

DOT 1293

REPORT NOS. 208-TRC-89-005

212-TRC-89-005

301-TRC-89-005

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

AUDI AG

1989 AUDI 200

4-DOOR SEDAN

NHTSA NO. CK0506

TRC TEST NO. 890327

THE TRANSPORTATION RESEARCH CENTER OF OHIO

U.S. RT. 33, LOGAN COUNTY

EAST LIBERTY, OHIO 43319



APRIL 12, 1989

FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
OFFICE OF VEHICLE SAFETY COMPLIANCE
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16. Abstract A 30 mph flat frontal barrier impact compliance test was conducted on a 1989 Audi 200 4-door sedan, VIN WAUFC5445KNO43702, NHTSA No. CK0506, at the Transportation Research Center of Ohio on March 27, 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 29.3 mph. The ambient temperature was 74° F. The vehicle appears to comply with the applicable requirements of FMVSS Nos. 212, 219 (partial), and 301. The vehicle recorded a marginal failure 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

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	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

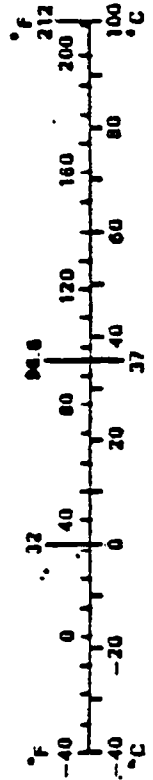


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SECTION 1.0

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 1989 Audi 200 4-door sedan, NHTSA No. CK0506, 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 1989 Audi 200 4-door sedan, NHTSA No. CK0506, was equipped with a 2.2 liter, inline engine, automatic transmission, power steering, and power brakes. The test weight of the vehicle was 3914 pounds. The test vehicle recorded a marginal failure of FMVSS No. 208. The test vehicle appeared to comply with the performance requirements of FMVSS test Nos. 212, 219 (partial), and 301. The Head Injury Criteria (HIC) calculations were less than 1000, and the resultant accelerations of the thorax did not exceed 60 g's as measured by Part 572 B dummies seated in the driver's and right front passenger's seats. The left femur force as measured by the driver dummy exceeded 2250 pounds. 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 Part 572 B adult male anthropomorphic test devices (ATD) were seated in the front outboard designated seating positions. The dummies were positioned according to the dummy placement procedures specified in Appendices B and C of Laboratory Procedure TP-208-07.

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

The vehicle was instrumented with eleven (11) 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. One (1) real-time camera was used for pre-test and post-test documentation.

The twenty-seven (27) 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 March 27, 1989. The test vehicle's impact speed was 29.3 mph. The vehicle sustained 25.5 inches of static crush.

The FMVSS 208, 212, 219 (partial) and 301 compliance data is 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.: CK0506 PROJECT: 208 Compliance
DATE: 3/27/89 TIME: 1510 TEMP: 74° F
VEHICLE: 1989 Audi 200
TEST WEIGHT (LBS): 3914
IMPACT ANGLE (DEG)*: 0
IMPACT VELOCITY (MPH)**: PRIMARY = 29.3 SECONDARY = 29.4
MAXIMUM STATIC CRUSH (IN): 25.5
VEHICLE REBOUND (IN): 12.6
DUMMIES: Driver #353 Passenger #354
TYPE: Part 572 B Part 572 B
LOCATION: Left front Right front
RESTRAINT: Driver's airbag 3-point unibelt
NUMBER OF DATA CHANNELS: 27
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: Audi AG

MAKE/MODEL: Audi 200

VIN: WAUFC5445KN043702

BODY STYLE: 4-door sedan

MODEL YEAR: 1989

NHTSA NO.: CK0506

COLOR: silver

ENGINE DATA: TYPE: inline CYLINDERS: 5 DISPLACEMENT: 2.2 liter

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

DATE VEHICLE RECEIVED: 2/20/89

ODOMETER READING: 94.0

DEALER'S NAME AND ADDRESS: Porsche Audi North
5016 Post Road
Dublin, OH 43017

ACCESSORIES:

POWER STEERING Yes

AUTOMATIC TRANSMISSION Yes

POWER BRAKES Yes

AUTOMATIC SPEED CONTROL Yes

POWER SEATS Yes

TILTING STEERING WHEEL No

POWER WINDOWS Yes

TELESCOPING STEERING WHEEL No

TINTED GLASS Yes

AIR CONDITIONING Yes

RADIO Yes

ANTI-SKID BRAKE Yes

CLOCK Yes

REAR WINDOW DEFROSTER Yes

OTHER Cold weather package

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: Audi AG

DATE OF MANUFACTURE: 11/88

GVWR: 4365 LBS

GAWR: FRONT 2425 LBS., REAR 2094 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 40 psi; REAR 42 psi

RECOMMENDED TIRE SIZE: 205/60R15 LOAD RANGE X B, C, D

TIRES ON VEHICLE (MFR., LINE, SIZE): Continental Sport Contact 205/60R15

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: Power Adjustable

NUMBER OF OCCUPANTS 2 FRONT 3 REAR 5 TOTAL

CARGO LOAD 350 LBS. TOTAL 1100 LBS.

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

RIGHT FRONT 1021 lbs. RIGHT REAR 650 lbs.

LEFT FRONT 1010 lbs. LEFT REAR 572 lbs.

TOTAL FRONT WEIGHT 2031 lbs. (62.4% OF TOTAL VEHICLE WEIGHT)

TOTAL REAR WEIGHT 1222 lbs. (37.6% OF TOTAL VEHICLE WEIGHT)

TOTAL DELIVERED WEIGHT 3253 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (3253 LBS)

VCW = VEHICLE CAPACITY WEIGHT (1100 LBS)

DSC = DESIGNATED SEATING CAPACITY (5)

RCLW = VCW - 150 (DCS) = 1100 - (150)(6) = 350 LBS

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

= 3253 + 350 + 328 LBS

TARGET TEST WEIGHT = 3931 LBS

TABLE 2 TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 333 LBS. CARGO

RIGHT FRONT	1066 lbs.	RIGHT REAR	928 lbs.
LEFT FRONT	1044 lbs.	LEFT REAR	876 lbs.
TOTAL FRONT WEIGHT	2110 lbs.	(53.9% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1804 lbs.	(46.1% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3914 lbs.	(0.4% UNDER TARGET WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE TRUNK AREA: 185 LBS.

COMPONENTS REMOVED TO MEET TARGET WEIGHT: None

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE: LF 27.3; RF 27.1; LR 25.9; RR 25.6

PRE-TEST ATTITUDE: LF 26.9; RF 26.9; LR 23.8; RR 23.2

POST-TEST ATTITUDE: LF 31.2; RF 26.8; LR 22.5; RR 22.1

WHEELBASE: 105.9 INCHES

CG = 48.8 INCHES REARWARD OF FRONT WHEEL CENTERLINE

TABLE 3 TEST CONDITIONS

TEST NUMBER: 890327

DATE OF TEST: 3/27/89

TIME OF TEST: 1510

TYPE OF TEST: Frontal barrier impact

IMPACT ANGLE: 0°

AMBIENT TEMPERATURE AT IMPACT AREA:

74° F

TEMPERATURE IN OCCUPANT COMPARTMENT:

74° F

IMPACT VELOCITY: PRIMARY = 29.3 MPH

SECONDARY = 29.4 MPH

(SPECIFIED RANGE = 28.9 TO 29.9 MPH)

VEHICLE REBOUND AND CRUSH (ALL DIMENSIONS IN INCHES):

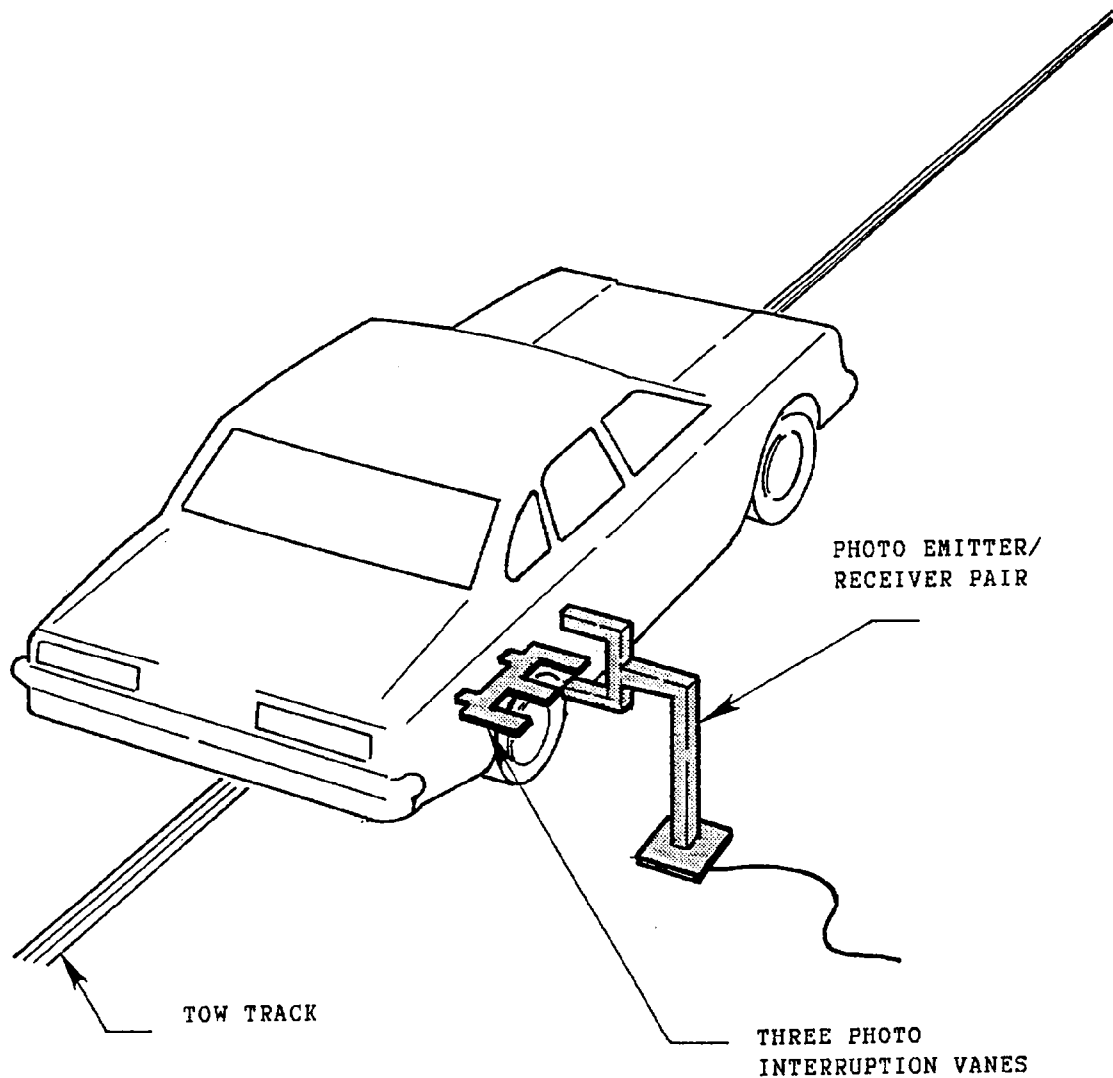
OVERALL LENGTH OF TEST VEHICLE: PRE-TEST: L 187.6; C 193.1; R 187.9

POST-TEST: L 167.4; C 167.6; R 167.4

TOTAL CRUSH: L 20.2; C 25.5; R 20.5

FOR FRONTAL IMPACTS, DISTANCE FROM FRONT OF TEST VEHICLE TO BARRIER AFTER IMPACT: L: 12.6; C: 12.6; R: 12.6; AVG: 12.6

FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



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

The vanes have one foot spacing.

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

VEHICLE MAKE/MODEL/BODY STYLE: Audi/200/4-door sedan
 VEH. NHTSA NO.: CK0506; VIN: WAUFC5445KNO43702
 MODEL YEAR: 1989; BUILD DATE: 11/88; TEST DATE: 3/27/89
 VEH. SIZE CATEGORY: Mid-size; TEST WEIGHT: 3914
 VEH. WHEELBASE: 105.9
 MAX. WIDTH: 71.1
 FRONT OVERHANG: 42.6

COLLISION DEFORMATION
 CLASSIFICATION (CDC) CODE: 12FDEW3

F (Frontal)
 CRUSH DEPTH
 DIMENSIONS:

C1 = 20.2 inches
 C2 = 22.8 inches
 C3 = 24.8 inches
 C4 = 24.2 inches
 C5 = 22.7 inches
 C6 = 20.5 inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline (Longitudinal)

LENGTH OF DAMAGED REGION: L = 60.8 inches

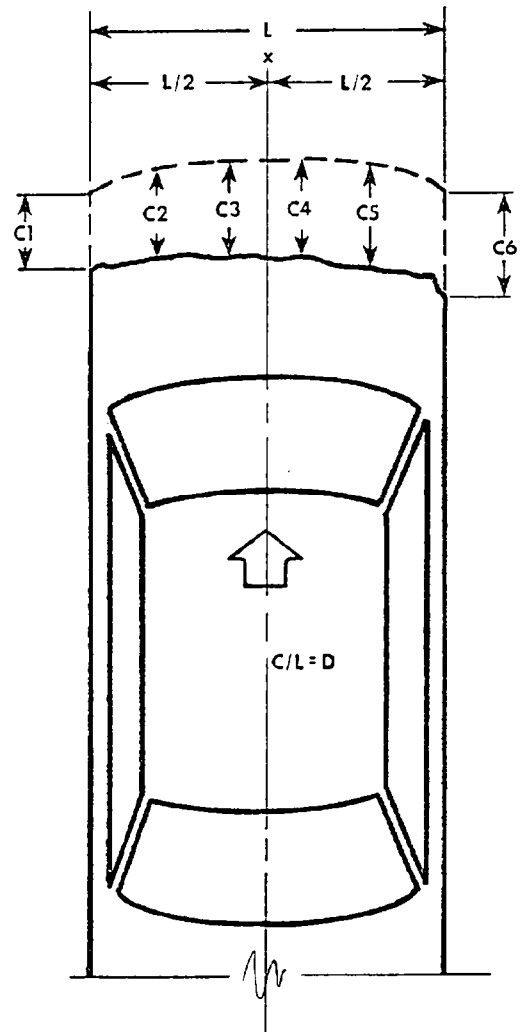
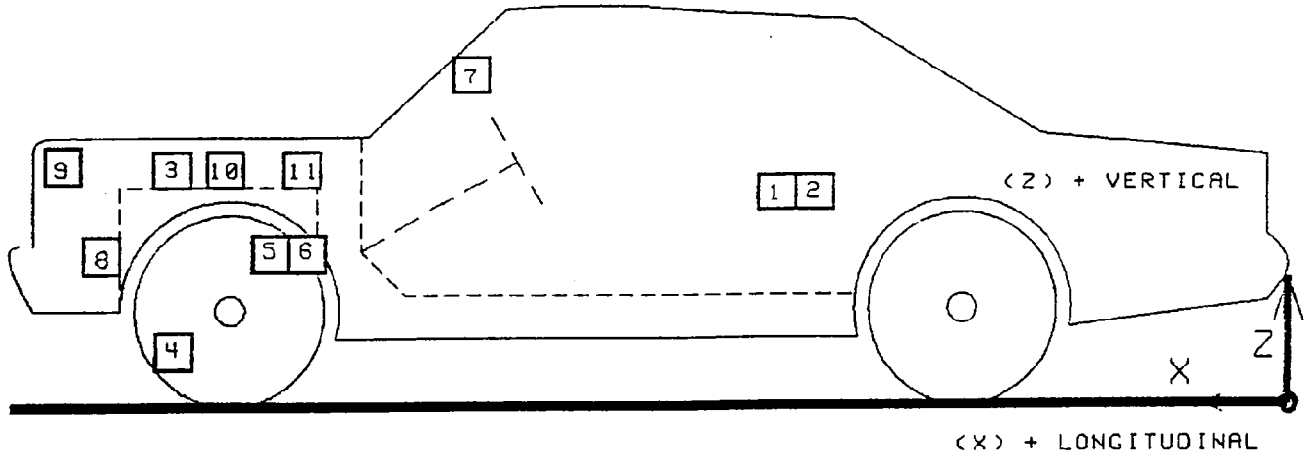
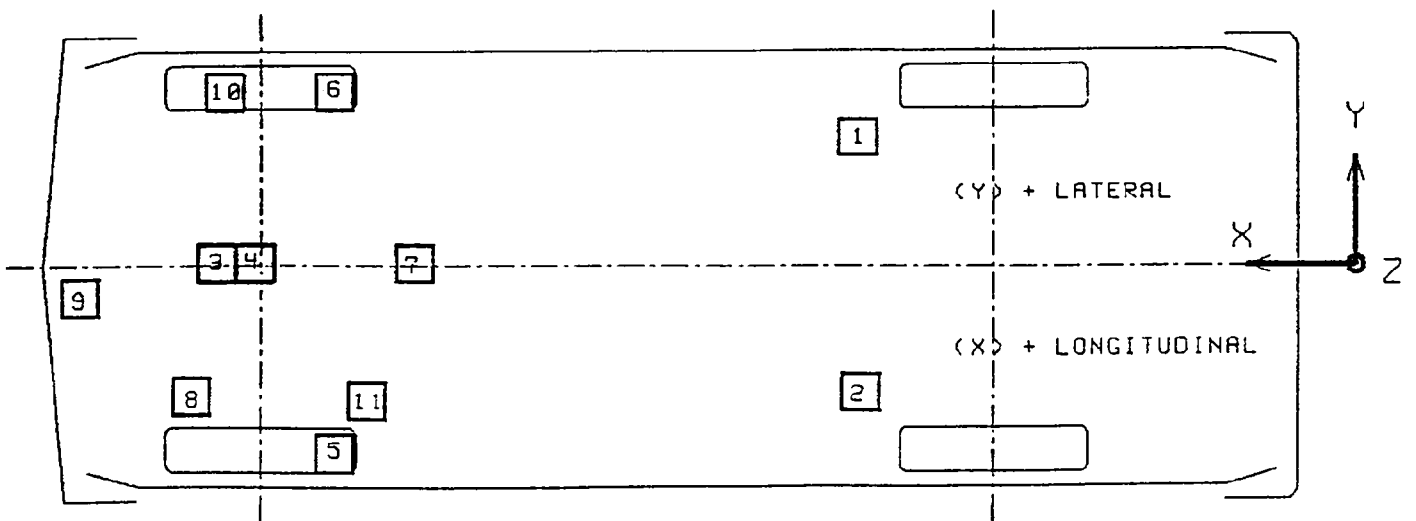


FIGURE 2
 VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 4

TEST NUMBER 890327

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	76.0	13.9	15.8				
		POST	76.0	13.9	15.5				
						2.0	191.4	24.3	58.0
2	REAR SEAT CROSSMEMBER AT RIGHT SIDE LONGITUDINAL	PRE	75.9	-18.0	15.4				
		POST	75.6	-18.0	16.6				
						7.4	11.8	26.0	41.3
3	TOP OF ENGINE BLOCK LONGITUDINAL	PRE	176.2	-0.8	32.2				
		POST	158.9	-1.8	32.9				
						51.0	33.8	195.0	26.1
4	BOTTOM OF ENGINE BLOCK LONGITUDINAL	PRE	169.6	1.5	9.8				
		POST	153.8	1.5	10.4				
						---	---Y	---	---Y
5	BRAKE CALIPER AT RIGHT SIDE LONGITUDINAL	PRE	154.5	-24.6	11.5				
		POST	147.1	-24.6	11.1				
						36.0	69.9	74.9	33.9
6	BRAKE CALIPER AT LEFT SIDE LONGITUDINAL	PRE	154.8	24.6	11.8				
		POST	148.6	24.6	10.9				
						17.2	79.4	69.4	33.1
7	DASH PANEL LONGITUDINAL	PRE	128.1	-3.1	37.9				
		POST	126.8	-3.1	38.2				
						3.7	14.9	41.7	53.4
8	FRONT FRAME RAIL LONGITUDINAL	PRE	177.4	-16.2	19.9				
		POST	160.4	-16.4	19.9				
						99.4	15.4	212.8	22.0
9	FRONT FRAME CROSSMEMBER LONGITUDINAL	PRE	181.6	-1.0	31.4				
		POST	163.0	-1.2	33.4				
						65.0	37.5	190.7	17.1

TABLE 4

TEST NUMBER 890327

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY CONTINUED

No.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX G	MSEC	MAX G	MSEC
10	LEFT FENDER	PRE 161.9	27.1	32.1				
	WELL INSIDE LONGITUDINAL	POST 159.1	27.9	36.3	---	---	---	---
11	RIGHT SHOCK TOWER	PRE 146.2	-17.9	33.6				
	LONGITUDINAL	POST 140.0	-16.6	33.5	14.2	63.8	73.1	41.8

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN INCHES.

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

Y See DATA ACQUISITION EXPLANATIONS

FIGURE 4
PRE-TEST AND POST-TEST MEASUREMENT POINTS

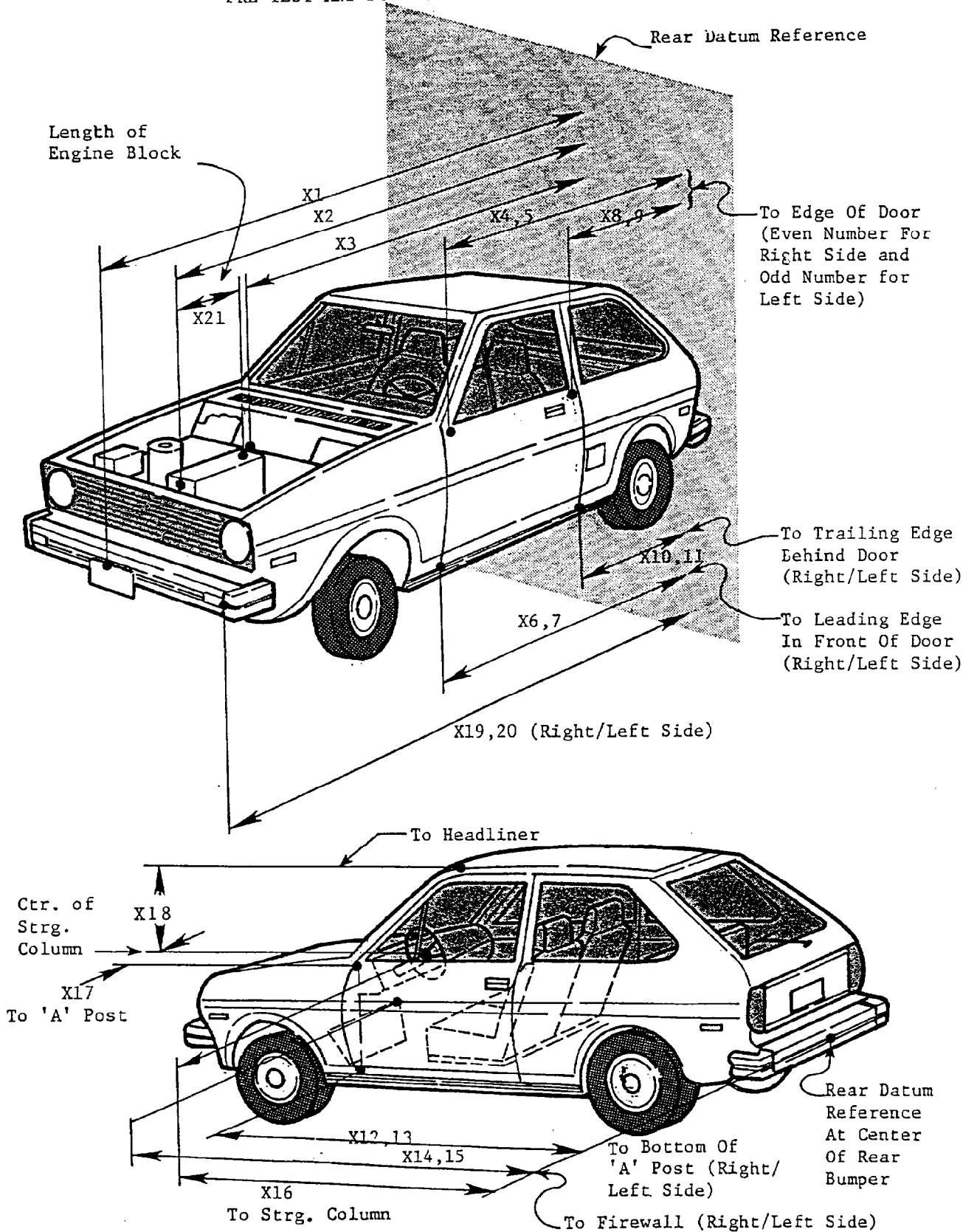


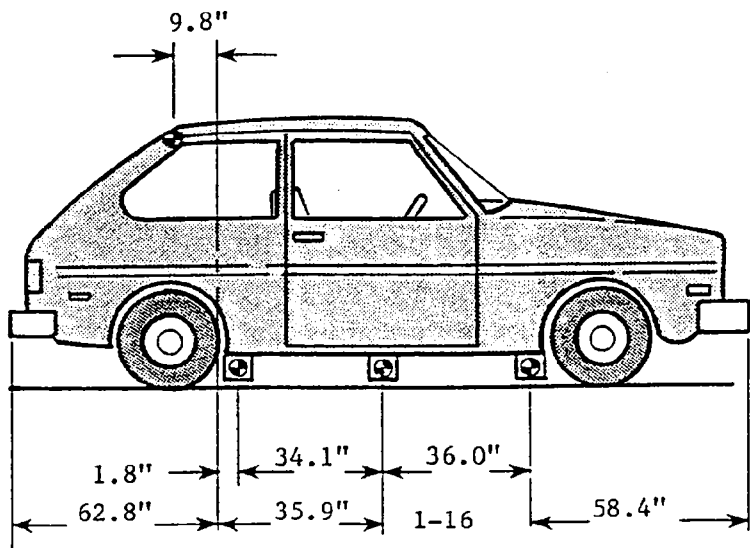
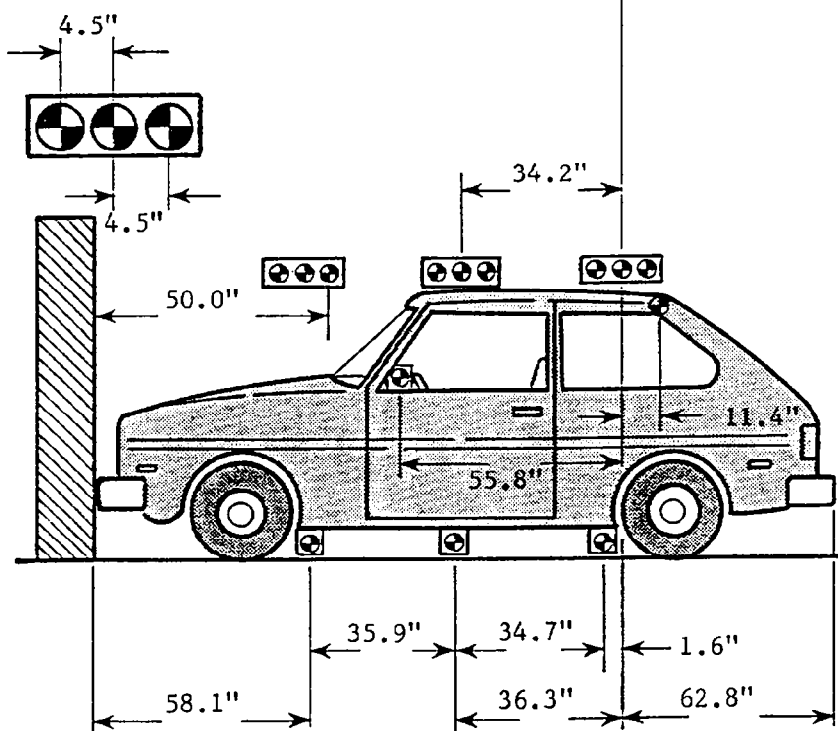
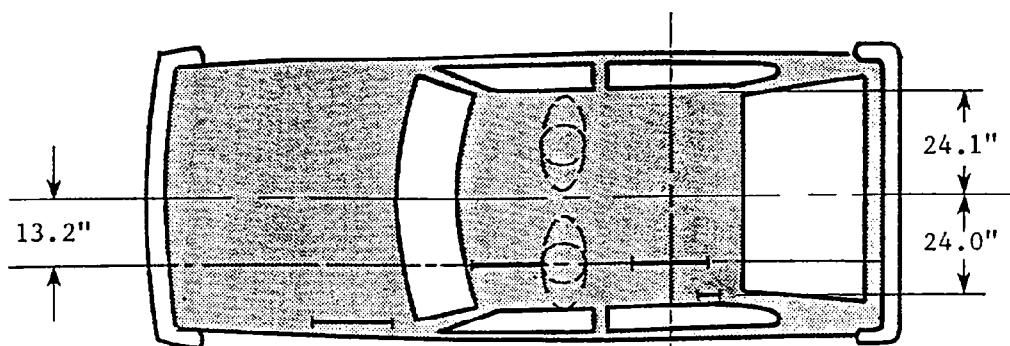
TABLE 5 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Audi 200

TEST NUMBER: 890327

NO.	TYPE OF MEASUREMENT	DIMENSIONS IN INCHES		
		PRE-TEST	POST-TEST	DIFF.
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE	193.1	167.6	25.5
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK	178.6	161.8	16.8
X3	REAR SURFACE OF VEHICLE TO FIREWALL	150.2	140.0	10.2
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR	128.8	128.1	0.7
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR	128.8	128.5	0.3
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR	129.8	129.8	0.0
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR	130.2	129.8	0.4
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR	89.0	88.5	0.5
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR	89.0	88.6	0.4
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR	90.4	90.1	0.3
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR	90.5	90.2	0.3
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE	126.5	126.2	0.3
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE	125.9	126.2	-0.3
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE	146.5	144.1	2.4
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE	146.4	144.8	1.6
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER	113.2	113.9	-0.7
X17	CENTER OF STEERING COLUMN TO "A" POST	12.8	12.9	-0.1
X18	CENTER OF STEERING COLUMN TO HEADLINER	18.2	18.1	0.1
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER	187.9	167.4	20.5
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER	187.6	167.4	20.2
X21	LENGTH OF ENGINE BLOCK	23.0	23.0	0.0

FIGURE 5
VEHICLE TARGET LOCATIONS



DATA ACQUISITION EXPLANATIONS

The engine bottom X-axis accelerometer, ENGXG2, lost data after 41 milliseconds due to the vehicle's crush cutting the accelerometer cable.

The left fender well inside X-axis accelerometer, FILXG, lost data after 38 milliseconds due to the vehicle's crush cutting the accelerometer cable.

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 1989 Audi 200 4-door sedan, NHTSA No. CK0506, appeared to comply with the requirements of FMVSS Nos. 212, 219 (partial), and 301. The vehicle recorded a marginal failure of FMVSS No. 208.

The driver's Head Injury Criteria (HIC) was 463. The driver's maximum chest deceleration over three milliseconds was 57.9 g. The driver's right and left compressive femur loads were 1375 pounds and 2263 pounds, respectively.

