

REPORT NO. MGA-90-N004
NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

Toyota Motor Corp.
1991 Toyota 4 x 4 Pickup Truck
NHTSA NO. MM5103

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



February 28, 1991

FINAL REPORT

Prepared For:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF MARKET INCENTIVES

400 SEVENTH STREET, S.W.

Room No. 5313 (NRM-22)

400 Seventh Street, S.W.

Washington, D.C. 20590

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-90-D-12121. This document is disseminated under the sponsorship of the U.S. Dept. of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

PREPARED BY:

Suzanne Phillips
Suzanne Phillips
MGA Research Corporation

APPROVED BY:

Rudy Arendt
Rudy Arendt
MGA Research Corporation

FINAL REPORT ACCEPTED BY:

H. Asfend
Manager, New Car Assessment Program
(NCAP)

AUG 01 1991

Date of Report Acceptance

/ Jan S. Chen
Contracting Officer's Tech. Rep. (COTR)

AUG 01 1991

Date of Report Acceptance

1. Report No. MGA-90-N004		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle NHTSA New Car Assessment Program (NCAP) Frontal Barrier Impact Test on Toyota 4X4 Pickup Truck to Indicate requirements of FMVSS No. 208, 212, 219 (partial) and 301.				5. Report Date February 28, 1991	
				6. Performing Organization Code MGA	
7. Author(s) Suzanne Phillips				8. Performing Organization Report No. MGA-OMI-004	
9. Performing Organization Name and Address MGA Proving Grounds 5000 Warren Road Burlington, WI 53105 (414)763-2705				10. Work Unit No. MGA-90-DOT-4	
				11. Contract or Grant No. DTNH22-90-D-12121	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Admin. Office of Market Incentives (NRM-20) 400 Seventh Street, S.W., Washington, DC 20590				13. Type of Report and Period Covered Final Report February 1991	
				14. Sponsoring Agency Code DOT/NHTSA/RM/OMI	
15. Supplementary Notes					
16. Abstract A 35 mph frontal barrier impact using a 6 load cell barrier was conducted on a 1991 Toyota 4X4 Pickup Truck at the MGA Proving Grounds Crash Test facility in Burlington, WI, on February 13, 1991. The barrier impact velocity was 35.0 mph, and the ambient temperature at the barrier fact at the time of impact was 72 degrees Fahrenheit. The post-test vehicle maximum crush was 19.0 inches. The test vehicle appeared to comply with the indicant requirements of the following Federal Motor 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 1342 and the 3 millisecond Clip (chest g's) for the chest g's was 49.0. The maximum load on the driver's left femur was 1104 lbs. There was no valid data collected for the driver's right femur. The passenger's HIC was 808 and the 3 millisecond Clip was 49.8. The maximum loads for the passenger's left and right femurs were 636 lbs. and 781 lbs. respectively.					
17. Key Words 35 mph Frontal Barrier Impact Test New Car Assessment Program (NCAP) FMVSS 212 Indicant Testing FMVSS 219 (Partial) Indicant Test. FMVSS 301 Indicant Testing			18. Distribution Statement Copies of this report are available from: Technical Reference Division National Hwy. Traffic Safety Admin. NASSIF Building, Room 5108 400 Seventh St. S.W. Wash. D.C. 20590		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 22. Price	

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. DTNH22-90-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 MM5103

A load cell barrier consisting of 6 load cells was impacted by a 1991 Toyota 4 X 4 Pickup Truck at a velocity of 35.0 mph. The test was performed at the MGA Proving Grounds and Crash Test Center on February 13, 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 tape recorders. 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 1342. The maximum chest deceleration over 3 milliseconds was 49.0 g's and femur load was 1104 lbs. for the left femur. There was no valid data collected for the right femur.

The right front passenger's HIC was 808 and maximum chest deceleration over 3 milliseconds was 49.8 g's. Femur loads were 636 and 781 pounds for the left and right femurs, respectively.

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1991 Toyota 4 X 4 Pickup Truck

NHTSA No.: MM5103 VIN: JT4RNOLPXM0010089

Body Color: Silver Metallic Date of Manufacture: 10/90

Engine: 4 Cylinders; C.I.D.; 2.4 Liters; CC

 X Gas; Diesel; Turbocharged

Placement X Longitudinal; Transverse

Transmission: 5 Speed; X Manual; Automatic; Overdrive

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

Date Received: 12/21/91 Odometer Reading: 52

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

 P/Seats; Cruise Control

Type of Occupant Restraint: Toyota 4 X 4 Seatbelt Description: This vehicle has manual 3-point continuous belts for both the driver and outside passenger. The retractors are located on the lower "B" pillars. The middle passenger has a manual adjusted lap belt. The "D" ring is located at the "B" pillar upper.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 26 psi, Rear 35 psi

Recommended Tire Size: P225/75R15

Recommended Cold Tire Pressure: Front 26 psi; Rear 35 psi

Tires on Vehicle: P225/75R15 ; Manufacturer: Bridgestone

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

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

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

Vehicle Capacity Weight (VCW) = 1100 lbs. (A)

No. of Occupants x 150 lbs. = 450 lbs. (B)

Rated Cargo Weight (RCW) A-B = 650 lbs. (300 lbs. see next page)

GVWR 5350 lbs. GAWR: Front 2600 lbs. Rear 3000 lbs.

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 960 lbs. Right Rear = 706 lbs.
Left Front = 932 lbs. Left Rear = 686 lbs.
TOTAL FRONT WEIGHT = 1892 lbs. (57.6 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1392 lbs. (42.4 % of Total Vehicle Weight)
TOTAL UNLOADED DELIVERED WEIGHT (UDW) = 3284 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3284 lbs.)
VCW = Vehicle Capacity Weight (450 lbs.)
DSC = Designated Seating Capacity (3)
RCW = VCW - 150 (DSC) = 300 *lbs.
Target Test Weight = UDW + RCW + (2 dummies x 164 lbs./dummy)
Target Test Weight = 3912 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 150 POUNDS CARGO:

Right Front = 992 lbs. Right Rear = 968 lbs.
Left Front = 996 lbs. Left Rear = 949 lbs.
TOTAL FRONT WEIGHT = 1988 lbs. (51 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1917 lbs. (49 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 3905 lbs.
Weight of ballast secured in vehicle trunk area = 150 lbs.
Vehicle components removed to meet target weight None

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 35.4 LF 35.8 RR 35.4 LR 35.4
Test Attitude: RF 35.5 LF 35.6 RR 35.4 LR 35.4
Wheel Base: 103.0 in.; C.G. = 43.4 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: February 13, 1991 Time of Test: 2:40 P.M.

Ambient Temperature: 72 °F at impact area

Temperature in Occupant Compartment: 73 °F (Spec. Range = 66 to 78 °F)

Windshield Molding Temperature: 71 °F

Required Impact Velocity Range: 34.5 to 35.5 mph

Impact Velocity: primary = 35.0 mph, secondary = 34.9 mph

Distance From Front Bumper to Barrier Face When

 Entering Speed Trap: 48 inches

 Exiting Speed Trap: 12 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length:	Pre-Test = R <u>177.1</u>	C _L <u>179.8</u>	L <u>177.6</u>
	Post-Test = R <u>159.4</u>	C _L <u>160.8</u>	L <u>160.3</u>
	Crush = R <u>17.7</u>	C _L <u>19.0</u>	L <u>17.3</u>

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

R 3.8 in. C_L 3.3 in. L 3.4 in.

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>to steering wheel rim/hub</u>	<u>to right leg</u>
Chest	<u>to steering wheel hub</u>	<u>N/A</u>
Abdomen	<u>N/A</u>	<u>N/A</u>
Left Knee	<u>to instrument panel</u>	<u>to instrument panel</u>
Right Knee	<u>to instrument panel</u>	<u>to 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>Opened</u>	<u>Opened</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>0</u>	<u>0</u>	<u>N/A</u>	<u>N/A</u>

Glazing Damage

Backlight/Windshield Cracked on right side

Other Notable Impact Effects: Driver's left hand struck windshield and cracked left side of the windshield.

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.:

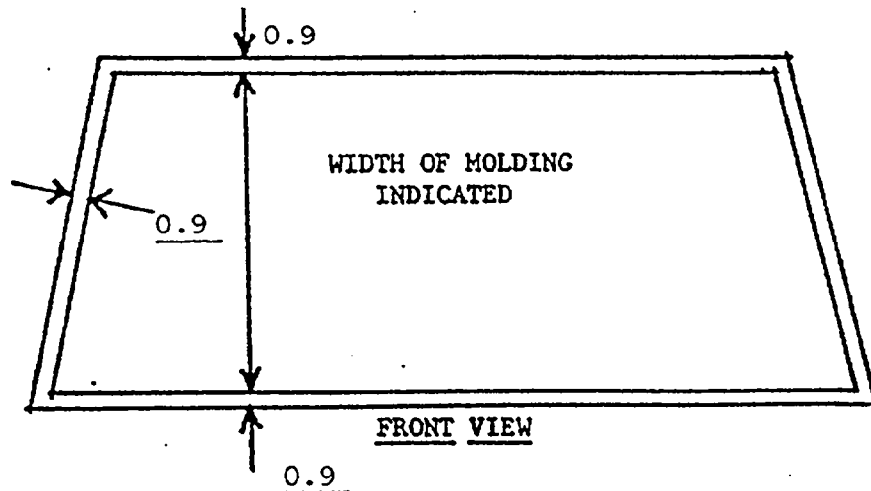
Adhesive with rubber/plastic trim.

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		PERCENT RETENTION
	PRE-TEST (in)	POST-TEST (in)	
RIGHT SIDE	75.6	75.6	100%
LEFT SIDE	75.6	75.6	100%
TOTAL	151.2	151.2	100%

AREA OF RETENTION FAILURE:

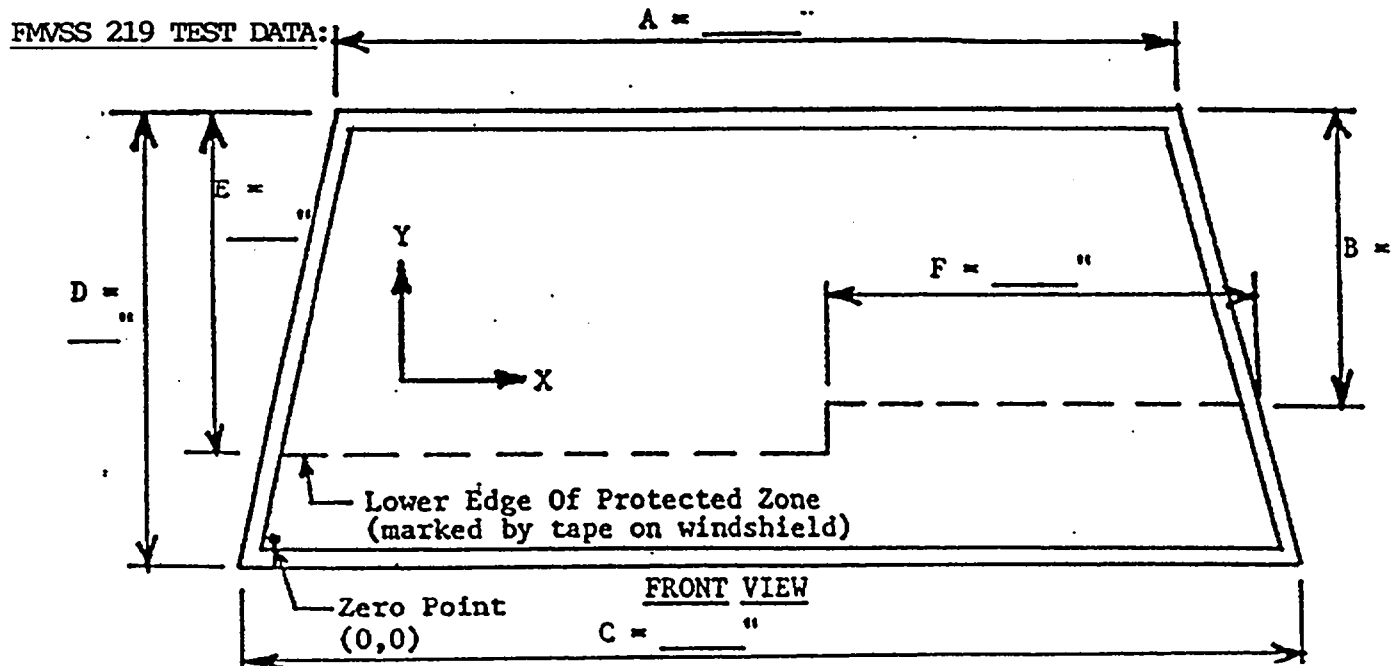


FAILURE DETAILS:

None

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 = 45.0 in.

B = 14.5 in.

C = 56.3 in.

D = 24.9 in.

E = 17.5 in.

F = 33.6 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.: MM5103 TEST DATE: February 13, 1991

VEHICLE MAKE/MODEL/BODY STYLE: 1991 Toyota 4 X 4 Pickup Truck

USABLE CAPACITY OF VEHICLE'S FUEL TANK: 17.2 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:

15.8 Gallons Which is 92 % 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

* Test not performed as per NHTSA 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 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 Toyota 4 X 4 Pickup Truck

VEH. NHTSA NO.: MM5103 TEST DATE: February 13, 1991

MAXIMUM ACCELERATION VALUES: (G'S)	DRIVER DUMMY #466	PASSENGER DUMMY #465
Head Channel X	143.3	66.2
Head Channel Y	9.3	13.1
Head Channel Z	192.3	83.7
HEAD RESULTANT	237.7	106.5
Chest Channel X	51.0	51.7
Chest Channel Y	12.3	12.8
Chest Channel Z	18.6	18.9
CHEST RESULTANT (CLIP)	49.0	49.8
TIME INTERVAL (msec)	$t_1 = 64.7$ $t_2 = 67.8$	$t_1 = 67.4$ $t_2 = 70.5$

HEAD INJURY CRITERIA (HIC) VALUES:

HIC	1342	808
t_1 (seconds)	56.8	61.0
t_2 (seconds)	92.8	97.0
Avg. Accel. t_1 to t_2	67.5	55.1

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

MAXIMUM FEMUR FORCES:

Left Side (lbs.)	1104	636
Right Side (lbs.)	Not available *	781

MAXIMUM SEAT BELT FORCES:

Lap Belt (lbs.)	1575	1867
Shoulder Belt (lbs.)	1491	2366

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)

* Driver Right Femur data not available due to a transducer failure.

HYBRID III NECK AND CHEST DATA SHEET *

VEHICLE YR./MAKE/MODEL/BODY STYLE: 1991 Toyota 4 X 4 Pickup Truck

VEHICLE NHTSA NO.: MM5103 TEST DATE: February 13, 1991

MAXIMUM VALUES	DRIVER DUMMY #	PASSENGER DUMMY #
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.: MM5103 Vehicle: 1991 Toyota 4 X 4 Pickup Truck

SEAT TYPE:

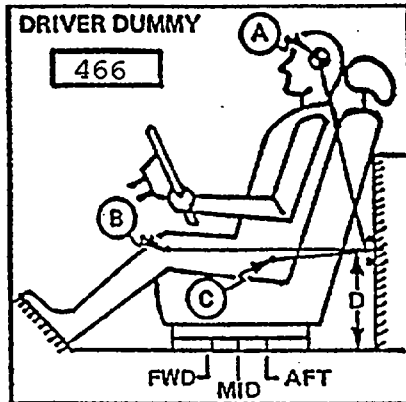
X Bench
 _____ Bucket
 _____ Split Bench

ADJUSTER TYPE:

X Manual
 _____ Power

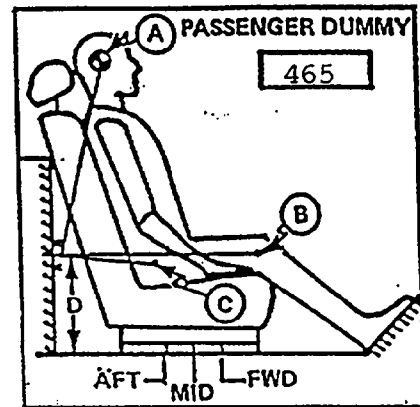
BUCKET SEAT BACK TYPE:

N/A Fixed
 _____ Adjustable Reclining



MEASUREMENT LOCATION

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



A = 20.8 in. -15.6 Degrees

B = 27.1 in. 2.2 Degrees

C = 12.6 in. 22.5 Degrees

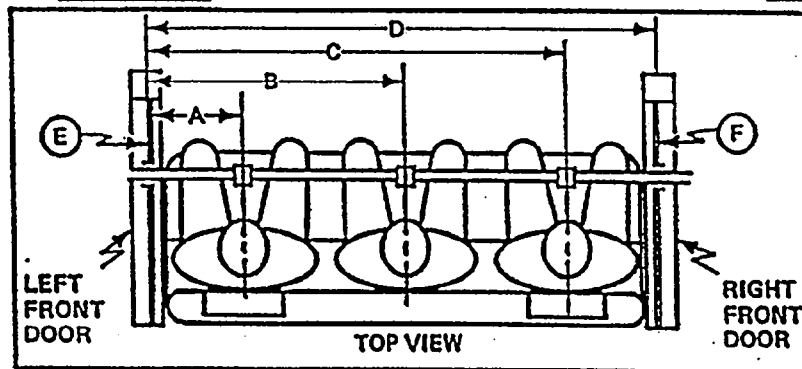
D = 15.8 in.
 Seat notch rearward 7th

A = 21.8 in. 14.5 Degrees

B = 26.9 in. 2.4 Degrees

C = 13.3 in. 22.5 Degrees

D = 15.7 in.
 Seat notch rearward 7th



A = Left Door to Driver Centerline 14.5 in.

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

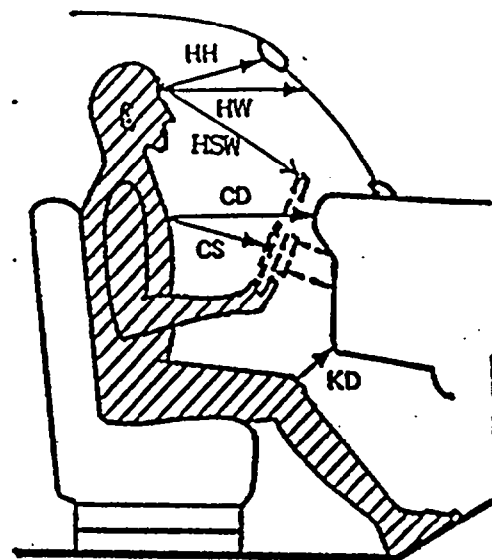
C = Left Door to Right Passenger Centerline 42.5 in.

D = Left Door to Right Door 57.8 in.

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

OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	17.1	15.6
HW	21.6	20.7
CD	22.5	22.6
CS	12.8	N/A
KDL	6.8	7.6
KDR	7.3	7.5
SA	24.1°	N/A
TA	30.3°	20.8°
HSW	19.3	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

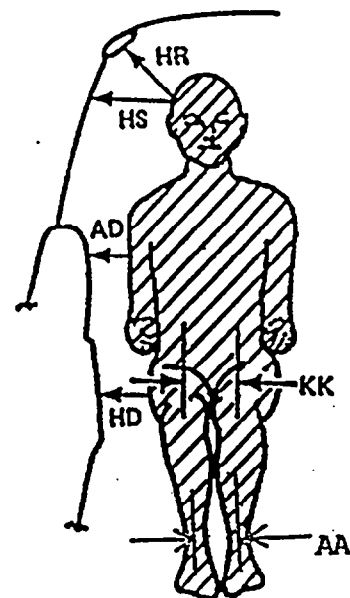
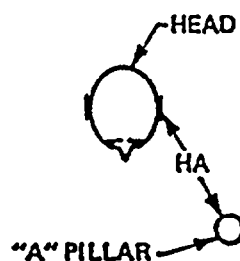
HS = Head to Side Window

AD = Arm to Door

HD = Hip to Door

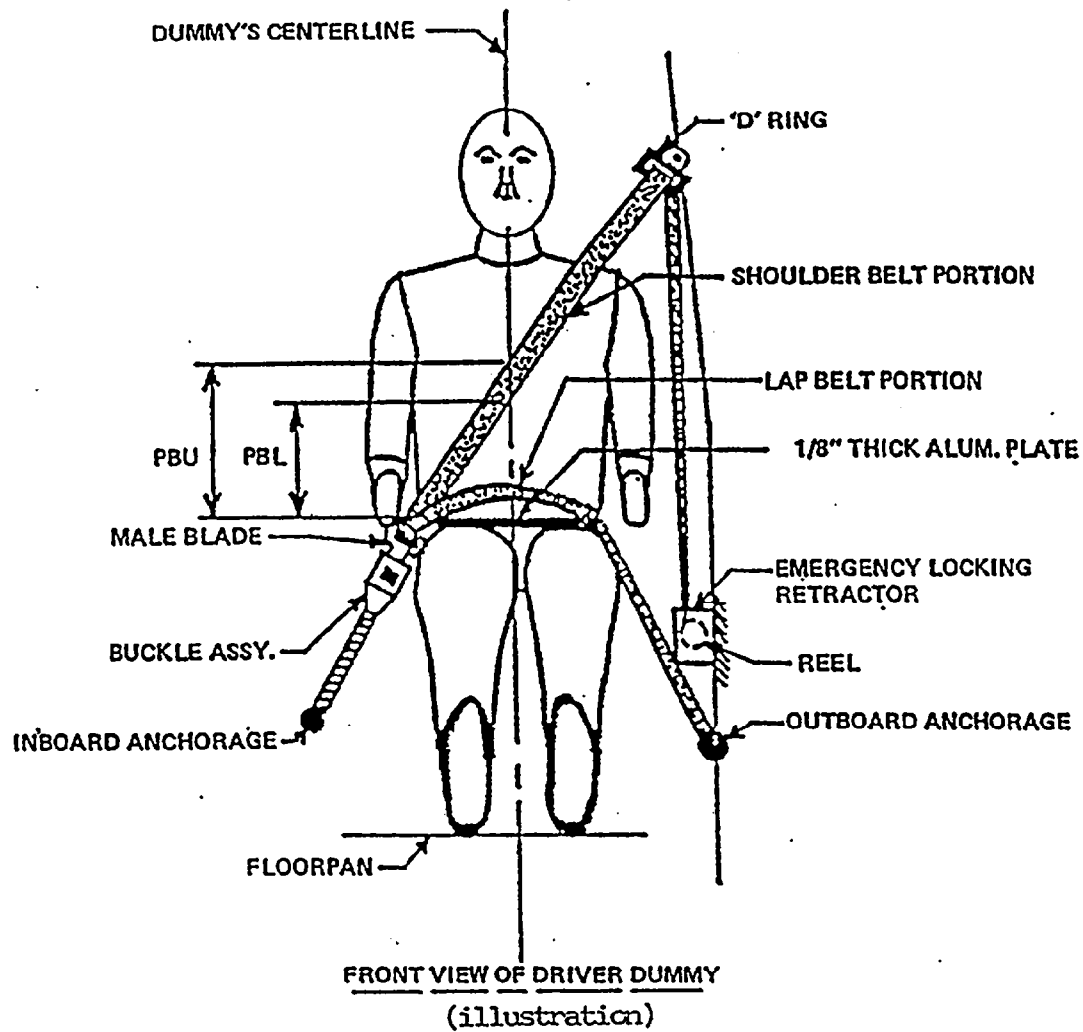
KK = Knee to Knee

AA = Ankle to Ankle



	DRIVER	PASSENGER
HR	7.7	7.3
HS	9.3	9.2
AD	4.0	4.0
HD	7.3	6.2
KK	14.5	11.6
HA	19.2	19.6
AA	15.2	11.5

SEAT BELT POSITIONING DATA

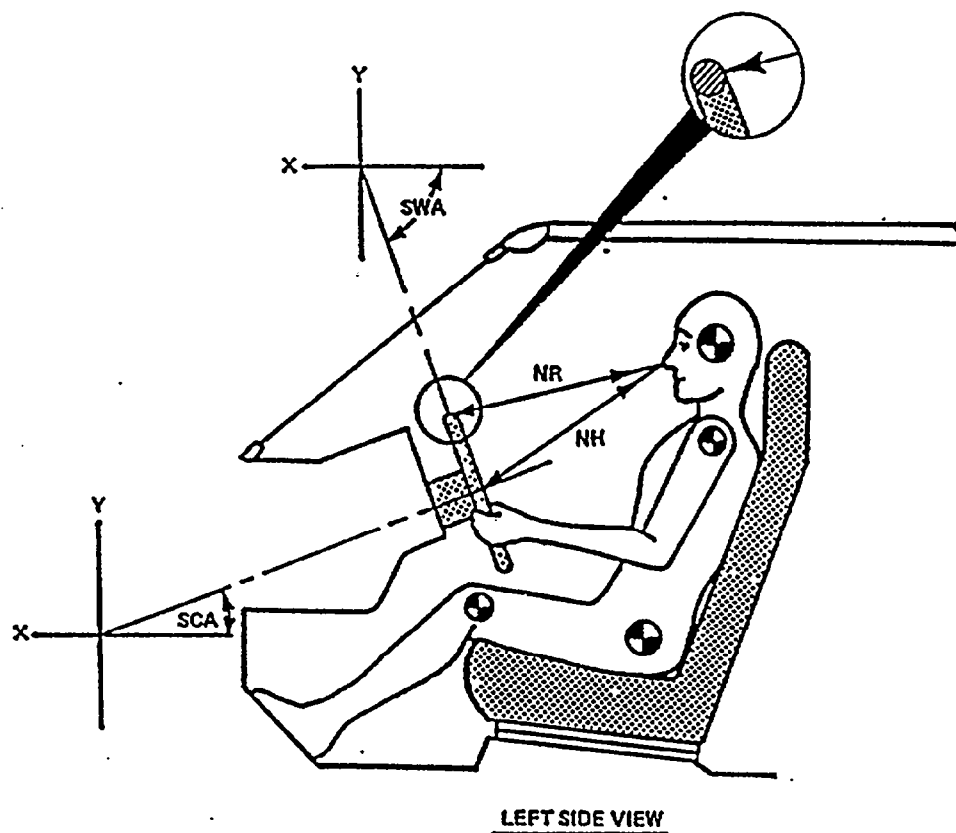


	DRIVER DUMMY	PASSENGER DUMMY
PBU -- Top surface of alum. plate to upper edge (inches)	14.0	13.8
PBL -- Top surface of alum. plate to belt lower edge (inches)	10.8	10.3
SEAT BELT TENSION (lbs.)	1.0	1.3

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

<u>BELT LENGTH DATA:</u>	<u>DRIVER</u>	<u>PASSENGER</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>26.0"</u>	<u>25.8"</u>
Shoulder belt length as measured on Part 572 dummy.	<u>33.8"</u>	<u>34.2"</u>
Lap belt length as measured on Part 572 dummy.	<u>31.6"</u>	<u>32.5"</u>
<u>SHOULDER BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>Not Avail.</u>	<u>Not Avail.</u>
As determined mechanically.	<u>2.6"</u>	<u>3.8"</u>
As determined electronically.	<u>Not Avail.</u>	<u>Not Avail.</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>0.2"</u>	<u>0.3"</u>
Measured mechanically.	<u>0"</u>	<u>0"</u>
<u>RETRACTOR LOCK-UP TIME:</u>		
As determined by shoulder belt spool-off.	<u>Not Avail.</u>	<u>Not Avail.</u>

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	17.4	inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	18.6	inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	24.1	degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	65.9	degrees

CAMERA LOCATIONS

VEH. NHTSA NO.: MM5103 ; TEST DATE: February 13, 1991 TIME: 2:40 p.m.VEH. YEAR/MAKE/MODEL/BODY STYLE: 1991 Toyota 4 X 4 Pickup Truck

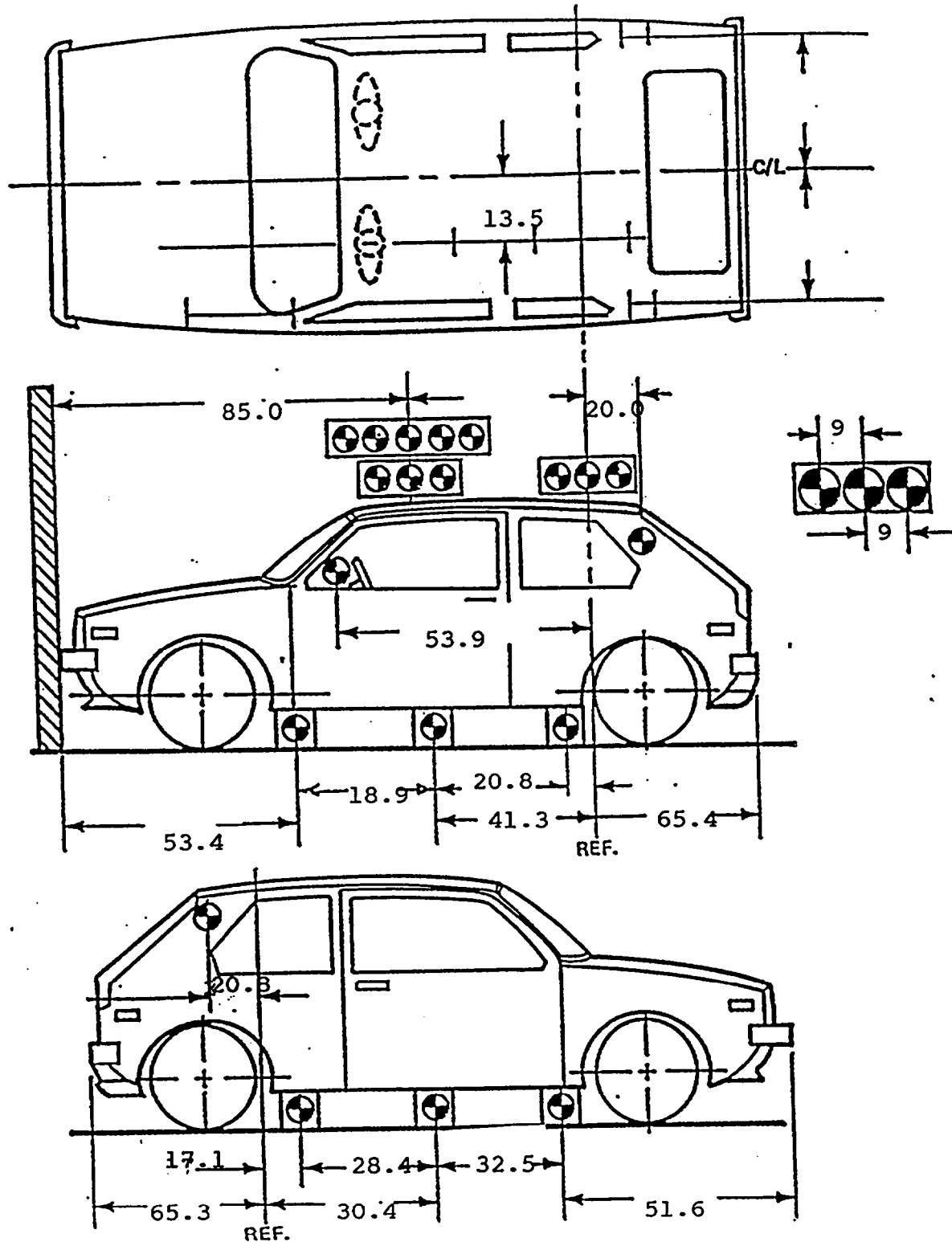
CAMERA NO.	VIEW	CAMERA POSITIONS (in.)*			ANGLE (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Left Side View	276	394	71	N/A	N/A	10	24
2	Right Side View	96	347	60	90	332	13	1000
3	Left Side View	44	404	59	90	389	35	1000
4	Overhead	38	0	152	N/A	N/A	7.5	500
5	Pit-Engine	44	0	-111	N/A	N/A	13	1000
6	Pit-Fuel Tank	104	0	-122	N/A	N/A	13	1000
7	Front-Passenger	-7	-13	89	40	N/A	13	500
8	Front-Driver	-7	13	89	40	N/A	13	500
9	Left Side-Driver	236	200	62	35	N/A	50	1000
10	Right Side-Passenger	236	200	58	35	N/A	50	1000
11	Right Side-"A" Post	60	112	47	90	97	13	1000
12	Left Side-"A" Post	58	105	46	90	90	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.	66	275	60	260	260	25	1000
16	Left Side-Steering Col.	66	275	40	260	260	25	1000
17	Right Side-Passenger	46	284	60	269	269	35	1000

*X = film plane to monorail centerline

Y = film plane to barrier face

Z = film plane to ground

VEHICLE TARGET LOCATIONS



(DIMENSIONS IN INCHES)

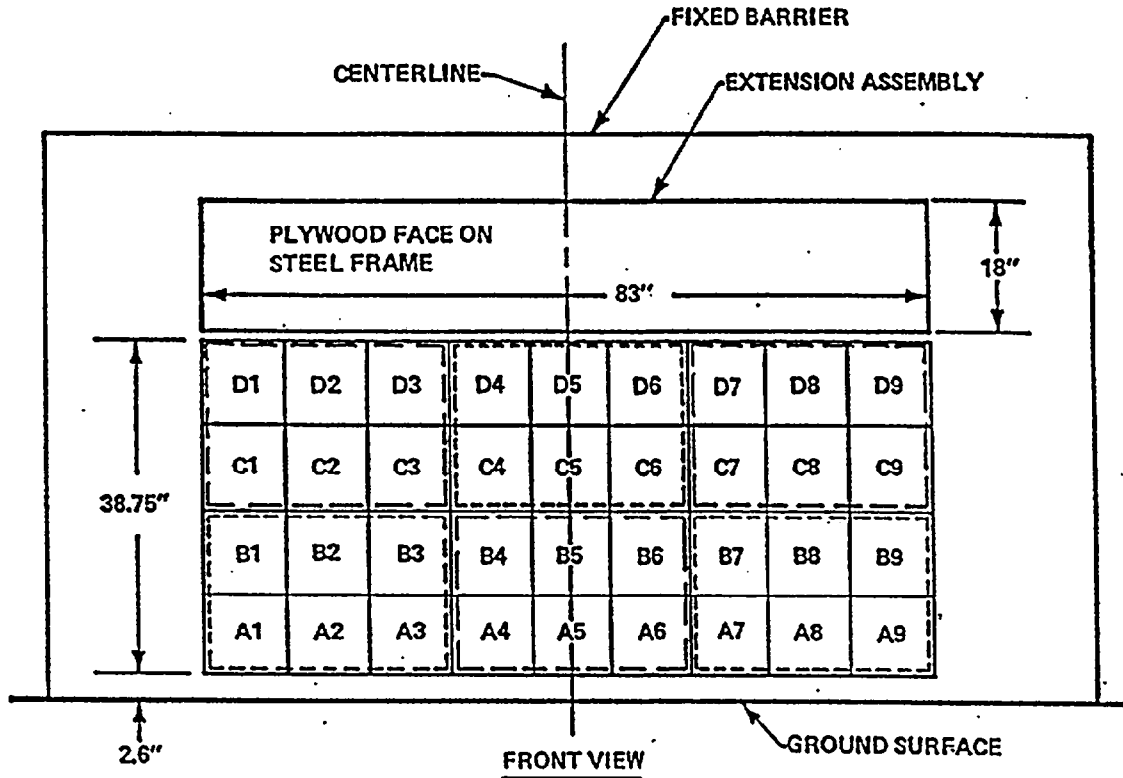
LOAD CELL LOCATIONS ON FIXED BARRIER

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 2 = A4-B6

Load Cell 3 = A7-B9

Load Cell 4 = C1-D3

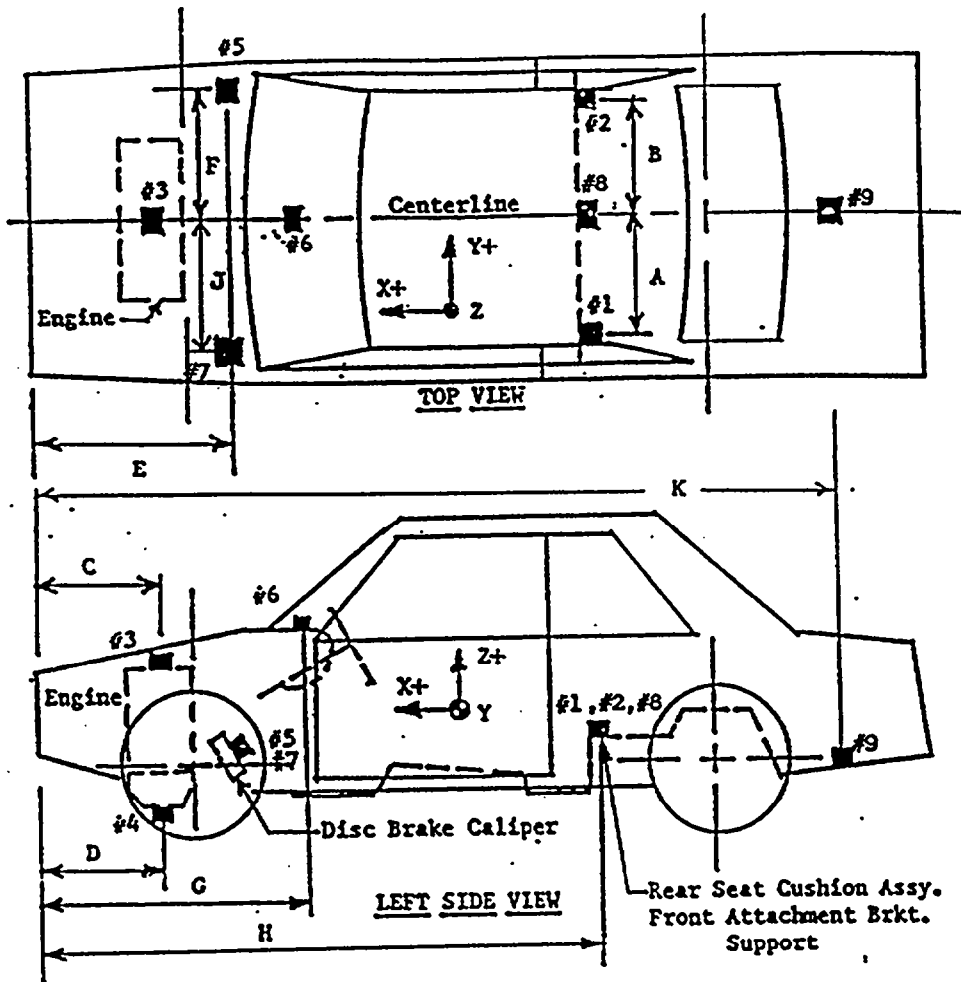
Load Cell 5 = C4-D6

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

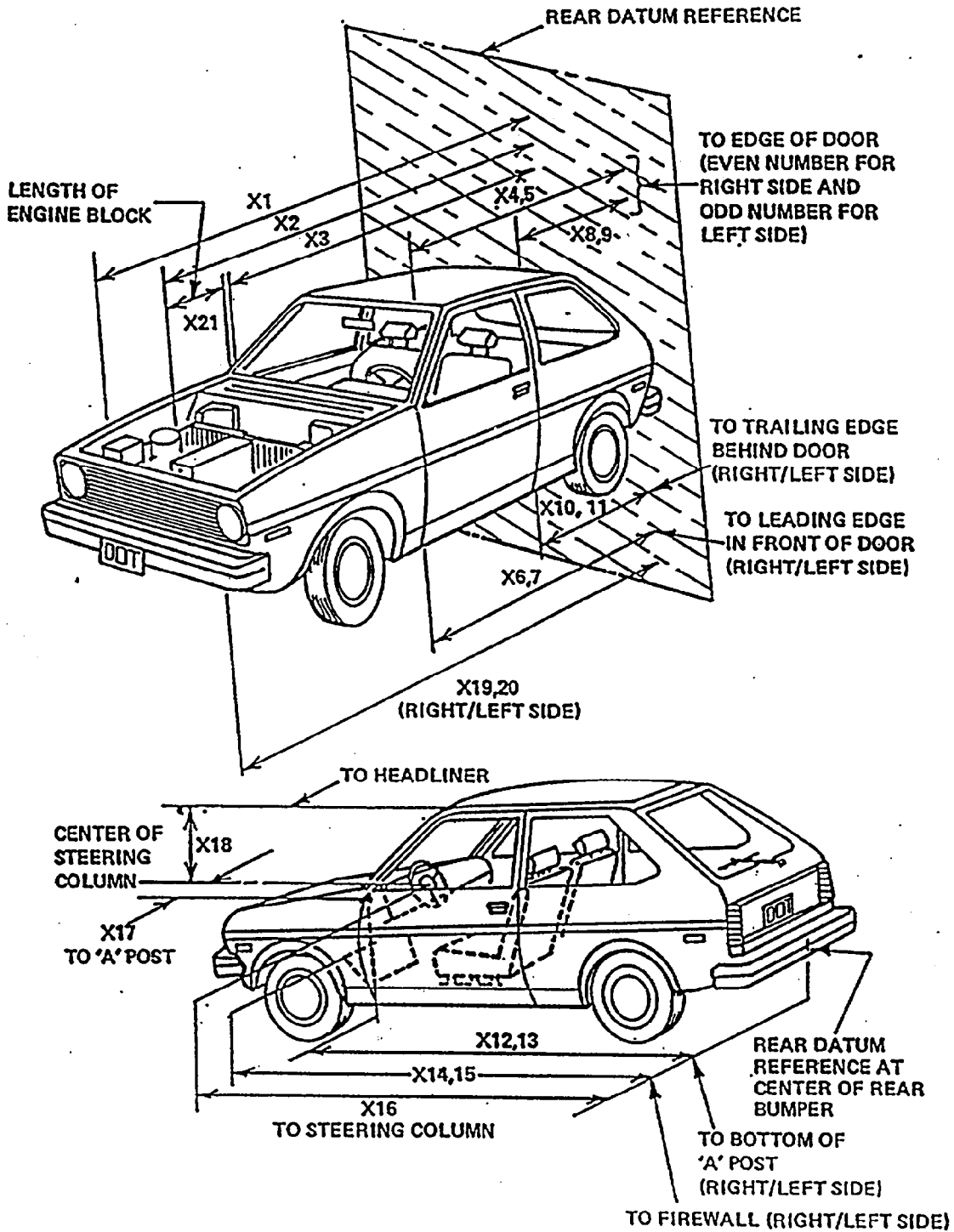


Dimension	Length (in.)
A	24.8
B	24.8
C	31.8
D	33.3
E	35.0
F	23.3
G	53.0
H	92.6
J	23.3
K	170.0

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	179.8	160.8	19.0
X2	Rear Surface of Vehicle to Front of Engine	163.1	155.3	7.8
X3	Rear Surface of Vehicle to Firewall	140.6	N/A*	N/A
X4	Rear Surface to Upr. Leading Edge of RT Door	129.0	130.4	-1.4
X5	Rear Surface to Upr. Leading Edge of Left Door	129.4	130.5	-1.1
X6	Rear Surface to Lwr. Leading Edge of RT Door	128.1	128.5	-0.4
X7	Rear Surface to Lwr. Leading Edge of Left Door	128.1	128.4	-0.3
X8	Rear Surface to Upr. Trailing Edge of RT Door	87.9	88.4	-0.5
X9	Rear Surface to Upr. Trailing Edge of LFT Door	87.3	88.4	-1.1
X10	Rear Surface to Lwr. Trailing Edge of RT Door	86.8	87.0	-0.2
X11	Rear Surface to Lwr. Trailing Edge of LFT Door	87.0	87.4	-0.4
X12	Rear Surface to Bottom of "A" Post on RT Side	128.1	128.5	-0.4
X13	Rear Surface to Bottom of "A" Post on LFT Side	128.0	128.0	0.0
X14	Rear Surface to Firewall on Right Side	140.8	141.8	-1.0
X15	Rear Surface to Firewall on Left Side	140.5	141.5	-1.0
X16	Rear Surface to Steering Column	113.9	114.9	-1.0
X17	Center of Steering Column to "A" Post	16.6	15.8	0.8
X18	Center of Steering Column to Headlining	16.8	16.0	0.8
X19	Rear Surface to Right Side of Front Bumper	177.1	159.4	17.7
X20	Rear Surface to Left Side of Front Bumper	177.6	160.3	17.3
X21	Length of Engine Block	22.0	22.0	0.0

* Measurement point not visible post-test.

