

REPORT NOS. 208-TRC-90-002
212-TRC-90-002
301-TRC-90-002

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

GENERAL MOTORS OF CANADA, LTD.
1990 CHEVROLET LUMINA
4-DOOR SEDAN
NHTSA NO. CL0102
TRC TEST NO. 891207

THE TRANSPORTATION RESEARCH CENTER OF OHIO
U.S. RT. 33, LOGAN COUNTY
EAST LIBERTY, OHIO 43319



DECEMBER 22, 1989

FINAL REPORT

PREPARED FOR:
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16. Abstract A 30 mph flat frontal barrier impact compliance test was conducted on a 1990 Chevrolet Lumina 4-door sedan, VIN 2G1WL54RXL9139496, NHTSA No. CL0102 at the Transportation Research Center of Ohio on December 7, 1989. 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 70° F. The vehicle appears to comply with the applicable requirements of FMVSS Nos. 212, 219 (partial), and 301. The vehicle recorded an apparent non-compliance with the requirements of FMVSS 208.					
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			Approximate Conversions from Metric Measures		
Symbol	When You Know	Multiply by	To Find	Symbol	Symbol
LENGTH					
in	inches	2.5	centimeters	cm	mm
ft	feet	30	centimeters	cm	cm
yd	yards	0.9	meters	m	m
mi	miles	1.6	kilometers	km	m
AREA					
in ²	square inches	6.5	square centimeters	cm ²	km ²
ft ²	square feet	0.09	square meters	m ²	mi ²
yd ²	square yards	0.8	square meters	m ²	ha
mi ²	square miles	2.6	square kilometers	km ²	ha
	acres	0.4	hectares	ha	ha
MASS (weight)					
oz	ounces	28	grams	g	kg
lb	pounds	0.45	kilograms	kg	kg
	short tons (2000 lb)	0.9	metric ton	t	t
VOLUME					
tsp	teaspoons	5	milliliters	ml	ml
Tbsp	tablespoons	15	milliliters	ml	ml
in ³	cubic inches	16	milliliters	ml	ml
fl oz	fluid ounces	30	milliliters	ml	ml
c	cups	0.24	liters	L	L
pt	pints	0.47	liters	L	L
qt	quarts	0.95	liters	L	L
gal	gallons	3.8	liters	L	L
ft ³	cubic feet	0.03	cubic meters	m ³	m ³
yd ³	cubic yards	0.76	cubic meters	m ³	m ³
TEMPERATURE (exact)					
°F	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C	°C

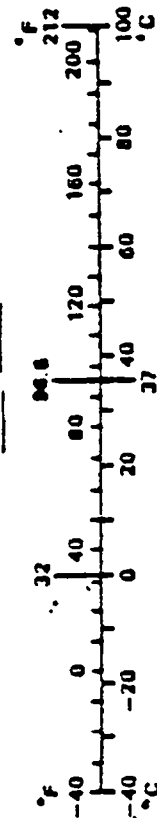


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SECTION 1.0

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 Chevrolet Lumina 4-door sedan, NHTSA No. CL0102, 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 Chevrolet Lumina 4-door sedan, NHTSA No. CL0102, was equipped with a 2.5 liter, transverse engine, automatic transmission, and power brakes. The test weight of the vehicle was 3663 pounds. The test vehicle recorded an apparent non-compliance with the performance requirements of FMVSS test No. 208. The Head Injury Criteria (HIC) calculation was greater than 1000 as measured by a Part 572 E dummy seated in the right front passenger's seat. The vehicle appeared to comply with the performance requirements of FMVSS Nos. 212, 219 (partial), and 301. 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. The static rollover test was not conducted due to the apparent non-compliance with FMVSS No. 208.

Two (2) Part 572 E, 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 Notice 45 of Federal Motor Vehicle Safety Standard TP-208-07.

Both ATDs were instrumented with head and chest accelerometers oriented to measure accelerations in the longitudinal, lateral, and vertical directions, with a chest displacement potentiometer, 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-five (25) 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 December 7, 1989. The test vehicle's impact speed was 29.6 mph. The vehicle sustained 21.4 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.:	CL0102	PROJECT:	208 Compliance
DATE:	12/07/89	TIME:	1333 TEMP: 70° F
VEHICLE:	1990 Chevrolet Lumina 4-door sedan		
TEST WEIGHT (LBS):	3663		
IMPACT ANGLE (DEG)*:	0		
IMPACT VELOCITY (MPH)**:	PRIMARY = 29.6	SECONDARY =	29.6
MAXIMUM STATIC CRUSH (IN):	21.4		
VEHICLE REBOUND (IN):	114.1		
DUMMIES:	Driver #230	Passenger	#314
TYPE:	Part 572 E	Part 572 E	
LOCATION:	Left front	Right front	
RESTRAINT:	3-point passive belt	3-point passive belt	
NUMBER OF DATA CHANNELS:	25		
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: General Motors of Canada, Ltd.

MAKE/MODEL: Chevrolet Lumina

VIN: 2G1WL54RXL9139496

BODY STYLE: 4-door sedan

MODEL YEAR: 1990

NHTSA NO.: CL0102

COLOR: Blue

ENGINE DATA: TYPE: transverse CYLINDERS: 4 DISPLACEMENT: 2.5 liter

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

DATE VEHICLE RECEIVED: 10/16/89

ODOMETER READING: 114.0

DEALER'S NAME AND ADDRESS: Bill Swad Chevrolet
100 South Hamilton Road
Columbus, OH 43213

ACCESSORIES:

POWER STEERING Yes

AUTOMATIC TRANSMISSION Yes

POWER BRAKES Yes

AUTOMATIC SPEED CONTROL Yes

POWER SEATS No

TILTING STEERING WHEEL Yes

POWER WINDOWS No

TELESCOPING STEERING WHEEL No

TINTED GLASS No

AIR CONDITIONING Yes

RADIO Yes

ANTI-SKID BRAKE No

CLOCK Yes

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: General Motors of Canada, Ltd.

DATE OF MANUFACTURE: 7/89

GVWR: 4265 LBS

GAWR: FRONT 2332 LBS., REAR 1933 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 30 psi; REAR 30 psi

RECOMMENDED TIRE SIZE: P195/75R14 LOAD RANGE X B, C, D

TIRES ON VEHICLE (MFR., LINE, SIZE): Uniroyal Tiger Paw XTM P195/75R14

IS SPARE TIRE A "SPACE SAVER": Yes

IS SPARE TIRE STANDARD EQUIPMENT: Yes

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

TYPE OF FRONT SEAT BACKS: Manual adjustable

NUMBER OF OCCUPANTS 3 FRONT 3 REAR 6 TOTAL

CARGO LOAD 158 LBS. TOTAL 1058 LBS.

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

RIGHT FRONT 974 lbs. RIGHT REAR 595 lbs.

LEFT FRONT 1034 lbs. LEFT REAR 581 lbs.

TOTAL FRONT WEIGHT 2008 lbs. (63.1% OF TOTAL VEHICLE WEIGHT)

TOTAL REAR WEIGHT 1176 lbs. (36.9% OF TOTAL VEHICLE WEIGHT)

TOTAL DELIVERED WEIGHT 3184 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (3184 LBS)

VCW = VEHICLE CAPACITY WEIGHT (1058 LBS)

DSC = DESIGNATED SEATING CAPACITY (6)

$RCLW = VCW - 150 (DCS) = 1058 - 150(6) = 158 \text{ LBS}$

TARGET TEST WEIGHT = UDW + RCLW + (2 DUMMIES X 167 LBS/DUMMY)

$= 3184 + 158 + 334 \text{ LBS}$

TARGET TEST WEIGHT = 3676 LBS

TABLE 2 TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 145 LBS. CARGO:

RIGHT FRONT	1045 lbs.	RIGHT REAR	762 lbs.
LEFT FRONT	1107 lbs.	LEFT REAR	749 lbs.
TOTAL FRONT WEIGHT	2152 lbs.	(58.7% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1511 lbs.	(41.3% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3663 lbs.	(0.3% UNDER TARGET WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE TRUNK AREA: 100 LBS.

COMPONENTS REMOVED TO MEET TARGET WEIGHT: None

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	LF 27.3;	RF 27.2;	LR 28.0;	RR 28.0
PRE-TEST ATTITUDE:	LF 27.1;	RF 27.2;	LR 27.1;	RR 27.6
POST-TEST ATTITUDE:	LF 33.9;	RF 29.2;	LR 26.0;	RR 25.6

MAXIMUM WIDTH: 70.0 INCHES

WHEELBASE: 107.5 INCHES

CG = 44.3 INCHES REARWARD OF FRONT WHEEL CENTERLINE

TABLE 3 TEST CONDITIONS

TEST NUMBER: 891207

DATE OF TEST: 12/07/89

TIME OF TEST: 1333

TYPE OF TEST: Frontal barrier impact

IMPACT ANGLE: 0°

AMBIENT TEMPERATURE AT IMPACT AREA:

70° 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):

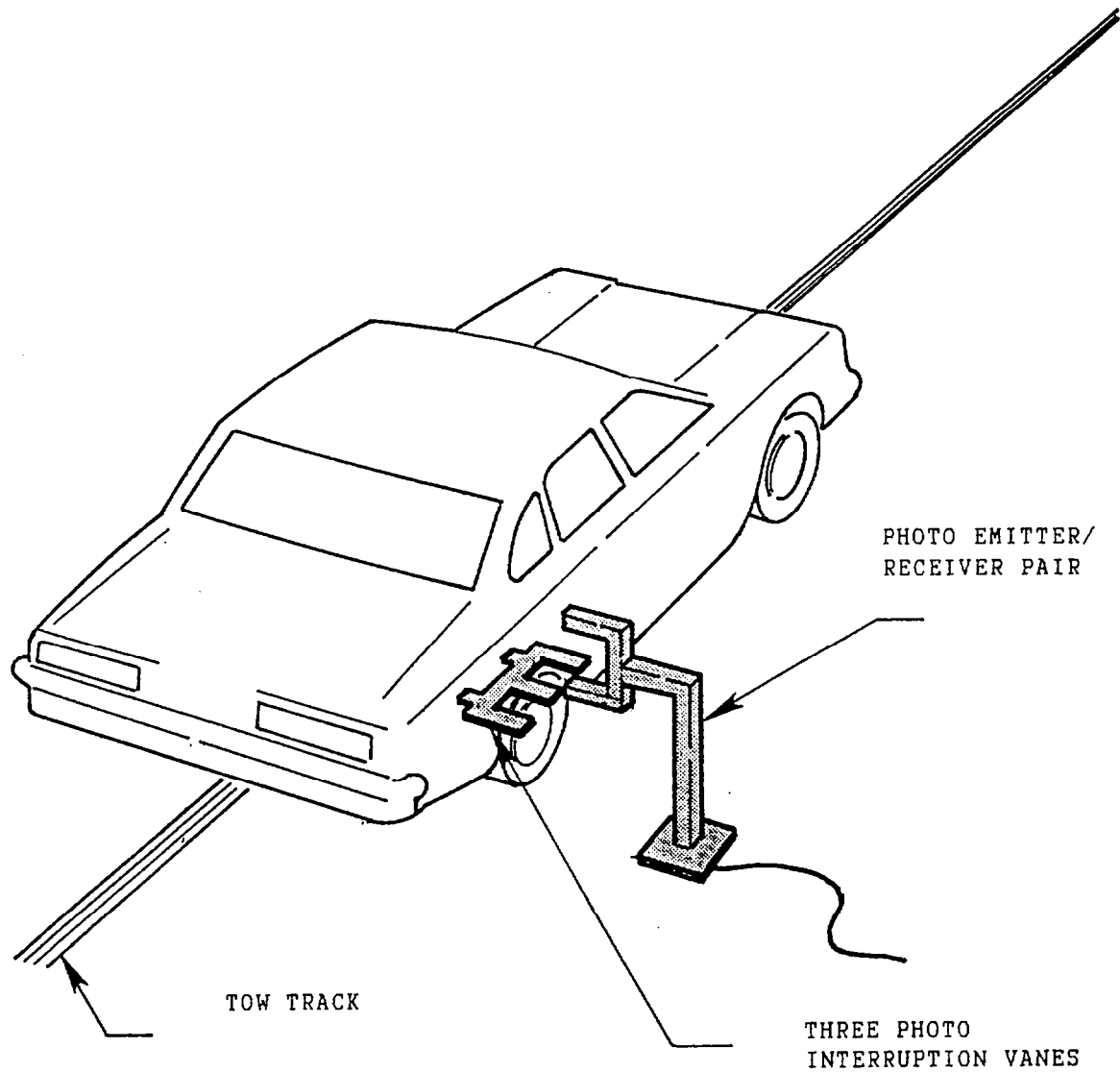
OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: L 192.6; C 199.1; R 191.4

POST-TEST: L 176.2; C 179.2; R 177.0

TOTAL CRUSH: L 16.4; C 19.9; R 14.4

FOR FRONTAL IMPACTS, DISTANCE FROM FRONT OF TEST VEHICLE TO BARRIER AFTER
IMPACT: L: 116.8; C: 112.1; R: 113.3; AVG: 114.1

FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM

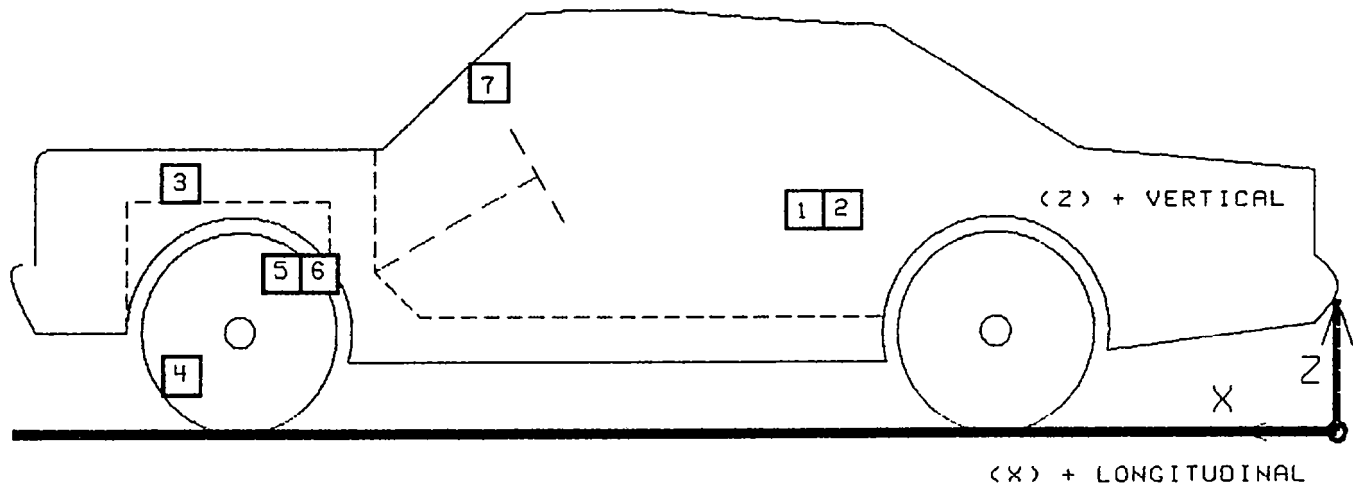


The final vane clears emitter/receiver two inches before impact.

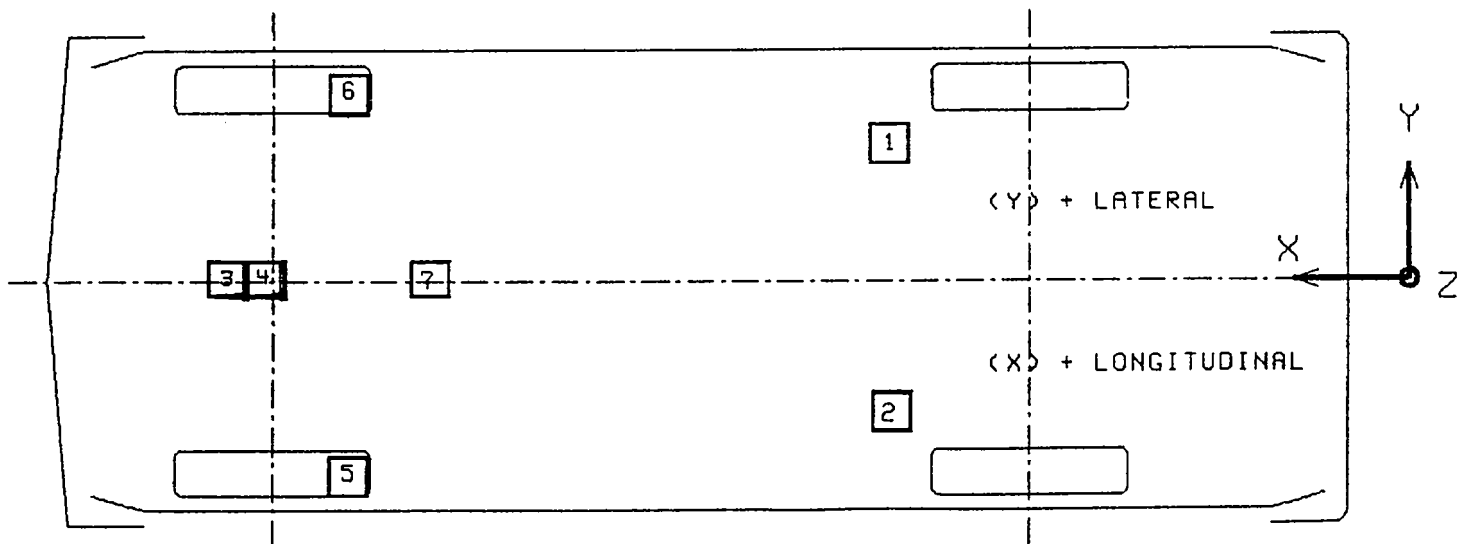
The vanes have one foot spacing.

FIGURE 2

VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 4

TEST NUMBER 891207

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

No.	LOCATION		X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
						MAX G MSEC		MAX G MSEC	
1	REAR SEAT CROSSMEMBER AT LEFT SIDE LONGITUDINAL	PRE	76.9	13.6	15.2				
		POST	77.0	13.6	15.4				
						1.6	161.4	25.3	30.9
2	REAR SEAT CROSSMEMBER AT RIGHT SIDE LONGITUDINAL	PRE	76.4	-13.2	15.7				
		POST	76.5	-13.2	15.1				
						1.5	258.0	29.2	30.9
3	TOP OF ENGINE BLOCK LONGITUDINAL	PRE	160.0	-2.5	30.9				
		POST	154.4	-2.6	27.2				
						46.3	71.3	70.7	53.9
4	BOTTOM OF ENGINE BLOCK LONGITUDINAL	PRE	159.5	-2.8	7.7				
		POST	146.4	-2.9	4.3				
						9.4	66.3	67.6	29.3
5	BRAKE CALIPER AT RIGHT SIDE LONGITUDINAL	PRE	156.3	-26.1	11.6				
		POST	156.2	-26.1	11.5				
						6.1	155.6	38.2	65.6
6	BRAKE CALIPER AT LEFT SIDE LONGITUDINAL	PRE	156.5	26.1	11.2				
		POST	155.3	26.1	10.2				
						9.0	116.6	36.1	62.6
7	DASH PANEL LONGITUDINAL	PRE	128.6	0.4	37.7				
		POST	129.0	0.4	38.6				
						15.4	62.9	59.6	53.9

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

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

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

VEHICLE MAKE/MODEL/BODY STYLE: Chevrolet/Lumina/4-door sedan
 VEH. NHTSA NO.: CL0102; VIN: 2G1WL54RXL9139496
 MODEL YEAR: 1990; BUILD DATE: 7/89; TEST DATE: 12/07/89
 VEH. SIZE CATEGORY: Mid-size; TEST WEIGHT: 3663
 VEH. WHEELBASE: 107.5
 MAX. WIDTH: 70.0
 FRONT OVERHANG: 47.3

COLLISION DEFORMATION
 CLASSIFICATION (CDC) CODE: 12FDEW2

F (Frontal)
 CRUSH DEPTH
 DIMENSIONS:

C1 = 16.4 inches
 C2 = 17.2 inches
 C3 = 19.3 inches
 C4 = 21.4 inches
 C5 = 17.1 inches
 C6 = 14.4 inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline
(Longitudinal)

LENGTH OF DAMAGED
 REGION: L = 56.6 inches

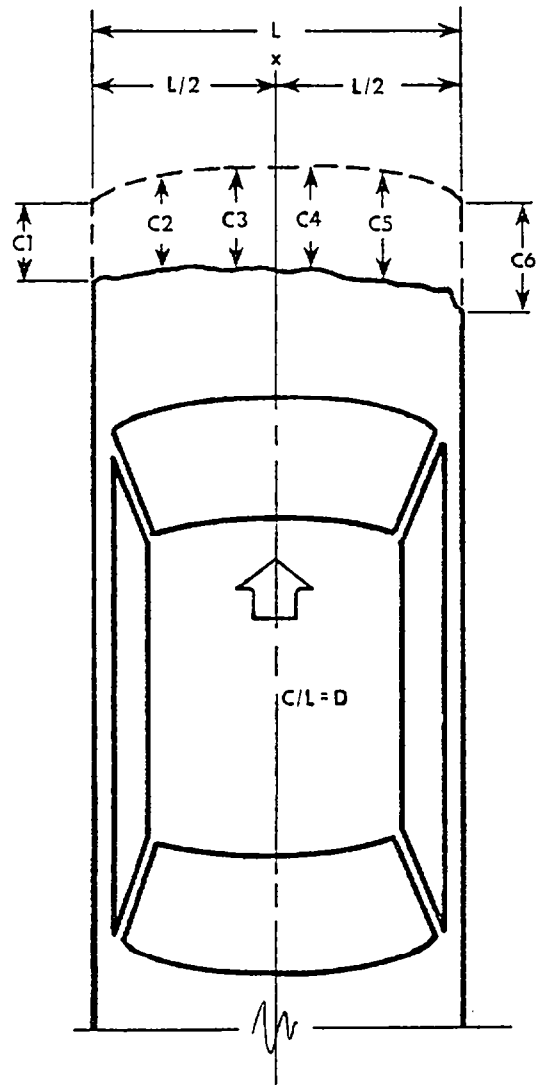


FIGURE 4

PRE-TEST AND POST-TEST MEASUREMENT POINTS

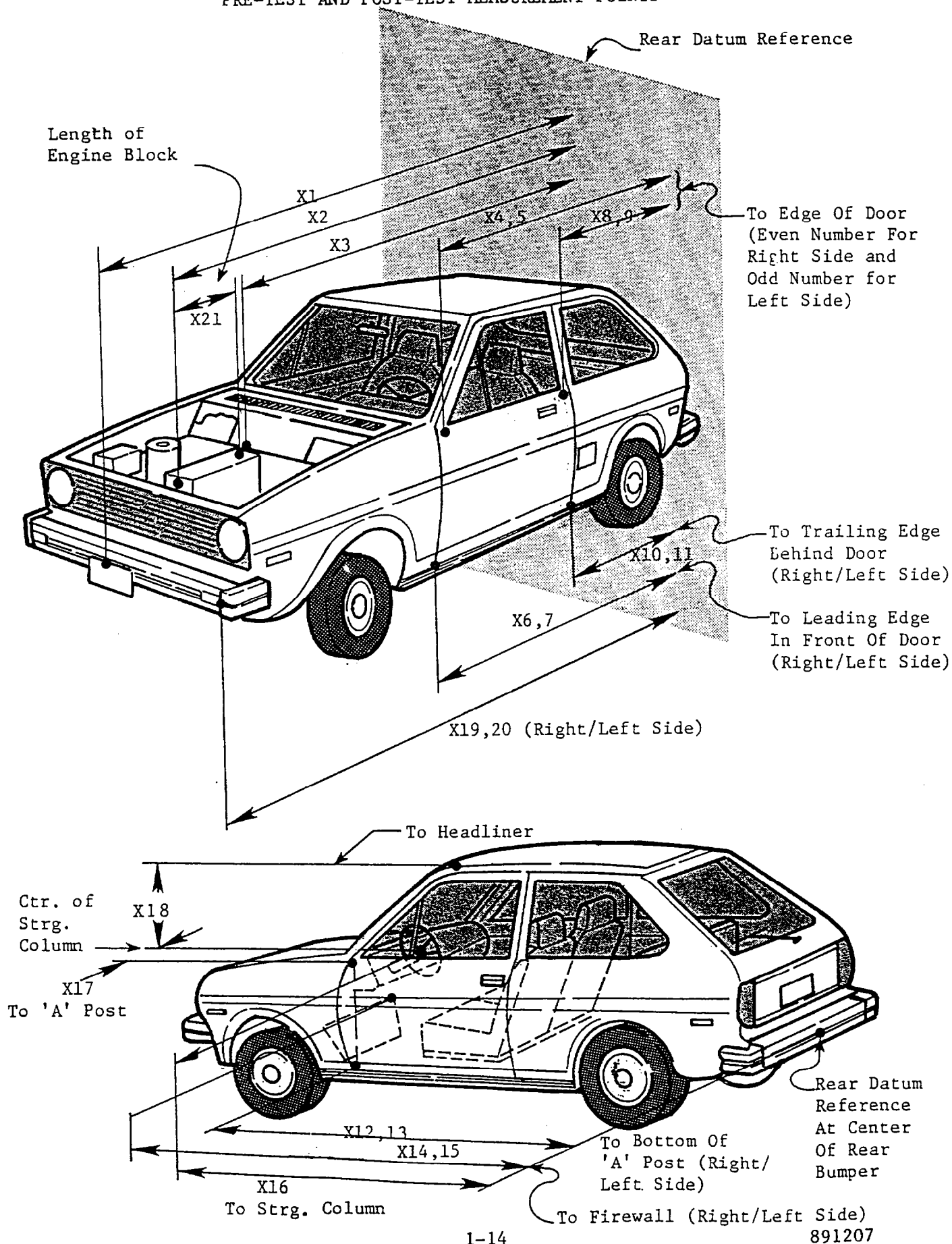
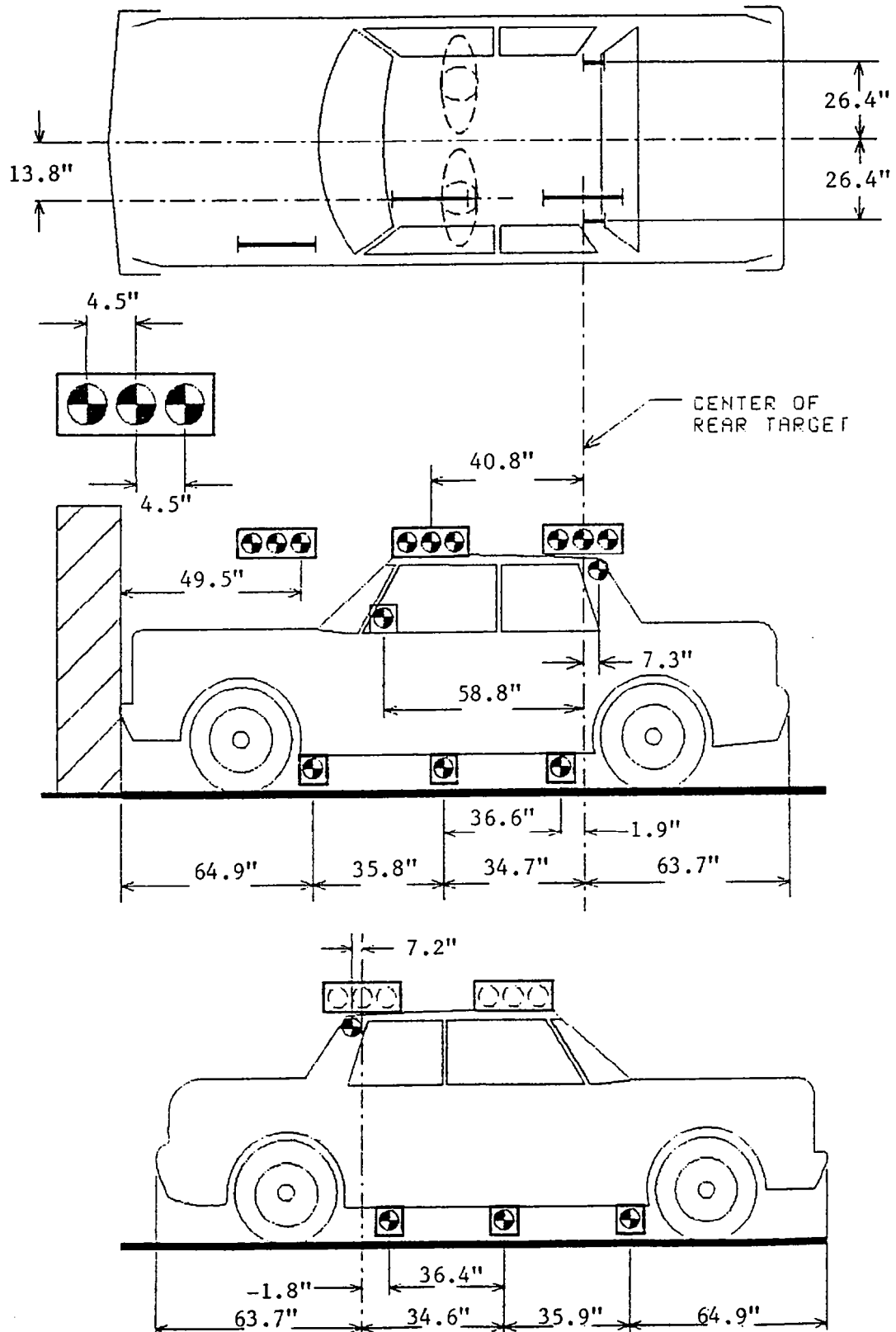


TABLE 5 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Chevrolet Lumina		TEST NUMBER: 891207		DIMENSIONS IN INCHES		
NO.	TYPE OF MEASUREMENT	PRE-TEST	POST-TEST	DIFF.		
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	199.1	179.2	19.9		
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	164.2	158.8	5.4		
X3	REAR SURFACE OF VEHICLE TO FIREWALL	147.3	146.5	0.8		
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	132.1	131.7	0.4		
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	132.0	131.8	0.2		
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	131.0	131.0	0.0		
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	131.3	131.9	-0.6		
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	91.6	91.2	0.4		
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	91.6	91.3	0.3		
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	92.9	92.8	0.1		
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	93.0	93.2	-0.2		
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	130.4	130.4	0.0		
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	130.3	130.2	0.1		
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	149.9	145.9	4.0		
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	149.6	145.5	4.1		
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	113.9	116.5	-2.6		
X17	CENTER OF STEERING COLUMN TO "A" POST	16.2	16.0	0.2		
X18	CENTER OF STEERING COLUMN TO HEADLINER	18.9	18.5	0.4		
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	191.4	177.0	14.4		
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	192.6	176.2	16.4		
X21	LENGTH OF ENGINE BLOCK	20.0	20.0	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.: CL0102
MAKE/MODEL/BODY STYLE: Chevrolet/Lumina/4-door sedan
MODEL YEAR: 1990 BODY COLOR: Blue
VIN: 2G1WL54RXL9139496
ODOMETER (ARRIVAL): 114.0 DATE: 10/16/89
ODOMETER (COMPLETION): 117.0 DATE: 12/07/89
COST: \$11,225

☒ Air Conditioner	☐ Console	Brakes: ☒ Power
☐ Tinted Glass	☐ Tachometer	Front: Disc
☒ Power Steering	☒ Speed Control	Rear: Disc
☐ Power Windows	☒ Rear Window Def.	
☐ Power Door Locks	☐ Sun/Moon Roof	Front Seats: ☐ Power
☒ Radio AM/FM stereo	☐ T-Top	Seat Type: Bench
☒ Clock	☒ Tilt Steering Wheel	No. of Seats: 6
☐ Roof Rack	☐ Other Options: <u>None</u>	

Engine: 4 Cylinders; 2.5 LITRES
Transmission: Automatic; Drive Type: Front
Tire Size: P195/75R14
Gasoline Type: Unleaded gasoline

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.

