

REPORT NO. MGA-90-N002
NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

Mazda Motor Corporation
1991 Mazda Protege
4-Door Sedan
NHTSA NO. MM5401

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



January 31, 1991

FINAL REPORT

Prepared For:

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16. Abstract A 35 mph frontal barrier impact test using a 6 load cell barrier was conducted on a 1991 Mazda Protege 4-Door Sedan at the MGA Proving Grounds crash test facility in Burlington, WI, on January 17, 1991. The barrier impact velocity was 35.5 mph, and the ambient temperature at the barrier face at the time of impact was 72°F. The post-test vehicle crush maximum was 20 1/2 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", both the driver and passenger appeared to meet the injury criteria requirements for head & chest. The driver dummy met the requirements for both femurs. The passenger dummy met the requirements for the right femur, however no data was collected for the left femur due to a failure in the umbilical strain relief for the cable.					
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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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-12121. 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

A load cell barrier consisting of 6 load cells was impacted by a 1991 Mazda Protege 4-Door Sedan at a velocity of 35.5 mph. The test was performed at the MGA Proving Grounds and Crash Test Center on January 17, 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 15 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. 465) and the right-front passenger ATD (Serial No. 466) 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 hub; the HIC was 779.2. The maximum chest deceleration over 3 milliseconds was 57.4 g's and femur loads were 851 and 1700 pounds for the right and left femurs respectively.

The right front passenger's HIC was 611.9 and maximum chest deceleration over 3 milliseconds was 51.0 g's. Femur loads were 997 pounds for the right femur. Data is not available for the left femur due to a problem with the umbilical strain relief.

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1991 Mazda Protege 4-Door Sedan
NHTSA No.: MM5401 VIN: JM1BG2242M0223985
Body Color: Blue Date of Manufacture: 9/90
Engine: 4 Cylinders; C.I.D.; Liters; CC
X Gas; Diesel; Turbocharged
Placement Longitudinal; X Transverse
Transmission: 3 Speed; Manual; X Automatic; Overdrive
Final Drive: X Front Wheel; Rear Wheel; Four Wheel
Date Received: 1/7/91 Odometer Reading: 112
 A/C; X P/S; X P/B; P/wdo; Tilt Wheel
 P/Seats; Cruise Control

Type of Occupant Restraint:

Lap Belt - Emergency locking retractor attached on outboard side. ELP mounted in sill in approximate area of the "B" post. Inboard buckle for lap belt with attachment on inboard side of driver seat.

Shoulder Belt - Passive shoulder belt (traveling belt when door opens). Shoulder belt has an emergency locking retractor mounted inboard between the driver and passenger seat. Shoulder belt can be separated from the traveling attachment point if desired.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 32 psi, Rear 32 psi
Recommended Tire Size: P175/70R-13 82S
Recommended Cold Tire Pressure: Front 32 psi; Rear 32 psi
Tires on Vehicle: P175/70R-13 ; Manufacturer: Yokohama
Number of Occupants: 2 Front; 3 Rear; 3rd Seat; 5 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) = 850 lbs. (A)
No. of Occupants x 150 lbs. = 750 lbs. (B)
Rated Cargo Weight (RCW) A-B = 100 lbs.
GVWR 3440 lbs. GAWR: Front 1850 lbs. Rear 1655 lbs.

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 759 lbs. Right Rear = 445 lbs.
Left Front = 741 lbs. Left Rear = 472 lbs.
TOTAL FRONT WEIGHT = 1500 lbs. (62 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 917 lbs. (38 % of Total Vehicle Weight)
TOTAL UNLOADED DELIVERED WEIGHT (UDW) = 2417 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (2417 lbs.)
VCW = Vehicle Capacity Weight (850 lbs.)
DSC = Designated Seating Capacity (5)
RCW = VCW - 150 (DSC) = 100 *lbs.
Target Test Weight = UDW + RCW + (2 dummies x 164 lbs./dummy)
Target Test Weight = 2845 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 75 POUNDS CARGO:

Right Front = 825 lbs. Right Rear = 573 lbs.
Left Front = 843 lbs. Left Rear = 595 lbs.
TOTAL FRONT WEIGHT = 1668 lbs. (58.8 of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1168 lbs. (41.2% of Total Vehicle Weight)
TOTAL TEST WEIGHT = 2836 lbs.

Weight of ballast secured in vehicle trunk area = 75 lbs.

Vehicle components removed to meet target weight Rear interior items
including seats, belts & retractors, muffler & tail pipe, tail light,
spare tire

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 25.6 LF 25.1 RR 25.8 LR 25.4
Test Attitude: RF 25 LF 24.6 RR 24.5 LR 24.3
Wheel Base: 98.4 in.; C.G. = 40.5 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 barrier Impact Angle: 0 °
 Date of Test: 1/17/91 Time of Test: 6:22 PM
 Ambient Temperature: 72 °F at impact area
 Temperature in Occupant Compartment: 72 °F (Spec. Range = 66 to 78°F)
 Windshield Molding Temperature: 72 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.5 mph, secondary = 35.5 mph
 Distance From Front Bumper to Barrier Face When
 Entering Speed Trap: 256 inches
 Exiting Speed Trap: 214 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length: Pre-Test = R 160.7 C_L 165.7 L 161.7
 Post-Test = R 140.5 C_L 145.2 L 143.1
 Crush = R 20.2 C_L 20.5 L 18.6
 Distance from front of test vehicle to point of impact (rebound):
 R 24 in. C_L 21.5 in. L 20.5 in.

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Steering Wheel Hub</u>	<u>None</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>

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>Jammed</u>	<u>Opened</u>	<u>Jammed</u>	<u>Opened</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>None</u>	<u>None</u>	<u>N/A</u>	<u>N/A</u>
Seat Shift (in.)	<u>0</u>	<u>0</u>	<u>N/A</u>	<u>N/A</u>

Glazing Damage

Backlight/Windshield Numerous cracks

Other Notable Impact Effects: _____

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.:

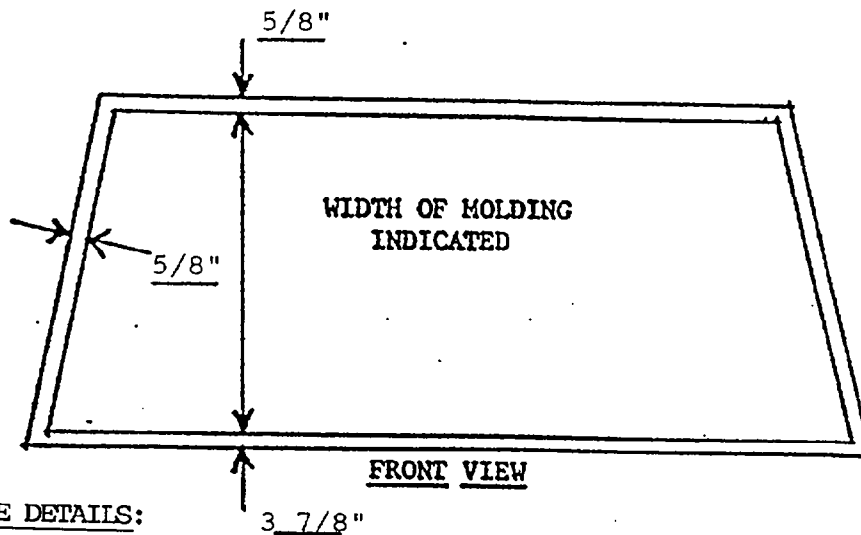
Rubber gasket, plastic retention strip on bottom

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	77.1	77.1	100%
LEFT SIDE	77.3	77.3	100%
TOTAL	154.4	154.4	100%

AREA OF RETENTION FAILURE:



FAILURE DETAILS:

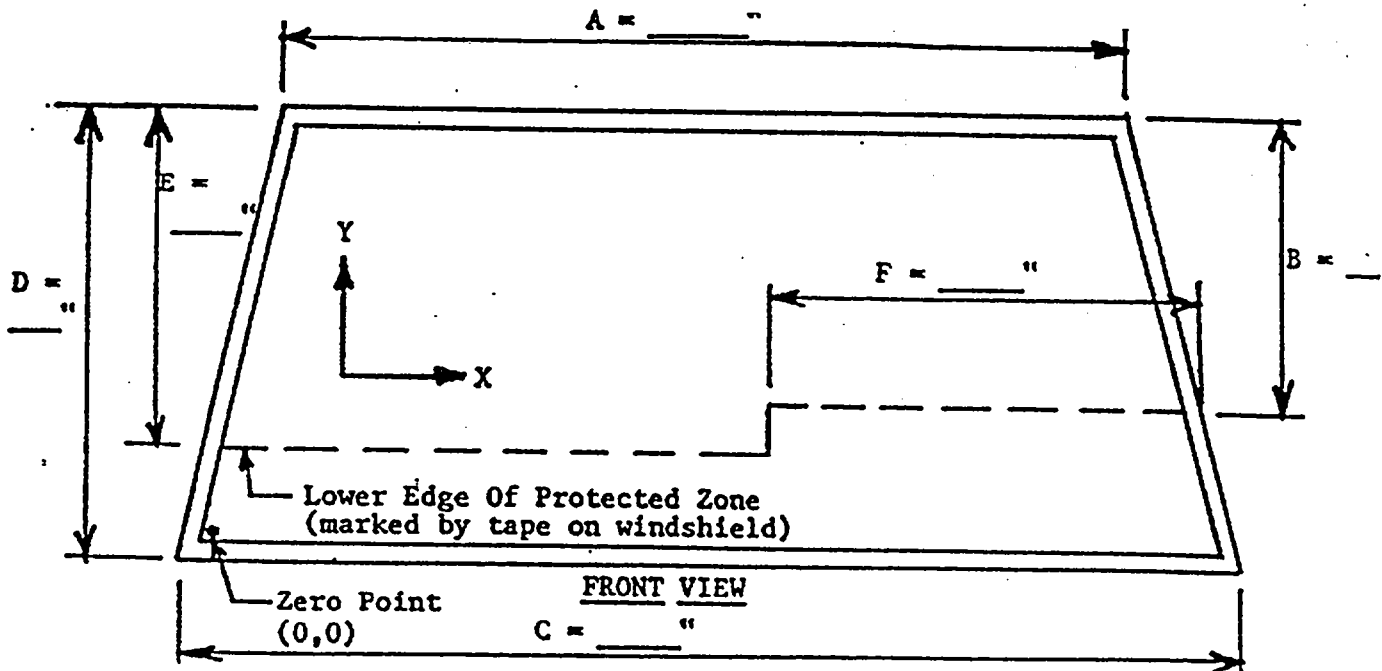
None

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.

FMVSS 219 TEST DATA:



DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":

(Show location of penetration on above sketch)

A = 44 in.

B = 16.5 in.

C = 59 in.

D = 28.3 in.

E = 20.4 in.

F = 28 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.: MM5401 TEST DATE: 1/17/91

VEHICLE MAKE/MODEL/BODY STYLE: 1991 Mazda Protege 4-Door Sedan

USABLE CAPACITY OF VEHICLE'S FUEL TANK: 14.5 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:

13.5 Gallons Which is 93.1 % 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:

No Solvent Spillage

*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

* Not Applicable - test not performed as per COTR

*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° -----	N/A	N/A	N/A	N/A

Solvent Spillage Location(s):

N/A

* Not Applicable - test not performed as per 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 Mazda Protege 4-Door Sedan

VEH. NHTSA NO.: MM5401 TEST DATE: 1/17/91

MAXIMUM ACCELERATION VALUES: (G'S)	DRIVER DUMMY #	PASSENGER DUMMY #
Head Channel X	54.8	36.2
Head Channel Y	14.1	18.6
Head Channel Z	52.8	56.9
HEAD RESULTANT	92.5	60.6
Chest Channel X	62.7	52.1
Chest Channel Y	9.5	15.6
Chest Channel Z	16.4	20.1
CHEST RESULTANT (CLIP)	57.4	51.0
TIME INTERVAL (msec)	$t_1=55.84$ $t_2=58.92$	$t_1=54.00$ $t_2=57.07$

HEAD INJURY CRITERIA (HIC) VALUES:

HIC	779.2	611.9
t_1 (msec)	60.6	59.7
t_2 (msec)	96.7	95.7
Avg. Accel. t_1 to t_2	54.2	49.3

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

MAXIMUM FEMUR FORCES:

Right Side (lbs.)	851	997
Left Side (lbs.)	1700	N/A*

MAXIMUM SEAT BELT FORCES:

Lap Belt (lbs.)	752	1038
Shoulder Belt (lbs.)	2697	2284

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)

* Not available - failure of umbilical cable strain relief.

HYBRID III NECK AND CHEST DATA SHEET *

VEHICLE YR./MAKE/MODEL/BODY STYLE: 1991 Mazda Protege 4-Door Sedan

VEHICLE NHTSA NO.: MM5401 TEST DATE: 1/17/91

MAXIMUM VALUES	DRIVER DUMMY # N/A *	PASSENGER DUMMY # N/A *
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	N/A	N/A

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.: MM5401 Vehicle: 1991 Mazda Protege 4-Door Sedan

SEAT TYPE:

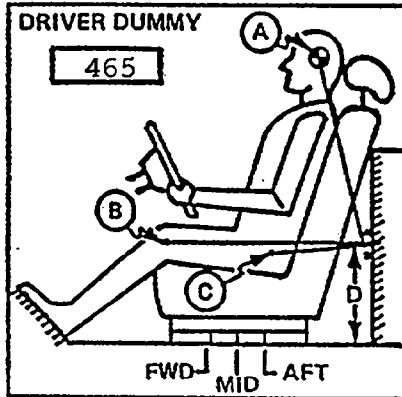
 Bench
 X Bucket

ADJUSTER TYPE:

 X Manual
 Power

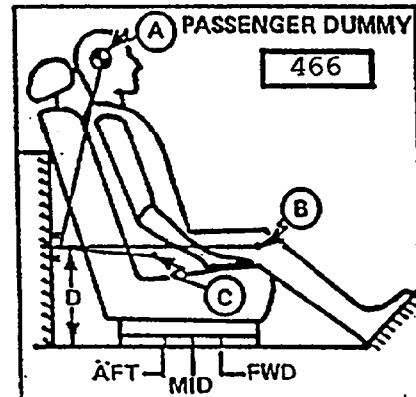
BUCKET SEAT BACK TYPE:

 Fixed
 X Adjustable Reclining



MEASUREMENT
LOCATION

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



A = 22 in. 6.5 Degrees

B = 22.3 in. 25.5 Degrees

C = 9 in. 0.3 Degrees

D = 12.3 in.

Seat notch rearward 11

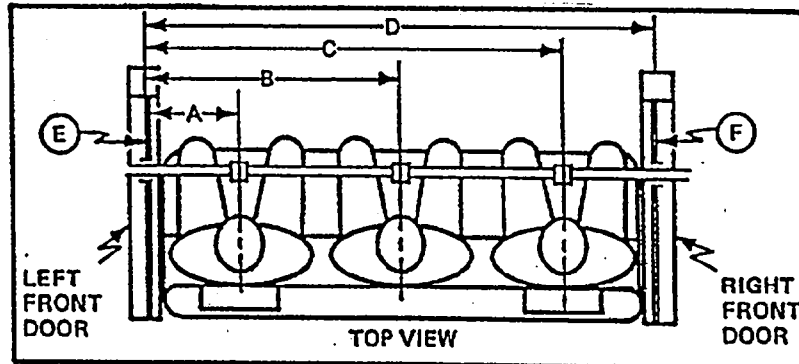
A = 21.9 in. 8.2 Degrees

B = 21.8 in. 16.5 Degrees

C = 8.4 in. 2.3 Degrees

D = 12.3 in.

Seat notch rearward 11



A = Left Door to Driver Centerline DUMMY ID 15.5 in.

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

C = Left Door to Right Passenger Centerline 41.3 in.

D = Left Door to Right Door 57 in.

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

OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	13.1	13.3
HW	18.5	18.5
CD	22.5	20.6
CS	13.5	N/A
KDL	4.9	5.3
KDR	5.0	5.5
SA	*	*
TA	14.6	18.4
HSW	17.5	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

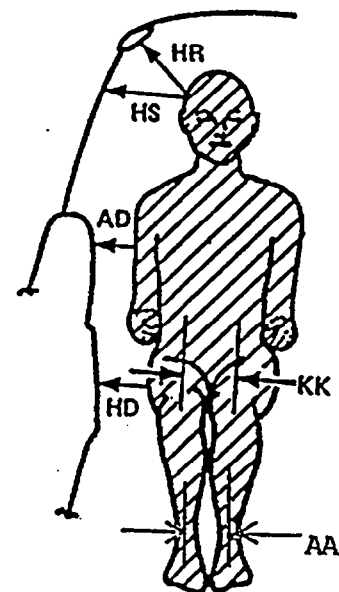
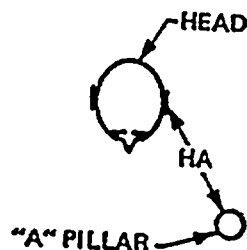
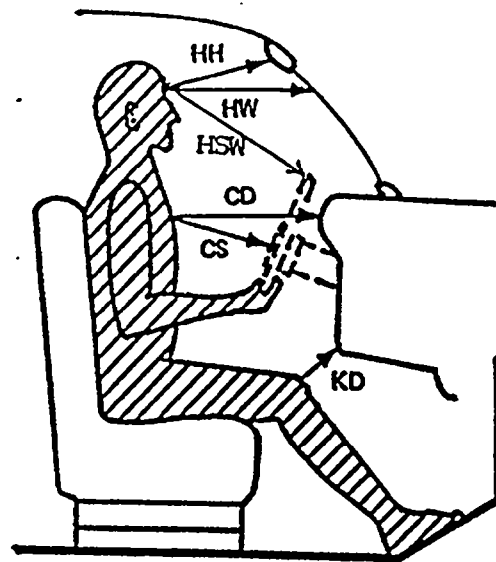
HS =Head to Side Window

AD = Arm to Door

HD = Hip to Door

KK = Knee to Knee

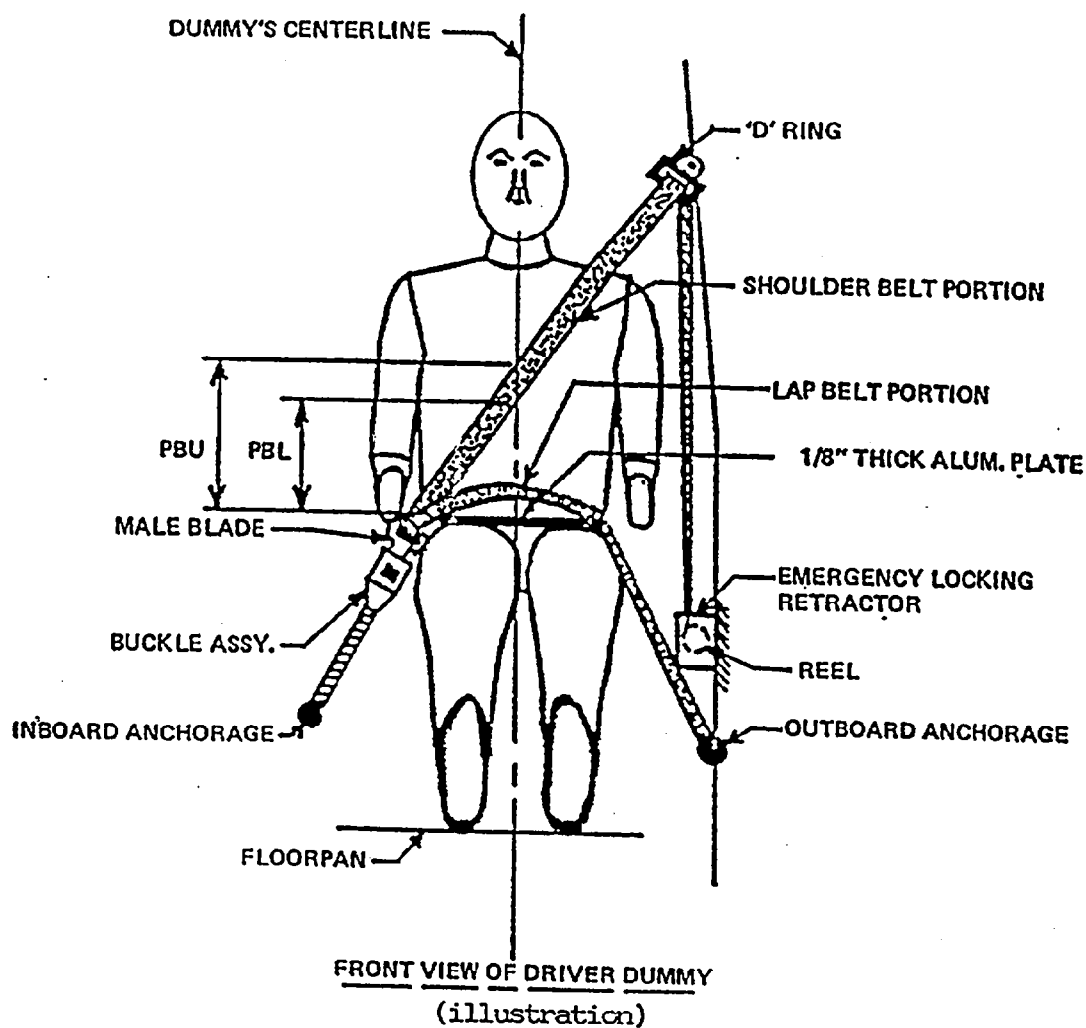
AA = Ankle to Ankle



	DRIVER	PASSENGER
HR	6.1	5.8
HS	8.5	11.6
AD	4.8	5.0
HD	7.1	7.0
KK	14.6	12.1
HA	13.6	16.3
AA	15.6	11.9

* Adjusted to manufacturer's specifications

SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
PBU -- Top surface of alum. plate to upper edge (inches)	12.0	13.4
PBL -- Top surface of alum. plate to belt lower edge (inches)	9.25	10.5

LAP BELT TENSION (lbs.)	N/A	N/A
SHOULDER BELT TENSION (lbs.)	N/A	N/A

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>N/A</u>	<u>N/A</u>
Shoulder belt length as measured on Part 572 dummy.	<u>38.5"</u>	<u>40"</u>
Lap belt length as measured on Part 572 dummy.	<u>32.3"</u>	<u>32.1"</u>

SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis	<u>2.0"</u>	<u>1.6"</u>
As determined mechanically	<u>N/A</u>	<u>N/A</u>
As determined electronically	<u>N/A</u>	<u>N/A</u>

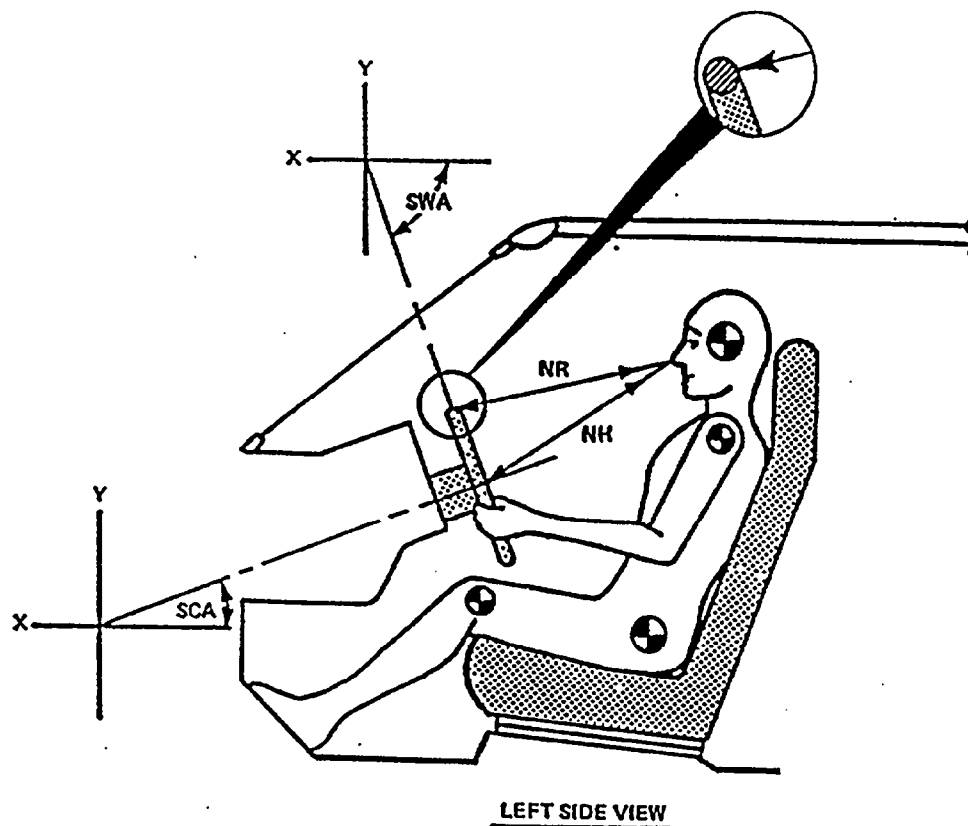
BELT STRETCH DATA:

Measured electronically between shoulder belt load cell and the "D" ring.	<u>0.2"</u>	<u>0.1"</u>
Measured mechanically.	<u>0"</u>	<u>0"</u>

RETRACTOR LOCK-UP TIME:

As determined by shoulder belt spool-off.	<u>61.1 msec</u>	<u>62.4 msec</u>
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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	15.6	inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	16.9	inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	22.9	degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	67.1	degrees

CAMERA LOCATIONS

VEH. NHTSA NO.: MM5401 ; TEST DATE: 1/17/91 ; TIME: 6:22 PMVEH. YEAR/MAKE/MODEL/BODY STYLE: 1991 Mazda Protege 4 Door Sedan

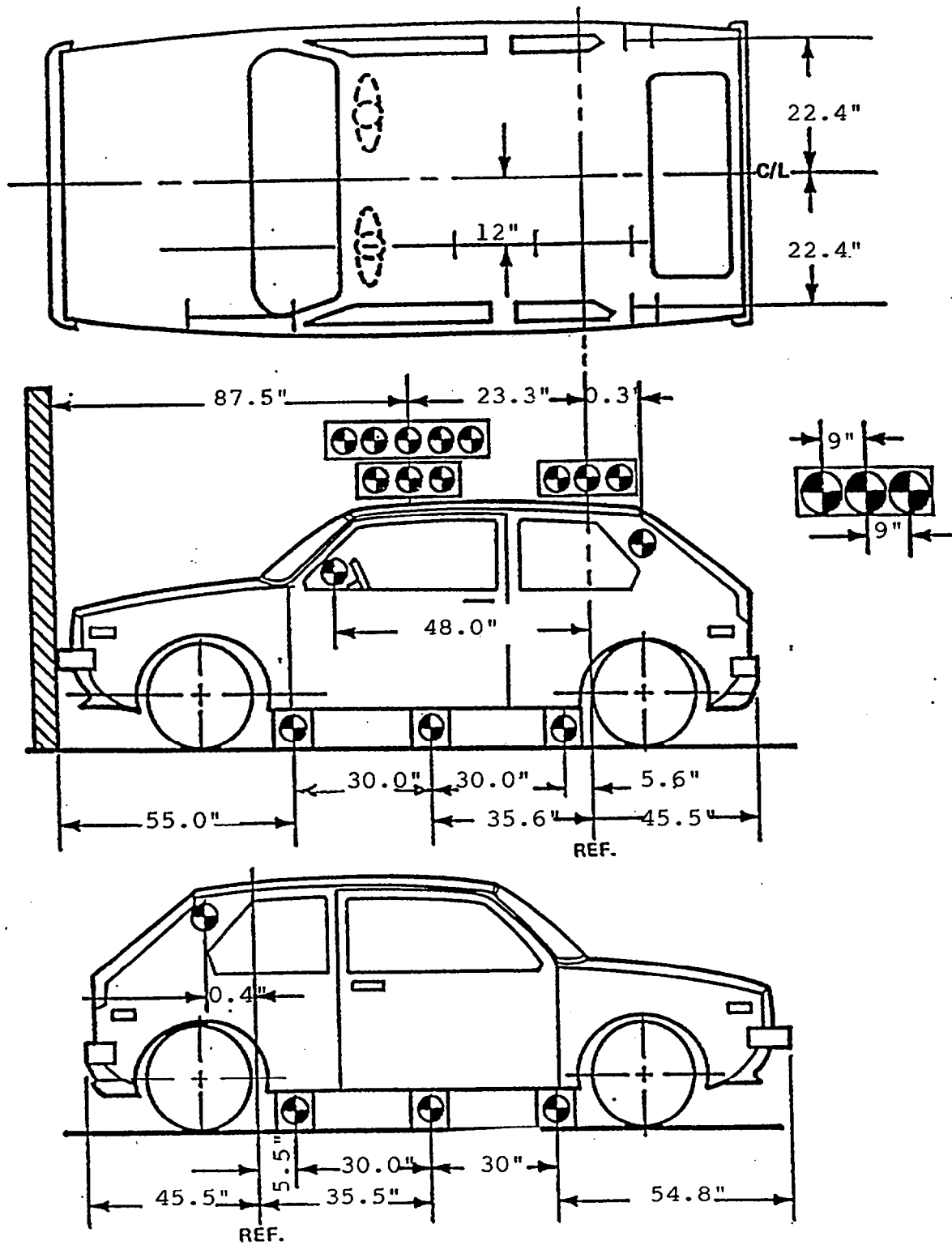
CAMERA NO.	VIEW	CAMERA POSITIONS (in.)*			ANGLE (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Left Side View	291	391	70	70	N/A	10	24
2	Right Side View	86	332	41	90	319	13	1000
3	Left Side View	391	372	39	90	358	35	1000
4	Overhead	38	0	152	N/A	N/A	7.5	500
5	Pit-Engine	36	0	-114	N/A	N/A	13	1000
6	Pit-Fuel Tank	108	0	-122	N/A	N/A	13	1000
7	Front-Passenger	-7	-15	89	40	N/A	13	500
8	Front-Driver	-7	13	89	N/A	N/A	13	500
9	Left Side-Driver	236	196	48	35	N/A	50	1000
10	Right Side-Passenger	236	194	49	N/A	N/A	50	1000
11	Right Side-"A" Post	45	116	35	90	102	13	1000
12	Left Side-"A" Post	59	106	35	90	102	13	1000
13	Onboard-Left Side	N/A	N/A	N/A	N/A	N/A	13	1000
14	Onboard-Right Side	N/A	N/A	N/A	N/A	N/A	13	1000
15	Left Side-Steering Col.	76	270	61	90	256	25	1000
16	Left Side-Steering Col.	76	270	40	90	256	25	1000
17	Right Side-Passenger	61	248	40	90	234	25	1000

*X = film plane to monorail centerline

Y = film plane to barrier face

Z = film plane to ground

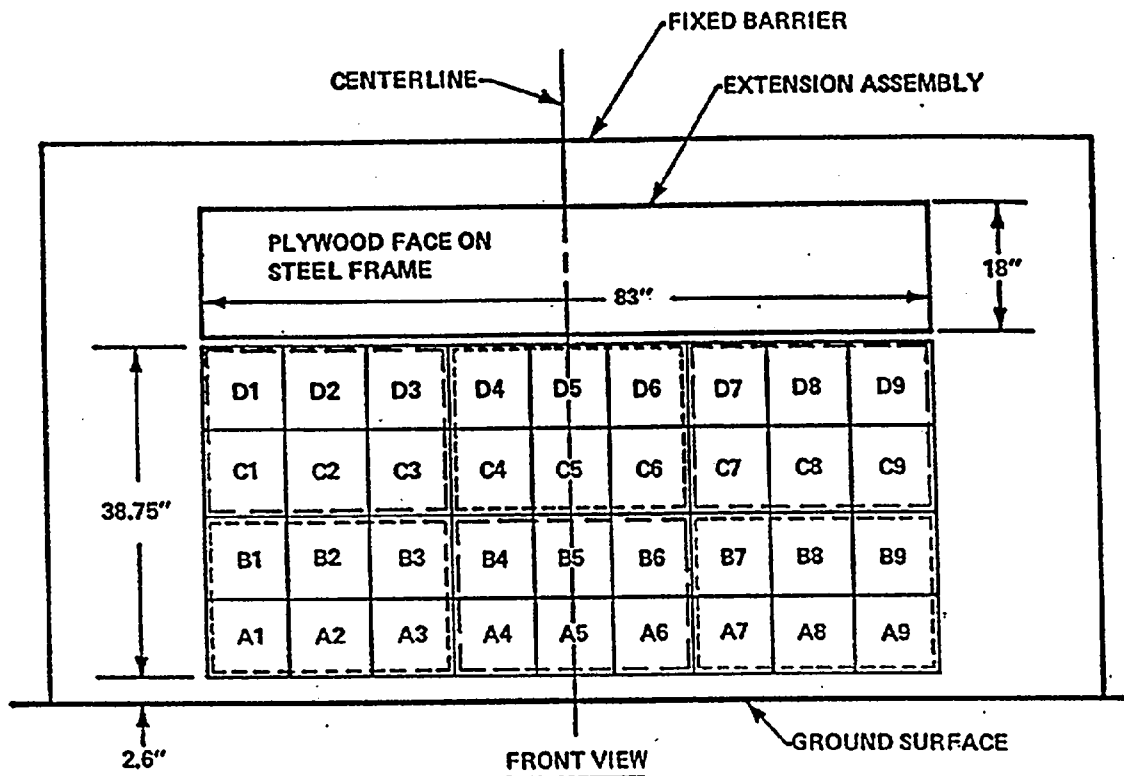
VEHICLE TARGET LOCATIONS



(DIMENSIONS IN INCHES)

LOAD CELL LOCATIONS ON FIXED BARRIER

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



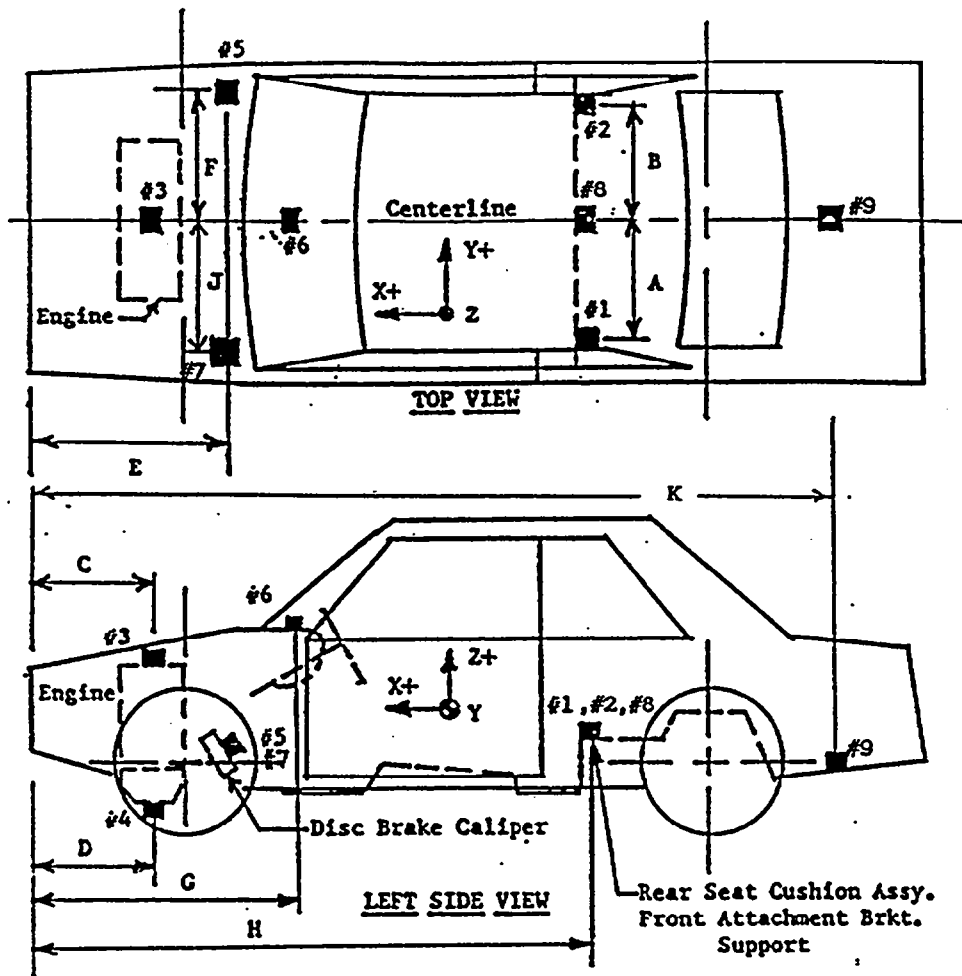
NOTE: MGA Load Cell 1 = A1-B3 MGA Load Cell 4 = C1-D3
 MGA Load Cell 2 = A4-B6 MGA Load Cell 5 = C4-D6
 MGA Load Cell 3 = A7-B9 MGA Load Cell 6 = C7-D9

The following data is presented in Appendix B:

- (1) Data from 36 individual load cells
- (2) Total or sum of 36 individual load cells
- (3) Data from 6 Groupings shown above (6 cells/group)
- (4) Total load vs. vehicle dynamic crush

* 36 load cell not used

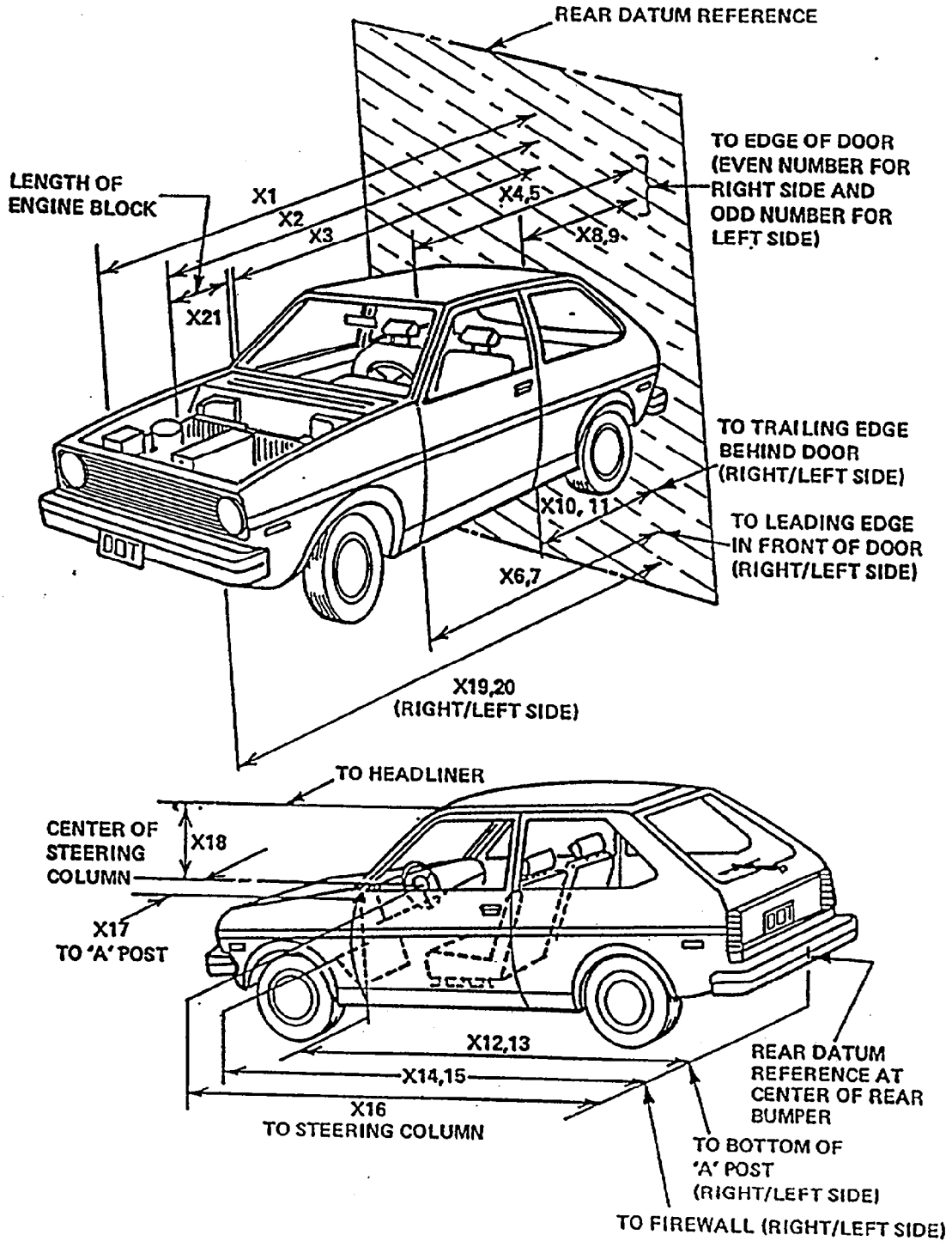
VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY



Dimension	Length (in.)	ACCELEROMETER NUMBER *	ACCELEROMETER LOCATION	DIRECTION
A	18.0	1	Left Rear Seat Crossmember	X
B	18.0	2	Right Rear Seat Crossmember	X
C	31.0	3	Top of Engine	X
D	20.5	4	Bottom of Engine	X
E	27.7	5	Right Disc Brake Caliper	X
F	22.8	6	Instrument Panel	X
G	45.1	7	Left Disc Brake Caliper	X
H	43.4	8	Center Rear Crossmember	Z
J	22.8	9	Vehicle Rear	Z
K	152.0			

*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	165.7	145.2	20.5
X2	Rear Surface of Vehicle to Front of Engine	146	135.7	10.3
X3	Rear Surface of Vehicle to Firewall	127.5	U/L	N/A
X4	Rear Surface to Upr. Leading Edge of RT Door	111.5	111.3	0.2
X5	Rear Surface to Upr. Leading Edge of Left Door	111.7	111.1	0.6
X6	Rear Surface to Lwr. Leading Edge of RT Door	112.5	112.3	0.2
X7	Rear Surface to Lwr. Leading Edge of Left Door	113.0	112.2	0.8
X8	Rear Surface to Upr. Trailing Edge of RT Door	73.5	73.5	0.0
X9	Rear Surface to Upr. Trailing Edge of LFT Door	73.6	73.0	0.6
X10	Rear Surface to Lwr. Trailing Edge of RT Door	73.2	73.1	0.1
X11	Rear Surface to Lwr. Trailing Edge of LFT Door	73.5	72.9	0.6
X12	Rear Surface to Bottom of "A" Post on RT Side	113.0	112.9	0.1
X13	Rear Surface to Bottom of "A" Post on LFT Side	113.0	112.3	0.7
X14	Rear Surface to Firewall on Right Side	123.2	U/L	N/A
X15	Rear Surface to Firewall on Left Side	123.2	121.2	2.0
X16	Rear Surface to Steering Column	95.5	95.5	0.0
X17	Center of Steering Column to "A" Post	17.7	17.3	0.4
X18	Center of Steering Column to Headlining	17.1	16.1	1.0
X19	Rear Surface to Right Side of Front Bumper	160.7	140.5	20.2
X20	Rear Surface to Left Side of Front Bumper	161.7	143.1	18.6
X21	Length of Engine Block	15.0	15.0	0.0

U/L - unable to locate due to crush of vehicle

ACCIDENT INVESTIGATION DIVISION DATA

FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: Mazda Protege 4-Door Sedan

VEH. NHTSA NO.: MM5401 ; VIN: JM1BG2242M0223985

MODEL YEAR: 1991 ; BUILD DATE: 9/90 ; TEST DATE: 1/17/91

VEH. SIZE CATEGORY: MINI ; TEST WEIGHT: 2836

VEH. WHEELBASE: 98.4" ; FRONT OVERHANG: 27.6 ; OVERALL WIDTH: 50.5"

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: 35.5 mph ; TIME OF SEPARATION: 0.076 sec.

