

REPORT NOS. 208-TRC-91-010
212-TRC-91-010
301-TRC-91-010

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

HYUNDAI MOTOR COMPANY
1991 HYUNDAI SCOUPE
2-DOOR COUPE
NHTSA NO. CM0504
TRC TEST NO. 910311

THE TRANSPORTATION RESEARCH CENTER OF OHIO
10820 STATE ROUTE 347
EAST LIBERTY, OHIO 43319



MARCH 27, 1991

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 1991 Hyundai Scoupe 2-door coupe, NHTSA No. CM0504, at the Transportation Research Center of Ohio on March 11, 1991. This test was conducted to determine compliance with Federal Motor Vehicle Safety Standards: FMVSS No. 208, "Occupant Crash Protection"; FMVSS No. 212, "Windshield Mounting"; FMVSS No. 219 (partial), "Windshield Zone Intrusion"; FMVSS 301, "Fuel System Integrity." The barrier impact velocity was 29.5 mph. The vehicle's maximum crush was 18.2 inches. The ambient temperature was 72° F. The driver's head injury criteria (HIC) was 1661. The driver's maximum chest deceleration over three (3) milliseconds was 41.1 g. The driver's maximum left and right femur forces were 1413 pounds and 676 pounds, respectively. The passenger's head injury criteria (HIC) was 1604. The passenger's maximum chest deceleration over three (3) milliseconds was 40.2 g. The passenger's maximum left and right femur forces were 1033 pounds and 1126 pounds, respectively. The vehicle appears to comply with the applicable requirements of FMVSS 212, 219 (partial), and 301. The vehicle's data indicated an apparent noncompliance with the requirements of FMVSS 208.					
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 Hornickie		
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures
Symbol When You Know Multiply by To Find Symbol

LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons	0.9	metric ton	t
	(2000 lb)			
VOLUME				
tsp	teaspoons	5	milliliters	ml.
Tbsp	tablespoons	15	milliliters	ml.
in ³	cubic inches	16	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	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C

Approximate Conversions from Metric Measures
Symbol When You Know Multiply by To Find Symbol

LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares	2.5	acres	acres
	(10 000 m ²)			
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton	1.1	short tons	
	(1000 kg)			
VOLUME				
ml.	milliliters	0.03	fluid ounces	fl oz
ml.	milliliters	0.06	cubic inches	in ³
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	degrees Celsius	9/5 (then add 32)	degrees Fahrenheit	°F

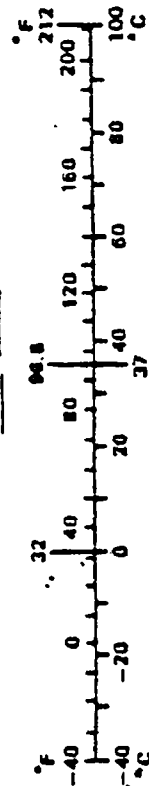


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SECTION 1.0

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 of Ohio (TRC) under Contract No. DTNH22-90-C-21003. The purpose of this test was to determine if the subject vehicle, a 1991 Hyundai Scoupe 2-door coupe, NHTSA No. CM0504, 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 B 50th percentile adult male anthropomorphic test devices (dummies). The dummies were positioned in the front outboard designated seating positions according to the dummy placement procedure specified in Appendices B and C of the Laboratory Test Procedure.

Both dummies were instrumented with head and chest accelerometers to measure longitudinal, lateral, and vertical accelerations, and with left and right femur load cells to measure axial forces.

The twenty-three (23) 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 March 11, 1991.

The test vehicle, a 1991 Hyundai Scoupe 2-door coupe, NHTSA No. CM0504, appeared to comply with the performance requirements of FMVSS test Nos. 212, 219 (partial), and 301 in the flat frontal barrier impact mode. The vehicle's data indicated an apparent noncompliance with the FMVSS test no. 208 requirements. For the Part 572 B dummy seated in the left front outboard designated seating position, the Head Injury Criteria (HIC) calculation was more than 1000. The chest resultant accelerations did not exceed 60 g's, and the compressive forces transmitted through the upper legs did not exceed 2,250 pounds as measured. For the Part 572 B dummy seated in the right front outboard designated seating position, the Head Injury Criteria (HIC) calculation was more than 1000. The chest resultant accelerations did not exceed 60 g's, and the compressive forces transmitted through the upper legs did not exceed 2,250 pounds as measured. 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 1.5 liter, transverse engine, automatic transmission, and power brakes. The vehicle's test weight was 2645 pounds. The vehicle's impact speed was 29.5 mph. The vehicle's maximum crush was 18.2 inches.

The driver's head injury criteria (HIC) was 1661. The driver's maximum chest resultant acceleration over three (3) milliseconds was 41.1 g. The driver's maximum left and right femur forces were 1413 pounds and 676 pounds, respectively.

The right front passenger's HIC was 1604. The right front passenger's maximum chest resultant acceleration over three (3) milliseconds was 40.2 g. The right front passenger's maximum left and right femur forces were 1033 pounds and 1126 pounds, respectively.

There was no loss of windshield periphery retention.

There was no intrusion through the windshield.

There was no fluid spillage from the vehicle's fuel system following the crash test event or during the static rollover test.

TABLE 1 CRASH TEST SUMMARY

NHTSA NO.: CM0504 TEST TYPE: Frontal Barrier Impact

TEST DATE: 03/11/91 TEST TIME: 1243 AMBIENT TEMP. (°F): 72

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1991 Hyundai Scoupe 2-door coupe

VEHICLE TEST WEIGHT (LBS): 2645

IMPACT ANGLE (DEG)*: 0

IMPACT VELOCITY (MPH)**: PRIMARY = 29.5 SECONDARY = 29.5

MAXIMUM STATIC CRUSH (IN): 18.2

AVERAGE REBOUND (IN): 15.0

DUMMIES: Driver #353 Passenger #354

TYPE: Part 572 B Part 572 B

LOCATION: Left front Right front

RESTRAINT: 2-point passive belt 2-point passive belt

NUMBER OF DATA CHANNELS: 23

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: Hyundai Motor Company

MAKE/MODEL: Hyundai/Scoupe

VIN: KMHVE22JXMU018475

BODY STYLE: 2-door coupe

MODEL YEAR: 1991

NHTSA NO.: CM0504

COLOR: White

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: 1.5 liter

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

DATE VEHICLE RECEIVED: 02/20/91

ODOMETER READING: 75.0

DEALER'S NAME AND ADDRESS: Hatfield Hyundai
1400 Auto Mall Drive
Columbus, OH 43228

ACCESSORIES:

POWER STEERING	No	AUTOMATIC TRANSMISSION	Yes
POWER BRAKES	Yes	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	Yes	AIR CONDITIONING	No
RADIO	No	ANTI-SKID BRAKE	No
CLOCK	No	REAR WINDOW DEFROSTER	Yes
OTHER	Floor mats		

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 ALTERED BY: Hyundai Motor Company

DATE OF MANUFACTURE: 07/90

VIN: KMHVE22JXMU018475

GVWR: 3175 LBS

GAWR: FRONT: 1720 LBS., REAR: 1545 LBS.

TABLE 2 TEST VEHICLE INFORMATION CONT'D

TIRES ON VEHICLE (MFR., LINE, SIZE): Michelin LX1 P175/70R13

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

SPARE TIRE (MFR., LINE, SIZE): Kumho Temp T105/70R14

TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manual adjustable

MAXIMUM WIDTH: 62.2 INCHES

WHEELBASE: 94.0 INCHES

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

TIRE & CAPACITY DATA FROM VEHICLE'S LABEL:

RECOMMENDED TIRE SIZE: FRONT: P175/70R135

RECOMMENDED COLD TIRE PRESSURE: FRONT: 28 PSI; REAR: 28 PSI

DESIGNATED SEATING CAPACITY: 2 FRONT 2 REAR 4 TOTAL

VEHICLE CAPACITY WEIGHT: 700 LBS.

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN INCHES):

DELIVERED ATTITUDE: LF 25.4; RF 25.4; LR 25.5; RR 25.4

FULLY LOADED ATTITUDE: LF 25.1; RF 25.1; LR 24.9; RR 24.9

PRE-TEST ATTITUDE: LF 25.4; RF 25.2; LR 23.8; RR 23.8

POST-TEST ATTITUDE: LF 27.9; RF 26.7; LR 24.0; RR 22.4

TABLE 2 TEST VEHICLE INFORMATION CONT'D

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

RIGHT FRONT	705 LBS.	RIGHT REAR	420 LBS.
LEFT FRONT	692 LBS.	LEFT REAR	412 LBS.
TOTAL FRONT WEIGHT	1397 LBS.	$\frac{1397}{2229} =$	(62.7% OF TOTAL VEHICLE WEIGHT)
TOTAL REAR WEIGHT	832 LBS.		(37.3% OF TOTAL VEHICLE WEIGHT)
TOTAL DELIVERED WEIGHT 2229 LBS.			

CALCULATION OF TEST VEHICLE'S TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT*

UDW = UNLOADED DELIVERED WEIGHT (2229 LBS)

VCW = VEHICLE CAPACITY WEIGHT (700 LBS)

DSC = DESIGNATED SEATING CAPACITY (4)

$RCLW* = VCW - 150 (DSC) = 700 - 150 (4) = 100$

$TARGET\ TEST\ WEIGHT = UDW + RCLW* + (NO.\ OF\ HYBRID\ II\ DUMMIES\ X\ 164\ LBS/DUMMY)$

$TARGET\ TEST\ WEIGHT = 2229 + 100 + 328$

TARGET TEST WEIGHT = 2657 LBS

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 88 LBS. OF CARGO WEIGHT:

RIGHT FRONT	740 LBS.	RIGHT REAR	571 LBS.
LEFT FRONT	760 LBS.	LEFT REAR	574 LBS.
TOTAL FRONT WEIGHT	1500 LBS.		(56.7% OF TOTAL VEHICLE WEIGHT)
TOTAL REAR WEIGHT	1145 LBS.		(43.3% OF TOTAL VEHICLE WEIGHT)
TOTAL TEST WEIGHT	2645 LBS.		(0.4% UNDER TARGET TEST WEIGHT)

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

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: Taillight

CG = 40.7 INCHES REARWARD OF FRONT WHEEL CENTERLINE

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

TABLE 3 POST-IMPACT DATA

TEST NUMBER: 910311 NHTSA NO.: CM0504
TEST DATE: 03/11/91 TEST TIME: 1243
TEST TYPE: Frontal Barrier Impact IMPACT ANGLE: 0
AMBIENT TEMPERATURE AT IMPACT AREA: 72° F
TEMPERATURE IN OCCUPANT COMPARTMENT: 70° F
IMPACT VELOCITY: PRIMARY = 29.5 MPH SECONDARY = 29.5 MPH
(SPECIFIED RANGE = 28.9 TO 29.9 MPH)
DISTANCE FROM VEHICLE TO BARRIER: ENTERING VELOCITY TRAP = 26.0 IN.
EXITING VELOCITY TRAP = 2.0 IN.

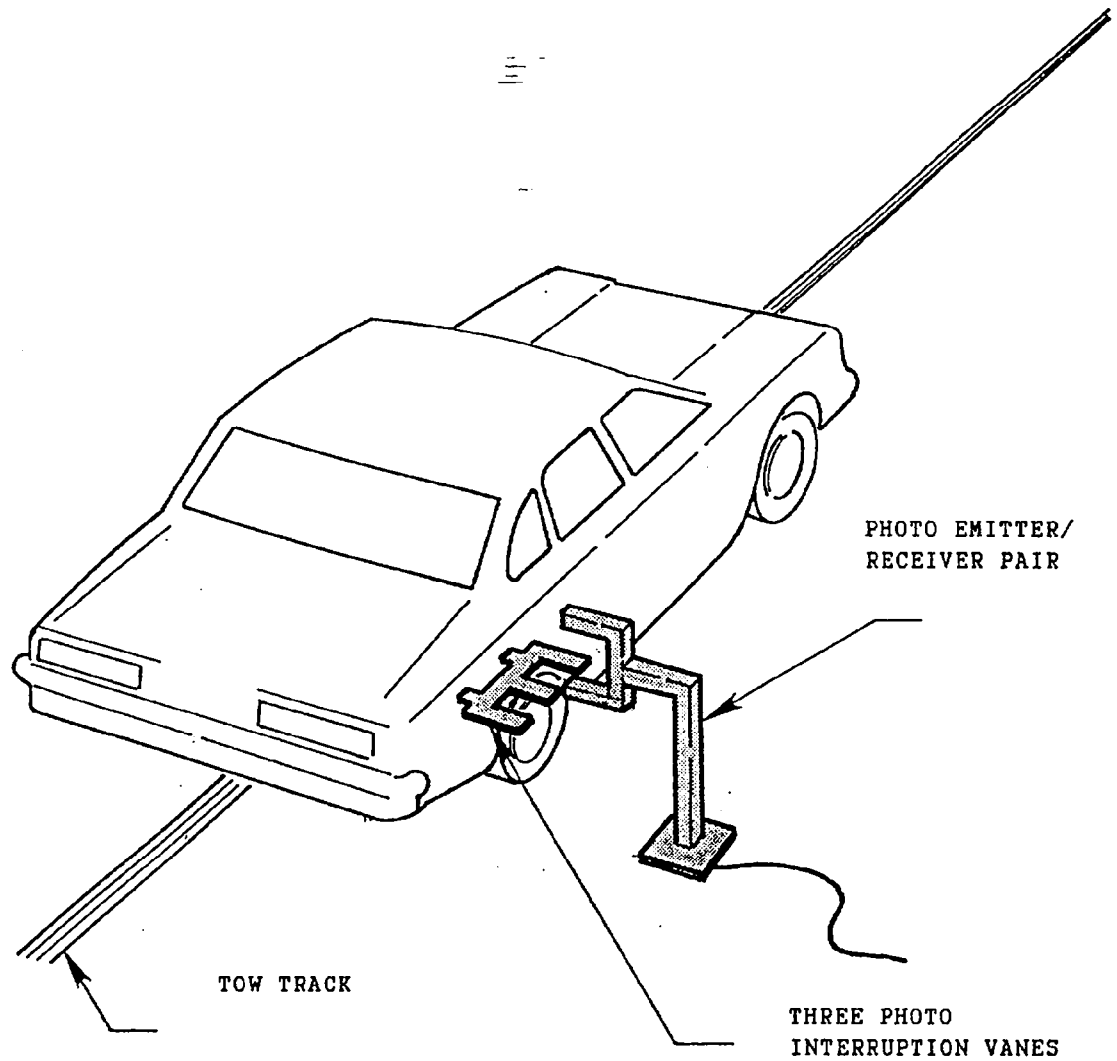
TEST VEHICLE STATIC CRUSH (ALL MEASUREMENTS ARE IN INCHES):

OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: L 159.5; C 165.1; R 159.2
POST-TEST: L 143.2; C 147.2; R 143.2
TOTAL CRUSH: L 16.3; C 17.9; R 16.0
AVERAGE CRUSH: 16.7

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

DISTANCE FROM TEST VEHICLE TO BARRIER: L 16.1; C 12.0; R 17.0; AVG. 15.0

FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



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

The vanes have one foot spacing.

FIGURE 2 ACCIDENT INVESTIGATION DIVISION DATA
FOR 30 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: Hyundai/Scoupe/2-door coupe

VEHICLE NHTSA NO.: CM0504; VIN: KMHVE22JXMU018475

MODEL YEAR: 1991; BUILD DATE: 07/90; TEST DATE: 03/11/91

VEHICLE SIZE CATEGORY: Subcompact; TEST WEIGHT: 2645 LBS.

VEHICLE WHEELBASE: 94.0 INCHES

MAXIMUM WIDTH: 62.2 INCHES

FRONT OVERHANG: 35.4 INCHES

COLLISION DEFORMATION
CLASSIFICATION (CDC) CODE: 12FDEW3

CRUSH DEPTH
MEASUREMENTS:

C1 = 16.3 INCHES

C2 = 17.7 INCHES

C3 = 18.2 INCHES

C4 = 18.1 INCHES

C5 = 17.2 INCHES

C6 = 16.0 INCHES

MIDPOINT OF DAMAGE: D = VEHICLE CENTERLINE
(LONGITUDINAL)

LENGTH OF DAMAGED
REGION: L = 52.0 INCHES

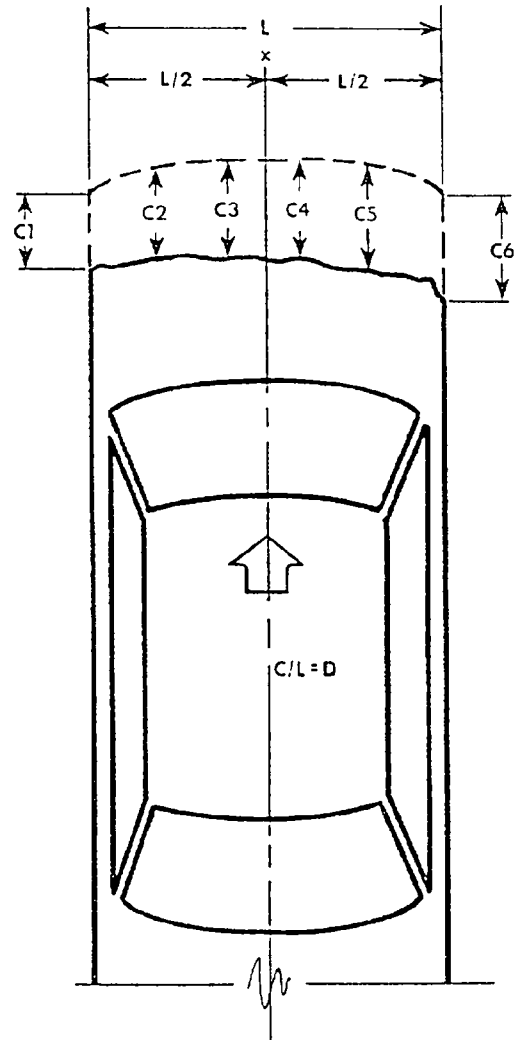
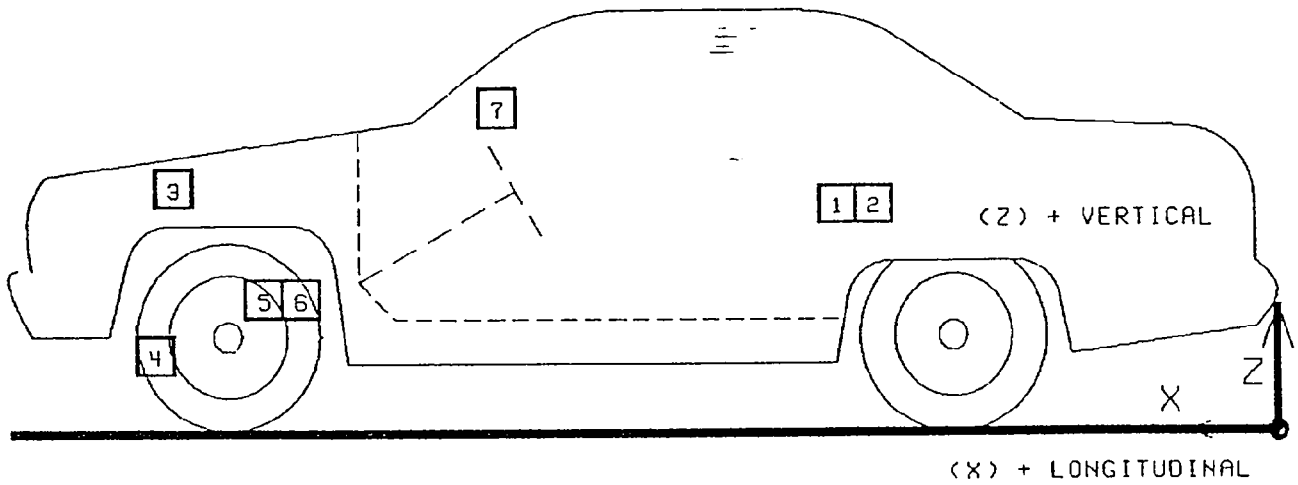
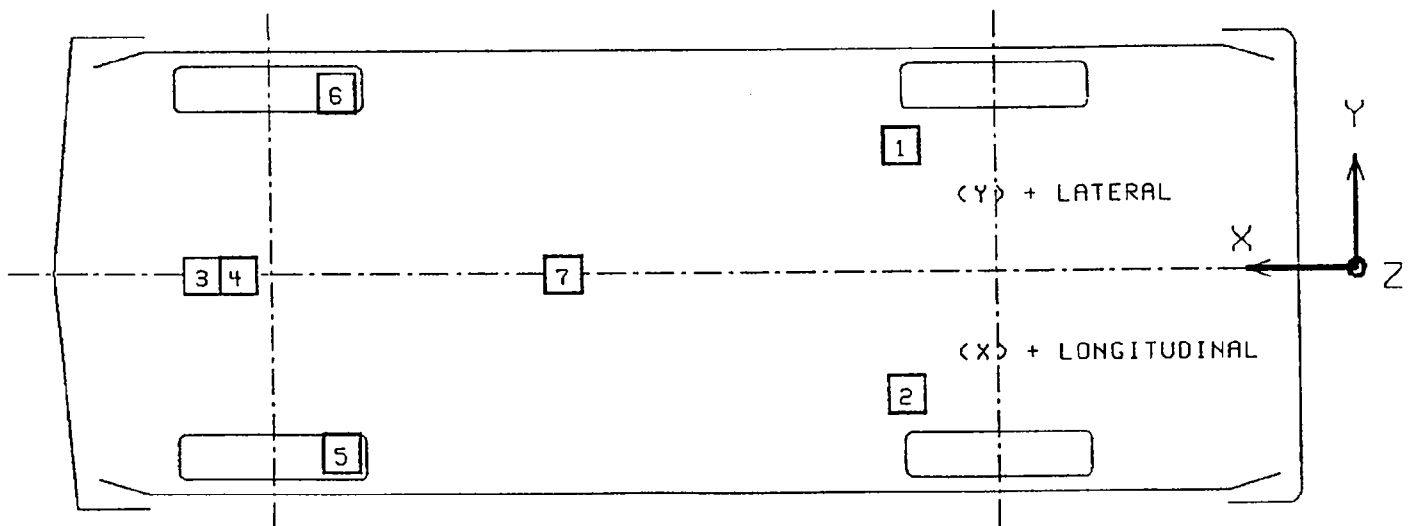


FIGURE 3
VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 4
VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 910311

No.	LOCATION		X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
						MAX G	MSEC	MAX G	MSEC
1	LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE	61.5	15.5	13.8				
		POST	61.5	15.5	14.2				
						4.1	100.4	41.8	58.5
2	RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	PRE	60.1	-15.5	13.5				
		POST	60.1	-15.5	13.5				
						2.8	97.5	37.0	43.9
3	ENGINE TOP LONGITUDINAL	PRE	139.0	6.0	28.2				
		POST	134.8	6.0	27.2				
						32.7	46.5	67.6	29.8
4	ENGINE BOTTOM LONGITUDINAL	PRE	136.5	10.5	6.0				
		POST	128.5	10.5	4.8				
						59.3	42.8	103.6	26.3
5	RIGHT BRAKE CALIPER LONGITUDINAL	PRE	135.0	-23.5	10.2				
		POST	124.8	-25.5	10.0				
						53.2	66.4	103.8	41.8
6	LEFT BRAKE CALIPER LONGITUDINAL	PRE	135.0	23.5	10.2				
		POST	129.8	25.5	10.0				
						34.1	66.4	99.6	47.4
7	INSTRUMENT PANEL CENTER LONGITUDINAL	PRE	107.0	-0.4	36.9				
		POST	105.9	-0.4	41.0				
						30.8	70.6	35.3	48.8

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

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

REPORT OF VEHICLE CONDITION AT THE
COMPLETION OF TESTING

CONTRACT NO.: DTNH22-90-C-21003
FROM: The Transportation Research Center of Ohio
10820 State Route 347
East Liberty, OH 43319

TO: Mr. Glen Brammeier
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.: CM0504
MAKE/MODEL/BODY STYLE: Hyundai/Scoupe/2-door coupe
MODEL YEAR: 1991 BODY COLOR: White
VIN: KMHVE22JXMU018475
ODOMETER (ARRIVAL): 75 DATE: 02/20/91
ODOMETER (COMPLETION): 78 DATE: 03/11/91
COST: \$8,117.00

☐ AIR CONDITIONER	☐ CONSOLE	BRAKES: ☒ POWER
☒ TINTED GLASS	☐ TACHOMETER	FRONT: Disc
☐ POWER STEERING	☐ SPEED CONTROL	REAR: Drum
☐ 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: 4
☐ ROOF RACK	☒ OTHER OPTIONS: <u>Floor mats</u>	

ENGINE: 4 CYLINDERS; 1.5 LITERS
TRANSMISSION: Automatic; DRIVE TYPE: Front wheel
TIRE SIZE: P175/70R13
GASOLINE TYPE: Unleaded

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

EXPLANATION: NA

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

SECTION 3.0

FMVSS 208, 212, 219 (partial), & 301 DATA

TABLE 5 DUMMY INJURY CRITERIA

MAXIMUM ACCELERATION (G)

	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DRIVER	250.2	238.6	-286.5	438.8	-41.1	9.9	12.5	41.1
PASSENGER	88.9	-416.3	-194.4	456.1	-41.1	-10.0	16.1	40.2

MAXIMUM FEMUR COMPRESSIVE FORCE (LBS)

	LEFT FEMUR	RIGHT FEMUR
DRIVER	1413	676
PASSENGER	1033	1126

HEAD INJURY CRITERIA**

	HIC	TIME t_1 (MSEC) ¹	TIME t_2 (MSEC) ²
DRIVER	1661	199.0	199.8
PASSENGER	1604	198.9	199.6

*Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

TABLE 6 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #353 Chest, passenger's head and right side of driver's head restraint	PASSENGER #354 Chest & driver's head
HEAD	<u>Chest, passenger's head and right side of driver's head restraint</u>	<u>Chest & driver's head</u>
CHEST	<u>None</u>	<u>None</u>
ABDOMEN	<u>None</u>	<u>None</u>
LEFT KNEE	<u>Instrument panel</u>	<u>Instrument panel</u>
RIGHT KNEE	<u>Instrument panel</u>	<u>Instrument panel</u>

DOOR OPENING:

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

SEAT MOVEMENT:

	SEAT BACK FAILURE Passenger's rotated fully back	SEAT SHIFT
FRONT	<u>Passenger's rotated fully back</u>	<u>None</u>
REAR	<u>NA</u>	<u>NA</u>

GLAZING DAMAGE:

The entire windshield was cracked upon impact.

OTHER NOTABLE IMPACT EFFECTS:

The glove box door opened during the impact.

DUMMY KINEMATIC SUMMARY

Driver Dummy

Upon impact, the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated forward contacting the dummy's chest as the dummy's chest was restrained by the two-point passive belt. The dummy's head rotated rearward as the dummy rebounded rearward and rightward into the right portion of the seat back. The dummy's head and right shoulder impacted the passenger's head and left shoulder. The driver's head contacted the right side of the driver's head restraint. The dummy came to rest seated in the driver's seat, leaning to the right against the right portion of the seat back, restrained by the two-point passive belt.

Right Front Passenger Dummy

Upon impact, the right front passenger dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated forward, impacting the dummy's chest, as the dummy's chest was restrained by the two-point passive belt. The dummy's head rotated rearward, as the dummy rebounded rearward and leftward into the left portion of the seat back. The dummy's head and left shoulder contacted the driver's head and right shoulder. The dummy then continued to rotate rearward as the passenger's seat back rotated fully rearward. The right front passenger dummy came to rest lying on the fully-reclined passenger's seat back.

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

MAKE/MODEL: Hyundai/Scoupe

VIN: KMHVE22JXMU018475

BODY STYLE: 2-door coupe

NHTSA NO.: CM0504

DATE OF MANUFACTURE: 07/90

CONVENIENCE HOOKS:

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

☐ The vehicle's drivetrain is engaged

☐ The vehicle's parking brake is in the released mode

☒ Not applicable, the vehicle's restraint system does not include convenience hooks or devices to stow seat belt webbing.

WEBBING TENSION - RELIEVING DEVICE:

DO OUTBOARD SEATING POSITION SEAT BELTS HAVE WEBBING TENSION - RELIEVING DEVICES? No

BELT CONTACT FORCE:

BELT CONTACT FORCE ON CHEST OF TEST DUMMY: .1 POUNDS

TABLE 8 FMVSS 208 SEAT BELT WARNING SYSTEM DATA

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

Duration of audible warning signal = 6 sec.

Duration of reminder light operation = 6 sec.

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

Duration of audible warning signal = 0 sec.

(NOTE: audible warning should not operate)

Duration of reminder light operation = 6 sec.

WORDING OF VISUAL WARNING:

Fasten Seat Belt

Fasten Belt

Symbol 101-80 X

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:

 X NOT APPLICABLE, VEHICLE DID NOT C ONTAIN 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.

X NOT APPLICABLE, VEHICLE DID NOT ^{CONTAIN} A CRASH-DEPLOYED OCCUPANT PROTECTION SYSTEM.

FIGURE 4 FMVSS 212 TEST DATA

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

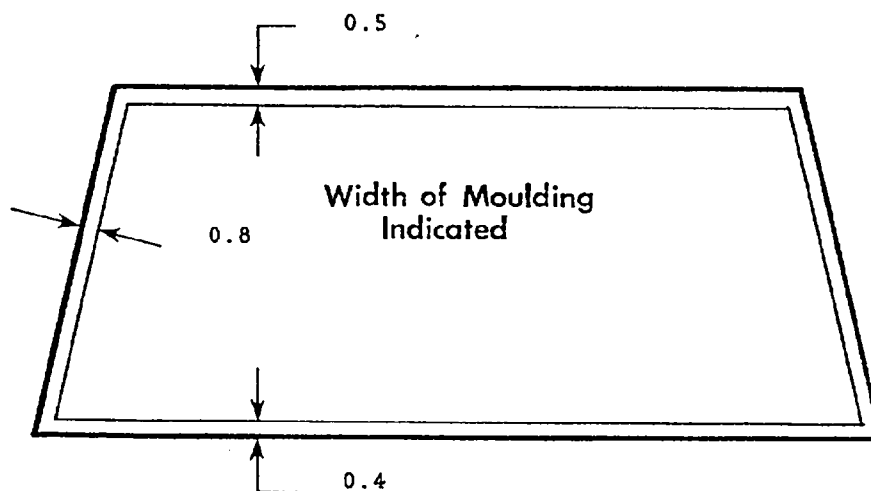
Plastic trim around outer perimeter, adhesive around inner perimeter.

FMVSS 212 REQUIREMENTS: The post-test periphery retention amount must be at least 75% of the pre-test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

WINDSHIELD PERIPHERY MEASUREMENTS:

	PRE-TEST	POST-TEST	PERCENT RETENTION
RIGHT SIDE	76.5	76.5	100%
LEFT SIDE	76.5	76.5	100%
TOTAL	153.0	153.0	100%

PRE-TEST WINDSHIELD MOUNTING MATERIAL TEMPERATURE: 70° F



FRONT VIEW OF WINDSHIELD*

LOSS OF WINDSHIELD RETENTION LENGTHS: None

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

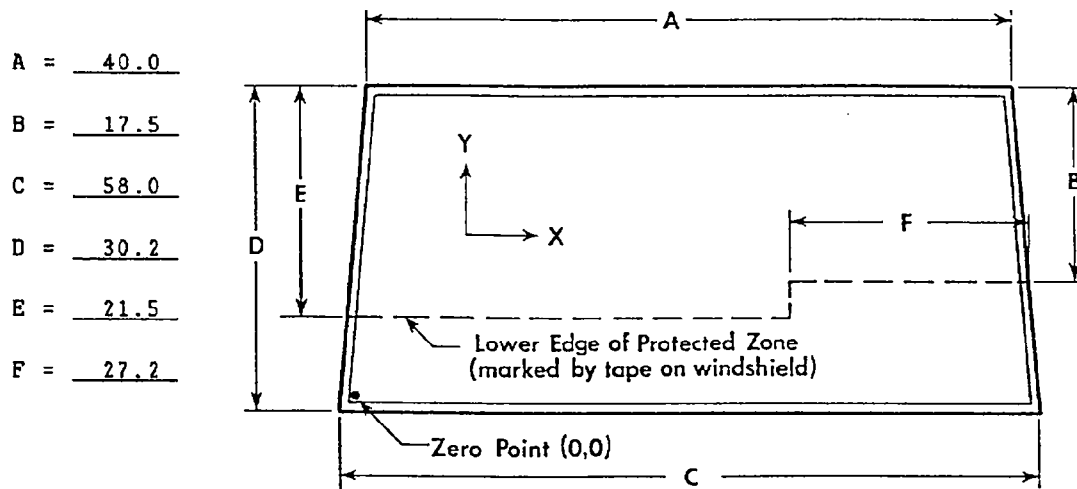
*INDICATE AREAS OF LOSS OF RETENTION, IF ANY, ON WINDSHIELD DIAGRAM.

FIGURE 5 FMVSS 219 TEST DATA

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5 inch diameter rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. Draw the locus of points on the inner surface of the windshield contactable by the sphere across the width of the instrument panel. From the outermost contactable points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and 0.5 inch from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection onto the outer surface of the windshield of this line.

WINDSHIELD MEASUREMENTS:



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: Hyundai/Scoupe

NHTSA NO.: CM0504

FUEL SYSTEM CAPACITY: 11.9 GALLONS (FROM OWNER'S MANUAL)

USABLE CAPACITY: 11.9 GALLONS (FURNISHED BY COTR)

TEST VOLUME RANGE: 10.9 GALLONS TO 11.2 GALLONS (92-94% OF USABLE)

ACTUAL TEST VOLUME: 11.1 GALLONS (WITH ENTIRE FUEL SYSTEM FILLED)

TEST FLUID TYPE: STODDARD SOLVENT

SPECIFIC GRAVITY: 0.764

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

TEST FLUID COLOR: PURPLE

DETAILS OF FUEL SYSTEM: The fuel tank was located behind the rear axle.

The fuel filler neck was located on the left side. The fuel lines ran
along the left frame rail to the front.

ELECTRIC FUEL PUMP: No

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.: CM0504; TEST DATE: 03/11/91
VEHICLE MAKE/MODEL/BODY STYLE: Hyundai/Scoupe/2-door coupe

TEST REQUIREMENTS:

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

TEST VEHICLE IMPACT TYPE:

- ☒ FRONTAL (30 MPH)
☐ OBLIQUE (30 MPH) WITH ° BARRIER FACE
FIRST CONTACTING (DRIVER/PASS.) SIDE.
☐ REAR MOVING BARRIER (30 MPH)
☐ LATERAL MOVING BARRIER (20 MPH)

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

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

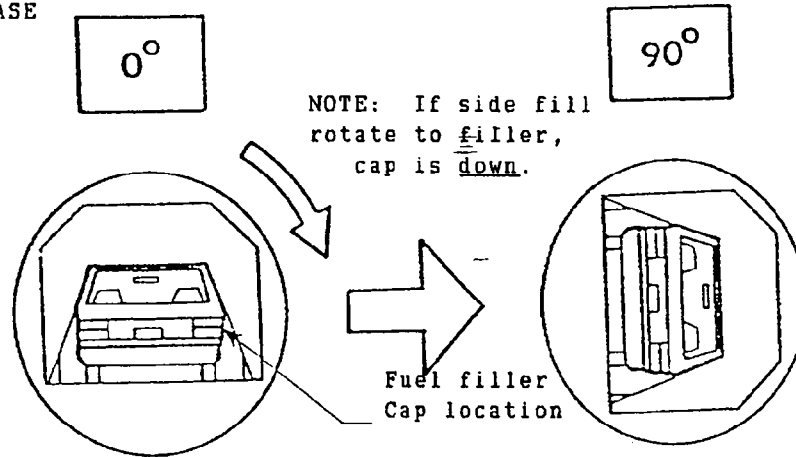
FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 6 FMVSS 301 STATIC ROLLOVER TEST DATA

NHTSA NO.: CM0504

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.

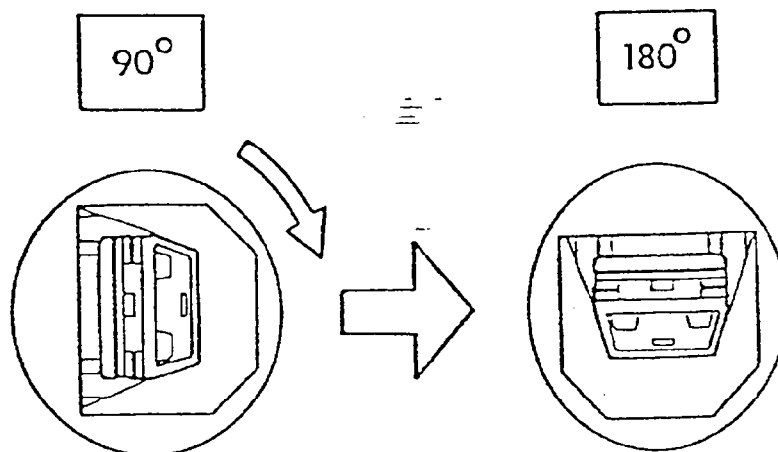
FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CM0504

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:

90° TO 180° ROTATION	TEST RESULTS	MAXIMUM ALLOWABLE
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.

