

V1268

R7050-00

SIDE IMPACT PROTECTION
IN PRODUCTION VEHICLES

MDB-TO-CAR SIDE IMPACT TEST OF
A 26° CRABBED MOVING DEFORMABLE BARRIER
TO A 1984 FORD RANGER
AT 33.5 MPH

MOBILITY SYSTEMS AND EQUIPMENT COMPANY
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JANUARY 1989

TEST REPORT

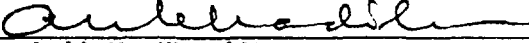
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For

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Research
400 Seventh Street, S.W.
Washington, DC 20590

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16. Abstract This test report documents a crash test to evaluate side impact protection. Testing was conducted on a 1984 Ford Ranger Pickup at the Mobility Systems and Equipment Company Test Facility, Mira Loma, California. The test vehicle was impacted on the left side by a moving deformable barrier, crabbled to 26°, at 33.5 mph. The test was a simulation of a 90° intersection collision with the striking vehicle traveling at 30 mph and the struck vehicle traveling at 15 mph. Occupant response of one side impact dummy was measured. The dummy was located in driver's designated seating position. The test date was September 30, 1988.			
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METRIC CONVERSION FACTORS

APPROXIMATE CONVERSIONS FROM 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	0.6	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha

MASS (weight)

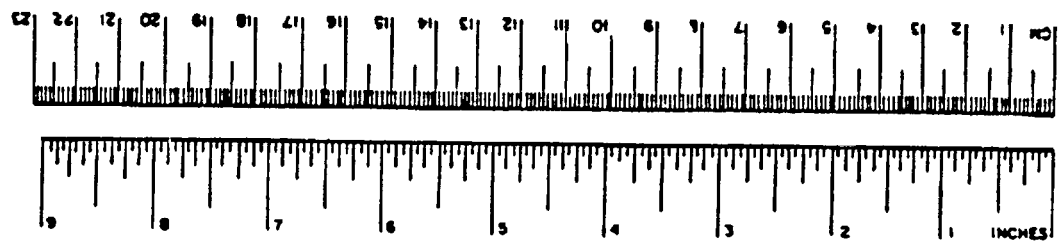
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t

VOLUME

tsp	teaspoons	5	milliliters	ml
tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pint	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	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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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	ac

MASS (weight)

g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	st

VOLUME

ml	milliliters	8.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	36	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F
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TABLE OF CONTENTS

<u>SECTIONS</u>	<u>PAGES</u>
1 Purpose and Introduction	1
2 Test Summary and Vehicle Information	2
3 Test Results	14
Appendix A Photographic Coverage	22
Appendix B Data Plots	26
Appendix C SID Certification Data	27
Appendix D SID Positioning Procedure	28

TABLES

2-1 Test Vehicle Data	3
2-2 Pretest Conditions	5
2-3 Crash Test Summary for Test Vehicle	6
2-4 Test Vehicle Accelerometer Locations and Data Summary	7
2-5 Side Impact Dummy Longitudinal Clearance Dimensions	8
2-6 Side Impact Dummy Test Data Summary	10
2-7 Crash Test Summary for Side Impactor	11
2-8 Moving Deformable Barrier (MDB) Accelerator Locations and Sample Data Summary	12
2-9 High-speed Camera Locations and Data	13
3-1 Pre and Posttest Measurements	15
3-2 Vehicle Side Measurements	16
3-3 Test Vehicle Exterior Profile from Reference Plane and Static Crush Data	17
3-4A Pre and Posttest Exterior Profile at Level -1 Axle Centerline 18.2" Above Ground Level	18
3-4B Pre and Posttest Exterior Profile at Level -2 H-Point 36.1" Above Ground Level	19
3-4C Pre and Posttest Exterior Profile at Level -3 Mid Door 33.6" Above Ground Level	20
3-4D Pre and Posttest Exterior Profile at Level -4 Window Sill 49.0" Above Ground Level	21

TABLE OF CONTENTS (Continued)

<u>TABLES</u>		<u>PAGES</u>
3-4E	Pre and Posttest Exterior Profile at Level -5 Window Top 67.5" Above Ground Level	22
3-5	Test Vehicle Measurement	23
3-6	Exterior Static Crush for Side Impactor	24

SECTION 1

PURPOSE AND INTRODUCTION

This testing program is an investigation and evaluation of side impact protection in production light trucks and vans. The test is specifically intended to simulate a 90° intersection collision with the striking vehicle moving at 30 mph and the struck vehicle traveling at 15 mph. This is accomplished by towing a Moving Deformable Barrier (MDB) crabbed at a 26° angle into the struck test vehicle which is placed in a stationary position. The velocity of the MDB is to be 33.5 $\pm$ 0.5 mph.

The subject vehicle for this test was a 1984 Ford Ranger Pickup. The test was performed on 30 September 1988 at an actual impact speed of 32.9 mph. The leading left-hand edge of the MDB contacted the test vehicle 36.5 inches forward of the midpoint between the axles.

Section 2 contains a general test summary and vehicle information data sheets. Section 3 contains the test results. Appendix A contains pretest and posttest vehicle and dummy photographs and Appendix B contains data plots for transducers. Appendix C contains side impact dummy certification data and Appendix D has the side impact dummy positioning procedure.

SECTION 2

TEST SUMMARY AND VEHICLE INFORMATION

The 1984 Ford Ranger Pickup, Test No. 00, was tested on 30 September 1988. General test vehicle information and pretest conditions are given in Table 2-1 and 2-2. A crash test summary is shown in Table 2-3. The vehicle was instrumented with 10 accelerometer channels and two onboard high-speed movie cameras. Accelerometer locations and peak values are shown in Table 2-4. All pretest measurements were made detailing the left side vehicle profile. The impact point was marked on the vehicle 37 inches forward of the midpoint of the wheelbase.

One side impact anthropomorphic dummy (SID) was placed in the vehicle's driver seat and positioned using the side impact dummy seating procedure (Appendix D). SID position measurements are shown in Table 2-5. The SID was instrumented with 12 accelerometers and one displacement transducer. A summary of the SID accelerometer data is given in Table 2-6. Colored chalk was applied to the SID's head, left shoulder, left hip and his knees to help determine dummy contact points during the test.

The MDB was crabbed at 26° and instrumented with five (5) accelerometers and two (2) high-speed movie cameras. A general crash test summary and accelerometer locations with peak values for the MDB are shown in Tables 2-7 and 2-8.

Additional film coverage of the test was also provided by two (2) overhead and two (2) ground high-speed movie cameras and one real-time camera. Camera locations are given in Table 2-9. A total of 26 channels of information were recorded on two (2) FM data tapes.

TABLE 2-1 TEST VEHICLE DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1988/FORD/RANGER/PICKUP TRUCK
 VEHICLE NHTSA NO.: TEST 00 VIN: 1FTBR10A5EUA79453
 VEHICLE BODY COLOR: BLUE; MONTH & YEAR OF MANUFACTURE: 09/82
 ENGINE: Cyl.: 4 C.I.D. 2.3 Liters; Placement: X Longitudinal; Lateral
X Gas; Diesel; Turbocharged
 TRANSMISSION: 4 Speed; X Manual; Automatic; Overdrive
 FINAL DRIVE: Front Wheel Drive; X Rear Wheel Drive; Four Wheel Drive
 DATE VEHICLE AVAILABLE FOR SIDE IMPACT TESTING: JUNE 1988
 ODOMETER READING: 745.8 miles; OPTIONS: A/C; P/S; P/Wdo;
 Tilt Whl.; Cruise Control

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): 35 psi Front; 35 psi Rear

Recommended Tire Size: P185/75R14SL

Tires On Vehicle: P185/75R14; Manufacturer: General

Number Of Occupants: 3 Front; Rear; 3rd Seat; 3 TOTAL

Type Of Front Seats: Bucket; X Bench; Split Bench

Type Of Front Seat Back: X Fixed; Adjustable With Lever/ Rotating Knob

Vehicle Maximum Capacity Loading = 1301* lb (A)

No. Of Occupants x 150 lb - - - = 450 lb (B)

Cargo Capacity (A - B) - - - - = 851 lb

*GVWR - Delivered Weight

TEST VEHICLE DELIVERED WEIGHT WITH MAXIMUM FLUIDS:

Right Front = 745 lb

Left Front = 810 lb

Right Rear = 522 lb

Left Rear = 497 lb

TOTAL WEIGHT = 2574 lb

TOTAL FRONT = 1555 lb (60.4% of TOTAL)

TOTAL REAR = 1019 lb (39.6% of TOTAL)

TABLE 2-1 TEST VEHICLE DATA (Cont'd)

CALCULATION OF TEST VEHICLE TARGET WEIGHT:

Total Test Vehicle Delivered Weight With Maximum Fluids	=	<u>2574</u>	lb
Maximum Cargo Carrying Capacity Of Test Vehicles* - - -	=	<u>300</u>	lb
Weight Of Two P.572 Dummies (1 x 164 lb)- - - - -	=	<u>174</u>	lb
TEST VEHICLE TARGET WEIGHT- - - - -	=	<u>3048</u>	lb

* 300 lb for light trucks and MPVs

ACTUAL WEIGHT OF TEST VEHICLE WITH 1 DUMMY AND CARGO:

Right Front	=	<u>797</u>	lb	
Left Front	=	<u>920</u>	lb	TOTAL FRONT = <u>1717</u> lb (<u>56.3%</u> of TOTAL)
Right Rear	=	<u>661</u>	lb	
Left Rear	=	<u>670</u>	lb	TOTAL REAR = <u>1331</u> lb (<u>43.7%</u> of TOTAL)
TOTAL WEIGHT	=	<u>3048</u>	lb (which includes <u>300</u> lb of cargo ballast weight)	

TEST VEHICLE ATTITUDE:

As Delivered — Right Front	=	<u>27.9</u>	In	Ready For Test — Right Front	=	<u>27.6</u>	In
Left Front	=	<u>27.6</u>	In	Left Front	=	<u>27.6</u>	In
Right Rear	=	<u>29.3</u>	In	Right Rear	=	<u>27.4</u>	In
Left Rear	=	<u>29.6</u>	In	Left Rear	=	<u>27.6</u>	In
Test Vehicle Wheelbase:		<u>107.0</u>	in; C.G. = <u>46.6</u>	in rearward of front wheel centerline			

TOTAL VEHICLE LENGTH:

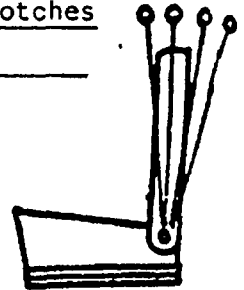
Right Side	=	<u>176.4</u>	in
Left Side	=	<u>176.4</u>	in
Centerline	=	<u>177.4</u>	in

TABLE 2-2 PRETEST CONDITIONS

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1984/FORD/RANGER/PICKUP
 VEH. NHTSA NO. N/A; TEST DATE: 09/30/88
 FRONT SEAT CUSHION PLACEMENT: Midpoint of forward/aft travel (6th notch rearward
TOTAL NUMBER OF ADJUSTMENT POSITIONS OR DETENTS: 11 notches
 FRONT SEAT BACK ADJUSTMENT POSITION: Not Adjustable

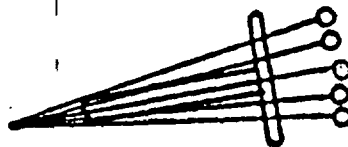
(latch position, knob rotations, etc.)

TORSO ANGLE: 25°



ADJUSTABLE STEERING COLUMN POSITION:

X Not Applicable



Midpoint of swing

WINDOW POSITIONS: Left Front — closed
 Left Rear — opened
 Right Front — N/A
 Right Rear — N/A

NOTE: Window will be in closed position on struck side of test vehicle and in open position on opposite side.

AMOUNT OF STODDARD SOLVENT IN FUEL TANK: Front Standard Tank 14.0 Gal

(92 to 94% of USABLE CAPACITY)

LOCATION OF IMPACT POINT ON TEST VEHICLE SIDE TO BE IMPACTED:

Wheelbase = 107.0 in

Impact point is 16.5 inches rearward of front axle centerline (which is 37 inches forward of the wheelbase midpoint).

TABLE 2-3 CRASH TEST SUMMARY FOR TEST VEHICLE

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1988/FORD/RANGER/PICKUP

VEH. NHTSA NO. N/A; VIN: 1FTBR10A5EUA79453

TEST DATE: 09/30/88 BUILD DATE: 09/83

OVERALL LENGTH = 177.4 inches; OVERALL WIDTH = 64.4 inches

TEST WEIGHT: Left Front = 920 lb; Left Rear = 670 lb

Right Front = 797 lb; Right Rear = 661 lb

SUBTOTALS - - - Front = 1717 lb Rear = 1331 lb

TOTAL VEHICLE WEIGHT - - - - - 3048 lb

WHEELBASE = 107.0 inches

LONGITUDINAL C.G. FROM CENTER OF FRONT AXLE = 46.6 inches

IMPACT ANGLE WITH RESPECT TO IMPACTOR = 90 degrees

MAXIMUM EXTERIOR STATIC CRUSH:

1. LEVEL 1 (16.0" above ground) = 16.9 inches

2. LEVEL 2 (27.5" above ground) = 21.5 inches

3. LEVEL 3 (30.3" above ground) = 22.0 inches

4. LEVEL 4 (43.4" above ground) = 14.9 inches

5. LEVEL 5 (59.6" above ground) = 5.6 inches

MAXIMUM POSTTEST INTRUSION = 22.0 inches

OCCUPANTS:

DRIVER

LEFT REAR

TYPE OF DUMMY - - - - SID

N/A

RESTRAINT USED- - - - None

N/A

(Manual Belts)

(Manual Belts)

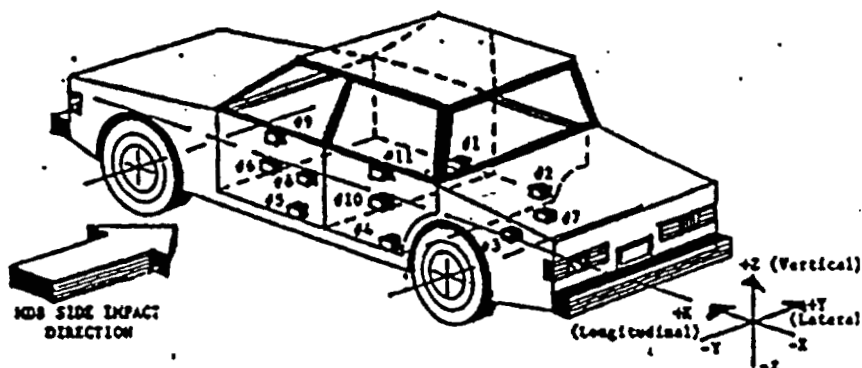
INSTRUMENTATION:

NUMBER OF DATA CHANNELS = 26

NUMBER OF CAMERAS: ONBOARD = 4 High-speed

OFFBOARD = 4 High-speed, 1 Real Time

TABLE 2-4 TEST VEHICLE ACCELOMETER LOCATIONS AND DATA SUMMARY

TEST VEHICLE: FORD RANGER PICKUPNHTSA NO.: N/ATEST DATE: 09/30/88

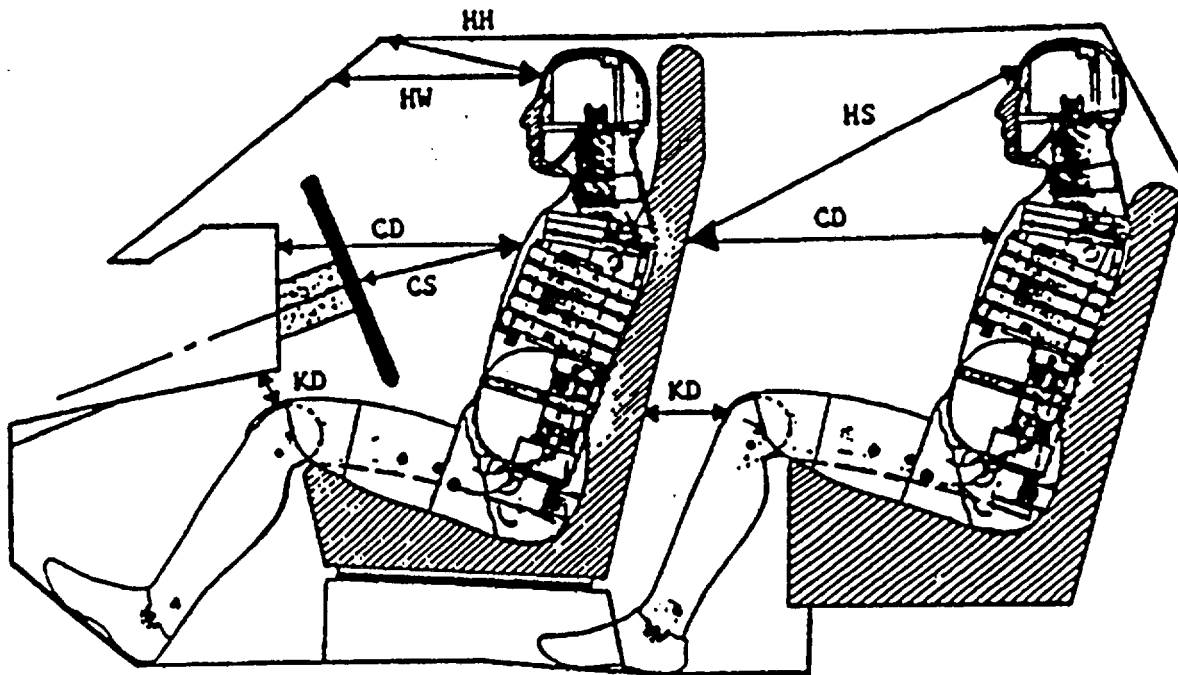
					LONG. (X) POS. / NEG.	LAT. (Y) POS. / NEG.	VERT. (Z) POS. / NEG.	RESULTANT POS. / NEG.				
ACCEL. NO.	LOCATION	COORDINATES(")			MAX	TIME	MAX	TIME	MAX	TIME	MAX	TIME
		X*	Y*	Z*	(g)	(msec)	(g)	(msec)	(g)	(msec)	(g)	(msec)
1	Right Side Sill At Front Seat	107.7	22.8	17.8	-28.8	41.1	+39.8	15.2	+28.3	41.4	+28.3	41.4
2	Right Side Sill At Rear Seat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	Right Floorpan Above Axle	41.4	0.0	27.5	+25.6	51.4	+32.1	42.3	-28.8	51.9	+48.6	51.6
4	Left Side Sill At Rear Seat	NA	NA	NA			NA	NA				
5	Left Side Sill At Front Seat	105.2	-23.7	17.5			-39.6	51.3				
6	Left Front Door on Centerline	107.2	-29.4	33.7			+257.6	8.2				
7	Right Rear Occ. Compartment	NA	NA	NA			NA	NA				
8	Midrear of Left Front Door	89.1	-29.4	34.3			+121.5	28.2				
9	Left Front Door Upper Centerline	104.3	-29.4	40.8			+79.1	22.4				
10	Midrear of Left Rear Door	NA	NA	NA			NA	NA				
11	Left Rear Door Upper Centerline	NA	NA	NA			NA	NA				