VELOCITY CHANGE: 42.2 mph

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:

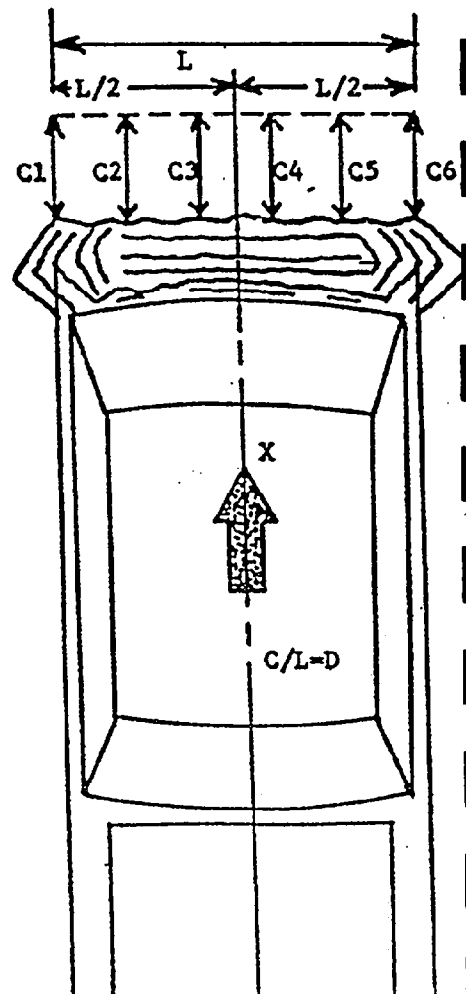
F (Frontal)

CRUSH DEPTH	C1 =	<u>20.2</u>	<u>inches</u>
DIMENSIONS:	C2 =	<u>19.3</u>	<u>inches</u>
	C3 =	<u>N/A*</u>	<u>inches</u>
	C4 =	<u>N/A*</u>	<u>inches</u>
	C5 =	<u>17.1</u>	<u>inches</u>
	C6 =	<u>18.6</u>	<u>inches</u>

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

LENGTH OF DAMAGED REGION: L = 50.5 inches

* Unable to locate measurement points after test to obtain crush dimensions



APPENDIX A
PHOTOGRAPHS

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Photo No. 4 - Post Test Left Side View	A-5
Photo No. 5 - Pre-Test Right Side View	A-6
Photo No. 6 - Post Test Right Side View	A-7
Photo No. 7 - Pre-Test Right Front Three Quarter View	A-8
Photo No. 8 - Post Test Right Front Three-Quarter View	A-9
Photo No. 9 - Pre-Test Left Rear Three-Quarter View	A-10
Photo No. 10 - Post-Test Left Rear Three-Quarter View	A-11
Photo No. 11 - Post Test Top View (Vehicle on Rollover Machine)	A-12
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Photo No. 16 - Pre-Test Fuel Filler Cap View	A-17
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Photo No. 18 - Post Test Front Underbody View	A-19
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Photo No. 23 - Pre-Test Passenger Dummy Position View	A-25
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Photo No. 27 - Post Test Driver Dummy & Vehicle Interior View (Door Open)	A-29
Photo No. 28 - Pre-Test Passenger Dummy & Vehicle Interior View (Door Open)	A-30
Photo No. 29 - Post Test Passenger Dummy & Vehicle Interior View (Door Open)	A-31
Photo No. 30 - Restraint System Problem Area View (if required)	A-32
Photo No. 31 - Post Test Driver Dummy Head Contact Area	A-33
Photo No. 32 - Post Test Steering Column Hub/Rim Contact	A-34
Photo No. 33 - Post Test Passenger Dummy Head/Knee Contact	A-35
Photo No. 34 - Post Test Passenger Dummy Head/IP Contact Area	A-36

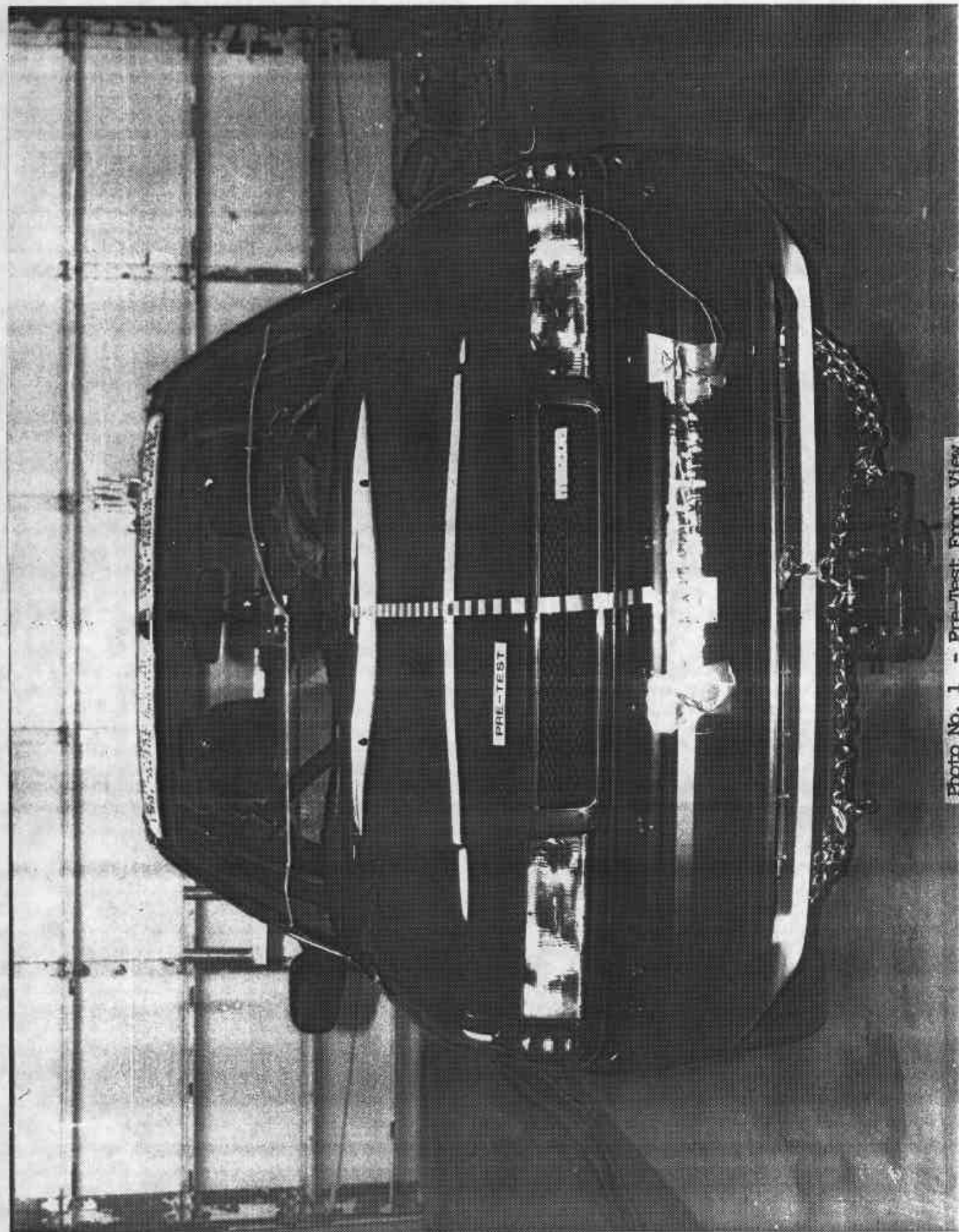


Photo No. 1 - Pre-Test Front View

Photo No. 2 - Post-Test Front View

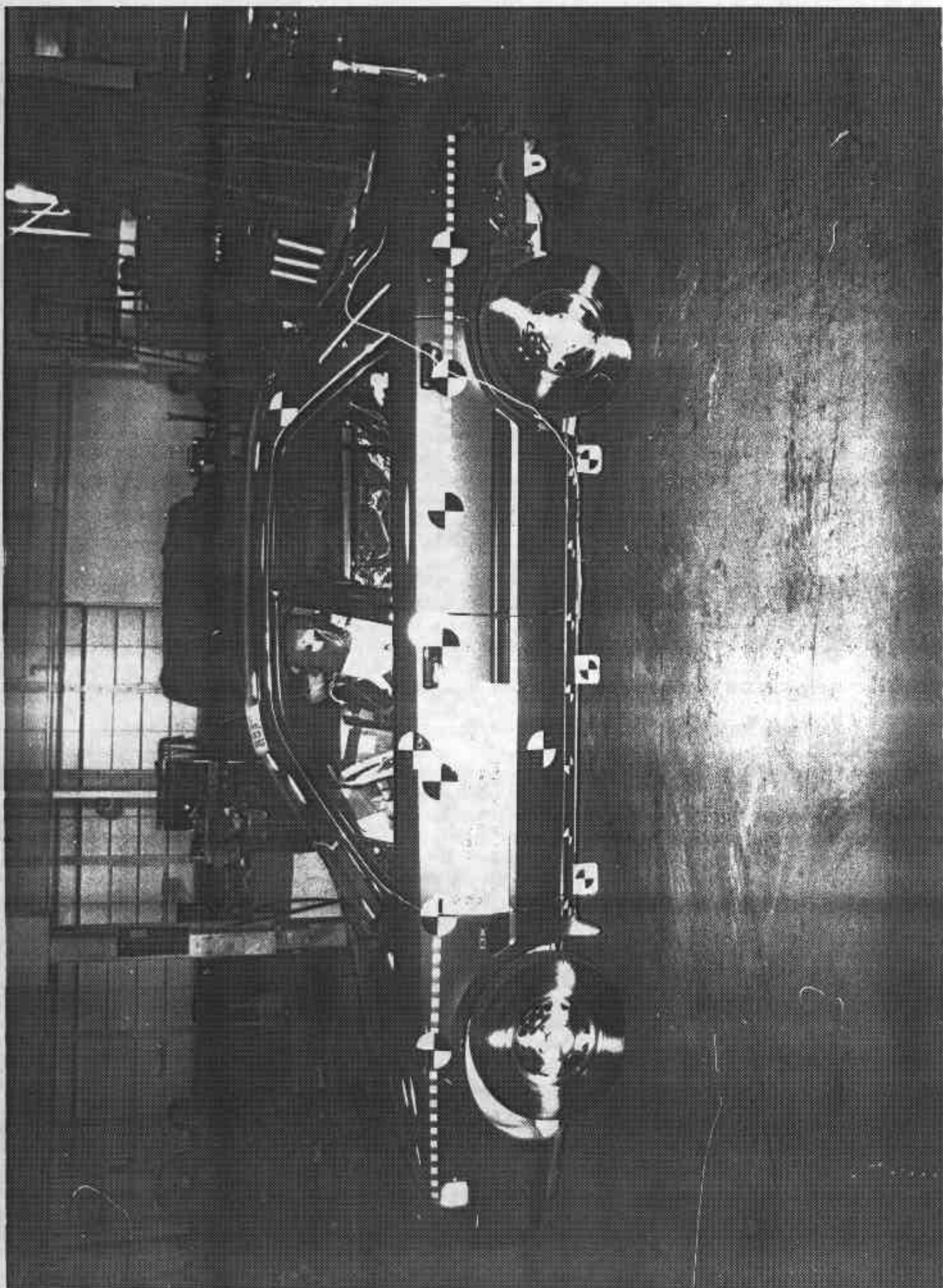


Photo No. 3 - Pre-Test Left Side View

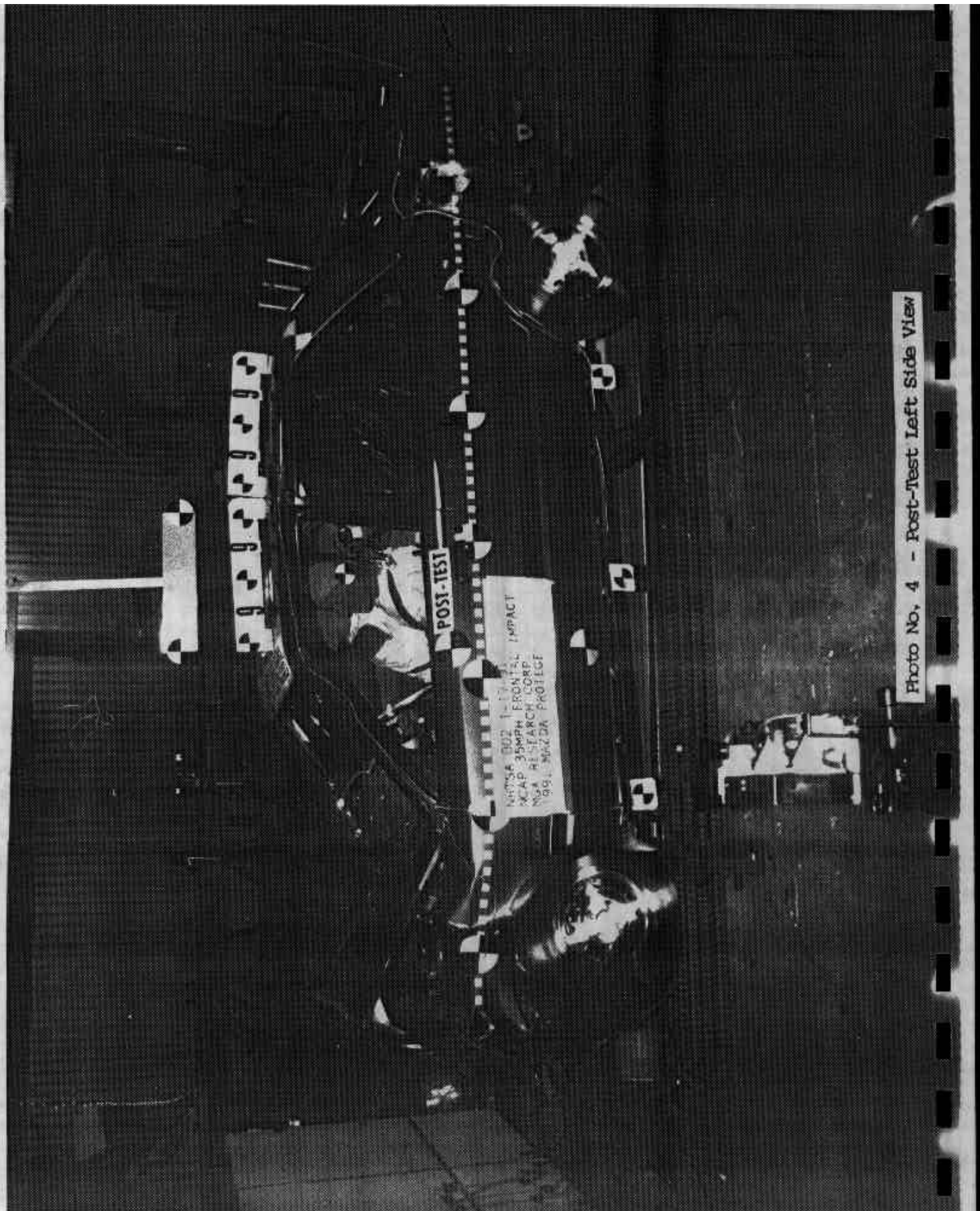


Photo No. 4 - Post-Test Left Side View

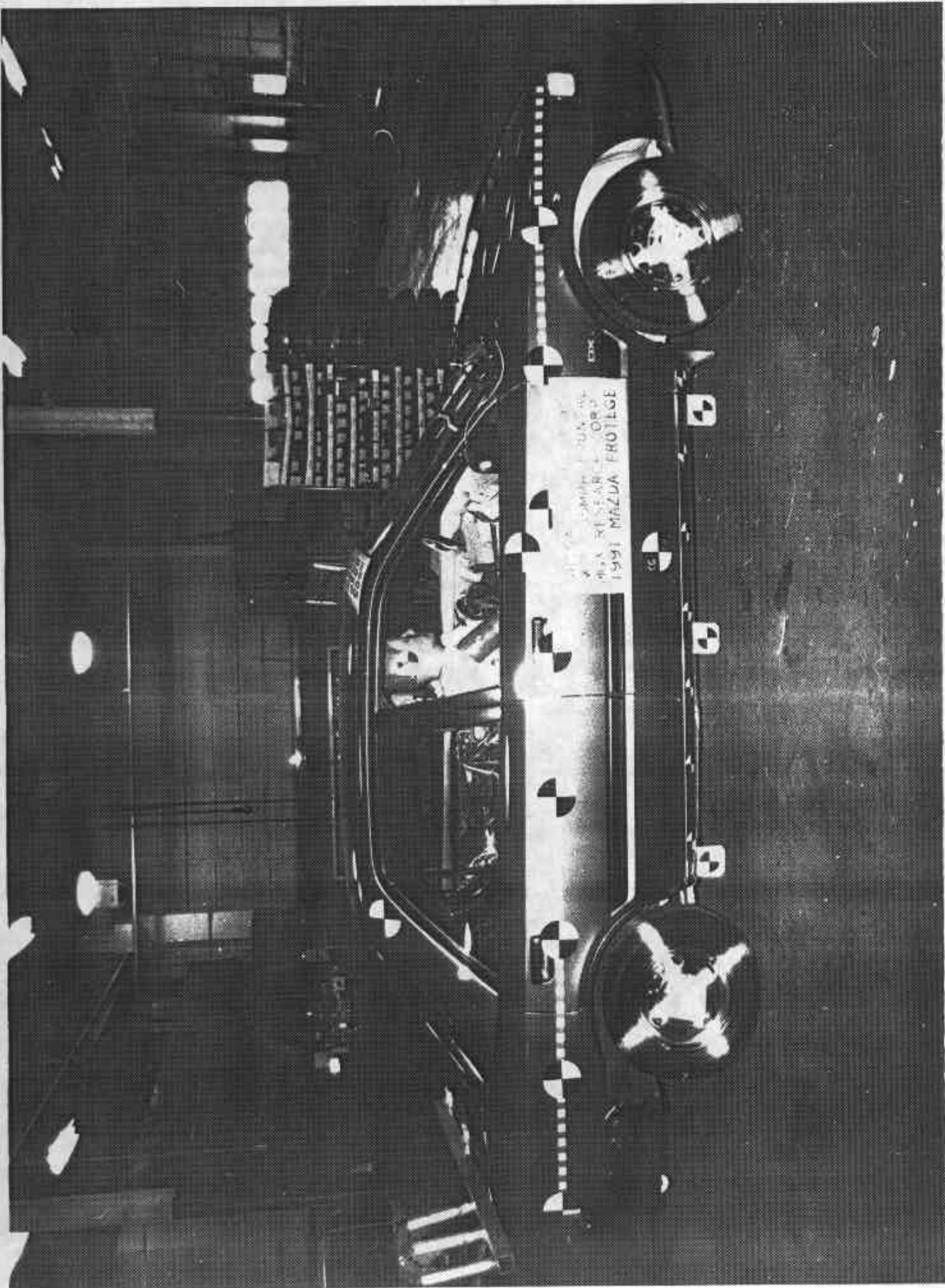


Photo No. 5 - Pre-Test Right Side View

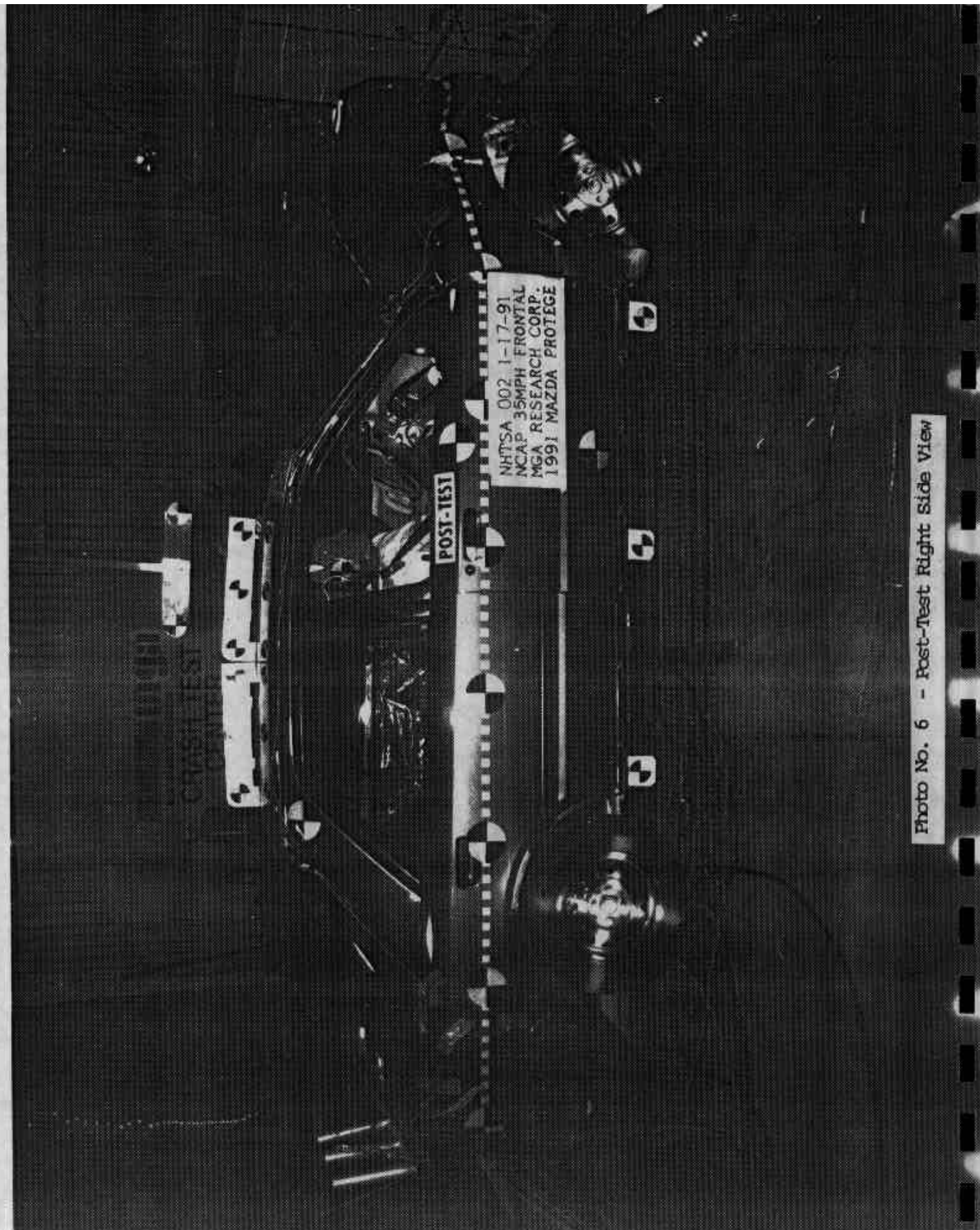
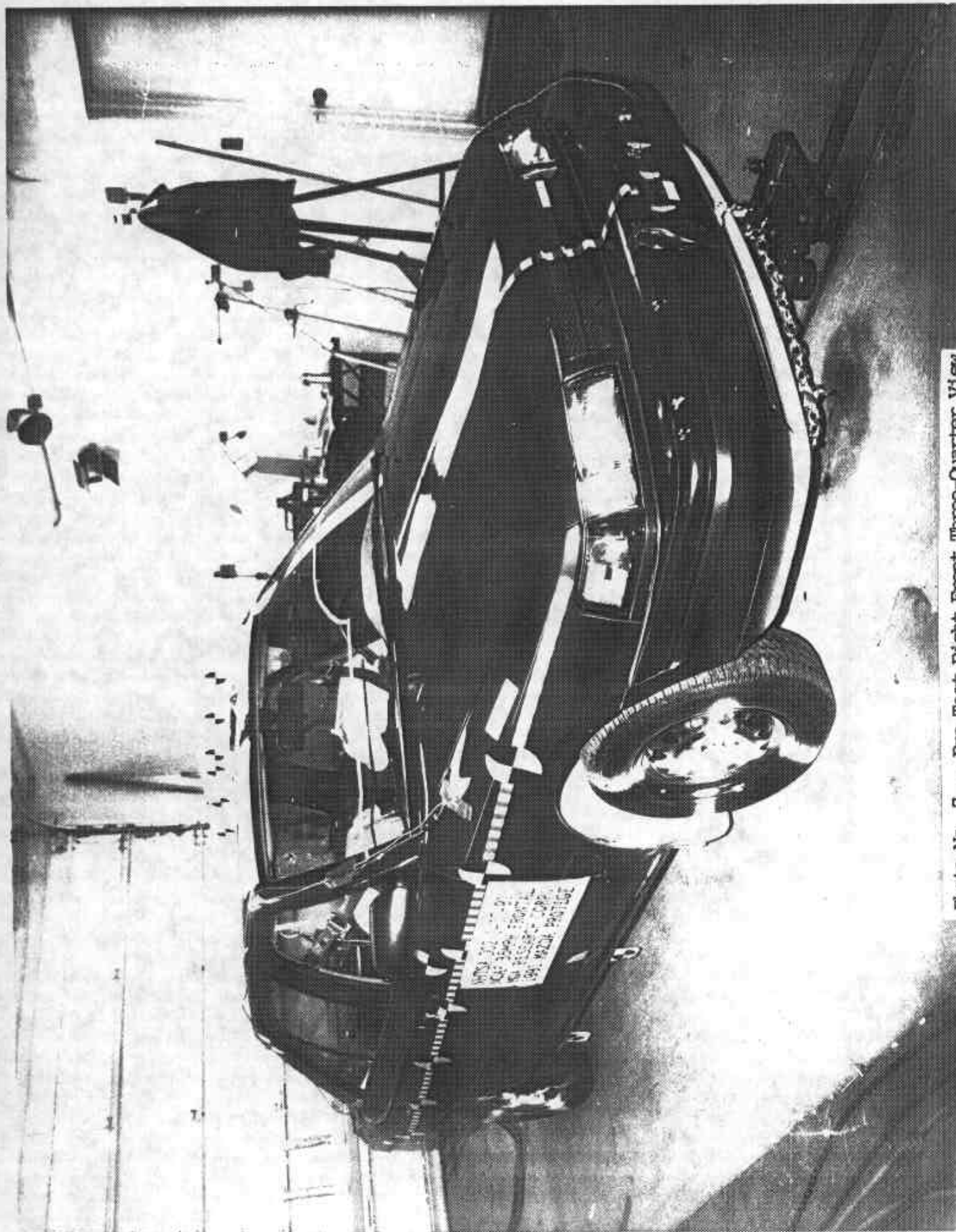


Photo No. 6 - Post-Test Right Side View

Photo No. 7 - Dem-Met Bight Event Three-Quarter View



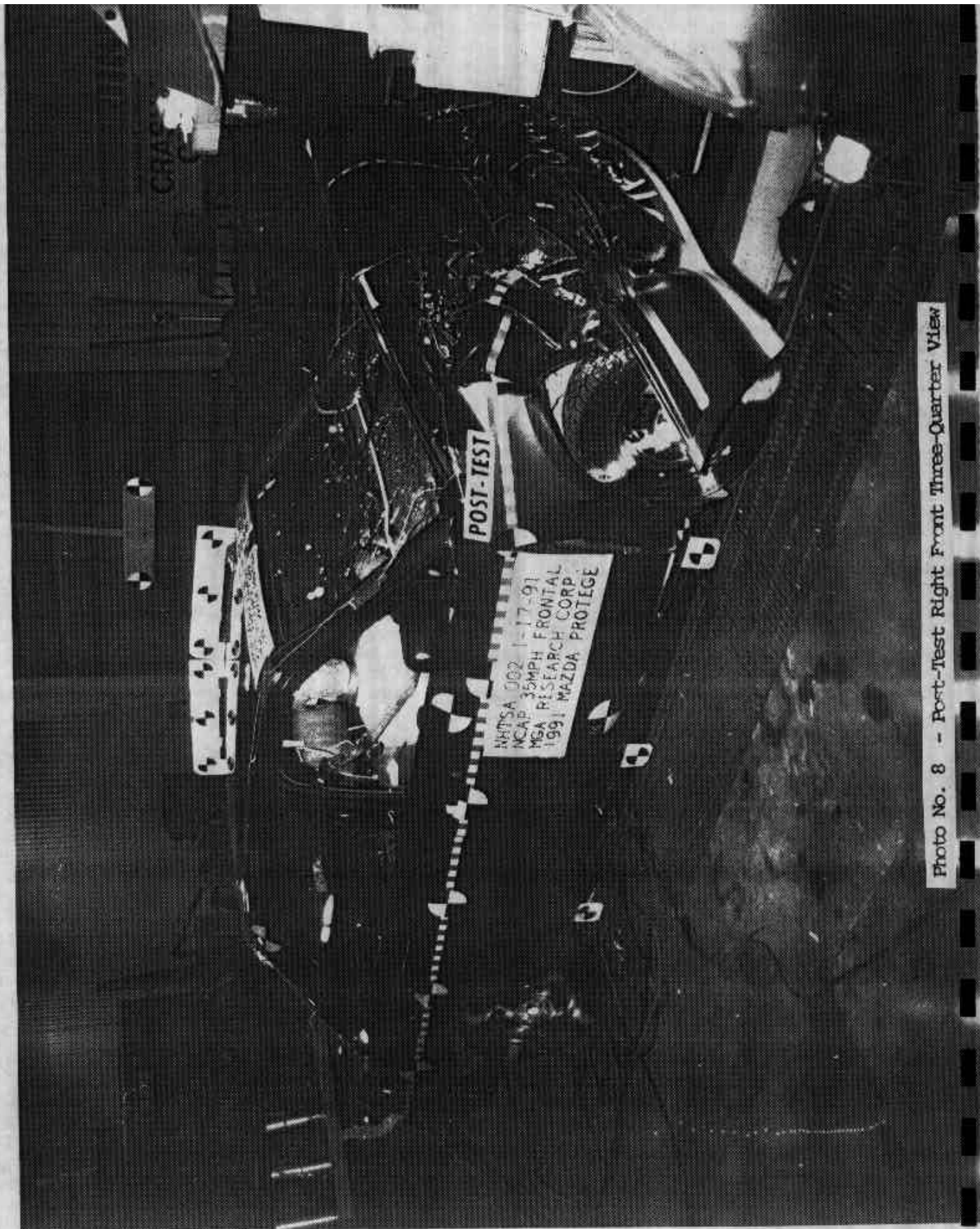


Photo No. 8 - Post-Test Right Front Three-Quarter View

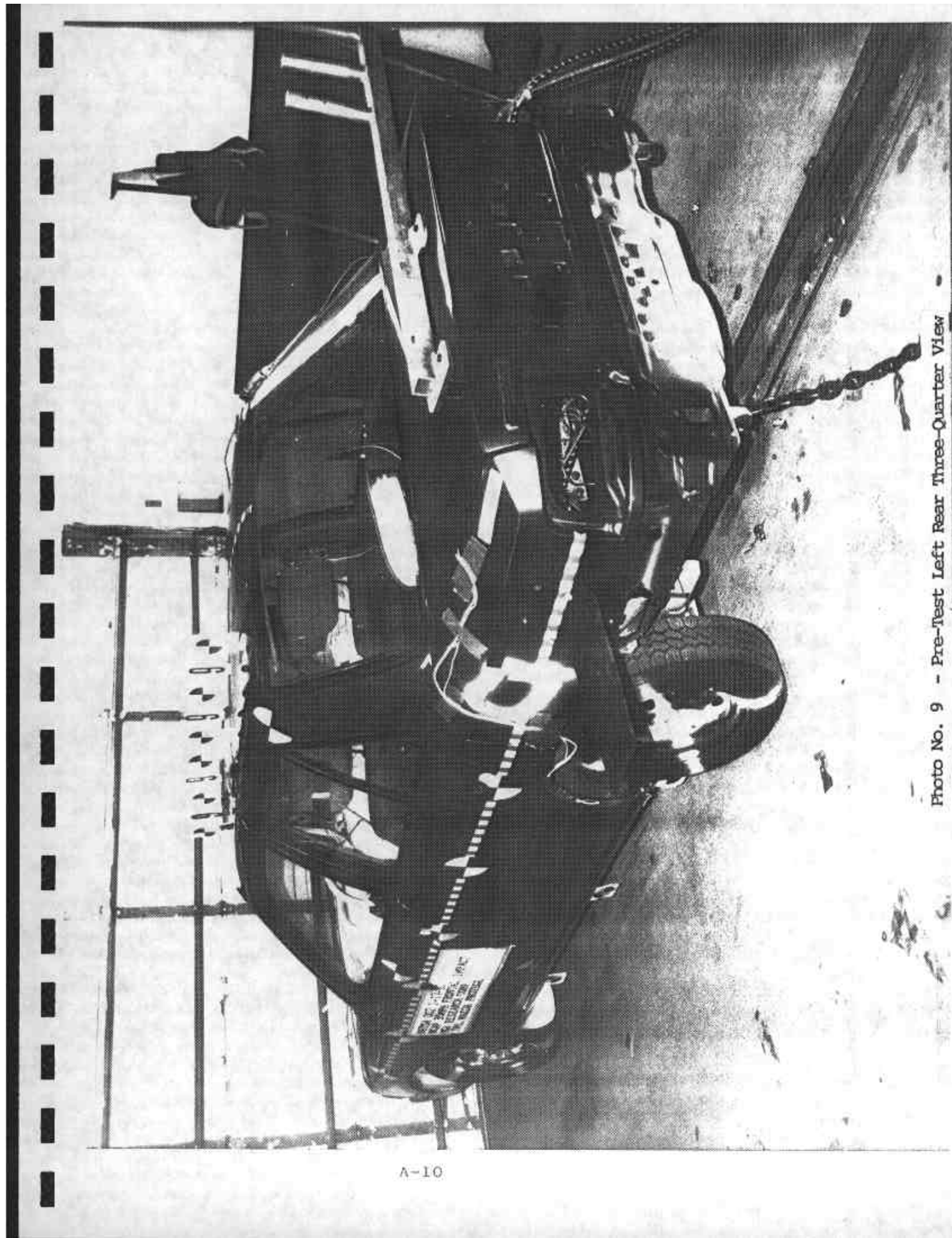


Photo No. 9 - Pre-Test Left Rear Three-Quarter View

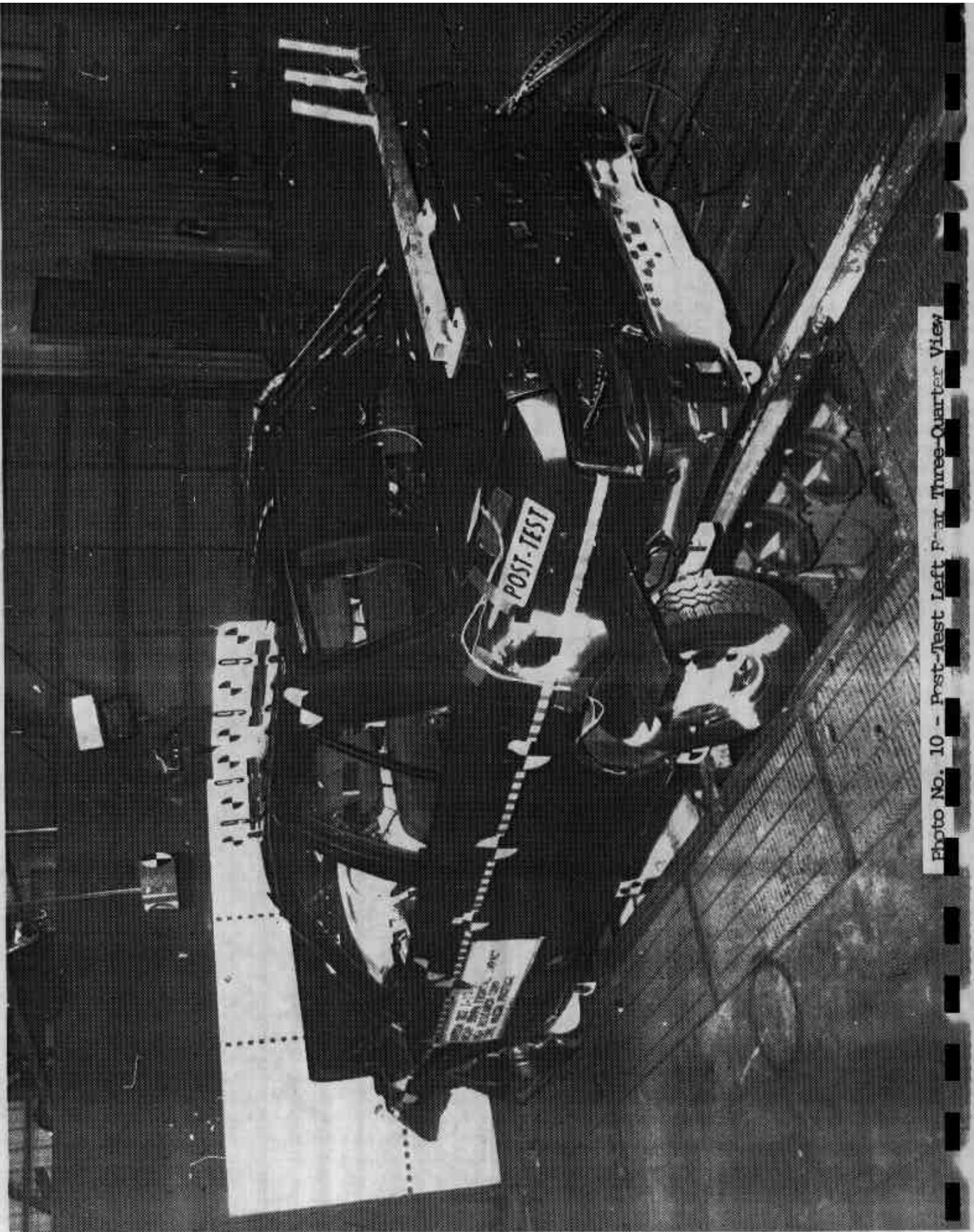


Photo No. 10 - Post-Test Left Rear Three-Quarter View

PHOTOGRAPH NOT AVAILABLE

NO VEHICLE ROLLOVER

PHOTO. NO. 11 - Post-Test Top View

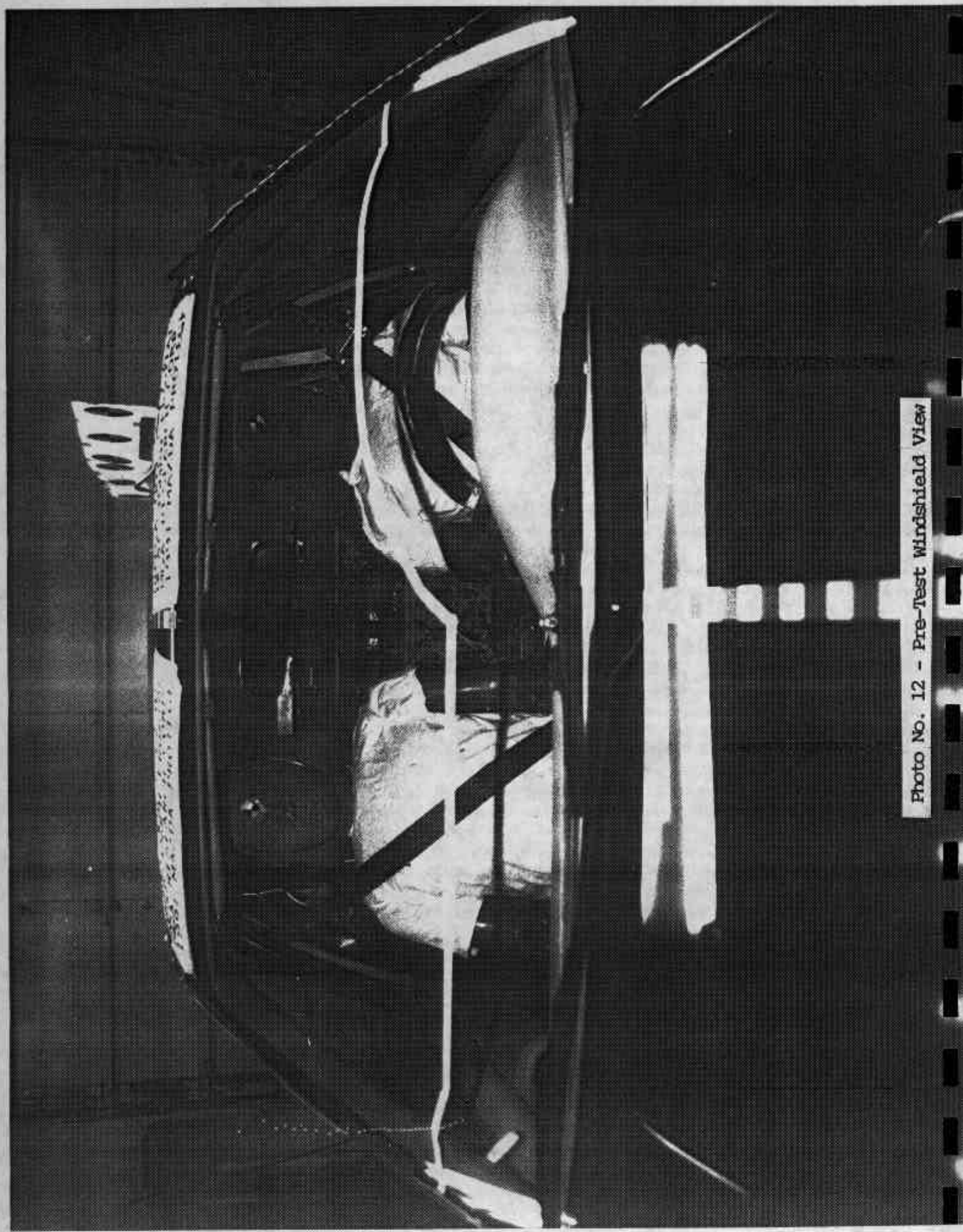
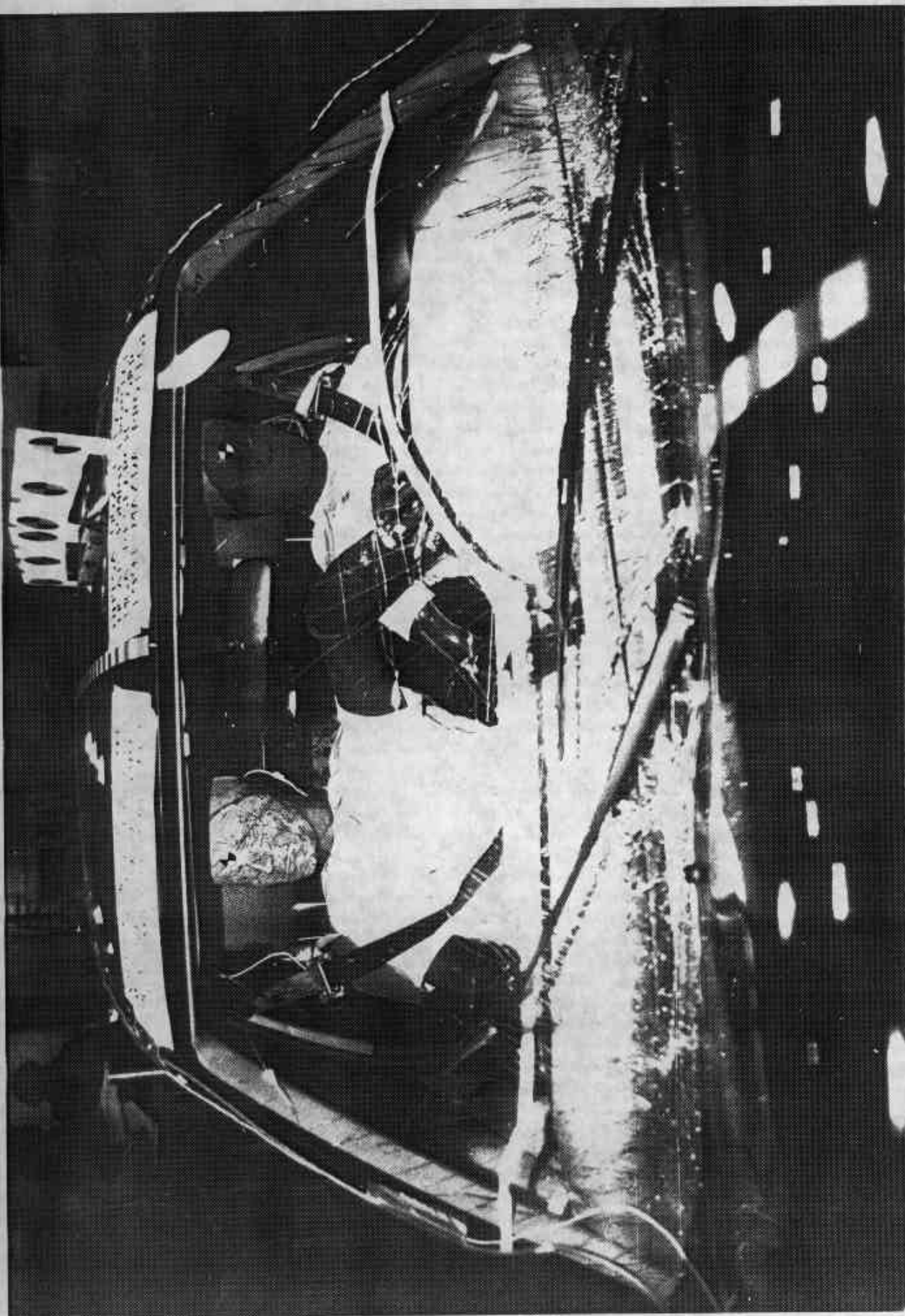


