

1389

REPORT NOS. 208-TRC-90-005

212-TRC-90-005

301-TRC-90-005

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

NEW UNITED MOTOR MANUFACTURING, INC.

1990 TOYOTA COROLLA

4-DOOR SEDAN

NHTSA NO. CL5101

TRC TEST NO. 900104

THE TRANSPORTATION RESEARCH CENTER OF OHIO

U.S. RT. 33, LOGAN COUNTY

EAST LIBERTY, OHIO 43319



JANUARY 23, 1990

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, S.W.
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Technical Report Documentation Page

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16. Abstract A 30 mph flat frontal barrier impact compliance test was conducted on a 1990 Toyota Corolla 4-door sedan, VIN 1NXAE91A5LZ073326, NHTSA No. CL5101 at the Transportation Research Center of Ohio on January 4, 1990. This test was conducted to determine compliance with Federal Motor Vehicle Safety Standards: FMVSS No. 208, "Occupant Crash Protection" FMVSS No. 212, "Windshield Mounting" FMVSS No. 219, (Partial), "Windshield Zone Intrusion" FMVSS No. 301, "Fuel System Integrity" The barrier impact velocity was 29.6 mph. The ambient temperature was 74° F. The vehicle appears to comply with the applicable requirements of FMVSS Nos. 208, 212, 219 (partial), and 301.					
17. Key Words Frontal Impact 30 mph Vehicle Safety Compliance Testing: FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Mounting" FMVSS 219, "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity"			18. Distribution Statement Available from: Technical Reference Division National Highway Traffic Safety Admin Nassif Building, Room 5108 400 Seventh Street, SW Washington, DC 20590		
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons	0.9	metric ton	t
	(2000 lb)			
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
in ³	cubic inches	16	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	L
pt	pints	0.47	liters	L
qt	quarts	0.95	liters	L
gal	gallons	3.8	liters	L
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares	2.5	acres	
	(10 000 m ²)			
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton	1.1	short tons	
	(1000 kg)			
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
ml	milliliters	0.06	cubic inches	in ³
L	liters	2.1	pints	pt
L	liters	1.06	quarts	qt
L	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	degrees Celsius	9/5 (then add 32)	degrees Fahrenheit	°F

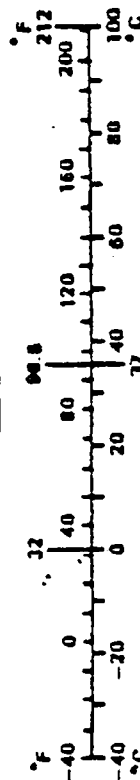


TABLE OF CONTENTS

<u>SECTION</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1.0	PURPOSE AND TEST SUMMARY	1-1
2.0	SUMMARY OF RESULTS FOR:	2-1
	FMVSS 208, "OCCUPANT CRASH PROTECTION"	
	FMVSS 212, "WINDSHIELD MOUNTING"	
	FMVSS 219, (PARTIAL), "WINDSHIELD ZONE INTRUSION"	
	FMVSS 301, "FUEL SYSTEM INTEGRITY"	
3.0	CAMERA INFORMATION	3-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	DATA PLOTS	B-1

LIST OF TABLES

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1	CRASH TEST SUMMARY	1-5
2	TEST VEHICLE INFORMATION	1-6
3	TEST CONDITIONS	1-9
4	VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY	1-12
5	IMPACTED VEHICLE MEASUREMENTS	1-15
6	DUMMY INJURY CRITERIA	2-3
7	FMVSS 208 COMFORT AND CONVENIENCE DATA	2-10
8	FMVSS 208 SEAT BELT WARNING SYSTEM DATA	2-11
9	FMVSS 208 LABELING AND DRIVER'S MANUAL DATA	2-12
10	FMVSS 208 READINESS INDICATOR DATA	2-13
11	SUMMARY OF FMVSS 301 DATA	2-14
12	"FUEL SYSTEM INTEGRITY" POST-IMPACT TEST DATA	2-17
13	HIGH SPEED CAMERA LOCATIONS	3-4

LIST OF FIGURES

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1	IMPACT VELOCITY MEASUREMENT SYSTEM	1-10
2	VEHICLE ACCELEROMETER LOCATIONS	1-11
3	ACCIDENT INVESTIGATION DIVISION DATA	1-13
4	PRE-TEST AND POST-TEST MEASUREMENT POINTS	1-14
5	VEHICLE TARGET LOCATIONS	1-16
6	DUMMY POSITIONING DATA	2-6
7	DUMMY IN-VEHICLE POSITION RECORDING SHEET	2-7
8	DRIVER DUMMY TO STEERING COLUMN ASSEMBLY	
	REFERENCE DIMENSIONS	2-8
9	SEAT BELT POSITIONING DATA	2-9
10	FMVSS NO. 212, "WINDSHIELD MOUNTING" DATA SHEET	2-15
11	FMVSS NO. 219, "WINDSHIELD INTRUSION" DATA SHEET	2-16
12	FMVSS NO. 301, "STATIC ROLLOVER" DATA SHEET	2-18
13	CAMERA POSITIONS	3-2

LIST OF PHOTOGRAPHS

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1.	PRE-TEST FRONT VIEW	A-2
2.	POST-TEST FRONT VIEW	A-2
3.	PRE-TEST LEFT SIDE VIEW	A-3
4.	POST-TEST LEFT SIDE VIEW	A-3
5.	PRE-TEST RIGHT SIDE VIEW	A-4
6.	POST-TEST RIGHT SIDE VIEW	A-4
7.	PRE-TEST RIGHT FRONT THREE-QUARTER VIEW	A-5
8.	POST-TEST RIGHT FRONT THREE-QUARTER VIEW	A-5
9.	PRE-TEST LEFT REAR THREE-QUARTER VIEW	A-6
10.	POST-TEST LEFT REAR THREE-QUARTER VIEW	A-6
11.	PRE-TEST REAR VIEW	A-7
12.	POST-TEST REAR VIEW	A-7
13.	PRE-TEST WINDSHIELD VIEW	A-8
14.	POST-TEST WINDSHIELD VIEW	A-8
15.	PRE-TEST ENGINE COMPARTMENT VIEW	A-9
16.	POST-TEST ENGINE COMPARTMENT VIEW	A-9
17.	PRE-TEST FUEL FILLER CAP VIEW	A-10
18.	POST-TEST FUEL FILLER CAP VIEW	A-10
19.	PRE-TEST FRONT UNDERBODY VIEW	A-11
20.	POST-TEST FRONT UNDERBODY VIEW	A-11
21.	PRE-TEST REAR UNDERBODY VIEW	A-12
22.	POST-TEST REAR UNDERBODY VIEW	A-12
23.	PRE-TEST FUEL FILLER NECK AND FUEL TANK VIEW	A-13
24.	PRE-TEST DRIVER DUMMY POSITION VIEW	A-13
25.	POST-TEST DRIVER DUMMY POSITION VIEW	A-14
26.	PRE-TEST PASSENGER DUMMY POSITION VIEW	A-14
27.	POST-TEST PASSENGER DUMMY POSITION VIEW	A-15
28.	PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR	A-15
29.	POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1	A-16
30.	POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2	A-16
31.	PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR	A-17
32.	POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1	A-17

LIST OF PHOTOGRAPHS CONTINUED

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
33.	POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2	A-18
34.	POST-TEST DRIVER DUMMY HEAD CONTACT VIEW	A-18
35.	POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1	A-19
36.	POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 2	A-19
37.	POST-TEST PASSENGER DUMMY HEAD CONTACT VIEW	A-20
38.	POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1	A-20
39.	POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2	A-21
40.	PRE-TEST VEHICLE CERTIFICATION LABEL VIEW	A-21
41.	PRE-TEST VEHICLE TIRE LOAD LABEL VIEW	A-22
42.	POST-TEST VEHICLE ON ROLLOVER MACHINE VIEW	A-22

SECTION 1.0

PURPOSE AND TEST SUMMARY

PURPOSE

This 30 mph frontal barrier impact test is part of the Federal Motor Vehicle Safety Standard (FMVSS) 208, 212, 219 (Partial), and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by the Transportation Research Center of Ohio (TRC) under Contract No. DTNH22-88-C-11038. The purpose of this test was to determine if the subject vehicle, a 1990 Toyota Corolla 4-door sedan, NHTSA No. CL5101, 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." The test was conducted in accordance with the Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-208-07.

TEST SUMMARY

The 1990 Toyota Corolla 4-door sedan, NHTSA No. CL5101, was equipped with a 1.6 liter, transverse engine, manual transmission, and power brakes. The test weight of the vehicle was 2727 pounds. The test vehicle appeared to comply with the performance requirements of FMVSS test Nos. 208, 212, 219 (partial), and 301. The Head Injury Criteria (HIC) calculations were less than 1000, the resultant accelerations of the thorax 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 driver's and right front passenger's seats. There was 100 percent windshield retention. There was no intrusion into the windshield. There was no fluid spillage from the fuel system following the impact or during the static rollover test.

Two (2) Part 572 B, adult male anthropomorphic test devices (ATDs) were seated in the front outboard designated seating positions. The dummies were positioned according to the dummy placement procedures specified in Appendices B and C of Laboratory Procedure TP-208-07.

Both ATDs were instrumented with head and chest accelerometers oriented to measure accelerations in the longitudinal, lateral, and vertical directions, and with right and left femur load cells.

The vehicle was instrumented with seven (7) accelerometers oriented to measure longitudinal axis acceleration.

The crash event was recorded by one (1) real-time panning camera and fourteen (14) high-speed motion picture cameras operating at approximately 500 frames per second. The pre-test and post-test events were recorded with one (1) real-time camera.

The twenty-three (23) channels of data were multiplexed and recorded on a 14-track tape drive. The data was digitally sampled at 8000 samples per second and digitally processed per sections 12.8 and 12.9 of the Laboratory Procedure.

The vehicle was impacted into the rigid, flat frontal barrier at the Transportation Research Center of Ohio on January 4, 1990. The test vehicle's impact speed was 29.6 mph. The vehicle sustained 17.3 inches of static crush.

The FMVSS 208, 212, 219 (partial), and 301 compliance data are presented in Section 2.0. The camera information is presented in Section 3.0. Appendix A contains the still photographic prints. Appendix B contains the vehicle and dummy data plots.

TABLE 1 CRASH TEST SUMMARY

NHTSA NO.:	CL5101	PROJECT:	208 Compliance
DATE:	01/04/90	TIME:	1233 TEMP: 74° F
VEHICLE:	1990 Toyota Corolla 4-door sedan		
TEST WEIGHT (LBS):	2727		
IMPACT ANGLE (DEG)*:	0		
IMPACT VELOCITY (MPH)**:	PRIMARY = 29.6	SECONDARY =	29.6
MAXIMUM STATIC CRUSH (IN):	17.3		
VEHICLE REBOUND (IN):	55.9		
DUMMIES:	Driver #353	Passenger	#354
TYPE:	Part 572 B	Part 572 B	
LOCATION:	Left front	Right front	
RESTRAINT:	2-point passive belt	2-point passive belt	
NUMBER OF DATA CHANNELS:	23		
NUMBER OF HIGH SPEED CAMERAS:	HIGH-SPEED: 14	REAL-TIME:	2

*With respect to tow track centerline.

**Speed trap measurement ($\pm$.05 mph accuracy)

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: New United Motor Manufacturing, Inc.

MAKE/MODEL: Toyota/Corolla

VIN: 1NXAE91A5LZ073326

BODY STYLE: 4-door sedan

MODEL YEAR: 1990

NHTSA NO.: CL5101

COLOR: Gray

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: 1.6 liter

TRANSMISSION DATA: 5 SPEED, X MANUAL, AUTOMATIC, X FWD, RWD, 4WD

DATE VEHICLE RECEIVED: 10/17/89

ODOMETER READING: 58.0

DEALER'S NAME AND ADDRESS: Performance Toyota
4248 Morse Road
Columbus, OH 43230

ACCESSORIES:

POWER STEERING Yes

AUTOMATIC TRANSMISSION No

POWER BRAKES Yes

AUTOMATIC SPEED CONTROL No

POWER SEATS No

TILTING STEERING WHEEL No

POWER WINDOWS No

TELESCOPING STEERING WHEEL No

TINTED GLASS Yes

AIR CONDITIONING No

RADIO No

ANTI-SKID BRAKE No

CLOCK No

REAR WINDOW DEFROSTER Yes

OTHER None

REMARKS:

1. IS THE VEHICLE STOCK THROUGHOUT? Yes
2. DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? No
3. DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
4. CONDITION OF THE FRONT/REAR BUMPER AND FRAME: Good

DATA FROM CERTIFICATION LABEL ON LEFT DOOR FACE OR "B" POST:

VEHICLE MANUFACTURED BY: New United Motor Manufacturing, Inc.

DATE OF MANUFACTURE: 9/89

GVWR: 3415 LBS

GAWR: FRONT 1770 LBS., REAR 1690 LBS.

TABLE 2 TEST VEHICLE INFORMATION CONT'D

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL ON DOOR, POST, GLOVEBOX, ETC.:

VEHICLE LOAD (UP TO CAPACITY): FRONT 29 psi; REAR 29 psi

RECOMMENDED TIRE SIZE: P155/80R13 LOAD RANGE X B, C, D

TIRES ON VEHICLE (MFR., LINE, SIZE): Firestone WR-12 P155/80R13

IS SPARE TIRE A "SPACE SAVER": Yes

IS SPARE TIRE STANDARD EQUIPMENT: Yes

VEHICLE CAPACITY: TYPES OF SEATS: FRONT: Buckets
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manual adjustable

NUMBER OF OCCUPANTS 2 FRONT 3 REAR 5 TOTAL

CARGO LOAD 100 LBS. TOTAL 850 LBS.

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

RIGHT FRONT 690 lbs. RIGHT REAR 460 lbs.

LEFT FRONT 710 lbs. LEFT REAR 450 lbs.

TOTAL FRONT WEIGHT 1400 lbs. (60.6% OF TOTAL VEHICLE WEIGHT)

TOTAL REAR WEIGHT 910 lbs. (39.4% OF TOTAL VEHICLE WEIGHT)

TOTAL DELIVERED WEIGHT 2310 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (2310 LBS)

VCW = VEHICLE CAPACITY WEIGHT (850 LBS)

DSC = DESIGNATED SEATING CAPACITY (5)

RCLW = VCW - 150 (DCS) = 850 - 150(5) = 100 LBS

TARGET TEST WEIGHT = UDW + RCLW + (2 DUMMIES X 164 LBS/DUMMY)

= 2310 + 100 + 328 LBS

TARGET TEST WEIGHT = 2738 LBS

TABLE 2 TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 89 LBS. CARGO:

RIGHT FRONT	755 lbs.	RIGHT REAR	604 lbs.
LEFT FRONT	782 lbs.	LEFT REAR	586 lbs.
TOTAL FRONT WEIGHT	1537 lbs.	(56.4% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1190 lbs.	(43.6% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	2727 lbs.	(0.4% UNDER TARGET WEIGHT)	

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

COMPONENTS REMOVED TO MEET TARGET WEIGHT: Tail lights

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE: LF 25.0; RF 25.0; LR 24.5; RR 24.3

PRE-TEST ATTITUDE: LF 25.3; RF 24.8; LR 23.8; RR 23.3

POST-TEST ATTITUDE: LF 29.2; RF 28.6; LR 22.4; RR 22.1

MAXIMUM WIDTH: 65.1 INCHES

WHEELBASE: 95.5 INCHES

CG = 41.7 INCHES REARWARD OF FRONT WHEEL CENTERLINE

TABLE 3 TEST CONDITIONS

TEST NUMBER: 900104

DATE OF TEST: 01/04/90

TIME OF TEST: 1233

TYPE OF TEST: Frontal barrier impact

IMPACT ANGLE: 0°

AMBIENT TEMPERATURE AT IMPACT AREA:

74° F

TEMPERATURE IN OCCUPANT COMPARTMENT:

71° F

IMPACT VELOCITY: PRIMARY = 29.6 MPH

SECONDARY = 29.6 MPH

(SPECIFIED RANGE = 28.9 TO 29.9 MPH)

VEHICLE REBOUND AND CRUSH (ALL DIMENSIONS IN INCHES):

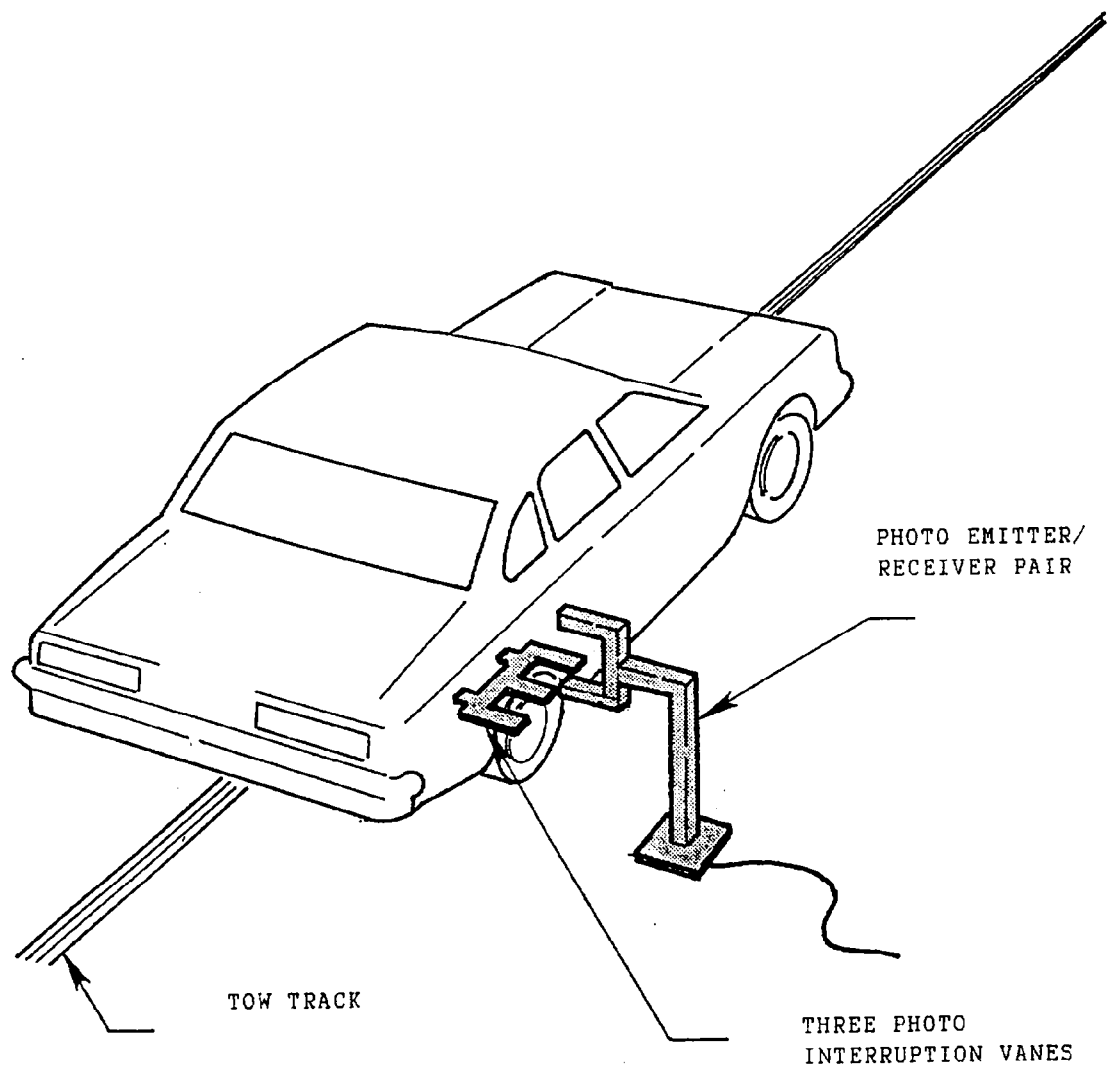
OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: L 167.5; C 169.5; R 167.3

POST-TEST: L 151.5; C 152.6; R 151.4

TOTAL CRUSH: L 16.0; C 16.9; R 15.9

FOR FRONTAL IMPACTS, DISTANCE FROM FRONT OF TEST VEHICLE TO BARRIER AFTER
IMPACT: L: 56.2; C: 55.2; R: 56.2; AVG: 55.9

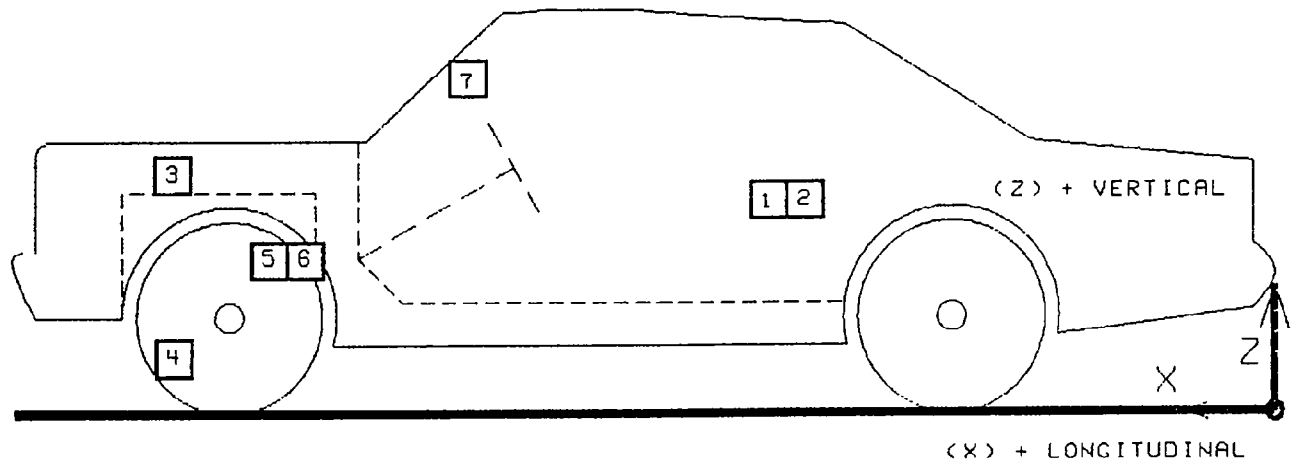
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



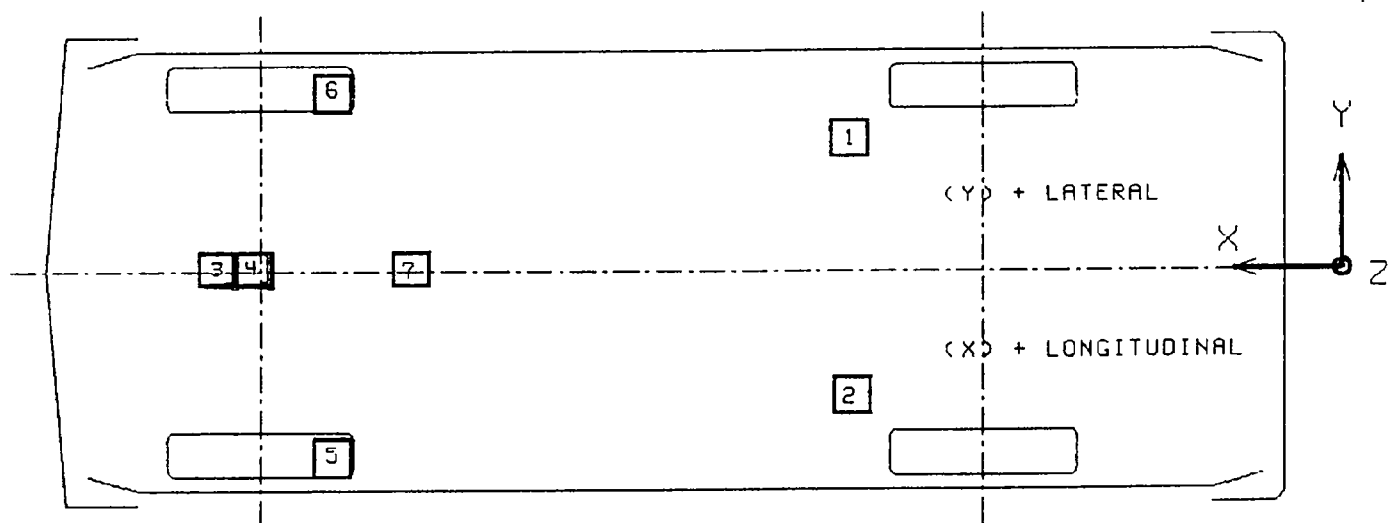
The final vane clears emitter/receiver two inches before impact.

The vanes have one foot spacing.

FIGURE 2
VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 4

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 900104

No.	LOCATION		X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
						MAX G MSEC		MAX G MSEC	
1	REAR SEAT CROSSMEMBER AT LEFT SIDE LONGITUDINAL	PRE	66.8	13.8	16.2				
		POST	66.6	13.8	17.1				
						1.9	145.9	30.7	39.3
2	REAR SEAT CROSSMEMBER AT RIGHT SIDE LONGITUDINAL	PRE	66.5	-13.7	15.9				
		POST	66.5	-13.7	17.0				
						1.5	145.6	31.5	59.6
3	TOP OF ENGINE BLOCK LONGITUDINAL	PRE	145.5	-5.8	29.2				
		POST	140.6	-5.8	29.5				
						---	---	Y 113.1	33.6 Y
4	BOTTOM OF ENGINE BLOCK LONGITUDINAL	PRE	143.1	-11.0	6.9				
		POST	138.1	-11.0	6.3				
						44.8	44.1	108.9	29.1
5	BRAKE CALIPER AT RIGHT SIDE LONGITUDINAL	PRE	139.0	-24.1	11.3				
		POST	137.4	-25.4	11.9				
						---	---	Y 71.7	48.4 Y
6	BRAKE CALIPER AT LEFT SIDE LONGITUDINAL	PRE	139.1	24.7	11.2				
		POST	137.4	25.4	11.2				
						19.5	71.5	56.0	47.6
7	DASH PANEL LONGITUDINAL	PRE	112.0	-0.5	37.9				
		POST	112.5	-0.5	37.5				
						25.5	60.0	66.9	68.9

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

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

Y See DATA ACQUISITION EXPLANATIONS

FIGURE 3 ACCIDENT INVESTIGATION DIVISION DATA
FOR 30 MPH FRONTAL BARRIER IMPACT

VEHICLE MAKE/MODEL/BODY STYLE: Toyota/Corolla/4-door sedan
 VEH. NHTSA NO.: CL5101; VIN: 1NXAE91A5LZ073326
 MODEL YEAR: 1990; BUILD DATE: 9/89; TEST DATE: 01/04/90
 VEH. SIZE CATEGORY: Sub-compact; TEST WEIGHT: 2727
 VEH. WHEELBASE: 95.5
 MAX. WIDTH: 65.1
 FRONT OVERHANG: 34.2

COLLISION DEFORMATION
 CLASSIFICATION (CDC) CODE: 12FDEW2

F (Frontal)
 CRUSH DEPTH
 DIMENSIONS:

C1 = 16.0 inches
 C2 = 16.8 inches
 C3 = 17.3 inches
 C4 = 17.3 inches
 C5 = 16.8 inches
 C6 = 15.9 inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline
(Longitudinal)