* Reference: X - Rear Bumper (+ Forward)

Y - Vehicle Centerline (+ To Right)

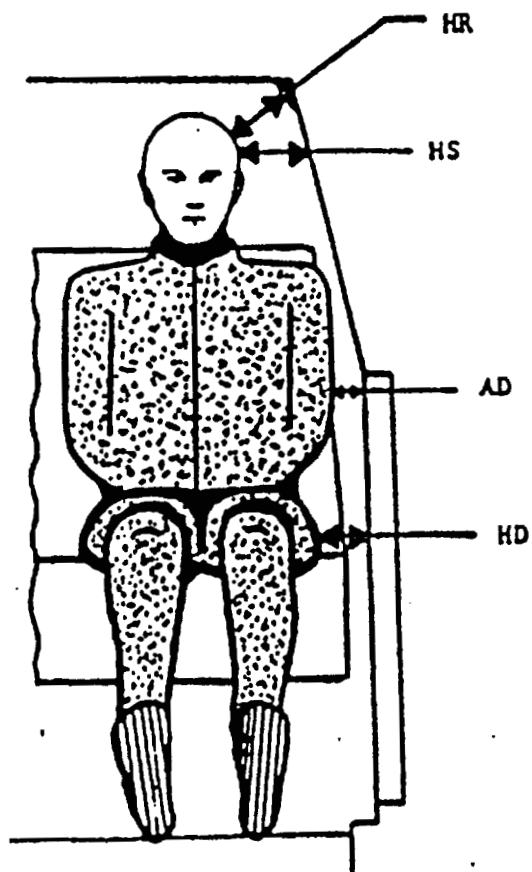
Z - Ground Level (+ Up)

TABLE 2-5 SIDE IMPACT DUMMY (SID) LONGITUDINAL CLEARANCE DIMENSIONS



	DRIVER ID # 137	REAR PASSENGER ID # N/A
HH	15.2 in	----- in
HW	20.7 in	----- in
HS	----- in	NA in
CD	20.5 in	NA in
CS	10.6 in	----- in
KDL	4.7 in	NA in
KDR	4.9 in	NA in

TABLE 2-5 SIDE IMPACT DUMMY (SID) LONGITUDINAL CLEARANCE DIMENSIONS (Cont'd)



	DRIVER ID # 137	REAR PASSENGER ID # N/A
HR	8.8 In	NA In
HS	10.4 In	NA In
AD	4.6 In	NA In
HD	7.2 In	NA In

TABLE 2-6 SIDE IMPACT DUMMY (SID) TEST DATA SUMMARY

TEST DATE: 10/28/88

	FRONT DUMMY — ID # 137				REAR DUMMY — ID # NA			
	POS.	DIRECT.	NEG.	DIRECT.	POS.	DIRECT.	NEG.	DIRECT.
	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
HEAD ACCELERATIONS:								
Longitudinal — X	37.9	48.7	-11.6	184.3	NA	NA	NA	NA
Lateral — Y	49.2	63.3	-12.3	48.3	NA	NA	NA	NA
Vertical — Z	NO DATA		NO DATA	NO DATA	NA	NA	NA	NA
RESULTANT — R	110.1	86.1	0.0	0.0	NA	NA	NA	NA
HIC — *	460.2				NA	NA	NA	NA
RIB ACCELERATIONS:								
1. Upper Rib Lateral Y*	125.6	35.0	-40.2	74.4	NA	NA	NA	NA
2. Upper Rib Lateral Y*	128.1	35.0	-40.1	75.0	NA	NA	NA	NA
1. Lower Rib Lateral Y*	139.9	35.0	-38.5	40.6	NA	NA	NA	NA
2. Lower Rib Lateral Y*	136.8	35.0	-32.6	60.6	NA	NA	NA	NA
SPINE ACCELERATIONS:								
1. Upper Lateral Y*					NA	NA	NA	NA
2. Upper Lateral Y*					NA	NA	NA	NA
1. Lower Lateral Y*	125.2	40.0	-36.6	67.5	NA	NA	NA	NA
2. Lower Lateral Y*	125.7	35.6	-41.3	60.6	NA	NA	NA	NA
PELVIS ACCELERATIONS:								
Lateral Y*	155.2	29.4	-37.6	41.2	NA	NA	NA	NA
RIB DEFLECTION:	0.22	210.0	-1.64 in	61.2	NA	NA	NA	NA

Data Required (other data to be used by R & D)

REFERENCE: Positive Direction — Longitudinal (X) = forward

Lateral (Y) = to right

Vertical (Z) = up

Positive Direction — Longitudinal (X) = rearward

Lateral (Y) = to left

Vertical (Z) = down

TABLE 2-7 CRASH TEST SUMMARY FOR SIDE IMPACTOR

TYPE OF TEST: 301 SIDE TEST DATE 09/20/88

NHTSA NO. FOR TARGET VEHICLE: NA

POSITION OF IMPACTOR (MDB) ON MONORAIL: CRABBED 26° TO RIGHT (CLOCKWISE)

MDB DETAILS: Overall Width of Framework Carriage = 49.35 in.

Overall Length of MDB = 162 in. (including honeycomb impact face)

Wheelbase of Framework Carriage = 102 in.

Tread of Framework Carriage (Front & Rear) = 72 in.

C.G. location rearward of front axle = 50 in.

MDB Weight — Left Front = 1123 lb; Left Rear = 884 lb

Right Front = 1077 lb; Right Rear = 896 lb

SUBTOTAL: Front = 2200 lb; Rear = 1780 lb

TOTAL MDB WEIGHT = 3980 lb

IMPACT ANGLE (MDB C/L to Target Vehicle C/L) = 90° (blank)

IMPACT SPEED = 32.9 MPH

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE:

1. ROW A at bumper level = 1.6 in.

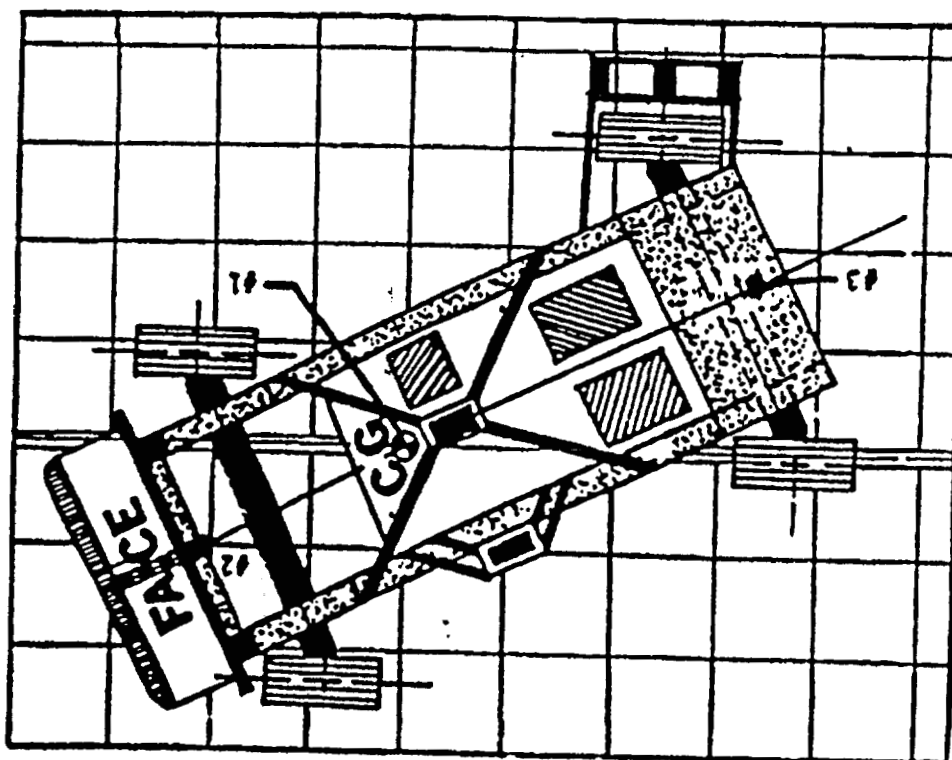
2. ROW B at mid-stack level = 0.5 in.

3. ROW C at top of stack level = 10.8 in.

INSTRUMENTATION:

Number of MDB Data Channels = 5 accelerometer channels

TABLE 2-8 MOVING DEFORMABLE BARRIER (MDB) ACCELEROMETER LOCATIONS AND SAMPLE DATA SUMMARY



ACCEL. NO.	LOCATION	Coordinates			POS. MAX (g)	DIRECT TIME (msec)	NEG. MAX (g)	DIRECT. TIME (msec)
		X*	Y*	Z*				
1	MDB Center of Gravity							
	Longitudinal X				12.8	54.9	-15.3	49.9
	Lateral Y				12.3	196.8	14.7	72.7
	Vertical Z	56.4	0.0	12.0	6.8	130.2	-5.8	61.0
	Resultant R				56.9	81.4	-0.0	0.0
2	Front Frame Member							
	Longitudinal X	121.4	0.0	9.8	56.0	81.4	-43.8	78.0
3	Rear Frame Member							
	Longitudinal X	2.5	0.0	14.0	4.6	187.9	-20.4	48.2

*References: X - Rearmost Frame Point (+ Forward)
Y - Centerline of MDB (+ Right)
Z - ground Level (+Up)

TABLE 2-9 HIGH-SPEED CAMERA LOCATIONS AND DATA

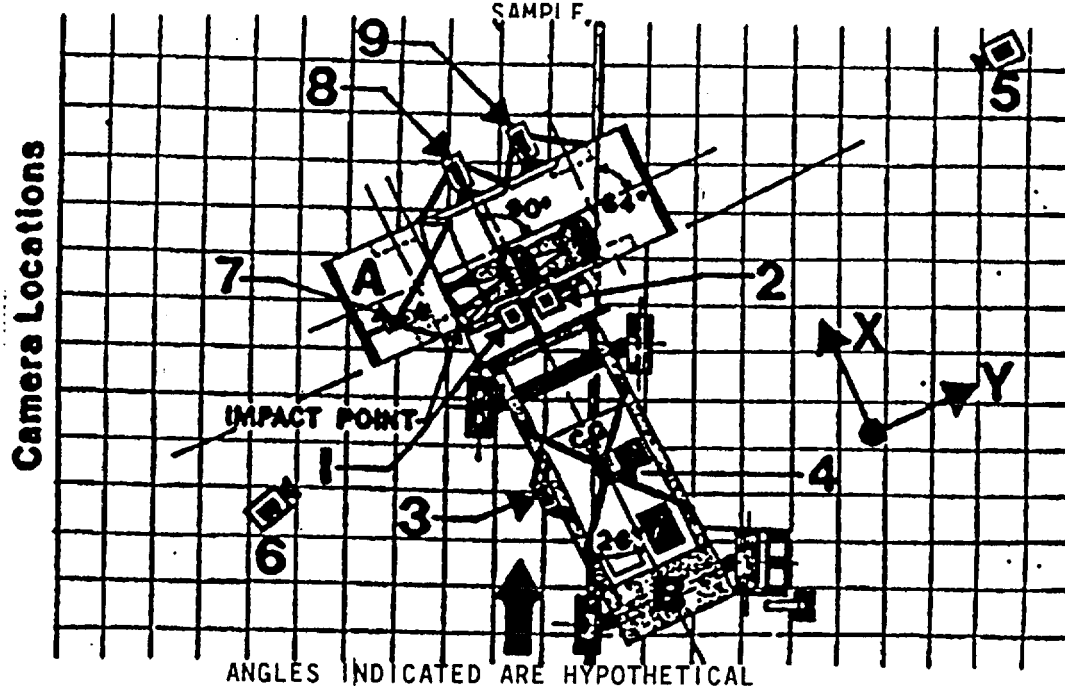
CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	COORDINATES (in)		
					X*	Y*	Z*
1	Overhead view of test vehicle dynamics	Fastex	8	600	0	18	252
2	Overhead Closeup view of Impact plane	Fastex	35	600	0	80	252
3	MDB Onboard Closeup view of impact point	Himac	25	600	-88	18	49
4	MDB Onboard view of driver dummy kinematics	Himac	13	600	-118	33	80
5	Overhead view of test Level—Overall View	Fastex	25	600	-18	648	39
6	Left Side Ground Level—Overall View	Fastex	17	600	0	-208	48
7	Test Vehicle Onboard-driver dummy front view kinematics	Photo-sonic		600	14	-42	50
8	Test Vehicle Onboard-driver dummy side view kinematics	Photo-sonic		600	77	35	51
9	Test Vehicle Onboard-pass. dummy side view kinematics	NA	NA	NA	NA	NA	NA

NOTE: Real time (24 fps) film coverage of pre-test test, and post-test events included in final print

* Reference (from point of impact

+X = Forward
+Y = To Right
+Z = Upward

SAMPLE



SECTION 3

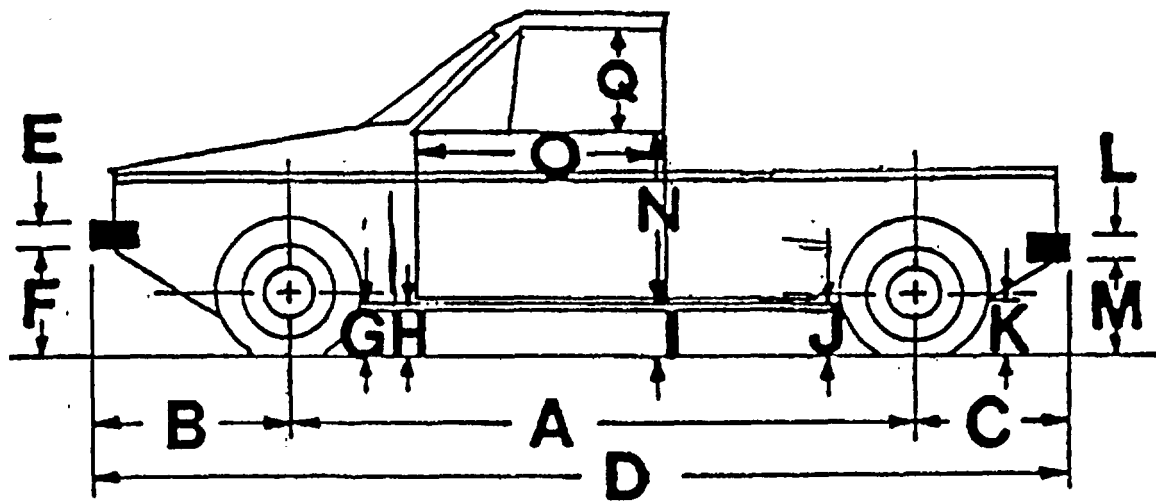
TEST RESULTS

The 1984 Ford Ranger Pickup was impacted at 32.9 mph by the 26° crabbed MDB on 30 September 1988. The MDB's left edge contacted the test vehicle 0.5 inches forward of the impact line. The test vehicle was spun around counterclockwise, the lighter back end of the vehicle pivoting around the heavier front. The vehicle driver side door and bed were crushed inwards a maximum of 22.0 inches. Pretest and posttest vehicle dimensions are shown in Tables 3-1 to 3-4.

The SID impacted the driver door with the left knee, hip and shoulder. The neck and body were rotated far enough by the impact force to allow the SID head to go through the driver side window. The SID head did not contact the aluminum barrier or any objects during this action. The SID then rotated to its left while being thrown across the cab interior. It appeared that the top of the SID head slightly impacted the cab ceiling. The SID ended up sitting in the passenger position facing forward. SID contact is documented in Table 3-5.

The MDB impacted the test vehicle and was stopped by the remote brake system to prevent a second impact. The aluminum deformable barrier received minor damage with a maximum crush of 10.4 inches on the left front corner. The crush details for the MDB are given in Table 3-6.