Photo No. 12 - Pre-Test Windshield View



A-14

Photo No. 13 - Post-Test Windshield View

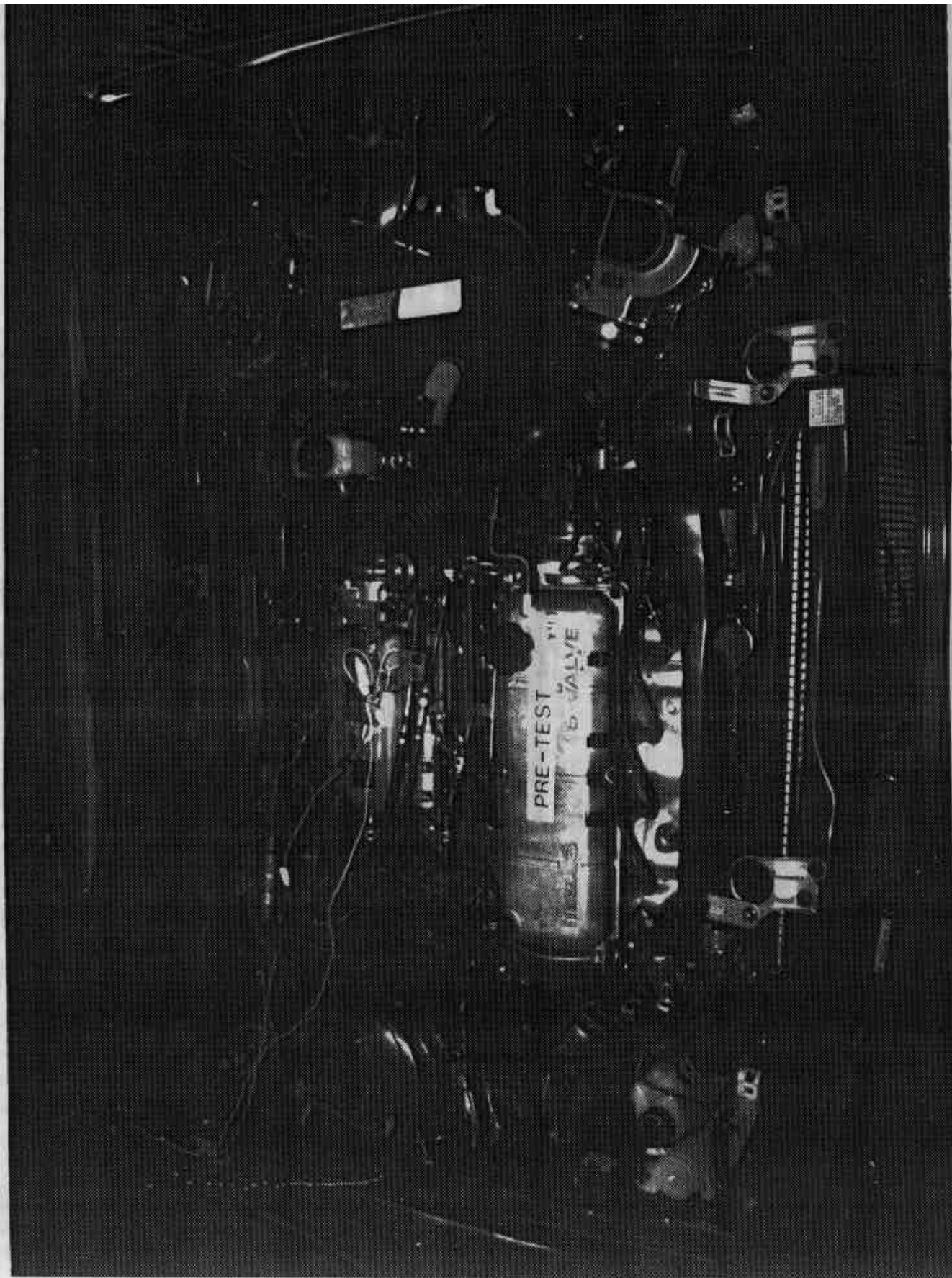


Photo No. 14 - Pre-Test Engine Compartment View

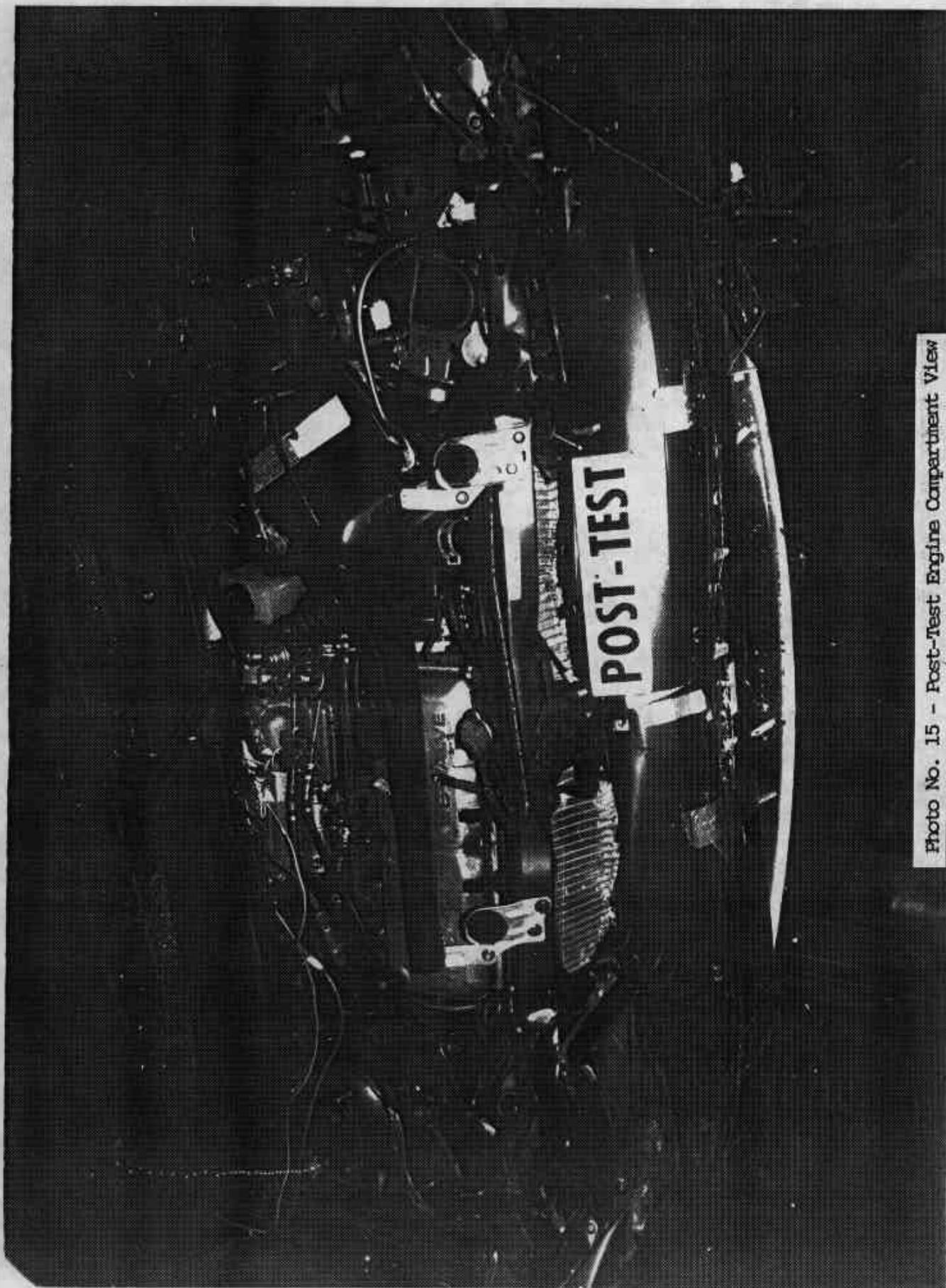


Photo No. 15 - Post-Test Engine Compartment View

PRE-TEST

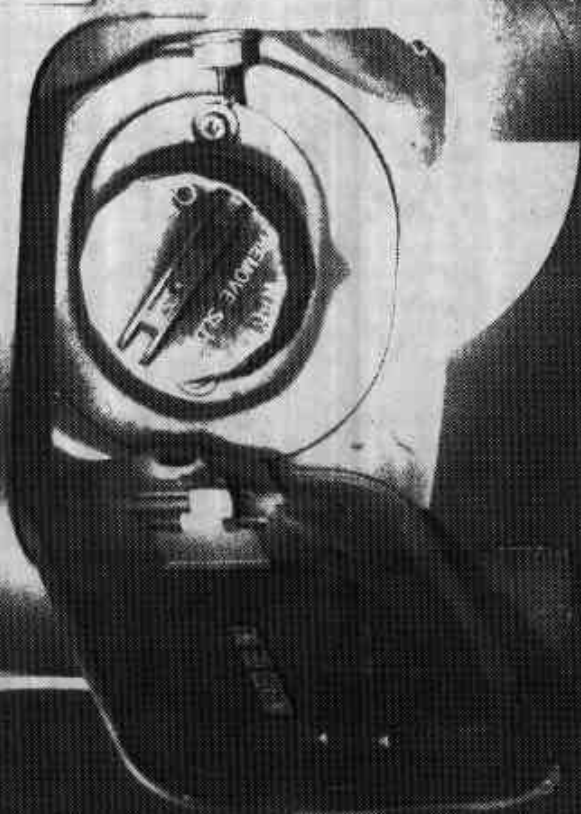
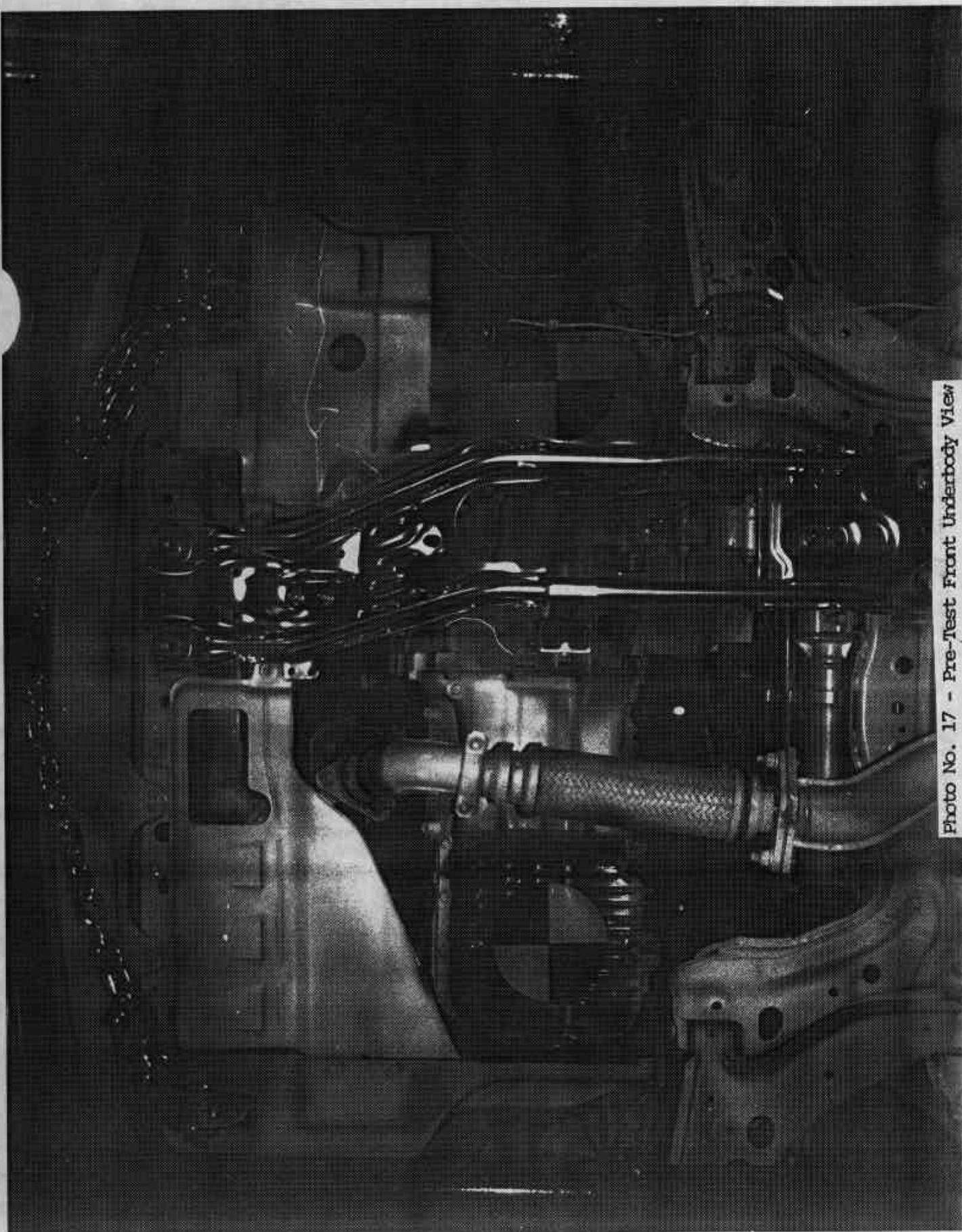


Photo No. 16 - Pre-Test Fuel Filler Cap View

Photo No. 17 - Pre-Test Front Underbody View



POST-TEST

NHTSA 002 1-17-91
NCAP 35MPH FRONTAL
MGA RESEARCH CORP.
1991 MAZDA PROTEGE

Photo No. 18 - Post-Test Front Underbody View

Photo No. 19 - (a) Pre-Test Rear Underbody View

Photo No. 19 - (b) Pre-Test Rear Underbody View

A-21

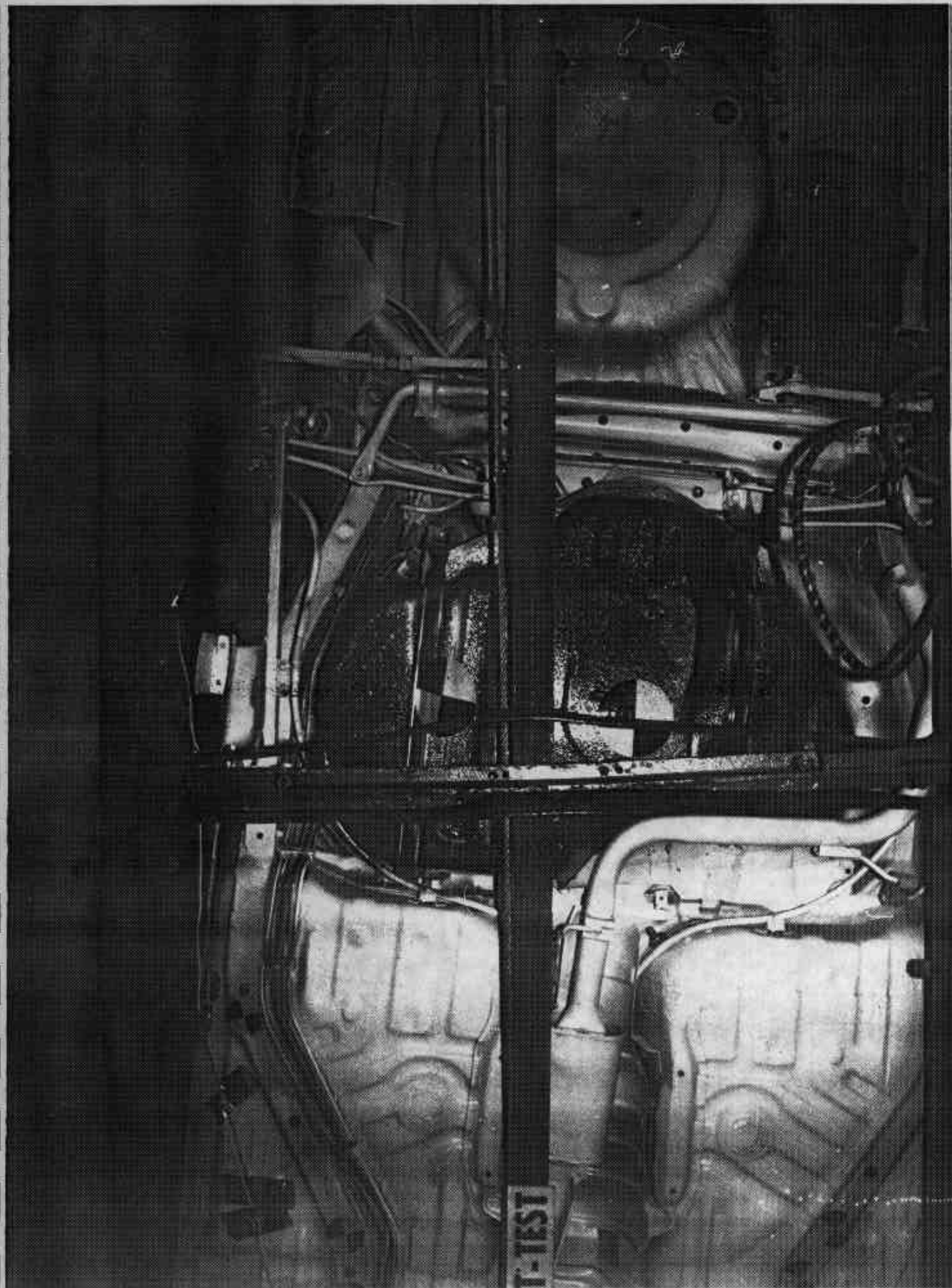


Photo No. 20 - Post-Test Rear Underbody View

1-17-91

NHTSA 002

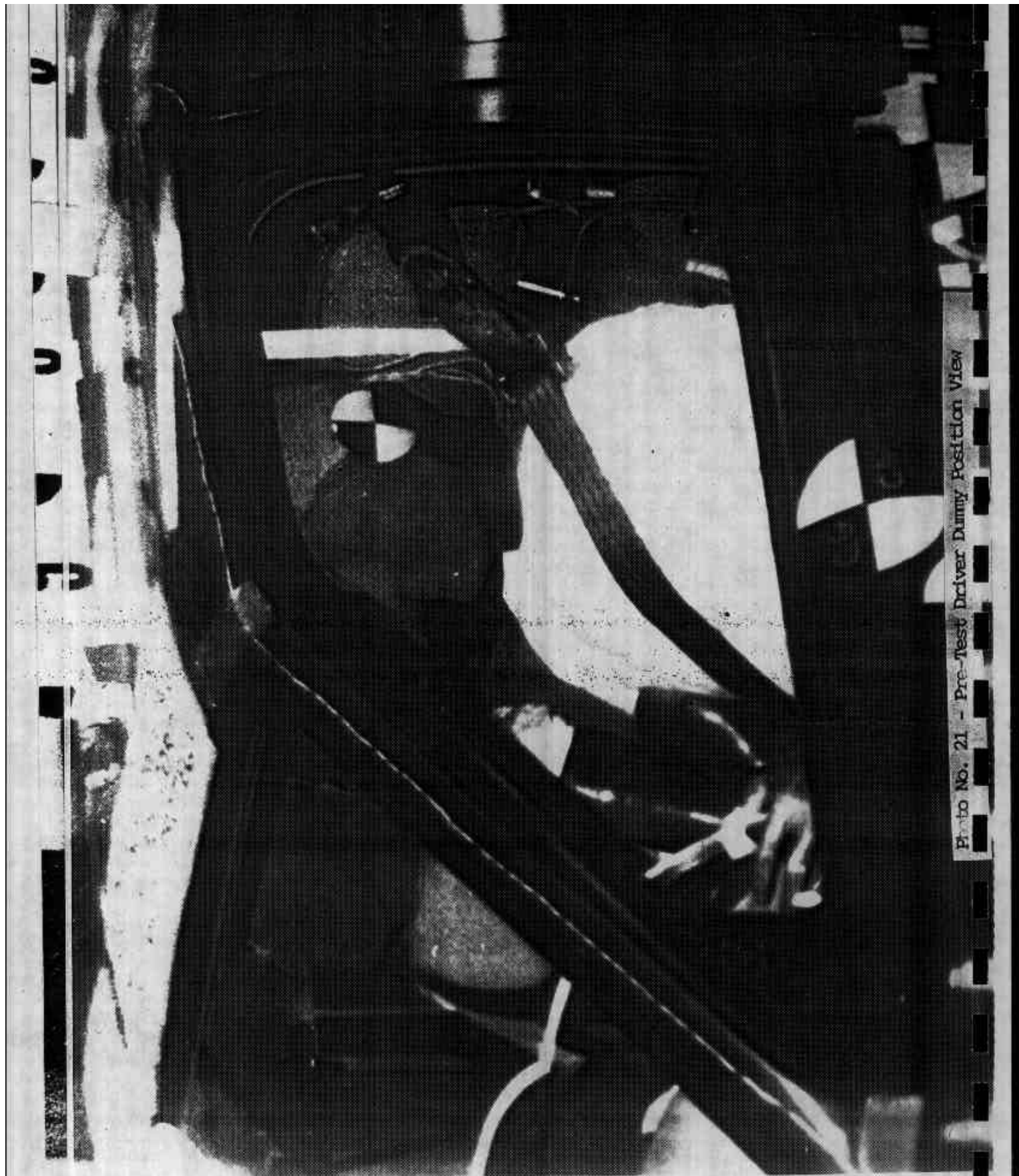
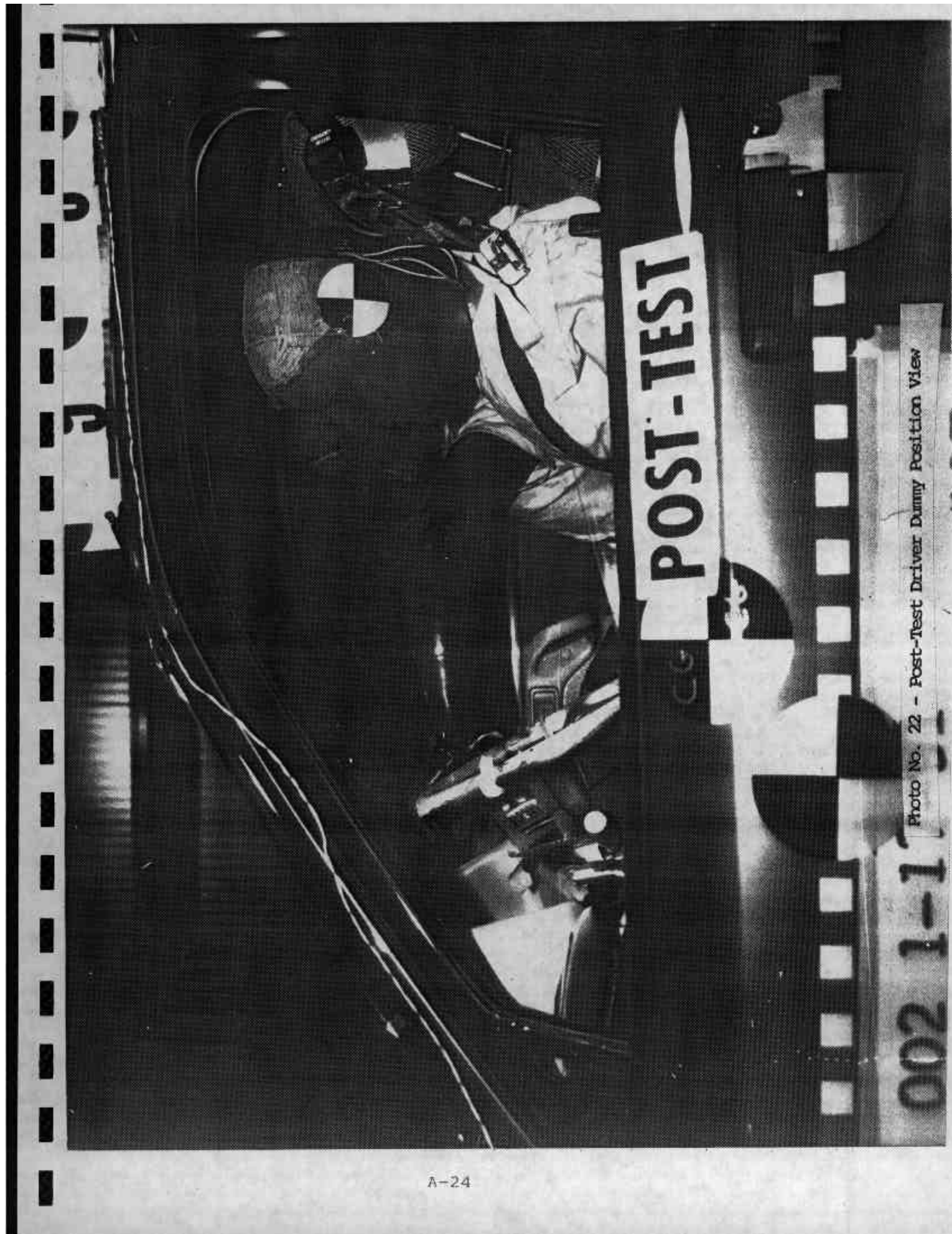
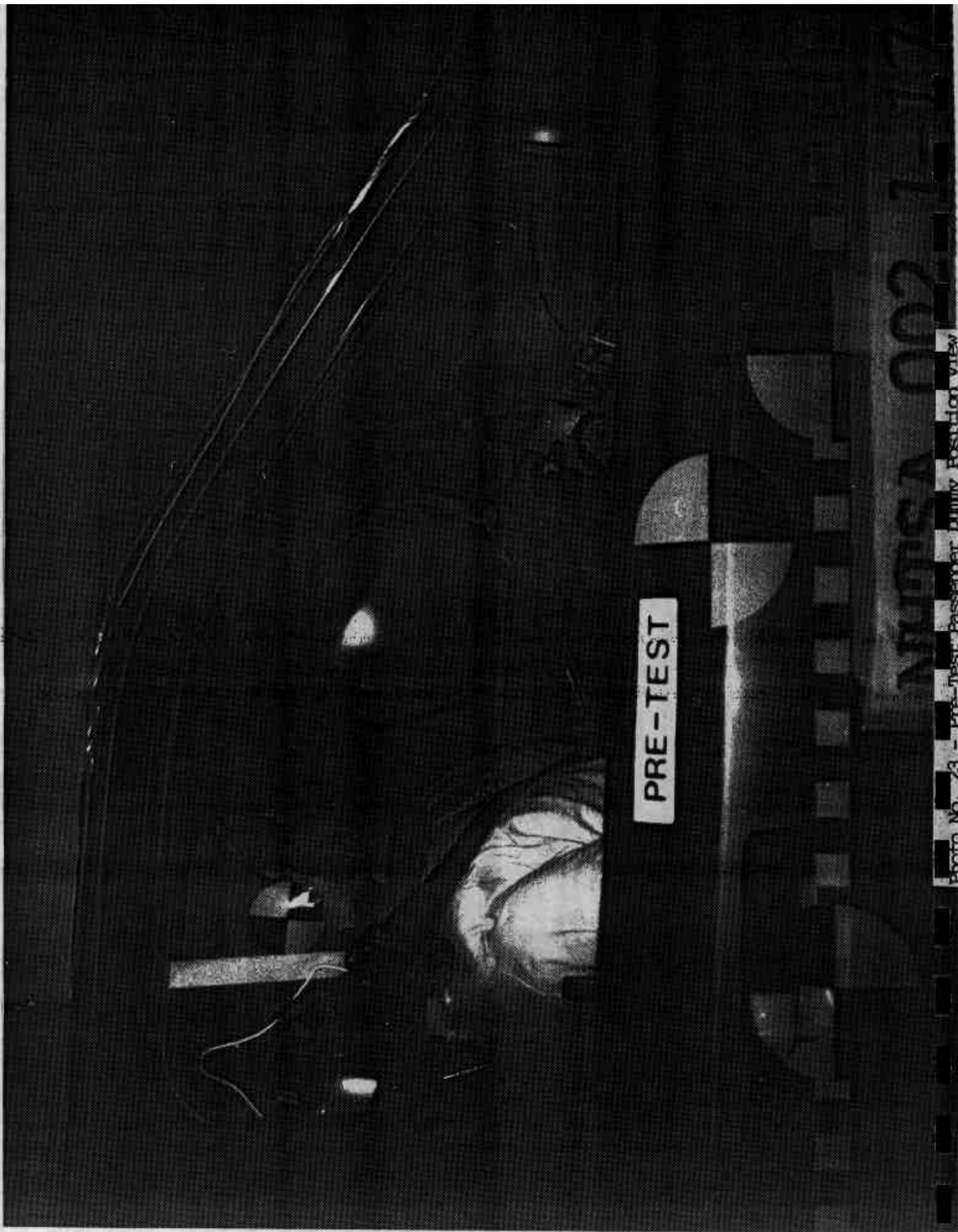


Photo No. 21 - Pre-Test Driver Dummy Position View





PRE-TEST

NUMPSA 002 7-17

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

PHOTOGRAPH NOT APPLICABLE
NO SOLVENT SPILLAGE

Photo No. 25 - Solvent Spillage Location View (if required)



POST-TEST

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

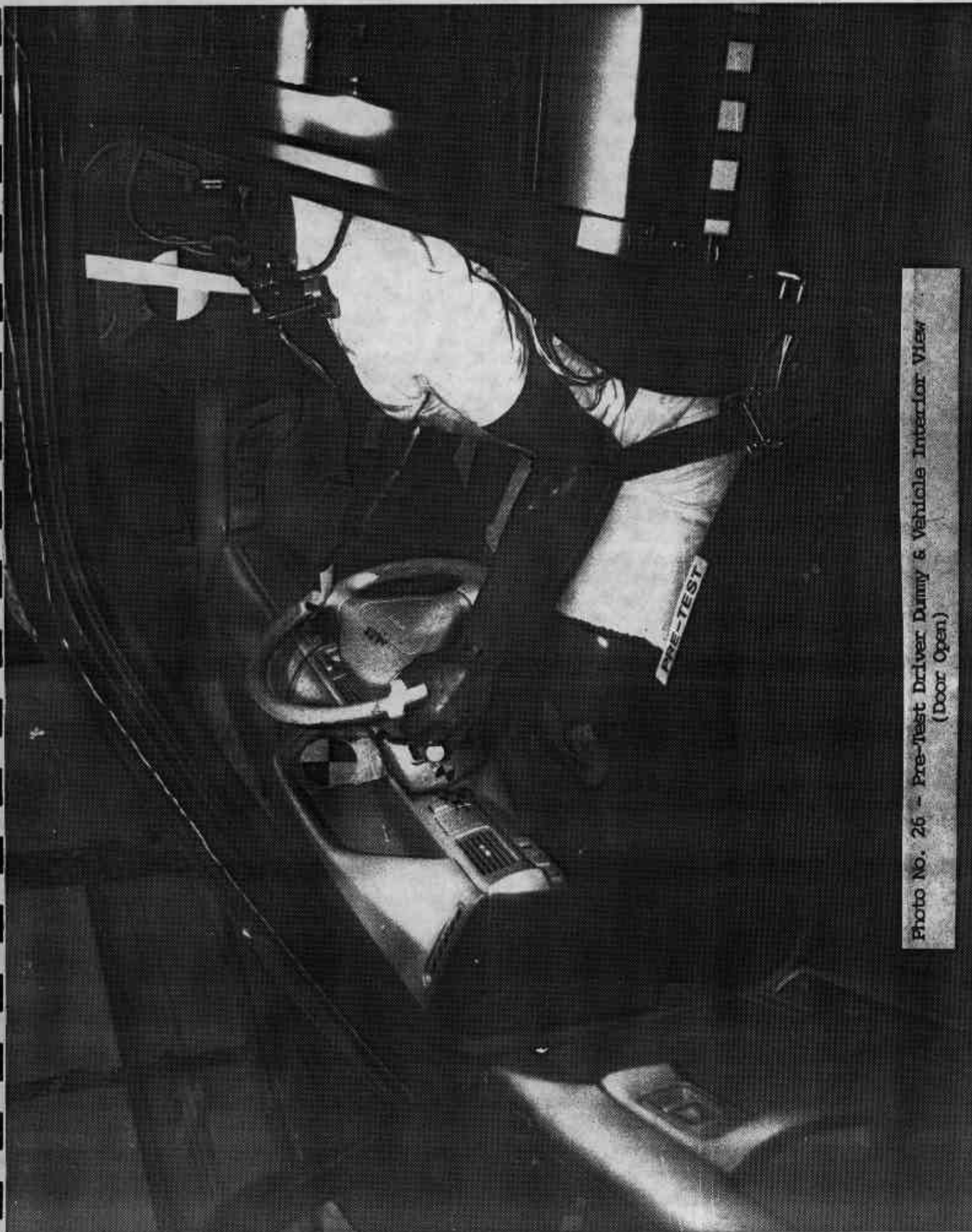


Photo No. 26 - Pre-Test Driver Dummy & Vehicle Interior View
(Door Open)

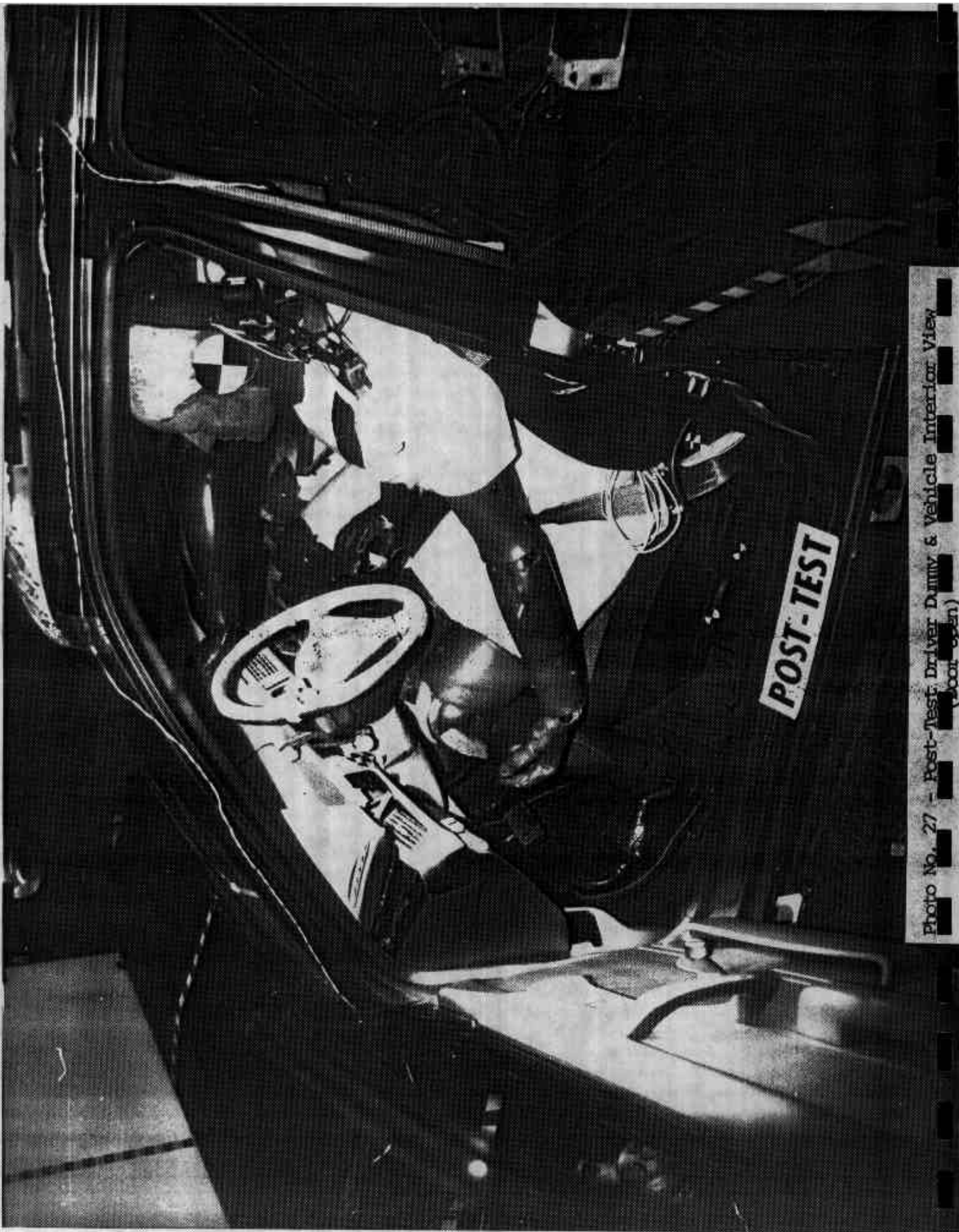


Photo No. 27 - Post-Test Driver Dummy & Vehicle Interior View
(Door Open)

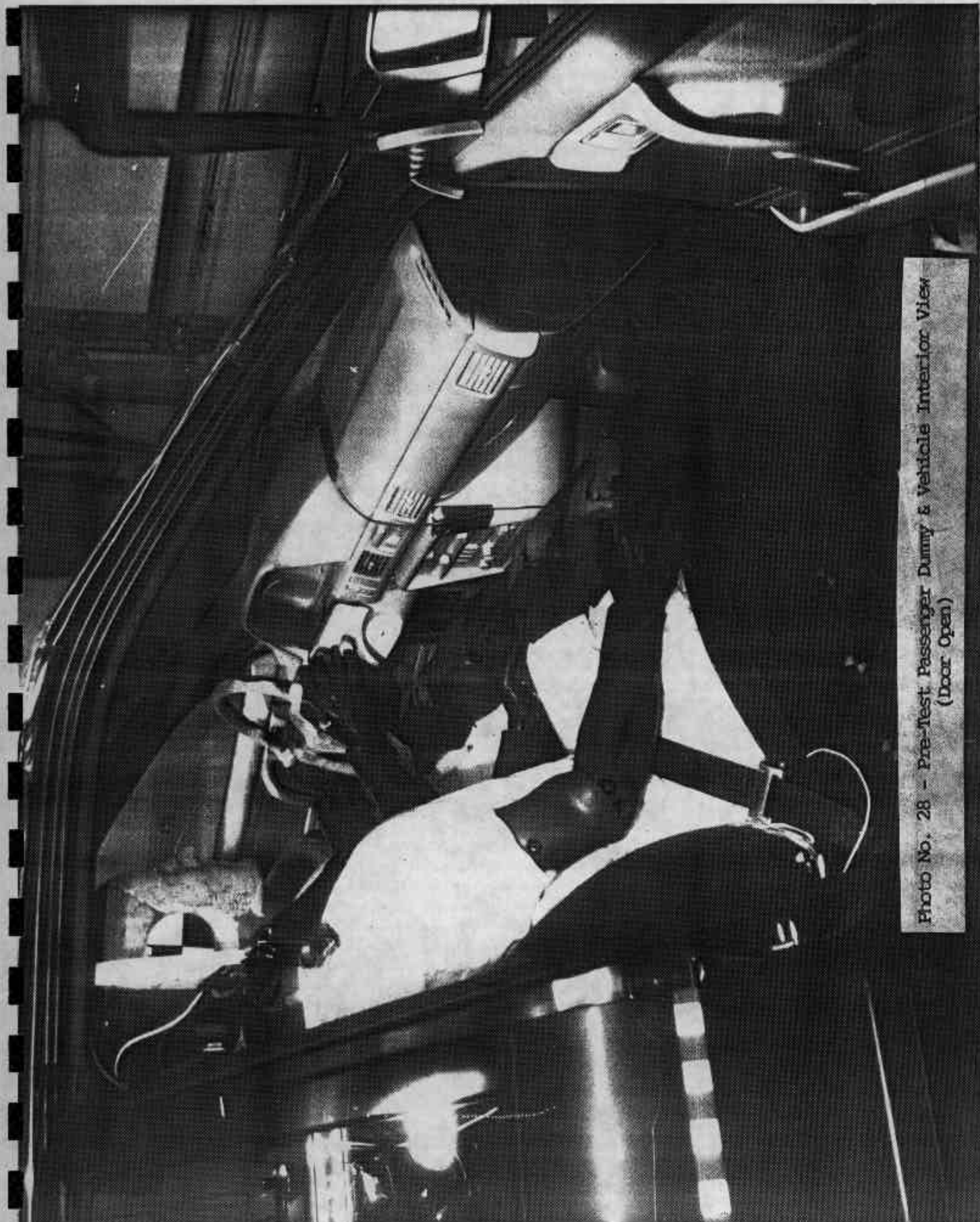


Photo No. 28 - Pre-Test Passenger Dummy & Vehicle Interior View
(Door Open)



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

PHOTOGRAPH NOT APPLICABLE
NO RESTRAINT SYSTEM PROBLEM

Photo No. 30 - Restraint System Problem Area View (if required)



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

SEE PHOTO NO. 31

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

PHOTOGRAPH NOT APPLICABLE

NO PASSENGER DUMMY HEAD CONTACT

Photo No. 33 - Post-Test Passenger Dummy Head/Knee Contact

PHOTOGRAPH NOT APPLICABLE

NO PASSENGER DUMMY HEAD CONTACT

Photo No. 34 - Post-Test Passenger Dummy Head/IP Contact Area

APPENDIX B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST: 1991 MAZDA PROTEGE

FOUR DOOR SEDAN

NHTSA NO. MM5401

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

TEST DATA MINIMUMS AND MAXIMUMS

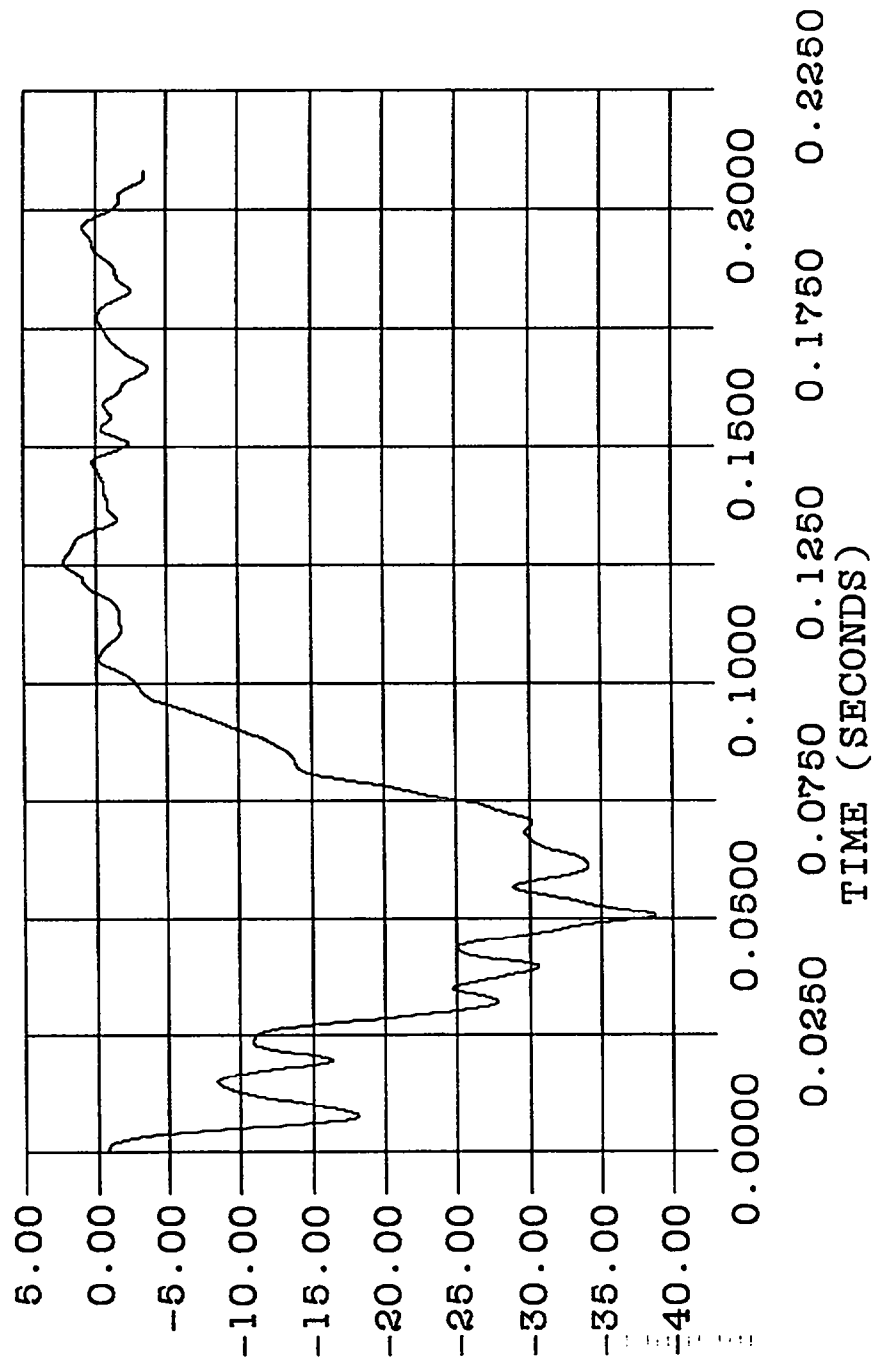
DESCRIPTION	MINIMUM		MAXIMUM	
Rear Seat RH X Acc.	-38.8 @	0.05080	2.2 @	0.12558
Rear Seat RH X Vel.	-15.8 @	0.20787	52.1 @	0.00000
Rear Seat RH X Disp.	0.0 @	0.00000	27.4 @	0.07159
Rear Seat LH X Acc.	-35.2 @	0.05424	4.7 @	0.12669
Rear Seat LH X Vel.	-9.5 @	0.09865	52.1 @	0.00098
Rear Seat LH X Disp.	0.0 @	0.00000	27.8 @	0.07405
Engine Upper X Acc.	-175.9 @	0.03014	50.6 @	0.03592
Engine Lower X Acc.	-162.4 @	0.02952	20.2 @	0.05117
Brake Caliper RH X Acc.	-61.1 @	0.04182	30.1 @	0.05633
Brake Caliper LH X Acc.	-61.4 @	0.03948	25.6 @	0.05474
Dash Panel X Acc.	N/A	N/A	N/A	N/A
Rear Seat Center Z Acc.	-11.8 @	0.04034	11.2 @	0.04723
Rear Seat Center Z Vel.	-1.7 @	0.20418	5.2 @	0.07564
Rear Seat Center Z Disp.	0.0 @	0.01820	5.1 @	0.16544
Vehicle Rear Z Acc.	-5.0 @	0.18622	9.1 @	0.16298
Vehicle Rear Z Vel.	0.0 @	0.00000	13.2 @	0.17810
Vehicle Rear Z Disp.	0.0 @	0.00000	17.3 @	0.20787

ACCELERATION (G, S)