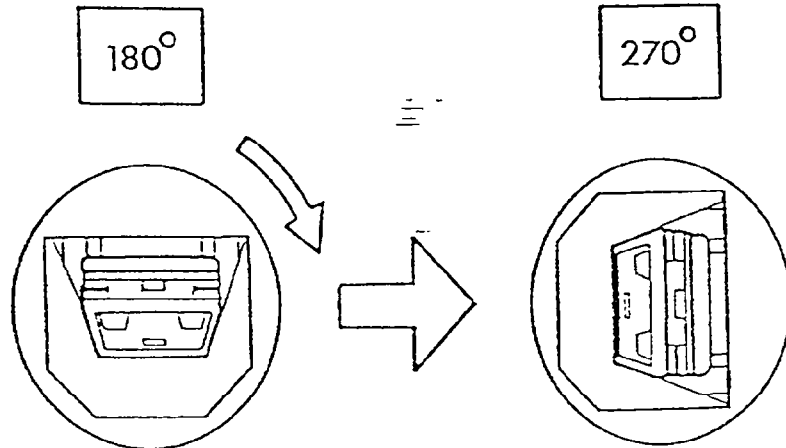
FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CM0504

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.

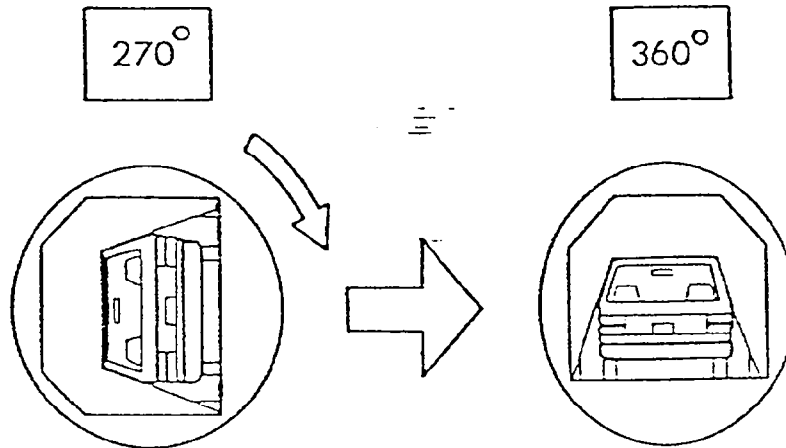
FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

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

NHTSA NO.: CM0504

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

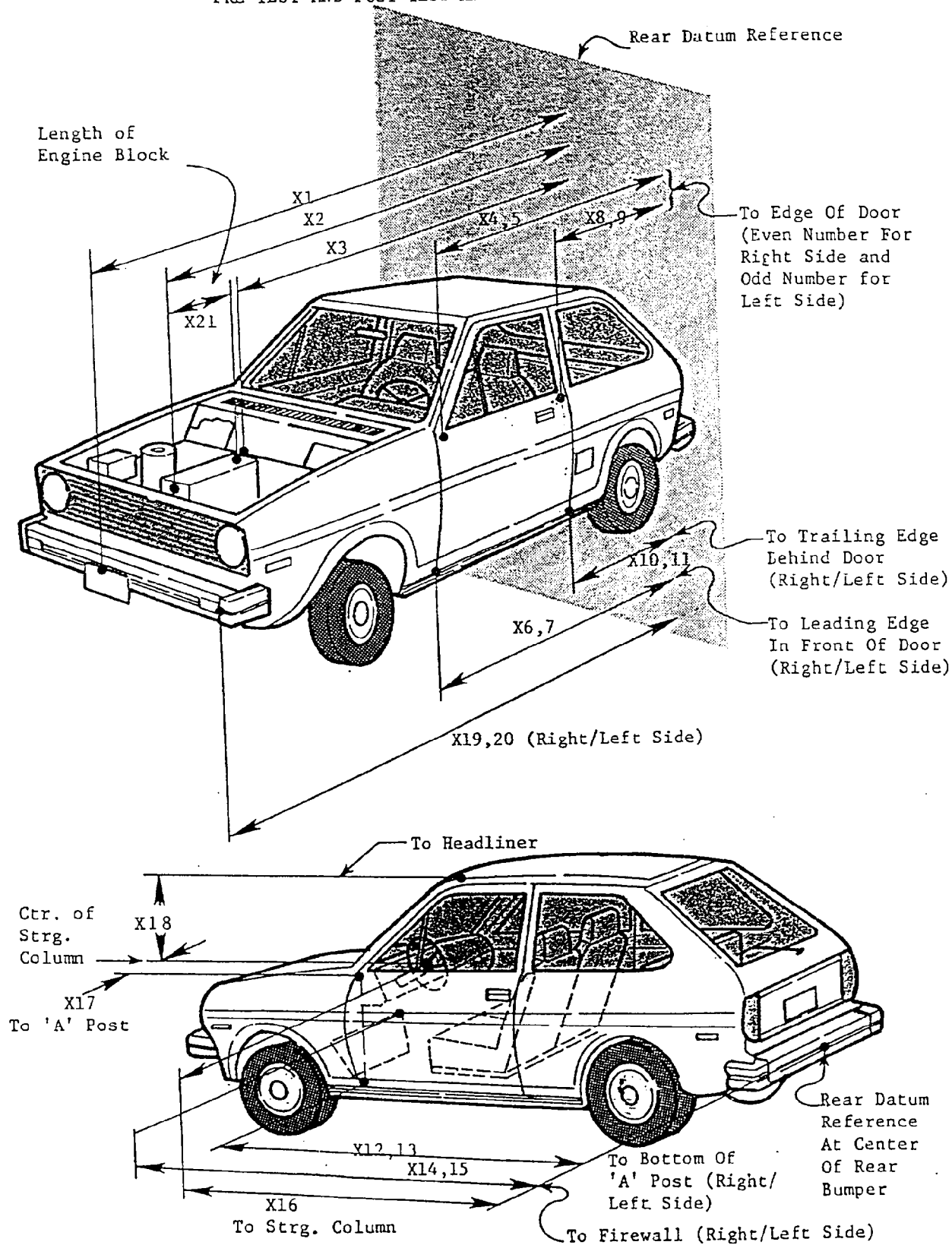
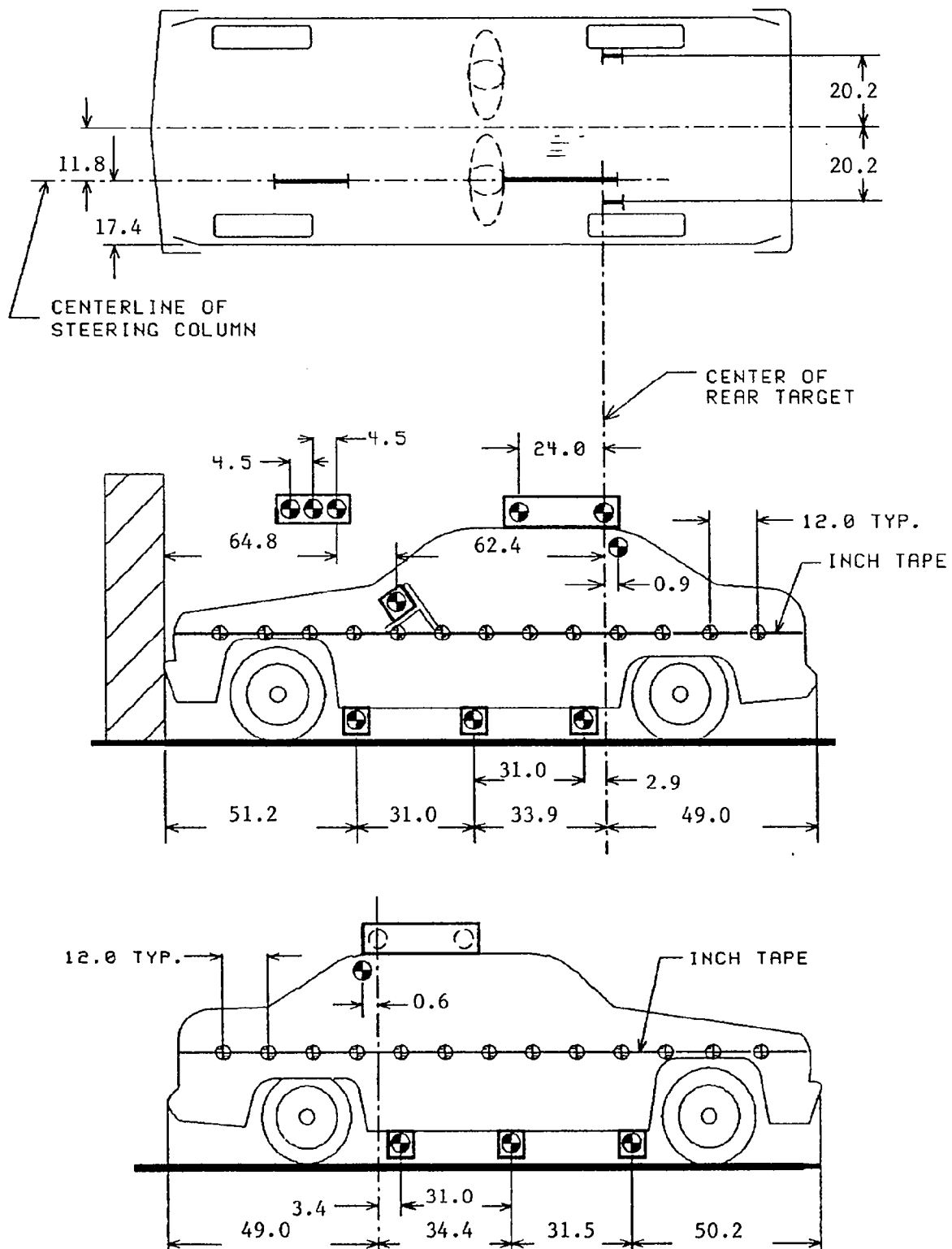


TABLE 13 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Hyundai/Scoupe		TEST NUMBER: 910311		ALL MEASUREMENTS ARE IN INCHES		
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.		
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	165.1	147.2	17.9		
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	143.1	137.8	5.3		
X3	REAR SURFACE OF VEHICLE TO FIREWALL	123.6	128.0	-4.4		
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	112.8	111.9	0.9		
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	112.8	112.2	0.6		
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	111.2	111.5	-0.3		
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	111.2	111.8	-0.6		
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	63.4	62.4	1.0		
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	63.4	62.6	0.8		
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	64.4	64.0	0.4		
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	64.5	64.0	0.5		
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	111.6	111.1	0.5		
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	111.5	111.2	0.3		
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	123.6	118.8	4.8		
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	123.5	122.2	1.3		
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	96.5	92.2	4.3		
X17	CENTER OF STEERING COLUMN TO "A" POST	13.8	11.5	2.3		
X18	CENTER OF STEERING COLUMN TO HEADLINER	18.6	15.8	2.8		
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	159.2	143.2	16.0		
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	159.5	143.2	16.3		
X21	LENGTH OF ENGINE BLOCK	15.5	15.5	0.0		

FIGURE 8
VEHICLE TARGET LOCATIONS



ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 9 DUMMY AND SEAT POSITIONING DATA

PRE-IMPACT DATA:

MAKE/MODEL: Hyundai/Scoupe
 BODY STYLE: 2-door coupe MODEL YEAR: 1991
 NHTSA NO.: CM0504 COLOR: White

DATA FROM CERTIFICATION LABEL:

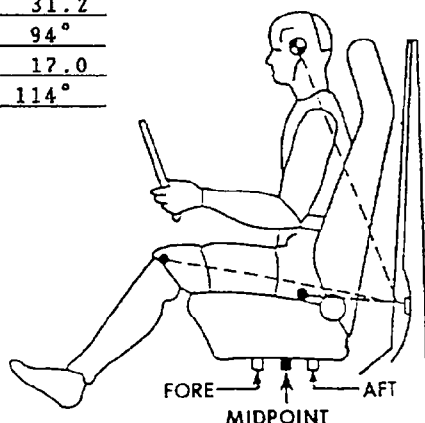
VEHICLE MANUFACTURER: Hyundai Motor Company
 DATE OF MANUFACTURE: 07/90 VIN: KMHVE22JXMU018475
 GVWR: 3175 LBS.; GAWR: FRONT = 1720 LBS.; REAR = 1545 LBS.

POST-IMPACT DATA:

DATE OF TEST: 03/11/91 TIME: 1055 TEMPERATURE: 72° F
 IMPACT VELOCITY: PRIMARY = 29.5 MPH SECONDARY = 29.5 MPH
 REQUIRED IMPACT VELOCITY RANGE: 28.9 TO 29.9 MPH
 SEAT TYPE: Bucket ADJUSTER TYPE: Manual
 FRONT SEAT BACK TYPE: Manual adjustable
 TECHNICIANS: B. Fishbaugh, B. Miller, P. Cummins

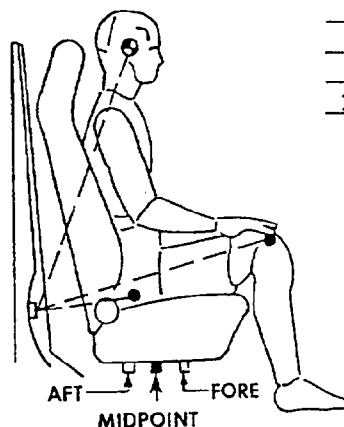
DRIVER DUMMY # 353 TYPE: HII

HEAD 19.4
 TARGET 17°
 KNEE 31.2
 JOINT 94°
 APPROX- 17.0
 IMATE 114°
 "H"
 POINT



PASSENGER DUMMY # 354 TYPE: HII

HEAD 19.2
 TARGET 16°
 KNEE 31.4
 JOINT 95°
 APPROX- 17.0
 IMATE 111°
 "H"
 POINT



A = 48.4
 B = 37.0
 C = 24.2
 D = 11.5
 E = 11.4

DOOR GLASS
 HEIGHT = 9.1

LATERAL BAR

ADJUSTABLE
 POINTER

LEFT
 FRONT
 DOOR

DRIVER
 DUMMY

PASSENGER
 DUMMY

DOOR GLASS
 HEIGHT = 9.1

RIGHT
 FRONT
 DOOR

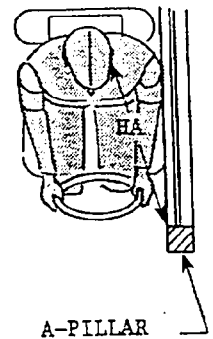
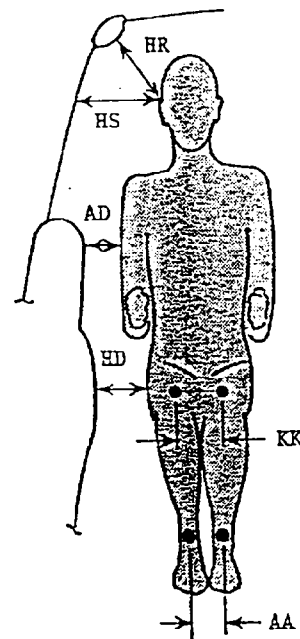
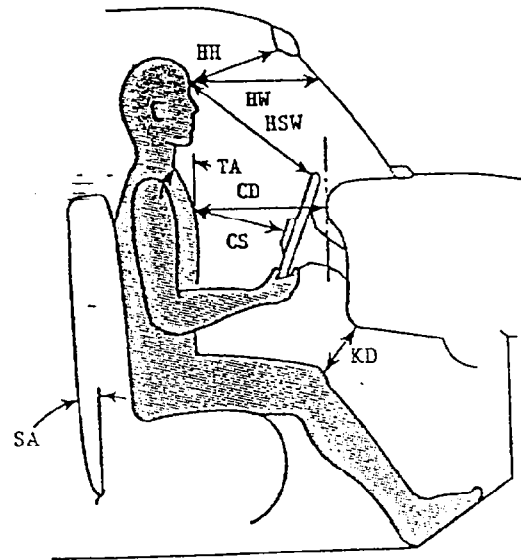
ALL ANGLES ARE RELATIVE TO VERTICAL PLANE THROUGH DOOR STRIKER.
 ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 10 DUMMY IN VEHICLE POSITIONING DATA

	DRIVER	PASSENGER
HH	17.0	16.5
HW	24.8	22.3
CD	24.7	27.0
CS	17.2	NA
KDL	7.8	8.2
KDR	7.5	8.1
TA	30°	30°
SA	19°	19°
HSW	26.0	NA

	DRIVER	PASSENGER
HR	6.1	5.6
HS	8.1	8.2
AD	4.4	3.9
HD	5.8	6.0
KK	10.2	7.9
AA	12.0	7.2
HA	17.8	18.6

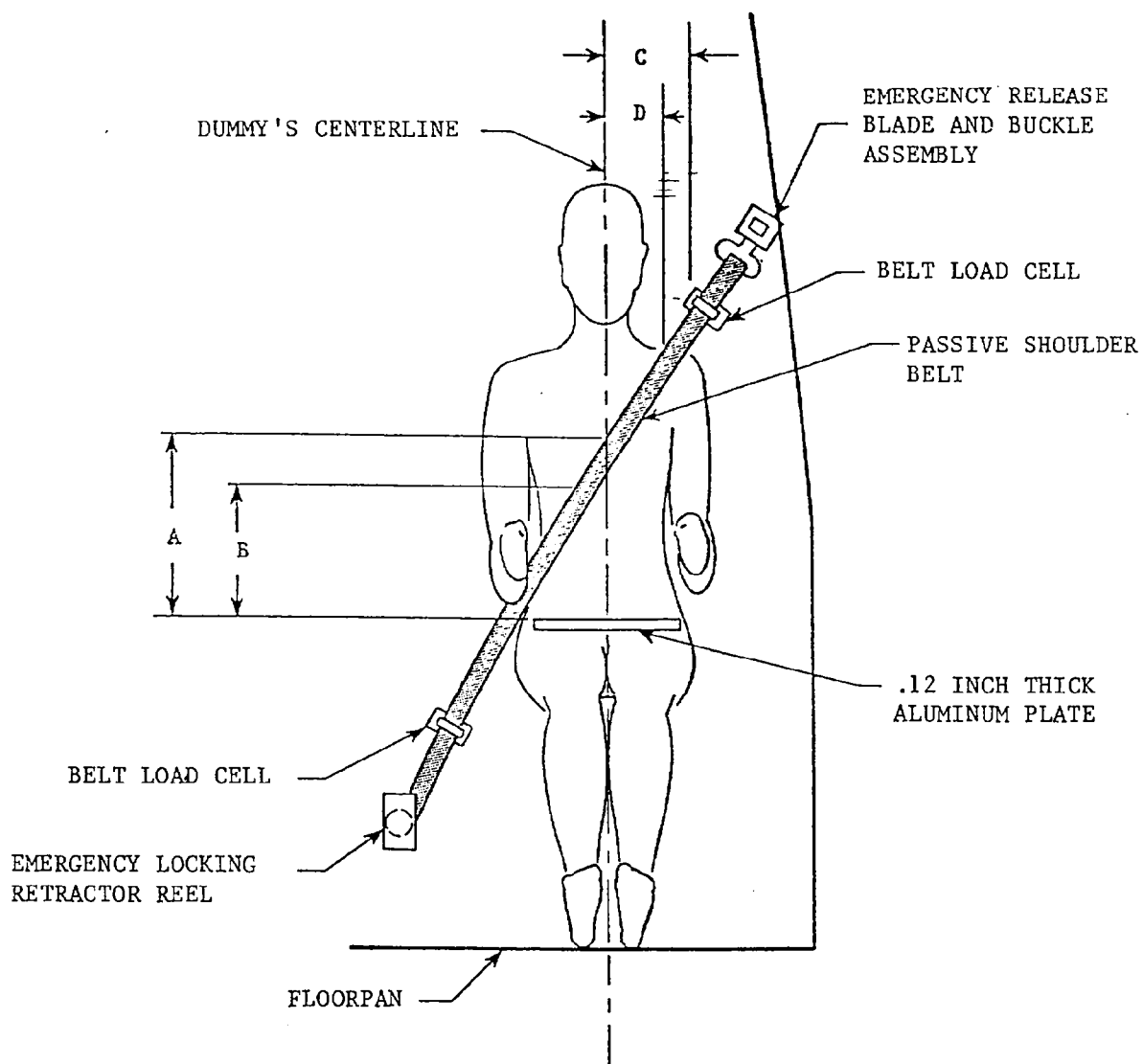
KNEE OUTER BOLT HEAD TO OUTER
BOLT HEAD SPACING:
DRIVER = 14.5
PASSENGER = 11.8



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

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

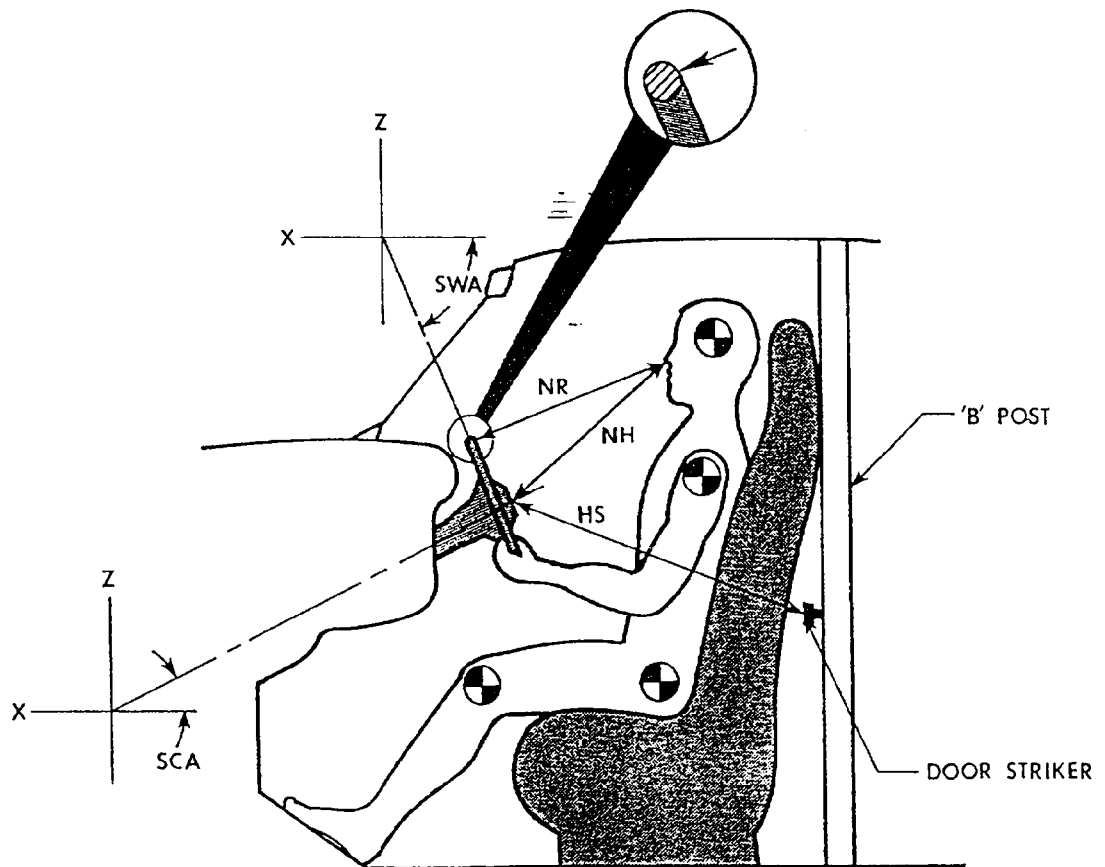
FIGURE 11 SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	14.0	13.8
B - Top surface of alum. plate to belt lower edge (in)	11.0	10.8
C - Dummy centerline to outer edge of belt at chest flesh top (in)	6.8	6.8
D - Dummy centerline to inner edge of belt at chest flesh top (in)	4.0	4.0

ALL MEASUREMENTS ARE IN INCHES.

FIGURE 12 DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY DATA



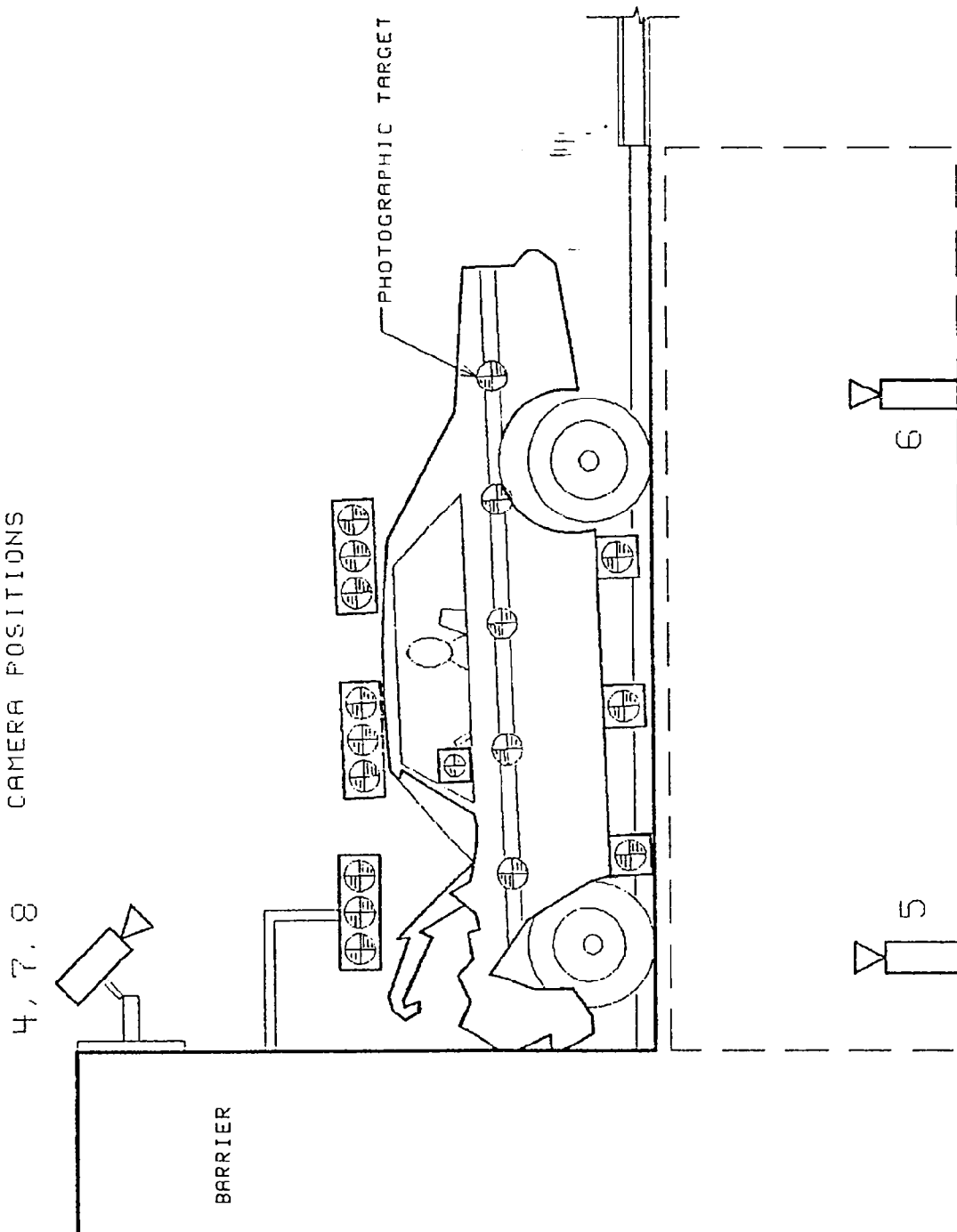
POSITION OF STEERING COLUMN TILTING AND TELESCOPING ADJUSTMENTS, IF ANY:
The steering column was not adjustable.

MEASUREMENTS

NR	- DISTANCE FROM TIP OF DUMMY'S NOSE TO TOP REAR SURFACE OF STEERING WHEEL RIM.	23.5
NH	- DISTANCE FROM TIP OF DUMMY'S NOSE TO CENTER OF STEERING COLUMN HUB.	23.6
HS	- DISTANCE FROM CENTER OF STEERING COLUMN HUB TO THE FORWARD SURFACE OF THE DOOR LOCK STRIKER PIN.	30.6
SCA	- ANGLE OF STEERING COLUMN RELATIVE TO THE HORIZONTAL X AXIS	25°
SWA	- ANGLE OF STEERING WHEEL RELATIVE TO THE HORIZONTAL X AXIS	65°

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

FIGURE 13
CAMERA POSITIONS



CAMERA POSITIONS, CONTINUED

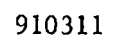


TABLE 14 MOTION PICTURE CAMERA LOCATIONS

TEST NO.: 910311		VEHICLE: Hyundai Scoupe 2-door coupe						
CAMERA NO.	VIEW	CAMERA POSITIONS (IN)*			ANGLE** (DEG)	FILM PLANE		FILM SPEED (FPS)
		X	Y	Z		TO HEAD TARGET(IN)	LENS (MM)	
1	Real-time panning	-142.0	-504.0	61.0	NA	NA	16	24
2	Right overall	-81.3	-266.4	37.1	-2	NA	13	493
3	Left vehicle crush	-41.5	295.0	44.0	-4	234.0	25	508
4	Windshield front view	-6.0	0.0		-40	NA	13	500
5	Pit front position	-50.5	0.0	-92.4	90	NA	13	998
6	Pit rear position	-99.3	0.0	-99.0	90	NA	13	1000
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	500
9	Driver kinematics	-157.3	116.0	87.0	-27	103.0	25	500
10	Passenger kinematics	-152.1	-116.0	87.0	-26	94.0	25	500
11	Right windshield intrusion	-38.1	-306.1	44.0	0	NA	50	502
12	Left windshield intrusion	-53.0	309.4	42.3	0	NA	50	500
13	Steering column motion	-120.0	262.0	103.0	-14	NA	25	498
14	Steering column motion	-120.0	262.0	75.1	-9	NA	25	500
15	Passenger kinematics	-38.8	-293.0	45.3	-4	229.0	25	498
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