TABLE 3-1 PRE AND POSTTEST MEASUREMENTS



NOTE: All dimensions are in inches

	PRETEST	POSTTEST	CHANGE
A	108.0	106.9	1.1
B	28.5	27.4	1.1
C	40.4	40.3	0.1
D	176.4	174.6	1.8
E	6.9	6.9	0.0
F	15.0	19.5	-4.5
G	13.7	14.5	-0.8
H	16.3	21.7	-5.4
I	17.3	20.4	-3.1
J	15.9	17.0	-1.1
K	17.8	19.8	-2.0
L	4.0	4.0	0.0
M	21.1	22.1	-1.0
N	27.5	22.8	4.7
O	42.5	41.4	1.1
P	N/A	N/A	N/A
Q	17.1	16.7	0.4

TABLE 3-2 VEHICLE SIDE MEASUREMENT

TEST VEHICLE NHTSA NO.: TEST #00

LEVEL 5 @ Window Top	59.6	in
LEVEL 4 @ Window Sill	43.4	in
LEVEL 3 @ Mid Door	30.3	in
LEVEL 2 @ Occupant H-Point	27.5	in
LEVEL 1 @ Axle Centerline Height	16.0	in
(or Sill Top Height)		

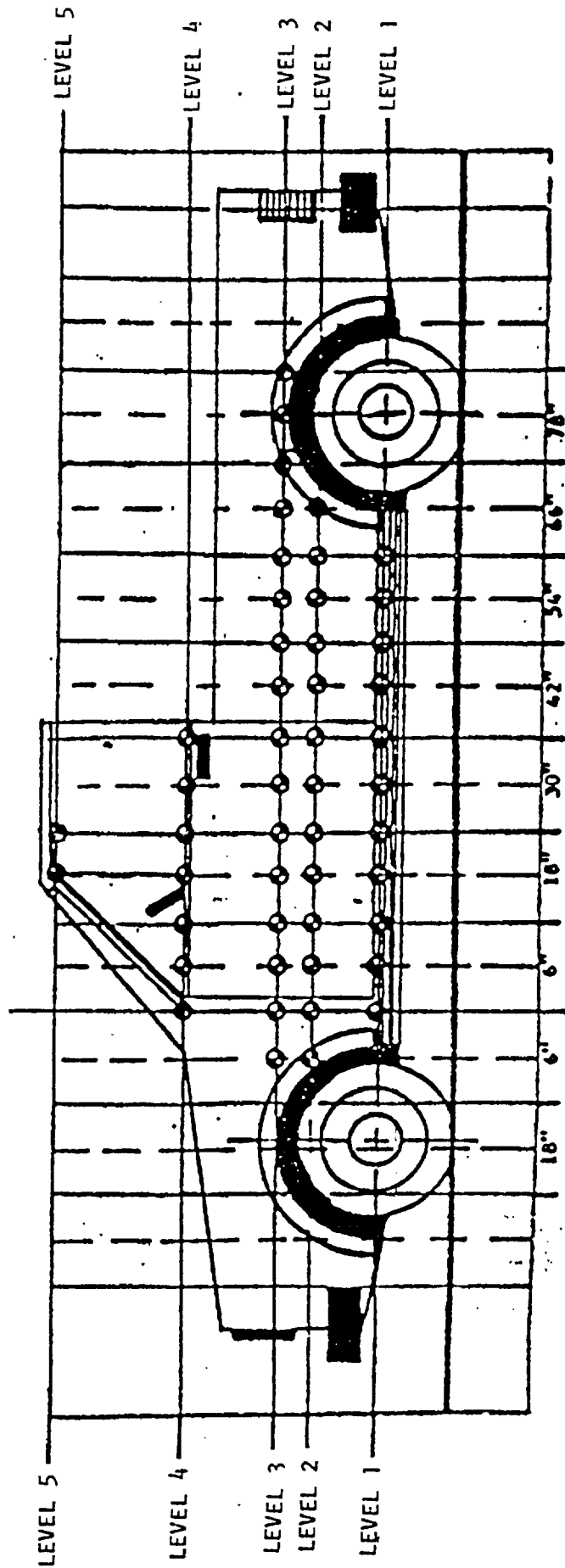


TABLE 3-3 TEST VEHICLE EXTERIOR PROFILES FROM REFERENCE PLANE* AND STATIC CRUSH DATA

TEST DATE	LOCATION:	HEIGHT (in)	PROFILES/CRUSH	IMPACT POINT													
				6"	0"	6"	12"	18"	24"	30"	36"	42"	48"	54"	60"	66"	72"
1. Window Top	59.6	Posttest-- --	NA	NA	NA	NA	26.3	26.5	27.2	27.6	NA	NA	NA	NA	NA	NA	NA
		Pretest -- --	NA	NA	NA	21.9	22.0	22.2	22.2	NA	NA	NA	NA	NA	NA	NA	NA
		Static Crush--	NA	NA	NA	4.4	4.5	5.2	5.6	NA	NA	NA	NA	NA	NA	NA	NA
2. Window Sill	43.4	Posttest-- --	NA	NA	NA	29.8	32.5	30.0	29.7	29.6	29.8	NA	NA	NA	NA	NA	NA
		Pretest -- --	NA	NA	NA	17.6	17.6	17.6	17.6	17.5	17.5	NA	NA	NA	NA	NA	NA
		Static Crush--	NA	NA	NA	12.2	14.9	14.9	12.4	12.1	12.3	NA	NA	NA	NA	NA	NA
3. Mid-Door	30.3	Posttest-- --	15.9	20.5	32.6	32.8	33.0	33.1	33.2	33.1	33.3	33.5	32.8	36.5	37.5	29.5	
		Pretest -- --	15.6	15.6	15.3	15.2	15.2	15.2	15.2	15.3	15.3	15.4	15.6	15.7	15.5	15.4	
		Static Crush--	0.3	4.9	17.3	17.6	17.8	17.9	18.0	17.8	18.0	18.1	17.2	20.8	22.0	14.1	
4. H-Point	27.5	Posttest-- --	18.5	20.3	31.5	32.4	32.9	33.0	33.1	33.0	32.9	33.2	35.4	36.4	37.0	35.5	
		Pretest -- --	15.0	15.3	15.5	15.2	15.2	15.2	15.5	15.3	15.4	15.6	15.6	15.6	15.5	15.5	
		Static Crush--	3.5	5.0	16.0	17.2	17.7	17.8	17.6	17.7	17.5	17.6	19.8	20.8	21.5	20.0	
5. Axle Centerline	16.0	Posttest-- --	NA	20.1	22.6	25.5	26.0	26.3	26.5	26.7	27.0	27.4	33.5	32.5	34.0	30.8	
		Pretest -- --	NA	17.0	17.1	17.0	17.0	17.0	17.1	17.1	17.2	17.3	17.5	17.3	17.1	17.1	
		Static Crush--	NA	3.1	5.5	8.5	9.0	9.3	9.4	9.6	9.8	10.1	16.0	15.2	16.9	13.4	

*Reference Plane is parallel to and 48 inches from test vehicle longitudinal centerline