ACCIDENT INVESTIGATION DIVISION DATA

FOR 35 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: 1991 Toyota 4 X 4 Pickup Truck

VEH. NHTSA NO.: MM5103 ; VIN: JT4RN01PXM 001 0089

MODEL YEAR: 1991 ; BUILD DATE: 10/90 ; TEST DATE: 2/13/91

VEH. SIZE CATEGORY: Light Truck ; TEST WEIGHT: 3905

VEH. WHEELBASE: 103.0 ; FRONT OVERHANG: 28.3 ; OVERALL WIDTH: 57.2

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: 35.0 ; TIME OF SEPARATION: 0.181 sec.

VELOCITY CHANGE: 39.2 mph

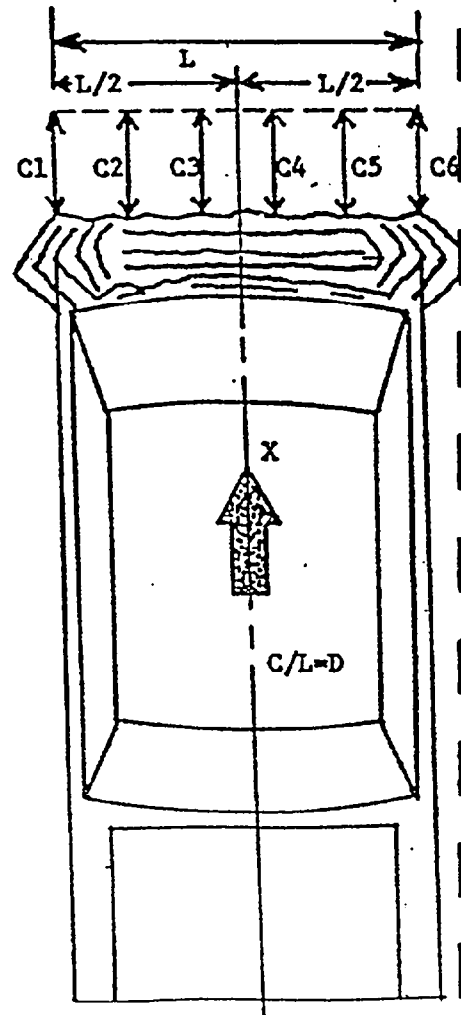
COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:

F (Frontal)

CRUSH DEPTH	C1 =	17.3	inches
DIMENSIONS:	C2 =	17.7	inches
	C3 =	19.1	inches
	C4 =	19.1	inches
	C5 =	18.2	inches
	C6 =	17.7	inches

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

LENGTH OF DAMAGED REGION: L = 57.2 inches



APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

	<u>Page No.</u>
Photo No. 1 - Pre-Test Front View	A-2
Photo No. 2 - Post-Test Front View	A-3
Photo No. 3 - Pre-Test Left Side View	A-4
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
Photo No. 12 - Pre-Test Windshield View	A-13
Photo No. 13 - Post-Test Windshield View	A-14
Photo No. 14 - Pre-Test Engine Compartment View	A-15
Photo No. 15 - Post-Test Engine Compartment View	A-16
Photo No. 16 - Pre-Test Fuel Filler Cap View	A-17
Photo No. 17 - Pre-Test Front Underbody View	A-18
Photo No. 18 - Post-Test Front Underbody View	A-19
Photo No. 19 - Pre-Test Rear Underbody View	A-20
Photo No. 20 - Post-Test Rear Underbody View	A-21
Photo No. 21 - Pre-Test Driver Dummy Position View	A-22
Photo No. 22 - Post-Test Driver Dummy Position View	A-23

TABLE OF PHOTOGRAPHS (cont'd)

	<u>Page No.</u>
Photo No. 23 - Pre-Test Passenger Dummy Position View	A-24
Photo No. 24 - Post-Test Passenger Dummy Position View	A-25
Photo No. 25 - Solvent Spillage Location View (if required)	A-26
Photo No. 26 - Pre-Test Driver Dummy & Vehicle Interior View (Door Open)	A-27
Photo No. 27 - Post-Test Driver Dummy & Vehicle Interior View (Door Open)	A-28
Photo No. 28 - Pre-Test Passenger Dummy & Vehicle Interior View (Door Open)	A-29
Photo No. 29 - Post-Test Passenger Dummy & Vehicle Interior View (Door Open)	A-30
Photo No. 30 - Restraint System Problem Area View (if required)	A-31
Photo No. 31 - Post-Test Driver Dummy Head Contact Area	A-32
Photo No. 32 - Post-Test Steering Column Hub/Rim Contact By Dummy Driver	A-33
Photo No. 33 - Post-Test Passenger Dummy Head/Knee Contact	A-34
Photo No. 34 - Post-Test Passenger Dummy Head/IP Contact Area	A-35

