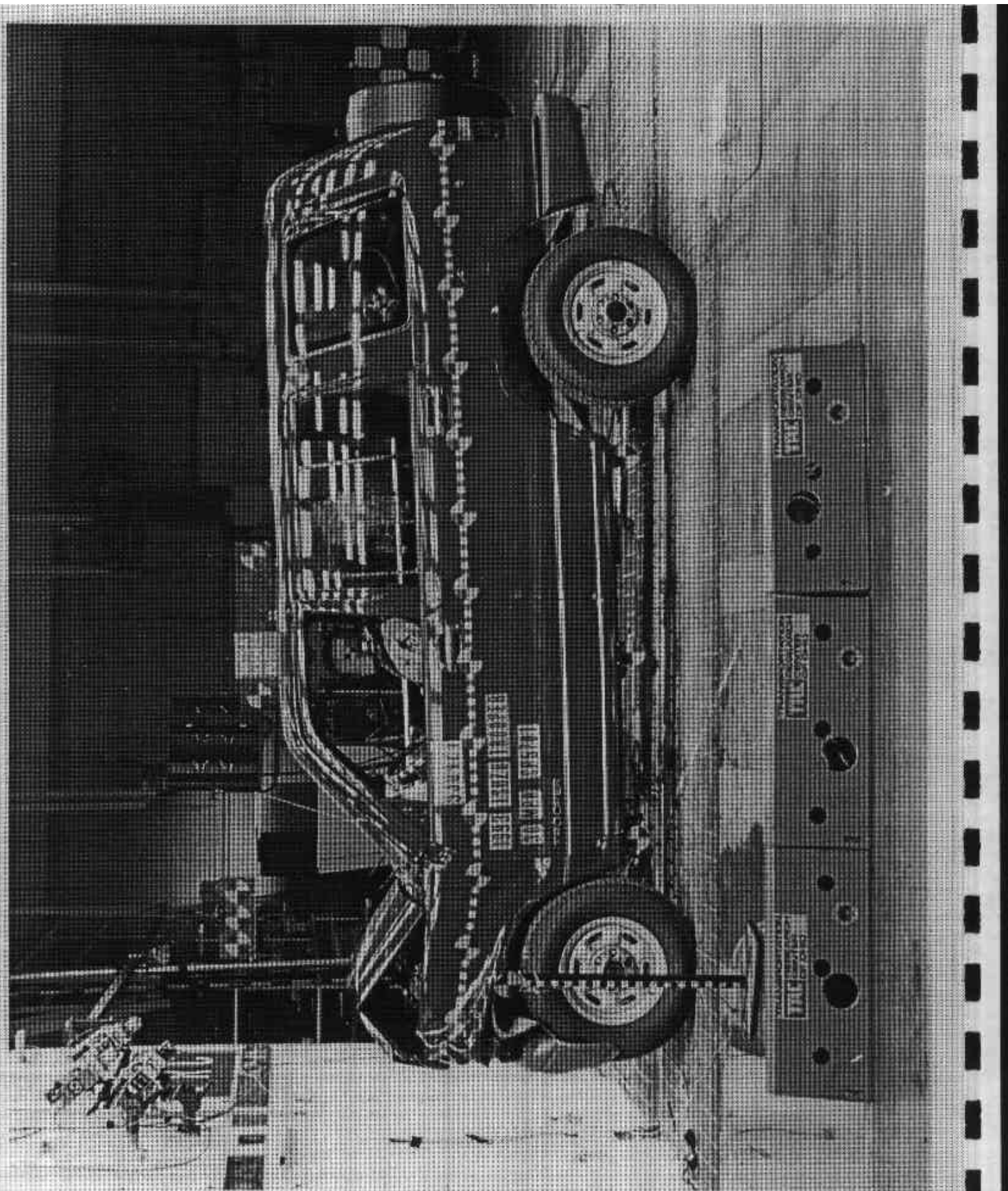


Figure A-4. POST-TEST LEFT SIDE VIEW
A-5

930421

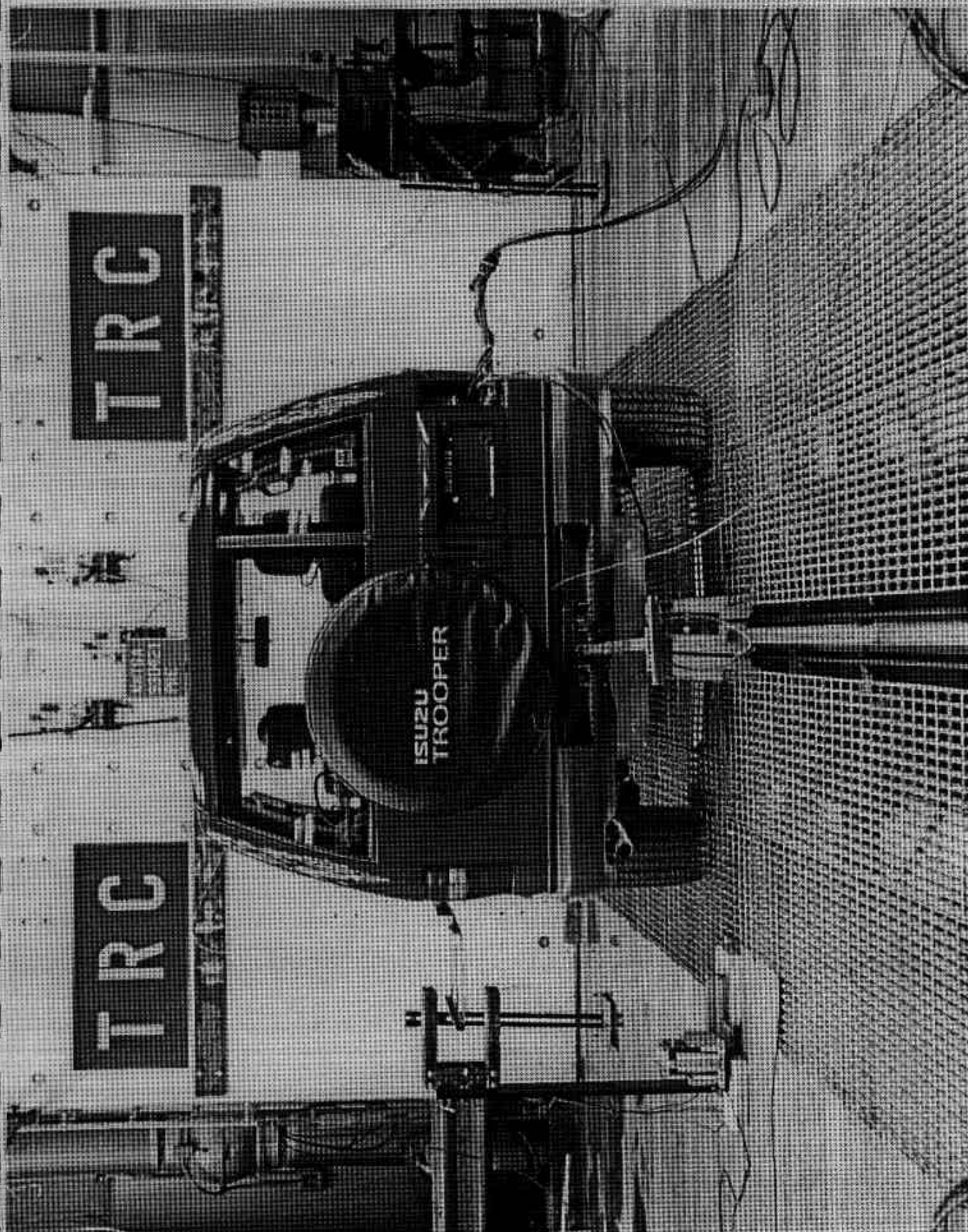


Figure A-5. PRE-TEST REAR VIEW

A-6

930421

TRC

TRC

AMTSA
S&P
POST



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

930421

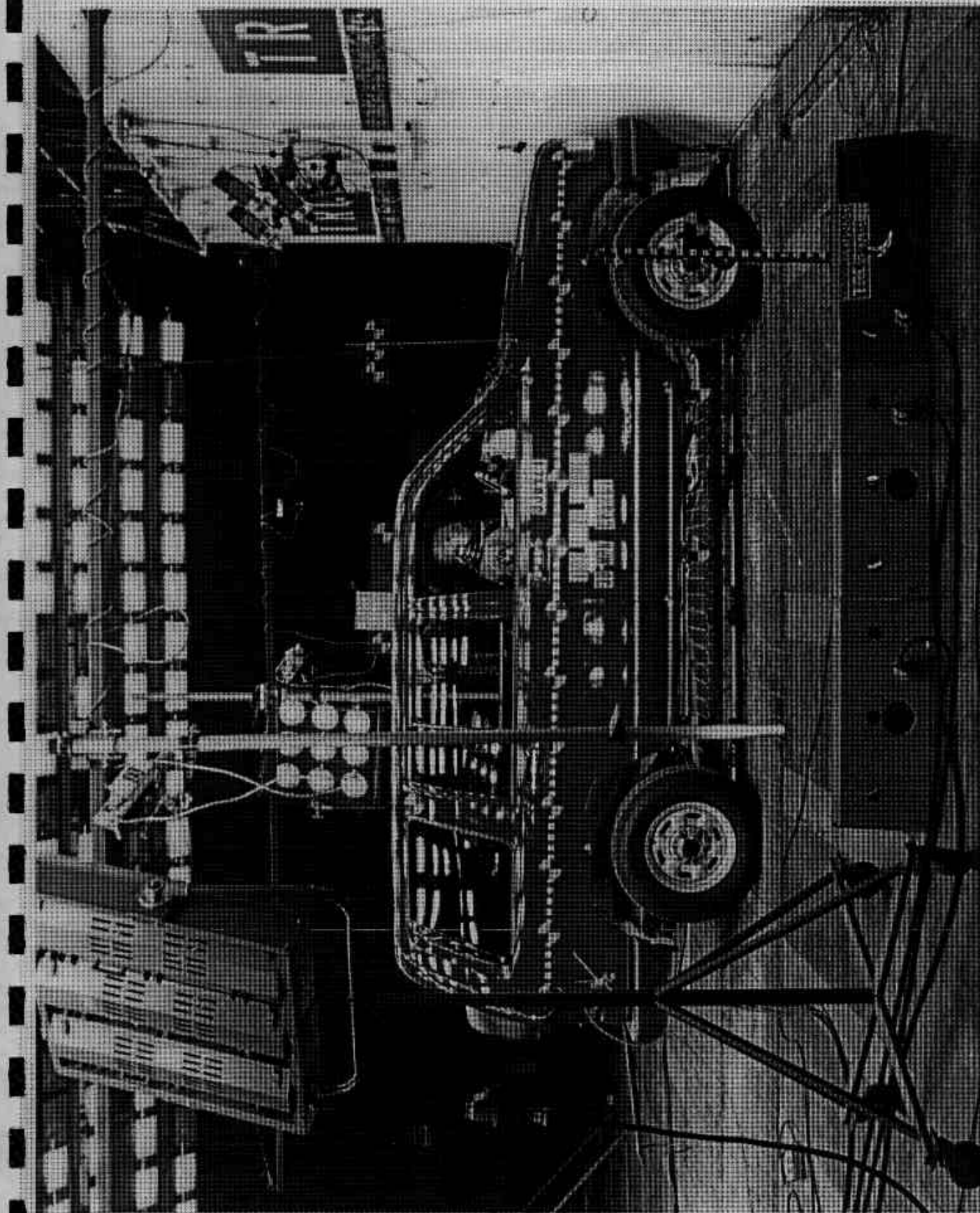


Figure A-7. PRE-TEST RIGHT SIDE VIEW

A-8

930421

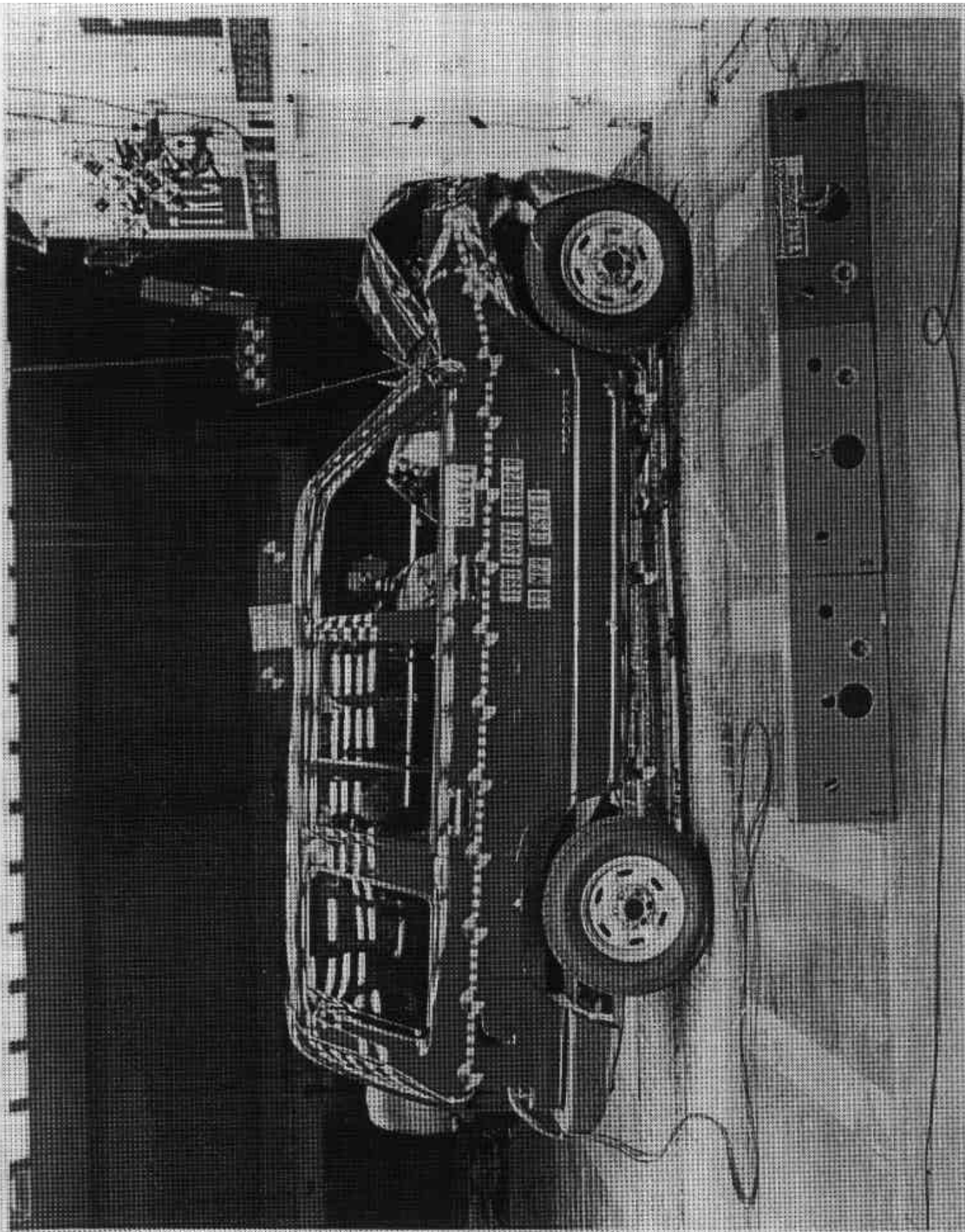


Figure A-8. POST-TEST RIGHT SIDE VIEW

A-9

930421



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

A-10

930421

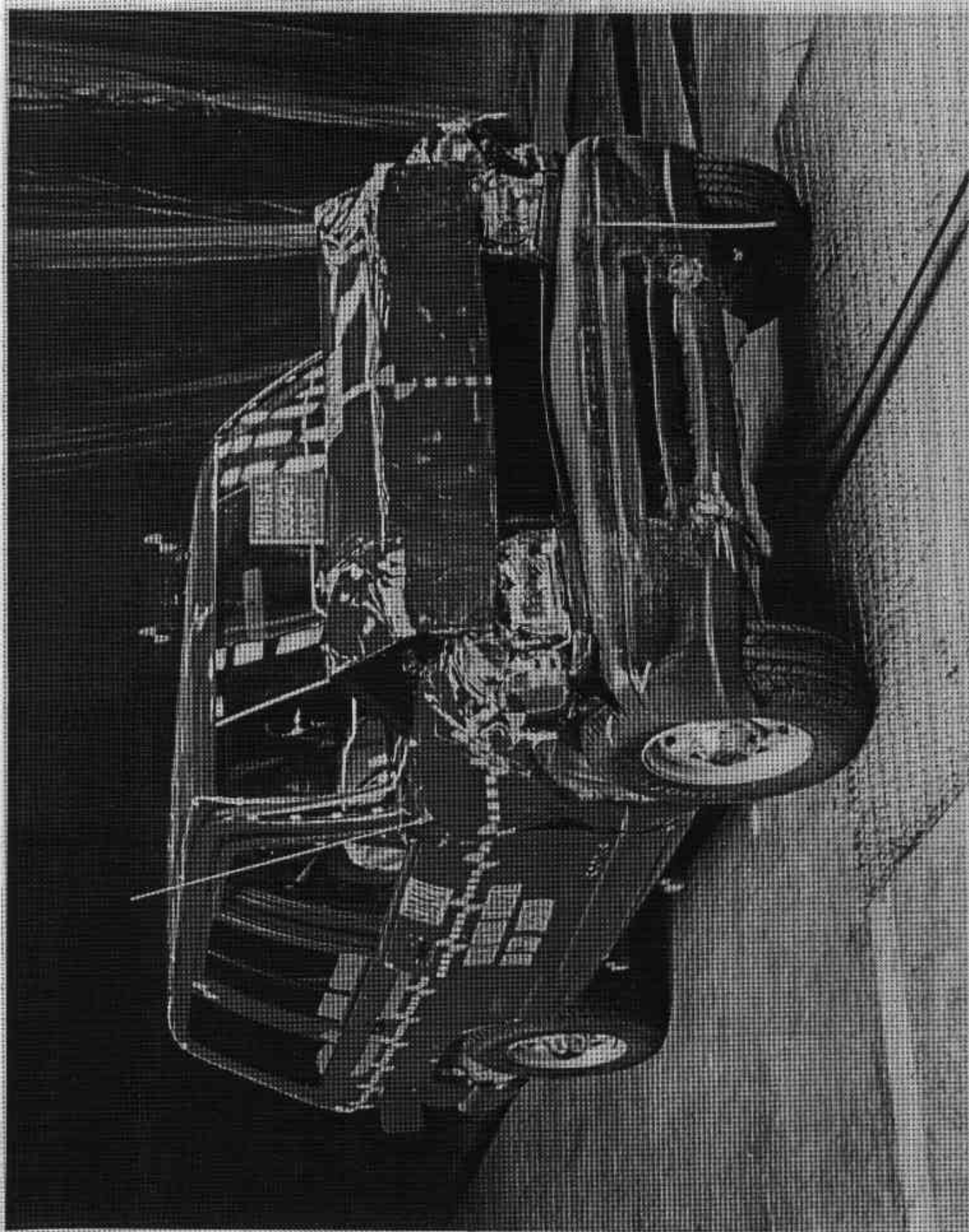


Figure A-10. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-11

930421

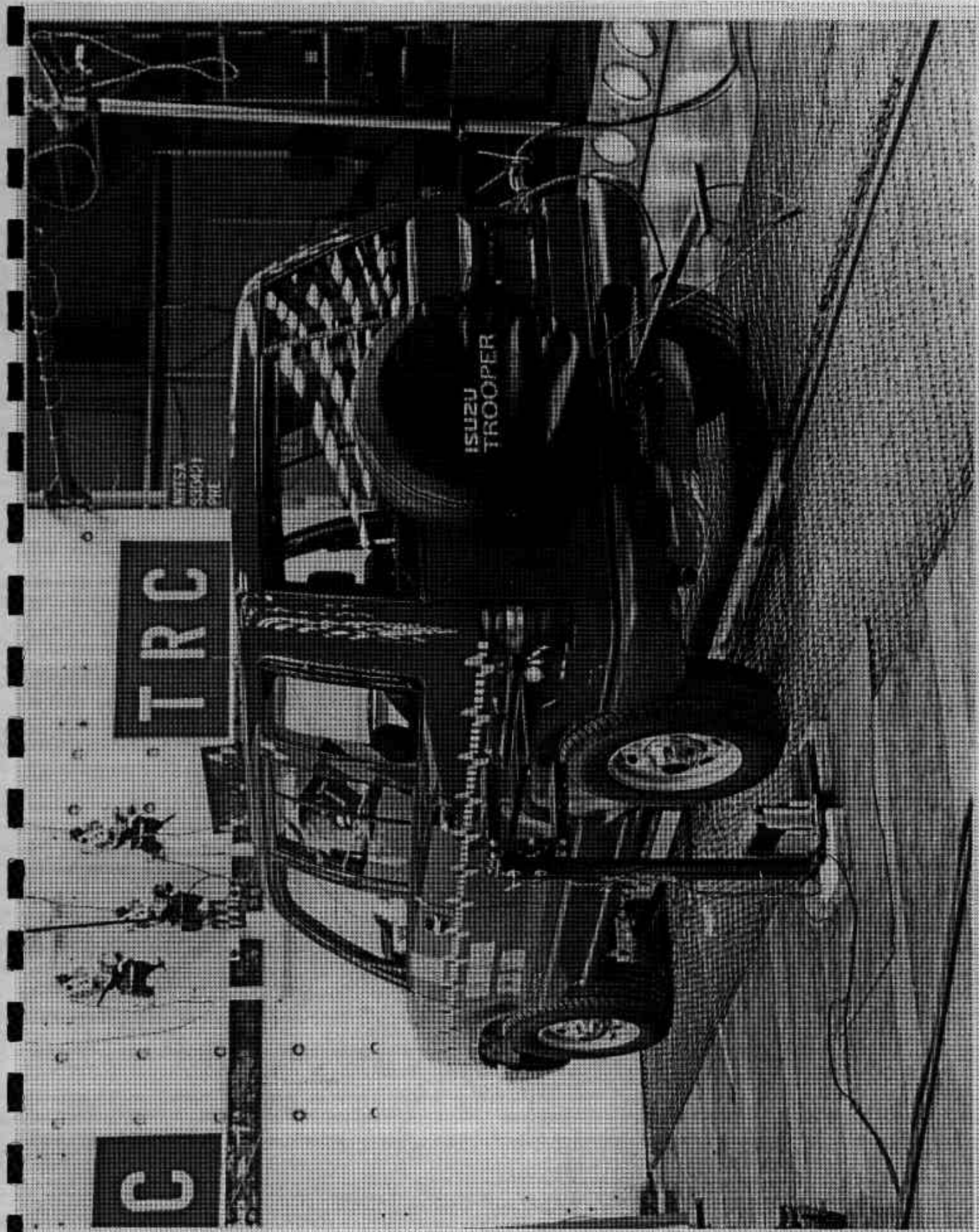


Figure A-11. PRE-TEST LEFT REAR THREE-QUARTER VIEW

A-12

930421

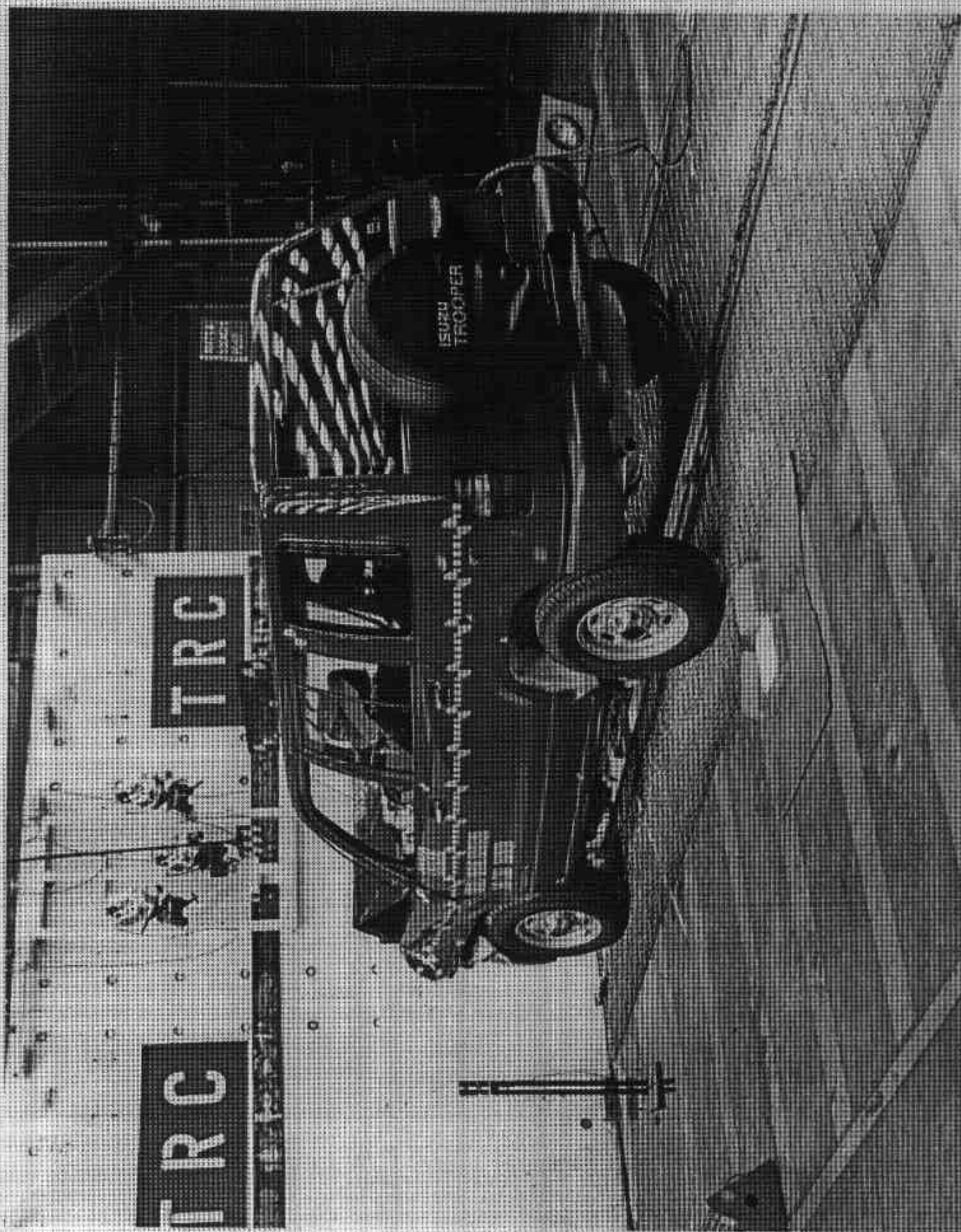


Figure A-12. POST-TEST LEFT REAR THREE-QUARTER VIEW

A-13

930421



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

930421

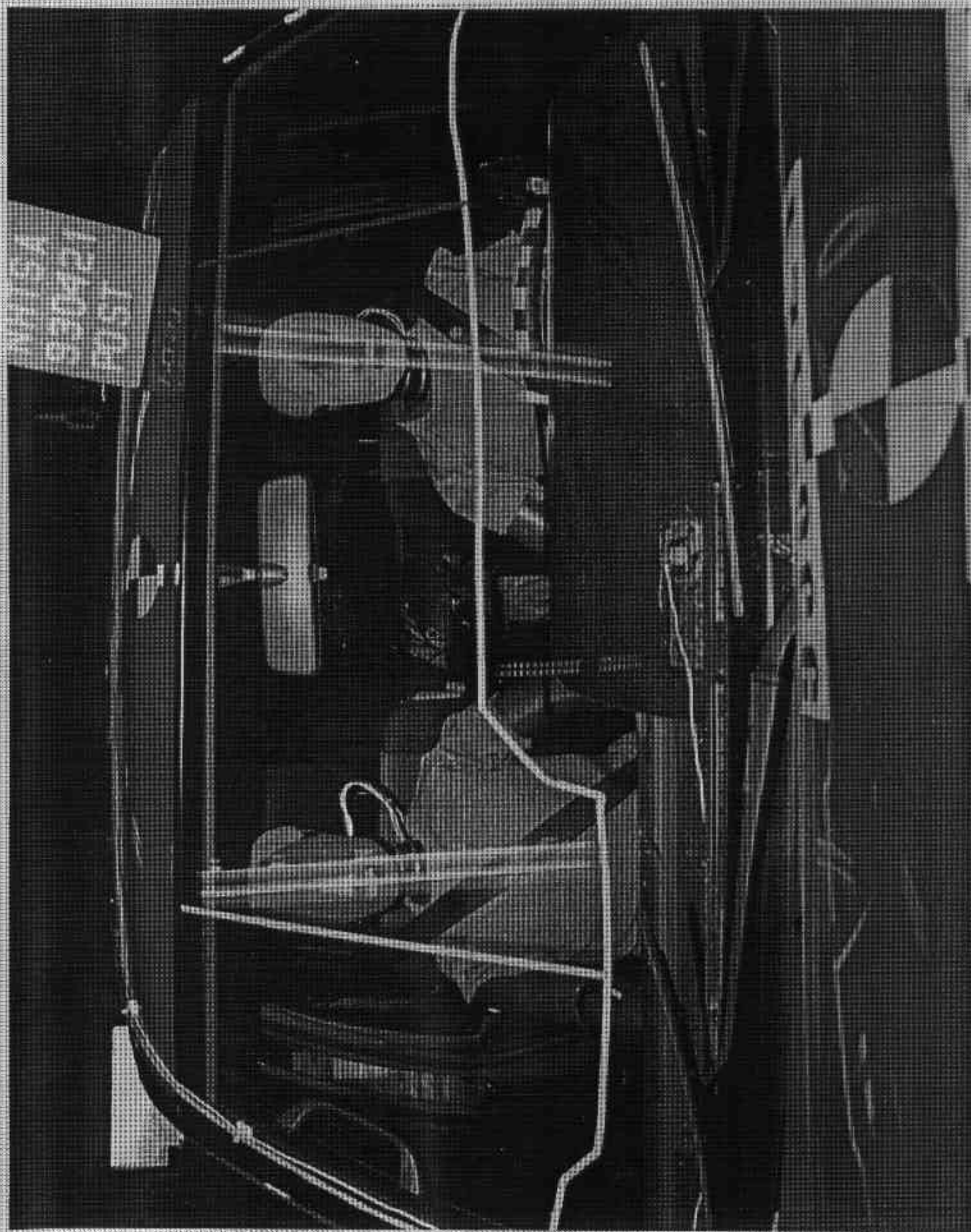


Figure A-14. POST-TEST WINDSHIELD VIEW
A-15

930421

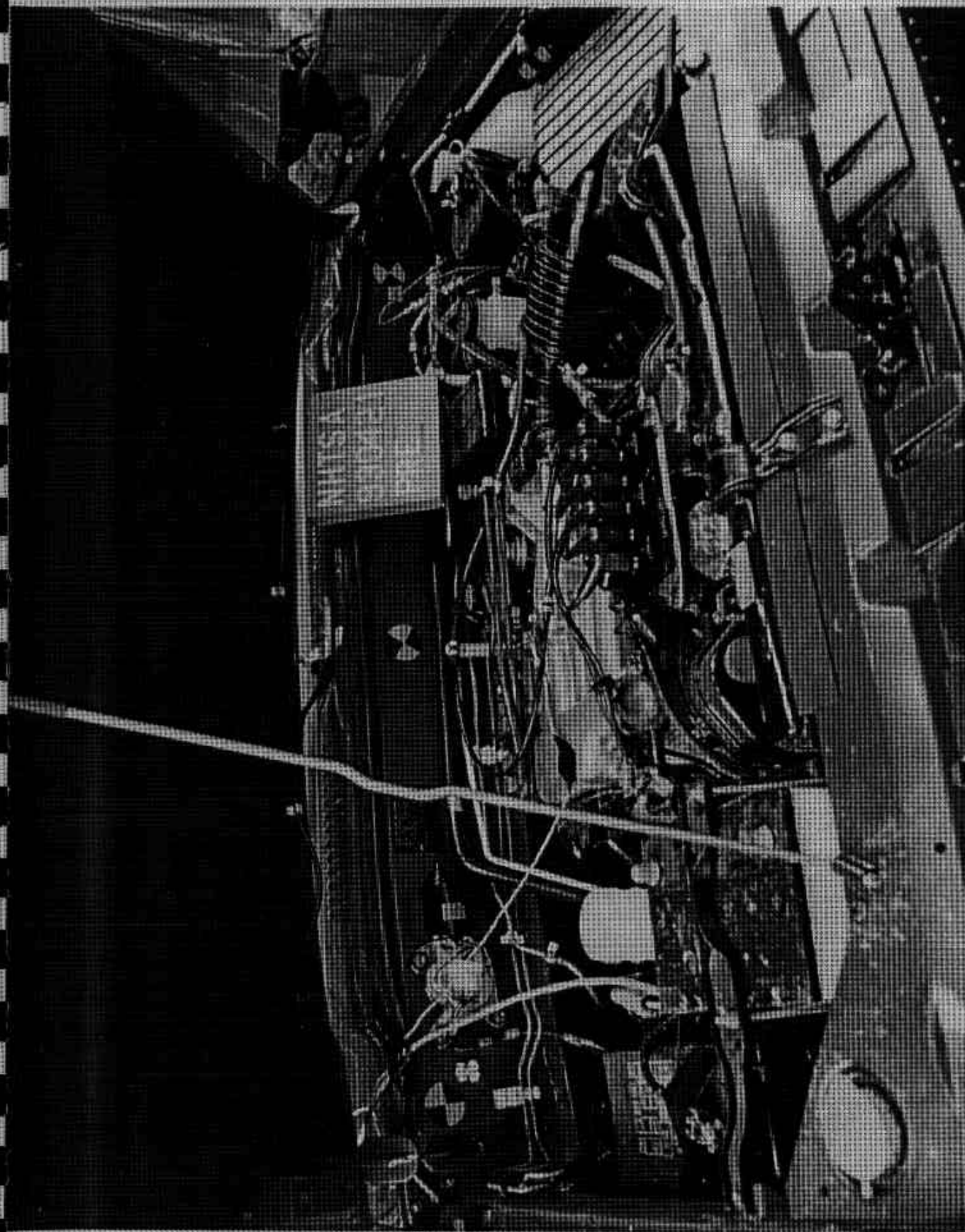


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW

A-16

930421



Figure A-16. POST-TEST ENGINE COMPARTMENT VIEW

A-17

930421

NHTSA
930421
PRE

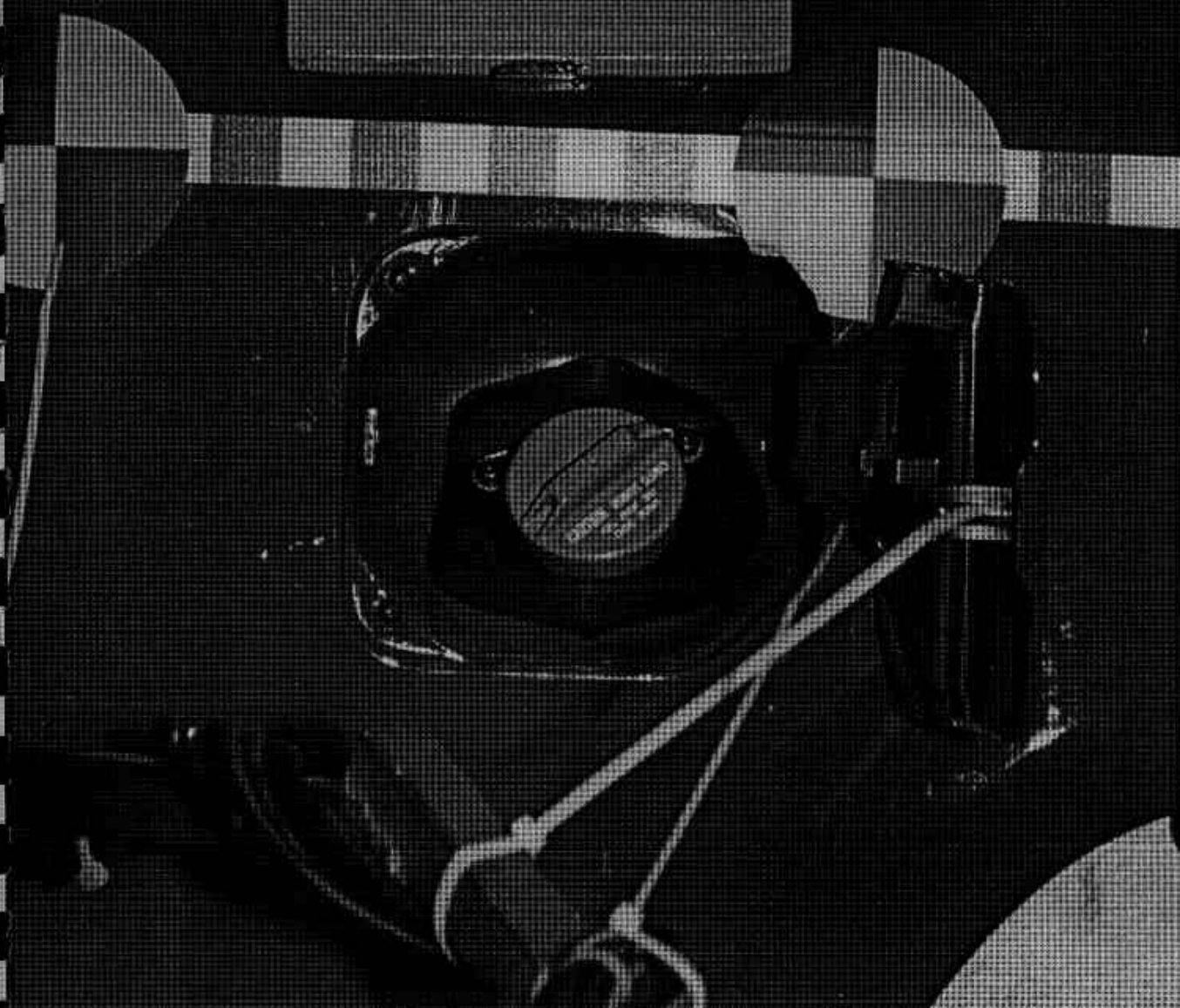