The right front passenger's Head Injury Criteria (HIC) was 185. The right front passenger's maximum chest deceleration over three milliseconds was 34.0 g. The right front passenger's right and left compressive femur loads were 259 pounds and 392 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			R*
	X	Y	Z	R	X	Y	Z	
DRIVER	-57.0	14.8	-29.0	58.2	-59.3	11.3	-9.6	57.9
PASSENGER	-36.1	9.1	-32.9	38.2	-36.0	-9.2	9.4	34.0

MAXIMUM FORCE-FEMUR LOAD (LBS)

	LEFT FEMUR	RIGHT FEMUR
DRIVER	2263	1375
PASSENGER	392	259

HEAD INJURY CRITERIA**

	HIC	TIME t ₁ (MSEC) ¹	TIME t ₂ (MSEC) ²
DRIVER	463	75.8	107.8
PASSENGER	185	79.8	115.8

*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 head and chest were restrained by the driver's airbag. The dummy rebounded into the seat back and head restraint. The dummy came to rest seated upright 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 as the dummy's chest was restrained by the three-point unbelt. The dummy's head rotated rearward into the head restraint 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 unbelt.

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #353	PASSENGER #354
Head	<u>Airbag</u>	<u>None</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>Passenger's shifted 1 inch forward</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: Audi 200
 Body Style: 4-door sedan Model Year: 1989
 NHTSA No.: CK0506 Color: Silver

DATA FROM CERTIFICATION LABEL:

Vehicle Manufacturer: Audi AG
 Date of Manufacture: 11/88 VIN: WAUFC5445KNO43702
 GVWR: 4365 lb; GAWR: Front = 2425 lb; Rear = 2094 lb

POST-IMPACT DATA:

Date of Test: 3/27/89 Time: 1510 Temperature: 74° F
 Required Impact Velocity Range: 28.9 to 29.9 mph
 Impact Velocity: Primary = 29.3 mph Secondary = 29.4 mph
 Seat Type: Bucket Adjuster Type: Power
 Bucket Seat Back Type: Power adjustable
 Technicians: B. Crabtree, R. Cribley

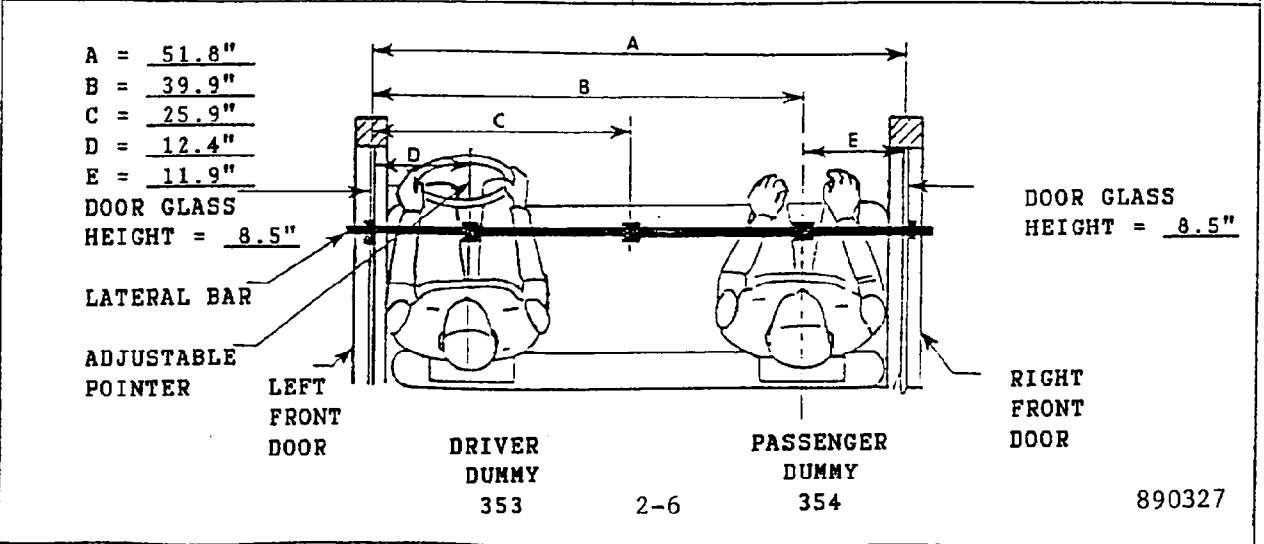
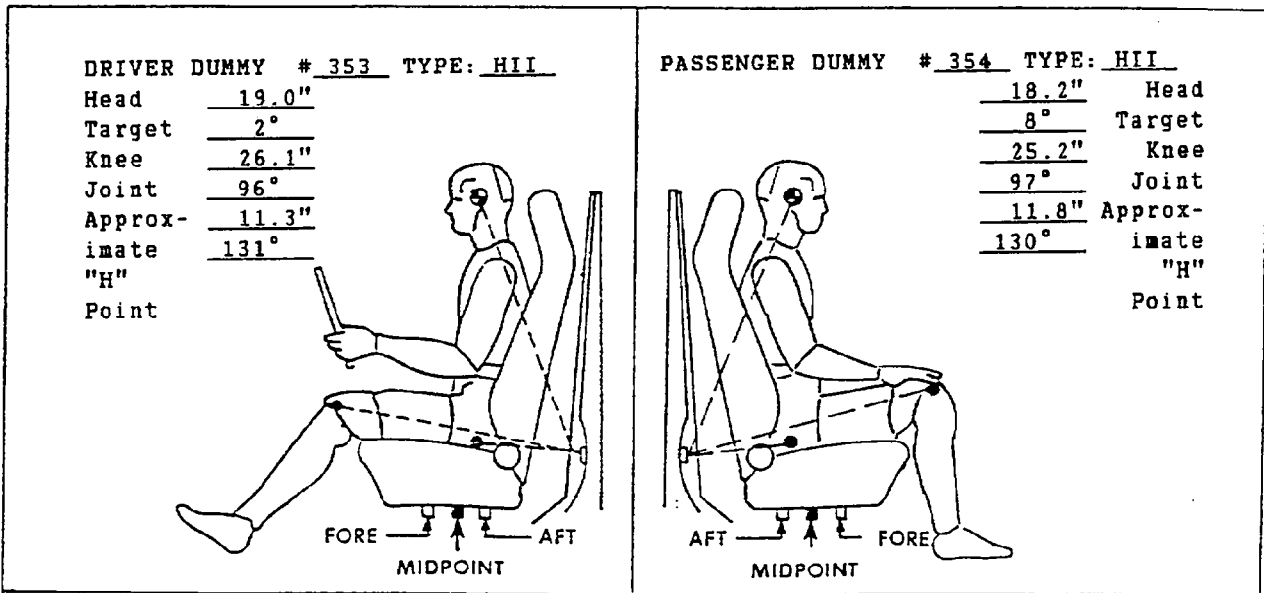
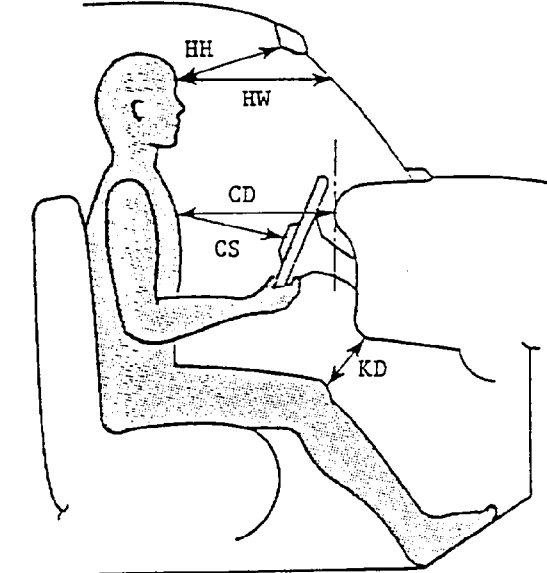
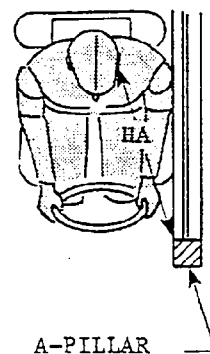
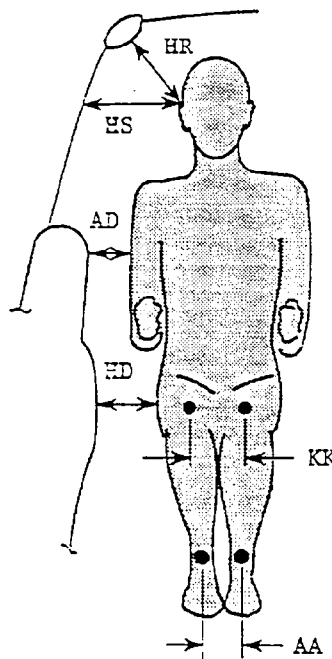


FIGURE 7 DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER	PASSENGER
HH	12.6	15.6
HW	18.5	22.1
CD	20.4	22.6
CS	13.9	NA
KDL	4.8	5.6
KDR	4.1	5.4
TA	19°	28°
SA	23°	23°
HA	16.5	16.2



	DRIVER	PASSENGER
HR	6.2	7.2
HS	9.4	10.2
AD	5.8	5.6
HD	8.6	8.5
KK	10.0	7.6
AA	9.5	8.8



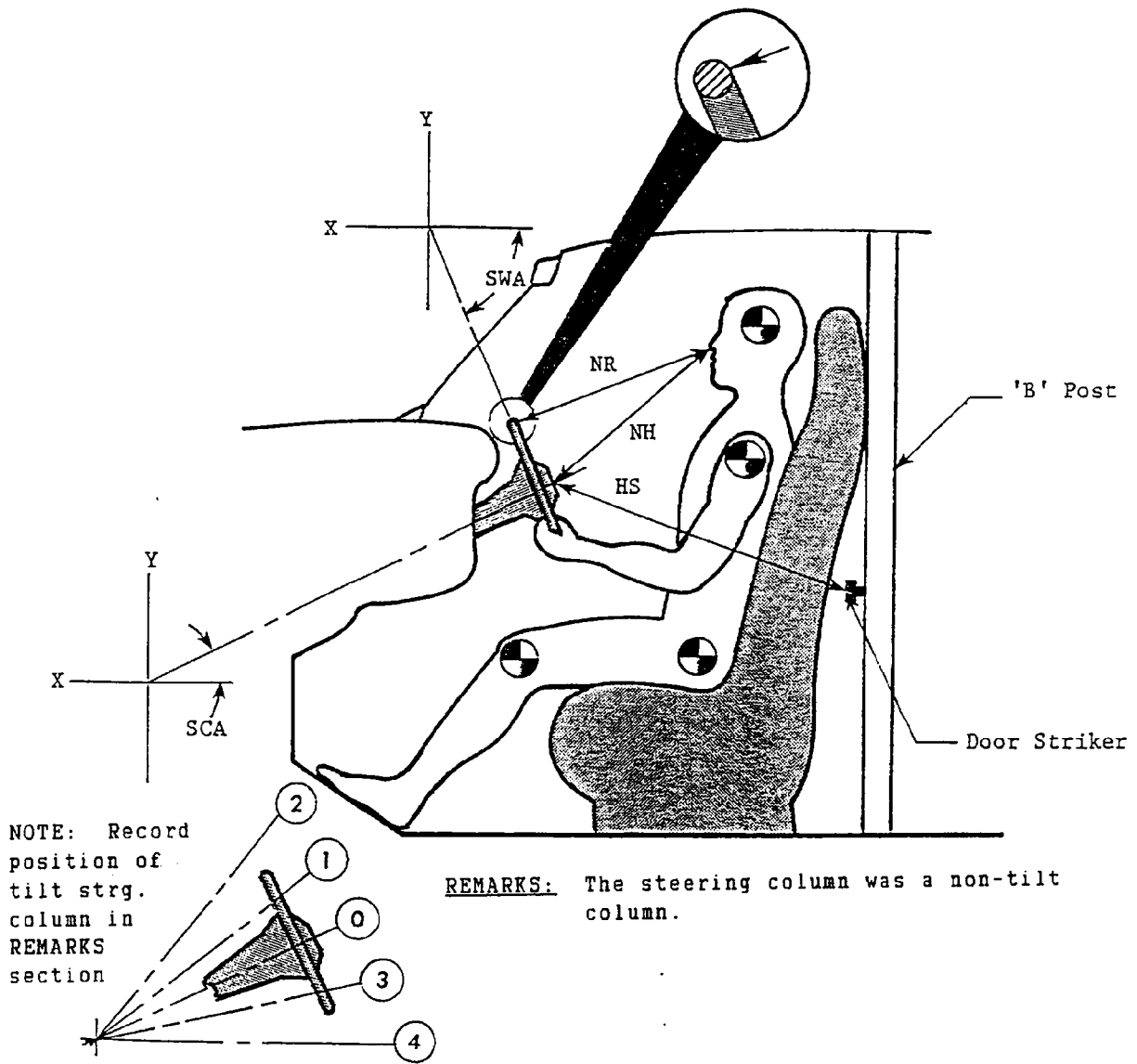
Knee outer bolt head to outer bolt head spacing:
 Driver = 14.5
 Passenger = 11.8

- | | |
|--------------------------------|--------------------------|
| 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.

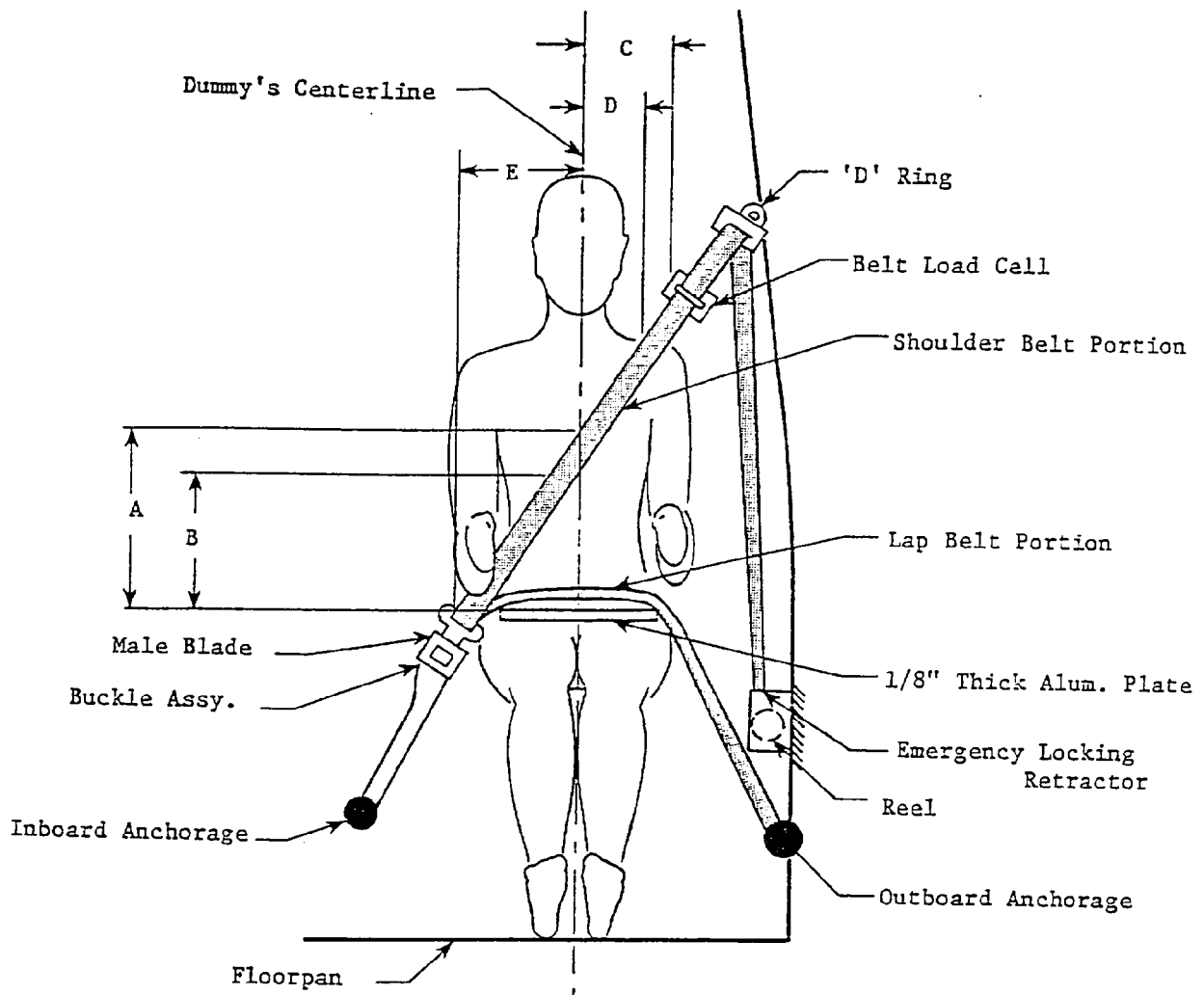
FIGURE 8 DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



MEASUREMENTS

NR	- Distance from tip of dummy's nose to top rear surface of steering wheel rim. (in.)	17.2
NH	- Distance from tip of dummy's nose to center of steering column hub. (in.)	18.6
HS	- Distance from center of steering column hub to the forward surface of the door lock striker pin. (in.)	24.4
SCA	- Angle of steering column relative to the horizontal X axis	25°
SWA	- Angle of steering wheel relative to the horizontal X axis	67°

FIGURE 9 SEAT BELT POSITIONING DATA



	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	14.0
B - Top surface of alum. plate to belt lower edge (in)	10.8
C - Dummy centerline to outer edge of belt at chest flesh top (in)	6.0
D - Dummy centerline to inner edge of belt at chest flesh top (in)	3.2
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: WAUFC5445KN043702 NHTSA NO: CK0506

MAKE: Audi MODEL: 200

VEHICLE BUILD DATE: 11/88 VEHICLE TYPE: 4-door sedan

FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:

(check one): 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
 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 CONTINUED

VEHICLE VIN: WAUFC5445KN043702 NHTSA NO: CK0506

MAKE: Audi MODEL: 200

VEHICLE BUILD DATE: 11/88 VEHICLE TYPE: 4-door sedan

FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:

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

RETRACTION:

SEATBELT AUTOMATICALLY RETRACTS WHEN

(check one): Adjacent vehicle door is open and seatbelt
latchplate is released
 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 THRU 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

TABLE 7 FMVSS 208 COMFORT AND CONVENIENCE DATA CONTINUED

VEHICLE VIN: WAUFC5445KNO43702 NHTSA NO: CK0506
MAKE: Audi MODEL: 200
VEHICLE BUILD DATE: 11/88 VEHICLE TYPE: 4-door sedan
FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:
(check one): Automatic belts
 X Type 2 lap/shoulder belts
 Other

ACCESSIBILITY, CONTINUED:

ARE THE REMAINING TWO PARTS ACCESSIBLE UNDER NORMAL CONDITIONS?

 NA

DO THE LATCHPLATE AND BUCKLE PASS THRU 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 SEATBACK, 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 3-POINT UNIBELT IN STOWED POSITION
AND IGNITION SWITCH PLACED IN "START/ON" POSITION:

Duration of audible warning signal = 0 sec.

Duration of reminder light operation = 6 sec.

WITH OCCUPANT IN DRIVER'S POSITION AND 3-POINT 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 PROTECTON SYSTEM:

The label is located on the top side of the passenger's sun visor mirror cover.

THE MANUFACTURER'S RECOMMENDED SCHEDULE IS TO: (check one)

replace _____ or repair _____

or renew X this system

a. by _____ month, _____ year

b. by _____ miles

c. or after a time interval of _____ months or 10 years.

WERE APPROPRIATE INSTRUCTIONS CONCERNING MAINTENANCE AND/OR REPLACEMENT OF THIS SYSTEM PROVIDED? Yes, in owner's manual

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

IS THERE A REFERENCE TO THE INSTRUCTIONS AND DESCRIPTION OF THE SYSTEM ON THE LABEL? No

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

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 light was located on the upper right portion of instrument panel.

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? No

TABLE 11 SUMMARY OF FMVSS 301 DATA

PRE-IMPACT DATA

MAKE/MODEL: Audi 200
BODY STYLE: 4-door sedan MODEL YEAR: 1989
NHTSA NO.: CK0506 COLOR: silver

DATA FROM CERTIFICATION LABEL

VEHICLE MANUFACTURER: Audi AG
DATE OF MANUFACTURE: 11/88 VIN: WAUFC5445KN043702
GVWR: 4365 LBS., GAWR: FRONT 2425 LBS., REAR 2094 LBS.

POST-IMPACT DATA

TYPE OF TEST: Frontal Barrier Impact
DATE OF TEST: 3/27/89 TIME: 1510 TEMP: 74° F
REQUIRED IMPACT VELOCITY RANGE: 28.9 MPH TO 29.9 MPH
IMPACT VELOCITY: PRIMARY = 29.3 MPH, SECONDARY = 29.4 MPH
TEST WEIGHT = 3914 LBS., STATIC CRUSH MAX. = 25.5 IN., REBOUND = 12.6 IN.

FUEL SYSTEM DATA

TEST FLUID TYPE: PURPLE SOLVENT #2; SPEC. GRAVITY: 0.764
KINEMATIC VISCOSITY: 0.99 CENTISTOKES
"USEABLE" CAPACITY*: 21.0 GALLONS (FURNISHED BY COTR)
TEST VOLUME: 19.5 GALLONS (92-94% OF USEABLE)
FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): 21.1 GALLONS
DETAILS OF FUEL SYSTEM: The fuel tank is located in front of the rear
axle. The fuel filler neck is located on the right side. The fuel lines
run along the right side 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

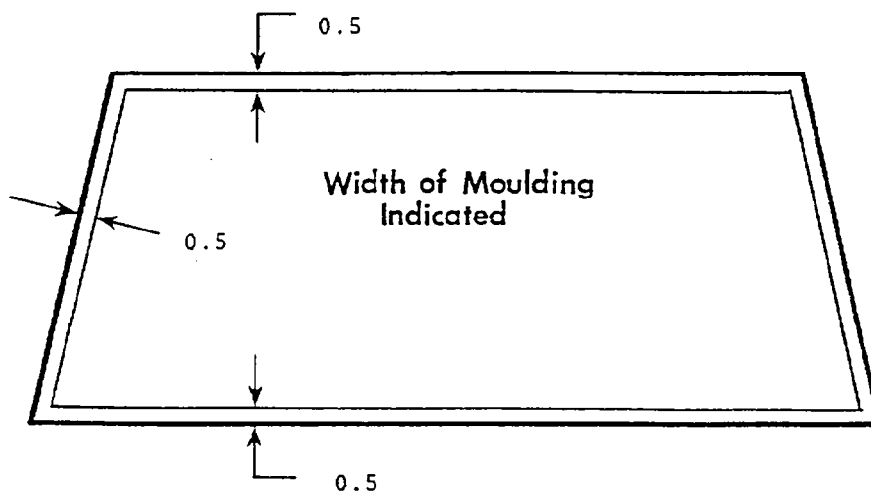
Details of windshield mounting such as retention method, trim type, etc.:

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	82.0	82.0	100%
LEFT SIDE	82.0	82.0	100%
TOTAL	164.0	164.0	100%

AREA OF RETENTION FAILURE:



FAILURE DETAILS: None

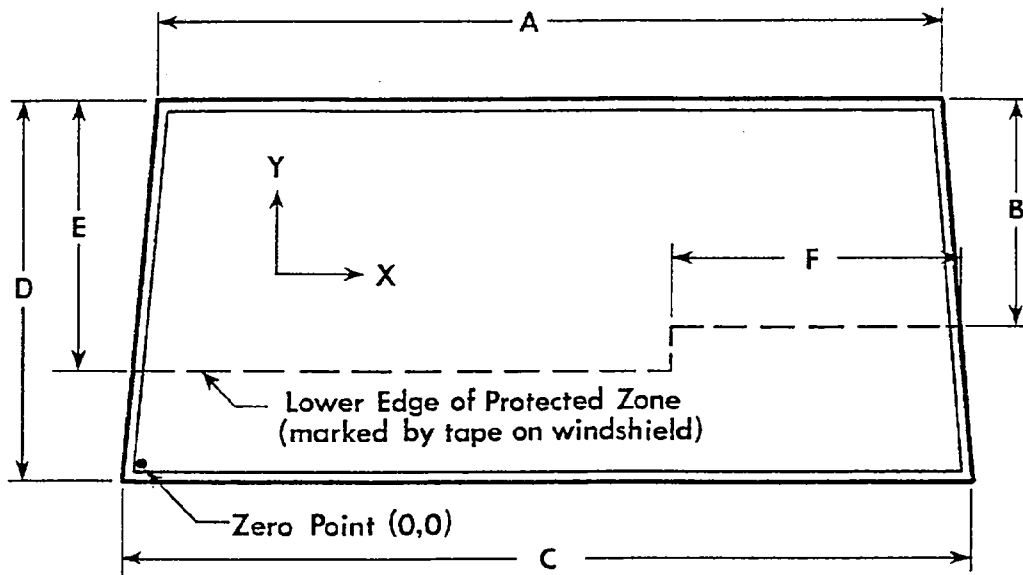
Windshield Temperature: 74° F

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>44.5</u>	C = <u>63.5</u>	E = <u>18.4</u>
B = <u>18.9</u>	D = <u>31.0</u>	F = <u>31.8</u>

<u>DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":</u> (Show location of penetration on above sketch)	<u>COORDINATES</u>
	<u> X Y</u>

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.: CK0506; TEST DATE: 3/27/89

VEH. MFR./MAKE/MODEL: Audi AG/Audi/200

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.

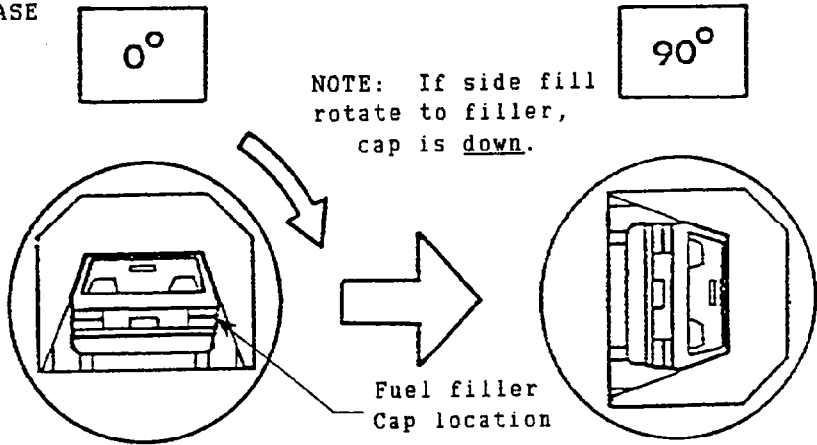
SOLVENT SPILLAGE DETAILS:

None

FIGURE 12 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

NHTSA NO.: CK0506

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

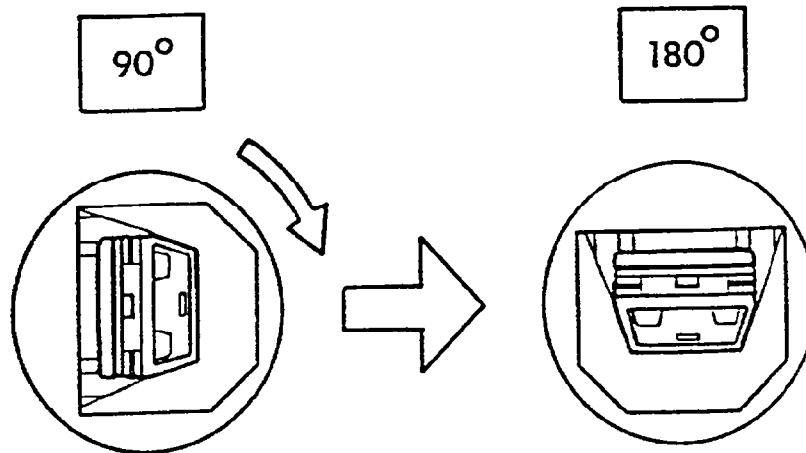
	First 5 minutes	6th	7th
	FROM ONSET OF ROTATION		
	Minute	Minute	Minute
Maximum allowable solvent spillage - -	<u> 5 oz. </u>	<u> 1 oz. </u>	<u> 1 oz. </u>
0 to 90° (filler cap down) - - - - -	<u> 0 oz. </u>	<u> 0 oz. </u>	<u> 0 oz. </u>

SOLVENT SPILLAGE LOCATION(S)

None

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

NHTSA NO.: CK0506
TEST PHASE



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

Time req. for machine to rotate 90° = 2 minutes, 00 seconds
 FMVSS 301 position hold time = 5 minutes, 00 seconds
 TOTAL - - - - - = 7 minutes, 00 seconds
 Next whole minute interval - - - - = 14 minutes

FMVSS 301 REQUIREMENTS

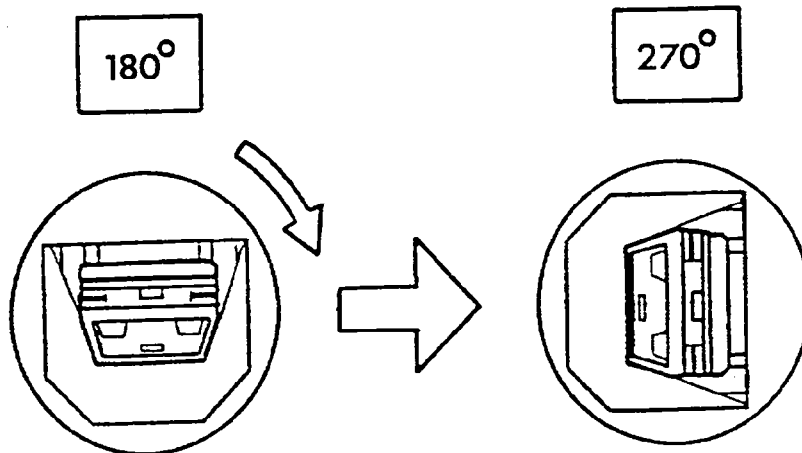
	First 5 minutes	6th	7th
	FROM ONSET OF ROTATION		
	Minute	Minute	Minute
Maximum allowable solvent spillage - -	<u> 5 oz. </u>	<u> 1 oz. </u>	<u> 1 oz. </u>
90° to 180° - - - - -	<u> 0 oz. </u>	<u> 0 oz. </u>	<u> 0 oz. </u>

SOLVENT SPILLAGE LOCATION(S)

None

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

NHTSA NO.: CK0506
TEST PHASE



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

Time req. for machine to rotate 90° = 2 minutes, 00 seconds
 FMVSS 301 position hold time = 5 minutes, 00 seconds
 TOTAL - - - - - = 7 minutes, 00 seconds
 Next whole minute interval - - - - = 21 minutes

FMVSS 301 REQUIREMENTS

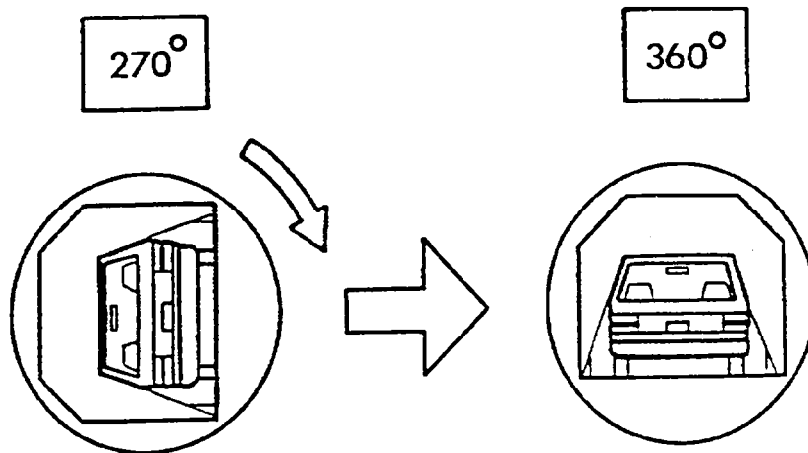
	First 5 minutes FROM ONSET OF ROTATION	6th Minute	7th Minute
Maximum allowable solvent spillage - -	<u> 5 oz. </u>	<u> 1 oz. </u>	<u> 1 oz. </u>
180° to 270° - - - - -	<u> 0 oz. </u>	<u> 0 oz. </u>	<u> 0 oz. </u>

