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212-TRC-96-007
301-TRC-96-007

Vehicle Safety Compliance Testing
for Occupant Crash Protection,
Windshield Mounting, Windshield Zone Intrusion,
and Fuel System Integrity

Hyundai Motor Company

1996 Hyundai Sonata

4-door sedan

NHTSA Number: CT0509

TRC Test Number: 960214

Transportation Research Center Inc.

10820 State Route 347

East Liberty, Ohio 43319



March 4, 1996

Final Report

Prepared For:

U.S. Department of Transportation
National Highway Traffic Safety Administration
Office of Vehicle Safety Compliance (NEF-30)
400 Seventh Street, S.W., Room No. 6115
Washington, DC 20590

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3/21/96

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16. Abstract A 30 mph flat frontal barrier impact test was conducted on a 1996 Hyundai Sonata 4-door sedan, NHTSA No. CT0509, at Transportation Research Center Inc. on February 14, 1996. This test was conducted to determine compliance with Federal Motor Vehicle Safety Standards: FMVSS 208, "Occupant Crash Protection"; 212, "Windshield Mounting"; 219 (partial), "Windshield Zone Intrusion"; and 301 "Fuel System Integrity." The barrier impact velocity was 29.3 mph. The vehicle's maximum static crush was 17.9 inches. The ambient temperature was 72° F. The driver's Head Injury Criteria (HIC) was 292. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 62.2 g (See Data Acquisition Explanations). The driver's chest deflection was 2.3 inches. The driver's left and right femur maximum axial forces were 1586 pounds and 1225 pounds, respectively. The passenger's HIC was 249. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 38.9 g. The passenger's chest deflection was 0.8 inch. The passenger's left and right femur maximum axial forces were 1616 pounds and 1693 pounds, respectively.			
17. Key Words Frontal Impact 30 mph Vehicle Safety Compliance Testing: FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Mounting" FMVSS 219, "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity"		18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division Nassif Building, Room 5108 400 Seventh Street, S.W. Washington, DC 20590	
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	meters	m
yd	yards	0.9	kilometers	km
mi	miles	1.6		
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square kilometers	km ²
mi ²	square miles	2.6	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

* 1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NIST 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
		1.06	quarts	qt
		0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
		1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

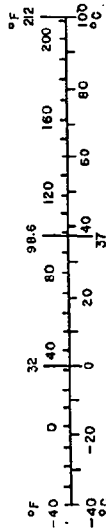


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Section 1.0

Purpose and Test Procedure

Purpose

This 30 mph flat frontal barrier impact test is part of the Federal Motor Vehicle Safety Standards (FMVSS) 208, 212, 219 (partial), and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by the Transportation Research Center Inc. (TRC) under Contract No. DTNH22-93-D-01089. The purpose of this test was to determine if the subject vehicle, a 1996 Hyundai Sonata 4-door sedan, NHTSA No. CT0509, 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-208-09. Data was obtained relative to FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Mounting"; FMVSS 219 (partial), "Windshield Zone Intrusion"; and FMVSS 301, "Fuel System Integrity," performance.

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

The test vehicle contained two (2) Part 572 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 C of the Laboratory Test Procedure.

Both dummies were instrumented with head and chest accelerometers to measure longitudinal, lateral, and vertical accelerations, chest deflection potentiometers, and with left and right femur load cells to measure axial forces. The dummies were also instrumented with upper and lower tibia load cells to measure forces and moments.

The forty-six (46) data channels were digitally sampled at 12,500 samples per second and processed per Sections 11.13 through 11.15 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. Appendix C contains the manufacturer's vehicle information.

Section 2.0

Frontal Barrier Impact Test Summary

Test Results Summary

This flat frontal barrier test was conducted at TRC on February 14, 1996.

The test vehicle, a 1996 Hyundai Sonata 4-door sedan, NHTSA No. CT0509, did not appear to comply with the performance requirements of FMVSS 208 in the flat frontal barrier impact mode. The driver's chest resultant acceleration exceeded 60 g's, the Head Injury Criteria (HIC) calculations were less than 1000, the passenger's chest resultant acceleration did not exceed 60 g's, the chest deflections did not exceed 3.0 inches, and the compressive 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. The vehicle's restraint system met the applicable comfort and convenience requirements. The windshield periphery retention was 75.5 percent. There was no penetration into any portion of the windshield. No fluid spilled from the vehicle's fuel system following the impact.

The test vehicle was equipped with airbags at the driver's and right front passenger's seating position. The vehicle's test weight was 3345 pounds. The vehicle's impact speed was 29.3 mph. The vehicle's maximum static crush was 17.9 inches.

The driver's HIC was 292. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 62.2 g¹. The driver's chest deflection was 2.3 inches. The driver's left and right femur maximum compressive forces were 1586 pounds and 1225 pounds, respectively.

The right front passenger's HIC was 249. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 38.9 g. The passenger's chest deflection was 0.8 inch. The right front passenger's left and right femur maximum compressive forces were 1616 pounds and 1693 pounds, respectively.

Windshield periphery retention was lost along the left A-pillar and 13.0 inches along the upper edge measured from the top of the left A-pillar. Total loss of retention was 40.4 inches. There was no penetration through the windshield. Following the impact, no fluid spilled from the vehicle's fuel system. The static rollover test was not conducted.

¹ See Data Acquisition Explanations on page 6

Data Acquisition Explanations

The driver's chest Y-axis acceleration data, CSTYG1, was lost after 68 milliseconds as a result of a cut accelerometer cable. The driver's chest resultant acceleration and resultant acceleration with 3 milliseconds minimum duration calculations excluded the Y-axis data.

The driver's left lower tibia moment about Y-axis data, ANLYM1, exceeded the data channel's full scale value from 65 to 70 milliseconds.

The driver's right lower tibia moment about Y-axis data, ANRYM1, exceeded the data channel's full scale value from 57 to 61 milliseconds.

Table 1 Crash Test Summary

NHTSA number:	CT0509
Test type:	Frontal barrier impact
Test date:	02/14/96
Test time:	1454
Ambient temperature at impact area:	72° F
Vehicle year/make/ model/body style:	1996/Hyundai/Sonata/4-door sedan
Vehicle test weight:	3345 lb
Impact angle ¹ :	0°
Impact velocity ² :	
Primary:	29.3 mph
Secondary:	29.3 mph
Maximum static crush:	17.9 in
Average rebound:	38.1 in
Number of cameras:	
Real-time:	2
High-speed:	14
Door opening data:	
Left-front:	Easy
Right-front:	Easy

¹ With respect to tow track centerline.

² Speed trap measurement ($\pm$.05 mph accuracy)

Table 1 Crash Test Summary, Cont'd.

Dummies:	<u>Driver #229</u>	<u>Passenger #230</u>
Type:	Part 572 E	Part 572 E
Location:	Left front	Right front
Restraint:	Airbag	Airbag
Number of data channels:		
Front seat data:		
Seat track failure:	None	None
Seat back failure:	None	None
Visible dummy contact points:		
Head:	Airbag	Airbag
Chest:	Airbag	Airbag
Abdomen:	None	None
Left knee:	Instrument panel	Instrument panel
Right knee:	Instrument panel	Instrument panel

Table 2 Test Vehicle Information

Vehicle year/make/
model/body style: 1996/Hyundai/Sonata/4-door sedan
Color: White
VIN: KMHC24F8TU528576
NHTSA number: CT0509
Engine data:
Placement: Transverse/Lateral
Cylinders: 4
Displacement: 2.0 liters
Transmission data: 5 speed, X manual, ___ automatic, ___ overdrive
Final drive: X fwd, ___ rwd, ___ 4wd
Date vehicle received: 02/01/96
Odometer reading: 76
Dealer's name
and address: Ricart Hyundai
4255 S. Hamilton Rd.
Columbus, OH 43227

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	No
Clock	Yes	Rear window defroster	Yes
Power door locks	No	Other:	None

Certification data from vehicle's label:

Vehicle manufactured by: Hyundai Motor Company
Date of manufacture: 11/95
VIN: KMHC24F8TU528576
GVWR: 3870 lb
GAWR: Front: 2194 lb
Rear: 1918 lb

Table 2 Test Vehicle Information, Cont'd.

Size of tires on vehicle: P185/70R14
Spare tire: Space saver
Type of front seats: Bucket

Tire & capacity data from vehicle's label:

Recommended tire size: P195/70R14 90H
Recommended cold tire pressure:

Front: 30 psi
Rear: 30 psi

Designated Seating Capacity:

Front 2
Rear 3
Total 5

Vehicle Capacity Weight: 860 lbs.

Test vehicle attitudes:

Delivered attitude:	LF: 28.1 in.	RF: 28.3 in	LR: 27.2 in	RR: 27.3 in
Fully loaded attitude:	LF: 27.0 in	RF: 27.4 in	LR: 26.0 in	RR: 26.1 in
Pre-test attitude:	LF: 27.2 in	RF: 27.5 in	LR: 25.8 in	RR: 26.2 in

Table 2 Test Vehicle Information, Cont'd.

Weight of test vehicle as received (with maximum fluids):

Right front	879 lb	Right rear	574 lb
Left front	903 lb	Left rear	563 lb
Total front weight	1782 lb	(61.0% of total vehicle weight)	
Total rear weight	1137 lb	(39.0% of total vehicle weight)	
Total delivered weight	2919 lb		

Calculation of test vehicle's target test weight:

RCLW = Rated Cargo and Luggage Weight

UDW = Unloaded Delivered Weight (2919 lb)

VCW¹ = Vehicle Capacity Weight = 860 lb

DSC = Designated Seating Capacity (5)

RCLW = VCW - 150 (DSC) = 110

Target test weight = UDW + RCLW¹ + (Number of Hybrid III dummies x 167 lb per dummy)

Target test weight = 2919 + 110 + 334 = 3363 lb

Weight of test vehicle with required dummies and 92 lb of cargo weight:

Right front	950 lb	Right rear	704 lb
Left front	987 lb	Left rear	704 lb
Total front weight	1937 lb	(57.9% of total vehicle weight)	
Total rear weight	1408 lb	(42.1% of total vehicle weight)	
Total test weight	3345 lb	(0.5% under target test weight)	

Weight of ballast secured in vehicle cargo area: 10 lb

Components removed to meet target test weight: Trunk lid and spare tire

CG rearward of front wheel centerline: 44.8 in

Vehicle Wheelbase: 106.4 in

¹ From vehicle's tire load label.

Table 3 Post-Impact Data

Test number: 960214
NHTSA number: CT0509
Test date: 02/14/96
Test time: 1454
Test type: Frontal barrier impact
Impact angle: 0°
Ambient temperature
at impact area: 72° F
Temperature in
occupant compartment: 70° F
Impact velocity:
Primary: 29.3 mph
Secondary: 29.3 mph
Specified range: 28.9 to 29.9 mph

Distance from vehicle to barrier:

Entering velocity trap: 14.0 in
Exiting velocity trap: 2.0 in

Test vehicle static crush:

Overall length of test vehicle:

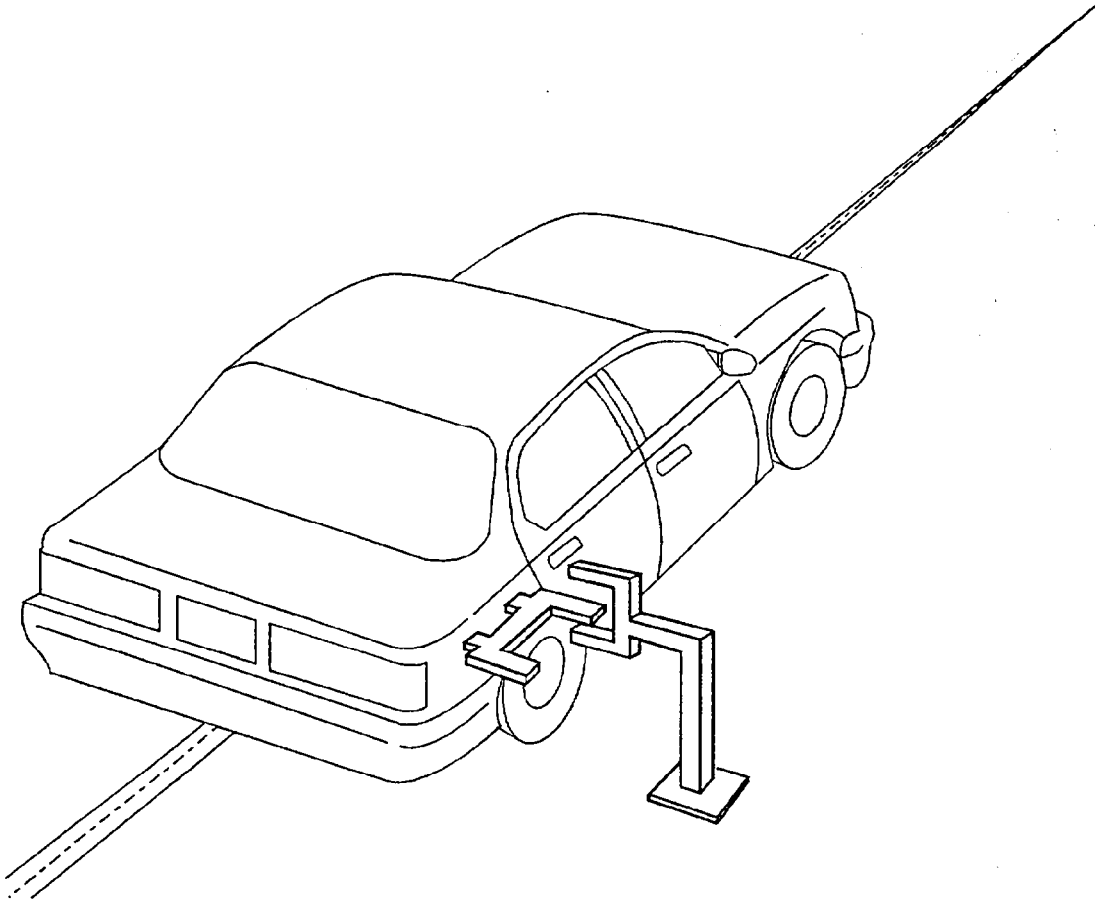
Pre-test:	L:	178.6 in	C:	184.4 in	R:	178.7 in
Post-test:	L:	169.6 in	C:	166.5 in	R:	165.0 in
Total crush:	L:	9.0 in	C:	17.9 in	R:	13.7 in
Average crush:		13.5 in				

Test vehicle rebound from flat barrier:

Distance from test vehicle to barrier:

Post-test:	L:	34.7 in	C:	38.2 in	R:	41.5 in
Average rebound:		38.1 in				

Figure 1 Impact Velocity Measurement System



The final vane clears emitter/receiver two inches before impact.

The vanes have a one-foot spacing.

Figure 2 Accident Investigation Division Data for 30 mph Frontal Barrier Impact

NHTSA number: CT0509
Test date: 02/14/96
Vehicle year/make/
model/body style: 1996/Hyundai/Sonata/4-door sedan
Vehicle size category: Mid size
VIN: KMHC24F8TU528576
Build date: 11/95
Test weight: 3345 lb
Vehicle wheelbase: 106.4 in
Maximum width: 69.3 in
Front overhang: 38.0 in

Collision Deformation

Classification (CDC) Code: 12FDEW2

Crush depth
measurements:

C1:	9.0 in
C2:	14.3 in
C3:	17.5 in
C4:	17.6 in
C5:	16.0 in
C6:	13.7 in

Midpoint of damage: D: Vehicle Longitudinal Centerline

Length of damaged
region: L: 60.0 in

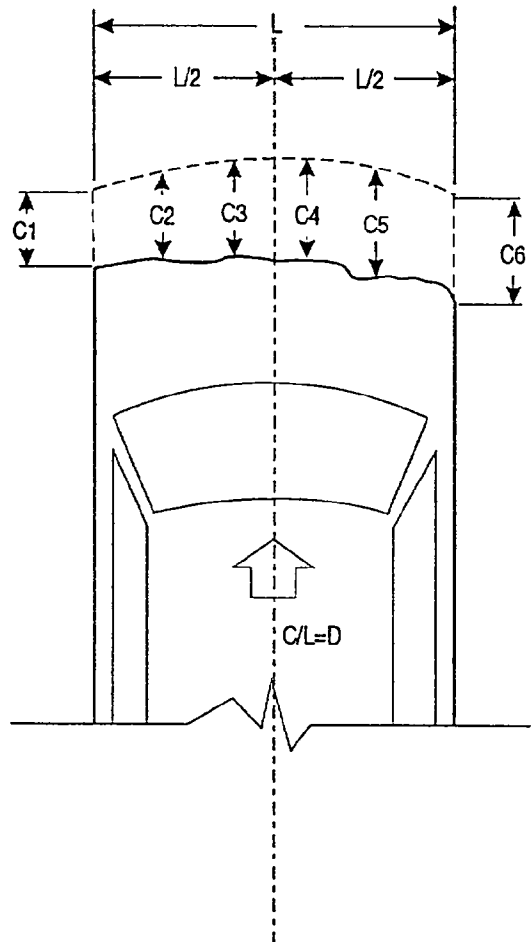


Table 4 Post-test Airbag Data

NHTSA number: CT0509
Test date: 02/14/96
Technician: Markusic
Vehicle year/make/
model/body style: 1996/Hyundai/Sonata/4-door sedan

A. Number of airbag vent holes:

Driver: 2
Passenger: None

B. Size of airbag vent holes:

Driver: 1.25 in dia.
Passenger: NA

C. Total airbag vent area:

Driver: 1.6 in²
Passenger: NA

D. Deflated airbag length and width dimensions or, if round, diameter

Driver:	Length	NA
	Width	NA
	Diameter	26.0 in
Passenger:	Length:	31.0 in
	Width:	32.0 in
	Diameter:	NA

Table 4 Post-test Airbag Data, Cont'd.

E. Is the airbag tethered?

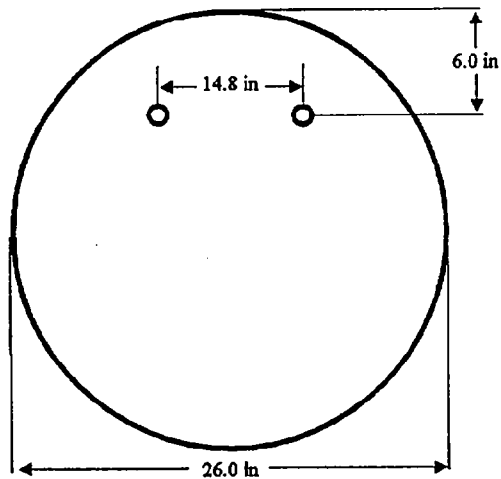
Driver: NA

If yes, record length of tether: NA

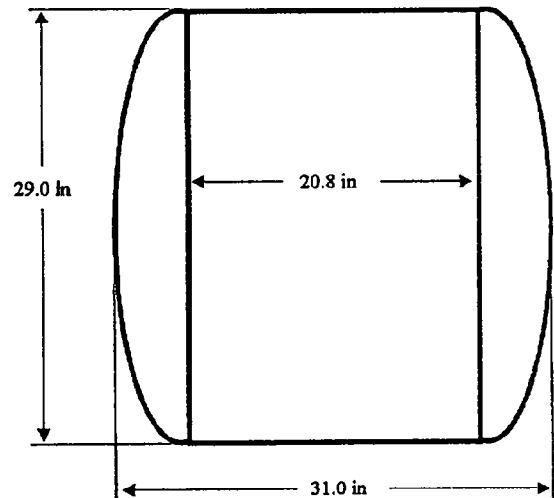
Passenger: NA

If yes, record length of tether: NA

Driver's airbag:



Passenger's airbag:



F. Airbag and gas generator part numbers and manufacturer's names.

Driver: Manufacturer: NA

Airbag: PE5080300-00

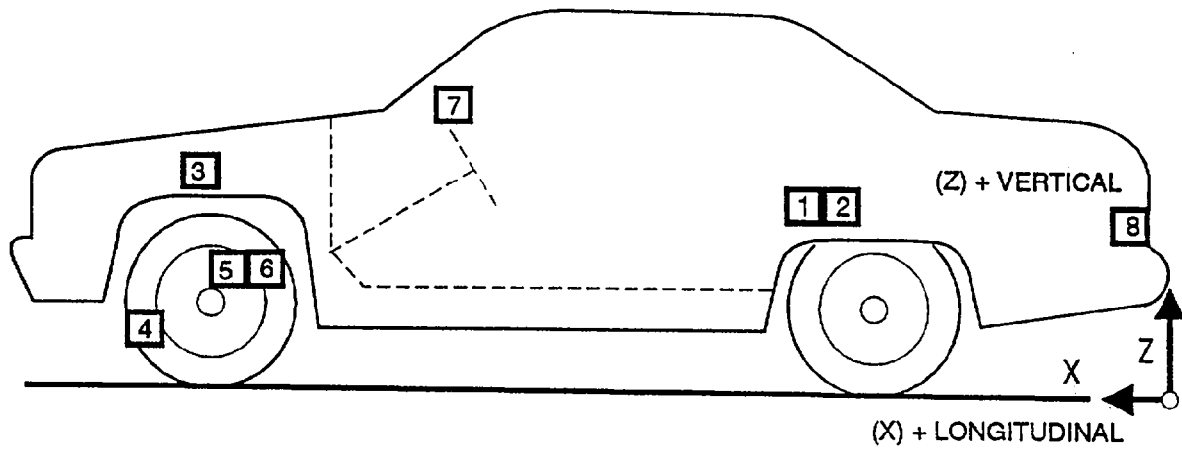
Inflator: NA

Passenger: Manufacturer: NA

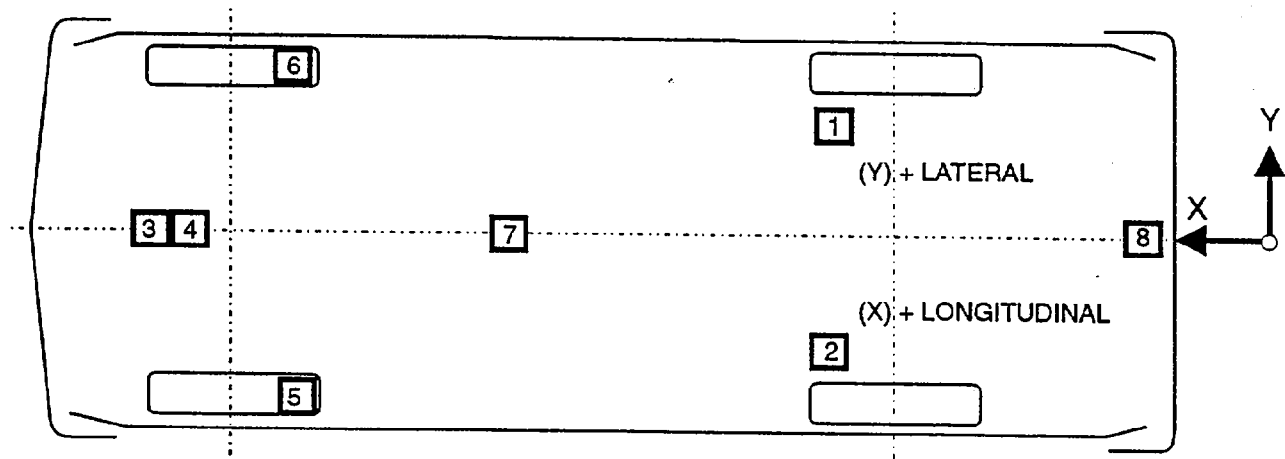
Airbag: NA

Inflator: NA

Figure 3 Vehicle Accelerometer Placement



SIDE VIEW



BOTTOM VIEW

Table 5 Vehicle Accelerometer Locations and Data Summary

TEST NUMBER: 960214 No. LOCATION		X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
1 LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE	69.8 in	14.1 in	16.0 in	5.6 g	@ 86.6 ms	36.7 g	@ 60.9 ms
	POST	69.8 in	14.1 in	17.0 in				
2 RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE	69.5 in	-14.1 in	16.1 in	5.1 g	@ 86.9 ms	38.3 g	@ 61.3 ms
	POST	69.5 in	-14.1 in	17.0 in				
3 ENGINE TOP LONGITUDINAL	PRE	154.9 in	3.4 in	31.5 in	15.8 g	@ 46.8 ms	82.3 g	@ 33.4 ms
	POST	149.7 in	4.0 in	31.5 in				
4 ENGINE BOTTOM LONGITUDINAL	PRE	159.2 in	8.6 in	9.0 in	28.0 g	@ 46.3 ms	86.9 g	@ 35.0 ms
	POST	153.9 in	9.0 in	9.0 in				
5 RIGHT BRAKE CALIPER LONGITUDINAL	PRE	152.5 in	-26.4 in	11.7 in	37.4 g	@ 77.4 ms	917.0 g	@ 70.2 ms
	POST	150.3 in	-27.1 in	11.7 in				
6 LEFT BRAKE CALIPER LONGITUDINAL	PRE	152.5 in	26.4 in	11.7 in	32.8 g	@ 66.3 ms	116.7 g	@ 48.2 ms
	POST	150.3 in	27.0 in	11.7 in				
7 INSTRUMENT PANEL CENTER LONGITUDINAL	PRE	126.0 in	-.5 in	36.4 in	7.9 g	@ 26.6 ms	53.4 g	@ 46.0 ms
	POST	124.5 in	-.5 in	36.7 in				
8 VEHICLE REAR CENTER VERTICAL	PRE	9.0 in	0.0 in	21.0 in	15.0 g	@ 60.7 ms	11.7 g	@ 83.0 ms
	POST	9.0 in	0.0 in	24.0 in				

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

Section 3.0

FMVSS 208, 212, 219 (partial), and 301 Data

Table 6 Dummy Injury Criteria

<u>Maximum Acceleration</u>							
	<u>Head</u>				<u>Chest</u>		
	X	Y	Z	R	X	Y	Z
Driver	-47.4 g	9.6 g	-29.4 g	56.1 g	-63.4 g	NA g ¹	-14.2 g
Passenger	-43.5 g	25.7 g	-20.8 g	44.2 g	-39.4 g	-8.4 g	9.7 g

<u>Maximum Femur Compressive Force</u>		
	<u>Left Femur</u>	<u>Right Femur</u>
Driver	1586 lbf	1225 lbf
Passenger	1616 lbf	1693 lbf

<u>Head Injury Criteria²</u>			
	<u>HIC</u>	<u>Time t₁</u>	<u>Time t₂</u>
Driver	292	65.04 ms	101.04 ms
Passenger	249	57.76 ms	91.28 ms

<u>Chest Maximum Resultant Acceleration³</u>			
	<u>Acceleration</u>	<u>Time t₁</u>	<u>Time t₂</u>
Driver ¹	62.2 g	82.8 ms	85.8 ms
Passenger	38.9 g	82.2 ms	85.2 ms

<u>Maximum Chest Deflection</u>	
Driver	2.3 in
Passenger	0.8 in

¹ See Data Acquisition Explanations.

² As defined in FMVSS No. 208

³ Defined as equal to or exceeding 0.003 sec. duration

Dummy Kinematic Summary

Driver Dummy

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

Right Front Passenger Dummy

Upon impact, the right front passenger dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head and chest impacted the airbag with the dummy's head rotating rearward and to the left. The dummy's head and chest were restrained by the passenger's airbag. The dummy's head rotated rearward contacting the head restraint as the dummy rebounded into the seat back. The dummy came to rest seated in the right front passenger's seat.

Table 7 FMVSS 208 Seat Belt Comfort and Convenience Test Summary

Front Outboard Designated Seating Positions

NHTSA number: CT0509

Vehicle model year/make/model/body style: 1996/Hyundai/Sonata/4-door sedan

Date of comfort/convenience check: 02/14/96

Technician performing check: Markusic

GVWR: 3870 lb

Automatic seat belts installed in any vehicle, other than a walk-in van-type vehicle which has a gross vehicle weight rating of 10,000 pounds or less, and is manufactured on or after September 1, 1986, shall meet the requirements for convenience hooks, webbing tension-relieving devices, and belt contact force.

Manual seat belts installed for compliance with this standard in front outboard designated seating positions of any vehicle, other than a walk-in van-type vehicle which has a gross vehicle rating of 10,000 pounds or less, and is manufactured after September 1, 1989, shall meet the requirements for belt contact force, plate access, retraction and seat belt guides, and hardware.

Vehicle Equipment:

The vehicle's front outboard seating positions were equipped with manual Type 2 seat belts which must comply with the dynamic test requirements of S5.1; requirements for webbing tension-relieving devices (S7.4.2), belt contact force (S7.4.3), latchplate access (S7.4.4), retraction (S7.4.5), and seat belt guides and hardware (S7.4.6) apply.

Convenience Hooks (S7.4.1):

Not applicable, the vehicle was not equipped with automatic seat belts.

Table 7 FMVSS 208 Seat Belt Comfort and Convenience Test Summary
Front Outboard Designated Seating Positions, Cont'd.

NHTSA number: CT0509

Vehicle model year/make/model/body style: 1996/Hyundai/Sonata/4-door sedan

Date of comfort/convenience check: 02/14/96

Technician performing check: Markusic

GVWR: 3870 lb

Webbing Tension-Relieving Device (S7.4.2):

The front outboard seating position assemblies do not have webbing tension-relieving devices.

Belt Contact Force (S7.4.3):

The belt contact force on the chest of the test dummy is 0.2 pound.

Latchplate Access (S7.4.4):

The seat belt latchplates, in their normal stowed position, are within the reach envelope.

The clearance test block moves unhindered to the latchplate or buckle.

Retraction (S7.4.5):

The seat belt automatically retracts when the seat belt latchplate is released.

The stowed seat belt webbing and hardware are not pinched when the door is closed.

Table 7 FMVSS 208 Seat Belt Comfort and Convenience Test Summary
Front Outboard Designated Seating Positions, Cont'd.

NHTSA number: CT0509

Vehicle model year/make/model/body style: 1996/Hyundai/Sonata/4-door sedan

Date of comfort/convenience check: 02/14/96

Technician performing check: Markusic

GVWR: 3870 lb

Seat Belt Guides and Hardware (S7.4.6):

The seat cushion is not removable.

The seat back does not serve a function other than seating.

The seat is not removable.

The seat is movable but the space formerly occupied by the seat cannot be used for a secondary function.

Note: If the seat or seat cushion is removable or if the seat is movable so the space formerly occupied by the seat can be used for a secondary function, the seat belt guides and hardware requirements do not apply.

The webbing is not designed to pass through the seat cushion or between the cushion and seat back.

The restraint system does not include webbing guides.

The seat belt receptacles were accessible without moving the center arm rest for access.

Table 8 FMVSS 208 Equipment Data

FMVSS 208 Seat Belt Warning System Data

With an occupant in the driver's position and the unbelt in stowed position and ignition switch placed in the "start/on" position, the duration of the reminder light and audible warning signal is 6 s.

With an occupant in the driver's position and the unbelt in use and the ignition switch placed in the "start/on" position the duration of audible warning signal is 0 s and the duration of the reminder light operation is 6 s.

NOTE: the audible warning should not operate.

The visual seat belt warning is the symbol from Table 2 of FMVSS 101.

Table 8 FMVSS 208 Equipment Data, Cont'd.

FMVSS 208 Labeling and Driver's Manual Data

The labels which describe the manufacturer's maintenance or replacement schedule for the crash-deployed occupant protection system were located on the driver's and passenger's sun visors.

The manufacturer's recommended regular airbag maintenance is to have the airbag system inspected ten years after the date that the vehicle was manufactured.

Appropriate instructions concerning maintenance and/or replacement of this system were provided in the owner's manual on page 1-20.

A description of the functional operation of the system was provided in the owner's manual on page 1-19.

A reference to the instructions and description of the system was included on the label.

An owner's manual was provided.

The owner's manual contained appropriate information concerning maintenance and/or replacement and a description of the functional operation of the systems on pages 1-19 and 1-20

Table 8 FMVSS 208 Equipment Data, Cont'd.

FMVSS 208 Readiness Indicator Data

The vehicle contained a crash-deployed occupant protection system which was not totally mechanical. The readiness indicator was a light stating "SRS" located on the lower right portion of the instrument cluster.

The readiness indicator was clearly visible to the driver.

A list of the elements in the occupant restraint system, being monitored by the readiness indicator was provided in the owner's manual on page 1-19.

FMVSS 208 Rear Outboard Seating Position Seat Belts

All rear outboard seating positions had Type 2 seat belts.

Figure 4 FMVSS 212 Test Data

Details of windshield mounting such as retention method, trim type, etc.:

Plastic trim around outer perimeter and adhesive around inner perimeter.

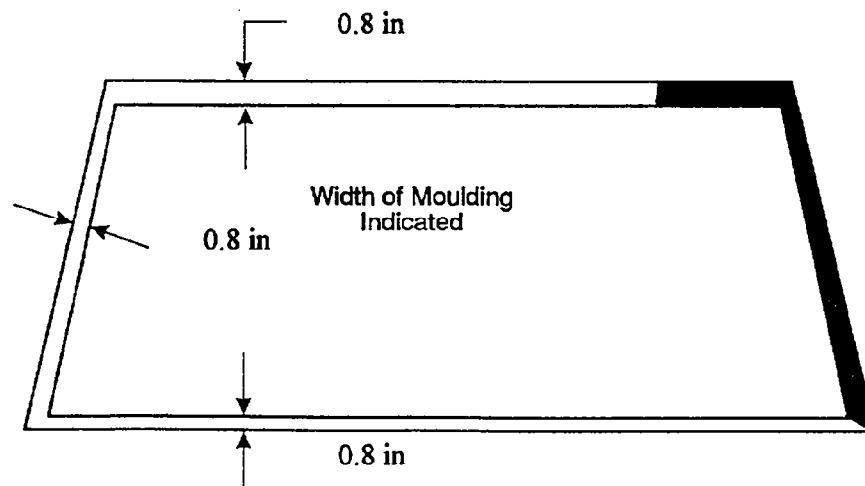
Clips or brackets used to retain windshield: None

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	82.5 in	82.5 in	100.0
Left side	82.5 in	42.1 in	51.0
Total	165.0 in	124.6 in	75.5

Pre-test windshield mounting material temperature: 70° F



Front view of windshield¹

Loss of windshield retention lengths: Periphery retention was lost along the left A-pillar and 13.0 inches along the upper edge measured from the top of the left A-pillar. Total loss of retention was 40.4 inches.

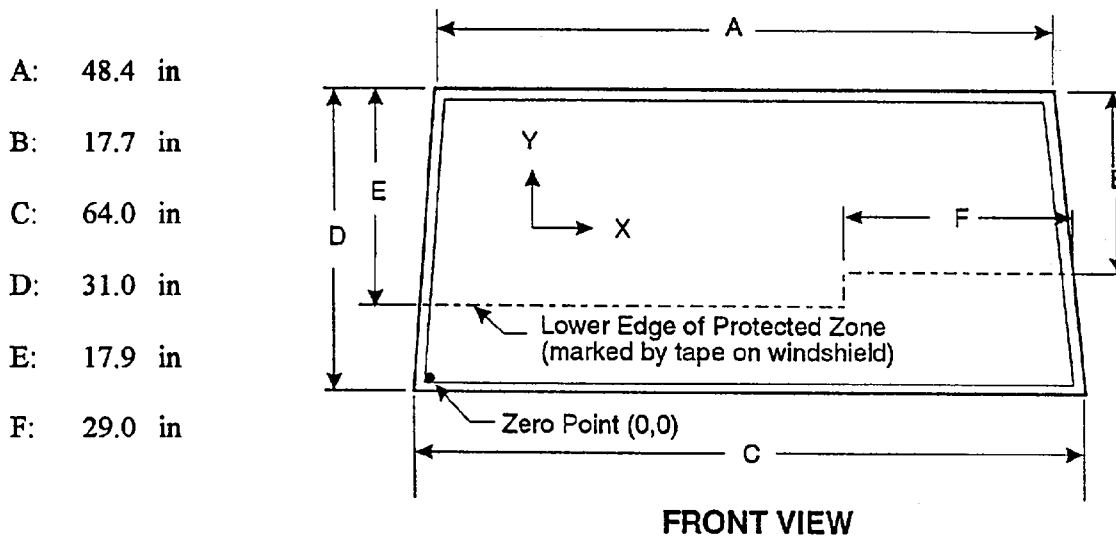
¹ Indicate areas of loss of retention, if any, on windshield diagram.

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:



Method of adhering protected zone template to windshield:

NA

Areas of windshield template penetration greater than 0.25 in:

NA

Coordinates

	<u>X</u>	<u>Y</u>
1.		
2.		
3.		

Areas of windshield penetration, below the protected zone, through the inner surface of the windshield:

None

- 1.
- 2.
- 3.

Table 9 Fuel System Data

Vehicle year/make/ model/body style:	1996/Hyundai/Sonata/4-door sedan
NHTSA number:	CT0509
Fuel system capacity:	17.2 gal (from owner's manual)
Usable capacity:	17.2 gal (furnished by COTR)
Test volume range:	15.8 gal to 16.2 gal (92-94% of usable)
Actual test volume:	16.0 gal (with entire fuel system filled)
Test fluid type:	Stoddard solvent
Specific gravity:	0.764
Kinematic viscosity:	0.99 centistoke
Test fluid color:	purple
Type of fuel pump:	electric

The electric fuel pump did not operate with ignition switch "on" and the engine not operating.

Details of fuel system:	The fuel tank is located in front of the rear axle. The fuel filler neck is located on the left side and enters the left, rear of the fuel tank. The fuel lines run along the left frame rail to the engine compartment.
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Table 10 FMVSS 301 Post-Impact Test Data

NHTSA number: CT0509
Test date: 02/14/96
Vehicle year/make/
model/body style: 1996/Hyundai/Sonata/4-door sedan

Test requirements:

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

Test vehicle impact type:

- ☒ Frontal (30 mph)
☐ Oblique (30 mph) with ___° barrier face first contacting (driver's/passenger's) 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

Section 4.0

Vehicle, Occupant, and Camera Measurements

Figure 6 Pre-test and Post-test Measurement Points

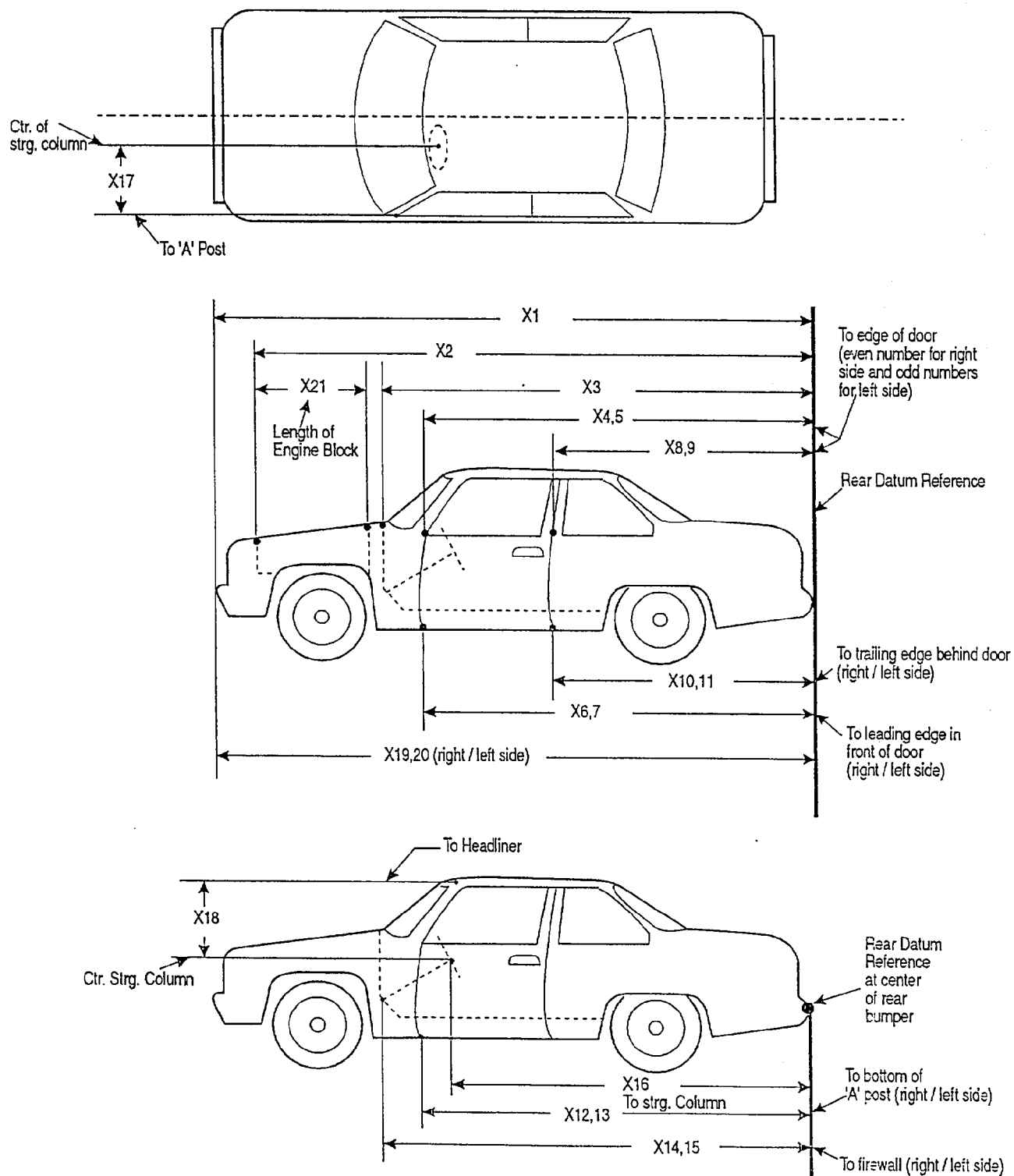


Table 11 Impacted Vehicle Measurements

Vehicle year/make/model/body style: 1996/Hyundai/Sonata/4-door sedan

Test Number: 960214

No.	Type of measurement	Pre-test	Post-test	Difference
X1	Total length of vehicle at centerline	184.4 in	166.5 in	17.9 in
X2	Rear surface of vehicle to front of engine block	162.4 in	156.5 in	5.9 in
X3	Rear surface of vehicle to firewall	134.5 in	137.0 in	-2.5 in
X4	Rear surface of vehicle to upper leading edge of right door	125.4 in	125.0 in	0.4 in
X5	Rear surface of vehicle to upper leading edge of left door	125.3 in	125.1 in	0.2 in
X6	Rear surface of vehicle to lower leading edge of right door	125.2 in	125.4 in	-0.2 in
X7	Rear surface of vehicle to lower leading edge of left door	125.1 in	125.5 in	-0.4 in
X8	Rear surface of vehicle to upper trailing edge of right door	84.3 in	84.2 in	0.1 in
X9	Rear surface of vehicle to upper trailing edge of left door	84.3 in	84.3 in	0.0 in
X10	Rear surface of vehicle to lower trailing edge of right door	84.8 in	84.7 in	0.1 in
X11	Rear surface of vehicle to lower trailing edge of left door	84.7 in	85.0 in	-0.3 in
X12	Rear surface of vehicle to bottom of "A" post on right side	124.0 in	124.3 in	-0.3 in
X13	Rear surface of vehicle to bottom of "A" post on left side	124.8 in	124.5 in	0.3 in
X14	Rear surface of vehicle to firewall - right side	138.3 in	137.5 in	0.8 in
X15	Rear surface of vehicle to firewall - left side	138.1 in	135.4 in	2.7 in
X16	Rear surface of vehicle to steering wheel center	110.7 in	106.8 in	3.9 in
X17	Center of steering column to "A" post	13.5 in	13.5 in	0.0 in
X18	Center of steering column to headliner	17.1 in	18.8 in	-1.7 in
X19	Rear surface of vehicle to right side of front bumper	178.7 in	165.0 in	13.7 in
X20	Rear surface of vehicle to left side of front bumper	178.6 in	169.6 in	9.0 in
X21	Length of engine block	16.8 in	16.8 in	0.0 in

Figure 7 Vehicle Target Locations

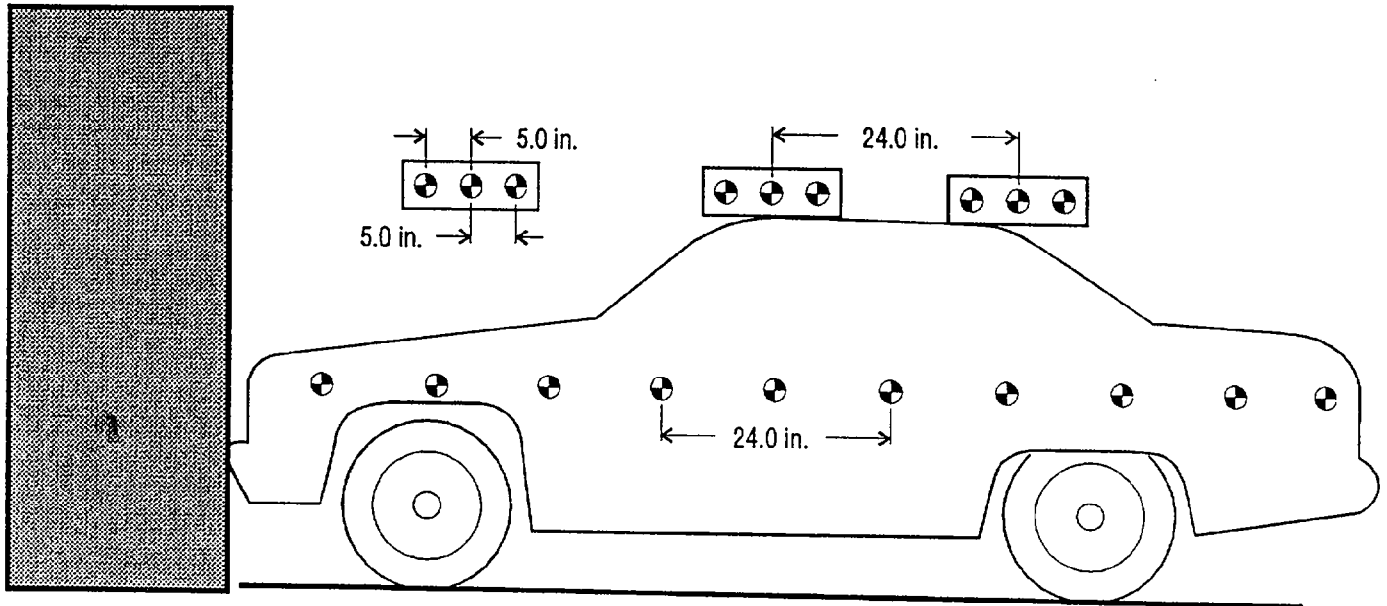
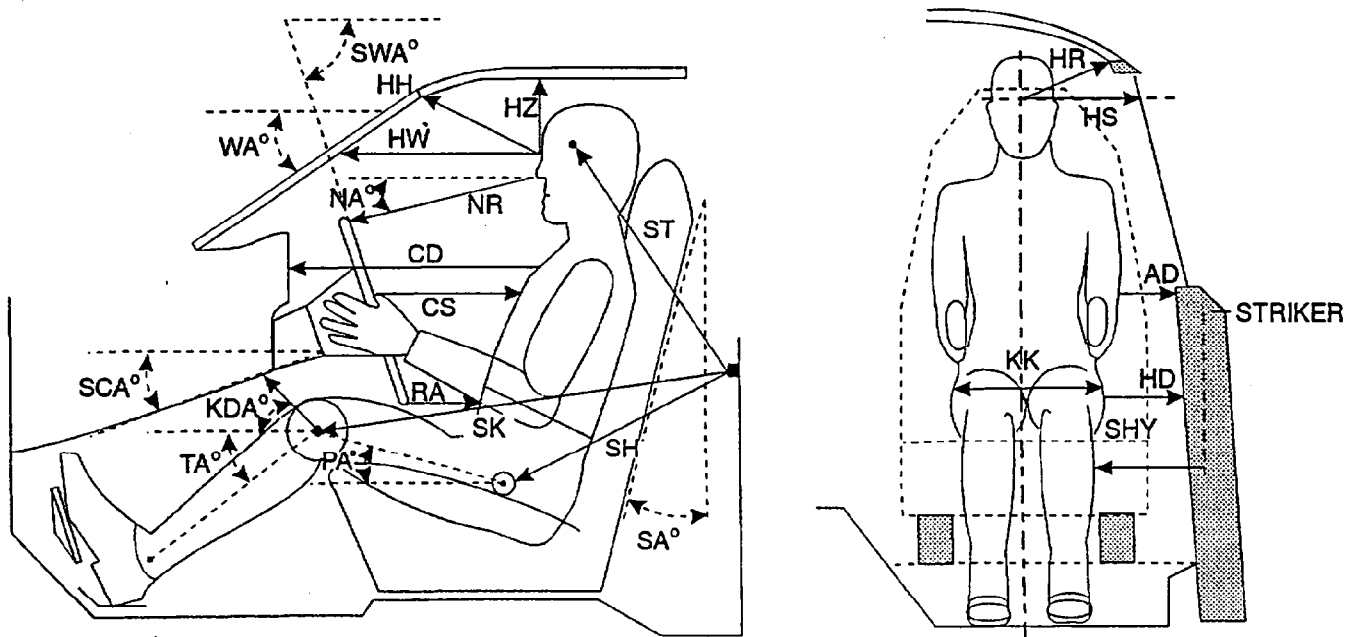
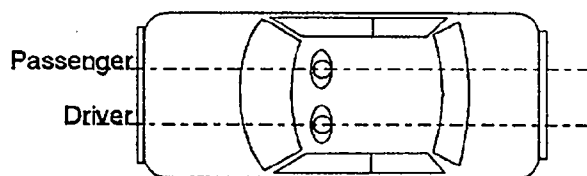


Figure 8 Dummy Measurement Locations for Front Seat Occupants



VERTICAL LONGITUDINAL PLANE



VERTICAL TRANSVERSE PLANE

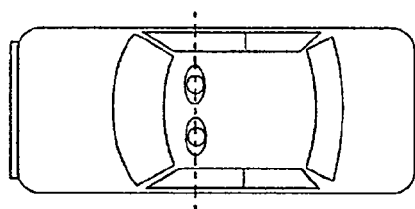


Table 12 Dummy Measurement Data for Front Seat Occupants

Designation	Type of Measurement	Driver (Serial 229)	Passenger (Serial #230)
WA	Windshield angle	29.5°	NA
SWA	Steering wheel angle	67°	NA
SCA	Steering column angle	23°	NA
SA	Seat back angle	26°	26°
HZ	Head to roof	7.3 in	7.1 in
HH	Head to header	12.8 in	7.9 in
HW	Head to windshield	20.2 in	19.9 in
HR	Head to side header	8.2 in	8.5 in
NR	Nose to rim	17.2 in	NA
NA	Nose to rim angle	7°	NA
CD	Chest to dash	22.1 in	22.9 in
CS	Steering wheel to chest	13.8 in	NA
RA	Rim to abdomen	8.6 in	NA
KDL	Left knee to dash	7.5 in	7.2 in
KDR	Right knee to dash	8.0 in	7.1 in
KDA	Outboard knee to dash angle	30.5°	30.5°
PA	Pelvic angle	24°	25°
TA	Tibial angle	40°	40°
KK	Knee to knee	14.4 in	10.8 in
ST ¹	Striker to head	19.2 in	19.2 in
	Striker to head angle	-81°	-79°
SK ¹	Striker to knee	24.1 in	25.3 in
	Striker to knee angle	2°	4°
SH ¹	Striker to H-point	11.1 in	11.2 in
	Striker to H-point angle	35°	21°
SHY	Striker to H-point (Y dir.)	10.0 in	9.2 in
HS	Head to side window	12.0 in	12.2 in
HD	H-point to door	6.2 in	5.8 in
AD	Arm to door	5.4 in	5.2 in

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

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

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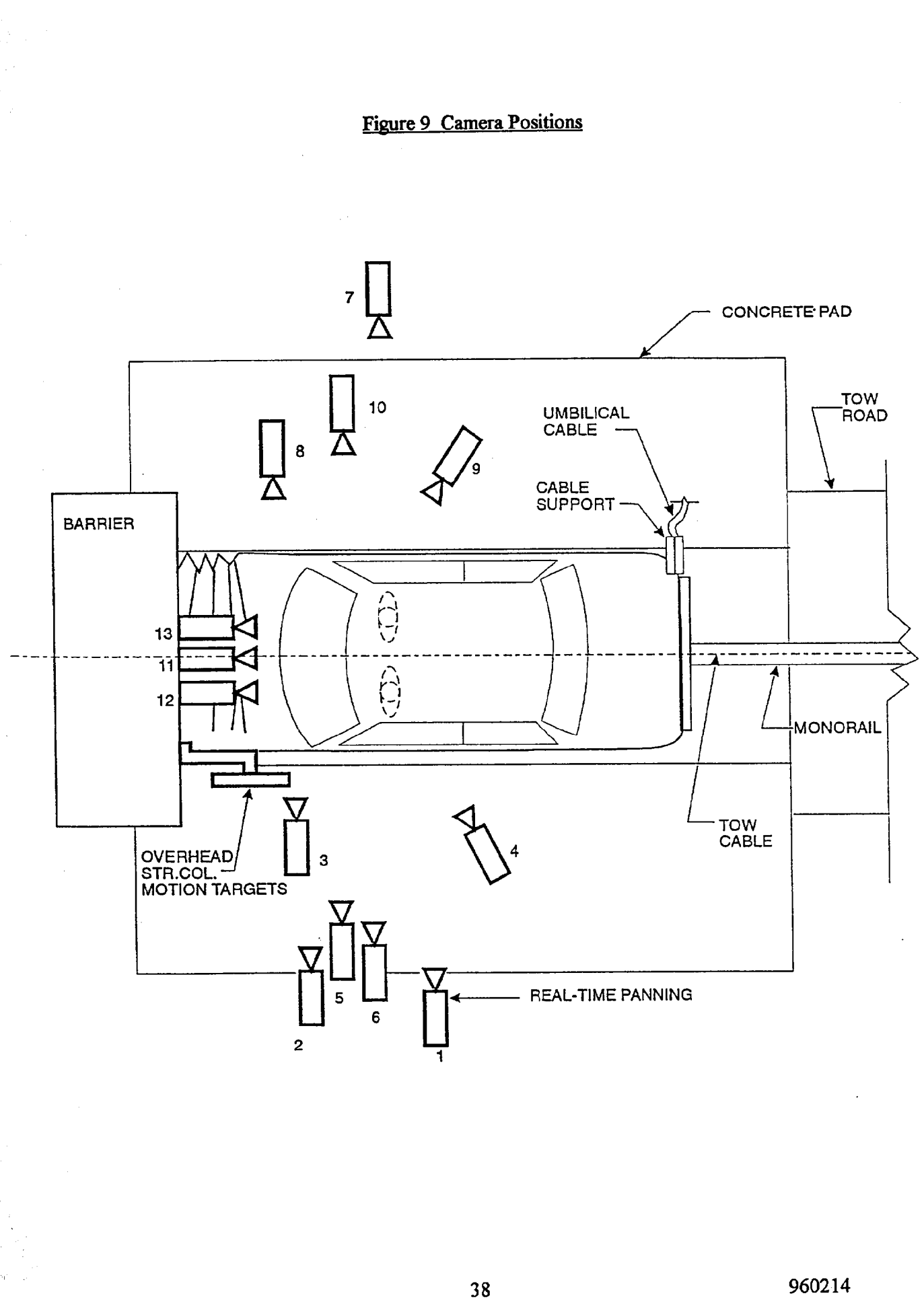


Figure 9 Camera Positions, Cont'd.

