

DOT 1275

REPORT NOS. 208-TRC-89-001

212-TRC-89-001

301-TRC-89-001

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

GENERAL MOTORS CORPORATION

1989 PONTIAC GRAND PRIX

2-DOOR COUPE

NHTSA NO. CK0108

TRC TEST NO. 890206

THE TRANSPORTATION RESEARCH CENTER OF OHIO

U.S. RT. 33, LOGAN COUNTY

EAST LIBERTY, OHIO 43319



FEBRUARY 22, 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 Pontiac Grand Prix 2-door coupe, VIN 1G2WJ14W7KF258970, NHTSA No. CK0108, at the Transportation Research Center of Ohio on February 6, 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 73° F. The vehicle appears to comply with the applicable requirements of FMVSS Nos. 208, 212, 219 (partial), and 301.					
17. Key Words Frontal Impact 30 mph Vehicle Safety Compliance Testing: FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Mounting" FMVSS 219, "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity"			18. Distribution Statement Available from: Technical Reference Division National Highway Traffic Safety Admin Nassif Building, Room 5108 400 Seventh Street, SW Washington, DC 20590		
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	metric ton	t
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 (10 000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton (1000 kg)	1.1	short tons	
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

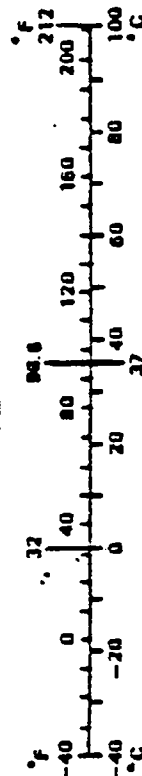


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SECTION 1.0

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 Pontiac Grand Prix 2-door coupe, NHTSA No. CK0108, 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 Pontiac Grand Prix 2-door coupe, NHTSA No. CK0108, was equipped with a 2.8 liter, transverse engine, manual transmission, power steering, and power brakes. The test weight of the vehicle was 3612 pounds. The test vehicle appeared to comply with the performance requirements of FMVSS test Nos. 208, 212, 219 (partial), and 301. The Head Injury Criteria (HIC) calculations were less than 1000, the resultant accelerations of the thorax did not exceed 60 g's, the thorax displacement did not exceed 3.0 inches, and the compressive forces transmitted through the upper legs did not exceed 2,250 pounds as measured by Part 572 E dummies seated in the driver's and right front passenger's seats. There was 100 percent windshield retention. There was no intrusion into the windshield. There was no fluid spillage from the fuel system following the impact or during the static rollover test.

Two Part 572 E, 50th percentile, 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 No. 208.-

Both ATDs were instrumented with head and chest accelerometers oriented to measure accelerations in the longitudinal, lateral, and vertical directions, with chest displacement potentiometers, 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. Pre-test and post-test events were recorded by one (1) real-time camera.

The twenty-nine (29) 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 February 6, 1989. The test vehicle's impact speed was 29.6 mph. The vehicle sustained 16.6 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.:	CK0108	PROJECT:	208 Compliance
DATE:	2/06/89	TIME:	1510 TEMP: 73° F
VEHICLE:	1989 Pontiac Grand Prix 2-door coupe		
TEST WEIGHT (LBS):	3612		
IMPACT ANGLE (DEG)*:	0		
IMPACT VELOCITY (MPH)**:	PRIMARY = 29.6	SECONDARY =	29.6
MAXIMUM STATIC CRUSH (IN):	16.6		
VEHICLE REBOUND (IN):	24.7		
DUMMIES:	Driver #229	Passenger	#230
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:	29		
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 Corporation

MAKE/MODEL: Pontiac Grand Prix

VIN: 1G2WJ14W7KF258970

BODY STYLE: 2-door coupe

MODEL YEAR: 1989

NHTSA NO.: CK0108

COLOR: blue

ENGINE DATA: TYPE: transverse CYLINDERS: 6 DISPLACEMENT: 2.8 liter

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

DATE VEHICLE RECEIVED: 1/17/89

ODOMETER READING: 56.0

DEALER'S NAME AND ADDRESS: Hadocy Pontiac, Inc.
101 Phillipi Rd.
Columbus, OH 43228

ACCESSORIES:

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

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

REMARKS:

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

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

VEHICLE MANUFACTURED BY: General Motors Corporation

DATE OF MANUFACTURE: 11/88

GVWR: 4113 LBS

GAWR: FRONT 2279 LBS., REAR 1834 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: P195/70R15 LOAD RANGE X B, C, D

TIRES ON VEHICLE (MFR., LINE, SIZE): Goodyear Eagle GT + 4 P195/70R15

IS SPARE TIRE A "SPACE SAVER": Yes

IS SPARE TIRE STANDARD EQUIPMENT: Yes

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

TYPE OF FRONT SEAT BACKS: Manual adjustable

NUMBER OF OCCUPANTS 2 FRONT 3 REAR 5 TOTAL

CARGO LOAD 167 LBS. TOTAL 917 LBS.

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

RIGHT FRONT 995 lbs. RIGHT REAR 550 lbs.

LEFT FRONT 1018 lbs. LEFT REAR 560 lbs.

TOTAL FRONT WEIGHT 2013 lbs. (64.4% OF TOTAL VEHICLE WEIGHT)

TOTAL REAR WEIGHT 1110 lbs. (35.6% OF TOTAL VEHICLE WEIGHT)

TOTAL DELIVERED WEIGHT 3123 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

RCLW = RATED CARGO AND LUGGAGE WEIGHT

UDW = UNLOADED DELIVERED WEIGHT (3123 LBS)

VCW = VEHICLE CAPACITY WEIGHT (917 LBS)

DSC = DESIGNATED SEATING CAPACITY (5)

RCLW = VCW - 150 (DCS) = 917 - 150(5) = 167 LBS

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

= 3123 + 167 + 334 LBS

TARGET TEST WEIGHT = 3624 LBS

TABLE 2 TEST VEHICLE INFORMATION CONT'D

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 155 LBS. CARGO

RIGHT FRONT	1065 lbs.	RIGHT REAR	770 lbs.
LEFT FRONT	1017 lbs.	LEFT REAR	760 lbs.
TOTAL FRONT WEIGHT	2082 lbs.	(57.6% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	1530 lbs.	(42.4% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	3612 lbs.	(0.3% UNDER TARGET WEIGHT)	
WEIGHT OF BALLAST SECURED IN VEHICLE TRUNK AREA: 75 LBS.			
COMPONENTS REMOVED TO MEET TARGET WEIGHT: None			

VEHICLE ATTITUDE (ALL DIMENSIONS IN INCHES):

DELIVERED ATTITUDE:	LF 29.0;	RF 29.1;	LR 29.5;	RR 29.6
PRE-TEST ATTITUDE:	LF 27.8;	RF 27.9;	LR 26.4;	RR 26.5
POST-TEST ATTITUDE:	LF 32.8;	RF 32.4;	LR 26.1;	RR 25.7
WHEELBASE: 107.5 INCHES				
CG = 45.5 INCHES REARWARD OF FRONT WHEEL CENTERLINE				

TABLE 3 TEST CONDITIONS

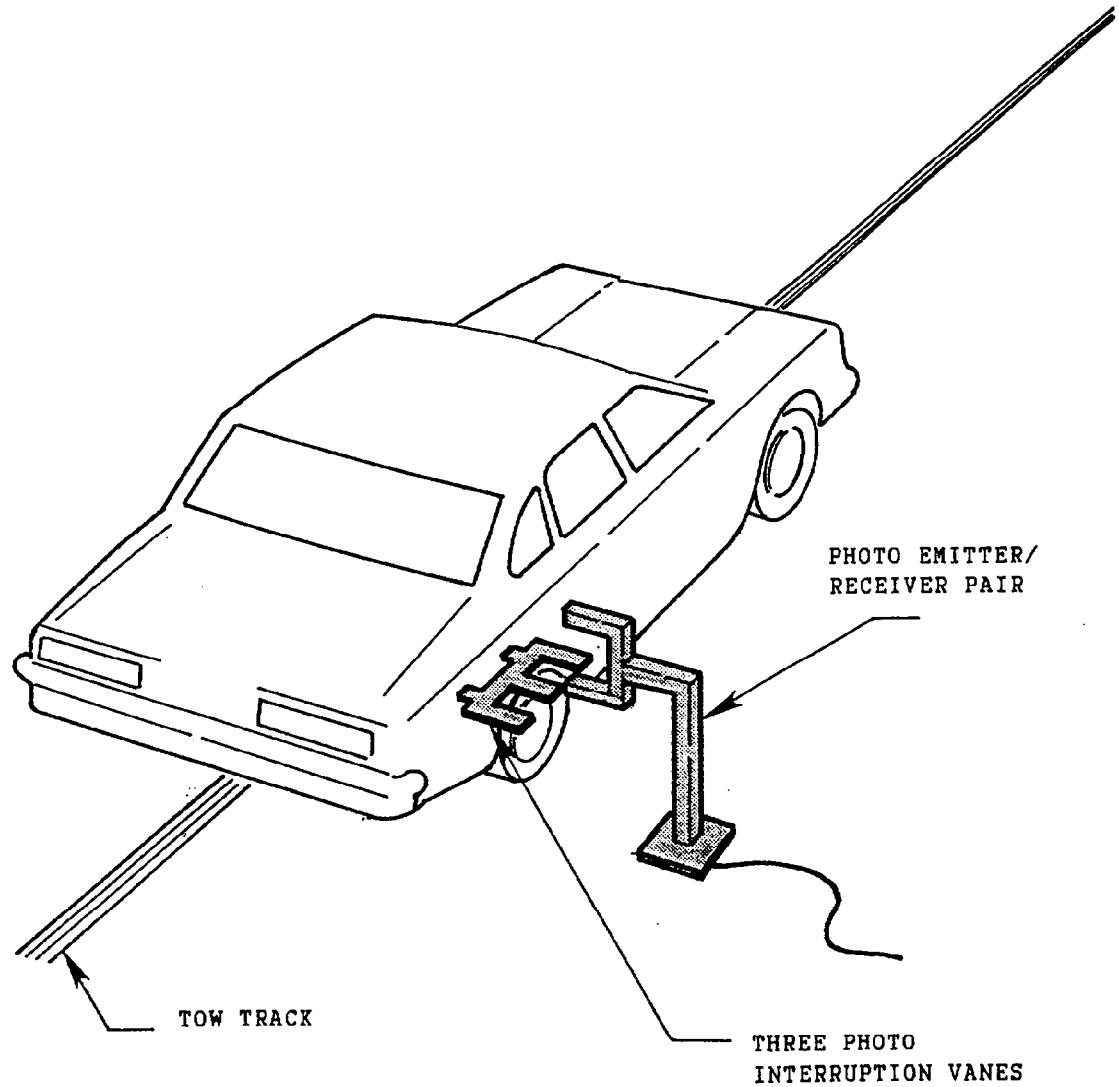
TEST NUMBER: 890206	
DATE OF TEST: 2/06/89	TIME OF TEST: 1510
TYPE OF TEST: Frontal barrier impact	IMPACT ANGLE: 0°
AMBIENT TEMPERATURE AT IMPACT AREA:	73° F
TEMPERATURE IN OCCUPANT COMPARTMENT:	72° F
IMPACT VELOCITY: PRIMARY = 29.6 MPH	SECONDARY = 29.6 MPH
(SPECIFIED RANGE = 28.9 TO 29.9 MPH)	

VEHICLE REBOUND AND CRUSH (ALL DIMENSIONS IN INCHES):

OVERALL LENGTH OF TEST VEHICLE:	PRE-TEST:	L 188.3;	C 193.6;	R 187.9
	POST-TEST:	L 176.2;	C 179.5;	R 178.8
	TOTAL CRUSH:	L 12.1;	C 14.1;	R 9.1

FOR FRONTAL IMPACTS, DISTANCE FROM FRONT OF TEST VEHICLE TO BARRIER AFTER IMPACT: L: 26.9; C: 22.7; R: 24.6; AVG: 24.7

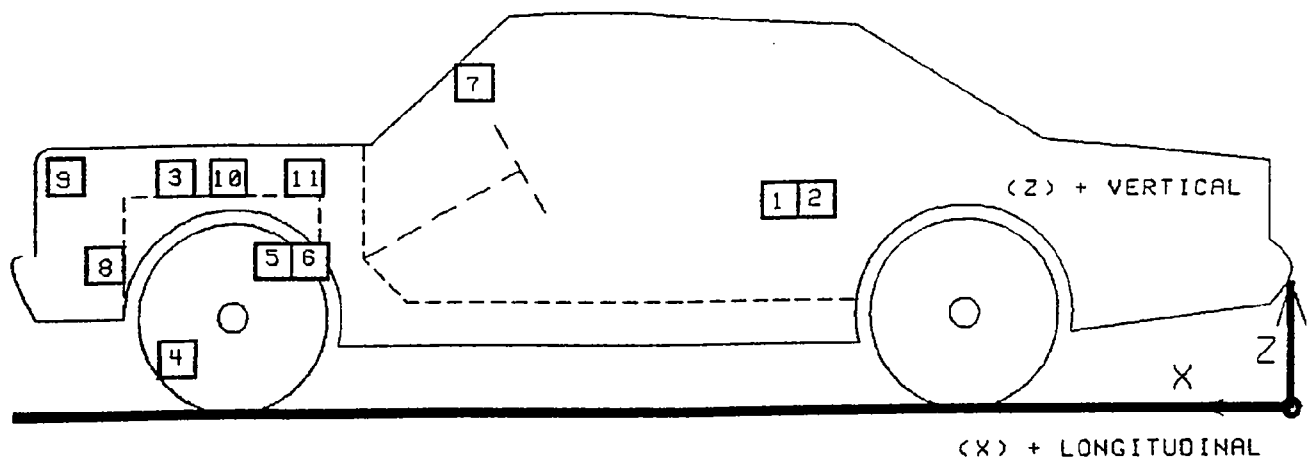
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



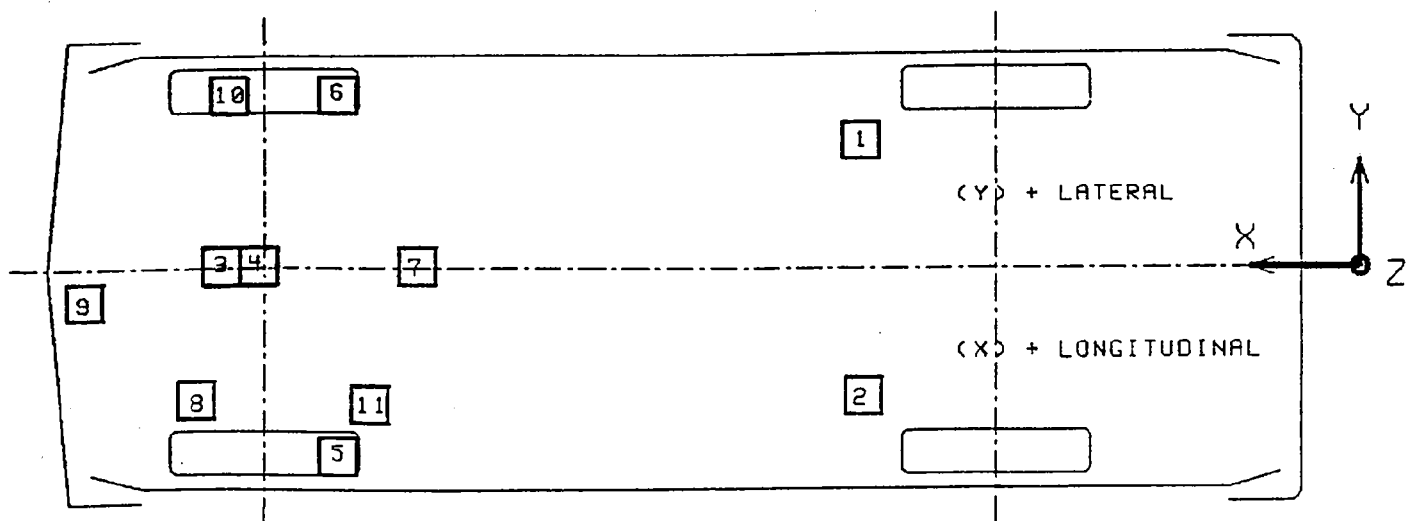
The final vane clears emitter/receiver two inches before impact.

The vanes have one foot spacing.

FIGURE 2
VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 4
TEST NUMBER 890206

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	PRE	74.4	13.6	15.5				
	AT LEFT SIDE	POST	74.3	13.6	16.8				
	LONGITUDINAL					1.2	222.5	27.8	23.1
2	REAR SEAT CROSSMEMBER	PRE	74.4	-13.6	15.4				
	AT RIGHT SIDE	POST	74.4	-13.6	16.8				
	LONGITUDINAL					1.6	145.1	28.2	22.9
3	TOP OF ENGINE BLOCK	PRE	160.8	-5.0	32.3				
		POST	155.1	-4.9	30.8				
	LONGITUDINAL					33.7	63.6	96.1	40.9
4	BOTTOM OF ENGINE BLOCK	PRE	158.8	-2.0	8.2				
		POST	155.2	-1.0	6.1				
	LONGITUDINAL					25.2	64.1	69.9	42.9
5	BRAKE CALIPER	PRE	155.1	-26.9	11.1				
	AT RIGHT SIDE	POST	153.9	-26.2	10.6				
	LONGITUDINAL					6.7	96.0	38.7	50.4
6	BRAKE CALIPER	PRE	155.1	26.9	10.9				
	AT LEFT SIDE	POST	153.3	25.0	11.2				
	LONGITUDINAL					5.6	113.1	69.3	59.8
7	DASH PANEL	PRE	126.4	-1.5	36.7				
		POST	126.2	-1.5	38.2				
	LONGITUDINAL					10.7	58.6	45.3	46.9
8	FRONT FRAME RAIL	PRE	160.8	-18.6	18.0				
		POST	158.8	-18.1	21.4				
	LONGITUDINAL					56.8	25.5	47.9	30.1
9	FRONT FRAME	PRE	181.5	10.5	28.8				
	CROSSMEMBER	POST	168.6	10.2	27.0				
	LONGITUDINAL					99.6	32.9	69.8	25.6

TABLE 4 CONT'D
TEST NUMBER 890206

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 159.0	27.4	32.5				
	WELL INSIDE	POST 154.2	28.4	36.2				
	LONGITUDINAL				3.1	135.6	56.4	43.8
11	RIGHT SHOCK TOWER	PRE 153.2	-22.8	34.5				
		POST 149.7	-22.4	37.5				
	LONGITUDINAL				1.2	227.8	49.1	43.0

* 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: Pontiac/Grand Prix/2-door coupe
 VEH. NHTSA NO.: CK0108; VIN: 1G2WJ14W7KF258970
 MODEL YEAR: 1989; BUILD DATE: 11/88; TEST DATE: 2/06/89
 VEH. SIZE CATEGORY: Mid-size; TEST WEIGHT: 3612
 VEH. WHEELBASE: 107.5
 MAX. WIDTH: 71.8
 FRONT OVERHANG: 43.5

COLLISION DEFORMATION
CLASSIFICATION (CDC) CODE: 12FDEW2

F (Frontal)
CRUSH DEPTH
DIMENSIONS:

C1 = 12.1 inches
 C2 = 16.6 inches
 C3 = 15.1 inches
 C4 = 13.0 inches
 C5 = 11.2 inches
 C6 = 9.1 inches

MIDPOINT OF DAMAGE: D = Vehicle Centerline
(Longitudinal)

LENGTH OF DAMAGED
REGION: L = 60.0 inches

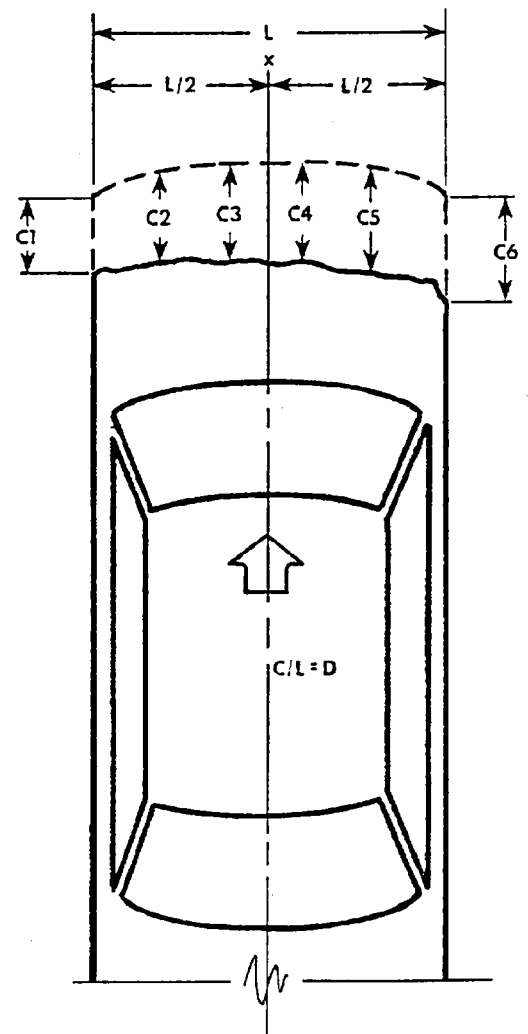


FIGURE 4
PRE-TEST AND POST-TEST MEASUREMENT POINTS

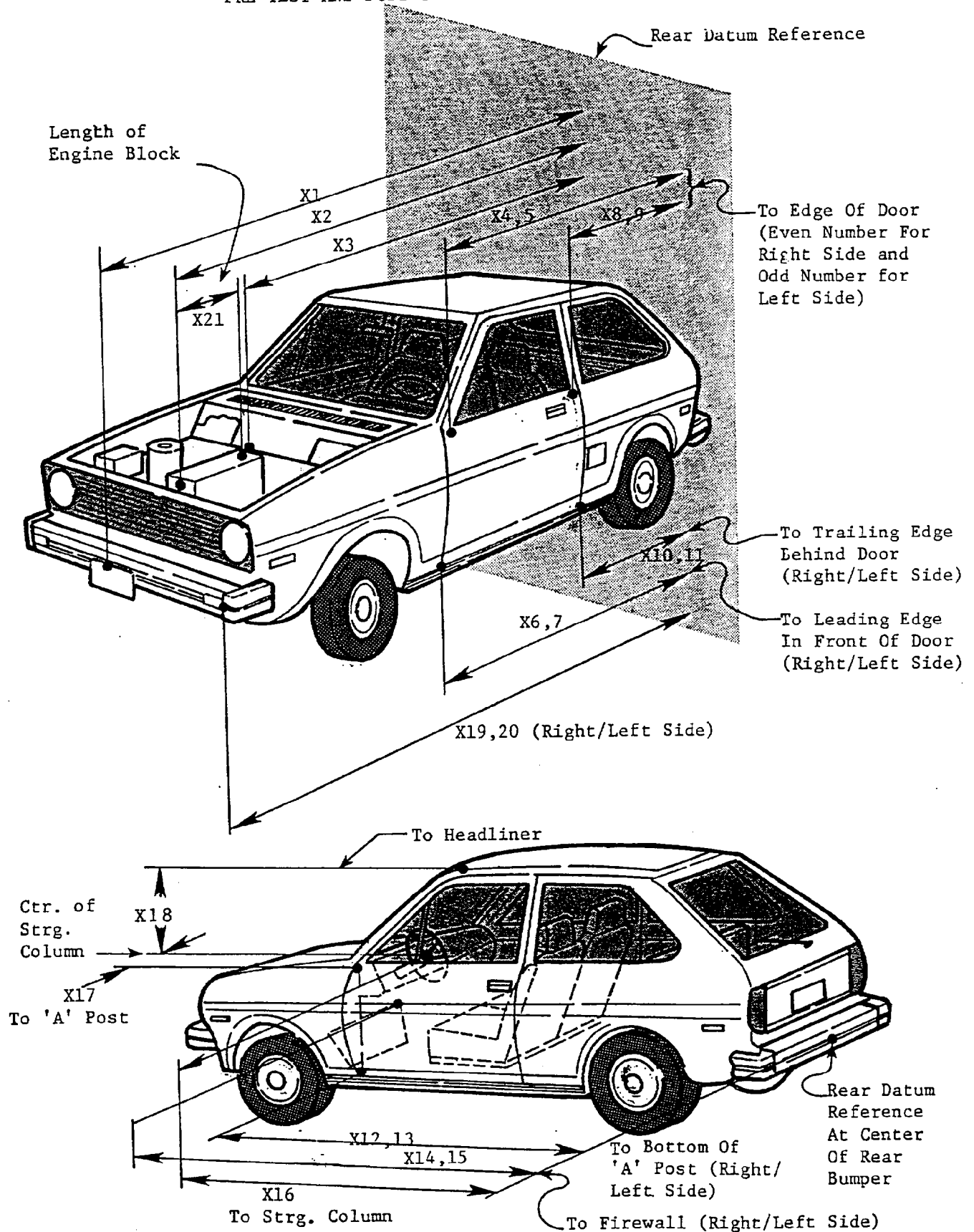
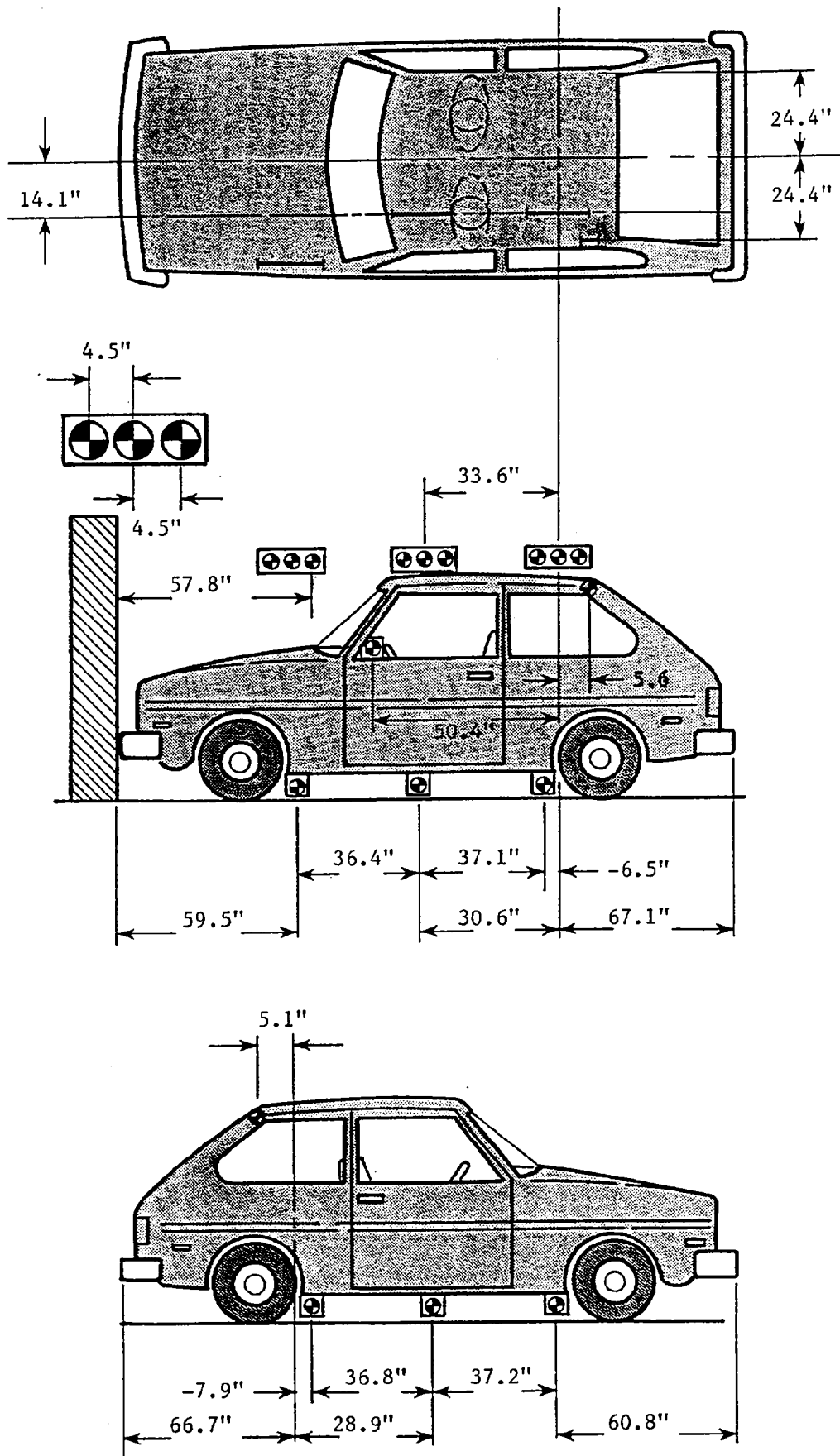


TABLE 5 IMPACTED VEHICLE MEASUREMENTS

VEHICLE MAKE/MODEL: Pontiac/Grand Prix		TEST NUMBER: 890206	DIMENSIONS IN INCHES			
NO.	TYPE OF MEASUREMENT		PRE-TEST	POST-TEST	DIFF.	
X1	TOTAL LENGTH OF VEHICLE AT CENTERLINE		193.6	179.5	14.1	
X2	REAR SURFACE OF VEHICLE TO FRONT OF ENGINE BLOCK		166.4	160.2	6.2	
X3	REAR SURFACE OF VEHICLE TO FIREWALL		147.6	144.9	2.7	
X4	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF RIGHT DOOR		129.1	128.4	0.7	
X5	REAR SURFACE OF VEHICLE TO UPPER LEADING EDGE OF LEFT DOOR		129.1	128.5	0.6	
X6	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF RIGHT DOOR		129.2	128.6	0.6	
X7	REAR SURFACE OF VEHICLE TO LOWER LEADING EDGE OF LEFT DOOR		129.2	128.5	0.7	
X8	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF RIGHT DOOR		77.1	76.7	0.4	
X9	REAR SURFACE OF VEHICLE TO UPPER TRAILING EDGE OF LEFT DOOR		77.2	76.6	0.6	
X10	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF RIGHT DOOR		78.1	77.2	0.9	
X11	REAR SURFACE OF VEHICLE TO LOWER TRAILING EDGE OF LEFT DOOR		77.6	77.2	0.4	
X12	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON RIGHT SIDE		128.2	128.1	0.1	
X13	REAR SURFACE OF VEHICLE TO BOTTOM OF "A" POST ON LEFT SIDE		128.6	128.4	0.2	
X14	REAR SURFACE OF VEHICLE TO FIREWALL - RIGHT SIDE		147.6	144.2	3.4	
X15	REAR SURFACE OF VEHICLE TO FIREWALL - LEFT SIDE		147.6	144.8	2.8	
X16	REAR SURFACE OF VEHICLE TO STEERING WHEEL CENTER		117.2	111.8	5.4	
X17	CENTER OF STEERING COLUMN TO "A" POST		13.2	13.1	0.1	
X18	CENTER OF STEERING COLUMN TO HEADLINER		16.6	17.8	-1.2	
X19	REAR SURFACE OF VEHICLE TO RIGHT SIDE OF FRONT BUMPER		187.9	178.8	9.1	
X20	REAR SURFACE OF VEHICLE TO LEFT SIDE OF FRONT BUMPER		188.3	176.2	12.1	
X21	LENGTH OF ENGINE BLOCK		14.5	14.5	0.0	

FIGURE 5
VEHICLE TARGET LOCATION



DATA ACQUISITION EXPLANATIONS

The driver's left femur force load cell, LFMF1, recorded questionable data spikes from 83 to 94 milliseconds.

SECTION 2.0

SUMMARY OF RESULTS FOR:

FMVSS 208, "Occupant Crash Protection"

FMVSS 212, "Windshield Mounting"

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

FMVSS 301, "Fuel System Integrity"

COMPLIANCE DATA SUMMARY

The test vehicle, a 1989 Pontiac Grand Prix 2-door coupe, NHTSA No. CK0108, appeared to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial), and 301.

The driver's Head Injury Criteria (HIC) was 598. The driver's maximum chest deceleration over three milliseconds was 41.9 g. The driver's right and left compressive femur loads were 1079 pounds and 1250 pounds, respectively. (See DATA ACQUISITION EXPLANATIONS.) The driver's maximum chest displacement was 1.9 inches.

The right front passenger's Head Injury Criteria (HIC) was 542. The right front passenger's maximum chest deceleration over three milliseconds was 43.8 g. The right front passenger's right and left compressive femur loads were 695 pounds and 671 pounds, respectively. The right front passenger's maximum chest displacement was 2.1 inches.

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

The windshield retention was 100 percent.

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

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

TABLE 6 DUMMY INJURY CRITERIA

MAXIMUM ACCELERATION ('G')

	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
DRIVER	-69.5	-8.6	-31.8	71.6	-44.0	5.0	7.4	41.9
PASSENGER	-38.2	-7.0	-53.0	60.4	-44.6	-6.3	-10.0	43.8

MAXIMUM FORCE-FEMUR LOAD (LBS)

	LEFT FEMUR	RIGHT FEMUR
DRIVER	1250 Y	1079
PASSENGER	671	695

HEAD INJURY CRITERIA**

	HIC	TIME t ₁ (MSEC) ¹	TIME t ₂ (MSEC) ²
DRIVER	598	68.9	104.9
PASSENGER	542	75.2	111.2

*Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

Y See DATA ACQUISITION EXPLANATIONS

DUMMY KINEMATIC SUMMARY

DRIVER DUMMY

Upon impact, the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated forward, impacting the steering wheel rim and hub. The dummy's torso was restrained by the three-point passive belt. The dummy's head rotated rearward into the head restraint as the dummy rebounded into the seat back. The dummy came to rest seated upright 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 and the dummy's chin contacted the dummy's chest. The dummy's torso was restrained by the three-point passive belt. The dummy's head rotated rearward into the head restraint as the dummy rebounded into the seat back. The dummy came to rest seated upright in the right front passenger's seat, restrained by the three-point passive belt.

