

REPORT NO. MGA-90-N005
NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

Hyundai Motor America
1991 Hyundai Scoupe 2-Door Coupe
NHTSA No. MM0500

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



May 30, 1991

FINAL REPORT

Prepared For:

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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
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16. Abstract A 35 mph frontal barrier impact using a 6 load cell barrier was conducted on a 1991 Hyundai Scoupe at the MGA Proving Grounds Crash Test Facility in Burlington, Wisconsin on May 8, 1991. The barrier impact velocity was 35.3 mph and the ambient temperature at the barrier face at the time of impact was 70 degrees Fahrenheit. The post test vehicle maximum crush was 22.3 inches. The test vehicle appeared to comply with the indicant requirements of the following Federal Motor Vehicle Safety Standards: 1. FMVSS No. 212, "Windshield Mounting" 2. FMVSS No. 219 (partial), "Windshield Zone Intrusion" 3. FMVSS No. 301, "Fuel System Integrity" With regard to FMVSS No. 208, "Occupant Crash Protection" injury criteria, the driver's HIC was 870 and the 3 millisecond clip (chest g's) for the the chest g's was 45.3. The maximum load on the driver's left femur was 2532 lbs. and 967 lbs. for the driver's right femur. The passenger's HIC was 618 and the 3 millisecond clip was 42.0. The maximum loads for the passenger's left and right femurs were 1296 lbs. and 333 lbs. respectively.			
17. Key Words 35 MPH Frontal Barrier Impact Test New Car Assessment Program (NCAP) FMVSS 212 Indicant Testing FMVSS 219 (partial) Indicant Testing FMVSS 301 Indicant Testing		18. Distribution Statement Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. NASSIF Building, Room 5108 400 Seventh St., S.W., Washington DC 20590	
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TABLE OF CONTENTS

<u>SECTION</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
1	Purpose and Test Procedure	1-1
2	Summary of Frontal Barrier Impact Test	2-1
3	Summary of Results for FMVSS Nos. 212, 219 & 301-75	3-1
4	Occupant and Vehicle Information	4-1
APPENDIX A	Photographs	A-1
APPENDIX B	Vehicle, Load Cell Barrier and Dummy Response Data	B-1
APPENDIX C	Dummy Configuration & Performance Verification Data	C-1
APPENDIX D	Dummy, Vehicle and Laboratory Calibration Data	D-1
APPENDIX E	Vehicle Owner's Manual Occupant Restraint System Instructions	E-1

SECTION 1

PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY '90 Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH 22-90-D-1212. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 30 mph FMVSS 208/212/219/301 requirements.

The 35 mph frontal barrier impact test was conducted in accordance with the National Highway Traffic Safety Administration (NHTSA) Indicant Test Laboratory Procedure for New Car Assessment Program (NCAP) dated January 1, 1990. Data for FMVSS No. 212, "Windshield Mounting", FMVSS No. 219 (Partial), "Windshield Zone Intrusion", FMVSS No. 301, "Fuel System Integrity", as well as occupant performance data are provided herein.

SECTION 2

SUMMARY OF TEST NUMBER MM0500

A load cell barrier consisting of 6 load cells was impacted by a Hyundai Scoupe at a velocity of 35.3 mph. The test was performed at the MGA Proving Grounds and Crash Test Center on May 8, 1991. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by one real-time camera and 16 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 466) and the right-front passenger ATD (Serial No. 465) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C and D.

The 39 channels of data were recorded on 4 computers. Appendix B contains the vehicle, load cell barrier and dummy response data traces.

The driver's head struck the steering wheel rim and hub; the HIC was 870. The maximum chest deceleration over 3 milliseconds was 45.3 g's. The left and right femur loads were 2532 and 966 pounds.

The right front passenger's HIC was 618 and maximum chest deceleration over 3 milliseconds was 42.0 g's. The left and right femur loads were 1296 and 333 pounds.

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1991 Hyundai Scoupe 2 Door Coupe

NHTSA No.: MM0500 VIN: KMHVE22JOMU054370

Body Color: Black Date of Manufacture: 2/2/91

Engine: 4 Cylinders; C.I.D.; 1.5 Liters; CC

 X Gas; Diesel; X Turbocharged

Placement Longitudinal; Transverse

Transmission: 5 Speed; X Manual; Automatic; Overdrive

Final Drive: X Front Wheel; Rear Wheel; Four Wheel

Date Received: 4/2/91 Odometer Reading: 110 miles

 A/C; X P/S; X P/B; P/wdo; Tilt Wheel

 P/Seats; Cruise Control

Type of Occupant Restraint: The Scoupe has manual/passive shoulder belts and manual lap belts. The shoulder belt assembly consists of a retractor located inboard of the front bucket seats. The latch for this belt is located on the door frame approximately 9 1/2 in. from the uppermost corner rearward. There is also an additional door latch and striker located near this anchor. There is an emergency release located on the latch. The lap belt is a manual type with retractors located outboard of the front bucket seats. The latch is located inboard of the seats.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 35 psi, Rear 35 psi

Recommended Tire Size: P175/70R13

Recommended Cold Tire Pressure: Front 28 psi; Rear 28 psi

Tires on Vehicle: P175/70R13 ; Manufacturer: Michelin

Number of Occupants: 2 Front; 2 Rear; 3rd Seat; 4 Total

Type of Front Seats: X Bucket; Bench; Split Bench

Type of Front Seat Back: Fixed; X Adj. With; X Lever; Rot. Knob

Vehicle Capacity Weight (VCW) = 700 lbs. (A)

No. of Occupants x 150 lbs. = 600 lbs. (B)

Rated Cargo Weight (RCW) A-B = 100 lbs.

GVWR 3175 lbs. GAWR: Front 1720 lbs. Rear 1545 lbs.

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (WITH MAXIMUM FLUIDS) = UDW:

Right Front = 668 lbs. Right Rear = 420 lbs.

Left Front = 683 lbs. Left Rear = 430 lbs.

TOTAL FRONT WEIGHT = 1351 lbs. (61.4 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 850 lbs. (38.6 % of Total Vehicle Weight)

TOTAL UNLOADED DELIVERED WEIGHT (UDW) = 2201 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (2201 lbs.)

VCW = Vehicle Capacity Weight (700 lbs.)

DSC = Designated Seating Capacity (4)

RCW = VCW - 150 (DSC) = 100 *lbs.

Target Test Weight = UDW + RCW + (2 dummies x 164 lbs./dummy)

Target Test Weight = 2629 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 0 POUNDS CARGO:

Right Front = 726 lbs. Right Rear = 573 lbs.

Left Front = 751 lbs. Left Rear = 578 lbs.

TOTAL FRONT WEIGHT = 1477 lbs. (56.2 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 1151 lbs. (43.8 % of Total Vehicle Weight)

TOTAL TEST WEIGHT = 2628 lbs.

Weight of ballast secured in vehicle trunk area = 0 lbs.

Vehicle components removed to meet target weight Rear seatback, rear seat cushion, retractor (rear), assorted trim rearward of front seats.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 25 11/16 LF 25 7/16 RR 25 3/4 LR 25 7/16

Test Attitude: RF 25 1/4 LF 25 1/8 RR 25 LR 25 1/8

Wheel Base: 93 7/8 in.; C.G. = 36 1/4 in. rearward of front wheel C/L

Remarks: None

*light trucks and MPVs RCW is 300 lbs. or manufacturer's value whichever is less

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: 35 mph frontal impact Impact Angle: 0 °
 Date of Test: May 8, 1991 Time of Test: 3:10 PM
 Ambient Temperature: 70 °F at impact area
 Temperature in Occupant Compartment: 70 °F (Spec. Range = 66 to 78°F)
 Windshield Molding Temperature: 70 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.3 mph, secondary = 35.3 mph
 Distance From Front Bumper to Barrier Face When
 Entering Speed Trap: 47 inches
 Exiting Speed Trap: 8 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length:	Pre-Test = R	<u>160.5</u>	C _L	<u>165.8</u>	L	<u>160.1</u>
	Post-Test = R	<u>138.5</u>	C _L	<u>143.5</u>	L	<u>141.5</u>
	Crush = R	<u>22.0</u>	C _L	<u>22.3</u>	L	<u>18.6</u>

Distance from front of test vehicle to point of impact (rebound):

R 8 3/4 in. C_L 9 1/2 in. L 8 3/4 in.

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Steering Wheel Hub center/rim</u>	<u>No contact</u>
Chest	<u>Steering Wheel rim</u>	<u>Chin to chest</u>
Abdomen	<u>No contact</u>	<u>No contact</u>
Left Knee	<u>Instrument Panel</u>	<u>Instrument Panel</u>
Right Knee	<u>Instrument Panel</u>	<u>Instrument Panel</u>

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening (without use of tools)	<u>X</u>	<u>X</u>	<u>N/A</u>	<u>N/A</u>

	<u>Front</u>		<u>Rear</u>	
<u>Seat Movement</u>	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Seat Back Failure	<u>No</u>	<u>No</u>	<u>N/A</u>	<u>N/A</u>
Seat Shift (in.)	<u>No</u>	<u>No</u>	<u>N/A</u>	<u>N/A</u>

Glazing Damage

Backlight/Windshield None

Other Notable Impact Effects: None

SECTION 3

SUMMARY OF RESULTS FOR-----

FMVSS 212, "Windshield Mounting"

FMVSS 219 (Partial), "Windshield Zone Intrusion"

FMVSS 301-75, "Fuel System Integrity"

FMVSS NO. 212, "WINDSHIELD MOUNTING", DATA SHEET

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

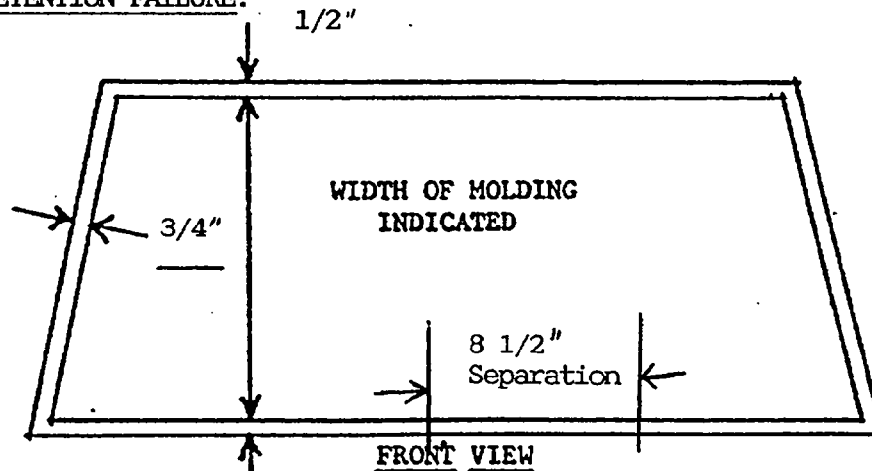
Windshield is retained with gasket and adhesive.
There is 1/2 inch gasket around entire windshield with 3/4 inch plastic trim on the sides.

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.

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY		
	PRE-TEST (in)	POST-TEST (in)	PERCENT RETENTION
RIGHT SIDE	76 1/4	76 1/4	100
LEFT SIDE	76 1/4	67 3/4	89
TOTAL	152 1/2	144	94

AREA OF RETENTION FAILURE:



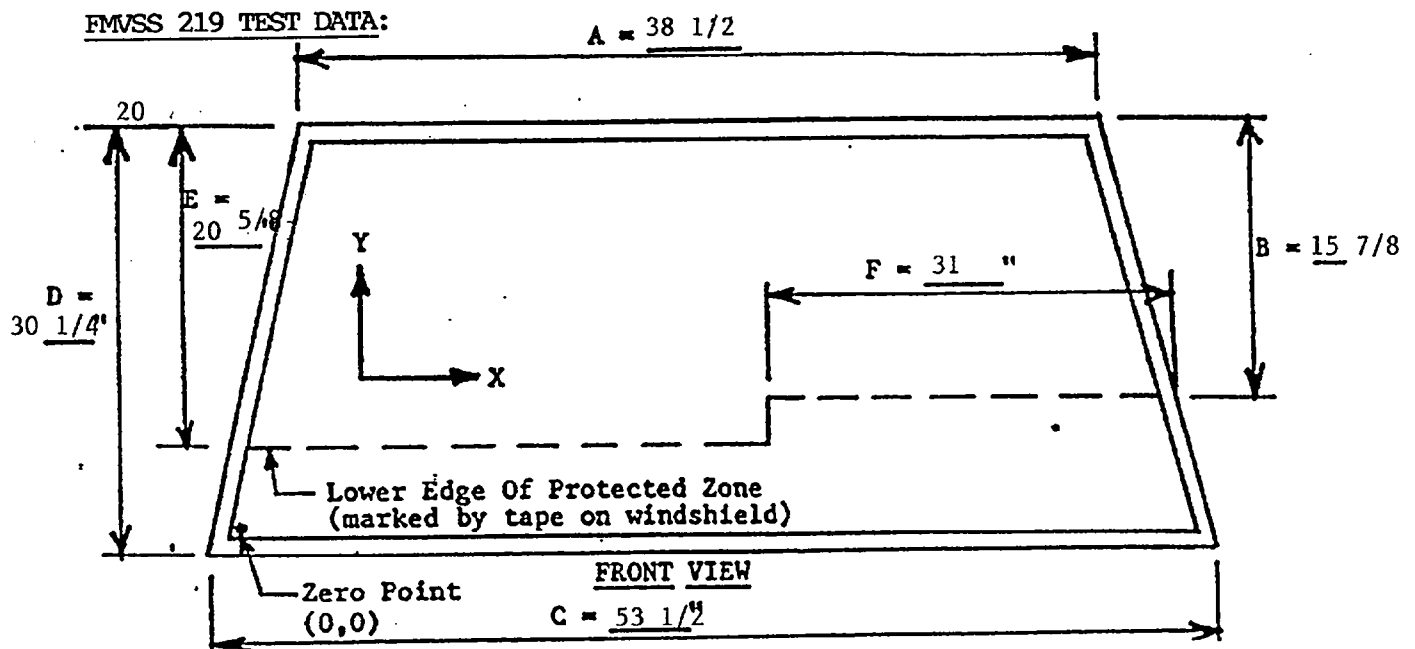
FAILURE DETAILS:

Some glass separation occurred on the bottom edge in front of the driver over a measured distance of 8 1/2 inches.

FMVSS NO. 219, "WINDSHIELD ZONE INTRUSION", DATA SHEET

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5" dia. 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 1/2" distant 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.



DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4": (Show location of penetration on above sketch)

A = 38 1/2 in.
 B = 15 7/8 in.
 C = 53 1/2 in.
 D = 30 1/4 in.
 E = 20 5/8 in.
 F = 31 in.

	COORDINATES	
	X	Y
1.	N/A	N/A
2.	N/A	N/A
3.	N/A	N/A
4.	N/A	N/A

FMVSS NO. 301-75, "FUEL SYSTEM INTEGRITY", DATA SHEETS

TEST VEHICLE NHTSA NO.: MM0500 TEST DATE: May 8, 1991
VEHICLE MAKE/MODEL/BODY STYLE: 1991 Hyundai Scoupe 2 Door Coupe
USABLE CAPACITY OF VEHICLE'S FUEL TANK: 11.9 Gallons (figure furnished by
vehicle manufacturer)

TEST REQUIREMENTS:

Test vehicle's 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.

AMOUNT OF STODDARD SOLVENT ADDED TO VEHICLE'S FUEL TANK:

11 Gallons Which is 92.4% of the Stated USABLE CAPACITY.

SOLVENT SPILLAGE MEASUREMENT AFTER 35 MPH FRONTAL BARRIER IMPACT TEST:

	<u>Actual</u>	<u>Maximum Allowed</u>
From impact until vehicle motion ceases -----	<u>0</u>	1 oz.
For 5 min. period after vehicle motion ceases -	<u>0</u>	5 oz.
For next 25 minutes at barrier face -----	<u>0</u>	1 oz./1 minute

SOLVENT SPILLAGE DETAILS:

None

STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range= 1 to 3 minute)*

Time reqd. for machine to rotate 90° = N/A minutes, N/A seconds

FMVSS 301-75 Position Hold Time = 5 minutes, 0 seconds

TOTAL ----- = N/A minutes, N/A seconds

Next Whole Minute Interval ----- = N/A minutes

* Rollover test not performed as per NHTSA COTR

FMVSS NO. 301-75 TEST DATA.....Continued:

VEHICLE STATIC ROLLOVER DATA: *

	First 5 Minutes FROM ONSET OF ROTATION	6th Minute	7th Minute	8th Minute
Maximum Allowable Solvent Spillage--	5 oz.	1 oz.	1 oz.	1 oz.
0 to 90° (filler cap down) -----	N/A	N/A	N/A	N/A
90 to 180° -----	N/A	N/A	N/A	N/A
180 to 270° -----	N/A	N/A	N/A	N/A
270 to 360° -----				

Solvent Spillage Location(s):

* N/A - Rollover test not performed as per NHTSA COTR.

SECTION 4

OMI FINAL DATA

Occupant and Vehicle Information

- I. OMI DATA
 - 1. Dummy Injury Criteria Data Summary
 - 2. Dummy Positioning Data
 - 3. Seat Belt Positioning Data
 - 4. Seat Belt Performance Assessment Data
 - 5. Driver Dummy to Steering Column Dimensions
 - 6. Camera Locations
 - 7. Vehicle Target Locations
- II. OVR DATA
 - 1. Load Cell Barrier Data
 - 2. Vehicle Accelerometer Data
 - 3. Test Vehicle Measurements
- III. AID DATA
 - 1. Accident Investigation Damage Data Summary

FMVSS NO. 208, "OCCUPANT CRASH PROTECTION", DATA SHEET

VEH. YR./MAKE/MODEL/BODY STYLE: 1991 Hyundai Scoupe 2 Door Coupe

VEH. NHTSA NO.: MM0500 TEST DATE: May 8, 1991

MAXIMUM ACCELERATION VALUES: (G'S)	DRIVER DUMMY #466	PASSENGER DUMMY #465
Head Channel X	194.0	25.6
Head Channel Y	25.0	19.9
Head Channel Z	51.7	53.5
HEAD RESULTANT	195.6	60.0
Chest Channel X	50.2	43.0
Chest Channel Y	23.1	16.3
Chest Channel Z	11.4	18.2
CHEST RESULTANT (clip)	45.3	42.0
TIME INTERVAL (msec) [0.003 seconds minimum]	$t_1 = 71.9$ $t_2 = 75.0$	$t_1 = 57.3$ $t_2 = 60.4$

HEAD INJURY CRITERIA (HIC) VALUES:

HIC	870	618
t_1 (msec)	67.2	81.7
t_2 (msec)	89.4	117.7
Avg. Accel. t_1 to t_2	68.7	49.4

[The maximum time interval from t_1 to t_2 is 36 milliseconds.]

MAXIMUM FEMUR FORCES:

Left Side (lbs.)	2532	1296
Right Side (lbs.)	966	333

MAXIMUM SEAT BELT FORCES:

Lap Belt (lbs.)	693	848
Shoulder Belt (lbs.)	1611	1870

NOTE: All values listed must be occurring during primary impact event.
(Head X, Y, Z and R listed must be during t_1 to t_2 HIC interval)

HYBRID III NECK AND CHEST DATA SHEET *

VEHICLE YR./MAKE/MODEL/BODY STYLE: 1991 Hyundai Scoupe 2 Door Coupe

VEHICLE NHTSA NO.: MM0500 TEST DATE: May 8, 1991

MAXIMUM VALUES	DRIVER DUMMY #466	PASSENGER DUMMY #465
Neck Load X	N/A	N/A
Neck Load Y	N/A	N/A
Neck Load Z	N/A	N/A
Neck Moment X	N/A	N/A
Neck Moment Y	N/A	N/A
Neck Moment Z	N/A	N/A
Chest Deflection X (in)	N/A	N/A
Time of Max. Occurrence		

Note: All values listed must be occurring during primary impact event.

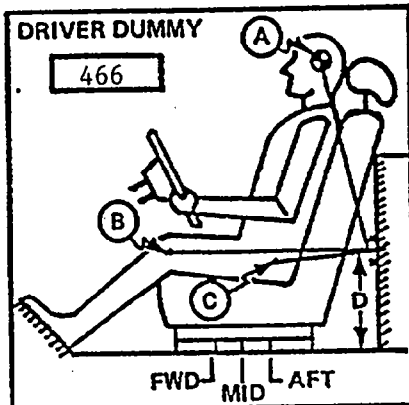
*For Hybrid III Dummy Application Only

PART 572 DUMMY IN-VEHICLE POSITION

Test No.: MM0500 Vehicle: 1991 Hyundai Scoupe 2 Door Coupe
 SEAT TYPE: ADJUSTER TYPE: BUCKET SEAT BACK TYPE:

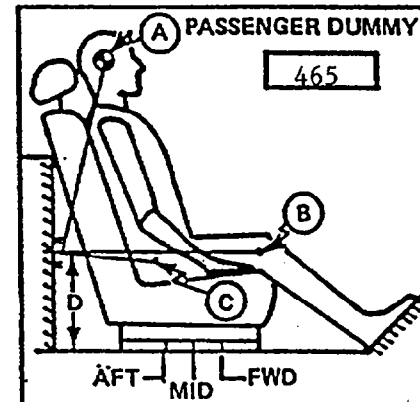
 Bench X Manual Fixed
X Bucket Power X Adjustable Reclining

Split Bench



MEASUREMENT LOCATION

- A - Head Target
- B - Knee Joint
- C - Approximate "H" Point
- D - Sill to Reference Point



A = 23 3/8 in. 62.5 Degrees

B = 30 7/16 in. 3.6 Degrees

C = 16 in. 19.3 Degrees

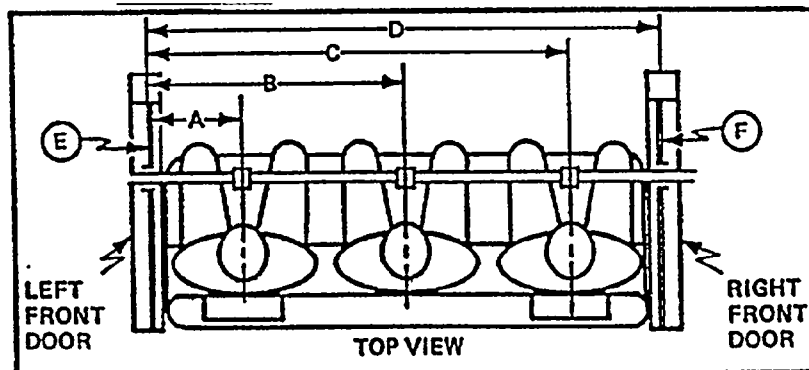
D = 12 1/2 in.
 Seat notch rearward 8th

A = 22 1/8 in. 25.8 Degrees

B = 31 3/4 in. 5.1 Degrees

C = 17 3/16 in. 19.8 Degrees

D = 12 1/2 in.
 Seat notch rearward 8th



A = Left Door to Driver Centerline 15 1/16 in.

B = Left Door to Center Passenger Centerline N/A in.

C = Left Door to Right Passenger Centerline 40 3/4 in.

D = Left Door to Right Door 55 1/2 in.

E, F = Window Glass Height (Right and Left Must Be Equal) 0 in.

OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	11 1/4	12 7/16
HW	19 1/4	19 3/4
CD	22 1/4	23 7/8
CS	15	N/A
KDL	7 3/4	8 1/16
KDR	8 1/2	7 5/8
SA	19.3	20.3
TA	19.7	19.7
HSW	20 7/8	N/A

HH = Head to Windshield Header (in. typ.)

HW = Head to Windshield

CD = Chest to Dash

CS = Chest to Steering Wheel

KD (L/R) = Knee to Dash (Left/Right)

SA = Seat Back Angle

TA = Torso Angle

HSW = Head to Steering Wheel

HA = Head Target to "A" Pillar

HR = Head to Side Roof

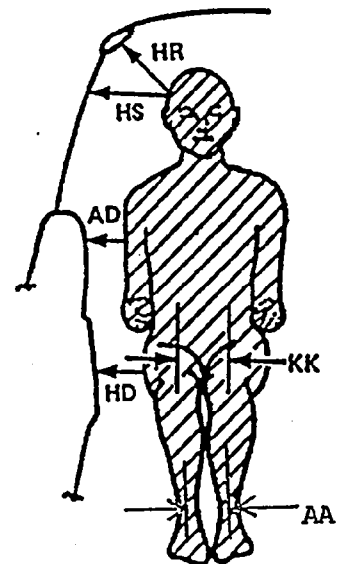
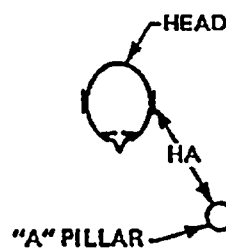
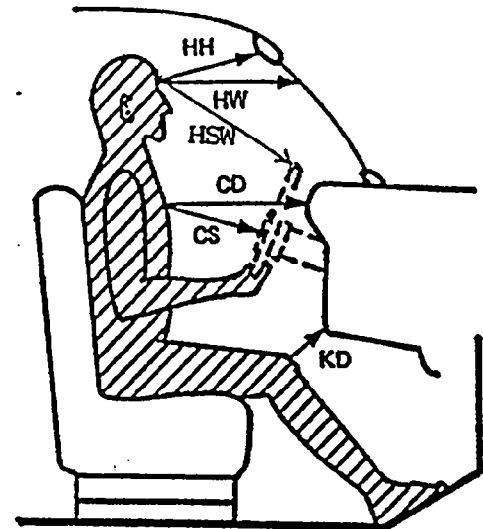
HS = Head to Side Window

AD = Arm to Door

HD = Hip to Door

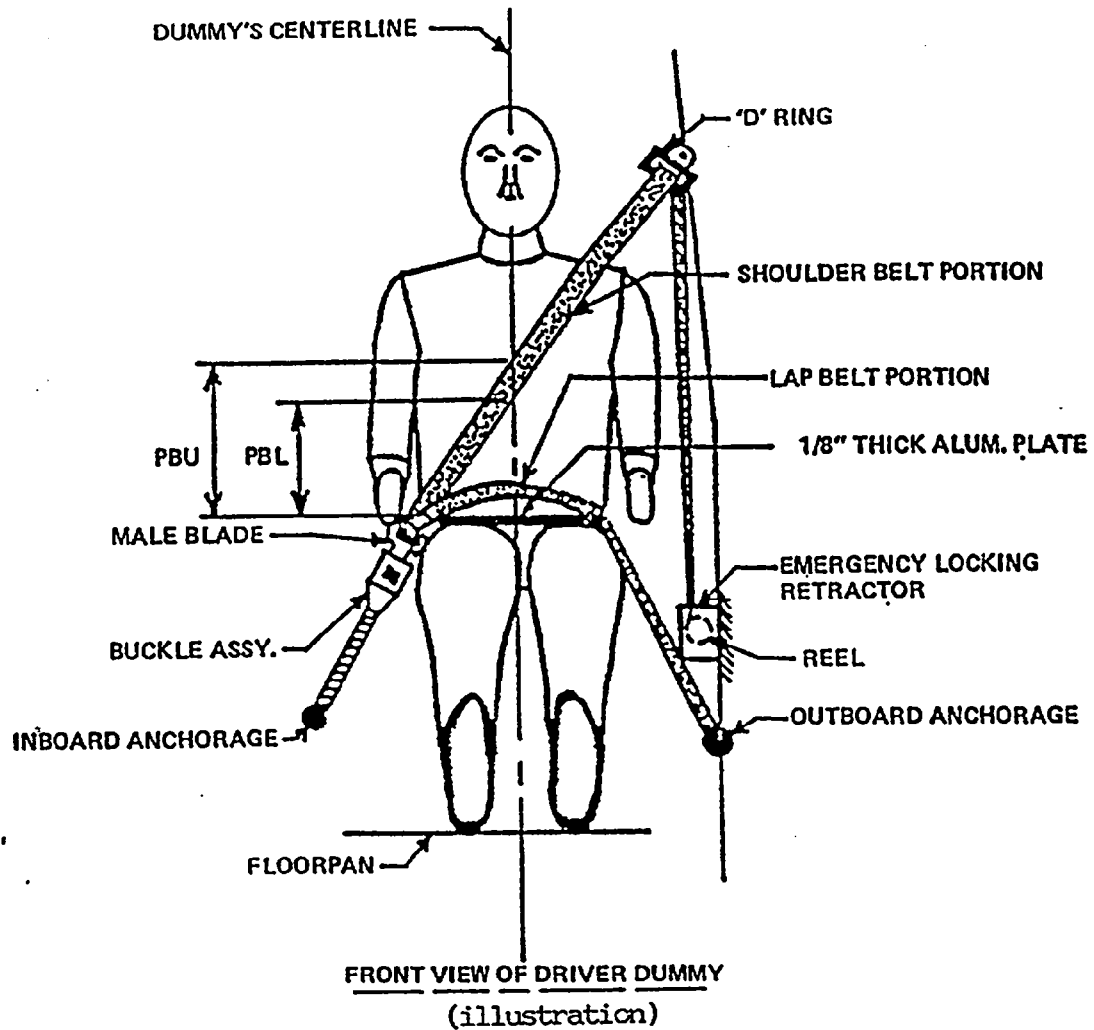
KK = Knee to Knee

AA = Ankle to Ankle



	DRIVER	PASSENGER
HR	5 1/8	5 3/16
HS	8 7/16	9 1/2
AD	4 1/2	4 3/8
HD	6 9/16	5 7/8
KK	14 3/8	13 1/2
HA	14 1/2	16 1/8
AA	15	14 1/2

SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
<u>PBU</u> -- Top surface of alum. plate to upper edge (inches)	13	13 1/2
<u>PBL</u> -- Top surface of alum. plate to belt lower edge (inches)	10 1/8	10 5/8
LAP BELT TENSION (lbs.)	3 3/4	3 1/2
SHOULDER BELT TENSION (lbs.)	1 1/2	2

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:

	<u>DRIVER</u>	<u>PASSENGER</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>85"</u>	<u>85"</u>
Shoulder belt length as measured on Part 572 dummy.	<u>35 3/4"</u>	<u>36"</u>
Lap belt length as measured on Part 572 dummy.	<u>33 1/2"</u>	<u>33 3/4"</u>

SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis. *	<u>Not Avail.</u>	<u>Not Avail.</u>
As determined mechanically. **	<u>Not Avail.</u>	<u>Not Avail.</u>
As determined electronically.	<u>Not Avail.</u>	<u>Not Avail.</u>

BELT STRETCH DATA:

Measured electronically between shoulder belt load cell and the "D" ring.	<u>0.3"</u>	<u>0.3"</u>
Measured mechanically.	<u>9/32"</u>	<u>5/32"</u>

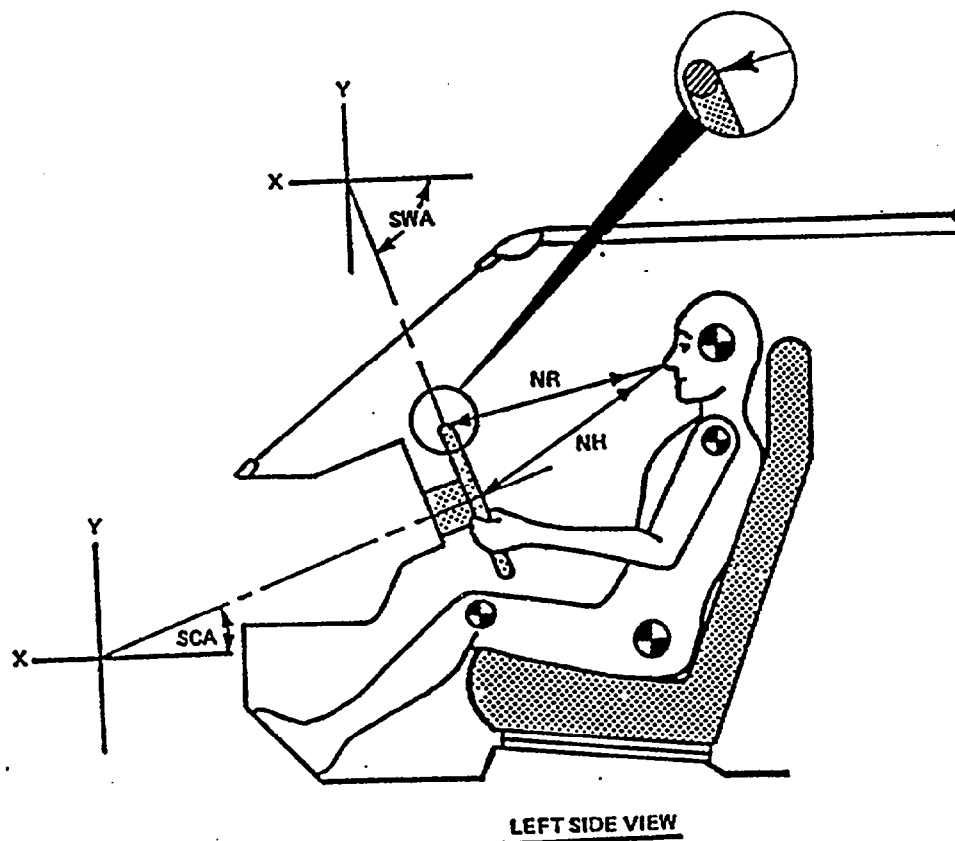
RETRACTOR LOCK-UP TIME:

As determined by shoulder belt spool-off.	<u>Not Avail.</u>	<u>Not Avail.</u>
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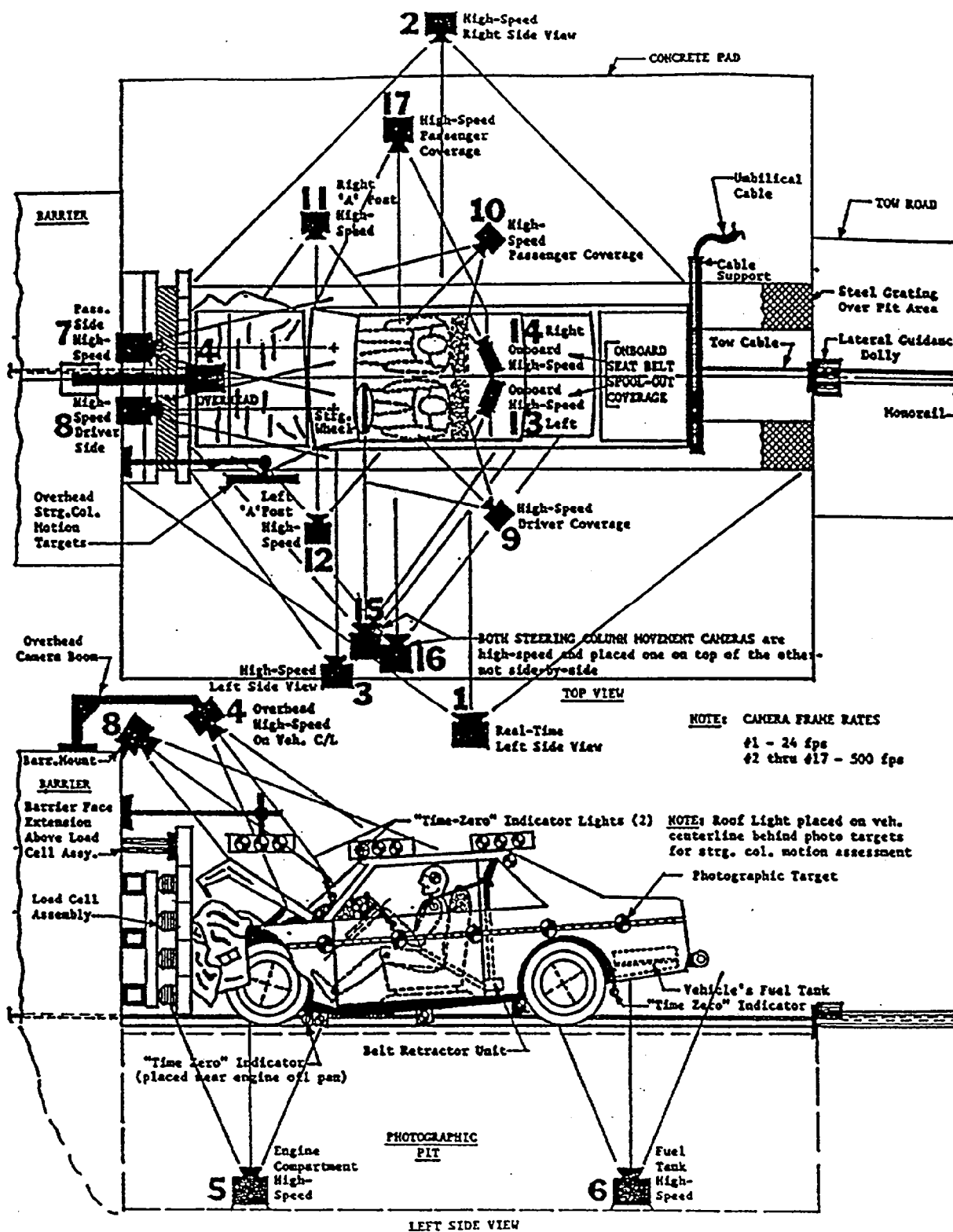
* Belt spool-out not visible in high speed film

** Not performed as per NHTSA COTR

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



		MEASUREMENTS	
<u>NR</u>	-- Distance from tip of dummy's nose to top rear surface of steering wheel rim	18 7/8	inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	19 5/8	inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	24.5	degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	65.5	degrees



CAMERA LOCATIONS

VEH. NHTSA NO.: MM 0500 ; TEST DATE: May 8, 1991 ; TIME: 3:10 PMVEH. YEAR/MAKE/MODEL/BODY STYLE: 1991 Hyundai Scoupe 2 Door Coupe

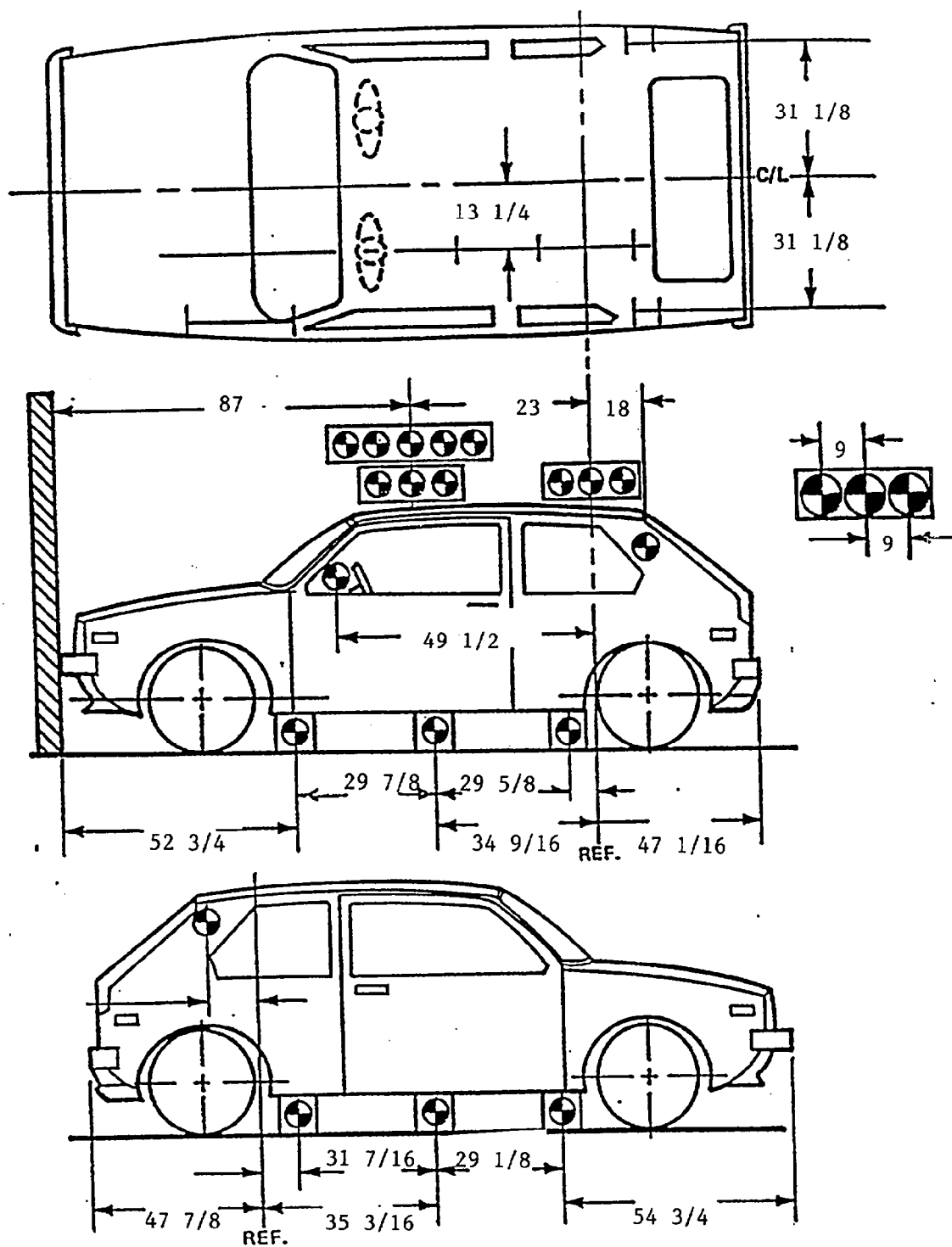
CAMERA NO.	VIEW	CAMERA POSITIONS (in.)*			ANGLE (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Left Side View	276	394	71	N/A	N/A	10	24
2	Right Side View	96	347	60	90	336	13	1000
3	Left Side View	44	404	40	90	483	35	1000
4	Overhead	38	0	152	N/A	N/A	7.5	1000
5	Pit-Engine	44	0	-111	N/A	N/A	7.5	1000
6	Pit-Fuel Tank	104	0	-122	N/A	N/A	13	1000
7	Front-Passenger	-7	-13	89	40	N/A	13	1000
8	Front-Driver	-7	13	89	40	N/A	13	1000
9	Left Side-Driver	236	200	60	35	N/A	50	1000
10	Right Side-Passenger	236	200	55	35	N/A	50	1000
11	Right Side-"A" Post	60	112	47	90	N/A	13	1000
12	Left Side-"A" Post	58	105	46	90	94	13	1000
13	Onboard-Left Side	N/A	N/A	N/A	N/A	94	13	1000
14	Onboard-Right Side	N/A	N/A	N/A	N/A	94	13	1000
15	Left Side-Steering Col.	66	275	60	N/A	264	25	1000
16	Left Side-Steering Col.	66	275	40	N/A	264	25	1000
17	Right Side-Passenger	46	284	50	N/A	273	25	1000

*X = film plane to monorail centerline

Y = film plane to barrier face

Z = film plane to ground

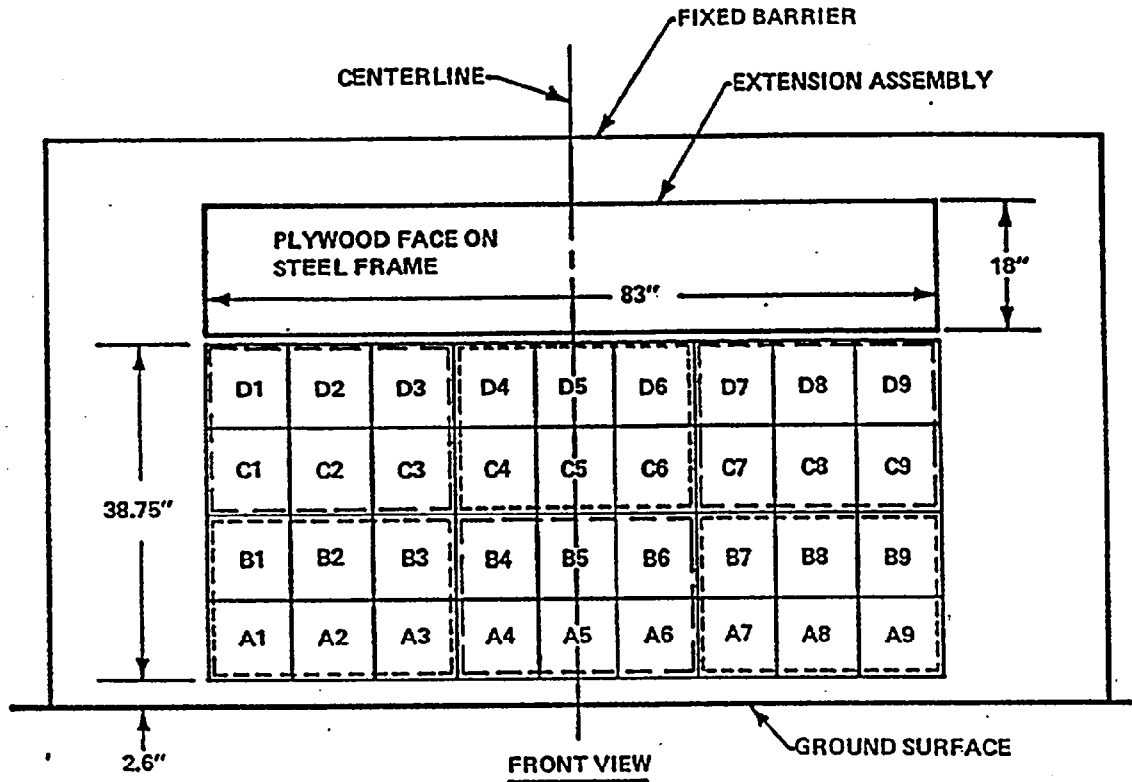
VEHICLE TARGET LOCATIONS



(DIMENSIONS IN INCHES)

LOAD CELL LOCATIONS ON FIXED BARRIER

36 Load Cells
 4 Rows
 9 Columns
 6 Groupings (6 cells/group)



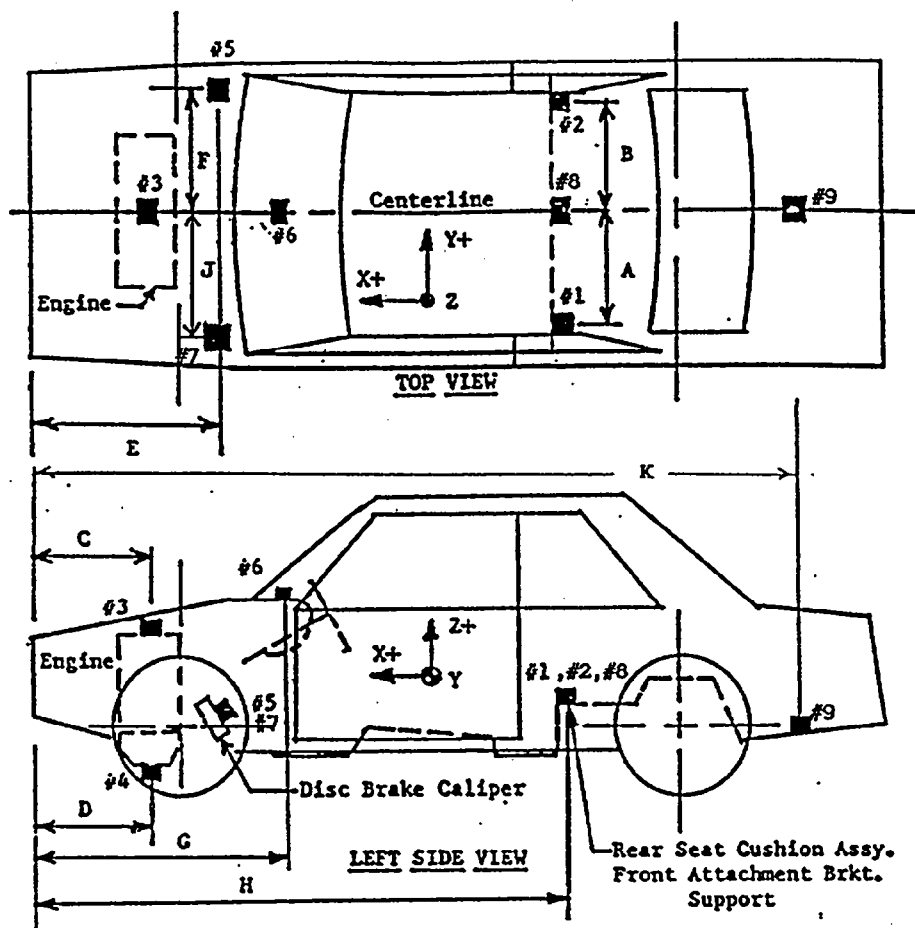
* Only 6 load cell barrier was used

Load Cell 1 = A1-B3 Load Cell 4 = C1-D3
 Load Cell 2 = A4-B6 Load Cell 5 = C4-D6
 Load Cell 3 = A7-B9 Load Cell 6 = C7-D9

The following data is presented in Appendix B:

- (1) Data from 6 individual load cells
- (2) Total or sum of 6 individual load cells
- (3) Total load vs. vehicle dynamic crush

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

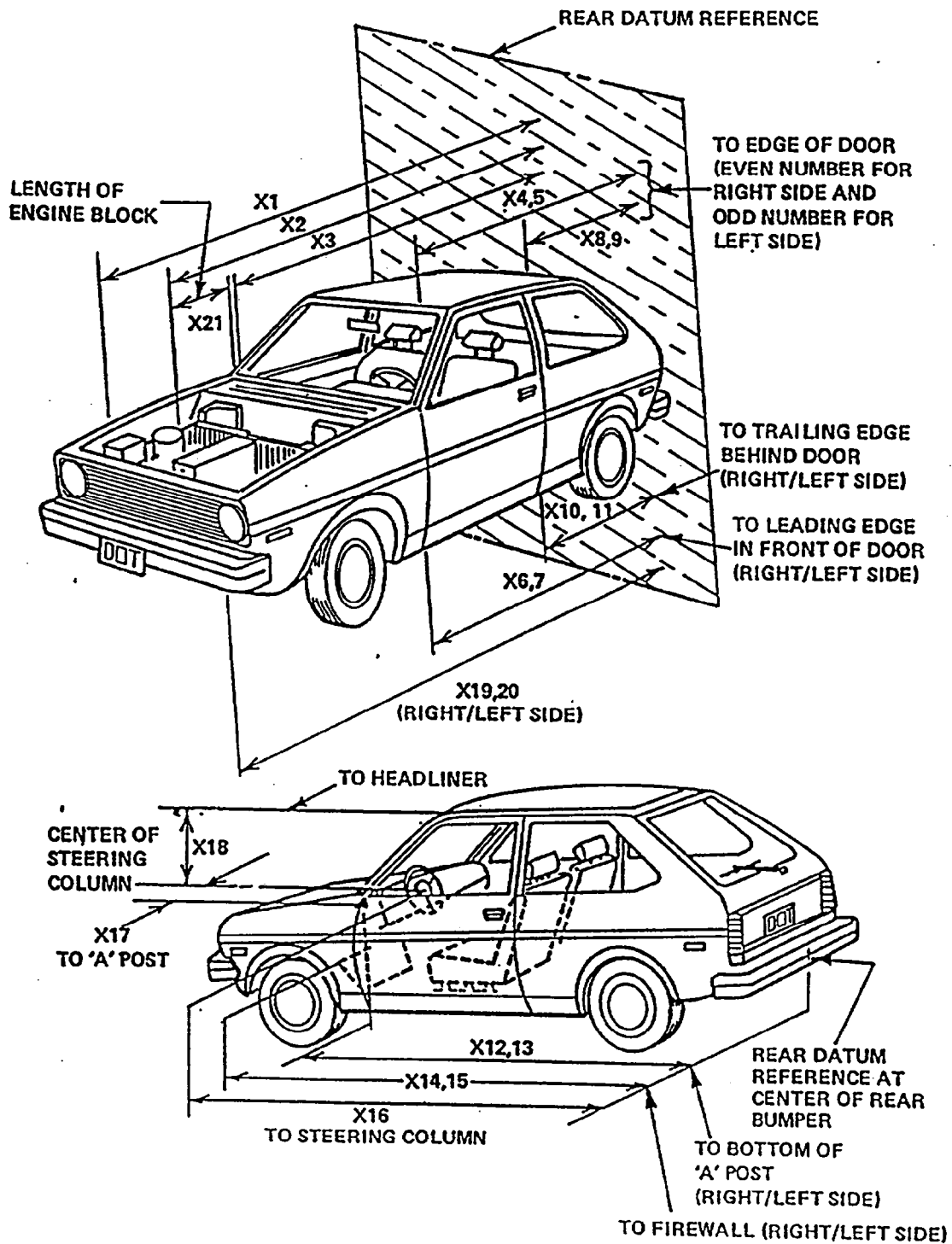


Dimension	Length (in.)
A	18 1/8
B	18 1/2
C	60 1/4
D	34 1/4
E	30 1/4
F	26 3/4
G	26 7/8
H	104 1/4
J	26 3/4
K	135 1/2

ACCELEROMETER NUMBER *	ACCELEROMETER LOCATION	DIRECTION
1	Left Rear Seat Crossmember	X
2	Right Rear Seat Crossmember	X
3	Top of Engine	X
4	Bottom of Engine	X
5	Right Disc Brake Caliper	X
6	Instrument Panel	X
7	Left Disc Brake Caliper	X
8	Center Rear Crossmember	Z
9	Vehicle Rear	Z

*The accelerometer pack number can be correlated with the vehicle response data traces found in Appendix B.