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 Chevrolet Lumina 4-door sedan, NHTSA No. CL0102, appeared to comply with the requirements of FMVSS Nos. 212, 219 (partial), and 301. The vehicle recorded an apparent non-compliance with the requirements of FMVSS No. 208.

The driver's Head Injury Criteria (HIC) was 830. The driver's maximum chest deceleration over three milliseconds was 44.9 g. The driver's chest displacement was 1.8 inches. The driver's right and left compressive femur loads were 739 pounds and 786 pounds, respectively.

The right front passenger's Head Injury Criteria (HIC) was 1084. The right front passenger's maximum chest deceleration over three milliseconds was 44.7 g. The right front passenger's chest displacement was 2.0 inches. The right front passenger's right and left compressive femur loads were 655 pounds and 268 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. The post-test static rollover was not conducted due to the apparent non-compliance with FMVSS No. 208.

TABLE 6 DUMMY INJURY CRITERIA

MAXIMUM ACCELERATION ('G')

	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DRIVER	-78.9	-9.7	-56.0	88.2	-46.7	-8.8	-6.9	44.9
PASSENGER	-91.9	6.5	-57.1	97.5	-45.5	8.7	-6.4	44.7

MAXIMUM FORCE-FEMUR LOAD (LBS)

	LEFT FEMUR	RIGHT FEMUR
DRIVER	786	739
PASSENGER	268	655

HEAD INJURY CRITERIA**

	HIC	TIME t_1 (MSEC) ¹	TIME t_2 (MSEC) ²
DRIVER	830	80.0	112.5
PASSENGER	1084	86.8	122.8

*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 chest impacted the lower steering wheel rim. The dummy's head rotated forward impacting the upper steering wheel rim and hub, as the dummy's torso was restrained by the three-point passive belt. The dummy's head rotated rearward as the dummy rebounded into the seat back. The dummy came to rest seated in the driver's seat, restrained by the three-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 instrument panel as the dummy's torso was restrained by the three-point passive belt. 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, restrained by the three-point passive belt.

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #230	PASSENGER #314
Head	Steering wheel rim and hub	Instrument panel
Chest	None	None
Abdomen	None	None
Left knee	Instrument panel	Instrument panel
Right knee	Instrument panel	Instrument panel

DOOR OPENING:

	LEFT	RIGHT
Front	Easy	Easy
Rear	Easy	Easy

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
Front	None	None
Rear	NA	NA

GLAZING DAMAGE:

The lower left corner area of 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: Chevrolet/Lumina
 Body Style: 4-door sedan Model Year: 1990
 NHTSA No.: CL0102 Color: Blue

DATA FROM CERTIFICATION LABEL:

Vehicle Manufacturer: General Motors of Canada, Ltd.
 Date of Manufacture: 7/89 VIN: 2G1WL54RXL9139496
 GVWR: 4265 lb; GAWR: Front = 2332 lb; Rear = 1933 lb

POST-IMPACT DATA:

Date of Test: 12/07/89 Time: 1333 Temperature: 70° F
 Required Impact Velocity Range: 28.9 to 29.9 mph
 Impact Velocity: Primary = 29.6 mph Secondary = 29.6 mph
 Seat Type: Bench Adjuster Type: Manual
 Bucket Seat Back Type: Manual-adjustable
 Technicians: R. Benavides, R. Branham, & P. Cummins

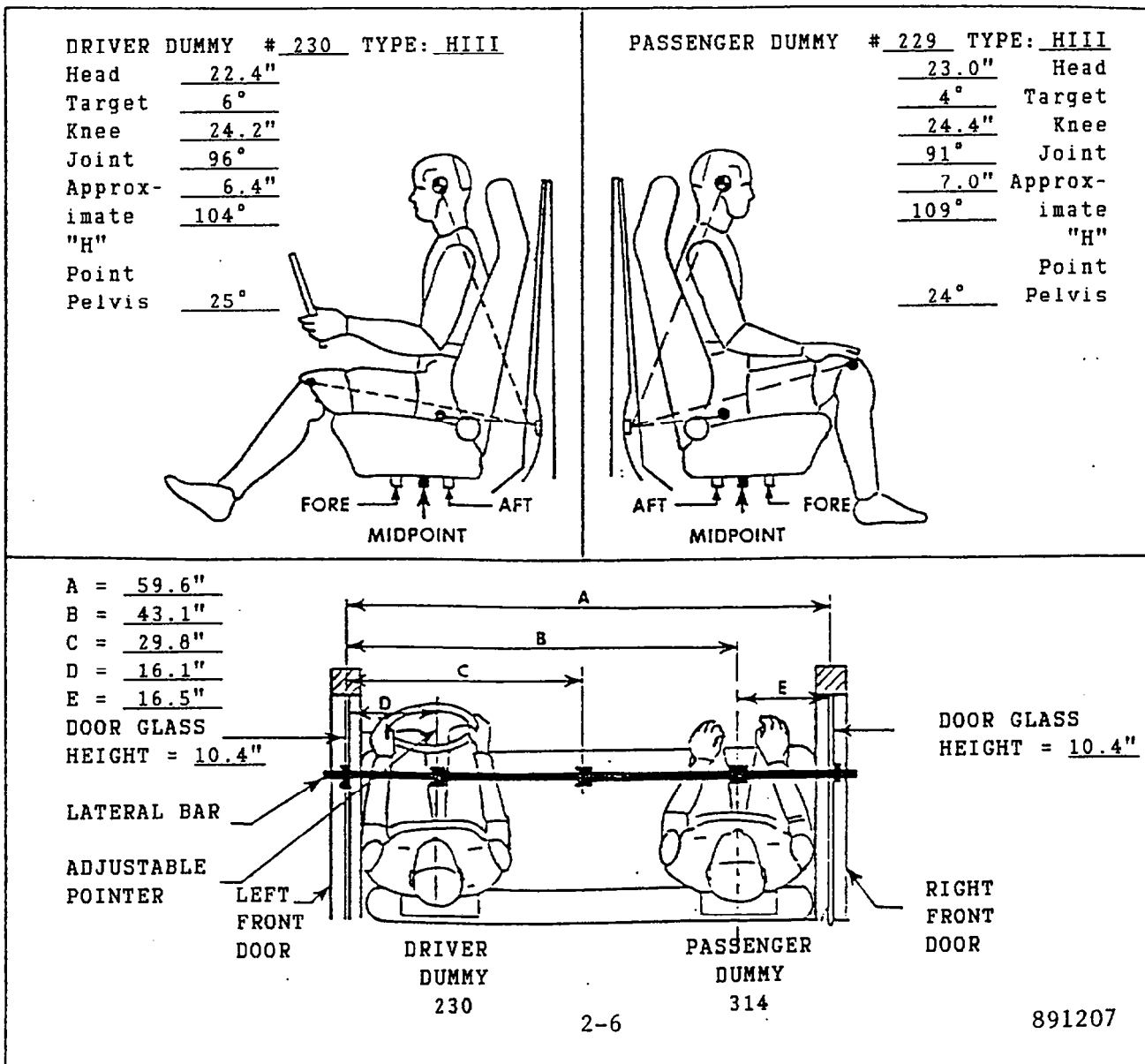
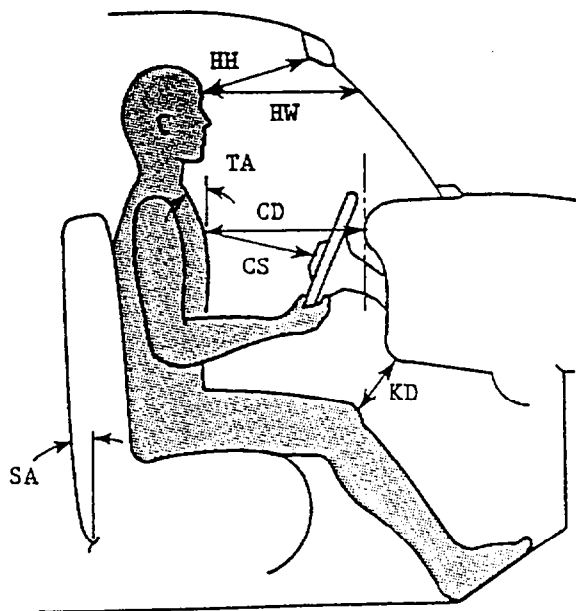


FIGURE 7 DUMMY IN-VEHICLE POSITION RECORDING SHEET

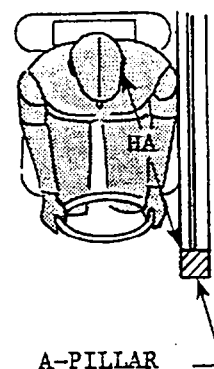
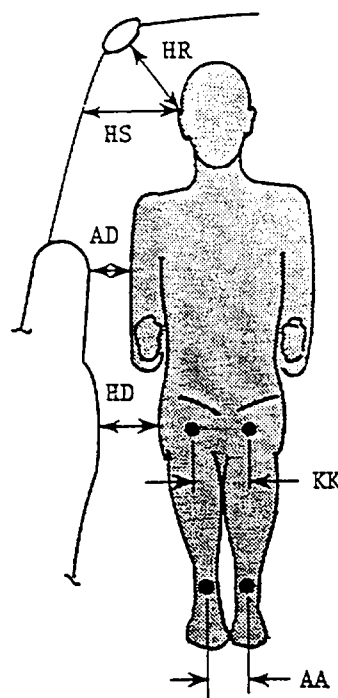
	DRIVER	PASSENGER
HH	12.0	12.4
HW	18.6	20.2
CD	23.9	23.6
CS	12.8	NA
KDL	2.5	4.1
KDR	3.0	3.4
TA	26°	24°
SA	26°	26°
HA	14.2	15.1



	DRIVER	PASSENGER
HR	7.8	7.4
HS	12.8	13.3
AD	6.2	6.6
HD	5.9	5.6
KK	8.5	8.5
AA	10.5	8.8

Knee outer clevis to outer clevis spacing:

Driver = 10.6
Passenger = 10.6

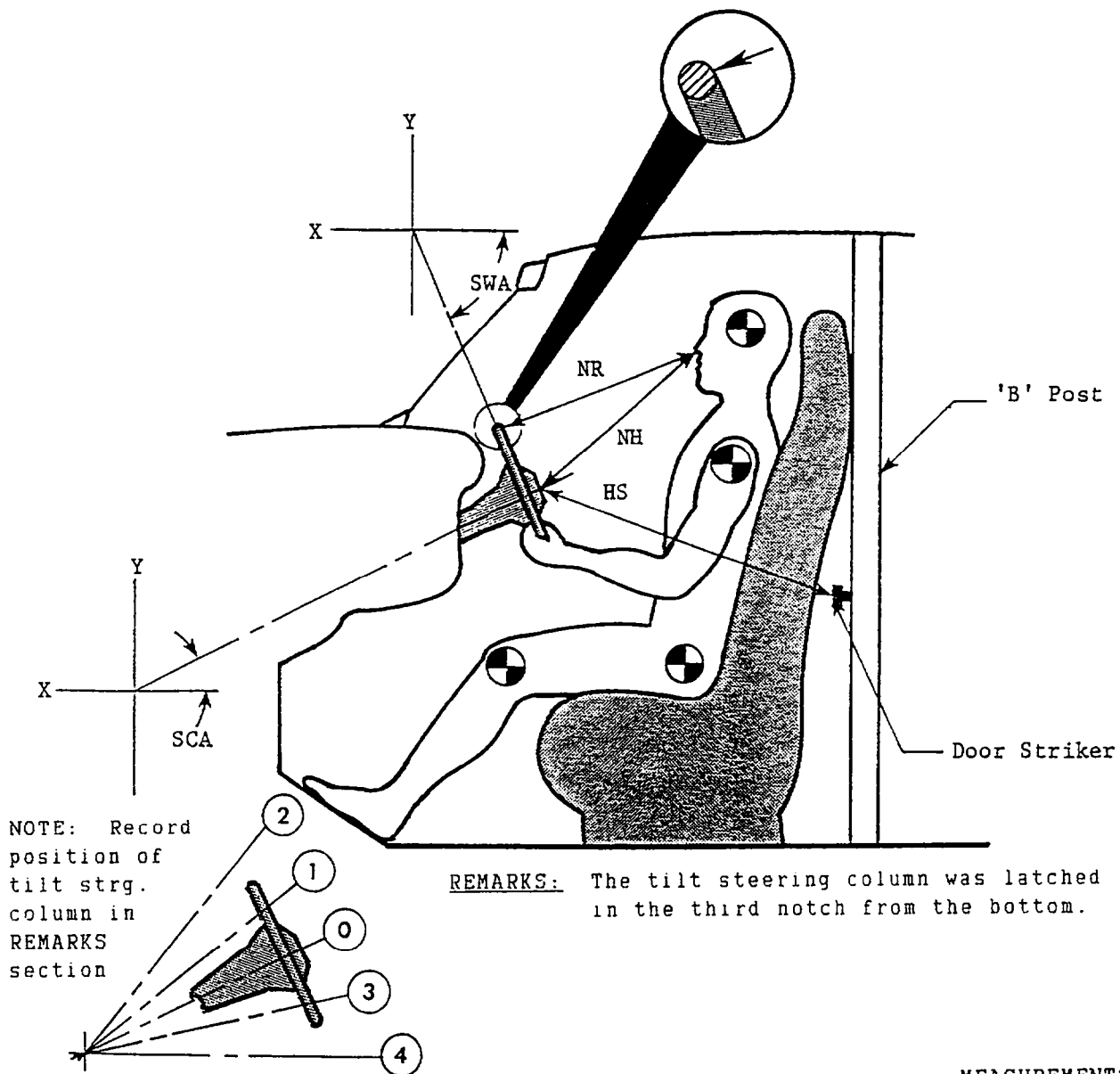


HH = Head to Windshield Header	HR = Head to Side Roof
HW = Head to Windshield	HS = Head to Side Window
CD = Chest to Dash	AD = Arm to Door
CS = Chest to Steering Wheel	HD = Hip to Door
KD = Knee to Dash	KK = Knee to Knee
TA = Torso Angle	AA = Ankle to Ankle
SA = Seat Back Angle	HA = Head to A-Pillar

Torso and seat back angles are relative to vertical.

ALL DISTANCE MEASUREMENTS ARE IN INCHES.

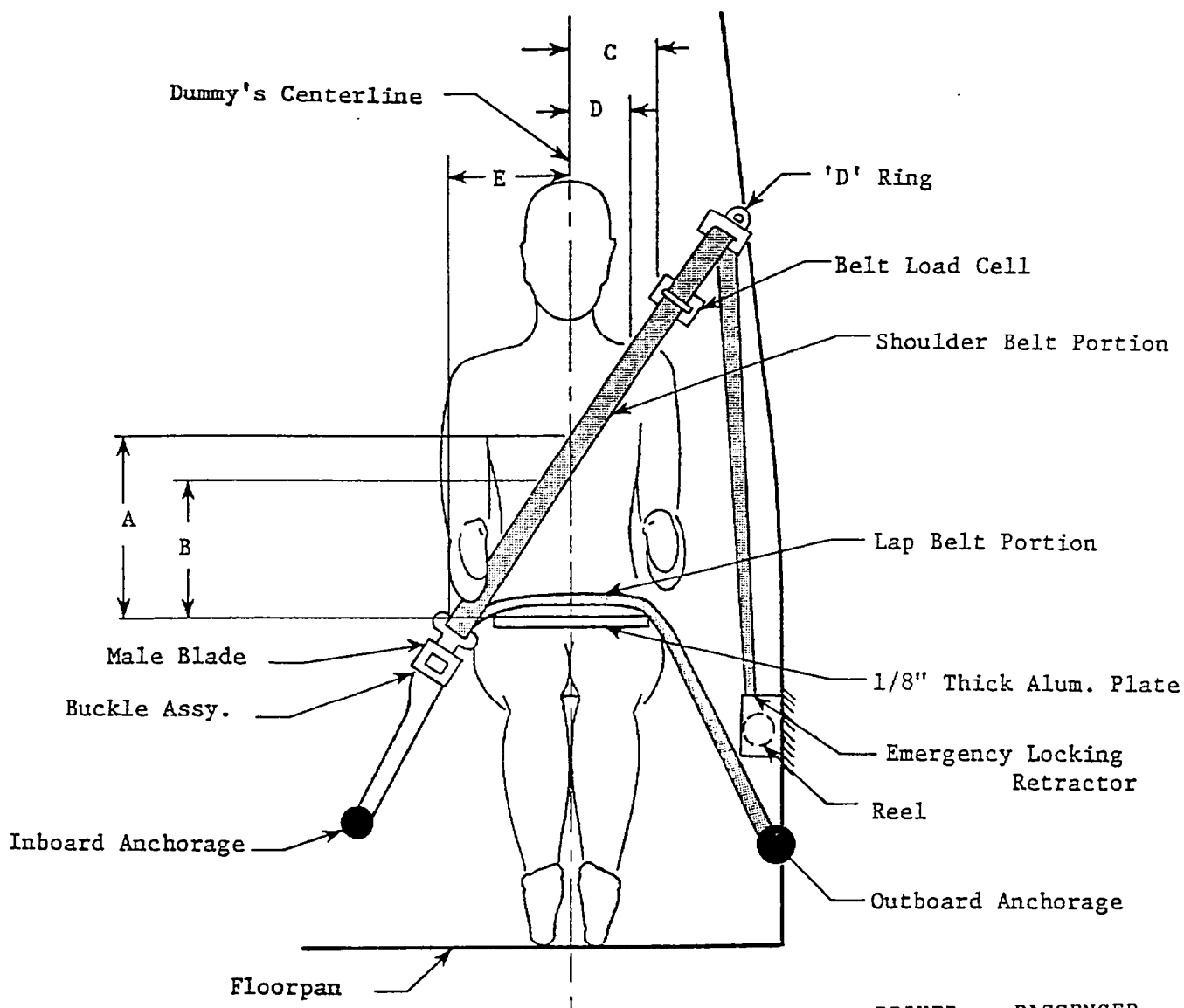
FIGURE 8 DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



MEASUREMENTS

NR	- Distance from tip of dummy's nose to top rear surface of steering wheel rim. (in.)	13.1
NH	- Distance from tip of dummy's nose to center of steering column hub. (in.)	16.2
HS	- Distance from center of steering column hub to the forward surface of the door lock striker pin. (in.)	21.5
SCA	- Angle of steering column relative to the horizontal X axis	27°
SWA	- Angle of steering wheel relative to the horizontal X axis	63°

FIGURE 9 SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	14.0	12.8
B - Top surface of alum. plate to belt lower edge (in)	10.9	9.5
C - Dummy centerline to outer edge of belt at chest flesh top (in)	4.5	4.2
D - Dummy centerline to inner edge of belt at chest flesh top (in)	2.0	2.0
E - Dummy centerline to intersection of upper torso belt and lap belt (in)	9.2	10.4

TABLE 7 FMVSS 208 COMFORT AND CONVENIENCE DATA

VEHICLE VIN: 2G1WL54RXL9139496 NHTSA NO: CL0102
MAKE: Chevrolet MODEL: Lumina
VEHICLE BUILD DATE: 7/89 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?
 Yes

MAXIMUM SLACK RECOMMENDED IN OWNER'S MANUAL: 1.0 INCHES
DOES OWNER'S MANUAL WARN THAT INTRODUCING SLACK BEYOND THE AMOUNT
SPECIFIED CAN SIGNIFICANTLY REDUCE THE EFFECTIVENESS OF THE SHOULDER
BELT? Yes

IF NO, EXPLAIN:

AUTOMATIC BELTS: IS TENSION - RELIEVING DEVICE CANCELLED EACH TIME
THE ADJACENT DOOR IS OPENED? Yes

BELT CONTACT FORCE:

NOT APPLICABLE, VEHICLE'S RESTRAINT SYSTEM INCLUDED A BELT
TENSION-RELIEVING DEVICE.

TABLE 7 FMVSS 208 COMFORT AND CONVENIENCE DATA CONT'D

VEHICLE VIN: 2G1WL54RXL9139496 NHTSA NO: CL0102

MAKE: Chevrolet MODEL: Lumina

VEHICLE BUILD DATE: 7/89 VEHICLE TYPE: 4-door sedan

FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:

(check one): ☒ Automatic belts
☐ Type 2 lap/shoulder belts
☐ Other

LATCHPLATE ACCESS: NA

RETRACTION: NA

ACCESSIBILITY: NA

LATCH MECHINISM: NA

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

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

Duration of audible warning signal = 7 sec.

Duration of reminder light operation = continuous sec.

WITH OCCUPANT IN DRIVER'S POSITION AND PASSIVE 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 = 0 sec.

Wording of visual warning:

Fasten Seat Belt

Fasten Belt X

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 PROTECTON 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: Chevrolet/Lumina

BODY STYLE: 4-door sedan

MODEL YEAR: 1990

NHTSA NO.: CL0102

COLOR: Blue

DATA FROM CERTIFICATION LABEL

VEHICLE MANUFACTURER: General Motors of Canada, Ltd.

DATE OF MANUFACTURE: 7/89

VIN: 2G1WL54RXL9139496

GVWR: 4265 LBS., GAWR: FRONT 2332 LBS., REAR 1933 LBS.

POST-IMPACT DATA

TYPE OF TEST: Frontal Barrier Impact

DATE OF TEST: 12/07/89

TIME: 1333

TEMP: 70° F

REQUIRED IMPACT VELOCITY RANGE: 28.9 MPH TO 29.9 MPH

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

TEST WEIGHT = 3663 LBS., STATIC CRUSH MAX. = 21.4 IN., REBOUND = 114.1 IN.

FUEL SYSTEM DATA

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

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: 17.1 GALLONS (FURNISHED BY COTR)

TEST VOLUME: 15.9 GALLONS (92-94% OF USEABLE)

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 16.0 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: 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 retention around periphery, plastic trim over exterior perimeter.

