

V2074
REPORT NO.: 208-MGA-94-004
212-MGA-94-004
301-MGA-94-004

VEHICLE SAFETY COMPLIANCE TESTING

FOR

FMVSS 208, OCCUPANT CRASH PROTECTION

FMVSS 212, WINDSHIELD MOUNTING

FMVSS 301, FUEL SYSTEM INTEGRITY

FMVSS 219, WINDSHEILD INTRUSION (PARTIAL)

TOYOTA MOTOR CORPORATION
1994 Toyota Previa Van
NHTSA NO. CR5103

MGA PROVING GROUNDS
5000 WARREN ROAD
BURLINGTON, WI 53105



Test Date: May 25, 1994

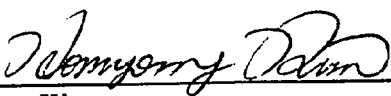
Report Date: November 15, 1994

FINAL REPORT

Prepared For:

**U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
ENFORCEMENT
OFFICE OF VEHICLE SAFETY COMPLIANCE
MAIL CODE: NEF-30
400 SEVENTH STREET, SW ROOM 6115
WASHINGTON, D.C. 20590**

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

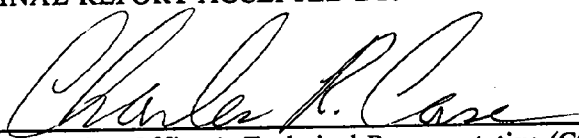
PREPARED BY: 
Homyoung Kim
MGA Research Corporation

DATE: 06/22/94

APPROVED BY: 
John Fleck
MGA Research Corporation

DATE: 11/16/94

FINAL REPORT ACCEPTED BY:


Contracting Officer's Technical Representative (COTR)
NHTSA, Office of Vehicle Safety Compliance

DATE: 12/2/94

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. 208-MGA-94-004 212-MGA-94-004 301-MGA-94-004		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Final Report for FMVSS 208 Compliance Testing of a 1994 Toyota Previa Van NHTSA NO. CR5103				5. Report Date November 15, 1994	
				6. Performing Organization Code MGA	
7. Author(s) Homyoung Kim				8. Performing Organization Report No. MGA-DOT-208-04	
9. Performing Organization Name and Address MGA Research Corporation 5000 Warren Road Burlington, WI 53105				10. Work Unit No.	
				11. Contract or Grant No. DTNH22-93-D-21089	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance (Mail Code: NEF-30) 400 Seventh St., S.W., Room 6115 Washington, D.C. 20590				13. Type of Report and Period Covered Final Report April - June 1994	
				14. Sponsoring Agency Code NEF-30	
15. Supplementary Notes					
16. Abstract Compliance tests were conducted on the subject 1994 Toyota Previa Van in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-208-09 for the determination of FMVSS 208 compliance. Test failures identified were as follows: None					
17. Key Words Frontal Impact 30 mph Vehicle Safety Compliance Testing: FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Mounting" FMVSS 219 (partial), "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity"				18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division, Room 5108 (NAD-52), 400 Seventh Street, S.W. Washington, D.C. 20590 Telephone No. (202) 366-4946 Attn: Robert Hornickle	
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 126	
				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 208, 212, 219 (Partial), & 301	3-1
4	Occupant, Vehicle, and Camera Information	4-1
APPENDIX A	Photographs	
APPENDIX B	Data Plots	
APPENDIX C	Manufacturer's Vehicle Information	

LIST OF TABLES

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
1	Crash Test Summary	2-4
2	General Test and Vehicle Parameter Data	2-5
3	Post Impact Data	2-7
4	Accident Investigation Division Data	2-8
5	Post Test Airbag Data	2-9
6	Vehicle Accelerometer Location and Data Summary	2-10
7	Report of Vehicle Condition at the Completion of Testing	2-11
8	FMVSS 208 Occupant Injury Criteria	3-2
9	Dummy Kinematic Summary	3-3
10	FMVSS 208 Seat Belt Comfort and Convenience Test Summary	3-4
11	FMVSS 208 Equipment Data	3-7
12	FMVSS 212 "Windshield Mounting" Data Summary	3-9
13	FMVSS 219 "Windshield Zone Intrusion" Data Summary	3-10
14	Fuel System Data	3-11
15	FMVSS 301 Post Impact Test Data	3-12
16	FMVSS 301 Static Rollover Test Data	3-13
17	Seat and Steering Column Positioning Data	4-2
18	Dummy Measurement Data for Front Seat Occupants	4-4
19	Camera Locations	4-8

LIST OF FIGURES

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE NO.</u>
1	Dummy Measurement Locations for Front Seat Occupants	4-3
2	Vehicle Target Locations	4-6
3	Camera Positions	4-7

SECTION 1
PURPOSE AND TEST PROCEDURE

PURPOSE

This 30 mph flat frontal barrier impact test is part of the Federal Motor Vehicle Safety Standard (FMVSS) 208, 212, 219 (partial), and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by the MGA Research Corporation (MGA) under Contract No. DTNH22-93-D-21089. The purpose of this test was to determine whether the subject vehicle, a 1994 Toyota Previa Van, NHTSA No. CR5103, meets the performance requirements of FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Mounting"; FMVSS 219 (partial), "Windshield Zone Intrusion"; and FMVSS 301, "Fuel System Integrity," in the flat frontal barrier impact mode.

TEST PROCEDURE

This test was conducted in accordance with NHTSA's Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-208-09 dated March 15, 1993. Data was obtained relative to FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Mounting"; FMVSS 219 (partial), "Windshield Zone Intrusion"; and FMVSS 301, "Fuel System Integrity," performance.

The test vehicle was instrumented with seven (7) accelerometers to measure longitudinal axis accelerations and one (1) accelerometer to measure vertical axis acceleration. The vehicle's specified impact velocity range was 28.9 to 29.9 mph. The vehicle impacted a fixed flat barrier of which face was covered with a sheet of 3/4 inch thick plywood.

The test vehicle contained two (2) Part 572 B 50th percentile adult male anthropomorphic test devices (dummies). The dummies were positioned in the front outboard designated seating positions according to the dummy placement procedures specified in Appendix B of the Laboratory Test Procedure.

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

The twenty-four (24) data channels were multiplexed and recorded on three IBM PC compatible computers with Metrobyte DAS-16F A/D converter boards. The data was digitally sampled at 8170 samples per second and processed per Section 11.13 through 11.15 of the Laboratory Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and fourteen (14) high-speed motion picture cameras. The pre-test and post-test conditions were recorded by the real-time motion picture camera.

The vehicle and occupant data are summarized in Section 2. The FMVSS 208, 212, 219 (partial) and 301 data are presented in Section 3. The vehicle, occupant, and camera measurements are presented in Section 4. Appendix A contains the still photographic prints. Appendix B contains the dummy and vehicle data plots. Appendix C contains the manufacturer's vehicle information.

SECTION 2
SUMMARY OF FRONTAL BARRIER IMPACT TEST

TEST RESULTS SUMMARY

This flat frontal barrier test was conducted at MGA Research Corporation on May 25, 1994.

The test vehicle, a 1994 Toyota Previa Van, NHTSA No. CR5103, appeared to comply with the performance requirements of FMVSS 208, 212, 219 (partial), and 301 in the flat frontal barrier impact mode. The Head Injury Criteria (HIC) calculations were less than 1000, the chest resultant accelerations did not exceed 60 g's, and the compressive forces transmitted through the upper legs did not exceed 2,250 pounds as measured by Part 572 B dummies seated in the front outboard designated seating positions. The vehicle's restraint system met the applicable comfort and convenience requirements. The windshield periphery retention on each side of the vehicle centerline was greater than 50 percent. There was not penetration into any portion of the windshield. No fluid spilled from the vehicle's fuel system following the impact or during the static rollover test.

The test vehicle was equipped with an airbag and a Type 2 seat belt in the front outboard designated seating positions. Both dummies were restrained only by the airbag during the test. The vehicle's test weight was 4207 pounds. The vehicle's impact speed was 29.4 mph. The vehicle's maximum static crush was 11.5 inches.

The driver's HIC was 362. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 56.6 g's. The driver's left and right femur maximum compressive forces were 1664 pounds and 2102 pounds, respectively.

The right front passenger's HIC was 217. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 34.1 g's. The right front passenger's left and right femur maximum compressive forces were 1159 pounds and 1406 pounds, respectively.

There was no loss of windshield periphery retention and no penetration through the windshield.

Following the impact, no fluid spilled from the vehicle's fuel system prior to the static rollover test or during any portion of the static rollover test.

TEST NOTES

The high-speed camera No. 2 (Left Vehicle Crush View) did not run during the test due to a failure of the power supply.

TABLE 1 CRASH TEST SUMMARY

Vehicle Yr/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 Test Type: Frontal Barrier Impact

Test Date: 05/25/94 Time: 16:49 Temp: 70° F

Vehicle Test Weight: 4207 lbs. Vehicle/Barrier Impact Angle: 0°

Impact Velocity: 29.4 mph Maximum Static Crush: 11.5 inches

Vehicle Rebound: 28.1 inches

Dummies:	Driver	Passenger
Dummy Type	<u>Part 572B</u>	<u>Part 572B</u>
Serial Number	<u>465</u>	<u>466</u>
Restraint System	<u>Airbag</u>	<u>Airbag</u>
No. of Data Channels	<u>8</u>	<u>8</u>

Number of Cameras: 1 Real Time
14 High Speed

Door Opening Data: Left Front: Easy
Right Front: Easy

Front Seat(s) Data:	Driver	Passenger
Seat Track Failure	<u>None</u>	<u>None</u>
Seat Back Failure	<u>None</u>	<u>None</u>

Visible Dummy Contact Points:	Driver	Passenger
Head	<u>Airbag</u>	<u>Airbag</u>
Chest	<u>Airbag</u>	<u>Airbag</u>
Left Knee	<u>Instrument Panel</u>	<u>Instrument Panel</u>
Right Knee	<u>Instrument Panel</u>	<u>Instrument Panel</u>

TABLE 2 GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Yr/Make/Model/Body Style: 1994/Toyota/Previa/Van

NHTSA No: CR5103 VIN: JT3AC11R5R1129989 Body Color: Evergreen Pearl

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

 Gas; Diesel; Turbocharged

 Longitudinal; Transverse

Transmission: 4 Speed; Manual; Automatic; Overdrive

Final Drive: Front Wheel; Rear Wheel; Four Wheel

Major Option: A/C; P/S; P/B; P/wdo; P/door locks;

 P/seats; Tilt Wheel; Anti-skid Brakes; Cruise Control; Other

Date Received: 03/22/94; Odometer Reading: 71 miles

Dealer's Name/Address: Toyota Motor Distributors
Chicago Region
2350 Sequoia Drive
Aurora, IL 60506

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured By: Toyota Motor Corporation

Date of Manufacture: 12/93; VIN: JT3AC11R5R1129989

GVWR: 5310 lbs; GAWR Front: 2745 lbs. GAWR Rear: 2745 lbs.

DATA FROM TIRE PLACARD:

Tire Pressure with maximum capacity vehicle load: Front 35 Psi; Rear 35 Psi

Recommended Tire Size: P215/65R15

Recommended Cold Tire Pressure: Front 35 Psi; Rear 35 Psi

Tires on Vehicle: P215/65R15; Manufacturer: Toyoi

Type of Spare Tire: Standard

Number of Occupants: 2 Front; 2 Rear; 3 3rd Seat; 7 TOTAL

Type of Front Seats: Bucket; Bench; Split Bench

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

TABLE 2 GENERAL TEST AND VEHICLE PARAMETER DATA (Cont'd)

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

Right Front = 997 lbs Right Rear = 868 lbs
Left Front = 1012 lbs Left Rear = 882 lbs
TOTAL FRONT WEIGHT = 2009 lbs (53.4% of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1750 lbs (46.6% of Total Vehicle Weight)
TOTAL UNLOADED DELIVERED WEIGHT (UDW) = 3759 lbs

CALCULATION FOR TARGET TEST WEIGHT:

UDW (Unloaded Delivered Weight) = 3759 lbs
VCW*(Vehicle Capacity Weight) = 1190 lbs
DSC (Designated Seating Capacity) = 7
RCLW**(Rated Cargo/Luggage Weight) = VCW - 150 (DSC) = 1190 - 150 (7) = 140 lbs
Target Test Weight = UDW + RCLW + (2 Dummies x Dummy Weight)
Target Test Weight = 3759 + 140 + 328 = 4227 lbs

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND CARGO WEIGHT:

Right Front = 1124 lbs Right Rear = 976 lbs
Left Front = 1088 lbs Left Rear = 1019 lbs
TOTAL FRONT WEIGHT = 2212 lbs (52.6% of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1995 lbs (47.4% of Total Vehicle Weight)
TOTAL TEST WEIGHT = 4207 lbs
Weight of ballast secured in vehicle = 116 lbs
Vehicle components removed to meet target weight: Rear seat was removed for
instrumentation installation

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 29.2 LF 28.9 RR 30.6 LR 30.6
Fully Loaded Attitude: RF 28.4 LF 28.1 RR 29.5 LR 29.3
Test Attitude: RF 28.5 LF 28.3 RR 29.8 LR 29.6
Wheel Base: 112.6 in; C.G. = 53.4 in rearward of front wheel centerline

* VCW was specified in the label on the glove box lid.

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

TABLE 3 POST-IMPACT DATA

Type of Test: Frontal Barrier Impact Impact Angle: 0°
Test Date: 05/25/94 Time: 16:49 Temperature: 70° F
Vehicle NHTSA No.: CR5103 VIN: JT3AC11R5R1129989

BARRIER IMPACT VELOCITY

Required Impact Velocity Range: 28.9 to 29.9 mph
Impact Velocity: Primary = 29.4 mph; Secondary = 29.3 mph
Distance From Front Bumper to Barrier Face When
Entering Speed Trap: 55.1 inches
Exiting Speed Trap: 15.7 inches

VEHICLE STATIC CRUSH AND REBOUND (inches):

Vehicle Length:	Pre-test	= R <u>178.2</u>	C _L <u>187.0</u>	L <u>178.9</u>
	Post-test	= R <u>171.1</u>	C _L <u>176.1</u>	L <u>169.2</u>
	Crush	= R <u>7.1</u>	C _L <u>10.9</u>	L <u>9.7</u>
	Average	= <u>9.2</u>		

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

R 28.1 in C_L 25.1 in L 27.9 in

TABLE 4 ACCIDENT INVESTIGATION DIVISION DATA

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van
Veh. NHTSA No.: CR5103 ; VIN: JT3AC11R5R1129989
Build Date: 12/93 ; Test Date: 05/25/94
Veh. Size Category: Van ; Test Weight: 4207 lbs
Veh. Wheelbase: 112.6 in; Front Overhang: 32.5 in; Overall Width: 71.3 in

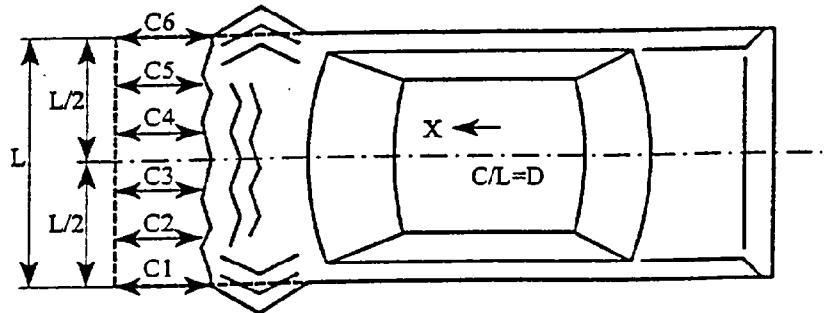
ACCELEROMETER DATA:

Location: As per measurements on pages 2-10
Calibration Procedure: As per MGA Calibration Procedure
Linearity: >99.9% ; Integration Algorithm: Trapezoidal

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE:

Impact Mode: Frontal Barrier

Crush Depth C1 = 9.7 inches
Dimensions: C2 = 9.0 inches
C3 = 10.1 inches
C4 = 11.5 inches
C5 = 11.3 inches
C6 = 7.1 inches



Midpoint of D = Vehicle Longitudinal Centerline
Damage:

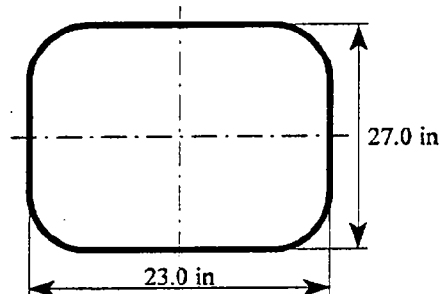
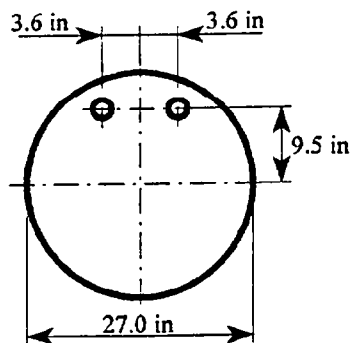
Length of L = 63.8 inches
Damaged Region:

TABLE 5 POST TEST AIRBAG DATA

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

NHTSA No: CR5103; Test Date: 05/25/94; Technician: Homyoung Kim

- A. No of Vent Holes: Driver 2; Passenger 0
- B. Size of Vent Holes: Driver 1.5 in Dia; Passenger N/A
- C. Total Vent Area: Driver 3.5 in²; Passenger 0
- D. Deflated Airbag Length and Width Dimensions or, if Round, Diameter
 Driver; Length in; Width in; Diameter 27.0 in
 Passenger; Length 27.0 in; Width 23.0 in; Diameter in
- E. Is the Airbag Tethered?
 Driver; Yes; X No; if yes, record length of tether N/A in
 Passenger; Yes; X No; if yes, record length of tether N/A in

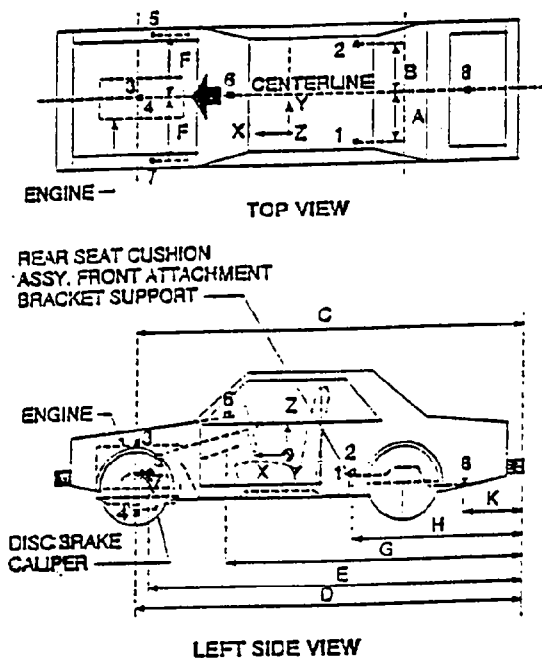


- F. Part Numbers and Manufacture Name of Airbag and Gas Generator
 Driver; Mfr N/A; Airbag 45165-28010; Gen N/A
 Passenger; Mfr N/A; Airbag 73970-28010-A; Gen 50540-28010

TABLE 6 VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103; Test Date: 05/25/94



ACCELEROMETER LOCATION (inches)		
	PRE-TEST	POST-TEST
A	29.1	29.1
B	20.5	20.5
C	116.0	116.0
D	119.3	119.3
E	146.0	147.5
F	26.0	27.2
G	147.1	147.1
H	89.5	89.5
K	9.5	9.5

ACCELEROMETER DATA SUMMARY					
No.	DESCRIPTION	MAXIMUM (g's)	TIME (msec)	MINIMUM (g's)	TIME (msec)
1	Left Rear Seat Crossmember	7.7	16	-45.2	11
2	Right Rear Seat Crossmember	11.9	16	-47.8	11
3	Top of Engine Block	3.5	95	-50.3	33
4	Bottom of Engine	4.3	125	-39.2	34
5	Right Disc Brake Caliper	14.2	71	-53.5	43
6	Instrument Panel	25.5	95	-79.0	50
7	Left Disc Brake Caliper	9.6	77	-42.6	49
8	Trunk*	28.1	21	-31.4	15

* The values appeared too high.

TABLE 7 REPORT OF VEHICLE CONDITION AT THE COMPLETION OF TESTING

Contract Number: DTNH22-93-D-21089

From: MGA Research Corporation
5000 Warren Road
Burlington, WI 53105

To: Mr. Charles Case, COTR
Office of Vehicle Safety Compliance

The following vehicle has been subjected to testing for FMVSS 208. The vehicle was inspected upon arrival at the laboratory for the test and found to contain all of the equipment listed below. The vehicle was again inspected after the above test had been conducted, and all changes were noted below. The final condition of the vehicle was also noted in detail.

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 Body Color: Evergreen Pearl

VIN: JT3AC11R5R1129989 Cost: \$25,918.00

Odometer: Arrival Date: 3/22/94 Reading: 71 miles

Completion Date: 5/25/94 Reading: 81 miles

Engine: 4 Cylinders; 2.4 Liters; X Gas; Diesel

Transmission: 4 Speed; Manual; X Automatic

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

Tire Size: P215/65R15; Manufacturer: Toyoi

Air Conditioner	<u>Yes</u>	Console	<u>No</u>	Brakes	<u>Power</u>
Tinted Glass	<u>Yes</u>	Tachometer	<u>No</u>	Front	<u>Disc</u>
Power Steering	<u>Yes</u>	Cruise Control	<u>No</u>	Rear	<u>Drum</u>
Power Windows	<u>Yes</u>	Rear Window Def.	<u>Yes</u>	Front Seats	<u>Manual</u>
Power Door Locks	<u>Yes</u>	Sun/Moon Roof	<u>No</u>	Seat Type	Front <u>Bucket</u>
Radio	<u>Yes</u>	T-Top	<u>No</u>		Mid <u>Bench</u>
Clock	<u>Yes</u>	Tilt Steering Wheel	<u>Yes</u>		Rear <u>Split Bench</u>
Roof Rack	<u>No</u>	Other Options:	<u>No</u>	No. of Seats	<u>5</u>

TABLE 7 REPORT OF VEHICLE CONDITION AT THE COMPLETION OF TESTING, (Cont'd)

Equipment that is no longer on the vehicle as noted above:

Rear Seat

Rear Floor Carpet

Explanation:

Items removed to allow installation of data acquisition system and to reduce test weight.

Vehicle Condition: The vehicle was subjected to a 30 mph frontal crash test. There is severe structural damage on the front body. Various interior and exterior portions of the vehicle have been painted and have had holes drilled to facilitate attachment of instrumentation. Various body parts have been removed. Stoddard solvent replaced the fuel in the fuel system and engine. THE VEHICLE IS FOR SALVAGE ONLY AND IS NOT TO BE REPAIRED FOR HIGHWAY USE.

SECTION 3
SUMMARY OF RESULTS FOR FMVSS 208
212, 219 (PARTIAL), AND 301

TABLE 8 FMVSS 208 OCCUPANT INJURY CRITERIA

Veh. Yr./Make/Model/Body Style: 1994/Toyota/Previa/Van

Veh. NHTSA No.: CR5103 Test Date: 05/25/94

MAXIMUM ACCELERATION VALUES: (g's)	DRIVER DUMMY #465	PASSENGER DUMMY #466
Head Channel X	-54.4	-68.1
Head Channel Y	-19.2	-28.2
Head Channel Z	26.4	33.2
HEAD RESULTANT	57.3	69.9
Chest Channel X	-57.0	-31.4
Chest Channel Y	-13.6	-10.8
Chest Channel Z	19.2	20.2
CHEST RESULTANT	58.4	35.3

HEAD INJURY CRITERIA (HIC) VALUES:

HIC	362	217
t_1 = (msec)	65.5	163.9
t_2 = (msec)	95.1	174.5

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

CHEST INJURY CRITERIA (CLIP) VALUES: (g's)

CLIP	56.6	34.1
t^1 = (msec)	78.5	80.7
t^2 = (msec)	81.5	83.7

**MAX. COMPRESSIVE FEMUR FORCES:
(lbs)**

Right Side	2102	1406
Left Side	1664	1159

TABLE 9 DUMMY KINEMATIC SUMMARY

DRIVER DUMMY

Upon impact, the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head and chest impacted the airbag with the dummy's head rotating rearward. The driver dummy was restrained by the airbag. The dummy rebounded rearward into the seat back with the dummy's head contacting the head restraint. The driver dummy came to rest in the seat.

RIGHT FRONT PASSENGER DUMMY

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

TABLE 10 FMVSS 208 SEAT BELT COMFORT AND CONVENIENCE TEST SUMMARY
FRONT OUTBOARD DESIGNATED SEATING POSITIONS

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

NHTSA No.: CR5103; Date of Comfort/Convenience Check: 05/20/94

Technician Performing Check: Homyoung Kim

GVWR: 5310 lbs

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

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

VEHICLE EQUIPMENT:

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

CONVENIENCE HOOKS (S7.4.1):

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

WEBBING TENSION-RELIEVING DEVICE (S7.4.2)

The seat belt assembly in the front outboard seating positions did not have webbing tension-relieving devices.

TABLE 10 FMVSS 208 SEAT BELT COMFORT AND CONVENIENCE TEST SUMMARY
FRONT OUTBOARD DESIGNATED SEATING POSITIONS. (Cont'd)

BELT CONTACT FORCE (S7.4.3)

The belt contact force on the chest of the test dummy was 0.3 pounds.

LATCHPLATE ACCESS (S7.4.4)

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

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

RETRACTION (S7.4.5):

The seat belt automatically retracted when the seat belt latchplate was released.

The stowed seat belt webbing and hardware were not pinched when the door was closed.

SEAT BELT GUIDES AND HARDWARE (S7.4.6)

The seat cushion was movable, but the seat back does not serve a function other than seating.

The seat was not removable.

The seat was foldable forward so that the space formerly occupied by the seat could be used for engine service.

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

TABLE 10 FMVSS 208 SEAT BELT COMFORT AND CONVENIENCE TEST SUMMARY
FRONT OUTBOARD DESIGNATED SEATING POSITIONS. (Cont'd)

SEAT BELT GUIDES AND HARDWARE (S7.4.6). (Cont'd)

The webbing was designed to pass through the seat cushion or between the cushion and seat back.

The remaining two parts (the seat belt latchplate and the buckle) were accessible under normal conditions.

The latchplate and buckle did not pass through the guides provided and fall behind the seat when the belt was completely retracted (or detached if not retractable); the seat was moved to any position; and the seat back, if foldable, is folded forward as far as possible and then moved backward into position.

The inboard receptacle end of the outboard seating position's seat belt is accessible with the center arm rest in any position to which it can be adjusted without moving the arm rest for access.

TABLE 11 FMVSS 208 EQUIPMENT DATA

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 Date of Check: 05/20/94

Technician Performing Check: Mike Janovicz

GVWR: 5310 lbs

FMVSS 208 SEAT BELT WARNING SYSTEM DATA

With an occupant in the driver's position and the lap belt/unibelt in stowed position and the ignition switch placed in the "start/on" position, the duration of audible warning signal was 6.3 seconds and the reminder light stayed on.

With an occupant in the driver's position and the lap belt/unibelt in use and the ignition switch placed in the "start/on" position, the duration of audible warning signal was 0 second and the duration of the reminder light operation was 0 second.

Note: The audible warning should not operate.

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

FMVSS 208 LABELING AND DRIVER'S MANUAL DATA

The label which describe manufacturer's maintenance or replacement schedule for the crash-deployed occupant protection system was located on the driver's sunvisor.

The manufacturer's recommended schedule was to maintain the system in 10 years from the manufacture date on the certification label and every 2 years thereafter.

Appropriate instructions concerning maintenance and/or replacement of this system were provided in the owner's manual on page 161 and in the label.

A description of the functional operation of the system was provided in the owner's manual on pages 32-33.

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

TABLE 11 FMVSS 208 EQUIPMENT DATA, (Cont'd)

FMVSS 208 LABELING AND DRIVER'S MANUAL DATA (Cont'd)

An owner's manual was provided.

The owner's manual contained appropriate information concerning maintenance and/or replacement and a description of the functional operation of the systems on pages 32-33 and 161.

FMVSS 208 READINESS INDICATOR DATA

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

The readiness indicator was clearly visible to the driver.

A list of the elements in the occupant restraint system, being monitored by the readiness indicator, was provided in the owner's manual on page 54.

TABLE 12 FMVSS 212, "WINDSHIELD MOUNTING", DATA SUMMARY

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 Test Date: 05/25/94

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

Rubber trim with glue retention

CLIPS OR BRACKETS USED TO RETAIN WINDSHIELD: None

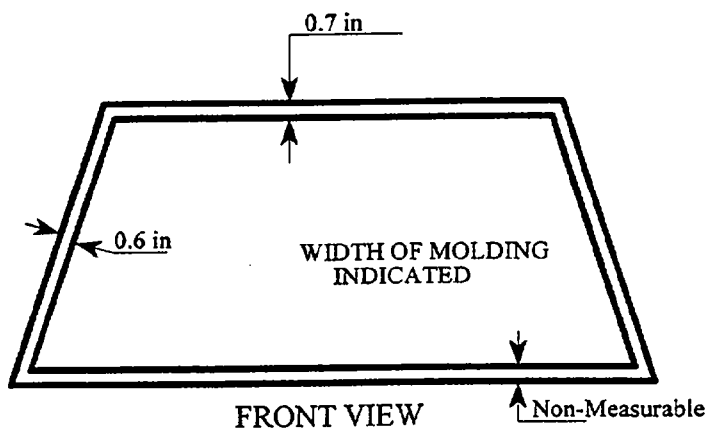
FMVSS 212 REQUIREMENTS:

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

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY (inches)		PERCENT RETENTION
	PRE-TEST	POST-TEST	
RIGHT SIDE	94.2	94.2	100%
LEFT SIDE	94.2	94.2	100%
TOTAL	188.4	188.4	100%

Pre-Test Windshield Mounting Material Temperature: 72° F



FAILURE DETAILS: None

TABLE 13 FMVSS 219, "WINDSHIELD ZONE INTRUSION", DATA SUMMARY

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 Test Date: 05/25/94

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 contacted by the sphere across the width of the instrument panel. From the outermost contact 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.