TEST VEHICLE MEASUREMENTS



TEST VEHICLE MEASUREMENTS

NO.	MEASUREMENT DESCRIPTION:	PRE-TEST (in.)	POST-TEST (in.)	DEFORM. (in.)
X1	Total Length of Test Vehicle at Centerline	165.8	143.5	22.3
X2	Rear Surface of Vehicle to Front of Engine	143.6	135.8	7.8
X3	Rear Surface of Vehicle to Firewall	123.8	121.5	2.3
X4	Rear Surface to Upr. Leading Edge of RT Door	111.9	110.3	1.6
X5	Rear Surface to Upr. Leading Edge of Left Door	111.5	111.1	0.4
X6	Rear Surface to Lwr. Leading Edge of RT Door	111.5	109.1	2.4
X7	Rear Surface to Lwr. Leading Edge of Left Door	111.0	110.8	0.2
X8	Rear Surface to Upr. Trailing Edge of RT Door	64.3	63.3	1.0
X9	Rear Surface to Upr. Trailing Edge of LFT Door	64.3	64.1	0.2
X10	Rear Surface to Lwr. Trailing Edge of RT Door	64.5	62.3	2.2
X11	Rear Surface to Lwr. Trailing Edge of LFT Door	64.0	63.6	0.4
X12	Rear Surface to Bottom of "A" Post on RT Side	111.9	108.9	3.0
X13	Rear Surface to Bottom of "A" Post on LFT Side	111.4	110.5	0.9
X14	Rear Surface to Firewall on Right Side	124.1	117.5	6.6
X15	Rear Surface to Firewall on Left Side	123.4	120.8	2.6
X16	Rear Surface to Steering Column	94.6	91.5	3.1
X17	Center of Steering Column to "A" Post	14.0	10.4	3.6
X18	Center of Steering Column to Headlining	18.1	15.1	3.0
X19	Rear Surface to Right Side of Front Bumper	160.5	138.5	22.0
X20	Rear Surface to Left Side of Front Bumper	160.1	141.5	18.6
X21	Length of Engine Block	15.5	15.5	0

ACCIDENT INVESTIGATION DIVISION DATA

FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: 1991 Hyundai Scoupe 2 Door Coupe

VEH. NHISA NO.: MM0500 ; VIN: KMHVE22J0M054370

MODEL YEAR: 1991 ; BUILD DATE: 2/2/91 ; TEST DATE: May 8, 1991

VEH. SIZE CATEGORY: Pass. Car-medium ; TEST WEIGHT: 2,628 lbs.

VEH. WHEELBASE: 93 7/8" ; FRONT OVERHANG: 36" ; OVERALL WIDTH: 54 ins.

ACCELEROMETER DATA:

LOCATION: As per measurements on page 4 - 13

CALIBRATION PROCEDURE: As per MGA Calibration Procedure

LINEARITY: >99.9% ; INTEGRATION ALGORITHM: trapezoidal

VEH. IMPACT SPEED: 35.3 ; TIME OF SEPARATION: 130 msec

VELOCITY CHANGE: 37.6

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:

F (Frontal)

CRUSH DEPTH DIMENSIONS: C1 = 18.6 inches

C2 = 19.8 inches

C3 = 21.5 inches

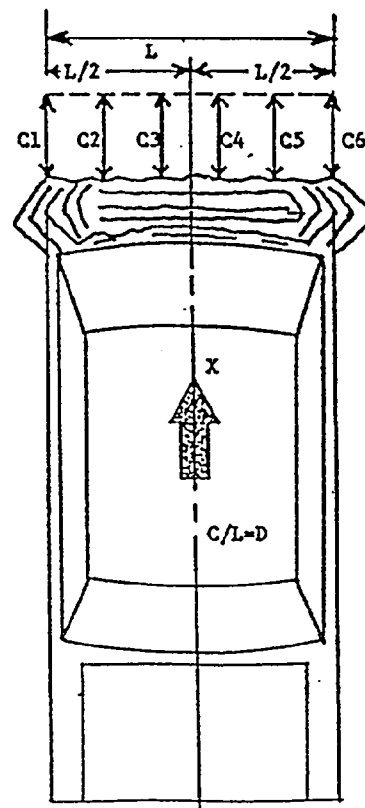
C4 = 21.8 inches

C5 = 21.2 inches

C6 = 22.0 inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitud.)

LENGTH OF DAMAGED REGION: L = 54 1/4 inches



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

	<u>Page No.</u>
Photo No. 1 - Pre-Test Front View	A-1
Photo No. 2 - Post-Test Front View	A-2
Photo No. 3 - Pre-Test Left Side View	A-3
Photo No. 4 - Post-Test Left Side View	A-4
Photo No. 5 - Pre-Test Right Side View	A-5
Photo No. 6 - Post-Test Right Side View	A-6
Photo No. 7 - Pre-Test Right Front Three-Quarter View	A-7
Photo No. 8 - Post-Test Right Front Three-Quarter View	A-8
Photo No. 9 - Pre-Test Left Rear Three-Quarter View	A-9
Photo No. 10 - Post-Test Left Rear Three-Quarter View	A-10
Photo No. 11 - Post-Test Top View (Vehicle on Rollover Machine)	A-11
Photo No. 12 - Pre-Test Windshield View	A-12
Photo No. 13 - Post-Test Windshield View	A-13
Photo No. 14 - Pre-Test Engine Compartment View	A-14
Photo No. 15 - Post-Test Engine Compartment View	A-15
Photo No. 16 - Pre-Test Fuel Filler Cap View	A-16
Photo No. 17 - Pre-Test Front Underbody View	A-17
Photo No. 18 - Post-Test Front Underbody View	A-18
Photo No. 19 - Pre-Test Rear Underbody View	A-19
Photo No. 20 - Post-Test Rear Underbody View	A-20
Photo No. 21 - Pre-Test Driver Dummy Position View	A-21
Photo No. 22 - Post-Test Driver Dummy Position View	A-22

TABLE OF PHOTOGRAPHS (cont'd)

	<u>Page No.</u>
Photo No. 23 - Pre-Test Passenger Dummy Position View	A-23
Photo No. 24 - Post-Test Passenger Dummy Position View	A-24
Photo No. 25 - Solvent Spillage Location View (if required)	A-25
Photo No. 26 - Pre-Test Driver Dummy & Vehicle Interior View (Door Open)	A-26
Photo No. 27 - Post-Test Driver Dummy & Vehicle Interior View (Door Open)	A-27
Photo No. 28 - Pre-Test Passenger Dummy & Vehicle Interior View (Door Open)	A-28
Photo No. 29 - Post-Test Passenger Dummy & Vehicle Interior View (Door Open)	A-29
Photo No. 30 - Restraint System Problem Area View (if required)	A-30
Photo No. 31 - Post-Test Driver Dummy Head Contact Area	A-31
Photo No. 32 - Post-Test Steering Column Hub/Rim Contact By Dummy Driver	A-32
Photo No. 33 - Post-Test Driver Dummy Knee Contact	A-33
Photo No. 34 - Post-Test Passenger Dummy Knee Contact Area	A-34

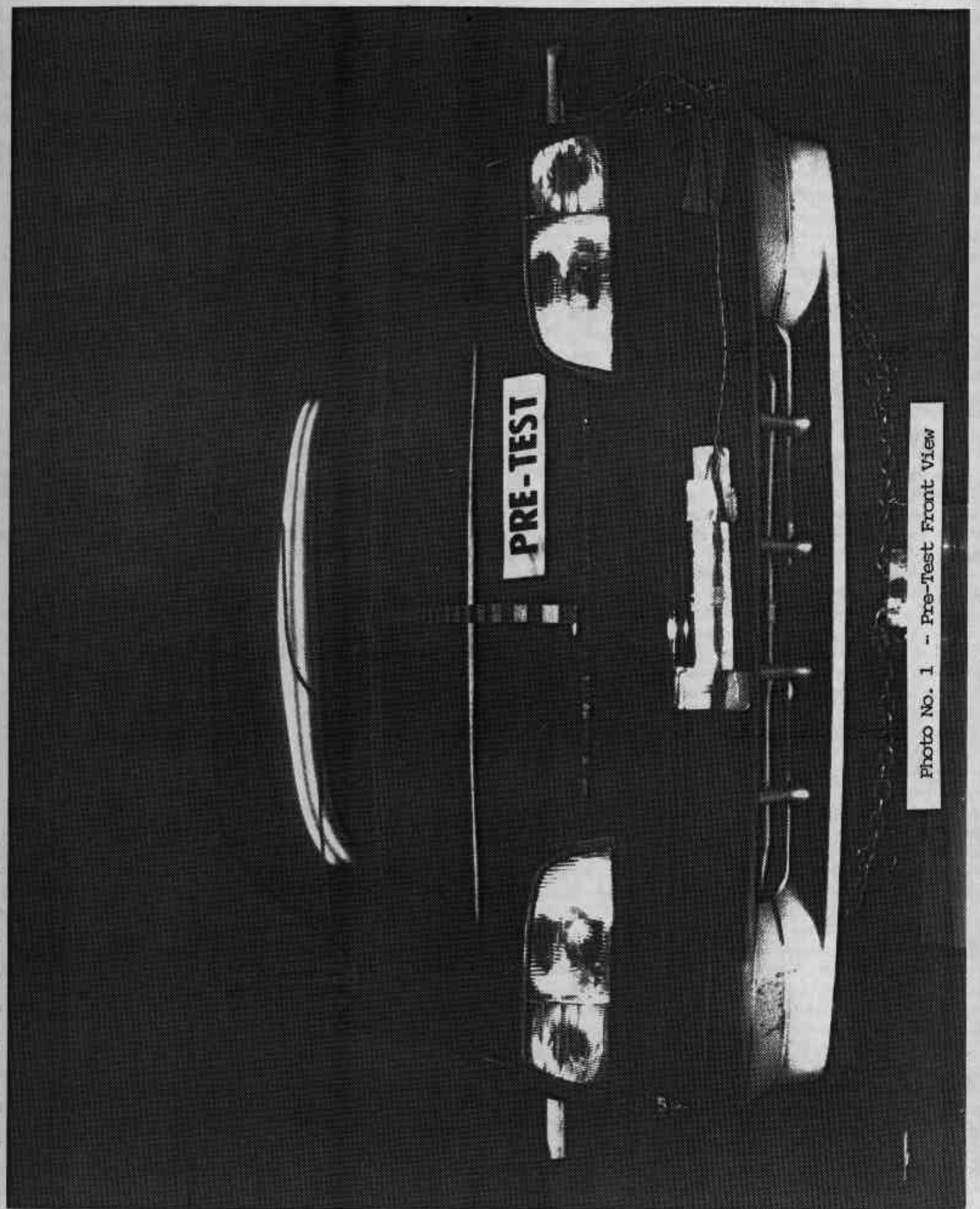


Photo No. 1 - Pre-Test Front View

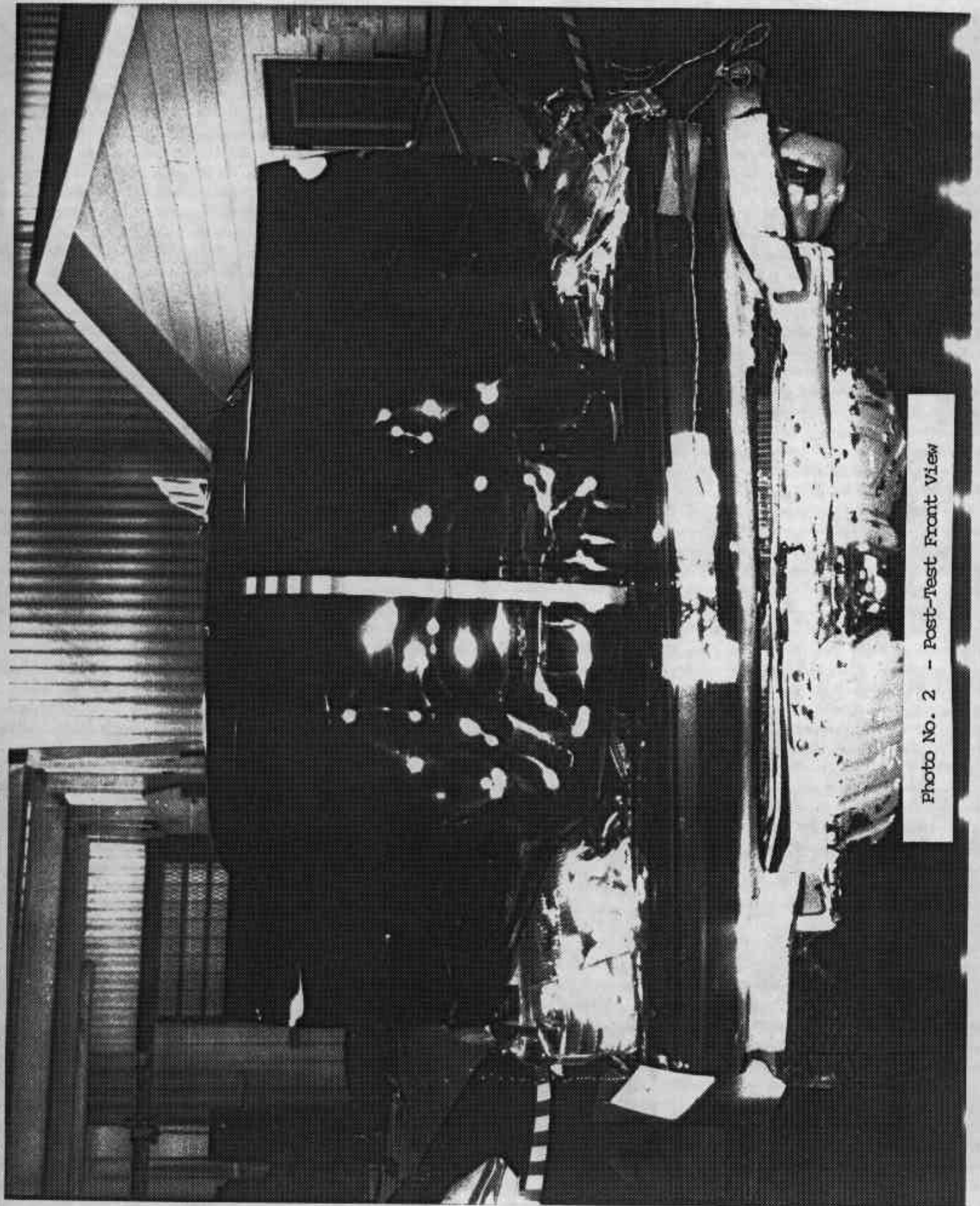


Photo No. 2 - Post-Test Front View

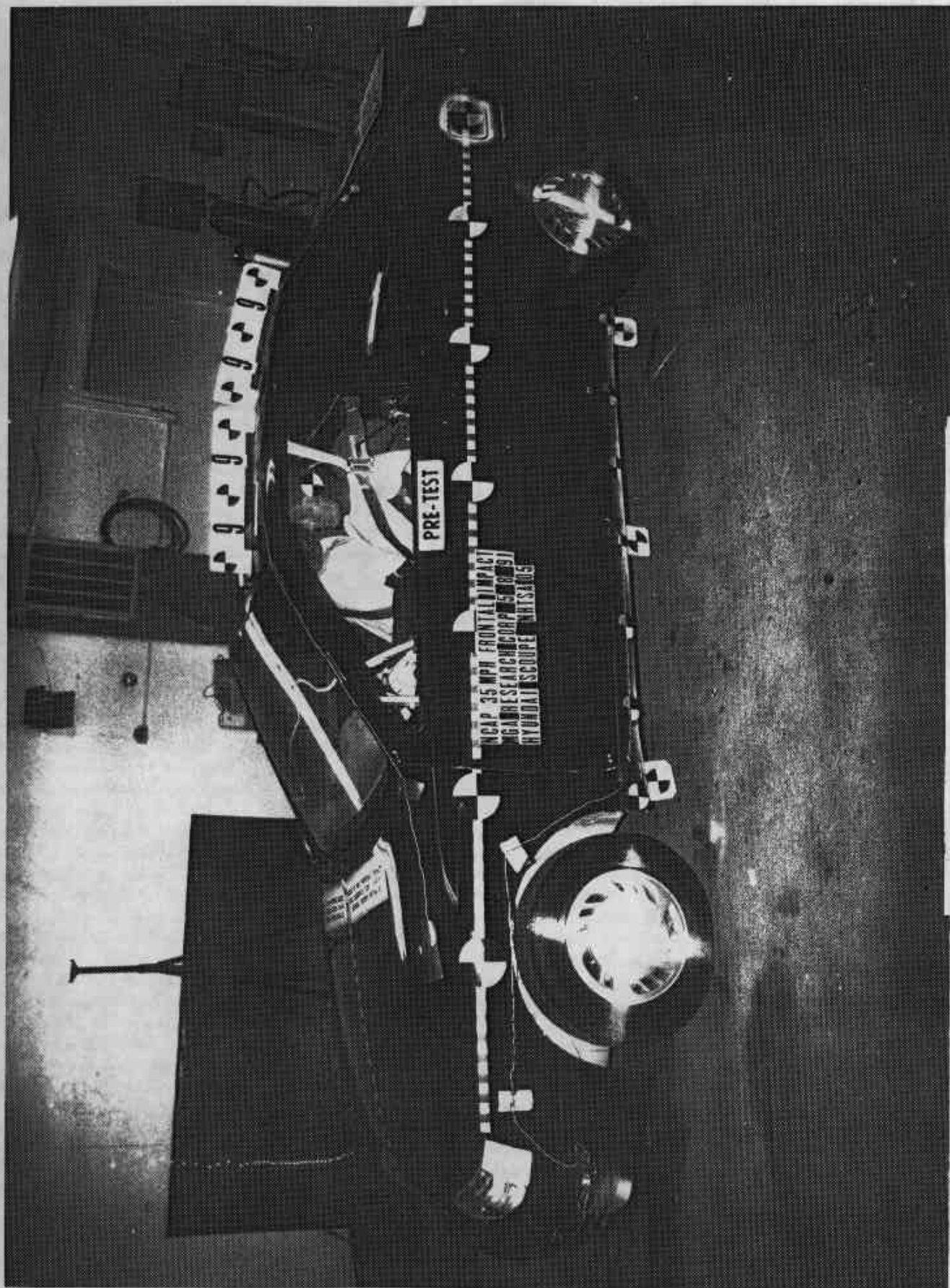


Photo No. 3 - Pre-Test Left Side View

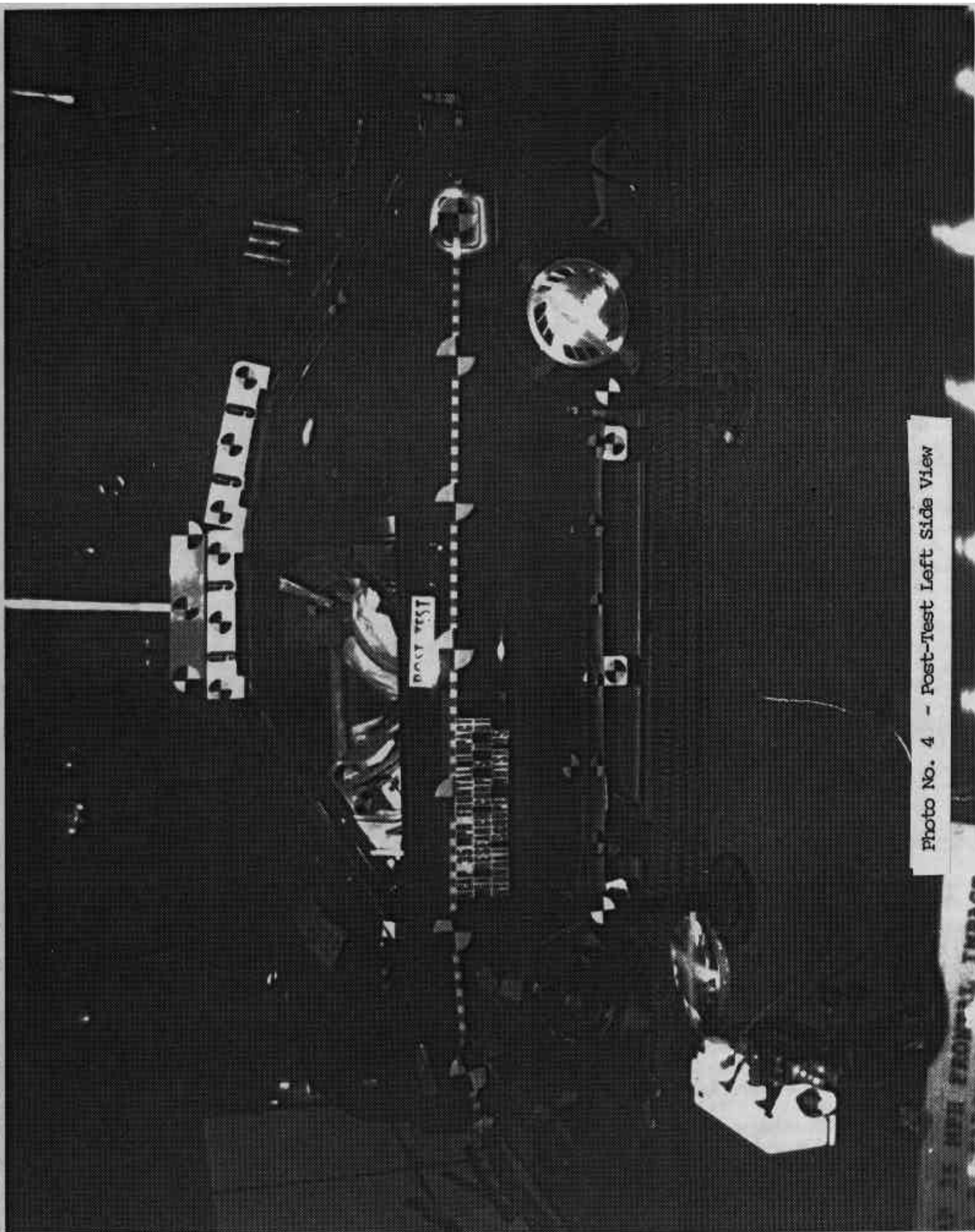


Photo No. 4 - Post-Test Left Side View

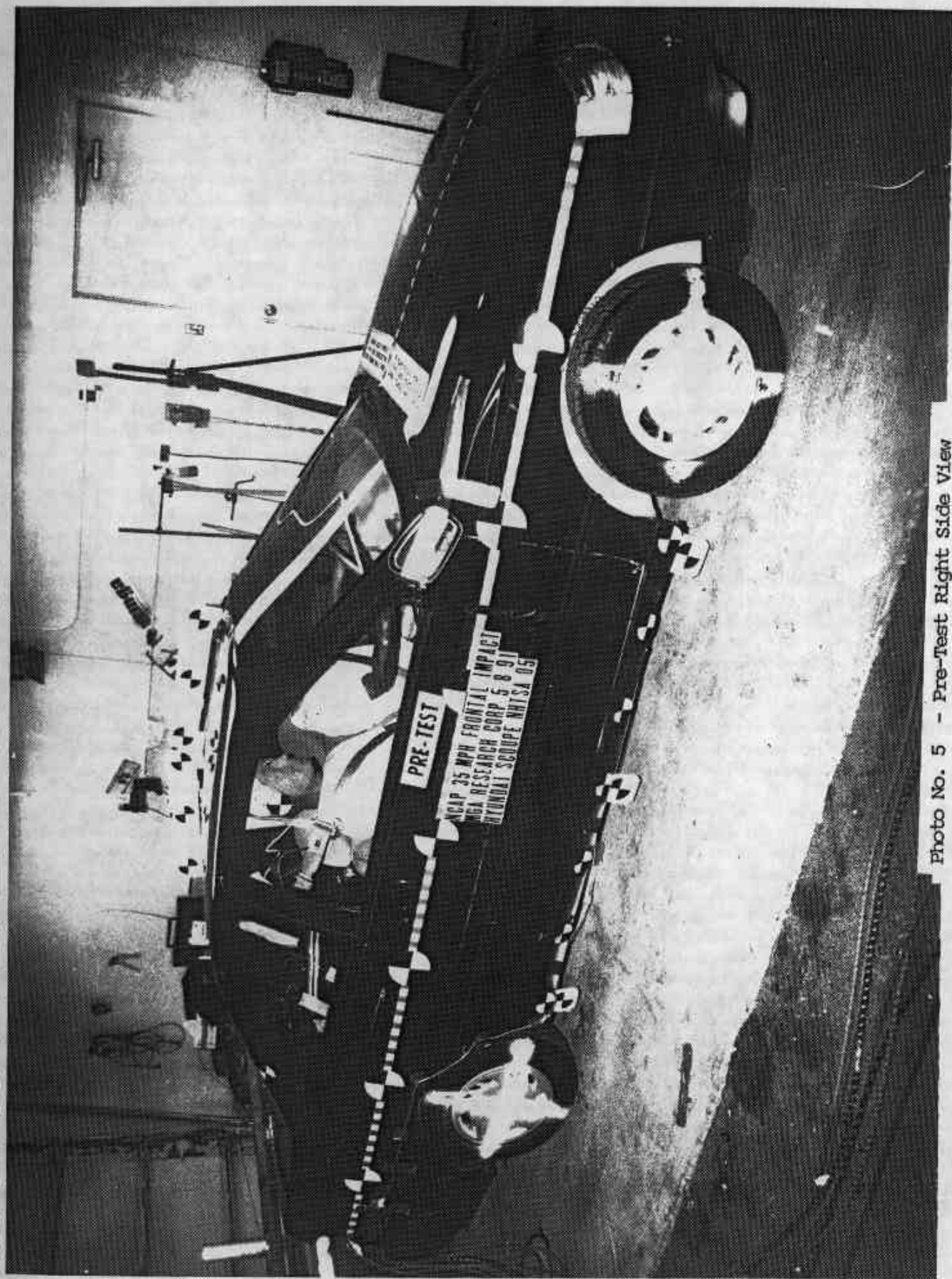


Photo No. 5 - Pre-Test Right Side View

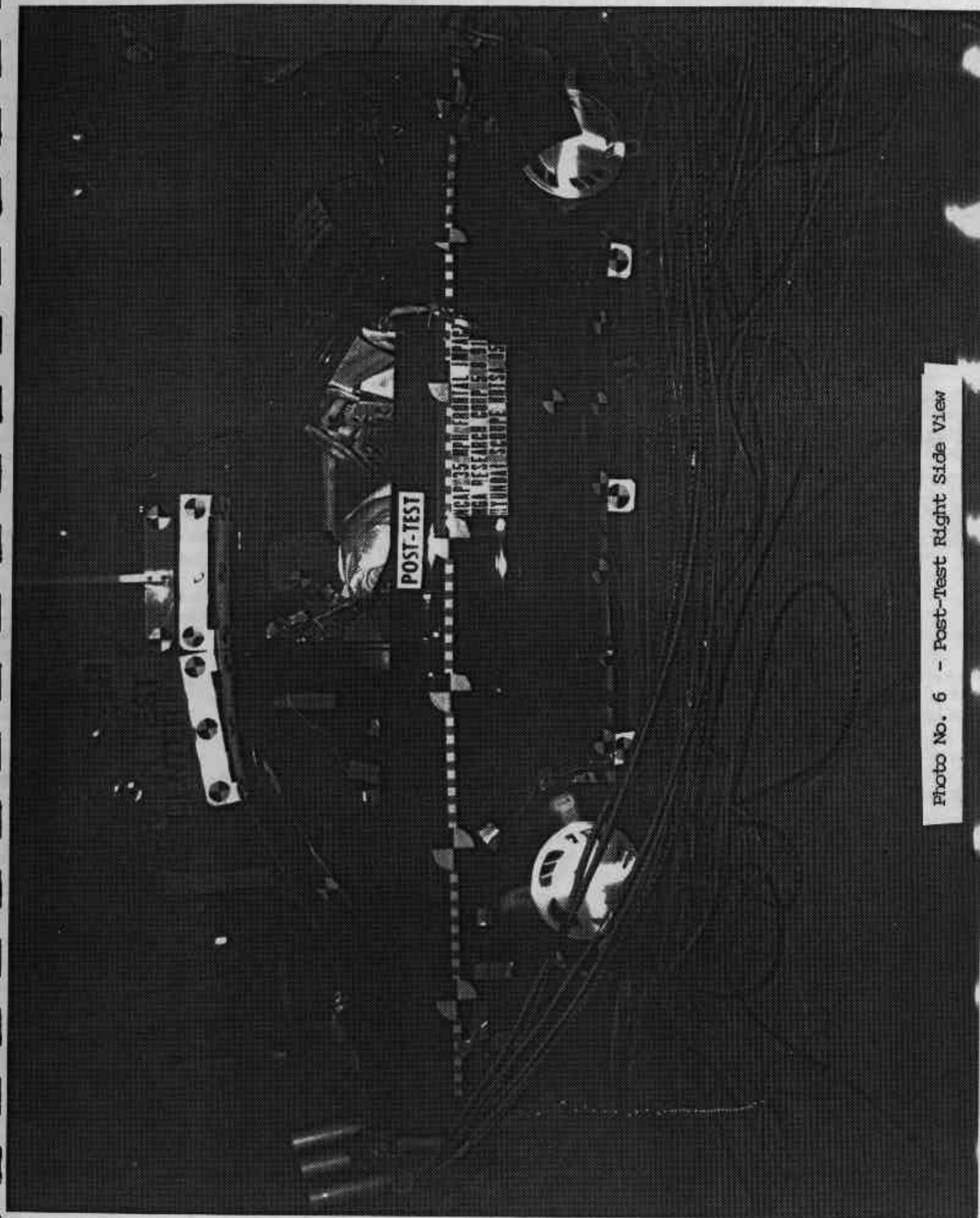


Photo No. 6 - Post-Test Right Side View

Photo No. 7 - Pre-Test Right Front Three-Quarter View

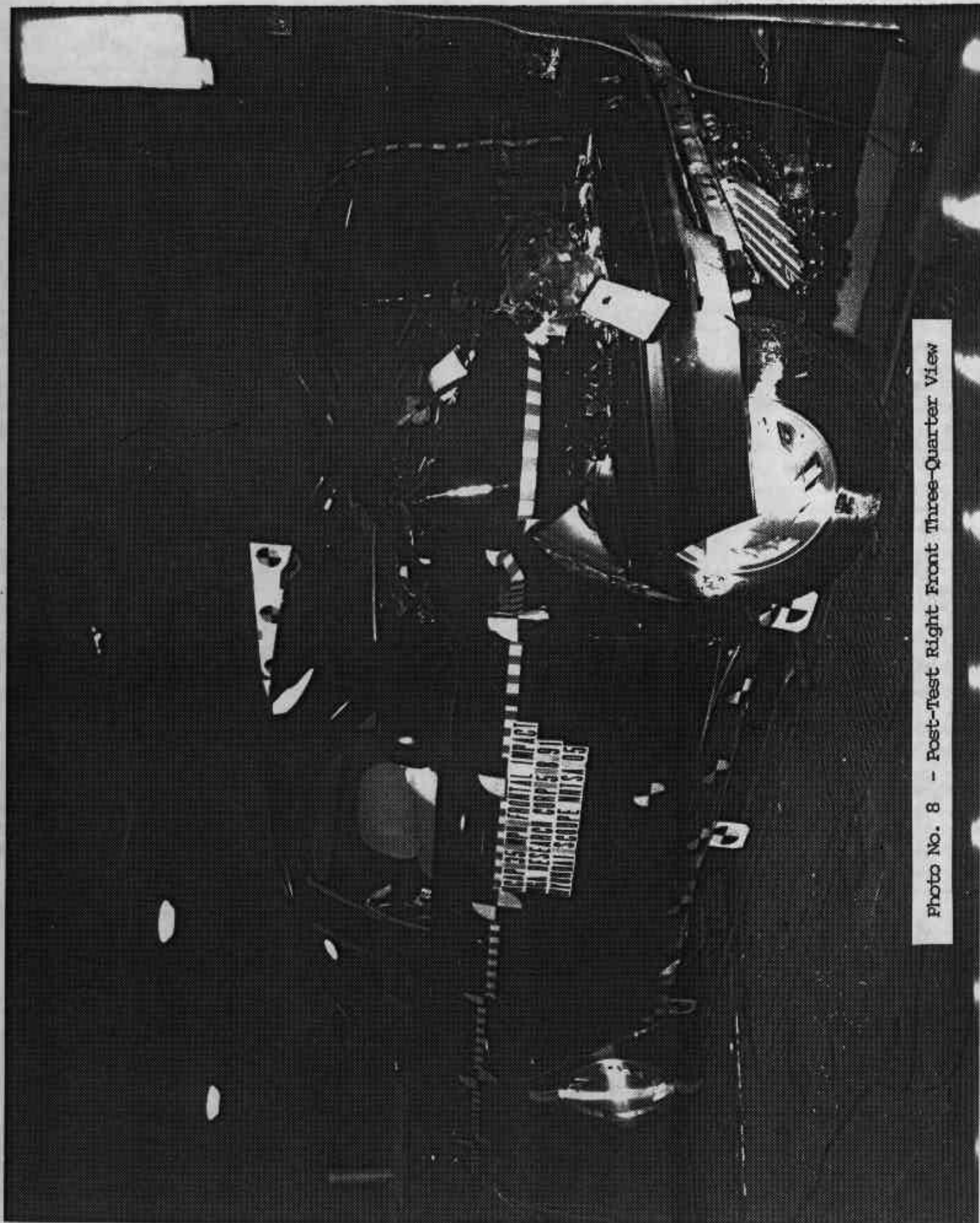


Photo No. 8 - Post-Test Right Front Three-Quarter View

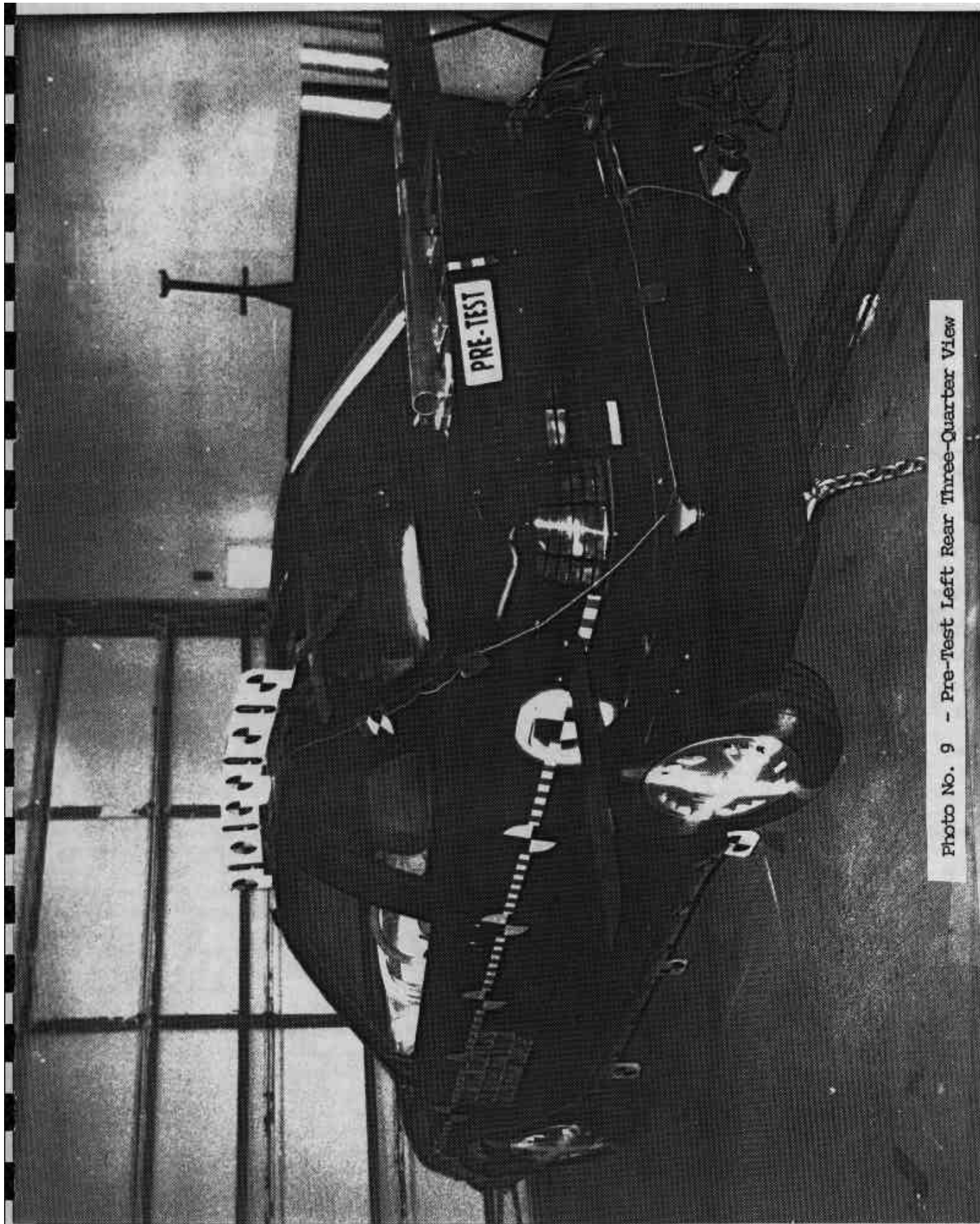


Photo No. 9 - Pre-Test Left Rear Three-Quarter View



Photo No. 10 - Post-Test Left Rear Three-Quarter View

PHOTOGRAPH NOT APPLICABLE
ROLLOVER TEST NOT PERFORMED
AS PER NHTSA COTR

Photo No. 11 - Post-Test Top View (Vehicle on Rollover Machine)