B-4

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

REAR SEAT R

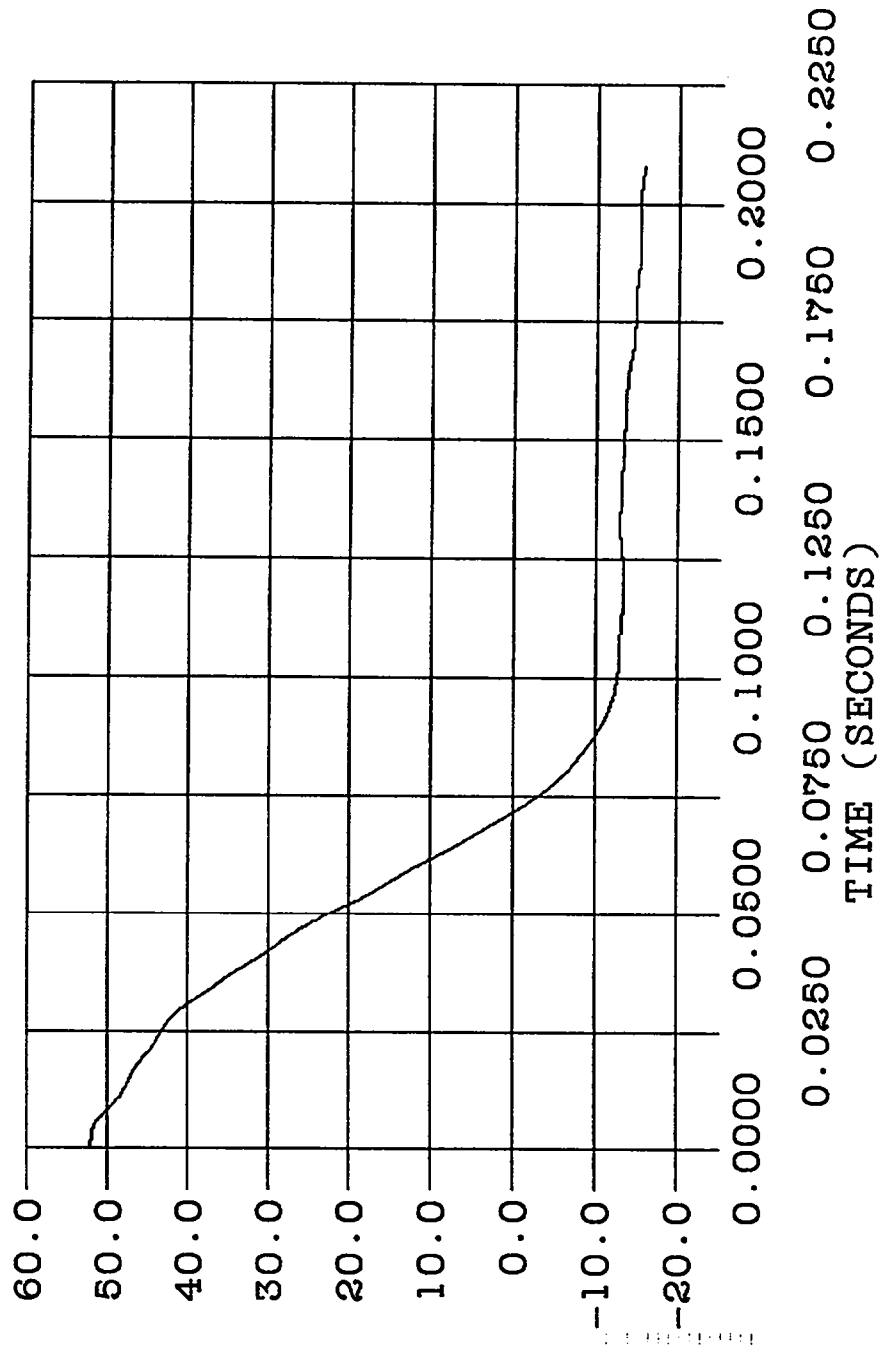


Right Rear Seat Cross-member X Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

REAR SEAT R VEL

VELOCITY (FT / S)

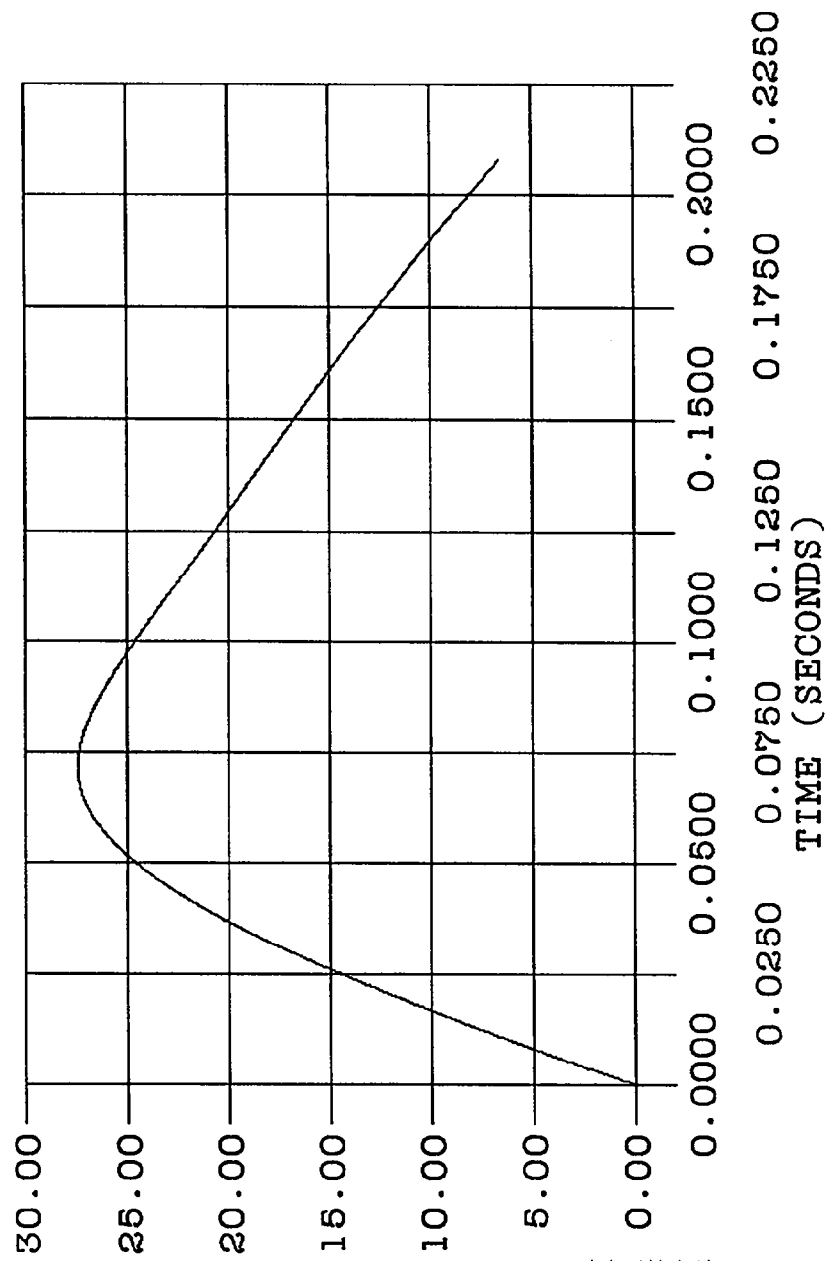


Right Rear Seat Cross-member X Velocity vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

REAR SEAT R DISP

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



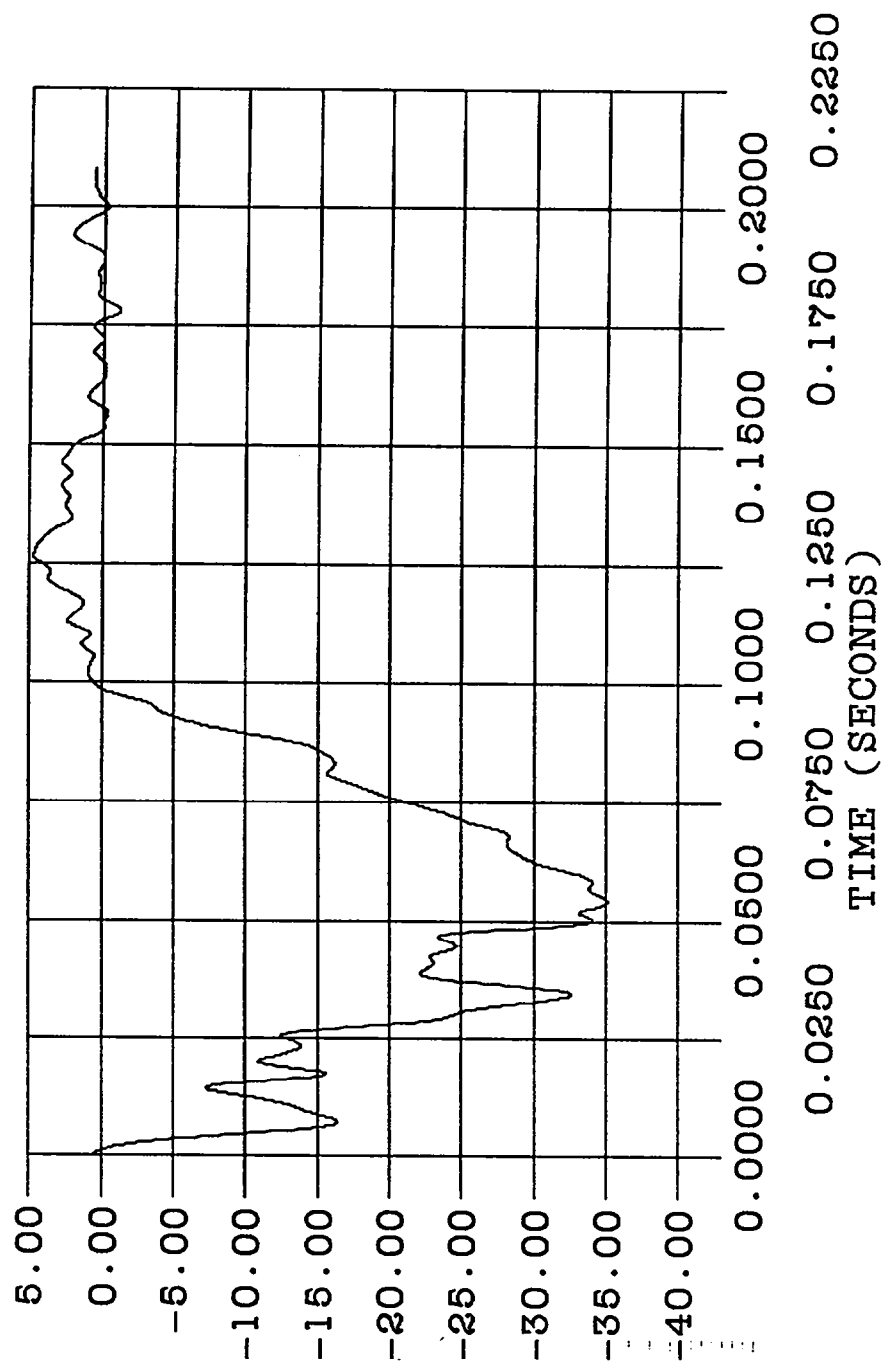
Right Rear Seat Cross-member X Displacement vs. Time

ACCELERATION (G, S)

B-7

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

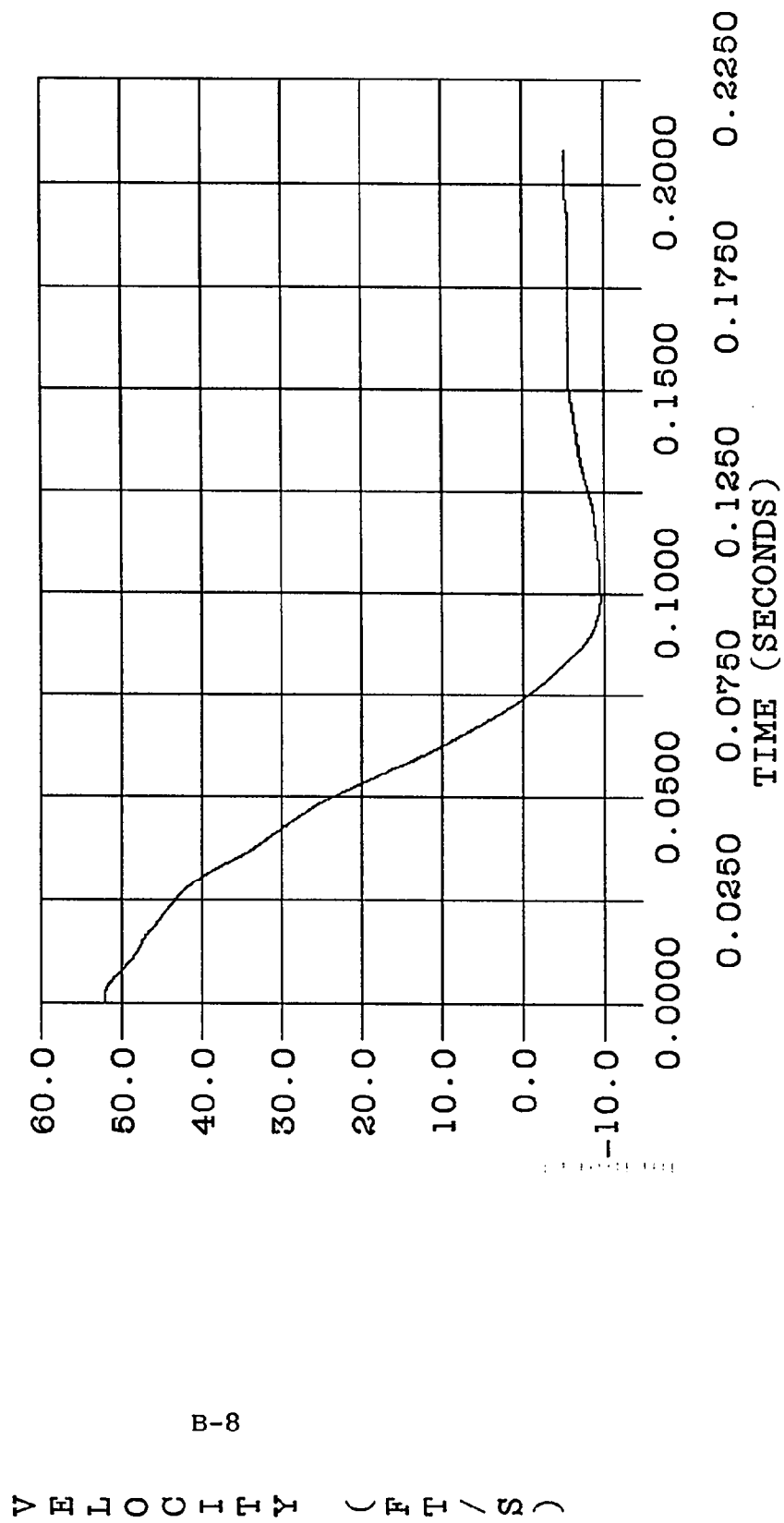
REAR SEAT L



Left Rear Seat Cross-member X Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

REAR SEAT L VEL



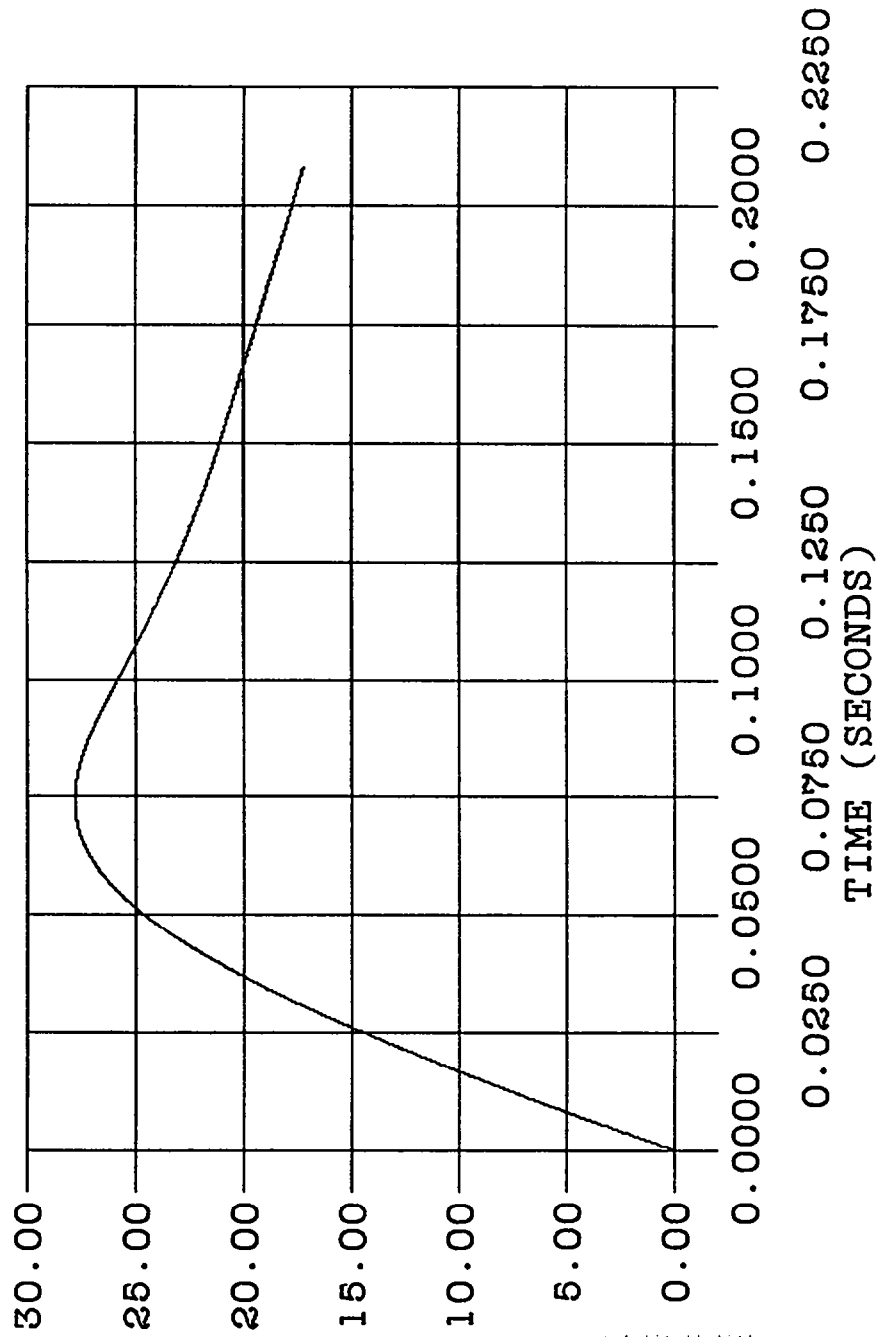
Left Rear Seat Cross-member X Velocity vs. Time

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

B-9

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

REAR SEAT L DISP

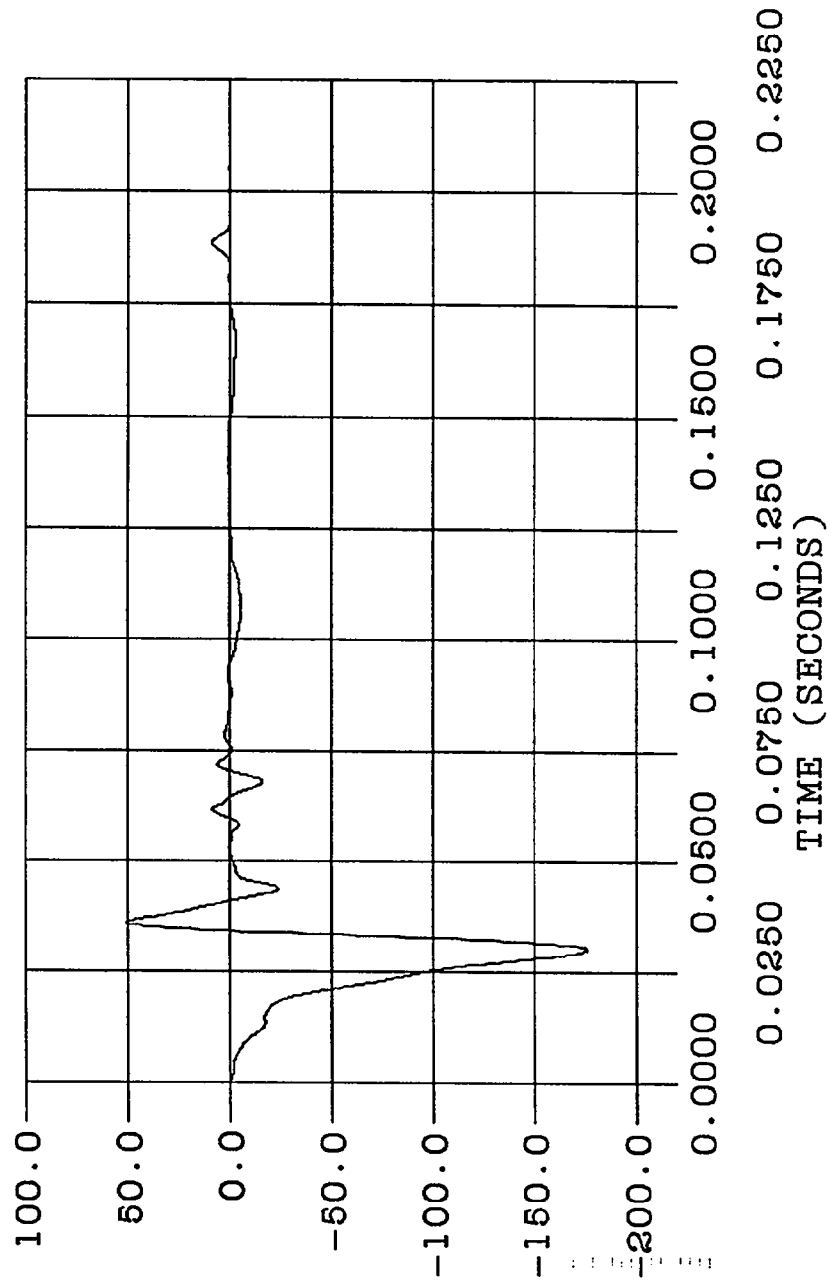


Left Rear Seat Cross-member X Displacement vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

ENGINE UPPER

ACCELERATION (G, S)

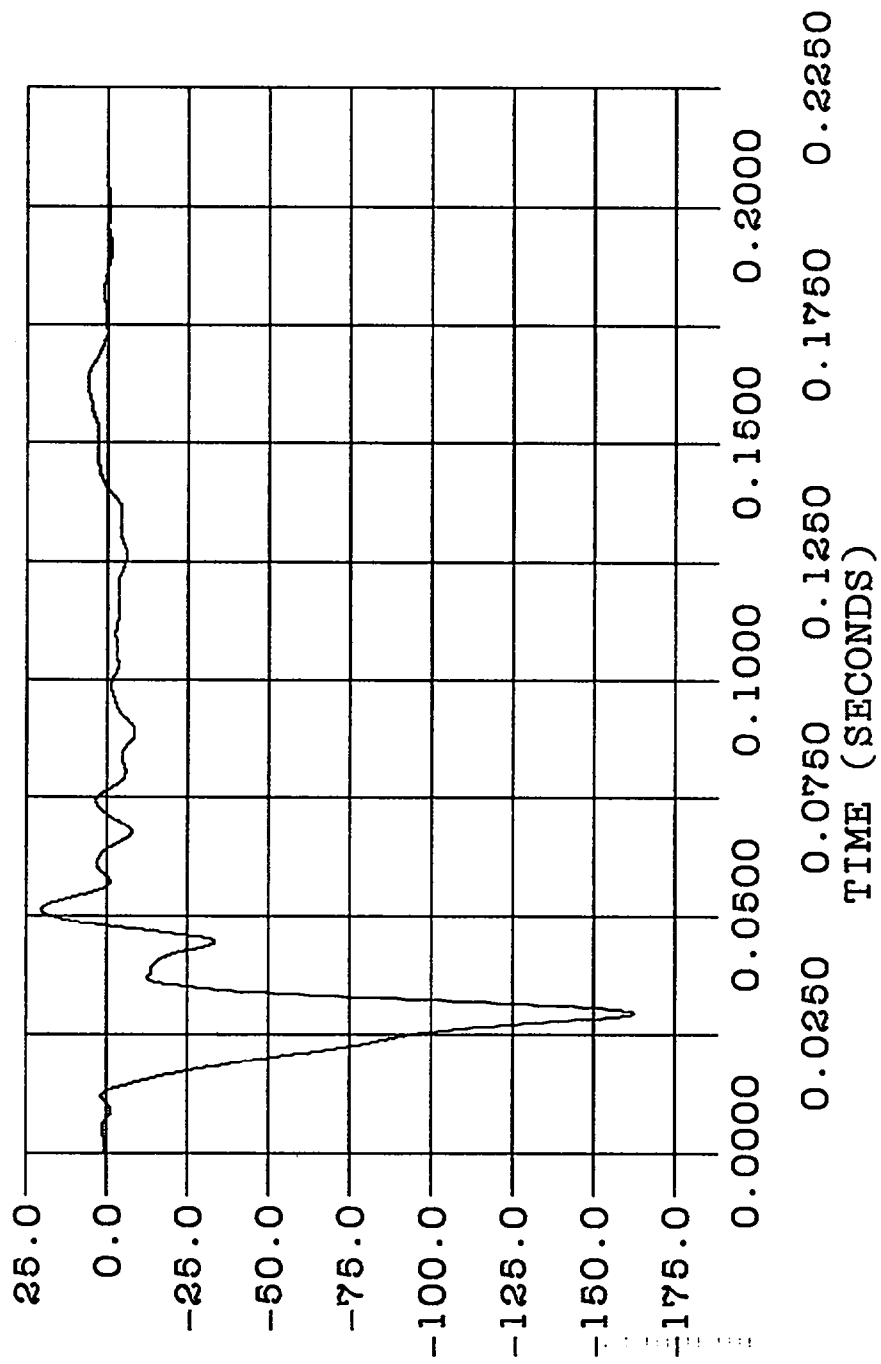


Top of Engine Block X Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

ENGINE LOWER

ACCELERATION (G, S)

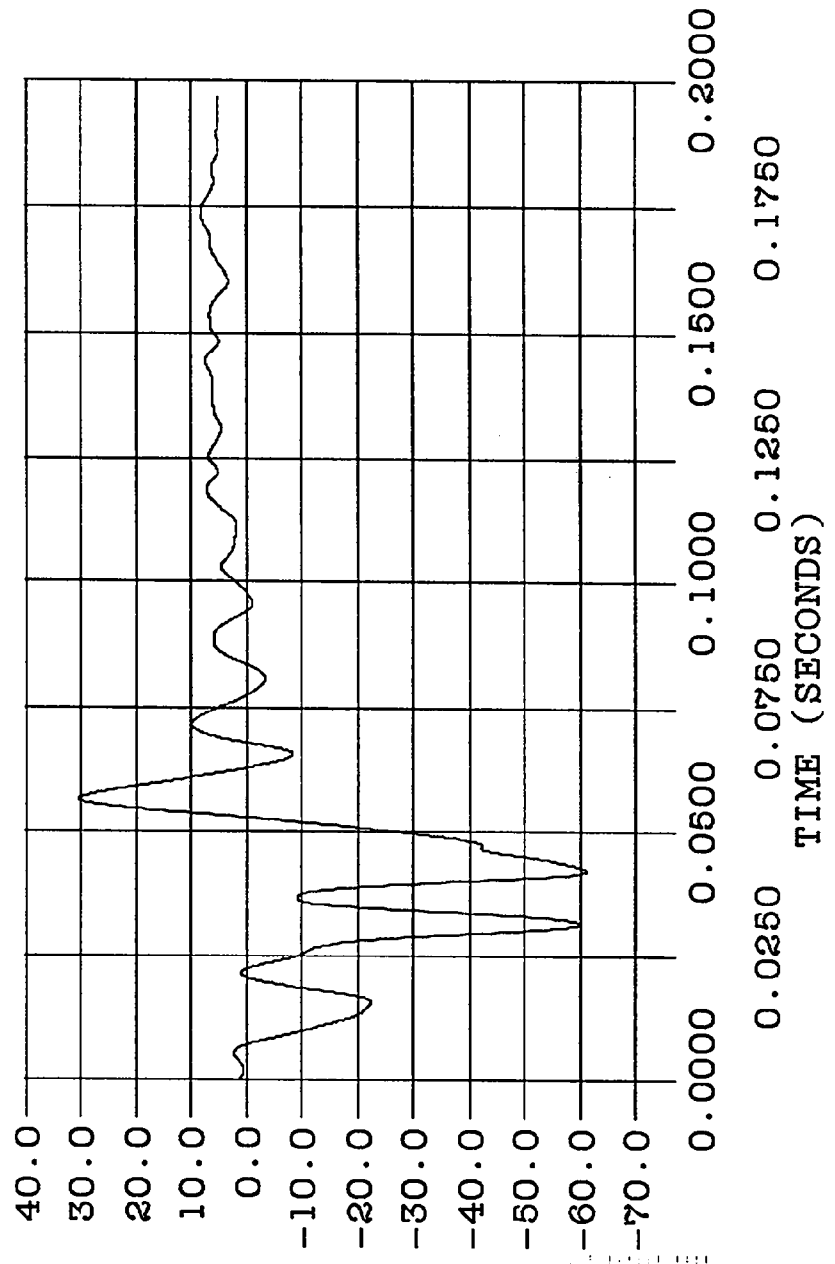


Bottom of Engine Block X Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

BRAKE CALIPER RH

ACCELERATION (G, S)

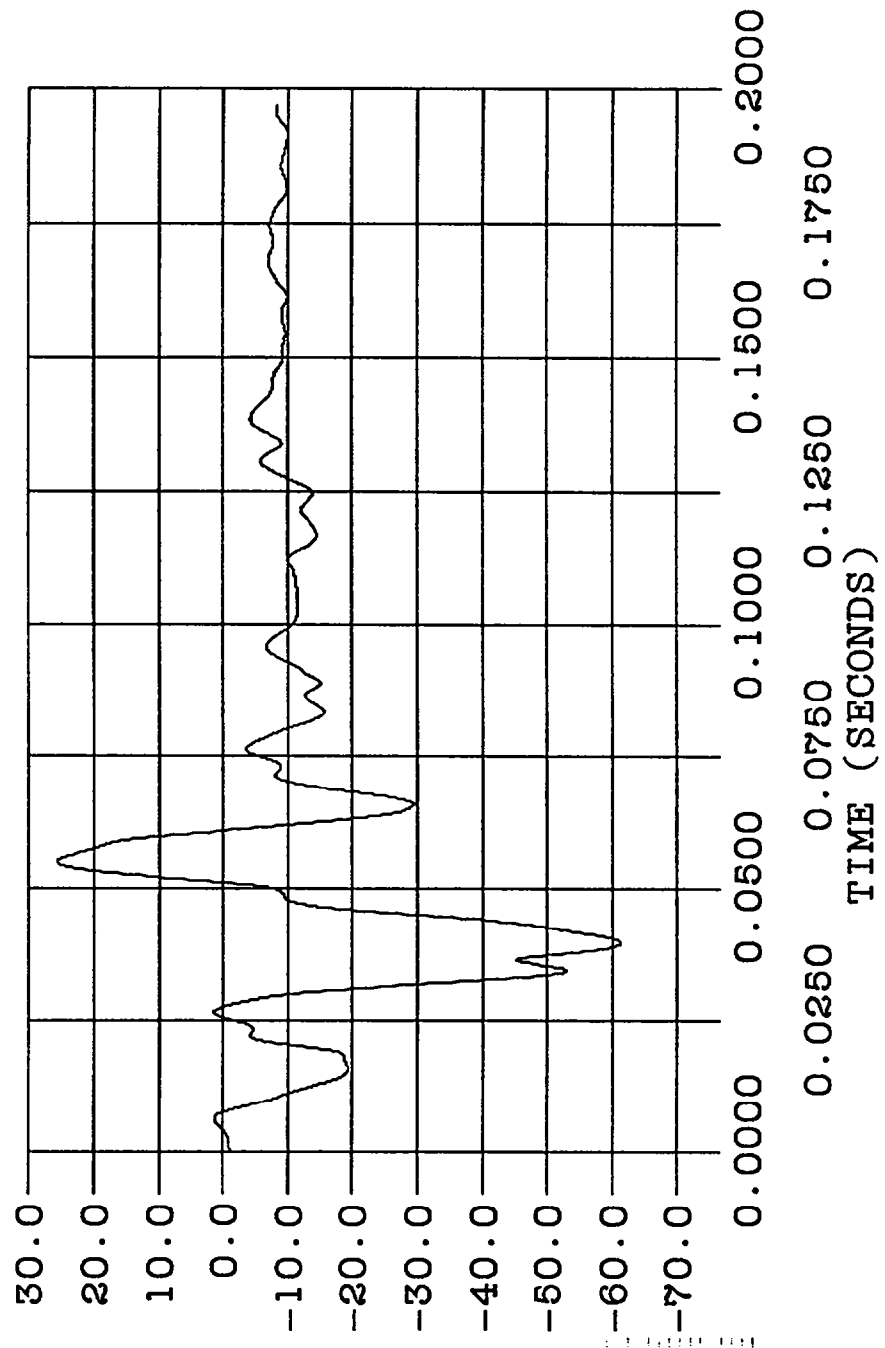


Right Front Disc Brake Caliper X Acceleration vs. Time

ACCELERATION (G, S)

B-13

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
BRAKE CALIPER LH



Left Front Disc Brake Caliper X Acceleration vs. Time

DATA PLOT NOT AVAILABLE

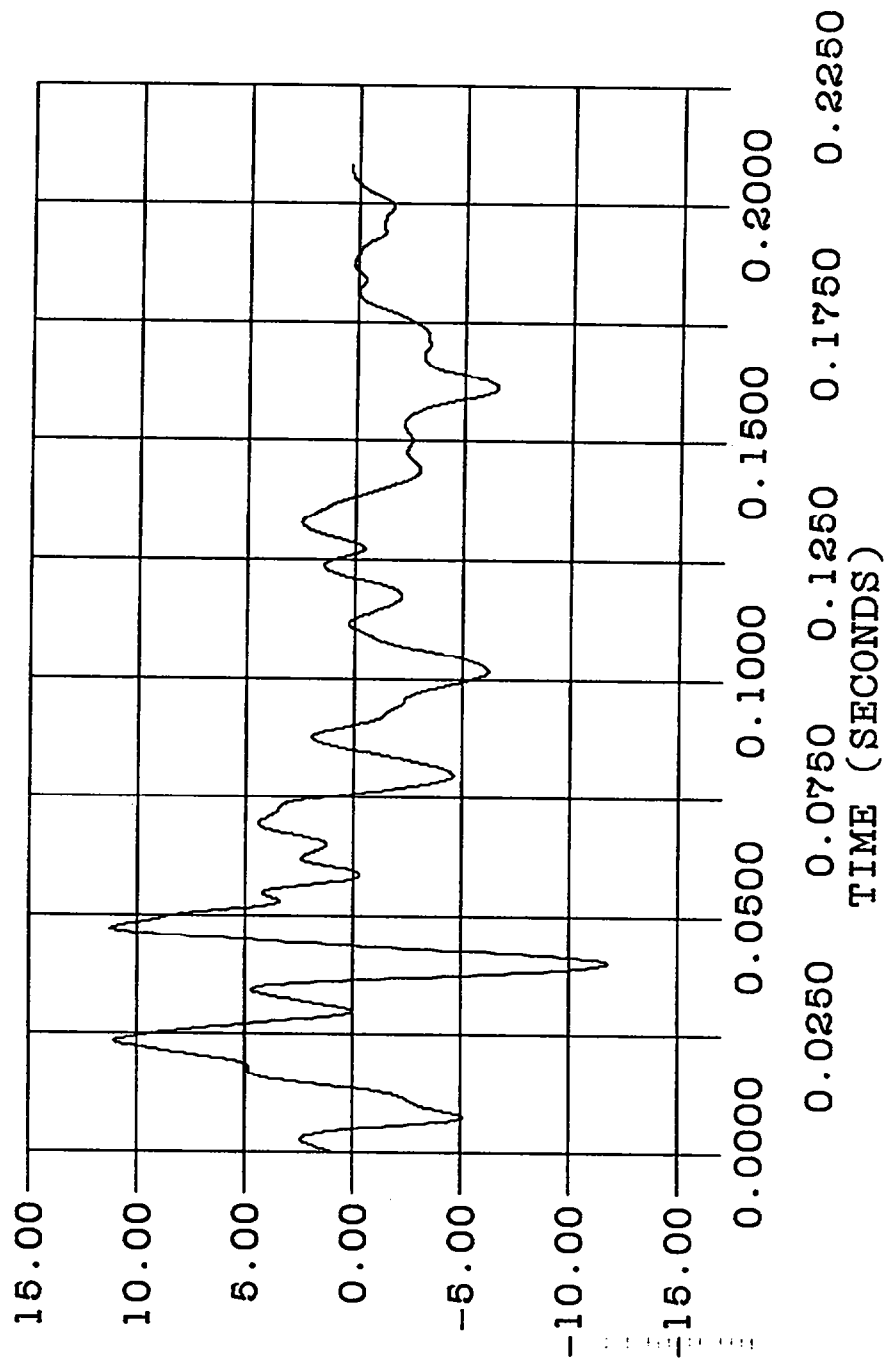
NO VALID DATA COLLECTED

Center of Instrument Panel Top Surface X Acceleration vs. Time

ACCELERATION (G, S)

B-15

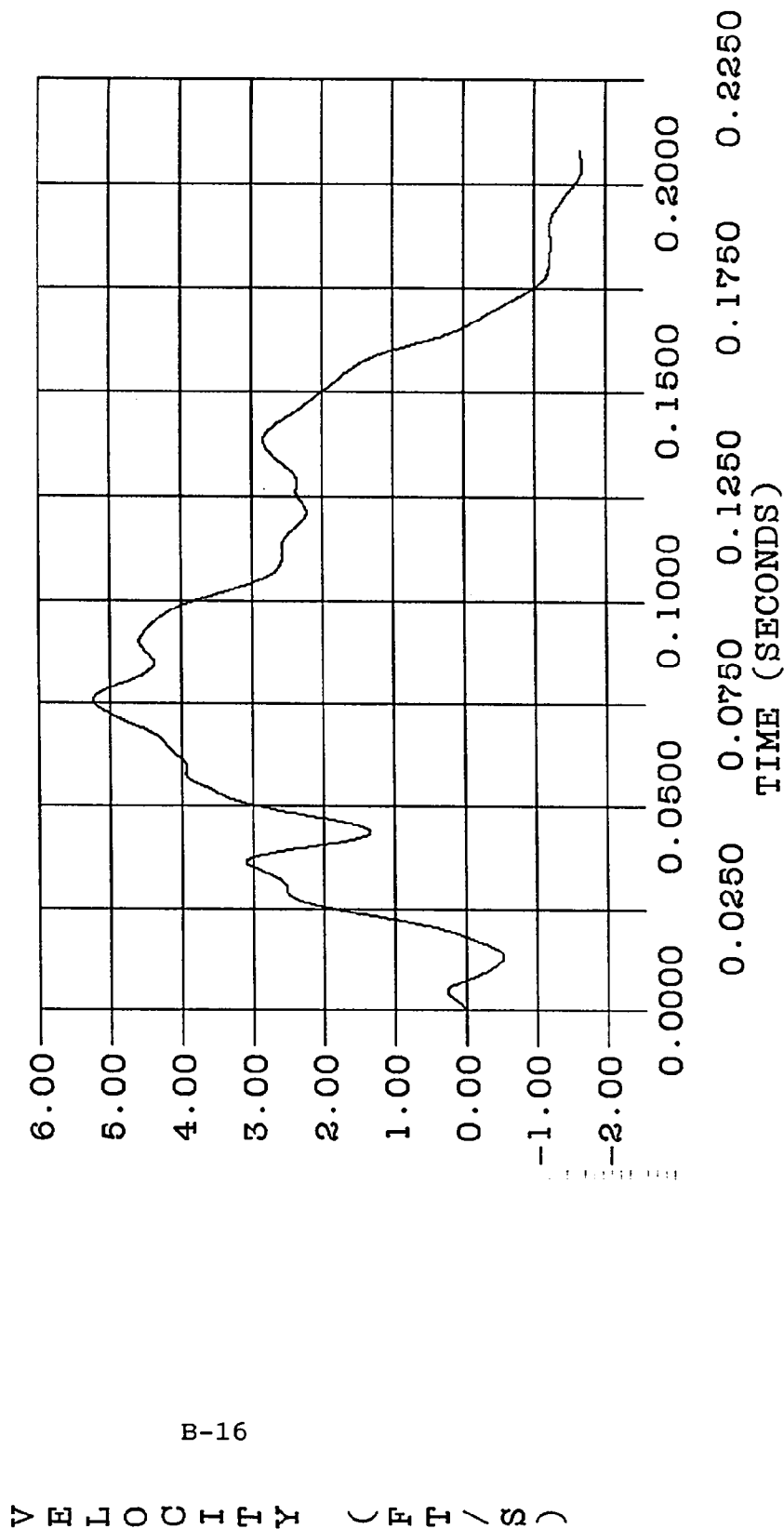
1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
REAR SEAT CTR



Center Rear Seat Cross-member Z Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

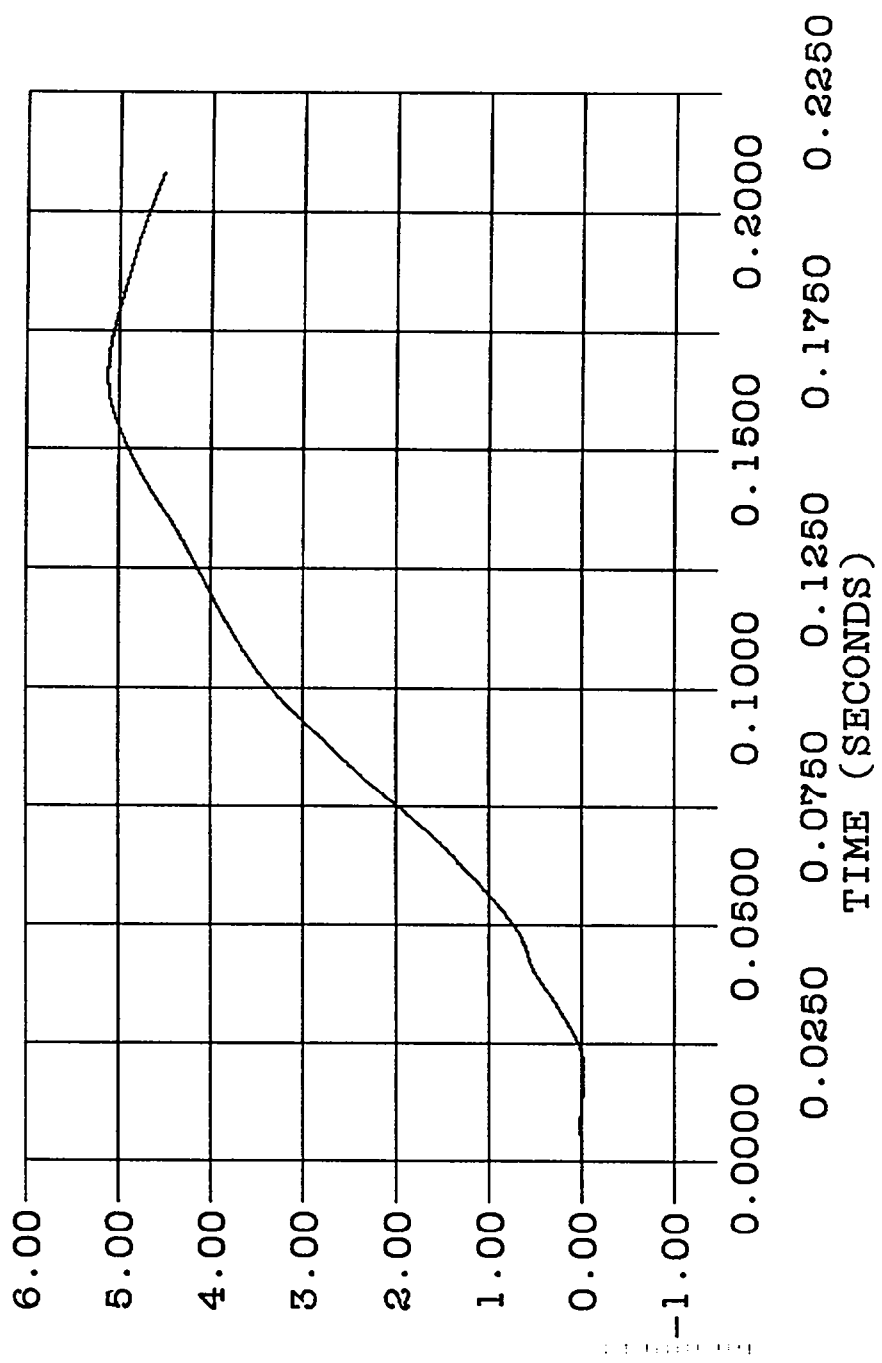
REAR SEAT CTR VEL



Center Rear Seat Cross-member Z Velocity vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
 REAR SEAT CTR DISP