LENGTH OF DAMAGED
 REGION: L = 49.9 inches

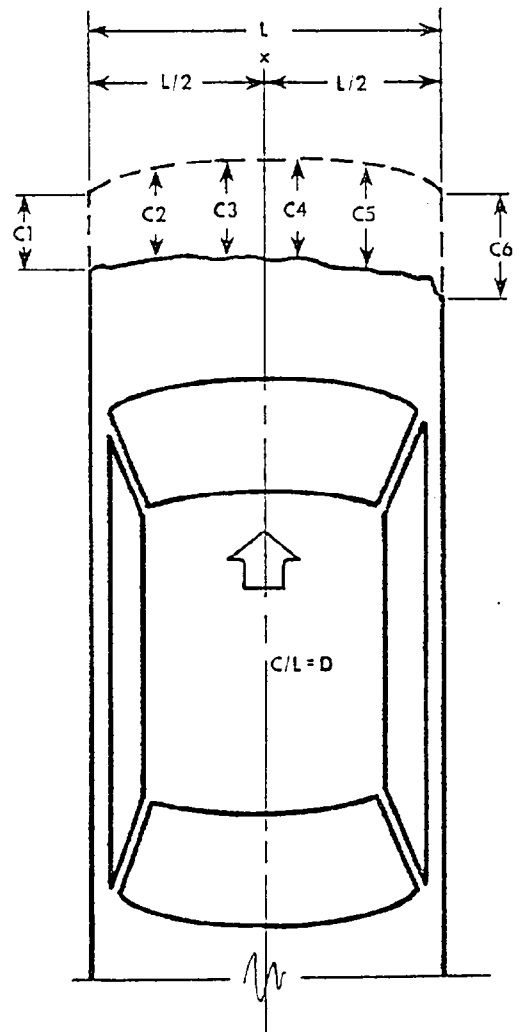


FIGURE 4

PRE-TEST AND POST-TEST MEASUREMENT POINTS

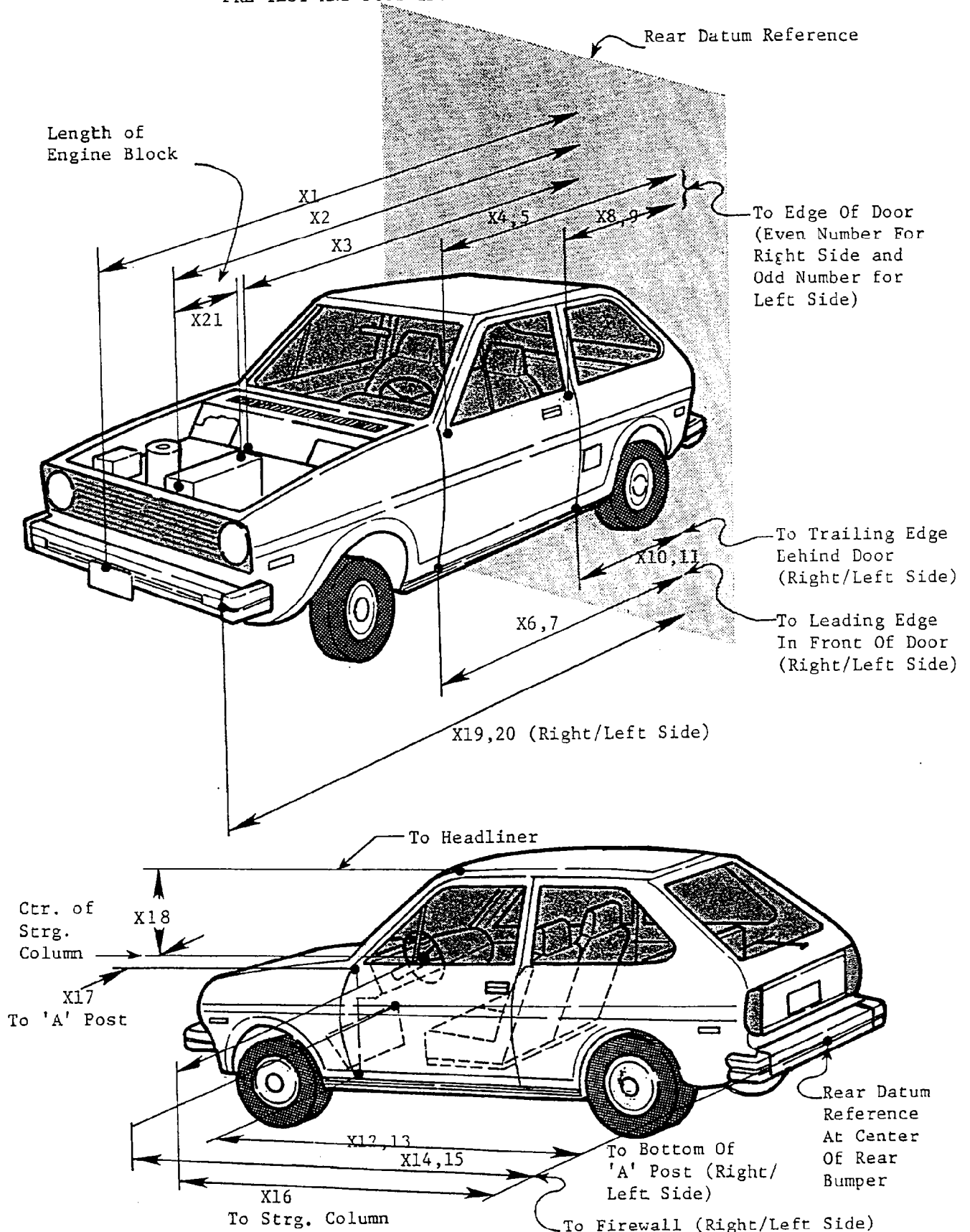
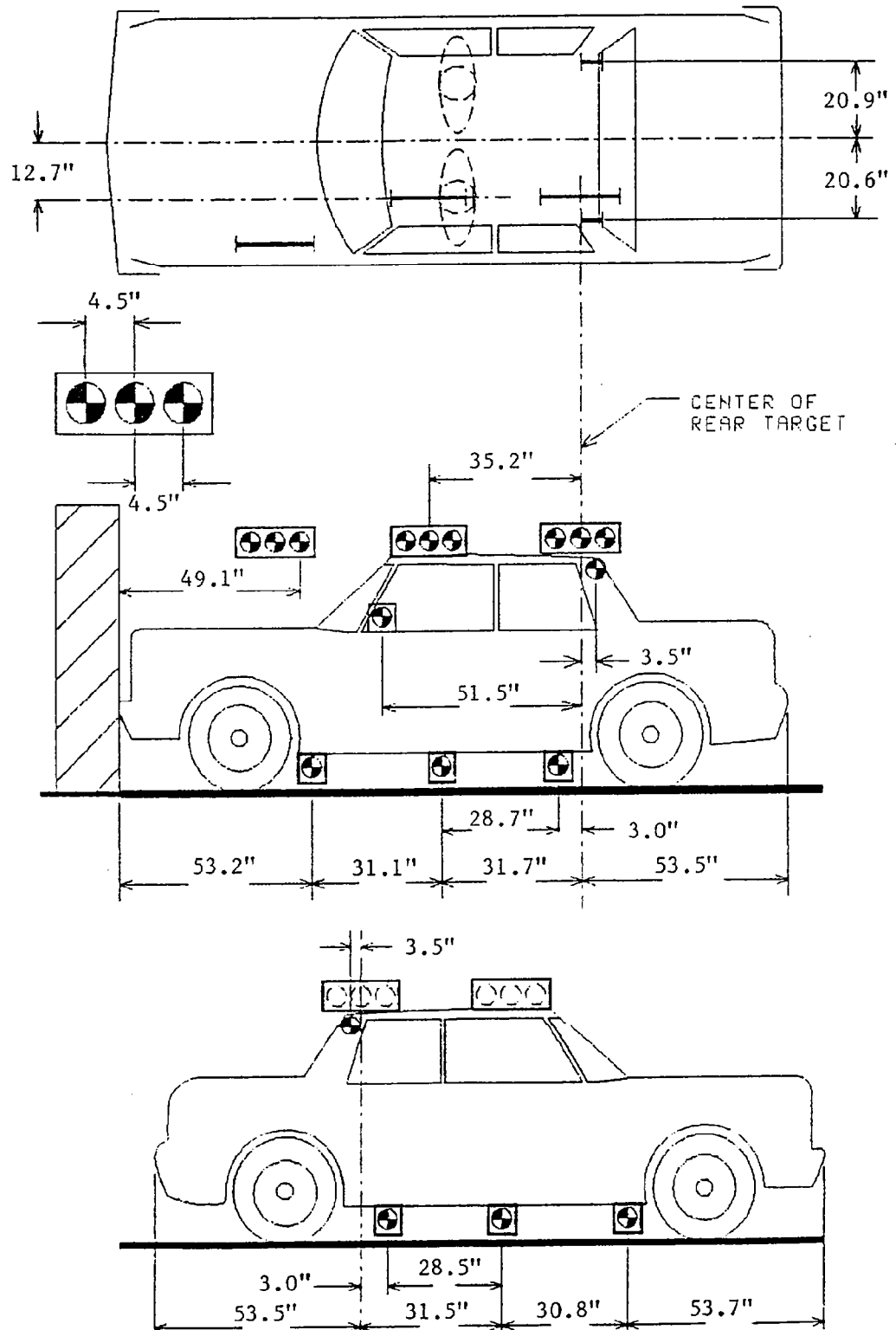


TABLE 5 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Toyota/Corolla		TEST NUMBER: 900104	DIMENSIONS IN INCHES		
NO.	TYPE OF MEASUREMENT		PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE		169.5	152.6	16.9
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK		149.5	145.6	3.9
X3	REAR SURFACE OF VEHICLE TO FIREWALL		126.8	126.1	0.7
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR.		116.6	116.6	0.0
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR		116.5	116.9	-0.4
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR		115.2	115.1	0.1
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR		115.6	115.4	0.2
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR		76.9	77.0	-0.1
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR		76.8	77.2	-0.4
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR		77.6	77.0	0.6
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR		77.4	77.2	0.2
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE		116.1	115.8	0.3
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE		116.2	115.6	0.6
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE		125.1	124.2	0.9
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE		125.2	124.8	0.4
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER		100.2	101.6	-1.4
X17	CENTER OF STEERING COLUMN TO "A" POST		14.5	14.6	-0.1
X18	CENTER OF STEERING COLUMN TO HEADLINER		17.6	17.8	-0.2
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER		167.3	151.4	15.9
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER		167.5	151.5	16.0
X21	LENGTH OF ENGINE BLOCK		18.0	18.0	0.0

FIGURE 5

VEHICLE TARGET LOCATIONS



REPORT OF VEHICLE CONDITION AT THE
COMPLETION OF TESTING

Contract No.: DTNH22-88-C-11038
From: The Transportation Research Center of Ohio
U.S. Route 33
East Liberty, OH 43319

To: Karen Knuschler
COTR
Office of Vehicle Safety Compliance

The following vehicle has been subjected to testing for FMVSS 208. The vehicle was inspected upon arrival at the laboratory for the test and found to contain all of the equipment listed below. All variances have been reported within 2 working days of vehicle arrival, by letter, to the NHTSA Industrial Property Manager/NAD-30, with a carbon copy to the responsible testing office. The vehicle is again inspected, after the above test has been conducted, and all changes are noted below. The final condition of the vehicle is also noted in detail.

NHTSA NO.: CL5101
MAKE/MODEL/BODY STYLE: Toyota/Corolla/4-door sedan
MODEL YEAR: 1990 BODY COLOR: Gray
VIN: 1NXAE91A5LZ073326
ODOMETER (ARRIVAL): 54.0 DATE: 10/17/89
ODOMETER (COMPLETION): 58.0 DATE: 01/04/90
COST: \$9,145

☐ Air Conditioner	☐ Console	Brakes: ☒ Power
☒ Tinted Glass	☐ Tachometer	Front: Disc
☒ Power Steering	☐ Speed Control	Rear: Drum
☐ Power Windows	☒ Rear Window Def.	
☐ Power Door Locks	☐ Sun/Moon Roof	Front Seats: ☐ Power
☐ Radio	☐ T-Top	Seat Type: Bucket
☐ Clock	☐ Tilt Steering Wheel	No. of Seats: 5
☐ Roof Rack	☐ Other Options: <u>None</u>	

Engine: 4 Cylinders; 1.6 LITRES
Transmission: Manual; Drive Type: Front
Tire Size: P155/80R13
Gasoline Type: Unleaded

Equipment that is no longer on the vehicle as noted above: None

Explanation: NA

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

DATA ACQUISITION EXPLANATIONS

The driver's chest Y-axis accelerometer, CSTYG1, data contained anomalous spikes at 30, 34, and 40 milliseconds.

The engine upper block X-axis accelerometer, ENGXG1, data was lost between 20 milliseconds and 22 milliseconds.

The right brake caliper X-axis accelerometer, BCRXG1, data was lost after 64 milliseconds.

SECTION 2.0

SUMMARY OF RESULTS FOR:

FMVSS 208, "Occupant Crash Protection"

FMVSS 212, "Windshield Mounting"

FMVSS 219, (Partial), "Windshield Zone Intrusion"

FMVSS 301, "Fuel System Integrity"

COMPLIANCE DATA SUMMARY

The test vehicle, a 1990 Toyota Corolla 4-door sedan, NHTSA No. CLS101, appeared to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial), and 301.

The driver's Head Injury Criteria (HIC) was 524. The driver's maximum chest deceleration over three milliseconds was 44.8 g. (See DATA ACQUISITION EXPLANATIONS.) The driver's right and left compressive femur loads were 1668 pounds and 1540 pounds, respectively.

The right front passenger's Head Injury Criteria (HIC) was 582. The right front passenger's maximum chest deceleration over three milliseconds was 40.9 g. The right front passenger's right and left compressive femur loads were 1208 pounds and 1024 pounds, respectively.

The vehicle's restraint system met the comfort and convenience requirements of FMVSS 208.

The windshield retention was 100 percent.

There was no intrusion into the inner surface of the windshield below the protected zone.

There was no Stoddard fluid spillage following the crash test event or during any phase of the post-test static rollover.

TABLE 6 DUMMY INJURY CRITERIA

MAXIMUM ACCELERATION ('G')

	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DRIVER	-25.4	14.5	-61.6	61.8	-44.9	36.6 ^Y	10.5	44.8 ^Y
PASSENGER	-24.9	-13.2	-64.9	65.7	-45.3	18.8	12.5	40.9

MAXIMUM FORCE-FEMUR LOAD (LBS)

	LEFT FEMUR	RIGHT FEMUR
DRIVER	1540	1668
PASSENGER	1024	1208

HEAD INJURY CRITERIA**

	HIC	TIME t_1 (MSEC) ¹	TIME t_2 (MSEC) ²
DRIVER	524	62.9	98.9
PASSENGER	582	66.9	102.9

*Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

^Y See DATA ACQUISITION EXPLANATIONS

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #353	PASSENGER #354
Head	<u>Chest</u>	<u>Chest</u>
Chest	<u>None</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left knee	<u>Instrument panel</u>	<u>Instrument panel</u>
Right knee	<u>Instrument panel</u>	<u>Instrument panel</u>

DOOR OPENING:

	LEFT	RIGHT
Front	<u>Easy</u>	<u>Easy</u>
Rear	<u>Easy</u>	<u>Easy</u>

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Front	<u>None</u>	<u>None</u>
Rear	<u>NA</u>	<u>NA</u>

GLAZING DAMAGE:

None

OTHER NOTABLE IMPACT EFFECTS:

None

DUMMY KINEMATIC SUMMARY

DRIVER DUMMY

Upon impact, the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated forward, impacting the dummy's chest, as the dummy was restrained by the two-point passive belt. The dummy's torso rotated counter-clockwise on the seat and the dummy's head rotated rearward as the dummy rebounded into the seatback. The dummy came to rest seated in the driver's seat, leaning to the right, restrained by the two-point passive belt.

RIGHT FRONT PASSENGER DUMMY

Upon impact, the right front passenger dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated forward, impacting the dummy's chest, as the dummy was restrained by the two-point passive belt. The dummy's torso rotated clockwise on the seat and the dummy's head rotated rearward as the dummy rebounded into the seat back. The dummy came to rest seated in the right front passenger's seat, leaning to the left, restrained by the two-point passive belt.

FIGURE 6 DUMMY POSITIONING DATA FOR 30 MPH FRONTAL BARRIER IMPACT TEST

PRE-IMPACT DATA:

Make/Model: Toyota/Corolla
 Body Style: 4-door sedan Model Year: 1990
 NHTSA No.: CL5101 Color: Gray

DATA FROM CERTIFICATION LABEL:

Vehicle Manufacturer: New United Motor Manufacturing, Inc.
 Date of Manufacture: 9/89 VIN: 1NXAE91A5LZ073326
 GVWR: 3415 lb; GAWR: Front = 1770 lb; Rear = 1690 lb

POST-IMPACT DATA:

Date of Test: 01/04/90 Time: 1233 Temperature: 74° F
 Required Impact Velocity Range: 28.9 to 29.9 mph
 Impact Velocity: Primary = 29.6 mph Secondary = 29.6 mph
 Seat Type: Bucket Adjuster Type: Manual
 Bucket Seat Back Type: Manual-adjustable
 Technicians: D. Carpenter, B. Crabtree, & R. Cribley

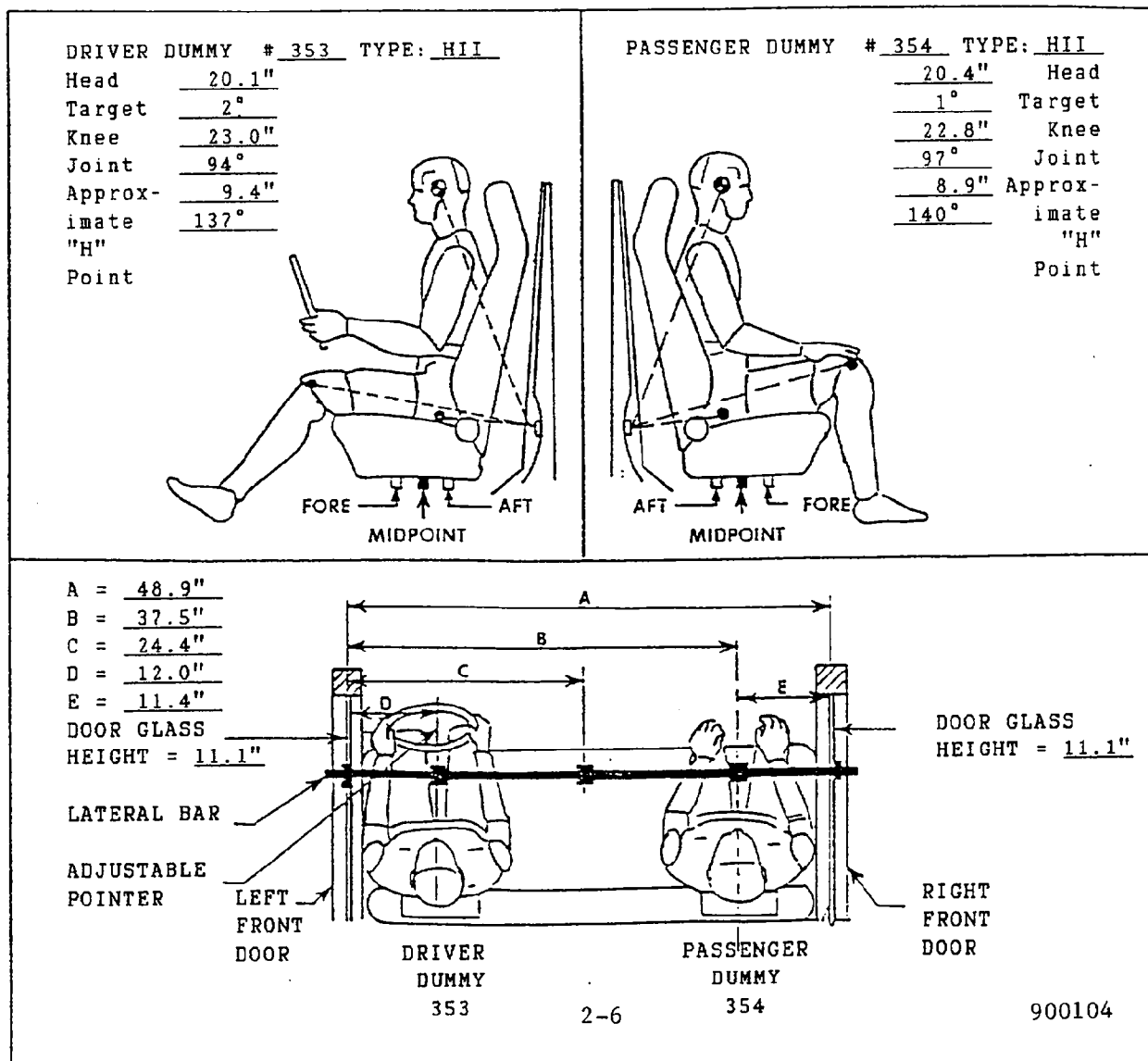
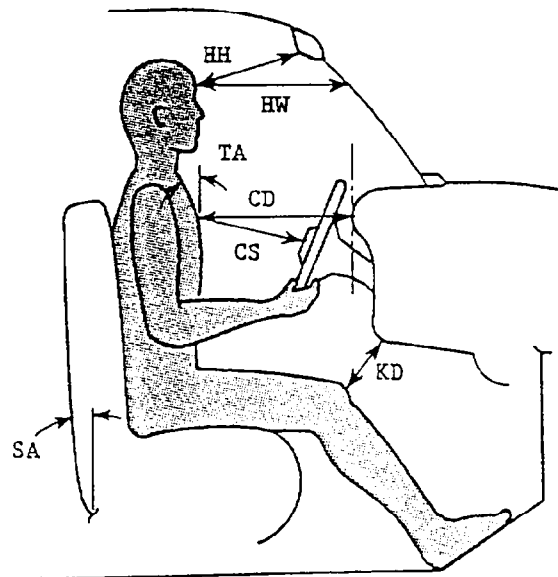


FIGURE 7 DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER	PASSENGER
HH	10.6	12.4
HW	18.4	17.9
CD	20.5	22.4
CS	13.4	NA
KDL	3.7	4.8
KDR	4.6	5.1
TA	15°	22°
SA	24°	22°
HA	12.4	13.1

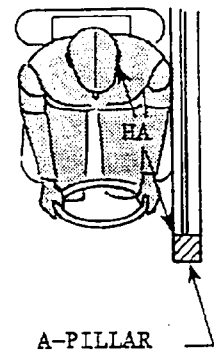
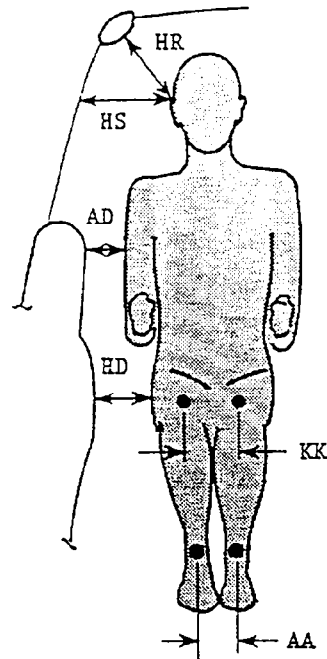


	DRIVER	PASSENGER
HR	5.5	6.2
HS	8.4	9.0
AD	3.5	4.3
HD	6.4	6.5
KK	10.6	7.9
AA	12.0	8.4

Knee outer bolt head to outer bolt head spacing:

Driver = 14.5

Passenger = 11.8



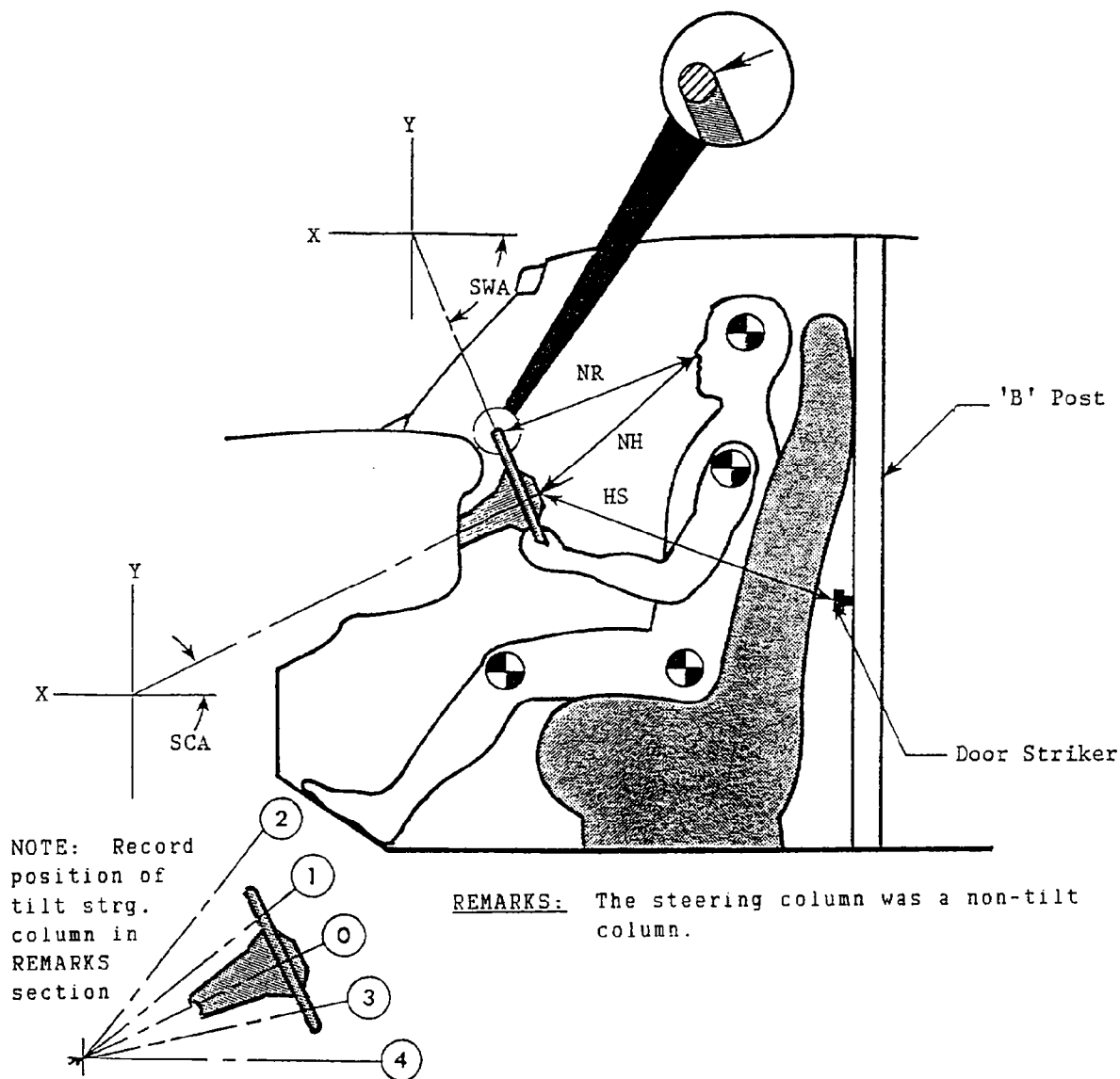
HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD = Knee to Dash
 TA = Torso Angle
 SA = Seat Back Angle

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
 HA = Head to A-Pillar

Torso and seat back angles are relative to vertical.

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

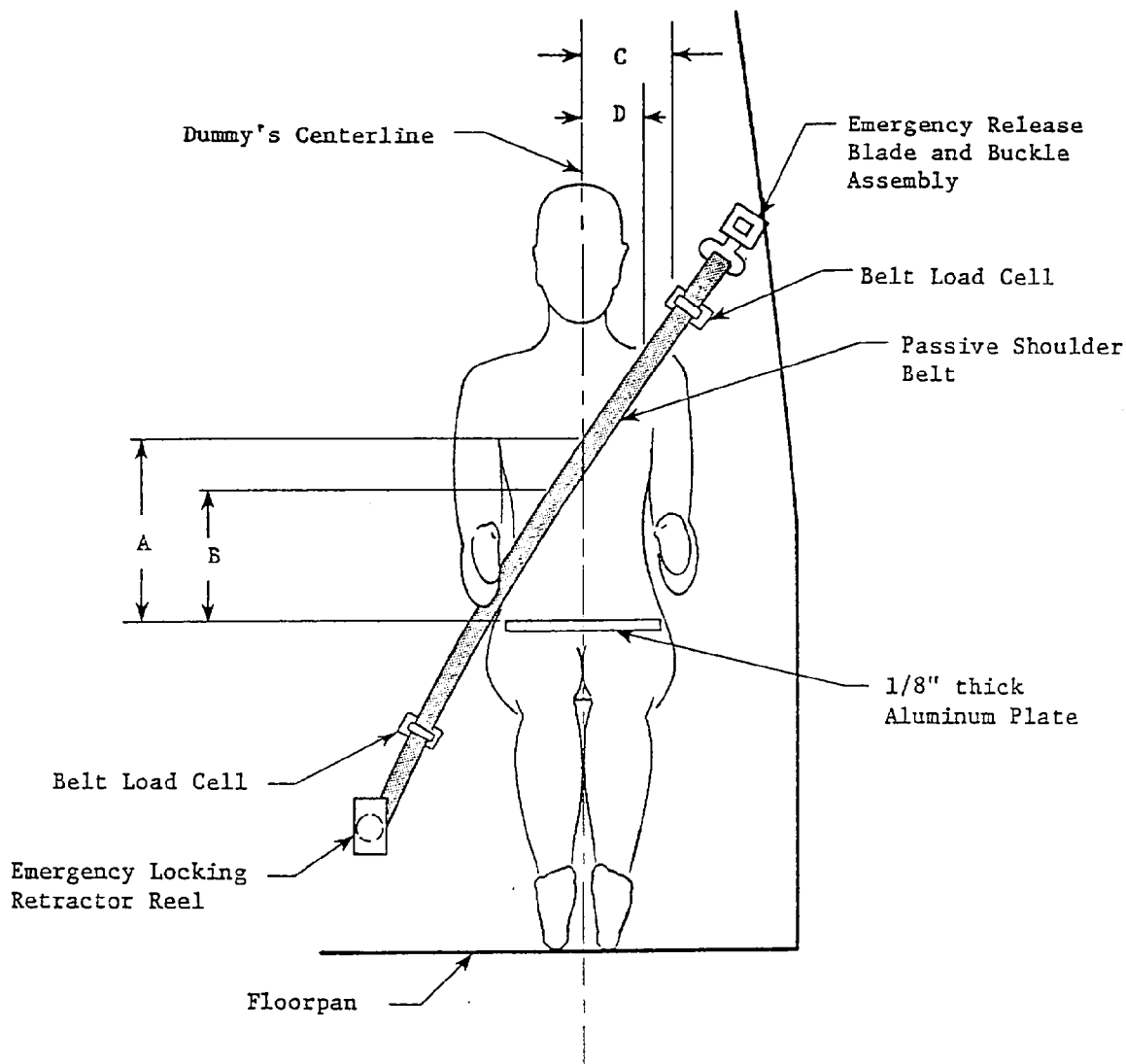
FIGURE 8 DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



MEASUREMENTS

NR	- Distance from tip of dummy's nose to top rear surface of steering wheel rim. (in.)	16.6
NH	- Distance from tip of dummy's nose to center of steering column hub. (in.)	17.1
HS	- Distance from center of steering column hub to the forward surface of the door lock striker pin. (in.)	22.8
SCA	- Angle of steering column relative to the horizontal X axis	24°
SWA	- Angle of steering wheel relative to the horizontal X axis	66°

FIGURE 9 SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	13.5	12.8
B - Top surface of alum. plate to belt lower edge (in)	9.8	9.5
C - Dummy centerline to outer edge of belt at chest flesh top (in)	5.6	6.9
D - Dummy centerline to inner edge of belt at chest flesh top (in)	3.2	4.3

TABLE 7 FMVSS 208 COMFORT AND CONVENIENCE DATA

VEHICLE VIN: 1NXAE91A5LZ073326 NHTSA NO: CL5101
MAKE: Toyota MODEL: Corolla
VEHICLE BUILD DATE: 9/89 VEHICLE TYPE: 4-door sedan
FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:
(check one): X Automatic belts
 Type 2 lap/shoulder belts
 Other

CONVENIENCE HOOKS:

DEVICE AUTOMATICALLY RELEASES WHEN IGNITION IS TURNED TO "ON" OR "START"
AND (check one):

 Vehicle's drivetrain is engaged
 Vehicle's parking brake is in the released mode
 X Not applicable, vehicle's restraint system does not
include convenience hooks

WEBBING TENSION - RELIEVING DEVICE:

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

BELT CONTACT FORCE:

FOR BELTS WITHOUT TENSION-RELIEVING DEVICES: BELT CONTACT FORCE:
 0.3 POUNDS

LATCHPLATE ACCESS: NA

RETRACTION: NA

ACCESSIBILITY: NA

LATCH MECHANISM: NA

TABLE 8 FMVSS NO. 208 - SEAT BELT WARNING SYSTEM DATA

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

Duration of audible warning signal = 7 sec.

Duration of reminder light operation = 7 sec.

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

Duration of audible warning signal = 0 sec.

(NOTE: audible warning should not operate)

Duration of reminder light operation = 7 sec.

Wording of visual warning:

Fasten Seat Belt

Fasten Belt

Symbol 101-80 X

TABLE 9 FMVSS NO. 208 - LABELING AND DRIVER'S MANUAL DATA

DESCRIBE LOCATION OF LABEL WHICH DESCRIBES MANUFACTURER'S MAINTENANCE OR
REPLACEMENT SCHEDULE FOR CRASH-DEPLOYED OCCUPANT PROTECTION SYSTEM: NA,
vehicle did not contain a crash-deployed occupant protection system.

TABLE 10 FMVSS NO. 208 - READINESS INDICATOR DATA

AN OCCUPANT RESTRAINT SYSTEM THAT DEPLOYS IN THE EVENT OF A CRASH SHALL HAVE A MONITORING SYSTEM WITH A READINESS INDICATOR. A TOTALLY MECHANICAL SYSTEM IS EXEMPT FROM THIS REQUIREMENT. NA, vehicle did not contain a crash-deployed occupant protection system.

TABLE 11 SUMMARY OF FMVSS 301 DATA

PRE-IMPACT DATA

MAKE/MODEL: Toyota/Corolla

BODY STYLE: 4-door sedan

MODEL YEAR: 1990

NHTSA NO.: CL5101

COLOR: Gray

DATA FROM CERTIFICATION LABEL

VEHICLE MANUFACTURER: New United Motor Manufacturing, Inc.

DATE OF MANUFACTURE: 9/89

VIN: 1NXAE91A5LZ073326

GVWR: 3415 LBS., GAWR: FRONT 1770 LBS., REAR 1690 LBS.

POST-IMPACT DATA

TYPE OF TEST: Frontal Barrier Impact

DATE OF TEST: 01/04/90

TIME: 1233

TEMP: 74° F

REQUIRED IMPACT VELOCITY RANGE: 28.9 MPH TO 29.9 MPH

IMPACT VELOCITY: PRIMARY = 29.6 MPH, SECONDARY = 29.6 MPH

TEST WEIGHT = 2727 LBS., STATIC CRUSH MAX. = 17.3 IN., REBOUND = 55.9 IN.