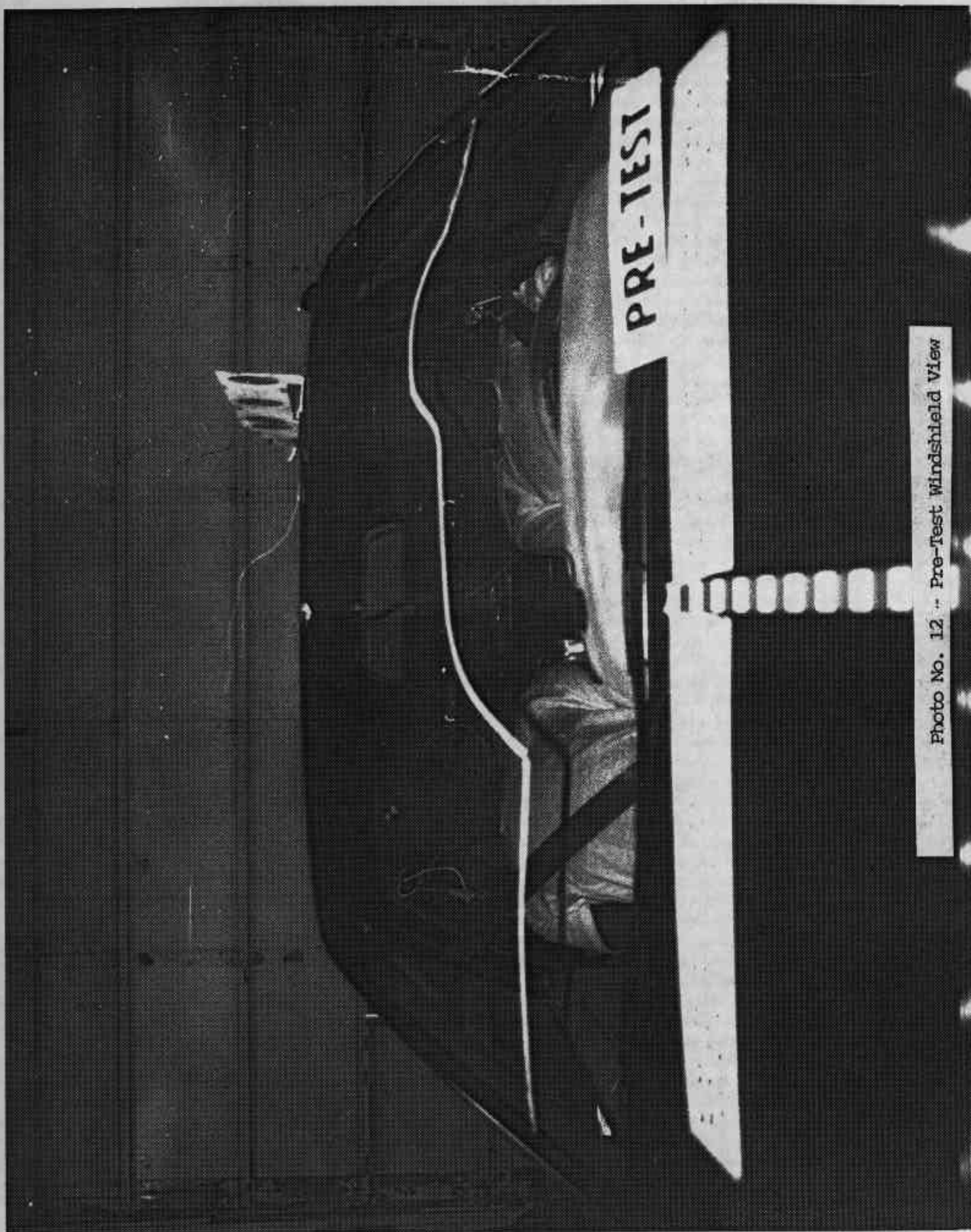


Photo No. 12 -- Pre-Test Windshield View

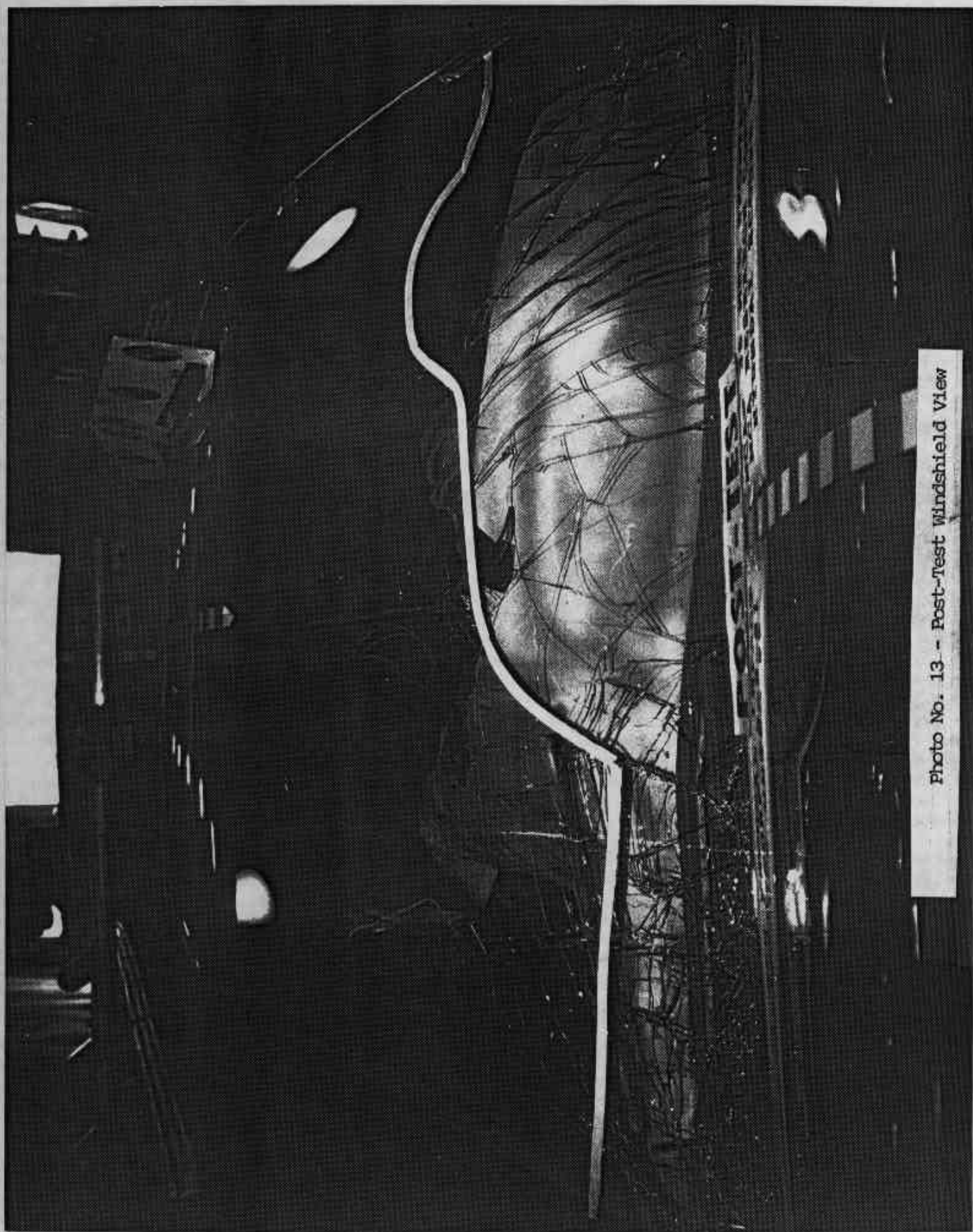
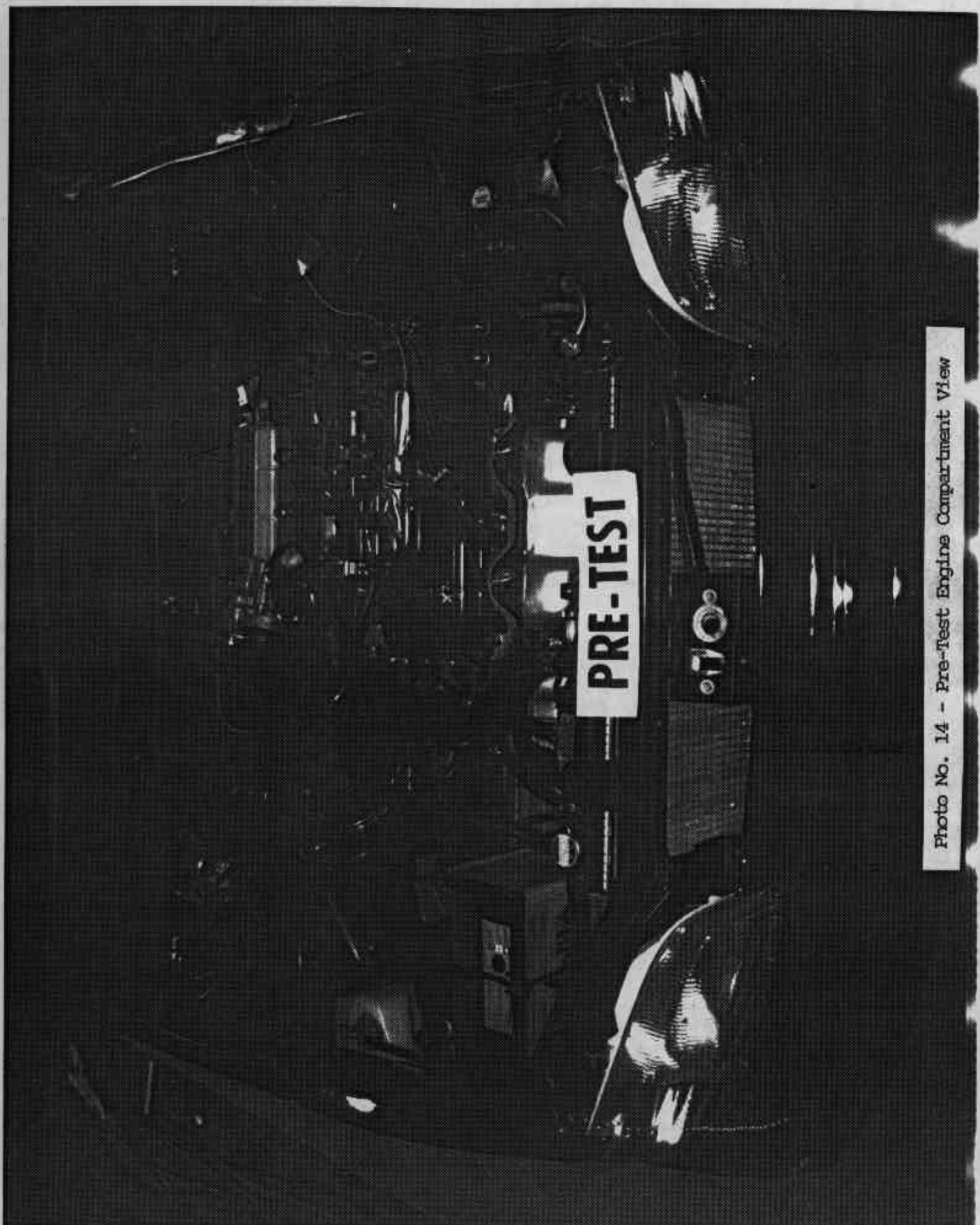


Photo No. 13 - Post-Test Windshield View



PRE-TEST

Photo No. 14 - Pre-Test Engine Compartment View

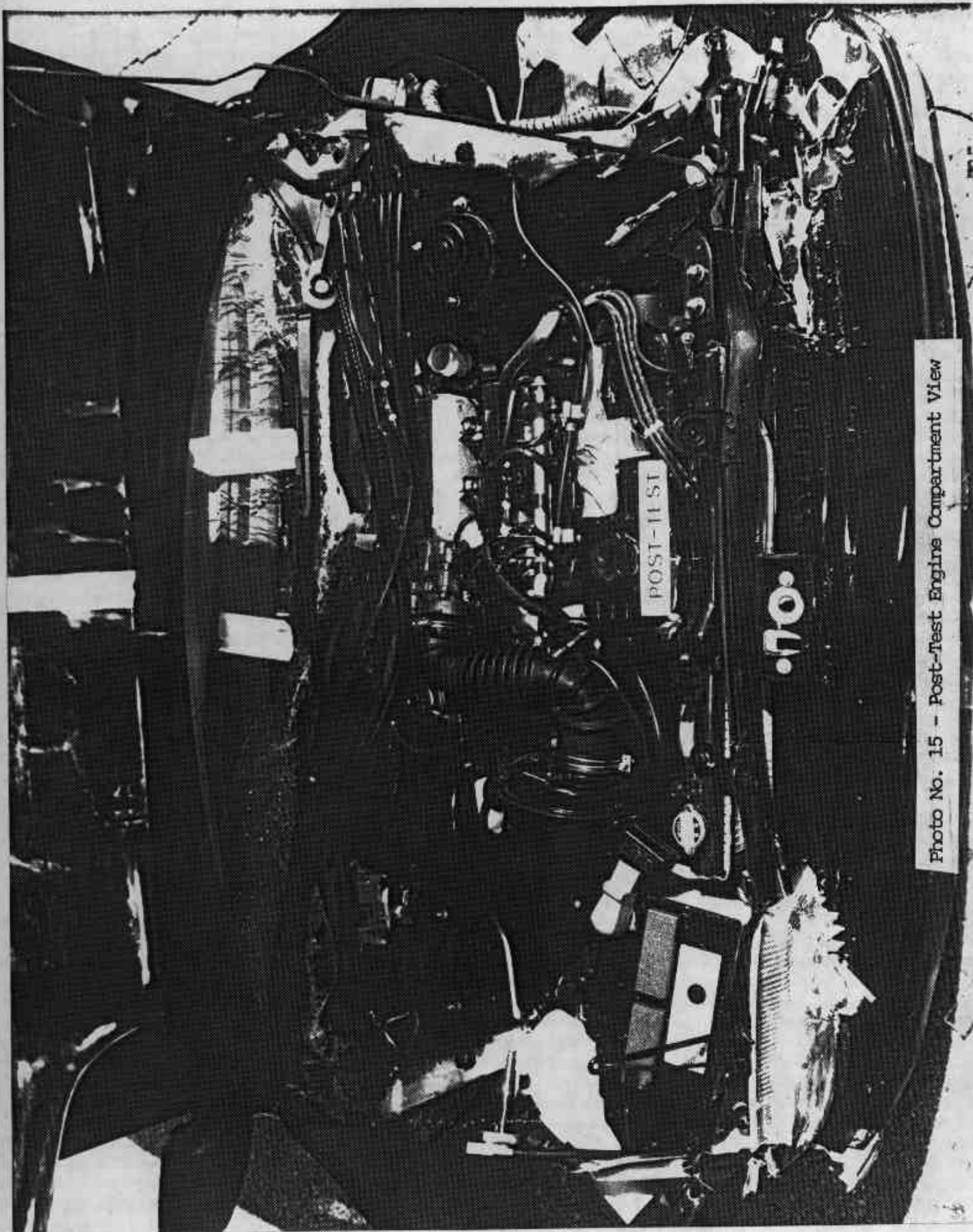
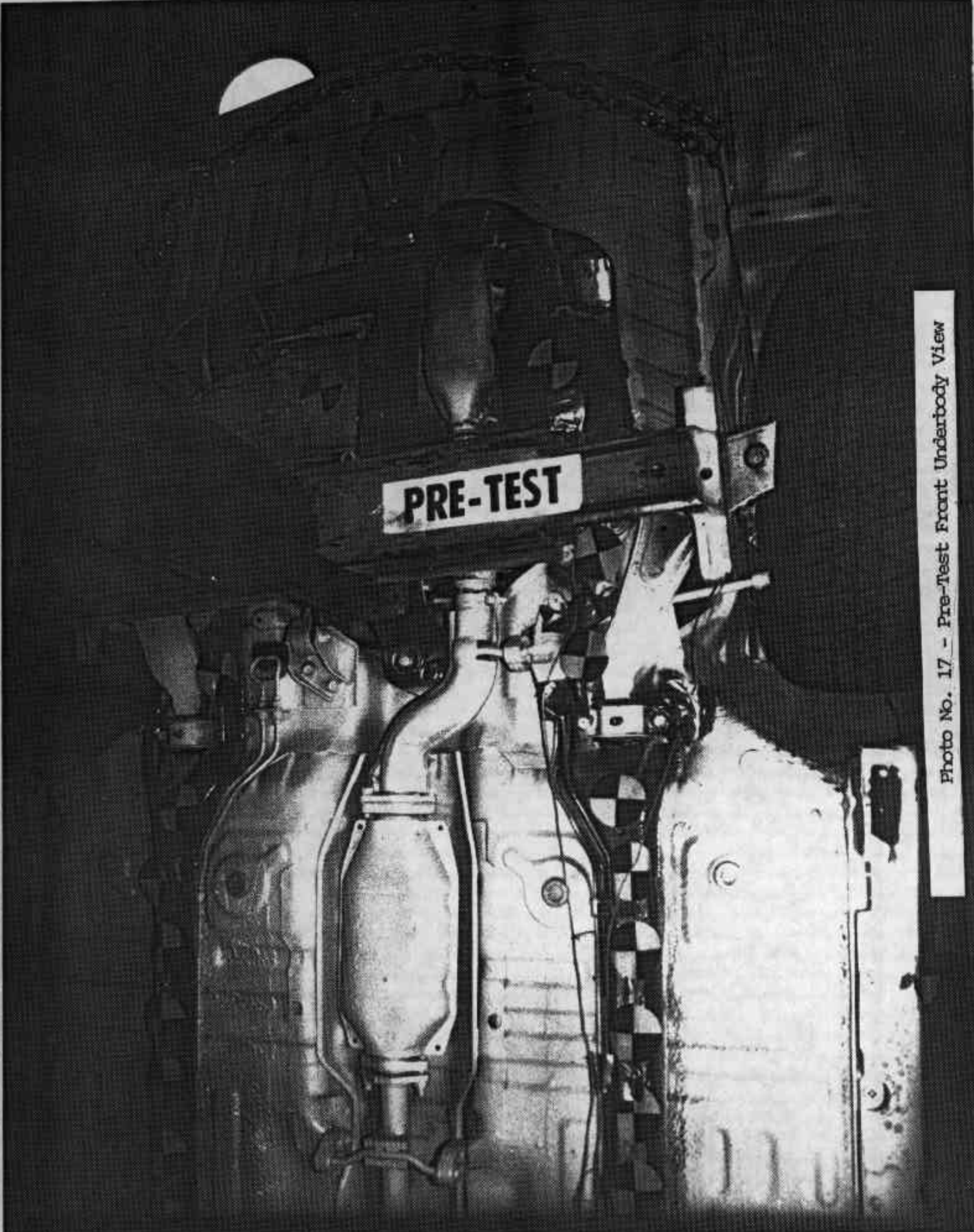


Photo No. 15 - Post-Test Engine Compartment View

PRE-TEST



Photo No. 16 - Pre-Test Fuel Filler Cap View



PRE-TEST

Photo No. 17 - Pre-Test Front Underbody View



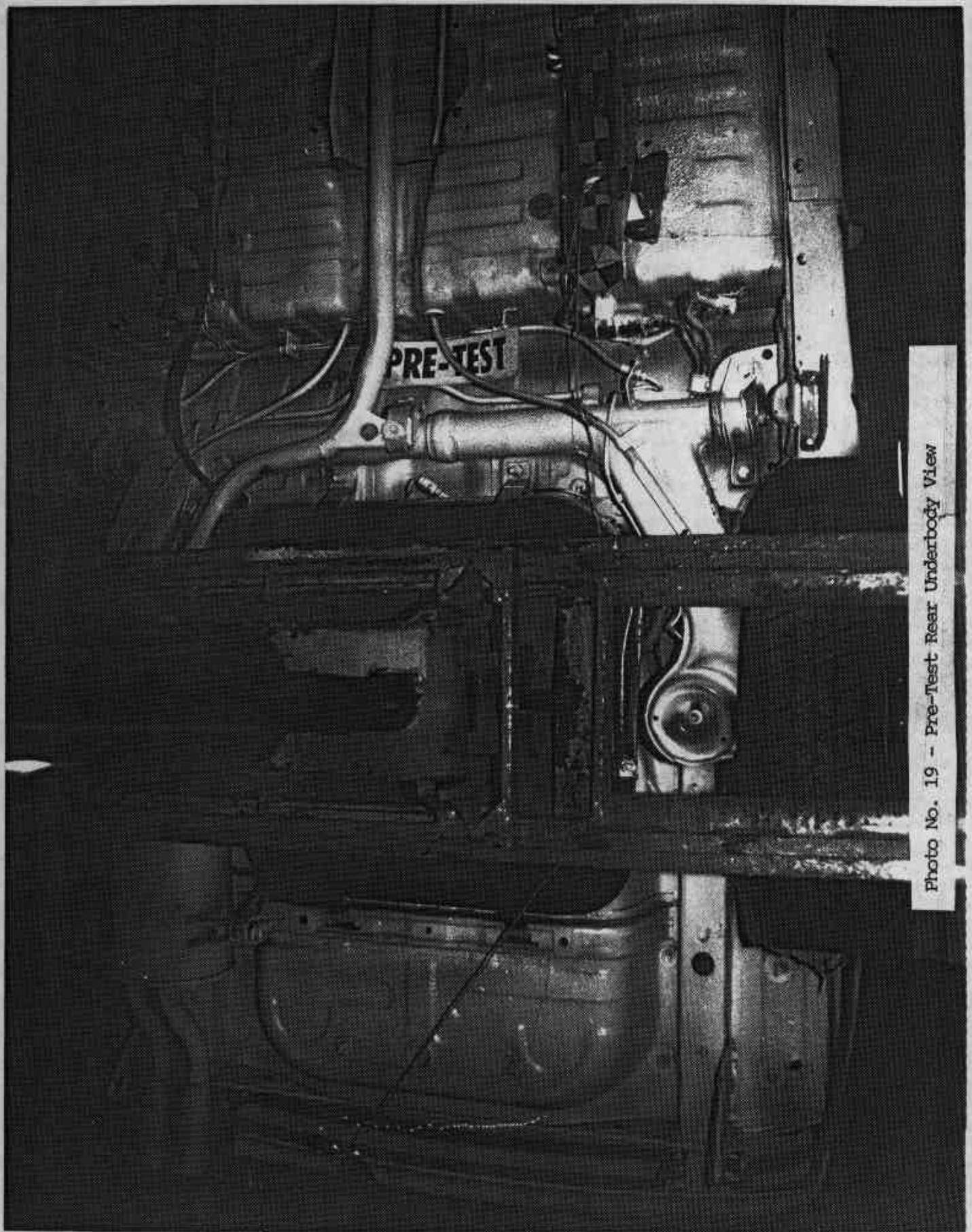


Photo No. 19 - Pre-Test Rear Underbody View

MCAP 35 MPH FRONTAL IMPACT
MGA RESEARCH CORP. 5-8-91
HYUNDAI SCOUPE NHTSA 85

POST-TEST

Photo No. 20 - Post-Test Rear Underbody View

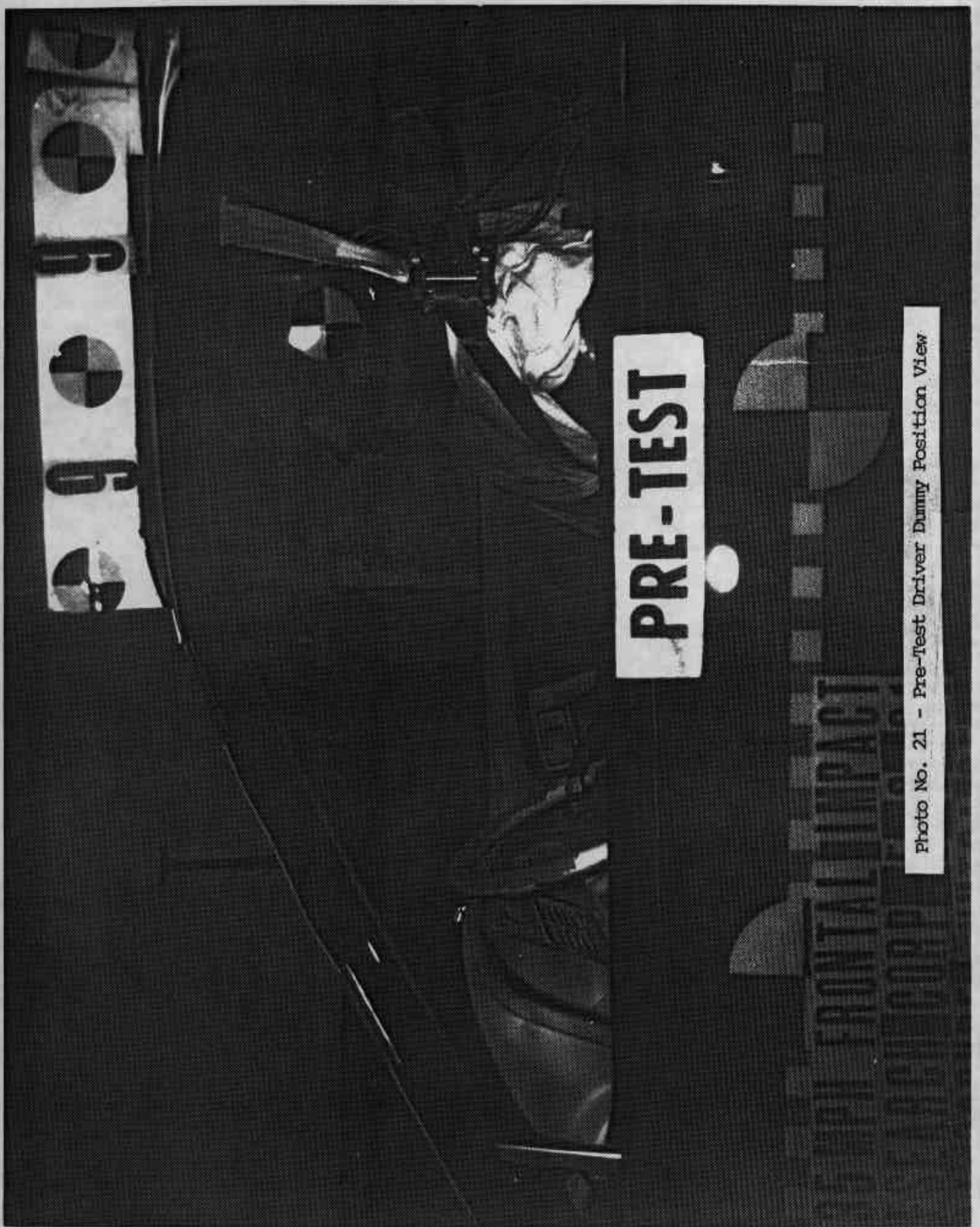
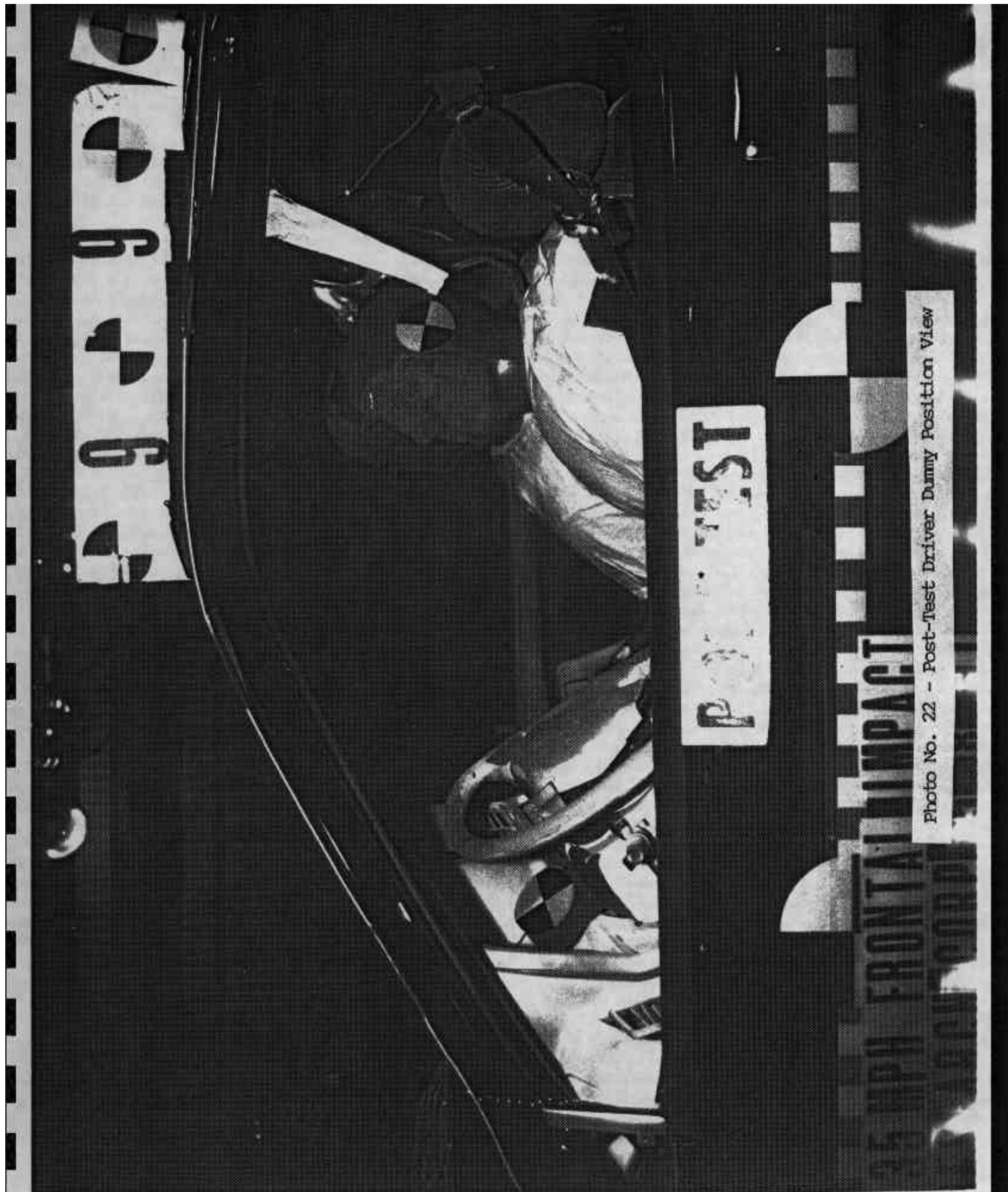


Photo No. 21 - Pre-Test Driver Dummy Position View



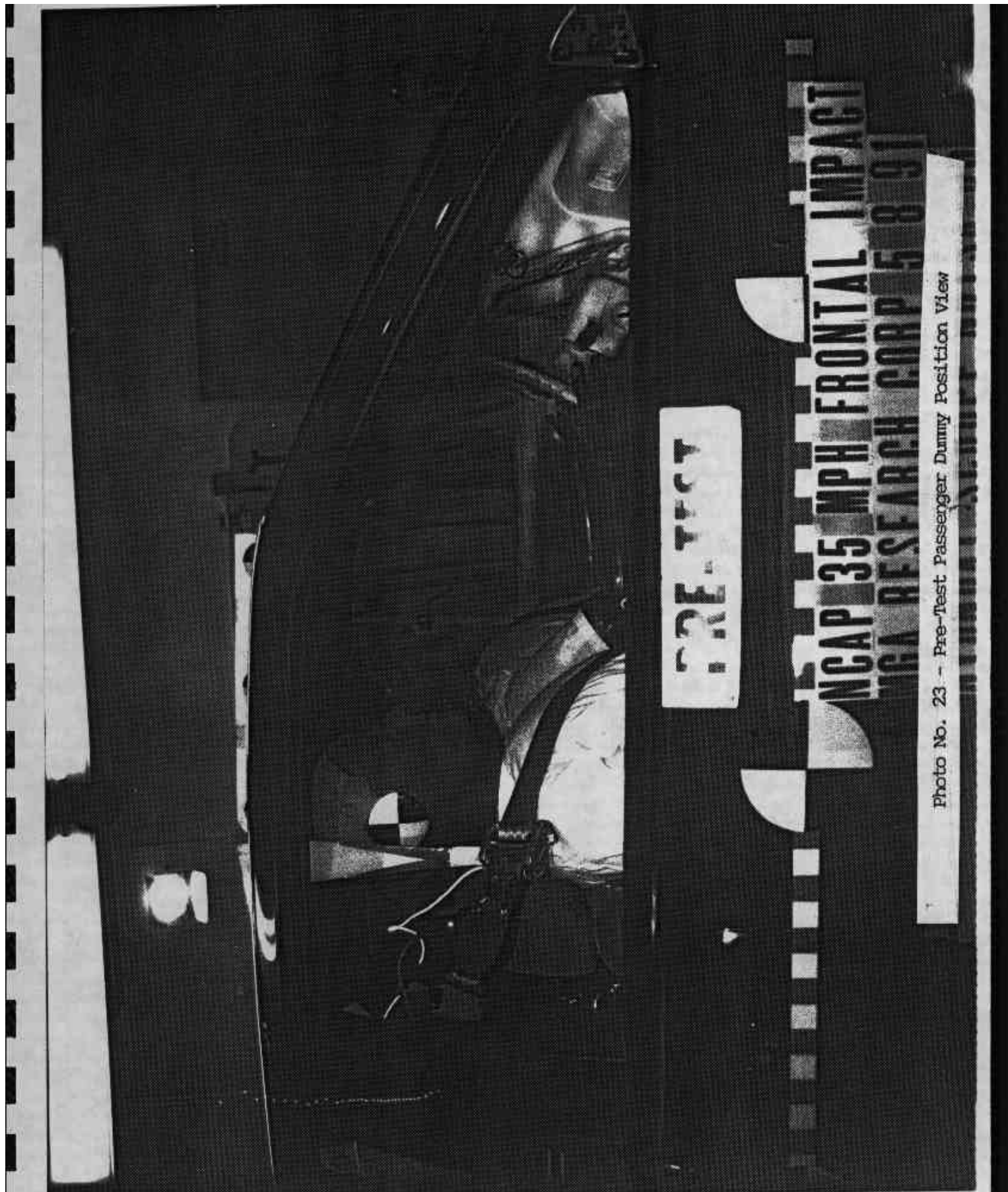


Photo No. 23 - Pre-Test Passenger Dummy Position View

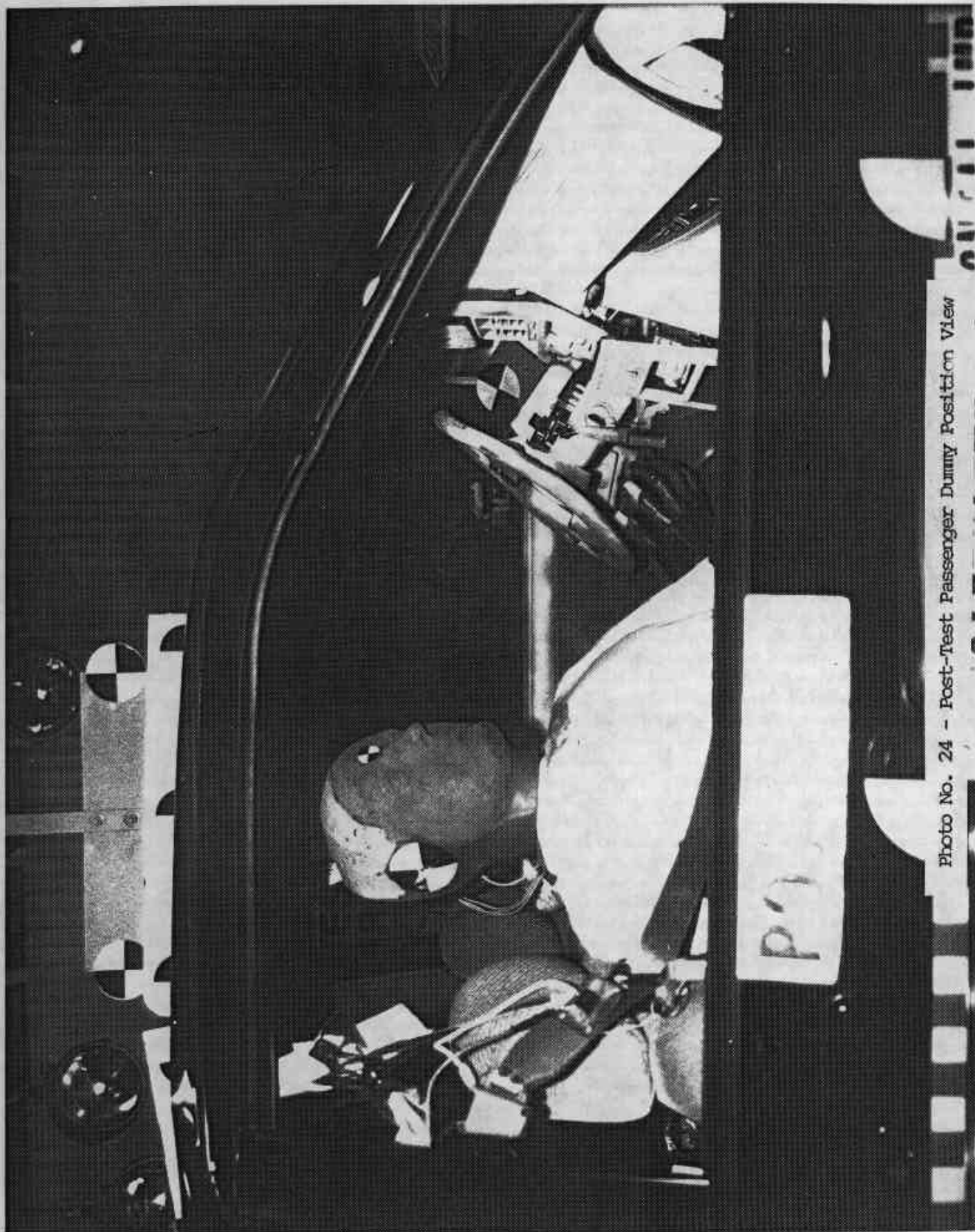


Photo No. 24 - Post-Test Passenger Dummy Position View

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NO SOLVENT SPILLAGE DURING TEST

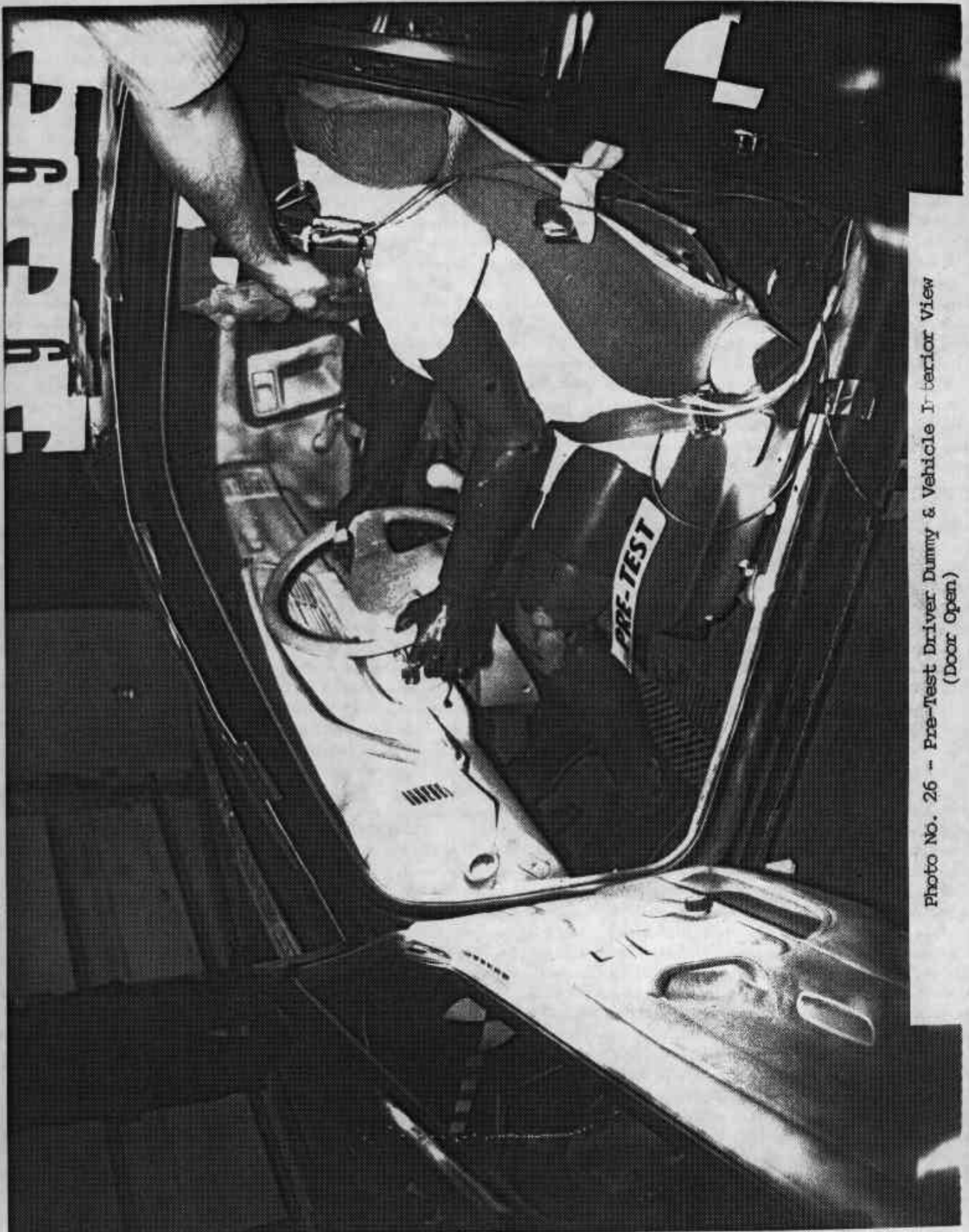


Photo No. 26 - Pre-Test Driver Dummy & Vehicle Interior View
(Door Open)

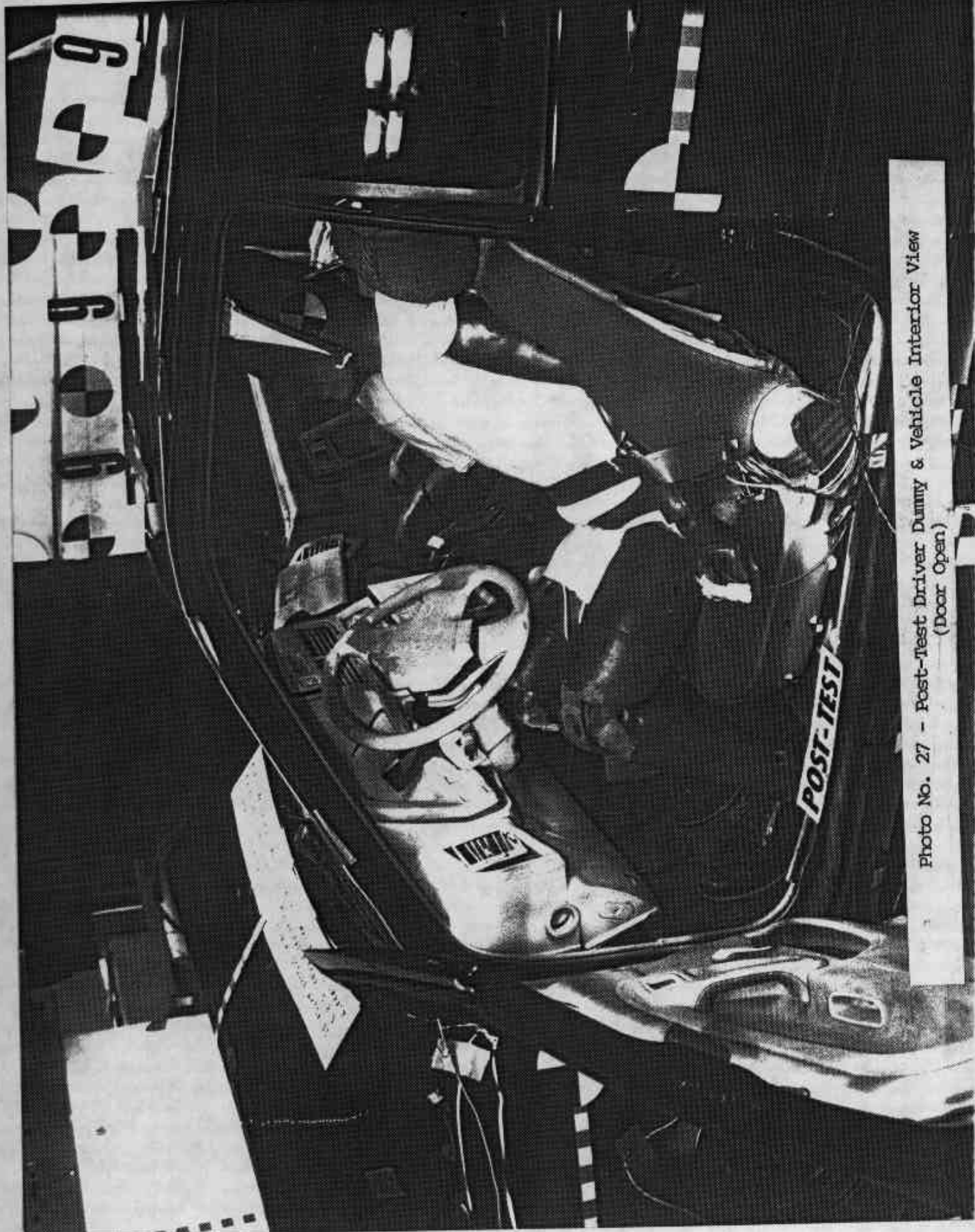


Photo No. 27 - Post-Test Driver Dummy & Vehicle Interior View
(Door Open.)