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

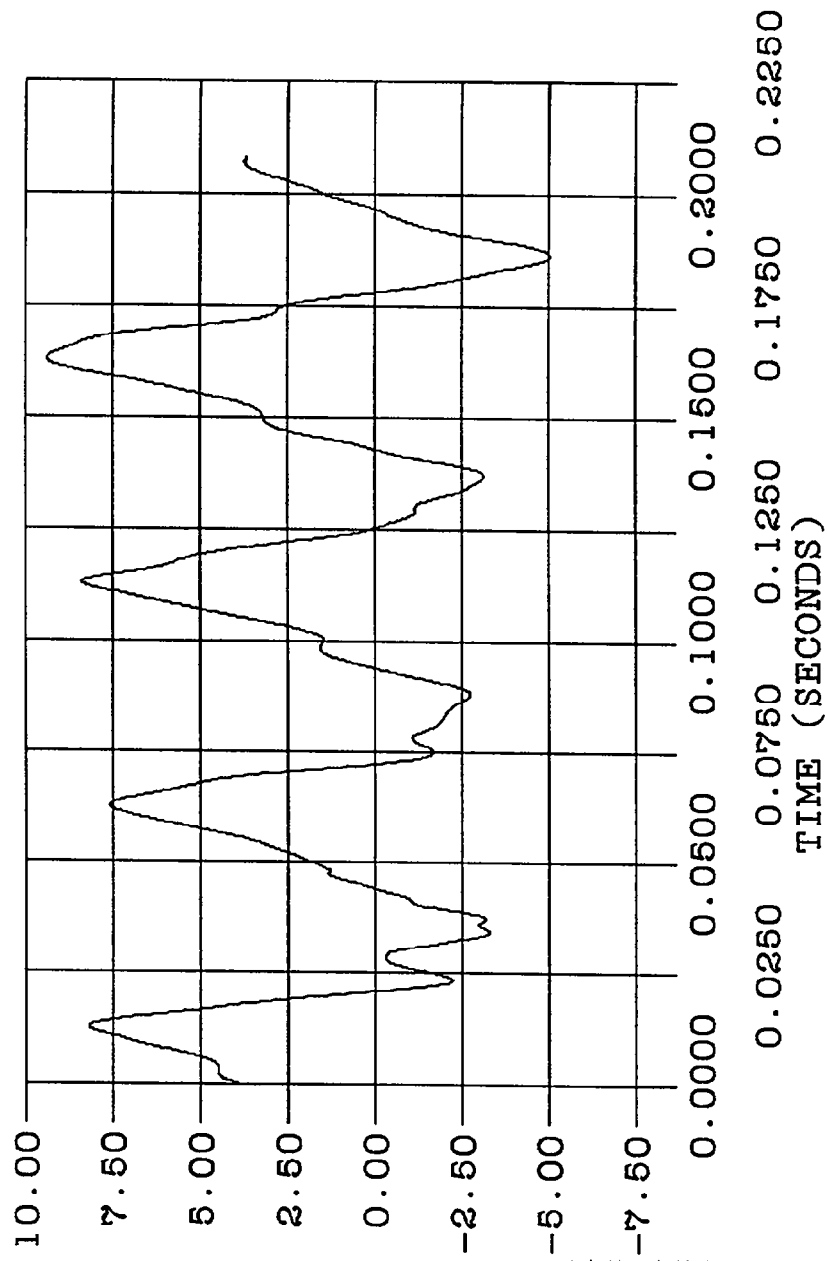


Center Rear Seat Cross-member Z Displacement vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

VEHICLE REAR ACC

ACCELERATION (G, S)

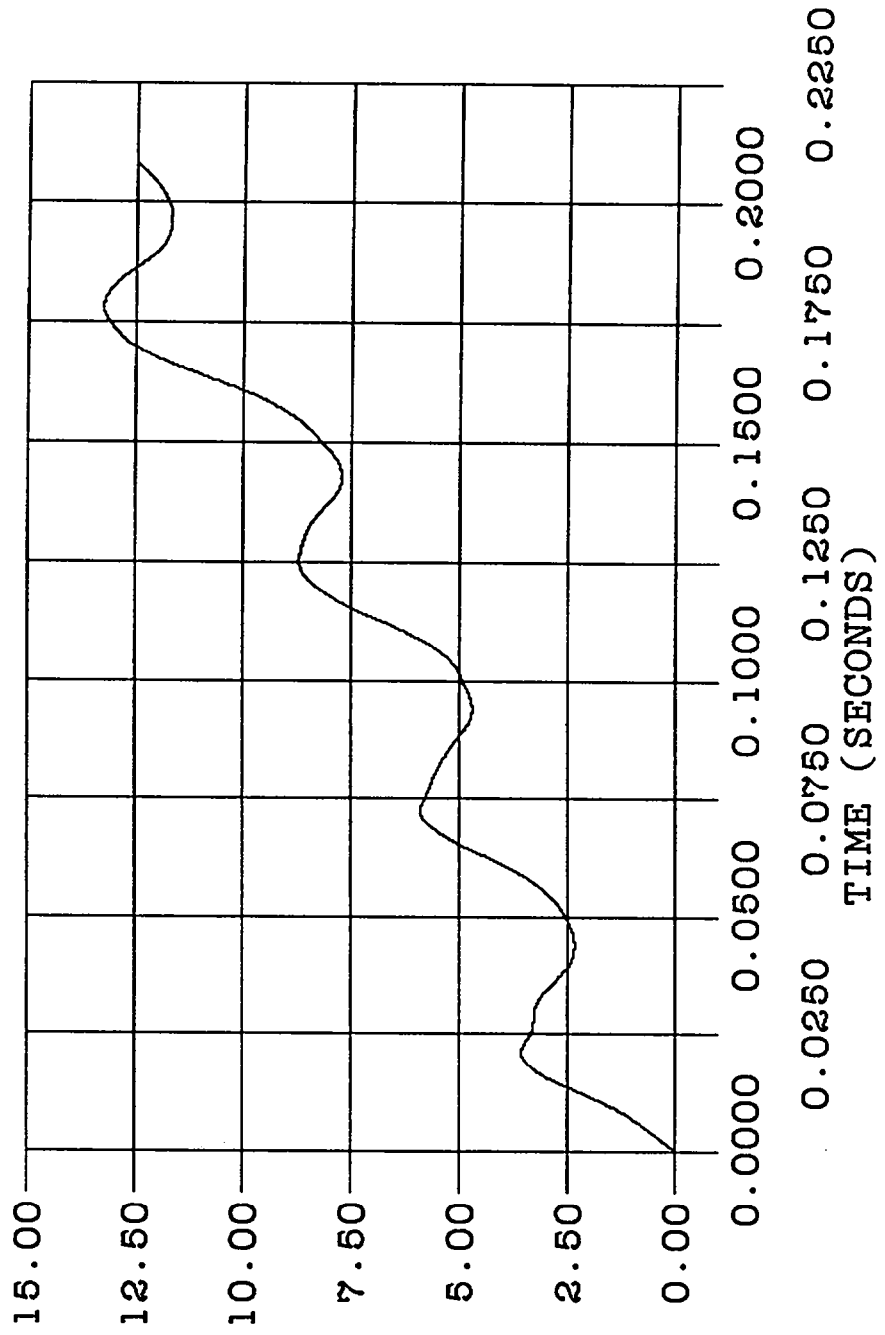


Vehicle Rear Z Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

VEHICLE REAR VEL

VELOCITY (FT / S)

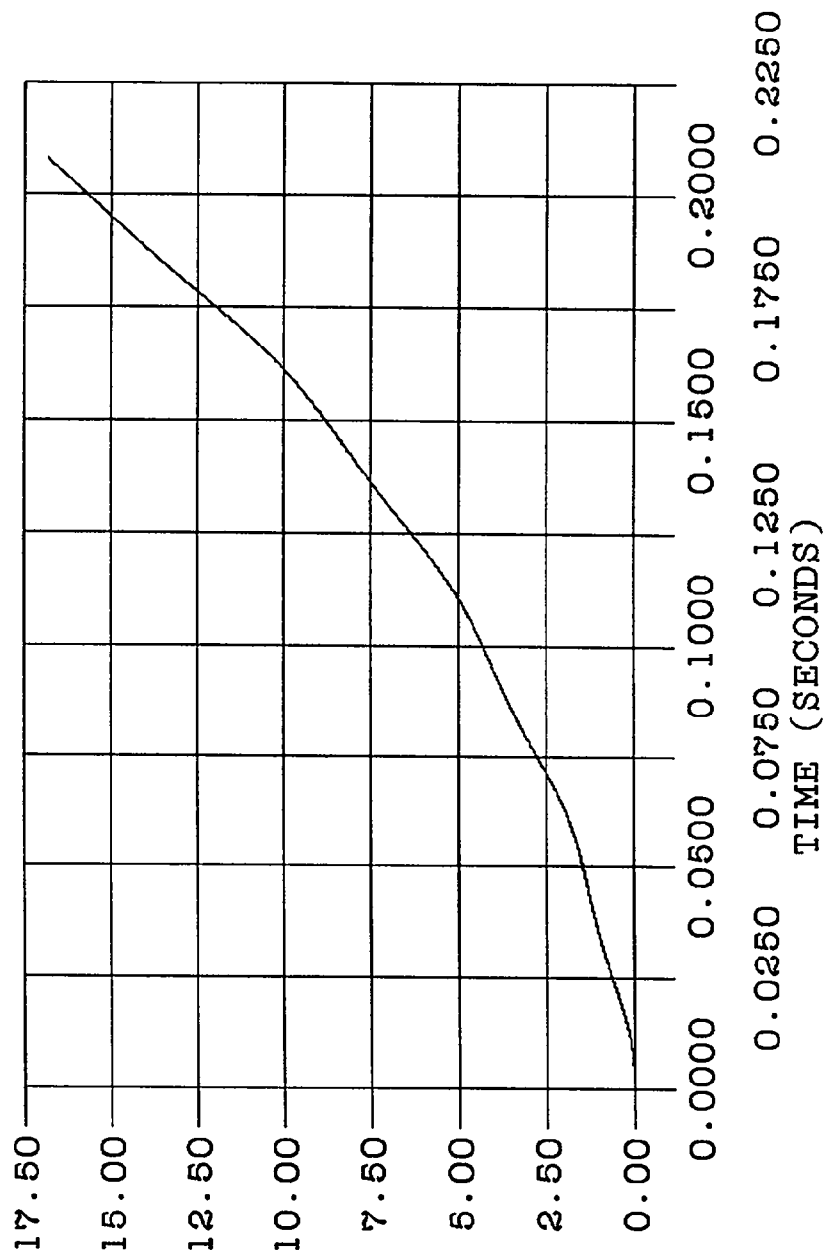


Vehicle Rear Z Velocity vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

VEHICLE REAR DISP

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



Vehicle Rear Z Displacement vs. Time

TEST NO: 1991 MAZDA PROTEGE

FOUR DOOR SEDAN

NHTSA NO. MM5401

LOAD CELL BARRIER DATA

FILTER CHANNEL CLASS

Forces

60

<u>Data Plot</u>	<u>Page No.</u>
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/A1
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

Load Cell Barrier Data (cont'd)

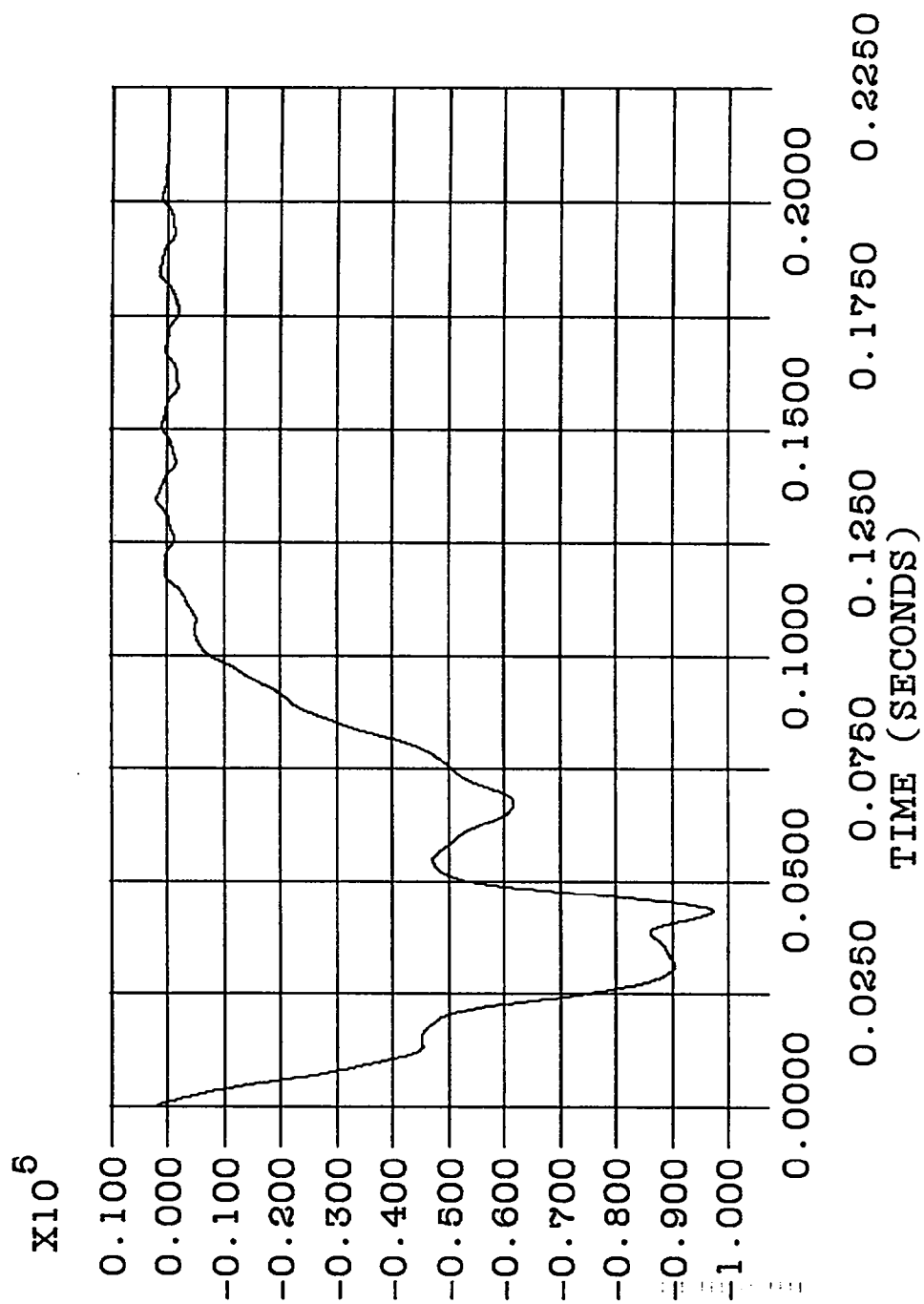
<u>Data Plot</u>	<u>Page No.</u>
Barrier Load Cell C2 Force vs. Time	N/A
Barrier Load Cell C3 Force vs. Time	N/A
Barrier Load Cell C4 Force vs. Time	N/A
Barrier Load Cell C5 Force vs. Time	N/A
Barrier Load Cell C6 Force vs. Time	N/A
Barrier Load Cell C7 Force vs. Time	N/A
Barrier Load Cell C8 Force vs. 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 6 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 6 Load Cells Force vs. Vehicle Dynamic Crush	B-31

TEST DATA MINIMUMS AND MAXIMUMS

DESCRIPTION	MINIMUM		MAXIMUM	
=====	=====	=====	=====	=====
Sum of Barrier Forces	-97256.8 @	0.04330	2191.1 @	0.00000
Barrier A1-B3 Force	-16927.9 @	0.04244	988.0 @	0.00000
Barrier A4-B6 Force	-53470.5 @	0.03186	-77.2 @	0.15092
Barrier A7-B9 Force	-20767.2 @	0.02595	596.3 @	0.00000
Barrier C1-D3 Force	-4968.4 @	0.02718	956.4 @	0.00517
Barrier C4-D6 Force	-7871.3 @	0.03136	500.6 @	0.13444
Barrier C7-D9 Force	-5666.1 @	0.02632	564.8 @	0.18487
Vehicle Disp/Barrier Force	-97256.8 @	22.51250	2191.1 @	0.00000

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

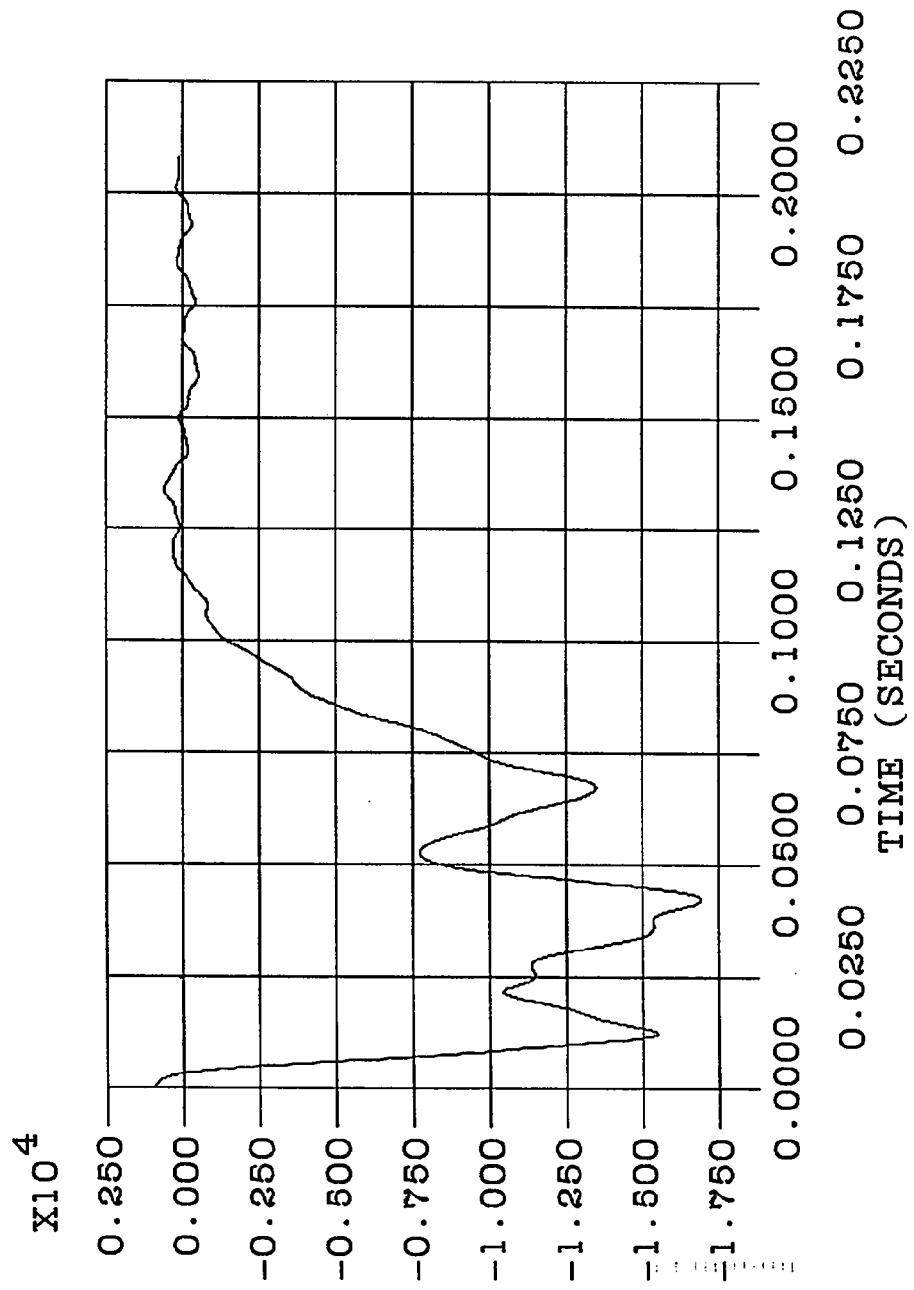
SUM OF BARRIER FORCES



Sum of 6 Load Cells Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

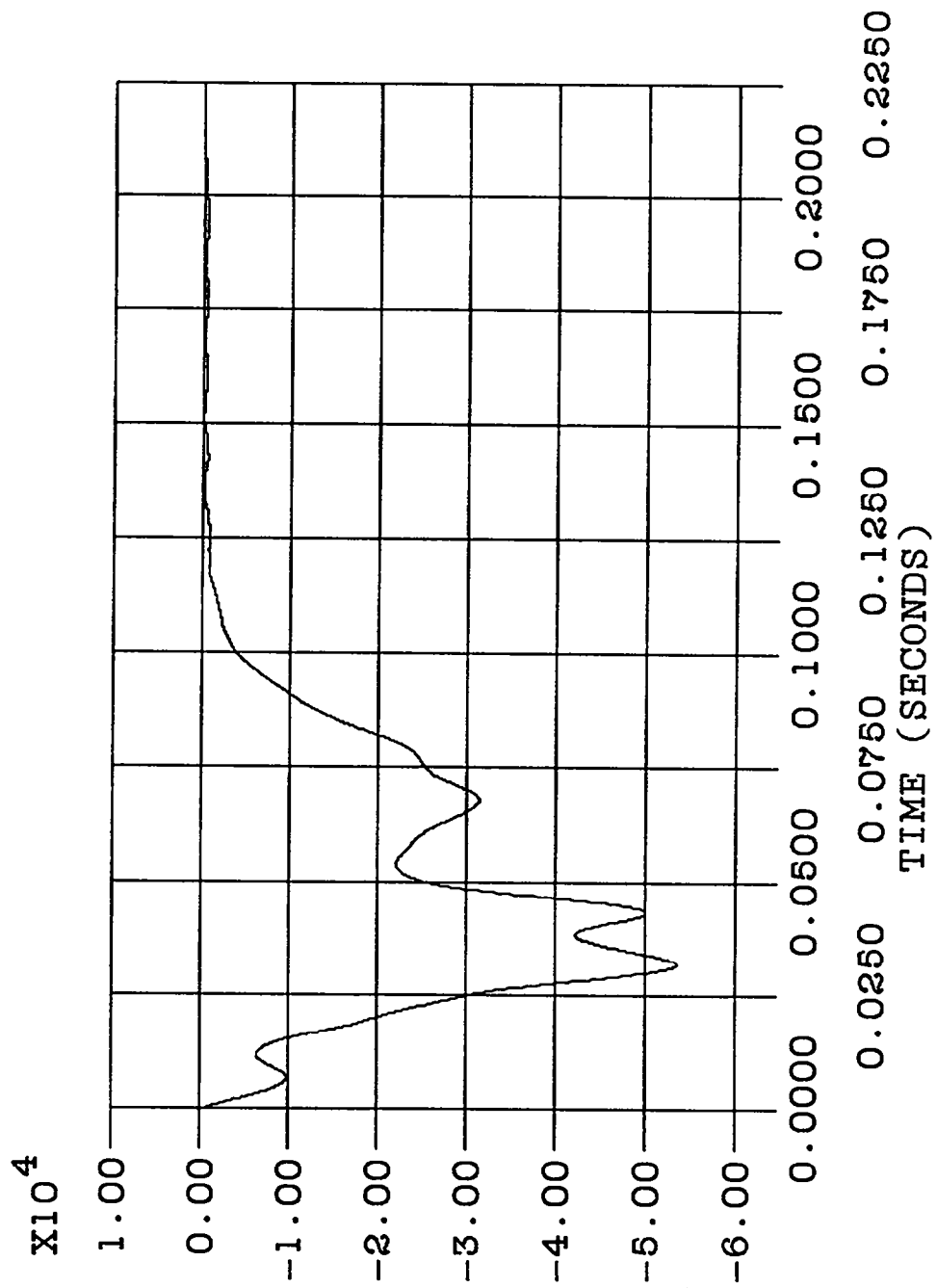
BARRIER LOWER LEFT



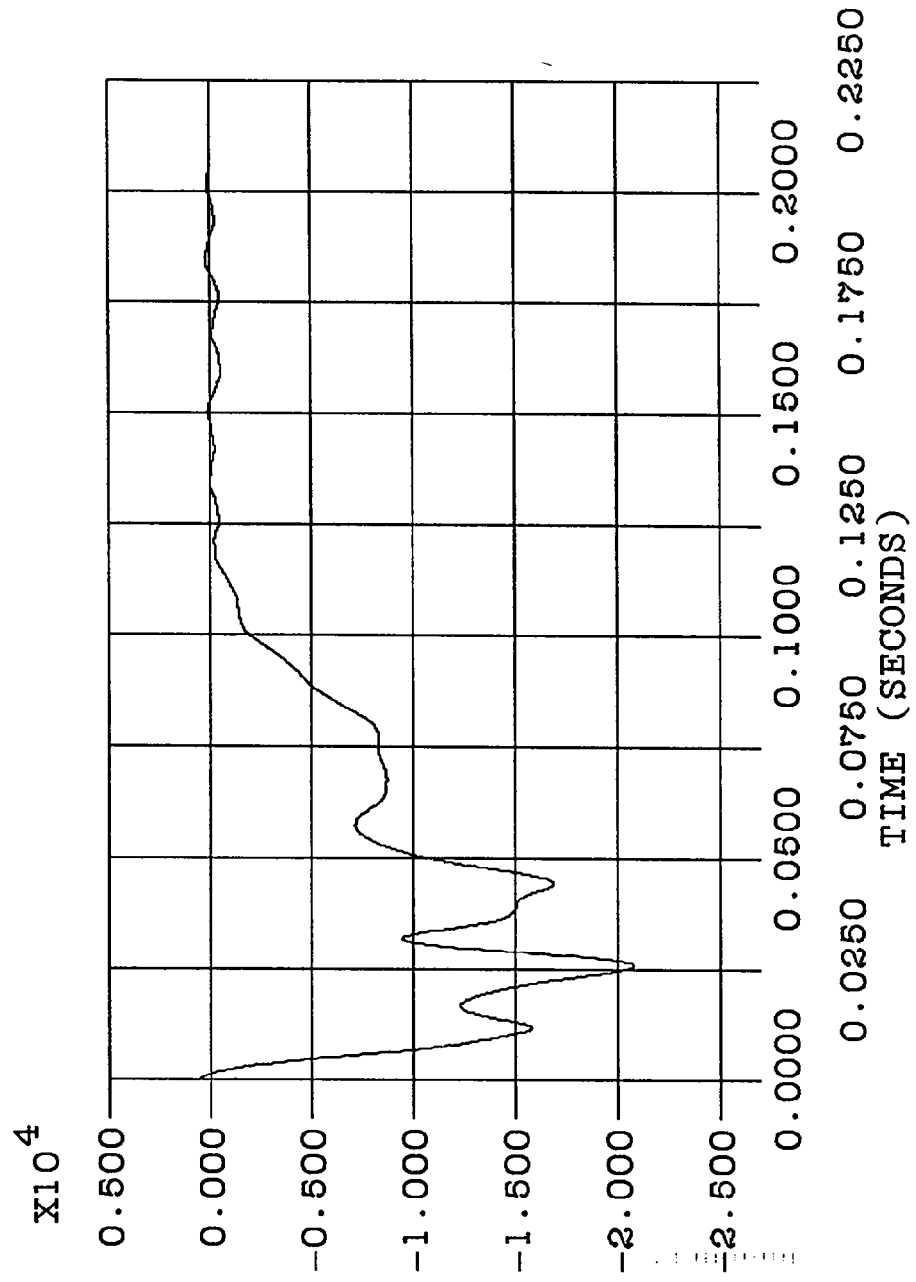
Sum of Load Cells A1-B3 Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

BARRIER LOWER CENTER

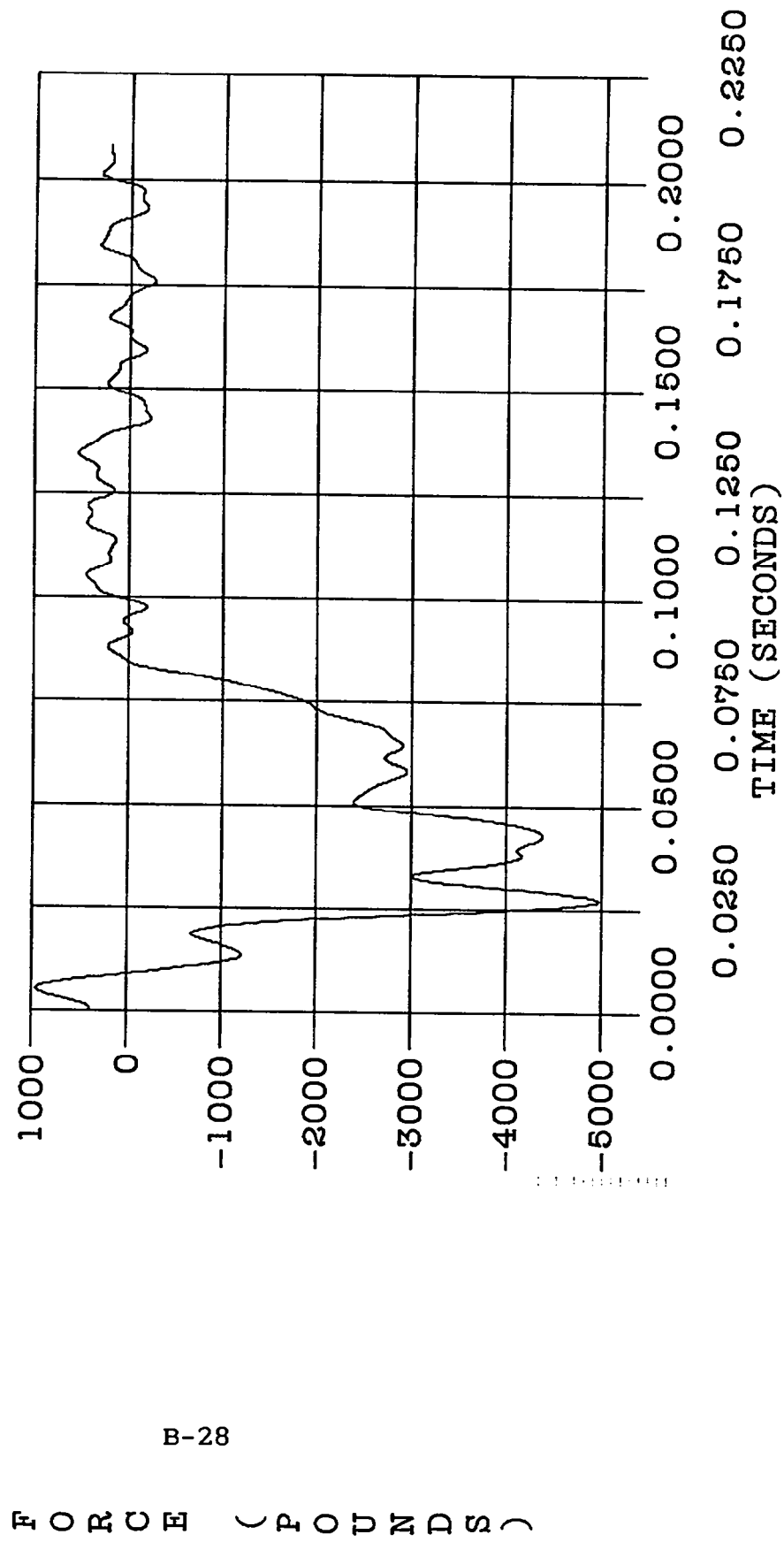


1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
 BARRIER LOWER RIGHT



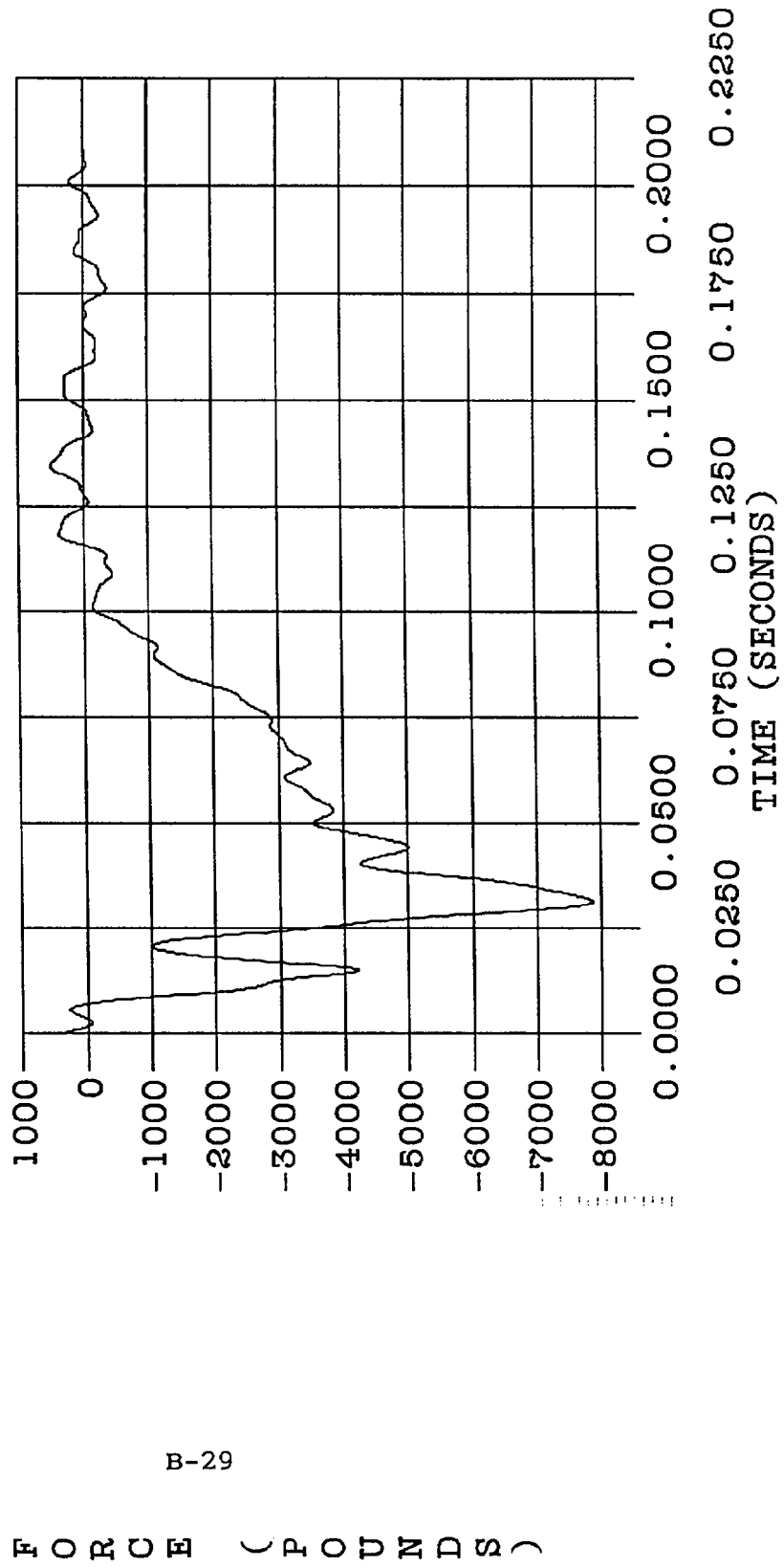
Sum of Load Cells A7-B9 Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
 BARRIER UPPER LEFT

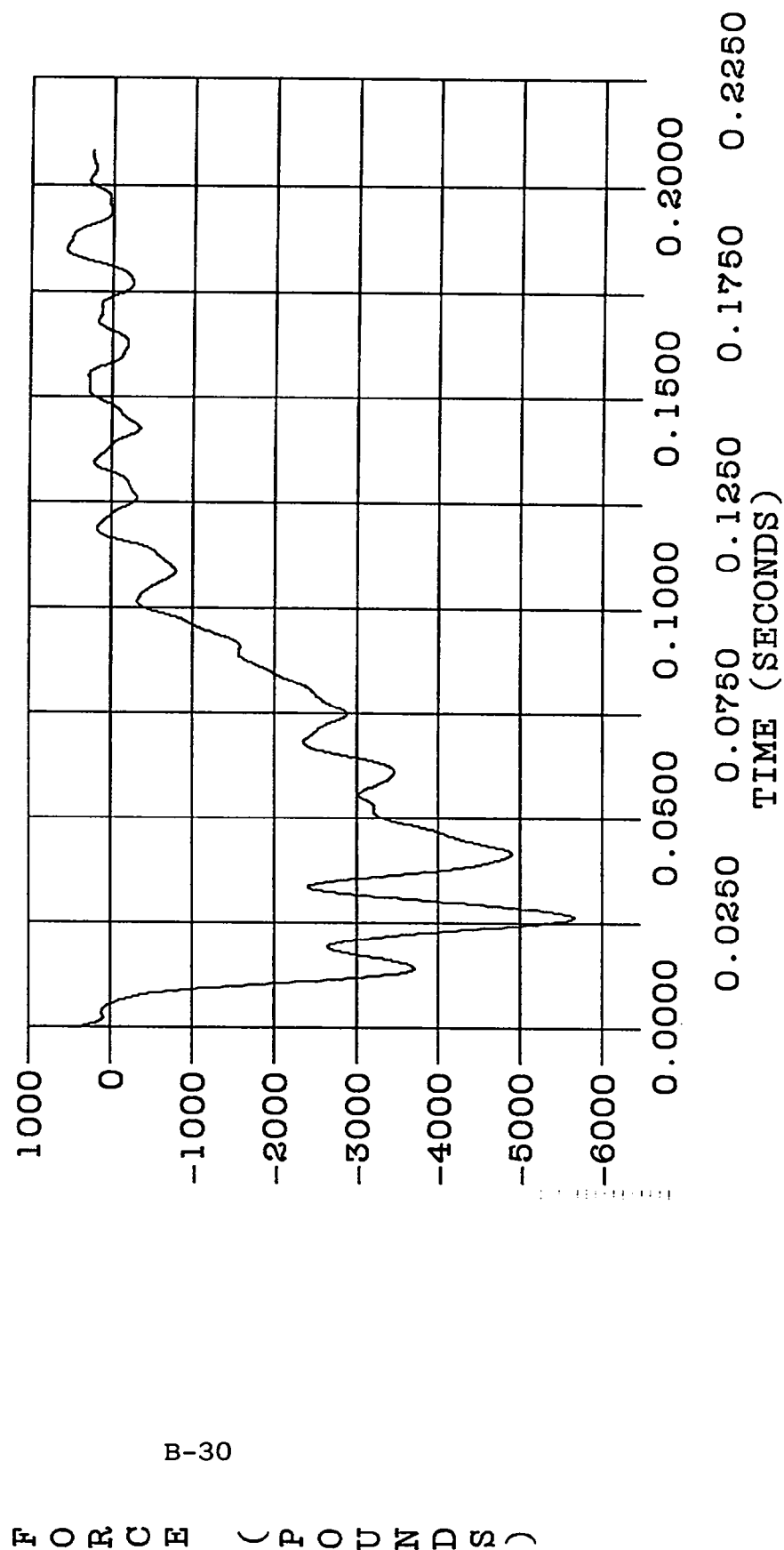


Sum of Load Cells C1-D3 Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
 BARRIER UPPER CENTER



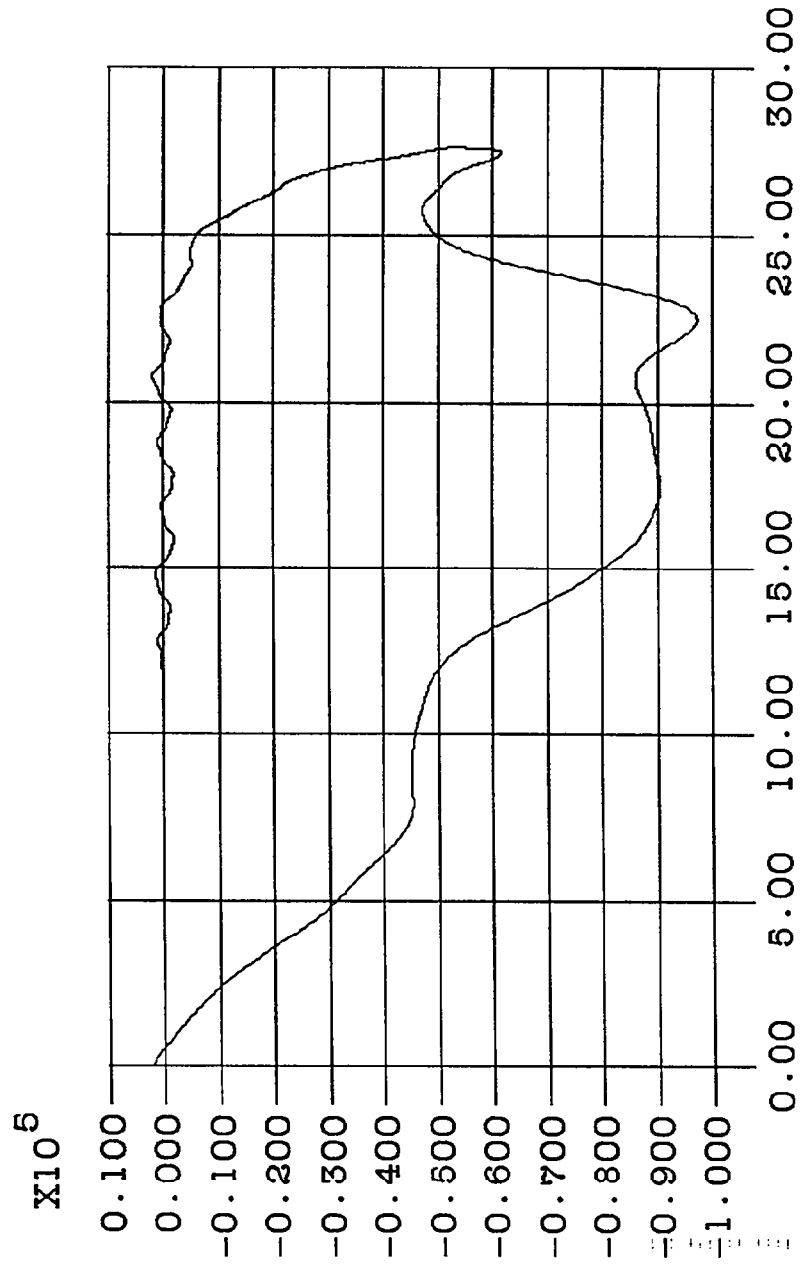
1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
 BARRIER UPPER RIGHT



Sum of Load Cells C7-D9 Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

VEH DISP/BARRIER FORCE



Sum of 6 Load Cells Force vs. Vehicle Dynamic Crush

B-31

FORCE (POUNDS)

TEST: 1991 MAZDA PROTEGE

FOUR DOOR SEDAN

NHTSA NO.: MM5401

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

TEST DATA MINIMUMS AND MAXIMUMS

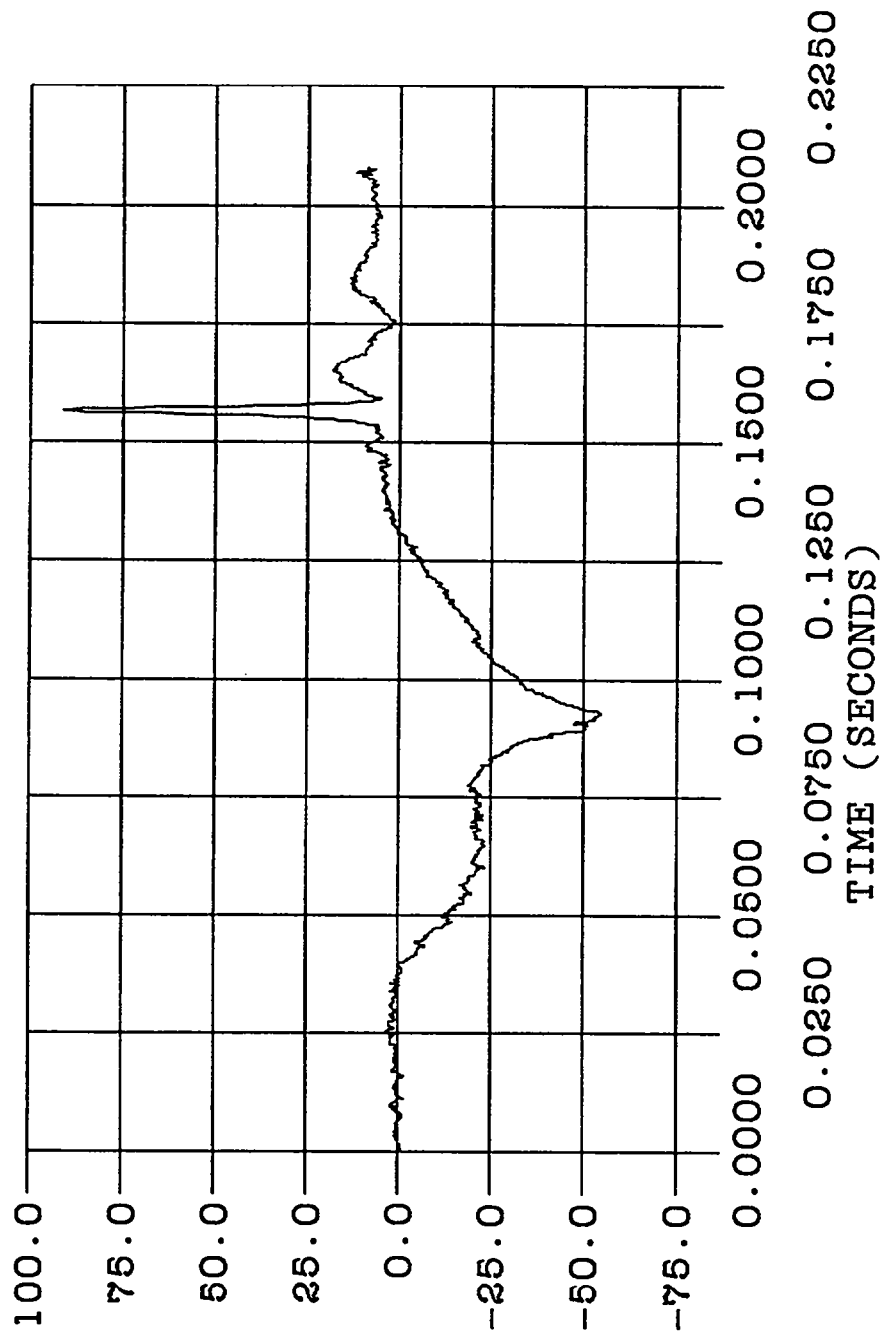
DESCRIPTION	MINIMUM		MAXIMUM	
Driver Head X Acc.	-54.8 @	0.09299	91.0 @	0.15646
Driver Head Y Acc.	-14.1 @	0.15707	5.9 @	0.09225
Driver Head Z Acc.	-1.5 @	0.17097	52.8 @	0.06544
Driver Head Resultant	0.2 @	0.01230	92.5 @	0.15646
Driver Head X Vel.	-8.5 @	0.13063	53.0 @	0.03641
Driver Chest X Acc.	-62.7 @	0.05695	13.7 @	0.18413
Driver Chest Y Acc.	-9.5 @	0.06162	6.5 @	0.07663
Driver Chest Z Acc.	-12.5 @	0.04416	16.4 @	0.08118
Driver Chest Resultant	0.3 @	0.00800	63.0 @	0.05695
Driver Femur RH Force	-851.4 @	0.05633	146.6 @	0.04846
Driver Femur LH Force	-1700.1 @	0.05510	127.9 @	0.04736
Driver Lap Belt Force	-8.8 @	0.01242	751.7 @	0.07023
Driver Torso Belt Force	-3.3 @	0.20701	2697.3 @	0.06851
Pass. Head X Acc.	-36.2 @	0.05018	7.6 @	0.19373
Pass. Head Y Acc.	-5.1 @	0.17060	18.6 @	0.09926
Pass. Head Z Acc.	-1.7 @	0.01082	56.9 @	0.08524
Pass. Head Resultant	0.1 @	0.00640	60.6 @	0.08831
Pass. Head X Vel.	52.2 @	0.15006	-8.3 @	0.00910
Pass. Chest X Acc.	-52.1 @	0.07306	3.5 @	0.11796
Pass. Chest Y Acc.	-10.0 @	0.07331	15.6 @	0.08352
Pass. Chest Z Acc.	-19.0 @	0.07564	20.1 @	0.04330
Pass. Chest Resultant	0.1 @	0.00996	54.3 @	0.07306
Pass. Femur RH Force	-997.2 @	0.04957	170.8 @	0.10541
Pass. Femur LH Force	N/A	N/A	N/A	N/A
Pass. Lap Belt Force	-6.8 @	0.17601	1037.8 @	0.06728
Pass. Torso Belt Force	-98.2 @	0.13223	2284.4 @	0.06999
Driver Torso Belt Stretch	0.0 @	0.02362	0.2 @	0.07897
Pass. Torso Belt Stretch	-0.1 @	0.19643	0.0 @	0.05486

* Data not available - no valid data collected for this channel.