FUEL SYSTEM DATA

TEST FLUID TYPE: PURPLE SOLVENT #2; SPEC. GRAVITY: 0.764

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: 12.9 GALLONS (FURNISHED BY COTR)

TEST VOLUME: 12.0 GALLONS (92-94% OF USEABLE)

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 13.2 GALLONS

DETAILS OF FUEL SYSTEM: The fuel tank is located in front of the rear
axle. The fuel filler neck is located on the left side. The fuel lines
run along the left frame rail to the front.

ELECTRIC FUEL PUMP: No

FUEL INJECTOR: Yes

DOES ELECTRIC FUEL PUMP OPERATE WITH IGNITION SWITCH "ON" AND THE ENGINE NOT OPERATING? NA

*WITH ENTIRE FUEL SYSTEM FILLED.

FIGURE 10 FMVSS NO. 212, "WINDSHIELD MOUNTING", DATA SHEET

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

Adhesive retention around periphery, plastic trim on outer perimeter.

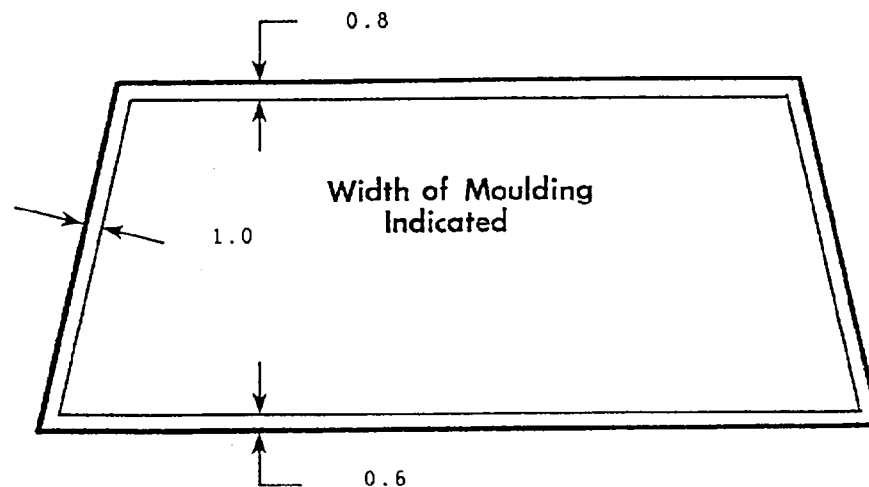
FMVSS 212 REQUIREMENTS: The post-test periphery retention amount must be at least 75% of the pre-test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

FMVSS 212 TEST DATA:

WINDSHIELD PERIPHERY

	PRE-TEST (in)	POST-TEST (in)	PERCENT RETENTION
RIGHT SIDE	77.9	77.9	100%
LEFT SIDE	77.9	77.9	100%
TOTAL	155.8	155.8	100%

AREA OF RETENTION FAILURE:



WINDSHIELD TEMPERATURE: 71° F

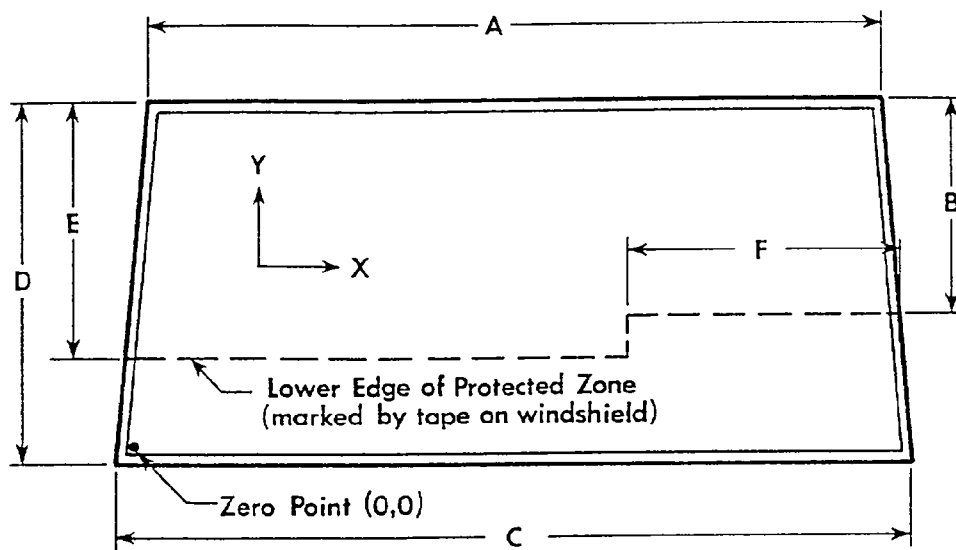
FAILURE DETAILS: None

FIGURE 11 FMVSS NO. 219, "WINDSHIELD ZONE INTRUSION", DATA SHEET

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5" dia. rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. Draw the locus of points on the inner surface of the windshield contactable by the sphere across the width of the instrument panel. From the outermost contactable points, extend the locus line horizontally to the edges of the windshield, and then draw a line on the inner surface of the windshield below and 1/2" from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection onto the outer surface of the windshield of this line.

FMVSS 219 TEST DATA:



FRONT VIEW

A = 43.6	C = 59.9	E = 20.8
B = 18.6	D = 30.1	F = 27.0

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

COORDINATES
X Y

None

- 1.
- 2.
- 3.
- 4.

ALL MEASUREMENTS ARE IN INCHES.

TABLE 12 "FUEL SYSTEM INTEGRITY" POST-IMPACT

TEST DATA, FMVSS NO. 301

TEST VEHICLE NHTSA NO.: CL5101; TEST DATE: 01/04/90

VEH. MFR./MAKE/MODEL: New United Motor Manufacturing, Inc./Toyota/Corolla

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

.....

TEST VEHICLE IMPACT TYPE:

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

FUEL SPILLAGE MEASUREMENT:

	<u>ACTUAL</u>	<u>MAX. ALLOW.</u>
1. From impact until vehicle motion ceases - - -	0	1 oz.
2. For 5 min. period after veh. motion ceases- -	0	5 oz.
3. For next 25 minutes - - - - -	0	1 oz./1 min.

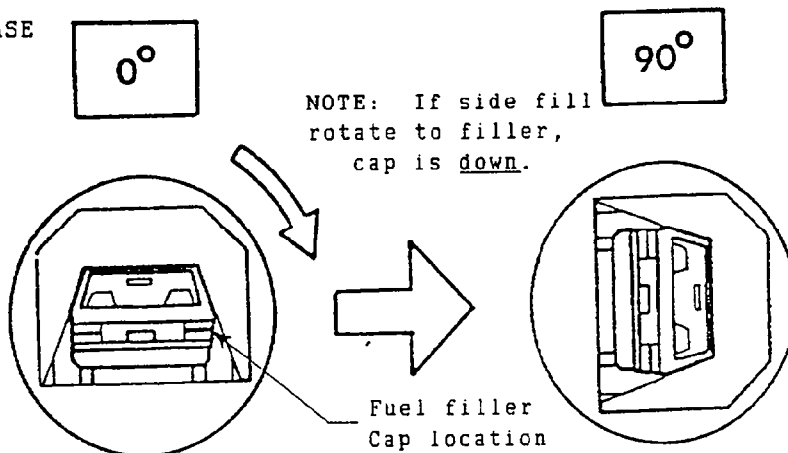
SOLVENT SPILLAGE DETAILS:

None

FIGURE 12 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

NHTSA NO.: CL5101

TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

Time req. for machine to rotate 90° = 2 minutes, 00 seconds

FMVSS 301 position hold time = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

Next whole minute interval - - - - = 7 minutes

FMVSS 301 REQUIREMENTS

	First 5 minutes	6th	7th
	FROM ONSET OF ROTATION	Minute	Minute
Maximum allowable solvent spillage - -	<u>5 oz.</u>	<u>1 oz.</u>	<u>1 oz.</u>
0 to 90° (filler cap down) - - - - -	<u>0 oz.</u>	<u>0 oz.</u>	<u>0 oz.</u>

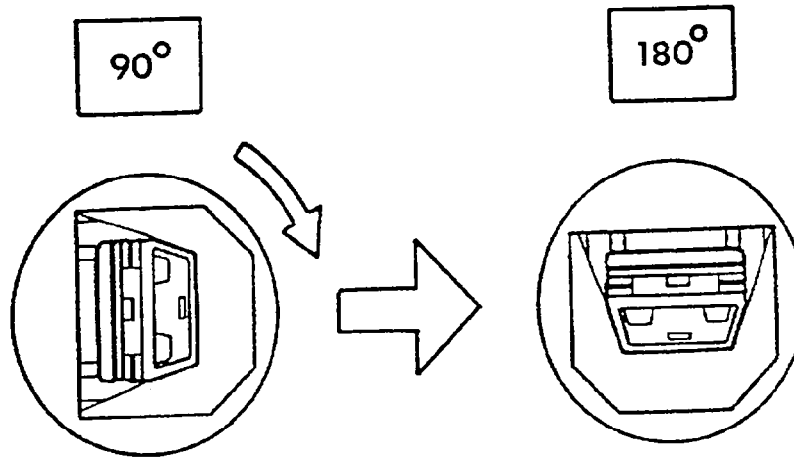
SOLVENT SPILLAGE LOCATION(S)

None

FIGURE 12 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET CONT'D

NHTSA NO.: CL5101

TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

Time req. for machine to rotate 90° = 2 minutes, 00 seconds

FMVSS 301 position hold time = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

Next whole minute interval - - - - = 14 minutes

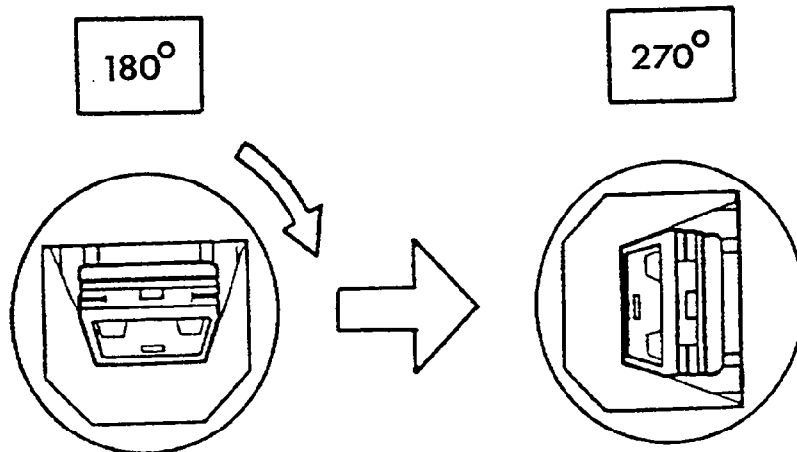
FMVSS 301 REQUIREMENTS

	First 5 minutes	6th	7th
	FROM ONSET OF ROTATION	Minute	Minute
Maximum allowable solvent spillage - -	<u>5 oz.</u>	<u>1 oz.</u>	<u>1 oz.</u>
90° to 180° - - - - -	<u>0 oz.</u>	<u>0 oz.</u>	<u>0 oz.</u>

SOLVENT SPILLAGE LOCATION(S)

None

FIGURE 12 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET CONT'D
 NHTSA NO.: CL5101
 TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

Time req. for machine to rotate 90° = 2 minutes, 00 seconds

FMVSS 301 position hold time = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

Next whole minute interval - - - - = 21 minutes

FMVSS 301 REQUIREMENTS

	First 5 minutes FROM ONSET OF ROTATION	6th Minute	7th Minute
Maximum allowable solvent spillage - -	<u>5 oz.</u>	<u>1 oz.</u>	<u>1 oz.</u>
180° to 270° - - - - -	<u>0 oz.</u>	<u>0 oz.</u>	<u>0 oz.</u>

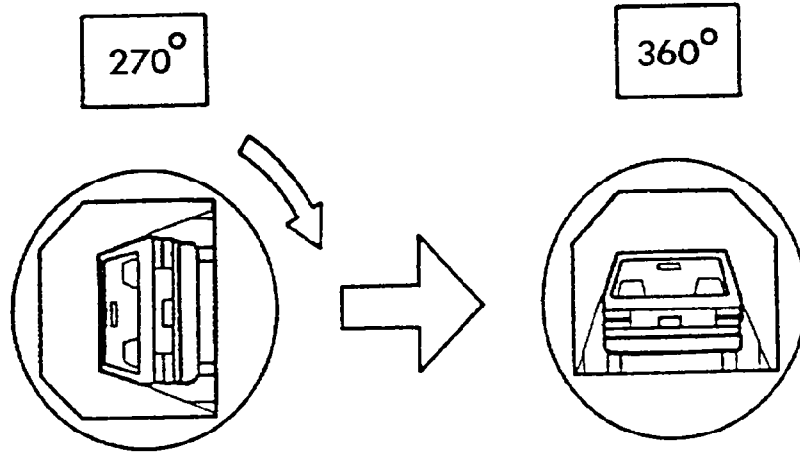
SOLVENT SPILLAGE LOCATION(S)

None

FIGURE 12 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET CONT'D

NHTSA NO.: CL5101

TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

Time req. for machine to rotate 90° = 2 minutes, 00 seconds

FMVSS 301 position hold time = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

Next whole minute interval - - - - - = 28 minutes

FMVSS 301 REQUIREMENTS

	First 5 minutes	6th	7th
	FROM ONSET OF ROTATION		
	Minute	Minute	Minute
Maximum allowable solvent spillage - -	<u>5 oz.</u>	<u>1 oz.</u>	<u>1 oz.</u>
270° to 360° - - - - -	<u>0 oz.</u>	<u>0 oz.</u>	<u>0 oz.</u>

SOLVENT SPILLAGE LOCATION(S)

None

SECTION 3.0

CAMERA INFORMATION

FIGURE 13
4, 7, 8 CAMERA POSITIONS

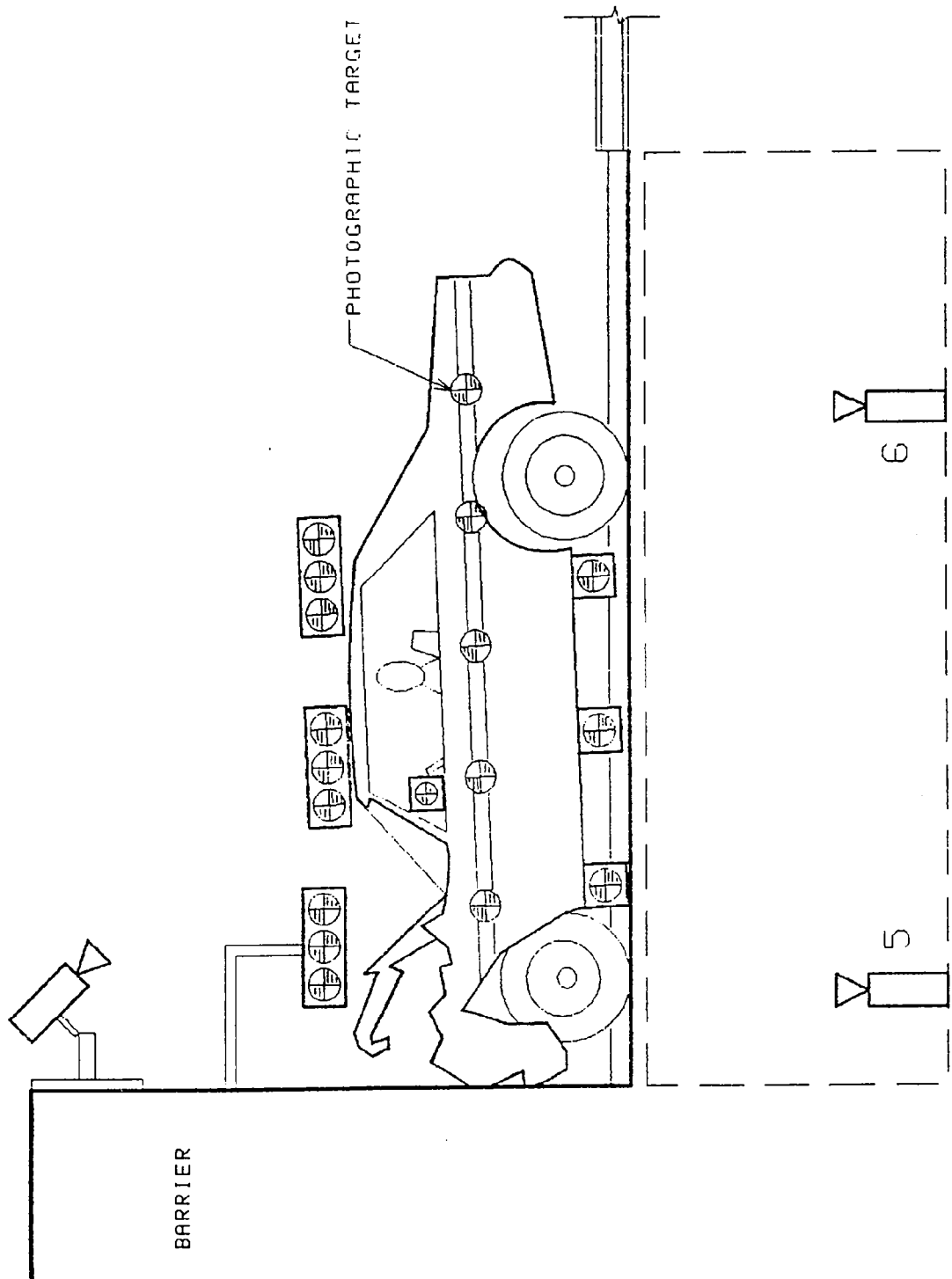


FIGURE 13

CAMERA POSITIONS, CONTINUED

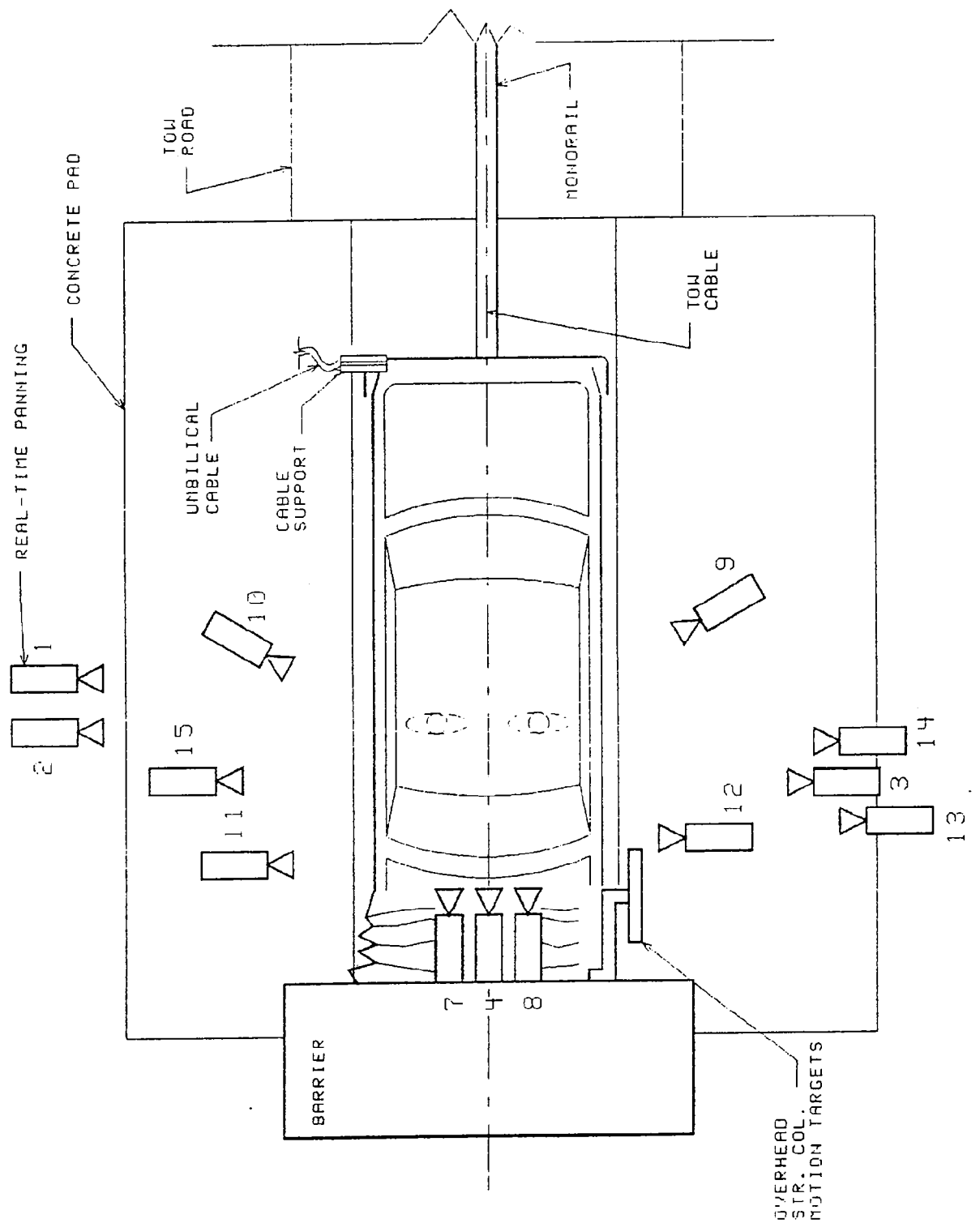


TABLE 13 HIGH SPEED CAMERA LOCATIONS

TEST NO.: 900104		VEHICLE: 1990 Toyota Corolla 4-door sedan		FILM PLANE		
CAMERA NO.	VIEW	CAMERA POSITIONS (IN)*			TO HEAD TARGET	SPEED (FPS)
		X	Y	Z	(MM)	
1	Real time panning	-142.0	-504.0	61.0	NA	24
2	Vehicle crush	-81.3	-266.4	37.1	NA	500
3	Dummy kinematics	-41.5	295.0	44.0	238.0	505
4	Windshield damage	-6.0	0.0	96.0	NA	500
5	Crush & fluid spillage	-50.5	0.0	-92.4	NA	500
6	Fluid spillage	-99.3	0.0	-99.0	NA	1000
7	Passenger kinematics	-4.5	-13.8	93.0	NA	505
8	Driver kinematics	-6.8	14.5	93.0	NA	498
9	Driver kinematics	-157.3	116.0	87.0	103.0	510
10	Passenger kinematics	-152.1	-116.0	87.0	92.0	500
11	Windshield intrusion	-38.1	-306.1	44.0	NA	500
12	Windshield intrusion	-53.0	309.4	42.3	NA	500
13	Column movement	-98.0	256.0	103.0	NA	498
14	Column movement	-98.0	256.0	75.1	NA	500
15	Passenger kinematics	-38.8	-293.0	45.3	239.0	495

* +X = Film plane forward of barrier face

+Y = Film plane to left of monorail centerline

+Z = Film plane above ground level

** +Angle = Film plane angled upward from horizontal plane

APPENDIX A

PHOTOGRAPHS



Figure A-1. PRE-TEST FRONT VIEW



Figure A-2. POST-TEST FRONT VIEW

A-2

900104



Figure A-3. PRE-TEST LEFT SIDE VIEW

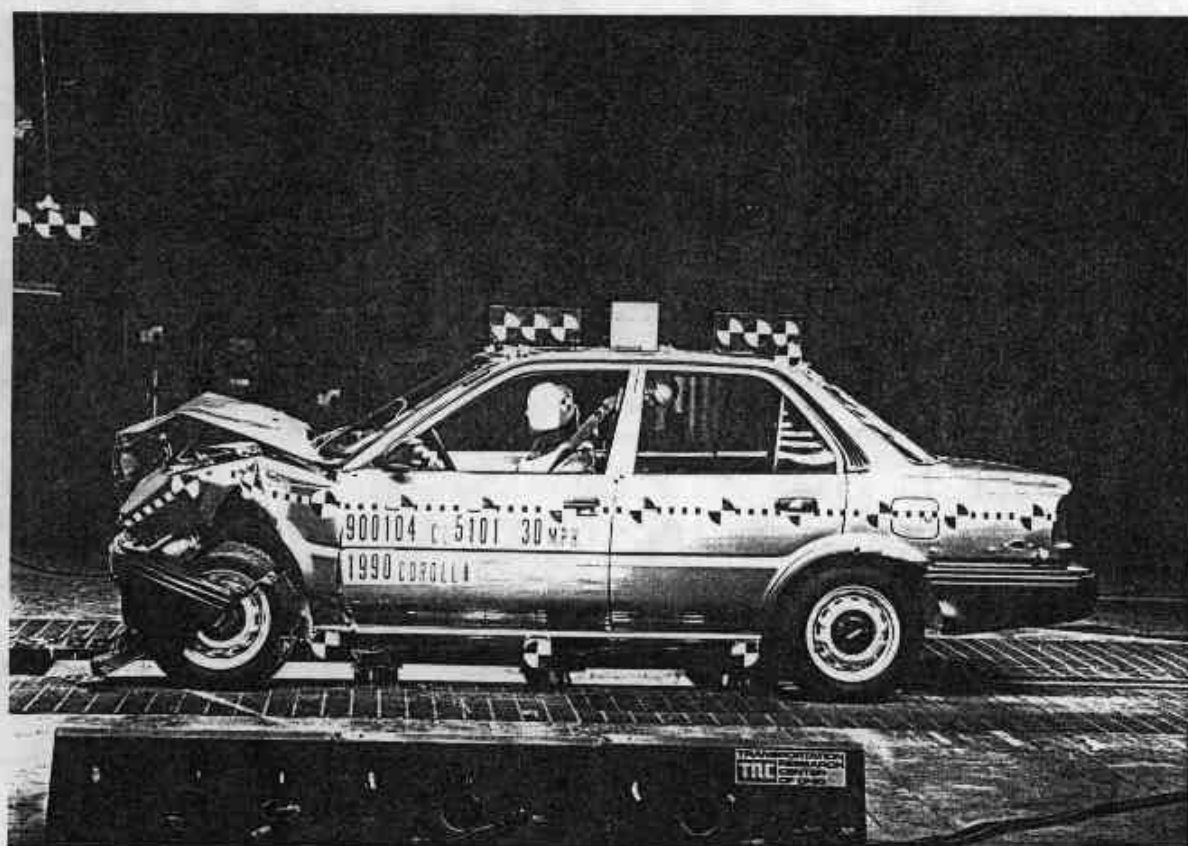


Figure A-4. POST-TEST LEFT SIDE VIEW
A-3

900104

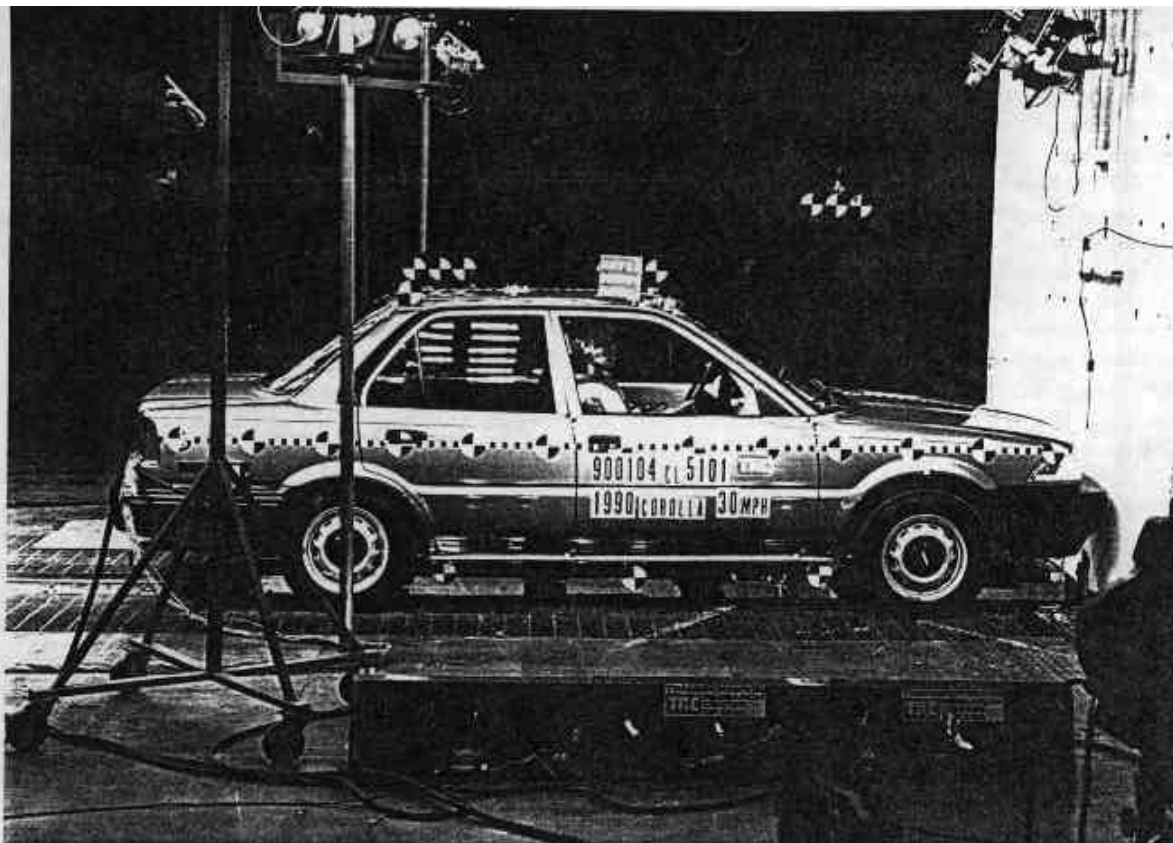


Figure A-5. PRE-TEST RIGHT SIDE VIEW



Figure A-6. POST-TEST RIGHT SIDE VIEW



Figure A-7. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-8. POST-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-9. PRE-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-10. POST-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-11. PRE-TEST REAR VIEW