Photo No. 28 - Pre-Test Passenger Dummy & Vehicle Interior View
(Door Open)

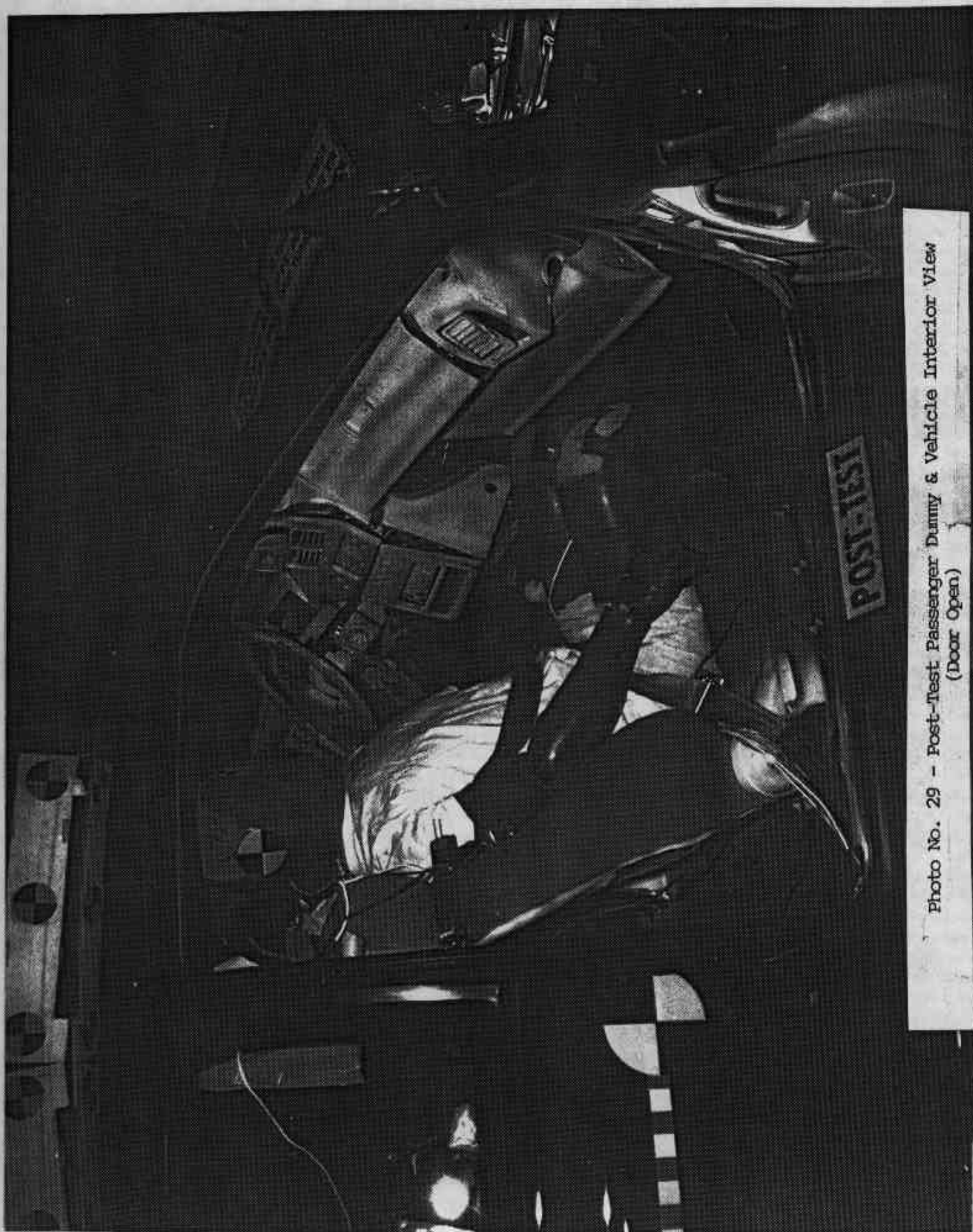


Photo No. 29 - Post-Test Passenger Dummy & Vehicle Interior View
(Door Open)

PHOTOGRAPH NOT APPLICABLE

NO RESTRAINT SYSTEM PROBLEM

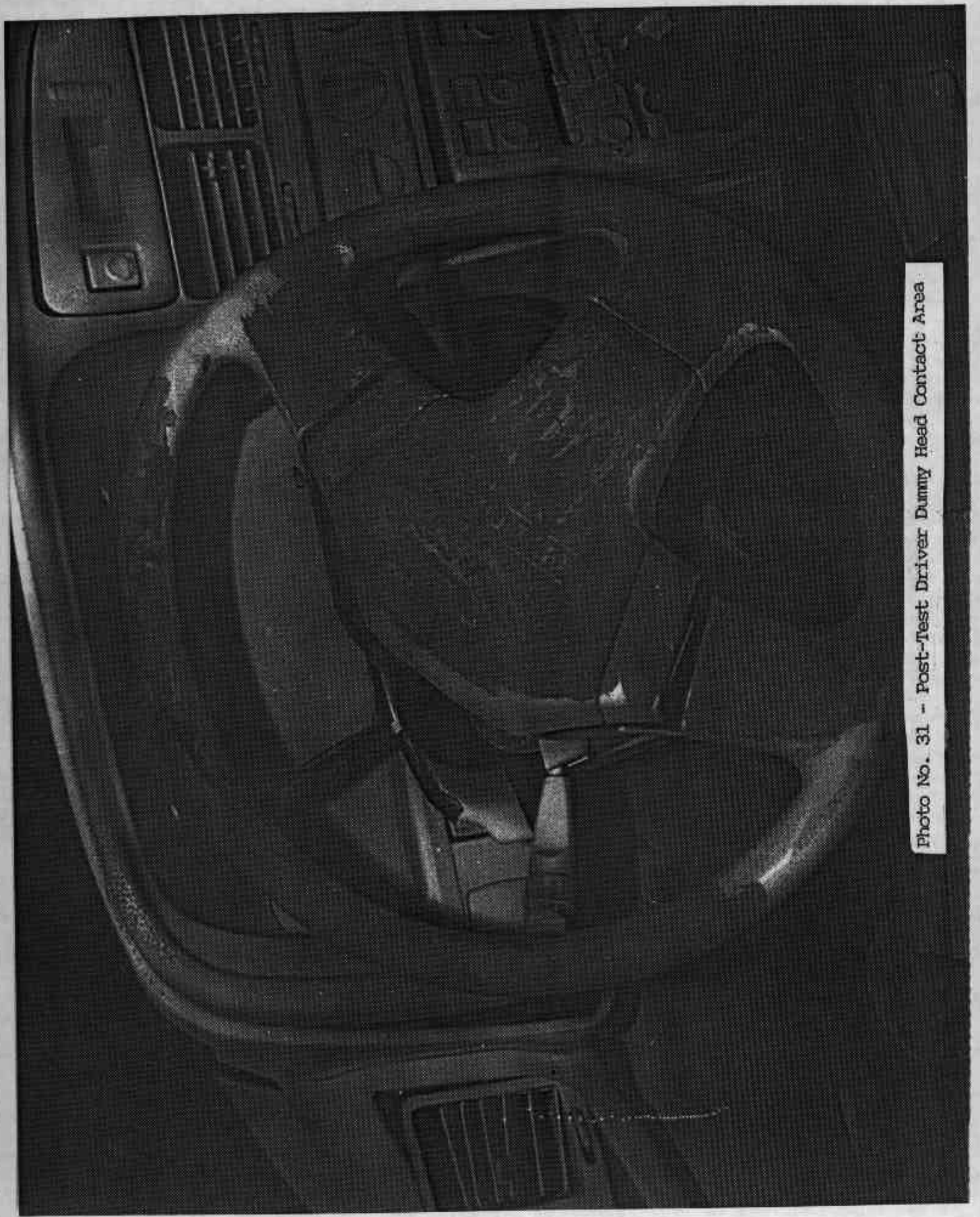


Photo No. 31 - Post-Test Driver Dummy Head Contact Area

SEE PHOTOGRAPH NO. 31

Photo No. 32 - Post-Test Steering Column Hub/Rim Contact
By Dummy Driver

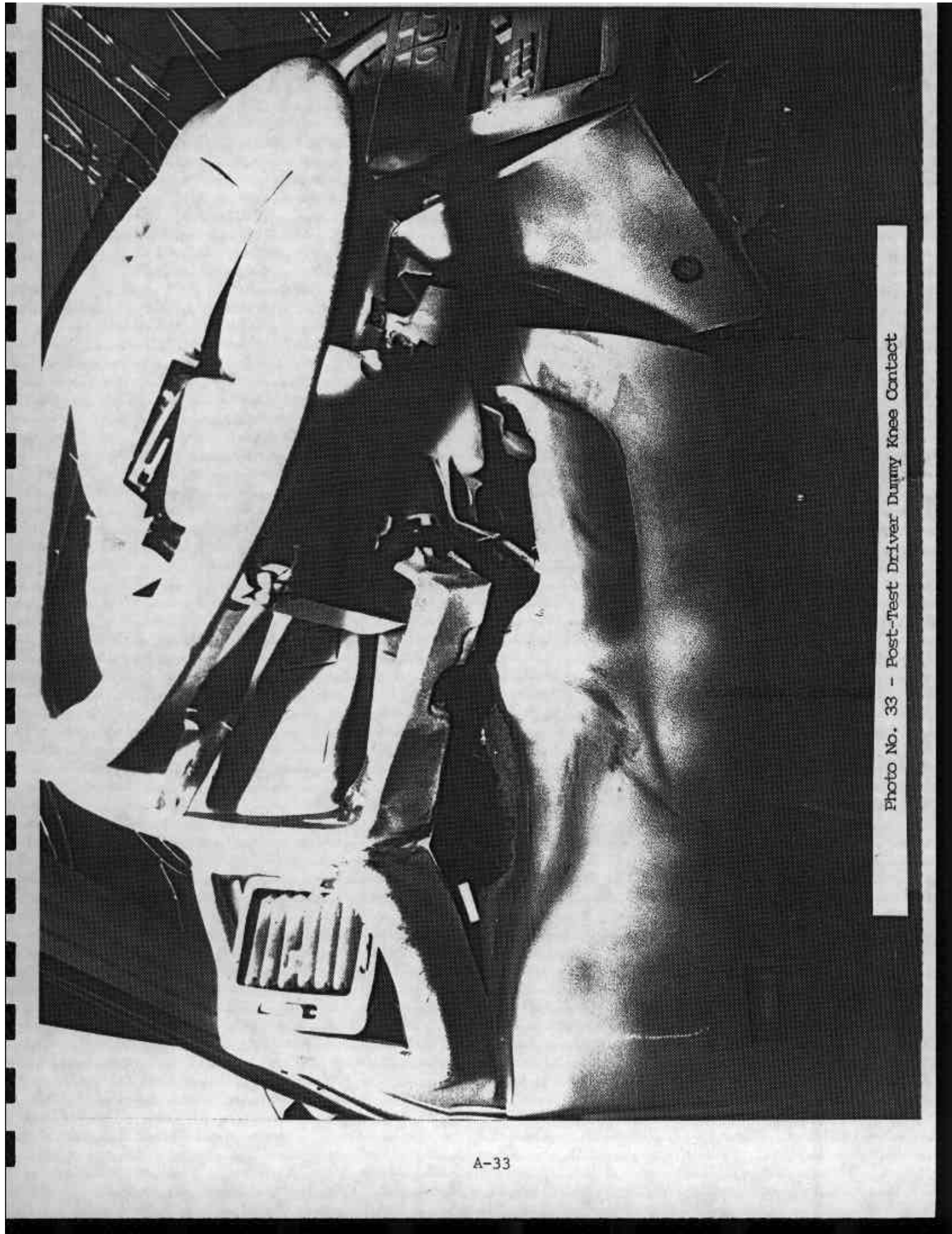


Photo No. 33 - Post-Test Driver Dummy Knee Contact



Photo No. 34 - Post-Test Passenger Dummy Knee Contact Area

APPENDIX B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

1991 HYUNDAI SCOUPE
NHTSA NO. MM0500

VEHICLE DATA	FILTER CHANNEL CLASS
Accelerations	60
Velocities	180
Displacements	180

<u>Data Plot</u>	<u>Page No.</u>
Right Rear Seat Cross-member X Acceleration vs. Time	B-4
Right Rear Seat Cross-member X Velocity vs. Time	B-5
Right Rear Seat Cross-member X Displacement vs. Time	B-6
Left Rear Seat Cross-member X Acceleration vs. Time	B-7
Left Rear Seat Cross-member X Velocity vs. Time	B-8
Left Rear Seat Cross-member X Displacement vs. Time	B-9
Top of Engine Block X Acceleration vs. Time	B-10
Bottom of Engine Block X Acceleration vs. Time	B-11
Right Front Disc Brake Caliper X Acceleration vs. Time	B-12
Left Front Disc Brake Caliper X Acceleration vs. Time	B-13
Center of Instrument Panel Top Surface X Acceleration vs. Time	B-14
Center Rear Seat Cross-member Z Acceleration vs. Time	B-15
Center Rear Seat Cross-member Z Velocity vs. Time	B-16
Center Rear Seat Cross-member Z Displacement vs. Time	B-17
Vehicle Rear Z Acceleration vs. Time	B-18
Vehicle Rear Z Velocity vs. Time	B-19
Vehicle Rear Z Displacement vs. Time	B-20

1991 HYUNDAI SCOUPE
NHTSA NO. MM0500

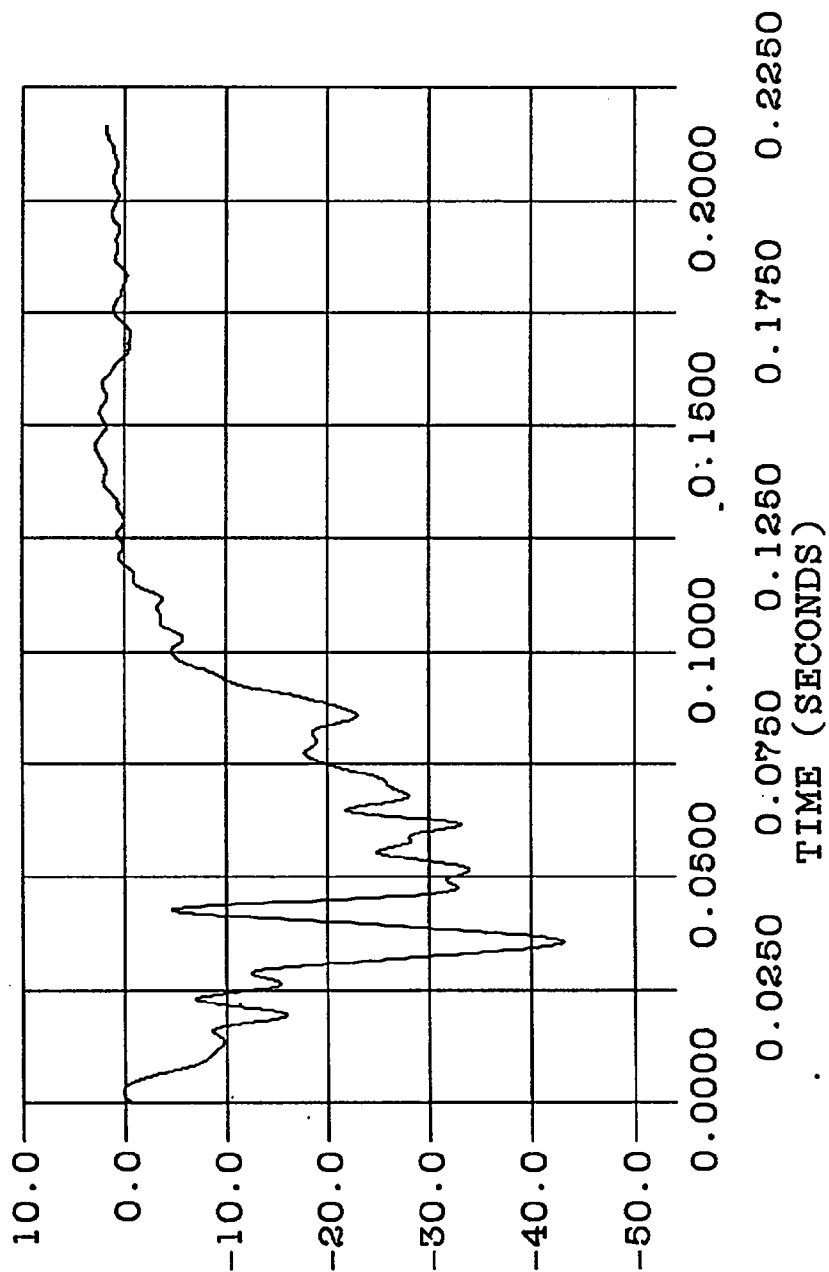
DATA FILE MINIMUMS AND MAXIMUMS

DESCRIPTION	MINIMUM		MAXIMUM	
Crossmember RH X Acc.	-43.2 @	0.03555	2.8 @	0.14526
Crossmember RH X Vel.	-6.9 @	0.11919	35.3 @	0.00000
Crossmember RH X Disp.	0.0 @	0.00000	30.6 @	0.08241
Crossmember LH X Acc.	-20.0 @	0.06814	2.6 @	0.15461
Crossmember LH X Vel.	2.4 @	0.13309	35.3 @	0.00197
Crossmember LH X Disp.	0.0 @	0.00000	44.4 @	0.21648
Engine Upper X Acc.	-122.2 @	0.02829	21.4 @	0.04010
Engine Lower X Acc.	Not Available - No Valid Data Collected			
Caliper RH X Acc.	-103.1 @	0.04440	52.7 @	0.06162
Caliper LH X Acc.	-140.7 @	0.03850	87.3 @	0.05584
Dash Panel X Acc.	-71.7 @	0.05535	34.3 @	0.06876
Crossmember CTR Z Acc.	-12.6 @	0.09533	27.5 @	0.06507
Crossmember CTR Z Vel.	-0.6 @	0.01205	5.3 @	0.08647
Crossmember CTR Z Disp.	-0.1 @	0.03223	6.2 @	0.21648
Vehicle Rear Z Acc.	-16.3 @	0.04440	30.3 @	0.04969
Vehicle Rear Z Vel.	-2.5 @	0.21648	2.4 @	0.09397
Vehicle Rear Z Disp.	-0.6 @	0.05018	1.8 @	0.16310

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

X-MEM RH ACC

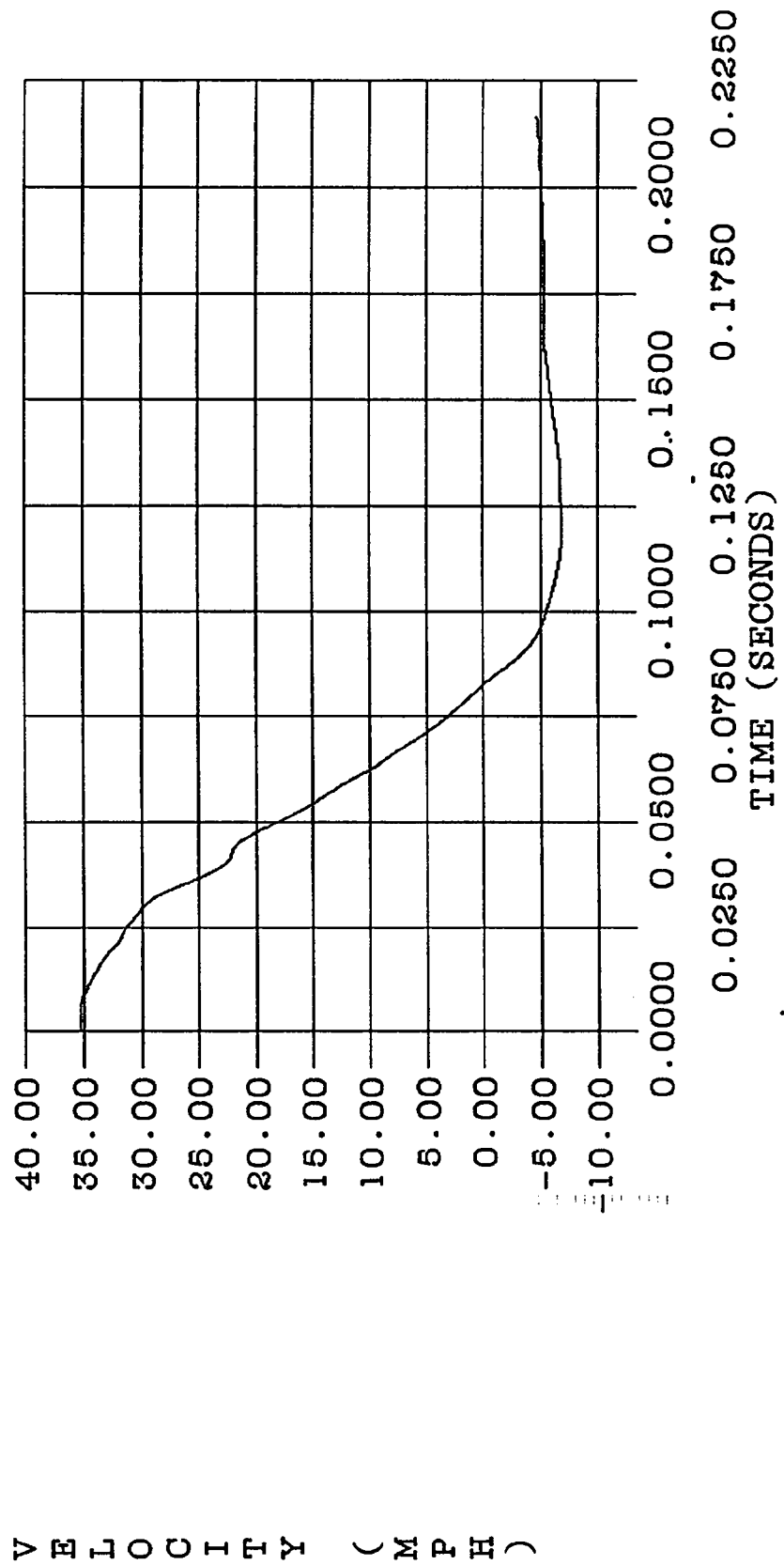
ACCELERATION (G, S)



Right Rear Seat Cross-member X Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

X-MEM RH VEL

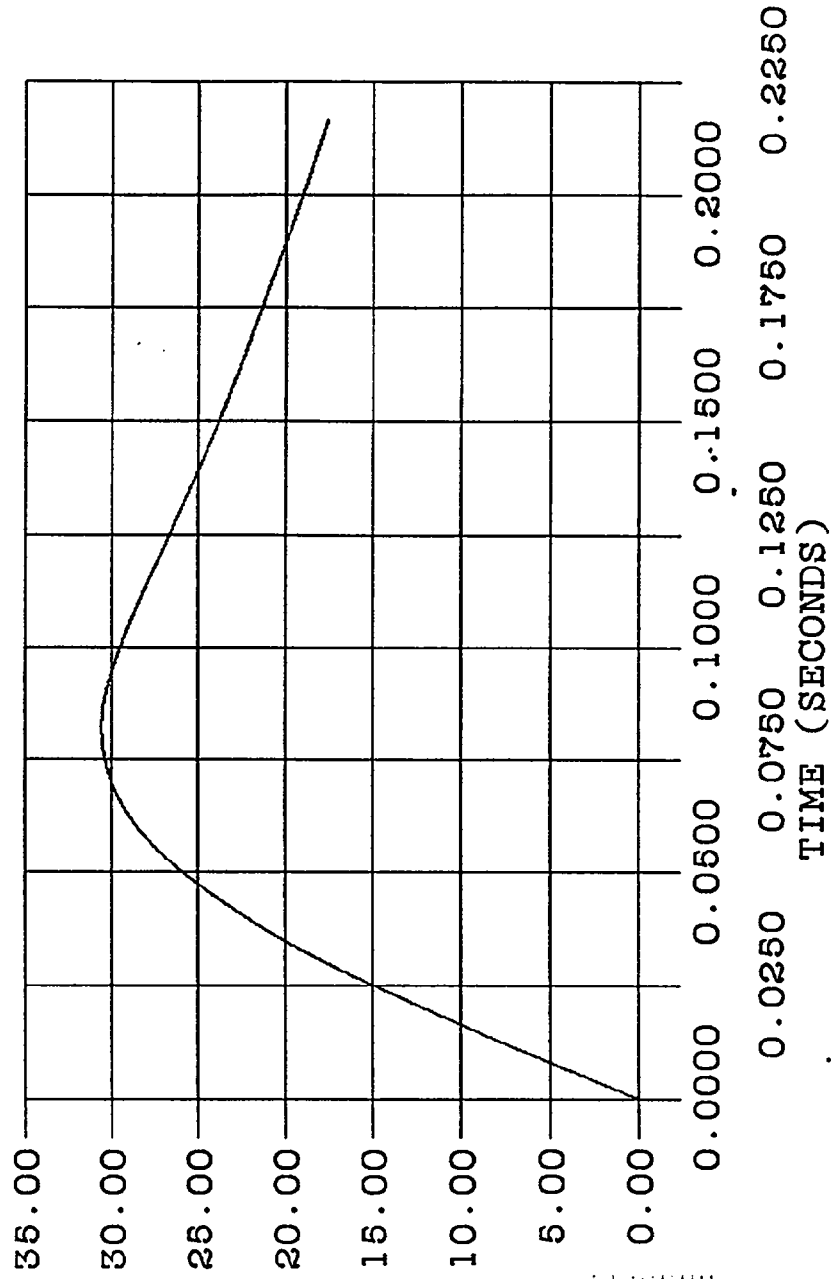


Right Rear Seat Cross-member X Velocity vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

X-MEM RH DISP

D I S P L A C E M E N T (I N)



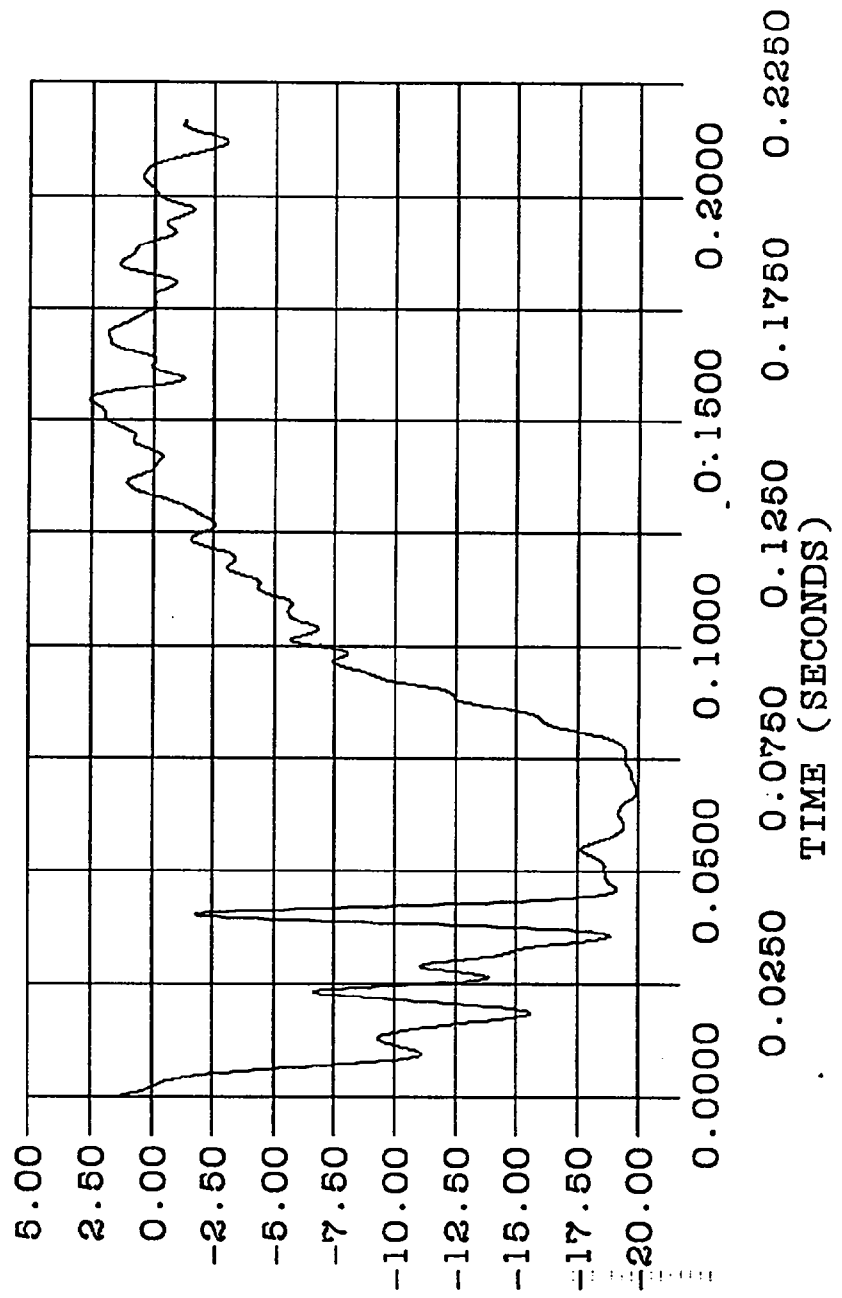
Right Rear Seat Cross-member X Displacement vs. Time

ACCELERATION (G, S)

B-7

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

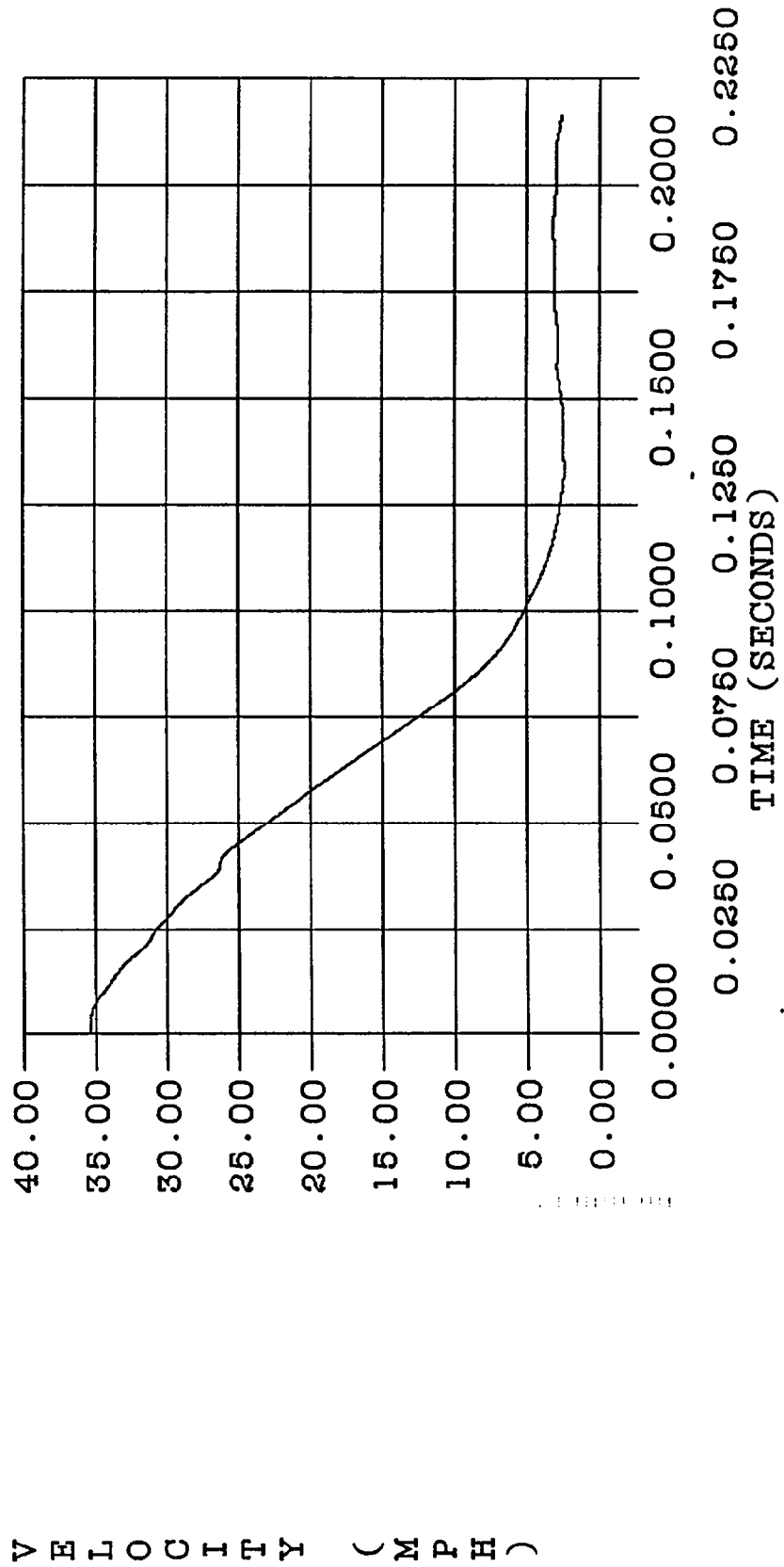
X-MEM LH ACC



Left Rear Seat Cross-member X Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

X-MEM LH VEL

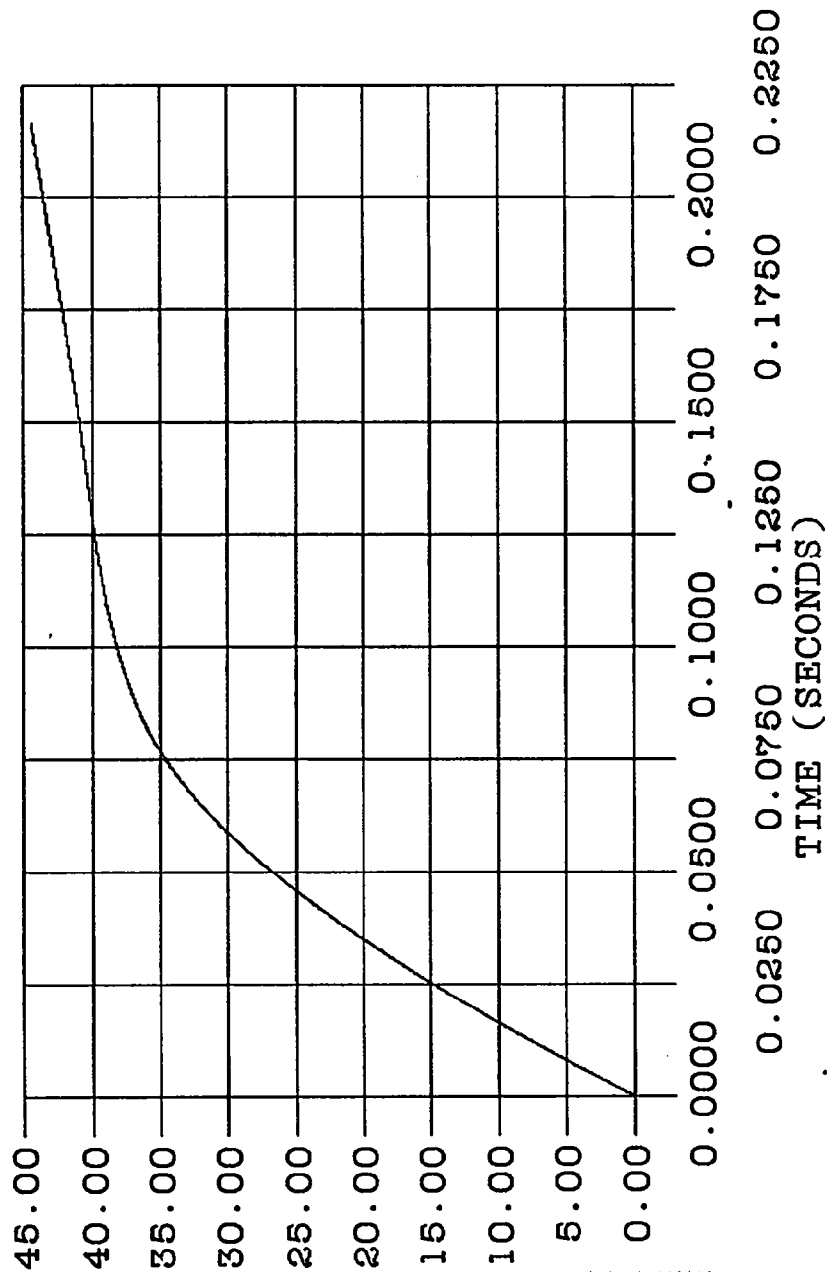


Left Rear Seat Cross-member X Velocity vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

X-MEM LH DISP

D I S P L A C E M E N T (I N)

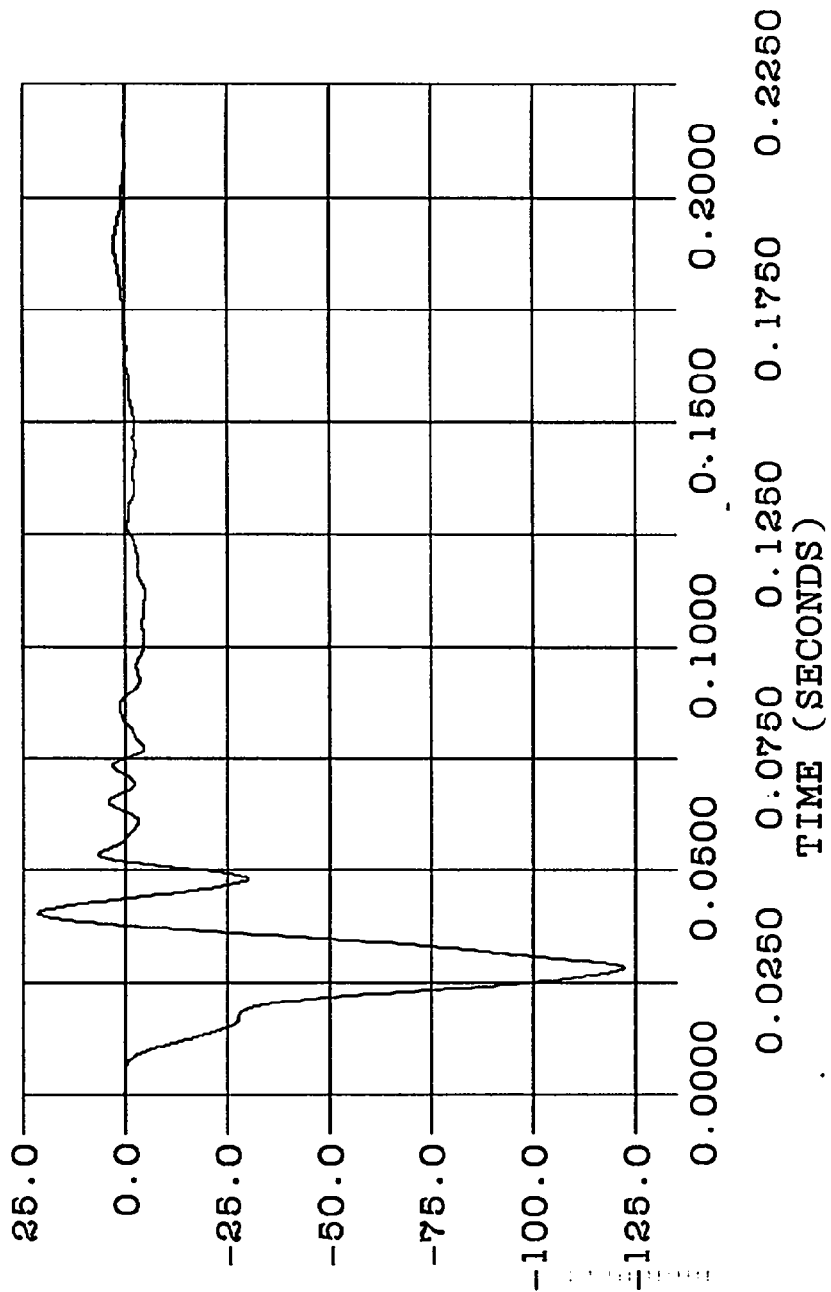


Left Rear Seat Cross-member X Displacement vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 06/08/91

ENGINE UPPER ACC

ACCELERATION (G, S)



Top of Engine Block X Acceleration vs. Time

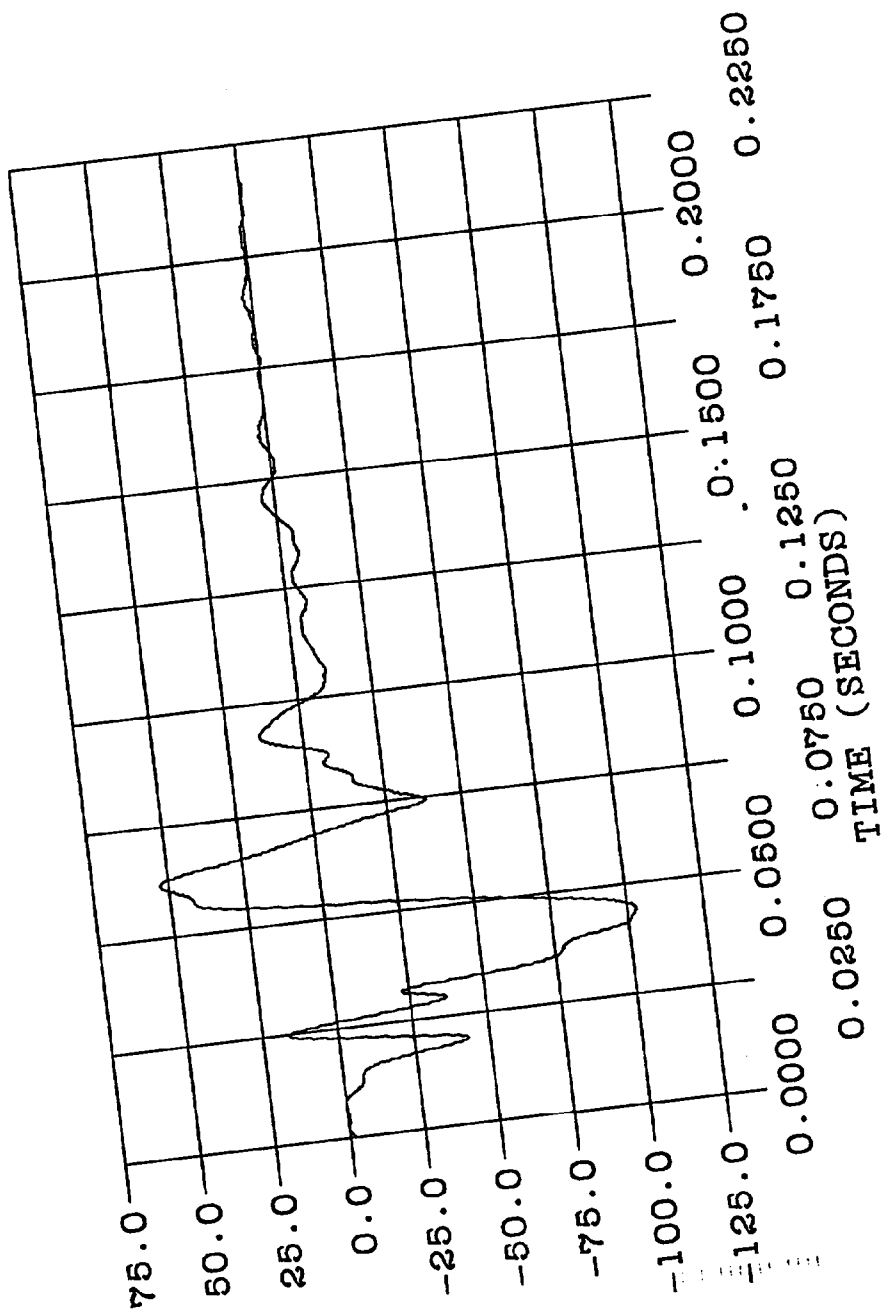
DATA PLOT NOT AVAILABLE

NO VALID DATA COLLECTED

Bottom of Engine Block X Acceleration vs. Time

TEST DATE: 05/08/91

1991 HYUNDAI SCOUPE NCAP TEST
CALIPER RH ACC

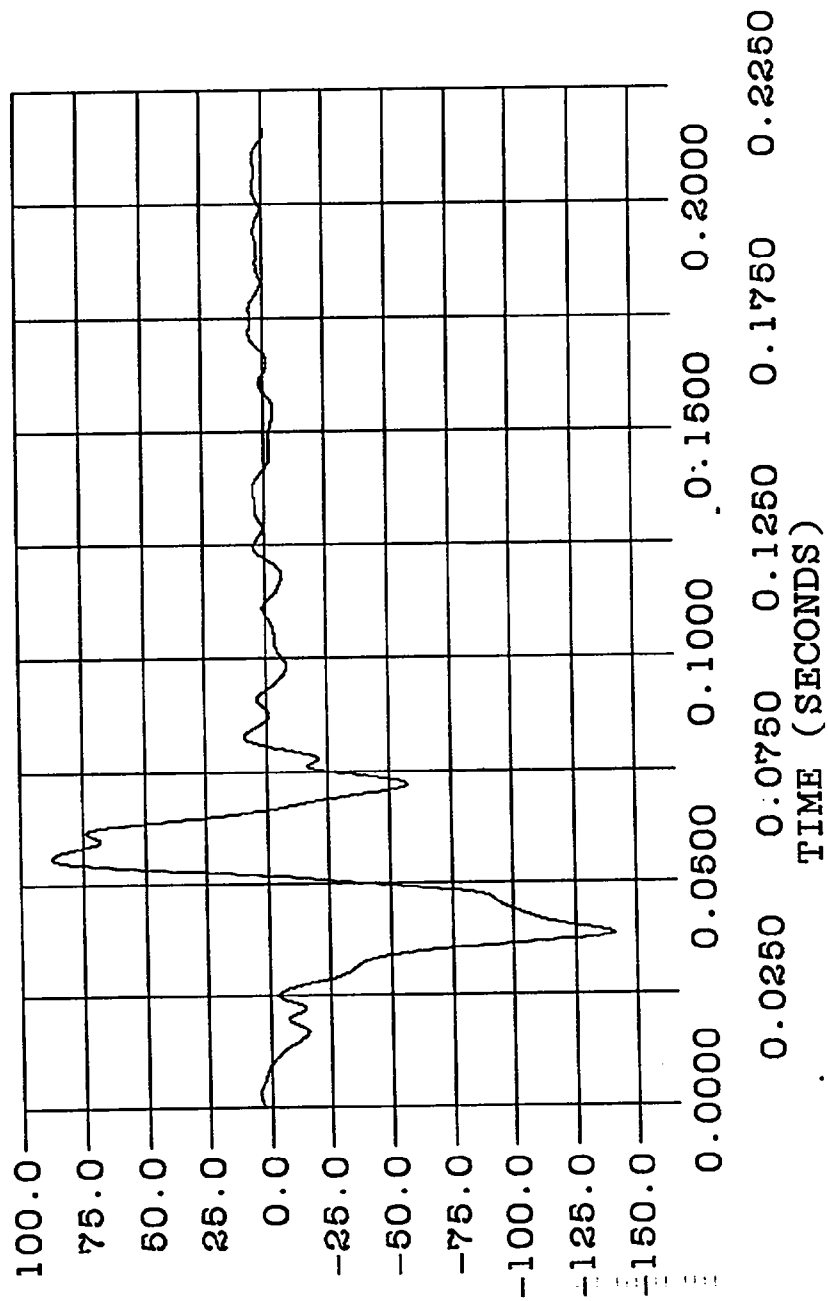


Right Front Disc Brake Caliper X Acceleration vs. Time

ACCELERATION (G, S)

ACCELERATION (G, S)

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91
CALIPER LH ACC

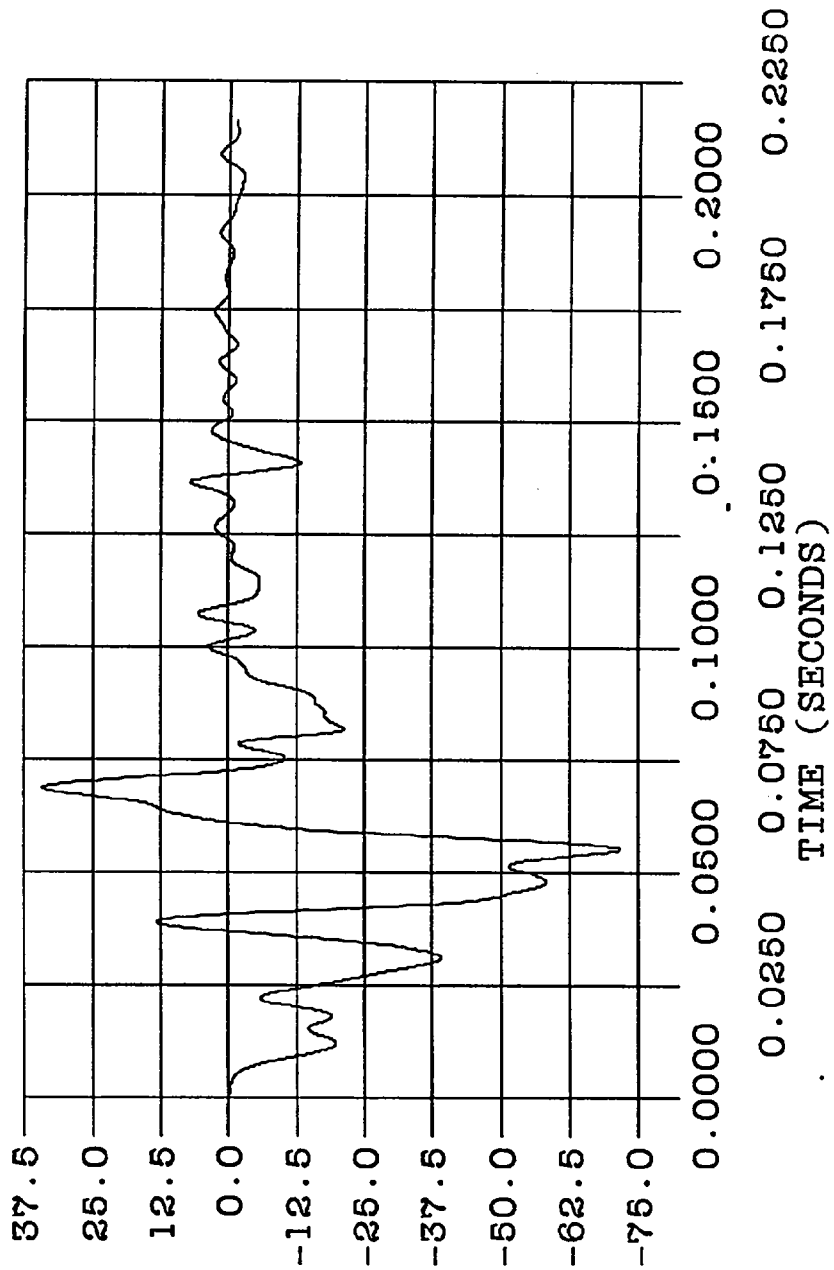


Left Front Disc Brake Caliper X Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DASH PANEL ACC

ACCELERATION (G, S)