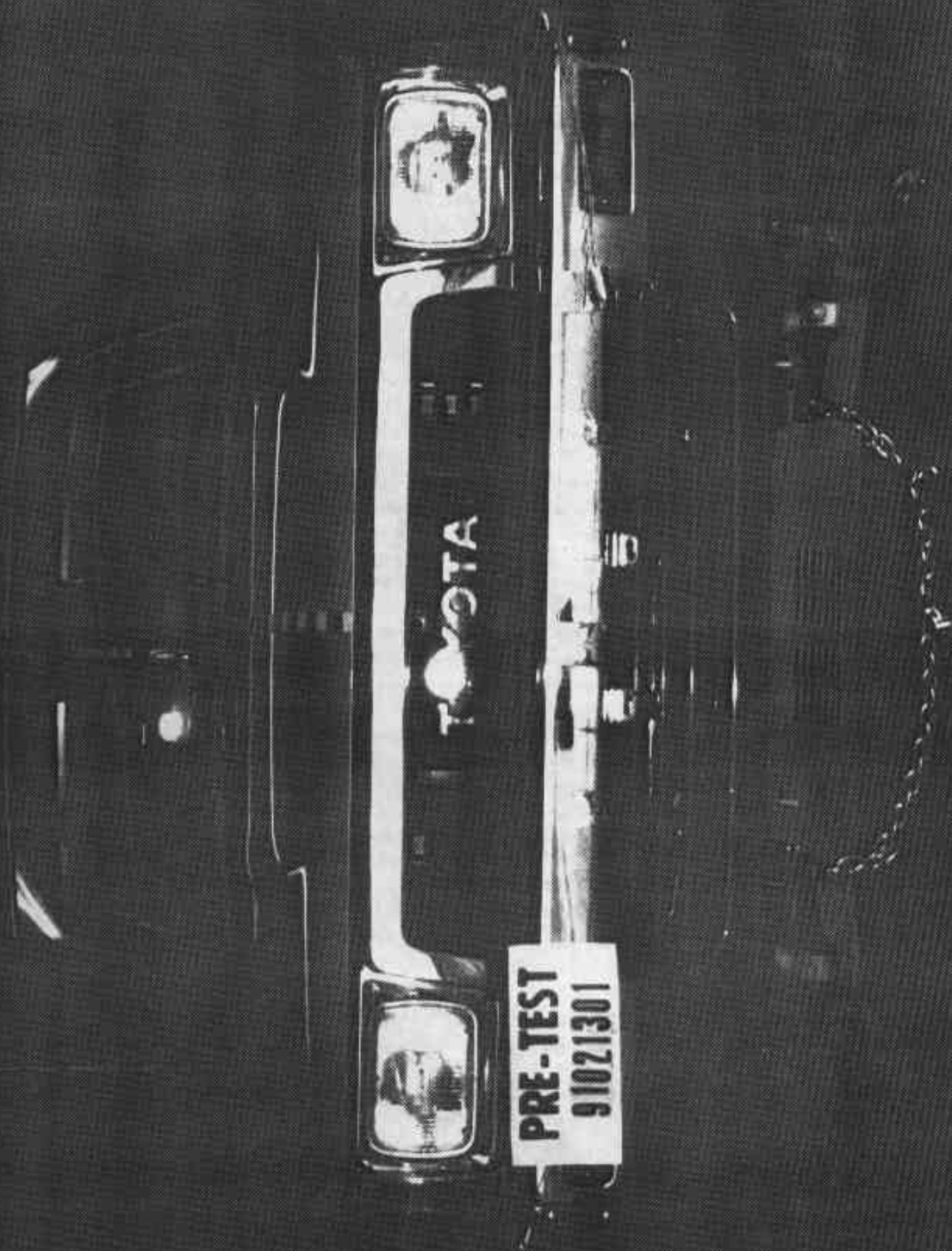


Photo No. 1 - Pre-Test Front View

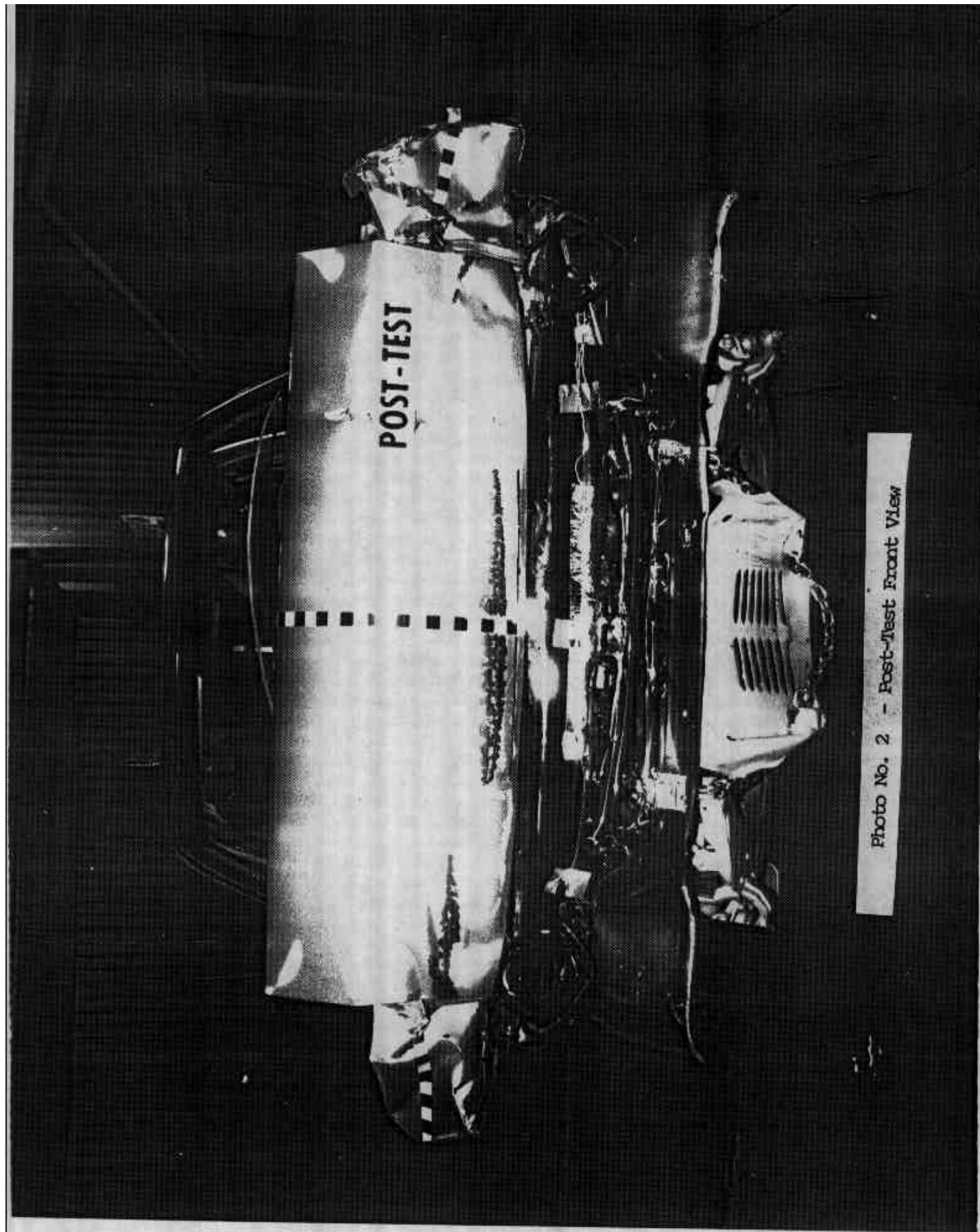


Photo No. 2 - Post-Test Front View

Photo No. 3 - Pre-Test Left Side View

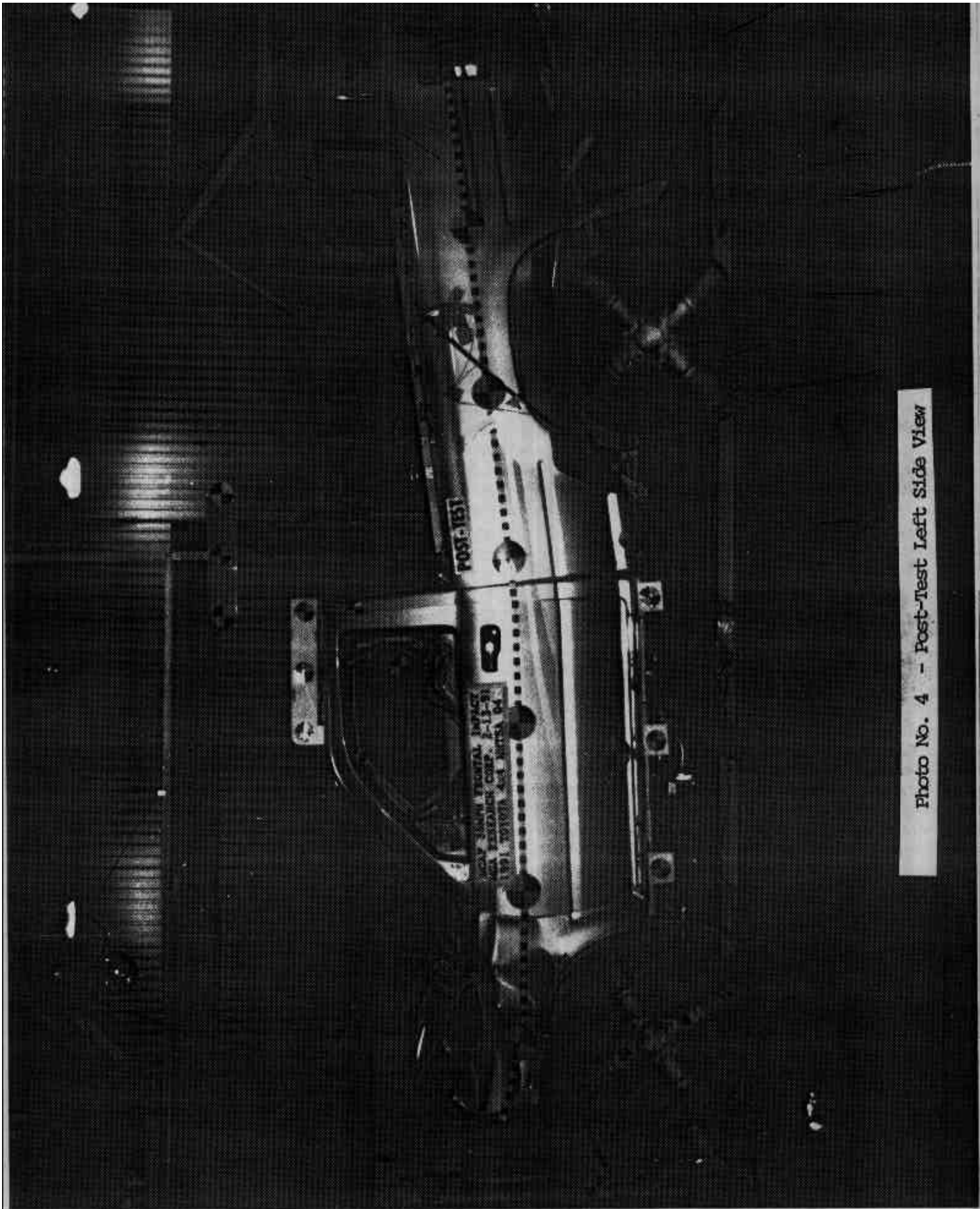


Photo No. 4 - Post-Test Left Side View

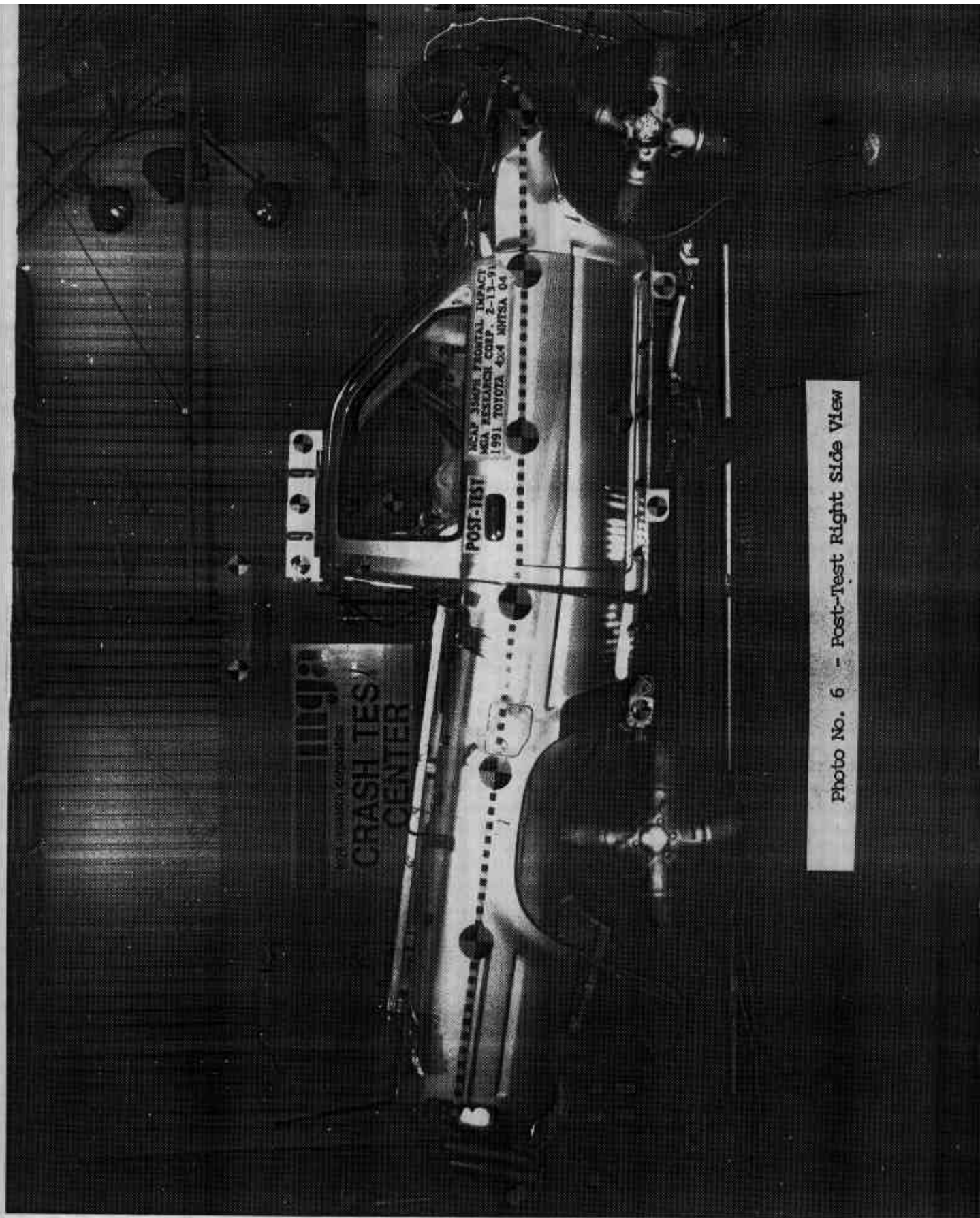


Photo No. 6 - Post-Test Right Side View

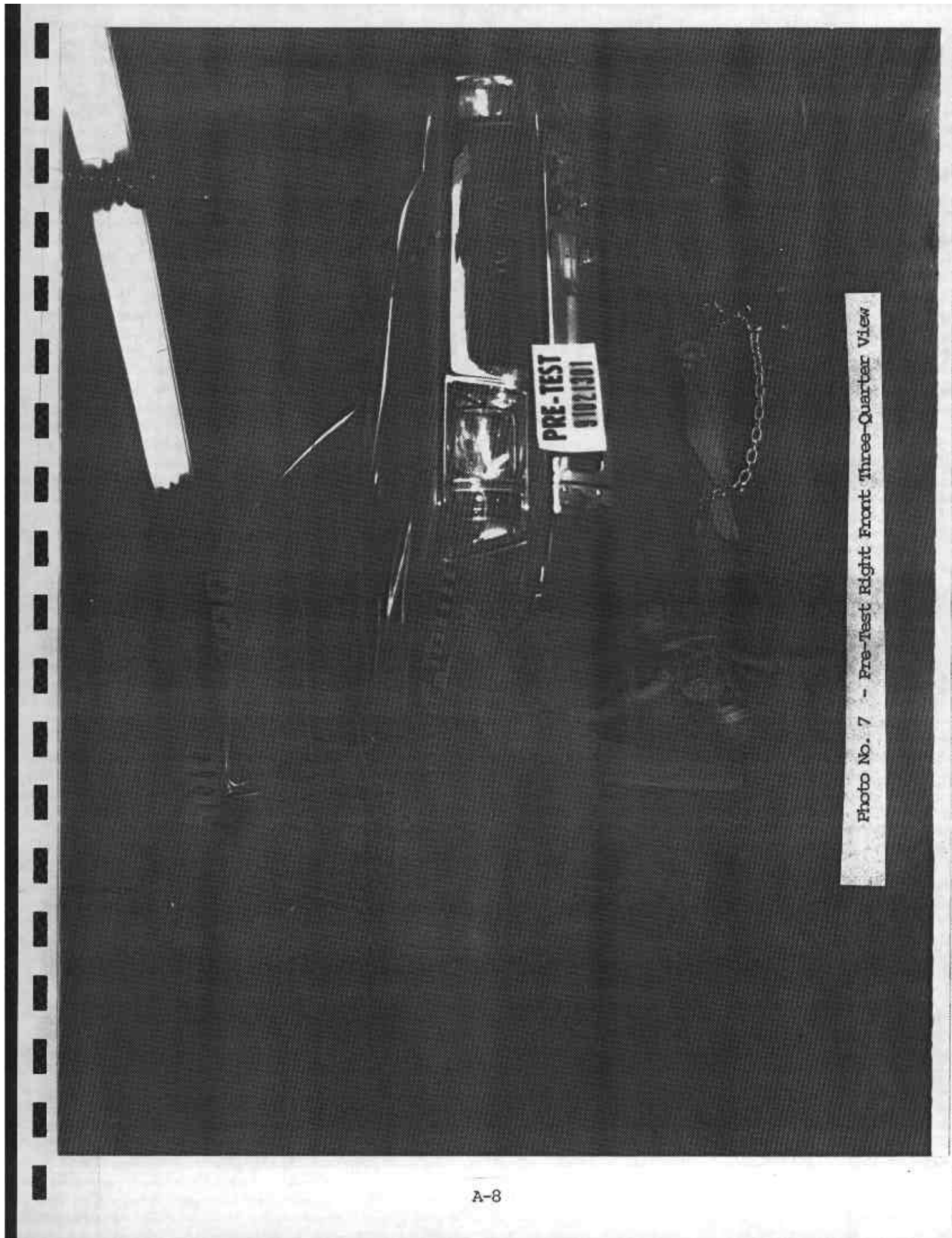


Photo No. 7 - Pre-Test Right Front Three-Quarter View

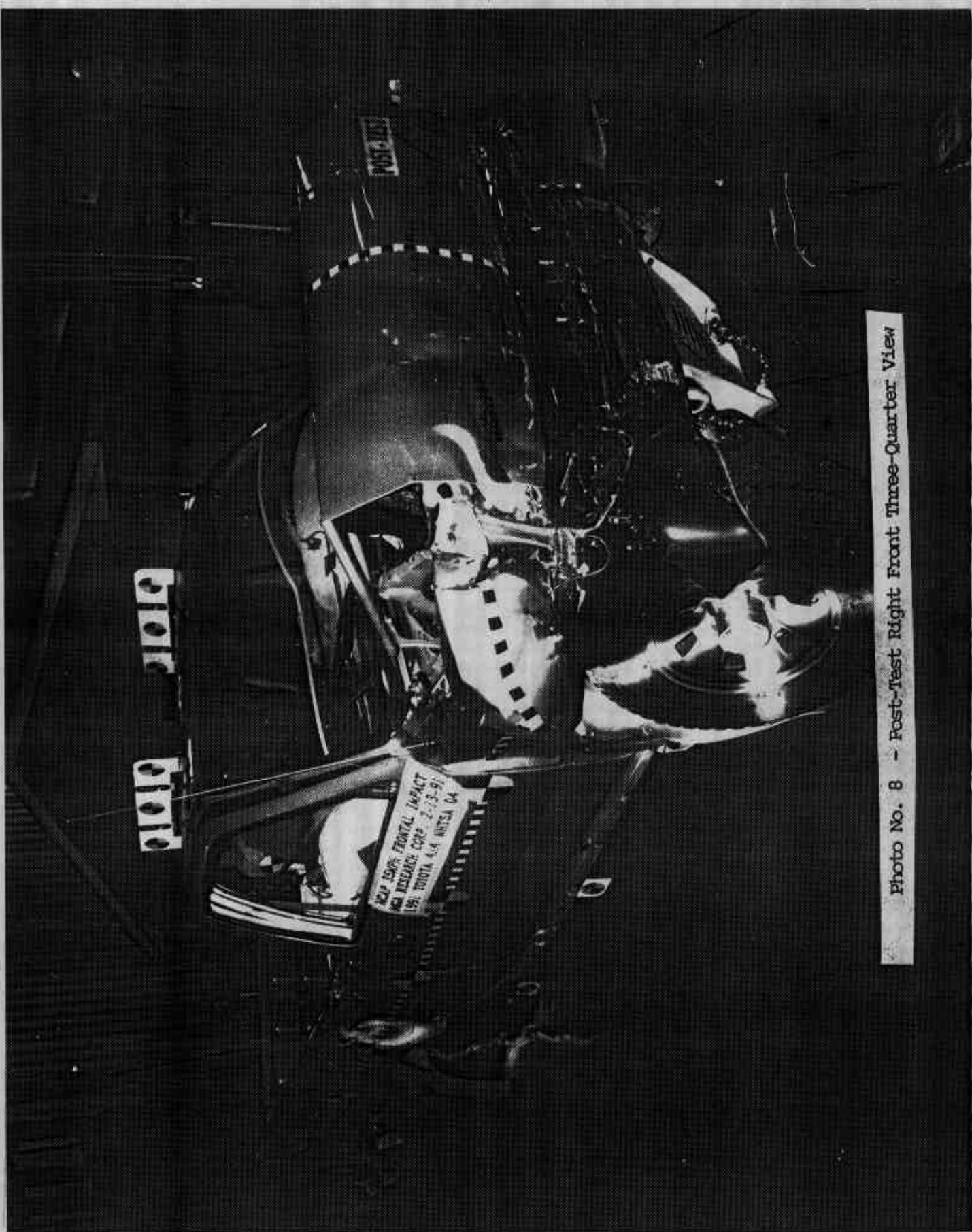


Photo No. 8 - Post-Test Right Front Three-Quarter View

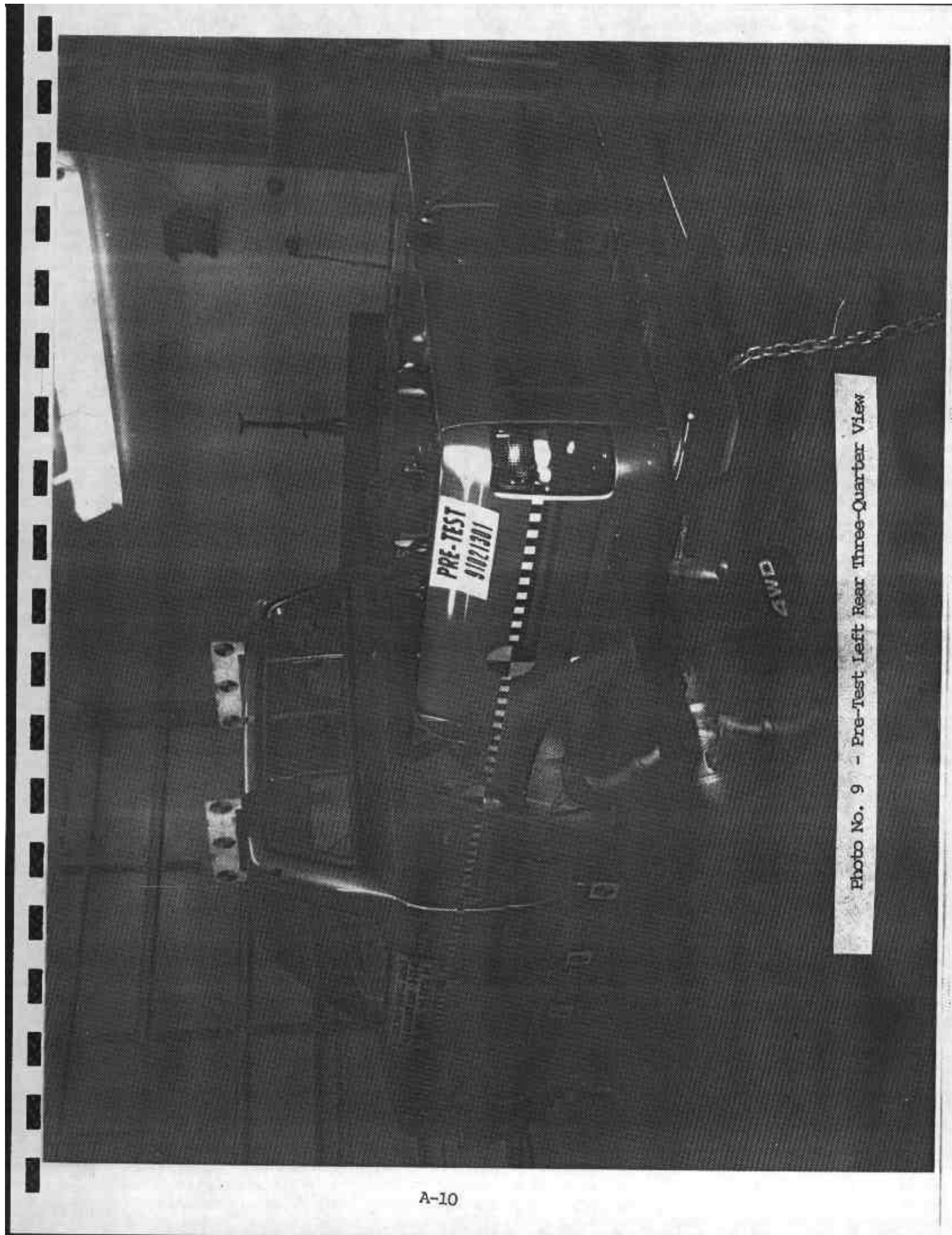


Photo No. 9 - Pre-Test Left Rear Three-Quarter View



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

Photograph Not Applicable
Rollover Not Performed

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

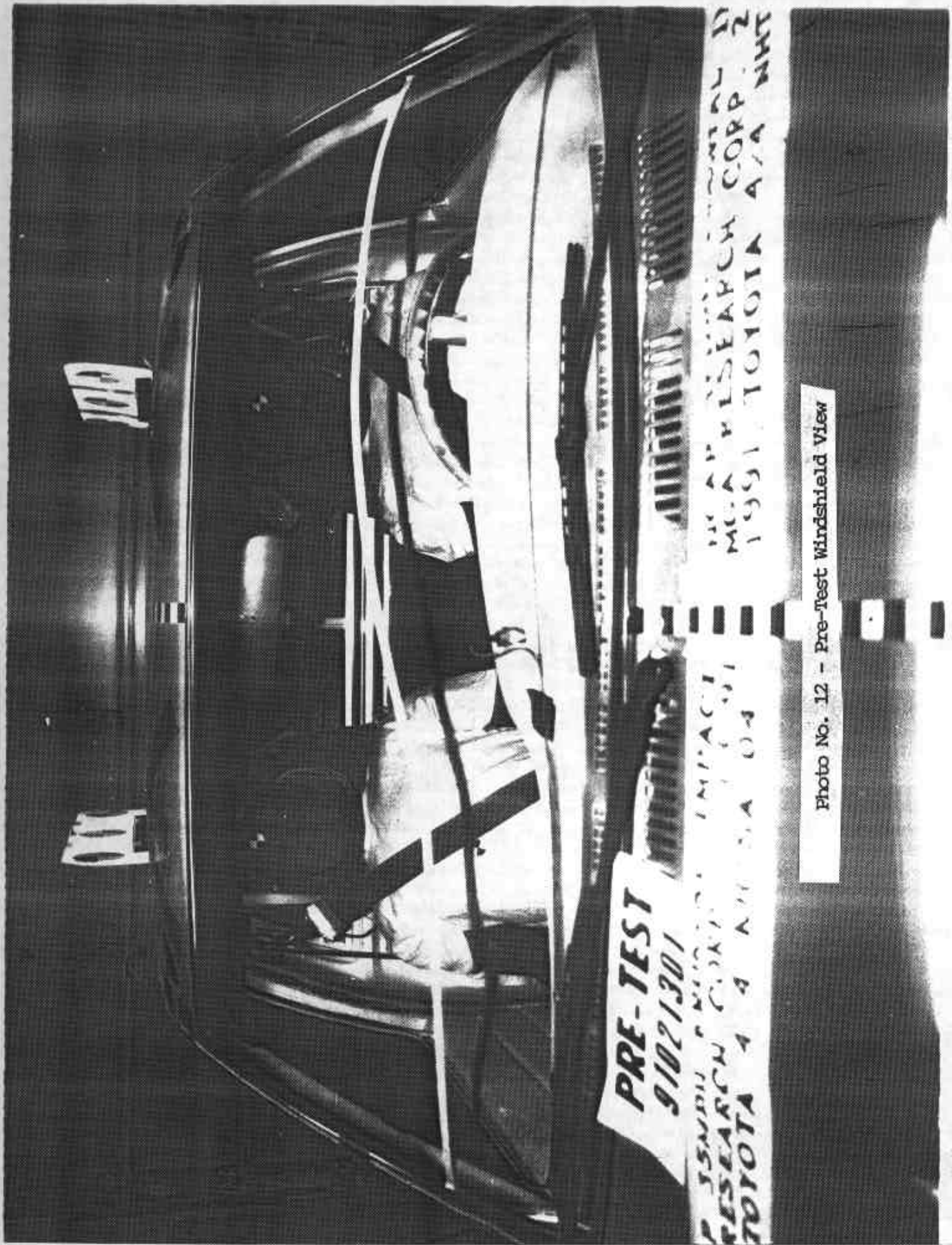


Photo No. 12 - Pre-Test Windshield View

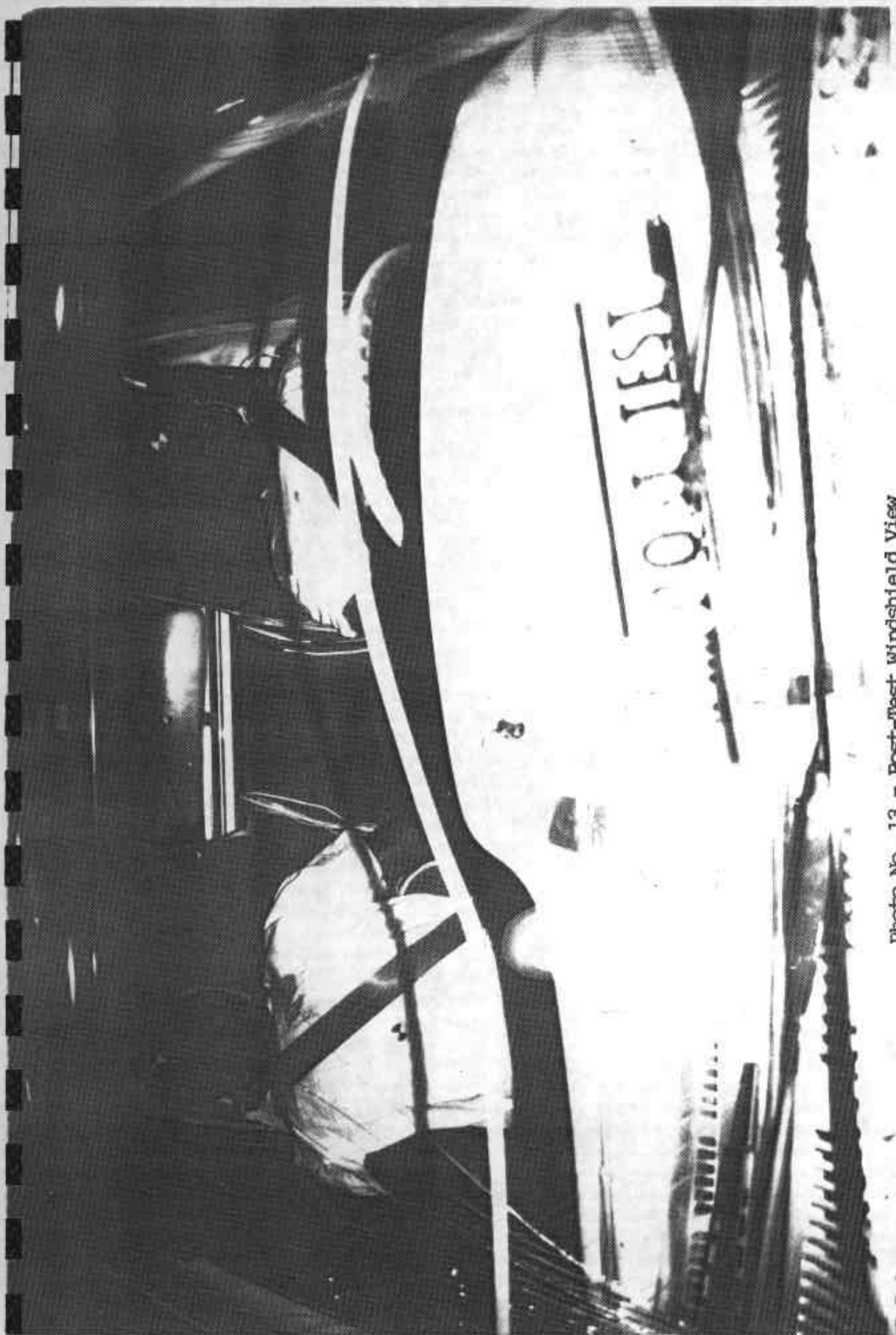


Photo No. 13 - Post-Test Windshield View

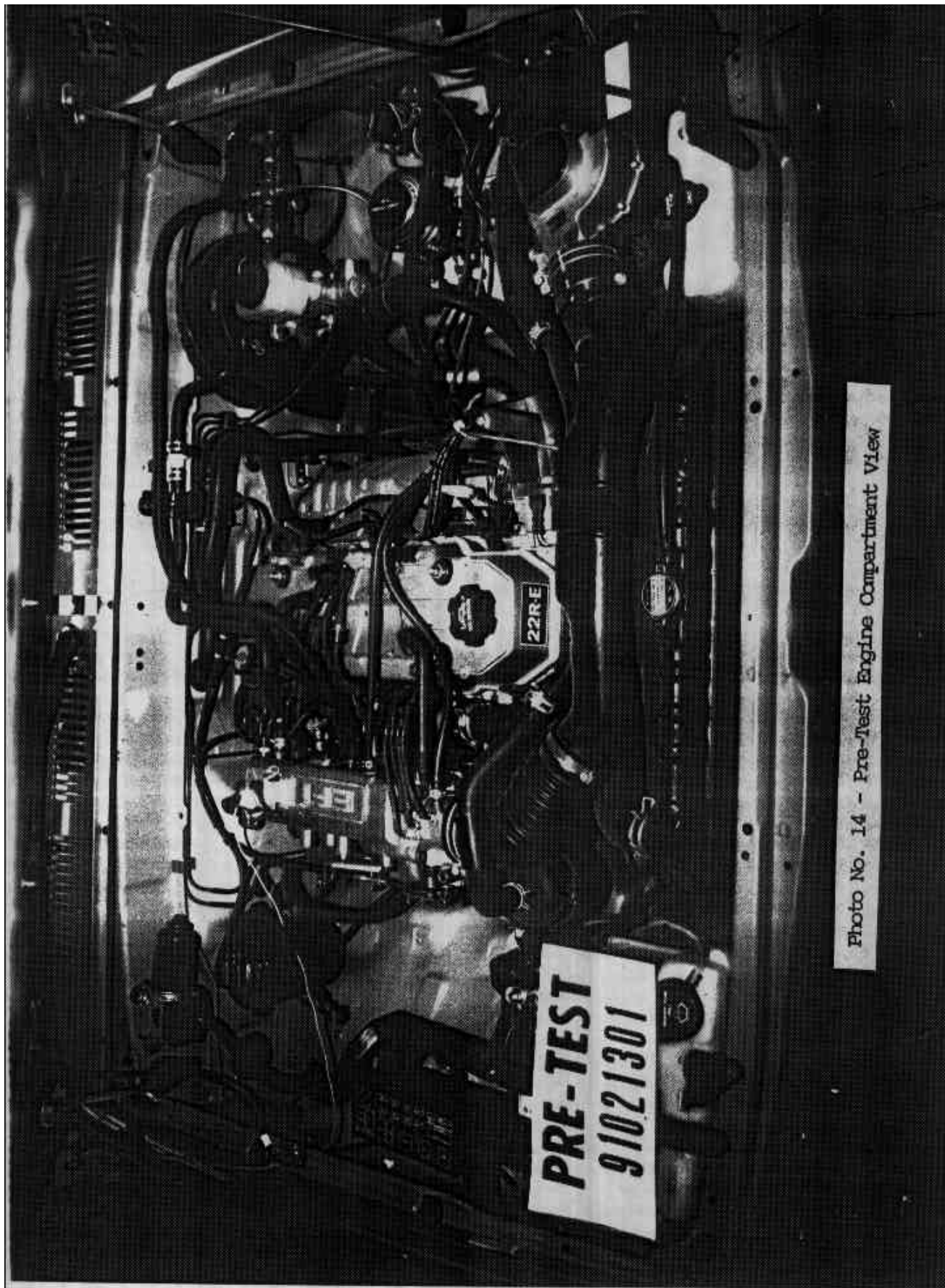


Photo No. 14 - Pre-Test Engine Compartment View

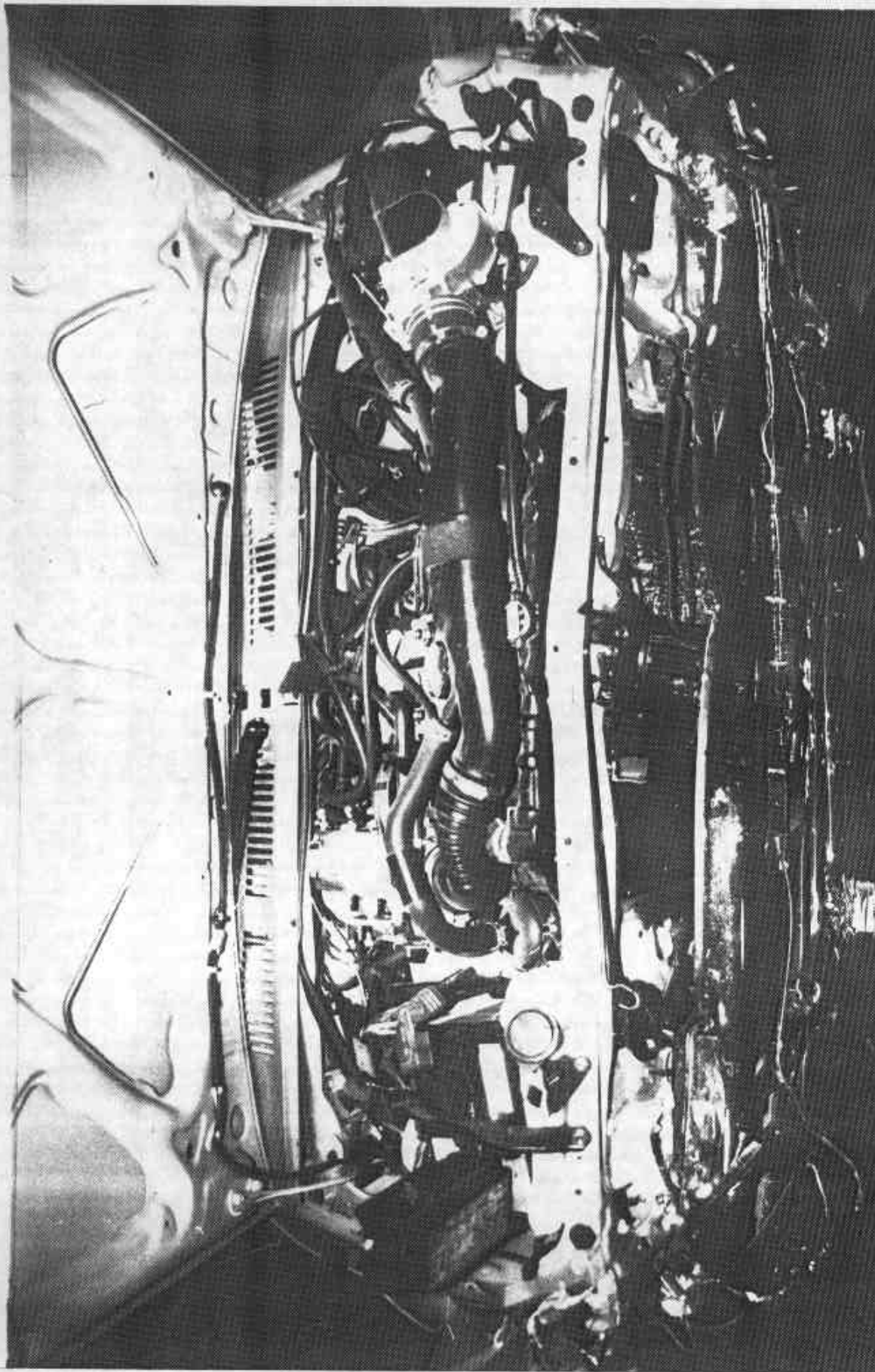


Photo No. 15 - Post-Test Engine Compartment View

CF-TEST

91021301



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

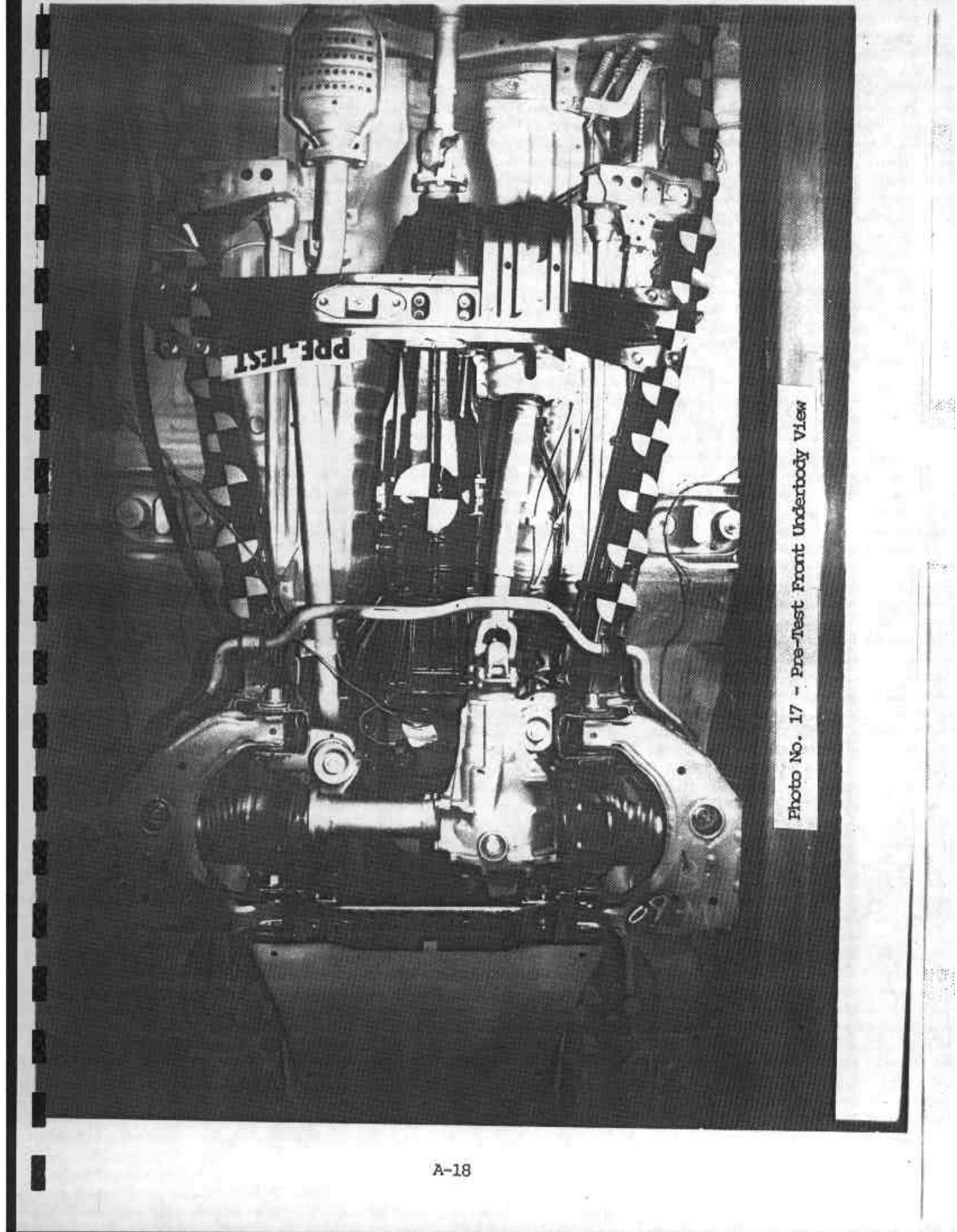


Photo No. 17 - Pre-Test Front Underbody View

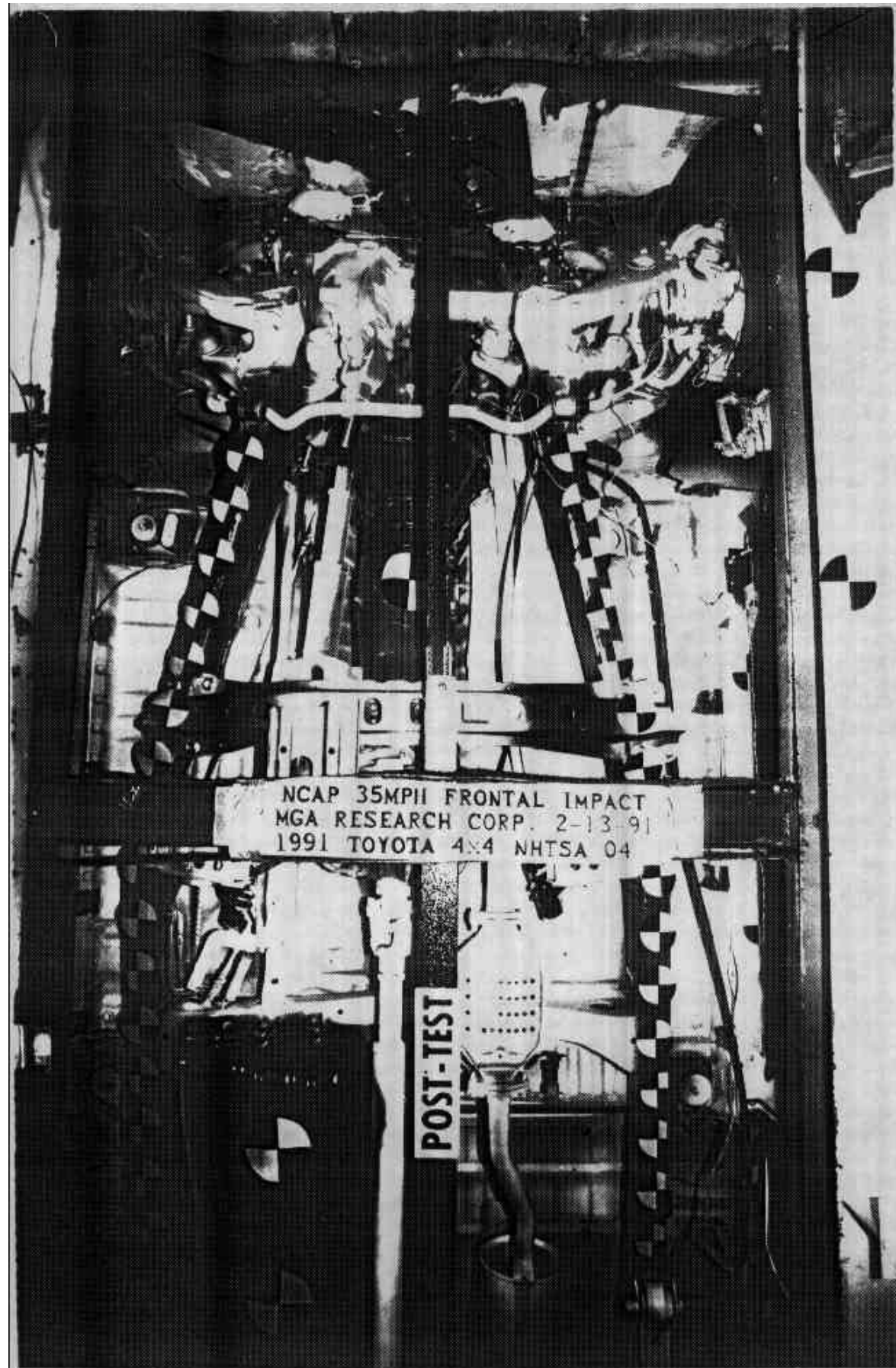


Photo No. 18 - Post-Test Front Underbody View

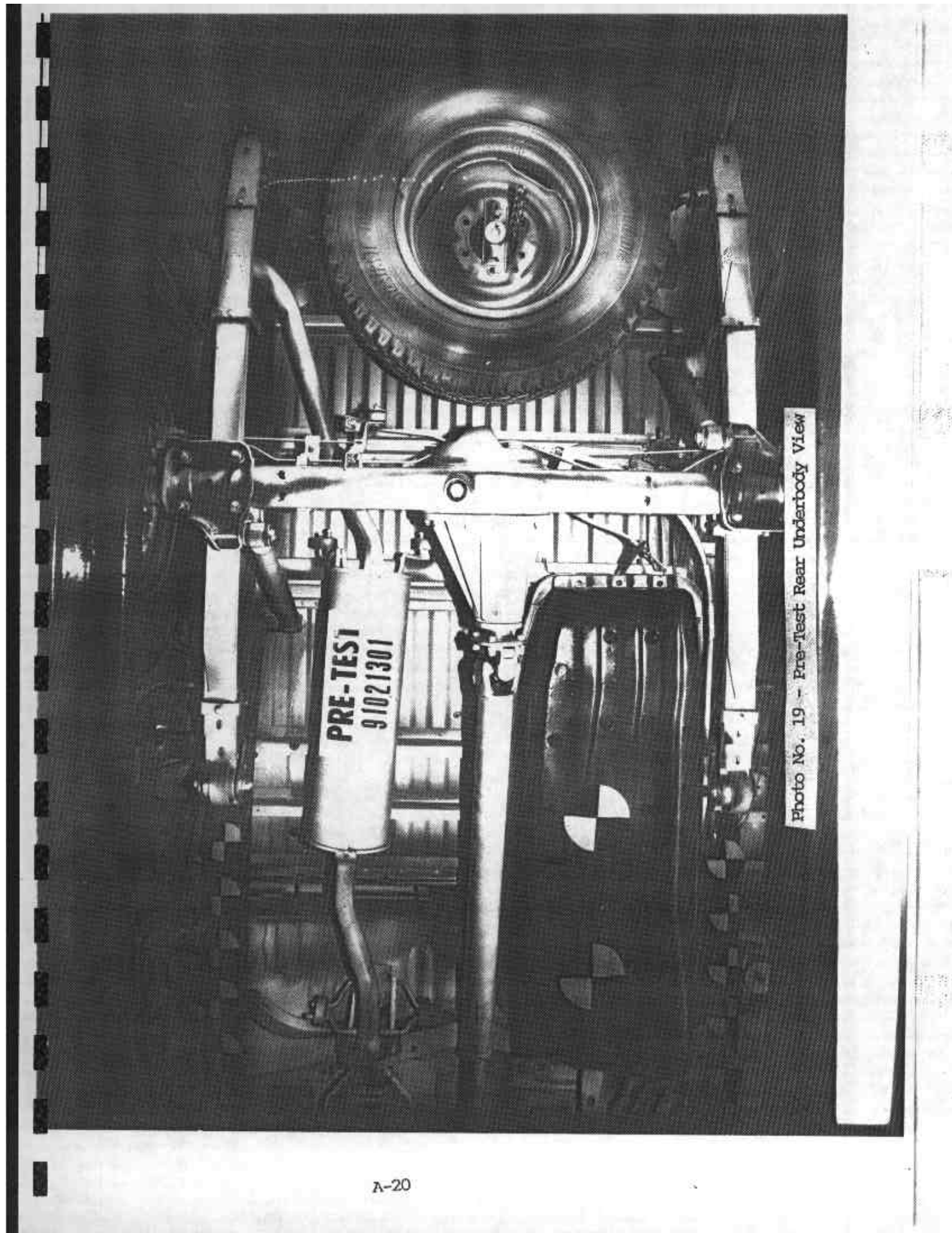


Photo No. 19 - Pre-Test Rear Underbody View

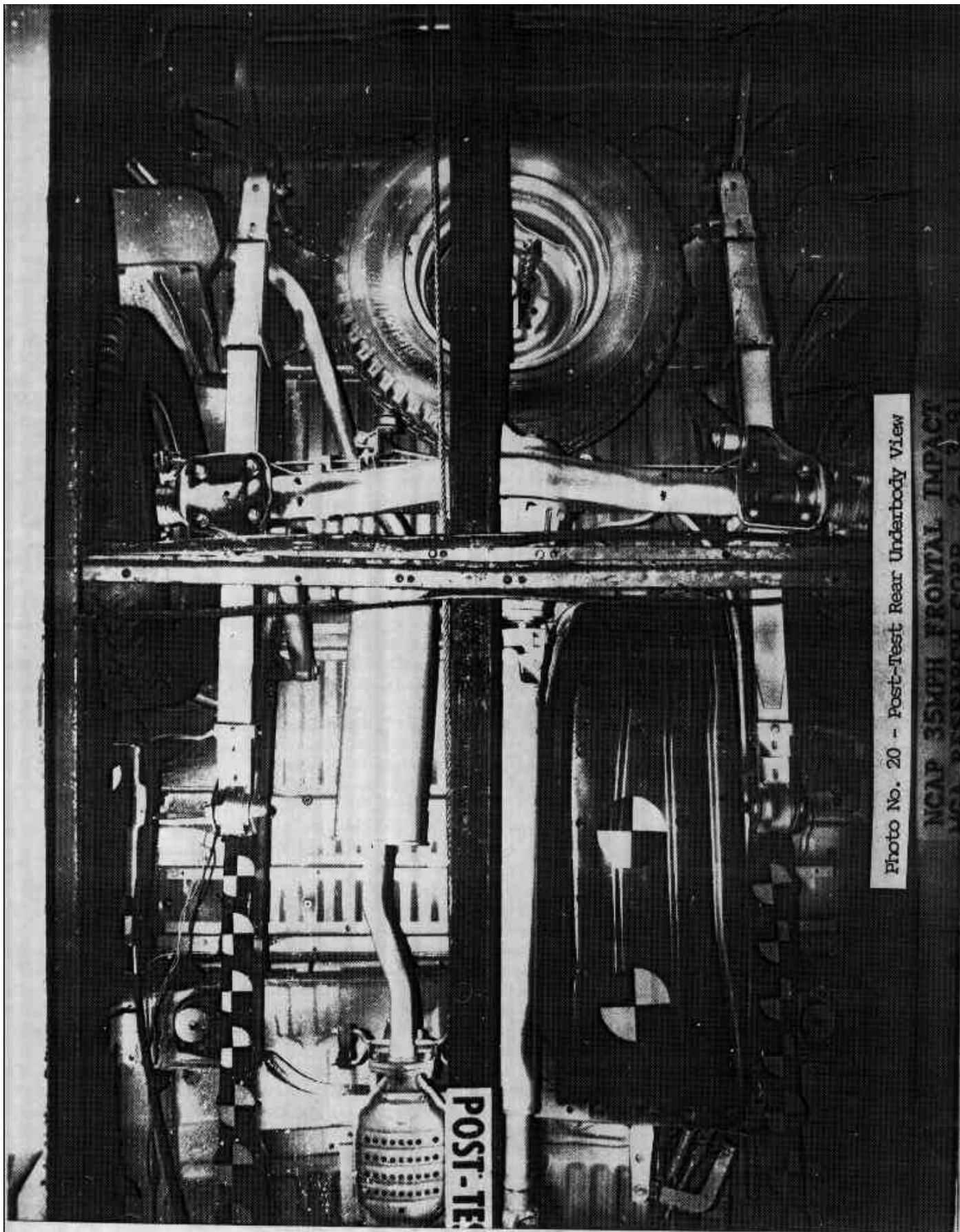
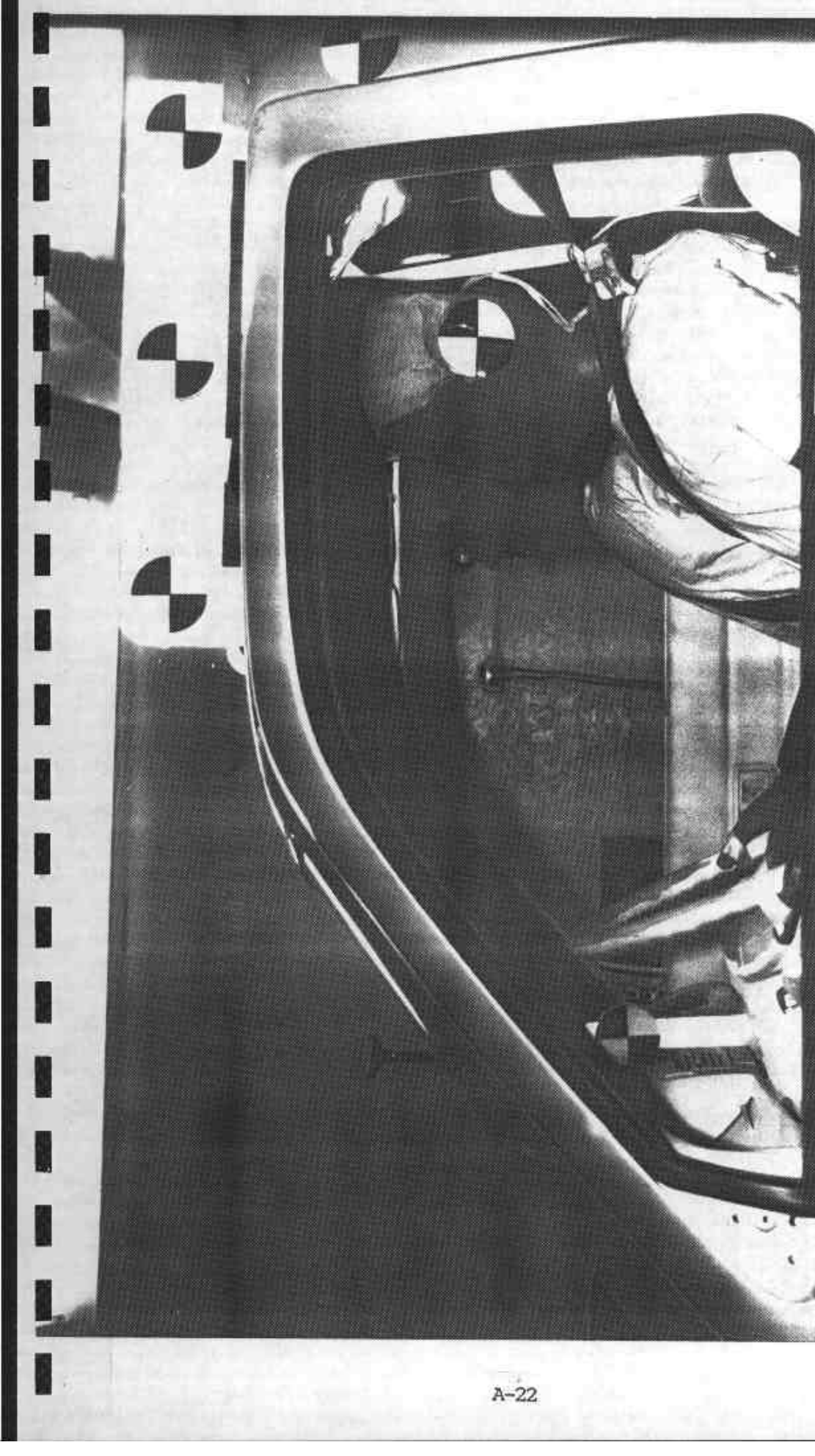


Photo No. 20 - Post-Test Rear Underbody View

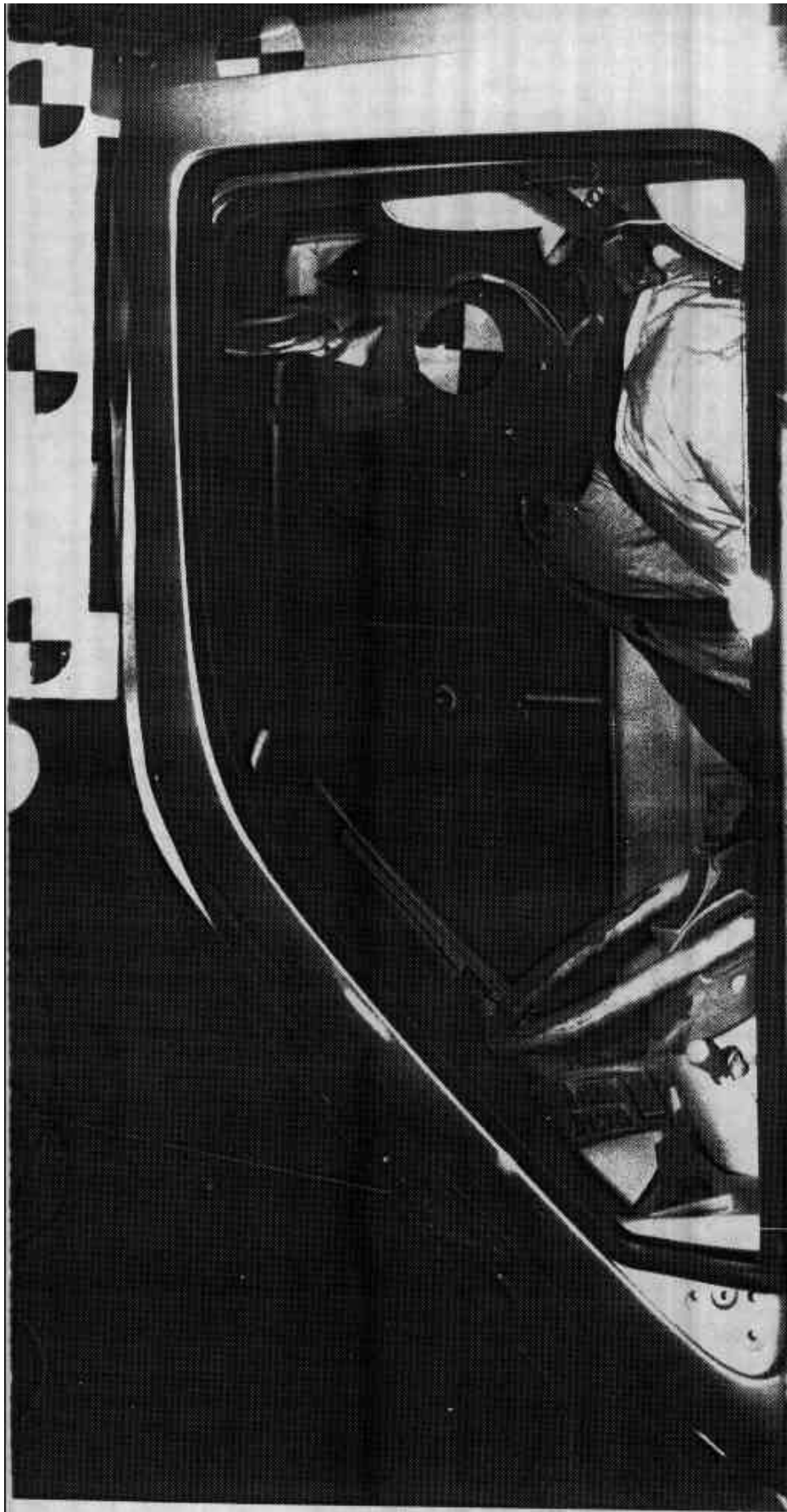
NCAP 35MPH FRONTAL IMPACT
NCA DESIGN CORP 2-13-81



PRE-TEST
91021301

NCAP 35MPH FRONTAL IMPACT
MGA RESEARCH CORP. 2-13-9
1991 TOYOTA 4x4 NHTSA 04

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

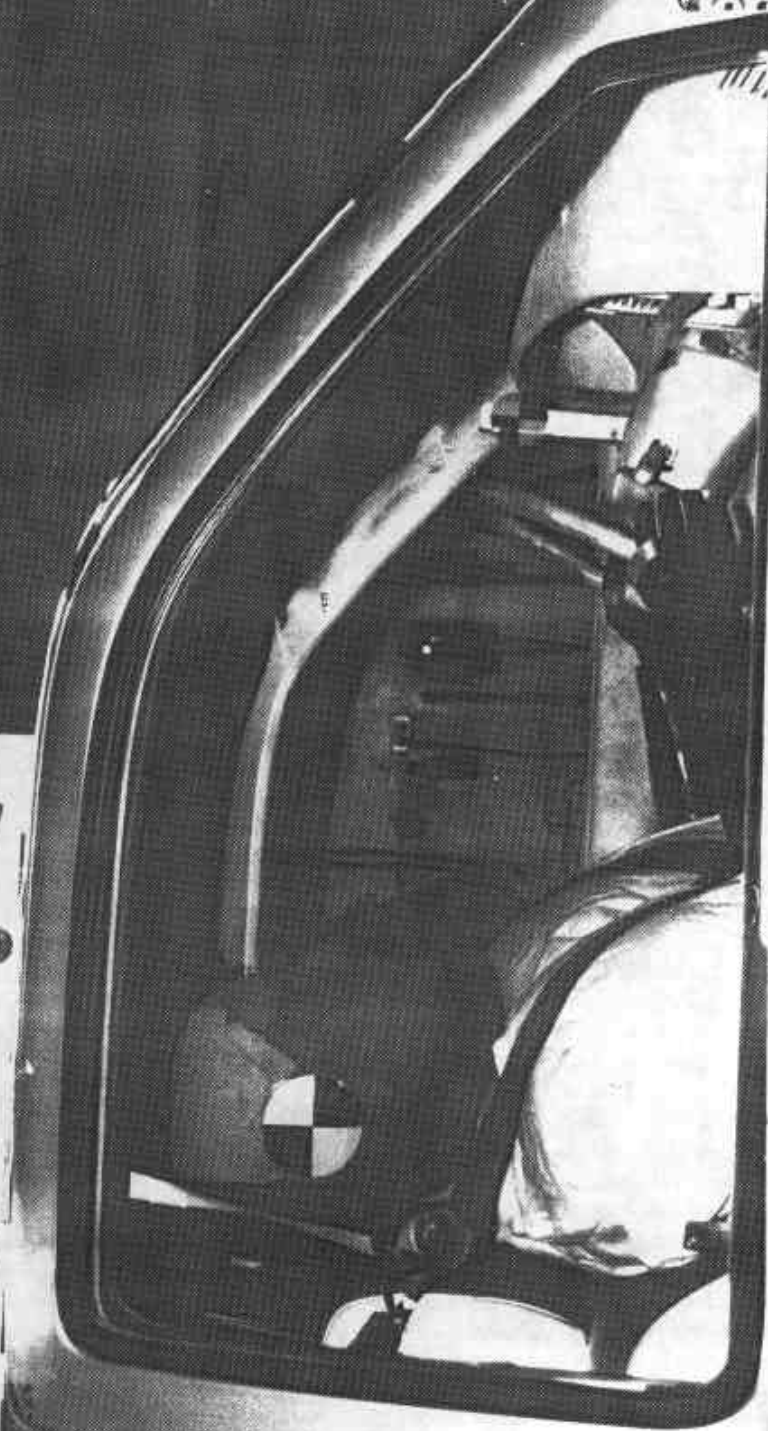


**NCAP 35MPH FRONTAL IMPACT
MGA RESEARCH CORP. 2-13-91
1991 TOYOTA 4x4 NHTSA 04**



Photo No. 22 - Post-Test Driver Dummy Position View

9 9 9



PRE-TEST

91021301

**NCAP 35MPH FRONTAL IMPACT
MGA RESEARCH CORP. 2-13-91
1991 TOYOTA 4X4 NHTSA 04**

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

POST-TEST

**NCAP 35MPH FRONTAL IMPACT
MGA RESEARCH CORP. 2-13-91
1991 TOYOTA 4X4 NHTSA 04**

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

Photograph Not Applicable

No Solvent Spillage

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



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

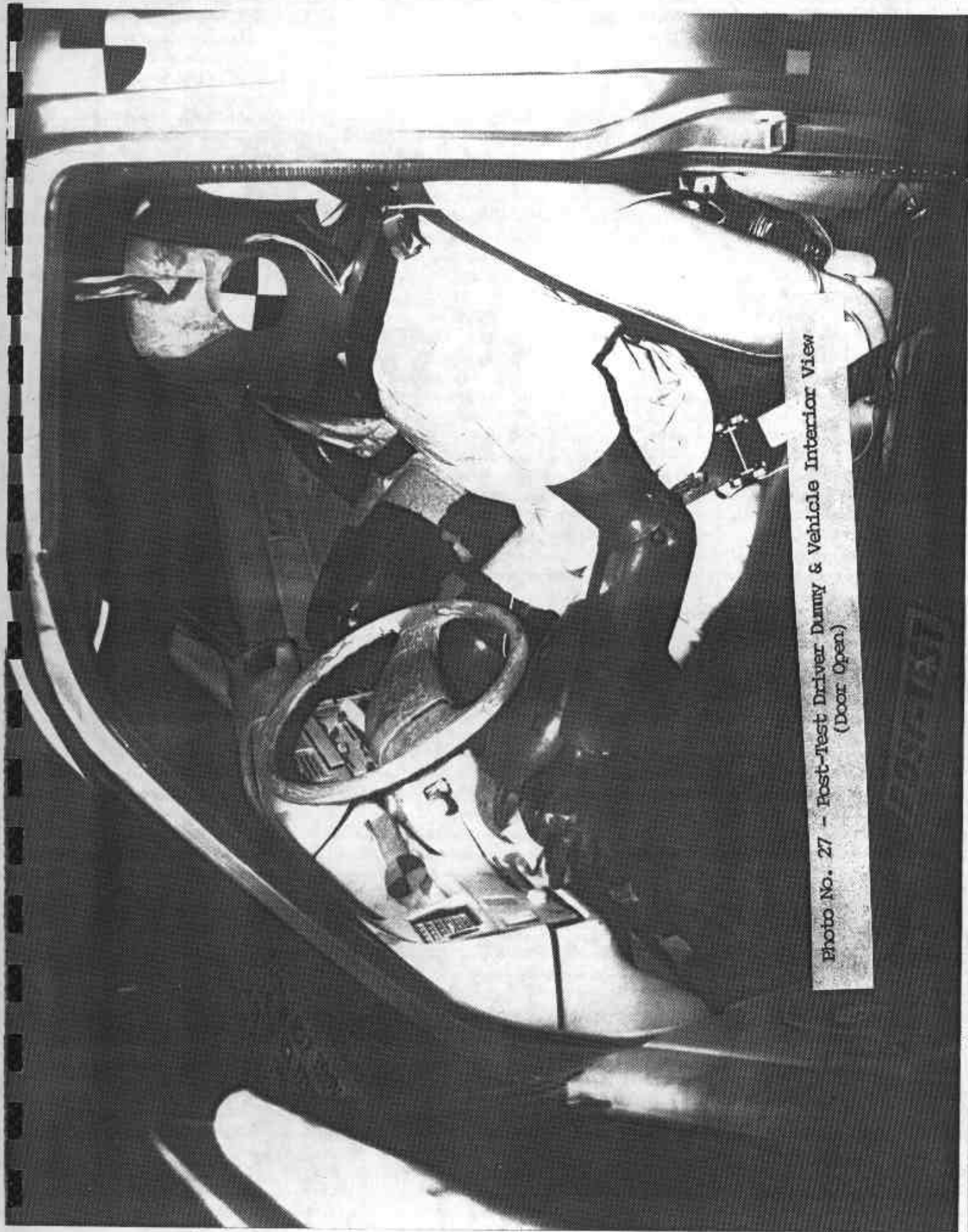


Photo No. 27 - Post-Test Driver Dummy & Vehicle Interior View
(Door Open)



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

Photograph Not Applicable

No Restraint System Problem

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

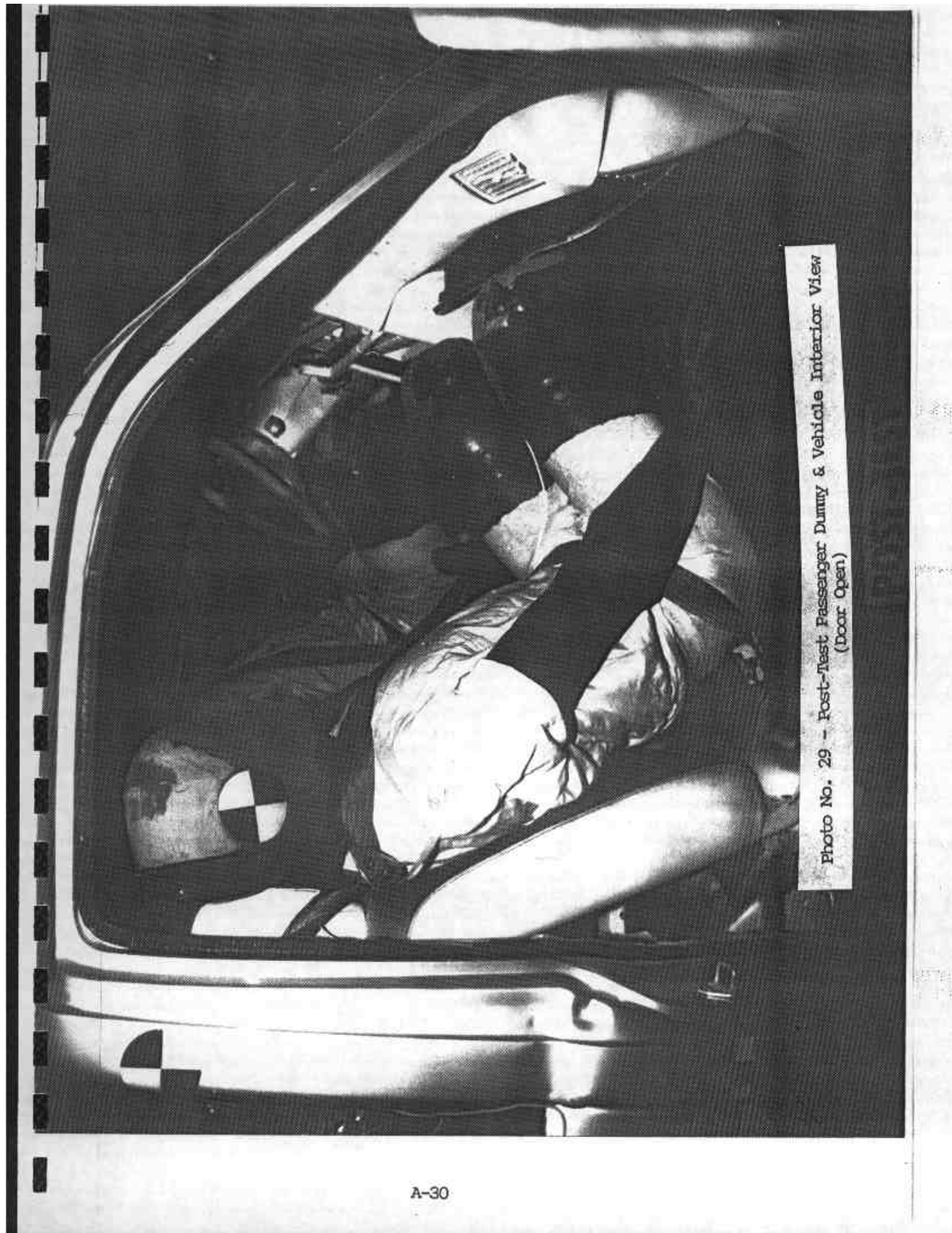


Photo No. 29 - Post-Test Passenger Dummy & Vehicle Interior View
(Door Open)

See Photo No. 31

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

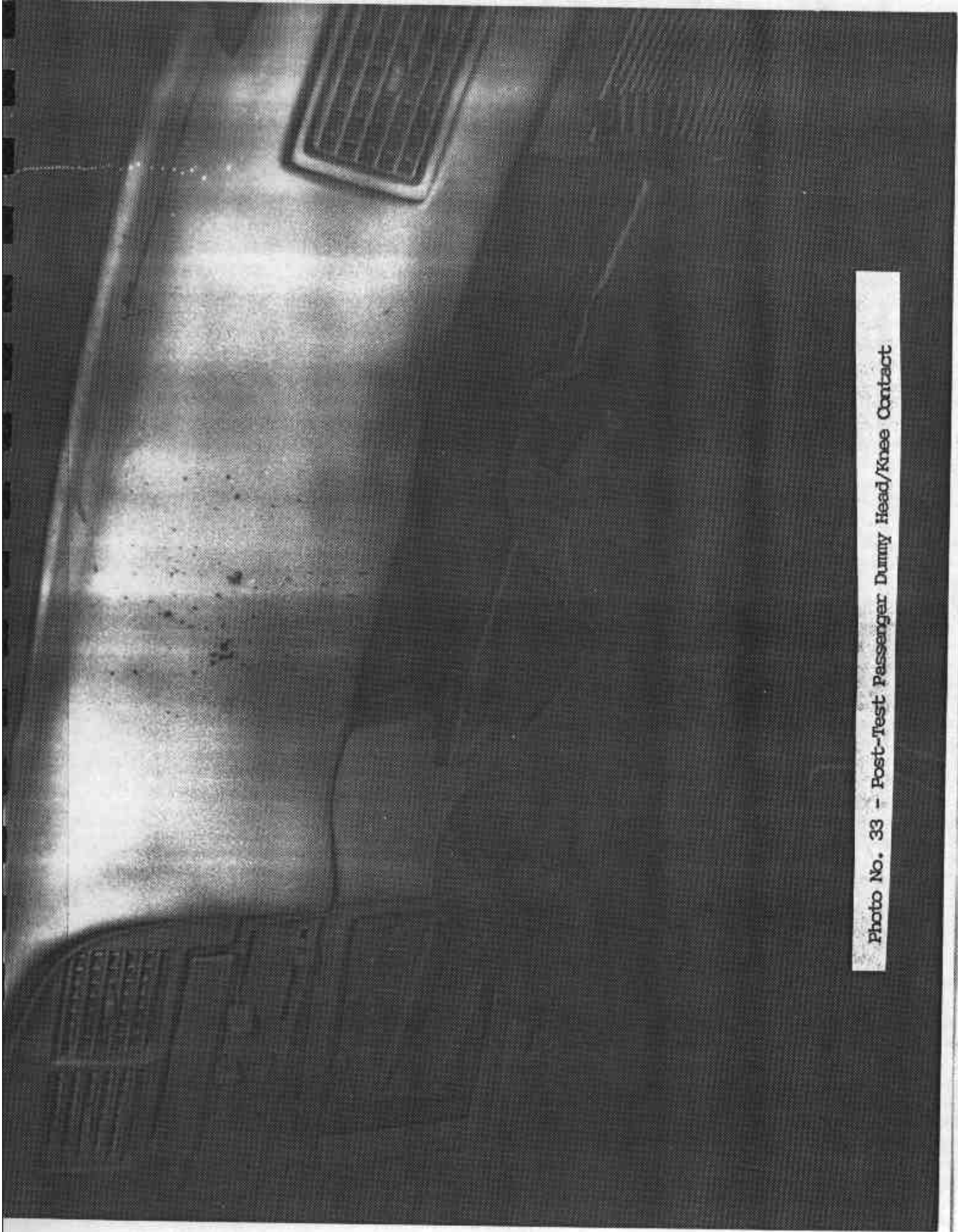


Photo No. 33 - Post-Test Passenger Dummy Head/Knee Contact

See Photo No. 33

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

APPENDIX B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

Toyota 4 X 4 Pickup Truck

NHTSA No. MM5103

VEHICLE DATA

FILTER CHANNEL CLASS

Accelerations

60

Velocities

180

Displacements

180

Data Plot

Page No.

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

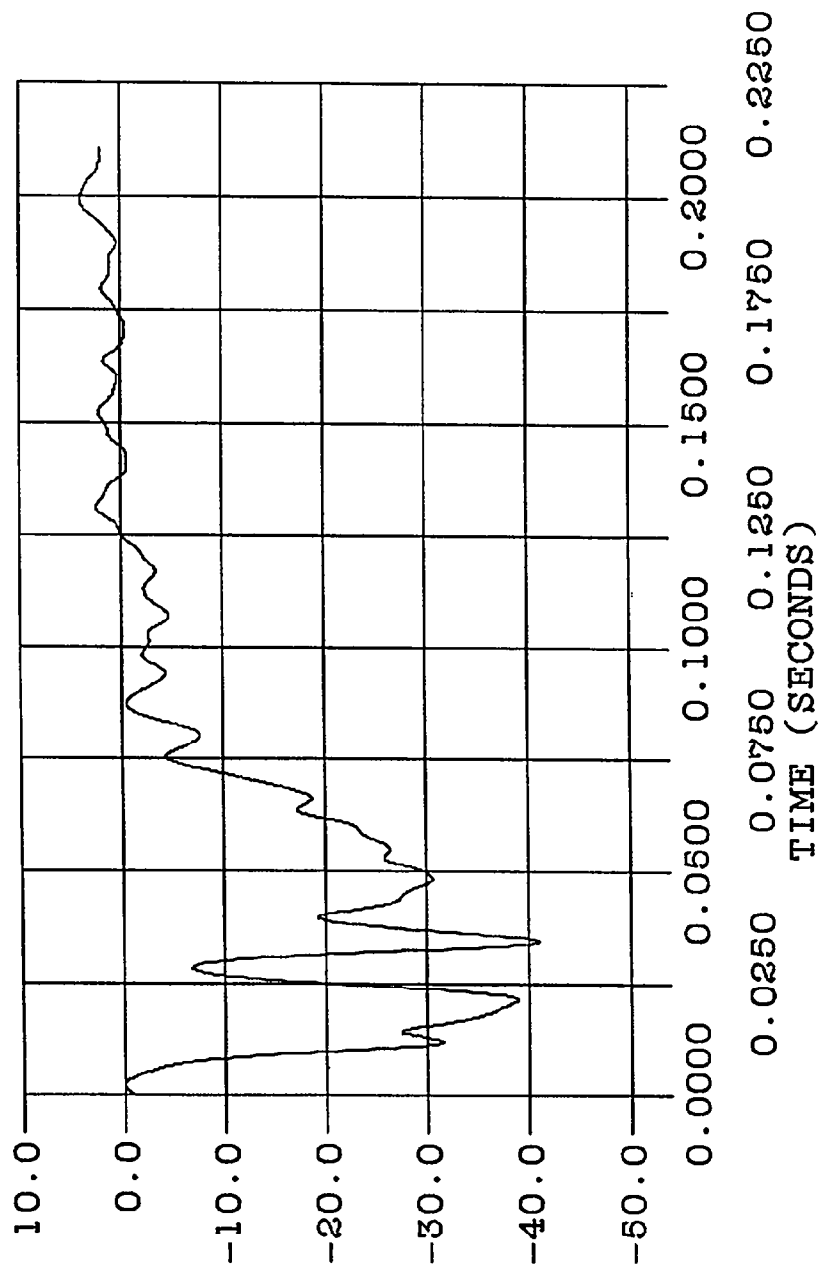
TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST
NHTSA NO. MM5103

DESCRIPTION	MINIMUM		MAXIMUM	
Crossmember RH X Acc.	-41.0 @	0.03456	3.9 @	0.19901
Crossmember RH X Vel.	-3.9 @	0.12497	35.0 @	0.00000
Crossmember RH X Disp.	0.0 @	0.00000	23.1 @	0.07196
Crossmember LH X Acc.	-48.1 @	0.01956	3.0 @	0.18007
Crossmember LH X Vel.	-6.5 @	0.12927	35.0 @	0.00283
Crossmember LH X Disp.	0.0 @	0.00000	21.9 @	0.06605
Engine Upper X Acc.	-162.2 @	0.02792	259.1 @	0.11673
Engine Lower X Acc.	-142.5 @	0.02903	26.9 @	0.03456
Caliper RH X Acc.	-20.6 @	0.03444	49.7 @	0.04330
Caliper LH X Acc.	-80.7 @	0.01193	58.8 @	0.04280
Dash Panel X Acc.	-63.3 @	0.06974	20.4 @	0.07675
Crossmember CTR Z Acc.	-133.4 @	0.16027	26.4 @	0.04207
Crossmember CTR Z Vel.	-170.2 @	0.21033	1.3 @	0.05141
Crossmember CTR Z Disp.	-103.7 @	0.21033	0.0 @	0.00000
Vehicle Rear Z Acc.	N/A*@	N/A	N/A @	N/A
Vehicle Rear Z Vel.	N/A @	N/A	N/A @	N/A
Vehicle Rear Z Disp.	N/A @	N/A	N/A @	N/A

*No valid data collected for Vehicle Rear Z Acceleration - Cable cut during test.

