

DOT 1418

REPORT NOS. 208-TRC-90-015

212-TRC-90-015

301-TRC-90-015

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

TOYOTA MOTOR CORPORATION

1990 LEXUS ES250

4-DOOR SEDAN

NHTSA NO. CL5104

TRC TEST NO. 900405

THE TRANSPORTATION RESEARCH CENTER OF OHIO

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APRIL 23, 1990

FINAL REPORT

PREPARED FOR:

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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
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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 Lexus ES250 4-door sedan, VIN JT8VV22T8L0092813, NHTSA No. CL5104 at the Transportation Research Center of Ohio on April 5, 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 72° 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

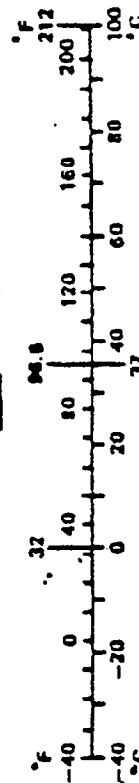


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SECTION 1.0

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 Lexus ES250 4-door sedan, NHTSA No. CL5104, 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 Lexus ES250 4-door sedan, NHTSA No. CL5104, was equipped with a 2.5 liter, transverse engine, automatic transmission, and power brakes. The test weight of the vehicle was 3725 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 procedure 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 April 5, 1990. The test vehicle's impact speed was 29.6 mph. The vehicle sustained 17.1 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.:	CL5104	PROJECT:	208 Compliance
DATE:	04/05/90	TIME:	1312 TEMP: 72° F
VEHICLE:	1990 Lexus ES250 4-door sedan		
TEST WEIGHT (LBS):	3725		
IMPACT ANGLE (DEG)*:	0		
IMPACT VELOCITY (MPH)**:	PRIMARY = 29.6	SECONDARY =	29.6
MAXIMUM STATIC CRUSH (IN):	17.1		
VEHICLE REBOUND (IN):	24.6		
DUMMIES:	Driver #354	Passenger	#690
TYPE:	Part 572 B	Part 572 B	
LOCATION:	Left front	Right front	
RESTRAINT:	Airbag	3-point unbelt	
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: Toyota Motor Corporation

MAKE/MODEL: Lexus/ES250

VIN: JT8VV22T8L0092813

BODY STYLE: 4-door sedan

MODEL YEAR: 1990

NHTSA NO.: CL5104

COLOR: Bluestone Metallic

ENGINE DATA: TYPE: transverse CYLINDERS: 6 DISPLACEMENT: 2.5 liter

TRANSMISSION DATA: 3 SPEED, MANUAL, X AUTOMATIC, X FWD, RWD, 4WD

DATE VEHICLE RECEIVED: 01/19/90

ODOMETER READING: 23.0

DEALER'S NAME AND ADDRESS: Alexandria Lexus
3410 King Street
Alexandria, VA 22302

ACCESSORIES:

POWER STEERING Yes
POWER BRAKES Yes
POWER SEATS No
POWER WINDOWS Yes
TINTED GLASS Yes
RADIO Yes
CLOCK Yes
OTHER None

AUTOMATIC TRANSMISSION Yes
AUTOMATIC SPEED CONTROL Yes
TILTING STEERING WHEEL No
TELESCOPING STEERING WHEEL No
AIR CONDITIONING Yes
ANTI-SKID BRAKE Yes
REAR WINDOW DEFROSTER Yes

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: Toyota Motor Corporation

DATE OF MANUFACTURE: 07/89

GVWR: 4210 LBS

GAWR: FRONT 2281 LBS., REAR 2017 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 35 psi; REAR 29 psi

RECOMMENDED TIRE SIZE: 195/60R15 LOAD RANGE X B, C, D

TIRES ON VEHICLE (MFR., LINE, SIZE): Bridgestone SF-406 steel P195/60R15

IS SPARE TIRE A "SPACE SAVER": Yes

IS SPARE TIRE STANDARD EQUIPMENT: Yes

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

TYPE OF FRONT SEAT BACKS: Manual adjustable

NUMBER OF OCCUPANTS 2 FRONT 3 REAR 5 TOTAL

CARGO LOAD 150 LBS. TOTAL 900 LBS.

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

RIGHT FRONT 1034 lbs. RIGHT REAR 595 lbs.

LEFT FRONT 1045 lbs. LEFT REAR 584 lbs.

TOTAL FRONT WEIGHT 2079 lbs. (63.8% OF TOTAL VEHICLE WEIGHT)

TOTAL REAR WEIGHT 1179 lbs. (36.2% OF TOTAL VEHICLE WEIGHT)

TOTAL DELIVERED WEIGHT 3258 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (3258 LBS)

VCW = VEHICLE CAPACITY WEIGHT (900 LBS)

DSC = DESIGNATED SEATING CAPACITY (5)

$RCLW = VCW - 150 (DSC) = 900 - 150(5) = 150 \text{ LBS}$

$TARGET \text{ TEST WEIGHT} = UDW + RCLW + (2 \text{ DUMMIES} \times 164 \text{ LBS/DUMMY})$

$= 3258 + 150 + 328 \text{ LBS}$

TARGET TEST WEIGHT = 3736 LBS

TABLE 2 TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 139 LBS. CARGO:

RIGHT FRONT	1091 lbs.	RIGHT REAR	779 lbs.
LEFT FRONT	1083 lbs.	LEFT REAR	772 lbs.
TOTAL FRONT WEIGHT	2174 lbs.	(58.4% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1551 lbs.	(41.6% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3725 lbs.	(0.3% UNDER TARGET WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE TRUNK AREA: 75 LBS.

COMPONENTS REMOVED TO MEET TARGET WEIGHT: None

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE: LF 26.6; RF 26.6; LR 26.4; RR 26.4

PRE-TEST ATTITUDE: LF 26.2; RF 26.0; LR 24.6; RR 24.4

POST-TEST ATTITUDE: LF 26.8; RF 25.1; LR 24.4; RR 23.0

MAXIMUM WIDTH: 67.0 INCHES

WHEELBASE: 101.5 INCHES

CG = 42.3 INCHES REARWARD OF FRONT WHEEL CENTERLINE

TABLE 3 TEST CONDITIONS

TEST NUMBER: 900405

DATE OF TEST: 04/05/90

TIME OF TEST: 1312

TYPE OF TEST: Frontal barrier impact

IMPACT ANGLE: 0°

AMBIENT TEMPERATURE AT IMPACT AREA:

72° F

TEMPERATURE IN OCCUPANT COMPARTMENT:

72° 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):

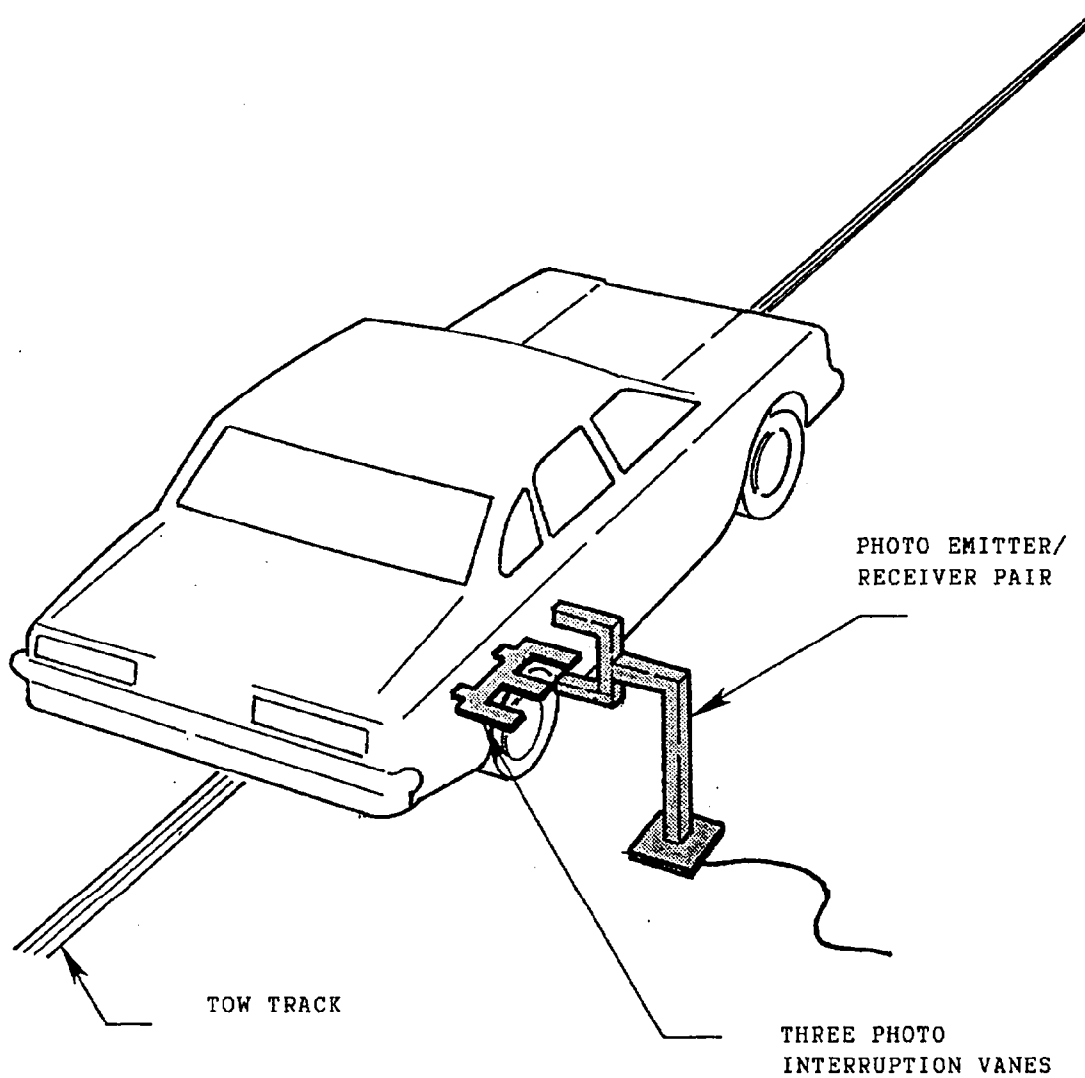
OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: L 178.8; C 184.1; R 178.4

POST-TEST: L 163.2; C 167.2; R 164.0

TOTAL CRUSH: L 15.6; C 16.9; R 14.4

FOR FRONTAL IMPACTS, DISTANCE FROM FRONT OF TEST VEHICLE TO BARRIER AFTER
IMPACT: L: 28.8; C: 24.6; R: 20.4; AVG: 24.6

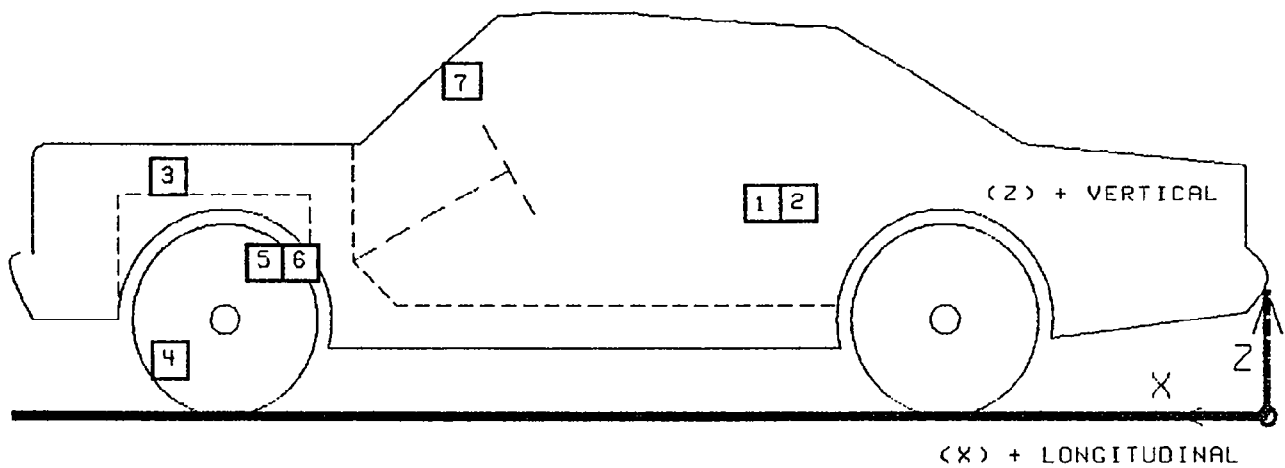
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



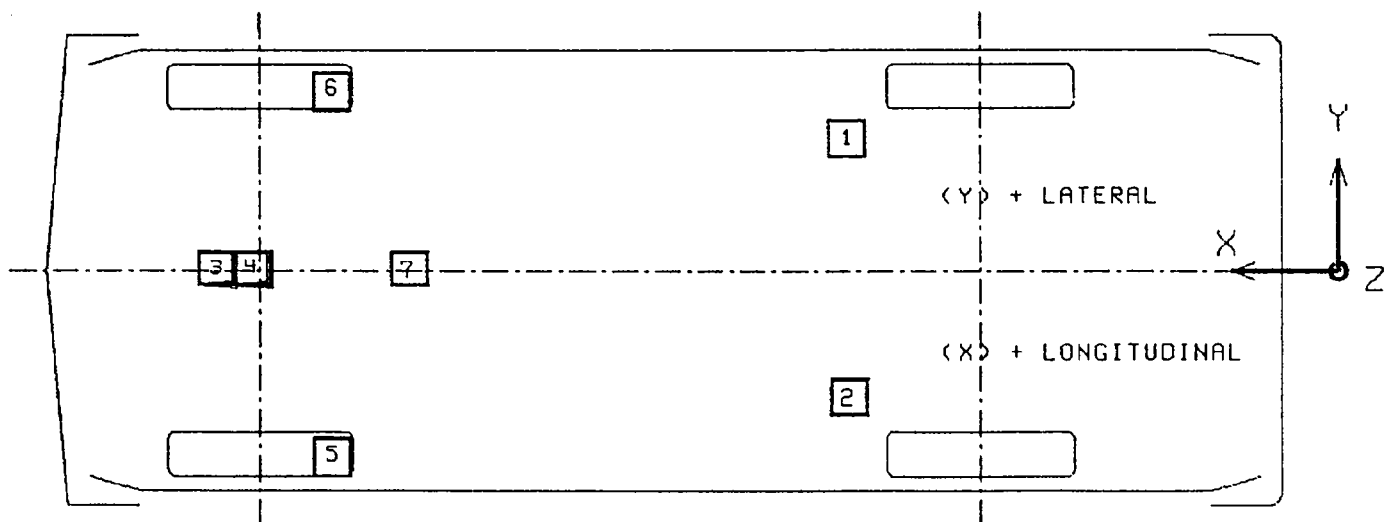
The final vane clears emitter/receiver two inches before impact.

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 900405

No.	LOCATION		X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
						MAX G	MSEC	MAX G	MSEC
1	REAR SEAT CROSSMEMBER AT LEFT SIDE LONGITUDINAL	PRE	72.8	16.1	16.4				
		POST	71.8	16.1	17.8				
						2.2	126.5	35.2	41.6
2	REAR SEAT CROSSMEMBER AT RIGHT SIDE LONGITUDINAL	PRE	72.8	-16.1	16.8				
		POST	72.0	-16.1	17.4				
						29.5	96.1	62.5	48.4
3	TOP OF ENGINE BLOCK LONGITUDINAL	PRE	155.6	-2.0	29.2				
		POST	152.5	-1.5	30.0				
						38.3	45.4	117.7	35.4
4	BOTTOM OF ENGINE BLOCK LONGITUDINAL	PRE	155.8	-10.5	6.5				
		POST	151.8	-10.5	7.4				
						7.4	42.0	97.0	28.9
5	BRAKE CALIPER AT RIGHT SIDE LONGITUDINAL	PRE	149.2	-25.2	11.1				
		POST	146.5	-24.2	11.0				
						33.9	72.5	75.6	32.1
6	BRAKE CALIPER AT LEFT SIDE LONGITUDINAL	PRE	149.8	25.2	11.4				
		POST	145.2	24.0	10.8				
						23.6	67.9	76.7	34.0
7	DASH PANEL LONGITUDINAL	PRE	121.0	0.0	36.0				
		POST	120.8	0.0	36.5				
						2.5	114.8	34.3	41.1

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

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

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

VEHICLE MAKE/MODEL/BODY STYLE: Lexus/ES250/4-door sedan
VEH. NHTSA NO.: CL5104; VIN: JT8VV22T8L0092813
MODEL YEAR: 1990; BUILD DATE: 07/89; TEST DATE: 04/05/90
VEH. SIZE CATEGORY: Compact; TEST WEIGHT: 3725 lbs.
VEH. WHEELBASE: 101.5
MAX. WIDTH: 67.0
FRONT OVERHANG: 37.4

COLLISION DEFORMATION
CLASSIFICATION (CDC) CODE: 12FDEW2

F (Frontal)
CRUSH DEPTH
DIMENSIONS:

C1 = 15.6 inches
C2 = 16.4 inches
C3 = 17.1 inches
C4 = 17.0 inches
C5 = 16.0 inches
C6 = 14.4 inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline
(Longitudinal)

LENGTH OF DAMAGED
REGION: L = 62.0 inches

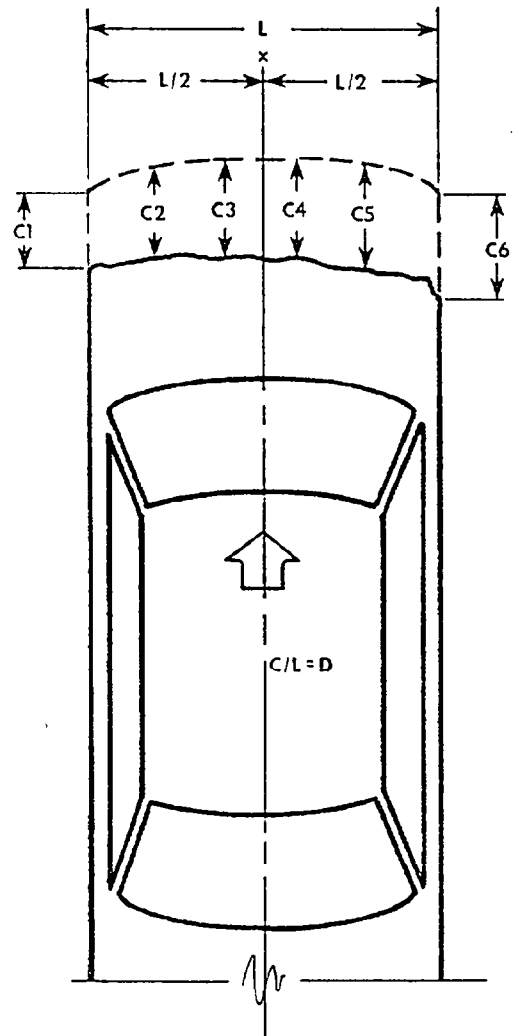


FIGURE 4
PRE-TEST AND POST-TEST MEASUREMENT POINTS

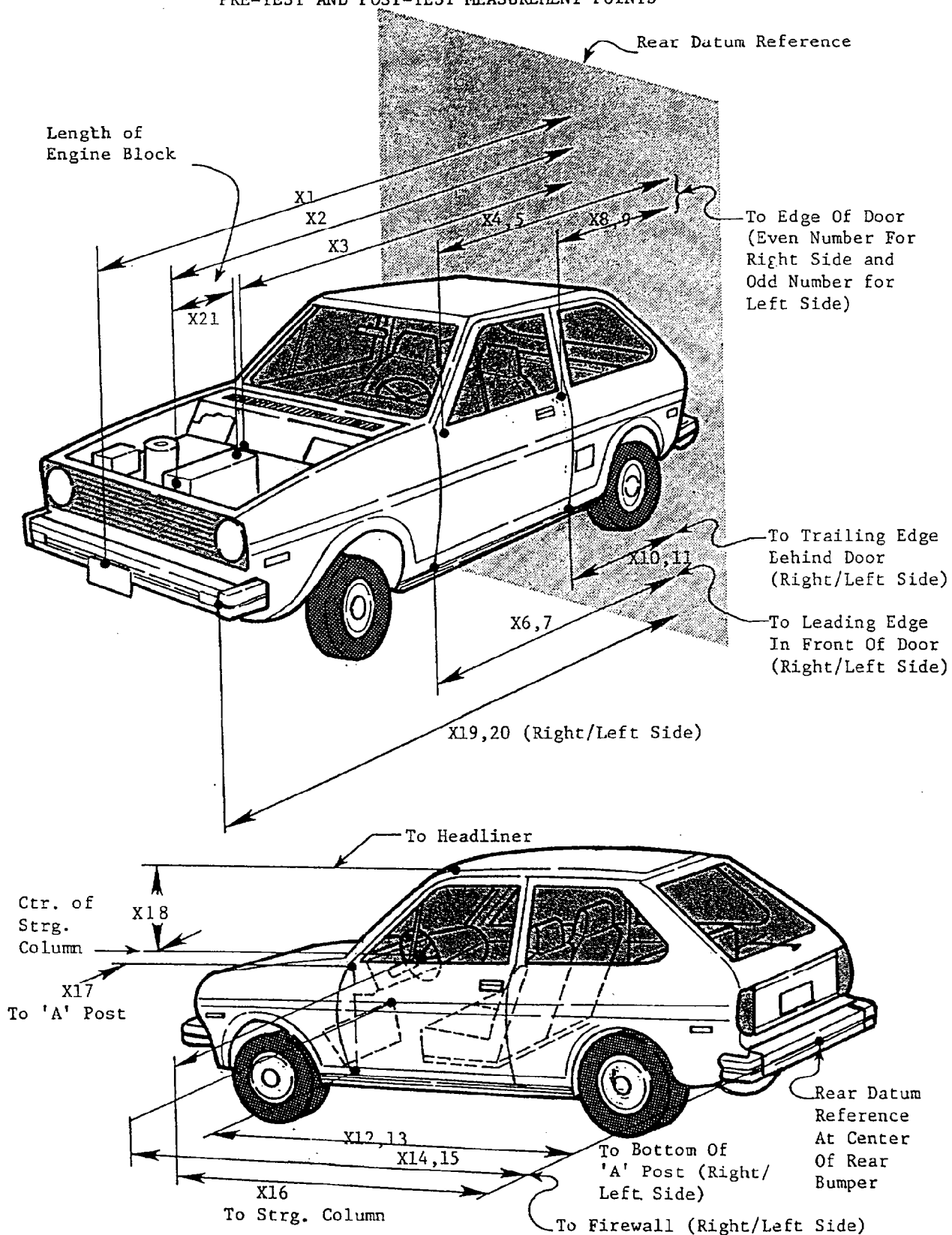
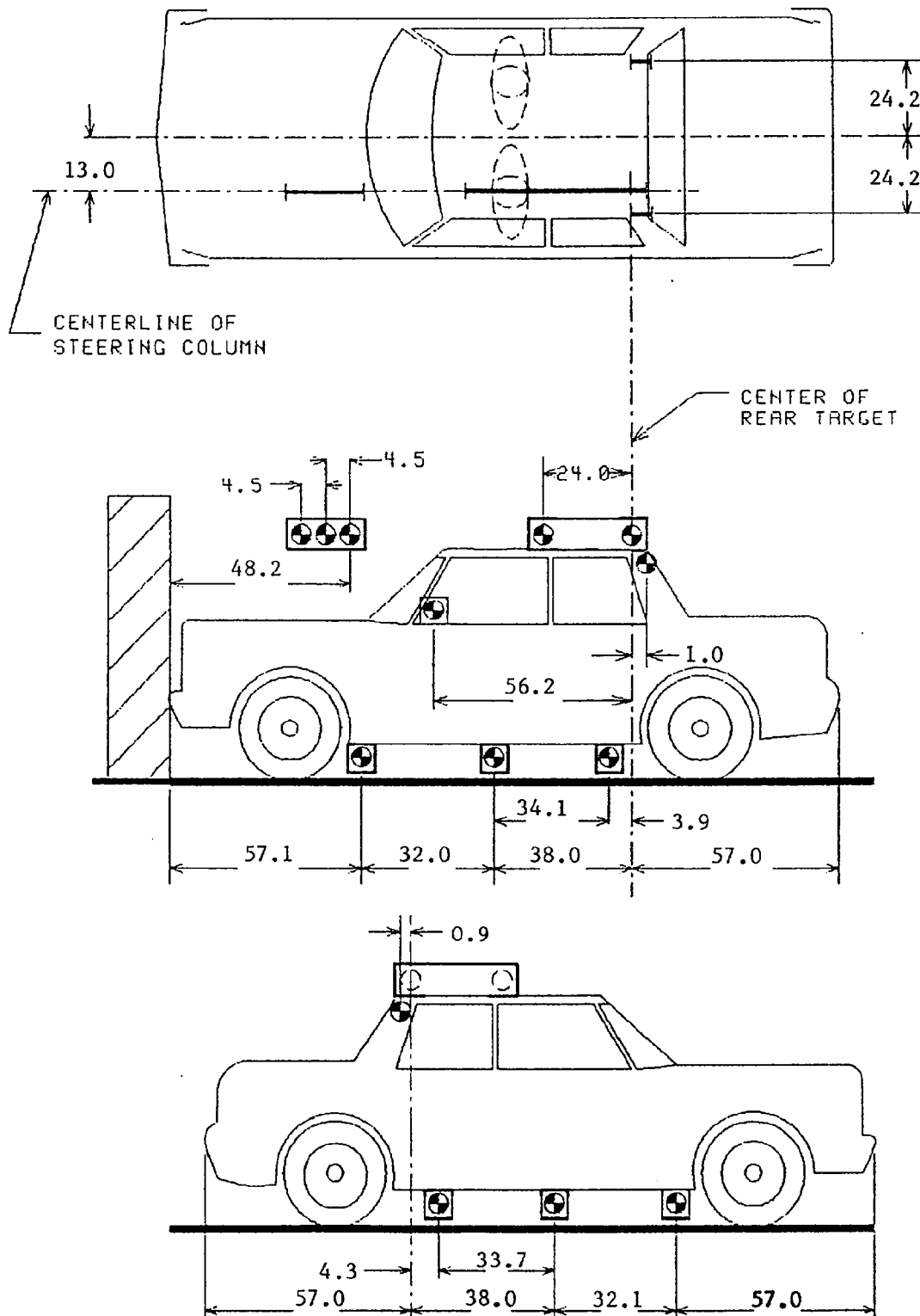


TABLE 5 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL:	TEST NUMBER:	TYPE OF MEASUREMENT	DIMENSIONS IN INCHES		
			PRE-TEST	POST-TEST	DIFF.
Lexus/ES250	900405				
		X1 TOTAL LENGTH OF VEHICLE AT CENTERLINE	184.1	167.2	16.9
		X2 REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	161.1	155.0	6.1
		X3 REAR SURFACE OF VEHICLE TO FIREWALL	136.6	132.2	4.4
		X4 REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	124.5	124.6	-0.1
		X5 REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	124.2	124.5	-0.3
		X6 REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	123.1	122.6	0.5
		X7 REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	122.8	122.4	0.4
		X8 REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	84.7	84.8	-0.1
		X9 REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	84.6	84.8	-0.2
		X10 REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	84.2	83.4	0.8
		X11 REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	83.9	83.5	0.4
		X12 REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	123.9	122.8	1.1
		X13 REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	123.1	122.8	0.3
		X14 REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	134.8	134.1	0.7
		X15 REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	135.0	134.0	1.0
		X16 REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	106.8	108.9	-2.1
		X17 CENTER OF STEERING COLUMN TO "A" POST	11.0	15.5	-4.5
		X18 CENTER OF STEERING COLUMN TO HEADLINER	17.8	16.5	1.3
		X19 REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	178.4	164.0	14.4
		X20 REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	178.8	163.2	15.6
		X21 LENGTH OF ENGINE BLOCK	16.5	16.5	0.0

FIGURE 5
VEHICLE TARGET LOCATIONS



ALL DISTANCE MEASUREMENTS ARE IN INCHES.

REPORT OF VEHICLE CONDITION AT THE
COMPLETION OF TESTING

: DTNH22-88-C-11038
Transportation Research Center of Ohio
20 State Route 347
Liberty, OH 43319

Nuschler

e of Vehicle Safety Compliance

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

CL5104
L/BODY STYLE: Lexus/ES250/4-door sedan
R: 1990 BODY COLOR: Bluestone Metallic
V22T8L0092813
(ARRIVAL): 13.0 DATE: 01/19/90
(COMPLETION): 23.0 DATE: 04/05/90
\$726.00
Conditioner Console Brakes: X Power
ed Glass Tachometer Front: Disc
Steering X Speed Control Rear: Drum
Windows X Rear Window Def.
Door Locks Sun/Moon Roof Front Seats: Power
T-Top Seat Type: Bucket
Tilt Steering Wheel No. of Seats: 5
Other Options: None

6 Cylinders; 2.5 LITRES
ion: Automatic; Drive Type: Front
P195/60R15
type: Unleaded

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

on: NA

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

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 Lexus ES250 4-door sedan, NHTSA No. CL5104, appeared to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial), and 301.

The driver's Head Injury Criteria (HIC) was 397. The driver's maximum chest deceleration over three milliseconds was 51.1 g. The driver's right and left compressive femur loads were 1513 pounds and 1530 pounds, respectively.

The right front passenger's Head Injury Criteria (HIC) was 364. The right front passenger's maximum chest deceleration over three milliseconds was 46.1 g. The right front passenger's right and left compressive femur loads were 1137 pounds and 847 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	-64.1	-14.9	-41.8	66.8	-53.4	-10.2	-11.8	51.1
PASSENGER	39.8	29.0	-54.3	56.9	48.0	-10.0	-8.1	46.1

MAXIMUM FORCE-FEMUR LOAD (LBS)

	LEFT FEMUR	RIGHT FEMUR
DRIVER	1530	1513
PASSENGER	847	1137

HEAD INJURY CRITERIA**

	HIC	TIME t_1 (MSEC) ¹	TIME t_2 (MSEC) ²
DRIVER	397	67.1	98.6
PASSENGER	364	65.1	101.1

*Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

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 rearward and contacted the driver's sunvisor as the dummy's head and chest were restrained by the driver's airbag. The dummy's head rotated forward and then rearward as the dummy rebounded into the seat back and head restraint. The dummy came to rest seated in the driver's 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 rotated forward, impacting the dummy's chest as the dummy was restrained by the three-point unbelt. The dummy's head rotated rearward as the dummy rebounded into the seat back and head restraint. The dummy came to rest seated in the right front passenger's seat, restrained by the three-point unbelt.

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #354	PASSENGER #690
Head	<u>Airbag & sunvisor</u>	<u>Chest</u>
Chest	<u>Airbag</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:

The entire windshield was cracked upon impact.