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #229	PASSENGER #230
Head	<u>Steering wheel</u> <u>rim and hub</u>	<u>Chest</u>
Chest	<u>None</u>	<u>None</u>
Abdomen	<u>None</u>	<u>None</u>
Left knee	<u>Instrument panel</u>	<u>Instrument panel</u>
Right knee	<u>Instrument panel</u>	<u>Instrument panel</u>

DOOR OPENING:

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

SEAT MOVEMENT:

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

GLAZING DAMAGE:

The windshield was cracked along each side upon
impact.

OTHER NOTABLE IMPACT EFFECTS:

None

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

PRE-IMPACT DATA:

Make/Model: Pontiac/Grand Prix
 Body Style: 2-door coupe Model Year: 1989
 NHTSA No.: CK0108 Color: Blue

DATA FROM CERTIFICATION LABEL:

Vehicle Manufacturer: General Motors Corporation
 Date of Manufacture: 11/88 VIN: 1G2WJ14W7KF258970
 GVWR: 4113 lb; GAWR: Front = 2279 lb; Rear = 1834 lb

POST-IMPACT DATA:

Date of Test: 2/06/89 Time: 1510 Temperature: 73° F
 Required Impact Velocity Range: 28.9 to 29.9 mph
 Impact Velocity: Primary = 29.6 mph Secondary = 29.6 mph
 Seat Type: Bucket Adjuster Type: Manual
 Bucket Seat Back Type: Manual-adjustable
 Technicians: B. Fishbaugh & S. Ericksen

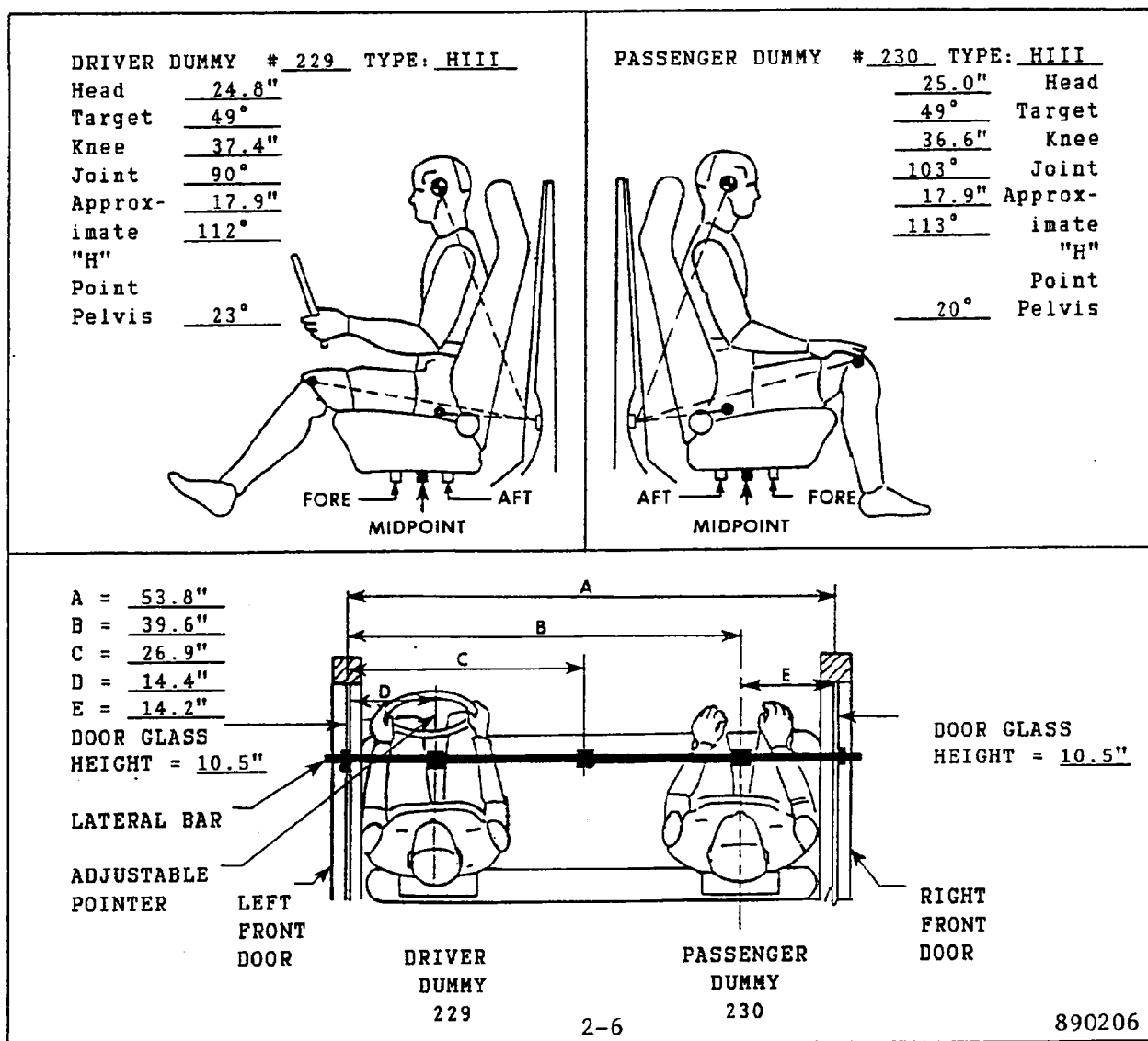
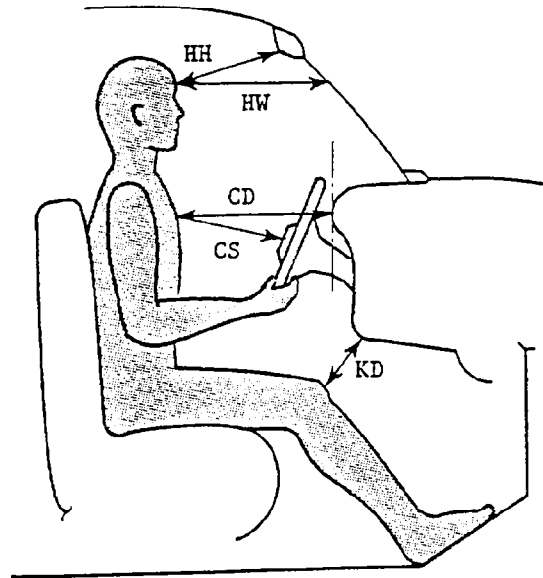
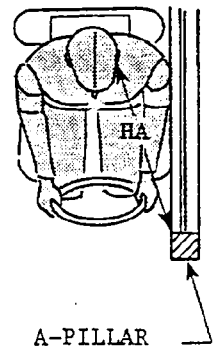
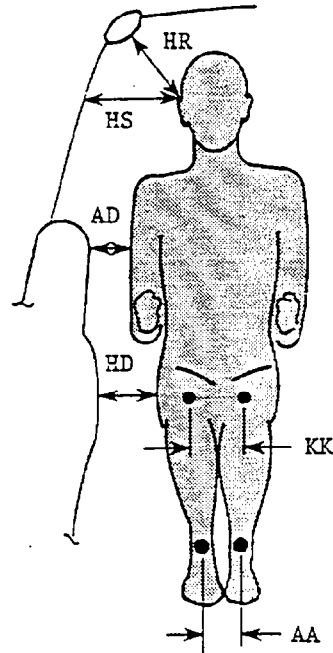


FIGURE 7 DUMMY IN-VEHICLE POSITION RECORDING SHEET

	DRIVER	PASSENGER
HH	11.4	12.1
HW	17.7	17.1
CD	19.4	19.8
CS	11.2	NA
KDL	3.1	5.2
KDR	4.2	4.9
TA	16°	18°
SA	20°	20°
HA	12.2	12.6



	DRIVER	PASSENGER
HR	7.8	7.6
HS	10.6	10.6
AD	5.2	5.6
HD	5.8	4.4
KK	7.9	8.0
AA	8.5	7.4



Knee outer clevis to outer clevis spacing:

Driver = 10.6

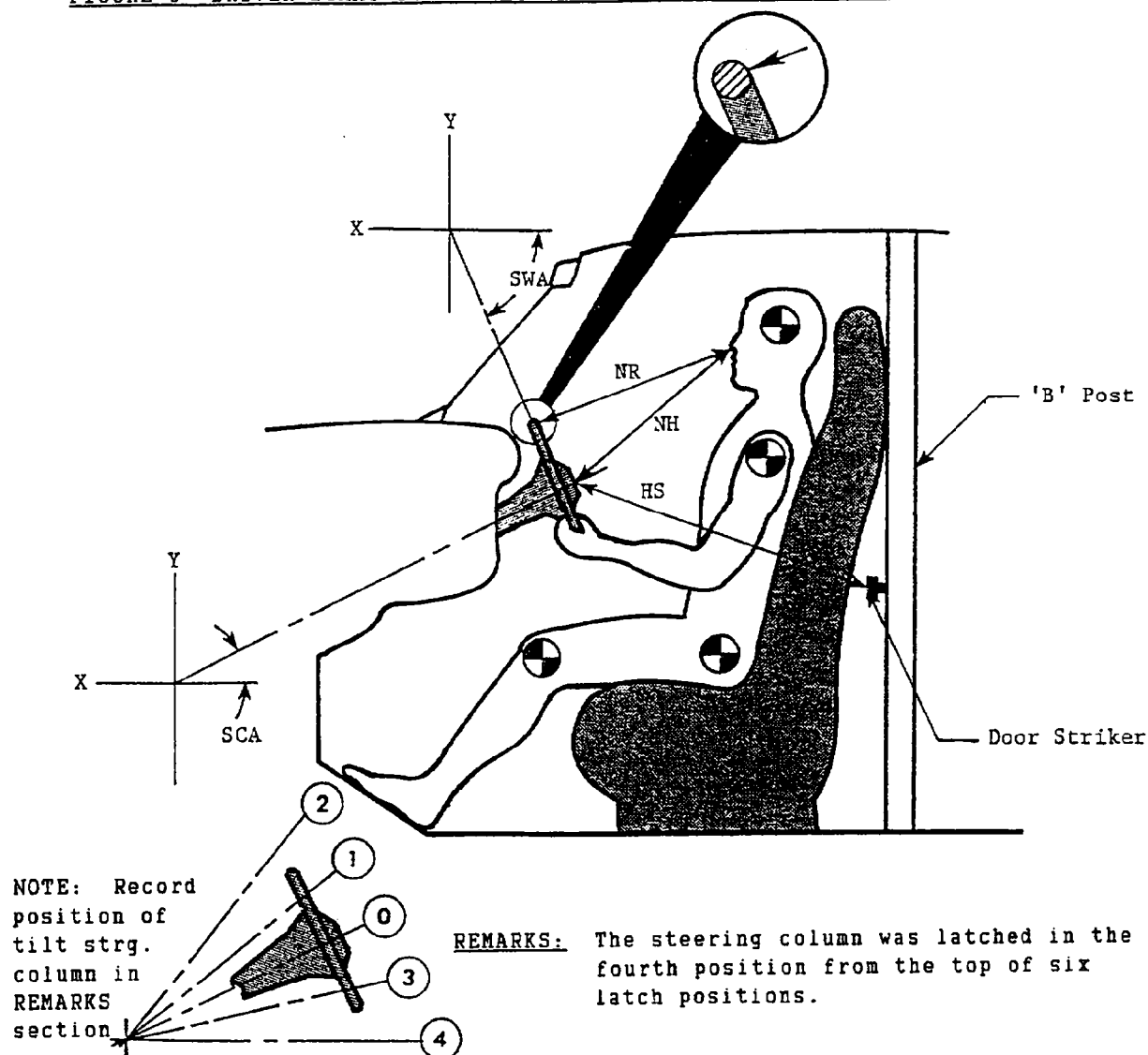
Passenger = 10.6

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.

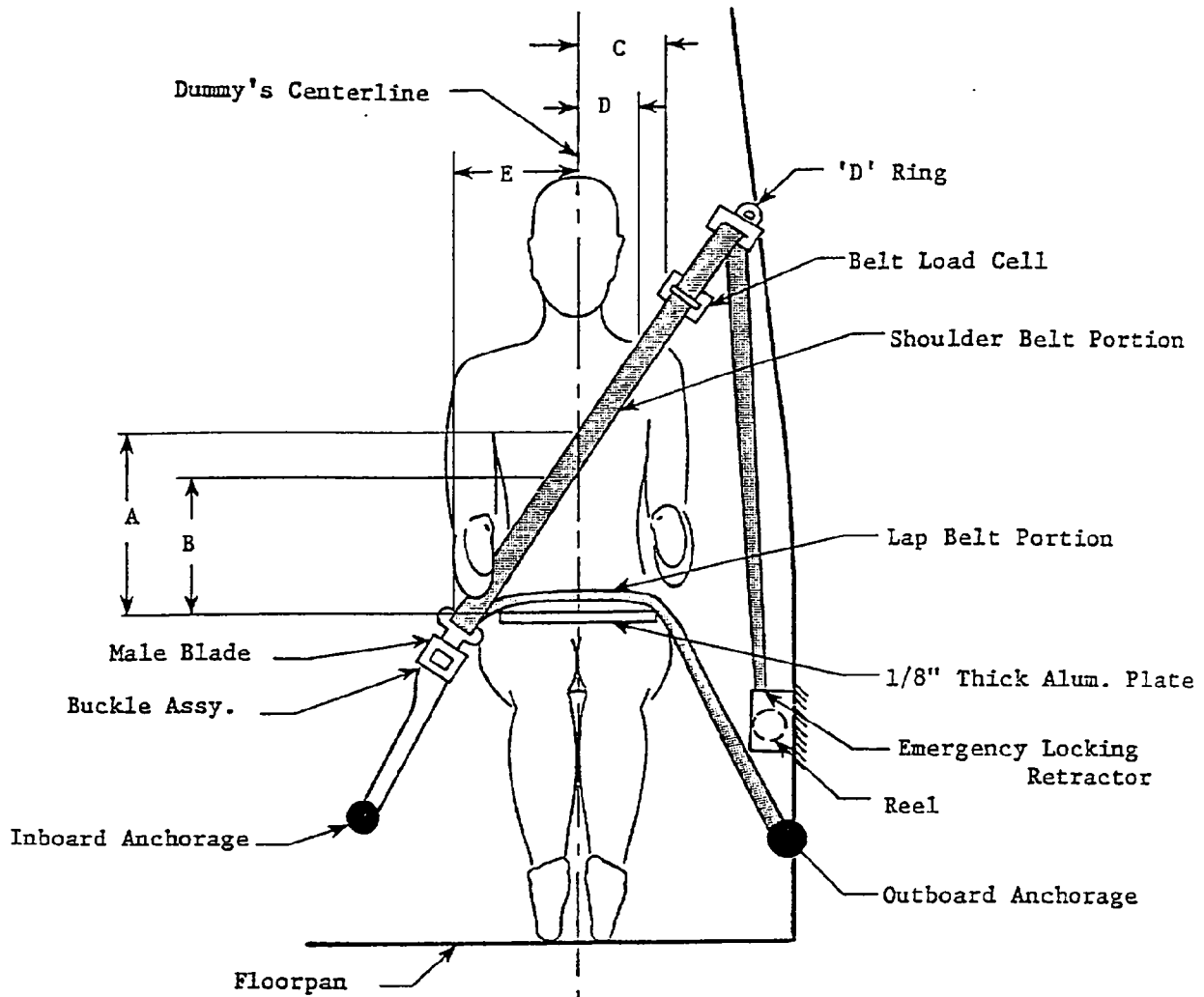
ALL DISTANCE MEASUREMENTS ARE IN INCHES.

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.)	13.6
NH	- Distance from tip of dummy's nose to center of steering column hub. (in.)	15.8
HS	- Distance from center of steering column hub to the forward surface of the door lock striker pin. (in.)	32.4
SCA	- Angle of steering column relative to the horizontal X axis	20°
SWA	- Angle of steering wheel relative to the horizontal X axis	70°

FIGURE 9 SEAT BELT POSITIONING DATA



	DRIVER DUMMY	PASSENGER DUMMY
A - Top surface of alum. plate to belt upper edge (in)	12.9	14.1
B - Top surface of alum. plate to belt lower edge (in)	9.5	10.5
C - Dummy centerline to outer edge of belt at chest flesh top (in)	4.8	4.4
D - Dummy centerline to inner edge of belt at chest flesh top (in)	2.6	2.1
E - Dummy centerline to intersection of upper torso belt and lap belt (in)	7.2	7.2

TABLE 7 FMVSS 208 COMFORT AND CONVENIENCE DATA

VEHICLE VIN: 1G2WJ14W7KF258970 NHTSA NO: CK0108
MAKE: Pontiac MODEL: Grand Prix
VEHICLE BUILD DATE: 11/88 VEHICLE TYPE: 2-door coupe
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 POSITON BELTS HAVE TENSION - RELIEVING DEVICES?

 Yes

MAXIMUM SLACK RECOMMENDED IN OWNER'S MANUAL: 1.0 INCH.

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

TABLE 7 FMVSS 208 COMFORT AND CONVENIENCE DATA CONT'D

VEHICLE VIN: 1G2WJ14W7KF258970 NHTSA NO: CK0108

MAKE: Pontiac MODEL: Grand Prix

VEHICLE BUILD DATE: 11/88 VEHICLE TYPE: 2-door coupe

FRONT OUTBOARD SEATING POSITIONS SEAT BELT TYPE:

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

BELT CONTACT FORCE: NA, vehicle's restraint system included a belt
tension-relieving device.

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 = 6 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

Symbol 101-80 X

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

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

TABLE 10 FMVSS NO. 208 - READINESS INDICATOR DATA

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

TABLE 11 SUMMARY OF FMVSS 301 DATA

PRE-IMPACT DATA

MAKE/MODEL: Pontiac/Grand Prix

BODY STYLE: 2-door coupe

MODEL YEAR: 1989

NHTSA NO.: CK0108

COLOR: blue

DATA FROM CERTIFICATION LABEL

VEHICLE MANUFACTURER: General Motors Corporation

DATE OF MANUFACTURE: 11/88

VIN: 1G2WJ14W7KF258970

GVWR: 4113 LBS., GAWR: FRONT 2279 LBS., REAR 1834 LBS.

POST-IMPACT DATA

TYPE OF TEST: Frontal Barrier Impact

DATE OF TEST: 2/06/89

TIME: 1510

TEMP: 73°F

REQUIRED IMPACT VELOCITY RANGE: 28.9 MPH TO 29.9 MPH

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

TEST WEIGHT = 3612 LBS., STATIC CRUSH MAX. = 16.6 IN., REBOUND = 24.7 IN.

FUEL SYSTEM DATA

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

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: 16.6 GALLONS (FURNISHED BY COTR)

TEST VOLUME: 15.4 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 and enters the
rear of the tank. The fuel lines run along the vehicle's left side.

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

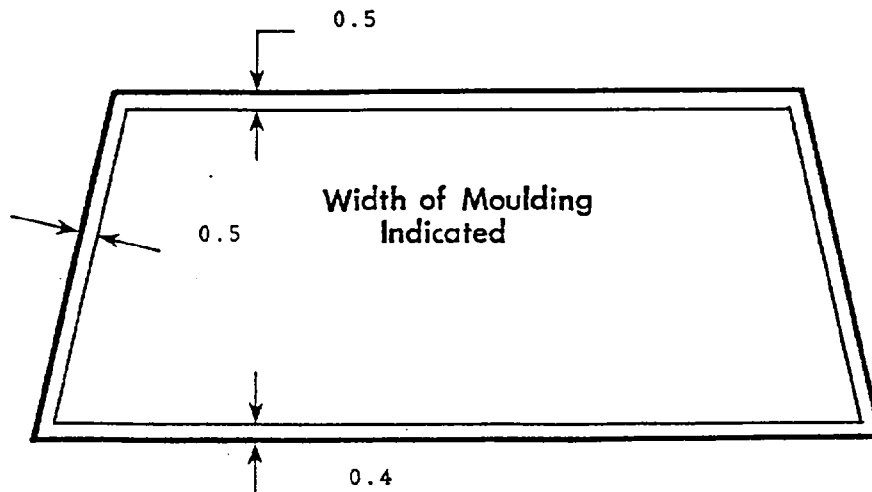
Details of windshield mounting such as retention method, trim type, etc.:

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	86.4	86.4	100%
LEFT SIDE	86.4	86.4	100%
TOTAL	172.8	172.8	100%

AREA OF RETENTION FAILURE:



FAILURE DETAILS: None

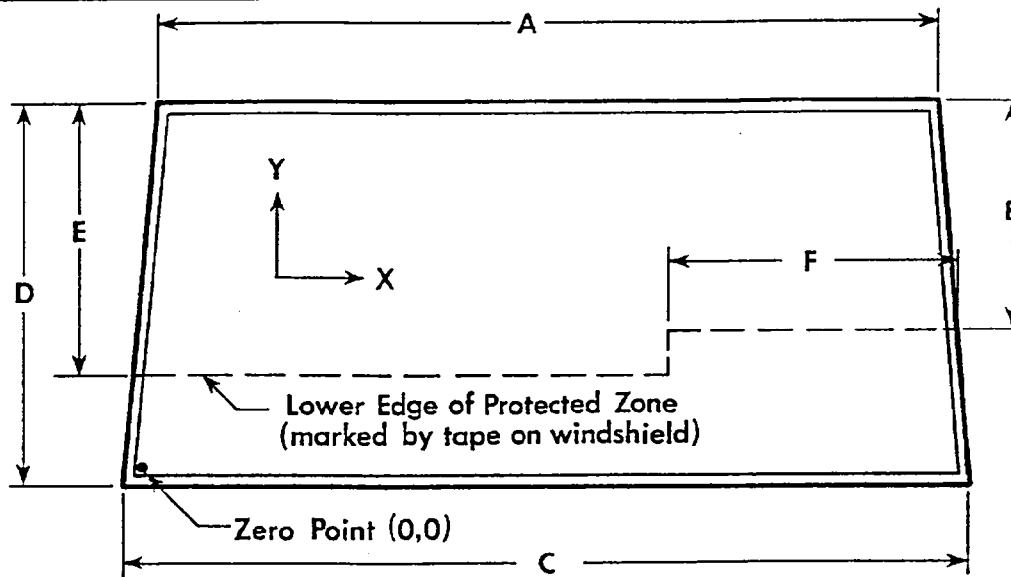
Windshield Temperature: 72° F

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 = 51.0	C = 71.0	E = 22.4
B = 19.1	D = 29.0	F = 27.5

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

COORDINATES
X Y

None

1.

2.

3.

ALL MEASUREMENTS ARE IN INCHES.

4.

TABLE 12 "FUEL SYSTEM INTEGRITY" POST-IMPACT

TEST DATA, FMVSS NO. 301

TEST VEHICLE NHTSA NO.: CK0108; TEST DATE: 2/06/89

VEH. MFR./MAKE/MODEL: General Motors Corporation/Pontiac/Grand Prix

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.

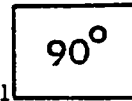
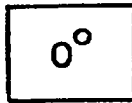
SOLVENT SPILLAGE DETAILS:

None

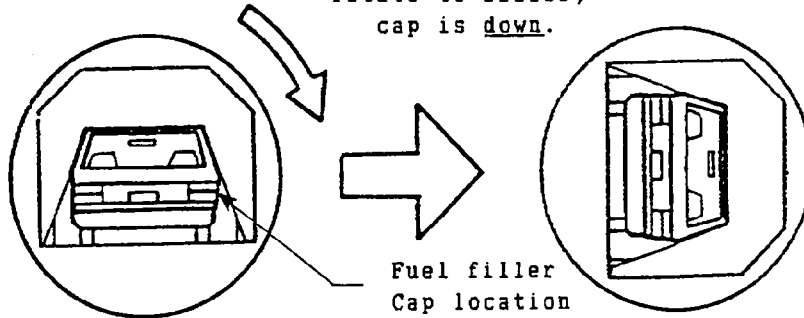
FIGURE 12 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

NHTSA NO.: CK0108

TEST PHASE



NOTE: If side fill
rotate to filler,
cap is down.



Fuel filler
Cap location

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

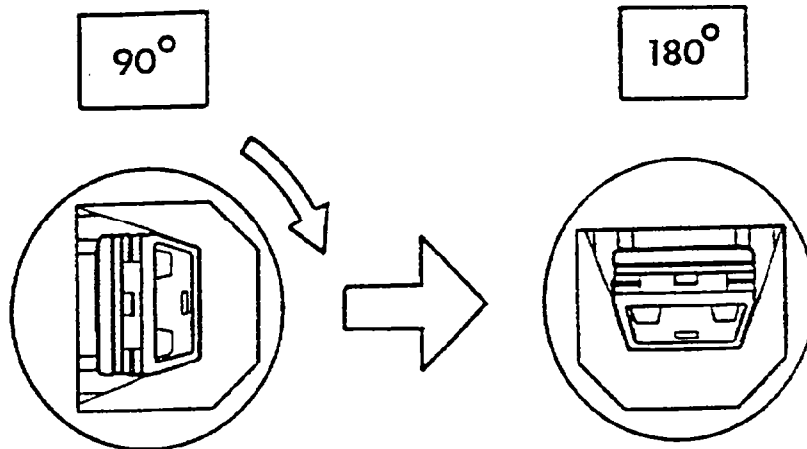
	First 5 minutes FROM ONSET OF ROTATION	6th Minute	7th Minute
Maximum allowable solvent spillage - -	<u>5 oz.</u>	<u>1 oz.</u>	<u>1 oz.</u>
0 to 90° (filler cap down) - - - - -	<u>0 oz.</u>	<u>0 oz.</u>	<u>0 oz.</u>

SOLVENT SPILLAGE LOCATION(S)

None

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

NHTSA NO.: CK0108
TEST PHASE



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

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

FMVSS 301 position hold time = 5 minutes, 00 seconds

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

Next whole minute interval - - - - = 14 minutes

FMVSS 301 REQUIREMENTS

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

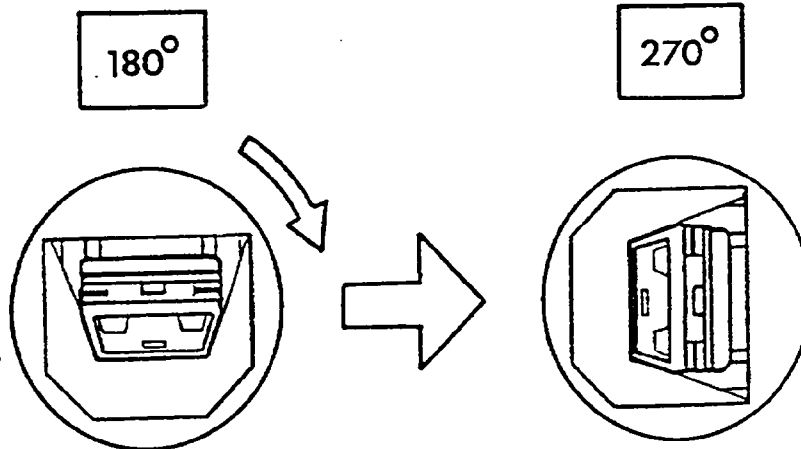
SOLVENT SPILLAGE LOCATION(S)

None

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

NHTSA NO.: CK0108

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

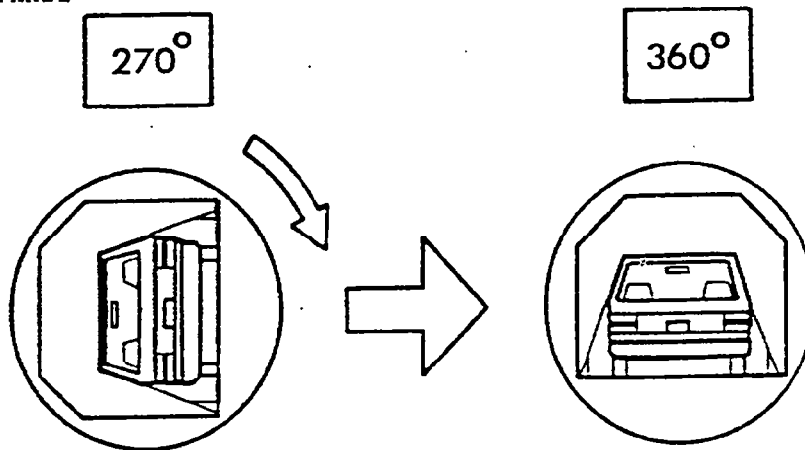
	First 5 minutes	6th	7th
	FROM ONSET OF ROTATION	Minute	Minute
Maximum allowable solvent spillage - -	<u>5 oz.</u>	<u>1 oz.</u>	<u>1 oz.</u>
180° to 270° - - - - -	<u>0 oz.</u>	<u>0 oz.</u>	<u>0 oz.</u>

SOLVENT SPILLAGE LOCATION(S)

None

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

NHTSA NO.: CK0108
TEST PHASE



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

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

FMVSS 301 position hold time = 5 minutes, 00 seconds

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

Next whole minute interval - - - - = 28 minutes

FMVSS 301 REQUIREMENTS

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

SOLVENT SPILLAGE LOCATION(S)

None

SECTION 3.0

CAMERA INFORMATION

FIGURE 13 CAMERA POSITIONS

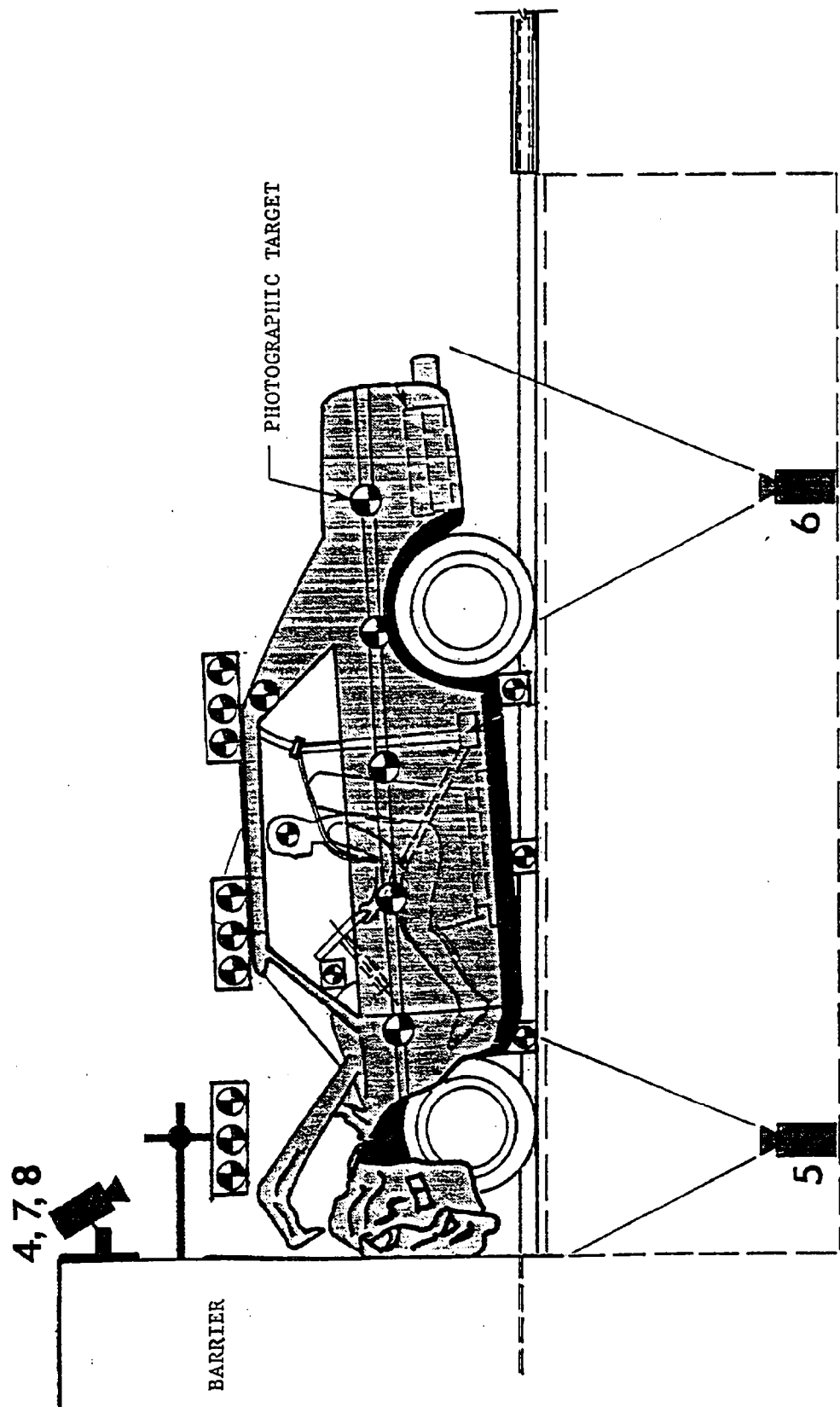


FIGURE 13 CAMERA POSITION CONT'D

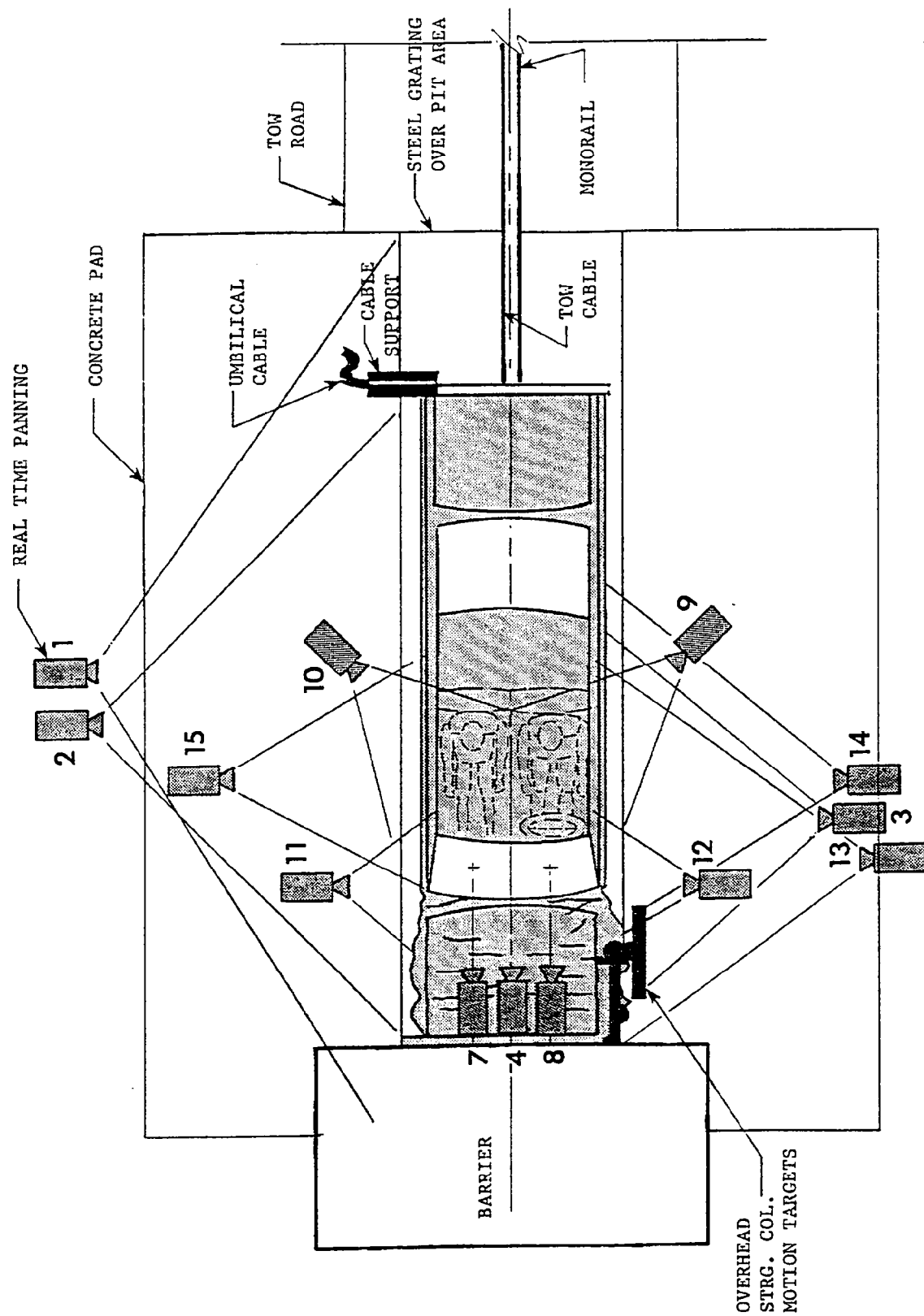


TABLE 13 HIGH SPEED CAMERA LOCATIONS

TEST NO.: 890206		VEHICLE: 1989 Pontiac Grand Prix 2-door coupe			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	225.0	25	493
4	Windshield damage	-6.0	0.0	89.0	-40	NA	13	498
5	Crush & fluid spillage	-50.5	0.0	-92.4	90	NA	13	999
6	Fluid spillage	-99.3	0.0	-99.0	90	NA	13	999
7	Passenger kinematics	-4.5	-13.8	93.0	-50	NA	17	495
8	Driver kinematics	-6.8	14.5	93.0	-50	NA	17	505
9	Driver kinematics	-157.3	116.0	87.0	-27	118.5	25	495
10	Passenger kinematics	-152.1	-116.0	87.0	-26	112.0	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	498
13	Column movement	-151.0	286.0	103.0	-14	NA	25	505
14	Column movement	-151.0	286.0	75.1	-9	NA	25	498
15	Passenger kinematics	-38.8	-293.0	45.3	-4	253.0	25	510