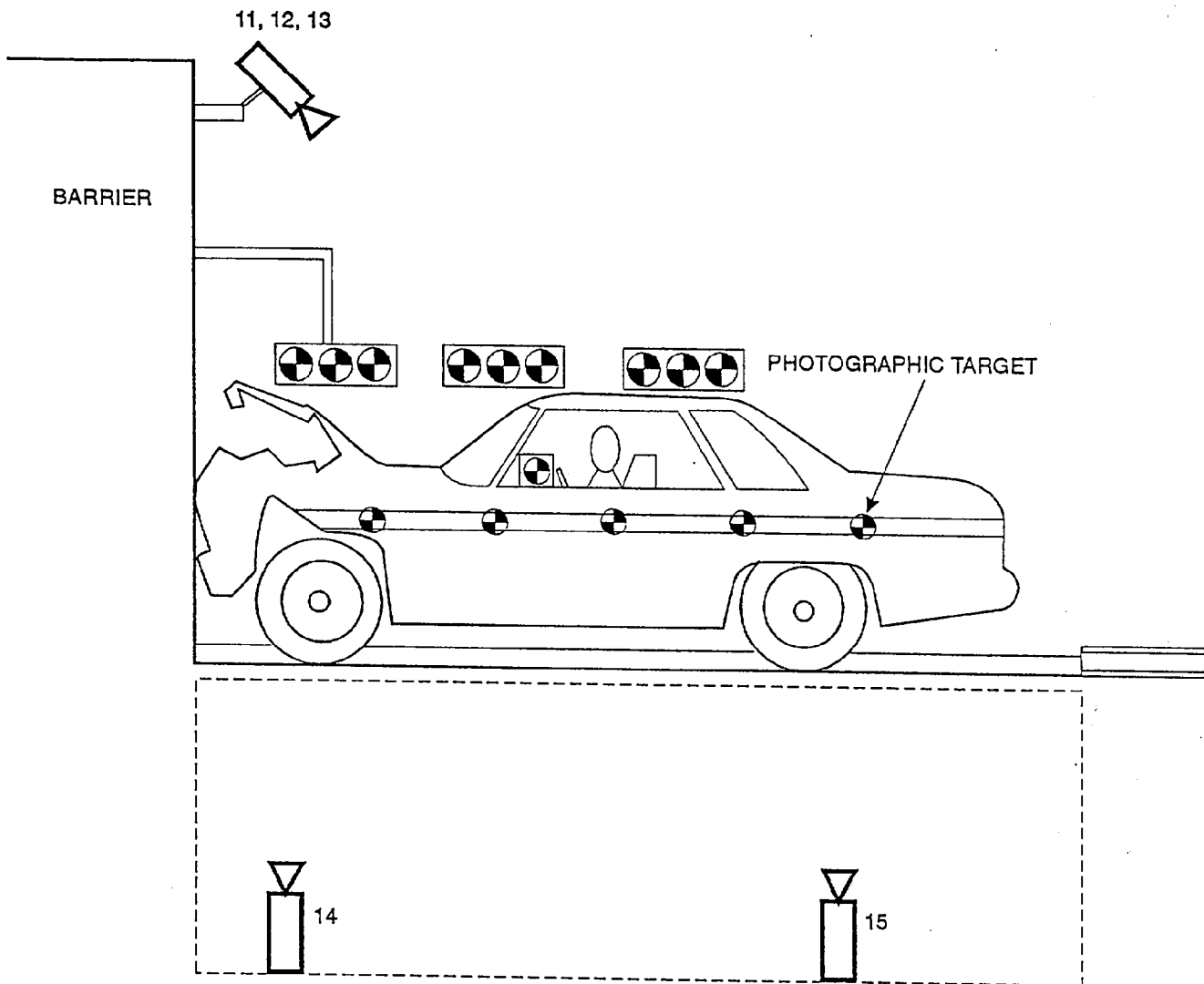


Table 13 Motion Picture Camera Locations

Vehicle year/make/model/body style: 1996/Hyundai/Sonata/4-door sedan

Test number: 960214

Camera Number	View	Camera Positions ¹			Camera Angle ²	Film Plane to Head Target	Camera Lens	Film Speed
		X	Y	Z				
1	Real-time panning	-142.0 in	504.0 in	61.0 in	NA	NA	16 mm	24 frames/s
2	Left vehicle crush	-41.5 in	295.0 in	44.0 in	-4°	216.0 in	25 mm	998 frames/s
3	Left windshield intrusion	-53.0 in	309.4 in	42.3 in	0°	NA	50 mm	1005 frames/s
4	Driver kinematics	-157.3 in	116.0 in	87.0 in	-27°	95.0 in	25 mm	1015 frames/s
5	Steering column motion	-72.0 in	286.0 in	103.0 in	-14°	NA	25 mm	995 frames/s
6	Steering column motion	-72.0 in	286.0 in	75.1 in	-9°	NA	25 mm	1002 frames/s
7	Right overall	-81.3 in	-266.4 in	37.1 in	-2°	NA	13 mm	985 frames/s
8	Right windshield intrusion	-38.1 in	-306.1 in	44.0 in	0°	NA	50 mm	1000 frames/s
9	Passenger kinematics	-152.1 in	-116.0 in	87.0 in	-26°	88.0 in	25 mm	992 frames/s
10	Passenger kinematics	-38.8 in	-293.0 in	45.3 in	-4°	490.0 in	25 mm	1000 frames/s
11	Windshield front view	-6.0 in	0.0 in	88.0 in	-40°	NA	13 mm	1002 frames/s
12	Driver - front view	-6.8 in	14.5 in	93.0 in	-50°	NA	17 mm	1005 frames/s
13	Passenger - front view	-4.5 in	-13.8 in	93.0 in	-50°	NA	17 mm	998 frames/s
14	Pit - front position	-50.5 in	0.0 in	-92.4 in	90°	NA	13 mm	1000 frames/s
15	Pit - rear position	-99.3 in	0.0 in	-99.0 in	90°	NA	13 mm	1008 frames/s
16	Real-time documentation	NA	NA	NA	NA	NA	12-120 mm	24 frames/s

¹ +X: Film plane forward of barrier face

+Y: Film plane to left of monorail centerline

+Z: Film plane above ground level

² +Angle: Film plane angled upward from horizontal plane

Appendix A

Photographs

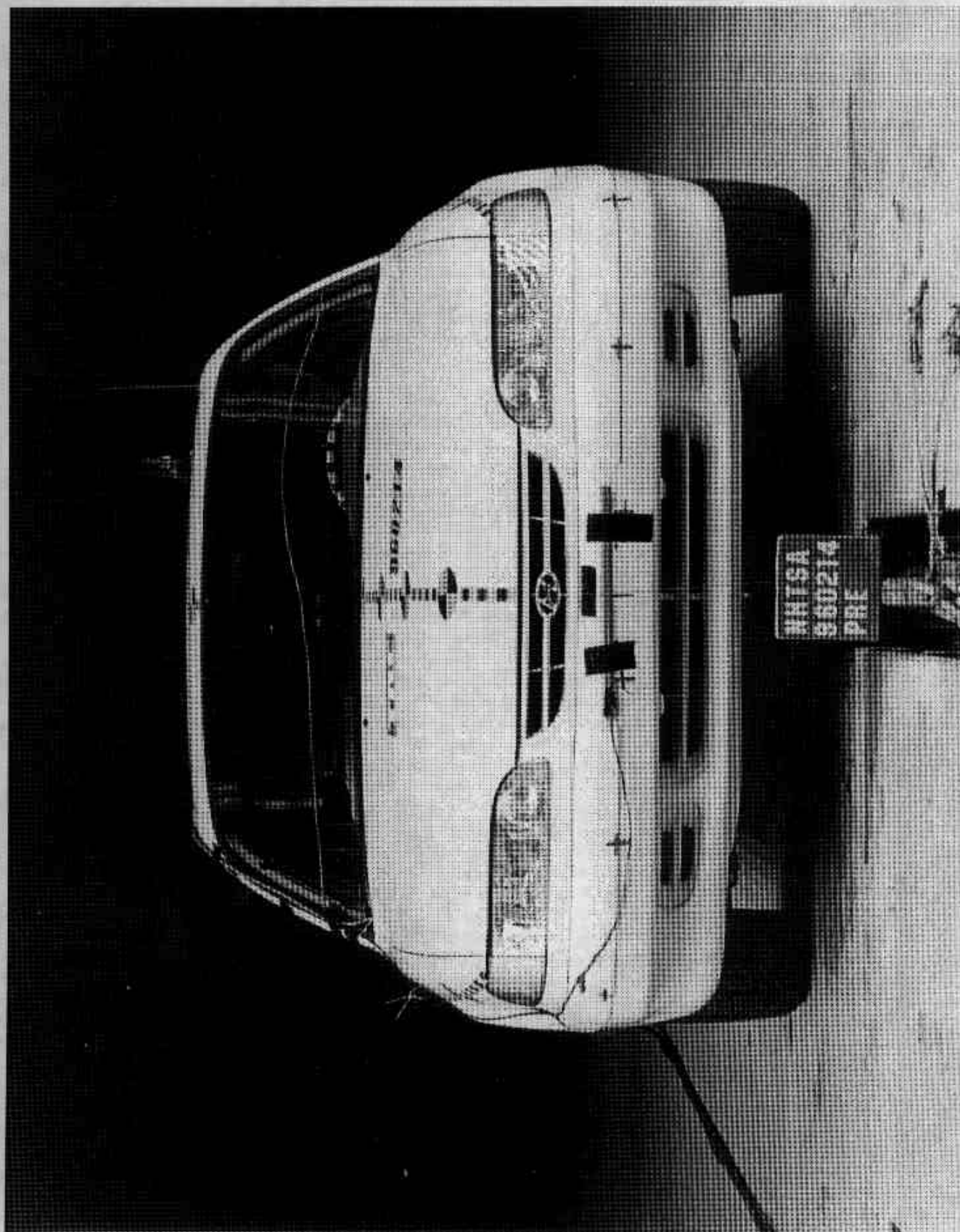


Figure A-1 Pre-Test Front View

A-2

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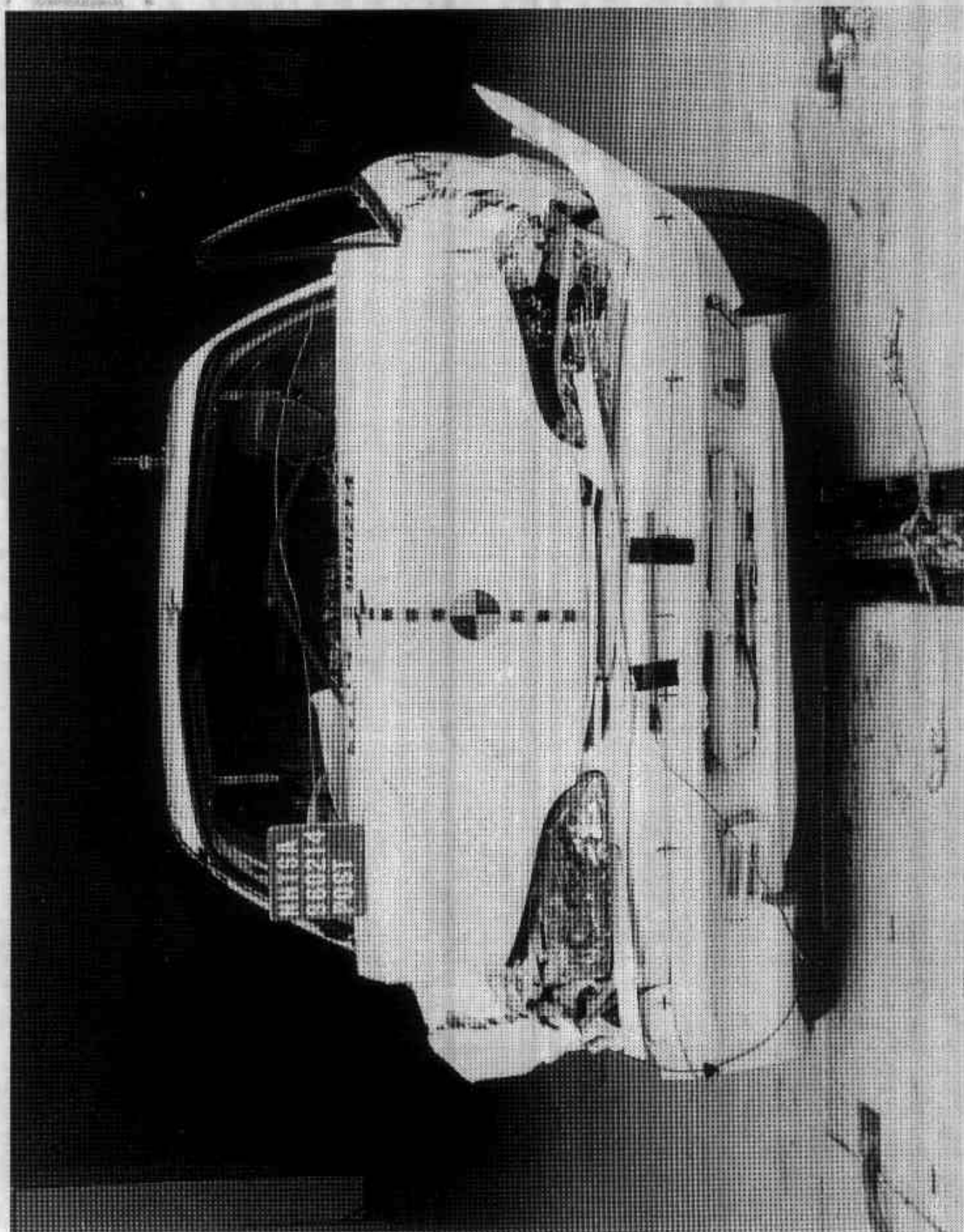


Figure A-2 Post-Test Front View

A-3

960214

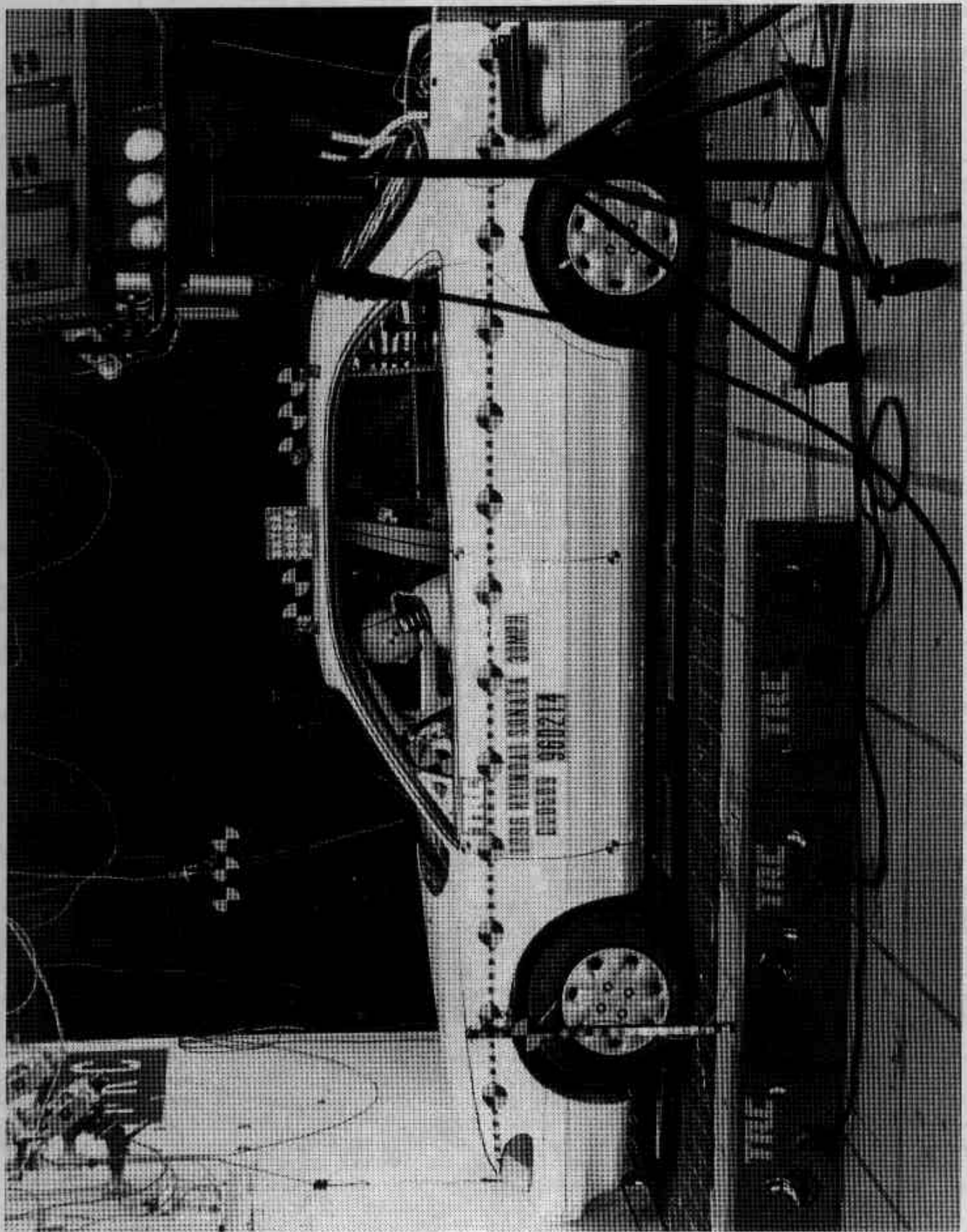


Figure A-3 Pre-Test Left Side View

A-4

960214

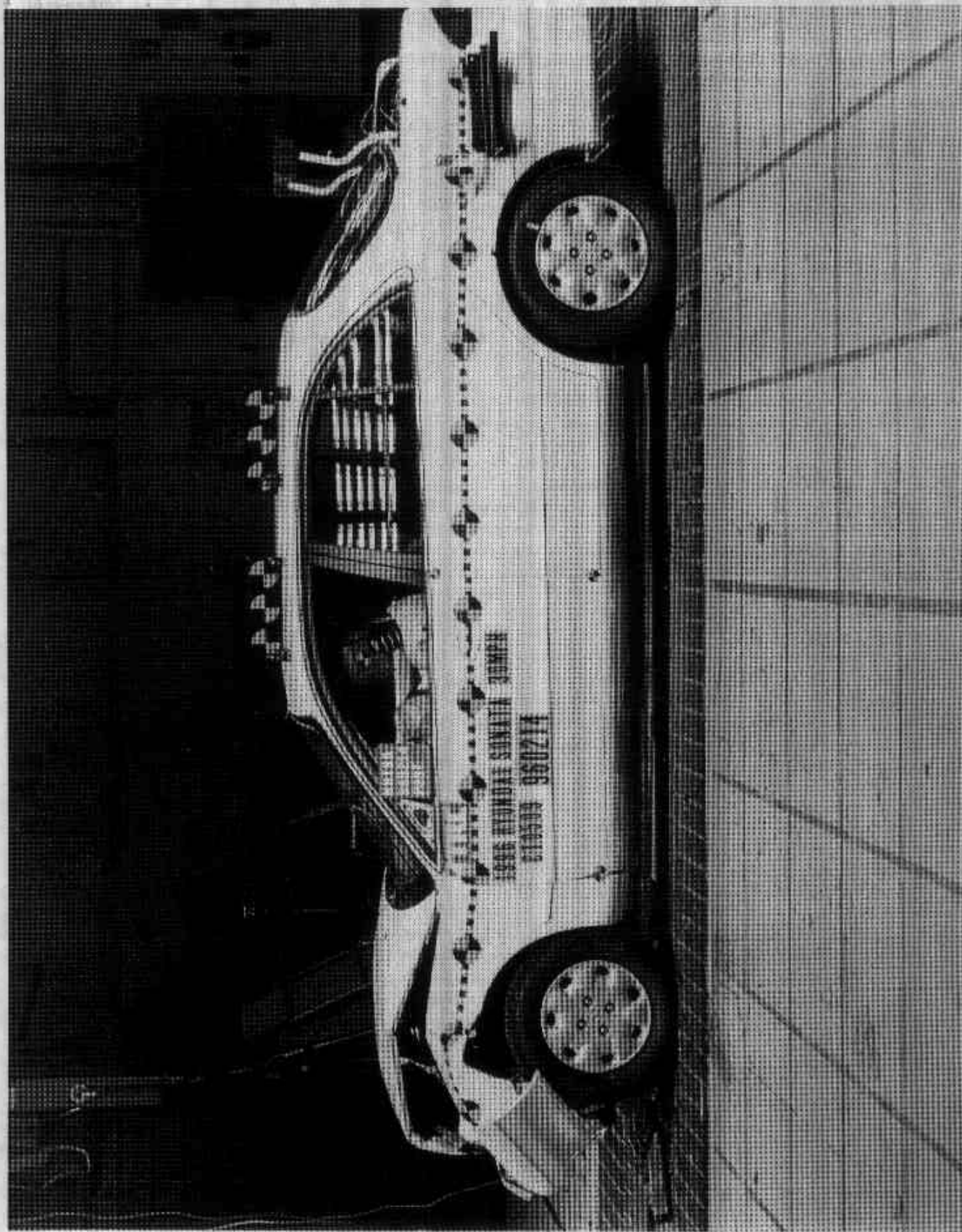


Figure A-4 Post-Test Left Side View

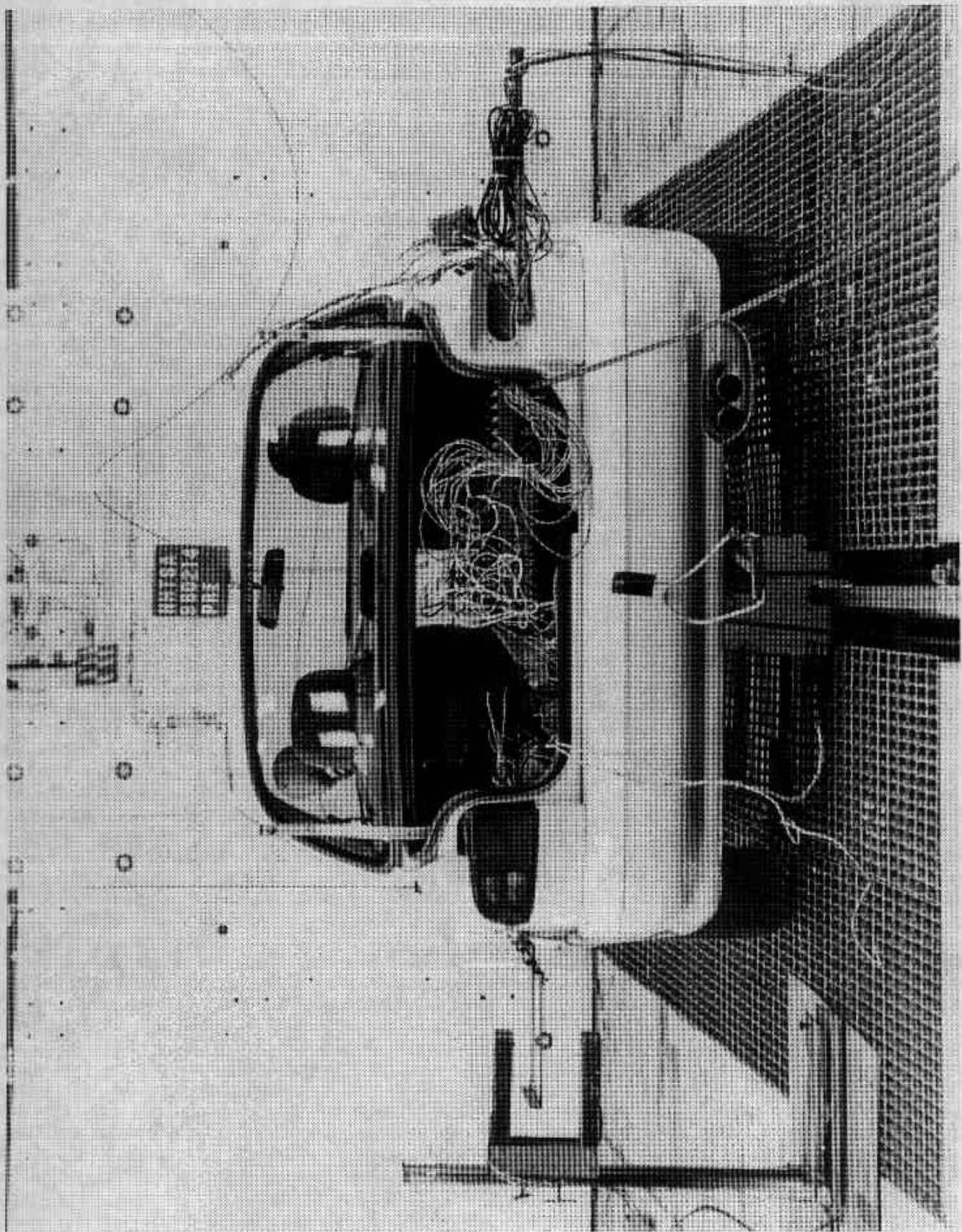


Figure A-5 Pre-Test Rear View

A-6

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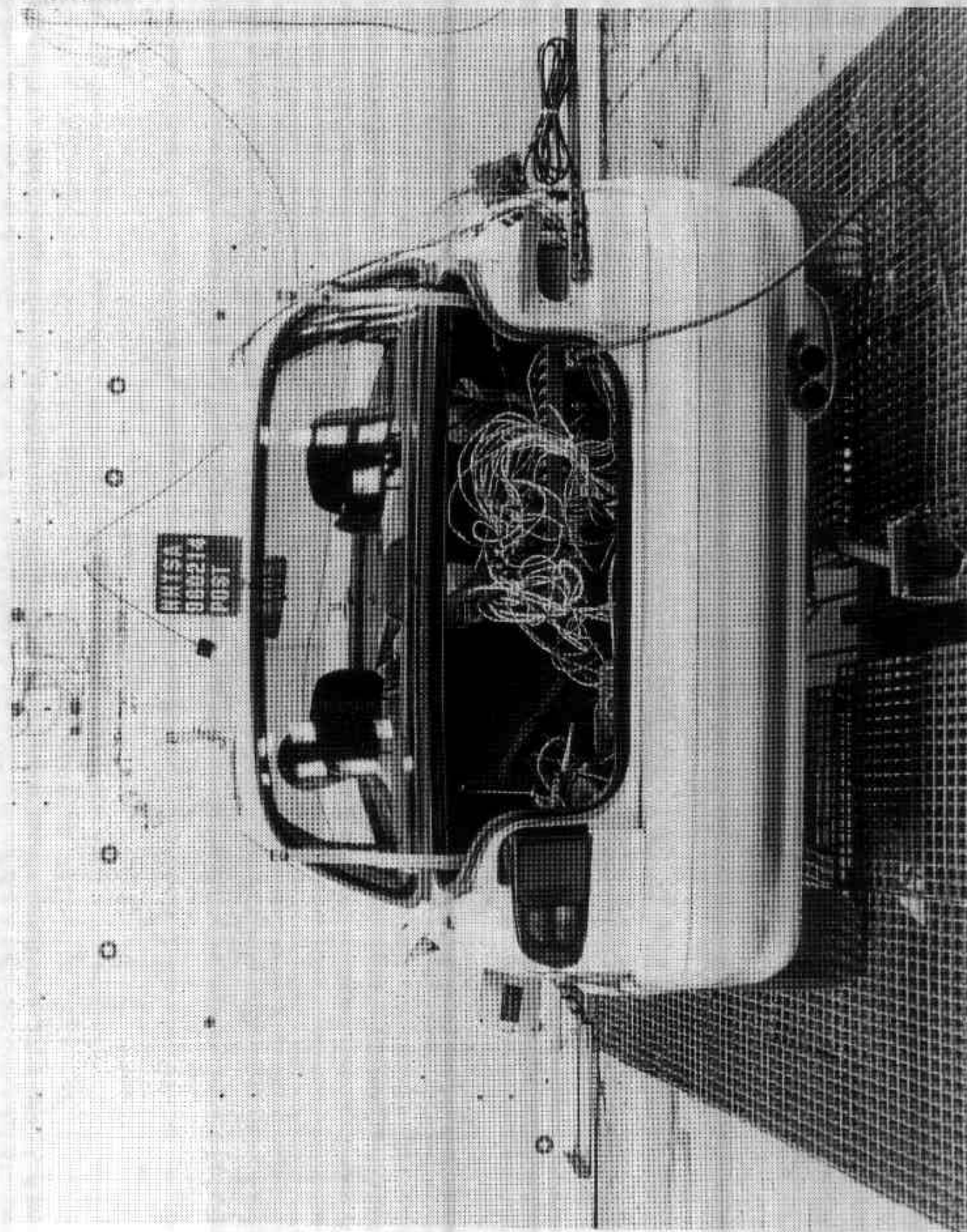


Figure A-6 Post-Test Rear View
A-7

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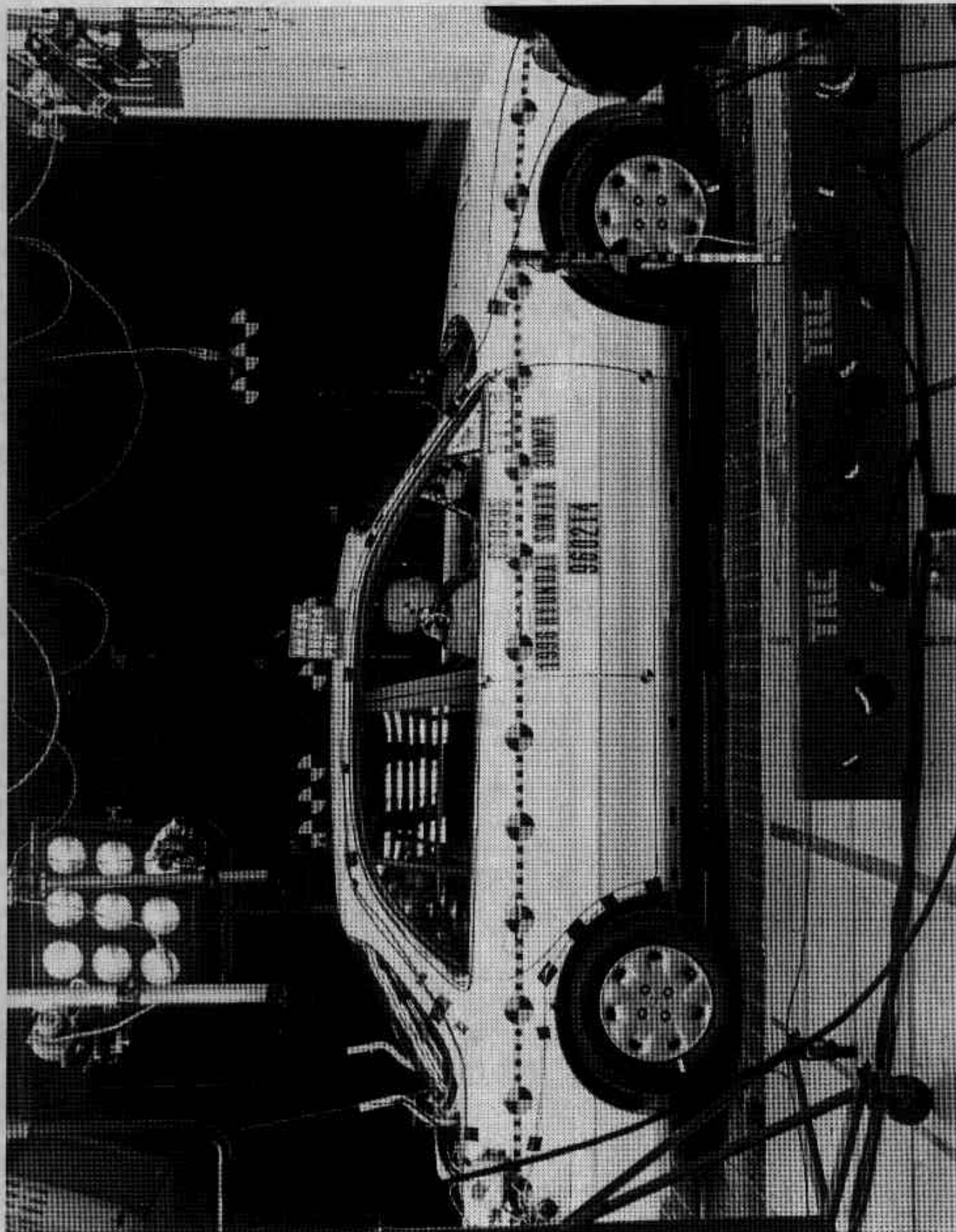


Figure A-7 Pre-Test Right Side View



Figure A-8 Post-Test Right Side View

A-9

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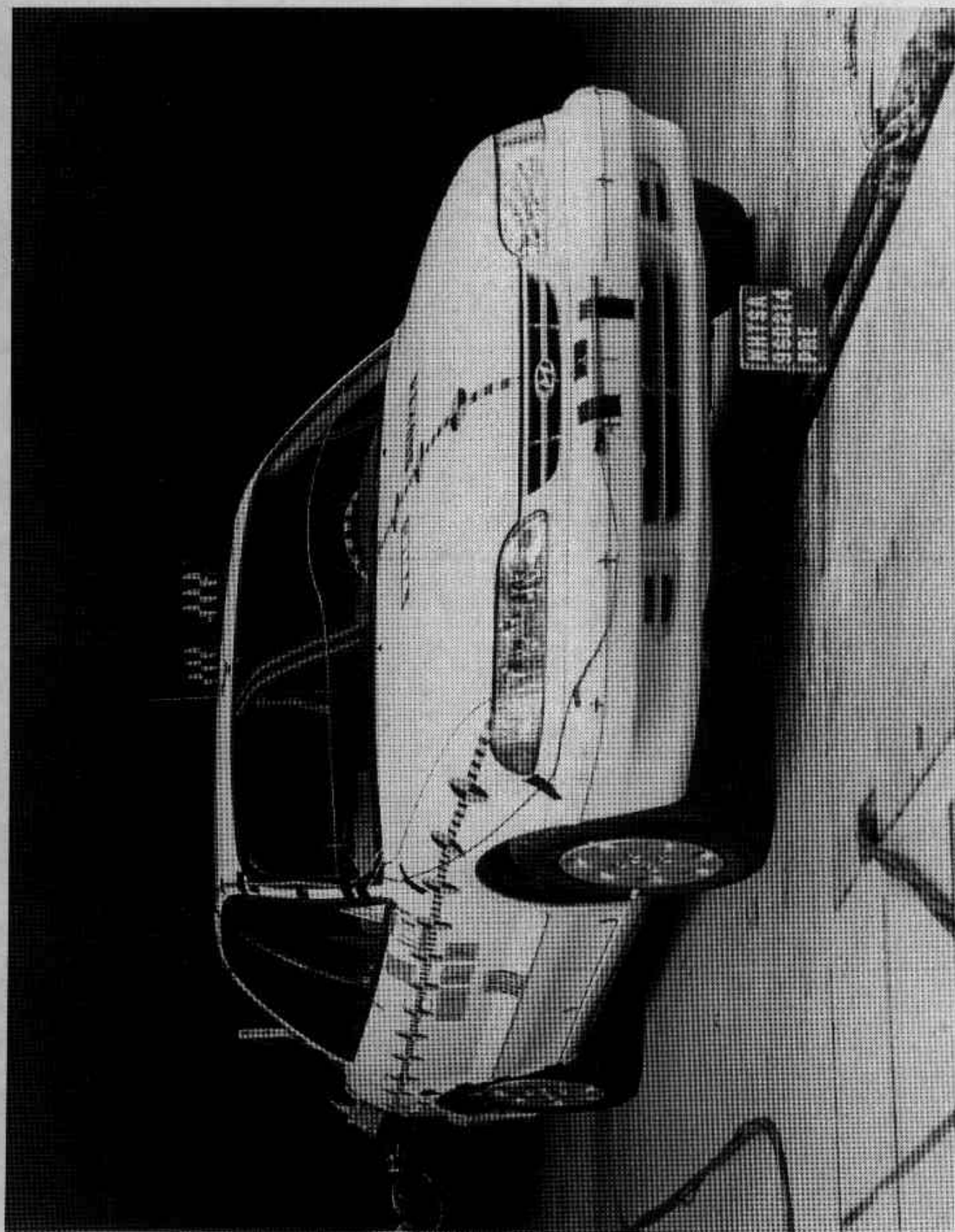


Figure A-9 Pre-Test Right Front Three-Quarter View

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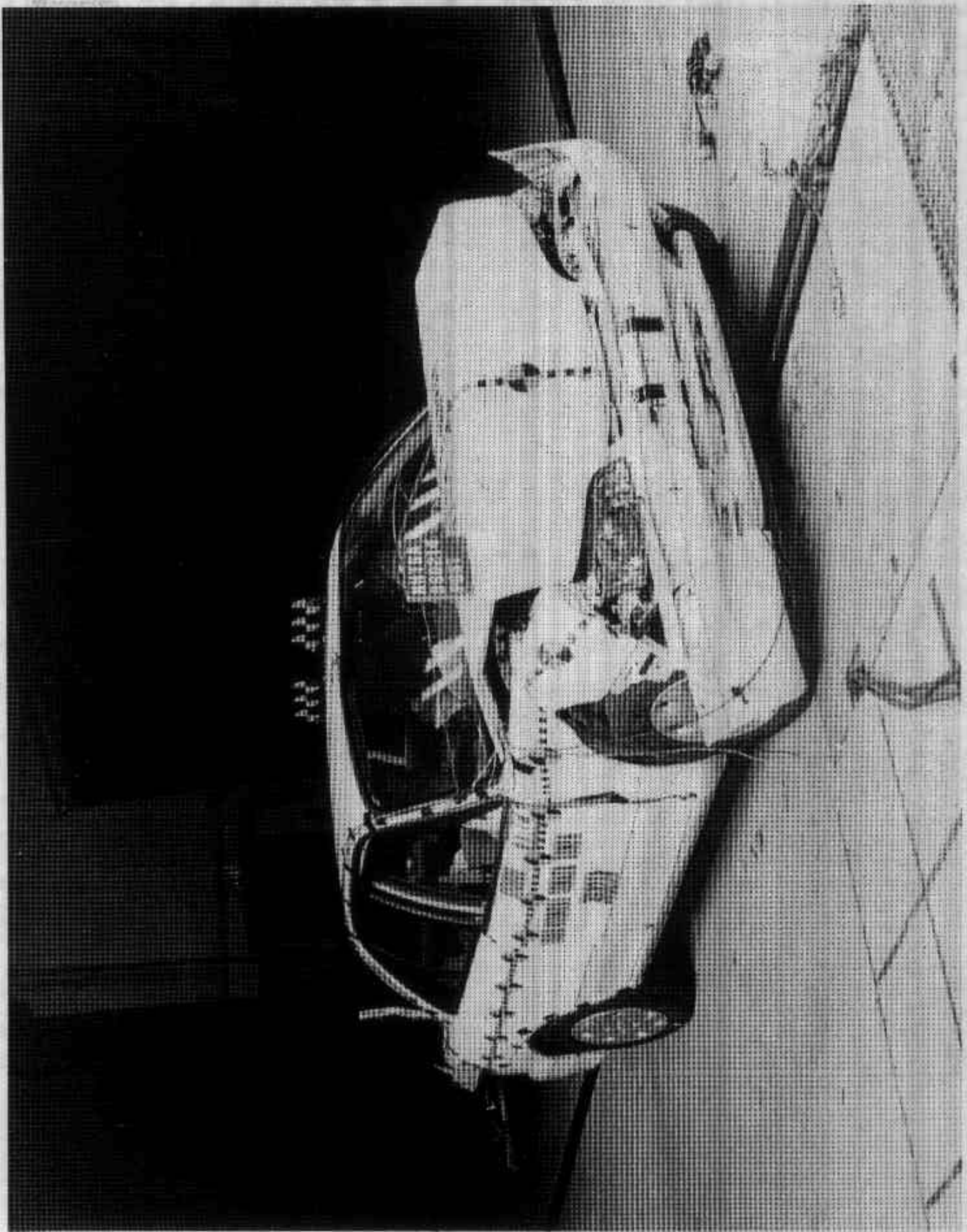


Figure A-10 Post-Test Right Front Three-Quarter View

A-11

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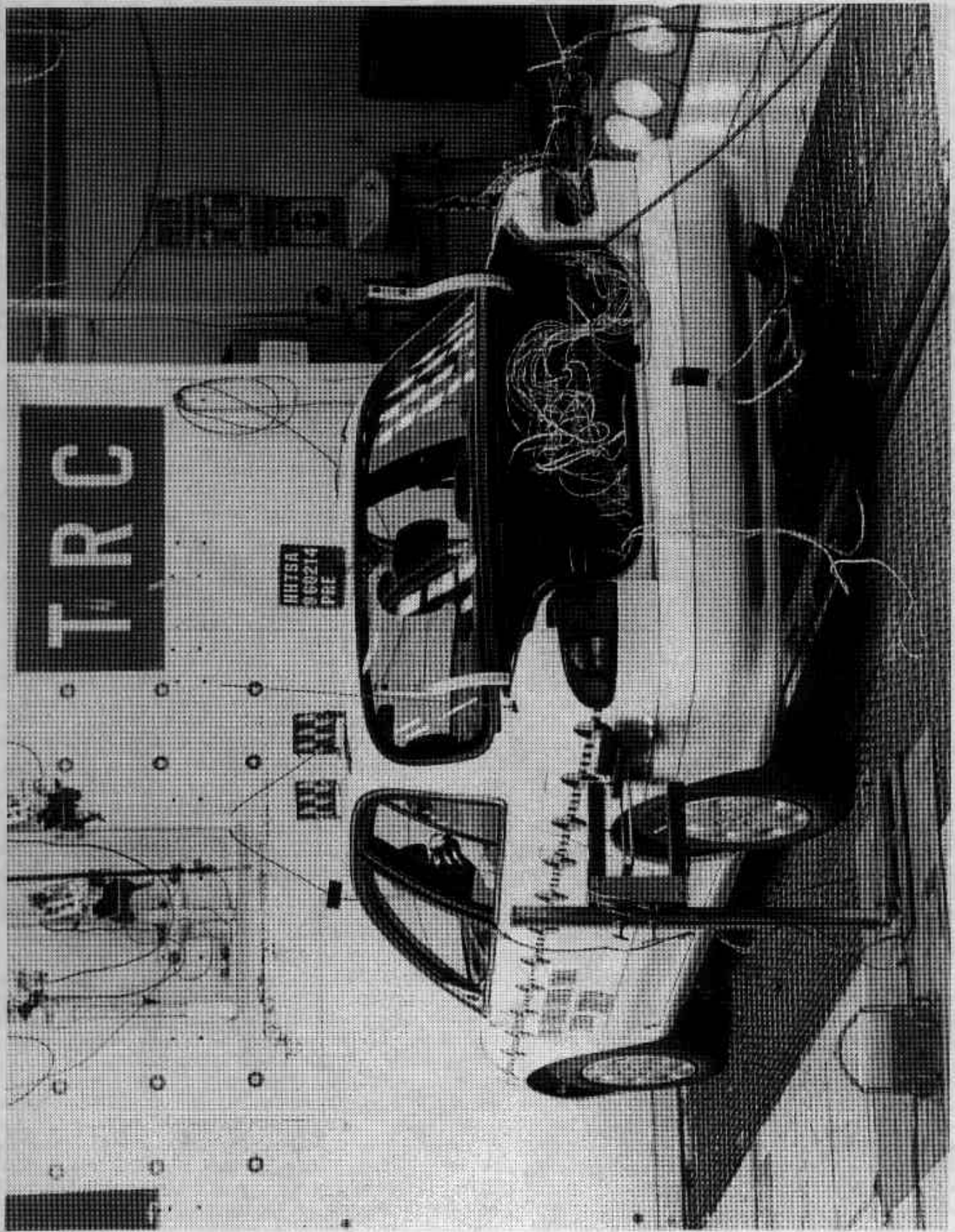


Figure A-11 Pre-Test Left Rear Three-Quarter View



Figure A-12 Post-Test Left Rear Three-Quarter View



Figure A-13 Pre-Test Windshield View

A-14

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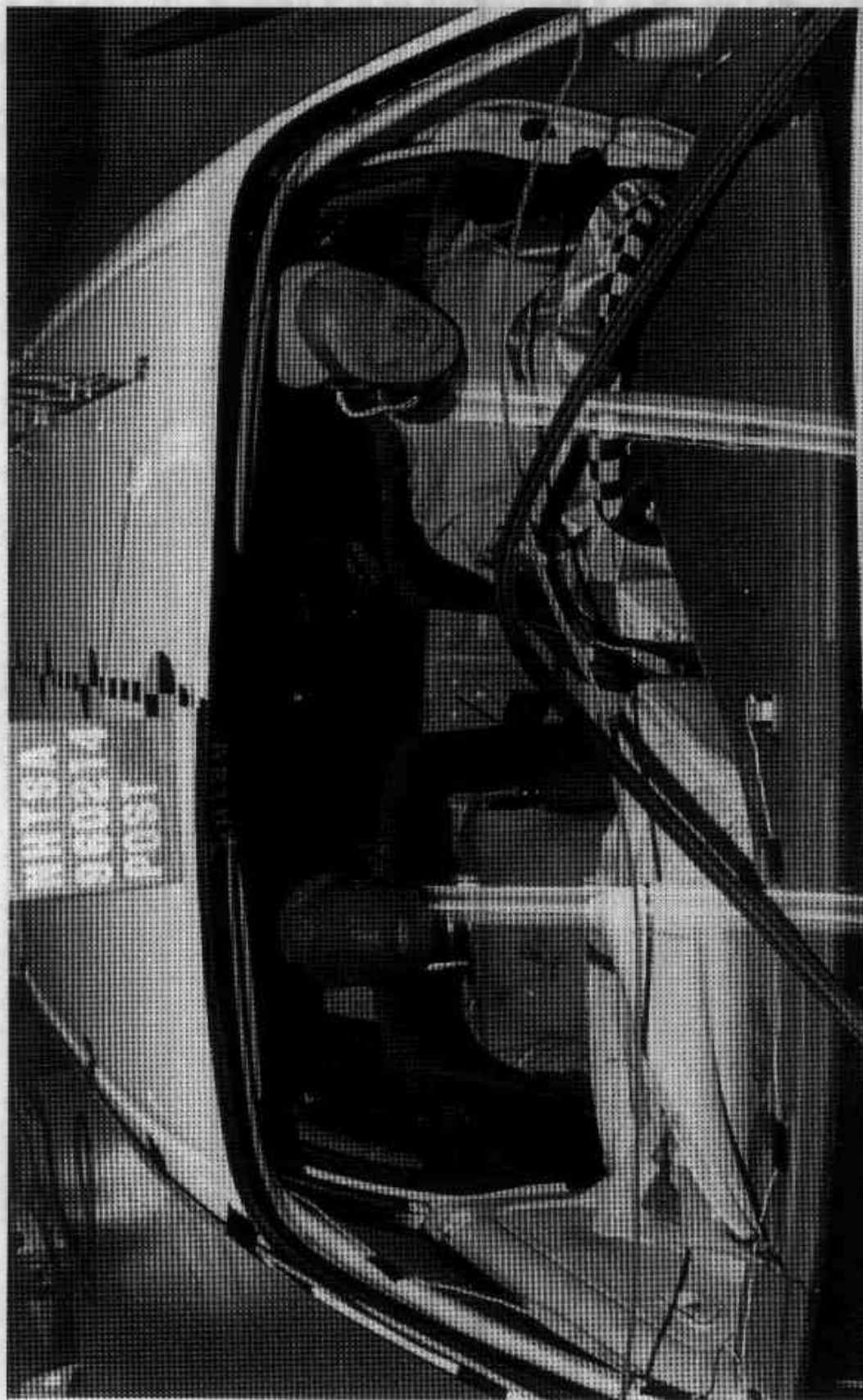