Figure A-17. PRE-TEST FUEL FILLER CAP VIEW



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

A-19

930421

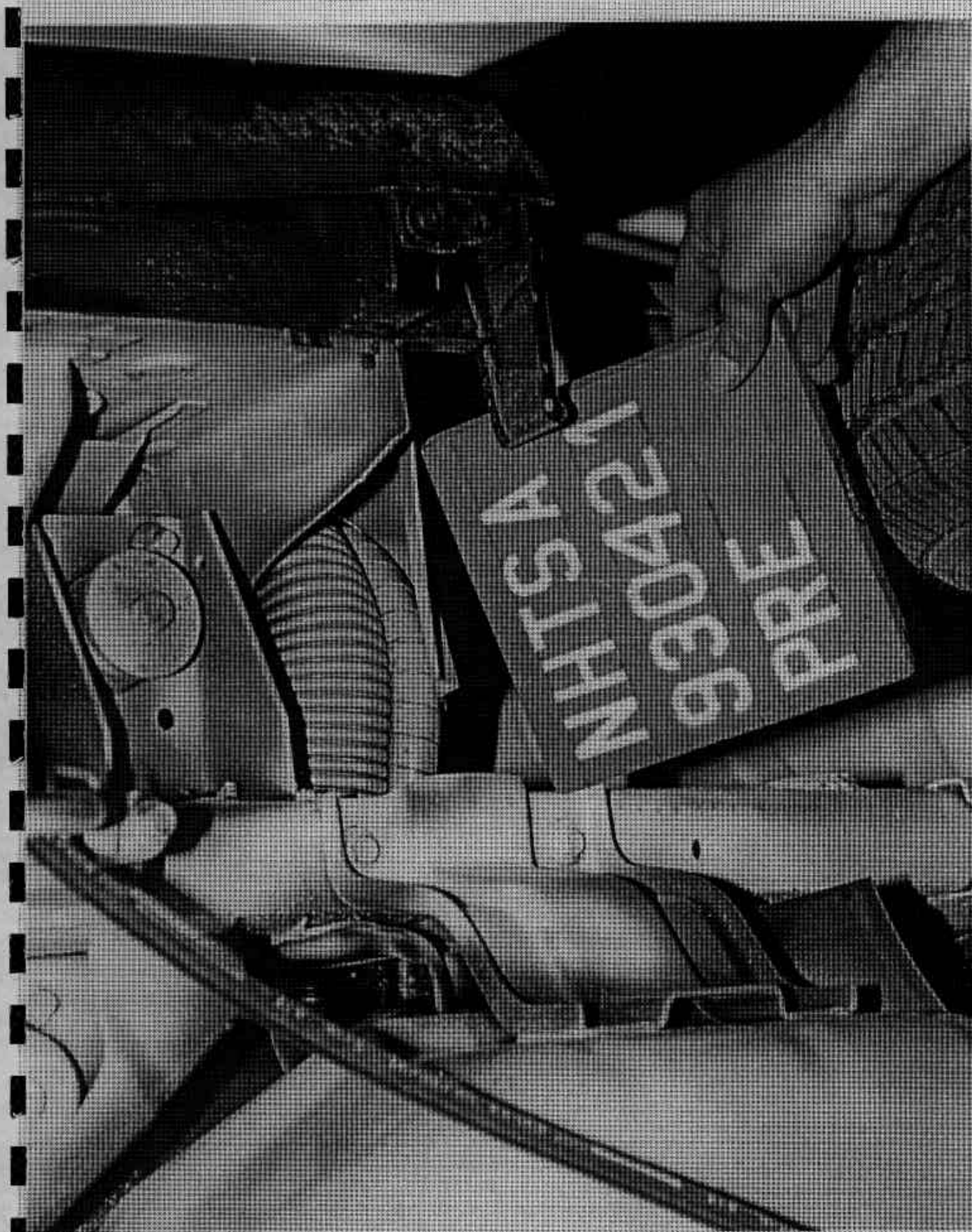


Figure A-19. PRE-TEST FUEL FILLER NECK VIEW

A-20

930421



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

930421

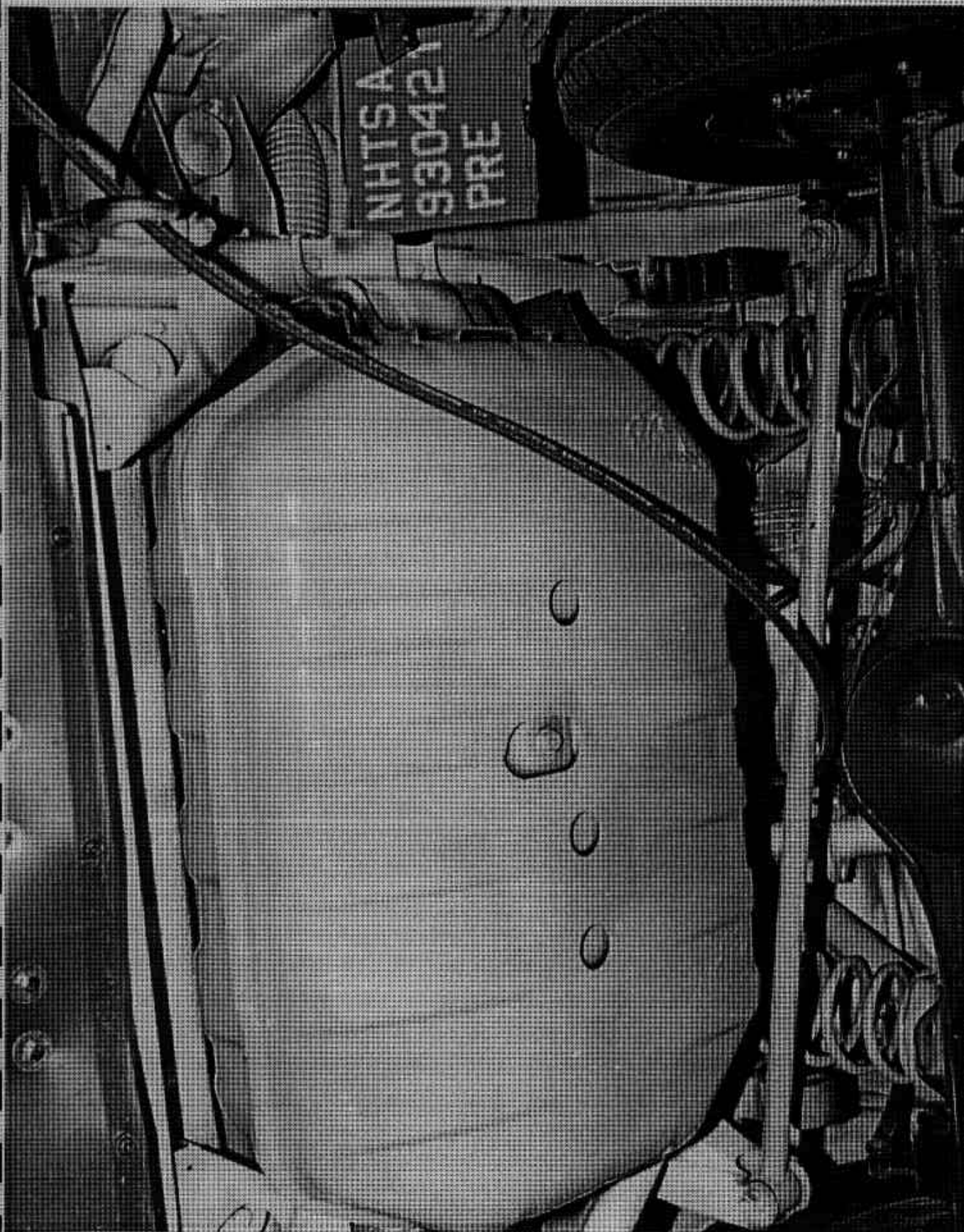


Figure A-21. PRE-TEST FUEL TANK VIEW

A-22

930421

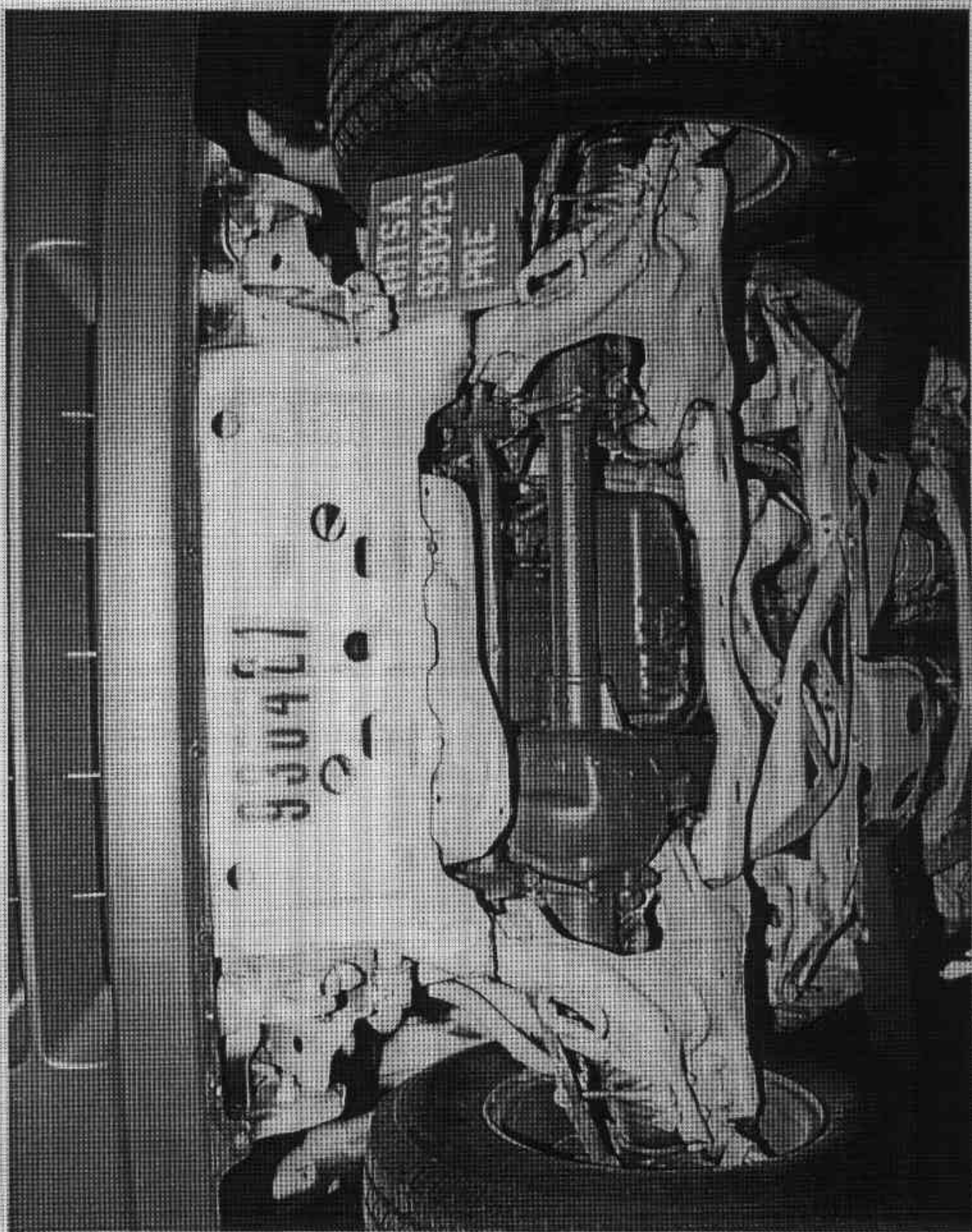


Figure A-22. PRE-TEST FRONT UNDERBODY VIEW

A-23

930421

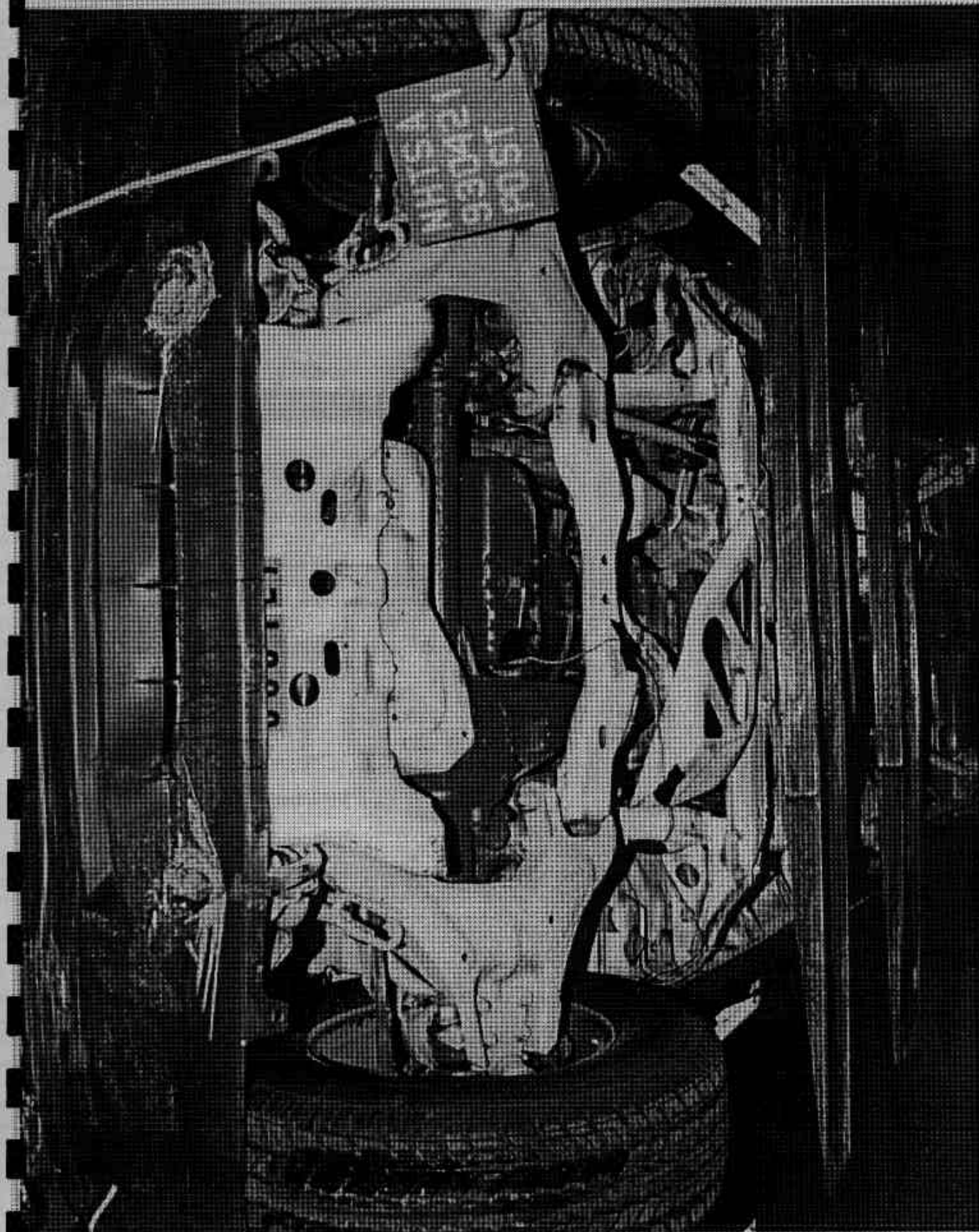


Figure A-23. POST-TEST FRONT UNDERBODY VIEW

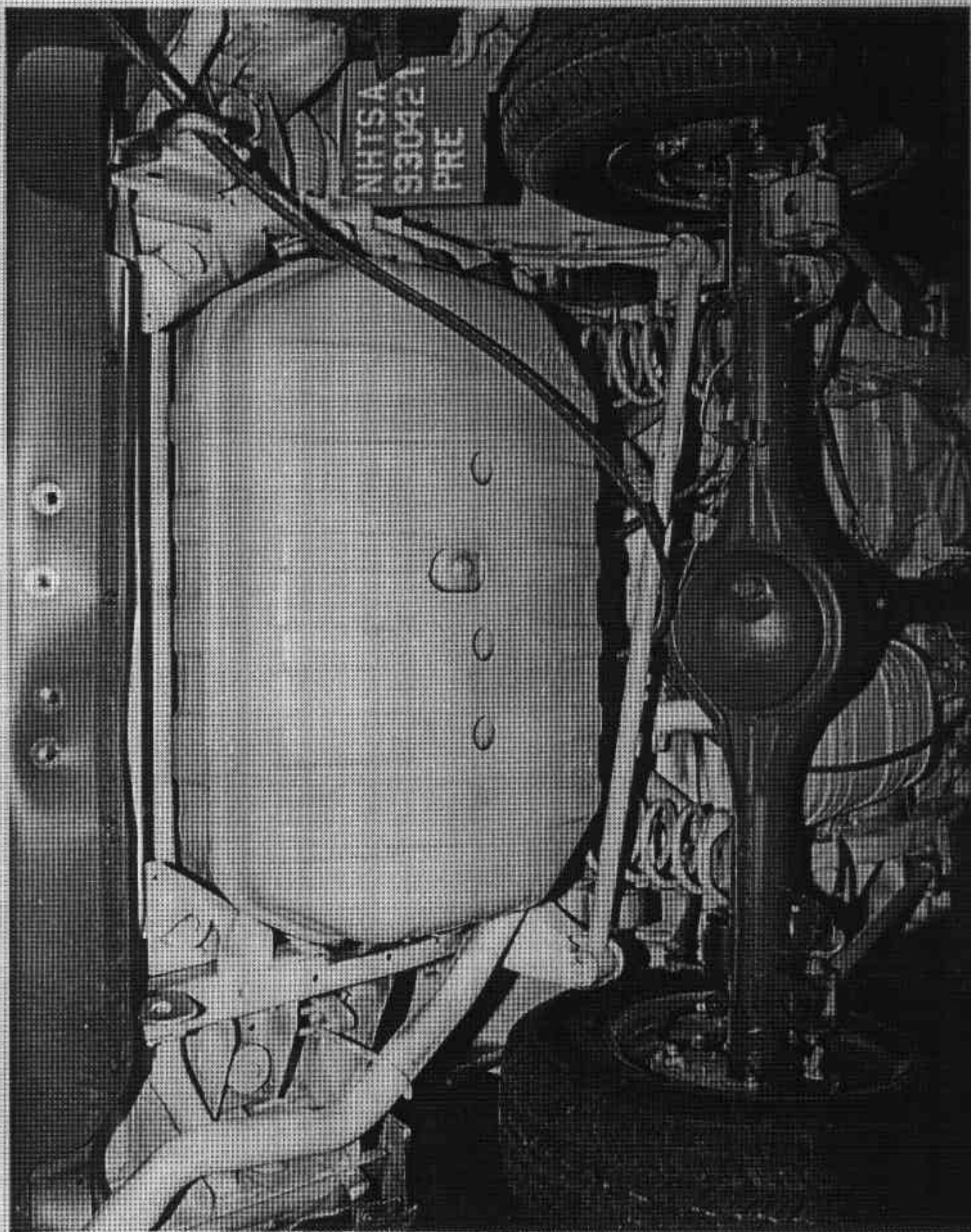


Figure A-24. PRE-TEST REAR UNDERBODY VIEW

A-25

930421

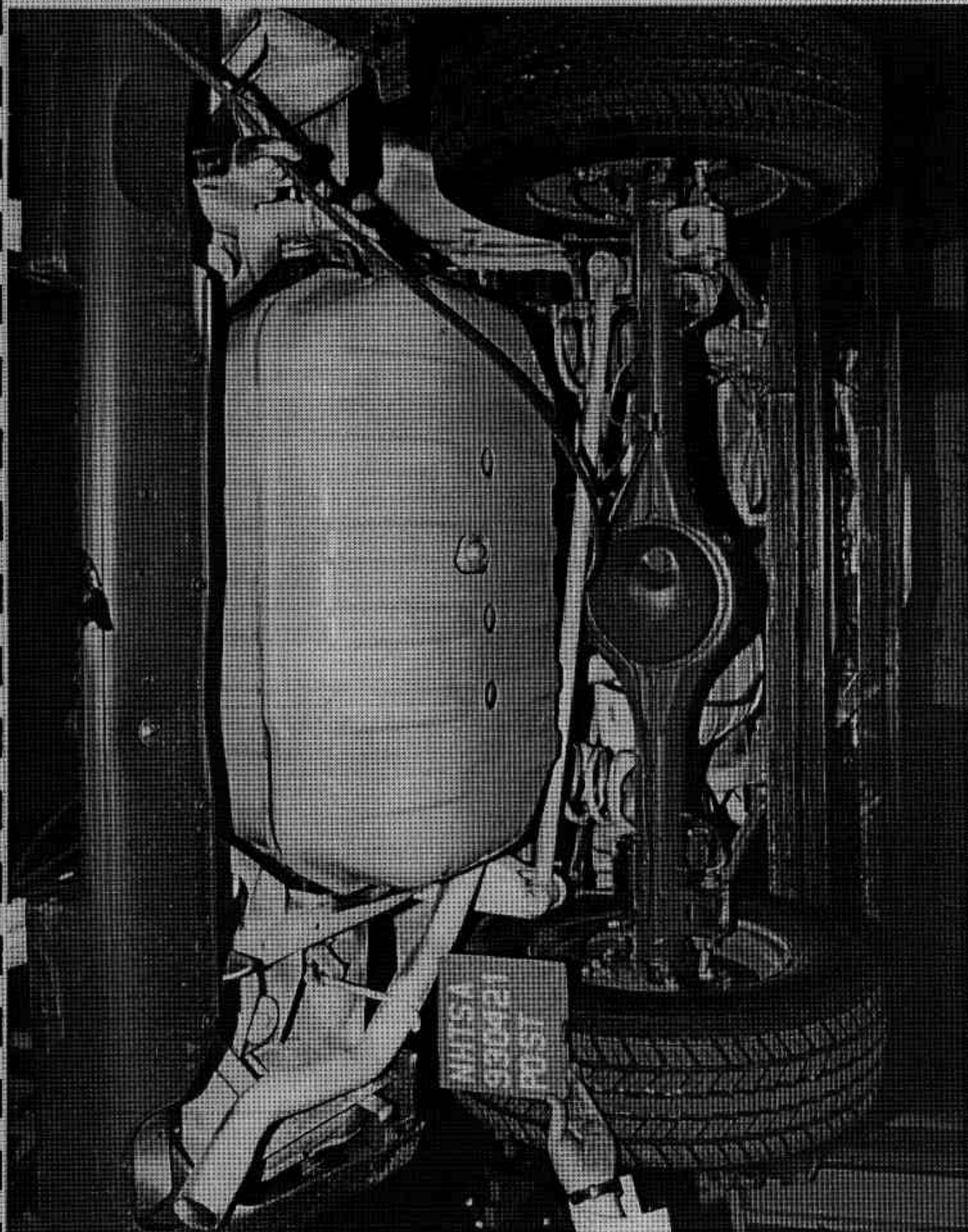


Figure A-25. POST-TEST REAR UNDERBODY VIEW

A-26

930421



Figure A-26. PRE-TEST BALLAST LOCATION VIEW

A-27

930421



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

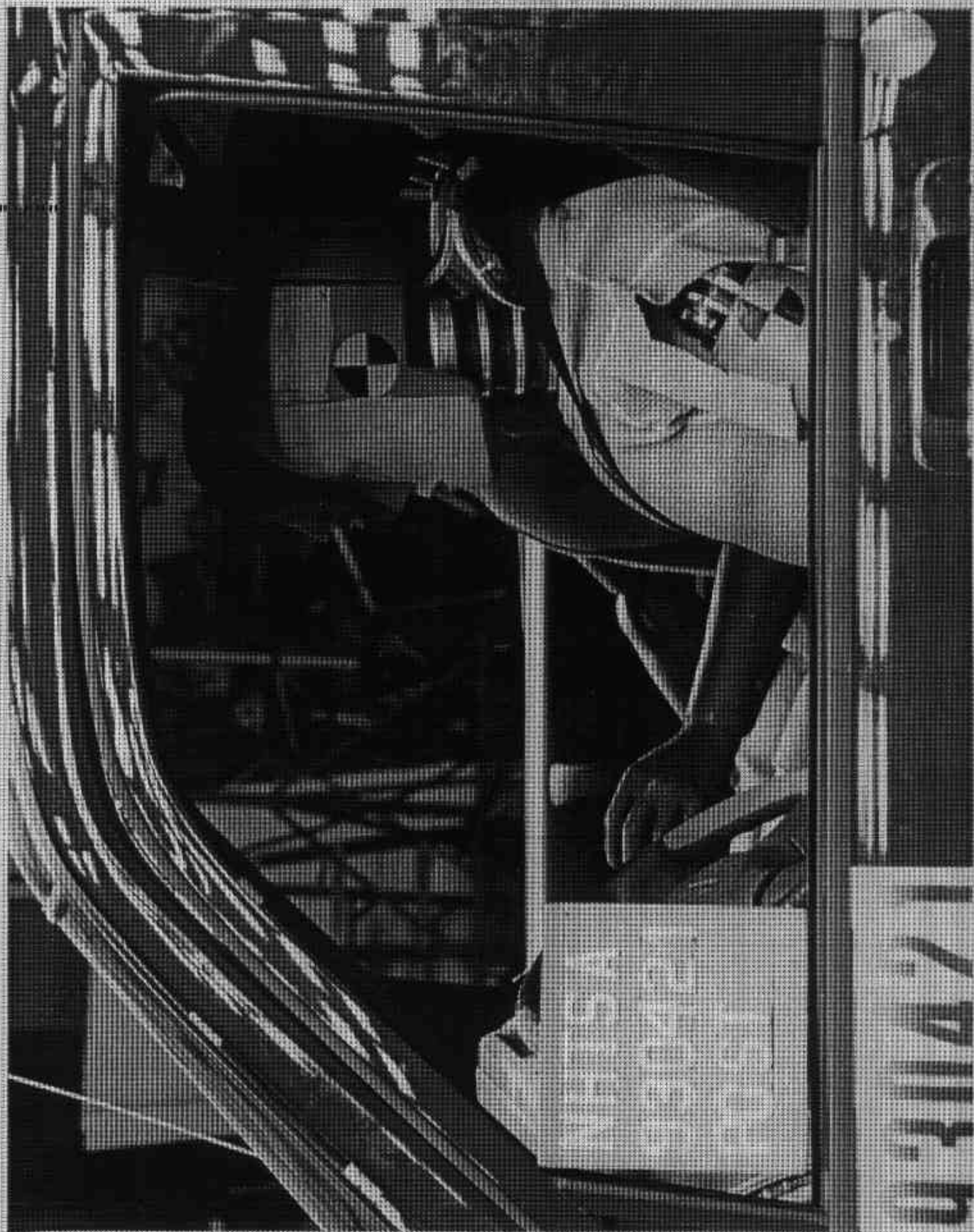


Figure A-28. POST-TEST DRIVER DUMMY POSITION VIEW

A-29

930421



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



Figure A-30. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1
A-31 930421

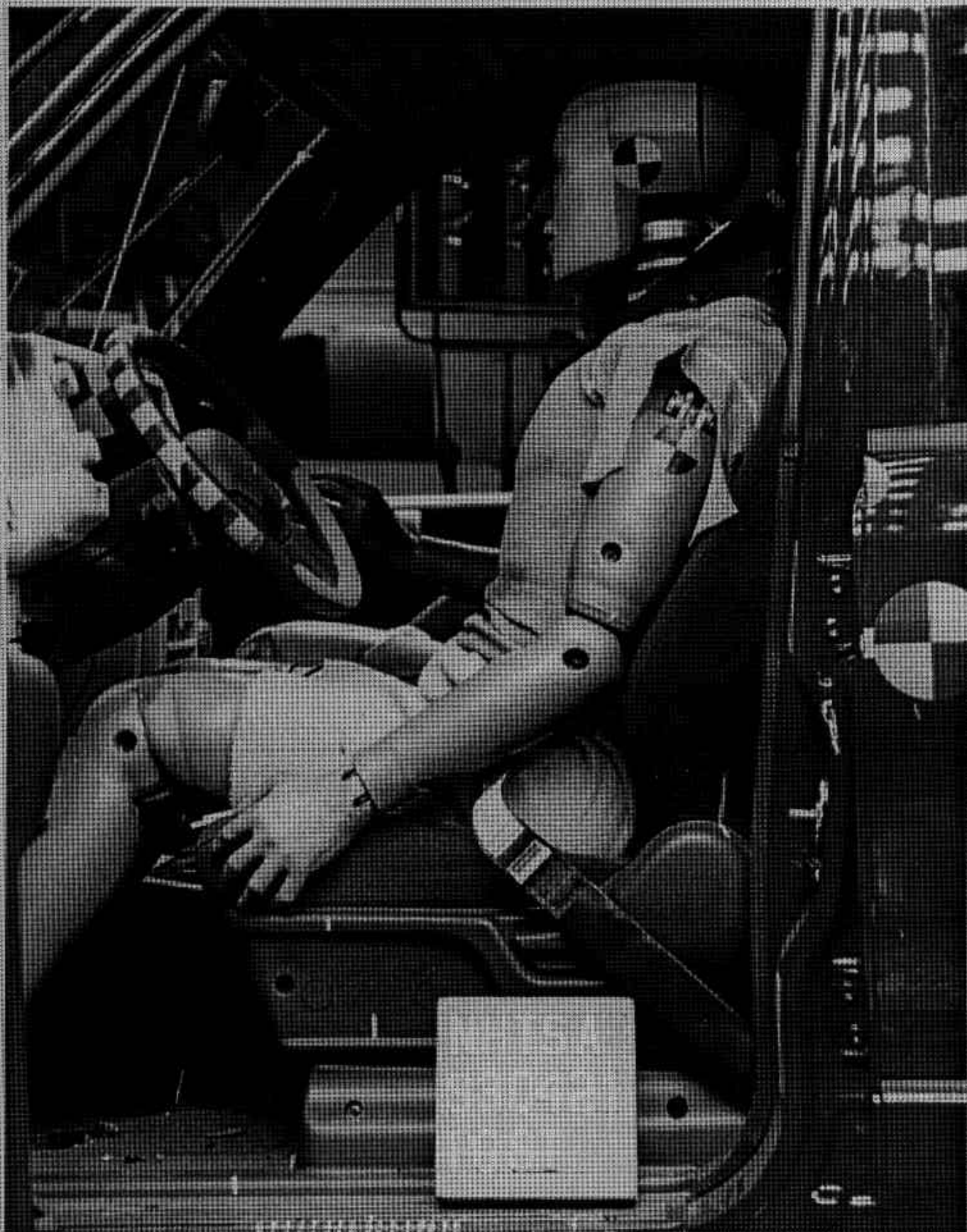


Figure A-31. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1
A-32 930421



Figure A-32. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2