OTHER NOTABLE IMPACT EFFECTS:

None

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

PRE-IMPACT DATA:

Make/Model: Lexus/ES250
 Body Style: 4-door sedan Model Year: 1990
 NHTSA No.: CL5104 Color: Bluestone Metallic

DATA FROM CERTIFICATION LABEL:

Vehicle Manufacturer: Toyota Motor Corporation
 Date of Manufacture: 07/89 VIN: JT8VV22T8L0092813
 GVWR: 4210 lb; GAWR: Front = 2281 lb; Rear = 2017 lb

POST-IMPACT DATA:

Date of Test: 04/05/90 Time: 1312 Temperature: 72° 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: R. Benavides, S. Ericksen, & P. Cummins

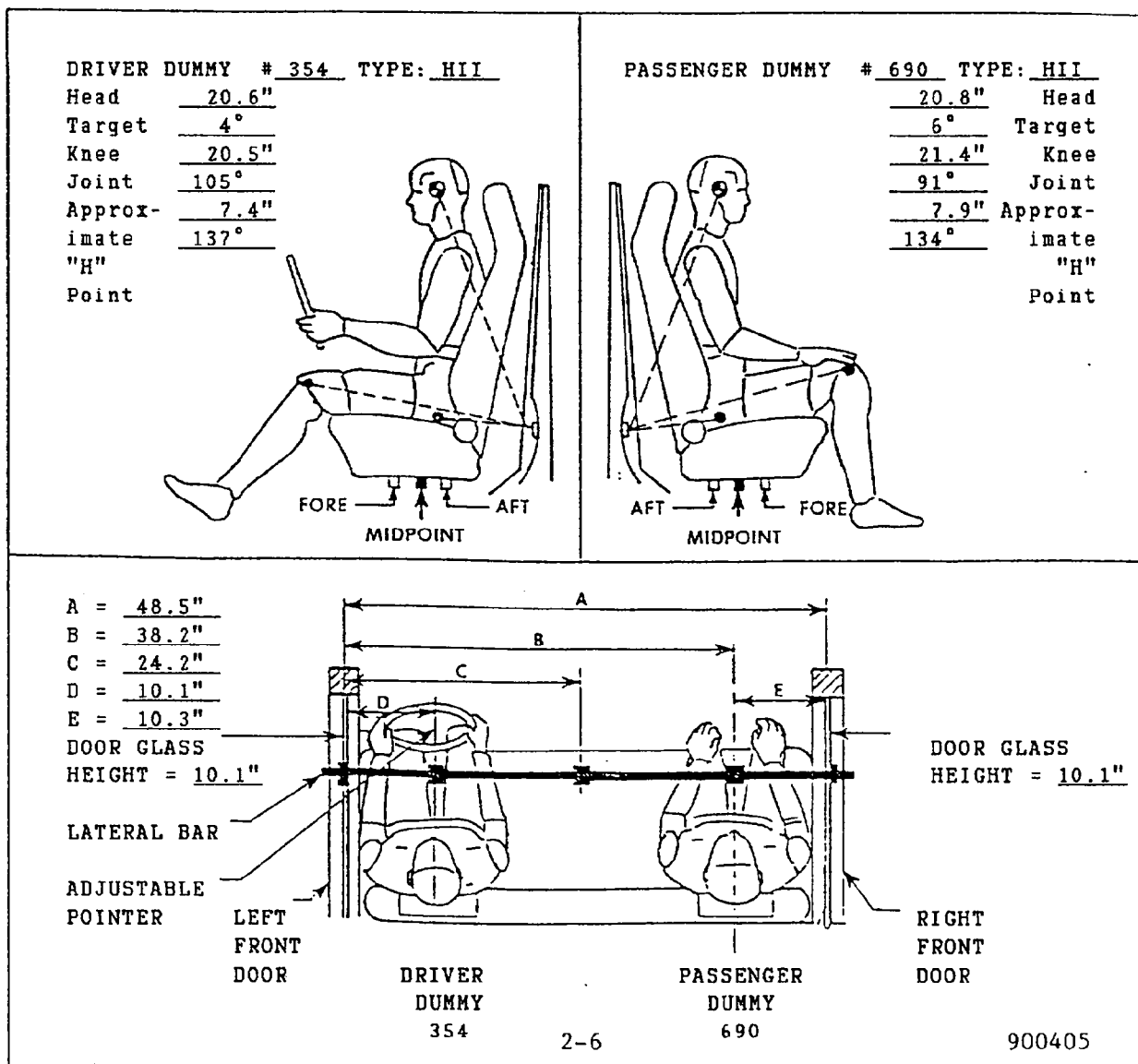
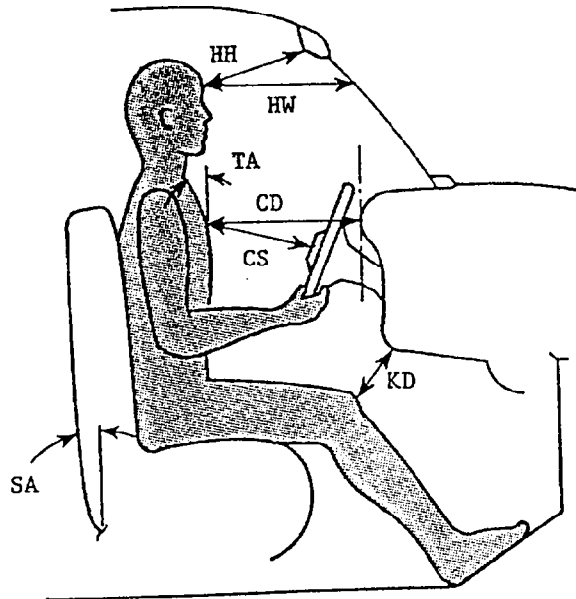


FIGURE 7 DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER	PASSENGER
HH	17.0	16.6
HW	19.1	18.1
CD	23.7	22.9
CS	14.8	NA
KDL	6.4	6.1
KDR	6.4	5.7
TA	21°	20°
SA	16°	15°
HA	19.0	21.9

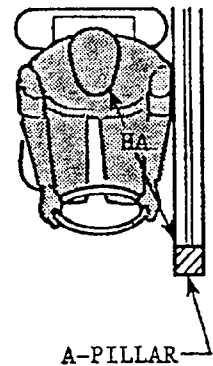
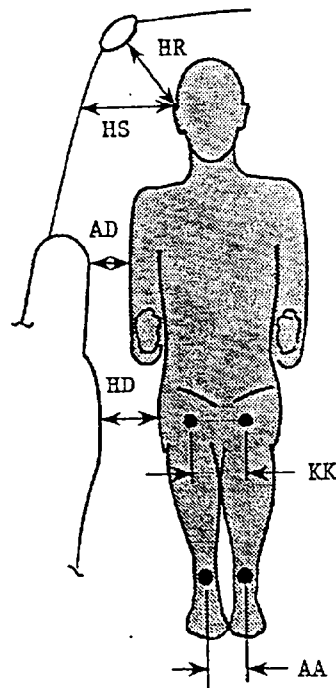


	DRIVER	PASSENGER
HR	5.6	5.8
HS	7.2	7.4
AD	3.1	3.5
HD	6.6	6.6
KK	10.5	7.8
AA	12.4	7.6

Knee outer bolt head to outer bolt head spacing:

Driver = 14.5

Passenger = 11.8

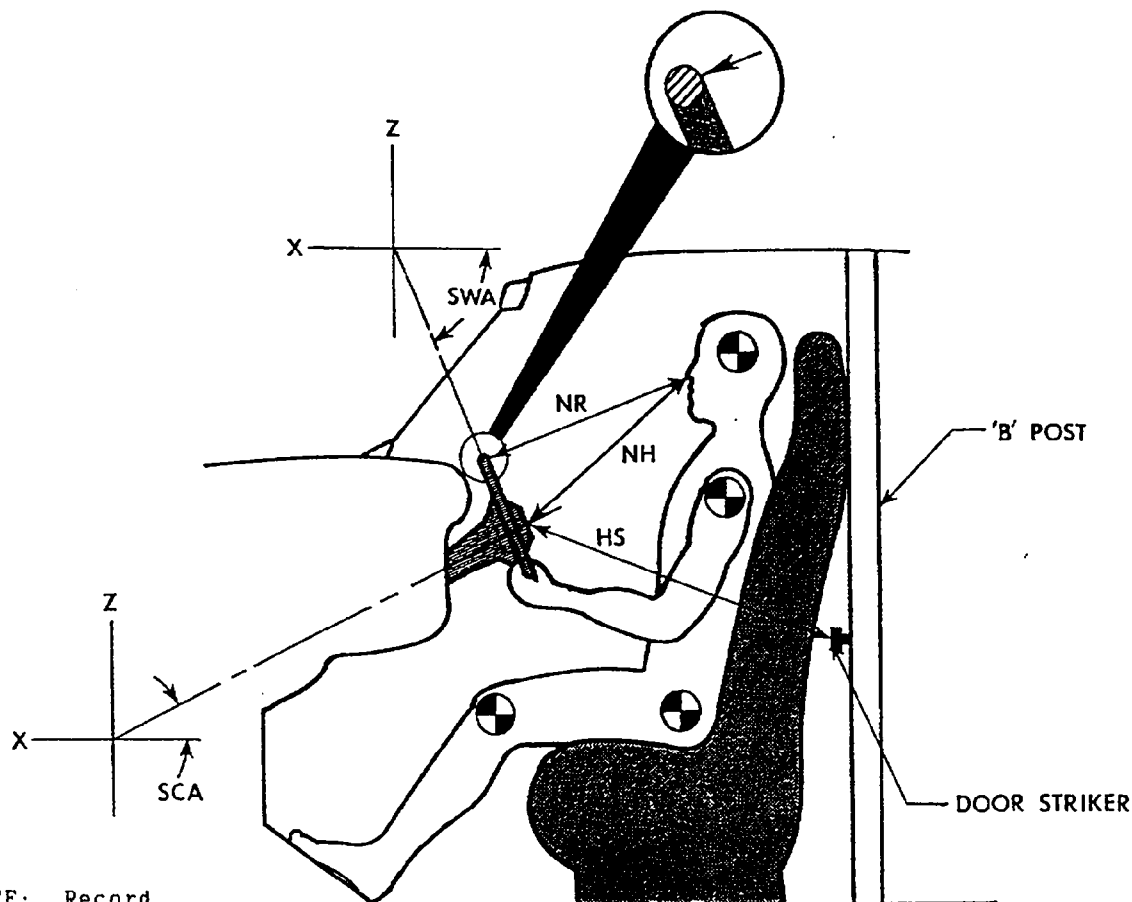


HH = Head to Windshield Header	HR = Head to Side Roof
HW = Head to Windshield	HS = Head to Side Window
CD = Chest to Dash	AD = Arm to Door
CS = Chest to Steering Wheel	HD = Hip to Door
KD = Knee to Dash	KK = Knee to Knee
TA = Torso Angle	AA = Ankle to Ankle
SA = Seat Back Angle	HA = Head to A-Pillar

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



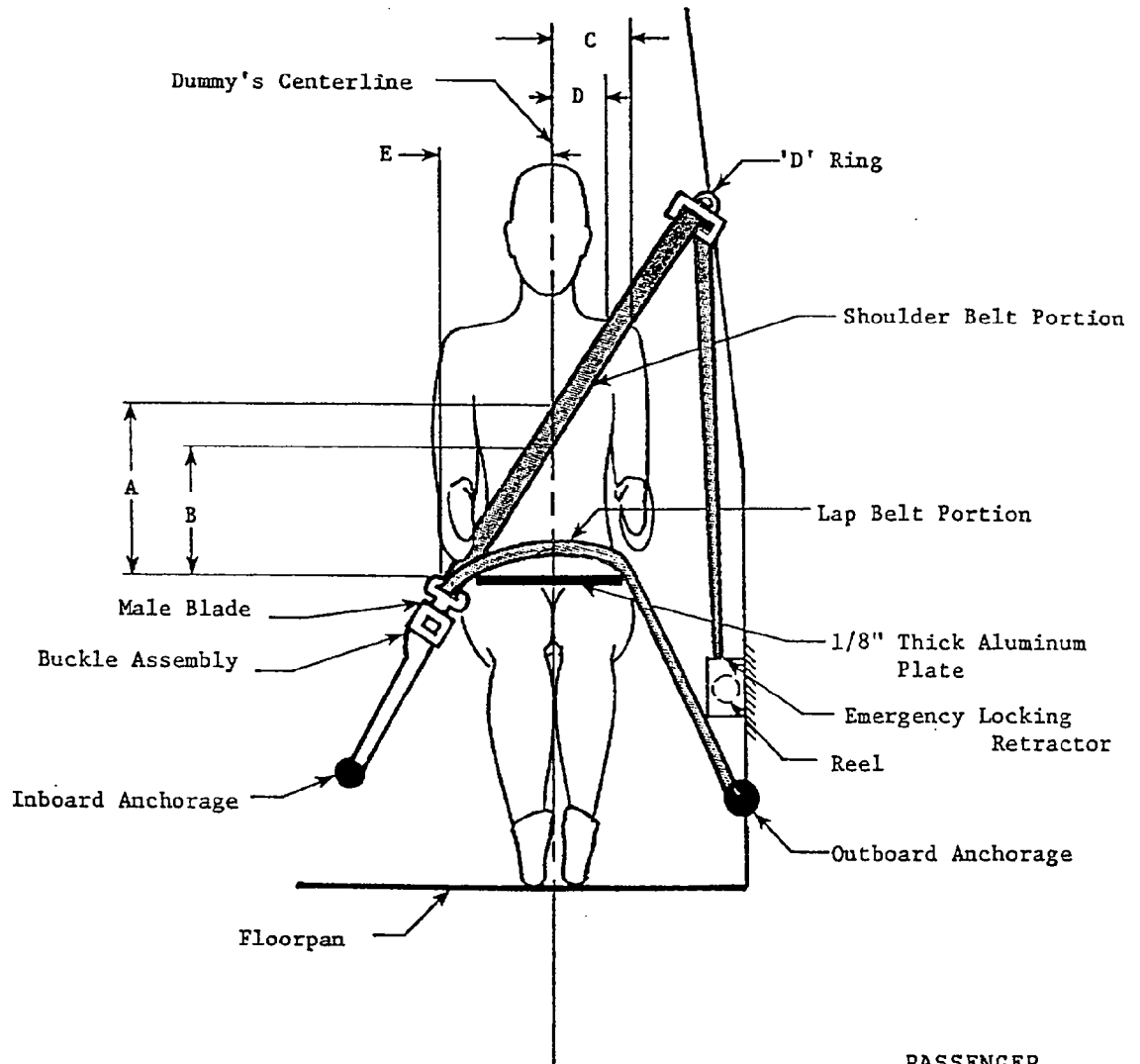
NOTE: Record position of tilt strg. column in REMARKS section

REMARKS: The steering column was a non-tilt column.

MEASUREMENTS

NR	- Distance from tip of dummy's nose to top rear surface of steering wheel rim. (in.)	18.4
NH	- Distance from tip of dummy's nose to center of steering column hub. (in.)	19.9
HS	- Distance from center of steering column hub to the forward surface of the door lock striker pin. (in.)	21.8
SCA	- Angle of steering column relative to the horizontal X axis	22°
SWA	- Angle of steering wheel relative to the horizontal X axis	68°

FIGURE 9 SEAT BELT POSITIONING DATA



	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	13.8
B - Top surface of alum. plate to belt lower edge (in)	10.4
C - Dummy centerline to outer edge of belt at chest flesh top (in)	6.9
D - Dummy centerline to inner edge of belt at chest flesh top (in)	4.0
E - Dummy centerline to intersection of upper torso belt and lap belt (in)	9.0

TABLE 7 FMVSS 208 COMFORT AND CONVENIENCE DATA

VEHICLE VIN: JT8VV22T8L0092813 NHTSA NO: CL5104
MAKE: Lexus MODEL: ES250
VEHICLE BUILD DATE: 07/89 VEHICLE TYPE: 4-door sedan
FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:
(check one): Automatic belts
 X 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:
 0.1 POUNDS

LATCHPLATE ACCESS:

ARE SEATBELT LATCHPLATES WITHIN REACH ENVELOPE: Yes
DOES CLEARANCE TEST BLOCK MOVE UNHINDERED TO LATCHPLATE OR BUCKLE?
 Yes

TABLE 7 FMVSS 208 COMFORT AND CONVENIENCE DATA CONT'D

VEHICLE VIN: JT8VV22T8L0092813 NHTSA NO: CL5104
MAKE: Lexus MODEL: ES250
VEHICLE BUILD DATE: 07/89 VEHICLE TYPE: 4-door sedan
FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:
(check one): Automatic belts
 X Type 2 lap/shoulder belts
 Other

RETRACTION:

SEATBELT AUTOMATICALLY RETRACTS WHEN

(check one)" _____ Adjacent vehicle door is open and seatbelt latchplate is released

 X Seatbelt latchplate is released

ARE THE STOWED WEBBING AND HARDWARE PINCHED WHEN THE DOOR IS CLOSED?

No

OPEN-BODY VEHICLE: DOES BELT SYSTEM FULLY RETRACT WHEN THE TENSION-RELIEVING
DEVICE IS MANUALLY DEACTIVATED? NA

ACCESSIBILITY:

IS SEAT CUSHION REMOVABLE SO THE SEATBACK SERVES A FUNCTION OTHER THAN SEATING? No

IS SEAT REMOVABLE? No

IS SEAT MOVABLE SO THE SPACE CAN BE USED FOR A SECONDARY FUNCTION?

No

IF WEBBING IS DESIGNED TO PASS THROUGH THE SEAT CUSHION OR BETWEEN THE CUSHION AND SEAT BACK ARE ONE OF THE FOLLOWING PARTS NORMALLY ON TOP OF OR ABOVE THE SEAT CUSHION: LATCHPLATE, BUCKLE, WEBBING? NA

ARE THE REMAINING TWO PARTS ACCESSIBLE UNDER NORMAL CONDITIONS?

NA

TABLE 7 FMVSS 208 COMFORT AND CONVENIENCE DATA CONT'D

VEHICLE VIN: JT8VV22T8L0092813 NHTSA NO: CL5104
MAKE: Lexus MODEL: ES250
VEHICLE BUILD DATE: 07/89 VEHICLE TYPE: 4-door sedan
FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:
(check one): Automatic belts
 X Type 2 lap/shoulder belts
 Other

ACCESSIBILITY CONT'D:

DO THE LATCHPLATE AND BUCKLE PASS THROUGH THE GUIDES PROVIDED AND FALL
BEHIND THE SEAT WHEN THE BELT IS COMPLETELY RETRACTED (OR UNATTACHED IF
NONRETRACTABLE); THE SEAT IS MOVED TO ANY POSITION; AND THE SEAT BACK,
IF FOLDABLE, IS FOLDED FORWARD AS FAR AS POSSIBLE AND THEN MOVED
BACKWARD INTO POSITION? No

IS THE INBOARD RECEPTACLE END ACCESSIBLE WITH THE CENTER ARM REST IN ANY
POSITION TO WHICH IT CAN BE ADJUSTED WITHOUT MOVING THE ARMREST FOR
ACCESS? Yes

LATCH MECHANISM:

ARE LATCH MECHANISM COMPONENTS ACCESSIBLE TO A SEATED OCCUPANT IN THE
STOWED AND OPERATIONAL POSITIONS? Yes

DOES LATCH MECHANISM RELEASE BOTH TORSO AND LAP BELTS SIMULTANEOUSLY?
 Yes

DOES LATCH MECHANISM RELEASE AT A SINGLE POINT BY A PUSH BUTTON ACTION?
 Yes

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

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

Duration of audible warning signal = 6 sec.

Duration of reminder light operation = 6 sec.

WITH OCCUPANT IN DRIVER'S POSITION AND UNIBELT 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 = 6 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: The label is located on the inner surface of the glove box door.

THE MANUFACTURER'S RECOMMENDED SCHEDULE IS TO: (check one)
maintain X, replace _____, or repair _____ this system: (check one)
a. by _____ month, _____ year
b. by _____ miles
c. or after a time interval of _____ months or 10 years,
and every 2 years thereafter.

WERE APPROPRIATE INSTRUCTIONS CONCERNING MAINTENANCE AND/OR REPLACEMENT OF THIS SYSTEM PROVIDED? Yes

WAS A DESCRIPTION OF THE FUNCTIONAL OPERATION OF THE SYSTEM PROVIDED?
Yes, owner's manual page 51

IS THERE A REFERENCE TO THE INSTRUCTIONS AND DESCRIPTION OF THE SYSTEM ON THE LABEL? Yes

WAS AN OWNER'S MANUAL PROVIDED? Yes

DID THE OWNER'S MANUAL CONTAIN APPROPRIATE INFORMATION CONCERNING MAINTENANCE AND/OR REPLACEMENT AND A DESCRIPTION OF THE FUNCTIONAL OPERATION OF THE SYSTEMS? Yes, pages 21, 51, and 52

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.

Is the system totally mechanical? No

IF NO:

Describe the location of the readiness indicator: The readiness indicator is a light stating "Airbag" on the instrument panel between the temperature gage and the speedometer.

Is the readiness indicator clearly visible to the driver? Yes

Is a list of the elements in the occupant restraint system, being monitored by the readiness indicator, provided? Yes,
owner's manual page 21

TABLE 11 SUMMARY OF FMVSS 301 DATA

PRE-IMPACT DATA

MAKE/MODEL: Lexus/ES250

BODY STYLE: 4-door sedan

MODEL YEAR: 1990

NHTSA NO.: CL5104

COLOR: Bluestone Metallic

DATA FROM CERTIFICATION LABEL

VEHICLE MANUFACTURER: Toyota Motor Corporation

DATE OF MANUFACTURE: 07/89

VIN: JT8VV22T8L0092813

GVWR: 4210 LBS., GAWR: FRONT 2281 LBS., REAR 2017 LBS.

POST-IMPACT DATA

TYPE OF TEST: Frontal Barrier Impact

DATE OF TEST: 04/05/90

TIME: 1312

TEMP: 72° F

REQUIRED IMPACT VELOCITY RANGE: 28.9 MPH TO 29.9 MPH

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

TEST WEIGHT = 3725 LBS., STATIC CRUSH MAX. = 17.1 IN., REBOUND = 24.6 IN.

FUEL SYSTEM DATA

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

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: 15.1 GALLONS (FURNISHED BY COTR)

TEST VOLUME: 14.0 GALLONS (92-94% OF USEABLE)

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 15.9 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 and enters the
right rear corner of the tank. The fuel lines run along the left sill
to the front.

ELECTRIC FUEL PUMP: Yes

FUEL INJECTOR: Yes

DOES ELECTRIC FUEL PUMP OPERATE WITH IGNITION SWITCH "ON" AND THE ENGINE NOT OPERATING? No

*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 trim around inner perimeter, plastic trim around outer perimeter, chrome trim around sides and top.

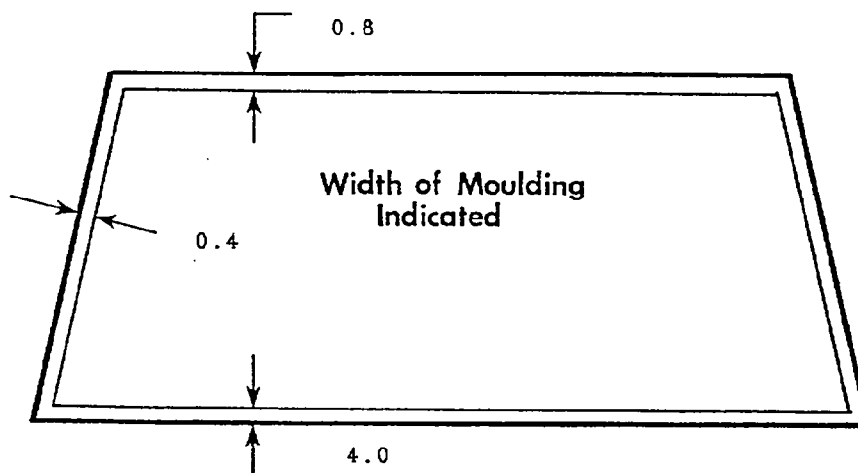
FMVSS 212 REQUIREMENTS: The post-test periphery retention amount must be at least 75% of the pre-test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

FMVSS 212 TEST DATA:

WINDSHIELD PERIPHERY

	PRE-TEST (in)	POST-TEST (in)	PERCENT RETENTION
RIGHT SIDE	79.4	79.4	100%
LEFT SIDE	79.4	79.4	100%
TOTAL	158.8	158.8	100%

AREA OF RETENTION FAILURE:



WINDSHIELD TEMPERATURE: 68° F

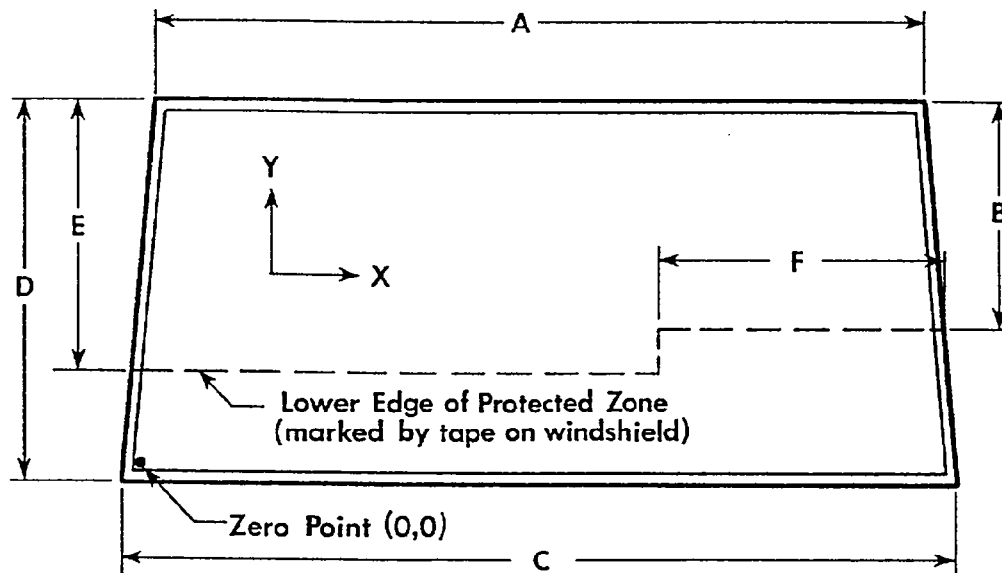
FAILURE DETAILS: None

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 = 43.0	C = 59.0	E = 20.9
B = 16.5	D = 32.0	F = 24.0

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.: CL5104; TEST DATE: 04/05/90

VEH. MFR./MAKE/MODEL: Toyota Motor Corporation/Lexus/ES250

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.

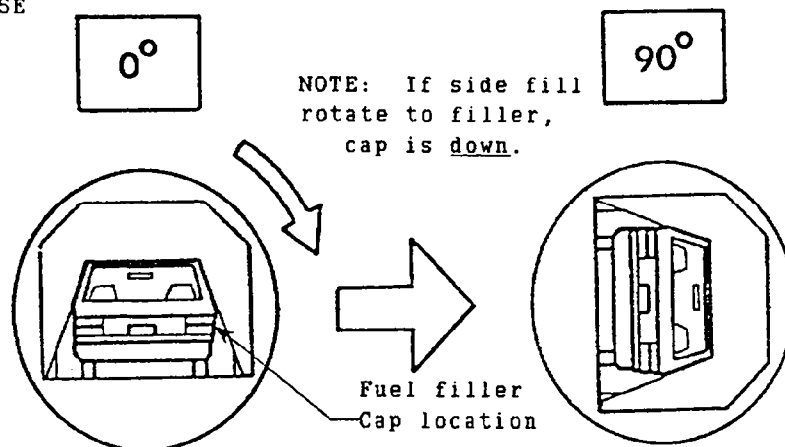
SOLVENT SPILLAGE DETAILS:

None

FIGURE 12 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

NHTSA NO.: CL5104

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

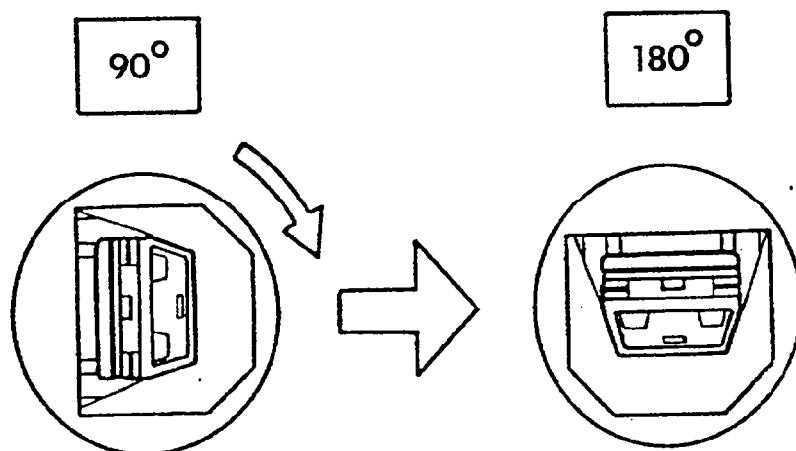
FMVSS 301 REQUIREMENTS

	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.: CL5104
 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 FROM ONSET OF ROTATION	6th Minute	7th 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>

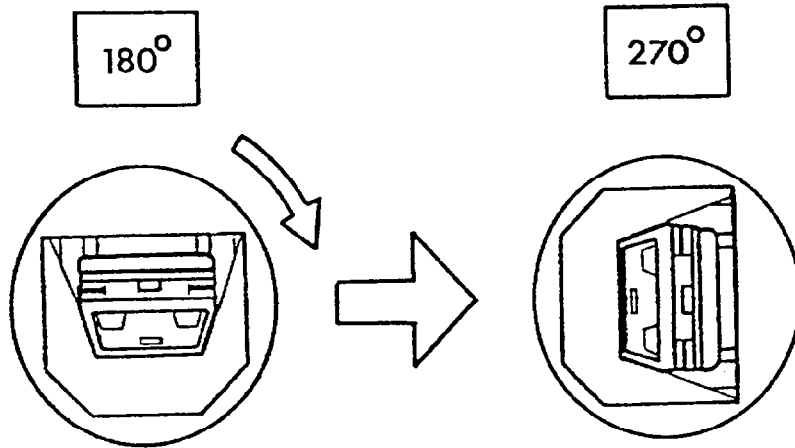
SOLVENT SPILLAGE LOCATION(S)

None

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

NHTSA NO.: CL5104

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

	<u>First 5 minutes 6th 7th</u> <u>FROM ONSET OF ROTATION Minute Minute</u>		
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>

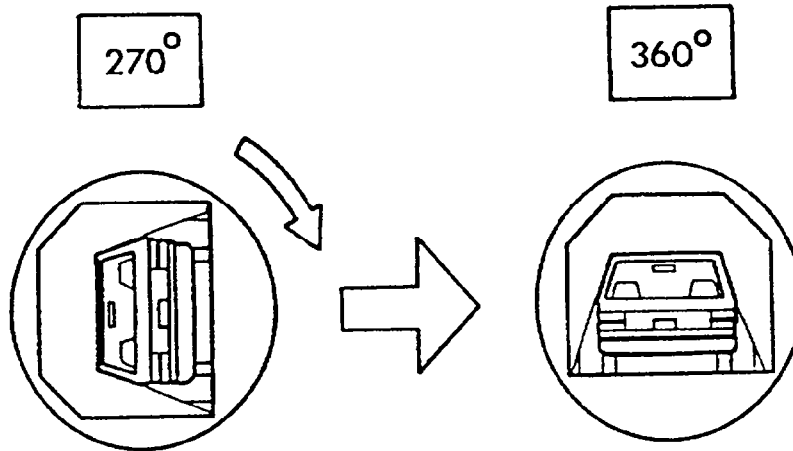
SOLVENT SPILLAGE LOCATION(S)