SOLVENT SPILLAGE LOCATION(S)

None

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

NHTSA NO.: CK0506
TEST PHASE



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

Time req. for machine to rotate 90° = 2 minutes, 00 seconds
 FMVSS 301 position hold time = 5 minutes, 00 seconds
 TOTAL - - - - - = 7 minutes, 00 seconds
 Next whole minute interval - - - - = 28 minutes

FMVSS 301 REQUIREMENTS

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

SOLVENT SPILLAGE LOCATION(S)

None

SECTION 3.0

CAMERA INFORMATION

FIGURE 13 CAMERA POSITIONS

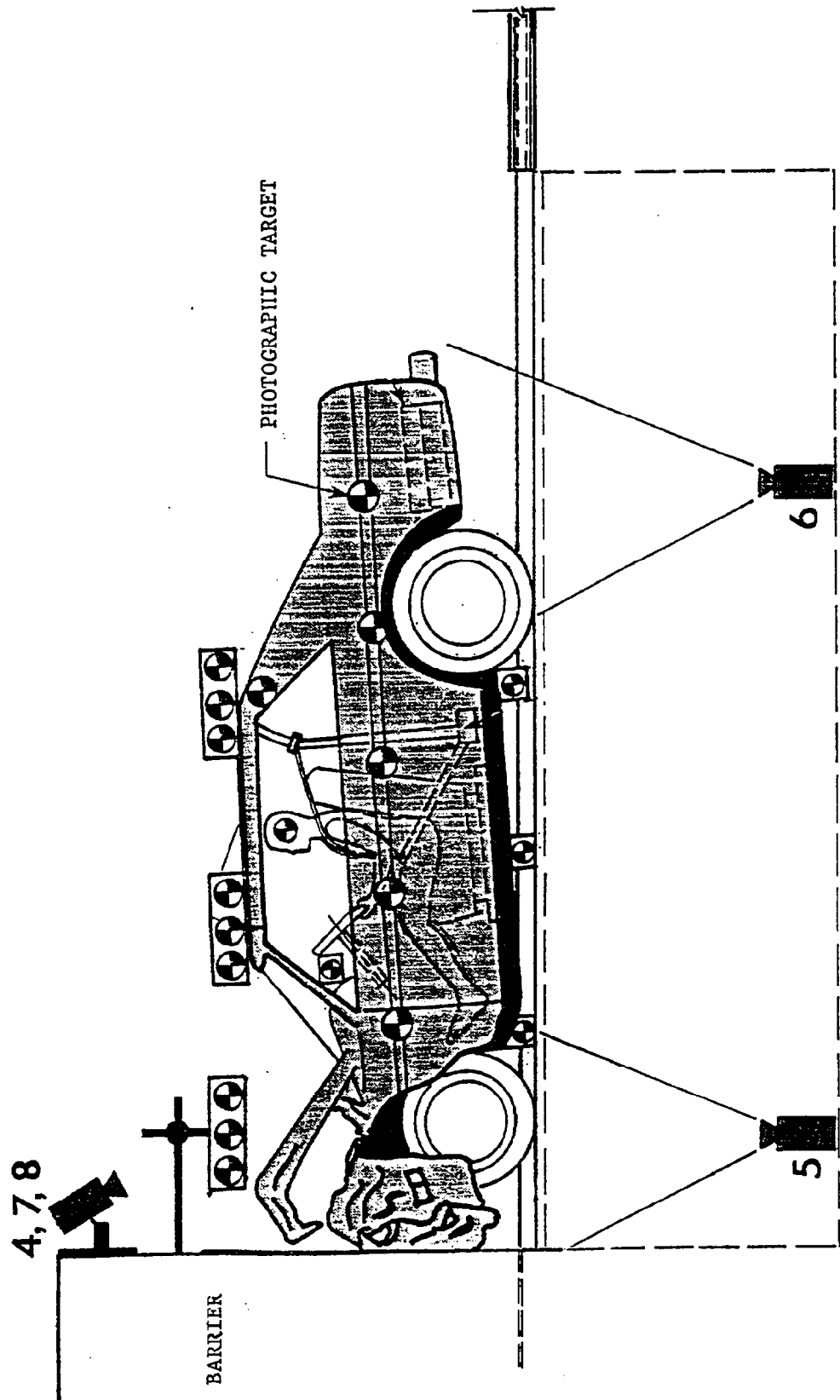


FIGURE 13 CAMERA POSITIONS CONTINUED

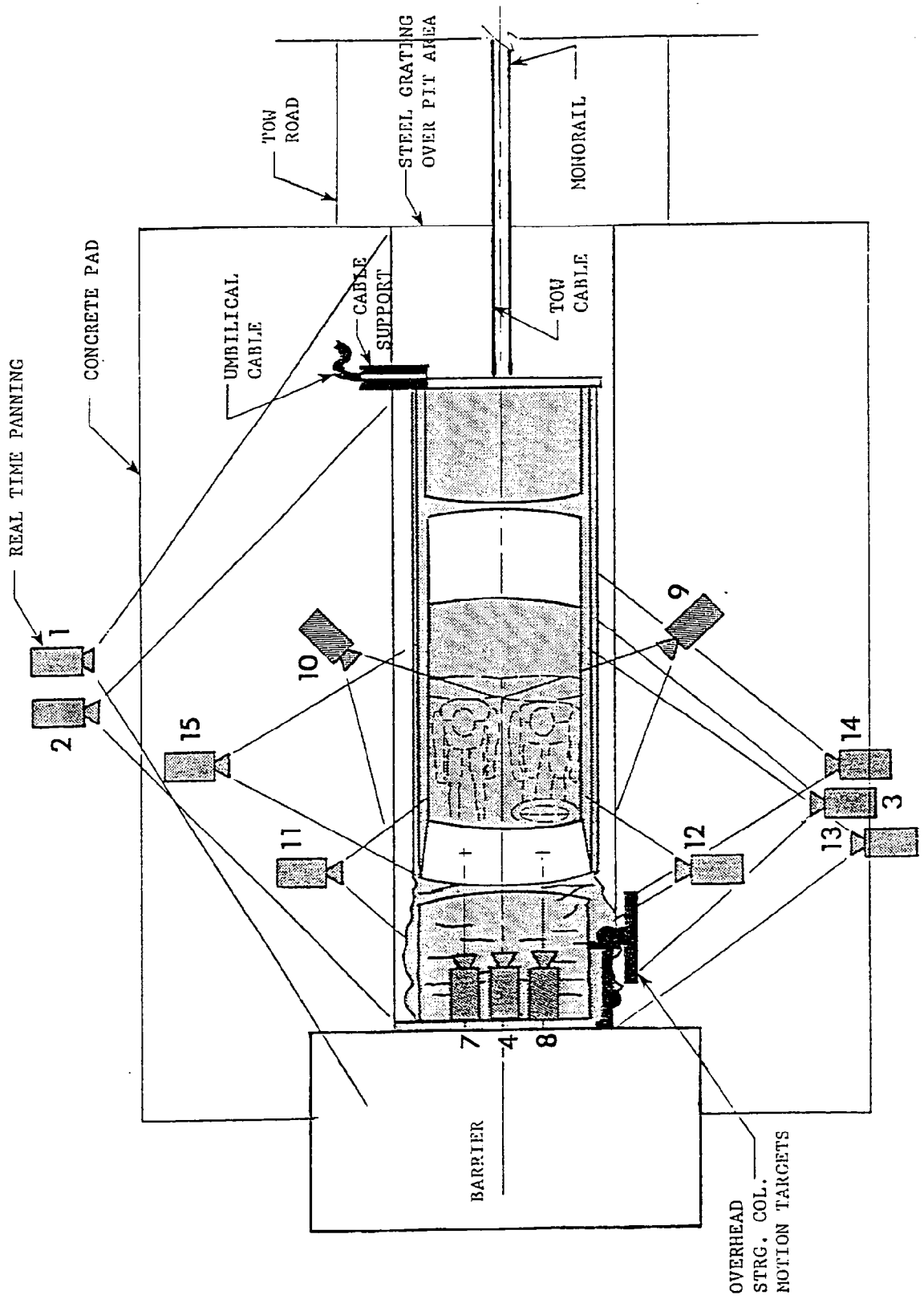


TABLE 13 HIGH SPEED CAMERA LOCATIONS

CAMERA NO.	VIEW	CAMERA POSITIONS (IN)*			ANGLE** (DEG)	FILM PLANE TO HEAD TARGET		SPEED (FPS)
		X	Y	Z		LEN (MM)	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	495
3	Dummy kinematics	-41.5	295.0	44.0	-4	227.0	25	495
4	Windshield damage	-6.0	0.0	89.0	-40	NA	13	495
5	Crush & fluid spillage	-50.5	0.0	-92.4	90	NA	13	1005
6	Fluid spillage	-99.3	0.0	-99.0	90	NA	13	1002
7	Passenger kinematics	-4.5	-13.8	93.0	-50	NA	17	498
8	Driver kinematics	-6.8	14.5	93.0	-50	NA	17	495
9	Driver kinematics	-157.3	116.0	87.0	-27	111.5	25	495
10	Passenger kinematics	-152.1	-116.0	87.0	-26	101.0	25	500
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	500
13	Column movement	-122.0	286.0	103.0	-14	NA	25	495
14	Column movement	-122.0	286.0	75.1	-9	NA	25	495
15	Passenger kinematics	-38.8	-293.0	45.3	-4	225.0	25	515