* +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

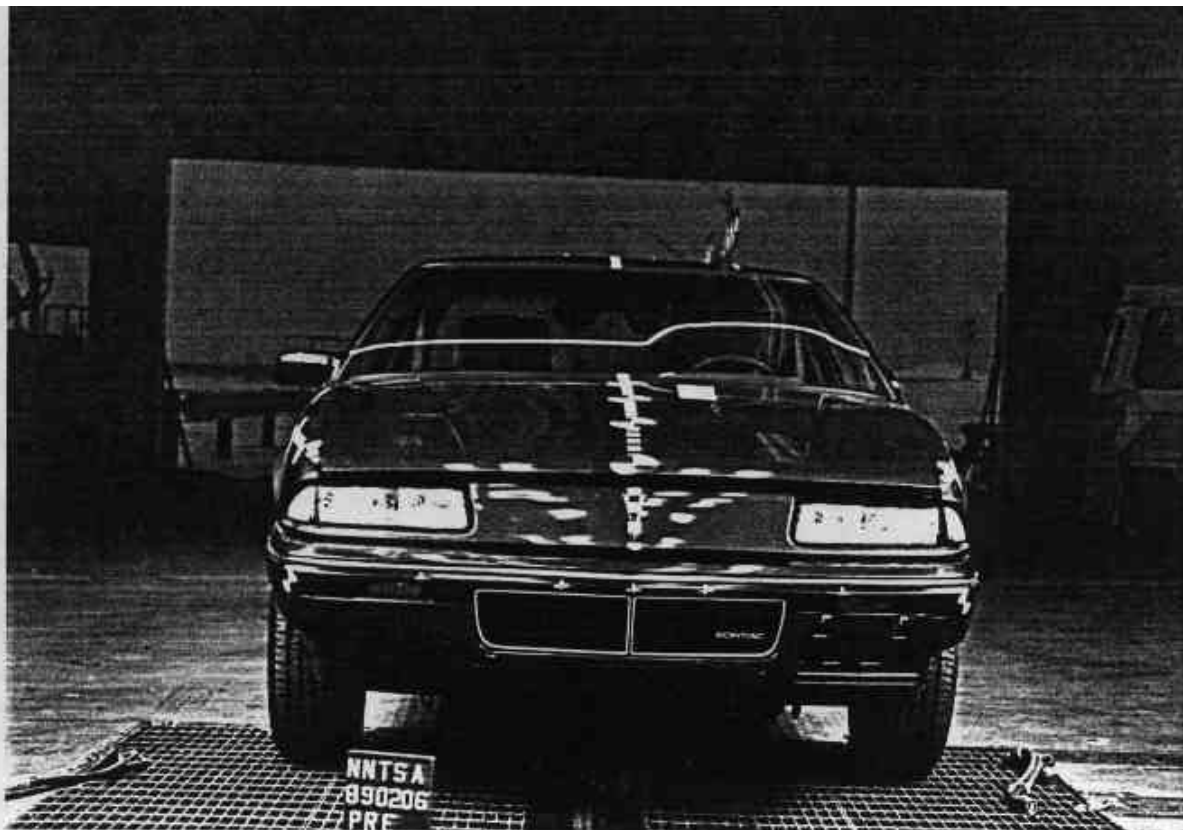


Figure A-1. PRE-TEST FRONT VIEW



Figure A-2. POST-TEST FRONT VIEW
A-2

890206



Figure A-3. PRE-TEST LEFT SIDE VIEW



Figure A-4. POST-TEST LEFT SIDE VIEW

A-3

890206

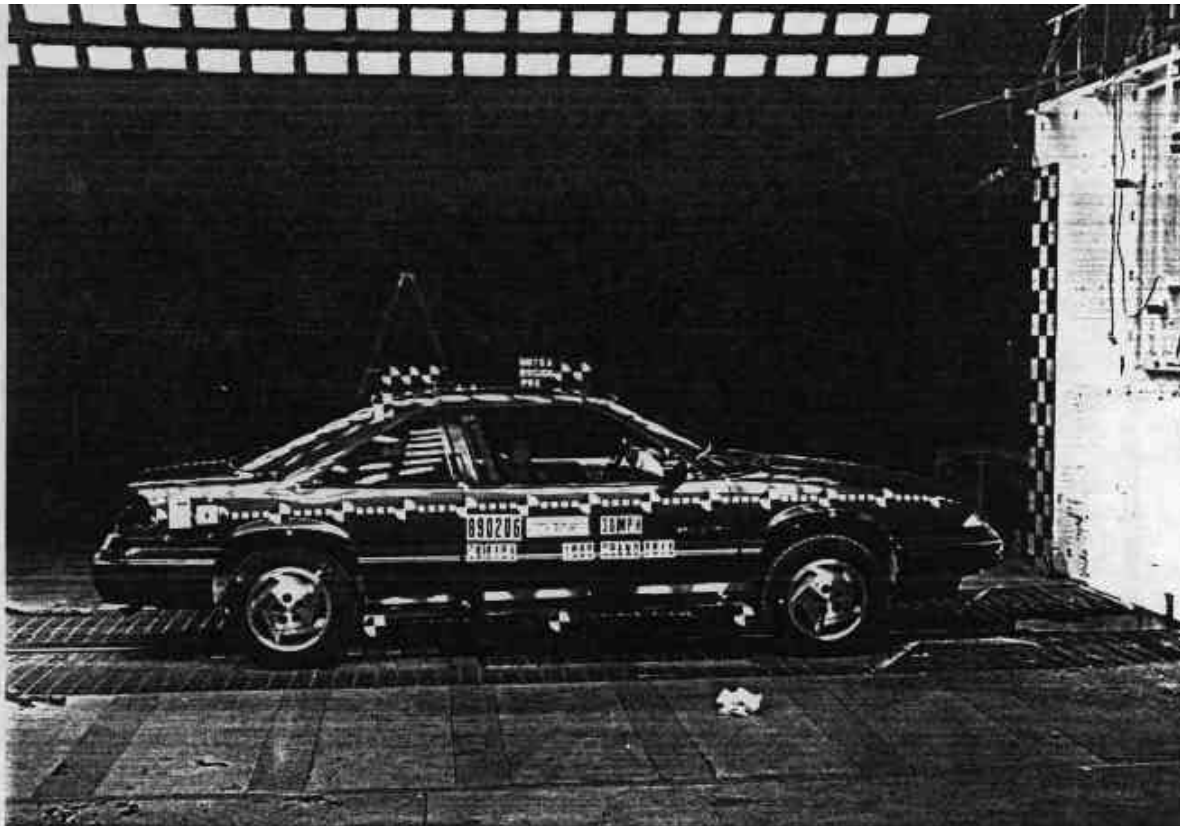


Figure A-5. PRE-TEST RIGHT SIDE VIEW

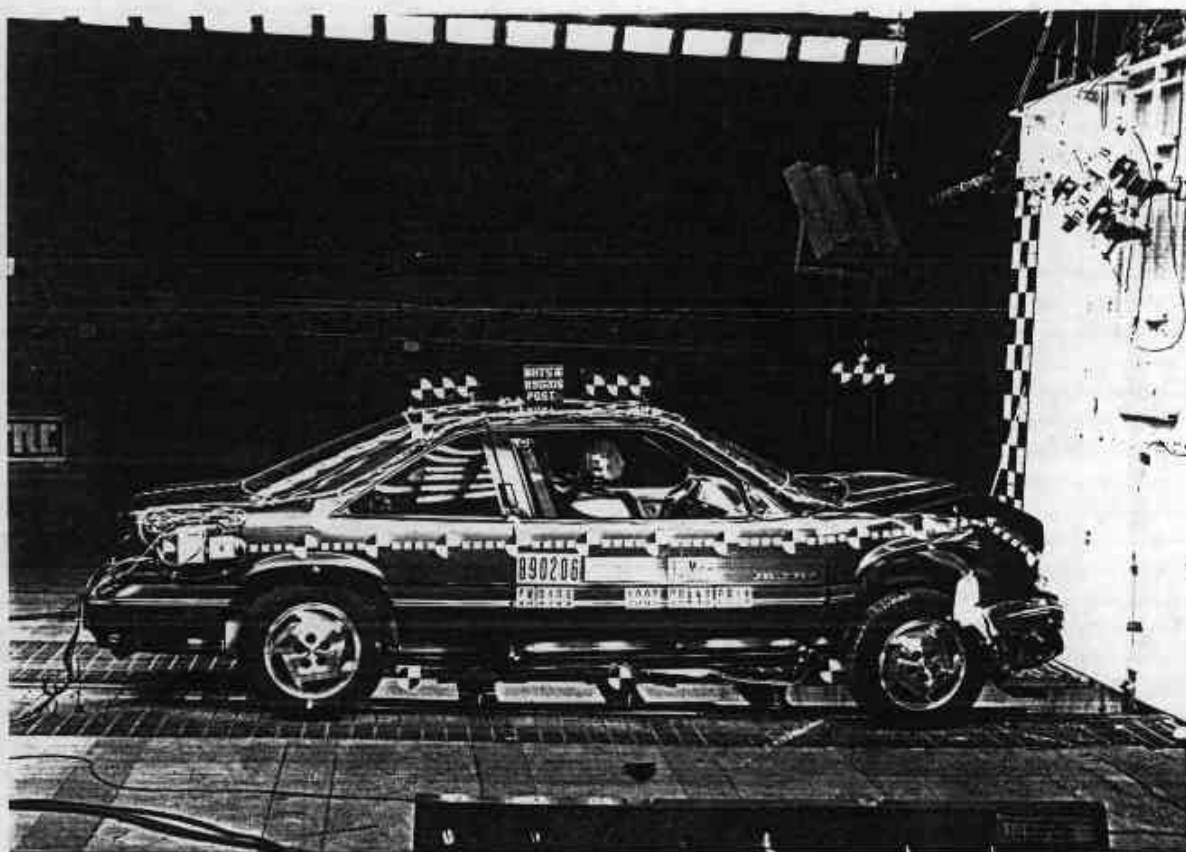


Figure A-6. POST-TEST RIGHT SIDE VIEW
A-4

890206

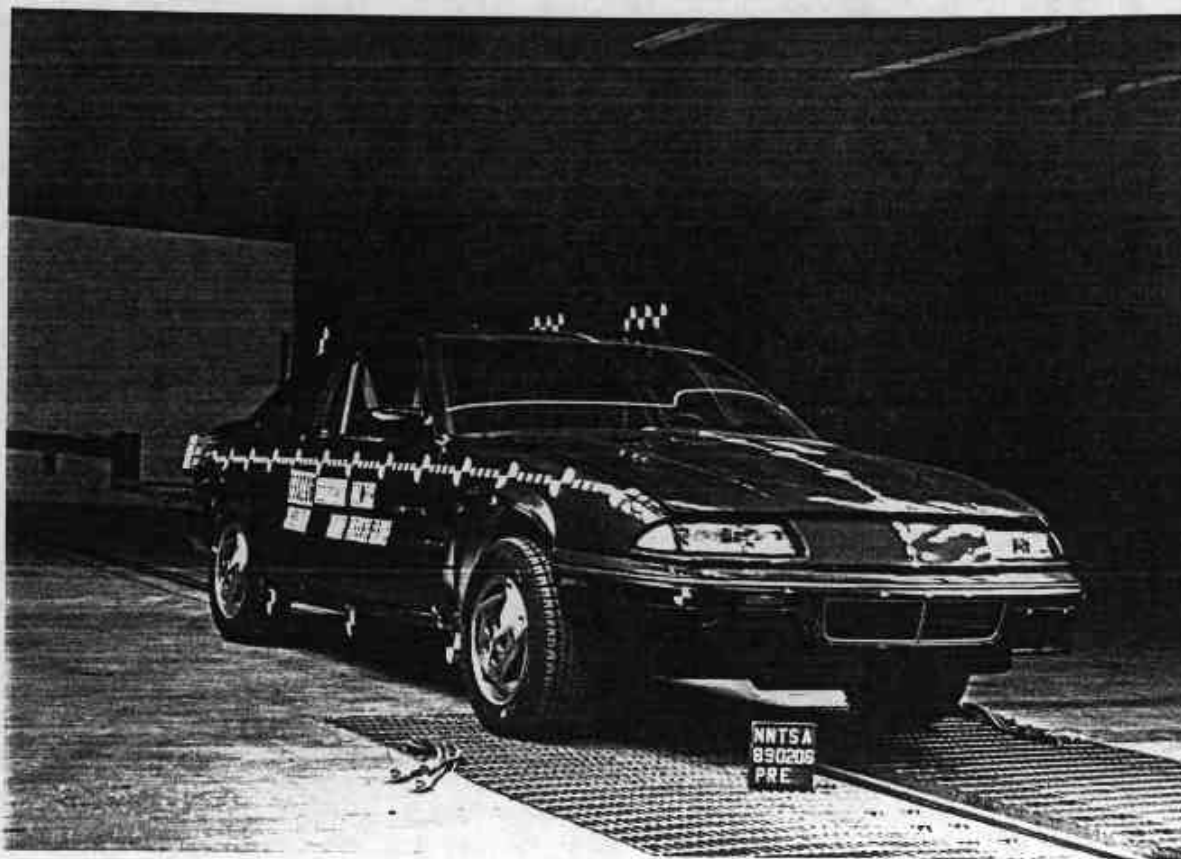


Figure A-7. PRE-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-8. POST-TEST RIGHT FRONT THREE-QUARTER VIEW
A-5