TABLE 3-4A PRE AND POSTTEST EXTERIOR PROFILE AT LEVEL 1-AXLE CENTERLINE 16.0" ABOVE GROUND LEVEL

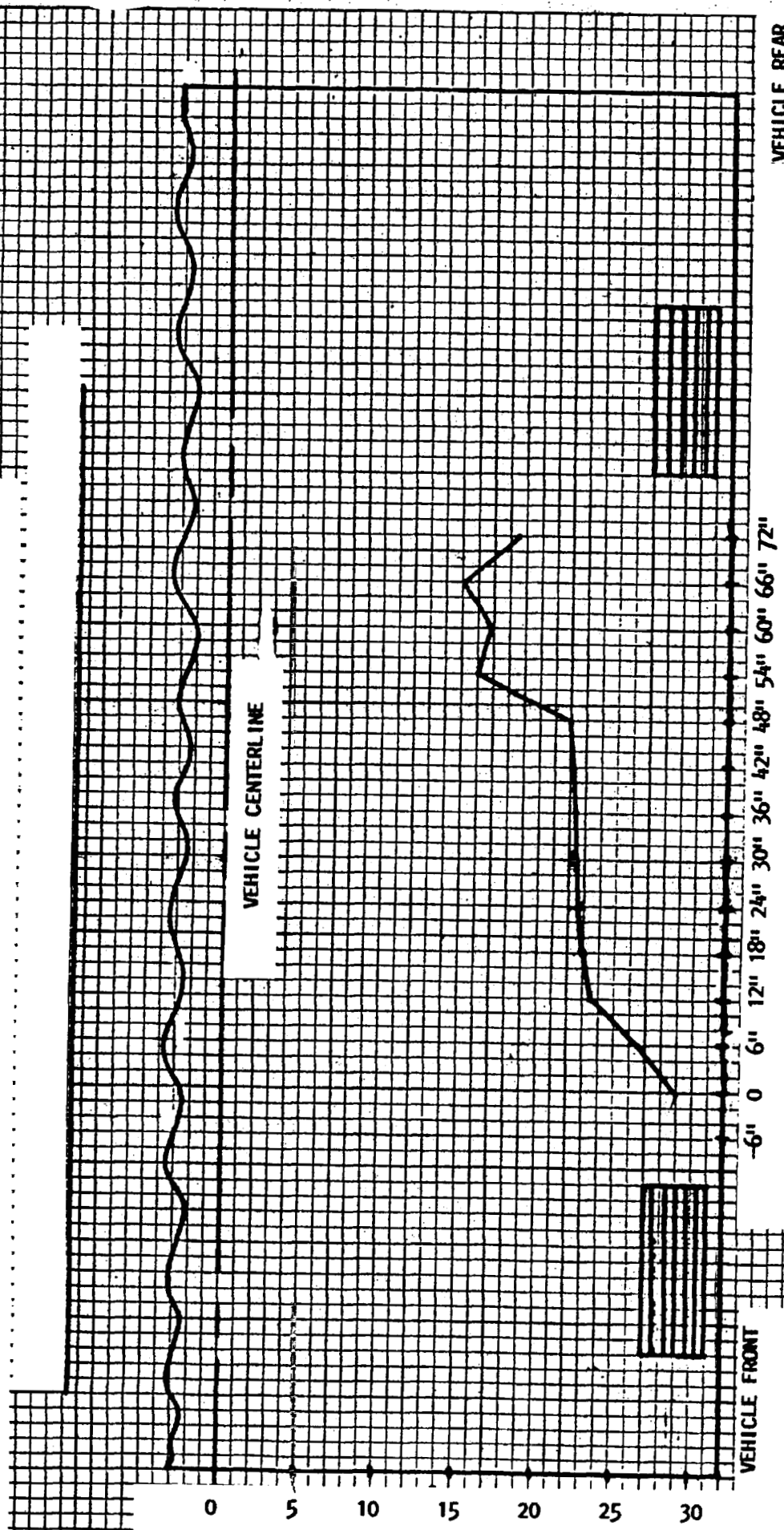


TABLE 3-48 PRE AND POSTTEST EXTERIOR PROFILE AT LEVEL 2-H-POINT 27.5" ABOVE GROUND LEVEL

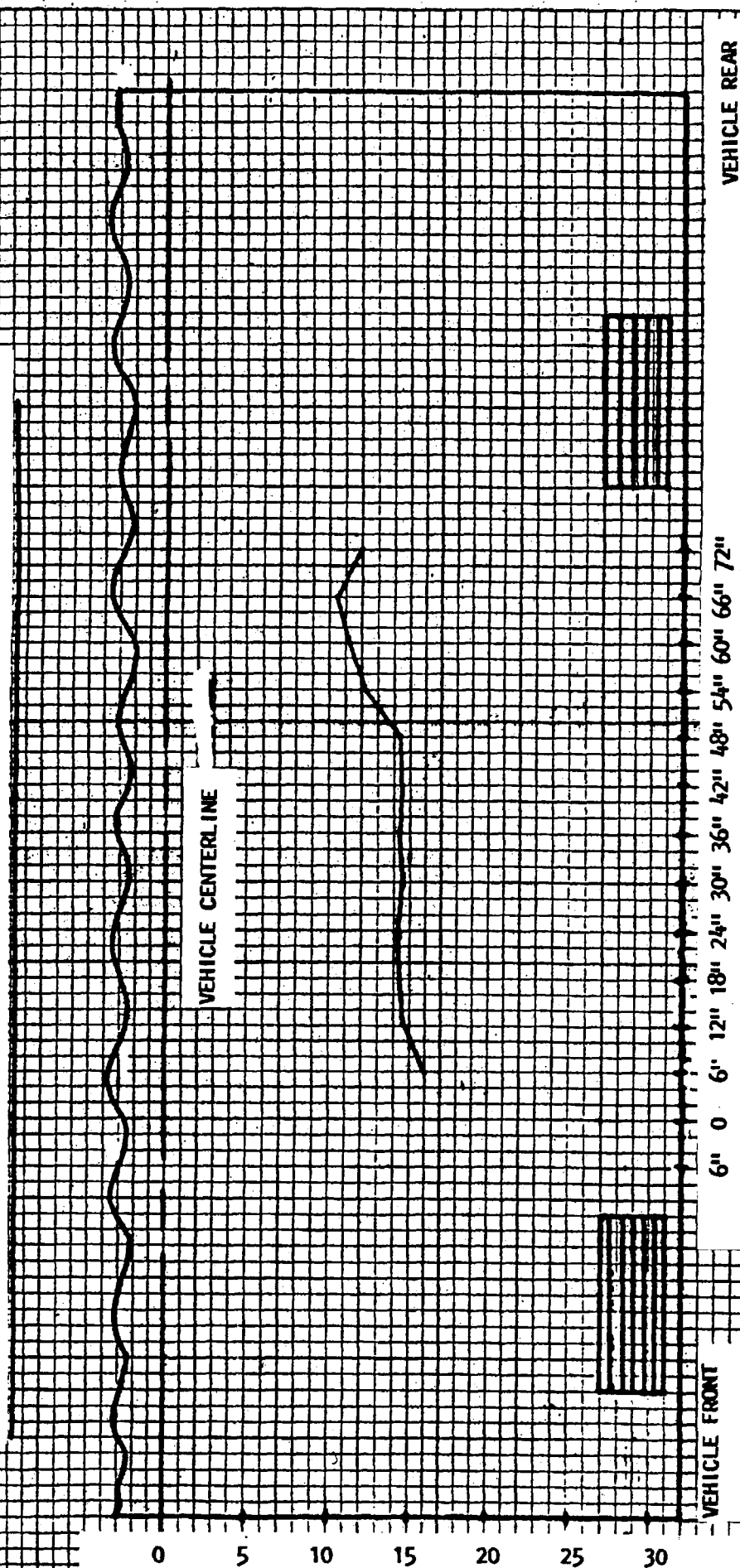


TABLE 3-4C PRE AND POSTTEST EXTERIOR PROFILE AT LEVEL 3-MID DOOR 30.3" ABOVE GROUND LEVEL

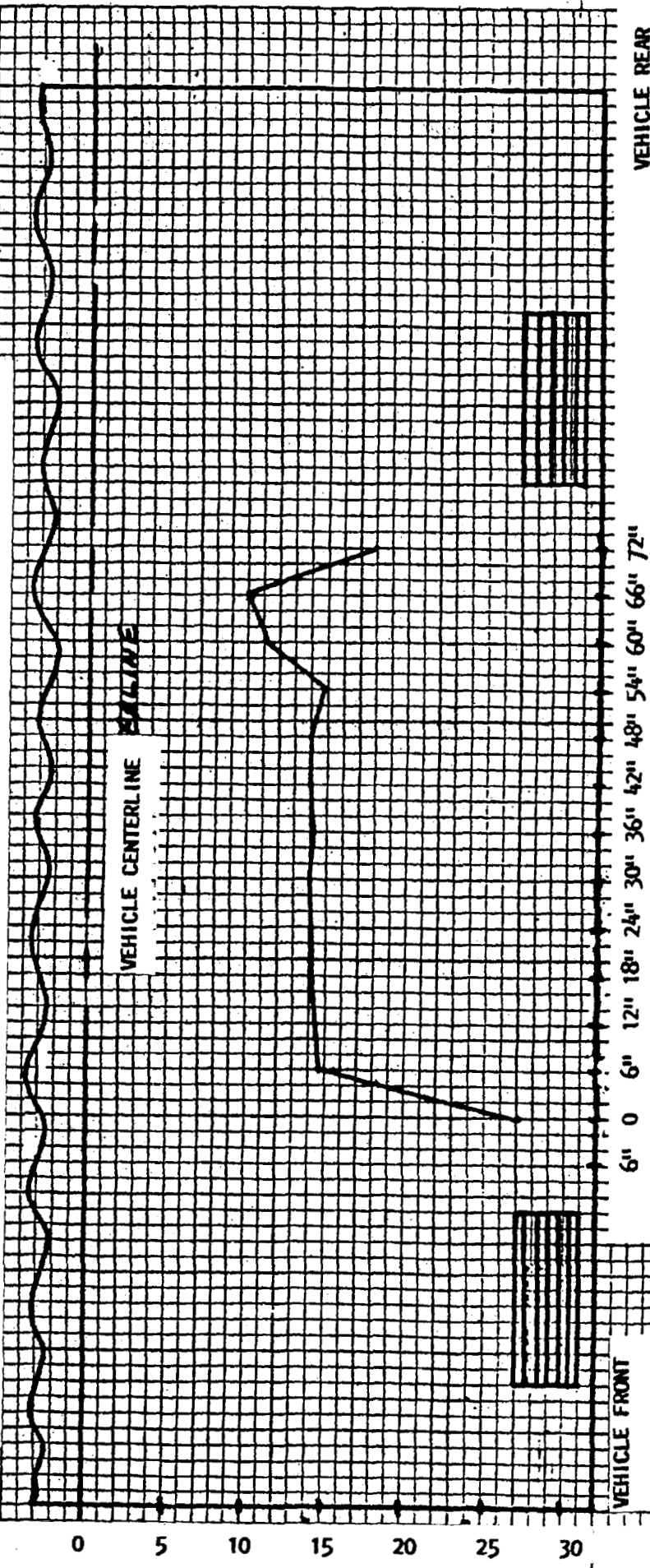
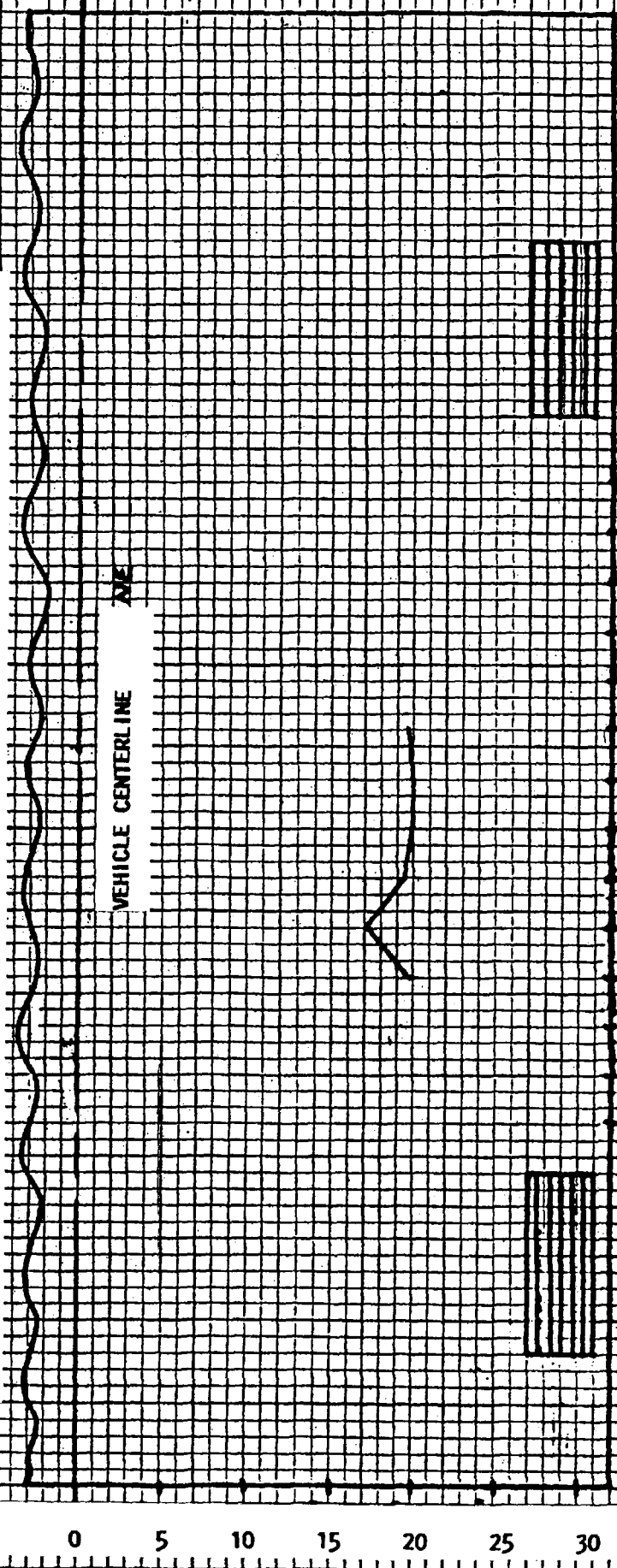


TABLE 3-40 PRE AND POSTTEST EXTERIOR PROFILE AT LEVEL 4-WINDOW SILL 43.4" ABOVE GROUND LEVEL



6" 0 6" 12" 18" 24" 30" 36" 42" 48" 54" 60" 66" 72"

TABLE 3-4E PRE AND POSTTEST EXTERIOR PROFILE AT LEVEL 5-WINDOW TOP 59.6" ABOVE GROUND LEVEL

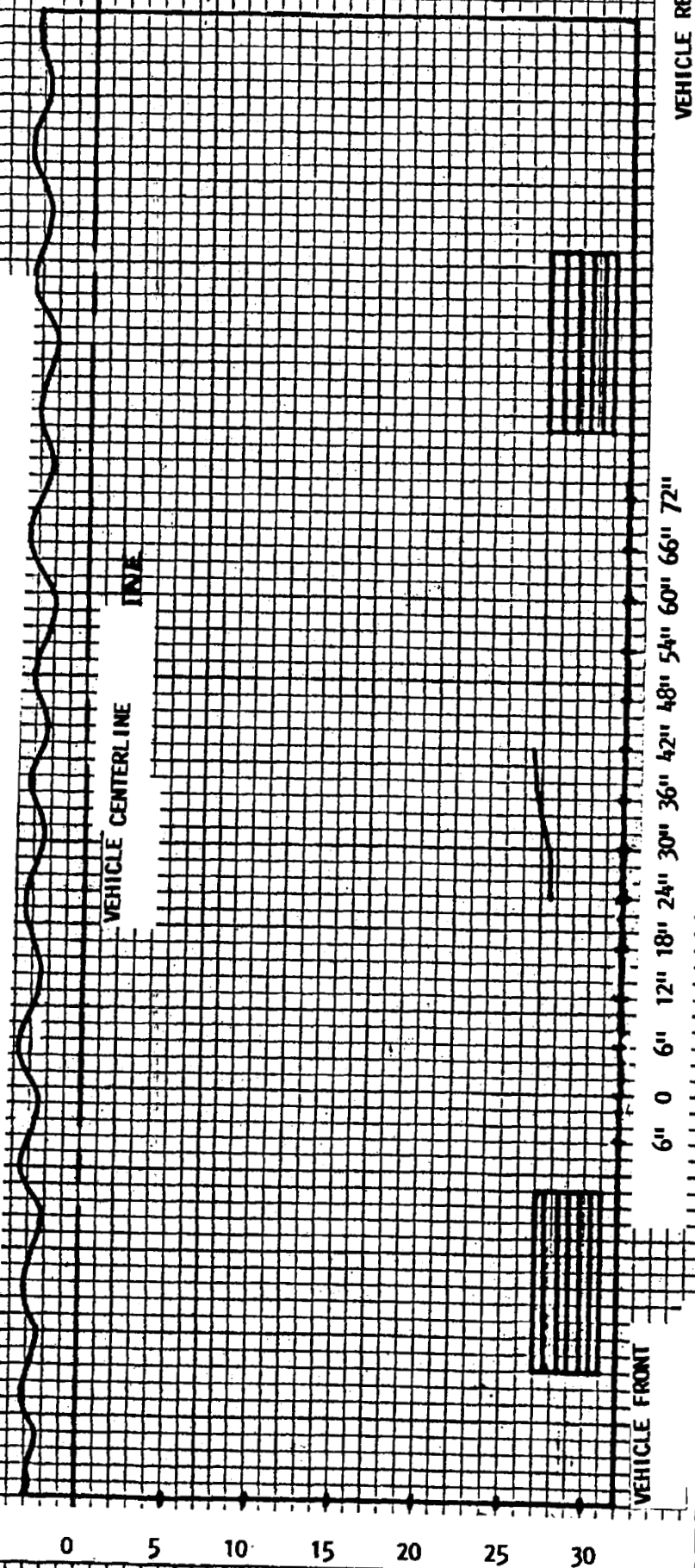


TABLE 3-5 POSTTEST OBSERVATIONS

TEST VEHICLE: 1984 FORD RANGER ; NHTSA NO.: N/A

VISIBLE DUMMY CONTACT POINT: FRONT SID REAR SID

HEAD - - - - -	<u>Deformable Barrier</u>	<u>N/A</u>
CHEST - - - - -	<u>Driver Side Door</u>	<u>N/A</u>
ABDOMEN - - - - -	<u>Driver Side Door</u>	<u>N/A</u>
LEFT KNEE - - - - -	<u>Driver Side Door</u>	<u>N/A</u>
RIGHT KNEE - - - - -	<u>None</u>	<u>N/A</u>

DOOR OPENING: LEFT SIDE RIGHT SIDE

FRONT - - - - -	<u>Needed Tools to Open</u>	<u>Needed Tools to Open</u>
REAR - - - - -	<u>N/A</u>	<u>N/A</u>

SEAT MOVEMENT:

None

GLAZING DAMAGE:

Windshield cracked on left side, no separation around edges.

OTHER NOTABLE IMPACT EFFECTS:

- o Various steering column and dash panel components were broken off by the force of the impact. The fuel tank receive no damage and leaked no solvent.

TABLE 3-6 EXTERIOR STATIC CRUSH FOR SIDE IMPACTOR

LOCATION	HEIGHT at CL*	DISTANCE RIGHT OF CENTER										DISTANCE LEFT OF CENTER**									
		32"	28"	24"	20"	16"	12"	8"	4"	0"	4"	8"	12"	16"	20"	24"	28"	32"			
Top of Stack Level	38.5"	2.3	0.0	0.0	0.2	2.0	0.3	0.0	0.0	0.2	0.3	0.2	0.0	0.2	0.0	0.4	3.4	10.8			
Mid-Stack Level	28.5"	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5			
Bumper Level	23.5"	1.2	0.6	0.7	1.0	1.6	1.2	1.2	0.9	0.5	0.6	0.6	0.5	0.5	0.6	0.8	1.4	1.1			

* Heights measured above ground level.