A-33 930421



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

A-34

930421



Figure A-34. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
A-35 930421



Figure A-35. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

A-36

930421



Figure A-36. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2
A-37 930421



Figure A-37. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2



Figure A-38. POST-TEST DRIVER DUMMY HEAD CONTACT VIEW

A-39

930421



Figure A-39. POST-TEST DRIVER DUMMY HEAD & CHEST CONTACT VIEW

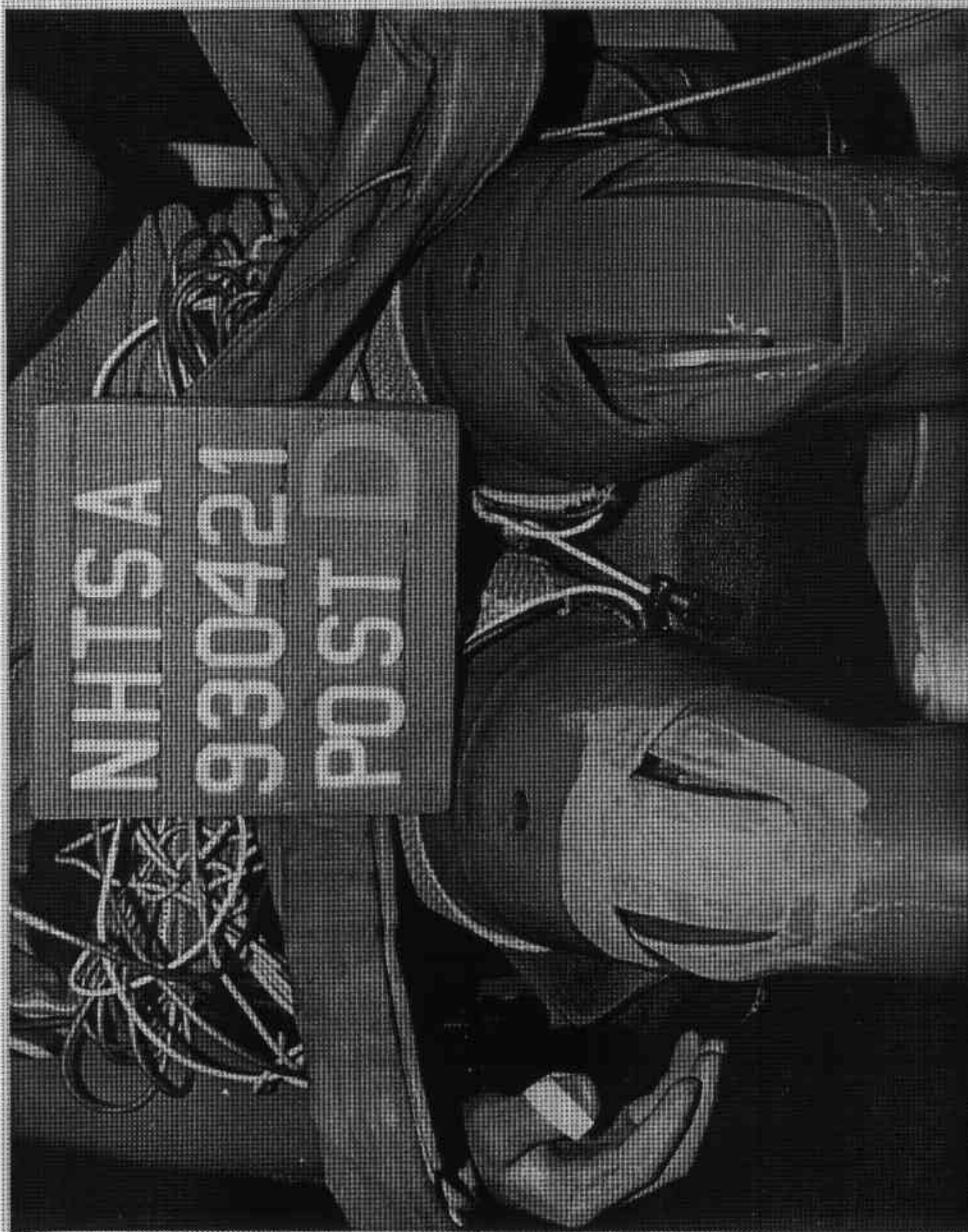


Figure A-40. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1

A-41

930421

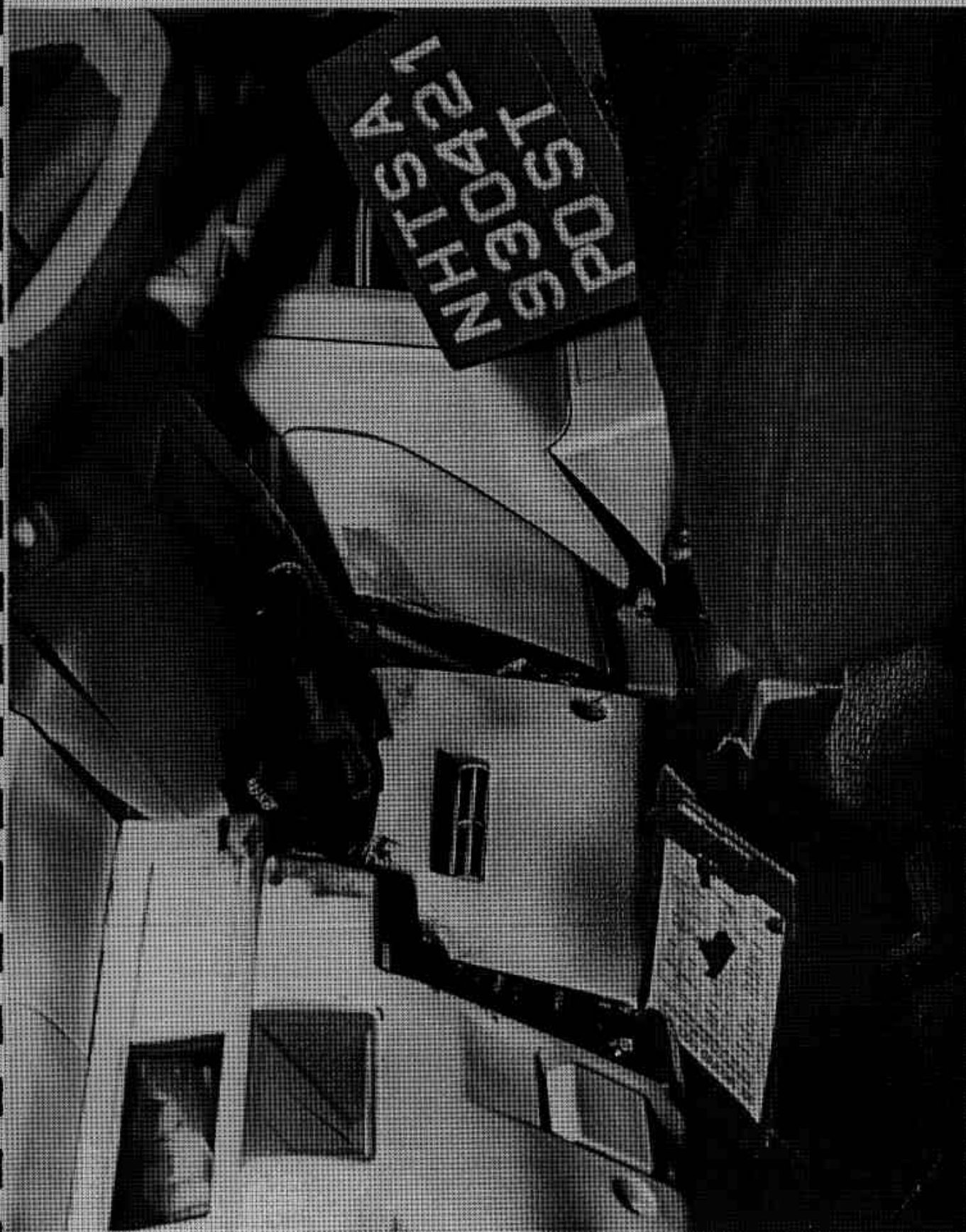


Figure A-41. POST-TEST DRIVER DUMMY KNEE CONTACT- VIEW 2
A-42 930421



Figure A-42. POST-TEST PASSENGER DUMMY HEAD CONTACT VIEW

A-43

930421

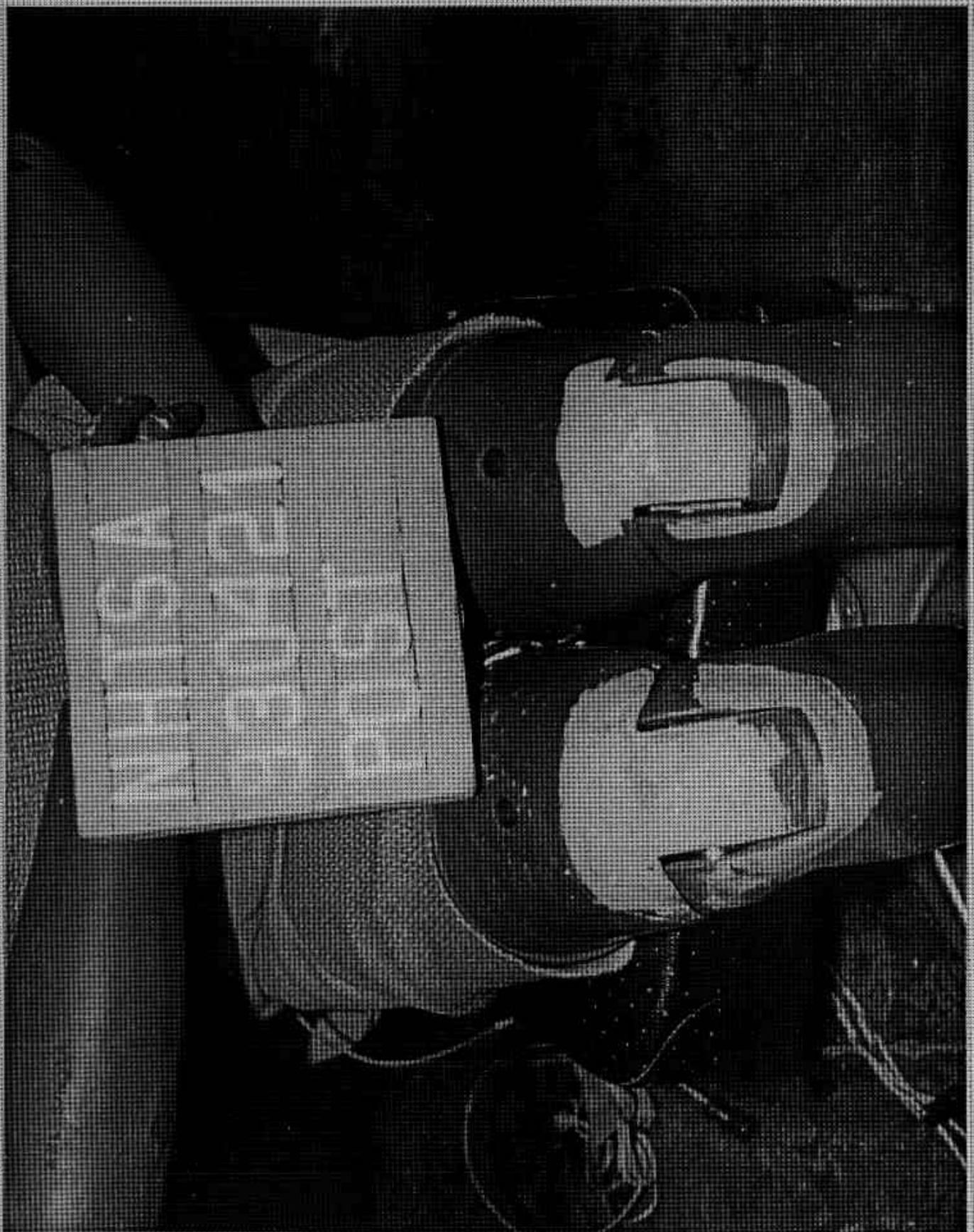


Figure A-43. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1

A-44

930421



Figure A-44. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2

A-45

930421

MANUFACTURED BY
ISUZU MOTORS LIMITED
IN JAPAN OCT.92

GVWR: 5510LBS.

GAWR FRONT: 2755LBS.
WITH P245/70R16 TIRES &
16 x 7JJ RIMS AT 30 PSI
COLD.

GAWR REAR: 3085LBS.
WITH P245/70R16 TIRES &
16 x 7JJ RIMS AT 35 PSI