WINDSHIELD MEASUREMENTS:

A= 51.0 in

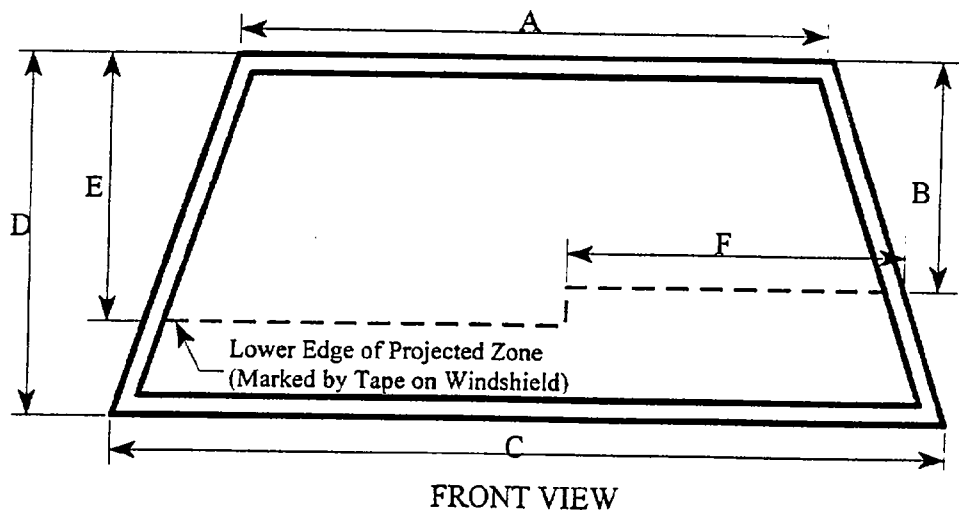
B= 25.0 in

C= 64.6 in

D= 36.3 in

E= 25.6 in

F= 24.2 in



AREAS OF WINDSHIELD TEMPLATE PENETRATION GREATER THAN 1/4 IN:

None

AREAS OF WINDSHIELD PENETRATION, BELOW THE PROTECTED ZONE, THROUGH THE INNER SURFACE OF THE WINDSHIELD:

None

TABLE 14 FUEL SYSTEM DATA

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 Test Date: 05/25/94

Fuel System Capacity from Owner's Manual = 19.8 gallons

Usable Capacity Figure Furnished by COTR = 19.81 gallons

Test Volume Range (92 to 94% of Usable Capacity)

= 18.23 to 18.62 gallons

Actual Test Volume = 18.5 gallons

Test Fluid Type: Stoddard Solvent; Spec. Grav. = 0.77

Kinematic Viscosity = 1.788 centistokes; Color = Purple

Type of Fuel Pump: X Electric; Mechanical

Does electric pump operate with ignition switch "On" and engine "Off"?

 Yes; X No

Details of Fuel System:

The fuel tank was located in front of the rear axle. The fuel filler pipe was located on the left side. The fuel lines ran along the left side to the front.

TABLE 15 FMVSS 301 POST IMPACT TEST DATA

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 Test Date: 05/25/94

TEST REQUIREMENTS:

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

TEST VEHICLE IMPACT TYPE:

- ☒ Frontal (30 mph)
☐ Oblique (30 mph) with ☐° barrier face first
contacting (driver/passenger) side
☐ Rear Moving Barrier (30 mph)
☐ Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT:

POST IMPACT TEST	TEST RESULTS	MAXIMUM ALLOWABLE
1. From impact until vehicle motion ceases	0 oz	1 oz
2. For 5 minute period after vehicle motion ceases	0 oz	5 oz
3. For next 25 minutes	0 oz	1 oz./1 min

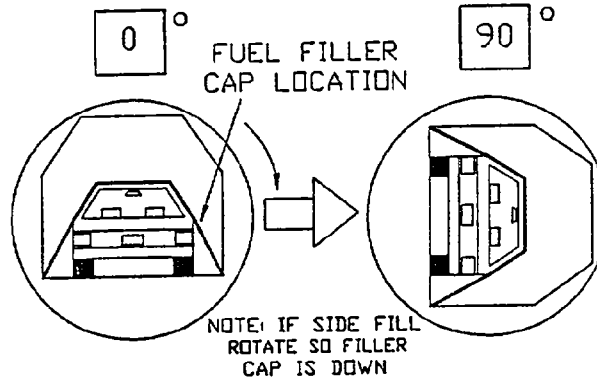
FUEL SPILLAGE LOCATION(S): None

TABLE 16 FMVSS 301 STATIC ROLLOVER TEST DATA

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 Test Date: 05/25/94

TEST PHASE: 0° - 90°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 46 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 46 seconds

Next Whole Minute Interval = 8 minutes

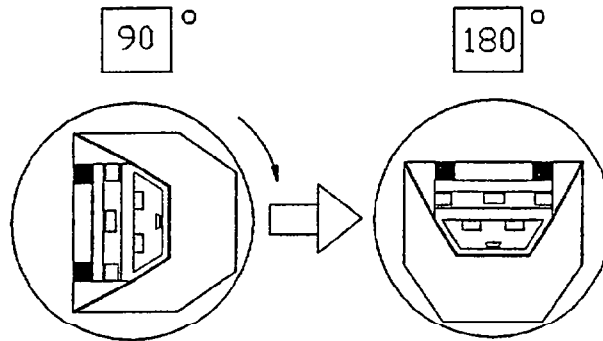
FUEL SPILLAGE MEASUREMENT:

0° TO 90° ROTATION (FILLER CAP DOWN)	TEST RESULTS	MAXIMUM ALLOWABLE
1. First 5 Minutes From Onset of Rotation	0 oz	5 oz
2. Sixth Minute From Onset of Rotation	0 oz	1 oz
3. Seventh Minute From Onset of Rotation	0 oz	1 oz
4. Eighth Minute if Required	N/A	1 oz

FUEL SPILLAGE LOCATIONS(S): None

TABLE 16 FMVSS 301 STATIC ROLLOVER TEST DATA (Cont'd)

TEST PHASE: 90° - 180°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 33 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 33 seconds

Next Whole Minute Interval = 8 minutes

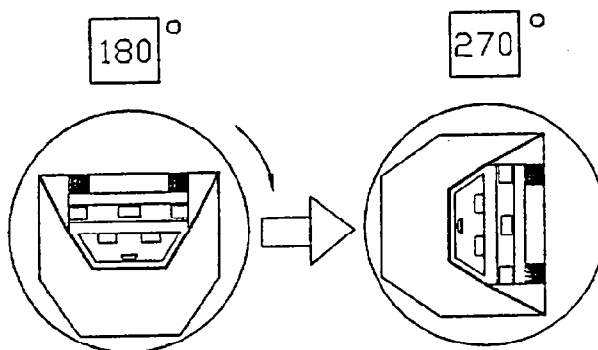
FUEL SPILLAGE MEASUREMENT:

90° TO 180° ROTATION	TEST RESULTS	MAXIMUM ALLOWABLE
1. First 5 Minutes From Onset of Rotation	0 oz	5 oz
2. Sixth Minute From Onset of Rotation	0 oz	1 oz
3. Seventh Minute From Onset of Rotation	0 oz	1 oz
4. Eighth Minute if Required	N/A	1 oz

FUEL SPILLAGE LOCATIONS(S): None

TABLE 16 FMVSS 301 STATIC ROLLOVER TEST DATA (Cont'd)

TEST PHASE: 180° - 270°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 17 seconds

(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 17 seconds

Next Whole Minute Interval = 8 minutes

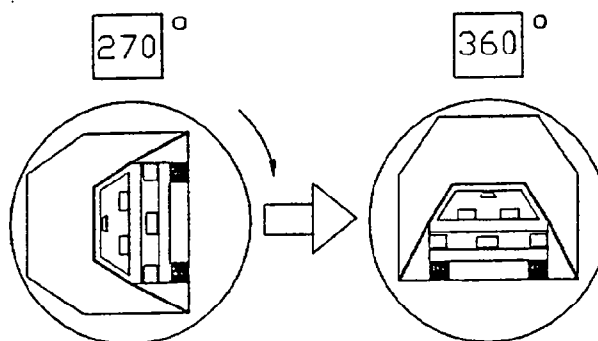
FUEL SPILLAGE MEASUREMENT:

180° TO 270° ROTATION	TEST RESULTS	MAXIMUM ALLOWABLE
1. First 5 Minutes From Onset of Rotation	0 oz	5 oz
2. Sixth Minute From Onset of Rotation	0 oz	1 oz
3. Seventh Minute From Onset of Rotation	0 oz	1 oz
4. Eighth Minute if Required	N/A	1 oz

FUEL SPILLAGE LOCATIONS(S): None

TABLE 16 FMVSS 301 STATIC ROLLOVER TEST DATA

TEST PHASE: 270° - 360°



DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time = 2 minutes 40 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time = 5 minutes 0 seconds

TOTAL TIME = 7 minutes 40 seconds

Next Whole Minute Interval = 8 minutes

FUEL SPILLAGE MEASUREMENT:

270° TO 360° ROTATION	TEST RESULTS	MAXIMUM ALLOWABLE
1. First 5 Minutes From Onset of Rotation	0 oz	5 oz
2. Sixth Minute From Onset of Rotation	0 oz	1 oz
3. Seventh Minute From Onset of Rotation	0 oz	1 oz
4. Eighth Minute if Required	N/A	1 oz

FUEL SPILLAGE LOCATIONS(S): None

SECTION 4
OCCUPANT, VEHICLE, AND CAMERA INFORMATION

TABLE 17 SEAT AND STEERING COLUMN POSITIONING DATA

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 Test Date: 05/25/94

NOMINAL DESIGN RIDING POSITION:

Driver Seat: Seat Back Angle = 20.0°
The seat back angle was adjustable and was positioned at the second notch rearward from the most upright position in accordance with the manufacturer's information. The seat back angle was measured on the seat back frame with the inclinometer.

Passenger Seat: Same as Driver's Seat.

SEAT FORE AND AFT POSITIONS:

Driver Seat: The seat track had 13 detents and was positioned at the 7th notch rearward from the foremost position.

Passenger Seat: Same as Driver's Seat

STEERING COLUMN ADJUSTMENTS:

There were 6 notches for the steering column adjustment. The steering column was positioned at the 4th notch upward from the lowermost position (the first notch upward from the mid position) because there was no notch for the mid position. The steering column angle was 32.2° .

FIGURE 1 DUMMY MEASUREMENT LOCATIONS FOR FRONT SEAT OCCUPANTS

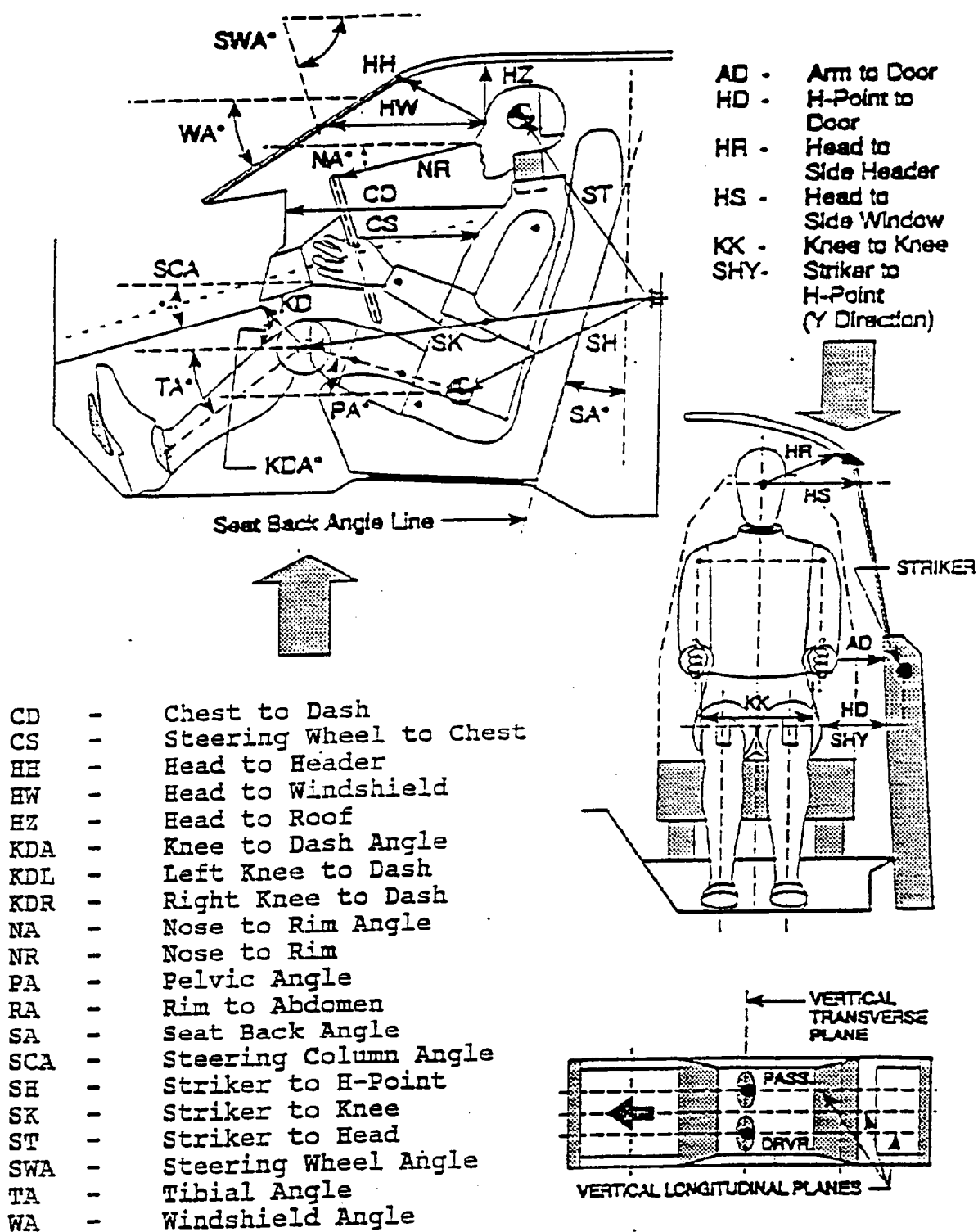


TABLE 18 DUMMY MEASUREMENT DATA FOR FRONT SEAT OCCUPANTS

Vehicle Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 Test Date: 05/25/94

	DRIVER (Serial #465)	PASSENGER (Serial #466)
WA°	30.0°	
SWA°	60.4°	N/A
SCA°	32.2°	N/A
SA°	20.0°	20.0°
HZ	6.4 in	6.5 in
HH	17.3 in	16.6 in
HW	23.1 in	24.0 in
HR	9.8 in	9.3 in
NR	17.4 in	N/A
CD	27.2 in	23.8 in
CS	13.1 in	N/A
RA	7.7 in	N/A
KDL	9.0 in Angle (KDA) 21.2°	6.5 in
KDR	8.5 in	8.0 in Angle (KDA) 7.4°
PA°	10.5°	7.1°
TA°	45.5°	42.8°
KK	14.8 in	12.8 in
ST	24.1 in Angle 21.2°	23.7 in Angle 24.6°
SK	28.8 in Angle 5.1°	29.7 in Angle 7.0°
SH	14.1 in Angle 17.1°	14.4 in Angle 17.7°
SHY	12.2 in	9.3 in
HS	12.8 in	11.2 in
HD	9.0 in	6.3 in
AD	5.9 in	4.0 in

N/A = Not Applicable

FIGURE 2 VEHICLE TARGET LOCATIONS

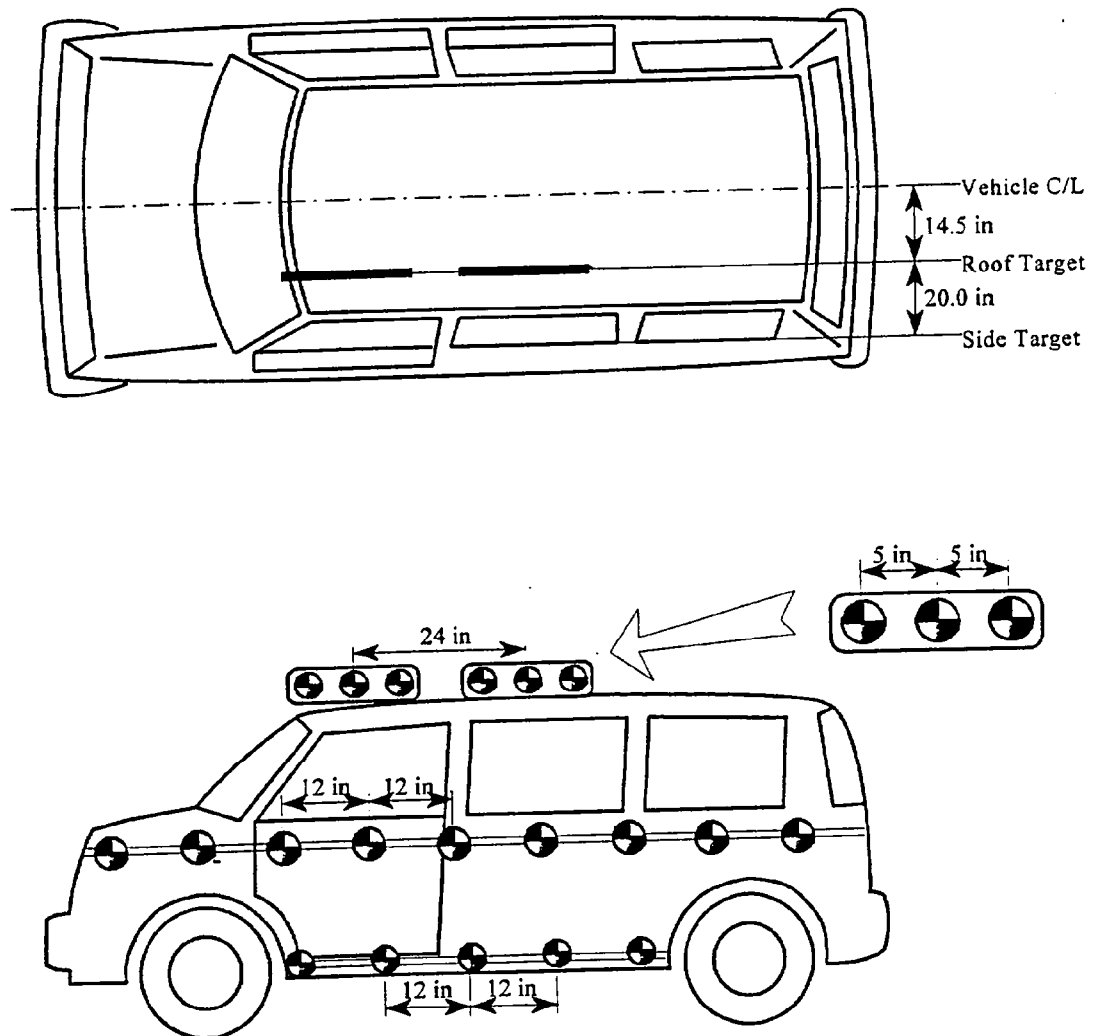


FIGURE 3 CAMERA POSITIONS

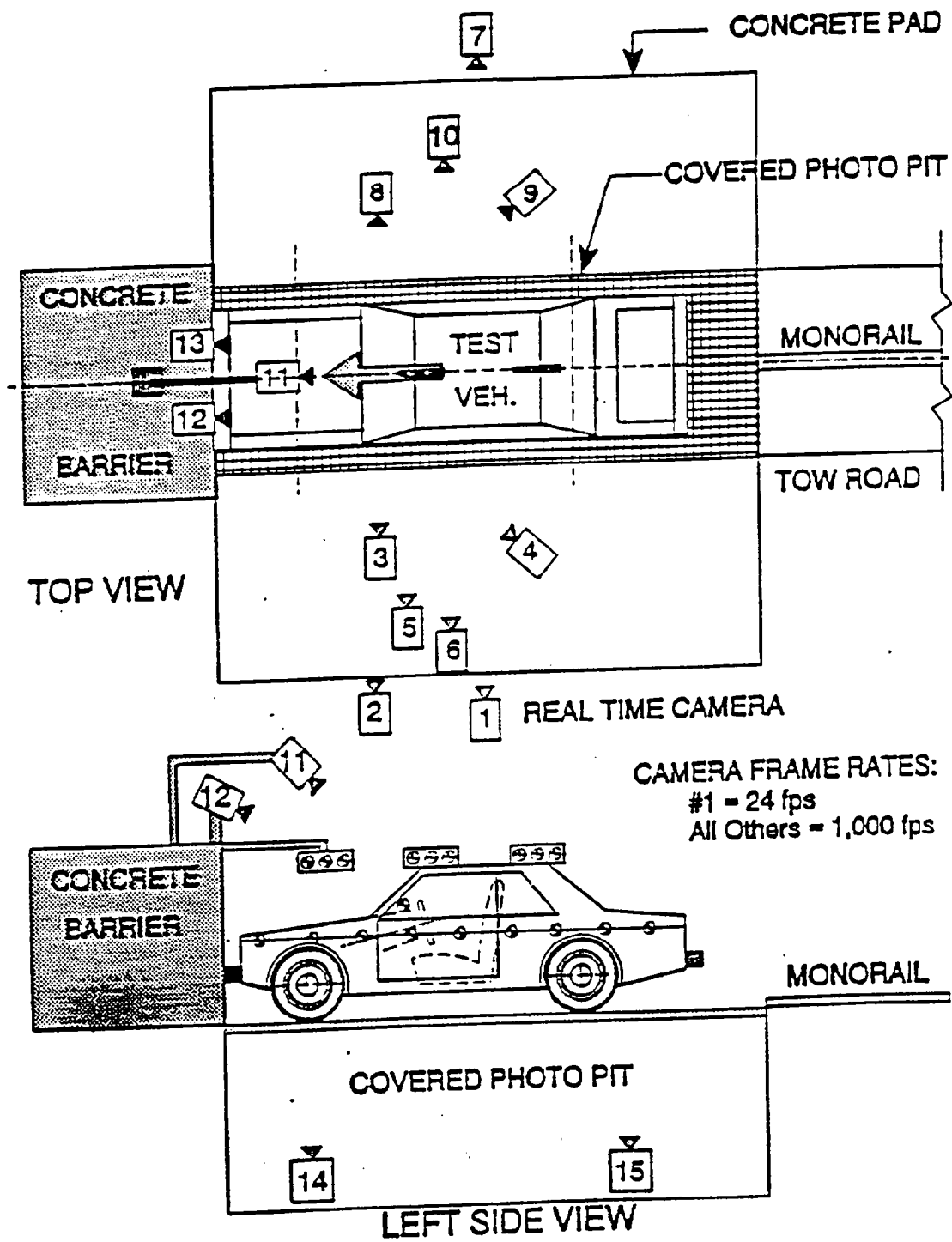


TABLE 19 CAMERA LOCATIONS

Veh. Year/Make/Model/Body Style: 1994/Toyota/Previa/Van

Vehicle NHTSA No.: CR5103 ; Test Date: 05/25/94

	VIEW	CAMERA POSITIONS (inches)*			ANGLE (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Left Side View						10	24
2	Left Vehicle Crush	37.8	292.9	53.9	90°	278.4	25	N/A**
3	Left Windshield Intrusion	20.5	258.3	57.5	90°	243.8	35	1020
4	Left Driver Kinematics	158.3	181.5	83.1	50°		35	1015
5	Left Steering Column Motion	66.5	328.3	62.2	90°	313.8	25	1015
6	Left Steering Column Motion	66.5	327.2	40.6	90°	312.7	25	no timing***
7	Right Overall View	83.5	-290.9	50.0	90°	274.4	13	957
8	Right Vehicle Crush	46.1	-278.3	53.5	90°	261.8	25	1047
9	Right Windshield Intrusion	36.2	-233.9	56.3	90°	217.4	35	1000
10	Right Passenger Kinematics	208.3	-238.2	81.3	50°		50	909
11	Front View Windshield	12.6	0	169.7			13	1026
12	Front View Driver	-10.2	14.6	92.1			13	1010
13	Front View Passenger	-5.5	-16.5	96.1			13	1124
14	Pit Camera Engine View	47.6	0	-123.6			13	813
15	Pit Camera Fuel Tank View	94.9	0	-125.0			13	755

* +X = Film plane rearward of barrier

+Y = Film plane to left of monorail centerline

+Z = Film plane to above ground level

** Camera #2 did not run during test

*** No timing mark was recorded. The camera was preset to 1000 fps.

APPENDIX A
PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

<u>Description</u>	<u>Page No.</u>
Photo No. A-1 - Pre-Test Front View	A-1
Photo No. A-2 - Post-Test Front View	A-2
Photo No. A-3 - Pre-Test Left Side View	A-3
Photo No. A-4 - Post-Test Left Side View	A-4
Photo No. A-5 - Pre-Test Right Side View	A-5
Photo No. A-6 - Post-Test Right Side View	A-6
Photo No. A-7 - Pre-Test Front Underbody View	A-7
Photo No. A-8 - Post-Test Front Underbody View	A-8
Photo No. A-9 - Pre-Test Driver Dummy Position View	A-9
Photo No. A-10 - Post-Test Driver Dummy Position View	A-10
Photo No. A-11 - Pre-Test Driver Dummy Position View (Door Open)	A-11
Photo No. A-12 - Post-Test Driver Dummy Position View (Door Open)	A-12
Photo No. A-13 - Pre-Test Driver Seat Position View	A-13
Photo No. A-14 - Post-Test Driver Seat Position View	A-14
Photo No. A-15 - Pre-Test Passenger Dummy Position View	A-15
Photo No. A-16 - Post-Test Passenger Dummy Position View	A-16
Photo No. A-17 - Pre-Test Passenger Dummy Position View (Door Open)	A-17
Photo No. A-18 - Post-Test Passenger Dummy Position View (Door Open)	A-18
Photo No. A-19 - Pre-Test Passenger Seat Position View	A-19
Photo No. A-20 - Post-Test Passenger Seat Position View	A-20
Photo No. A-21 - Pre-Test Driver Dummy Knee Bolster View	A-21
Photo No. A-22 - Post-Test Driver Dummy Knee Bolster View	A-22
Photo No. A-23 - Pre-Test Passenger Dummy Knee Bolster View	A-23
Photo No. A-24 - Post-Test Passenger Dummy Knee Bolster View	A-24
Photo No. A-25 - Driver Head Contact View	A-25
Photo No. A-26 - Passenger Head Contact View	A-26
Photo No. A-27 - Pre-Test Steering Column at Firewall View - Interior	A-27
Photo No. A-28 - Post-Test Steering Column at Firewall View - Interior	A-28
Photo No. A-29 - Pre-Test Steering Column at Firewall View - Underhood	A-29
Photo No. A-30 - Pre-Test Vehicle Certification Label and Tire Placard	A-30