Figure A-14 Post-Test Windshield View

A-15

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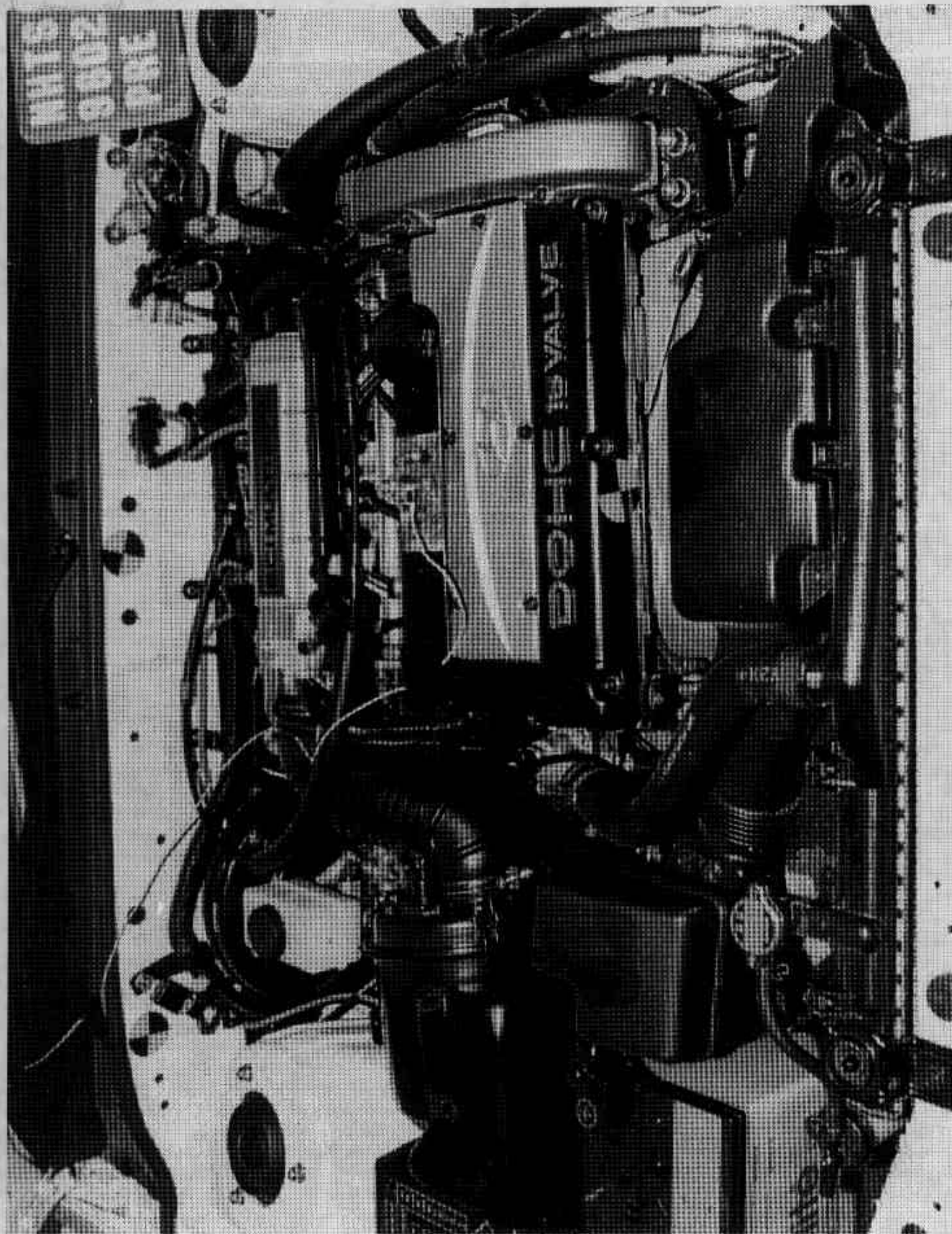


Figure A-15 Pre-Test Engine Compartment View

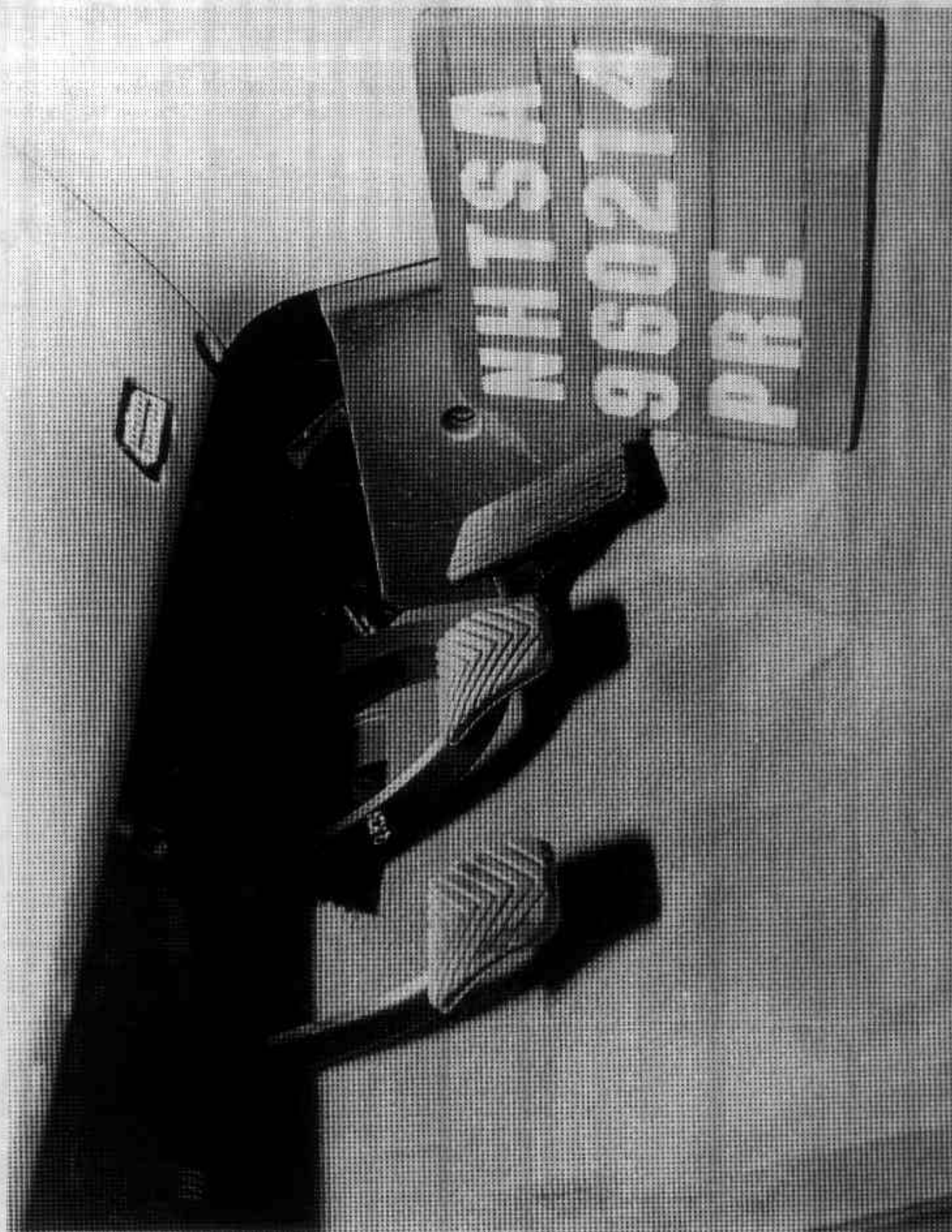


Figure A-16 Pre-Test Steering Column View - Interior

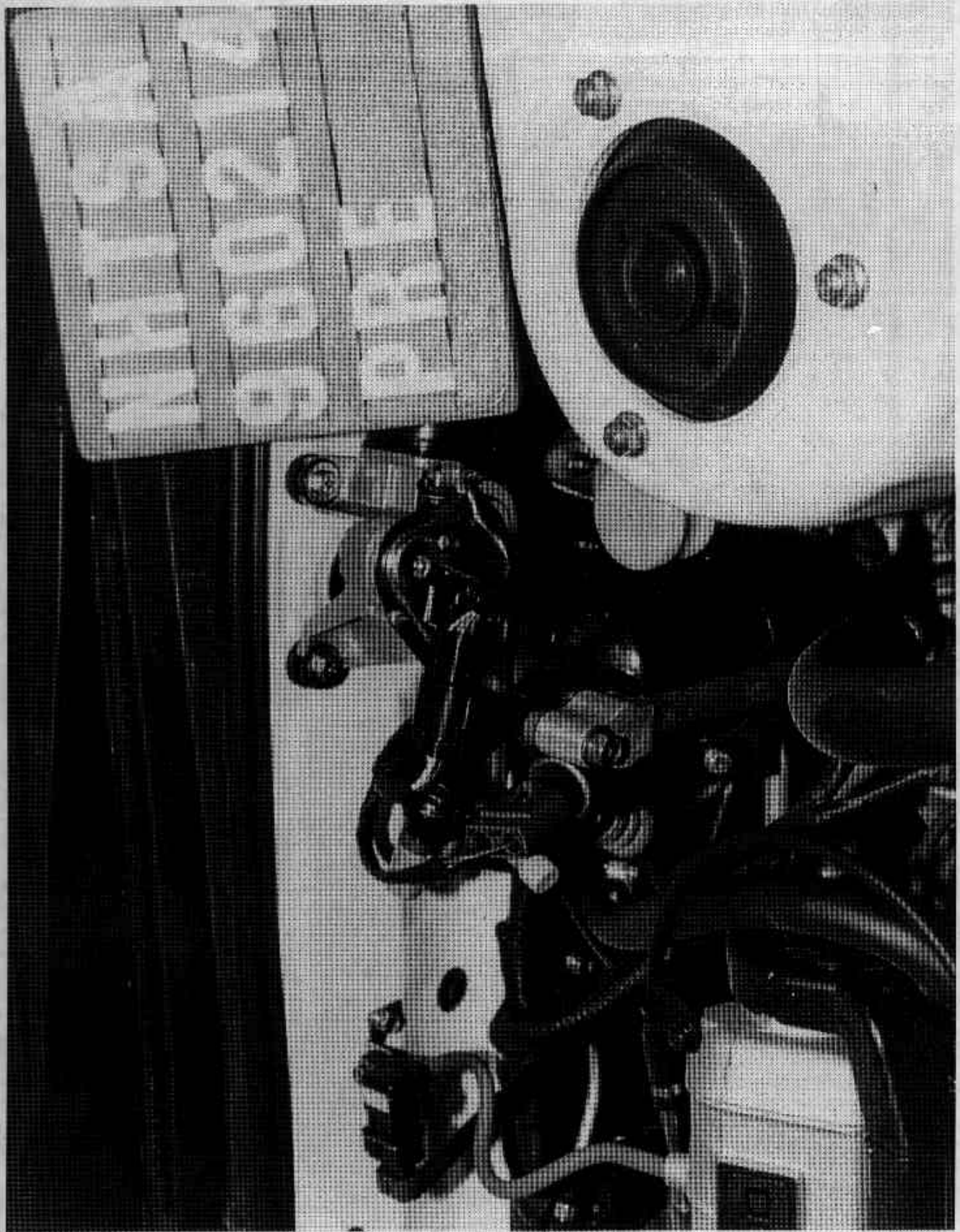


Figure A-17 Pre-Test Steering Column View - Exterior

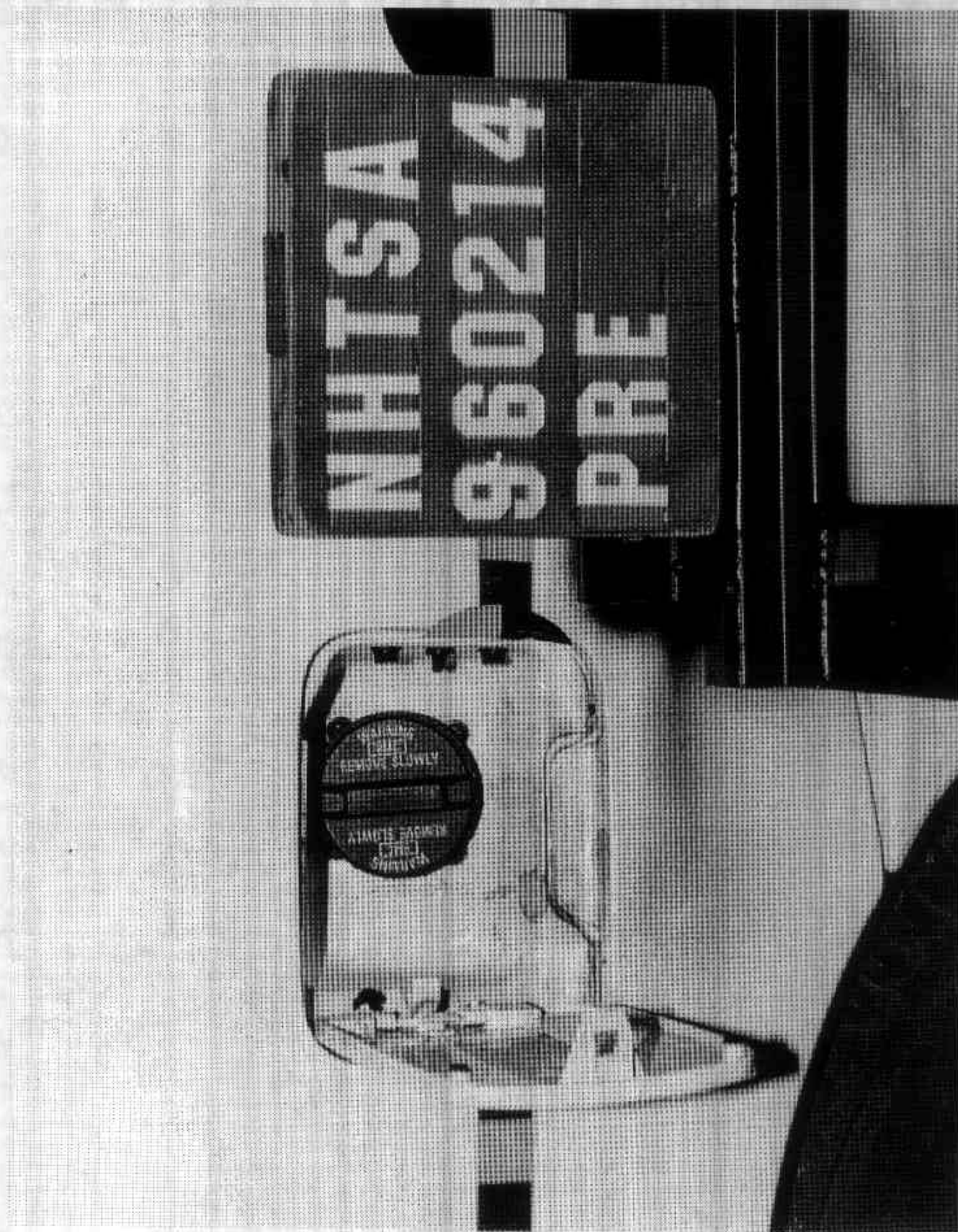


Figure A-18 Pre-Test Fuel Filler Cap View

A-19

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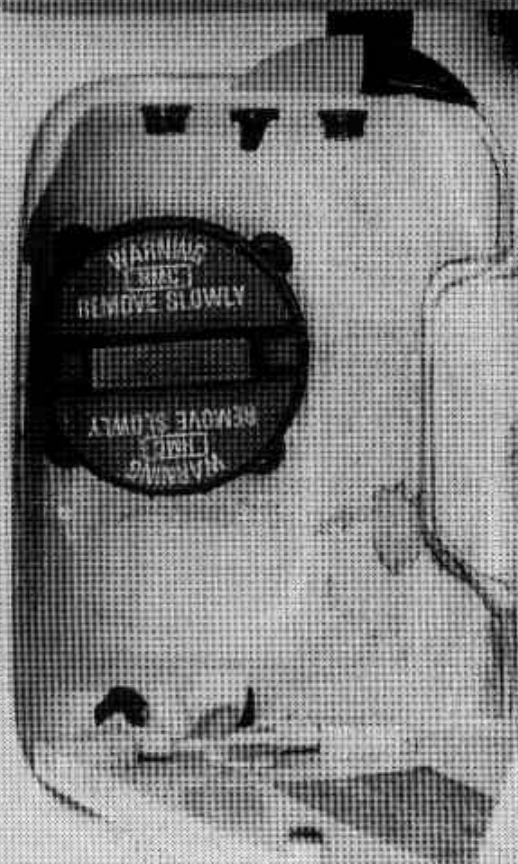


Figure A-19 Post-Test Fuel Filler Cap View



Figure A-20 Pre-Test Fuel Filler Neck View

A-21

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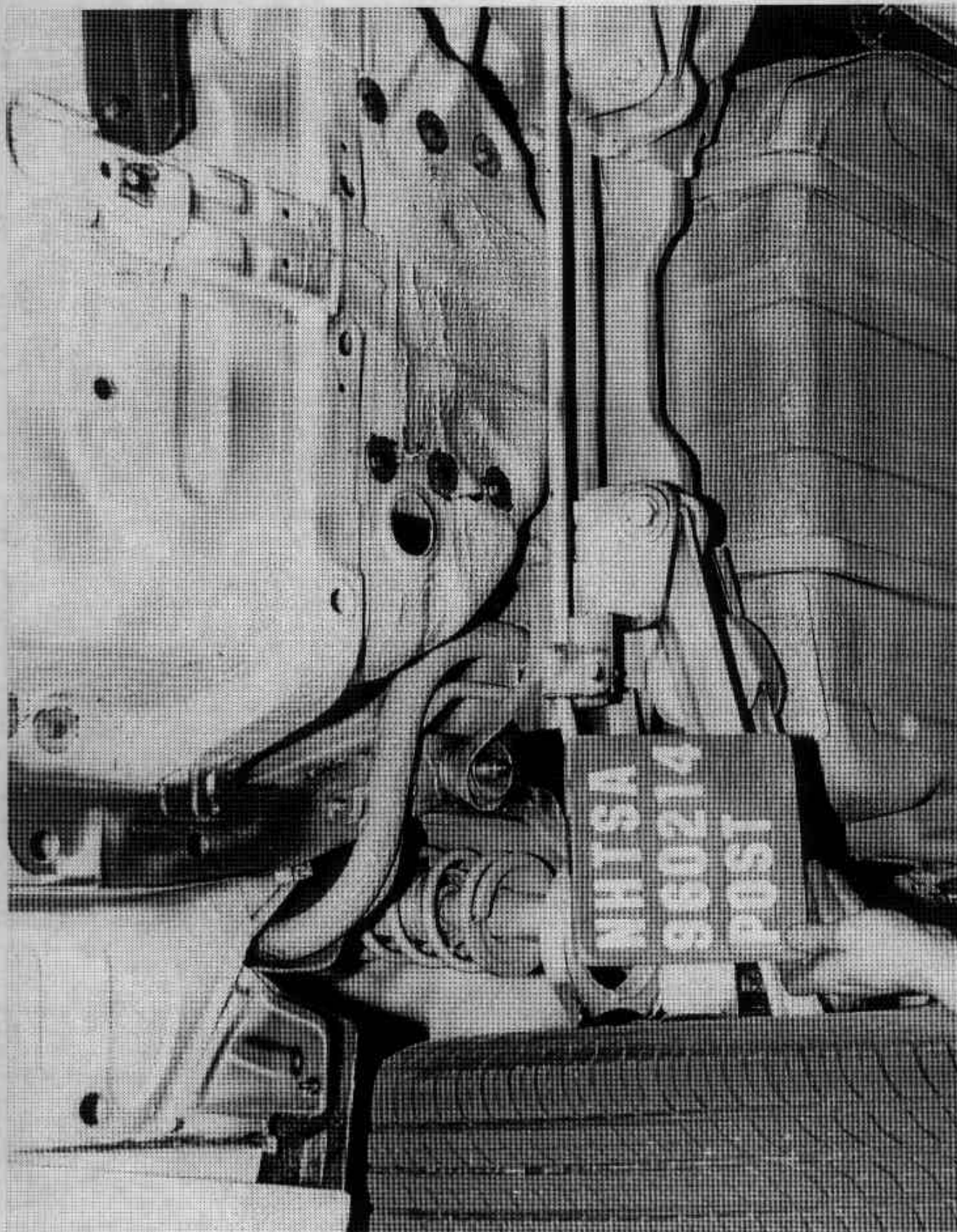


Figure A-21 Post-Test Fuel Filler Neck View

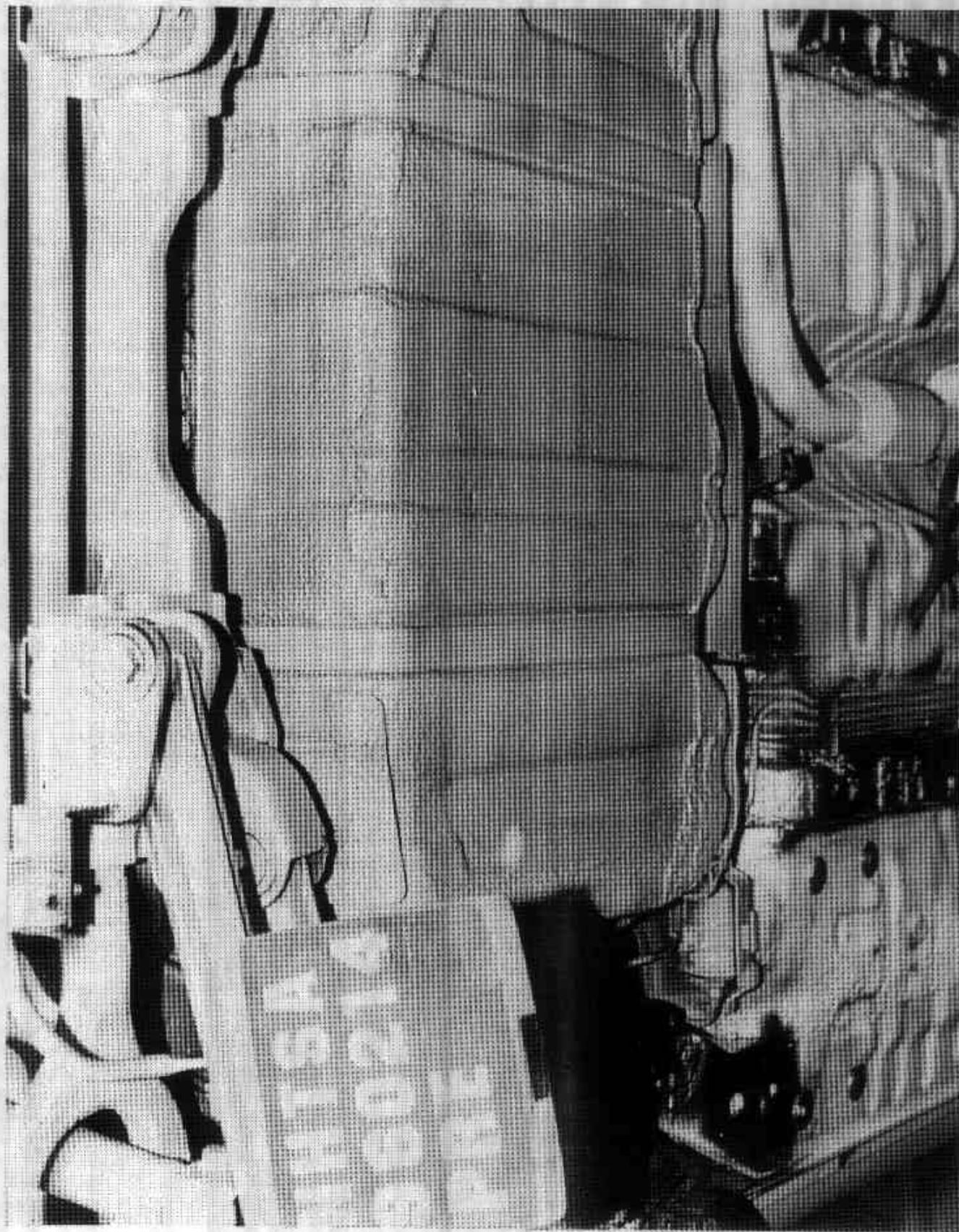


Figure A-22 Pre-Test Fuel Tank View



Figure A-23 Post-Test Fuel Tank View

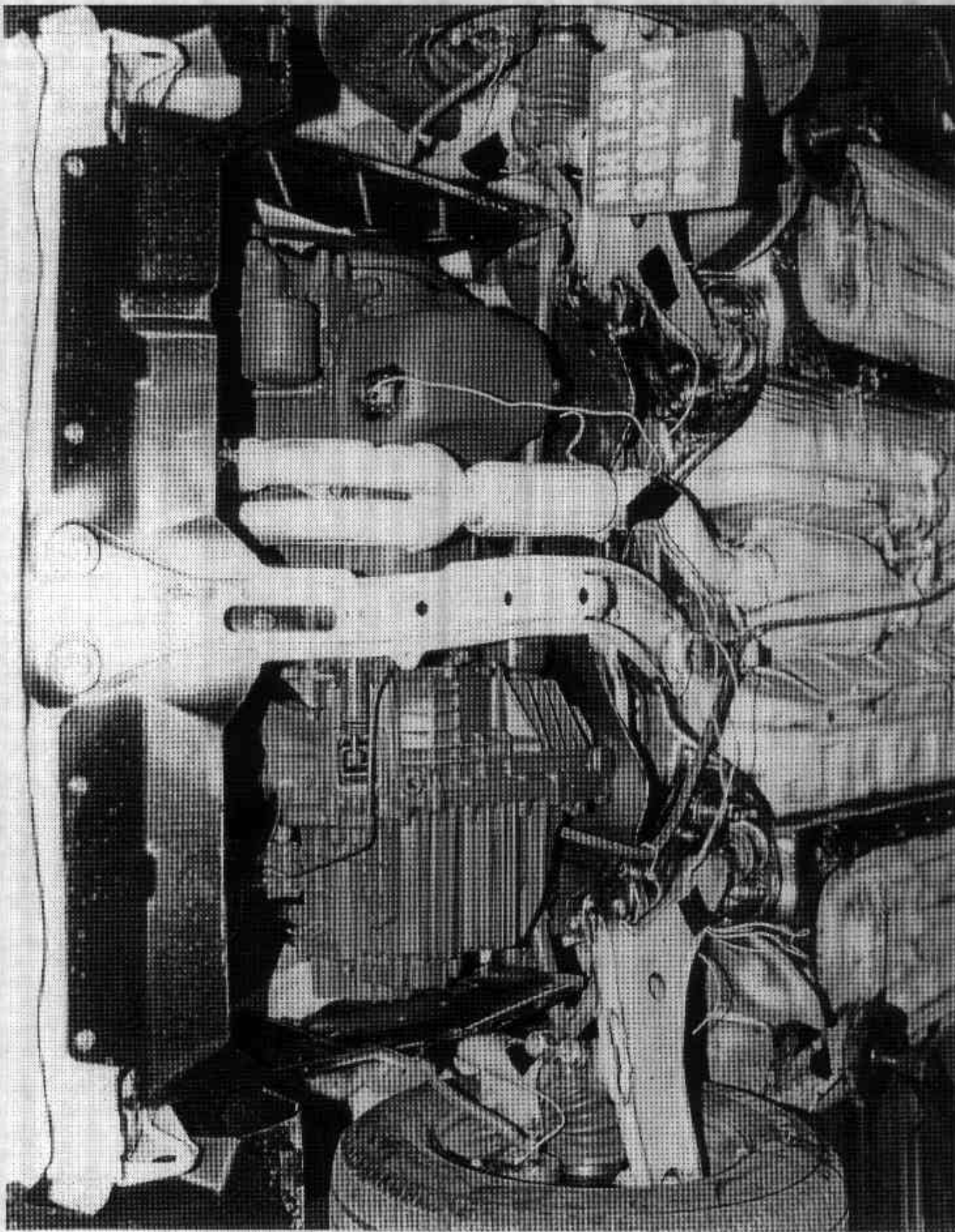


Figure A-24 Pre-Test Front Underbody View

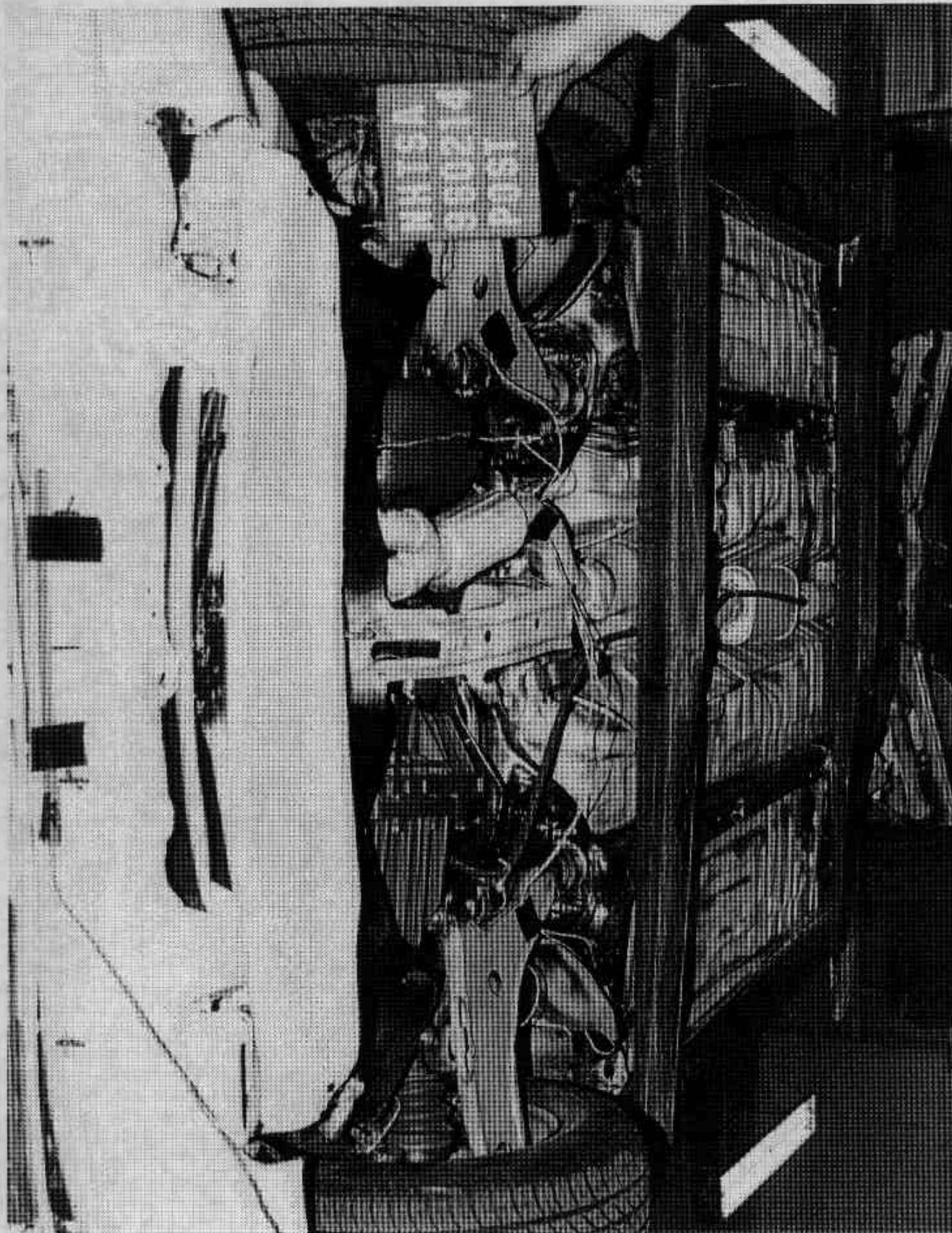


Figure A-25 Post-Test Front Underbody View

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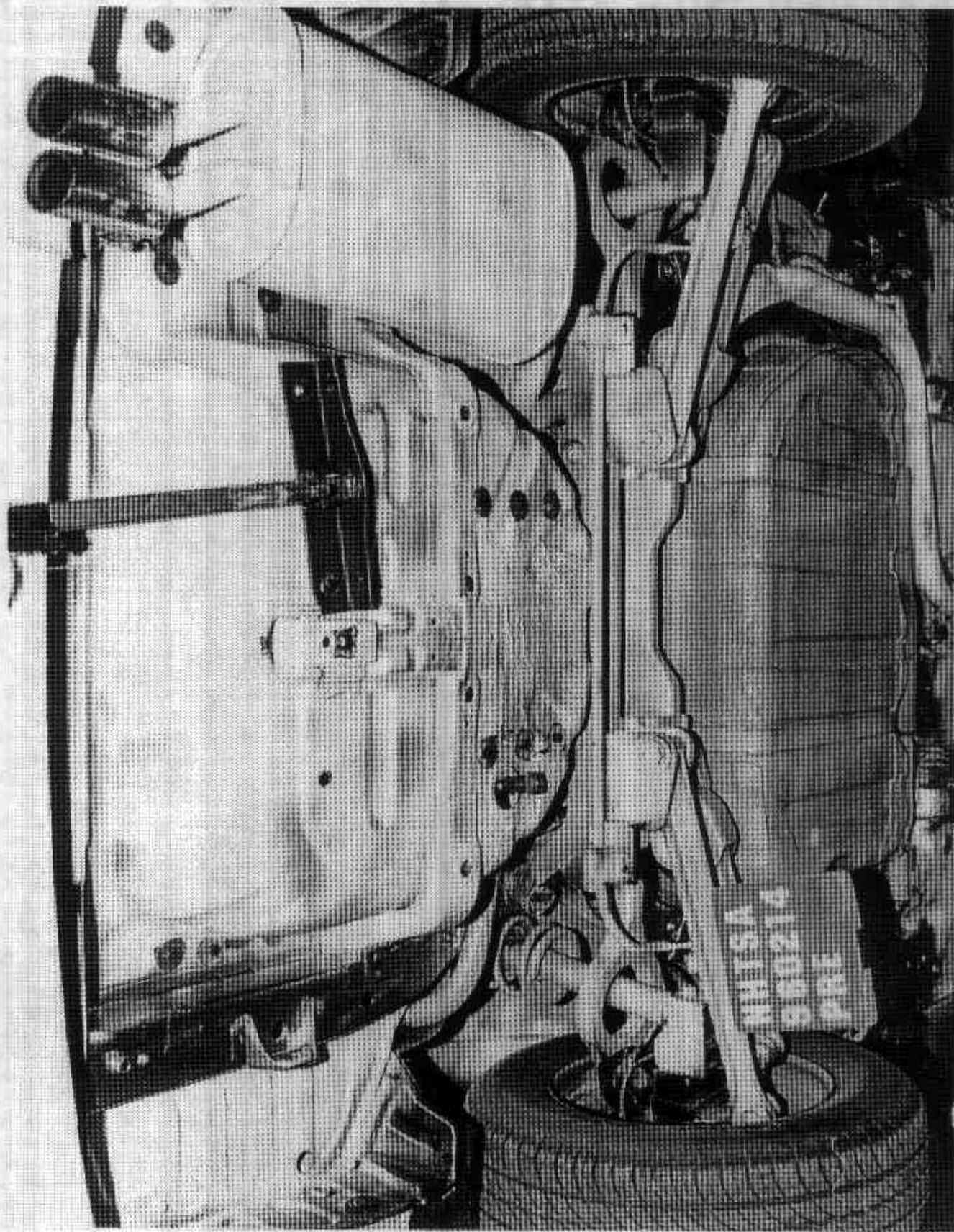


Figure A-26 Pre-Test Rear Underbody View

A-27

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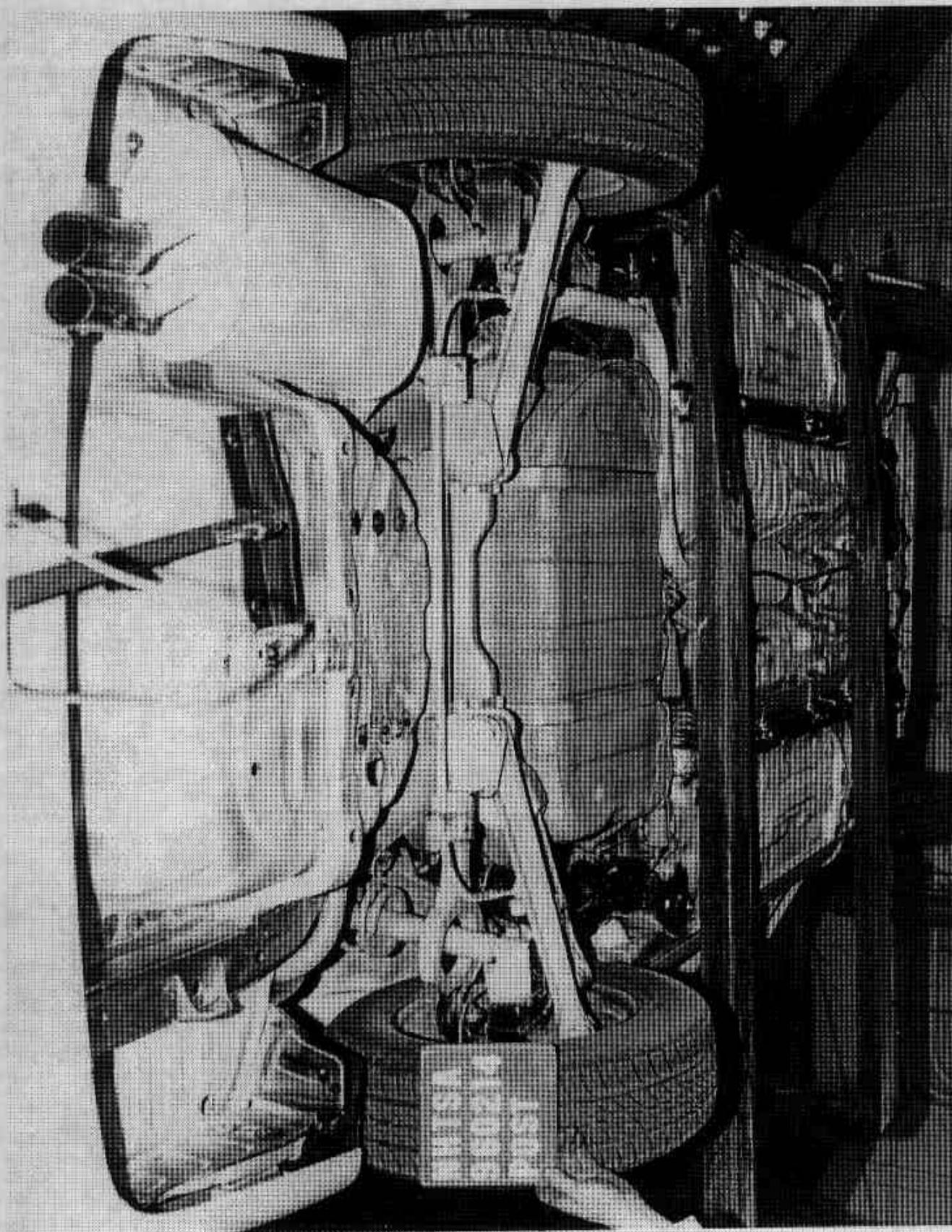


Figure A-27 Post-Test Rear Underbody View

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Figure A-28 Pre-Test Driver's Knee Bolster View

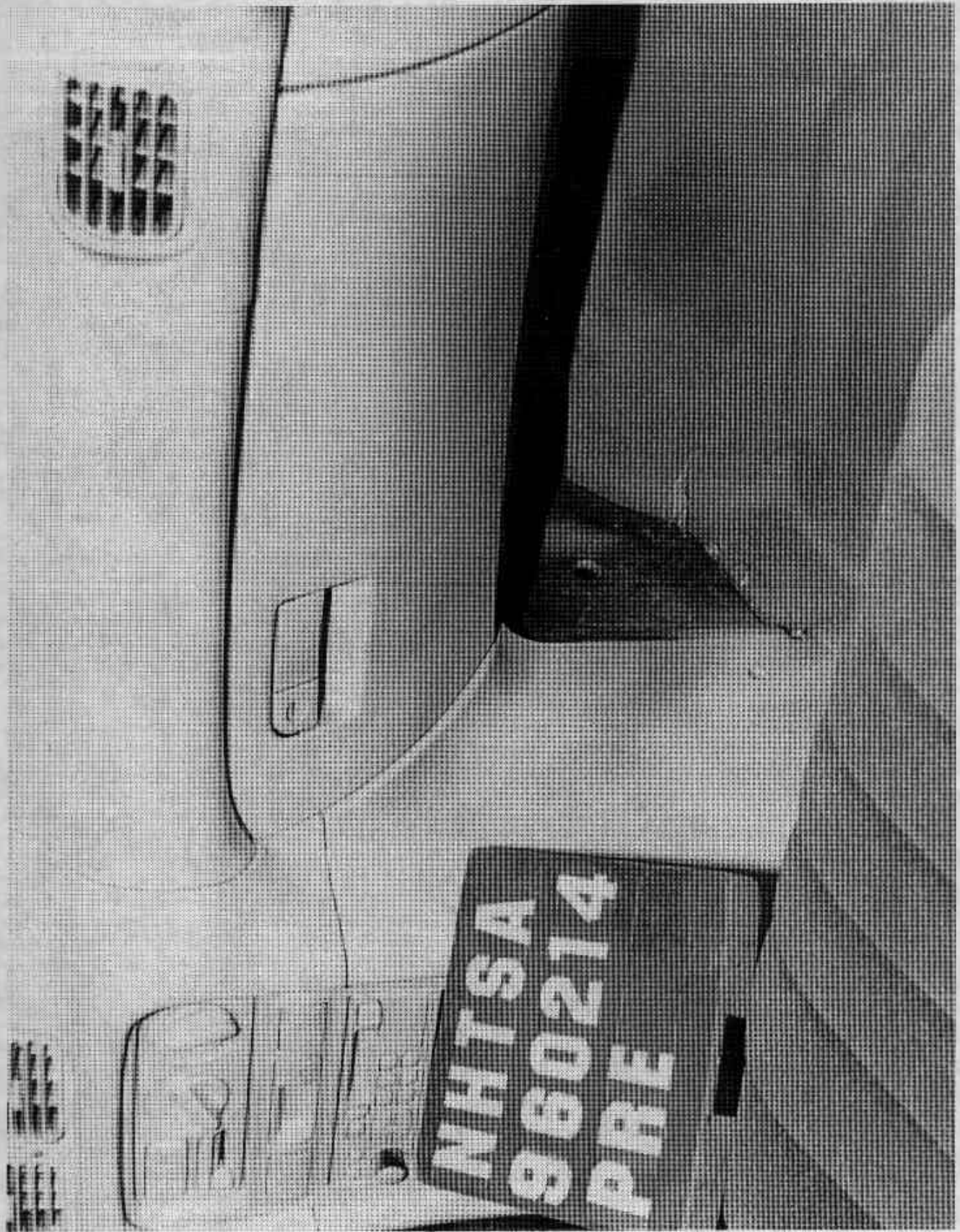


Figure A-29 Pre-Test Passenger's Knee Bolster View

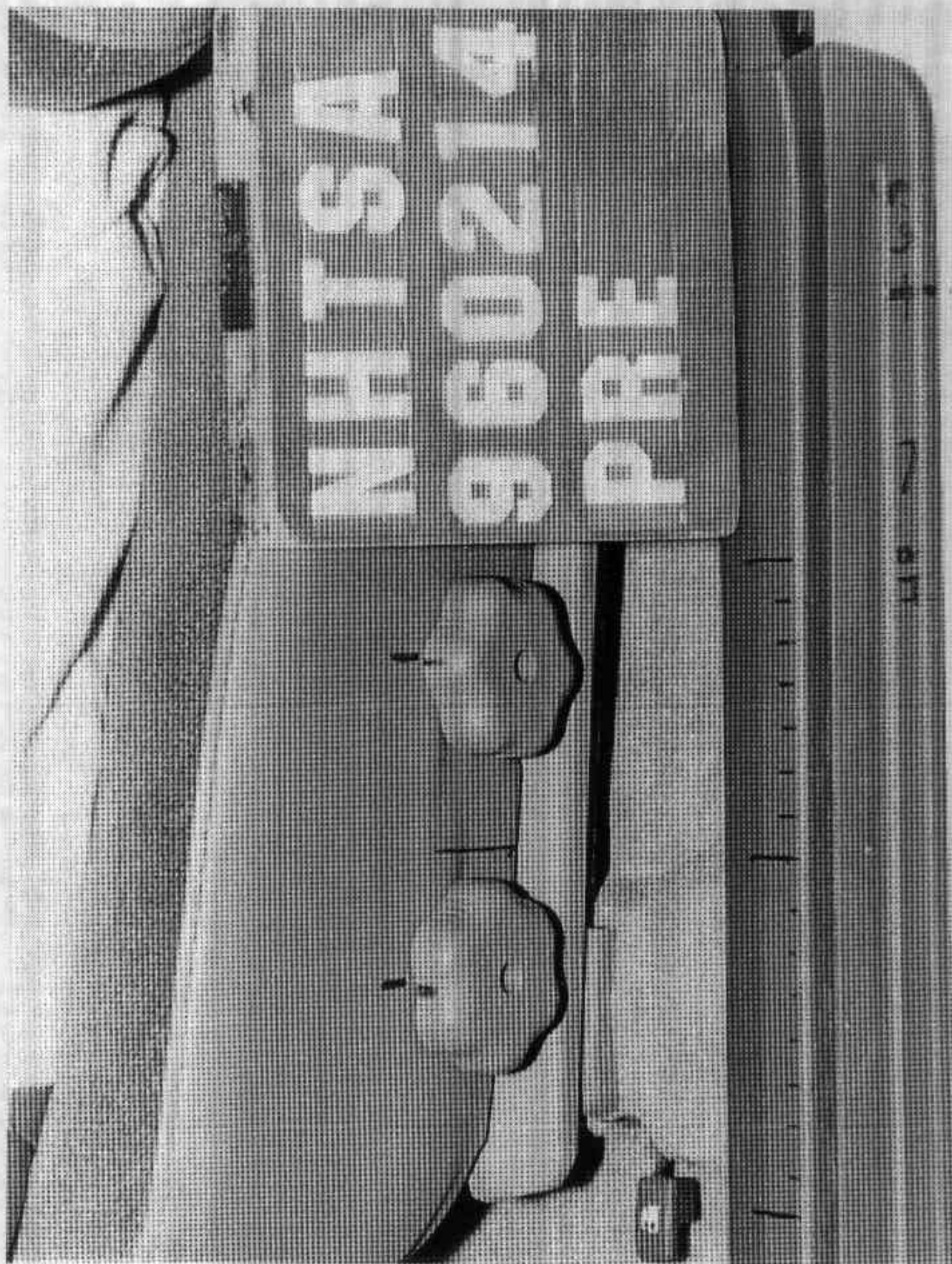


Figure A-30 Pre-Test Driver's Seat Position View

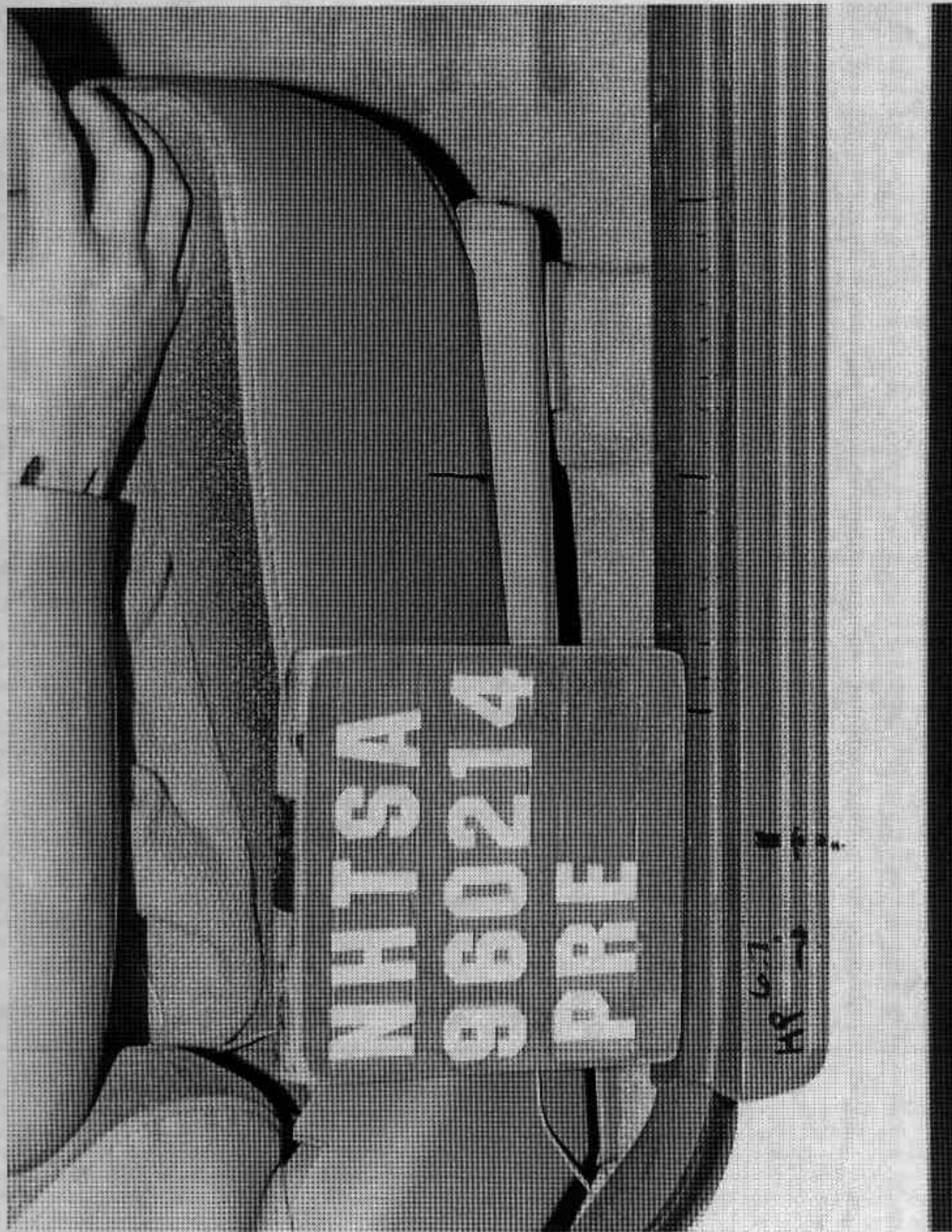


Figure A-31 Pre-Test Passenger's Seat Position View



Figure A-32 Pre-Test Driver Dummy Position - View 1

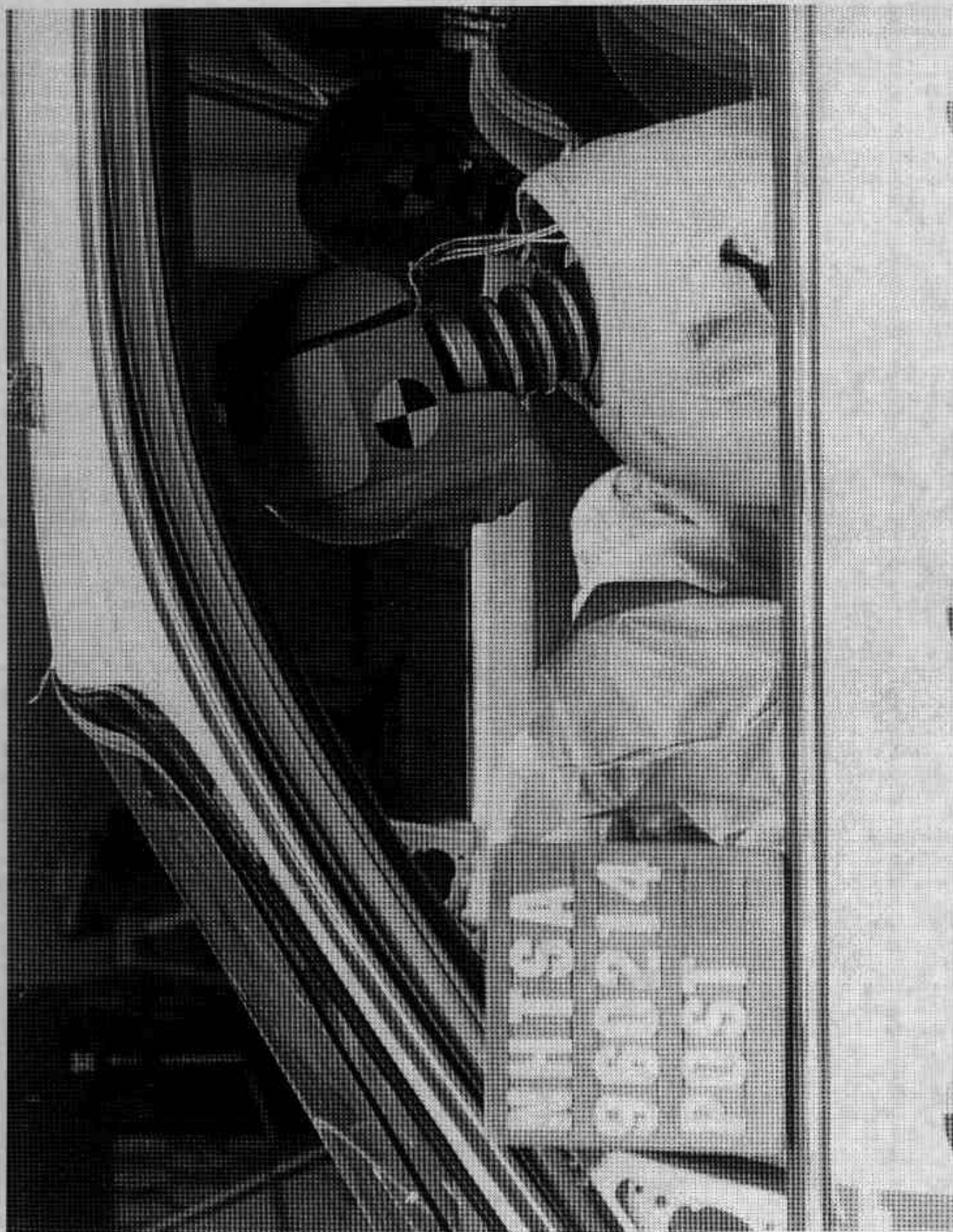


Figure A-33 Post-Test Driver Dummy Position View



Figure A-34 Pre-Test Driver Dummy Position - View 2



Figure A-35 Pre-Test Passenger Dummy Position - View 1

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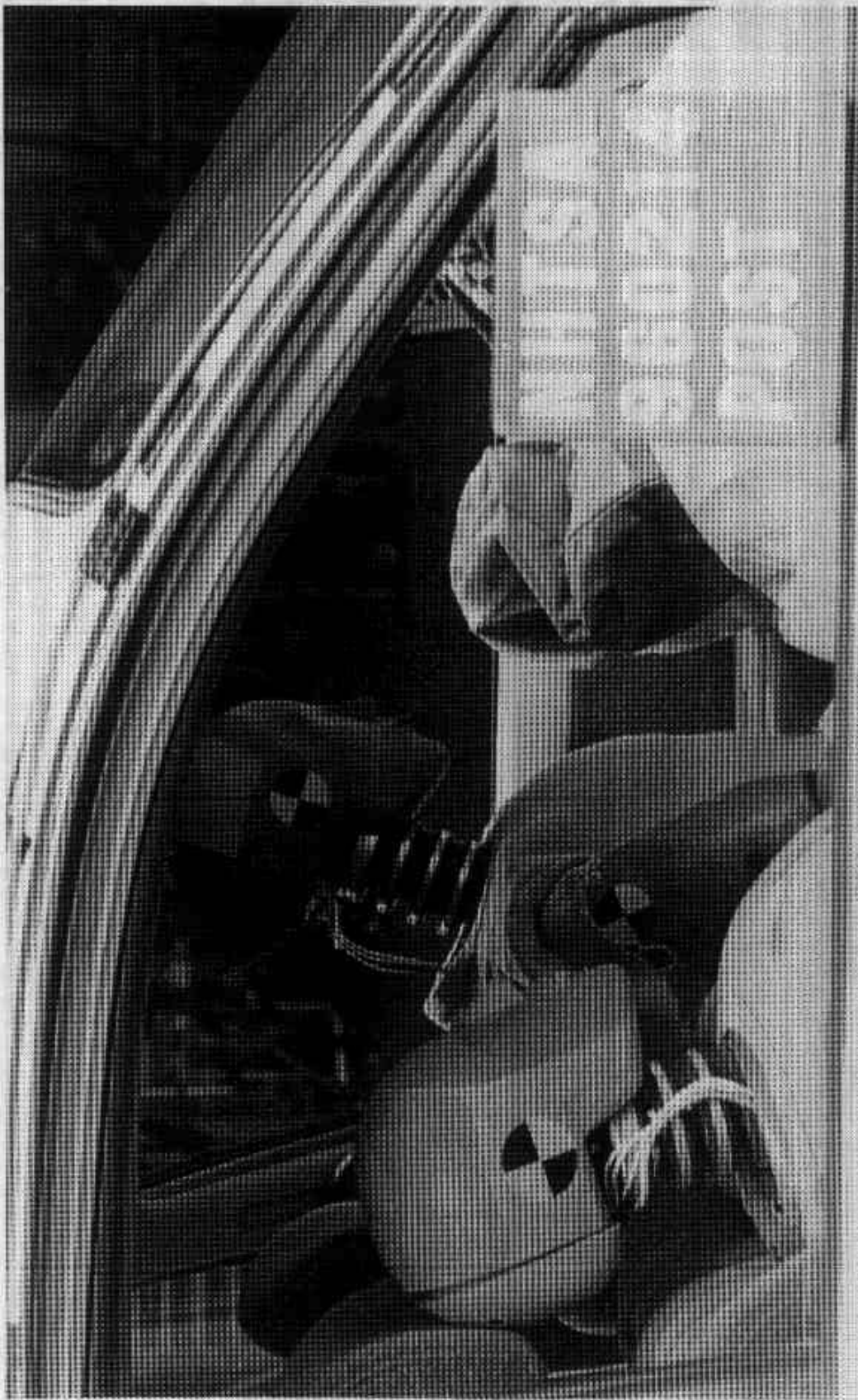