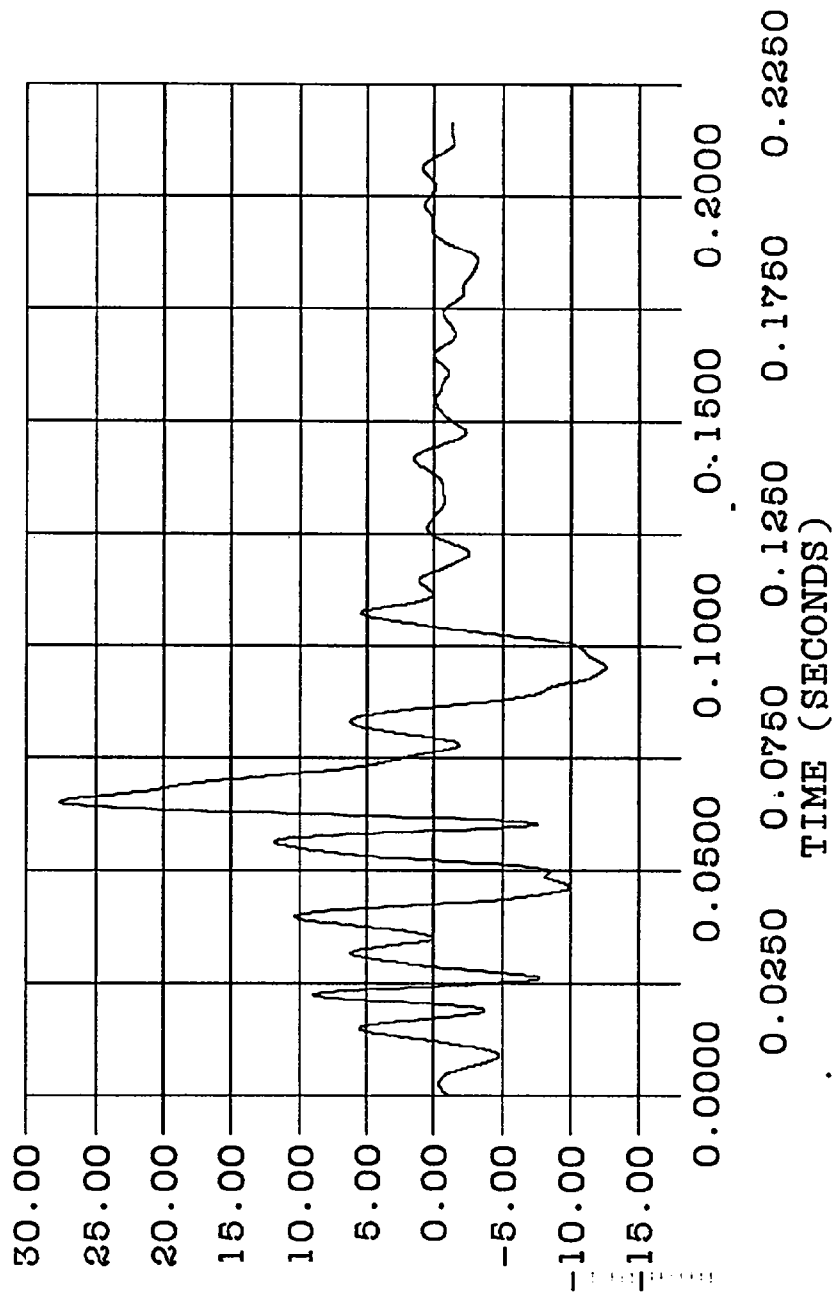


Center of Instrument Panel Top Surface X Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

X-MEM CTR ACC

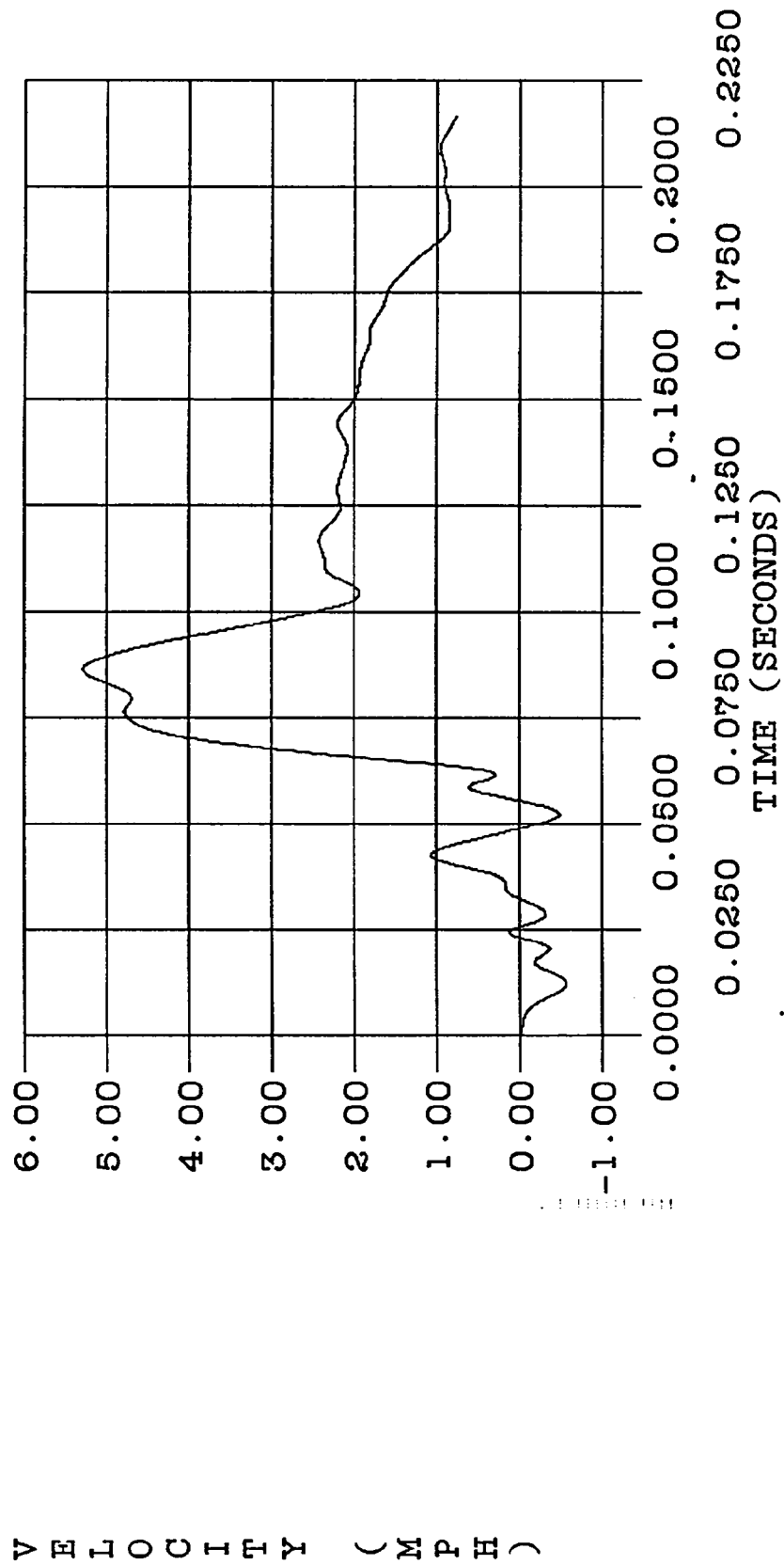
ACCELERATION (G, S)



Center Rear Seat Cross-member Z Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

X-MEM CTR VEL

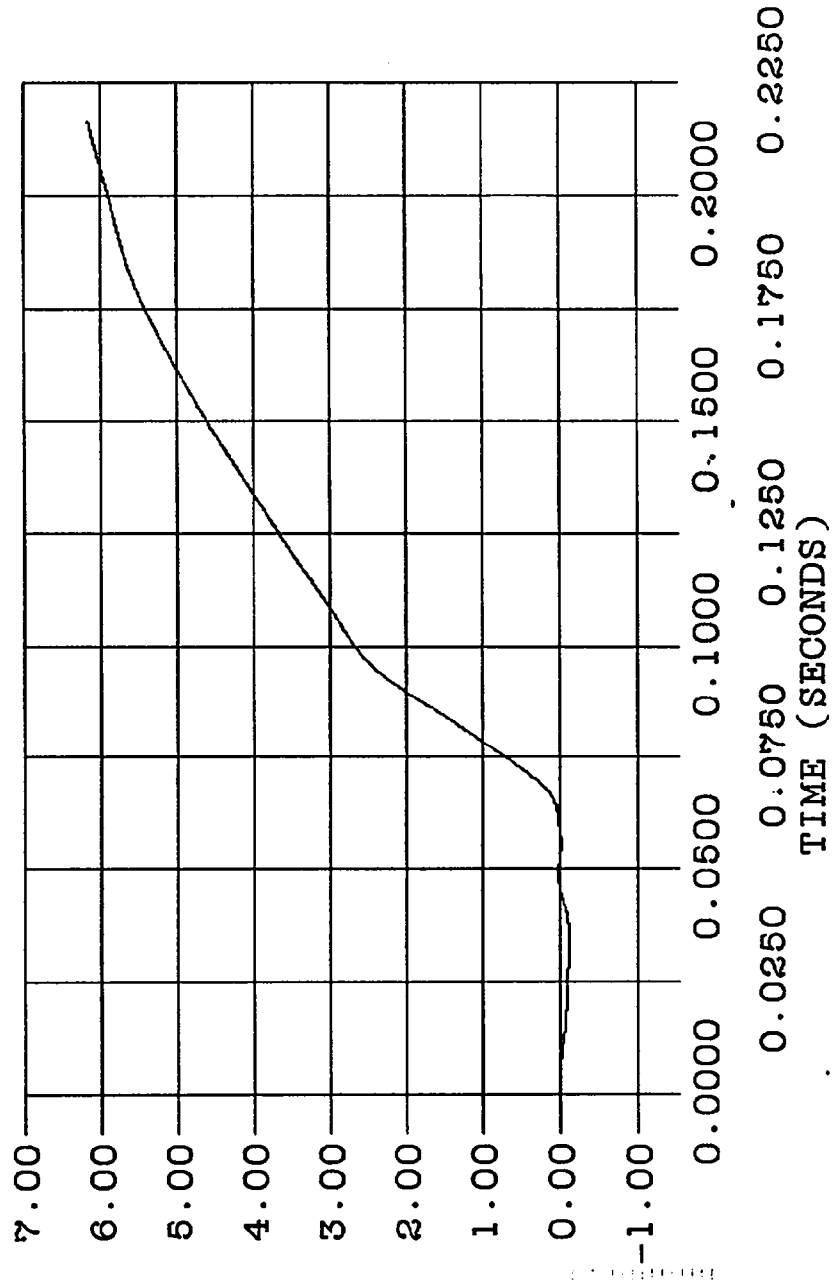


Center Rear Seat Cross-member Z Velocity vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

X-MEM CTR DISP

D I S P L A C E M E N T (I N)

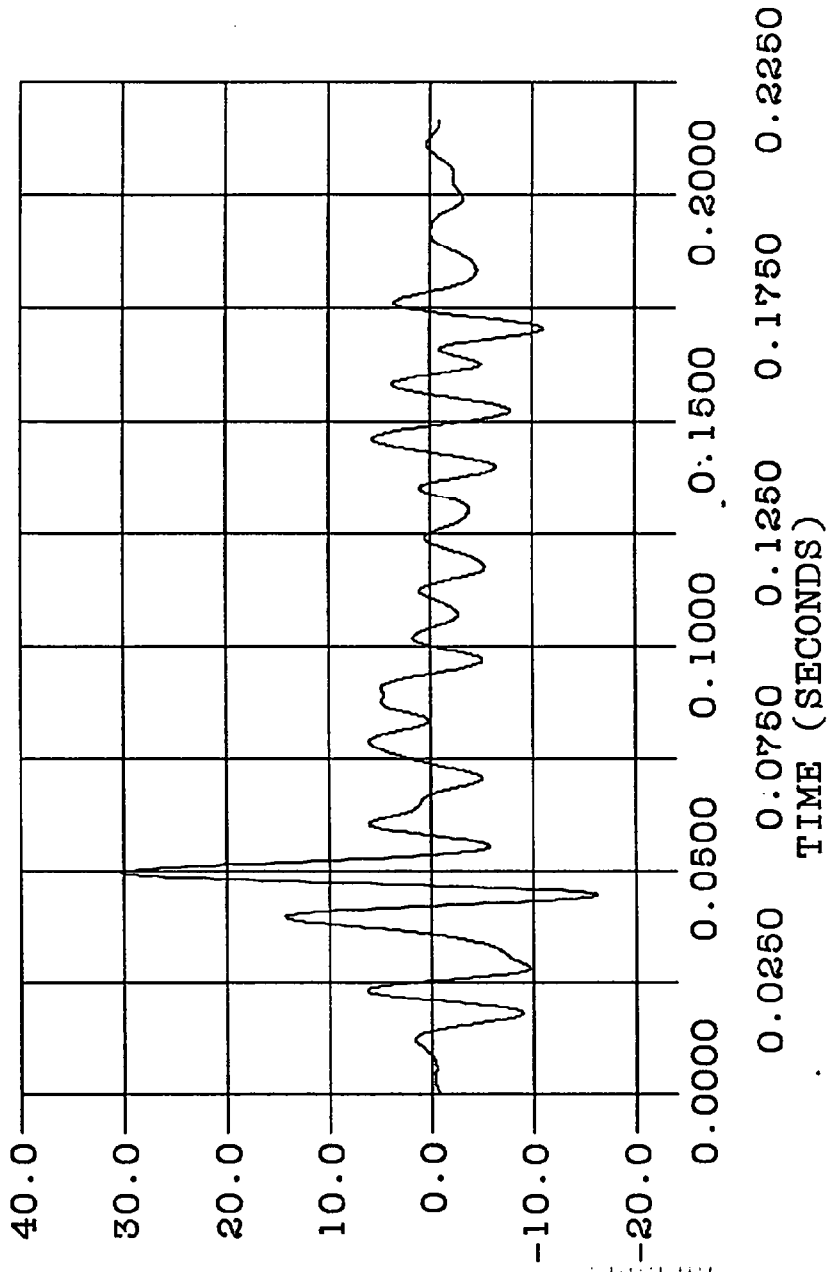


Center Rear Seat Cross-member Z Displacement vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

VEHICLE REAR ACC

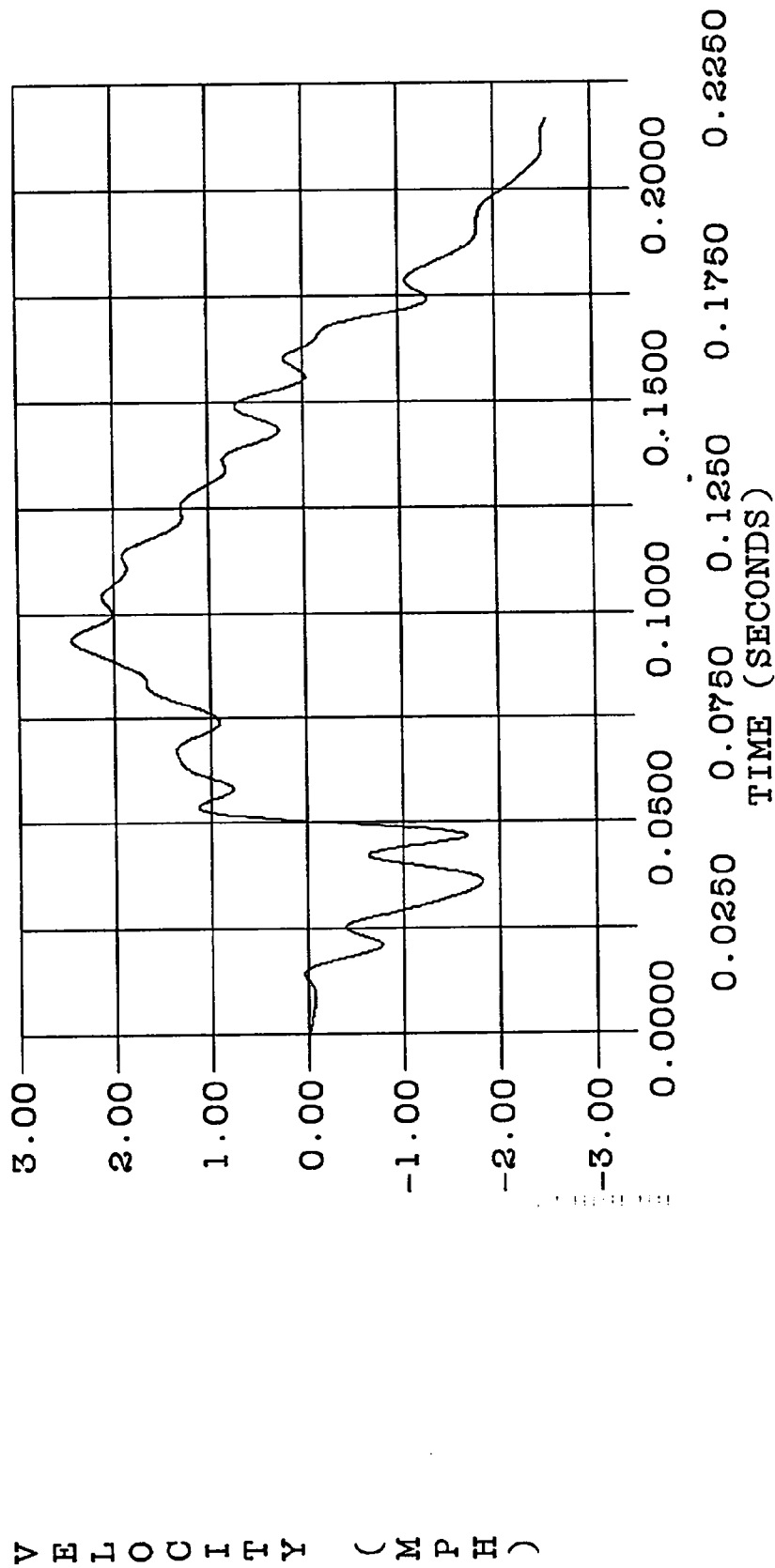
ACCELERATION (G, S)



Vehicle Rear Z Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 06/08/91

REAR VEH VEL

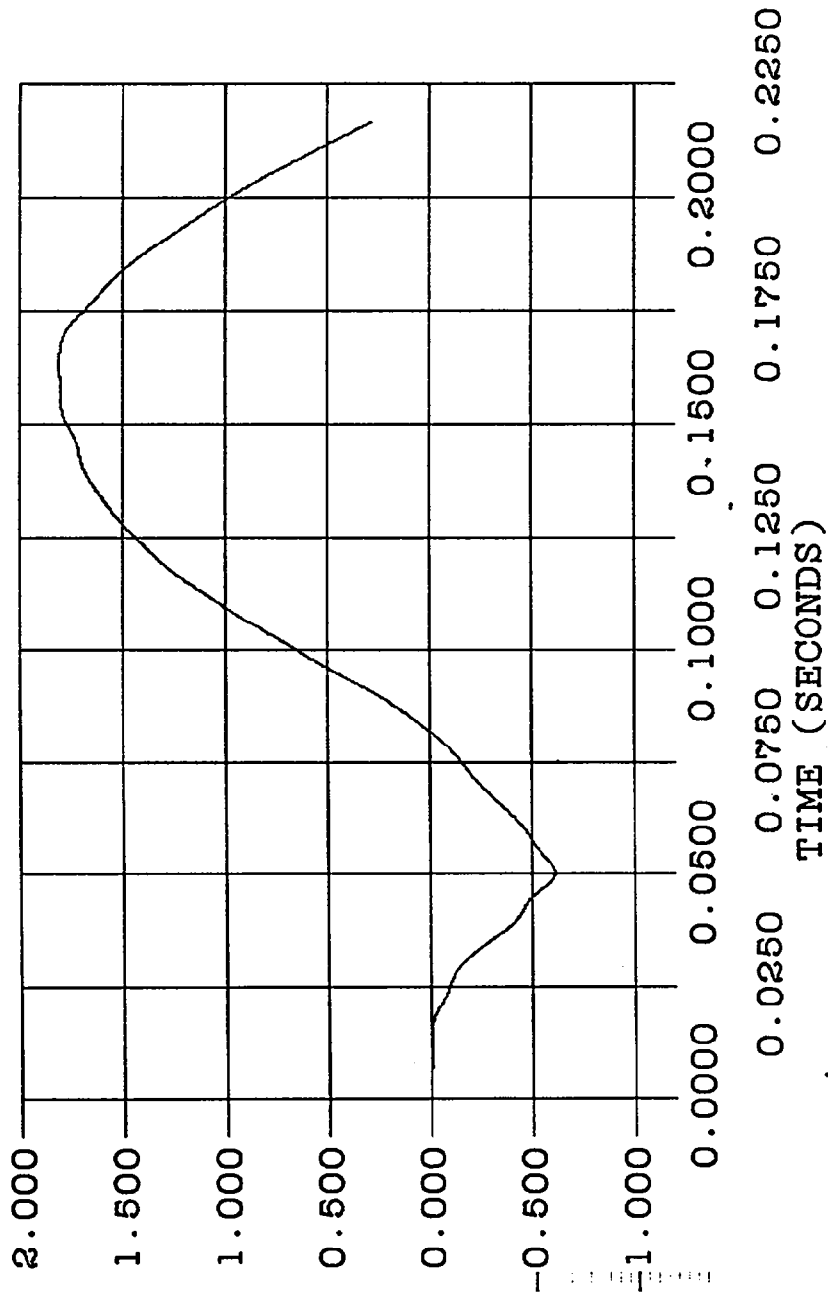


Vehicle Rear Z Velocity vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

VEHICLE REAR DISP

D I S P L A C E M E N T (I N)



Vehicle Rear Z Displacement vs. Time

1991 HYUNDAI SCOUPE
NHTSA NO. MM0500

LOAD CELL BARRIER DATA

FILTER CHANNEL CLASS

Forces

60

Data Plot

Page No.

Barrier Load Cell A1 Force vs. Time	N/A*
Barrier Load Cell A2 Force vs. Time	N/A
Barrier Load Cell A3 Force vs. Time	N/A
Barrier Load Cell A4 Force vs. Time	N/A
Barrier Load Cell A5 Force vs. Time	N/A
Barrier Load Cell A6 Force vs. Time	N/A
Barrier Load Cell A7 Force vs. Time	N/A
Barrier Load Cell A8 Force vs. Time	N/A
Barrier Load Cell A9 Force vs. Time	N/A
Barrier Load Cell B1 Force vs. Time	N/A
Barrier Load Cell B2 Force vs. Time	N/A
Barrier Load Cell B3 Force vs. Time	N/A
Barrier Load Cell B4 Force vs. Time	N/A
Barrier Load Cell B5 Force vs. Time	N/A
Barrier Load Cell B6 Force vs. Time	N/A
Barrier Load Cell B7 Force vs. Time	N/A
Barrier Load Cell B8 Force vs. Time	N/A
Barrier Load Cell B9 Force vs. Time	N/A
Barrier Load Cell C1 Force vs. Time	N/A
Barrier Load Cell C2 Force vs. Time	N/A

* 36 Load Plate Not used

Load Cell Barrier Data (cont'd)

<u>Data Plot</u>	<u>Page No.</u>
Barrier Load Cell C3 Force vs. Time	N/A
Barrier Load Cell C4 Force vs. Time	N/A
Barrier Load Cell C5 Force vs. Time	N/A
Barrier Load Cell C6 Force vs. Time	N/A
Barrier Load Cell C7 Force vs. Time	N/A
Barrier Load Cell C8 Force vs. Time	N/A
Barrier Load Cell C9 Force vs. Time	N/A
Barrier Load Cell D1 Force vs. Time	N/A
Barrier Load Cell D2 Force vs. Time	N/A
Barrier Load Cell D3 Force vs. Time	N/A
Barrier Load Cell D4 Force vs. Time	N/A
Barrier Load Cell D5 Force vs. Time	N/A
Barrier Load Cell D6 Force vs. Time	N/A
Barrier Load Cell D7 Force vs. Time	N/A
Barrier Load Cell D8 Force vs. Time	N/A
Barrier Load Cell D9 Force vs. Time	N/A
Sum of 36 Load Cells Force vs. Time	B-24
Sum of Load Cells A1-B3 Force vs. Time	B-25
Sum of Load Cells A4-B6 Force vs. Time	B-26
Sum of Load Cells A7-B9 Force vs. Time	B-27
Sum of Load Cells C1-D3 Force vs. Time	B-28
Sum of Load Cells C4-D6 Force vs. Time	B-29
Sum of Load Cells C7-D9 Force vs. Time	B-30
Sum of 36 Load Cells Force vs. Vehicle Dynamic Crush	B-31

1991 HYUNDAI SCOUPE
NHTSA NO. MM0500

DATA FILE MINIMUMS AND MAXIMUMS

DESCRIPTION	MINIMUM		MAXIMUM	
=====	=====	=====	=====	=====
Sum of Barrier Forces	Not Available - No Valid Data For Load Cell C1-D3			
Barrier Load Cell A1-B3	-19088.2 @	0.02743	1279.2 @	0.20074
Barrier Load Cell A4-B6	-48075.9 @	0.04391	1233.4 @	0.20049
Barrier Load Cell A7-B9	-17971.6 @	0.02460	1675.6 @	0.14981
Barrier Load Cell C1-D3	Not Available - No Valid Data Collected			
Barrier Load Cell C4-D6	-4478.6 @	0.04280	1106.9 @	0.00000
Barrier Load Cell C7-D9	-8039.4 @	0.02964	1394.4 @	0.18807
Sum of Forces/Veh. Disp.	Not Available - No Valid Data For Load Cell C1-D3			

DATA PLOT NOT AVAILABLE

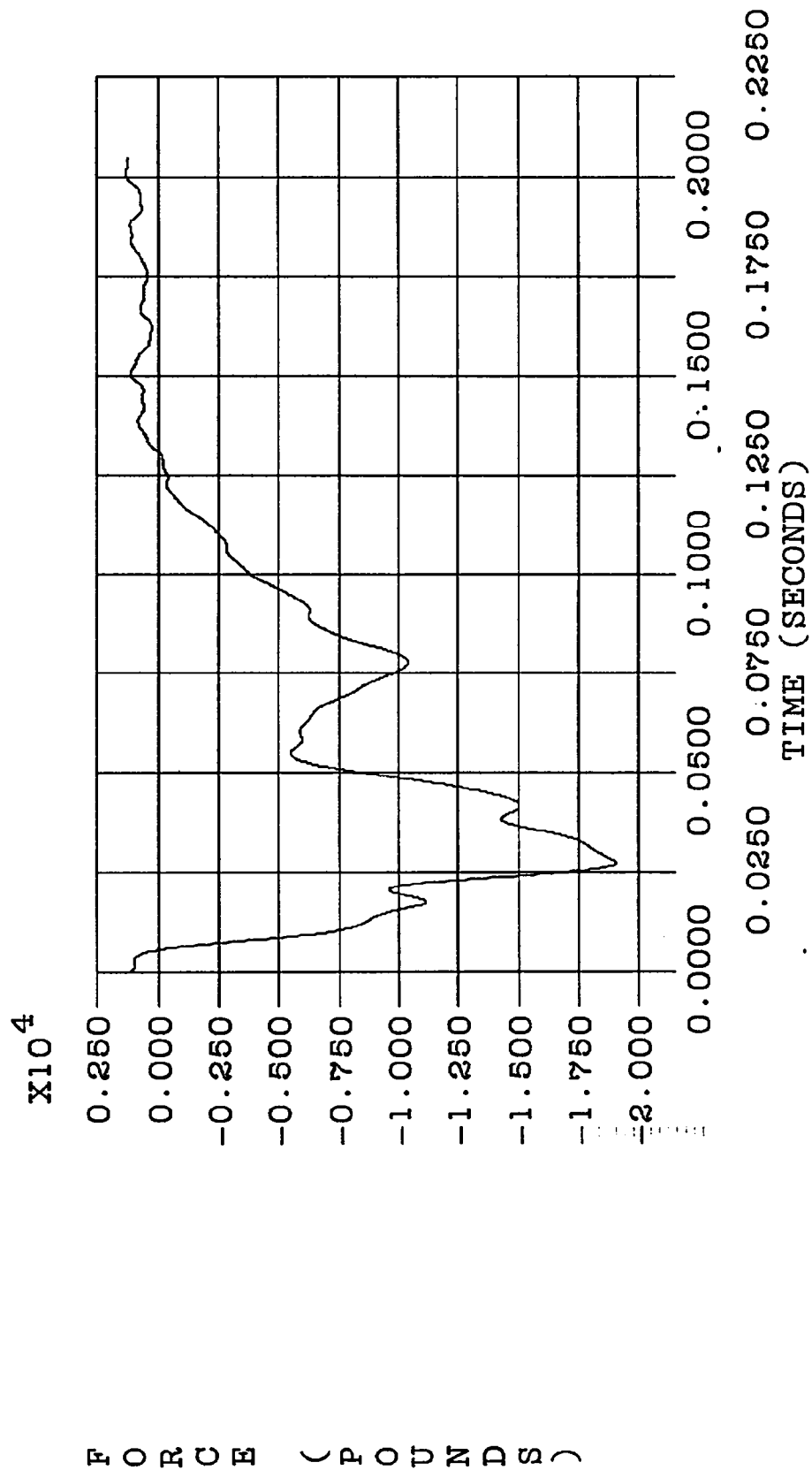
NO VALID DATA COLLECTED

FOR BARRIER UPPER LEFT LOAD
CELL

Sum of 36 Load Cells Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

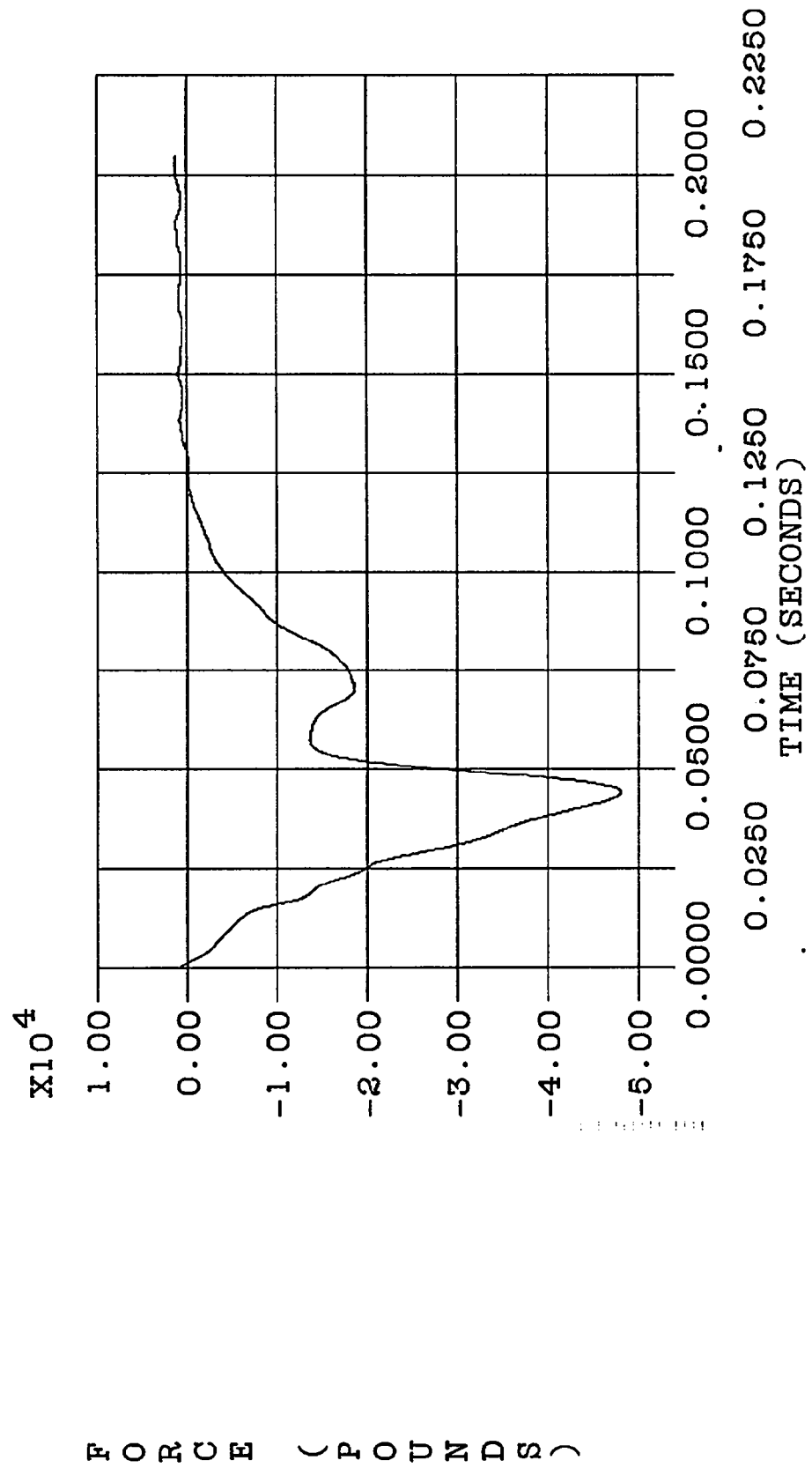
BARRIER LL FORCE



Sum of Load Cells A1-B3 Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

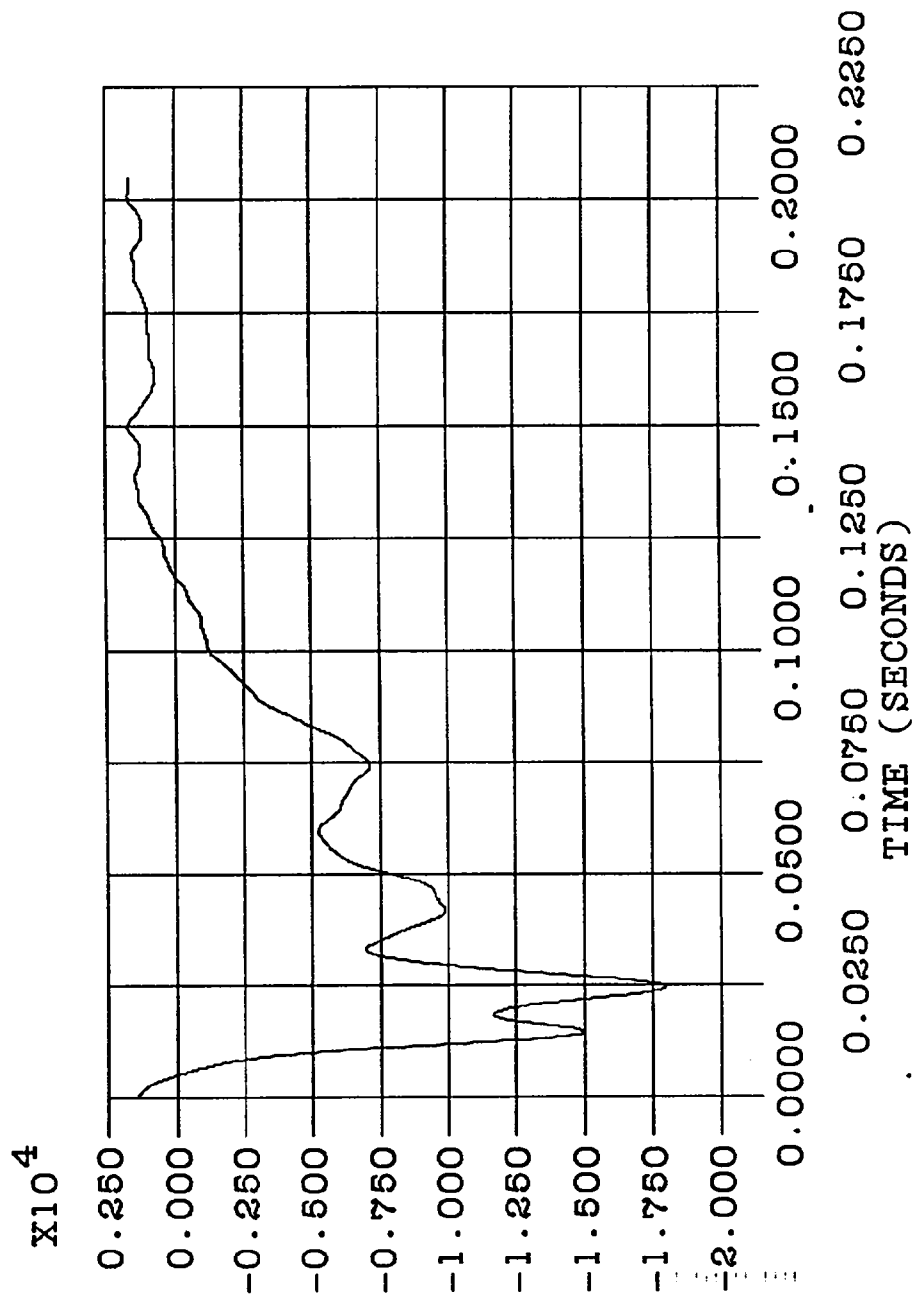
BARRIER LC FORCE



Sum of Load Cells A4-B6 Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

BARRIER LR FORCE



Sum of Load Cells A7-B9 Force vs. Time

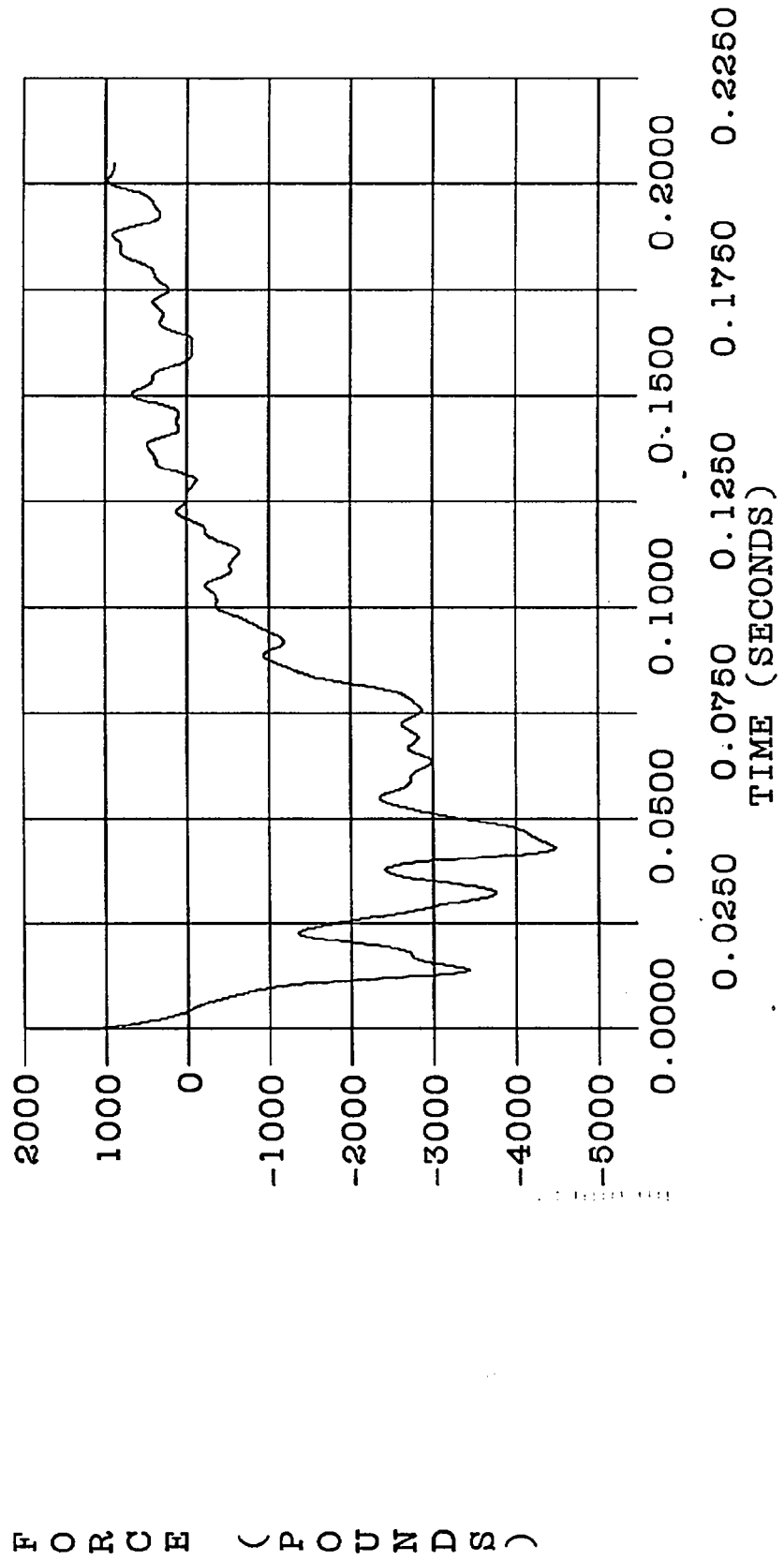
DATA PLOT NOT AVAILABLE

NO VALID DATA COLLECTED

Sum of Load Cells C1-D3 Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

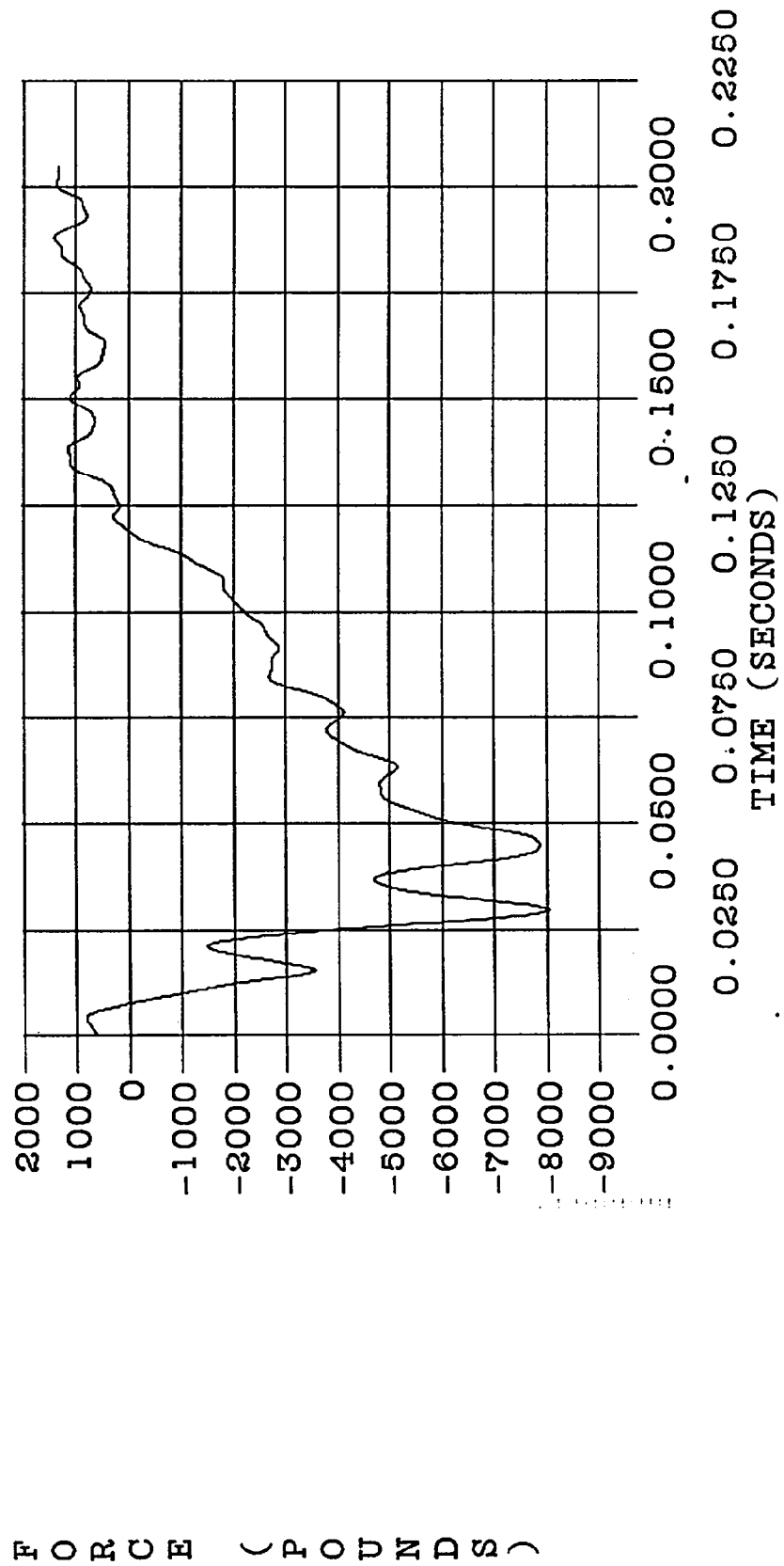
BARRIER UC FORCE



Sum of Load Cells C4-D6 Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

BARRIER UR FORCE



Sum of Load Cells C7-D9 Force vs. Time

DATA PLOT NOT AVAILABLE

NO VALID DATA COLLECTED

FOR BARRIER UPPER LEFT
LOAD CELL

Sum of 36 Load Cells Force vs. Vehicle Dynamic Crush

1991 HYUNDAI SCOUPE
NHTSA NO. MM0500

DUMMY DATA

CLASS	FILTER CHANNEL
Head Accelerations	1000
Chest Accelerations	180
Femur Forces	600
Belt Loads	60

<u>Data Plot</u>	<u>Page No.</u>
Driver Head X Acceleration vs. Time	B-35
Driver Head Y Acceleration vs. Time	B-36
Driver Head Z Acceleration vs. Time	B-37
Driver Head Resultant Acceleration vs. Time	B-38
Driver Head X Velocity vs. Time	B-39
Driver Chest X Acceleration vs. Time	B-40
Driver Chest Y Acceleration vs. Time	B-41
Driver Chest Z Acceleration vs. Time	B-42
Driver Chest Resultant Acceleration vs. Time	B-43
Driver Right Femur Force vs. Time	B-44
Driver Left Femur Force vs. Time	B-45
Driver Lap Belt Force vs. Time	B-46
Driver Torso Belt Force vs. Time	B-47

Dummy Data (cont'd)

<u>Data Plot</u>	<u>Page No.</u>
Passenger Head X Acceleration vs. Time	B-48
Passenger Head Y Acceleration vs. Time	B-49
Passenger Head Z Acceleration vs. Time	B-50
Passenger Head Resultant Acceleration vs. Time	B-51
Passenger Head X Velocity vs. Time	B-52
Passenger Chest X Acceleration vs. Time	B-53
Passenger Chest Y Acceleration vs. Time	B-54
Passenger Chest Z Acceleration vs. Time	B-55
Passenger Chest Resultant Acceleration vs. Time	B-56
Passenger Right Femur Force vs. Time	B-57
Passenger Left Femur Force vs. Time	B-58
Passenger Lap Belt Force vs. Time	B-59
Passenger Torso Belt Force vs. Time	B-60
Driver Torso Belt Stretch vs. Time	B-61
Passenger Torso Belt Stretch vs. Time	B-62