COLD.

THIS VEHICLE CONFORMS TO
ALL APPLICABLE FEDERAL
MOTOR VEHICLE SAFETY
STANDARDS IN EFFECT ON
THE DATE OF MANUFACTURE
SHOWN ABOVE.

JACDH58V9P7901892

MPV.

P.NO. 894375302

Fig. A-45. PRE-TEST VEHICLE CERT. & RECOMMENDED TIRE PRES. LABEL

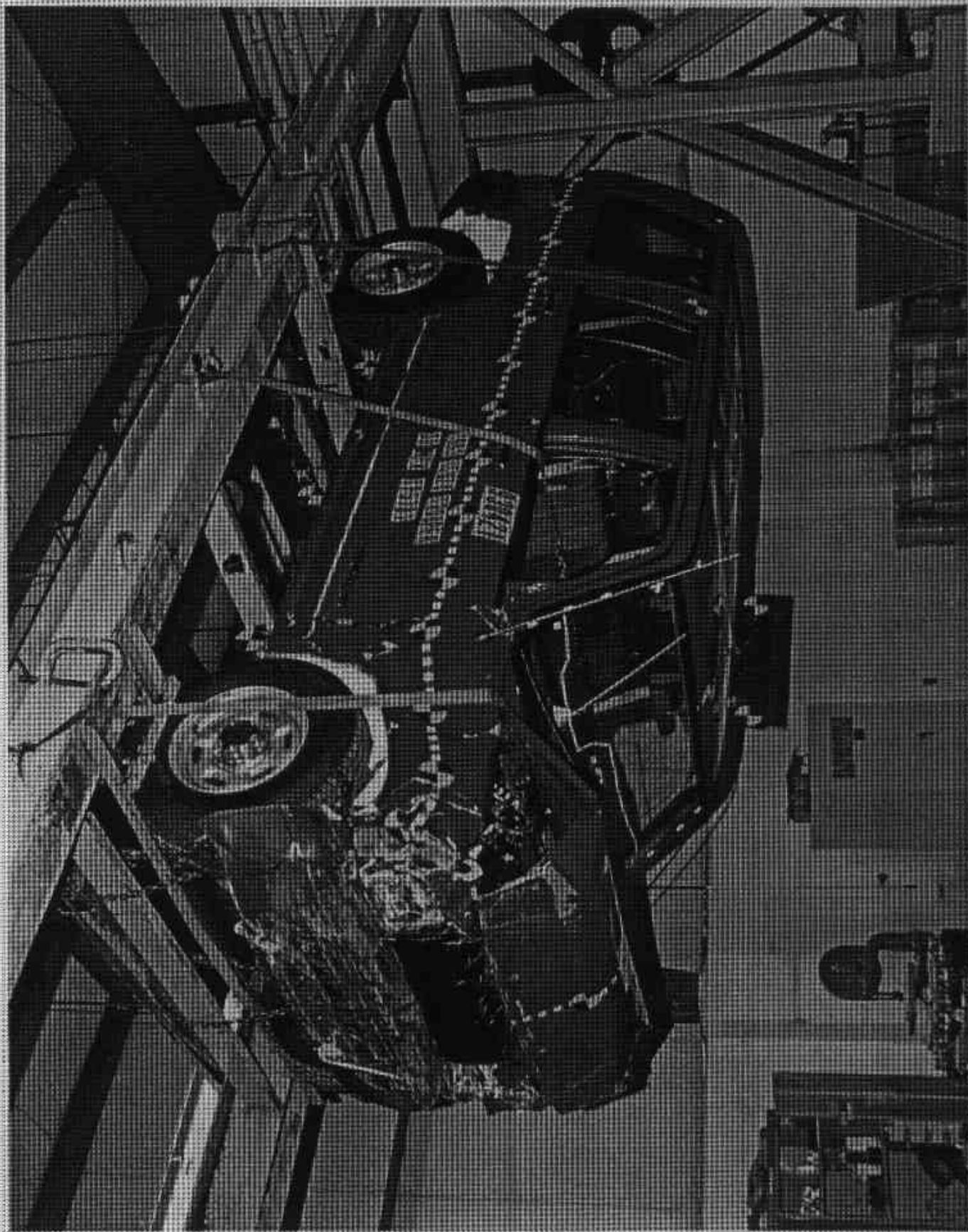


Figure A-46. POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW

A-47

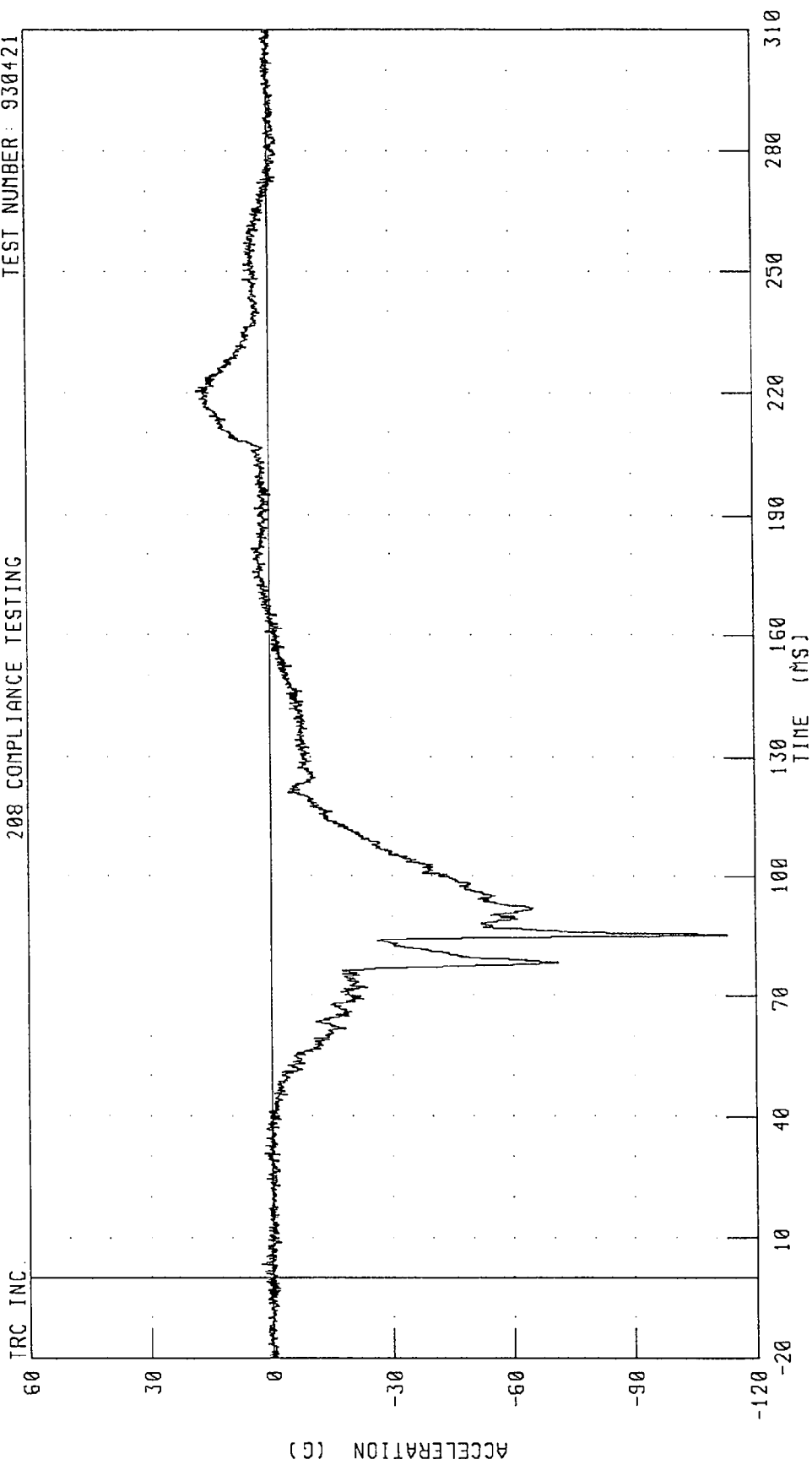
930421

APPENDIX B

DATA PLOTS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
DRIVER HEAD X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 930421



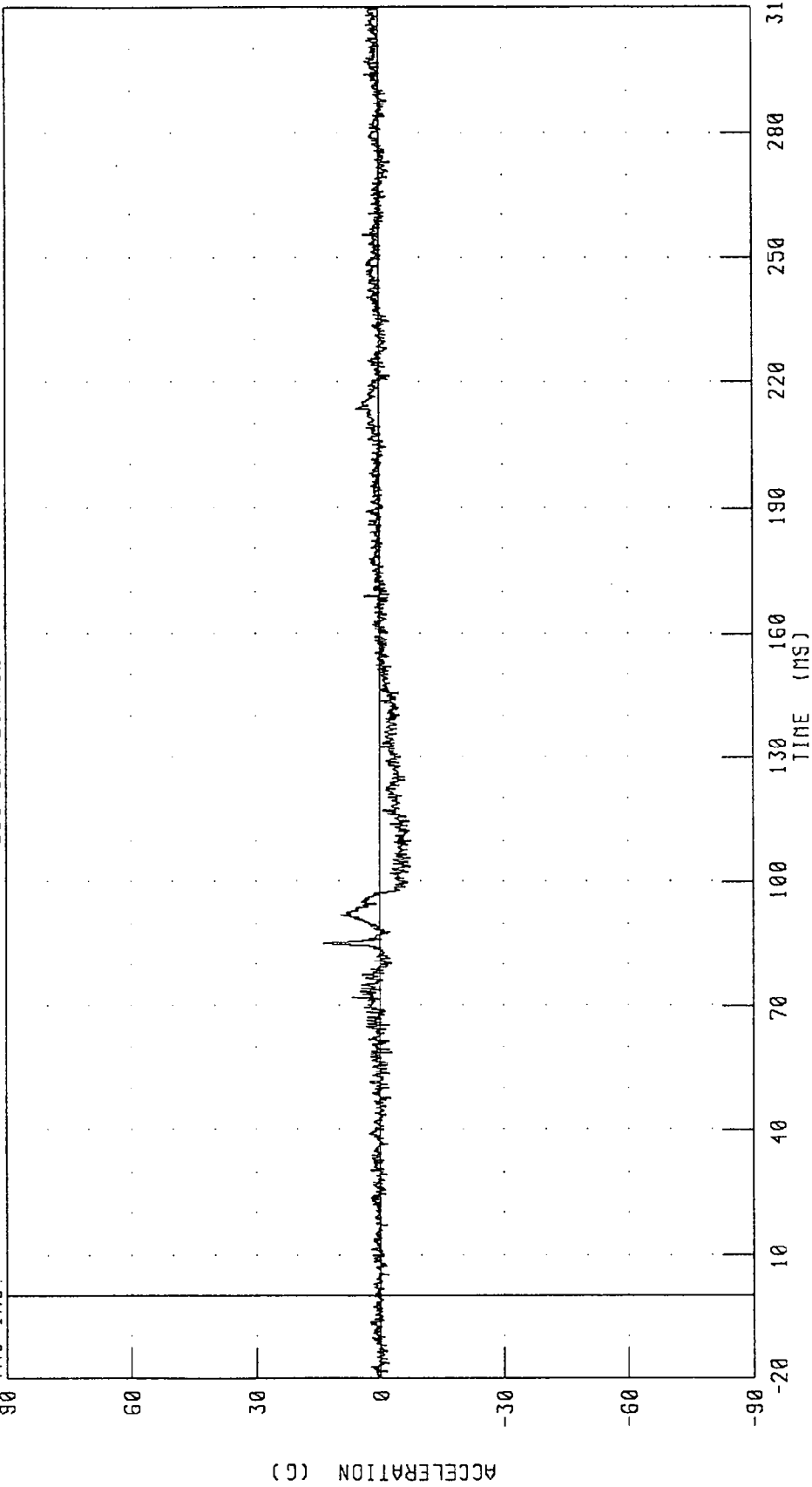
CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

PEAK DATA: 17.94 G @ 220.38 MS, -113.12 G @ 85.25 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Y-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

TRC INC.

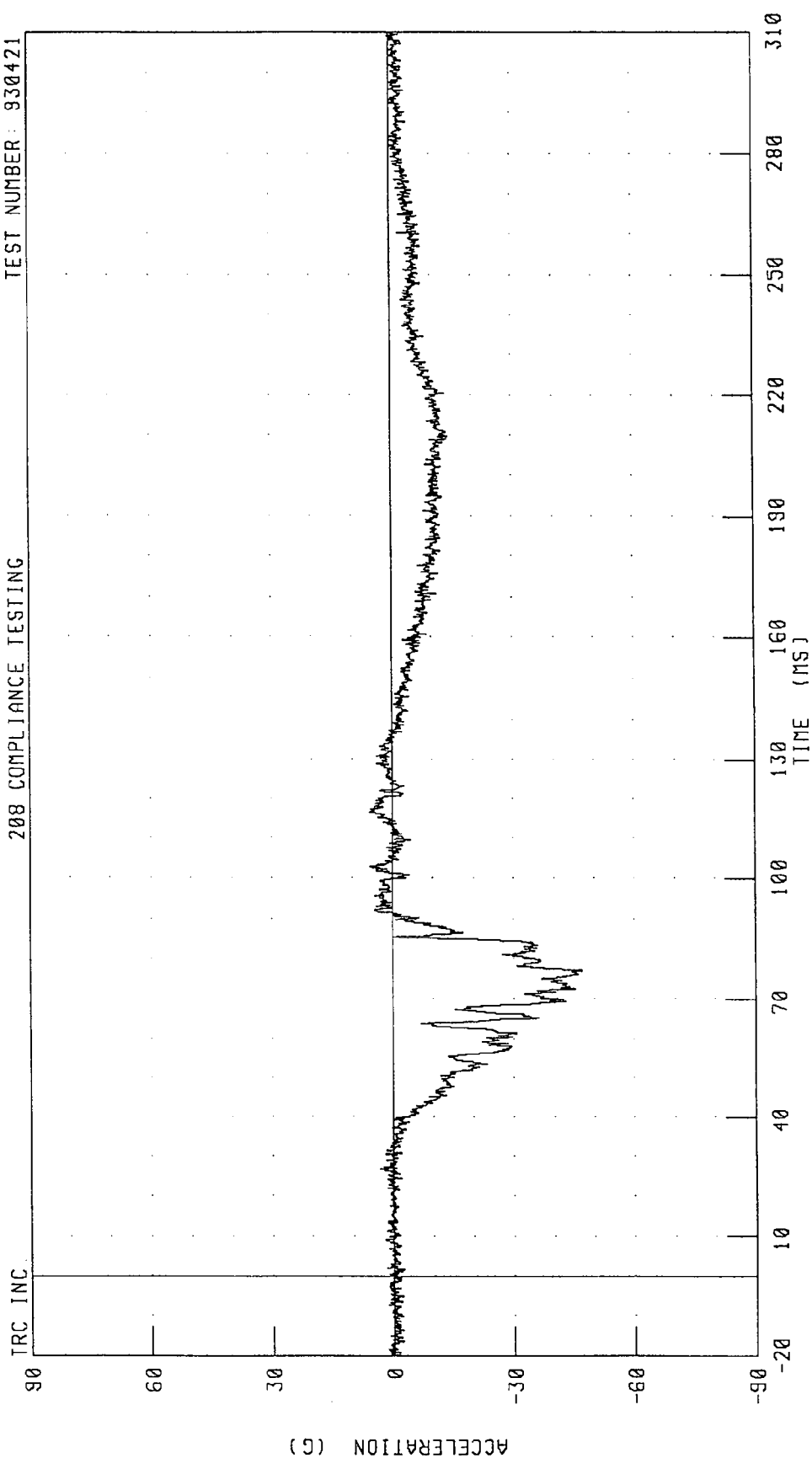


CHANNEL: HEDYG1 FILTER: CH. CLASS 1000

PEAK DATA: 13.72 G @ 85.13 MS; -7.49 G @ 110.00 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

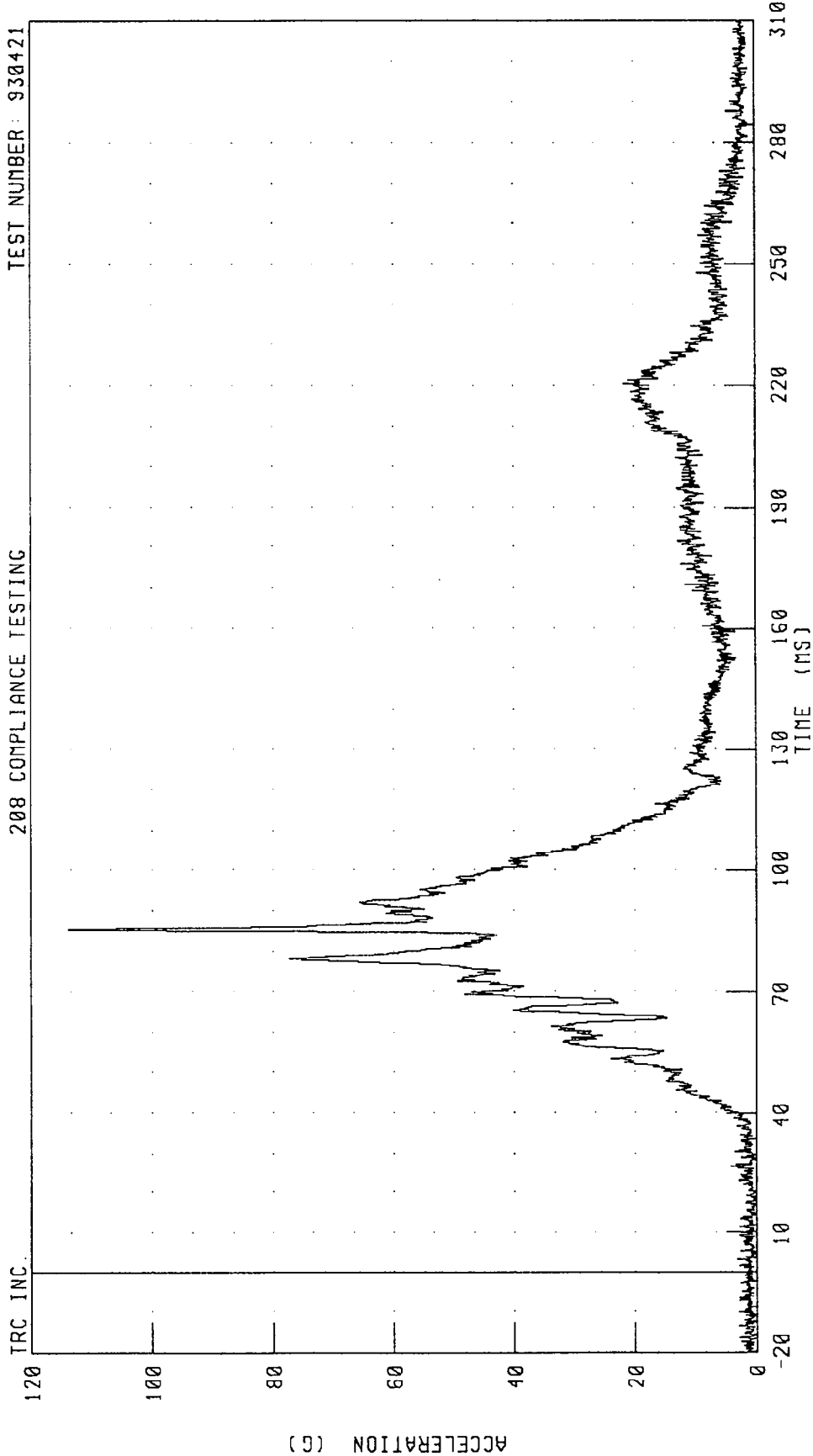


CHANNEL: HEDZG1 FILTER: CH. CLASS 1000

PEAK DATA: 5.72 G @ 116.50 MS; -47.00 G @ 77.00 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 DRIVER HEAD RESULTANT ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