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91
CROSSMEMBER RH X ACC

ACCELERATION (G, S)

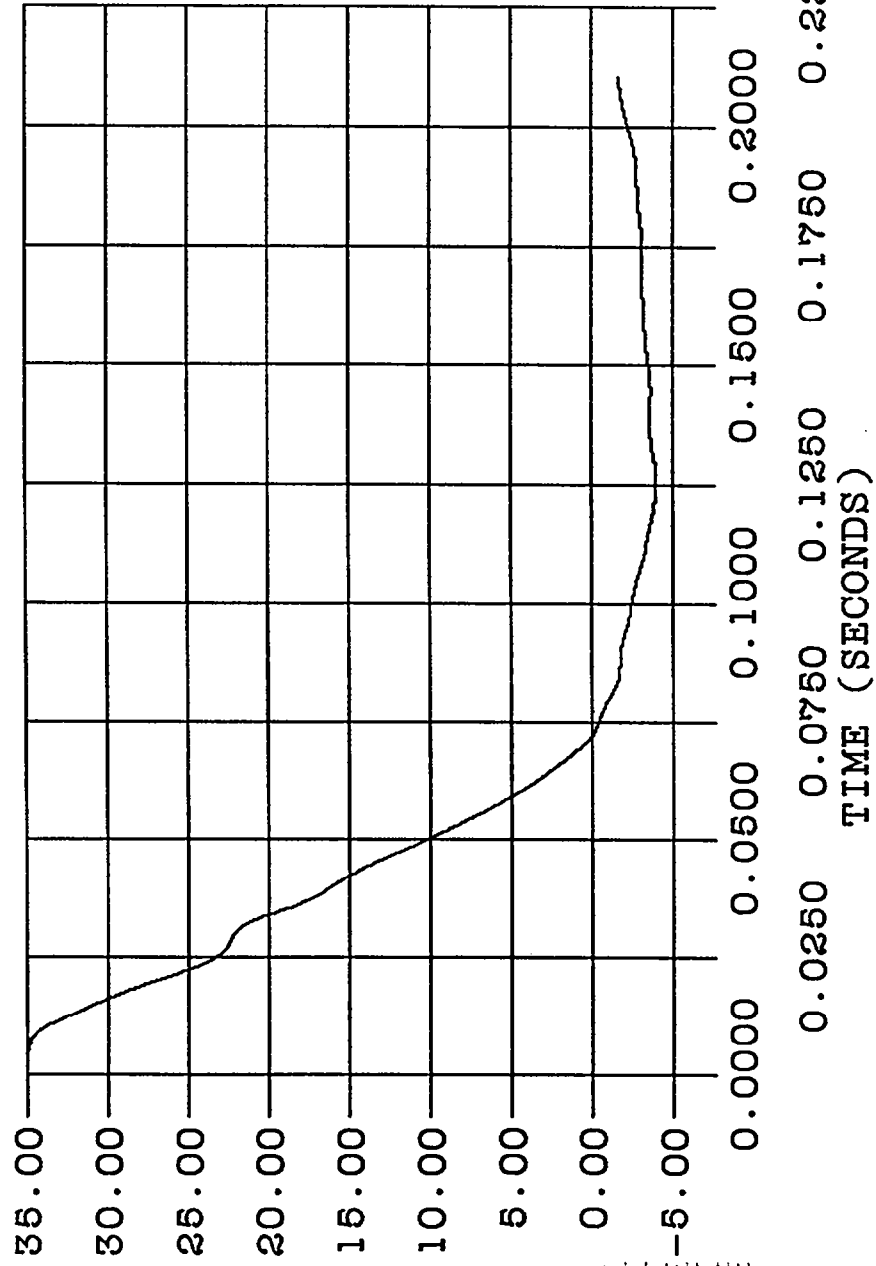


Right Rear Seat Cross-member X Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

CROSSMEMBER RH X VEL

VELOCITY (MPH)

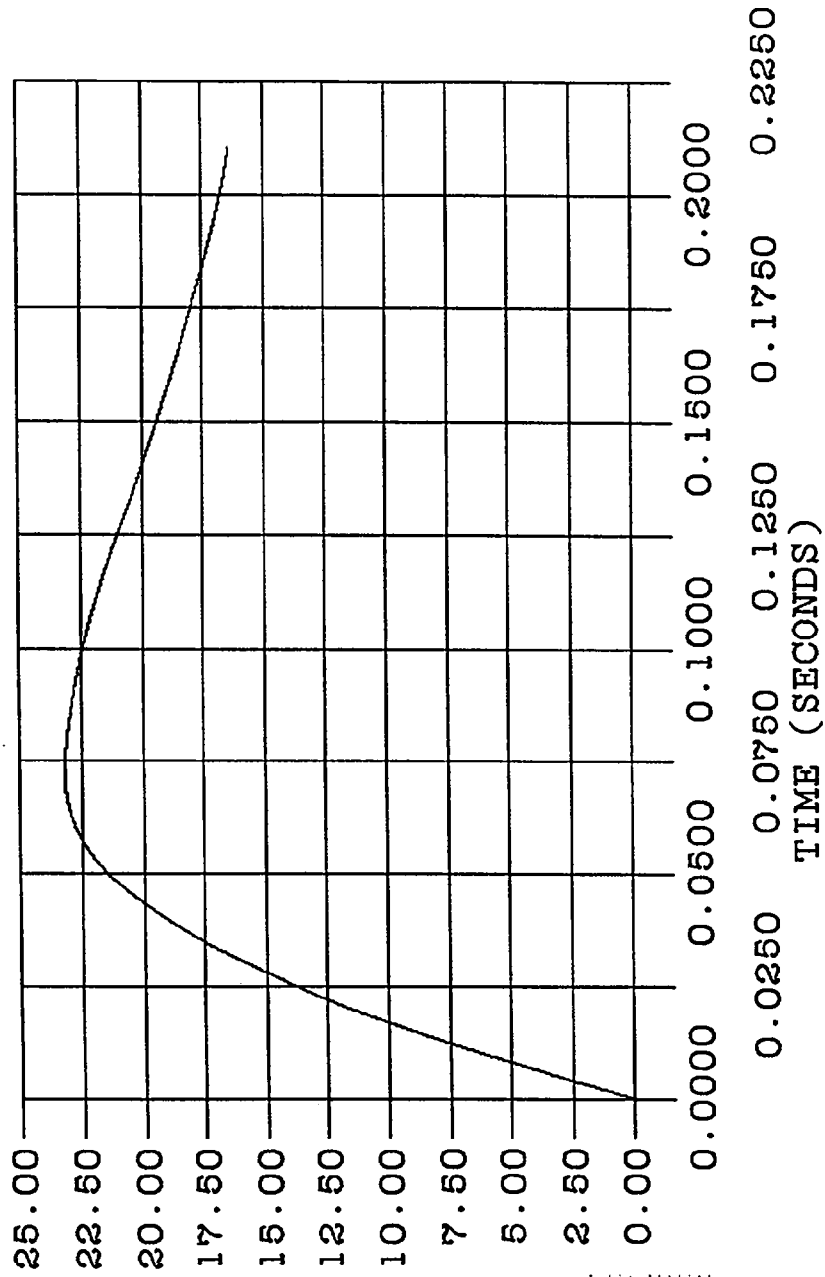


Right Rear Seat Cross-member X Velocity vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

CROSSMEMBER RH X DISP

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

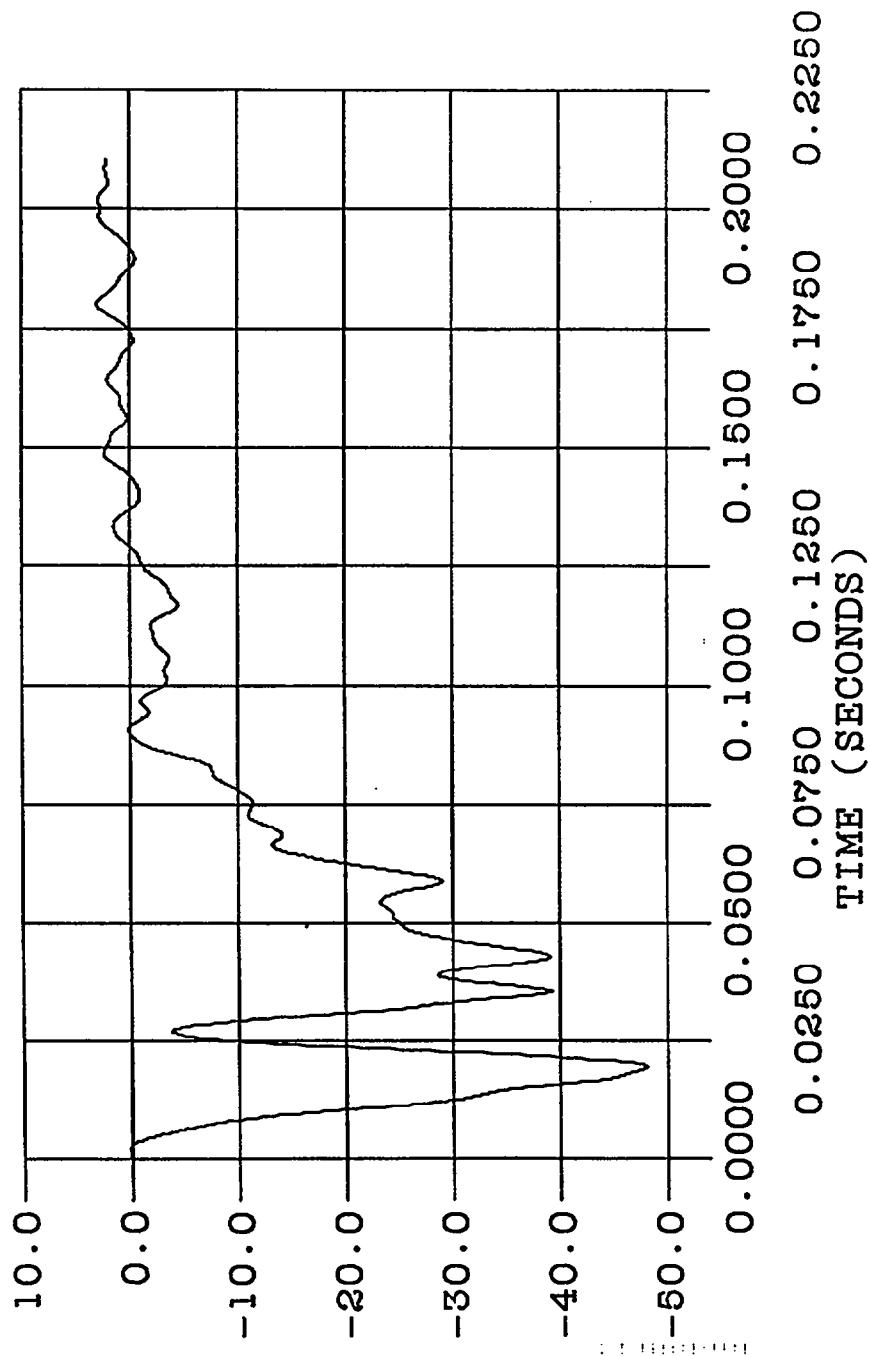


Right Rear Seat Cross-member X Displacement vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

CROSSMEMBER LH X ACC

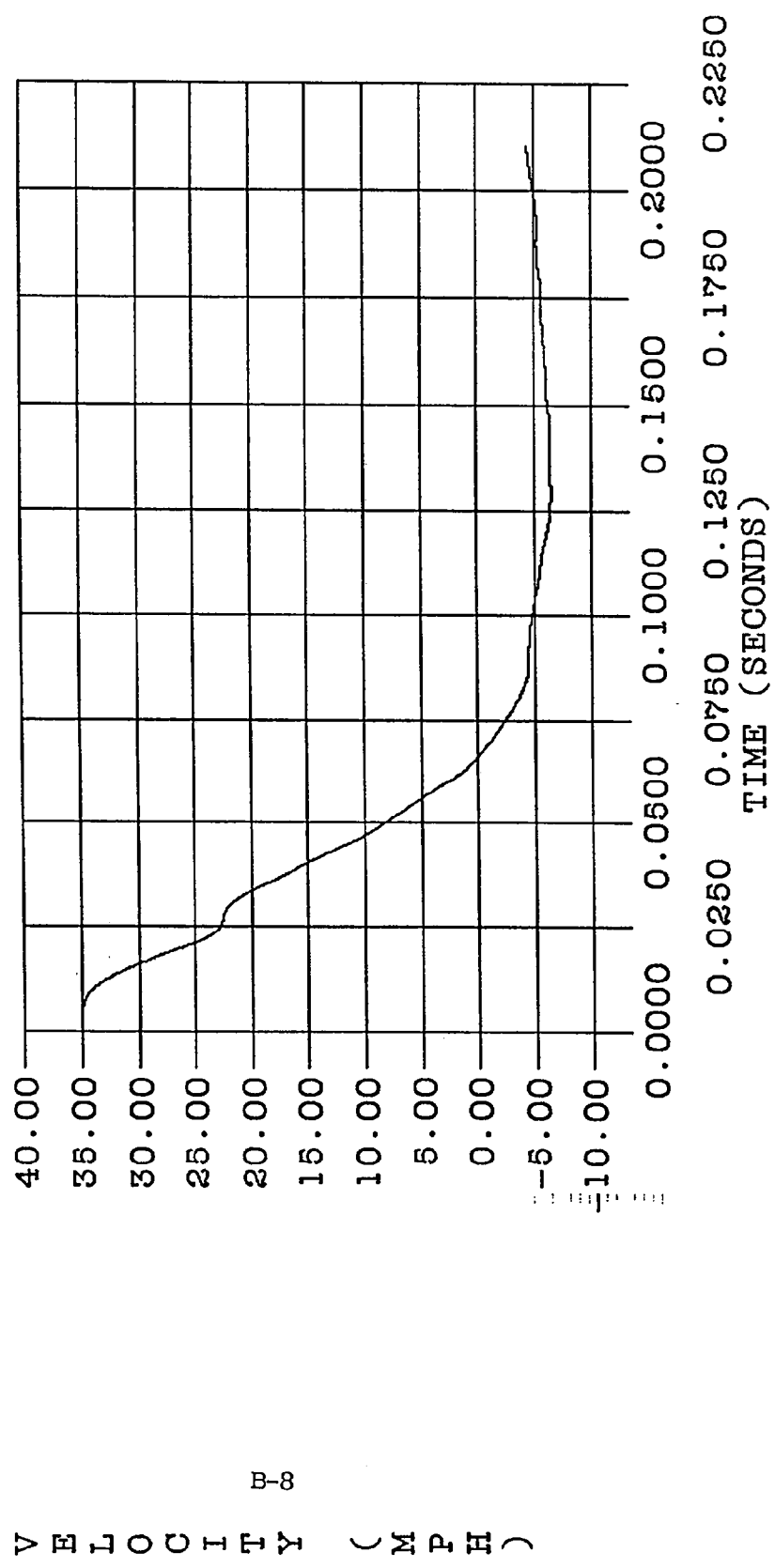
ACCELERATION (G, S)



Left Rear Seat Cross-member X Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

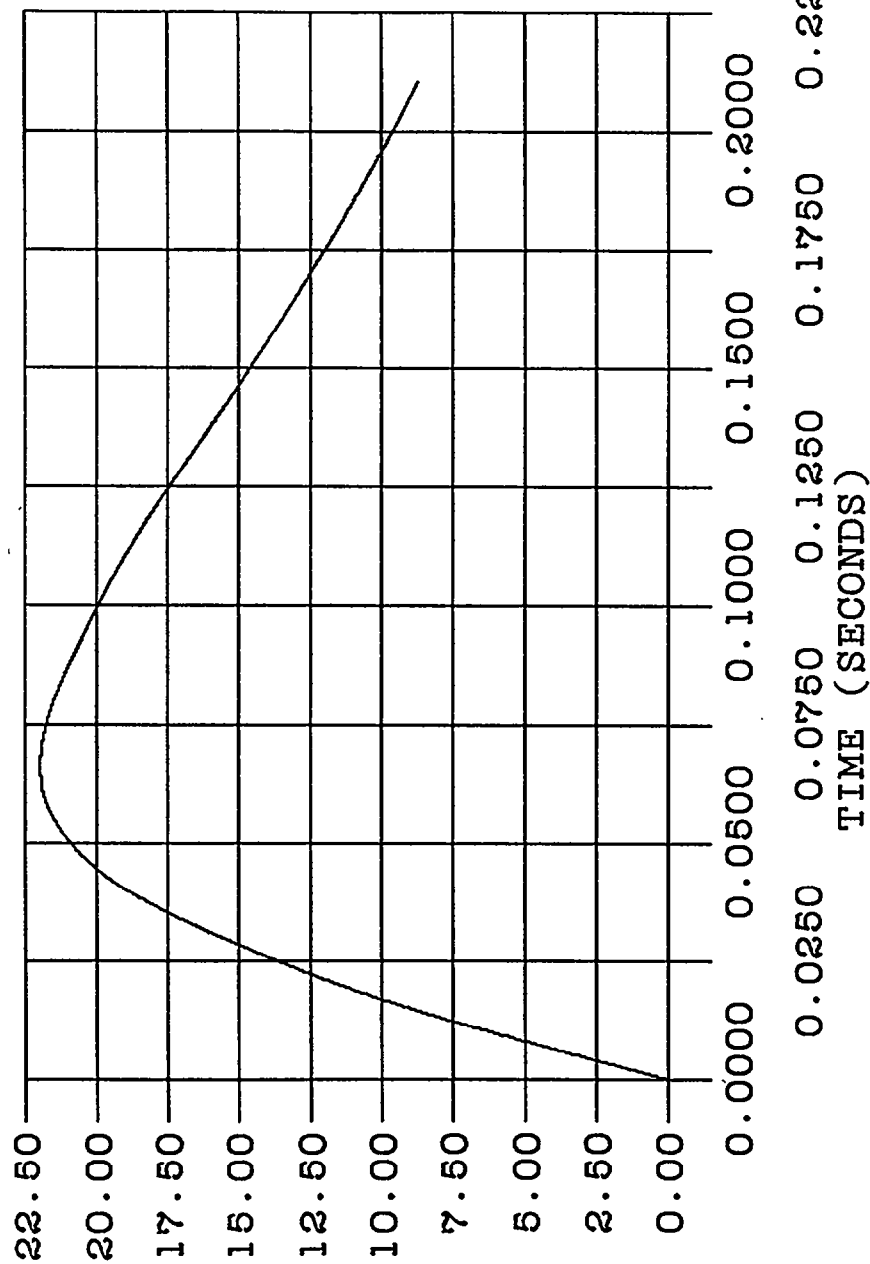
CROSSMEMBER LH X VEL



Left Rear Seat Cross-member X Velocity vs. Time

CROSSMEMBER LH X DISP

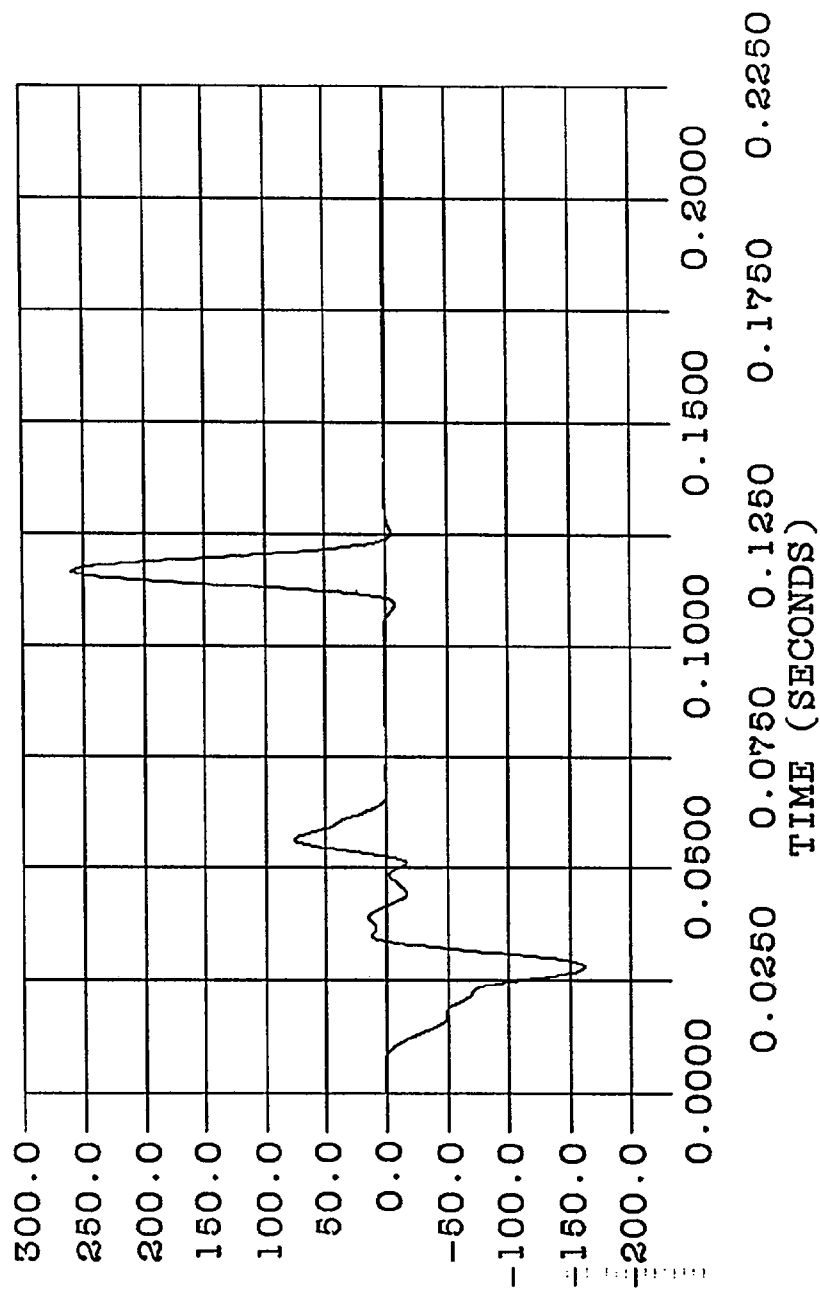
DISPLACEMENT (IN)



Left Rear Seat Cross-member X Displacement vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

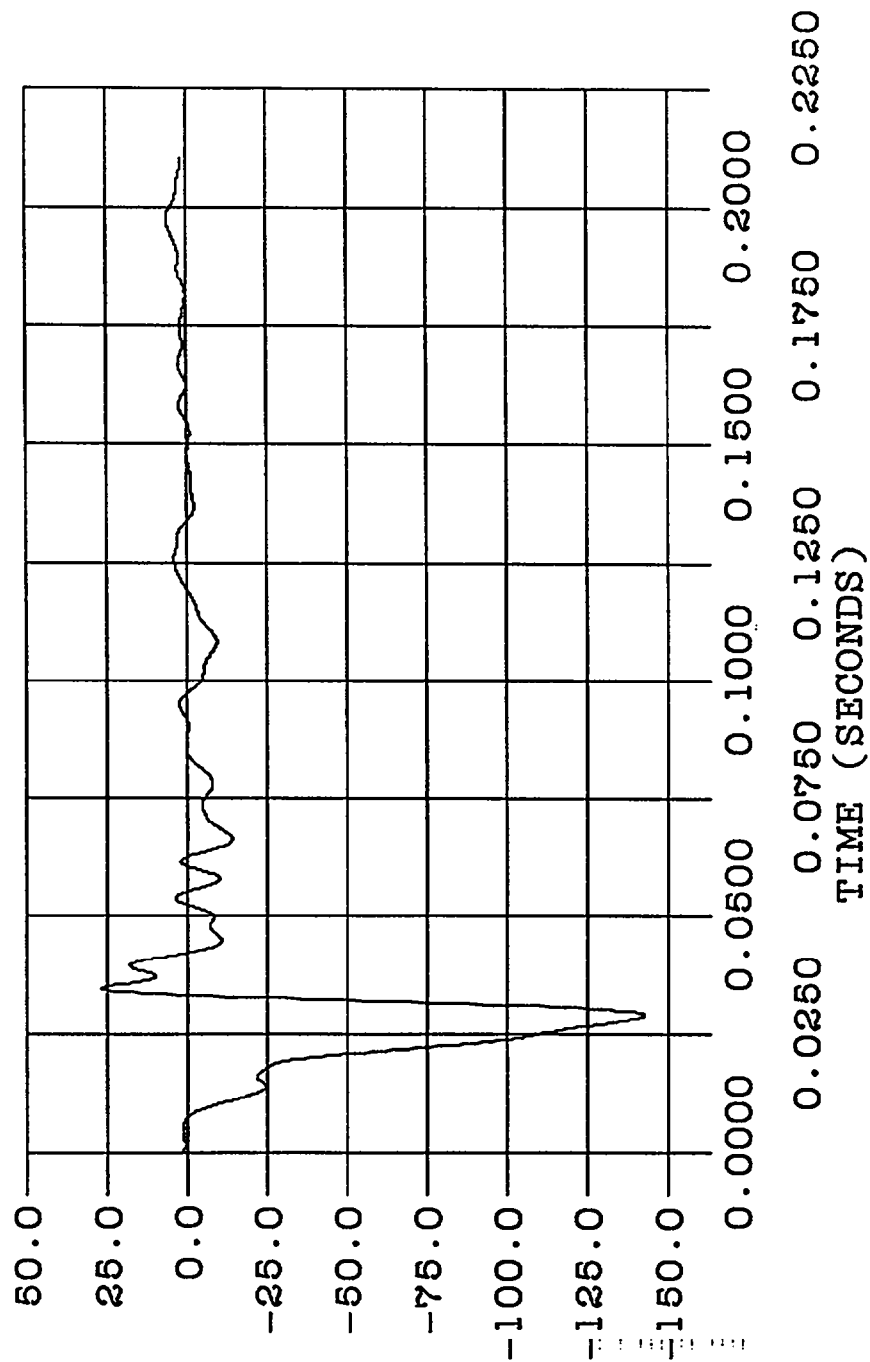
ENGINE UPPER X ACC



Top of Engine Block X Acceleration vs. Time

ENGINE LOWER X ACC

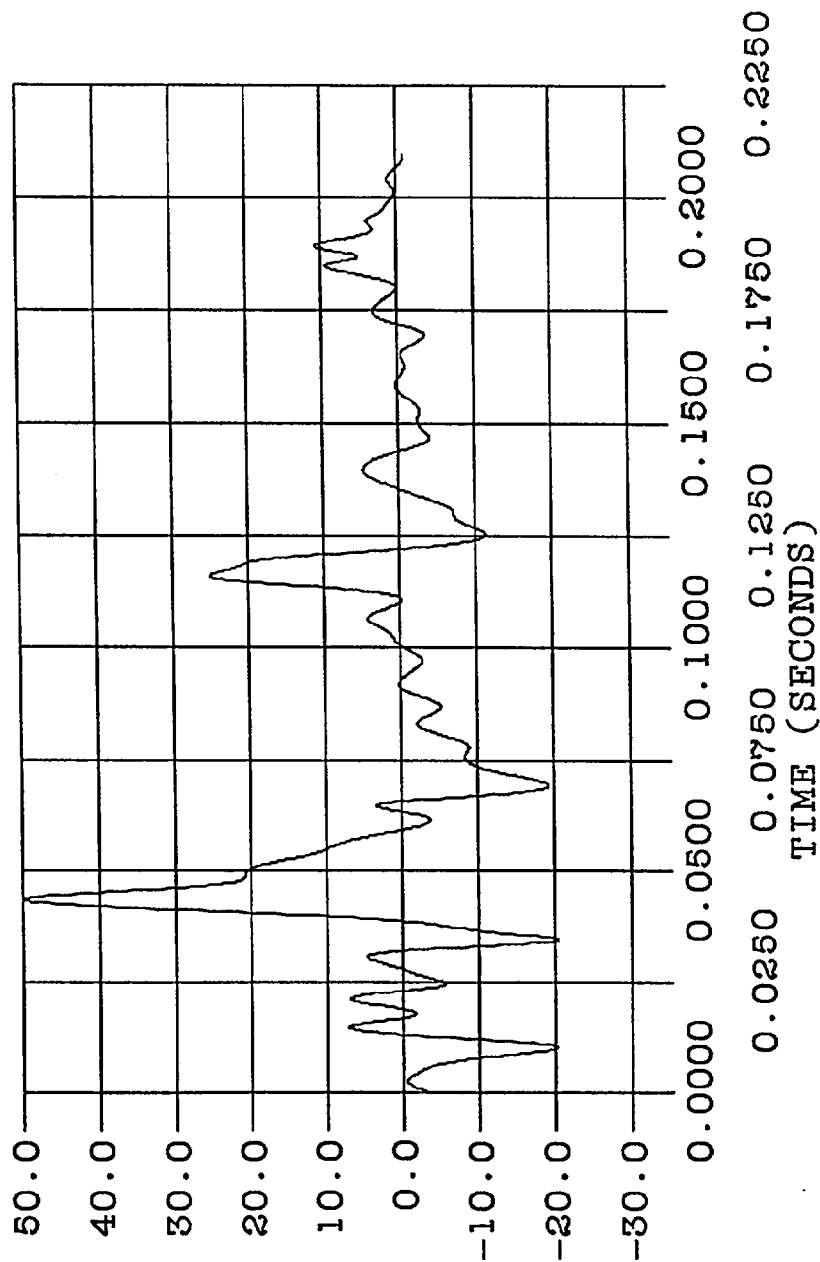
ACCELERATION (G, S)



Bottom of Engine Block X Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

CALIPER RH X ACC



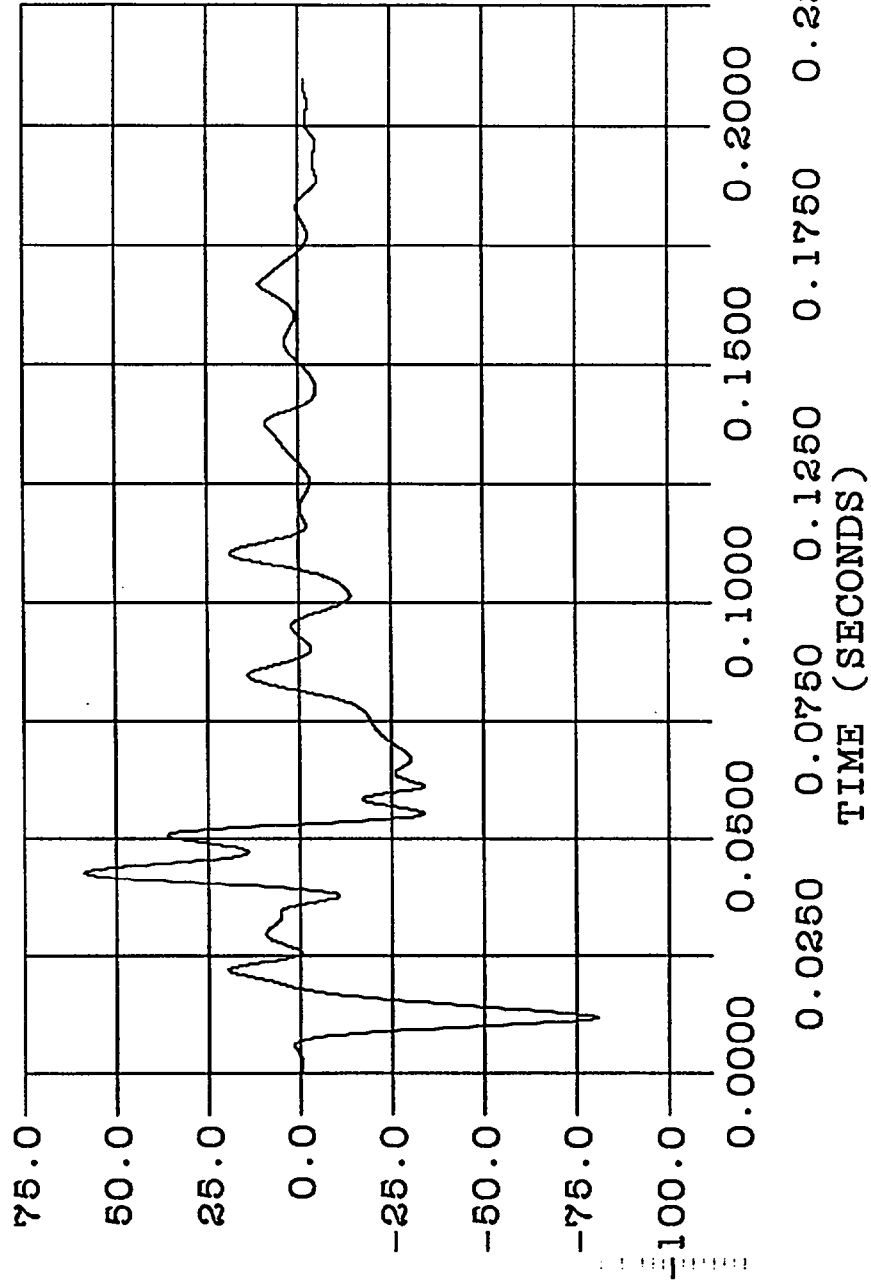
Right Front Disc Brake Caliper X Acceleration vs. Time

B-12

ACCELERATION (G's)

CALIPER LH X ACC

ACCELERATION (G, S)

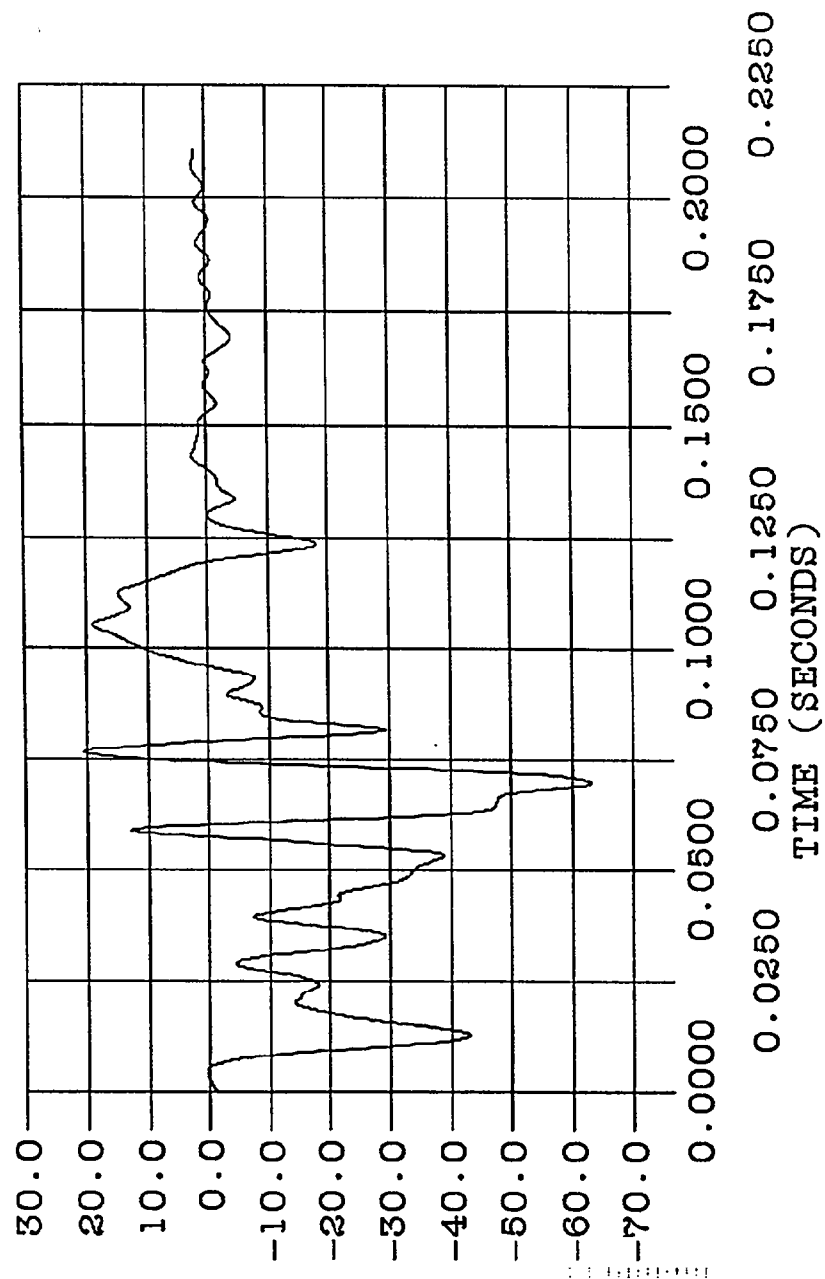


Left Front Disc Brake Caliper X Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

DASH PANEL X ACC

ACCELERATION (G, S)

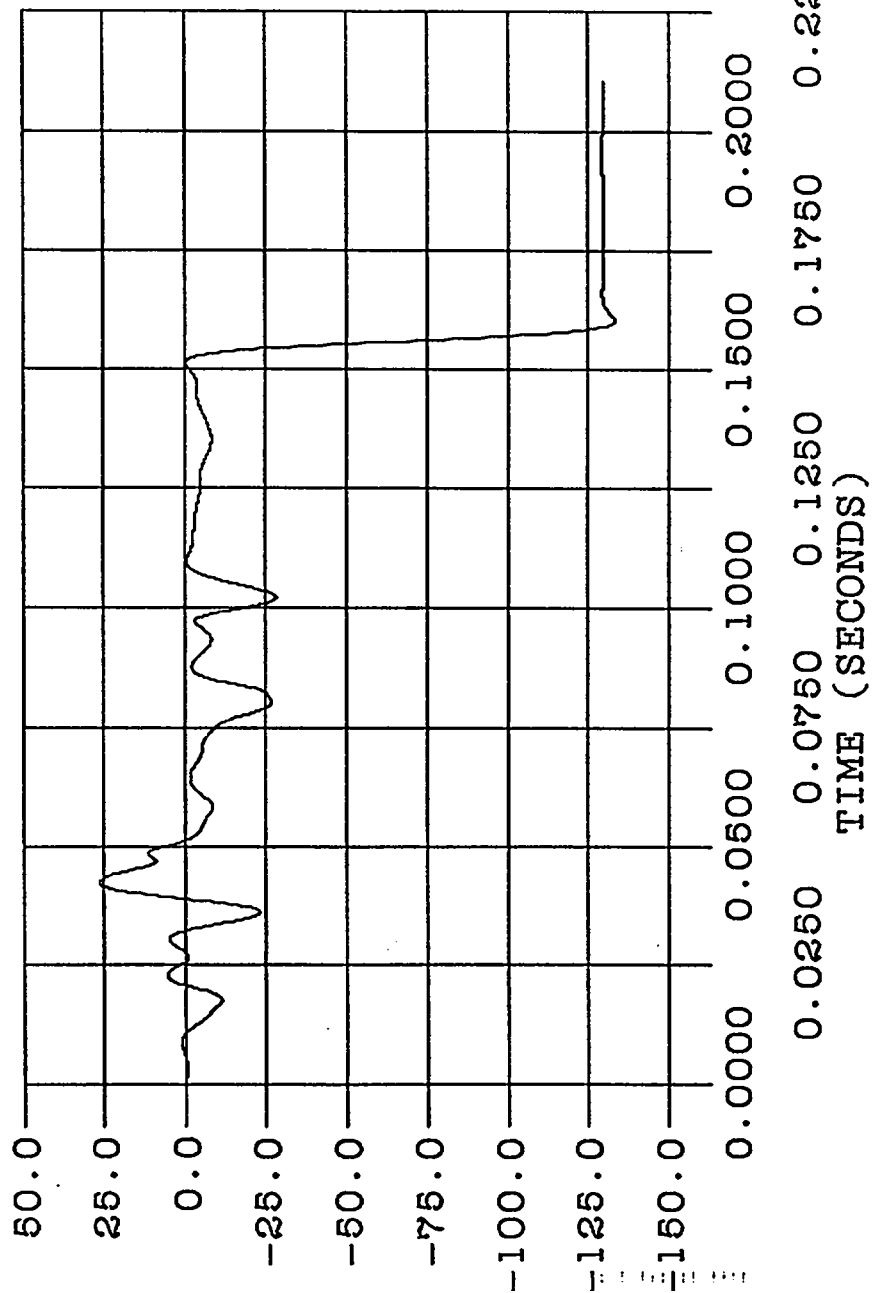


Center of Instrument Panel Top Surface X Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

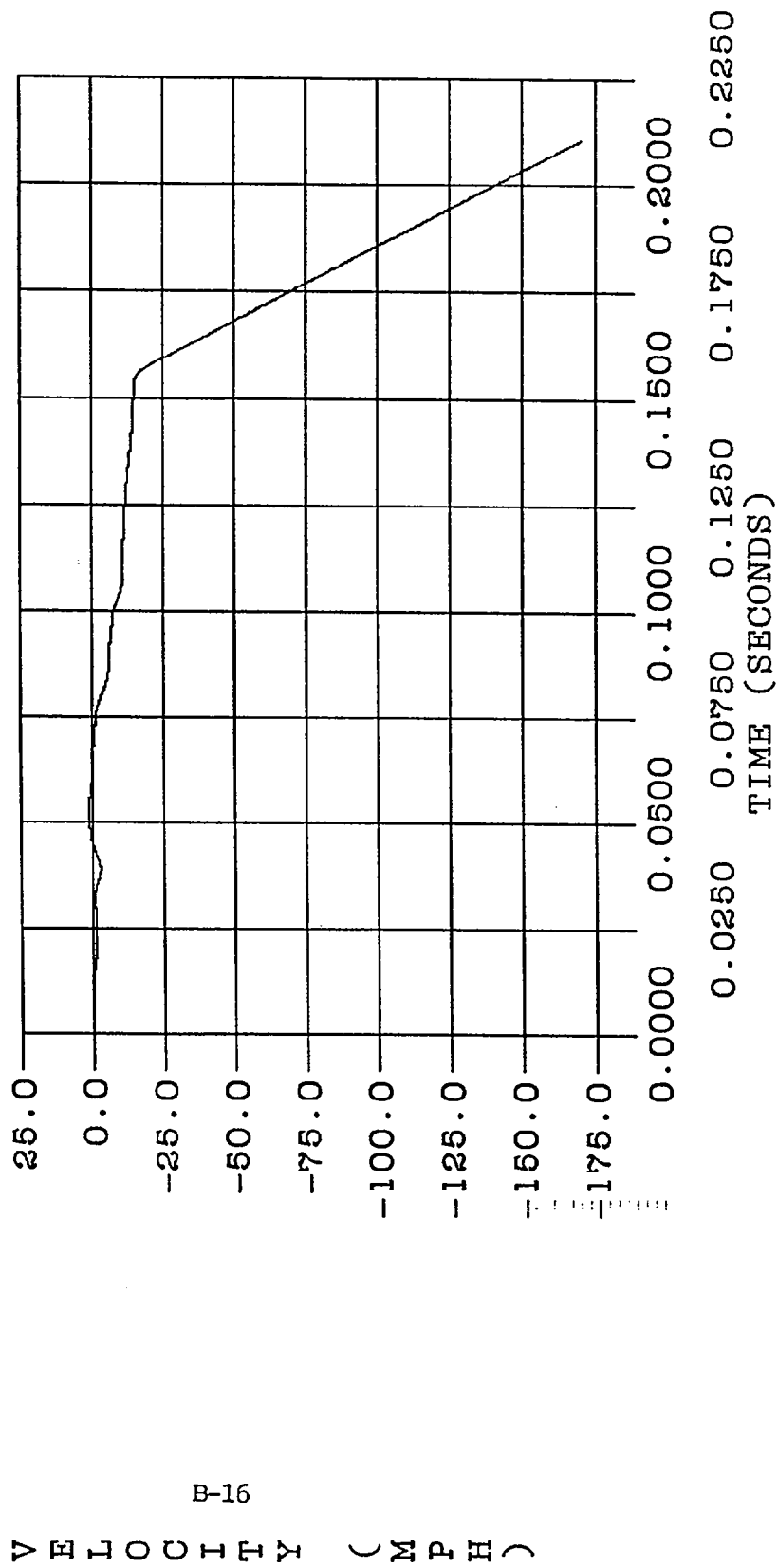
CROSSMEMBER CTR Z ACC Cable cut at approximately 0.155 seconds.