* +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

890327



Figure A-3. PRE-TEST LEFT SIDE VIEW



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

890327



Figure A-5. PRE-TEST RIGHT SIDE VIEW



Figure A-6. POST-TEST RIGHT SIDE VIEW
A-4

890327



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



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



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



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

A-6

890327



Figure A-11. PRE-TEST REAR VIEW



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

890327



Figure A-13. PRE-TEST WINDSHIELD VIEW



Figure A-14. POST-TEST WINDSHIELD VIEW

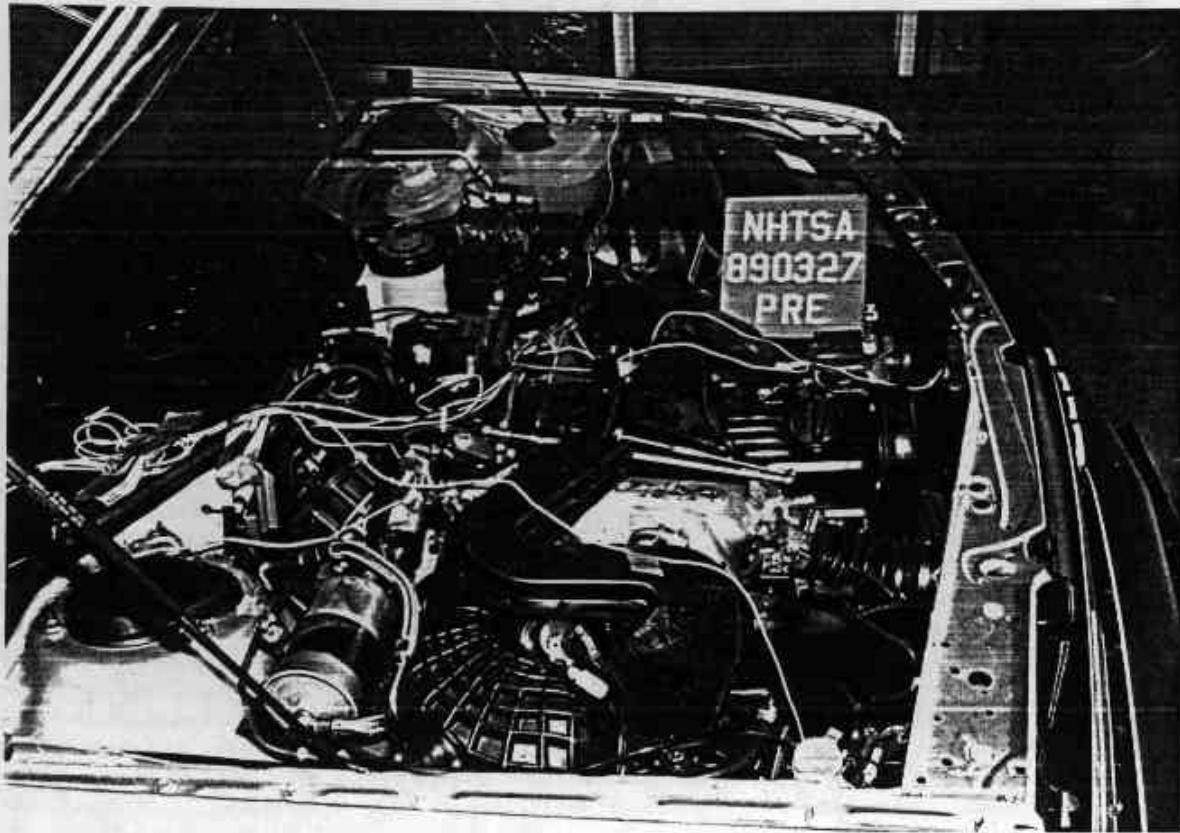


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW



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

A-10

890327

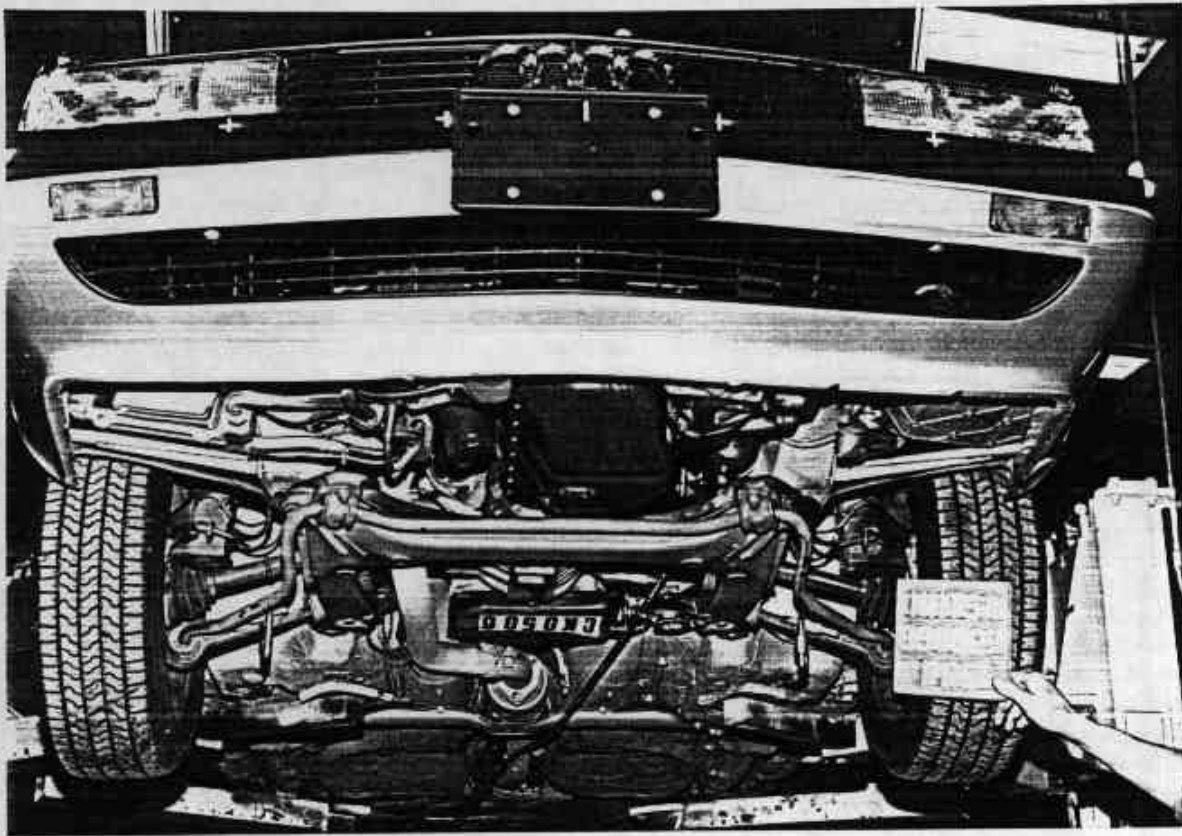


Figure A-19. PRE-TEST FRONT UNDERBODY VIEW

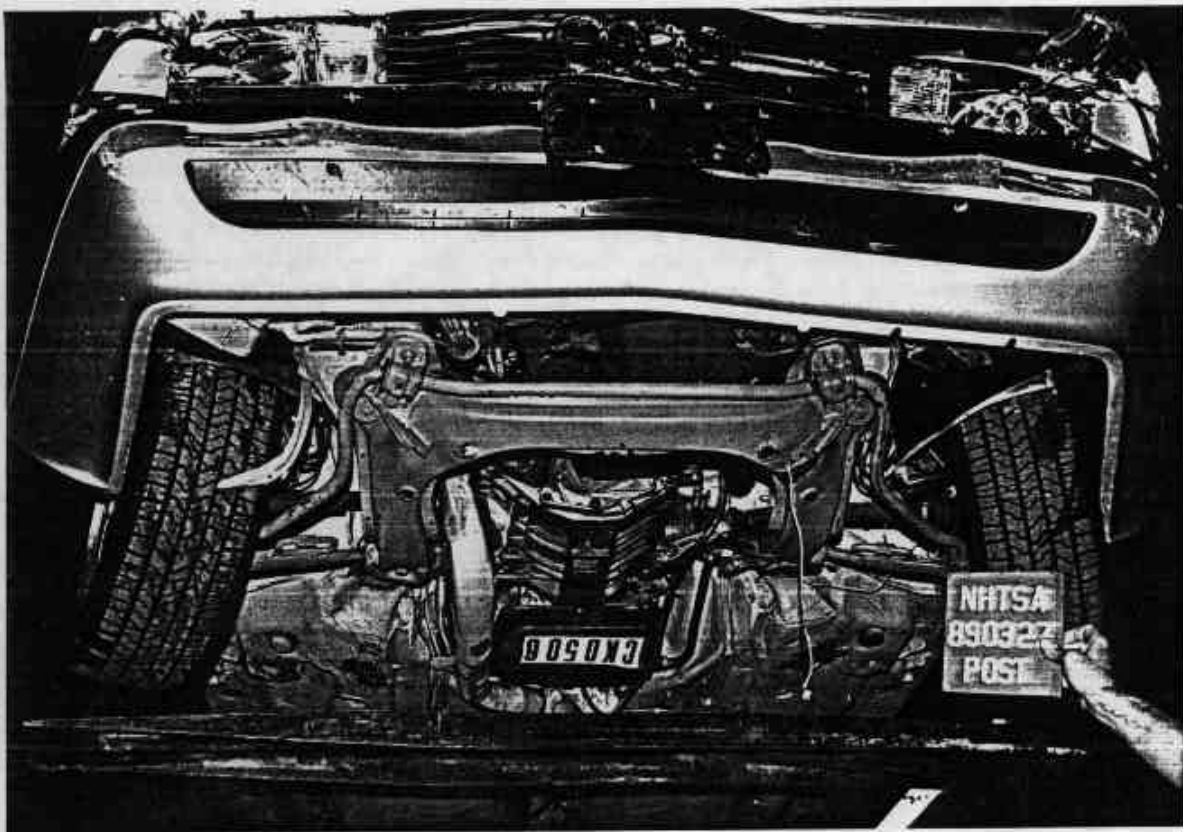


Figure A-20. POST-TEST FRONT UNDERBODY VIEW

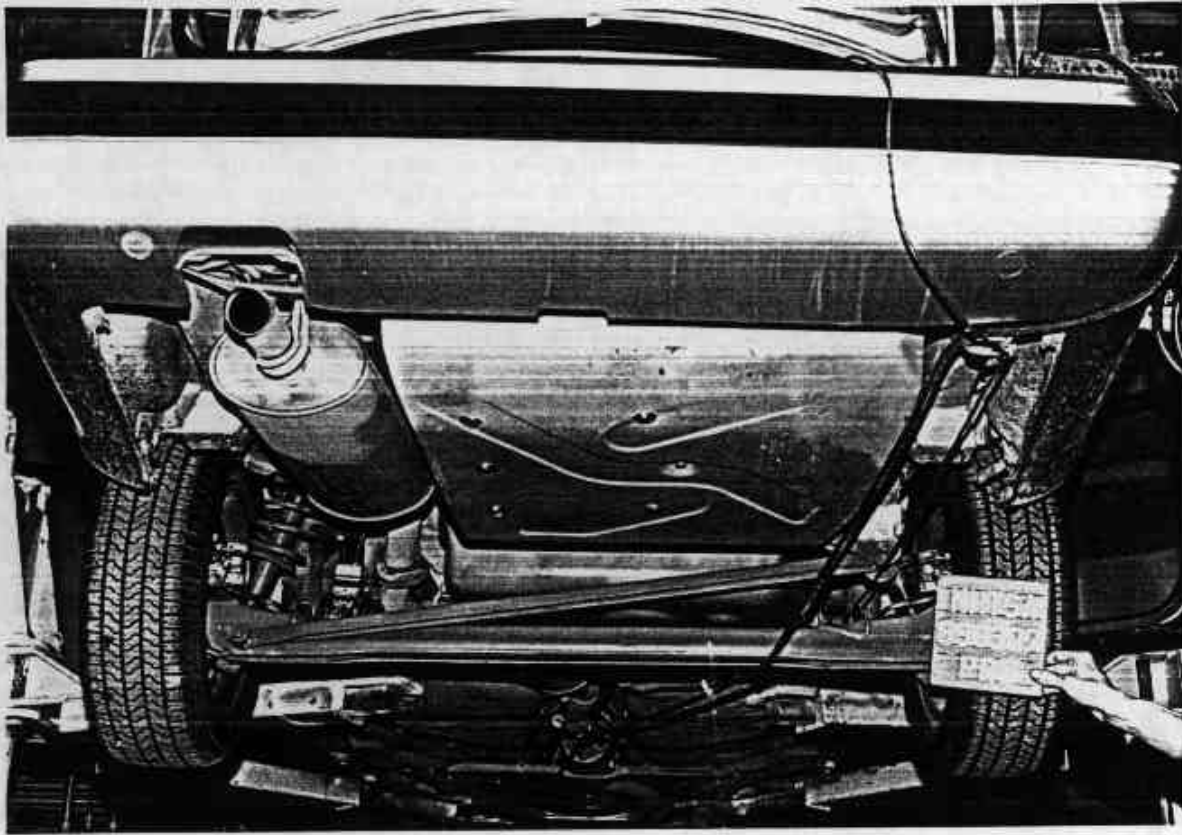


Figure A-21. PRE-TEST REAR UNDERBODY VIEW



Figure A-22. POST-TEST REAR UNDERBODY VIEW

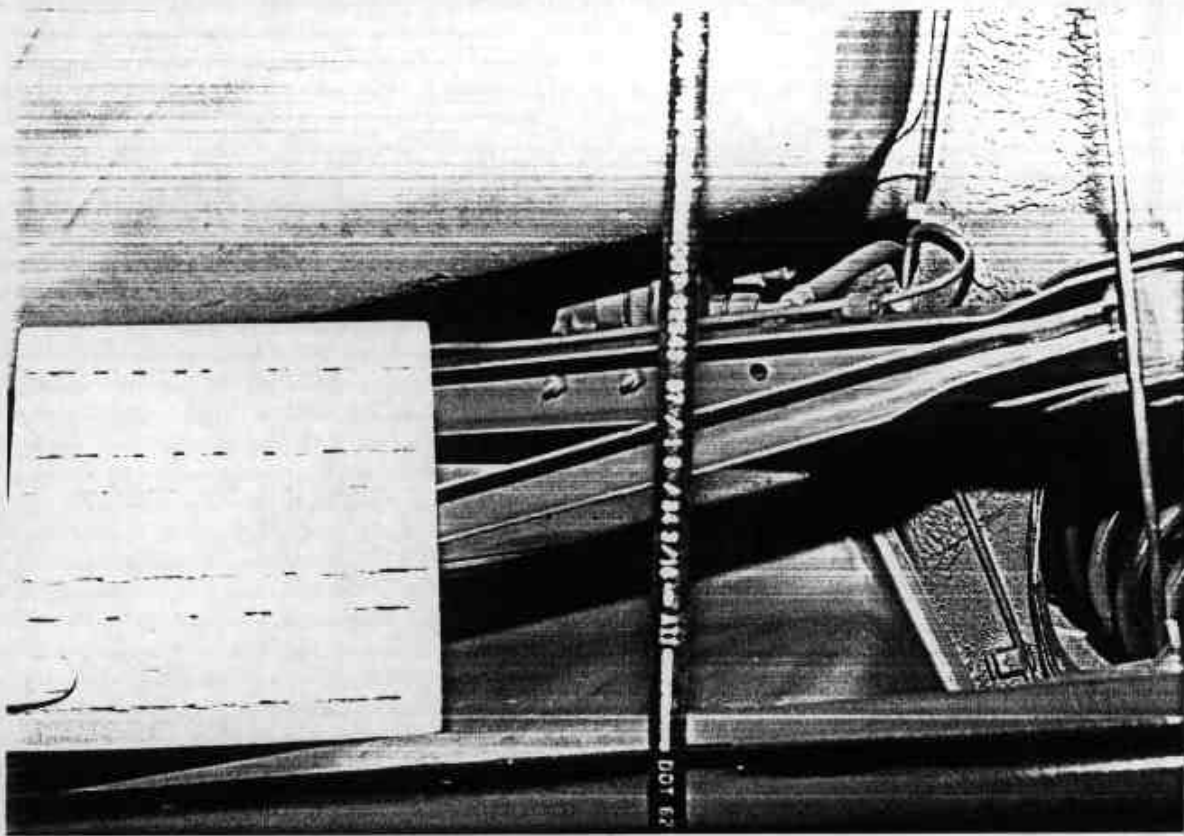


Figure A-23. PRE-TEST FUEL LINES VIEW



Figure A-24. PRE-TEST CARGO BALLAST - VIEW 1

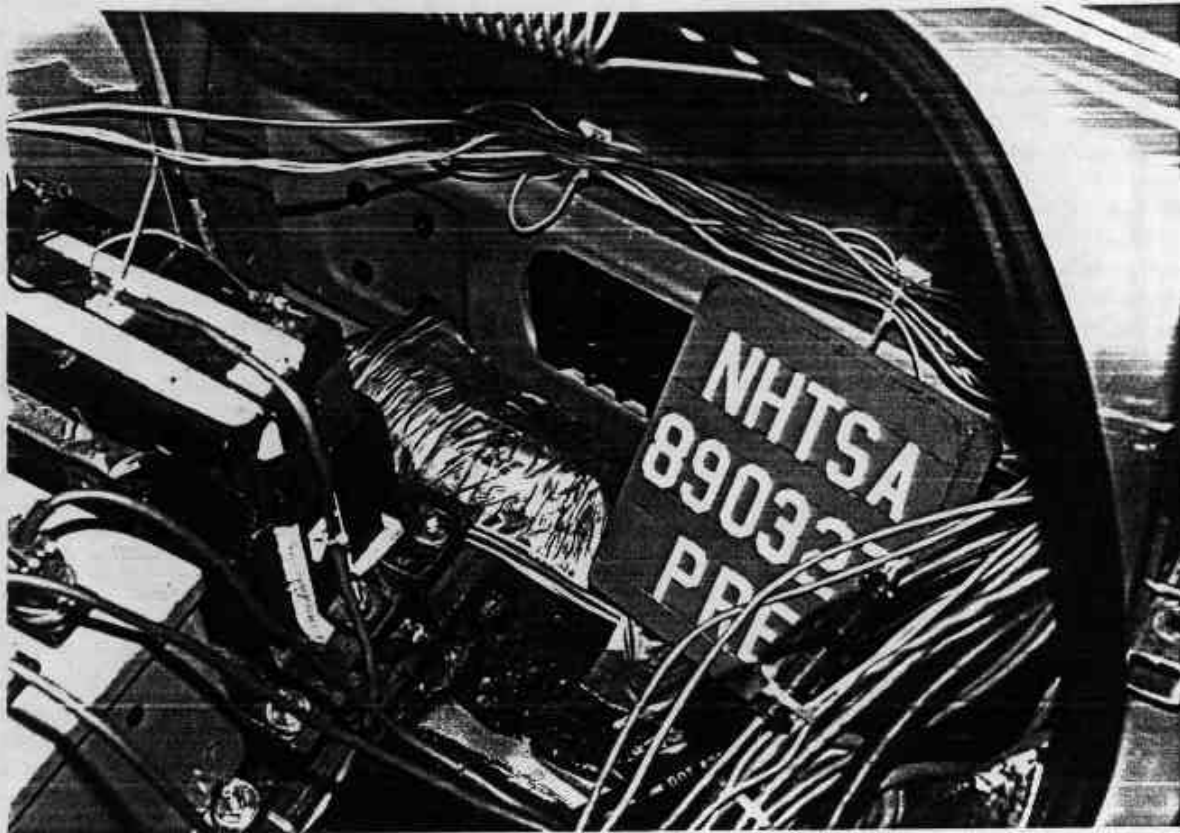


Figure A-25. PRE-TEST CARGO BALLAST - VIEW 2

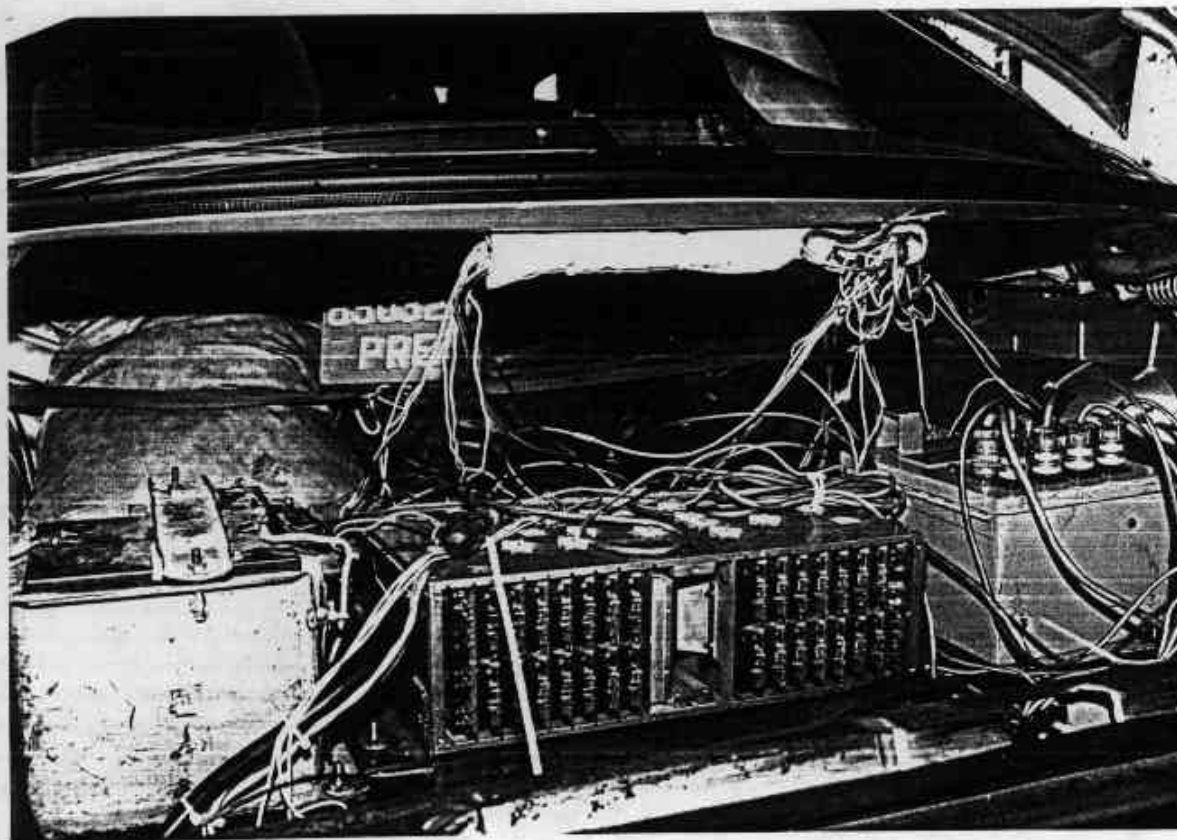


Figure A-26. PRE-TEST CARGO BALLAST - VIEW 3



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



Figure A-28. POST-TEST DRIVER DUMMY POSITION VIEW
A-15

890327

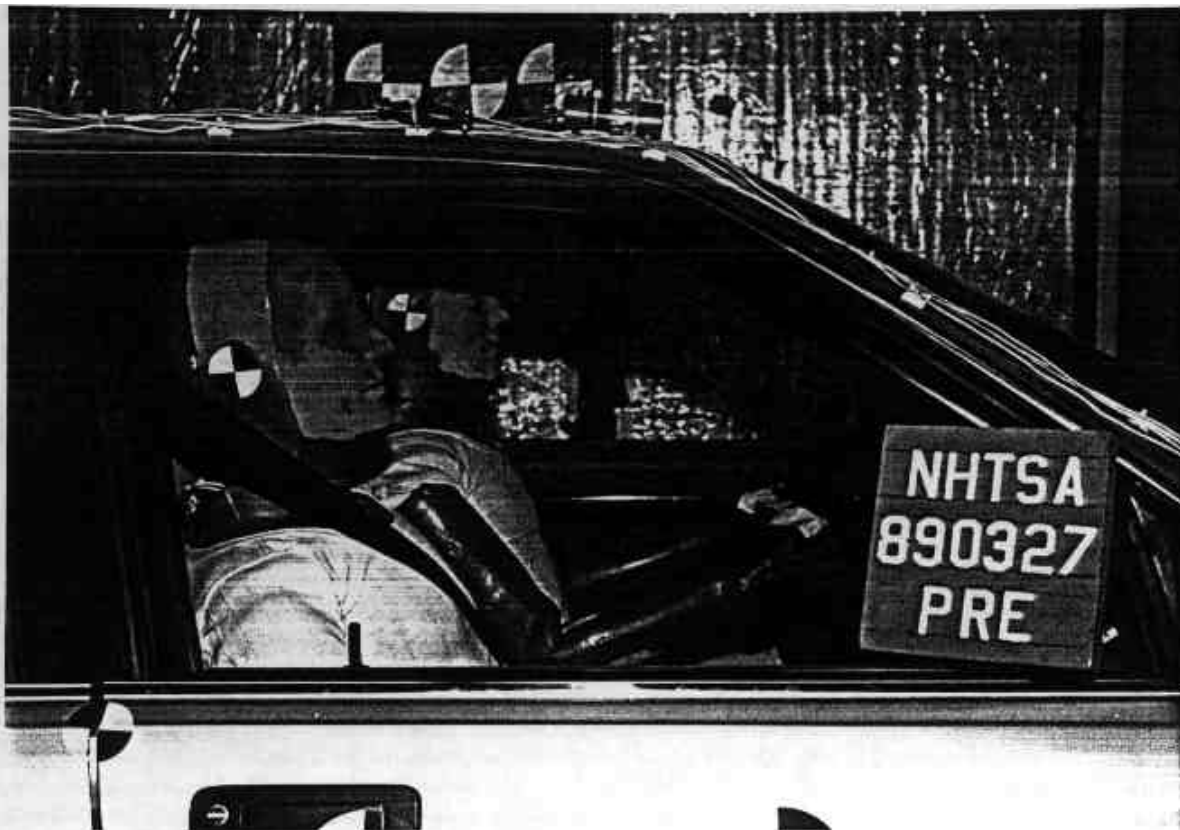


Figure A-29. PRE-TEST PASSENGER DUMMY POSITION VIEW



Figure A-30. POST-TEST PASSENGER DUMMY POSITION VIEW



Figure A-31. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1



Figure A-32. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

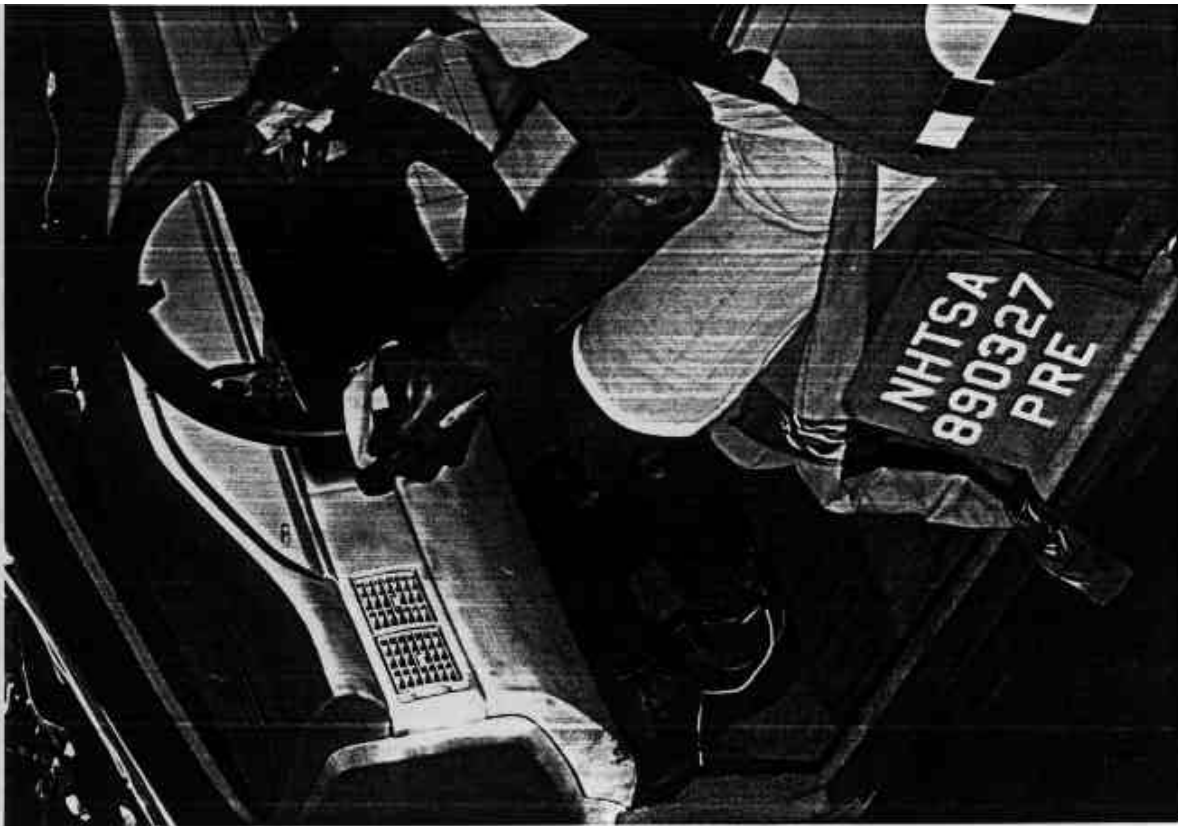


Figure A-33. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

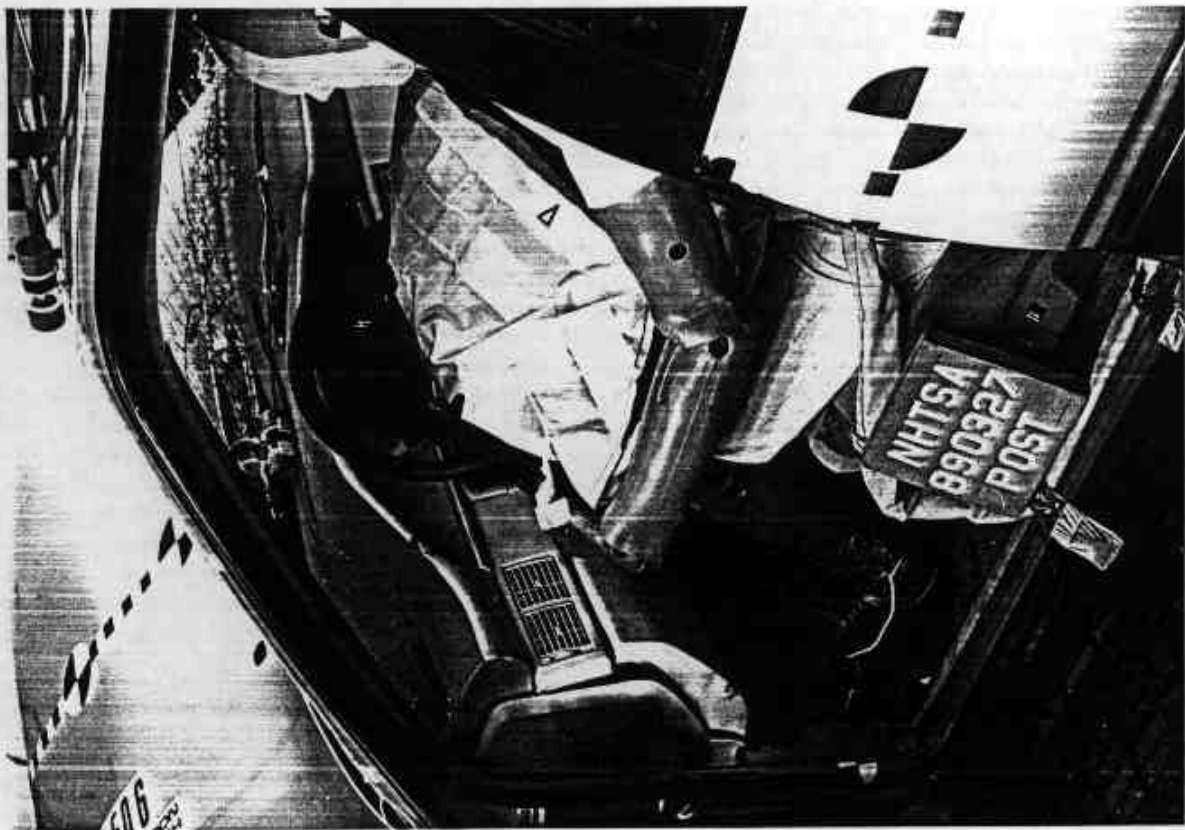


Figure A-34. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

A-18

890327

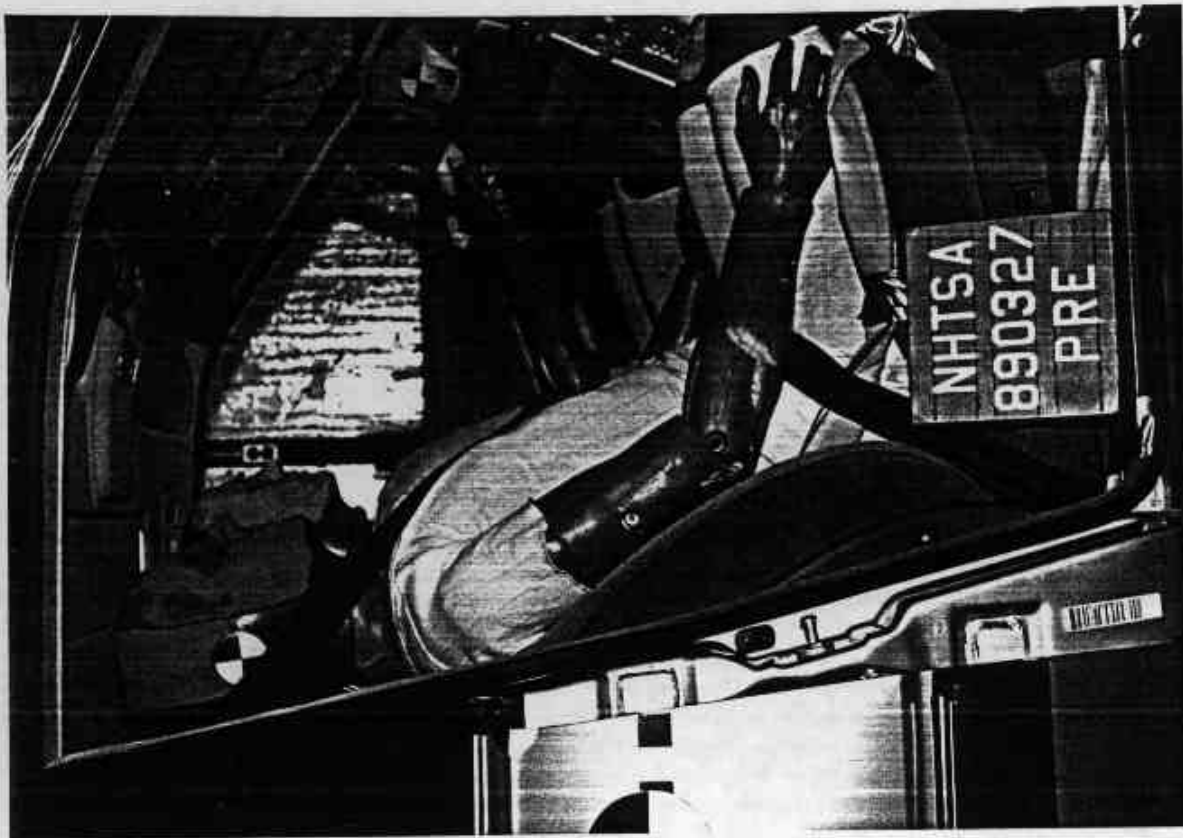


Figure A-35. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

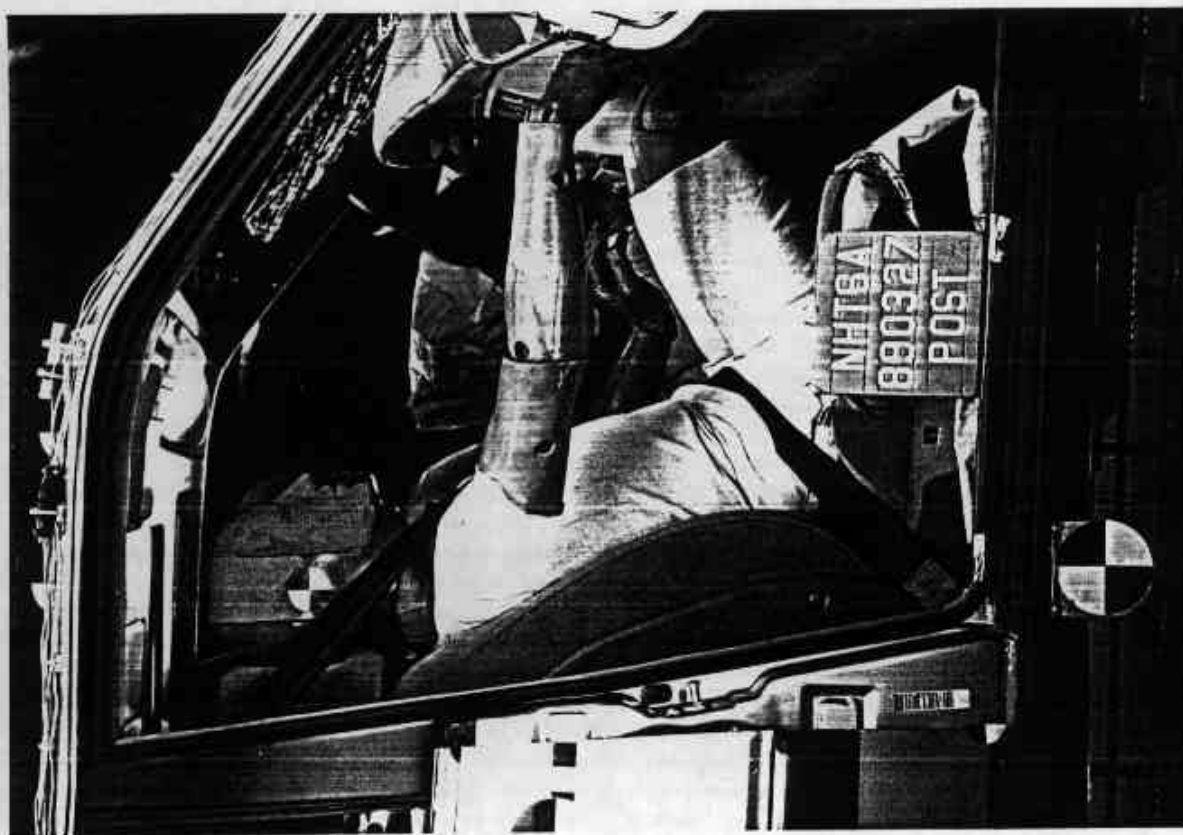


Figure A-36. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

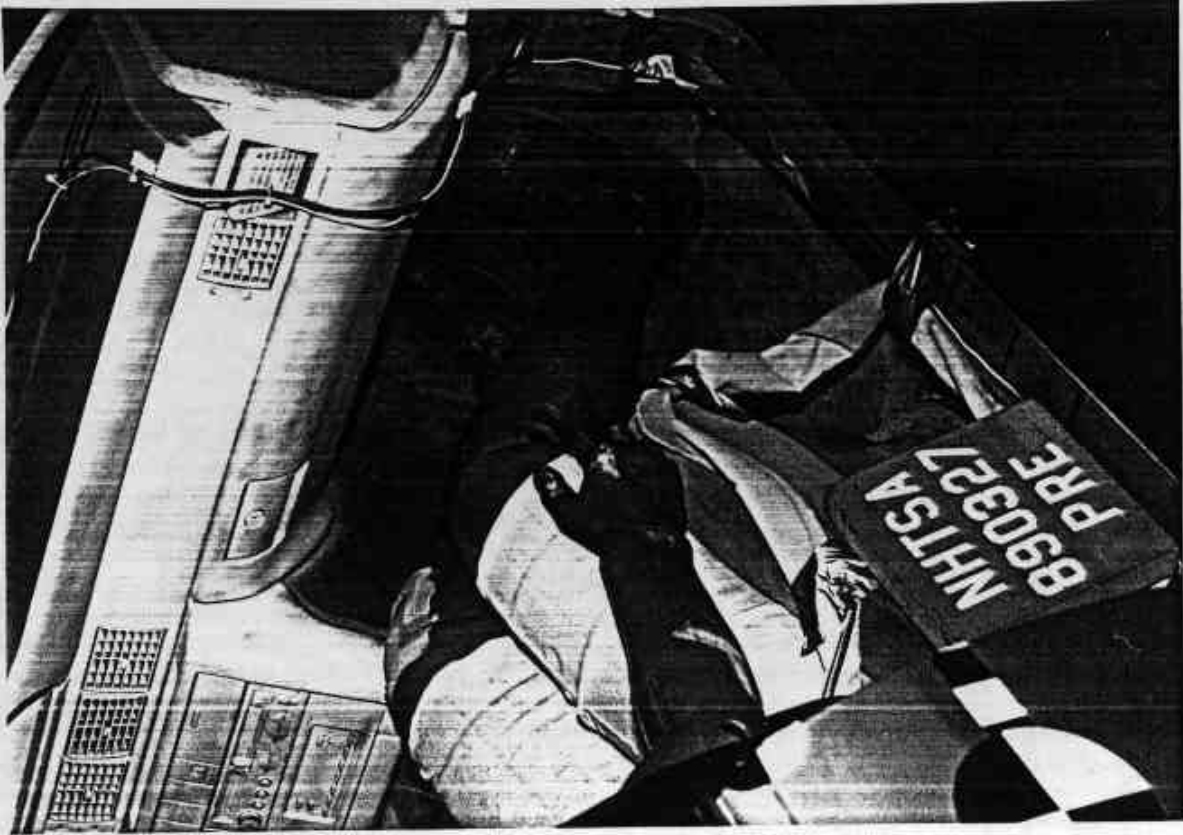


Figure A-37. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2

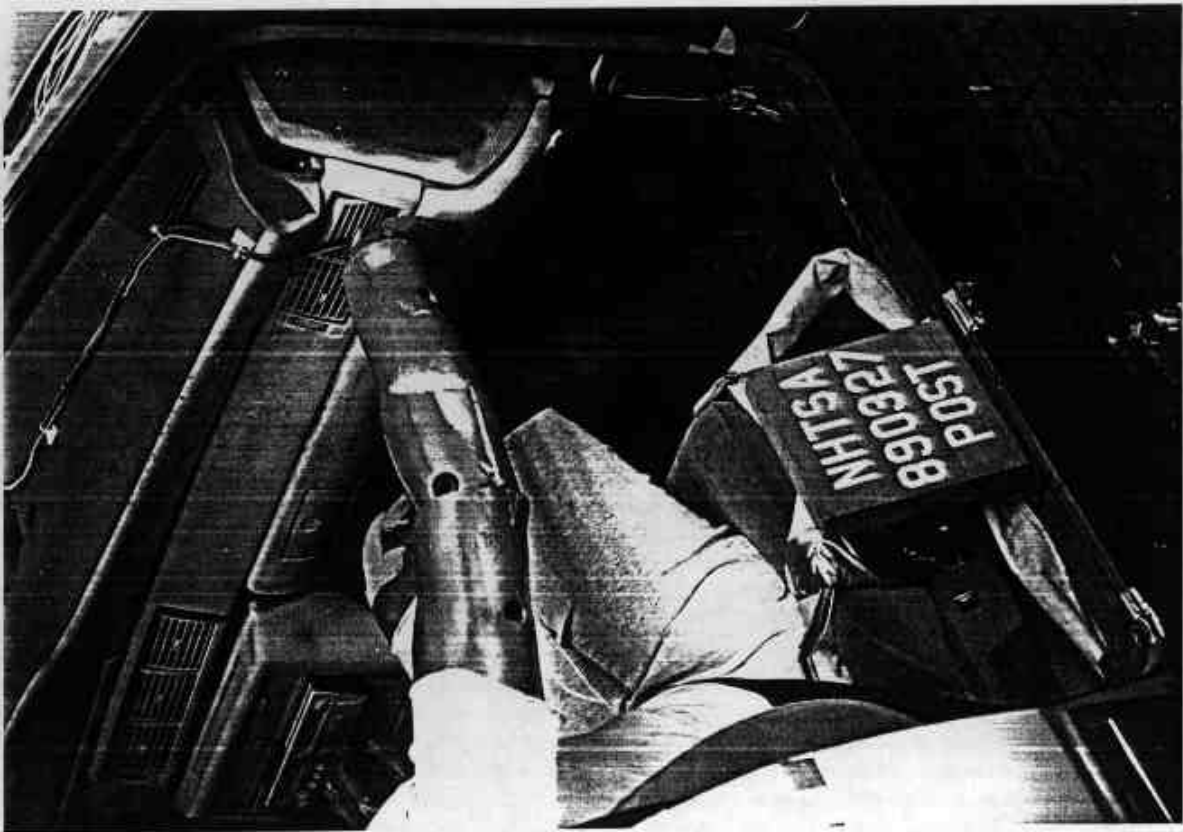