ACCELERATION (G, S)

B-35

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
DRIVER HEAD X

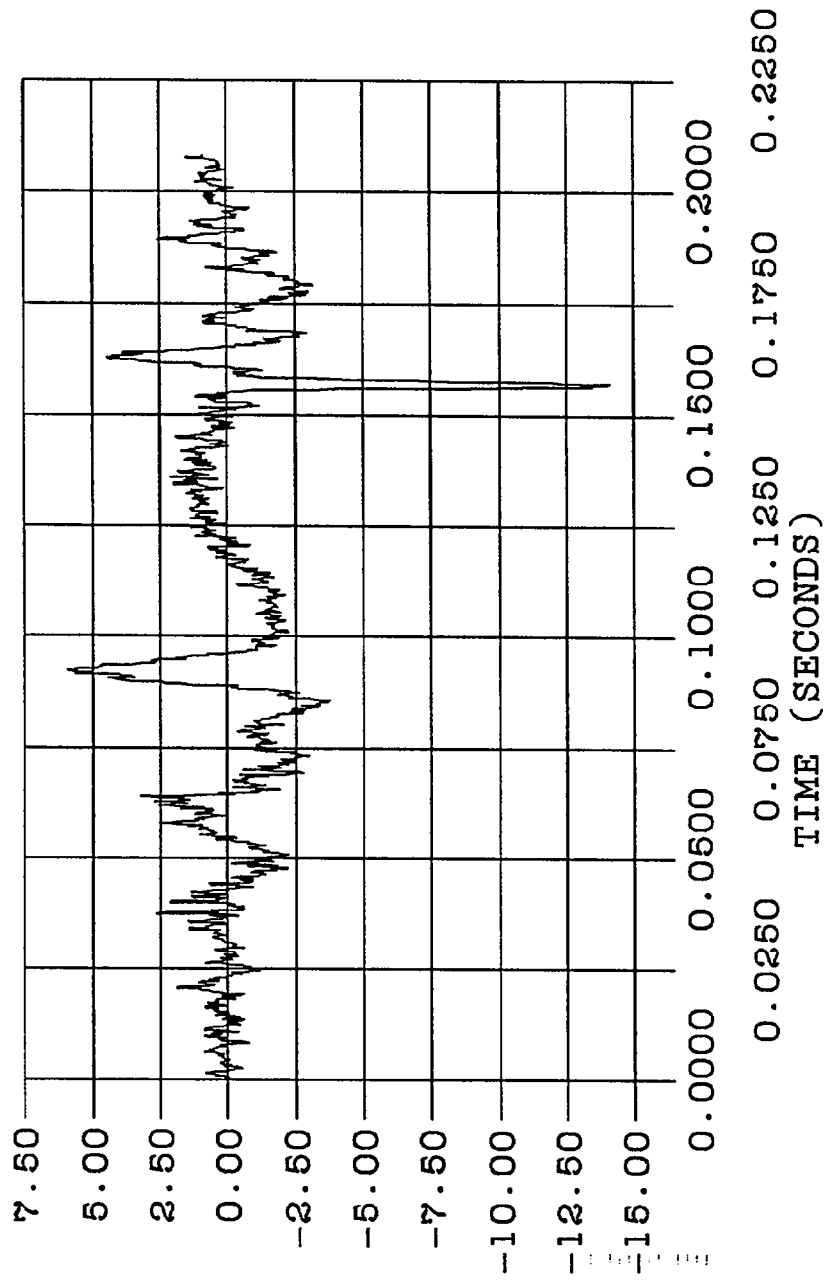


Driver Head X Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

DRIVER HEAD Y

ACCELERATION (G, S)



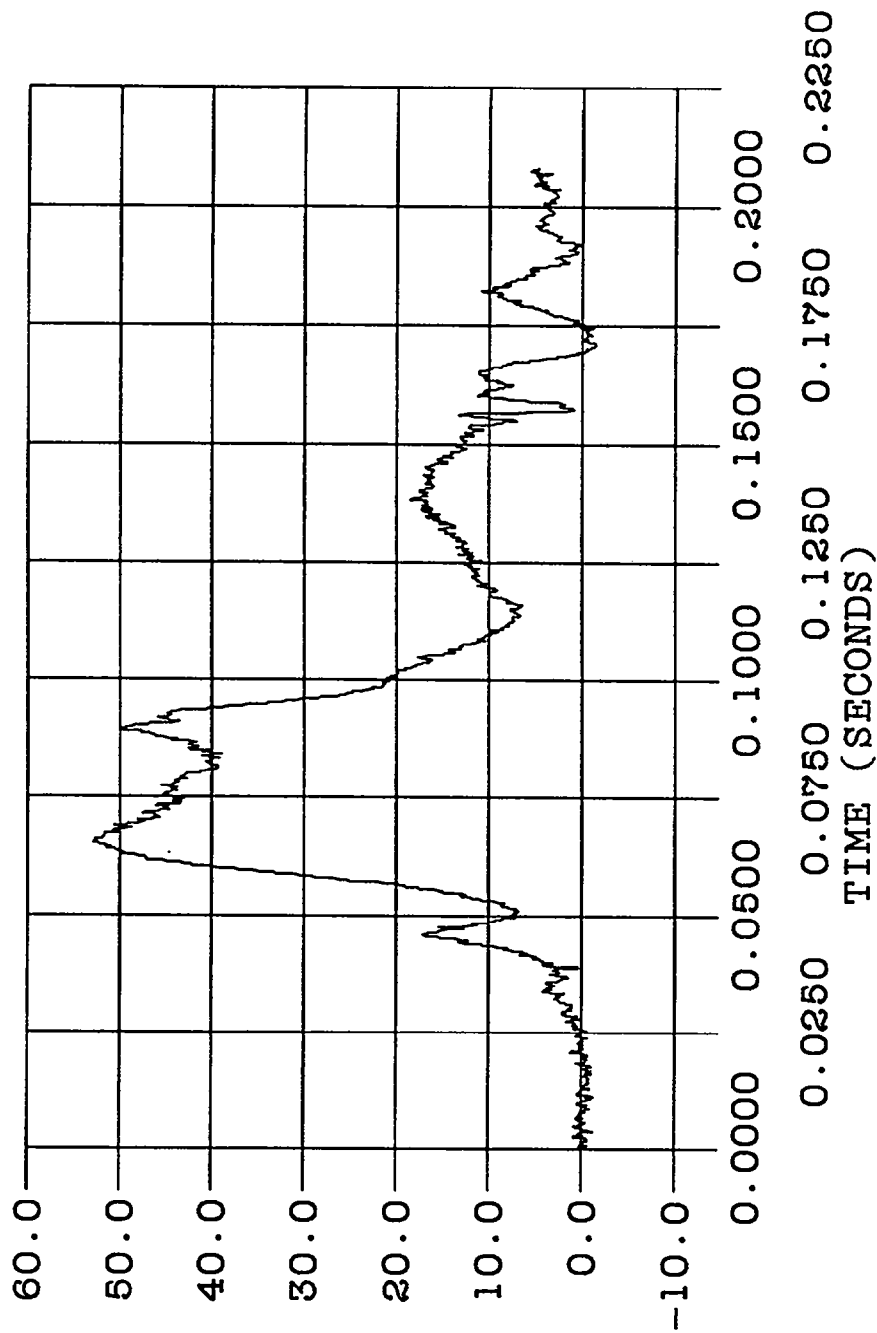
Driver Head Y Acceleration vs. Time

11111

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

DRIVER HEAD Z

ACCELERATION (G, S)

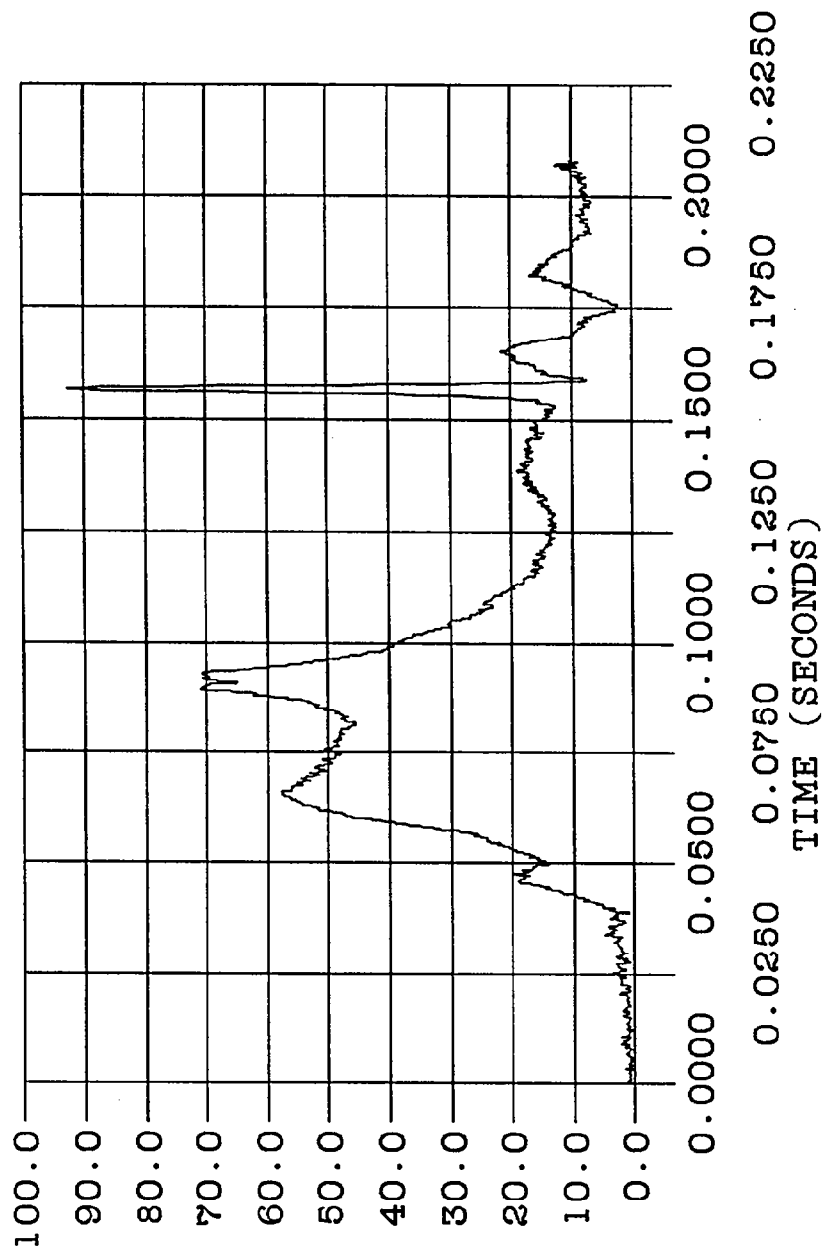


Driver Head Z Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

DRIVER HEAD RES

ACCELERATION (G, S)

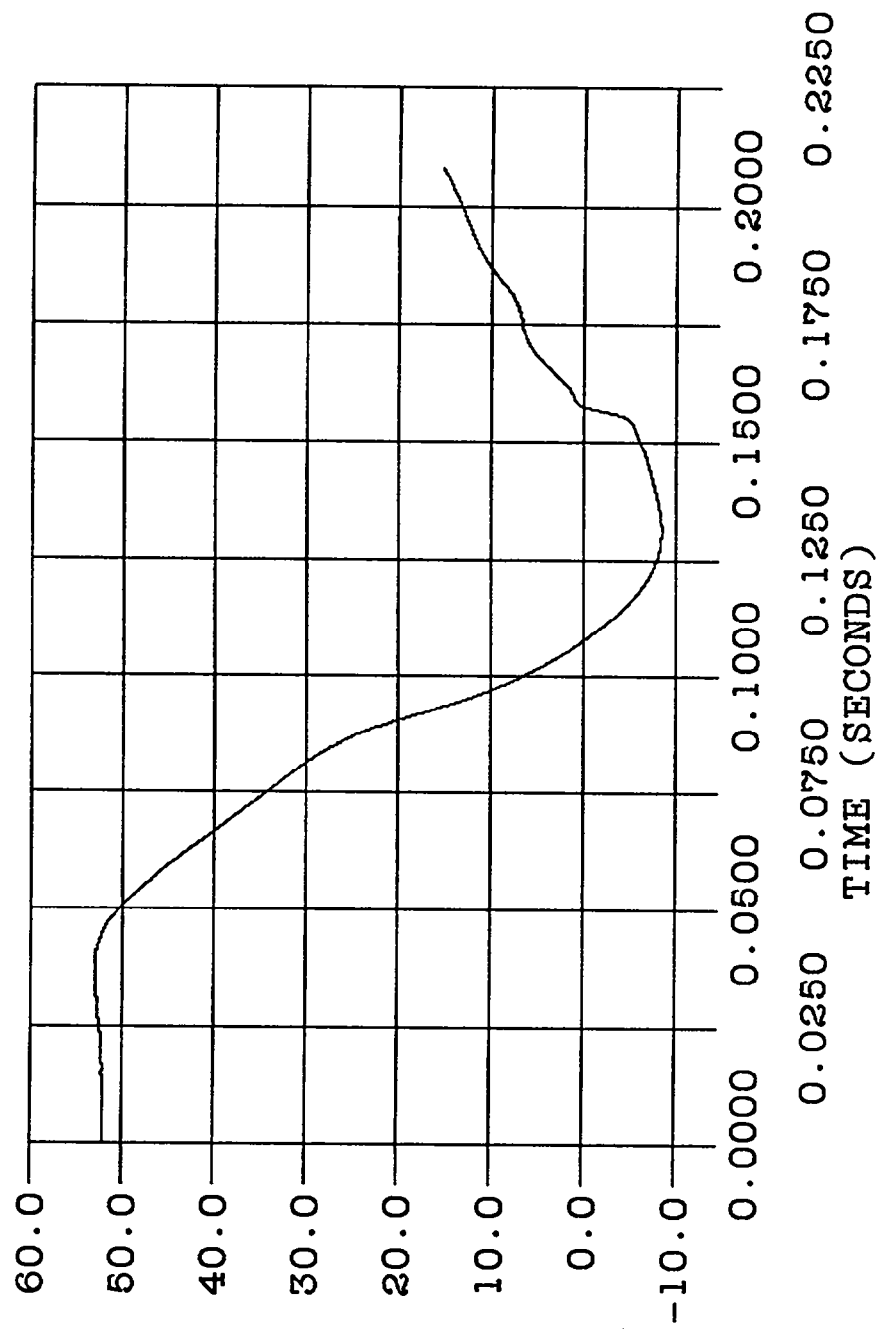


Driver Head Resultant Acceleration vs. Time

VELOCITY (FT / S)

B-39

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
DRIVER HEAD X VEL

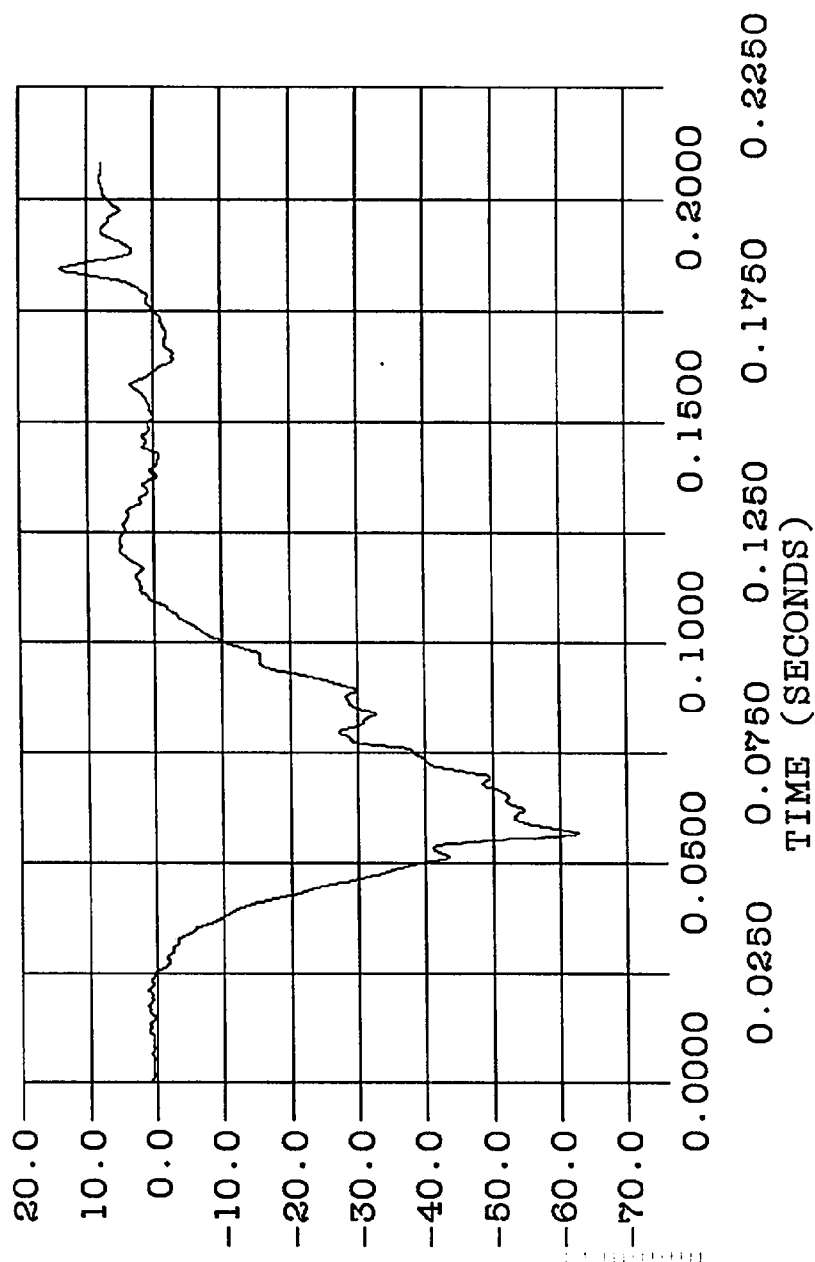


Driver Head X Velocity vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

DRIVER CHEST X

ACCELERATION (G, S)

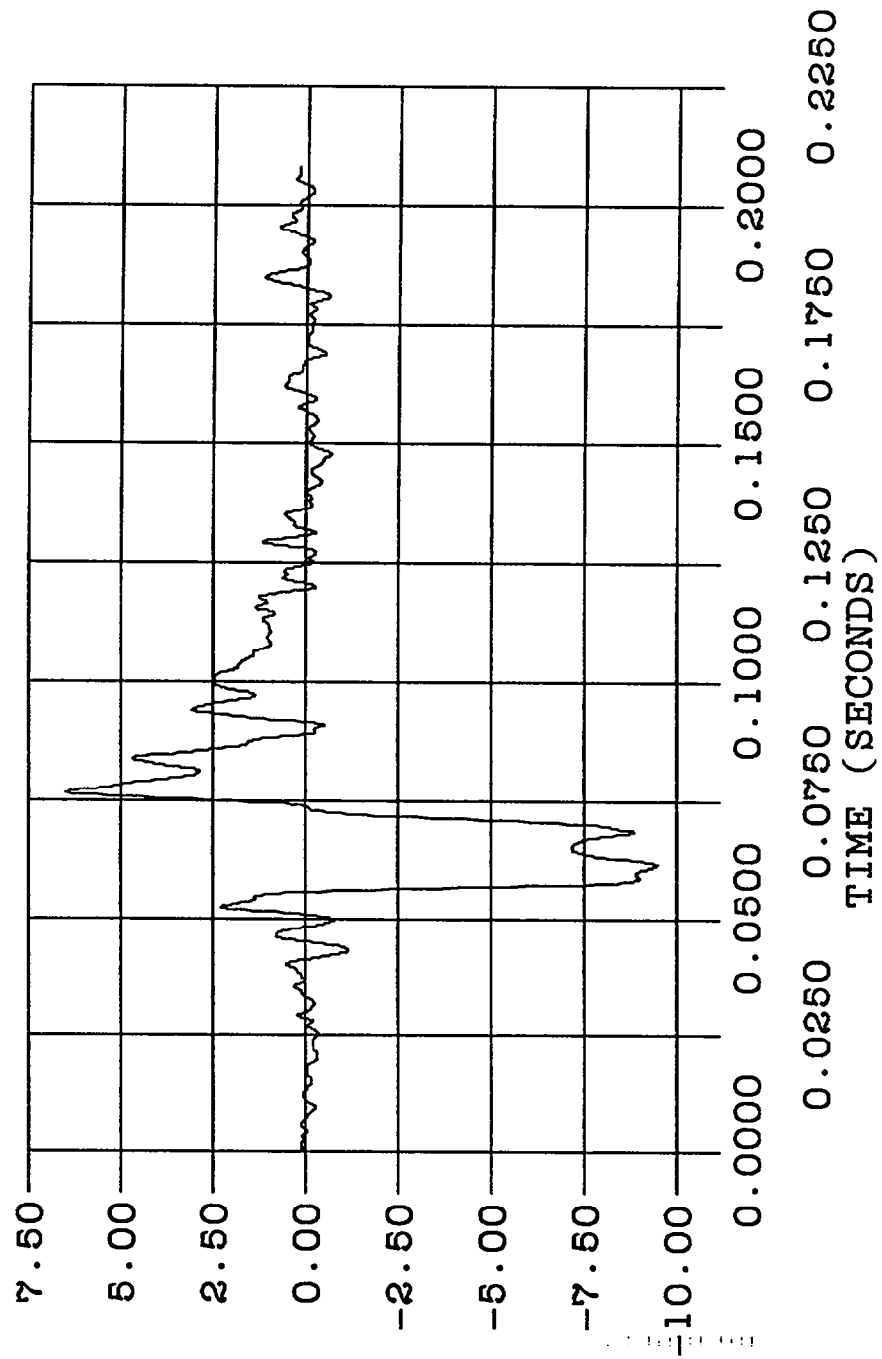


Driver Chest X Acceleration vs. Time

ACCELERATION (G, S)

B-41

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
DRIVER CHEST Y

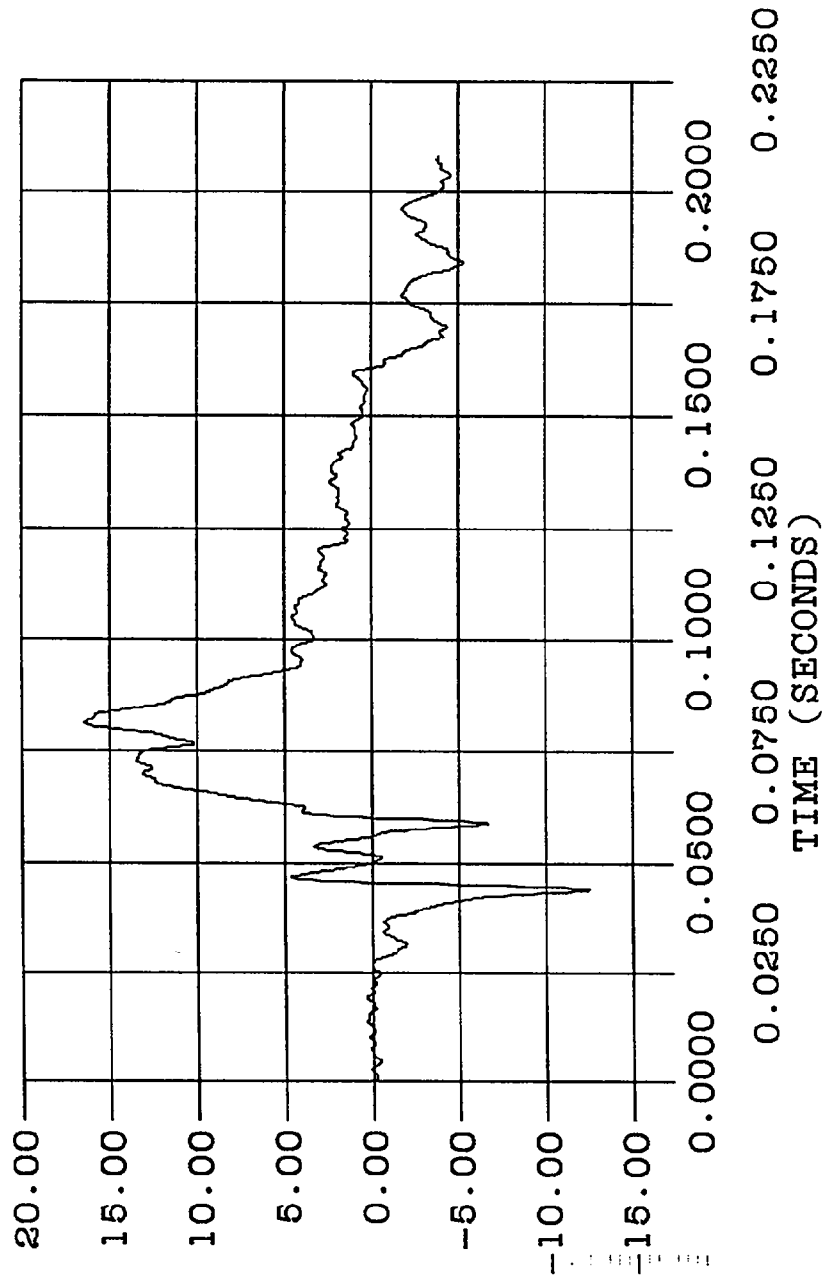


Driver Chest Y Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

DRIVER CHEST Z

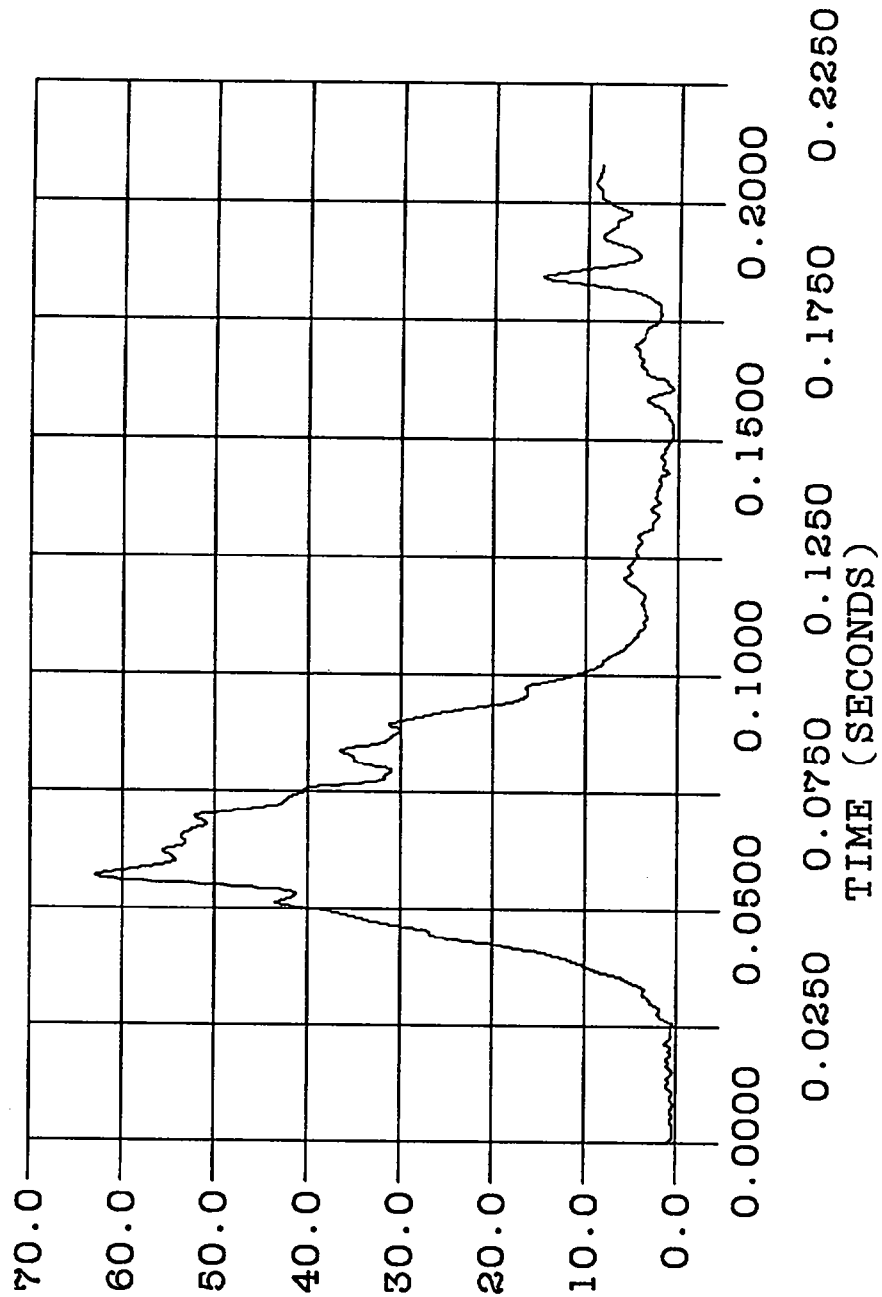
ACCELERATION (G, S)



Driver Chest Z Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
 DRIVER CHEST RES

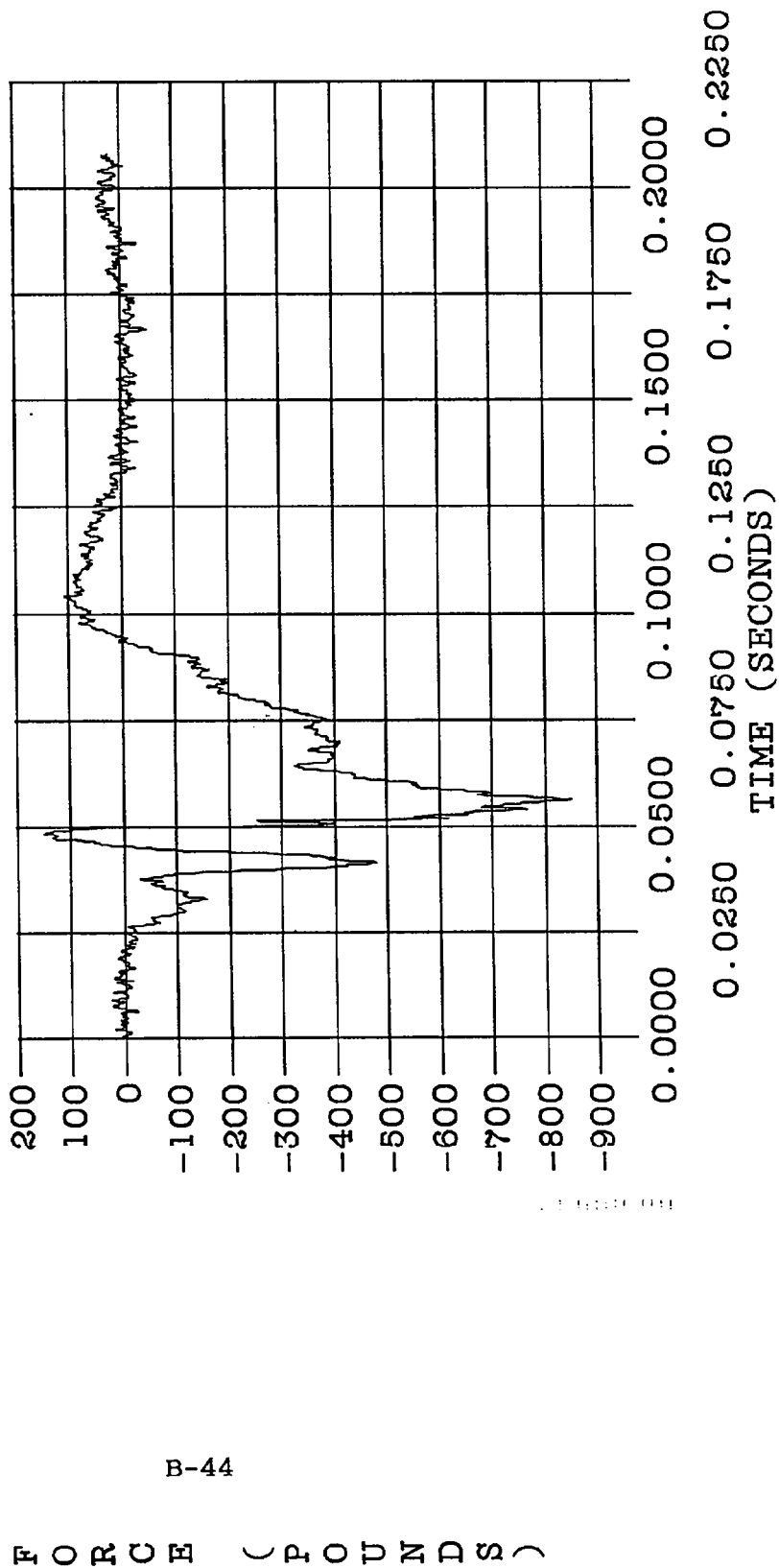
ACCELERATION (G, S)



Driver Chest Resultant Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

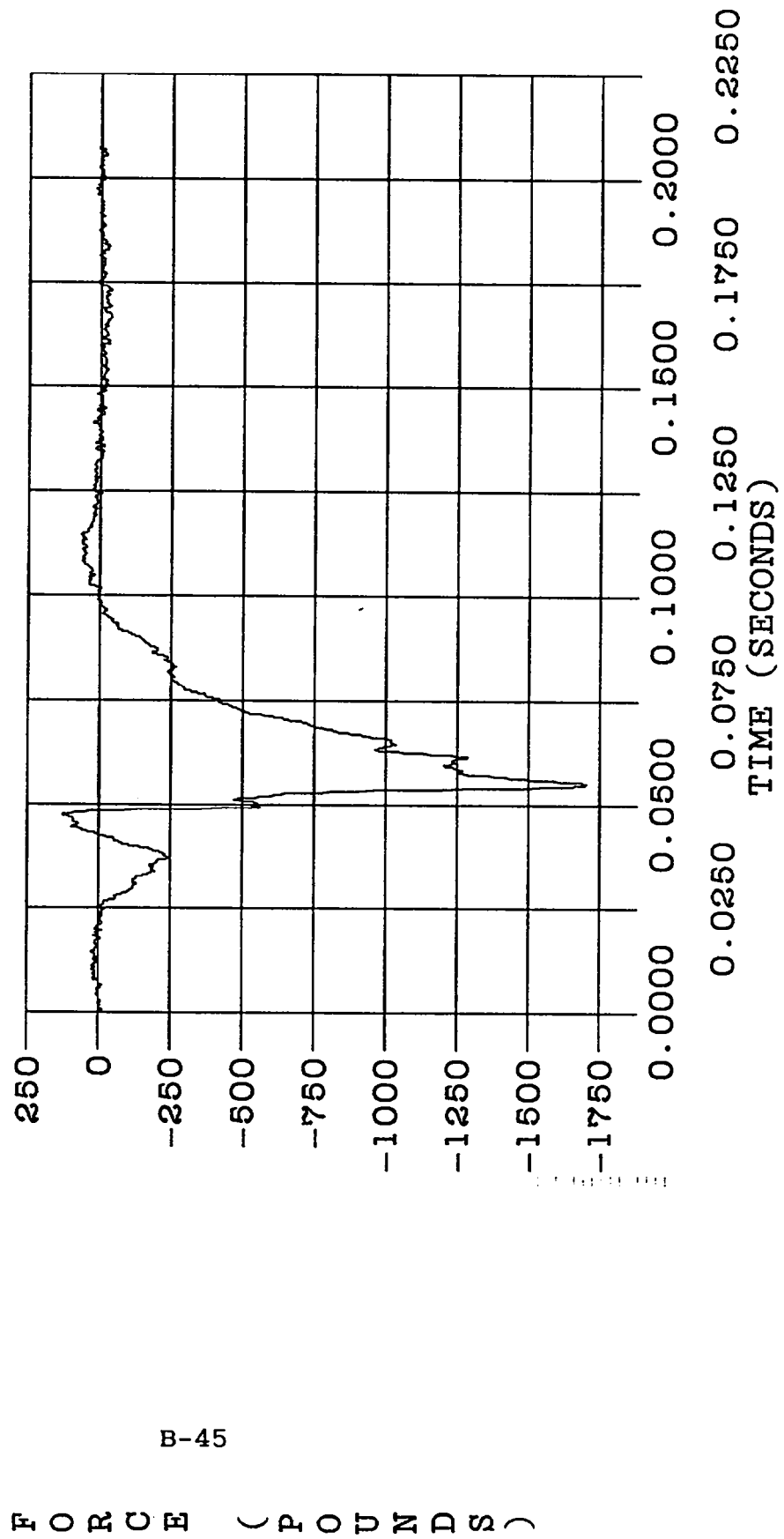
DRIVER FEMUR RH



Driver Right Femur Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

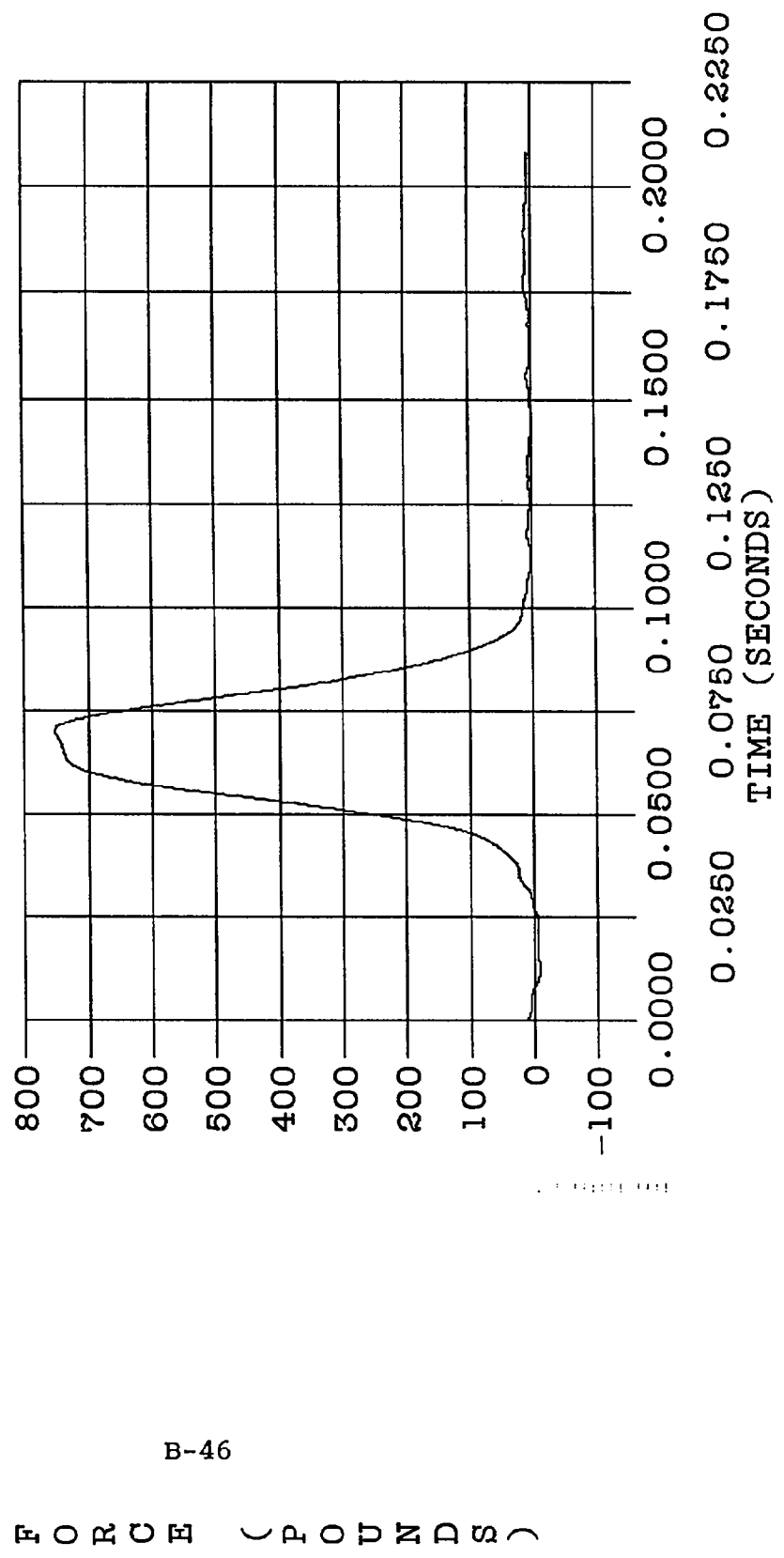
DRIVER FEMUR LH



Driver Left Femur Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

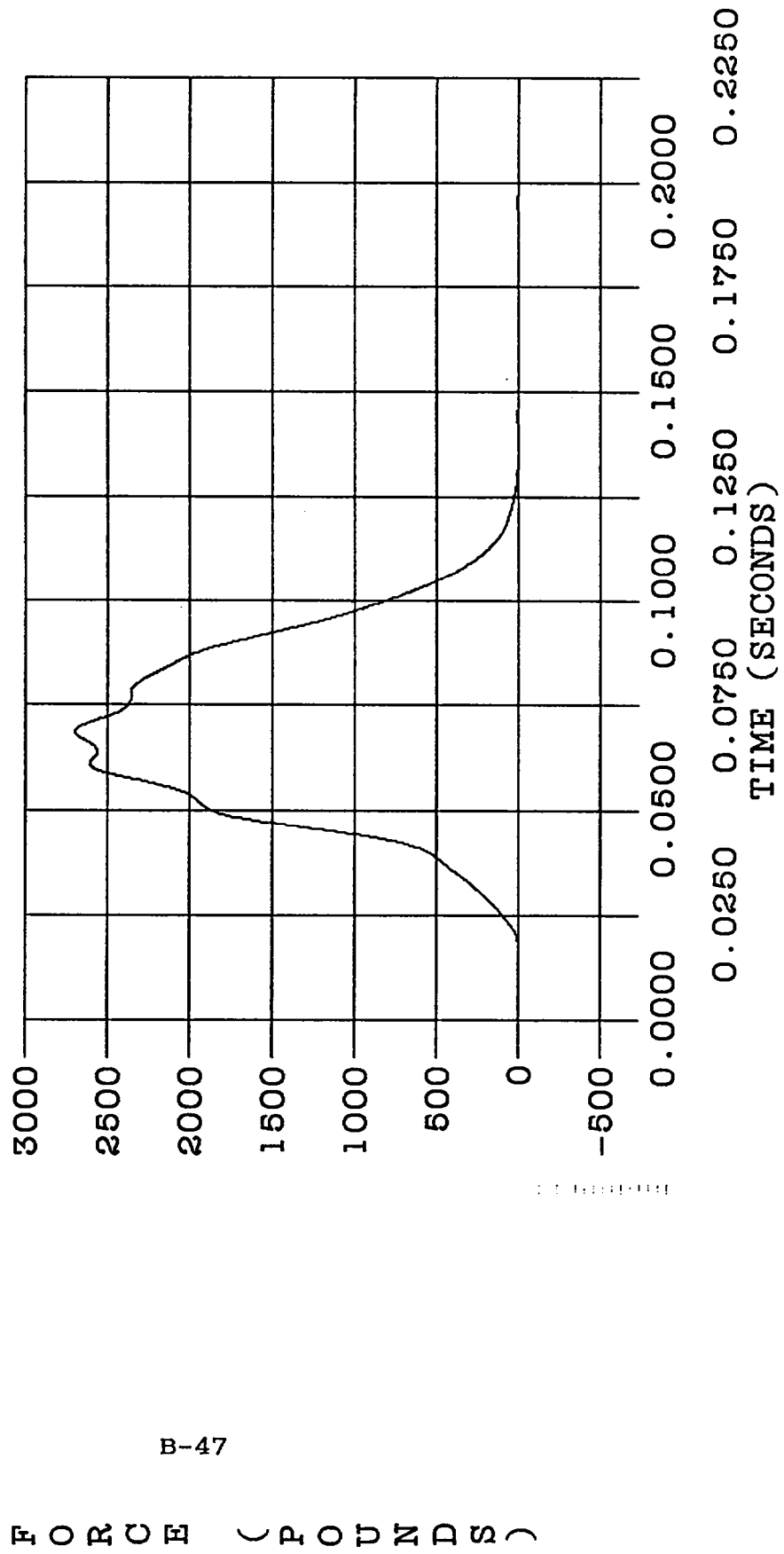
DRIVER LAP BELT



Driver Lap Belt Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

DRIVER TORSO BELT

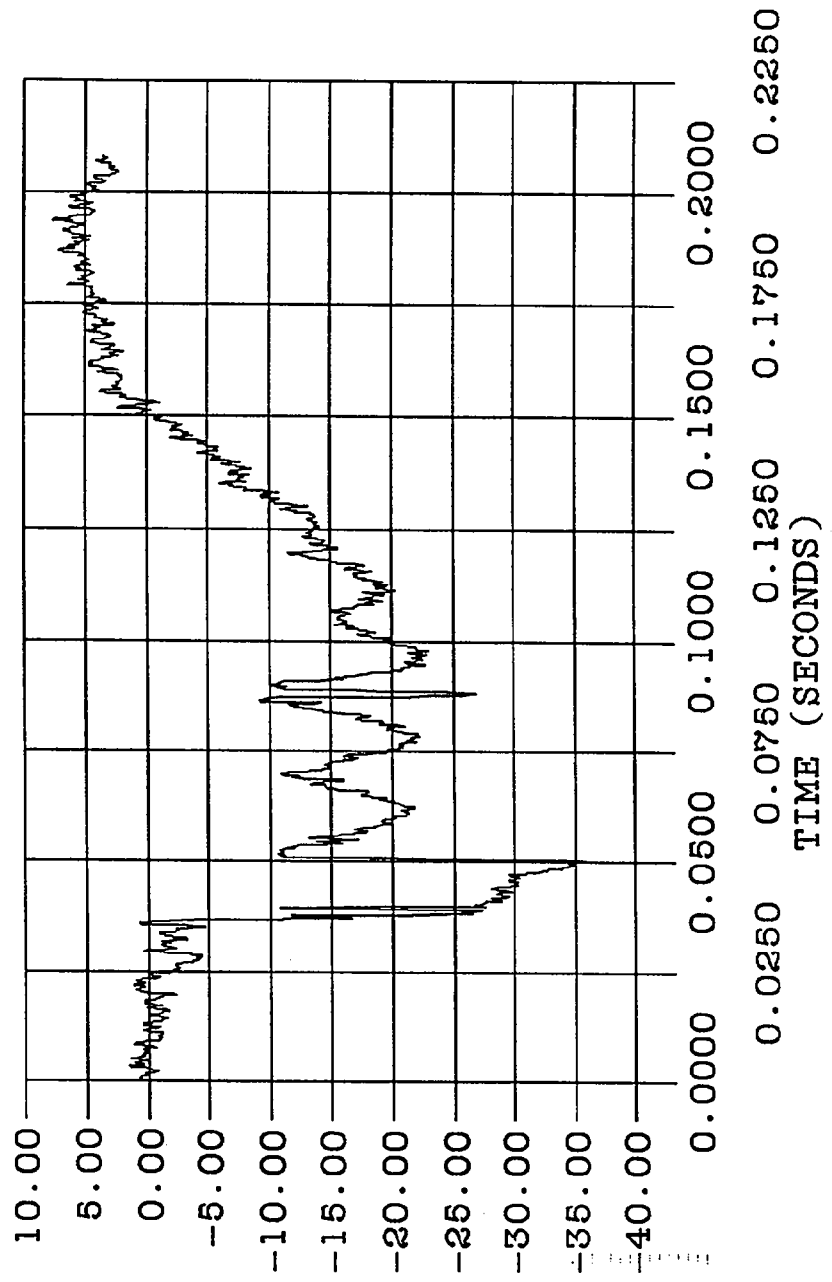


Driver Torso Belt Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

PASS HEAD X

ACCELERATION (G, S)