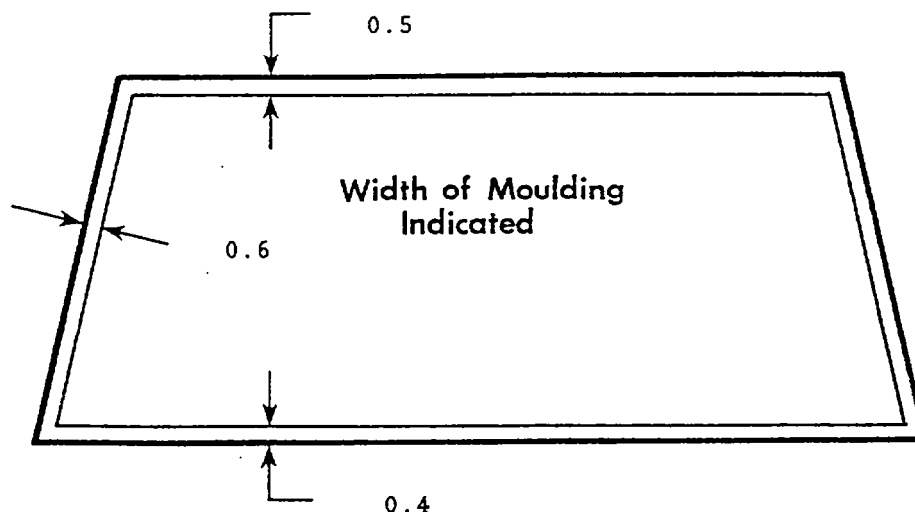
FMVSS 212 REQUIREMENTS: The post-test periphery retention amount must be at least 75% of the pre-test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

FMVSS 212 TEST DATA:

WINDSHIELD PERIPHERY

	PRE-TEST (in)	POST-TEST (in)	PERCENT RETENTION
RIGHT SIDE	87.8	87.8	100%
LEFT SIDE	87.8	87.8	100%
TOTAL	175.6	175.6	100%

AREA OF RETENTION FAILURE:



WINDSHIELD TEMPERATURE: 72° F

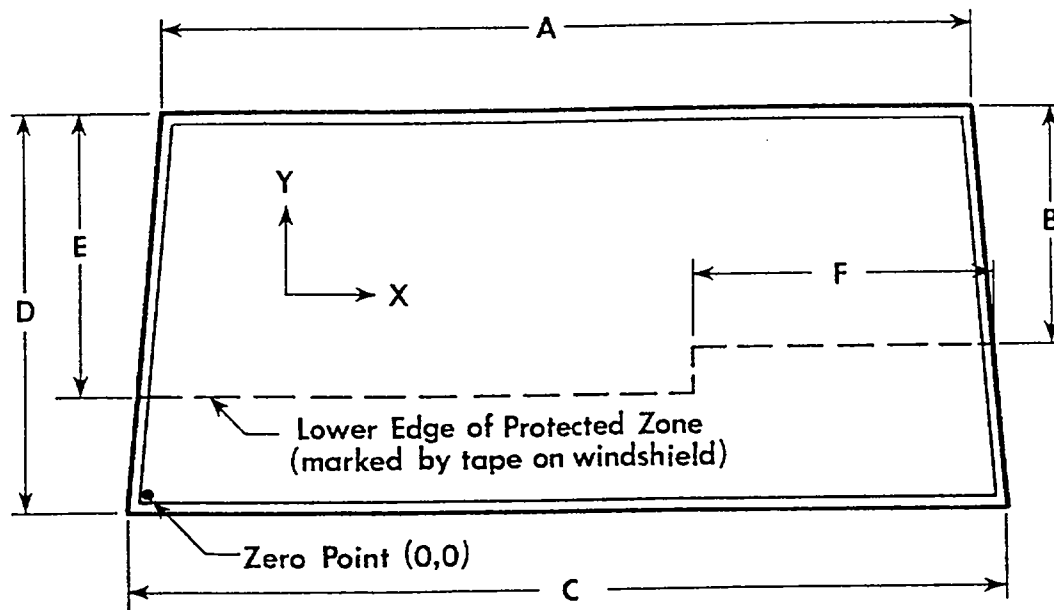
FAILURE DETAILS: None

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 = <u>50.6</u>	C = <u>70.0</u>	E = <u>22.1</u>
B = <u>23.1</u>	D = <u>29.0</u>	F = <u>7.5</u>

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.: CL0102; TEST DATE: 12/07/89
VEH. MFR./MAKE/MODEL: General Motors of Canada, Ltd./Chevrolet/Lumina

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:

 X 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

SECTION 3.0

CAMERA INFORMATION

FIGURE 12

CAMERA POSITIONS

4, 7, 8

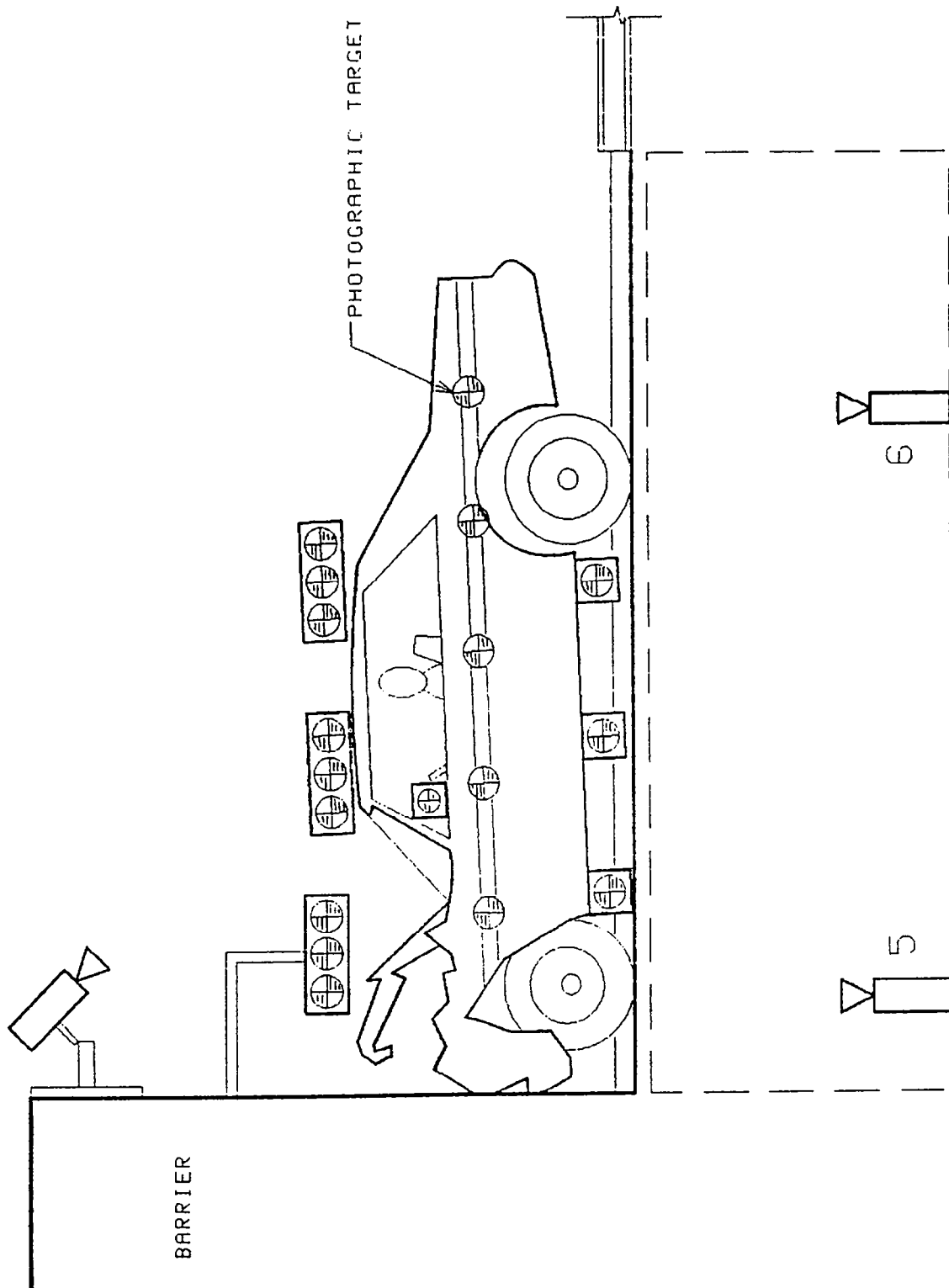


FIGURE 12

CAMERA POSITIONS, CONTINUED

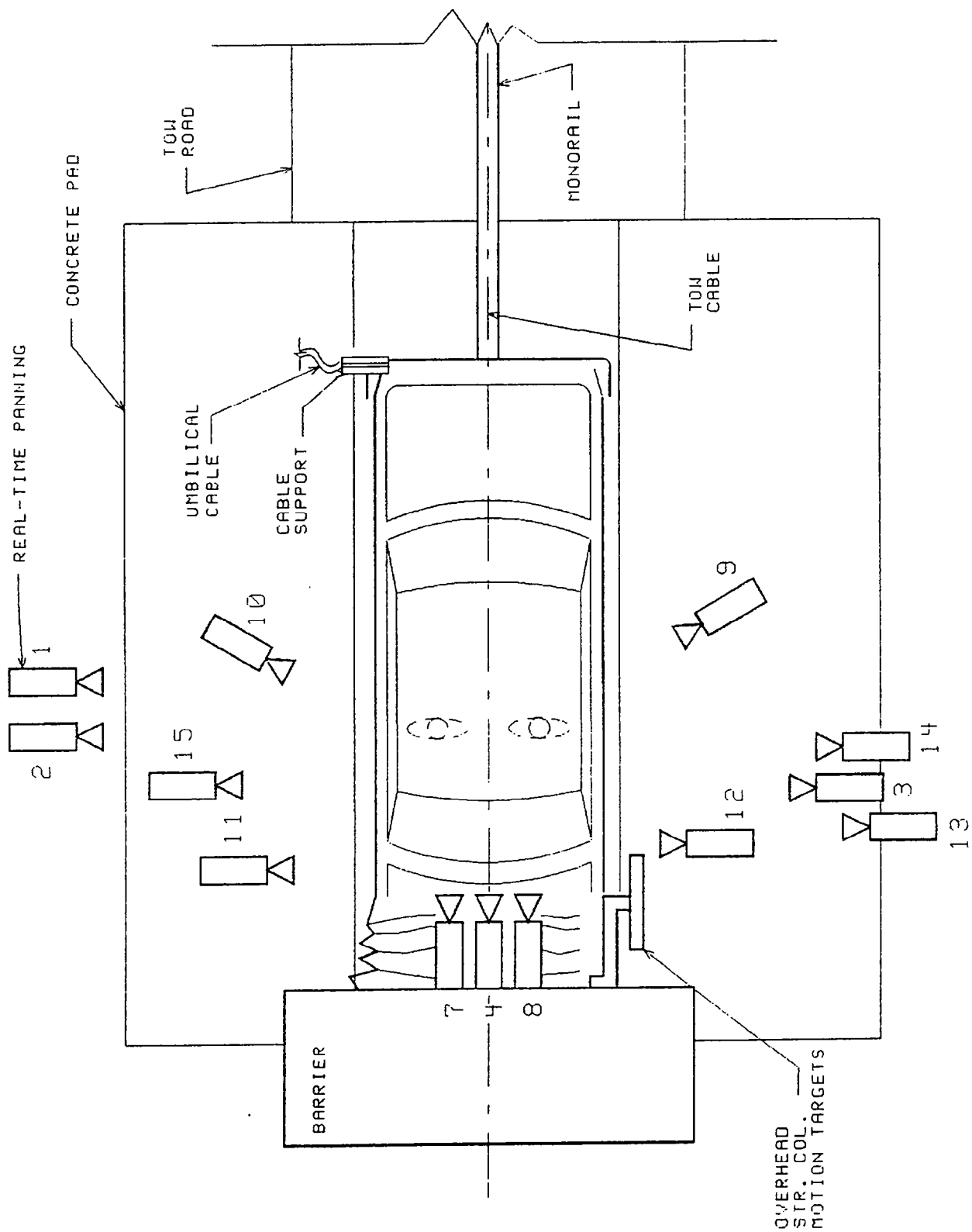


TABLE 13 HIGH SPEED CAMERA LOCATIONS

TEST NO.: 891207		VEHICLE: 1990 Chevrolet Lumina 4-door sedan			FILM PLANE			
CAMERA NO.	VIEW	CAMERA POSITIONS (IN)*			ANGLE** (DEG)	TO HEAD TARGET	LENS (MM)	SPEED (FPS)
		X	Y	Z				
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	498
3	Dummy kinematics	-41.5	295.0	44.0	-4	228.0	25	500
4	Windshield damage	-6.0	0.0	96.0	-40	NA	8.5	500
5	Crush & fluid spillage	-50.5	0.0	-92.4	90	NA	13	1000
6	Fluid spillage	-99.3	0.0	-99.0	90	NA	13	1000
7	Passenger kinematics	-4.5	-13.8	93.0	-50	NA	17	502
8	Driver kinematics	-6.8	14.5	93.0	-50	NA	17	502
9	Driver kinematics	-157.3	116.0	87.0	-27	114.0	25	502
10	Passenger kinematics	-152.1	-116.0	87.0	-26	109.0	25	505
11	Windshield intrusion	-38.1	-306.1	44.0	0	NA	50	500
12	Windshield intrusion	-53.0	309.4	42.3	0	NA	50	498
13	Column movement	-128.0	256.0	103.0	-14	NA	25	600
14	Column movement	-128.0	256.0	75.1	-9	NA	25	502
15	Passenger kinematics	-38.8	-293.0	45.3	-4	248.0	25	488

* +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

891207



Figure A-3. PRE-TEST LEFT SIDE VIEW



Figure A-4. POST-TEST LEFT SIDE VIEW

A-3

891207



Figure A-5. PRE-TEST RIGHT SIDE VIEW



Figure A-6. POST-TEST RIGHT SIDE VIEW

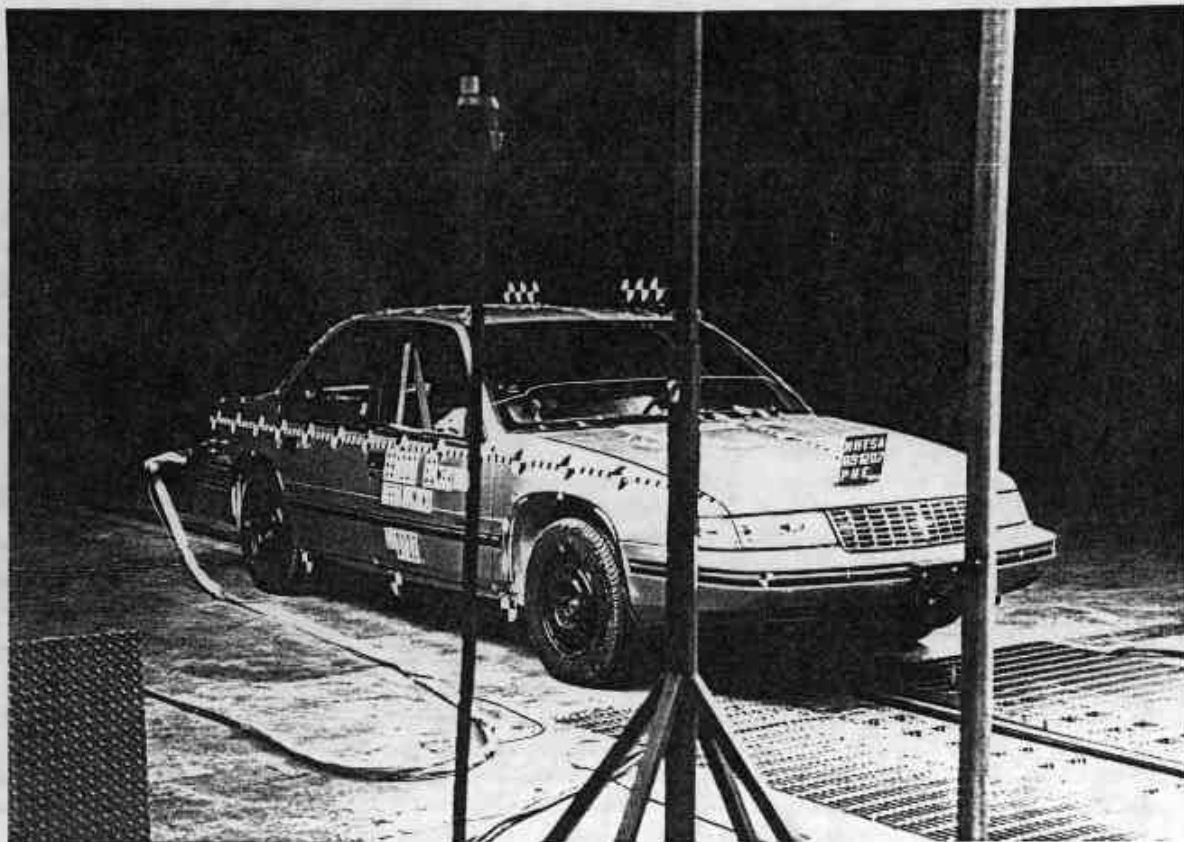


Figure A-5. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-6. POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-5