Figure A-36 Post-Test Passenger Dummy Position View

A-37

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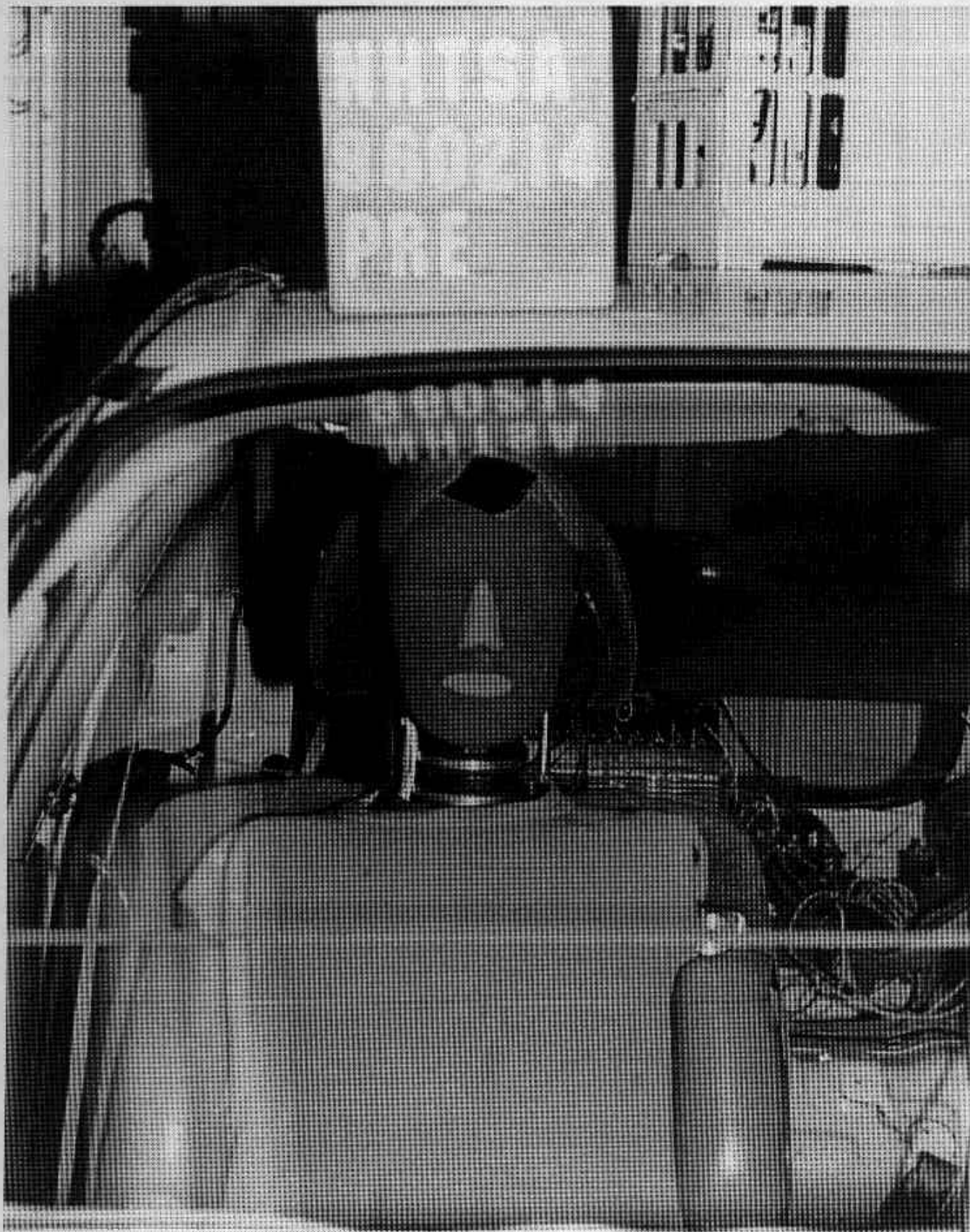


Figure A-37 Pre-Test Passenger Dummy Position - View 2

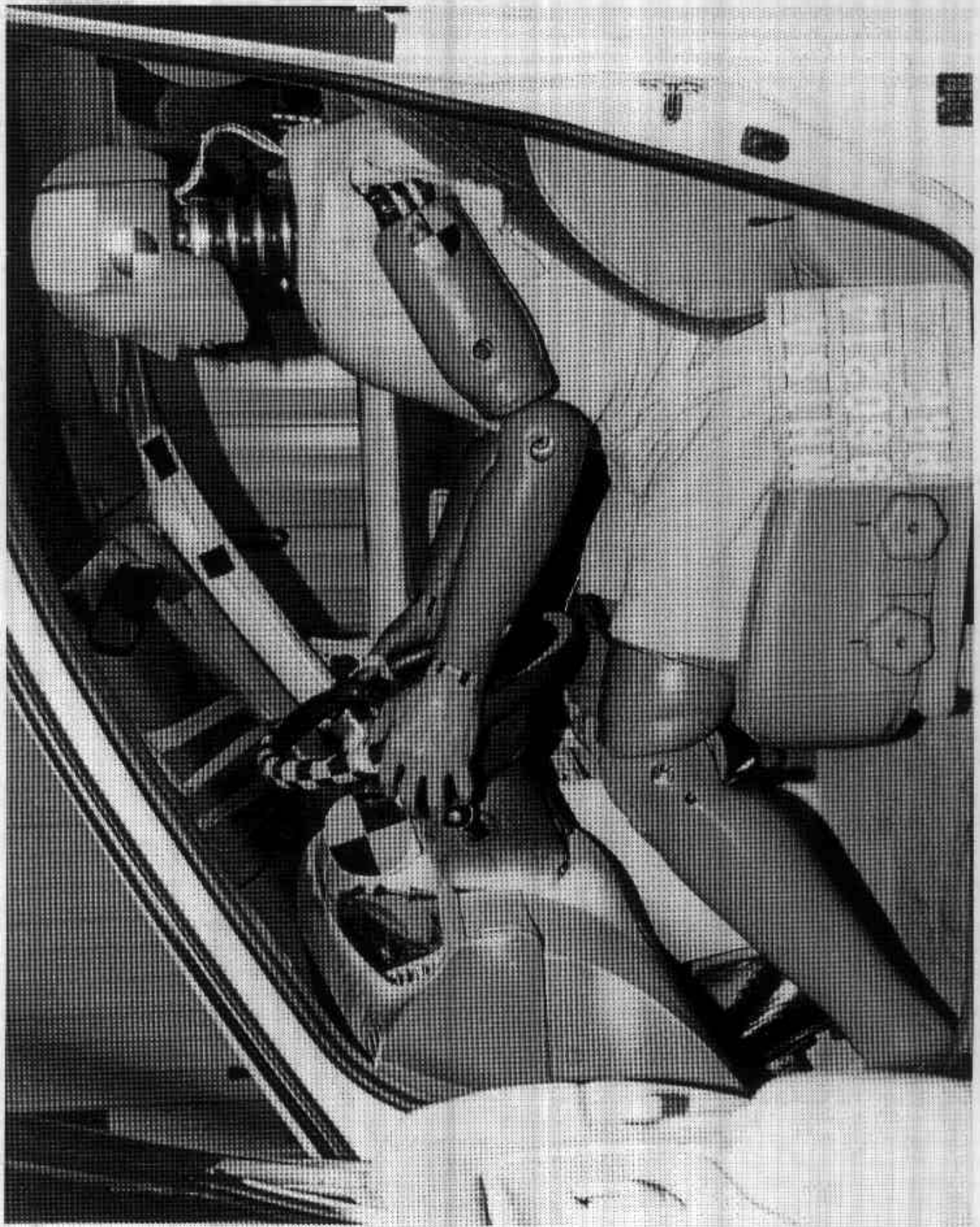


Figure A-38 Pre-Test Driver Dummy and Vehicle Interior - View 1

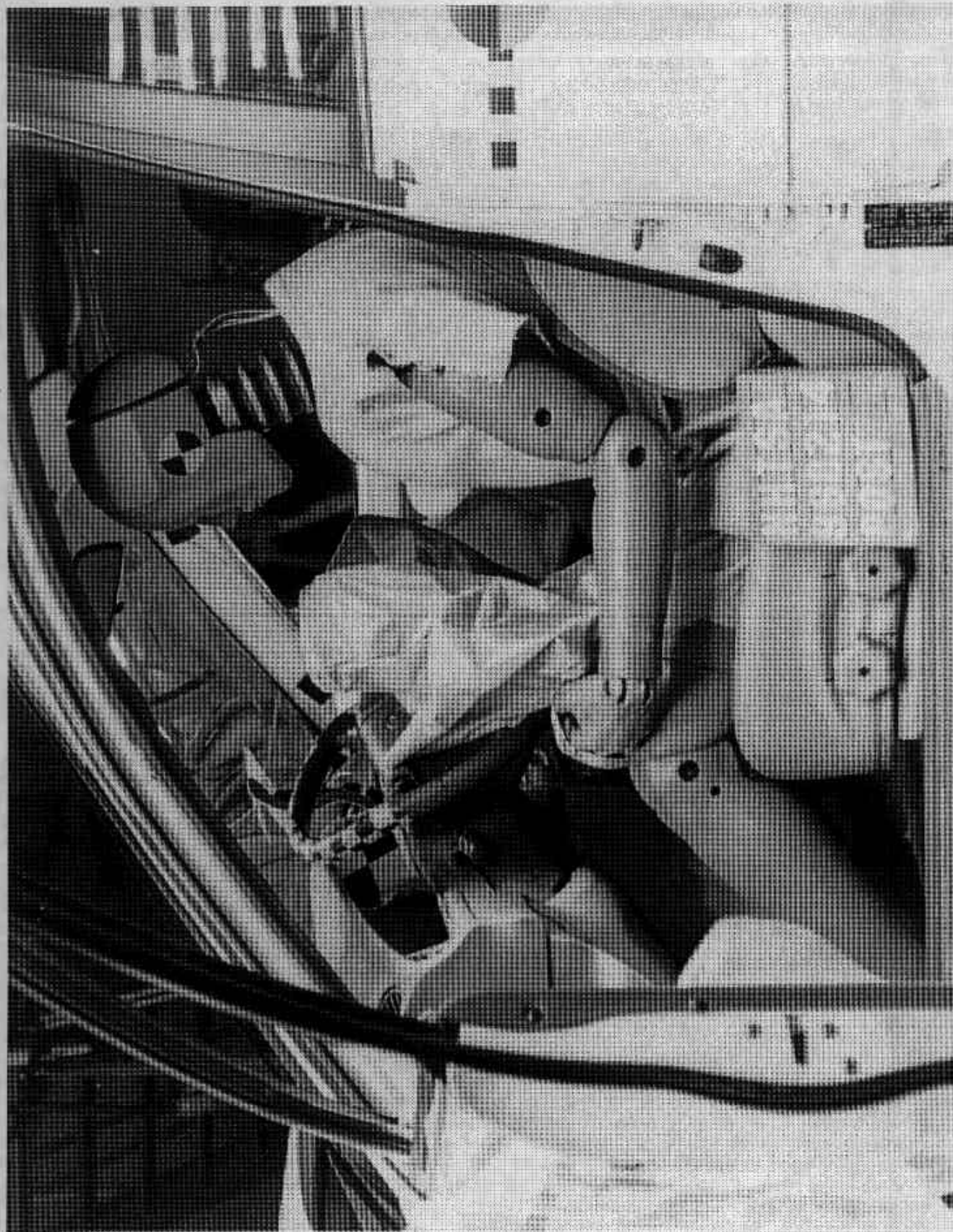


Figure A-39 Post-Test Driver Dummy and Vehicle Interior - View 1

A-40

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Figure A-40 Pre-Test Driver Dummy and Vehicle Interior - View 2



Figure A-41 Post-Test Driver Dummy and Vehicle Interior - View 2

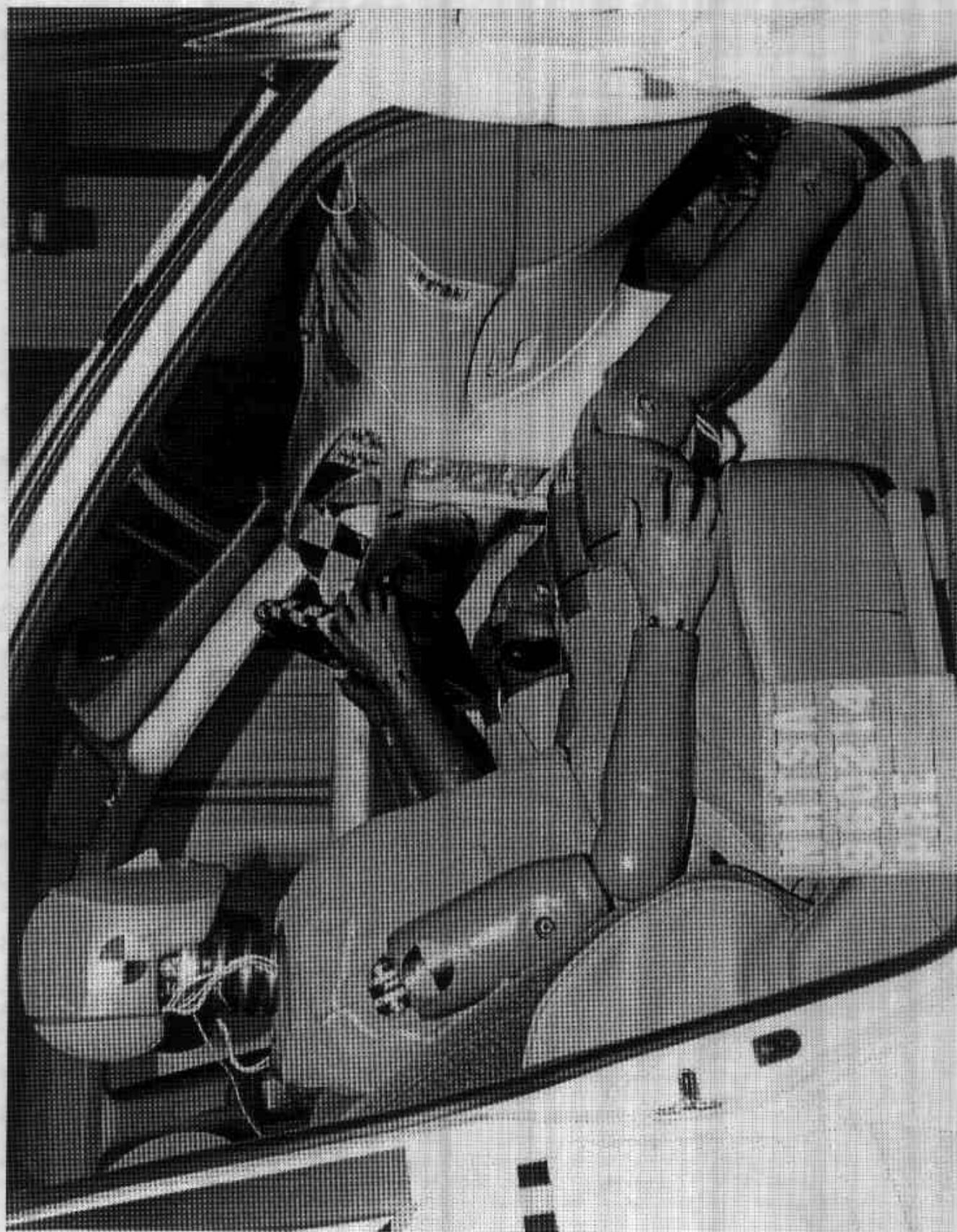


Figure A-42 Pre-Test Passenger Dummy and Vehicle Interior - View 1



Figure A-44 Pre-Test Passenger Dummy and Vehicle Interior - View 2



Figure A-45 Post-Test Passenger Dummy and Vehicle Interior - View 2

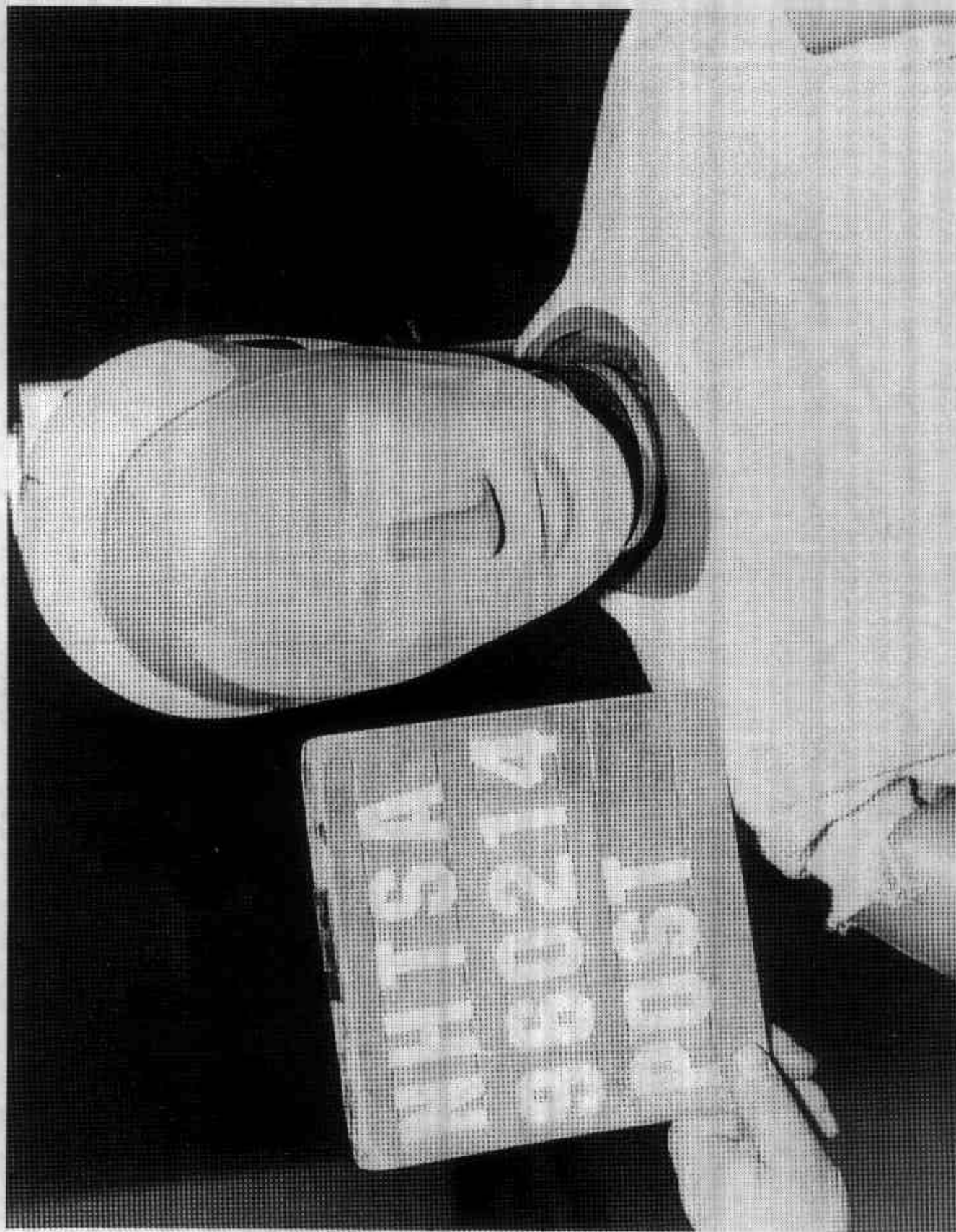


Figure A-46 Post-Test Driver Dummy Head Contact - View 1



Figure A-47 Post-Test Driver Dummy Head Contact - View 2

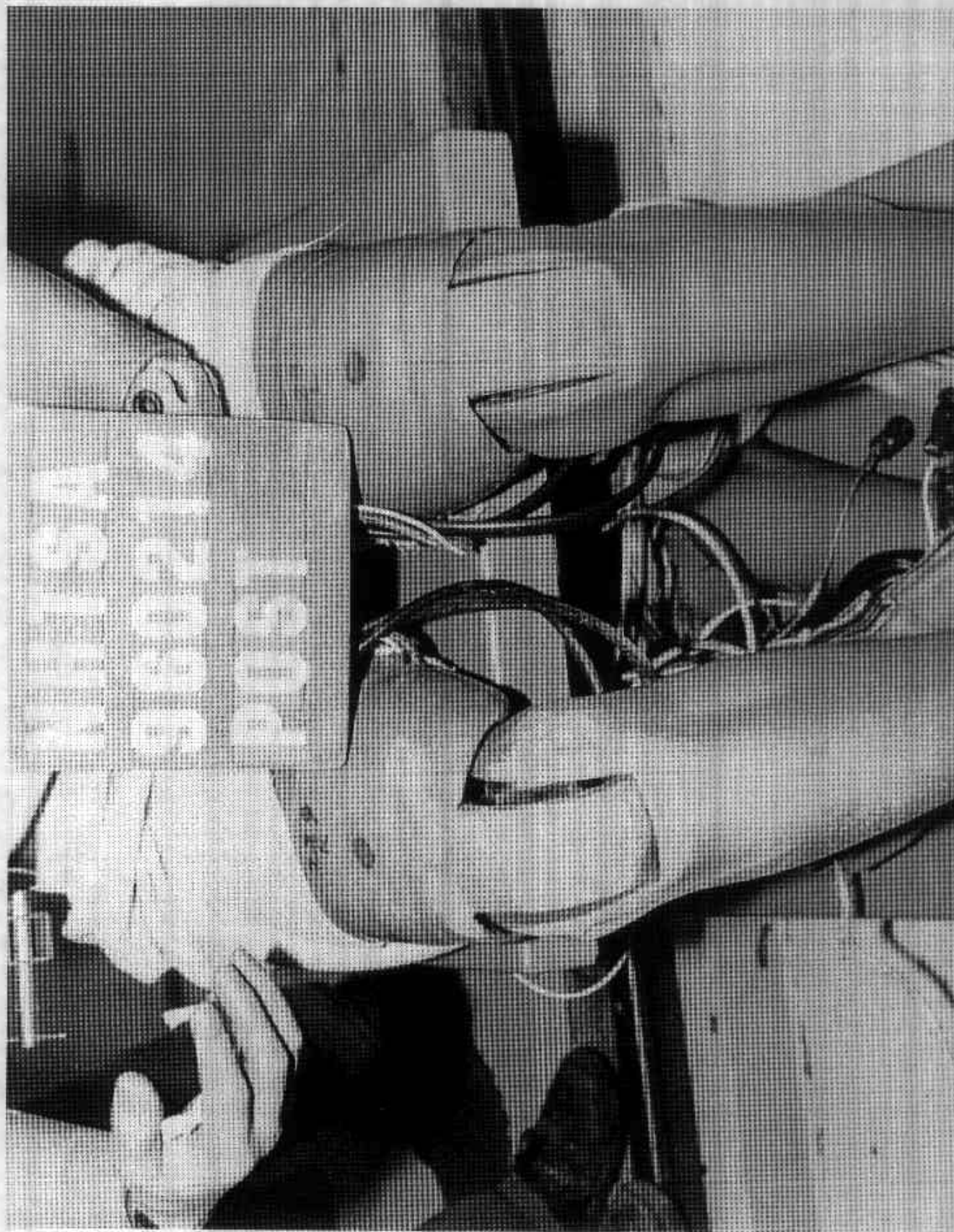


Figure A-48 Post-Test Driver Dummy Knee Contact - View 1



Figure A-49 Post-Test Driver Dummy Knee Contact - View 2

A-50

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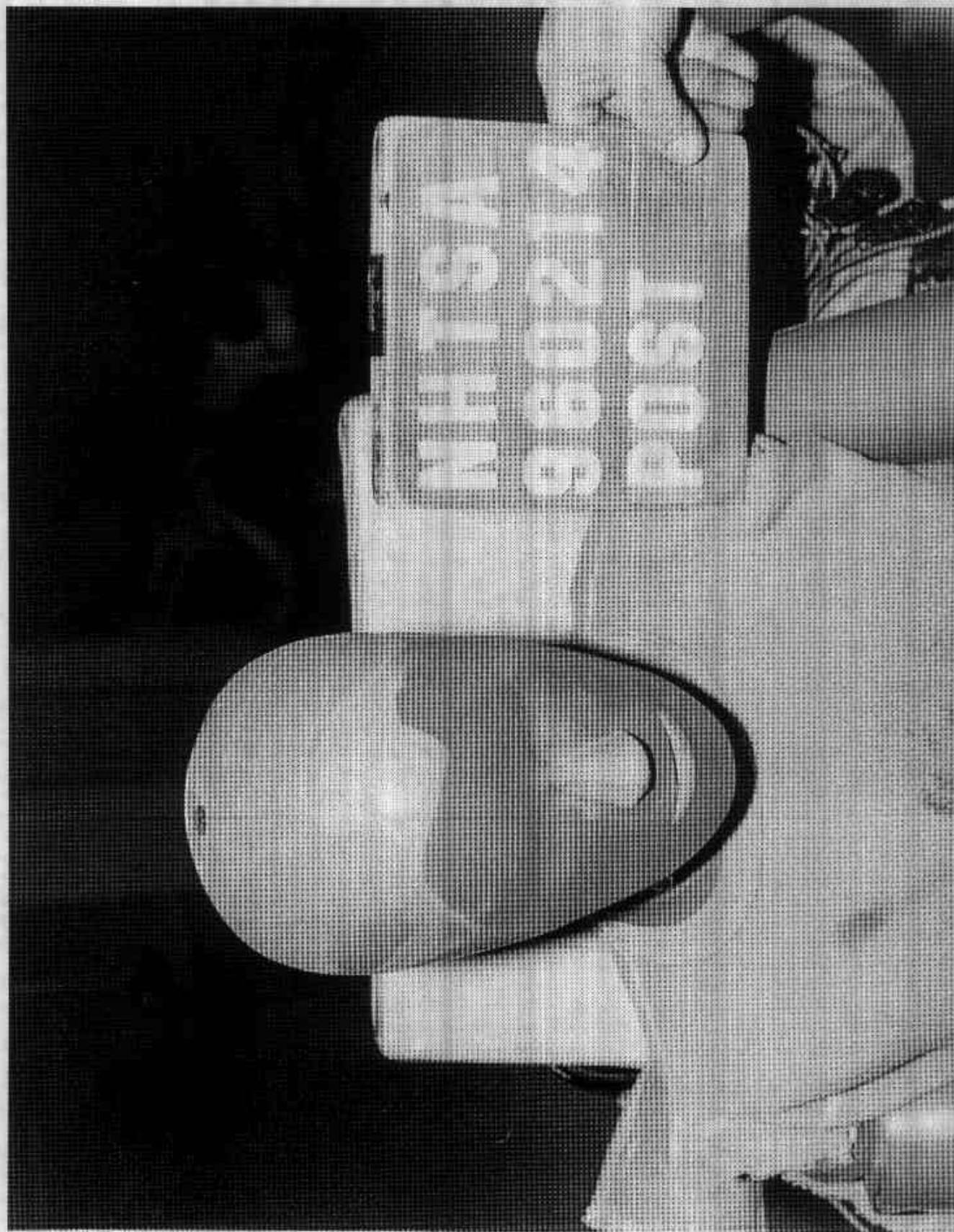


Figure A-50 Post-Test Passenger Dummy Head Contact - View 1



Figure A-51 Post-Test Passenger Dummy Head Contact - View 2

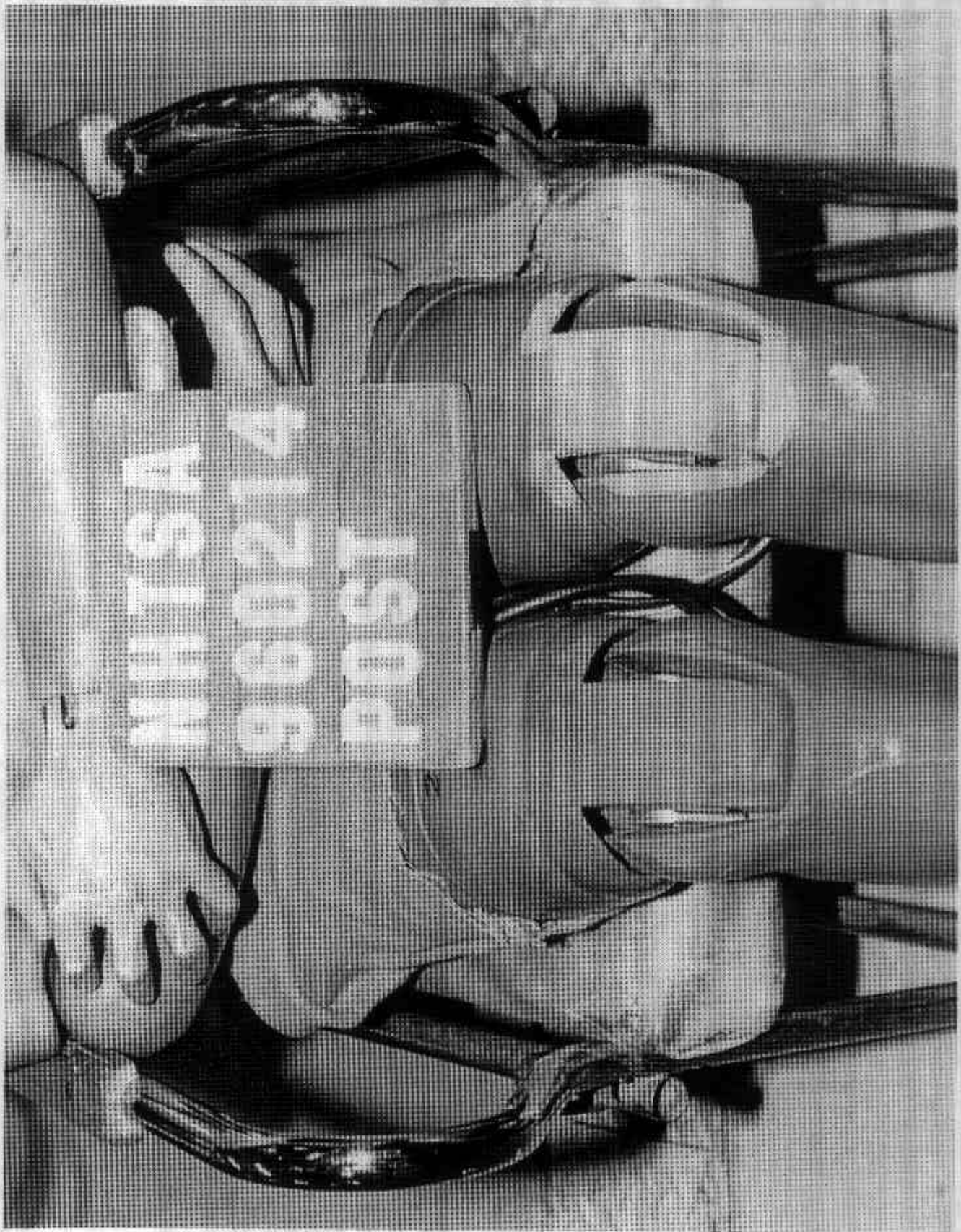


Figure A-52 Post-Test Passenger Dummy Knee Contact - View 1

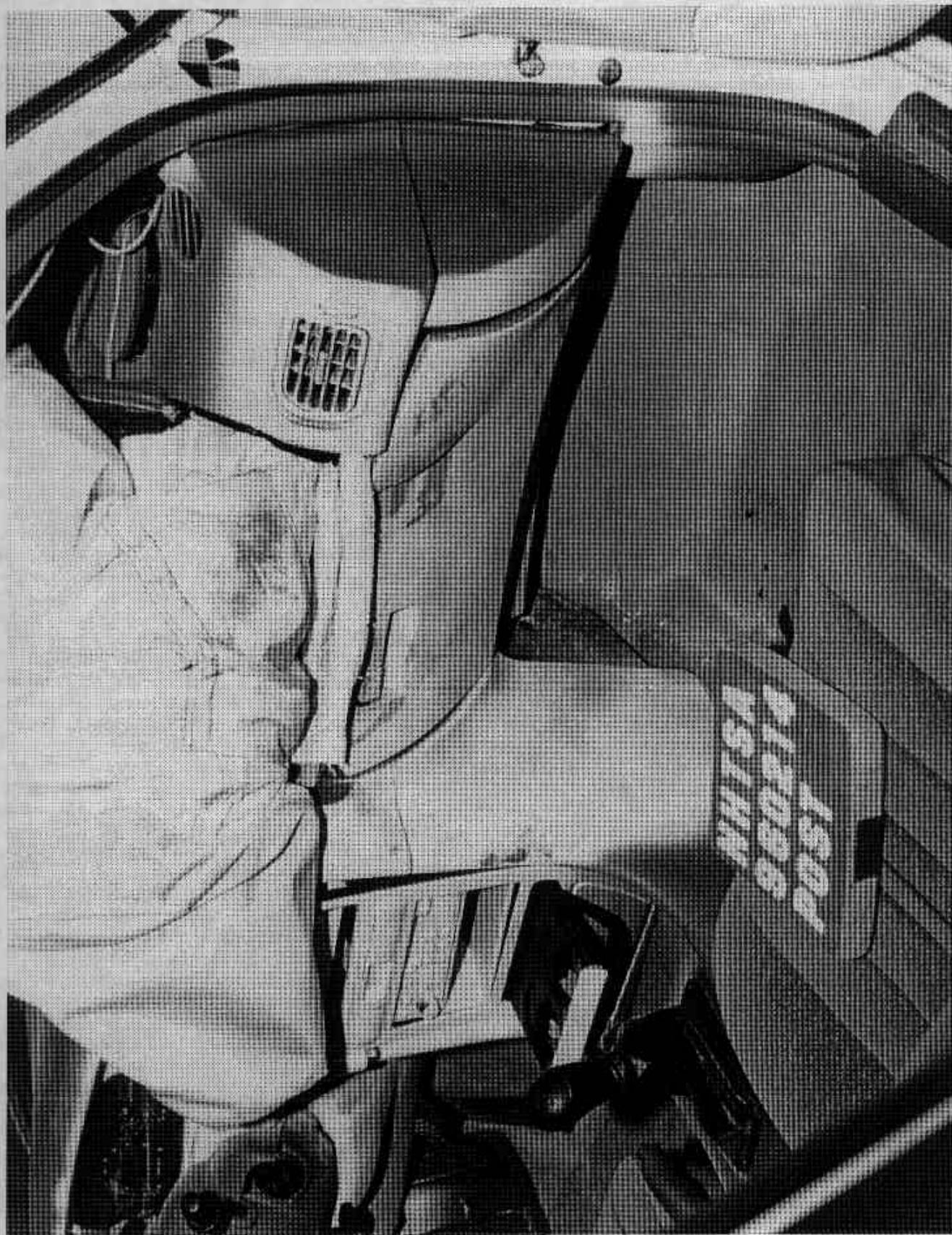


Figure A-53 Post-Test Passenger Dummy Knee Contact - View 2

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MANUFACTURED IN KOREA BY
HYUNDAI MOTOR COMPANY
NOV/16/95 GWR 3870 LBS PAINT NW

GAWR 2194 LBS	GAWR 1918 LBS	TRIM GL
FRONT	REAR	

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S.A. FEDERAL
MOTOR VEHICLE SAFETY, BUMPER, AND THEFT PREVENTION STANDARDS
IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE

V.I.N. KMHCF24F8TU528576
PASSENGER CAR

Figure A-54 Pre-Test Vehicle Certification Label View

1	TIRE INFLATION PRESSURE (COLD)	
STANDARD INFLATION PRESSURE FOR ALL LOAD		
1ST SEAT 2 PASS.		
2ND SEAT 3 PASS.		
TOTAL 5 PASS.		
LUGGAGE 50kg (110LBS)		
VEHICLE CAPACITY WT.		
390kg (860LBS)		
TIRE P195/70R14 90H		
SIZE P205/60R15 90H		
FRONT		REAR
210kPa		210kPa
(30psi)		(30psi)
TIRE SIZE T125/70015		
TEMPORARY USE ONLY		
420kPa		(60psi)

Figure A-55 Pre-Test Vehicle Recommended Tire Pressure Label View

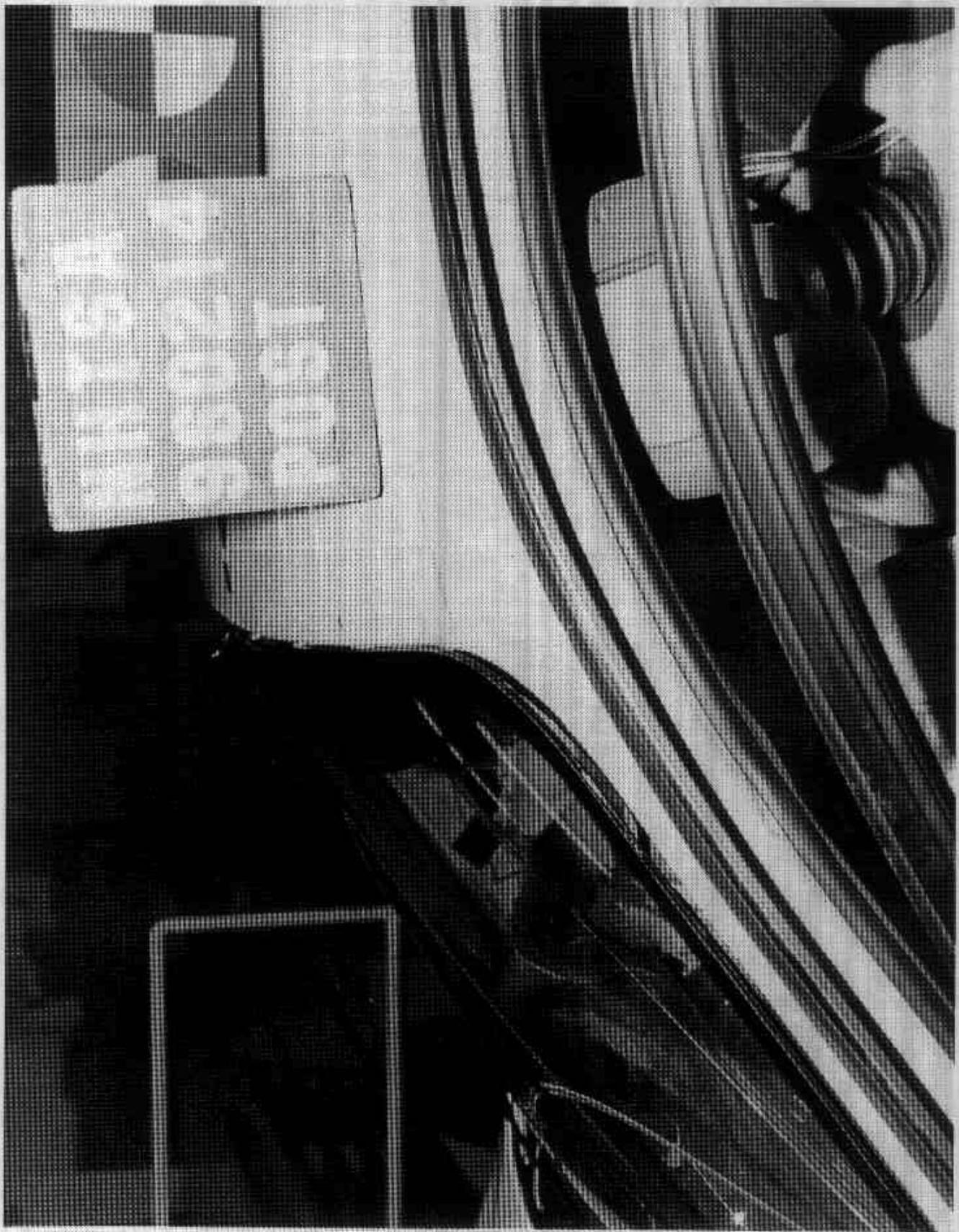


Figure A-56 Post-Test Windshield Retention Loss

A-57

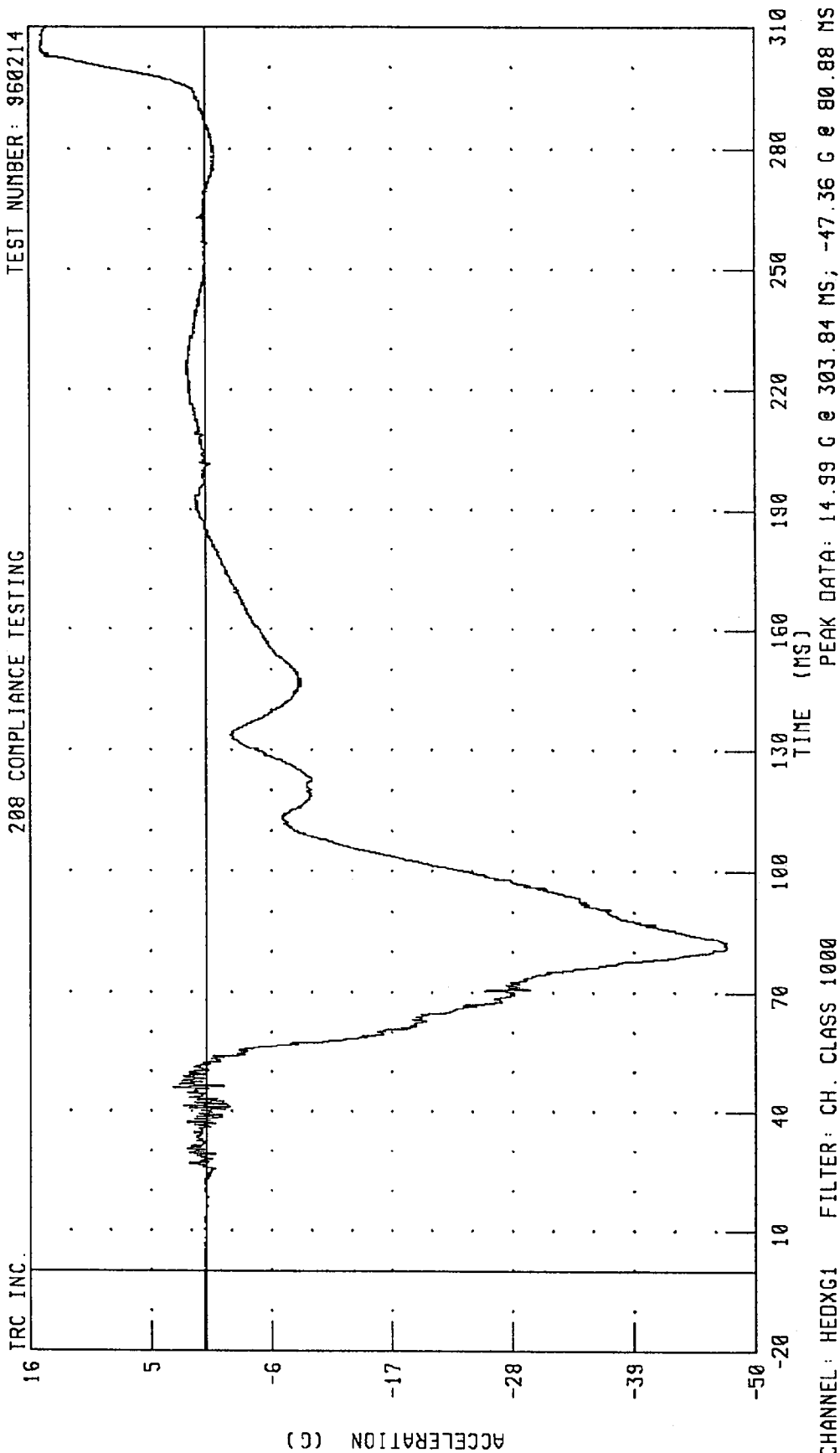
960214

Appendix B

Data Plots

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER HEAD X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 960214

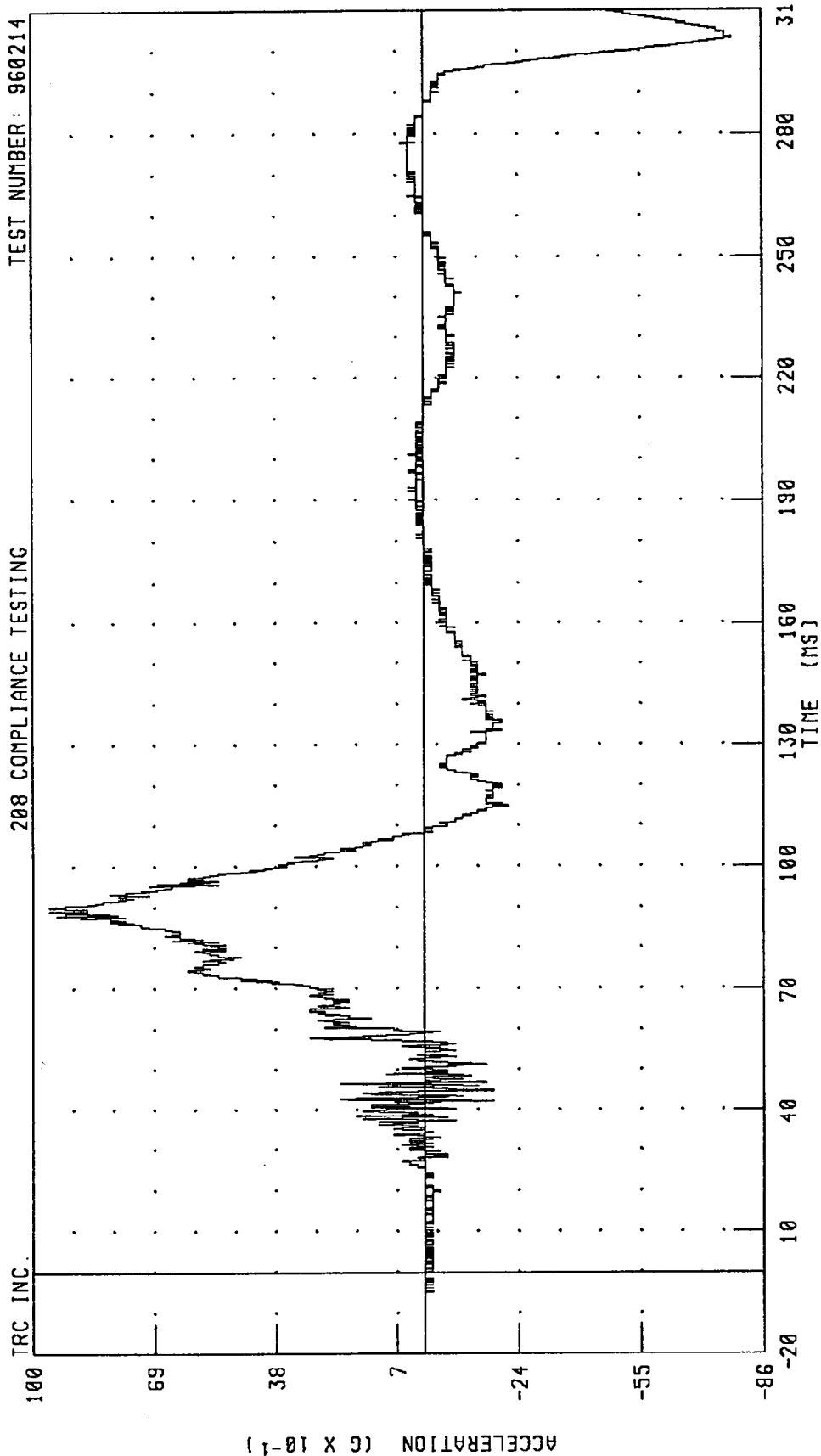


CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

PEAK DATA: 14.99 G @ 303.84 MS; -47.36 G @ 80.88 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Y-AXIS ACCELERATION
 208 COMPLIANCE TESTING