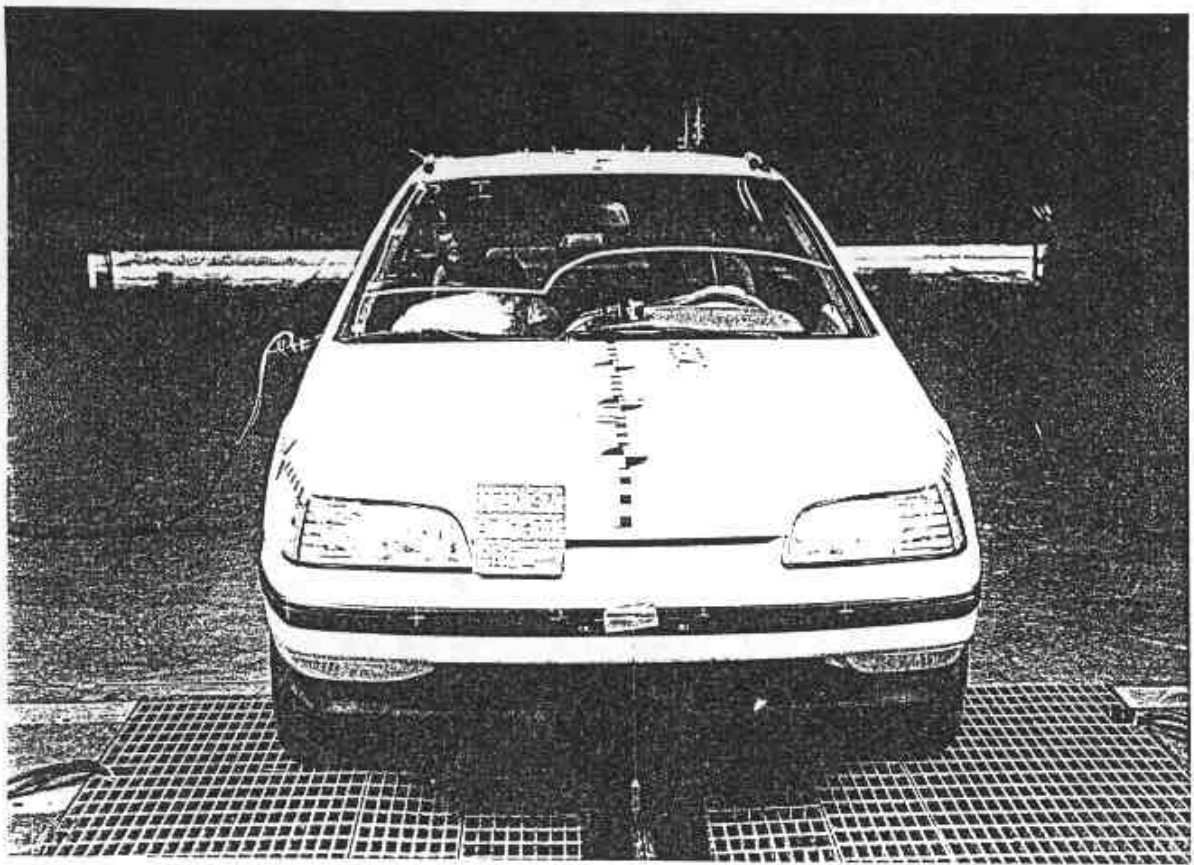


Figure A-1. PRE-TEST FRONT VIEW



Figure A-2. POST-TEST FRONT VIEW

A-2

910311

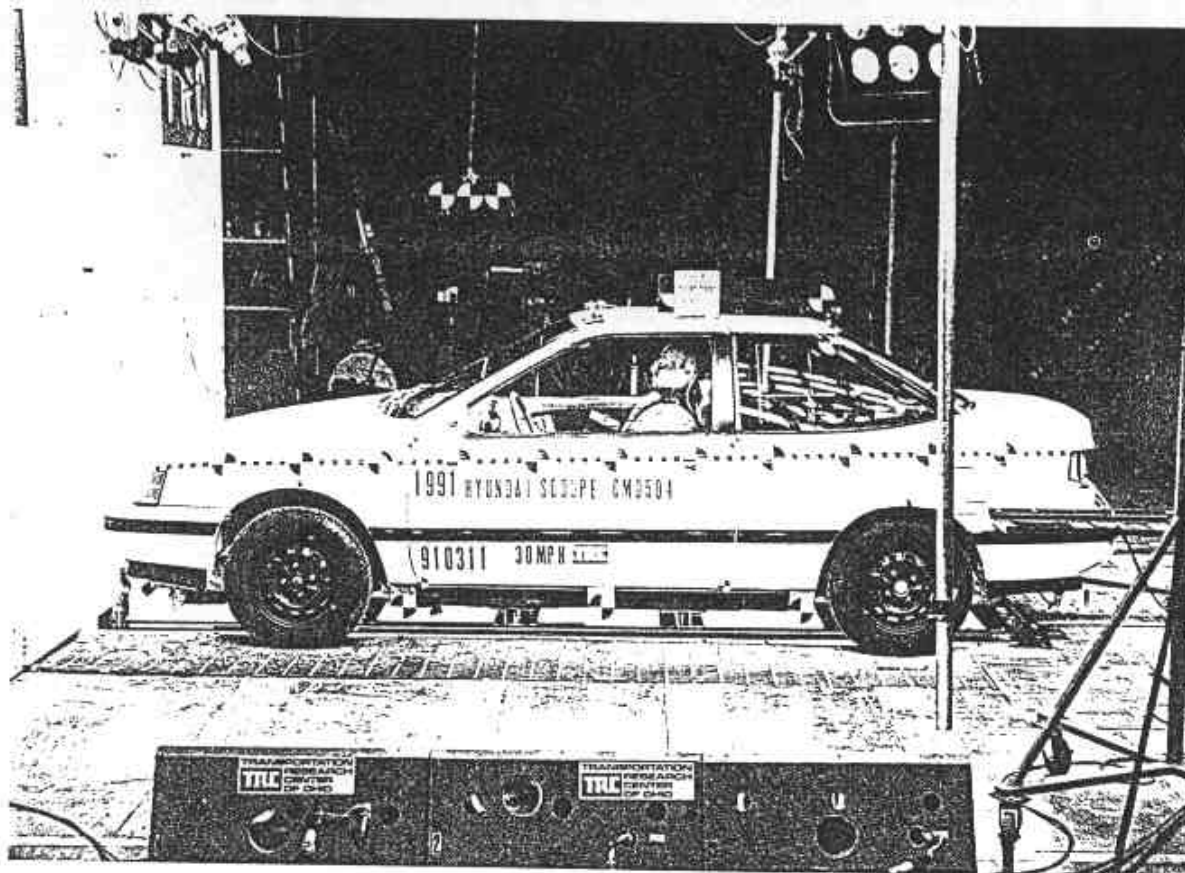


Figure A-3. PRE-TEST LEFT SIDE VIEW

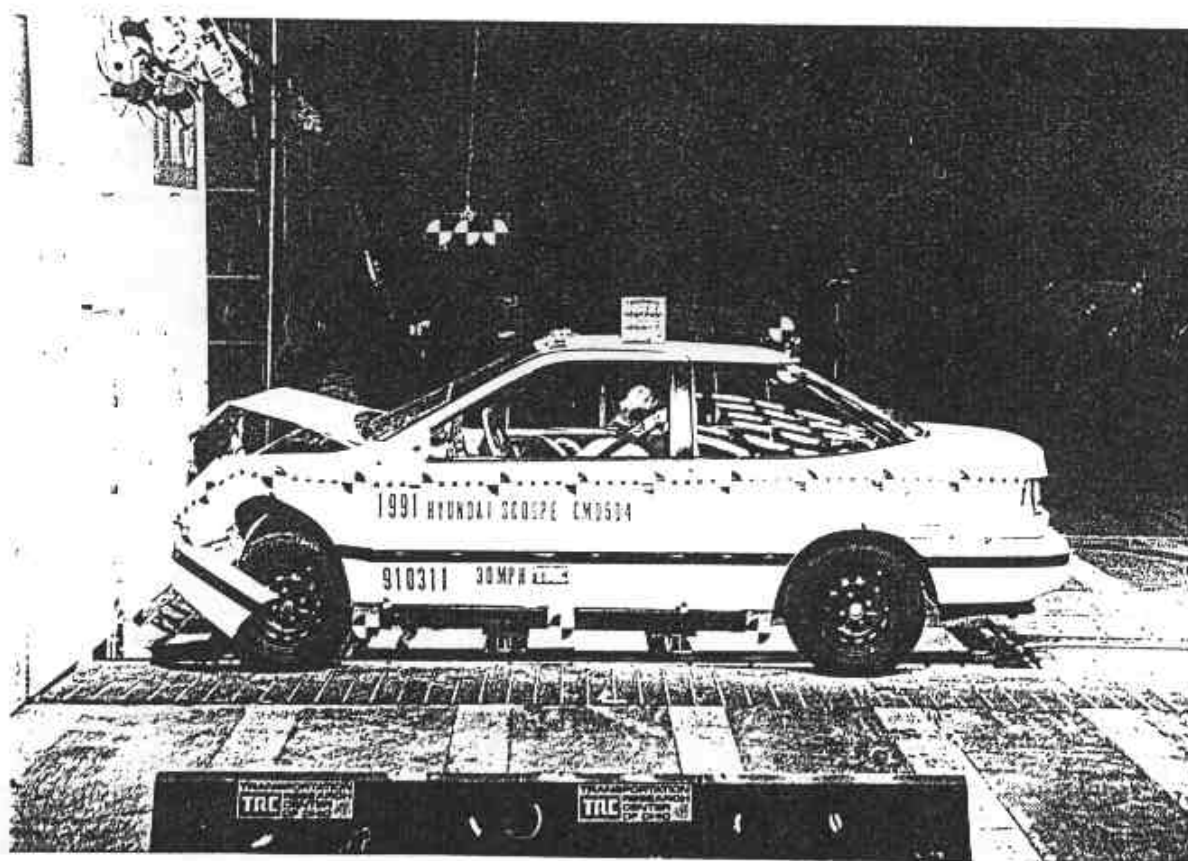


Figure A-4. POST-TEST LEFT SIDE VIEW

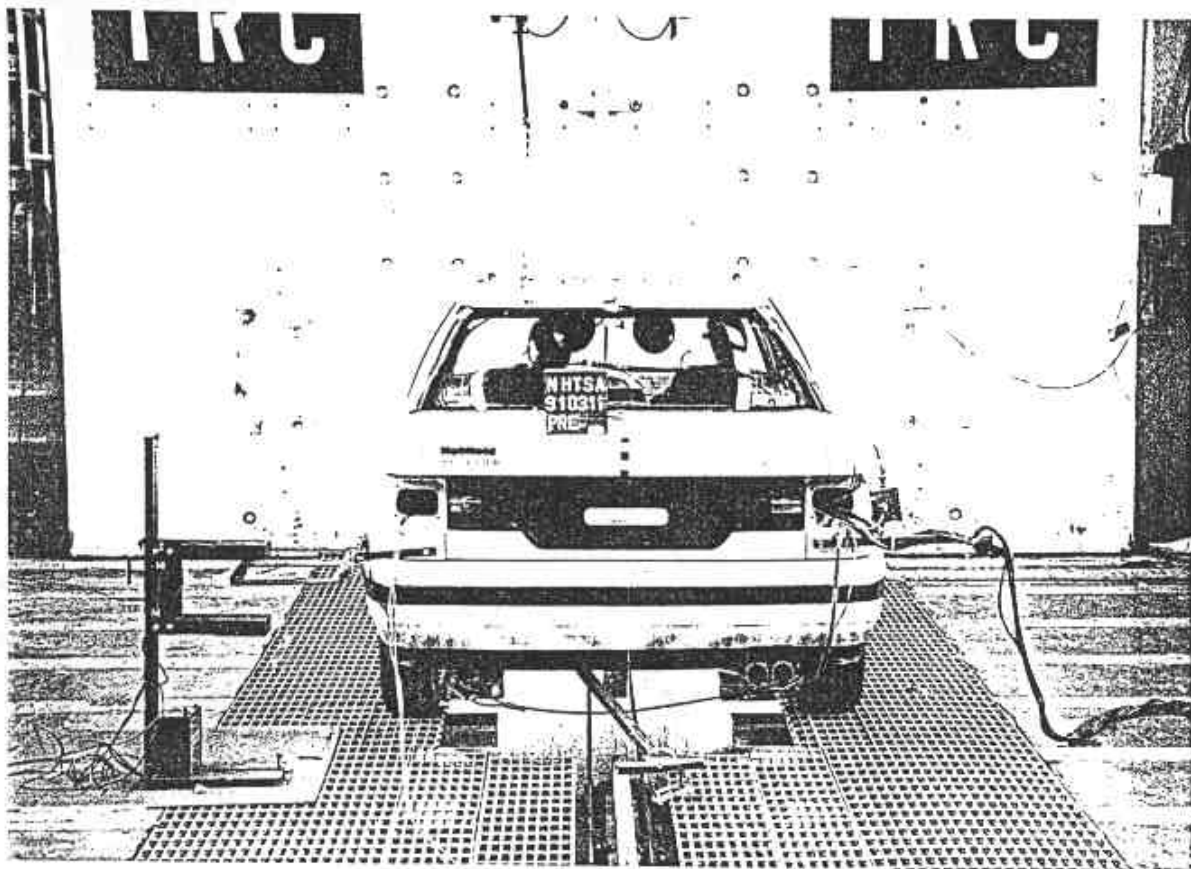


Figure A-5. PRE-TEST REAR VIEW

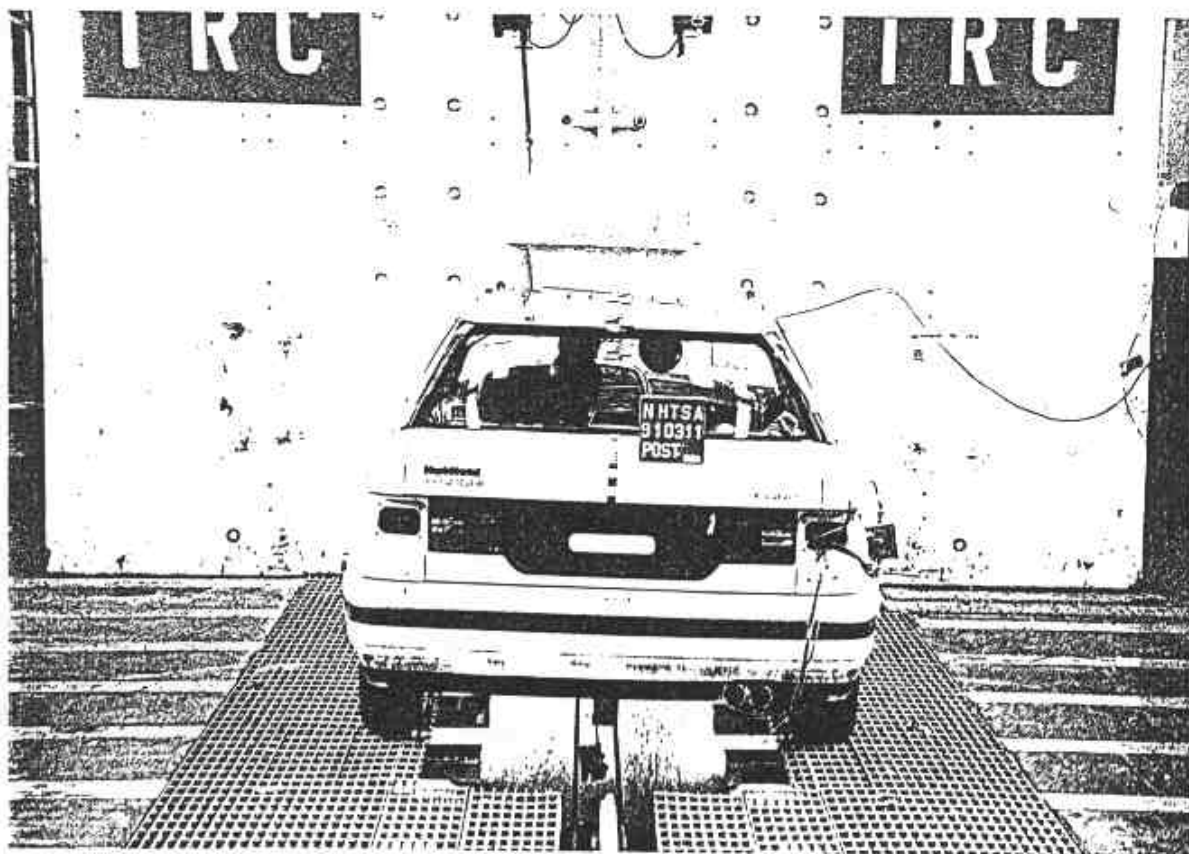


Figure A-6. POST-TEST REAR VIEW

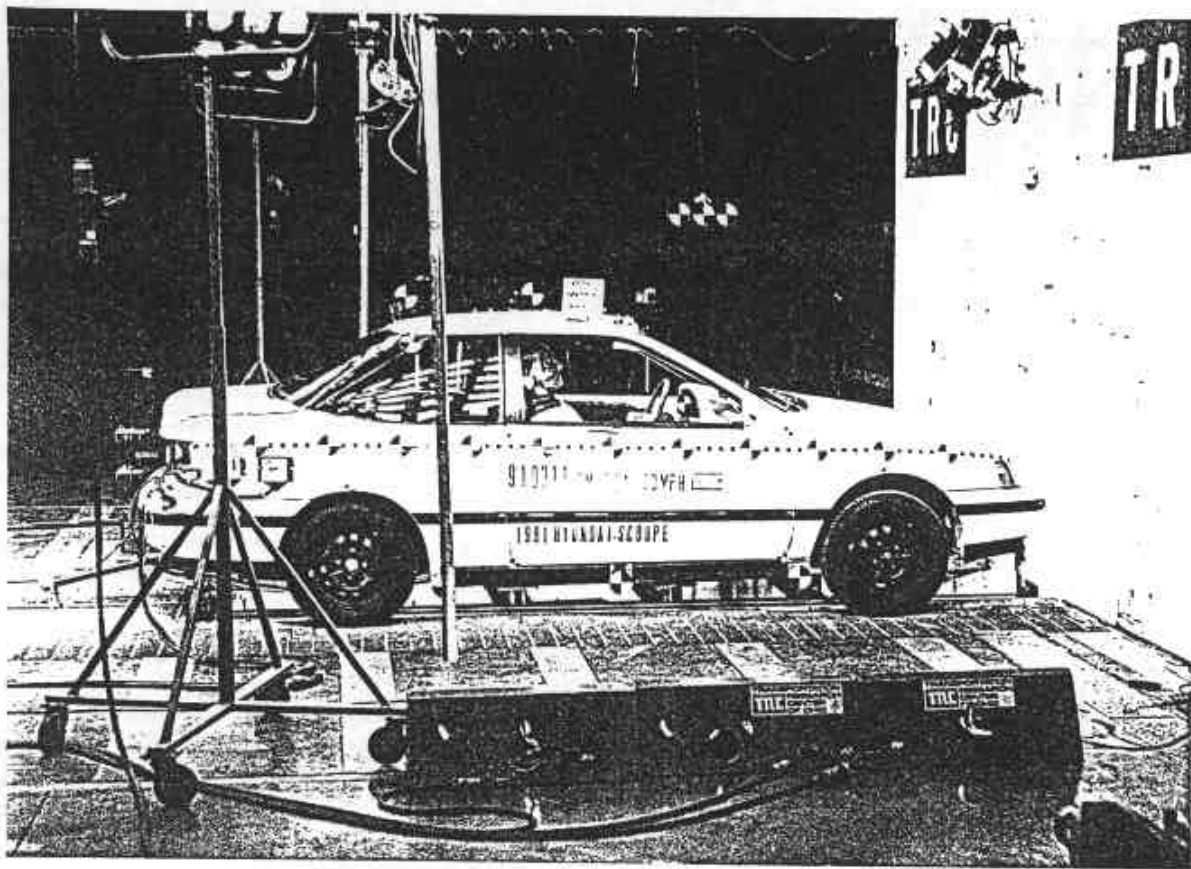


Figure A-7. PRE-TEST RIGHT SIDE VIEW

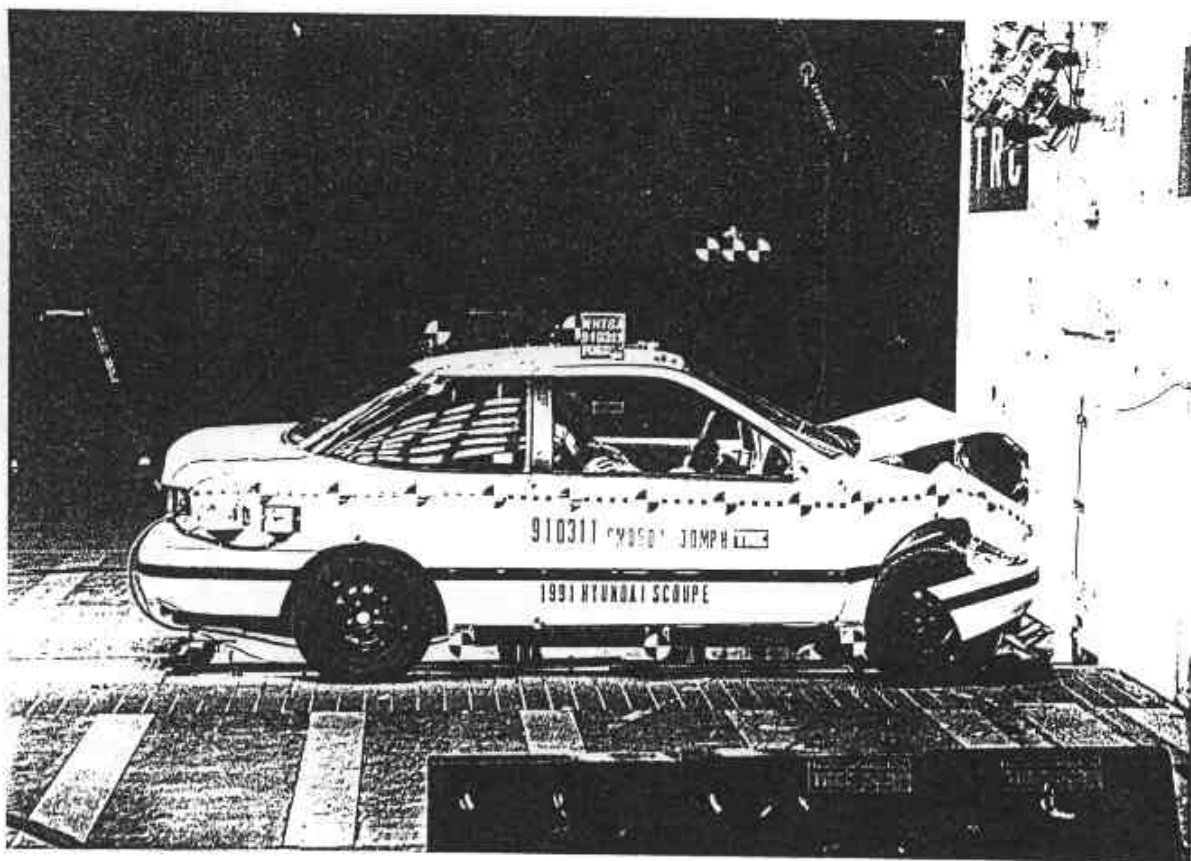


Figure A-8. POST-TEST RIGHT SIDE VIEW

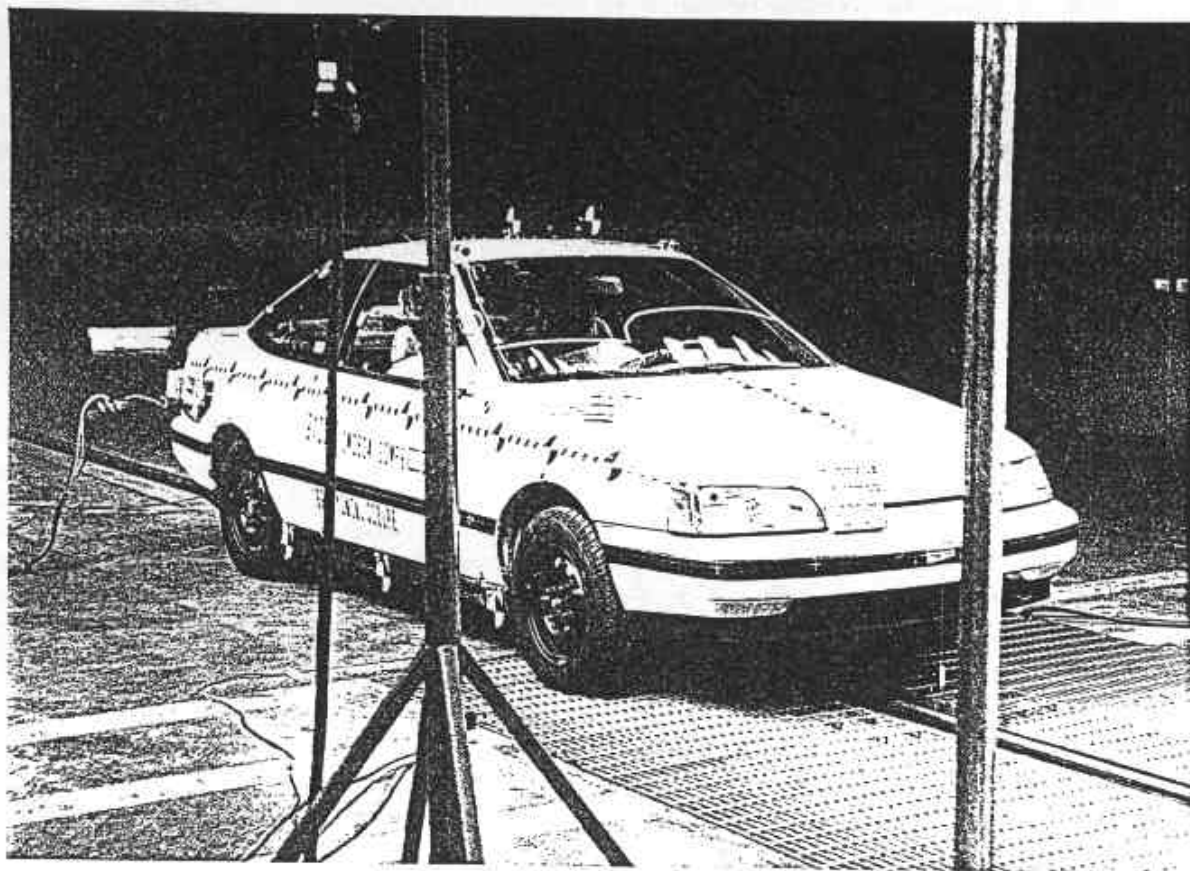


Figure A-9. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

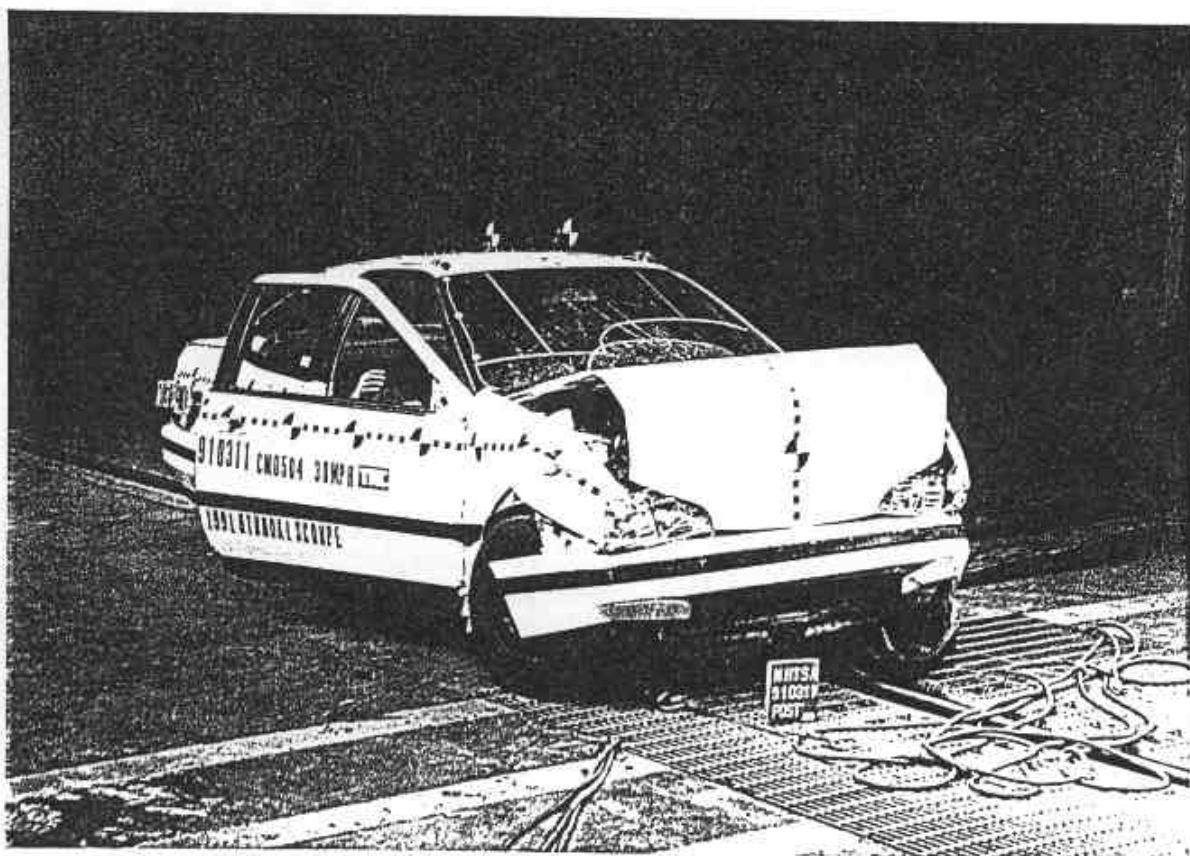


Figure A-10. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

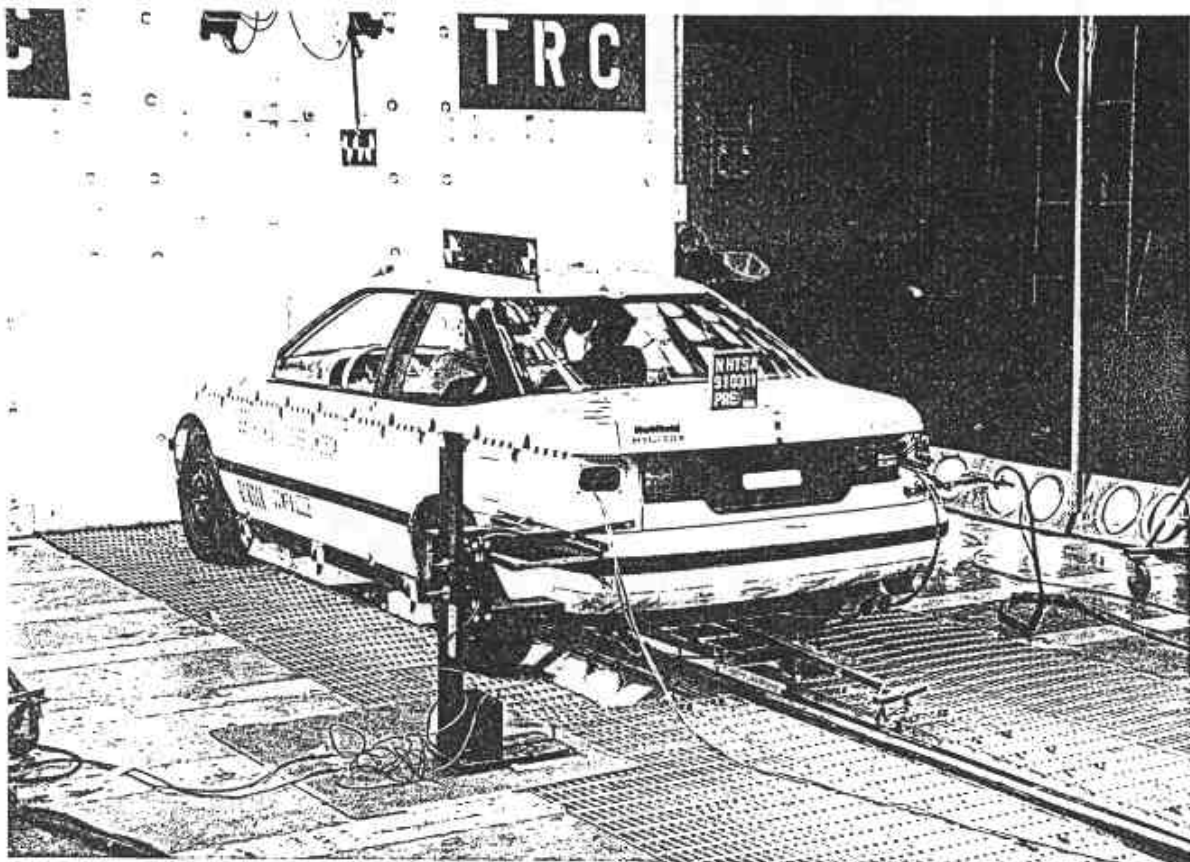


Figure A-11. PRE-TEST LEFT REAR THREE-QUARTER VIEW



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

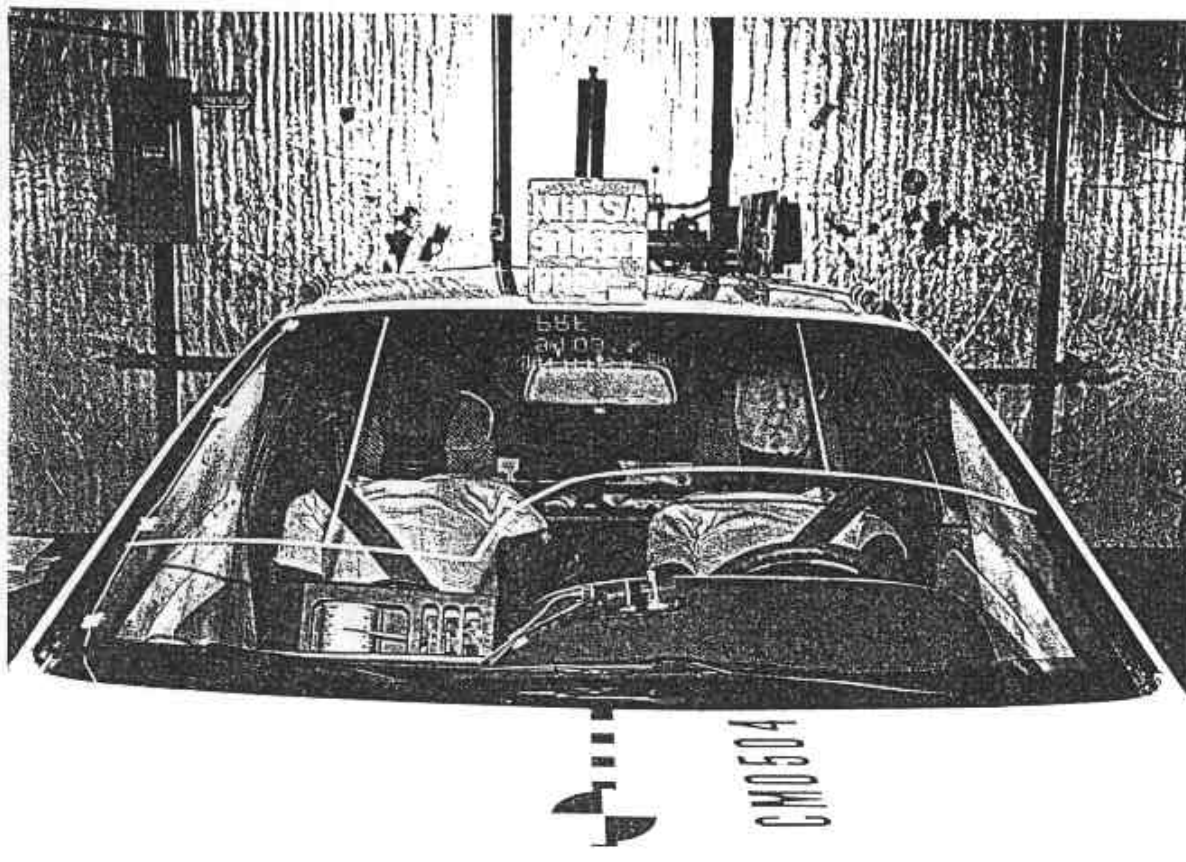


Figure A-13. PRE-TEST WINDSHIELD VIEW

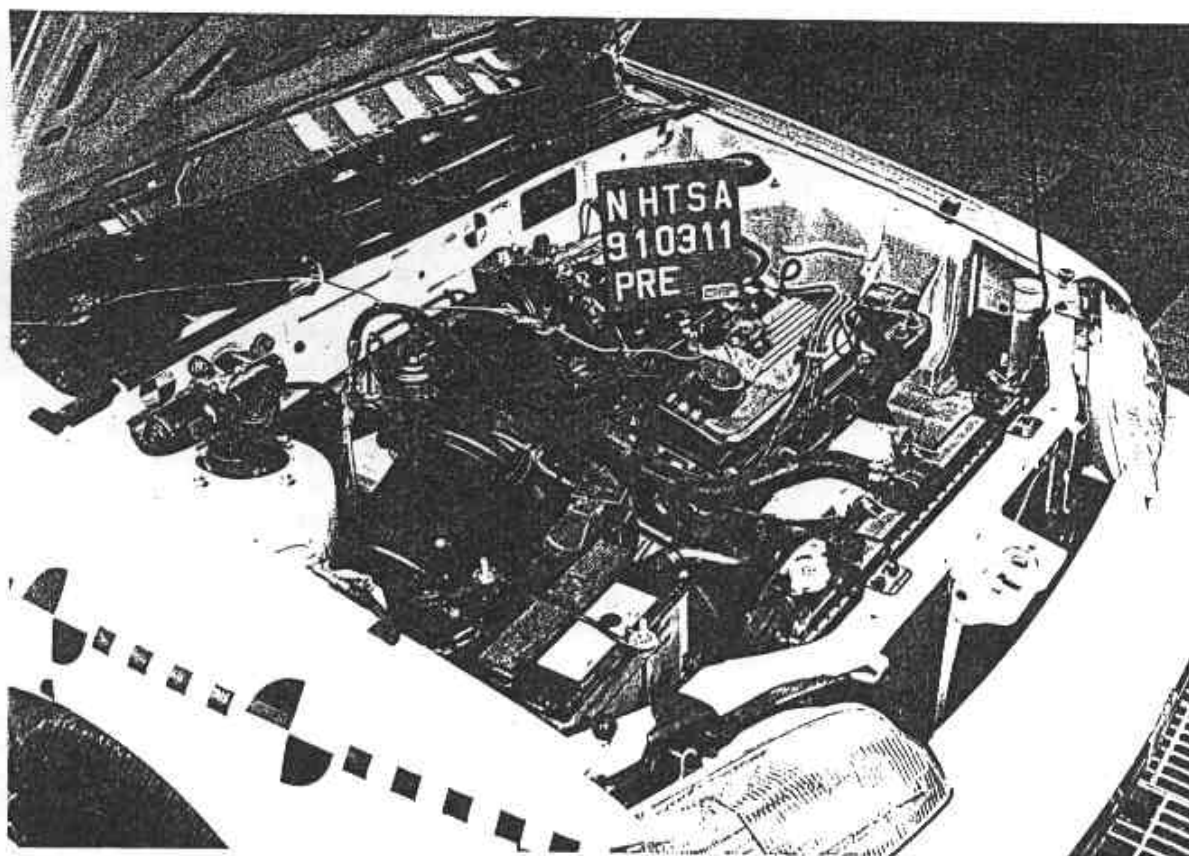