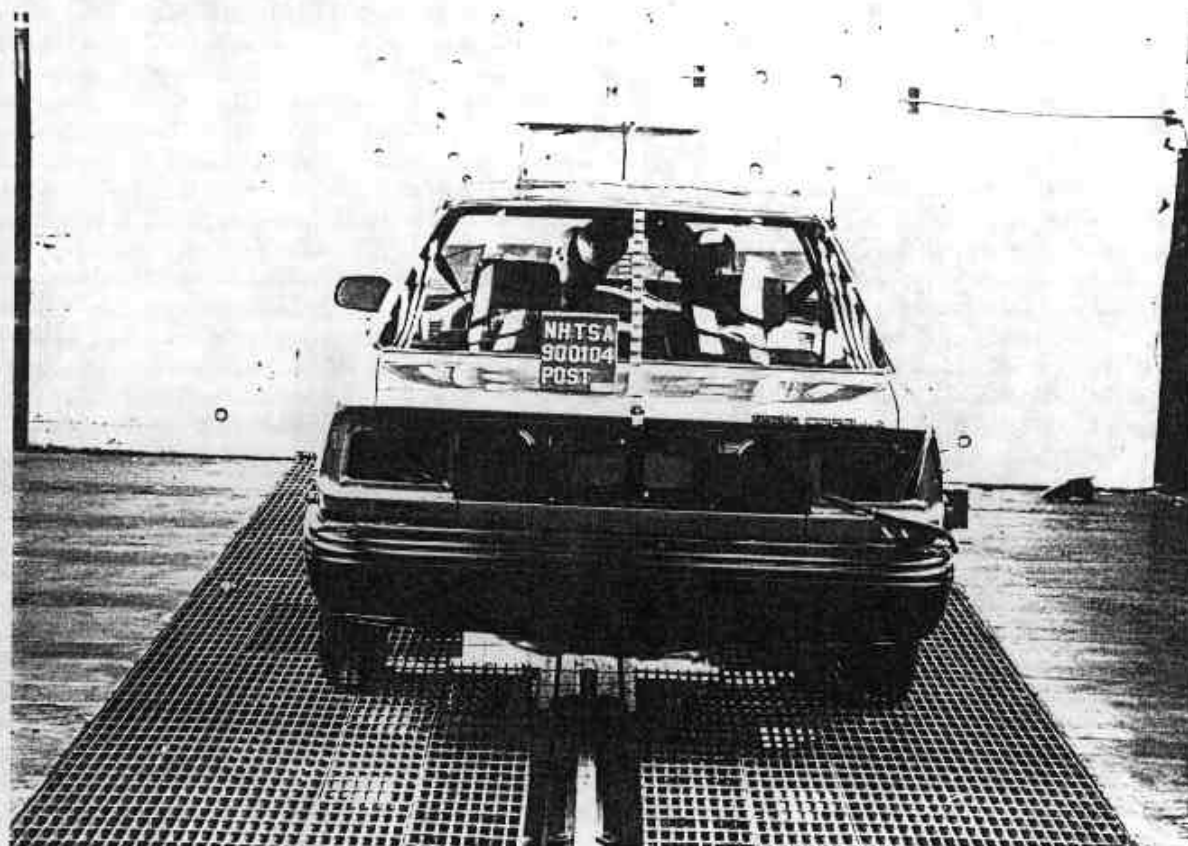


Figure A-12. POST-TEST REAR VIEW

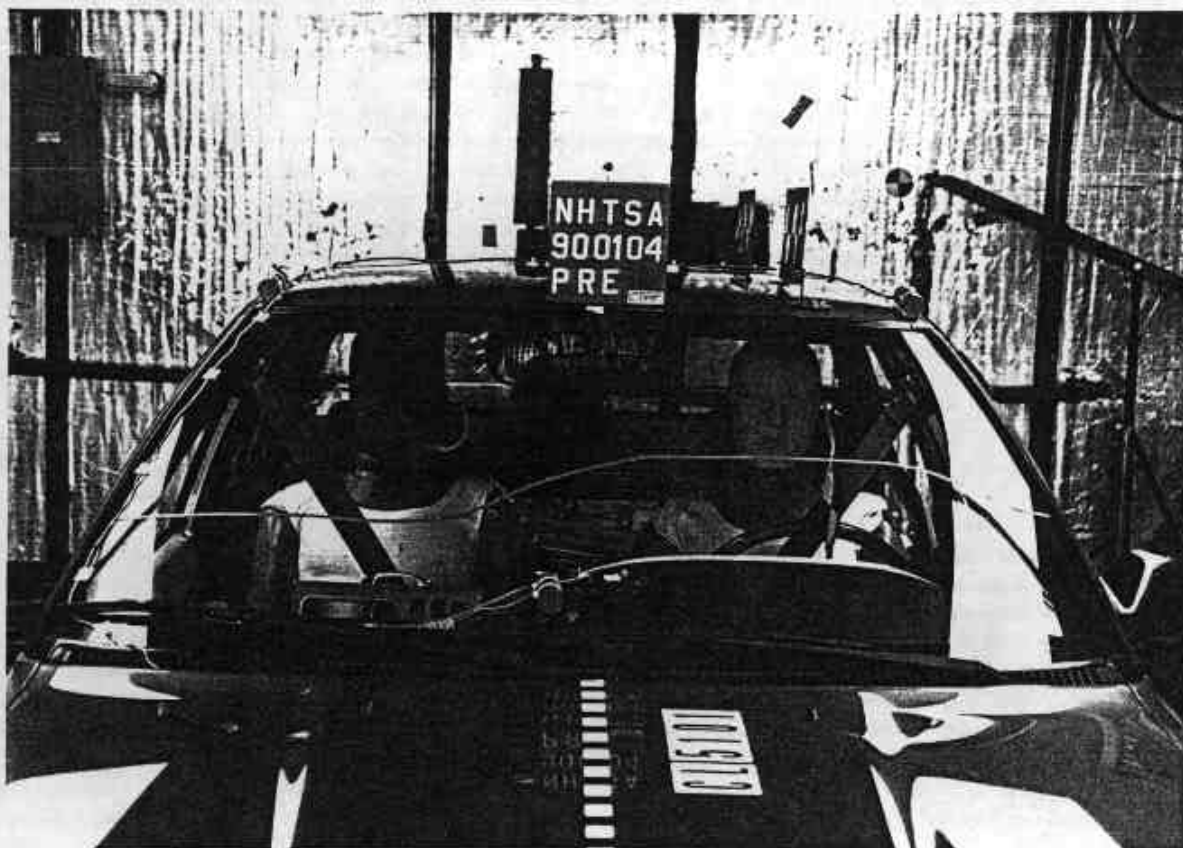


Figure A-13. PRE-TEST WINDSHIELD VIEW

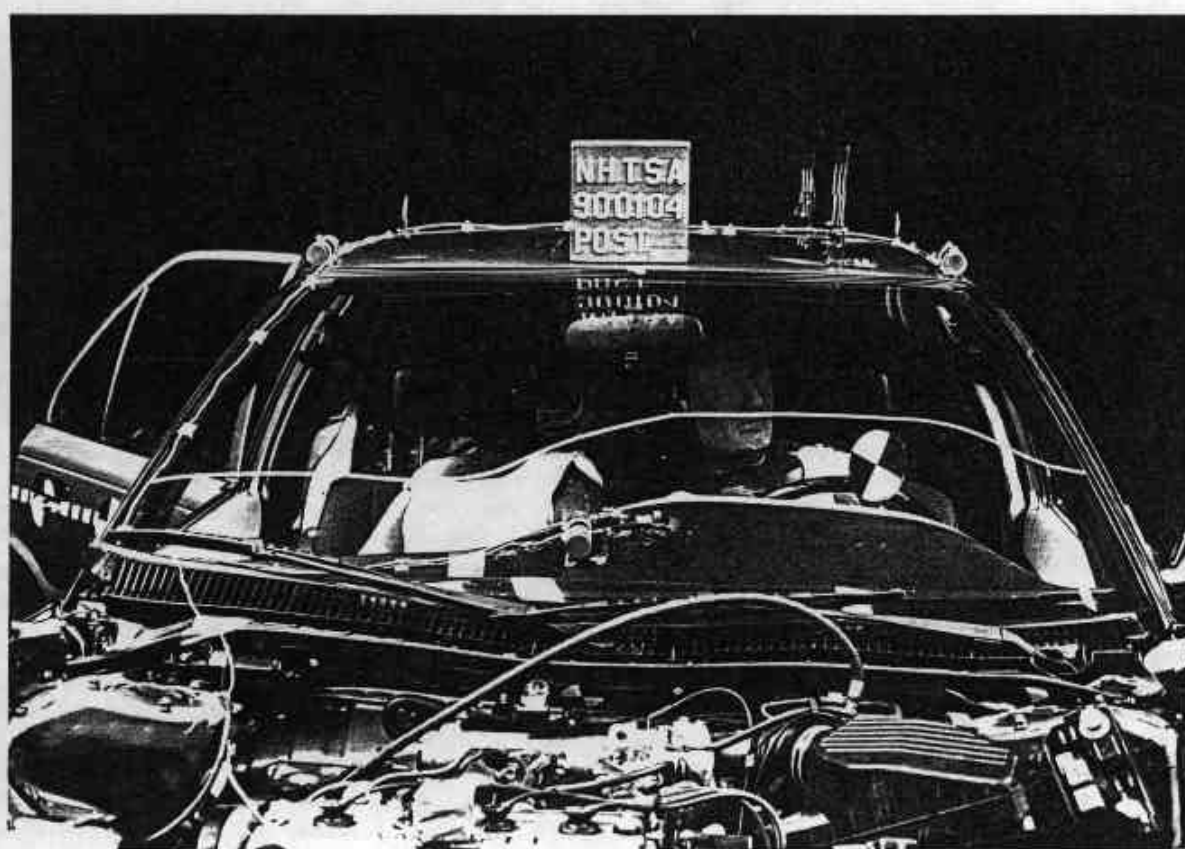


Figure A-14. POST-TEST WINDSHIELD VIEW
A-8

900104

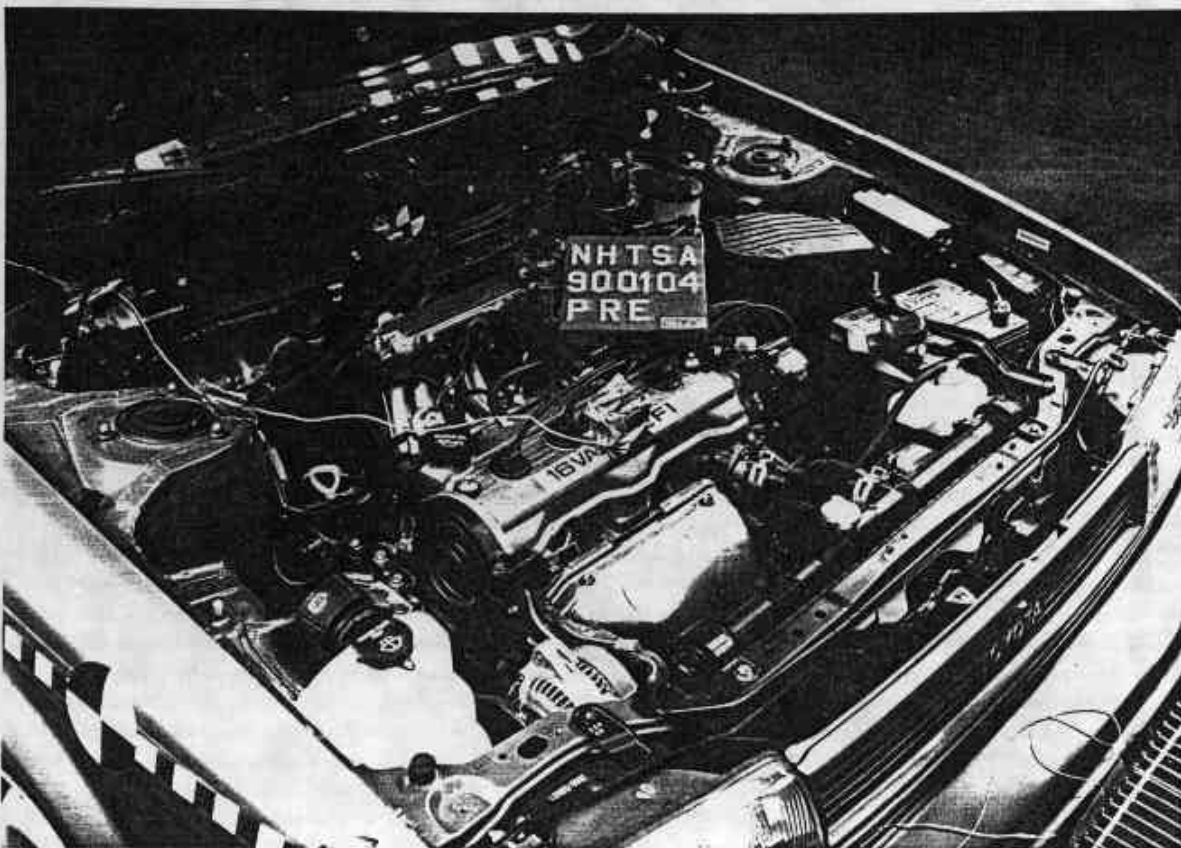


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW

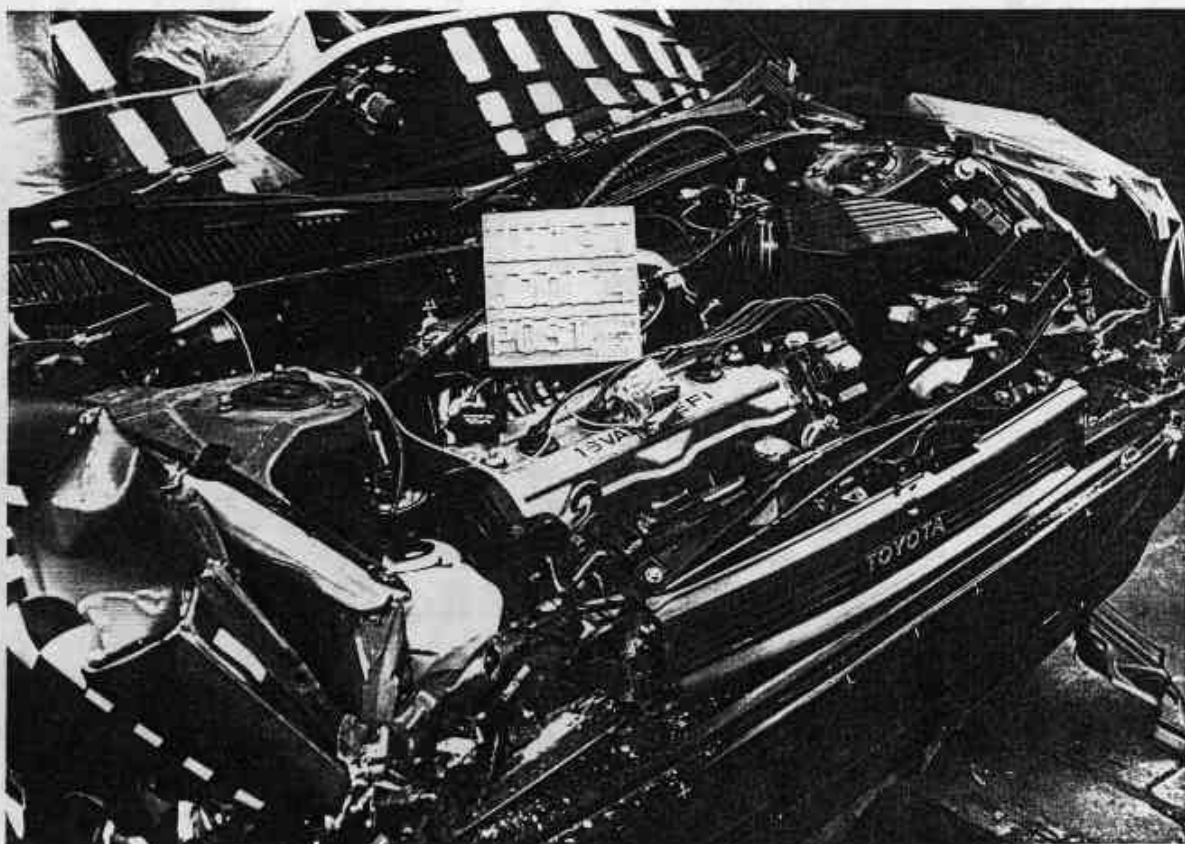


Figure A-16. POST-TEST ENGINE COMPARTMENT VIEW



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



Figure A-18. POST-TEST FUEL FILLER CAP VIEW

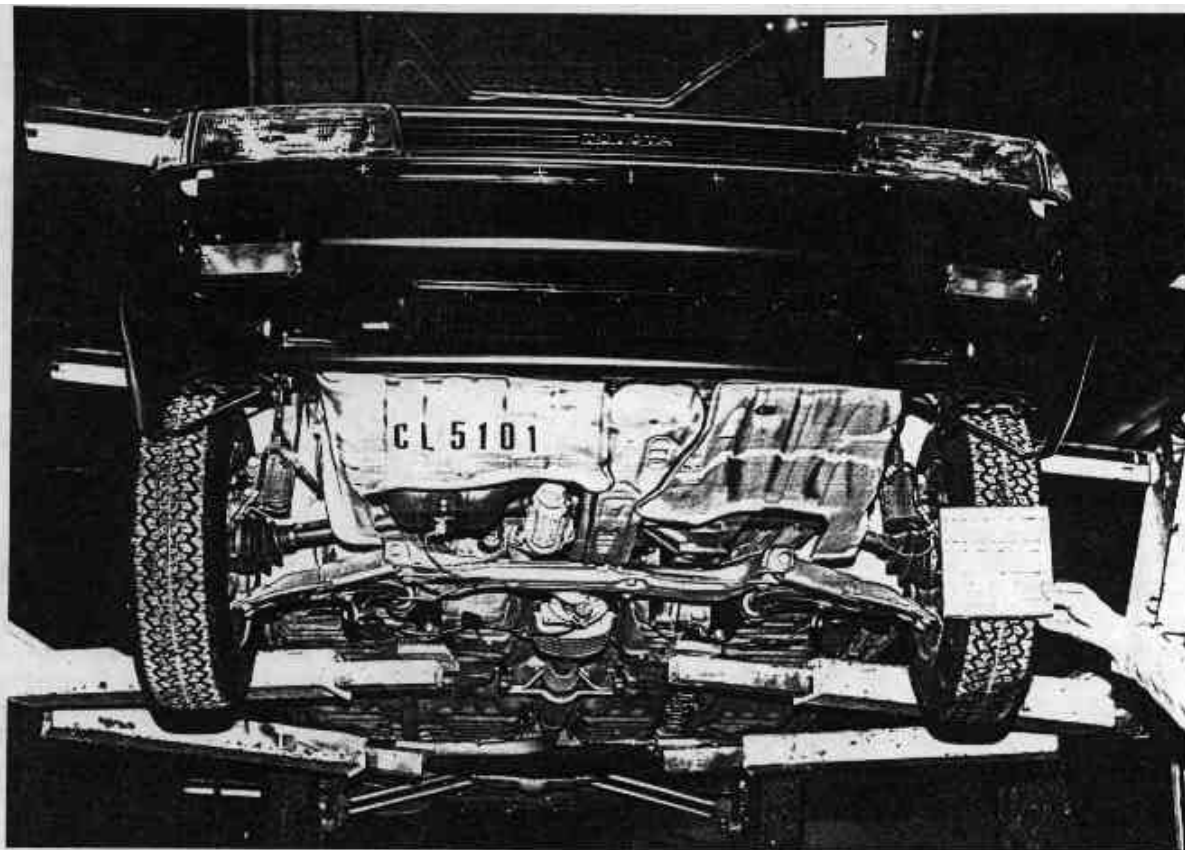


Figure A-19. PRE-TEST FRONT UNDERBODY VIEW

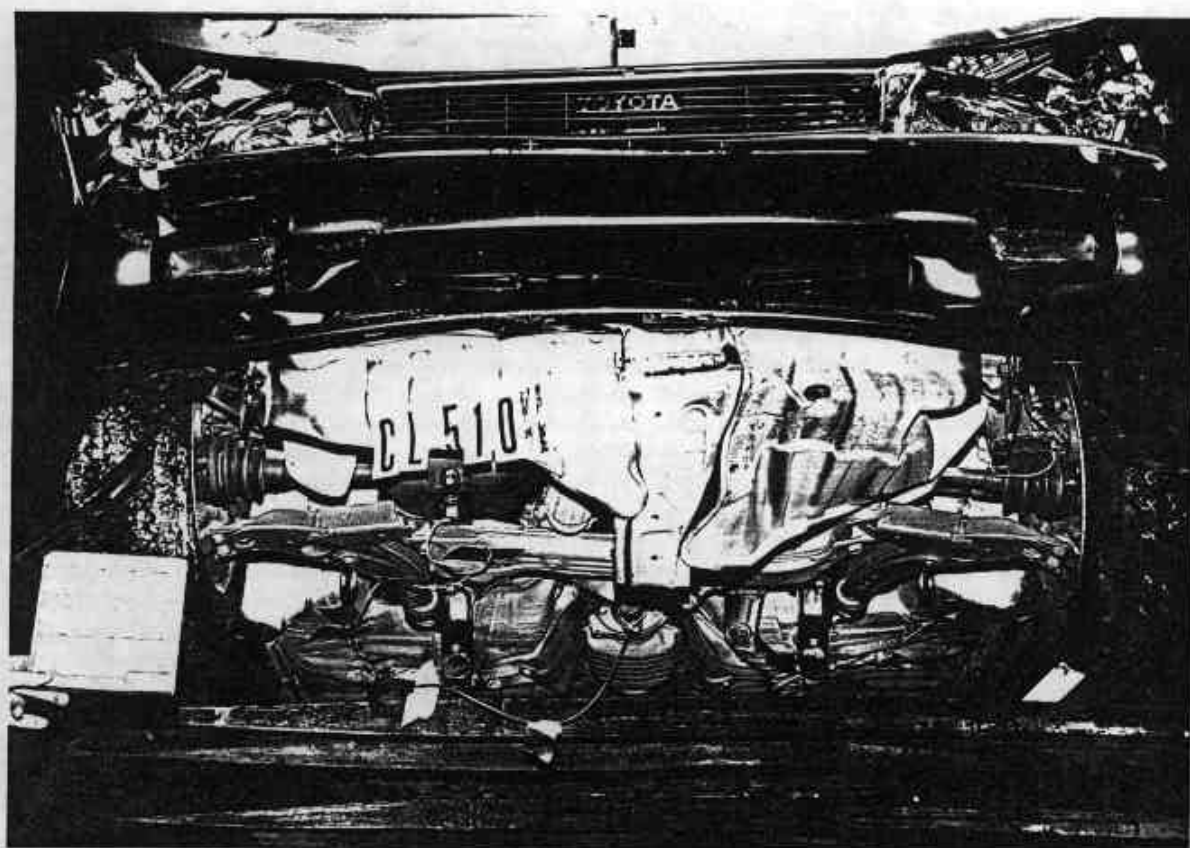


Figure A-20. POST-TEST FRONT UNDERBODY VIEW

A-11

900104

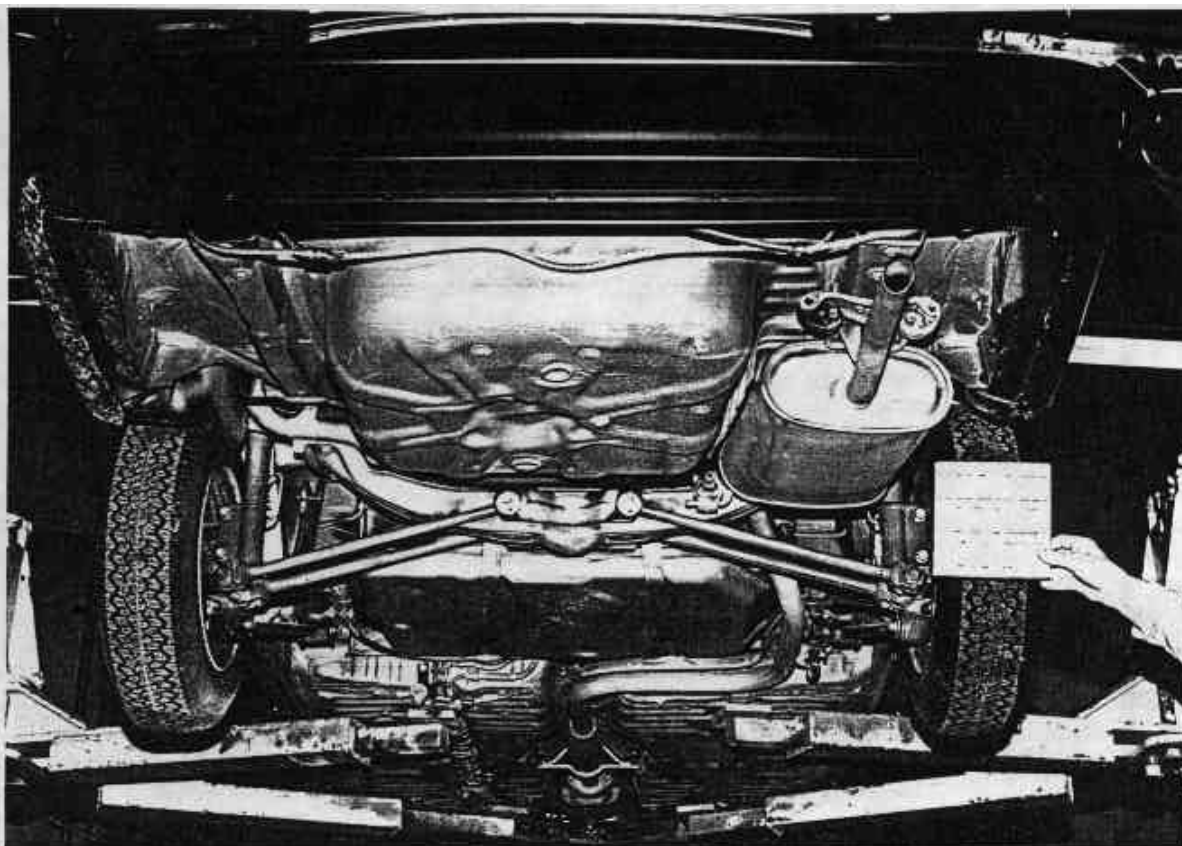


Figure A-21. PRE-TEST REAR UNDERBODY VIEW

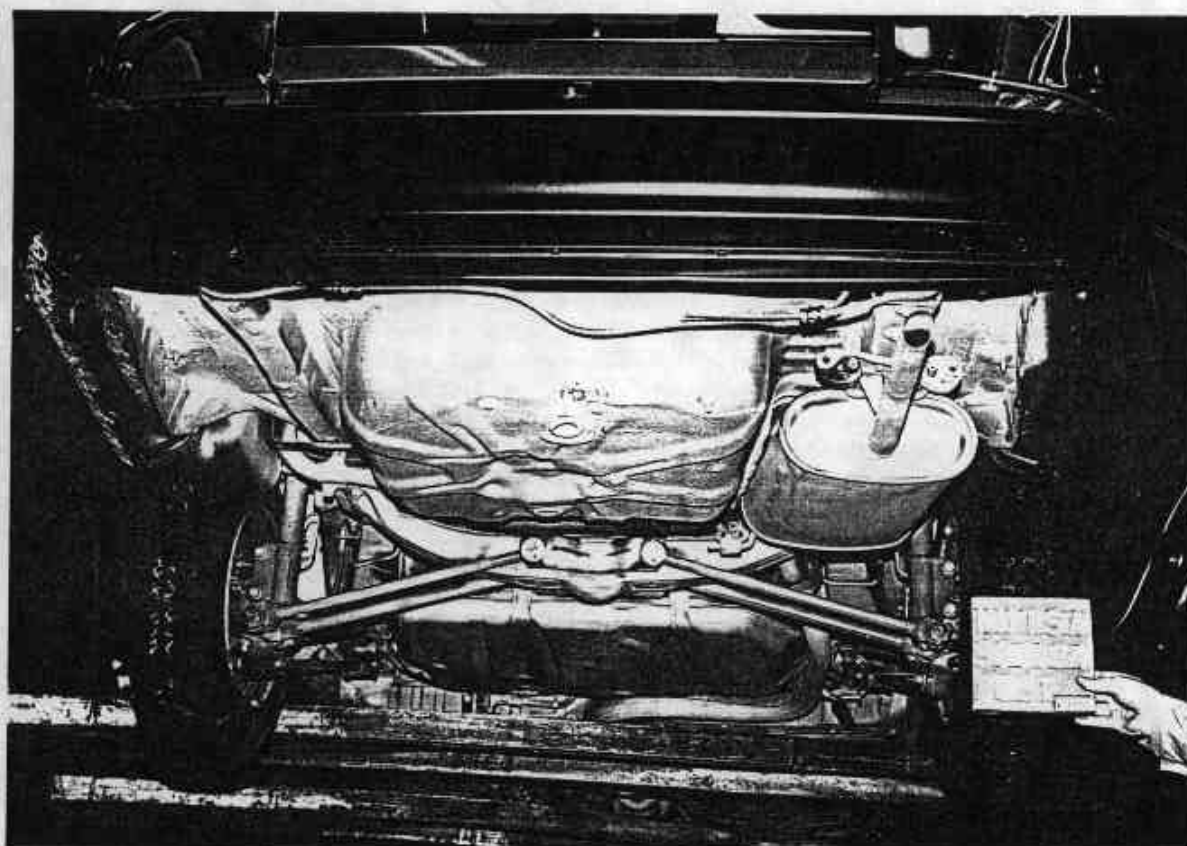


Figure A-22. POST-TEST REAR UNDERBODY VIEW
A-12

900104

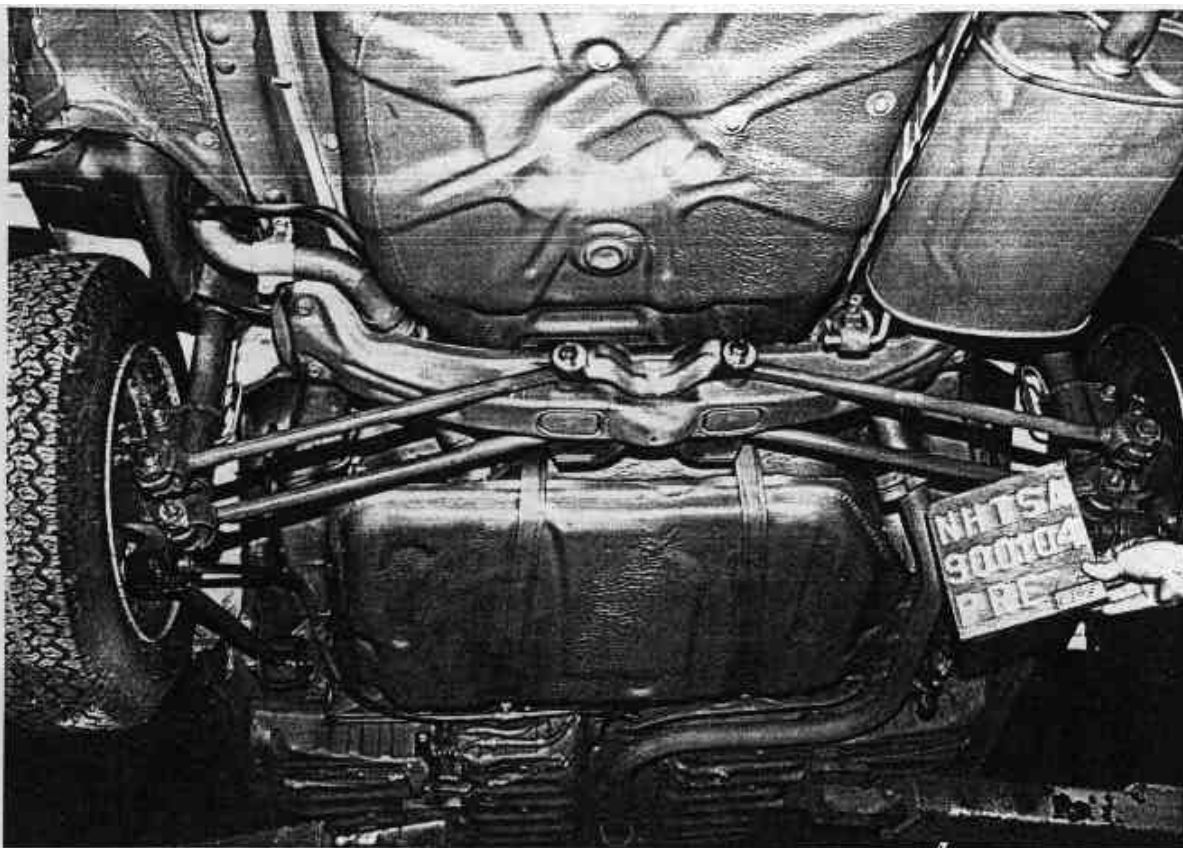


Figure A-23. PRE-TEST FUEL FILLER NECK AND FUEL TANK VIEW

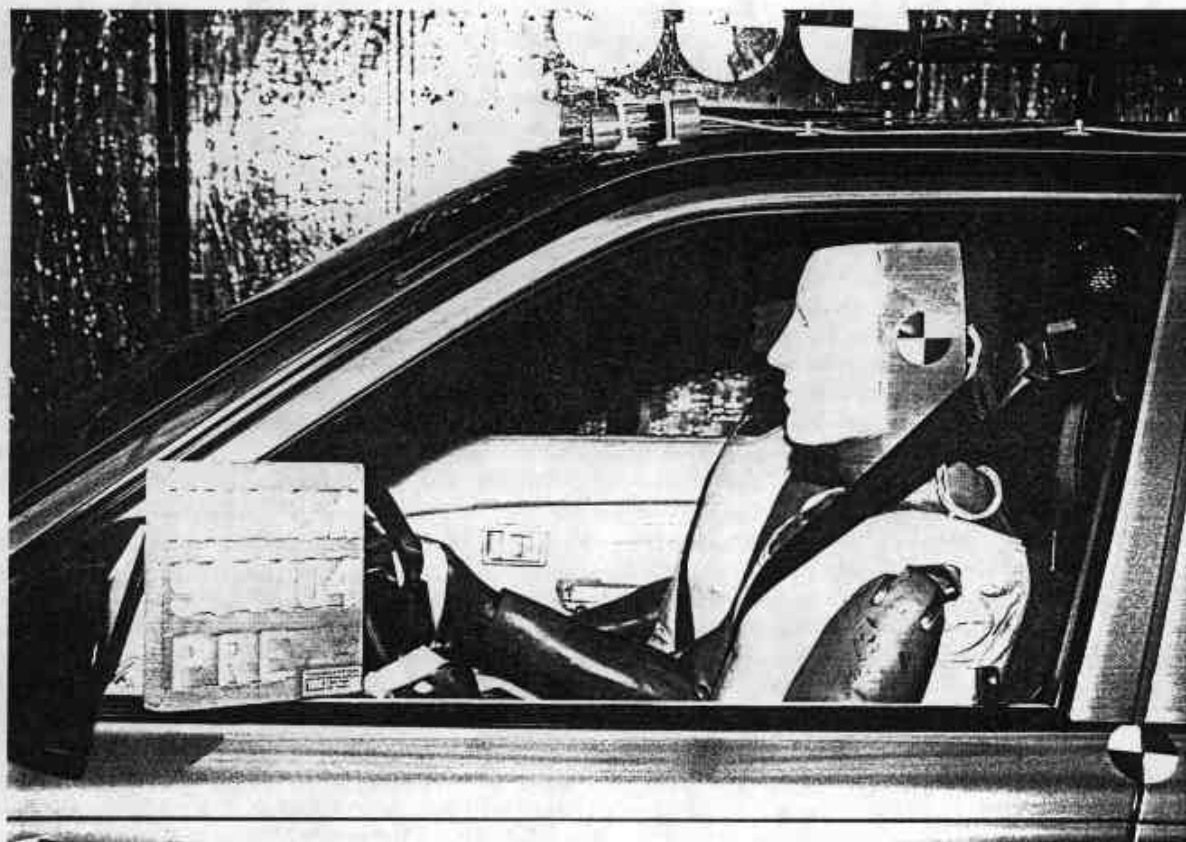


Figure A-24. PRE-TEST DRIVER DUMMY POSITION VIEW



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



Figure A-26. PRE-TEST PASSENGER DUMMY POSITION VIEW



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

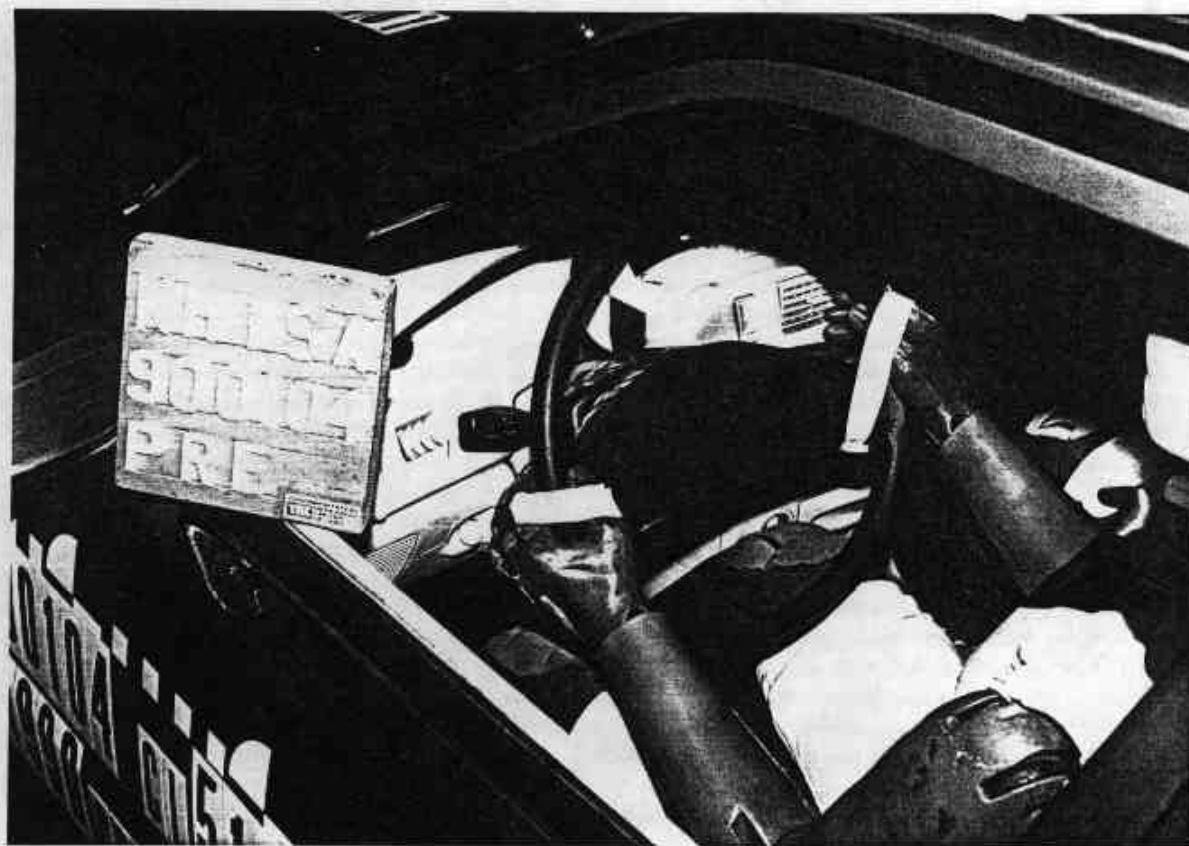


Figure A-28. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR

A-15

900104

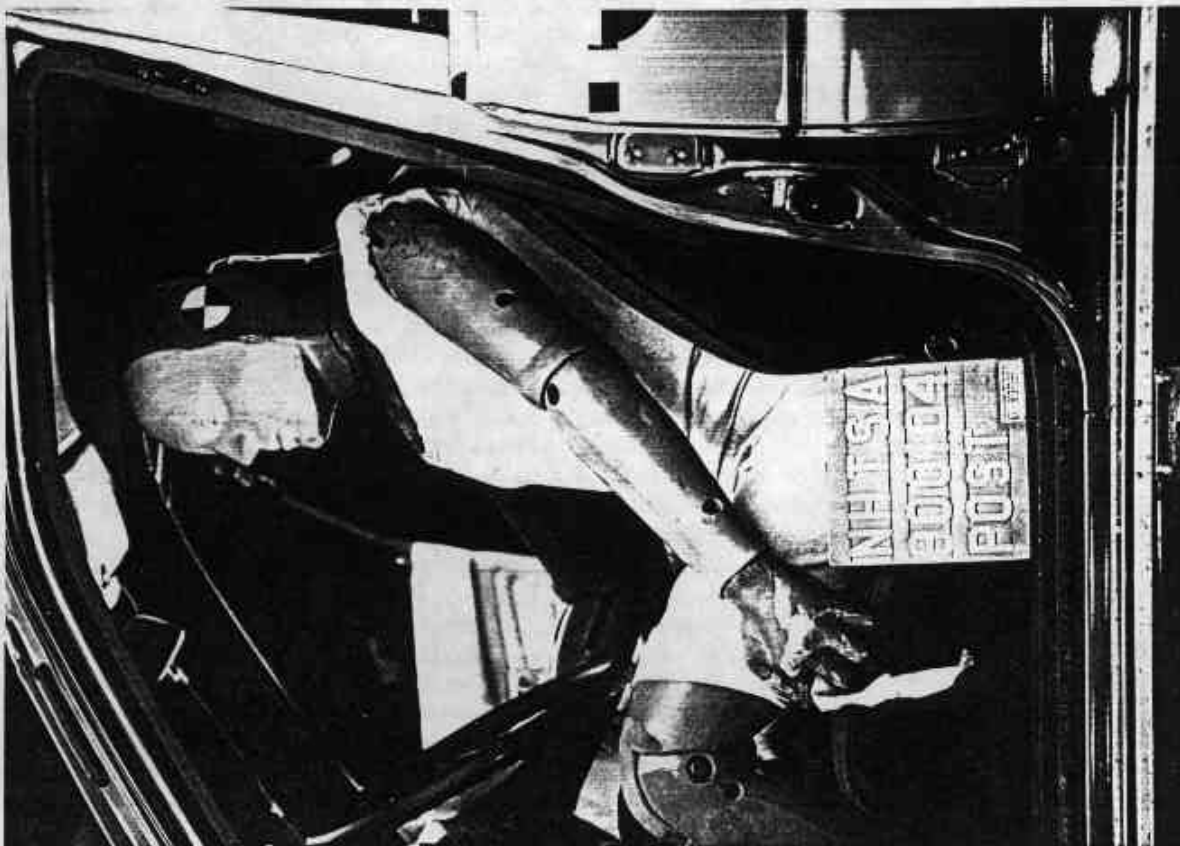


Figure A-29. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1