None

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

NHTSA NO.: CL5104

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 FROM ONSET OF ROTATION	6th Minute	7th 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

4, 7, 8

FIGURE 13
CAMERA POSITIONS

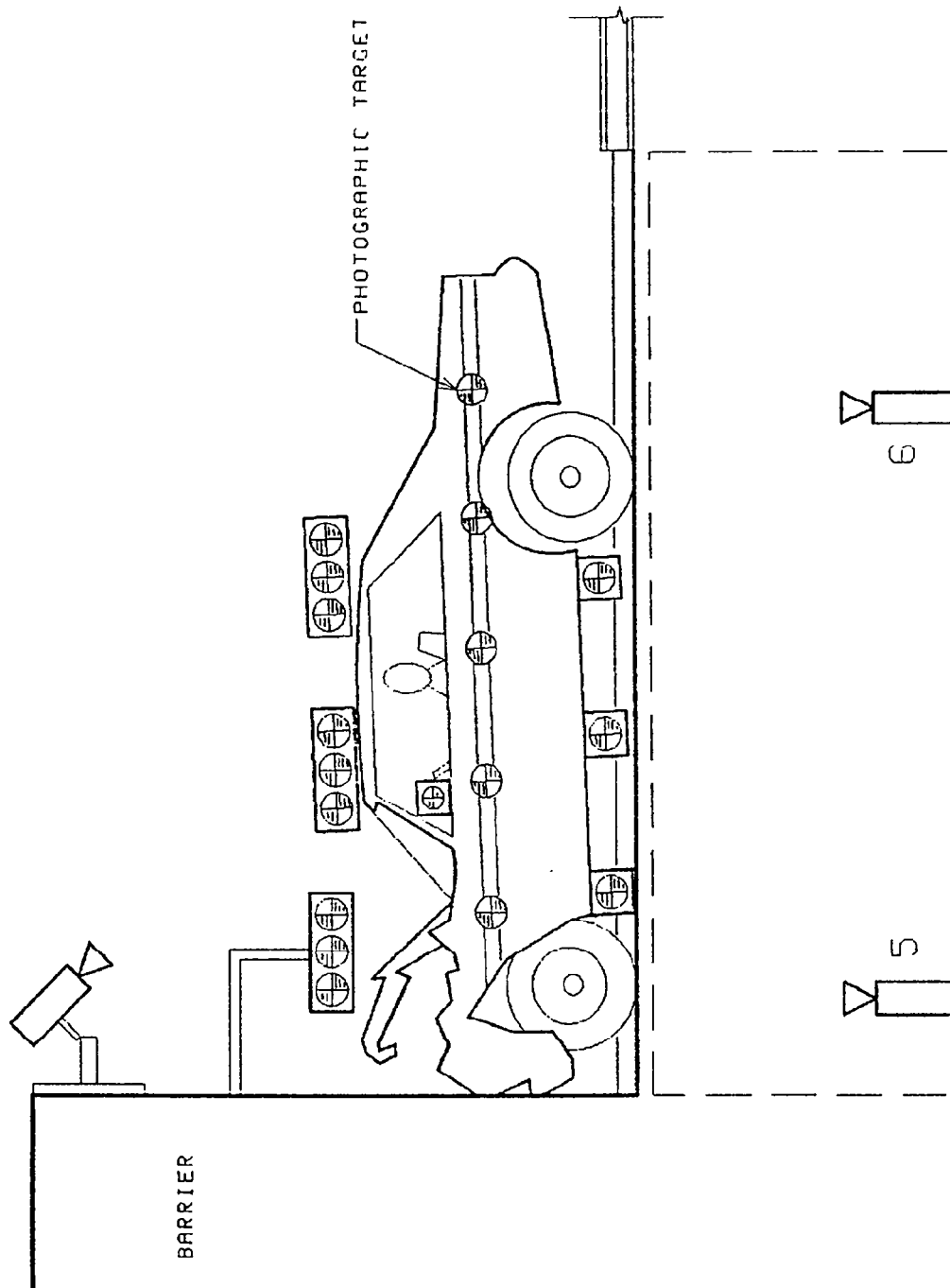


FIGURE 13

CAMERA POSITIONS, CONTINUED

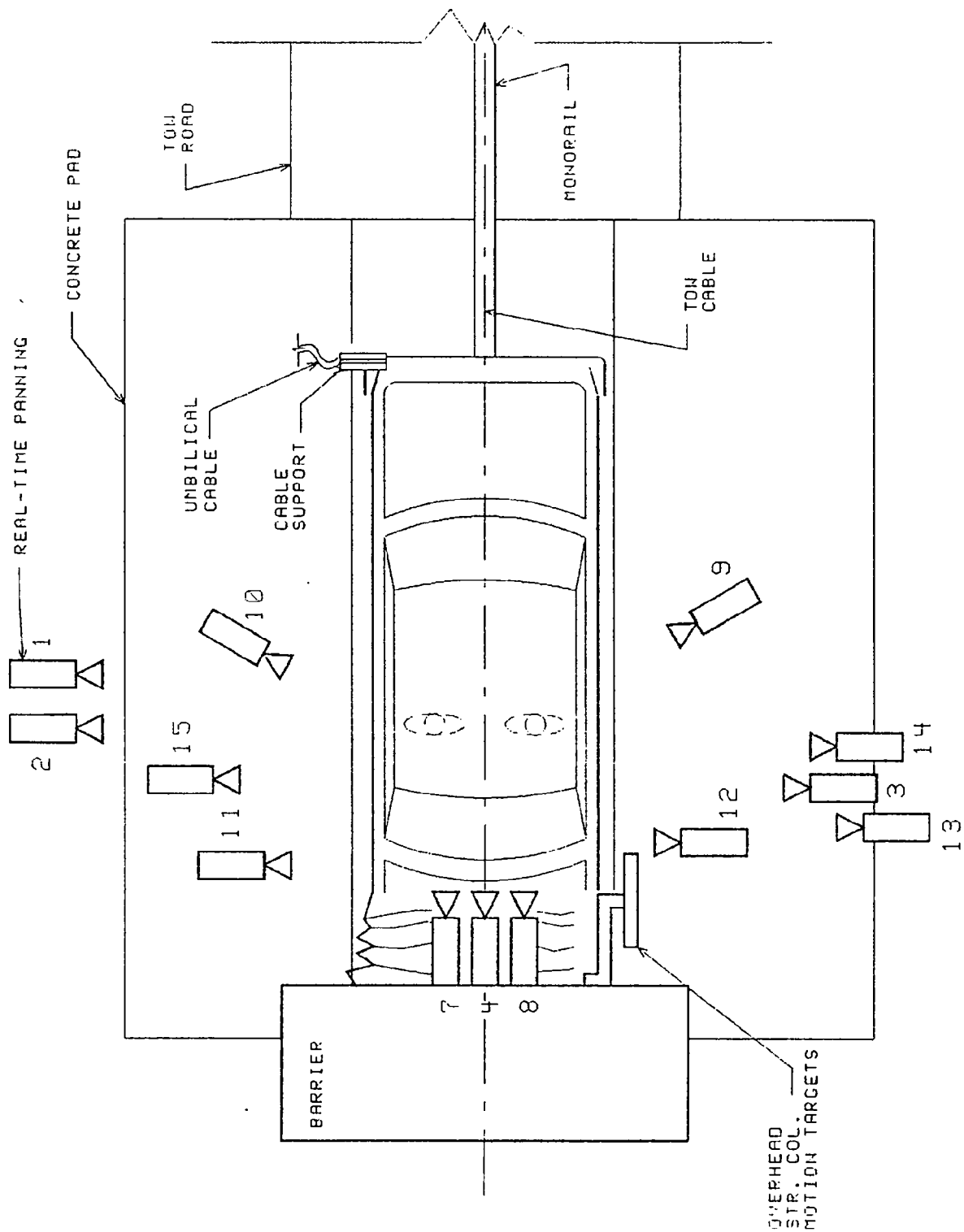


TABLE 13 HIGH SPEED CAMERA LOCATIONS

TEST NO.: 900405		VEHICLE: 1990 Lexus ES250 4-door sedan							
CAMERA NO.	VIEW	CAMERA POSITIONS (IN)*			ANGLE** (DEG)	FILM PLANE		LENS (MM)	SPEED (FPS)
		X	Y	Z		TO HEAD TARGET			
1	Real time panning	-142.0	-504.0	61.0	NA	NA	16	24	
2	Vehicle crush	-81.3	-266.4	37.1	-2	NA	13	500	
3	Dummy kinematics	-41.5	295.0	44.0	-4	216.0	25	505	
4	Windshield damage	-6.0	0.0	96.0	-40	NA	8.5	502	
5	Crush & fluid spillage	-50.5	0.0	-92.4	90	NA	13	1007	
6	Fluid spillage	-99.3	0.0	-99.0	90	NA	13	1005	
7	Passenger kinematics	-4.5	-13.8	93.0	-50	NA	17	500	
8	Driver kinematics	-6.8	14.5	93.0	-50	NA	17	502	
9	Driver kinematics	-157.3	116.0	87.0	-27	100.0	25	500	
10	Passenger kinematics	-152.1	-116.0	87.0	-26	90.0	25	500	
11	Windshield intrusion	-38.1	-306.1	44.0	0	NA	50	502	
12	Windshield intrusion	-53.0	309.4	42.3	0	NA	50	495	
13	Column movement	-102.0	290.0	103.0	-14	NA	25	495	
14	Column movement	-102.0	290.0	75.1	-9	NA	25	502	
15	Passenger kinematics	-38.8	-293.0	45.3	-4	251.0	25	520	