Figure A-14. PRE-TEST ENGINE COMPARTMENT VIEW
A-8

910311

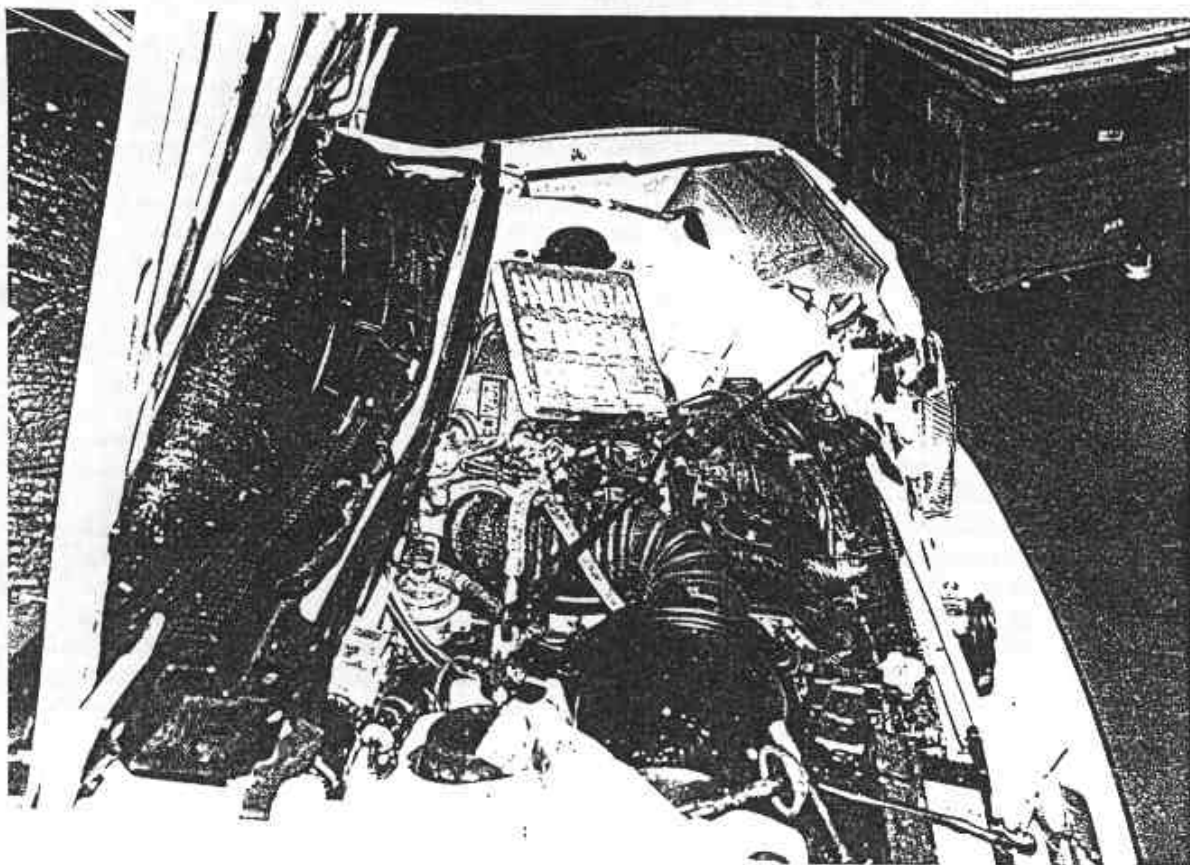


Figure A-15. POST-TEST ENGINE COMPARTMENT VIEW



Figure A-16. PRE-TEST FUEL FILLER CAP VIEW



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

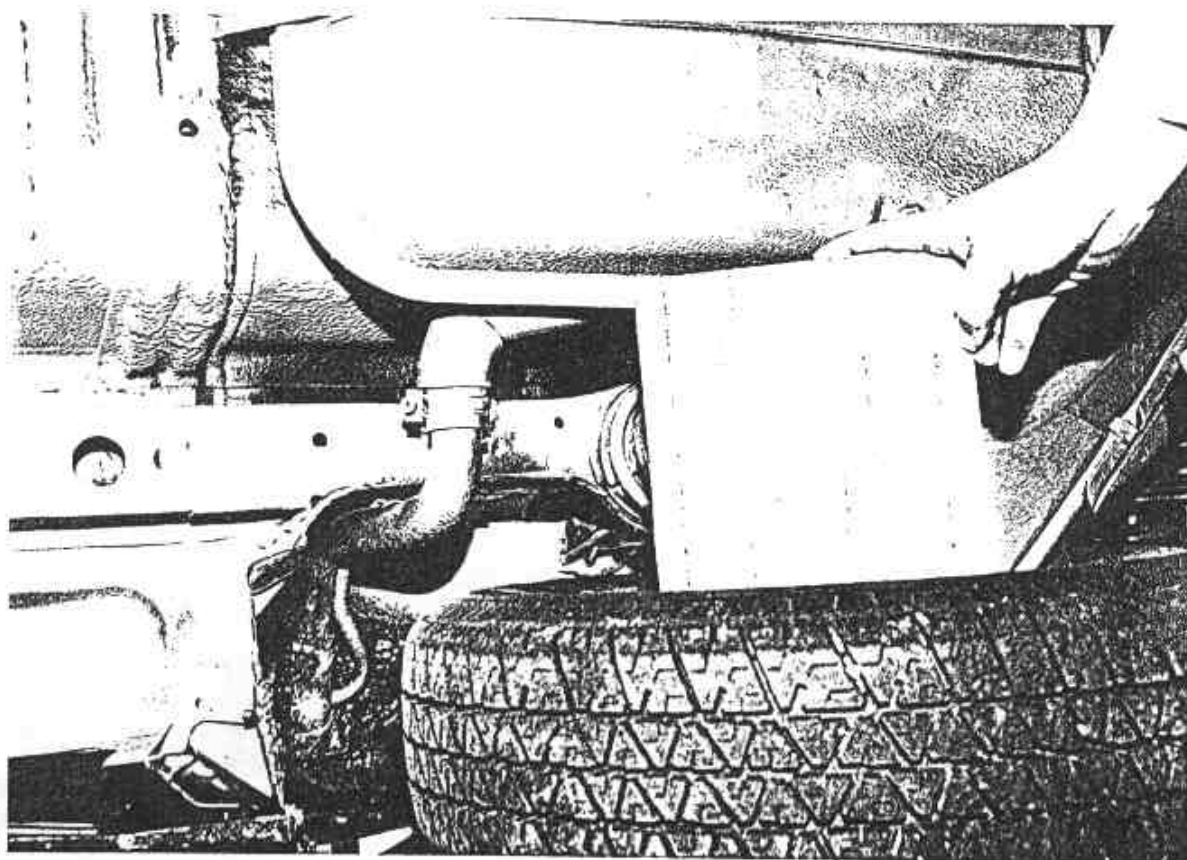


Figure A-18. PRE-TEST FUEL FILLER NECK VIEW



Figure A-19. PRE-TEST FUEL LINES VIEW

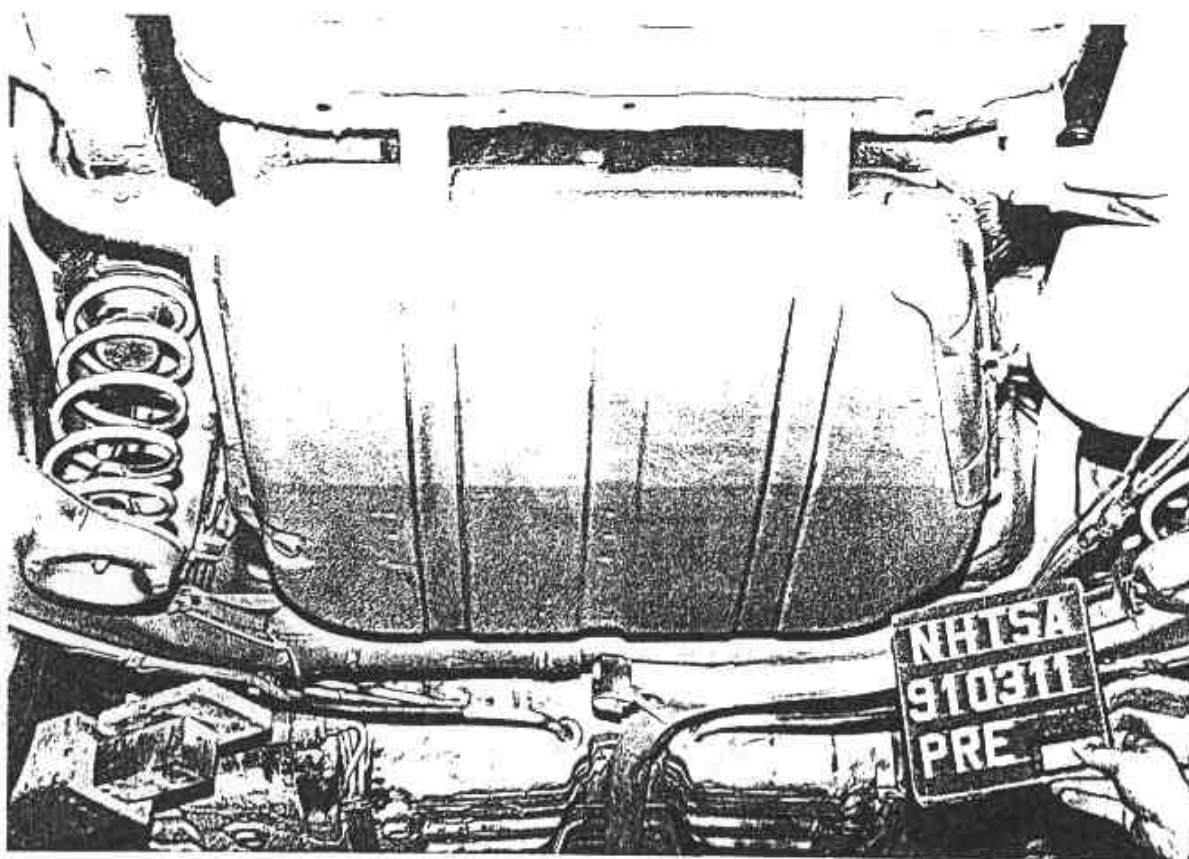


Figure A-20. PRE-TEST FUEL TANK VIEW

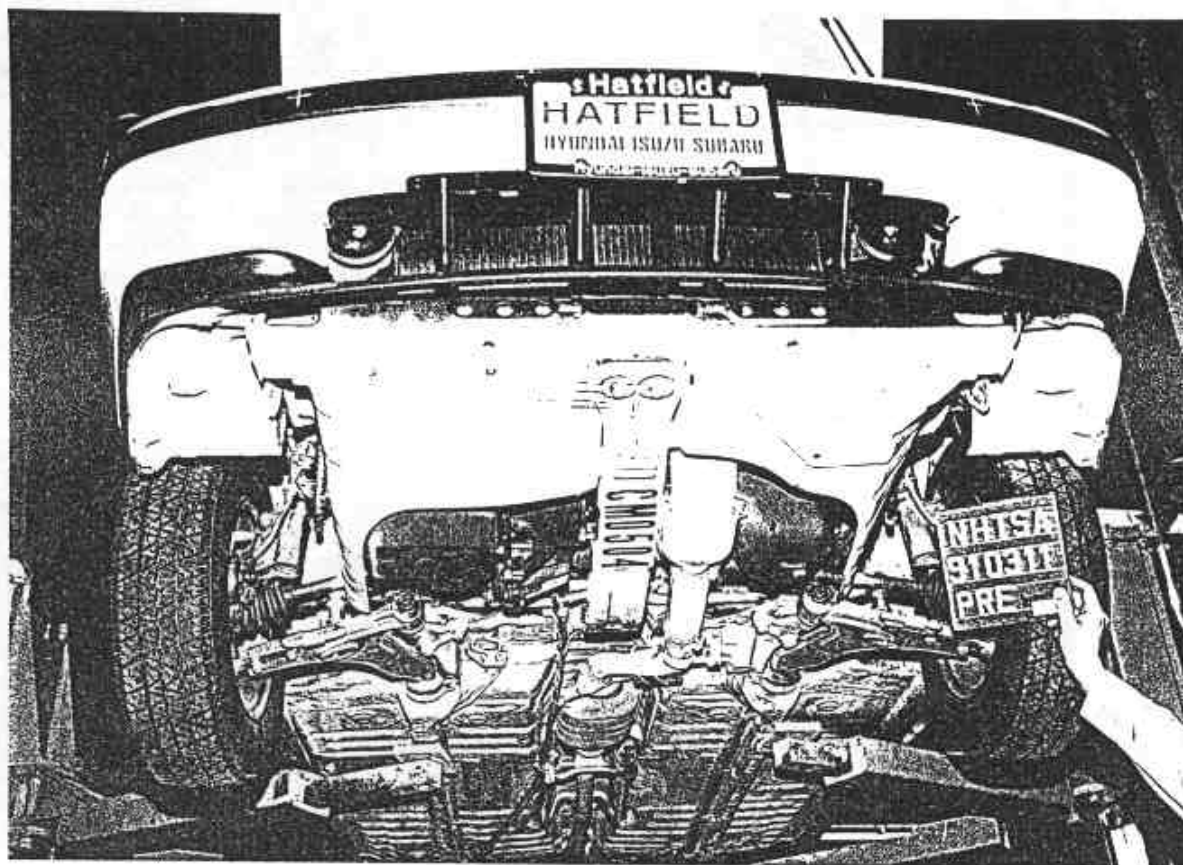


Figure A-21. PRE-TEST FRONT UNDERBODY VIEW

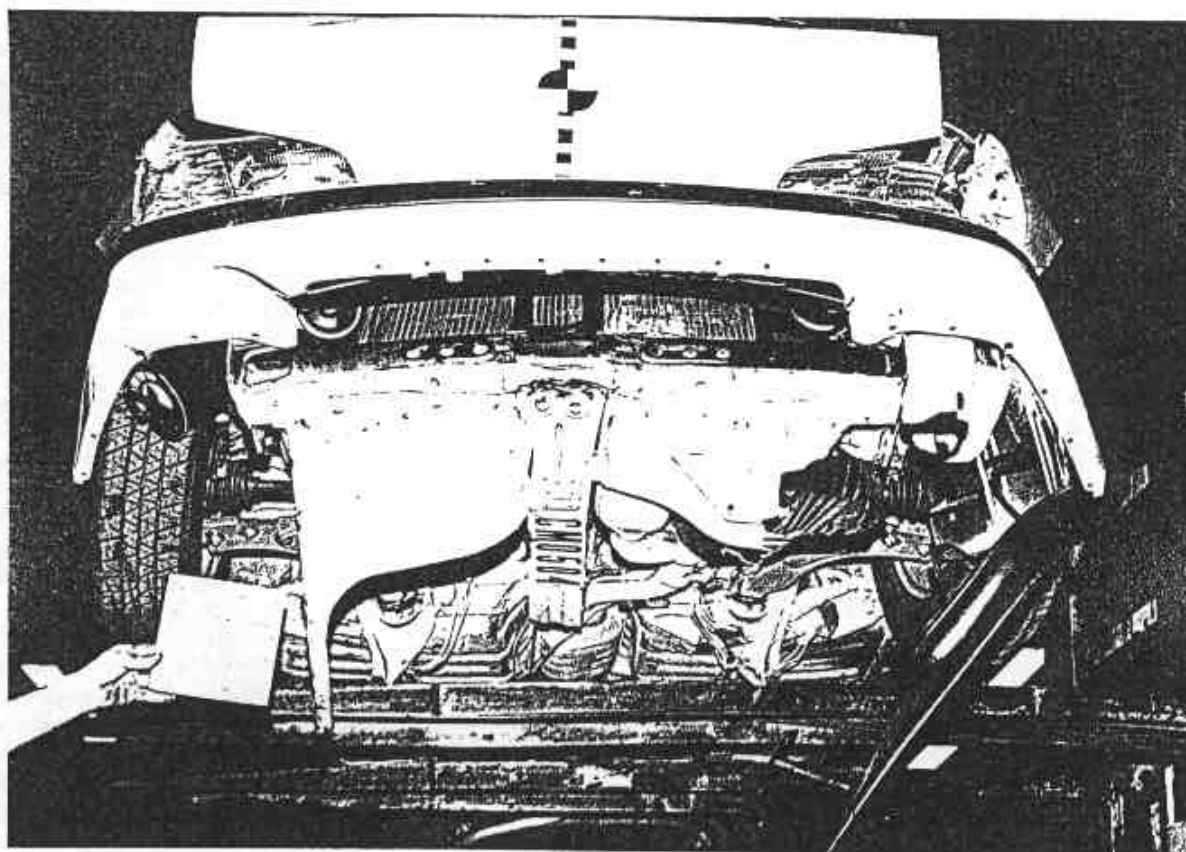


Figure A-22. POST-TEST FRONT UNDERBODY VIEW

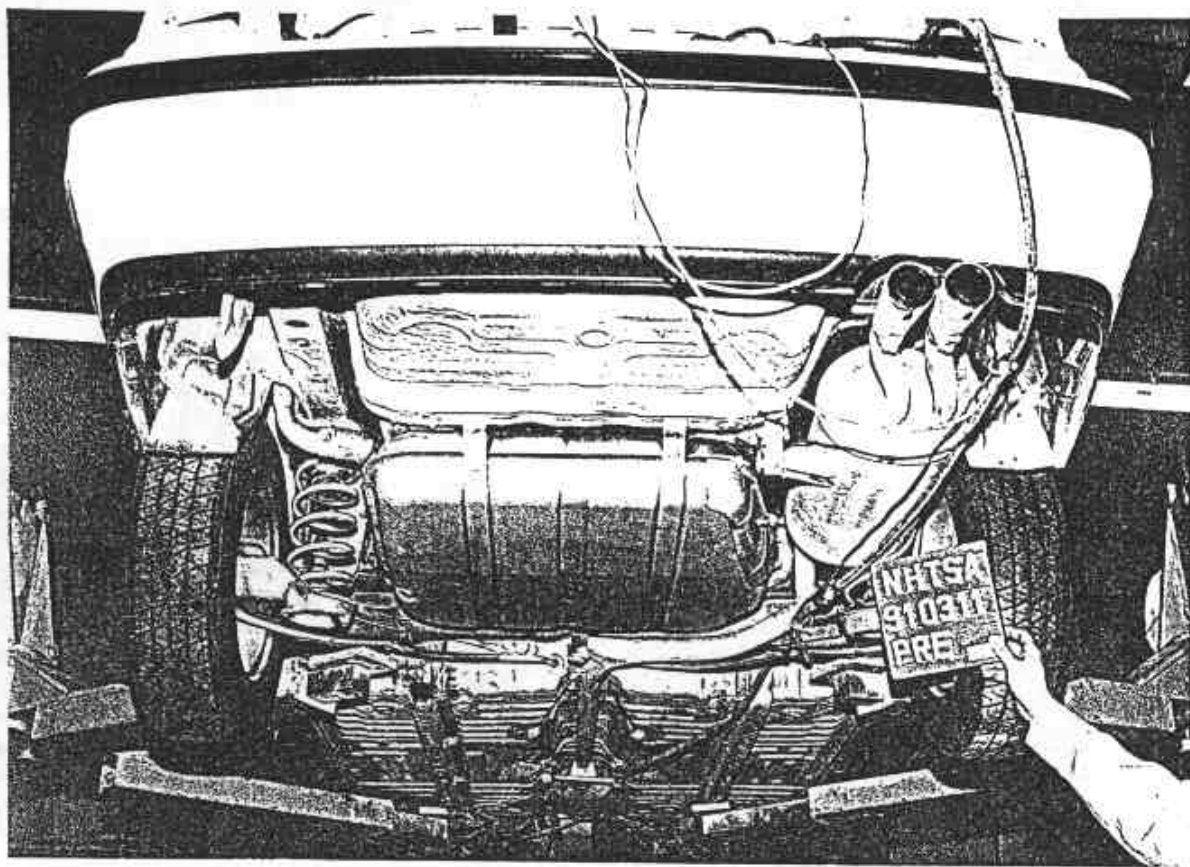


Figure A-23. PRE-TEST REAR UNDERBODY VIEW

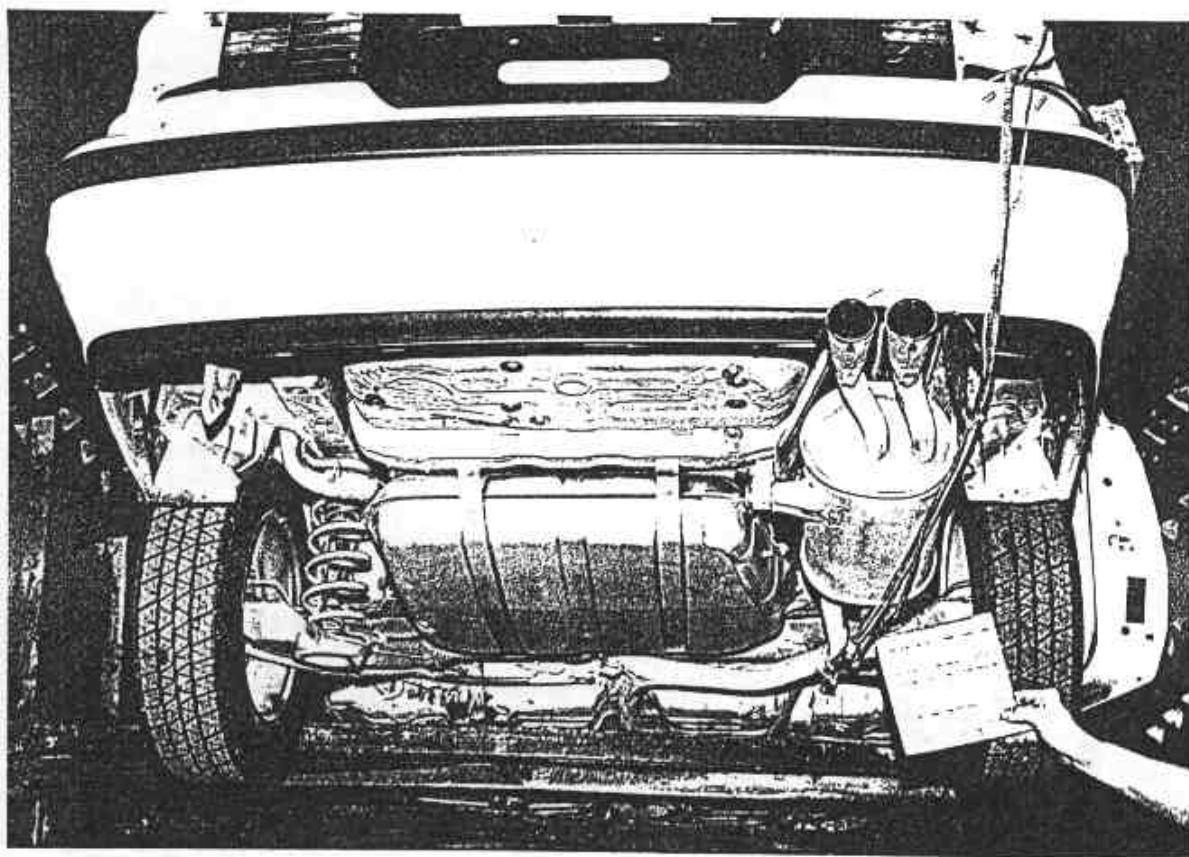


Figure A-24. POST-TEST REAR UNDERBODY VIEW



Figure A-25. PRE-TEST DRIVER DUMMY POSITION VIEW

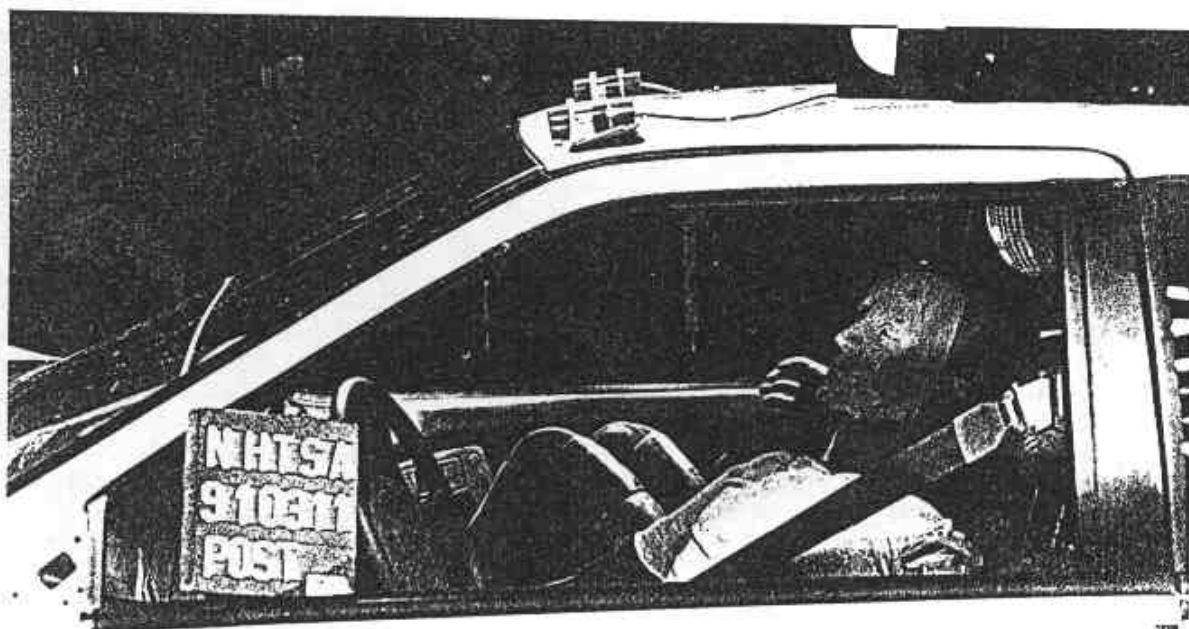


Figure A-26. POST-TEST DRIVER DUMMY POSITION VIEW
A-14

910311

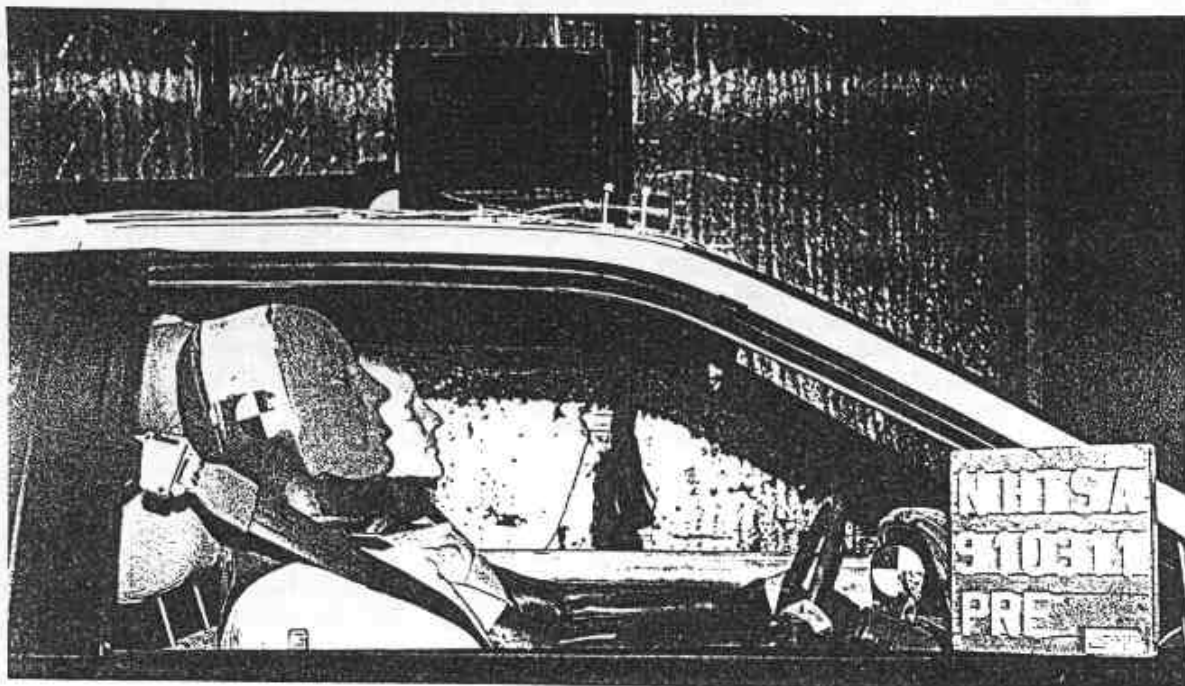
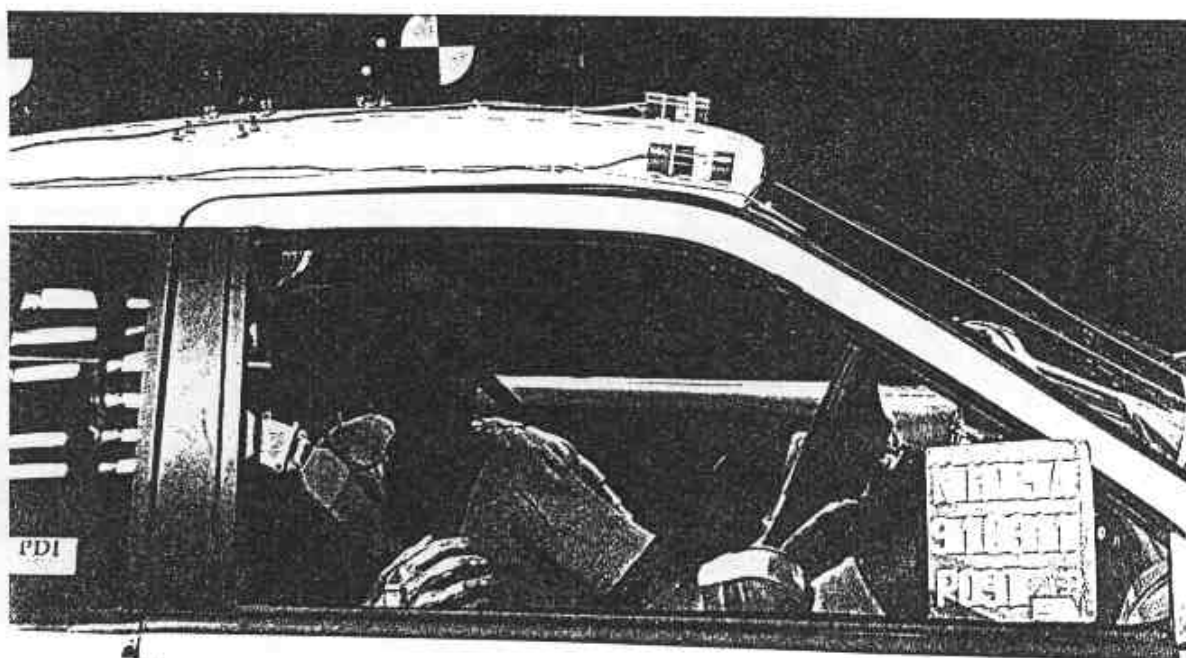