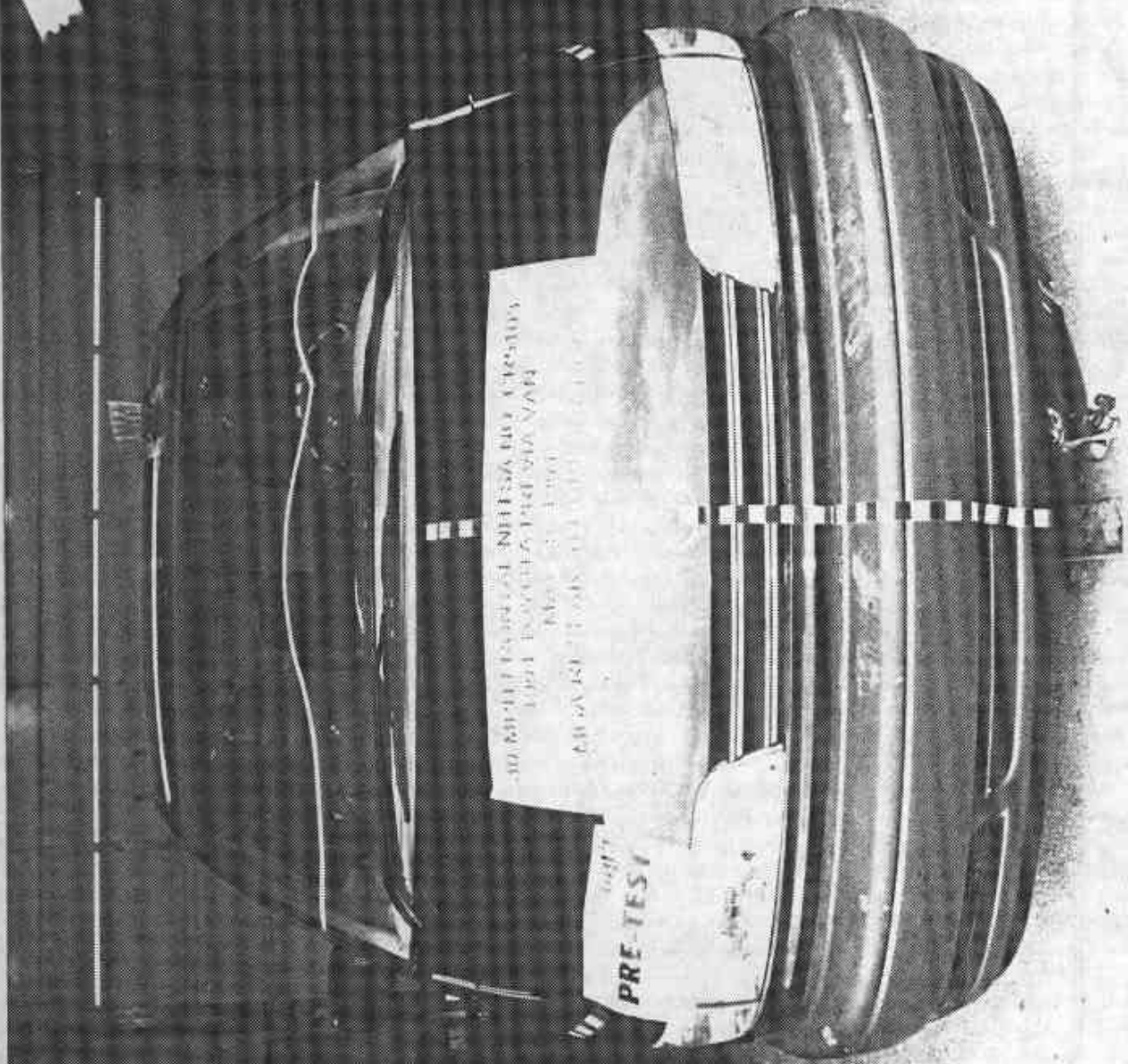


Photo No. A-1 - Pre-Test Front View

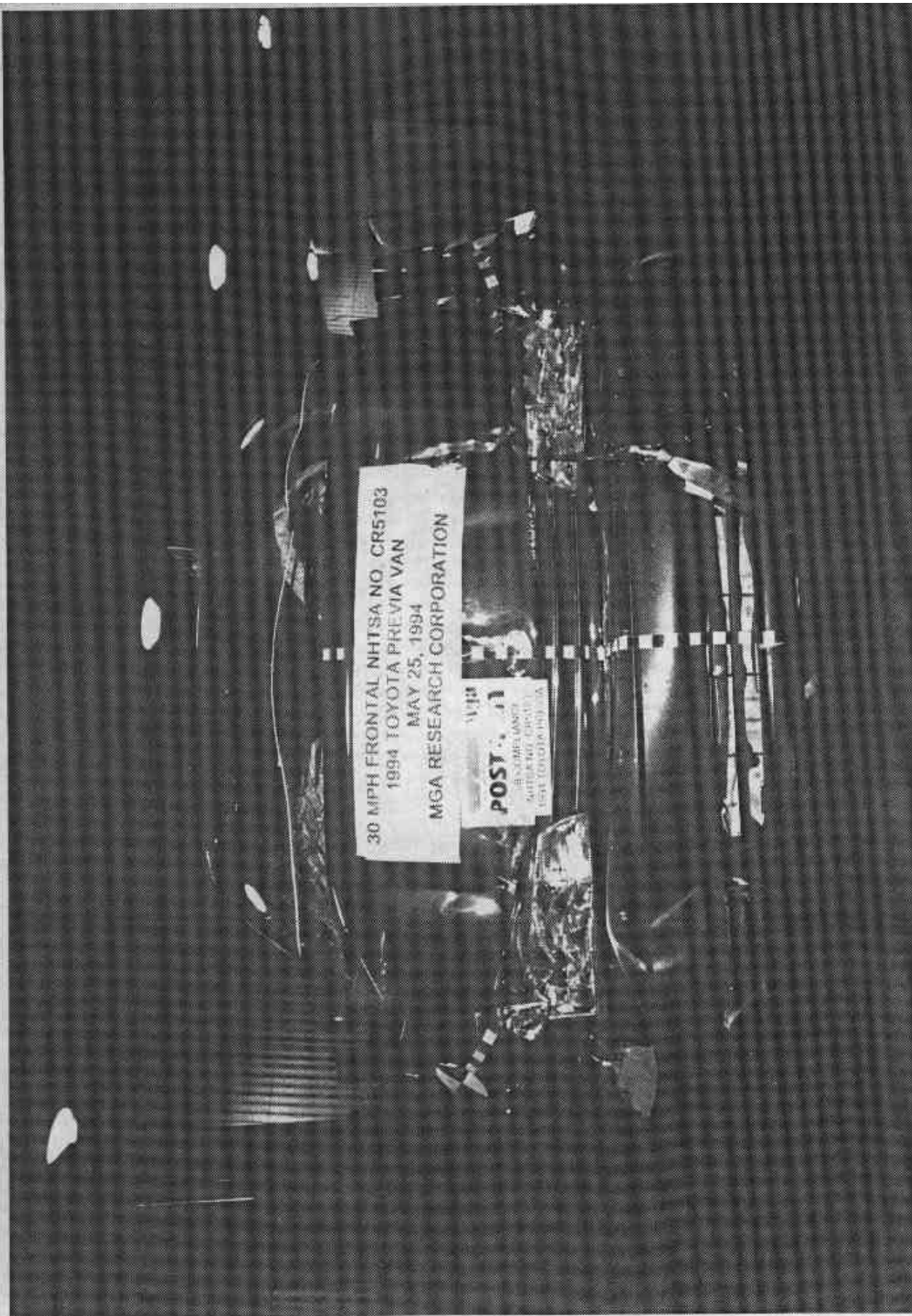


Photo No. A-2 - Post-Test Front View

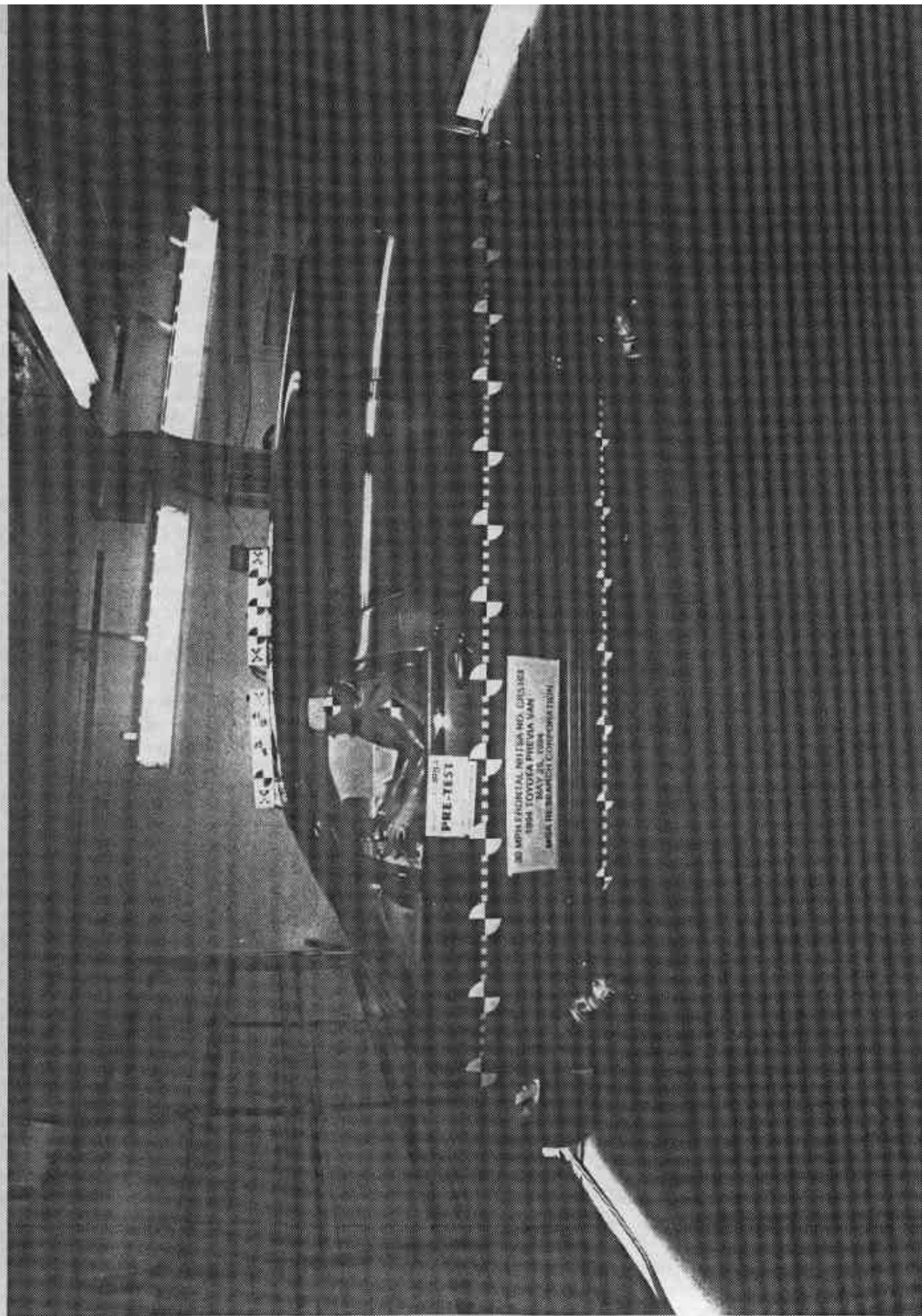


Photo No. A-3 - Pre-Test Left Side View



Photo No. A-4 - Post-Test Left Side View

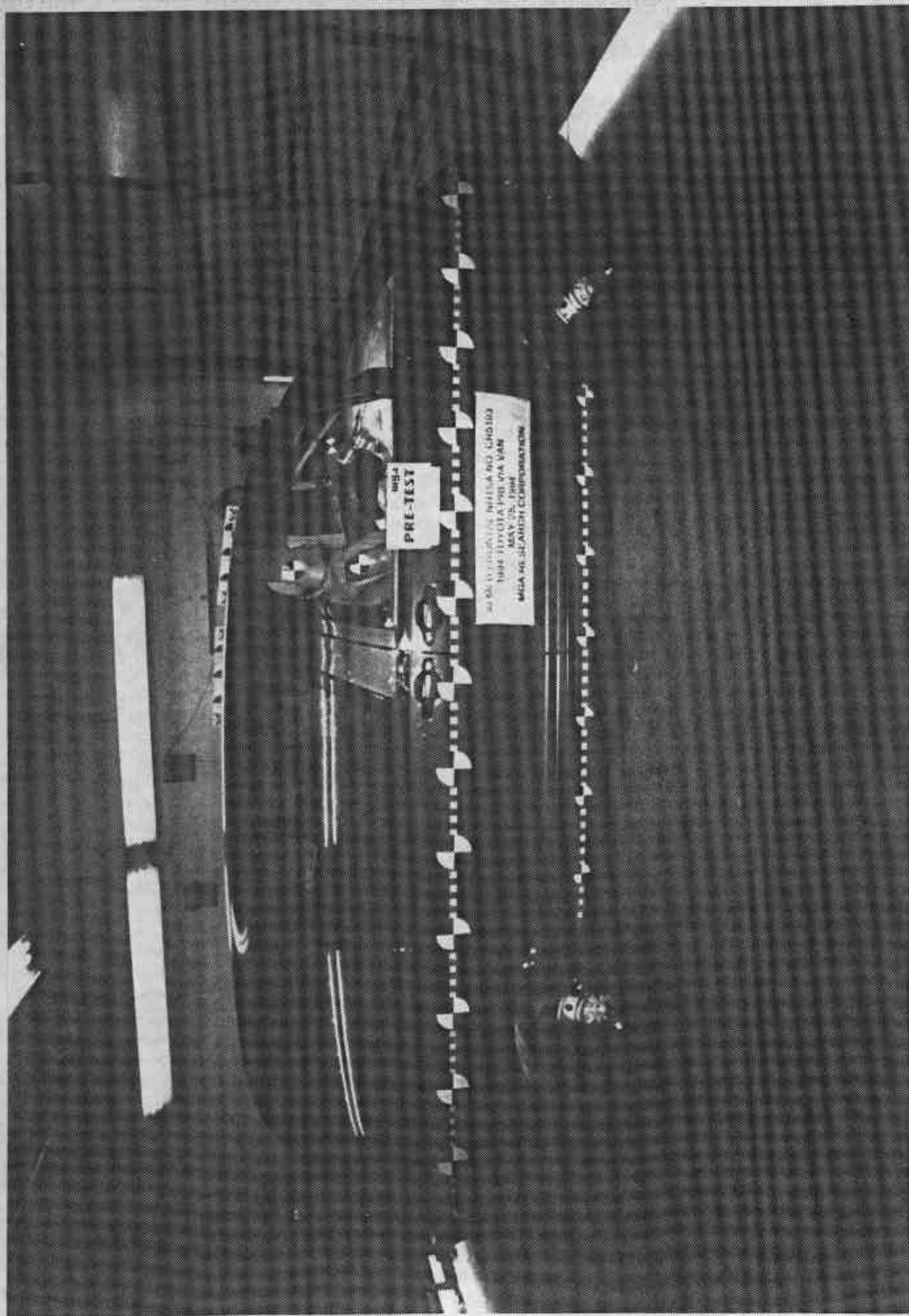


Photo No. A-5 - Pre-Test Right Side View

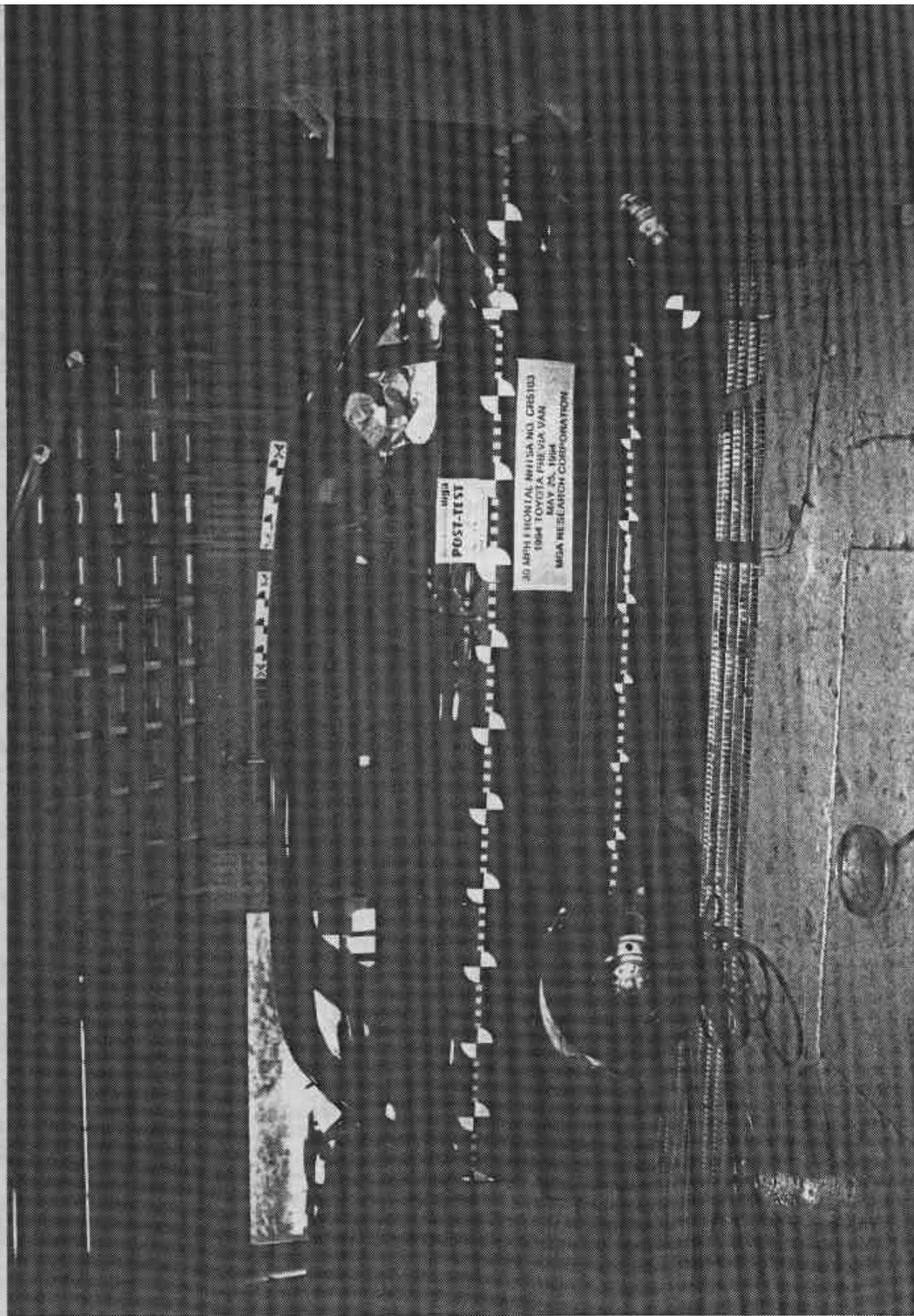


Photo No. A-6 - Post-Test Right Side View

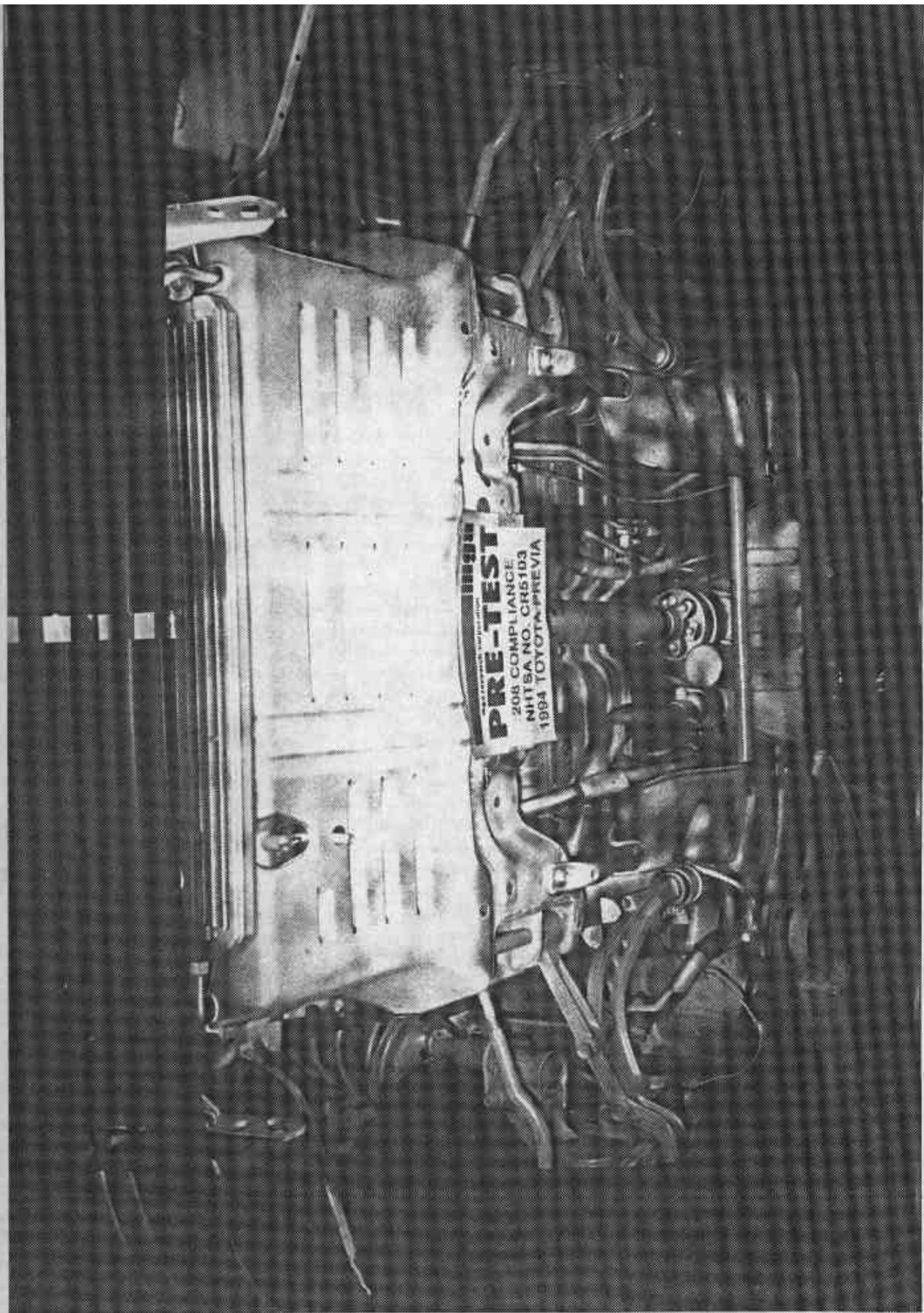


Photo No. A-7 - Pre-Test Front Underbody View



Photo No. A-8 - Post-Test Front Underbody View

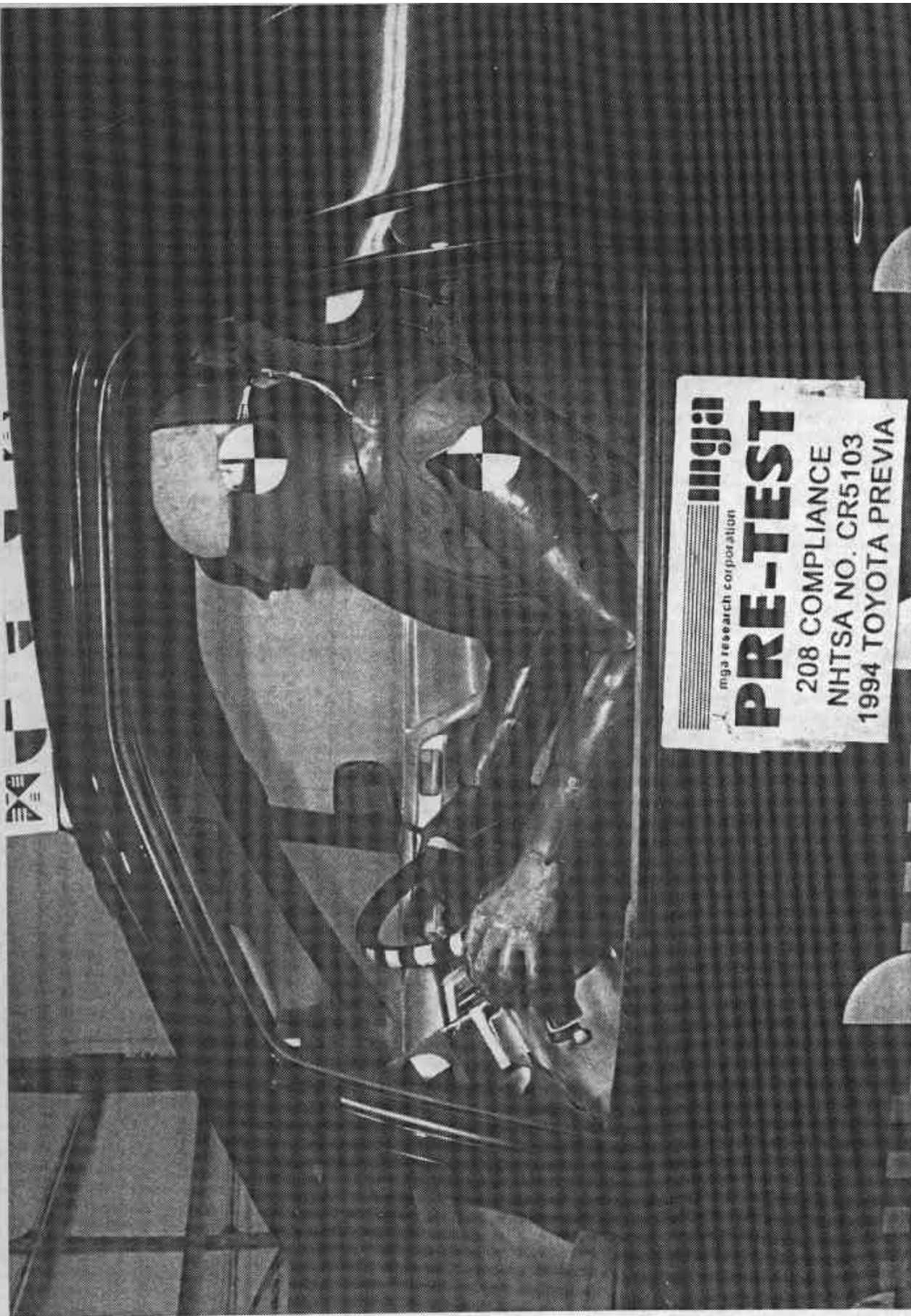


Photo No. A-9 - Pre-Test Driver Dummy Position View



Photo No. A-10 - Post-Test Driver Dummy Position View



Photo No. A-11 - Pre-Test Driver Dummy Position View (Door Open)



Photo No. A-12 - Post-Test Driver Dummy Position View (Door Open)

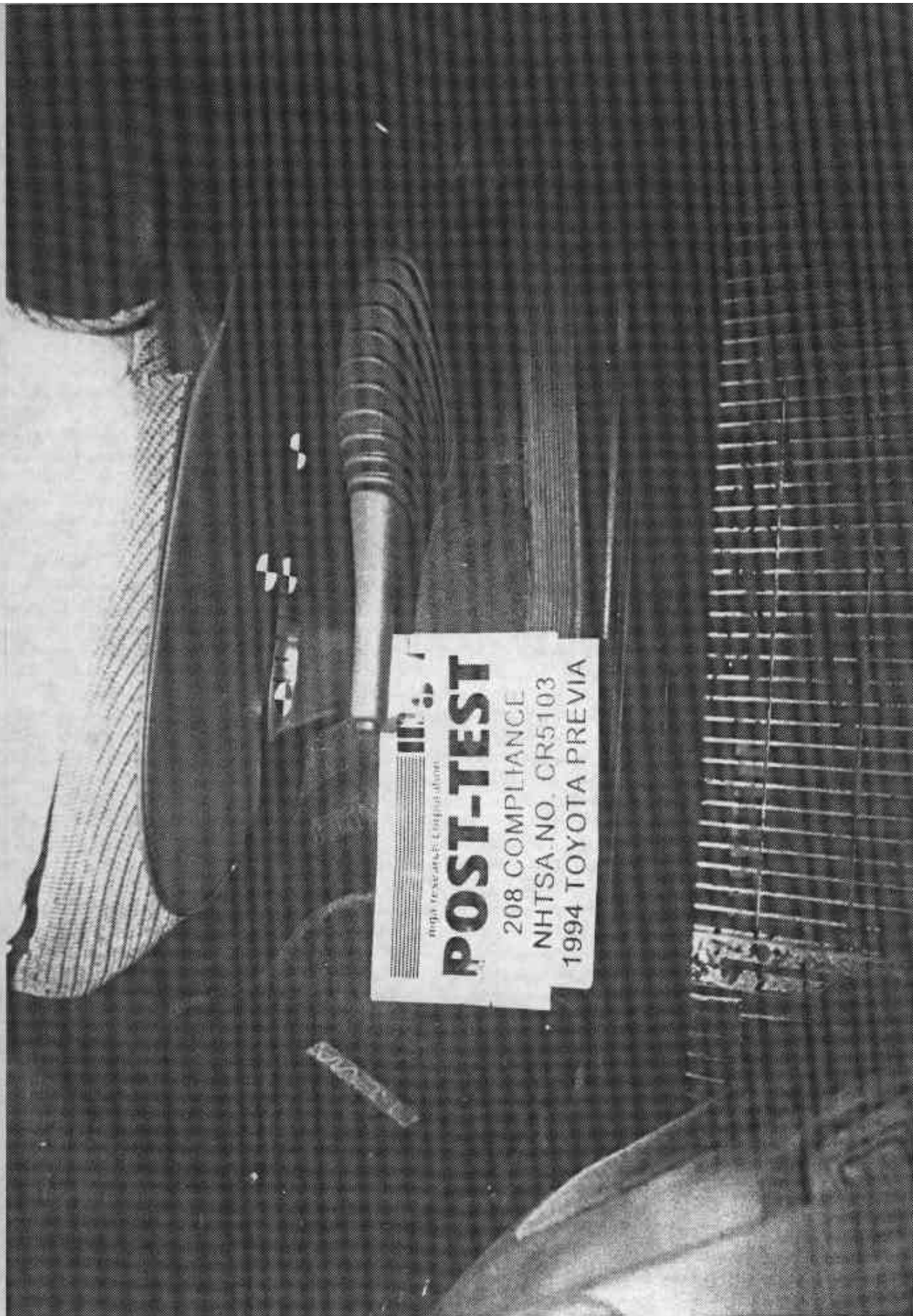


Photo No. A-14 - Post-Test Driver Seat Position View

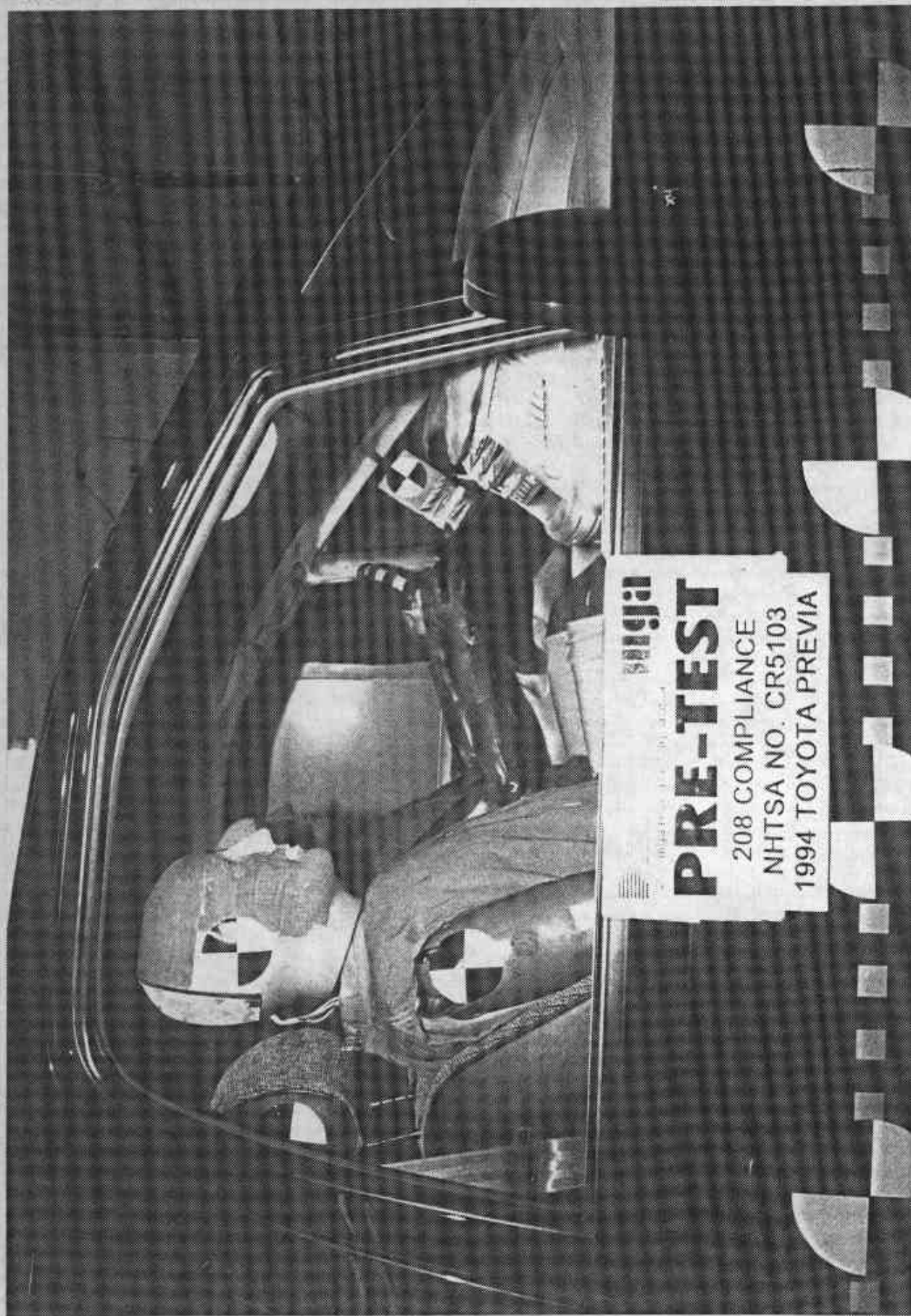


Photo No. A-15 - Pre-Test Passenger Dummy Position View

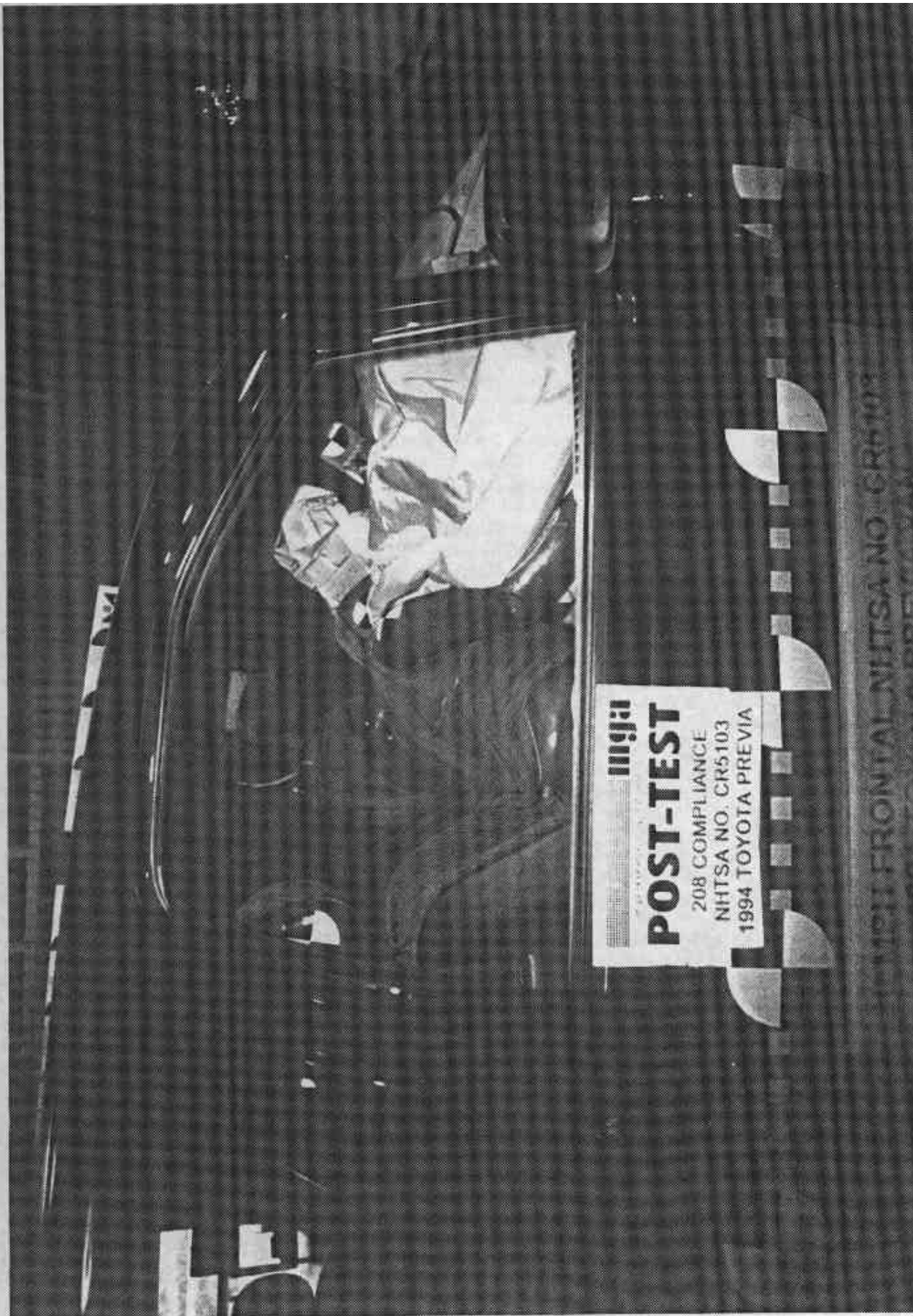


Photo No. A-16 - Post-Test Passenger Dummy Position View



Photo No. A-17 - Pre-Test Passenger Dummy Position View (Door Open)