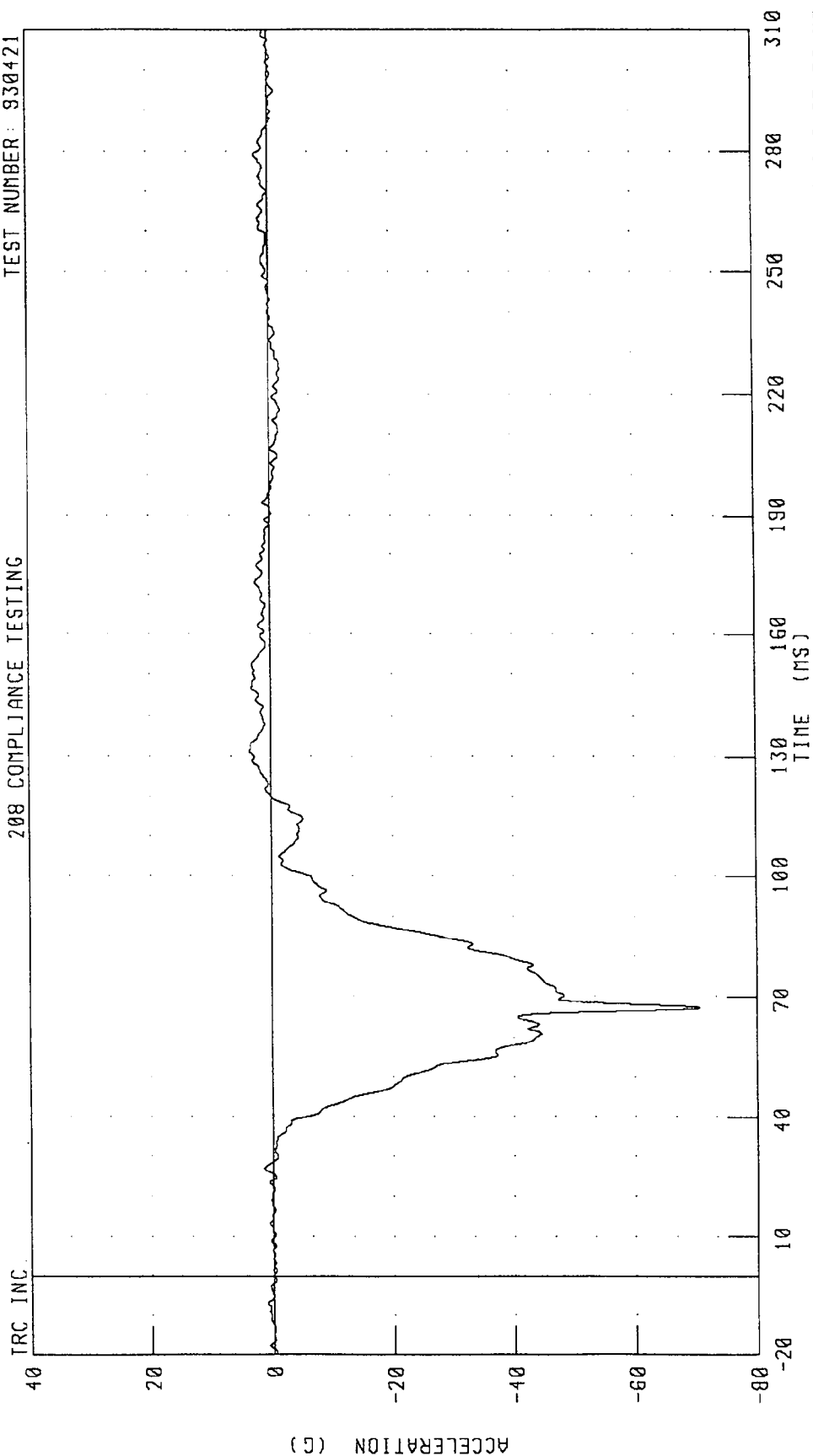


PEAK DATA: 113.87 G @ 85.25 MS; 0.17 G @ 17.75 MS

CHANNEL: HEDRG1 FILTER: CH. CLASS 1000

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
DRIVER CHEST X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 930421

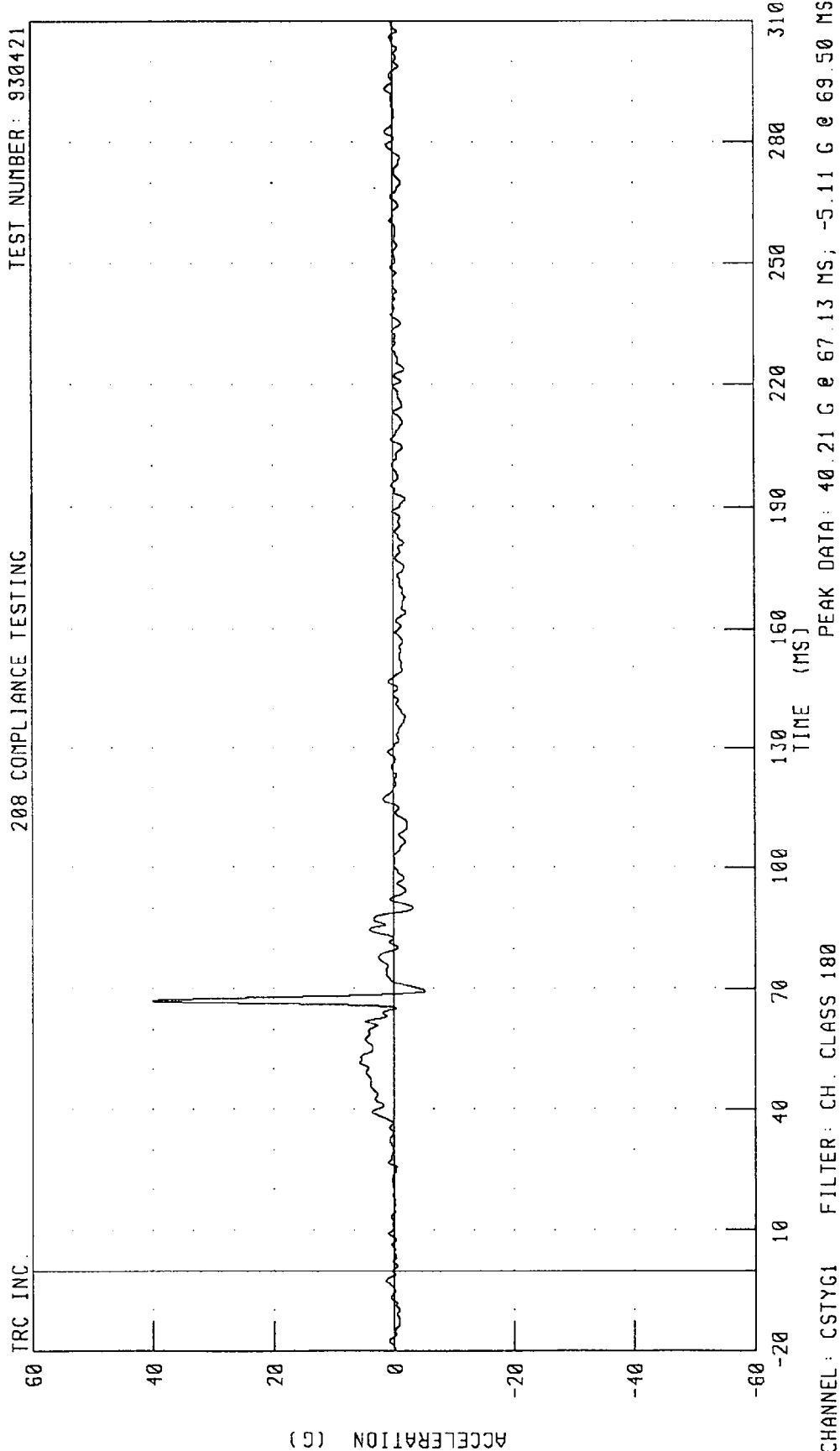


PEAK DATA: 3.56 G @ 131.25 MS; -70.63 G @ 67.38 MS

CHANNEL: CSTXG1 FILTER: CH. CLASS 180

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
DRIVER CHEST Y-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 930421

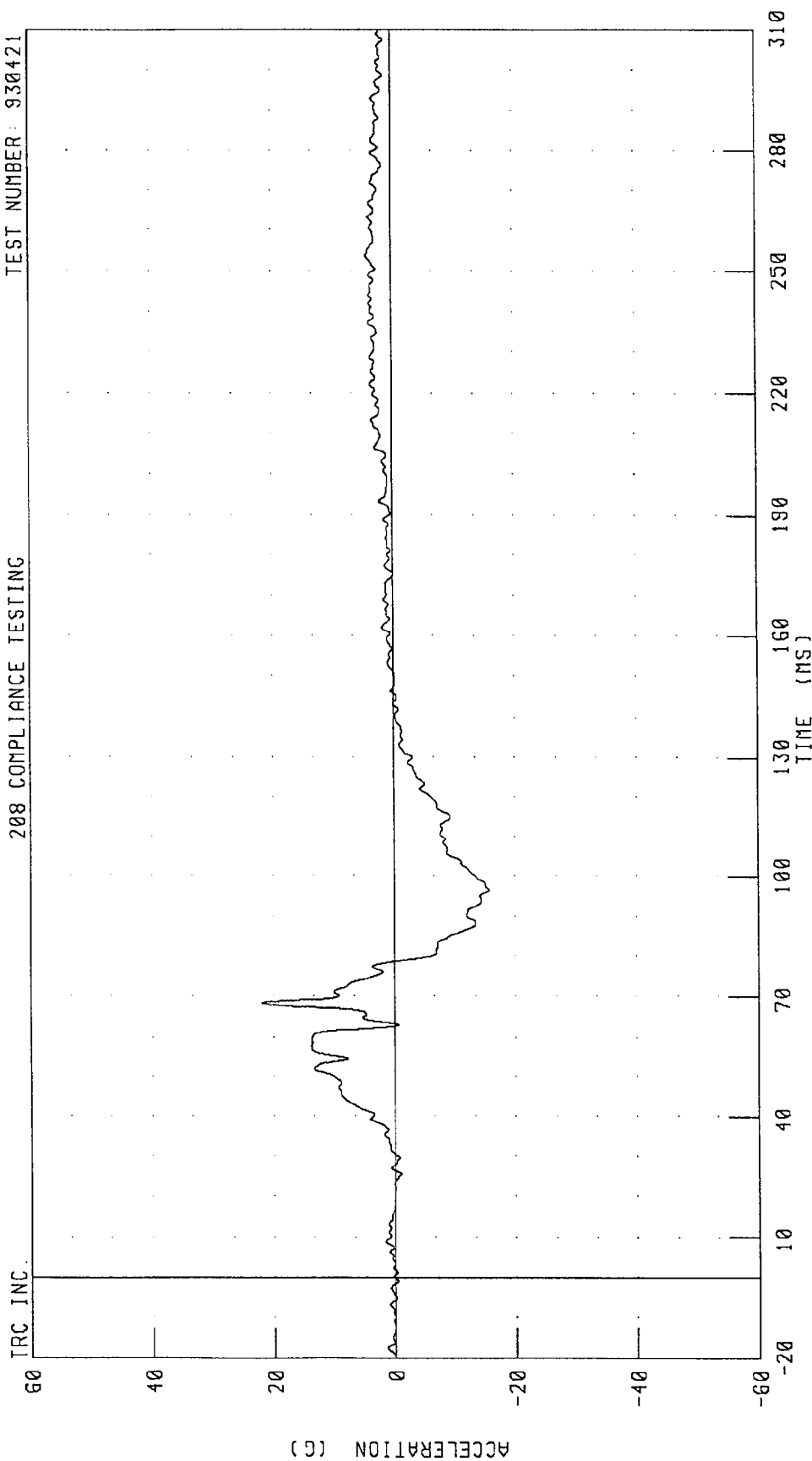


PEAK DATA: 40.21 G @ 67.13 MS; -5.11 G @ 69.50 MS

CHANNEL: CSTYG1 FILTER: CH. CLASS 180

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

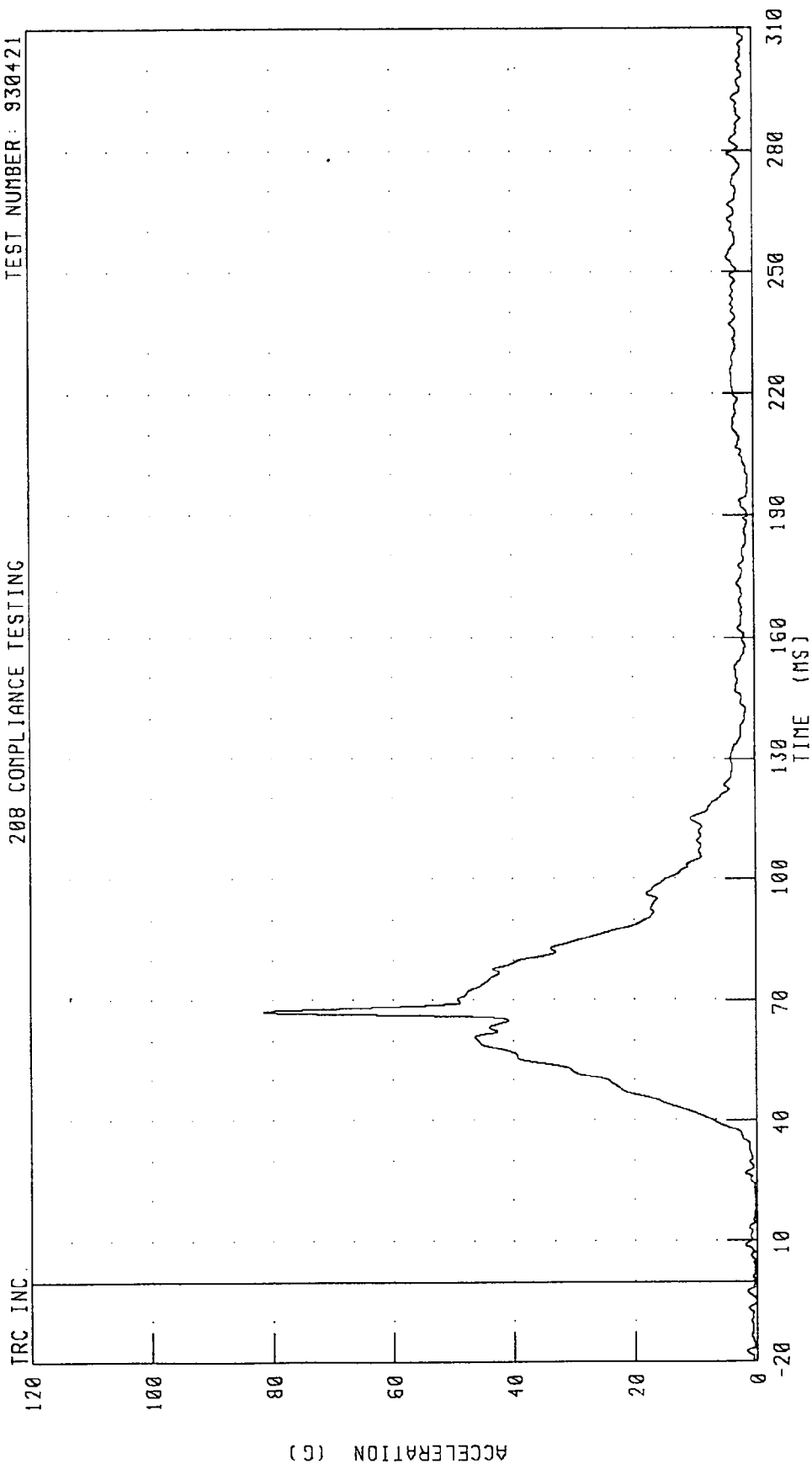


PEAK DATA: 21.98 G @ 68.38 MS; -15.67 G @ 96.50 MS

CHANNEL: CSTZG1 FILTER: CH. CLASS 180

1983 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 DRIVER CHEST RESULTANT ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

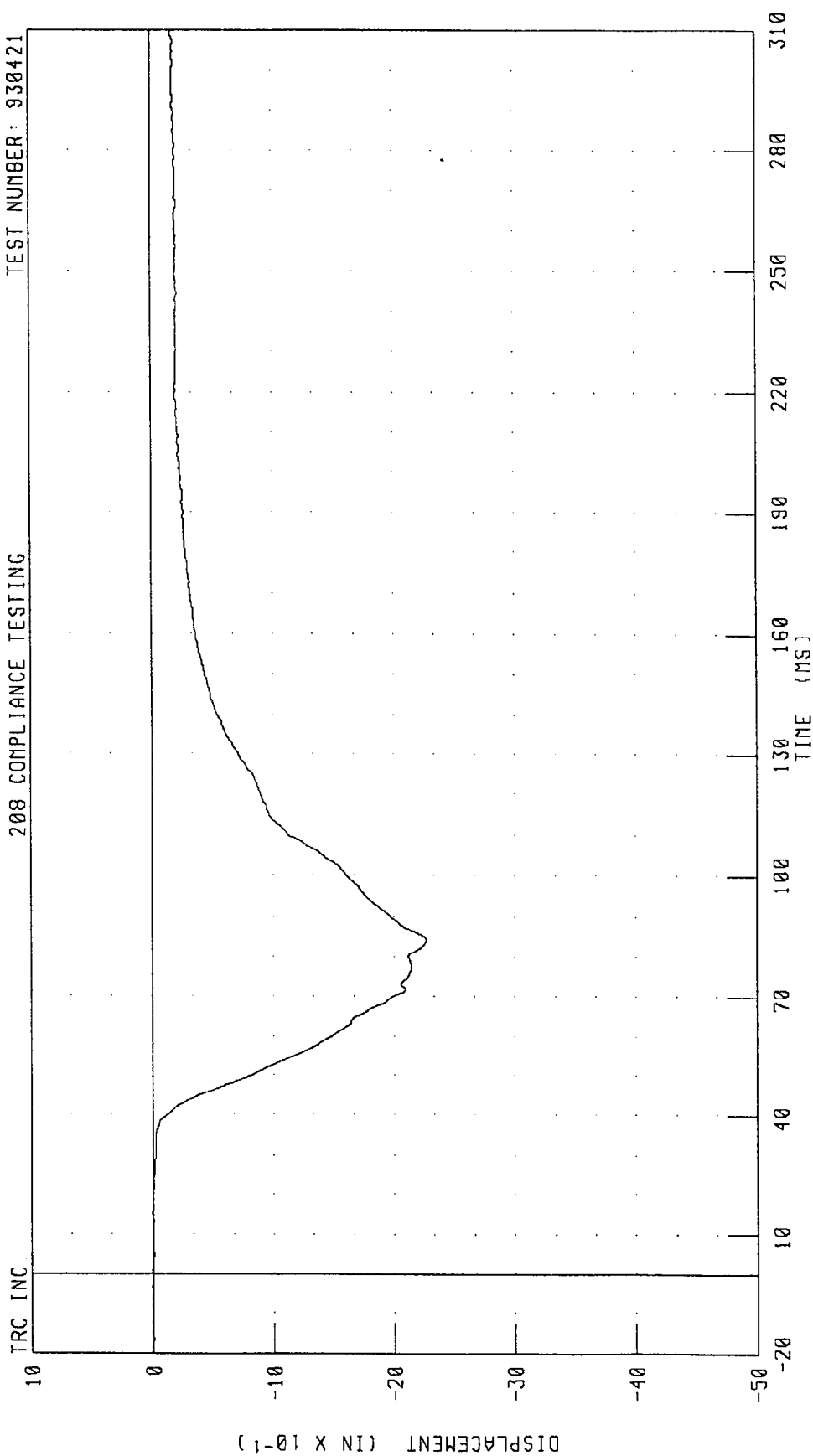


CHANNEL: CSTRG1 FILTER: CH. CLASS 180

PEAK DATA: 81.44 G @ 67.25 MS; 0.05 G @ -5.63 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
DRIVER CHEST DEFLECTION
208 COMPLIANCE TESTING

TEST NUMBER: 930421

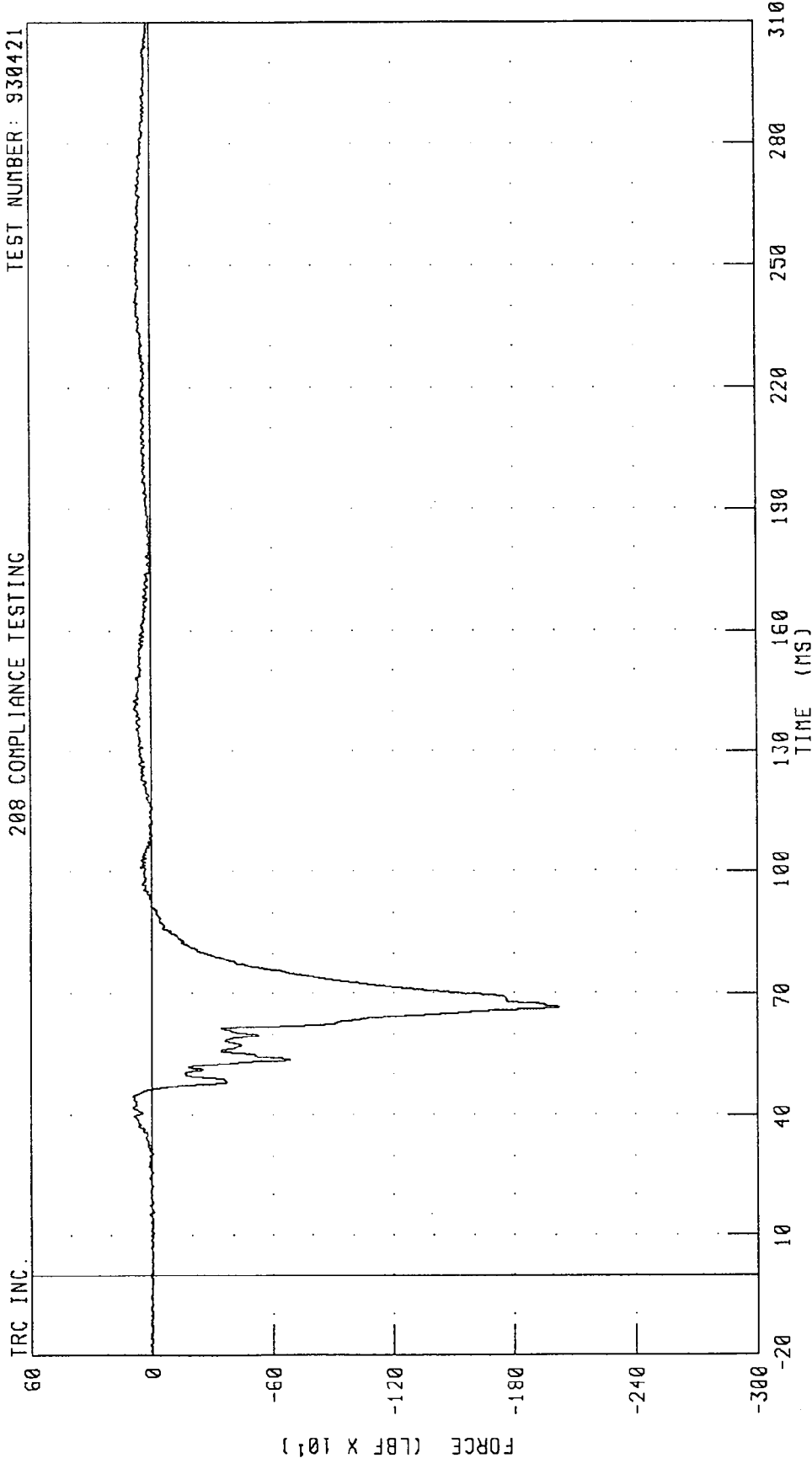


CHANNEL: CSTXD1 FILTER: CH. CLASS 180

PEAK DATA: 0 01 IN @ -6.13 MS; -2 27 IN @ 84.38 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 DRIVER LEFT FEMUR FORCE
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