Figure A-38. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2



Figure A-39. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 1



Figure A-40. POST-TEST DRIVER DUMMY HEAD CONTACT - VIEW 2



Figure A-41. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 1



Figure A-42. POST-TEST DRIVER DUMMY KNEE CONTACT - VIEW 2



Figure A-43. POST-TEST PASSENGER DUMMY HEAD CONTACT VIEW



Figure 44. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1

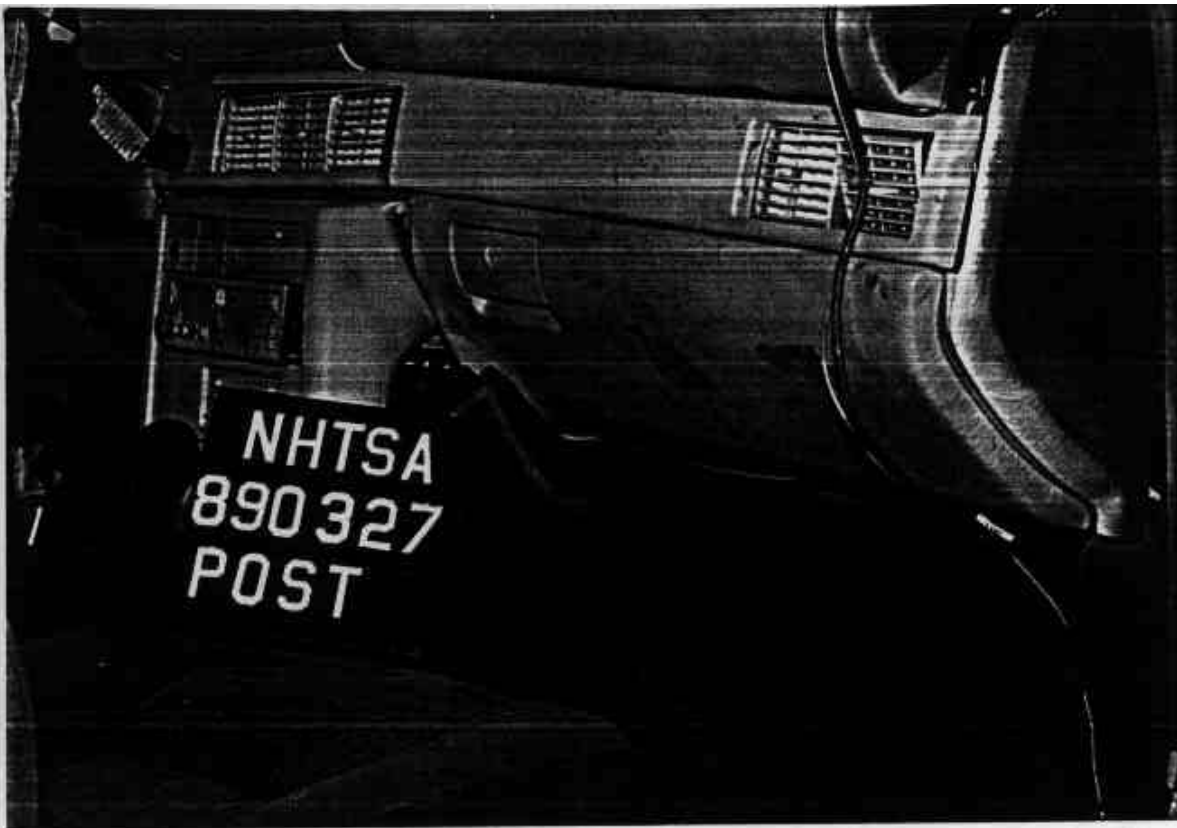


Figure A-45. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2



Figure A-46. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW

A-24

890327



Figure A-47. PRE-TEST VEHICLE TIRE LOAD LABEL VIEW

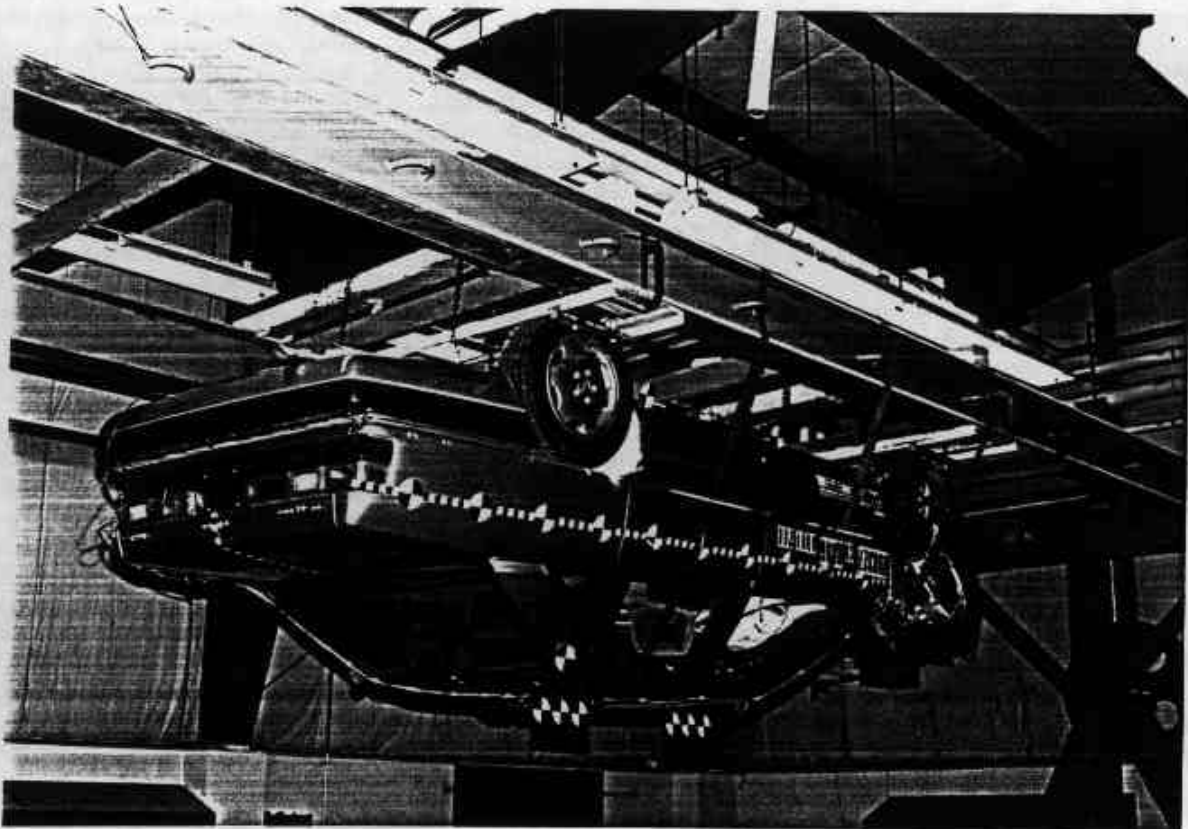


Figure A-48. POST-TEST VEHICLE ON STATIC ROLLOVER VIEW

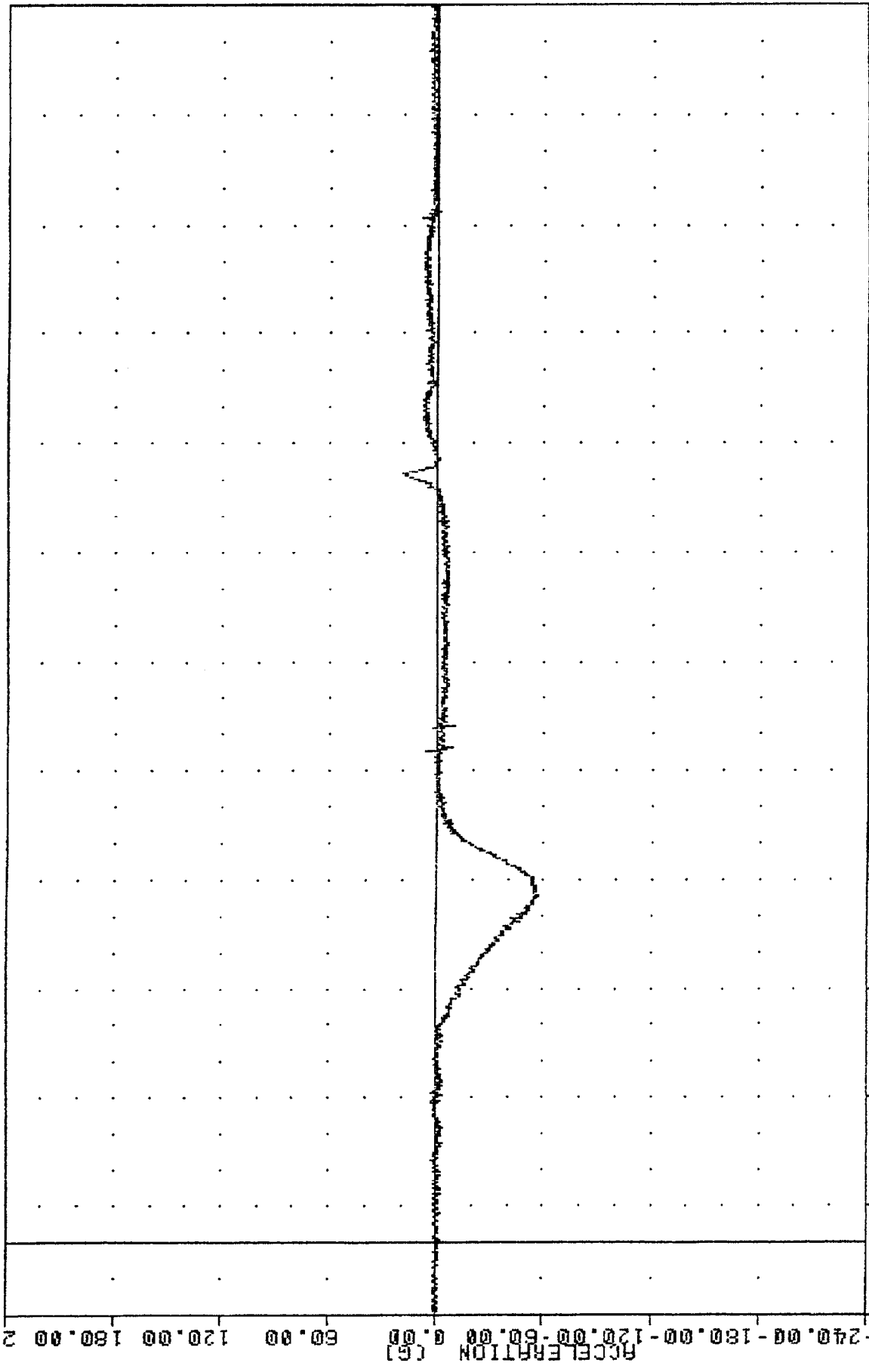
APPENDIX B

DATA PLOTS

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

TRC 890327
208 COMPLIANCE TEST
89086
HDXG1

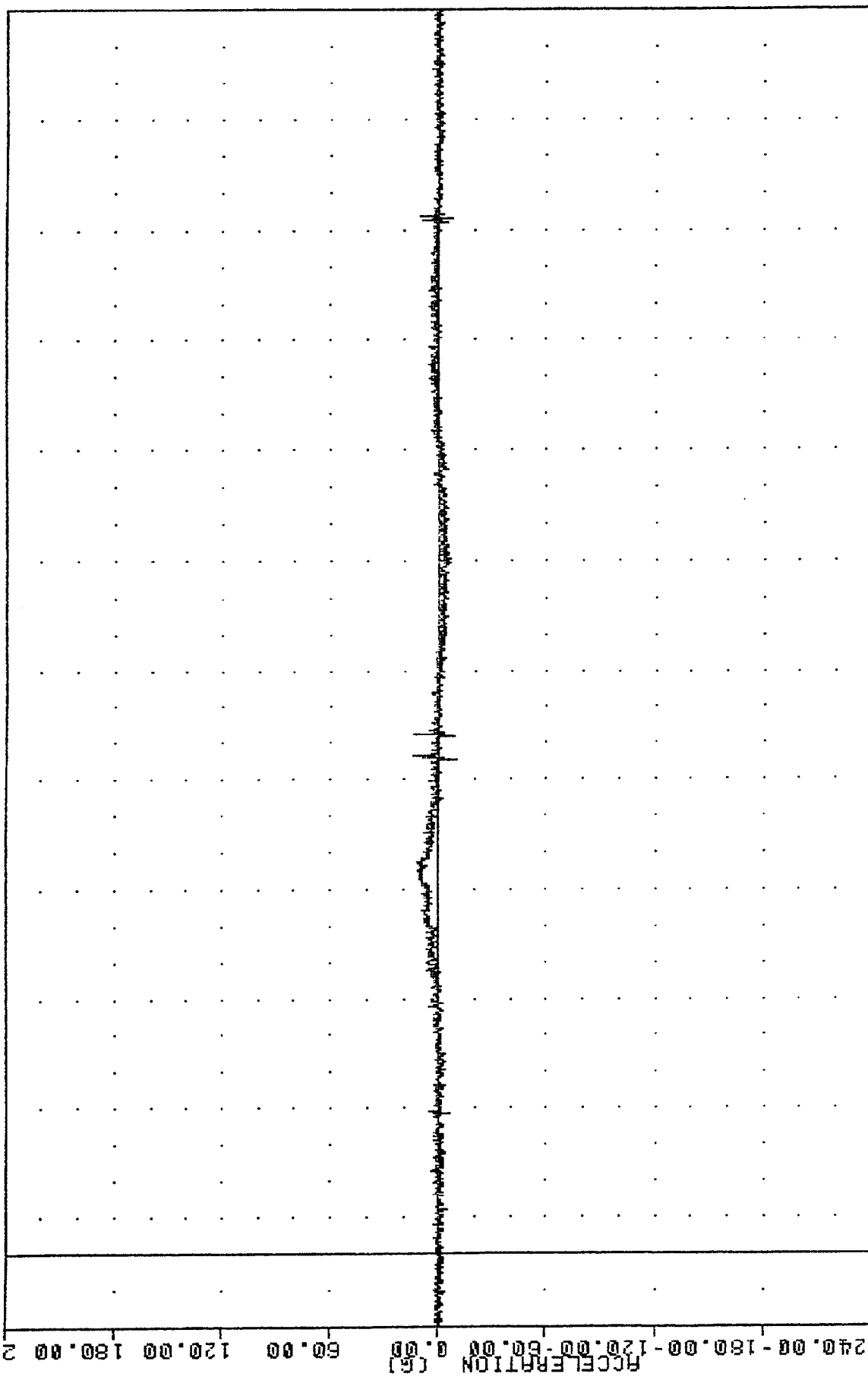
FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -56.98e 18.86 e 211.50



1989 AUDI 200 INTO FRONTAL BARRIER
DRIVER HEAD X AXIS ACCELERATION

TRC
890327
208 COMPLIANCE TEST
89086
HEDYG1

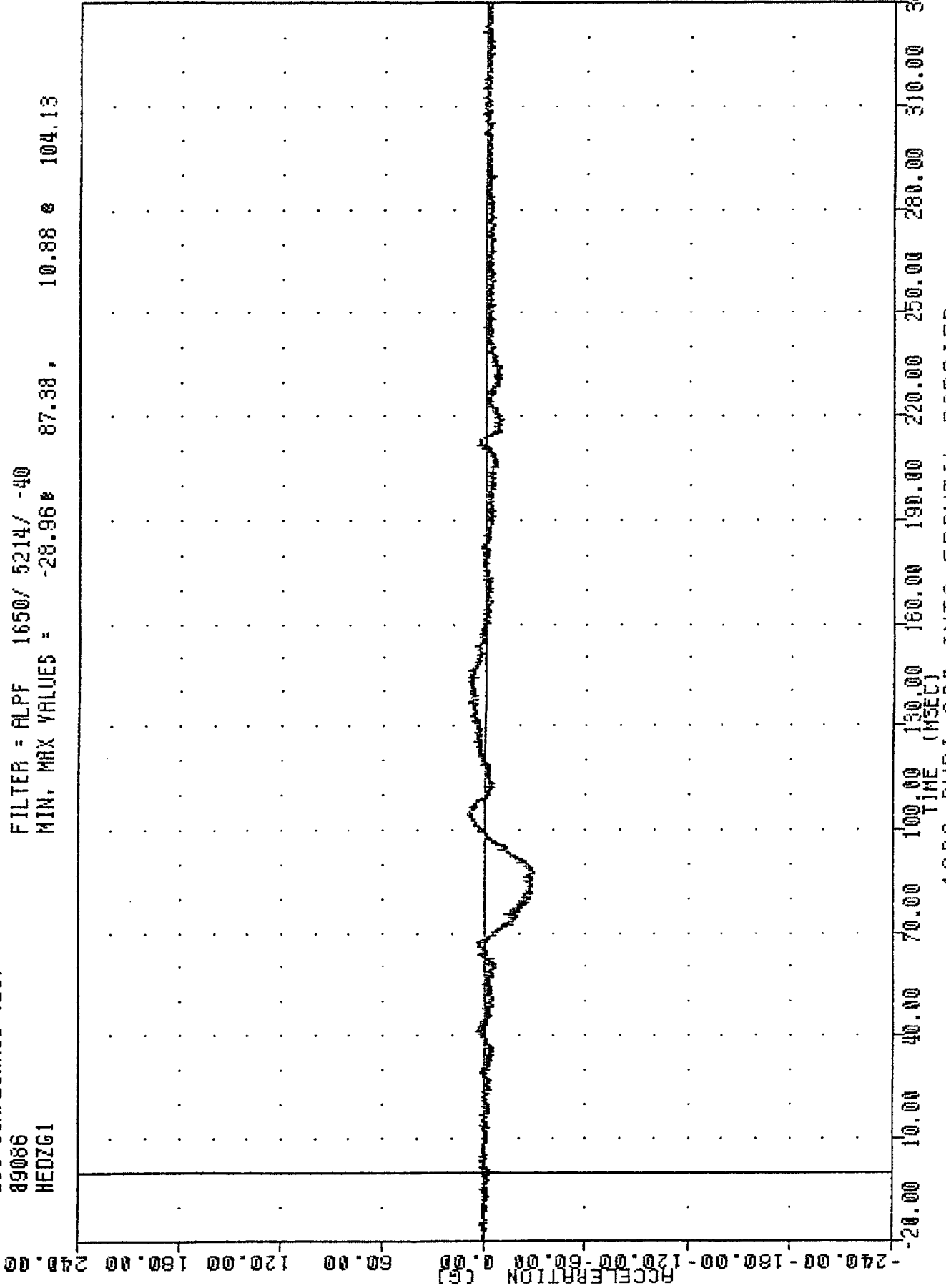
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -9.99E 135.50, 14.80 e 142.25



-240.00 180.00 120.00 60.00 0.00 60.00 120.00 180.00 240.00
-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
TIME (MSEC)
1989 AUDI 200 INTO FRONTAL BARRIER
DRIVER HEAD Y AXIS ACCELERATION

INC 890327
209 COMPLIANCE TEST
89086
HEDIG1

FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -28.96g 87.38, 10.88g 104.13



1989 AUDI 200 INTO FRONTAL BARRIER
DRIVER HEAD Z AXIS ACCELERATION

890327

IRC
208 COMPLIANCE TEST

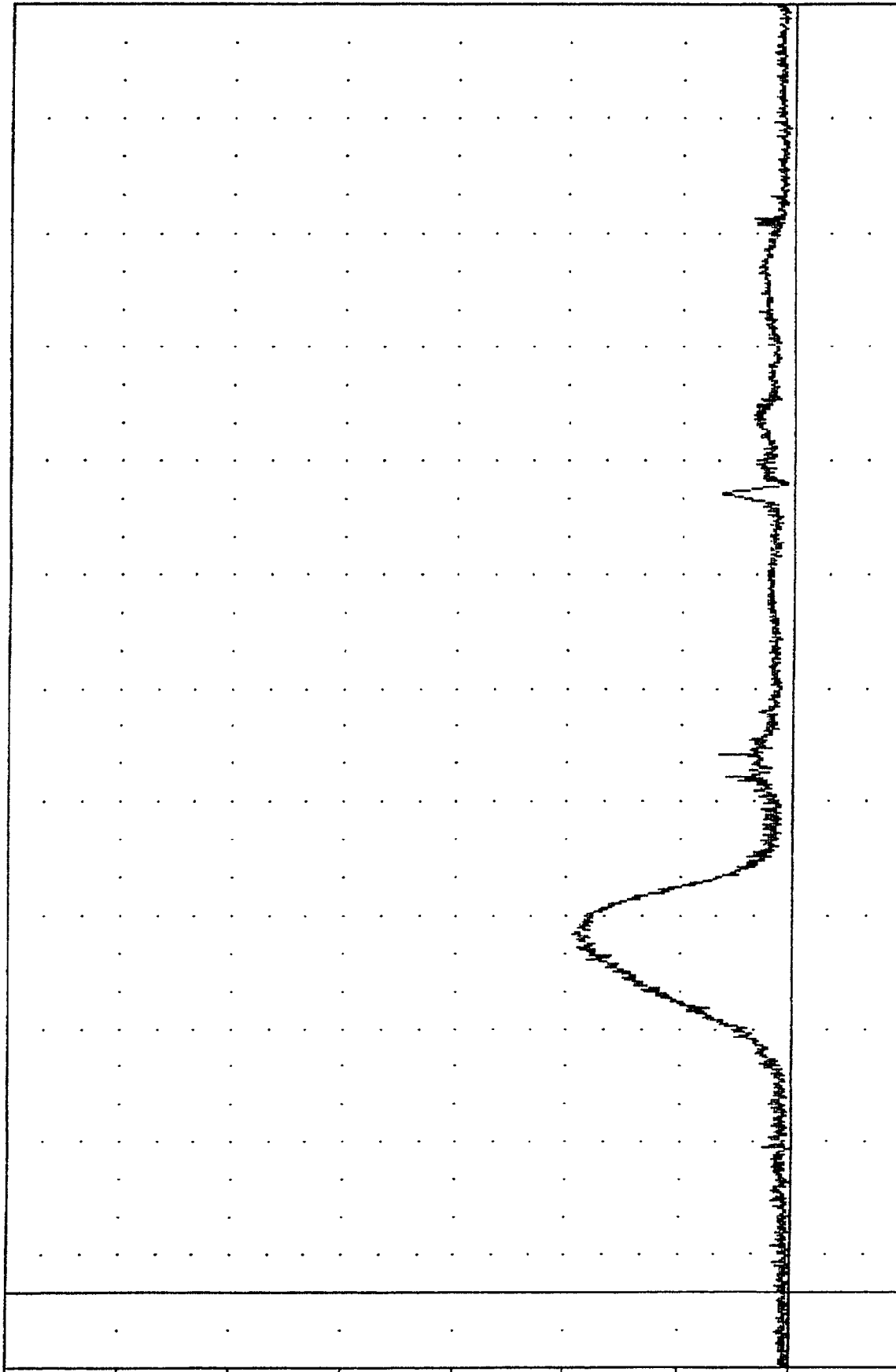
89086

HEDRG1

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = 0.15% 7.50, 58.24 & 95.25

ACCELERATION (G)



TIME (MSEC)

1989 AUDI 200 INTO FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

890327

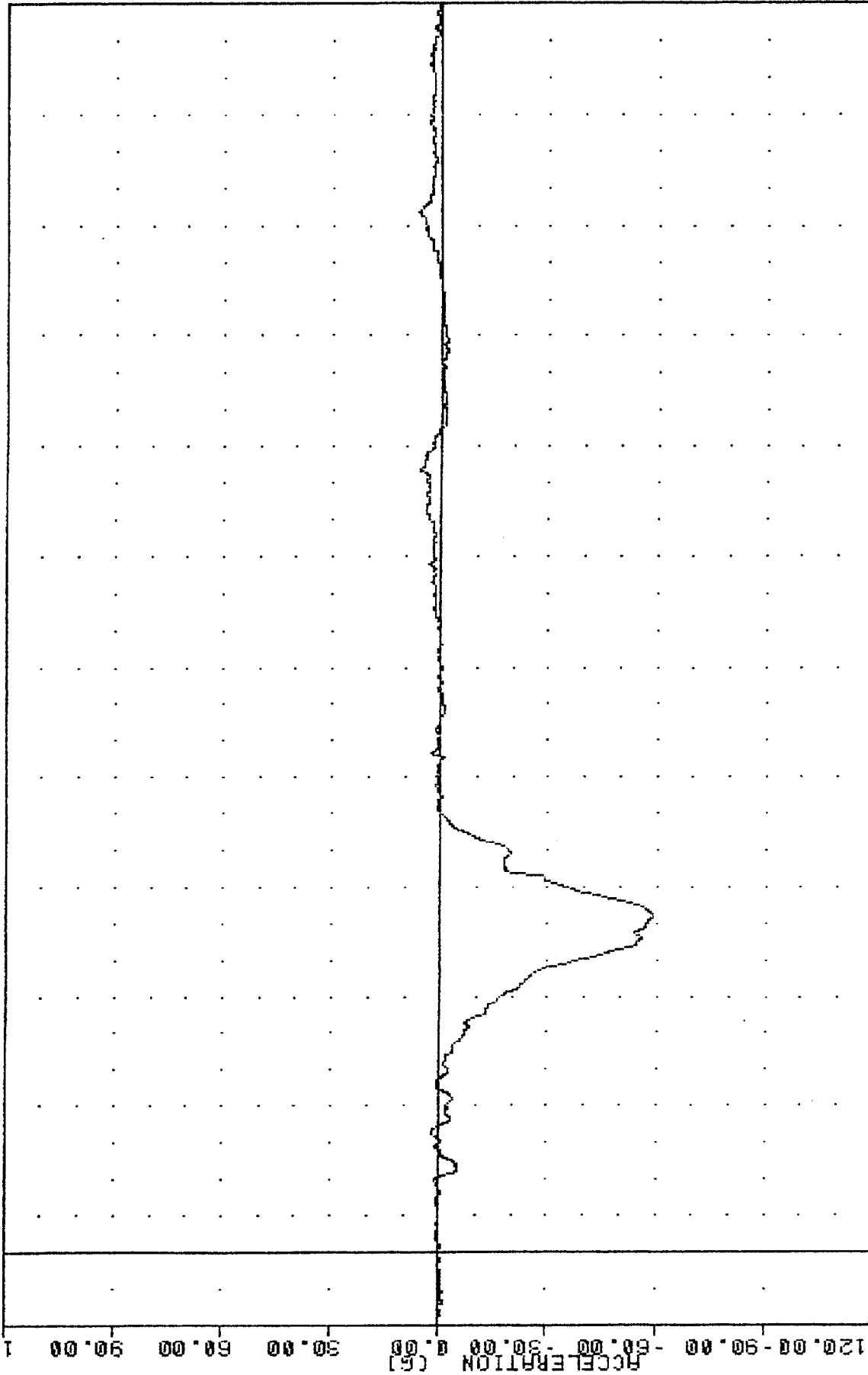
208 COMPLIANCE TEST

89086

CSTXG1

FILTER = BLPP 300/ 750/ -16

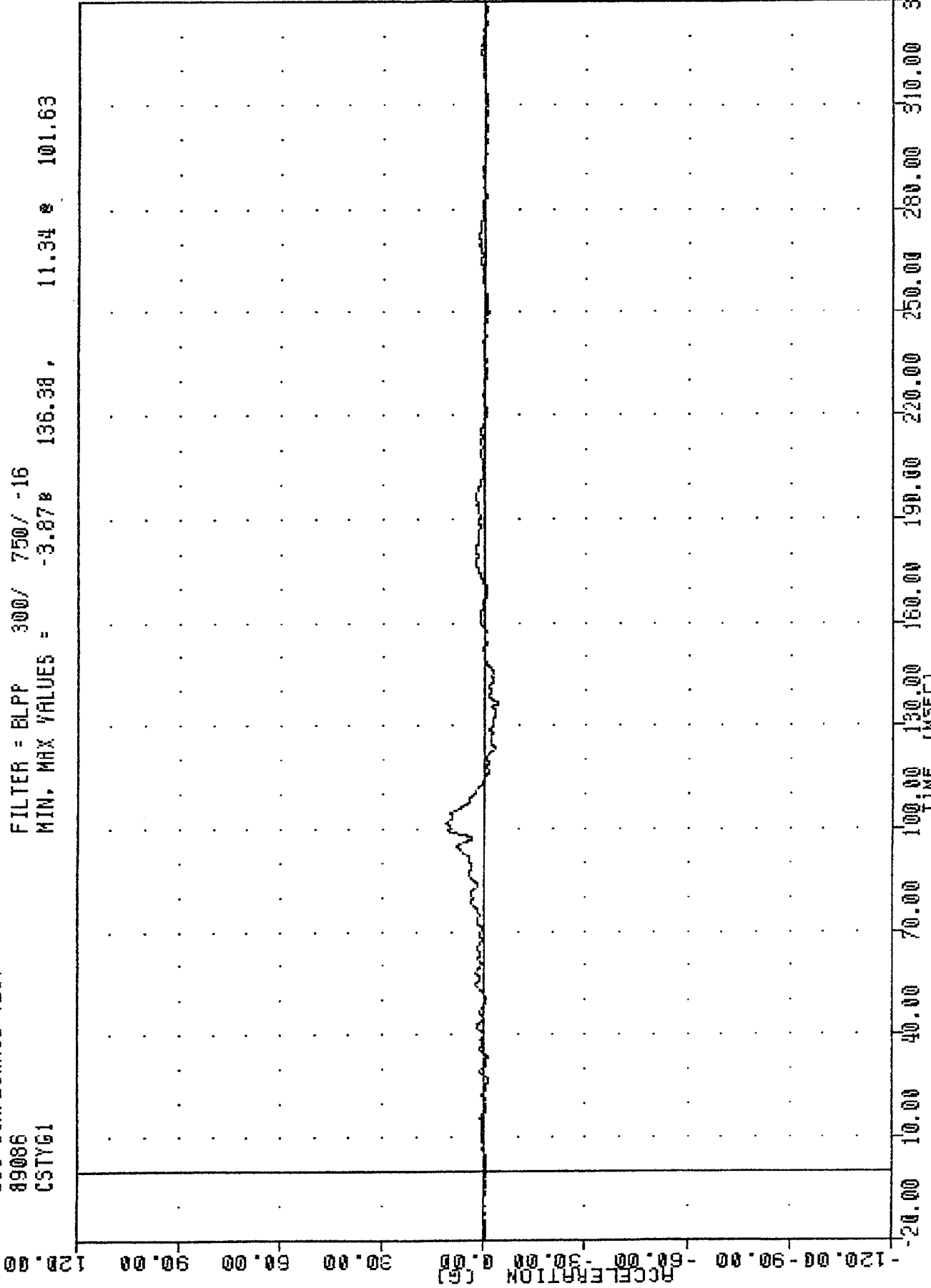
MIN. MAX VALUES = -59.29e 92.13, 6.24 e 289.50



1989 AUG 1 200 INTO FRONTAL BARRIER
DRIVER CHEST X AXIS ACCELERATION

TRC 890327
208 COMPLIANCE TEST
89086
CSTYGI

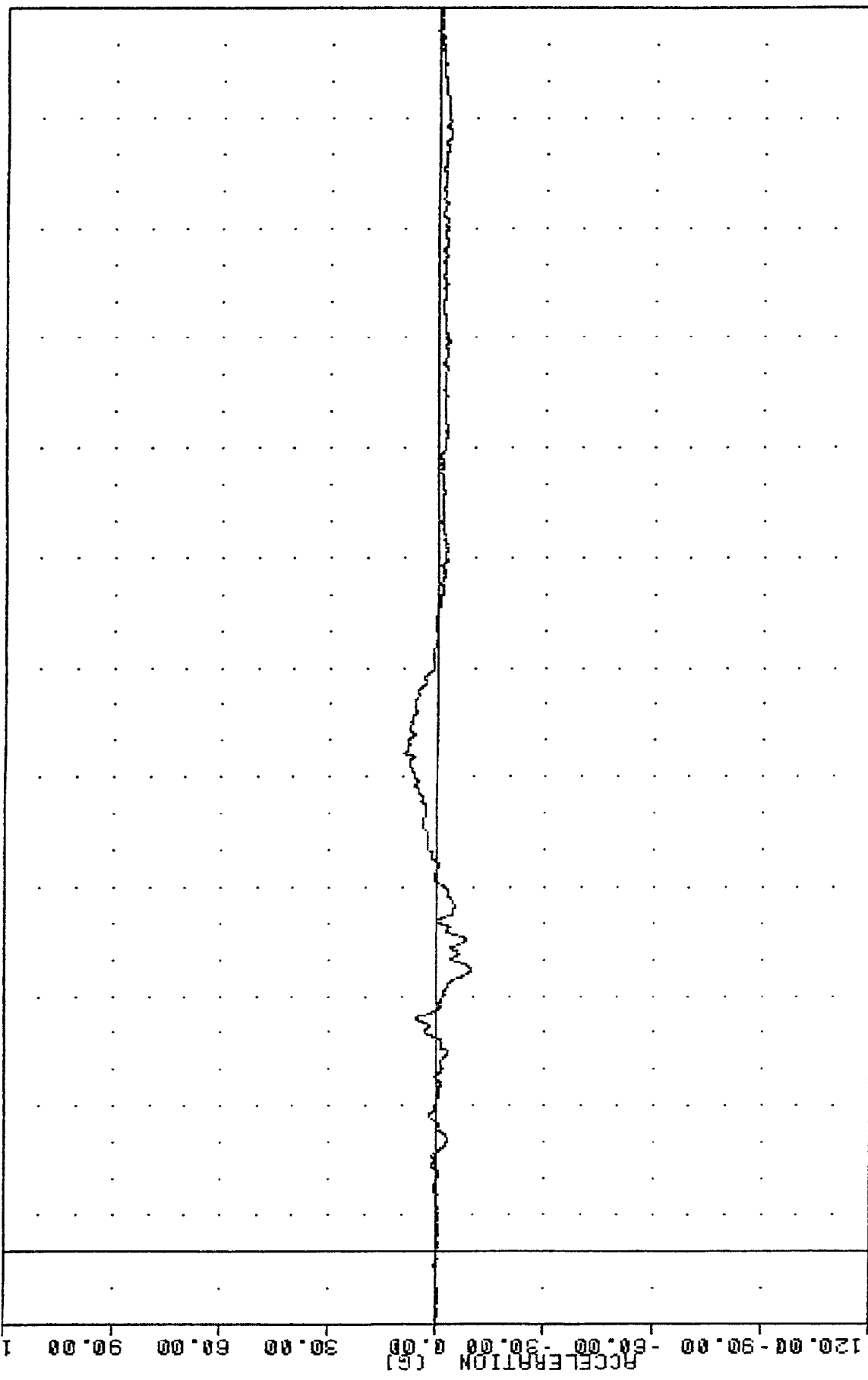
FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -3.87g 136.38g 11.34g 101.63