1991 HYUNDAI SCOUPE
NHISA NO. MM0500

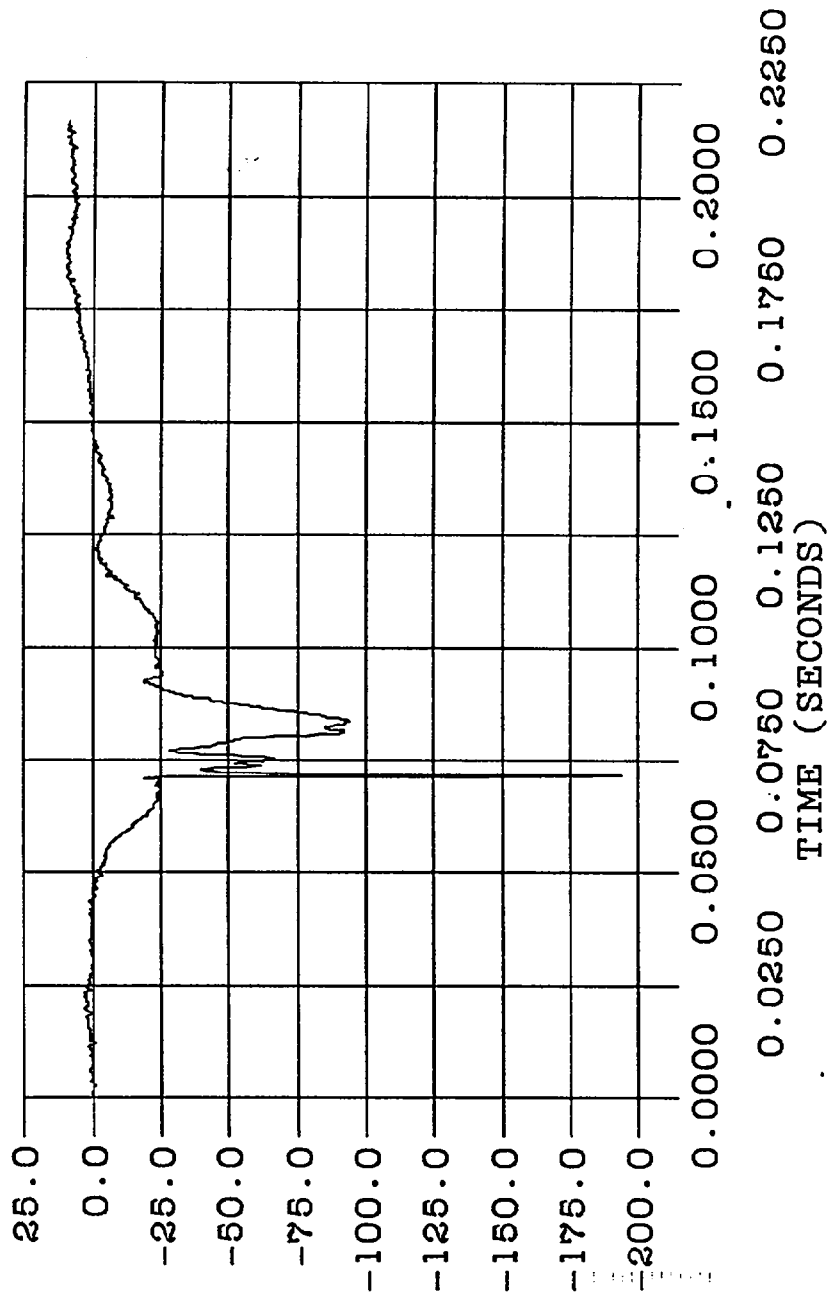
DATA FILE MINIMUMS AND MAXIMUMS

DESCRIPTION	MINIMUM		MAXIMUM	
Driver Head X Acc.	-194.0 @	0.07171	9.9 @	0.18831
Driver Head Y Acc.	-25.0 @	0.07159	13.0 @	0.08167
Driver Head Z Acc.	-2.2 @	0.03813	51.7 @	0.07614
Driver Head Resultant	0.2 @	0.00467	195.6 @	0.07159
Driver Head X Vel.	-12.3 @	0.15104	35.9 @	0.04354
Driver Chest X Acc.	-50.2 @	0.07405	6.3 @	0.17884
Driver Chest Y Acc.	-23.1 @	0.09434	6.0 @	0.05240
Driver Chest Z Acc.	-11.4 @	0.04465	10.9 @	0.09446
Driver Chest Resultant	0.3 @	0.00910	52.0 @	0.07405
Driver Femur RH Force	-966.2 @	0.05978	135.5 @	0.08426
Driver Femur LH Force	-2531.7 @	0.07220	264.0 @	0.05240
Driver Lap Belt Force	-6.8 @	0.00873	693.1 @	0.07306
Driver Torso Belt Force	-6.6 @	0.21414	1611.4 @	0.06052
Passenger Head X Acc.	-25.6 @	0.09410	7.6 @	0.19828
Passenger Head Y Acc.	-4.0 @	0.17466	19.9 @	0.09963
Passenger Head Z Acc.	-2.5 @	0.00234	53.5 @	0.08831
Passenger Head Resultant	0.1 @	0.02460	60.0 @	0.09471
Pass Head X Vel.	0.6 @	0.15240	35.2 @	0.00258
Passenger Chest X Acc.	-43.0 @	0.05879	3.2 @	0.13321
Passenger Chest Y Acc.	-2.6 @	0.04920	16.3 @	0.09397
Passenger Chest Z Acc.	-5.7 @	0.04133	18.2 @	0.08795
Passenger Chest Resultant	0.1 @	0.00689	43.4 @	0.05953
Pass. Femur RH Force	-332.7 @	0.06888	49.9 @	0.12017
Pass. Femur LH Force	-1296.3 @	0.03948	175.0 @	0.07122
Pass. Lap Belt Force	0.2 @	0.00000	848.2 @	0.09840
Pass. Torso Belt Force	-28.8 @	0.15818	1870.1 @	0.06630
Driver Torso Belt Stretch	0.0 @	0.00701	0.3 @	0.05978
Pass. Torso Belt Stretch	0.0 @	0.03616	0.3 @	0.06224

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DRIVER HEAD X ACC

ACCELERATION (G, S)

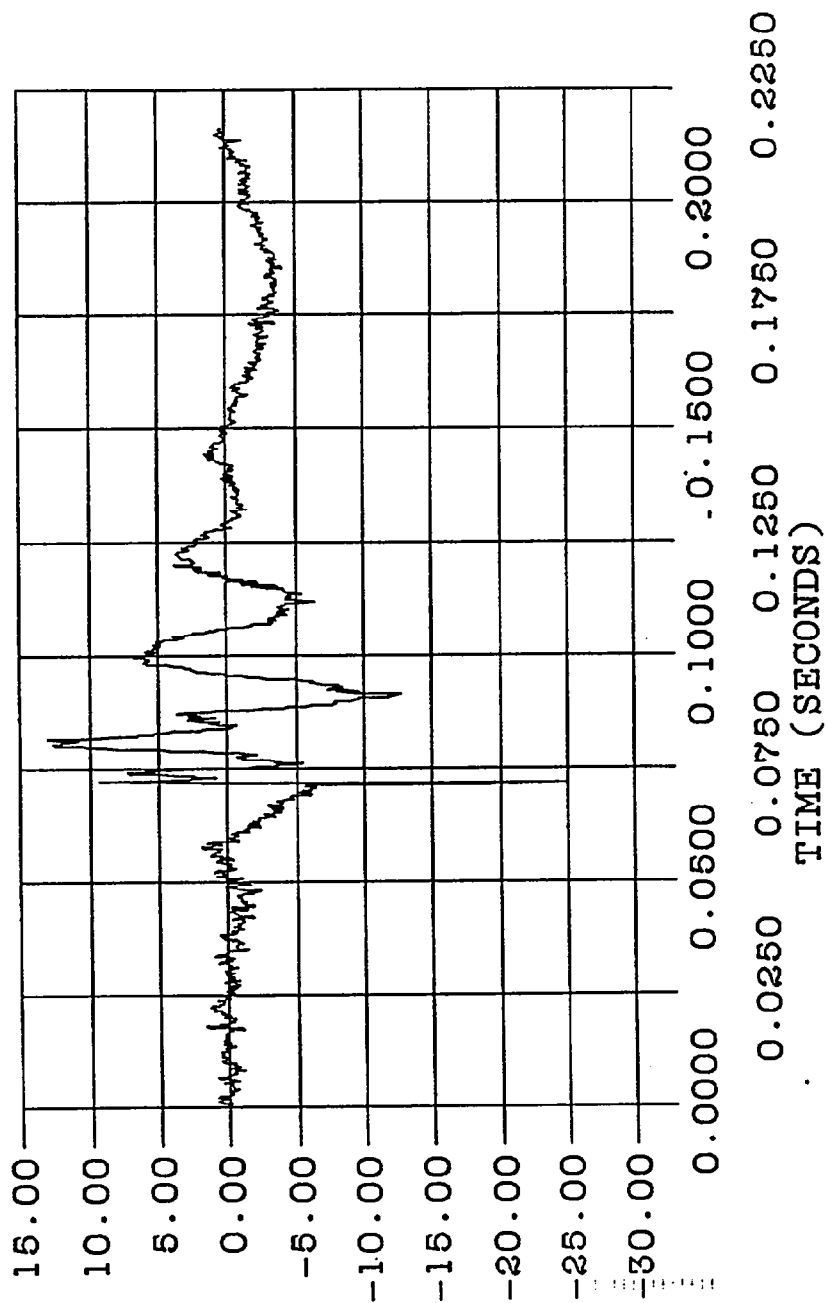


Driver Head X Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DRIVER HEAD Y ACC

ACCELERATION (G, S)

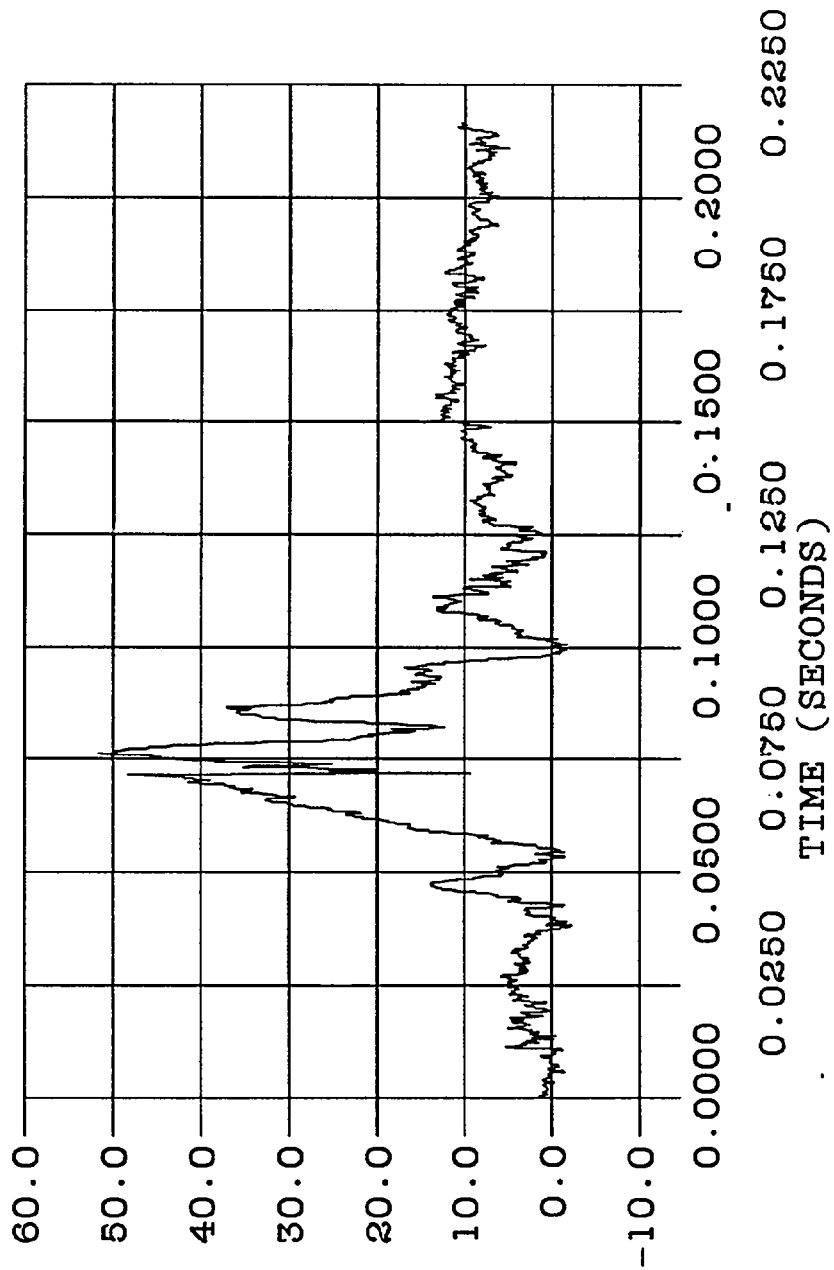


Driver Head Y Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DRIVER HEAD Z ACC

ACCELERATION (G, S)

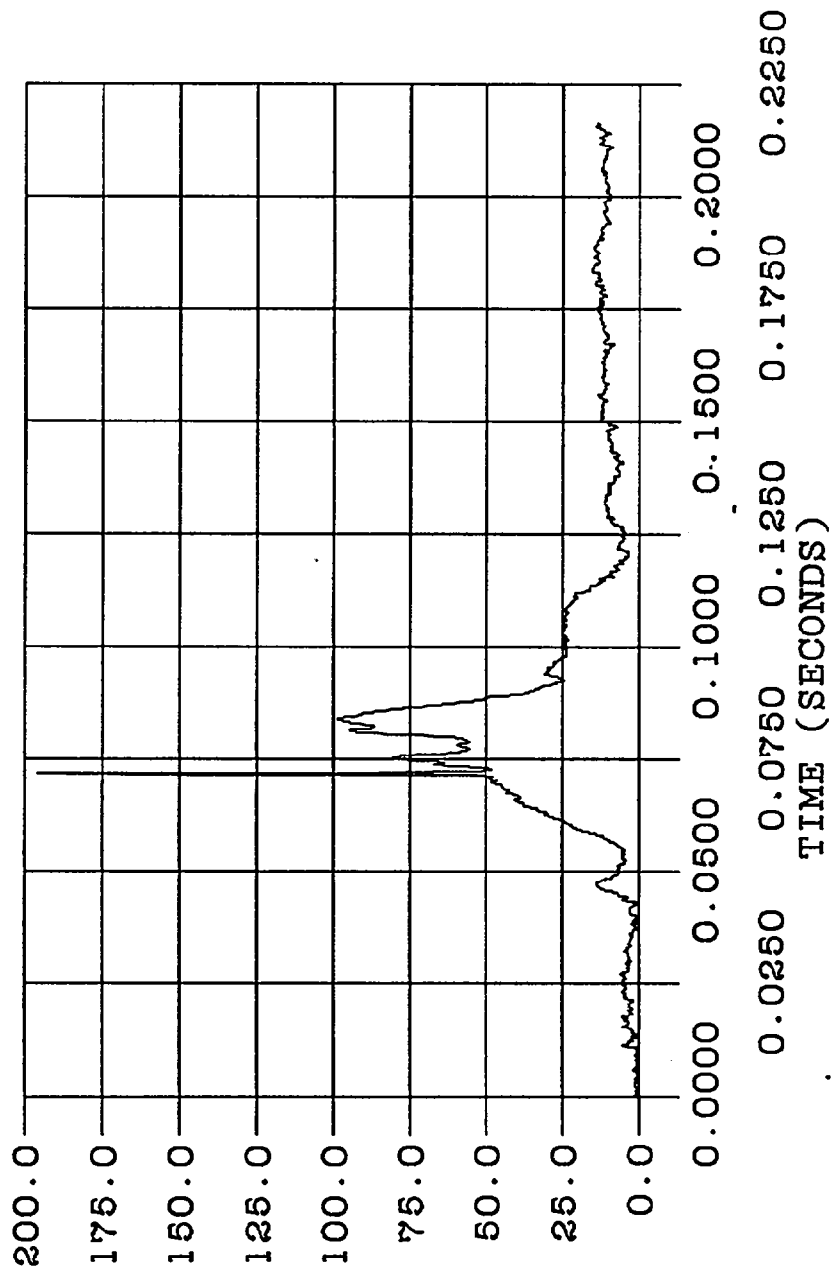


Driver Head Z Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DRIVER HEAD RES

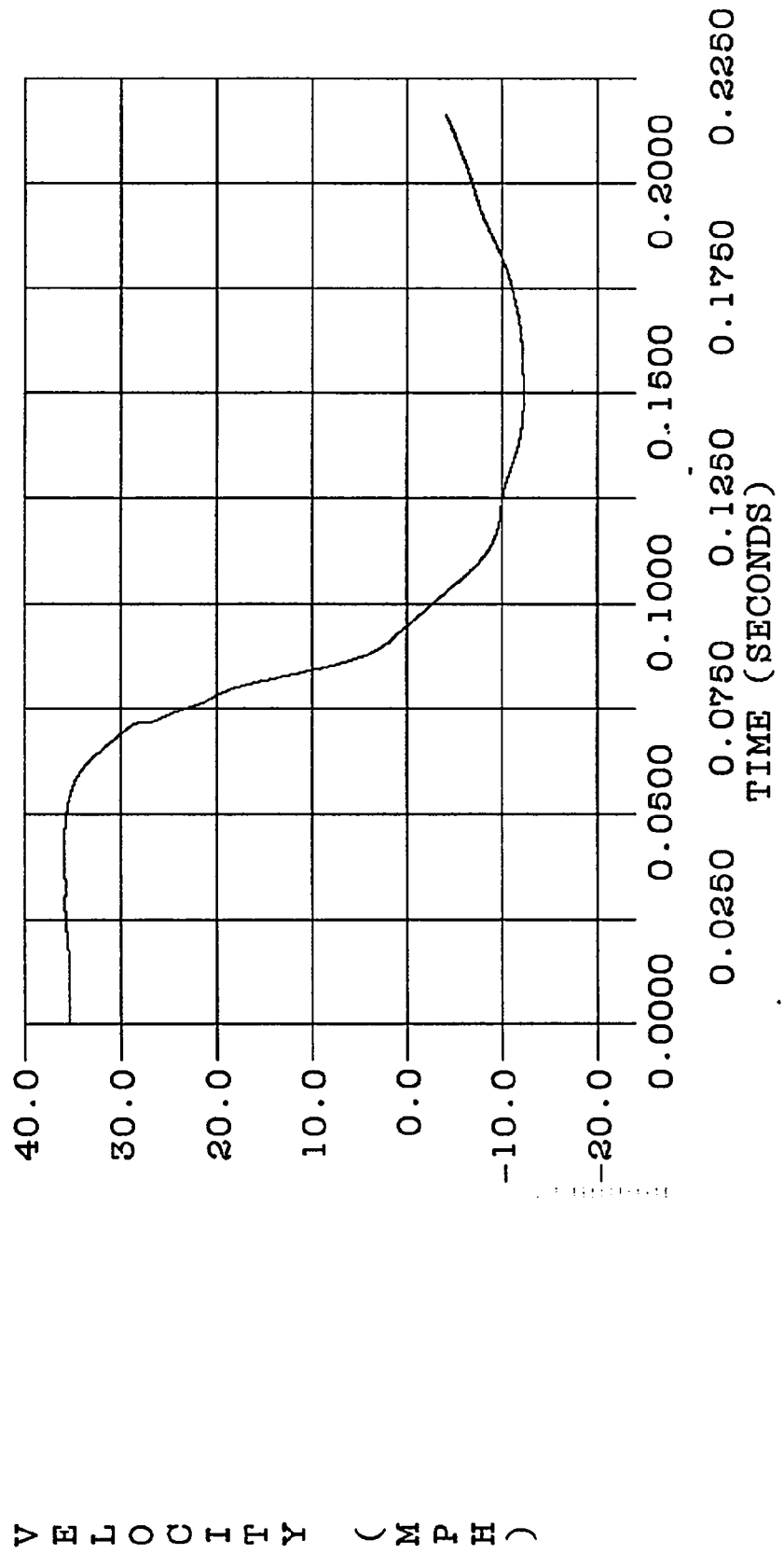
ACCELERATION (G, S)



Driver Head Resultant Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DRIVER HEAD X VEL

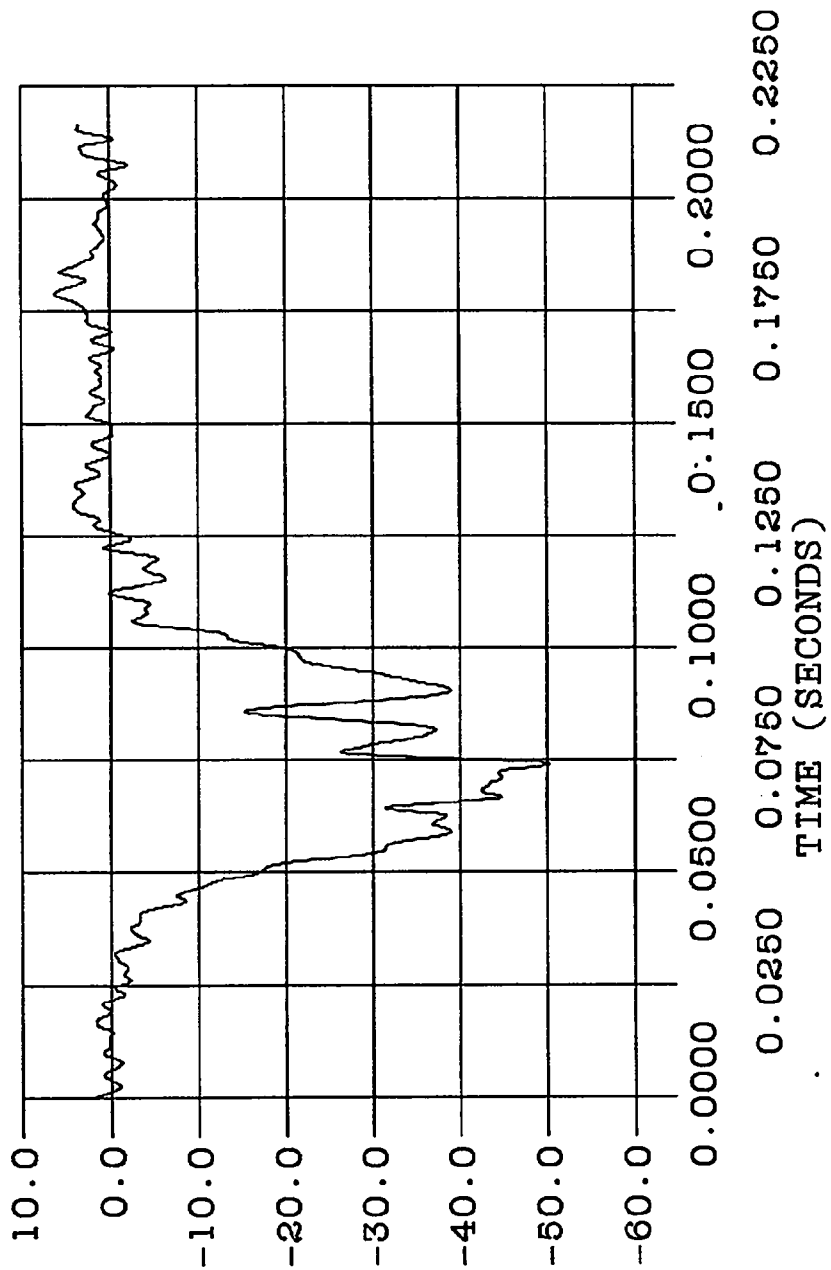


Driver Head X Velocity vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DRIVER CHEST X ACC

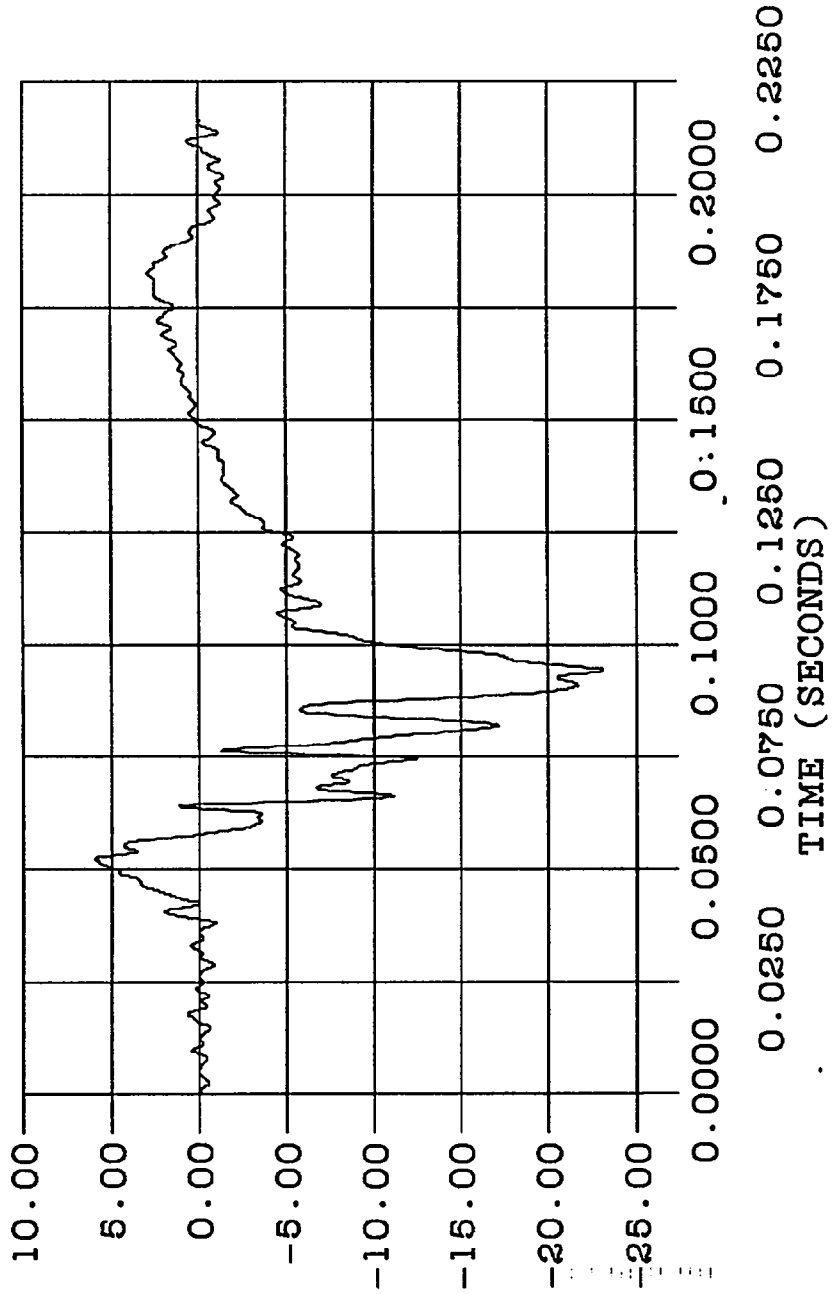
ACCELERATION (G, S)



Driver Chest X Acceleration vs. Time

ACCELERATION (G, S)

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91
 DRIVER CHEST Y ACC

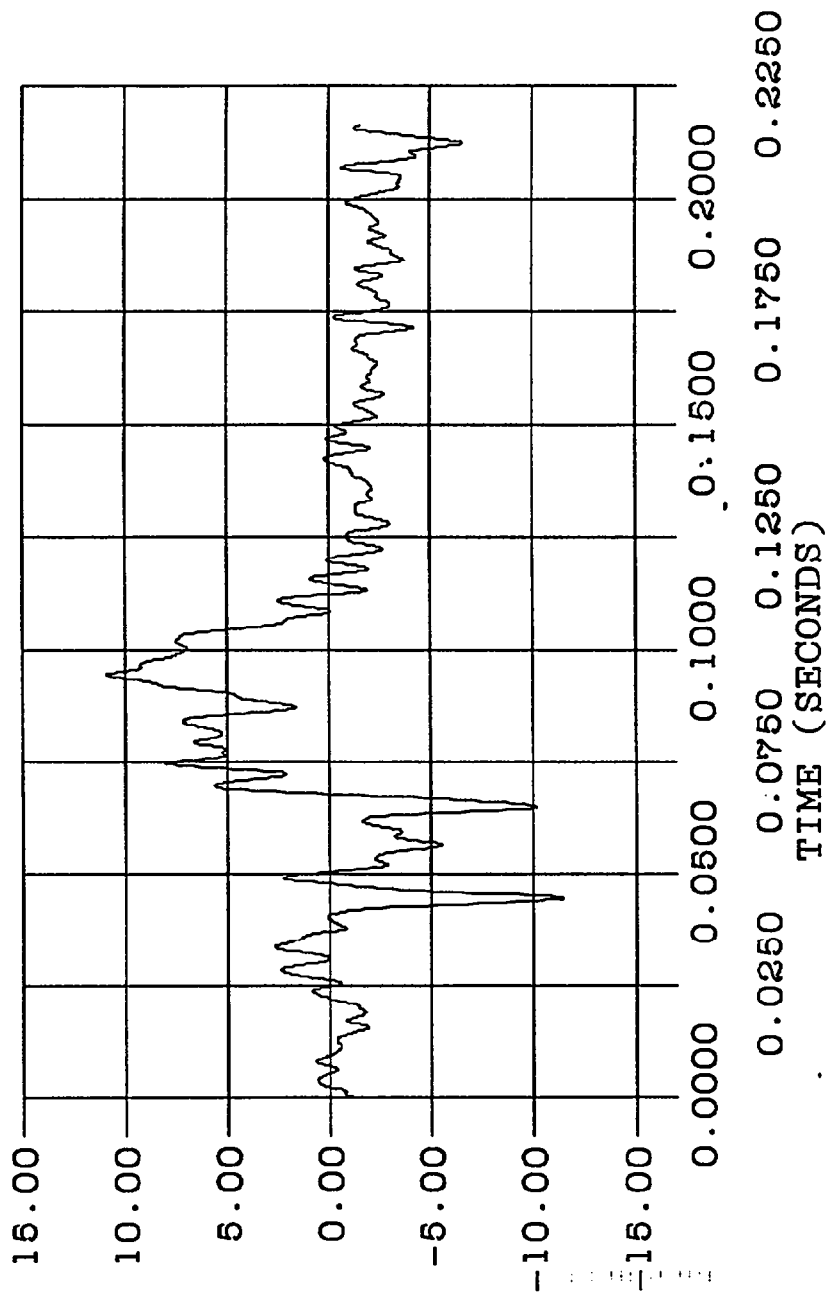


Driver Chest Y Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DRIVER CHEST Z ACC

ACCELERATION (G, S)

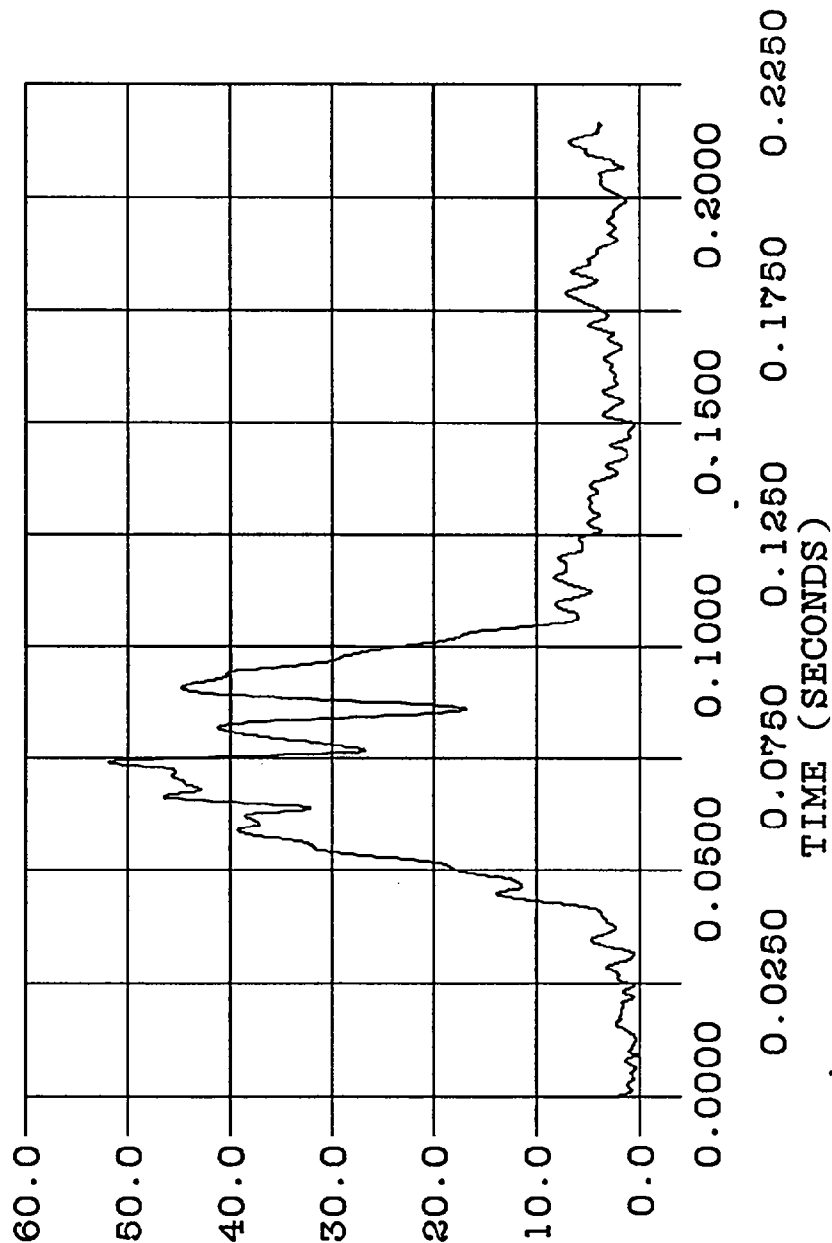


Driver Chest Z Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DRIVER CHEST RES

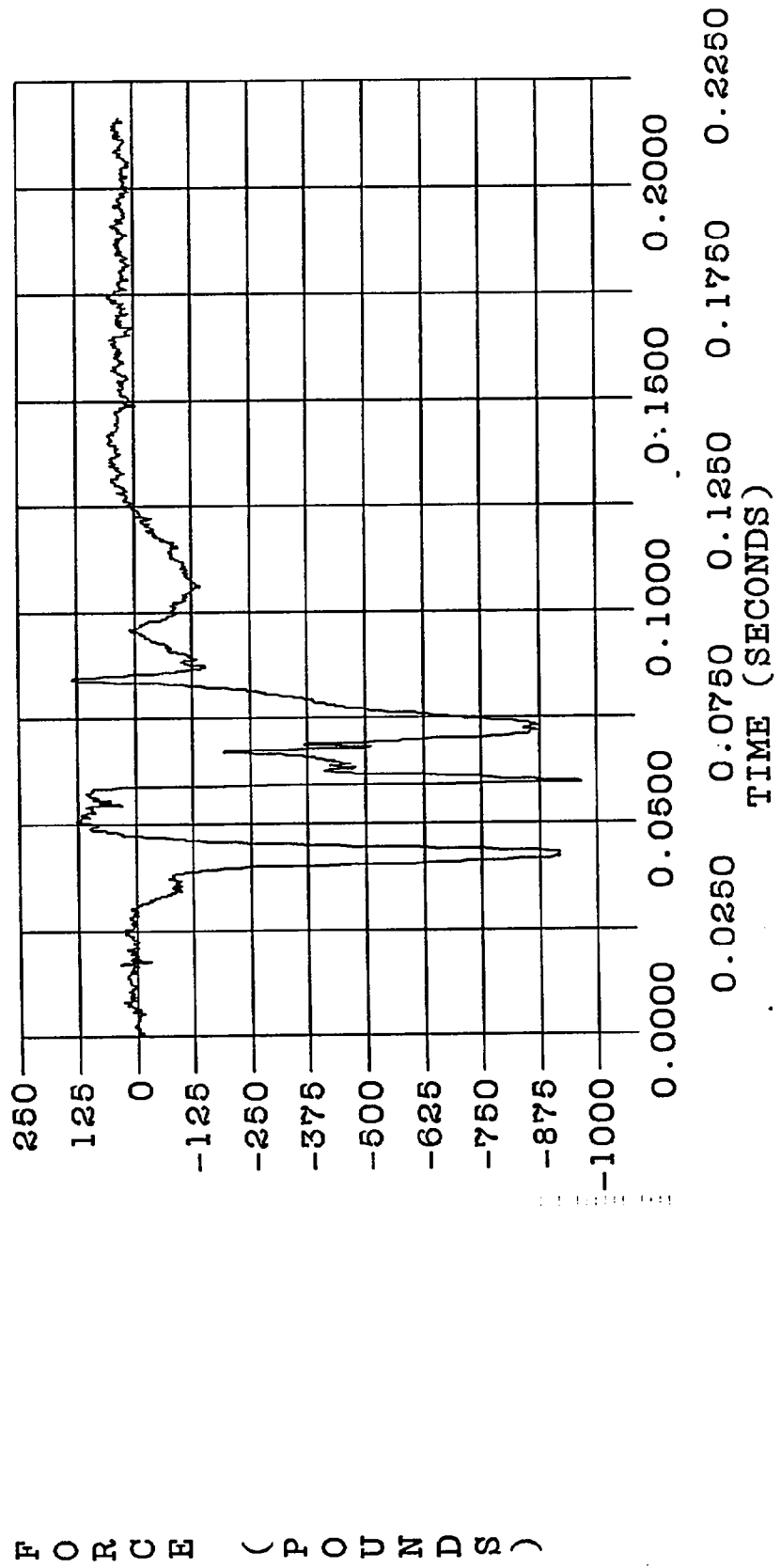
ACCELERATION (G, S)



Driver Chest Resultant Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

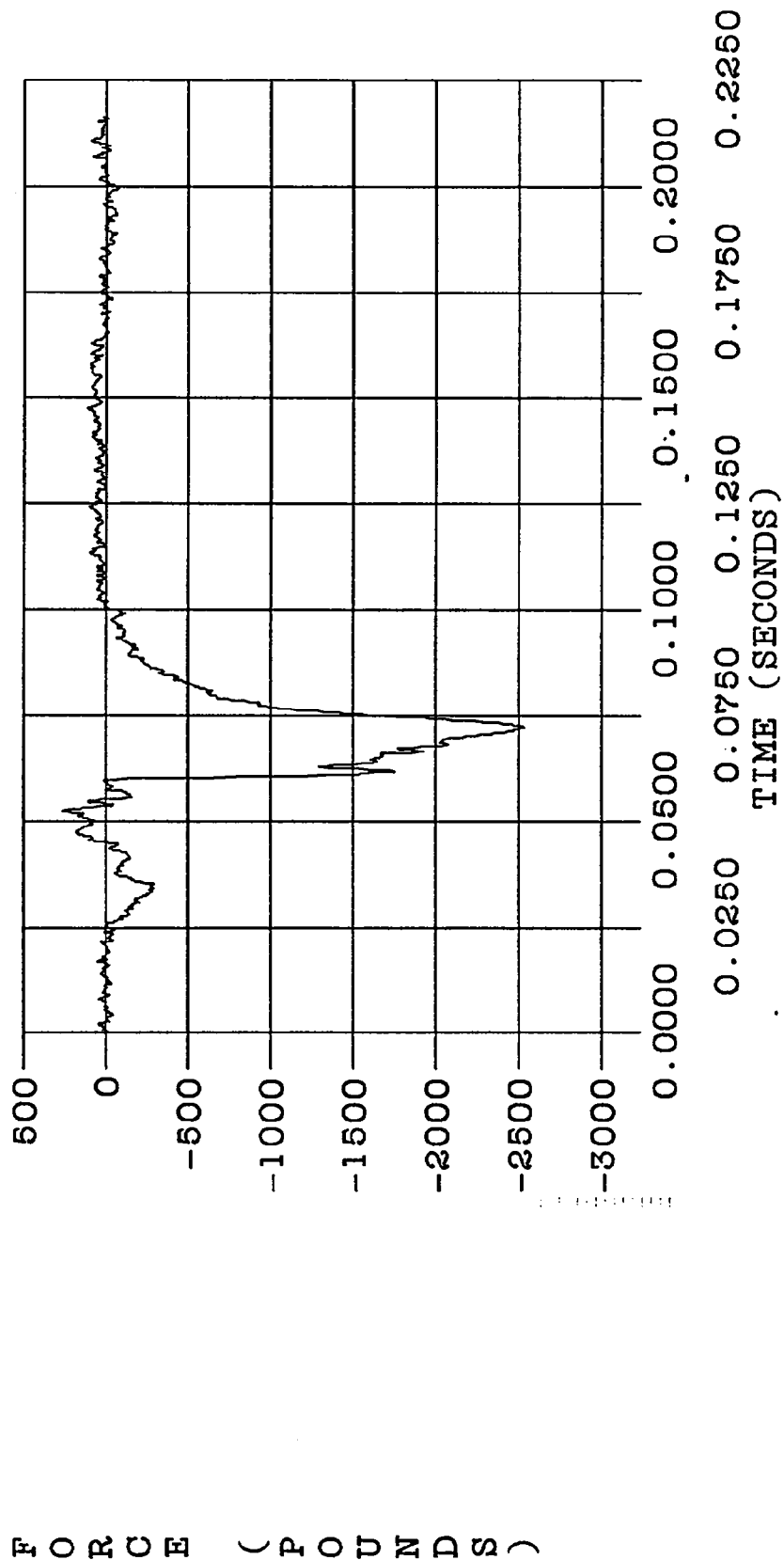
DRIVER FEMUR RH



Driver Right Femur Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

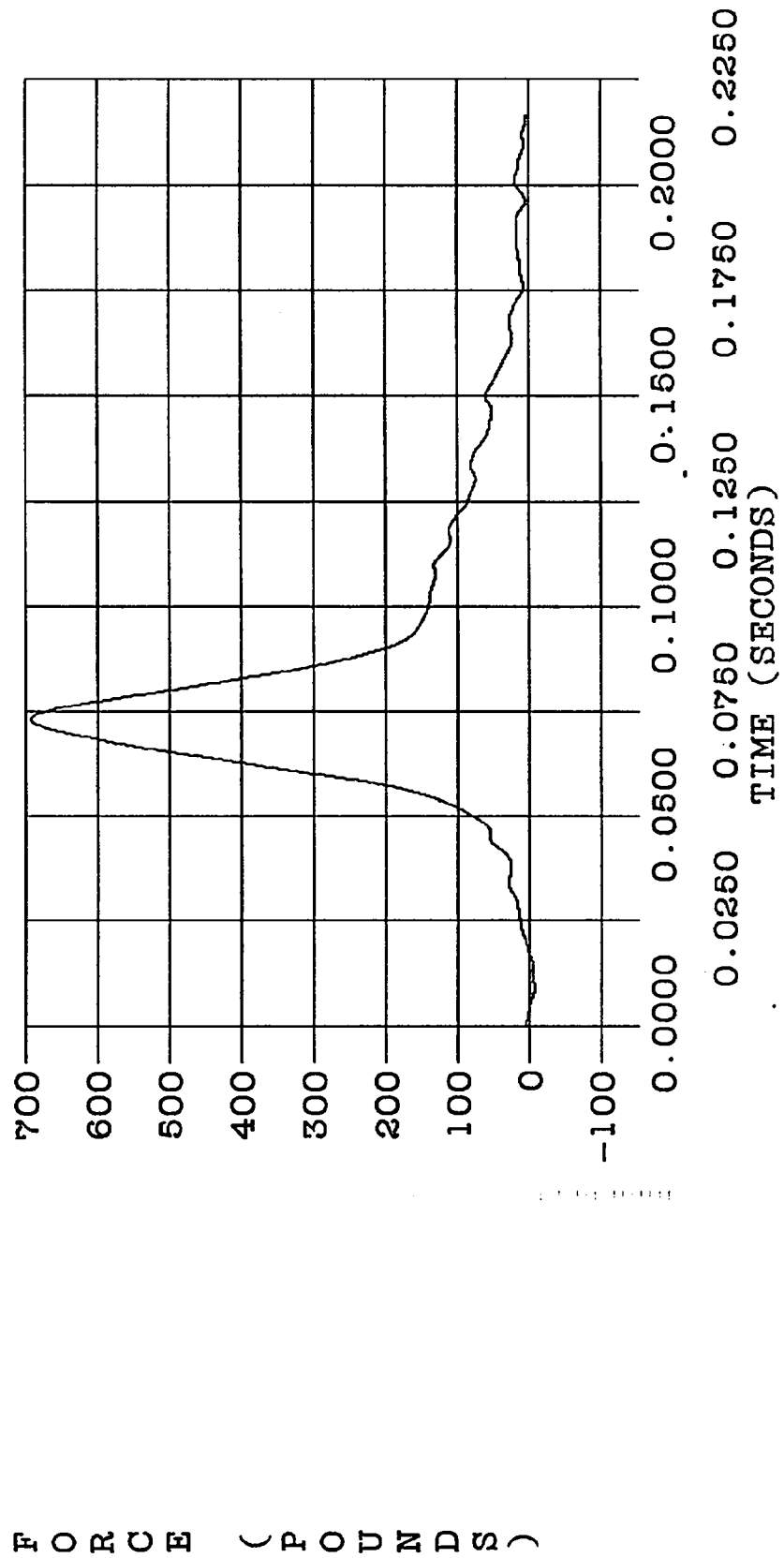
DRIVER FEMUR LH



Driver Left Femur Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DRIVER LAP BELT

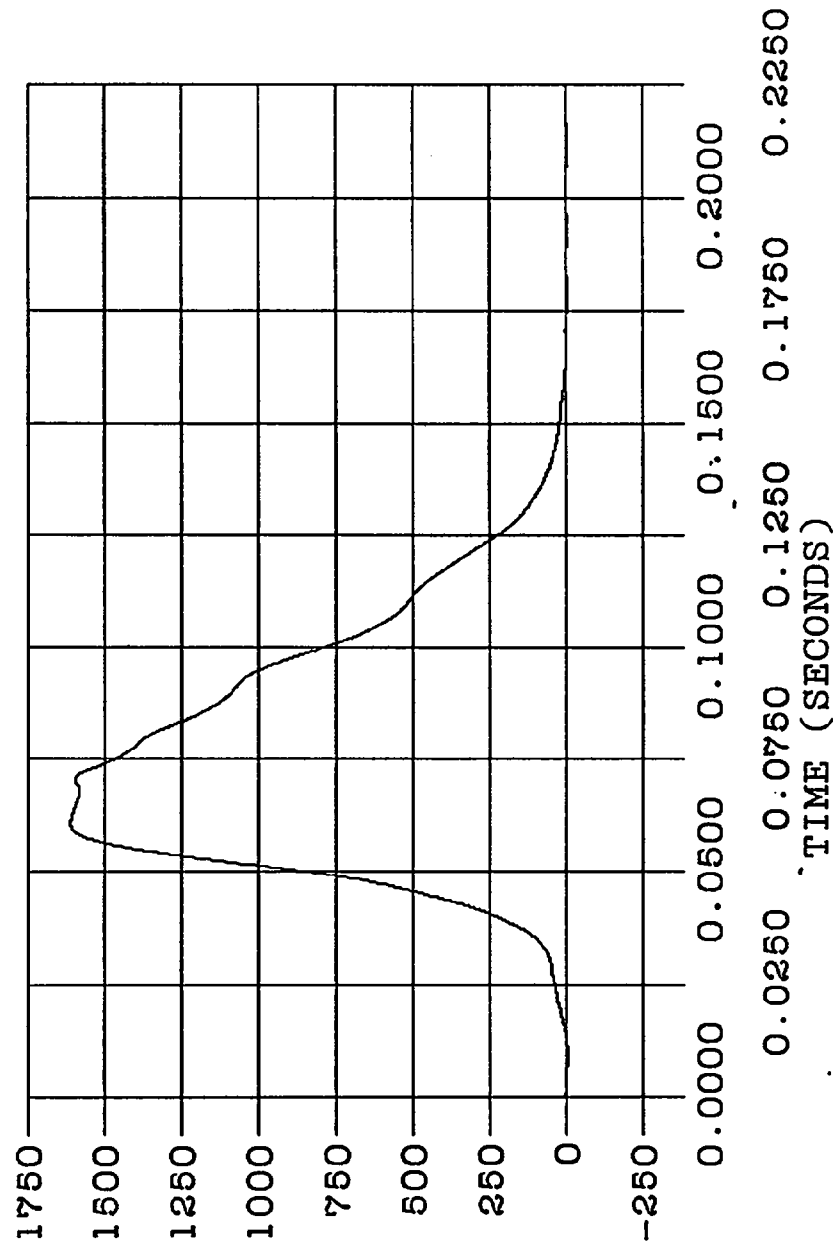


Driver Lap Belt Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DRIVER TORSO BELT

FORCE (POUNDS)