* +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



Figure A-3. PRE-TEST LEFT SIDE VIEW



Figure A-4. POST-TEST LEFT SIDE VIEW

A-3

900405



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

A-5

300405

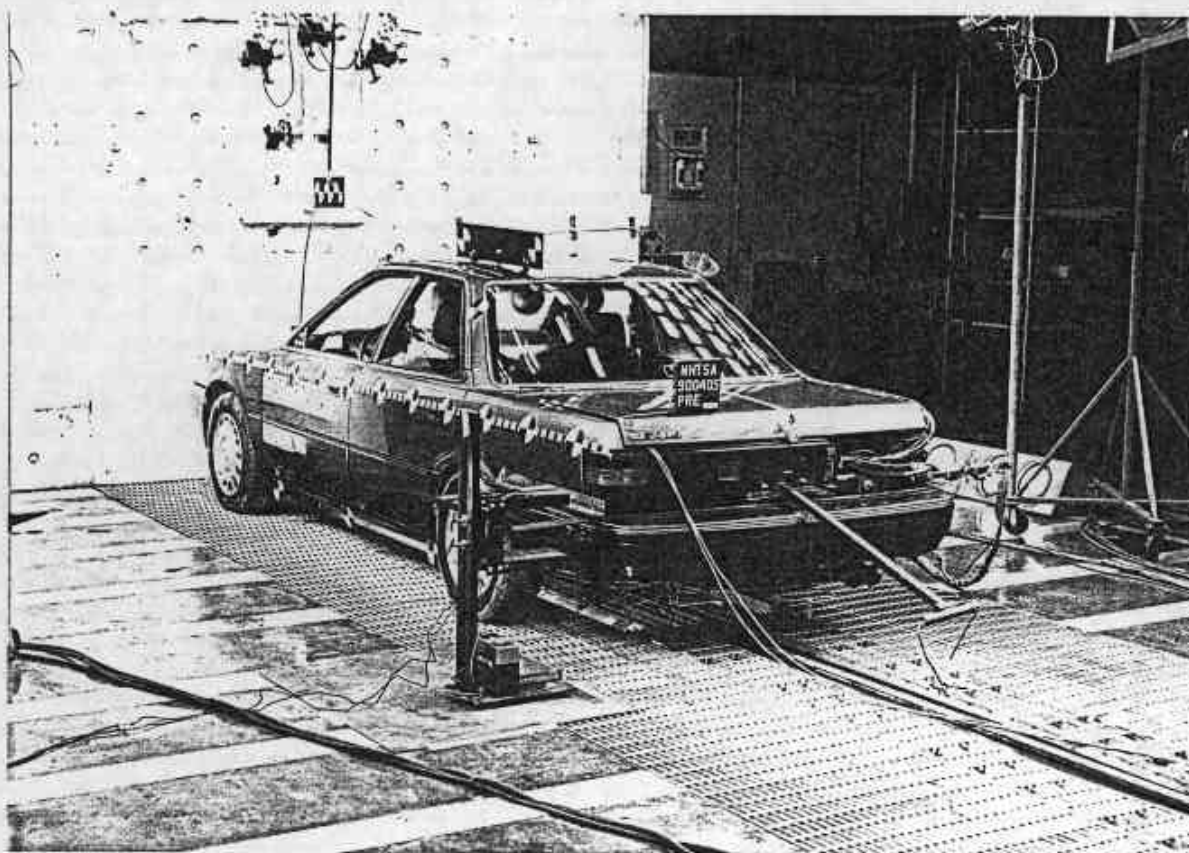


Figure A-9. PRE-TEST LEFT REAR THREE-QUARTER VIEW



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

A-6

300405

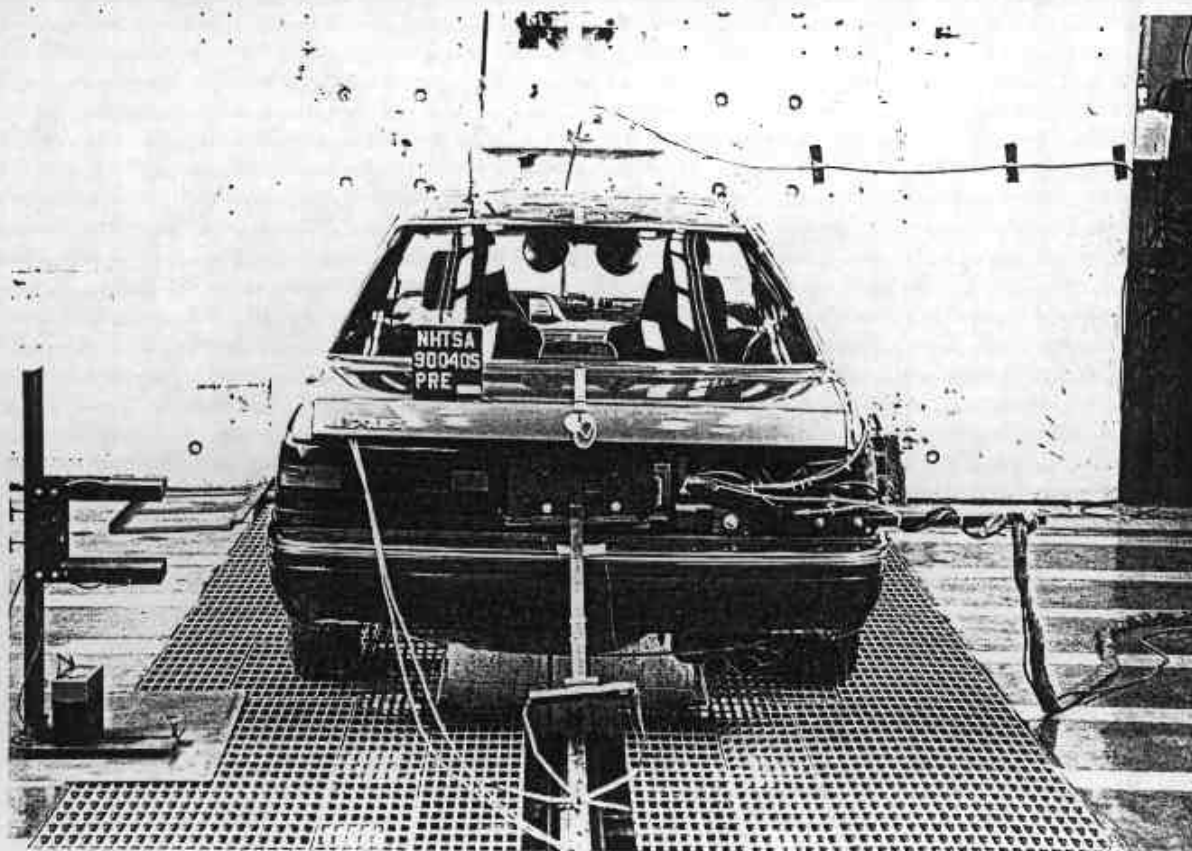


Figure A-11. PRE-TEST REAR VIEW



Figure A-12. POST-TEST REAR VIEW



Figure A-13. PRE-TEST WINDSHIELD VIEW

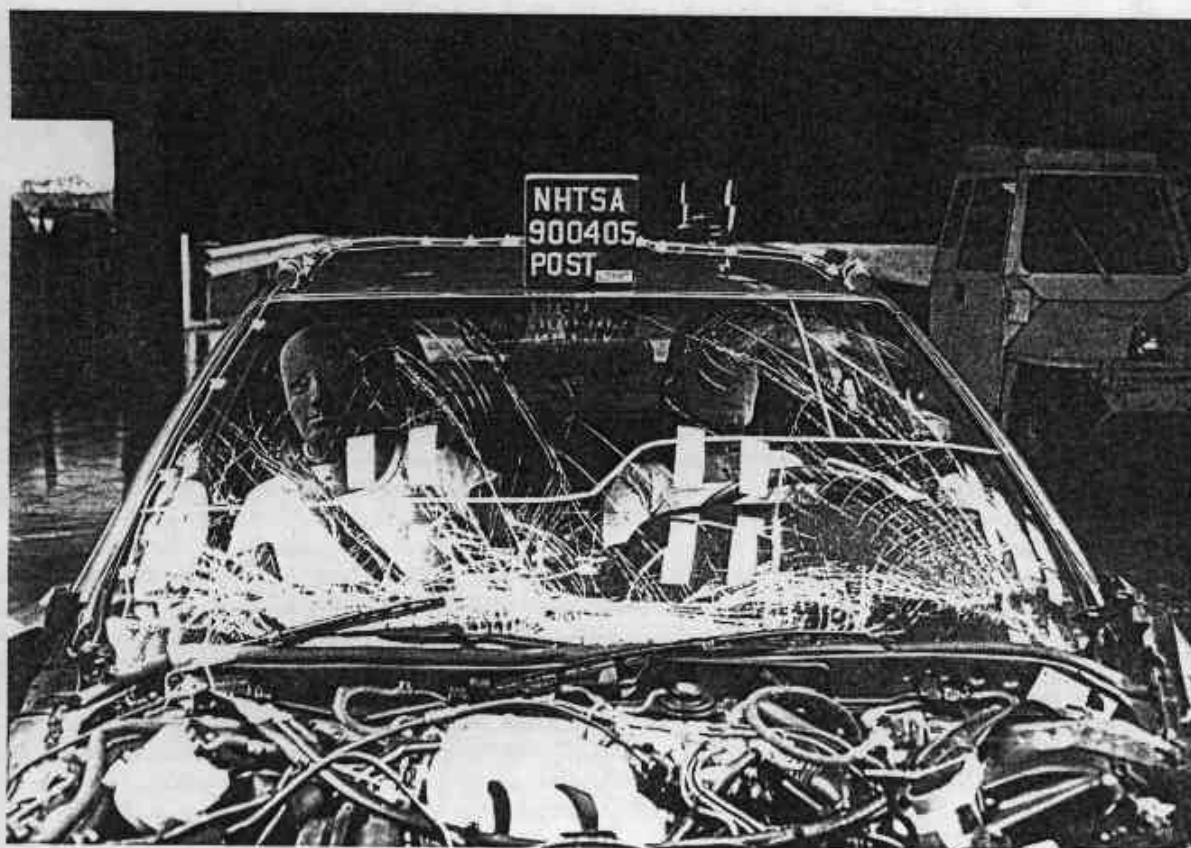


Figure A-14. POST-TEST WINDSHIELD VIEW

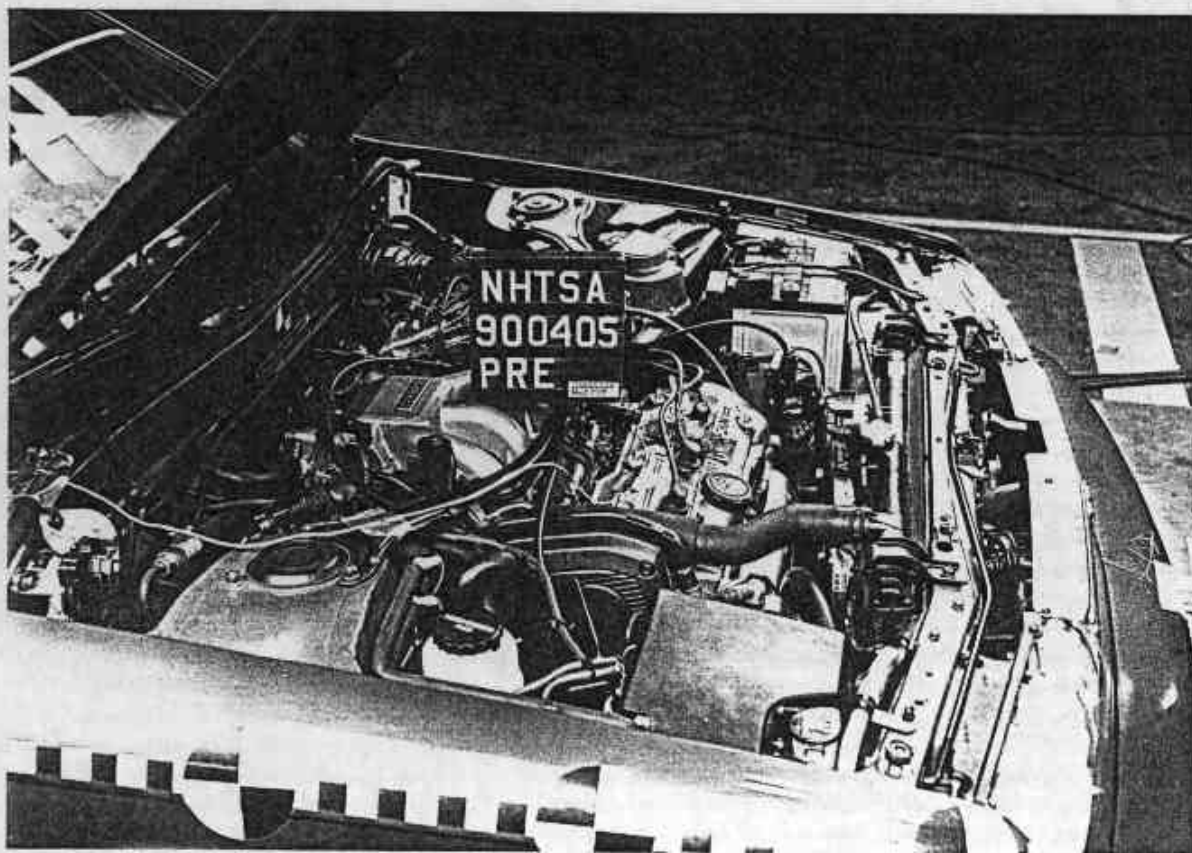


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW

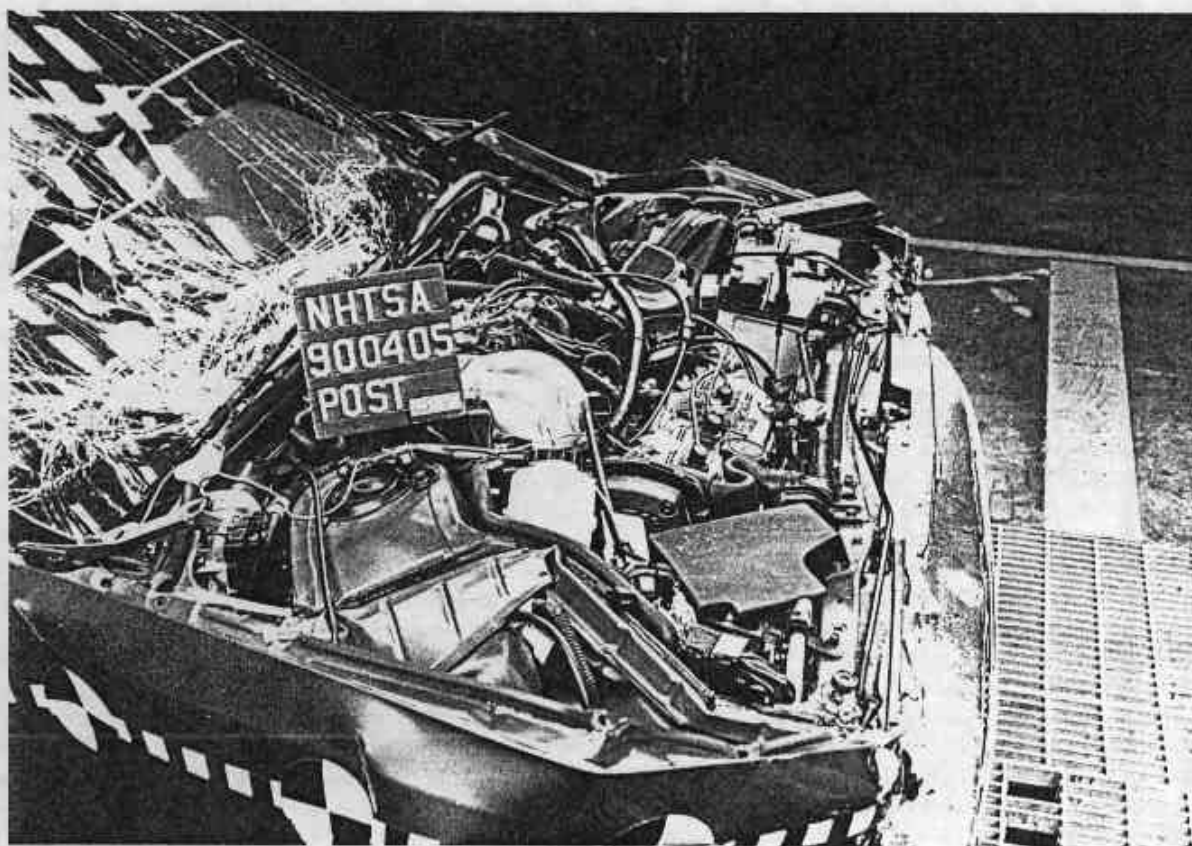


Figure A-16. POST-TEST ENGINE COMPARTMENT VIEW



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

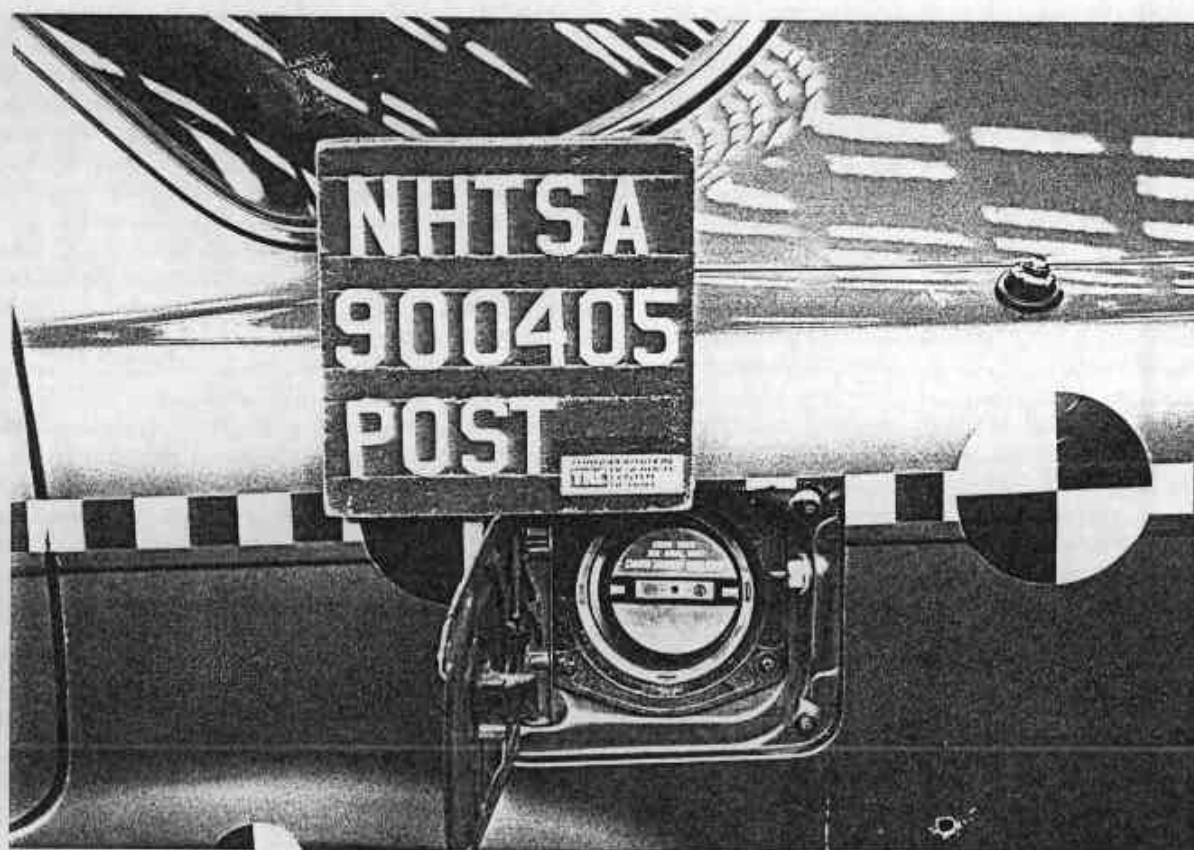


Figure A-18. POST-TEST FUEL FILLER CAP VIEW

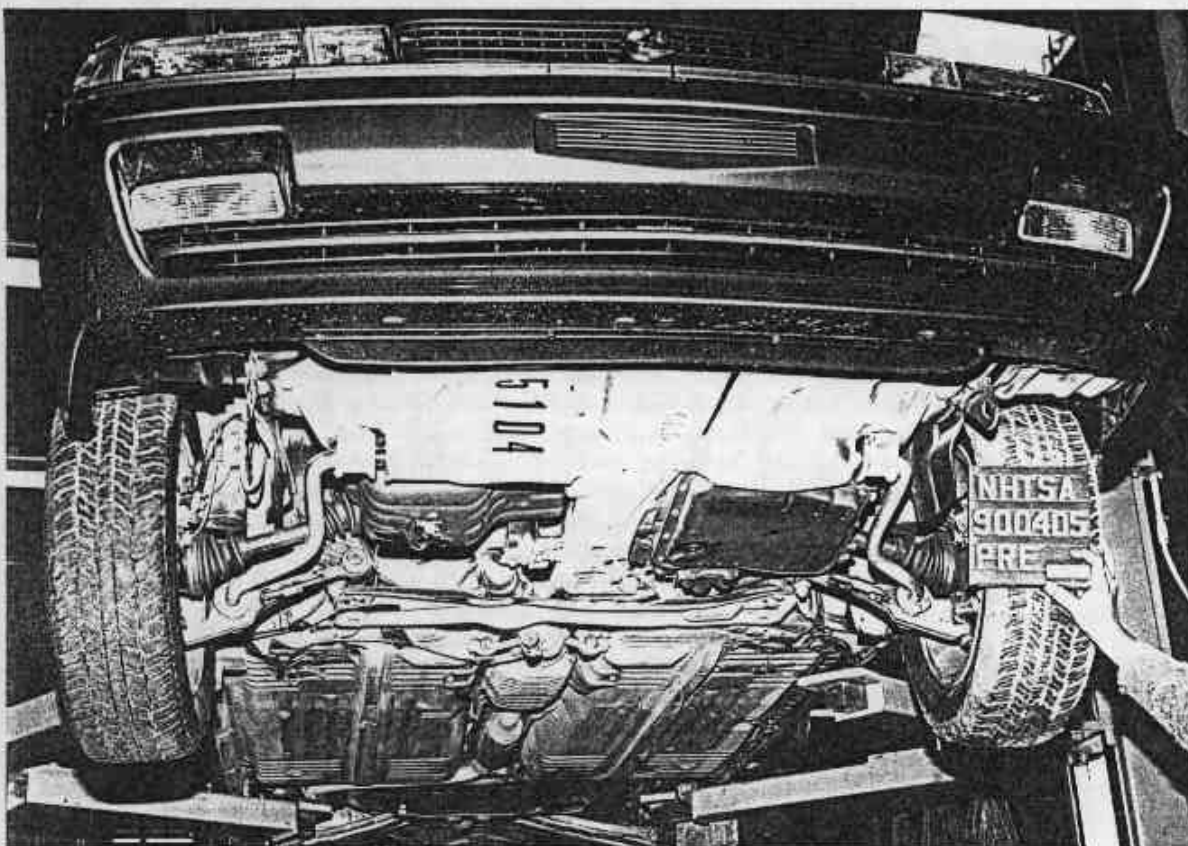


Figure A-19. PRE-TEST FRONT UNDERBODY VIEW

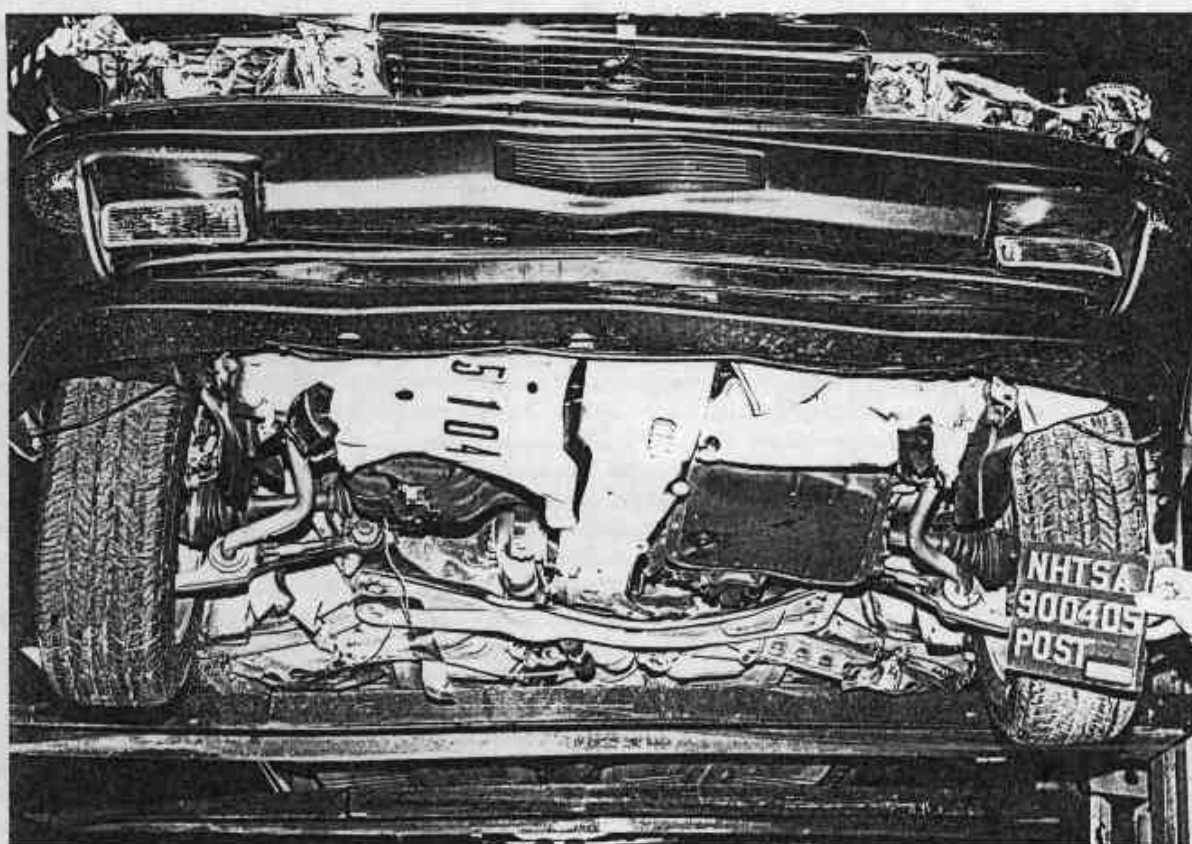


Figure A-20. POST-TEST FRONT UNDERBODY VIEW

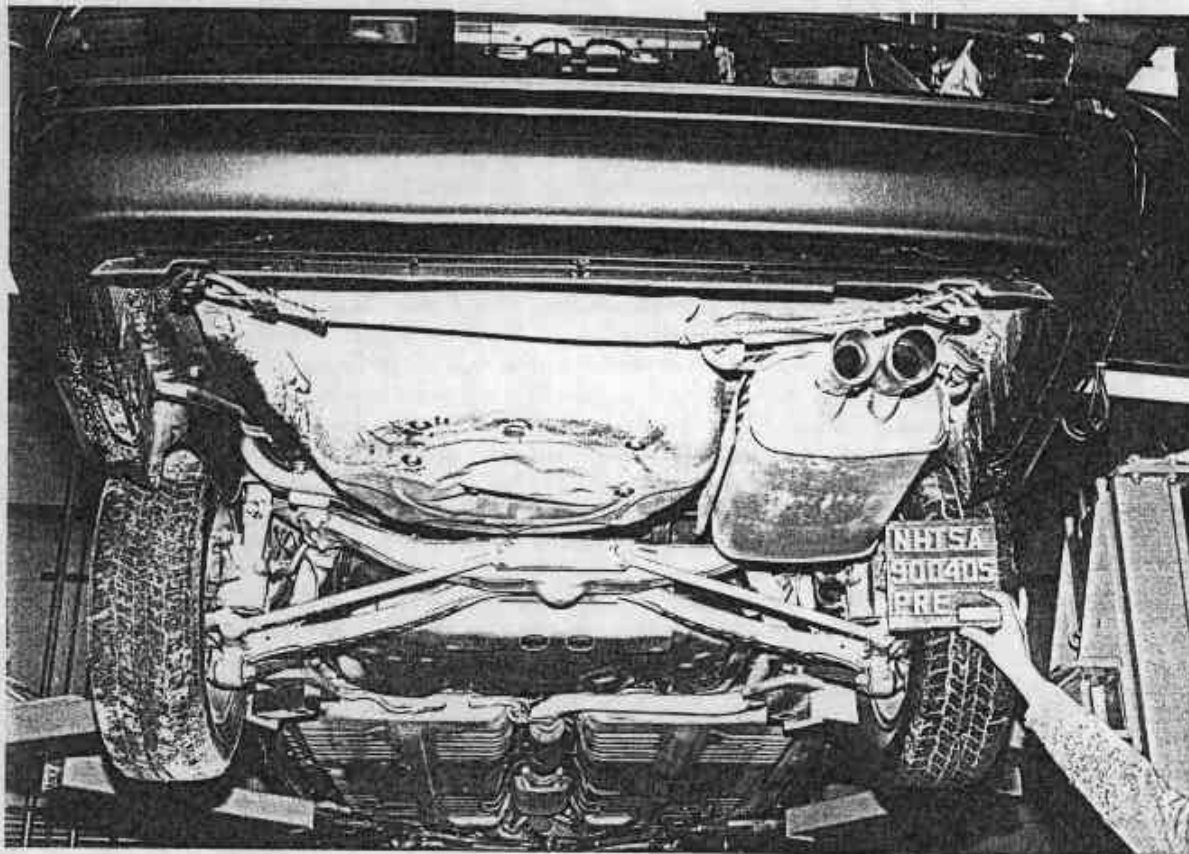


Figure A-21. PRE-TEST REAR UNDERBODY VIEW

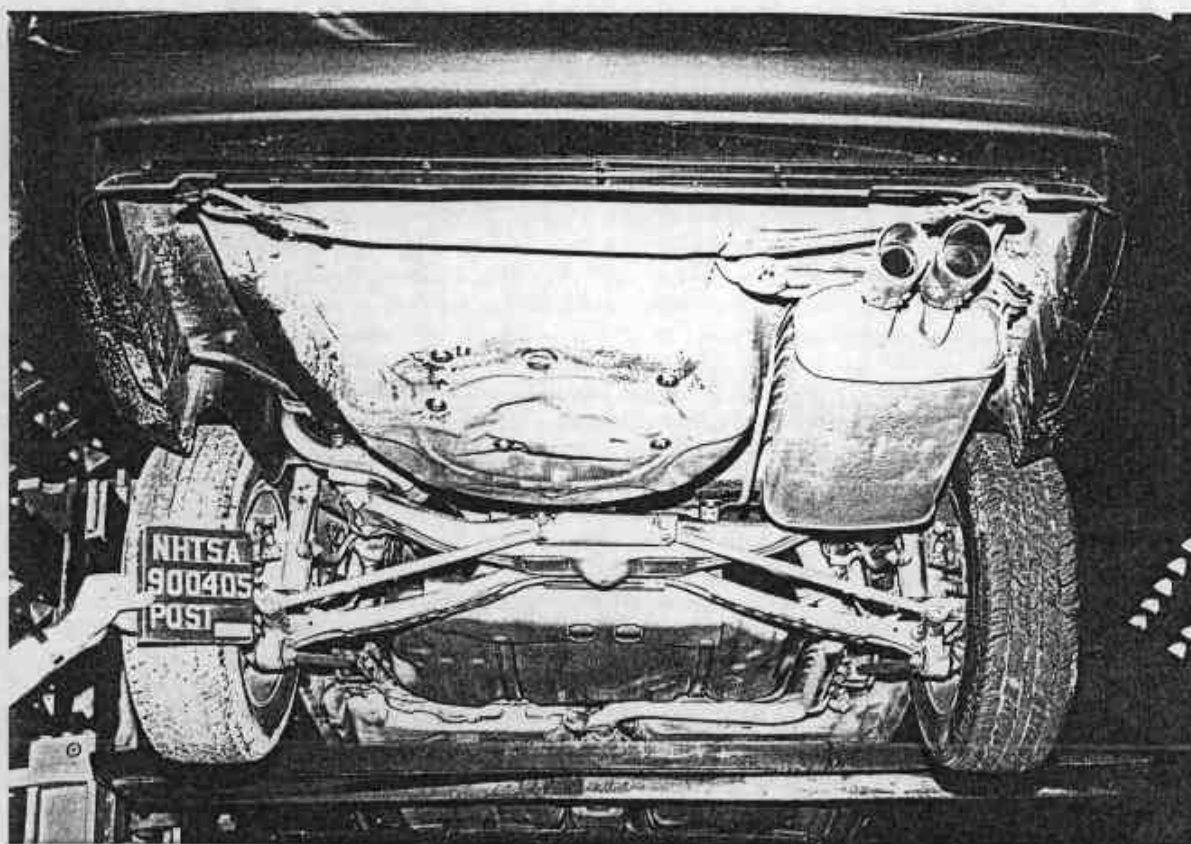


Figure A-22. POST-TEST REAR UNDERBODY VIEW

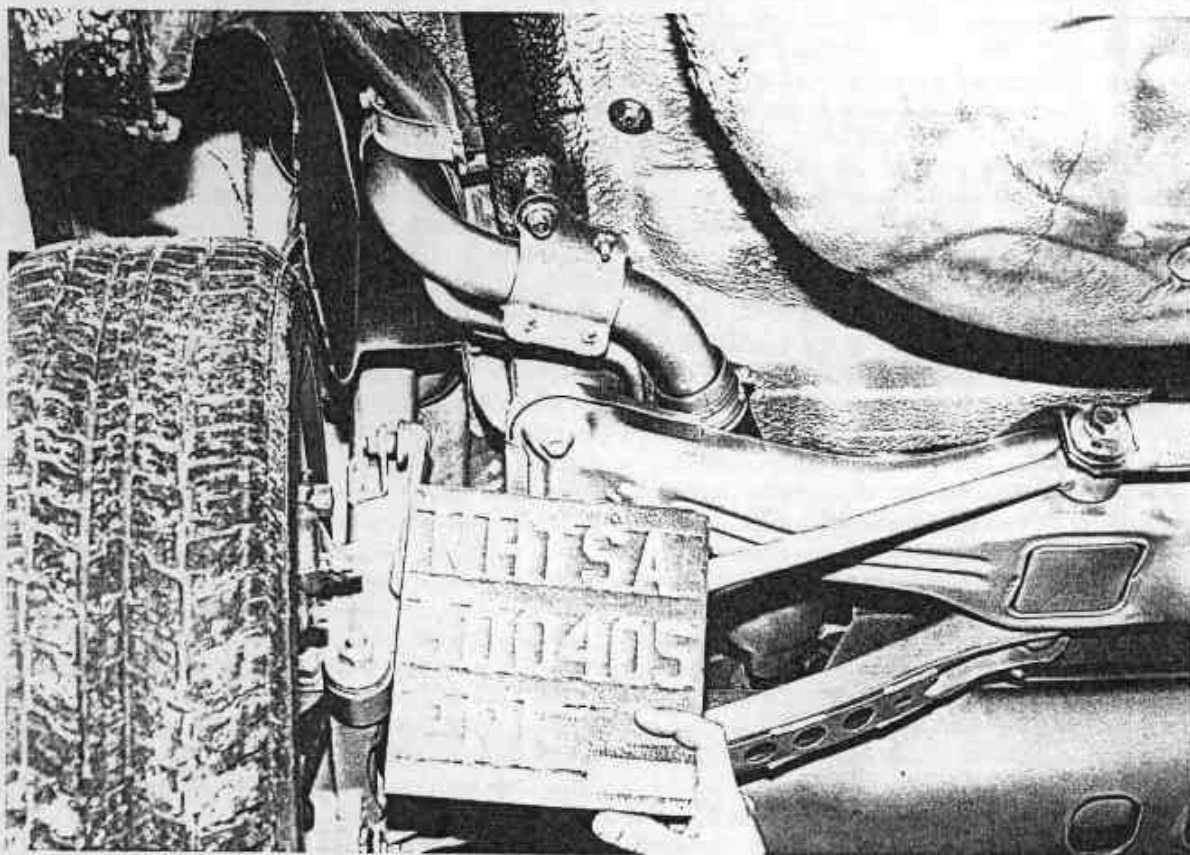


Figure A-23. PRE-TEST FUEL FILLER NECK VIEW



Figure A-24. PRE-TEST BALLAST LOCATION VIEW



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



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



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



Figure A-28. POST-TEST PASSENGER DUMMY POSITION VIEW

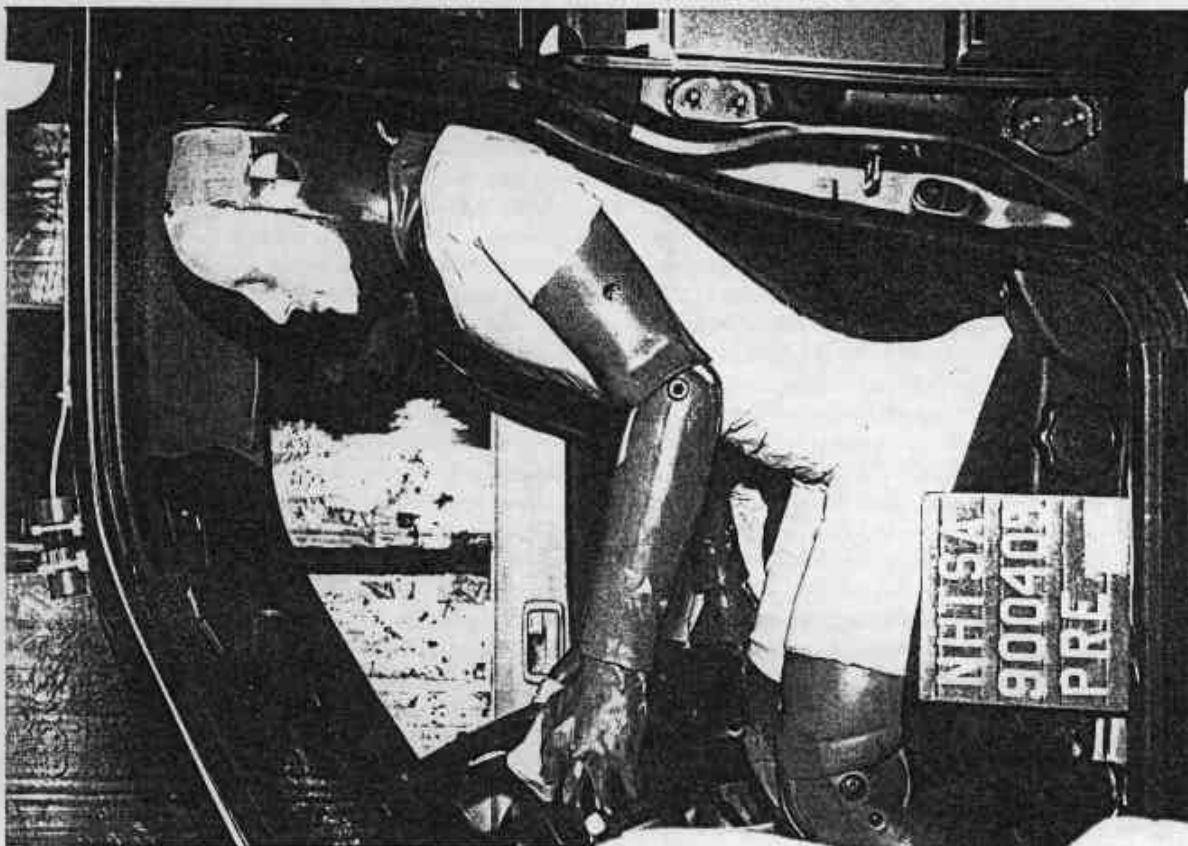


Figure A-29. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

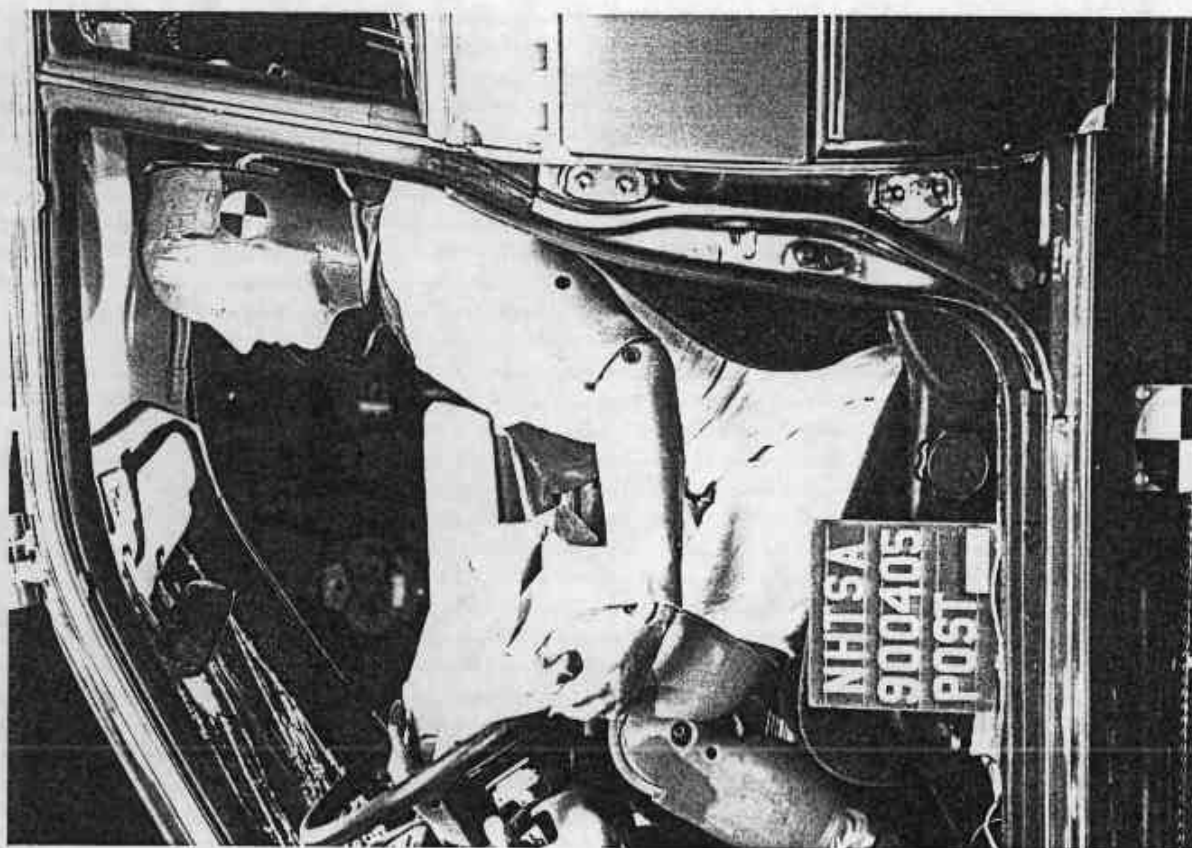


Figure A-30. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

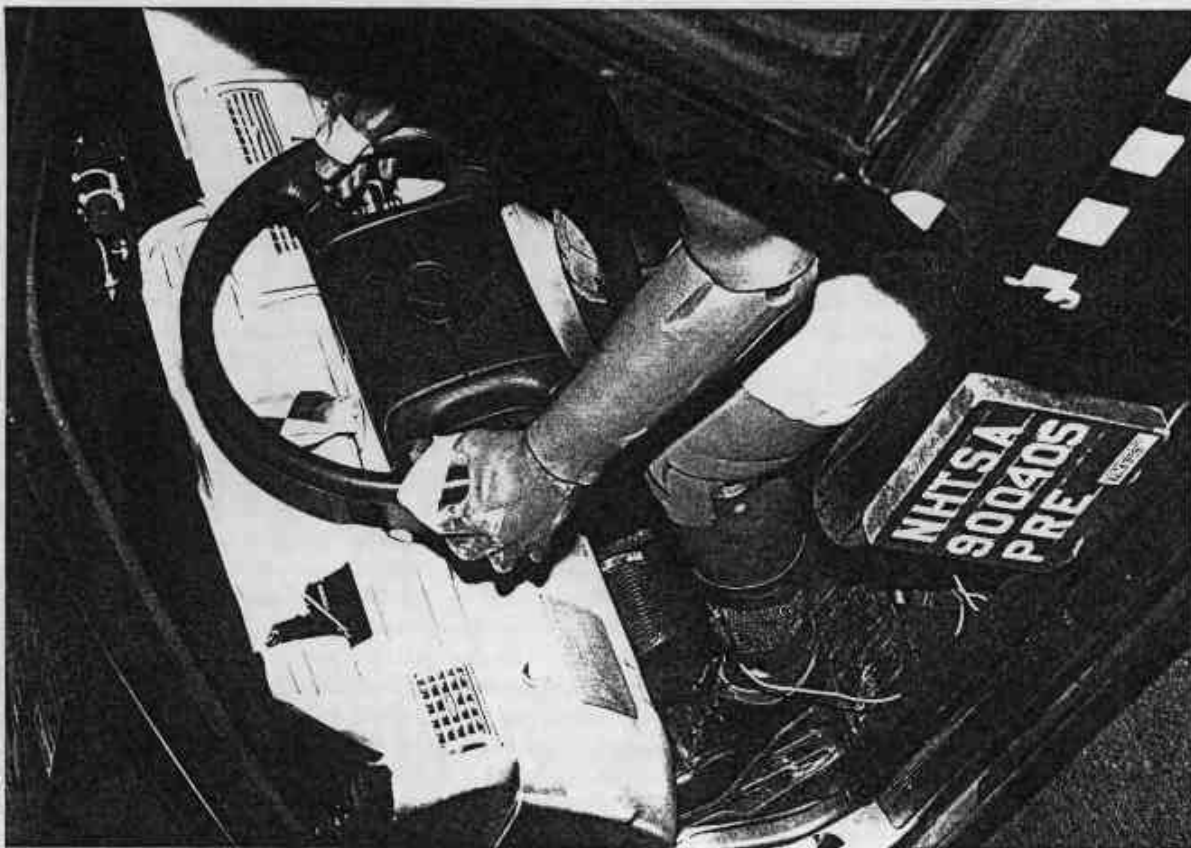


Figure A-31. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

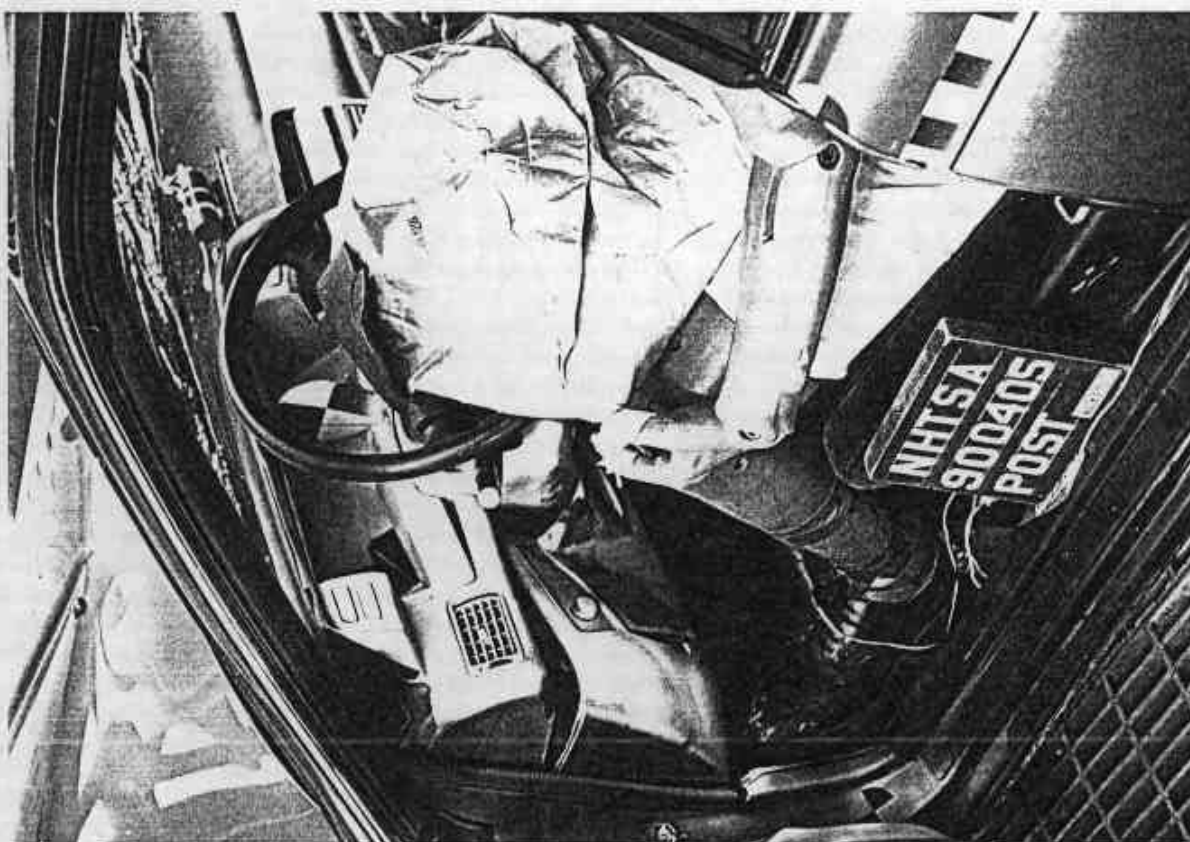


Figure A-32. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