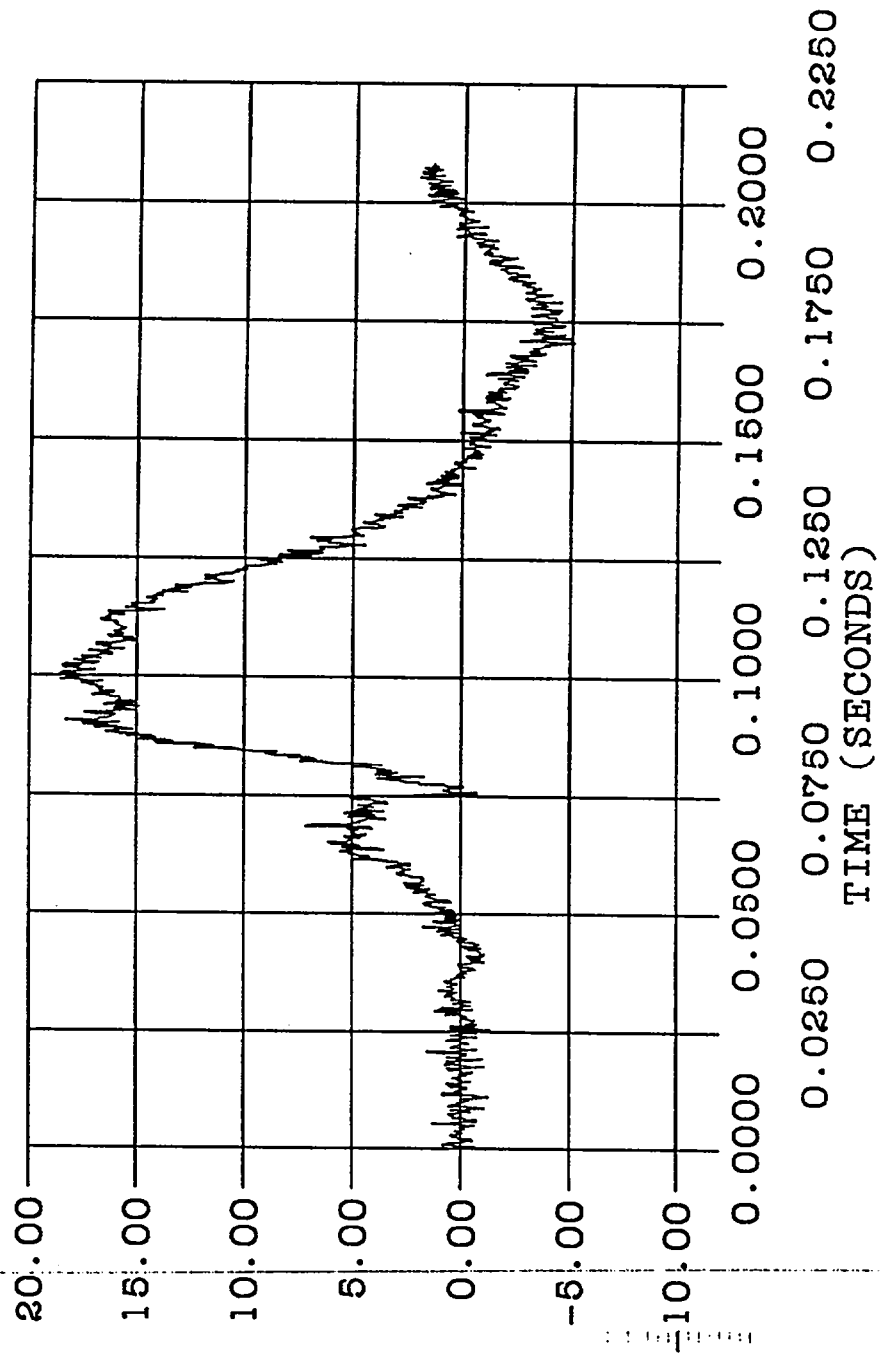


Passenger Head X Acceleration vs. Time

ACCELERATION (G, S)

B-49

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
PASS HEAD Y

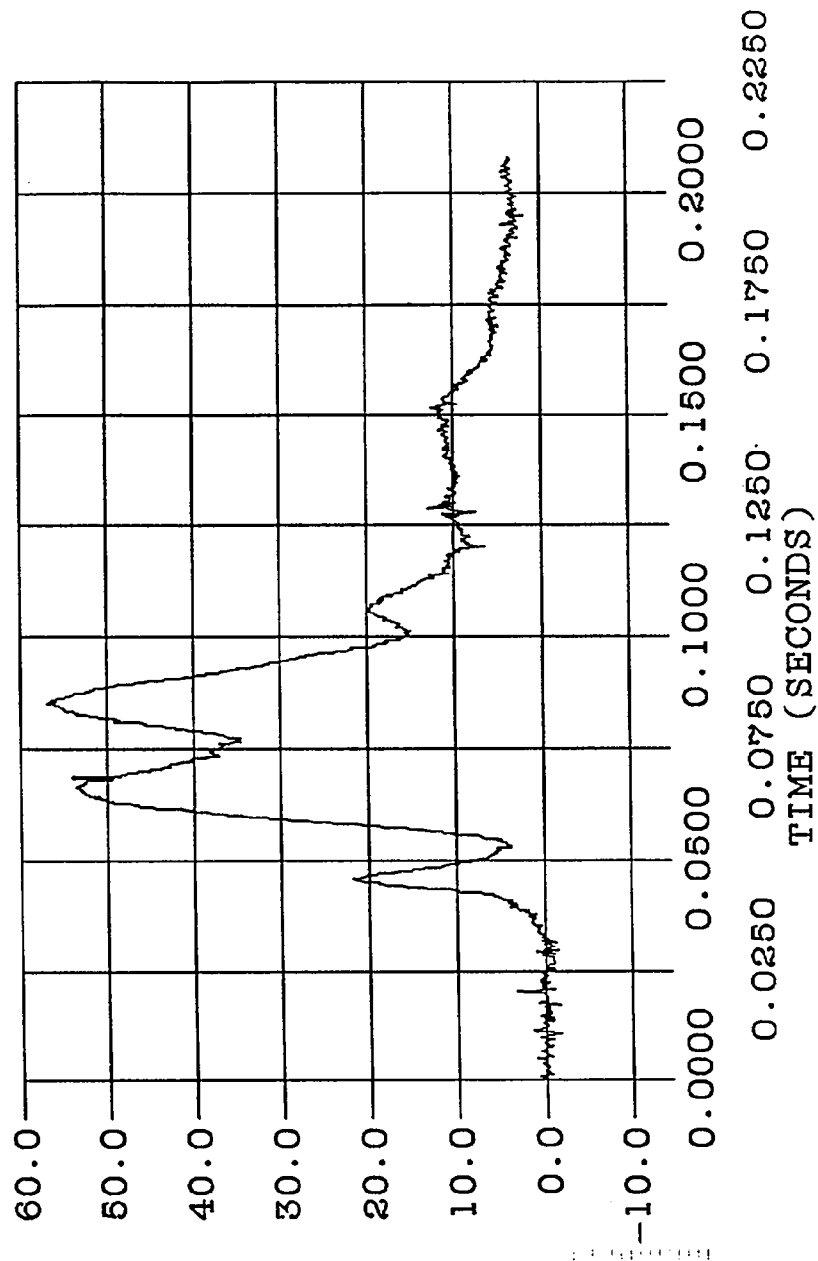


Passenger Head Y Acceleration vs. Time

ACCELERATION (G, S)

B-50

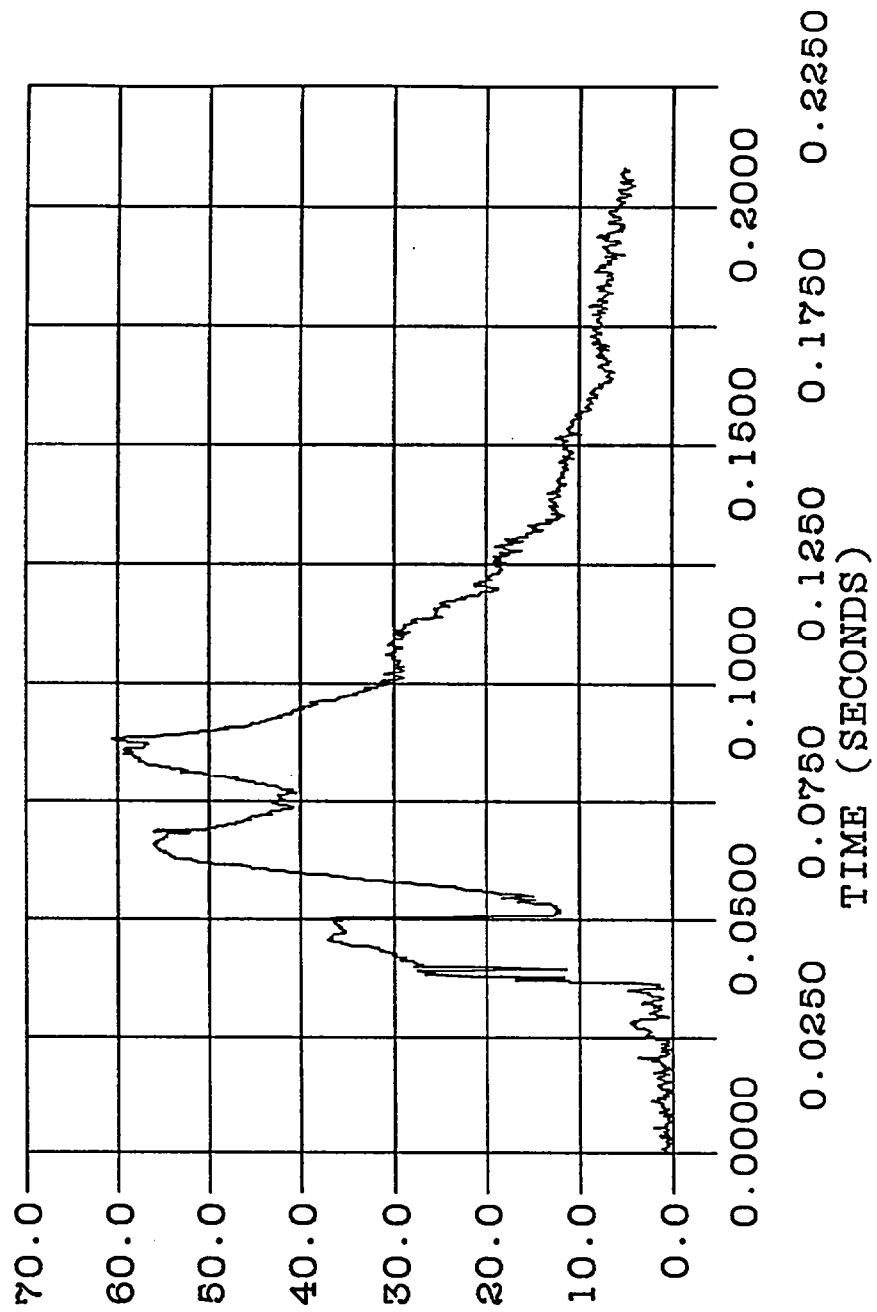
1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
PASS HEAD Z



Passenger Head Z Acceleration vs. Time

ACCELERATION (G, S)

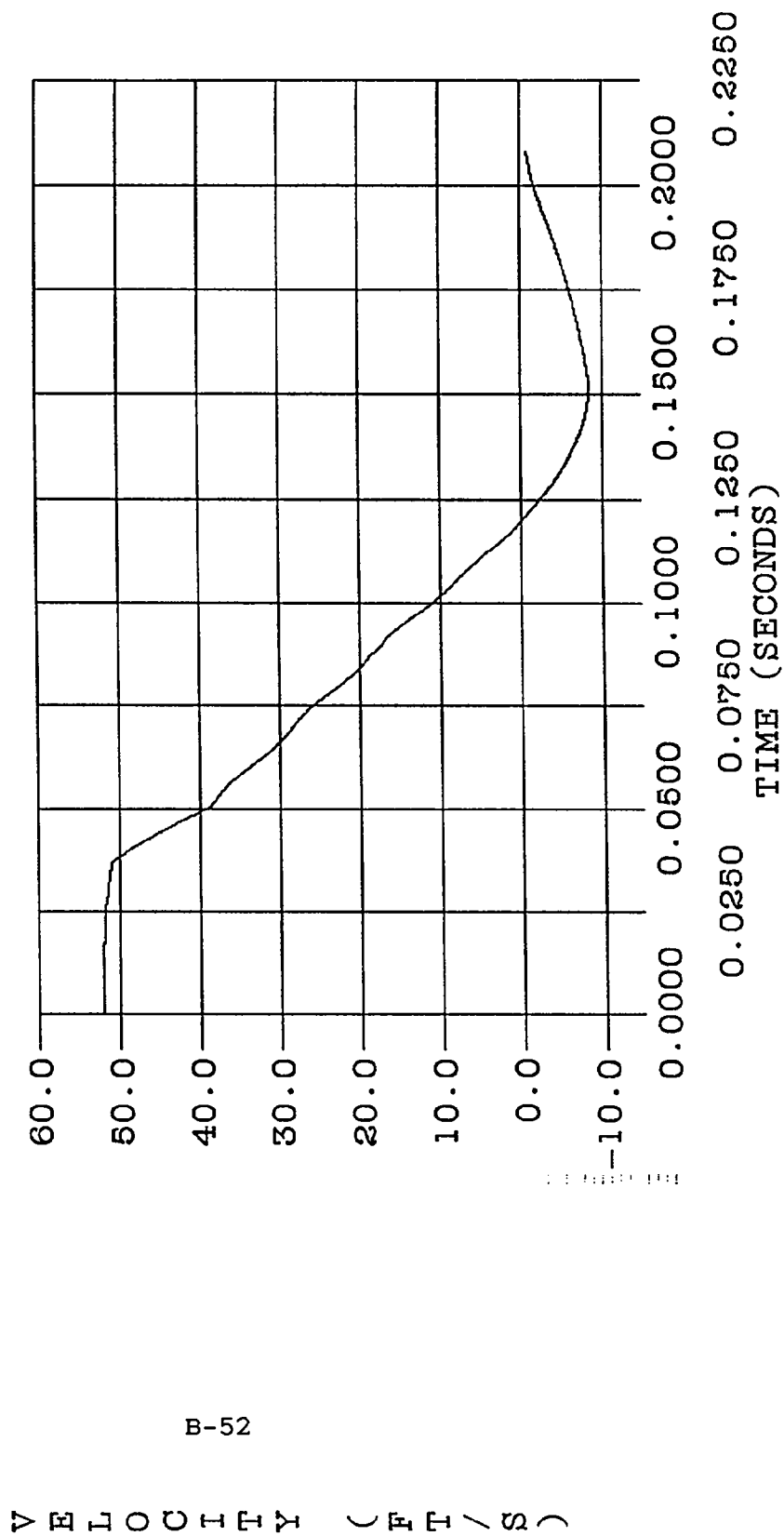
1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
PASS HEAD RES



Passenger Head Resultant Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

PASS HEAD X VEL

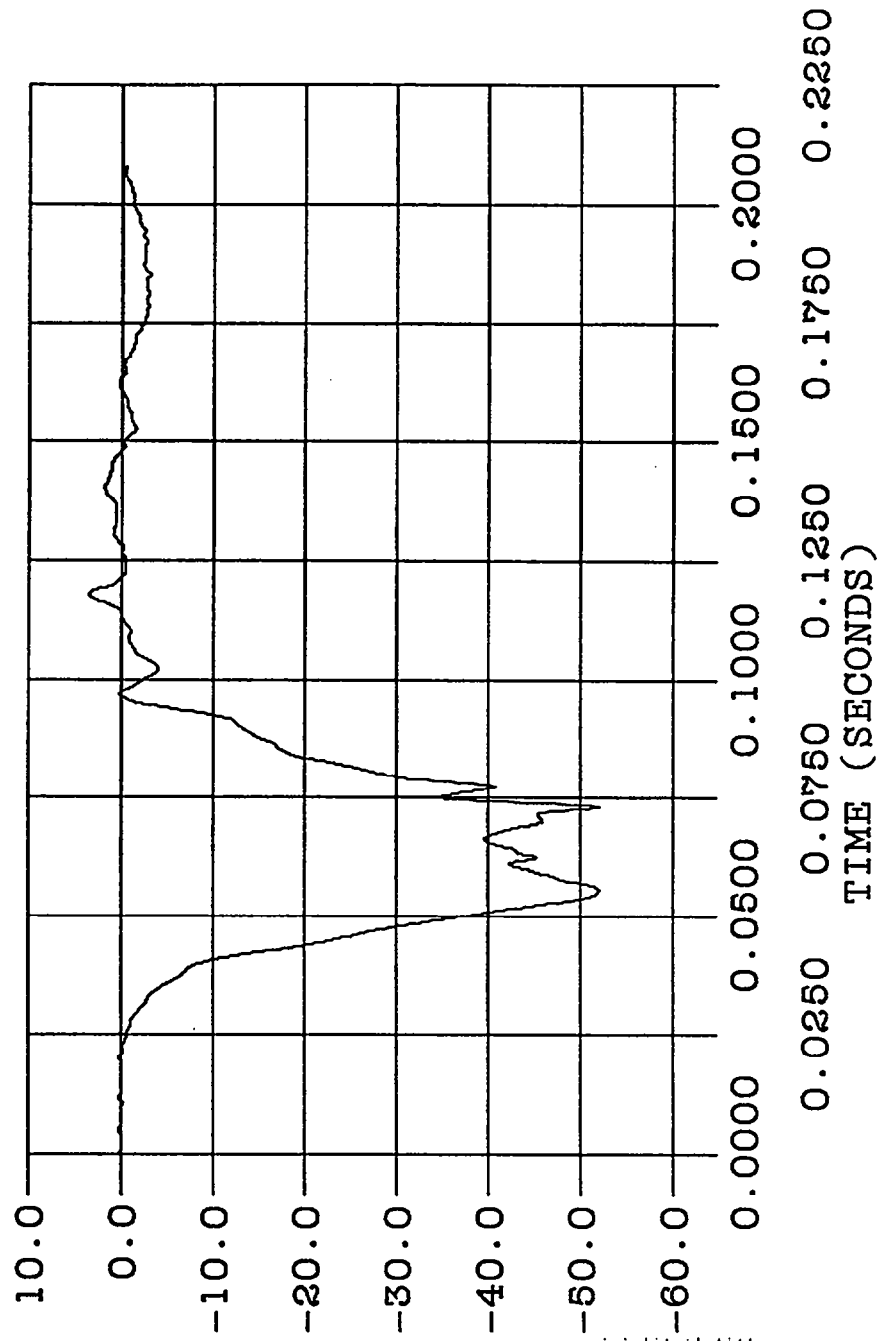


Passenger Head X Velocity vs. Time

ACCELERATION (G, S)

B-53

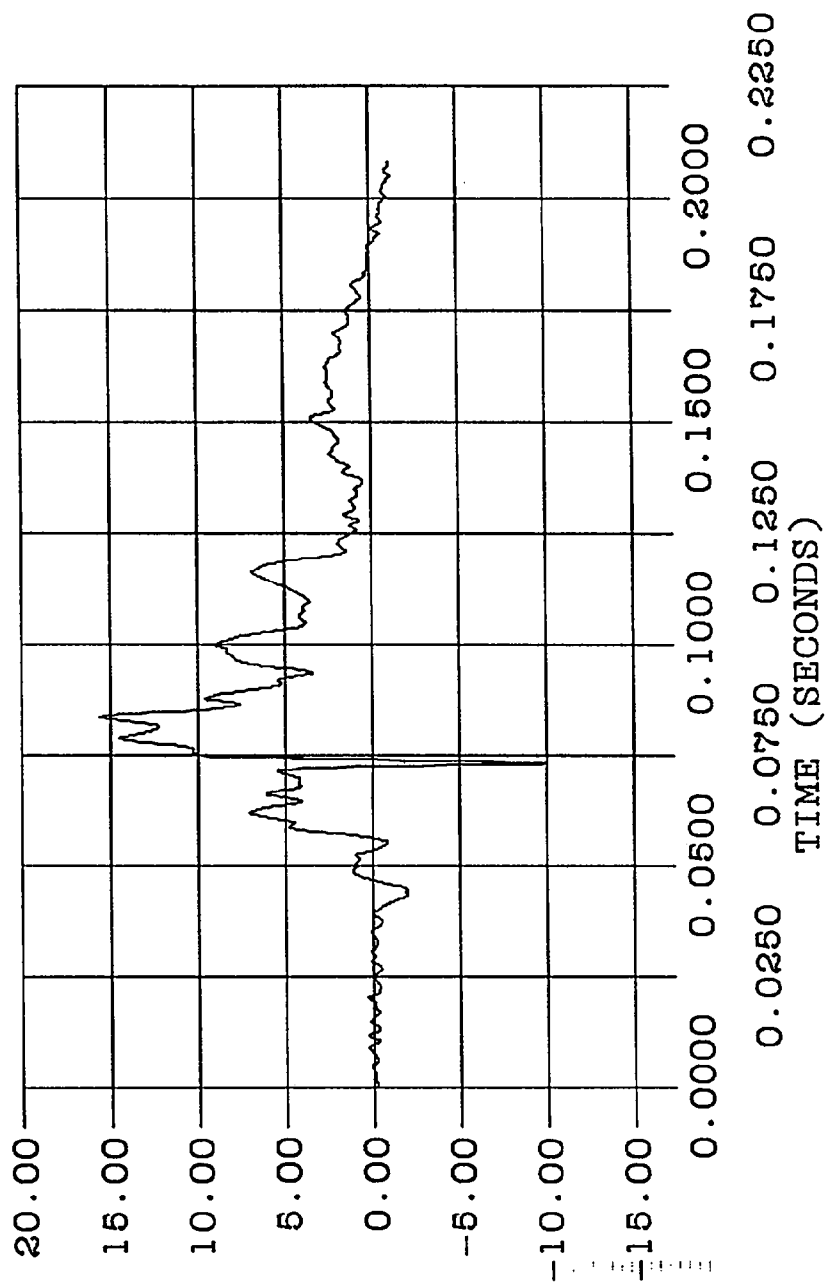
1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
PASS CHEST X



Passenger Chest X Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

PASS CHEST Y

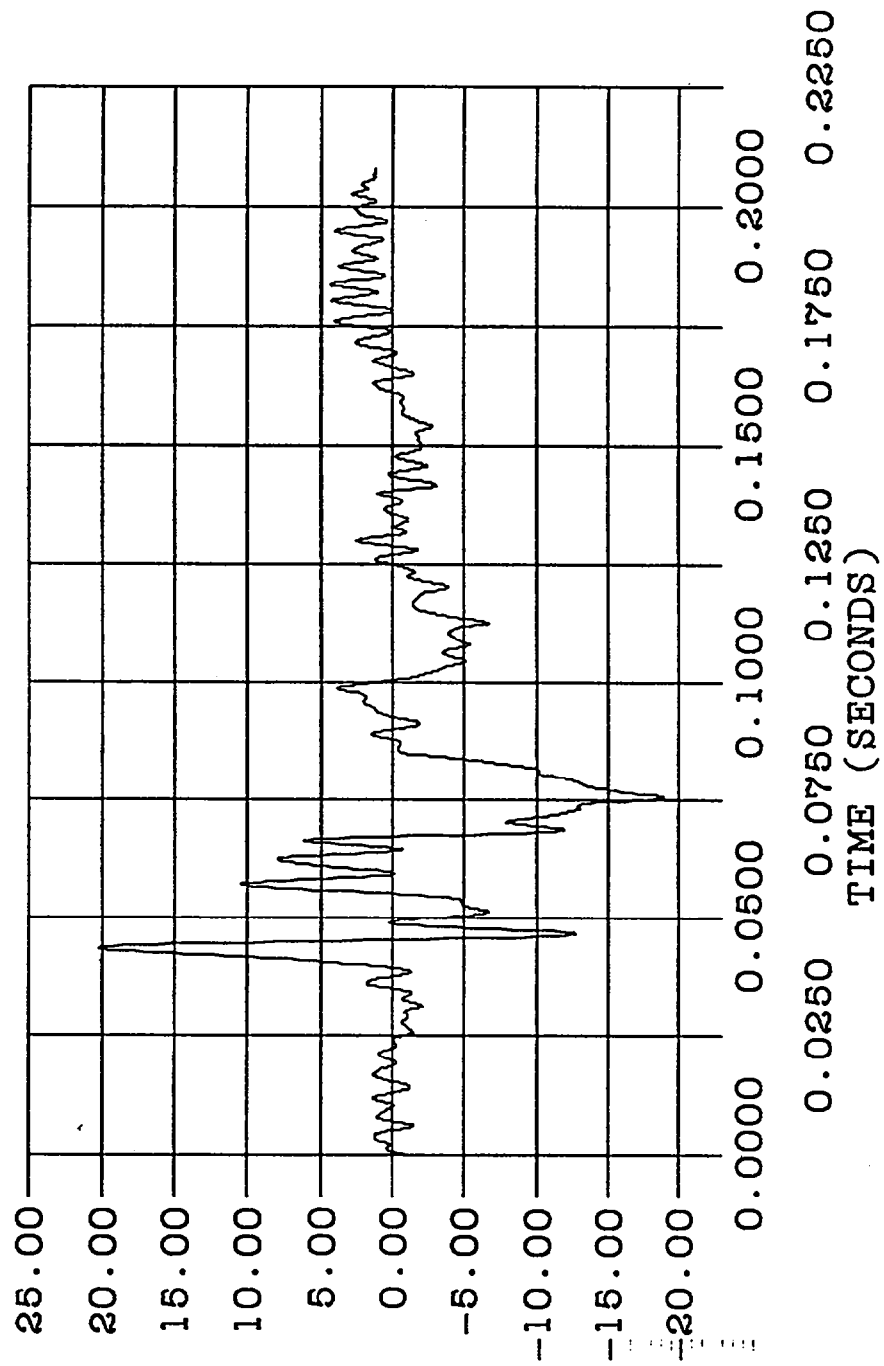


Passenger Chest Y Acceleration vs. Time

ACCELERATION (G, S)

B-55

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
PASS CHEST Z

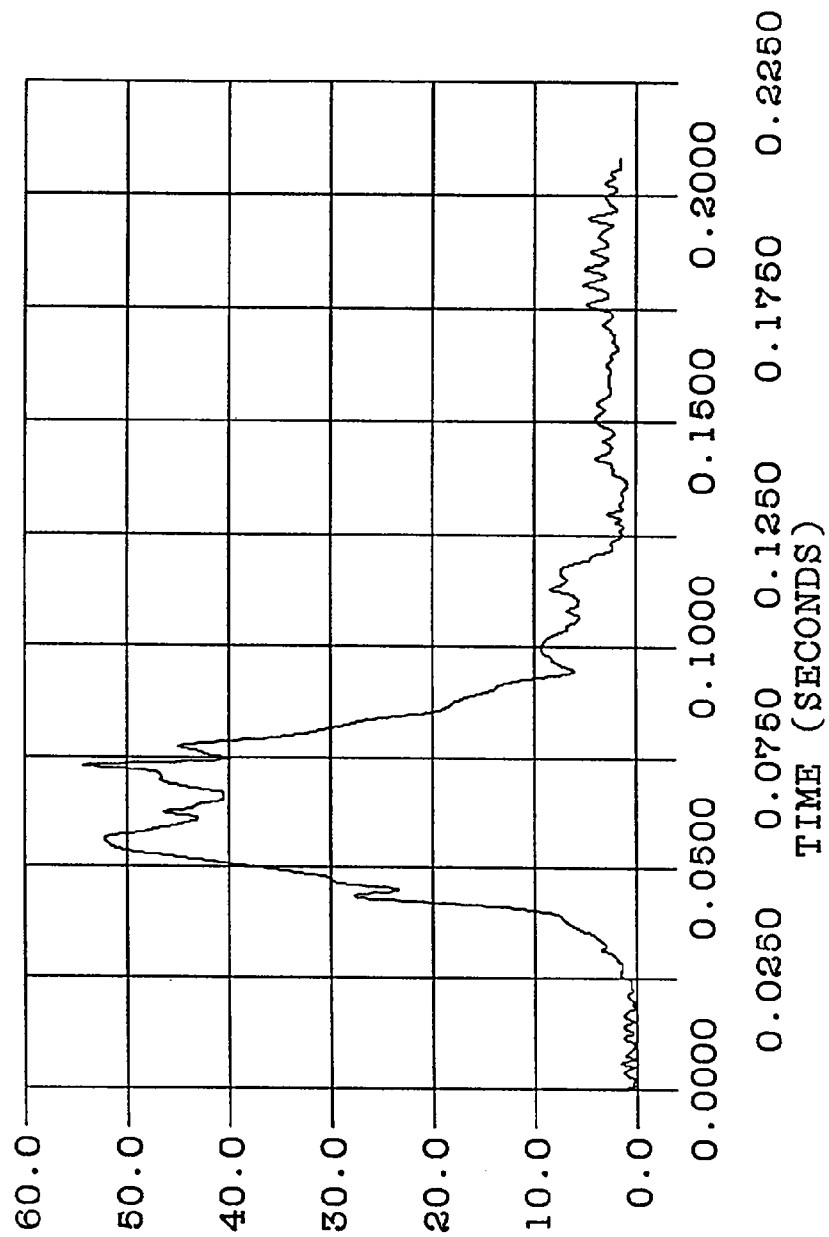


Passenger Chest Z Acceleration vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

PASS CHEST RES

ACCELERATION (G, S)

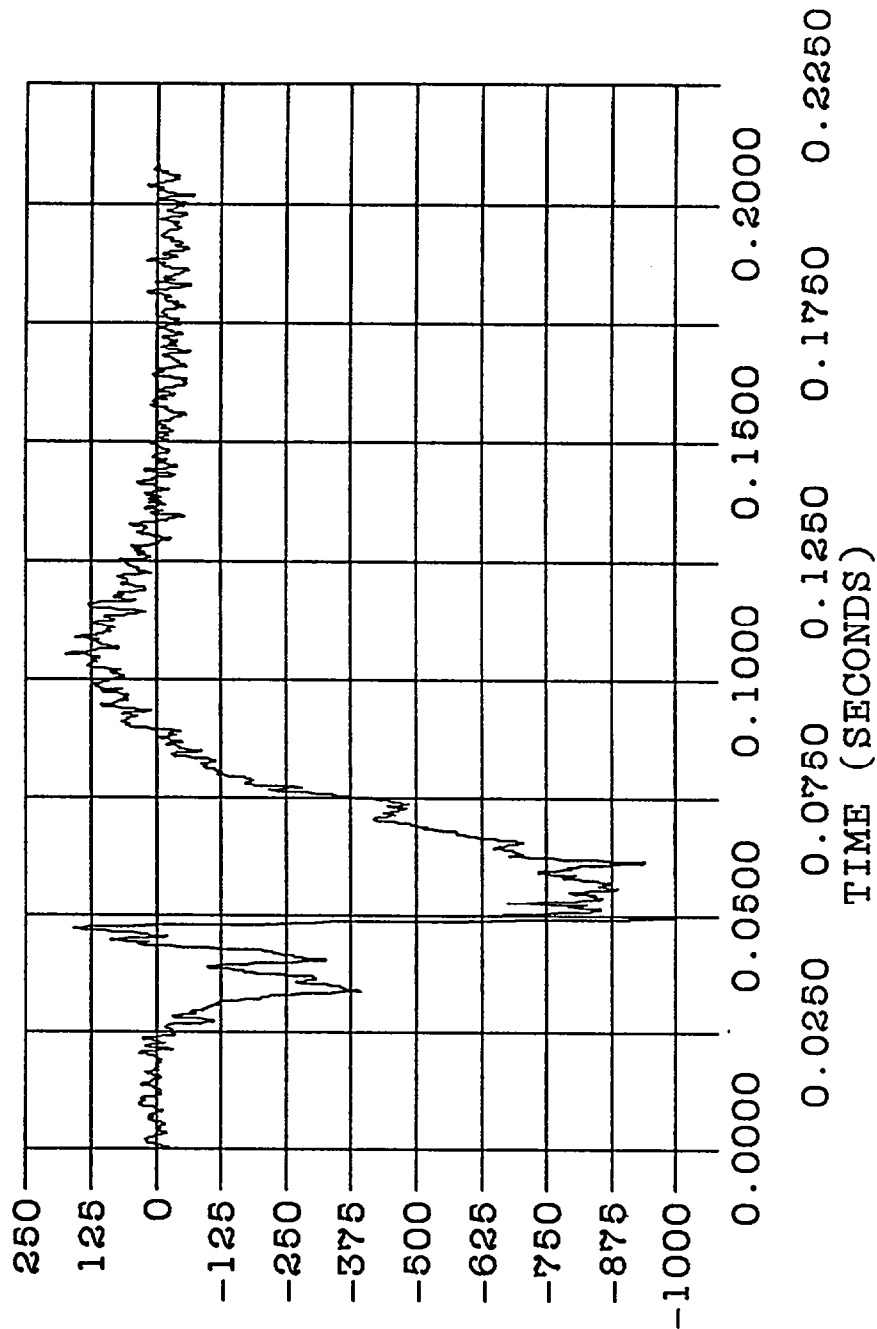


Passenger Chest Resultant Acceleration vs. Time

FORCE (POUNDS)

B-57

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
PASS FEMUR RH



Passenger Right Femur Force vs. Time

DATA PLOT NOT AVAILABLE
NO VALID DATA COLLECTED

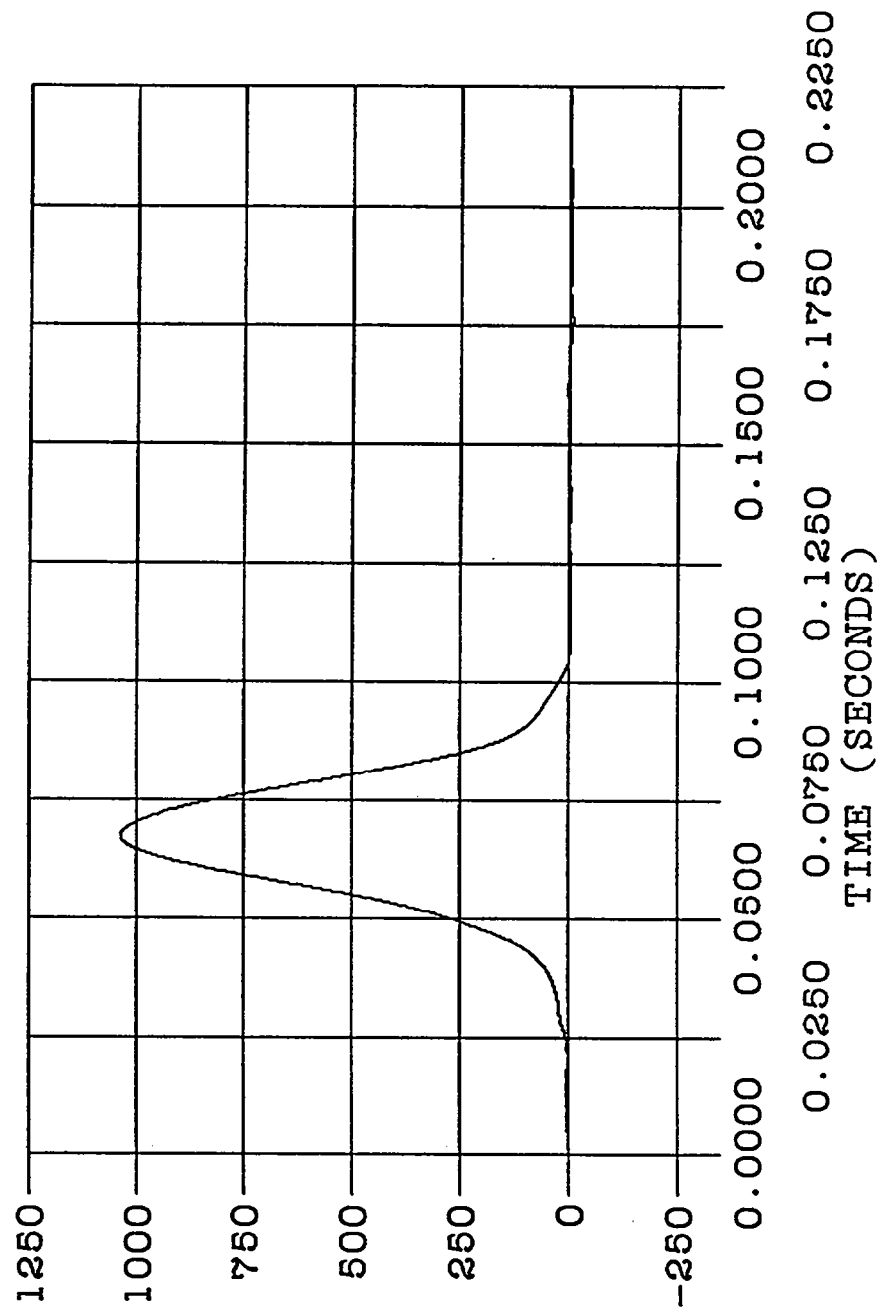
B-58

Passenger Left Femur Force vs. Time

FORCE (POUNDS)

B-59

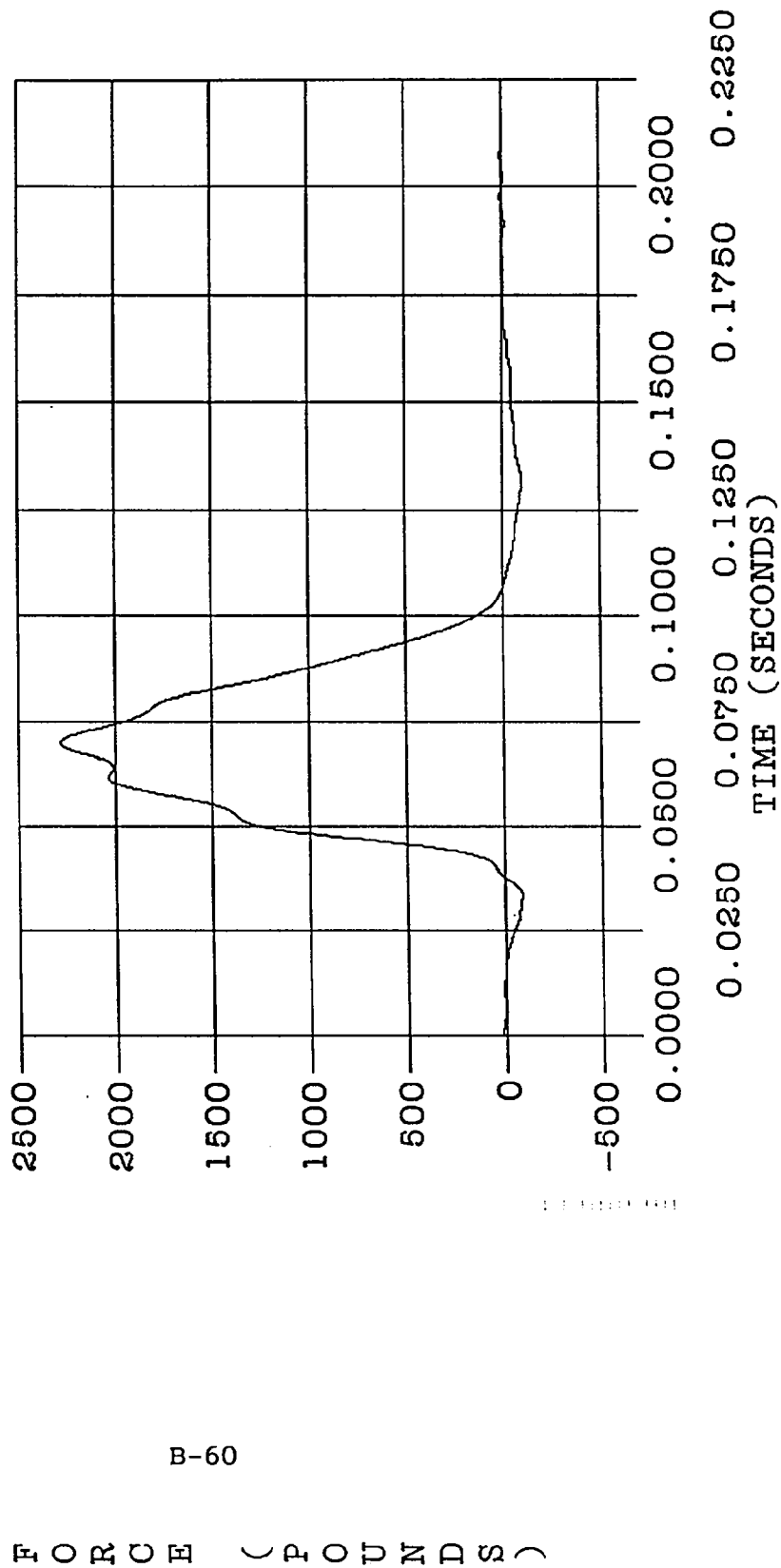
1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91
PASS LAP BELT