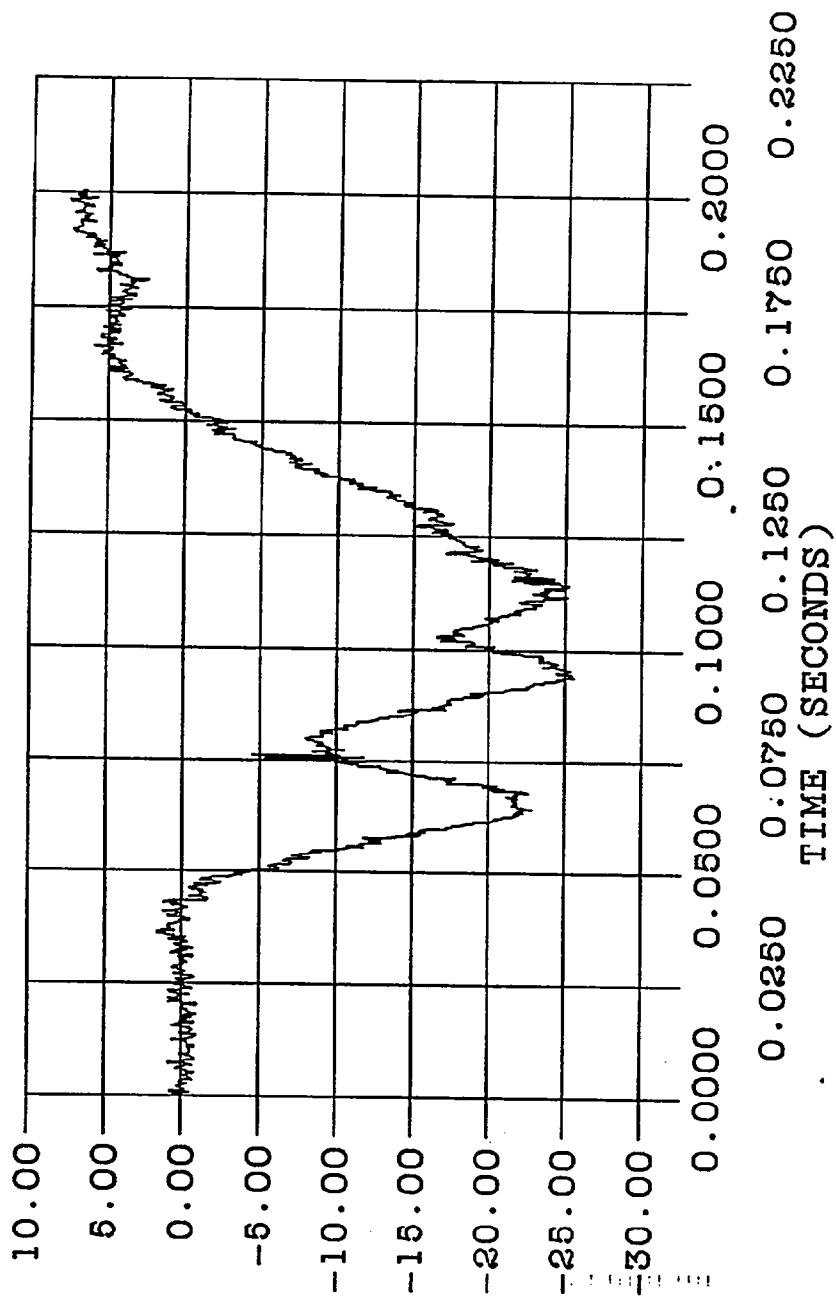


Driver Torso Belt Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

PASS HEAD X ACC

ACCELERATION (G, S)

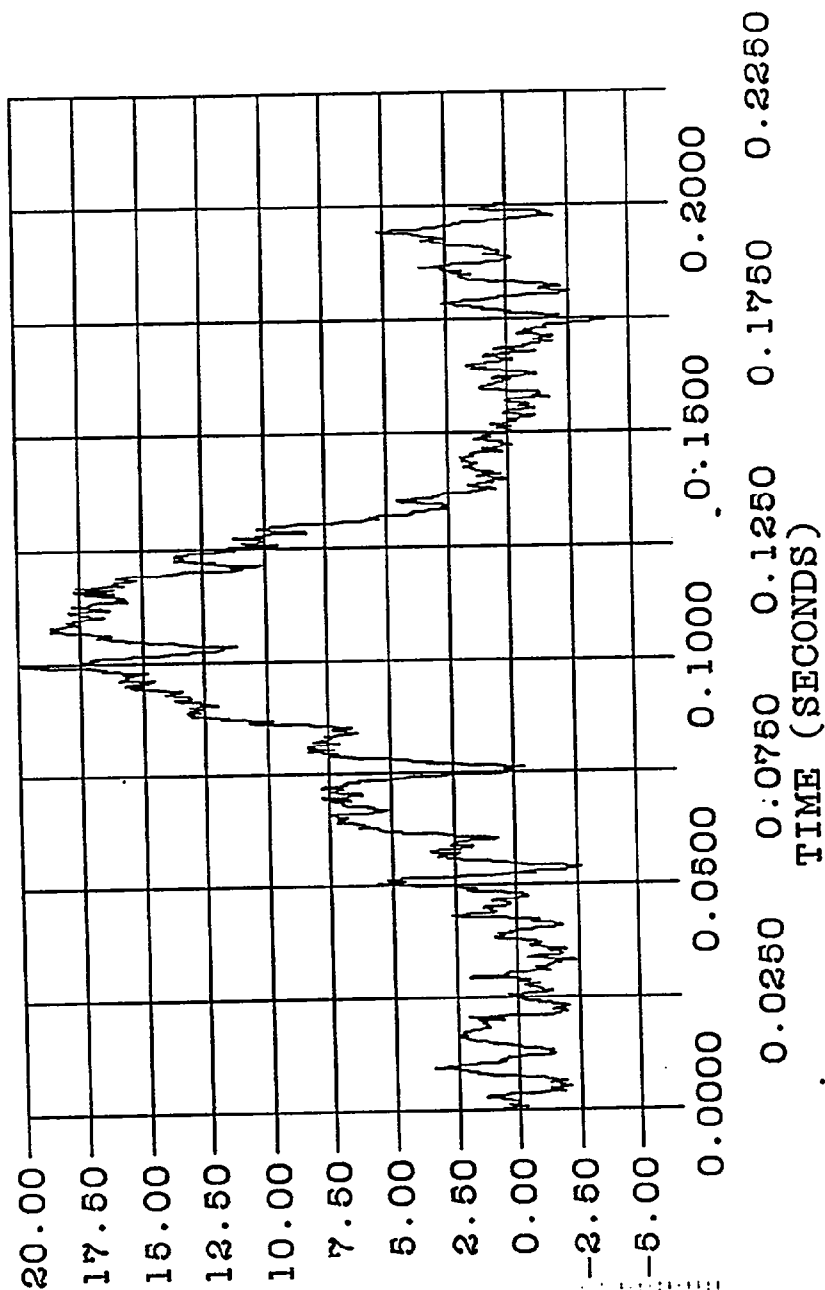


Passenger Head X Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 06/08/91

PASS HEAD Y ACC

ACCELERATION (G, S)

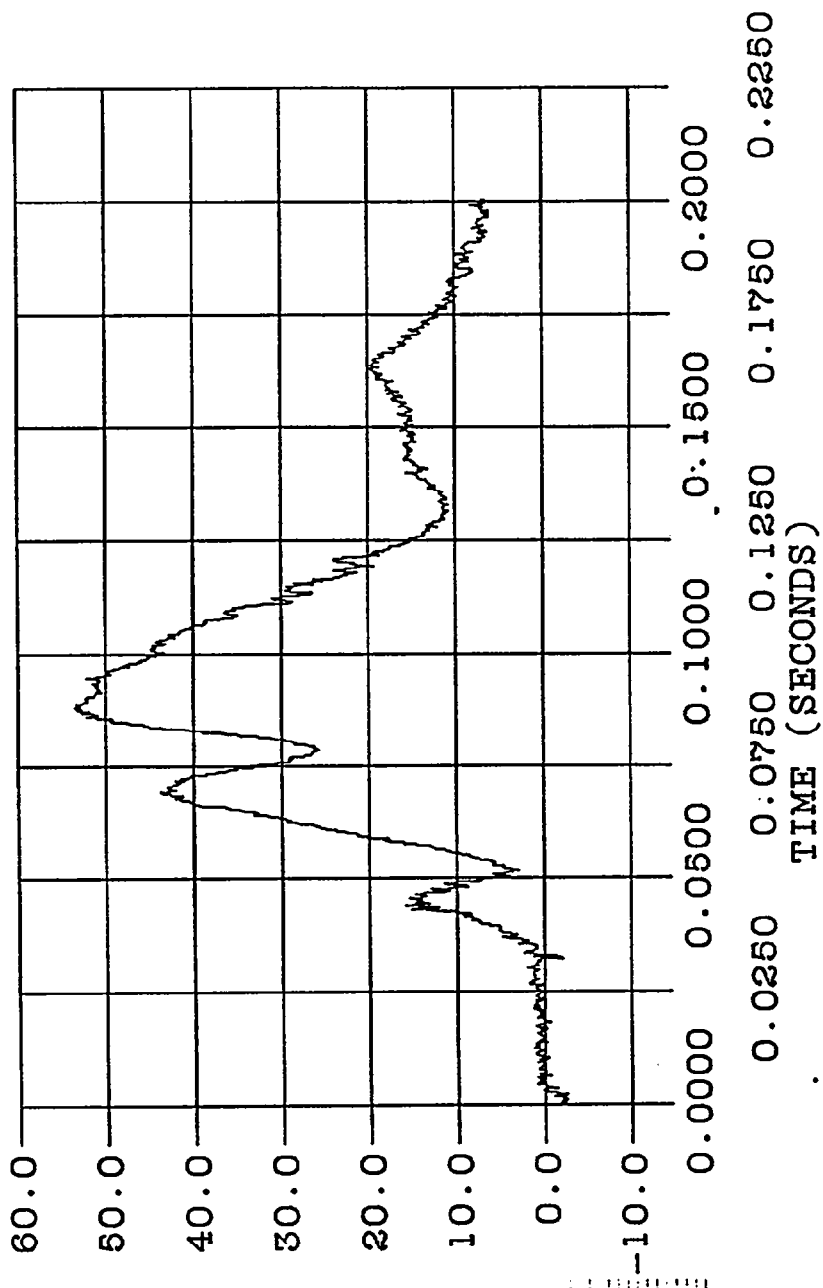


Passenger Head Y Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

PASS HEAD Z ACC

ACCELERATION (G, S)

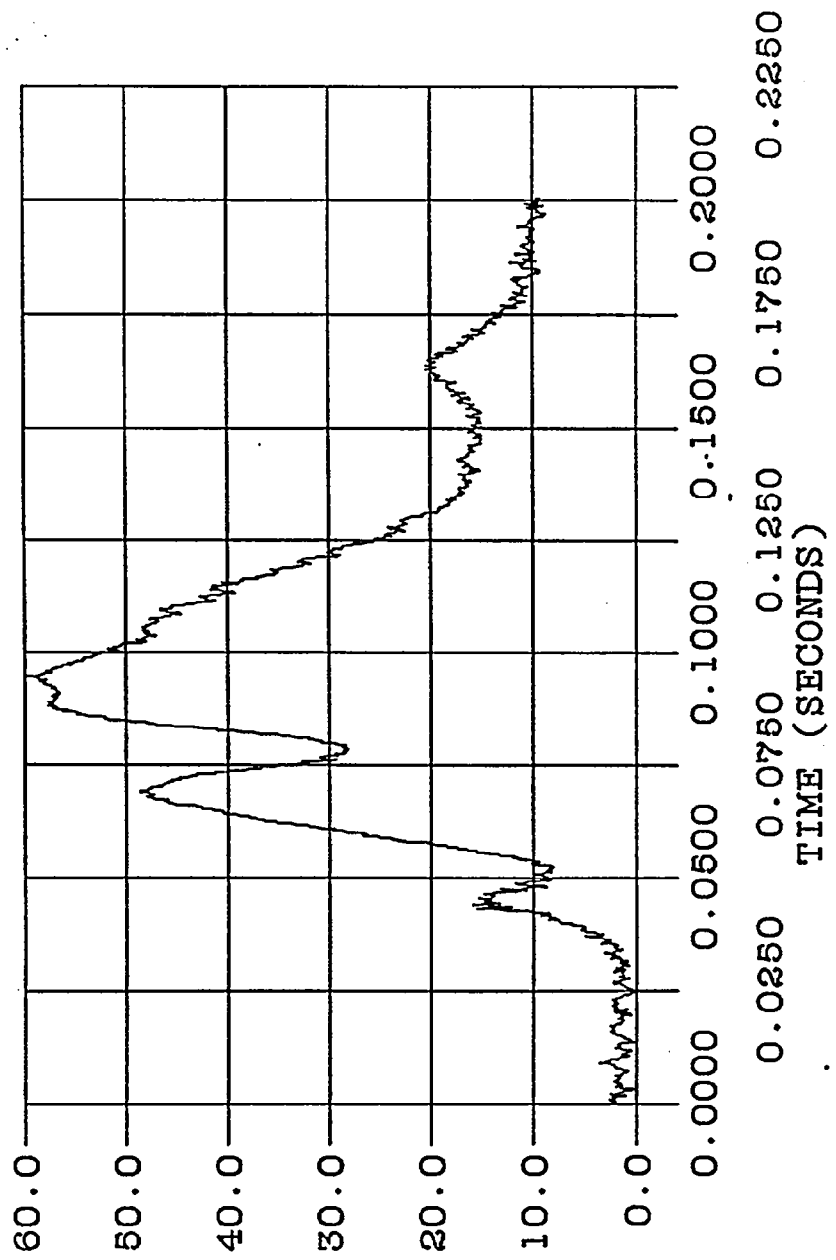


Passenger Head Z Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91.

PASS HEAD RES

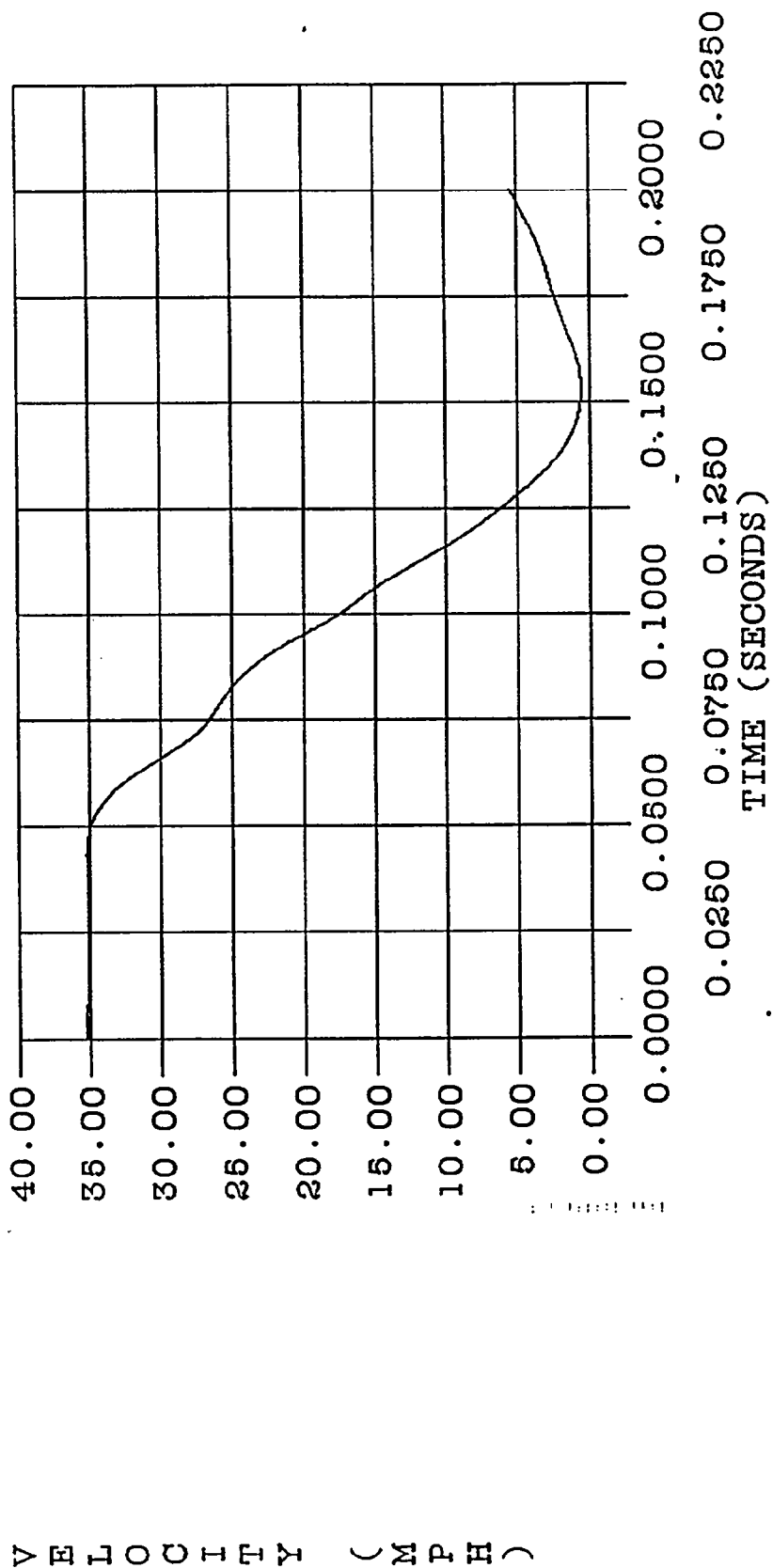
ACCELERATION (G, S)



Passenger Head Resultant Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

PASS HEAD X VEL

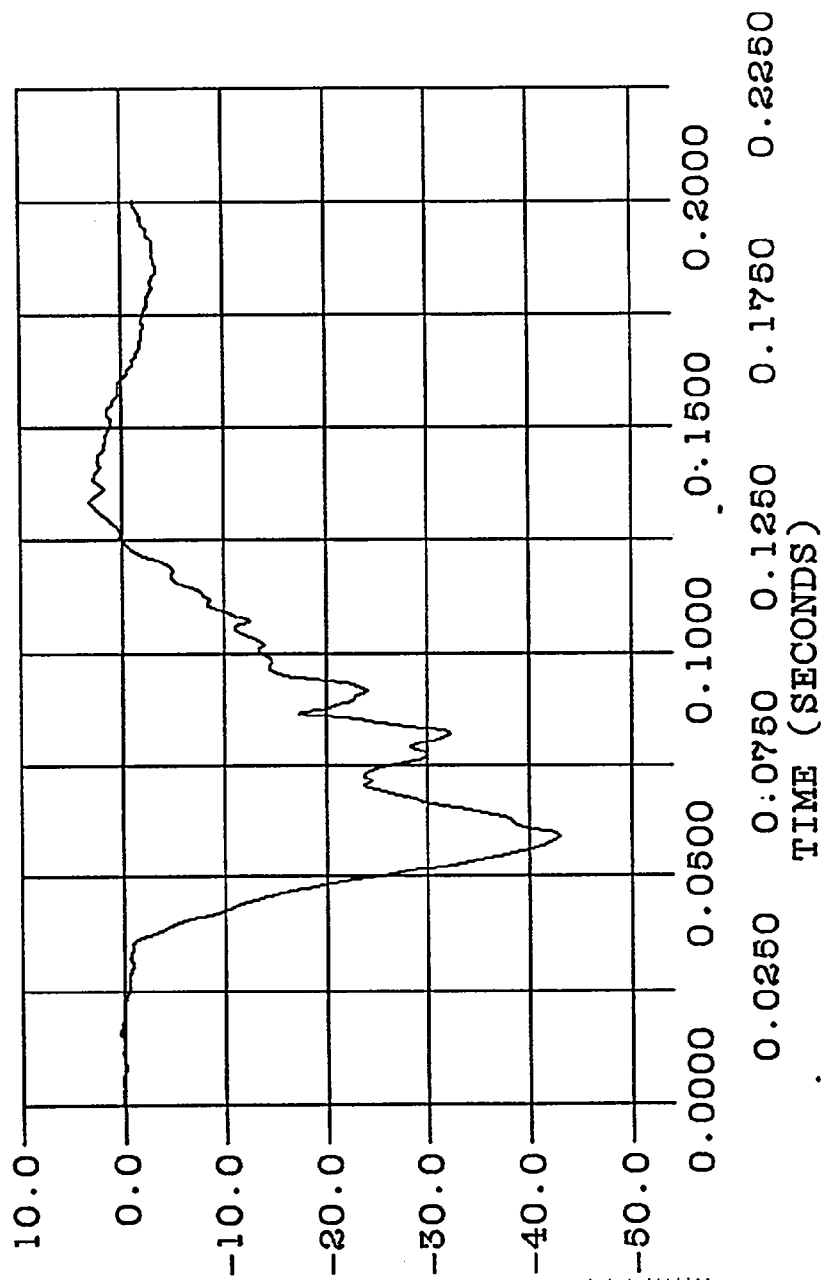


Passenger Head X Velocity vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

PASS CHEST X ACC

ACCELERATION (G, S)

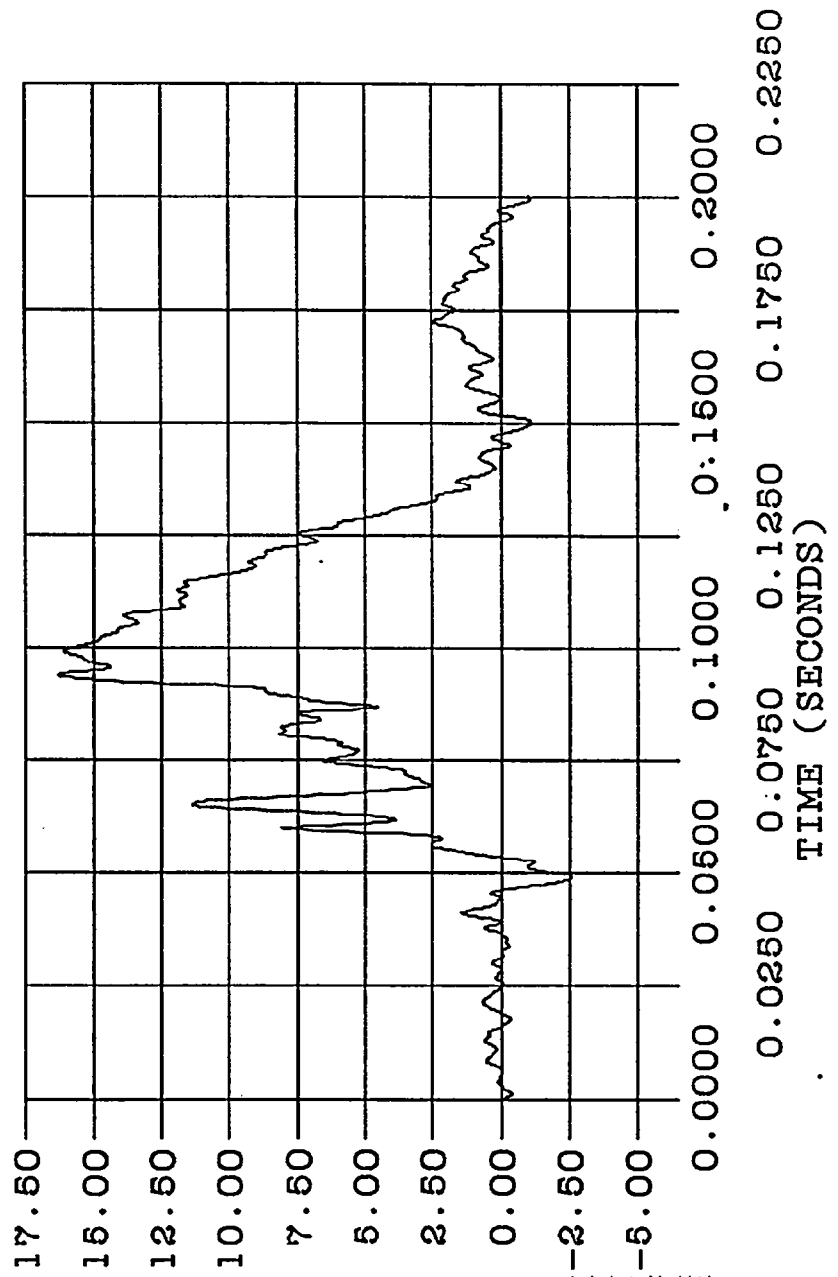


Passenger Chest X Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

PASS CHEST Y ACC

ACCELERATION (G, S)

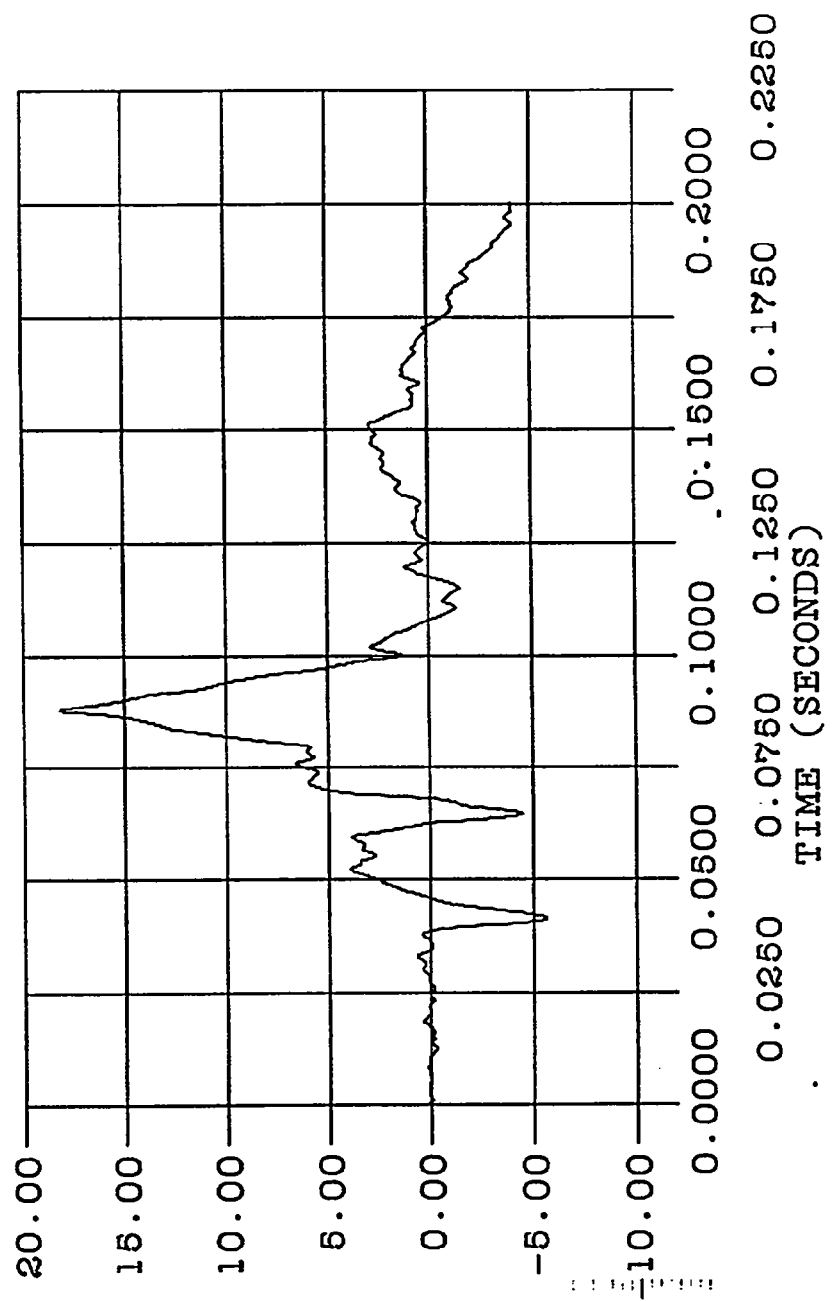


Passenger Chest Y Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

PASS CHEST Z ACC

ACCELERATION (G, S)

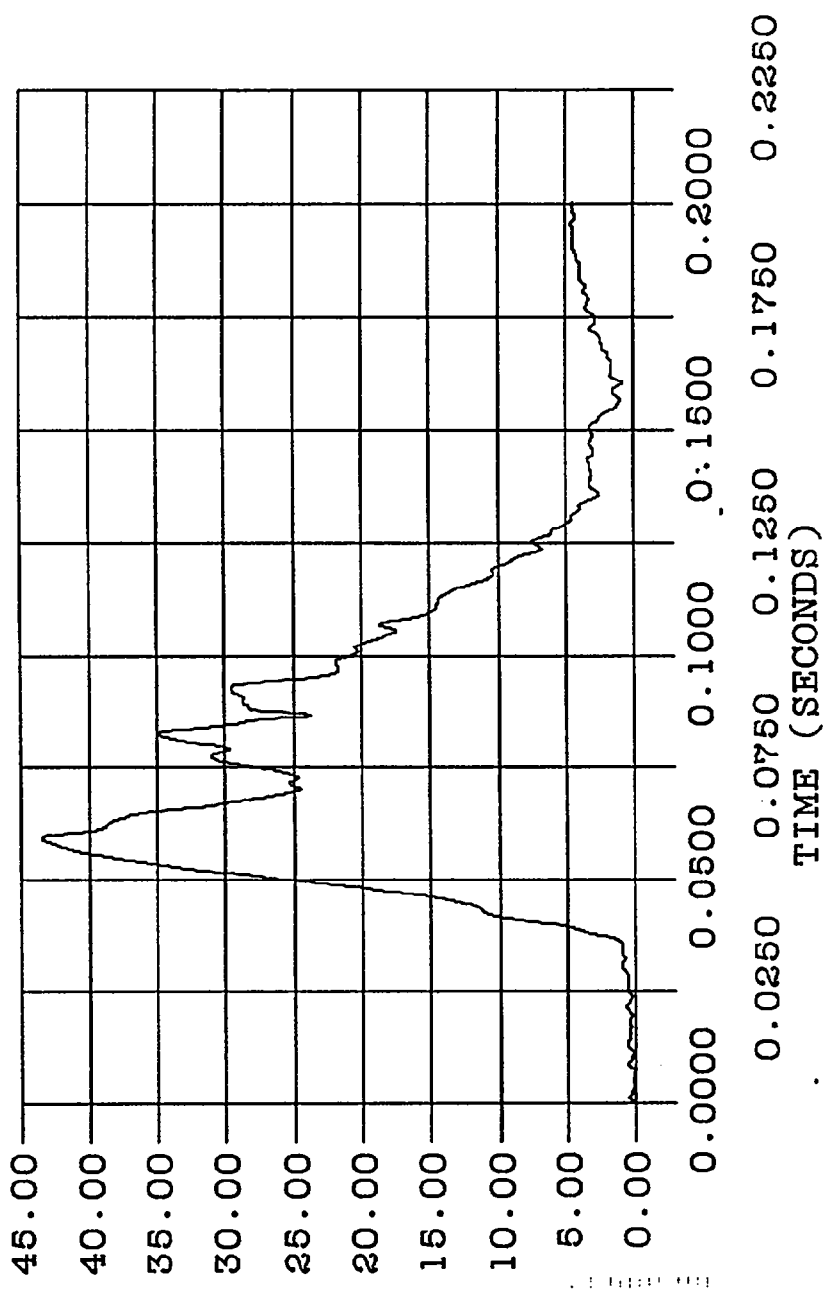


Passenger Chest Z Acceleration vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

PASS CHEST RES

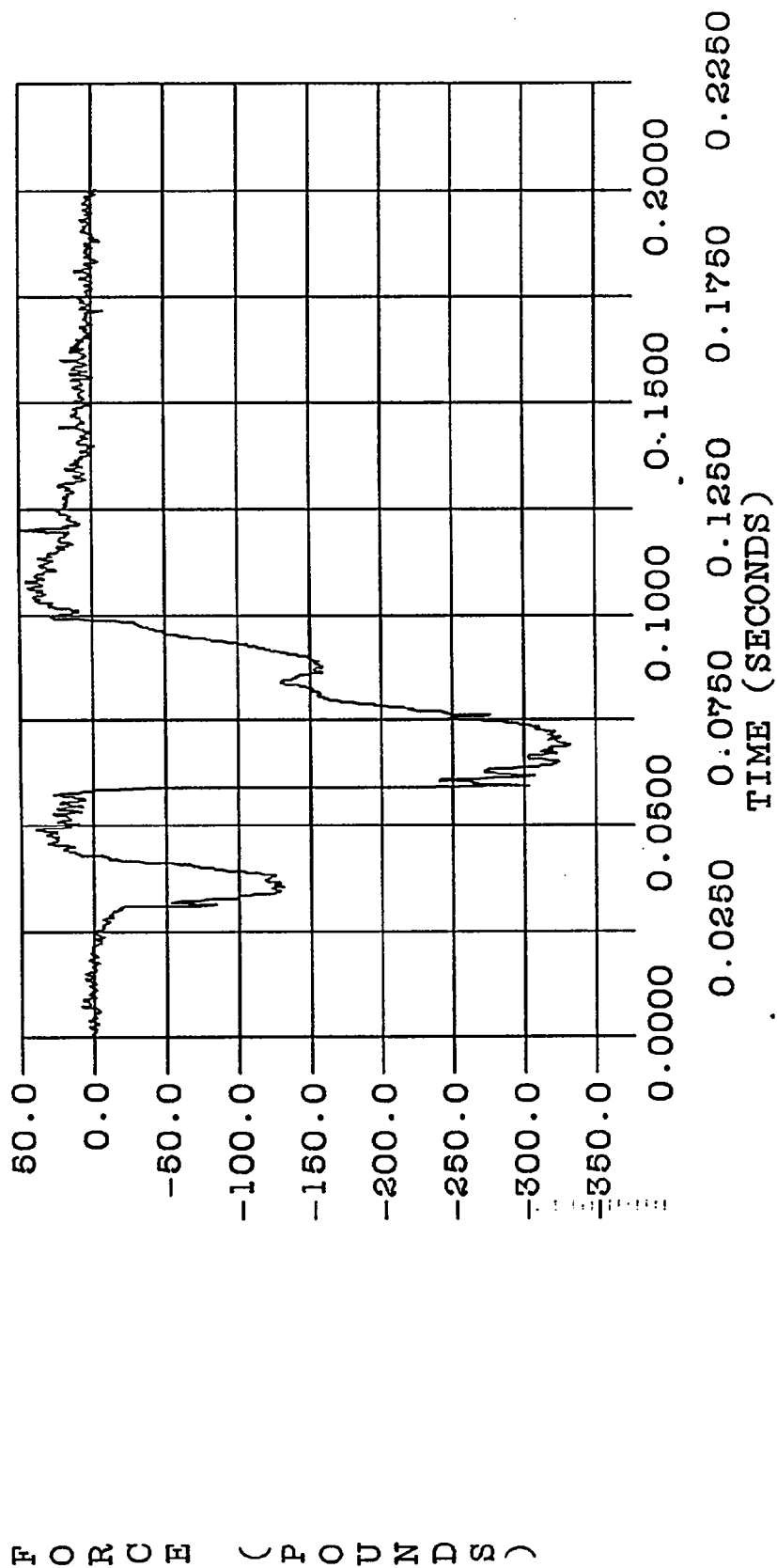
ACCELERATION (G, S)



Passenger Chest Resultant Acceleration vs. Time

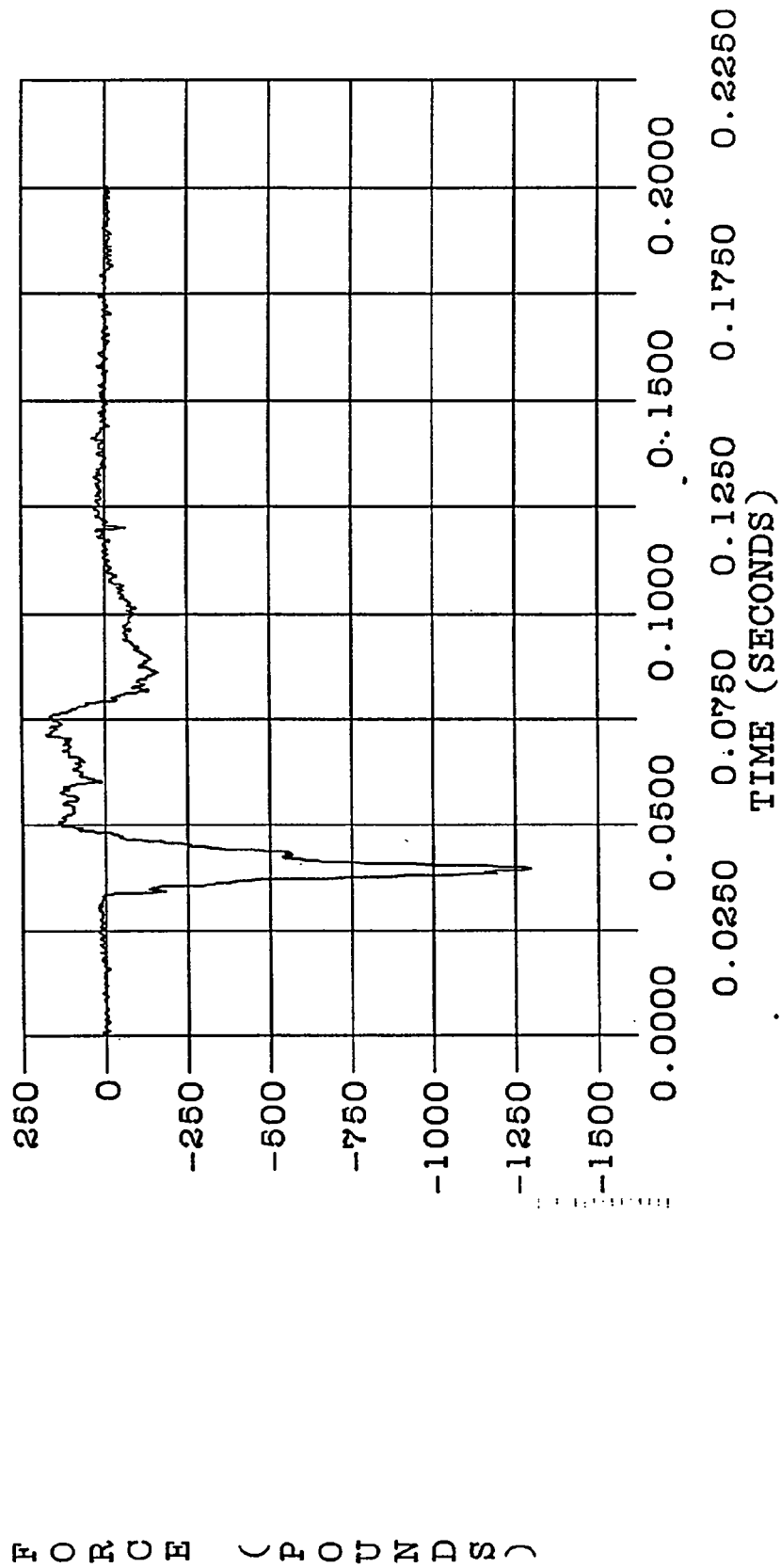
1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

PASS FEMUR RH



passenger Right Femur Force vs. Time

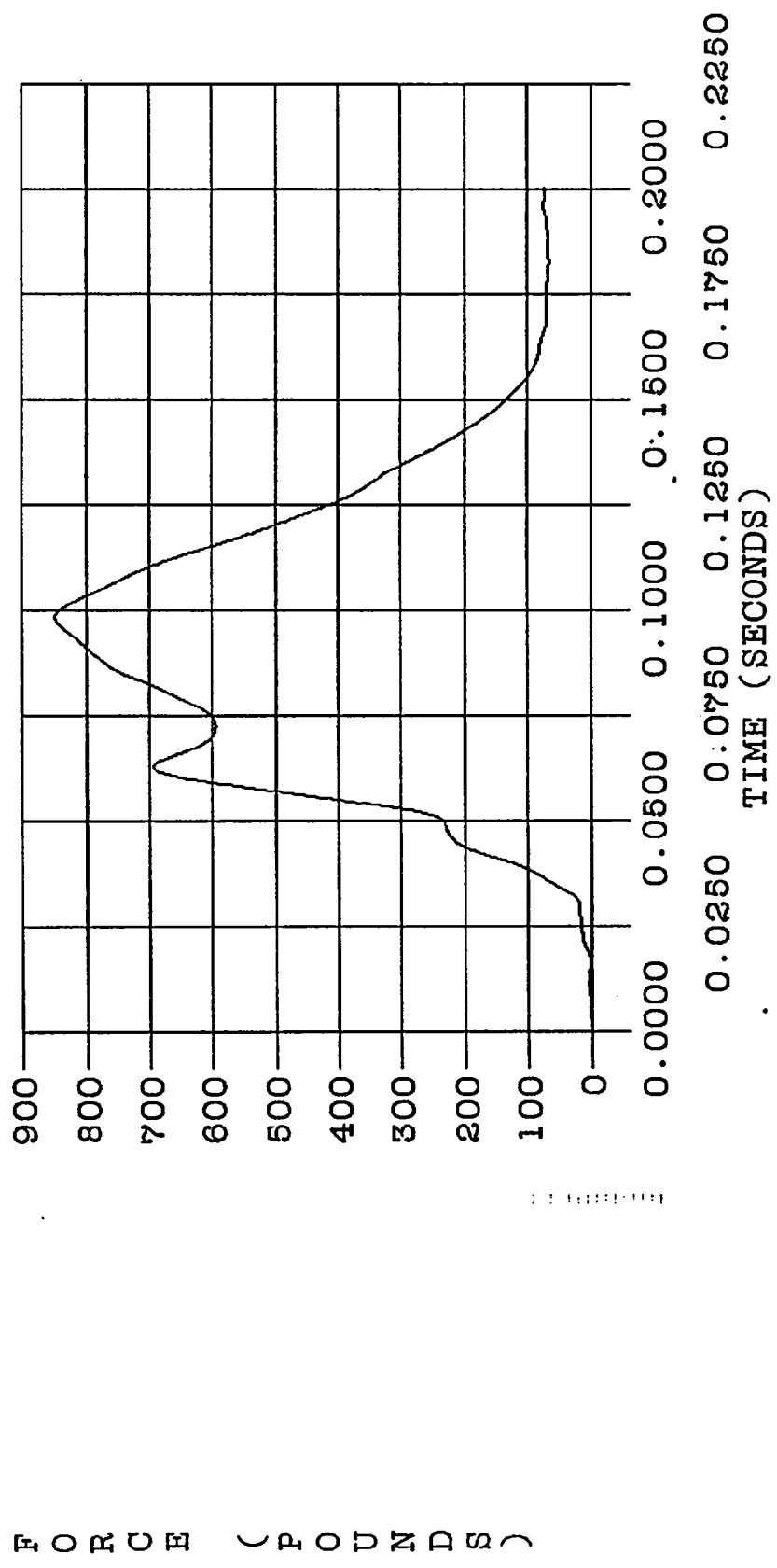
1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91
PASS FEMUR LH