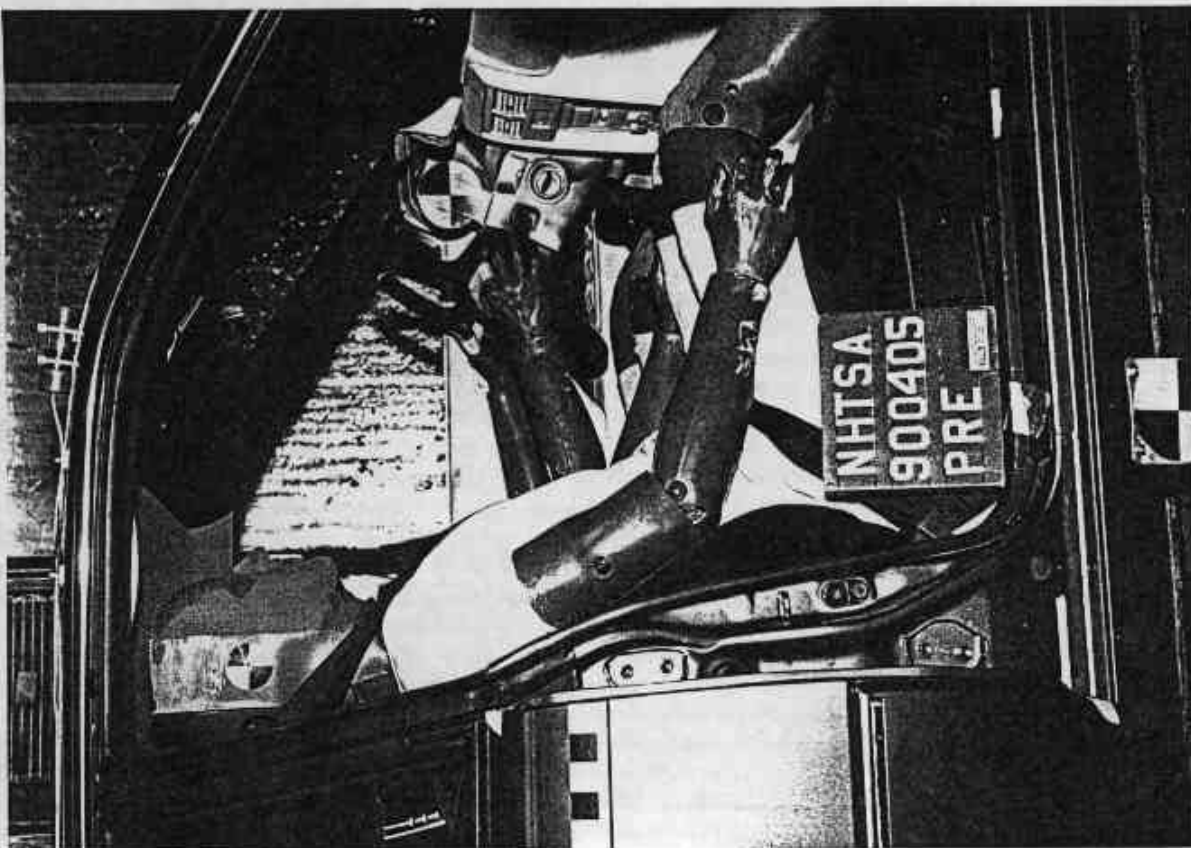


Figure A-33. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

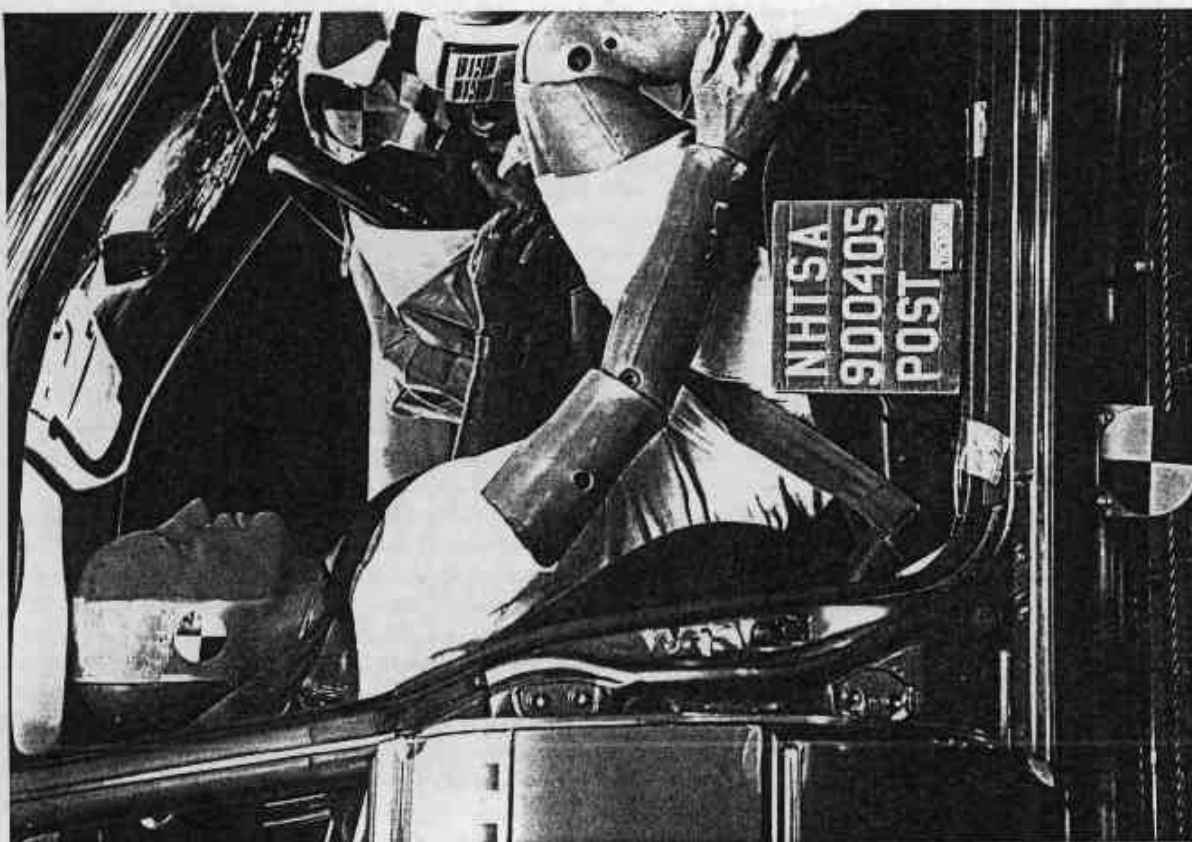


Figure A-34. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1



Figure A-35. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2



Figure A-36. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2



Figure A-37. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 1



Figure A-38. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 2



Figure A-39. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 3

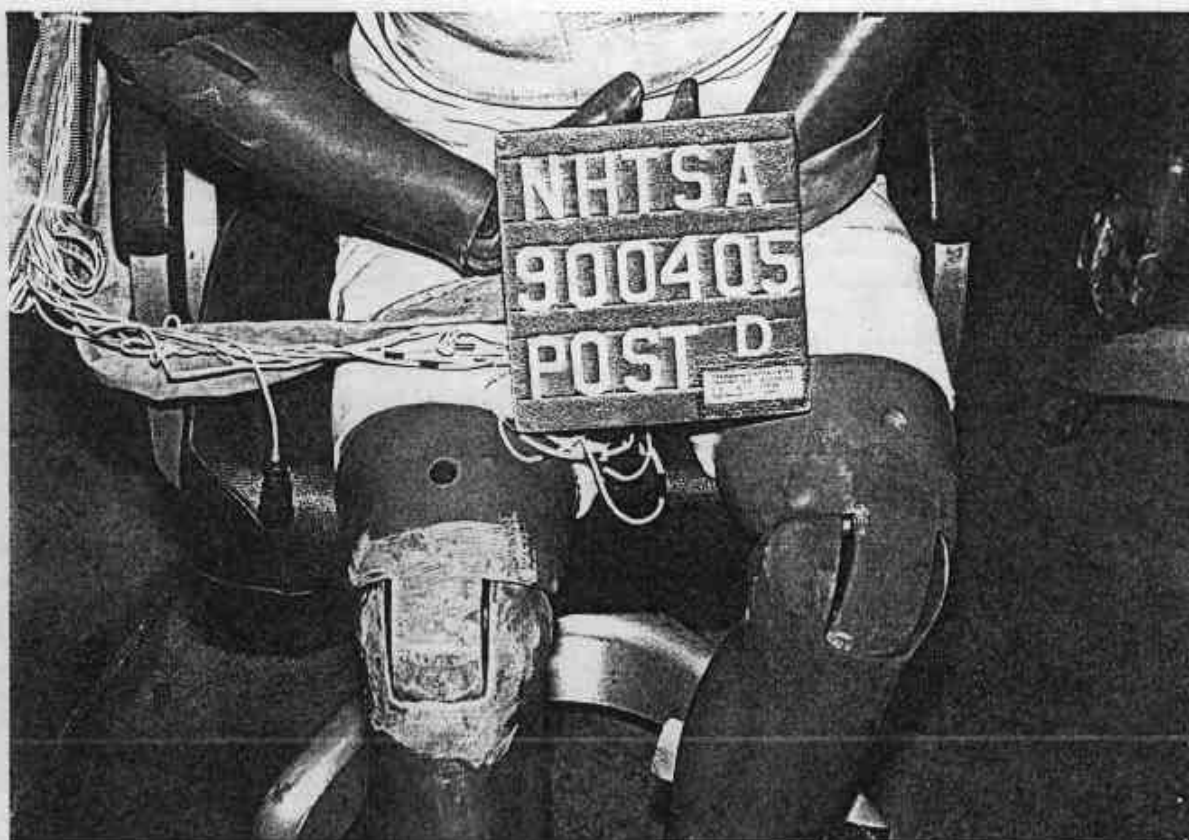


Figure A-40. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1



Figure A-41. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 2.



Figure A-42. POST-TEST PASSENGER DUMMY HEAD CONTACT VIEW



Figure A-43. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1



Figure A-44. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2

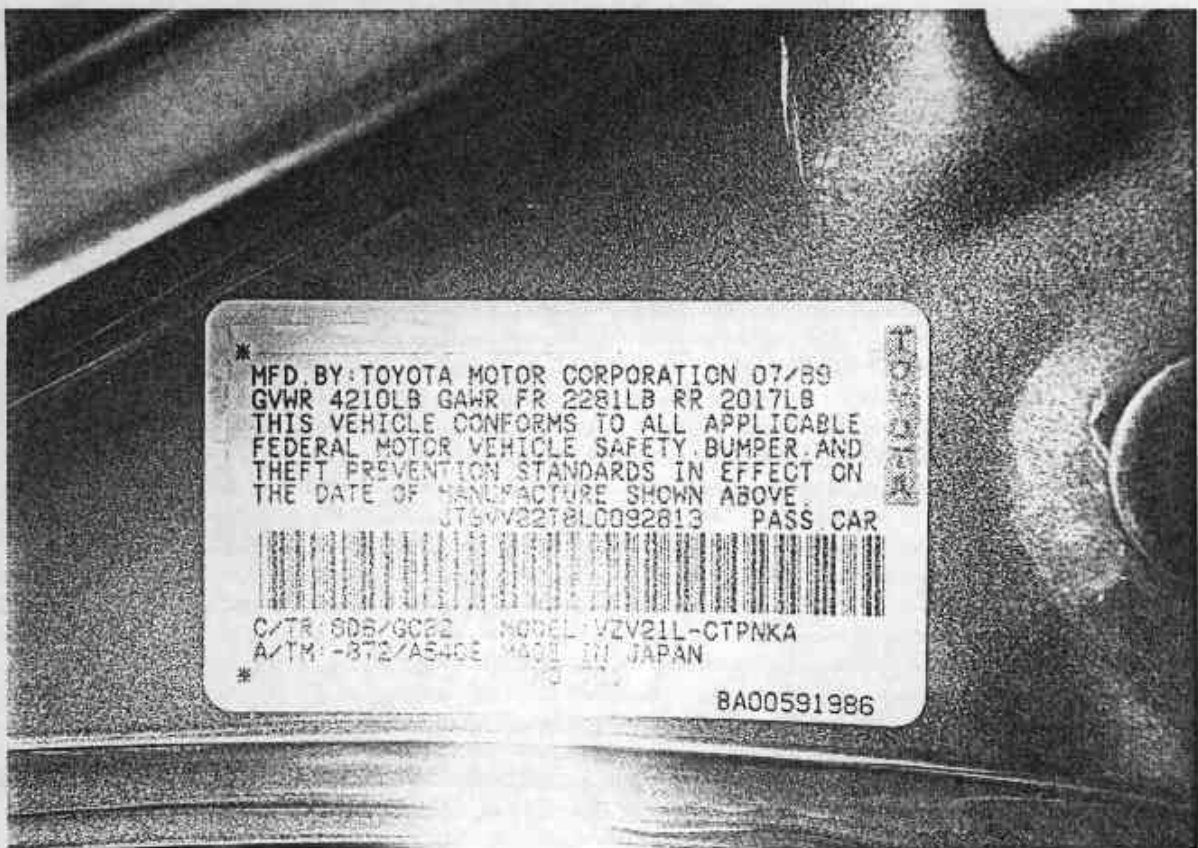


Figure 45. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW

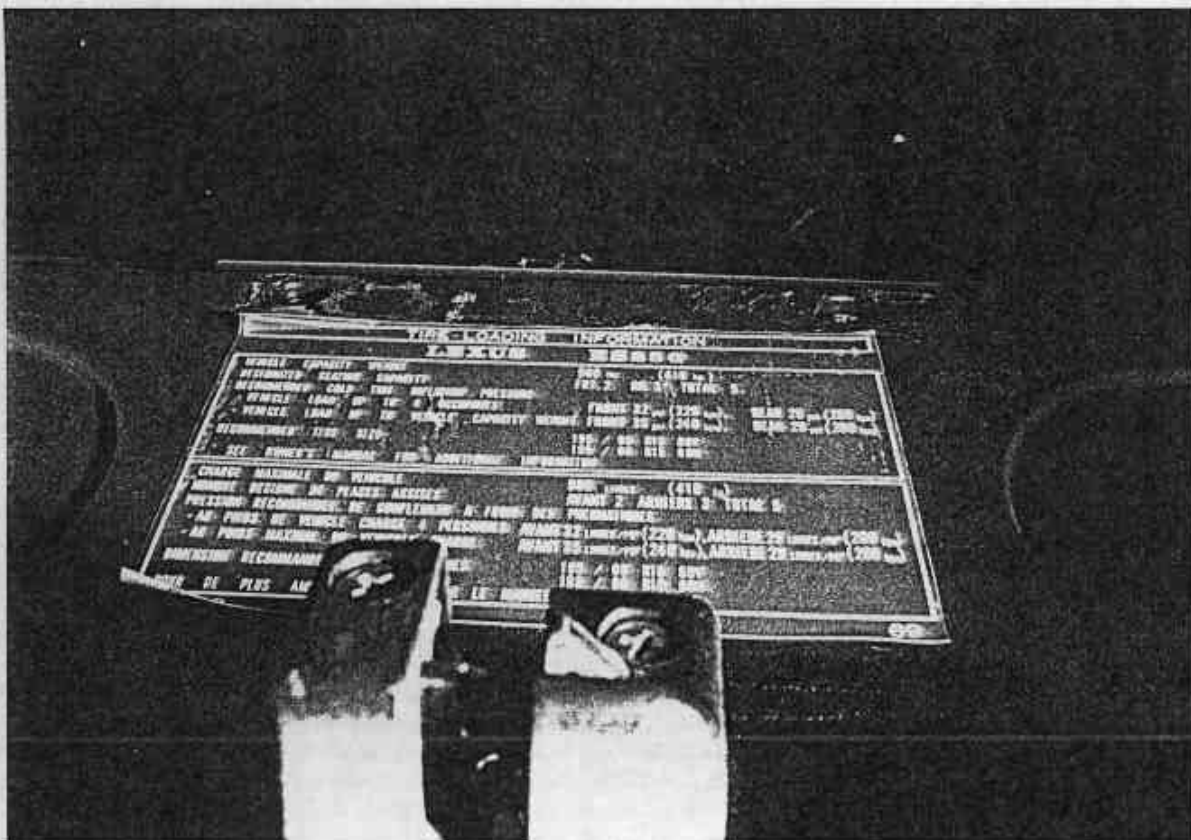


Figure A-46. POST-TEST VEHICLE TIPE LOAD LABEL VIEW

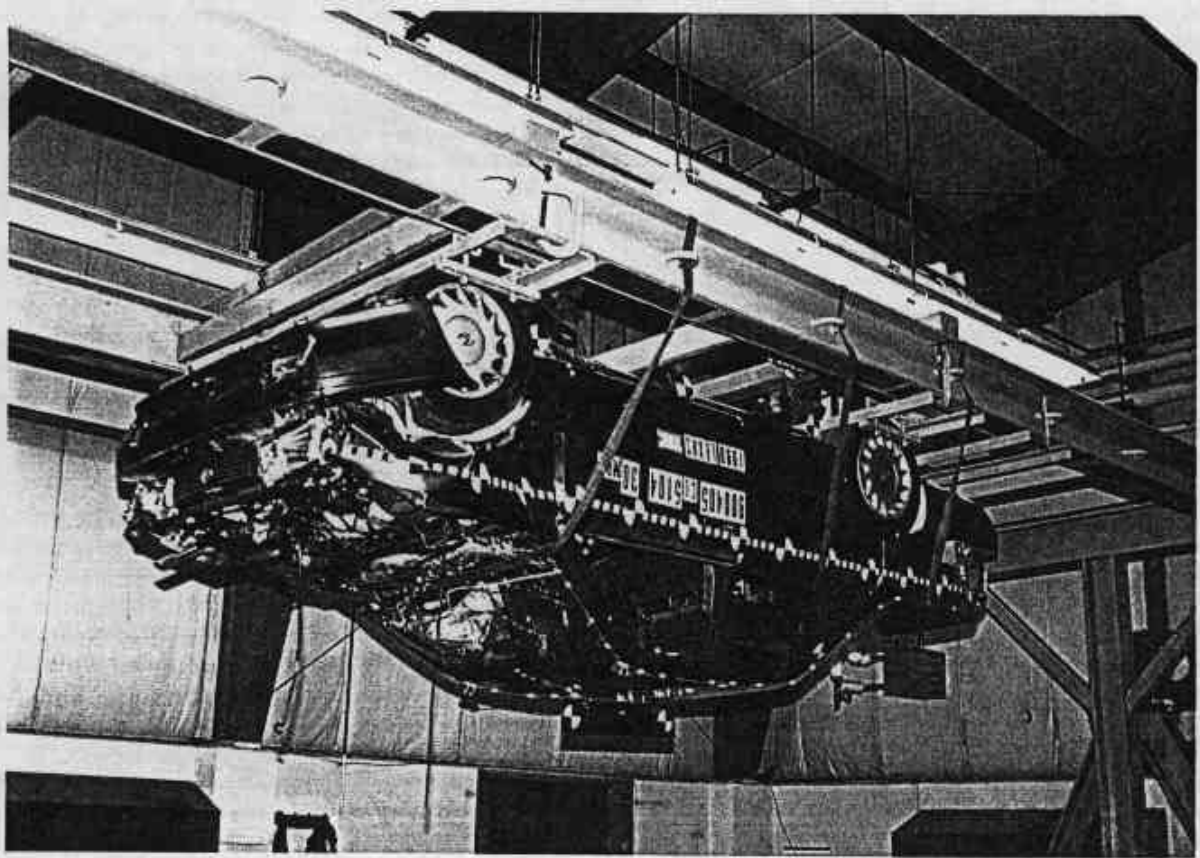


Figure A-47. POST-TEST VEHICLE ON ROLLOVER MACHINE VIEW

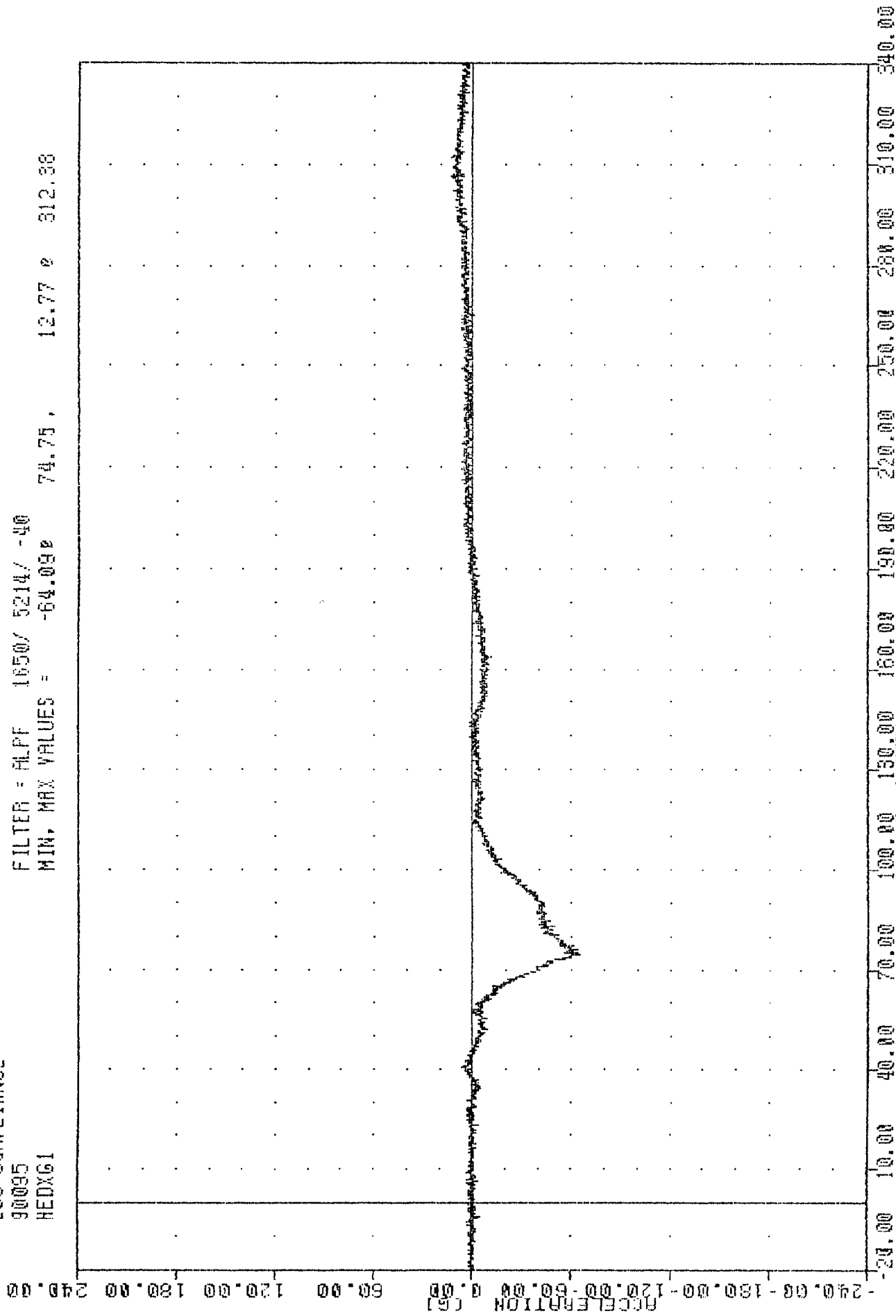
APPENDIX B

DATA PLOTS

DUMMY AND VEHICLE AXES: X: FRONT/REAR
Y: LEFT/RIGHT
Z: UP/DOWN

TRC , 900405
 208 COMPLIANCE
 90035
 HEDXG1

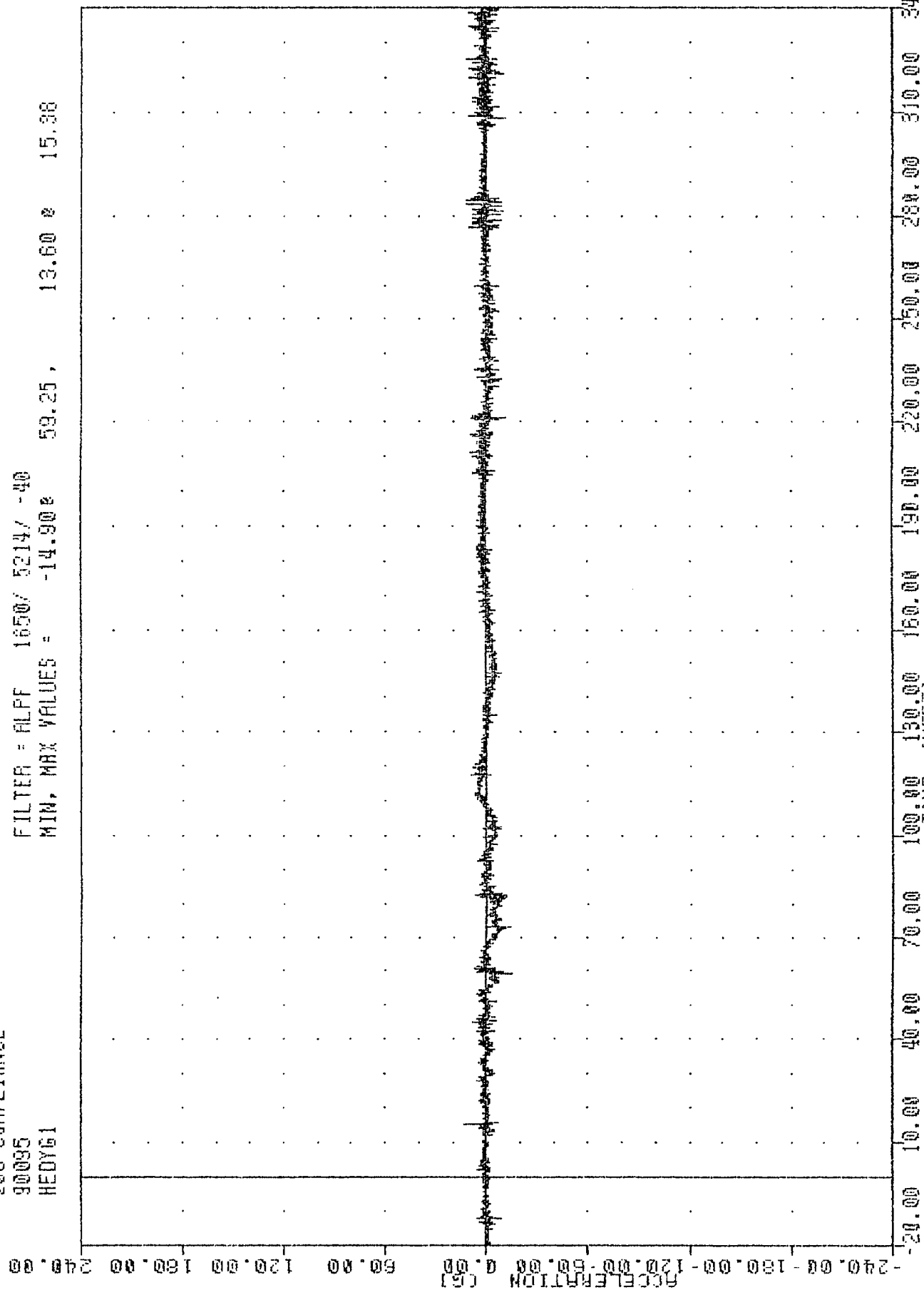
FILTER = ALPF 1650/ 5214/ -40
 MIN. MAX VALUES = -64.098 74.75 , 12.77 e 312.38



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 DRIVER HEAD X AXIS ACCELERATION

TRC 900405
 208 COMPLIANCE
 90035
 HEDY61

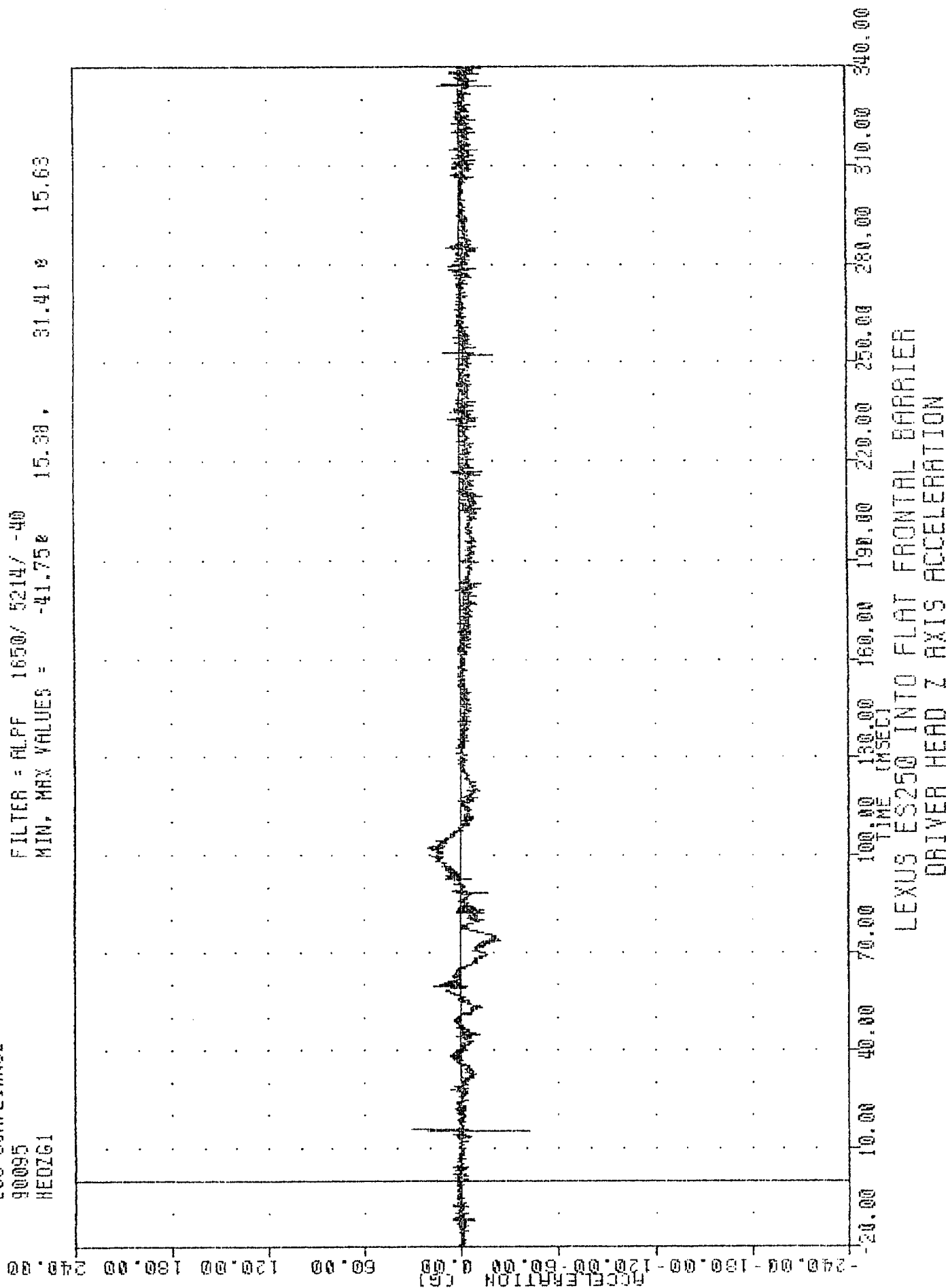
FILTER = ALPF 1650/ 5214/ -40
 MIN, MAX VALUES = -14.90e 59.25, 13.60 e 15.38



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Y AXIS ACCELERATION

TRC , 800405
 208 COMPLIANCE
 90095
 HEDZG1

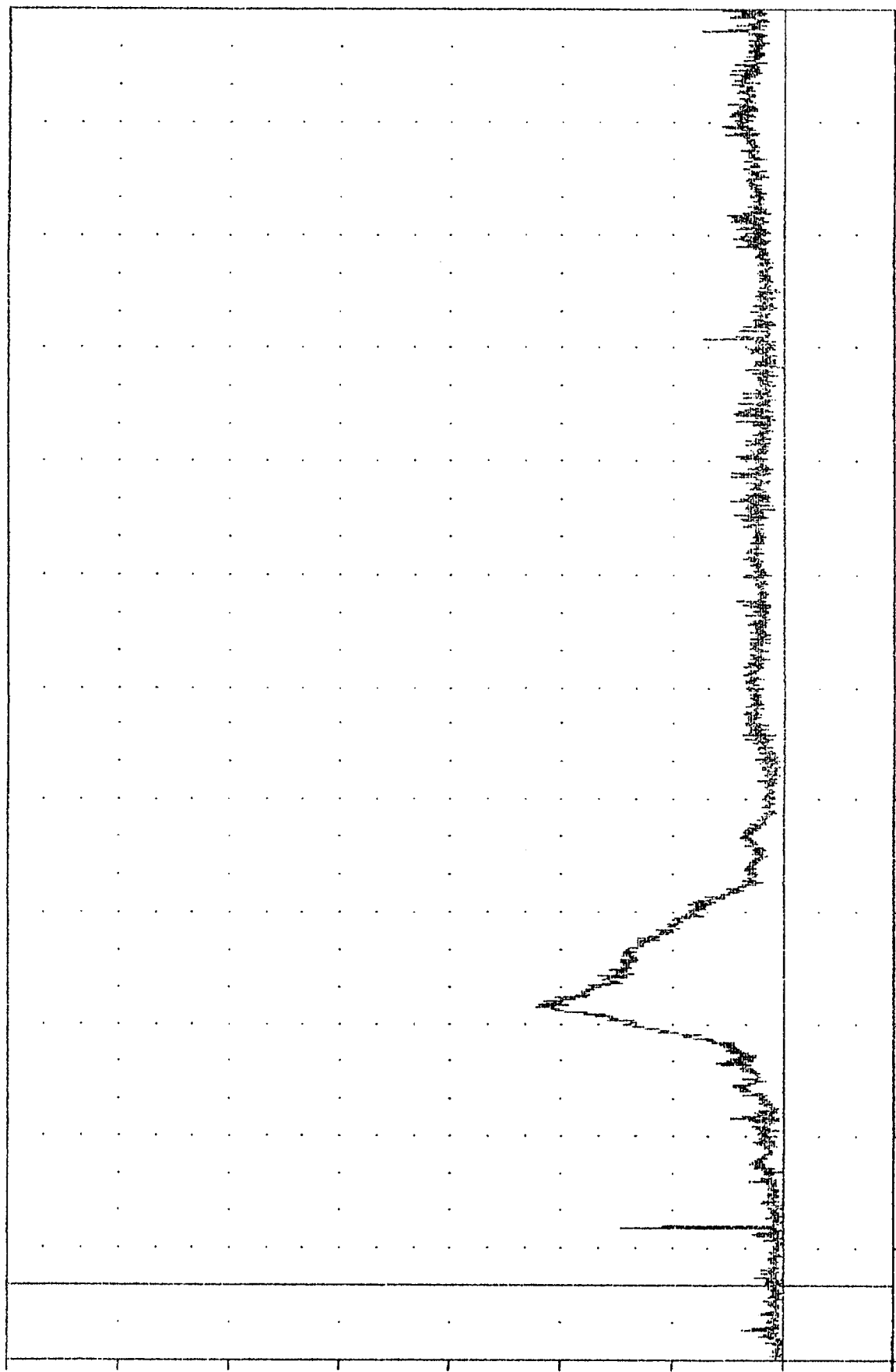
FILTER = ALPF 1650/ 5214/ -40
 MIN. MAX VALUES = -41.75e 15.38 , 31.41 e 15.63