ACCELERATION (G's)



Center Rear Seat Cross-member Z Acceleration vs. Time

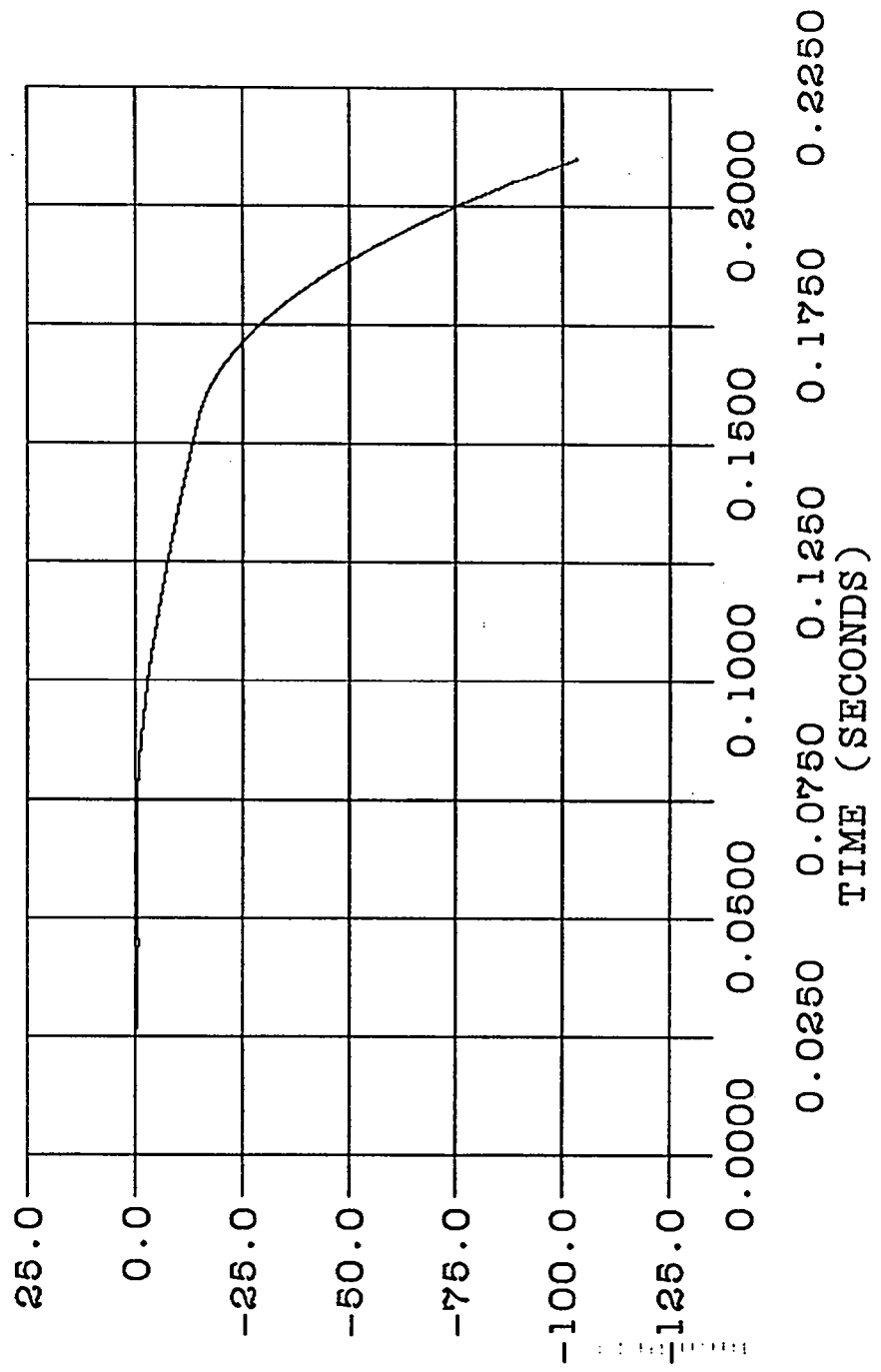
1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91
 CROSSMEMBER CTR Z VEL



Center Rear Seat Cross-member Z Velocity vs. Time

CROSSMEMBER CTR Z DISP

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



Center Rear Seat Cross-member Z Displacement vs. Time

Cable cut During test.

DATA PLOT NOT AVAILABLE

NO VALID DATA COLLECTED

Vehicle Rear Z Acceleration vs. Time

DATA PLOT NOT AVAILABLE

NO VALID DATA COLLECTED

Vehicle Rear Z Velocity vs. Time

DATA PLOT NOT AVAILABLE
NO VALID DATA COLLECTED

Vehicle Rear Z Displacement vs. Time

Toyota 4 X 4 Pickup Truck

NHTSA No. MM5103

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 Cell Barrier not used per NHTSA COTR.

Load Cell Barrier Data (cont'd)

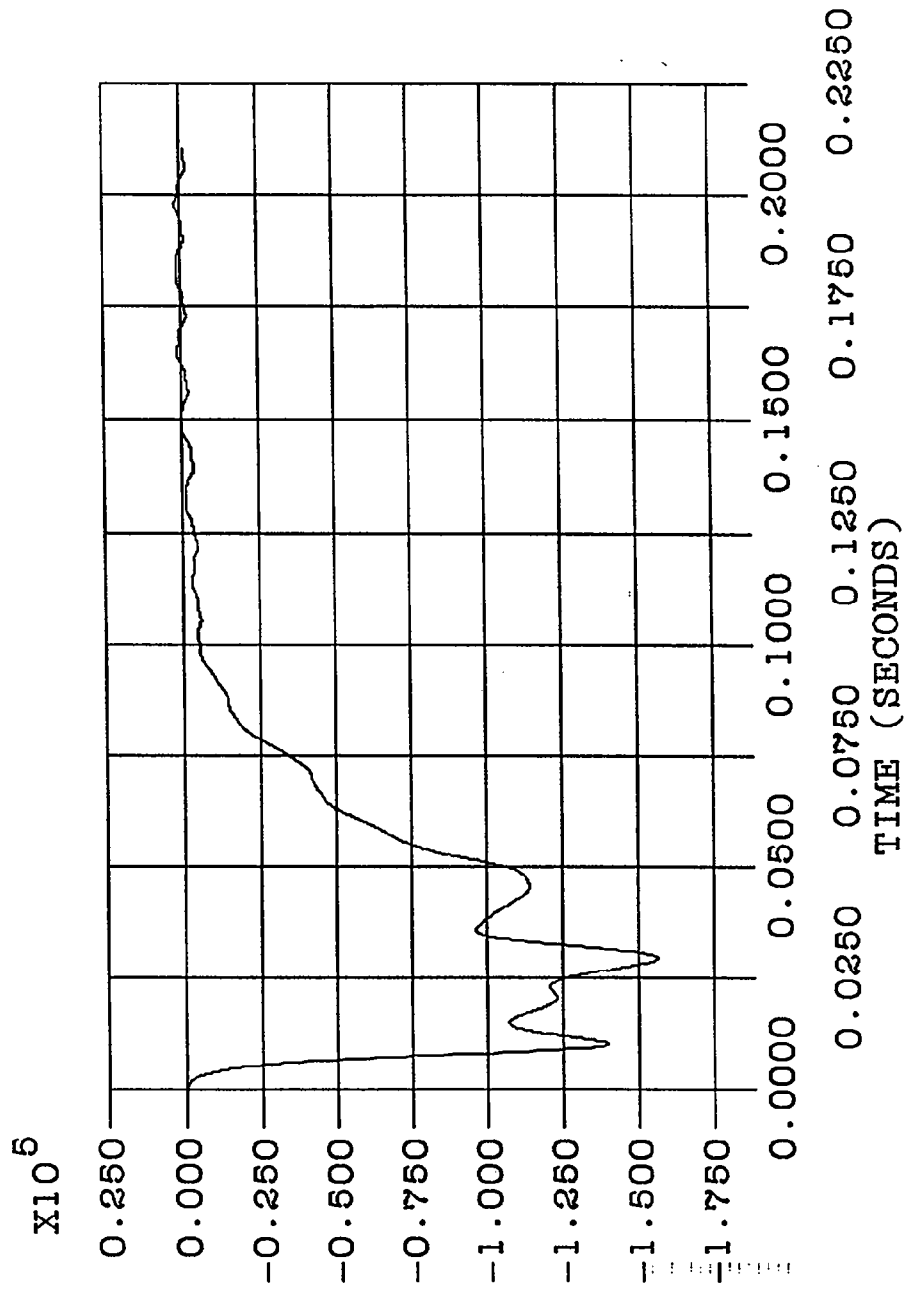
<u>Data Plot</u>	<u>Page No.</u>
Barrier Load Cell C3 Force vs. Time	N/A
Barrier Load Cell C4 Force vs. Time	N/A
Barrier Load Cell C5 Force vs. Time	N/A
Barrier Load Cell C6 Force vs. Time	N/A
Barrier Load Cell C7 Force vs. Time	N/A
Barrier Load Cell C8 Force vs. Time	N/A
Barrier Load Cell C9 Force vs. 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

TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST
NHTSA NO. MM5103

DESCRIPTION	MINIMUM		MAXIMUM	
Sum of Barrier Forces	-156432.3 @	0.02940	1624.0 @	0.19766
Barrier A1-B3 Force	-5858.2 @	0.04428	392.5 @	0.00283
Barrier A4-B6 Force	-63643.0 @	0.01082	2330.6 @	0.00406
Barrier A7-B9 Force	-41818.2 @	0.01673	928.4 @	0.00258
Barrier C1-D3 Force	-20129.1 @	0.03358	560.2 @	0.09791
Barrier C4-D6 Force	-101230.1 @	0.02940	386.3 @	0.14822
Barrier C7-D9 Force	-29705.5 @	0.02128	289.6 @	0.18622
Barrier Force/Veh. Disp.	-156432.3 @	15.41306	1624.0 @	13.29729

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

SUM OF BARRIER FORCES

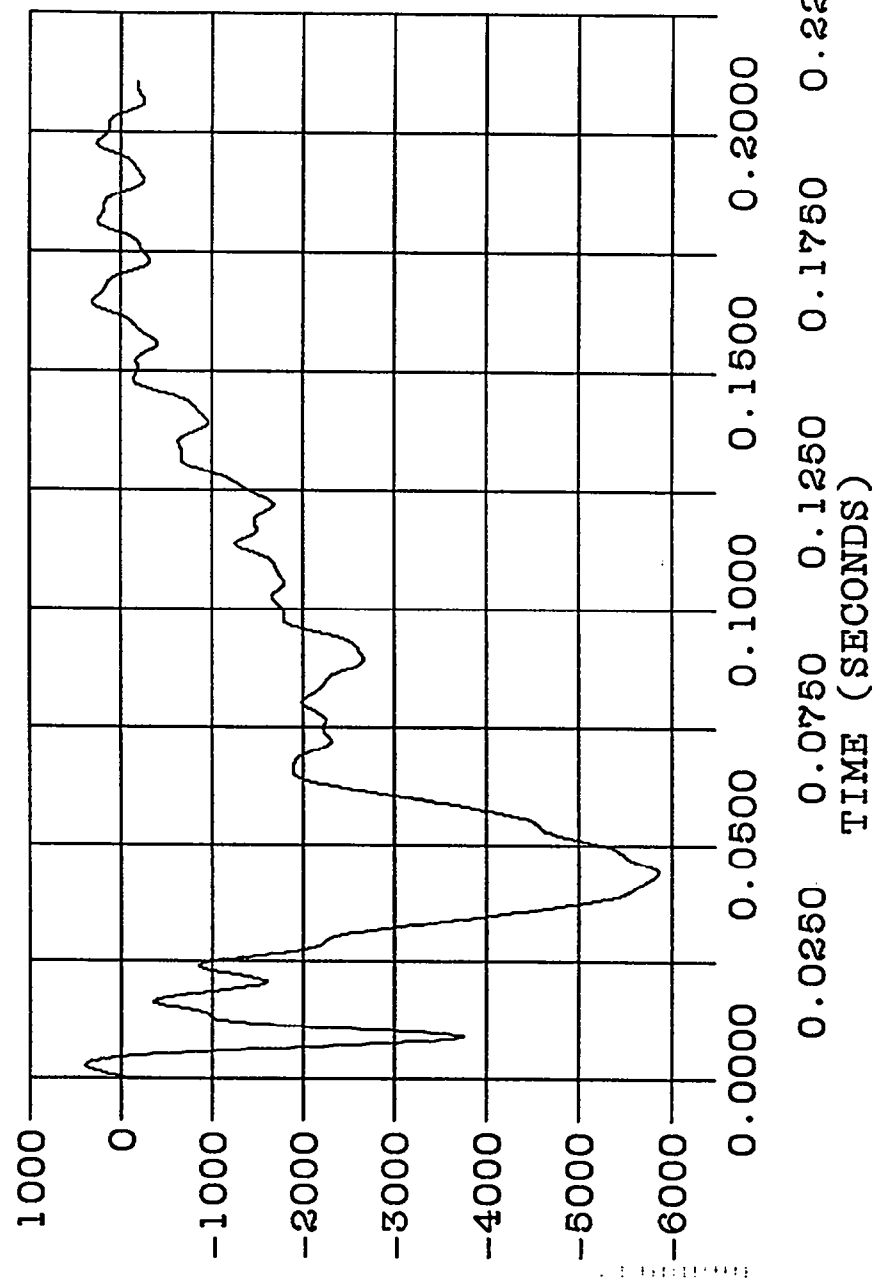


Sum of 36 Load Cells Force vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

BARRIER LL FORCE

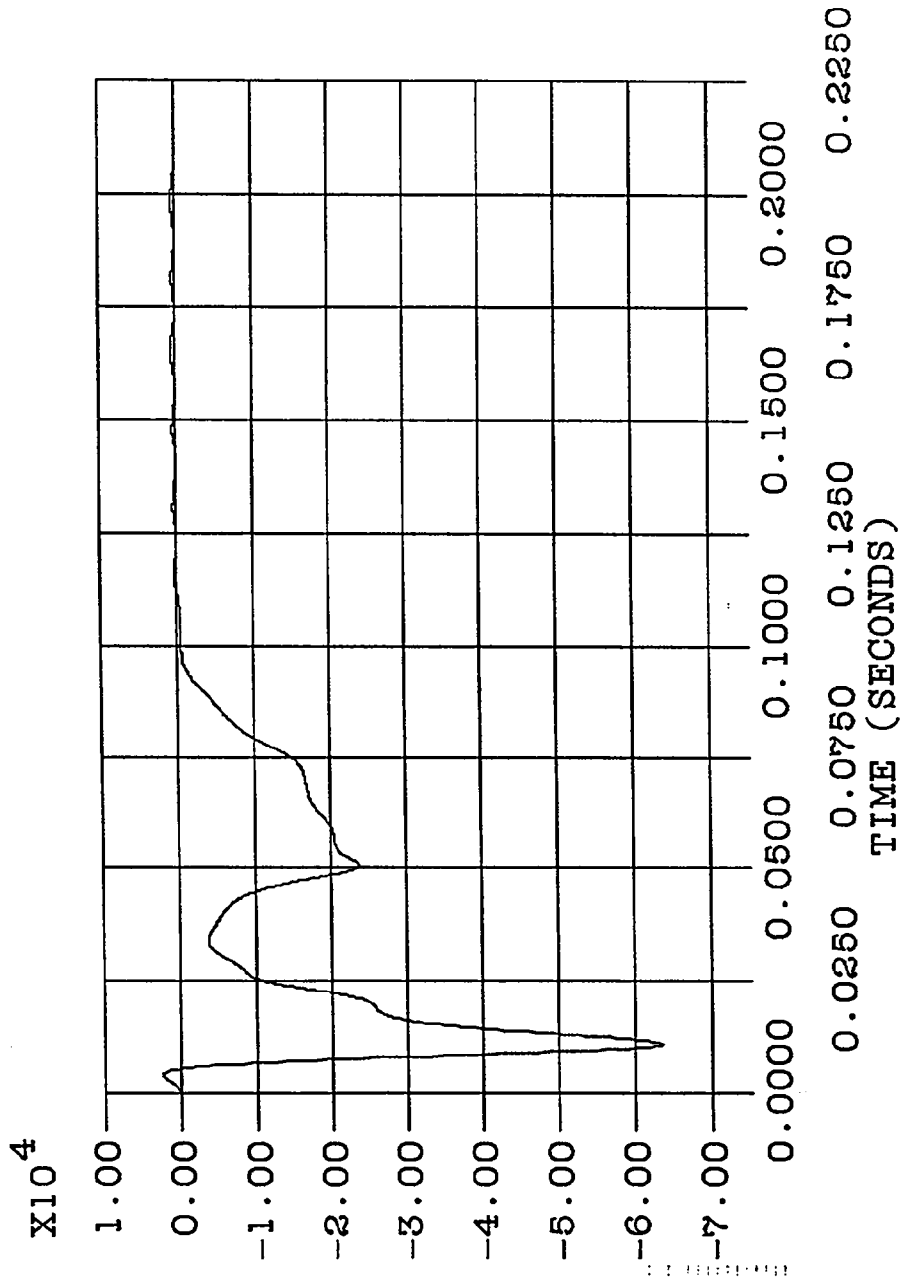
FORCE (POUNDS)



Sum of Load Cells A1-B3 Force vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

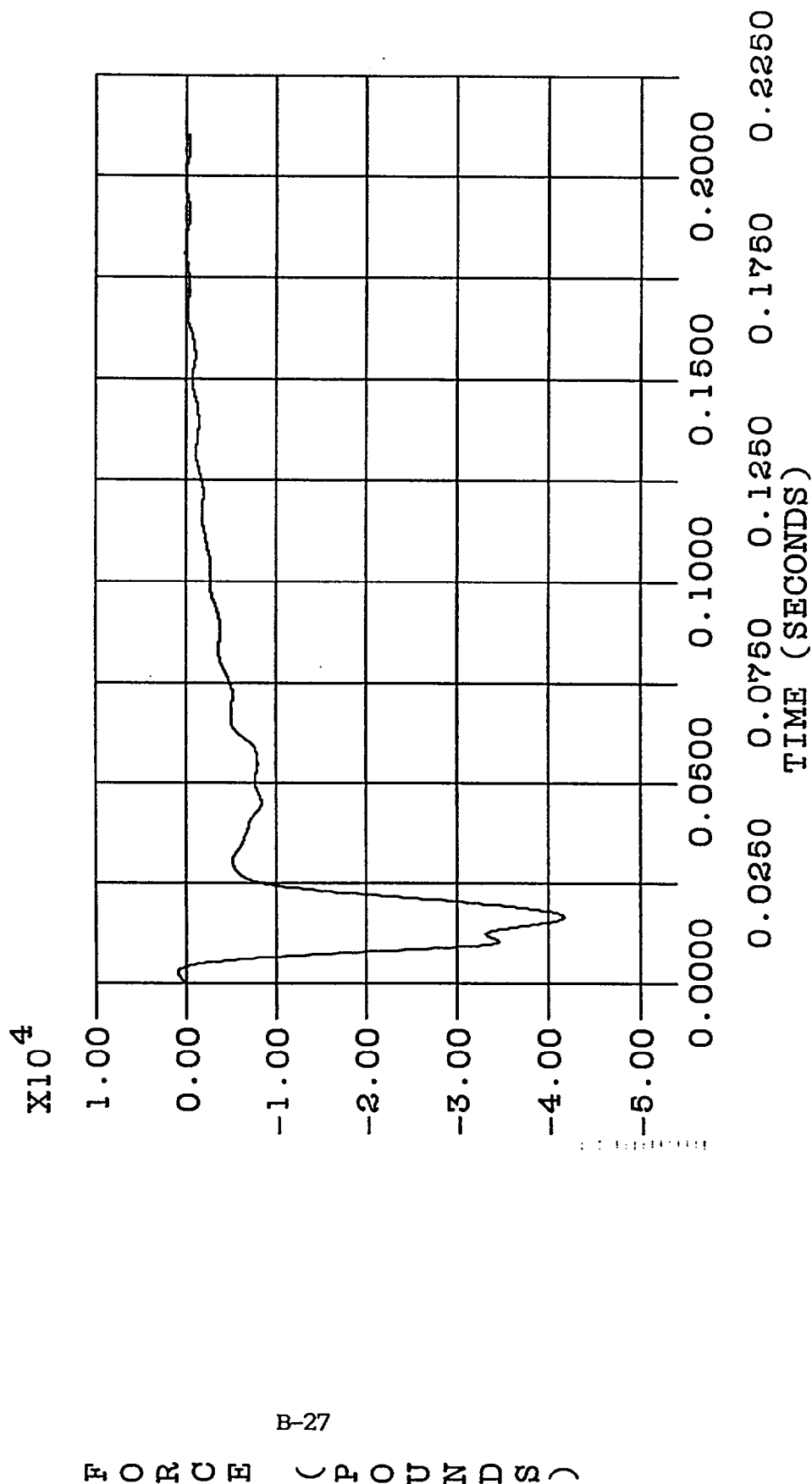
BARRIER LC FORCE



Sum of Load Cells A4-B6 Force vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

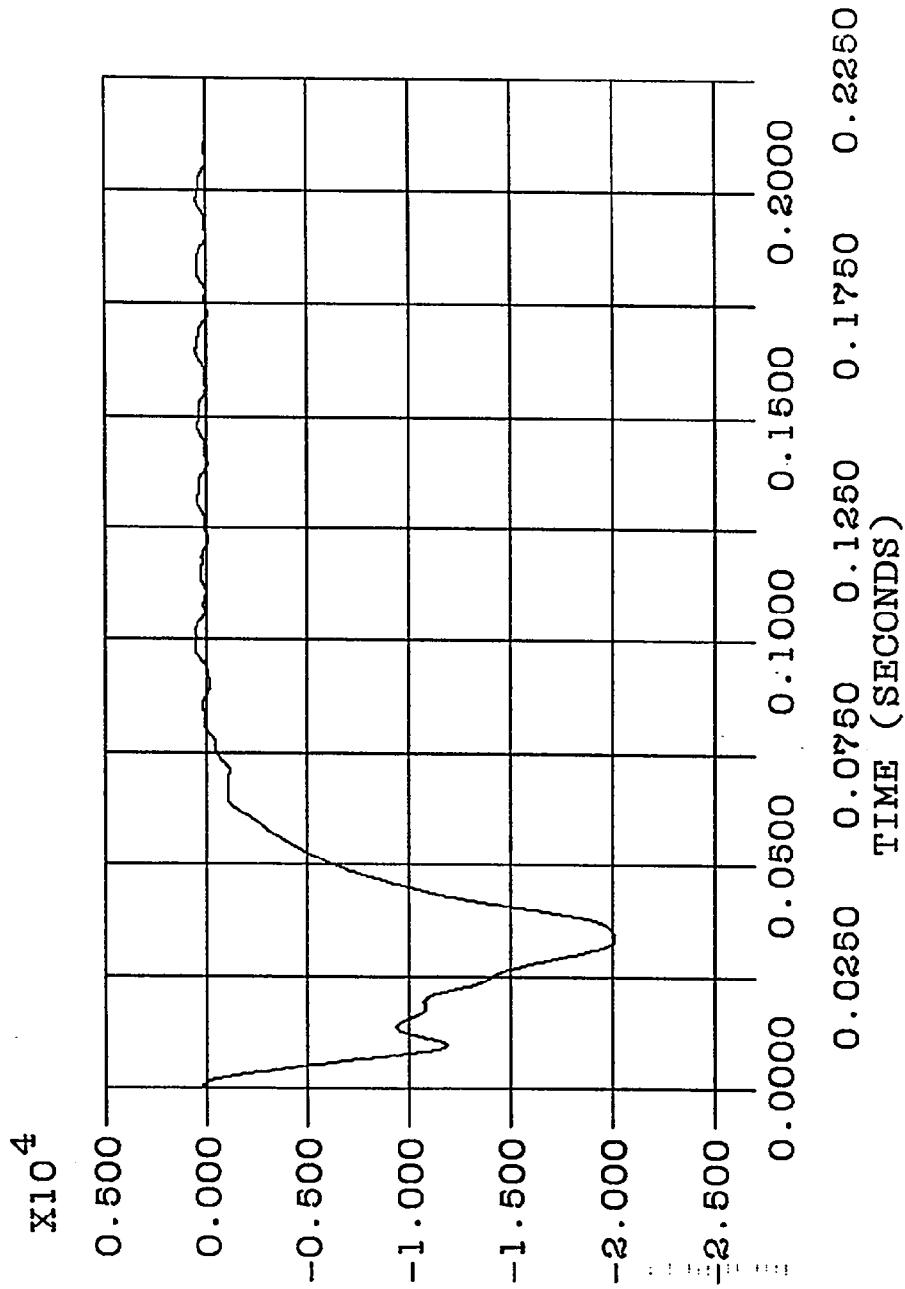
BARRIER LR FORCE



Sum of Load Cells A7-B9 Force vs. Time

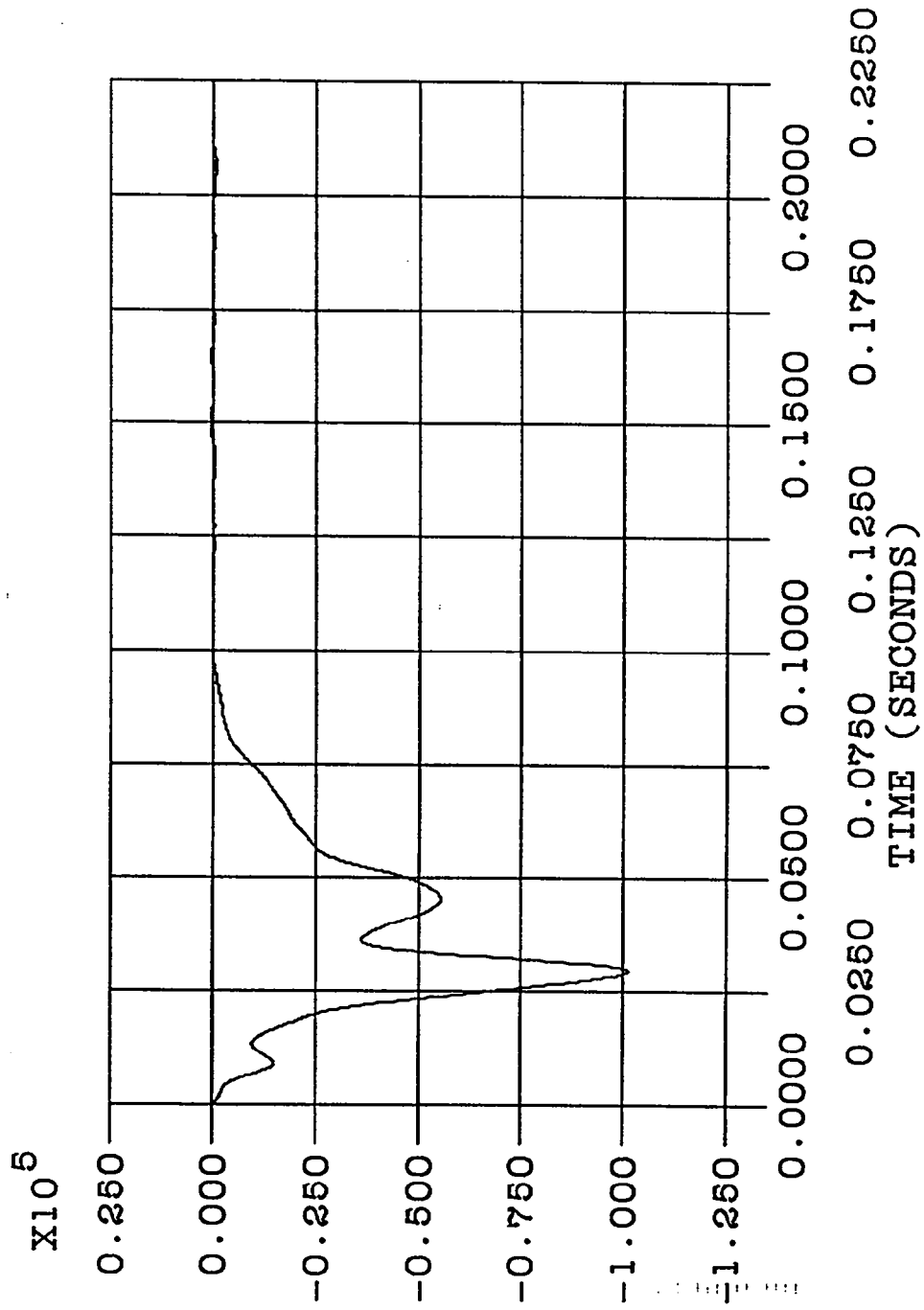
1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

BARRIER UL FORCE



Sum of Load Cells C1-D3 Force vs. Time

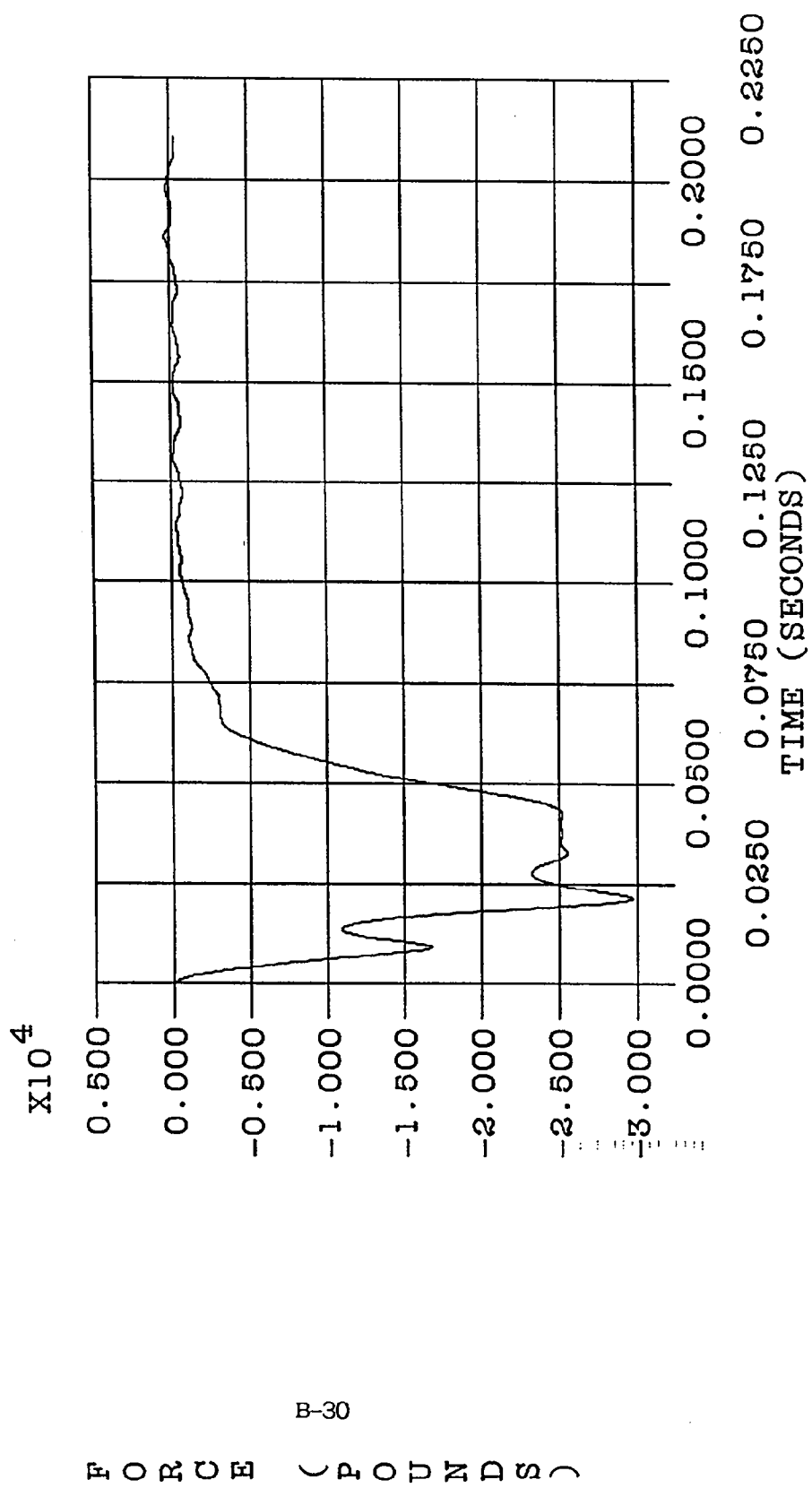
BARRIER UC FORCE



Sum of Load Cells C4-D6 Force vs. Time

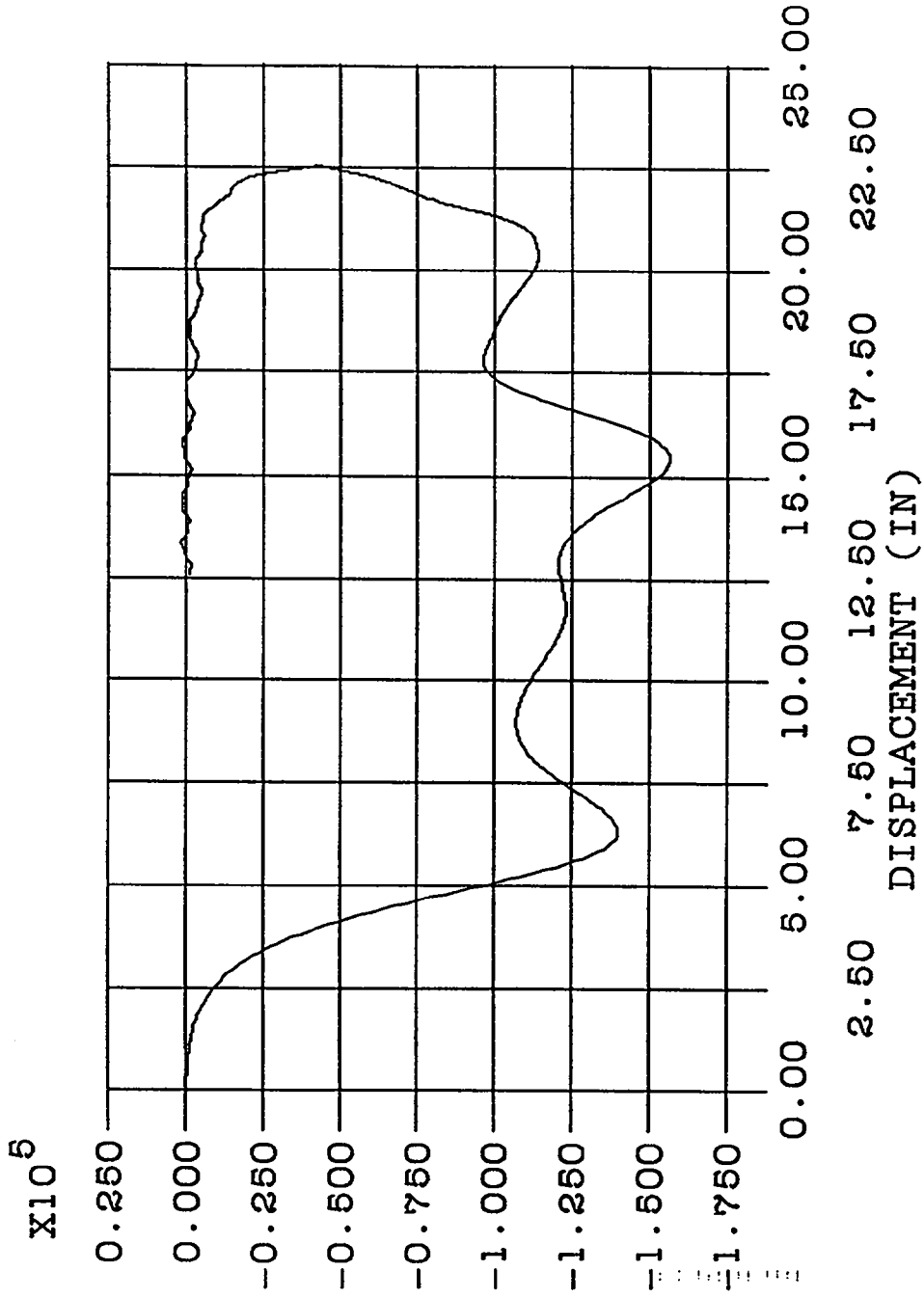
1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

BARRIER UR FORCE



Sum of Load Cells C7-D9 Force vs. Time

BAR FORCE/VEH DISP



Sum of 36 Load Cells Force vs. Vehicle Dynamic Crush

Toyota 4 X 4 Pickup Truck

NHTSA No. MM5103

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)

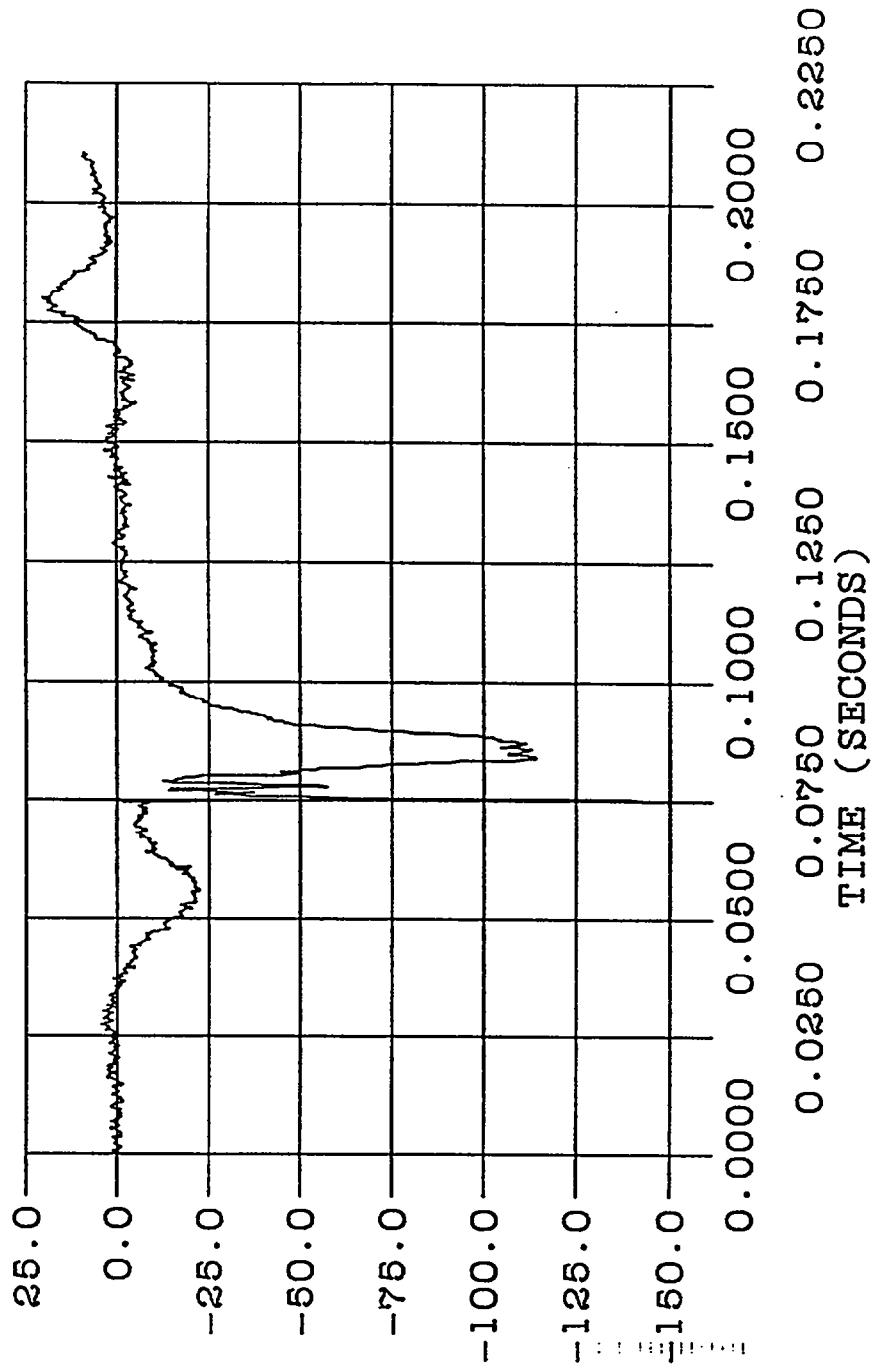
<u>Data Plot</u>	<u>Page No.</u>
Passenger Head X Acceleration vs. Time	B-48
Passenger Head Y Acceleration vs. Time	B-49
Passenger Head Z Acceleration vs. Time	B-50
Passenger Head Resultant Acceleration vs. Time	B-51
Passenger Head X Velocity vs. Time	B-52
Passenger Chest X Acceleration vs. Time	B-53
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

TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST
NHTSA NO. MM5103

DESCRIPTION	MINIMUM		MAXIMUM	
Driver Head X Acc.	-143.3 @	0.07515	20.5 @	0.18007
Driver Head Y Acc.	-9.3 @	0.08647	6.3 @	0.14686
Driver Head Z Acc.	-7.1 @	0.12829	192.5 @	0.07528
Driver Head X Vel.	-8.1 @	0.16999	35.6 @	0.03481
Driver Head Resultant	0.2 @	0.00258	237.7 @	0.07528
Driver Chest X Acc.	-51.0 @	0.06605	5.8 @	0.16900
Driver Chest Y Acc.	-8.0 @	0.06224	12.3 @	0.07823
Driver Chest Z Acc.	-11.6 @	0.10418	18.6 @	0.07675
Driver Chest Resultant	0.1 @	0.00873	51.2 @	0.06605
Driver Femur RH Force	Not Available			
Driver Femur LH Force	-1104.2 @	0.06212	120.5 @	0.04502
Driver Lap Belt Force	-8.1 @	0.13776	1574.5 @	0.05966
Driver Torso Belt Force	-52.5 @	0.10726	1490.6 @	0.05498
Pass. Head X Acc.	-66.2 @	0.10799	4.6 @	0.20135
Pass. Head Y Acc.	-6.2 @	0.10898	13.1 @	0.10307
Pass. Head Z Acc.	-7.1 @	0.11218	83.7 @	0.10849
Pass. Head Resultant	0.1 @	0.00295	106.5 @	0.10849
Pass. Head X Vel.	-46.0 @	0.16986	0.4 @	0.04034
Pass. Chest X Acc.	-51.7 @	0.06949	2.4 @	0.14932
Pass. Chest Y Acc.	-2.7 @	0.14957	12.8 @	0.06445
Pass. Chest Z Acc.	-18.9 @	0.11931	16.1 @	0.03641
Pass. Chest Resultant	0.1 @	0.00431	52.3 @	0.06519
Pass. Femur RH Force	-780.8 @	0.05449	324.0 @	0.04932
Pass. Femur LH Force	-635.7 @	0.05572	192.6 @	0.04330
Pass. Lap Belt Force	-13.2 @	0.11574	1866.9 @	0.06408
Pass. Torso Belt Force	-8.1 @	0.20295	2365.7 @	0.07368
Driver Torso Belt Stretch	0.0 @	0.00861	0.2 @	0.10074
Pass. Torso Belt Stretch	0.0 @	0.00652	0.3 @	0.11464

DRIVER HEAD X ACC

ACCELERATION (G, S)

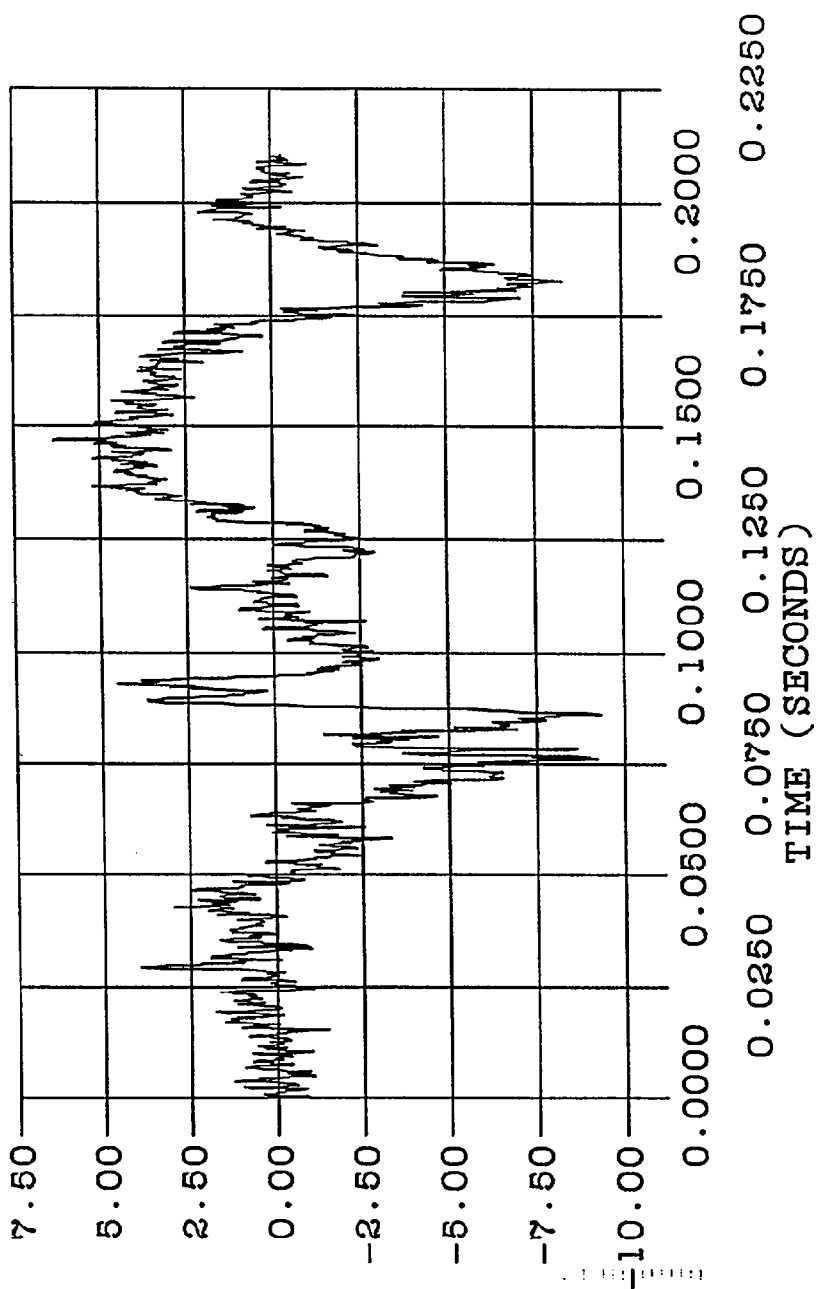


Driver Head X Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

DRIVER HEAD Y ACC

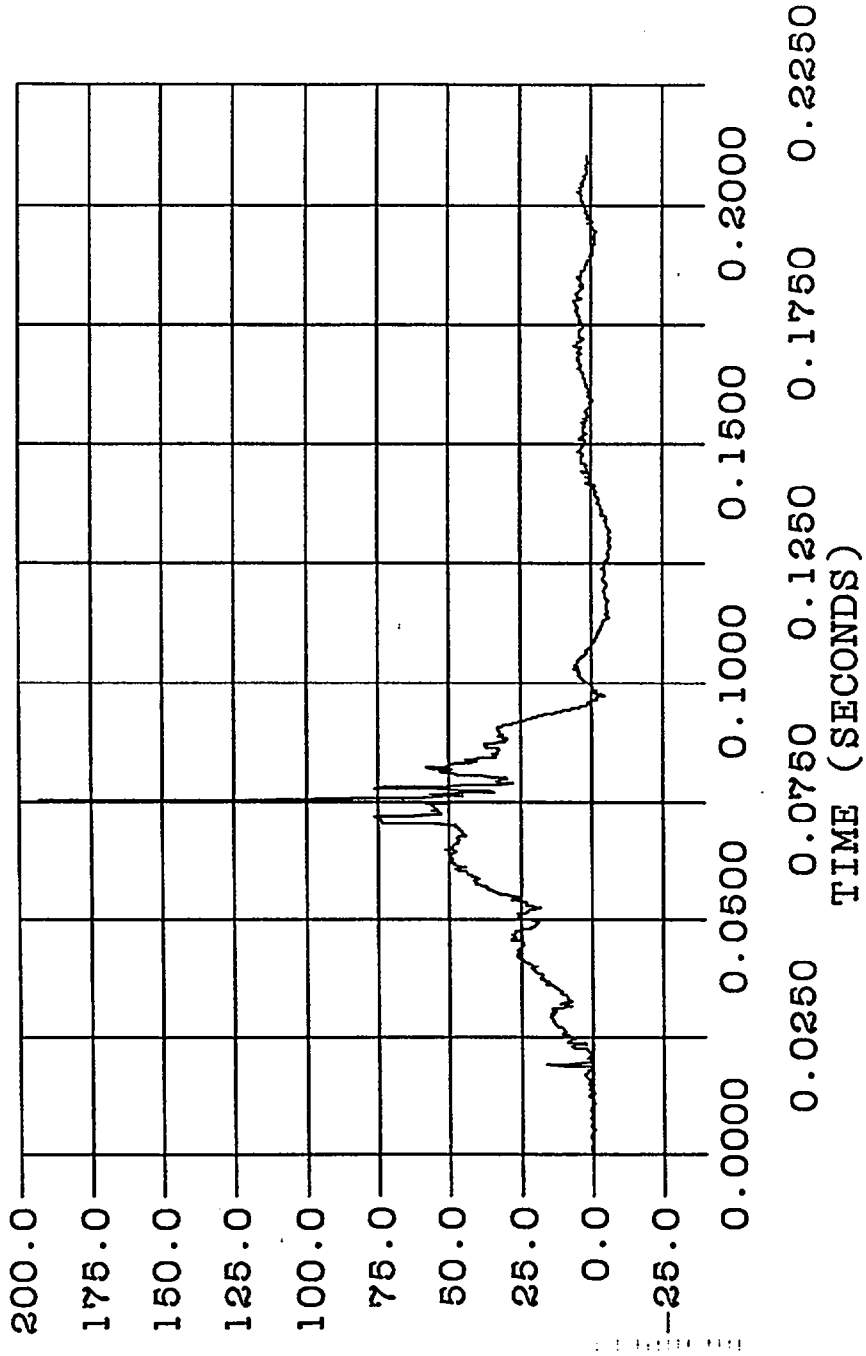
ACCELERATION (G, S)



Driver Head Y Acceleration vs. Time

DRIVER HEAD Z ACC

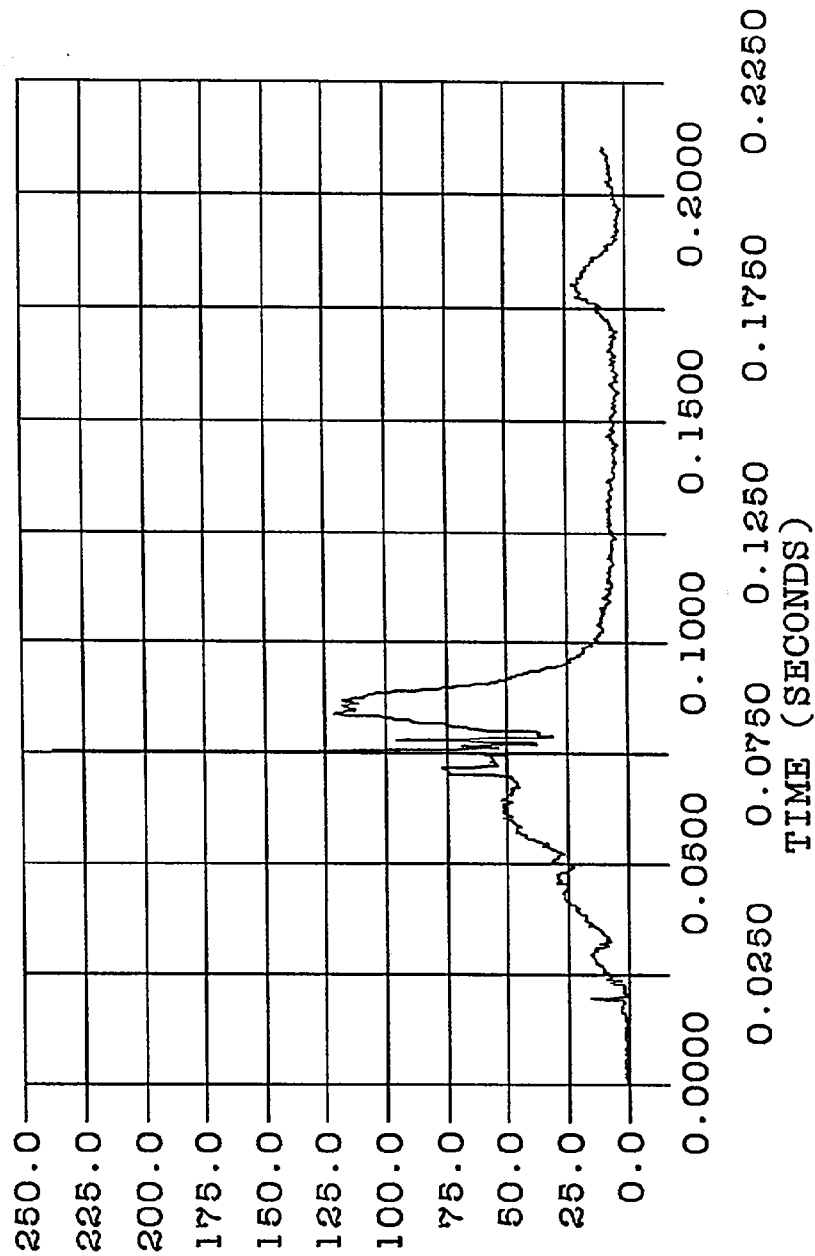
ACCELERATION (G, S)



Driver Head Z Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

DRIVER HEAD RES

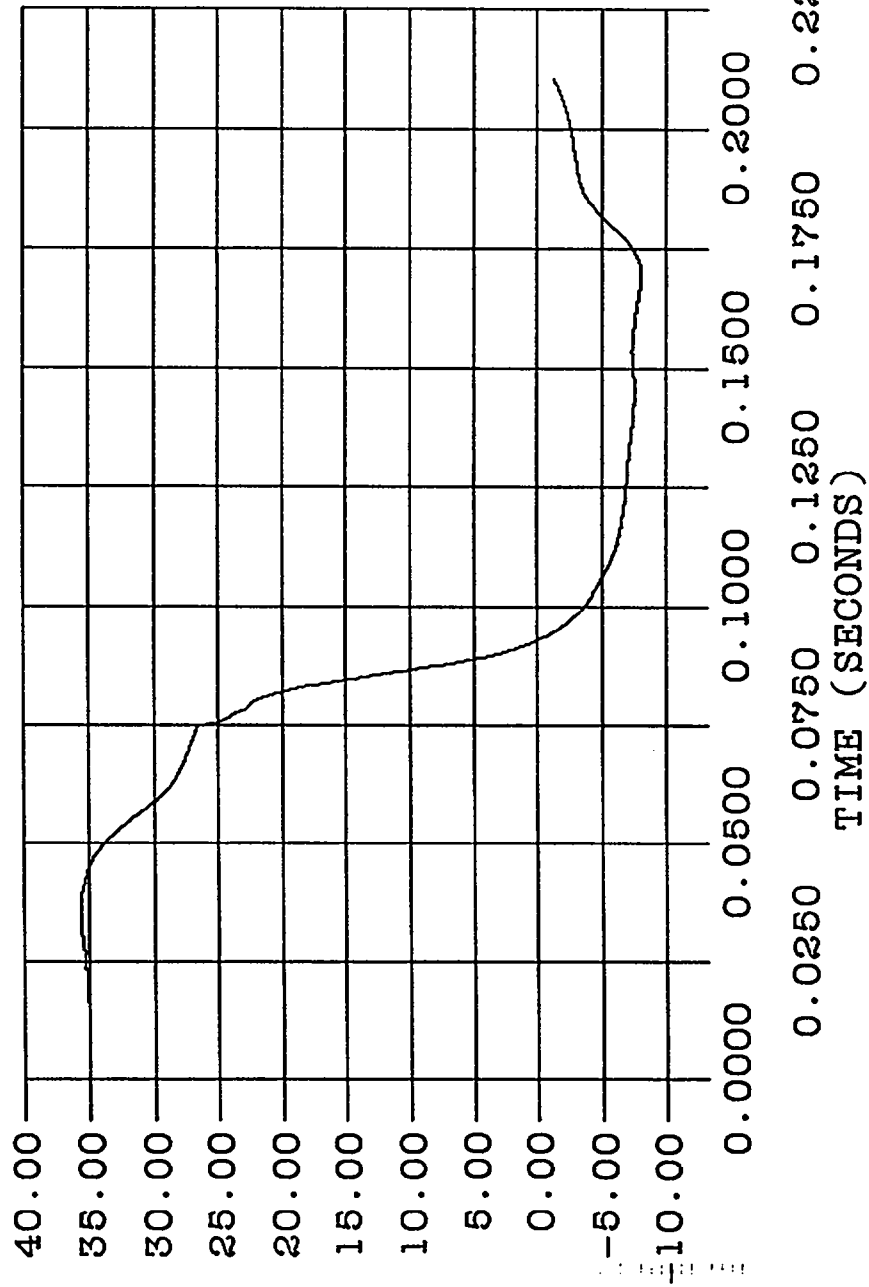


Driver Head Resultant Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

DRIVER HEAD X VEL

VELOCITY (MPH)

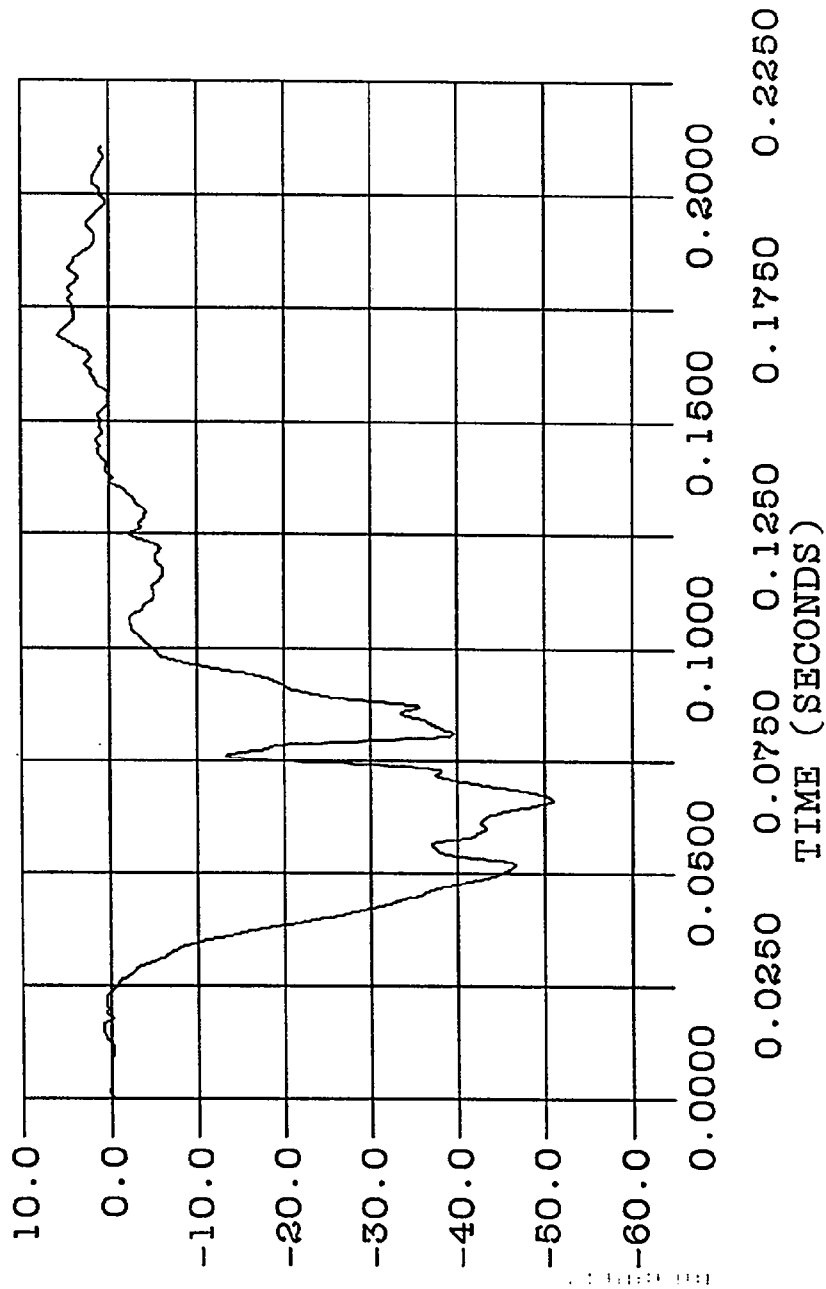


Driver Head X Velocity vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

DRIVER CHEST X ACC

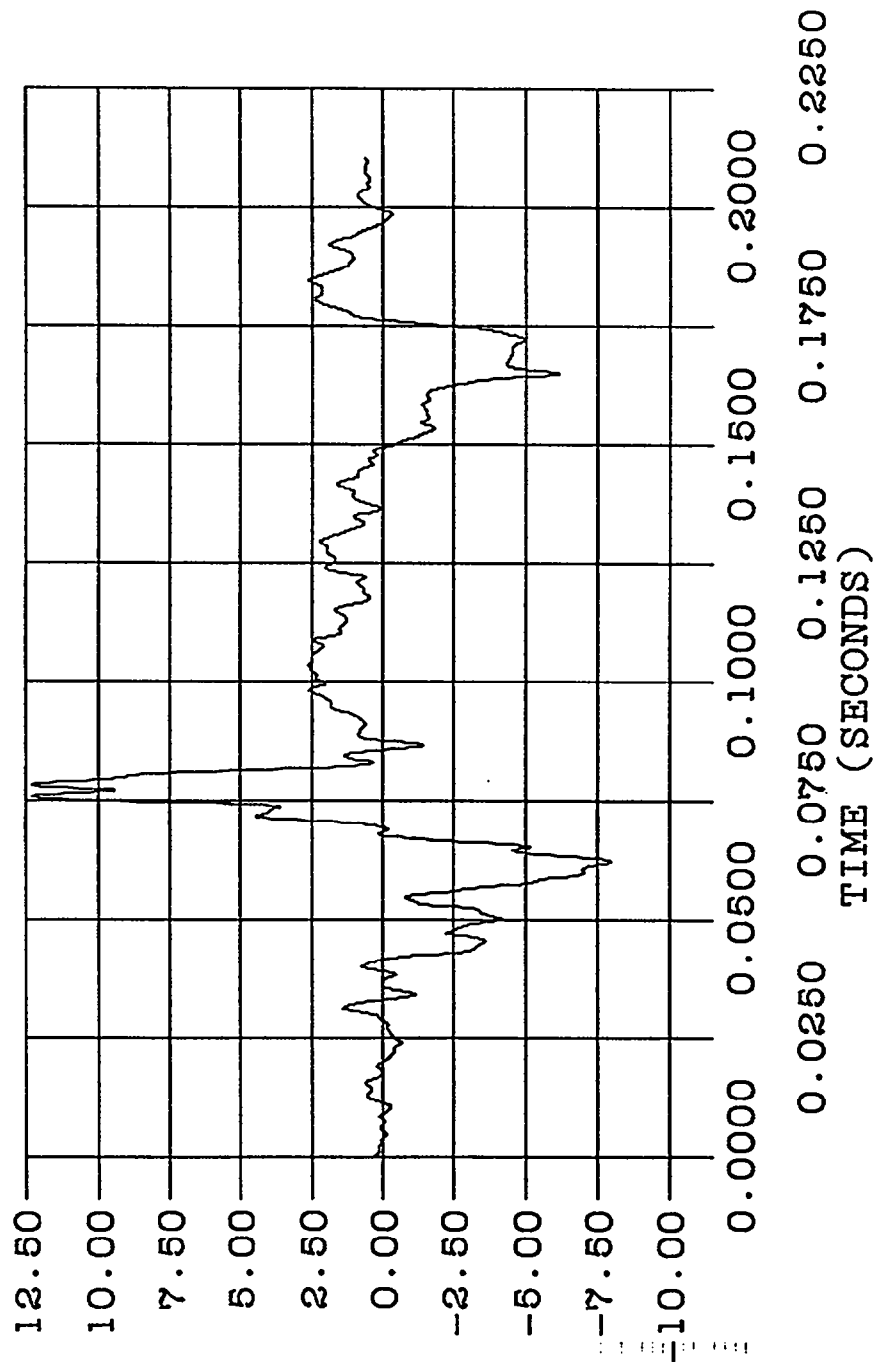
ACCELERATION (G, S)



Driver Chest X Acceleration vs. Time

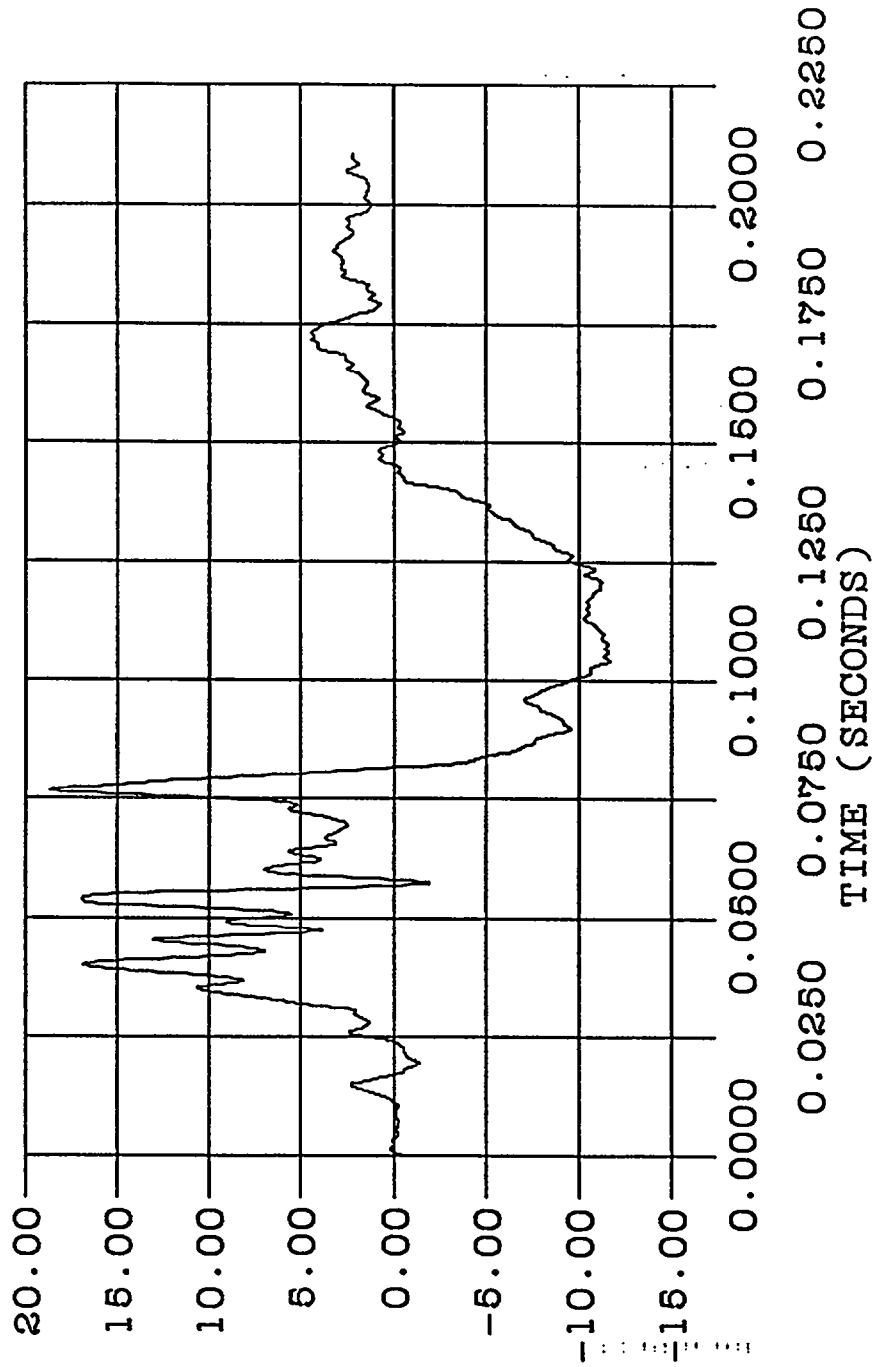
DRIVER CHEST Y ACC

ACCELERATION (G, S)



Driver Chest Y Acceleration vs. Time

DRIVER CHEST Z ACC

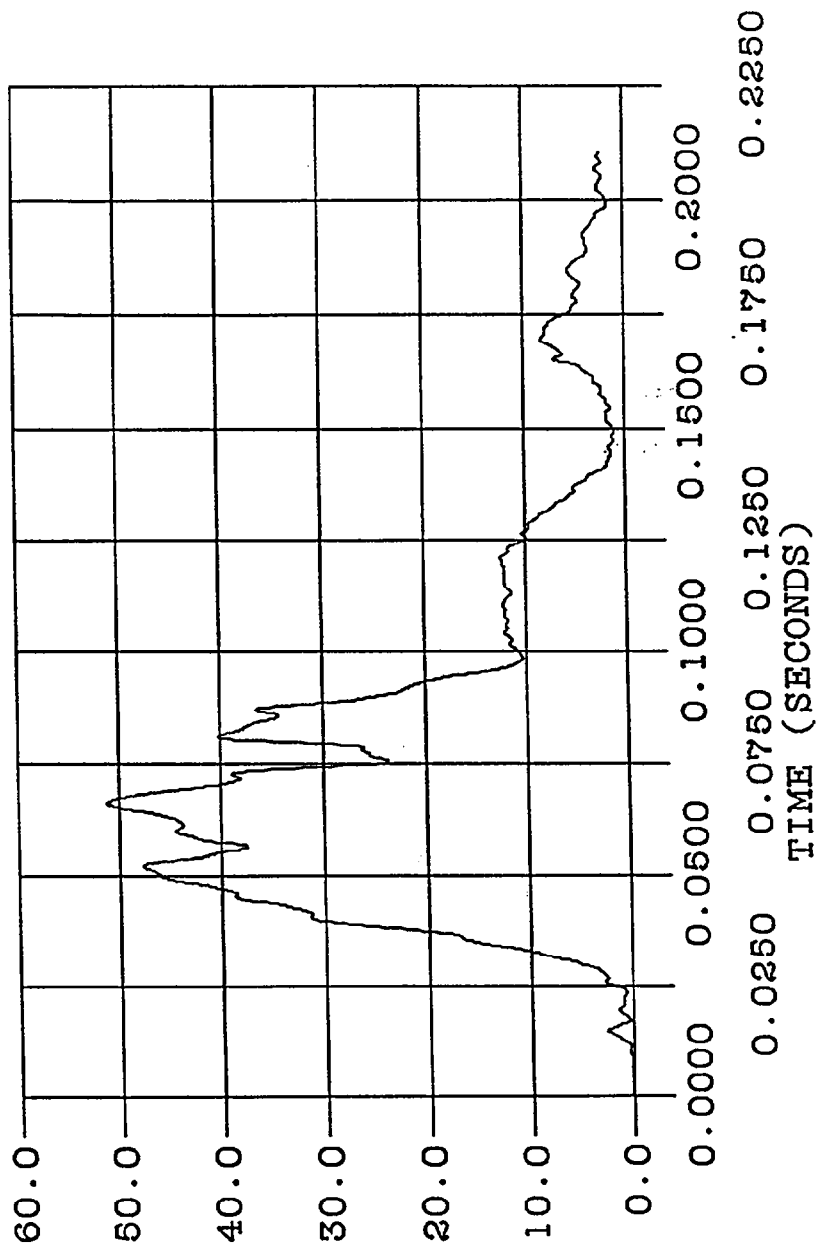


Driver Chest Z Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

DRIVER CHEST RES

ACCELERATION (G, S)



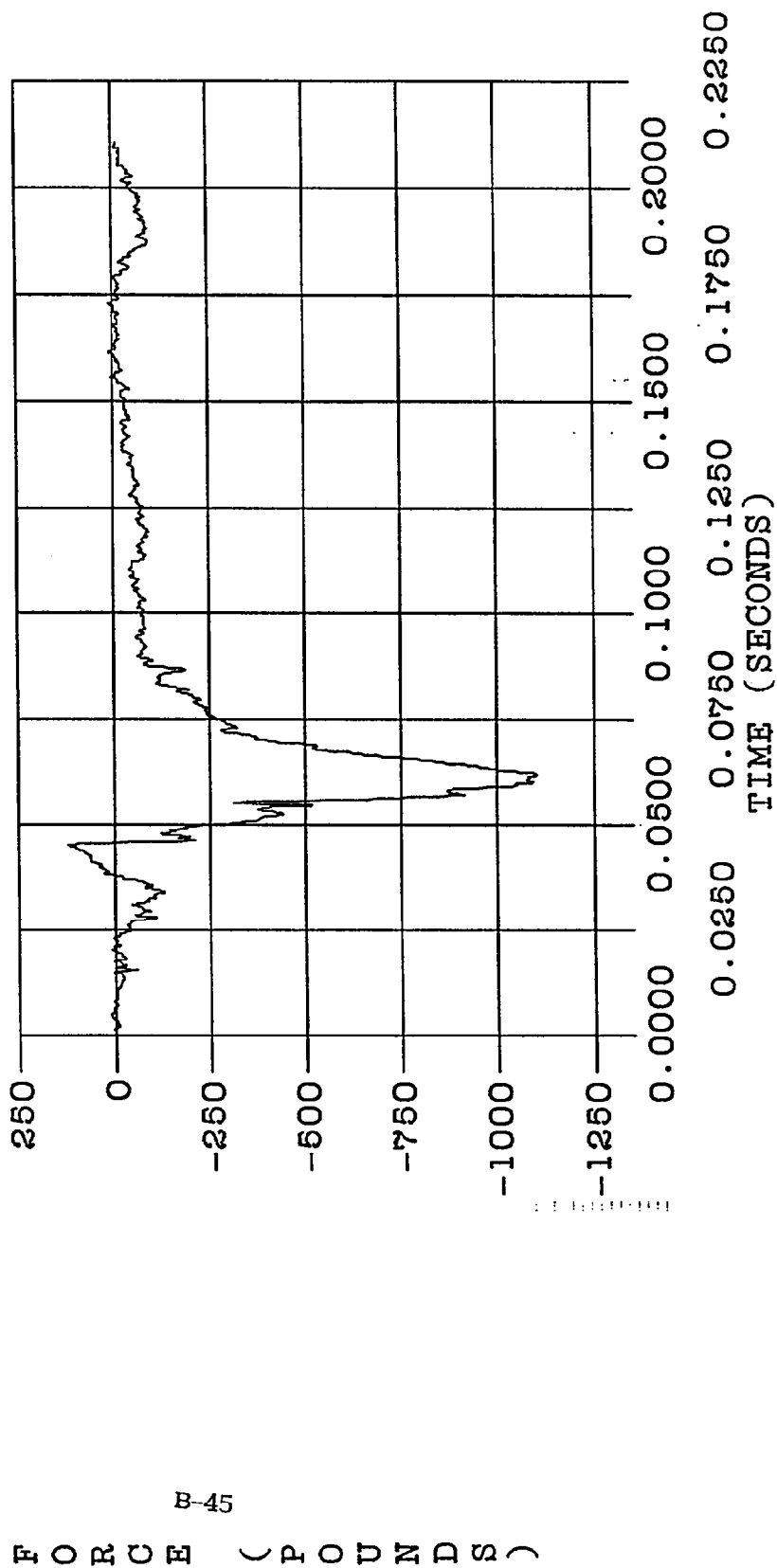
Driver Chest Resultant Acceleration vs. Time

DATA PLOT NOT AVAILABLE
NO VALID DATA COLLECTED

Driver Right Femur Force vs. Time
Transducer malfunction during test.

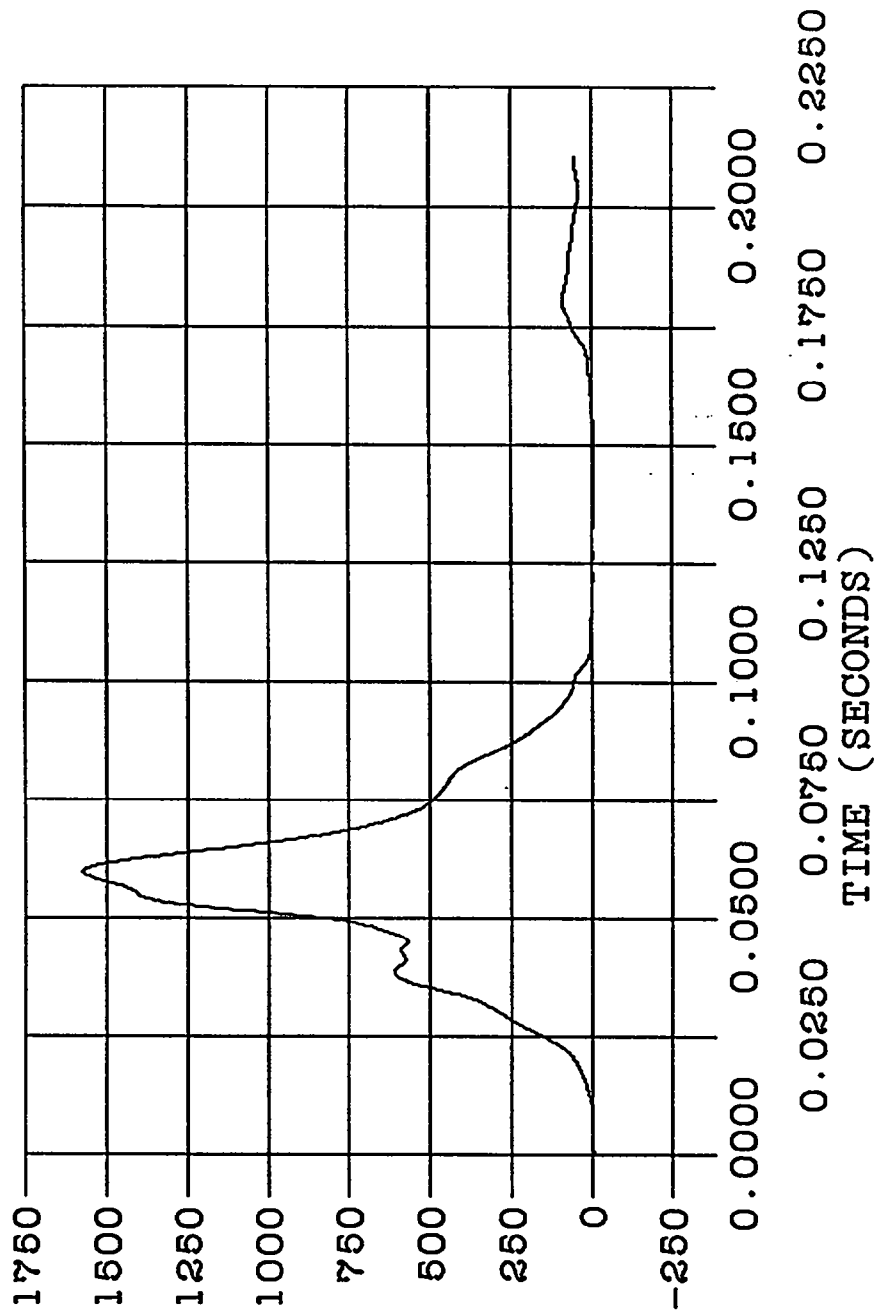
1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

DRIVER FEMUR LH



Driver Left Femur Force vs. Time

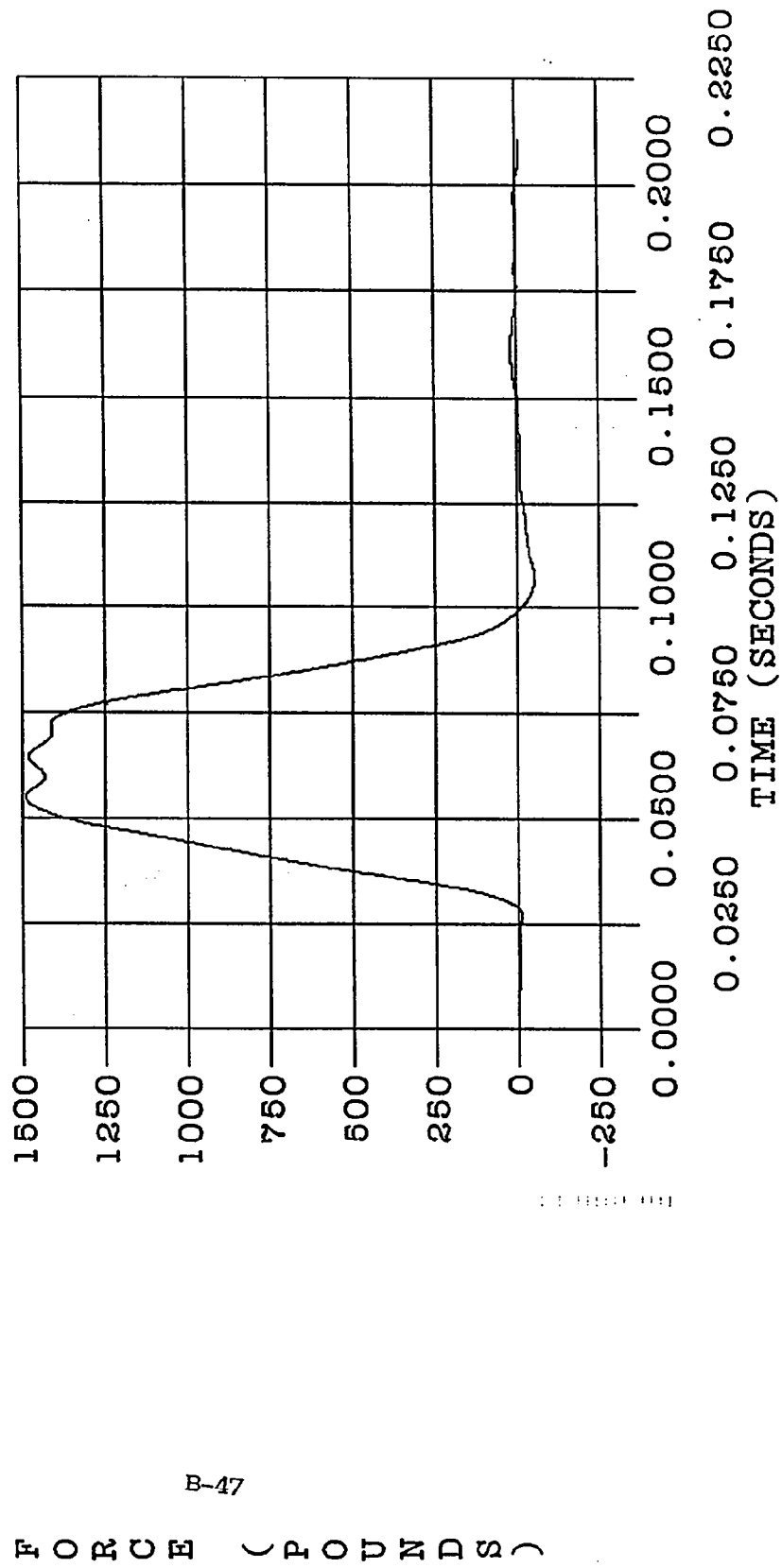
DR LAP BELT FORCE



Driver Lap Belt Force vs. Time

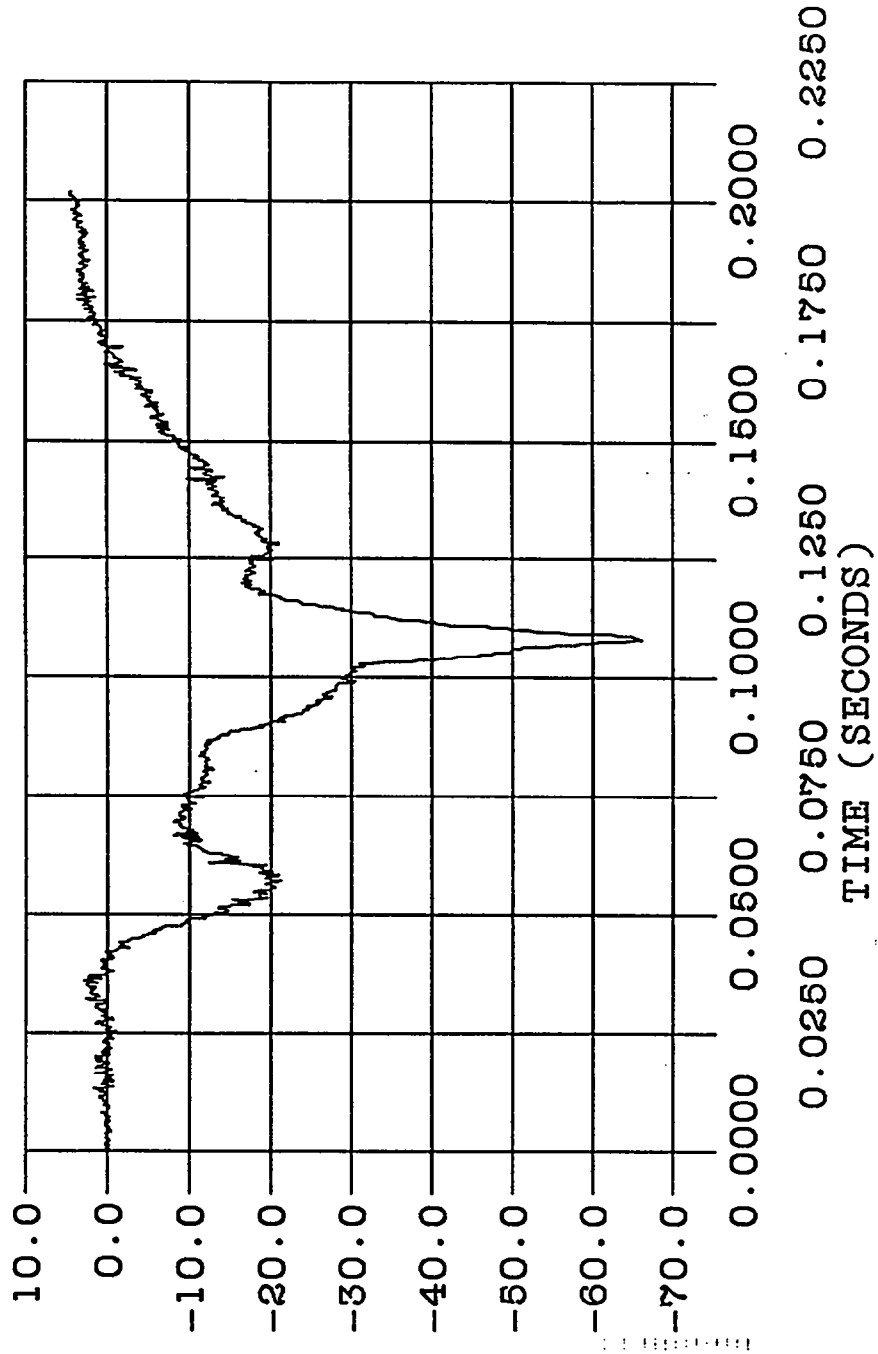
1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