891207



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

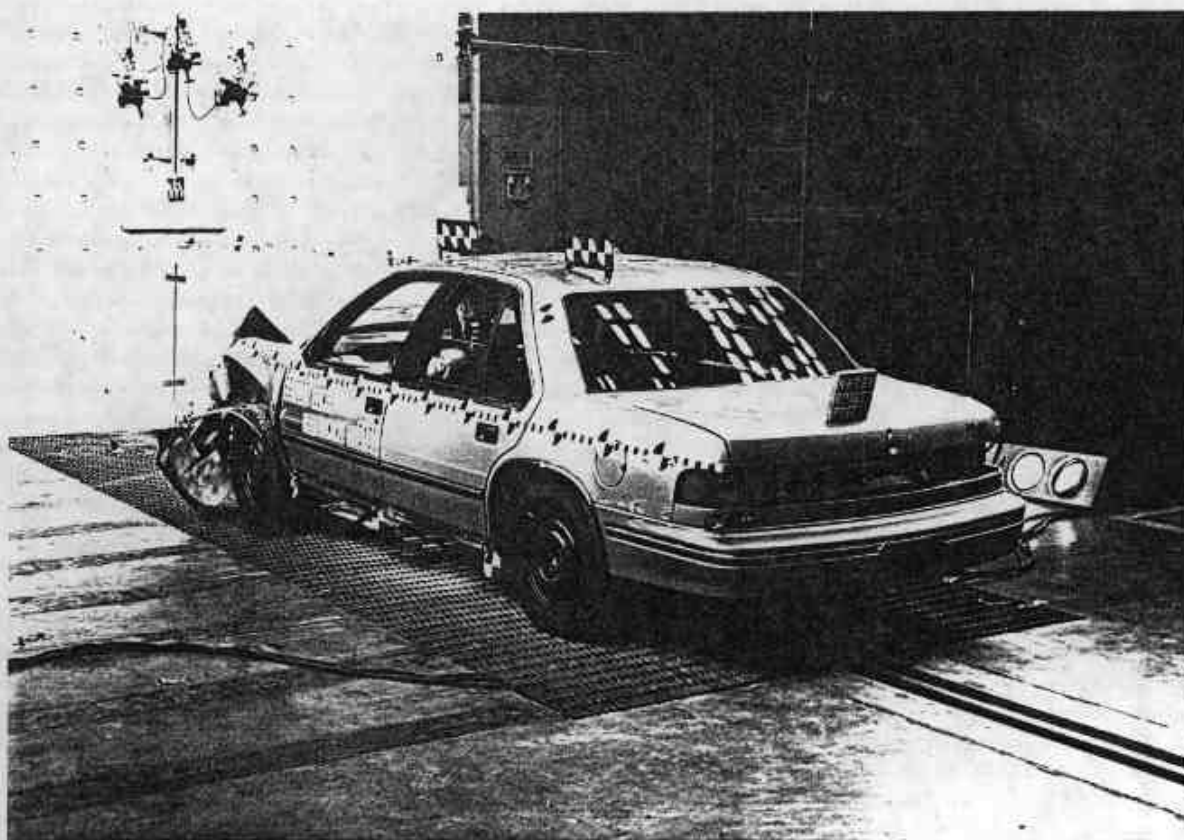


Figure A-10. POST-TEST LEFT REAR THREE-QUARTER VIEW

A-6

891207



Figure A-11. PRE-TEST REAR VIEW

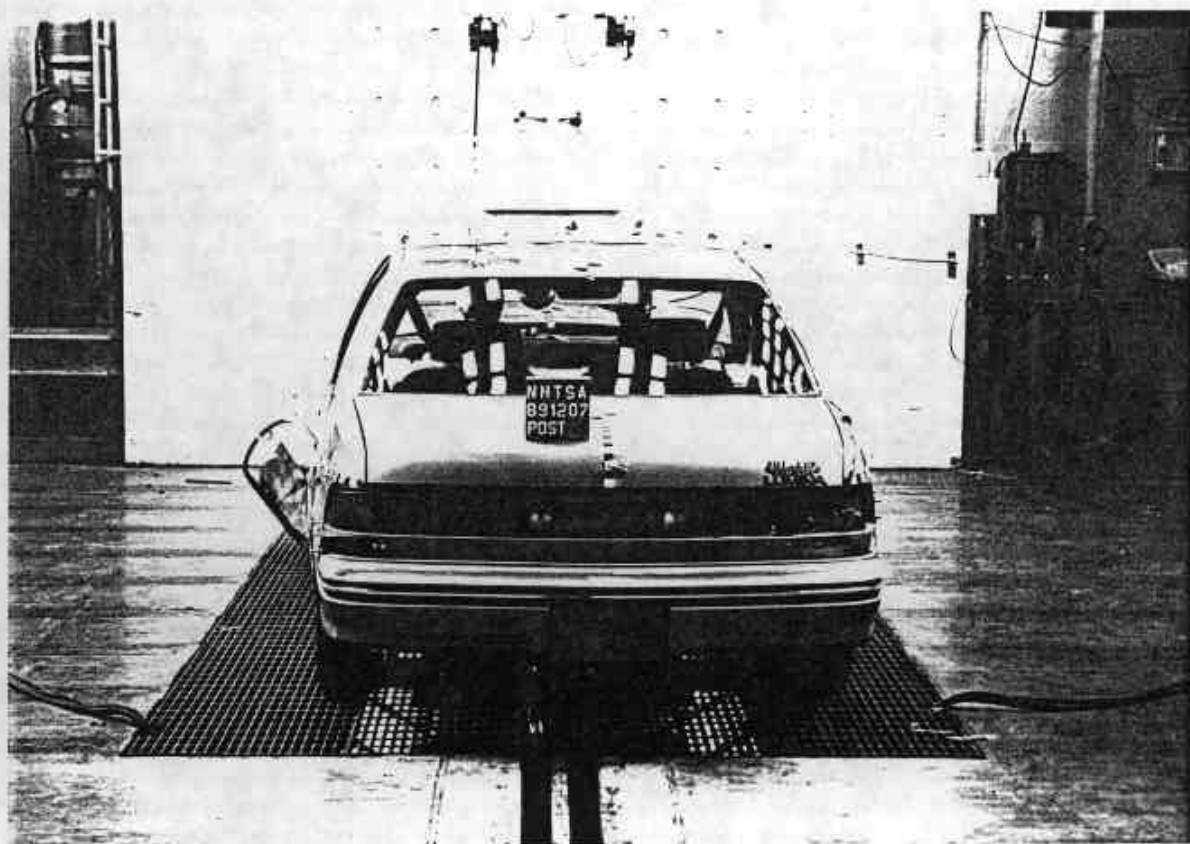


Figure A-12. POST-TEST REAR VIEW
A-7

891207

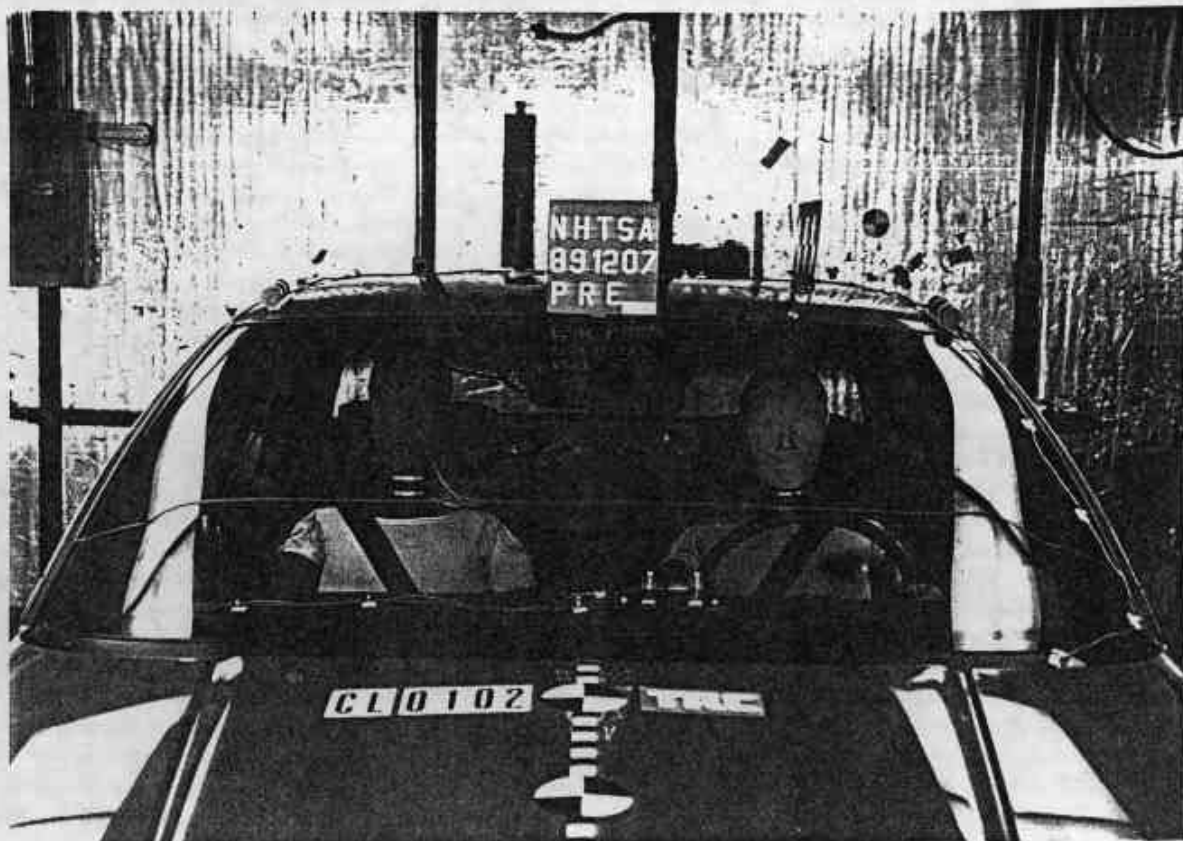


Figure A-13. PRE-TEST WINDSHIELD VIEW

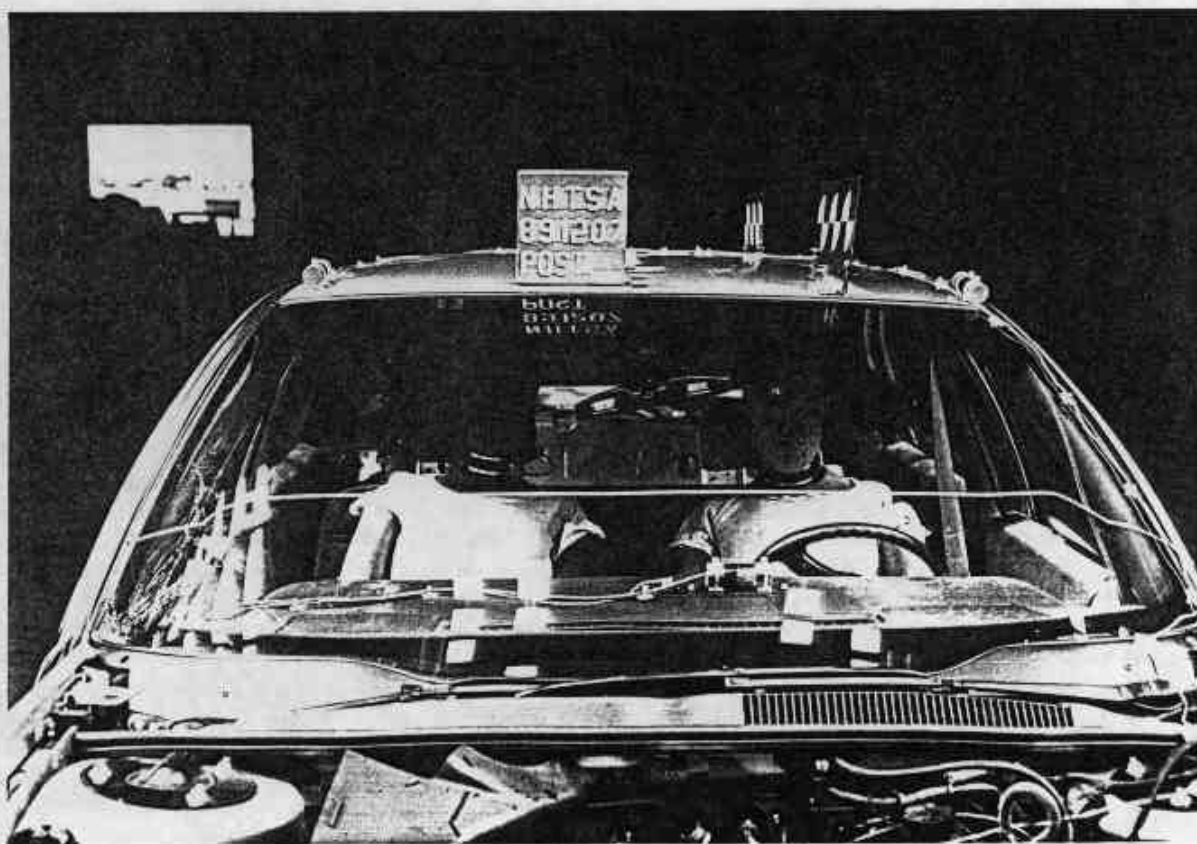


Figure A-14. POST-TEST WINDSHIELD VIEW
A-8

891207

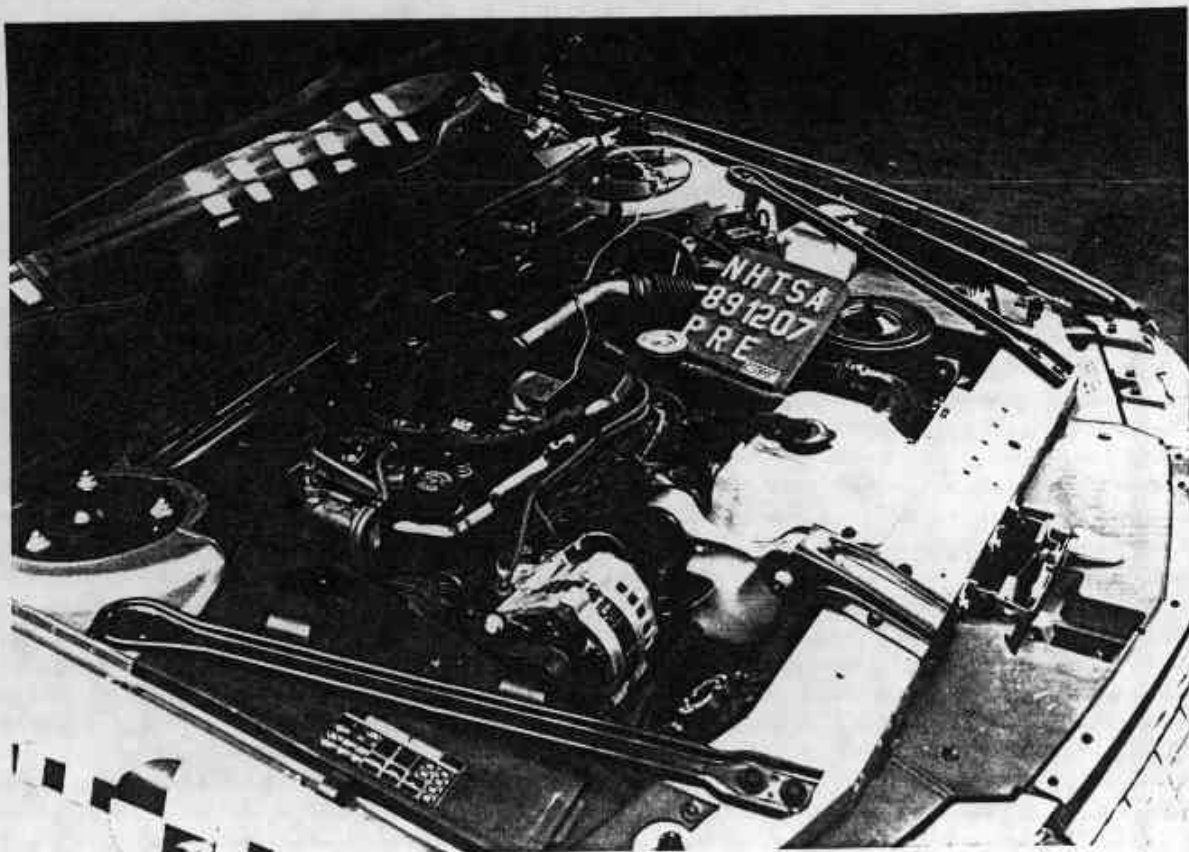


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW

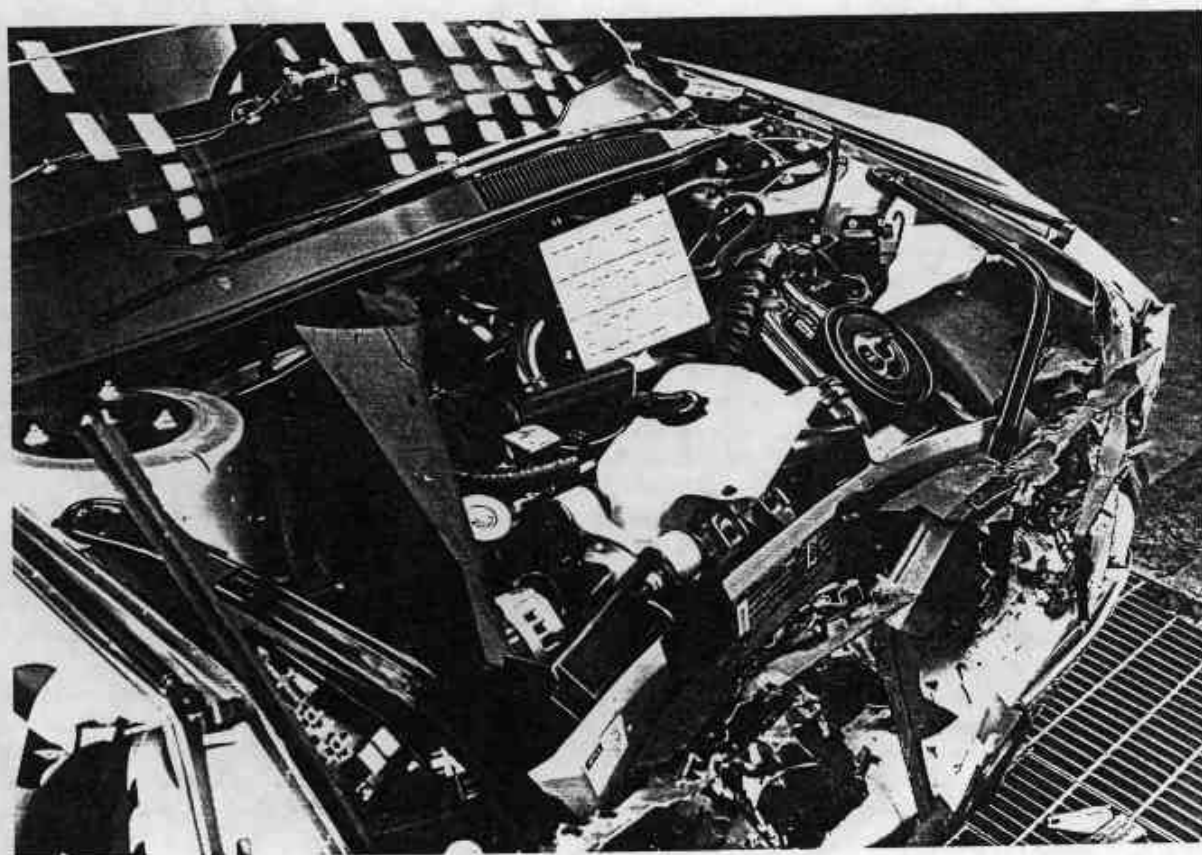


Figure A-16. POST-TEST ENGINE COMPARTMENT VIEW

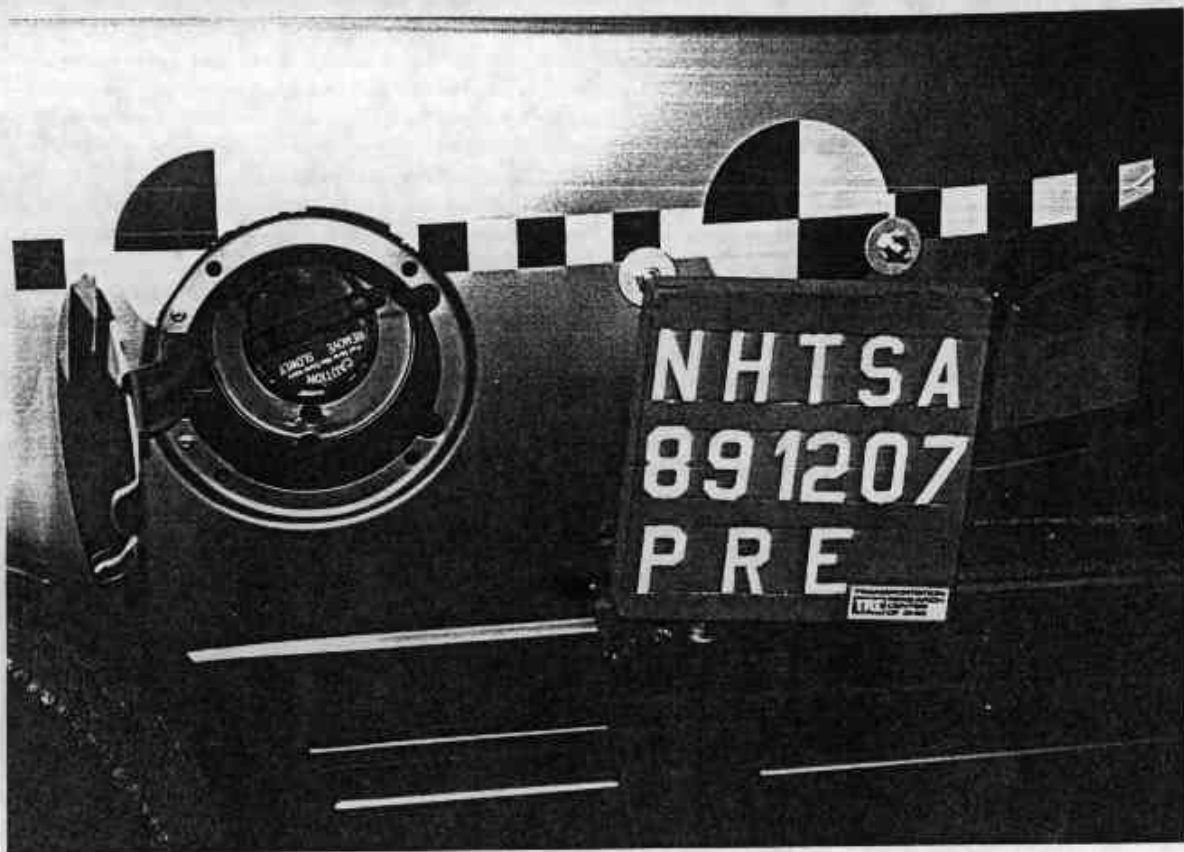


Figure A-17. PRE-TEST FUEL FILLER CAP VIEW

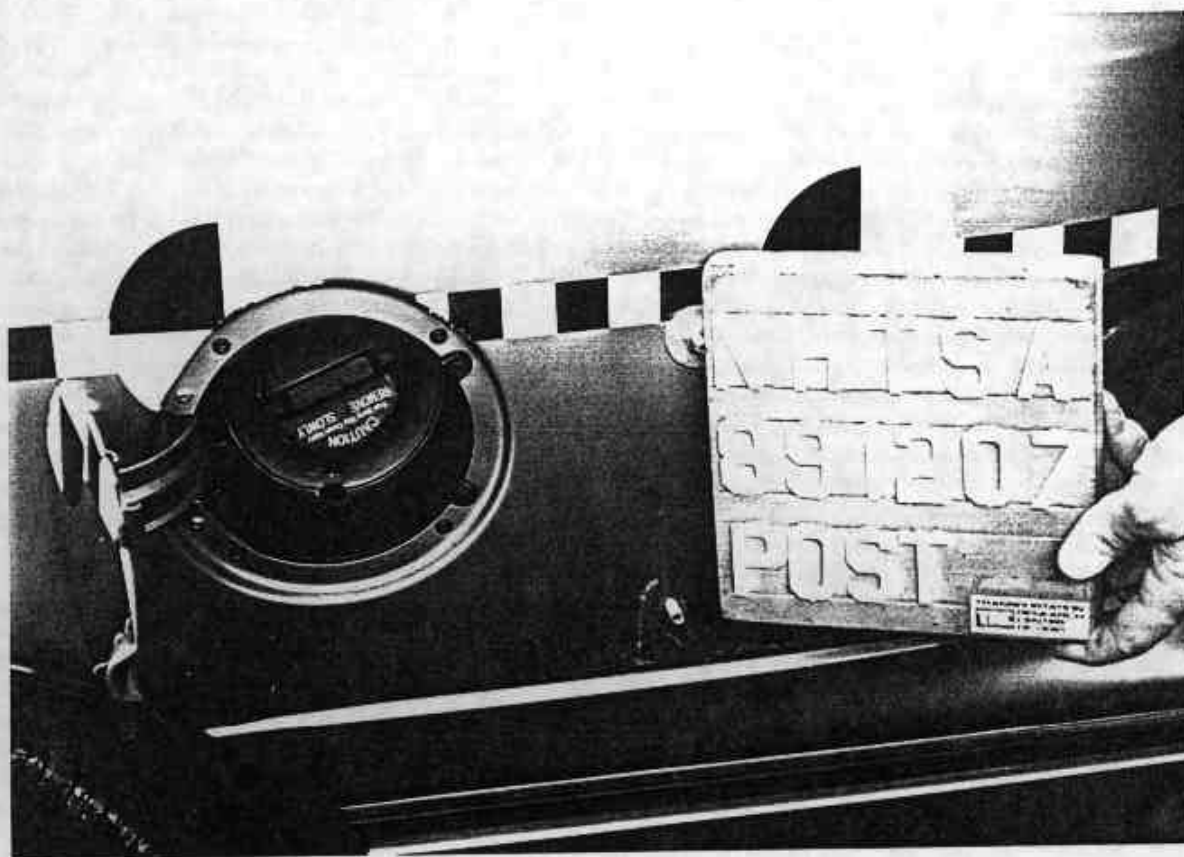


Figure A-18. POST-TEST FUEL FILLER CAP VIEW
A-10

891207



Figure A-19. PRE-TEST FRONT UNDERBODY VIEW

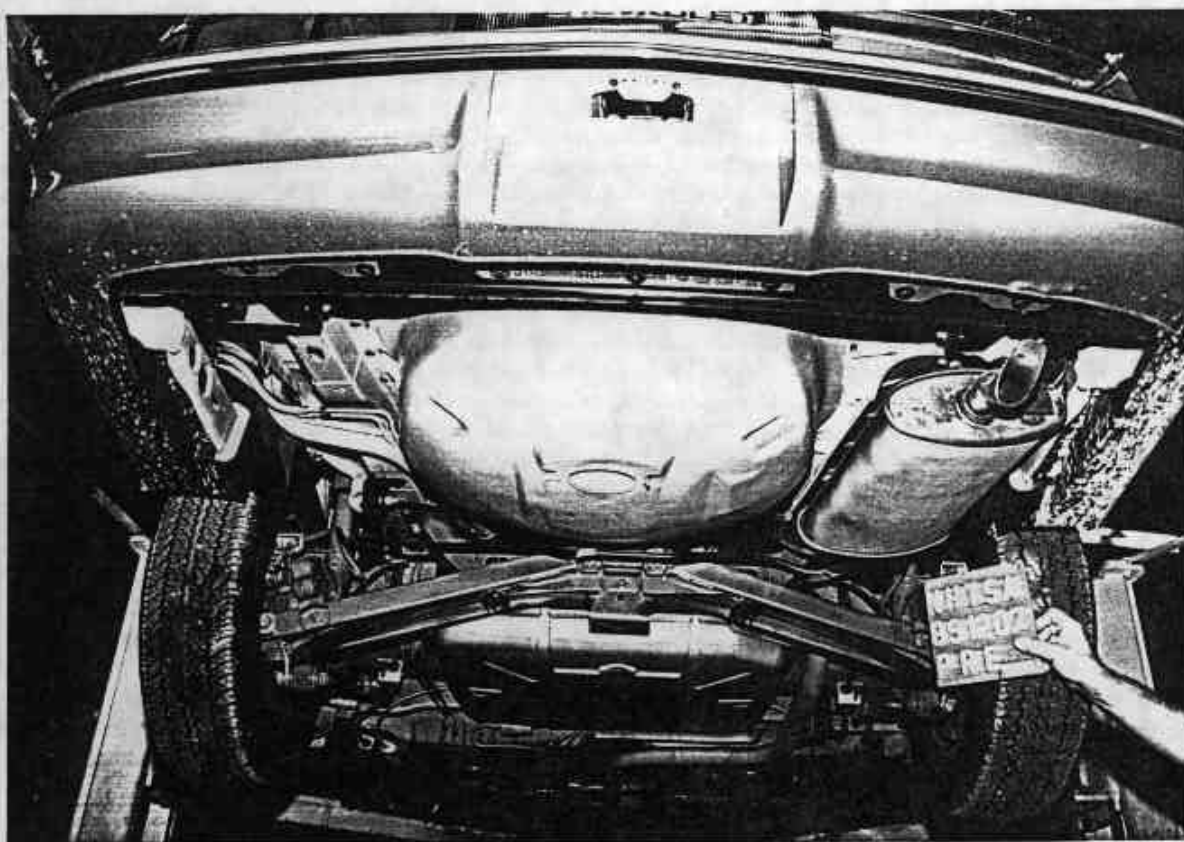


Figure A-20. PRE-TEST REAR UNDERBODY VIEW

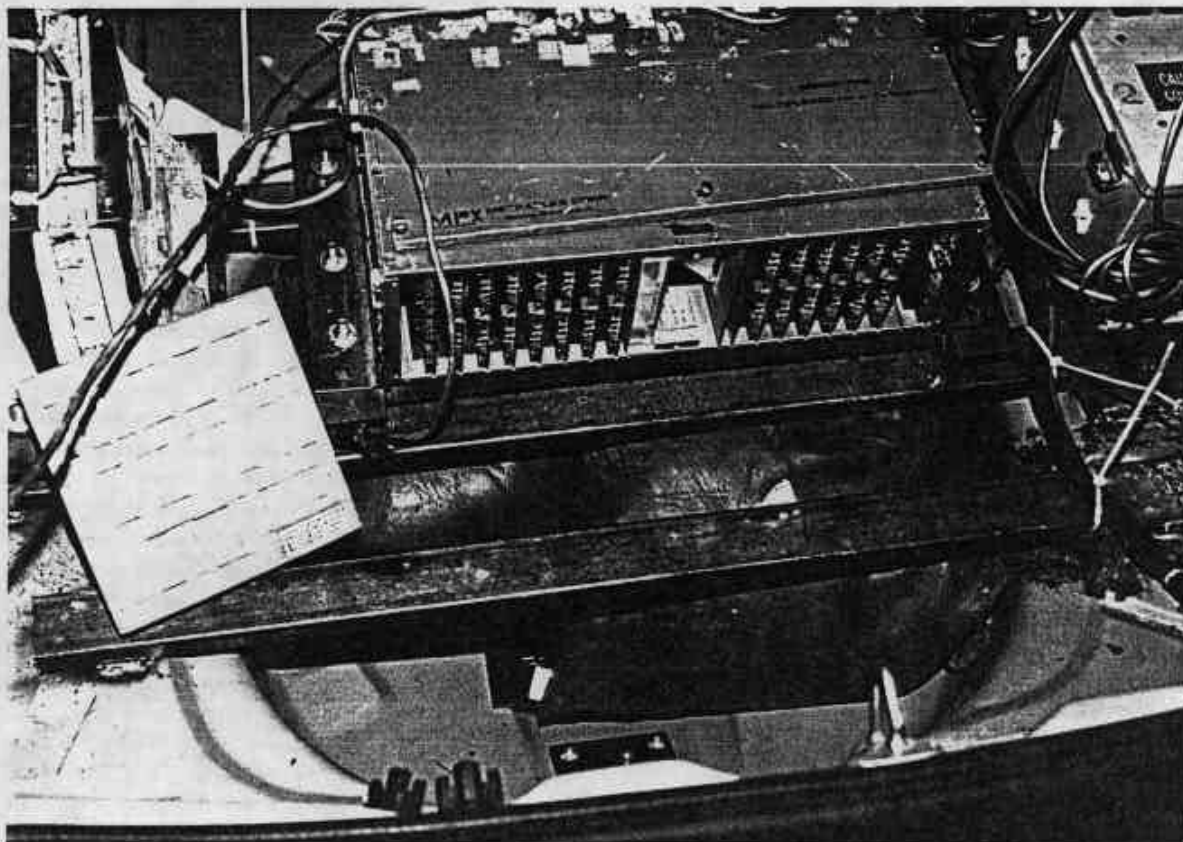


Figure A-21. PRE-TEST BALLAST VIEW

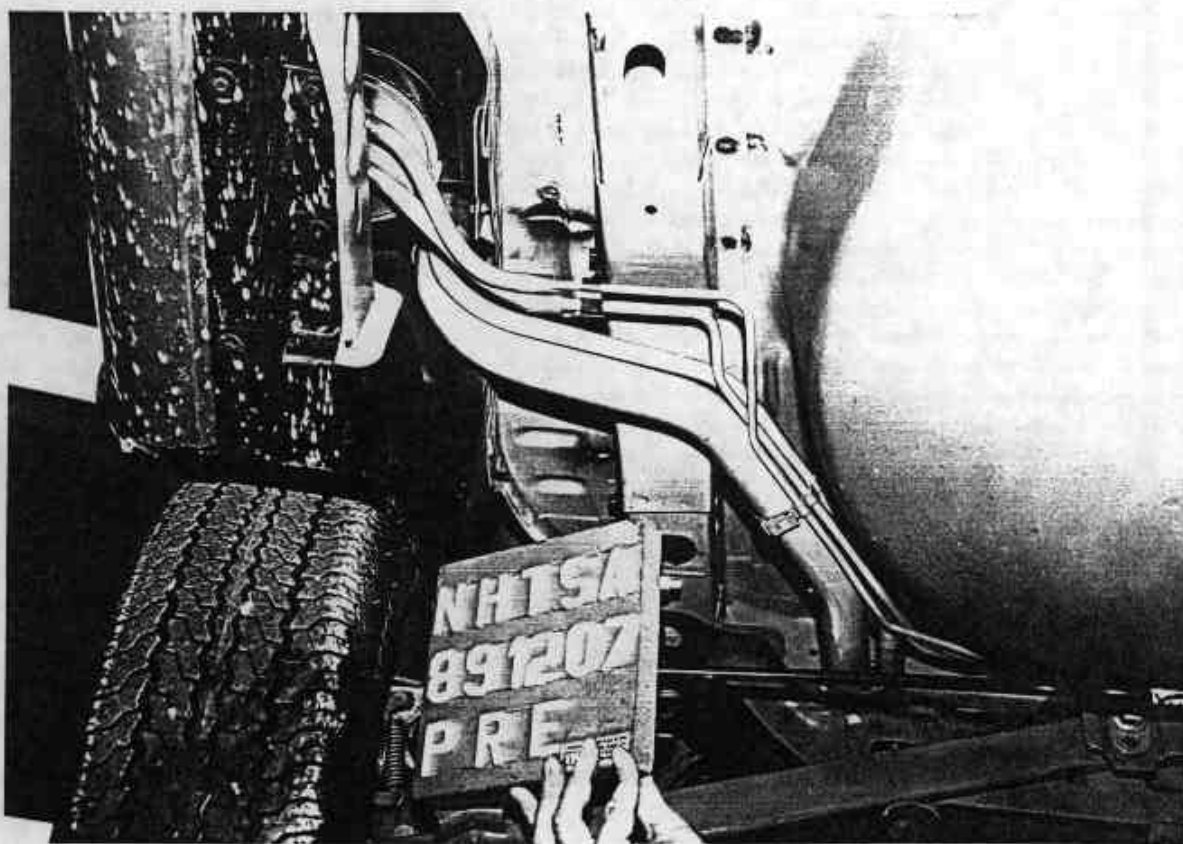


Figure A-22. PRE-TEST FUEL FILLER NECK VIEW
A-12

891207

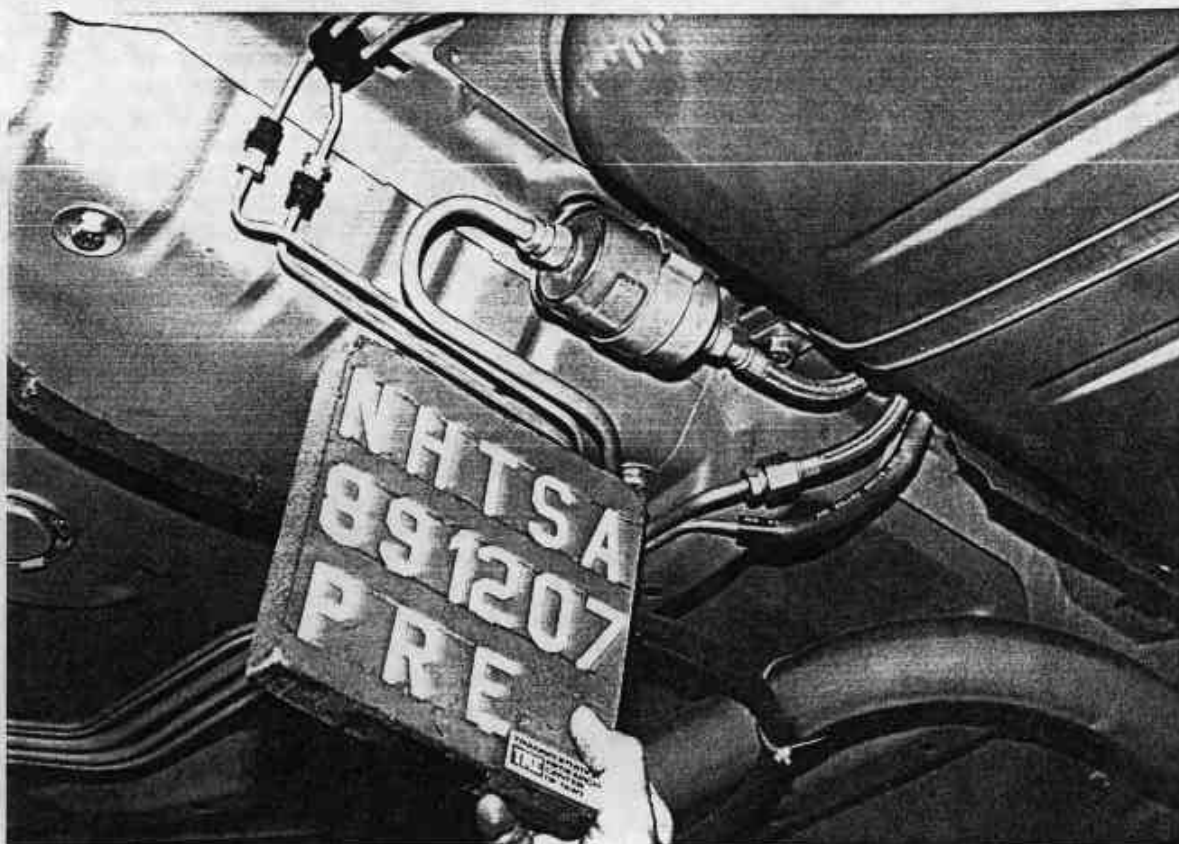


Figure A-23. PRE-TEST FUEL PUMP VIEW



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

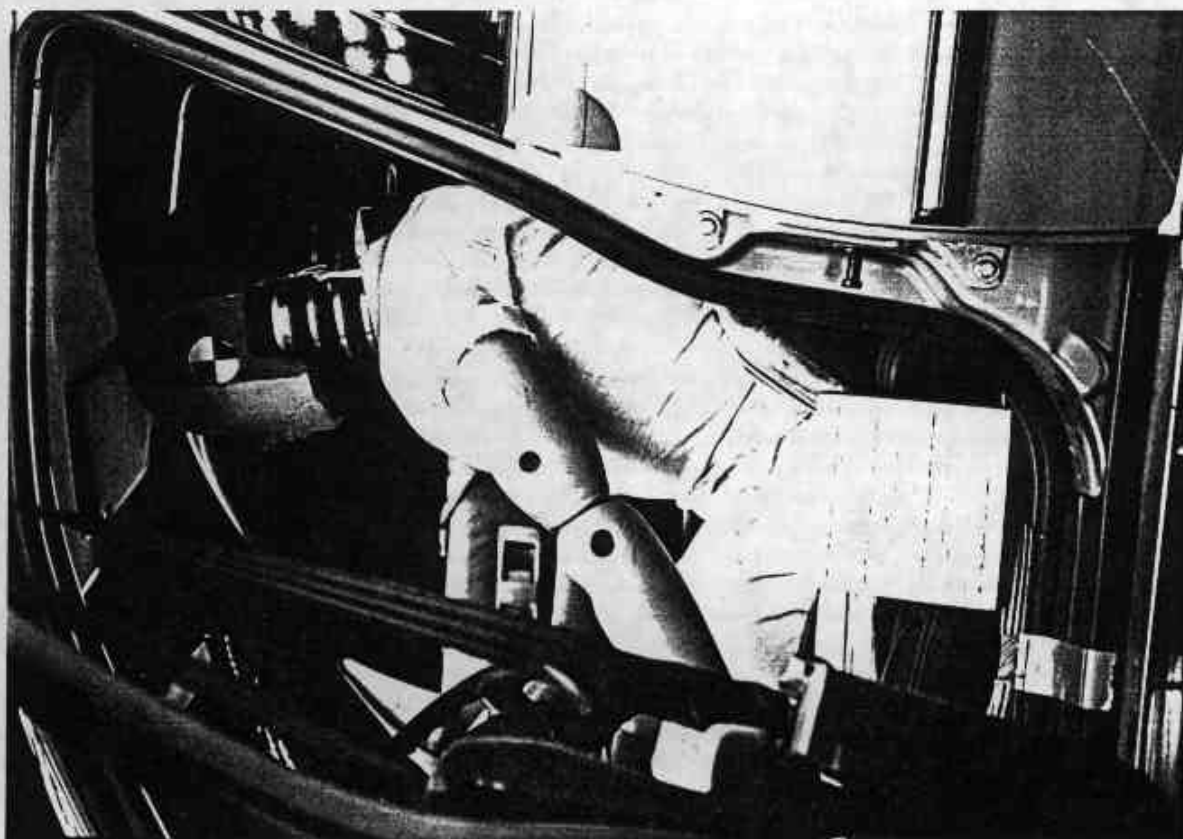


Figure A-28. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR

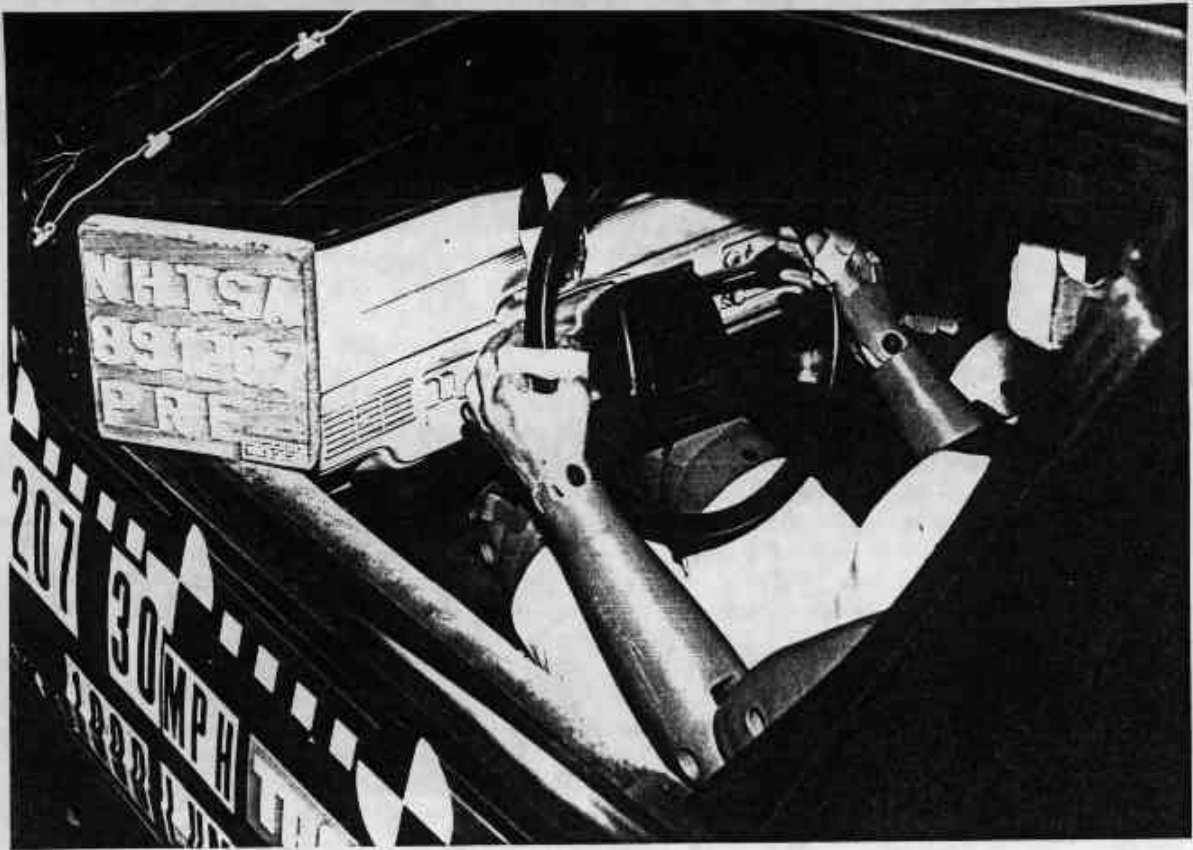