TRC , 900405
 200 COMPLIANCE
 90095
 HEADG1

FILTER = ALPF 1650/ 5214/ -40
 MIN, MAX VALUES = 0.172 -18.50 . 56.79 0 74.75

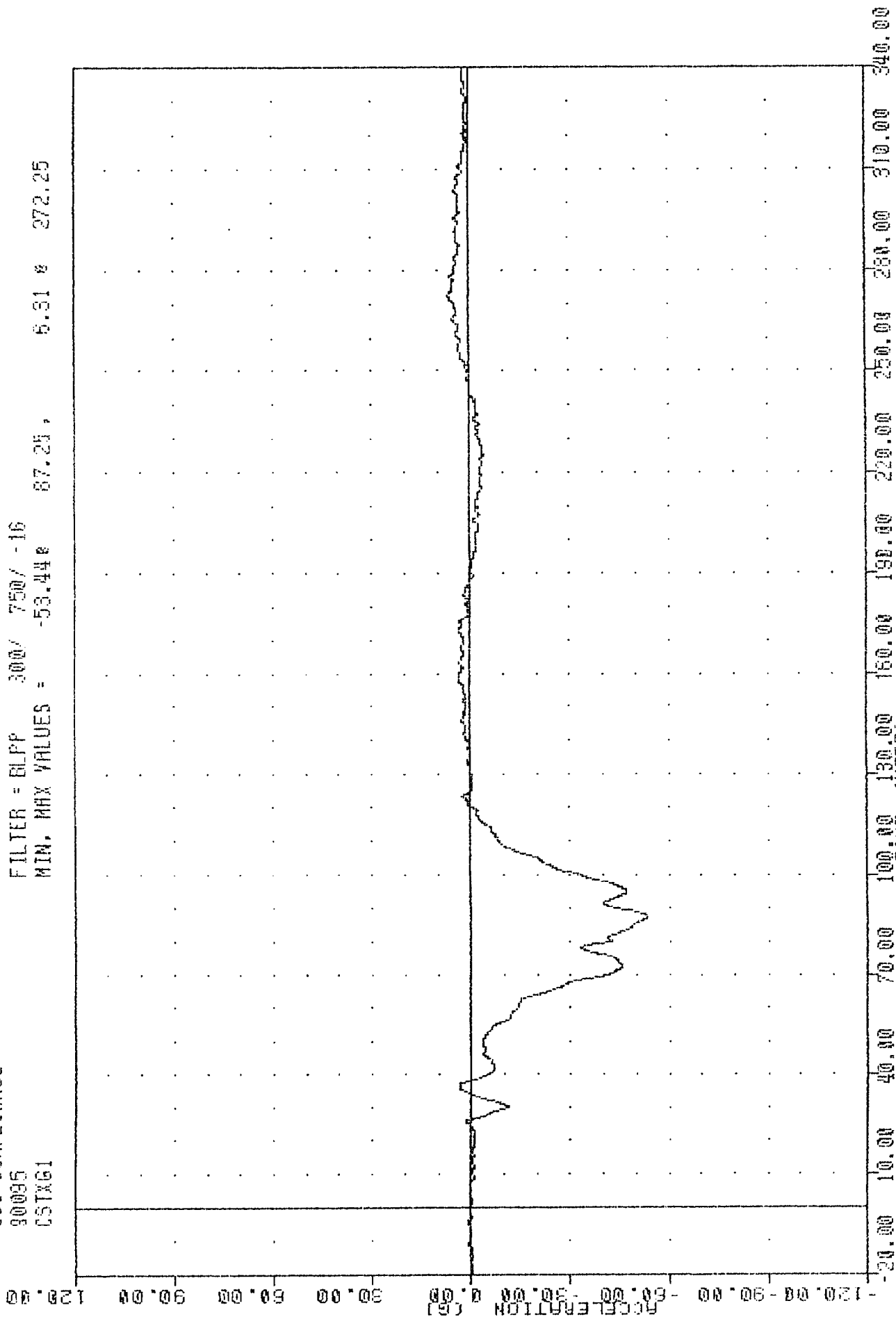
ACCELERATION (g)



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 DRIVER HEAD RESULTANT ACCELERATION

TRC , 900405
 208 COMPLIANCE
 90095
 CSTXG1

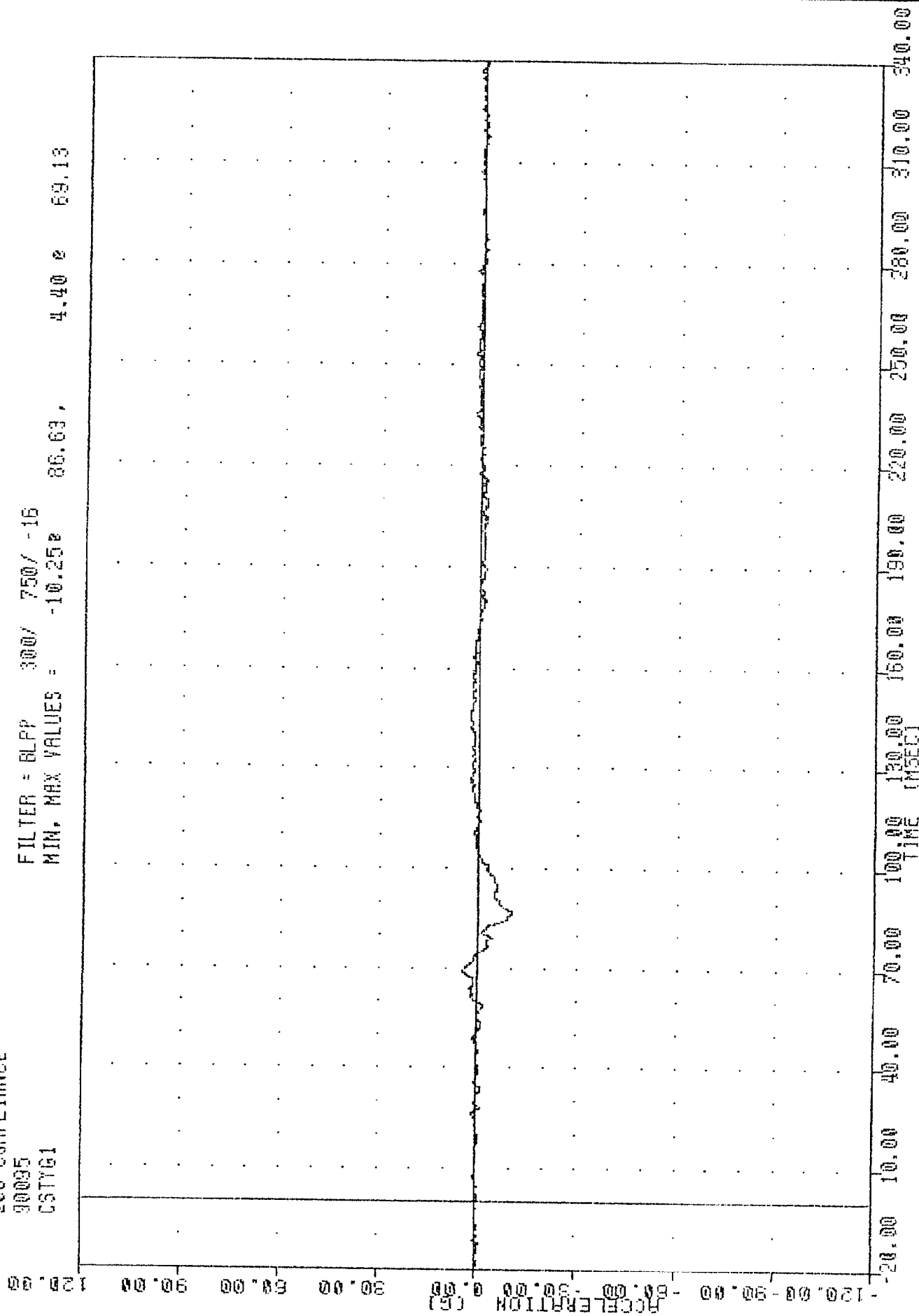
FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -53.44e 87.25, 6.61e 272.25



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Y AXIS ACCELERATION

TRC , 900405
200 COMPLIANCE
90095
CSTY61

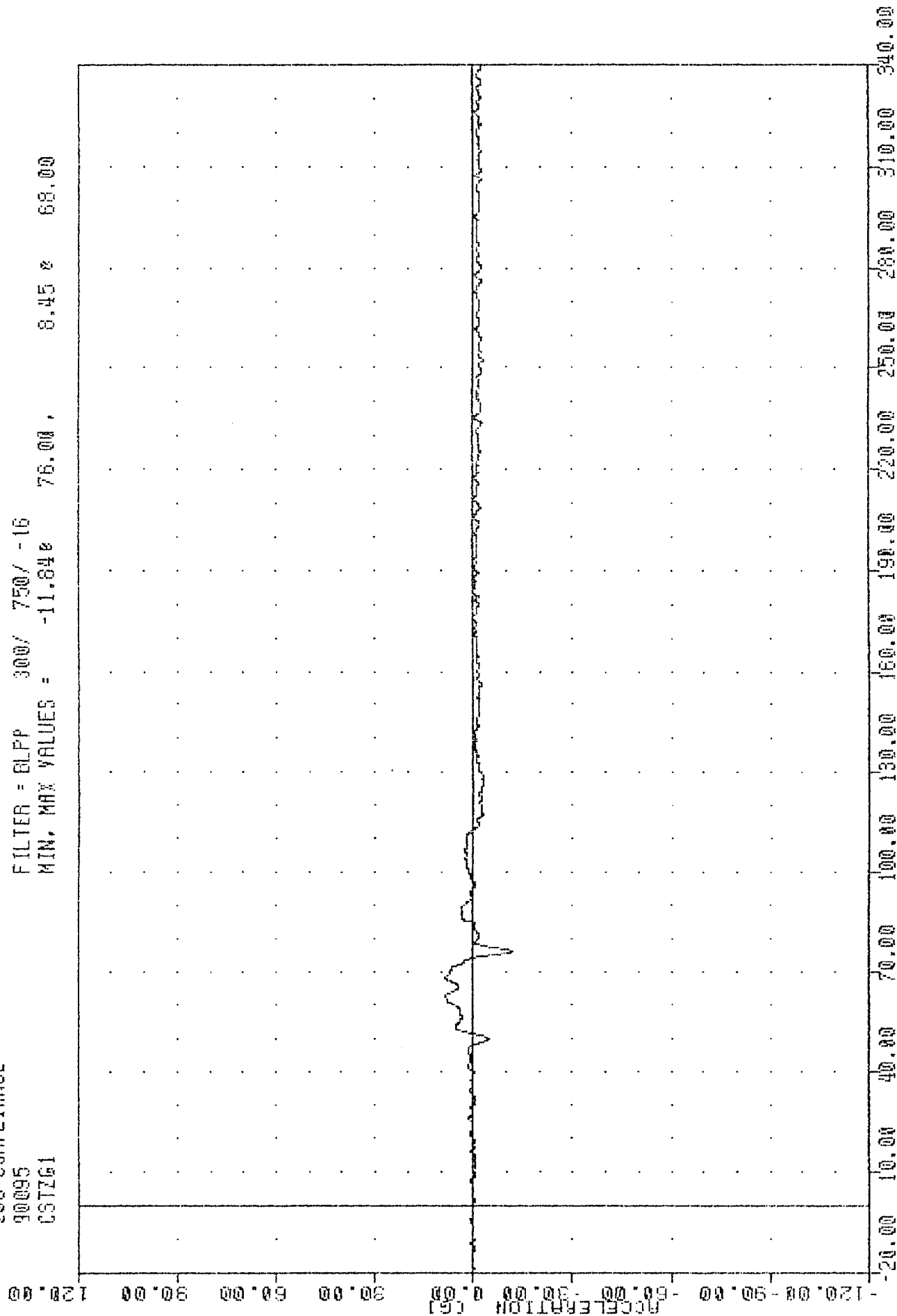
FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -10.25e 86.63, 4.40 e 69.13



LEXUS ES250 INTO FLAT FRONTAL BARRIER
NATIVE CHEST Y AXIS ACCELERATION

TRC , 900405
 200 COMPLIANCE
 90095
 CSTZ61

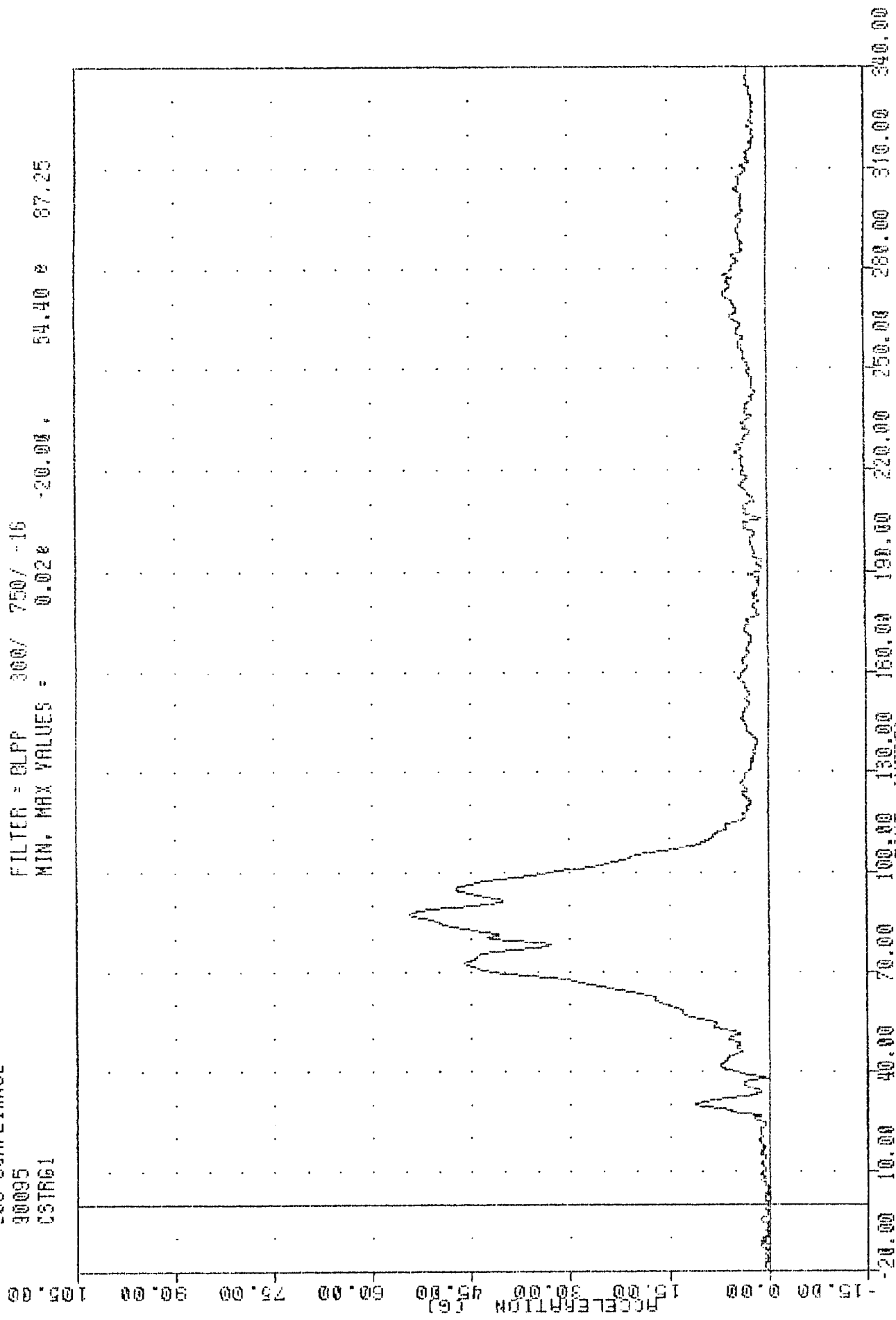
FILTER = BLPP 300/ 750/ -16
 MIN, MAX VALUES = -11.840 76.00 , 8.45 0 68.00



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 DRIVER CHEST 7 AXIS ACCELERATION

TRC , 900405
 200 COMPLIANCE
 90095
 CSTRG1

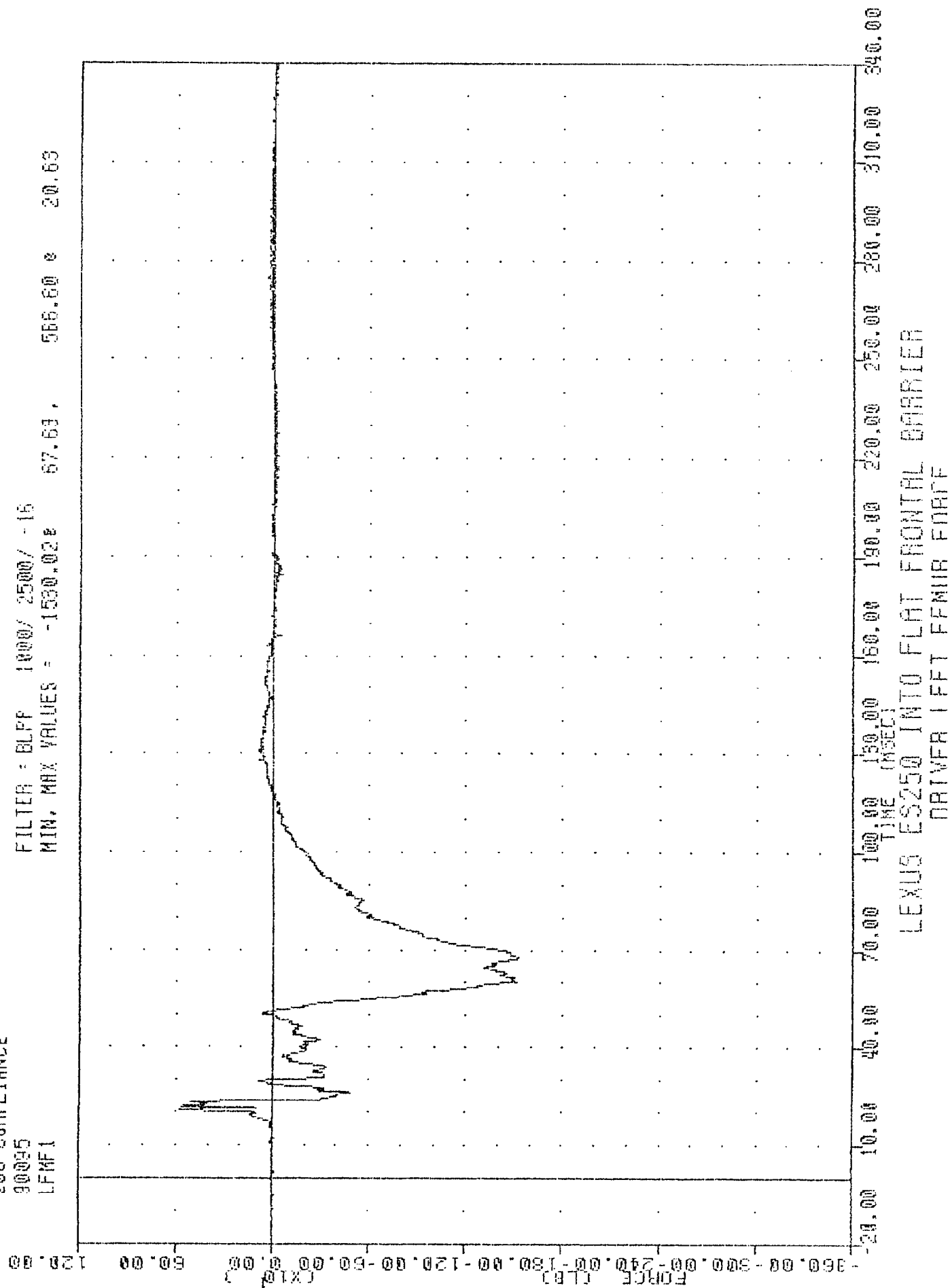
FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = 0.020 -20.00 54.40 0 07.25



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 DRIVER CHEST RESULTANT ACCELERATION

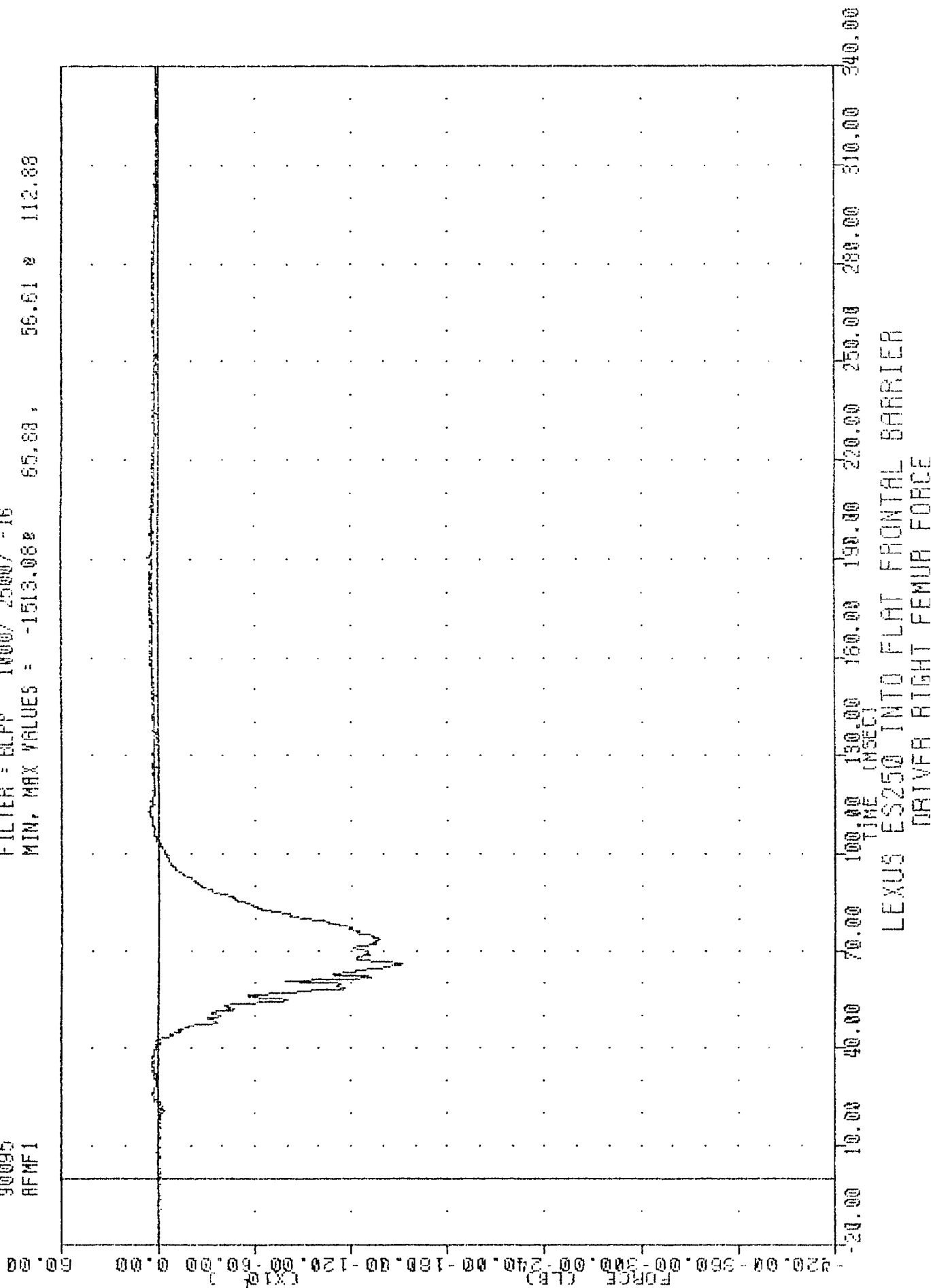
TRC , 900405
 208 COMPLIANCE
 90095
 LFMF1

FILTER = BLPP 1000/ 2500/ -15
 MIN, MAX VALUES = -1530.028 67.63, 566.60 e 20.63



TRC 900405
 208 COMPLIANCE
 90095
 AFMF1

FILTER = BLPP 1000/ 2500/ -16
 MIN, MAX VALUES = -1513.08 55.88, 56.61 112.88



TRC : 900405

208 COMPLIANCE

90095

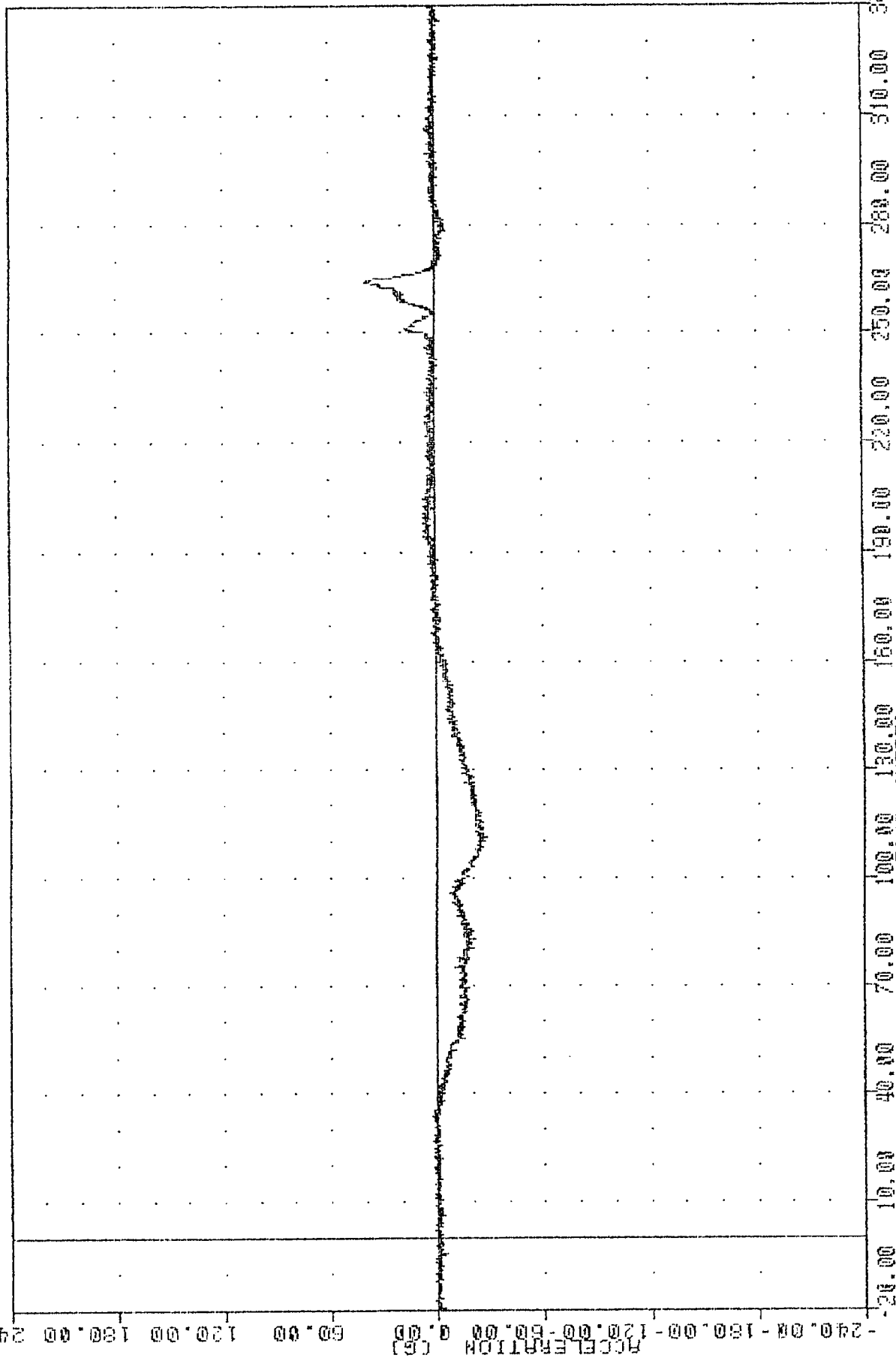
HEDX62

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -27.25%

111.10, 39.85 263.88

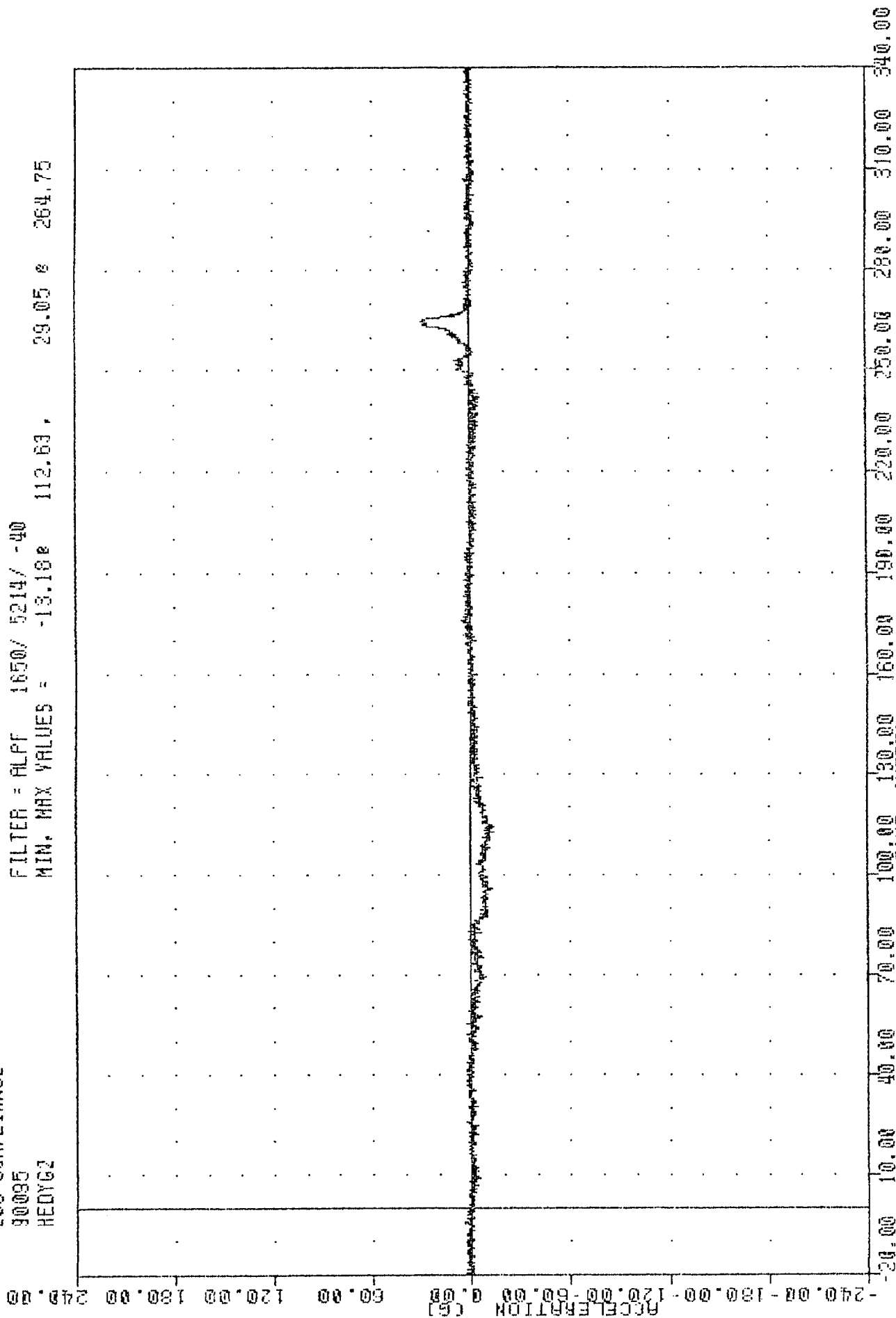
ACCELERATION (G)