** Impact Side

APPENDIX A
PHOTOGRAPHIC COVERAGE

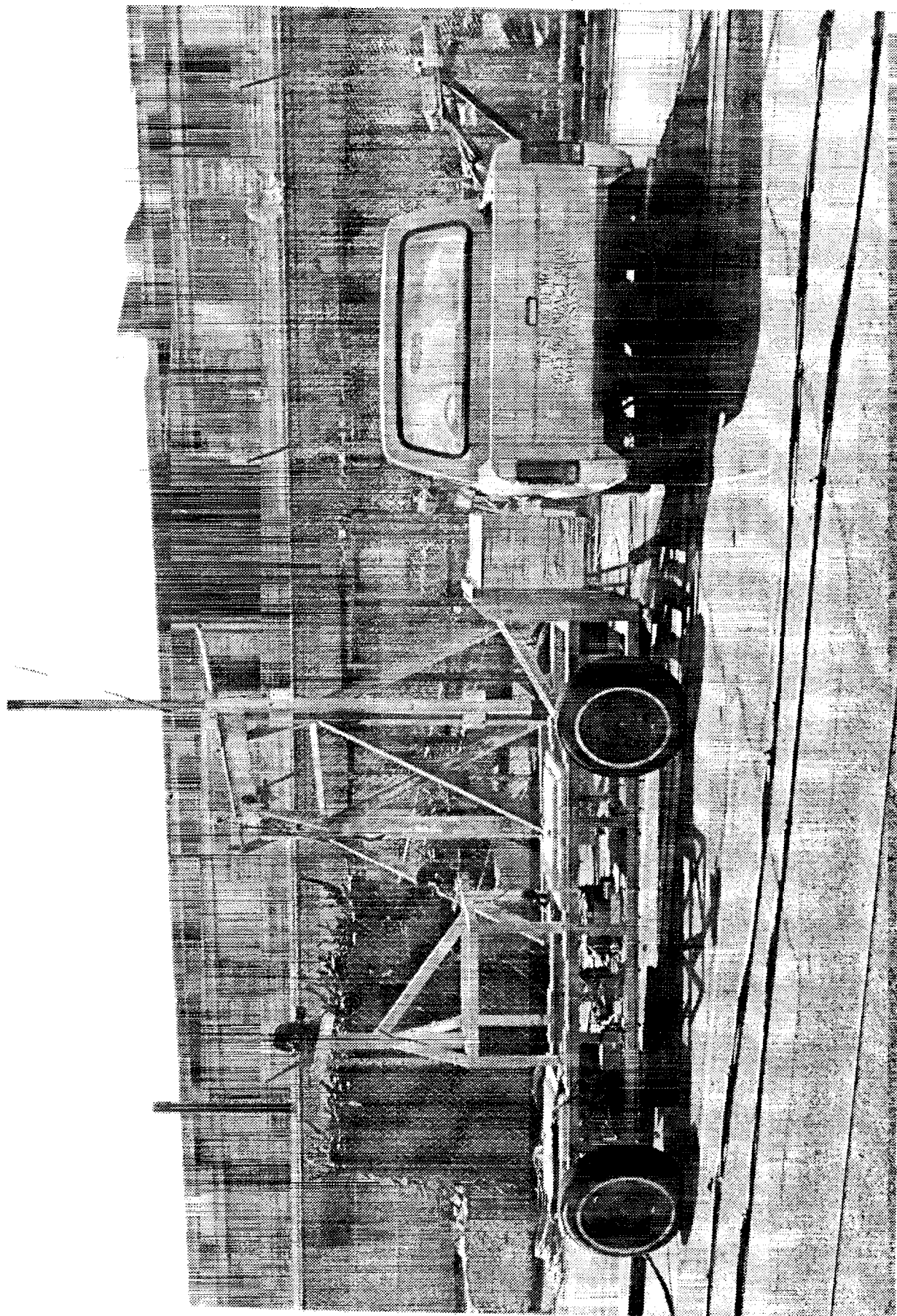


FIGURE A-1 MB8 AT TEST VEHICLE, OVERALL VIEW PRETEST

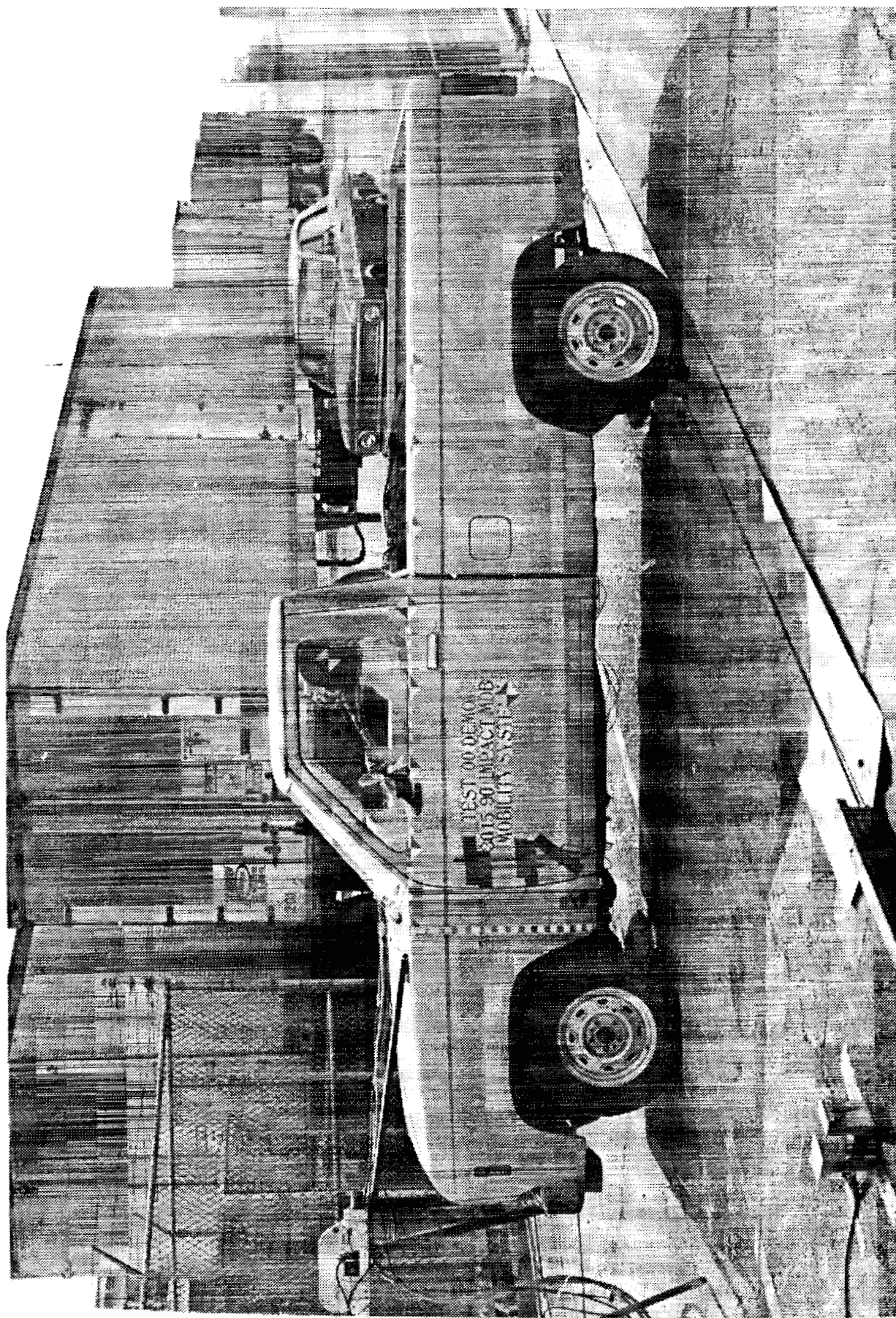


FIGURE A-2 TEST VEHICLE, LEFT SIDE VIEW - PRETEST



FIGURE A-3 TEST VEHICLE, FRONT VIEW -PRETEST

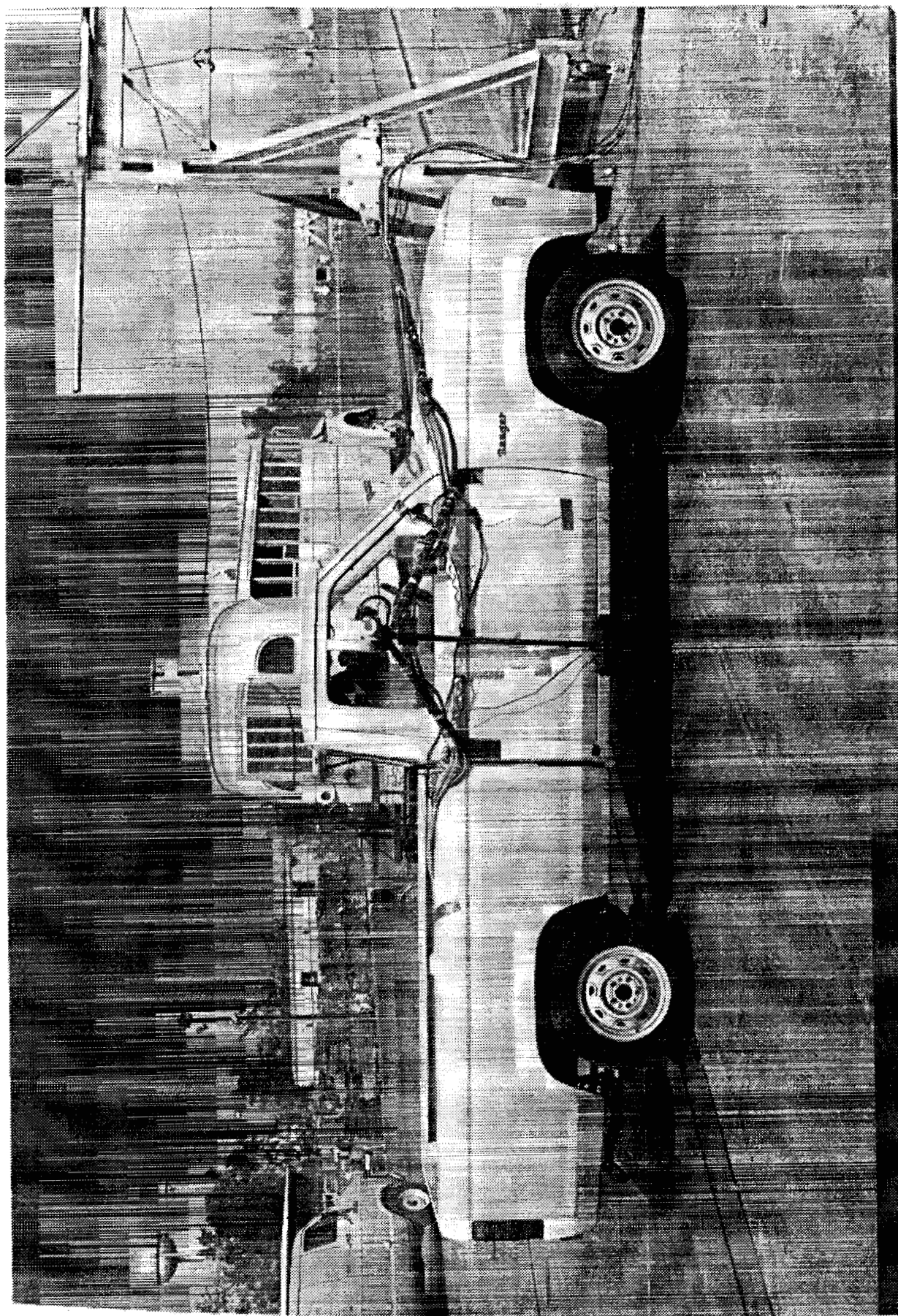


FIGURE A-4 TEST VEHICLE, RIGHT SIDE VIEW - PRETEST

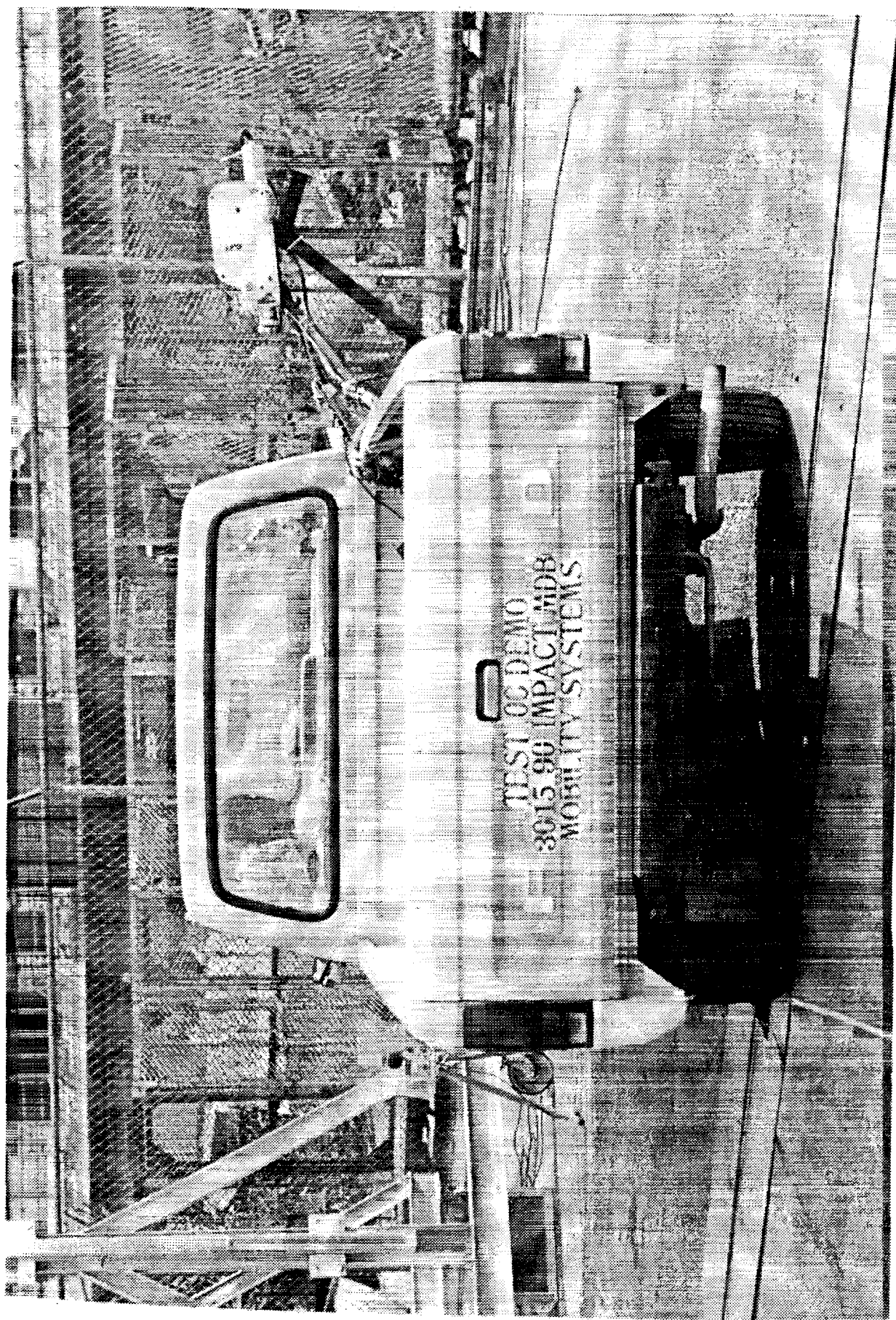


FIGURE A-5 TEST VEHICLE, REAR VIEW - PRETEST