Figure A-30. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

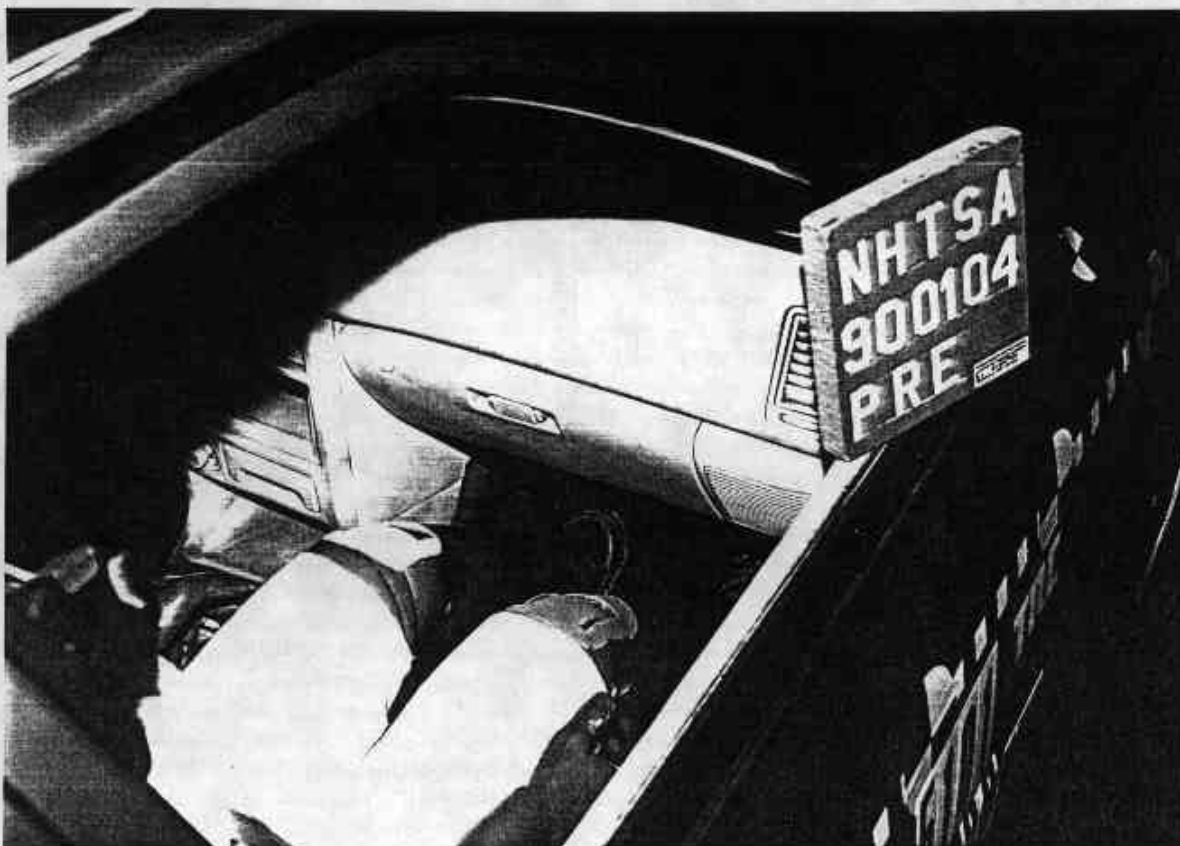


Figure A-31. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR

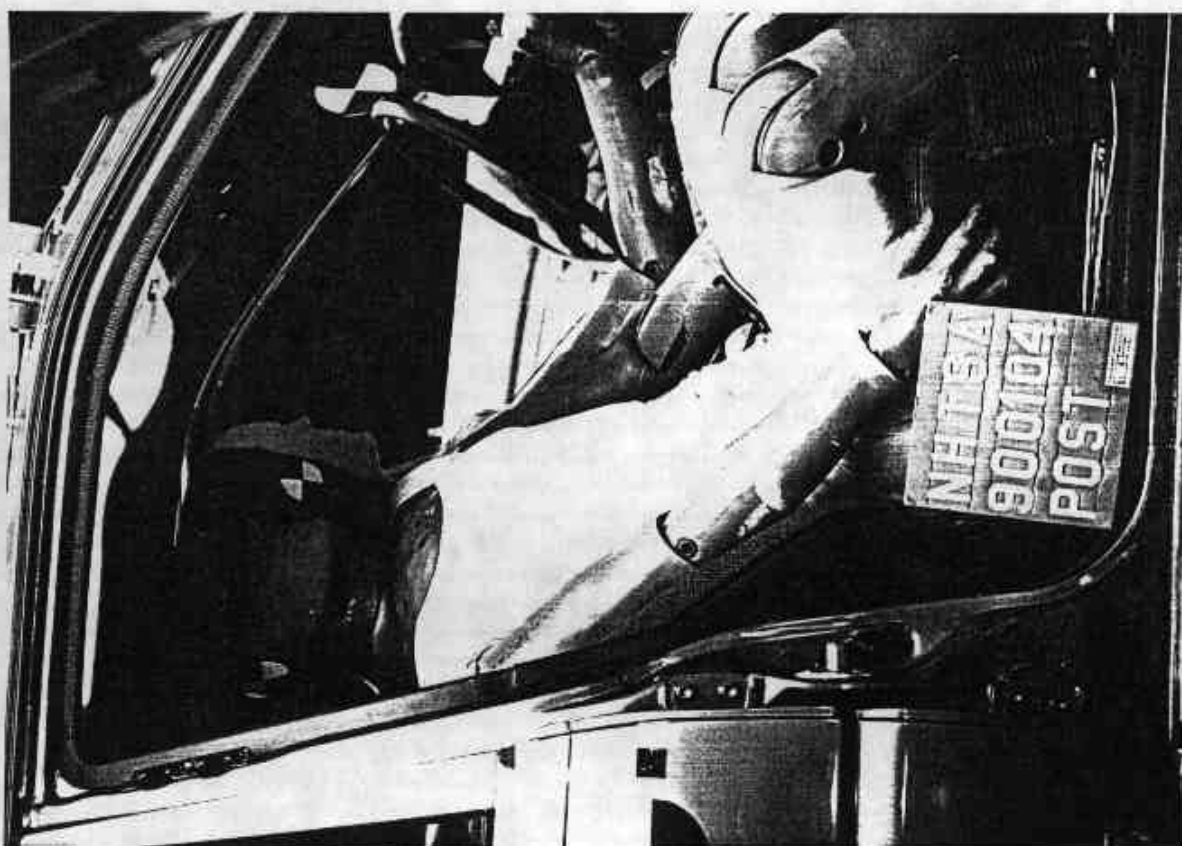


Figure A-32. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
A-17 900104



Figure A-33. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2



Figure A-34. POST-TEST DRIVER DUMMY HEAD CONTACT VIEW



Figure A-35. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1



Figure A-36. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 2



Figure A-37. POST-TEST PASSENGER DUMMY HEAD CONTACT VIEW



Figure A-38. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1



Figure A-39. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2

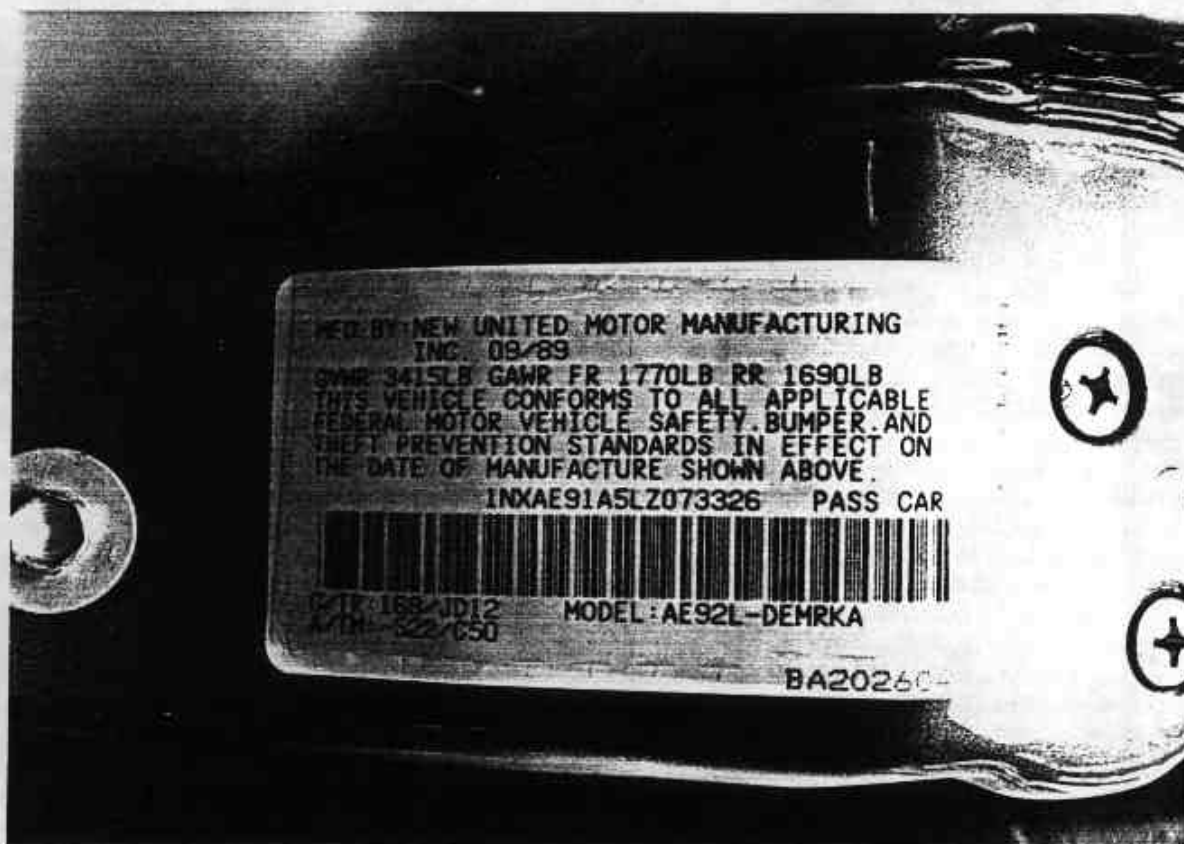


Figure A-40. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW



Figure A-41. PRE-TEST VEHICLE TIRE LOAD LABEL VIEW

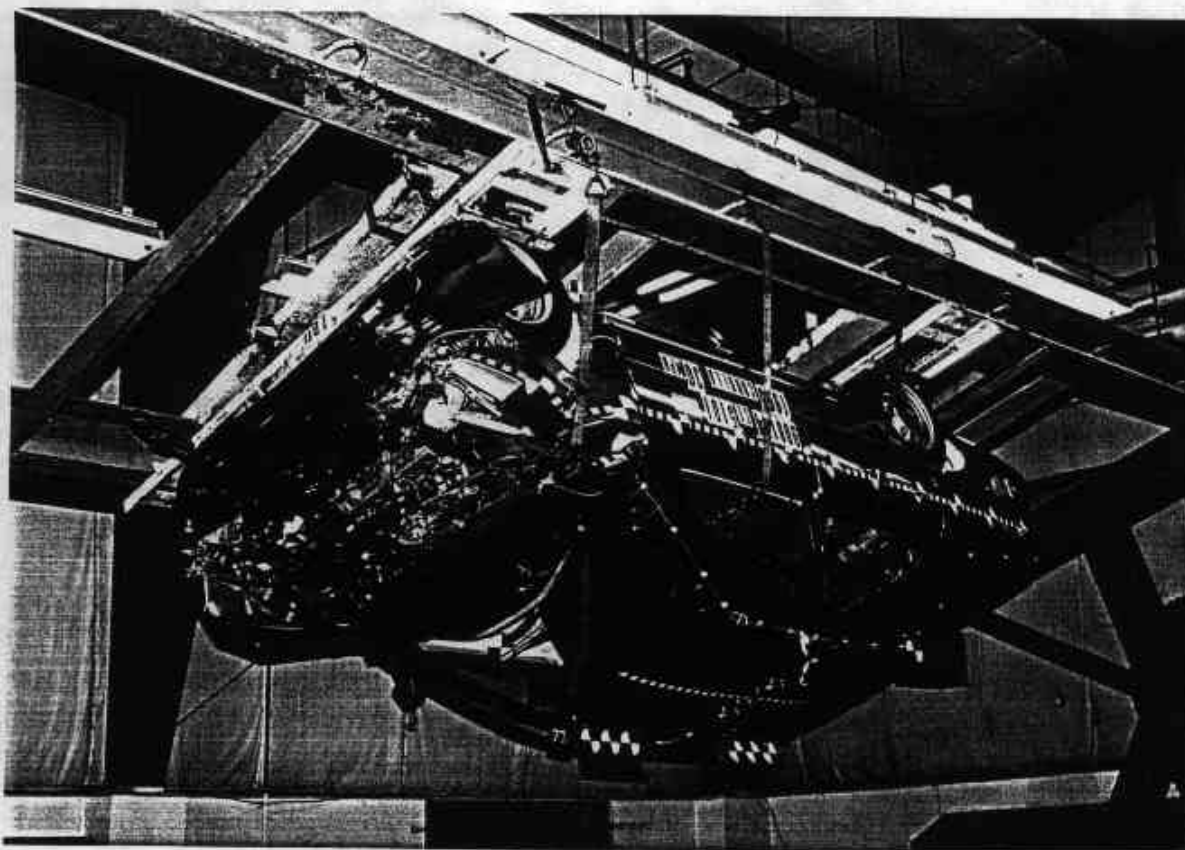


Figure A-42. POST-TEST VEHICLE ON ROLLOVER MACHINE VIEW

APPENDIX B

DATA PLOTS

DUMMY AND VEHICLE AXES: X: FRONT/REAR

Y: LEFT/RIGHT

Z: UP/DOWN

TRC 900104

200 COMPLIANCE

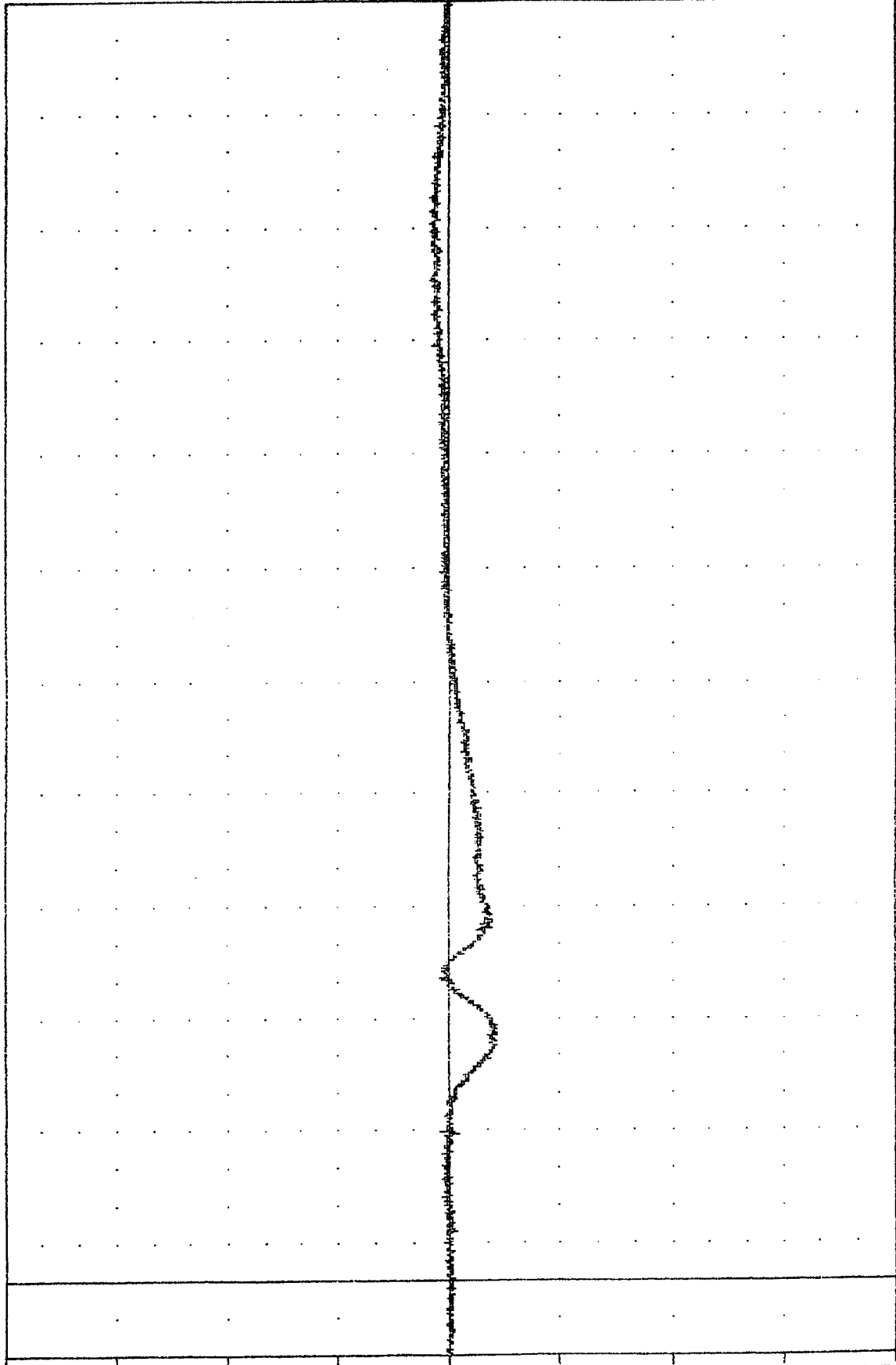
900004

HEDXG1

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -25.42 63.00, 10.94 @ 288.00

ACCELERATION [G]



900104

B-2

TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
DRIVER HEAD X AXIS ACCELERATION

TRC 300104

208 COMPLIANCE

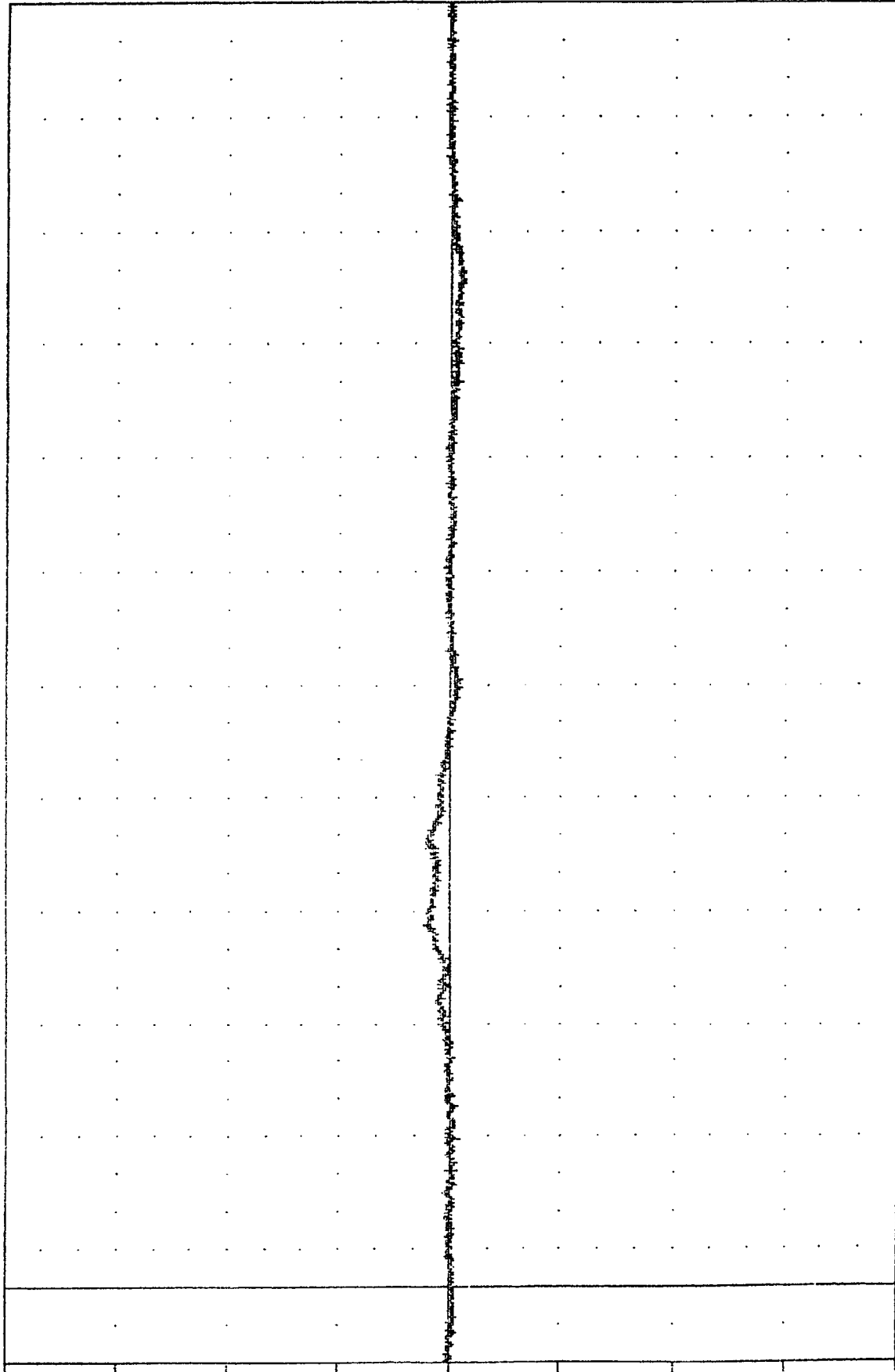
90004

HEDYG1

FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = -7.81E 269.00, 14.47 E 96.25