LEXUS ES250 INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD X AXIS ACCELERATION

TRC , 900405
 208 COMPLIANCE
 90095
 HEDYG2

FILTER = ALPF 1650/ 5214/ -40
 MIN. MAX VALUES = -13.10e 112.63, 29.05 e 264.75



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER HEAD Y AXIS ACCELERATION

TAC , 900405

200 COMPLIANCE

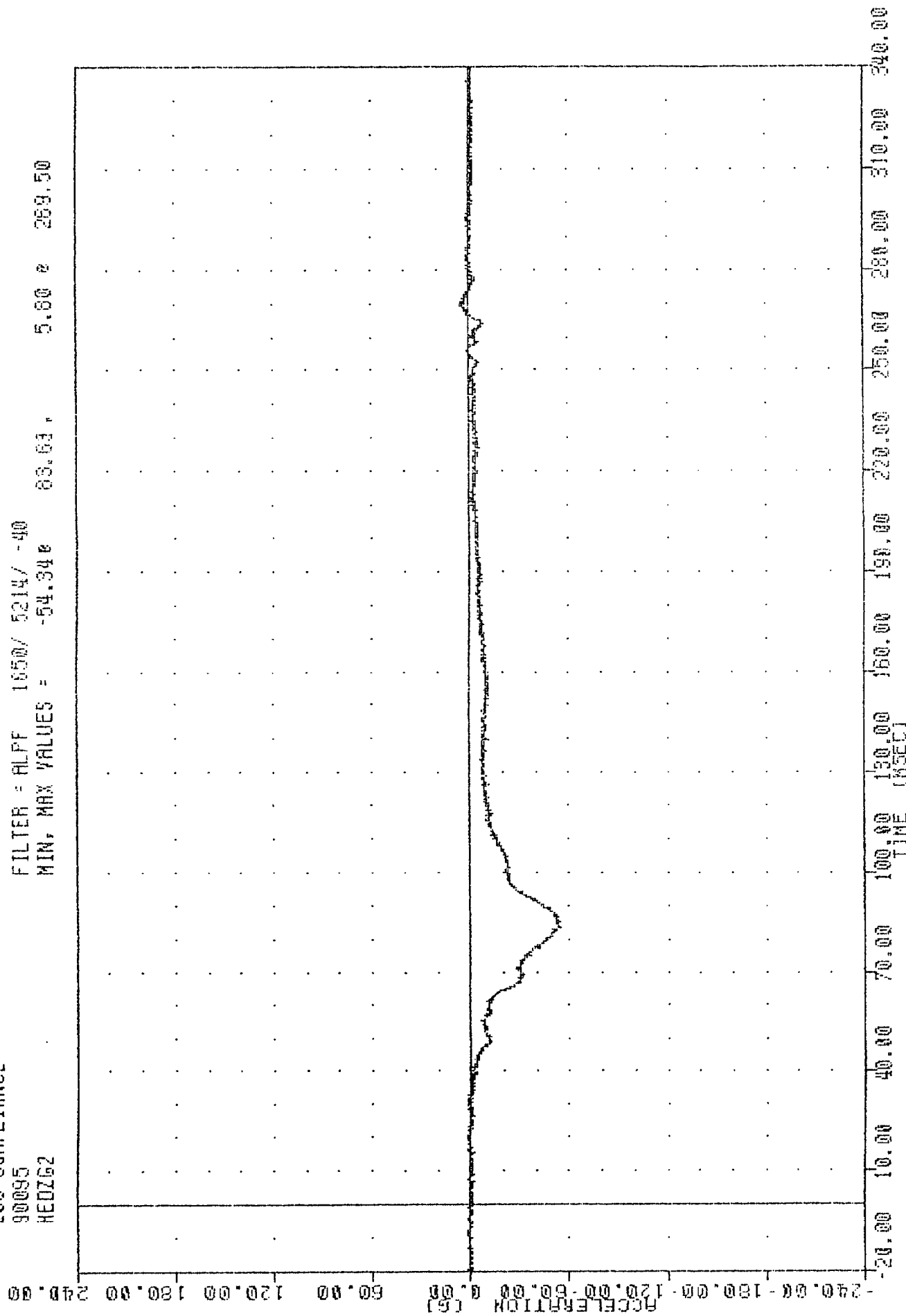
90095

REDZG2

FILTER = ALPF 1050/ 5214/ -40

MIN, MAX VALUES = -54.340

83.63, 5.60 2 289.50

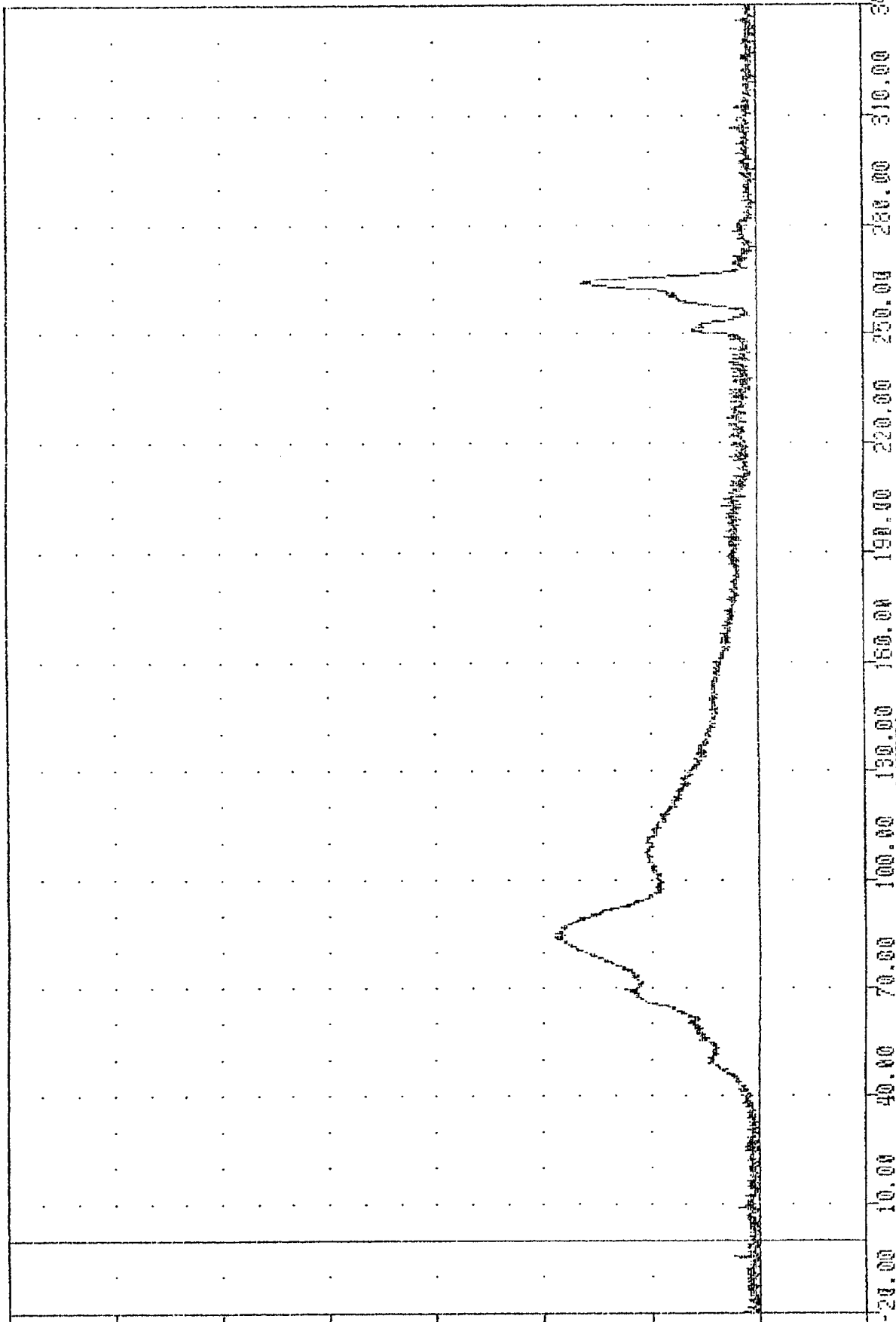


LEXUS ES250 INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Z AXIS ACCELERATION

TRC , 900405
 200 COMPLIANCE
 90095
 HEDSG2

FILTER = ALPF 1650/ 5214/ -40
 MIN, MAX VALUES = 0.092 -5.68, 55.91 & 85.25

ACCELERATION (g)



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION

TRC 900405

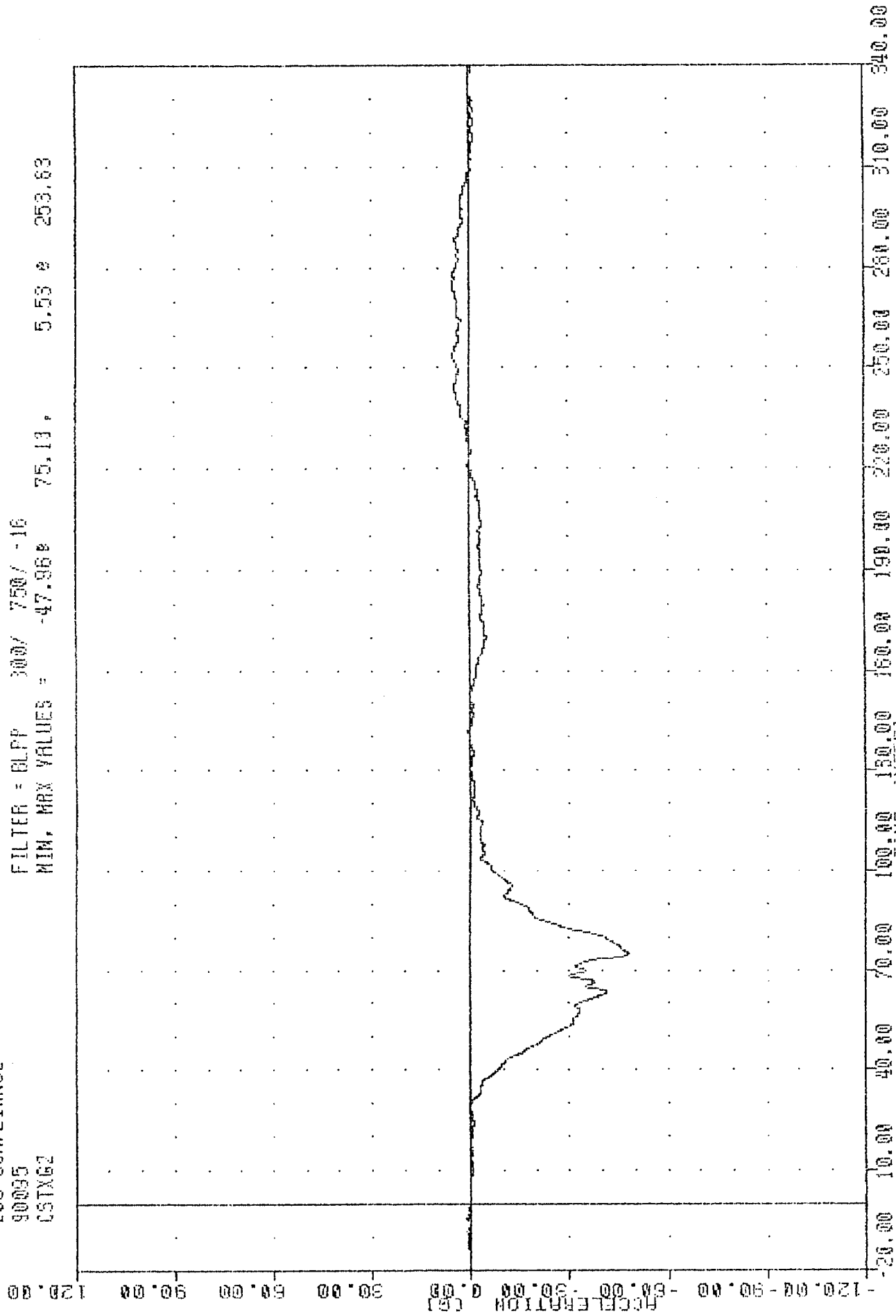
208 COMPLIANCE

90035

CSTXG2

FILTER = BLPP 300/ 750/ -16

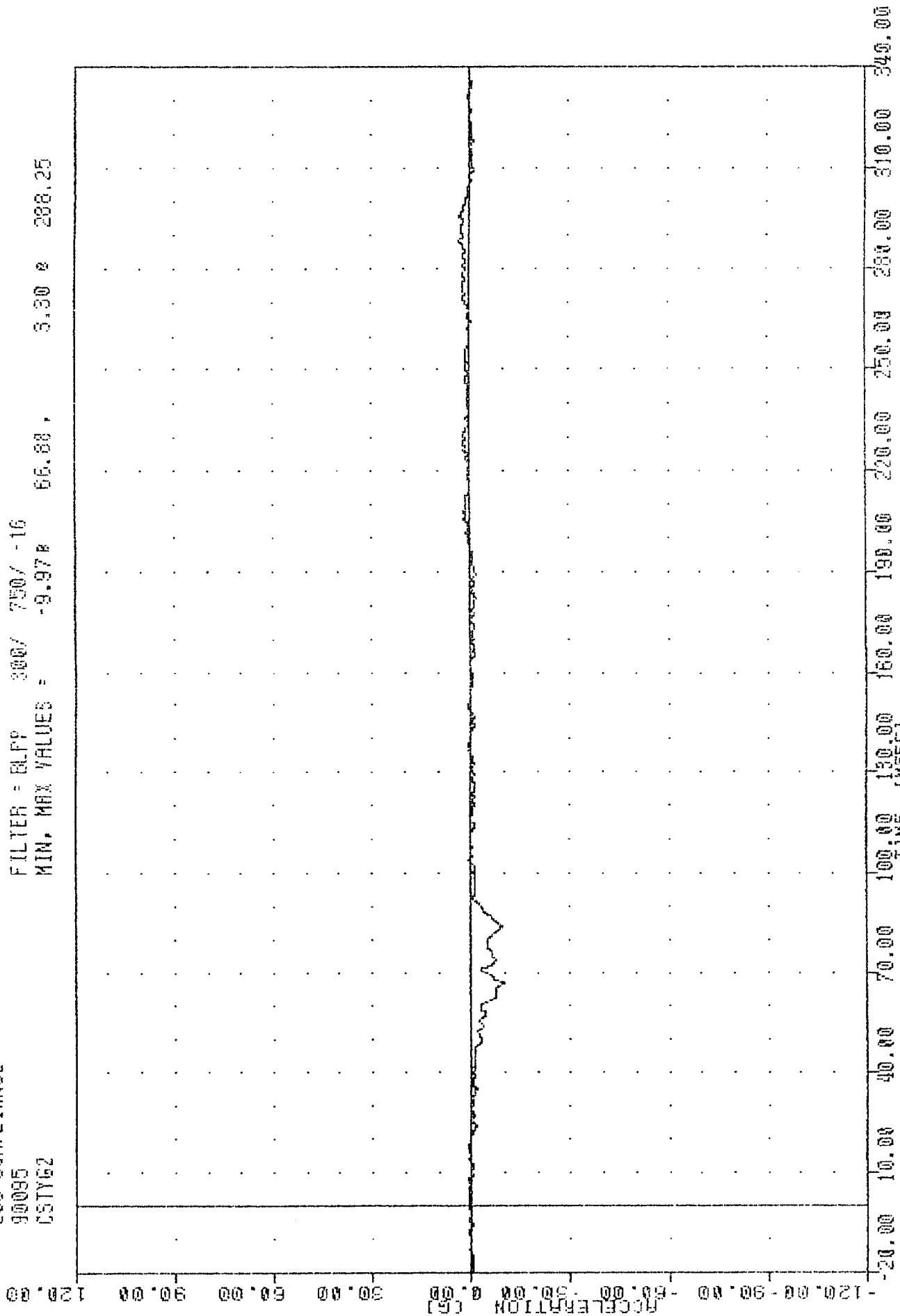
MIN. MAX VALUES = -47.96% 75.13, 5.53% 253.63



LEXUS ES250 INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST X AXIS ACCELERATION

TRC 800405
 208 COMPLIANCE
 90085
 CSTY62

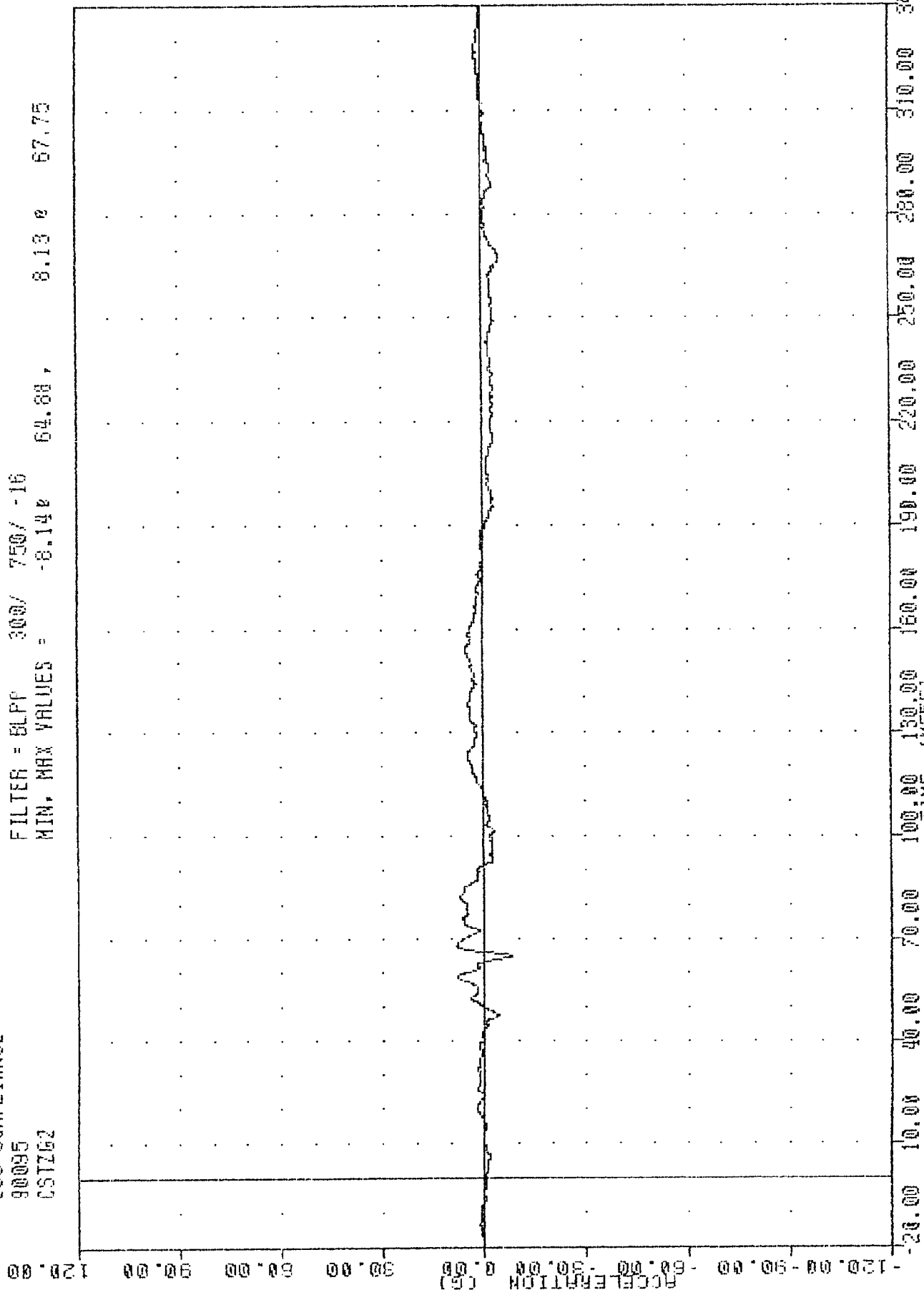
FILTER = BLFP 300/ 750/ -16
 MIN, MAX VALUES = -9.978 66.68, 3.30 2 208.25



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST Y AXIS ACCELERATION

TRC , 900405
 200 COMPLIANCE
 90095
 CSTZ62

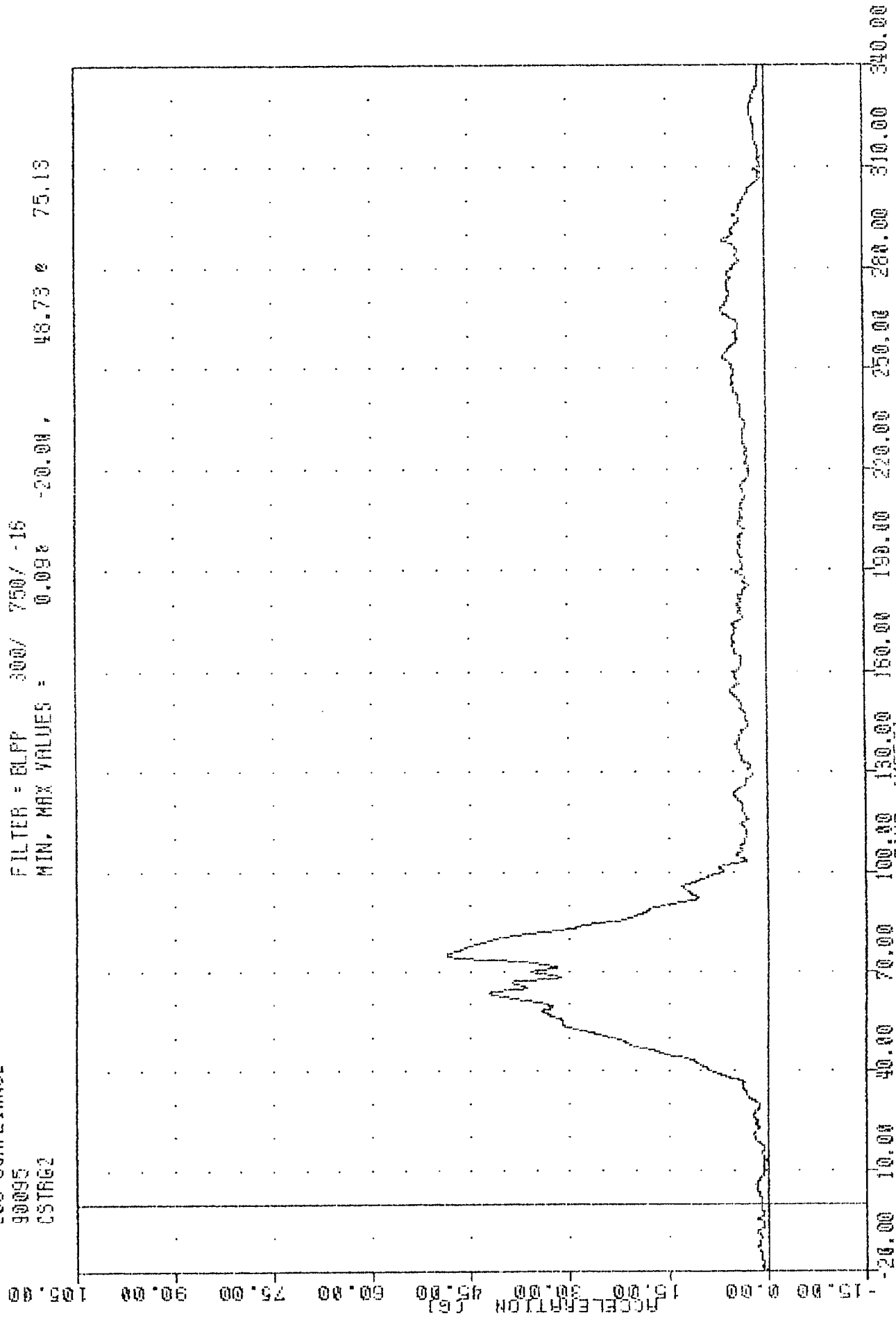
FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -8.14e 64.88, 8.13 e 67.75



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST Z AXIS ACCELERATION

TRC , 800405
 200 COMPLIANCE
 90095
 CSTRG2

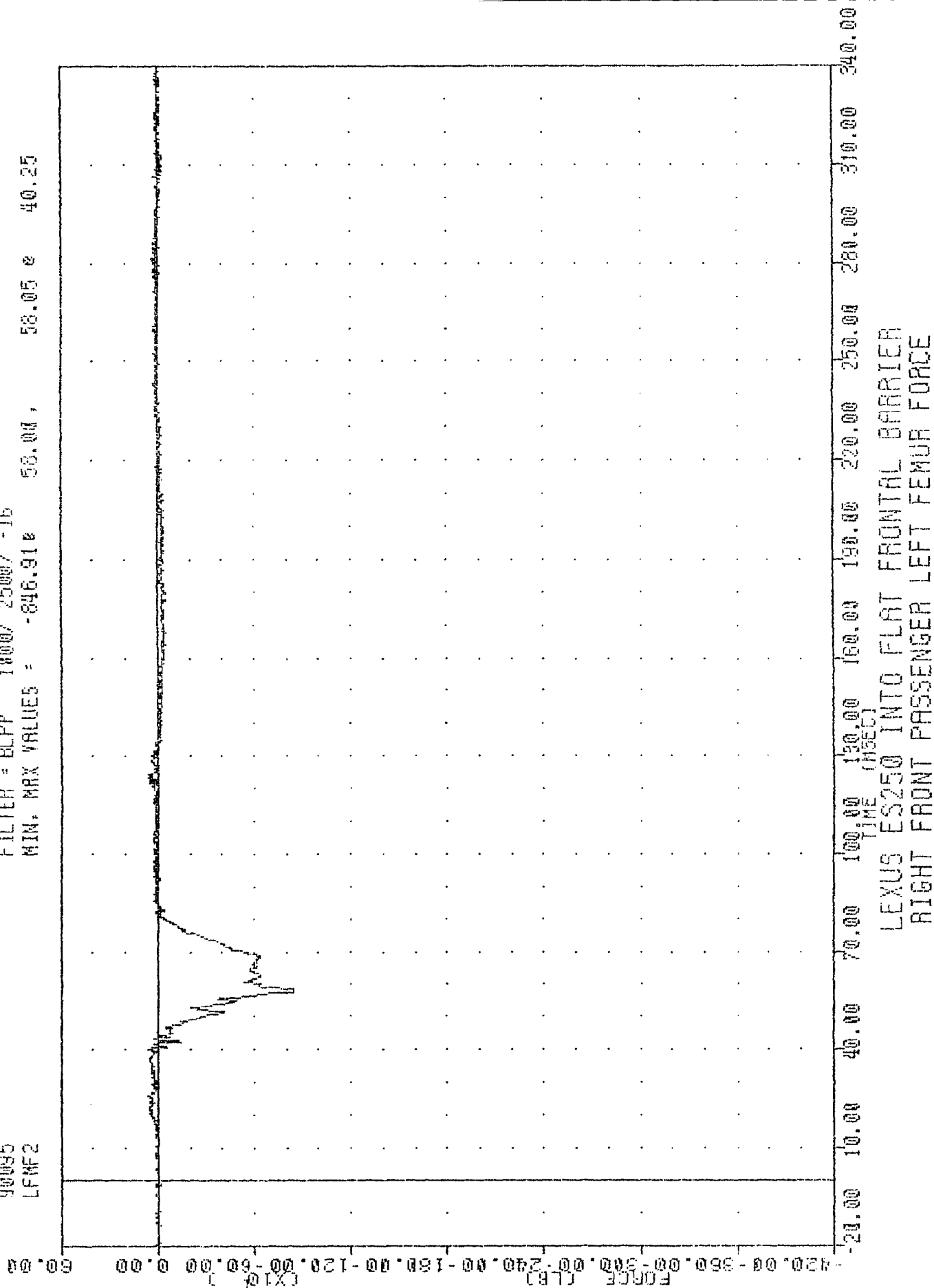
FILTER = BLPP 300/ 750/ -15
 MIN. MAX VALUES = 0.098 -20.00, 48.73 0 75.13