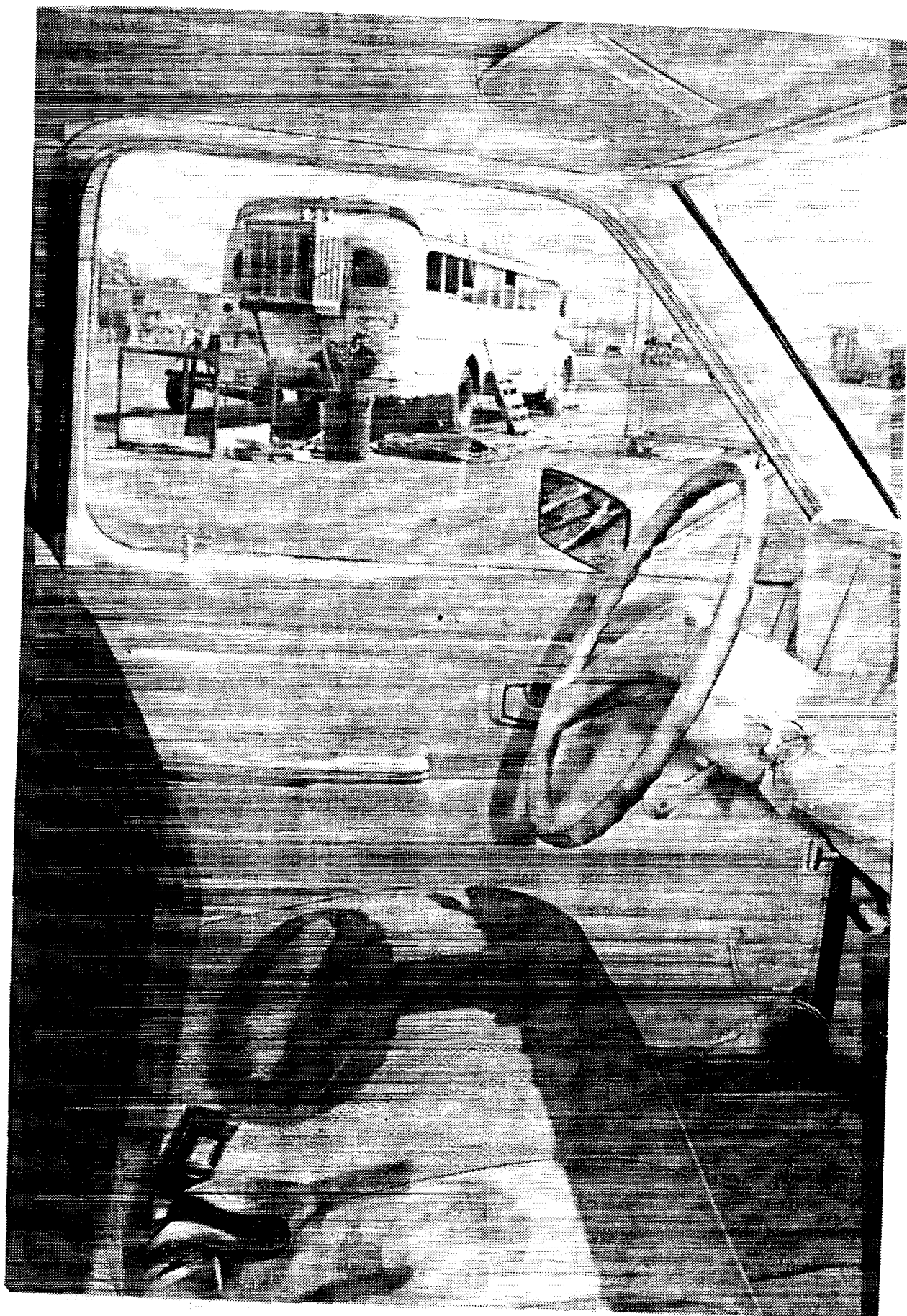


FIGURE A-6 TEST VEHICLE, DRIVER SIDE DOOR, PRETEST



FIGURE A-7 SID IN DRIVER POSITION - PRETEST



FIGURE A-8 MDB AND TEST VEHICLE, OVERALL VIEW - POSTTEST

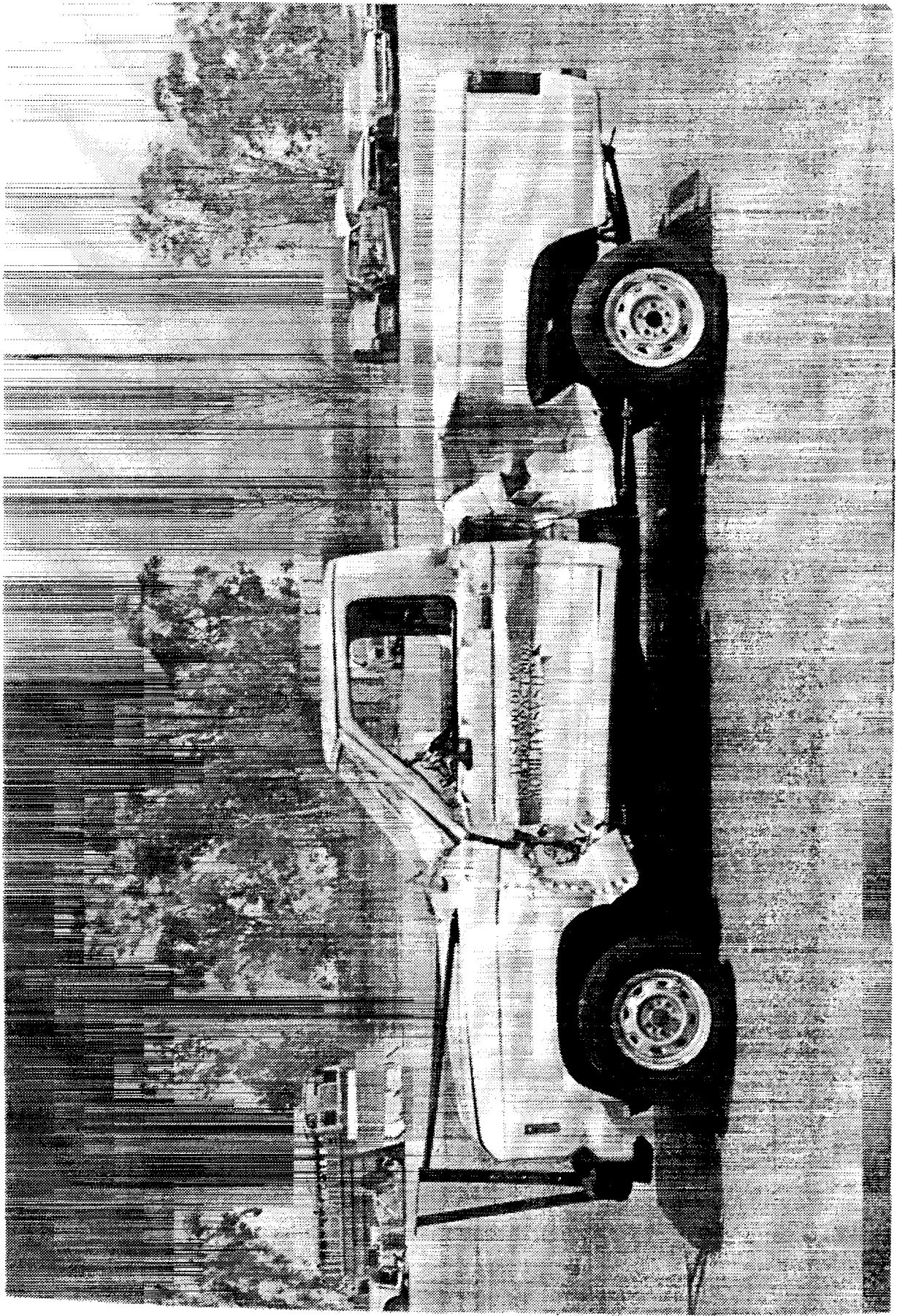


FIGURE A-9 TEST VEHICLE, LEFT SIDE VIEW - POSTTEST

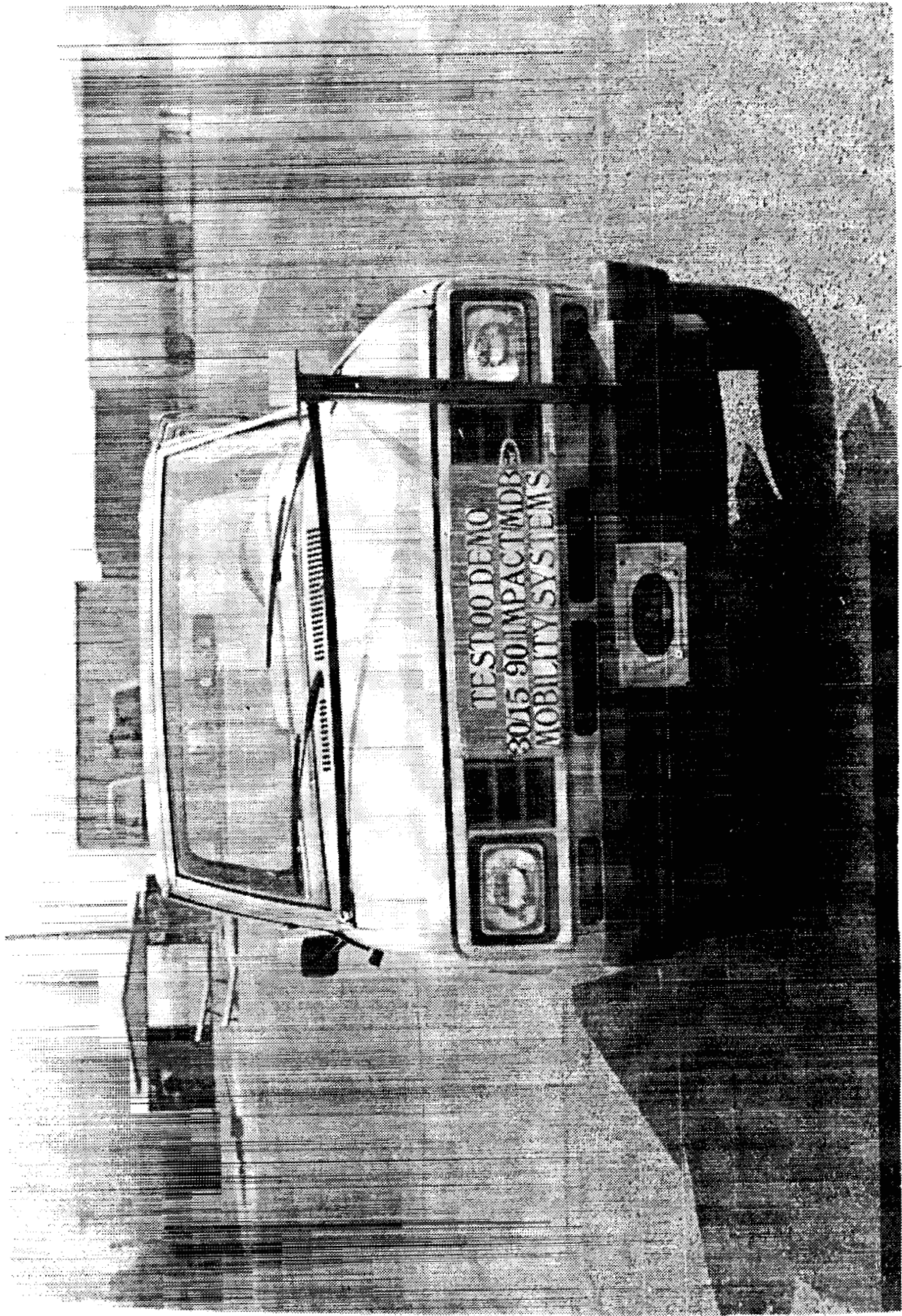


FIGURE A-10 TEST VEHICLE, FRONT VIEW -POSTTEST

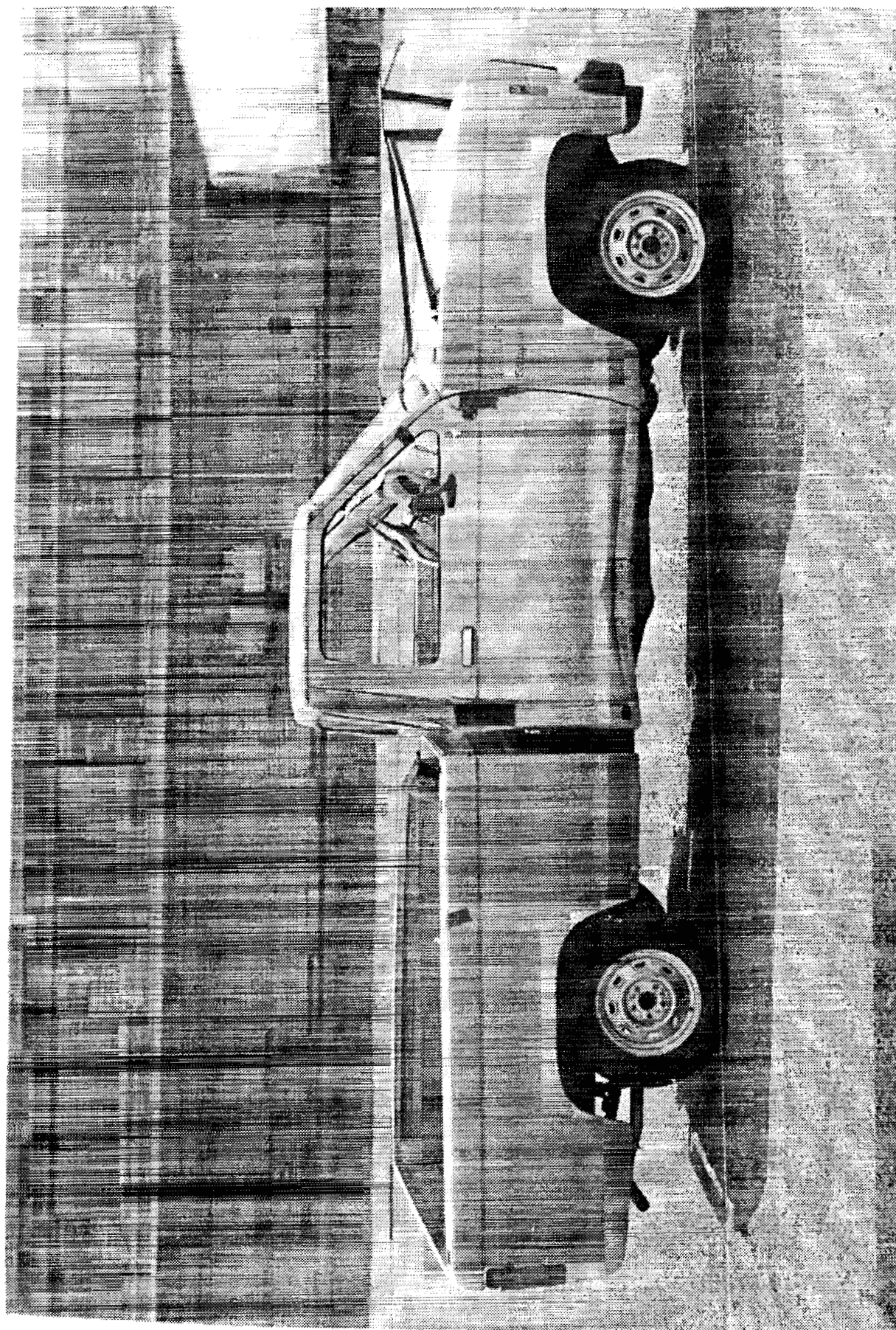


FIGURE A-11 TEST VEHICLE, RIGHT SIDE VIEW - POSTTEST

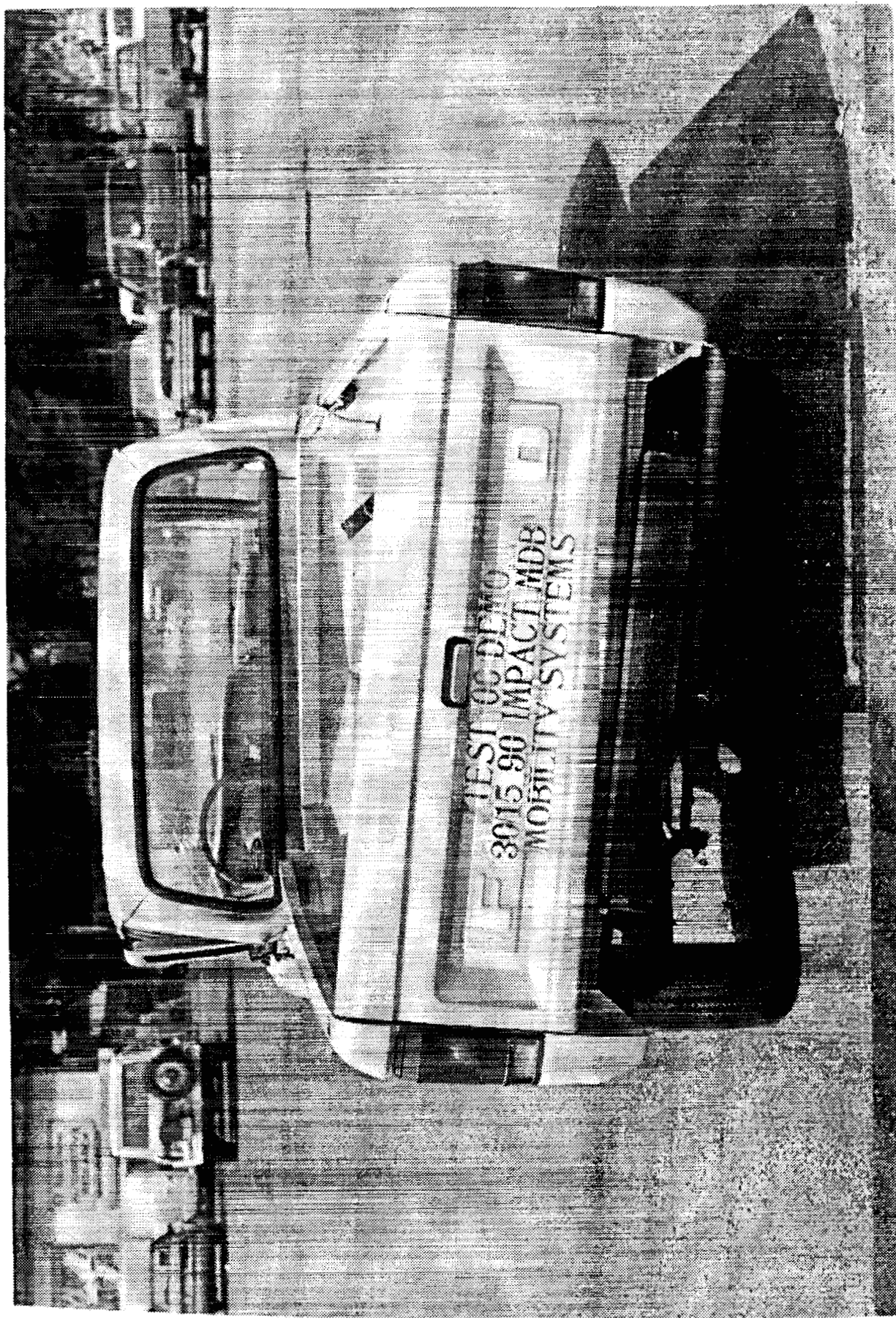