Figure A-27. PRE-TEST PASSENGER DUMMY POSITION VIEW



010211

Figure A-28. POST-TEST PASSENGER DUMMY POSITION - VIEW 1



Figure A-29. POST-TEST PASSENGER DUMMY POSITION - VIEW 2

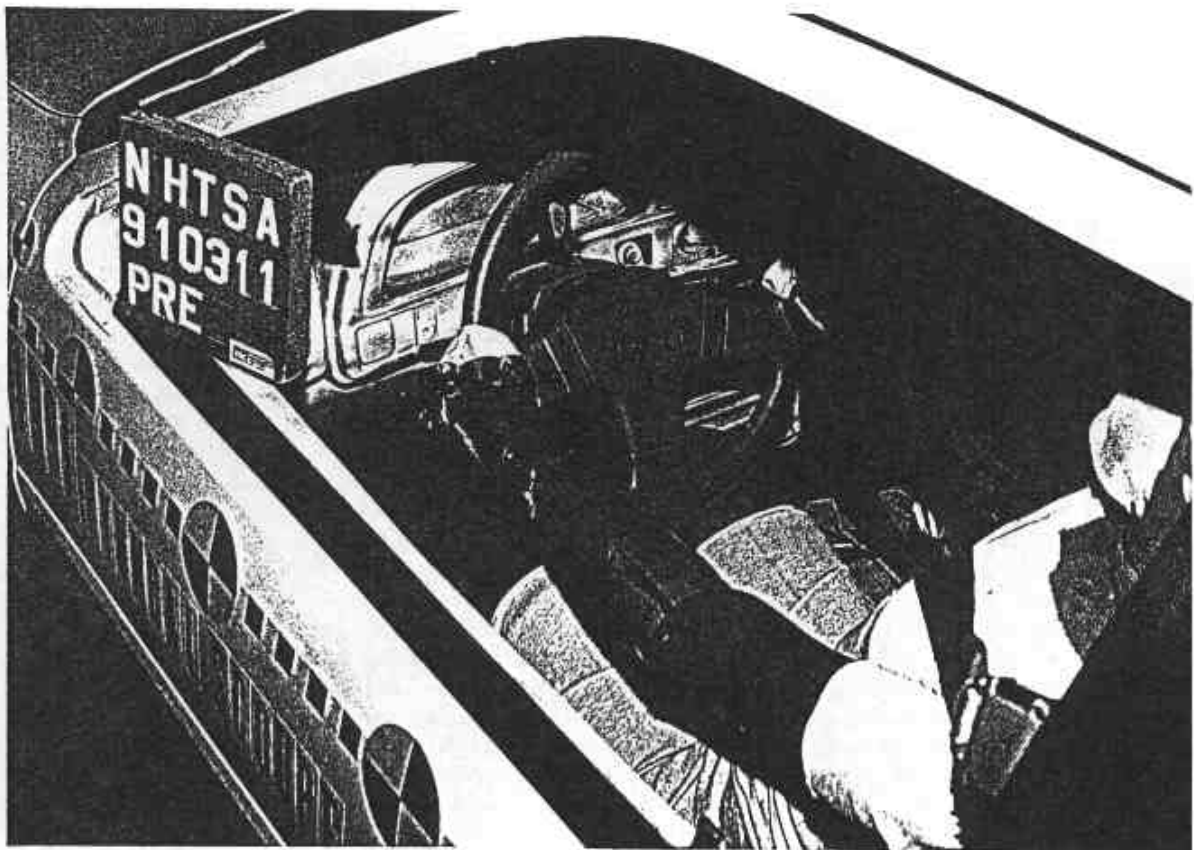


Figure A-30. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR VIEW

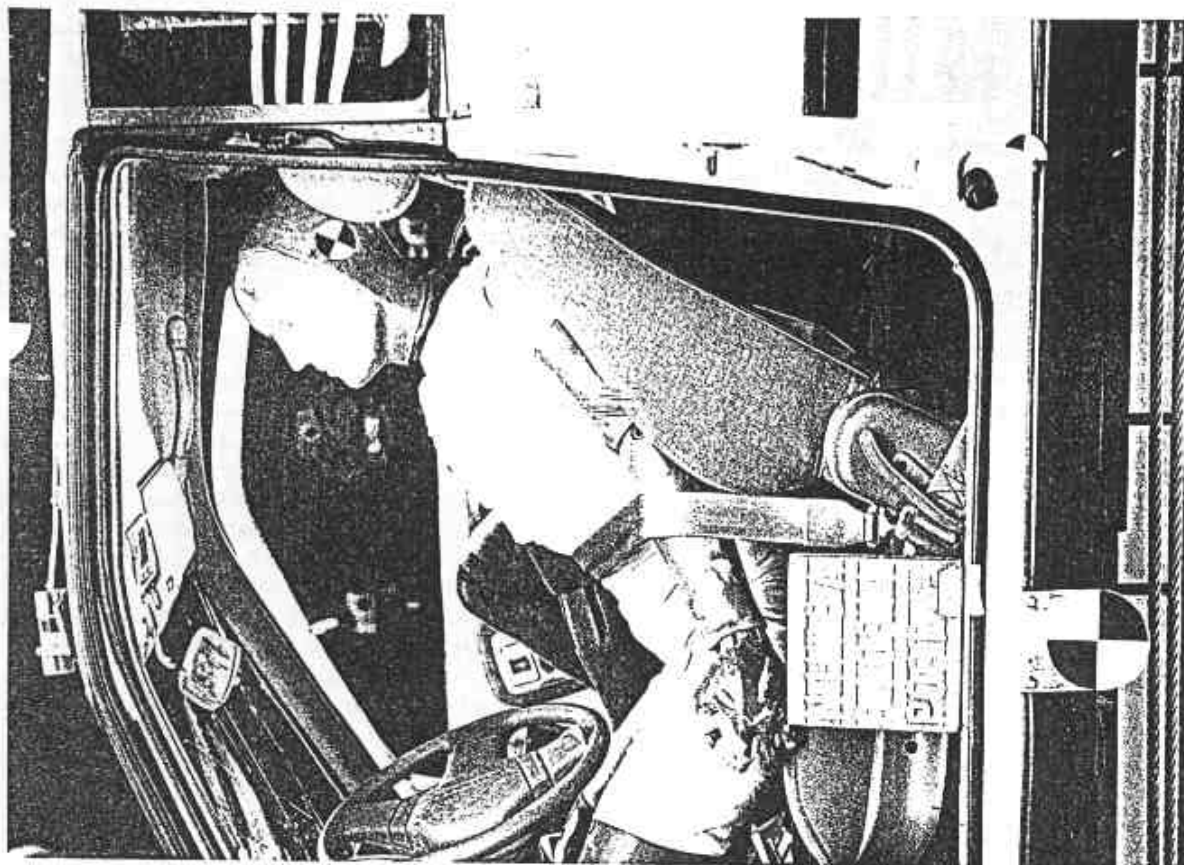


Figure A-31. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

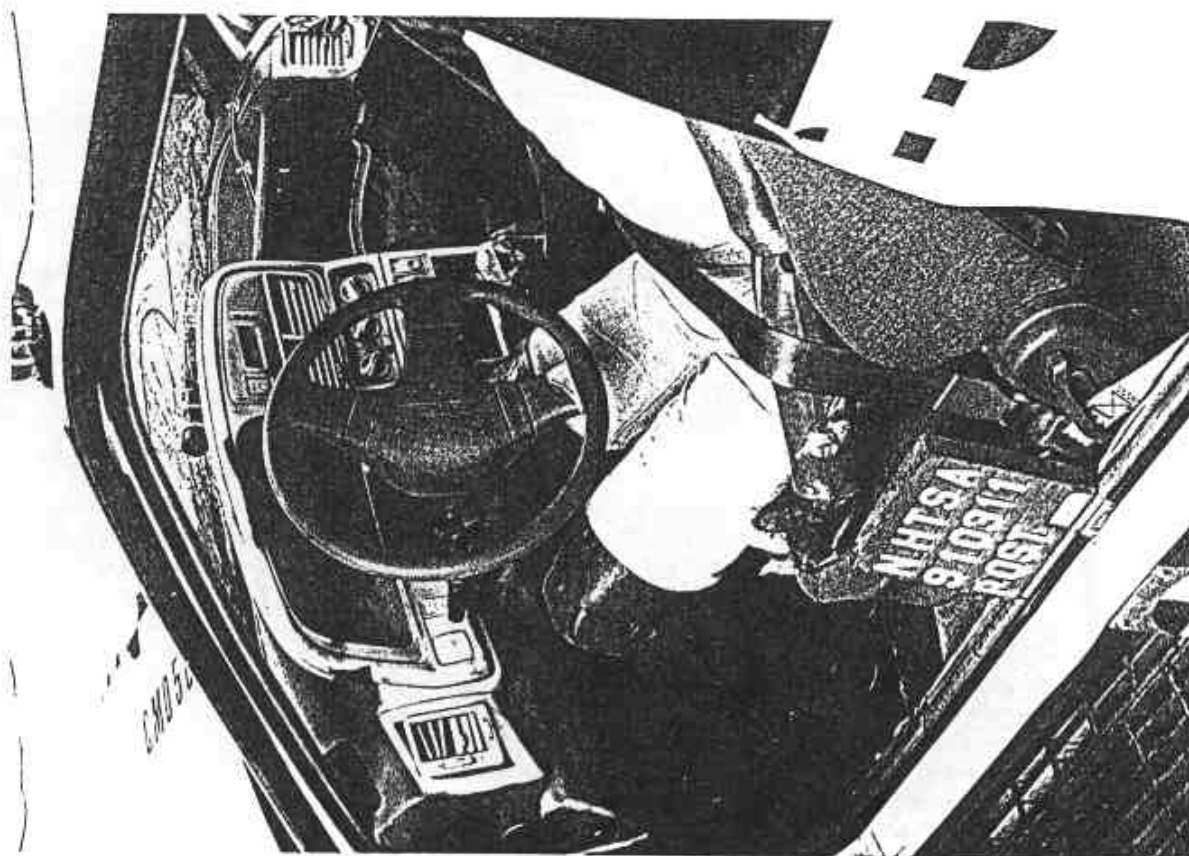


Figure A-32. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2



Figure A-33. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR VIEW

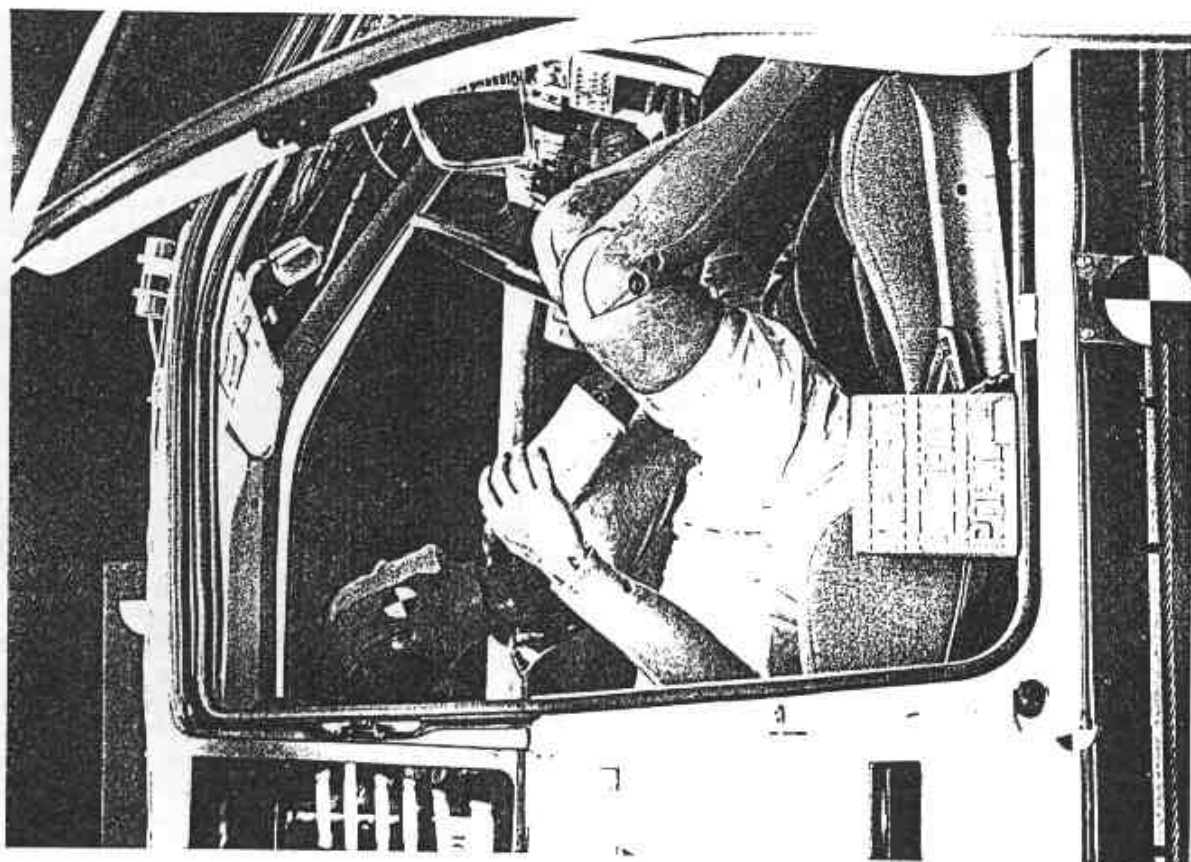


Figure A-34. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
A-18 910311

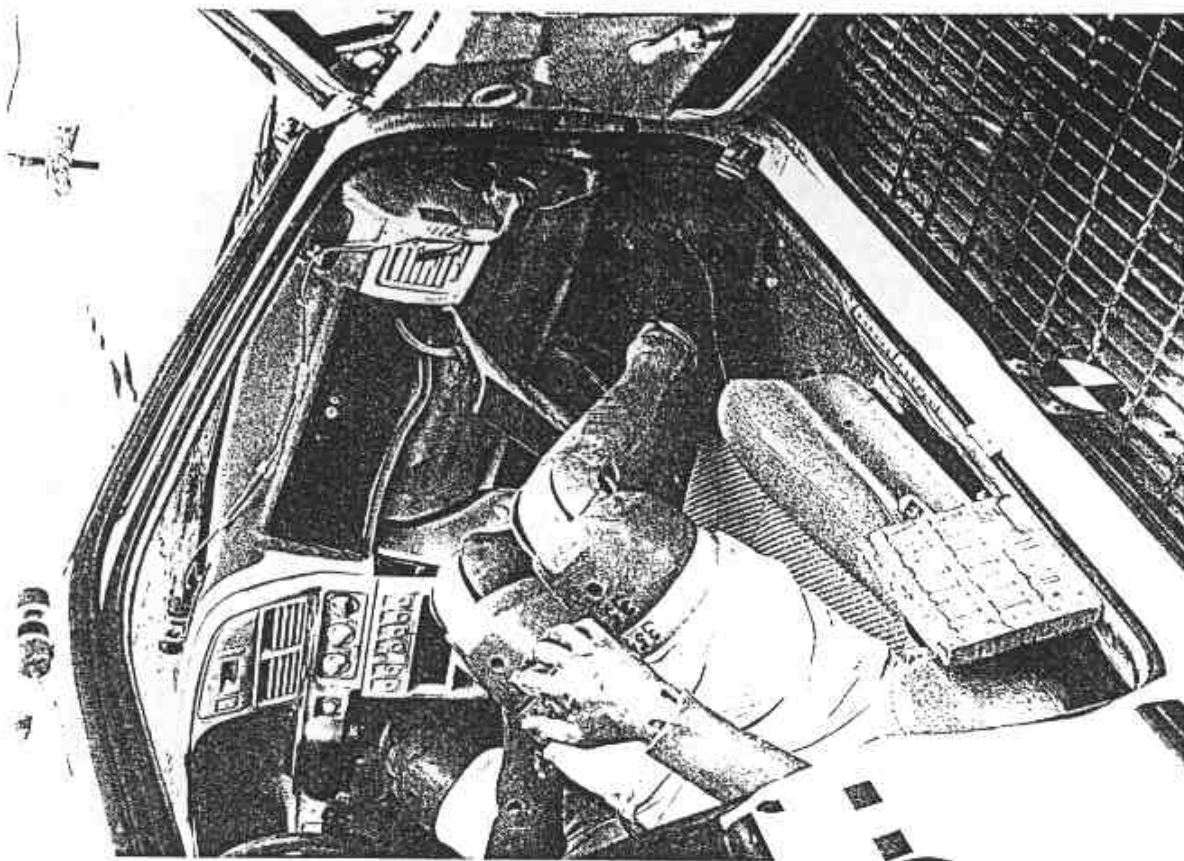


Figure A-35. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2

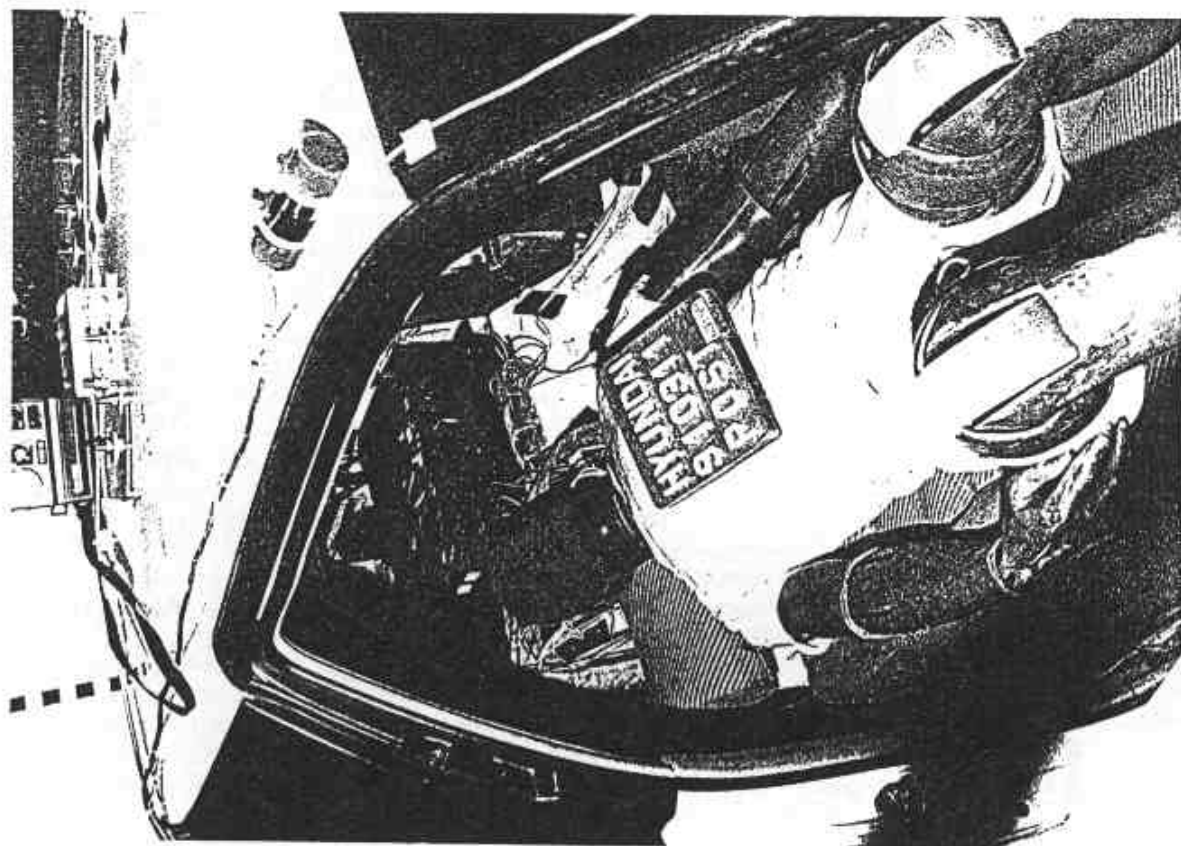


Figure A-36. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 3

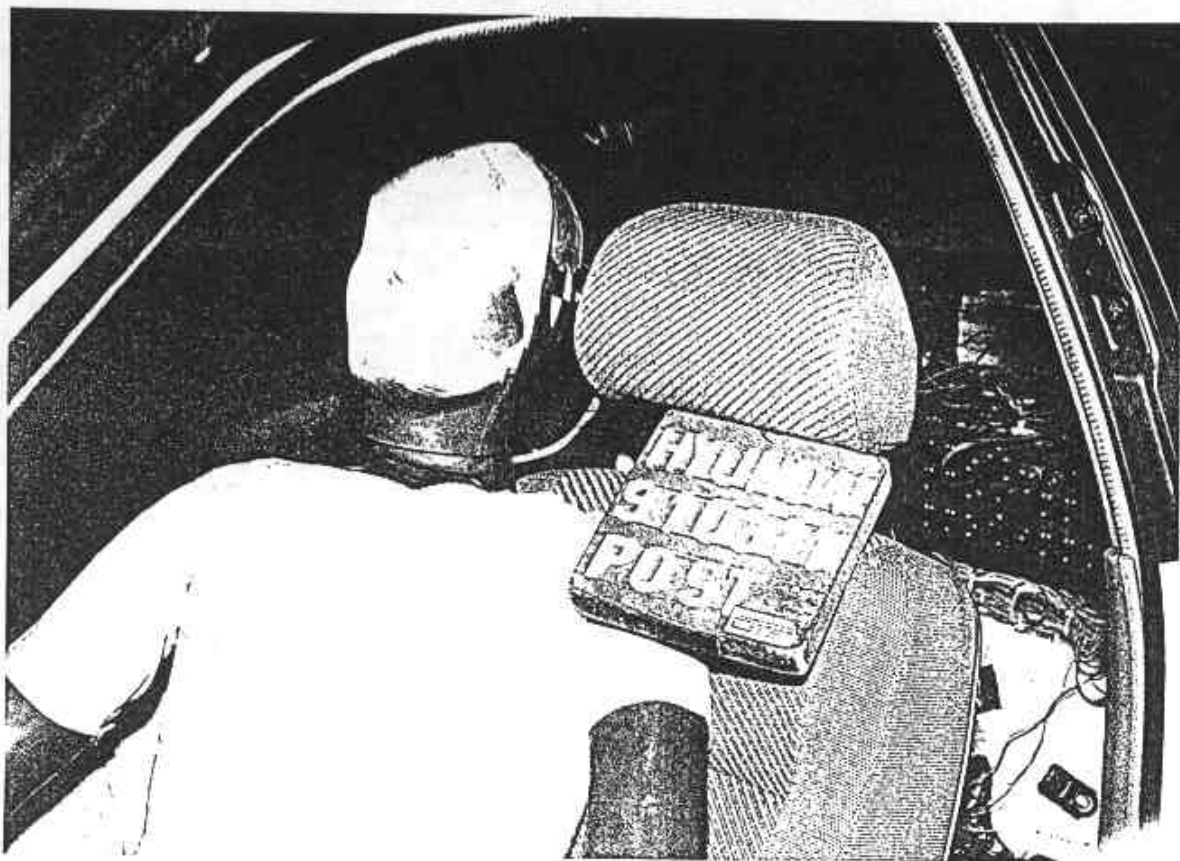


Figure A-37. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 1

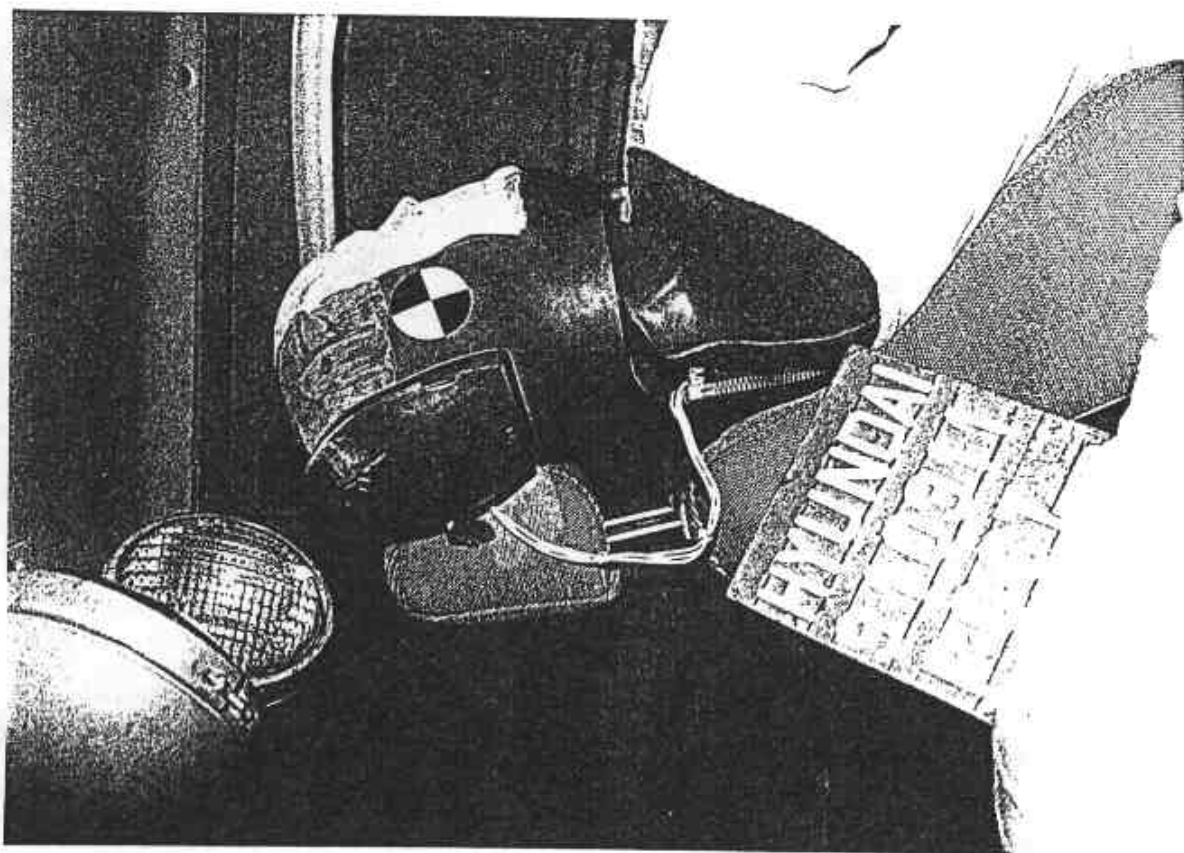


Figure A-38. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 2

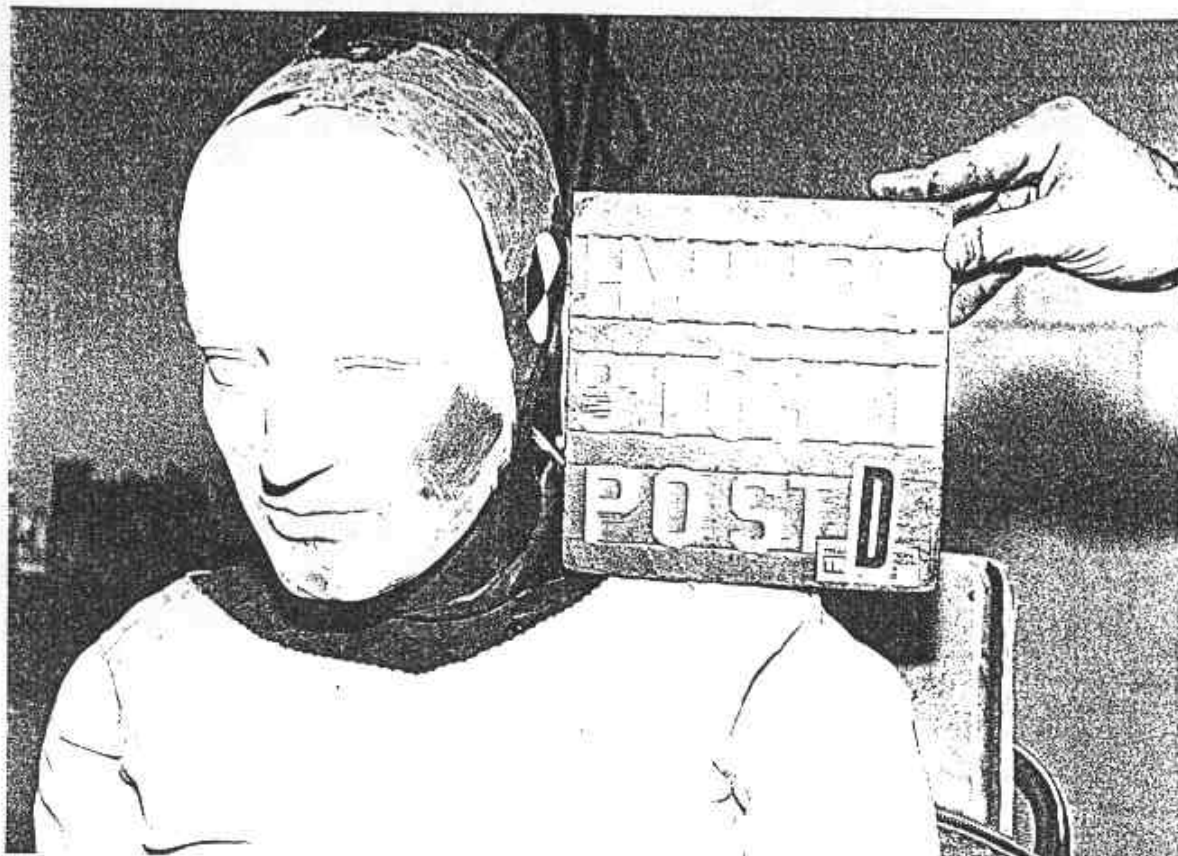


Figure A-39. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 3

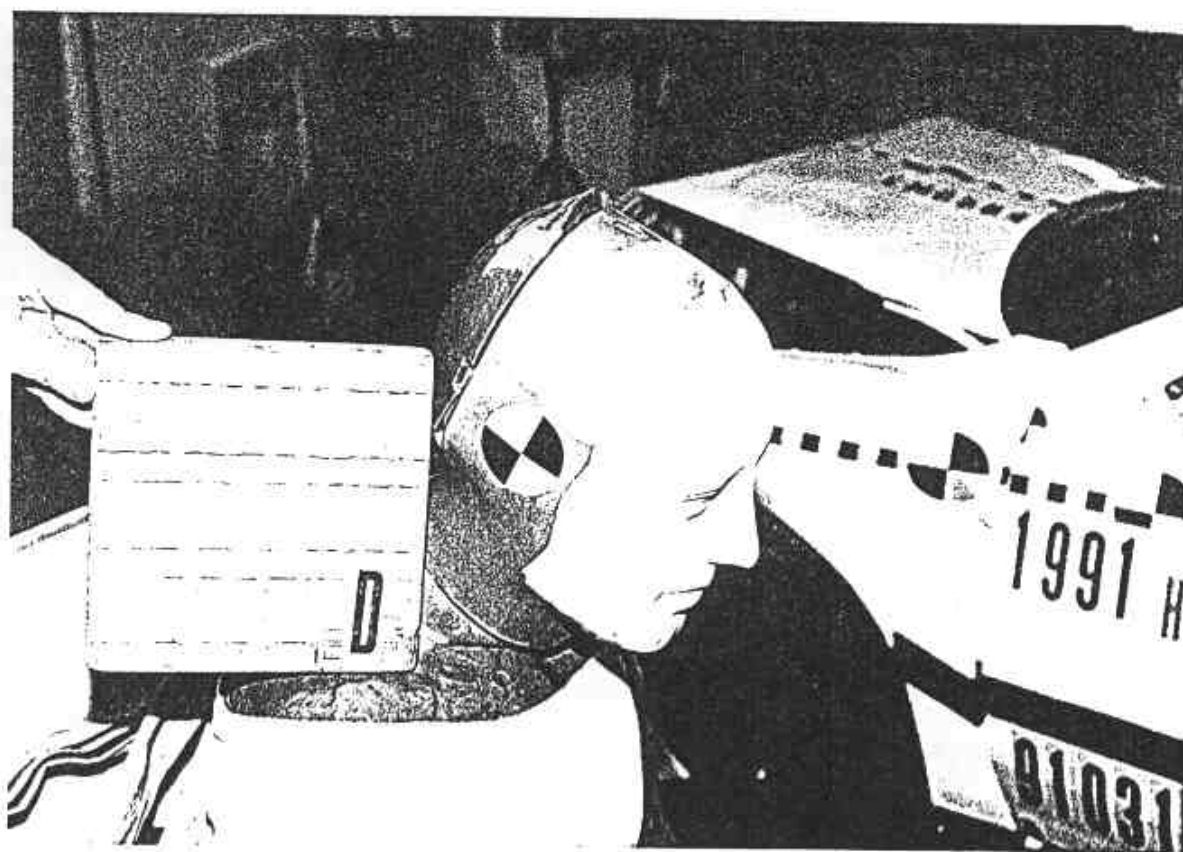


Figure A-40. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 4

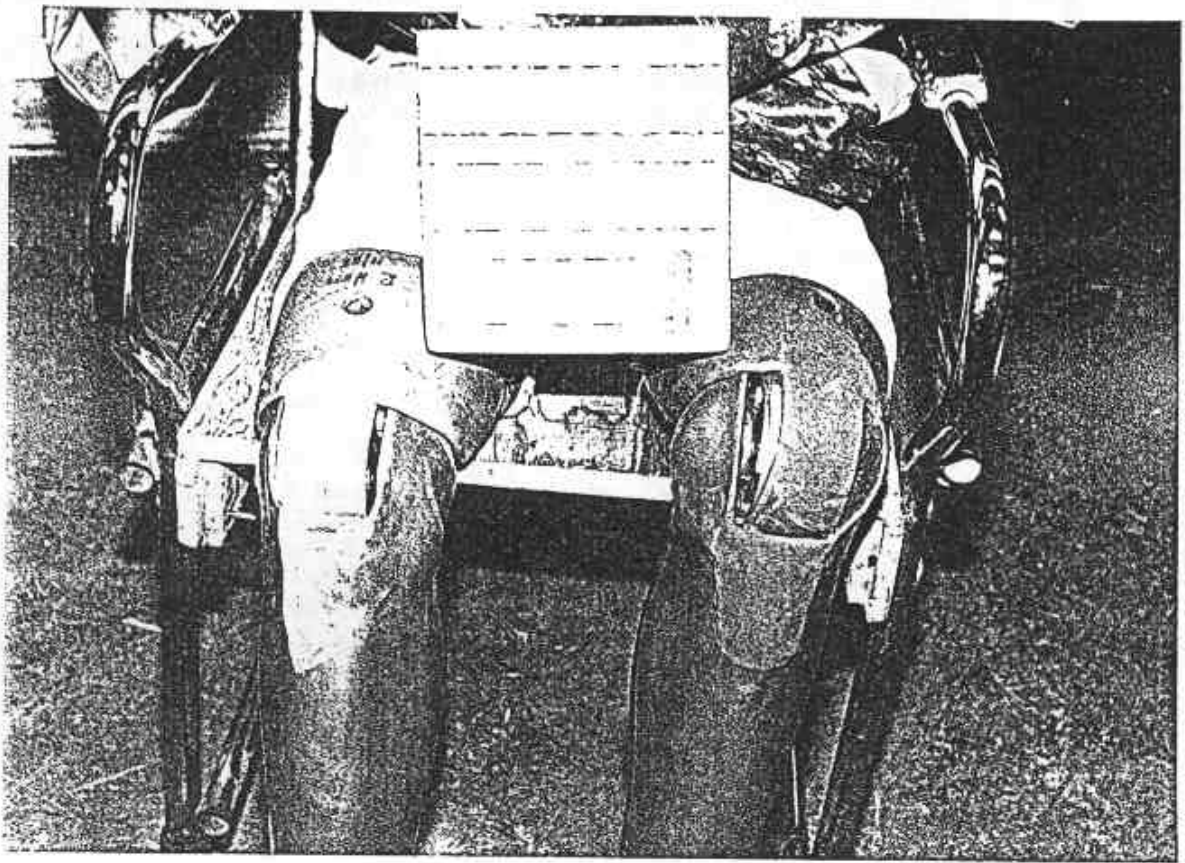


Figure A-41. POST-TEST DRIVER DUMMY KNEE CONTACT VIEW

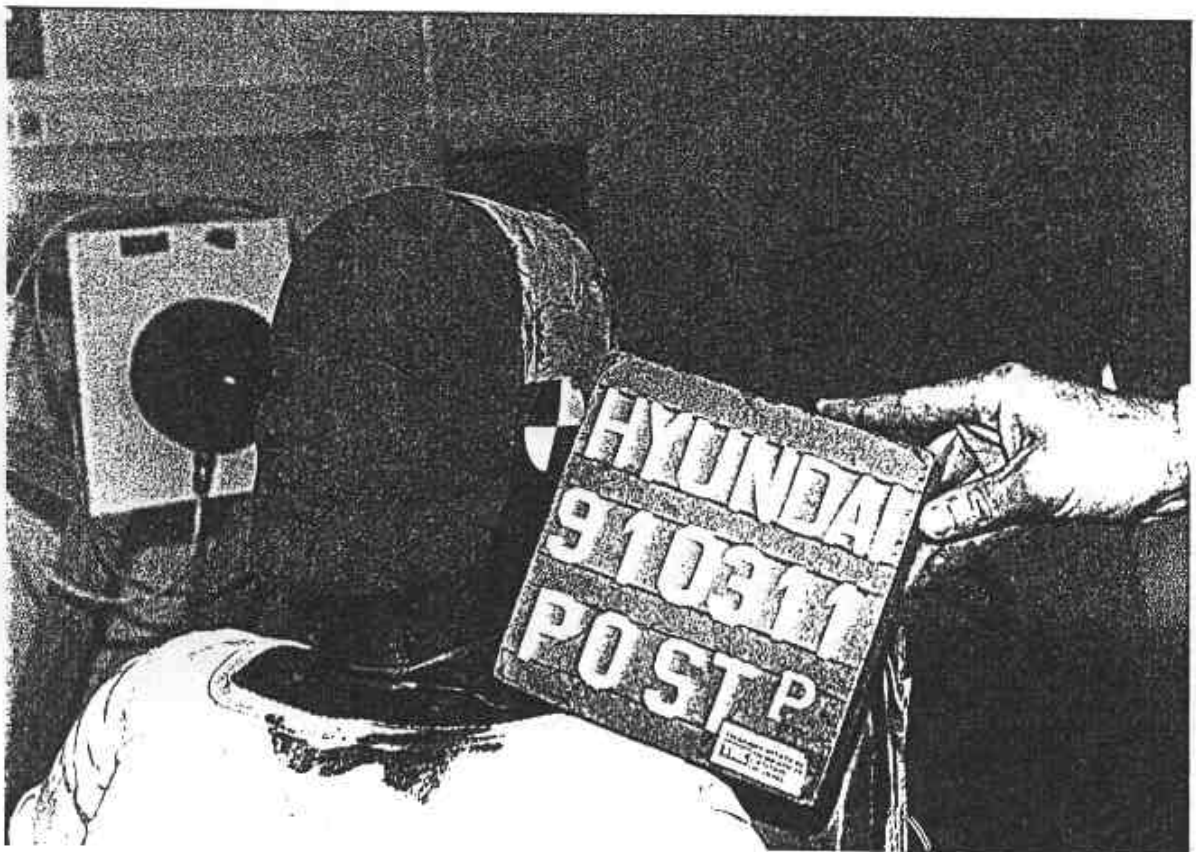


Figure A-42. POST-TEST PASSENGER DUMMY HEAD CONTACT VIEW

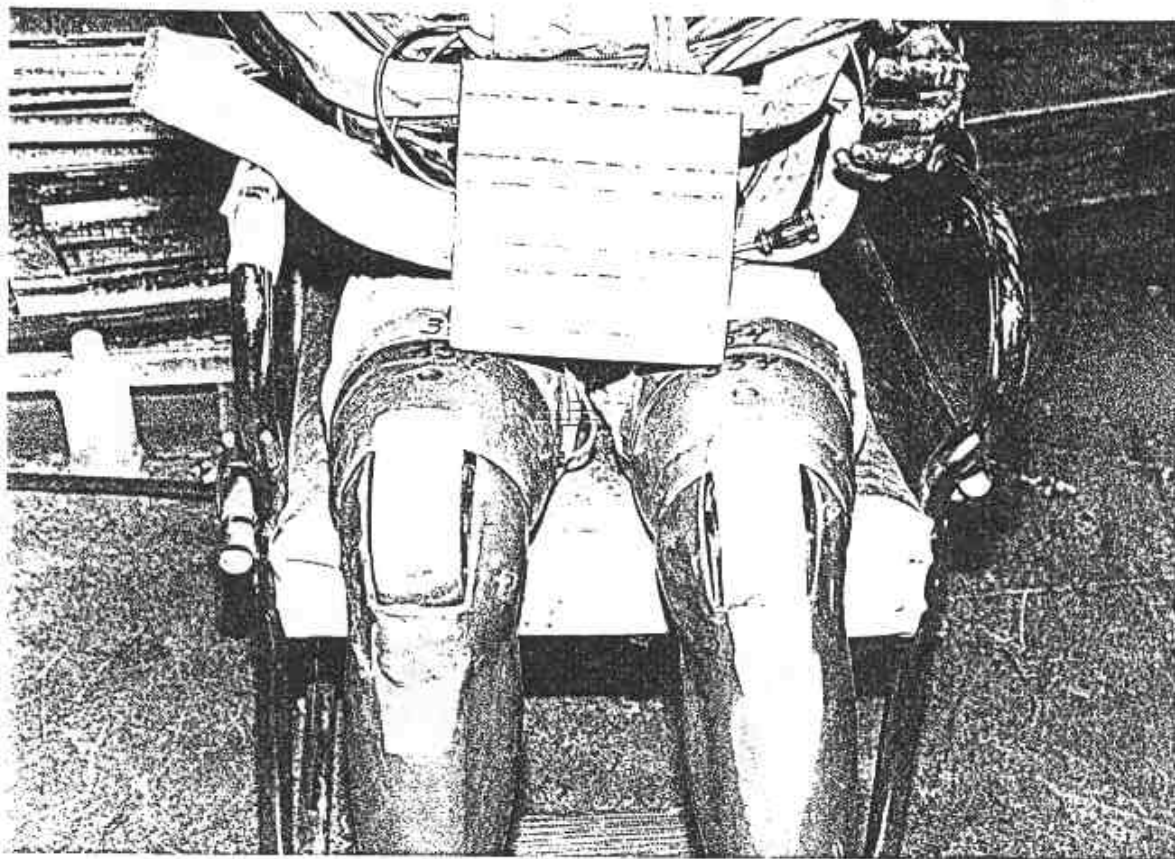


Figure A-43. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1

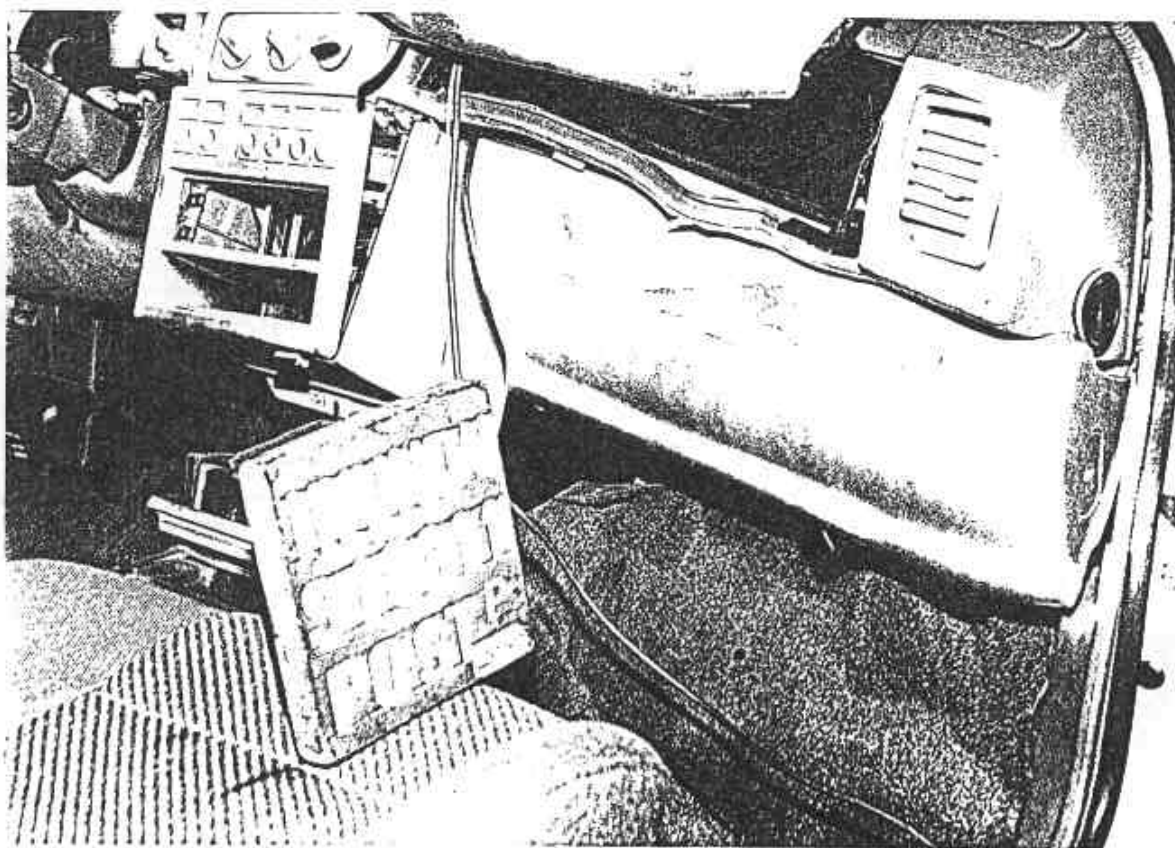


Figure A-44. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2



Figure A-45. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW

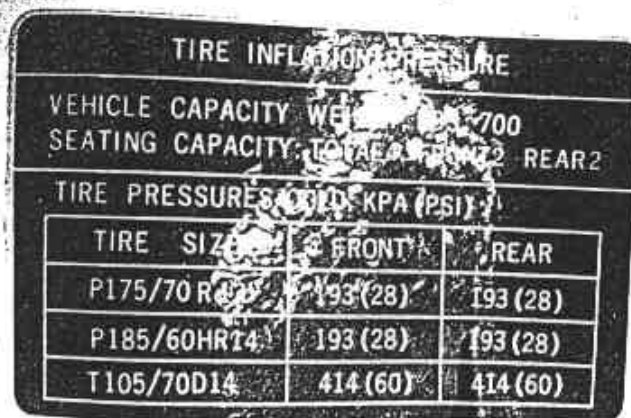


Figure A-46. PRE-TEST VEHICLE RECOMMENDED TIRE PRESSURE LABEL VIEW

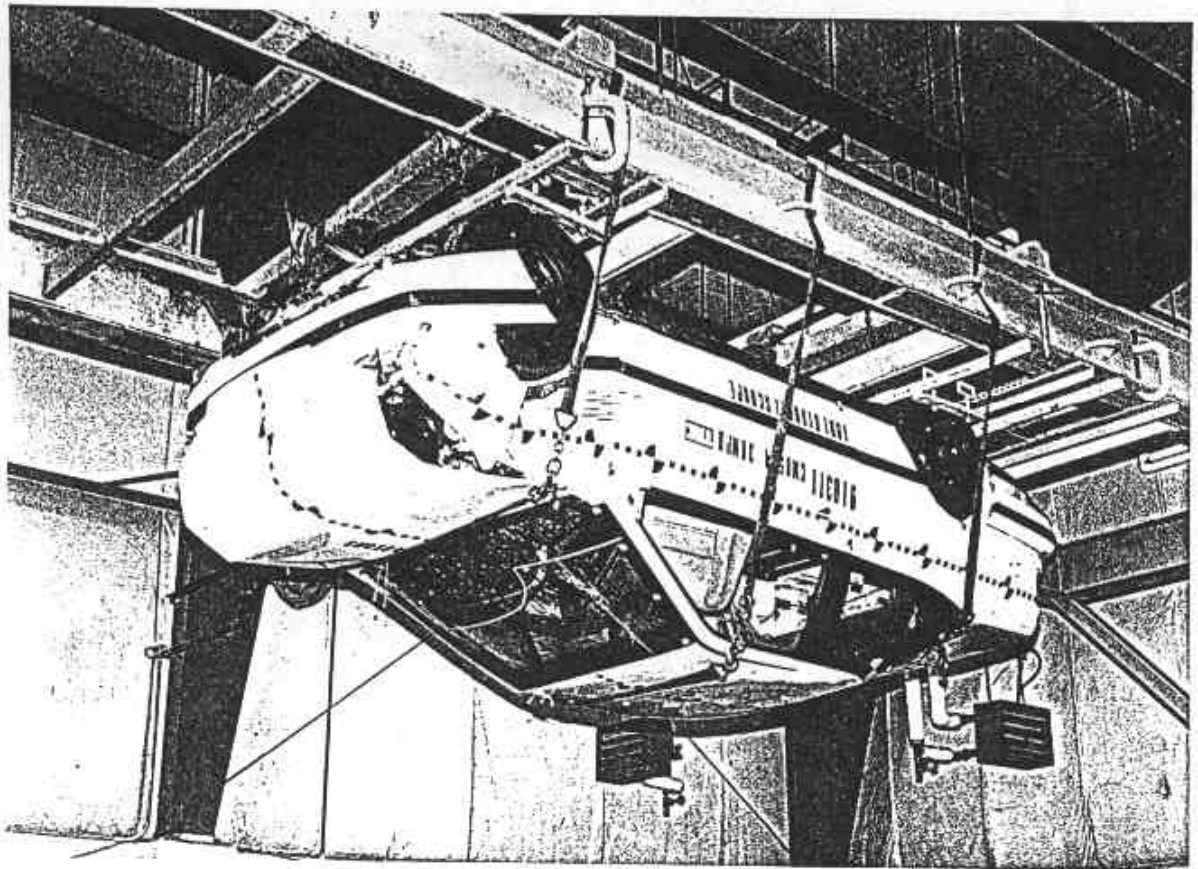