ACCELERATION (G)



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

TOYOTA COROLLA INTO FLAT FRONTAL BARRIER

DRIVER HEAD Y AXIS ACCELERATION

TRC 900104

208 COMPLIANCE

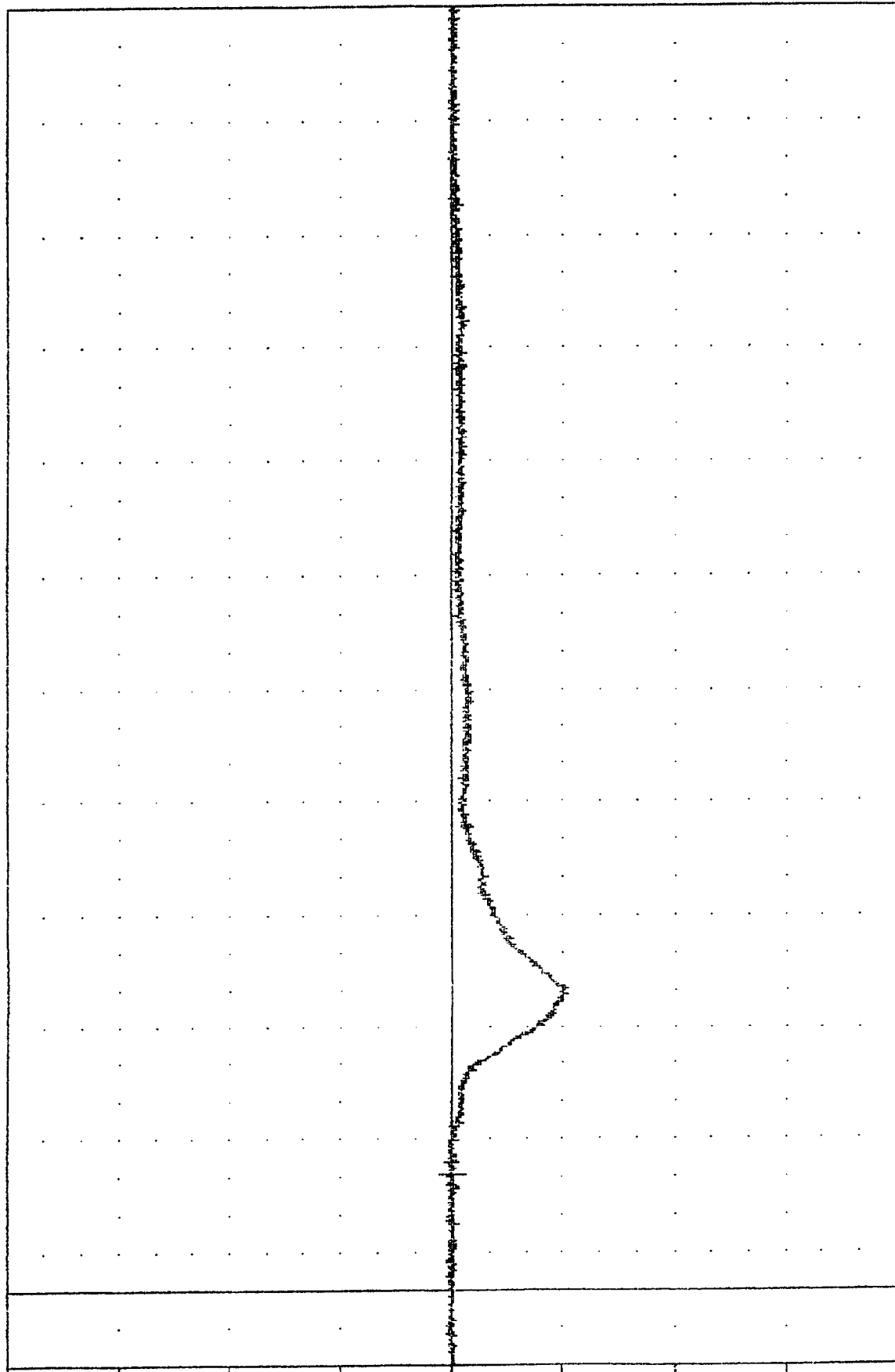
90004

HEOZG1

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -61.64 78.75, 7.08 30.38

ACCELERATION (G)



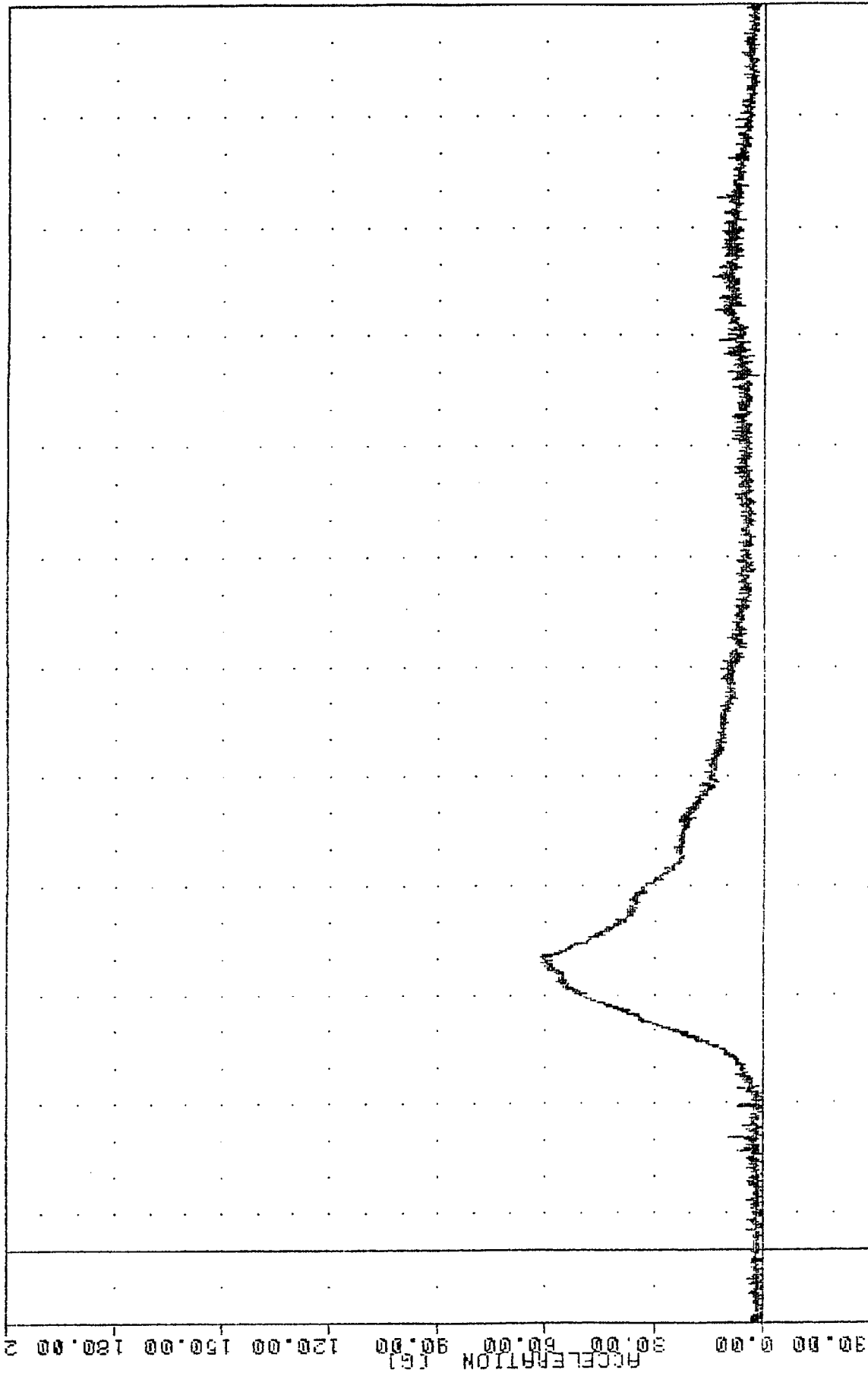
TIME (msec)

TOYOTA COROLLA INTO FLAT FRONTAL BARRIER

DRIVER HEAD Z AXIS ACCELERATION

TRC
208 COMPLIANCE
900004
HEAD61

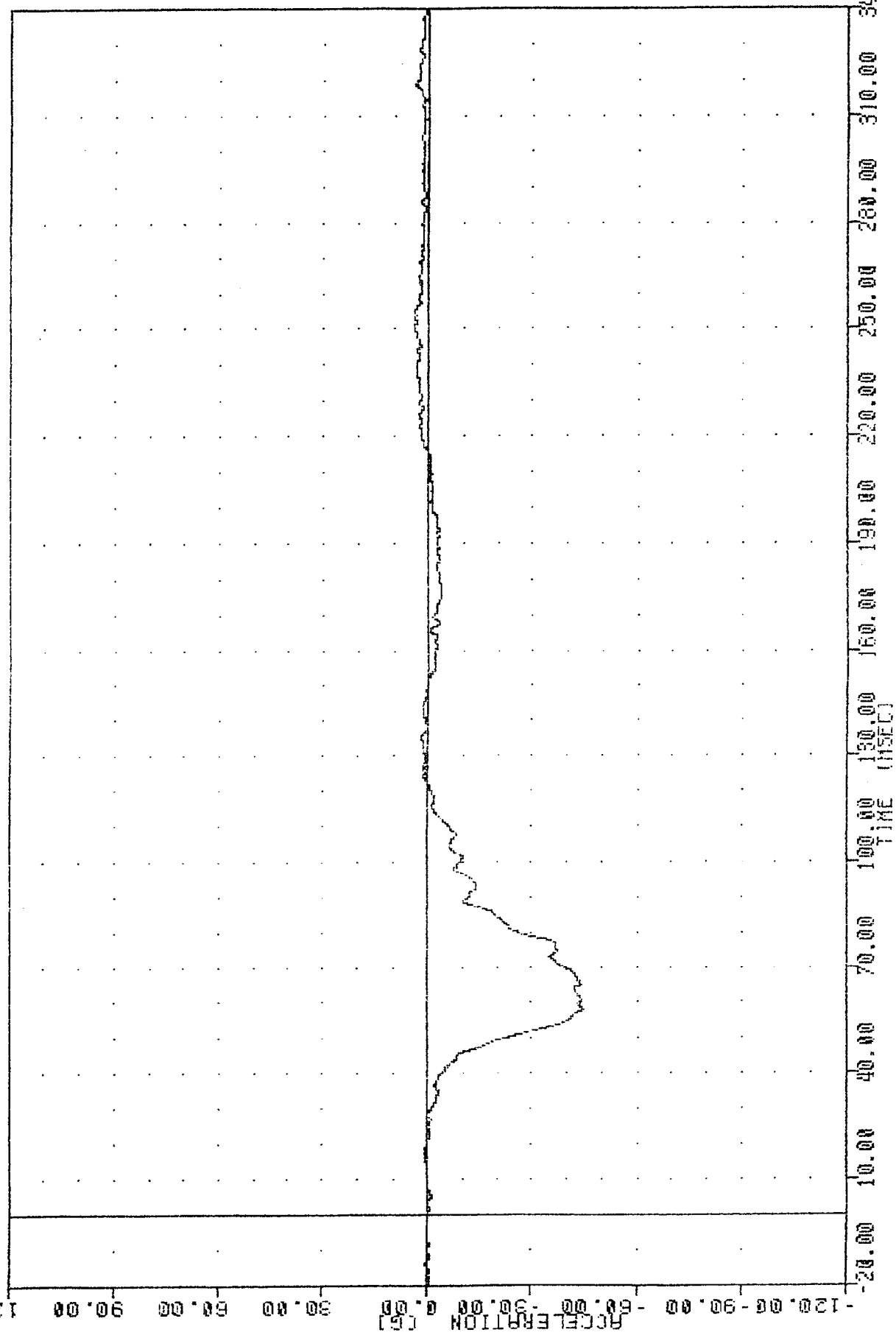
FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = 0.22 7.00, 61.77 78.75



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

TRC
208 COMPLIANCE
90004
CSTXG1

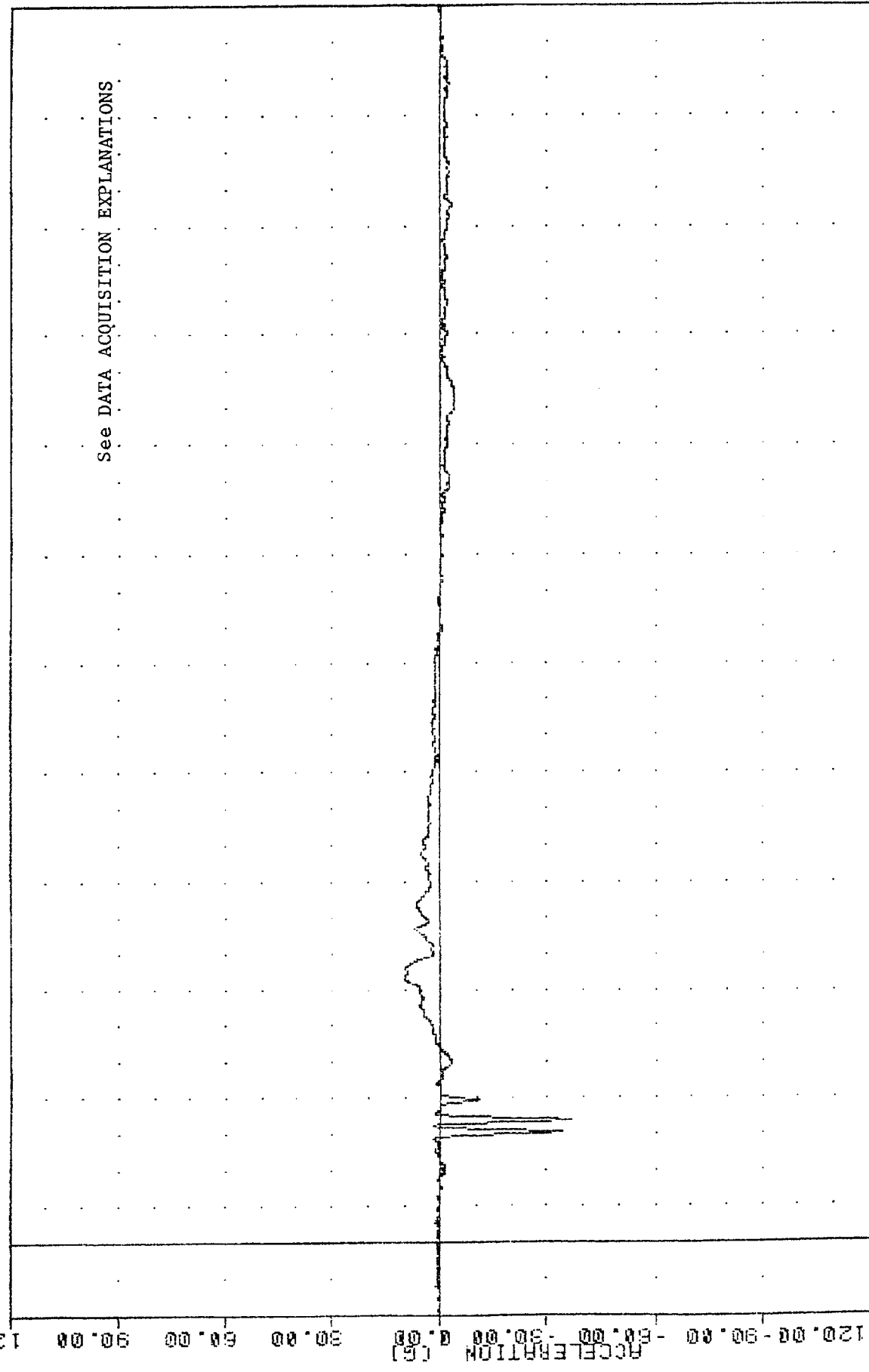
FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -44.86 58.13 4.17 252.88



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
DRIVER CHEST X AXIS ACCELERATION

THC
 208 COMPLIANCE
 90004
 CSTY61

FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -36.55 33.88 9.93 73.38



-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
 TIME (msec)
 TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Y AXIS ACCELERATION

TRC 900104

200 COMPLIANCE

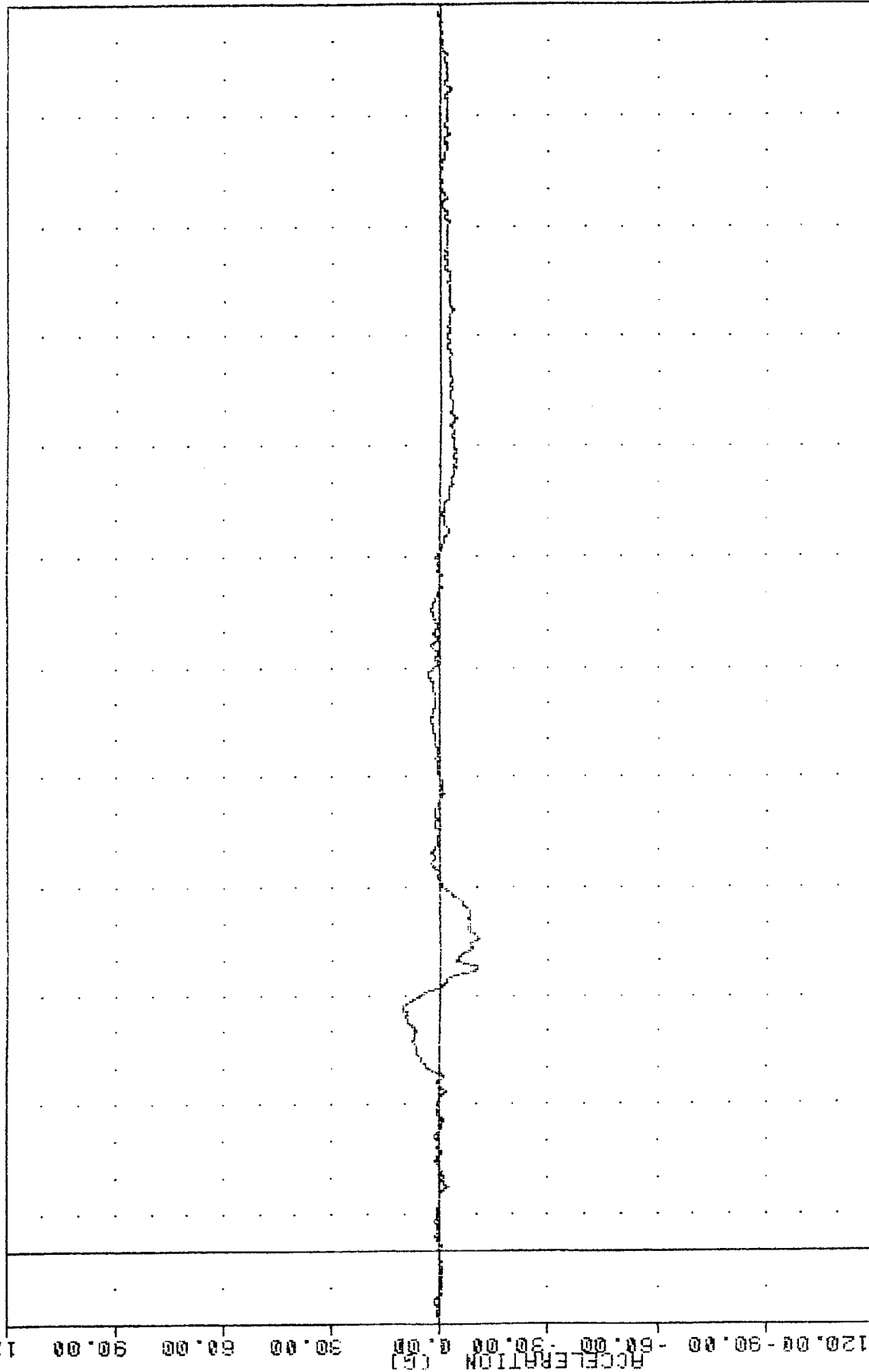
90004

CSTZG1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -10.34 85.63, 10.50 66.25

120.00



-20.00

10.00

40.00

70.00

100.00

130.00

160.00

190.00

220.00

250.00

280.00

310.00

340.00

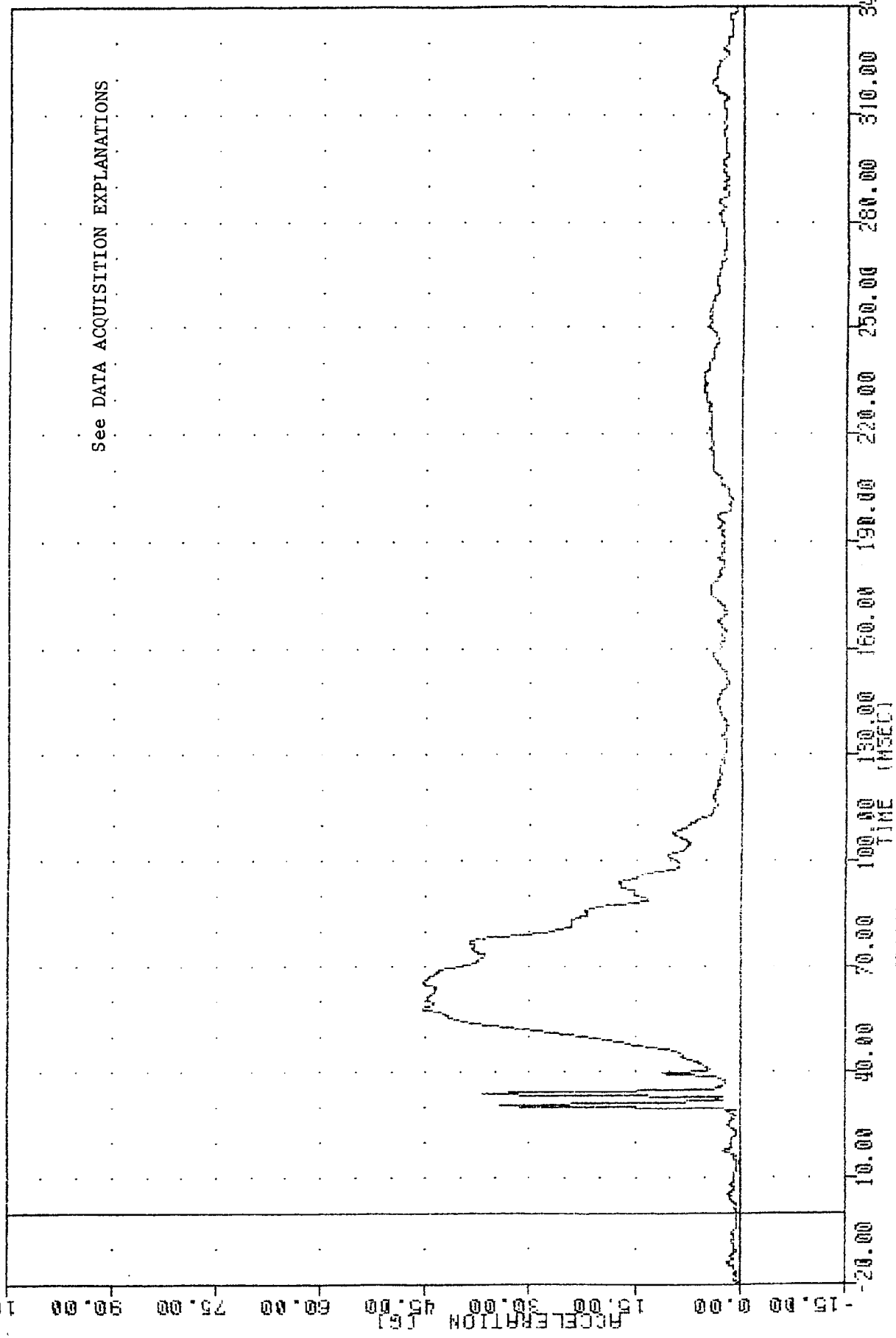
900104

B-8

TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
DRIVER CHEST Z AXIS ACCELERATION

TRC
208 COMPLIANCE
900004
CSTRG1

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = 0.08e -20.00 . 45.49 e 58.13



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
DRIVER CHEST RESULTANT ACCELERATION

TRC 900104

208 COMPLIANCE

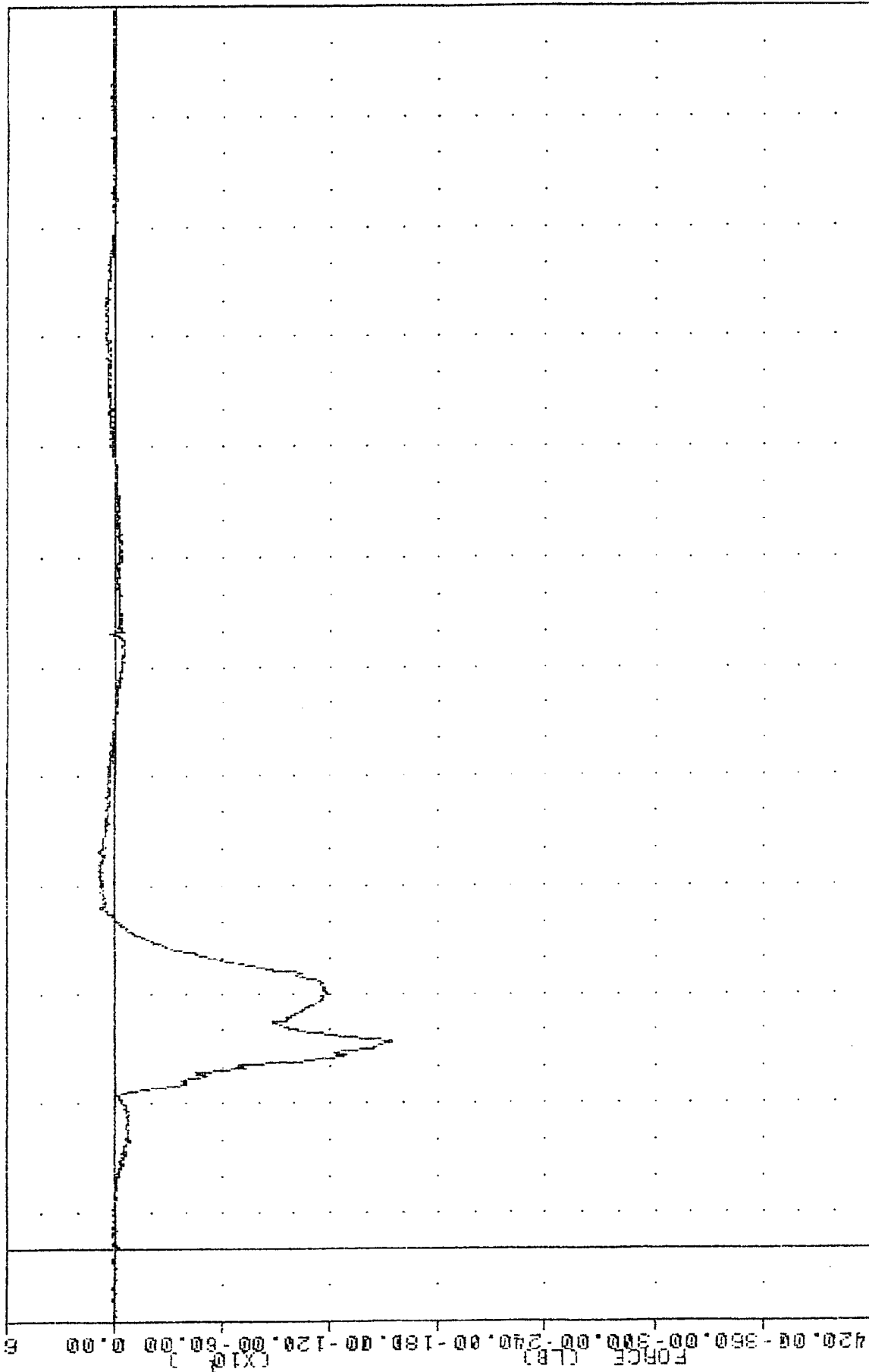
90004

LFNF1

FILTER = BLPP 1000/ 2500/ -16

MIN. MAX VALUES = -1539.76 56.88, 83.97 109.00

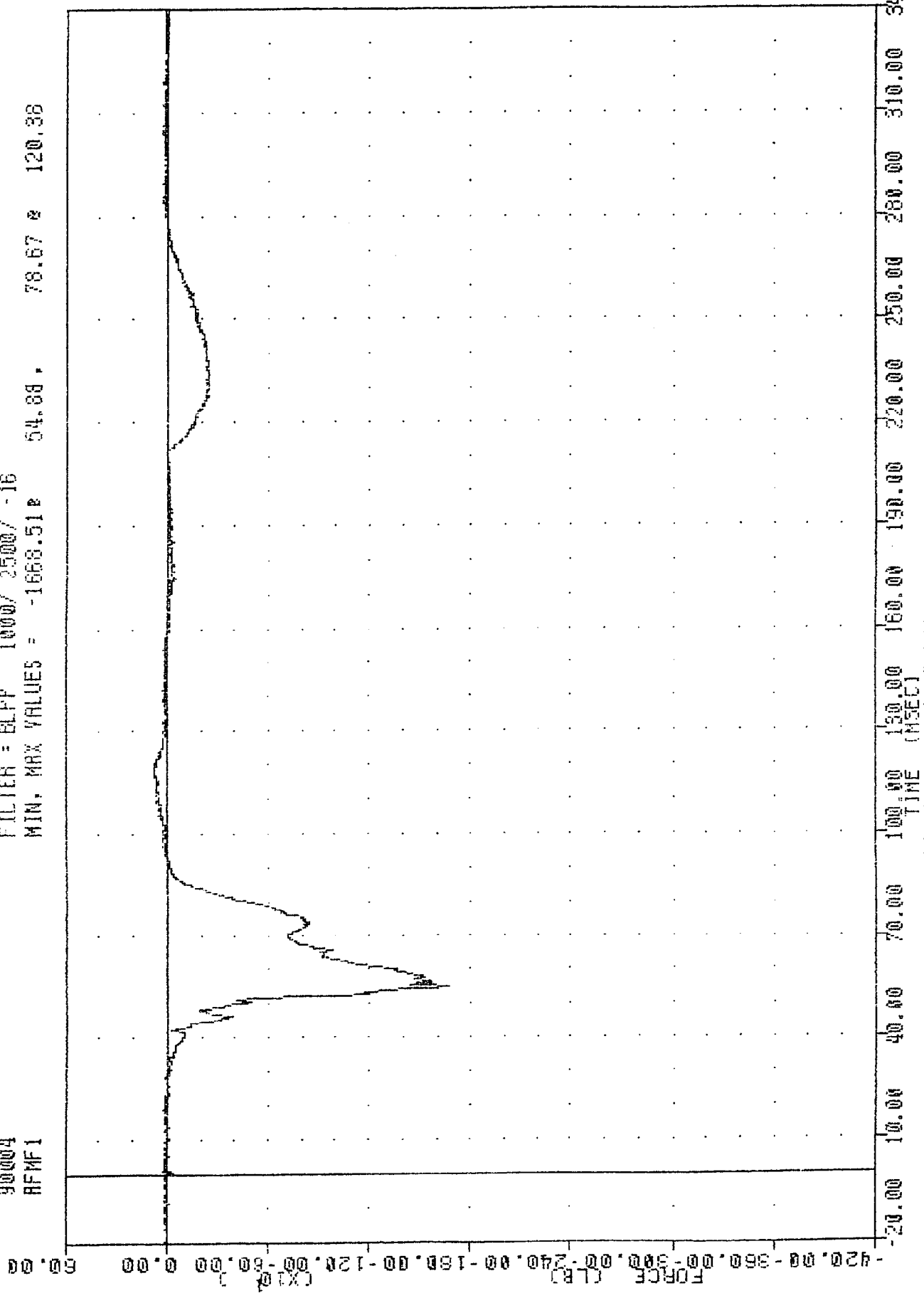
50.00



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
DRIVER LEFT FEMUR FORCE

IRC
 208 COMPLIANCE
 900004
 AFMF1

FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -1668.51e 54.88, 78.67 e 120.38