FIGURE A-12 TEST VEHICLE, REAR VIEW - POSTTEST



FIGURE A-13 SID FINAL POSITION - POSTTEST

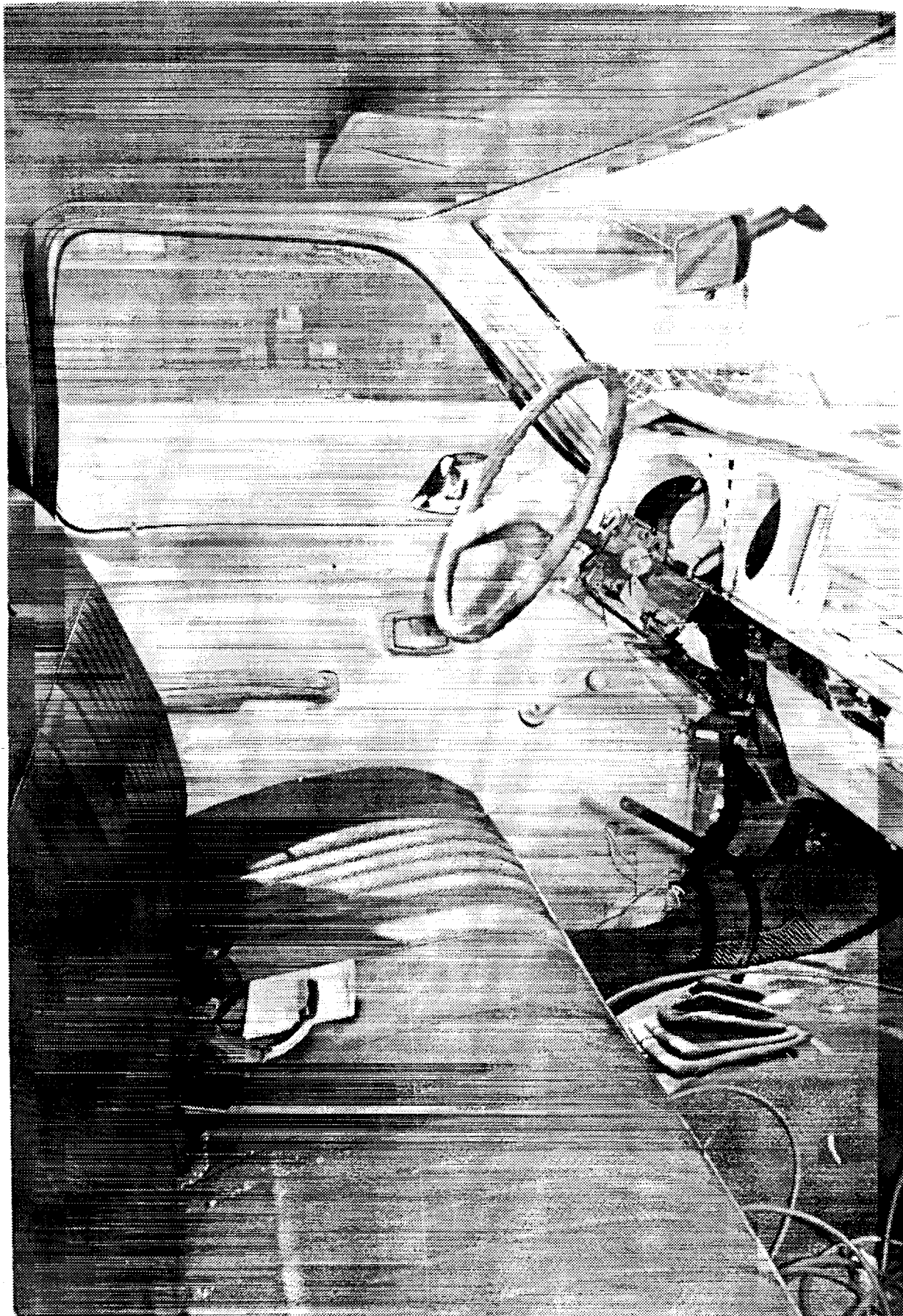


FIGURE A-14 OCCUPANT COMPARTMENT INTERIOR - POSTTEST

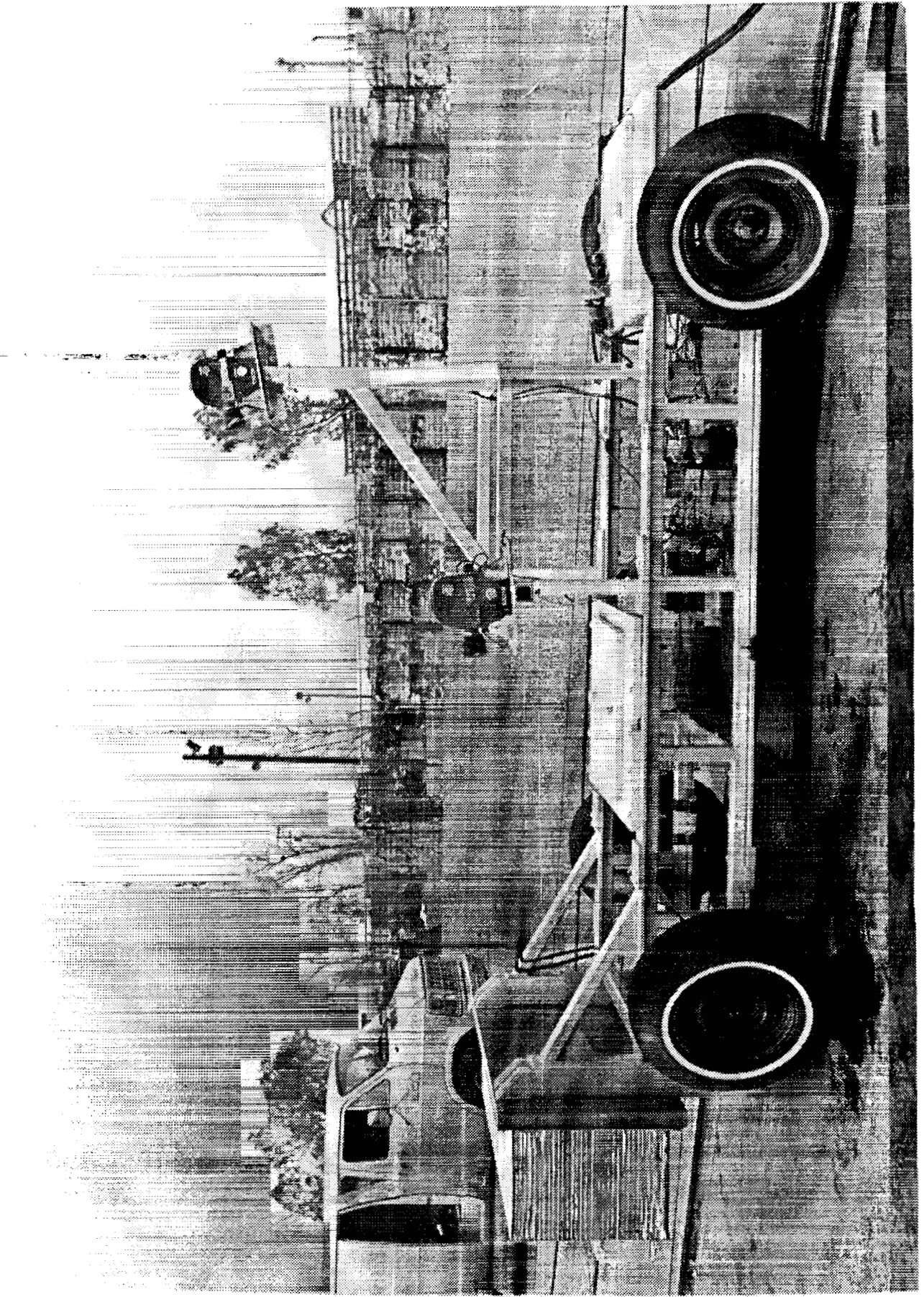


FIGURE A-15 MDB, VIEW NO. 1 - PRETEST

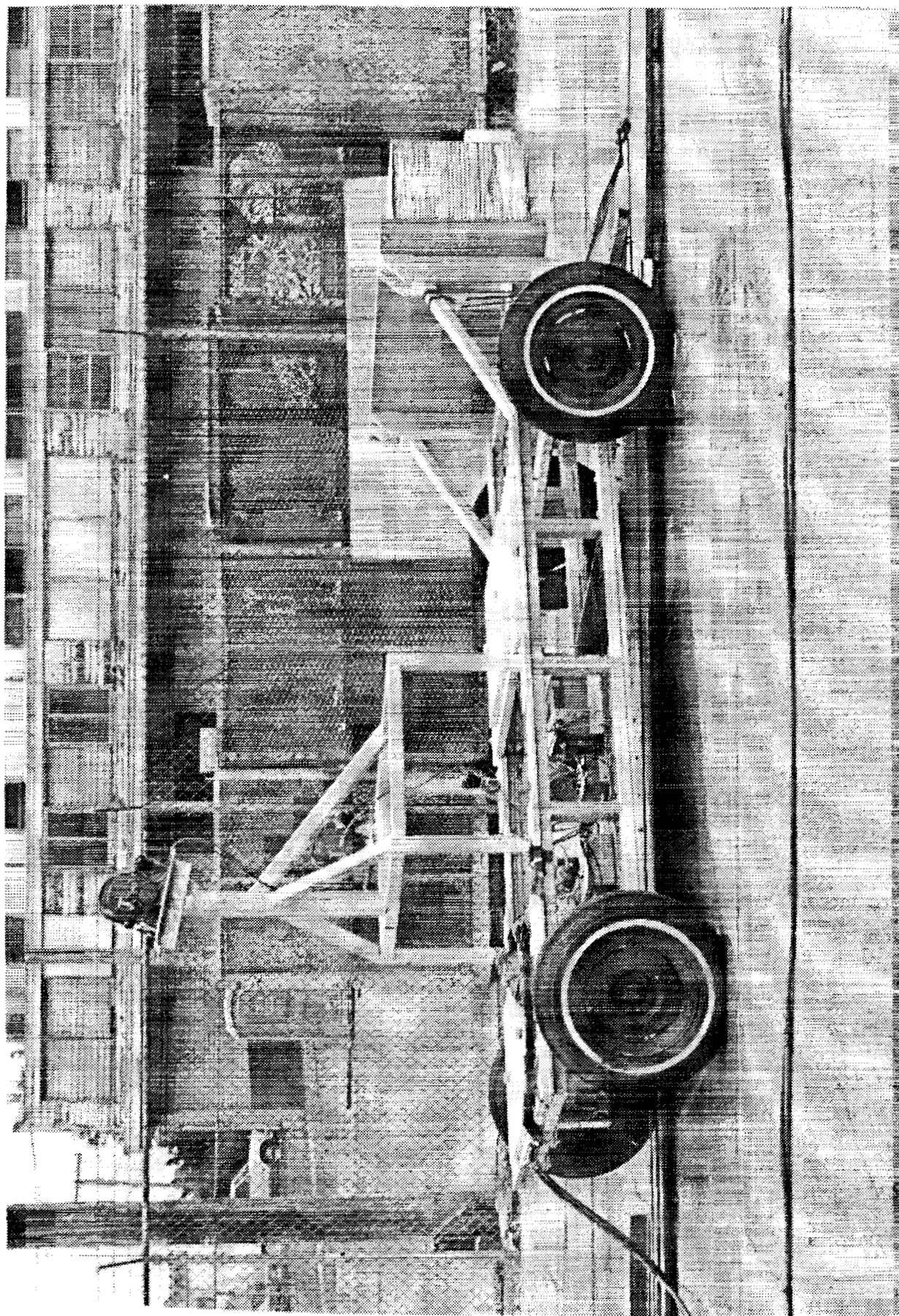


FIGURE A-16 MDB. VIEW NO. 2 - PRFTFST

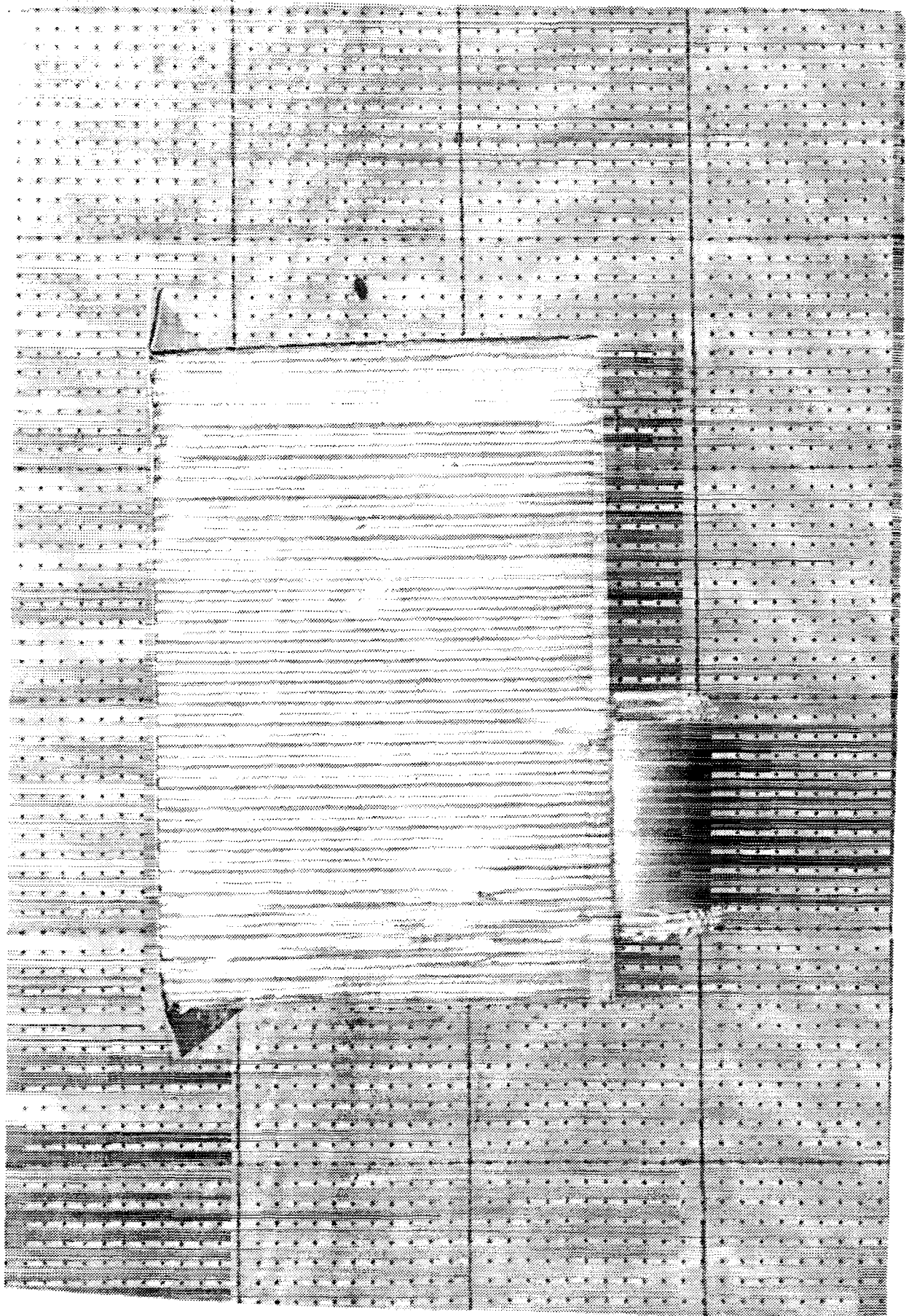


FIGURE A-17 MDB FACE, VIEW NO. 1 - PRETEST

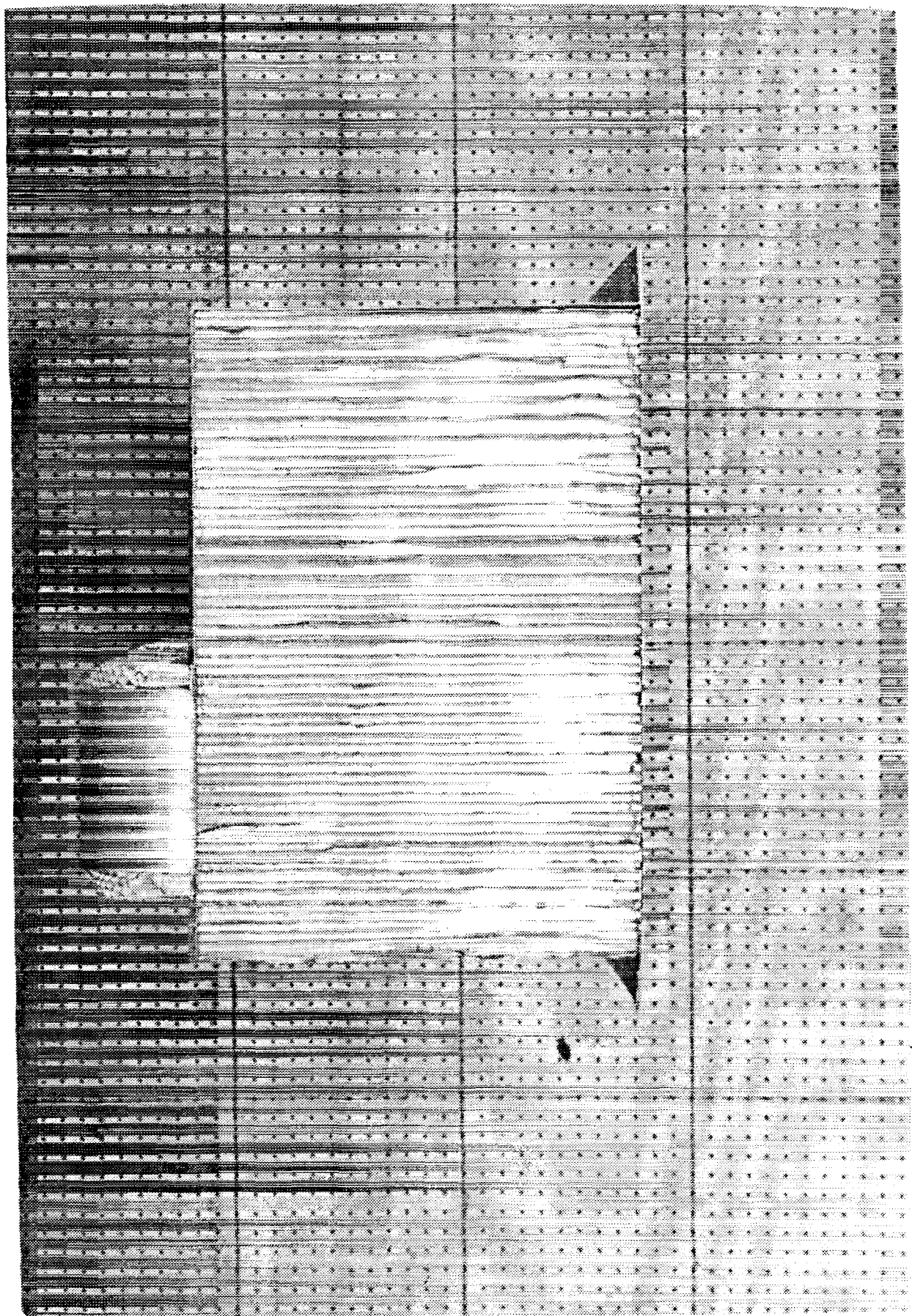