890206

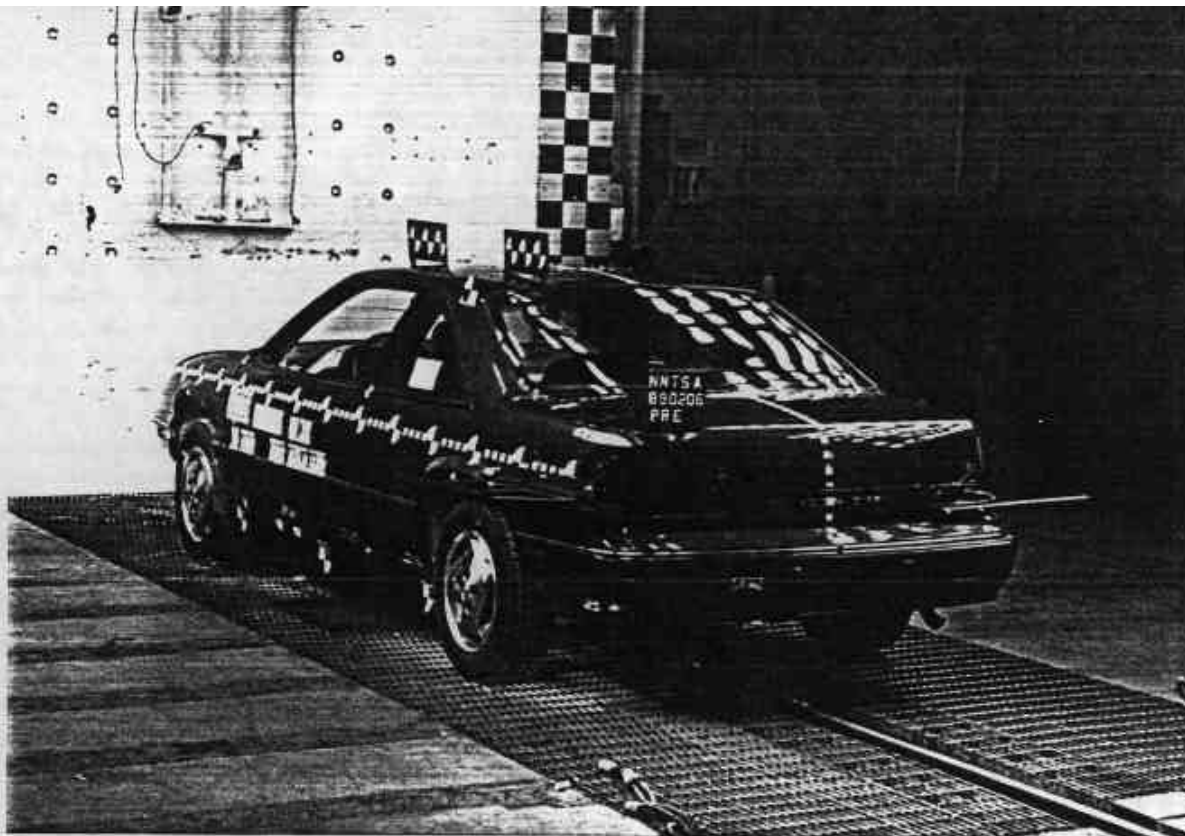


Figure A-9. PRE-TEST LEFT REAR THREE-QUARTER VIEW



Figure A-10. POST-TEST LEFT REAR THREE-QUARTER VIEW
A-6

890206

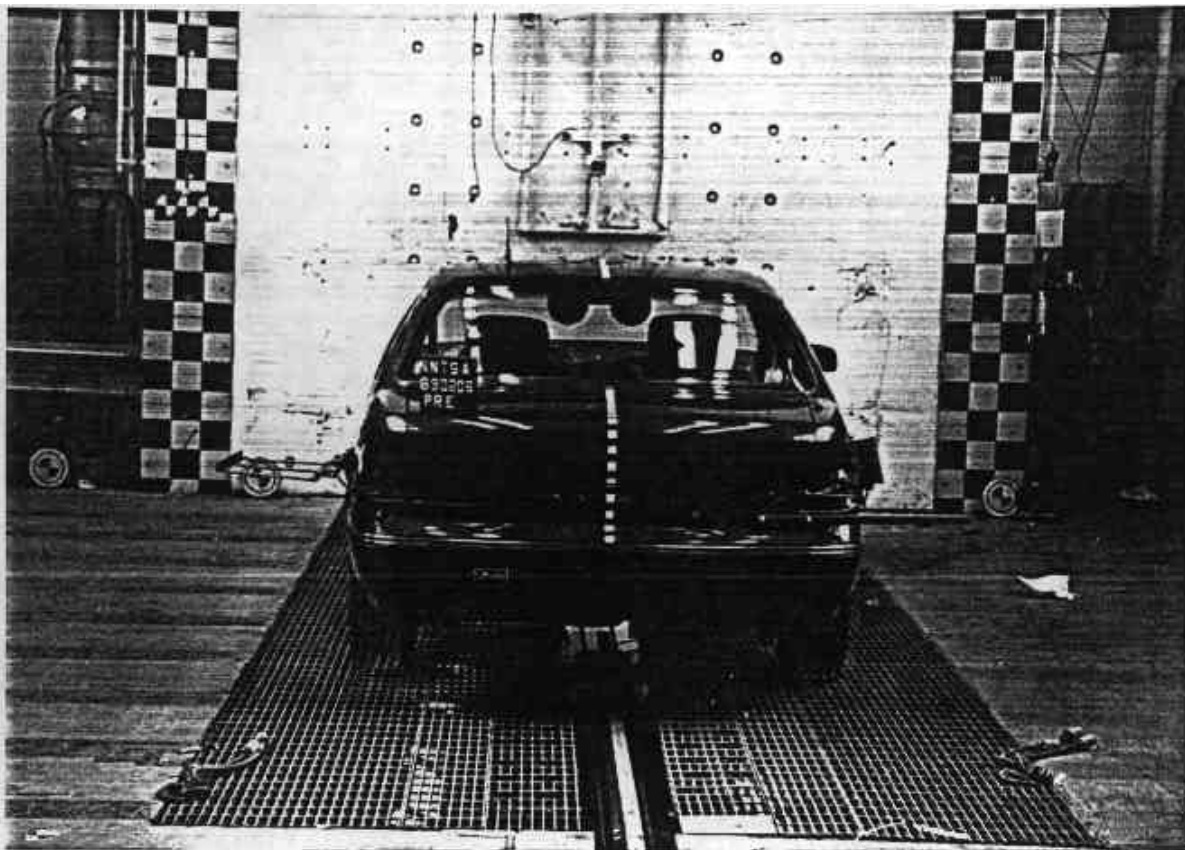


Figure A-11. PRE-TEST REAR VIEW

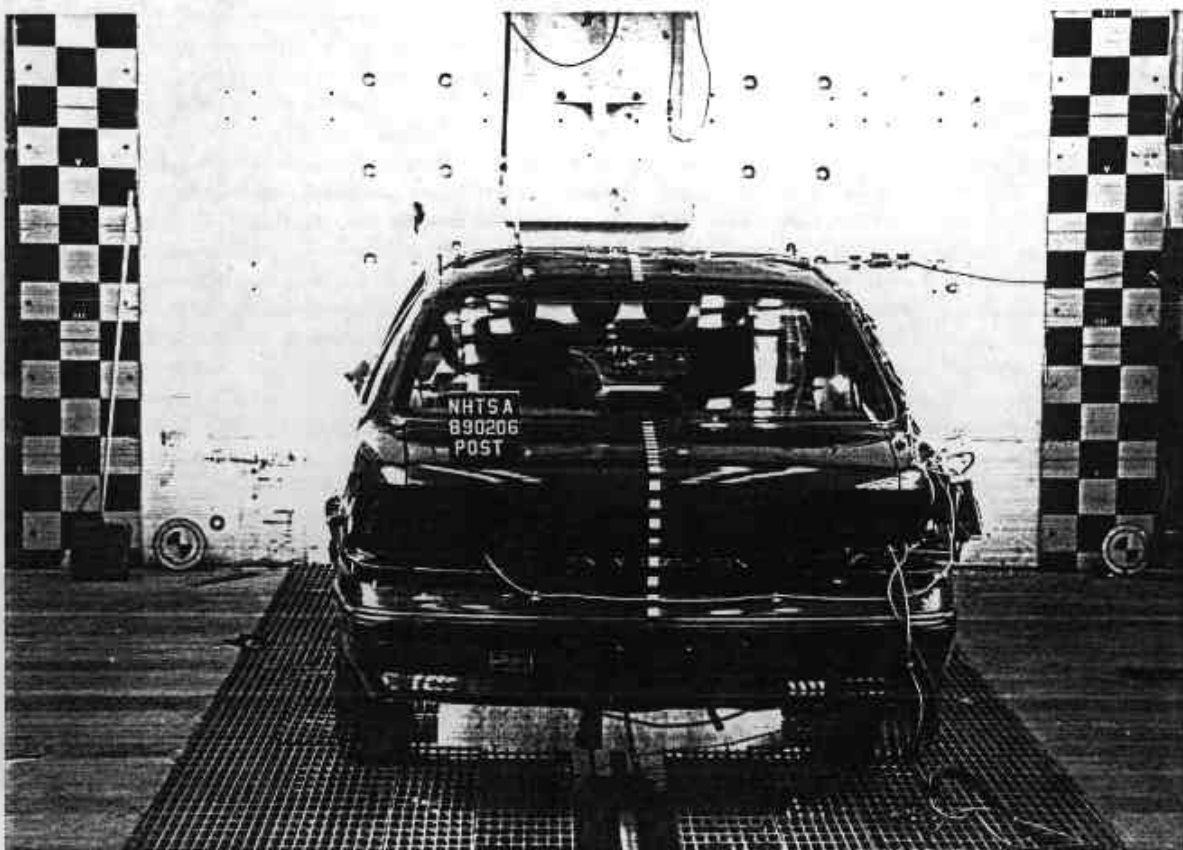


Figure A-12. POST-TEST REAR VIEW
A-7

890206

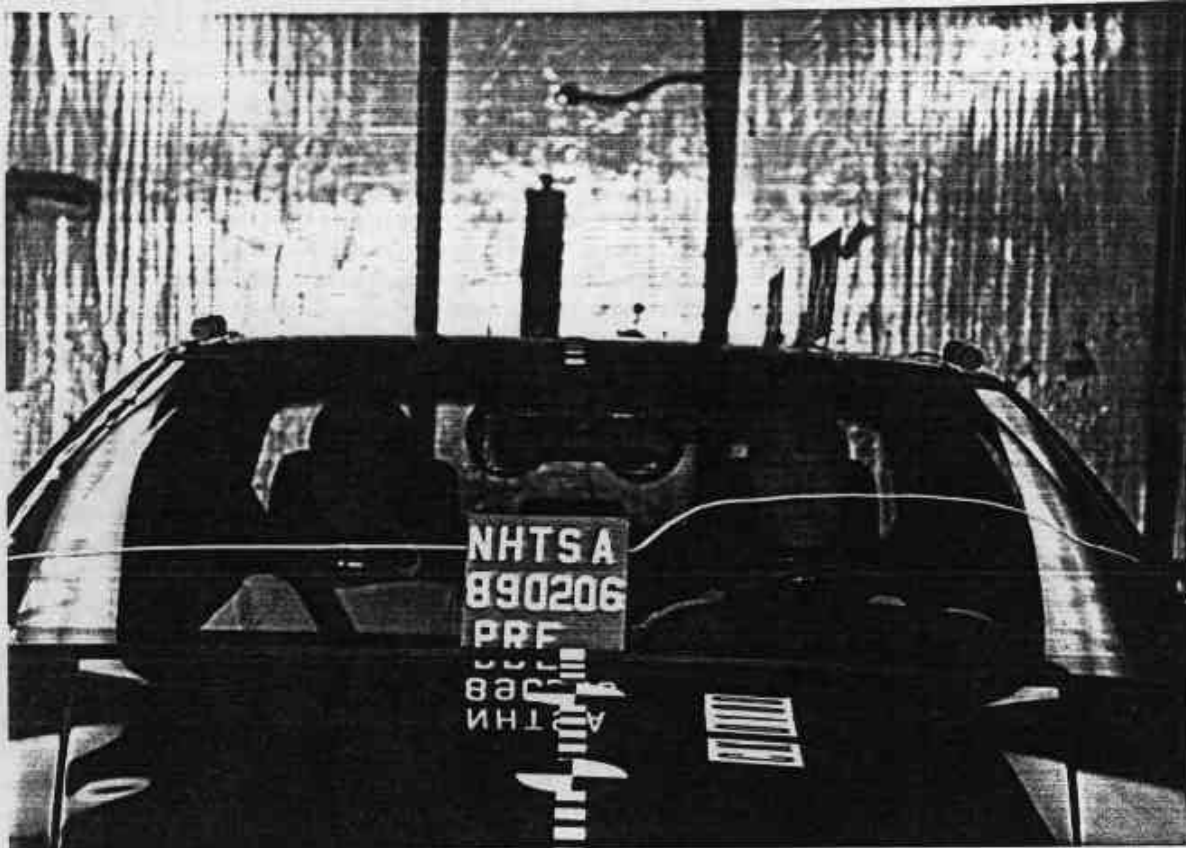


Figure A-13. PRE-TEST WINDSHIELD VIEW



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

890206

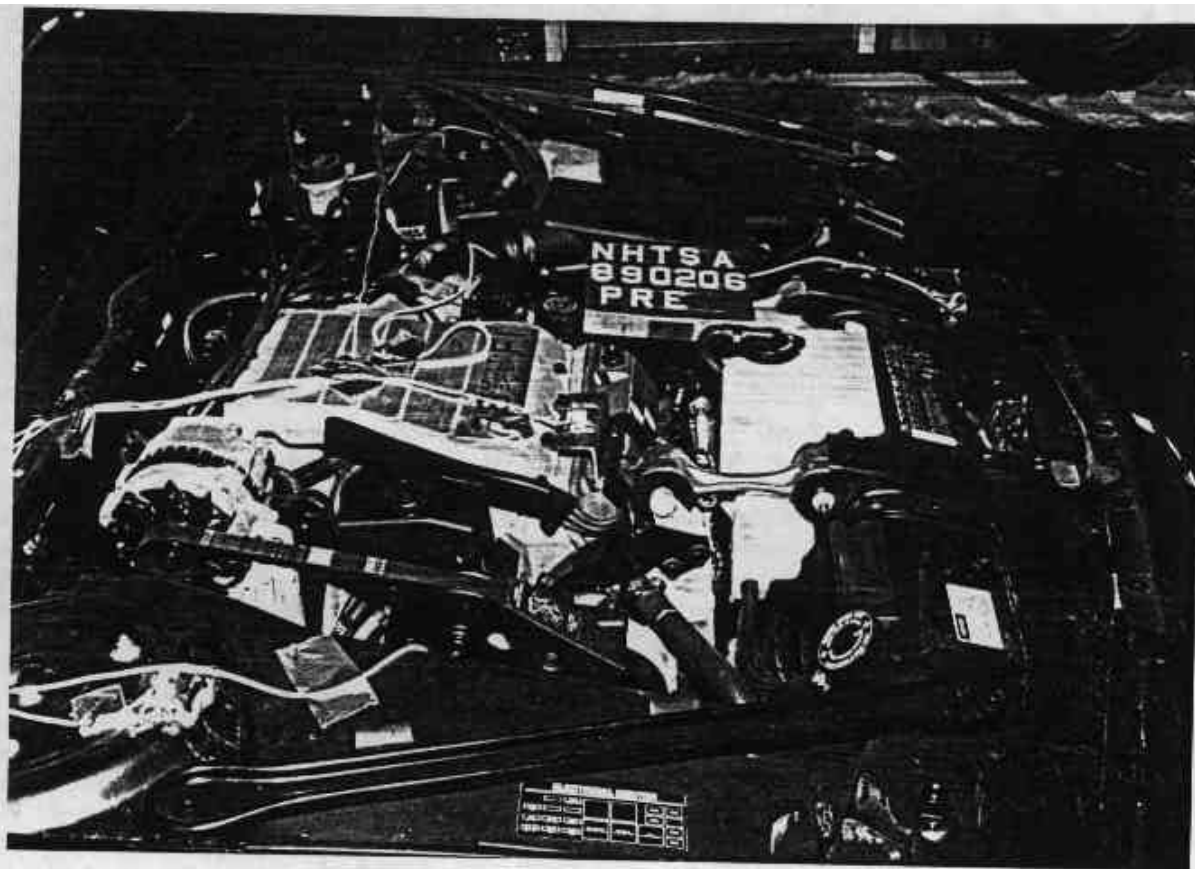


Figure A-15. PRE-TEST ENGINE COMPARTMENT VIEW

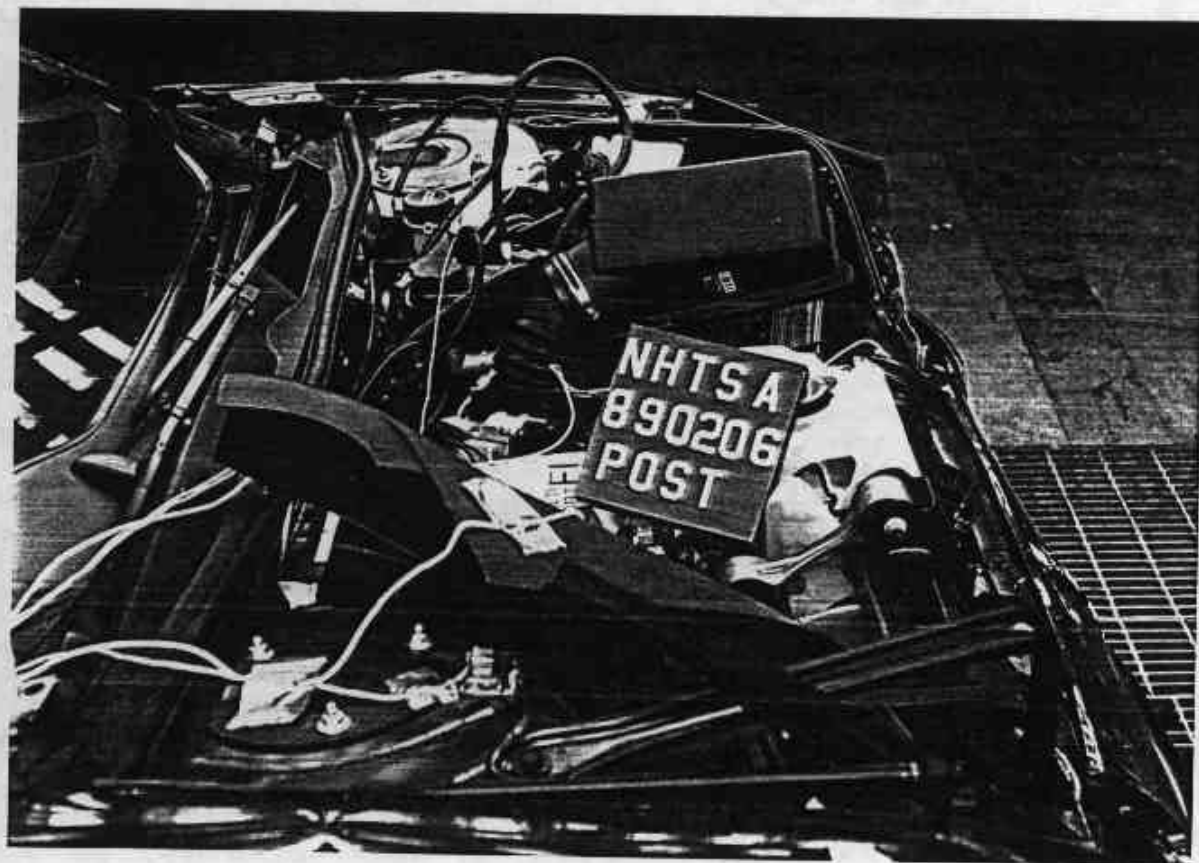


Figure A-16. POST-TEST ENGINE COMPARTMENT VIEW
A-9

890206



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



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



Figure A-19. PRE-TEST FRONT UNDERBODY VIEW

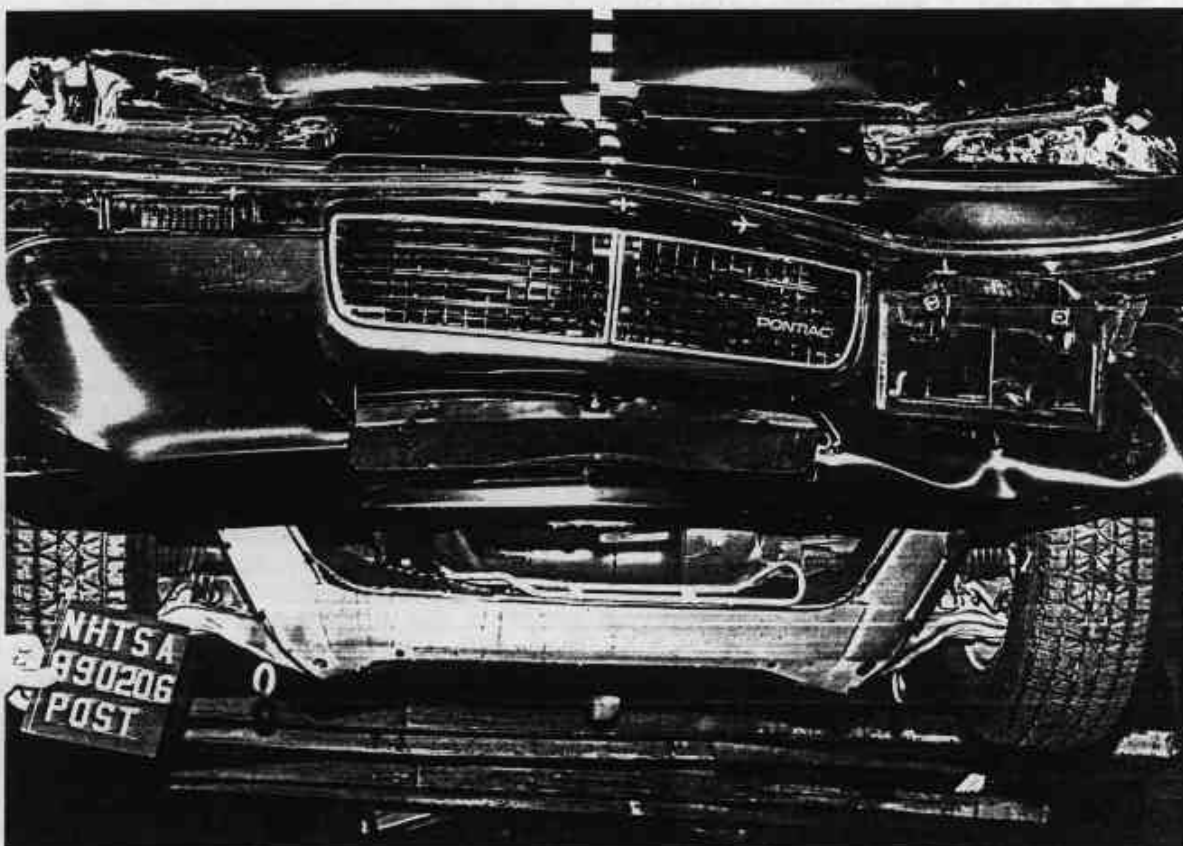


Figure A-20. POST-TEST FRONT UNDERBODY VIEW
A-11

890206

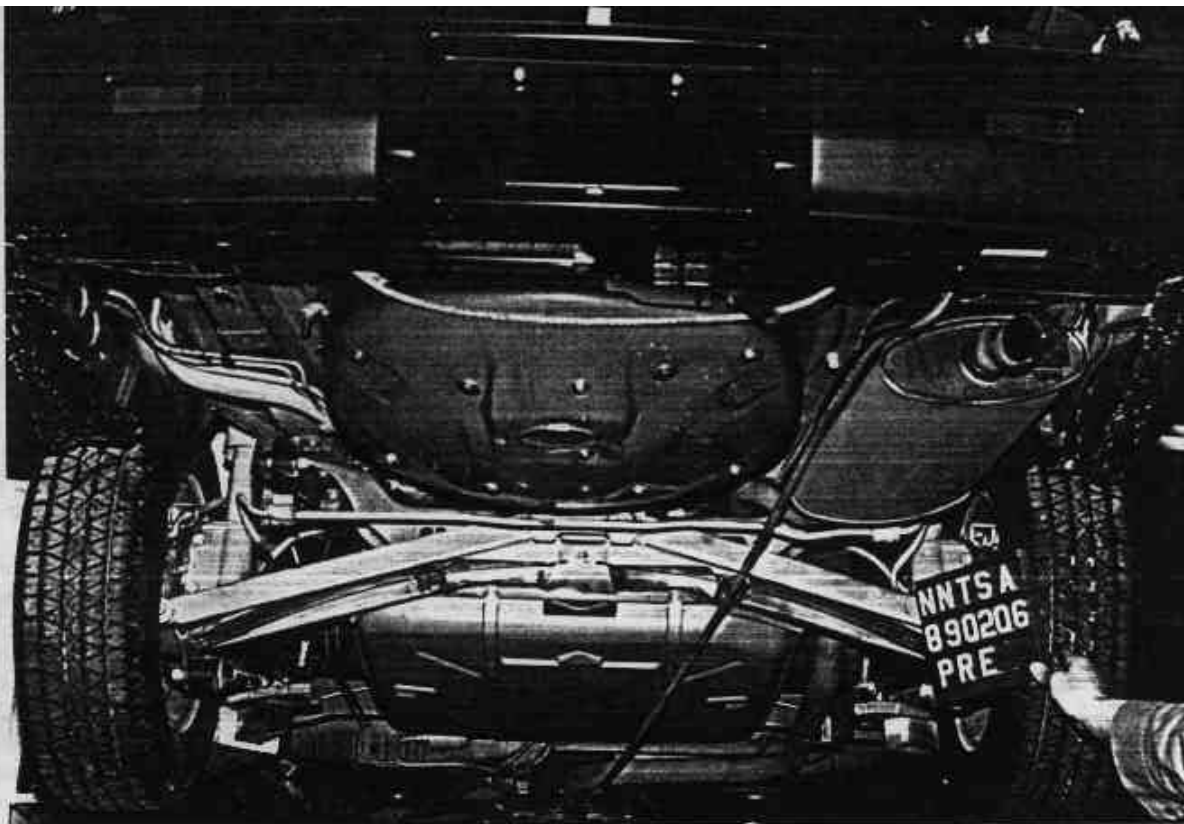


Figure A-21. PRE-TEST REAR UNDERBODY VIEW

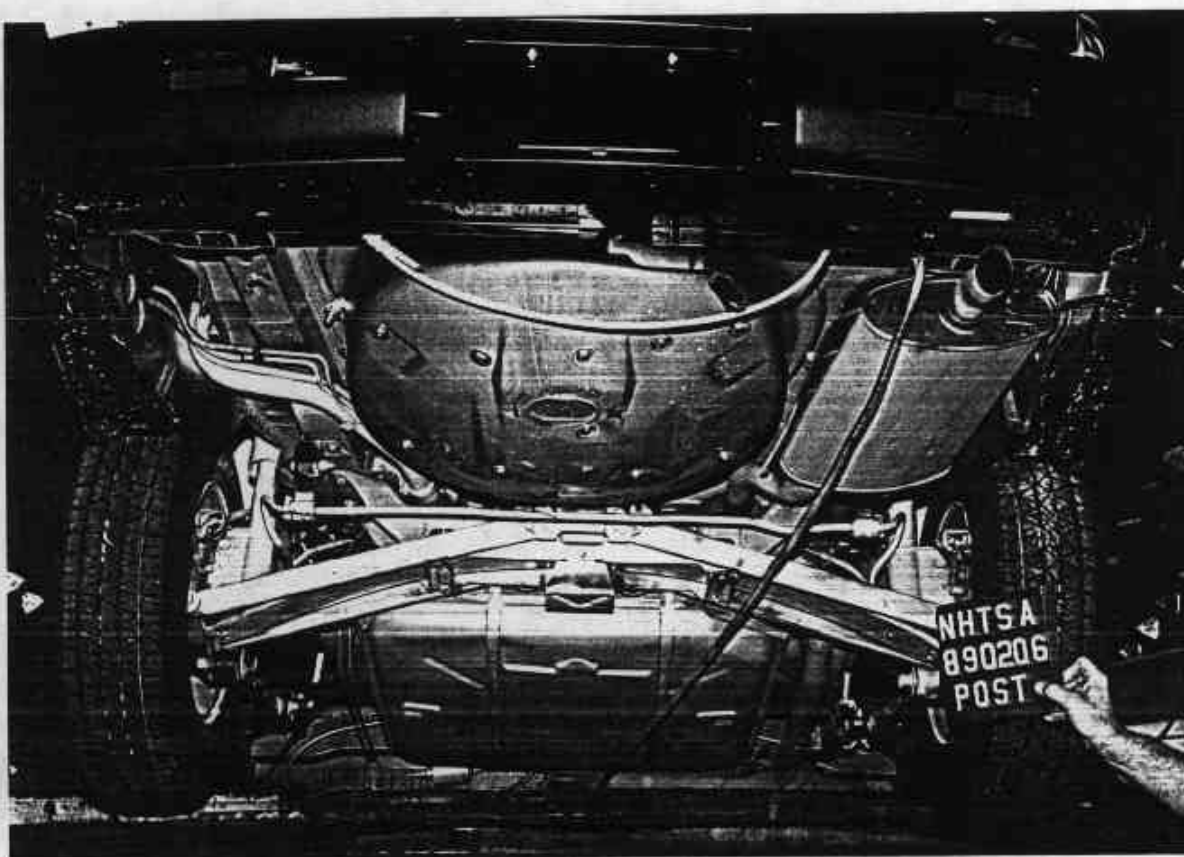


Figure A-22. POST-TEST REAR UNDERBODY VIEW
A-12

890206

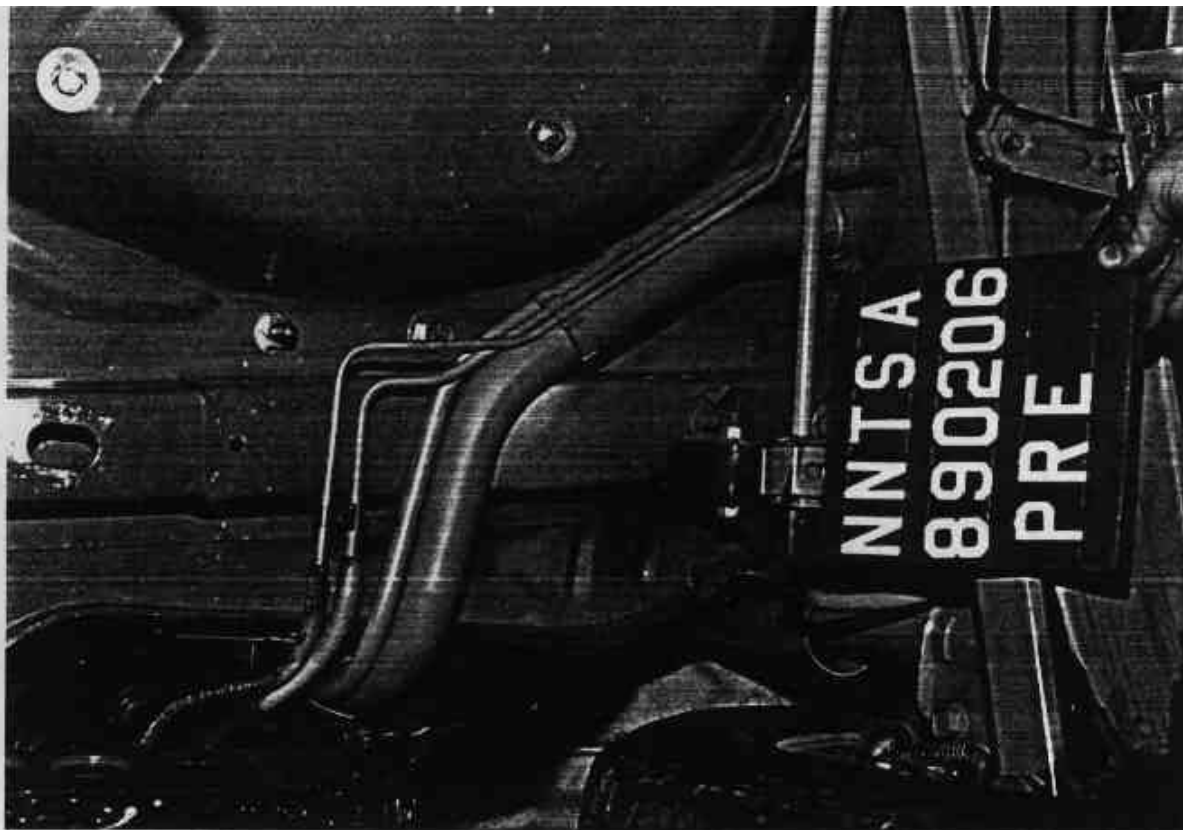


Figure A-23. PRE-TEST FUEL FILLER NECK VIEW



Figure A-24. PRE-TEST CARGO BALLAST VIEW
A-13

890206



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



Figure A-26. POST-TEST DRIVER DUMMY POSITION VIEW
A-14

890206



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



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

890206

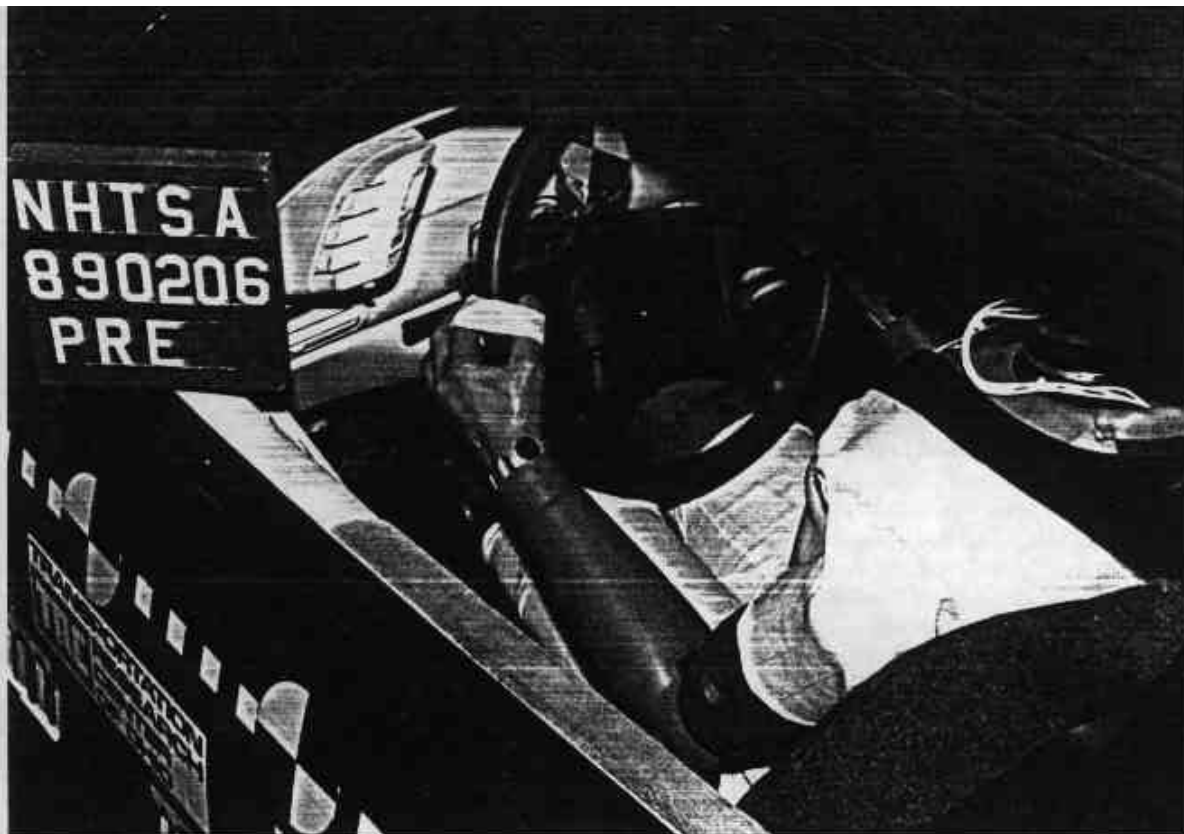


Figure A-29. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR

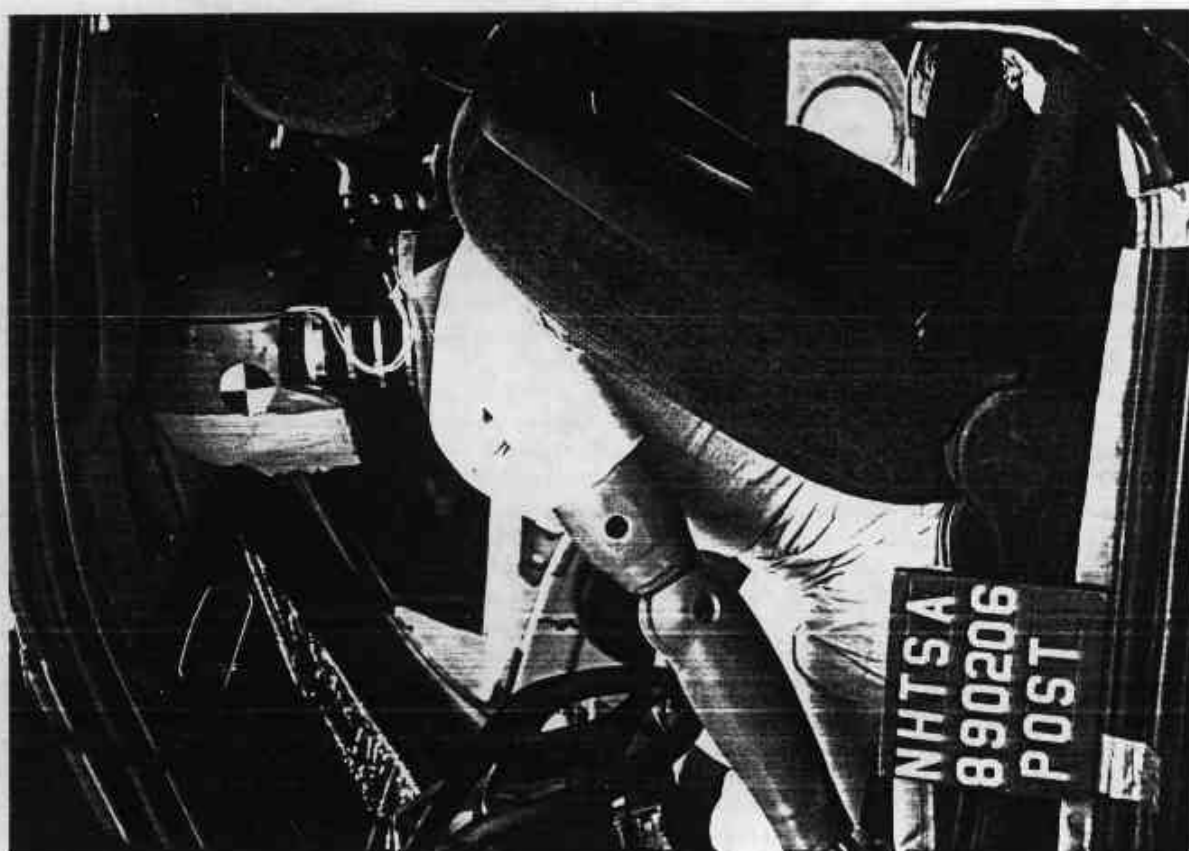


Figure A-30. POST-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1

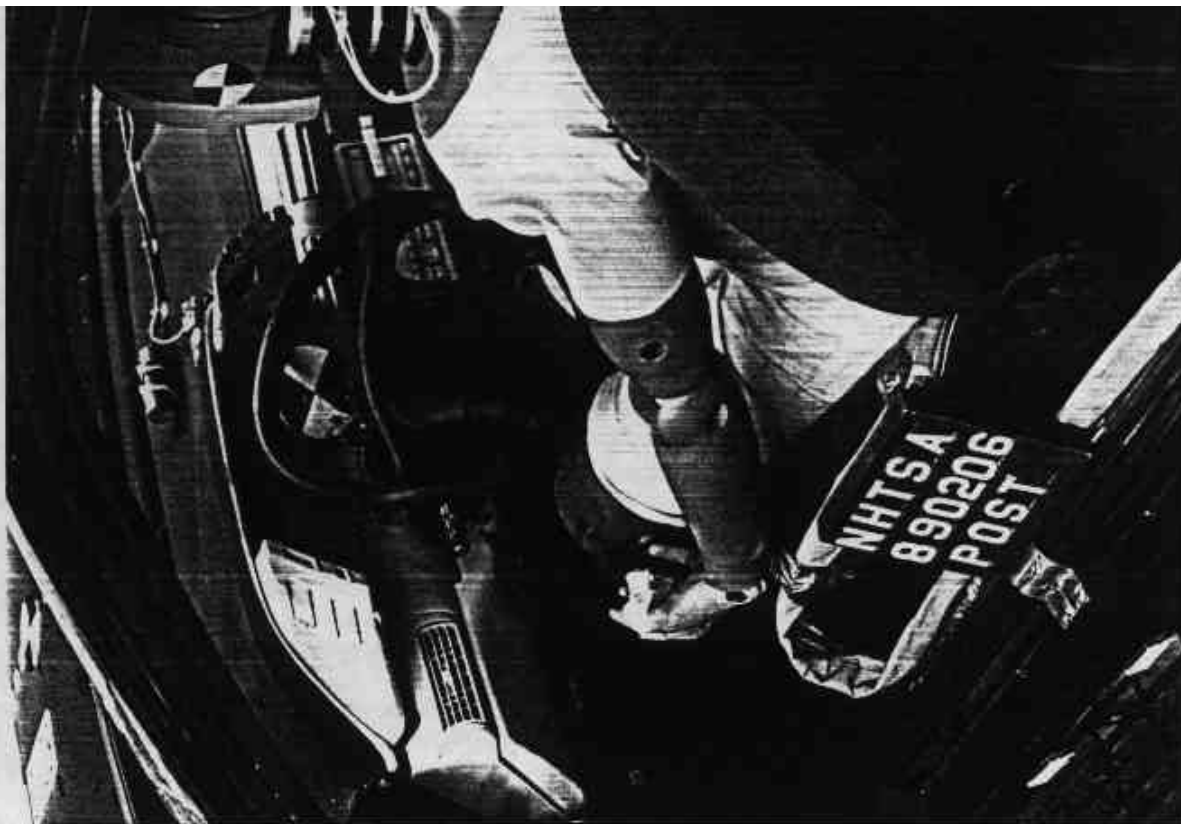


Figure A-31. PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2



Figure A-32. PRE-TEST PASSENGER DUMMY & VEHICLE INTERIOR

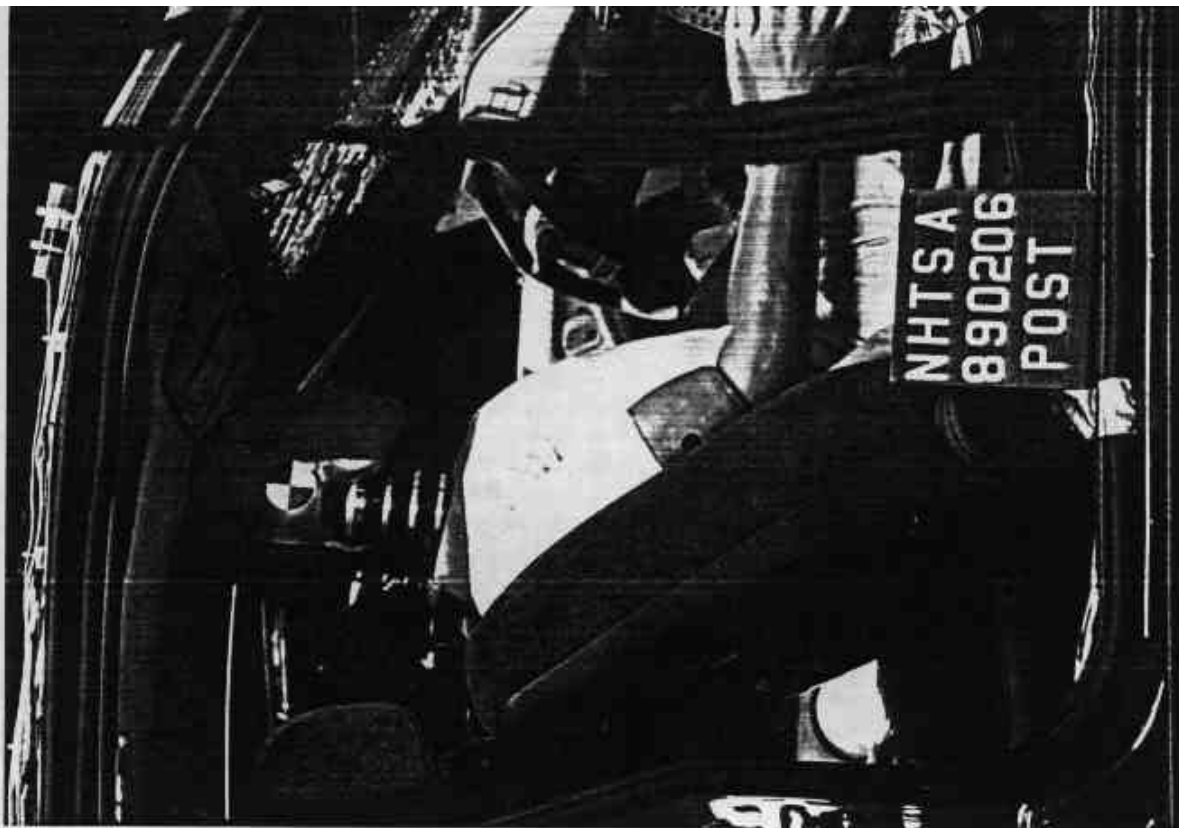


Figure A-33. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 1

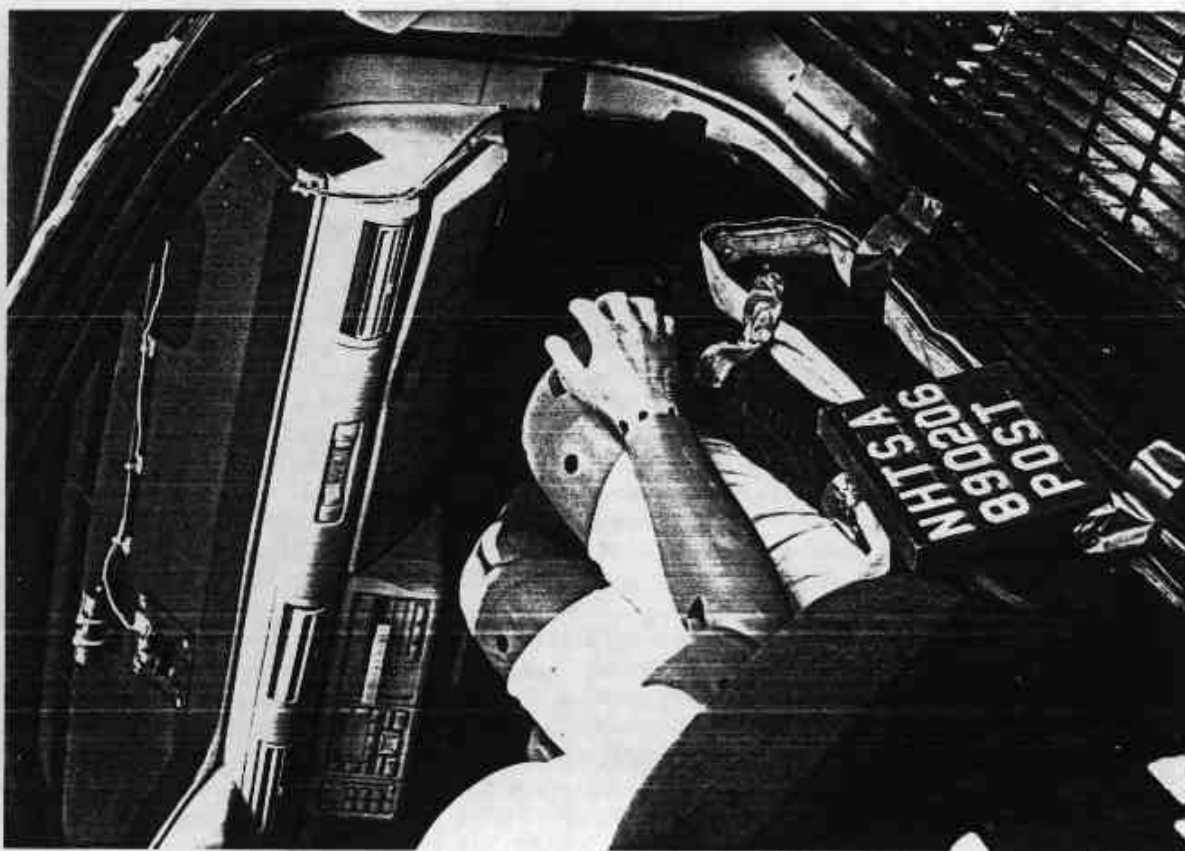


Figure A-34. POST-TEST PASSENGER DUMMY & VEHICLE INTERIOR - VIEW 2
A-18 890206



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



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