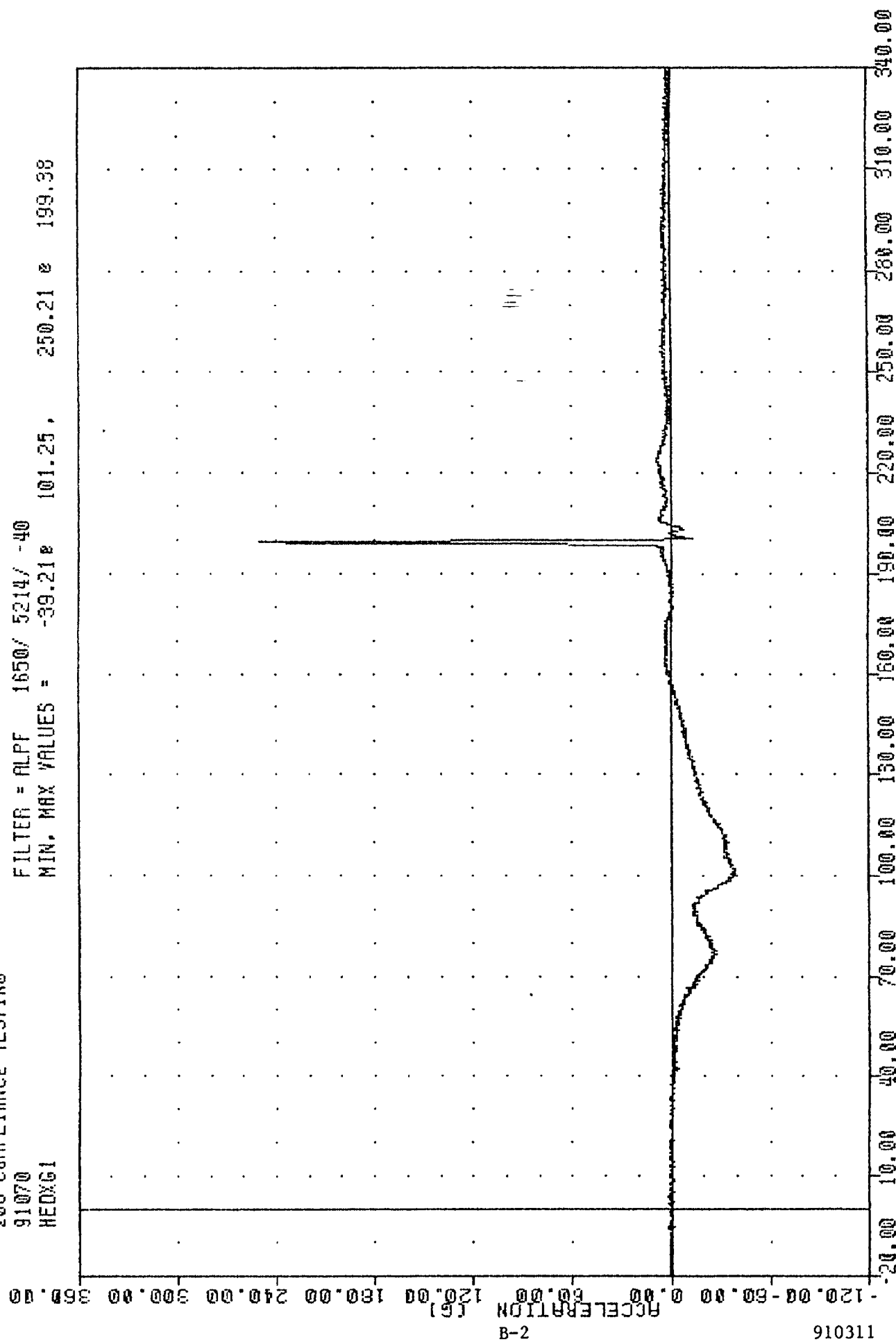
Figure A-47. POST-TEST VEHICLE ON STATIC ROLLOVER MACHINE VIEW

APPENDIX B

DATA PLOTS

TRC , 910311
200 COMPLIANCE TESTING
91070
HEXG1

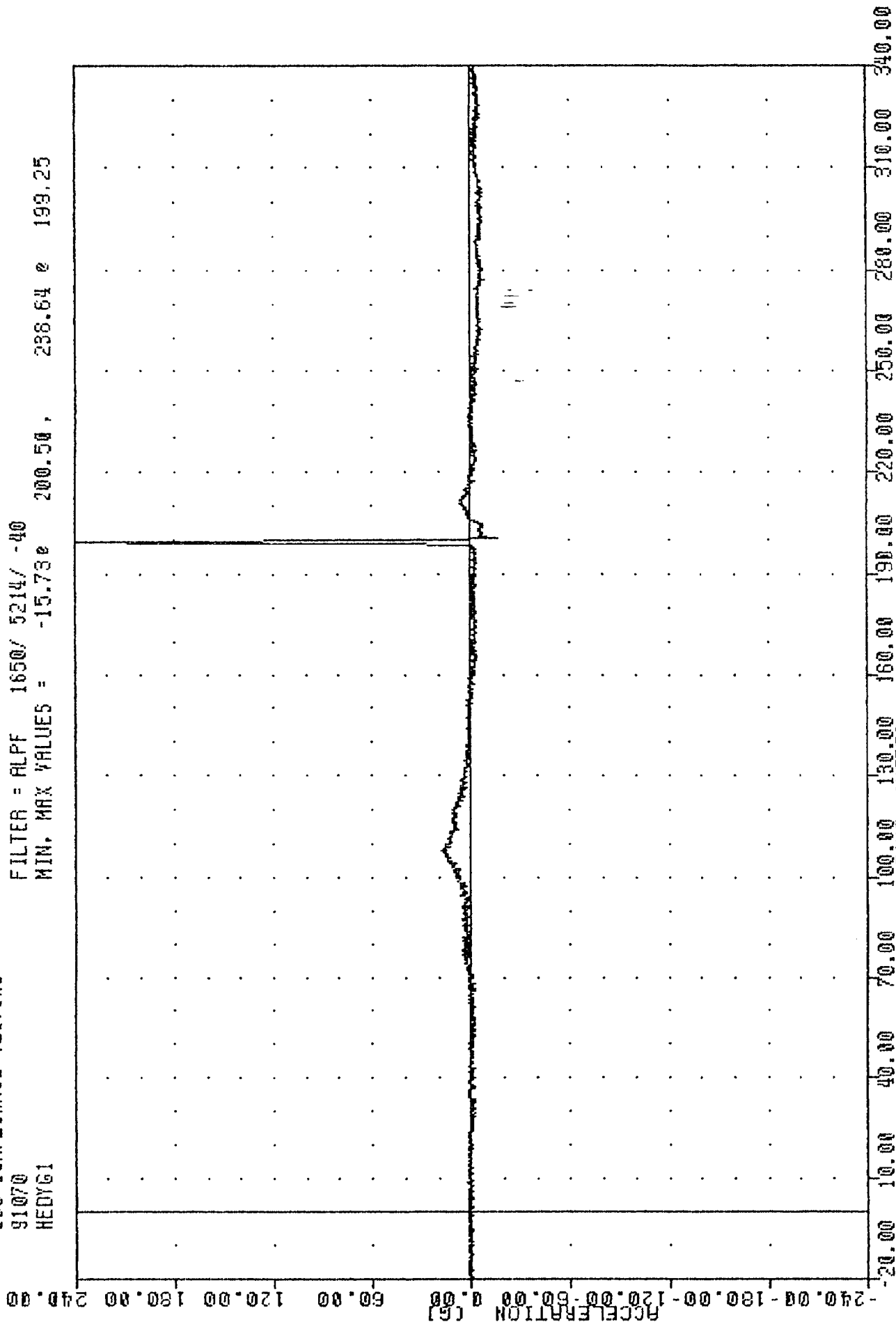
FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -39.210 101.25, 250.21 0 199.38



1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
DRIVER HEAD Y-AXIS ACCELERATION

TRC , 910311
 208 COMPLIANCE TESTING
 91070
 HEDYG1

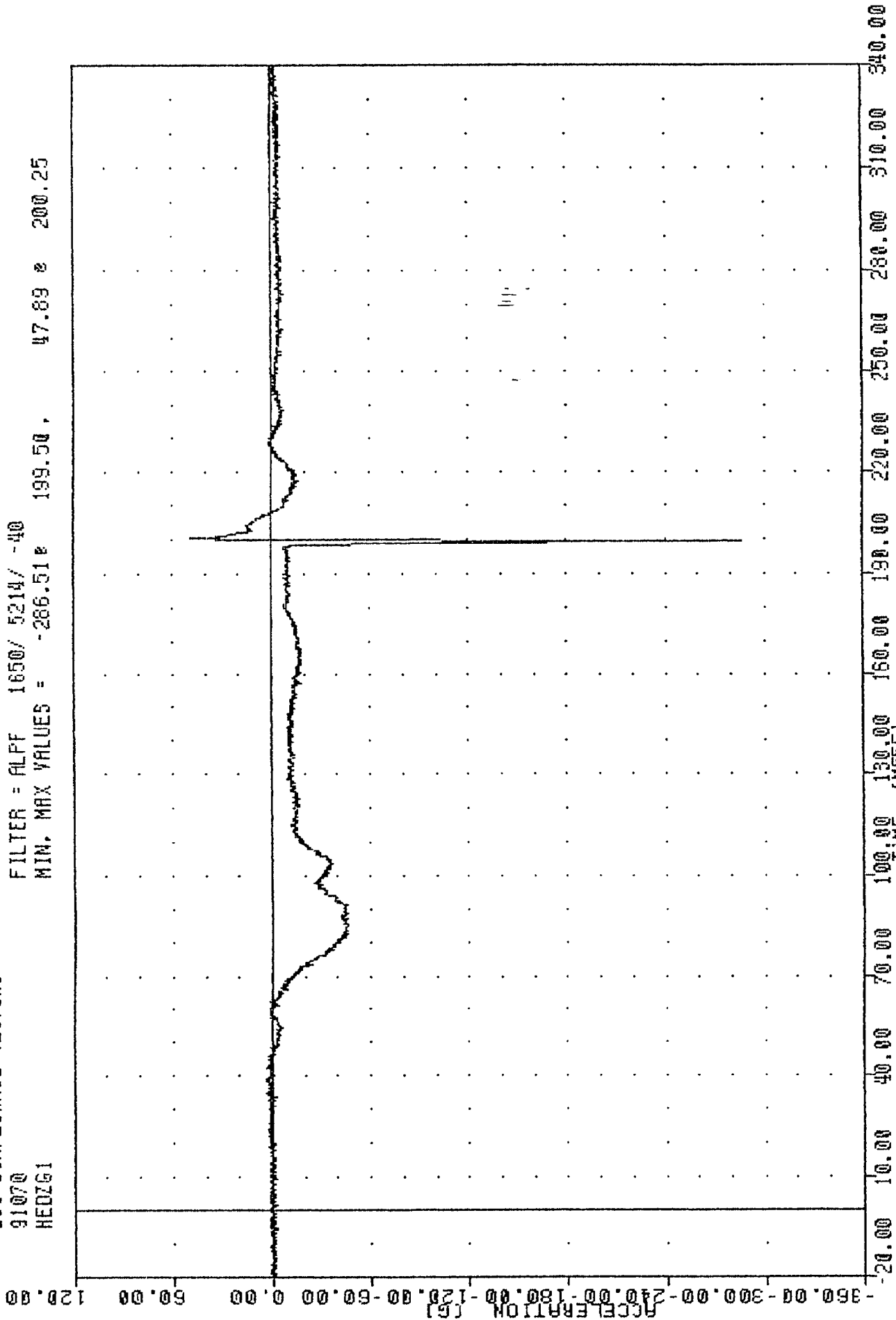
FILTER = ALPF 1650/ 5214/ -40
 MIN. MAX VALUES = -15.73e 200.50 , 238.64 e 199.25



1991 HYUNDAI COUPE INTO FLAT FRONTAL BARRIER
 NOTED DEON V. DYIC ACCELERATION

TRC , 910311
 208 COMPLIANCE TESTING
 91070
 HEDZG1

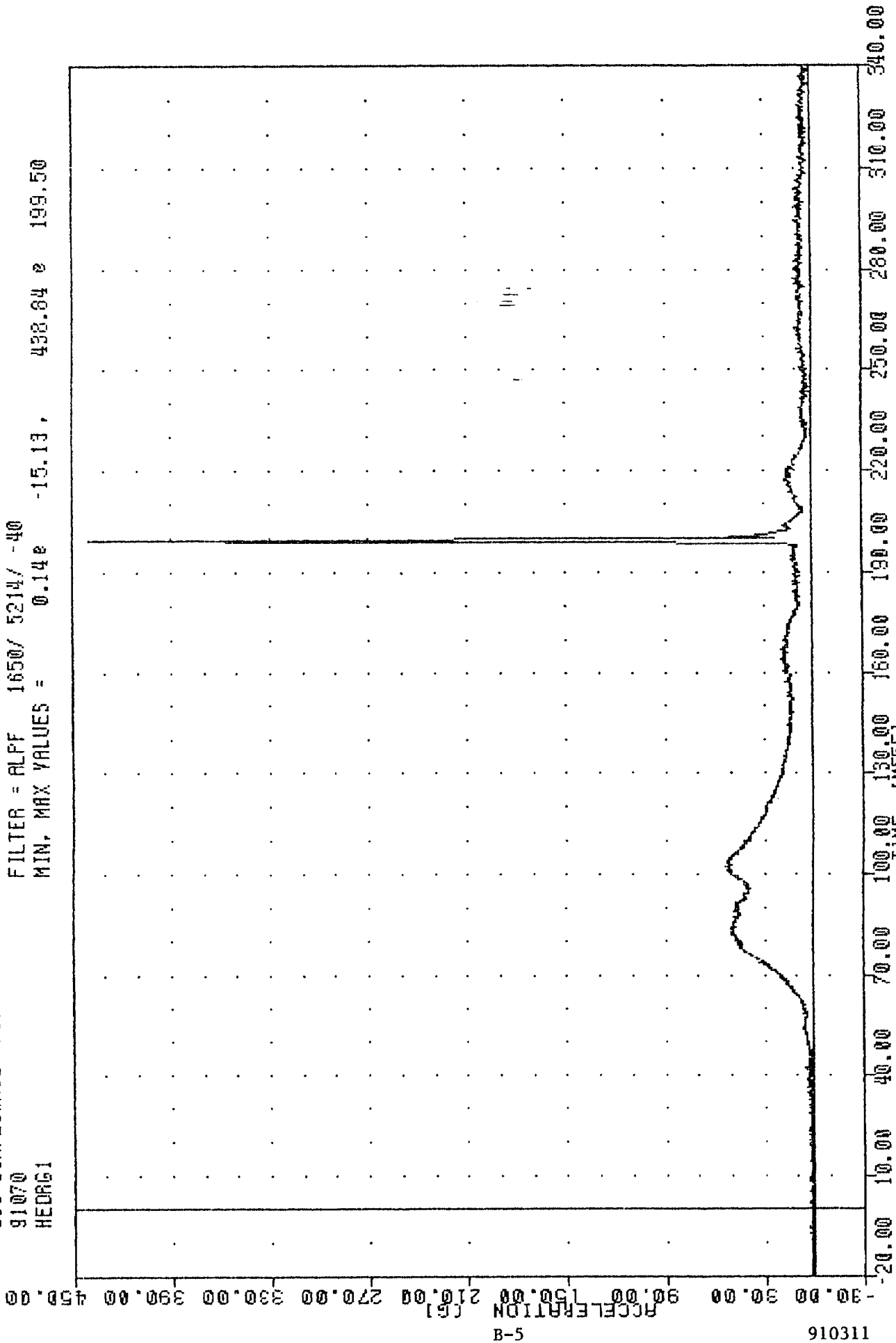
FILTER = ALPF 1650/ 5214/ -40
 MIN. MAX VALUES = -286.51e 199.50, 47.89 e 200.25



1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 DRIVER HEAD 7-AXIS ACCELERATION

TRC , 910311
 208 COMPLIANCE TESTING
 91070
 HEDRG1

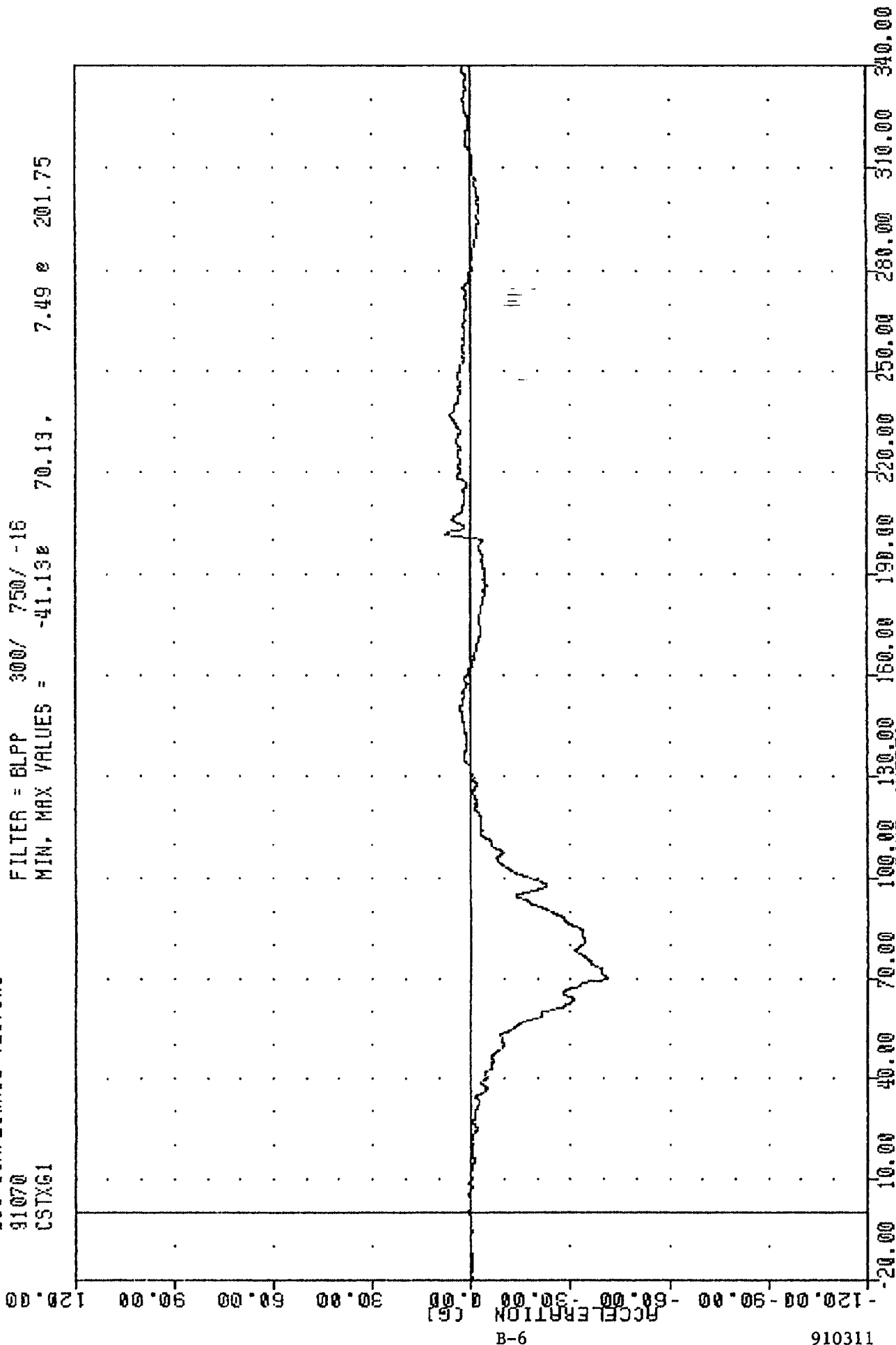
FILTER = ALPF 1650/ 5214/ -40
 MIN, MAX VALUES = 0.14e -15.13, 438.84 e 199.50



1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 DRIVER HEAD RESILIENT ACCELERATION

TRC , 910311
 200 COMPLIANCE TESTING
 91070
 CSTXG1

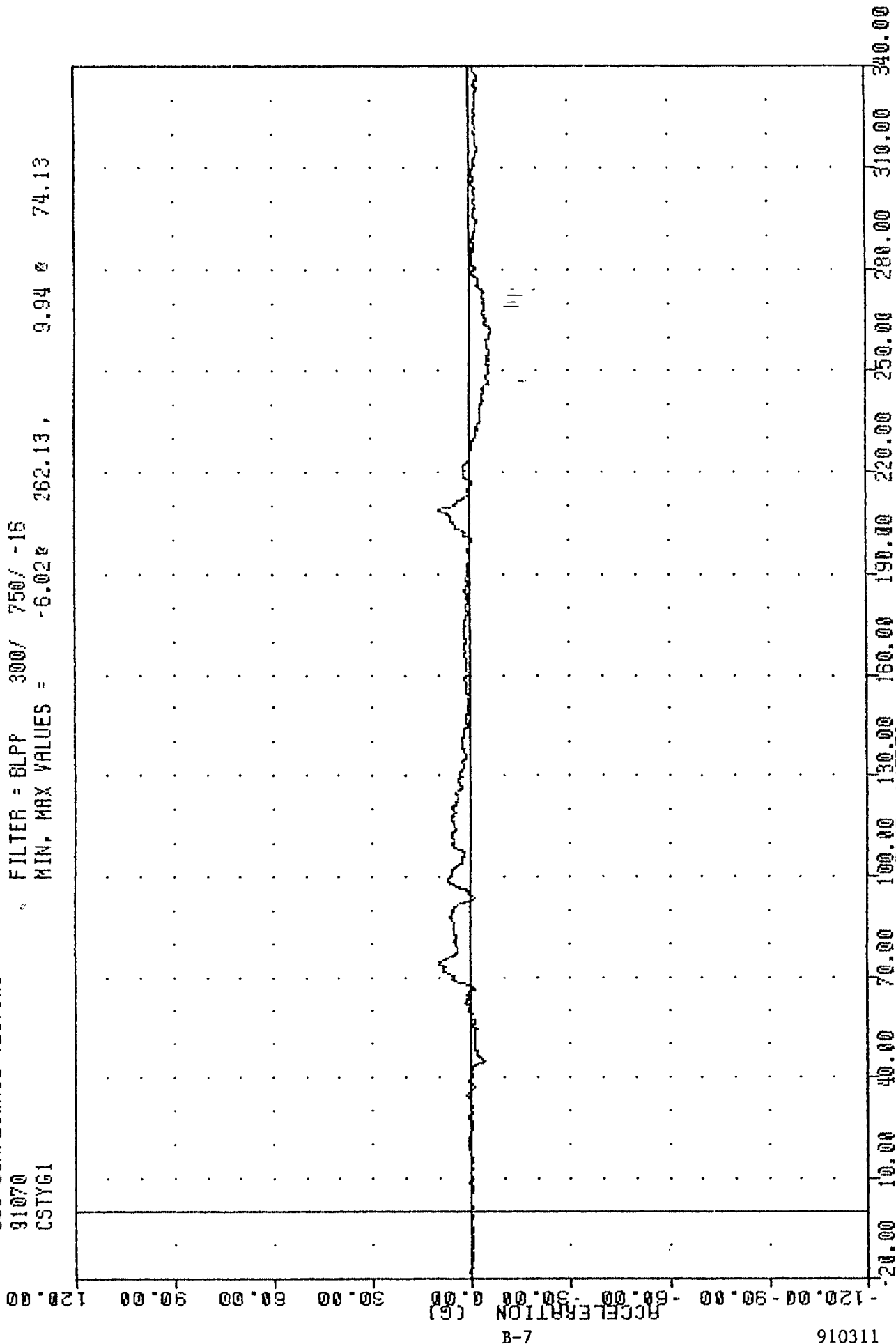
FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -41.130 70.13, 7.49 201.75



1991 HYUNDAI COUPE INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Y-AXIS ACCELERATION

TRC , 910311
 208 COMPLIANCE TESTING
 91070
 CSTY61

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -6.028 262.13 , 9.94 74.13

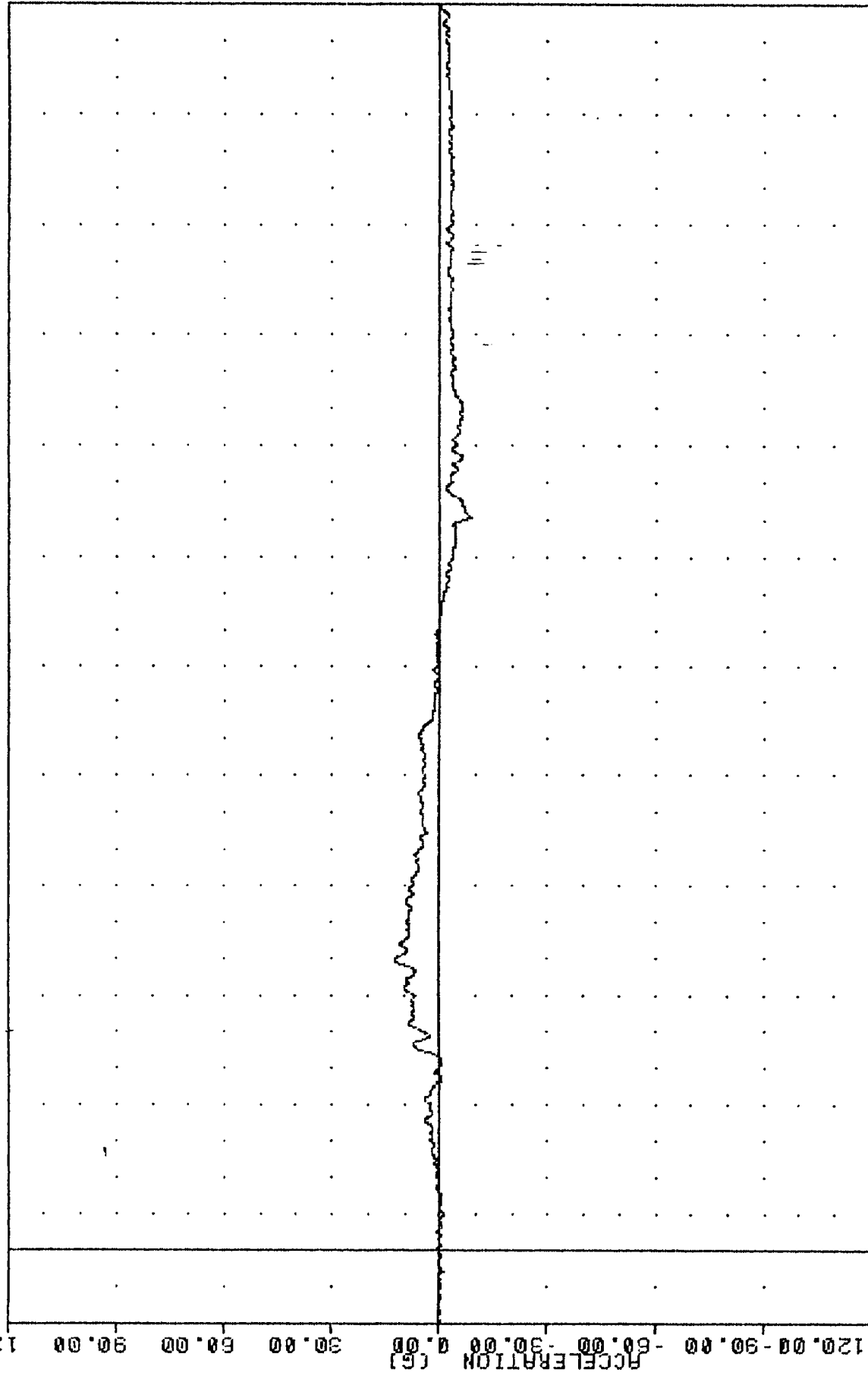


1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 NATVFR CRFST Y-AXIS ACCELERATION

TRC , 910311
 200 COMPLIANCE TESTING
 91070
 CSTZG1

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -8.43 200.75 , 12.52 79.38

120.00



B-8

910311

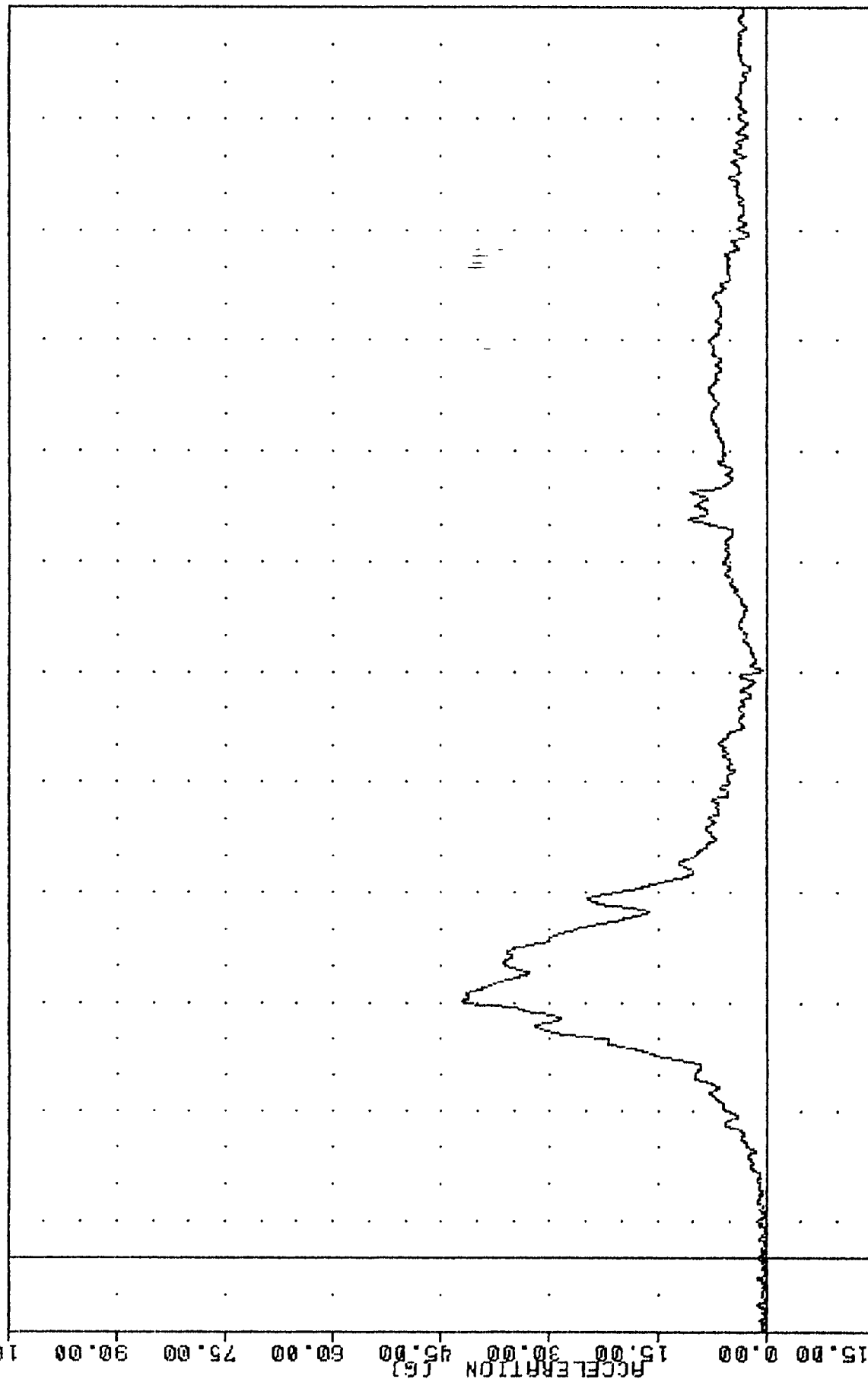
-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 DATA ACQUISITION