1989 AUDI 200 INTO FRONTAL BARRIER
DRIVER CHEST Y AXIS ACCELERATION

INC 890327
208 COMPLIANCE TEST
89086
CSTZG1

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -9.64e 77.13, 9.55 e 136.50



1989 AUDI 200 INTO FRONTAL BARRIER
DRIVER CHEST Z AXIS ACCELERATION

TRC 890327

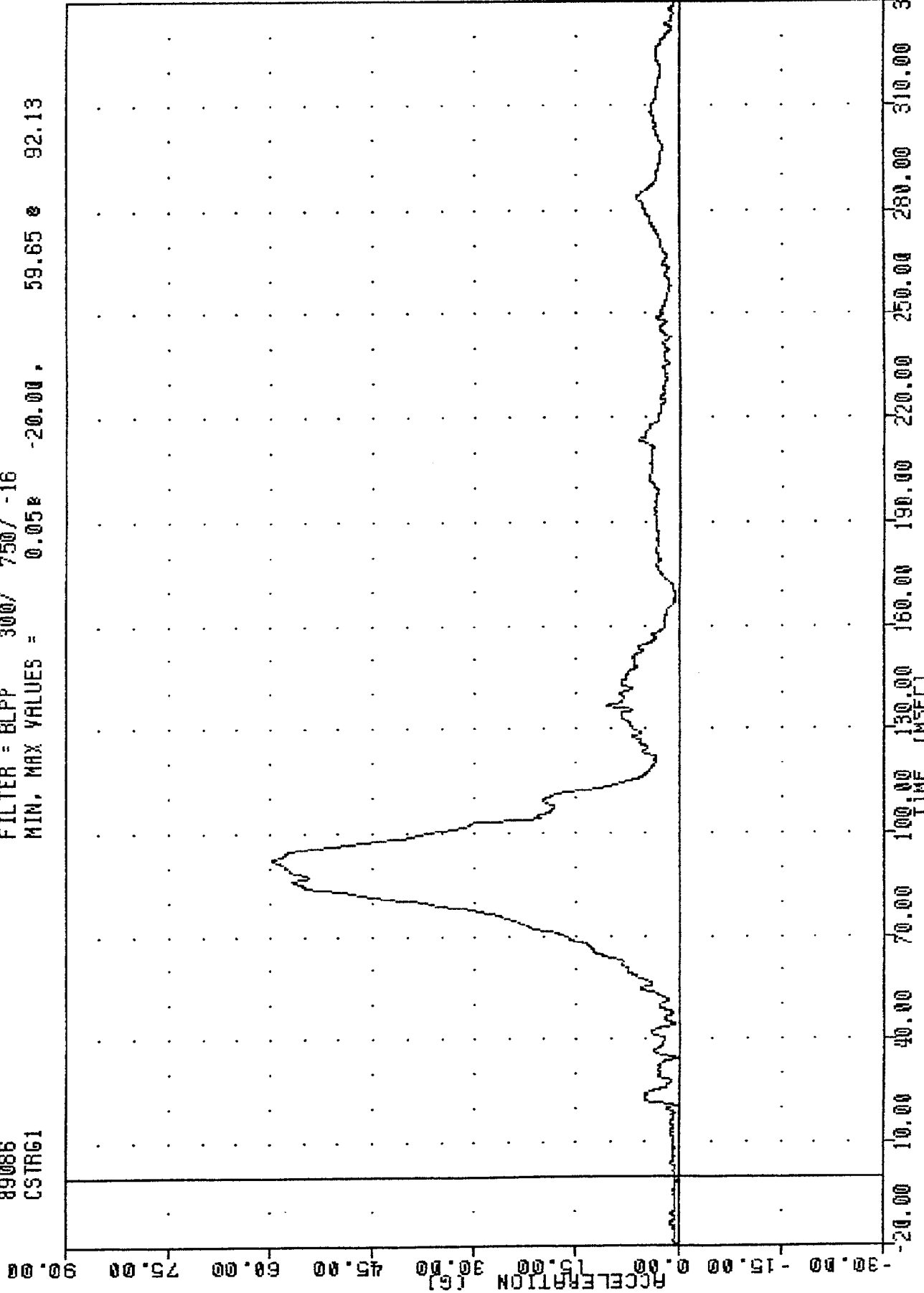
208 COMPLIANCE TEST

89086

CSTRG1

FILTER = BLPP 300/ 750/ -16

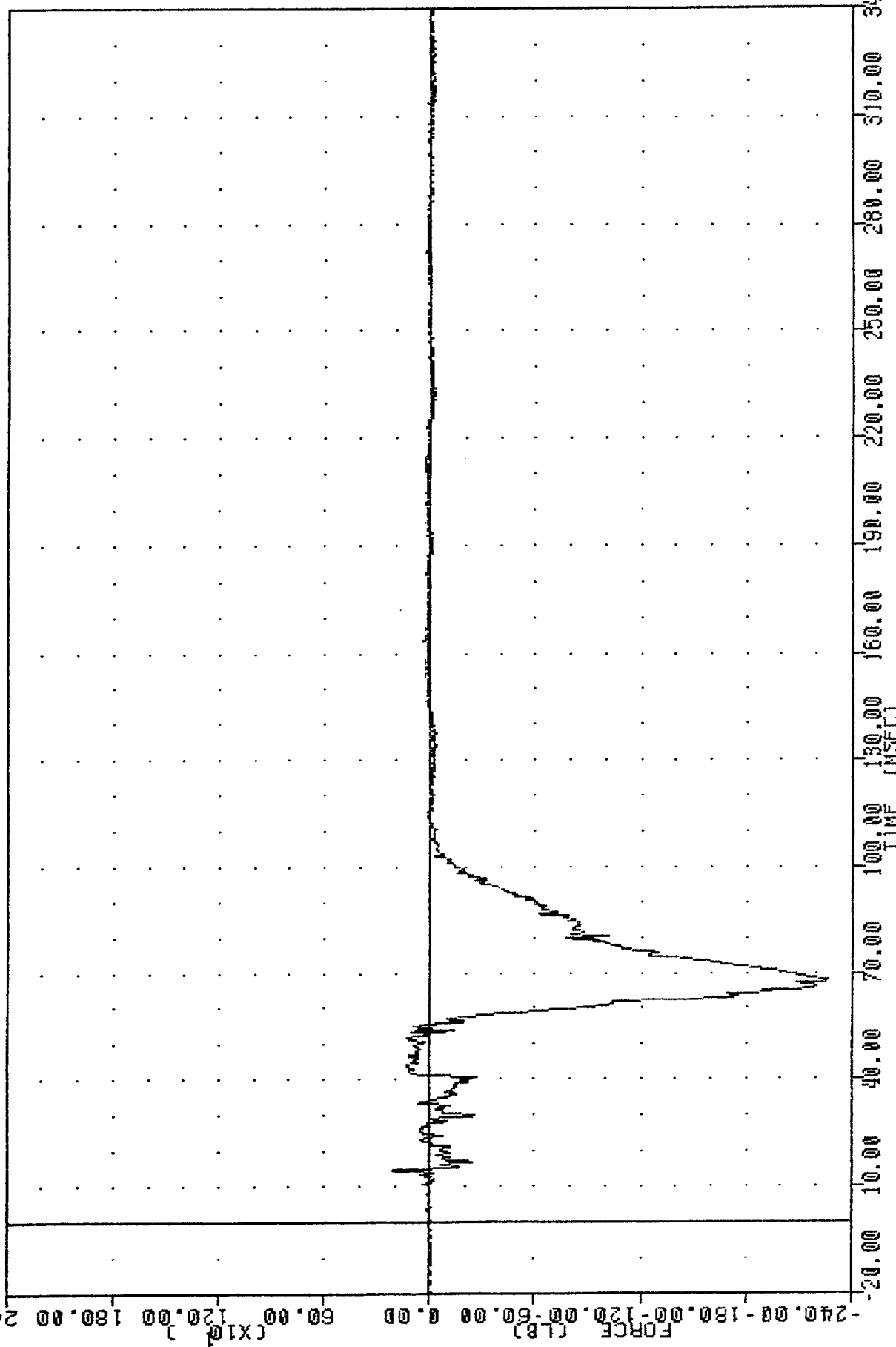
MIN. MAX VALUES = 0.05e -20.00. 59.65 e 92.13



1989 AUDI 200 INTO FRONTAL BARRIER
DRIVER CHEST RESULTANT ACCELERATION

THC
890327
209 COMPLIANCE TEST
89086
LFMF1

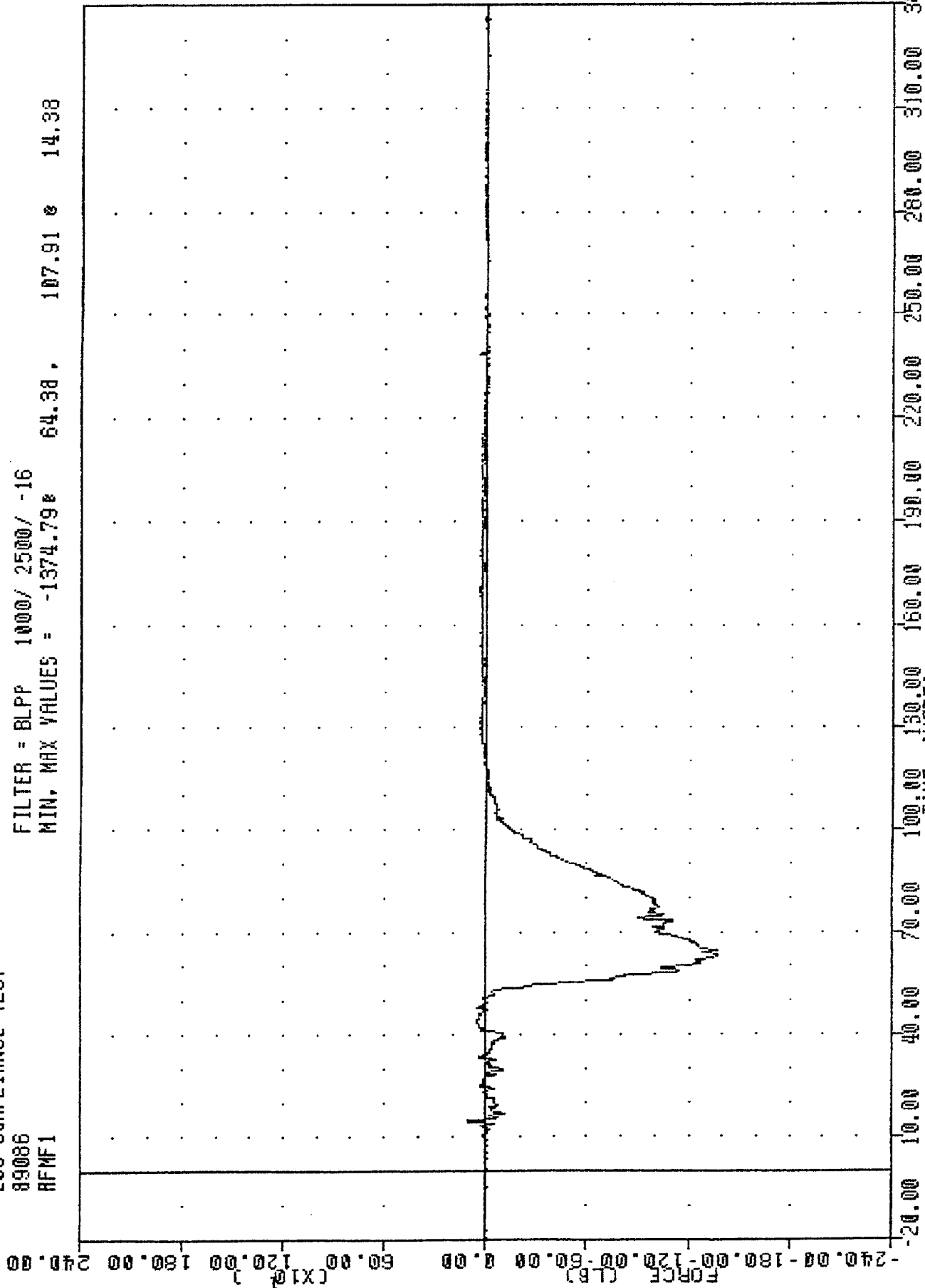
FILTER = BLPP 1000/ 2500/ -16
MIN. MAX VALUES = -2262.65B 68.13, 209.23 e 14.50



1989 AUDI 200 INTO FRONTAL BARRIER
DRIVER LEFT FEMUR FORCE

TFC
890327
208 COMPLIANCE TEST
89086
RFMF1

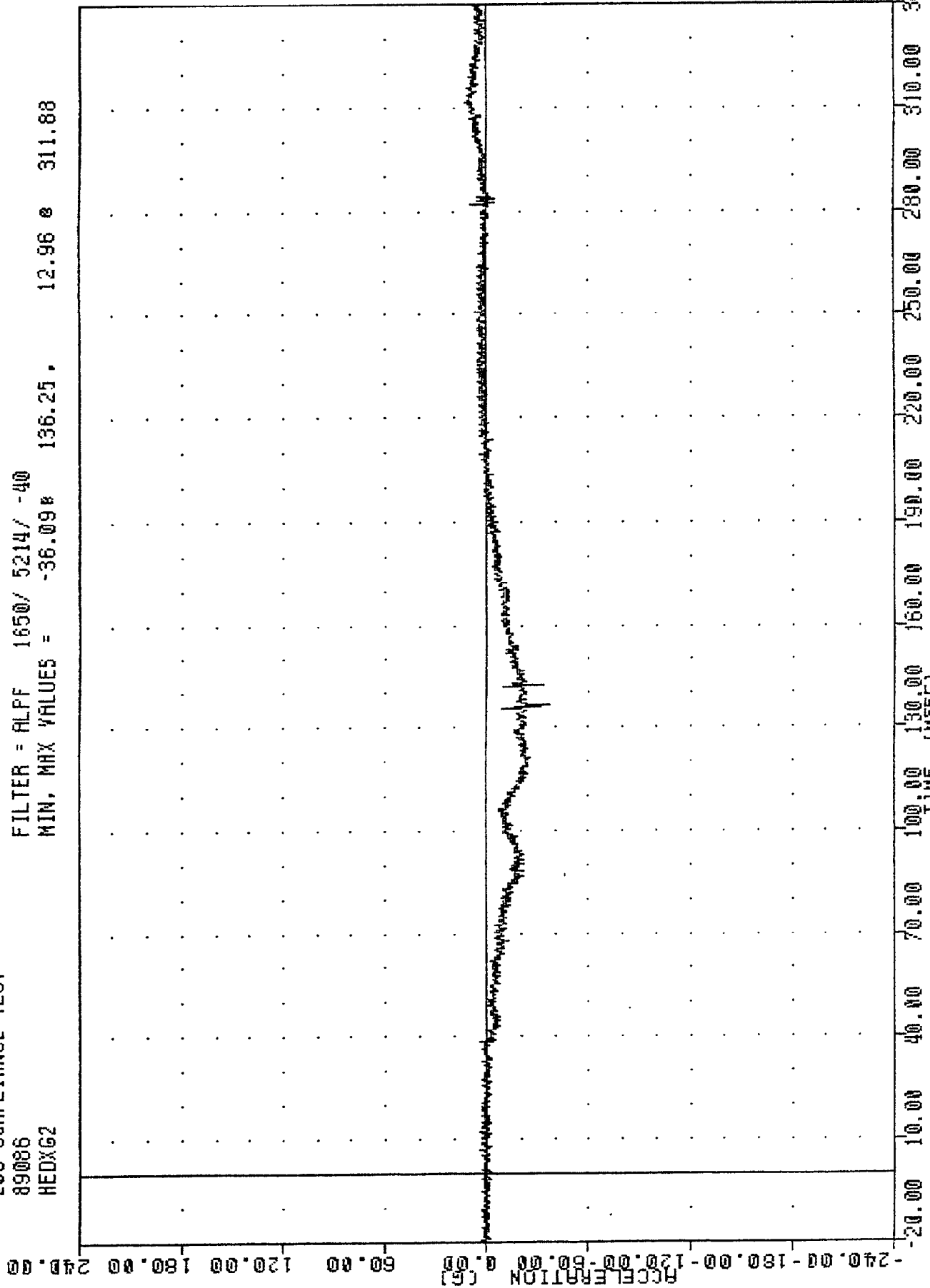
FILTER = BLPP 1000/ 2500/ -16
MIN. MAX VALUES = -1374.79e 64.38. 107.91 e 14.38



1989 AUDI 200 INTO FRONTAL BARRIER
DRIVER RIGHT FEMUR FORCE

TRC
890327
200 COMPLIANCE TEST
89086
HEDXG2

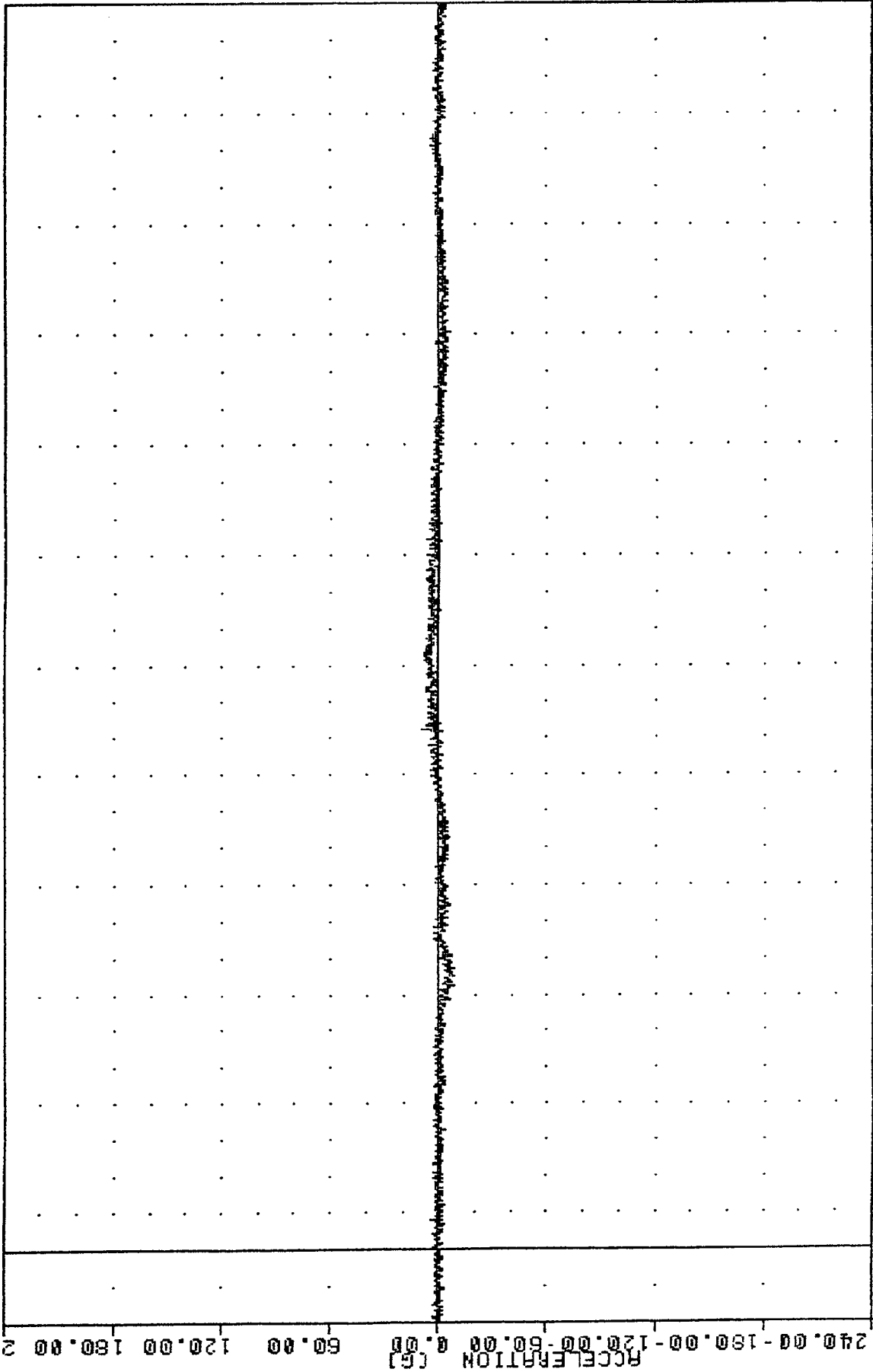
FILTER = ALFF 1650/ 5214/ -40
MIN. MAX VALUES = -36.09# 136.25. 12.96 @ 311.88



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD X AXIS ACCELERATION

TRC
208 COMPLIANCE TEST
89086
HEDY62

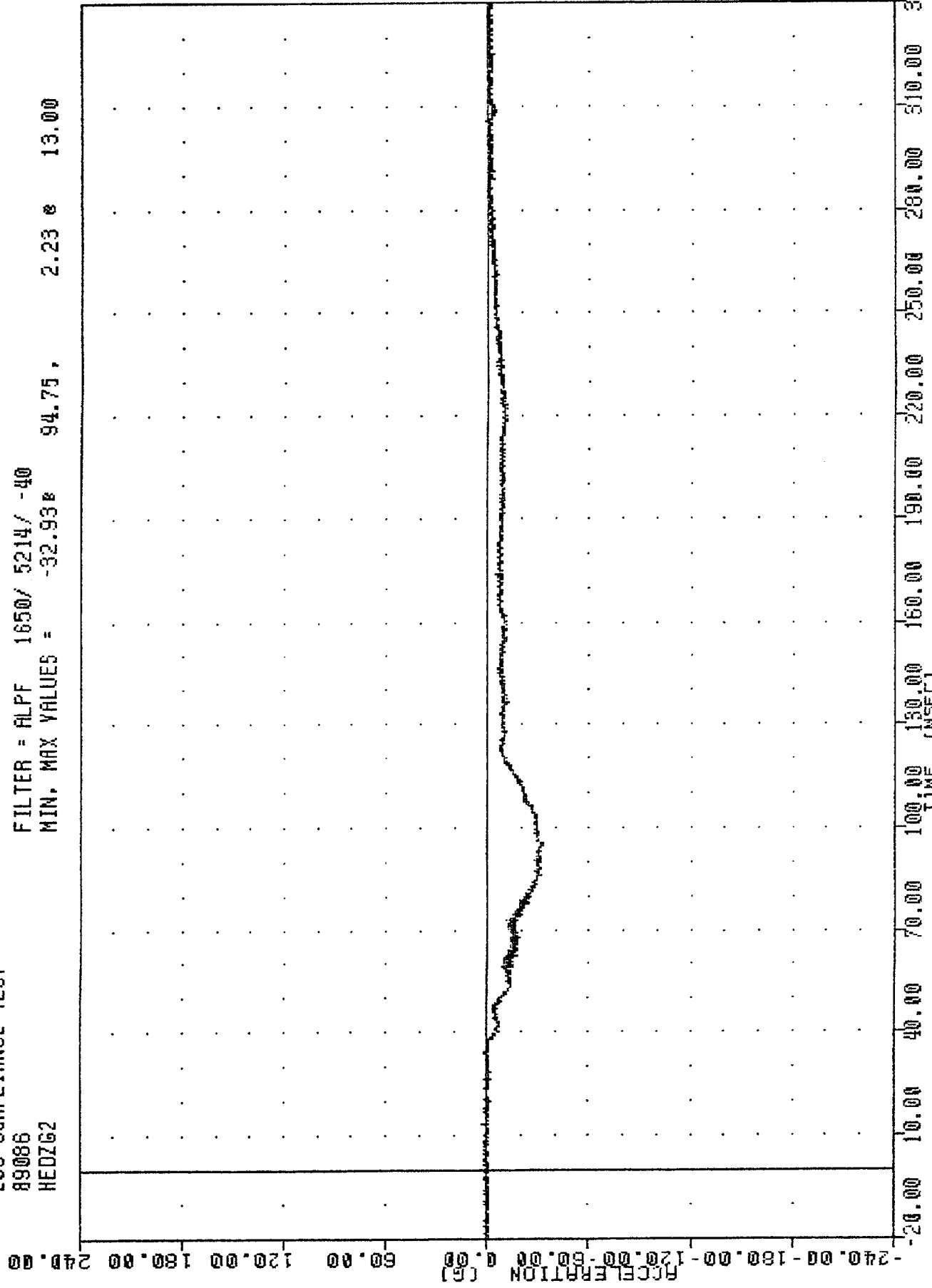
FILTER = ALPF 1650/ 5214/ -40
MIN, MAX VALUES = -8.59e 9.08 e 142.25



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Y AXIS ACCELERATION

TRC
890327
208 COMPLIANCE TEST
89086
HEDZ62

FILTER = ALPF 1650/ 5214/ -40
MIN. MAX VALUES = -32.93e 94.75, 2.23 e 13.00



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Z AXIS ACCELERATION

TRC 890327

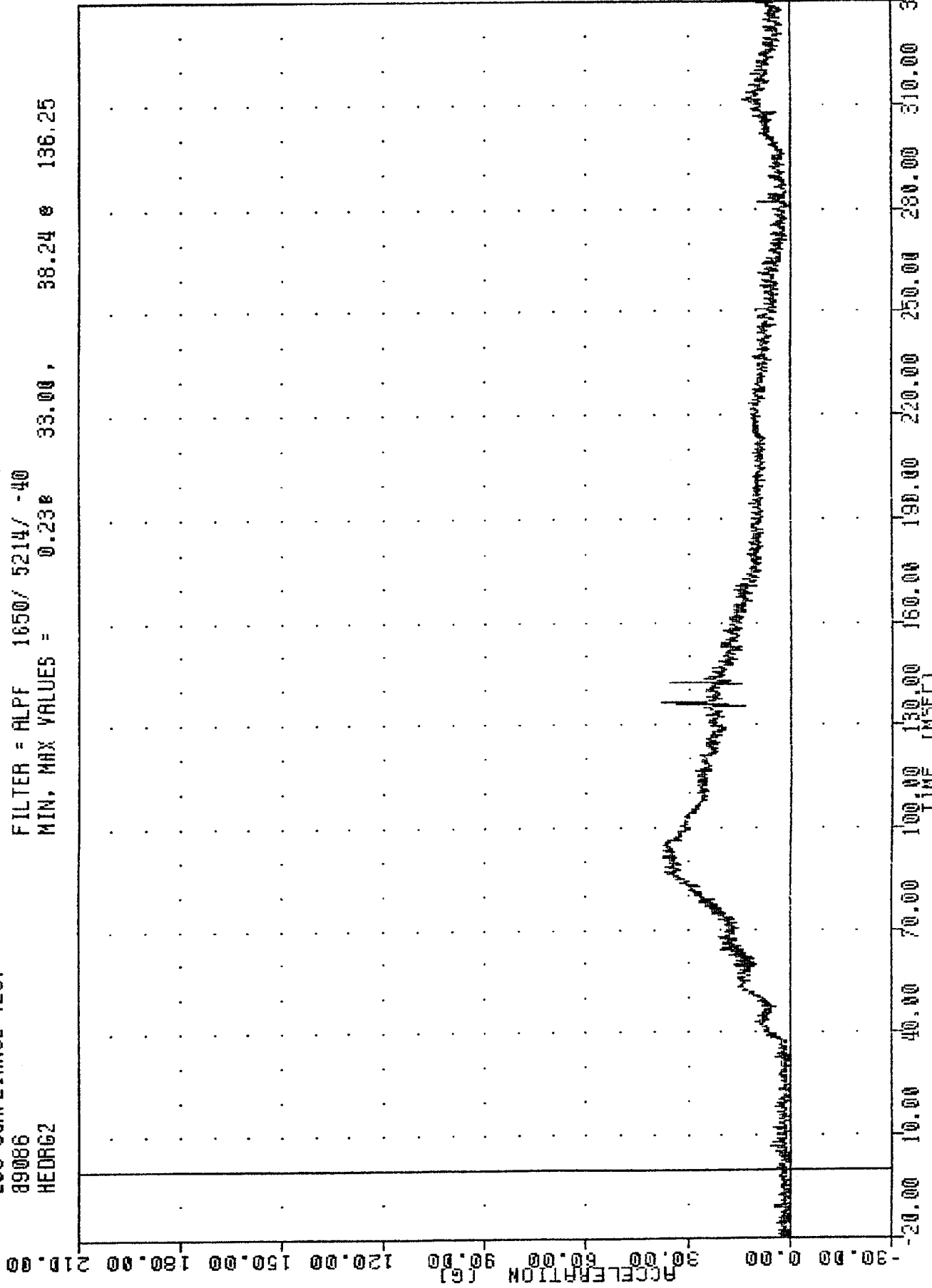
208 COMPLIANCE TEST

89086

HEADG2

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = 0.238 33.00 , 38.24 e 136.25