Figure A-29. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

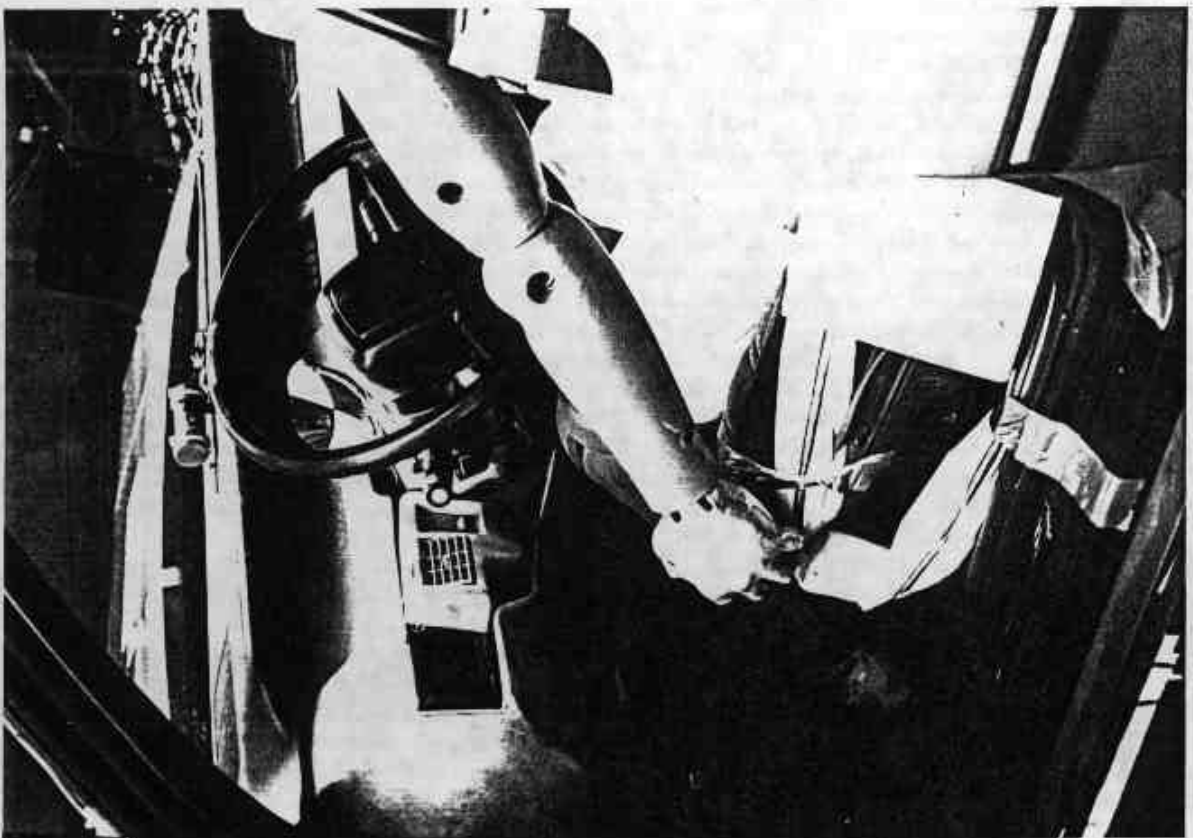


Figure A-30. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2
A-16 891207

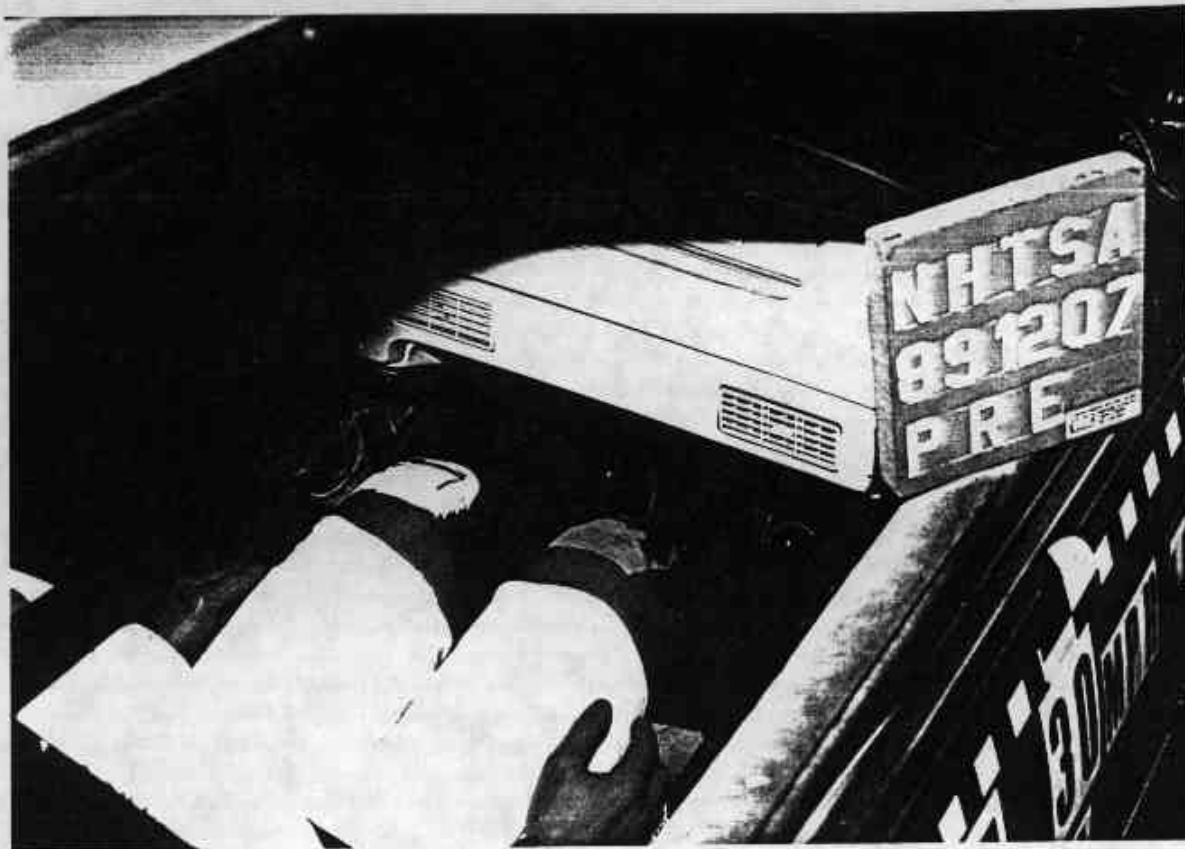


Figure A-31. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR

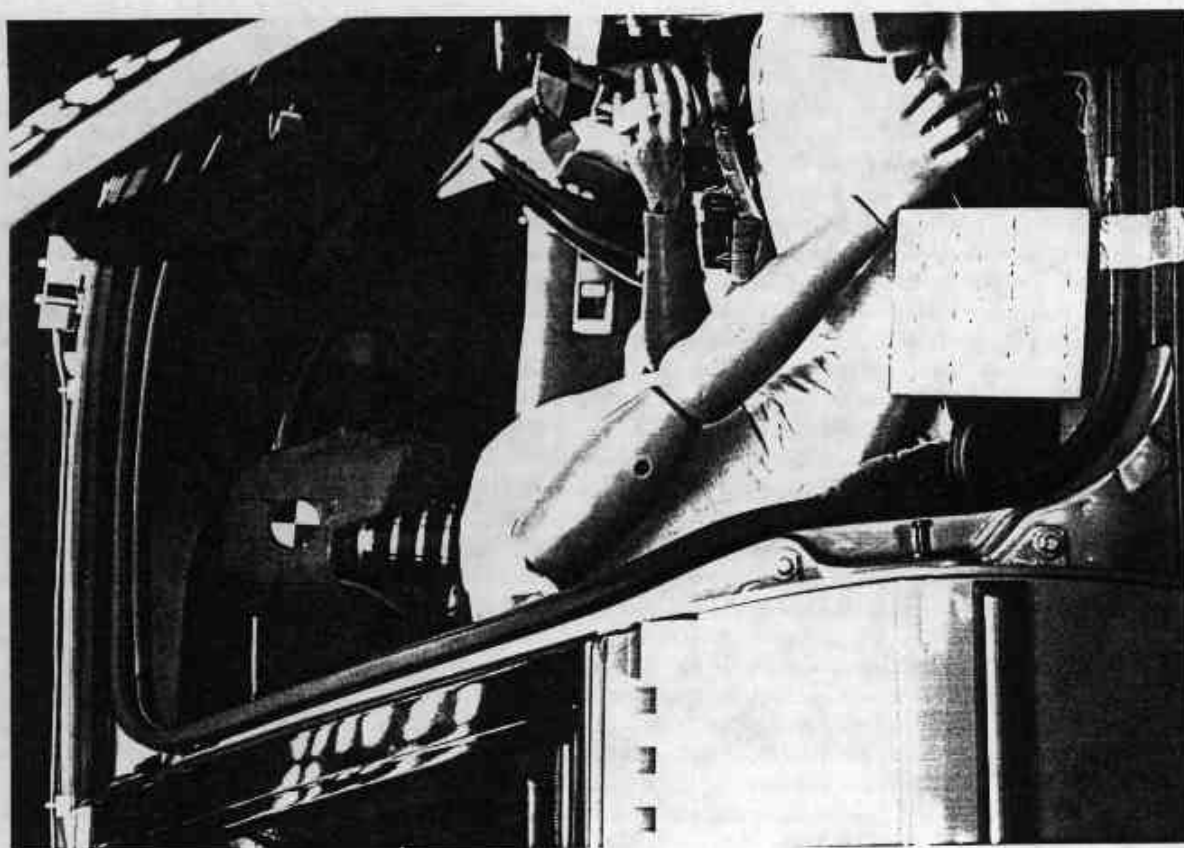


Figure A-32. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1
A-17 891207



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



Figure A-34. POST-TEST DRIVER HEAD CONTACT - VIEW 1



Figure A-35. POST-TEST DRIVER HEAD CONTACT - VIEW 2



Figure A-36. POST-TEST DRIVER KNEE CONTACT - VIEW 1



Figure A-37. POST-TEST DRIVER KNEE CONTACT - VIEW 2



Figure A-38. POST-TEST FRONT PASSENGER HEAD CONTACT VIEW



Figure A-39. POST-TEST RIGHT FRONT PASSENGER HEAD AND KNEE CONTACT VIEW



Figure A-40. POST-TEST RIGHT FRONT PASSENGER KNEE CONTACT VIEW

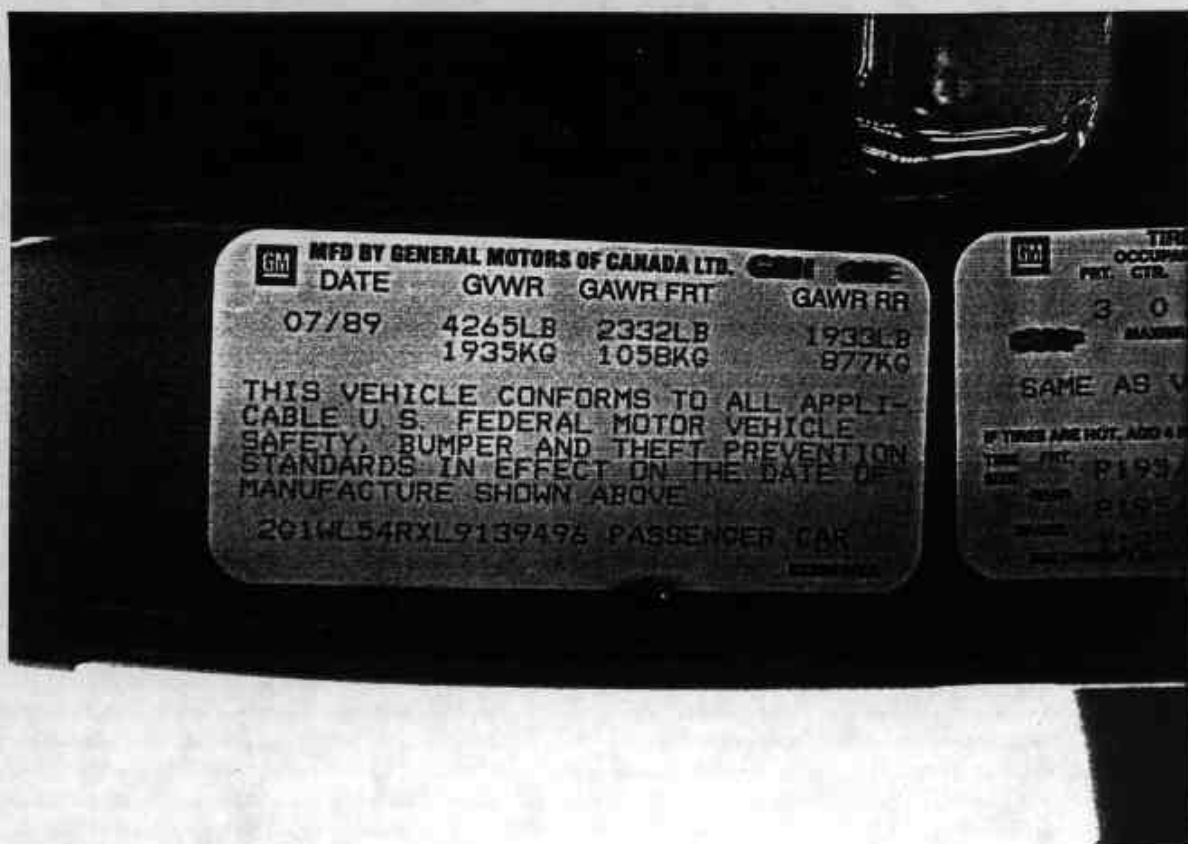


Figure A-41. PRE-TEST VEHICLE CERTIFICATION LABEL

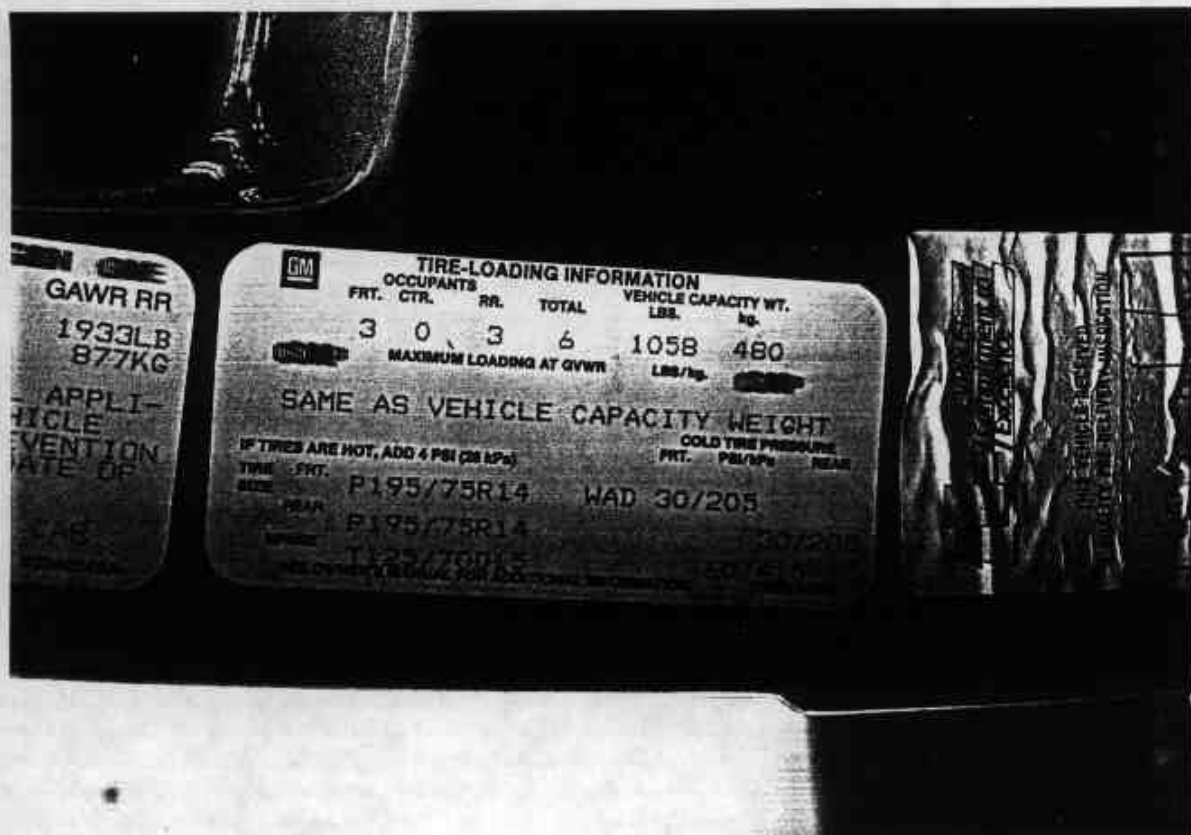


Figure A-42. PRE-TEST VEHICLE TIRE LOAD LABEL

APPENDIX B

DATA PLOTS

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

200 COMPLIANCE

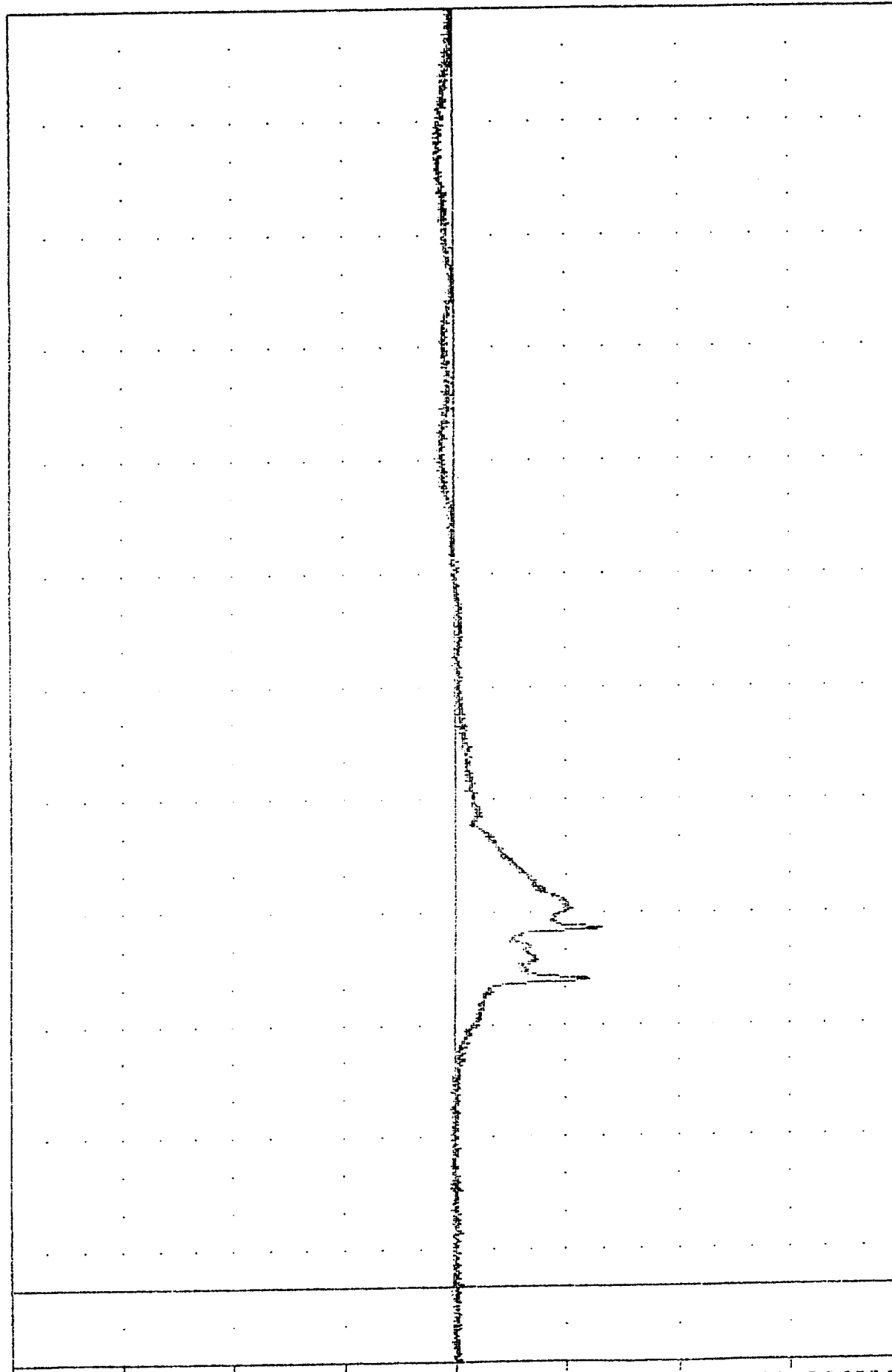
89341

HEDX61

FILTER = ALPF 1650/ 5214/ -90

MIN, MAX VALUES = -78.91e 95.63, 10.49 e 295.25

ACCELERATION (G)



200 COMPLIANCE

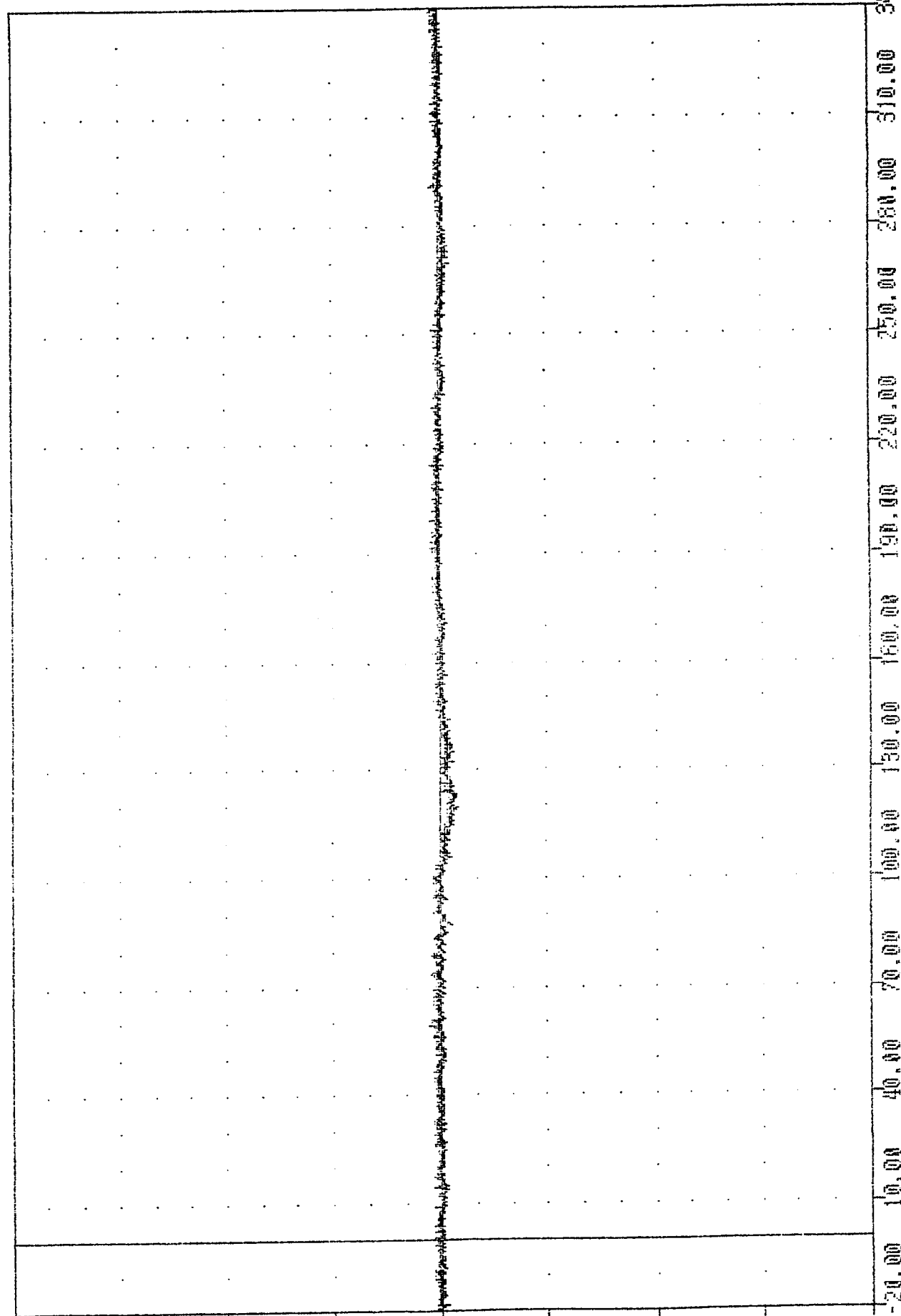
89241

HEUY61

FILTER = NLFF 1650/ 5214/ -40

MIN. MAX VALUES = -9.67% 119.38, 6.86 % 59.13

ACCELERATION (G)