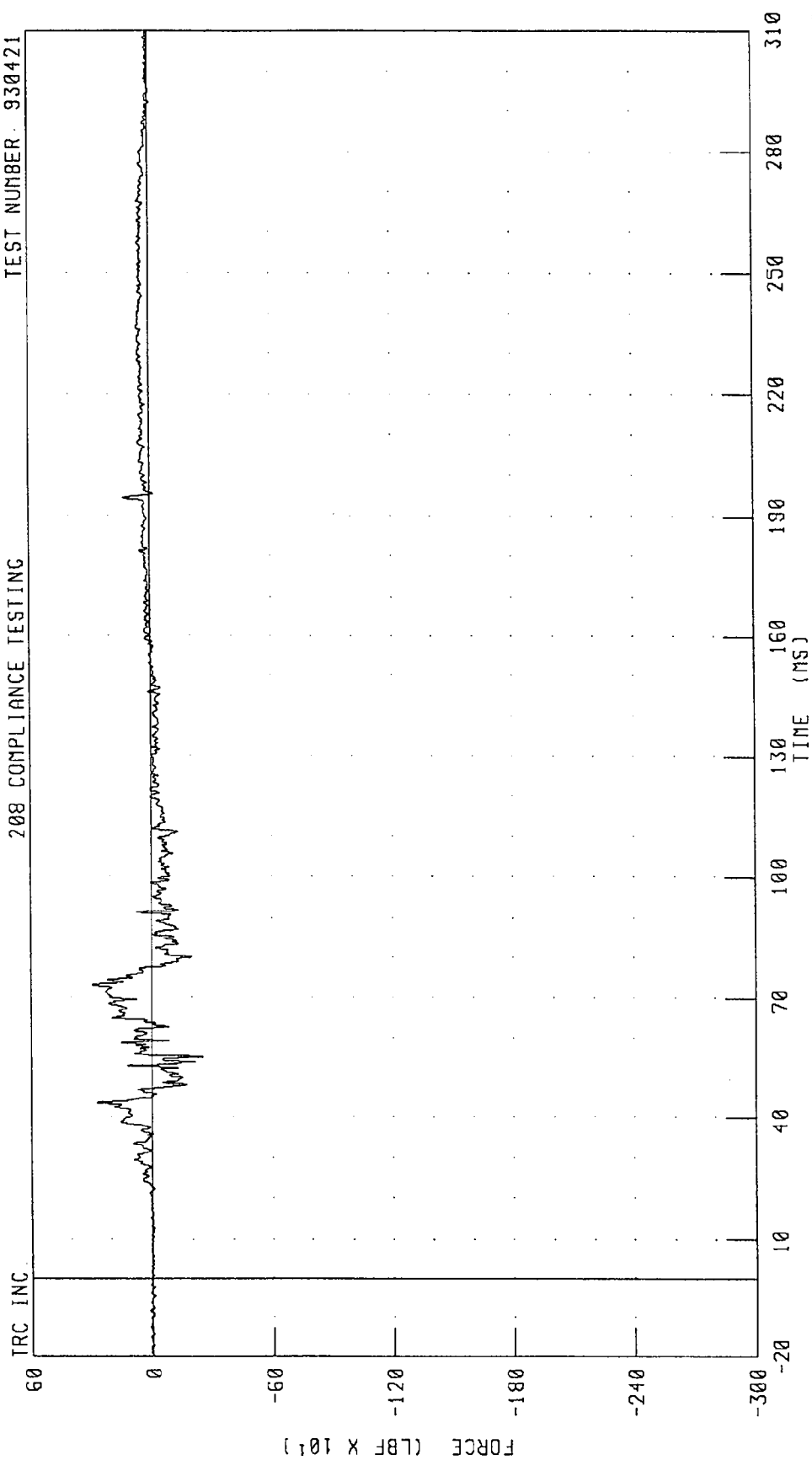


PEAK DATA: 98.09 LBF @ 41.88 MS; -2023.65 LBF @ 66.63 MS

CHANNEL: LFMF1 FILTER: CH. CLASS 600

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT FEMUR FORCE
 208 COMPLIANCE TESTING

TEST NUMBER 930421

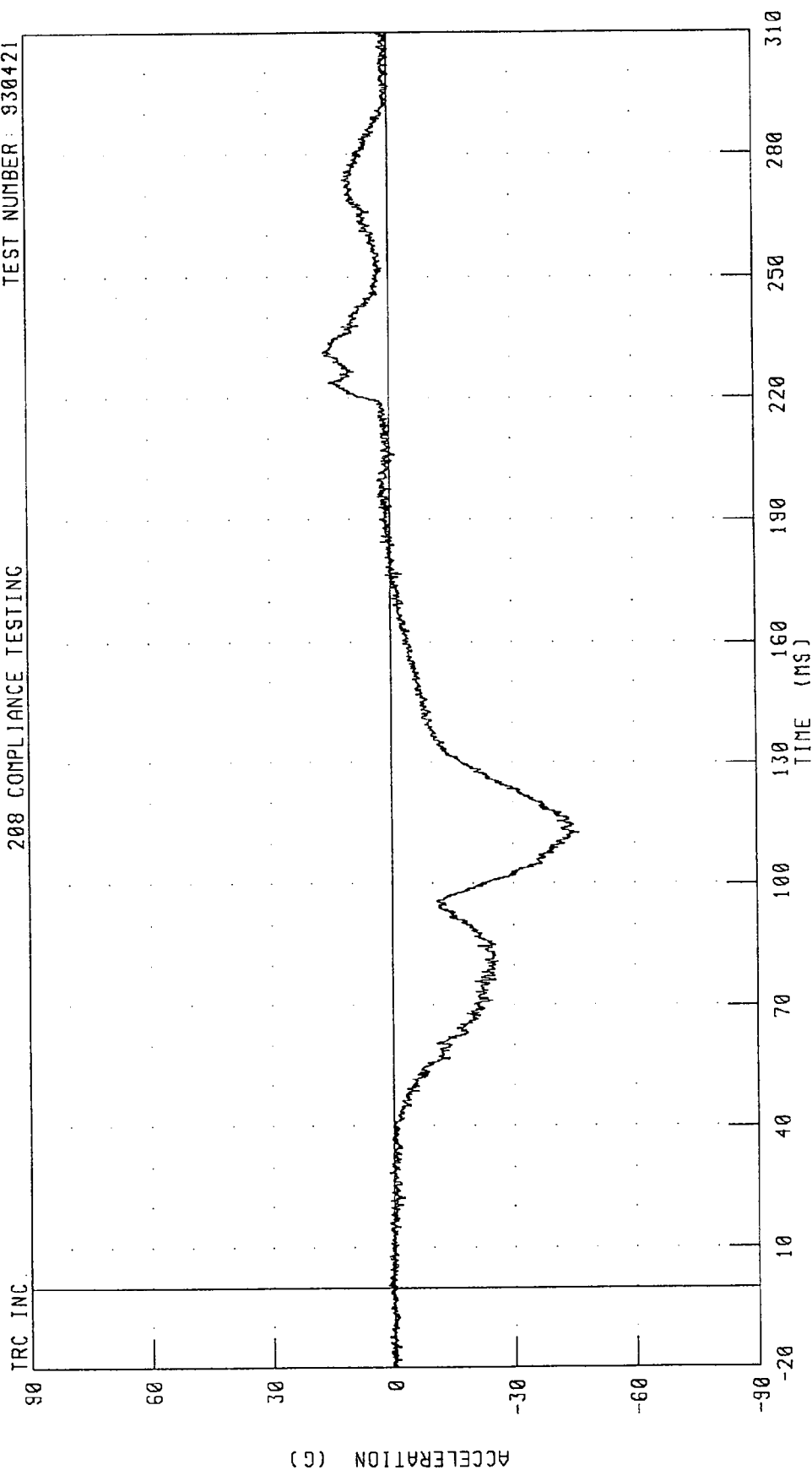


CHANNEL: RFMF1 FILTER: CH. CLASS 600

PEAK DATA: 294.05 LBF @ 73.13 MS; -251.98 LBF @ 55.25 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

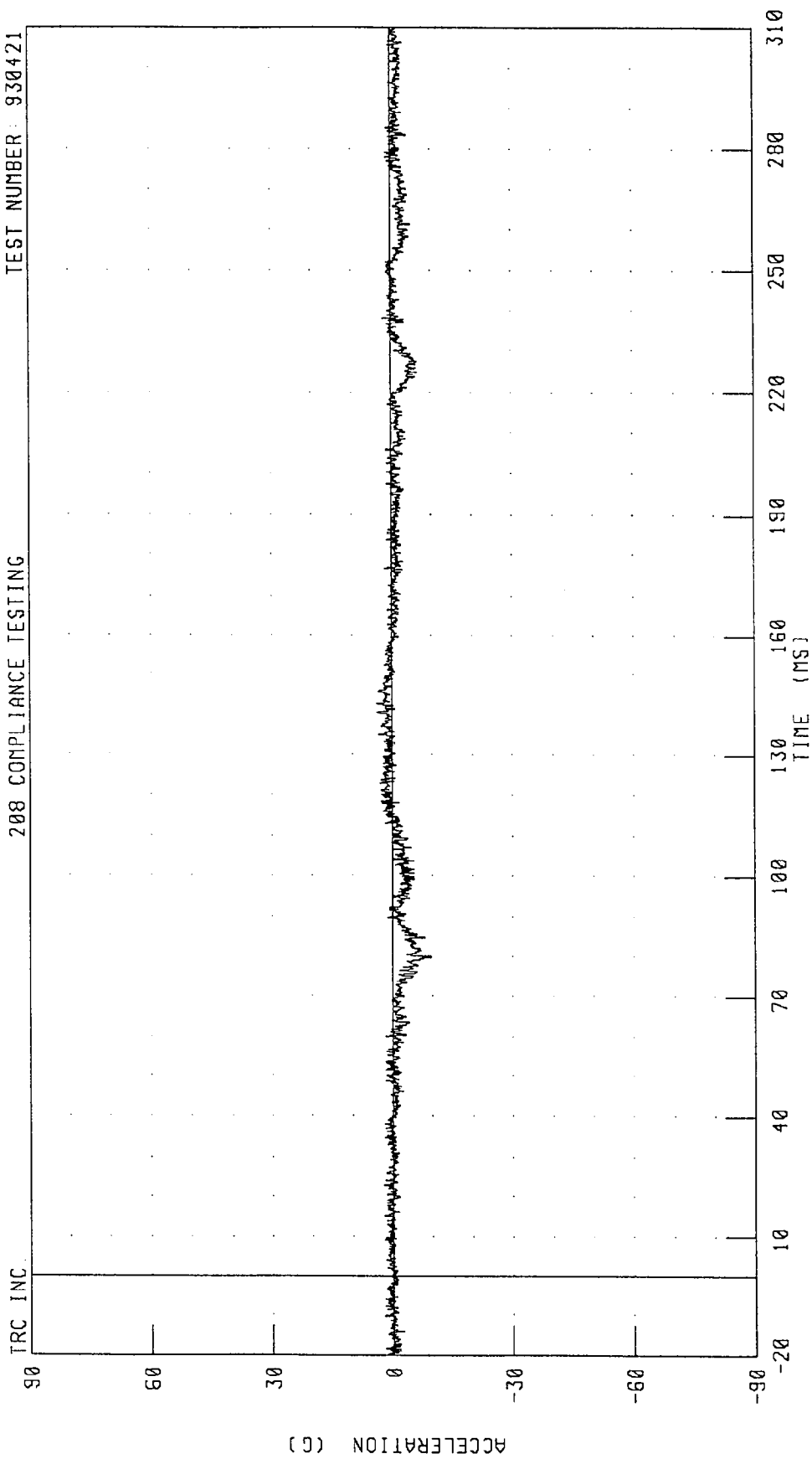


PEAK DATA: 16.18 G @ 231.38 MS; -46.28 G @ 112.63 MS

CHANNEL: HEDXC2 FILTER: CH CLASS 1000

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION
208 COMPLIANCE TESTING

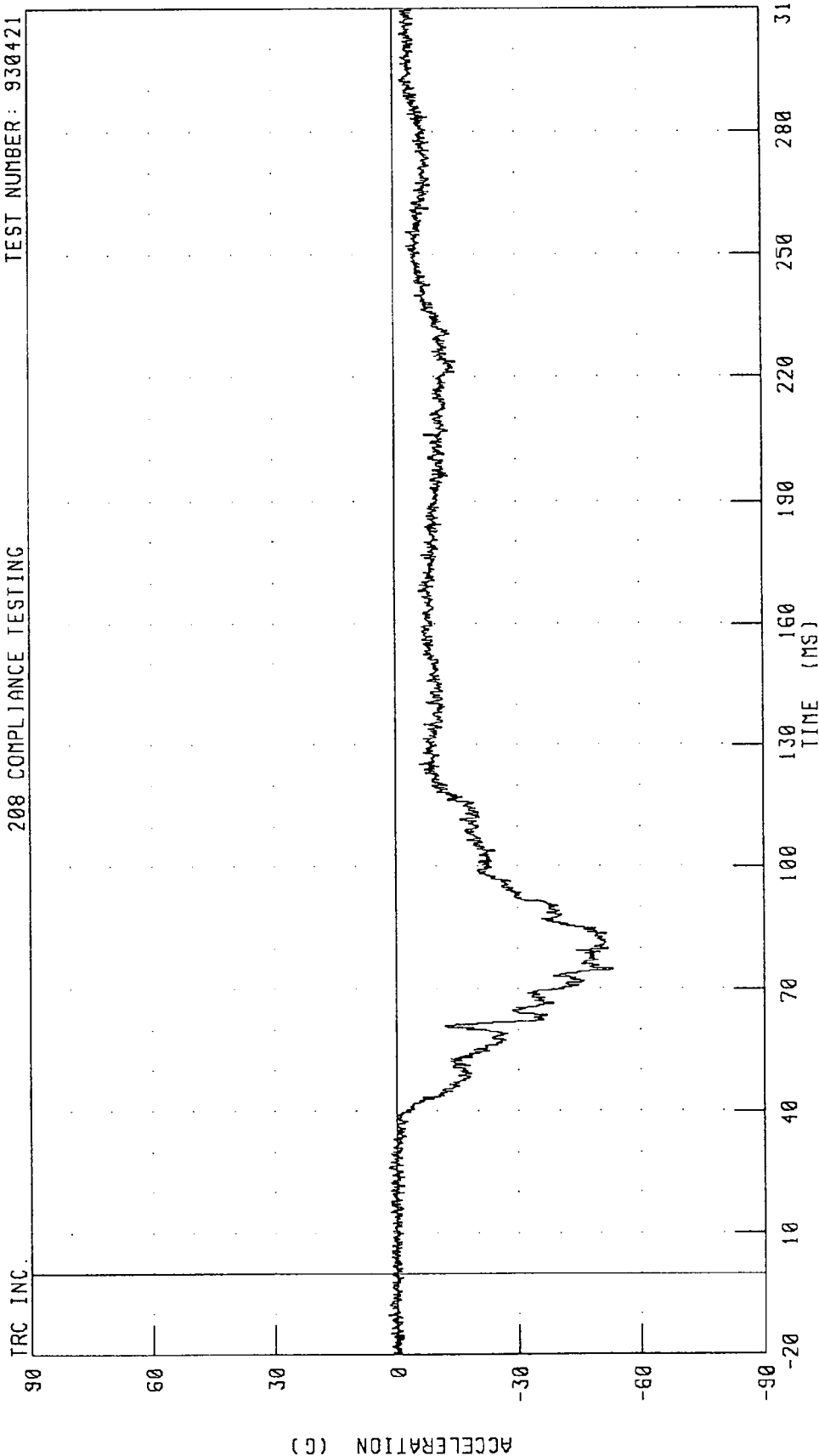
TEST NUMBER: 930421



CHANNEL: HEDYG2 FILTER: CH. CLASS 1000

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

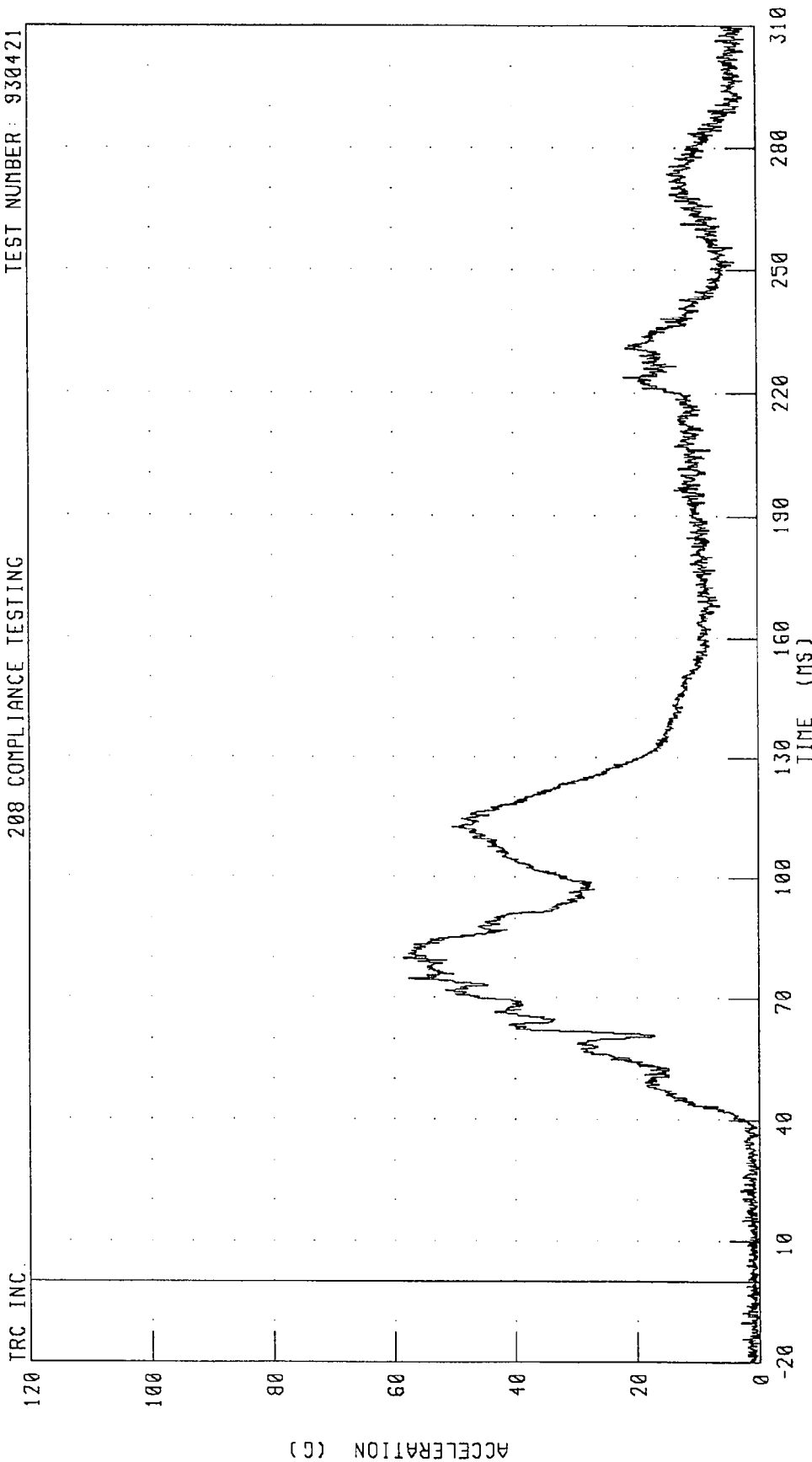


PEAK DATA: 2.23 G @ -10.25 MS; -53.11 G @ 74.75 MS

CHANNEL: HEDZG2 FILTER: CH. CLASS 1000

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION
200 COMPLIANCE TESTING

TEST NUMBER: 930421

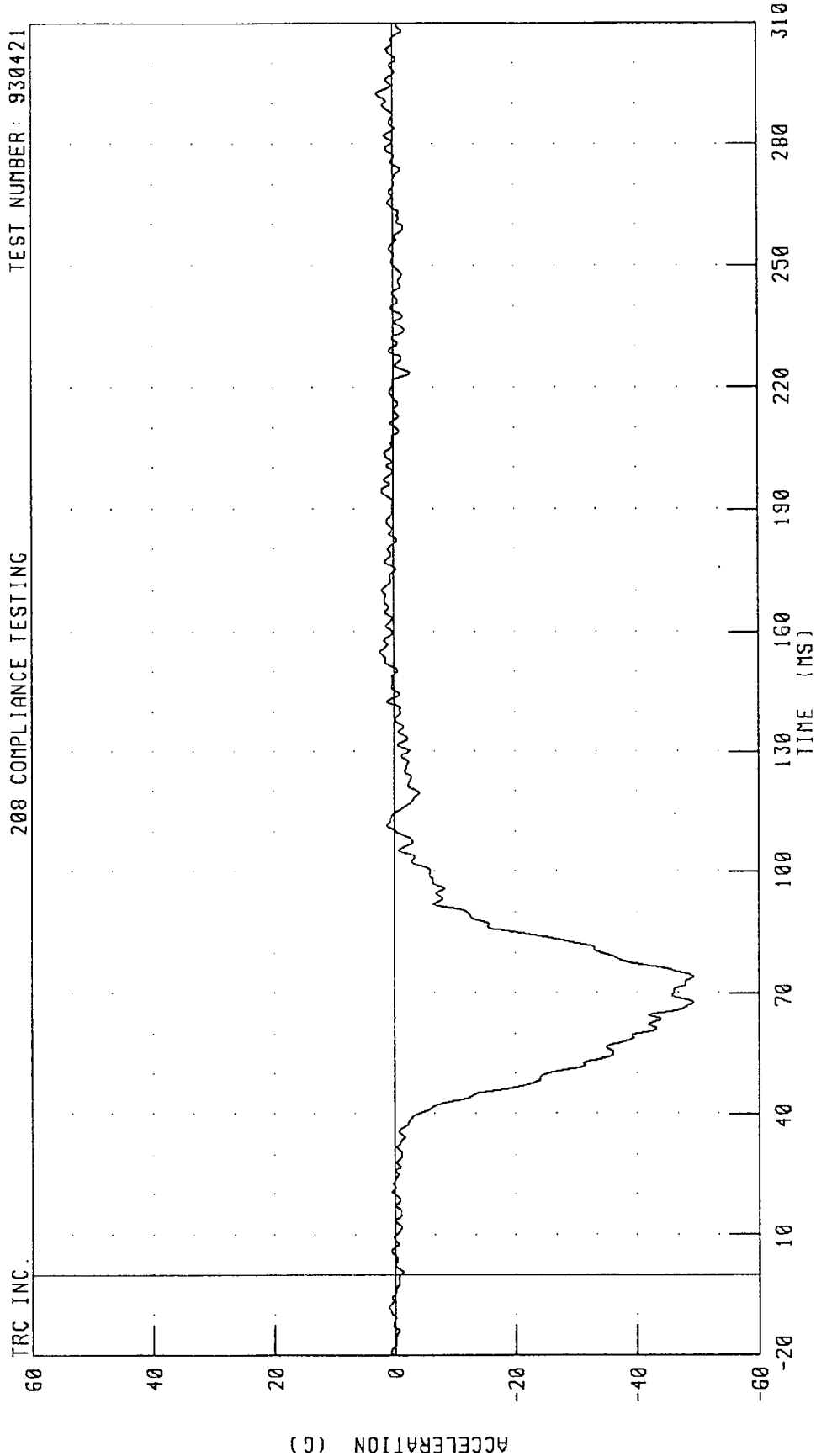


PEAK DATA: 58.40 G @ 80.00 MS, 0.09 G @ -13.50 MS

CHANNEL: HEDRG2 FILTER: CH. CLASS 1000

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 930421

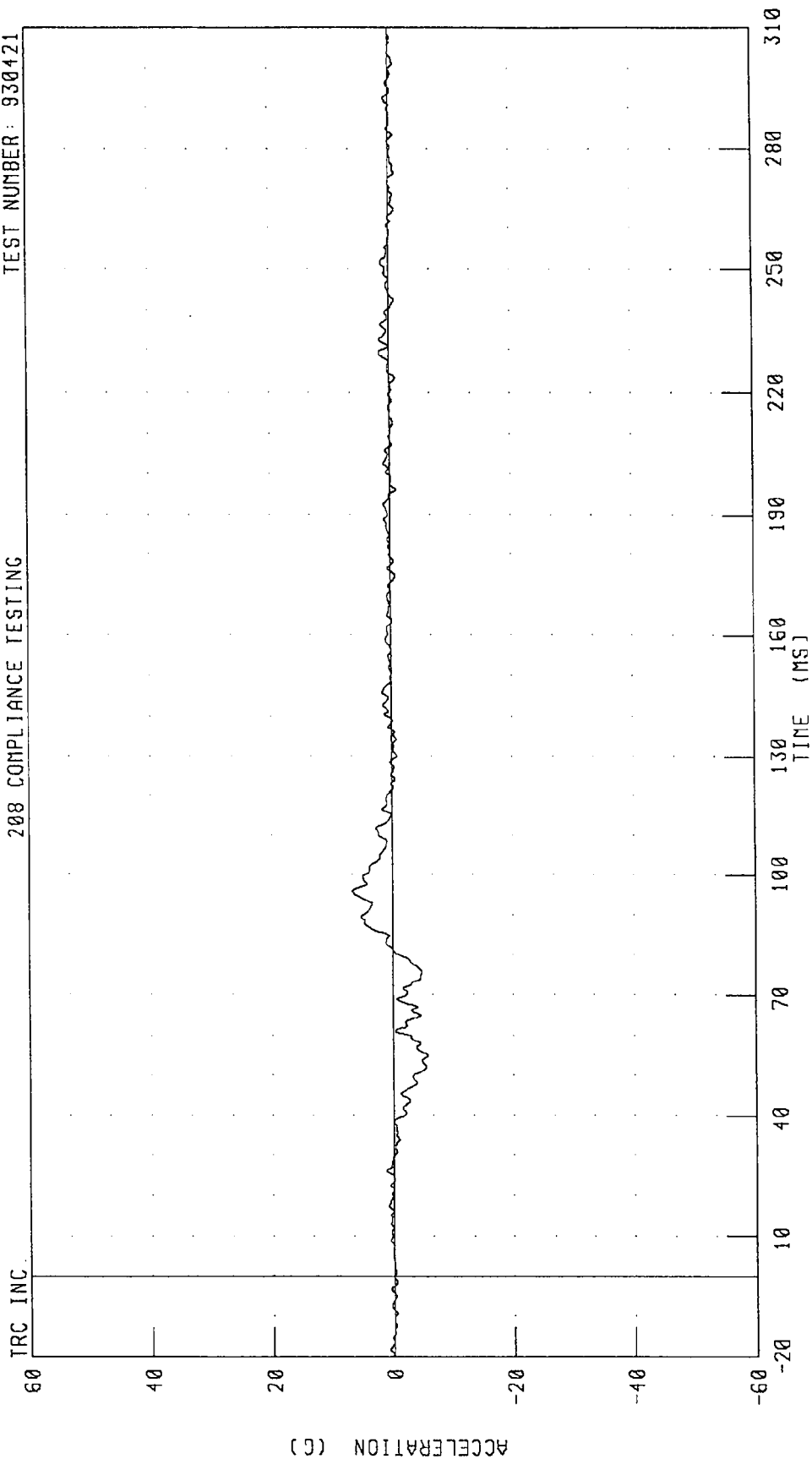


CHANNEL: CSTXG2 FILTER: CH. CLASS 180

PEAK DATA: 2.76 G @ 292.50 MS, -49.35 G @ 67.50 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