Photo No. A-19 - Pre-Test Passenger Seat Position View



Photo No. A-20 - Post-Test Passenger Seat Position View



Photo No. A-21 - Pre-Test Driver Dummy Knee Bolster View



Photo No. A-22 - Post-Test Driver Dummy Knee Bolster View



Photo No. A-23 - Pre-Test Passenger Dummy Knee Bolster View



Photo No. A-24 - Post-Test Passenger Dummy Knee Bolster View



Photo No. A-25 - Driver Head Contact View



Photo No. A-26 - Passenger Head Contact View

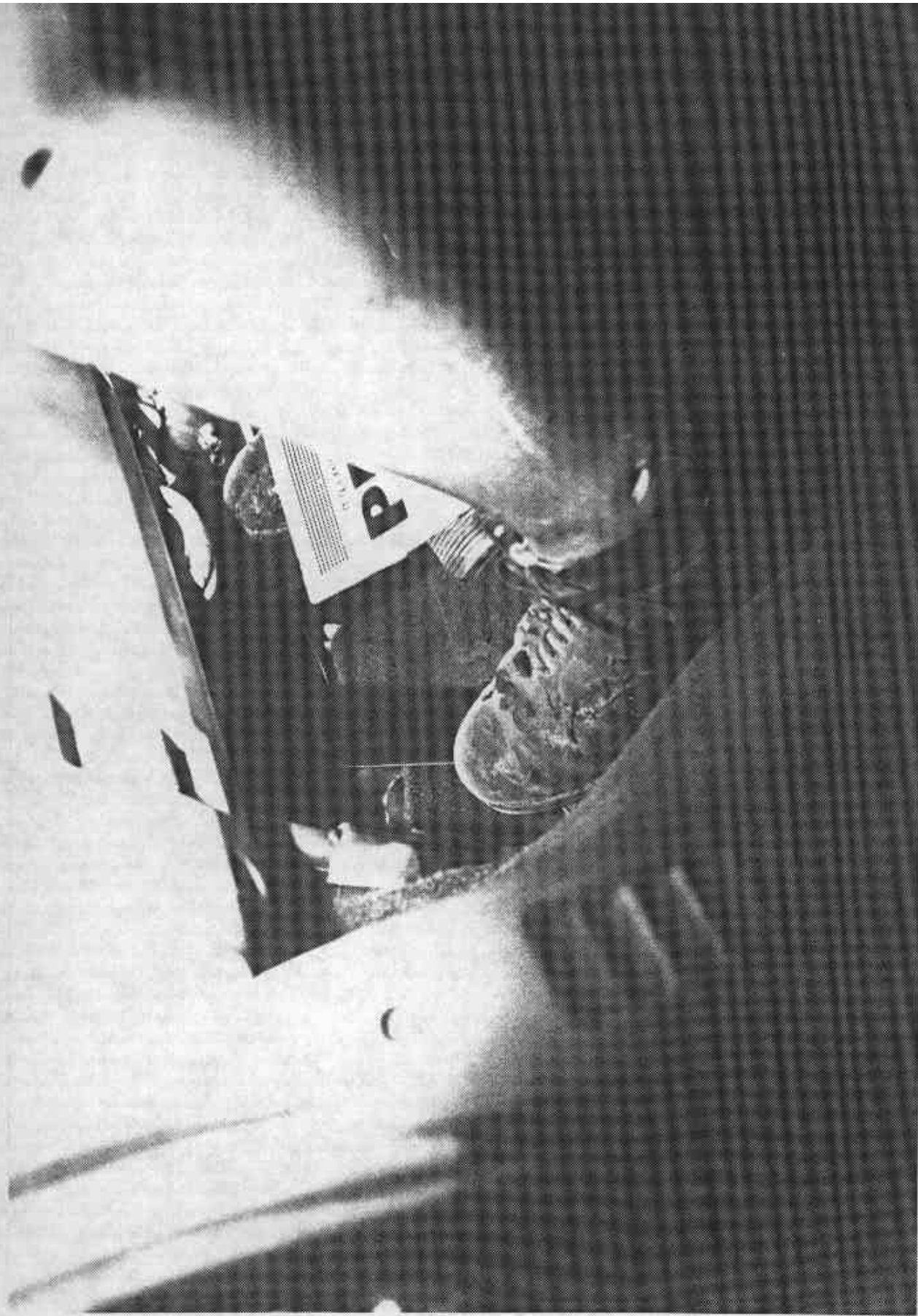


Photo No. A-27 - Pre-Test Steering Column at Firewall View - Interior



Photo No. A-28 - Post-Test Steering Column at Firewall View - Interior

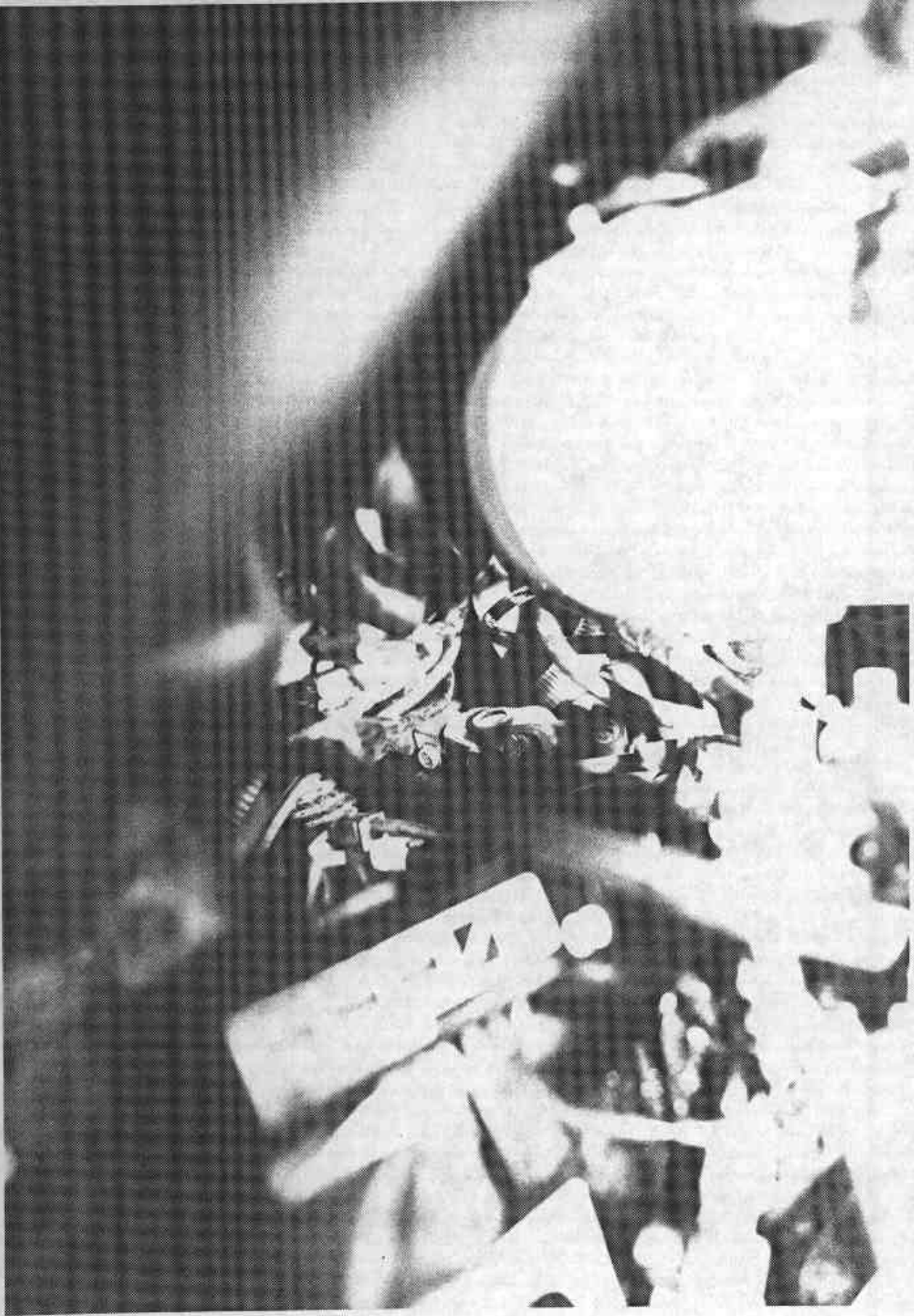


Photo No. A-29 - Pre-Test Steering Column at Firewall View - Underhood

A-29

208 COMPLIANCE
NHTSA NO. CR5103
1994 TOYOTA PREVIA

A-38

APPENDIX B
DATA PLOTS

TABLE OF DATA PLOTS

<u>Description</u>	<u>Filter Class</u>	<u>Page No.</u>
Figure B-1 - Driver Head X Acceleration vs. Time	1000	B-1
Figure B-2 - Driver Head Y Acceleration vs. Time	1000	B-2
Figure B-3 - Driver Head Z Acceleration vs. Time	1000	B-3
Figure B-4 - Driver Head Resultant Acceleration vs. Time	1000	B-4
Figure B-5 - Driver Chest X Acceleration vs. Time	180	B-5
Figure B-6 - Driver Chest Y Acceleration vs. Time	180	B-6
Figure B-7 - Driver Chest Z Acceleration vs. Time	180	B-7
Figure B-8 - Driver Chest Resultant vs. Time	180	B-8
Figure B-9 - Driver Left Femur Force vs. Time	600	B-9
Figure B-10 - Driver Right Femur Force vs. Time	600	B-10
Figure B-11 - Passenger Head X Acceleration vs. Time	1000	B-11
Figure B-12 - Passenger Head Y Acceleration vs. Time	1000	B-12
Figure B-13 - Passenger Head Z Acceleration vs. Time	1000	B-13
Figure B-14 - Passenger Head Resultant Acceleration vs. Time	1000	B-14
Figure B-15 - Passenger Chest X Acceleration vs. Time	180	B-15
Figure B-16 - Passenger Chest Y Acceleration vs. Time	180	B-16
Figure B-17 - Passenger Chest Z Acceleration vs. Time	180	B-17
Figure B-18 - Passenger Chest Resultant vs. Time	180	B-18
Figure B-19 - Passenger Left Femur Force vs. Time	600	B-19
Figure B-20 - Passenger Right Femur Force vs. Time	600	B-20
Figure B-21 - Upper Engine X Acceleration vs. Time	60	B-21
Figure B-22 - Lower Engine X Acceleration vs. Time	60	B-22
Figure B-23 - Instrument Panel X Acceleration vs. Time	60	B-23
Figure B-24 - Left Rear Seat Crossmember X Accel. vs. Time	60	B-24
Figure B-25 - Right Rear Seat Crossmember X Accel. vs. Time	60	B-25
Figure B-26 - Left Brake Caliper X Acceleration vs. Time	60	B-26
Figure B-27 - Right Brake Caliper X Acceleration vs. Time	60	B-27
Figure B-28 - Trunk Floor Z Acceleration vs. Time	60	B-28