200 COMPLIANCE

89541

HE0261

FILTER = HUFF 1650/ 5214/ -40

MIN, MAX VALUES = -55.950

94.75 ,

3.86 0

-1.13

240.00

180.00

120.00

60.00

0.00

-60.00

-120.00

-180.00

-240.00

ACCELERATION

(G)

0.00

-50.00

-100.00

-150.00

-200.00

-250.00

-300.00

-350.00

-400.00

-450.00

-500.00

-550.00

-600.00

-650.00

-700.00

-750.00

-800.00

-850.00

-900.00

-950.00

-1000.00

-1050.00

-1100.00

-1150.00

-1200.00

-1250.00

-1300.00

891207

B-4

341 310.00 280.00 250.00 220.00 190.00 160.00 130.00 100.00 70.00 40.00 10.00 -20.00

TIME (SECT)

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER

DRIVER HEAD Z AXIS ACCELERATION

SWB COMPLIANCE

89341

HEDR61

FILTER = ALPF 1850/ 5214/ -40

MIN, MAX VALUES = 0.170

40.75,

88.18 0

95.63

210.00

180.00

150.00

120.00

90.00

60.00

30.00

0.00

-30.00

-60.00

-90.00

-120.00

-150.00

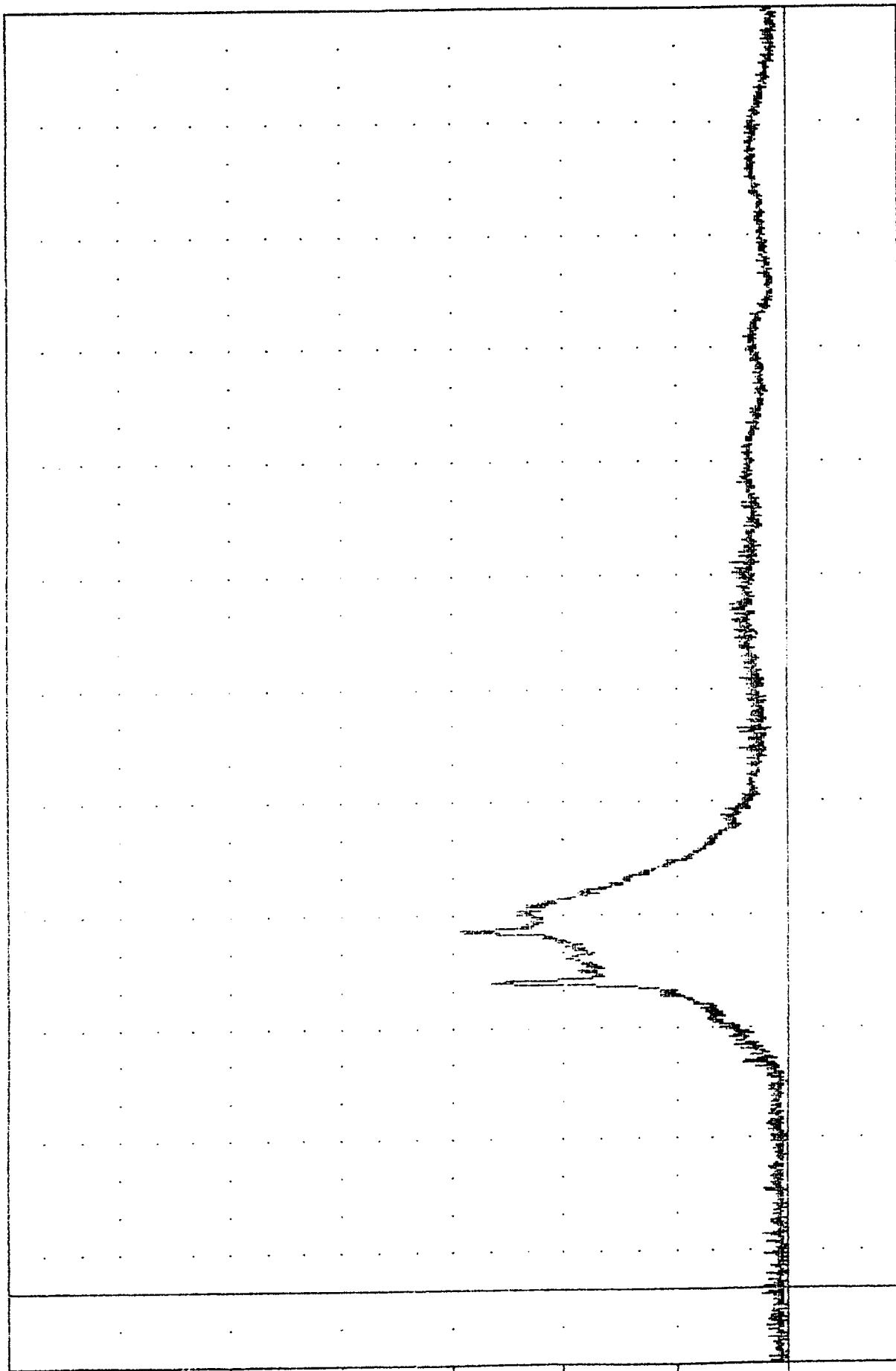
-180.00

-210.00

ACCELERATION (G)

B-5

891207



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

200 COMPLIANCE

89341

CSTXG1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -46.68 82.50

7.23 276.75

120.00

90.00

60.00

30.00

0.00

-30.00

-60.00

-90.00

-120.00

ACCELERATION [G]

TIME [MSEC]

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

360.00

380.00

400.00

420.00

440.00

460.00

480.00

500.00

520.00

540.00

560.00

580.00

600.00

620.00

640.00

660.00

680.00

700.00

720.00

740.00

760.00

780.00

800.00

820.00

840.00

860.00

880.00

900.00

920.00

940.00

960.00

980.00

1000.00

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
DRIVER CHEST X AXIS ACCELERATION

END COMPLIMCE

09341

CSY61

FILTER = RLFF 300/ 750/ -10

MIN, MAX VALUES =

-8.750

71.63,

2.00 0

120.50

120.00

90.00

60.00

30.00

0.00

-30.00

-60.00

-90.00

-120.00

ACCELERATION (G)

TIME (SECS)

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

360.00

380.00

400.00

420.00

440.00

460.00

480.00

500.00

520.00

540.00

560.00

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
DRIVER CHEST Y AXIS ACCELERATION

200 COMPLIANCE

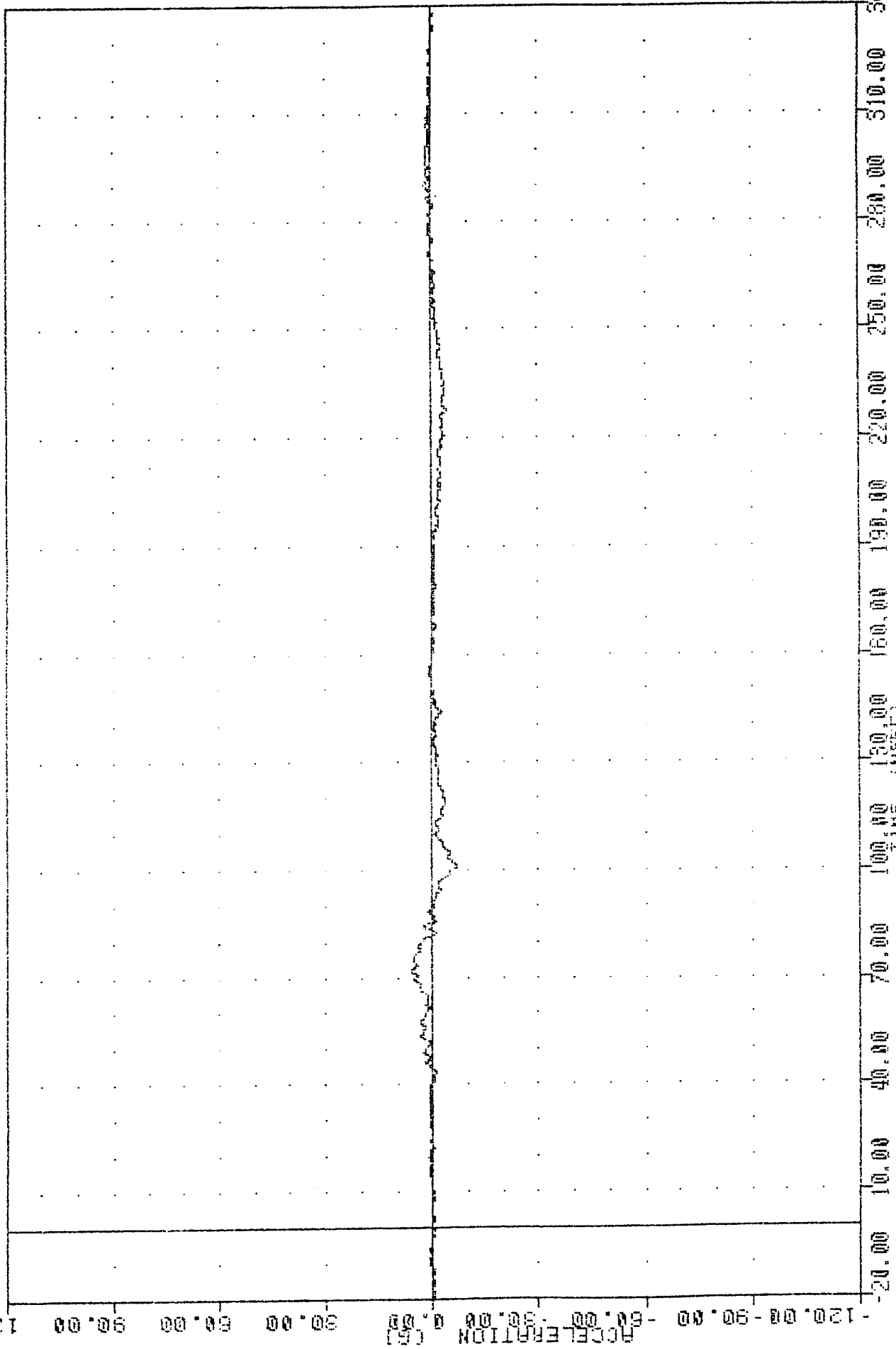
89341

CS1261

FILTER = BPF 300/ 750/ -16

MIN, MAX VALUES = -6.08 100.68

6.05 e 72.13



200 COMPLIANCE

89341

CSTRG1

FILTER = PLPF 300/ 750/ -16

MIN. MAX VALUES = 0.12e -11.50, 47.17 e 82.50

105.00

90.00

75.00

60.00

45.00

30.00

15.00

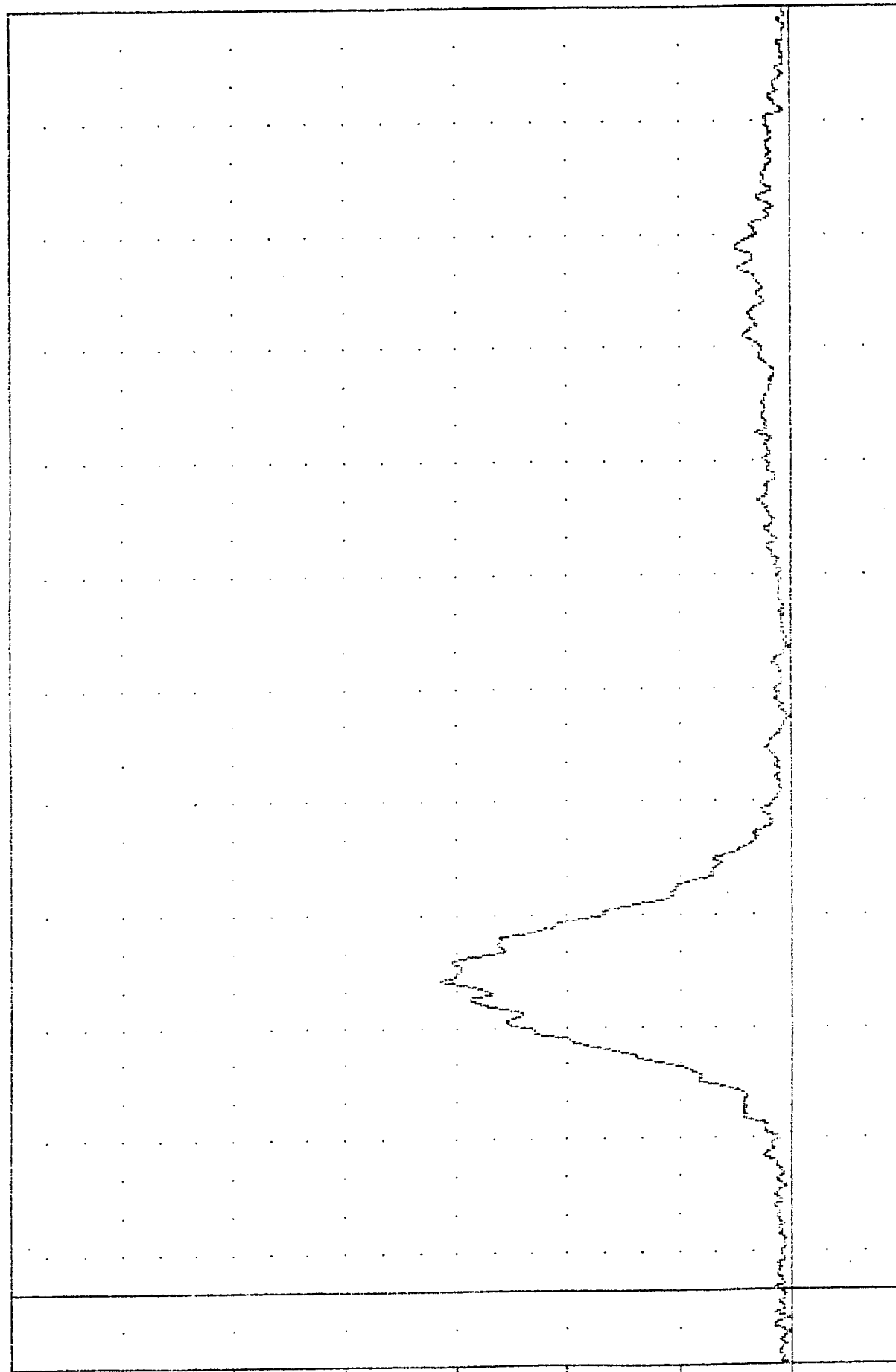
0.00

-15.00

ACCELERATION (G)

B-9

891207



-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

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
DRIVER CHEST RESULTANT ACCELERATION

MIN, MAX VALUES = -1.812 90.63 , 0.01 e 2.50

CSIXD1

0.01 e 2.50

4.00

3.00

2.00

1.00

0.00

-1.00

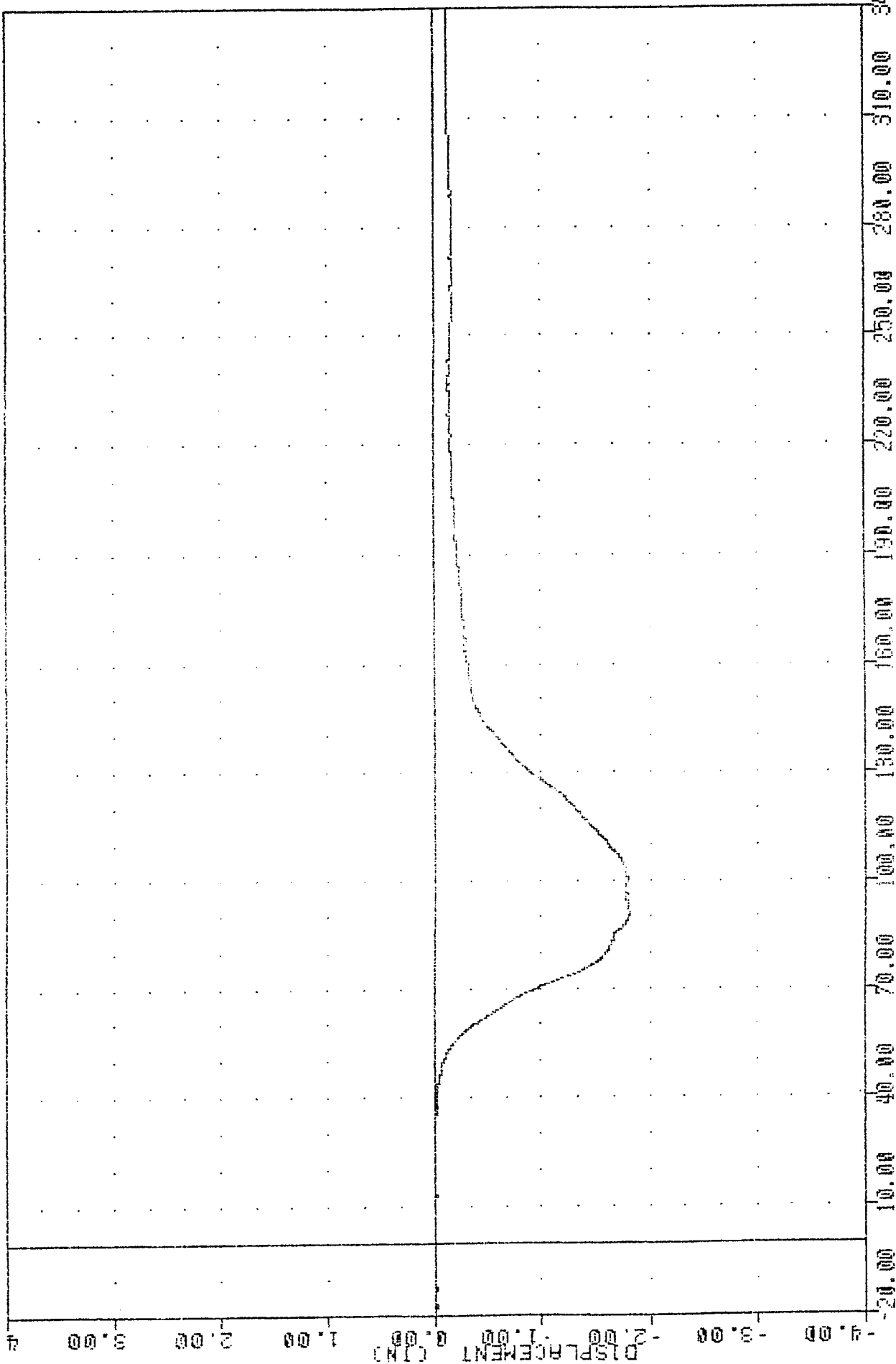
-2.00

-3.00

-4.00

891207

B-10



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
DRIVER CHEST DISPLACEMENT

200 COMPLIMENTS

89341

LFMFI

FILTER = OLPP 1000/ 2500/ -16

MIN, MAX VALUES = -785.800 68.000 , 99.97 2 144.00

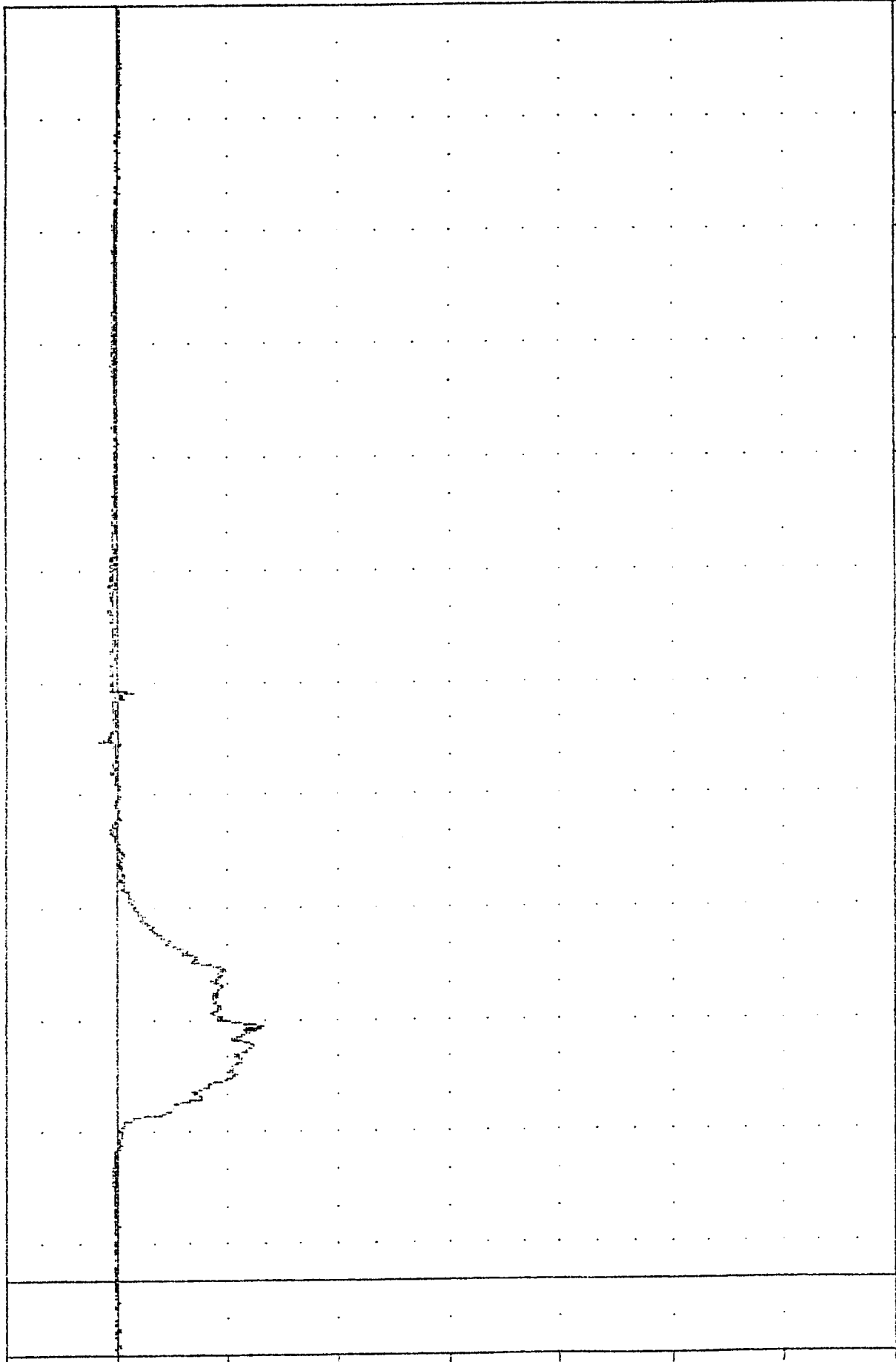
50.00

0.00
-50.00
-100.00
-150.00
-200.00
-250.00
-300.00
-350.00
-400.00
-450.00

(X10³)

B-11

891207



-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

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
DRIVER LEFT FEMUR FORCE

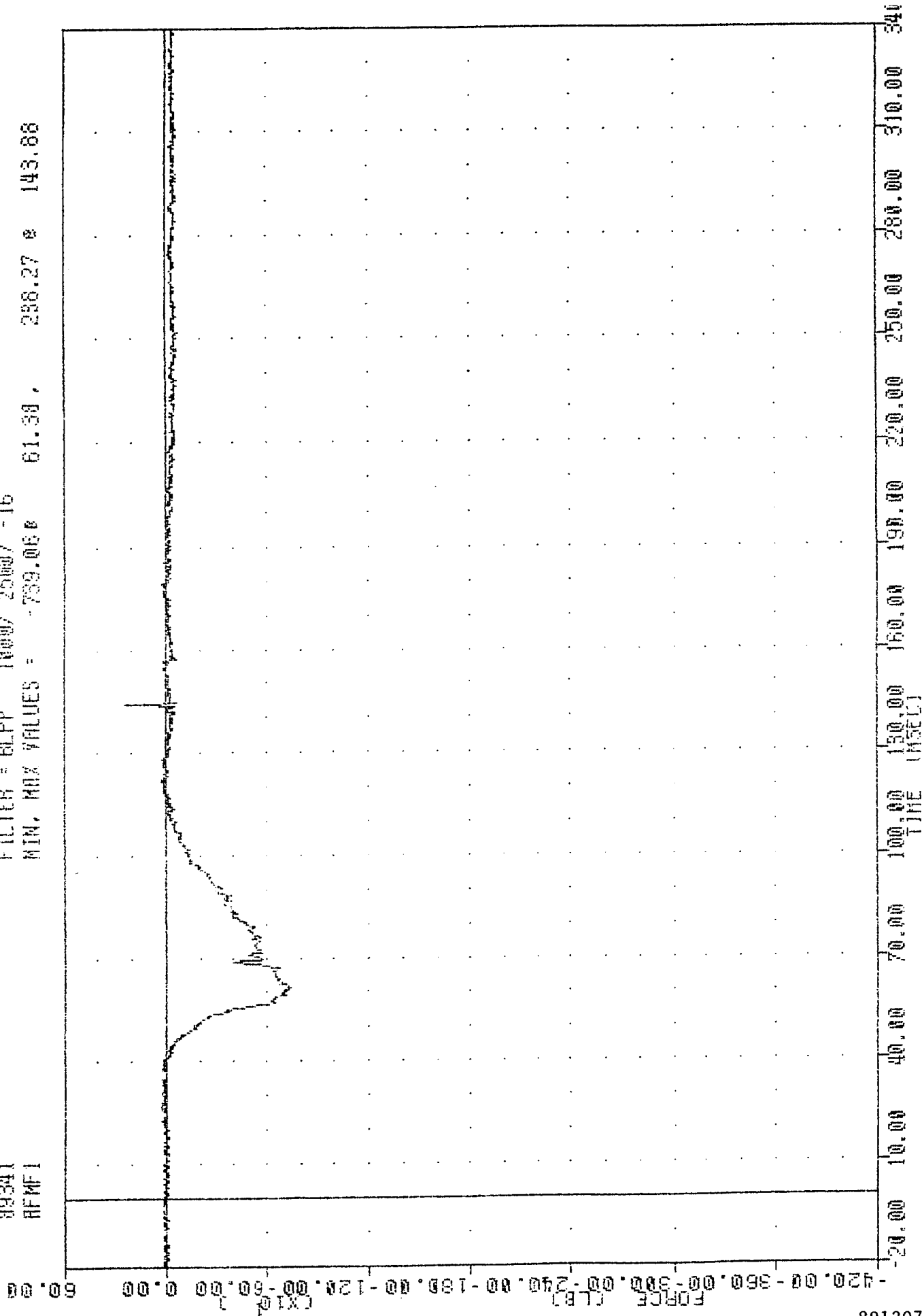
200 COMPLIANCE

89341

RFMF1

FILTER = BLPP 1000/ 25000/ -16

MIN, MAX VALUES = -739.060 61.30, 238.27 0 143.88



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
DRIVER RIGHT FEMUR FORCE

200 LUMPLINAGE

89341

HEDX62

FILTER = NLPT 1650/ 5214/ -40

MIN, MAX VALUES = -91.860

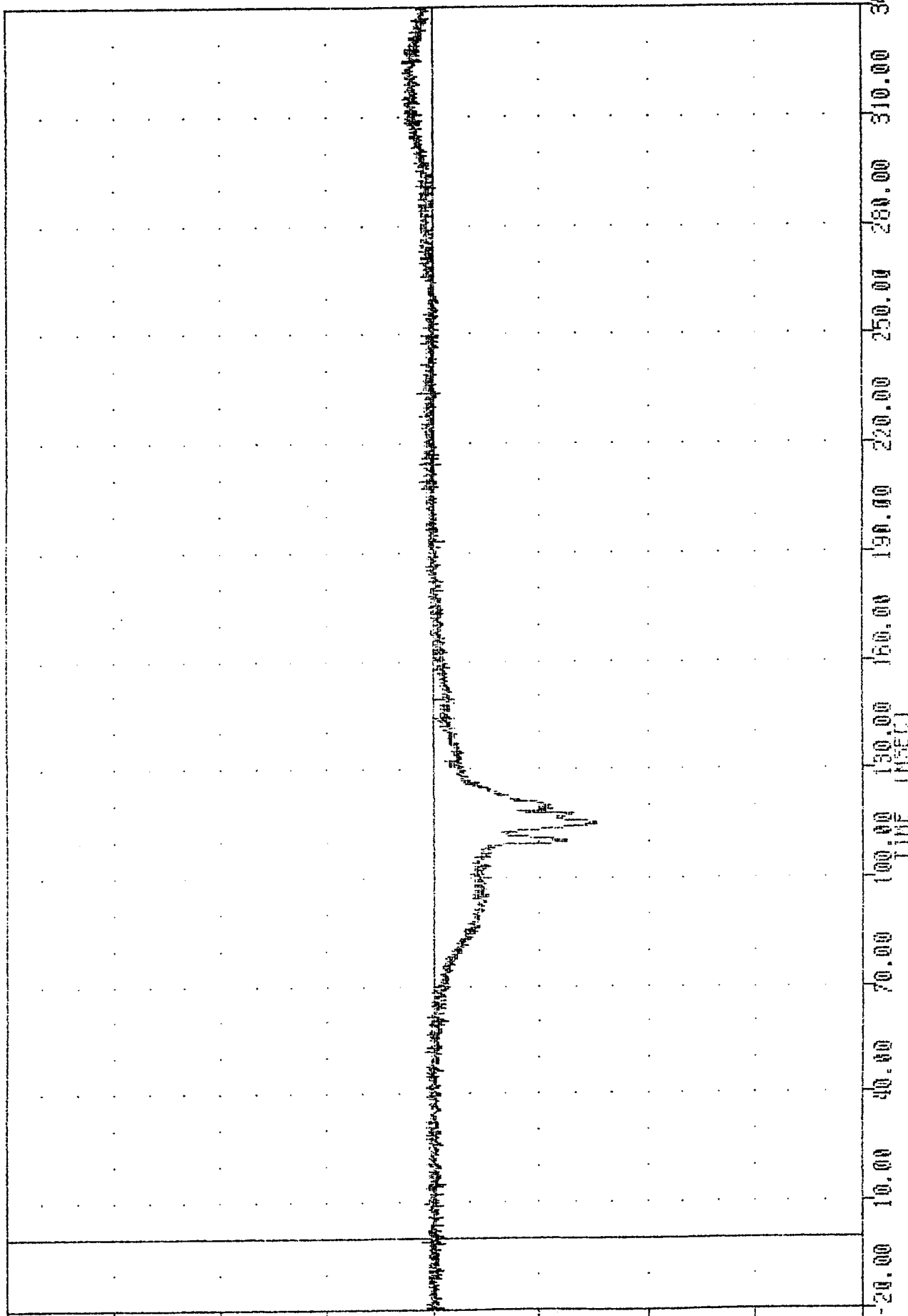
114.80 , 16.81 0 325.38

240.00 180.00 120.00 60.00 0.00 -60.00 -120.00 -180.00 -240.00

ACCELERATION (G)