DR TORSO BELT FORCE



Driver Torso Belt Force vs. Time

PASS HEAD X ACC

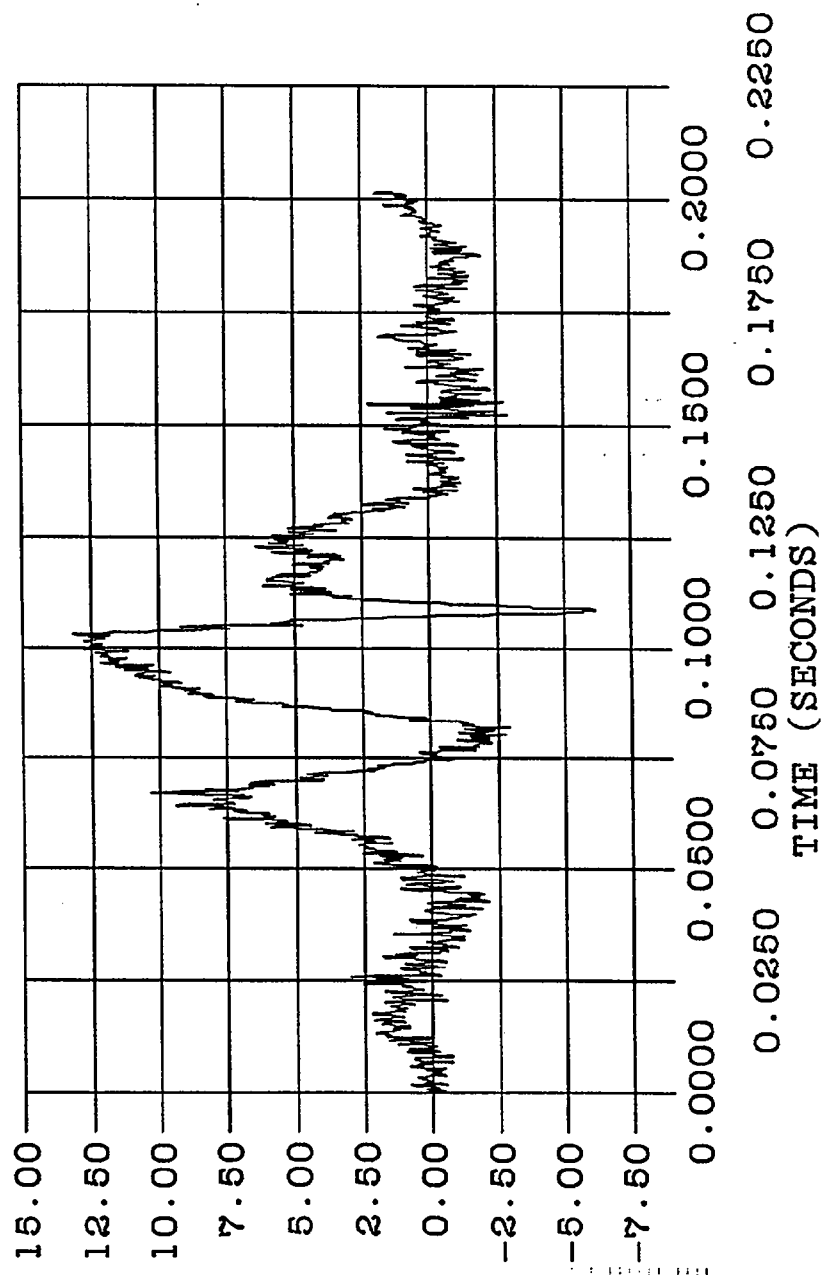


Passenger Head X Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

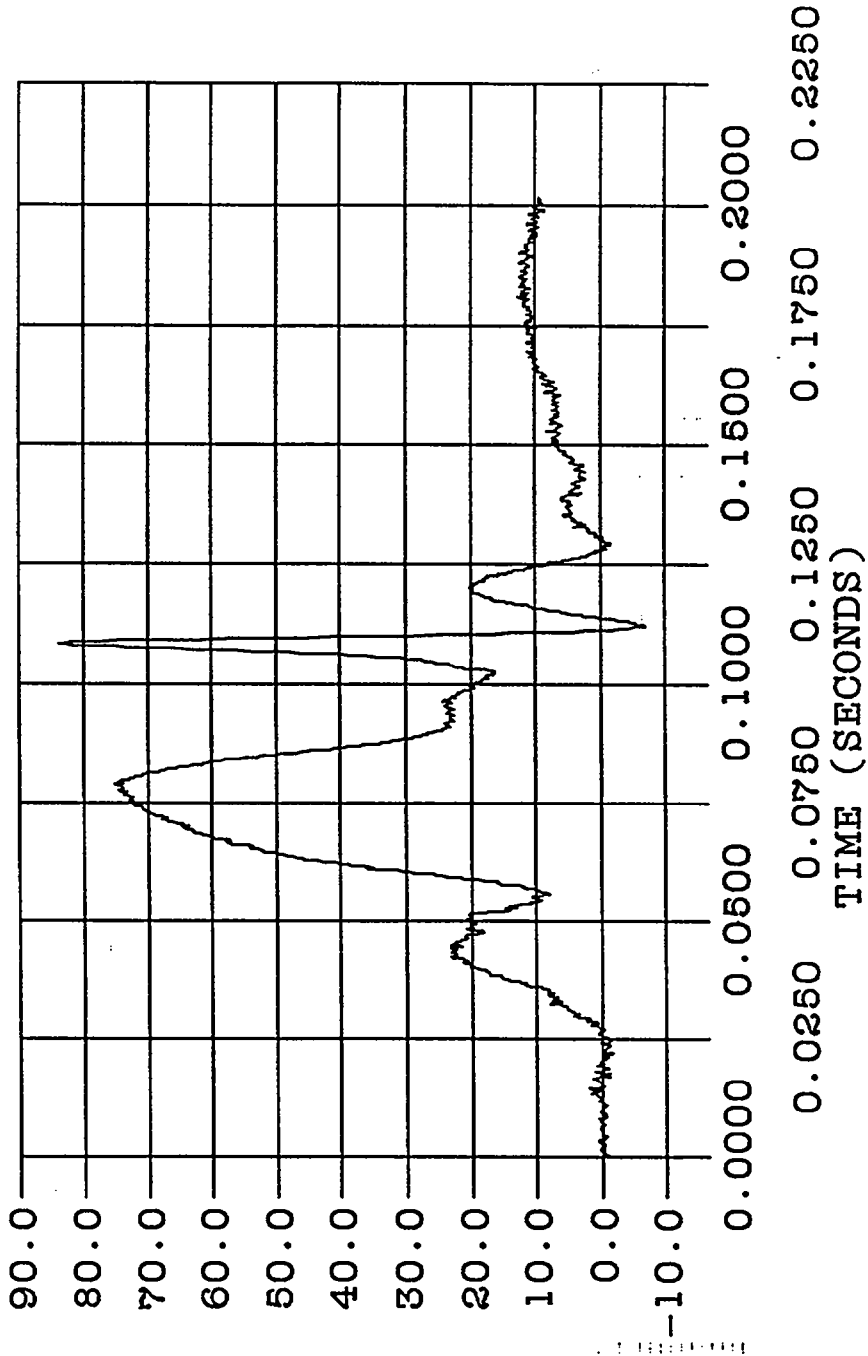
PASS HEAD Y ACC

ACCELERATION (G, S)



Passenger Head Y Acceleration vs. Time

PASS HEAD Z ACC

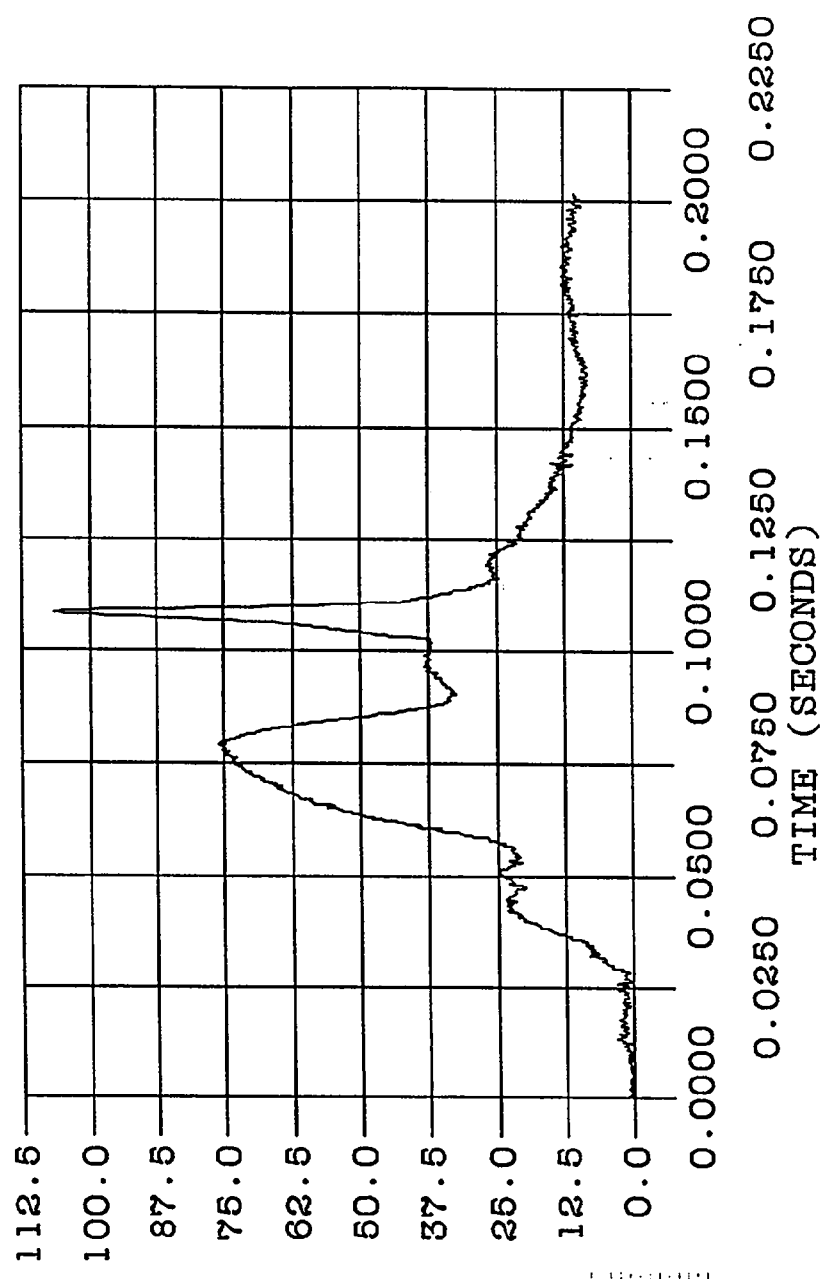


Passenger Head Z Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

PASS HEAD RES

ACCELERATION (G, S)

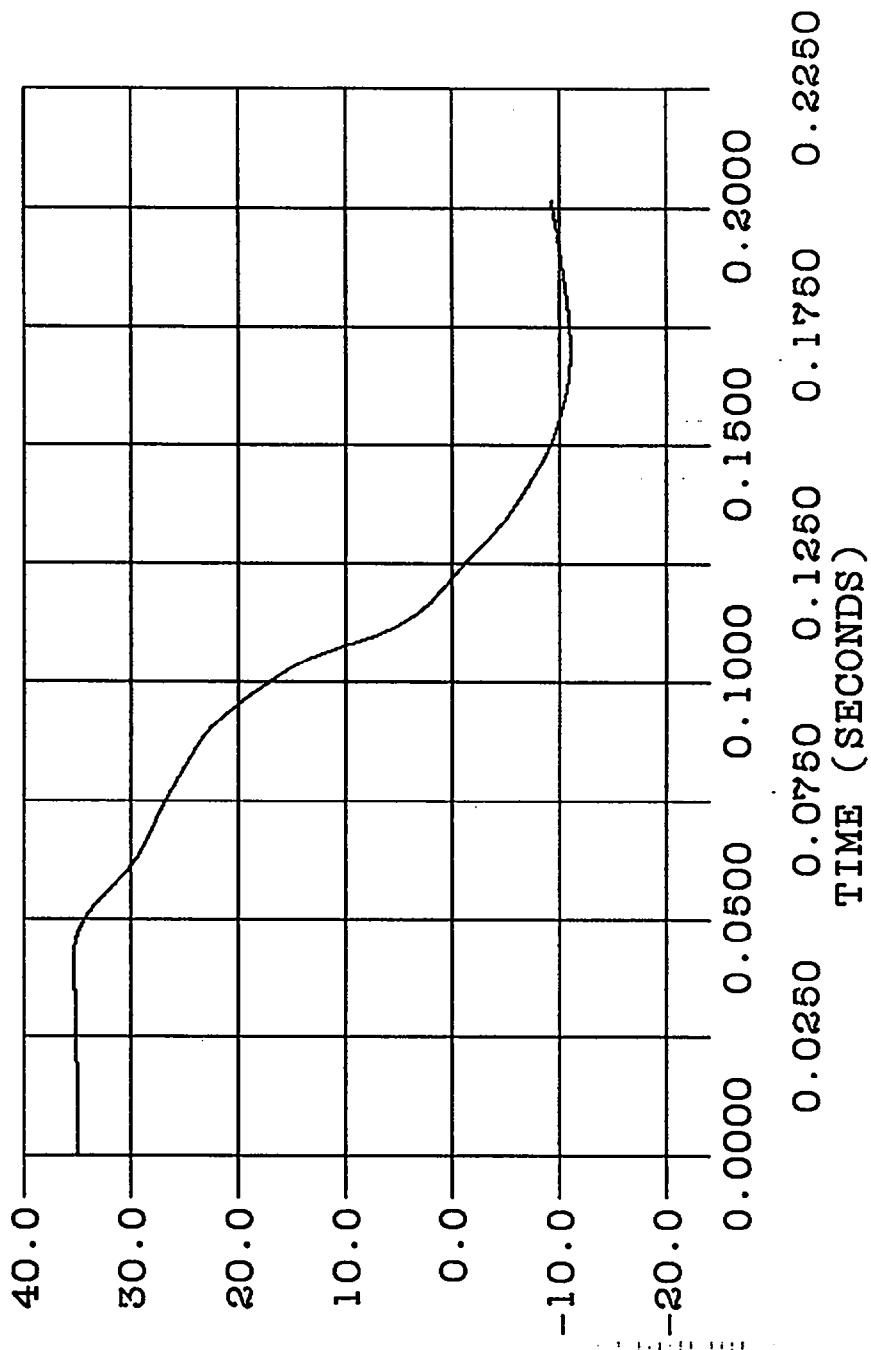


Passenger Head Resultant Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

PASS HEAD X VEL

VELOCITY (FT / S)

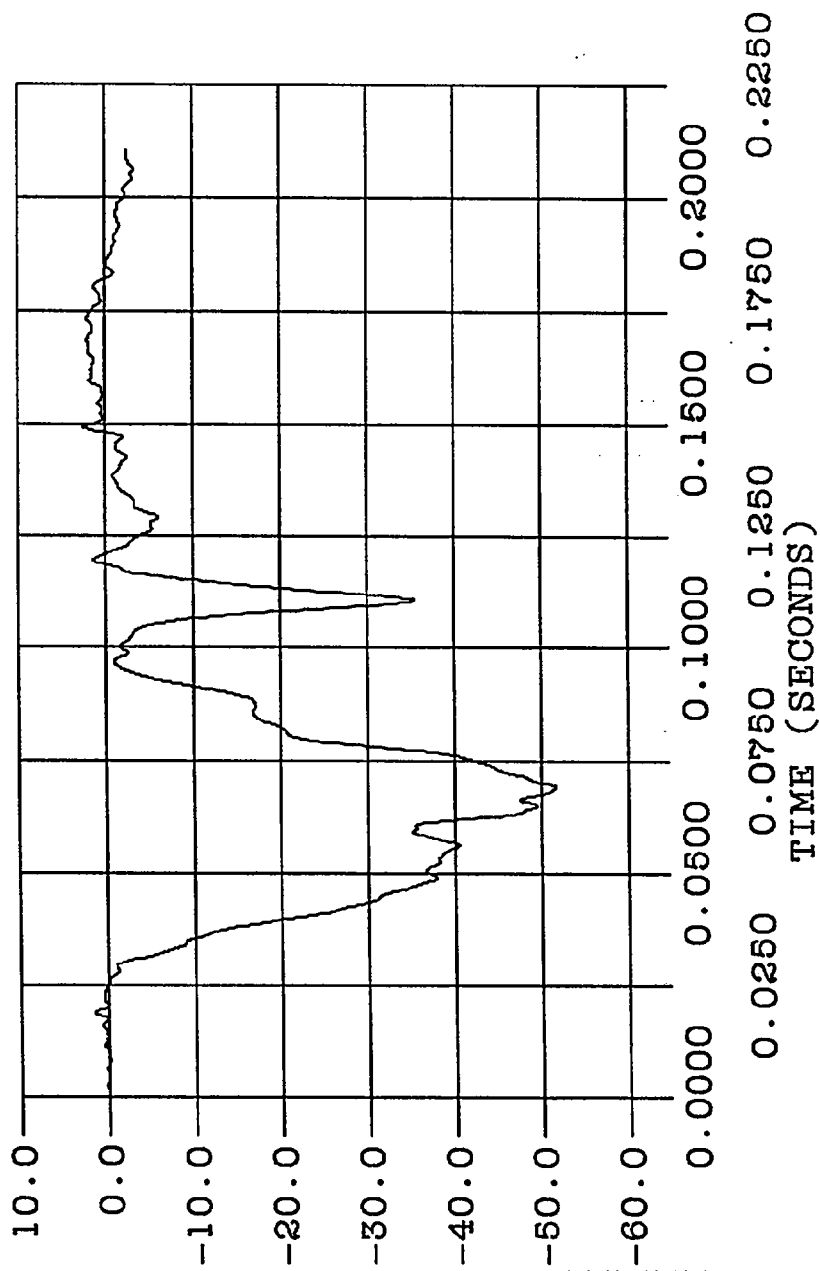


Passenger Head X Velocity vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

PASS CHEST X ACC

ACCELERATION (G, S)

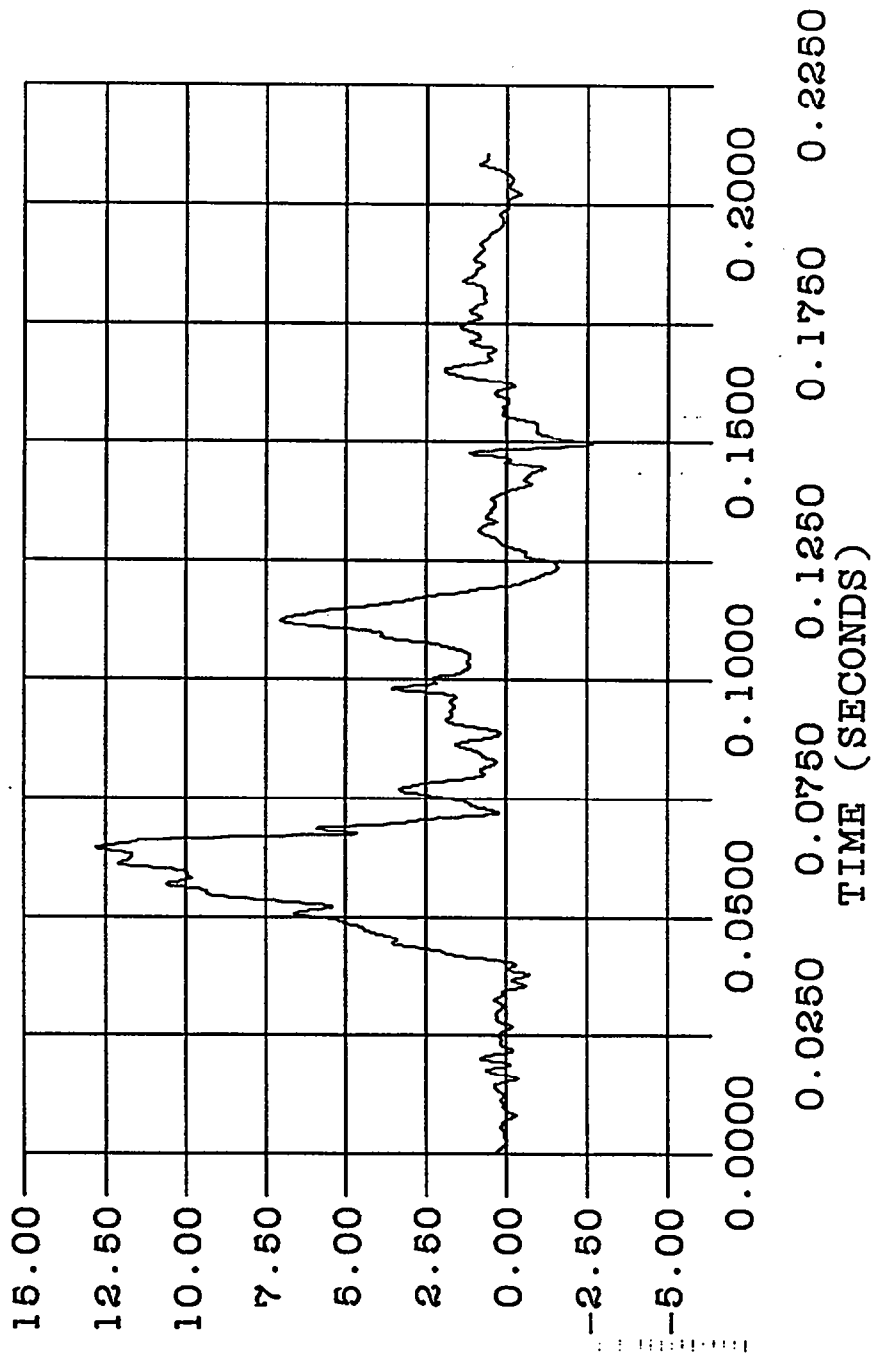


Passenger Chest X Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

PASS CHEST Y ACC

ACCELERATION (G, S)

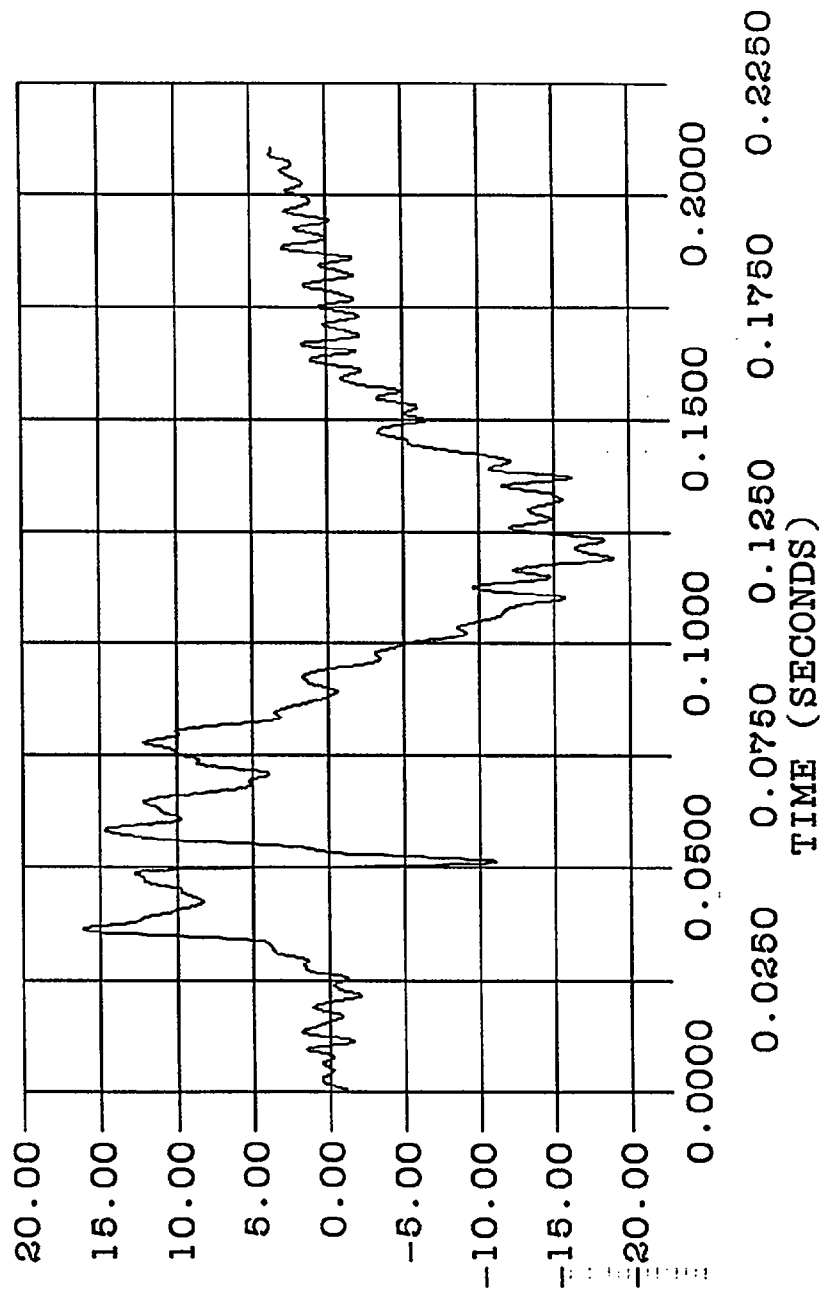


Passenger Chest Y Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

PASS CHEST Z ACC

ACCELERATION (G, S)

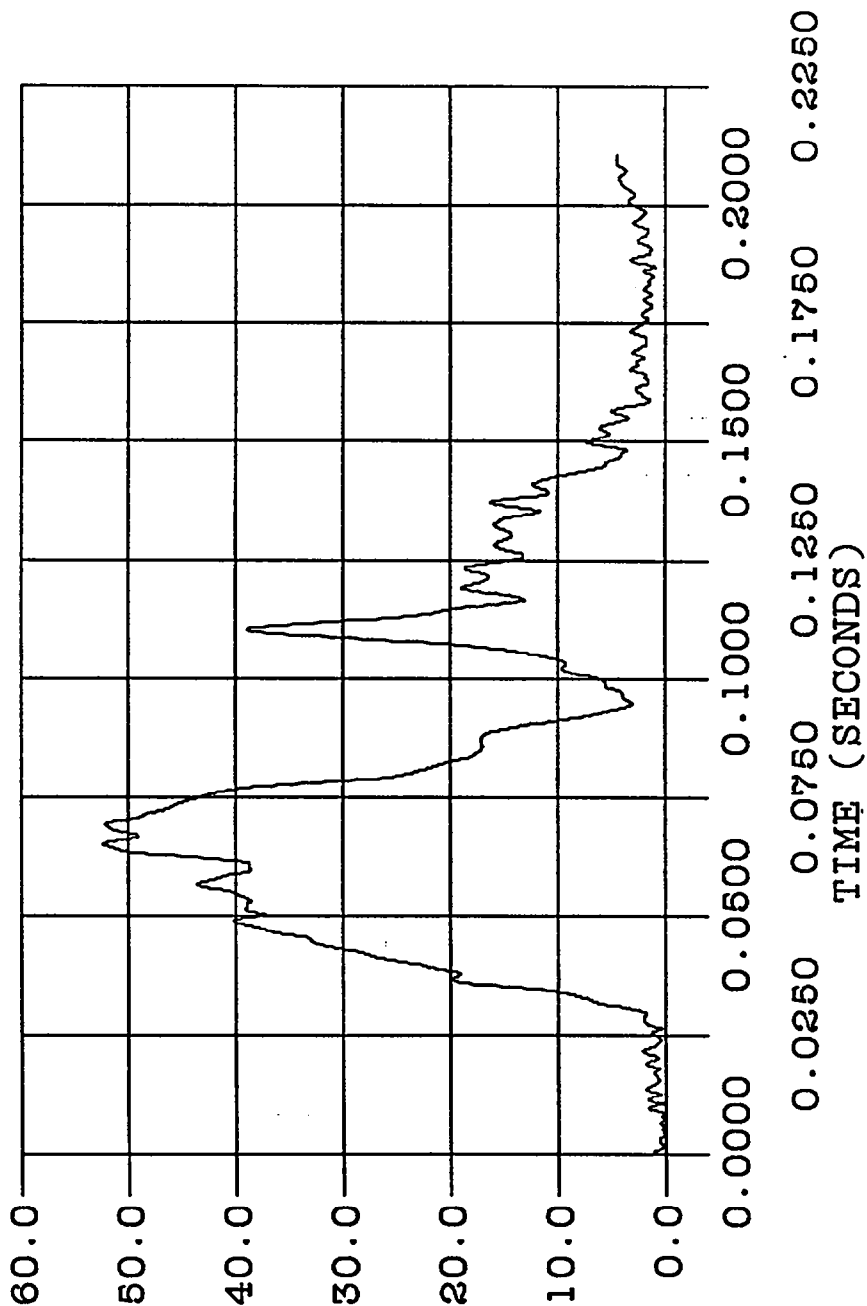


Passenger Chest Z Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

PASS CHEST RES

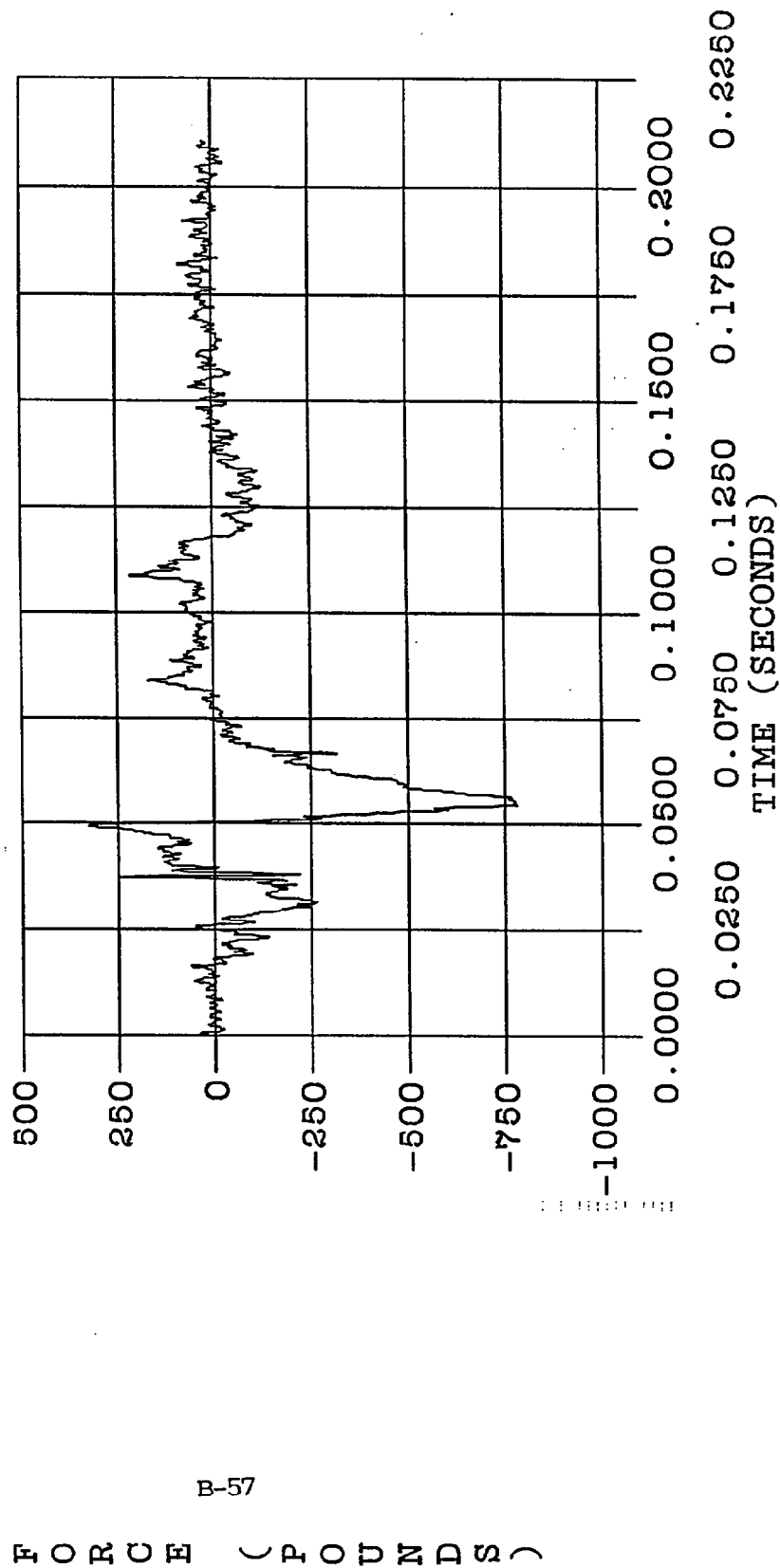
ACCELERATION (G, S)



Passenger Chest Resultant Acceleration vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

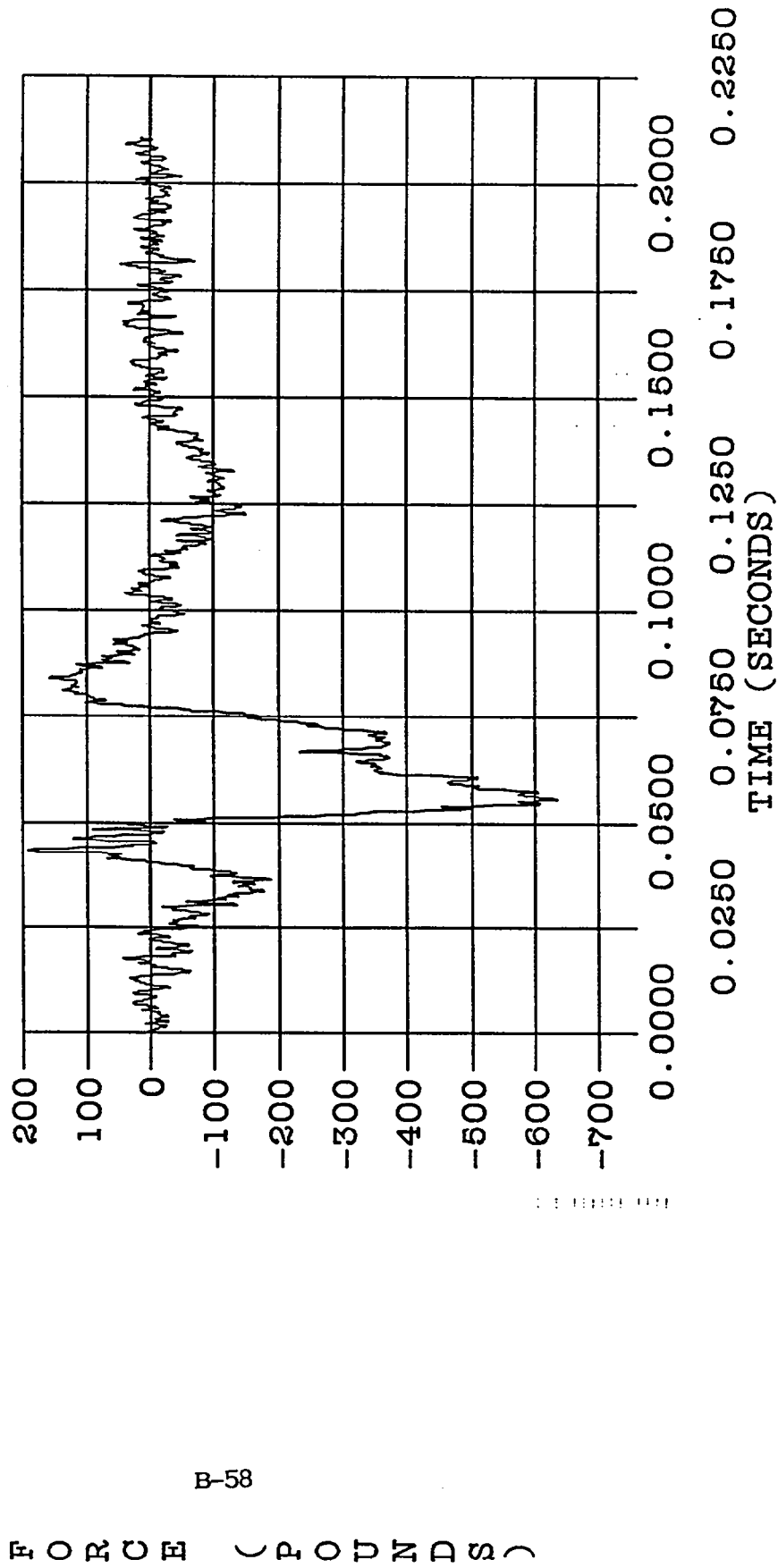
PASS FEMUR RH



Passenger Right Femur Force vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

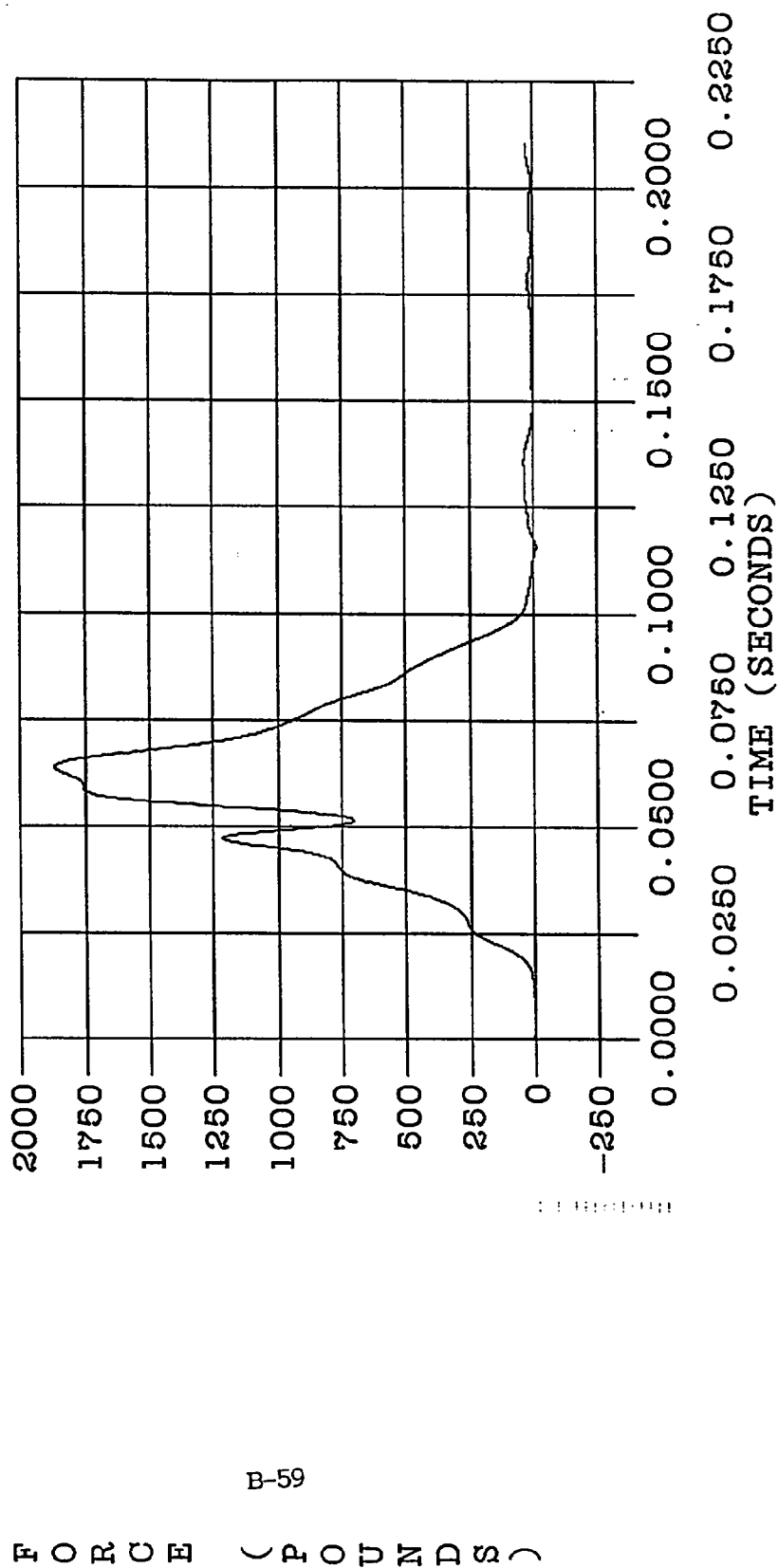
PASS FEMUR LH



Passenger Left Femur Force vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