Filter: Class 1000

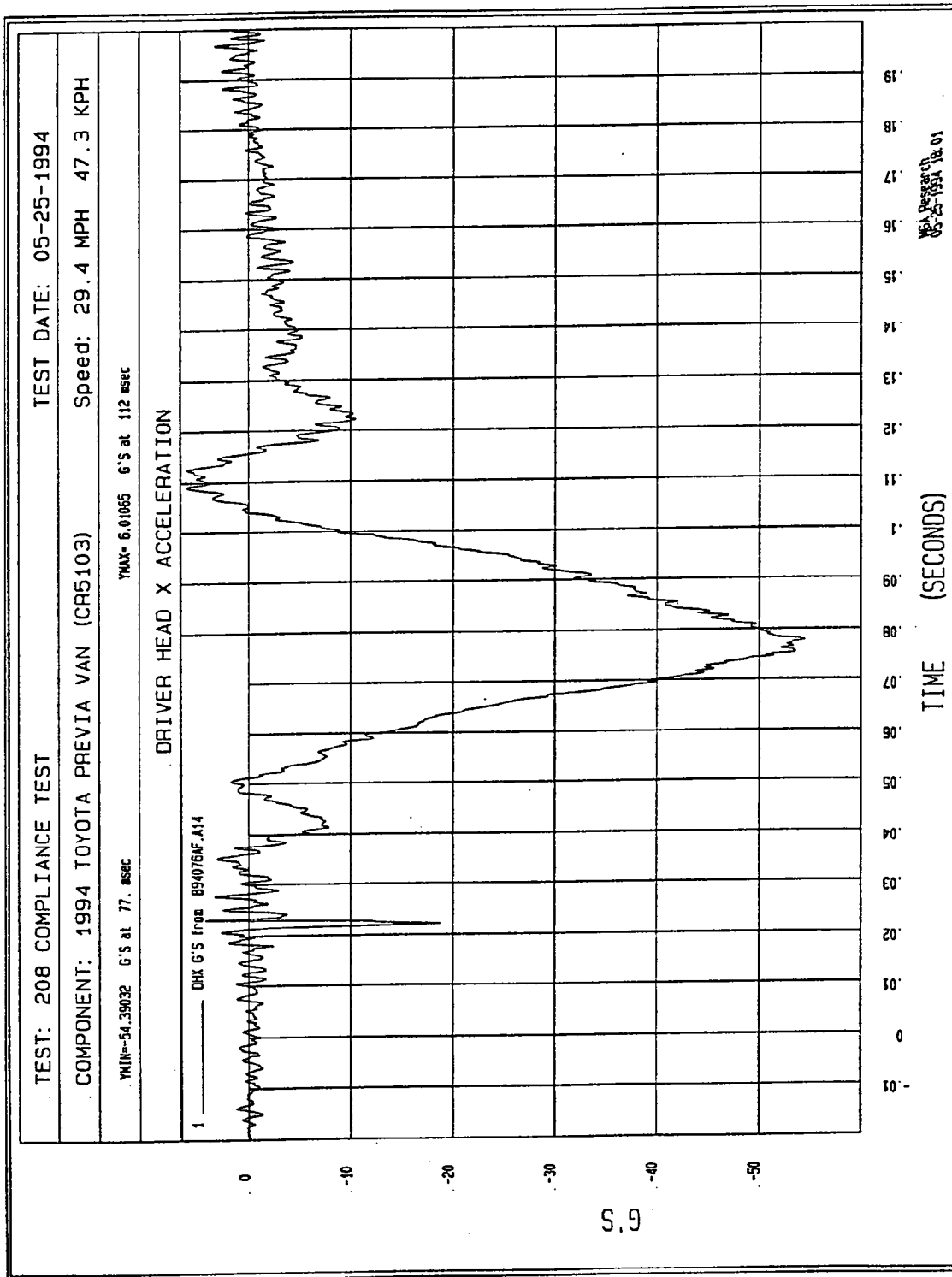


Figure B-1 - Driver Head X Acceleration vs. Time

Filter: Class 1000

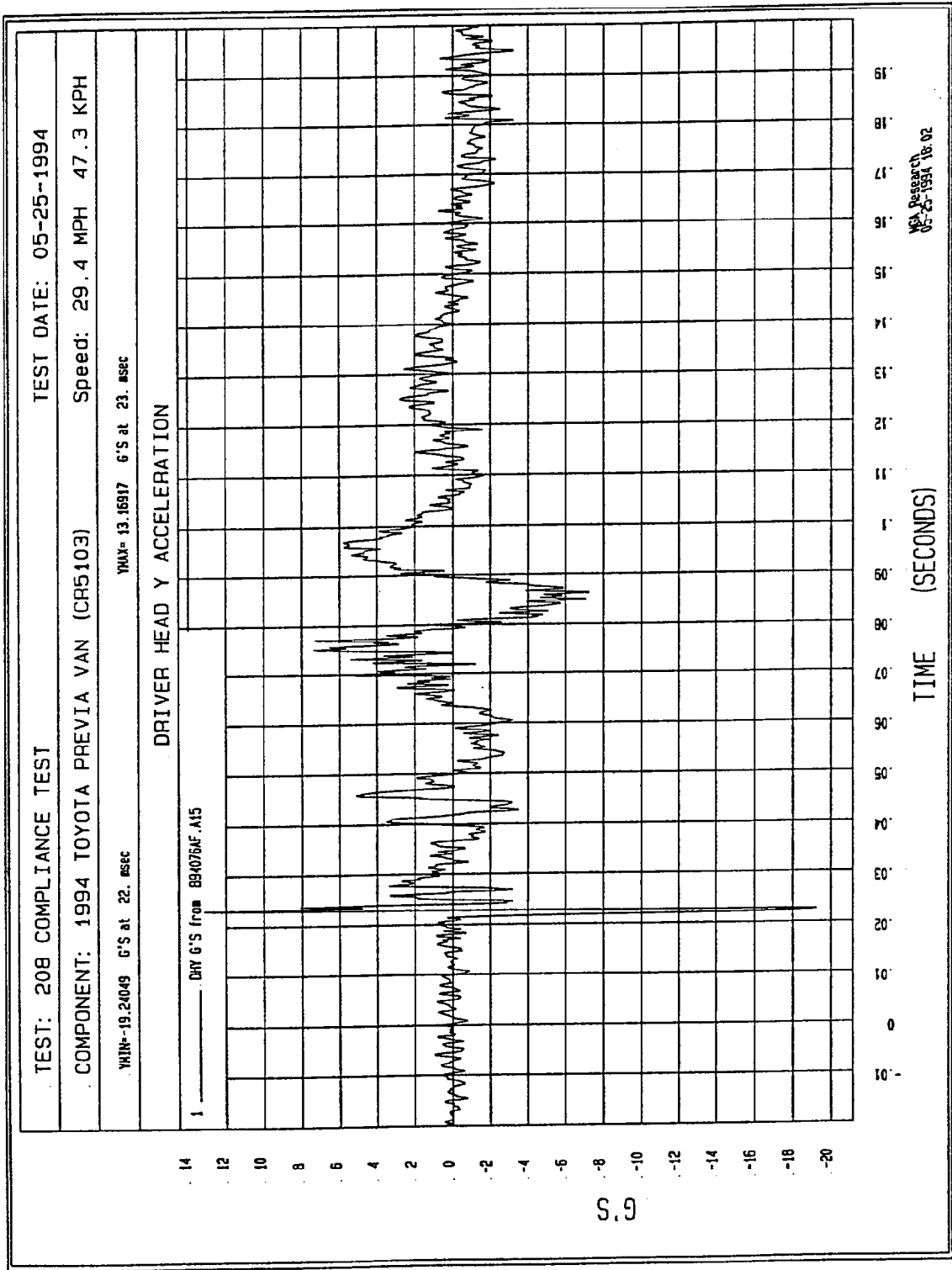


Figure B-2 - Driver Head Y Acceleration vs. Time

Filter: Class 1000

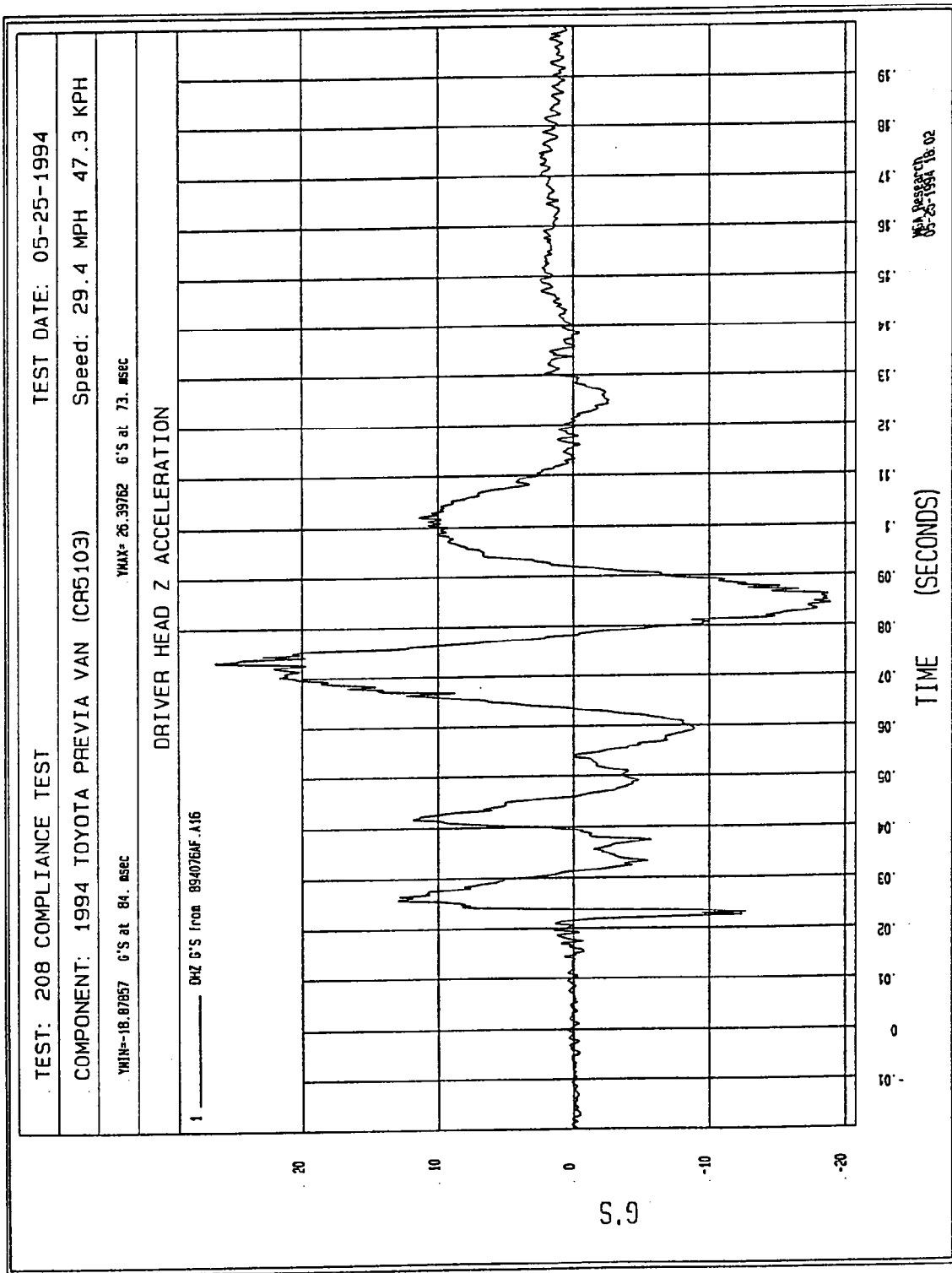


Figure B-3 - Driver Head Z Acceleration vs. Time

Filter: Class 1000

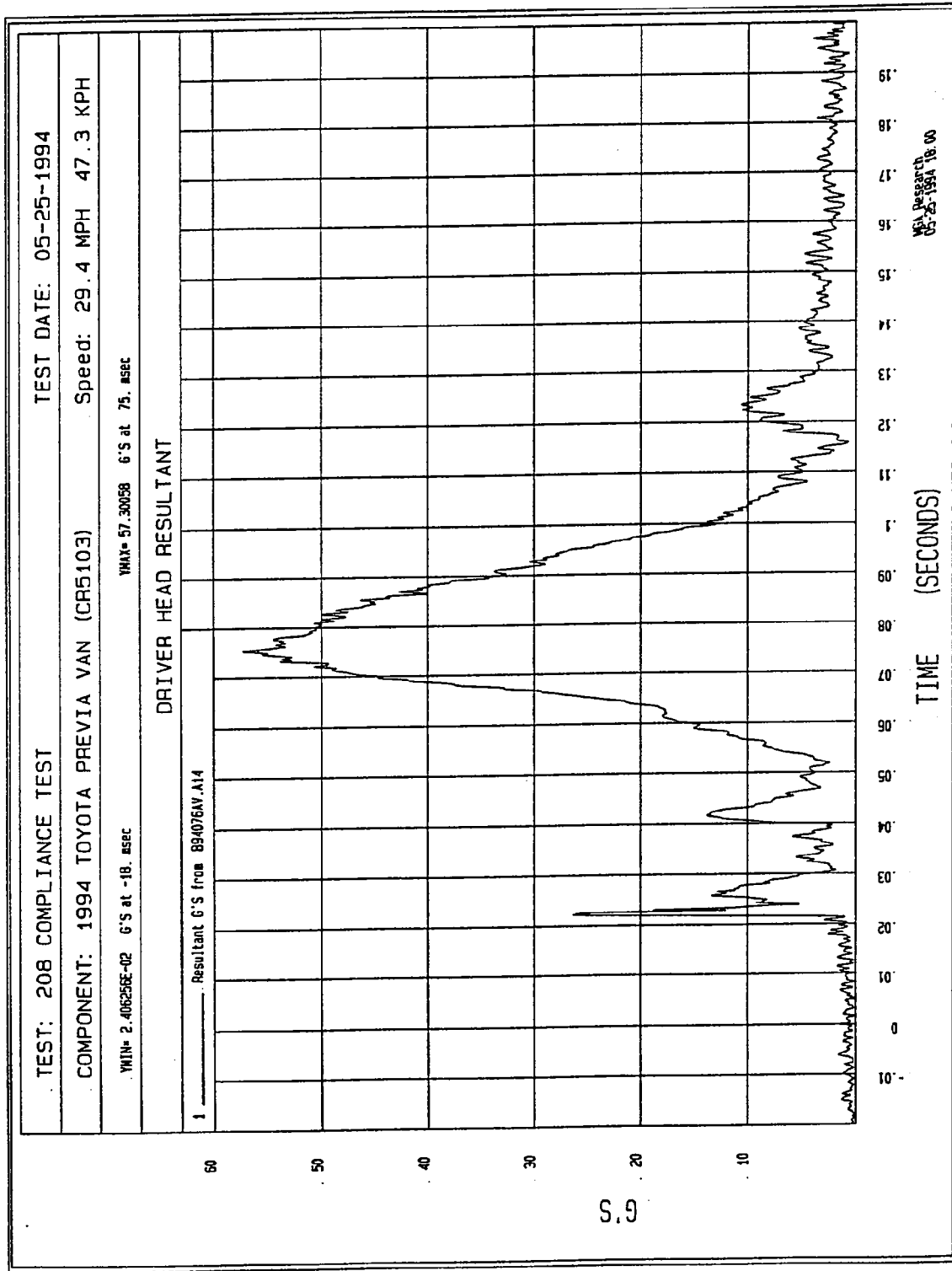


Figure B-4 - Driver Head Resultant Acceleration vs. Time

Filter: Class 180

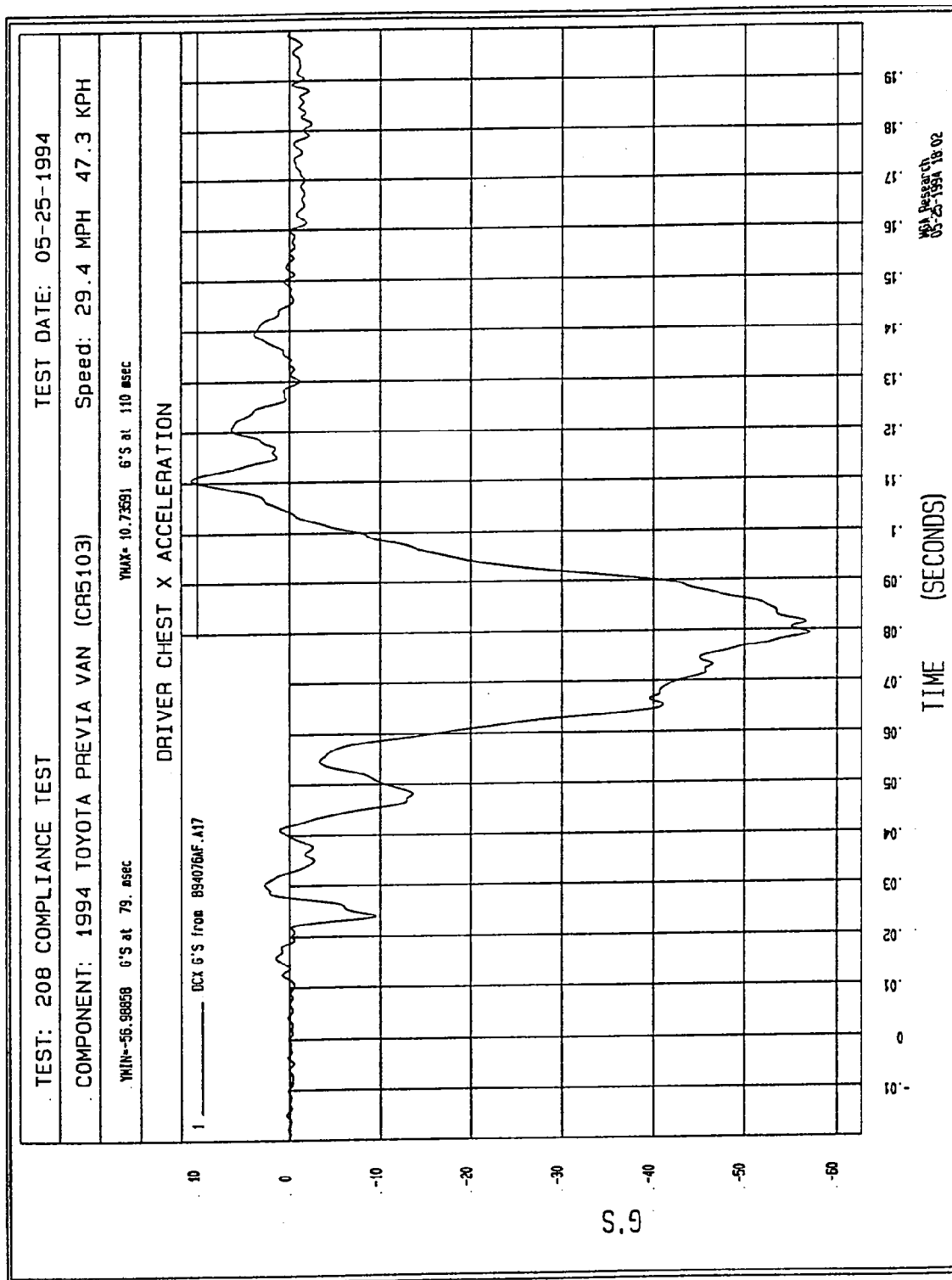


Figure B-5 - Driver Chest X Acceleration vs. Time

Filter: Class 180

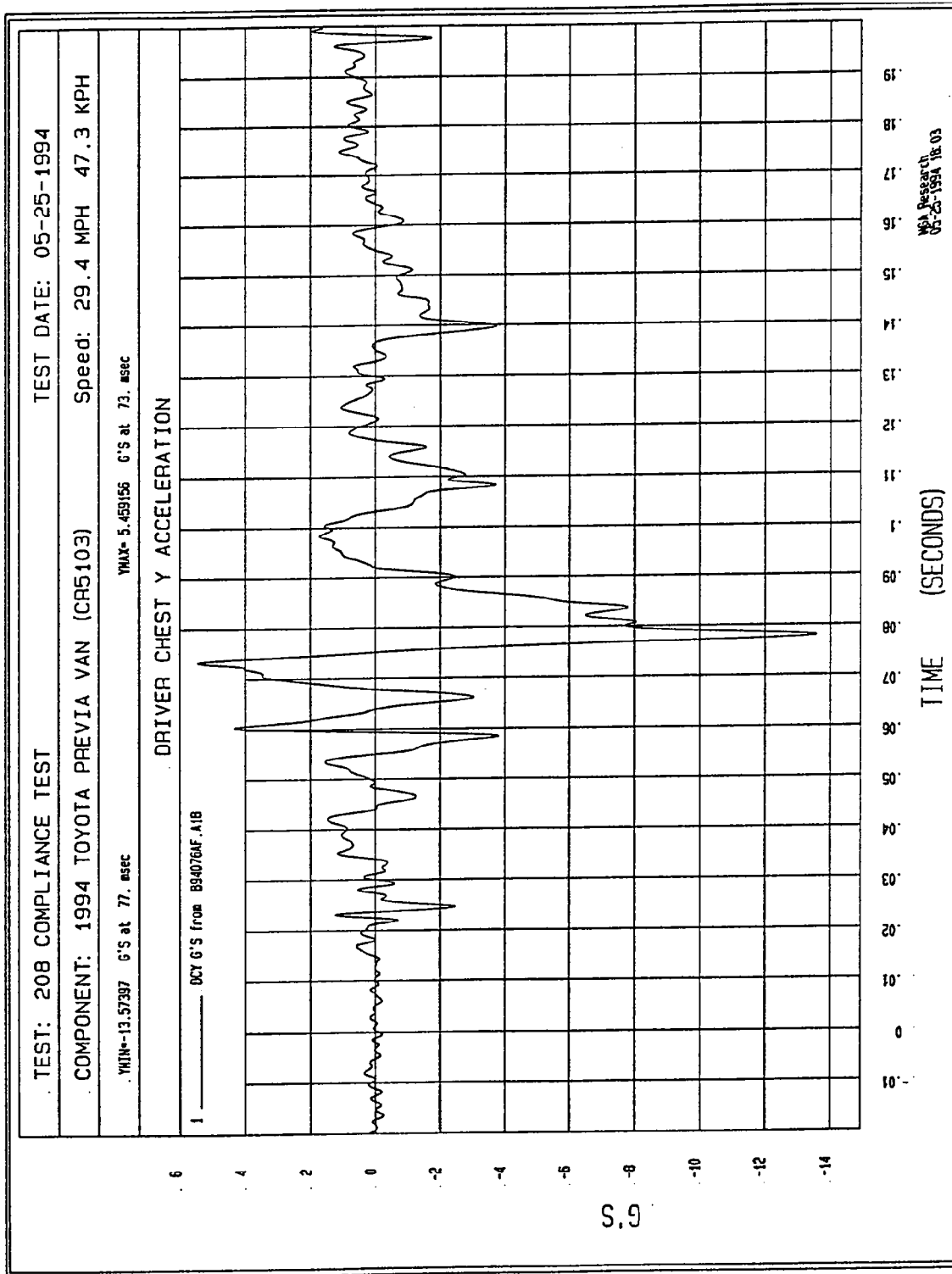


Figure B-6 - Driver Chest Y Acceleration vs. Time

Filter: Class 180

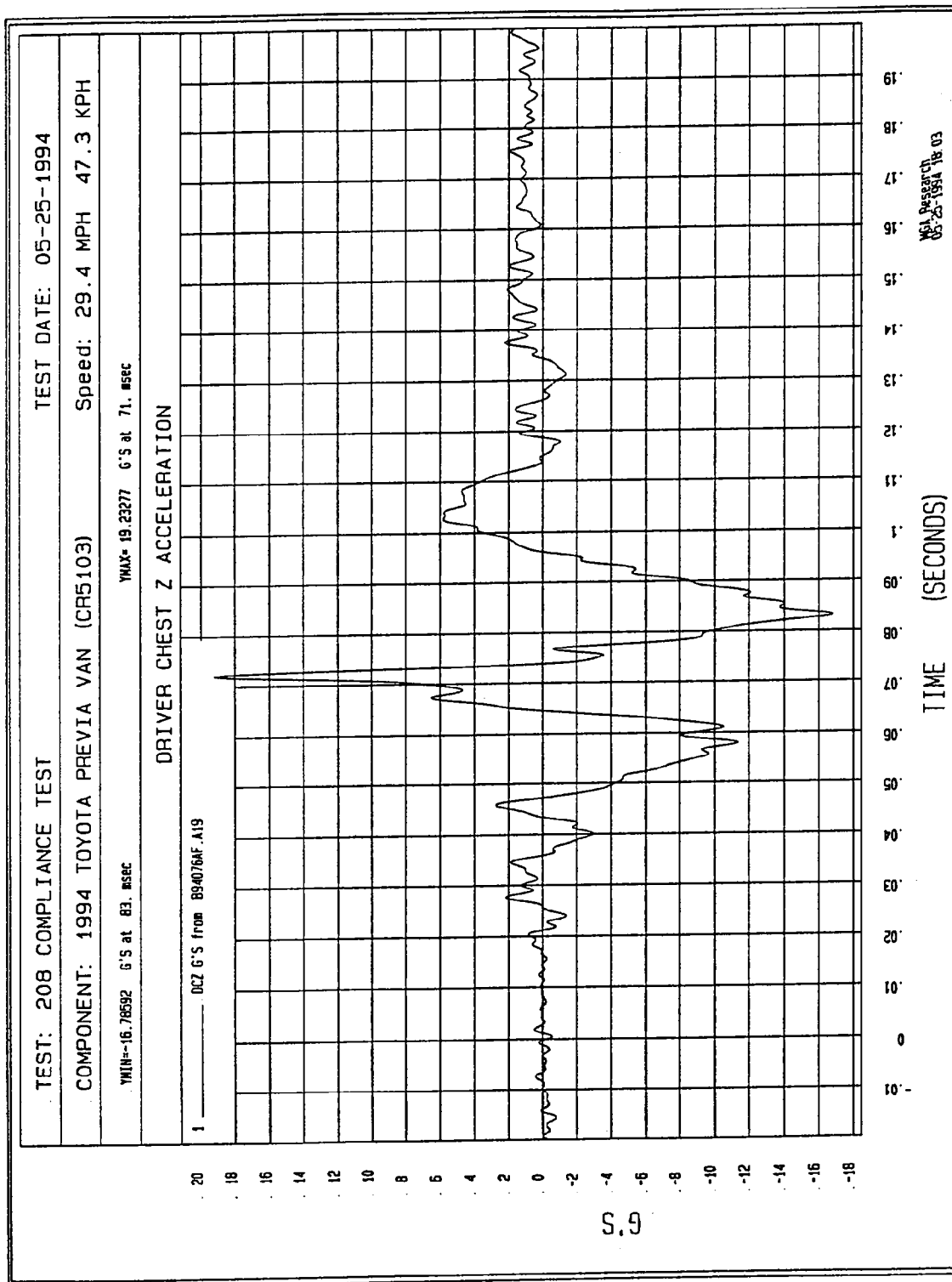


Figure B-7 - Driver Chest Z Acceleration vs. Time

Filter: Class 180

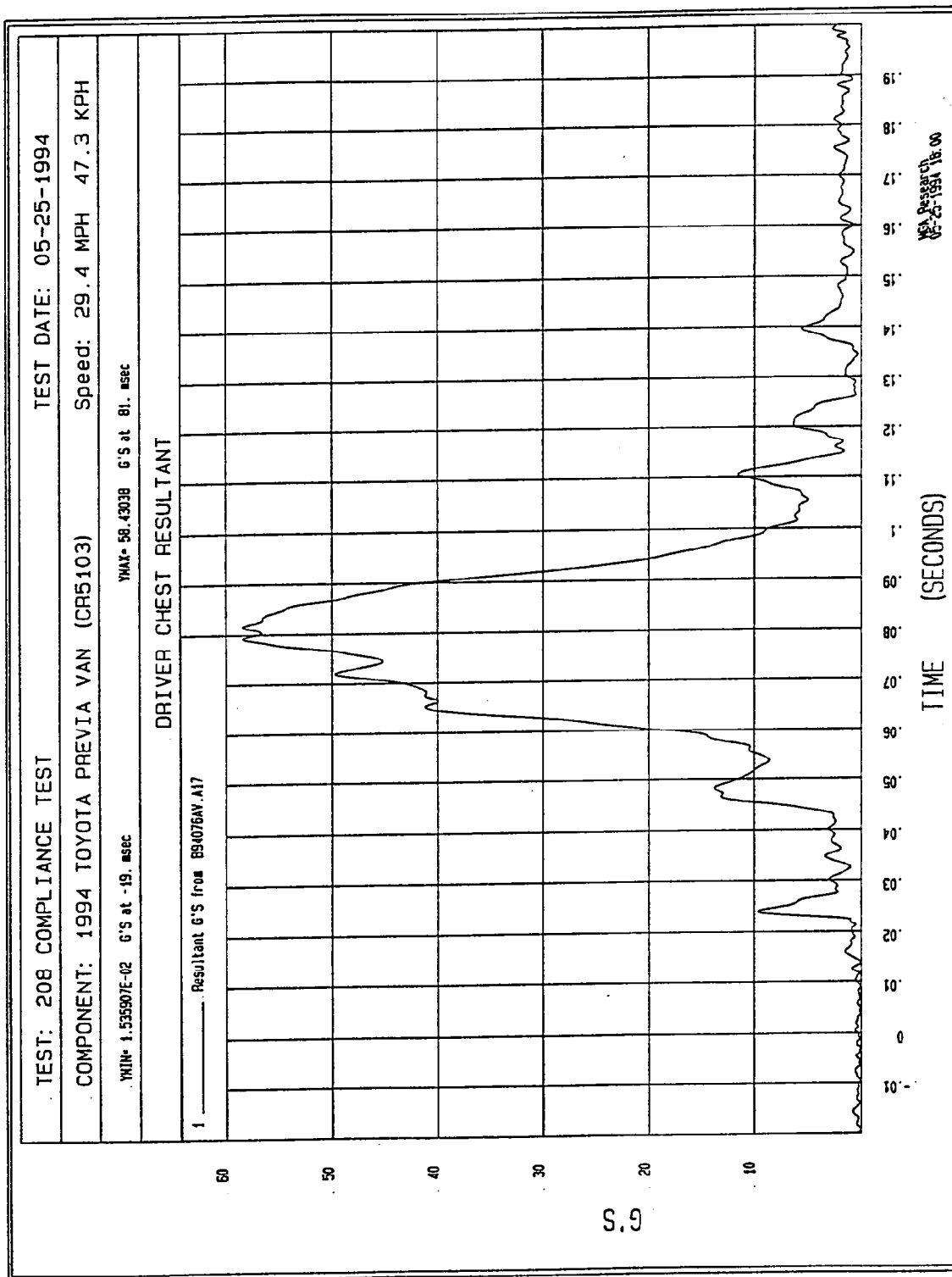


Figure B-8 - Driver Chest Resultant vs. Time

Filter: Class 600

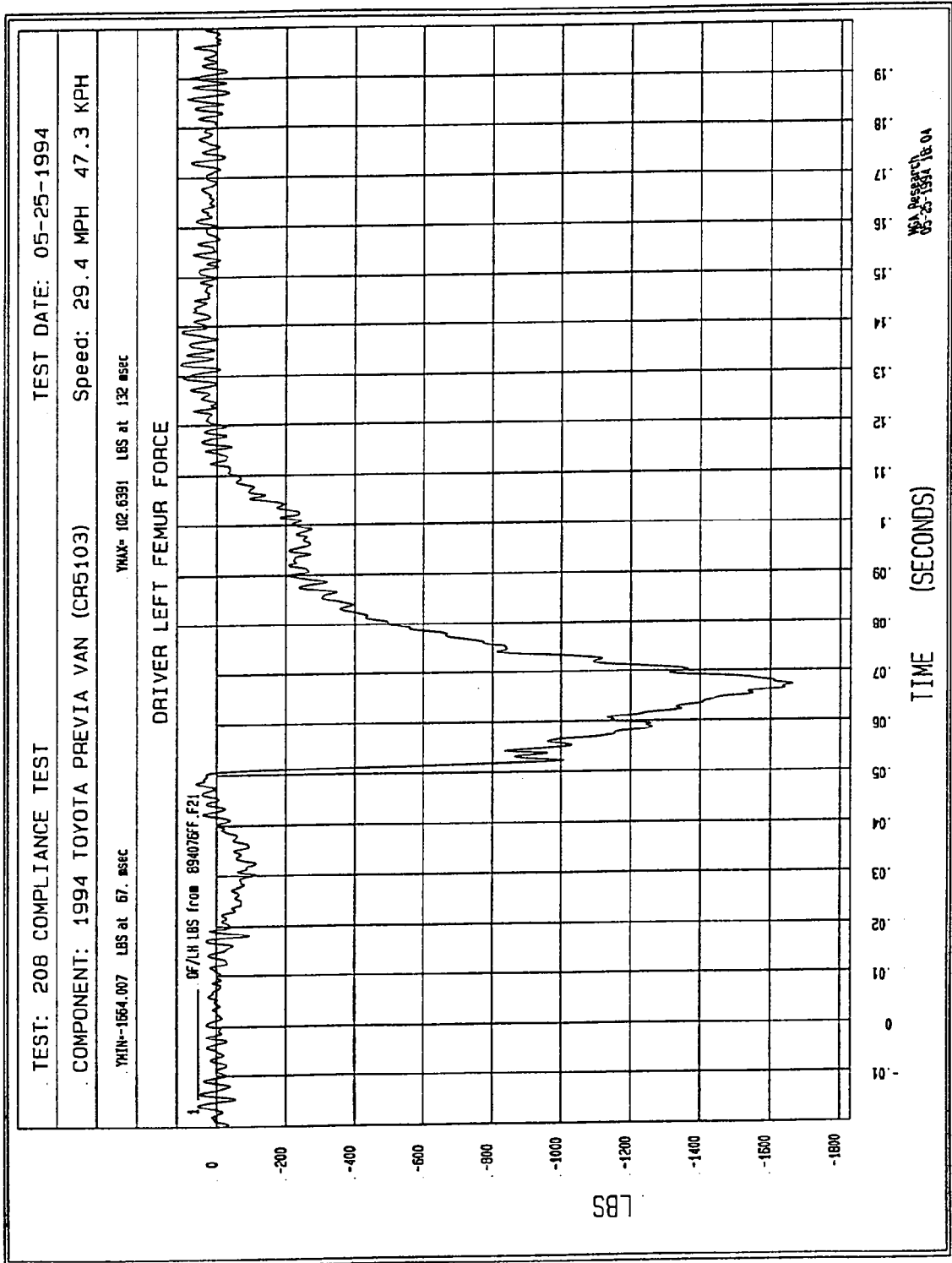


Figure B-9 - Driver Left Femur Force vs. Time

Filter: Class 600

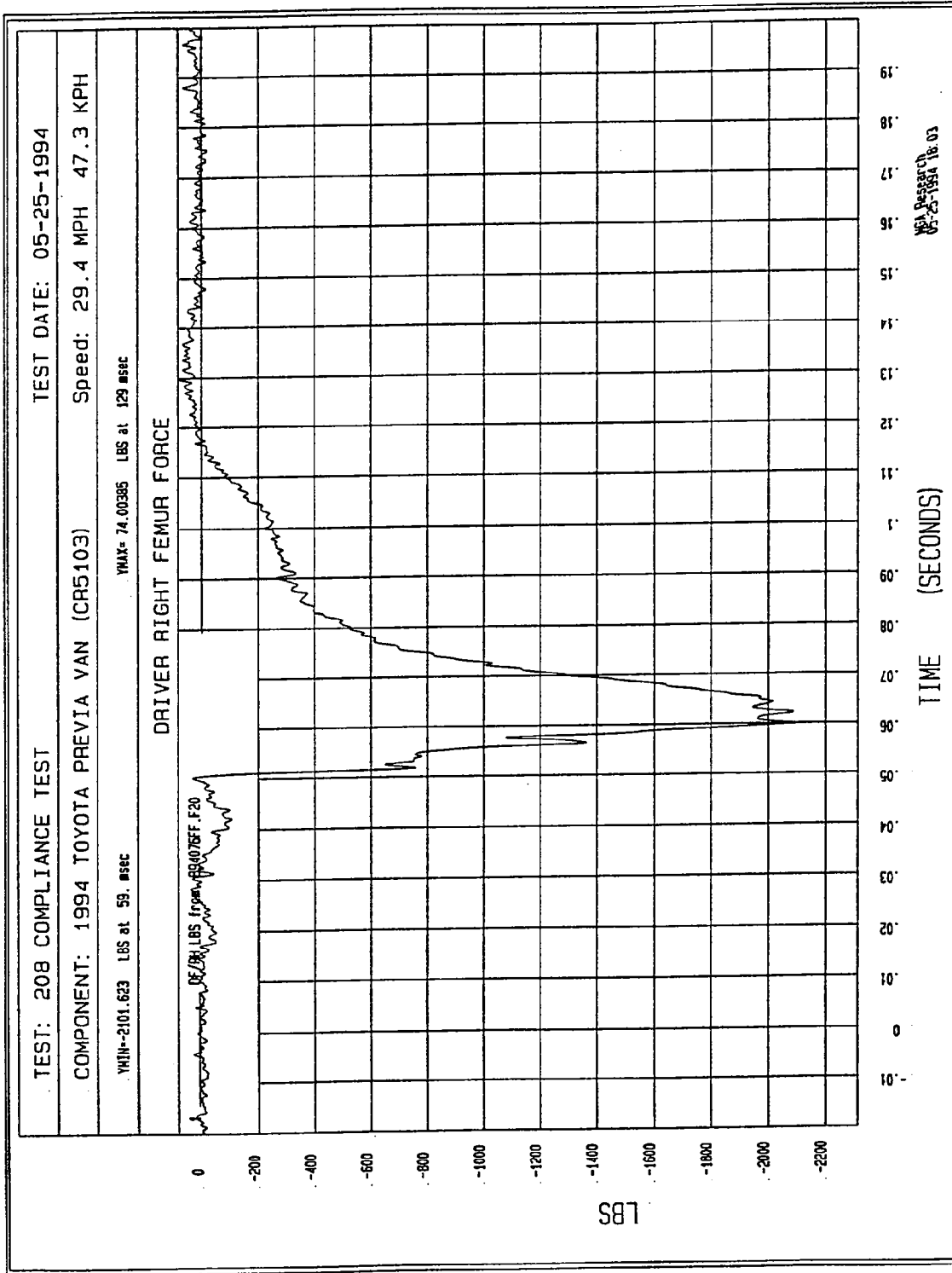


Figure B-10 - Driver Right Femur Force vs. Time

Filter: Class 1000

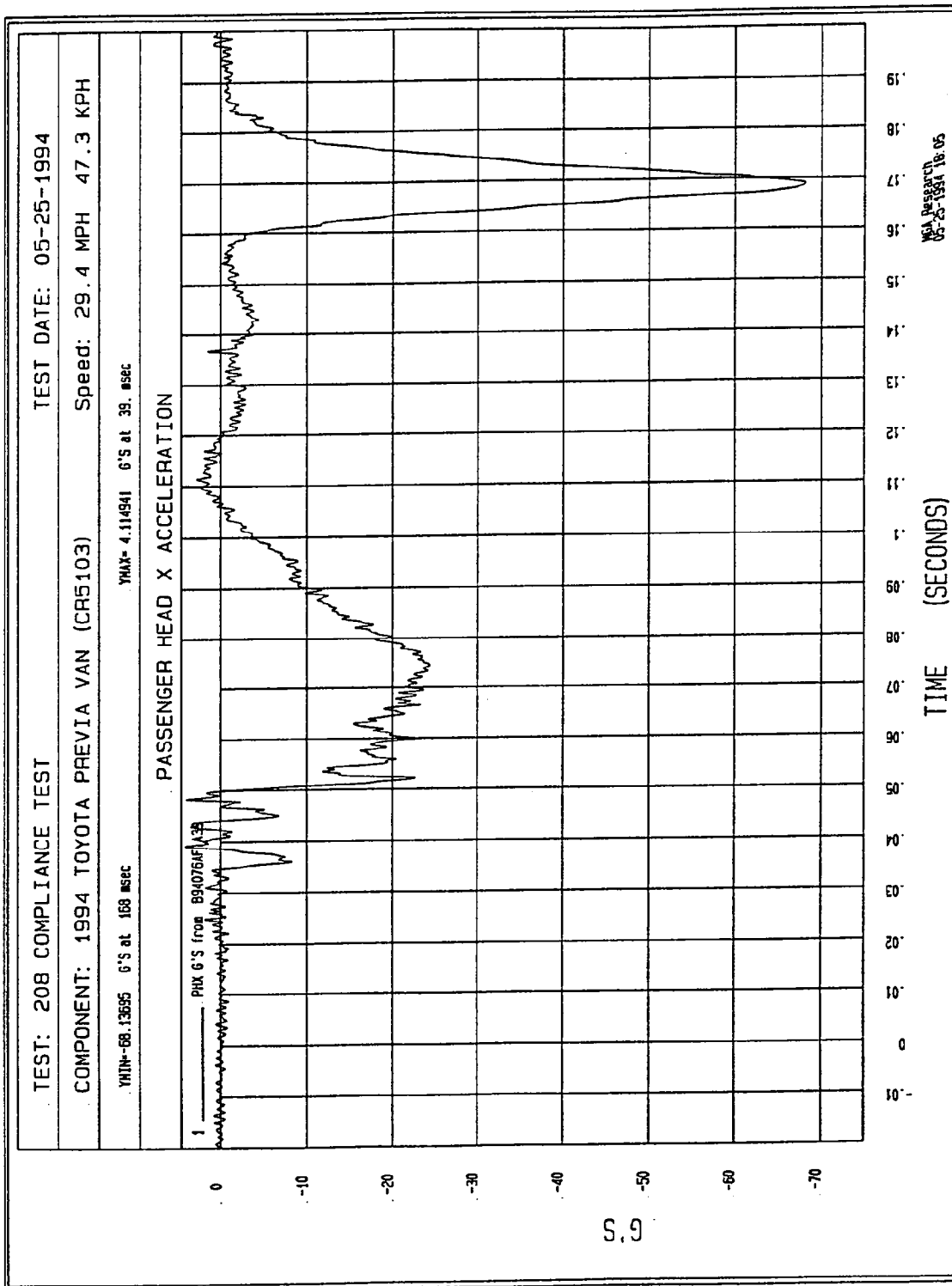


Figure B-11 - Passenger Head X Acceleration vs. Time

Filter: Class 1000

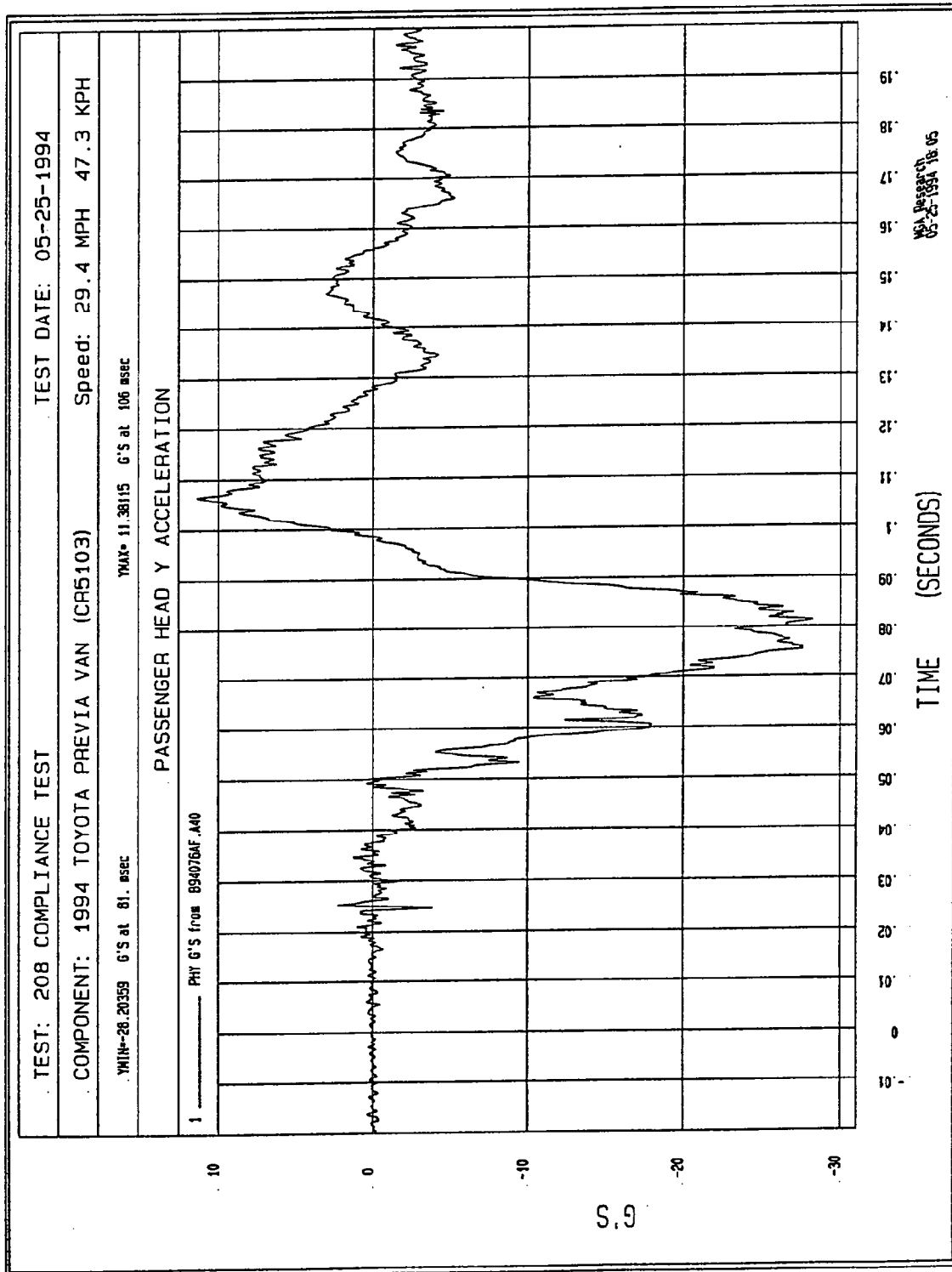


Figure B-12 - Passenger Head Y Acceleration vs. Time

Filter: Class 1000

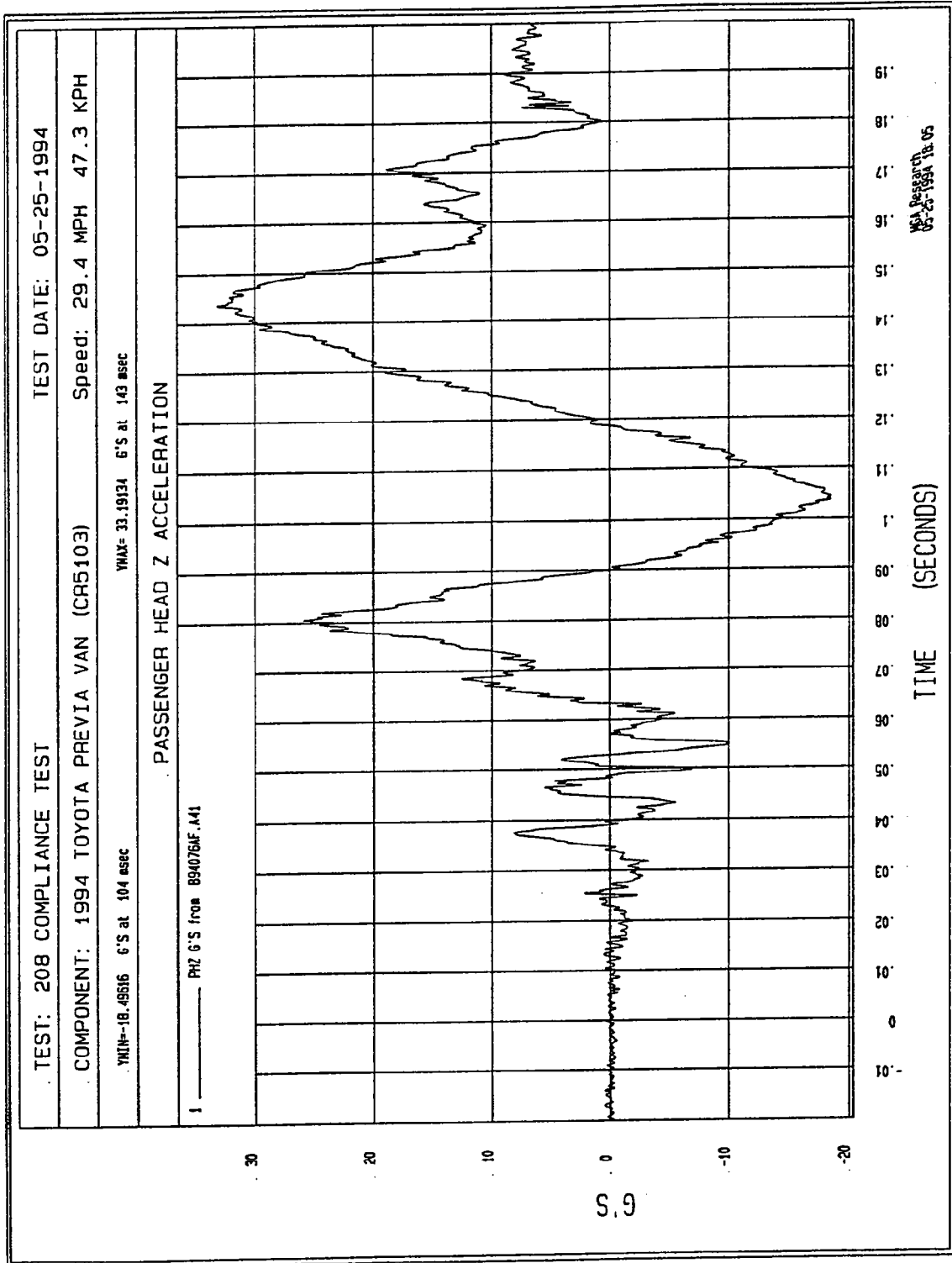


Figure B-13 - Passenger Head Z Acceleration vs. Time

Filter: Class 1000

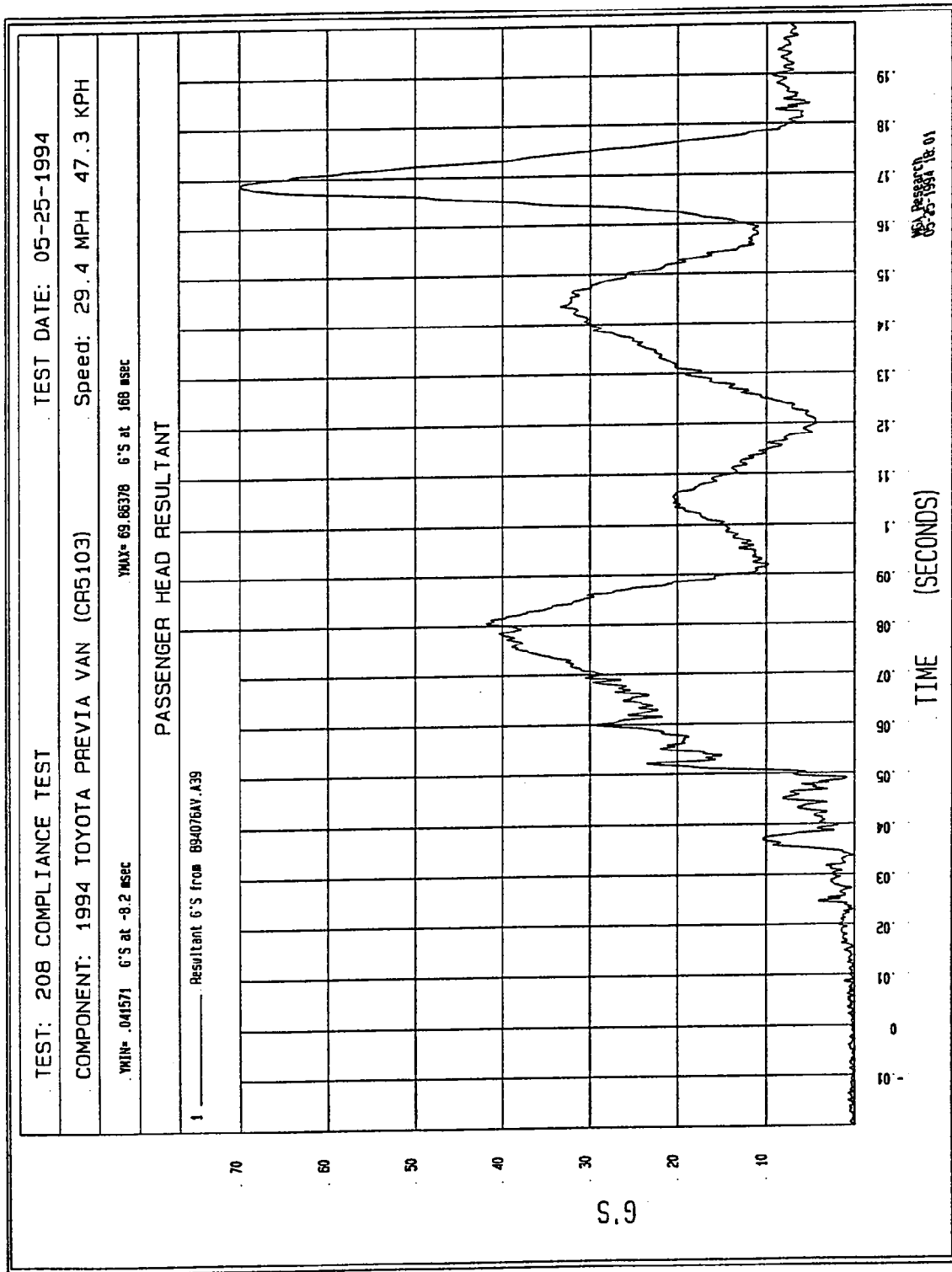


Figure B-14 - Passenger Head Resultant Acceleration vs. Time

Filter: Class 180

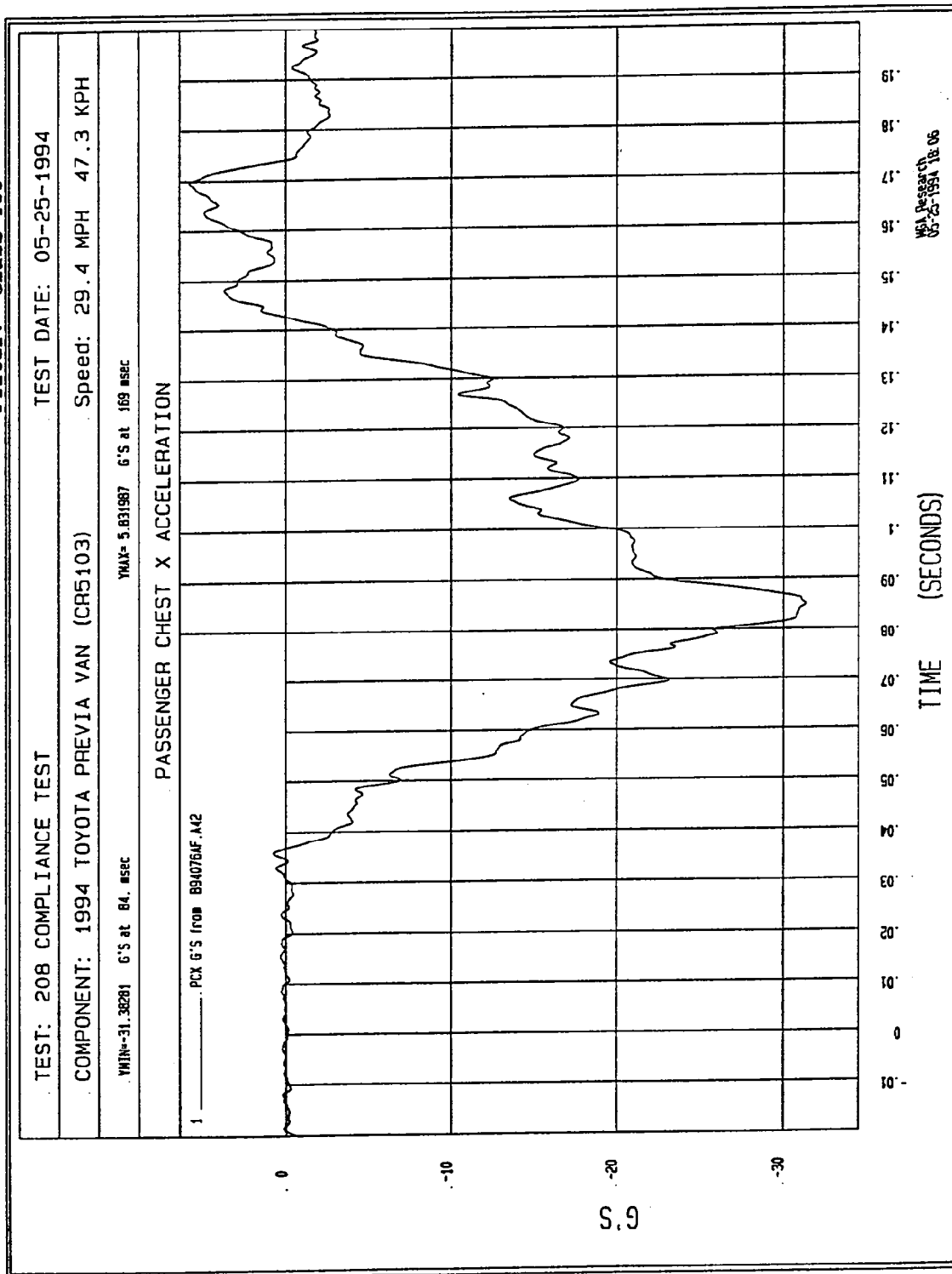


Figure B-15 - Passenger Chest X Acceleration vs. Time

Filter: Class 180

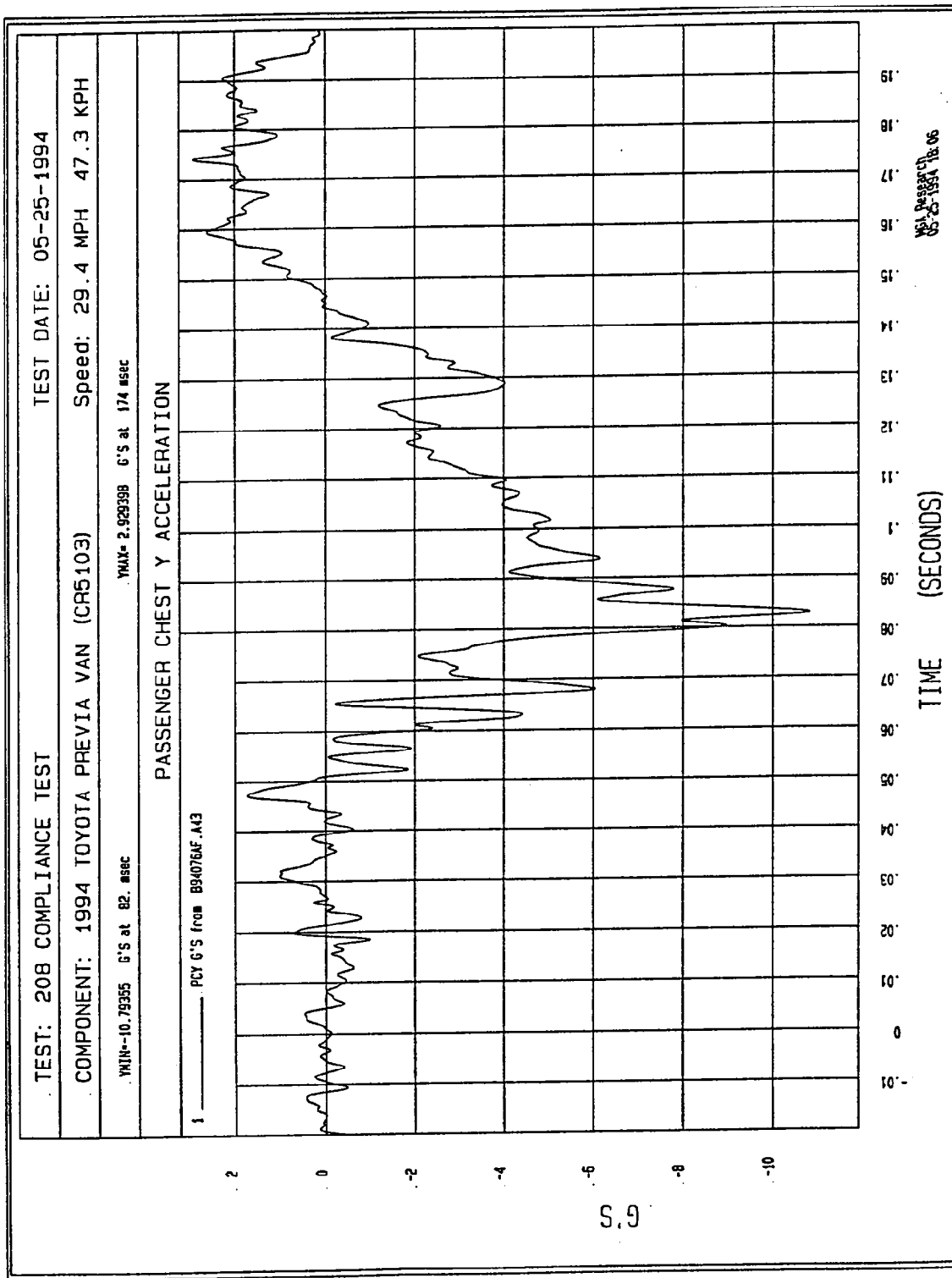


Figure B-16 - Passenger Chest Y Acceleration vs. Time

Filter: Class 180

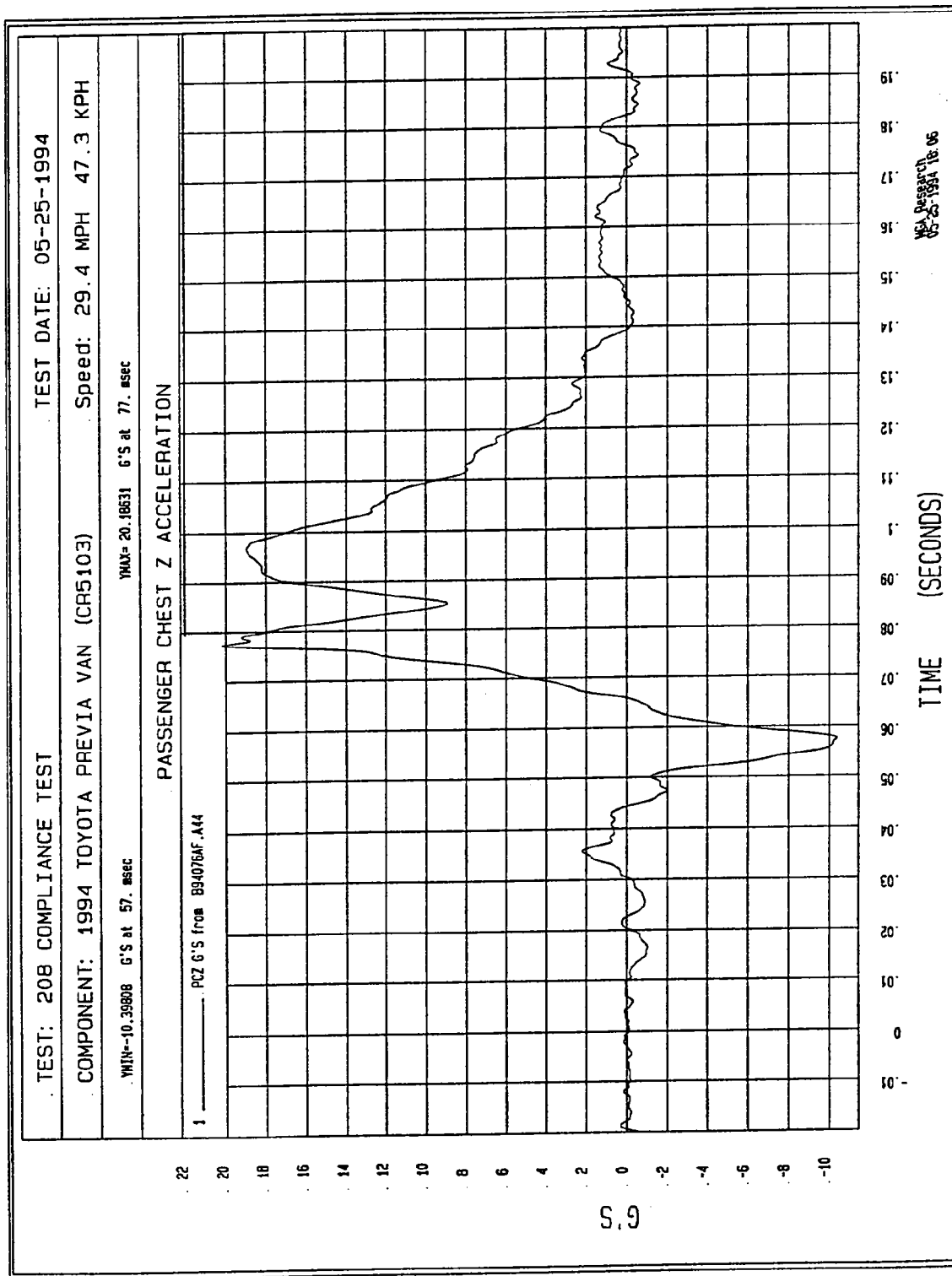


Figure B-17 - Passenger Chest Z Acceleration vs. Time

Filter: Class 180

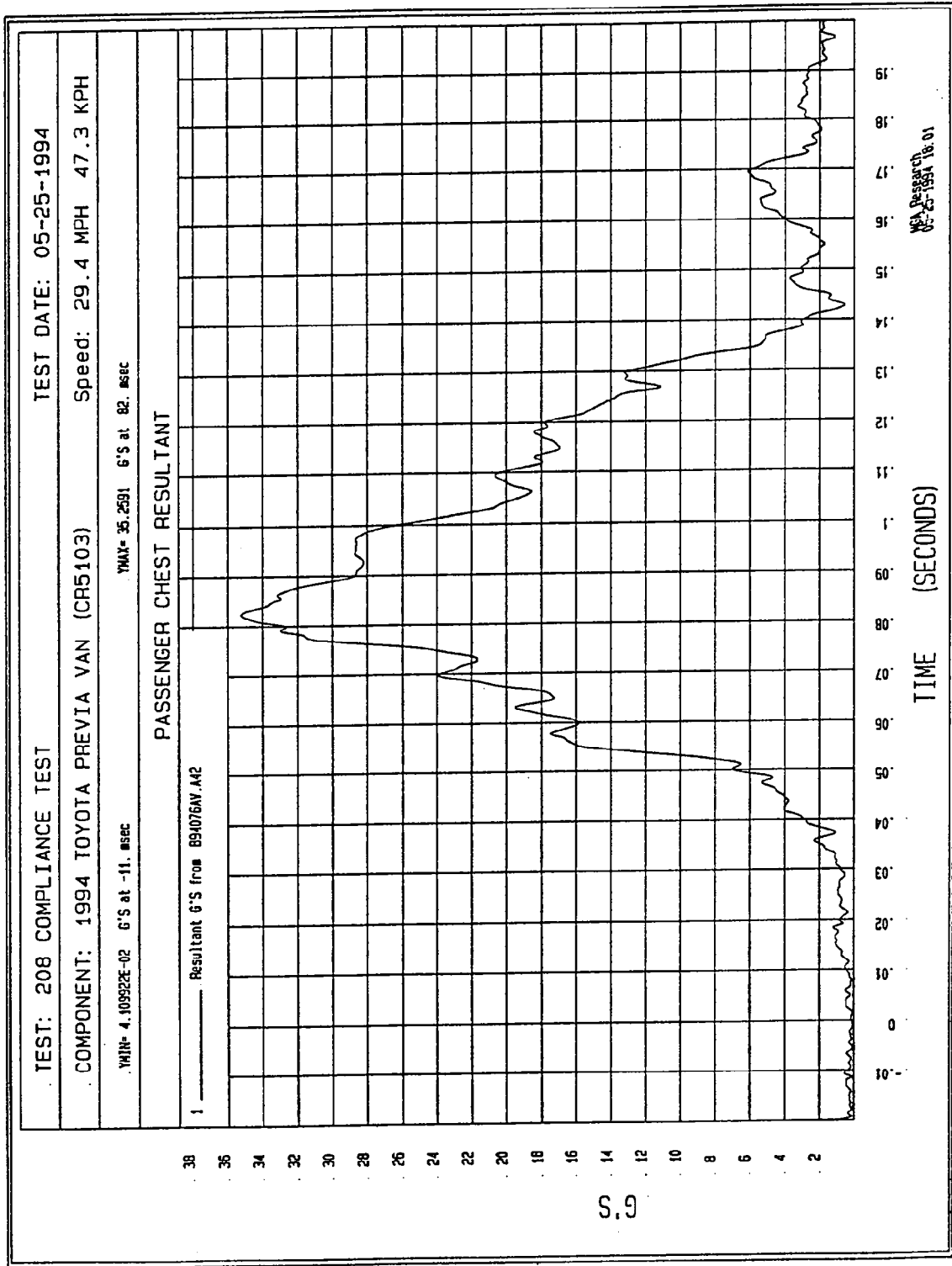


Figure B-18 - Passenger Chest Resultant vs. Time

Filter: Class 600

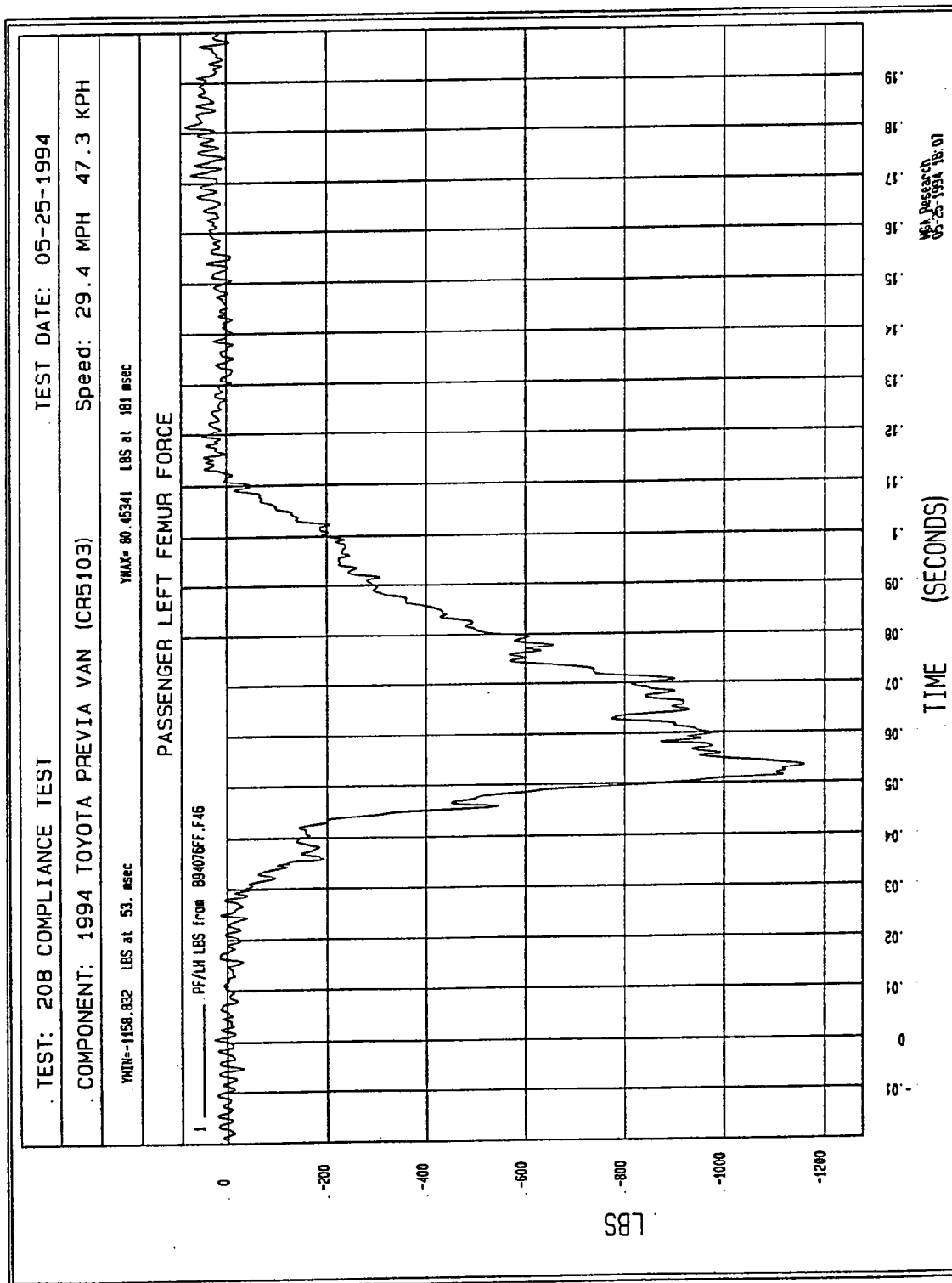


Figure B-19 - Passenger Left Femur Force vs. Time

Filter: Class 600

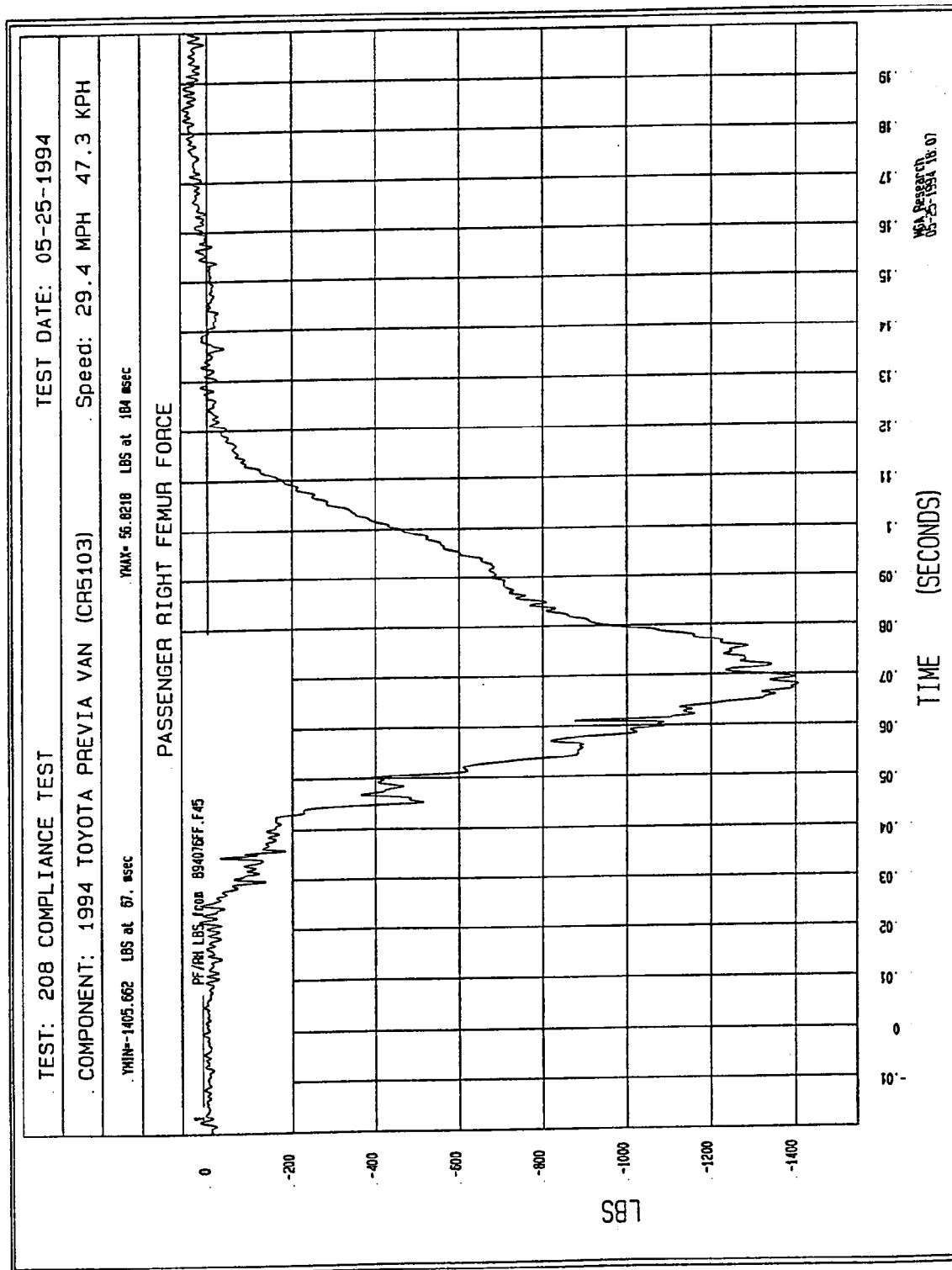


Figure B-20 - Passenger Right Femur Force vs. Time

Filter: Class 60

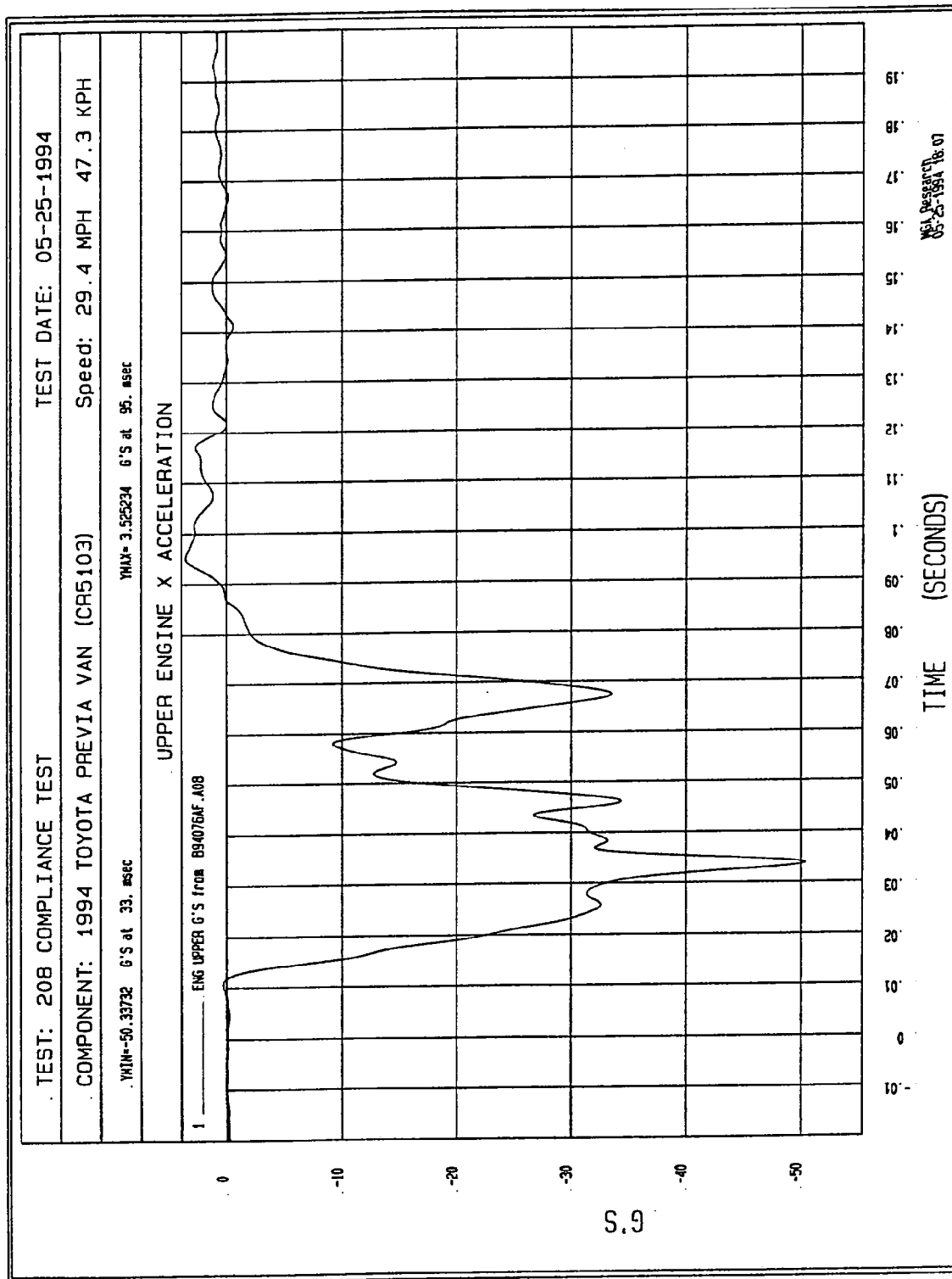


Figure B-21 - Upper Engine X Acceleration vs. Time

Filter: Class 60

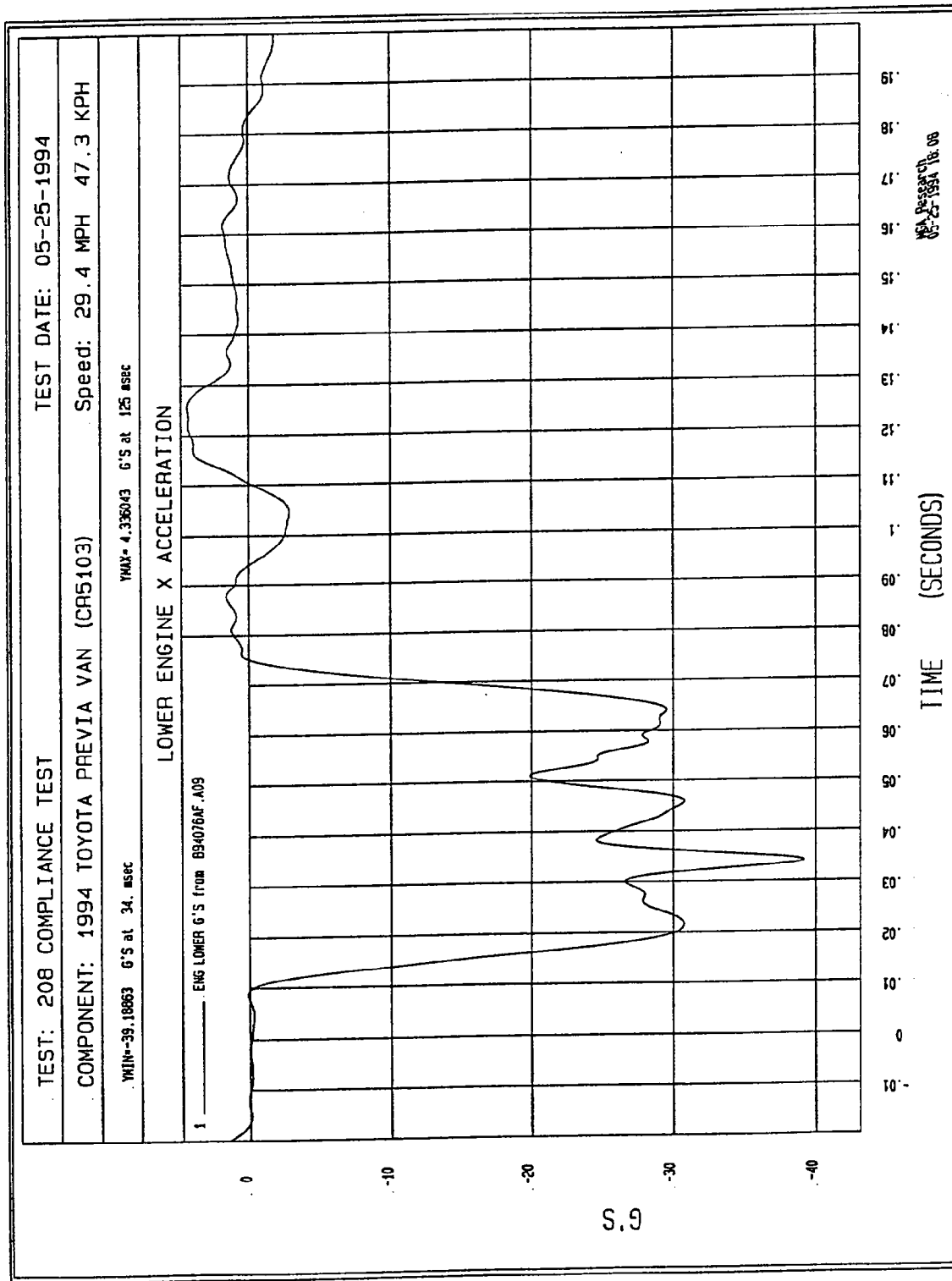


Figure B-22 - Lower Engine X Acceleration vs. Time

Filter: Class 60

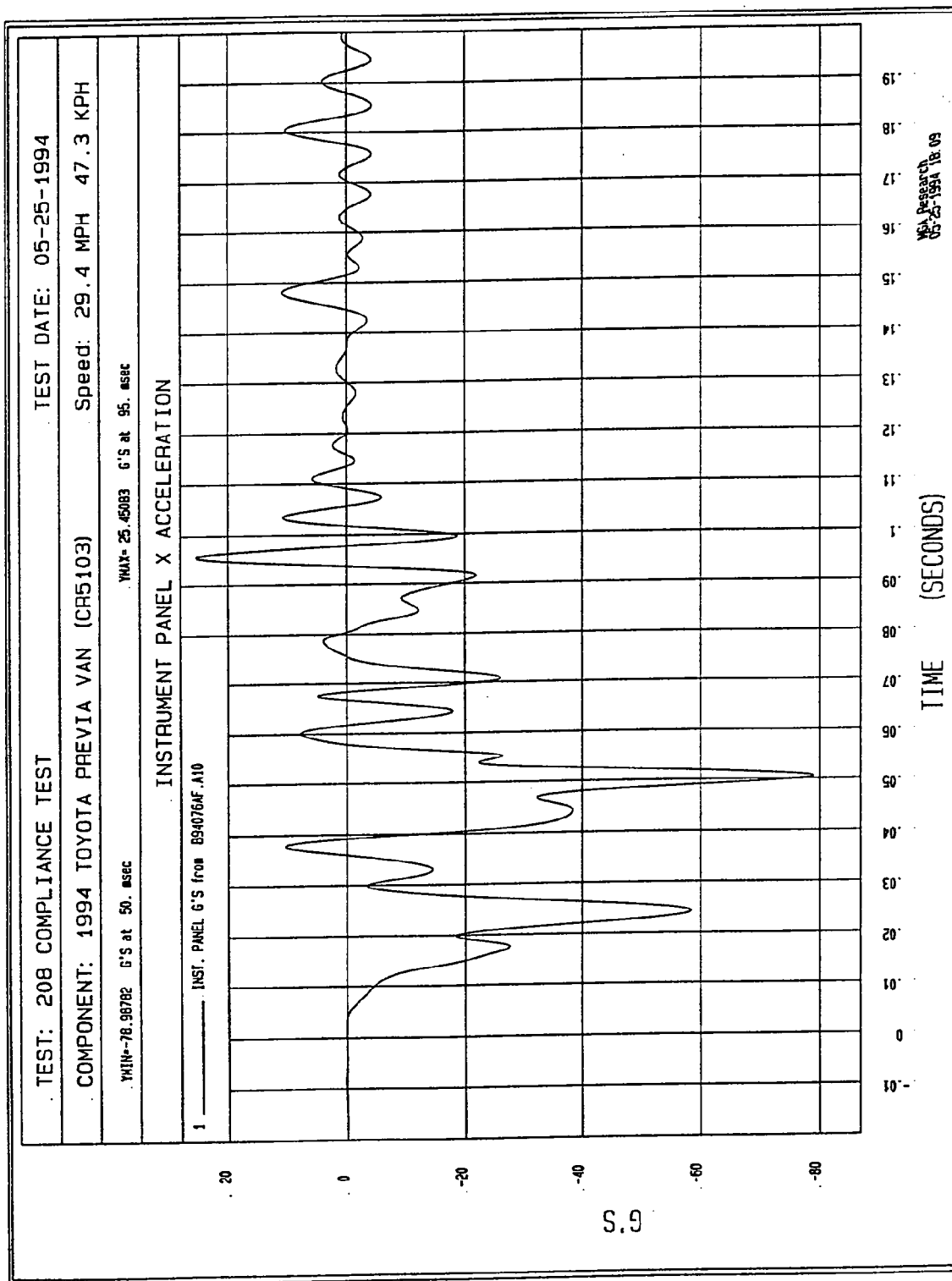


Figure B-23 - Instrument Panel X Acceleration vs. Time

Filter: Class 60

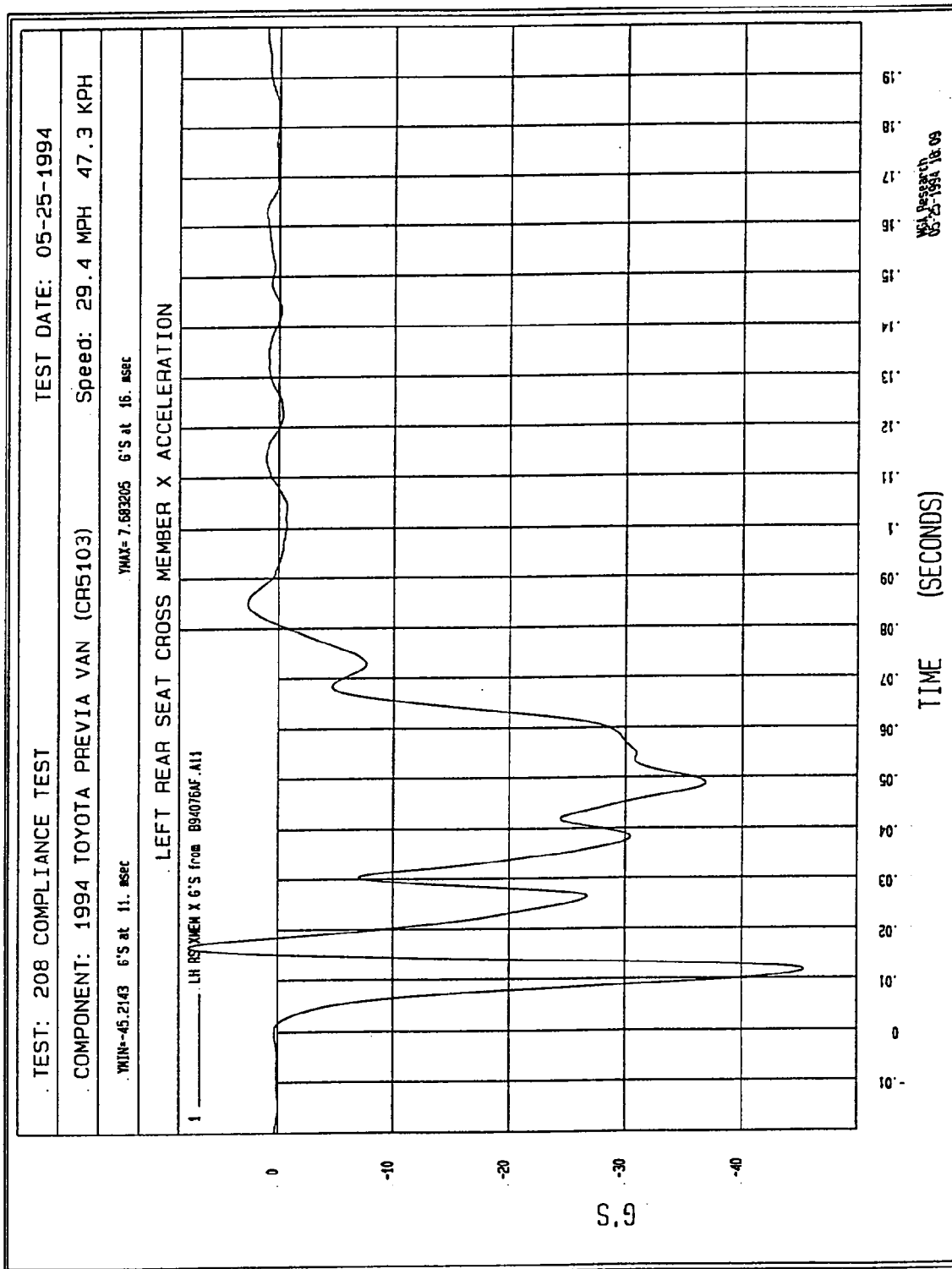


Figure B-24 - Left Rear Seat Crossmember X Accel. vs. Time

Filter: Class 60

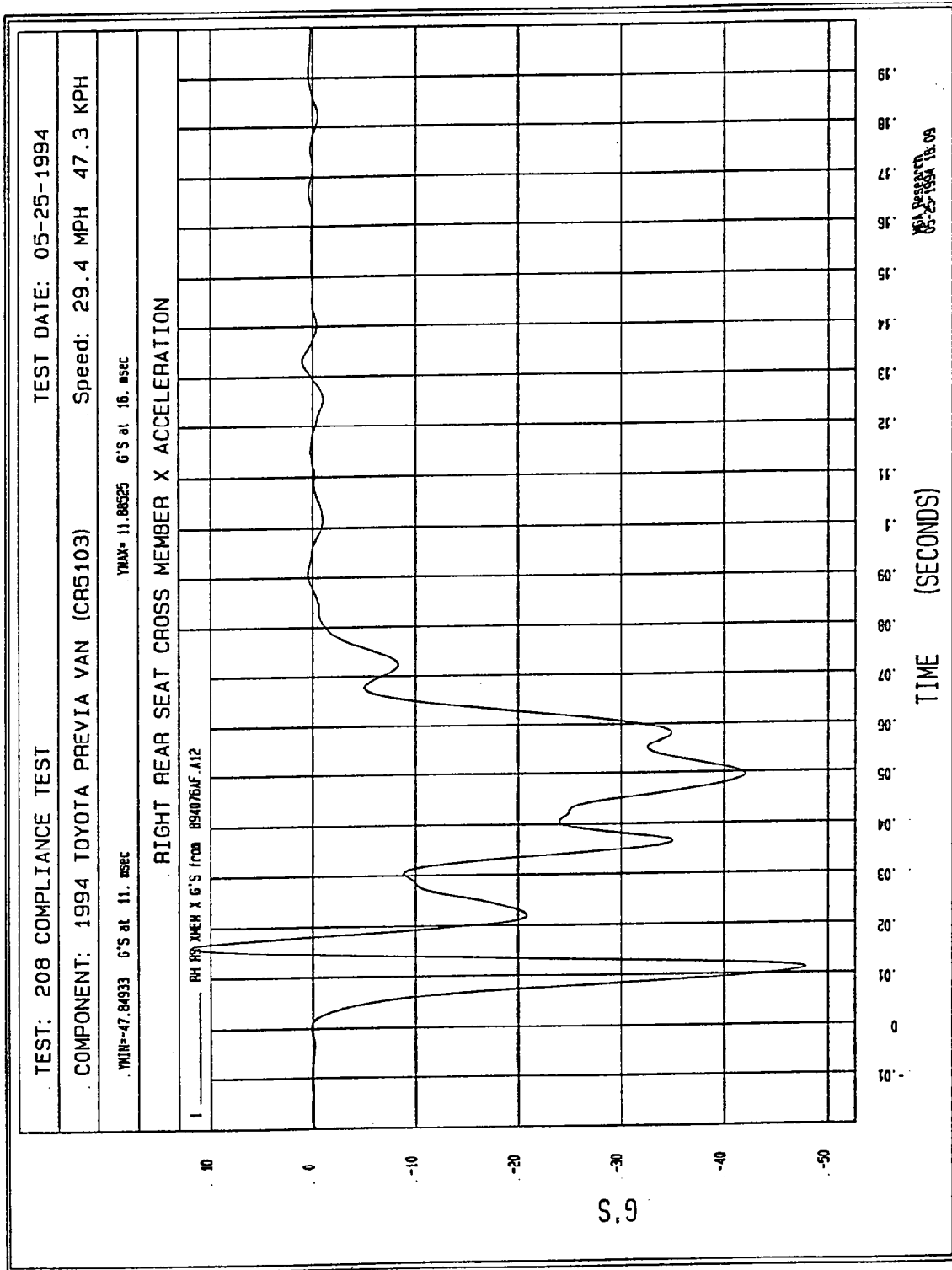


Figure B-25 - Right Rear Seat Crossmember X Accel. vs. Time

Filter: Class 60

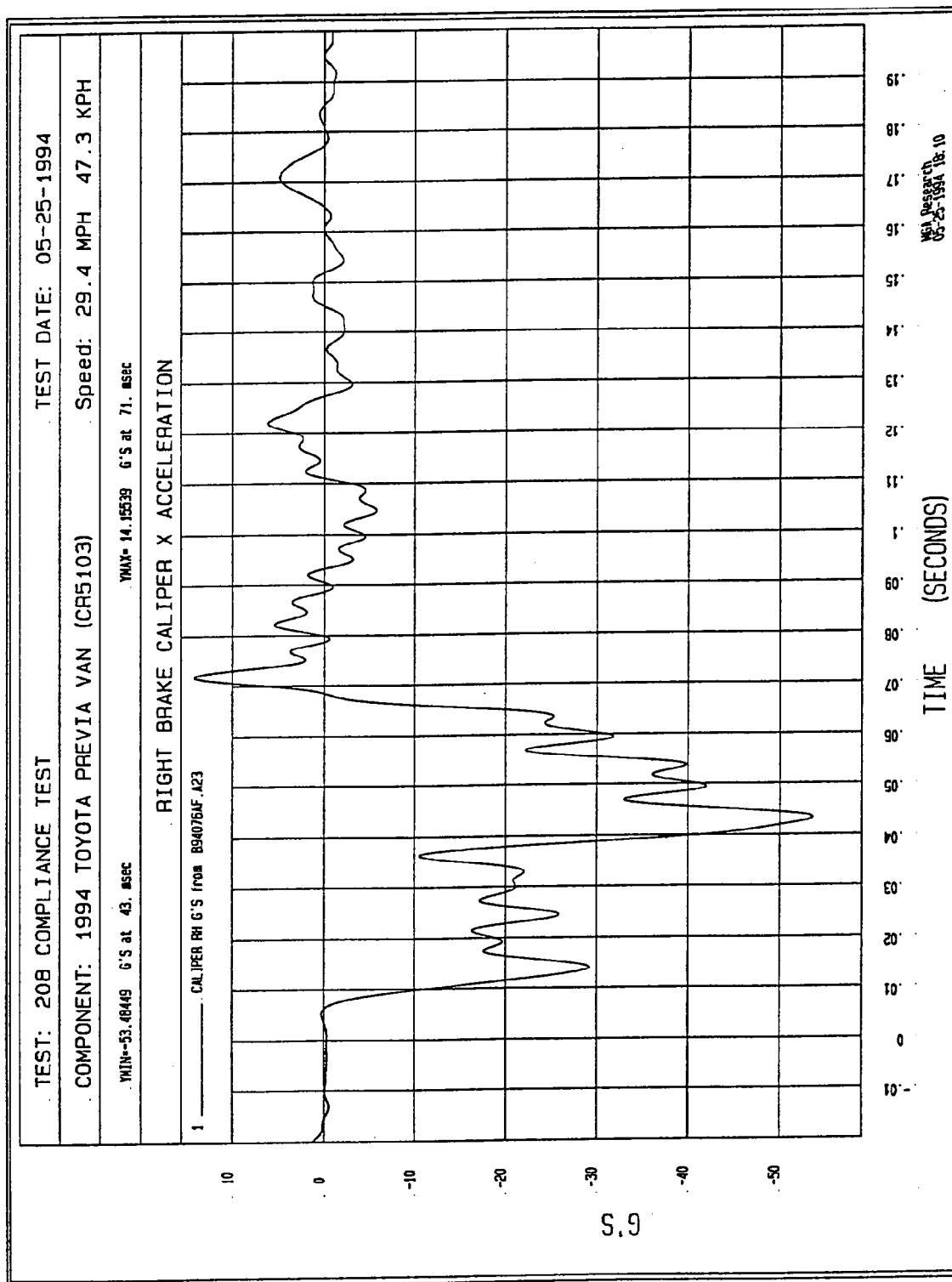


Figure B-27 - Right Brake Caliper X Acceleration vs. Time

Filter: Class 60

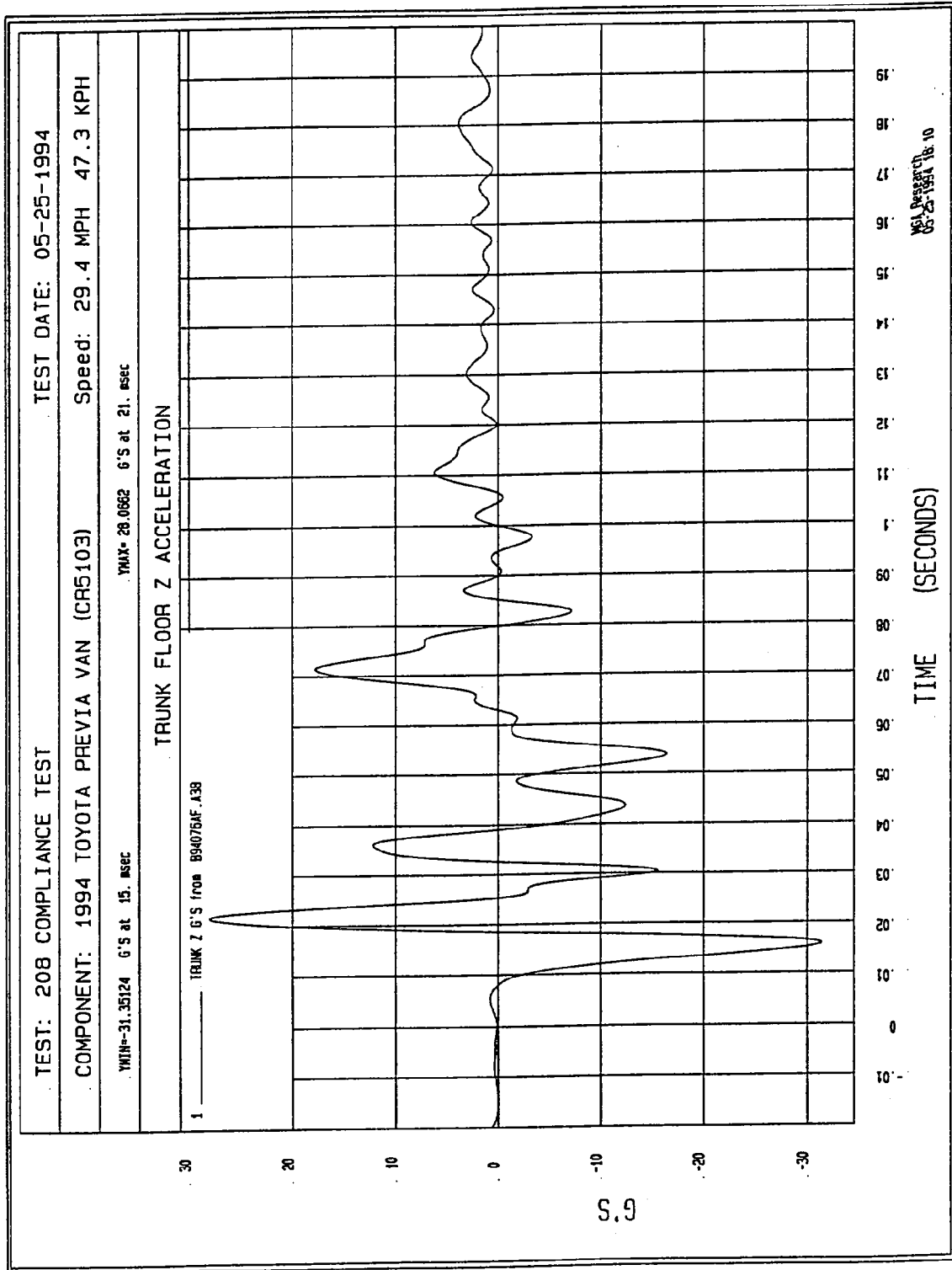


Figure B-28 - Trunk Floor Z Acceleration vs. Time

APPENDIX C
MANUFACTURER'S VEHICLE INFORMATION

TOYOTA'S RESPONSE TO
NHTSA'S REQUEST ON FMVSS 208 FOR
THE 1994 TOYOTA PREVIA (All models)
(NEF-31CCa, IR 1340)

- Q. 1. Please inform OVSC whether the air bag restraint system provided at the driver's and passenger's seating positions are certified to meet the requirements of S4.1.2.1. If it is, please inform the OVSC whether the air bag restraint provided at the driver's and passenger's seating positions is certified to meet the requirements of S4.1.2.1 (c)(1) or S4.1.2.1(C)(2) for FMVSS208.

If the air bag restraints were installed to meet the requirements of S4.1.2.1 (c)(1), please provide a copy of the certification test reports for each of the test configurations required by that section of the standard (i.e., moving barrier lateral impact and dynamic rollover) and a copy of the certification test reports for the frontal/angular barrier impact test required by S4.1.2.1.