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



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

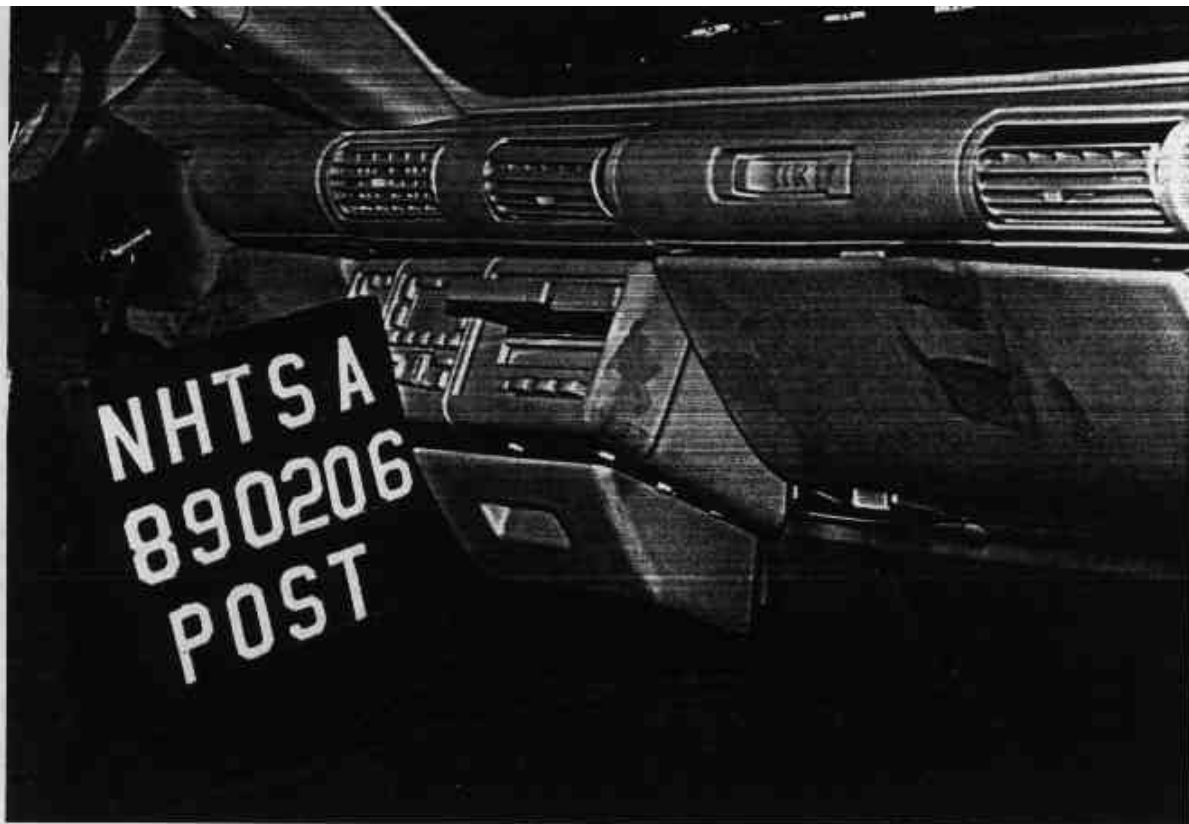


Figure A-39. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 1



Figure A-40. POST-TEST PASSENGER DUMMY KNEE CONTACT - VIEW 2

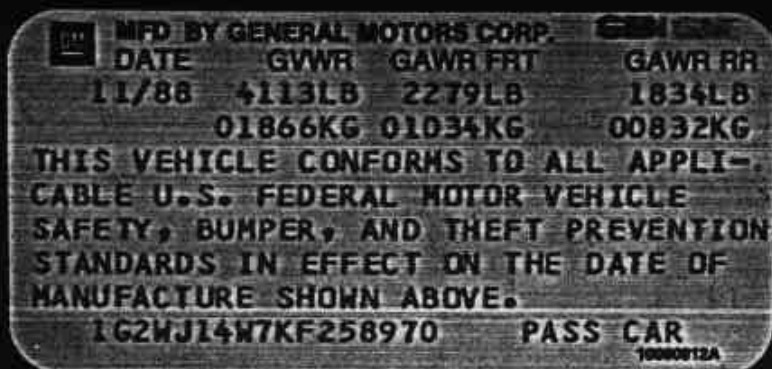


Figure A-41. PRE-TEST VEHICLE CERTIFICATION LABEL VIEW

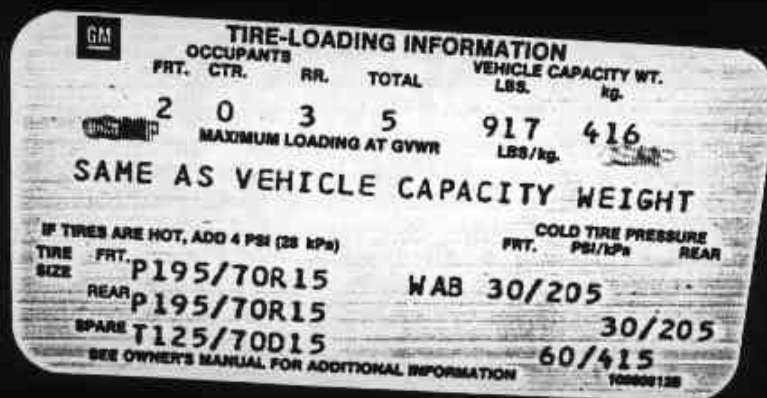


Figure A-42. PRE-TEST VEHICLE TIRE LOAD LABEL VIEW

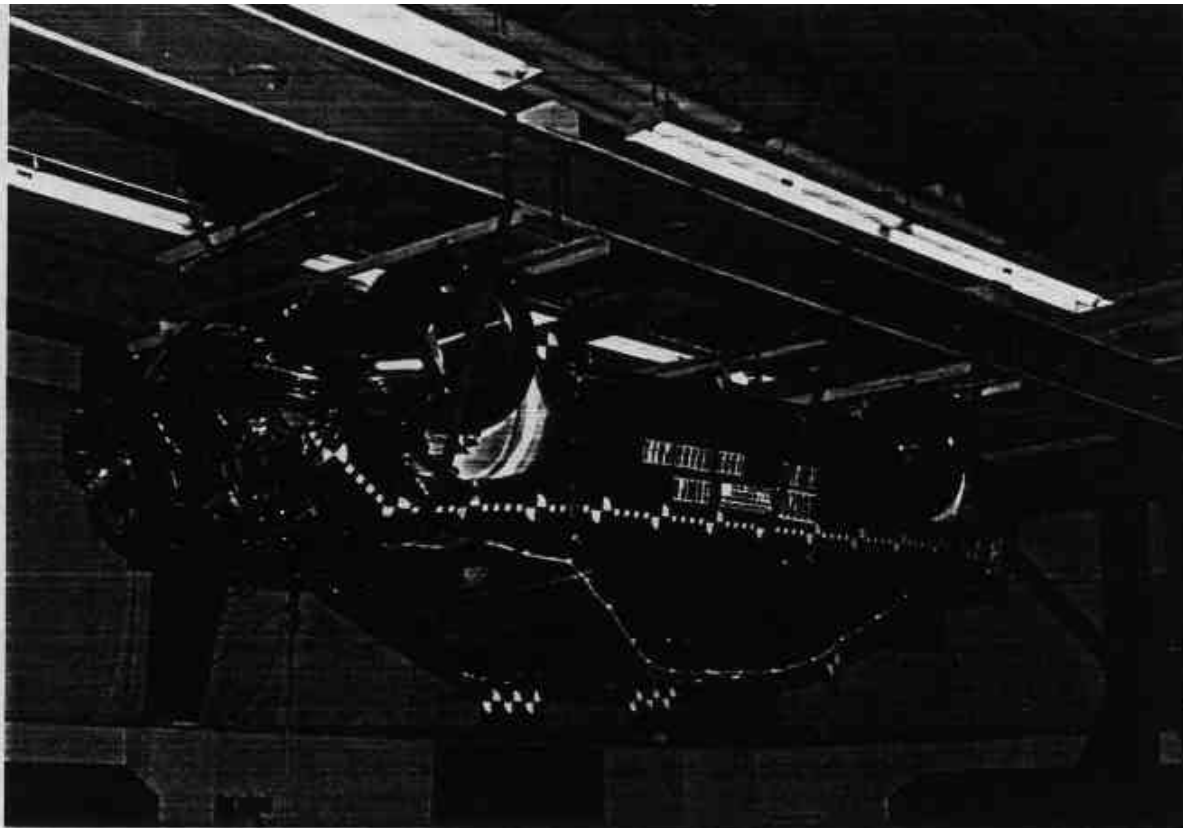


Figure A-43. POST-TEST VEHICLE ON STATIC ROLLOVER VIEW

APPENDIX B

DATA PLOTS

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

TRC 890206

308 COMPLIANCE TEST

89037

HEDX61

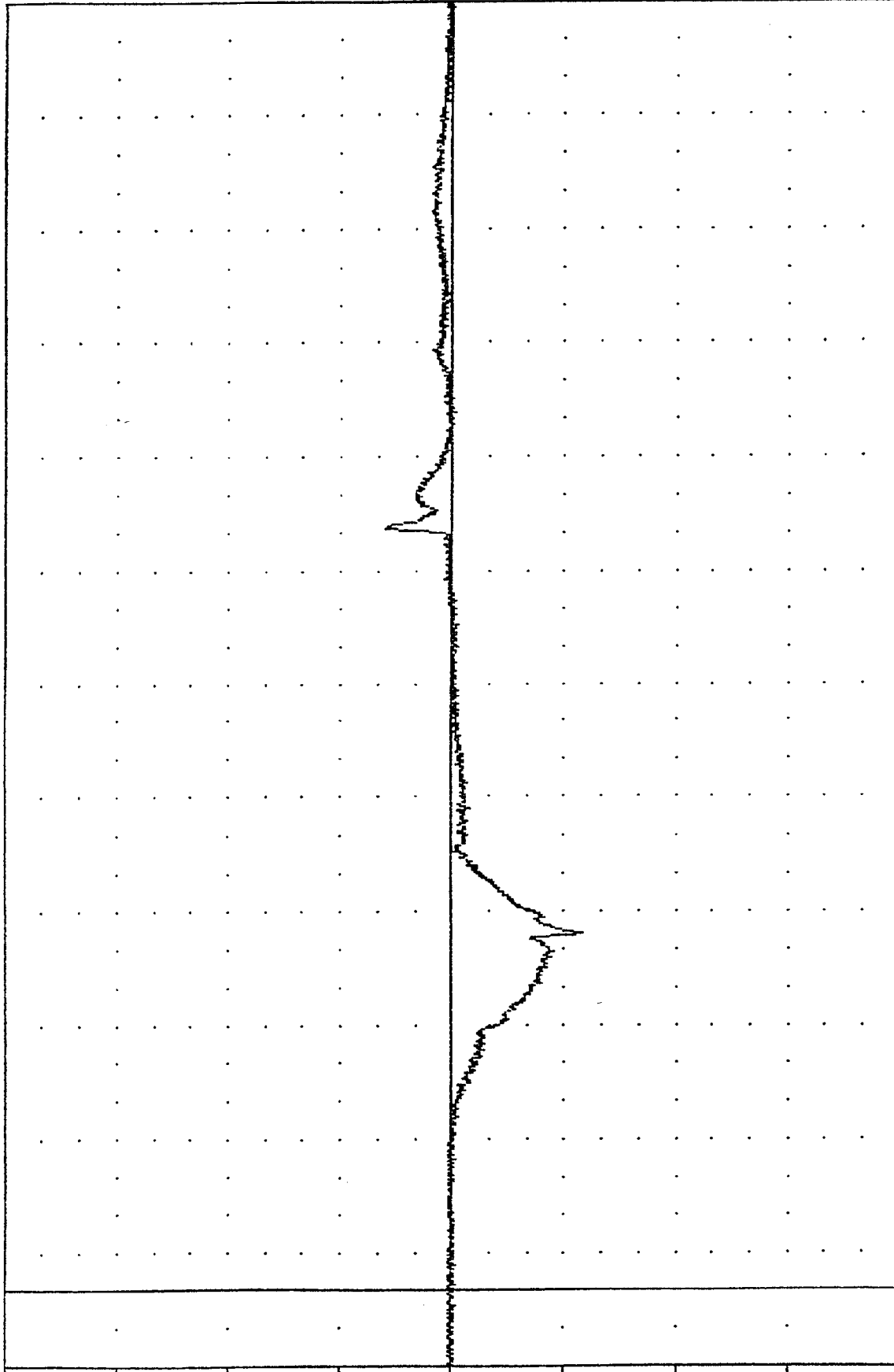
FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -69.46 94.13

35.77 201.13

ACCELERATION (G)

B-2



890206

1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
DRIVER HEAD X AXIS ACCELERATION

TRC 890206

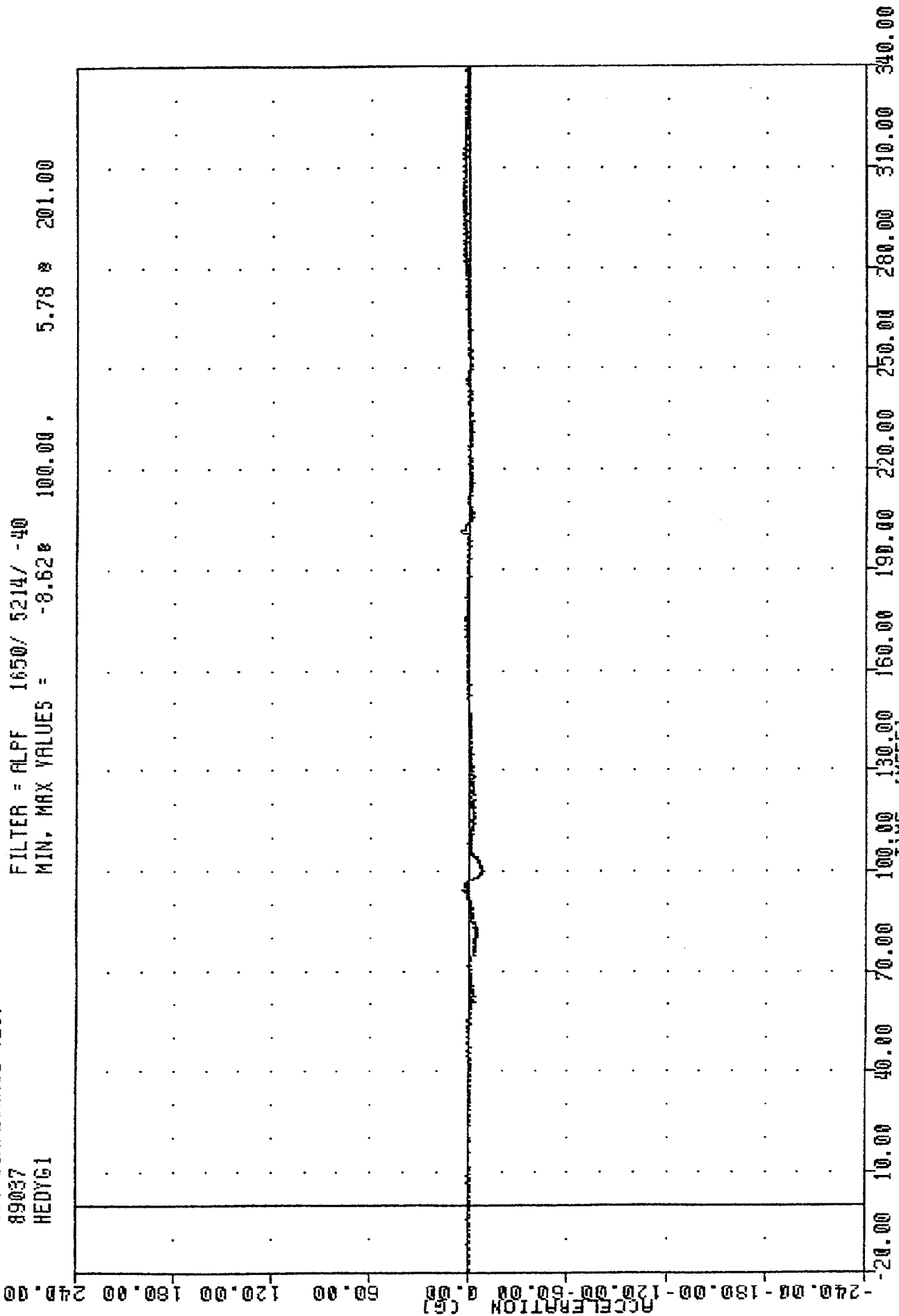
208 COMPLIANCE TEST

89037

HEDYG1

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -8.62e 100.00, 5.78 e 201.00



TRC 880206

208 COMPLIANCE TEST

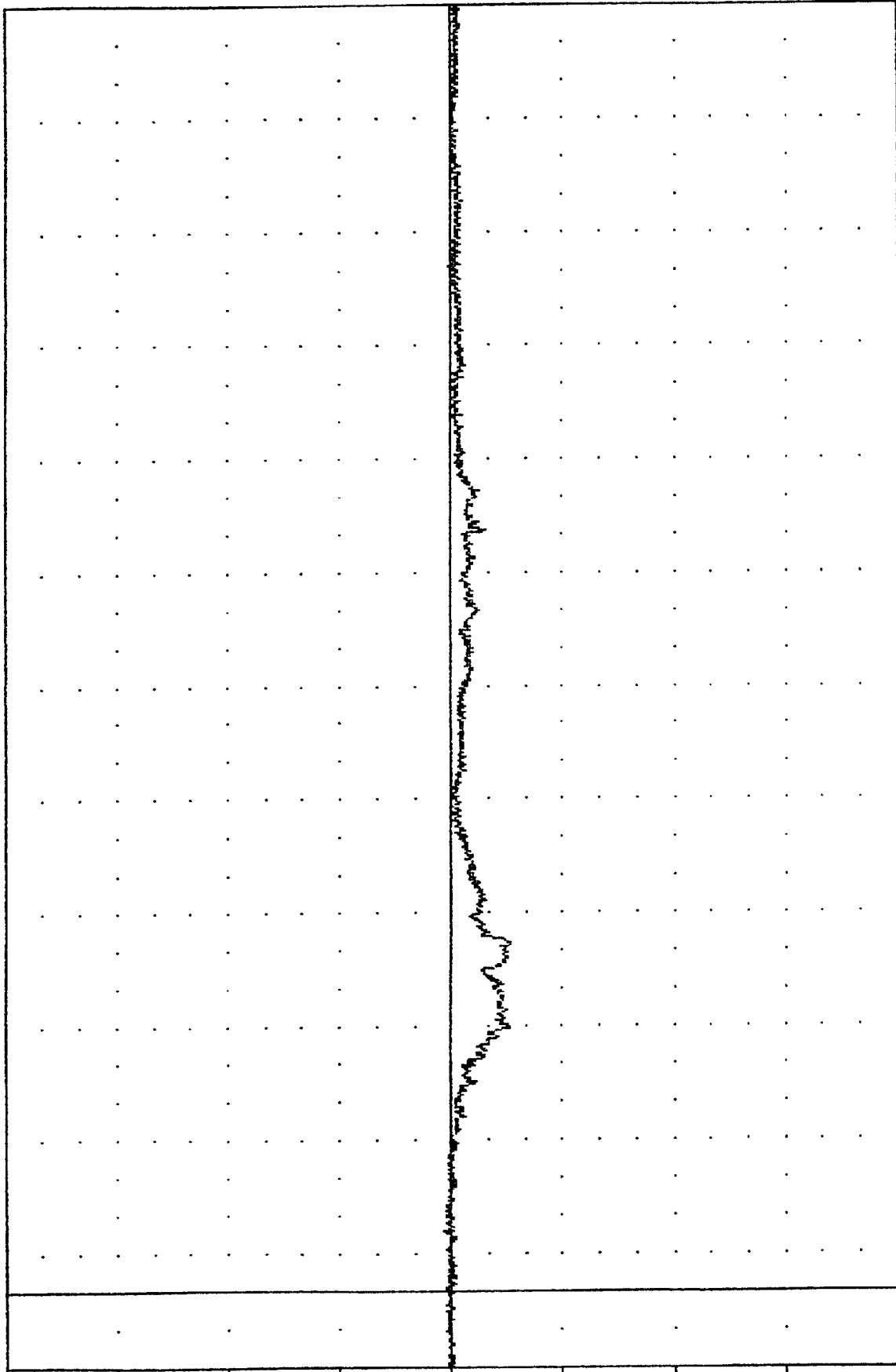
89037

HE0261

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -31.79e 91.63, 3.86 e 15.63

ACCELERATION (G)



890206

B-4

TRC 890206

208 COMPLIANCE TEST

89037

HEDRG1

FILTER = ALPF 1650/ 5214/ -40

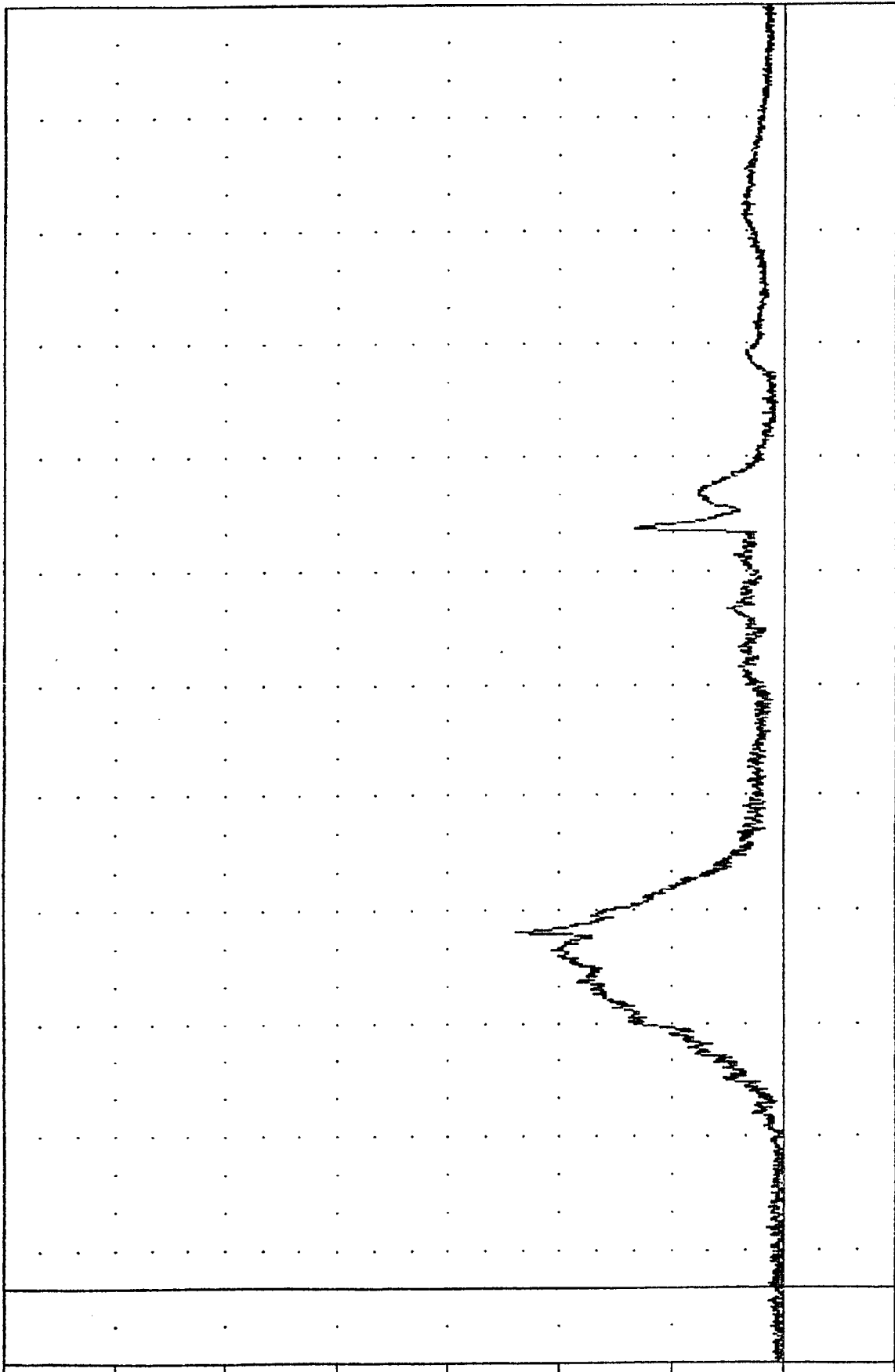
MIN. MAX VALUES = 0.09e

14.63, 71.57 e 94.13

ACCELERATION (G)

B-5

890206



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION

TRC 890206

208 COMPLIANCE TEST

89037

CSTXG1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -43.97 68.50 6.84 249.63

120.00

90.00

60.00

30.00

0.00

-30.00

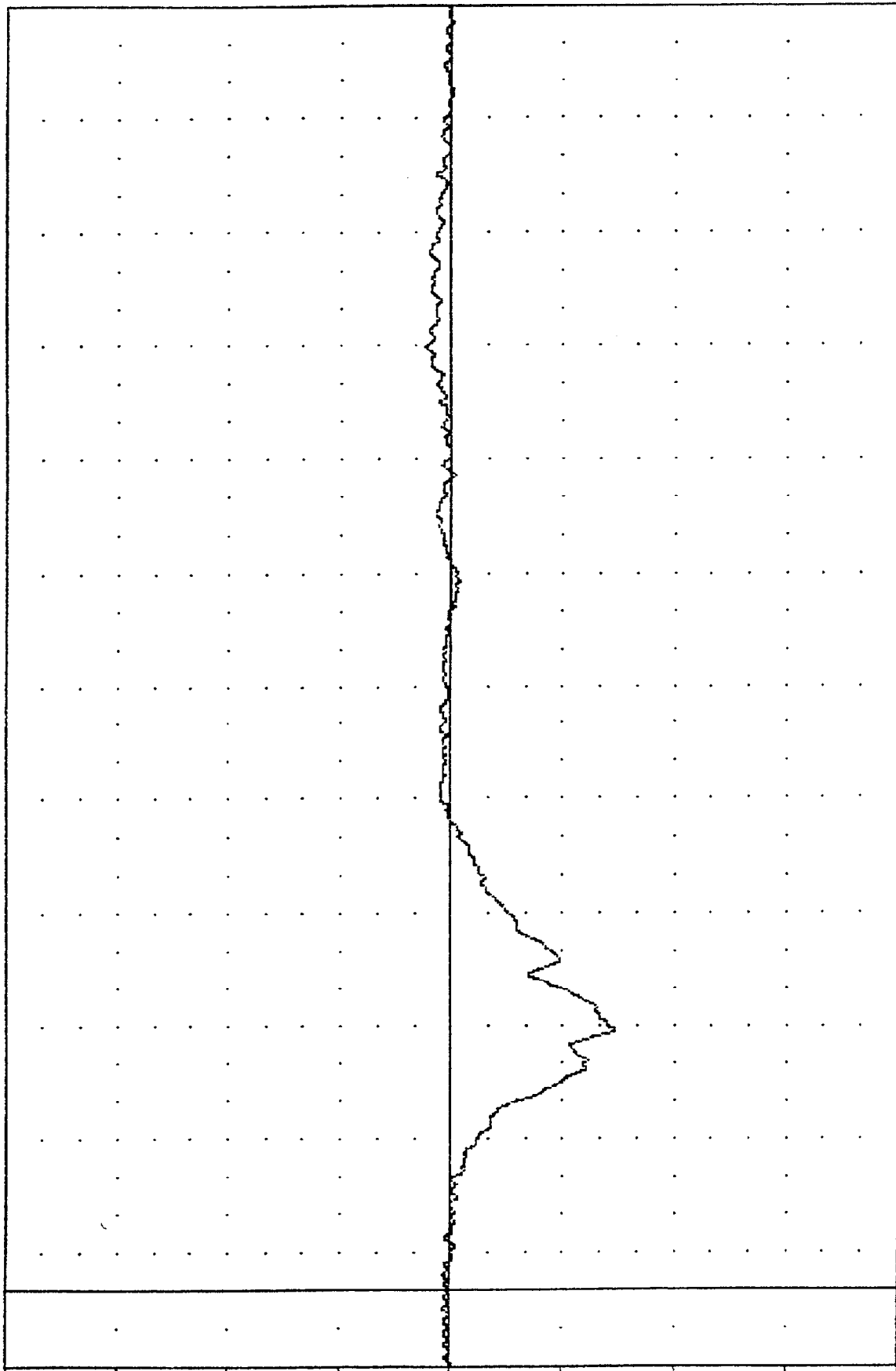
-60.00

-90.00

-120.00

890206

B-6



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
DRIVER CHEST X AXIS ACCELERATION

TRC 890206

208 COMPLIANCE TEST

89037

CSTYG1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -3.038 64.25, 5.05 e 59.88

120.00

90.00

60.00

30.00

0.00

-30.00

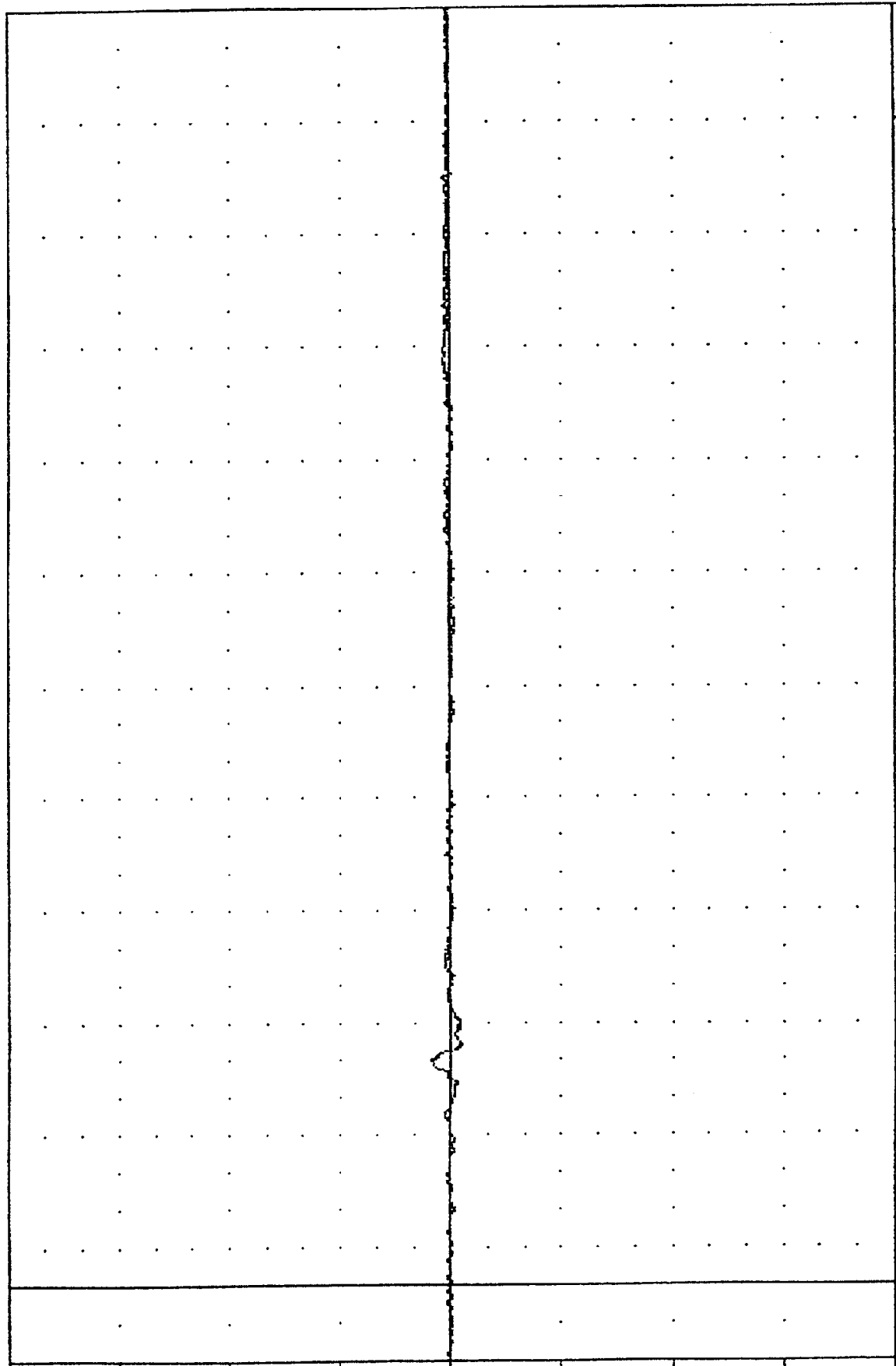
-60.00

-90.00

-120.00

890206

B-7

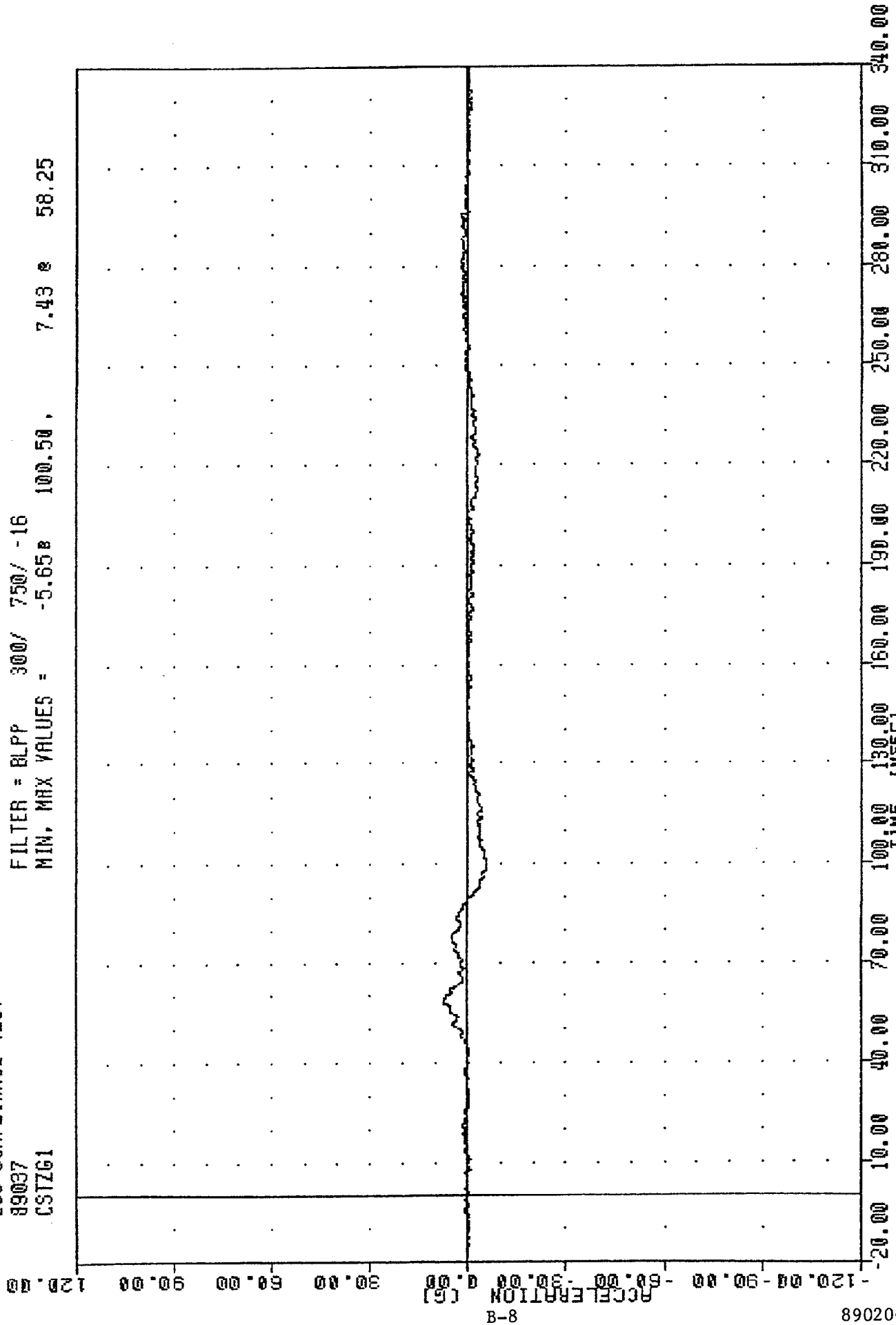


20.00 10.00 40.00 70.00 100.00 130.00 160.00 190.00 220.00 250.00 280.00 310.00 340.00