TRC 910311
 208 COMPLIANCE TESTING
 91070
 CSTRG1

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = 0.078 3.25, 42.13 70.25

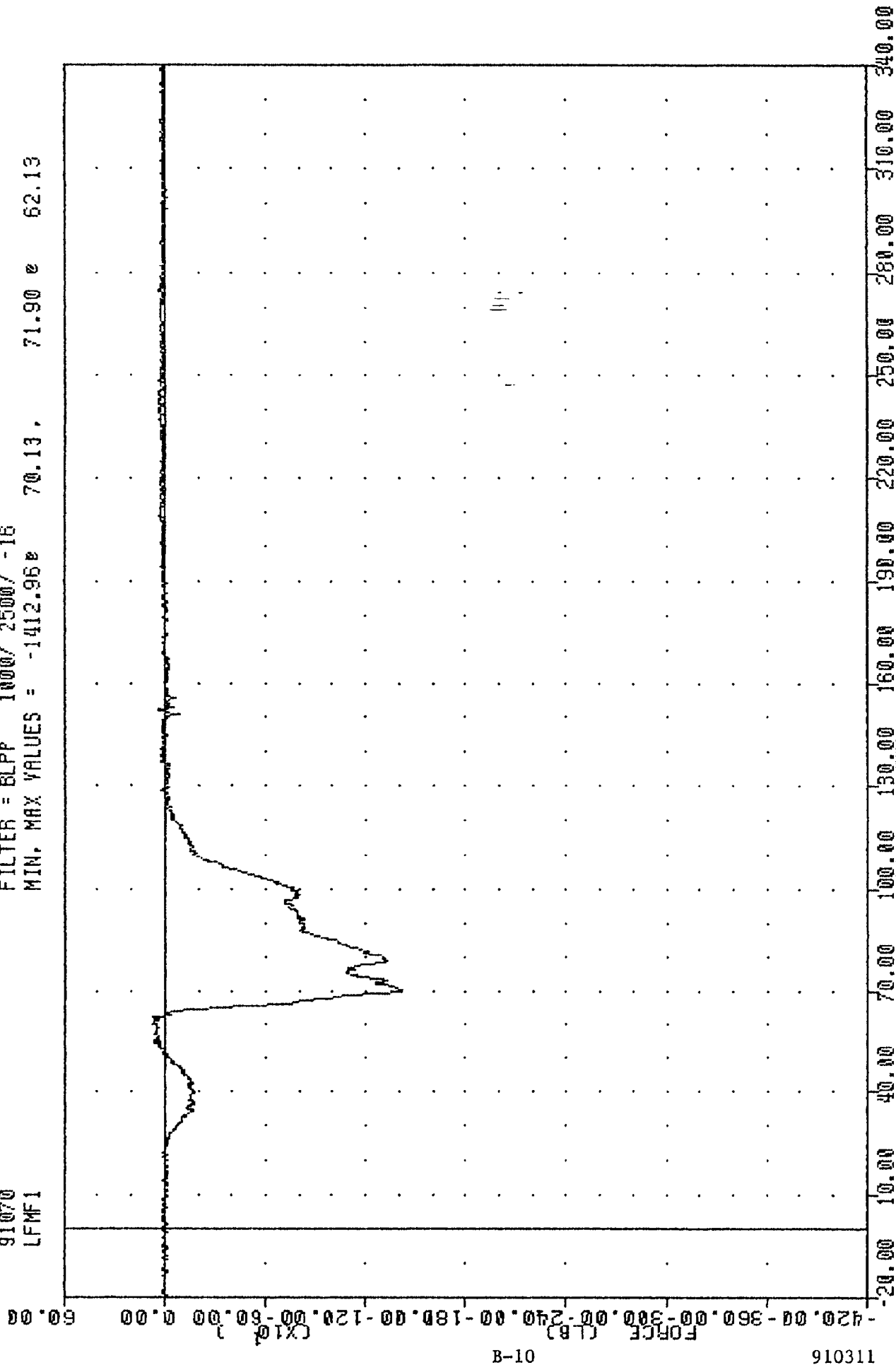
105.00



1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER

TRC 910311
 208 COMPLIANCE TESTING
 91070
 LFMF1

FILTER = BLPP 1000/ 2500/ -16
 MIN, MAX VALUES = -1412.96 70.13, 71.90 62.13

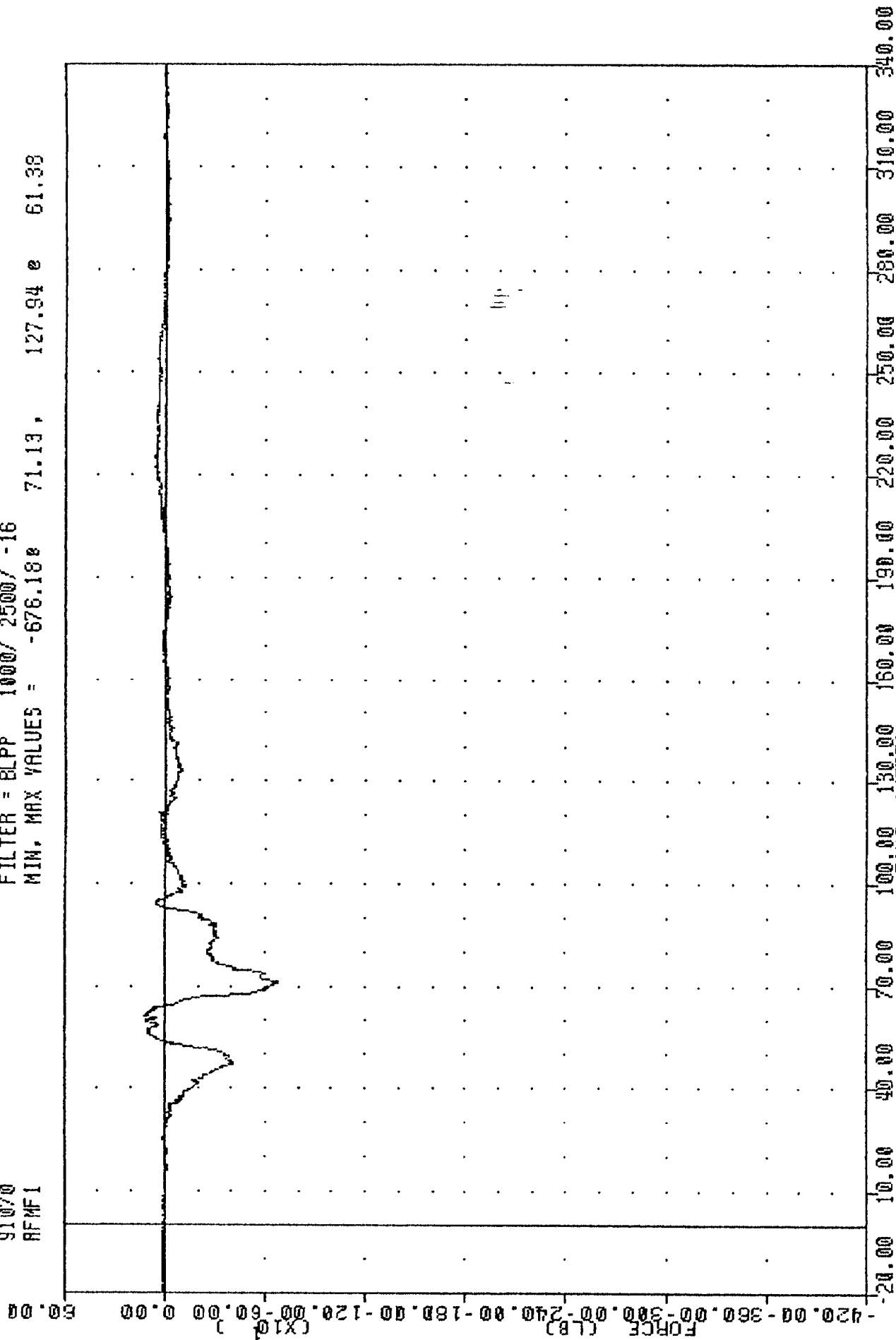


1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER

TRC , 910311
208 COMPLIANCE TESTING

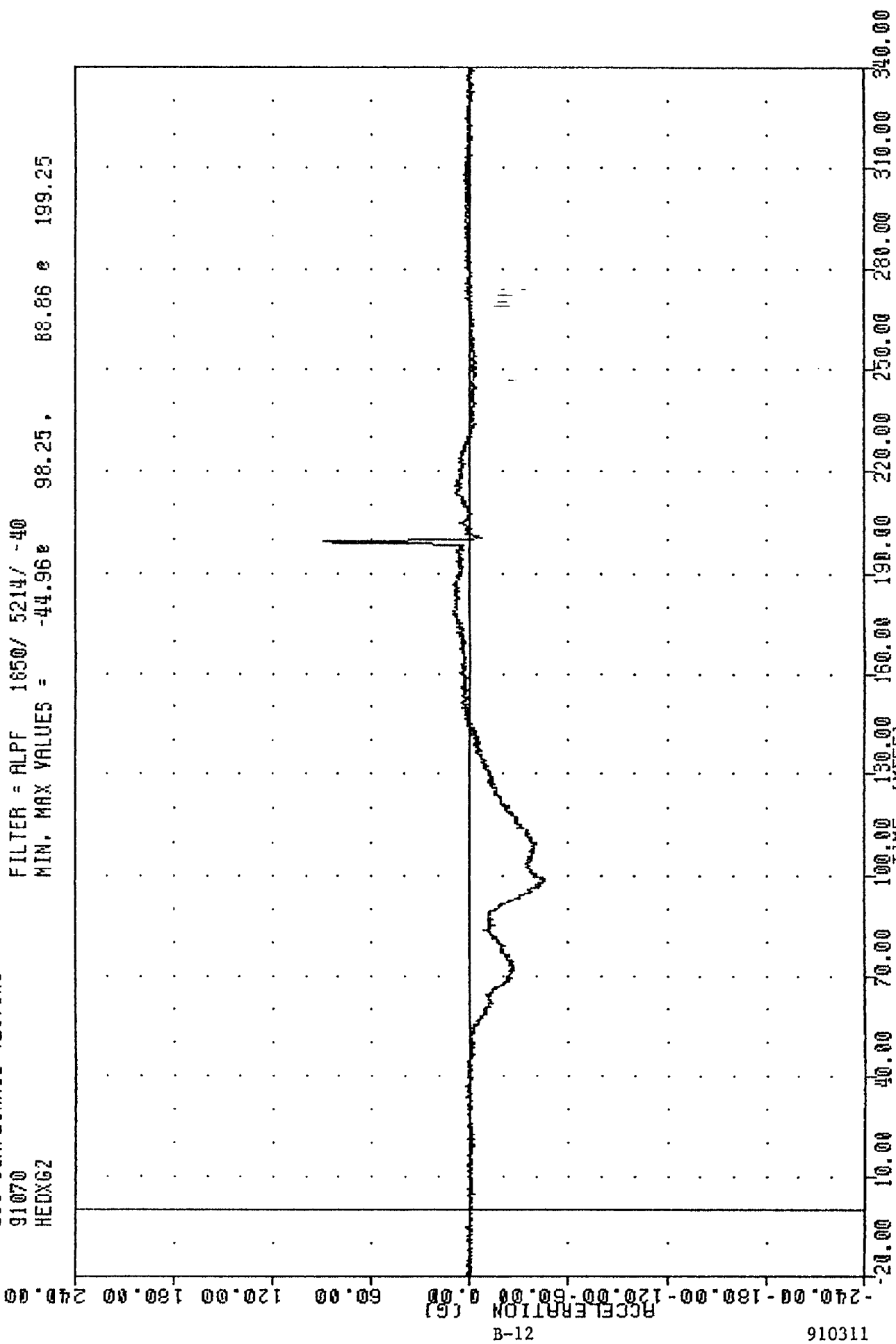
91070
AFMFI

FILTER = BLPP 1000/ 2500/ -16
MIN, MAX VALUES = -676.188 71.13, 127.94 e 61.38



TRC 910311
 208 COMPLIANCE TESTING
 91070
 HEDXG2

FILTER = ALPF 1850/ 5214/ -40
 MIN. MAX VALUES = -44.96e 88.86 e 199.25



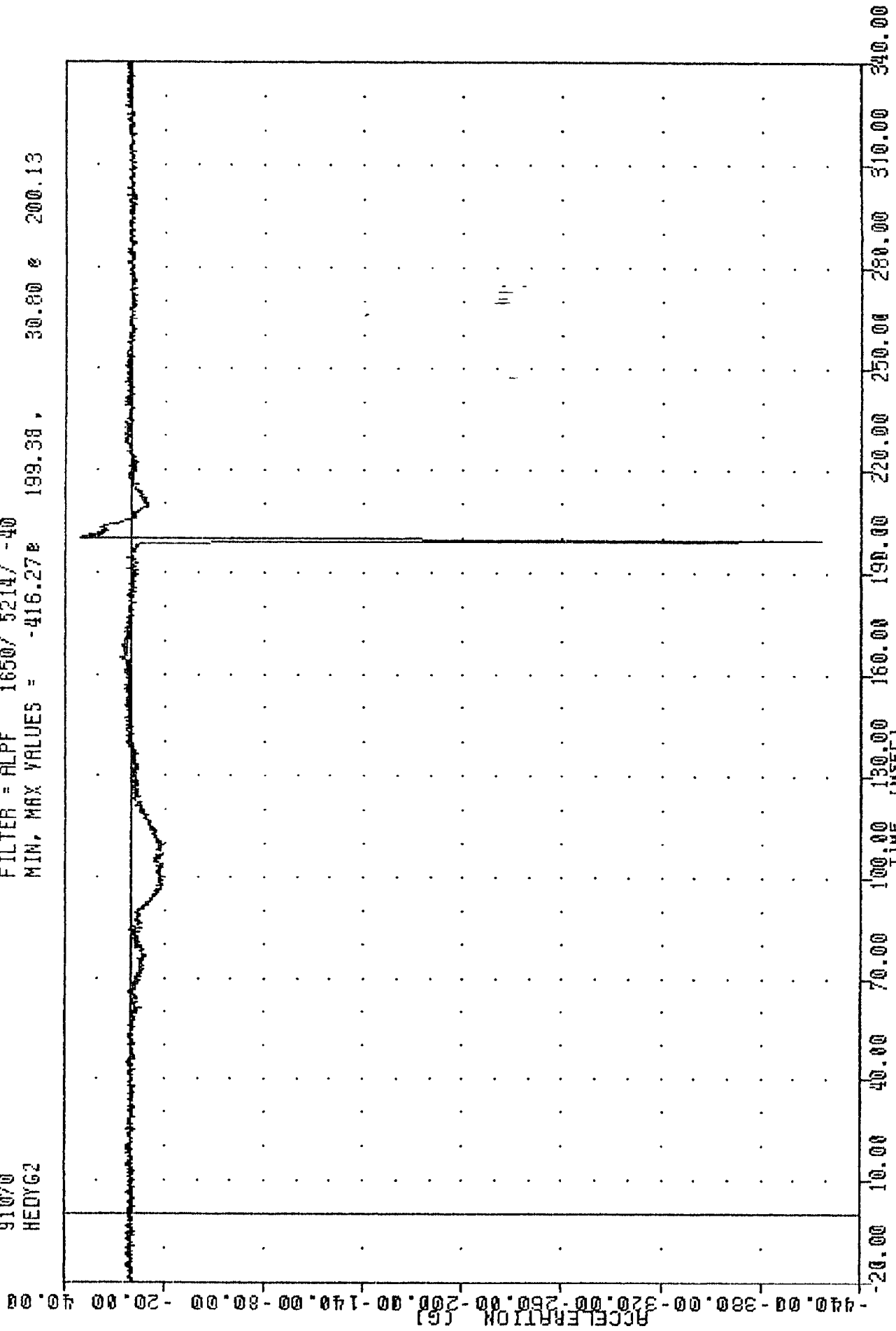
B-12

910311

1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 RIGHT FRONT ROCKER FROM V-CLIP APPLICATION

TRC , 910311
 200 COMPLIANCE TESTING
 91070
 HEDY62

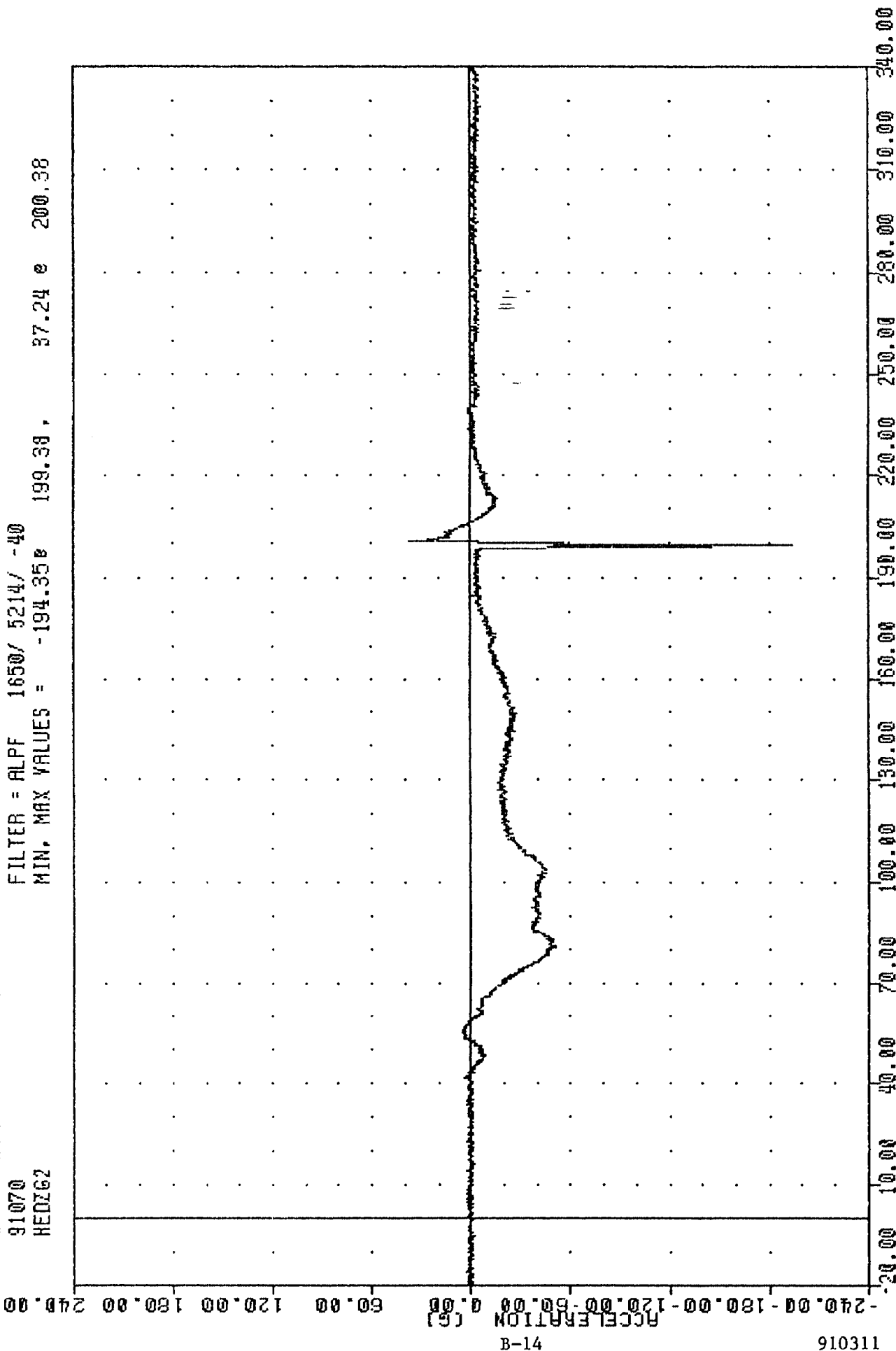
FILTER = ALPF 1650/ 5214/ -40
 MIN, MAX VALUES = -416.270 199.38, 30.00 & 200.13



1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION

TRC , 910311
 200 COMPLIANCE TESTING
 91070
 HEDZ62

FILTER = ALPF 1650/ 5214/ -40
 MIN. MAX VALUES = -194.35e 199.38 , 37.24 e 200.38



B-14

910311

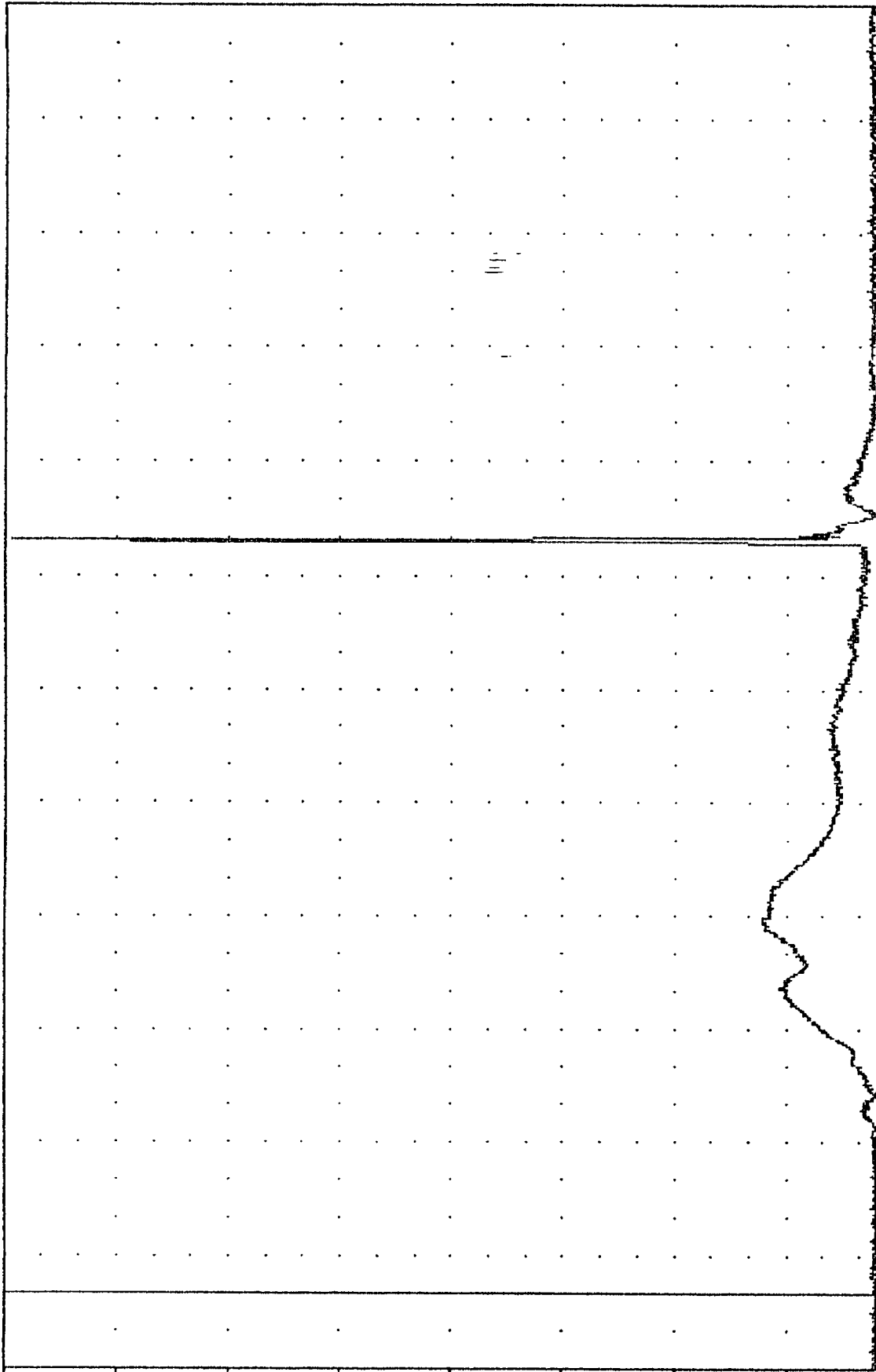
1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 RIGHT FRONT OCCURRED UPON 7.0VIS OCCURRENCE

TRC , 910311
 208 COMPLIANCE TESTING
 91070
 HEDR62

FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = 0.14e 24.38, 466.11 e 199.38

ACCELERATION (G)



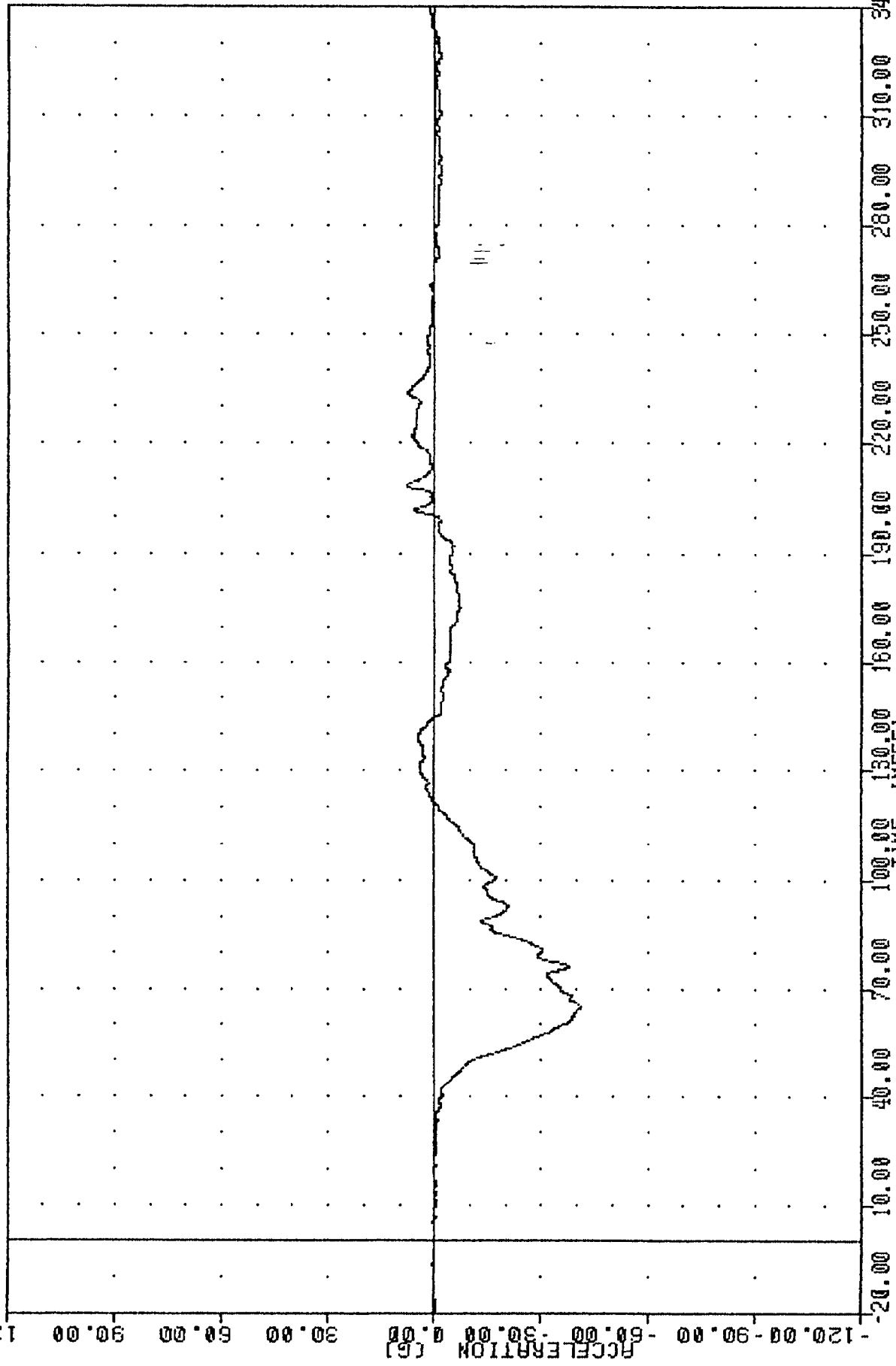
R-15

910311

1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER HEAD RESPONSANT ACCELERATION

TRC , 910311
 208 COMPLIANCE TESTING
 91070
 CSTXG2

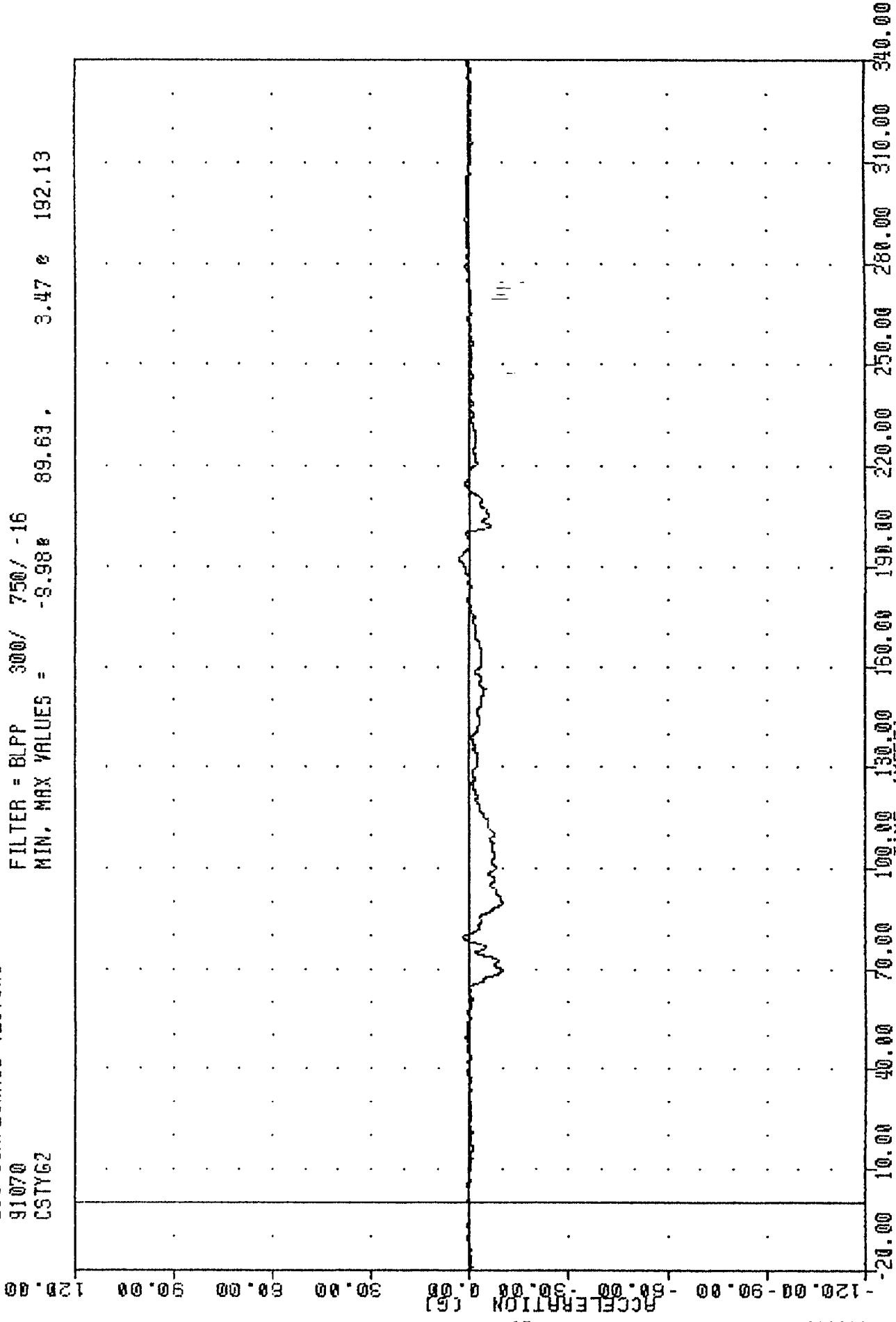
FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -41.148 64.88 , 7.90 & 208.25



1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST X-RAYS ACCELERATION

TRC , 910311
 208 COMPLIANCE TESTING
 91070
 CSTY62

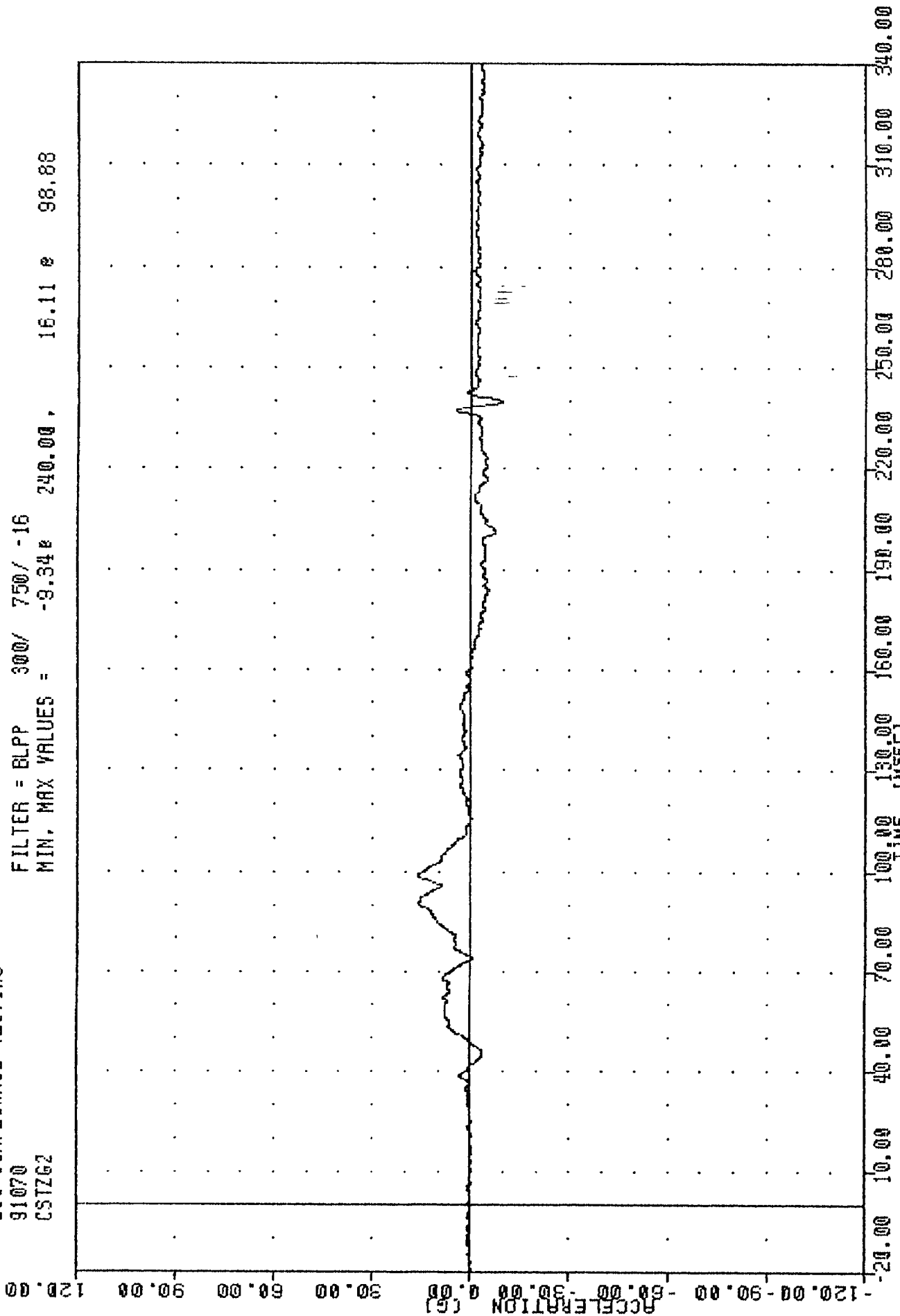
FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -8.98 89.63 , 3.47 192.13



1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 FRONT BARRIER DEFORMATION CURVE X AXIS DEFORMATION

TRC , 910311
 208 COMPLIANCE TESTING
 91070
 CSTZGZ

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -9.34e 240.00, 16.11 e 98.88

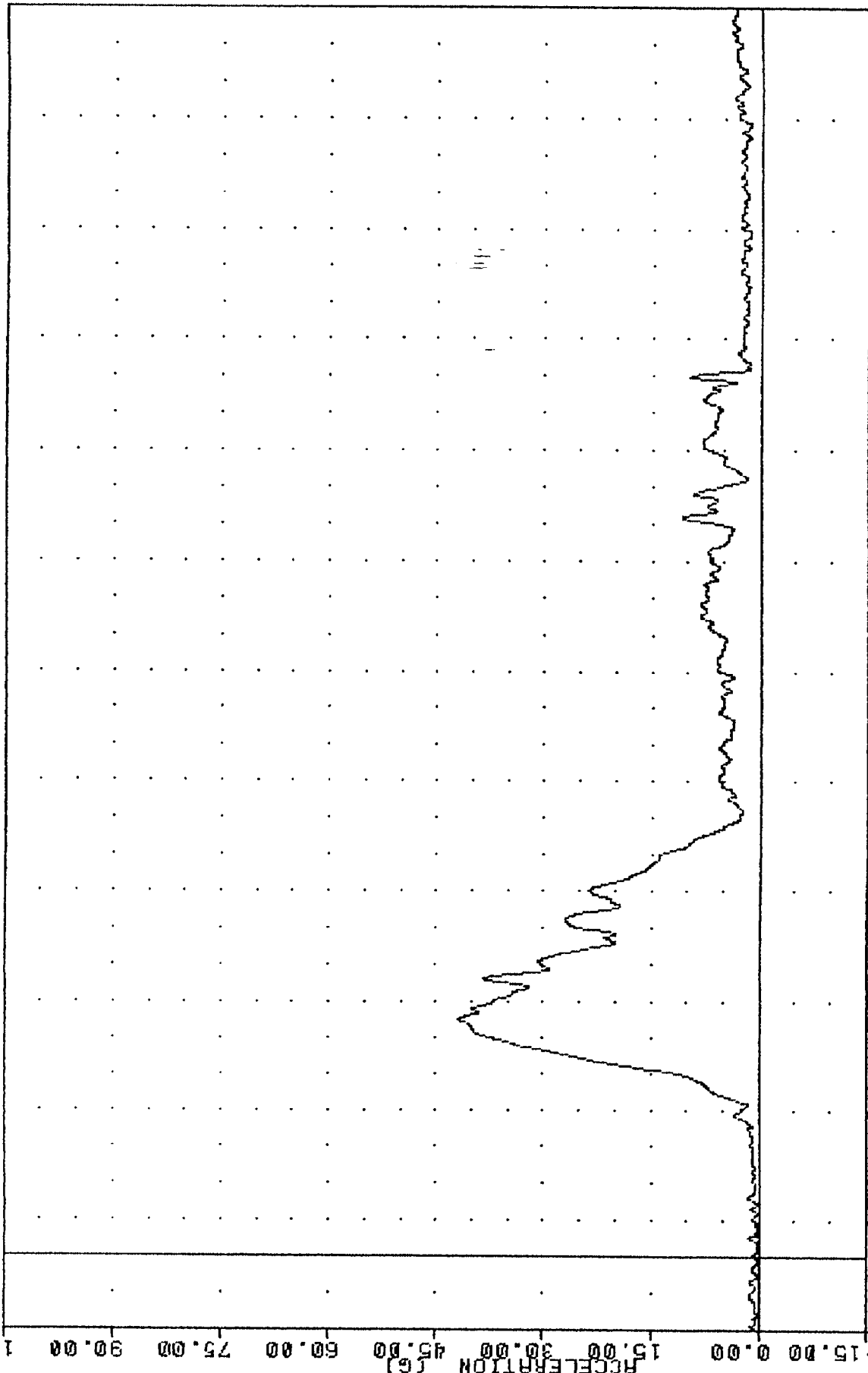


1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 FIRST FRONT REPAIRS SHOT 7 DATA COLLECTION