If the manual 3-point safety belts are provided with the driver's and passenger's air bag restraint in order to meet the requirements of S4.1.2.1 (c)(2), please provide certification test reports for each of the test configurations required by that section of the standard (i.e., frontal/angular barrier impact test of the automatic restraint system with the manual safety belt unfastened and frontal/angular barrier impact test of the automatic restraint system with manual safety belt fastened).

Response 1:

The air bag restraint system at the driver's and passenger's seating positions of the 1994 PREVIA meets the requirements of paragraph S4.1.2.1(C)(2).

We provide test summary results for the frontal and angular barrier impact tests without the manual 3-point safety belt as the Attachment I-1 through I-3. The result for the frontal barrier impact with manual safety belt is provided as Attachment I-4.

As for the angular impacts with the manual safety belt, we concluded that the 1994 model PREVIA satisfies the requirements based upon our technical analysis. Toyota's theory and criteria for the on-paper technical analysis judgement is provided as Attachment I-5, and the result of the technical analysis on the 1994 PREVIA is provided as Attachment I-6.

- Q. 2. If the air bag restraints at driver's and passenger's seating positions were not installed to meet the requirements of S4.1.2.1, please inform the OVSC whether the 3-point manual belts provided in the front outboard seating positions were installed to meet the requirements of S4.1.2.3 as referenced by S4.2.2.

If the manual belts provided at the front outboard seating positions were installed in accordance with S4.1.2.3, please provide a copy of your certification test reports for the requirements specified (frontal crash test requirements of S5.1) in S4.6 of the standard.

Response 2:

Not Applicable.

Q.3. If the vehicle uses a pressure vessel to inflate the air bag, provide a copy of the test reports or engineering analysis to demonstrate that it meets all the requirements of S9.1.

Response 3:

Not applicable.

We do not use any pressure vessel to inflate the air bag of the 1994 PREVIA.

Q.4. If the vehicle uses an explosive device to inflate the air bag, provide a copy of the test reports or engineering analysis to demonstrate that it meets all the requirements of S9.2.

Response 4:

The air bag inflators of the 1994 PREVIA were approved for shipment by the Research and Special Programs Administration of the Department of Transportation. These approvals mean that the air bag inflators of the 1994 PREVIA meet all the requirements of paragraph S9.2.

We provide the approval letters of Research and Programs Administration as Attachment II-1 and II-2. The Attachment II-1 is for the driver and the Attachment II-2 is for the front left hand passenger.

Q.5. State, for any automatic safety belt system in this vehicle, whether or not it is equipped with a tension-relieving device. Provide a copy of the information furnished in accordance with S7.4.2, if the tension-relieving device is used.

Response 5:

Tension-relieving device is not used in the 1994 PREVIA.

Q.6. FMVSS 208. S8.1.5 allows the manufacturer the option of having movable vehicle windows and vents placed in the closed position. State whether the vehicle's movable windows and vents were opened or closed during certification tests.

Response 6:

All windows and vents were opened during the tests.

Q. 7. FMVSS208. S5.1 provides a manufacturer with the option of using either a Part572(B) or Part572(E) test dummy. Please inform OVSC which test dummy was used in each seat for each certification test. Submit dummy placement measurements, including diagrams or photographs which show exactly where measurements were taken. Enclosed is a diagram of some of OVSC's dummy measurements. Where possible, use the dimension shown in the diagram to provide the individual dummy placement measurements.