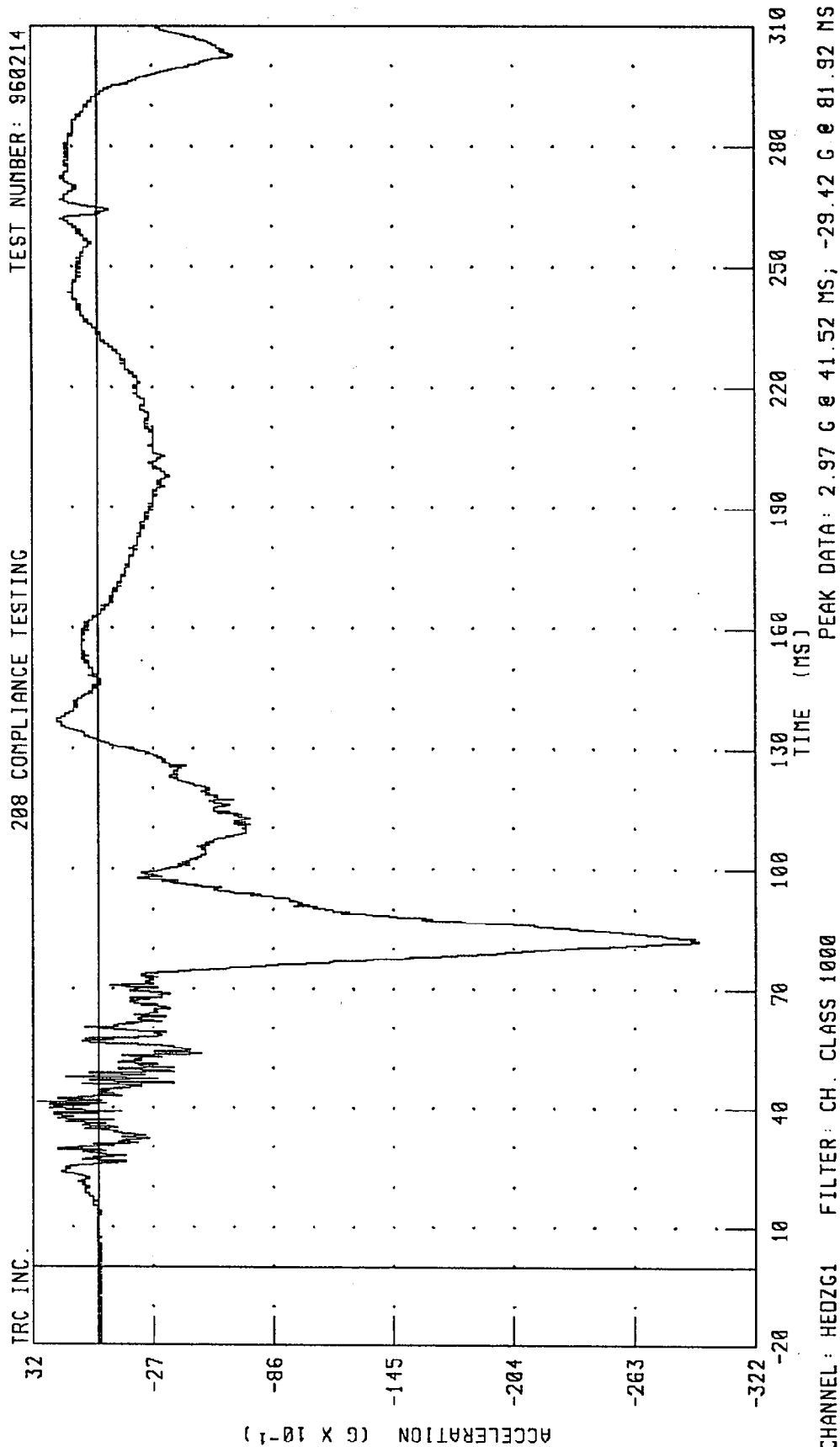
TEST NUMBER: 960214



CHANNEL: HEDYG1 FILTER: CH. CLASS 1000

PEAK DATA: 9.58 G @ 89.12 MS, -7.84 G @ 303.28 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING



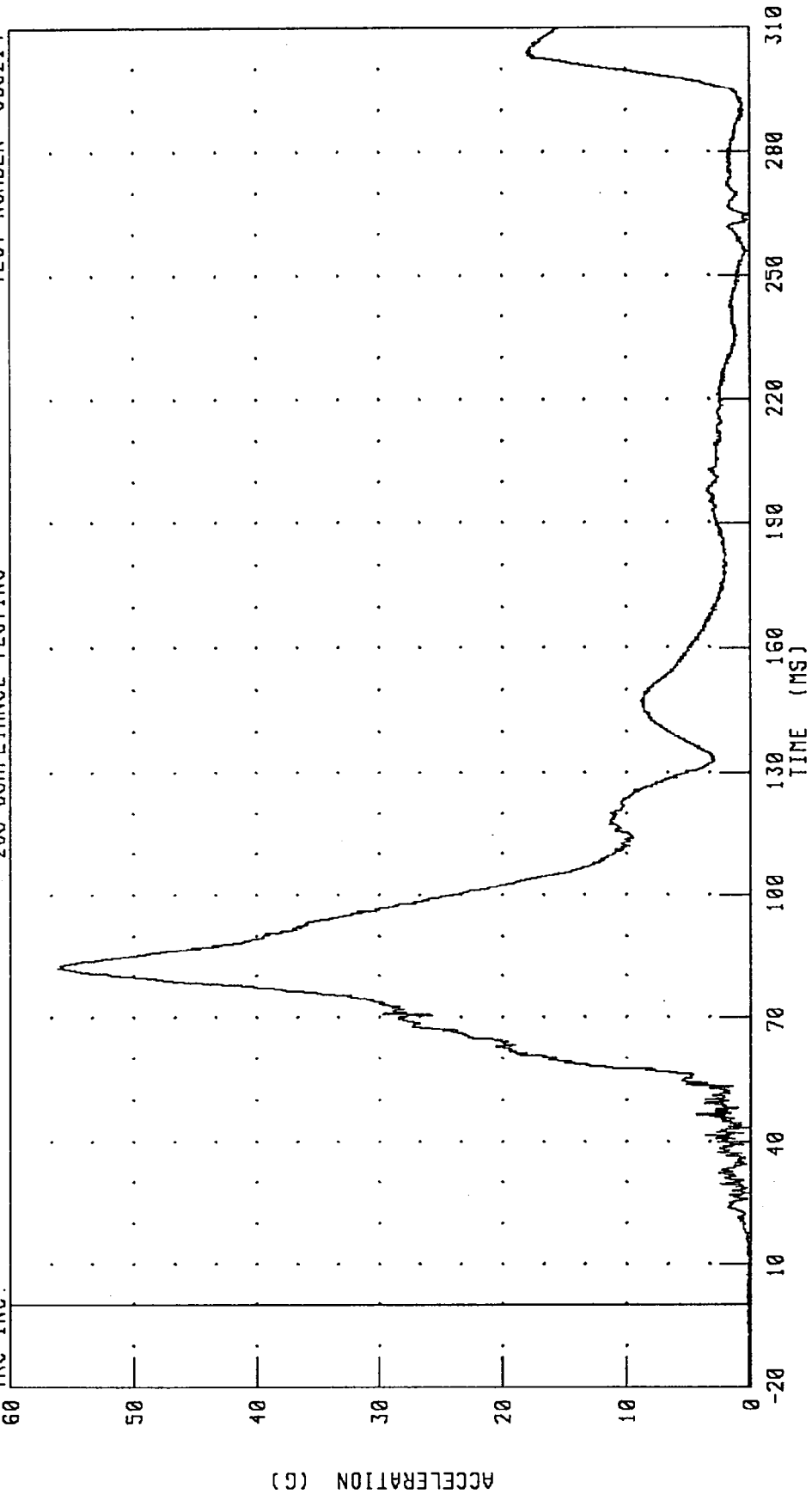
CHANNEL: HEDZG1 FILTER: CH. CLASS 1000

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.



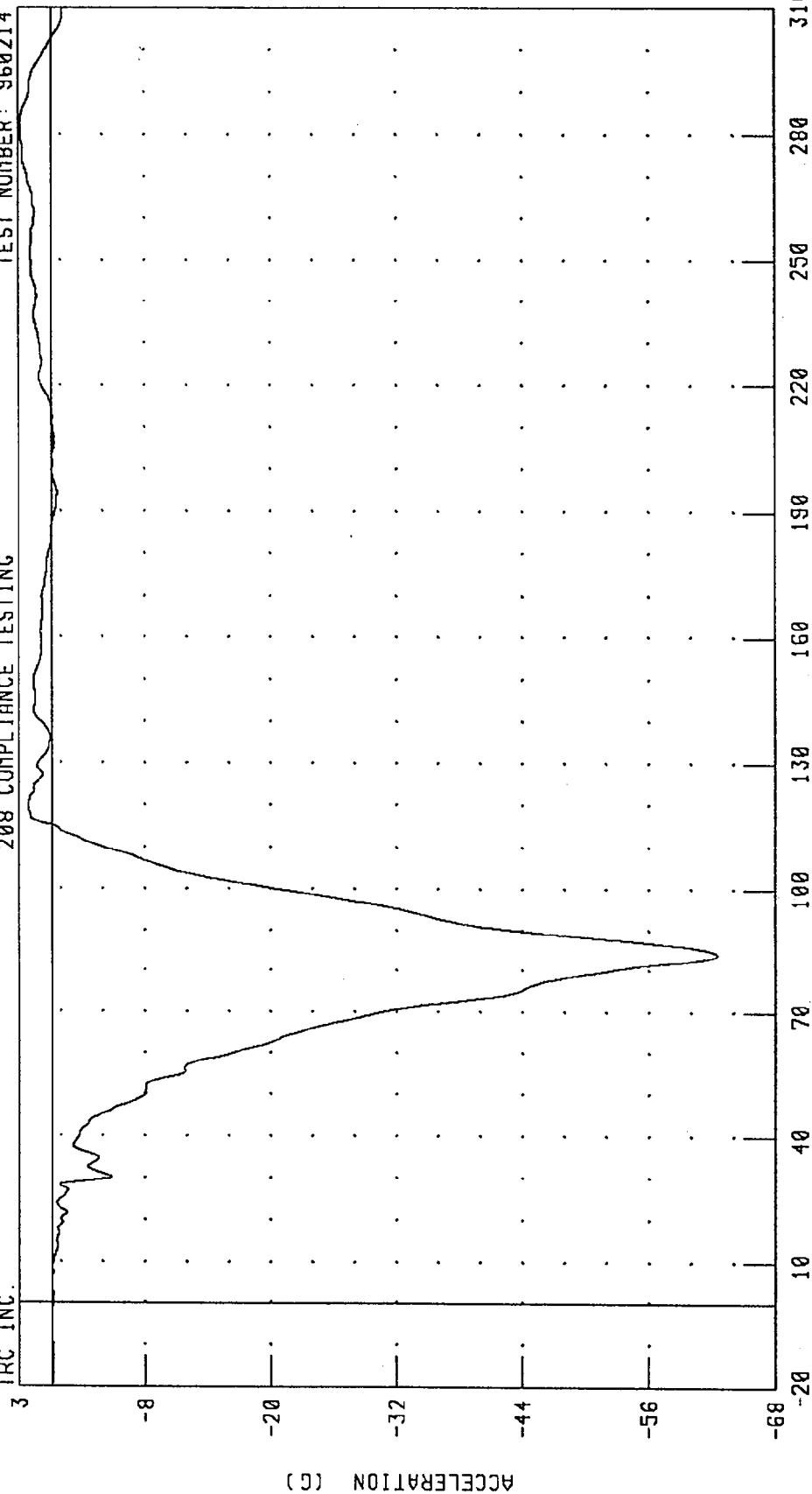
PEAK DATA: 56.13 G @ 81.92 MS; 0.07 G @ -15.68 MS

CHANNEL: HEDRG1 FILTER: CH. CLASS 1000

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER CHEST X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 960214

IRC INC.



CHANNEL: CSTXG1 FILTER: CH. CLASS 180

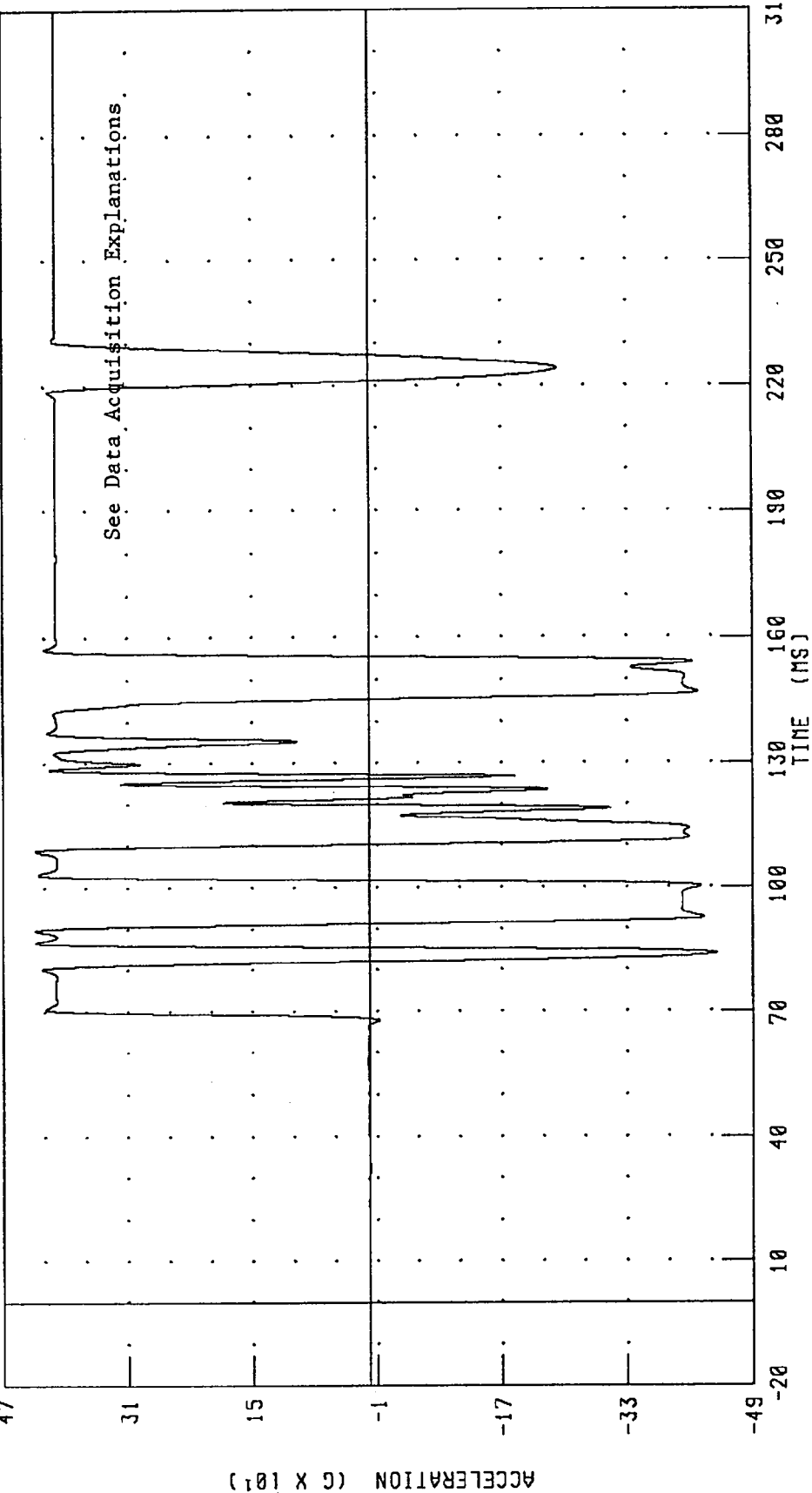
PEAK DATA: 2.97 G @ 282.16 MS; -63.35 G @ 84.32 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER CHEST Y-AXIS ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.



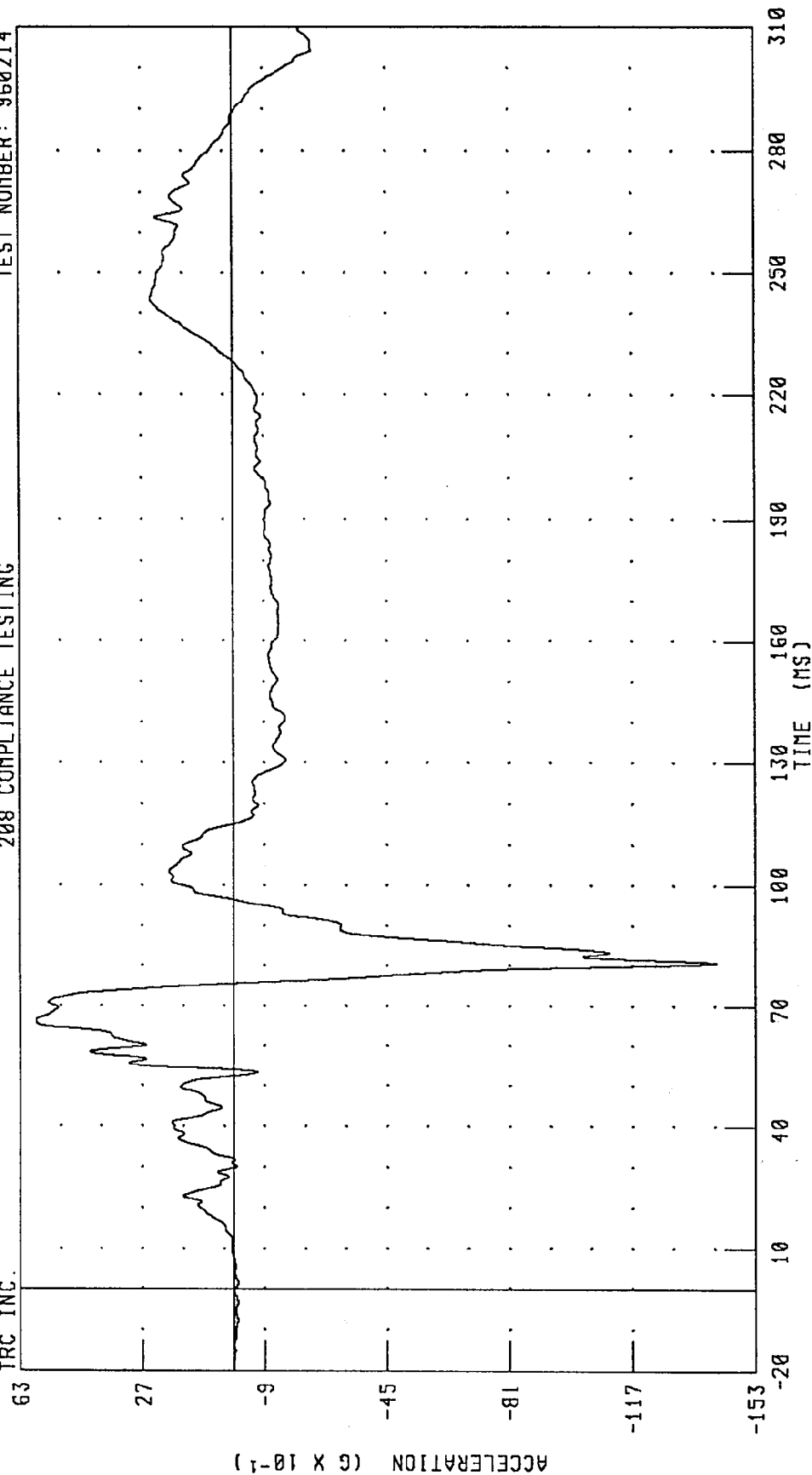
CHANNEL: CSTYG1 FILTER: CH. CLASS 180

PEAK DATA: 428.35 G @ 89.84 MS; -444.68 G @ 83.92 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Z-AXIS ACCELERATION
 208 COMPLIANCE TESTING

TEST NUMBER: 360214

TRC INC.



PEAK DATA: 5.80 G @ 66.56 MS; -14.15 G @ 80.80 MS

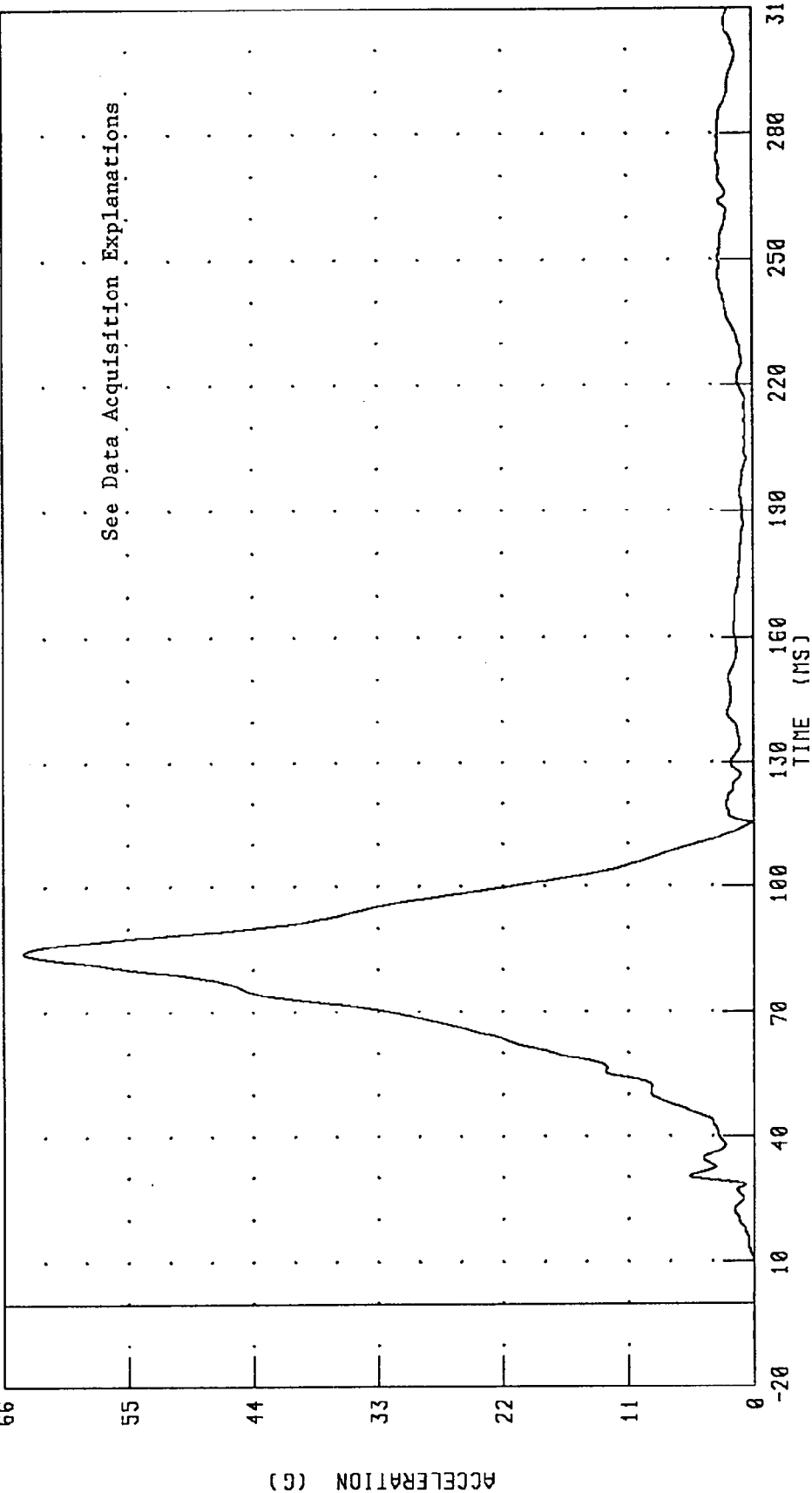
CHANNEL: CSTZG1 FILTER: CH. CLASS 180

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER CHEST RESULTANT ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.

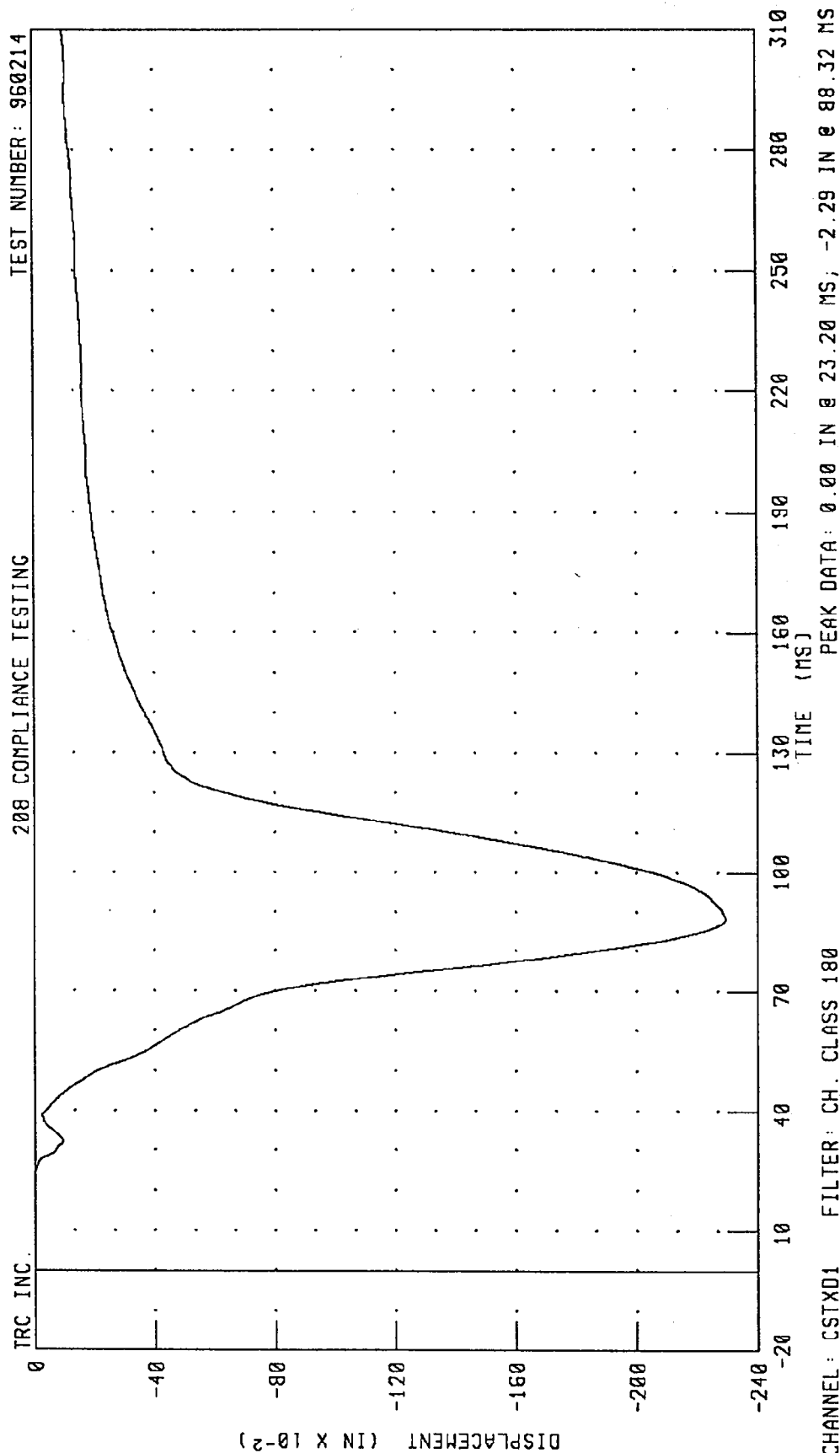


CHANNEL: CSTRG1 FILTER: CH. CLASS 180

PEAK DATA: 64.20 G @ 84.08 MS; 0.00 G @ -20.00 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 DRIVER CHEST DEFLECTION
 208 COMPLIANCE TESTING

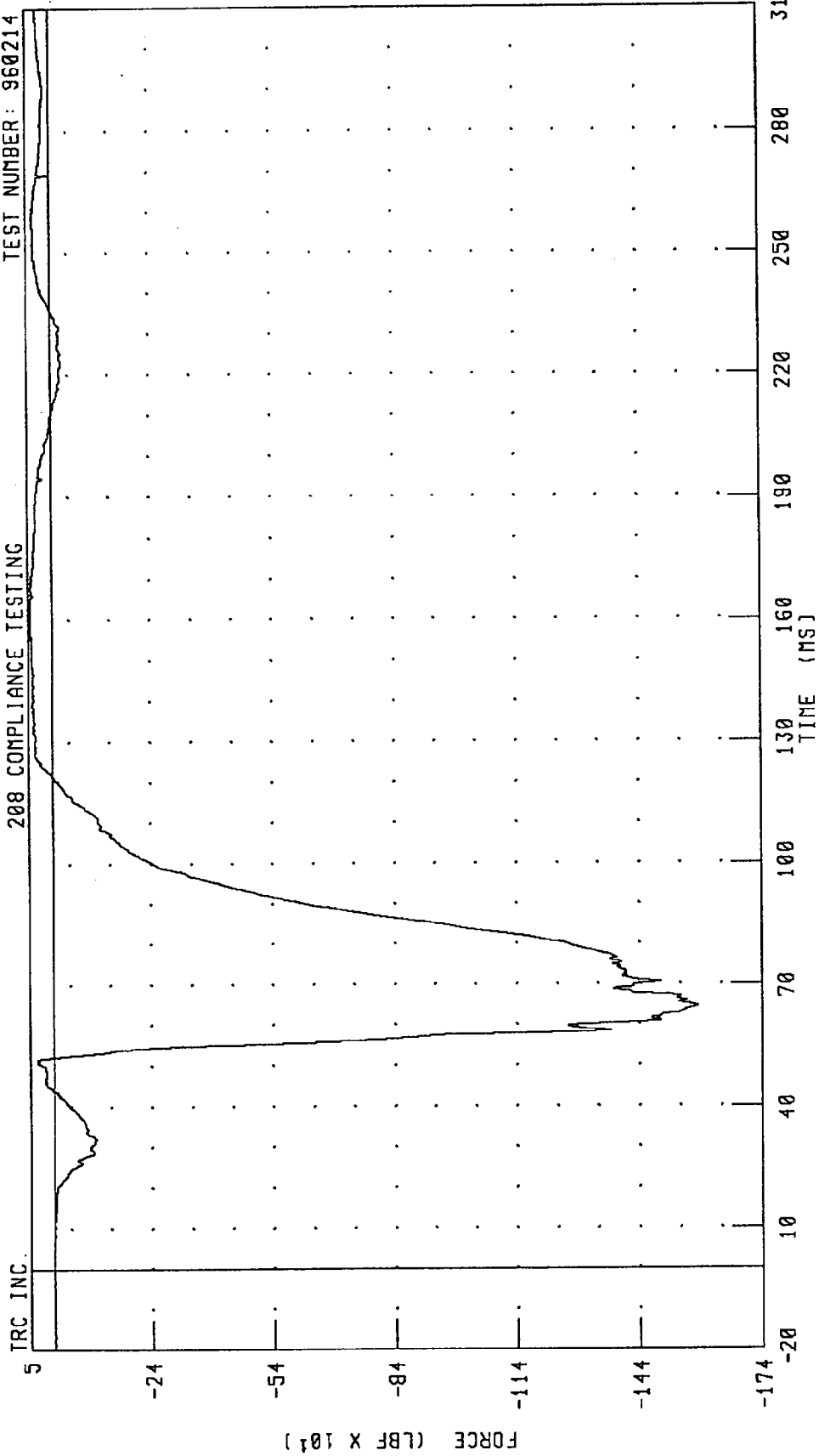
TEST NUMBER: 960214



CHANNEL: CSTXD1 FILTER: CH. CLASS 180

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 DRIVER LEFT FEMUR FORCE
 208 COMPLIANCE TESTING

TEST NUMBER: 960214



PEAK DATA: 53.26 LBF @ 162.80 MS; -1586.02 LBF @ 64.48 MS

CHANNEL: LFMF1 FILTER: CH. CLASS 600

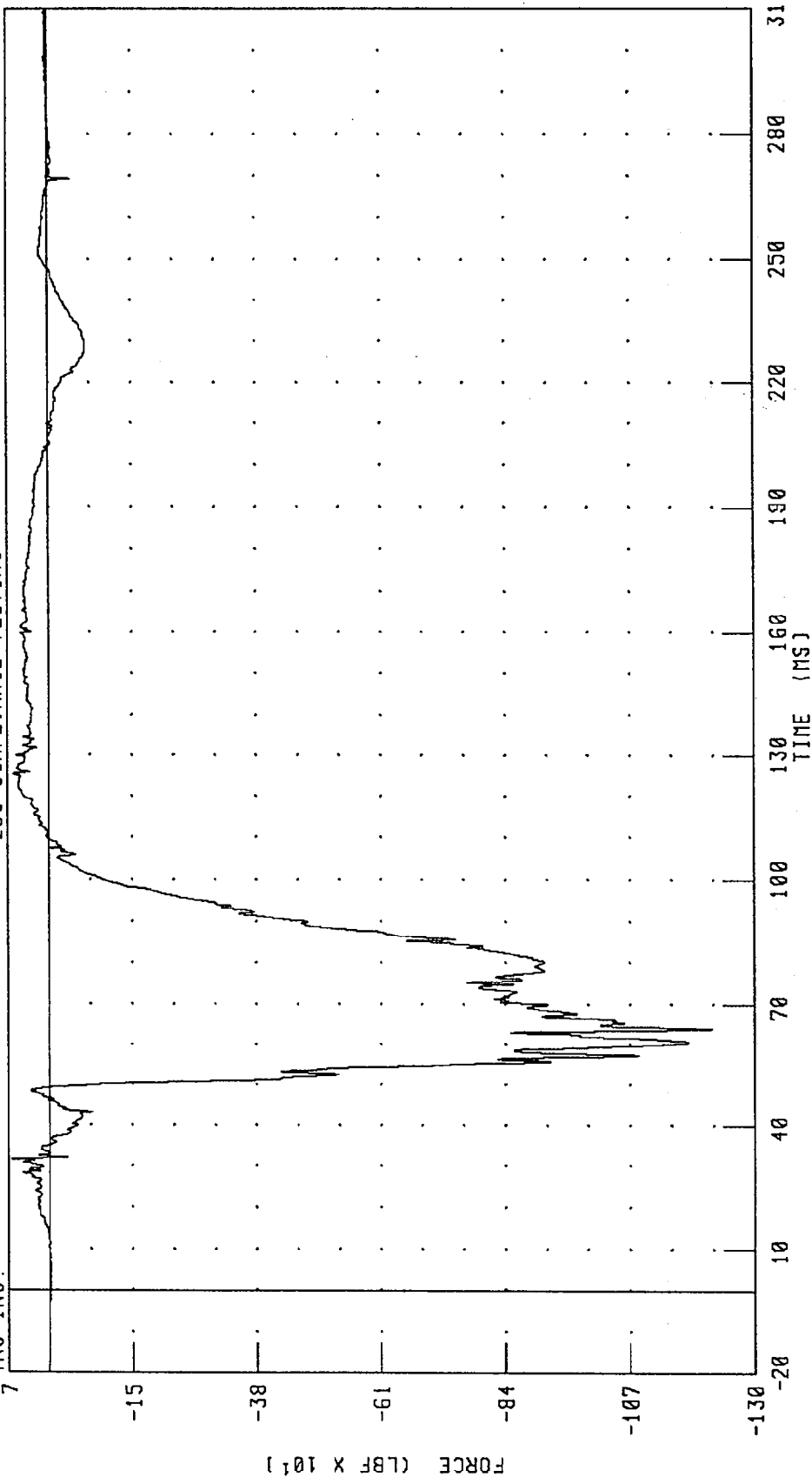
1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER

DRIVER RIGHT FEMUR FORCE

208 COMPLIANCE TESTING

TEST NUMBER: 960214

TRC INC.



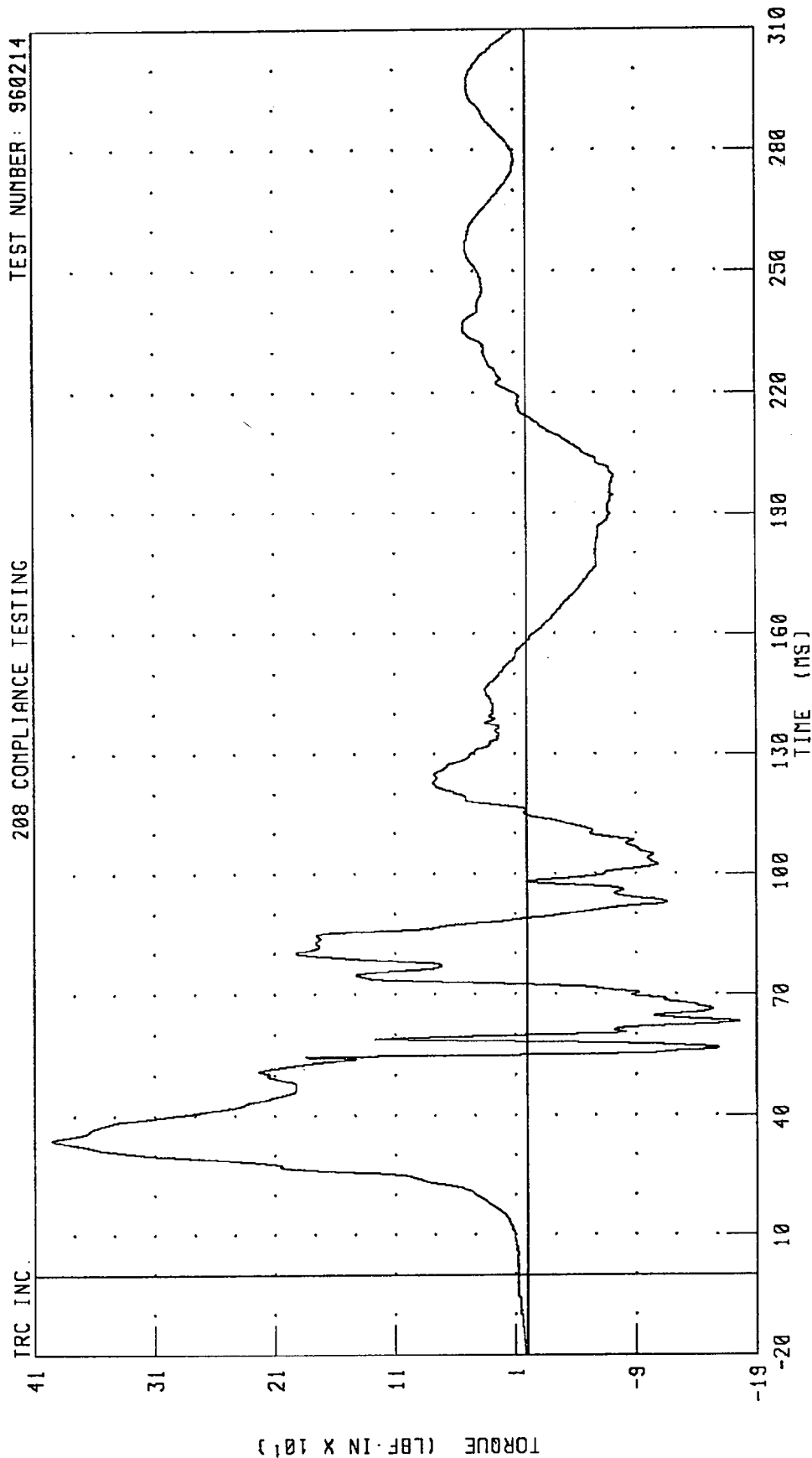
PEAK DATA: 69.28 LBF @ 31.52 MS; -1224.59 LBF @ 64.08 MS

CHANNEL: RFMF1 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER LEFT UPPER TIBIA MOMENT ABOUT X-AXIS

TEST NUMBER: 960214

208 COMPLIANCE TESTING



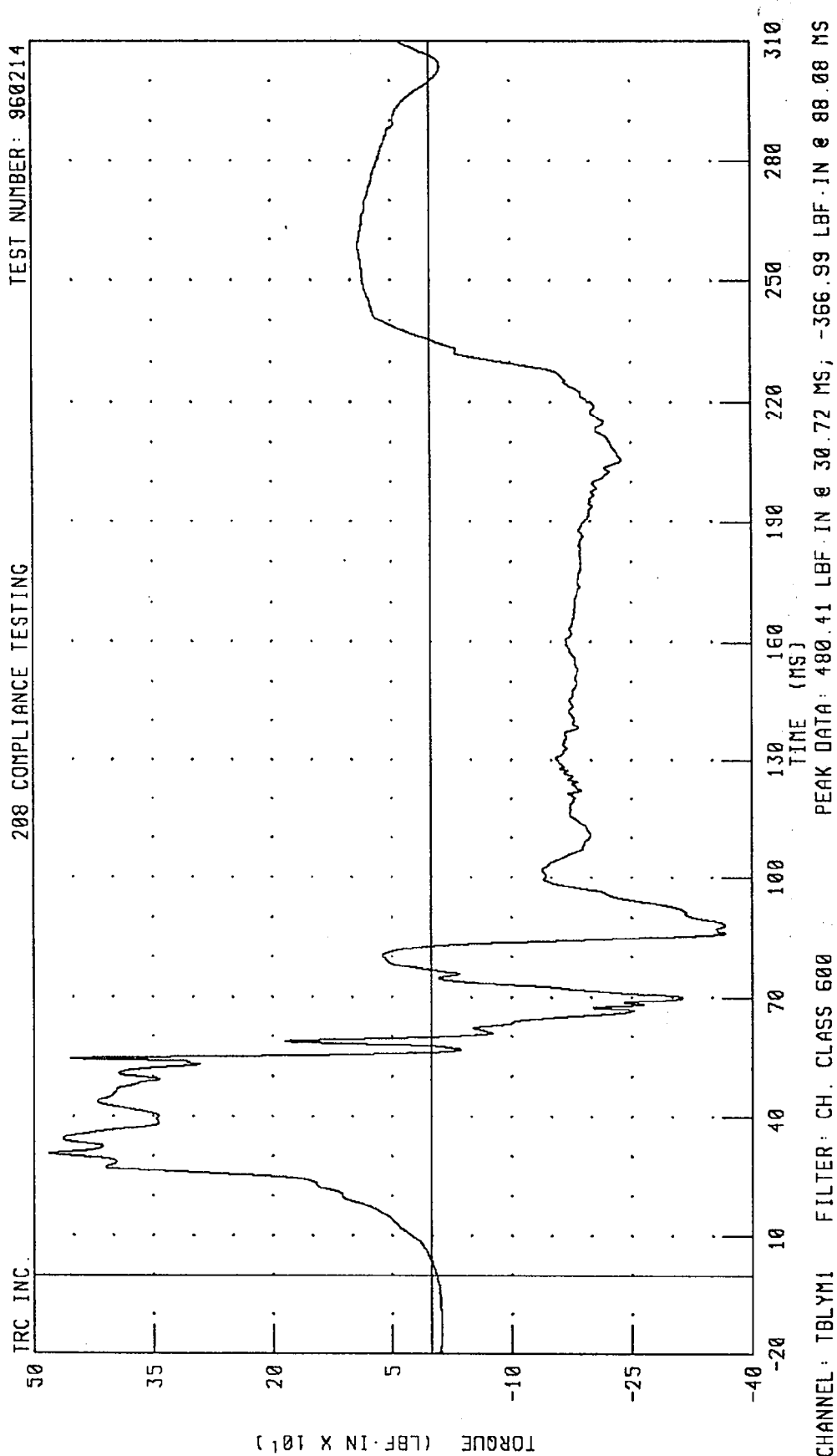
PEAK DATA: 395.20 LBF·IN @ 34.08 MS; -175.15 LBF·IN @ 63.20 MS

CHANNEL: TBLXM1 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER LEFT UPPER TIBIA MOMENT ABOUT Y-AXIS

208 COMPLIANCE TESTING

TEST NUMBER: 960214

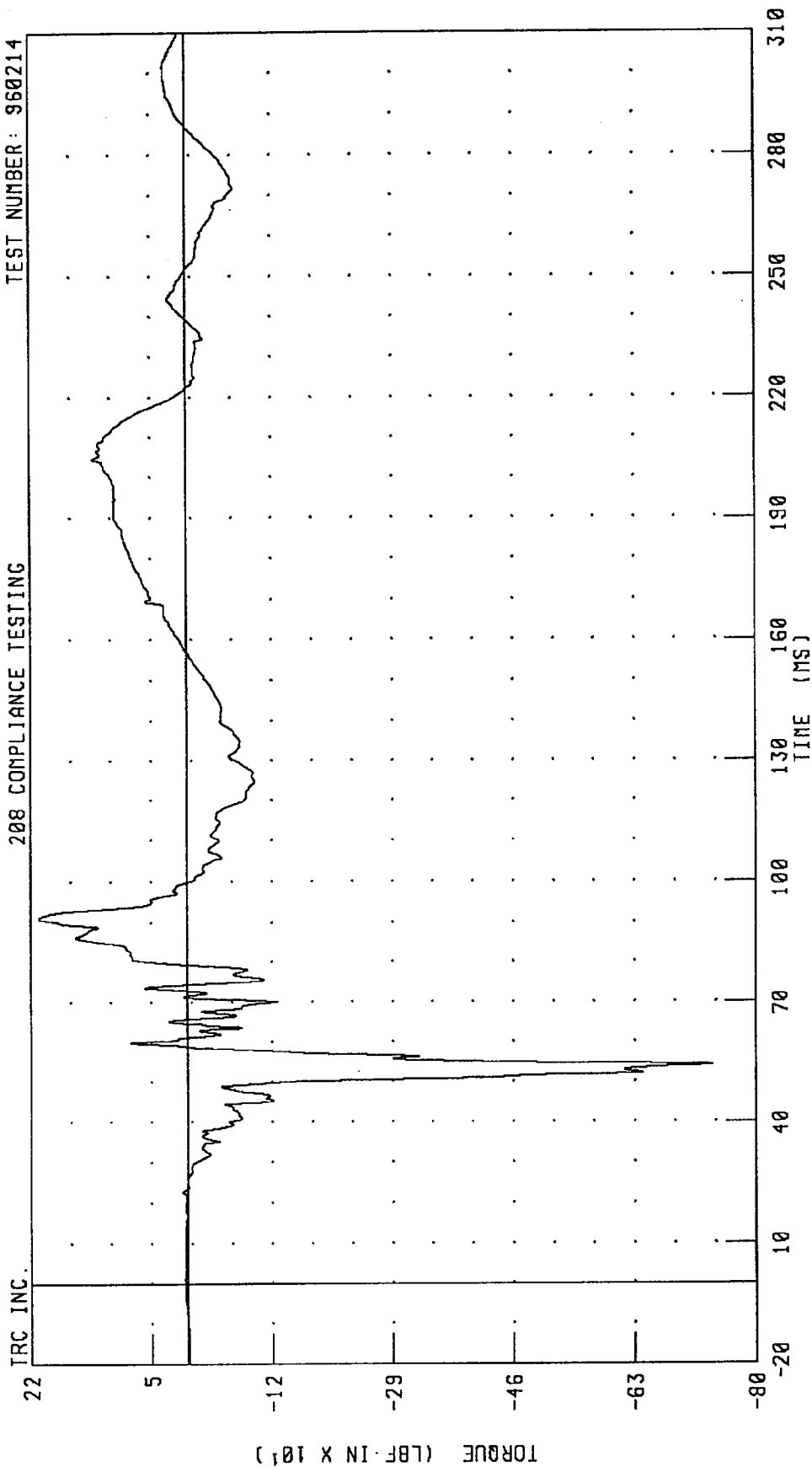


CHANNEL: TBLYM1 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT UPPER TIBIA MOMENT ABOUT X-AXIS

208 COMPLIANCE TESTING

TEST NUMBER: 960214



PEAK DATA: 208.53 LBF-IN @ 91.28 MS; -738.96 LBF-IN @ 54.00 MS

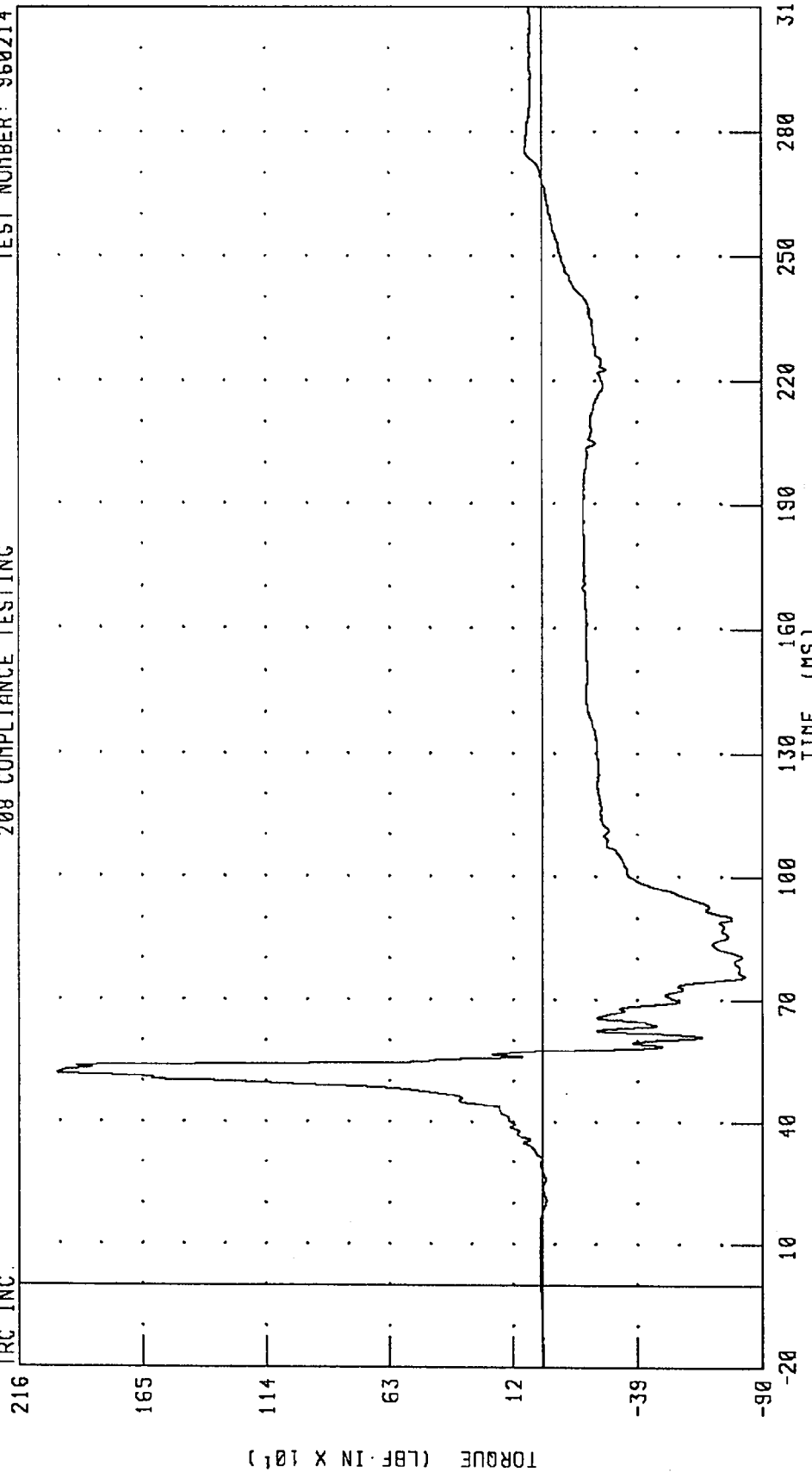
CHANNEL: TBRXM1 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER RIGHT UPPER TIBIA MOMENT ABOUT Y-AXIS

208 COMPLIANCE TESTING

TEST NUMBER: 960214

TRC INC.