Passenger Lap Belt Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

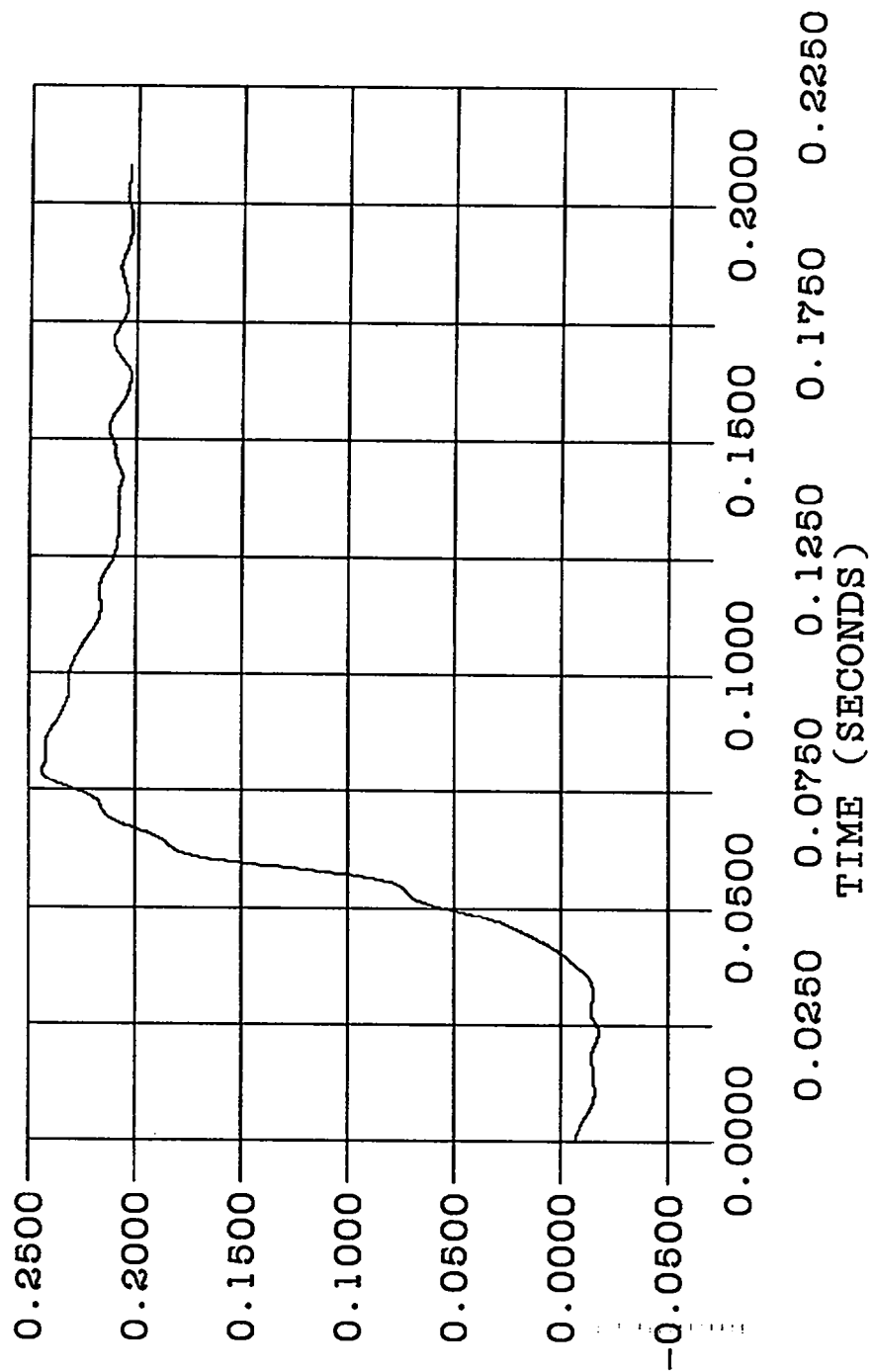
PASS TORSO BELT



Passenger Torso Belt Force vs. Time

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

DR TORSO BELT STRETCH

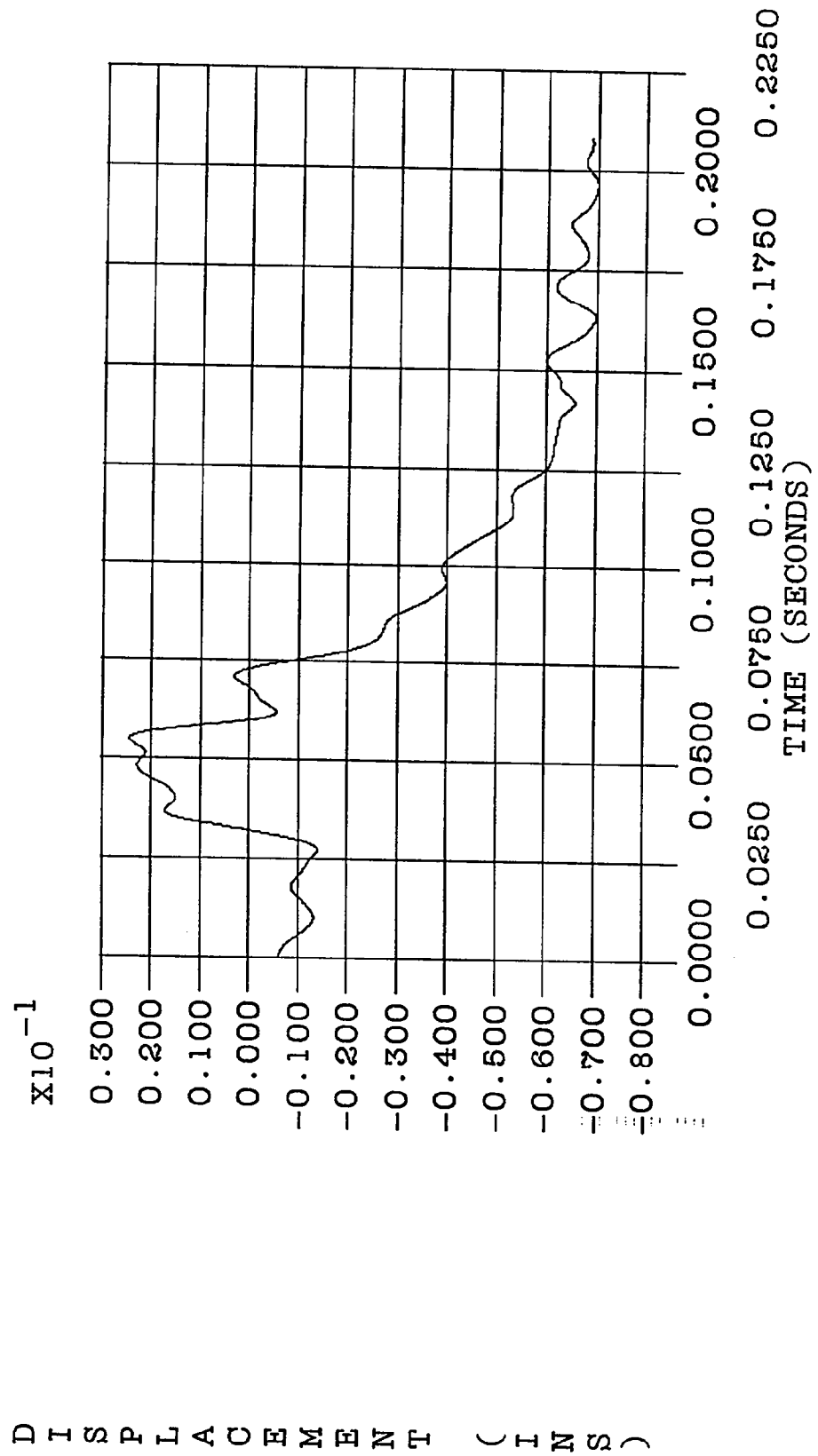


Driver Torso Belt Stretch vs. Time

DISPLACEMENT (IN)

1991 MAZDA PROTEGE NCAP TEST TEST DATE: 01/17/91

PA TORSO BELT STRETCH



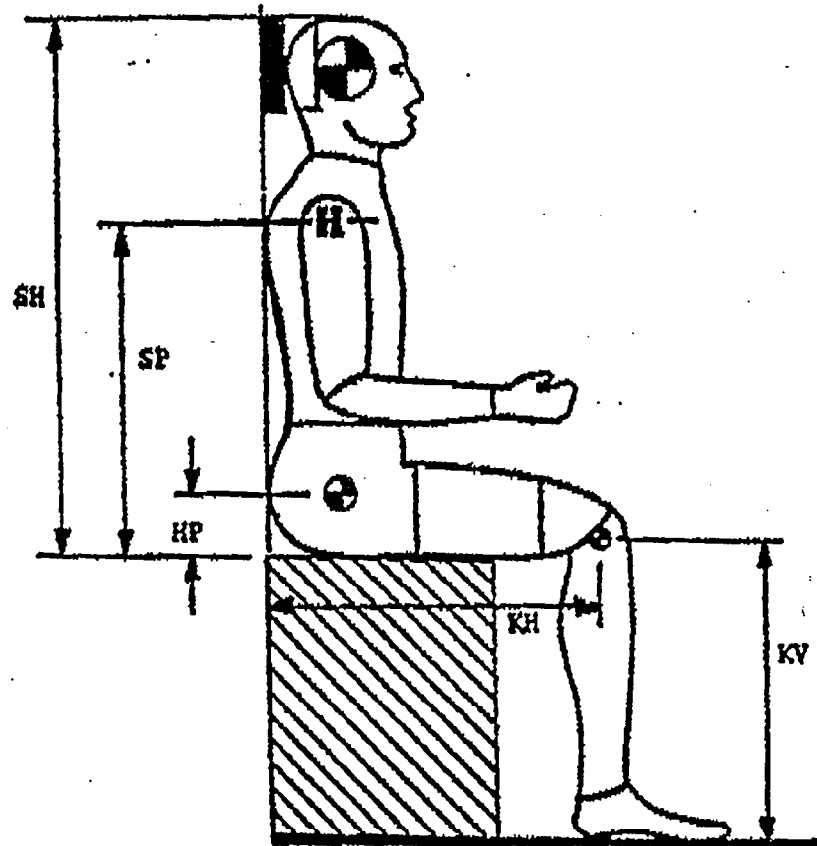
APPENDIX C

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

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHTSA DUMMY I.D. NO.: 465

I. CONFIGURATION VERIFICATION DATA:



	PART 572 SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
DATE OF CONFIGURATION VERIFICATION		12/19/90	N/A
VERIFICATION NUMBER FOR DUMMY*		1	N/A
SH - Seated Height	35.6 to 35.8"	35.6	N/A
SP - Shoulder Pivot Height	21.8 to 22.4"	22.3	N/A
HP - Hip Pivot Height	3.9" ref.	3.9	N/A
KH - Knee Pivot from back line	20.1 to 20.7"	20.5	N/A
KV - Knee Pivot from floor	19.3 to 19.9"	19.5	N/A
SW - Shoulder Width	17.8 to 18.4"	18.0	N/A
HW - Hip Width	14.0 to 15.4"	14.25	N/A

TECHNICIAN'S NAME: Kevin Heckel

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: Kevin Heckel

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		12/17/90	N/A
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*		1	N/A
VERIF. LAB. TEMPERATURE (66 TO 78°F Range)		76 °F	N/A °F
VERIF. LAB. HUMIDITY (10 to 70% Range)		60 %	N/A %
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.	210 to 260G	220.0	N/A
b. Peak Lateral Acce.	-10G	6.50	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	23.8	N/A
b. Pend. Avg. Decel. over t ₃ - t ₂	20 to 24G	22.9	N/A
c. Peak Resultant Head Acceleration	26G max.	25.9	N/A
d. Pendulum Deceleration (t ₂ - t ₁)	-3ms	2.3	N/A
e. Pendulum Deceleration (t ₃ - t ₂)	25 to 30ms	27.4	N/A
f. Pendulum Deceleration (t ₄ - t ₃)	-10ms	7.6	N/A
g. Max. Head Rotation	63 to 73°	64.4	N/A
h. Chordal Displacement Head Rotation Angle			
0°	Time	-2 to 2ms	0
	Displ.	-.5 to .5"	0.0
30°	Time	25.6 to 34.4ms	29.5
	Displ.	2.1 to 3.1"	2.6
60°	Time	40.3 to 51.7ms	47.9
	Displ.	4.3 to 5.3"	4.8
Maximum ()	Time	53.2 to 66.8ms	58.7
	Displ.	5.0 to 6.0"	5.2

*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: Kevin Heckel

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	69.4	N/A
	Displ.	4.3 to 5.3 in.	4.8	N/A
30°	Time	85.4 to 104.6ms	91.5	N/A
	Displ.	2.1 to 3.1 in	2.4	N/A
0°	Time	101.0 - 123.0ms	106.5	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	33.0	N/A
b. Force @ .75"		36.7 to 49.8 lb	45.4	N/A
c. Force @ 1.0"		50 to 63 lbs.	60.5	N/A
d. Force @ 1.3"		73 to 88 lbs.	86.6	N/A
4. LUMBAR FLEXION TEST				
a. Force @ 20°		22 to 34 lbs.	29.9	N/A
b. Force @ 30°		34 to 46 lbs.	40.1	N/A
c. Force @ 40°		46 to 58 lbs.	54.3	N/A
d. Return Angle		12° maximum	10.8	N/A
5. CHEST IMPACT TESTS				
a. High Speed				
(1) Probe Speed		21.78-22.22 fps	22.0	N/A
(2) Peak Deflection		1.7" maximum	1.5	N/A
(3) Peak Resistive Force		2250 lbs. max.	2186.8	N/A
(4) Internal Hysteresis		50 to 70%	56.0%	N/A
b. Low Speed				
(1) Probe Speed		13.86-14.14fps	13.9	N/A
(2) Peak Deflection		1.1" maximum	0.83	N/A
(3) Peak Resistive Force		1450 lbs. max.	1359.7	N/A
(4) Internal Hysteresis		50 to 70%	54.9%	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	1853.7	N/A
(3) Time Above 1000#		1.7 as minimum	11.8	N/A
b. Left Side				
(1) Probe Speed		6.76 to 7.04fps	7.0	N/A
(2) Maximum Force		1850 to 2500lbs	2051.5	N/A
(3) Time Above 1000#		1.7 as minimum	1.75	N/A

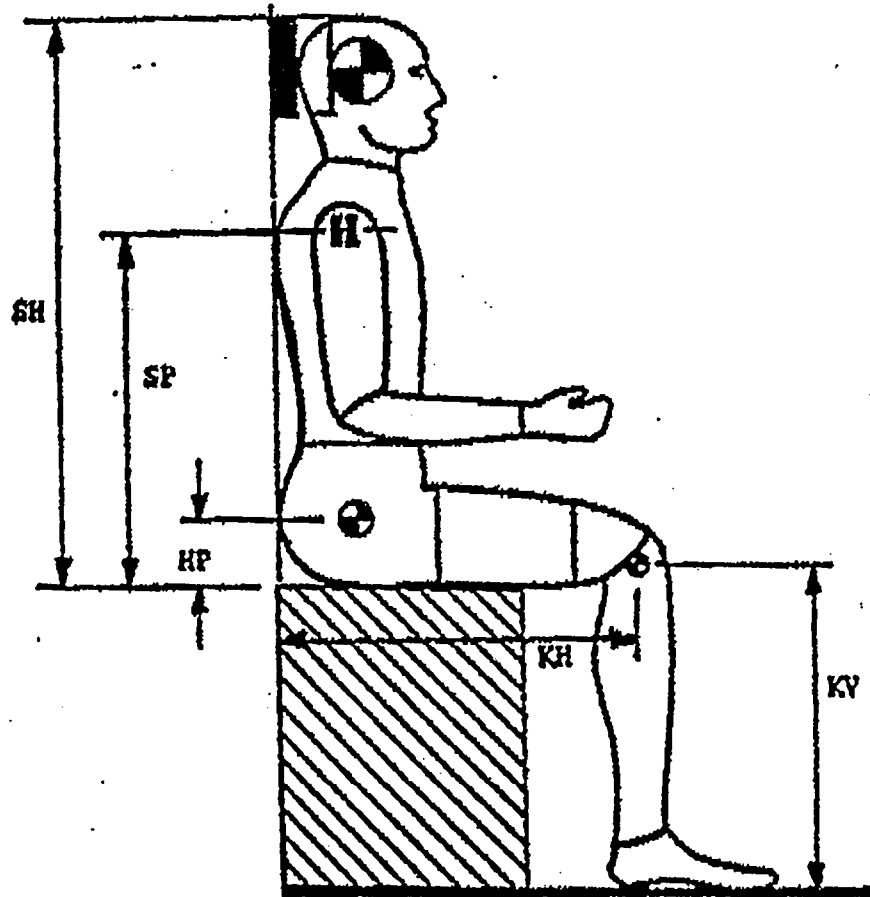
REMARKS:

None

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		12/19/90	N/A
VERIFICATION NUMBER FOR DUMMY*		1	N/A
SH - Seated Height	35.6 to 35.8"	35.6	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"	20.18	N/A
KV - Knee Pivot from floor	19.3 to 19.9"	19.4	N/A
SW - Shoulder Width	17.8 to 18.4"	18	N/A
HW - Hip Width	14.0 to 15.4"	14.75	N/A

TECHNICIAN'S NAME: Kevin Heckel

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: Kevin Heckel

		PRE-TEST (if required)	POST-TEST (if required)
DATE OF PERFORMANCE VERIFICATION		12/17/90	N/A
SEQUENTIAL VERIFICATION NUMBER FOR DUMMY*		1	N/A
VERIF. LAB. TEMPERATURE (66 TO 78°F Range)		76 °F	N/A °F
VERIF. LAB. HUMIDITY (10 to 70% Range)		60 %	N/A %
TEST PARAMETER	SPECIFICATION		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.	210 to 260G	215	N/A
b. Peak Lateral Acce.	-10G	6.3	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	23.9	N/A
b. Pend. Avg. Decel. over $t_3 - t_2$	20 to 24G	22.7	N/A
c. Peak Resultant Head Acceleration	26G max.	22.9	N/A
d. Pendulum Deceleration ($t_2 - t_1$)	-3ms	2.4	N/A
e. Pendulum Deceleration ($t_3 - t_2$)	25 to 30ms	27.7	N/A
f. Pendulum Deceleration ($t_4 - t_3$)	-10ms	7.3	N/A
g. Max. Head Rotation	63 to 73°	67.1	N/A
h. Chordal Displacement Head Rotation Angle			
0°	Time	-2 to 2ms	0.0
	Displ.	-.5 to .5"	0.0
30°	Time	25.6 to 34.4ms	28.6
	Displ.	2.1 to 3.1"	2.6
60°	Time	40.3 to 51.7ms	45.3
	Displ.	4.3 to 5.3"	4.9
Maximum ()	Time	53.2 to 66.8ms	59.0
	Displ.	5.0 to 6.0"	5.4

*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: Kevin Heckel

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	71.8	N/A
	Displ.	4.3 to 5.3 in.	4.8	N/A
30°	Time	85.4 to 104.6ms	91.2	N/A
	Displ.	2.1 to 3.1 in	2.4	N/A
0°	Time	101.0 - 123.0ms	104.8	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	29.6	N/A
b. Force @ .75"		36.7 to 49.8 lb	48.5	N/A
c. Force @ 1.0"		50 to 63 lbs.	60.0	N/A
d. Force @ 1.3"		73 to 88 lbs.	88.0	N/A
4. LUMBAR FLEXION TEST				
a. Force @ 20°		22 to 34 lbs.	27.9	N/A
b. Force @ 30°		34 to 46 lbs.	42.3	N/A
c. Force @ 40°		46 to 58 lbs.	57.6	N/A
d. Return Angle		12° maximum	6.0	N/A
5. CHEST IMPACT TESTS				
a. High Speed				
(1) Probe Speed		21.78-22.22 fps	22.0	N/A
(2) Peak Deflection		1.7" maximum	1.5	N/A
(3) Peak Resistive Force		2250 lbs. max.	2045.2	N/A
(4) Internal Hysteresis		50 to 70%	54.1	N/A
b. Low Speed				
(1) Probe Speed		13.86-14.14fps	13.9	N/A
(2) Peak Deflection		1.1" maximum	1.1	N/A
(3) Peak Resistive Force		1450 lbs. max.	1251.2	N/A
(4) Internal Hysteresis		50 to 70%	51.0	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	2226.1	N/A
(3) Time Above 1000#		1.7 as minimum	1.7	N/A
b. Left Side				
(1) Probe Speed		6.76 to 7.04fps	7.0	N/A
(2) Maximum Force		1850 to 2500lbs	2172.4	N/A
(3) Time Above 1000#		1.7 as minimum	1.75	N/A

REMARKS:

None

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION TEST LOG SHEET

LAB. NAME: MGA Research Corporation : CONTRACT NO.:DTNH22- 90 - D - 12121 : DUMMY I.D. NO.: 466

FY- 90 TEST PROGRAM DELIVERY ORDER NO.: 91046 (DATE: 11/19/90) NOTE: Separate Log Sheet is Required for Each GTE Test Dummy.

CRASH TEST										
TEST VEHICLE		VEHICLE	CRASH	DUMMY USAGE		PRE-TEST		STD. 208	POST-TEST	
NO.	YEAR/MAKE/MODEL/BODY STYLE	NHTSA NO.	TEST DATE	DRIVER	PASS.	NO.	DATE	FAILURE	VERIFICATION	REMARKS:
1	91/Honda/Civic/DX	MM5301	12/20/90		X	1	12/19/90	Pass		N/A
2	91/Mazda/Protege/Sedan	MM5401	1/17/91		X	1	12/19/90	Pass		N/A
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION TEST LOG SHEET (cont'd)

LAB. NAME: MGA Research Corporation ; CONTRACT NO.:DTNH22- 90 - D - 12121 ; DUMMY I.D. NO.: 465

FT- 90 TEST PROGRAM DELIVERY ORDER NO.: 91046 (DATE: 11/19/90) NOTE: Separate Log Sheet is Required for Each GTE Test Dummy.

CRASH											
TEST	TEST VEHICLE	VEHICLE	CRASH	DUMMY USAGE	PRE-TEST	STD.208	POST-TEST				
NO.	YEAR/MAKE/MODEL/BODY STYLE	NHTSA NO.	TEST DATE	DRIVER	PASS.	NO.	DATE	MODE	NO.	DATE	REMARKS:
1	91/Honda/Civic/DX	MM5301	12/21/89	X		1	12/19/90	Pass		N/A	
2	91/Mazda/Protege/Sedan	MM5401	1/17/91	X		1	12/19/91	Pass		N/A	
3											
4											
5											
6											
7											
8											
9											
10											

APPENDIX D

DUMMY, VEHICLE, AND LABORATORY
INSTRUMENT CALIBRATION

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

INSTRUMENTS FOR DUMMY:

DRIVER						
		Serial #	Manufacturer	calibration		
Head		DK74J	Endevco	Last	Next	
X		DK74J	Endevco	10/90	04/91	
Y		ED47J	Endevco	10/90	04/91	
Z		EA45J	Endevco	10/90	04/91	
Chest		ED50J	Endevco	10/90	04/91	
X		ED50J	Endevco	10/90	04/91	
Y		ED0875	Endevco	10/90	04/91	
Z		DR22J	Endevco	10/90	04/91	
Right Femur Load Cell		957	GSE	11/90	05/91	
Left Femur Load Cell		956	GSE	11/90	05/91	
*Neck Load Cell		X	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	
	Y	N/A	N/A	N/A	N/A	
	Z	N/A	N/A	N/A	N/A	
*Chest Deflection Gauge						
*Hybrid III Use Only						
Lap Belt Load Cells		661	GSE	11/90	05/91	
Shoulder Belt Load Cells		568	Lebow	11/90	05/91	
Spool-Out Potentiometer		N/A	N/A	N/A	N/A	
Belt Stretch Transducer		N/A	Buorns	N/A	N/A	
				Prior to use	Prior to use	

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

INSTRUMENTS FOR DUMMY:

PASSENGER				
	Serial #	Manufacturer	Calibration	
Head X			Last	Next
Y	EC45J	Endevco	10/90	04/91
Z	ED15J	Endevco	10/90	04/91
	DJ87J	Endevco	10/90	04/91
Chest X	AA20	Endevco	10/90	04/91
Y	EA71J	Endevco	10/90	04/91
Z	DK21J	Endevco	10/90	04/91
Right Femur Load Cell	959	GSE	11/90	05/91
Left Femur Load Cell	959	GSE	11/90	05/91
*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				
*Hybrid III Use Only				
Lap Belt Load Cells	664	Lebow	11/90	05/91
Shoulder Belt Load Cells	211	Lebow	11/90	05/91
Spool-Out Potentiometer	N/A	N/A	N/A	N/A
Belt Stretch Transducer	N/A	Buorns	Prior to use	N/A

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

VEHICLE ACCELEROMETERS

	Serial #	Manufacturer	calibration	
			Last	Next
Left Seat Rear Crossmem.	2260024	Kyowa	10/90	04/91
Rt Rear Seat Crossmember	5220090	Kyowa	10/90	04/91
Top of Engine	ED70J	Endevco	10/90	04/91
Bottom of Engine	BC44	Endevco	10/90	04/91
Left Disc Brake Caliper	DW02J	Endevco	10/90	04/91
Right Disc Brake Caliper	DM44J	Endevco	10/90	04/91
Instrument Panel	2270030	Kyowa	10/90	04/91
Center Rear Crossmember Z	5220080	Kyowa	10/90	04/91
Vehicle Rear Z	5220072	Kyowa	10/90	04/91

LABORATORY INSTRUMENTS

	Serial #	Manufacturer	calibration	
			Last	Next
Neck Bending Pendulum Accelerometer	5220070	Kyowa	10/90	04/91
Neck Bending Rotary Potentiometer	N/A	Buorns	Prior to use	Prior to use
Neck Bending Linear Potentiometer	N/A	Buorns	Prior to use	Prior to use
Femur/Chest/Thorax Probe Accelerometer	5220074	Kyowa	10/09	04/91
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	Transducers, Inc.	Prior to use	Prior to use

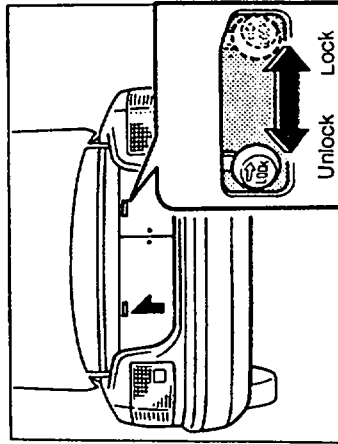
APPENDIX E

**VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT
SYSTEM INSTRUCTIONS**

SEATS, SEAT BELTS

99LUC00004E

Seat-Belt Restraint System



The split-folding seat is lockable from inside the trunk.

Should it be necessary to leave the vehicle with a parking attendant, or someone else, you may protect valuables in the trunk by locking the rear seat back and trunk lid. Sur-render only the secondary key. This key will operate only the door locks, ignition switch, and fuel-filler lid.

To lock the seat backs, move the lever in the direction of the arrow on the lever.

To unlock the seat back, move the lever in the opposite direction of the arrow.

WARNING!

- **Lap/shoulder-belt assemblies may be damaged when subjected to stress.**
- **Replace all belts, retractors, and hardware in use during any collision except a minor one.**
- **Replace all restraint systems and properly repair all anchorages in areas damaged by a collision.**
- **Passengers should not be allowed to ride in the cargo area of a vehicle. Persons not riding in a seat with a fastened seat belt are much more likely to suffer serious bodily injury during a collision.**

SEAT BELTS

89JLIC11004E

89JLIC11004E

Restraint of Pregnant Women

Pregnant women should wear lap/shoulder-belt assemblies whenever possible according to specific recommendations by their doctors. The lap belt should be worn **SNUGLY AND AS LOW AS POSSIBLE**.

Restraint of Infants and Children

89JLIC11004E

Small children and infants should be restrained by an approved child-restraint system. Never allow a child to stand or kneel on the seat of a moving vehicle, and never put the same seat belt around a child and yourself at the same time. Also, never hold a child on your lap or in your arms in a moving vehicle. Even a very strong person cannot hold onto a child in the event of a serious accident, and the released child may be injured as it hits parts of the vehicle or be crushed by an unrestrained passenger. A child-restraint system can help protect small children and infants in a vehicle. Many companies manufacture safety seats for infants and small children. An acceptable child-restraint system should always satisfy local motor vehicle safety standards.

Moreover, it should be chosen to fit both the size of the child and the size of the vehicle seat. Be sure to follow any instructions provided by the manufacturer when installing the child-restraint system.

89JLIC12004E

CHILDREN

A child who has outgrown the child-restraint system should use the belts provided in the vehicle. If seated, the child should be belted at both the lap and the shoulder. If the child is so small that the shoulder belt binds the neck or face, place the child closer to the center of the vehicle.

NOTE

- All child-restraint systems are designed to be secured in vehicle seats by lap belts or the lap-belt portion of a lap/shoulder belt.
- Children could be endangered in a crash if their child restraints are not properly secured in the vehicle.
- According to accident statistics, children are safer when properly restrained in the rear seating positions than in the front seating positions.

SEAT BELTS

CAUTION

- Since a safety belt or child-restraint system can become very hot in a closed vehicle during warm weather, be sure and check the seat cover and buckles before using either on a child.
- 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 event of a sudden stop or an accident.

83XUC4220AE

INSTALLATION OF A CHILD-RESTRAINT SYSTEM

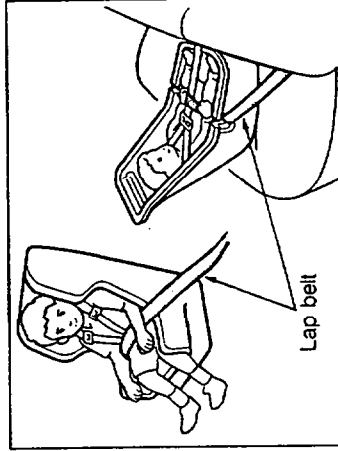
The installation of a child-restraint system requires a seat-belt locking clip. Secure the child-restraint system with the lap belt, as shown in the illustration.

To prevent loosening of the lap belt, use a Genuine Mazda locking clip (part number FA55 57 999, available at Authorized Mazda Dealers) or a clip of equivalent dimensions and strength.

It is recommended that the child-restraint system always be installed in the center of the rear seat and secured with the lap belt.

WARNING!

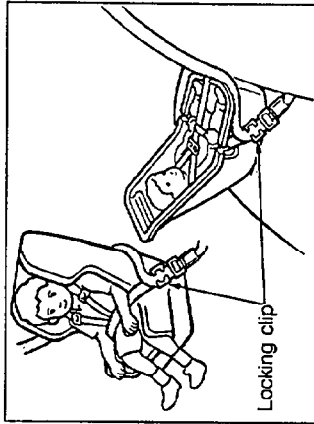
- The automatic shoulder belt cannot be used to secure the child-restraint system; do not attempt to use it for this purpose.
- Failure to follow the following instructions could increase the chance and/or severity of injury in an accident.



Rear center seat

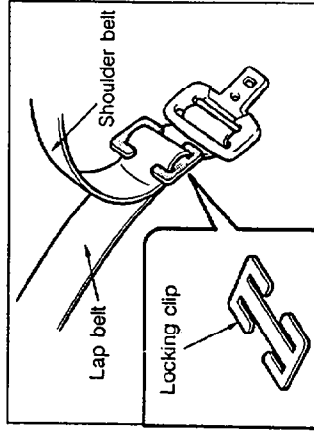
Secure the child seat with the lap belt. When the lap belt is slack, adjust for a snug fit by pulling on the loose end of the belt webbing.

SEAT BELTS



Rear outboard seat

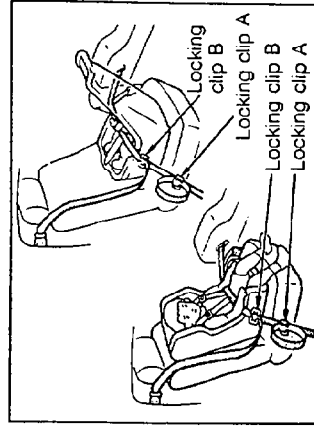
1. Secure the child seat with the lap/shoulder belts.
2. Tighten the lap belt by pulling on the shoulder belt.



3. To install the locking clip, insert the webbing through the recesses of the locking clip near the seat-belt tongue plate.
4. After securing the belt with the locking clip, tuck the shoulder portion of the belt between the child seat and the seat back.

NOTE

When the child seat is not installed, the locking clip should be stored in the vehicle to prevent its loss.

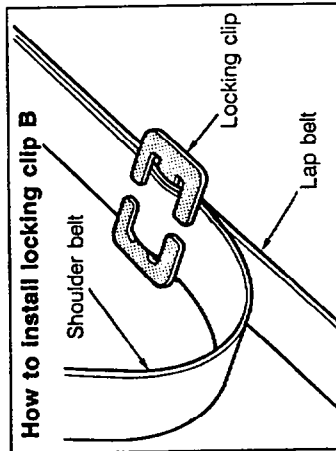
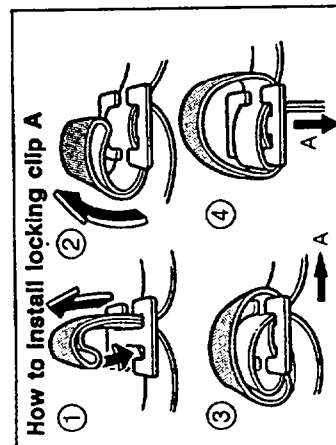


Front seat

For safety reasons, we recommend that the child seat be used in a rear seat. However, if for some reason it must be installed on the front seat with the lap belt, follow the procedure below.

1. Slide the seat to the rearmost position.
2. Fasten the child seat with the lap belt.
3. Pull the lap belt out fully.
4. Remove the slack of the lap belt with the locking clip at any convenient point along the lap belt. Make the loop as large as possible to remove any slack.

SEAT BELTS



5. After securing the belt, pull on it in the directions marked A in the illustration to make sure it does not slip.
6. If necessary, slide the seat forward to remove any remaining slack.
7. Pull the shoulder belt all the way out from the retractor, and overlapping the lap belt, pass it through the child seat; then, at the outer side (door side) of the seat, secure it and the lap belt by using the locking clip.

NOTE
When the child seat is not installed, the locking clips should be stored in the vehicle to prevent its loss.

SEAT BELTS

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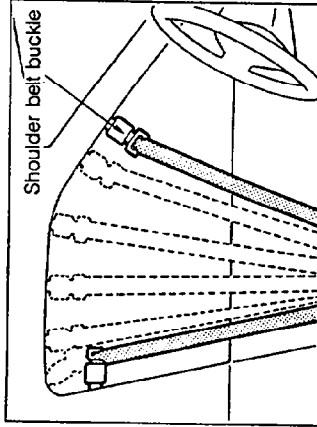
Front Seat Belts

The vehicle is equipped with an automatic shoulder belt.

The automatic shoulder belt automatically fastens and unfastens for persons sitting in the front seats. This shoulder belt is equipped with a retractor that will lock in case of a sudden stop or impact.

The lap belt is operated manually.

To provide sufficient restraint, always fasten the lap belt.



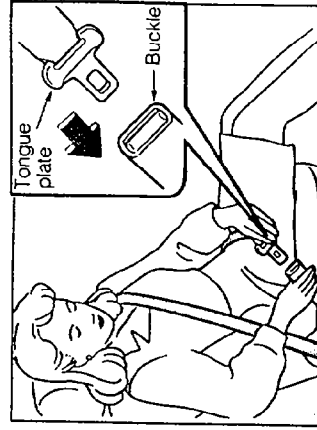
Shoulder Belt

To fasten:

1. Get in the vehicle and close the door.
2. Turn the ignition switch to the ON position; the shoulder belt buckle will move from front to rear automatically.

To unfasten:

When the door is opened, the shoulder belt buckle moves from rear to front.



Lap Belt

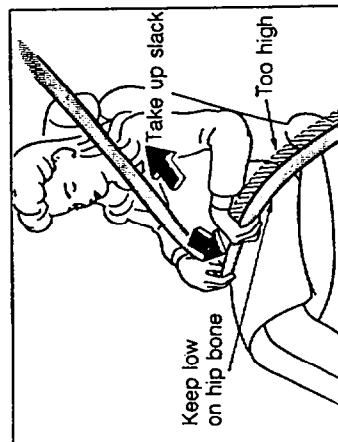
To fasten:

1. Grasp the tongue plate and pull it until the desired length is obtained.
2. Insert the tongue plate into the open end of the buckle until an audible click is heard, indicating the belt is locked. Make sure the belt is not twisted.
3. Adjust the belt by pulling it down toward the retractor.

CAUTION

Make sure the lap belt does not cross the shoulder belt.

SEAT BELTS

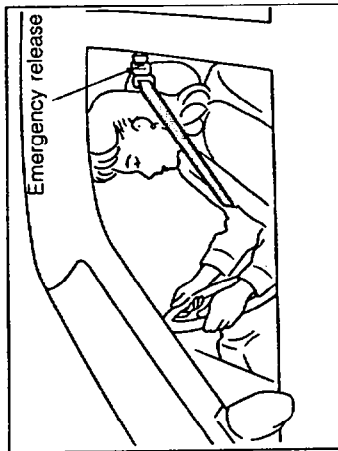


To unfasten:

Depress the button on the buckle.

WARNING!

Be sure the lap belt is fitted snugly around the hips, not on the waist. Failure to do so may increase the chance of injury in the event of a collision.



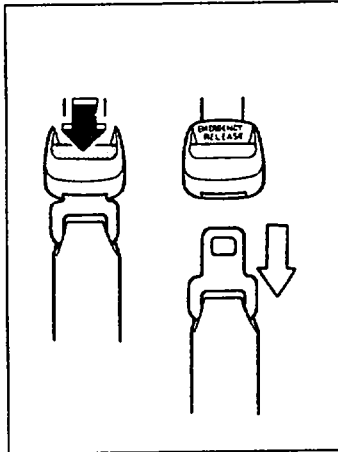
Emergency Release

In an emergency such as an accident, press the emergency release on the shoulder belt buckle. This allows the tongue to unlatch from the buckle.

To insert the tongue in to the shoulder belt buckle, push it in until an audible click is heard.

WARNING!

- **For your safety, never let the shoulder belt pass under your outer arm.**
- **Under normal circumstances, do not press the emergency release**



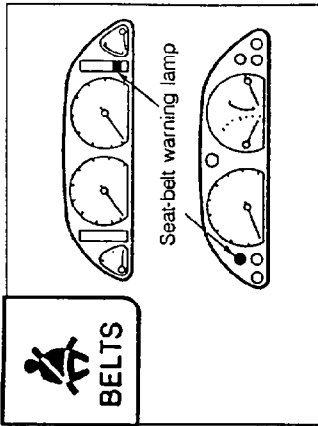
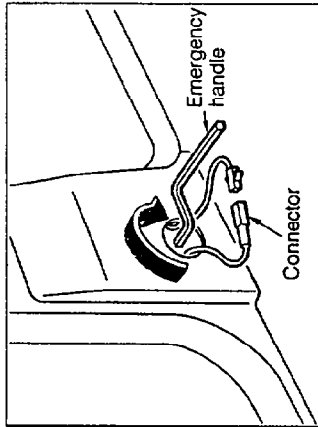
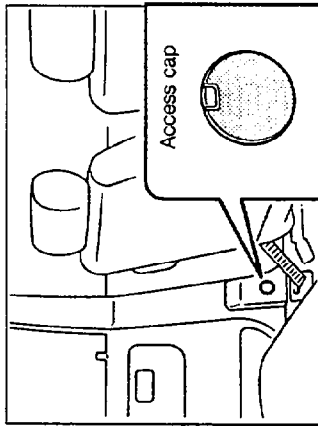
to release the shoulder belt, or you will not have shoulder belt restraint in a collision.

- **Keep your hands, head, and other parts of your body and other objects away from the buckle and its path while it is moving. They may get caught in it, resulting in injury or damage.**

CAUTION

When the shoulder belt is moving, do not impede its movement by pulling on it with anything.

SEAT BELTS



Emergency handle

If the belt should fail to operate correctly, consult an Authorized Mazda Dealer as soon as possible.

If the belt fails to move to the rearmost position, perform the following procedures.

1. Turn the ignition switch OFF.
2. Release the shoulder belt from the buckle.
3. Remove the access cap.
4. Pull the electrical wiring harness out through the access hole and disconnect the connector.

5. Fix the emergency handle into the hex nut inside.
6. Turn the emergency handle to move the buckle rearward (driver's side, turn clockwise; passenger's side, turn counterclockwise) until an audible click is heard.

NOTE

Always keep the emergency handle in the glove box.

SEAT-BELT WARNING LAMP/BEEP

When you turn the ignition switch ON without first having fastened your seat belt, a warning lamp will come on and a beep will sound. (For more detailed information, refer to Warnings and Indicators on page 4-23.)

SEAT BELTS

REAR SEAT BELTS

Rear Seat Belts

Two kinds of belts are equipped.

- Lap/shoulder belts, for people who sit next to the side windows.
- Lap belt, for people who sit in the center of the rear seat.

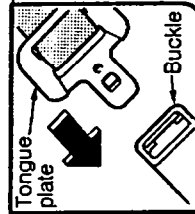
WARNING!

- **Never wear the shoulder belt under the arm.**
- **Never swing it around your neck and over the inside shoulder.**
- **Never use a single belt for more than one person at a time.**
- **Be sure the lap portion of the belt is fitted snugly around the hips, not the waist.**
- **Use the shoulder belt on the outside shoulder only.**

Failure to follow these precautions could increase the chance and severity of injury.

NOTE

If the belt locks when being pulled out, rewind it completely into the retractor then pull it out to the desired length.



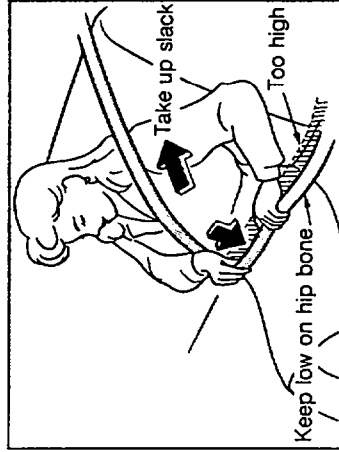
Lap/shoulder belt

To fasten:

1. Grasp the buckle and tongue plate.
2. Slowly pull out the lap/shoulder belt.
3. Insert the tongue plate into the open end of the buckle until an audible click is heard, indicating the belt is locked.

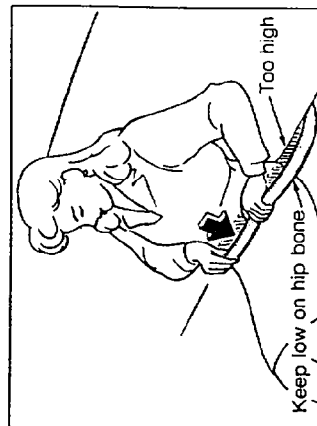
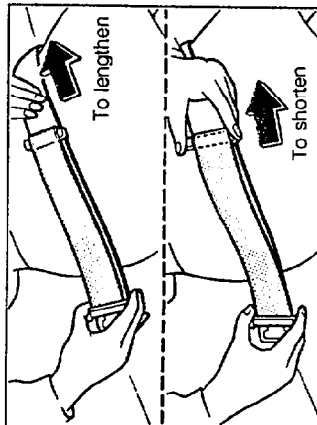
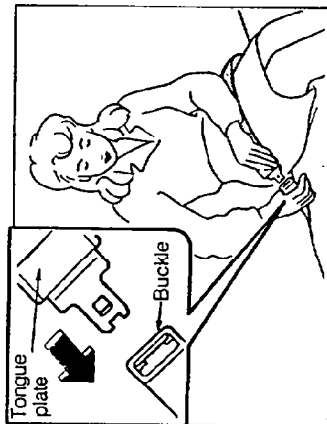
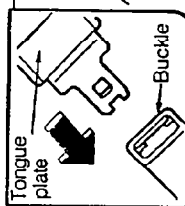
To unfasten:

Depress the button on the buckle.



Position the lap/shoulder belt across your lap as **LOW ON THE HIPS** as possible to reduce the risk of sliding under it during an accident. Adjust the belt to a **SNUG FIT** by pulling it. The belt retractor is designed to take up excess webbing automatically and to maintain tension on the belt.

SEAT BELTS



Lap Belt

To fasten:

1. Grasp the buckle end.
2. Insert the tongue plate into the open end of the buckle until an audible click is heard, indicating the belt is locked. Make sure the belt is not twisted.

3. If necessary, lengthen or shorten the belt. To adjust, hold the tongue at right angles to the webbing and pull to lengthen, or pull the loose end of the belt webbing to shorten.

To unfasten:

Depress the button on the buckle.

Position the lap belt across your lap as LOW ON THE HIPS as possible.

WARNING!

Be sure the lap belt is fitted snugly around the hips, not on the waist. Failure to do so may increase the chance of injury in the event of a collision.

SEAT BELTS

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Proper Use and Care of the Seat-Belt System

To gain maximum effectiveness from the seat-belt system, follow these suggestions:

- Use the belts at all times—even on short trips.
- Never use the same belt for more than one person at a time.
- Avoid wearing twisted belts.
- Keep sharp edges and damaging objects away from the belts and other parts of the restraint system.
- Periodically inspect belt webbing, anchors, buckles, and all other parts for signs of wear, damage, and weakness. Replace questionable parts immediately.
- To clean the belt webbing, use any mild soap solution recommended for cleaning upholstery or carpets; follow the instructions provided with the soap. Do not bleach or redye the webbing because this may weaken it.
- No modifications or additions should be made by the user.
- After wearing a seat belt, make sure it is not caught on the adjusting levers or elsewhere.

WARNING!

All seat-belt assemblies, including retractors and attaching harness, should be inspected after any collision. We recommend that all seat-belt assemblies in use during a collision be replaced unless the collision was minor and the seat belts show no damage and continue to operate properly. Seat-belt assemblies not in use during a collision should also be inspected and replaced if damage or improper operation is noted.