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

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

Response 7:

Part 572(B) test dummies were used in the front seating positions of the 1994 PREVIA certification tests. The dummy placement measurement data including our diagrams is provided in the section 11 of Attachment III. Also the dummy placement data in the OVSC form is provided in the Attachment IV.

A foot rest is provided for the driver.

The 1994 Toyota PREVIA is equipped with a bucket seat for each front outboard seating position. (The PREVIA is not equipped with a split front bench seat.)

Q. 8. Provide the seat positioning, steering column positioning, and fuel tank data on the enclosed form.

Response 8:

We provide above information in Attachment IV.

Q. 9. If the vehicle is equipped with adjustable seat belt anchorages, provide the manufacturer's nominal design position for a 50th percentile adult male occupant.

Response 9:

See section 9 of the Attachment III.

Q. 10. Provide the speed at impact, vehicle test weight, and resulting injury criteria (i.e., HIC, chest acceleration, chest compression for the Part 572(E) dummy and femur loads) recorded for all certification tests conducted to meet the requirements of S4.1.2.1. or S4.1.2.3.

In addition, include each dummy's head and chest acceleration versus time plots and femur load versus time plots for the full frontal barrier impact tests. Mark these plots to indicate when the following and any other significant events occur:

10.1 Driver and Passenger knee contact with knee bolster

10.2 Collapse of the driver and passenger knee bolsters

10.3 Beginning and end of seat belt stretch

10.4 Steering column stroke (when it starts and when it ends)

10.5 Driver: Contact of the head with the air bag, steering wheel, hub, windshield, header and any other contact points

Passenger: Contact of the head with the air bag, instrument panel, windshield, header and any other contact points

10.6 Contact of the driver's torso with the air bag, steering wheel and hub

10.7 Time during event when each air bag starts to deploy and when it is fully deployed

10.8 Mark on the plots any unexpected events, like steering wheel fracture, windshield contact, windshield header contact, that affect the normal loading characteristics.

Response 10:

We provide the testing injury criteria recorded during each certification test in Attachment I-1 through I-4 in response to your request No. 1.

The required plots for the full frontal barrier impact test (without manual belt, see Attachment I-1) are provided as Attachment V.

Q. 11. When vehicle components must be removed to obtain the proper test weight, what components do you recommend for removal and in what priority order do you recommend removal?

Response 11:

The recommended parts for vehicle weight adjustment are listed in the section 13 of the Attachment III. There is no priority order for the part removal.

Q. 12. Please provide FMVSS No. 204, "Steering Control Rearward Displacement" certification data. Include a copy of the test report any engineering analysis forming the basis of the certification. The report should document the vehicle test weight, impact velocity, and the horizontal and vertical displacements of the steering control. Pre and post test photographs are also required.

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

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

Response 12:

The test report is provided as Attachment VI.

The test procedure for FMVSS 204 is provided as Attachment VII.

The steering control system of the 1994 model PREVIA is detailed in the Attachment VIII.