B-13

891207



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD X AXIS ACCELERATION

200 COMPLIANCE

89341

HEDY62

FILTER = RLFF 1650/ 5214/ -40

MIN, MAX VALUES = -5.128

6.48 @ 115.00

240.00

180.00

120.00

60.00

0.00

-60.00

-120.00

-180.00

-240.00

(6)

ACCELERATION

TIME

INSEC

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

891207

B-14

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Y AXIS ACCELERATION

200 COMPLIANCE

89341

HE0262

FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = -57.142

108.88,

3.14 2

34.13

240.00

180.00

120.00

60.00

0.00

-60.00

-120.00

-180.00

-240.00

ACCELERATION

(G)

TIME

(MSEC)

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

360.00

380.00

400.00

420.00

440.00

460.00

480.00

500.00

B-15

891207

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Z AXIS ACCELERATION

200 COMPLIANCE

89341

HE0662

FILTER = ALPF 1650/ 5214/ -40

MIN, MAX VALUES = 0.170

49.38 , 97.53 @ 114.88

210.00

180.00

150.00

120.00

90.00

60.00

30.00

0.00

-30.00

-60.00

-90.00

-120.00

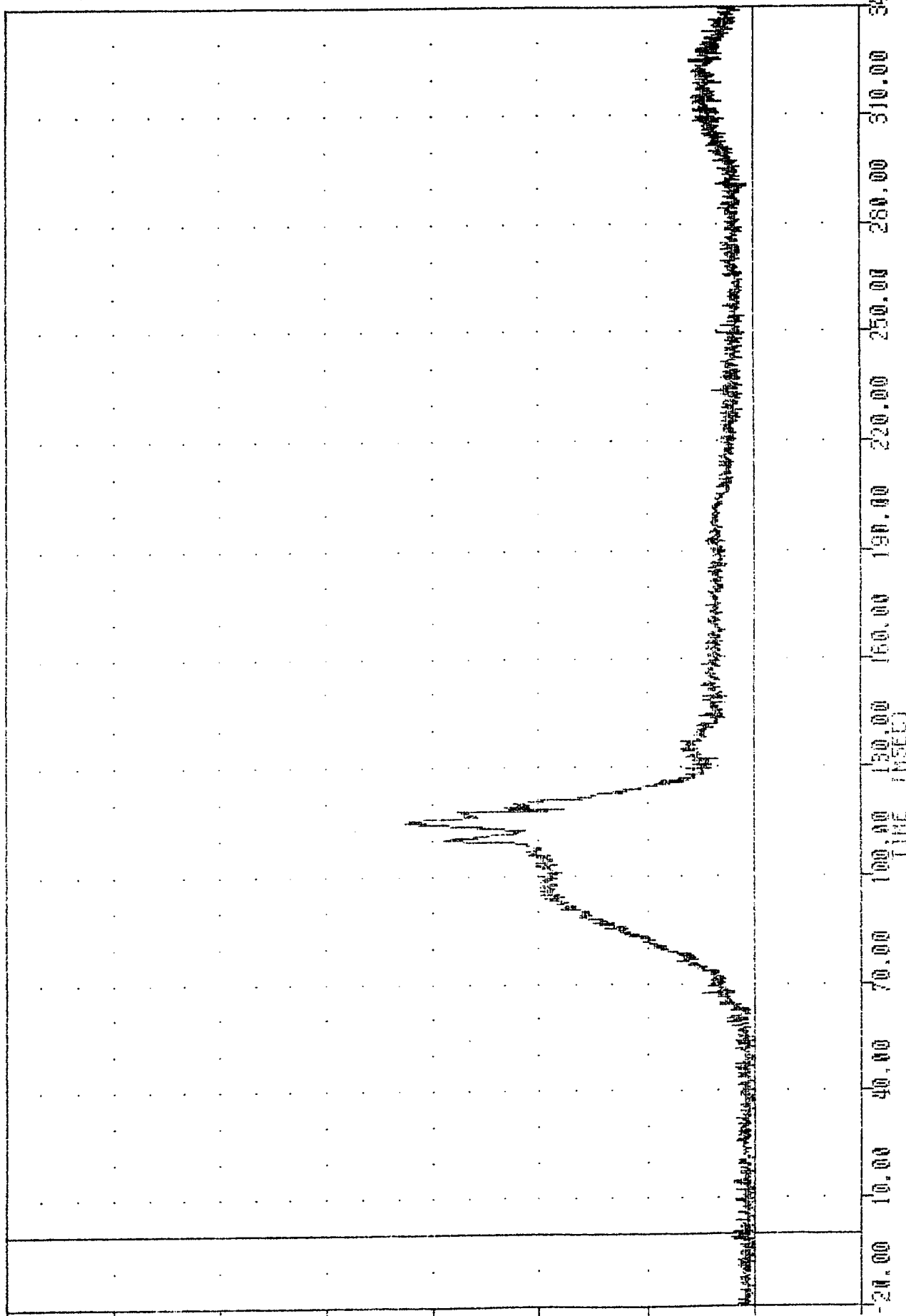
-150.00

-180.00

-210.00

B-16

891207



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION

END OF LIMIT

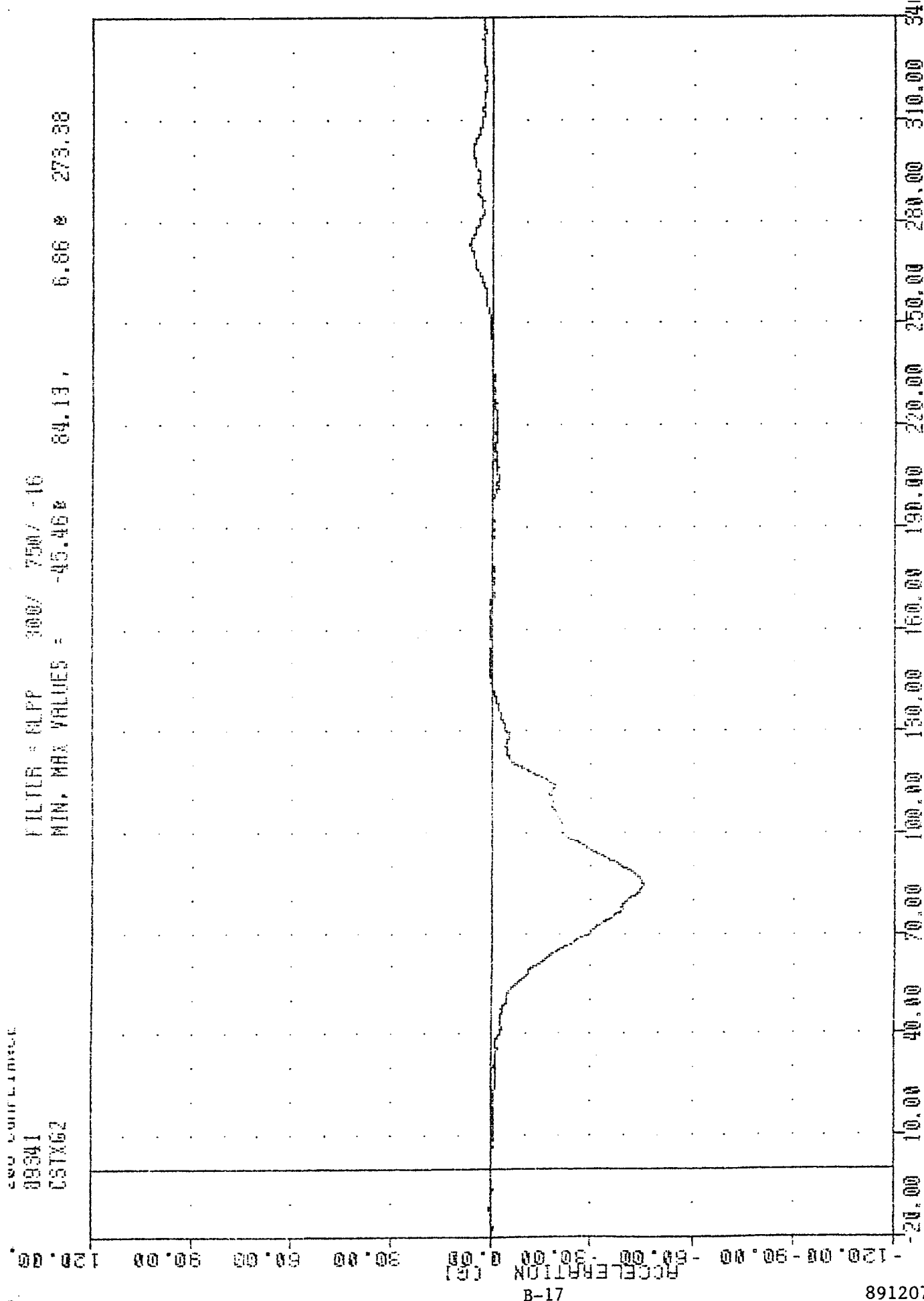
89341

CSTX62

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -45.46 84.13

6.86 273.38



B-17

891207

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST X AXIS ACCELERATION

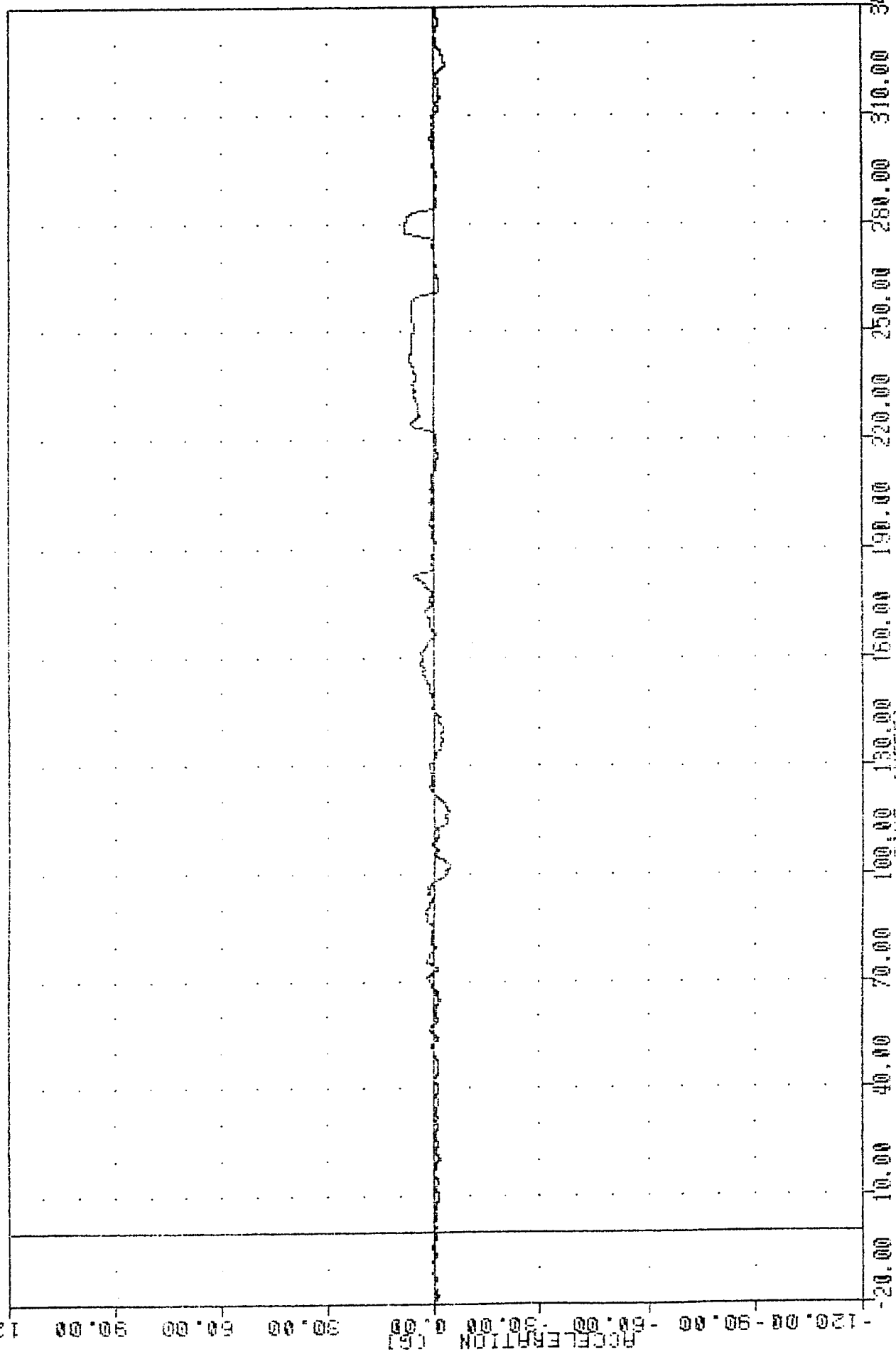
200 COMPLIANCE

89341

CSTY62

FILTER = BLPP 300/ 750/ -16

MIN, MAX VALUES = -4.61E 102.25, 8.73 E 278.00



891207

B-18

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Y AXIS ACCELERATION

END COMPLIANCE

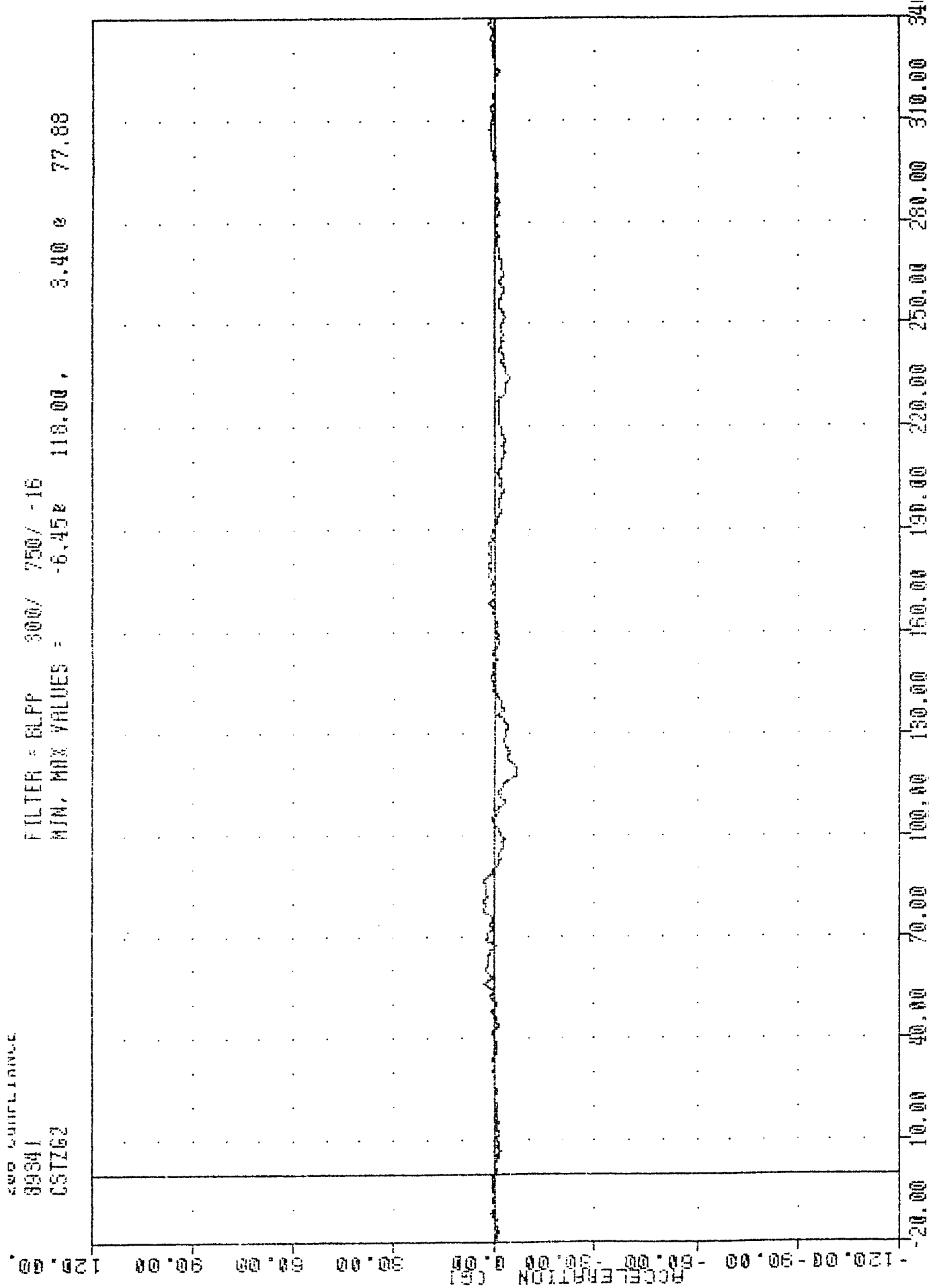
89341

CST762

FILTER = BLPP 300/ 750/ -16

MIN, MAX VALUES = -6.45E 118.00 ,

3.40 E 77.88



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Z AXIS ACCELERATION

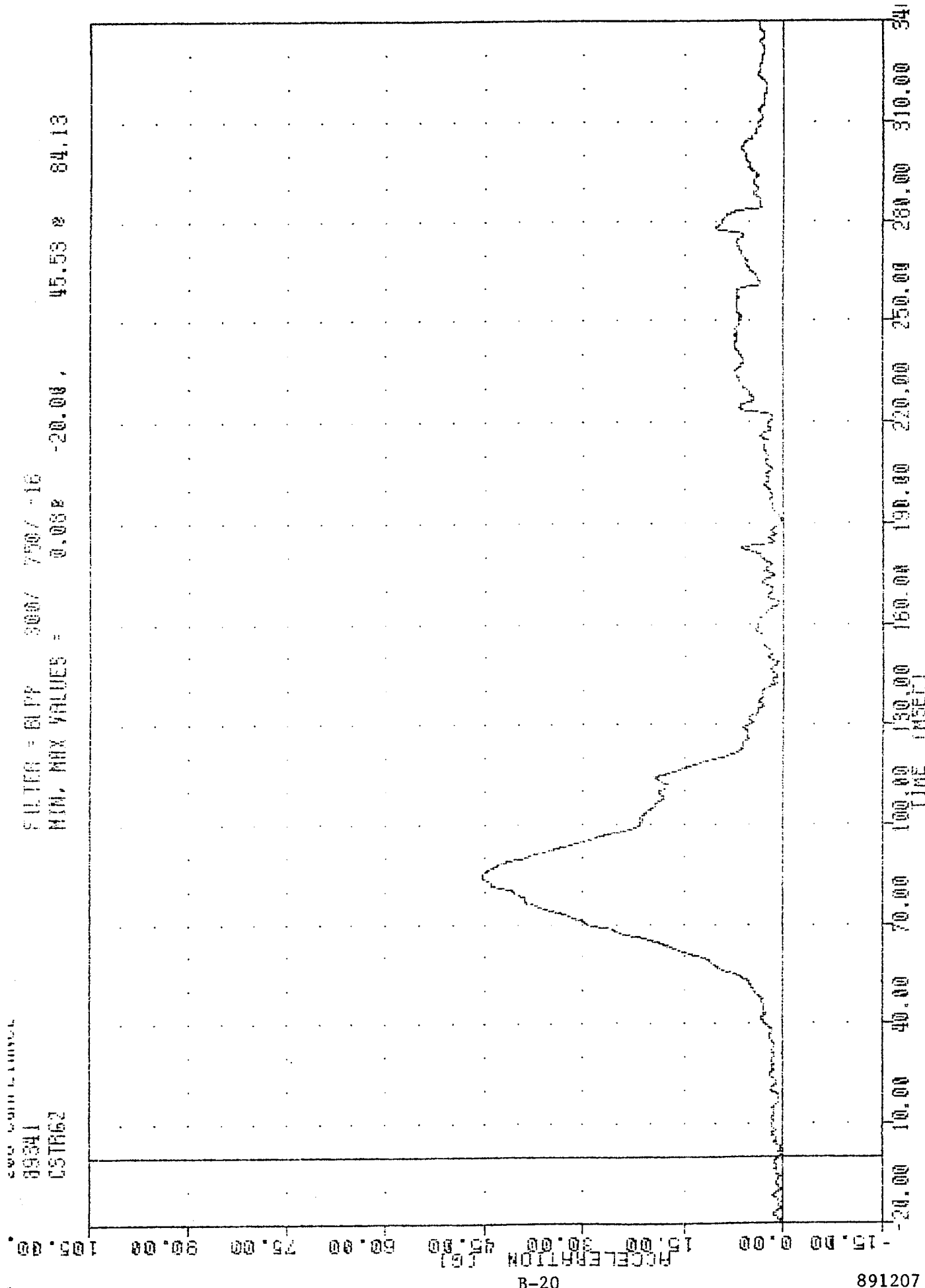
200 CONTINUED

89341

CSTR62

FILTER = BLPF 3007 7507 -16

MIN, MAX VALUES = 0.000 -20.00, 45.53 84.13



B-20

891207

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION

208 COMPLIANCE

89341

CSTXD2

FILTER = BLPP 3007 7507 -16

MIN, MAX VALUES = -1.97 111.00 0.02 33.75

4.00

3.00

2.00

1.00

DISPLACEMENT (IN)

0.00

-1.00

-2.00

-3.00

-4.00

-20.00

10.00

40.00

70.00

100.00

130.00

160.00

190.00

220.00

250.00

280.00

310.00

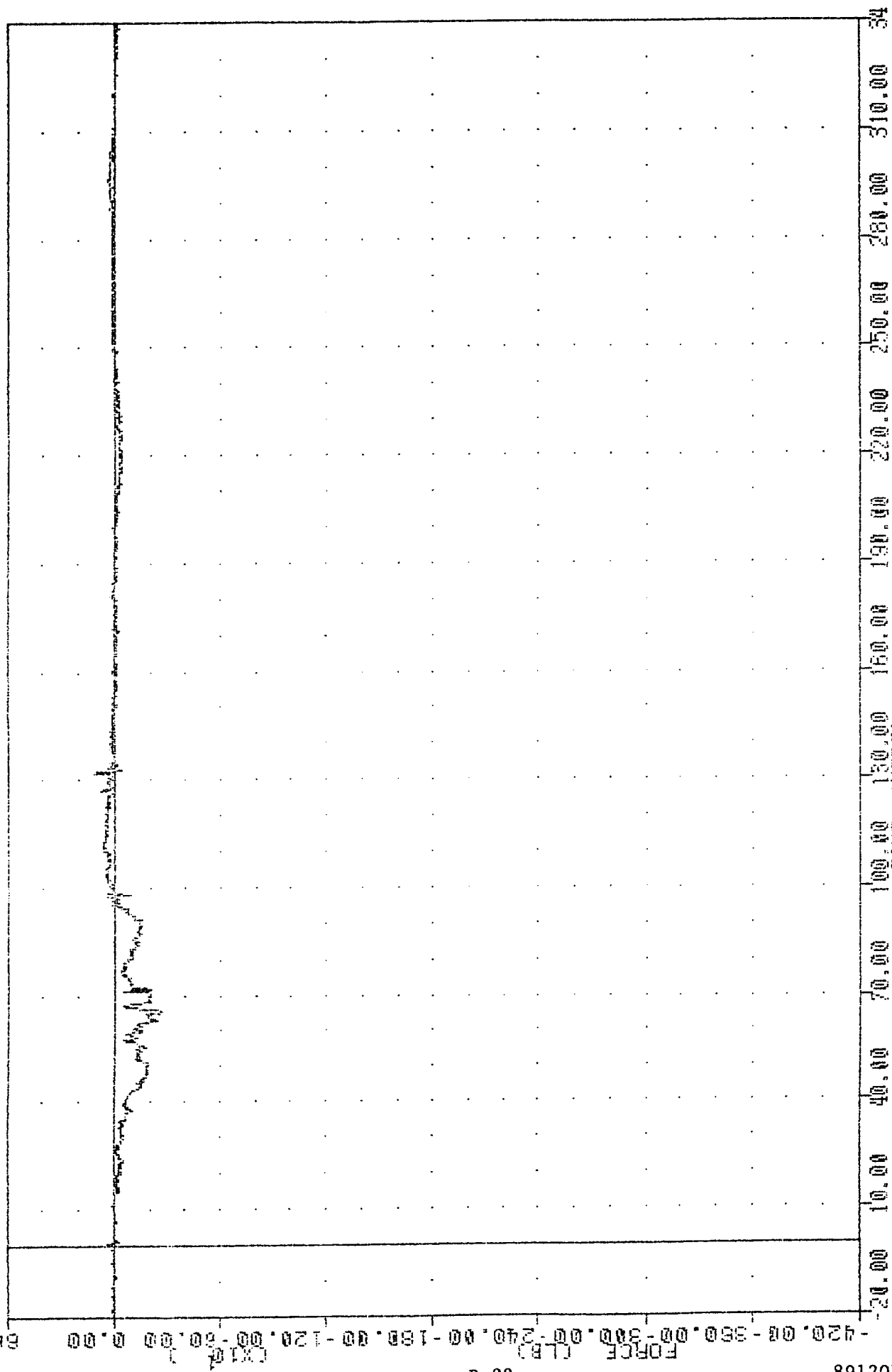
340

TIME (MSEC)