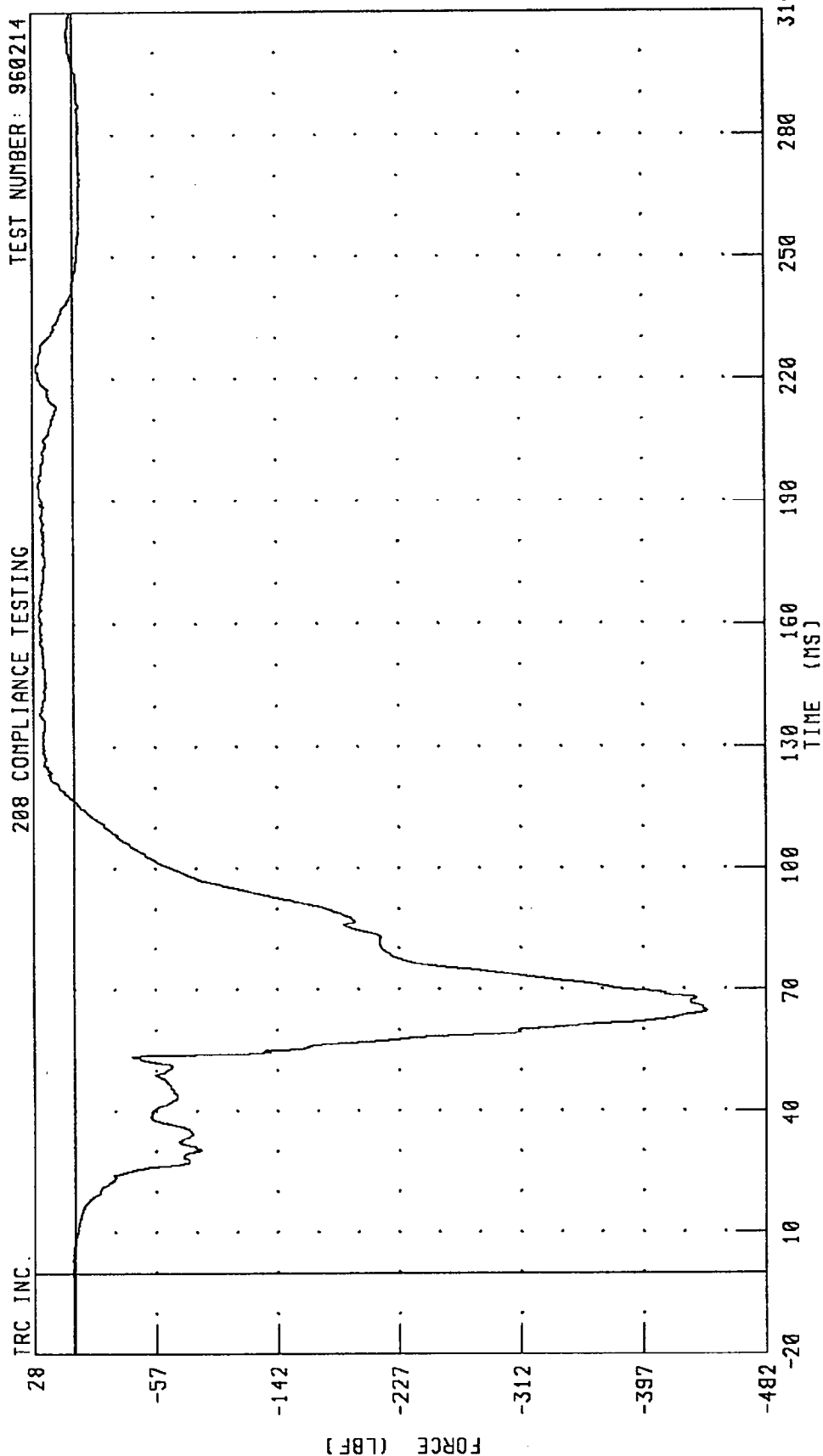
PEAK DATA: 2001.80 LBF-IN @ 51.92 MS; -827.04 LBF-IN @ 75.76 MS

CHANNEL: TBRYM1 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER LEFT LOWER TIBIA X-AXIS FORCE

TEST NUMBER: 960214

208 COMPLIANCE TESTING

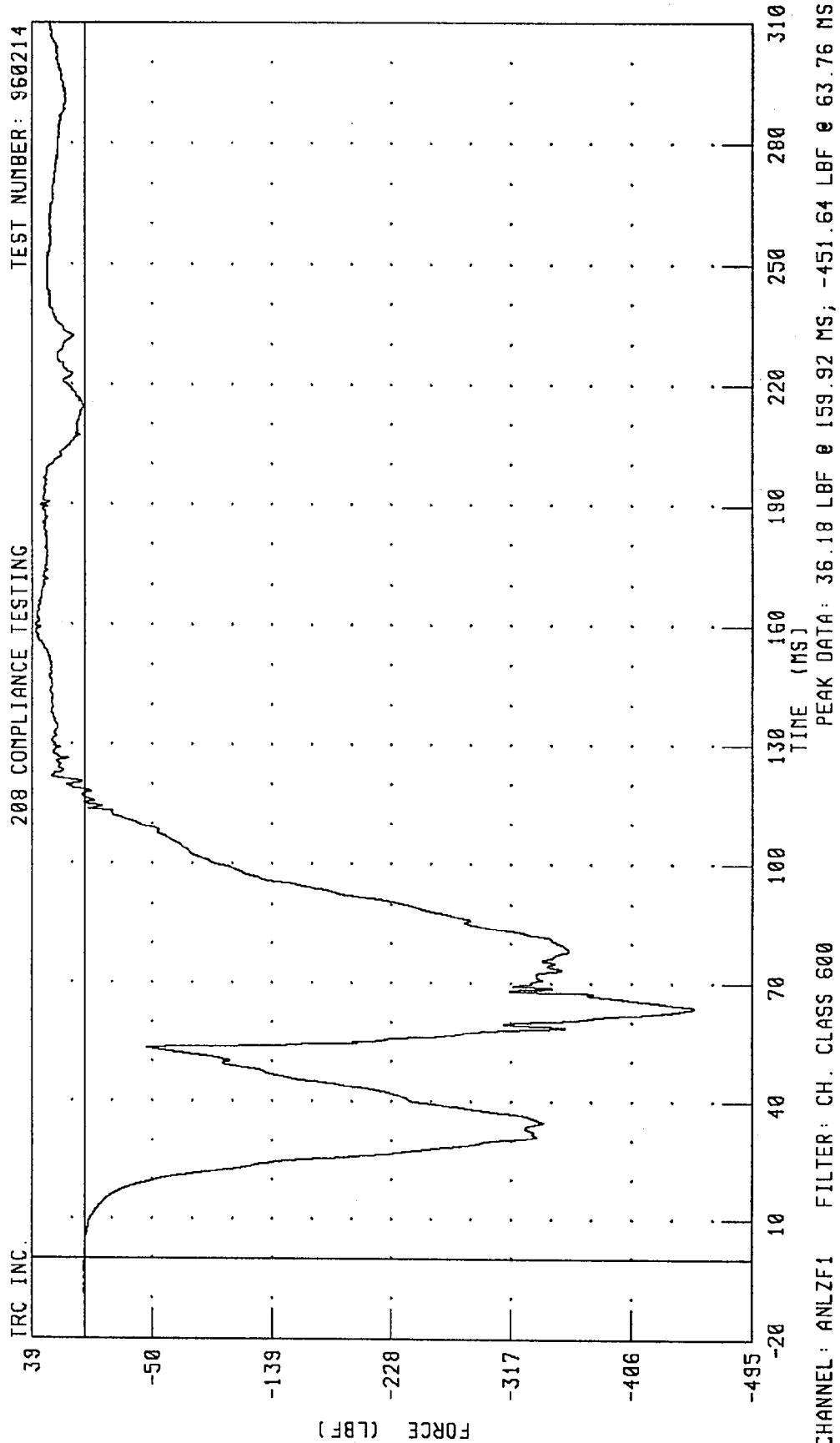


CHANNEL: ANLXF1 FILTER: CH. CLASS 600

PEAK DATA: 25.86 LBF @ 222.56 MS; -441.21 LBF @ 64.64 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 DRIVER LEFT LOWER TIBIA Z-AXIS FORCE
 208 COMPLIANCE TESTING

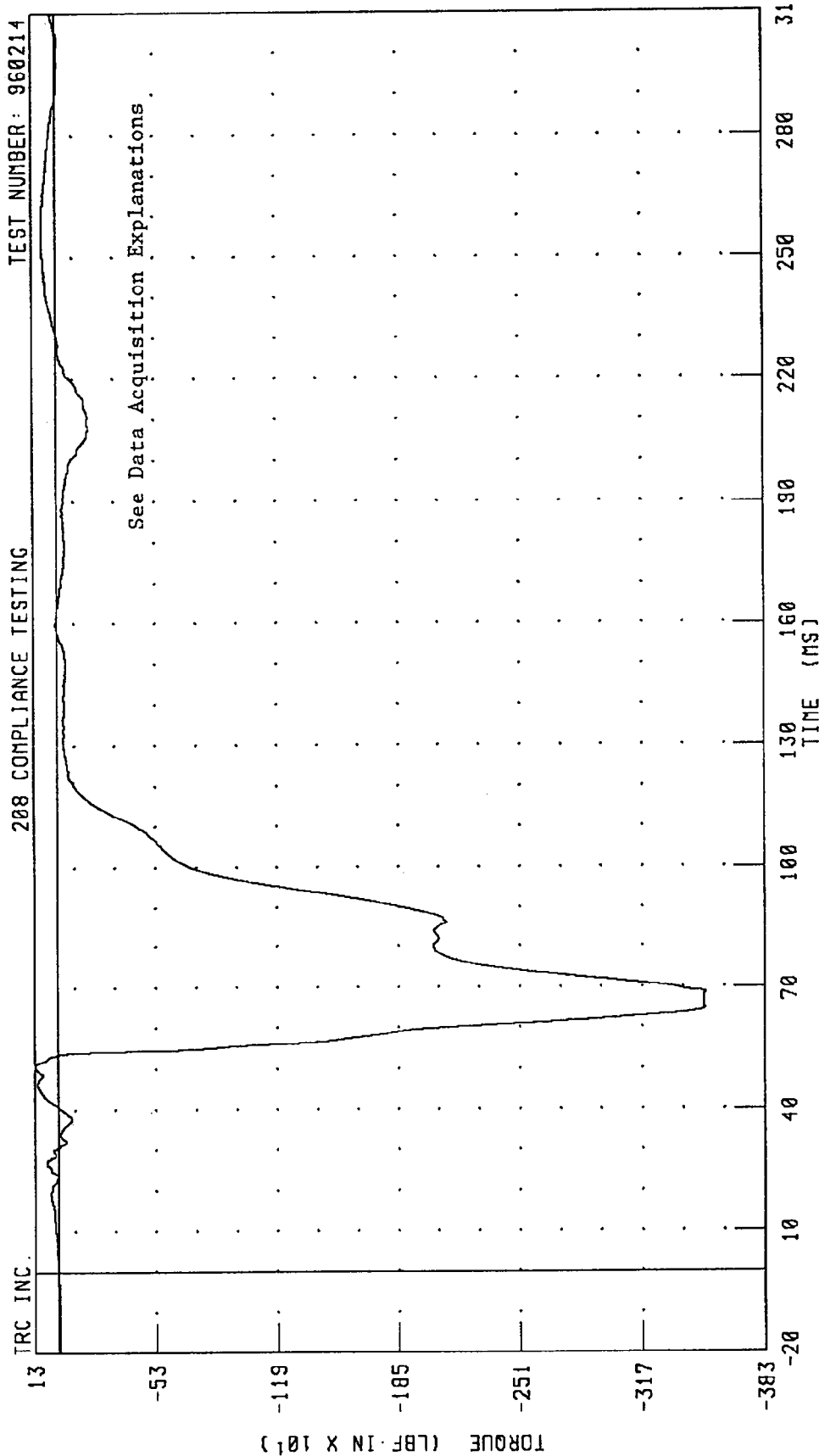
TEST NUMBER: 960214



1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER LEFT LOWER TIBIA MOMENT ABOUT Y-AXIS

TEST NUMBER: 960214

208 COMPLIANCE TESTING



PEAK DATA: 126.26 LBF-IN @ 50.88 MS; -3508.46 LBF-IN @ 68.72 MS

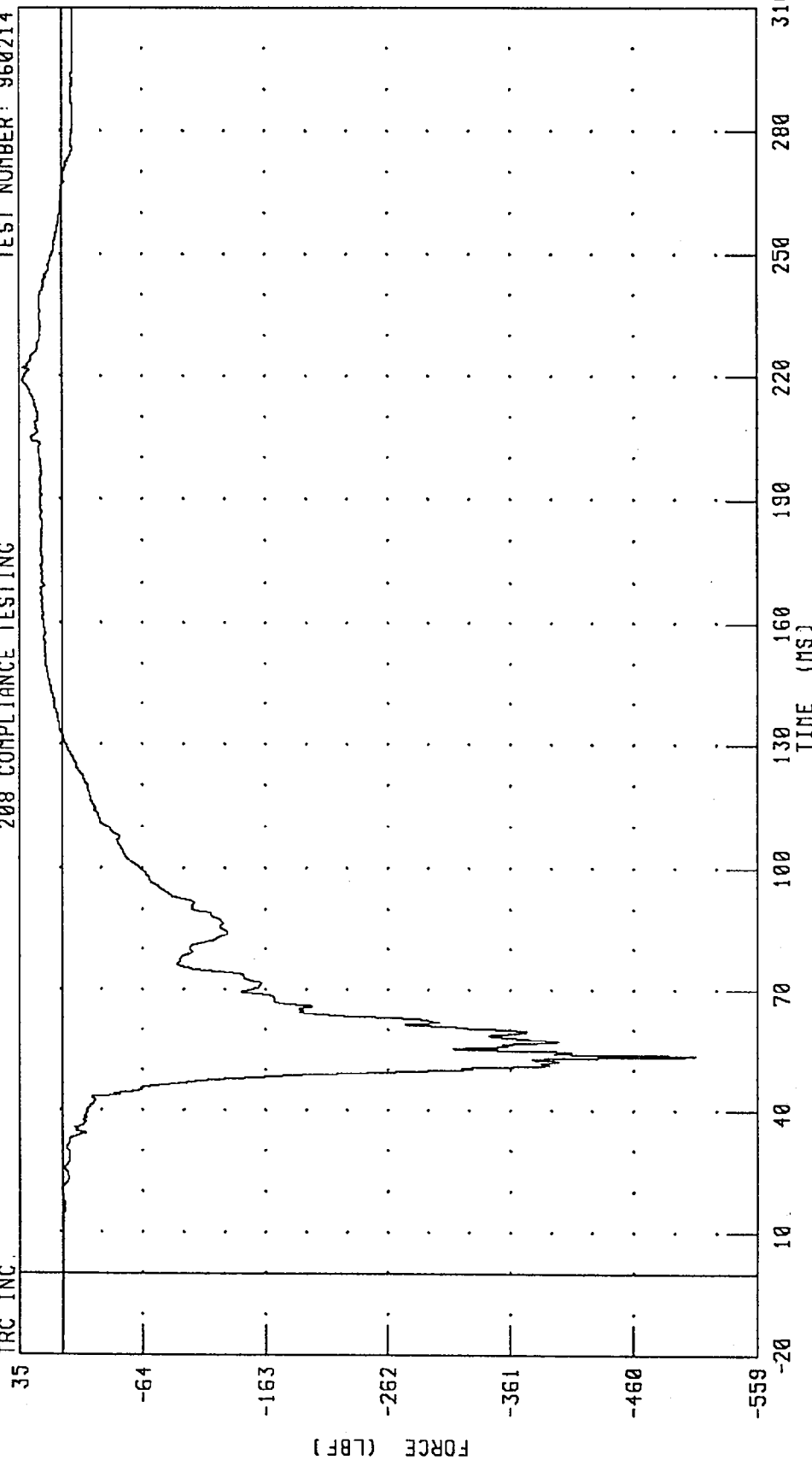
CHANNEL: ANLYM1 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT LOWER TIBIA X-AXIS FORCE

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.

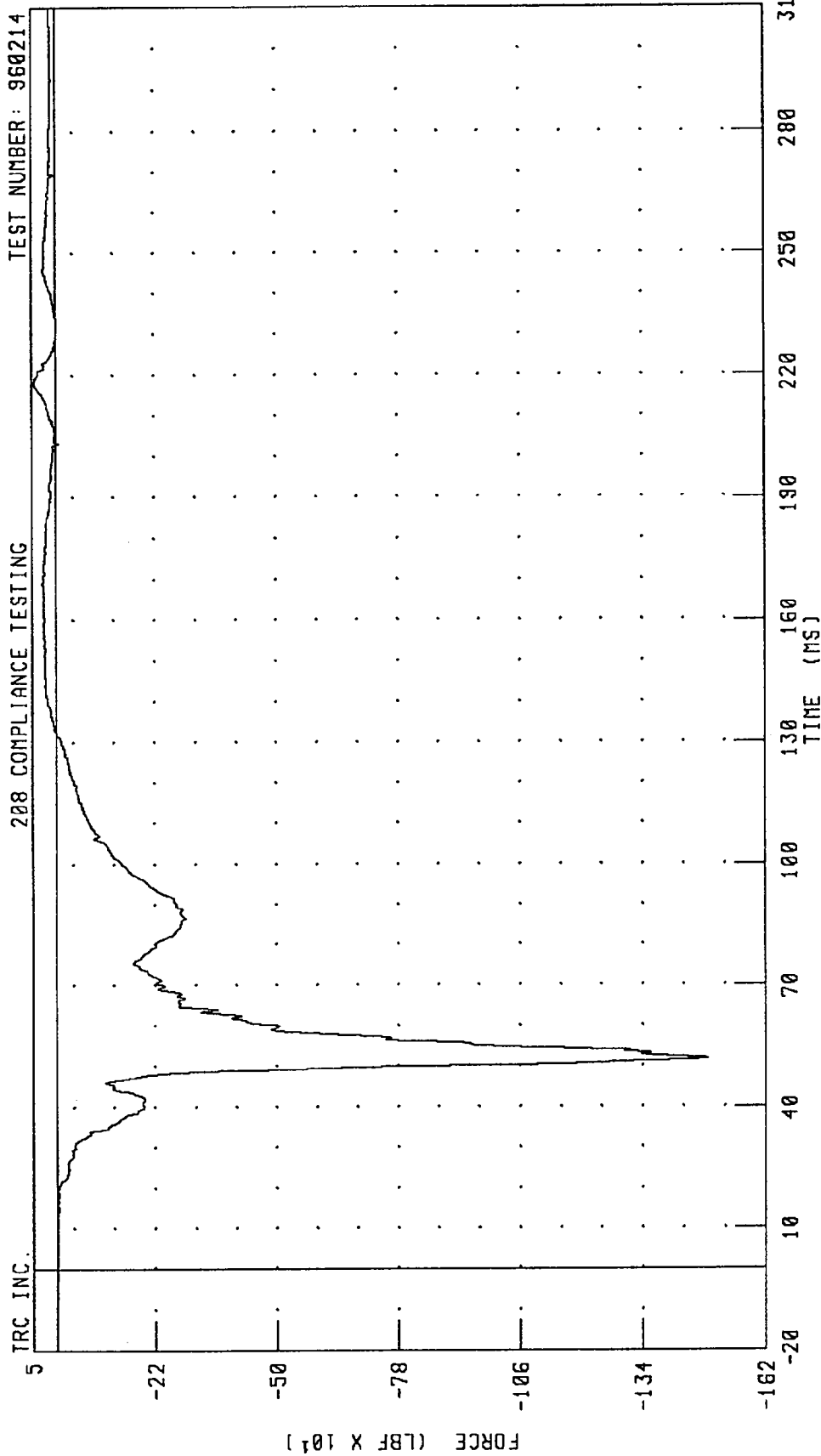


PEAK DATA: 32.14 LBF @ 219.04 MS; -509.44 LBF @ 53.44 MS

CHANNEL: ANRXF1 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER RIGHT LOWER TIBIA Z-AXIS FORCE

228 COMPLIANCE TESTING TEST NUMBER: 960214



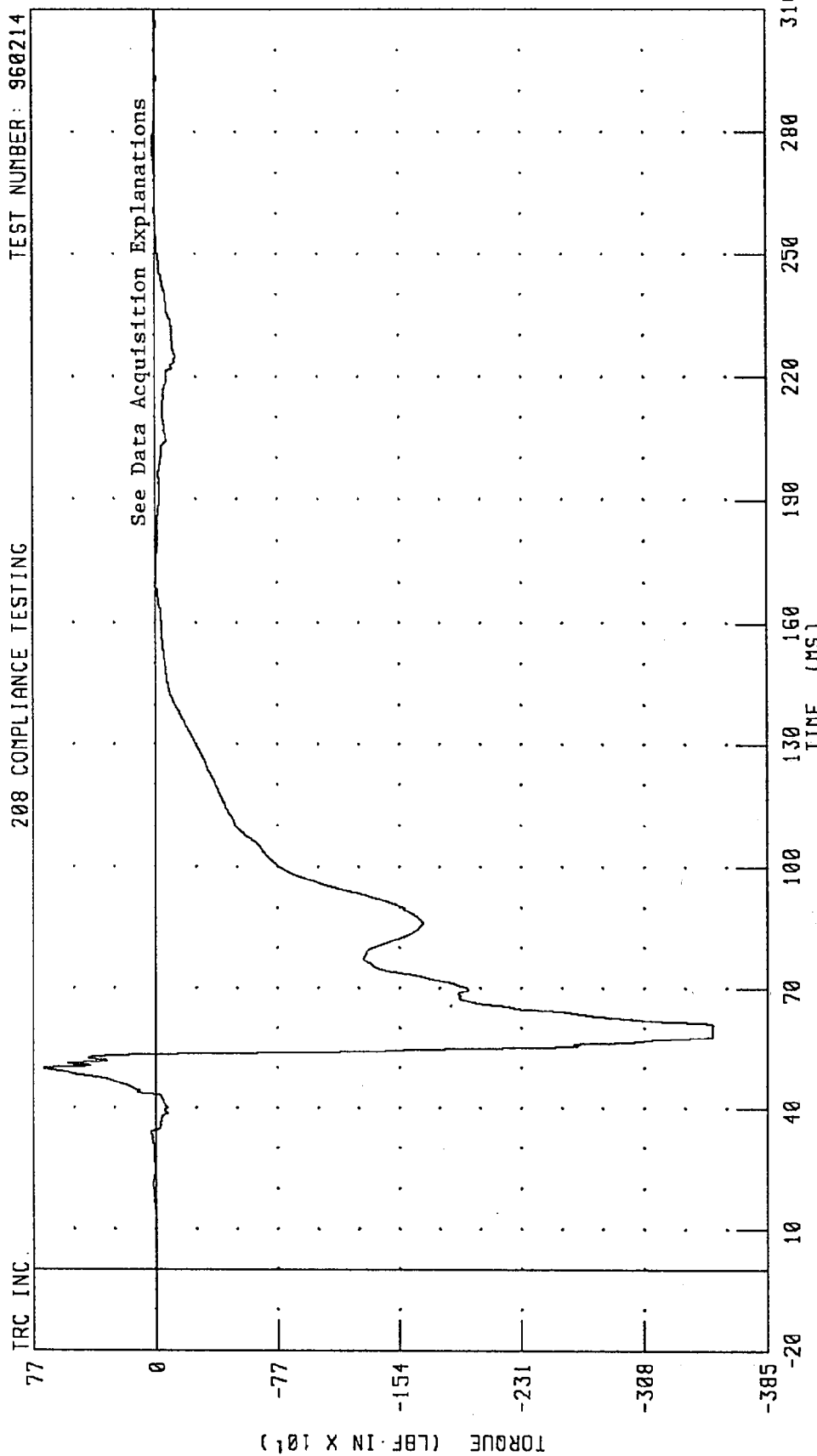
CHANNEL: ANRZF1 FILTER: CH. CLASS 600

PEAK DATA: 51.10 LBF @ 218.24 MS; -1493.77 LBF @ 51.76 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DRIVER RIGHT LOWER TIBIA MOMENT ABOUT Y-AXIS

208 COMPLIANCE TESTING

TEST NUMBER: 960214

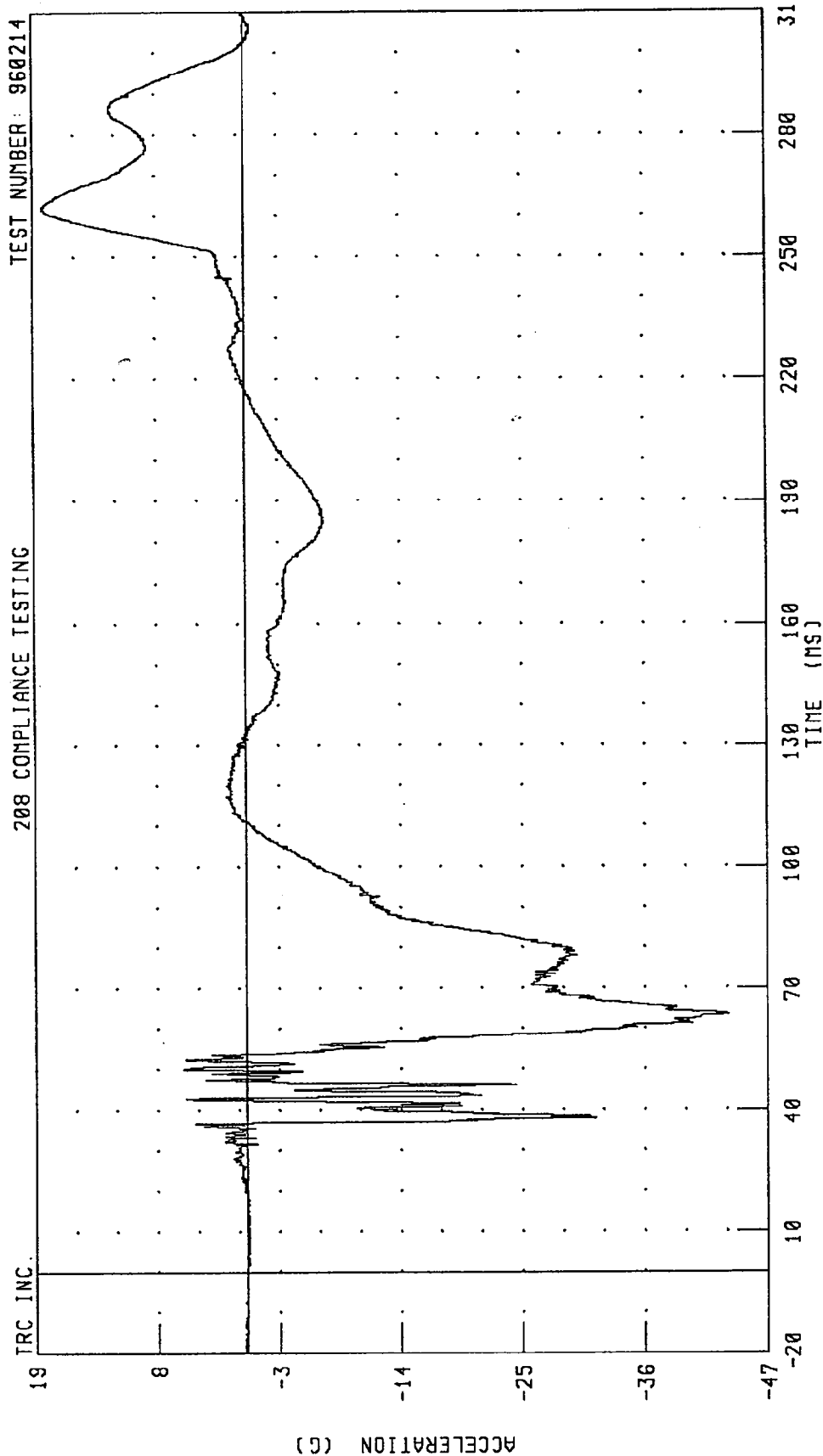


CHANNEL: ANRYM1 FILTER: CH. CLASS 600 PEAK DATA: 703.10 LBF·IN @ 49.76 MS; -3511.67 LBF·IN @ 60.88 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING



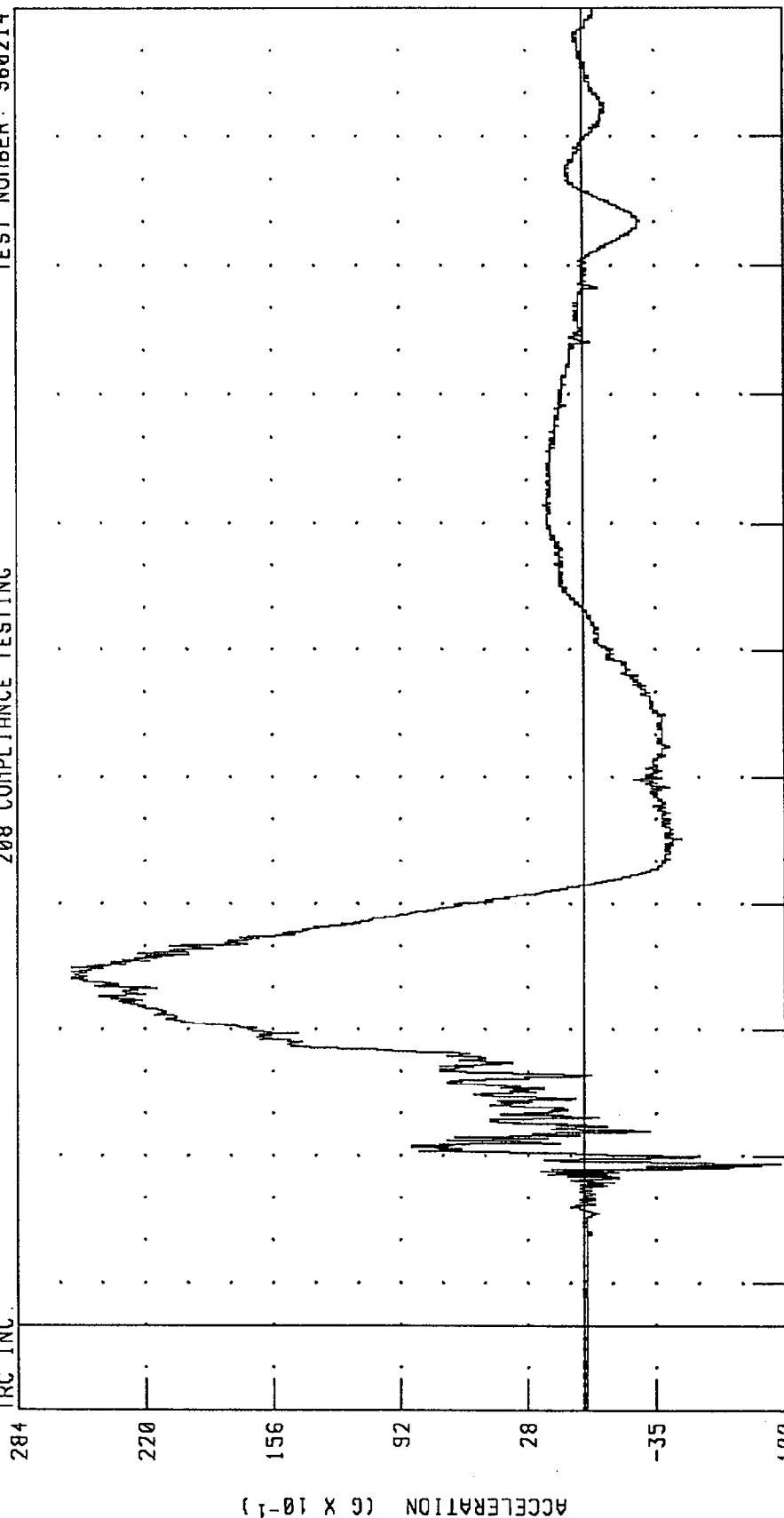
CHANNEL: HEDXG2 FILTER: CH. CLASS 1000

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION

208 COMPLIANCE TESTING

TEST NUMBER: 960214

TRC INC.



PEAK DATA: 25.69 G @ 82.32 MS; -9.76 G @ 38.16 MS

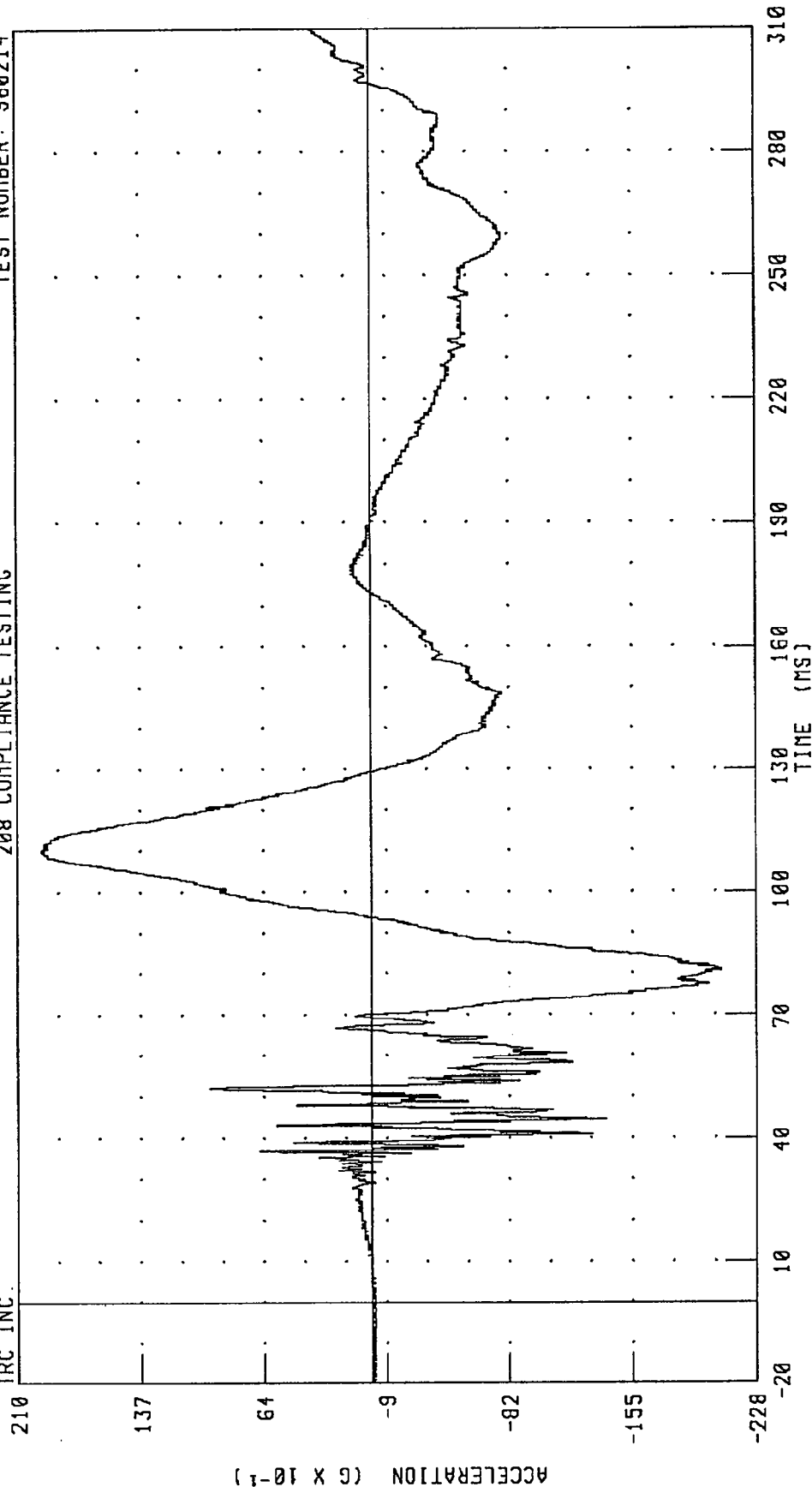
CHANNEL: HEDYG2 FILTER: CH. CLASS 1000

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.



CHANNEL: HEDZG2 FILTER: CH. CLASS 1000

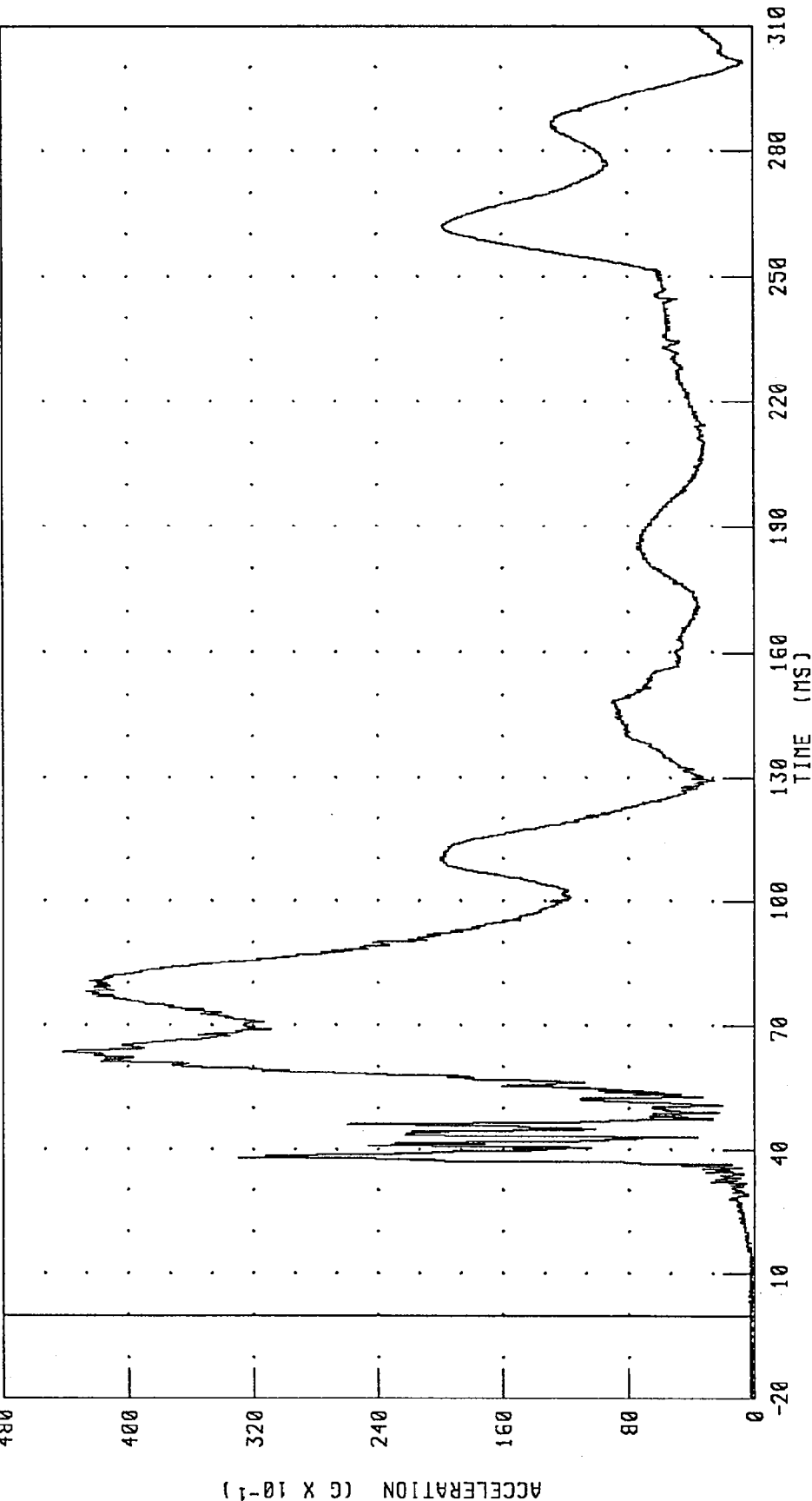
PEAK DATA: 19.57 G @ 109.52 MS; -20.76 G @ 80.72 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.



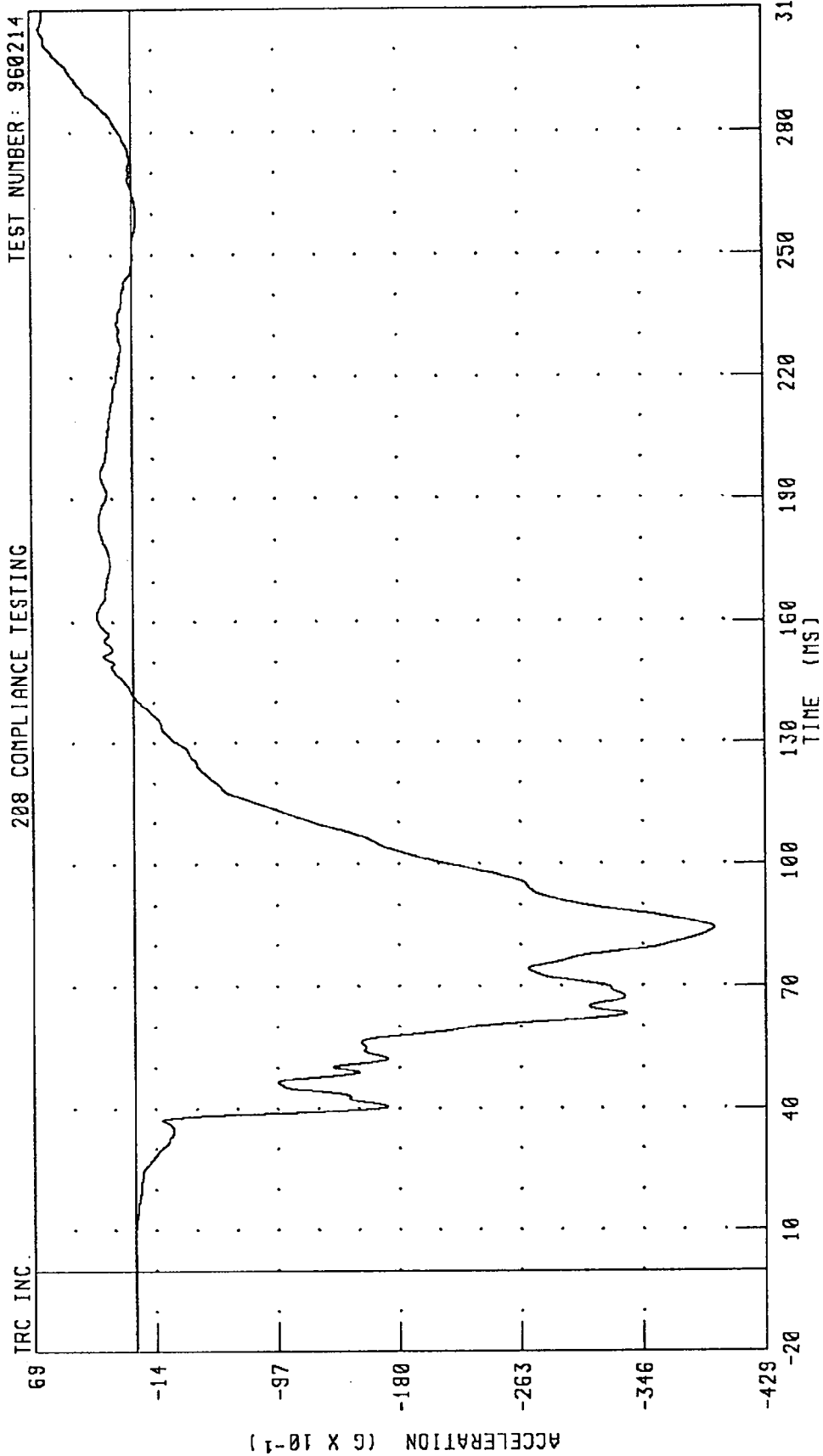
CHANNEL: HEDRG2 FILTER: CH. CLASS 1000

PEAK DATA: 44.16 G @ 63.68 MS; 0.04 G @ -17.12 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING



CHANNEL: CSTXG2 FILTER: CH. CLASS 180

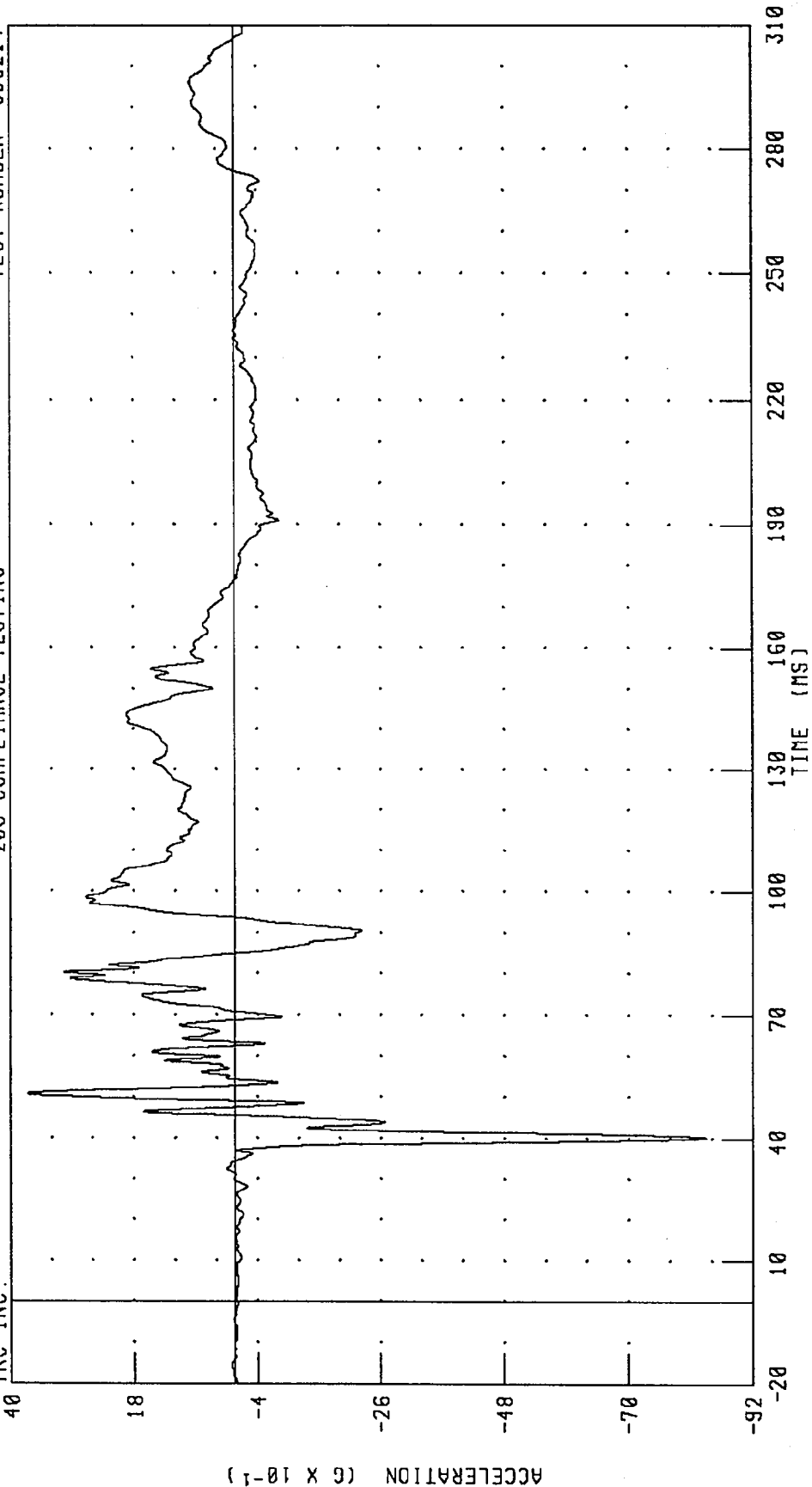
PEAK DATA: 6.29 G @ 305.36 MS; -39.44 G @ 84.24 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION

208 COMPLIANCE TESTING

TEST NUMBER: 960214

TRC INC.