1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
DRIVER CHEST Y AXIS ACCELERATION

TRC 890206
208 COMPLIANCE TEST
89037
CSTZG1

FILTER = BLPP 300/ 750/ -16
MIN, MAX VALUES = -5.65B 100.50, 7.43 e 58.25



B-8

890206

1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
DRIVER CHEST Z AXIS ACCELERATION

TRC 890206

208 COMPLIANCE TEST

89037

CSTRG1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = 0.09e -20.00, 44.05 e 68.50

90.00

75.00

50.00

45.00

30.00

15.00

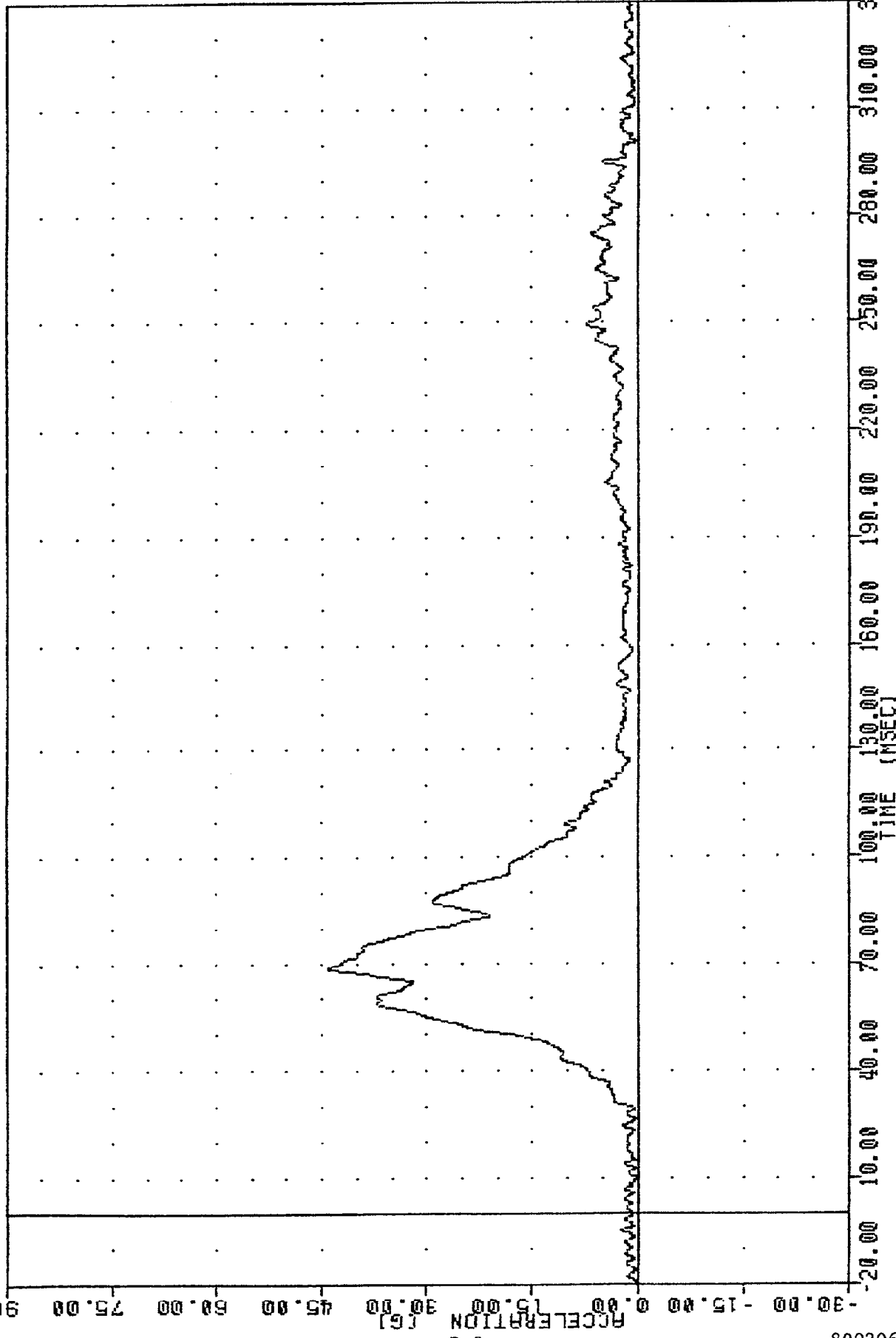
0.00

-15.00

-30.00

890206

6-9



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
DRIVER CHEST RESULTANT ACCELERATION

TRC 890206

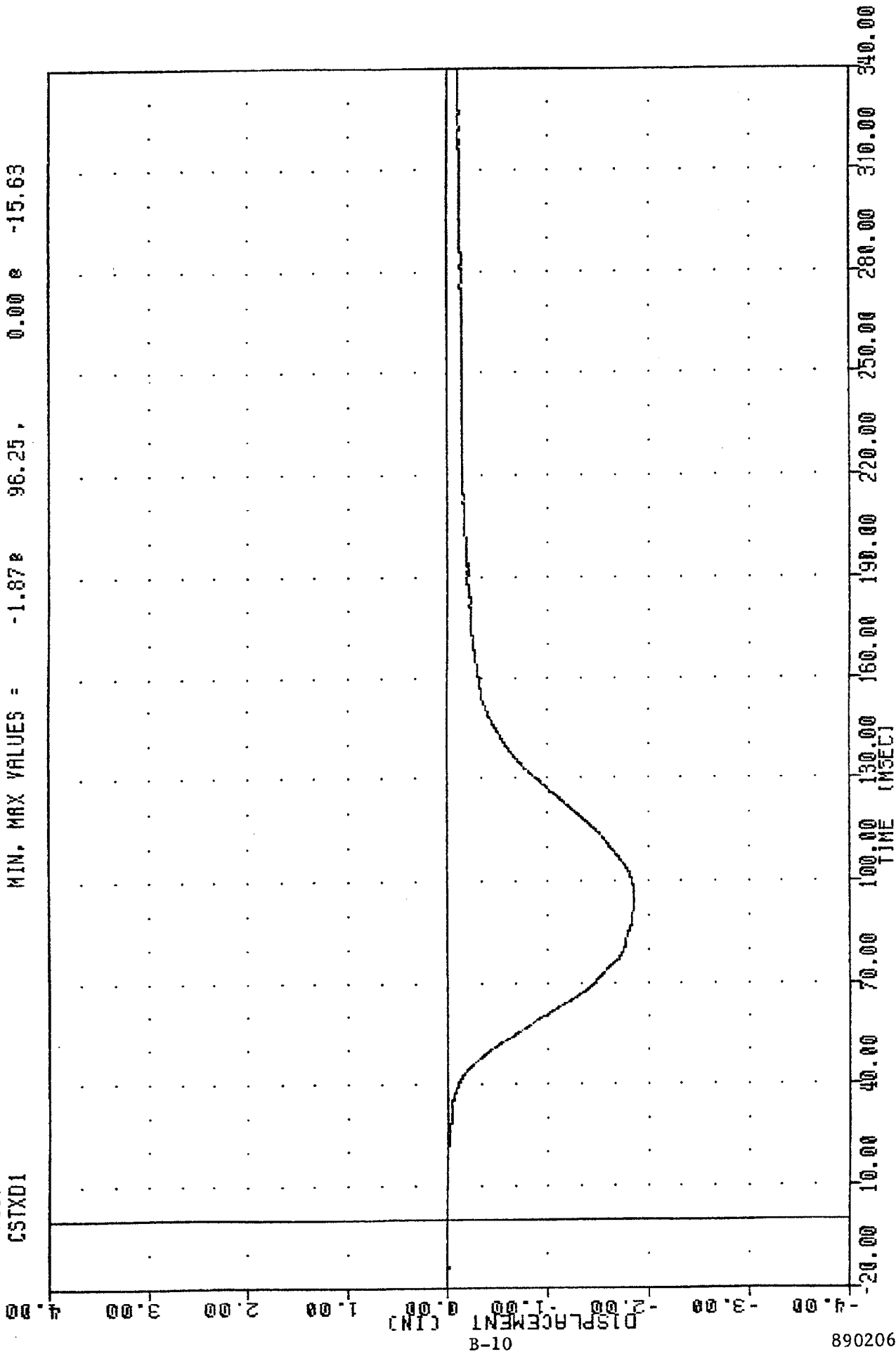
208 COMPLIANCE TEST

89037

CSTXD1

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -1.87 96.25 0.00 e -15.63



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
DRIVER CHEST DISPLACEMENT

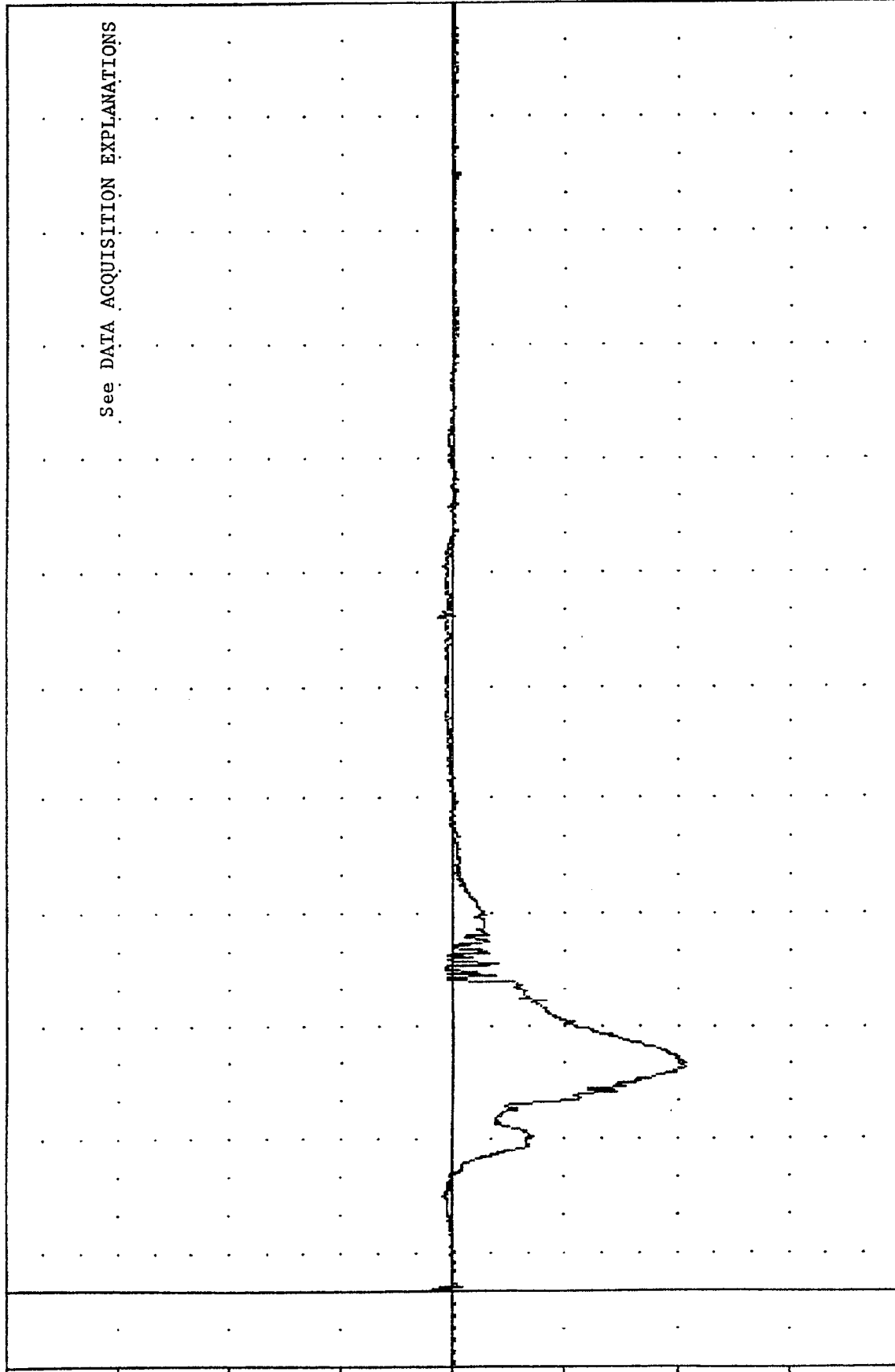
TRC , 890206
 208 COMPLIANCE TEST
 89037
 LFMF1

FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -1249.94 59.25 , 100.17 & 0.50

240.00 180.00 120.00 60.00 0.00
 (X10³)

B-11

FORCE (LB)



890206

1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
 DRIVER LEFT FEMUR FORCE

TRC 890206

209 COMPLIANCE TEST

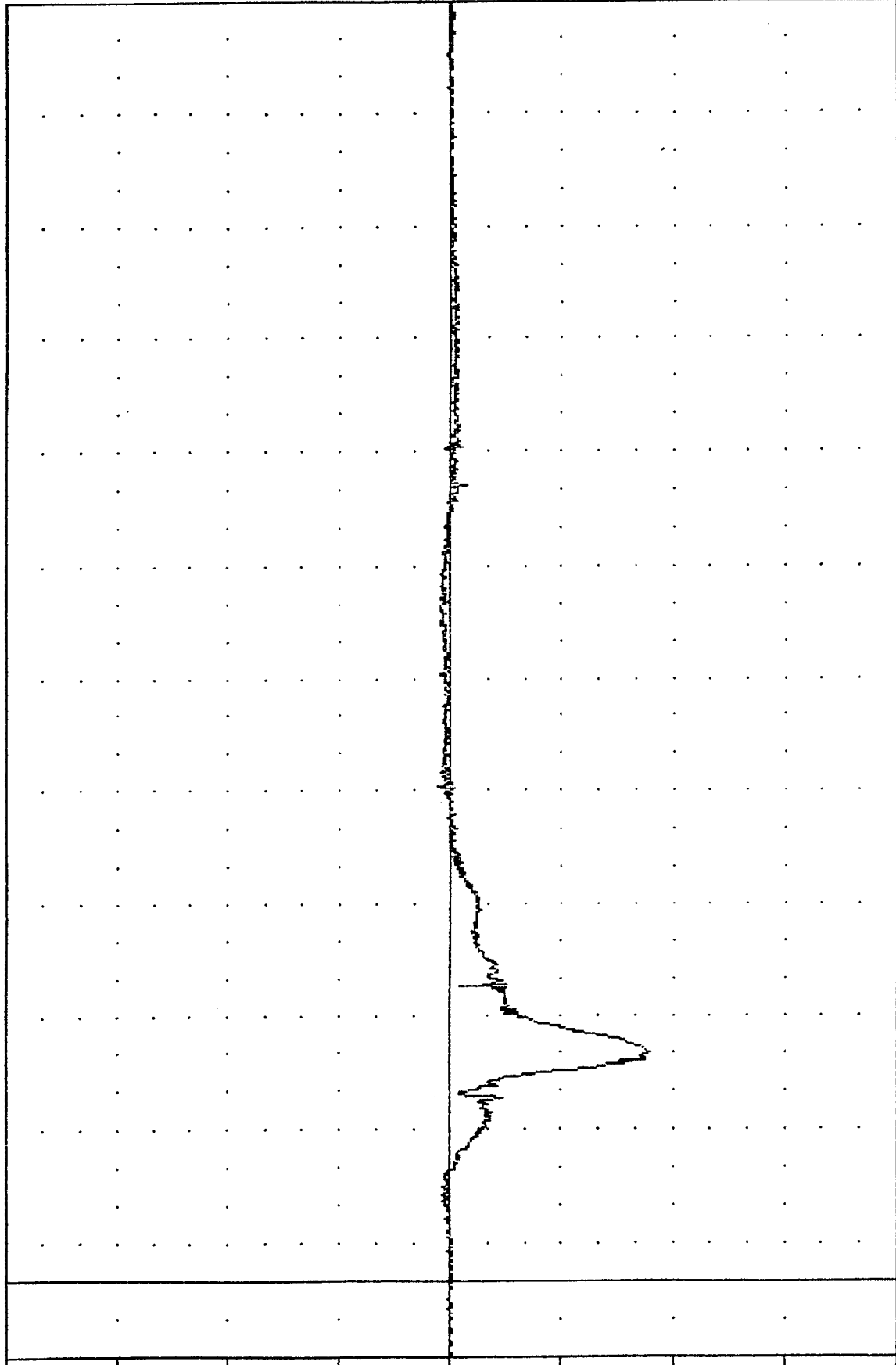
89037

RFMF1

FILTER = BLPP 1000/ 2500/ -16

MIN. MAX VALUES = -1078.82e 60.13, 70.73 e 131.00

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



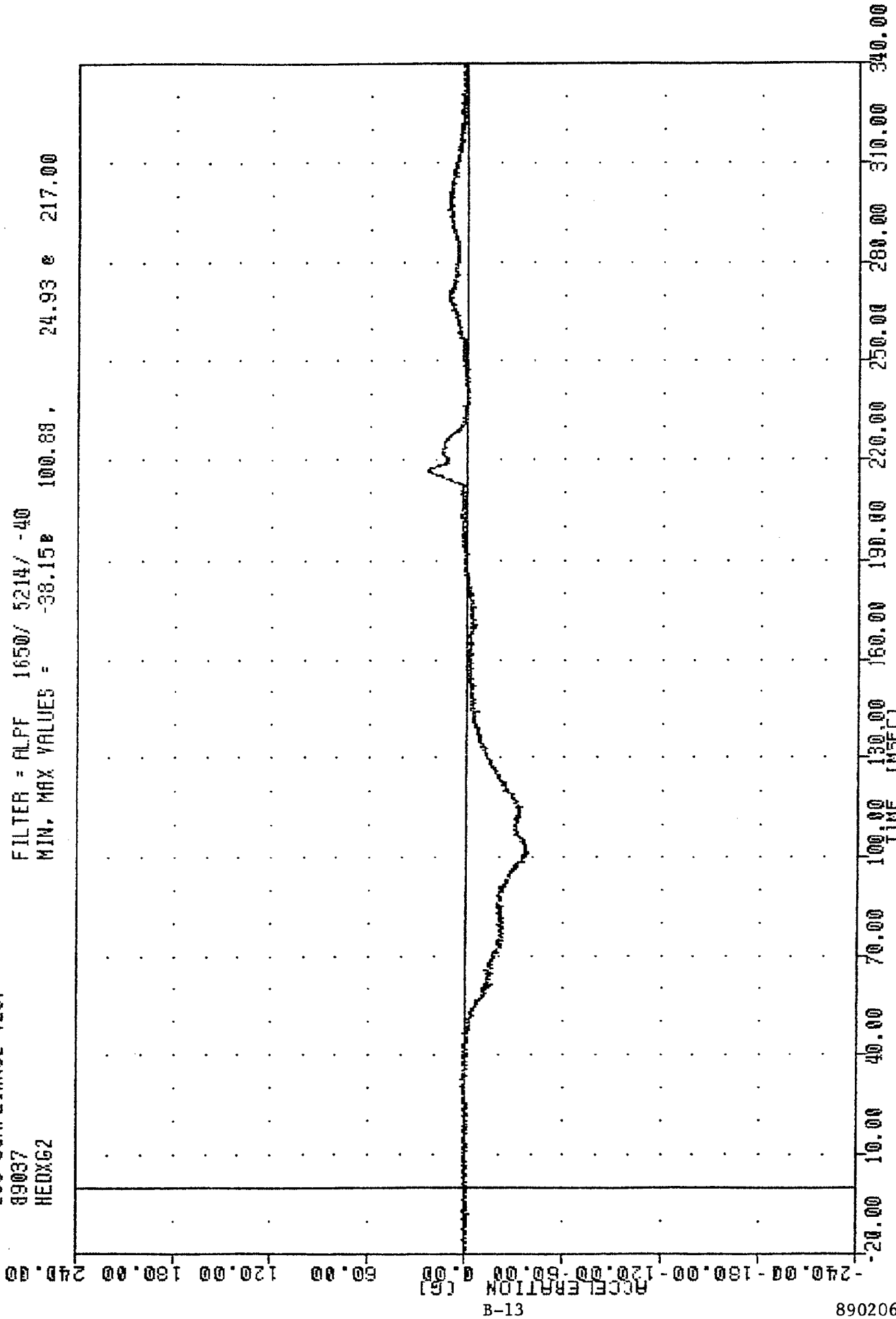
B-12

890206

1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
DRIVER RIGHT FEMUR FORCE

TRC 890206
 200 COMPLIANCE TEST
 89037
 HEDXG2

FILTER = ALPF 1650/ 5214/ -40
 MIN, MAX VALUES = -38.15e 100.88, 24.93 e 217.00



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
 RIGHT FRONT PASSENGER HEAD X AXIS ACCELERATION

TRC 890206

208 COMPLIANCE TEST

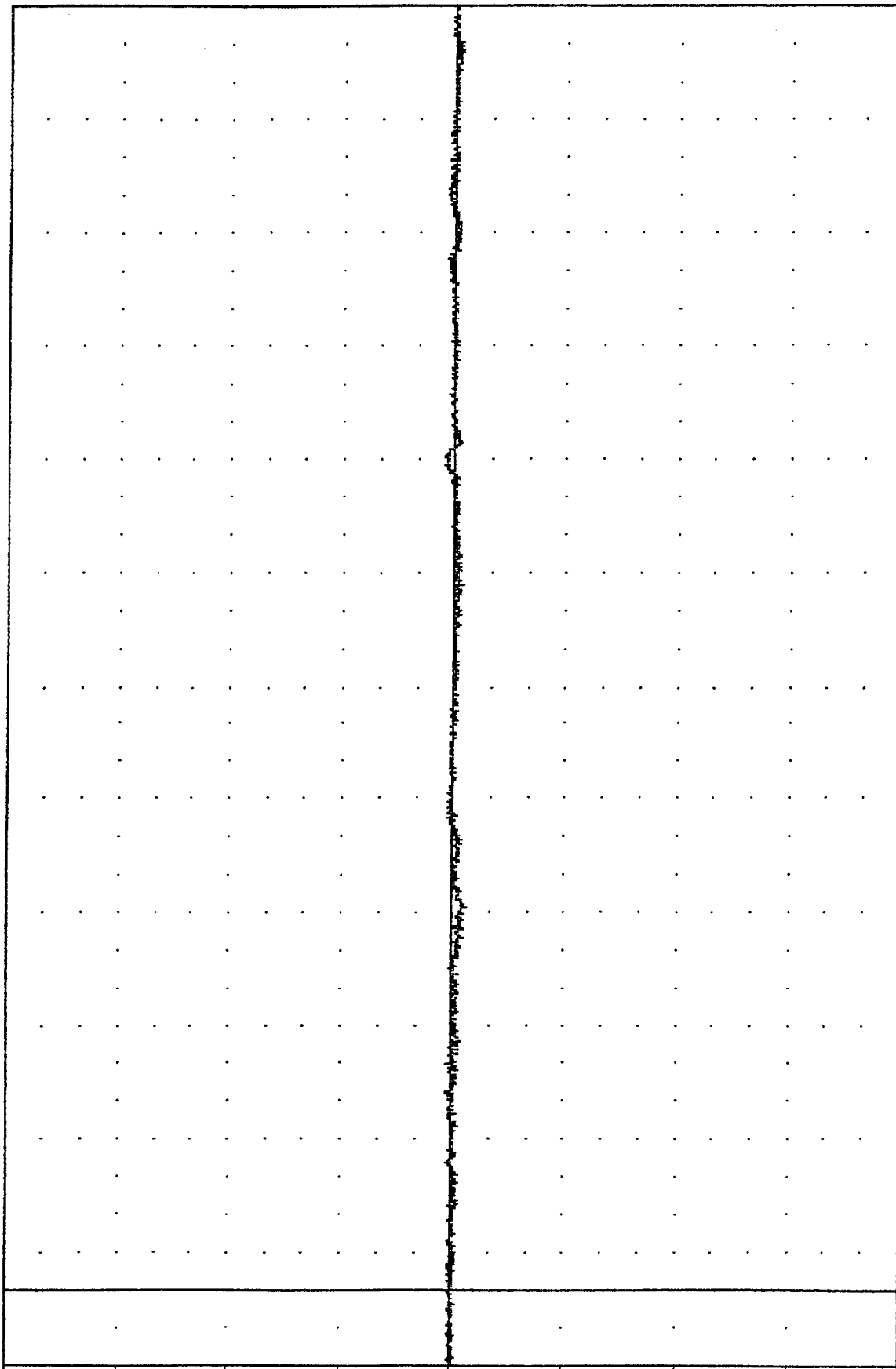
89037

HEDY62

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -7.028 101.13 , 5.59 220.50

ACCELERATION (G)



20.00 10.00 0.00 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 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Y AXIS ACCELERATION

TRC 890206

208 COMPLIANCE TEST

89037

HE0ZG2

FILTER = ALPF 1650/ 5214/ -40

MIN. MAX VALUES = -52.998

95.88

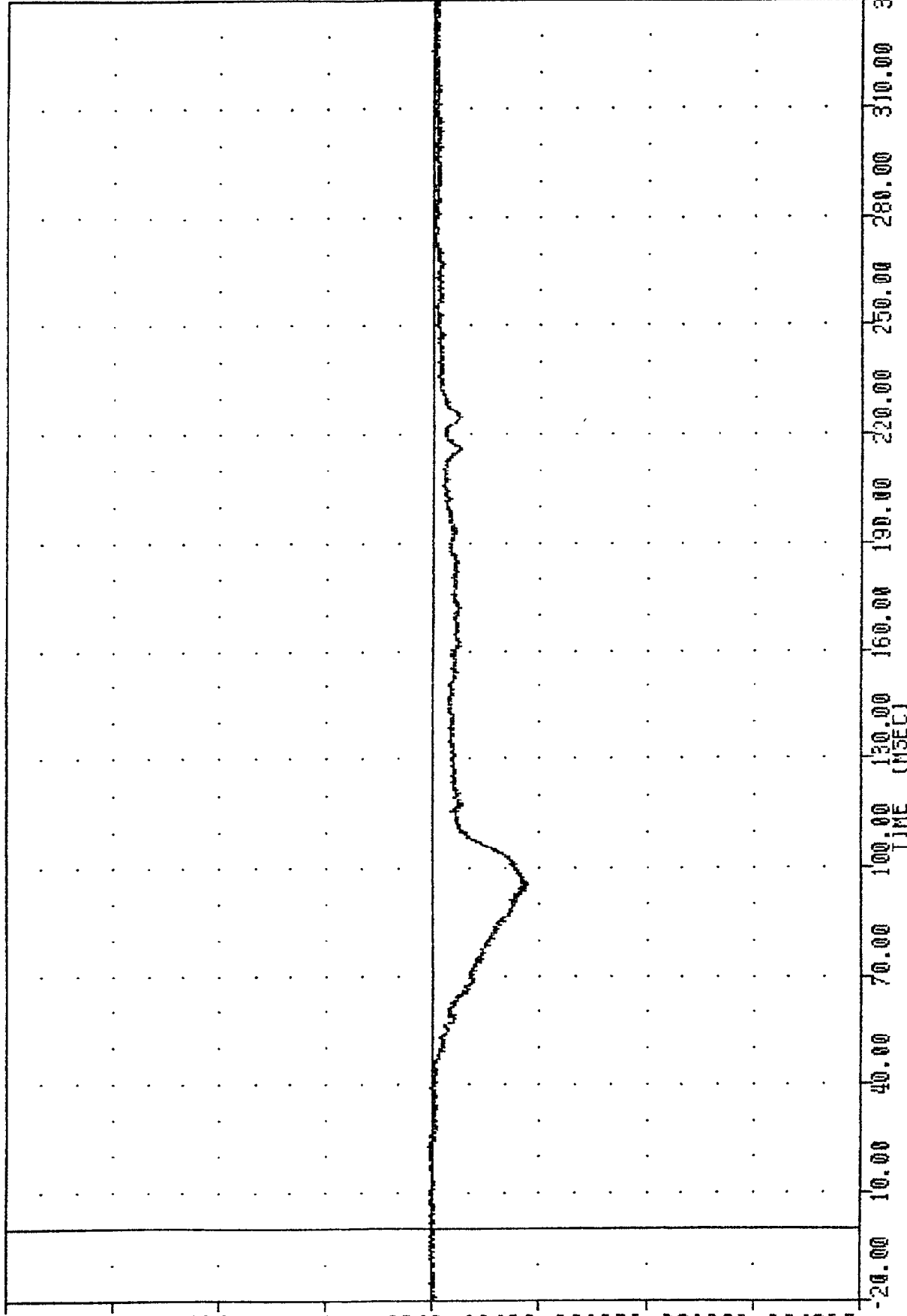
2.74

22.50

ACCELERATION (G)

B-15

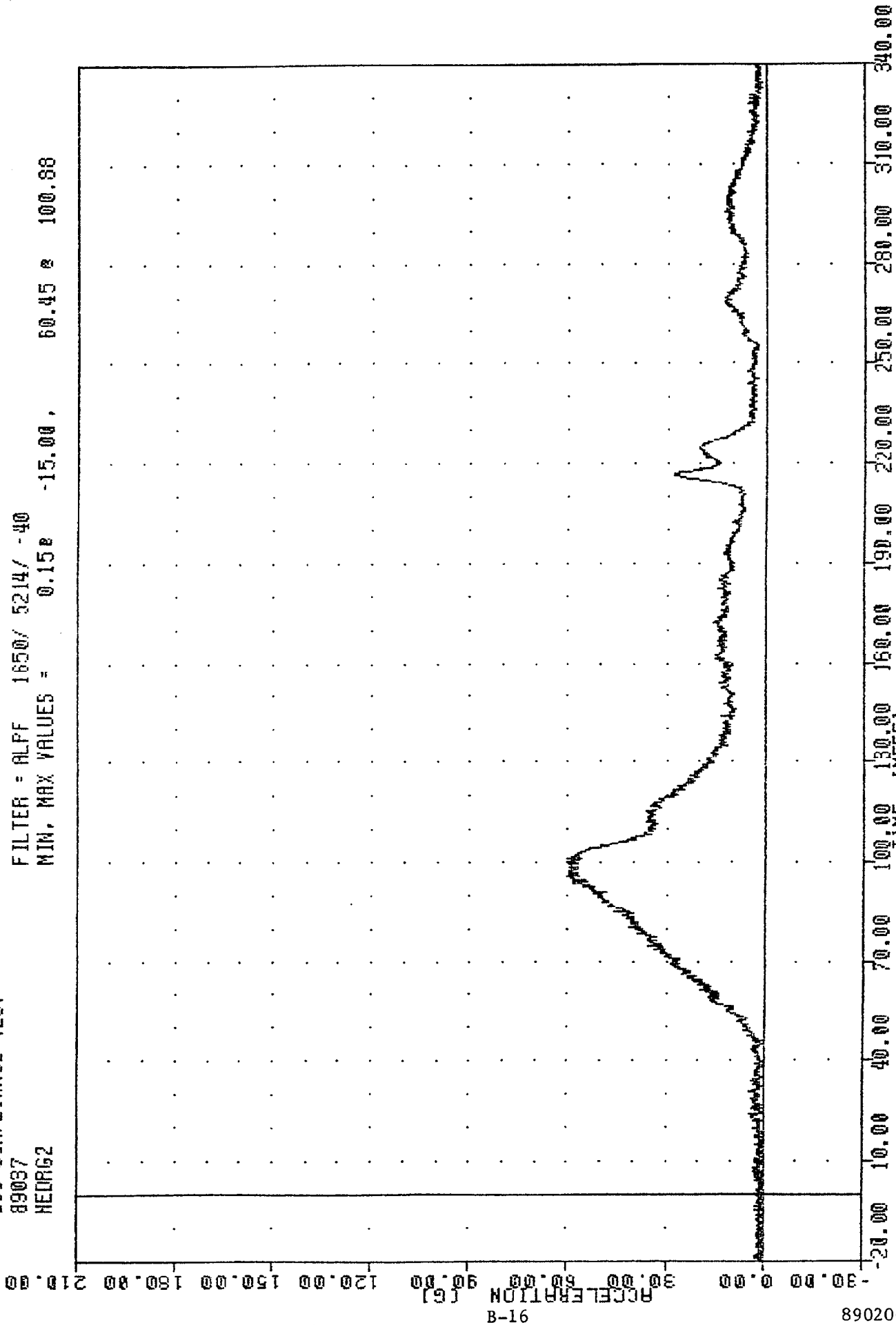
890206



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER HEAD Z AXIS ACCELERATION

TRC 890206
 200 COMPLIANCE TEST
 89037
 HEDR62

FILTER = ALPF 1650/ 5214/ -40
 MIN, MAX VALUES = 0.152 -15.00, 60.45 & 100.88



TRC 890206

208 COMPLIANCE TEST

89037

CSTX62

FILTER = BLPP 300/ 750/ -16

MIN. MAX VALUES = -44.60e 68.25, 8.83 e 267.25

120.00

90.00

60.00

30.00

0.00

B-17

ACCELERATION (G)