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION

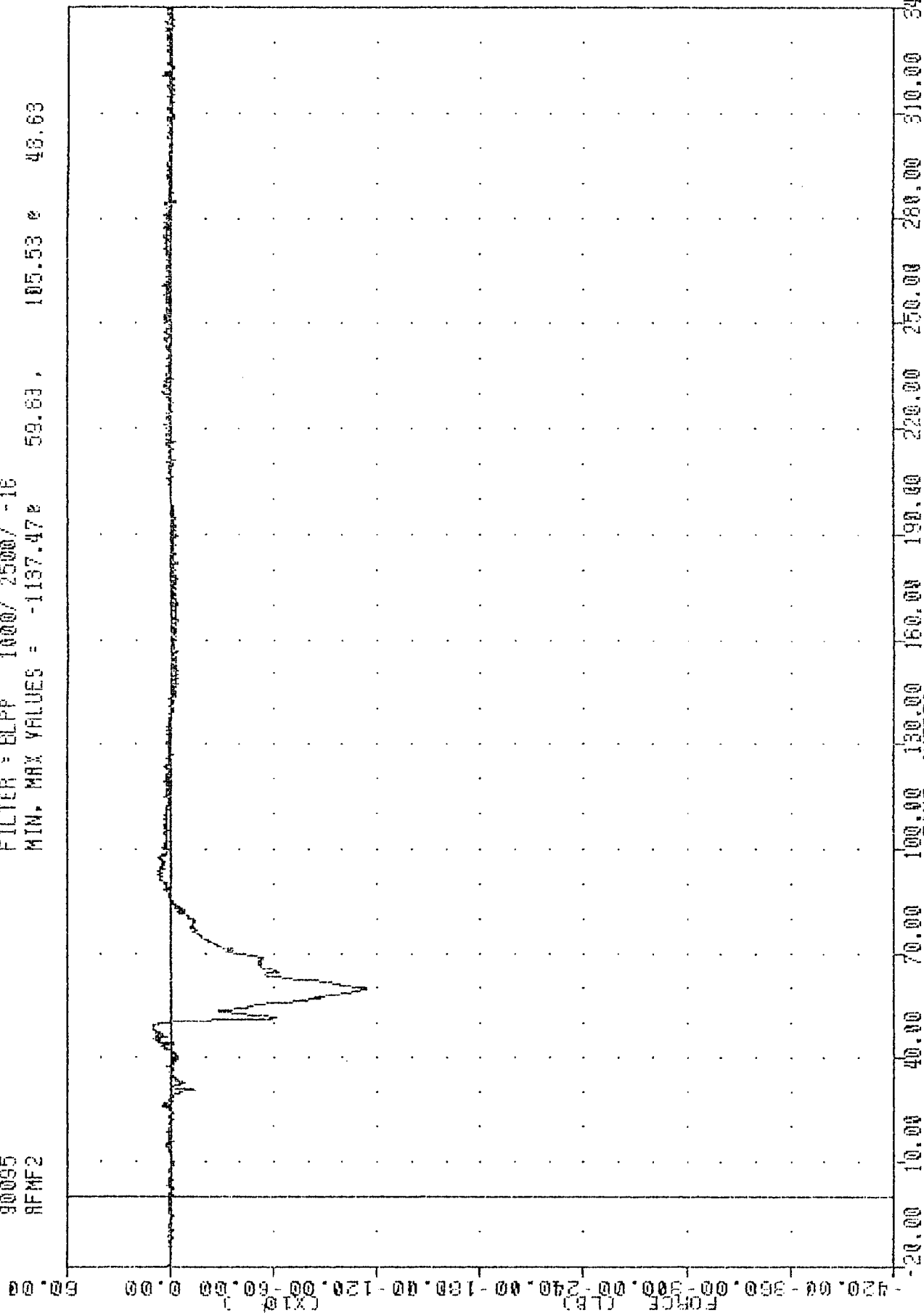
TAC 900405
 209 COMPLIANCE
 90035
 LFMF2

FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -846.910 58.00, 58.05 & 40.25



TRC , 900405
 208 COMPLIANCE
 90095
 RNF2

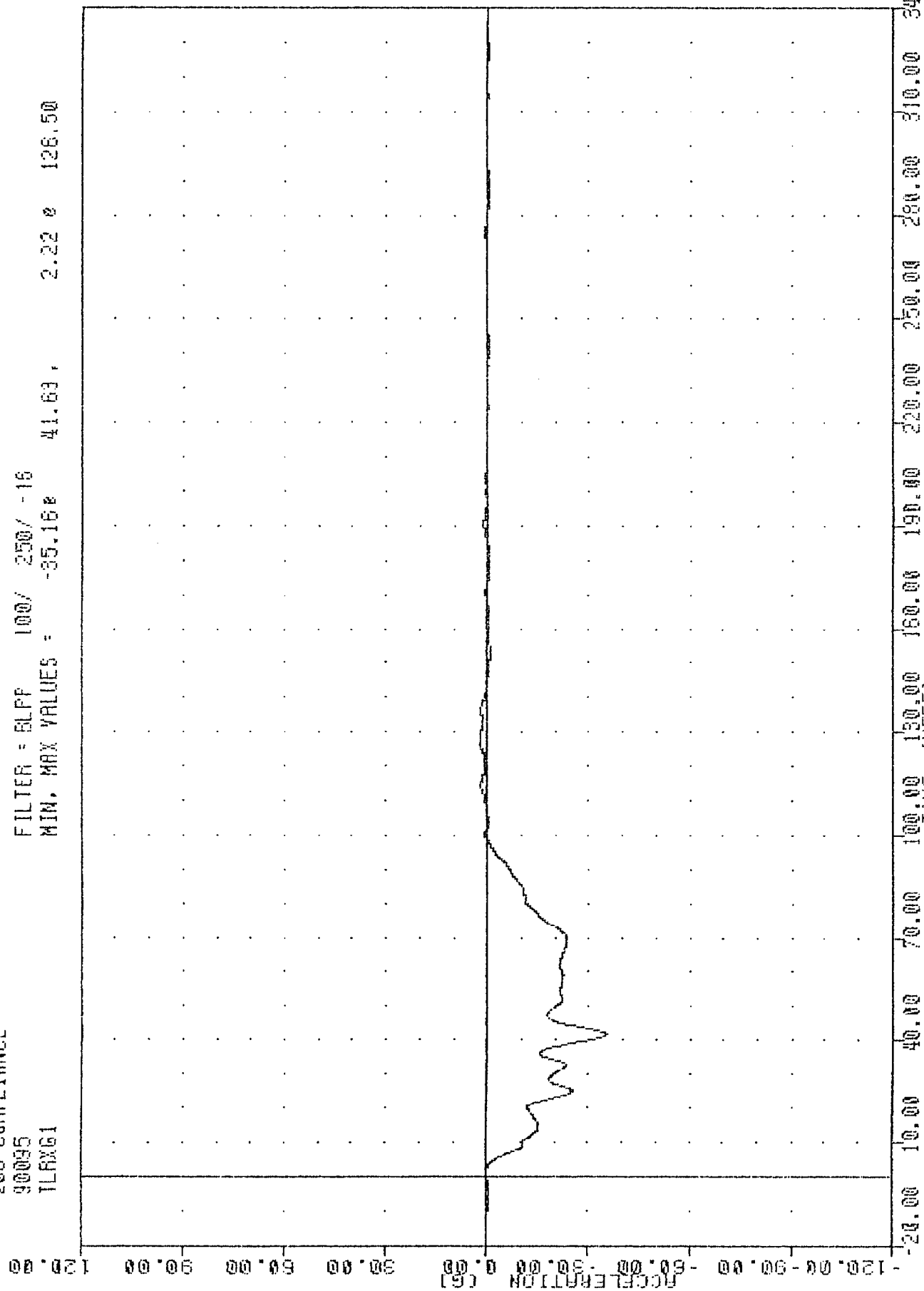
FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -1137.47e 59.63, 105.53 e 48.63



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

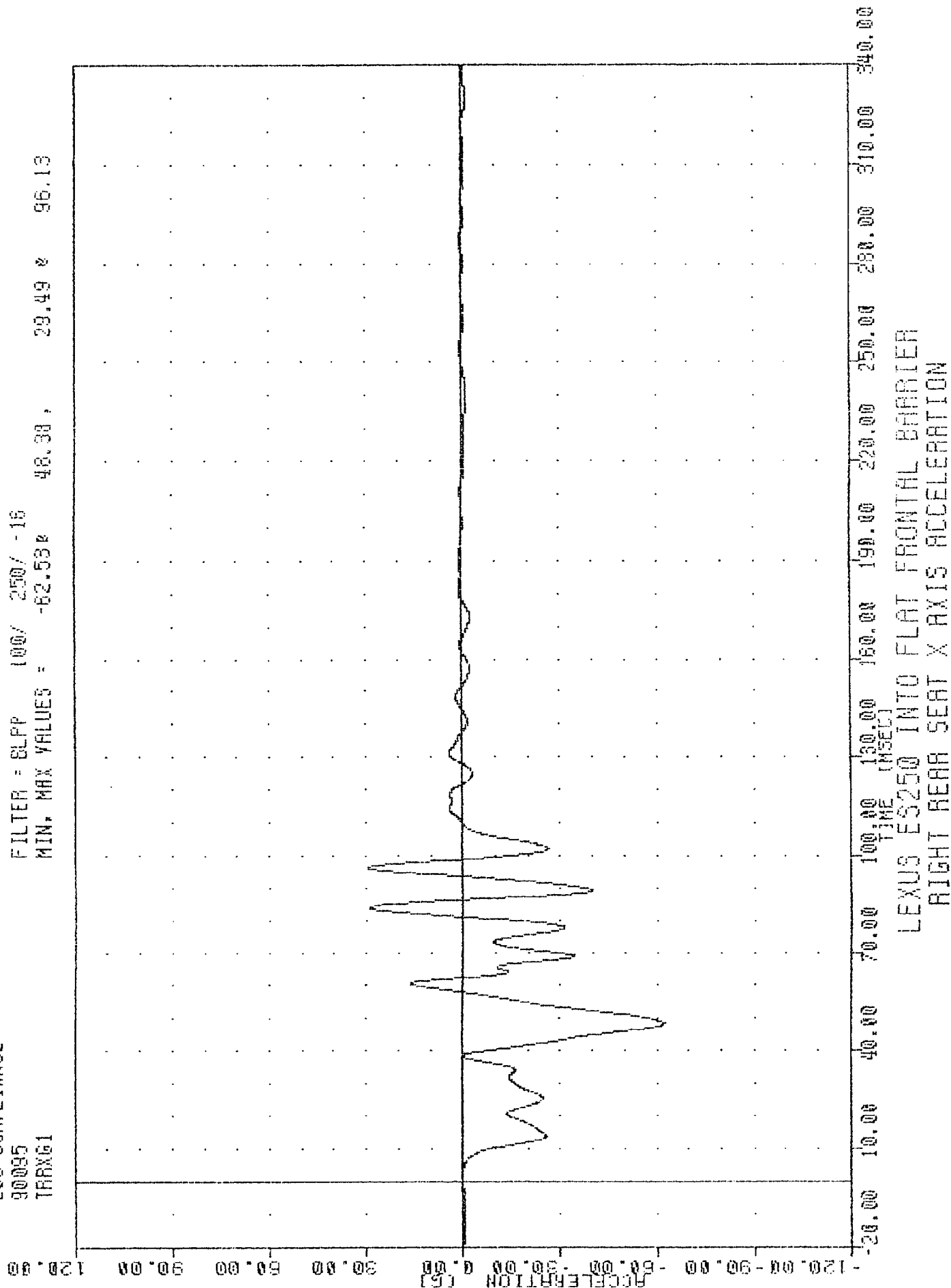
TRC 900405
 208 COMPLIANCE
 90095
 TLXG1

FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -35.16 41.63, 2.22 0 126.50



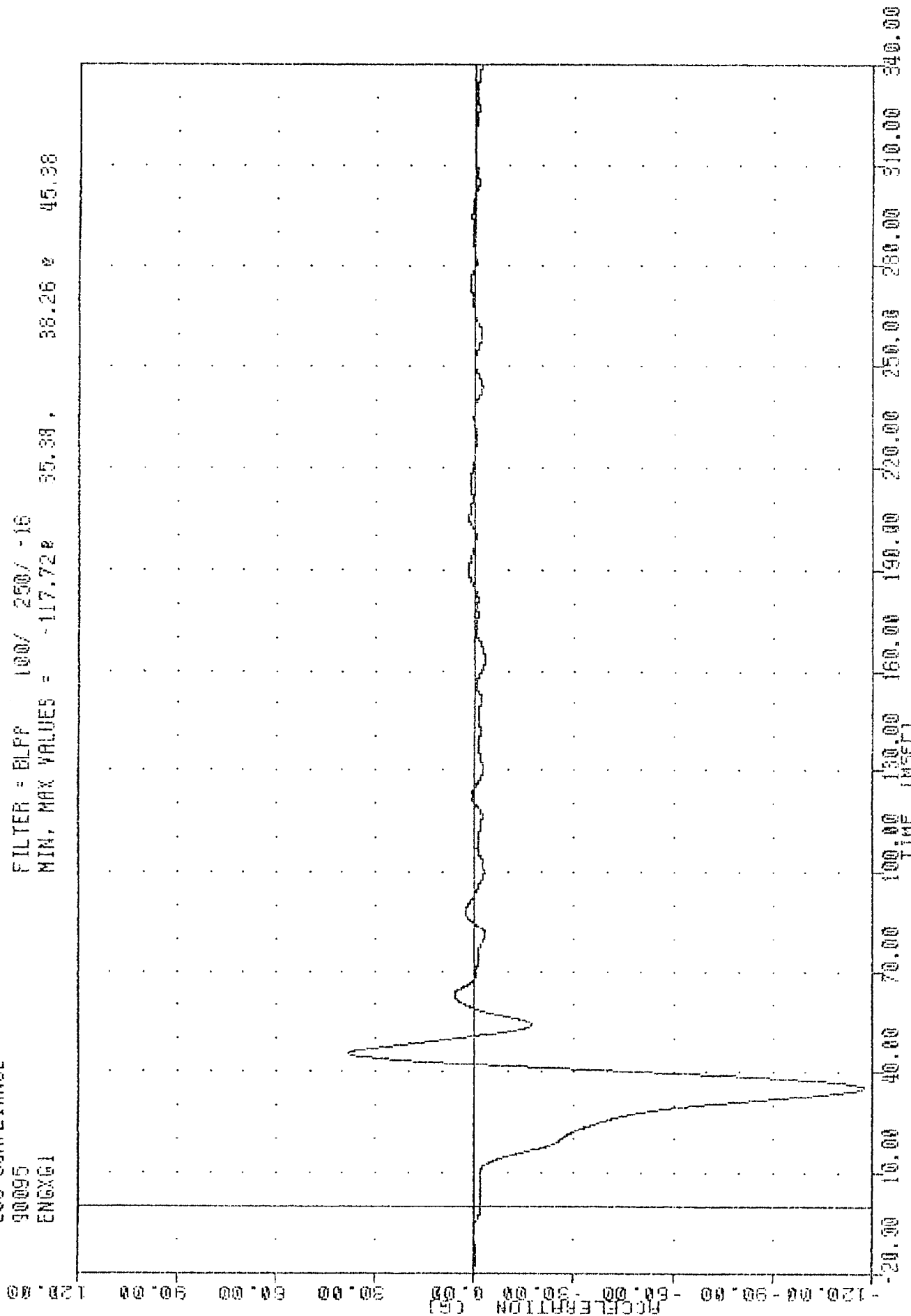
TRC 900405
 200 COMPLIANCE
 90095
 TRAX61

FILTER = BLPP 100/ 250/ -18
 MIN. MAX VALUES = -62.53 48.38, 29.49 96.13



TRC
200 COMPLIANCE
90095
ENGXG1

FILTER = BLPP 100/ 250/ -18
MIN, MAX VALUES = -117.728 35.38, 38.26 45.38



LEXUS ES250 INTO FLAT FRONTAL BARRIER
ENGINE UPPER BLOCK X AXIS ACCELERATION

TRC. 900405

200 COMPLIANCE

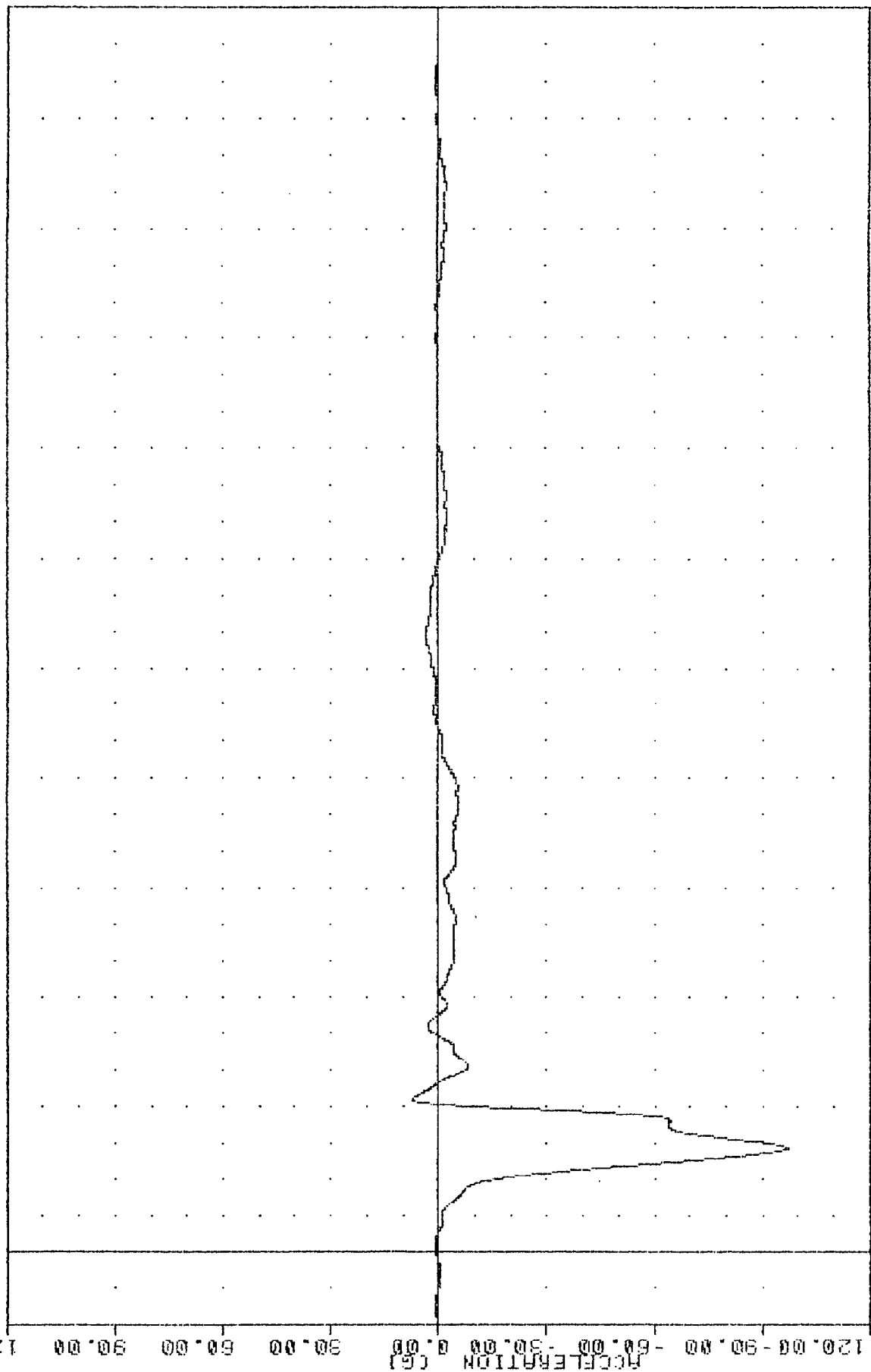
90085

ENGXG2

FILTER = BLPF 100/ 250/ -16

MIN. MAX VALUES = -96.98e 28.68, 7.42 e 42.00

120.00

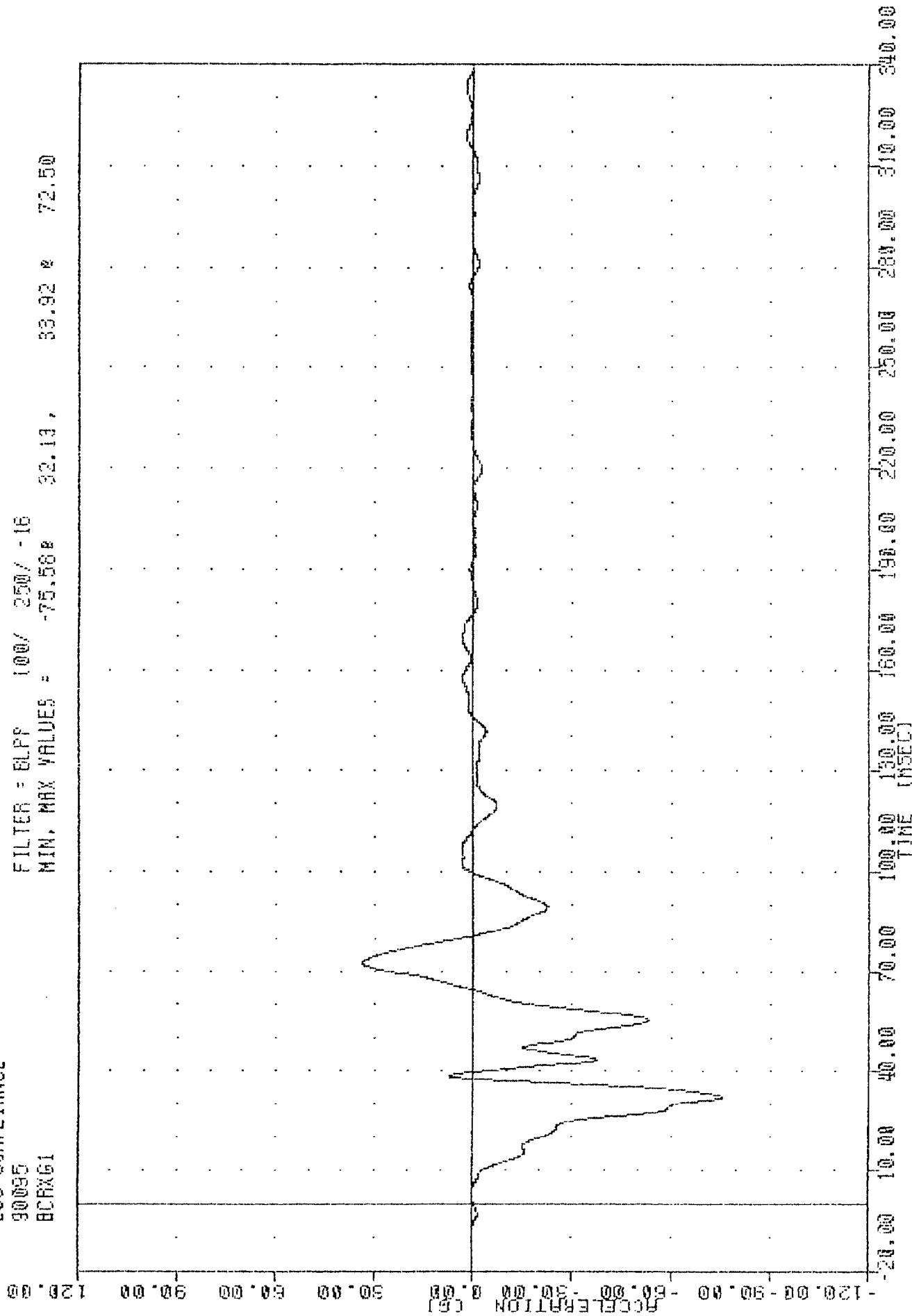


-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

LEXUS ES250 INTO FLAT FRONTAL BARRIER
ENGINE BOTTOM BLOCK X AXIS ACCELERATION

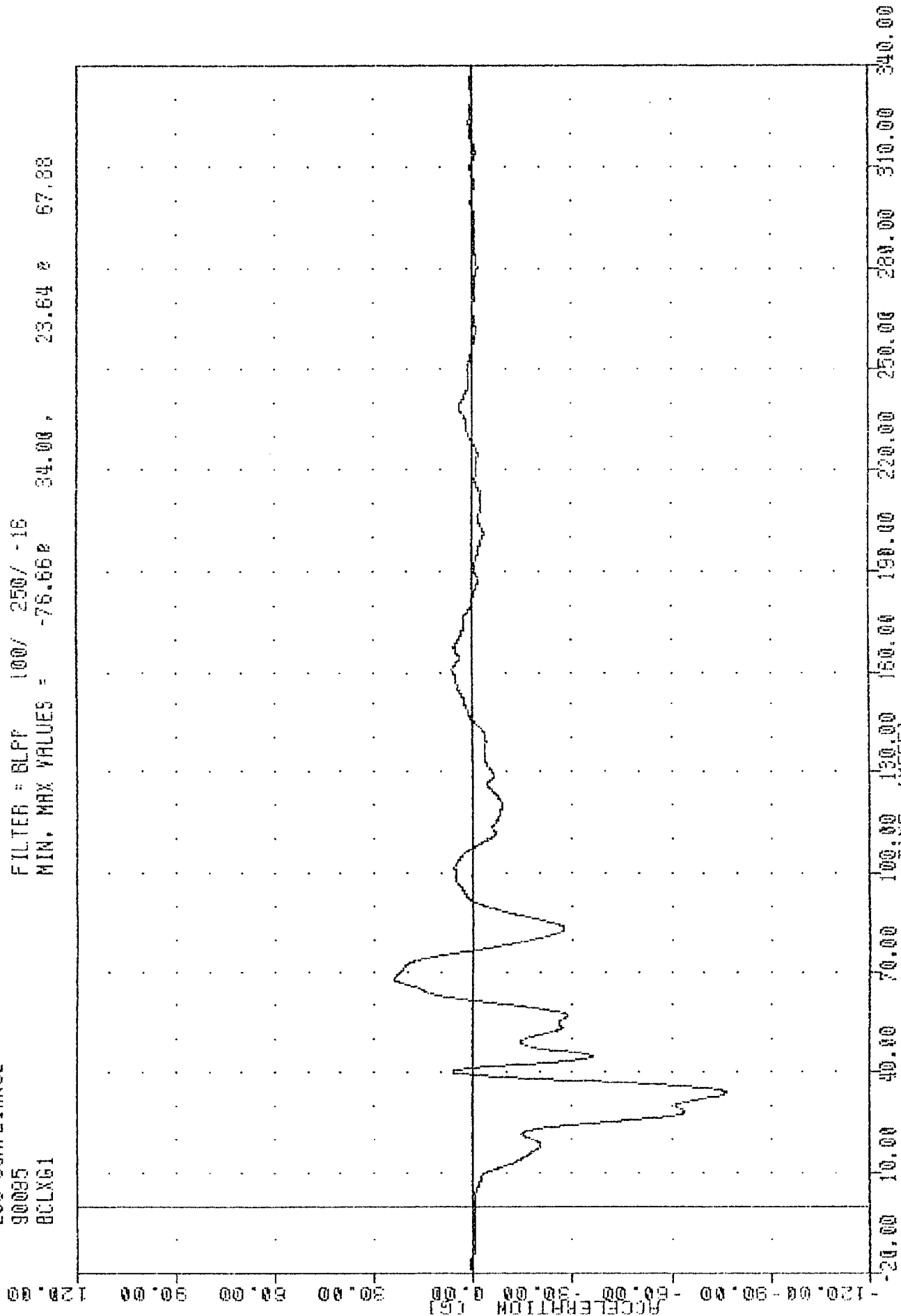
TRC 900405
 200 COMPLIANCE
 90095
 BCRXG1

FILTER = BLPP 100/ 250/ -16
 MIN, MAX VALUES = -75.58 32.13, 33.92 72.50



TAC , 900405
 209 COMPLIANCE
 90095
 BCLXG1

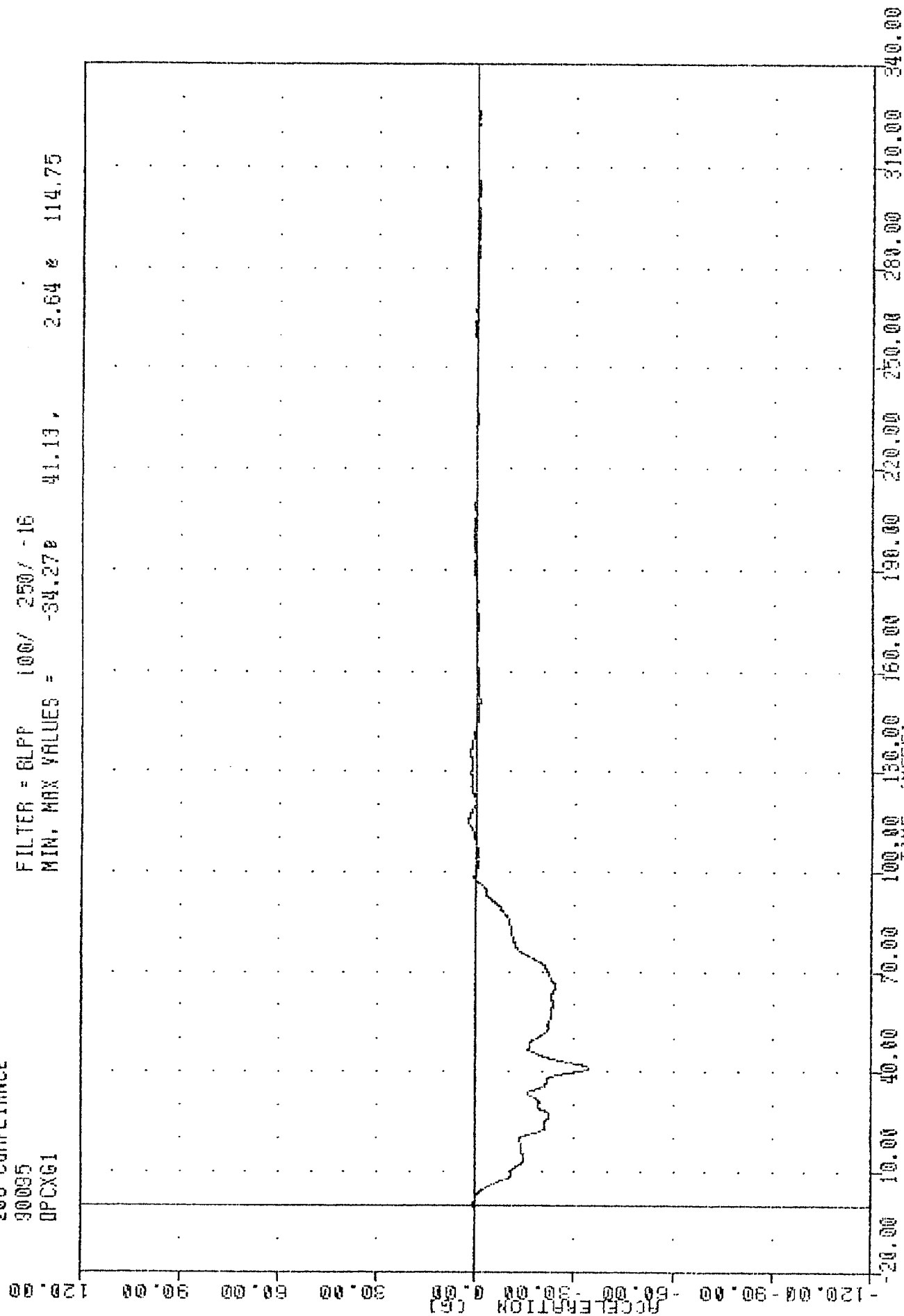
FILTER = BLPF 100/ 250/ -18
 MIN. MAX VALUES = -76.660 34.00 , 23.64 0 67.88



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 LEFT BRAKE CALIPER X AXIS ACCELERATION

TRC 900405
 200 COMPLIANCE
 90035
 OPCXG1

FILTER = 6LPP 100/ 250/ -16
 MIN, MAX VALUES = -34.27e 41.13, 2.64 e 114.75



LEXUS ES250 INTO FLAT FRONTAL BARRIER
 DASH PANEL CENTER X AXIS ACCELERATION