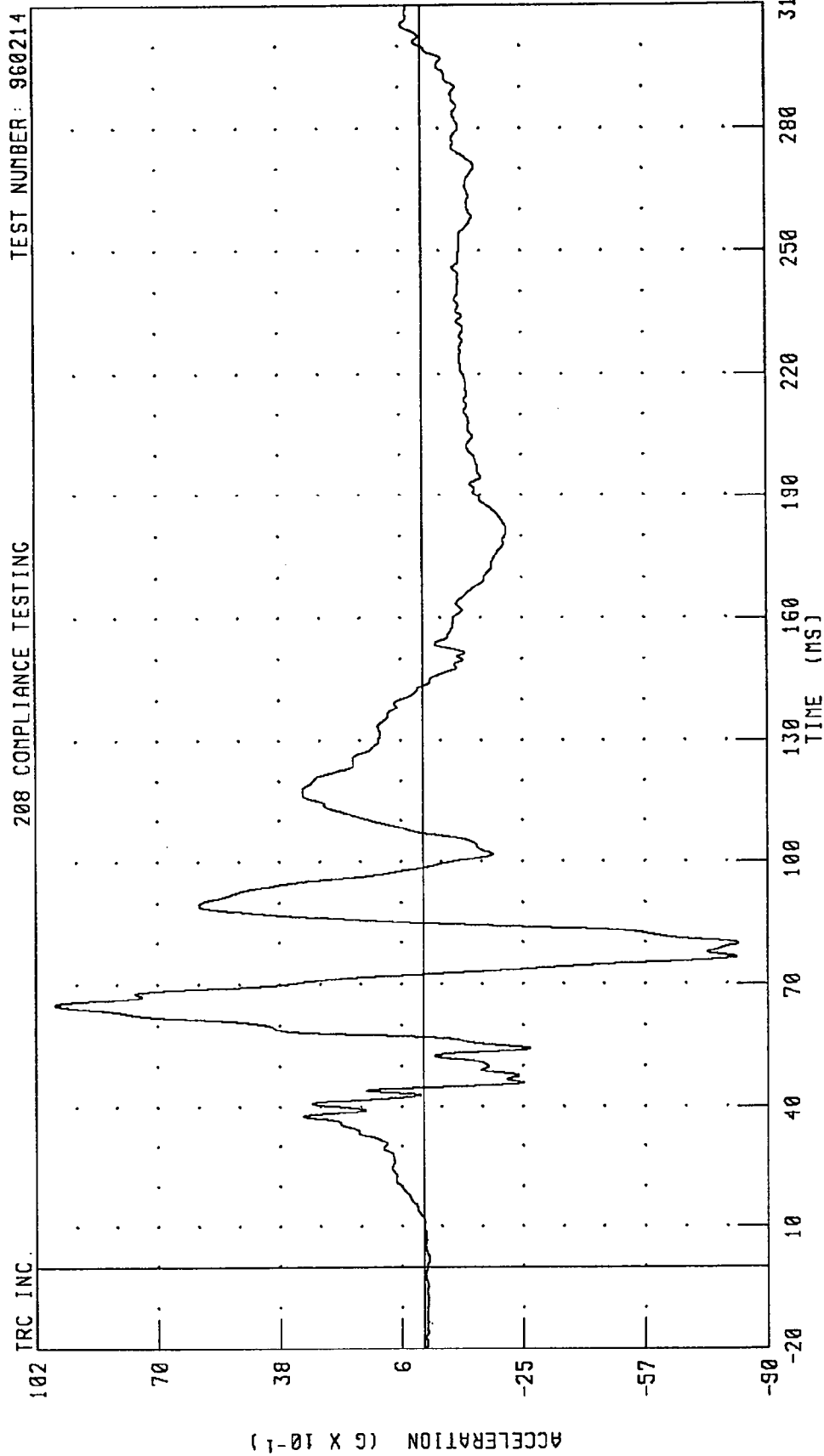
CHANNEL: CSTYG2 FILTER: CH. CLASS 180

PEAK DATA: 3.70 G @ 50.72 MS; -8.37 G @ 40.32 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING



PEAK DATA: 9.70 G @ 65.20 MS, -8.22 G @ 79.76 MS

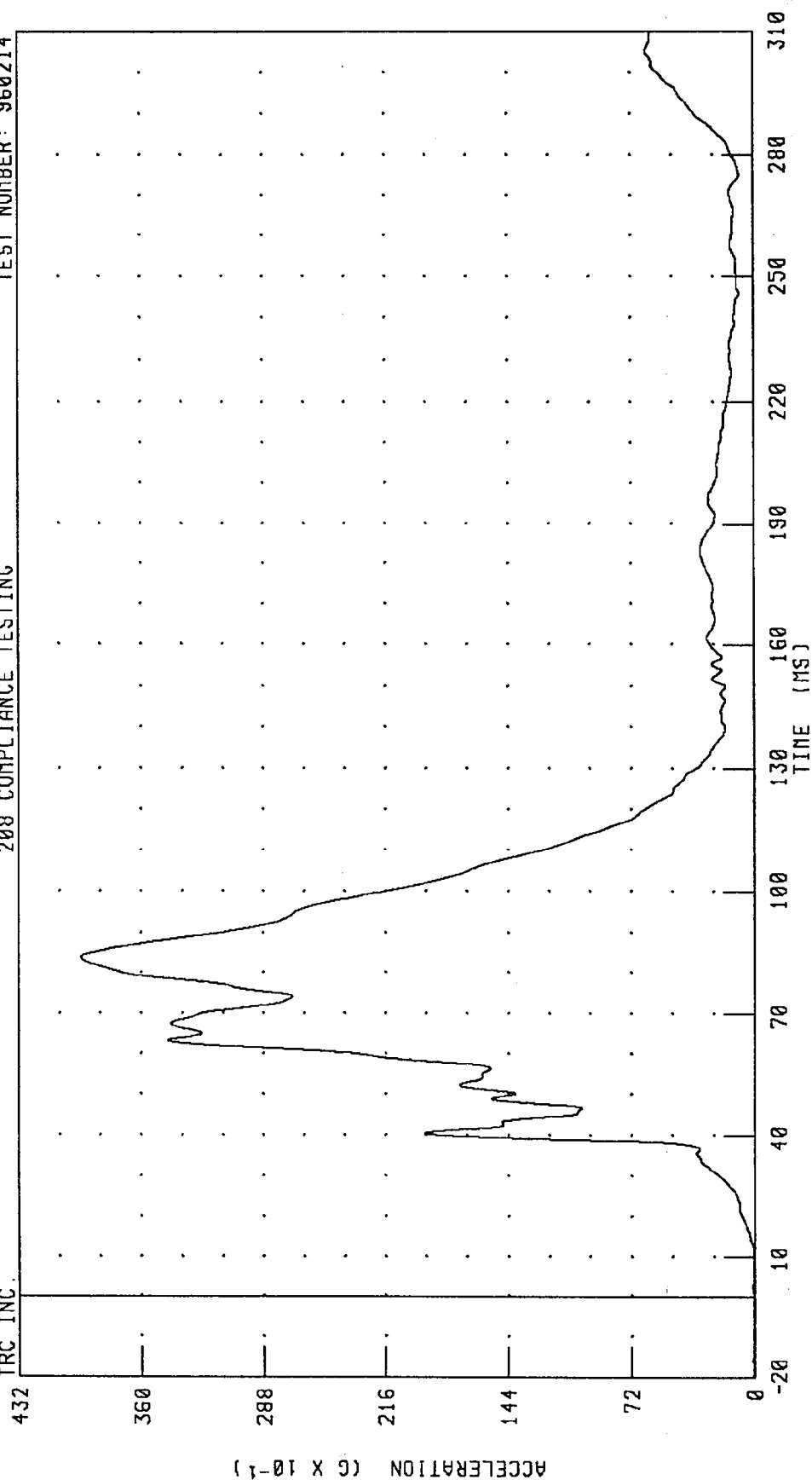
CHANNEL: CSTZG2 FILTER: CH. CLASS 180

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION

208 COMPLIANCE TESTING

TEST NUMBER: 960214

TRC INC.



CHANNEL: CSTRG2 FILTER: CH. CLASS 180

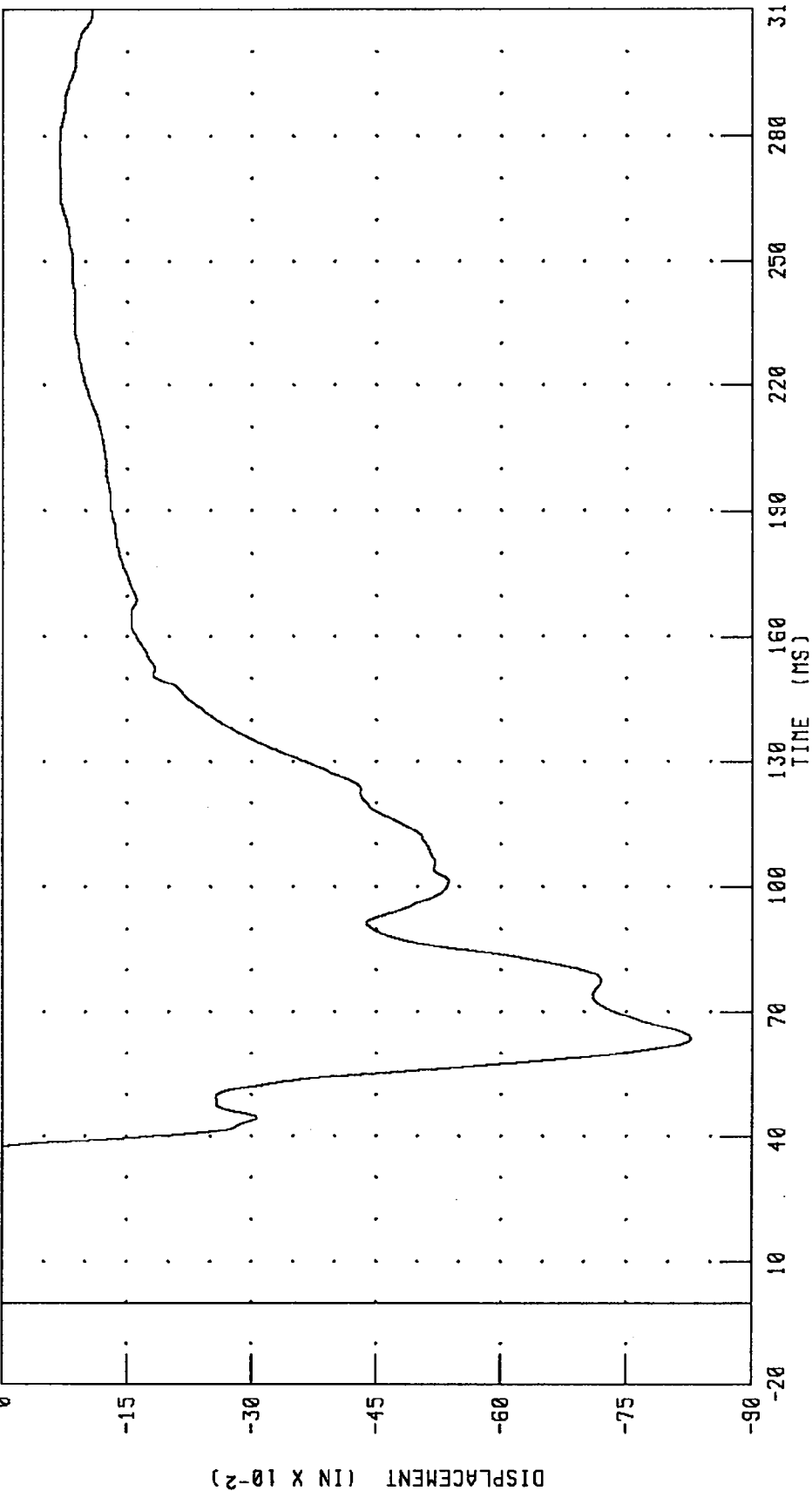
PEAK DATA: 39.53 G @ 83.84 MS; 0.00 G @ -20.00 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST DEFLECTION

TEST NUMBER: 960214

208 COMPLIANCE TESTING

IRC INC.



CHANNEL: CSTXD2 FILTER: CH. CLASS 180

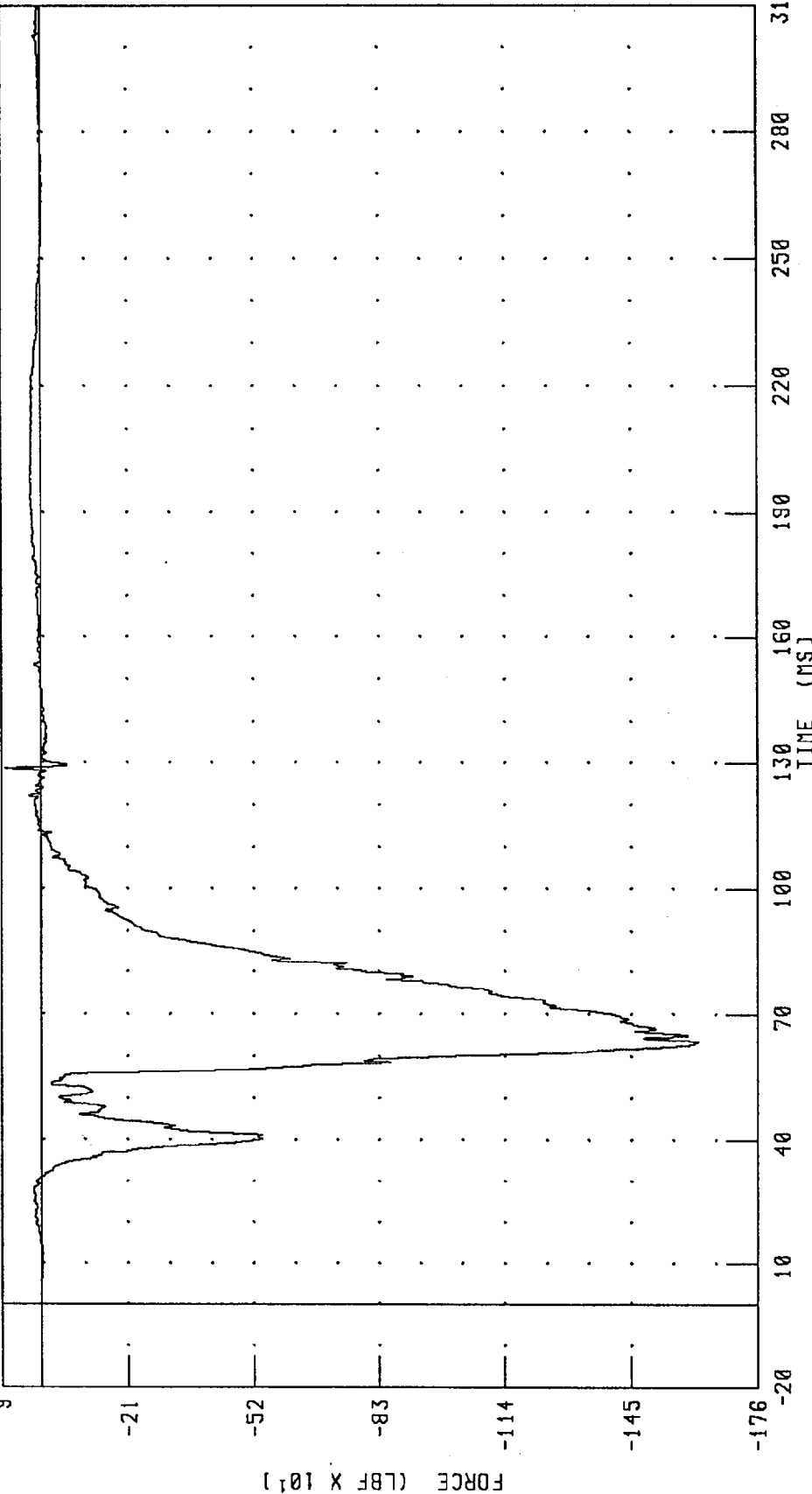
PEAK DATA: 0.02 IN @ 33.84 MS; -0.83 IN @ 63.68 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER LEFT FEMUR FORCE

TEST NUMBER: 960214

200 COMPLIANCE TESTING

TRC INC.



PEAK DATA: 90.67 LBF @ 128.64 MS; -1615.54 LBF @ 63.44 MS

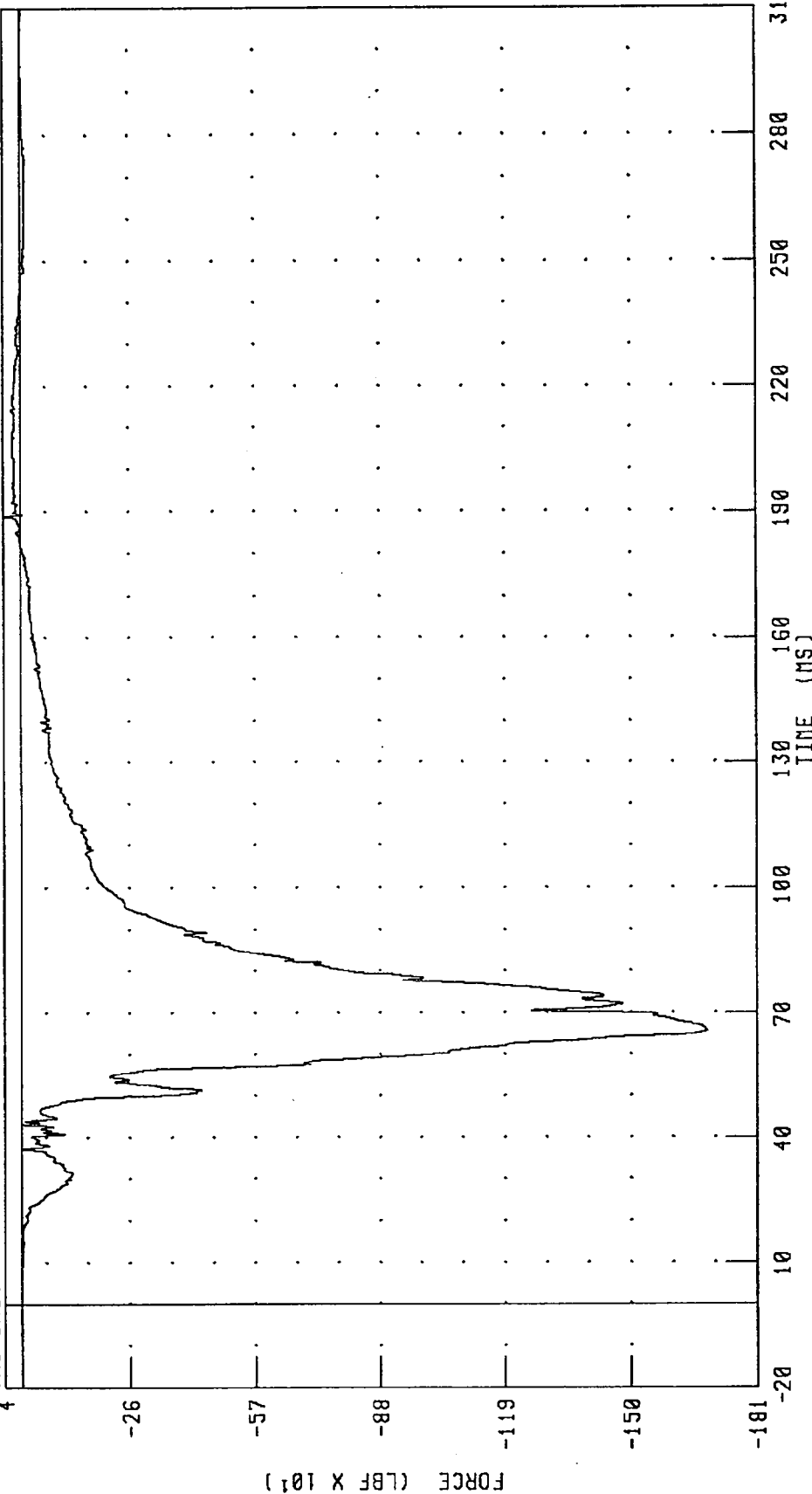
CHANNEL: LFMF2 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.



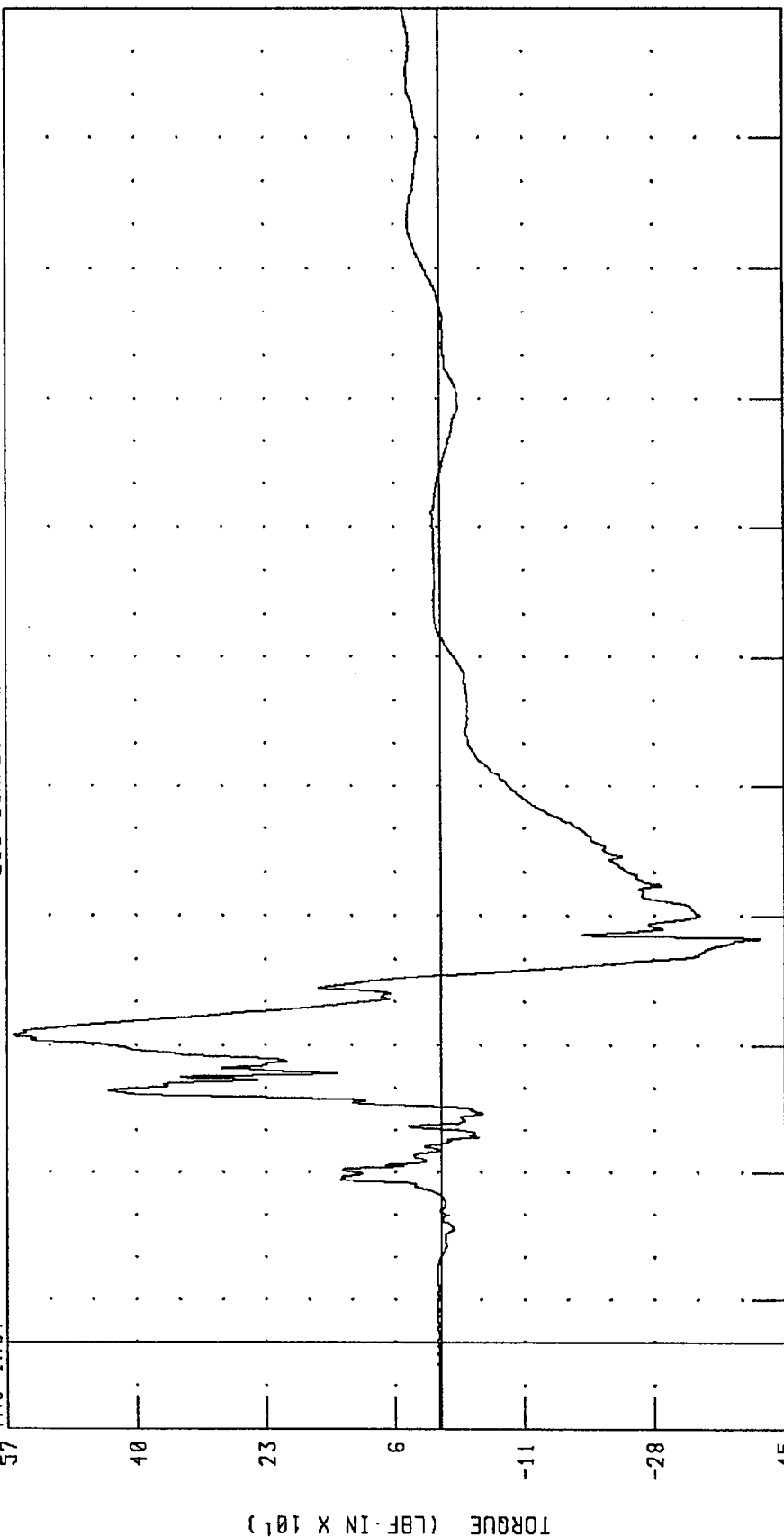
PEAK DATA: 40.65 LBF @ 188.80 MS; -1692.93 LBF @ 65.68 MS

CHANNEL: RFMF2 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT UPPER TIBIA MOMENT ABOUT X-AXIS
 208 COMPLIANCE TESTING

TEST NUMBER: 960214

TRC INC.



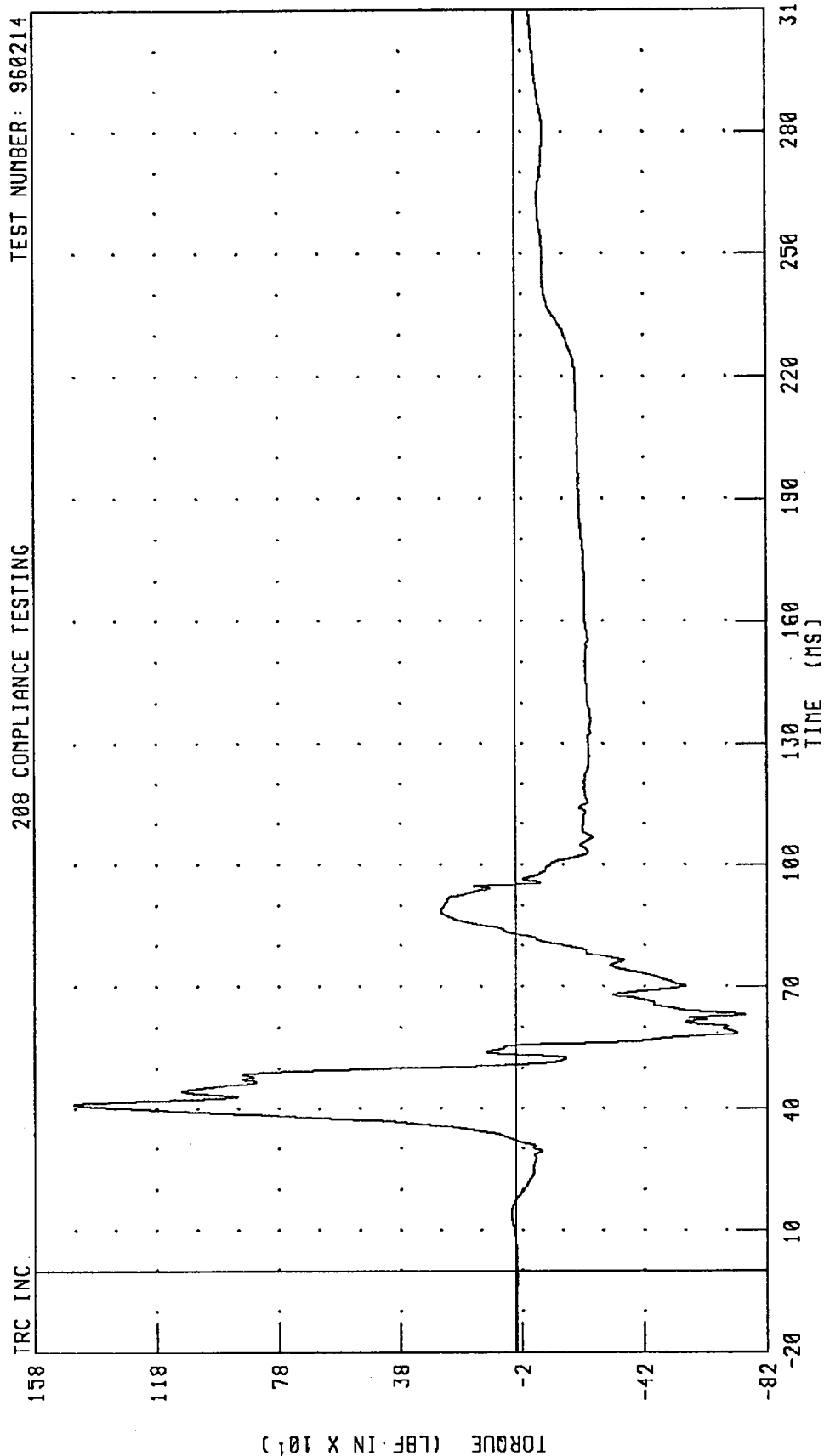
PEAK DATA: 561.73 LBF-IN @ 72.32 MS; -418.08 LBF-IN @ 94.80 MS

CHANNEL: TBLXM2 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER LEFT UPPER TIBIA MOMENT ABOUT Y-AXIS

TEST NUMBER: 960214

208 COMPLIANCE TESTING

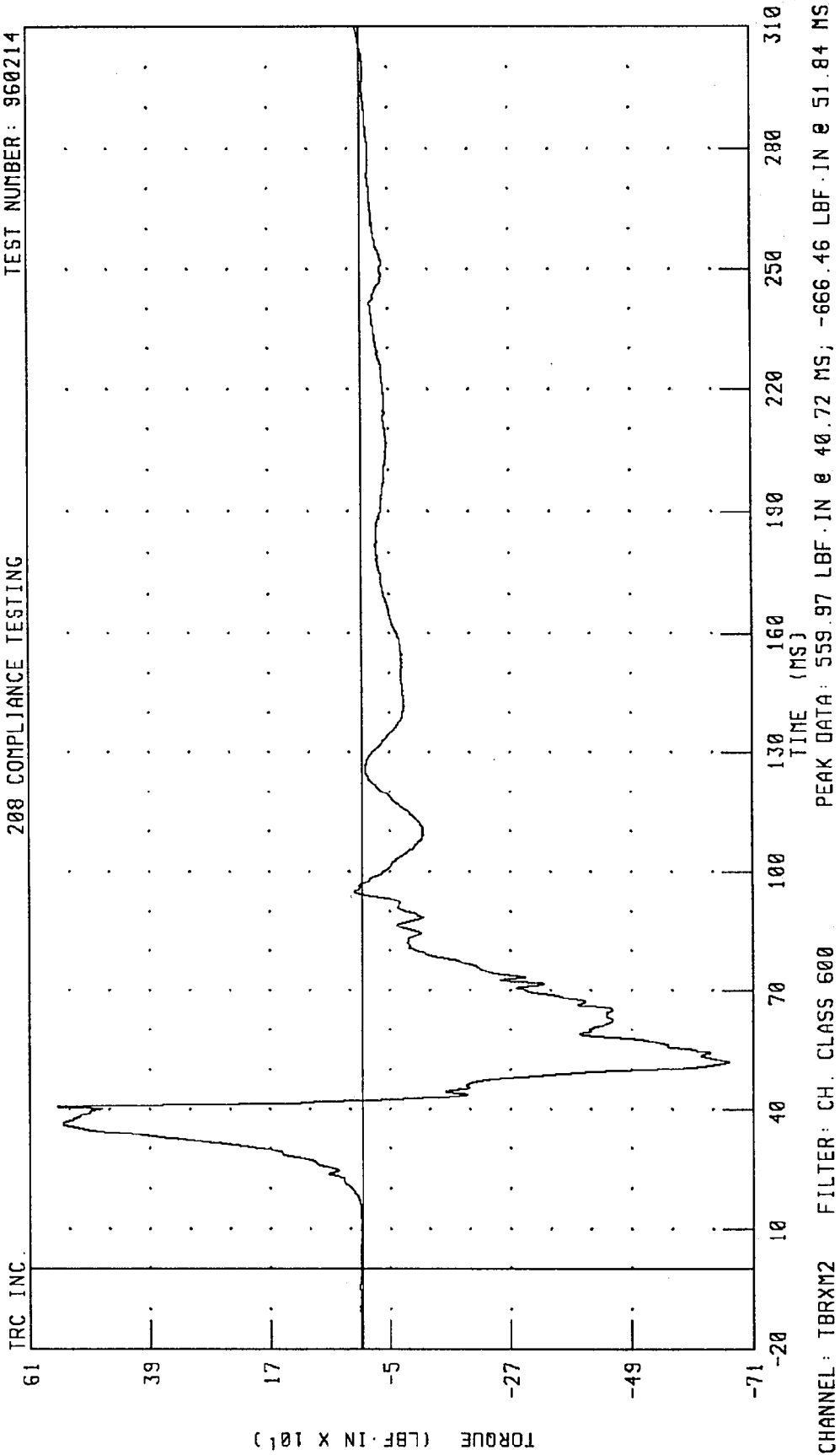


PEAK DATA: 1450.90 LBF-IN @ 41.04 MS; -748.38 LBF-IN @ 63.20 MS

CHANNEL: TBLM2 FILTER: CH. CLASS 600

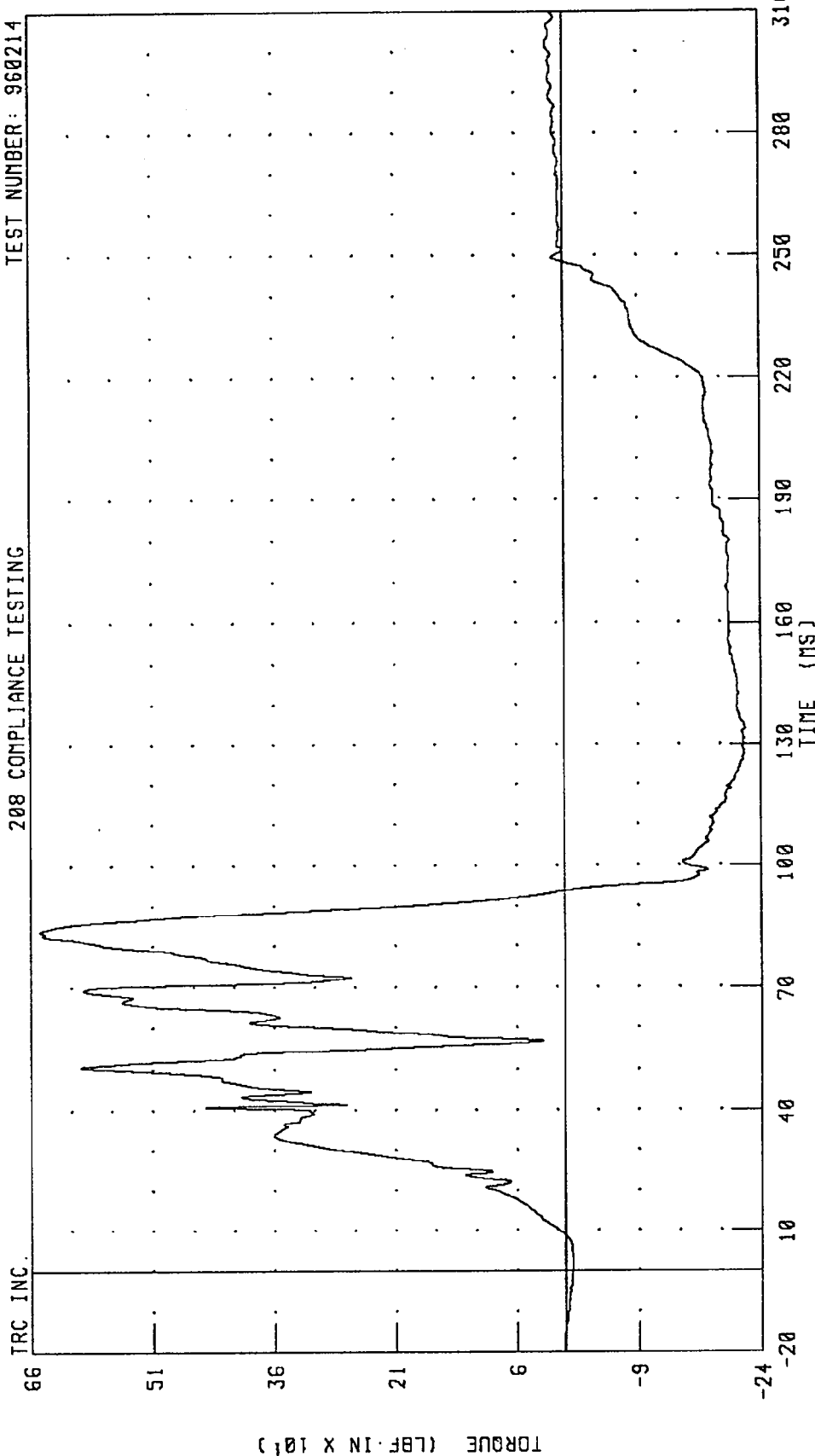
1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER RIGHT UPPER TIBIA MOMENT ABOUT X-AXIS
 208 COMPLIANCE TESTING

TEST NUMBER: 960214



1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER RIGHT UPPER TIBIA MOMENT ABOUT Y-AXIS
 208 COMPLIANCE TESTING

TEST NUMBER: 960214



PEAK DATA: 649.58 LBF-IN @ 83.68 MS; -221.40 LBF-IN @ 133.76 MS

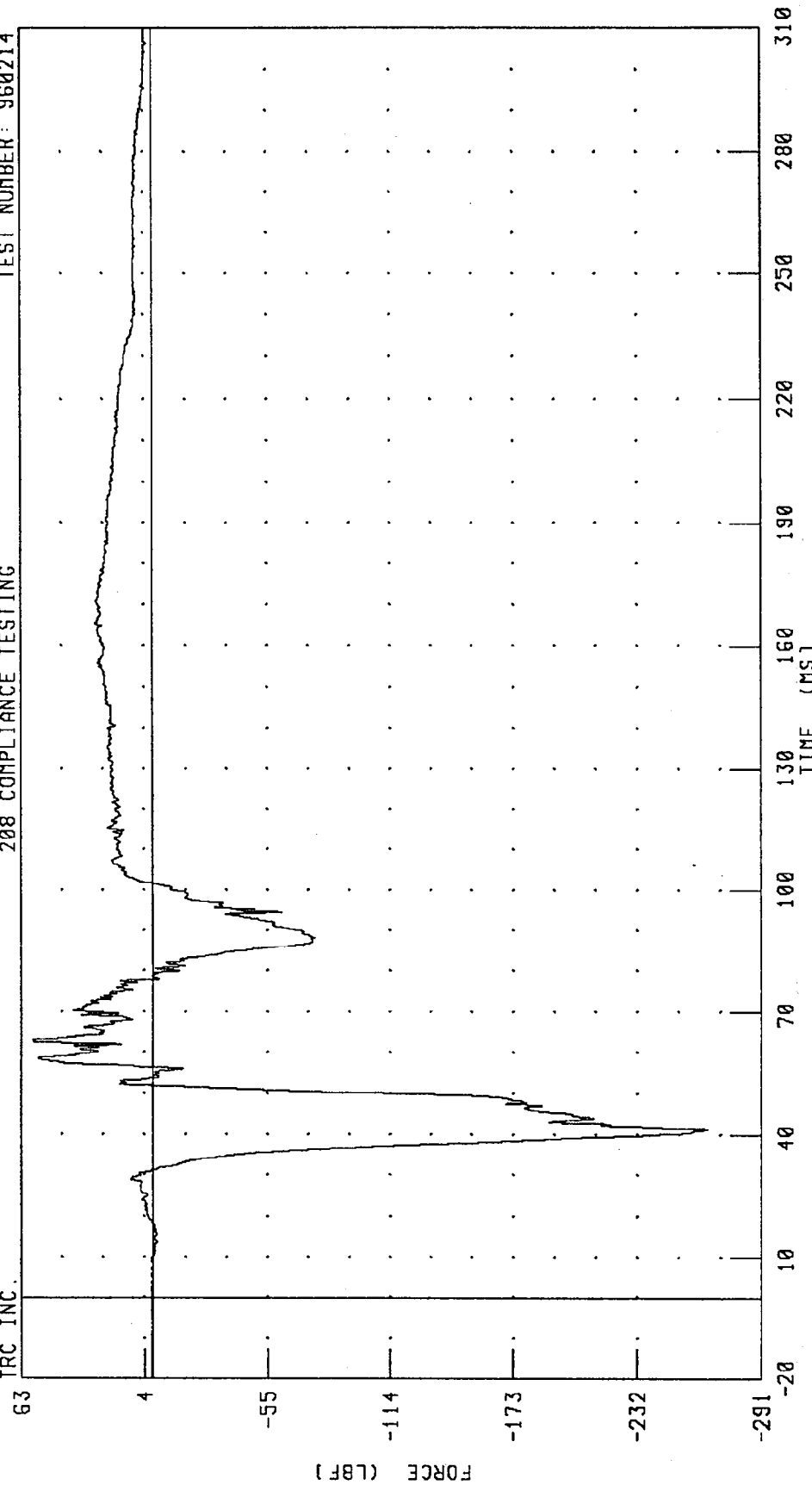
CHANNEL: TDRYM2 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER LEFT LOWER TIBIA X-AXIS FORCE

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.



PEAK DATA: 57.44 LBF @ 63.04 MS; -265.39 LBF @ 41.28 MS

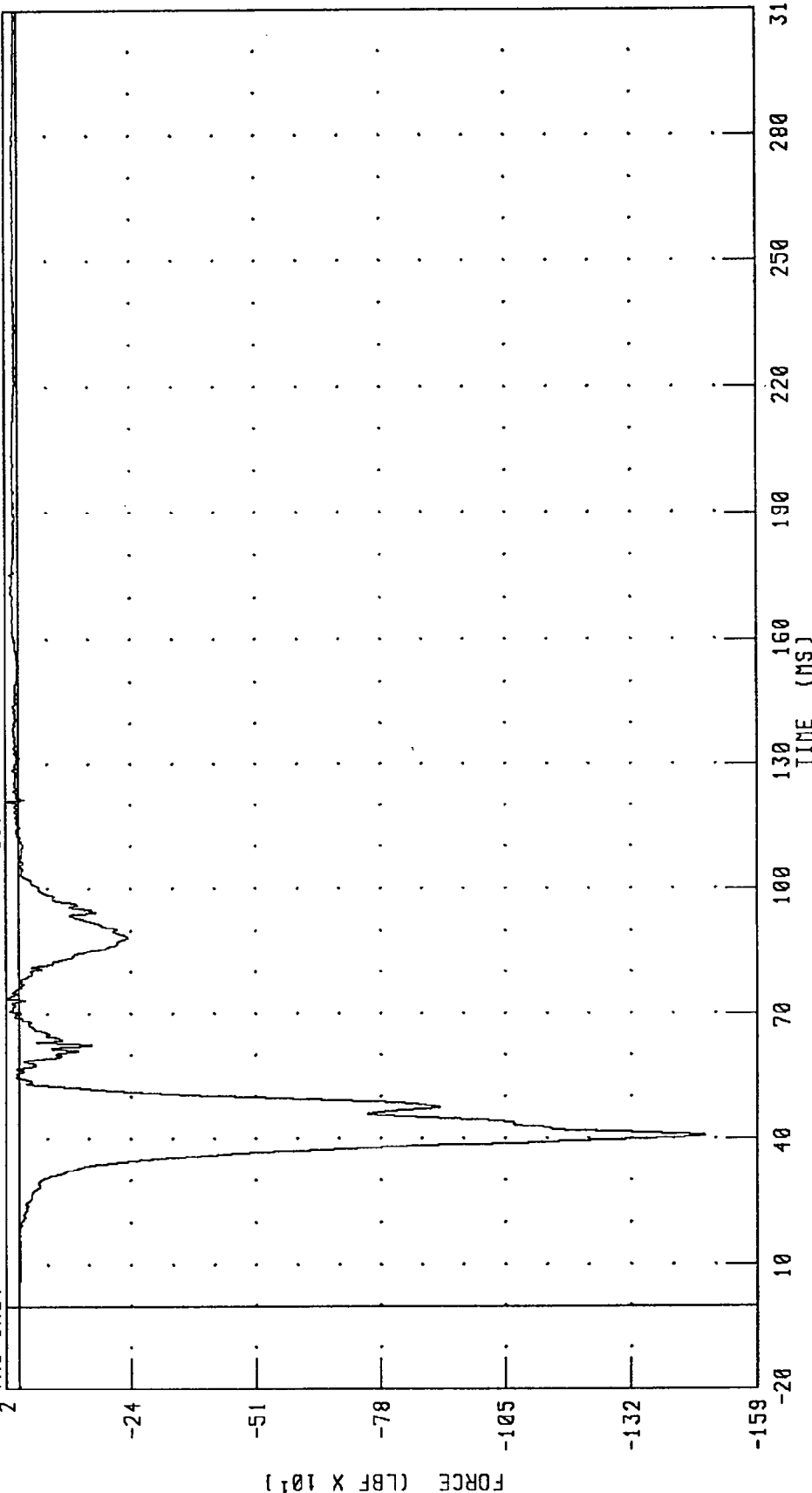
CHANNEL: ANLXF2 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT LOWER TIBIA Z-AXIS FORCE

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.

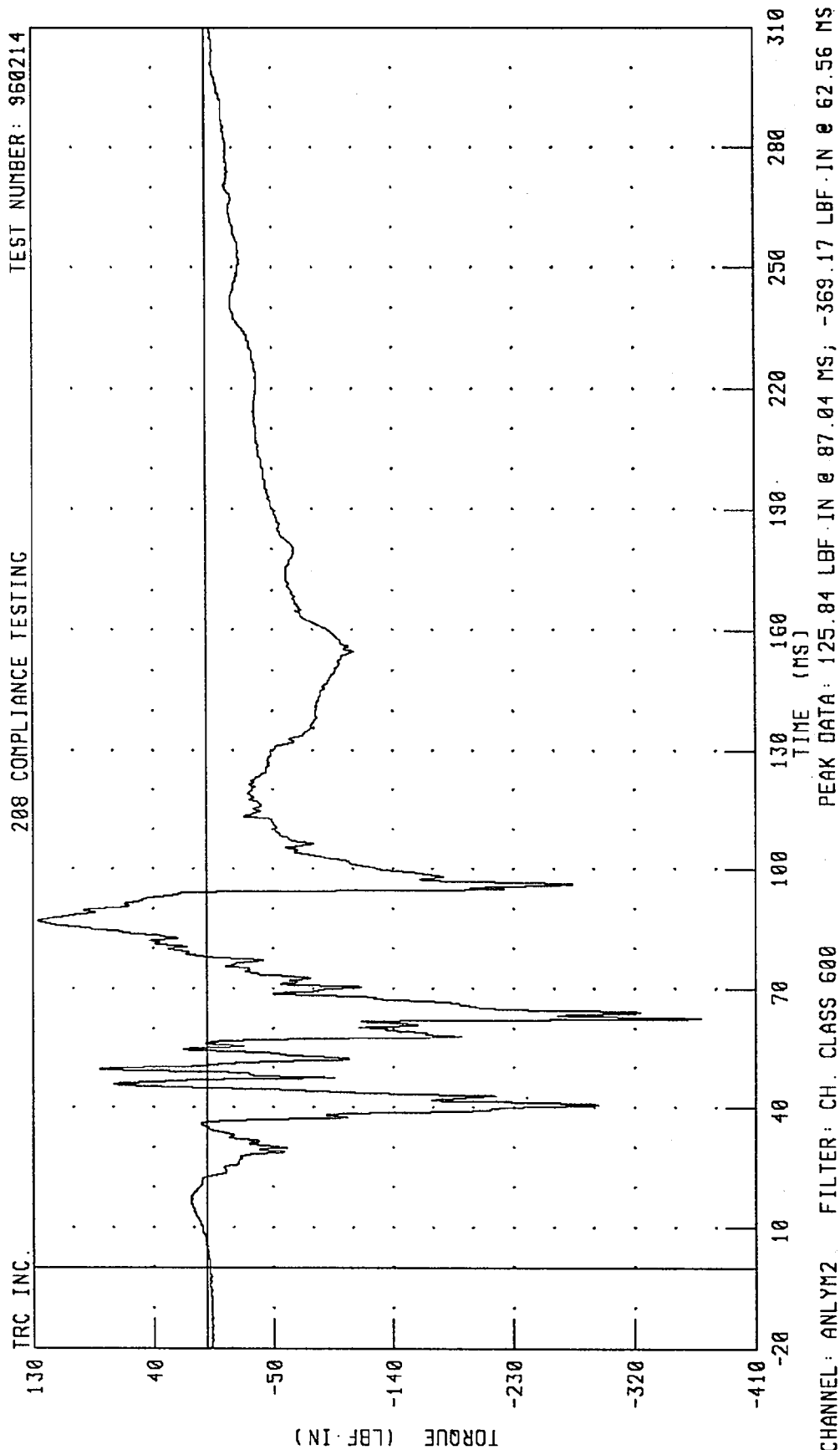


PEAK DATA: 27.05 LBF @ 74.00 MS; -1478.32 LBF @ 40.80 MS

CHANNEL: ANLZF2 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT LOWER TIBIA MOMENT ABOUT Y-AXIS
 208 COMPLIANCE TESTING

TEST NUMBER: 960214

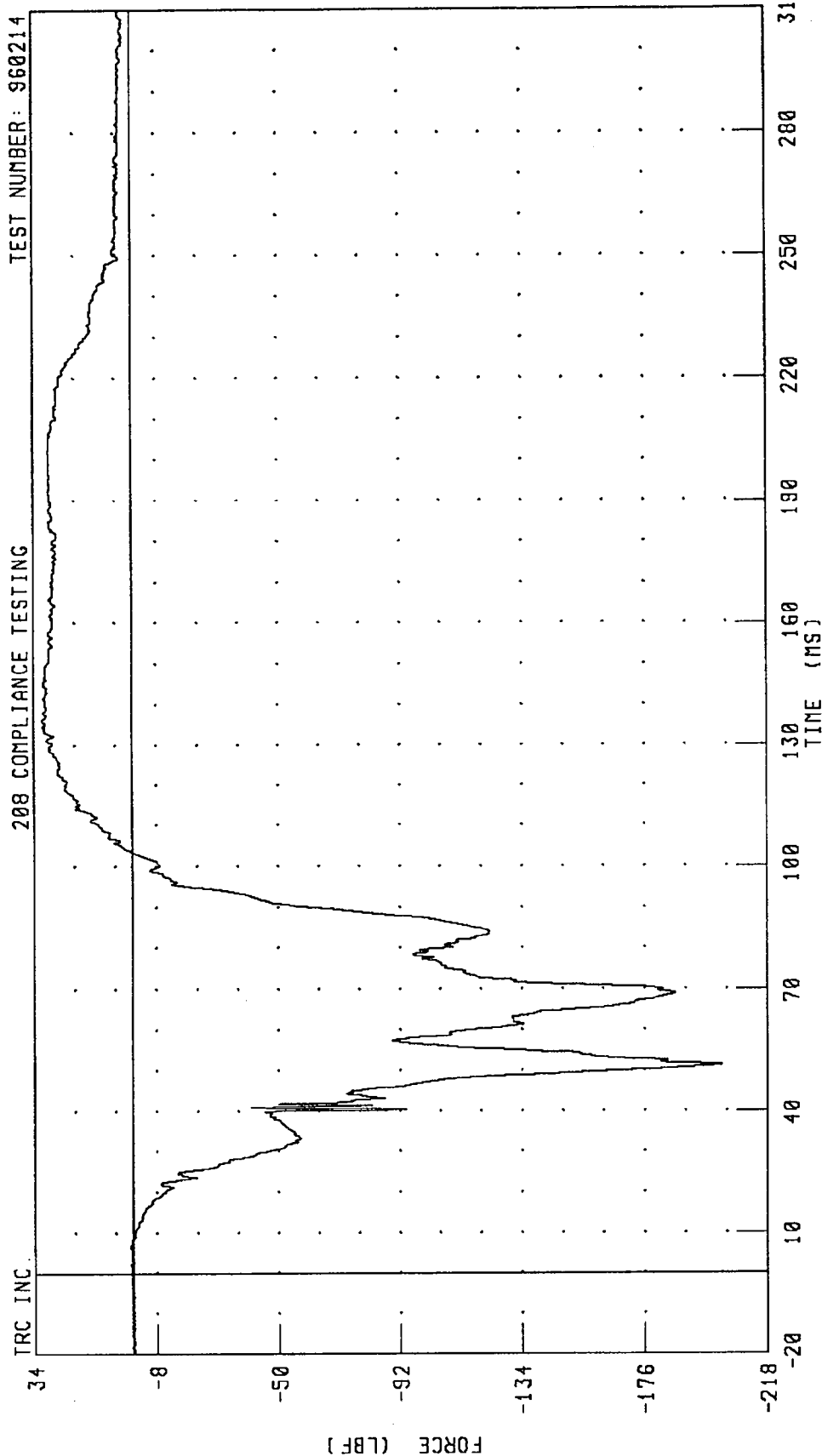


CHANNEL: ANLYM2 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER RIGHT LOWER TIBIA X-AXIS FORCE

TEST NUMBER: 960214

208 COMPLIANCE TESTING

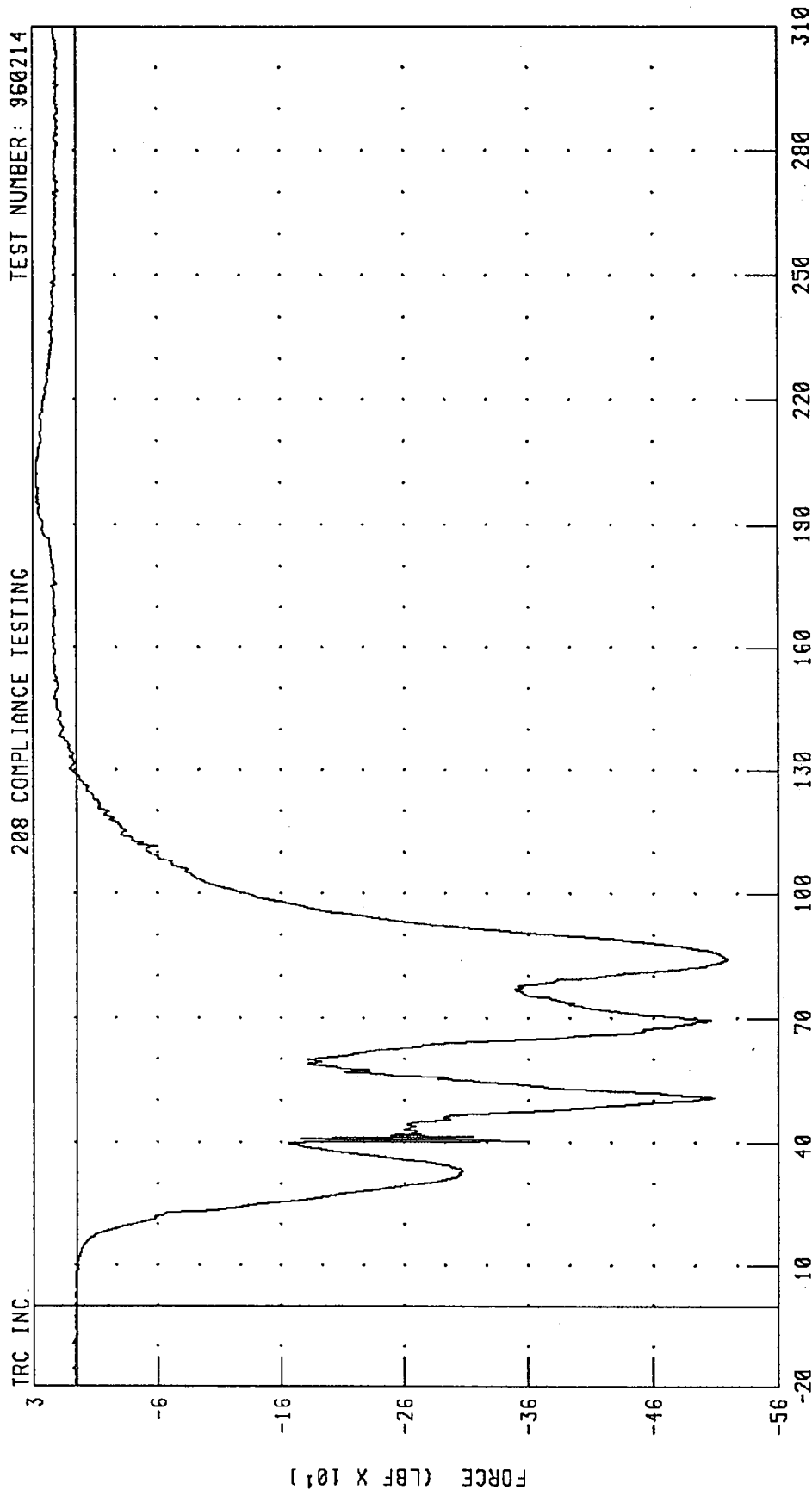


CHANNEL: ANRXF2 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER RIGHT LOWER TIBIA Z-AXIS FORCE

TEST NUMBER: 960214

208 COMPLIANCE TESTING



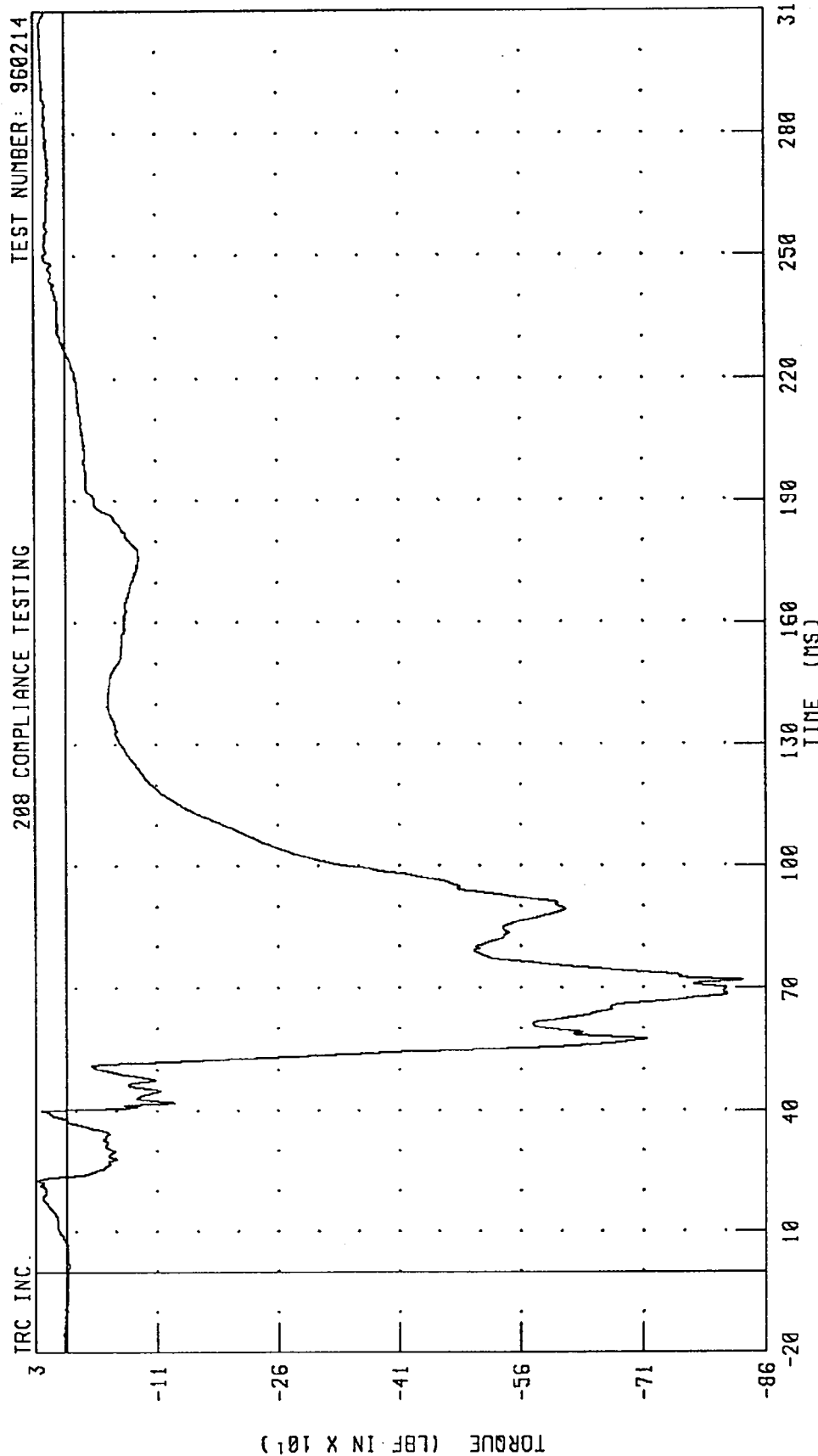
PEAK DATA: 32.41 LBF @ 202.96 MS; -525.28 LBF @ 84.32 MS