-30.00

-60.00

-90.00

-120.00

-150.00

-180.00

-210.00

-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

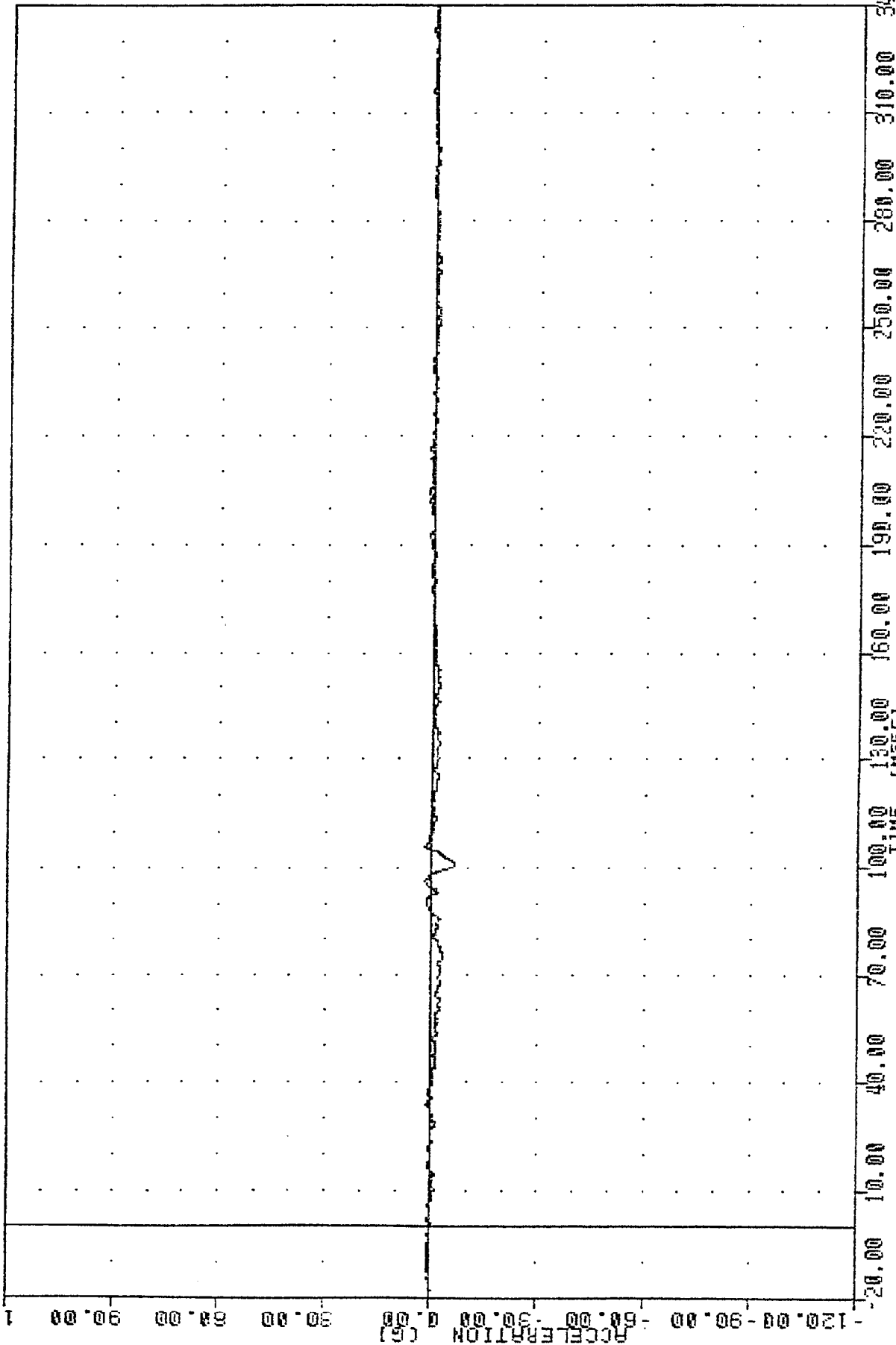
TIME (MSEC)

1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST X AXIS ACCELERATION

890206

TR 205
208 COMPLIANCE TEST
89037
CSTYG2

FILTER = BLPP 300/ 750/ -16
MIN. MAX VALUES = -6.34e 100.75, 1.94 e 96.25



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Y AXIS ACCELERATION

TRC 890206

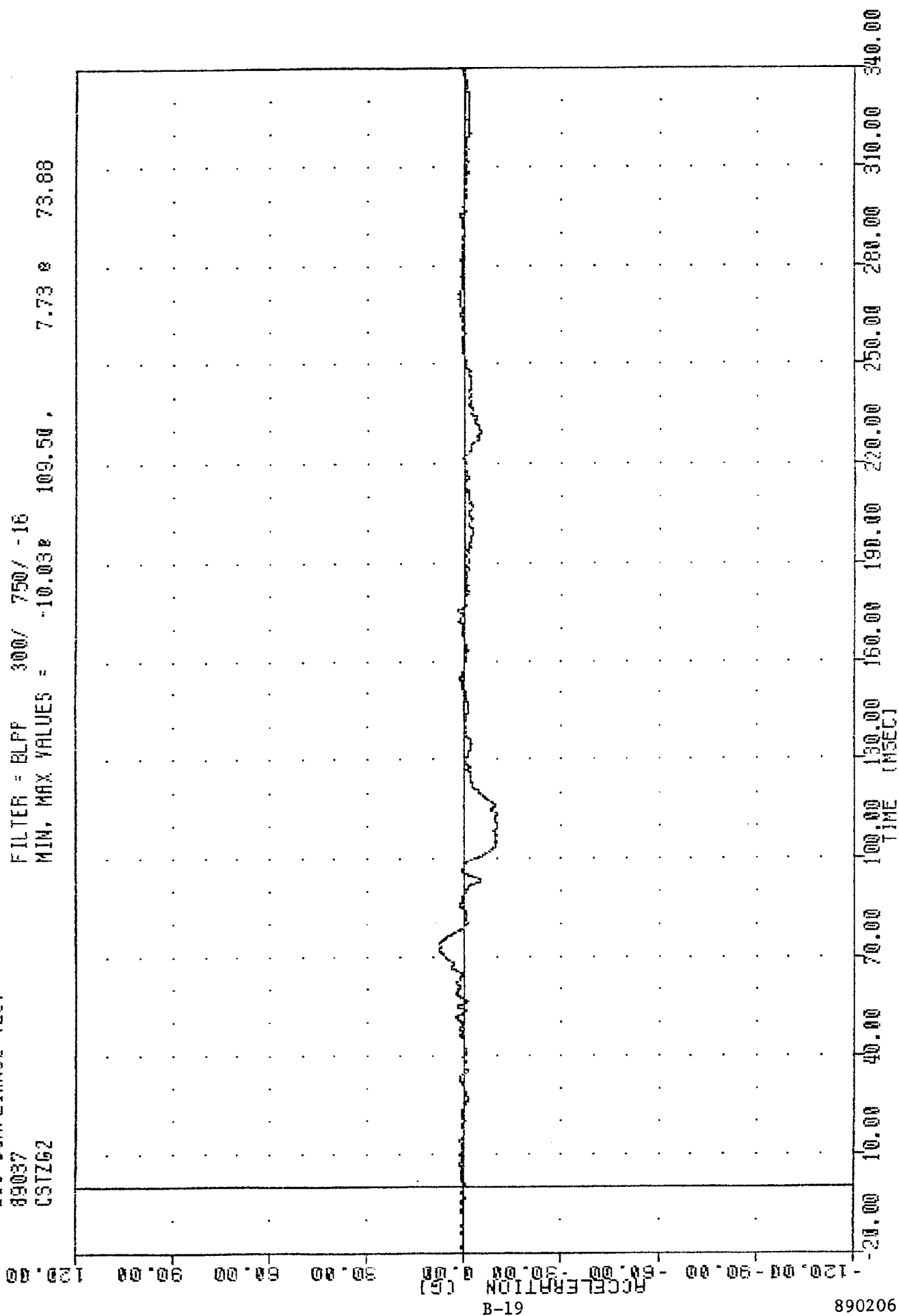
200 COMPLIANCE TEST

89037

CS1Z62

FILTER = BLPF 300/ 750/ -16

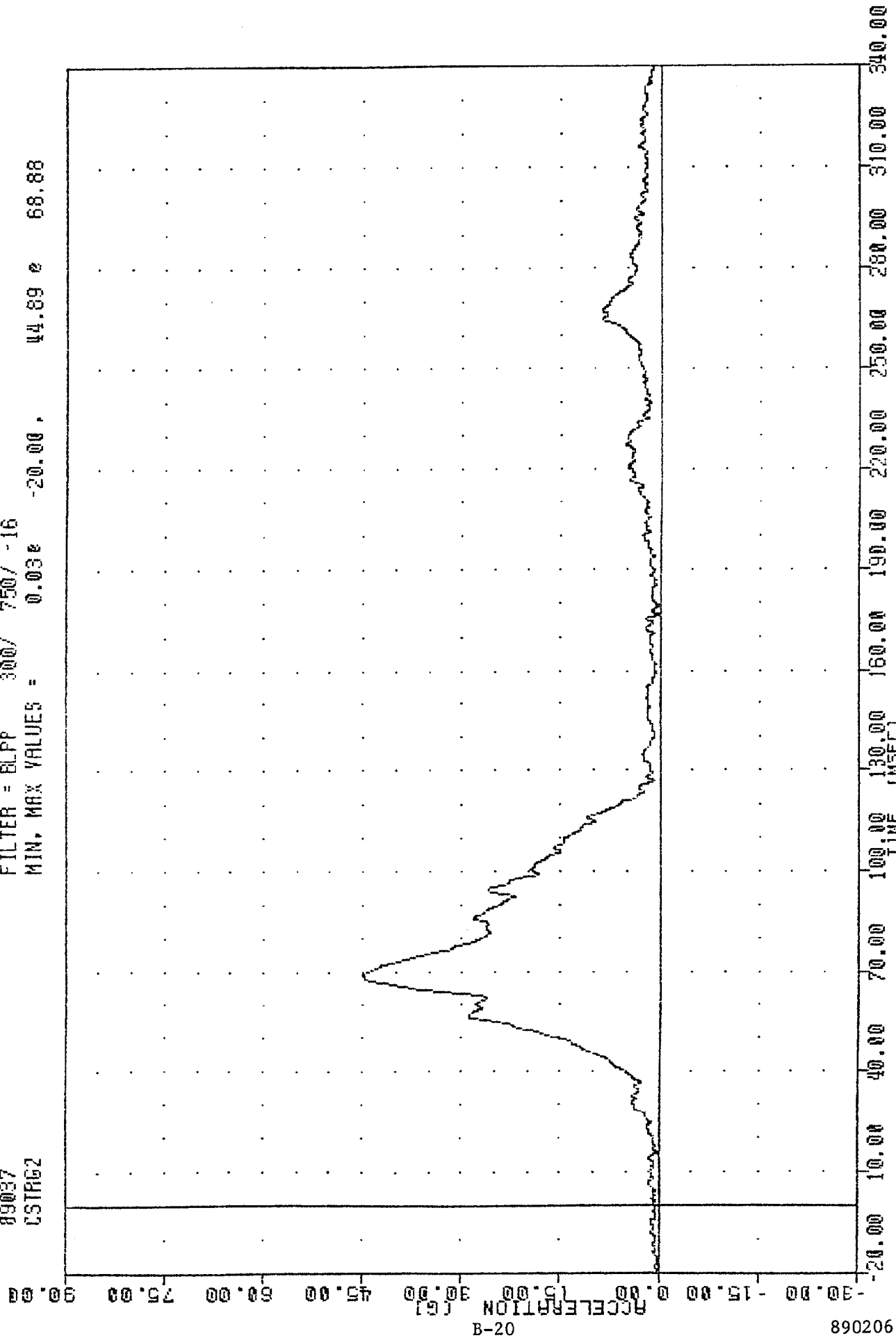
MIN. MAX VALUES = -10.03e 109.50. 7.73 e 73.88



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
RIGHT FRONT PASSENGER CHEST Z AXIS ACCELERATION

TRC 890206
 200 COMPLIANCE TEST
 89037
 CSTR62

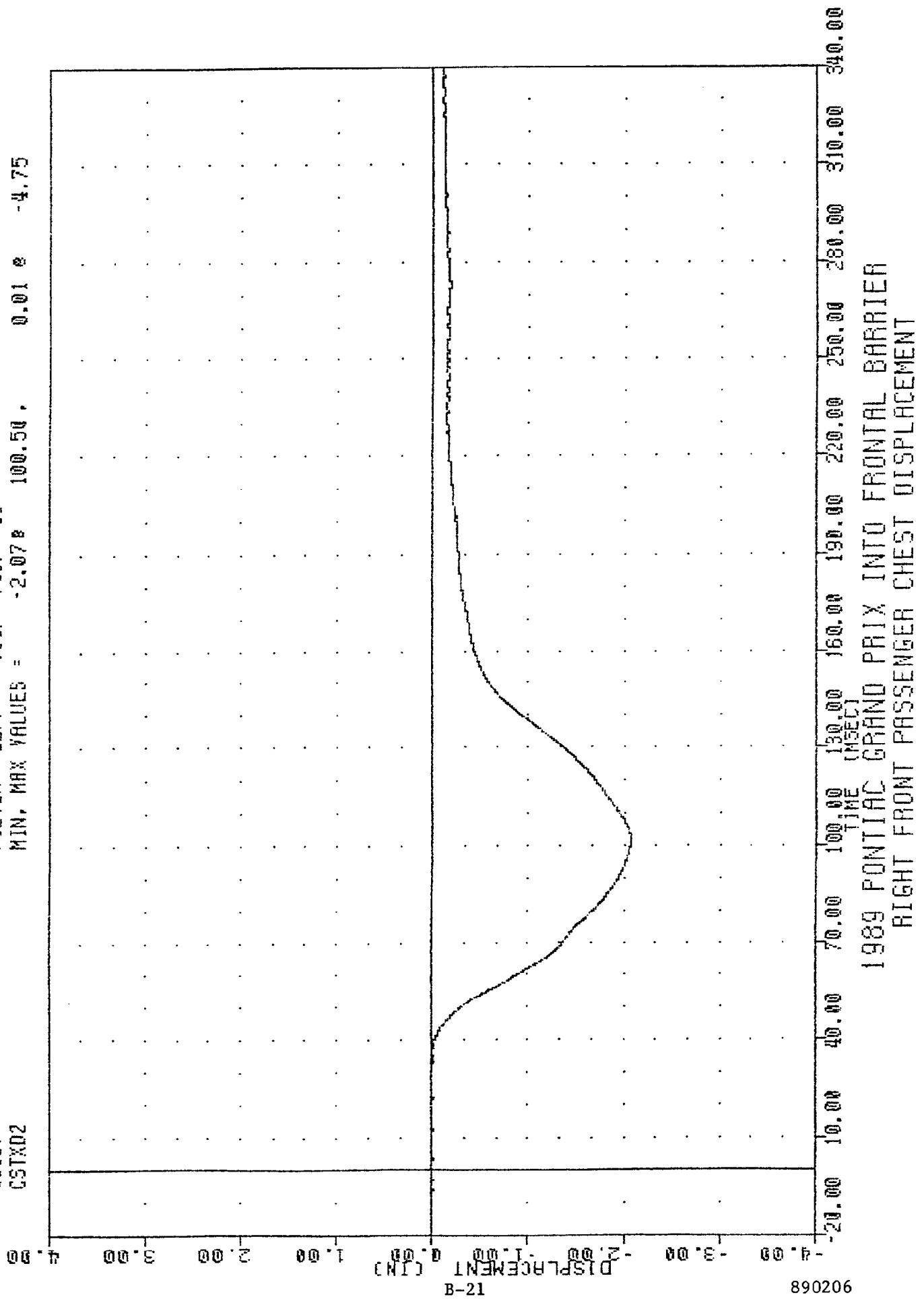
FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = 0.03e -20.00, 44.89 e 68.88



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION

TRC 89037
 208 COMPLIANCE TEST
 CSTXD2

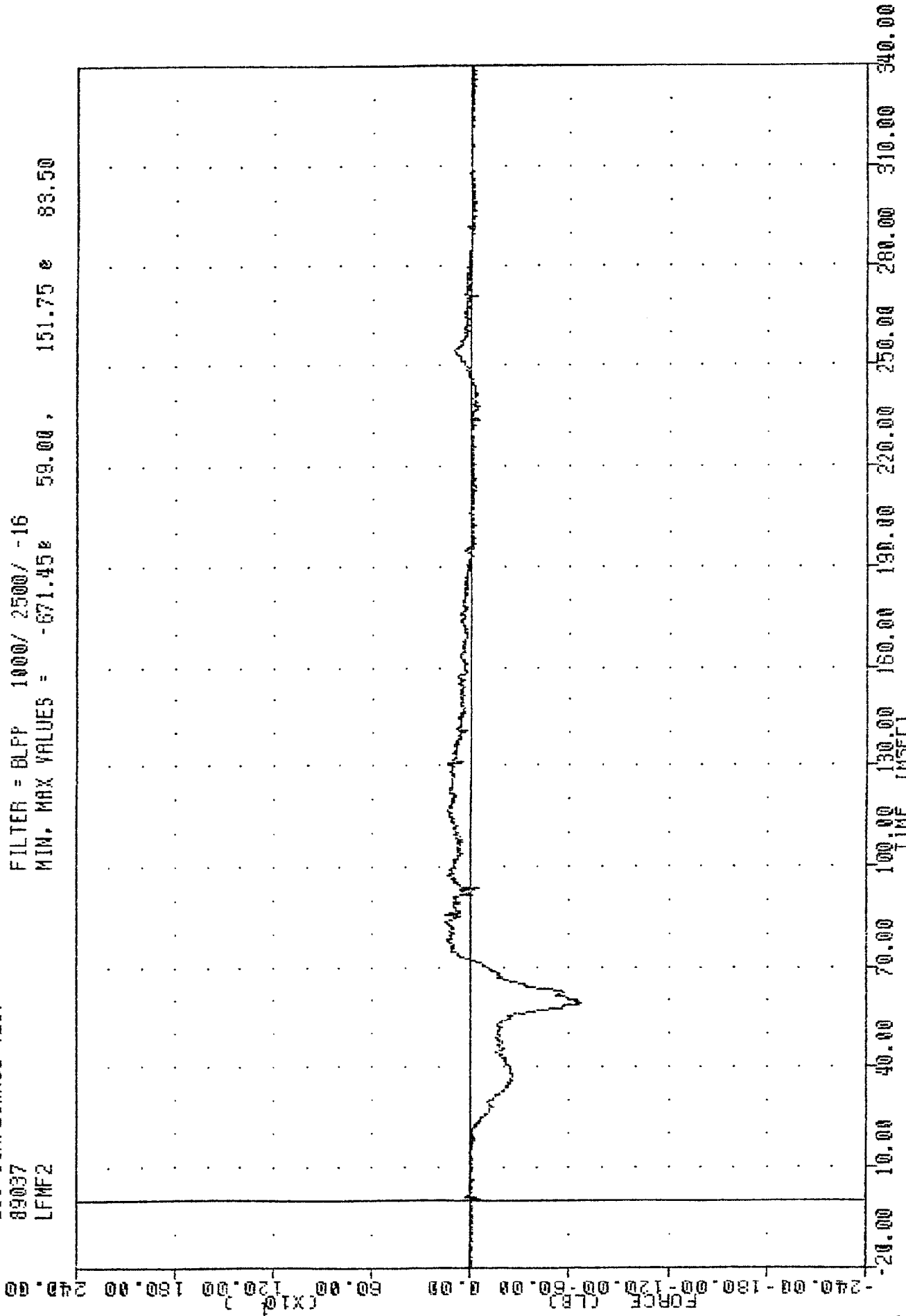
FILTER = BLPP 300/ 750/ -16
 MIN. MAX VALUES = -2.078 100.50 0.012 -4.75



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
 RIGHT FRONT PASSENGER CHEST DISPLACEMENT

TRC 890206
 208 COMPLIANCE TEST
 89037
 LFMF2

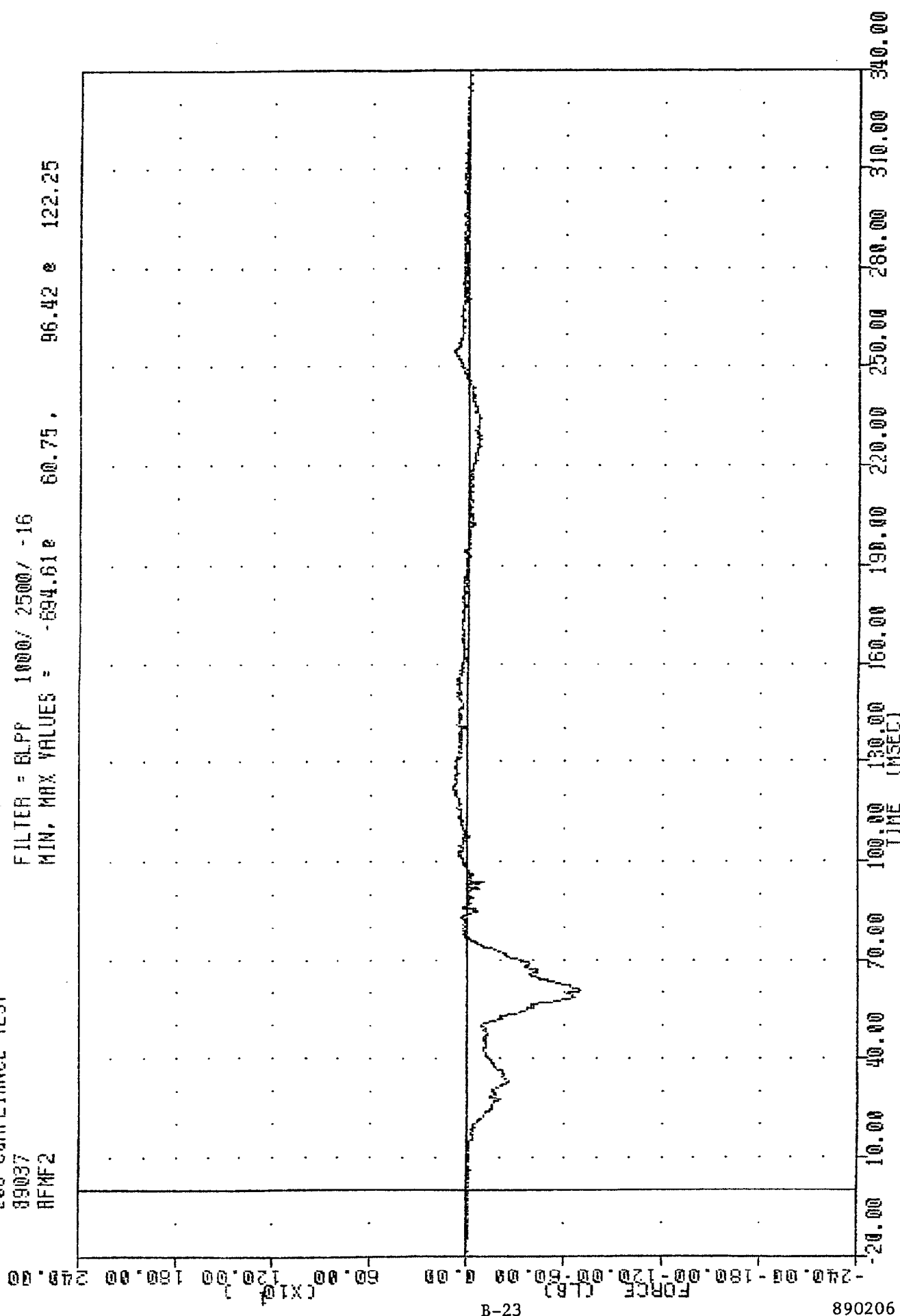
FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -671.45% 59.00, 151.75 e 83.50



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
 RIGHT FRONT PASSENGER LEFT FEMUR FORCE

TRC 890206
 200 COMPLIANCE TEST
 89037
 AFMF2

FILTER = BLPP 1000/ 2500/ -16
 MIN. MAX VALUES = -894.61e 60.75 . 96.42 e 122.25



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
 RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

TRC 890206

208 COMPLIANCE TEST

89037

TLRX61

FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -27.75 23.13 1.21 222.50

240.00

180.00

120.00

60.00

0.00

-60.00

-120.00

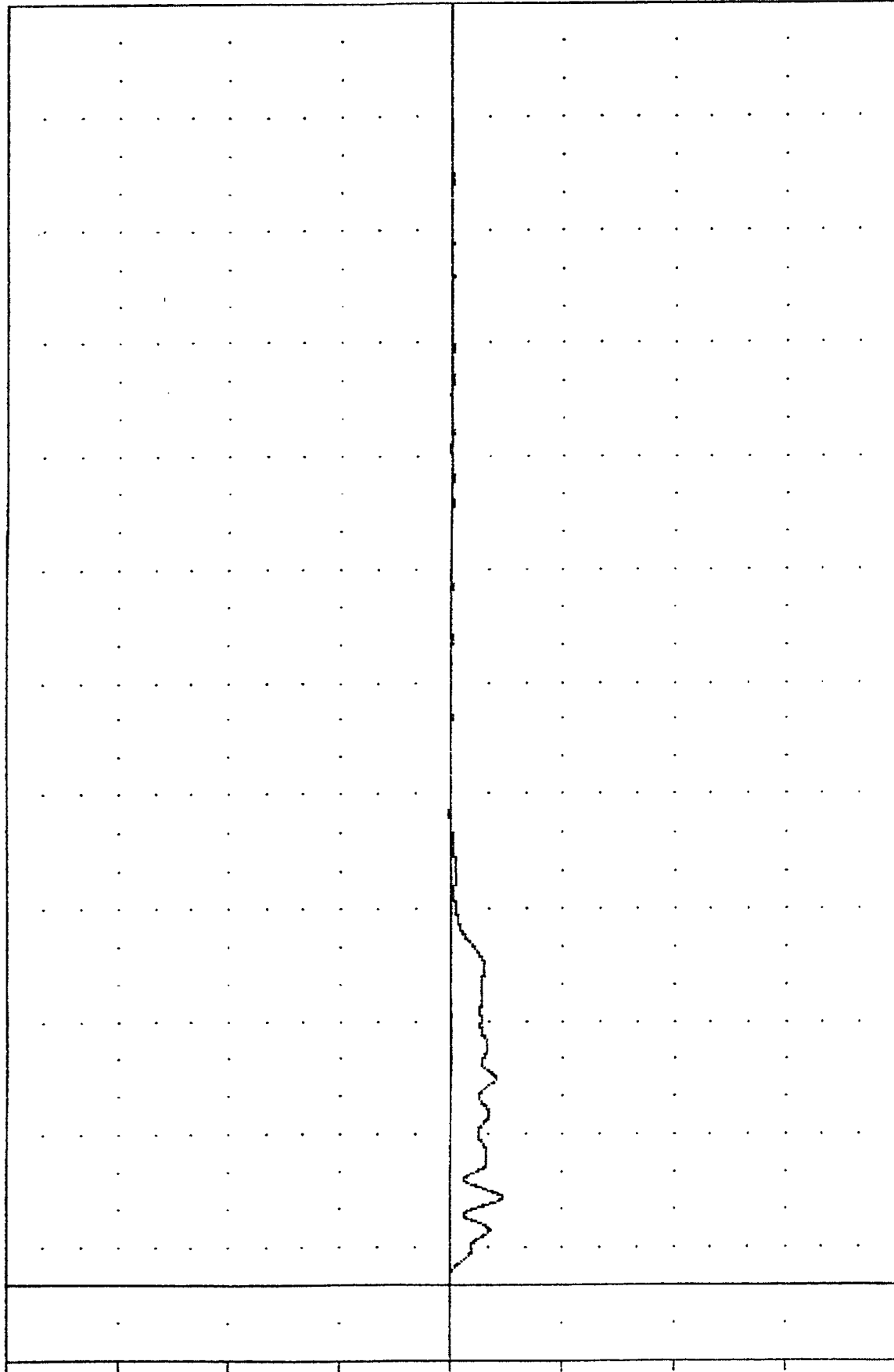
-180.00

-240.00

ACCELERATION [G]

B-24

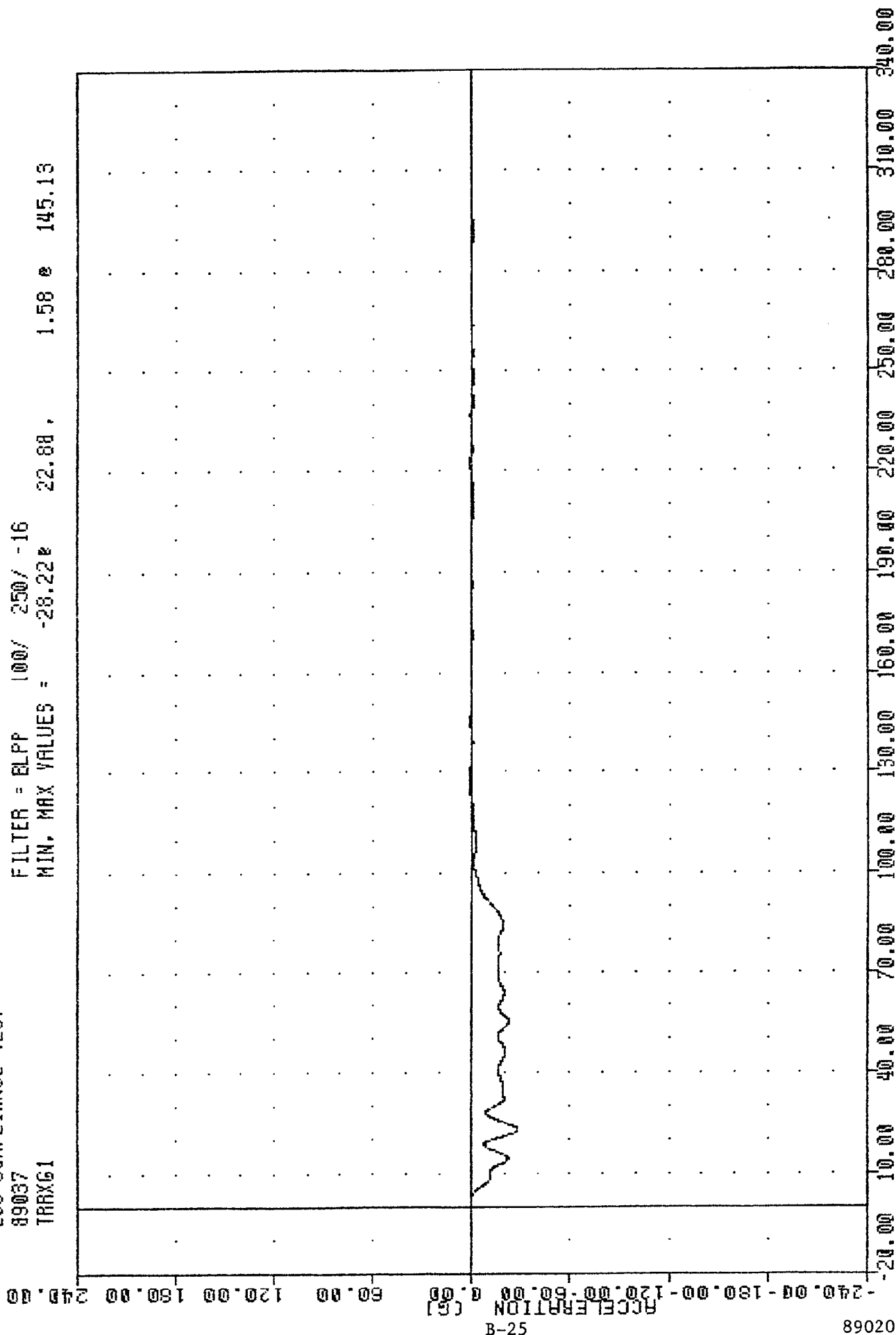
890206



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
LEFT REAR SEAT X AXIS ACCELERATION

TRC
890206
200 COMPLIANCE TEST
89037
TRRXG1

FILTER = ELPP 100/ 250/ -16
MIN. MAX VALUES = -28.22% 22.88, 1.58 e 145.13



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
RIGHT REAR SEAT X AXIS ACCELERATION

TRC , 890206

208 COMPLIANCE TEST

89037

ENGXG1

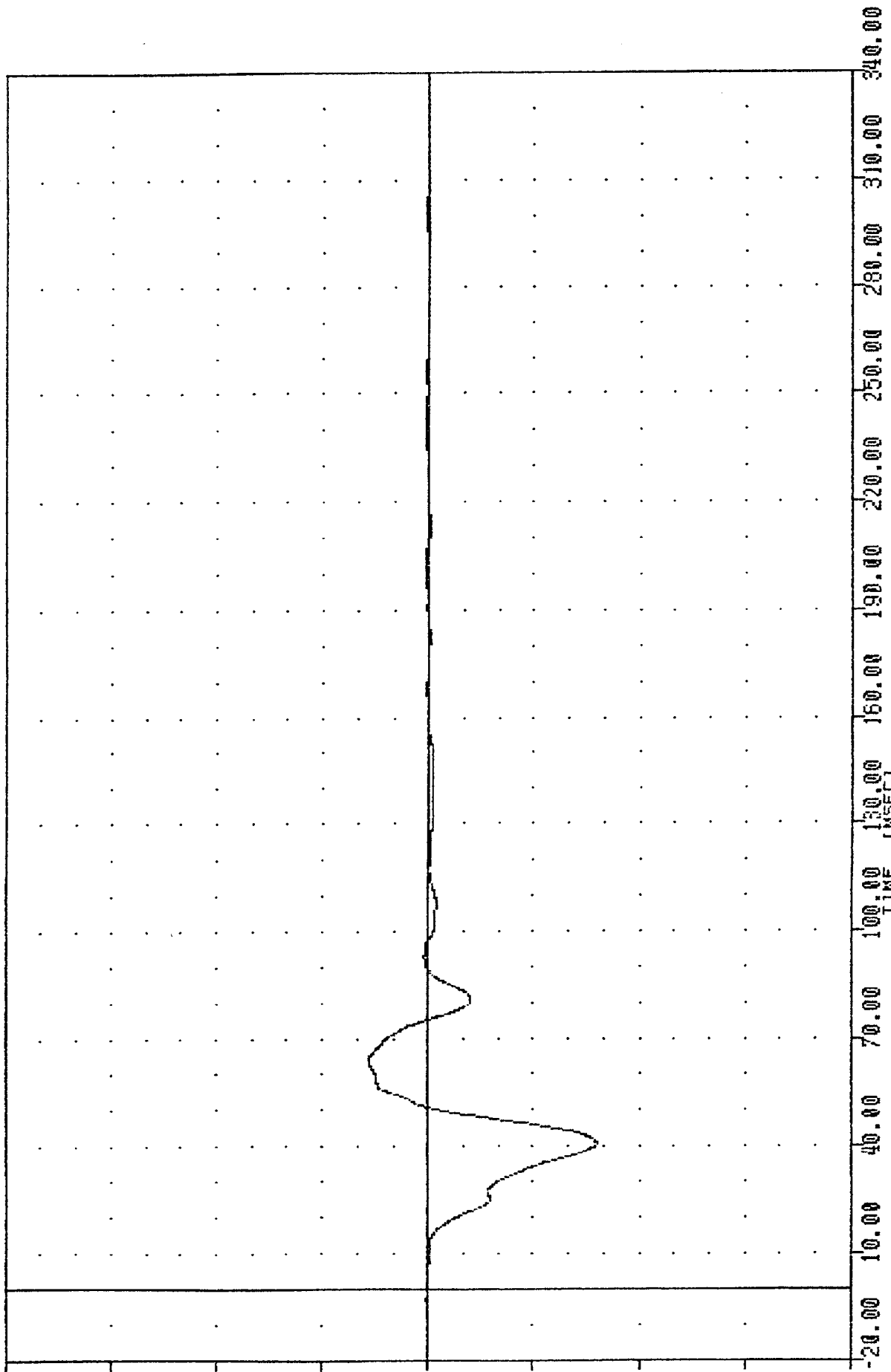
FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -96.10e 40.88, 33.74 e 63.63