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST DISPLACEMENT

FILTER = BLPP 1000/ 2500/ -16
 MIN, MAX VALUES = -268.42 65.50 , 115.36 131.88

89341
 LFMF2



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT FEMUR FORCE

200 CUMULATIVE

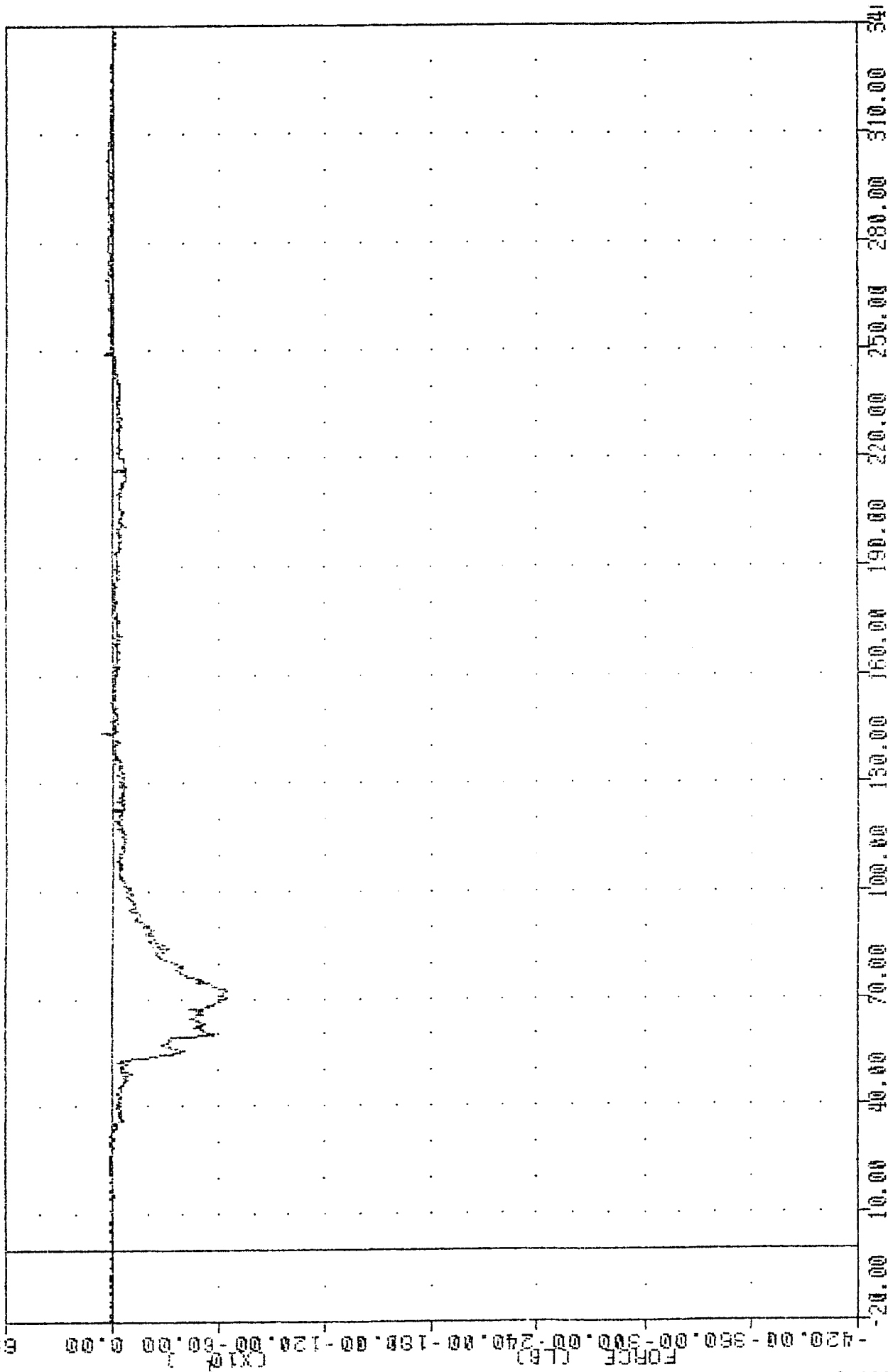
89341

AFMF2

FILTER = BLPP 1000/ 2500/ -16

MIN, MAX VALUES = -654.998 72.50 ,

55.01 0 143.75



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

200 COMPLIANCE

89341

TLRXG1

FILTER = 6LPP 100/ 250/ -16

MIN, MAX VALUES = -25.27 30.88, 1.57 161.38

120.00

90.00

60.00

30.00

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

ACCELERATION (G)

B-24

891207

TIME (SECT)

CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
LEFT REAR SEAT X AXIS ACCELERATION

200 CONTINUED

89341

FILTER = 8 HZ 100/ 250/ -16

TRX61

MIN, MAX VALUES = -29.22 30.88

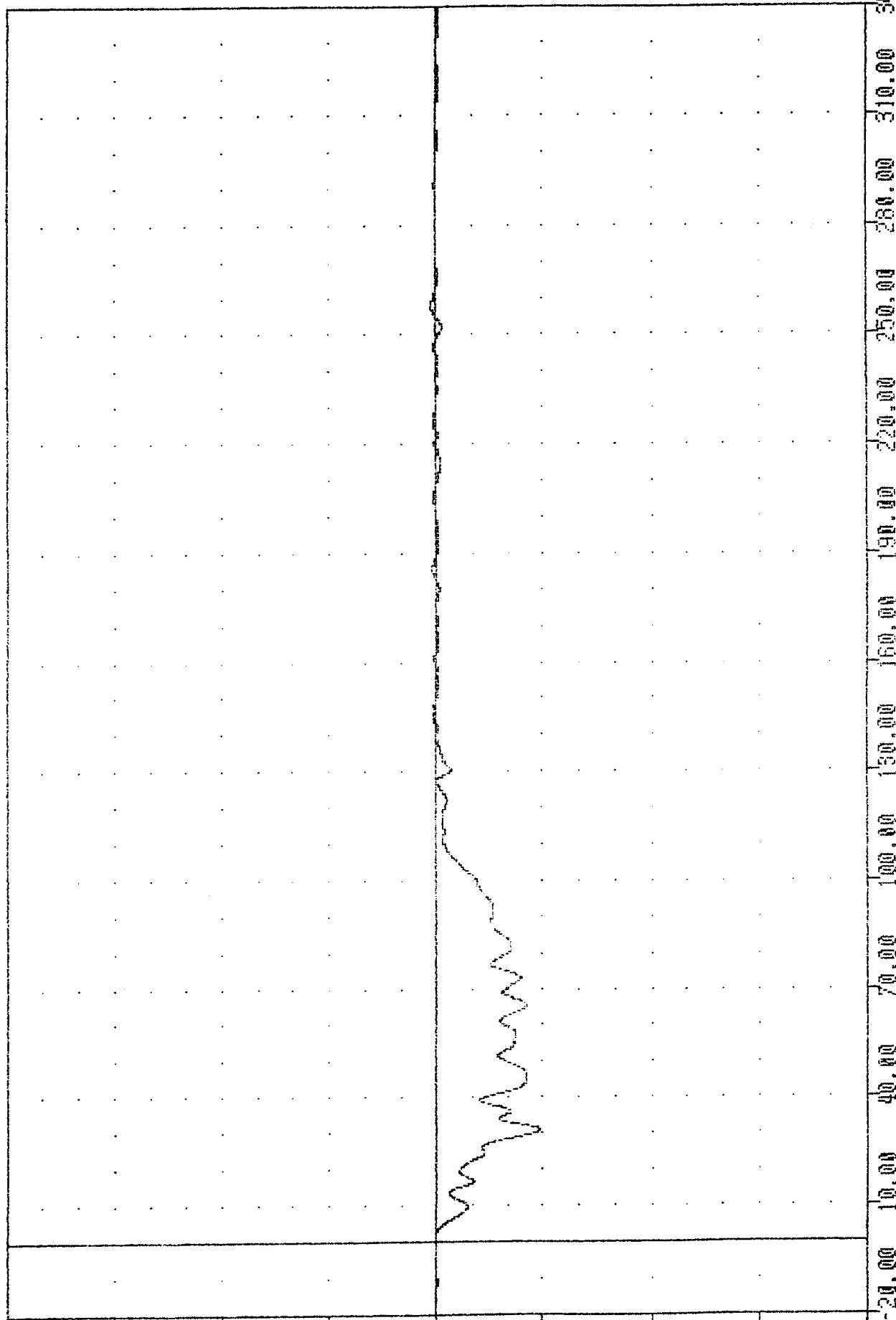
1.51 258.00

120.00 90.00 60.00 30.00 0.00 -30.00 -60.00 -90.00 -120.00

ACCELERATION (G)

B-25

891207



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT REAR SEAT X AXIS ACCELERATION

200 COMPLIANCE

89341

ENGXG1

FILTER = BLFF 100/ 250/ -16

MIN, MAX VALUES = -70.700 53.80 , 46.26 0 71.25

120.00

90.00

60.00

30.00

0.00

-30.00

-60.00

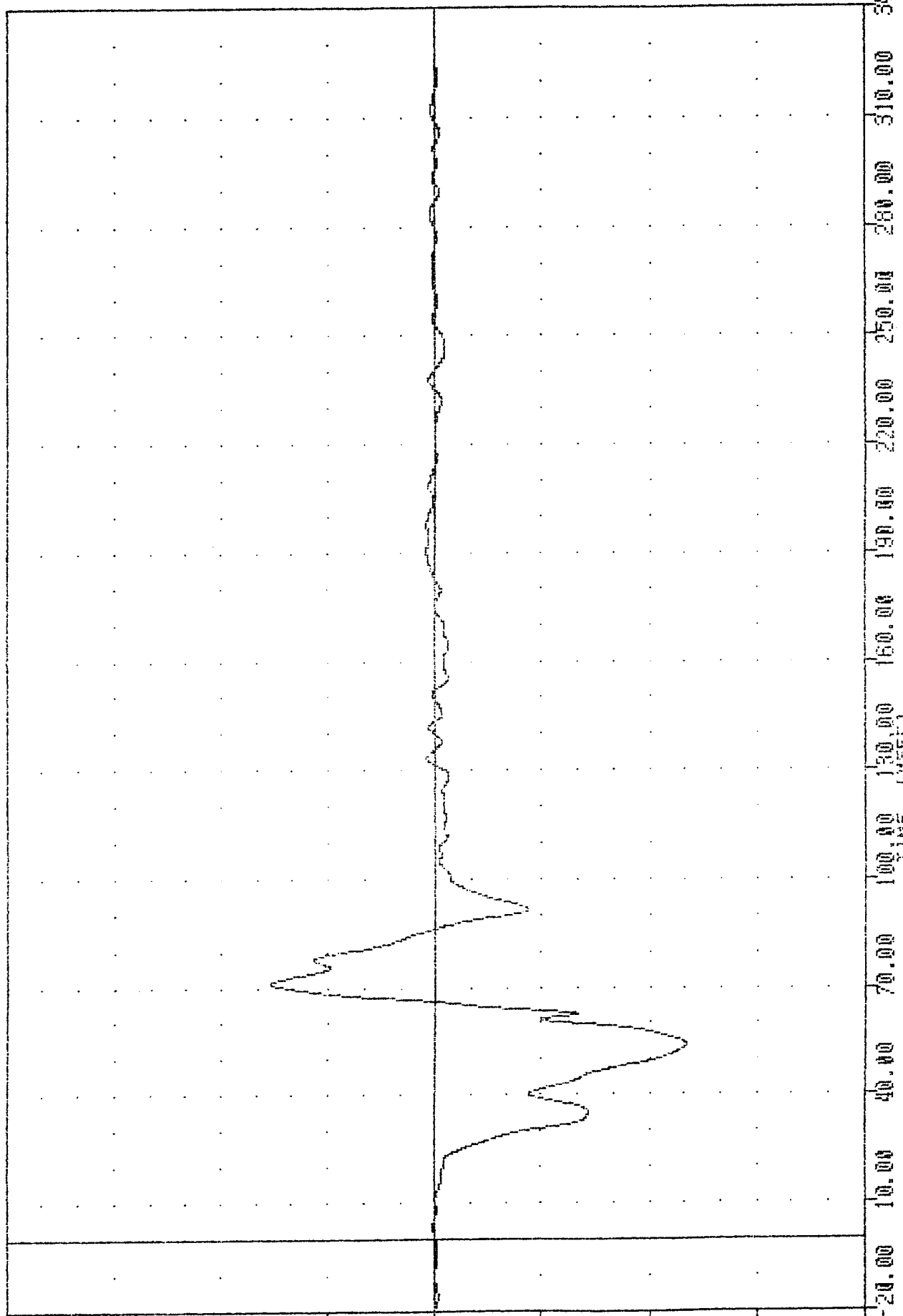
-90.00

-120.00

ACCELERATION (G)

B-26

891207



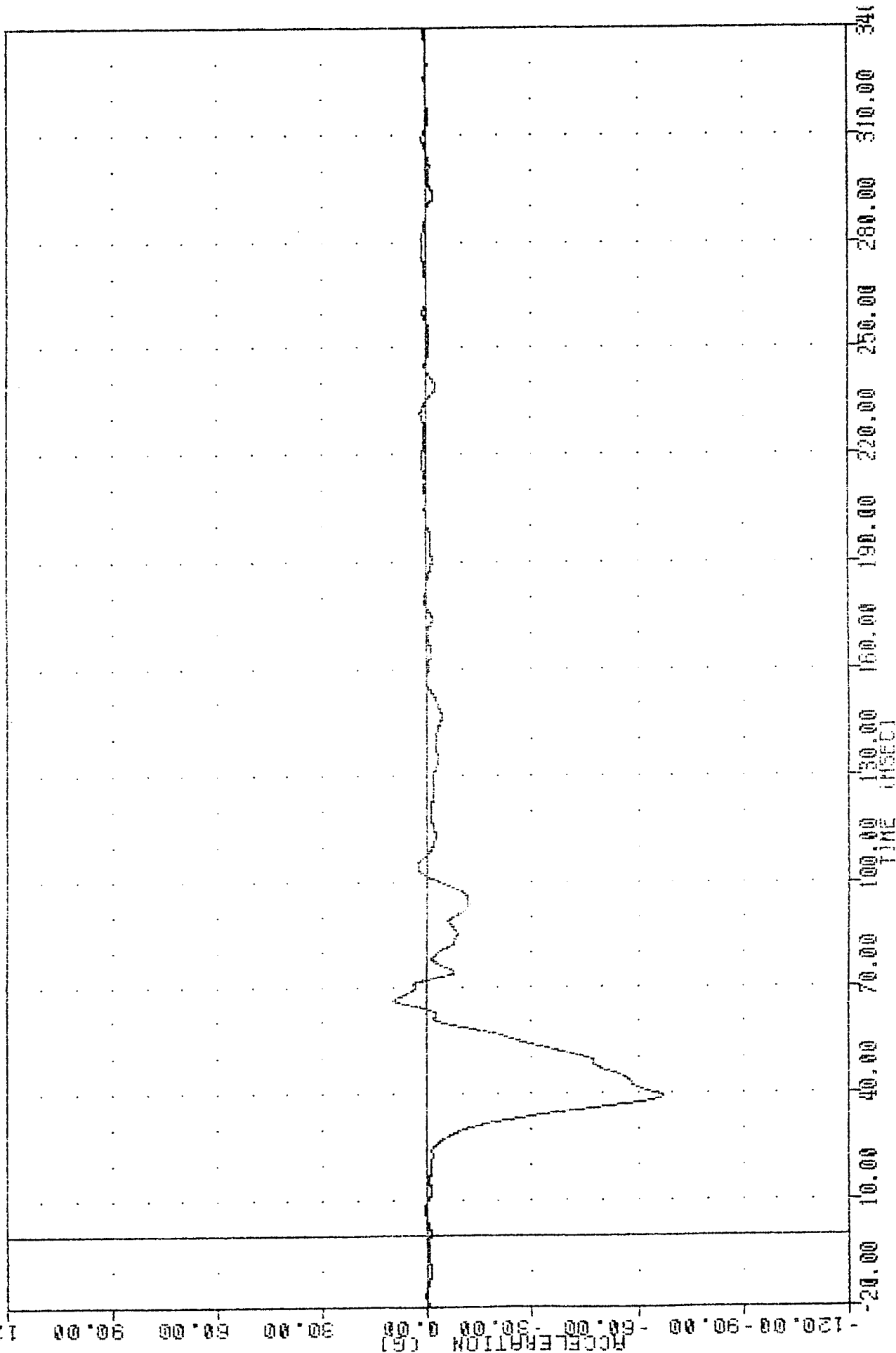
200 COMPLIANCE

89241

ENGXG2

FILTER = BLFF 100/ 250/ -16

MIN. MAX VALUES = -67.57 9.43 8 66.25

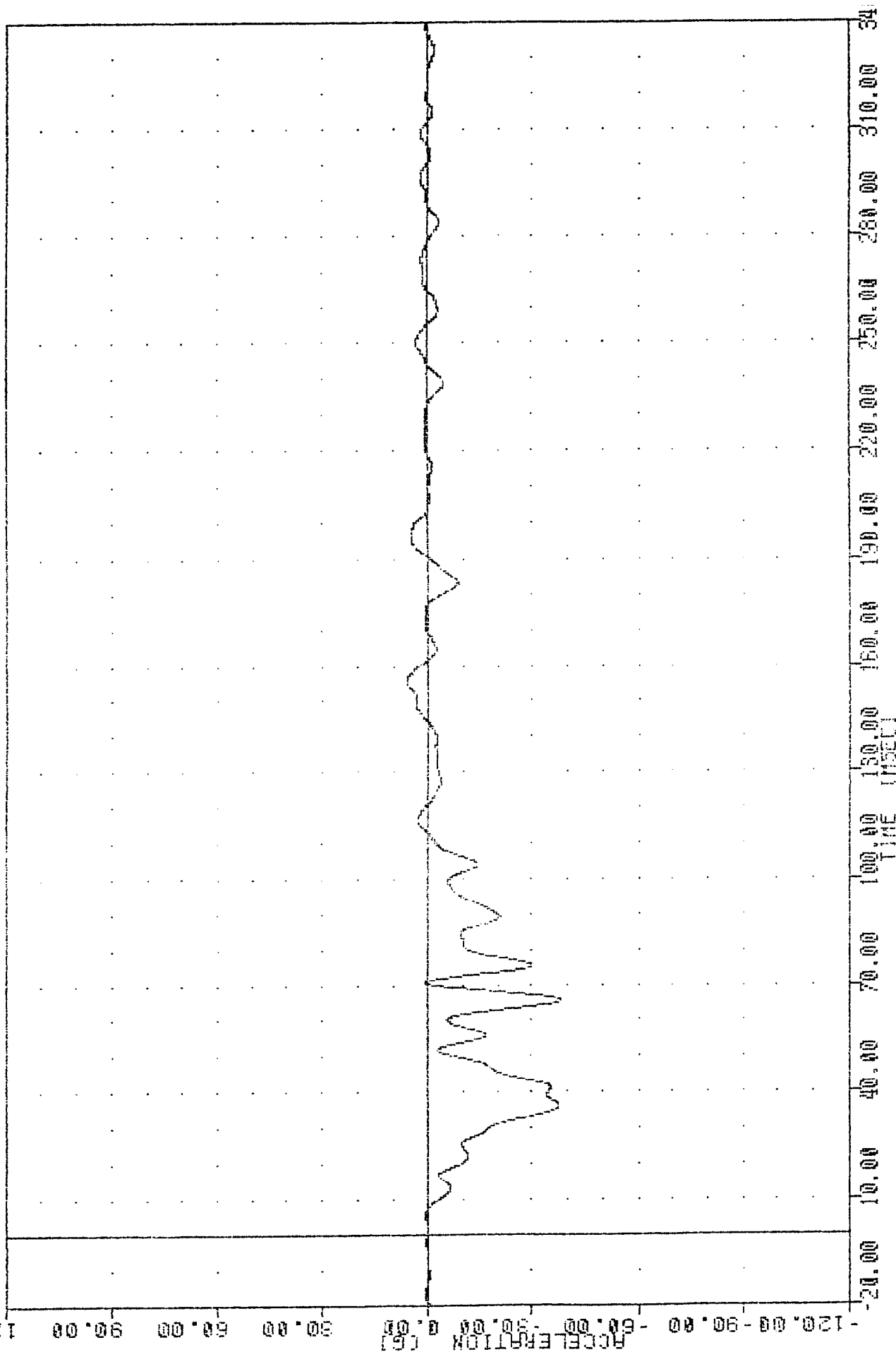


CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
ENGINE BOTTOM BLOCK X AXIS ACCELERATION

891207

89341
BCRXG1

FILTER = GUPP 100/ 250/ -16
MIN, MAX VALUES = -38.212 65.63, 6.14 2 155.63



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
RIGHT BRAKE CALIPER X AXIS ACCELERATION

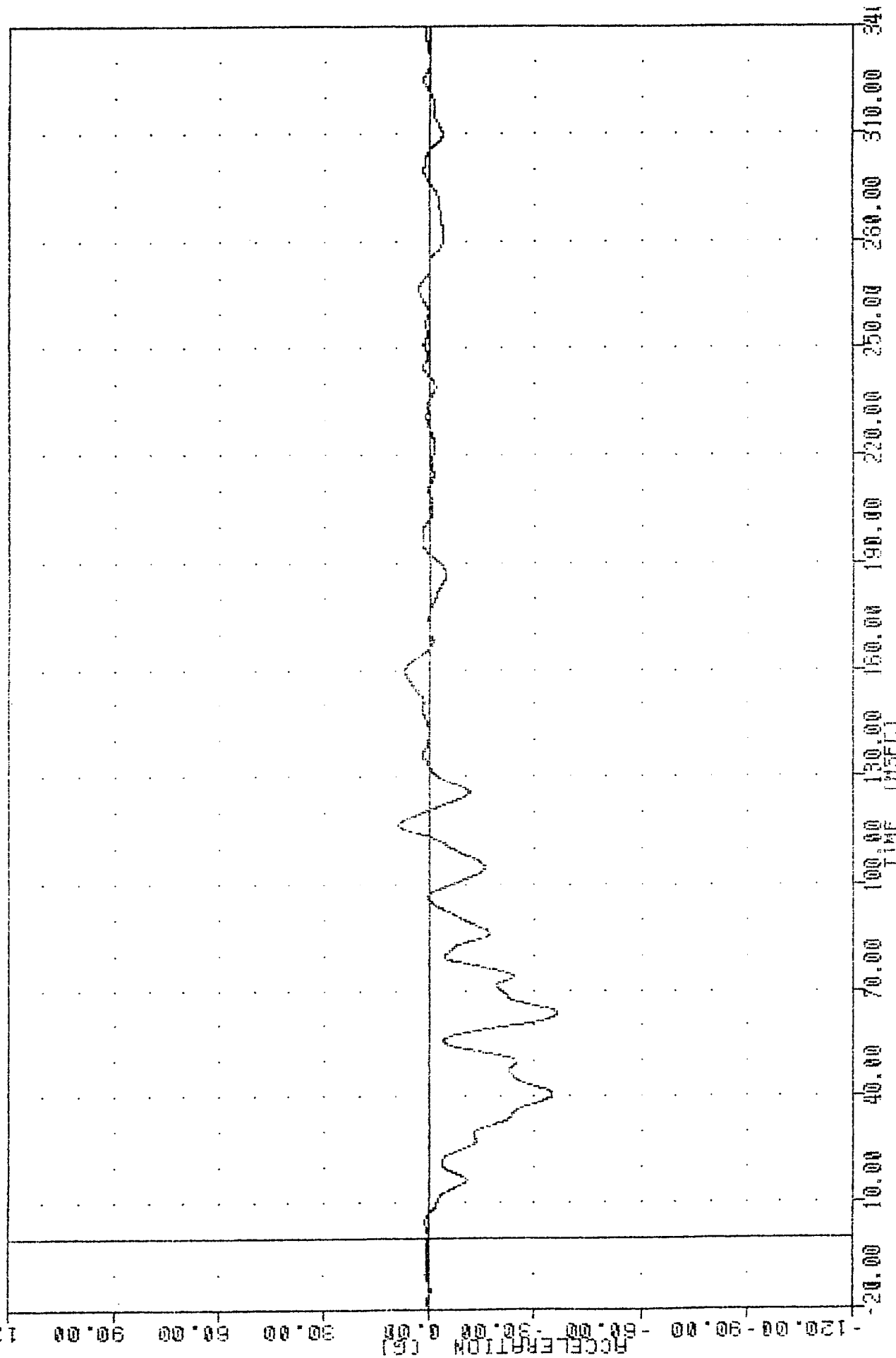
200 COMPLIANCE

89341

BCLX61

FILTER = BLPP 100/ 250/ -10

MIN. MAX VALUES = -35.120 63.50 , 9.03 0 116.63

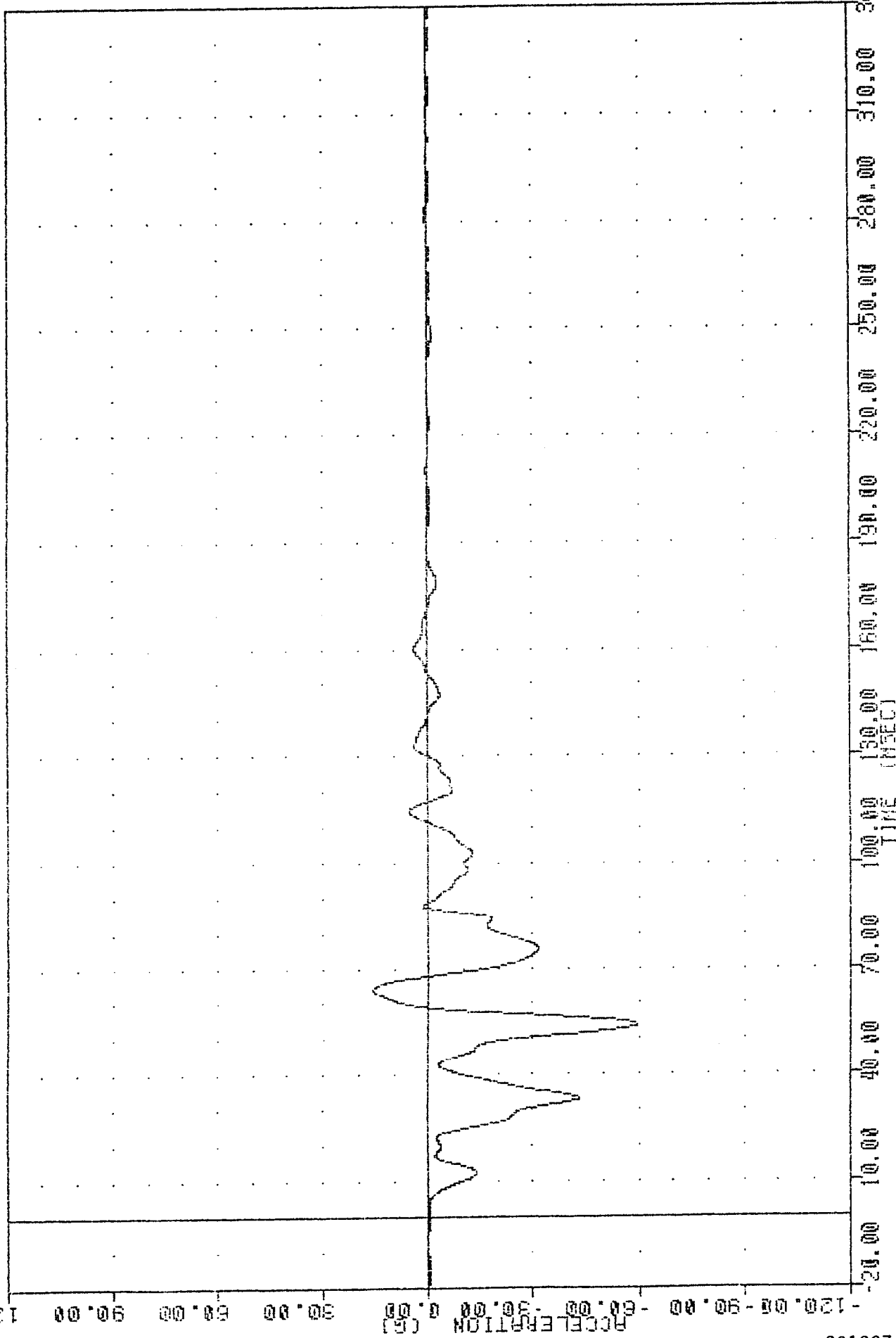


CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
LEFT BRAKE CALIPER X AXIS ACCELERATION

89341
 DPCXG1
 FILTER = BLFF 100/ 250/ -16
 MIN. MAX VALUES = -59.63e 53.80, 15.90 e 63.88

891207

B-30



CHEVROLET LUMINA INTO FLAT FRONTAL BARRIER
 DASH PANEL CENTER X AXIS ACCELERATION