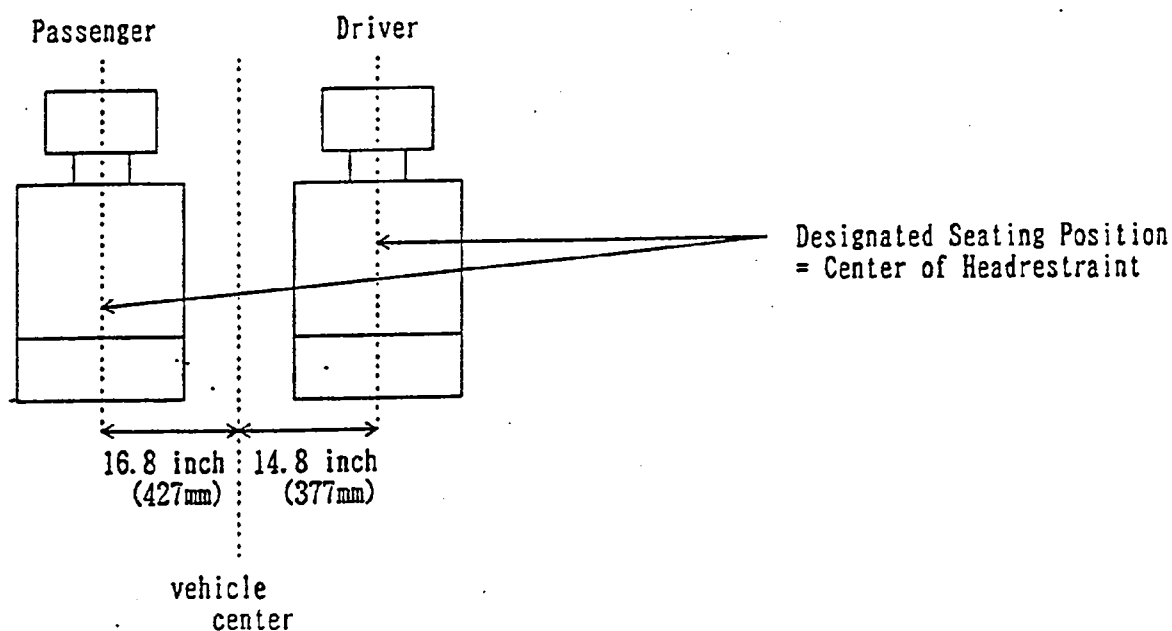
Information for NHTSA Regarding The 1994 TOYOTA PREVIA
(Test Conditions for Barrier Crash Test)

The following are design-related matters necessary for conducting the barrier crash test.

Test Conditions:

1. Useable Fuel Tank Volume : 19.81 gallons
 92% of useable volume : 18.23 gallons
 94% of useable volume : 18.62 gallons
2. Vehicle Capacity Weight : LE 1100 lbs
 DX 1185 lbs
 Rated Cargo & Luggage Weight : LE 501 lbs
 DX 135 lbs
 Designated Seating Capacity : 7
3. Tire Inflation Pressure : Fr. 35 psi Rr. 35 psi
4. Outboard Designated Seating Position :

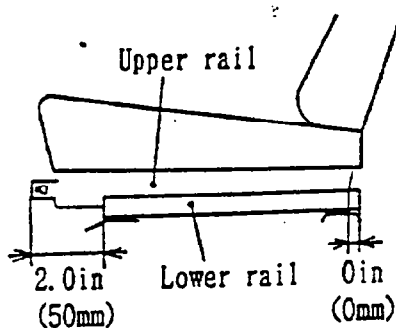
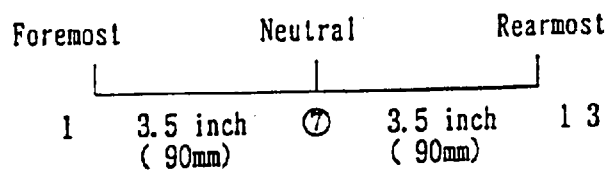
16.8 inch(427mm) and 14.8 inch(377mm) outboard of the vertical plane which includes vehicle center



5. Front Seat Adjustment (Driver & Passenger Side) :

Driver's Seat

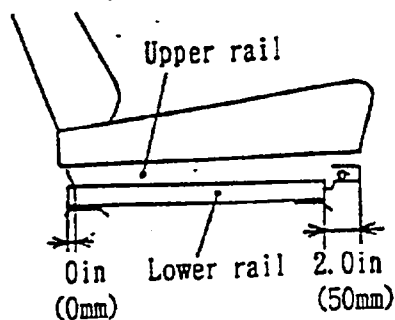
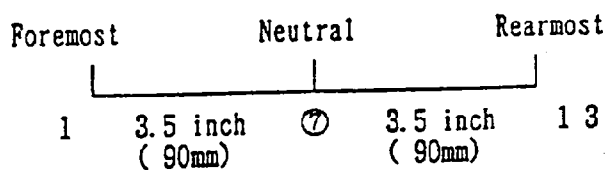
Move to the seventh notch rearward from the foremost position.



without vertical adjuster

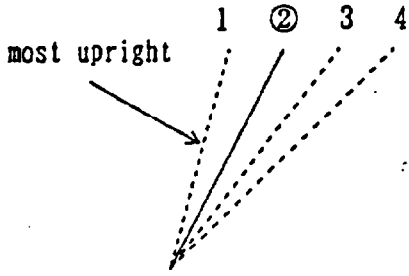
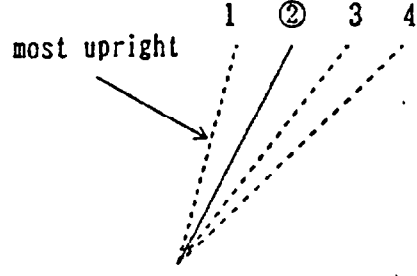
Passenger's Seat

Move to the seventh notch rearward from the foremost position.



without vertical adjuster

6. Designated Seat Back Positions :

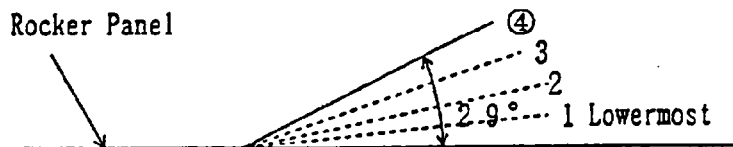
Seat Type	Driver Side Position	Passenger Side Position
Separate Seat	Recline to the <u>second notch</u> rearward from the most upright position. 	Recline to the <u>second notch</u> rearward from the most upright position. 

7. Other Seat Adjustment :

None.

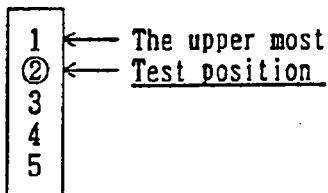
8. Steering Column Adjustment :

Tilt to the fourth notch upward from the lowermost position.



9. Shoulder Belt Anchor Position :

We conducted our certification tests with the adjustable shoulder belt connection locked in the second position from the upper most.



10. Anthropomorphic Test Device :

Driver : HYBRID-II

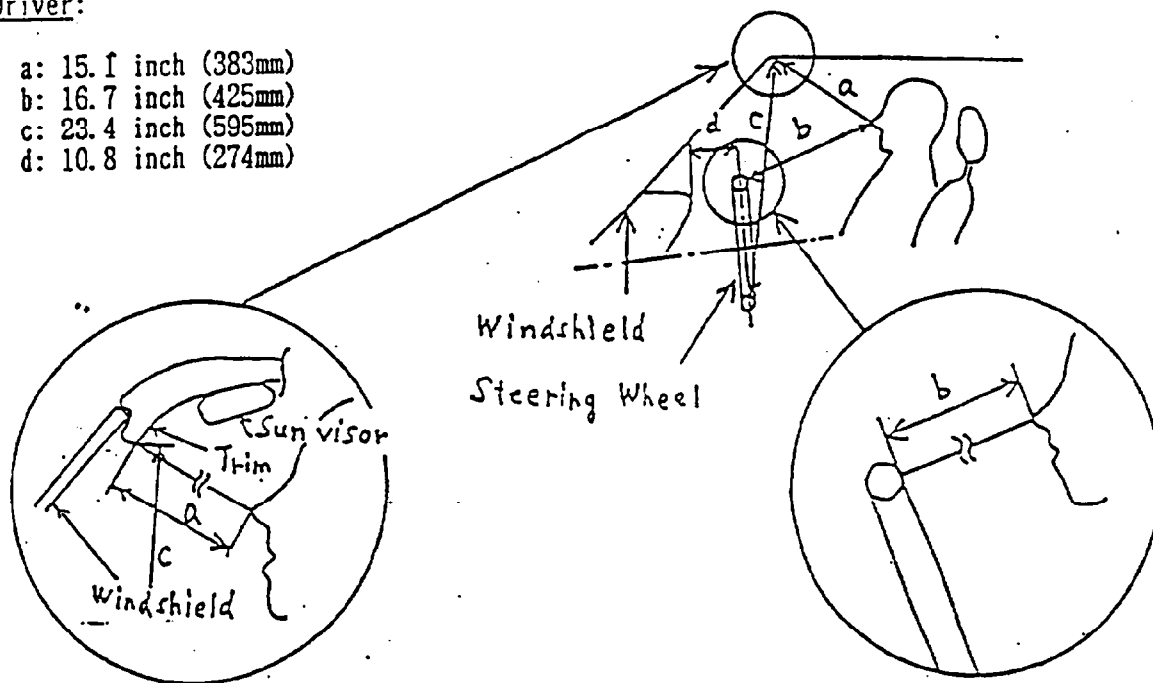
Passenger : HYBRID-II

11. Dummy Clearance Dimensions :

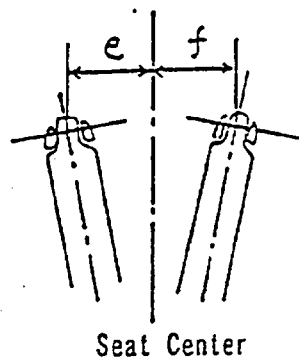
If the dummies are properly positioned on the adjusted seating system, the dimensions are as follows:

Driver:

- a: 15.1 inch (383mm)
- b: 16.7 inch (425mm)
- c: 23.4 inch (595mm)
- d: 10.8 inch (274mm)



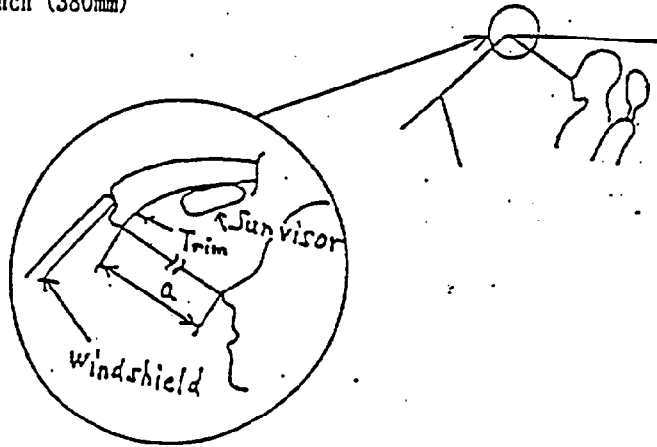
Interval of the knee



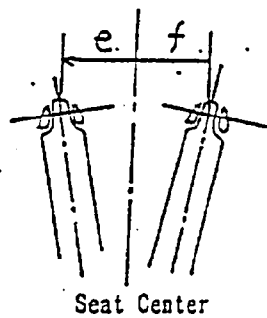
- e: 3.9 inch (100mm)
- f: 6.5 inch (165mm)

Passenger:

a: 15.0 inch (380mm)



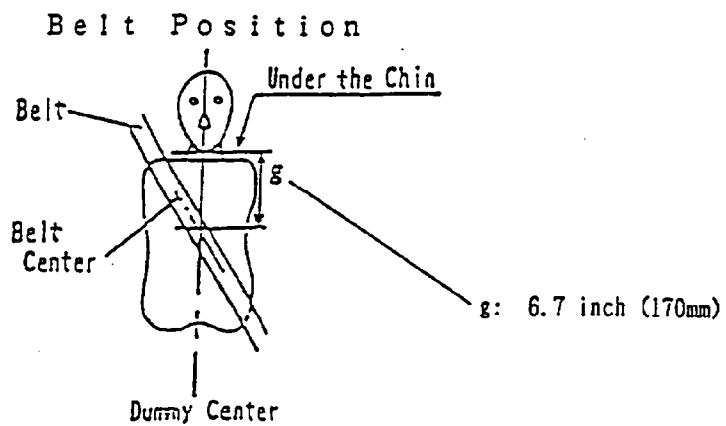
Interval of the knee



e: 3.9 inch (100mm)
f: 3.9 inch (100mm)

12. Belt Position

Driver and passenger



13. RECOMENDED REMOVAL PARTS FOR WEIGHT ADJUSTMENT

Following is the list of the vehicle components that may be removed in order to adjust the test vehicle weight, which has become necessary because of the added weight of the test instrumentation mounted on the vehicle.

<u>Item No.</u>	<u>Part Name</u>	<u>Estimated Weight (lbs.)</u>
1	Rear 1st row Captain Seat Ass' y	147.7
2	Rear 1st row Bench Seat Ass' y	70.5
3	Rear 2nd row Separate Seat Ass' y	75.0
4	Rear Bumper Ass' y	32.3
5.	Rear Combination Lamp Ass' y	7.4
6.	Tool & Jack	9.0
7	Rear Seatbelt Ass' y	8.8
8	Outside Mirror	5.0
9	Inner Mirror	1.1
10	Assist Grip	0.2
11	Spare Tire	33.1
	Temper	
	Grand p 205	44.8
	p 215	48.5
12	Back Door Inner Trim	4.6

14. Reconfirmation of the Test Procedure

We would like to reconfirm the FMVSS208 test procedure. in particular concerning the following 10 items. in order to avoid test procedure trouble that may affect the test result.

1. Dummy center positions:

We would like you to adjust the dummy center position in the following mannar.

- ① Scribe a line for the dummy center position 14.8 inches apart from the vehicle center line in side and passenger side is 16.8 inches as illustrated below.
- ② Place each dummy with its center line adjusted to the line described in ①.
- ③ The scribing portion are windshield, seat cushion, seat back, roof and rear window.

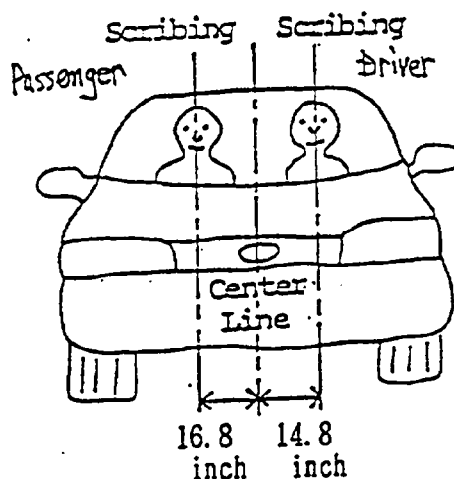
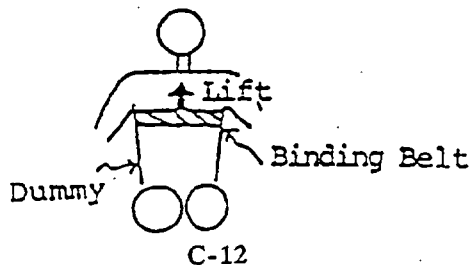


Figure: Outline of the scribing position

2. Dummy upward displacement:

Please slowly lift the dummy parallel to the seat back plane until the dummy's buttocks no longer contact seat cushion or until there is dummy head contact with the headlining by binding the armpit as shown below.



3. Dummy H-point:

Please adjust the H-point of dummy as close as possible with the point where was obtained by using a three dimensional dummy. If differs, please record the gap between the position of the 3 dimensional dummy and that of the pre-test position.

4. Hands:

The palms of the driver test dummy shall be contact with the outer part of the steering wheel rim. The thumbs shall be over the steering wheel rim and shall be lightly taped to the steering rim so that if the hand of the test dummy is pushed upward by a force of not less than 2 pounds and not more than 5 pounds, the tape shall release the hand from the steering wheel rim. The tape shall be 0.5 inch width and the thumb taping shall be one round.

5. Limb joints:

The dummy limb joints shall be set at 1G, barely restraining the weight of the limb when it is extended horizontally. The force required to move a limb segment shall not exceed 2G throughout the range of limb motion.

6. Abdomen assy:

A extremely worn abdomen assembly which seemed to fail with the calibration requirement was used in a compliance test. If any abnormal condition can be seen on dummy, please assure that the abdomen complies with the calibration requirements.

7. Ribs:

Please assure that the ribs of the dummies are not deformed. If any deformation can be seen on ribs, please exchange it to the undeformed one.

8. Leg positioning:

Please set the legs in the following mannar.

- (1) Put the driver's feet on the accelerator pedal and foot rest.
- (2) After the feet are positioned, adjust the knee position so that the legs stand perpendicularly.

9. Shoulder belt:

The shoulder belt shall be straightly fastened on the upper torso.

10. Steering column target:

In some NHTSA's vehicle impact tests, the steering column target was fixed onto the steering column cover by using a steel plate as a bracket. The steel plate fixed onto the steering column cover may contact with the speed meter and the contact between steel plate and speed meter has a possibility of preventing the normal steering column stroke.

Therefore, we would like to propose the following countermeasures;

- ① Using any breakable material like plastics as the substitution for a steel plate.
- ② Having enough distance (at least not less than 40mm) between the bracket of target and the speed meter.

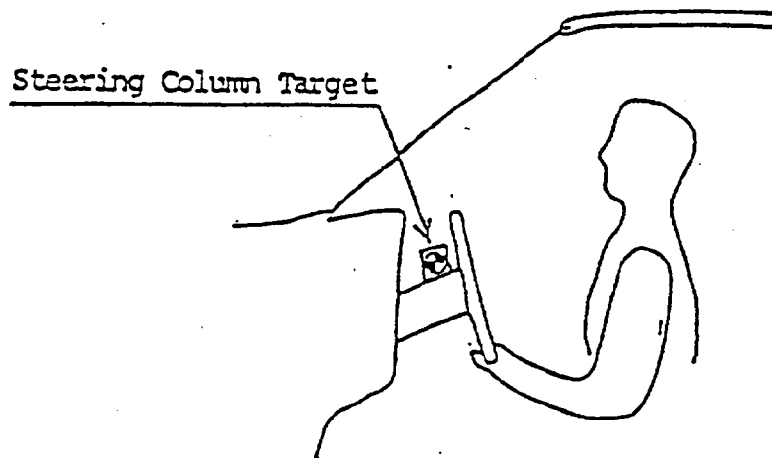


Figure: Steering column target

FORM NO. 1

TEST VEHICLE INFORMATION

Vehicle Model Year & Make : 1994 Model Toyota
 Vehicle Model & Body Style : PREVIA 1BOX

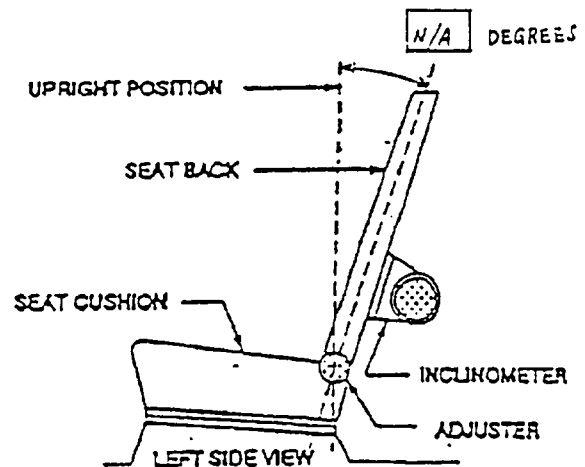
1. NOMINAL DESIGN RIDING POSITION

(1) Driver's Seat:

See section 6 "Designated Seat Back Position"
 of Attachment II.

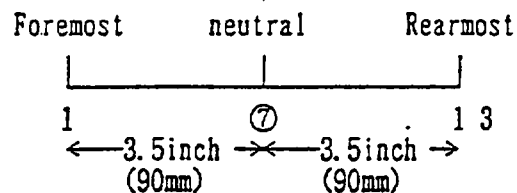
(2) Passenger's Seat:

See section 6 "Designated Seat Back Position"
 of Attachment II.

2. SEAT FORE & AFT POSITIONS

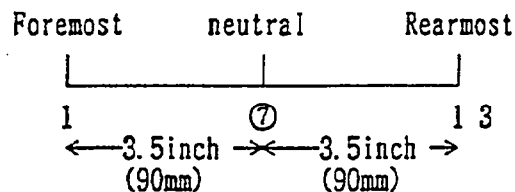
(1) Positioning of the driver's seat:

Move to the seventh notch
 rearward from the foremost position.
 (See section 5 of Attachment II
 in detail.)



(2) Positioning of the passenger's seat:

Move to the seventh notch
 rearward from the foremost position.
 (See section 5 of Attachment II
 in detail.)



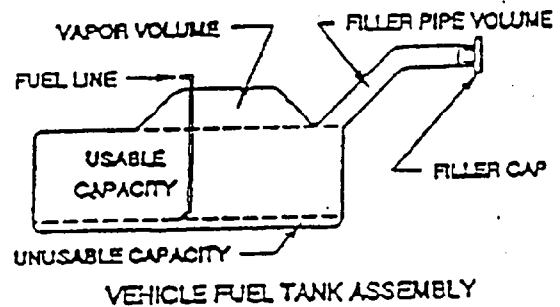
3. FUEL TANK CAPACITY DATA

3.1

- A. "Usable Capacity" of standard equipment fuel tank = 19.81 gallons.
- B. "Usable Capacity" of optional equipment fuel tank = N/A.
- C. "Usable Capacity" of vehicle(s) used for certification testing to requirements of FMVSS 301 = 18.81 gallons.

Operational Instructions:

None.



3.2 Amount of Stoddard solvent added to vehicle for certification test = 18.81 gallons.

3.3 Is vehicle equipped with electric fuel pump? (X)YES ()NO

If-YES, explain the vehicle operating conditions under which the fuel pump will pump fuel.

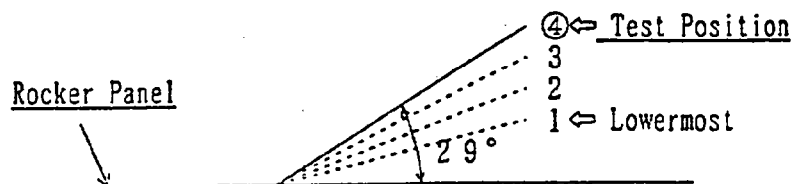
The electric fuel pump operates only during the engine is running.

4. STEERING COLUMN ADJUSTMENTS

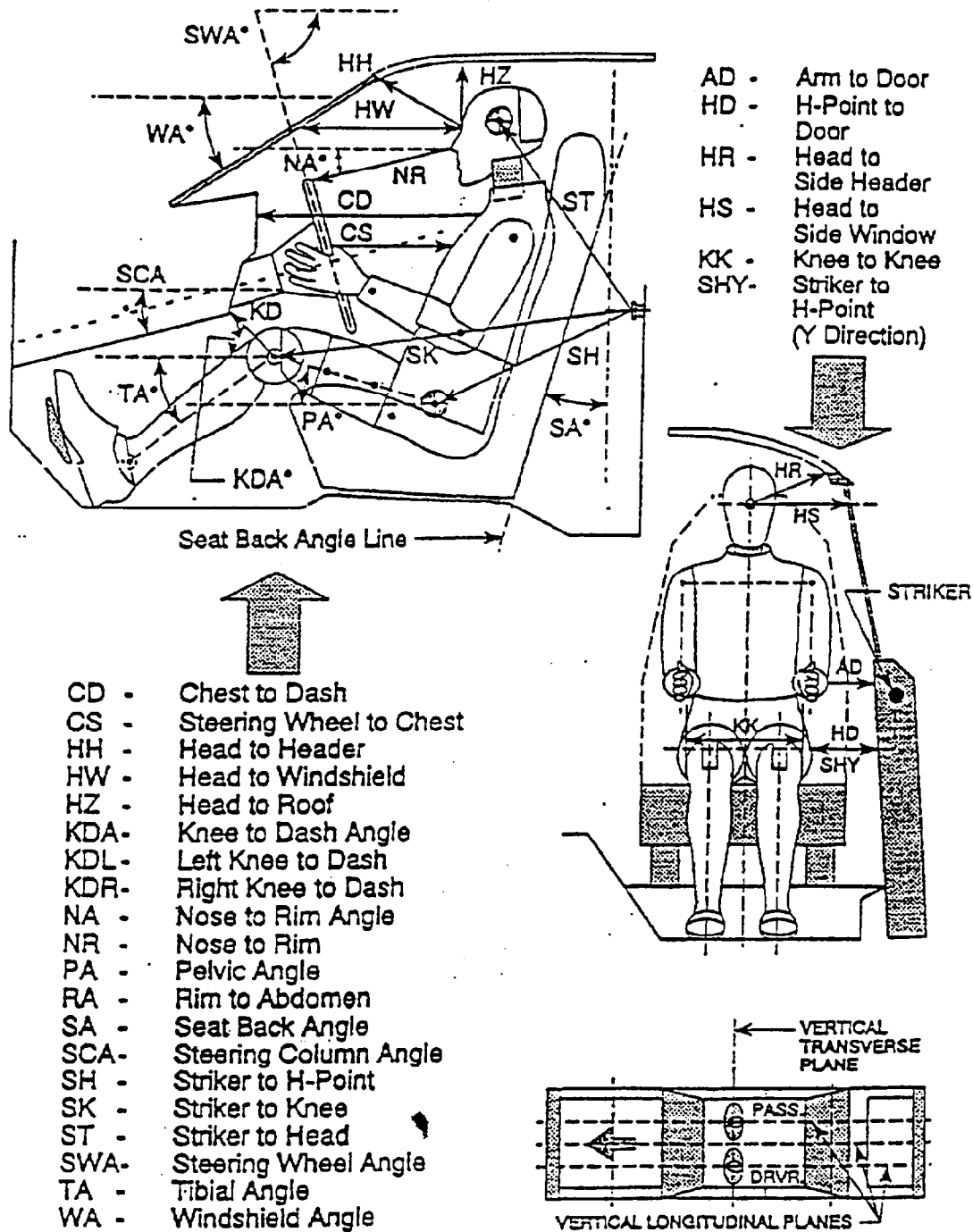
Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of locus it describes when it is moved through its full range of driving positions. If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine the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

Operational Instructions:

Tilt to the fourth notch upward from the lowermost position.
(See section 8 of Attachment II.)



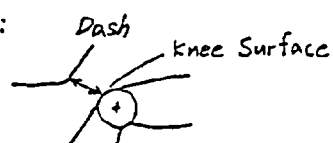
DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



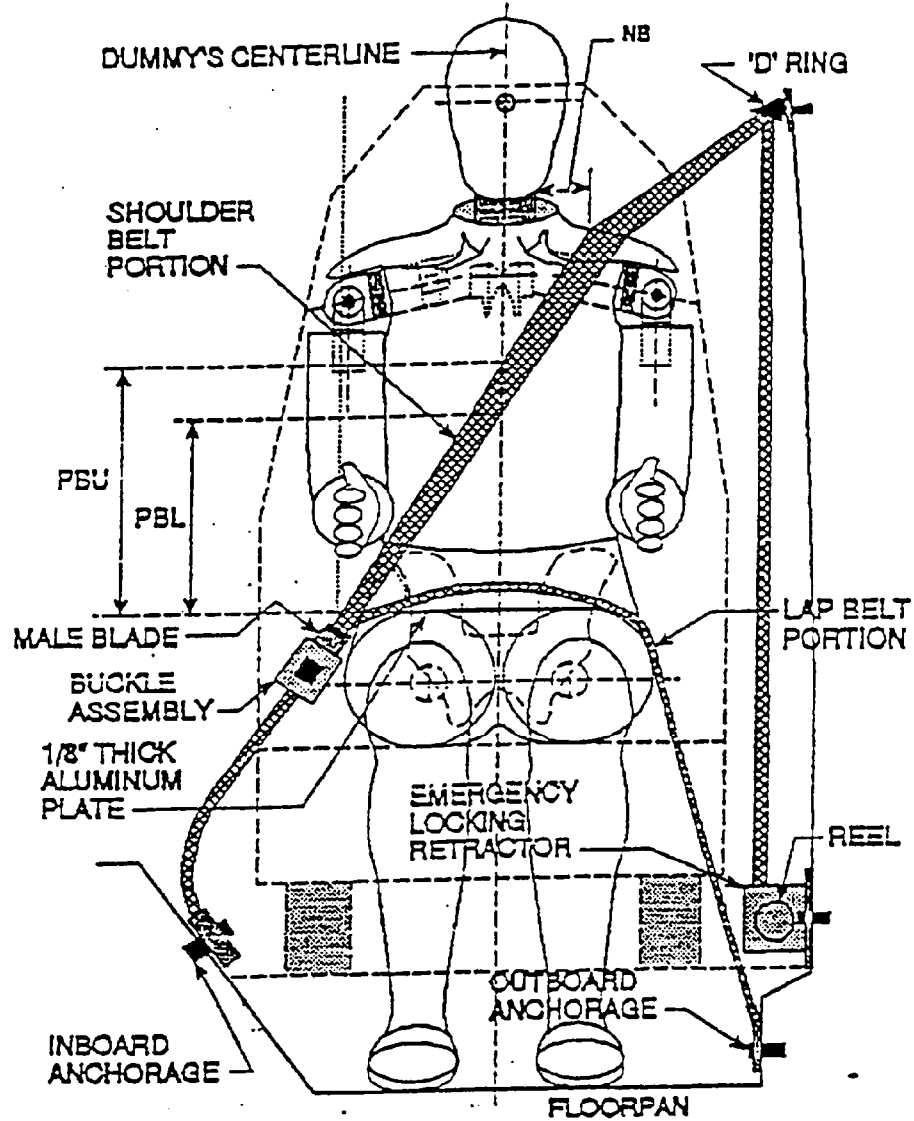
DUMMY POSITIONING IN VEHICLE FRONT SEAT MEASUREMENT TABLE

	DRIVER	PASS.
WA°	30°	
SWA°	61°	
SCA°	29°	
SA°	_____	_____
HZ	_____	_____
HH	15.7 in (398 mm)	15.7 in (400 mm)
HW	22.1 in (561 mm)	22.0 in (560 mm)
HR	9.8 in (250 mm)	9.1 in (230 mm)
NR	17.3 in (440 mm) ANGLE (NA°)	
CD	26.0 in (661 mm)	23.4 in (595 mm)
CS	12.6 in (321 mm)	
RA	7.5 in (190 mm)	
KDL*	5.5 in (140 mm) ANGLE (KDA°)	5.1 in (130 mm)
KDR*	5.5 in (140 mm)	5.3 in (135 mm) ANGLE (KDA°)
PA°	_____	_____
TA°	_____	_____
KK	13.8 in (350 mm)	11.5 in (291 mm)
ST	28.7 in (730 mm) ANGLE	28.3 in (720 mm) ANGLE
SK	31.7 in (805 mm) ANGLE	31.3 in (795 mm) ANGLE
SH	17.5 in (445 mm) ANGLE	17.1 in (435 mm) ANGLE
SHY	_____	_____
HS	_____	_____
HD	8.5 in (215 mm)	6.7 in (170 mm)
AD	6.3 in (160 mm)	4.3 in (110 mm)

* KDL, KDR:



SEAT BELT POSITIONING DATA



FRONT VIEW OF DUMMY

	DRIVER DUMMY	PASSENGER DUMMY
NB-Shortest distance from outside edge of rubber neck along top of shoulder to belt inside edge.	3.1 inches (80 mm)	3.1 inches (80 mm)
PBU-Top surface of aluminum plate to belt upper edge.	15.6 inches (395 mm)	15.0 inches (381 mm)
PBL-Top surface of aluminum plate to belt lower edge.	12.1 inches (305 mm)	11.6 inches (295 mm)