TRC 910311
 208 COMPLIANCE TESTING
 91070
 CSTRG2

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = 0.028 -5.25, 41.80 e 64.88

105.00



B-19

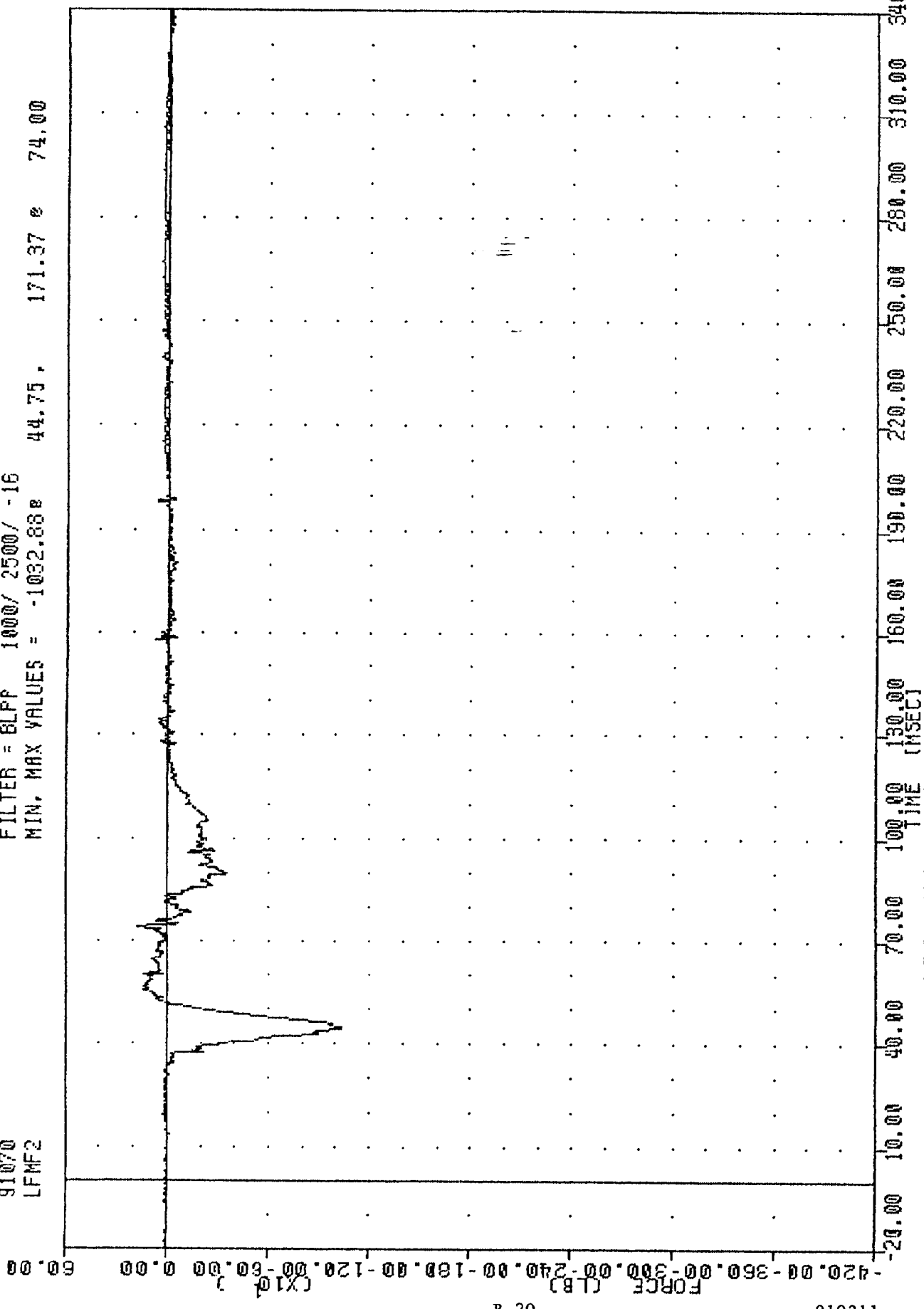
910311

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

1991 HYUNDAI COUPE INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST RESTRAINT ACCELERATION

TRC 910311
 208 COMPLIANCE TESTING
 91070
 LFMF2

FILTER = BLPP 1000/ 2500/ -16
 MIN, MAX VALUES = -1032.88e 44.75, 171.37 e 74.00

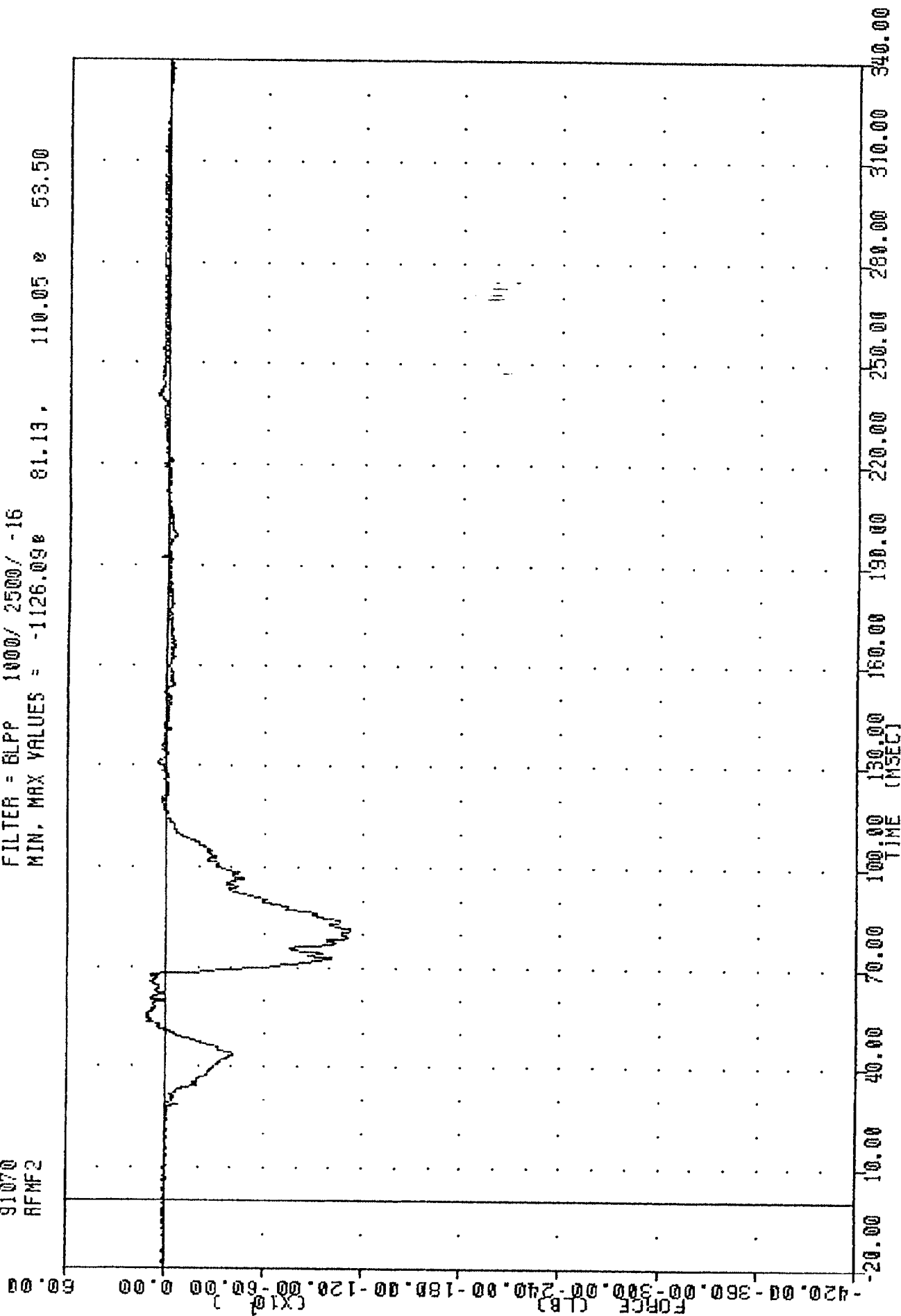


1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER

TRC , 910311
208 COMPLIANCE TESTING

91070
AFMF2

FILTER = BLPP 1000/ 2500/ -16
MIN. MAX VALUES = -1126.098 81.13, 110.05 0 53.50



1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER

TRC , 910311

208 COMPLIANCE TESTING

91070

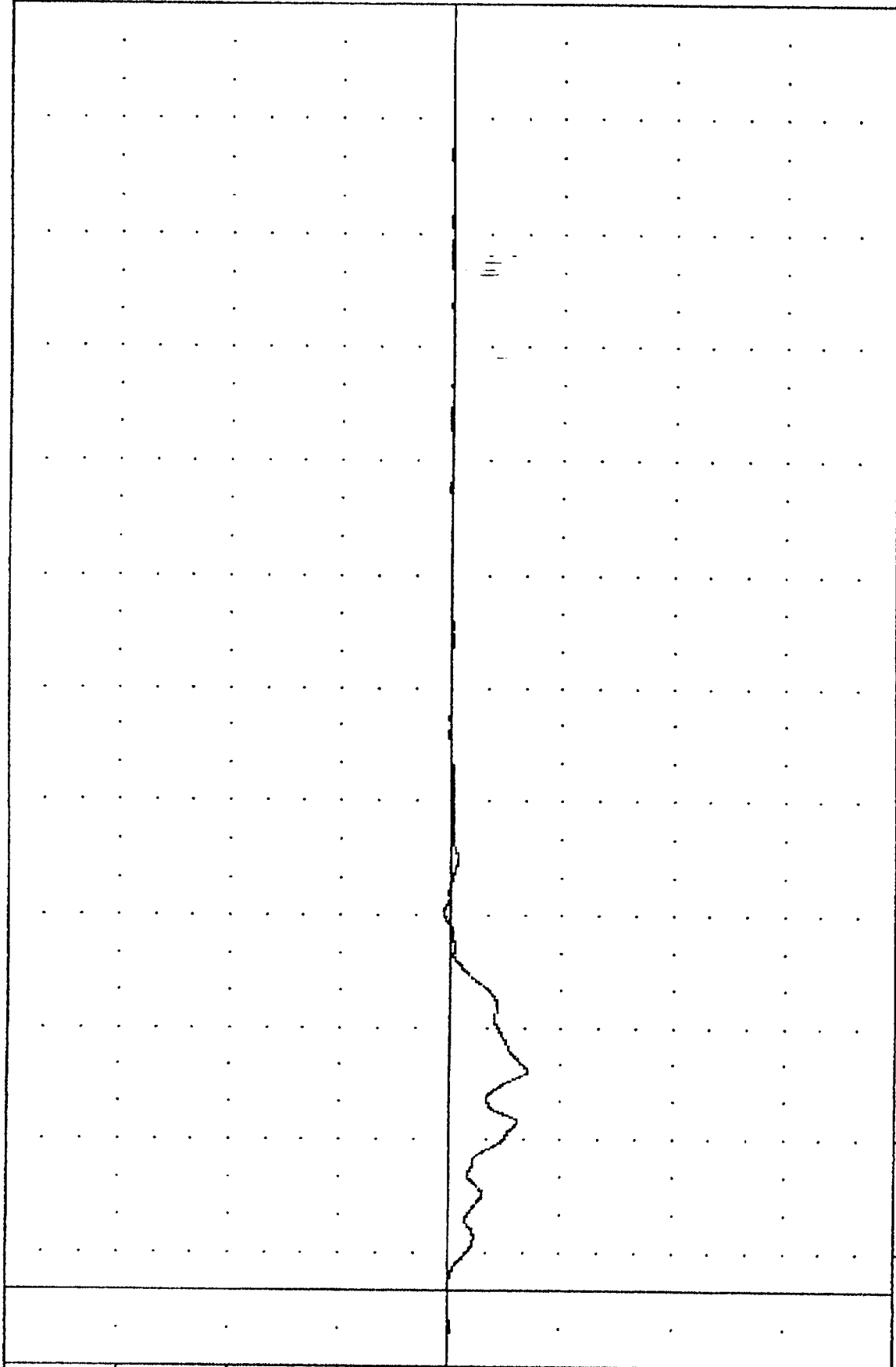
TLRXG1

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -41.76 58.50 ,

4.13 100.38

ACCELERATION (G)



-20.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00

1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
100 FT BEHIND SEAT VEHICLE OCCUPANT POSITION

TRC , 910311

208 COMPLIANCE TESTING

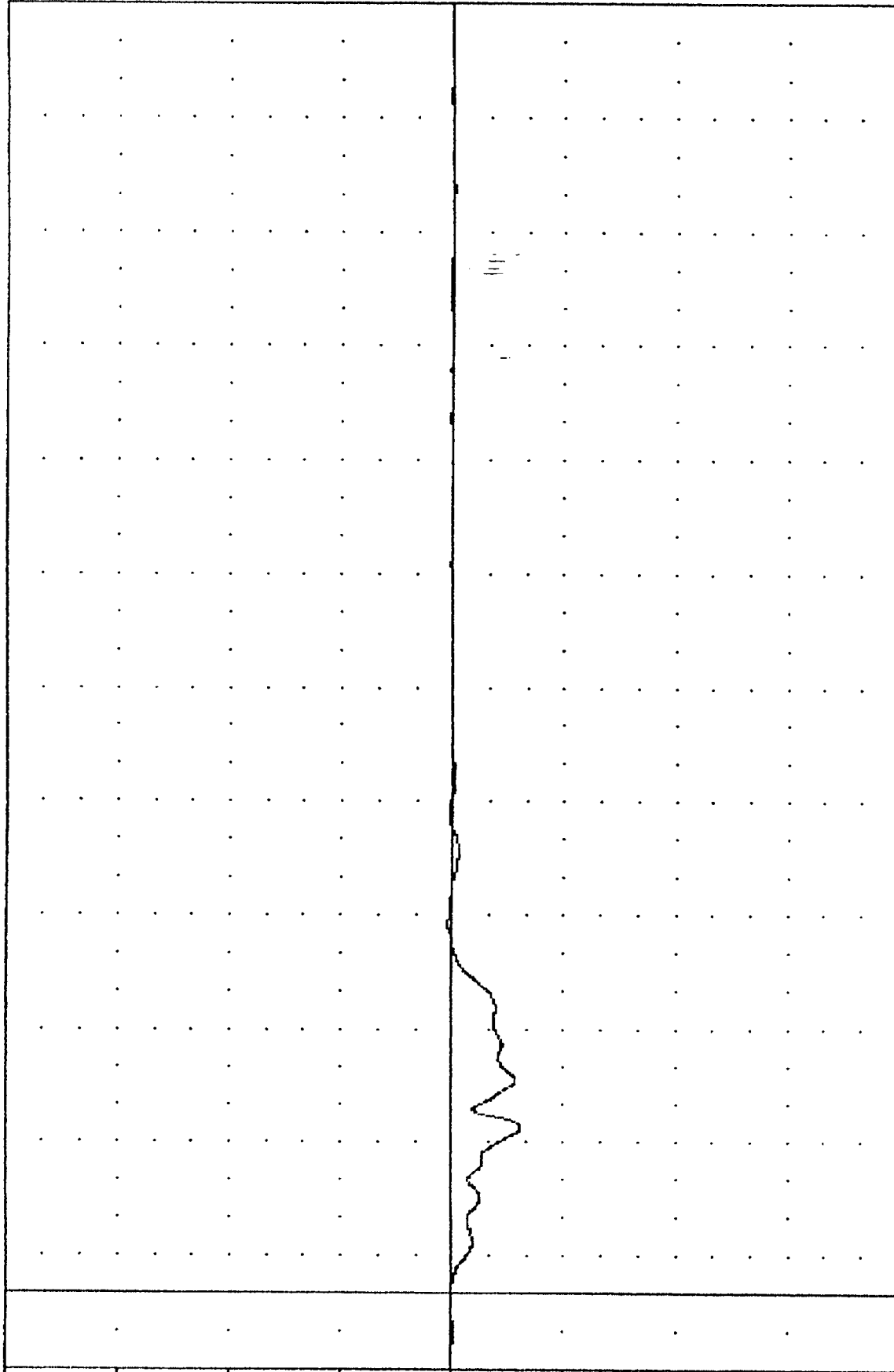
91070

TRXG1

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -36.98 43.88, 2.84 97.50

ACCELERATION [G]



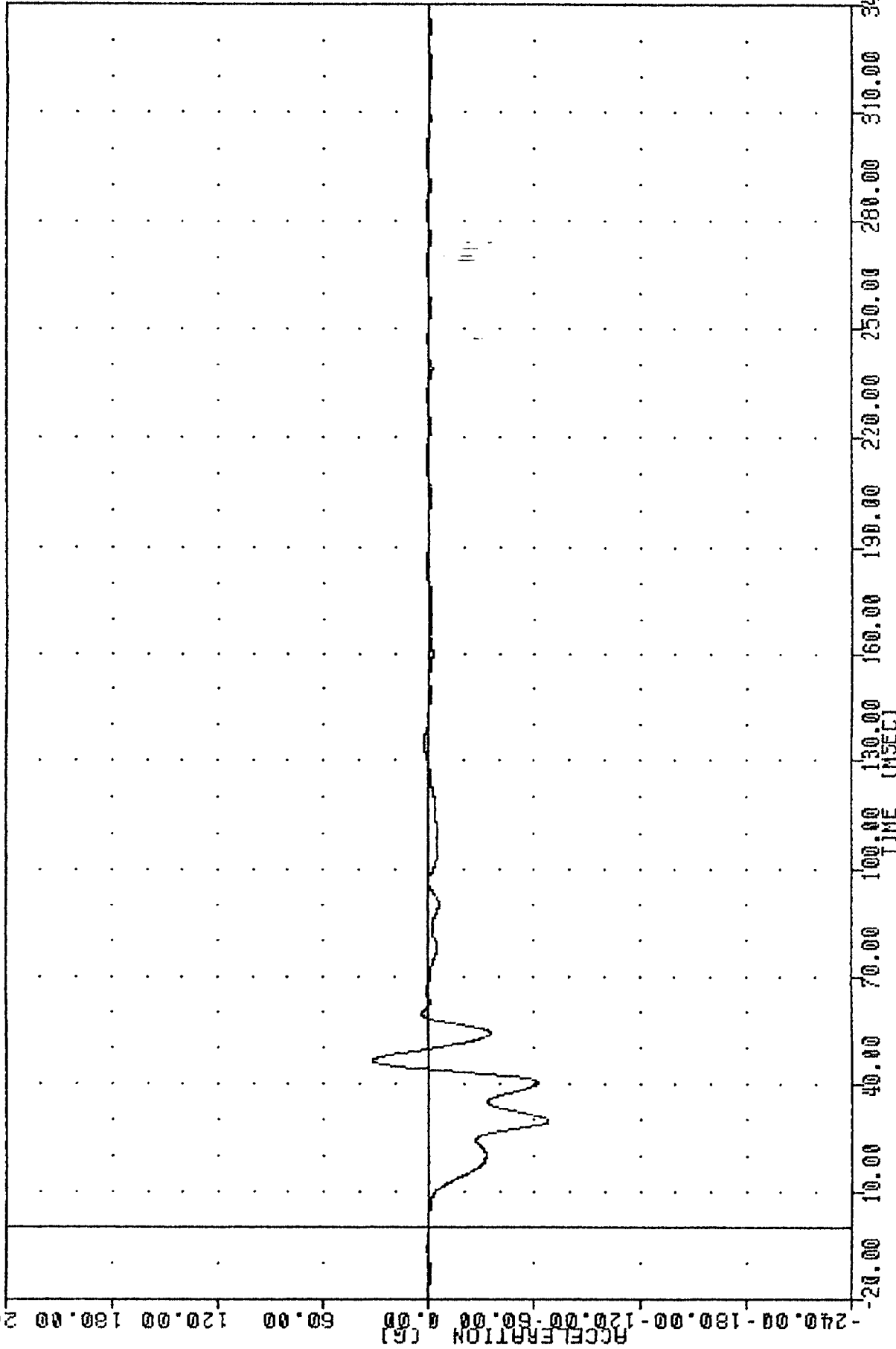
B-23

910311

1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
DTCUT DEOD CROT V-OVIE ACCFIEDOTON

TRC , 910311
 208 COMPLIANCE TESTING
 91070
 ENGCG1

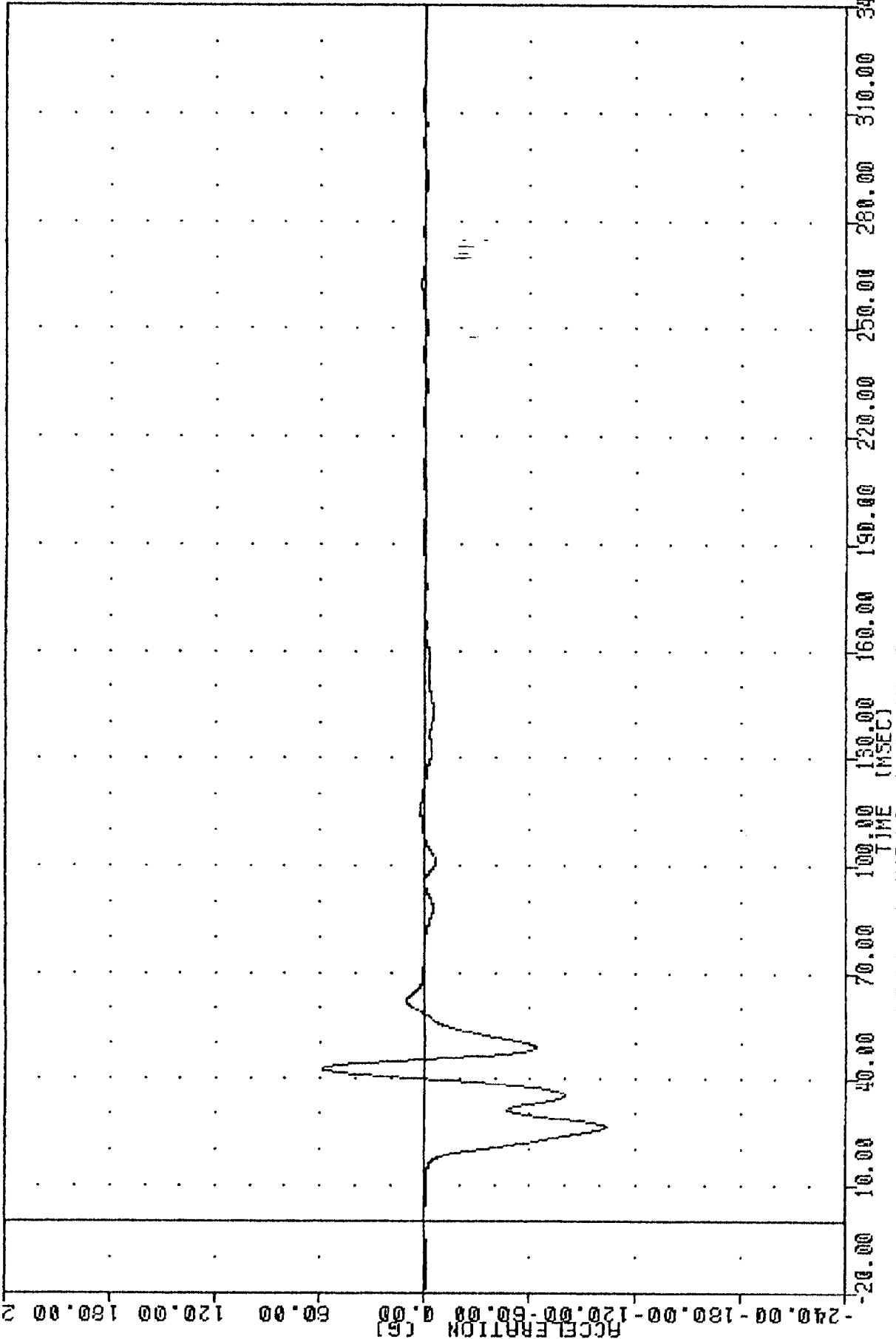
FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -67.62e 29.75, 32.67 e 46.50



1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
 ENGINE AND V-DWTC ACCELERATION

TRC
200 COMPLIANCE TESTING
91070
ENGXG2

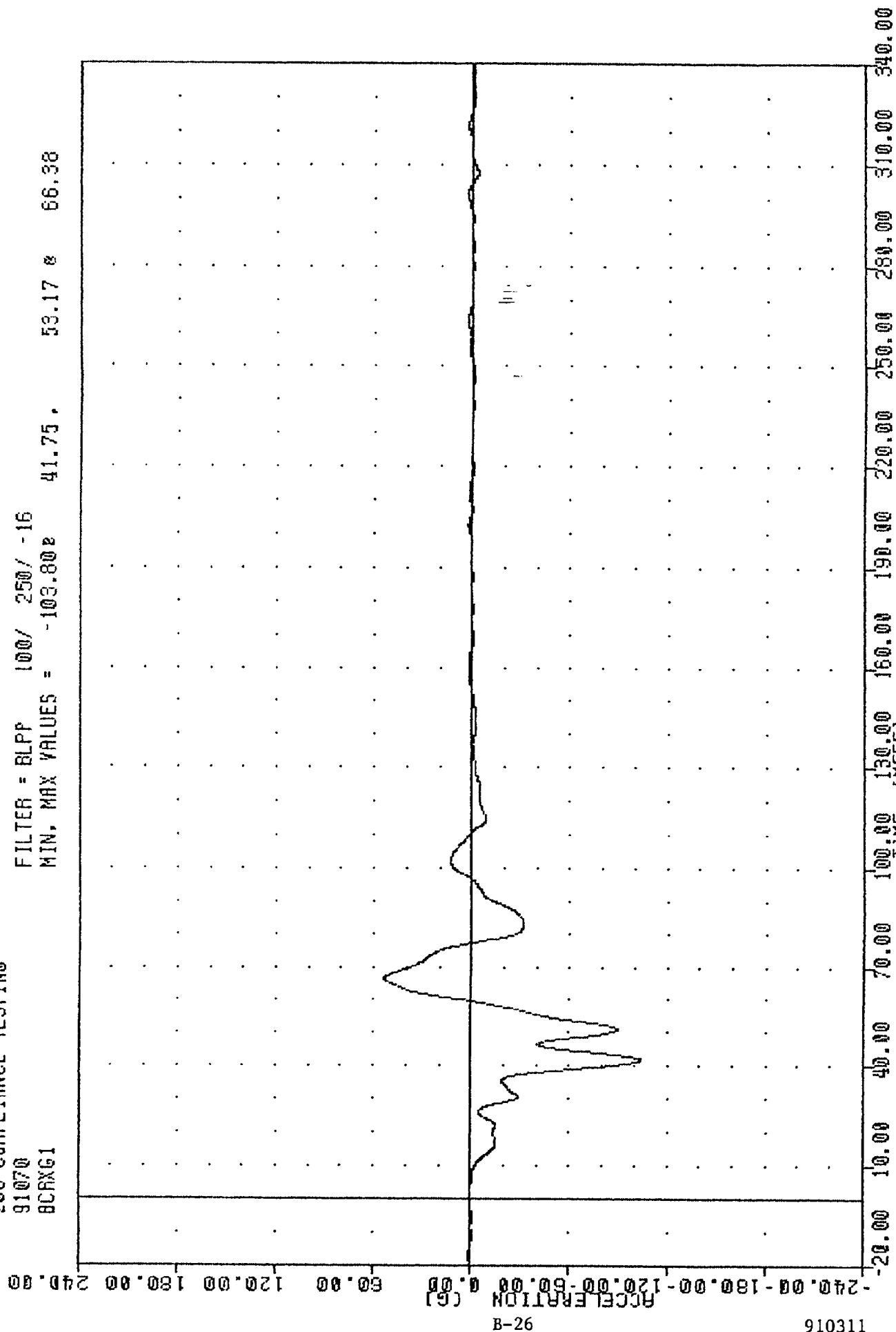
FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -103.62e 26.25, 59.32 e 42.75



1991 HYUNDAI COUPE INTO FLAT FRONTAL BARRIER
ENGINE BOTTOM V-Axis OCCURRENCE

TRC 910311
 208 COMPLIANCE TESTING
 91070
 BCRXG1

FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -103.802 41.75, 53.17 & 66.38



1991 HYUNDAI COUPE INTO FLAT FRONTAL BARRIER
 FRONT CROSS CURVE V AUTO ACCELERATION

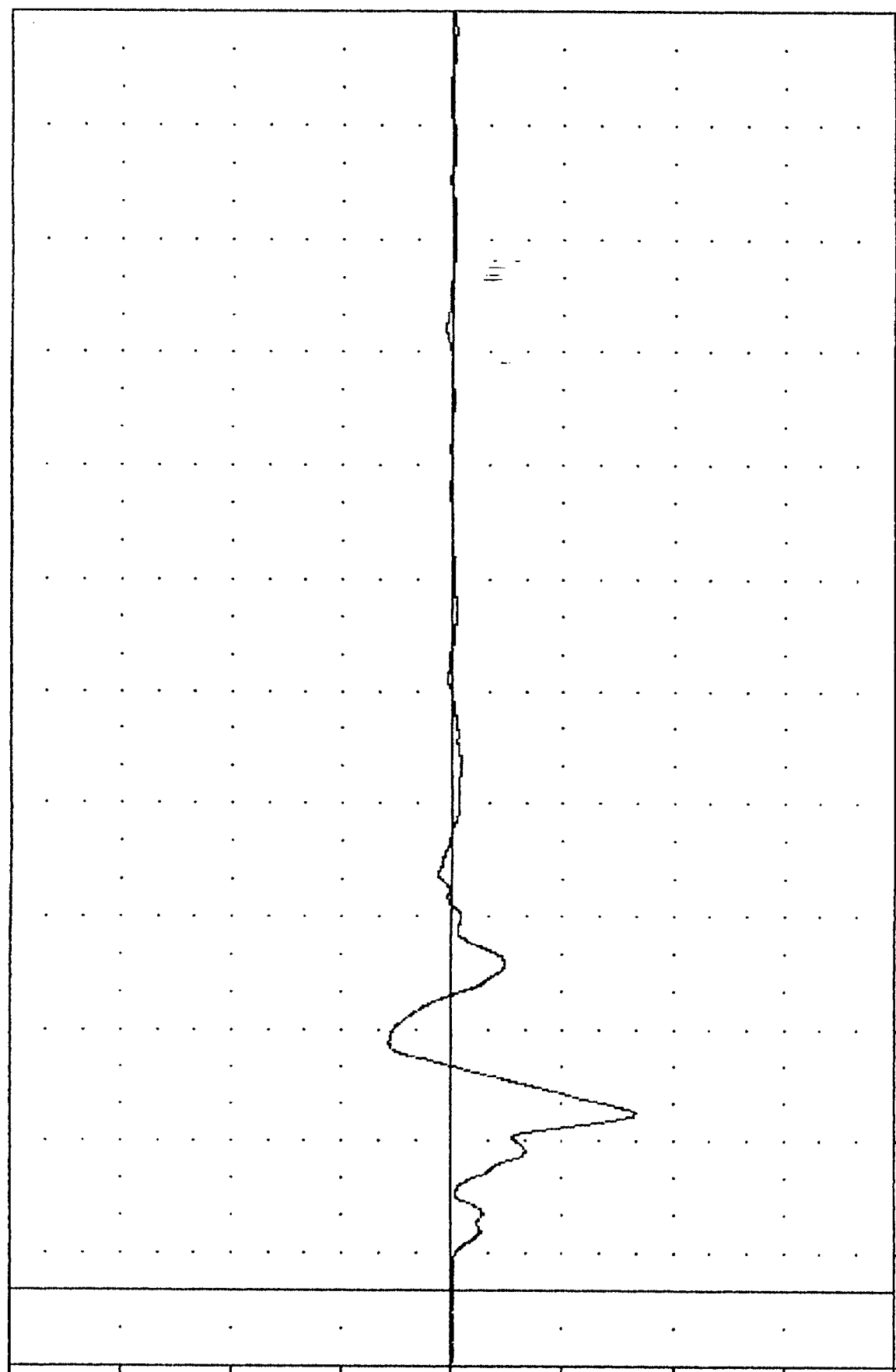
TRC , 910311
208 COMPLIANCE TESTING

91070
BCLXG1

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -99.60e

47.38 . 34.14 e 66.38

ACCELERATION (G)
-240.00 -180.00 -120.00 -60.00 0.00 60.00 120.00 180.00 240.00

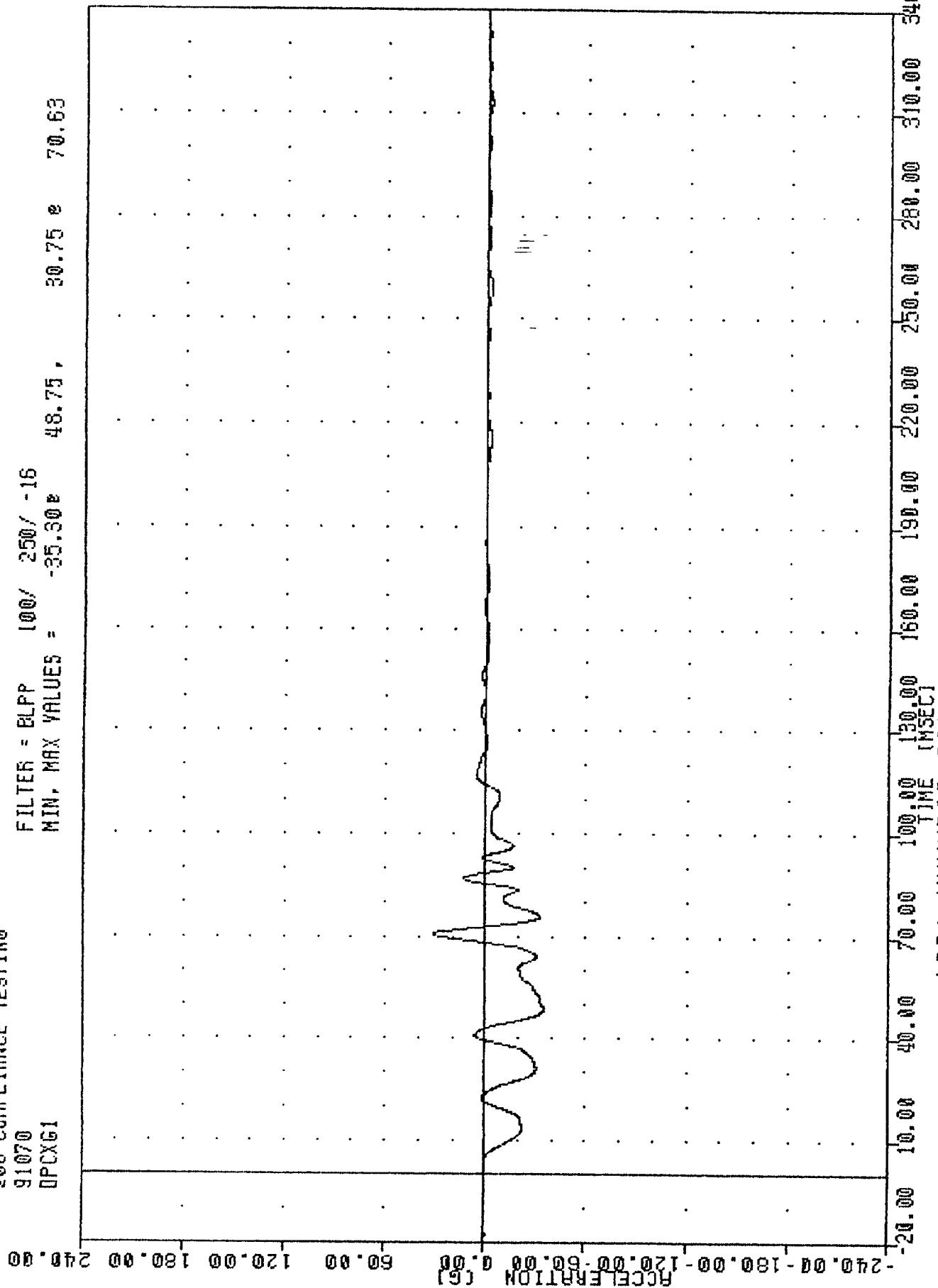


-20.00 10.00 50.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER
1 CFT ABOVE COLLIDED VEHICLE OCCUPATION

TRC , 910311
 208 COMPLIANCE TESTING
 91070
 DPCXG1

FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -35.30 48.75, 30.75 70.63



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910311

1991 HYUNDAI SCOUPE INTO FLAT FRONTAL BARRIER