CHANNEL: ANRZF2 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER RIGHT LOWER TIBIA MOMENT ABOUT Y-AXIS

TEST NUMBER: 960214

200 COMPLIANCE TESTING



PEAK DATA: 35.30 LBF IN @ 22.64 MS; -834.07 LBF IN @ 71.76 MS

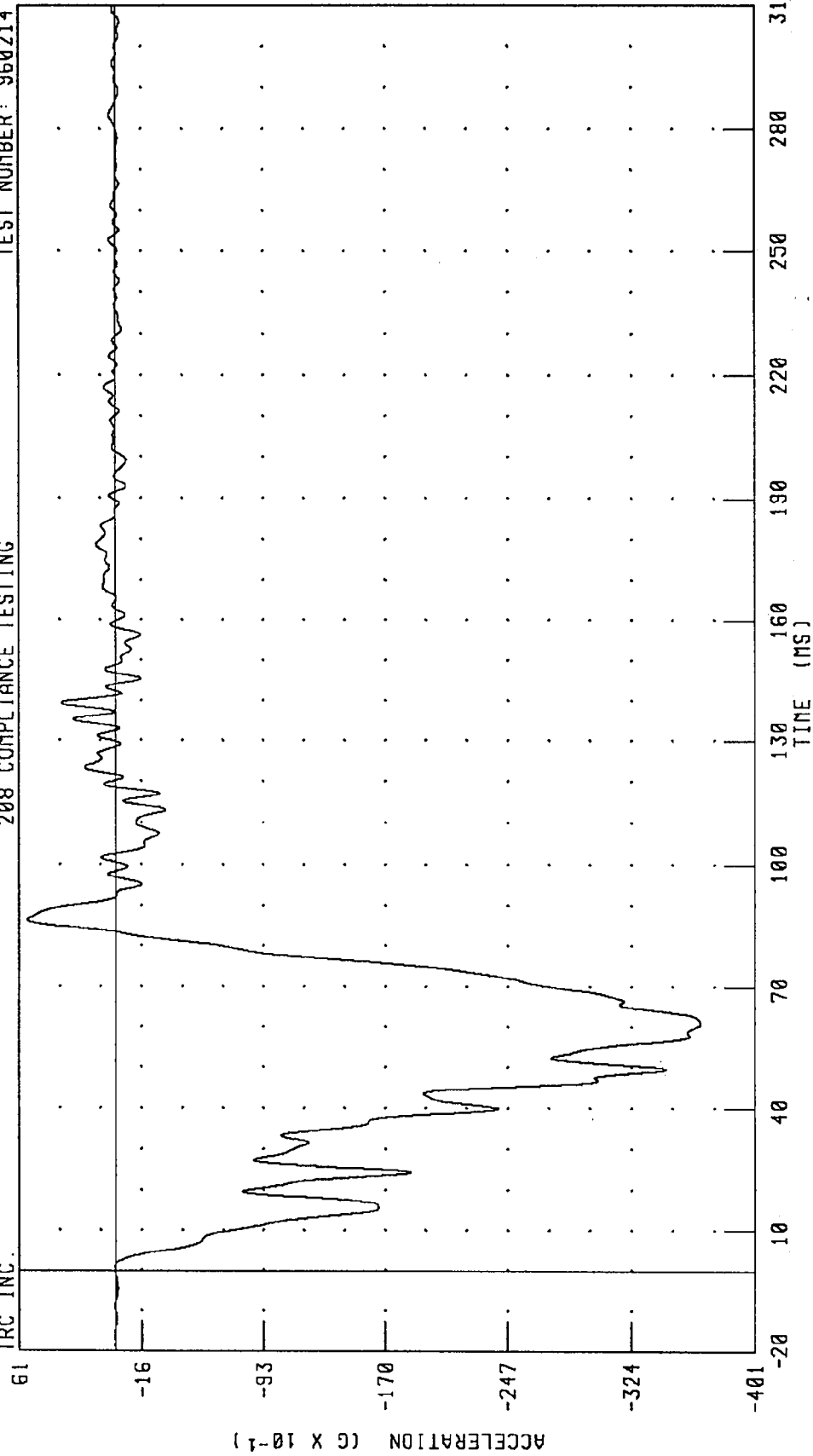
CHANNEL: ANRYM2 FILTER: CH. CLASS 600

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
LEFT REAR SEAT X-AXIS ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.

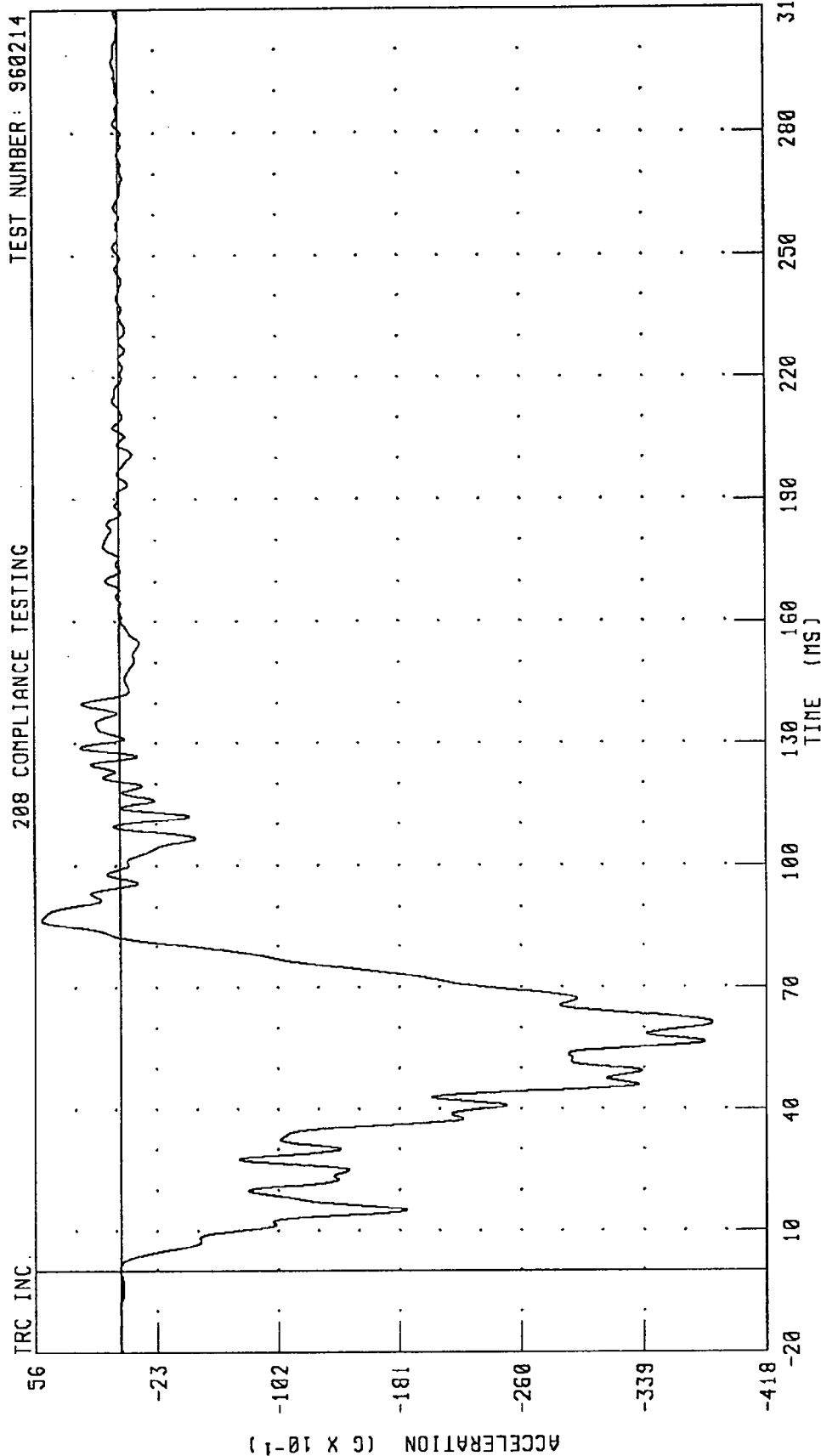


CHANNEL: TLRXG1 FILTER: CH. CLASS 60

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT REAR SEAT X-AXIS ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING



PEAK DATA: 5.12 G @ 86.88 MS; -38.32 G @ 61.28 MS

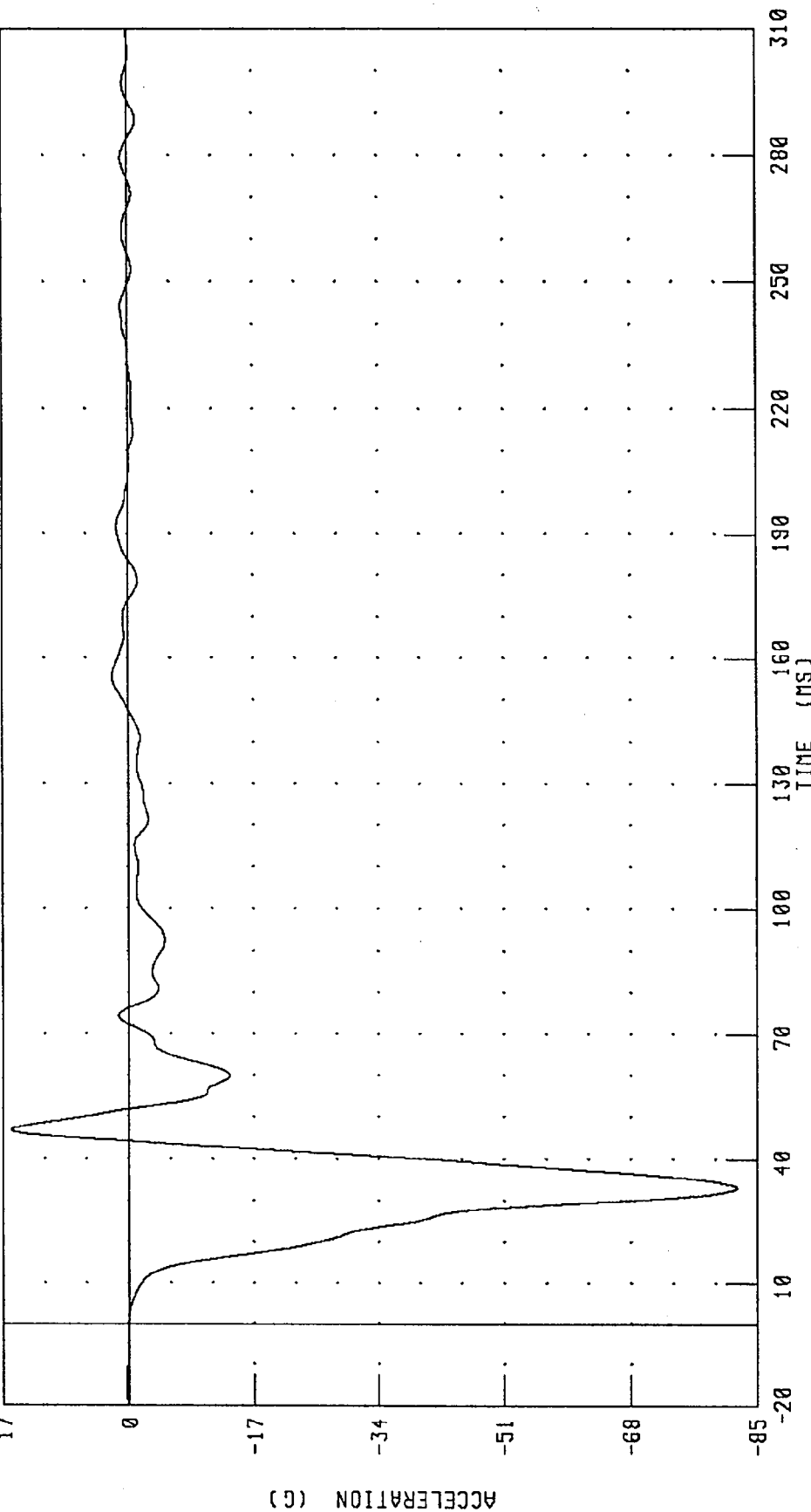
CHANNEL: TRRXG1 FILTER: CH. CLASS 60

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
ENGINE UPPER BLOCK X-AXIS ACCELERATION

208 COMPLIANCE TESTING

TEST NUMBER: 960214

TRC INC.



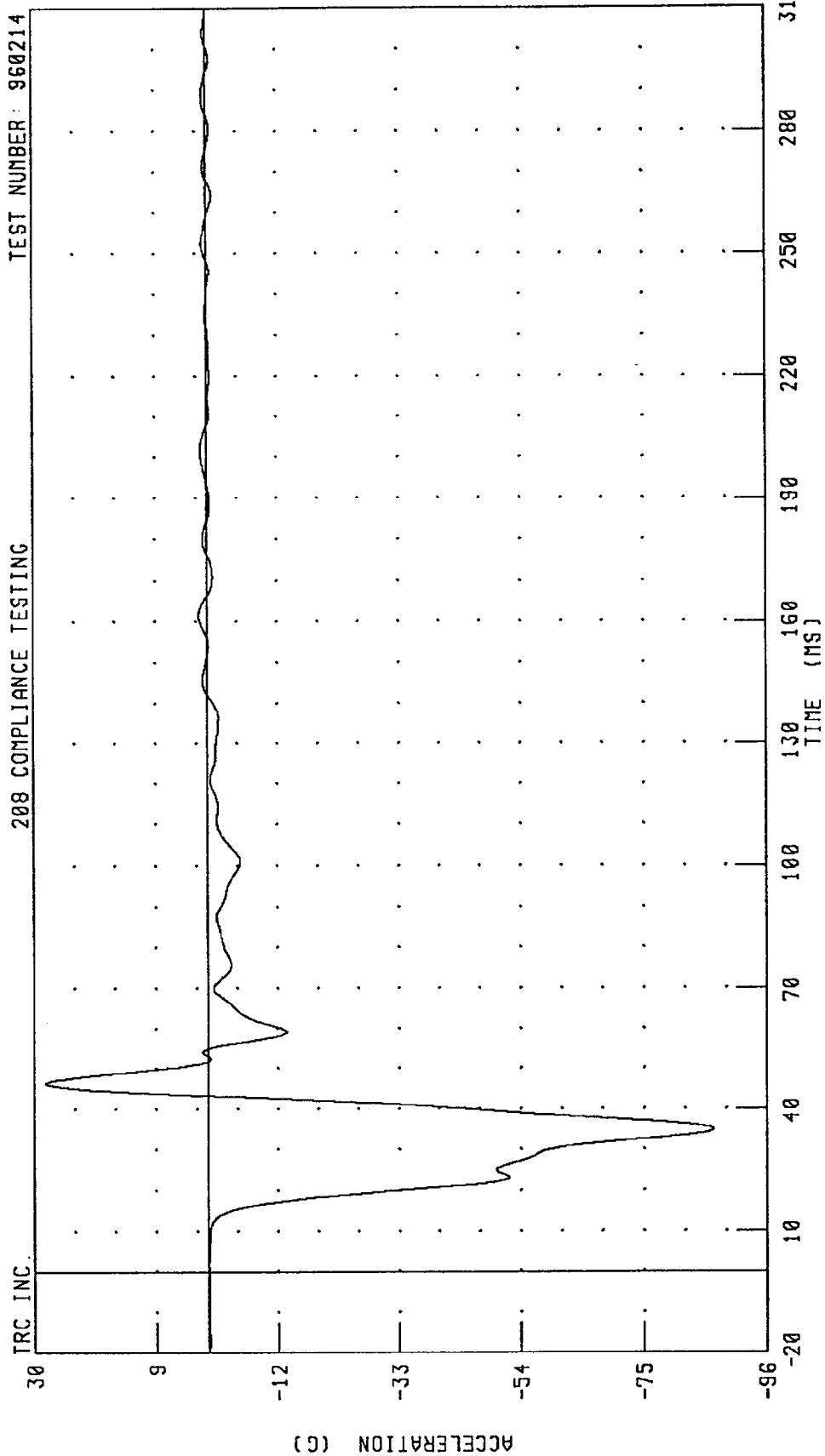
CHANNEL: ENGCG1 FILTER: CH. CLASS 60

PEAK DATA: 15.81 G @ 46.80 MS; -82.30 G @ 33.36 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
ENGINE BOTTOM BLOCK X-AXIS ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING



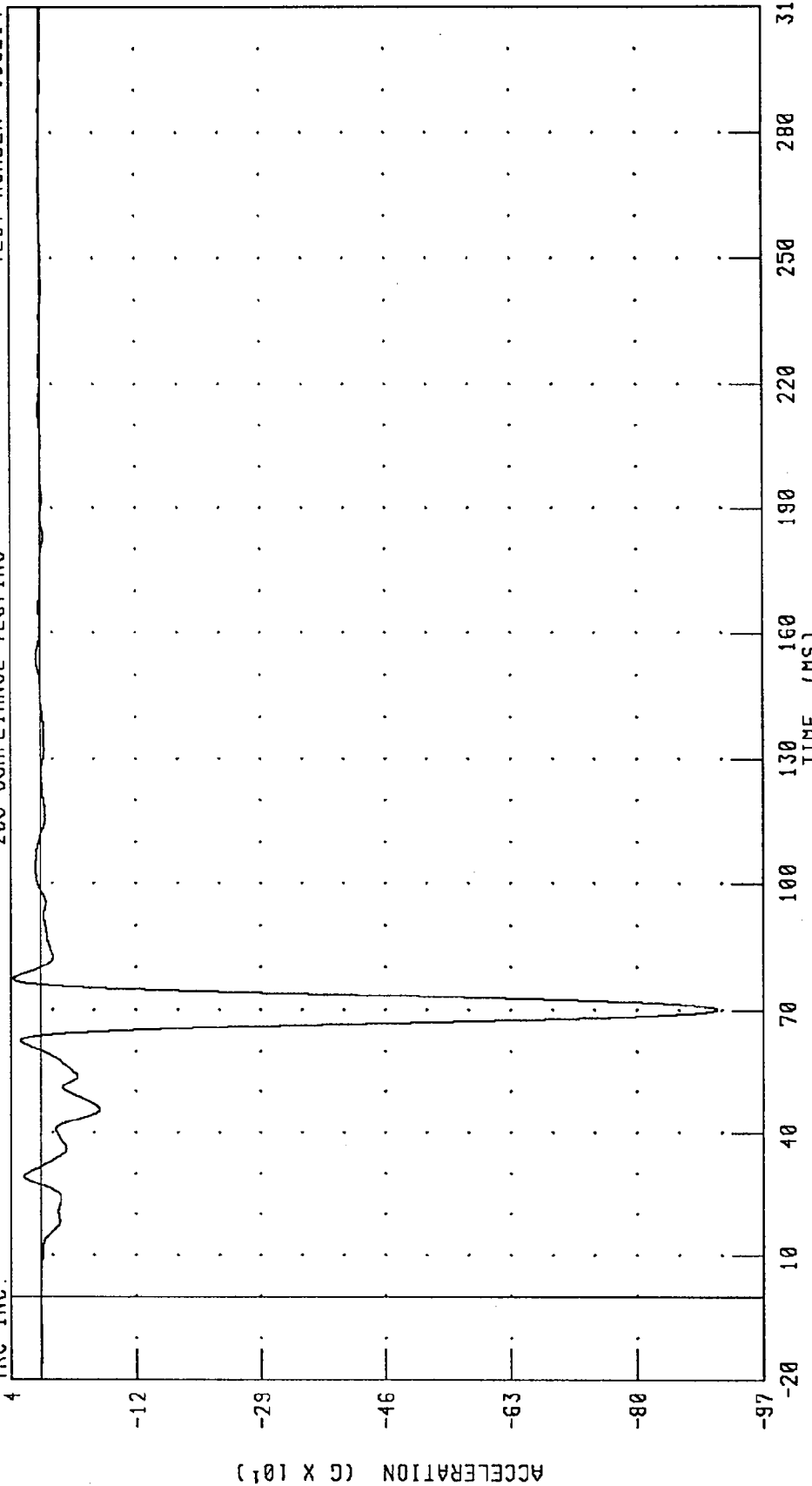
CHANNEL: ENGXC2 FILTER: CH. CLASS 60

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
RIGHT BRAKE CALIPER X-AXIS ACCELERATION

208 COMPLIANCE TESTING

TEST NUMBER: 960214

TRC INC.



CHANNEL: BCRXG1 FILTER: CH. CLASS 60

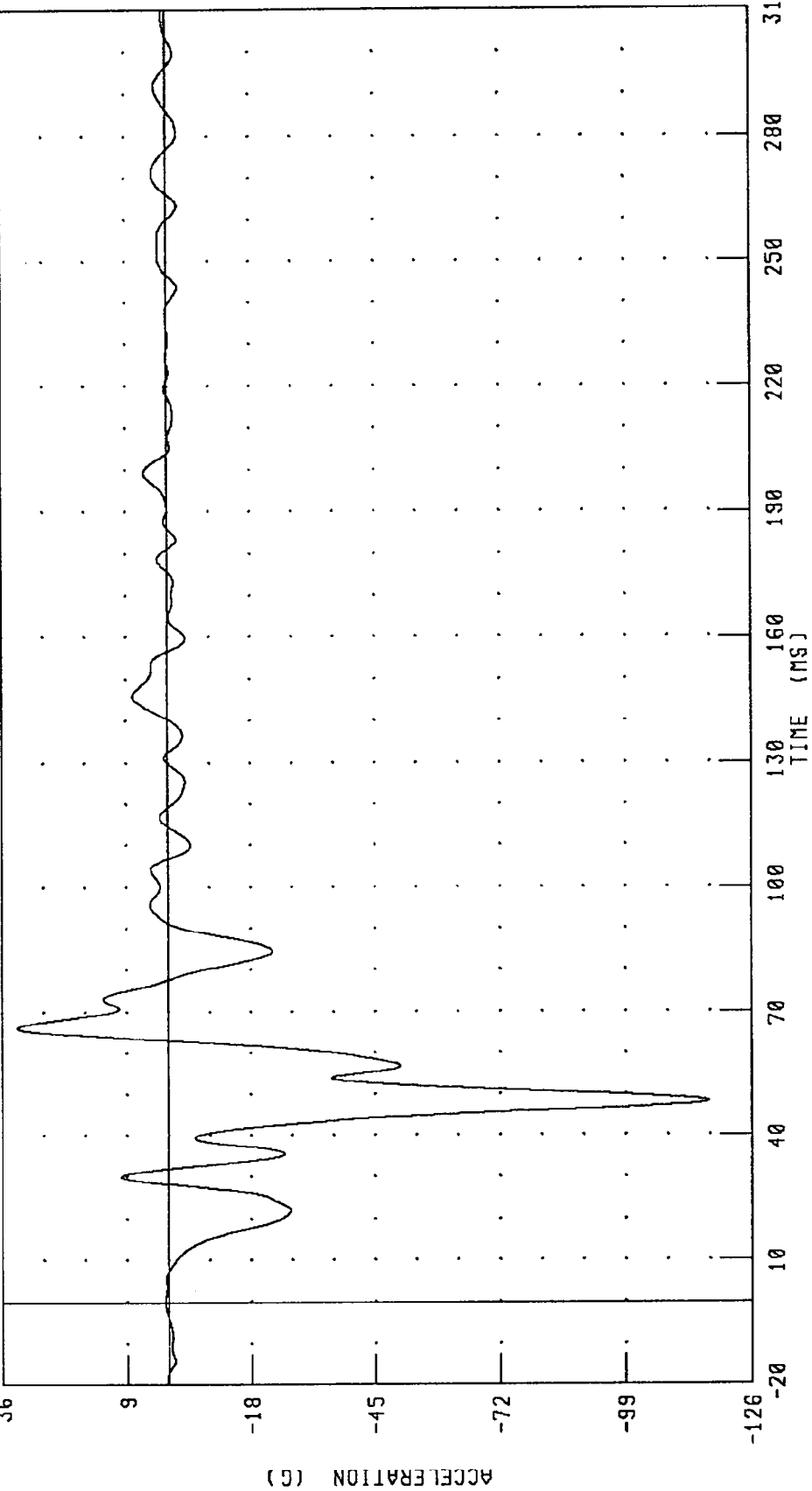
PEAK DATA: 37.37 G @ 77.44 MS; -917.03 G @ 70.24 MS

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
LEFT BRAKE CALIPER X-AXIS ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.



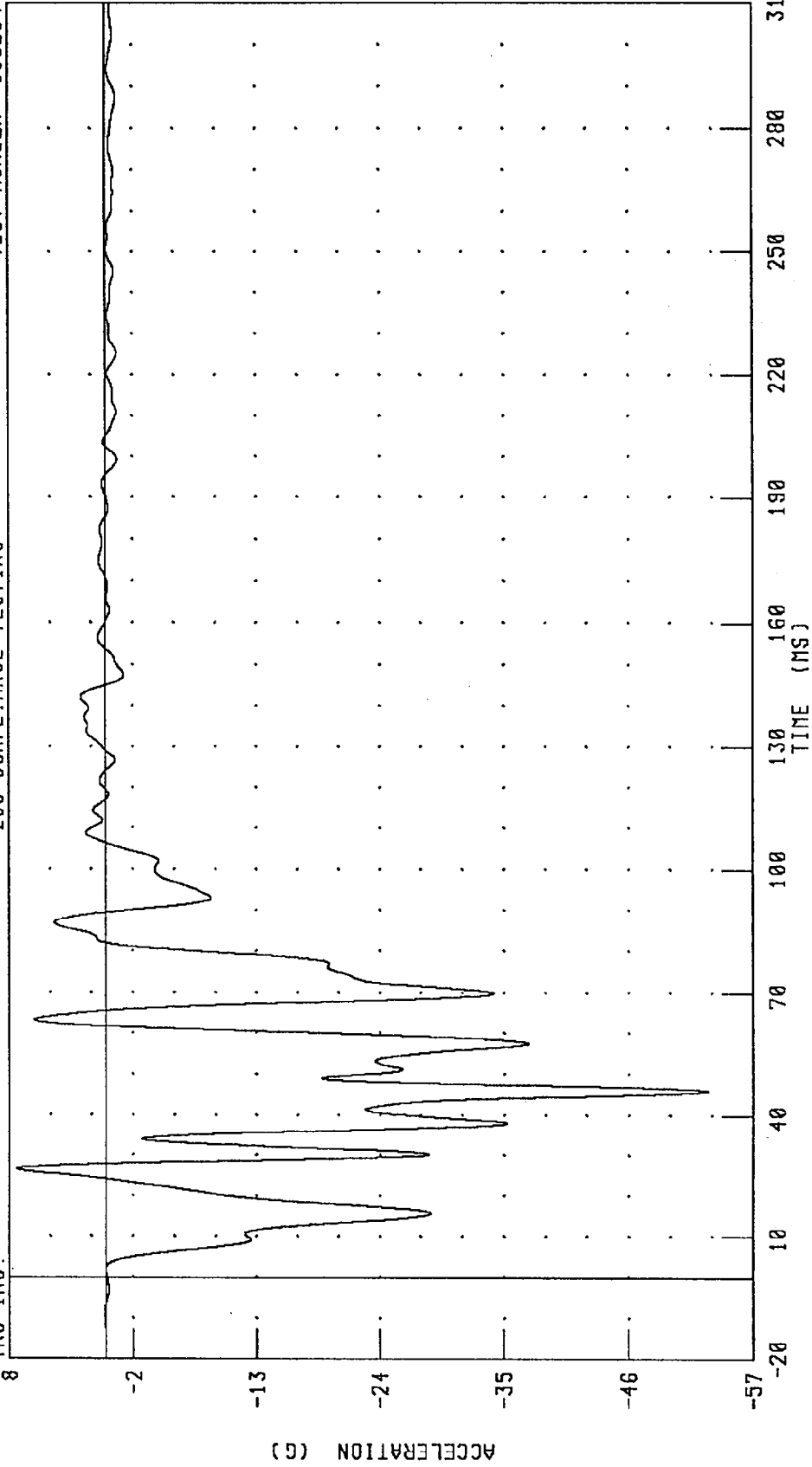
PEAK DATA: 32.78 G @ 66.32 MS; -116.68 G @ 48.16 MS

CHANNEL: BCLXG1 FILTER: CH. CLASS 60

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
DASH PANEL CENTER X-AXIS ACCELERATION
208 COMPLIANCE TESTING

TEST NUMBER: 960214

TRC INC.



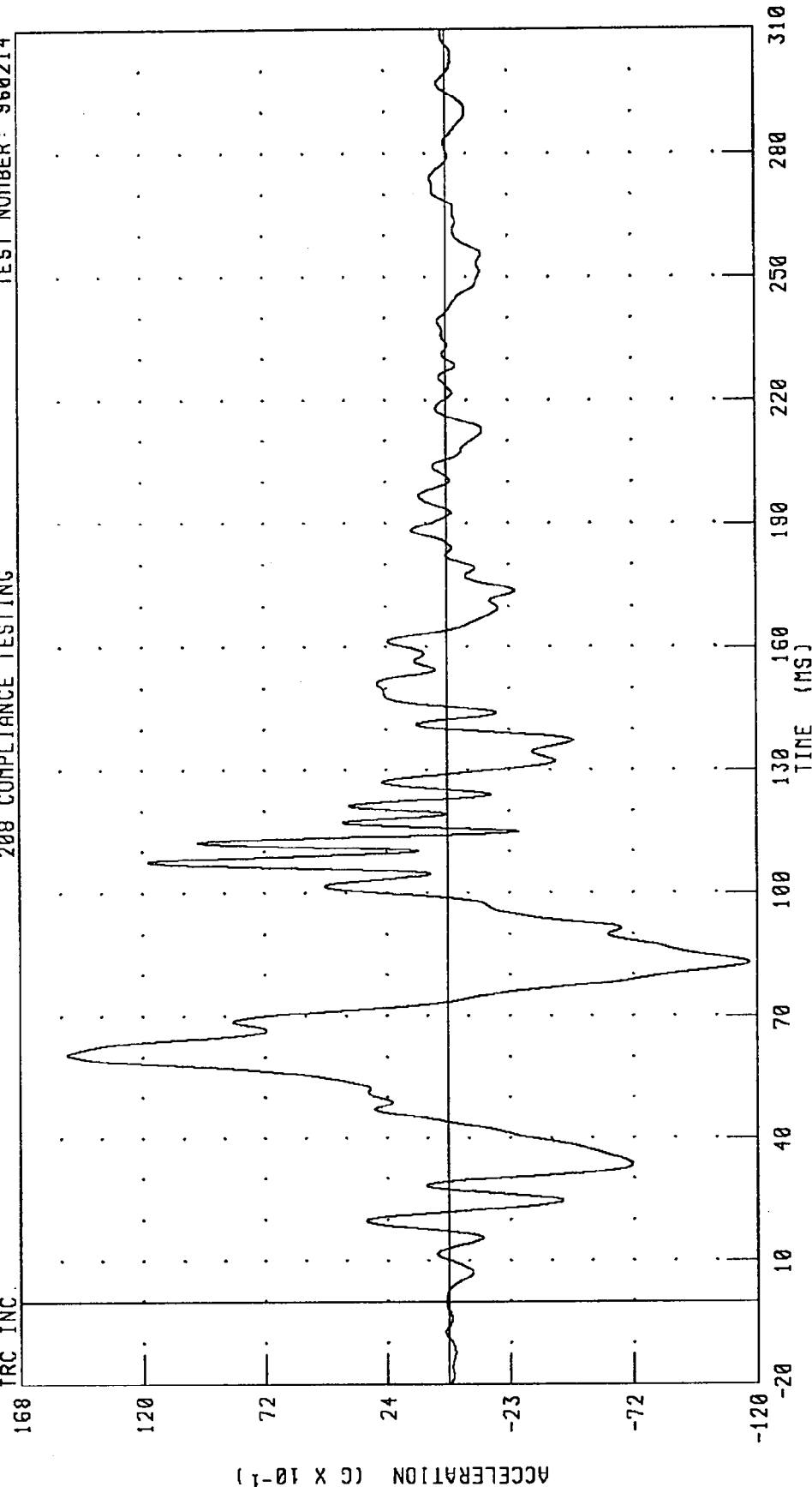
CHANNEL: DPCXG1 FILTER: CH. CLASS 60

1996 HYUNDAI SONATA INTO FLAT FRONTAL BARRIER
VEHICLE REAR CENTER Z-AXIS ACCELERATION

TEST NUMBER: 960214

208 COMPLIANCE TESTING

TRC INC.



PEAK DATA: 14.96 G @ 60.72 MS; -11.69 G @ 82.96 MS

CHANNEL: TFCZG1 FILTER: CH. CLASS 60

Appendix C

Manufacturer's Vehicle Information



U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

400 Seventh Street, S.W.
Washington, D.C. 20590

CERTIFIED MAIL

JUL 31 1995

NSA-31CCa

IR 1638

Mr. K. H. Choi

President

Hyundai America Technical Center, Inc.

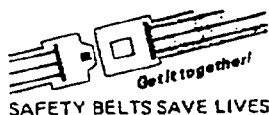
5075 Venture Drive

Ann Arbor, MI 48108

Dear Mr. Choi:

The Office of Vehicle Safety Compliance (OVSC) will conduct compliance tests to the requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 208, "Occupant Crash Protection." The 1996 Hyundai Sonata (all models) equipped with a driver and passenger air bag restraint system has potentially been selected for crash testing. The following information is requested:

1. Please inform OVSC whether the air bag automatic restraint systems provided at the driver's and passenger's seating positions in your vehicle are certified to meet the requirements of S4.1.2.1(c)(1) or S4.1.2.1(c)(2) for FMVSS No. 208.
2. If the automatic restraint systems provided at the driver's and passenger's seating positions in the subject vehicle was installed to meet the requirements of S4.1.2.1(c)(1), please provide a copy of the certification test reports for each of the test configurations required by that section of the standard (i.e., moving barrier lateral impact and dynamic rollover) and a copy of the certification reports for the frontal/angular barrier impact test required by S4.1.2.1.
3. If a manual 3-point safety belt is provided with the driver's automatic restraint system in order to meet the requirements of S4.1.2.1(c)(2), please provide a copy of the certification test reports for each of the test configurations required by that section of the standard (i.e., frontal/angular barrier impact test of the automatic restraint system with the manual safety belt unfastened and frontal/angular barrier impact test of the automatic restraint system with the manual safety belt fastened).
4. If the manual safety belt provided at the driver's and passenger's seating positions was not installed to meet the requirements of S4.1.2.1(c)(2), please provide a copy of a crash test report or engineering analysis showing that the use of the manual safety belt



AUTO SAFETY HOTLINE
(800) 424-9393
Wash. D.C. Area (202) 366-0123

with the automatic restraint system does not affect the ability of the vehicle to meet the requirements of FMVSS No. 208.

5. If the vehicle uses a pressure vessel to inflate the air bag, provide a copy of the test reports or engineering analysis to demonstrate that it meets all the requirements of S9.1.
6. If the vehicle uses an explosive device to inflate the air bag, provide a copy of the test reports or engineering analysis to demonstrate that it meets all the requirements of S9.2.
7. State, for any safety belt system in this vehicle, whether or not it is equipped with a tension-relieving device. Provide a copy of the information furnished in accordance with S7.4.2, if the tension-relieving device is used.
8. FMVSS No. 208, S8.1.5 allows the manufacturer the option of having movable vehicle windows and vents placed in the closed position. State whether the vehicle's movable windows and vents were opened or closed for the certification tests.
9. FMVSS No. 208, S5.1 provides a manufacturer with the option of using either a Part 572(B) or Part 572(E) test dummy. Please inform OVSC which test dummy was used in each seat for each certification test. Submit dummy placement measurements, including diagrams or photographs which show exactly where measurements were taken. Enclosed is a diagram of some of OVSC's dummy measurements. Where possible, use the dimension shown in the diagram to provide the individual dummy placement measurements.

State whether the vehicle has a foot rest for the driver.

If the vehicle can be equipped with a split front bench seat, state whether the driver dummy was located so that the midsagittal plane was centered on the steering wheel rim or the center of the seat cushion. Also, state whether the passenger dummy was located so that the midsagittal plane was centered the same distance from the longitudinal centerline of the vehicle as the driver dummy or in the center of the seat cushion.

10. Provide the seat positioning, steering column positioning, and fuel tank data on the enclosed form. If more than one front seating configuration, steering column or fuel tank are available on this vehicle, provide separate information for each.
11. If the vehicle is equipped with adjustable seat belt anchorages, provide the manufacturer's nominal design position for a 50th percentile adult male occupant.

12. Provide the speed at impact, vehicle test weight, and resulting injury criteria (i.e., HIC, chest acceleration, chest compression for the Part 572(E) dummy and femur loads) recorded for all certification tests conducted to meet the requirements of S4.1.2.1.

In addition, include each dummy's head and chest acceleration versus time plots and femur load versus time plots for the full frontal barrier impact tests.

13. When vehicle components must be removed to obtain the proper test weight, what components do you recommend for removal and in what priority order do you recommend removal?
14. Please provide FMVSS No. 204, "Steering Control Rearward Displacement" certification data. Include a copy of the test report and any engineering analysis forming the basis of the certification. The report should document the vehicle test weight, impact velocity, and the horizontal and vertical displacements of the steering control. Pre and post test photographs are also requested.

Discuss the test procedure detailing the vehicle preparation and the measurement technique used to determine the steering control rearward displacement.

Provide a diagram of the steering control system and describe how the components of the steering control system work to provide energy management in a frontal impact.

15. Inform OVSC if these vehicles have built-in child restraints either as standard equipment or optional equipment. If they do, identify the type of restraint (i.e., 5-point harness, T-shield, or other), and provide a copy of the certification test reports and any engineering analysis forming the basis for certification to FMVSS No. 213, "Child Restraint Systems."

Your written response in the English language referencing "NSA-31CCa/IR 1638" must be sent to me within 20 working days after you receive this letter. If you need additional time to complete your response, please call Mr. Charles Case on (202) 366-5319 at least 5 days prior to the due date. You must also submit the request in writing via mail or FAX to (202) 366-3081. You will be notified whether your request has been granted and for how long.

Confidential business information must be sent in a separate enclosure marked confidential. A copy of that material must be sent under separate cover to the agency's Chief Counsel/NCC-01. If you have any questions concerning confidential information, call Ms. Heidi Coleman on (202) 366-1834.

We appreciate your cooperation. If you have any questions concerning this information request, please call Mr. Charles Case.

Sincerely,



Harry Thompson
Chief, Vehicle Division
Office of Vehicle Safety Compliance

2 Enclosures

HYUNDAI AMERICA TECHNICAL CENTER, INC.

Response to Question 1

S4.1.2.1(C)(2)

Response to Question 2

N/A

Response to Question 3

Please see the Attachment #1

Accent(2DR/4DR), Sonata test report is provided as follow

- FMVSS 208 :
 - Front Impact : A/Bag , A/Bag+S/Belt
 - 30° Oblique(Driver Side) : A/Bag , A/Bag+S/Belt
 - 30° Oblique(Passenger Side) : A/Bag , A/Bag+S/Belt
- NCAP
- FMVSS 204

Response to Question 4

N/A

Response to Question 5

Please see the Attachment #2

Response to Question 6

Please see the Attachment #3

Response to Question 7

N/A

Response to Question 8

Front : Fully Opened, Rear : Fully Closed

Response to Question 9

- 9-1 : Part 572 Subpart E Dummy(Hybrid III)
- 9-2 : Dummy placement measurements, Diagram, Dimension, etc
Please see the Attachment #4
- 9-3 : Vehicle(Accent/Sonata) have a foot rest
- 9-4 : Vehicle can not be equipped with a split front bench seat.

Response to Question 10

Seat positioning, Steering column positioning, Fuel tank data : please see the Attachment #5

Response to Question 11

Please see the Attachment #6

Response to Question 12

- 12-1 : The speed at impact, vehicle test weight, test result : please see the Attachment #7
- 12-1 : Dummy's head and chest acceleration versus time plots, Femur load versus time plots : be included the test report

Response to Question 13

- 13-1: Jack, Jack Stand, Rear seat ass'y, Spare Tire
- 13-2: removed the parts which was not affected by test result.

Response to Question 14

- 14-1:
 - Accent(4DR), Sonata Test Report is provided
 - All of related test information is included in the test report.
- 14-2: Diagram of the steering column system : please see the Attachment #8
- 14-3: Describe how the components of the steering control system work to provide energy management in a frontal impact : please see the Attachment #9

HYUNDAI AMERICA TECHNICAL CENTER, INC.

Response to Question 15

N/A

Others

Test vehicle information : please see the Attachment #5

ATTACHMENT #4.

DUMMY MEASUREMENTS FOR
FRONT SEAT PASSENGERS (•)

MEASUREMENT ITEM	96MY ACCENT(3 DOOR)	96MY ACCENT(4 DOOR)	96MY SONATA
HH	13.1	12.9	13.4
NR	17.5	17.4	18.2
KDL	6.2	6.6	5.4
KDR	4.0	5.9	5.6
CS	12.7	12.7	13.5
SH	17.6	8.2	10.9
SHY	9.0	8.8	
HS(••)	11.9	12.1	13.5

[UNIT : INCHES]

NOTE) • : AVERAGE DATA FOR FMVSS 208 COMPLIANCE TESTS.

•• : AMENDED DATA BASED ON HMC COMPLIANCE TEST REPORTS DUE TO THE
DIFFERENCE OF DUMMY MEASUREMENTS POINT BETWEEN HMC AND NHTSA.

TEST VEHICLE INFORMATION

Vehicle Model Year & Make: 1996 MODEL YEAR HYUNDAI
Vehicle Model & Body Style: SONATA 4 DOOR SEDAN

1. NOMINAL DESIGN RIDING POSITION --

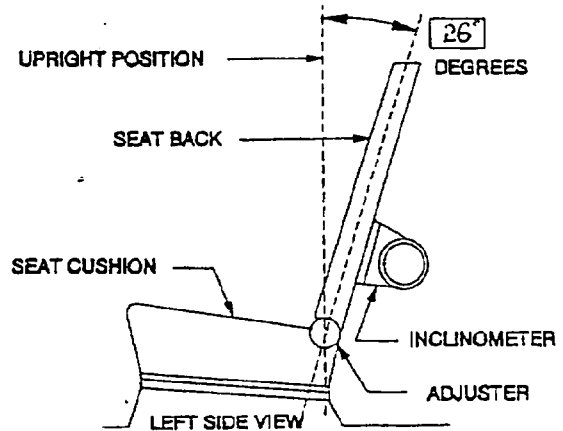
For adjustable driver and passenger seat backs.

Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent if applicable. Indicate, if applicable, how the detents are numbered (Is the first detent "0" or "1"?). Indicate if the seat back angle is measured with the dummy in the seat.

Seat back angle for driver's seat = 26 degrees.

Measurement Instructions:

Seat back angle is measured along the rear
edge of the metal seat back frame as
attached sketch 4.



Seat back angle for passenger's seat = 26 degrees.

Measurement Instructions:

Same as driver seat.

2. SEAT FORE & AFT POSITIONS --

Provide instructions for positioning the driver and front outboard passenger seat(s) in the center of fore and aft travel. For example, indicate how the detents are numbered (Is the first detent "0" or "1"?). Provide information to locate the detent in which the seat track is to be locked.

Positioning of the driver's seat:

See attached sketch 5.

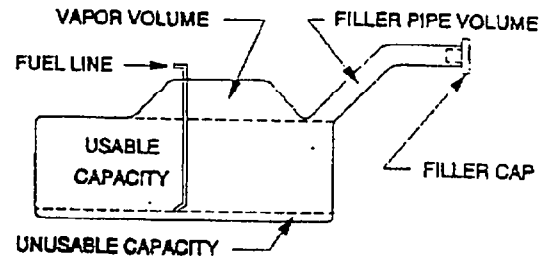
Positioning of the passenger's seat (if applicable):

Same as driver seat.

Rev. 7/11/94

3. FUEL TANK CAPACITY DATA --

- 3.1 A. "Usable Capacity" of standard equipment fuel tank = 17.17 gallons.
- B. "Usable Capacity" of optional equipment fuel tank = Not Applicable gallons.
- C. "Usable Capacity" of vehicle(s) used for certification testing to requirements of FMVSS 301 = 17.17 gallons.



Operational Instructions:

Test vehicle engine operated to "run dry" condition, and then a small amount of Stoddard solvent which has been dyed RED shall be added to the vehicle's fuel tank.

Operate the fuel pump enough to completely fill the fuel system ahead of the fuel tank, and add 92% to 94% of the stated usable capacity to the fuel tank.

- 3.2 Amount of Stoddard solvent added to vehicle(s) used for certification test(s) = 16.11 gallons
- 3.3 Is vehicle equipped with electric fuel pump? ☒ YES ☐ NO
If YES, explain the vehicle operating conditions under which the fuel pump will pump fuel.

Fuel pump starts to operate when engine RPM exceeds 22 with the ignition key on.

4. STEERING COLUMN ADJUSTMENTS --

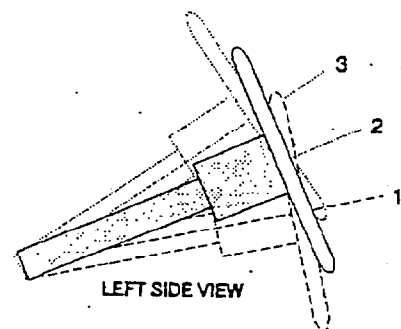
Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine the geometric center.

Operational Instructions:

96MY SONATA has a gear tilting type steering column.

Steering wheel hub can be placed at the midpoint locking position.

* MIDPOINT = (Lower tilt angle + Upper tilt angle) / 2



STEERING COLUMN ASSEMBLY

SKETCH #4

note) seat back cover should be torn for attaching the inclinometer correctly on measurement position.

DETAIL A

HYUNDAI MOTOR COMPANY

CHECKER

TITLE

DRG NUMBER

DATE

NOMINAL DESIGN RIDING POSITION

96MY SONATA

FMVSS 208

SKETCH #5

SEAT CUSHION

S.R.P.

TRACK UPPER RAIL

TRACK LOWER RAIL

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

FLOOR MT'G POSITION

LOCK POSITION

Note) seat should be positioned at the 9th lock position from the force 1st lock position.

[illegible]

HYUNDAI MOTOR COMPANY

TITLE

SEAT ADJUSTMENT POSITION IN THE CENTER OF
FORE AND AFT TRAVEL

DRG NUMBER

96MY SONATA
FMVSS 208