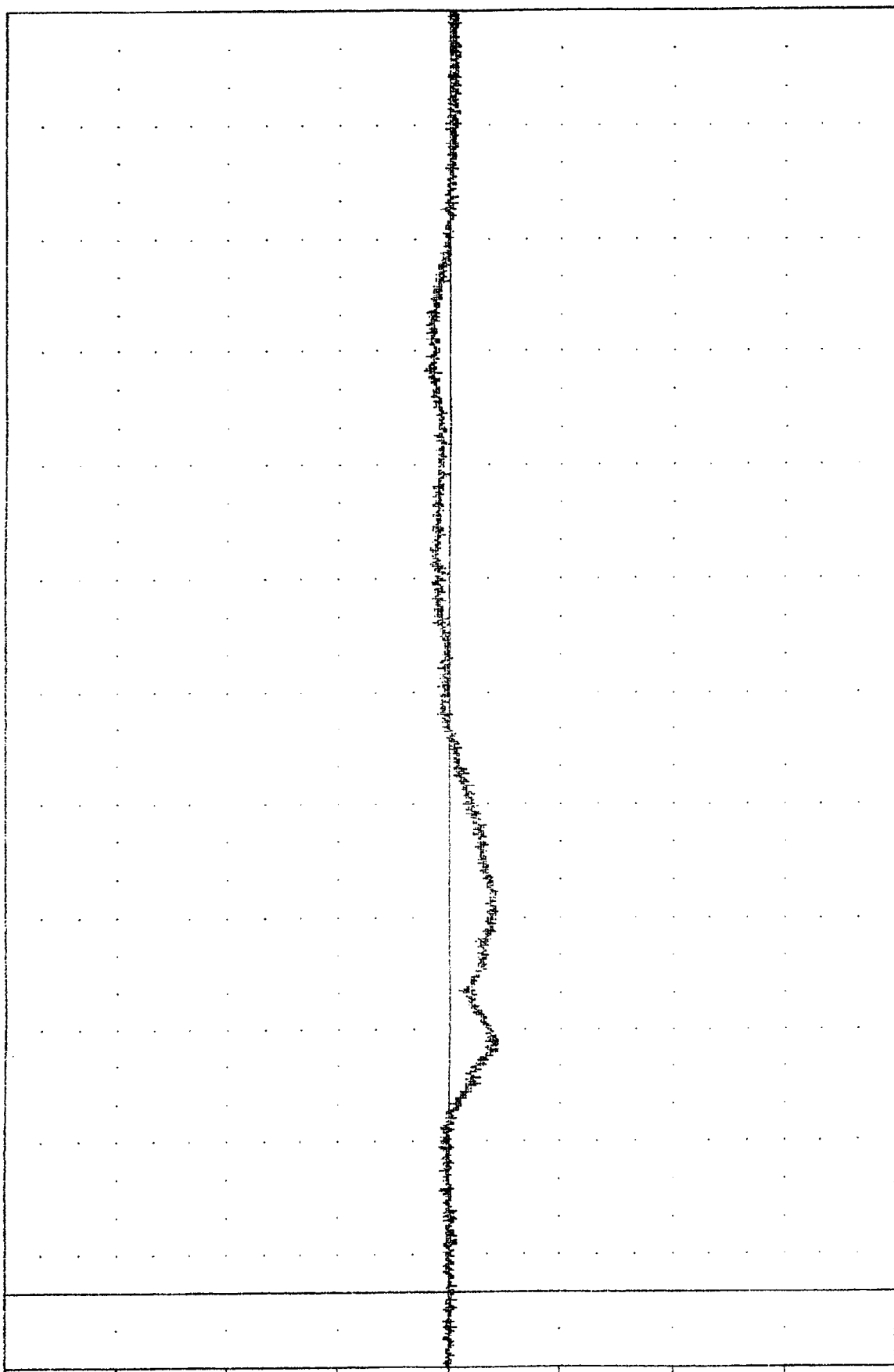
TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT FEMUR FORCE

IRC
 208 COMPLIANCE
 90004
 HEDX62

FILTER : HUFF 1650/ 5214/ -40
 MIN. MAX VALUES = -24.938

65.75, 14.40 2 244.75

ACCELERATION (G)
 -240.00 180.00 120.00 60.00 0.00



-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
 TIME (MSEC)

TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER HEAD X AXIS ACCELERATION

TRC 900104

200 COMPLIANCE

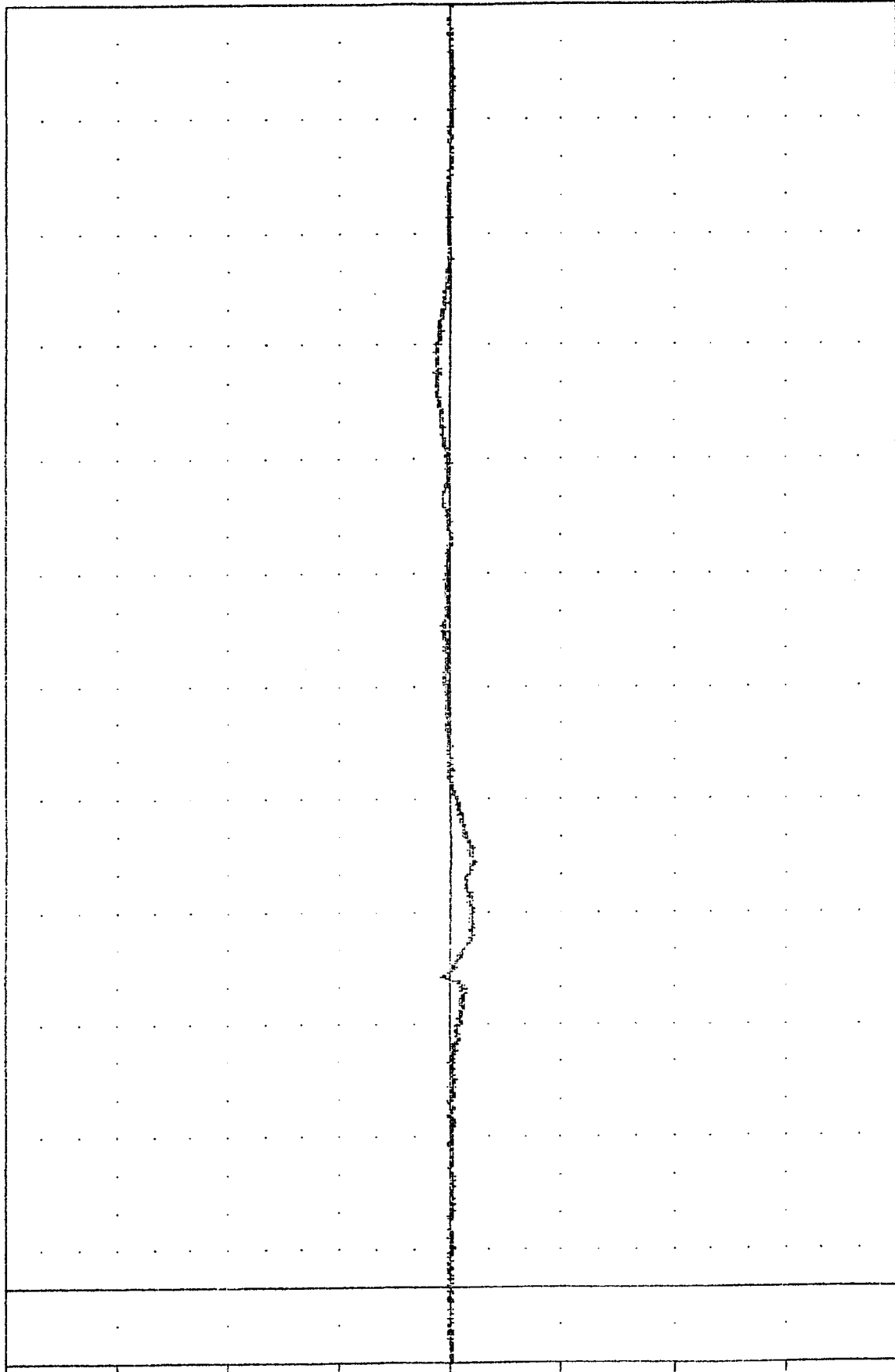
900004

HEDY62

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -13.160 113.000, 9.310 247.800

ACCELERATION (G)

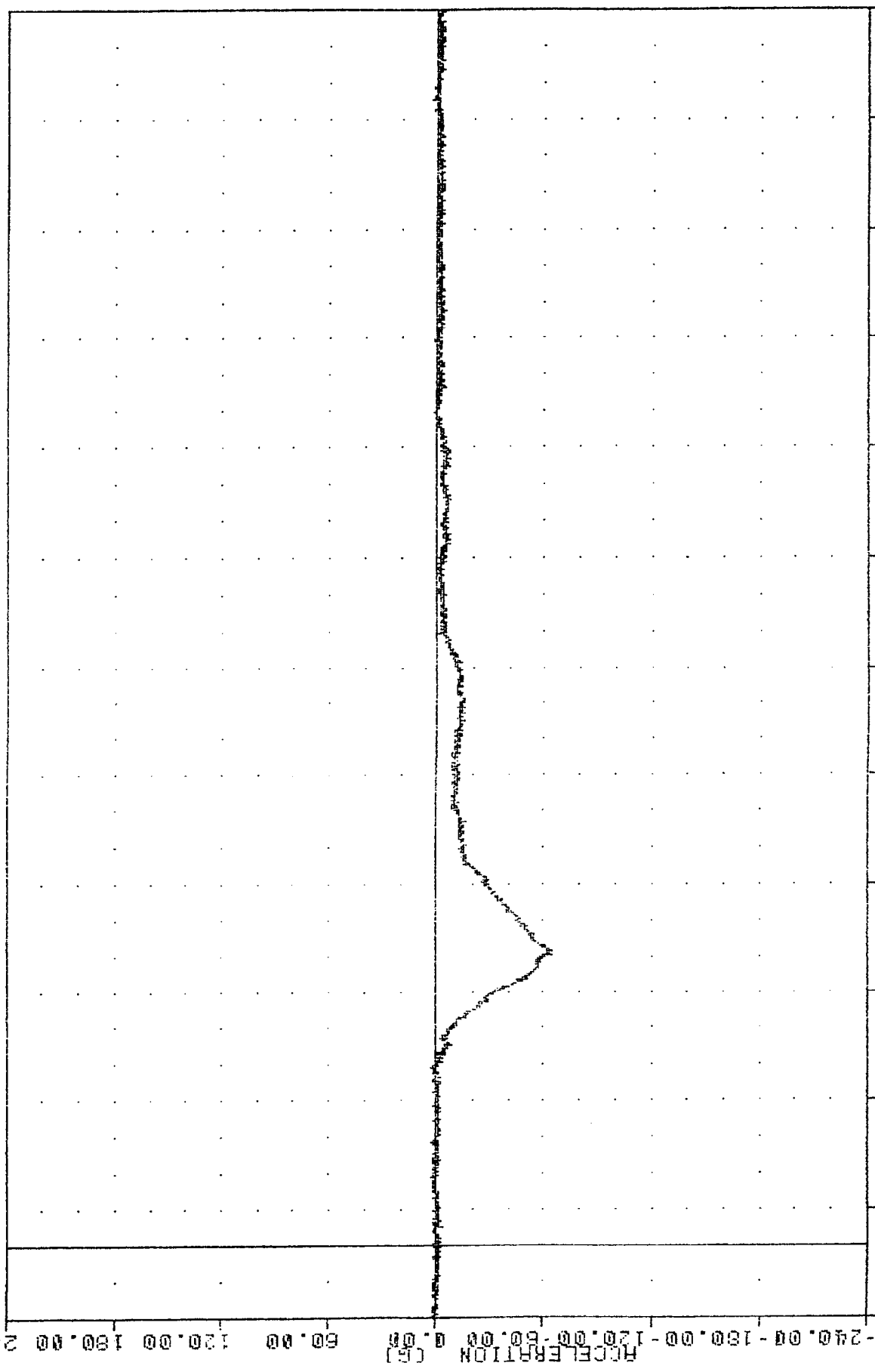


0.00 20.00 40.00 60.00 80.00 100.00 120.00 140.00 160.00 180.00 200.00 220.00 240.00 260.00 280.00 300.00 320.00 340.00

TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Y AXIS ACCELERATION

7500104
 200 COMPLIANCE
 90004
 HEDZ62

FILTER = ALPF 1050/ 5214/ -40
 MIN. MAX VALUES = -64.89% 81.25. 2.67 % 28.63



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER HEAD Z AXIS ACCELERATION

TRC 900104

200 COMPLIANCE

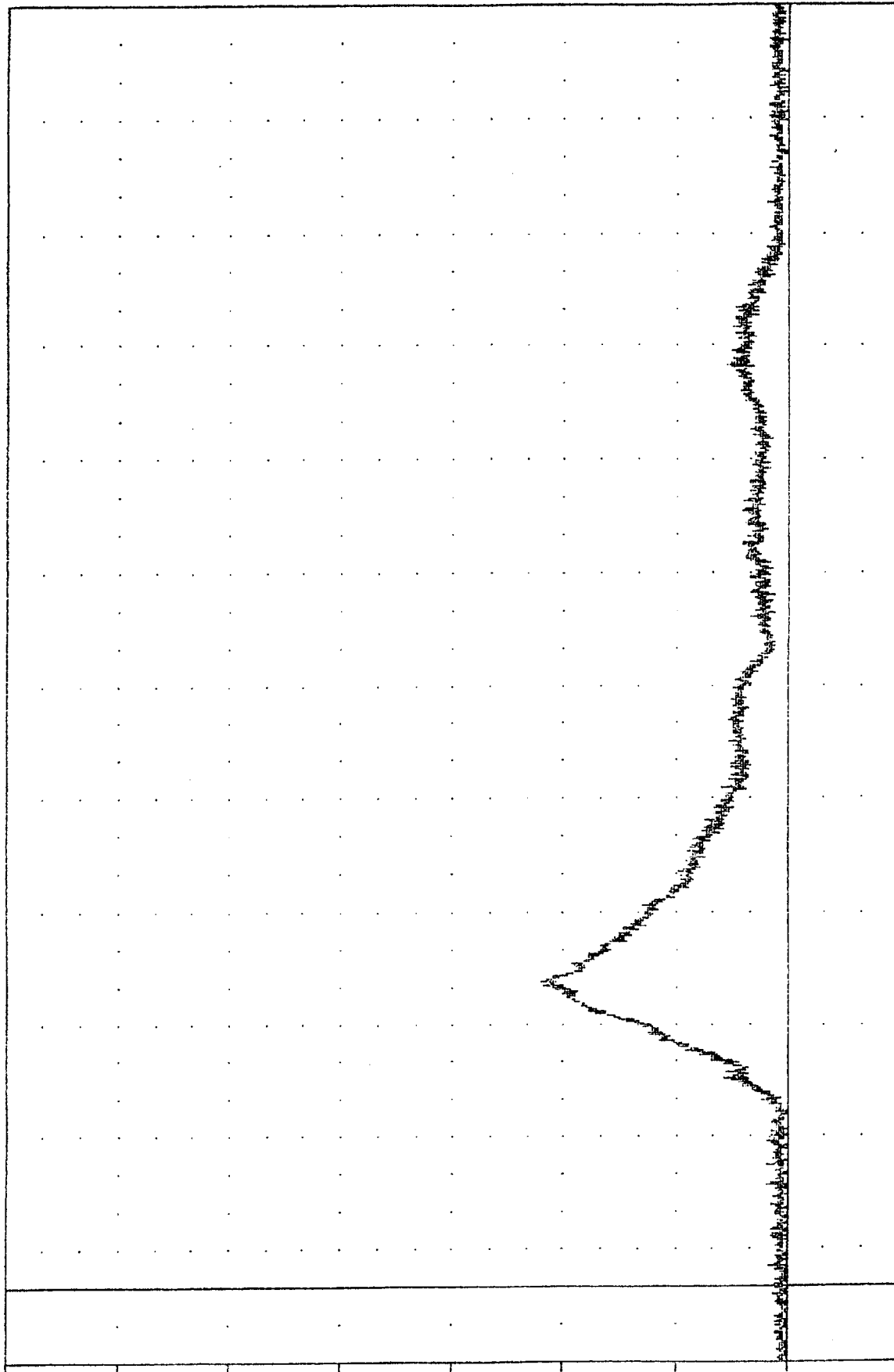
90004

HEADG2

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = 0.26 16.50 65.69 81.25

ACCELERATION (G)



-30.00

0.00

30.00

60.00

90.00

120.00

150.00

180.00

210.00

240.00

270.00

300.00

330.00

360.00

390.00

420.00

TIME (msec)

TOYOTA COROLLA INTO FLAT FRONTAL BARRIER

RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION

TFC 900104

200 COMPLIANCE

900004

05TX62

FILTER = BLPP 300/ 750/ -18

MIN. MAX VALUES = -45.26e 79.83e

8.85 e 234.50

120.00

90.00

60.00

30.00

0.00

-30.00

-60.00

-90.00

-120.00

ACCELERATION (G)

-20.00

10.00

40.00

70.00

100.00

130.00

160.00

190.00

220.00

250.00

280.00

310.00

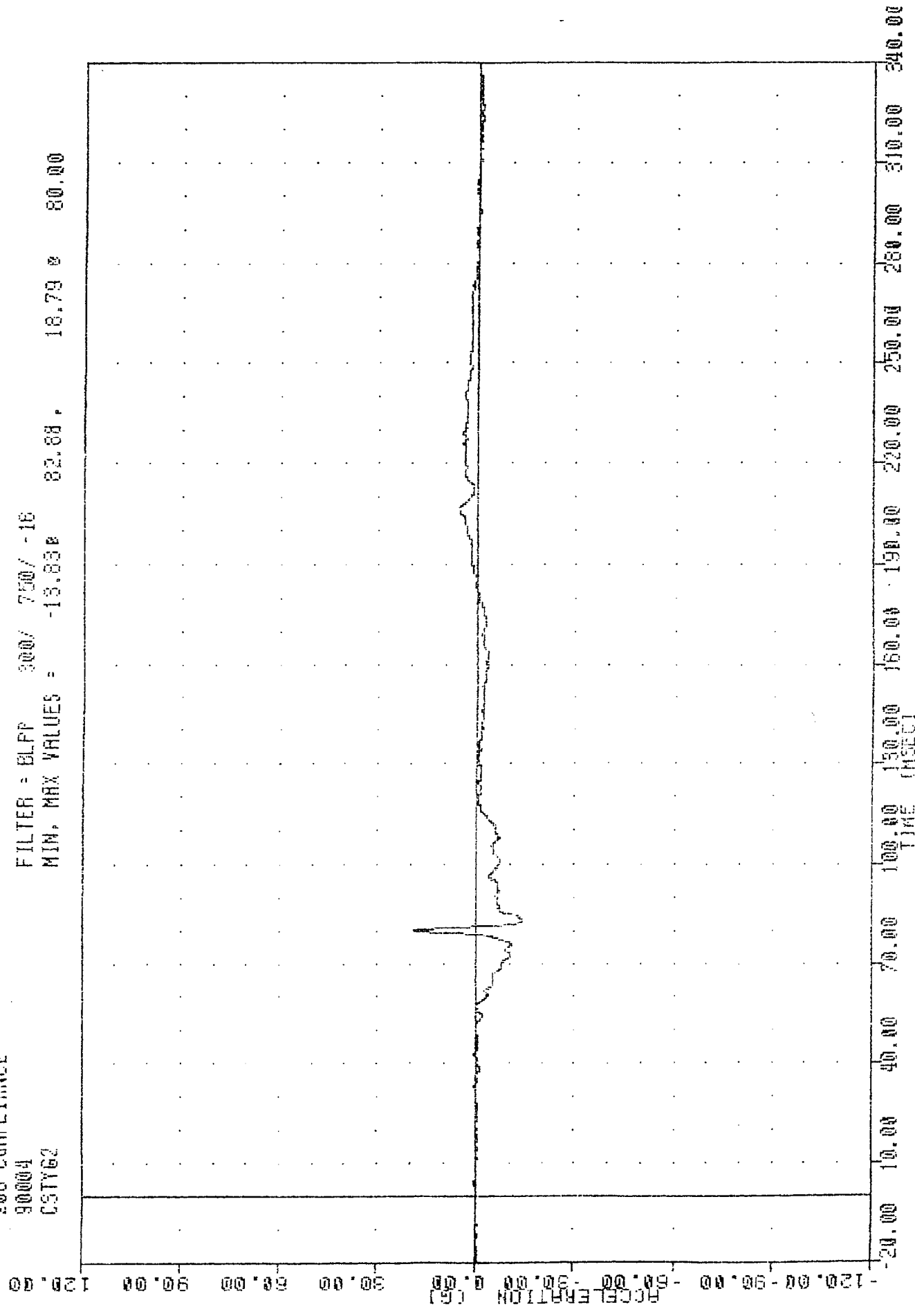
340.00

TIME (MSEC)

TOYOTA-COROLLA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST X AXIS ACCELERATION

HRC
 200 COMPLIANCE
 90004
 CSTV62

FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -13.838 82.88, 18.79 80.00



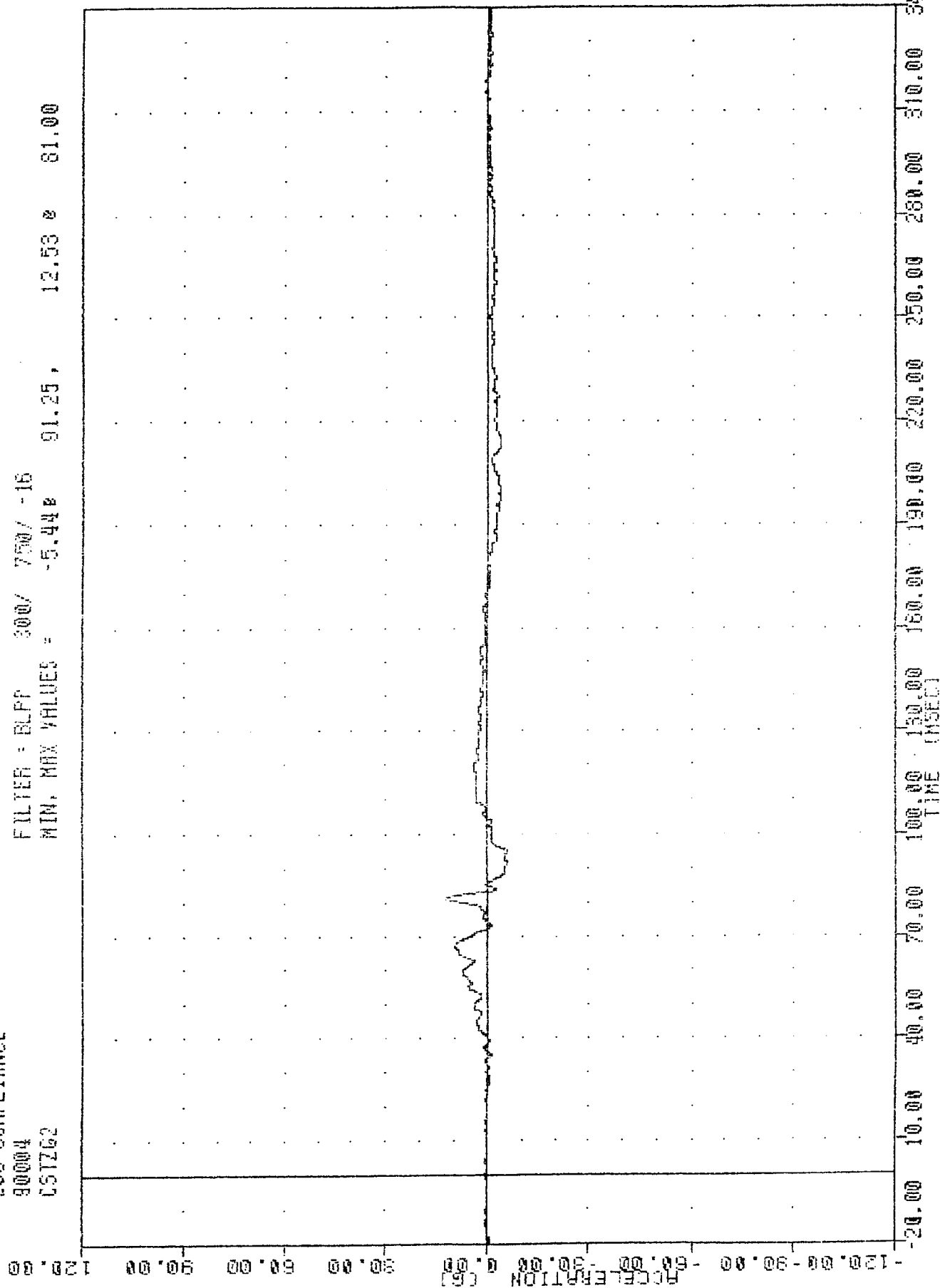
TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST Y AXIS ACCELERATION

545

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10
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10



LINE USED:
TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Z AXIS ACCELERATION