Passenger Left Femur Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

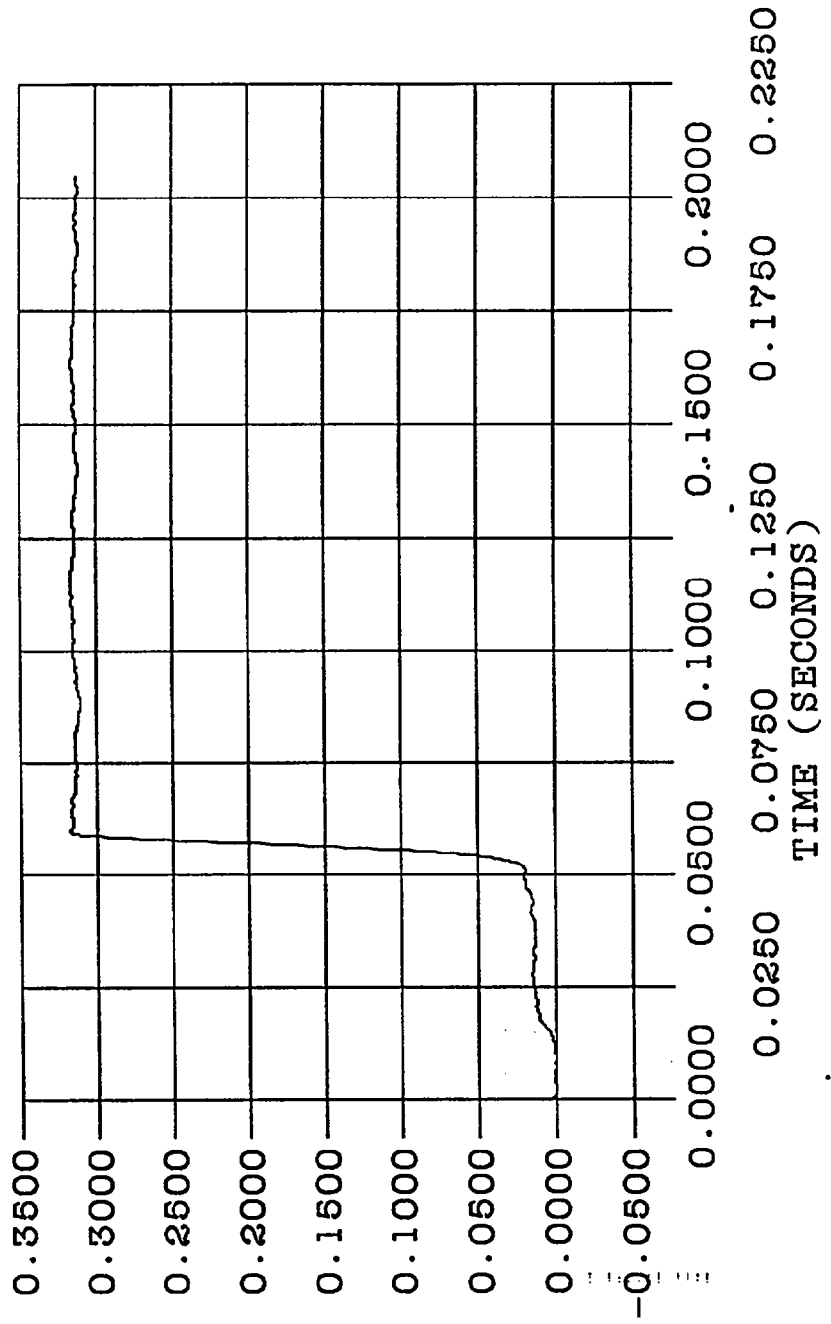
PASS LAP BELT



Passenger Lap Belt Force vs. Time

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

DR TORSO BELT STRETCH

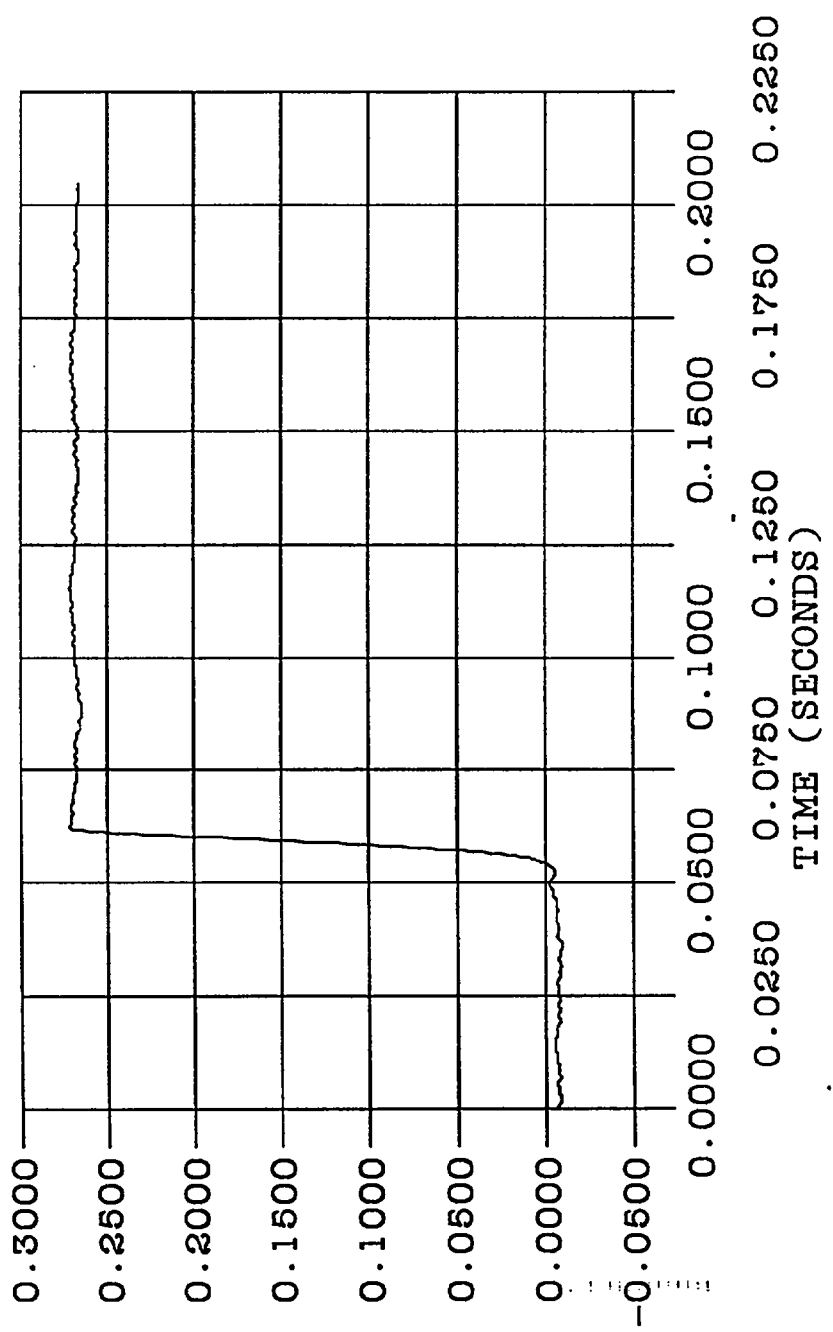


Driver Torso Belt Stretch vs. Time

DRIVER BELT STRETCH IN

1991 HYUNDAI SCOUPE NCAP TEST TEST DATE: 05/08/91

PA TORSO BELT STRETCH



Passenger Torso Belt Stretch vs. Time

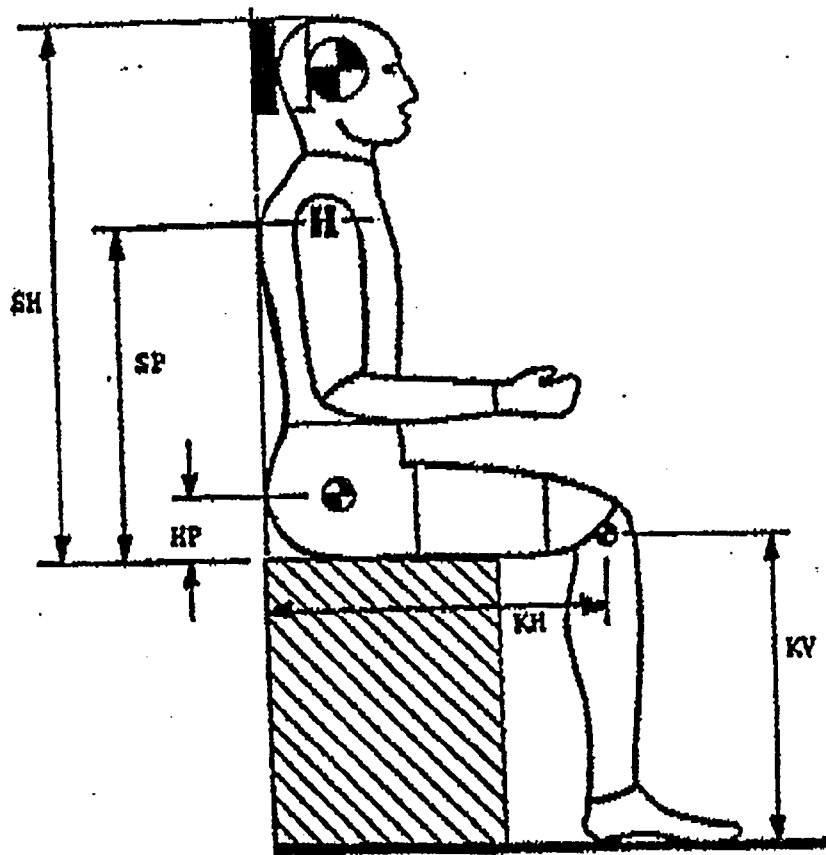
PASSENGER TORSO BELT STRETCH IN

APPENDIX C
PART 572 B/E DUMMY CONFIGURATION
AND PERFORMANCE VERIFICATION
DATA SHEETS

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 466

I. CONFIGURATION VERIFICATION DATA:



	PART 572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		3/28/91	N/A
VERIFICATION NUMBER FOR DUMMY*		3	N/A
SH - Seated Height	35.6 to 35.8"	35.6	N/A
SP - Shoulder Pivot Height	21.8 to 22.4"	22.1	N/A
HP - Hip Pivot Height	3.9" ref.	3.9	N/A
KH - Knee Pivot from back line	20.1 to 20.7"	20.7	N/A
KV - Knee Pivot from floor	19.3 to 19.9"	19.3	N/A
SW - Shoulder Width	17.8 to 18.4"	18.2	N/A
HW - Hip Width	14.0 to 15.4"	14.1	N/A

TECHNICIAN'S NAME: Eric Callahan

Sequential number beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA...continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.: 466

TECHNICIAN'S NAME: Eric Callahan

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		3/28/91	N/A
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*		3	N/A
VERIF. LAB. TEMPERATURE (66 TO 78°F Range)		72 °F	N/A °F
VERIF. LAB. HUMIDITY (10 to 70% Range)		60 %	N/A %
TEST PARAMETER	SPECIFICATION		N/A
1. HEAD DROP TEST--			
a. Peak Resultant Accel.	210 to 260G	245	N/A
b. Peak Lateral Acce.	-10G	4.3	N/A
c. Time above 100G	0.9 to 1.5ms	1.2	N/A
2. NECK BENDING TEST--			
a. Pendulum Speed	21.5 to 25.5fps	23.5	N/A
b. Pend. Avg. Decel. over $t_3 - t_2$	20 to 24G	23.3	N/A
c. Peak Resultant Head Acceleration	26G max.	21.7	N/A
d. Pendulum Deceleration ($t_2 - t_1$)	-3ms	2.6	N/A
e. Pendulum Deceleration ($t_3 - t_2$)	25 to 30ms	29.8	N/A
f. Pendulum Deceleration ($t_4 - t_3$)	-10ms	3.9	N/A
g. Max. Head Rotation	63 to 73°	66.3	N/A
h. Chordal Displacement Head Rotation Angle			N/A
0°	Time	-2 to 2ms	0.0
	Displ.	-.5 to .5"	0.0
30°	Time	25.6 to 34.4ms	28.3
	Displ.	2.1 to 3.1"	2.6
60°	Time	40.3 to 51.7ms	45.2
	Displ.	4.3 to 5.3"	4.8
Maximum ()	Time	53.2 to 66.8ms	57.3
	Displ.	5.0 to 6.0"	5.3

*beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA...continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.: 466

TECHNICIAN'S NAME: Eric Callahan

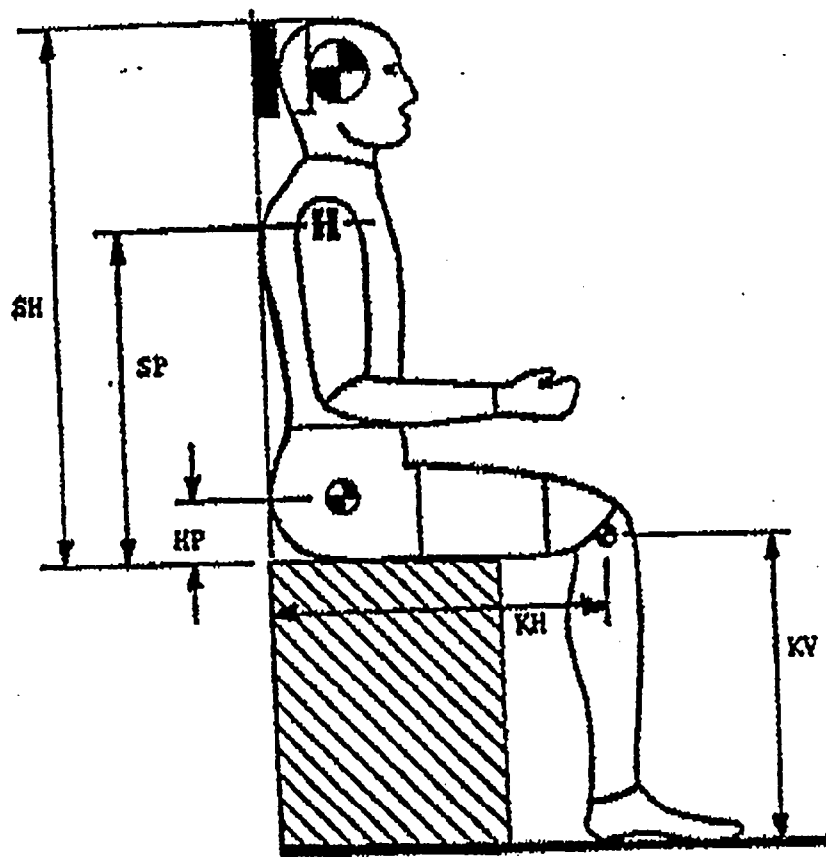
TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST-- Continued				
h. Chordal Displacement Head Rotation Angle				
60°	Time	67.0 to 83.0ms	70.0	N/A
	Displ.	4.3 to 5.3 in.	4.8	N/A
30°	Time	85.4 to 104.6ms	90.1	N/A
	Displ.	2.1 to 3.1 in	2.3	N/A
0°	Time	101.0 - 123.0ms	104.0	N/A
	Displ.	-.3 to 0.5 in	0.1	N/A
3. ABDOMINAL COMP. TEST (Preload = 10 lbs)				
a. Force @ .5"		23.3 to 36.5 lb	26.0	N/A
b. Force @ .75"		36.7 to 49.8 lb	40.0	N/A
c. Force @ 1.0"		50 to 63 lbs.	58.0	N/A
d. Force @ 1.3"		73 to 88 lbs.	87.0	N/A
4. LUMBAR FLEXION TEST				
a. Force @ 20°		22 to 34 lbs.	26.1	N/A
b. Force @ 30°		34 to 46 lbs.	41.5	N/A
c. Force @ 40°		46 to 58 lbs.	50.3	N/A
d. Return Angle		12° maximum	8	N/A
5. CHEST IMPACT TESTS				
a. High Speed				
(1) Probe Speed		21.78-22.22 fps	21.8	N/A
(2) Peak Deflection		1.7" maximum	1.5	N/A
(3) Peak Resistive Force		2250 lbs. max.	2180	N/A
(4) Internal Hysteresis		50 to 70%	55.5	N/A
b. Low Speed				
(1) Probe Speed		13.86-14.14fps	14.0	N/A
(2) Peak Deflection		1.1" maximum	0.85	N/A
(3) Peak Resistive Force		1450 lbs. max.	1388	N/A
(4) Internal Hysteresis		50 to 70%	53.3	N/A
6. KNEE IMPACT TESTS				
a. Right Side				
(1) Probe Speed		6.76 to 7.04fps	7.0	N/A
(2) Maximum Force		1850 to 2500lbs	1863	N/A
(3) Time Above 1000#		1.7 as minimum	2.0	N/A
b. Left Side				
(1) Probe Speed		6.76 to 7.04fps	7.0	N/A
(2) Maximum Force		1850 to 2500lbs	2193	N/A
(3) Time Above 1000#		1.7 as minimum	1.8	N/A

REMARKS:

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 465

I. CONFIGURATION VERIFICATION DATA:



	PART 572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		2/12/91	N/A
VERIFICATION NUMBER FOR DUMMY*		2	N/A
SH - Seated Height	35.6 to 35.8"	35.7	N/A
SP - Shoulder Pivot Height	21.8 to 22.4"	21.9	N/A
HP - Hip Pivot Height	3.9" ref.	3.9	N/A
KH - Knee Pivot from back line	20.1 to 20.7"	20.6	N/A
KV - Knee Pivot from floor	19.3 to 19.9"	19.3	N/A
SW - Shoulder Width	17.8 to 18.4"	18.0	N/A
HW - Hip Width	14.0 to 15.4"	14.7	N/A

TECHNICIAN'S NAME: Eric Callahan

Sequential number beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA...continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.: 465

TECHNICIAN'S NAME: Eric Callahan

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		2/12/91	N/A
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*		2	N/A
VERIF. LAB. TEMPERATURE (66 TO 78°F Range)		69 °F	N/A °F
VERIF. LAB. HUMIDITY (10 to 70% Range)		52 %	N/A %
TEST PARAMETER	SPECIFICATION		N/A
1. HEAD DROP TEST--			
a. Peak Resultant Accel.	210 to 260G	225	N/A
b. Peak Lateral Acce.	-10G	-5.1	N/A
c. Time above 100G	0.9 to 1.5ms	1.3	N/A
2. NECK BENDING TEST--			
a. Pendulum Speed	21.5 to 25.5fps	24.1	N/A
b. Pend. Avg. Decel. over $t_3 - t_2$	20 to 24G	23.1	N/A
c. Peak Resultant Head Acceleration	26G max.	21.1	N/A
d. Pendulum Deceleration ($t_2 - t_1$)	-3ms	2.4	N/A
e. Pendulum Deceleration ($t_3 - t_2$)	25 to 30ms	26.8	N/A
f. Pendulum Deceleration ($t_4 - t_3$)	-10ms	7.2	N/A
g. Max. Head Rotation	63 to 73°	66.3	N/A
h. Chordal Displacement Head Rotation Angle			N/A
0°	Time	-2 to 2ms	0.0
	Displ.	-.5 to .5"	0.0
30°	Time	25.6 to 34.4ms	28.1
	Displ.	2.1 to 3.1"	2.6
60°	Time	40.3 to 51.7ms	44.7
	Displ.	4.3 to 5.3"	4.8
Maximum (°)	Time	53.2 to 66.8ms	59.0
	Displ.	5.0 to 6.0"	5.3

*beginning with "1" at the start of each fiscal year's crash test program

DUMMY CONFIG. & PERF. VERIF. DATA...continued:

II. PERFORMANCE VERIFICATION DATA:

NHTSA DUMMY I.D. NO.: 465

TECHNICIAN'S NAME: Eric Callahan

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. <u>NECK BENDING TEST--</u> Continued				
h. Chordal Displacement Head Rotation Angle				
60°	Time	67.0 to 83.0ms	69.8	N/A
	Displ.	4.3 to 5.3 in.	4.8	N/A
30°	Time	85.4 to 104.6ms	90.5	N/A
	Displ.	2.1 to 3.1 in	2.3	N/A
0°	Time	101.0 - 123.0ms	104.6	N/A
	Displ.	-.3 to 0.5 in	0.1	N/A
3. <u>ABDOMINAL COMP. TEST</u> (Preload = 10 lbs)				
a. Force @ .5"		23.3 to 36.5 lb	32.0	N/A
b. Force @ .75"		36.7 to 49.8 lb	47.0	N/A
c. Force @ 1.0"		50 to 63 lbs.	62.0	N/A
d. Force @ 1.3"		73 to 88 lbs.	88.0	N/A
4. <u>LUMBAR FLEXION TEST</u>				
a. Force @ 20°		22 to 34 lbs.	31.5	N/A
b. Force @ 30°		34 to 46 lbs.	39.1	N/A
c. Force @ 40°		46 to 58 lbs.	50.4	N/A
d. Return Angle		12° maximum	11.6	N/A
5. <u>CHEST IMPACT TESTS</u>				
a. High Speed				
(1) Probe Speed		21.78-22.22 fps	21.8	N/A
(2) Peak Deflection		1.7" maximum	1.7	N/A
(3) Peak Resistive Force		2250 lbs. max.	2169	N/A
(4) Internal Hysteresis		50 to 70%	62.2	N/A
b. Low Speed				
(1) Probe Speed		13.86-14.14fps	13.9	N/A
(2) Peak Deflection		1.1" maximum	0.8	N/A
(3) Peak Resistive Force		1450 lbs. max.	1233	N/A
(4) Internal Hysteresis		50 to 70%	54.8	N/A
6. <u>KNEE IMPACT TESTS</u>				
a. Right Side				
(1) Probe Speed		6.76 to 7.04fps	7.0	N/A
(2) Maximum Force		1850 to 2500lbs	1932	N/A
(3) Time Above 1000#		1.7 as minimum	2.1	N/A
b. Left Side				
(1) Probe Speed		6.76 to 7.04fps	7.0	N/A
(2) Maximum Force		1850 to 2500lbs	1877	N/A
(3) Time Above 1000#		1.7 as minimum	1.9	N/A

REMARKS:

APPENDIX D

DUMMY, VEHICLE, AND LABORATORY
INSTRUMENT CALIBRATION

DUMMY, VEHICLE, AND LABORATORY INSTRUMENT CALIBRATION (6 month cal. min.)

INSTRUMENTS FOR DUMMY: 465

	DRIVER			calibration	
	Serial #	Manufacturer	Last	Next	
Head X Y Z	DK74	Endevco	4/26/91	10/26/91	
	ED47	Endevco	4/26/91	10/26/91	
	EA45	Endevco	4/26/91	10/26/91	
Chest X Y Z	ED50	Endevco	4/26/91	10/26/91	
	ED87	Endevco	4/26/91	10/26/91	
	DR22	Endevco	4/26/91	10/26/91	
Right Femur Load Cell Left Femur Load Cell	957	GSE	11/20/91	5/20/91	
	956	GSE	11/20/91	5/20/91	
*Neck Load Cell X Y Z	N/A	N/A	N/A	N/A	
	N/A	N/A	N/A	N/A	
	N/A	N/A	N/A	N/A	
*Neck Moment X Y Z	N/A	N/A	N/A	N/A	
	N/A	N/A	N/A	N/A	
	N/A	N/A	N/A	N/A	
	N/A	N/A	N/A	N/A	
	N/A	N/A	N/A	N/A	
	N/A	N/A	N/A	N/A	
*Chest Deflection Gauge *Hybrid III Use Only	N/A	N/A	N/A	N/A	
	N/A	N/A	N/A	N/A	
	N/A	N/A	N/A	N/A	
Lap Belt Load Cells	568	Lebow	2/8/91	8/8/91	
Shoulder Belt Load Cells	664	Lebow	2/8/91	8/8/91	
Spool-Out Potentiometer	N/A	N/A	N/A	N/A	
Belt Stretch Transducer	1	Bourns	N/A	N/A	prior to use

DUMMY, VEHICLE, AND LABORATORY INSTRUMENT CALIBRATION (6 month cals. min.)

INSTRUMENTS FOR DUMMY: 466

PASSENGER				
	Serial #	Manufacturer	Last	Next
Head X	EC09J	Endevco	4/26/91	10/26/91
Y	ED15J	Endevco	4/26/91	10/26/91
Z	EA45J	Endevco	4/26/91	10/26/91
Chest X	AA20	Endevco	4/26/91	10/26/91
Y	EA71	Endevco	4/26/91	10/26/91
Z	DK21	Endevco	4/26/91	10/26/91
Right Femur Load Cell	958	GSE	11/20/90	5/20/91
Left Femur Load Cell	953	GSE	5/6/91	11/6/91
*Neck Load Cell X	N/A	N/A	N/A	N/A
Y	N/A	N/A	N/A	N/A
Z	N/A	N/A	N/A	N/A
*Neck Moment X	N/A	N/A	N/A	N/A
Y	N/A	N/A	N/A	N/A
Z	N/A	N/A	N/A	N/A
*Chest Deflection Gauge	N/A	N/A	N/A	N/A
*Hybrid III Use Only	N/A	N/A	N/A	N/A
Lap Belt Load Cells	662	N/A	2/8/91	8/8/91
Shoulder Belt Load Cells	625	N/A	2/8/91	8/8/91
Spool-Out Potentiometer	N/A	N/A	N/A	N/A
Belt Stretch Transducer	2	Bourns	prior to use	N/A

DUMMY, VEHICLE, AND LABORATORY INSTRUMENT CALIBRATION (6 month cal. min.) (cont'd)

VEHICLE ACCELEROMETERS

	Serial #	Manufacturer	calibration	
			Last	Next
Left Seat Rear Crossmem.	YJ5220091	Kyowa	4/26/91	10/26/91
RT Rear Seat Crossmember	YJ5220065	Kyowa	4/26/91	10/26/91
Top of Engine	ED30J	Endevco	4/26/91	10/26/91
Bottom of Engine	DY34J	Endevco	4/26/91	10/26/91
Left Disc Brake Caliper	ED70J	Endevco	4/26/91	10/26/91
Right Disc Brake Caliper	DM97J	Endevco	4/26/91	10/26/91
Instrument Panel	YE2260048	Kyowa	4/26/91	10/26/91
Center Rear Crossmember Z	YF3201036	Kyowa	4/26/91	10/26/91
Vehicle Rear Z	YE2270026	Kyowa	4/26/91	10/26/92

LABORATORY INSTRUMENTS

	Serial #	Manufacturer	calibration	
			Last	Next
Neck Bending Pendulum Accelerometer	5220070	Kyowa	4/91	10/91
Neck Bending Rotary Potentiometer	N/A	Bourns	prior to use	prior to use
Neck Bending Linear Potentiometer	N/A	Bourns	prior to use	prior to use
Femur/Chest/Thorax Probe Accelerometer	5220074	Kyowa	4/91	10/91
Lumbar Flexion Force Gauge	Custom Fabricated	-	prior to use	prior to use
Lumbar Flexion Rotation Gauge	Custom Fabricated	-	prior to use	prior to use
Abdomen Compression Disp. Gauge	4356116	Computer Inst. Corp.	prior to use	prior to use
Abdomen Compression Force Gauge	49710	Computer Inst. Corp.	prior to use	prior to use

APPENDIX E

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT
SYSTEM INSTRUCTIONS

DB04C1-A

Locking from Outside

The doors can be locked without a key. First push the lock button down, then close the door.

CAUTION:
Be careful not to lock your key in the vehicle.

ZB04D1-A

Locking from Inside

To lock your Hyundai from inside, simply close the door and push the lock button down.

When this is done, the door cannot be opened using either the inside or the outside door handle.

ZB06A1-A

ADJUSTABLE FRONT SEATS

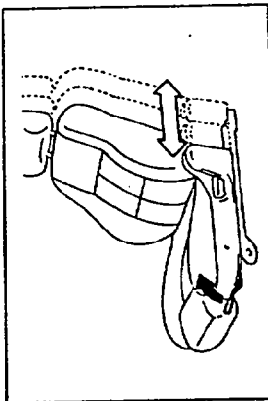
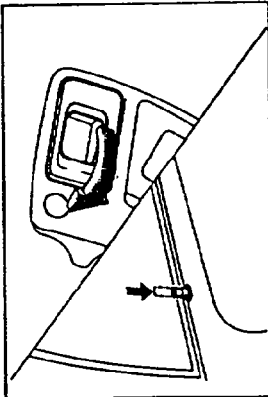
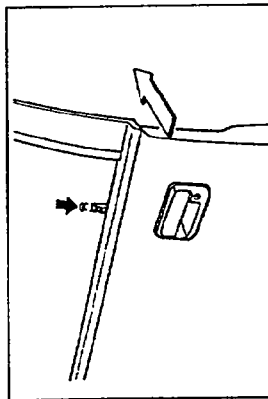
WARNING:

Never attempt to adjust the seat while the vehicle is moving. This could result in loss of control, and an accident causing injury to the occupants.

ZB06B1-A

Adjusting Seat Forward and Rearward

To move the seat toward the front or rear, pull the lock release lever toward the center of the car. This releases the seat on its track so you can move it forward or rearward to the desired position. When you find the position you want, release the lever and slide the seat forward or rearward on its track until it locks into position and cannot be moved further.



SEATS

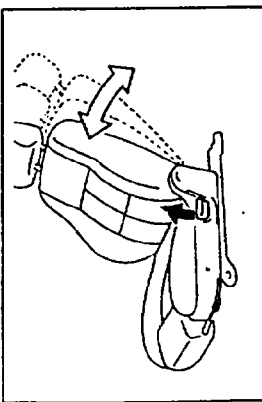
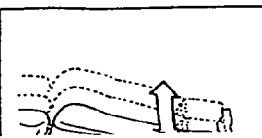
seat while the
if result in loss
causing injury

and Rearward
front or rear, pull
the center of the
its track so you
rd to the desired
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the seat forward
fill it locks into
rd further.

ZB06C1-A

Adjusting Seatback Angle

To release the seatback, lean forward to take your weight off it, then pull up on the recliner control lever at the outside edge of the seat. Now lean back until the desired seatback angle is achieved. To lock the seatback into position, release the recliner control lever.

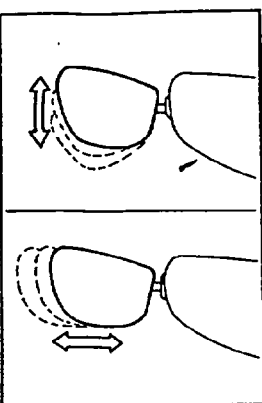
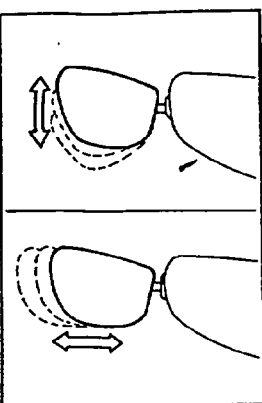


DB06D1-A

Adjustable Headrests

The headrests in your Hyundai may be raised or lowered by releasing the lock button on the headrest support. For maximum effectiveness in case of an accident the headrest should be adjusted so the top of the headrest is at the same height as the top of the occupant's ears. For this reason, the use of a cushion that holds the body away from the seatback is not recommended.

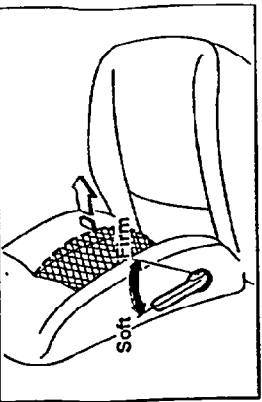
WARNING:
Do not operate the vehicle with the headrests removed. Headrests may provide protection against neck injuries when properly adjusted.



ZB06E1-A

Lumbar Support Control (if installed) (Driver's seat only)

The front seats in some Hyundais are equipped with adjustable lumbar support. To increase the amount of lumbar support, turn the handle forward. To decrease it, turn the handle toward the rear.

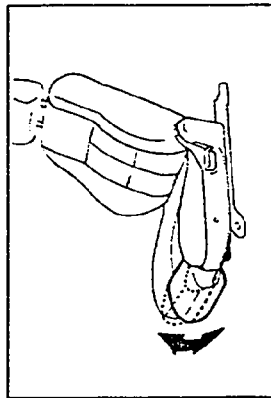


1-5

D00611-A

Seat Cushion Height Adjustment (If installed) (Driver's seat only)

To adjust the height of the seat cushion, manually turn the front portion of seat cushion in the desired direction.



D007A1-A

REAR SEAT ENTRY

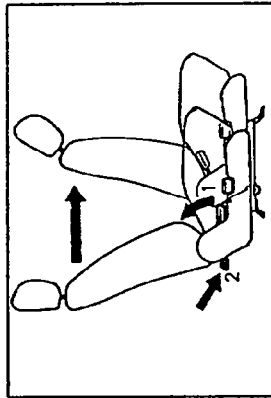
The front passenger seatback should be tilted to enter the rear seat.

By pulling up on the recliner control lever (1) at the outside of the front passenger seat, the seatback will tilt forward and the seat will automatically slide forward.

Rear seat occupants can tilt the front passenger seatback by depressing the foot lever (2) as shown in the drawing.

WARNING:

Passengers sitting in the rear seat should be careful not to accidentally press the foot lever (2) while the vehicle is moving. This may cause the seat back to move forward and injure a front seat occupant.



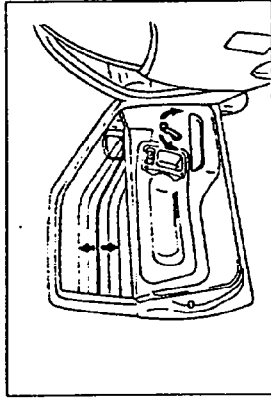
Z606A1-A

WINDOW GLASS

To raise or lower the window, turn the window regulator handle clockwise or counterclockwise.

NOTE:

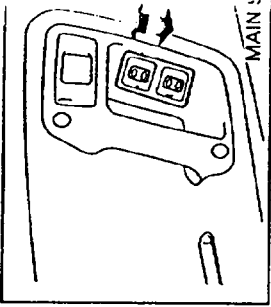
When opening or closing the windows, make sure your passenger's arms and hands are safely out of the way.



D0081-A

POWER WINDOW (If installed)

The power windows operate on the ignition key in the "ON" position. Switches are located on the driver's rest and control the front windows, respectively sides of the vehicle. They may be opened by pressing the top of the switch. The windows may be closed by depressing the upper portion of the switch.



D09081-A

POWER WINDOW (If Installed)

The power windows operate only when the ignition key is in the "ON" position. The main switches are located on the driver's side arm rest and control the front windows on the respective sides of the vehicle. The windows may be opened by pressing the lower portion of the switch. The windows may be raised by depressing the upper portion of the switch.

the window
counterclock-

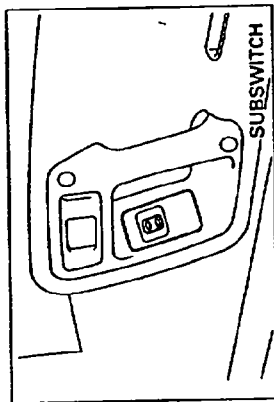
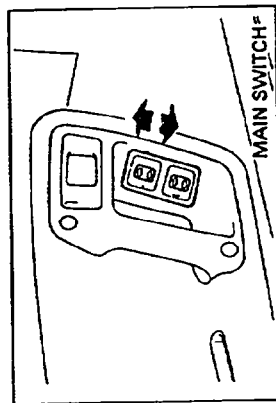
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t arms and
way.



D09081-A

CAUTION:

1. Be careful that head or hands are not trapped by a closing window.
2. Never operate the main switch and subswitch in opposing directions at the same time, as the window will stop, and not able to be opened or closed.
3. If passengers remain in the car when you leave, especially if a child remains alone, remove the ignition key for their safety.



D09081-A

SEAT BELT PRECAUTIONS AND WARNINGS

All occupants of the vehicle should wear their seat belts at all times. Your state's laws may require that some or all occupants of the vehicle use seat belts. The possibility of injury or the severity of injury in an accident will be decreased if this safety precaution is observed. In addition, the following recommendations are made:

D09081-A

Baby or Small Child

All states require the use of child restraint systems for babies and small children. Whether this is required by law or not, it is strongly recommended that a child restraint seat or infant restraint system be used for babies or small children weighing less than 40 pounds. Information about the use of such restraints is included on page 1-13.

D09081-A

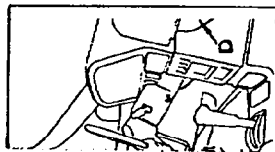
Larger Children

It is recommended that larger children occupy the rear seat and wear their seat belts. If the child is in the front seat, he/she should be securely restrained by the seat belt. Under no circumstances should the child be allowed to stand or kneel on any seat. Children are afforded the most safety in the event of an accident when they are restrained by a proper child restraint system.

1-7

With a new safety
 belt and the front
 seat automatically
 reclined. Your new
 seat has a knee
 assembly. Always
 insert the knee
 into the edge of the door

For protection,
 insert lap belt in
 the shoulder belt.



- o Front seat passengers should not ride in a moving vehicle with the seatback reclined. The seat belts operate securely only when the seatback is in an upright position.
- o Both arms should not be under or over the belt. Rather, one should be over and the other under, as shown in the illustration.
- o Do not wear the shoulder portion of the seat belt under your arm as this increases the possibility of serious injury to you in the event of an accident.
- o When wearing the automatic seat belt, make sure that the belt is positioned midway over the shoulder-NEVER ACROSS THE NECK.
- o To operate the automatic seat belt system, the shoulder belt tab should always remain inserted in the shoulder belt buckle.
- o Do not wear the lap belt across the shoulder belt.
- o Be careful not to damage the belt webbing or hardware, and that they do not get caught or pinched in the seat or doors.
- o Hyundai recommends that children be seated in the rear seats.
- o Avoid wearing twisted seat belts.
- o Release the shoulder belt buckle from the tab only in an emergency.
- o The retractors lock only on sudden impact or stops. The belt will allow some freedom of movement if done slowly.

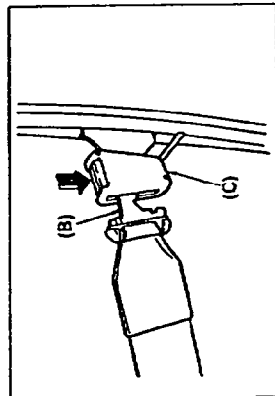
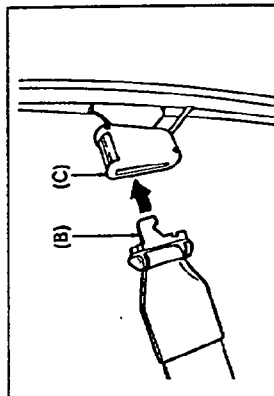
2B09N1-A

How The Passive Seat Belt System Works

The metal tab (B) is inserted in the buckle (C) which is fastened firmly to the upper rear edge of the door. The other end of the belt is wound automatically on the Web Locking Retractor (A) under the seat.

When you open the front doors, it extends the belt from the retractor and provides access to the interior. When the door is closed, the belt automatically places itself diagonally across the chest.

The seat belt automatically adjusts to the proper length. If you lean forward in a slow, easy motion, the belt will extend and let you move around. If there is a sudden stop or impact, however, the belt will lock into position. It will also lock if you try to lean forward too quickly.



1-9

2B09O1-A

To Release The Seat Belt

If required, press the emergency release button on the buckle (C) marked PRESS EMERGENCY.

When it is released, the belt tab (B) should automatically drawback into the retractor.

For your safety, we recommend that you hold the belt tab (B) with your hand and allow it to retract gently.

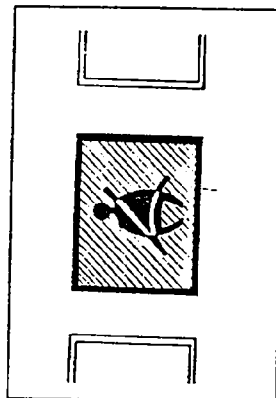
SEAT BELT WARNING LIGHT AND CHIME

With the key in the "ON" position and the lap belt unfastened, the seat belt warning light will stay on and the chime will sound for six seconds. (Driver's only).
If the shoulder belt is disconnected while the key is in the "ON" position, the chime will sound for 6 seconds and the warning light will flash for 60 seconds. (Driver's only).

LAP BELTS (2-Point Automatic Locking Retractor Type) (Front Seat)

To Fasten Your Lap Belt

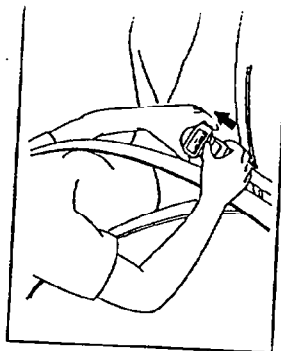
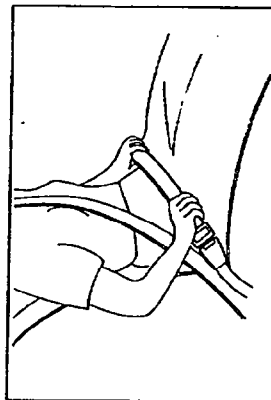
To fasten a 2-point type lap belt with an automatic locking retractor, pull the belt out of the retractor in one continuous motion and insert the metal tab into the buckle. The length of the lap belt is automatically locked into position when you stop pulling on it. Once it locks, it cannot be pulled out any further until it is allowed to retract completely. Then it can be pulled out again.



1-10

Adjusting Your Lap Belt

You should place the belt as low as possible on your hips, not on your waist. If located too high on your body, the chances of sliding out from under it and being injured are increased. Pull the belt toward the retractor to take up extra slack.



To Release the Lap Belt

When you want to release the lap belt, the button in the locking buckle. The should then retract automatically. If it, make sure it is not twisted and try

ZB0932-A

To Release the Lap Belt

When you want to release the lap belt, press the button in the locking buckle. The lap belt should then retract automatically. If it does not, make sure it is not twisted and try again.



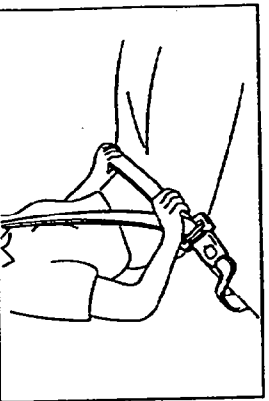
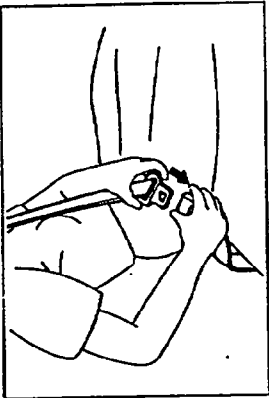
ZB0931-A

SEAT BELTS (3-Point Webbing Clamp Locking Retractor) (Rear seat outboard)

To Fasten Your Belt

To fasten your seat belt, pull it out of the retractor and insert the metal tab into the buckle. There will be an audible "click" when the tab locks into the buckle.

The seat belt automatically adjusts to the proper length only after the lap belt is adjusted manually so that it fits snugly around your hips. If you lean forward in a slow, easy motion, the belt will extend and let you move around. If there is a sudden stop or impact, however, the belt will lock into position. It will also lock if you try to lean forward too quickly.



1-11

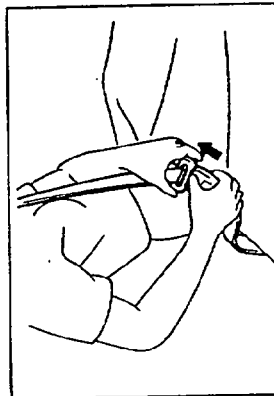
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Adjusting Your Seat Belt

You should place the belt as low as possible on your hips, not on your waist. If located too high on your body, the chances of sliding out from under it and being injured are increased. Both arms should not be under or over the belt. Rather, one should be over and the other under, as shown in the illustration.

To Release the Seat Belt

The seat belt is released by pressing the release button in the locking buckle. When it is released, the belt should automatically draw back into the retractor. If this does not happen, check the belt to be sure it is not twisted, then try again.



1-12

CHILD RESTRAINT SYSTEM

Children riding in the car should sit in the rear seat and be restrained to minimize the risk of injury in an accident, sudden stop, or sudden maneuver. According to accident statistics provided by the National Highway Traffic Safety Administration (NHTSA), children are safer when properly restrained in the rear seating positions than in the front seat. Larger children should use one of the seat belts provided. For smaller children, we strongly recommend the use of a commercially available child restraint system that meets the requirements of the Federal Motor Vehicle Safety Standard, (FMVSS), because it offers the most protection against injury. All states now have laws which require that small children must be seated in a child passenger seat restraint system. Check local laws. All child restraint systems are designed to be secured by lap belts or the lap belt portion of a lap-shoulder belt.

Children could be injured in a crash if their restraints are not properly secured. For small children and babies we strongly recommend a child seat or infant seat. Before buying a particular child restraint system, make sure it fits your car seat and seat belts, and fits your child. Follow all the instructions provided by the manufacturer when installing the child restraint system.

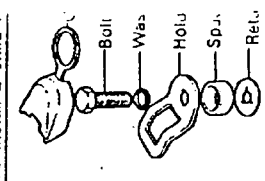
CAUTION:

- Since a safety belt or child restraint system can become very hot if it is left in a closed vehicle, be sure and check the seat cover and buckles before placing a child there.
- When the child restraint system is not in use, store it in the trunk or fasten it with a safety belt so that it will not be thrown forward in the case of a sudden stop or accident.
- It is recommended that a child restraint system be placed in the vehicle's rear seat since this can make an important contribution to safety.
- Children who are old enough to sit by themselves should sit in the rear seat and be restrained with the seat belt.
- Always make sure that the shoulder belt portion of the outboard lap/shoulder belt is positioned midway over the shoulder - never across the neck. The lap belt portion of the lap/shoulder belt or the center seat lap belt must always be positioned as low as possible on your hips, not on your waist. See illustration and instructions on page (1-11).
- If the seat belt will not properly fit the child, we recommend the use of a suitable booster seat in the rear seat in order to raise the child's seating height so that the seat belt will properly fit the child. Before purchasing a booster seat, make sure that it meets applicable Motor Vehicle Safety

- Standards and use with this vehicle.
- Never allow a child to sit on any seat.
- Never use an infant seat that "hooks" not provide an accident.
- Never allow a person's arms or legs to protrude from the vehicle. This could result in injury to the child.
- Hold the child in the vehicle does not mean of any means of accident, even if child is wearing.

Using a Child Restraint

To install a child restraint system:



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outboard lap/shoulder belt
midway over the shoulder -
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your hips, not on your waist.
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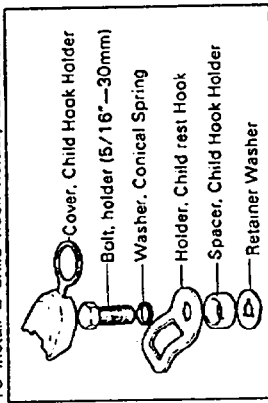
Standards and that it is satisfactory for
use with this vehicle.

- o Never allow a child to stand up or kneel on any seat.
- o Never use an infant carrier or child safety seat that "hooks" over a seatback; it may not provide adequate security in an accident.
- o Never allow a child to be held in a person's arms while they are in a moving vehicle. This could result in serious injury to the child in the event of an accident. Holding a child in a moving vehicle does not provide the child with any means of protection during an accident, even if the person holding the child is wearing a seat belt.

031001-A

Using a Child Restraint System

To install a child hook holder, use a 5/16"



18 UNC threaded bolt and 11mm spacer. You can damage the holder nut on your vehicle if you force a bolt with a different thread into the holder nut.

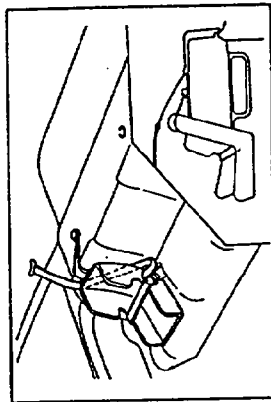
In addition to the bolt, you may also need a spacer and a locking clip depending on the vehicle or the position in which the child seat is installed.

If these parts do not come with your child seat, you can purchase them from your Hyundai dealer.

031001-A

CHILD HOOK HOLDER NUT LOCATION

The child hook holder nut is located on the rear deck as shown below.

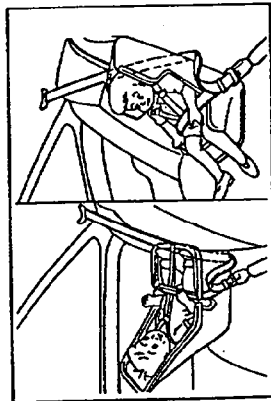


031001-A Outboard Shoulder/Lap Belt

Secure the child restraint with the lap belt as illustrated. To prevent slack in the lap belt, it will be necessary to secure the lap/shoulder belt in place with a locking clip. If your child restraint has a top strap, install the child rest hook holder to the provided anchor. Secure the child restraint with the outboard lap belt of the rear seat and latch the top strap hook onto the anchor bracket.

NOTE:

- o Before using the locking clip, read the instructions supplied by the manufacturer.
- o Child restraint anchors are designed to withstand only those loads imposed by correctly fitted child restraints. Under no circumstances are they to be used for adult seat belts or harnesses.

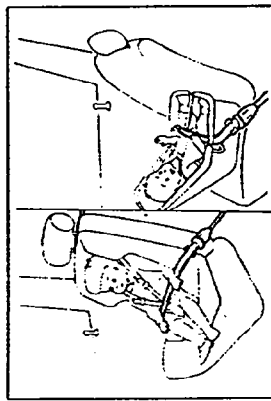


1-13

Installation on Front Seat:

To install a child restraint system in the front of your vehicle, a seat belt locking clip is required.

Secure the child restraint system with the lap belt, as shown in the illustration, below. To prevent looseness of the lap belt, use a genuine Hyundai locking clip (available from your Hyundai dealer) or one of equivalent dimension and strength. To install the locking clip, insert the lap belt through the recesses of the locking clip near the top of the lap belt, as shown in the illustration. (Follow the instructions attached to the locking clip for its use). When your child restraint system is not installed, the locking clip should be stored in the glove box to prevent it from being lost.



1-14

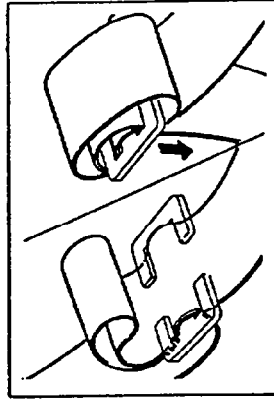
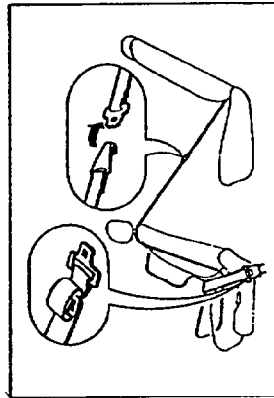
Adjusting The Lap Belt (Front seat)

To prevent slack in the lap belt, it will be necessary to secure the lap belt when you use the child restraint system. Secure the child restraint with the lap belt as illustrated.

1. Pull the lap belt out fully.
2. Tie up the slack of the lap belt using the locking clip at any convenient point along the lap belt. Make the loop as large as possible to remove any slack.
3. After you have tied up the belt, pull on it in the direction of the arrows to make sure that it does not slip.

WARNING:

Never install the child restraint with the automatic seat belt, it is not designed for this purpose. Failure to follow this warning may result in injury to the child.



1. Side Air
2. Side Air
3. Multi-Fit
4. Horn Bu
5. Windsh...
6. Hazard
7. Digital C
8. Center