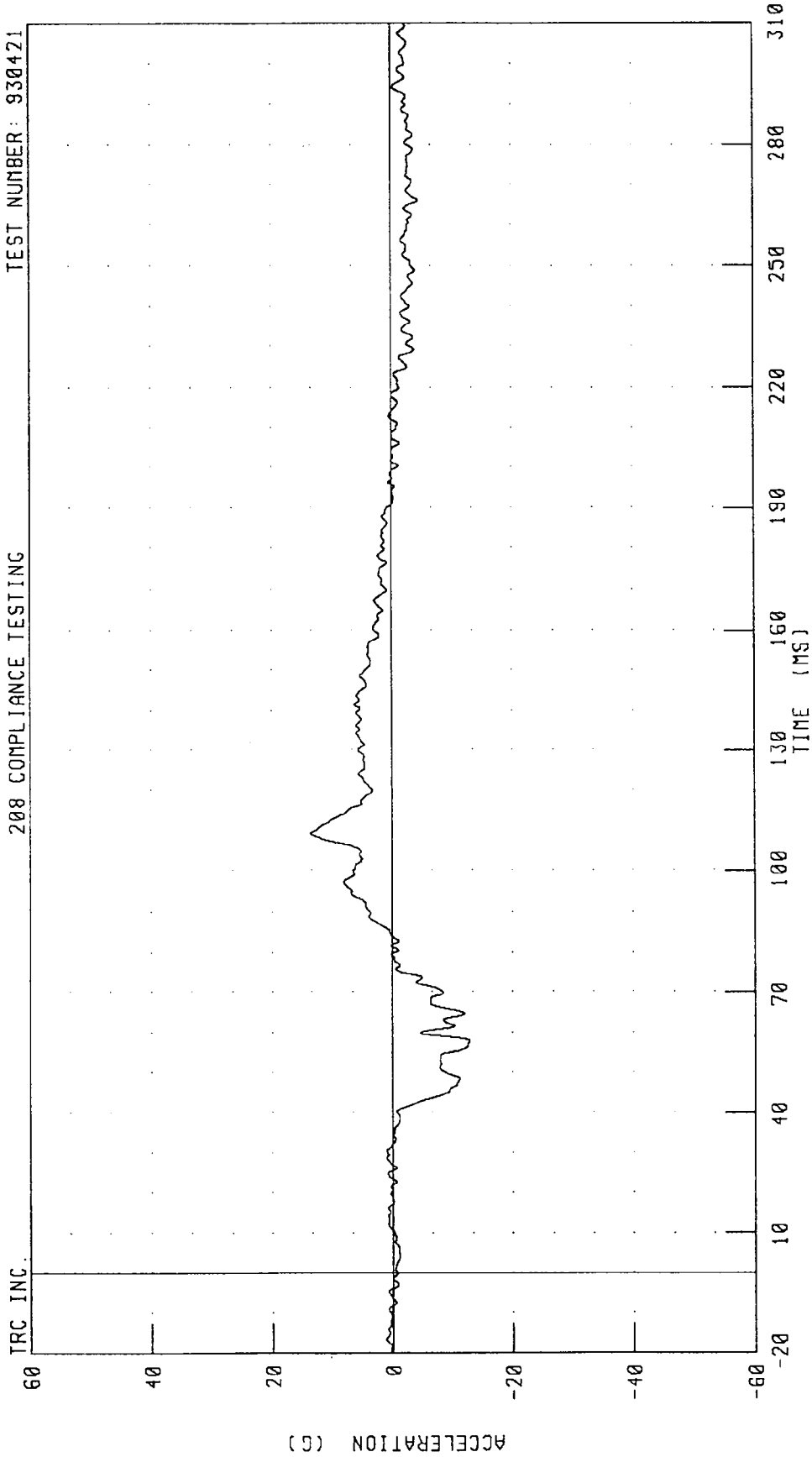


PEAK DATA: 6.59 G @ 95.88 MS; -5.74 G @ 54.88 MS

CHANNEL: CSTYG2 FILTER: CH. CLASS 180

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 930421



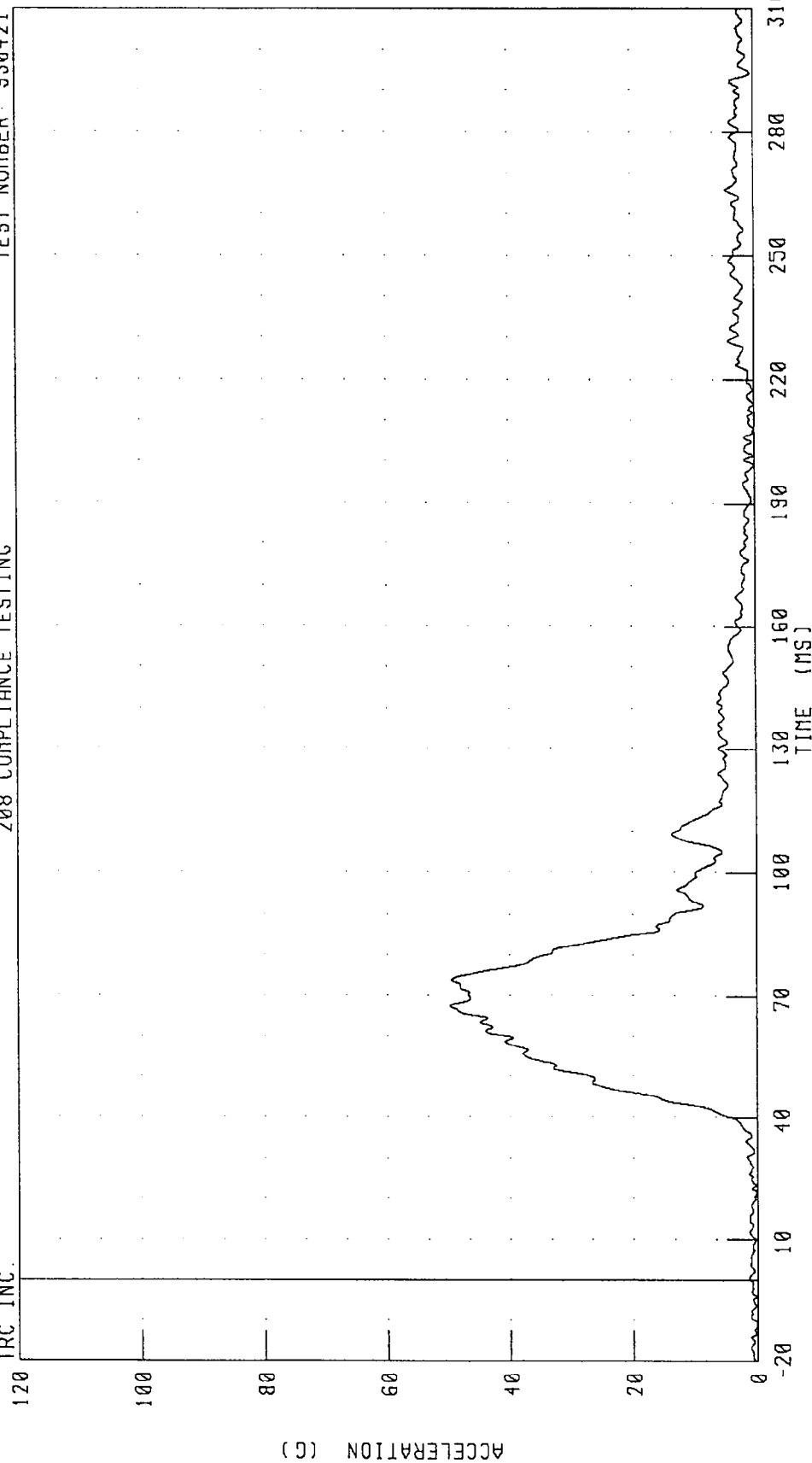
CHANNEL: CSTZG2 FILTER: CH. CLASS 180
PEAK DATA: 13.68 G @ 109.25 MS; -12.77 G @ 57.88 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION

TEST NUMBER: 930421

208 COMPLIANCE TESTING

TRC INC.

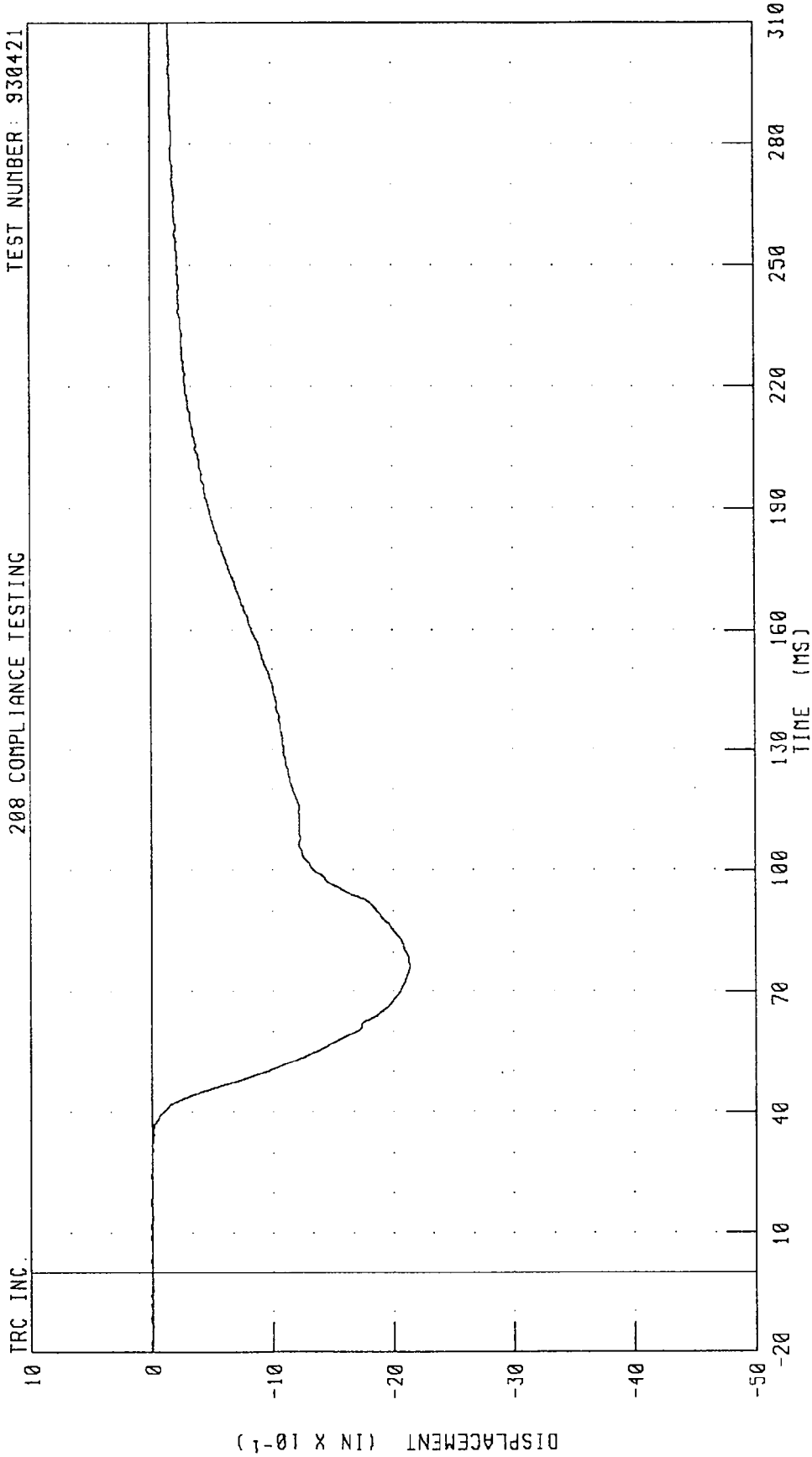


CHANNEL: CSTRG2 FILTER: CH. CLASS 180

PEAK DATA: 49.87 G @ 67.50 MS, 0.11 G @ 23.38 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST DEFLECTION
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

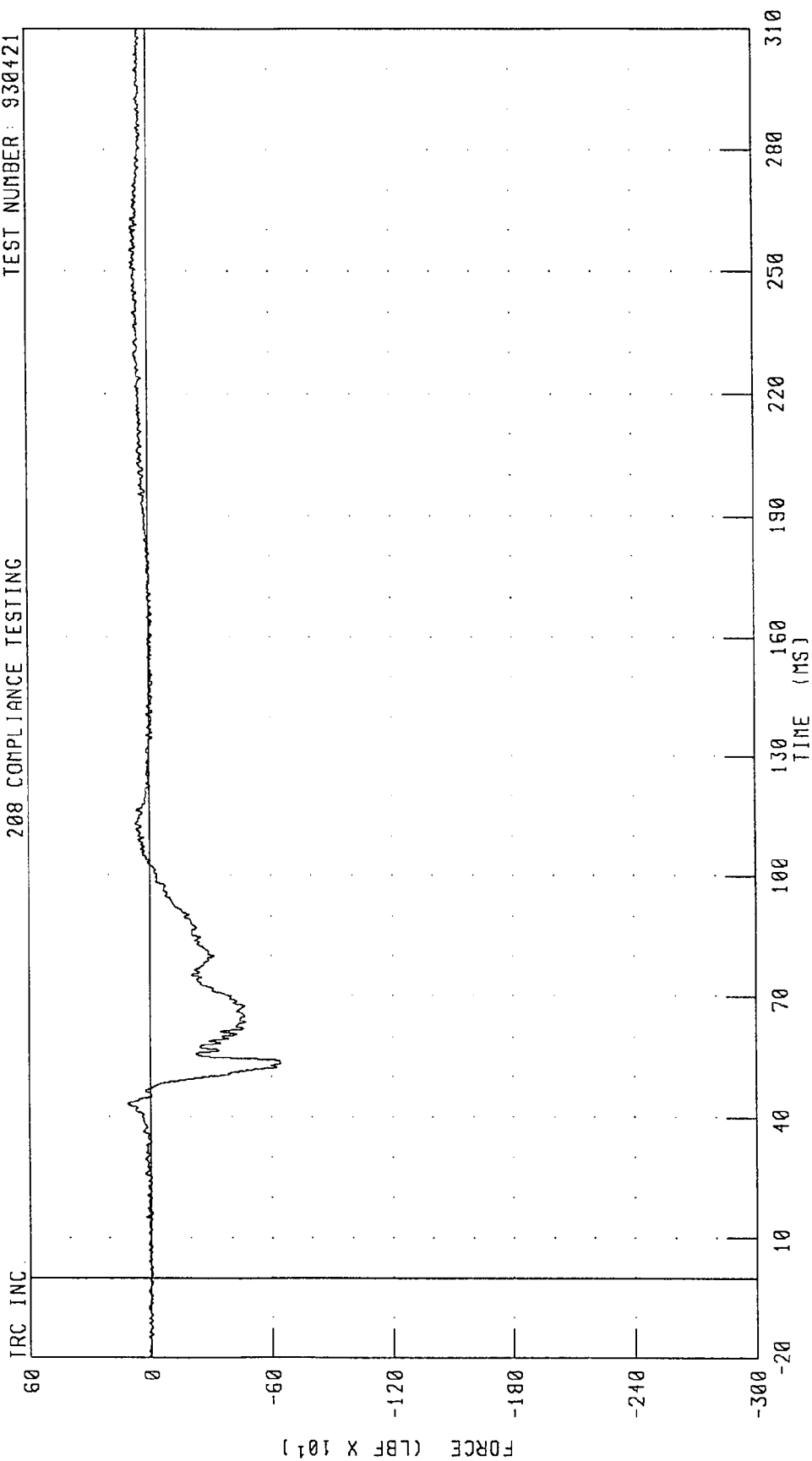


PEAK DATA: 0.01 IN @ -12.13 MS; -2.14 IN @ 76.25 MS

CHANNEL: CSTX02 FILTER: CH. CLASS 180

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER LEFT FEMUR FORCE
208 COMPLIANCE TESTING

TEST NUMBER: 930421



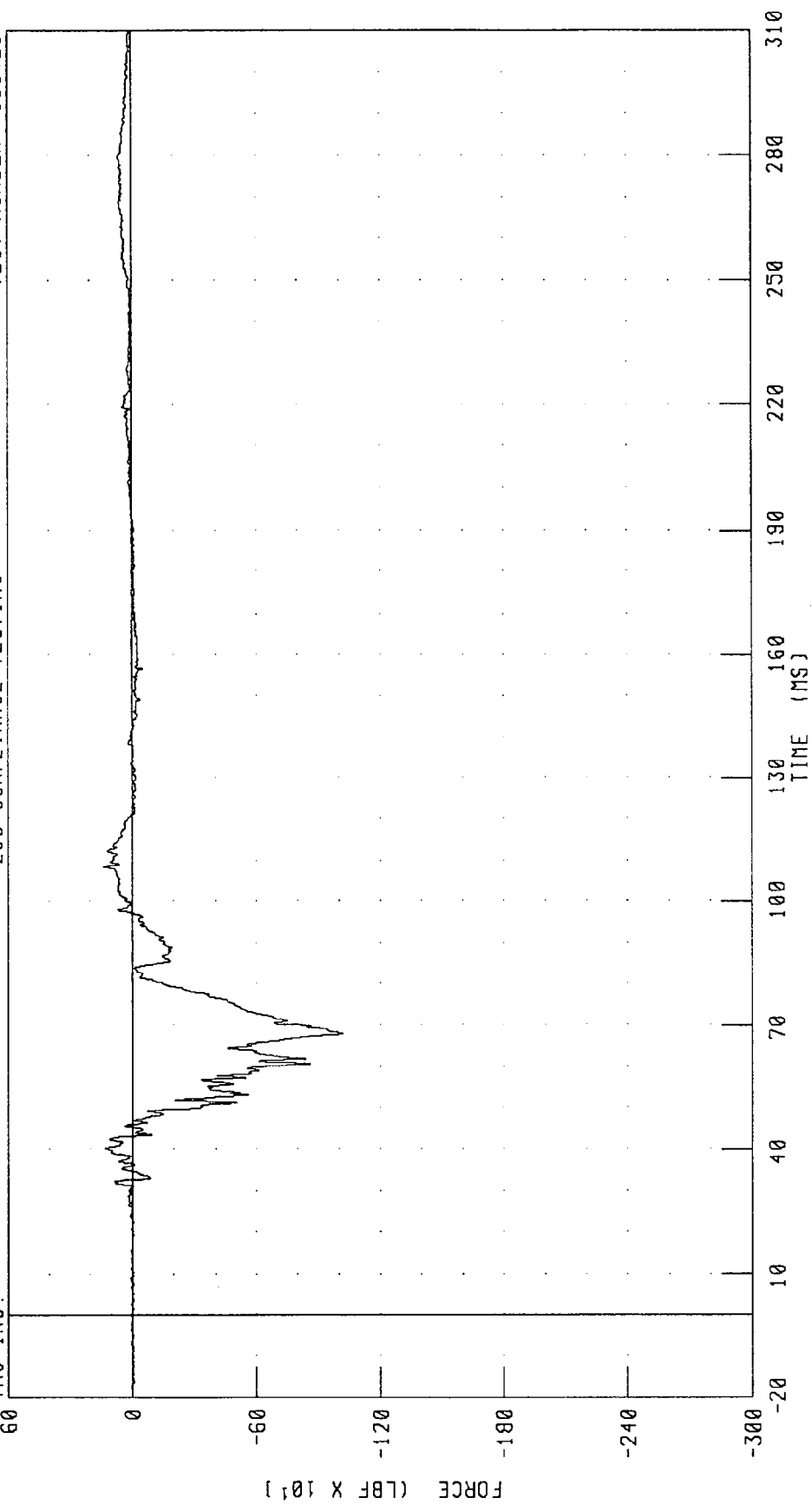
PEAK DATA: 110.39 LBF @ 43.38 MS; -644.47 LBF @ 53.38 MS

CHANNEL: LFMF2 FILTER: CH. CLASS 600

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER RIGHT FEMUR FORCE
208 COMPLIANCE TESTING

TEST NUMBER: 930421

TRC INC.