1989 AUDI 200 INTO FRONTAL BARRIER

RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION

TRC 890327

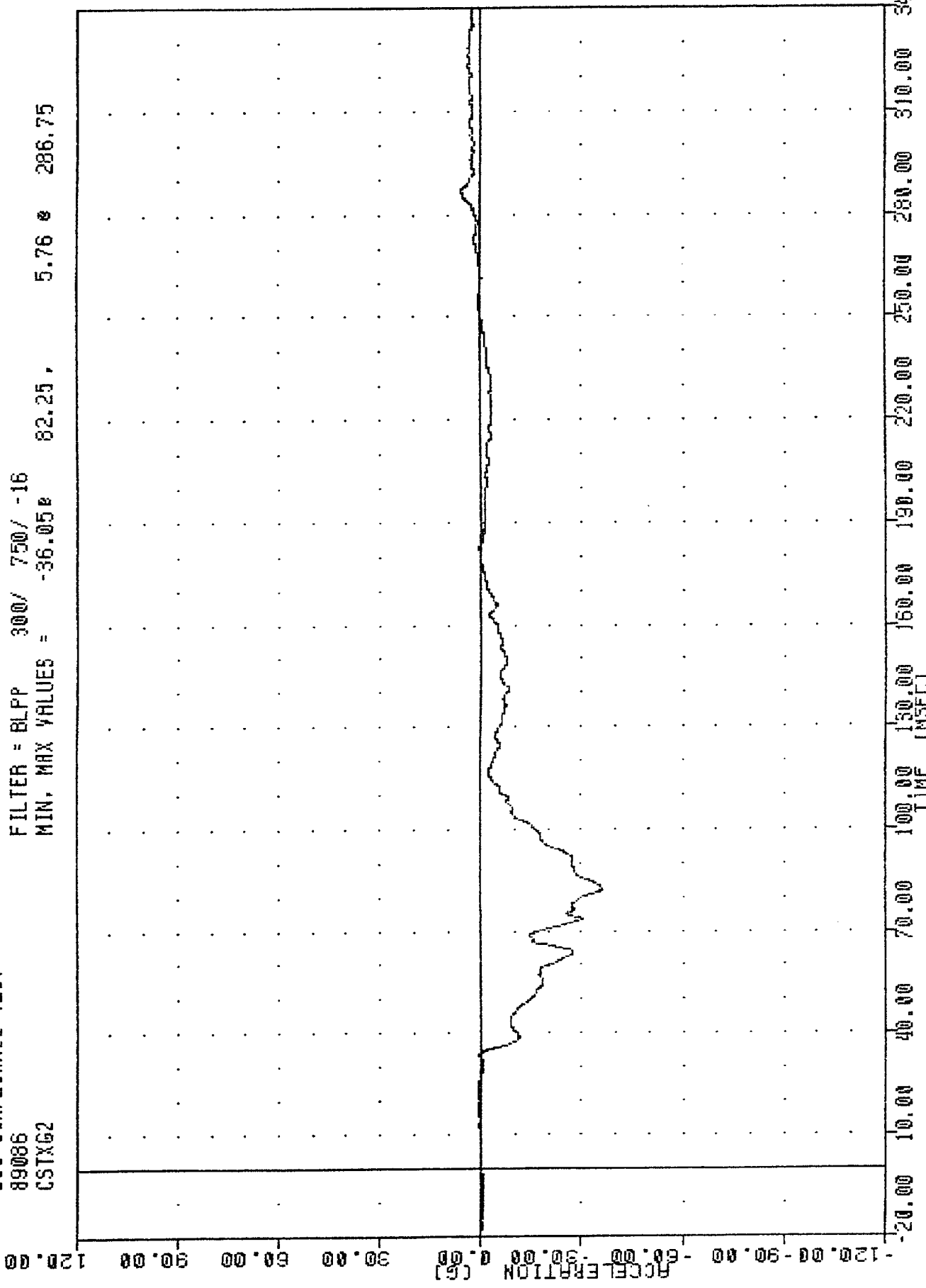
208 COMPLIANCE TEST

89036

CSTXG2

FILTER = BLPP 300/ 750/ -16

MIN, MAX VALUES = -36.05e 82.25, 5.76 e 286.75



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST X AXIS ACCELERATION

TRC 890327

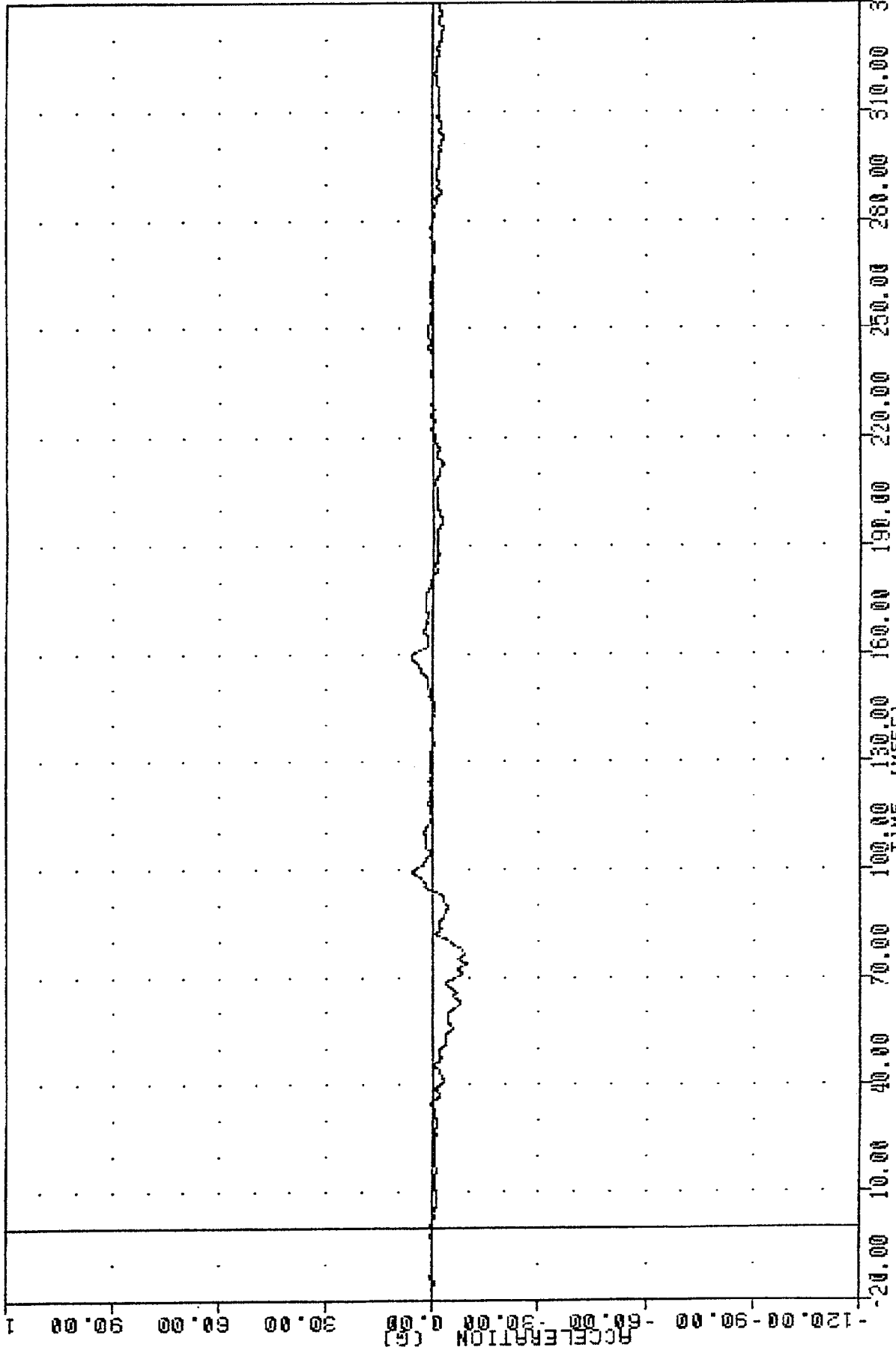
200 COMPLIANCE TEST

89086

CSTYG2

FILTER = BLPF 300/ 750/ -16

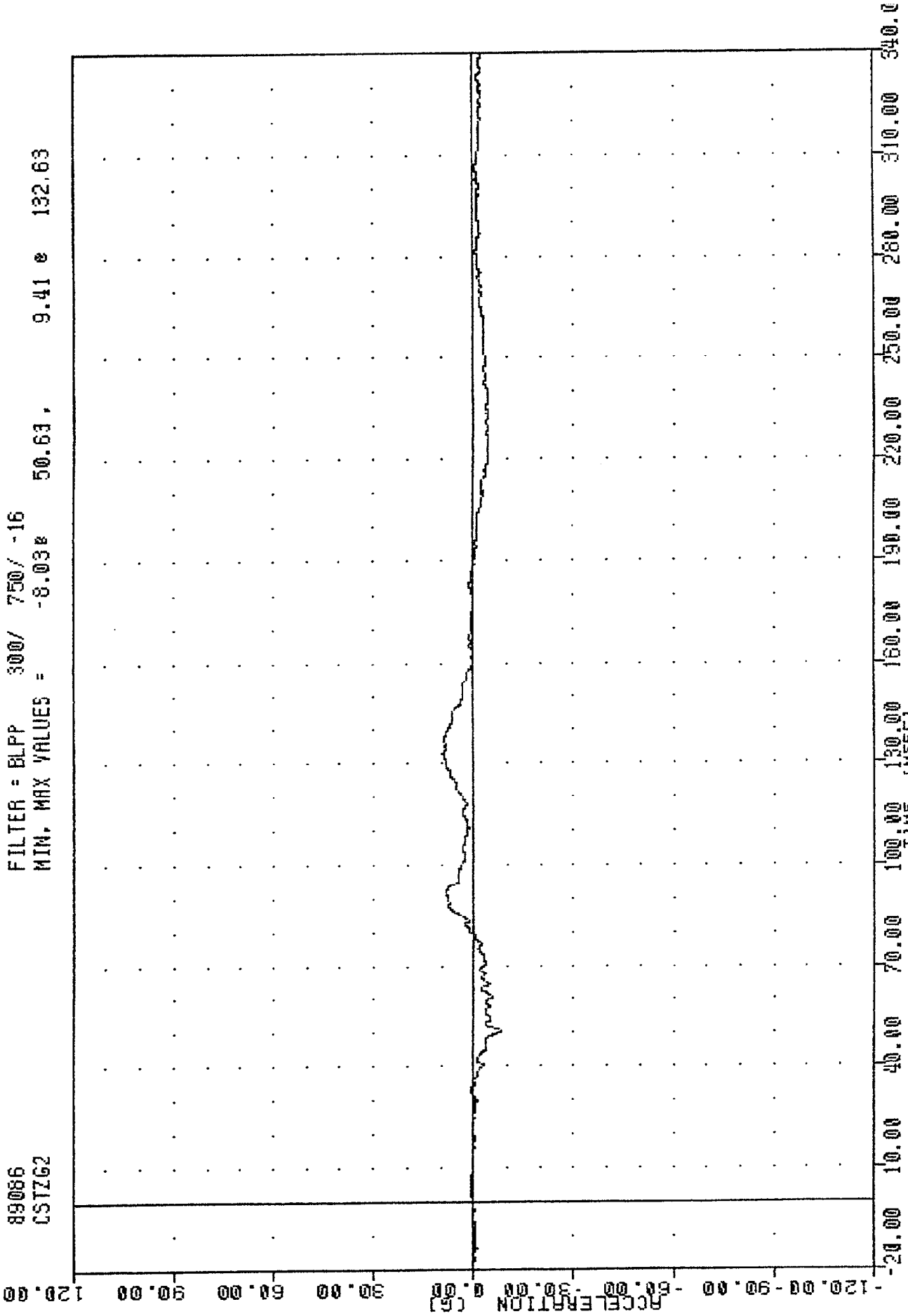
MIN. MAX VALUES = -9.23B 73.75. 6.01 S 159.00



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Y AXIS ACCELERATION

TRC
890866
CSTZ62
200 COMPLIANCE TEST
890327

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -8.03e 50.63, 9.41 e 132.63



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Z AXIS ACCELERATION

TRC 890327

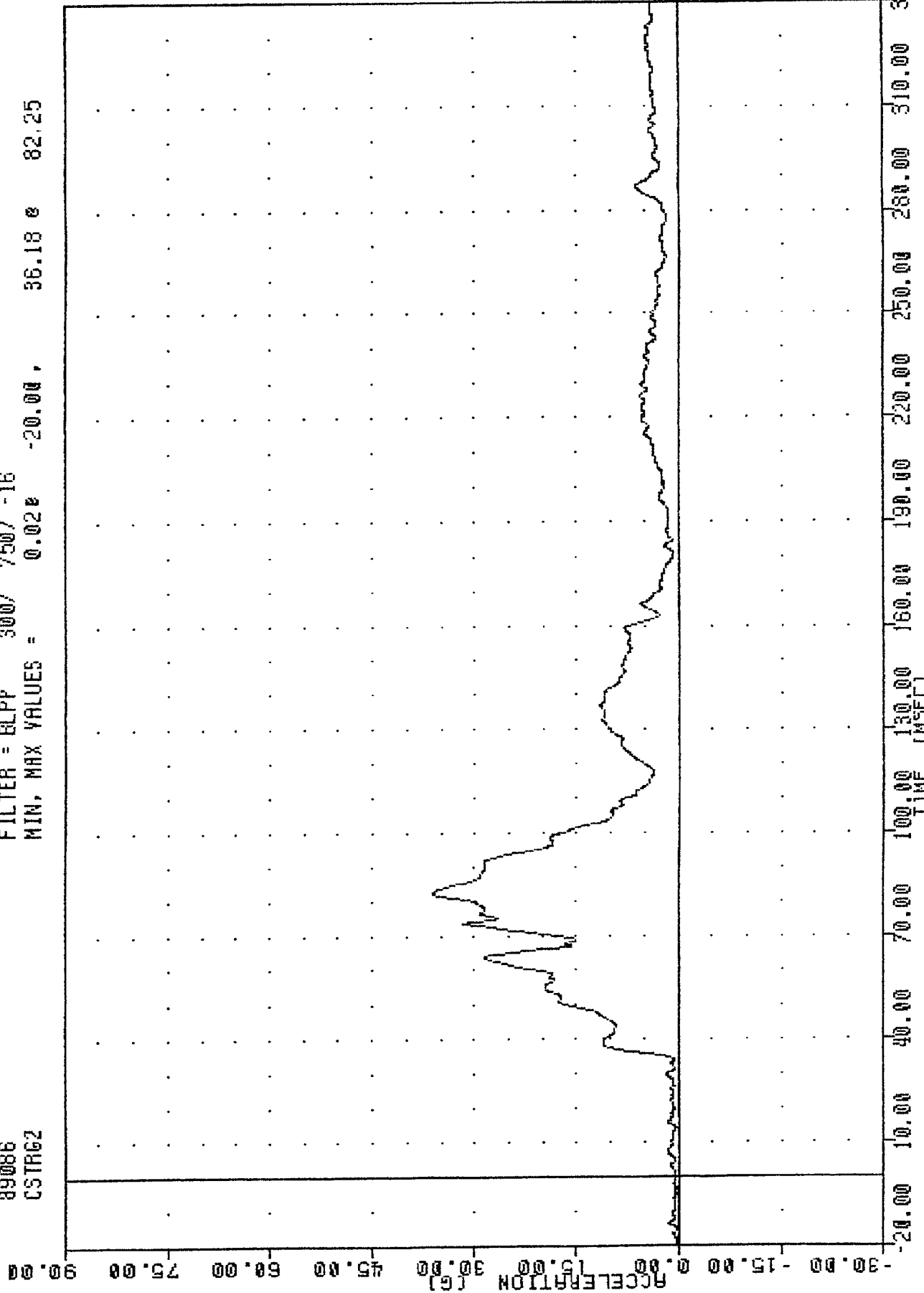
200 COMPLIANCE TEST

89086

CSTR62

FILTER = BLPP 300/ 750/ -16

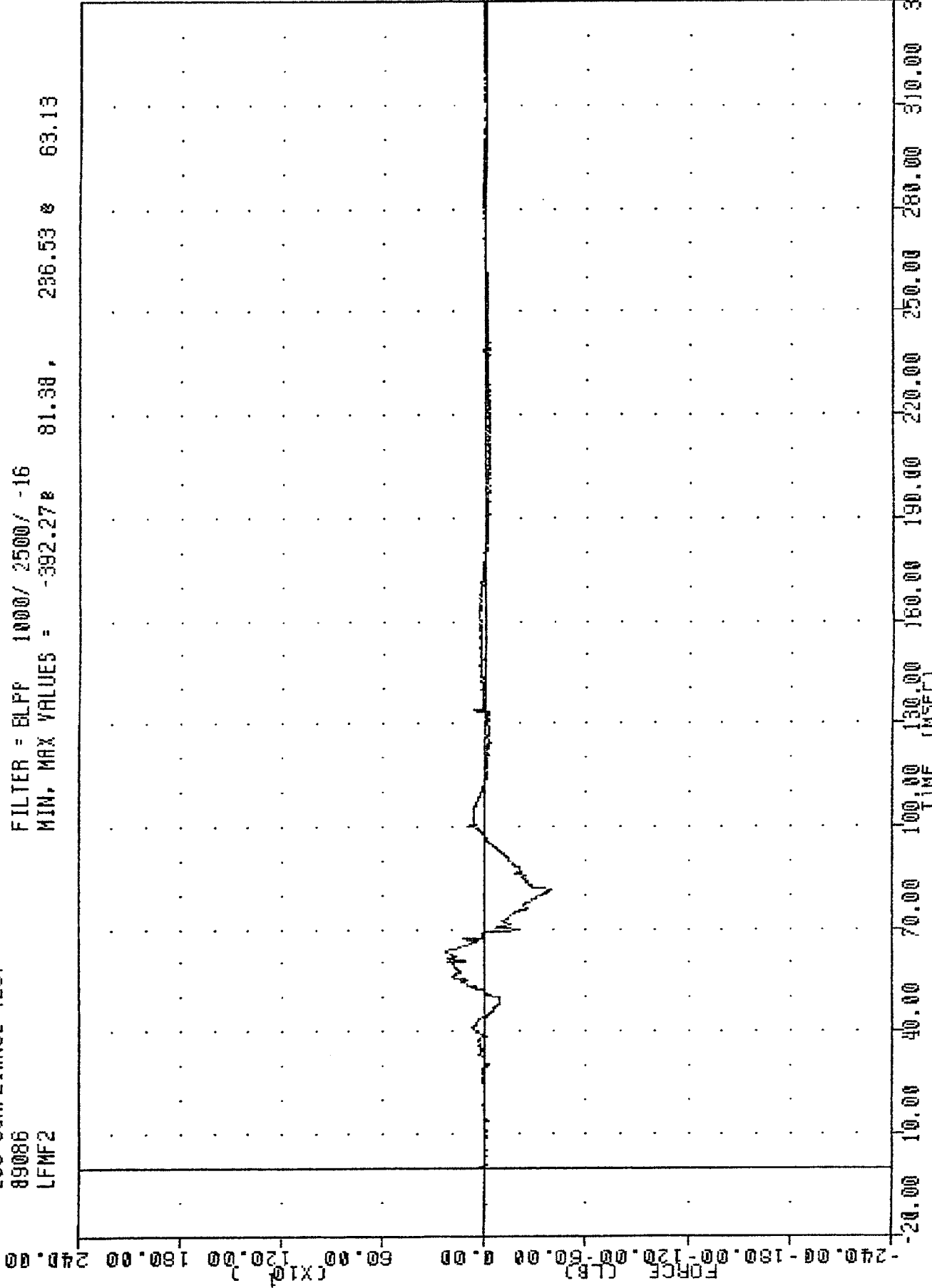
MIN, MAX VALUES = 0.02e -20.00, 36.18 e 82.25



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION

TRC
890327
200 COMPLIANCE TEST
89086
LFMF2

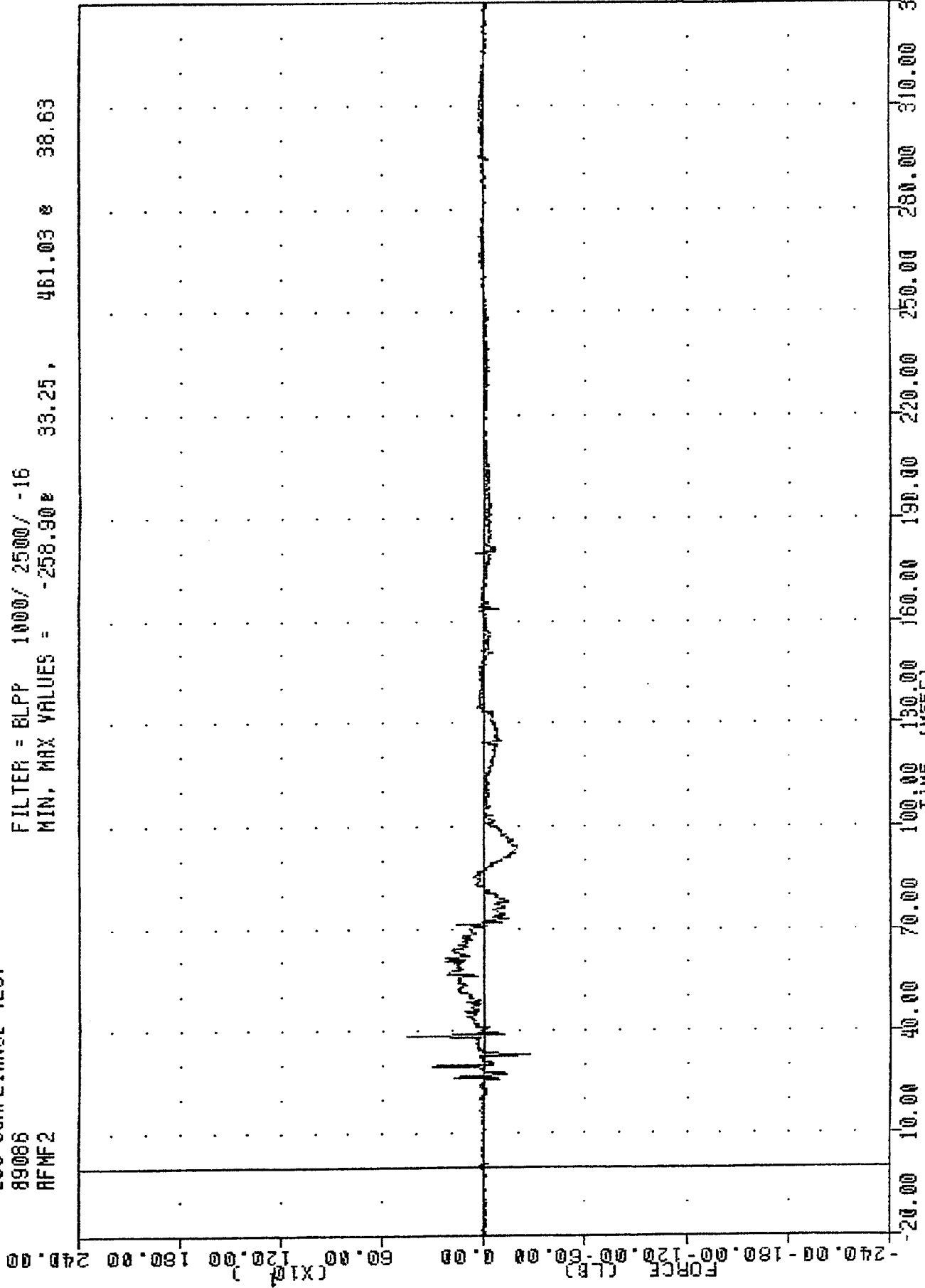
FILTER = BLPF 1000/ 2500/ -16
MIN, MAX VALUES = -392.27e 81.38, 236.53 e 63.13



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER LEFT FEMUR FORCE

TRC
890327
208 COMPLIANCE TEST
89086
RFMF2

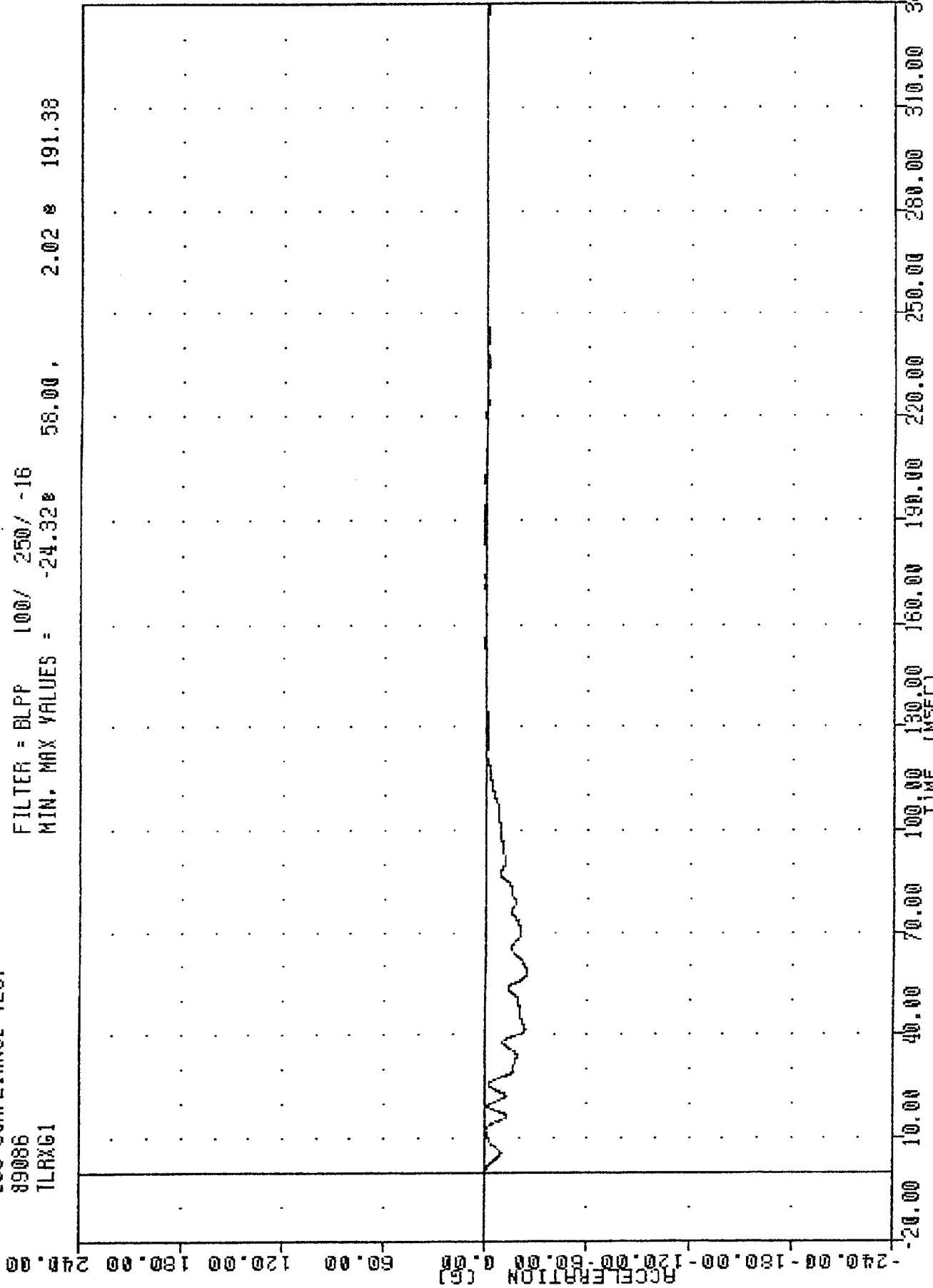
FILTER = BLPP 1000/ 2500/ -16
MIN. MAX VALUES = -258.90e 461.03 e 38.63



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

JRC
890327
206 COMPLIANCE TEST
89086
TLRXG1

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -24.32 58.00 , 2.02 191.38



1989 AUDI 200 INTO FRONTAL BARRIER
LEFT REAR SEAT X AXIS ACCELERATION

TRC , 890327

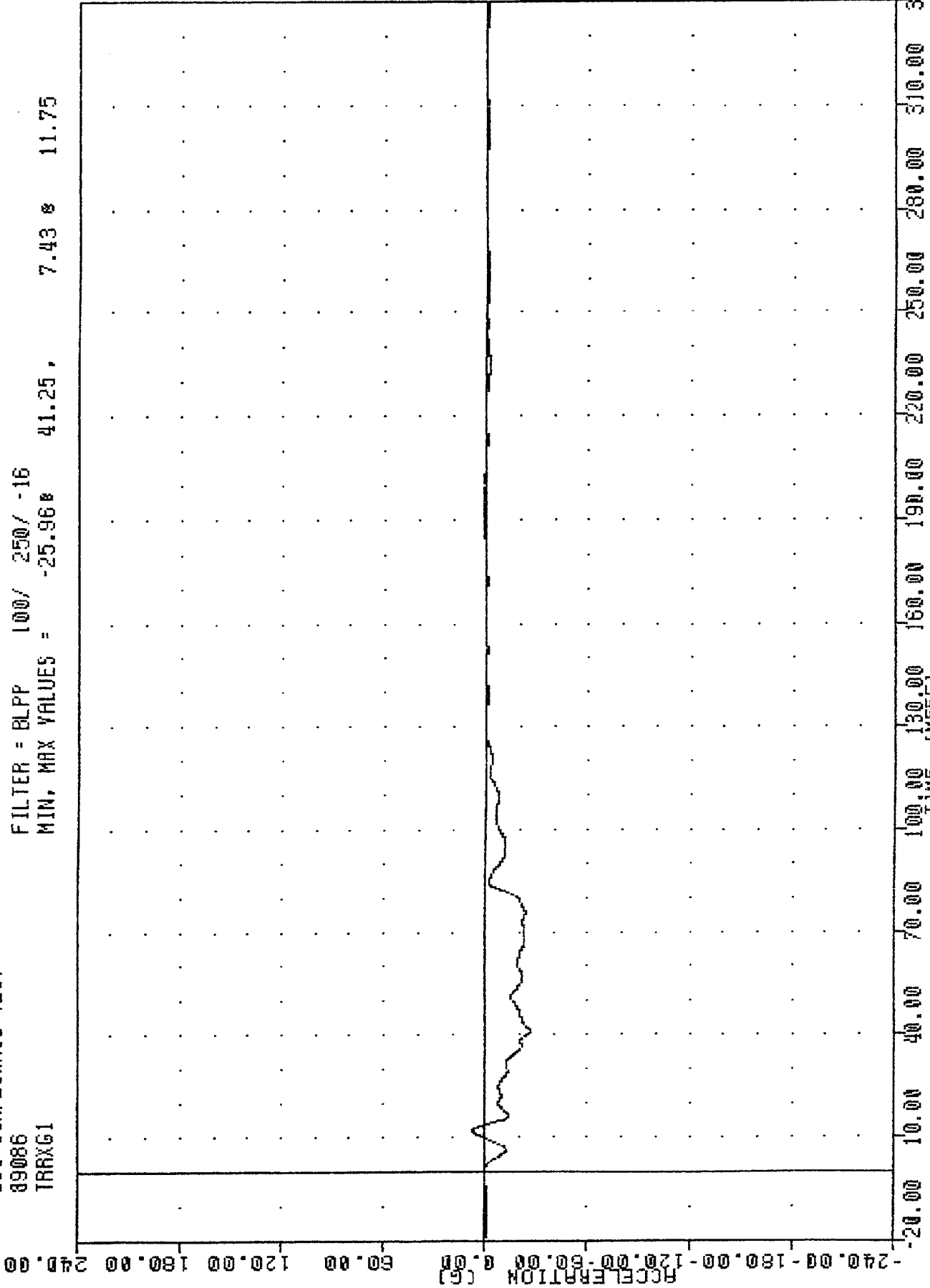
208 COMPLIANCE TEST

89086

TRRXG1

FILTER = BLPP 100/ 250/ -16

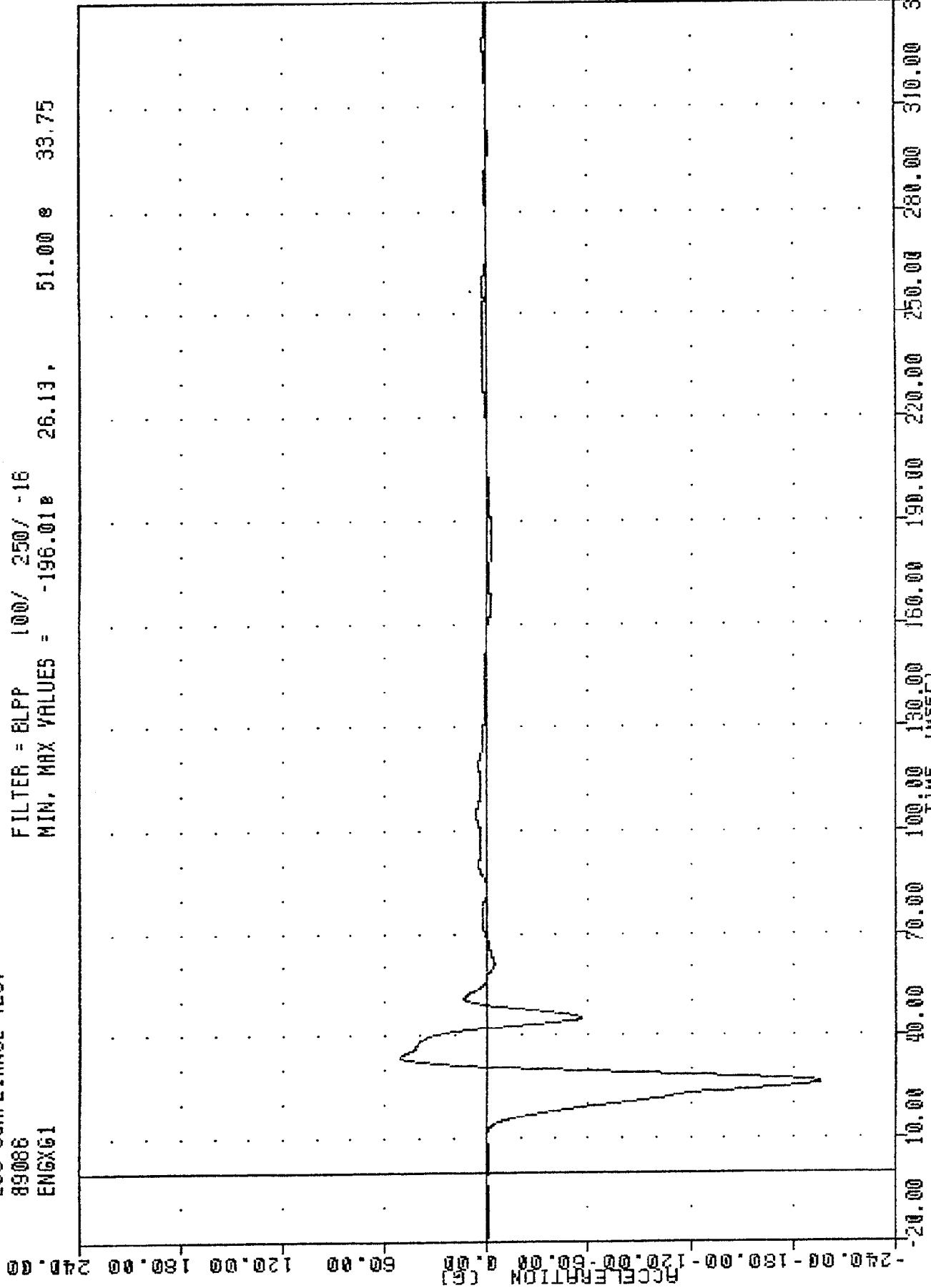
MIN, MAX VALUES = -25.96 41.25, 7.43 11.75



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT REAR SEAT X AXIS ACCELERATION