TAC 900104

200 COMPLIANCE

900004

CSTRAG2

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = 0.01e -5.50 48.26 79.75

105.00

90.00

75.00

60.00

45.00

30.00

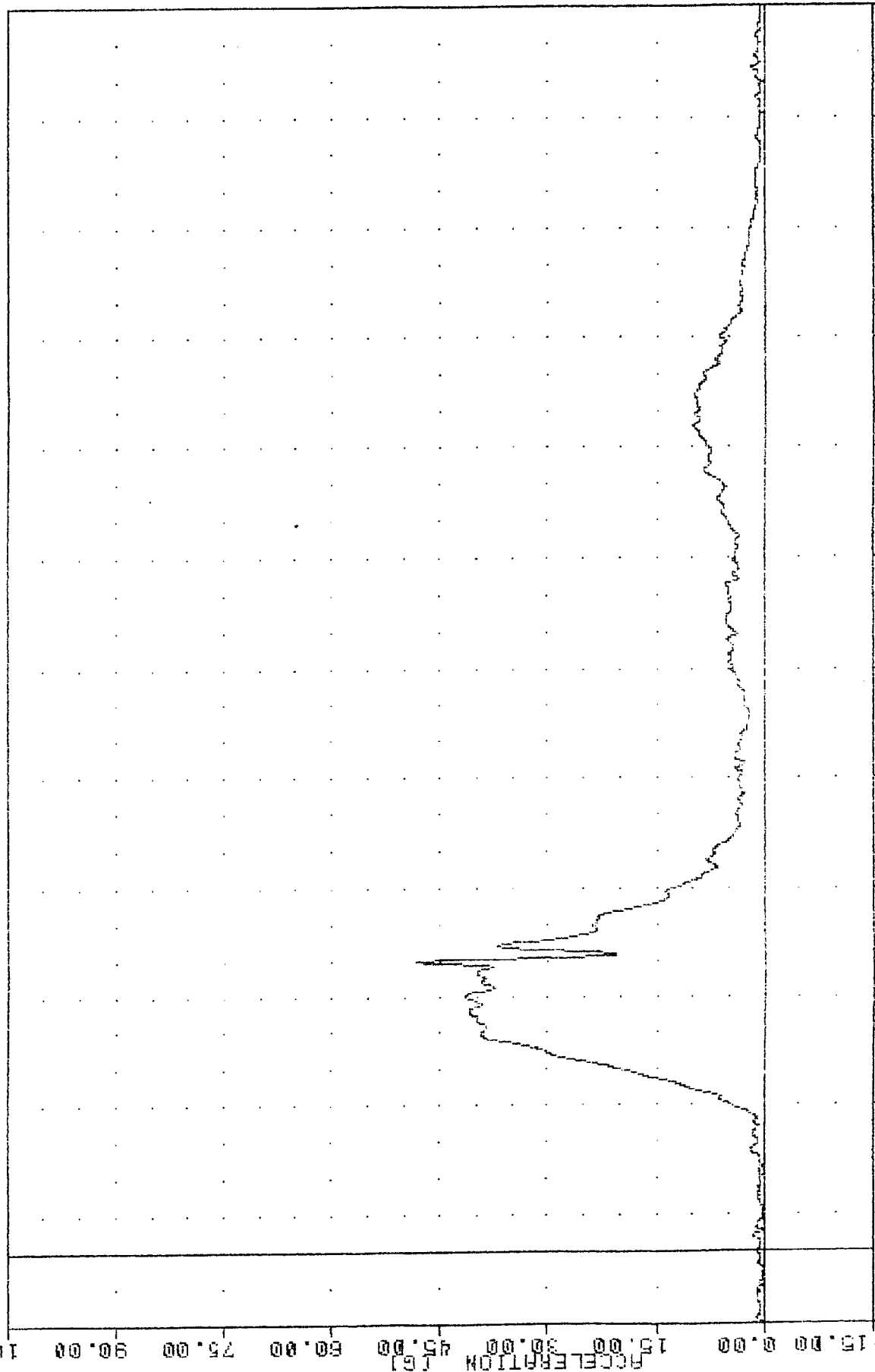
15.00

0.00

-15.00

B-19

900104



208 COMPLIANCE

90004

LFMF2

FILTER = BLPP 1000/ 2500/ -16

MIN. MAX VALUES = -1024.340 57.80, 46.38 0 133.25

50.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

0.00

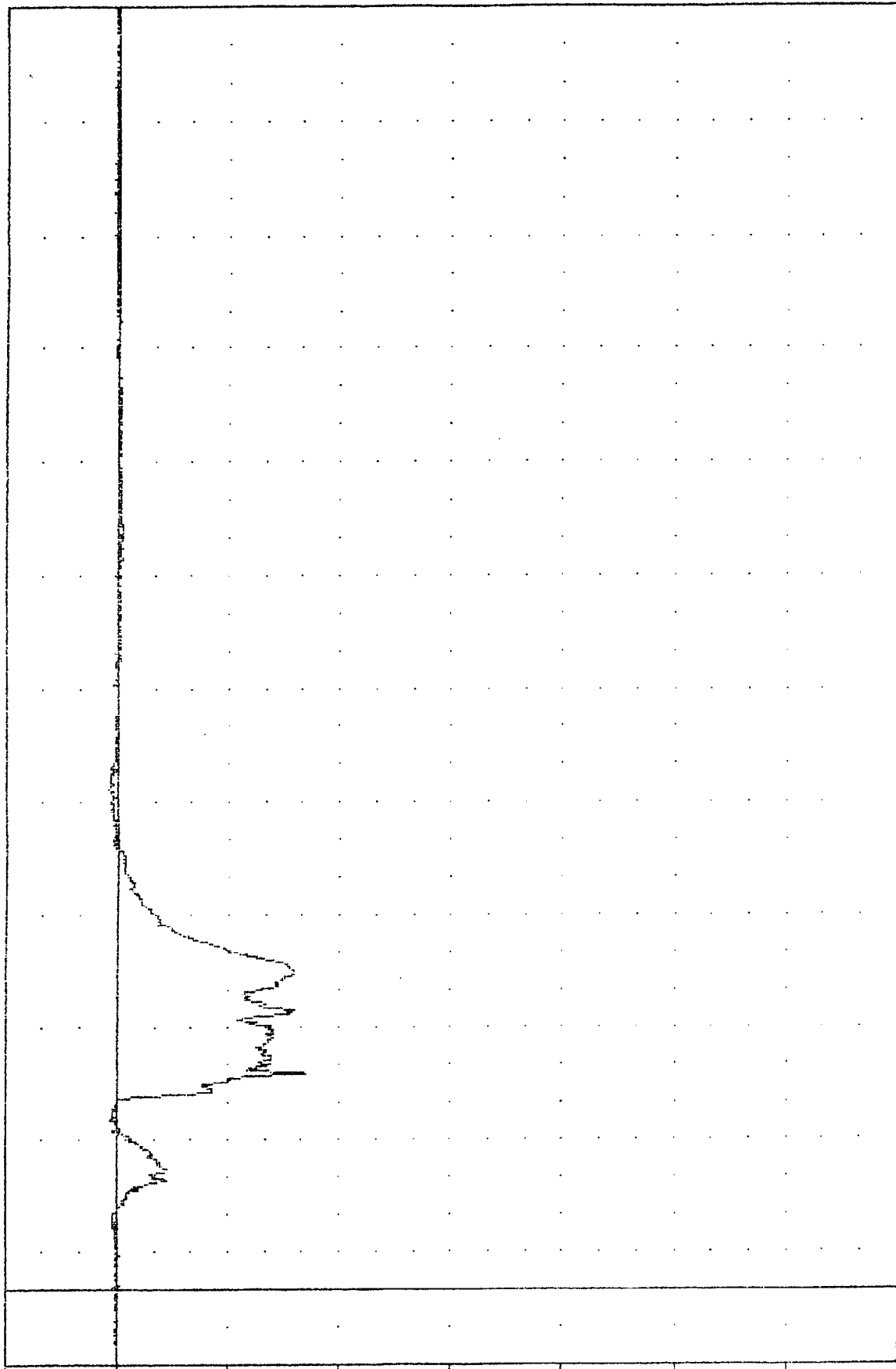
0.00

0.00

0.00

0.00

0.00

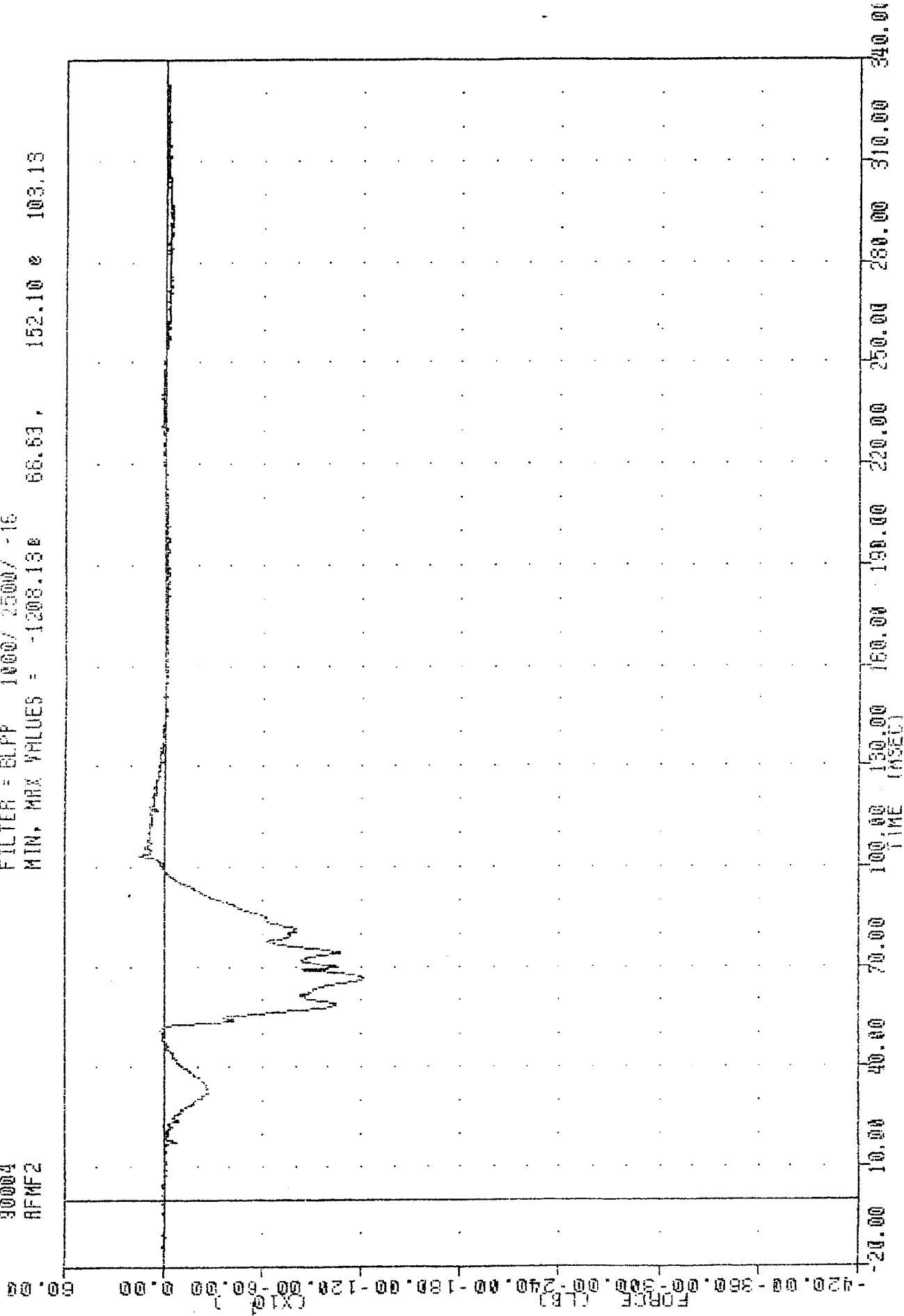


-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER LEFT FEMUR FORCE

IRC
 208 COMPLIANCE
 30004
 AFMF2

FILTER = BLPP 1000/ 2500/ -15
 MIN. MAX VALUES = -1208.13 66.63, 152.10 e 103.13



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

TRC 900104

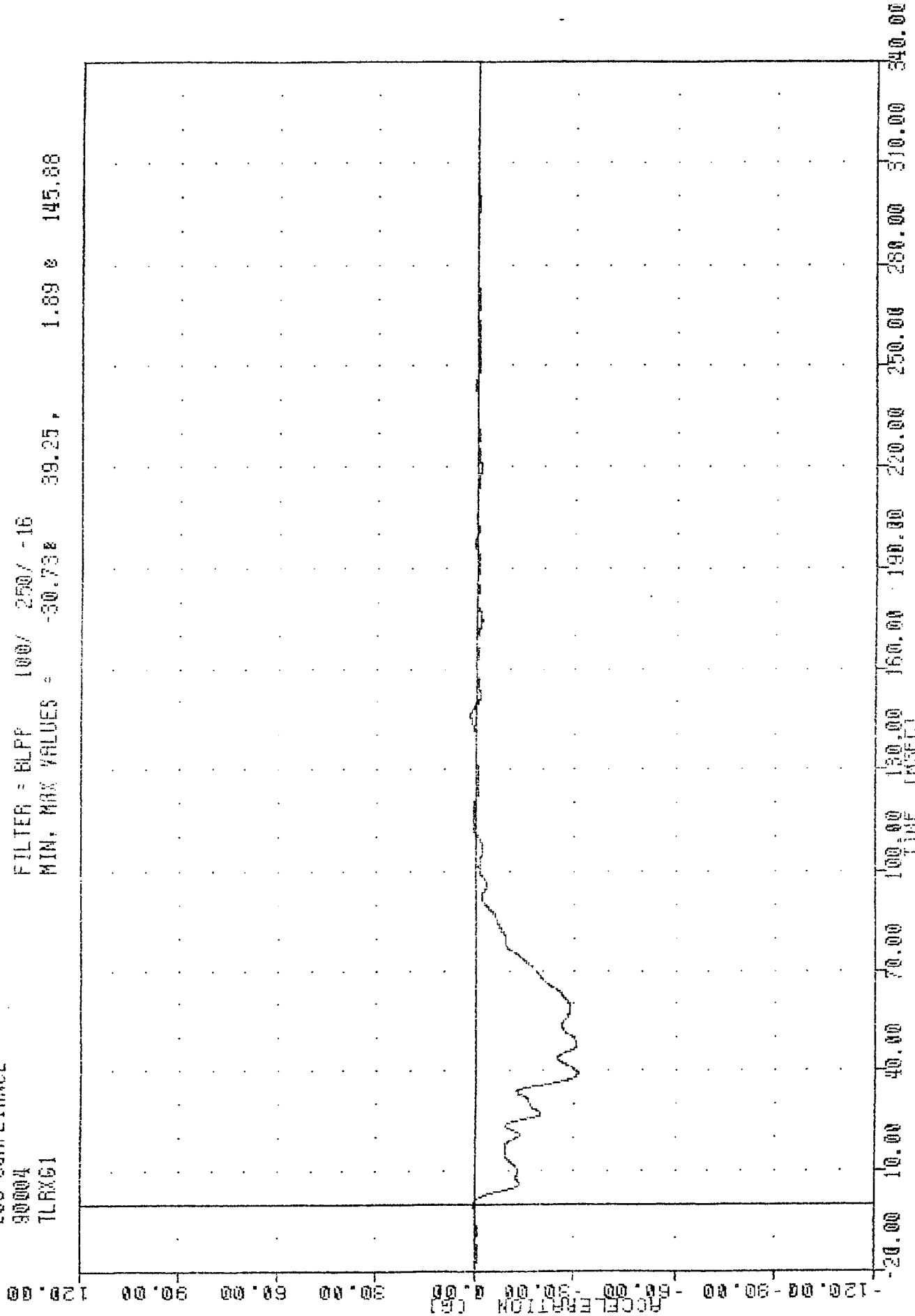
209 COMPLIANCE

90004

TLRXG1

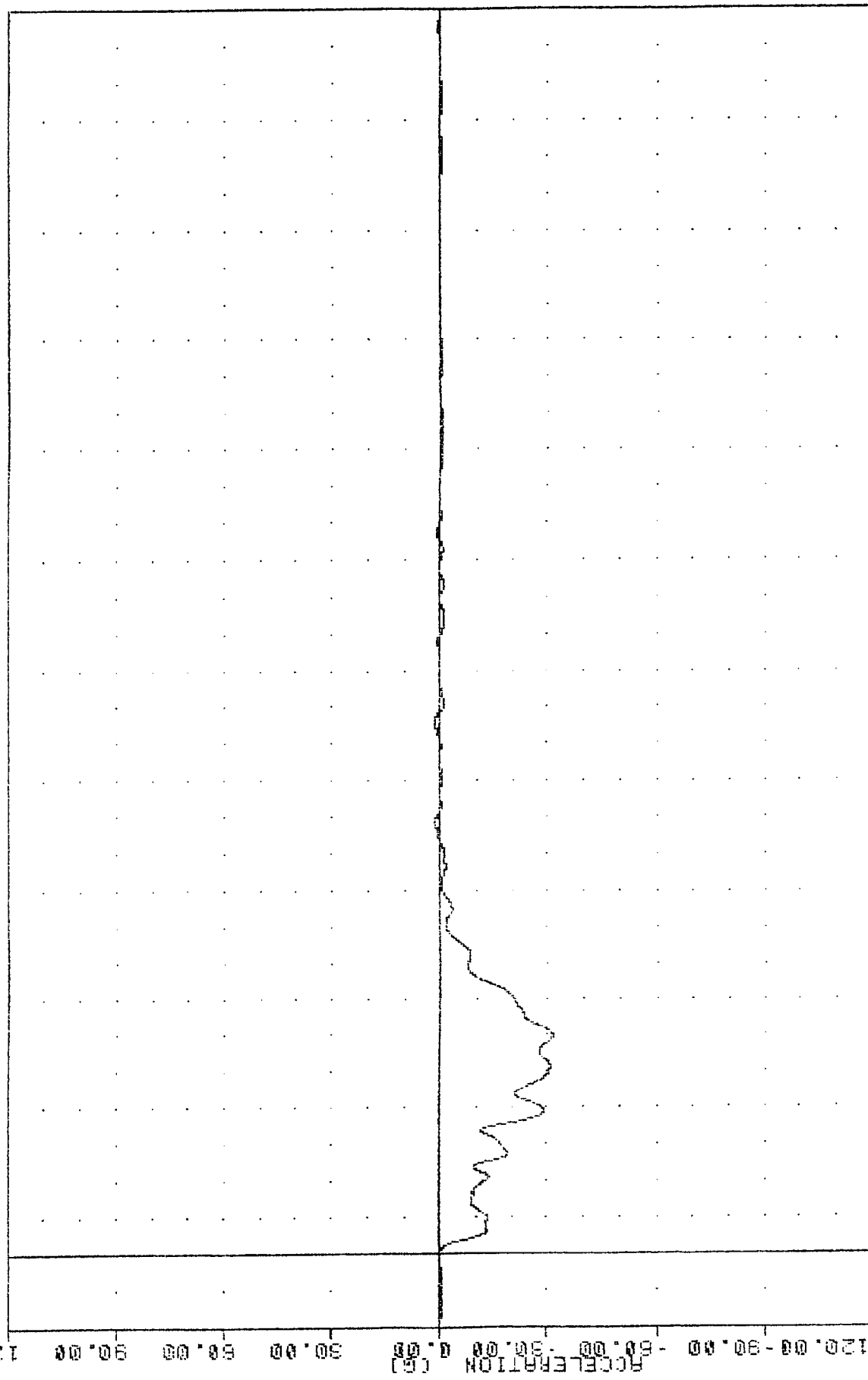
FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -30.73 39.25 1.89 145.68



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
LEFT REAR SEAT X AXIS ACCELERATION

208 COMPLIANCE
 90004
 THX61
 FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -81.53 59.75 1.55 145.63



-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
 TIME (msec)
 TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
 RIGHT REAR SEAT X AXIS ACCELERATION

TRC 900104

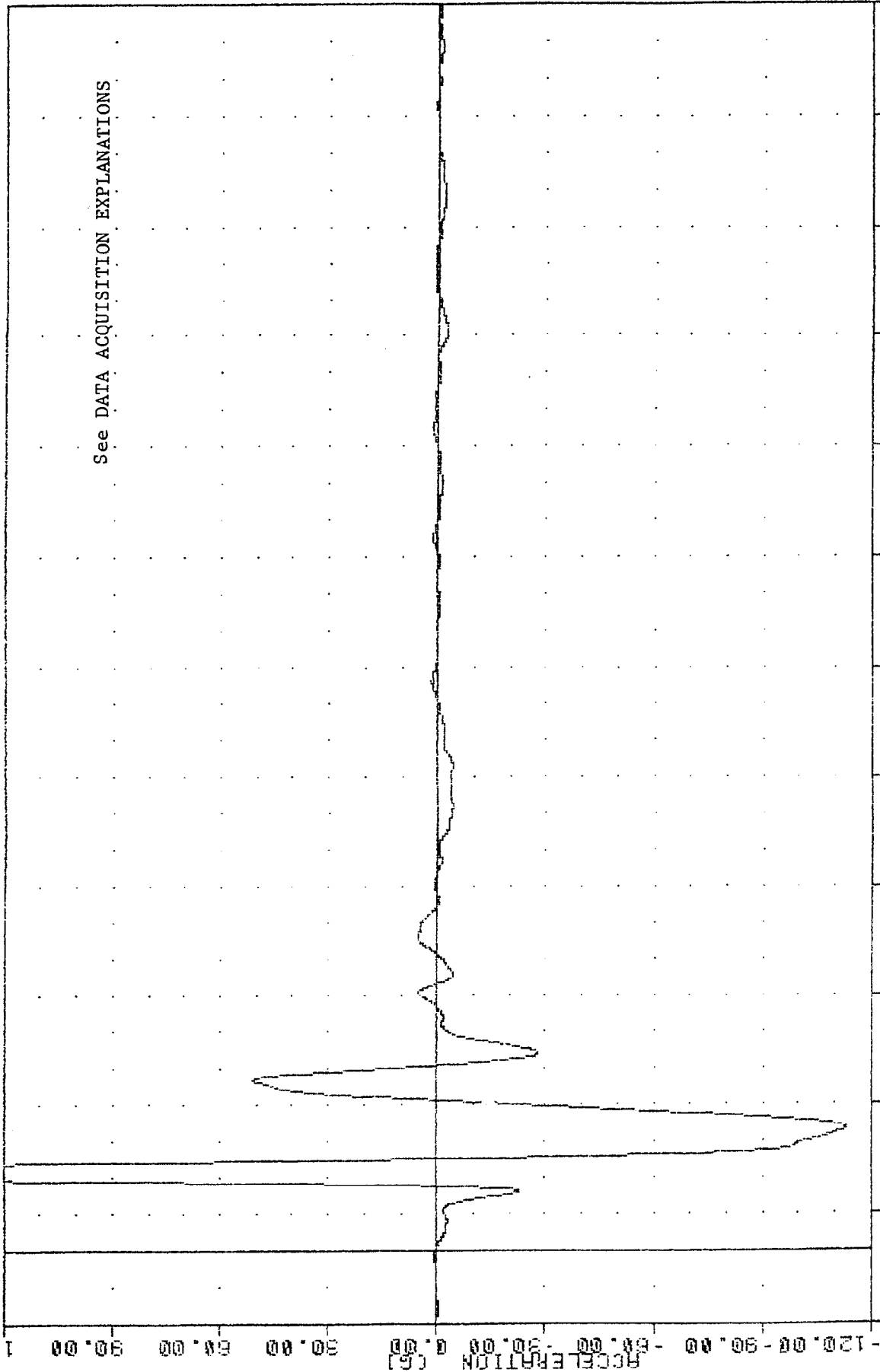
200 COMPLIANCE

90004

ENGXG1

FILTER = BLFF 100/ 250/ -16

MIN. MAX VALUES = -113.10% 33.63, 485.88 & 21.63



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
ENGINE UPPER BLOCK X AXIS ACCELERATION

TRC 900104

200 COMPLIANCE

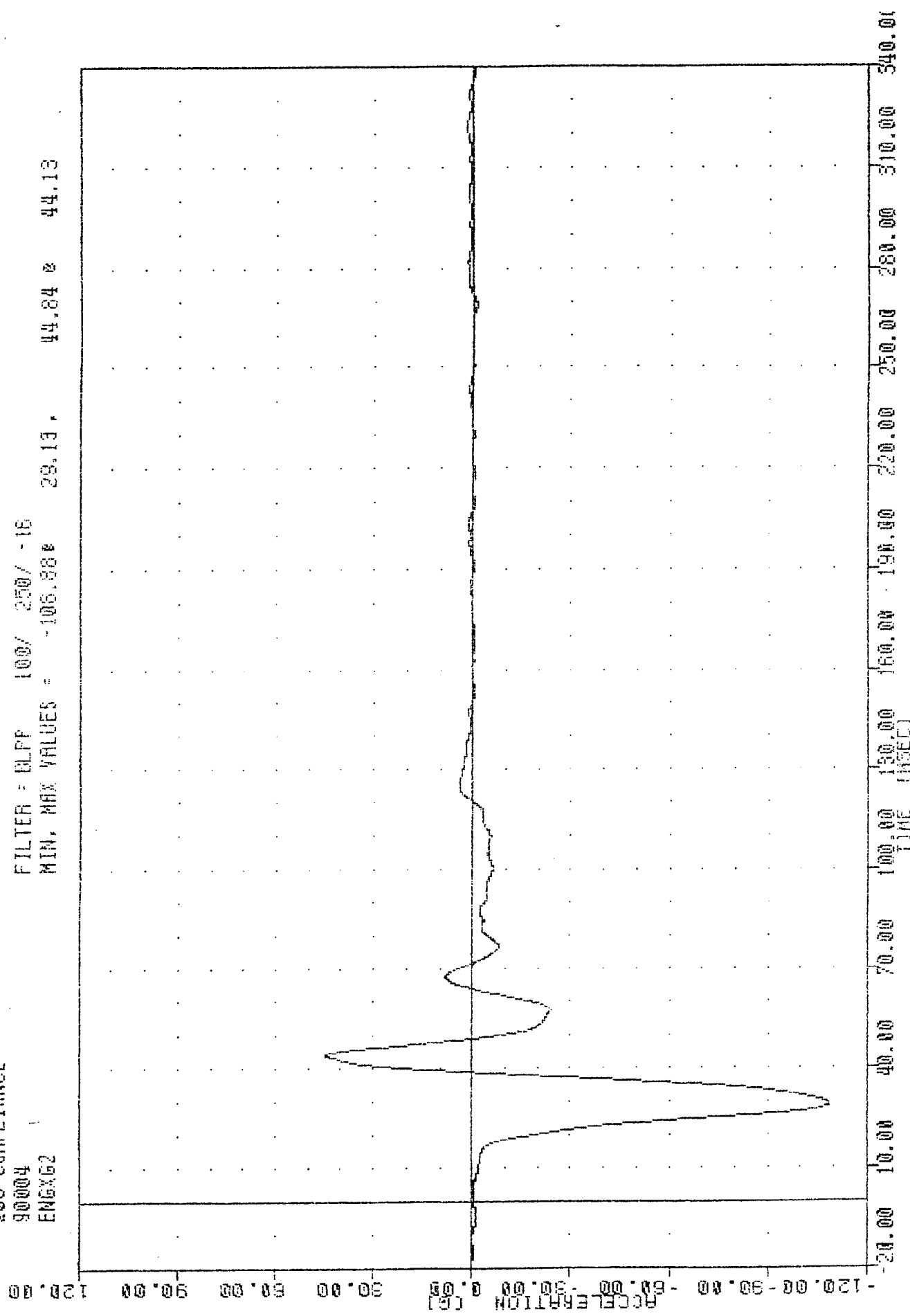
90004

ENGXG2

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -106.88 29.13

44.84 2 44.13



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
ENGINE BOTTOM BLOCK X AXIS ACCELERATION

INC COMPLIANCE

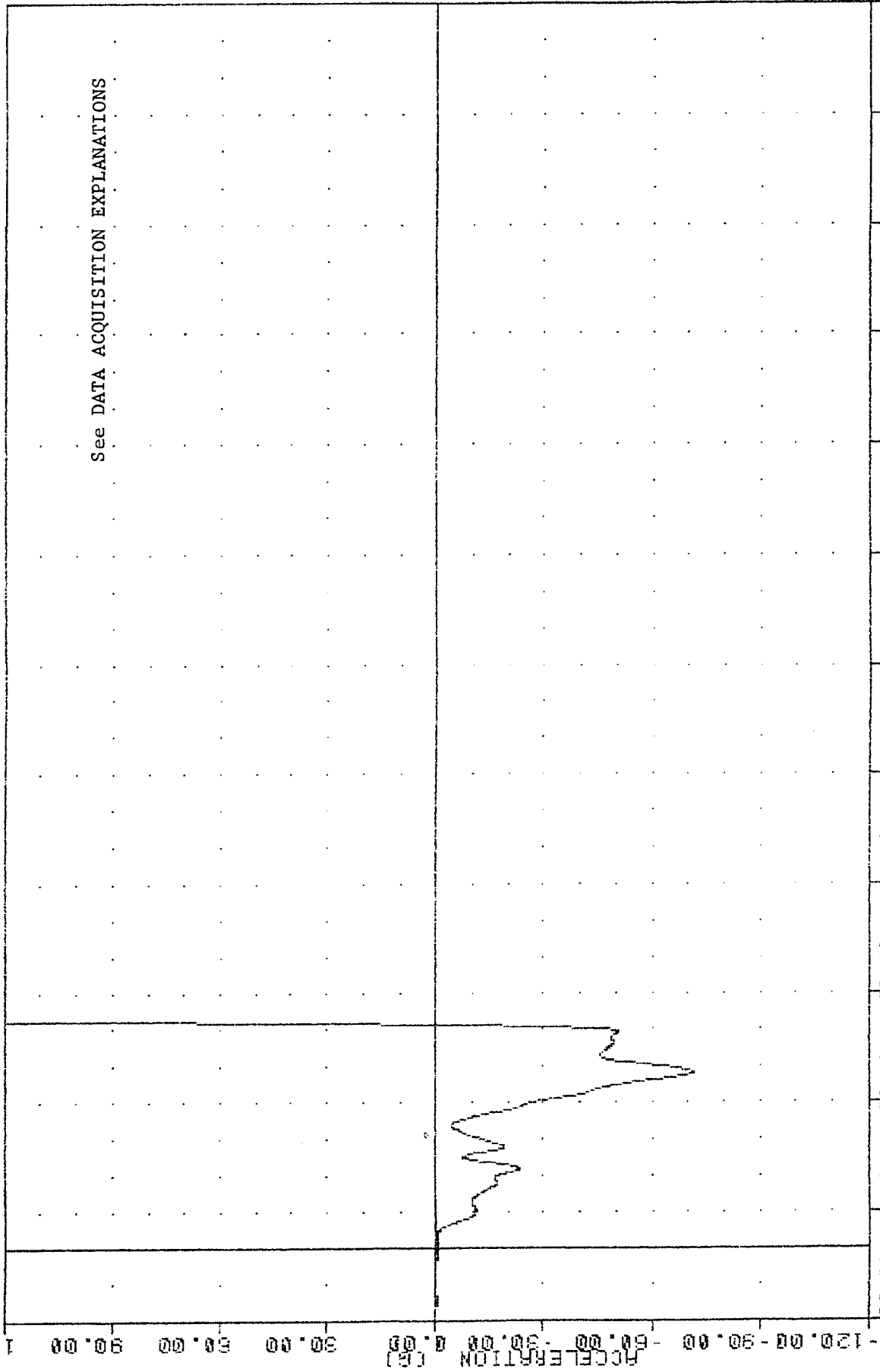
90004

BCRXG1

FILTER = GLPF 100/ 250/ -16

MIN. MAX VALUES = -71.69e

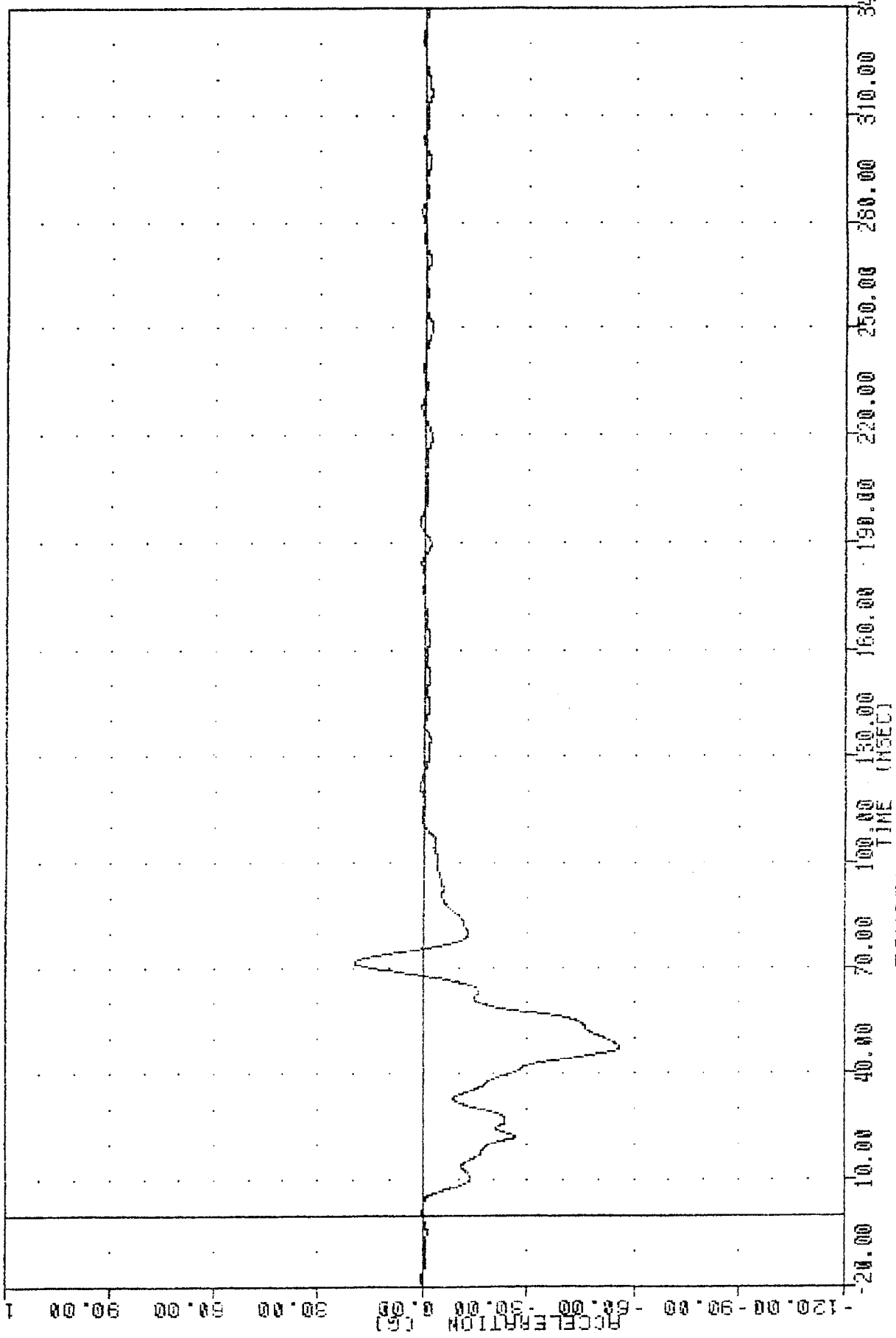
48.38, 1035.40 e 68.25



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
RIGHT BRAKE CALIPER X AXIS ACCELERATION

TRC
 208 COMPLIANCE
 90004
 BCLXG1

FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -56.028 47.63, 19.50 2 71.50



TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
 LEFT BRAKE CALIPER X AXIS ACCELERATION

TRC 900104

200 COMPLIANCE

90004

DPCXG1

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -66.850 68.88, 25.46 8 60.00

120.00

90.00

60.00

30.00

ACCELERATION [G]

0.00

-30.00

-60.00

-90.00

-120.00

-20.00

10.00

40.00

70.00

100.00

130.00

160.00

190.00

220.00

250.00

280.00

310.00

340.00

TIME (MSEC)
TOYOTA COROLLA INTO FLAT FRONTAL BARRIER
DASH PANEL CENTER X AXIS ACCELERATION