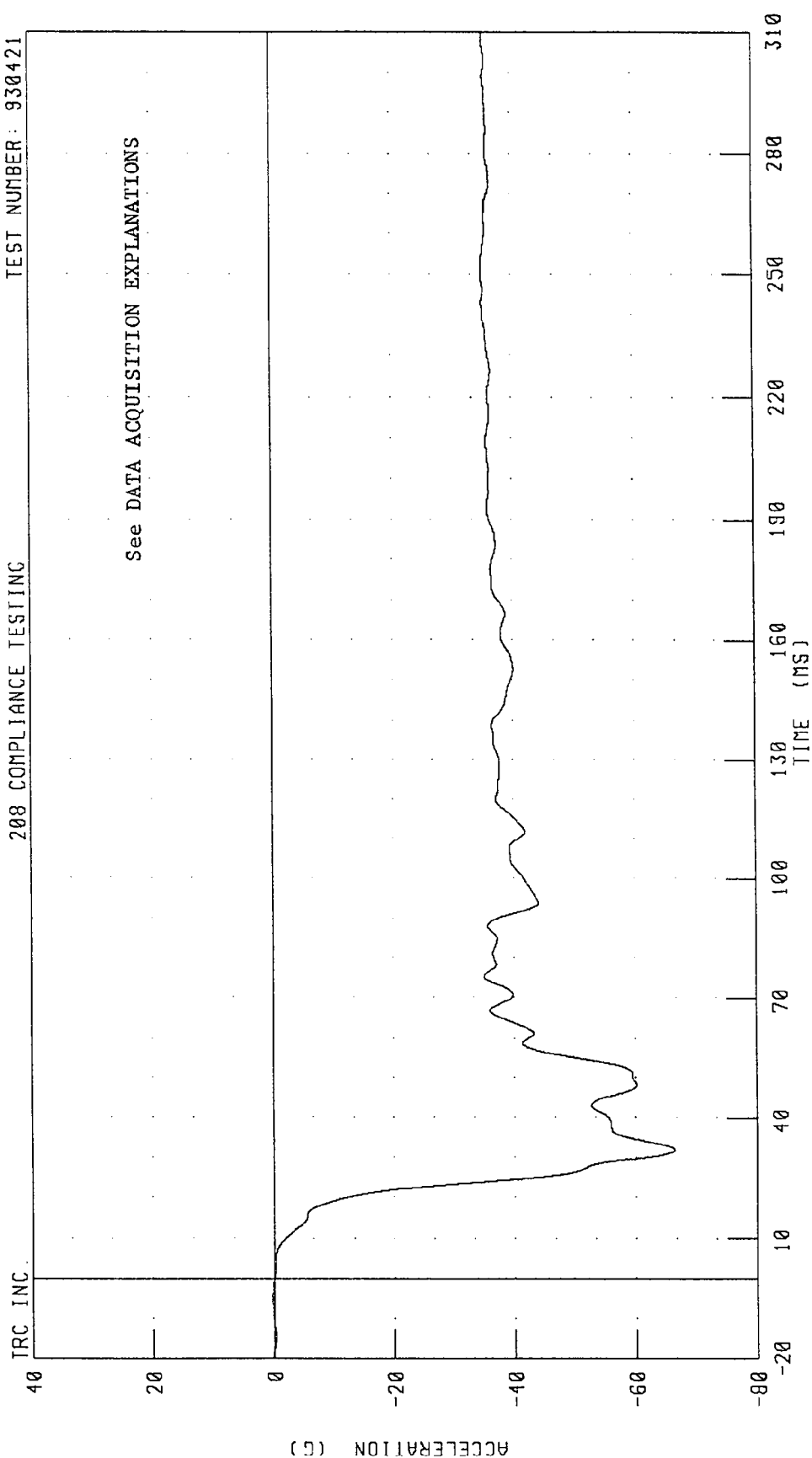


PEAK DATA: 135.16 LBF @ 108.50 MS, -1017.19 LBF @ 68.00 MS

CHANNEL: RFMF2 FILTER: CH. CLASS 600

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
LEFT REAR SEAT X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 930421

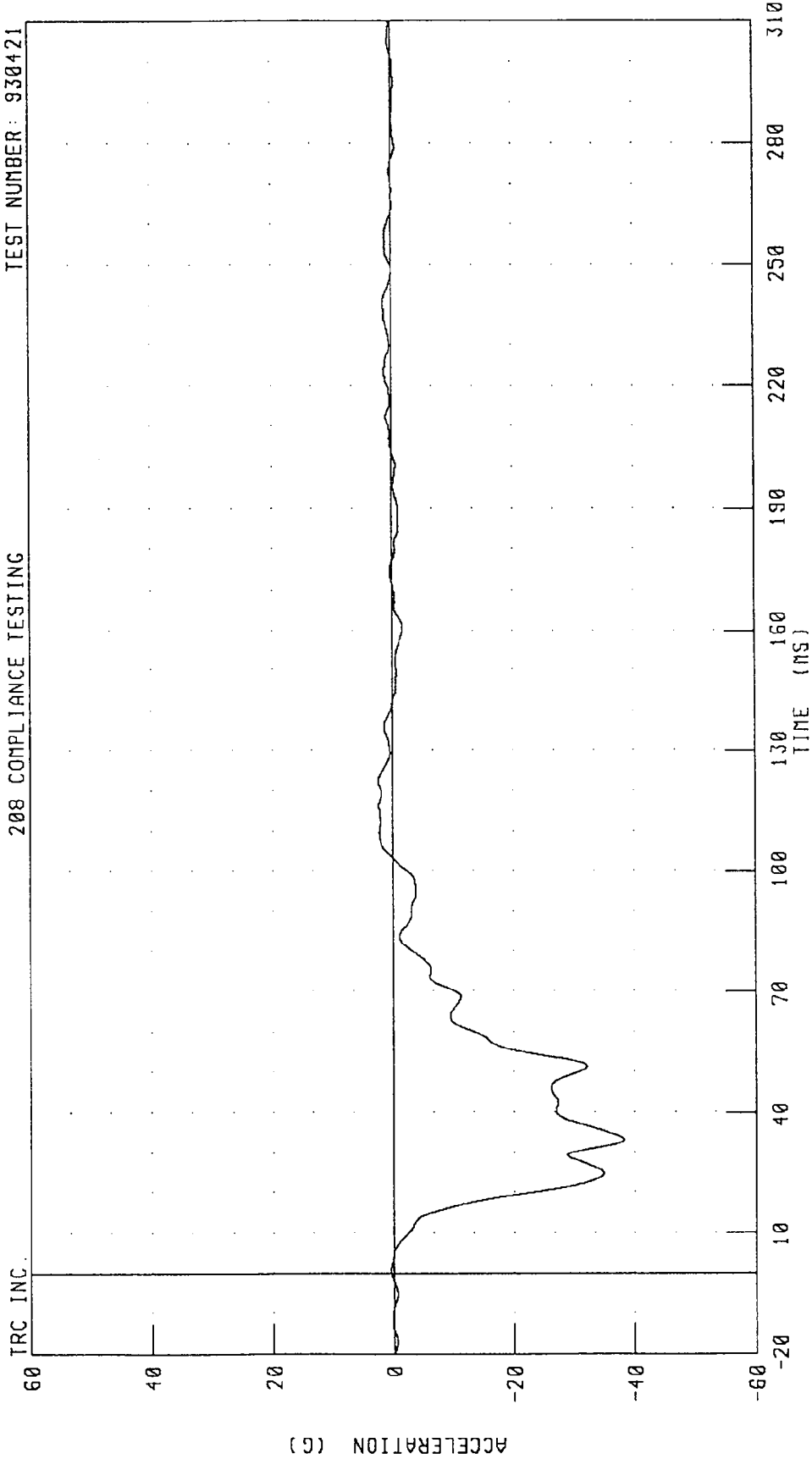


CHANNEL: TLRXG1 FILTER: CH. CLASS 60

PEAK DATA: 0.29 G @ -5.13 MS; -66.47 G @ 31.88 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 RIGHT REAR SEAT X-AXIS ACCELERATION
 208 COMPLIANCE TESTING

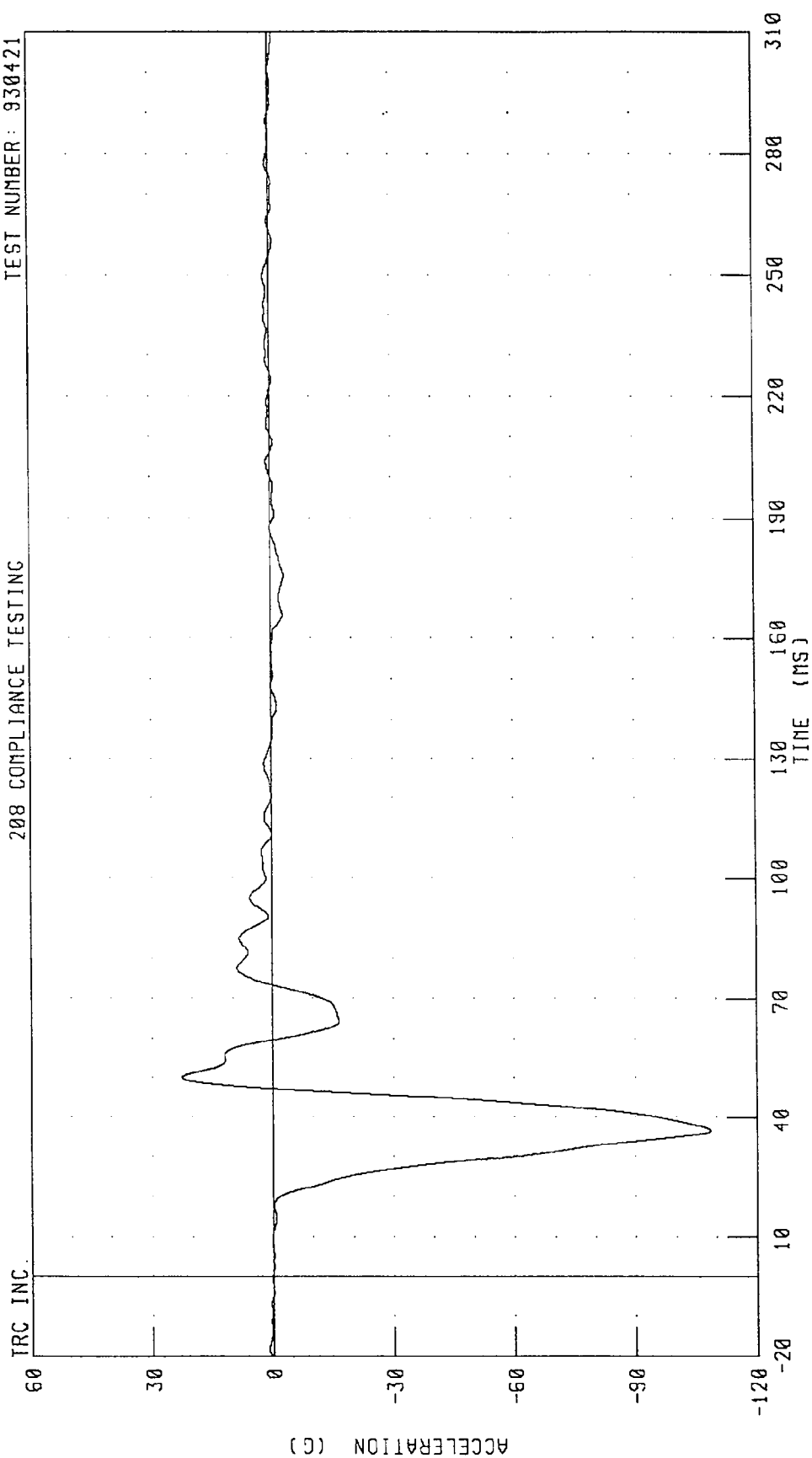
TEST NUMBER: 930421



CHANNEL: TRRXG1 FILTER: CH. CLASS 60

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
ENGINE TOP X-AXIS ACCELERATION
208 COMPLIANCE TESTING

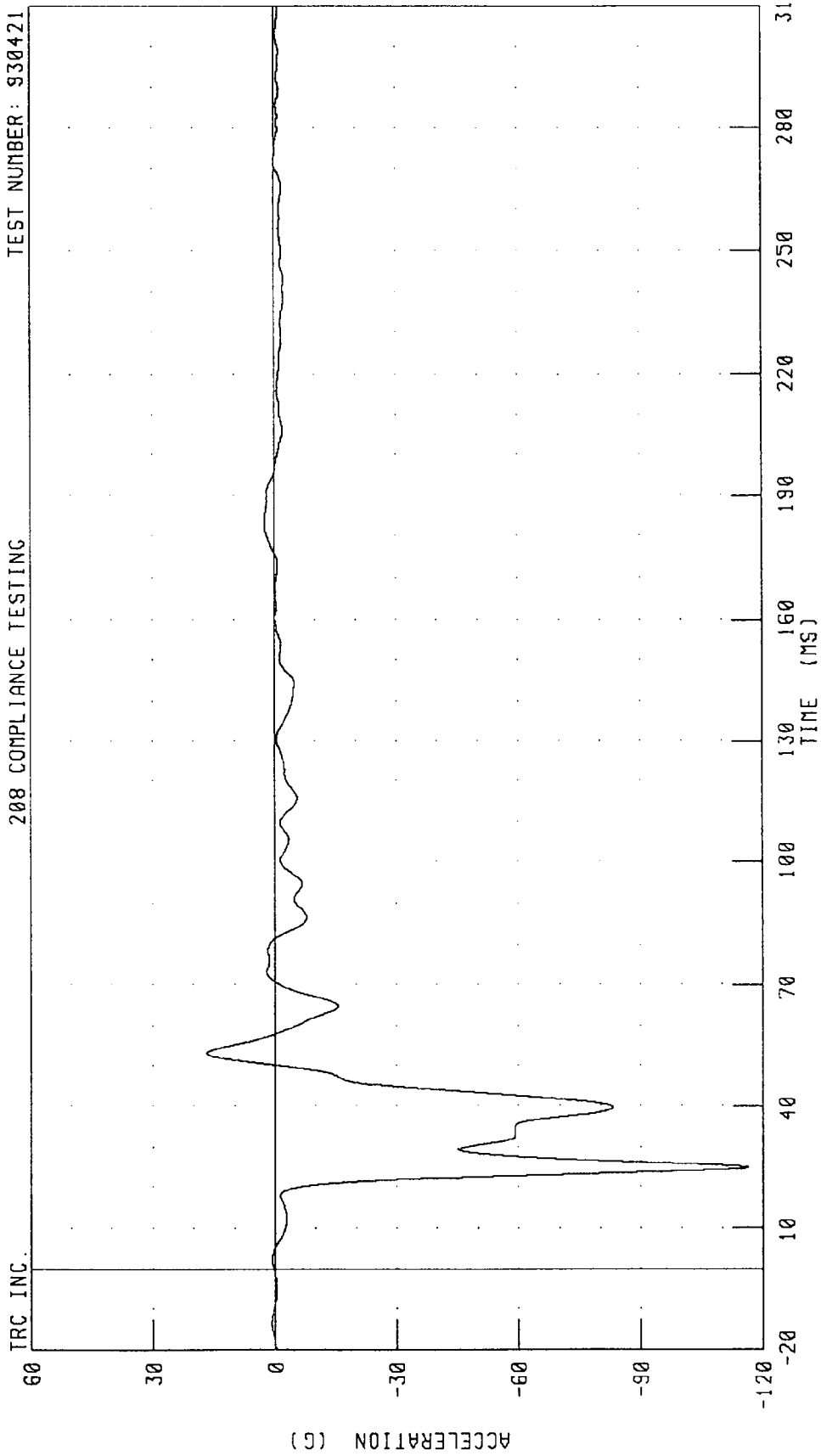
TEST NUMBER: 930421



CHANNEL: ENGXC1 FILTER: CH. CLASS 60

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
ENGINE BOTTOM X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 930421

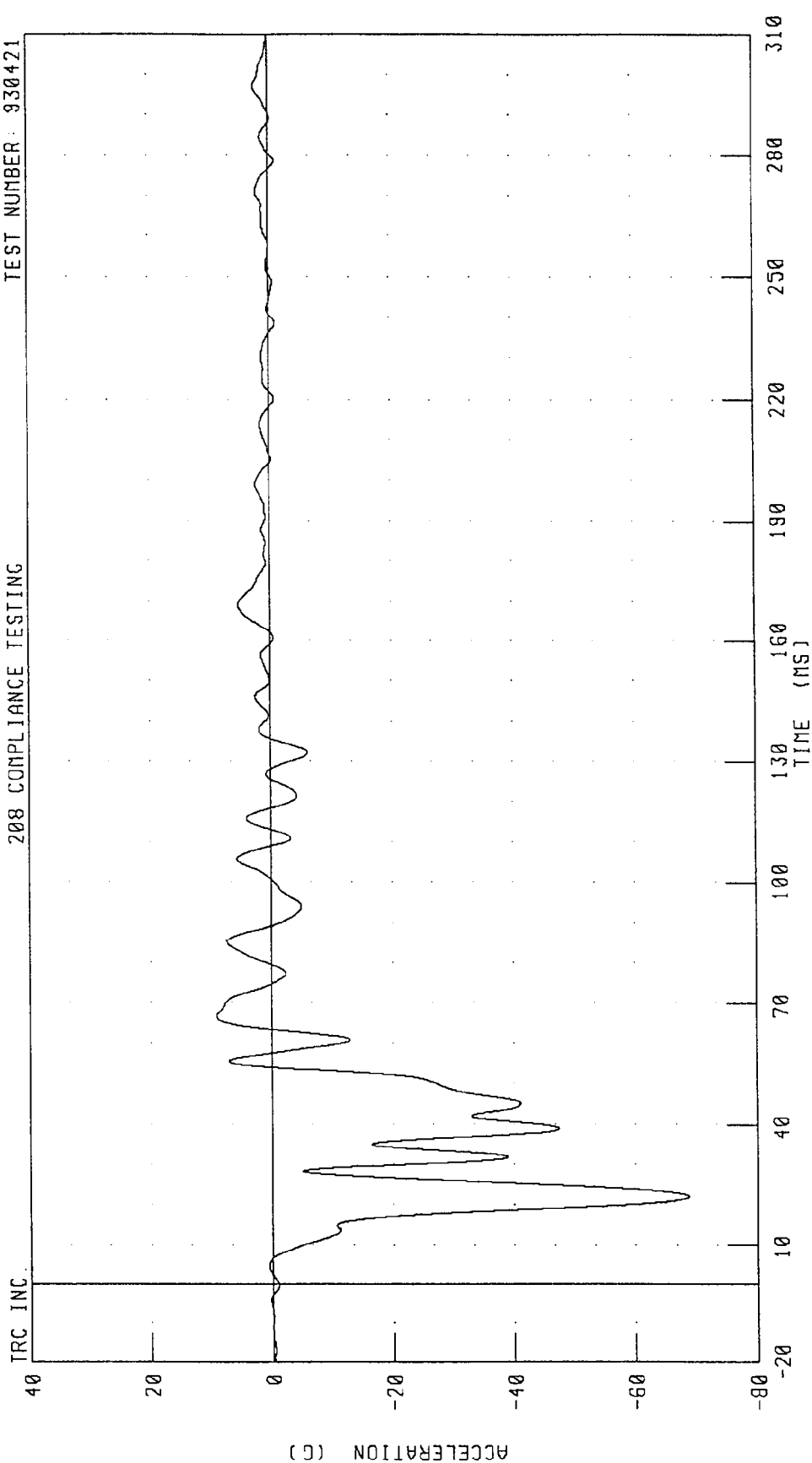


CHANNEL: ENGXC2 FILTER: CH. CLASS 60

PEAK DATA: 16.88 G @ 53.13 MS, -116.42 G @ 24.88 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
RIGHT BRAKE CALIPER X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 930421

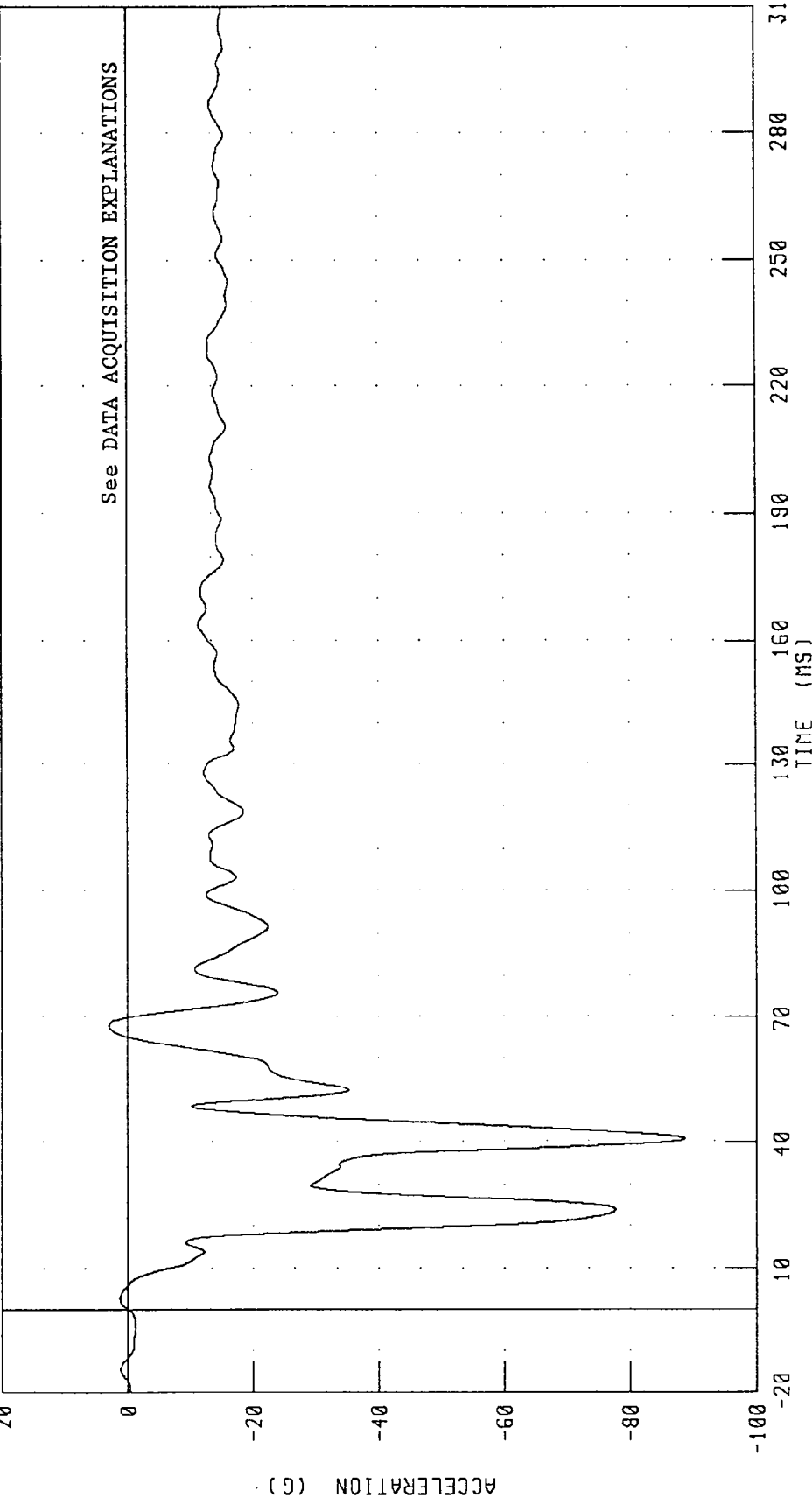


CHANNEL: BCRXG1 FILTER: CH. CLASS 60

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
 LEFT BRAKE CALIPER X-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 930421

TRC INC.



CHANNEL: BCLXG1 FILTER: CH. CLASS 60

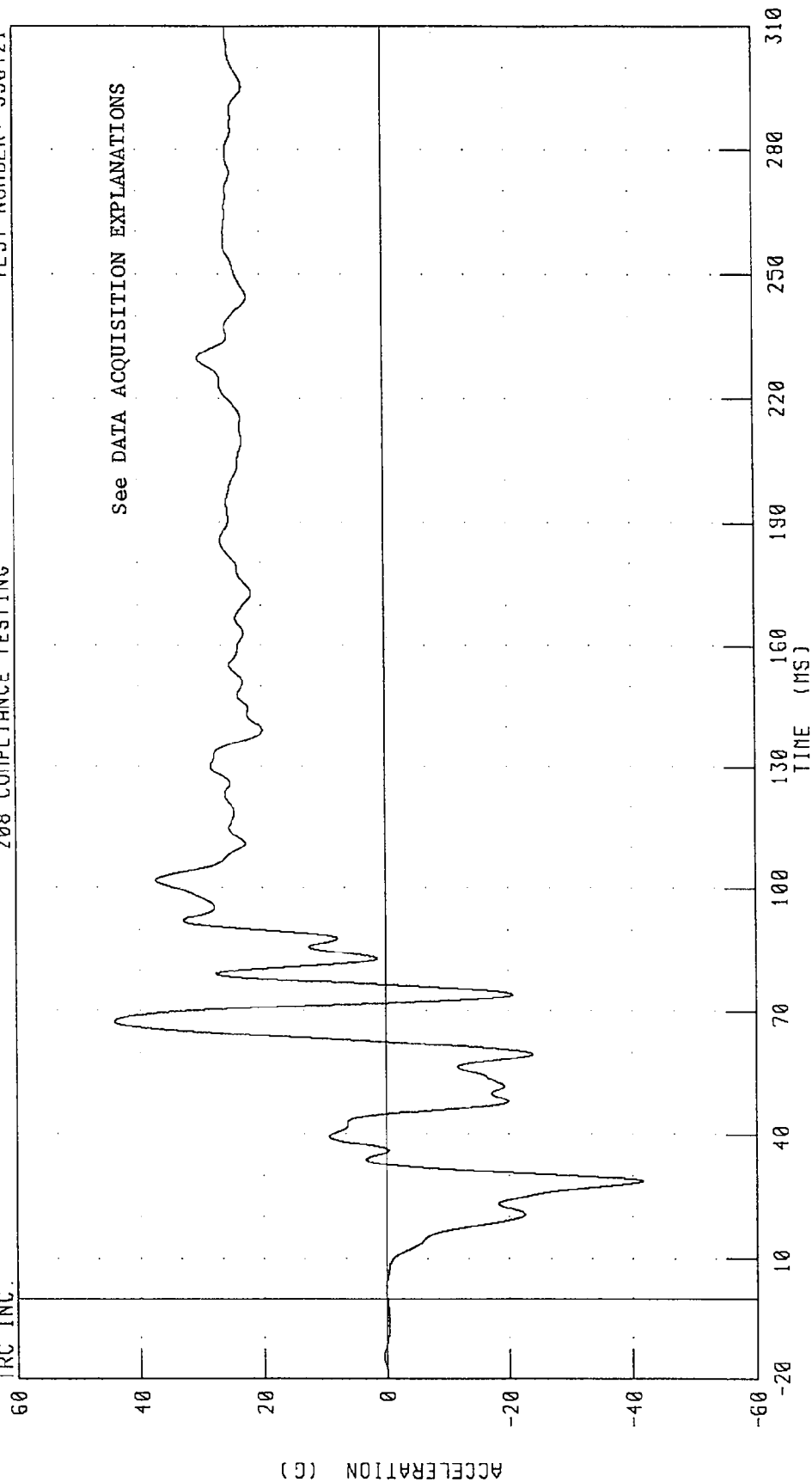
PEAK DATA: 2.94 G @ 67.75 MS; -88.70 G @ 40.75 MS

1993 ISUZU TROOPER INTO FLAT FRONTAL BARRIER
INSTRUMENT PANEL CENTER X-AXIS ACCELERATION

208 COMPLIANCE TESTING

TEST NUMBER: 930421

TRC INC.



CHANNEL: DPCXG1 FILTER: CH. CLASS 60

PEAK DATA: 44.08 G @ 67.50 MS; -41.63 G @ 28.75 MS