TRC
890886
ENGX61
208 COMPLIANCE TEST
, 890327

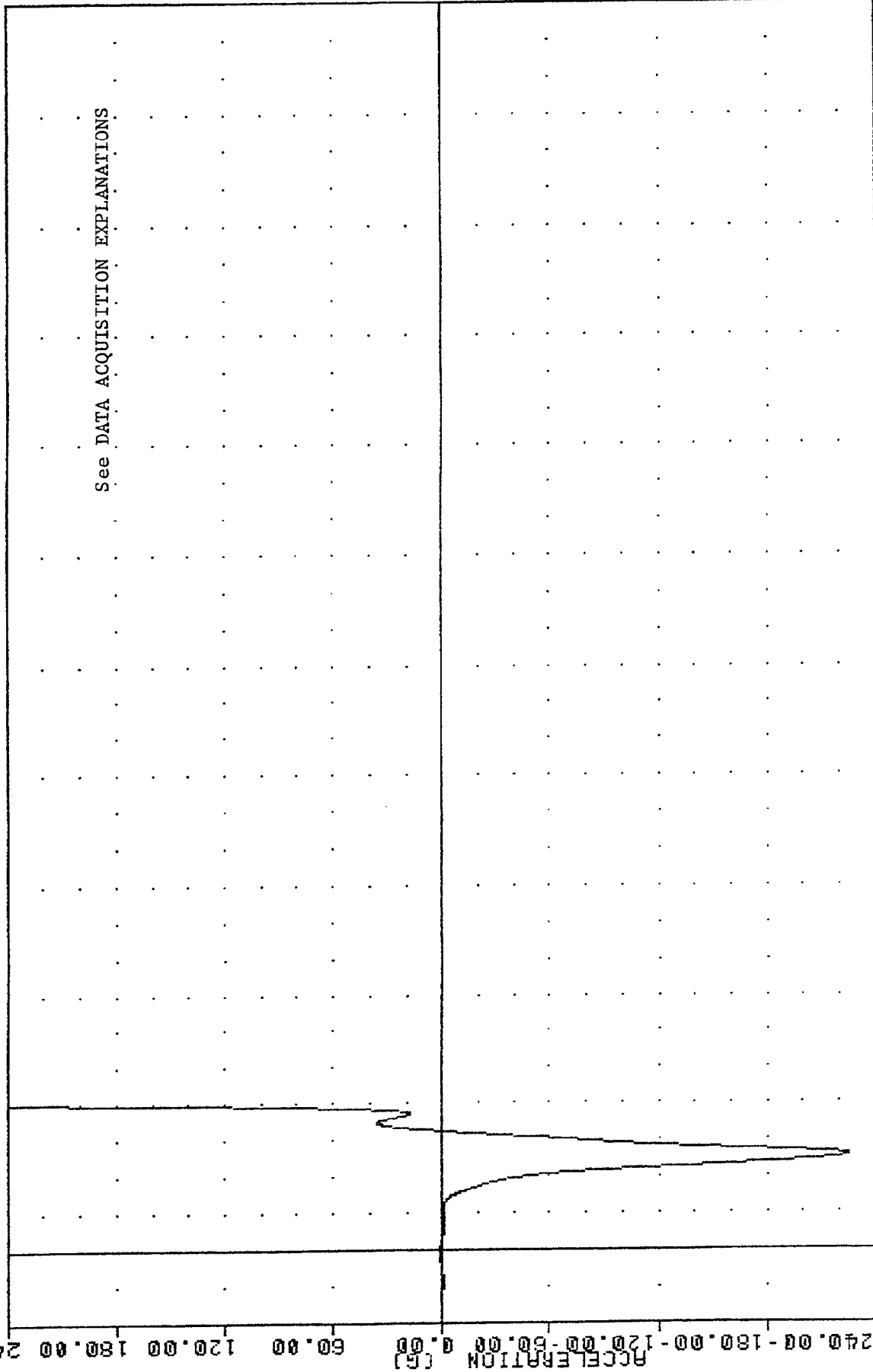
FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -196.01e 26.13, 51.00 e 33.75



1989 AUDI 200 INTO FRONTAL BARRIER
ENGINE UPPER BLOCK X AXIS ACCELERATION

TRC 890327
208 COMPLIANCE TEST
89086
ENGXG2

FILTER = BLPP 100/ 250/ -18
MIN, MAX VALUES = -225.35e 25.50, 984.11 e 92.75



-240.00 -180.00 -120.00 -60.00 0.00 60.00 120.00 180.00 240.00
-20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00
TIME (MSEC)

1989 AUDI 200 INTO FRONTAL BARRIER
ENGINE BOTTOM BLOCK X AXIS ACCELERATION

TRC 890327

208 COMPLIANCE TEST

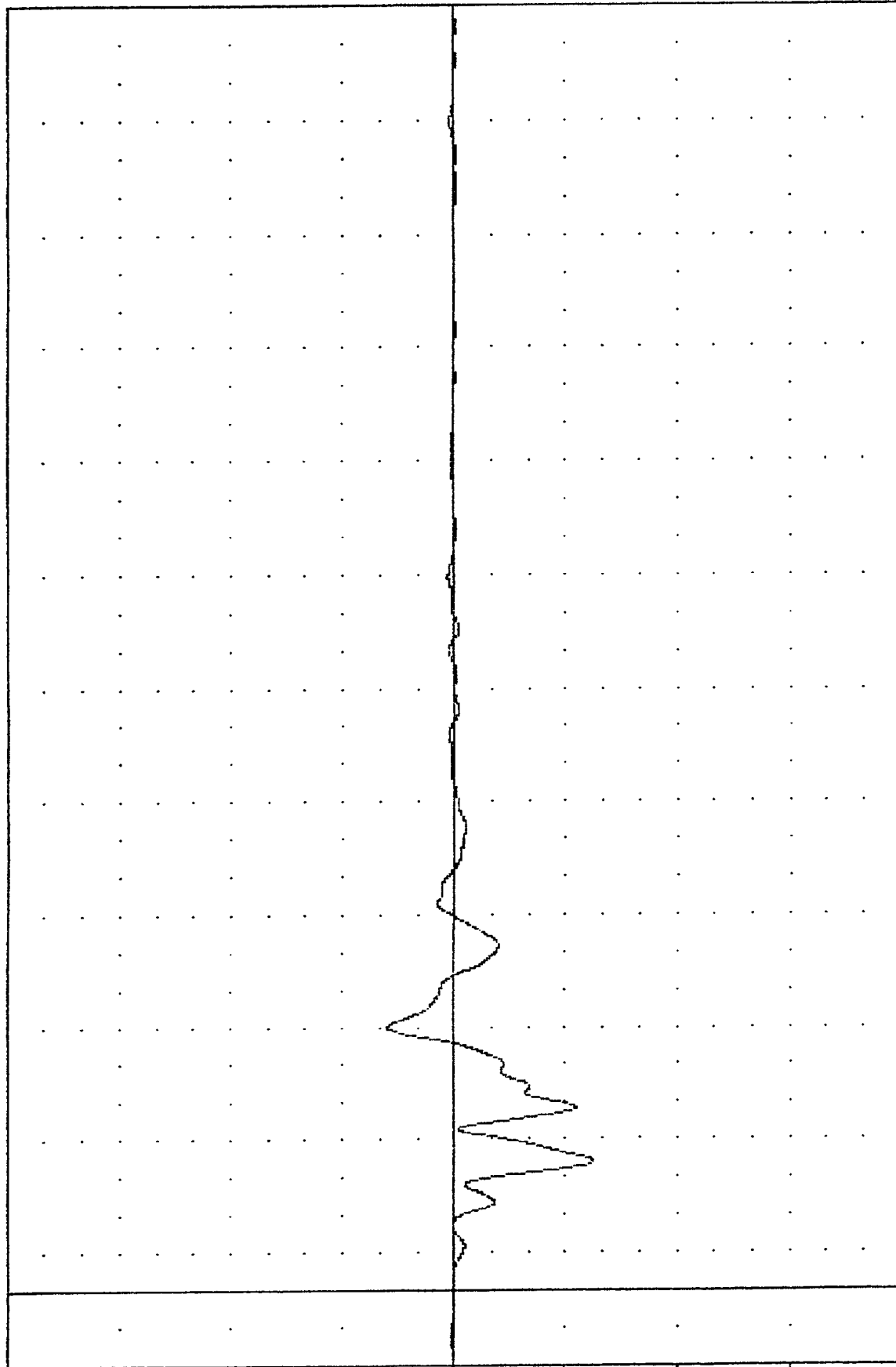
89086

BCRXG1

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -74.88e 33.88, 35.97 e 69.88

ACCELERATION (G) -240.00 -180.00 -120.00 -60.00 0.00 60.00 120.00 180.00 240.00

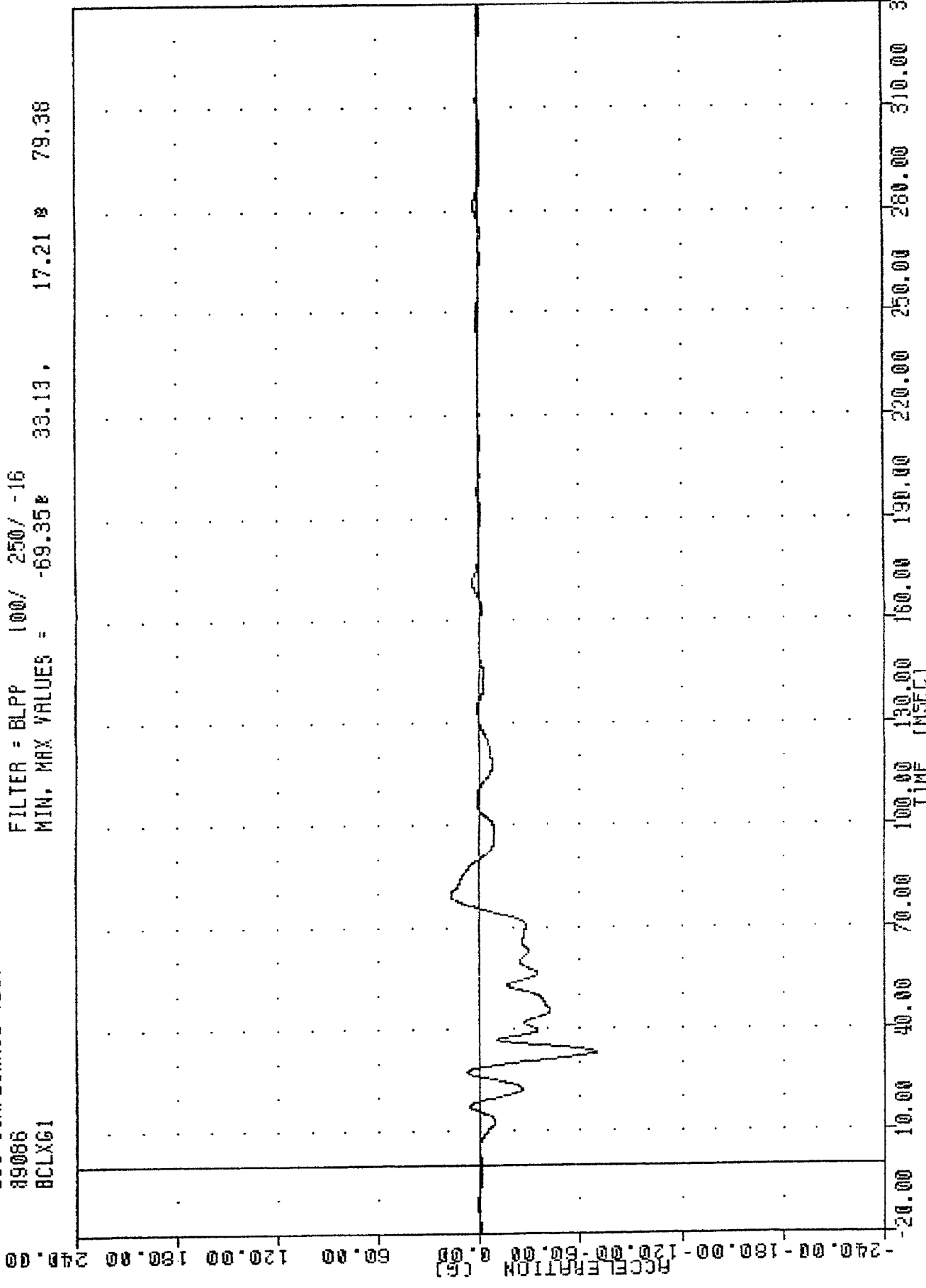


0 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00

1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT BRAKE CALIPER X AXIS ACCELERATION

TRC
89086
BCLX61
200 COMPLIANCE TEST
890327

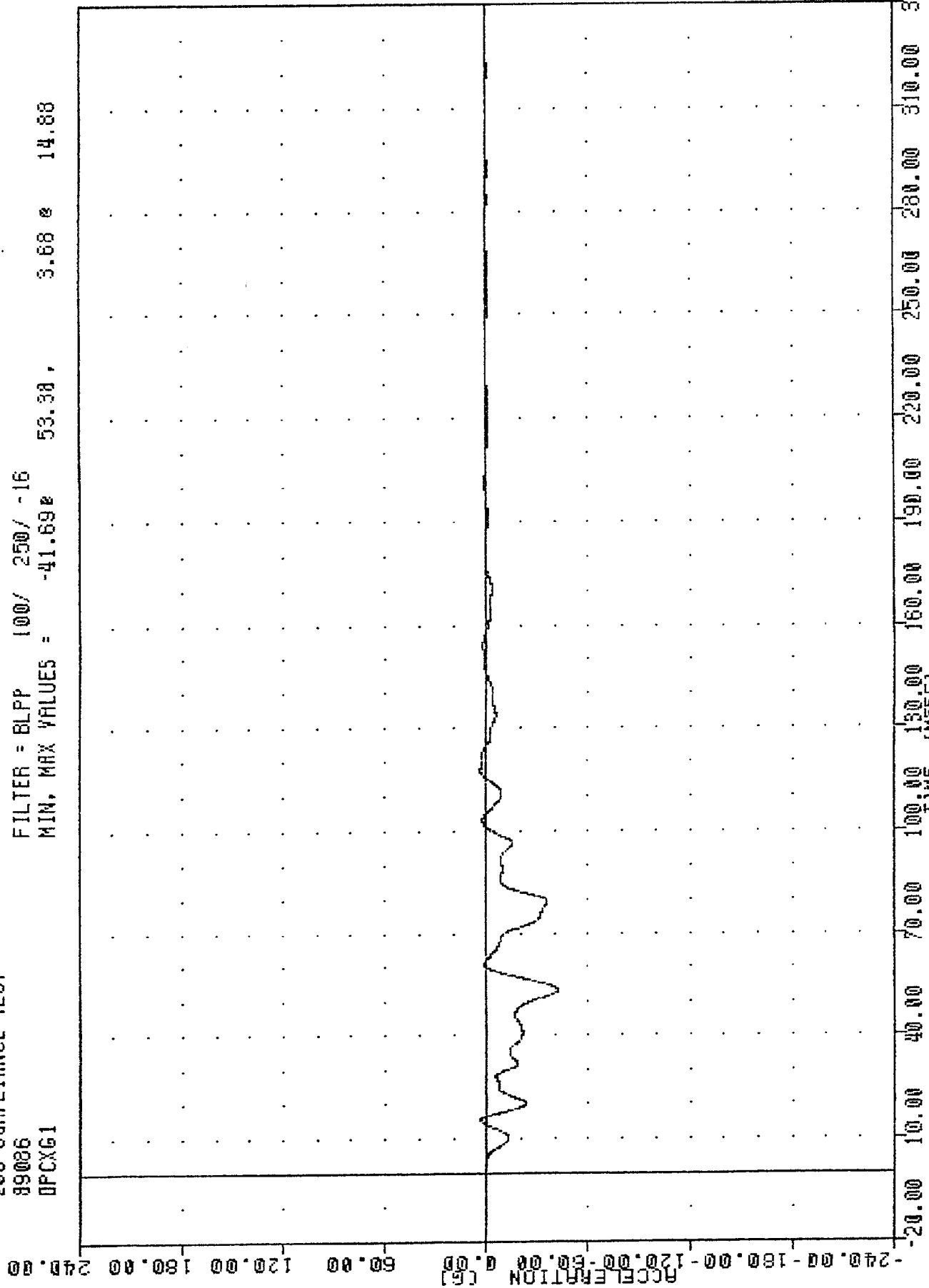
FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -69.35 33.13 17.21 79.38



1989 AUDI 200 INTO FRONTAL BARRIER
LEFT BRAKE CALIPER X AXIS ACCELERATION

TRC
89086
DPCX61
208 COMPLIANCE TEST
* 890327

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -41.69e 53.38 , 3.68 e 14.88



1989 AUDI 200 INTO FRONTAL BARRIER
DASH PANEL CENTER X AXIS ACCELERATION

TRC 890327

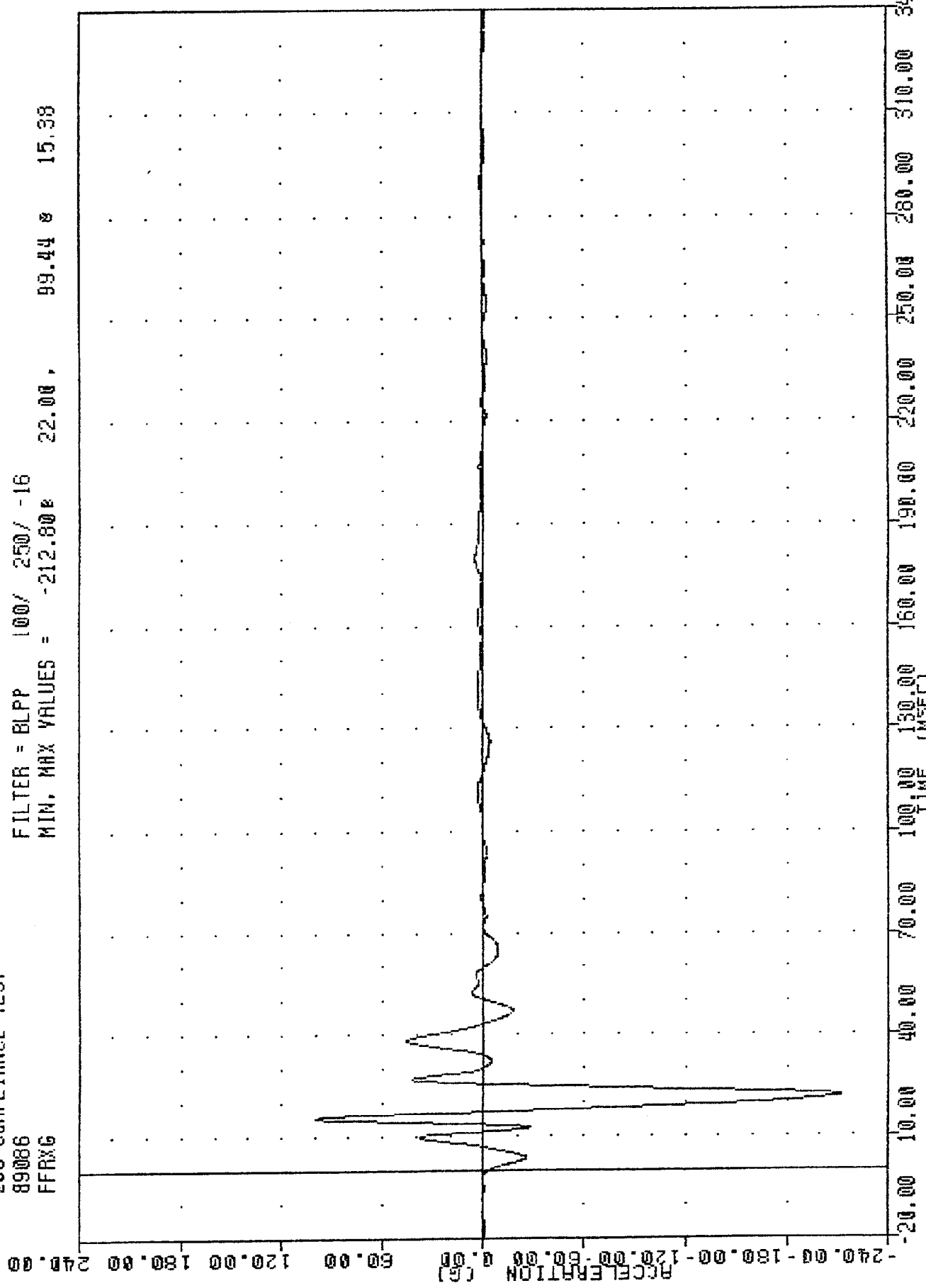
208 COMPLIANCE TEST

89086

FFRXG

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -212.80E 22.00, 99.44 @ 15.38



1989 AUDI 200 INTO FRONTAL BARRIER
FRONT FRAME RAIL X AXIS ACCELERATION

IRC , 890327

208 COMPLIANCE TEST

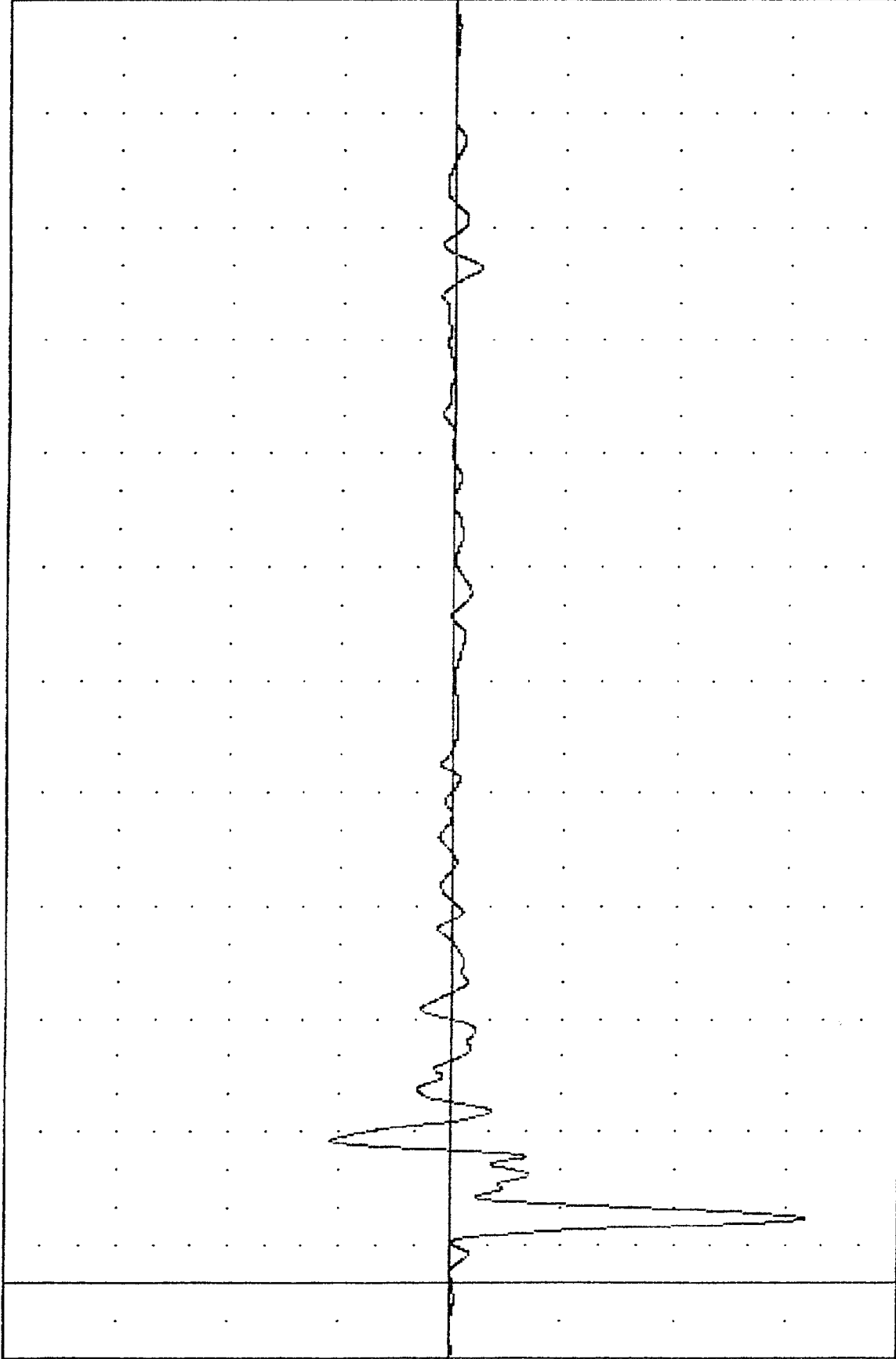
89086

FFCXG

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -190.71g 17.13, 64.96g 37.50

ACCELERATION (G) 240.00 180.00 120.00 60.00 0.00 -60.00 -120.00 -180.00 -240.00



TIME (MSEC) 100.00 150.00 190.00 220.00 250.00 280.00 310.00 340.00

1989 AUDI 200 INTO FRONTAL BARRIER
FRONT FRAME CROSSMEMBER X AXIS ACCELERATION

TRC 890327

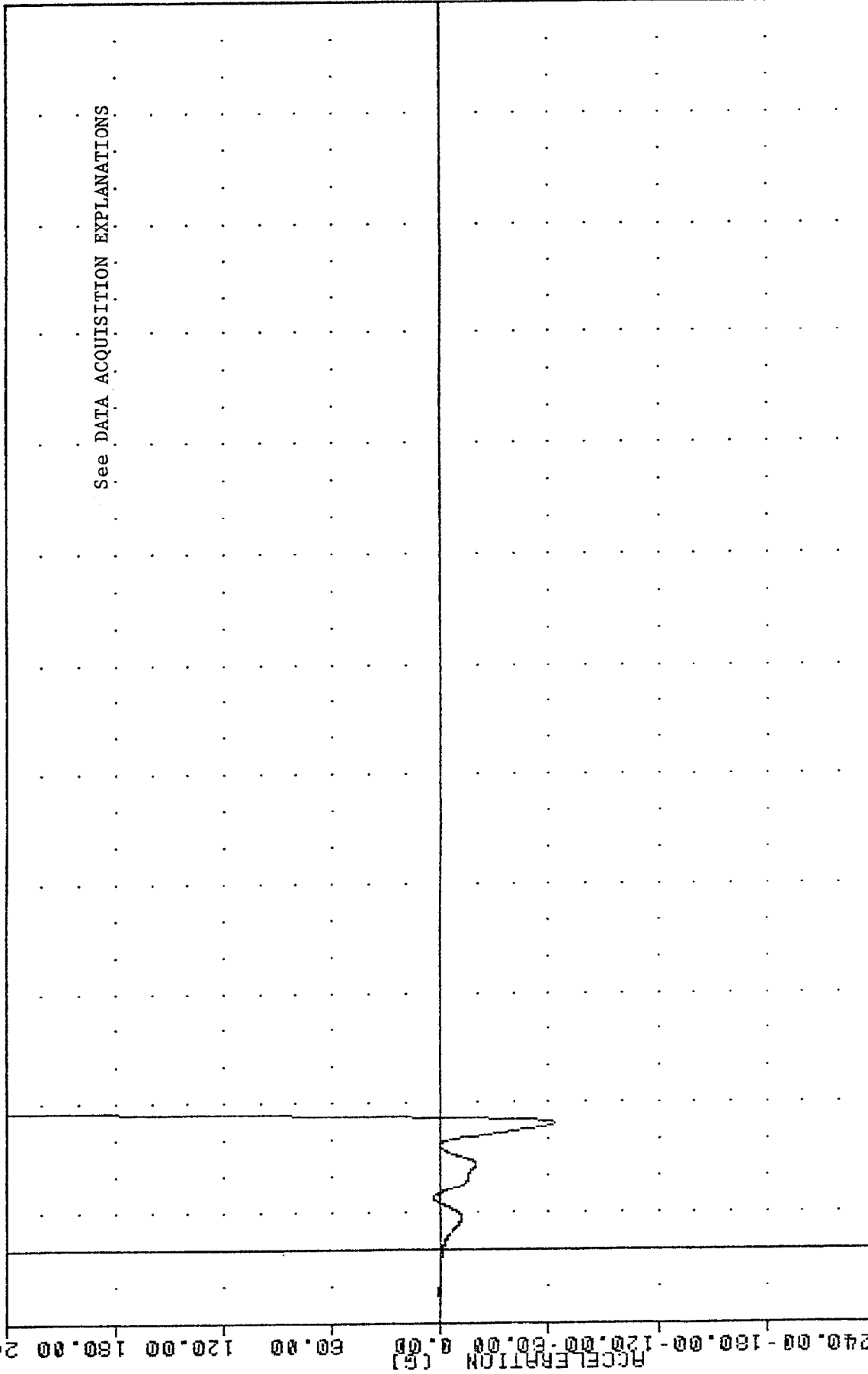
208 COMPLIANCE TEST

89086

FILXG

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -63.20e 34.25, 1249.65 e 42.63

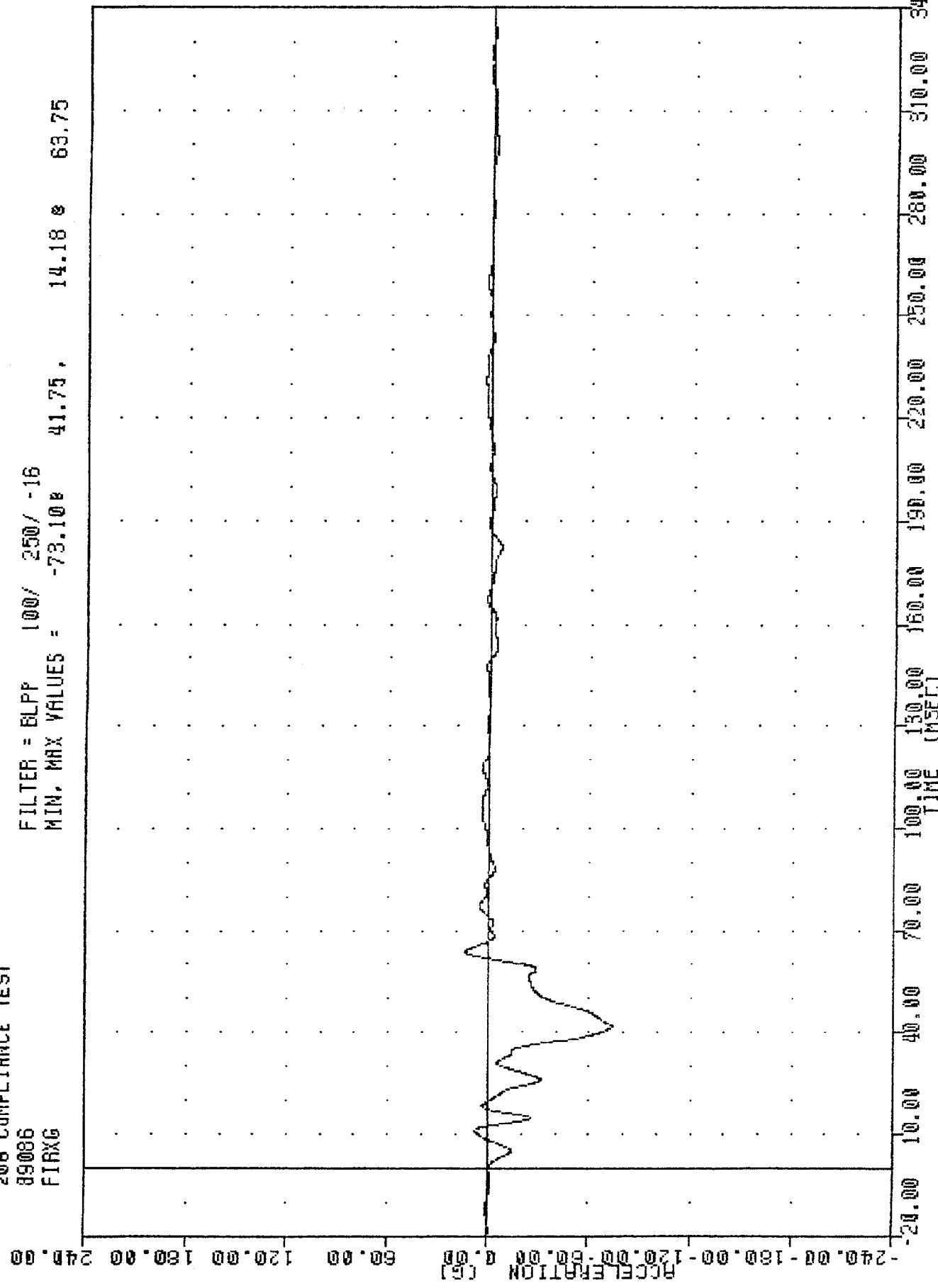


-20.00	10.00	40.00	70.00	100.00	130.00	160.00	190.00	220.00	250.00	280.00	310.00	340.00
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1989 AUDI 200 INTO FRONTAL BARRIER
LEFT FENDER WELL INSIDE X AXIS ACCELERATION

INC 890327
208 COMPLIANCE TEST
89086
FIRXG

FILTER = BLPP 100/ 250/ -16
MIN, MAX VALUES = -73.10e 41.75, 14.18 e 63.75



1989 AUDI 200 INTO FRONTAL BARRIER
RIGHT SHOCK TOWER X AXIS ACCELERATION