ACCELERATION (G)

B-26

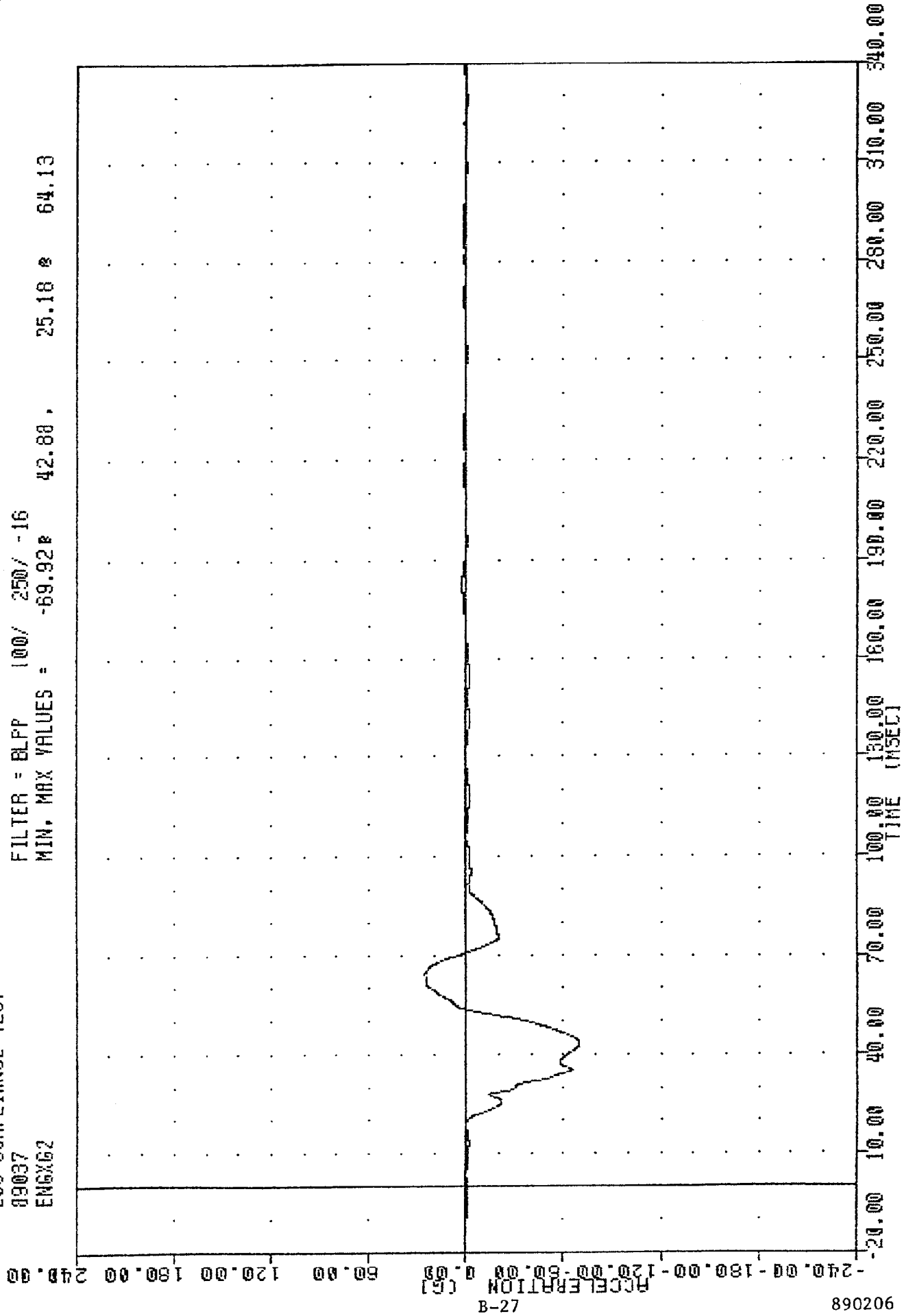
890206



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
ENGINE UPPER BLOCK X AXIS ACCELERATION

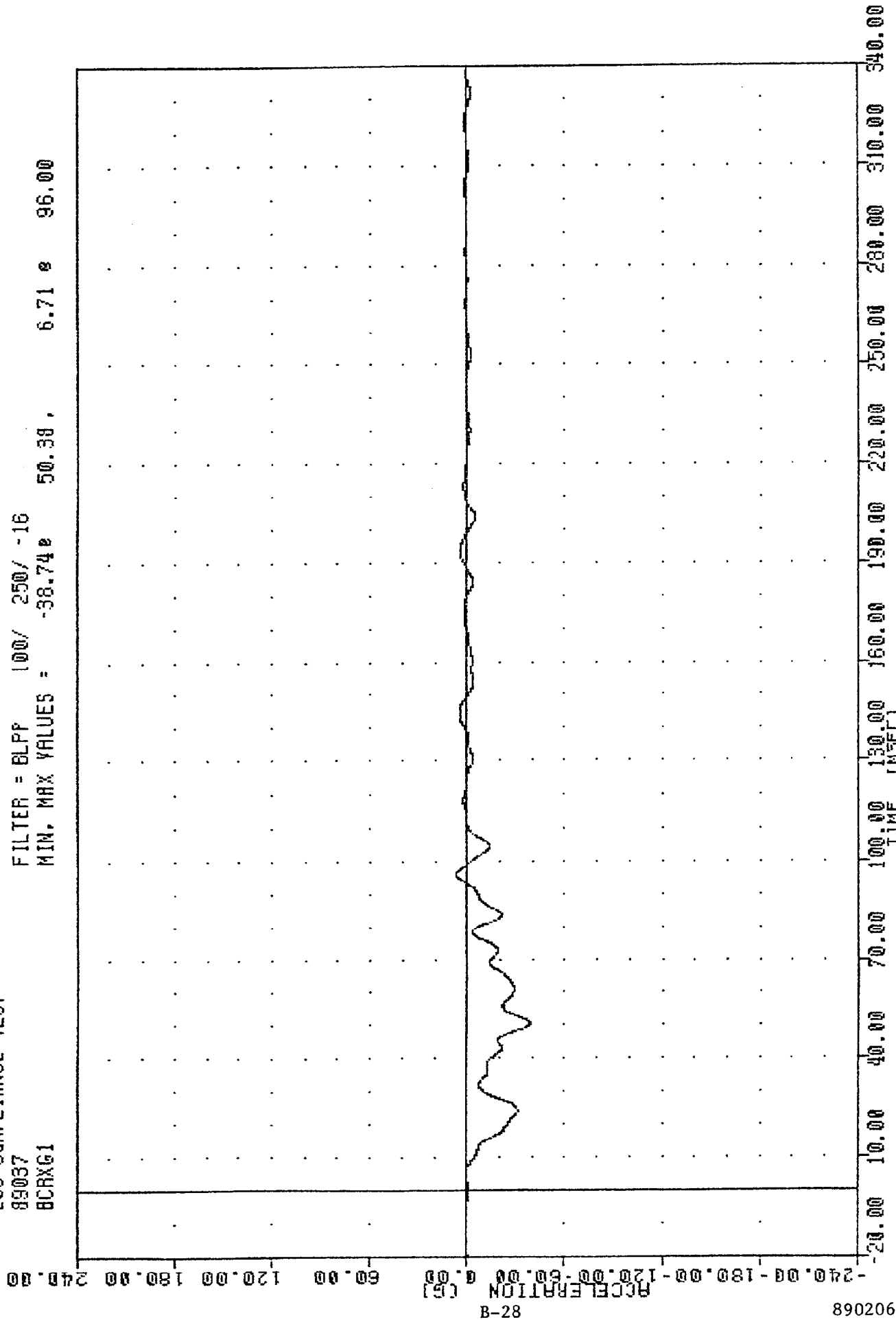
TRC 890206
208 COMPLIANCE TEST
89037
ENGXG2

FILTER = BLPP 100/ 250/ -16
MIN. MAX VALUES = -69.92 42.88 25.18 64.13



TRC 890206
 208 COMPLIANCE TEST
 89037
 8CRXG1

FILTER = BLPP 100/ 250/ -18
 MIN. MAX VALUES = -38.74e 50.38, 6.71 e 96.00



TRC 890206

208 COMPLIANCE TEST

89037

BCLXG1

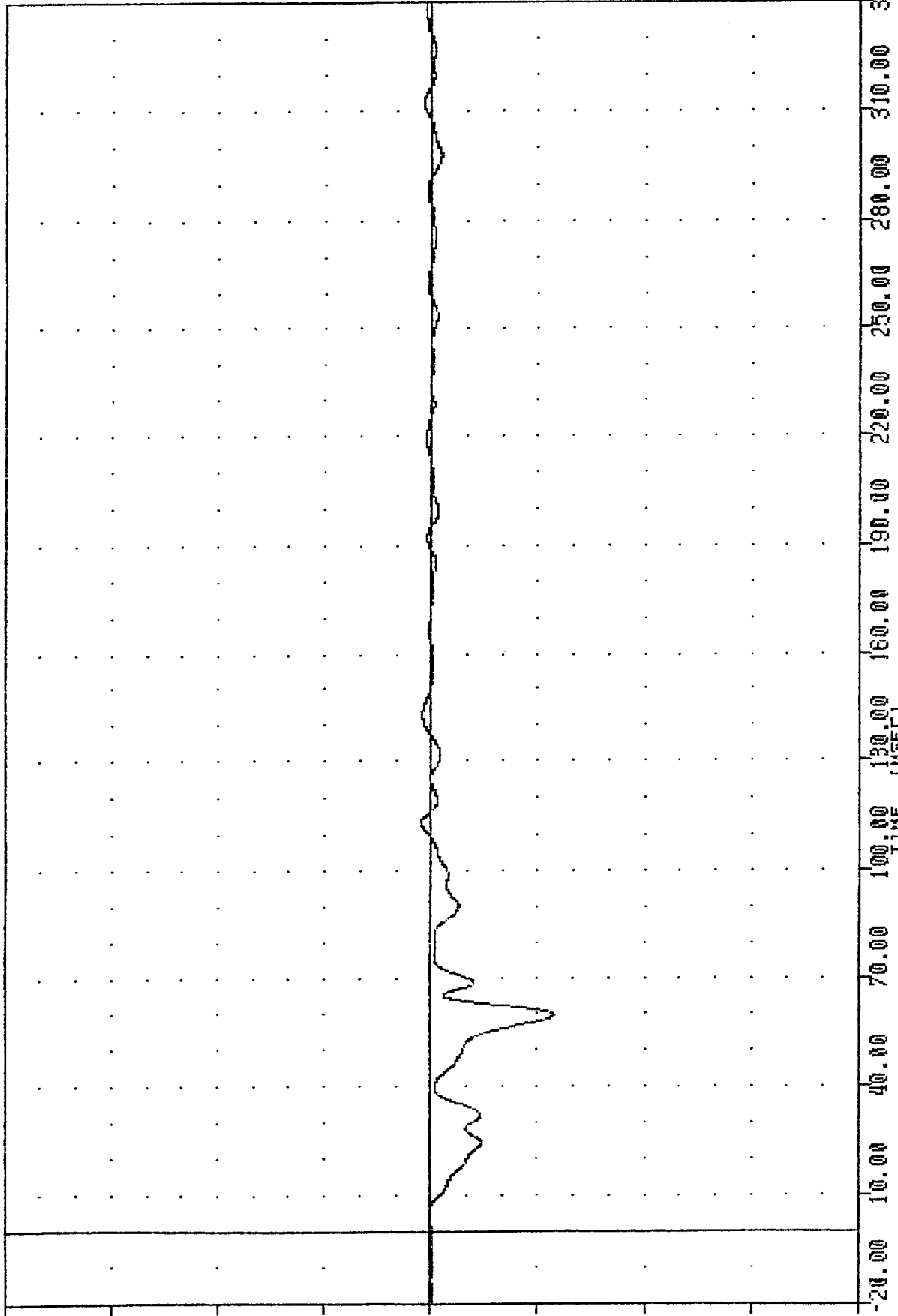
FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -69.25% 59.75, 5.60 e 113.13

ACCELERATION [G]

B-26

890206



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
LEFT BRAKE CALIPER X AXIS ACCELERATION

TRC 890206

208 COMPLIANCE TEST

89037

DFCXG1

FILTER = BLPP 100/ 250/ -16

MIN, MAX VALUES = -45.33e 46.88, 10.72 e 58.63

240.00

180.00

120.00

60.00

0.00

-60.00

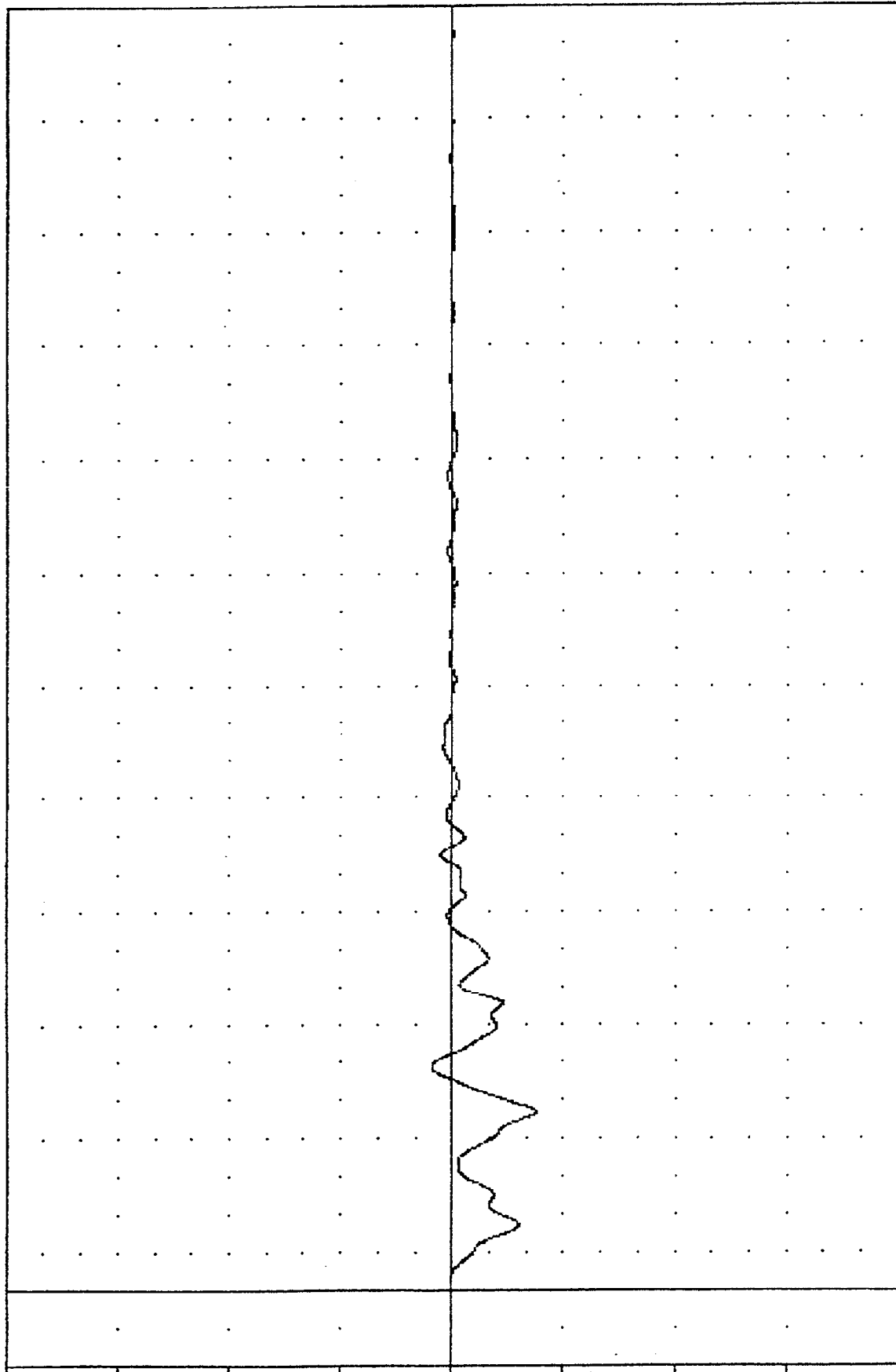
-120.00

-180.00

-240.00

B-30

ACCELERATION (G)



890206

-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 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
DASH PANEL CENTER X AXIS ACCELERATION

TRC 890206

208 COMPLIANCE TEST

89037

FFRXG

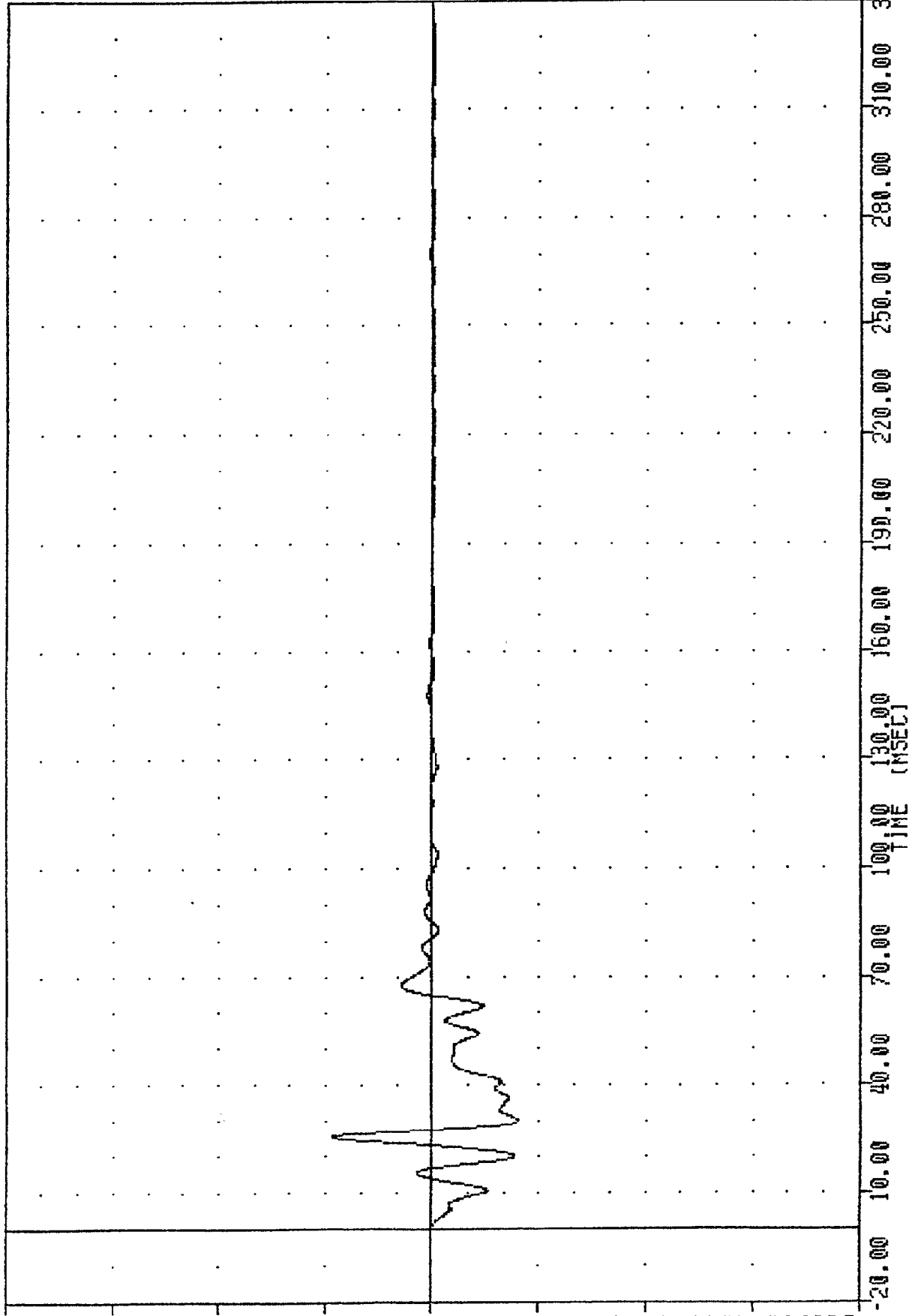
FILTER = BLPP 100/ 250/ -16

MIN. MAX VALUES = -47.93 30.13 56.84 25.50

ACCELERATION (G)

B-31

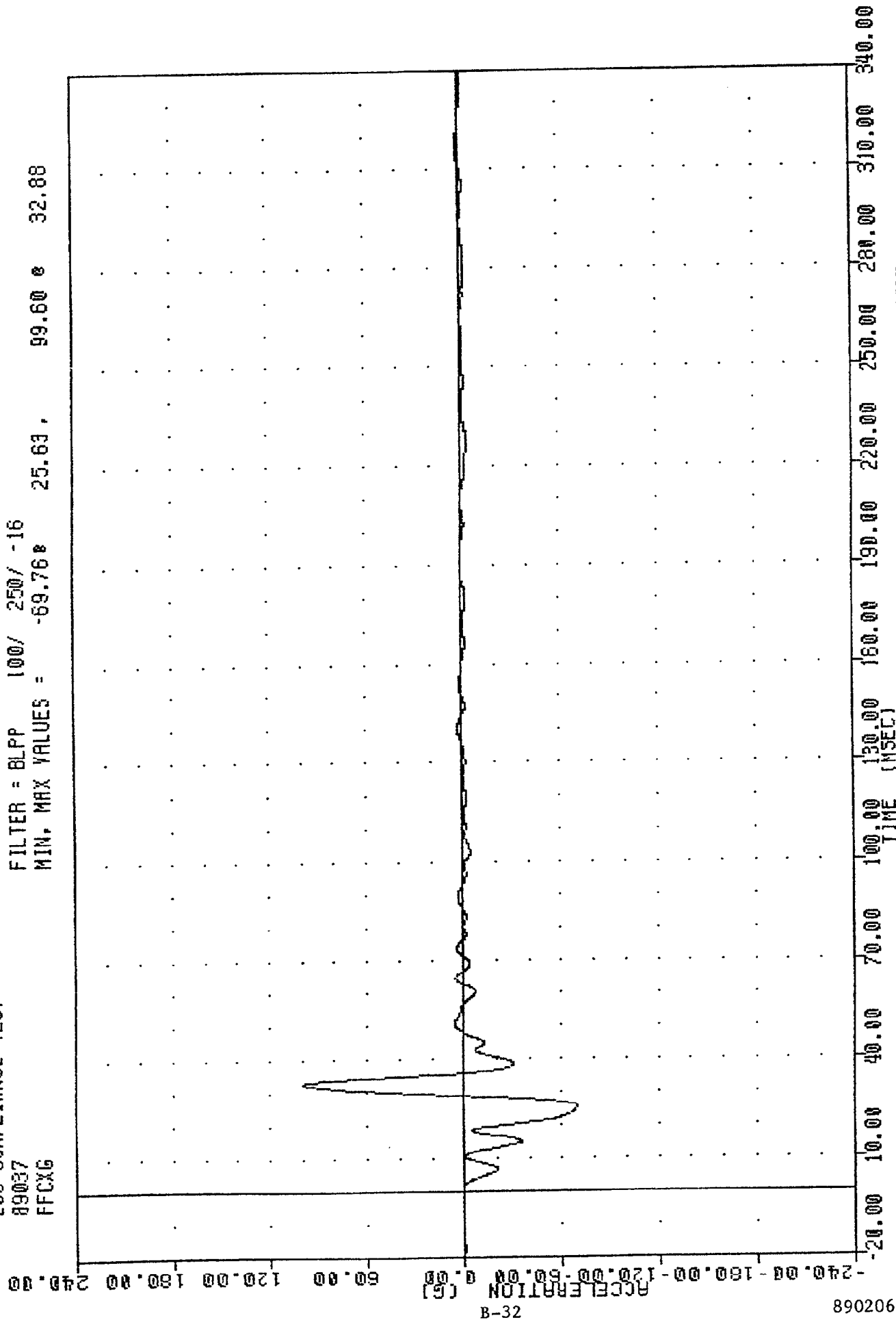
8902068



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
FRONT FRAME RAIL X AXIS ACCELERATION

TRC 890206
 208 COMPLIANCE TEST
 89037
 FFCXG

FILTER = BLPP 100/ 250/ -16
 MIN. MAX VALUES = -69.768 25.63, 99.60 e 32.88



TRC 890206

208 COMPLIANCE TEST

89037

FILXG

FILTER = BLPP 100/ 250/ -16

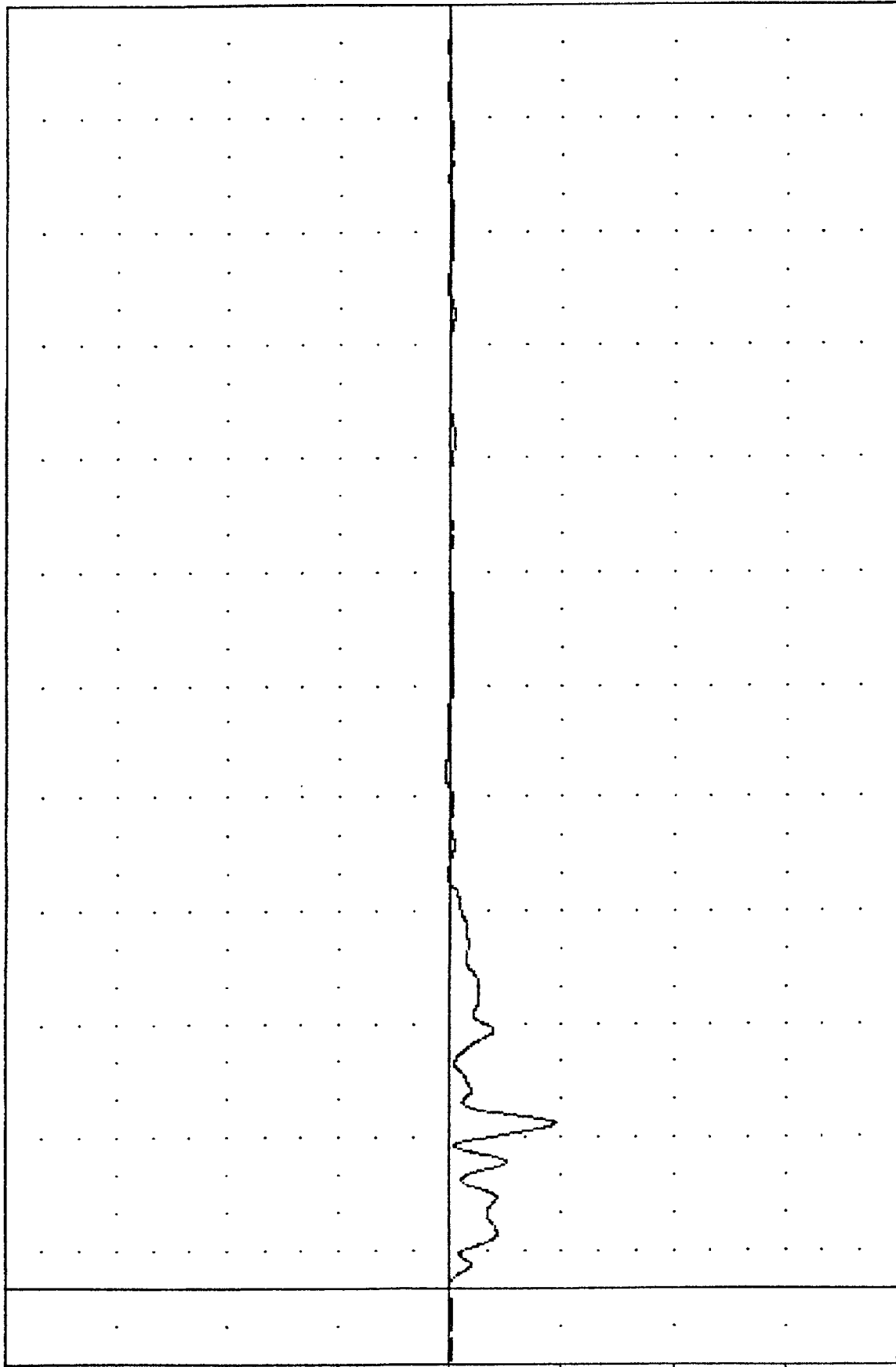
MIN. MAX VALUES = -56.42e

43.75.

3.11 e

135.63

ACCELERATION (G)



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

0.00 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

890206

B-33

1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
LEFT FENDER WELL INSIDE X AXIS ACCELERATION

TRC 890206

200 COMPLIANCE TEST

89037

FIRXG

FILTER = BLPP 100/ 250/ -16

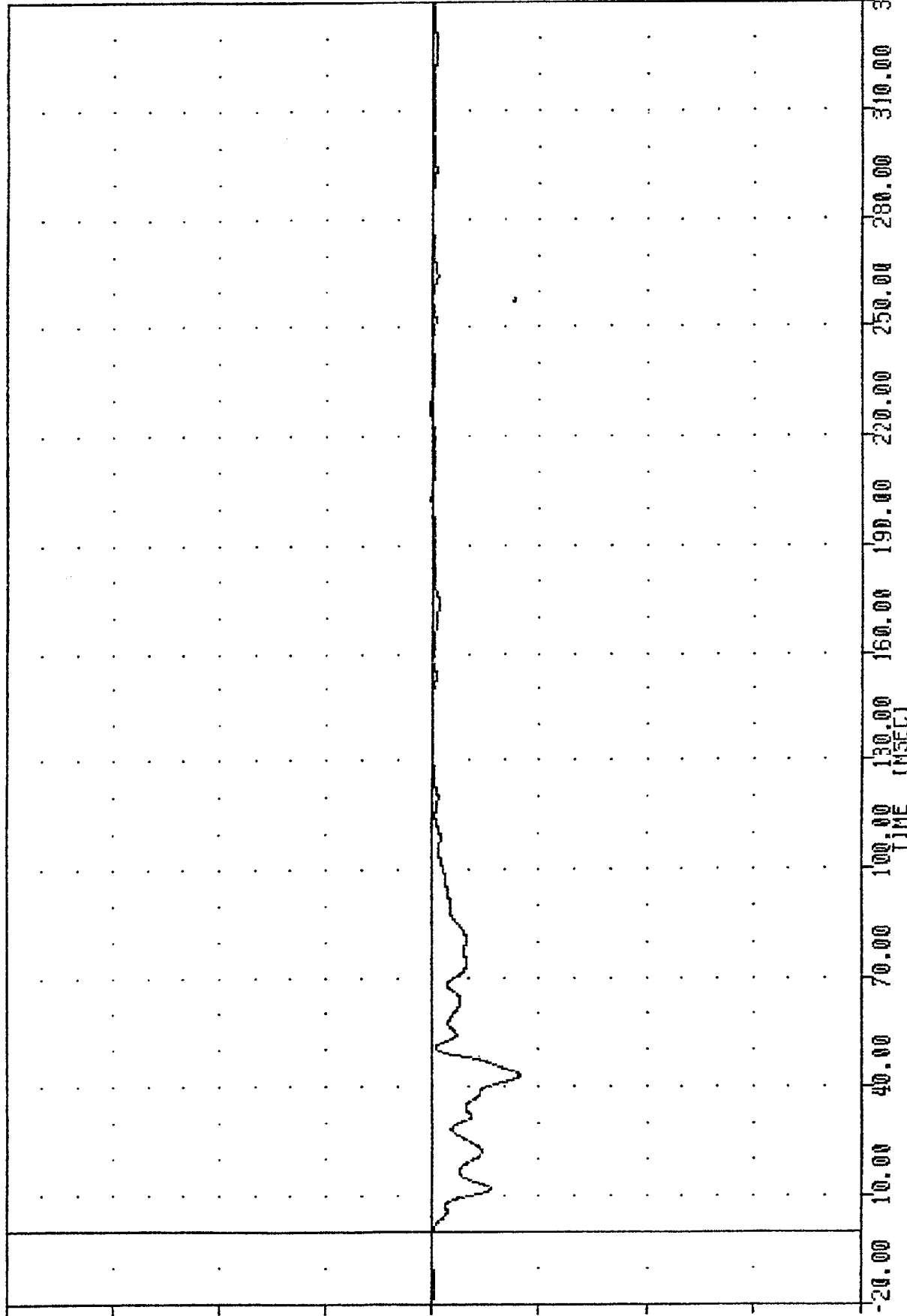
MIN. MAX VALUES = -49.08 43.00

1.18 227.75

ACCELERATION (G)

B-34

890206



1989 PONTIAC GRAND PRIX INTO FRONTAL BARRIER
RIGHT SHOCK TOWER X AXIS ACCELERATION