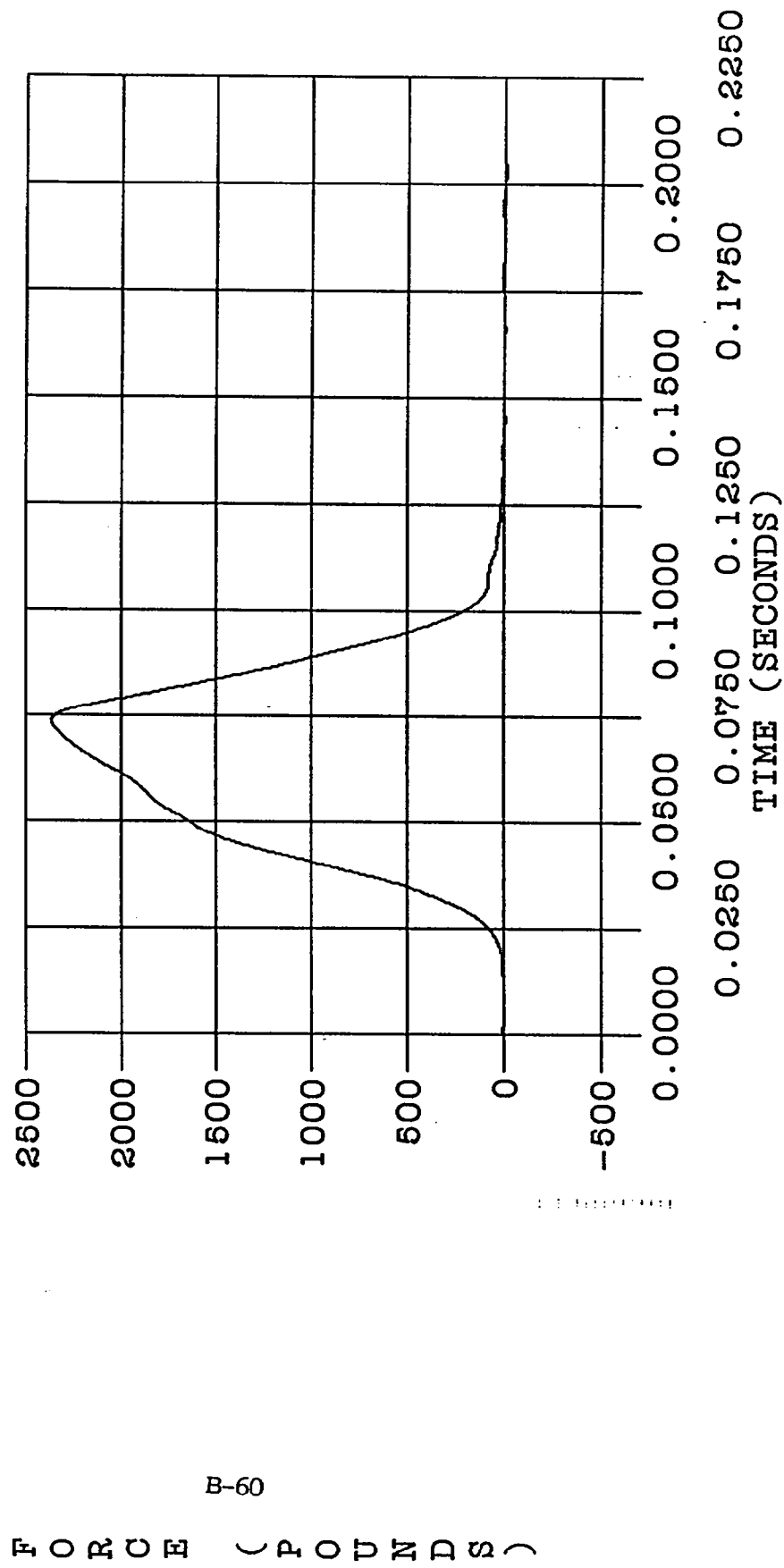
PA LAP BELT FORCE



Passenger Lap Belt Force vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

PA TORSO BELT FORCE

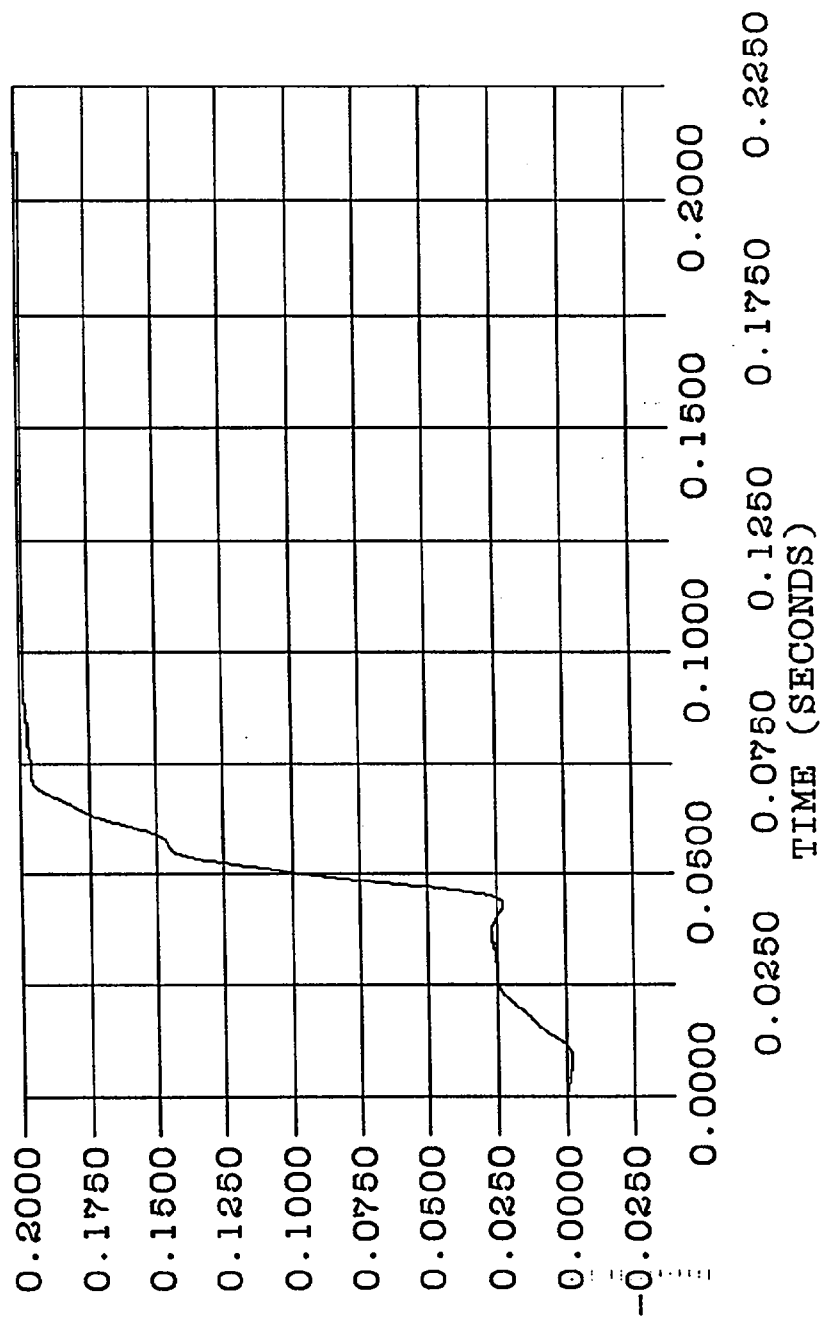


Passenger Torso Belt Force vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

DR TORSO BELT STRETCH

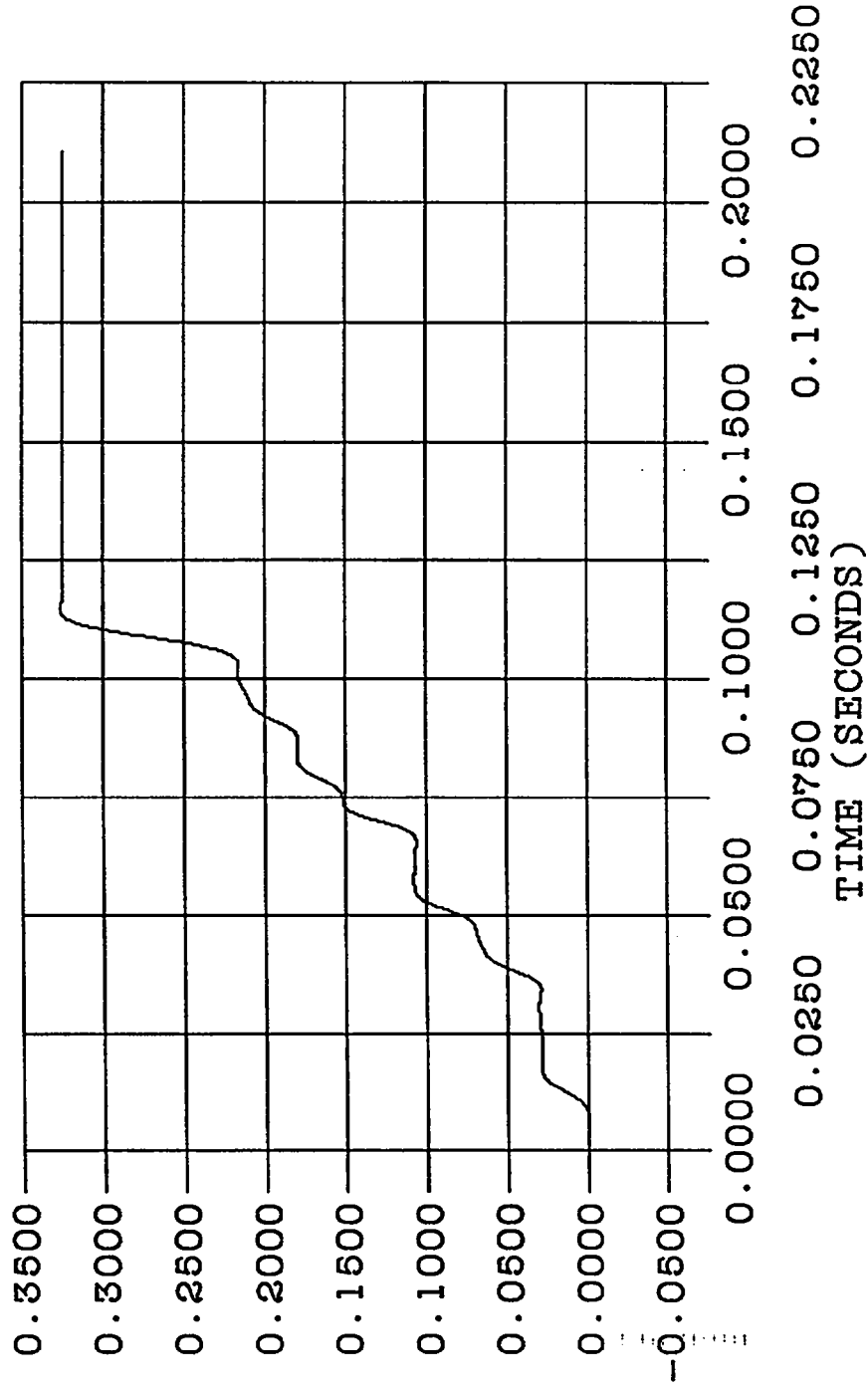
D S B S T R E T C H I N C H E S



Driver Torso Belt Stretch vs. Time

1991 TOYOTA 4 X 4 PICKUP TRUCK NCAP TEST TEST DATE: 02/13/91

PA TORSO BELT STRETCH



Passenger Torso Belt Stretch vs. Time

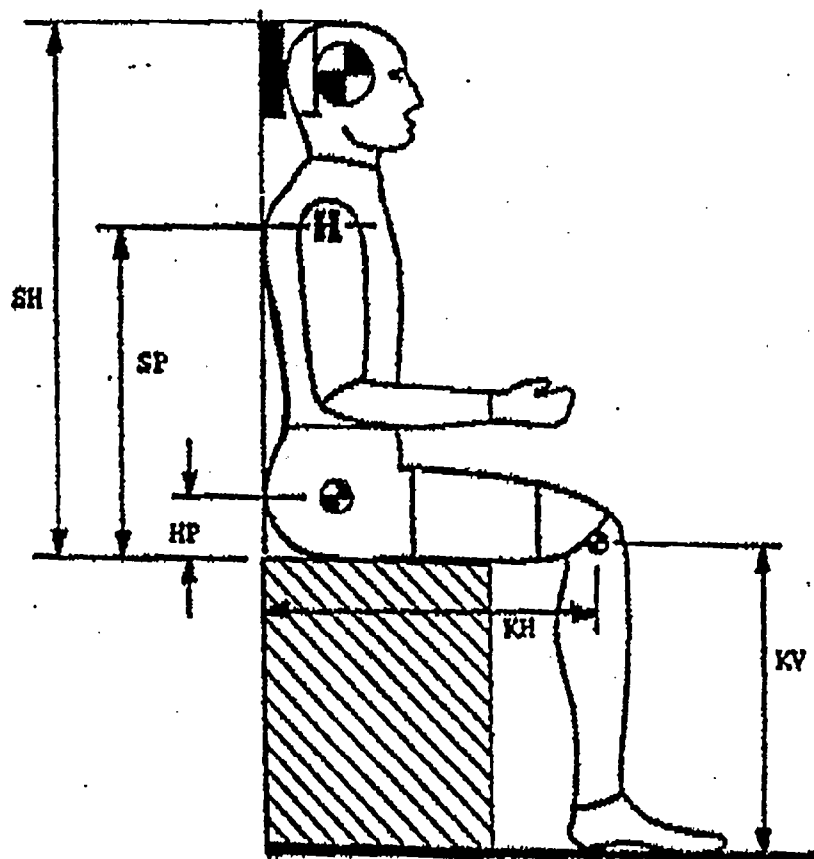
APPENDIX C

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

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION DATA

NHISA 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. & PER. 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		
1. HEAD DROP TEST—			
a. Peak Resultant Accel.	210 to 260G	225	N/A
b. Peak Lateral Accel.	-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			
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 (66.3°)	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:

NHISA DUMMY I.D. NO.: 465

TECHNICIAN'S NAME: Eric Callahan

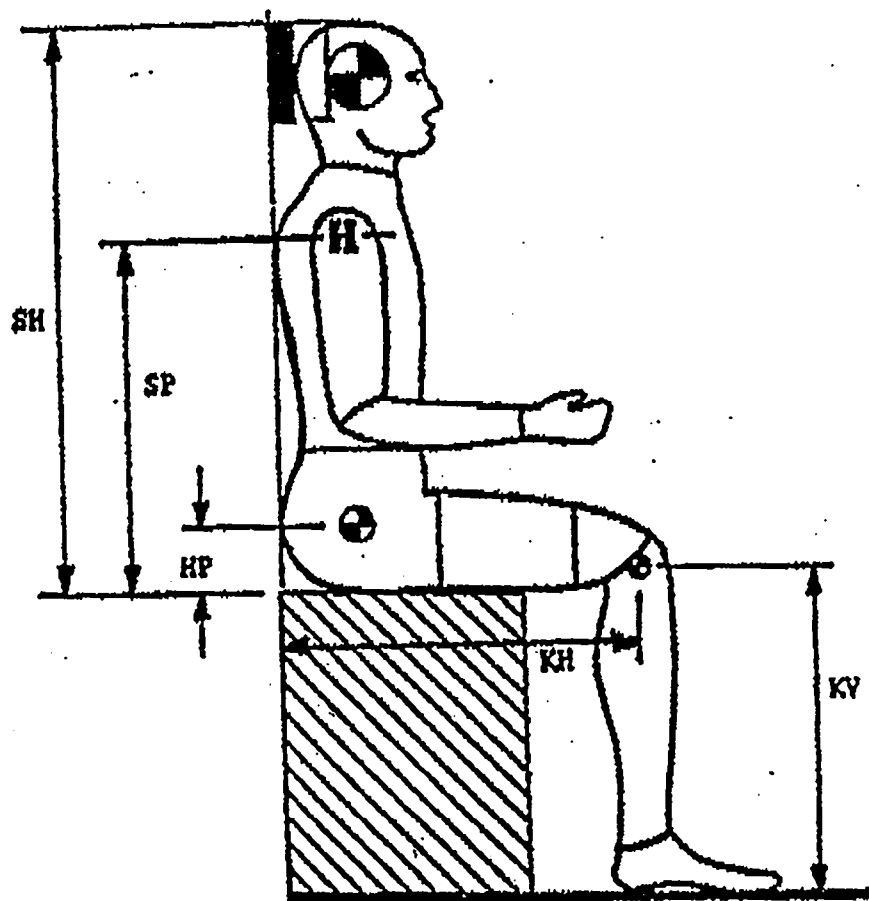
TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST—				
<u>Continued</u>				
h. Chordal Displacement				
Head Rotation Angle				
60°	Time	67.0 to 83.0ms	69.8	N/A
	Displ.	4.3 to 5.3 in.	4.8	N/A
30°	Time	85.4 to 104.6ms	90.5	N/A
	Displ.	2.1 to 3.1 in.	2.3	N/A
0°	Time	101.0 - 123.0ms	104.6	N/A
	Displ.	-.3 to 0.5 in.	0.1	N/A
3. ABDOMINAL COMP. TEST				
(Preload = 10 lbs)				
a. Force @ .5"		23.3 to 36.5 lb	32	N/A
b. Force @ .75"		36.7 to 49.8 lb	47	N/A
c. Force @ 1.0"		50 to 63 lbs.	62	N/A
d. Force @ 1.3"		73 to 88 lbs.	88	N/A
4. LUMBAR FLEXION TEST				
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. CHEST IMPACT TESTS				
a. High Speed				
(1) Probe Speed		21.78-22.22 fps	21.8	N/A
(2) Peak Deflection		1.7" maximum	1.7	N/A
(3) Peak Resistive Force		2250 lbs. max.	2169.3	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.	1233.5	N/A
(4) Internal Hysteresis		50 to 70%	54.8	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	1932.6	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	1877.2	N/A
(3) Time Above 1000#		1.7 as minimum	1.9	N/A

REMARKS:

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		2/12/91	N/A
VERIFICATION NUMBER FOR DUMMY*		2	N/A
SH - Seated Height	35.6 to 35.8"	35.6	N/A
SP - Shoulder Pivot Height	21.8 to 22.4"	22.0	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"	19.3	N/A
SW - Shoulder Width	17.8 to 18.4"	17.9	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.: 466

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		
1. HEAD DROP TEST--			
a. Peak Resultant Accel.	210 to 260G	216.1	N/A
b. Peak Lateral Acce.	-10G	-2.0	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	21.9	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	26.4	N/A
f. Pendulum Deceleration ($t_4 - t_3$)	-10ms	-9.5	N/A
g. Max. Head Rotation	63 to 73°	66.2	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	29.2
	Displ.	2.1 to 3.1"	2.6
60°	Time	40.3 to 51.7ms	46.3
	Displ.	4.3 to 5.3"	4.9
Maximum (61.4°)	Time	53.2 to 66.8ms	61.4
	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: Eric Callahan

TEST PARAMETER		SPECIFICATION	PRE-TEST (if required)	POST-TEST (if required)
2. NECK BENDING TEST-- <u>Continued</u>				
h. Chordal Displacement Head Rotation Angle				
60°	Time	67.0 to 83.0ms	71.5	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	2.3	N/A
0°	Time	101.0 - 123.0ms	105.1	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	24	N/A
b. Force @ .75"		36.7 to 49.8 lb	37	N/A
c. Force @ 1.0"		50 to 63 lbs.	53	N/A
d. Force @ 1.3"		73 to 88 lbs.	75	N/A
4. LUMBAR FLEXION TEST				
a. Force @ 20°		22 to 34 lbs.	28.8	N/A
b. Force @ 30°		34 to 46 lbs.	42.1	N/A
c. Force @ 40°		46 to 58 lbs.	53.4	N/A
d. Return Angle		12° maximum	8.8	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	1.4	N/A
(3) Peak Resistive Force		2250 lbs. max.	2129.2	N/A
(4) Internal Hysteresis		50 to 70%	60.3	N/A
b. Low Speed				
(1) Probe Speed		13.86-14.14fps	14.1	N/A
(2) Peak Deflection		1.1" maximum	1.0	N/A
(3) Peak Resistive Force		1450 lbs. max.	1349.8	N/A
(4) Internal Hysteresis		50 to 70%	57.3	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	2035.4	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	2308.1	N/A
(3) Time Above 1000#		1.7 as minimum	1.8	N/A

REMARKS:

PART 572 DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION TEST LOG SHEET

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

FY- 90 TEST PROGRAM DELIVERY ORDER NO.: 91045 (DATE: 11/19/90) NOTE: Separate Log Sheet is Required for Each GTE Test Dummy.

CRASH TEST															
USAGE		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	01	12/20/90		X	1	12/19/90	Pass			N/A				
2	91/Mazda/Protege/Sedan	02	1/17/91		X	1	12/19/90	Pass			N/A				
3	91/Volkswagen/Jetta	03	1/31/91	X		1	12/19/90	Fail			N/A				
4	91/Toyota/ 4 X 4 Pickup	04	2/13/91		X	2	2/12/91	Pass			N/A				
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 Corp. : CONTRACT NO.:DTNH22- 90 - D - 12121 ; DUMMY I.D. NO.: 466

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	VEHICLE	CRASH	DUMMY USAGE	PRE-TEST	STD.208	POST-TEST
USAGE	TEST VEHICLE	IN VEHICLE	VERIFICATION	FAILURE	VERIFICATION		
NO.	YEAR/MAKE/MODEL/BODY STYLE	NHTSA NO.	TEST DATE	DRIVER/PASS.	NO.	DATE	REMARKS:
1	91/Honda/Civic/DX	01	12/21/89	X	1	12/19/90	Pass
2	91/Mazda/Protege/Sedan	02	1/17/91	X	1	12/19/90	Pass
3	91/Volkswagon/Jetta	03	1/31/91	X	1	12/19/90	Fail
4	91/Toyota/ 4 X 4 Pickup	04	2/13/91	X	2	2/12/91	Fail
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			calibration	
	Serial #	Manufacturer	Last	Next	
Head X	EC09J	Endevco	10/90	04/91	
Y	ED15J	Endevco	10/90	04/91	
Z	EA45J	Endevco	10/90	04/91	
Chest X	AA20	Endevco	10/90	04/91	
Y	EA71	Endevco	10/90	04/91	
Z	DK21	Endevco	10/90	04/91	
Right Femur Load Cell	959	GSE	11/90	05/91	
Left Femur Load Cell	958	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	624	GSE	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 Last	Next
Head X Y Z	DK74	Endevco	10/90	04/90
	ED47	Endevco	10/90	04/90
	EH45	Endevco	10/90	04/90
Chest X Y Z	ED50	Endevco	10/90	04/90
	ED87	Endevco	10/90	04/90
	DR22	Endevco	10/90	04/90
Right Femur Load Cell Left Femur Load Cell *Neck Load Cell X Y Z	957	GSE	11/90	05/91
	956	GSE	11/90	05/91
	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
*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 Shoulder Belt Load Cells Spool-Out Potentiometer Belt Stretch Transducer	N/A	N/A	N/A	N/A
	211	Lebow	11/90	05/91
	661	Lebow	11/90	05/91
	N/A	N/A	N/A	N/A
	N/A	Buorns	PRIOR TO USE	PRIOR TO USE

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

VEHICLE ACCELEROMETERS

	Serial #	Manufacturer	calibration	
			Last	Next
Left Seat Rear Crossmem.	2260039	Kyowa	10/90	04/91
RT Rear Seat Crossmember	5220084	Kyowa	10/90	04/91
Top of Engine	DY97J	Endevco	10/90	04/91
Bottom of Engine	DM96J	Endevco	10/90	04/91
Left Disc Brake Caliper	ED70J	Endevco	10/90	04/91
Right Disc Brake Caliper	DW02J	Endevco	10/90	04/91
Instrument Panel	5220072	Kyowa	10/90	04/91
Center Rear Crossmember Z	1740026	Kyowa	10/90	04/91
Vehicle Rear Z	1740087	Kyowa	10/90	04/91

D-4

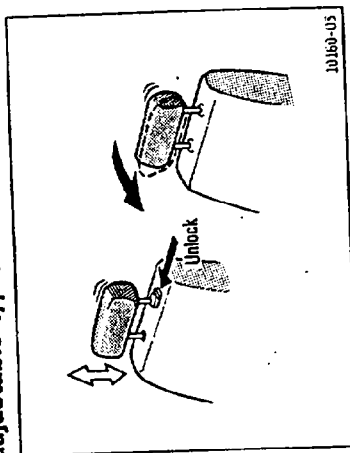
LABORATORY INSTRUMENTS

	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	10/90	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**

Headrests (vertically and rotationally adjustable type)



To raise the headrest, pull it up. To lower it, press the lock release button and push the headrest down. To move the headrest forward, pull on the top.

Pulling the top of the headrest as far as it can go will return it to the upright position.

The headrest is most effective when it is close to your head. Therefore, using a cushion on the seatback is not recommended.

CAUTION:

- Adjust the top of the headrest so that it is closest to the top of your ears.

Seat belts —

—Seat belt precautions

Toyota recommends that the driver and passengers in the vehicle be properly restrained at all times with the seat belts provided. Failure to do so could increase the chance of injury and/or the severity of injury in accidents.

Baby or small child. Use a child restraint system which fits your vehicle. See "Child restraint" for details.

Children. If they are too big for child restraint systems, they should sit in the seat and be restrained with the seat belts. Do not allow the child to stand up or kneel on the seat.

On models with rear seats, the children should sit in the rear seat and be restrained with the seat belts. According to accident statistics, children are safer when properly restrained in the rear seat than in the front seat.

On models without rear seats, the children should be restrained with the lap/shoulder belt. If the shoulder belt falls across the child's neck or face, move the seat fully backward so that the belt lays across the child's shoulder. In vehicles equipped with bench seats, if the shoulder belt cannot be positioned correctly, move the child to the center position and use the center lap belt.

Small-framed type seat belt. If a small-framed person has a seat belt that is slightly closer to the shoulder (neck). On models with a seat belt that is fully extended.

Pregnant women. Use of a seat belt is recommended. Pregnant women should be seated in the rear seat and be restrained with the seat belts. Do not allow the child to stand up or kneel on the seat.

Injured persons. Do not drive with a seat belt that is damaged.

CAUTION:

Persons who are properly restrained with a seat belt when involved in a collision may suffer serious injury or death. When using a seat belt, follow the following instructions:

- Use the seat belt at all times.
- Do not drink alcohol and drive.
- Do not use drugs and drive.
- Do not use a child's seat belt.

Small-framed person or youth in a 3-point type seat belt. On models with a bench seat, have a small-framed person or youth sit slightly closer to the center of the vehicle (so the shoulder belt does not cross over the neck). On models with separate seats, move the seat fully backward.

Pregnant woman. Toyota recommends the use of a seat belt. Ask your doctor for specific recommendations. The lap belt should be worn securely and as low as possible over the hips and not on the waist.

Injured person. Toyota recommends the use of a seat belt. Depending on the injury, however, first check with your doctor.

CAUTION: ~~~~~

Persons should ride in their seats properly wearing their seat belts whenever the vehicle is moving. Otherwise, they are much more likely to suffer serious bodily injury in the event of sudden braking or a collision.

When using the seat belts, observe the following:

- Use the belt for only one person at a time. Do not use a single belt for two or more people—even children.

- After inserting the tab, make sure that the connection is secure and the belt is not twisted.

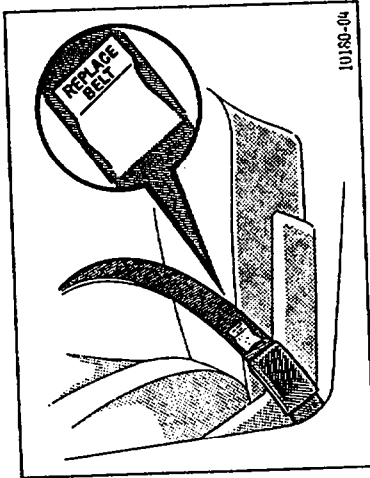
- Avoid reclining the seatbacks too much. The seat belts provide maximum protection when the seatbacks are in the upright position. (See the seat adjustment instructions.)

- Be careful not to damage the belt webbing or hardware, and take care that they do not get caught or pinched in the seat or doors.

- Inspect the belt system periodically. Check for cuts, frays, and loose parts. Damaged parts should be replaced. Do not disassemble or modify the system.

- Keep the belts clean and dry. If they need cleaning, use a mild soap solution or lukewarm water. Never use bleach, dye, or abrasive cleaners—they may severely weaken the belts.

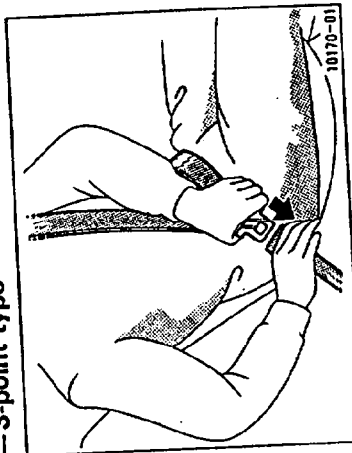
- Replace the belt assembly if it has been used in a severe impact. The entire assembly should be replaced even if damage is not obvious.



- Replace the seat belt if the warning label under the sleeve can be seen. The warning label, "REPLACE BELT", will appear if the belt receives a severe impact or other force.

~~~~~

### -3-point type

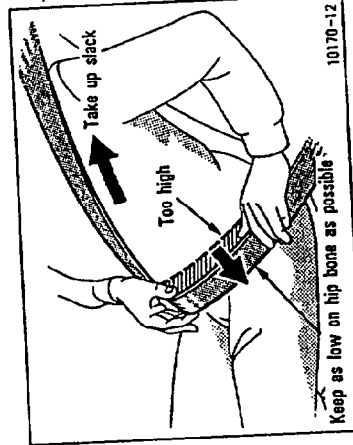


Adjust the seat as needed and sit up straight and well back in the seat. To fasten your belt, pull it out of the retractor and insert the tab into the buckle.

You will hear a click when the tab locks into the buckle.

The seat belt length automatically adjusts to your size and the seat position.

The retractor will lock the belt during a sudden stop or on impact. At other times you can move around freely.



Adjust the position of the lap and shoulder belts.

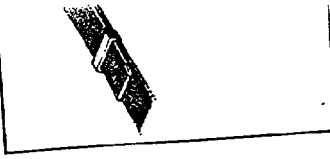
Position the lap belt as low as possible on your hips—not on your waist, then adjust it to a snug fit by pulling the shoulder portion upward through the latch plate.

**CAUTION:**

- High-positioned lap belts and loose-fitting shoulder belts both could increase the chance of injury due to sliding under the lap belt during an accident.

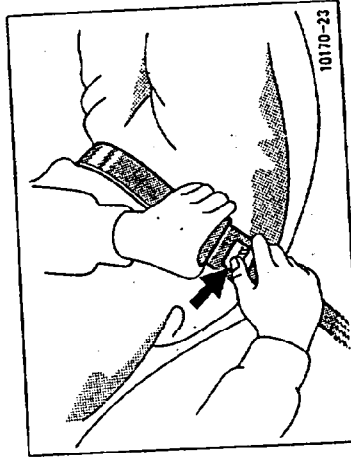
- For your safety, do not place the shoulder belt under your arm.

### -2-point type



Sit up straight. To fasten your buckle.

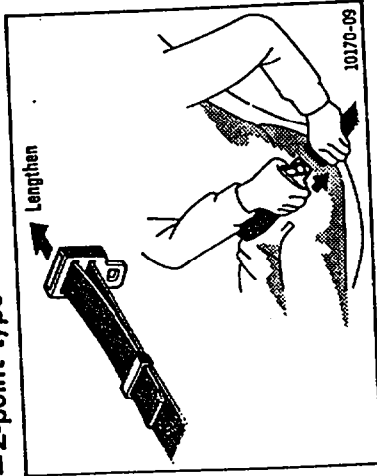
You will hear a click when the tab locks into the buckle. If the belt is too loose, pull the tab at a 90-degree angle to the tab.



To release the belt, press the buckle-release button and allow the belt to retract.

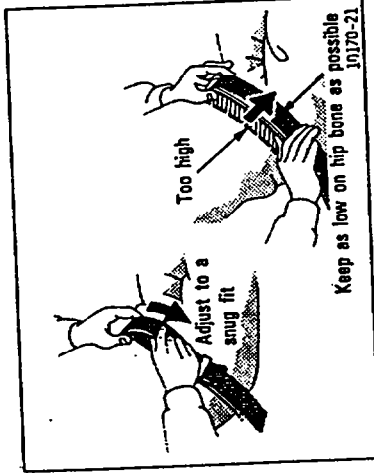
If the belt does not smoothly retract, pull it out and check for kinks or twists. Then make sure that it remains untwisted as it retracts.

-2-point type



Sit up straight and well back in the seat. To fasten your belt, insert the tab into the buckle.

You will hear a click when the tab locks into the buckle. If the belt is not long enough for you, hold the tab at a right angle to the belt and pull on the tab.

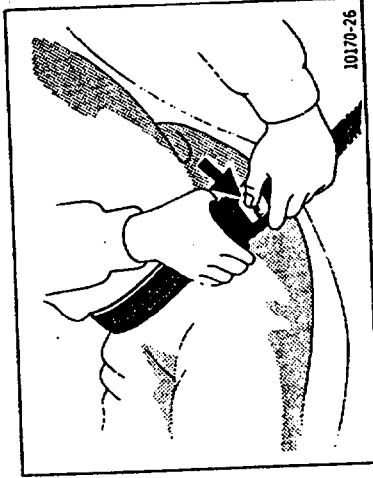


Remove excess length of the belt and adjust the belt position.

To shorten the belt, pull the free end of the belt.

Position the lap belt as low as possible on your hips—not on your waist, then adjust it to a snug fit.

**CAUTION:** High-positioned lap belts could increase the chance of injury due to sliding under the lap belt during an accident.



To release the belt, press the buckle-release button.

Child  
 —Chi.  
 Toyota  
 restr  
 enoug.  
 The la  
 most  
 use of  
 CAU:  
 For c  
 acci  
 mus  
 Hol  
 sub:  
 syst  
 a pc  
 wet  
 unt  
 illu.

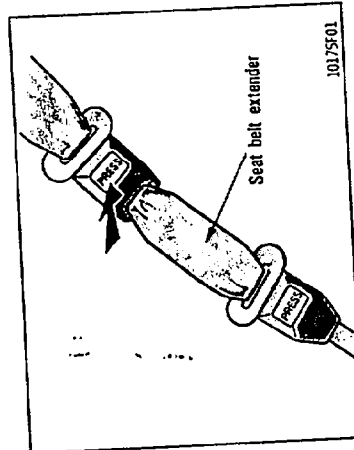
### —Seat belt extender

If your seat belt cannot be fastened securely because it is not long enough, a personalized seat belt extender is available from your Toyota dealer free of charge.

Please contact your local Toyota dealer so that the dealer can order the proper required length for the extender. Bring the heaviest coat you expect to wear for proper measurement and selection of length. Additional ordering information is available at your Toyota dealer.

**CAUTION:** When using the seat belt extender, observe the following. Failure to follow these instructions could result in less effectiveness of the seat belt restraint system in case of vehicle accident, increasing the chance of personal injury.

- Never use the seat belt extender if you can fasten the seat belt without it.
- Remember that the extender provided for you may not be safe when used on a different vehicle, or for another person and at different seating position than specified.



To connect the extender to the seat belt, insert the tab into the seat belt buckle so that the buckle-release buttons of the extender and the seat belt are located on the same side as shown.

You will hear a click when the tab locks into the buckle.

When releasing the seat belt, press on the buckle-release button on the extender, not on the seat belt. This helps prevent damage to the vehicle interior and extender itself.

When not in use, remove the extender and store in the vehicle for future use.

**CAUTION:** After inserting the tab, make sure that the connection is secure and the seat belt extender is not twisted.

## Child restraint—

### —Child restraint precautions

Toyota strongly urges the use of child restraint systems for children small enough for the child restraint system.

The laws of all fifty states in the U.S.A. and most provinces in Canada now require the use of child restraint system.

**CAUTION:** For effective protection in automobile accidents and sudden stops, children must not be transported unrestrained. Holding a child in your arms is not a substitute for a child restraint system. In an accident, a child held in a person's arms can be crushed between the vehicle's interior and an unrestrained person.

### —Child restraint system

A child restraint system for a small child or baby must be restrained on the seat with the lap portion of the lap/shoulder belt.

The child restraint system should conform to the size of the child and properly fit the vehicle seat. For a higher degree of safety, the child restraint system should be installed in the rear seat if your vehicle is equipped with rear seats. According to accident statistics, children are safer when properly restrained in the rear seat than in the front seat.

When installing a child restraint system, you must use a locking clip.

When installing a child restraint system, refer to the instructions provided by the manufacturer of the system and follow the directions listed under the following illustrations.

Your vehicle is provided with anchors for securing the top strap of a child restraint system. The anchor nuts are welded beneath the sheet metal to permit installation of an anchor bracket for a child restraint system.

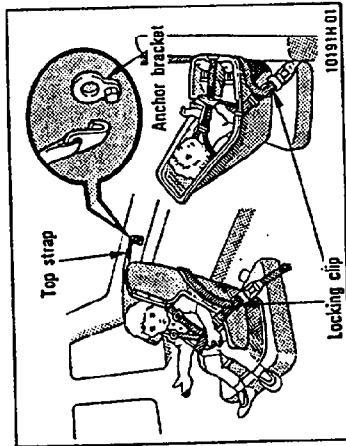
To install an anchor bracket, use an 8 mm X 30 mm X 1.25 mm coarse thread metric bolt. Note that the bolts accompanying many child restraint systems are not metric. You can damage the anchor nuts on your vehicle if you force bolts with different thread into the anchor nuts.

If any of the necessary parts does not come with your child restraint system, you can purchase it from your Toyota dealer. Details are as follows:

- Bolt (Part No. 91511-60830)
- Locking clip (Part No. 73119-22010)

**CAUTION:** After installation, make sure the child restraint system is secure in place. If the child restraint system is not restrained securely, it may cause injury to the child in case of vehicle accident and sudden stops.

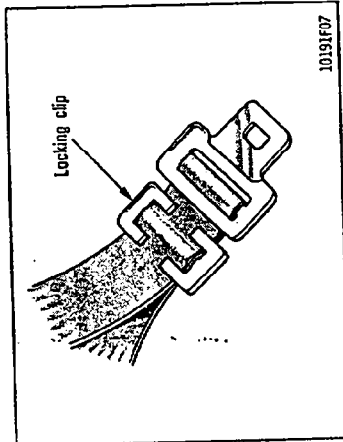
When not using the child restraint system, keep it secured with the seat belt or remove it and place it somewhere other than in the vehicle to prevent injury to passengers in event of a sudden stop or accident.



#### INSTALLATION ON REAR SEAT (Xtra-cab models)

If your child restraint system requires the use of a top strap, install the system on the right side rear seat.

1. Fasten the lap and shoulder belt over the child restraint system.
2. Take up the slack in the lap portion of the belt.
3. Holding the tab in that position, release the buckle.
4. Install a locking clip near the tab of the lap and shoulder belt. (See instructions in the next column.)
5. Buckle the belt again.

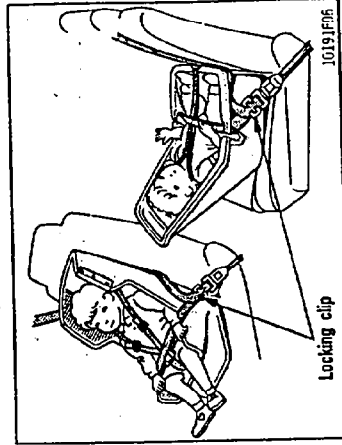


6. Place the shoulder portion of the belt between the vehicle seatback and the child restraint system.

To use a top strap, latch the hook onto the anchor bracket and tighten the top strap.

To install the locking clip, insert the lap and shoulder webbing through the recesses of the locking clip.

Always remove the locking clip when the child restraint system is not installed.



#### INSTALLATION ON FRONT SEAT (Xtra-cab models)

If your child restraint system requires the use of a top strap, install the system on the right side rear seat.

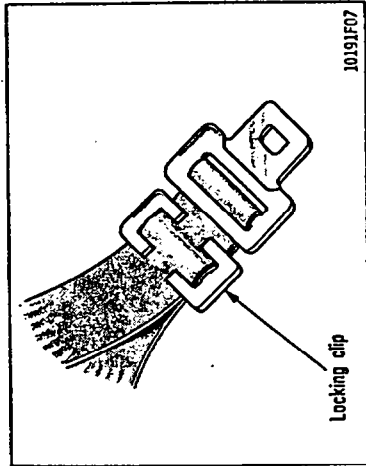
1. Fasten the lap and shoulder belt over the child restraint system.
2. Take up the slack in the lap portion of the belt.
3. Holding the tab in that position, release the buckle.
4. Install a locking clip near the tab of the lap and shoulder belt. (See instructions in the next column.)
5. Buckle the belt again. If necessary, slide the seat forward and remove any slack.

Loc.

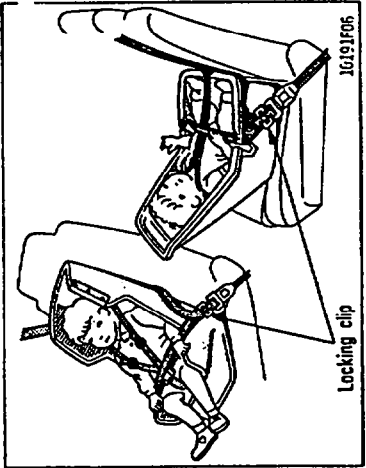
6. Place the shoulder portion of the belt between the vehicle seatback and the child restraint system.



1. Fasten the lap and shoulder belt over the right side of the vehicle seat. If necessary, slide the seat forward and remove any slack.

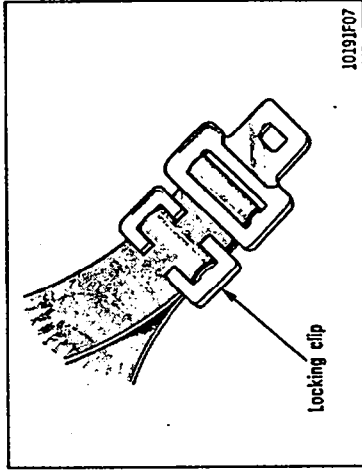


6. Place the shoulder portion of the belt between the vehicle seatback and the child restraint system.  
To install the locking clip, insert the lap and shoulder webbing through the recesses of the locking clip.  
Always remove the locking clip when the child restraint system is not installed.



#### INSTALLATION ON PASSENGER'S SEAT (normal-cab models)

1. Fasten the lap and shoulder belt over the child restraint system.
2. Take up the slack in the lap portion of the belt.
3. Holding the tab in that position, release the buckle.
4. Install a locking clip near the tab of the lap and shoulder belt. (See instructions in the next column.)
5. Buckle the belt again. If necessary, slide the seat forward and remove any slack.
6. Place the shoulder portion of the belt between the vehicle seatback and the child restraint system.

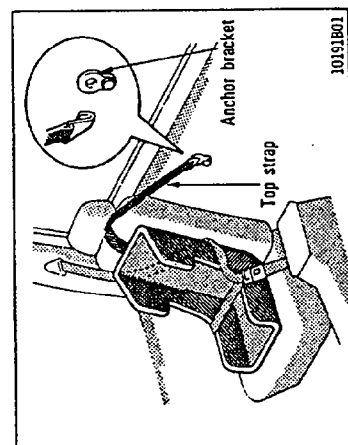
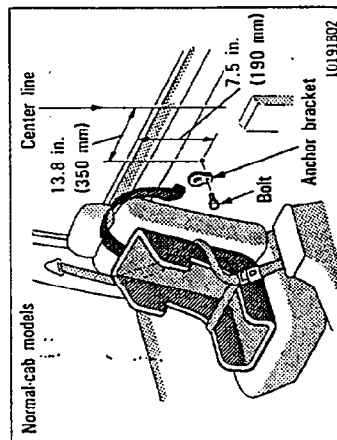
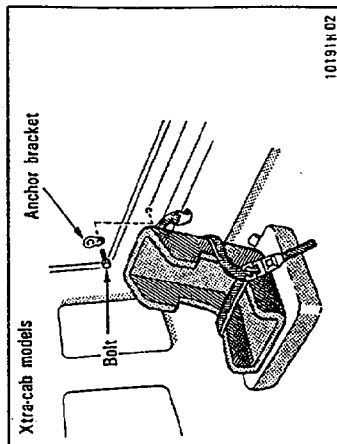


To install the locking clip, insert the lap and shoulder webbing through the recesses of the locking clip.  
Always remove the locking clip when the child restraint system is not installed.

Tilt s

Unlock  
↑

To ch  
the  
releas  
the d  
The st  
est pc  
pulled  
CAU  
• Ti  
• Al  
tr  
st  
mm



### TOP STRAP ANCHOR AND LOCATION —

On the back panel behind the seat

- Using the illustration as a guide, run your fingers across the back panel trim to locate the hollow.
- Make a hole in the hollow. The anchor hole is plugged. (If a back panel trim is not installed, a plug is visible.)
- Remove the plug and tighten down the anchor bracket for your child restraint system with a bolt.

If you remove the anchor bracket when the child restraint system is necessary no longer, replace the bolt in the hole to prevent entry of exhaust emissions, water or dirt.

If your child restraint system requires the use of a top strap, latch the hook onto the anchor bracket and tighten the top strap.