FIGURE A-18 MDB FACE, VIEW NO. 2 - PRETEST

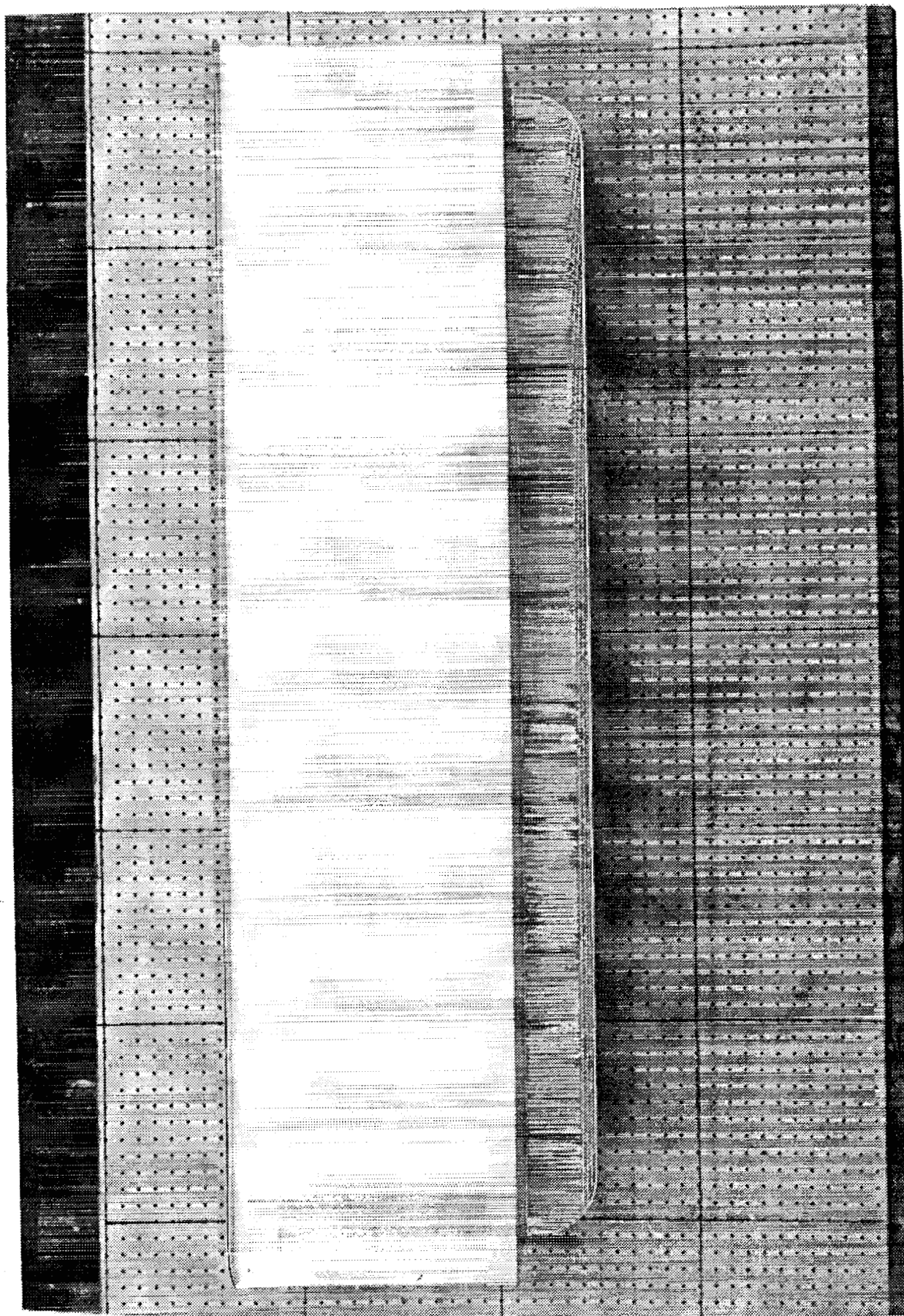


FIGURE A-19 MDB FACE, VIEW NO. 3 - PRETEST

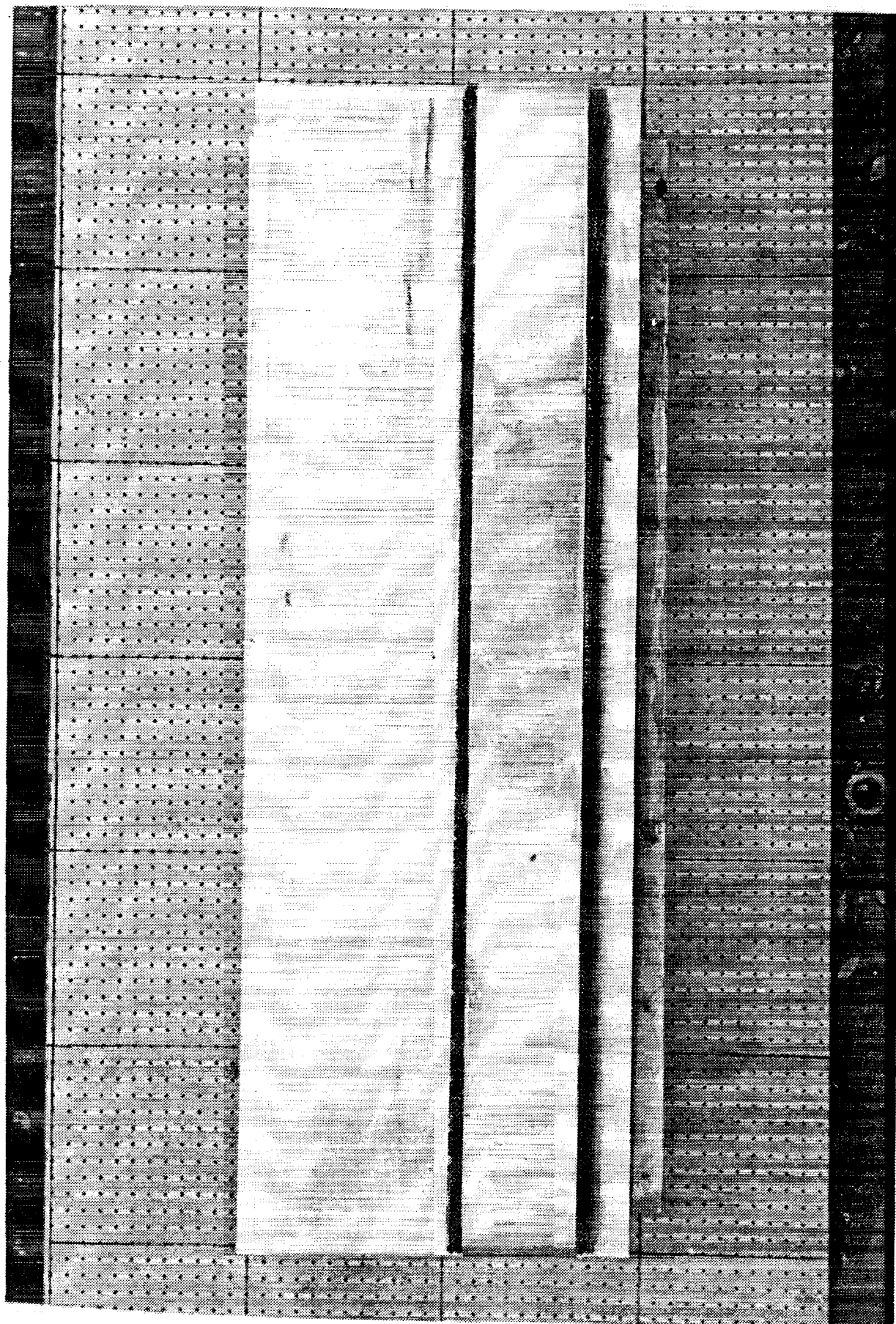


FIGURE A-20 MDB FACE, VIEW NO. 4 - PRETEST

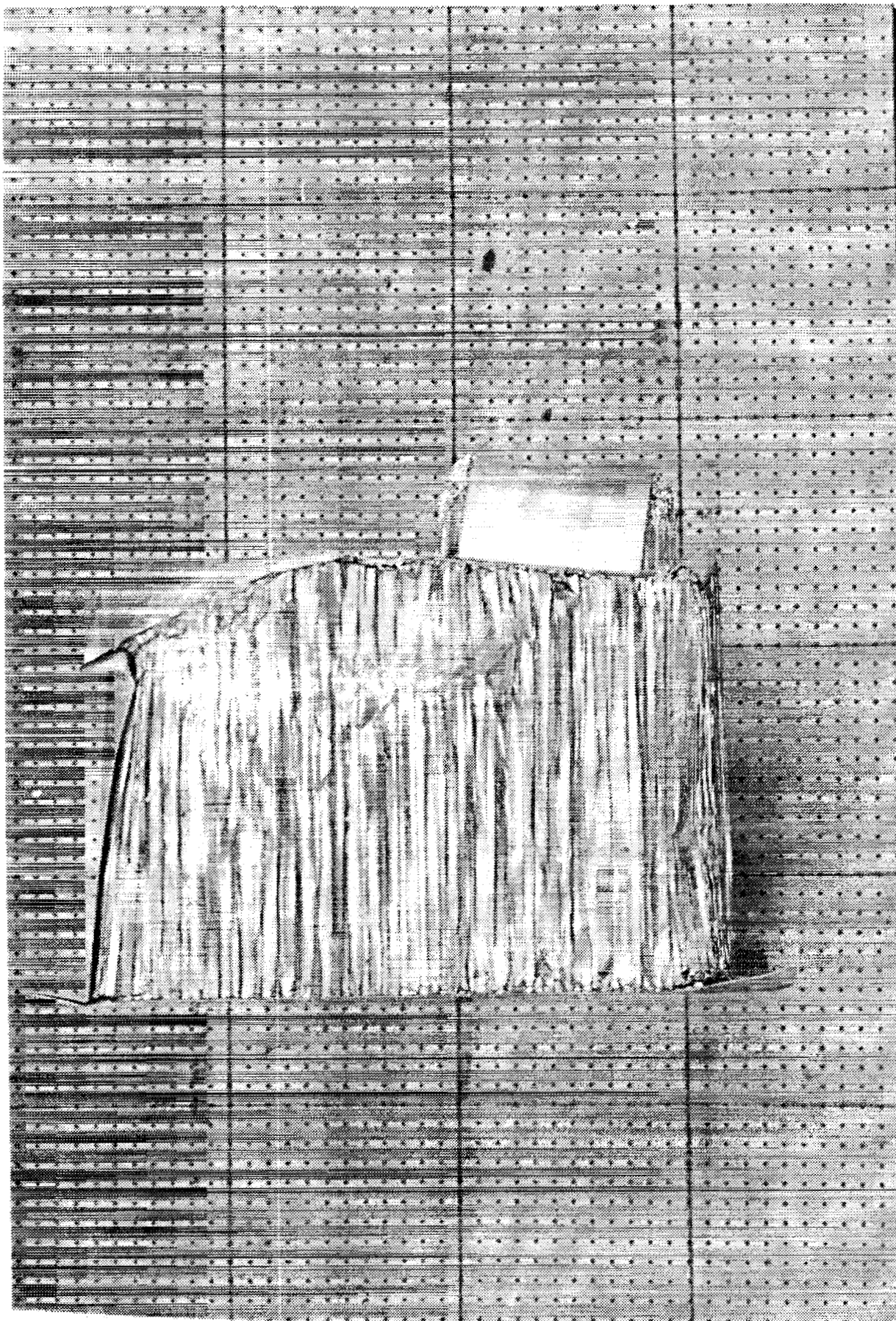


FIGURE A-21 MDB FACE VIEW NO. 1 - POSTTEST

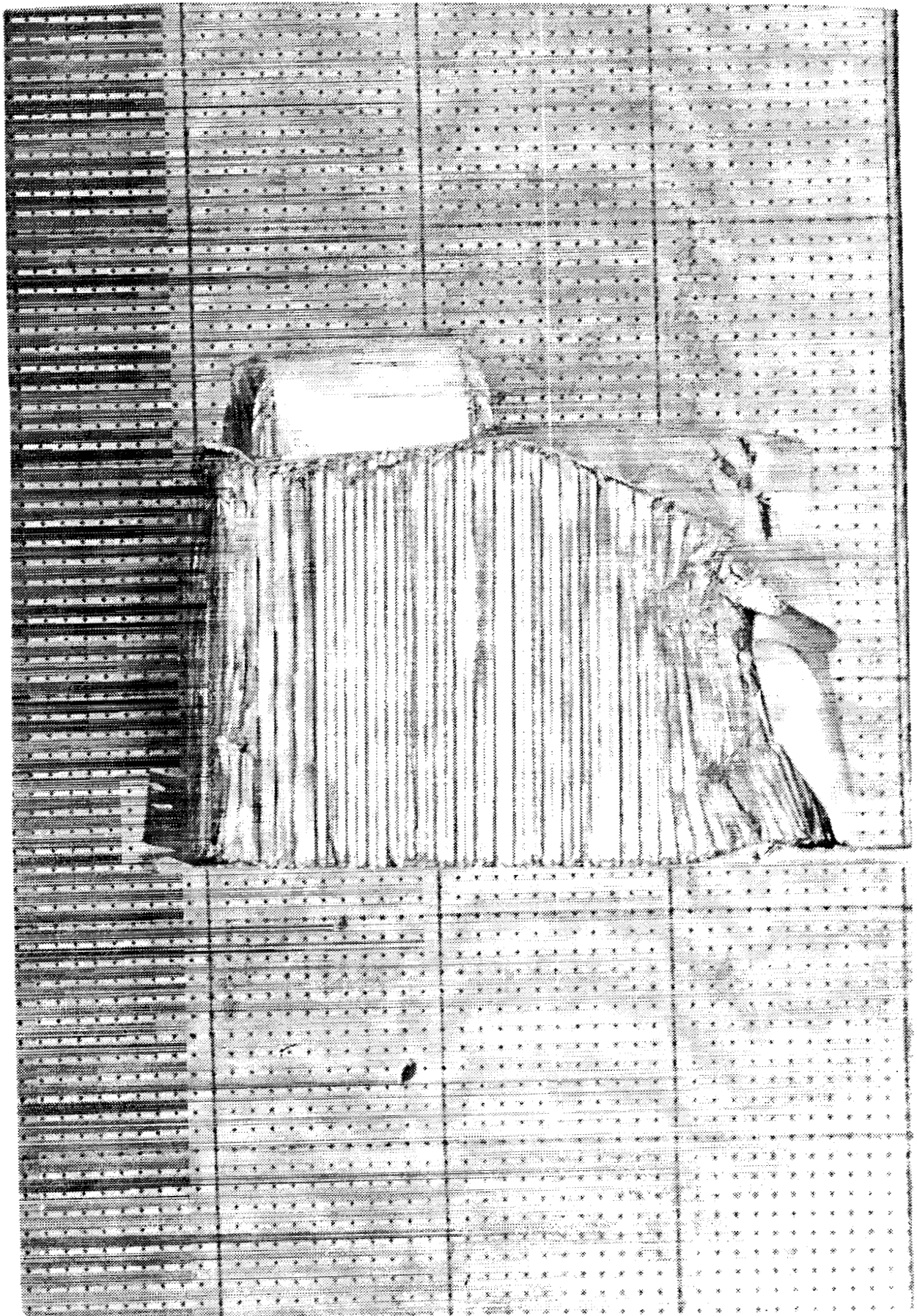


FIGURE A-22 MDB FACE VIEW NO 2 - POSTTEST

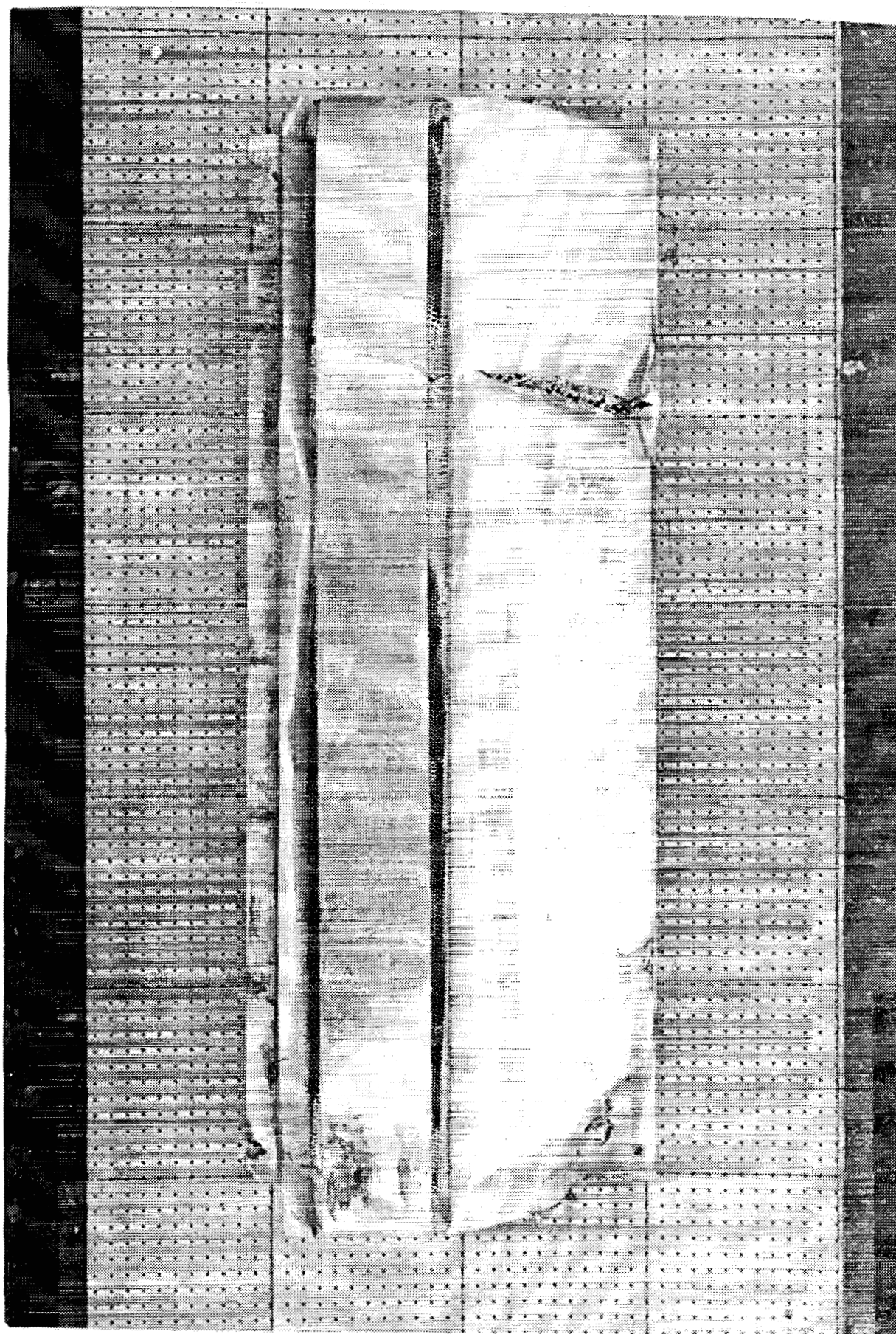
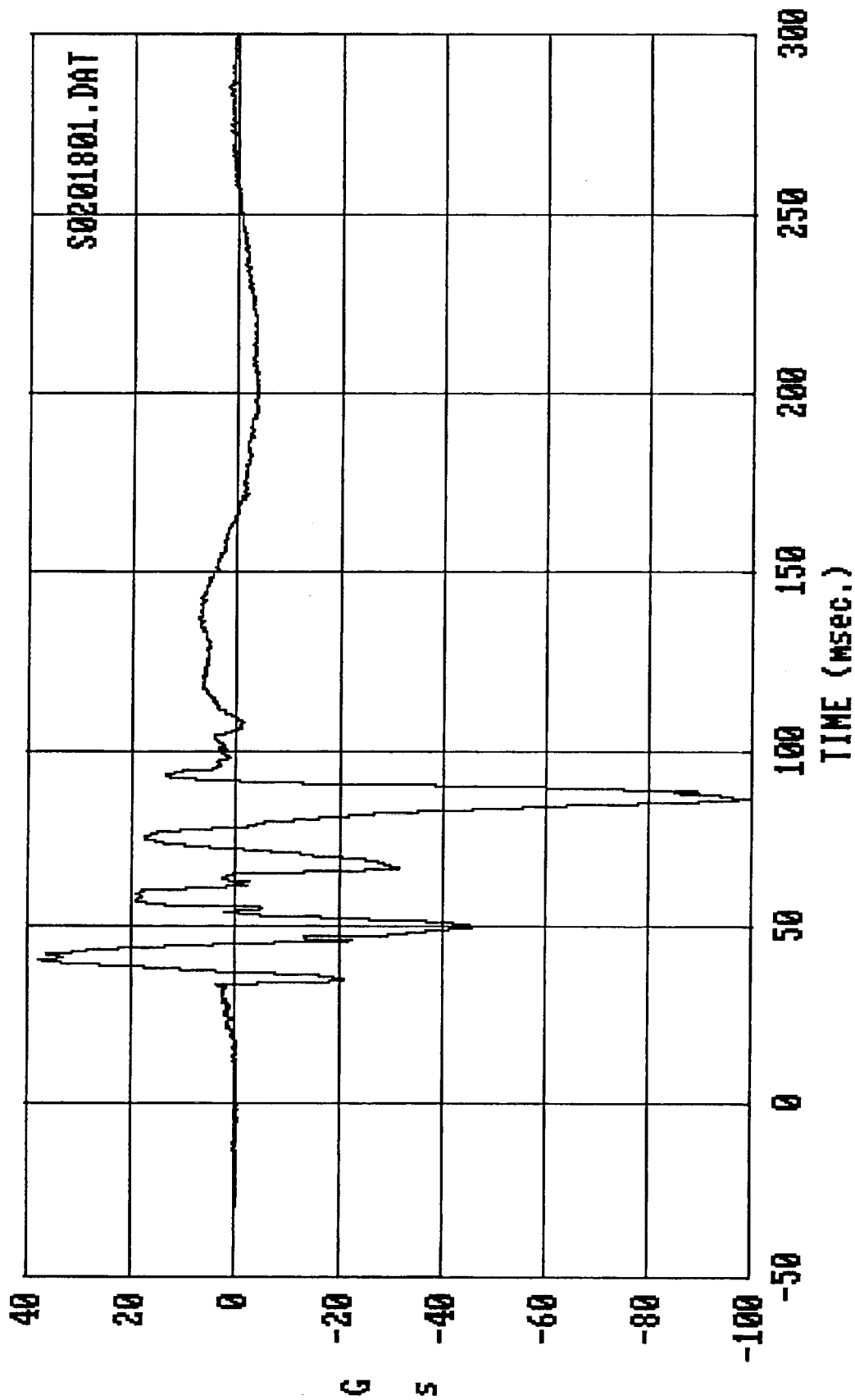


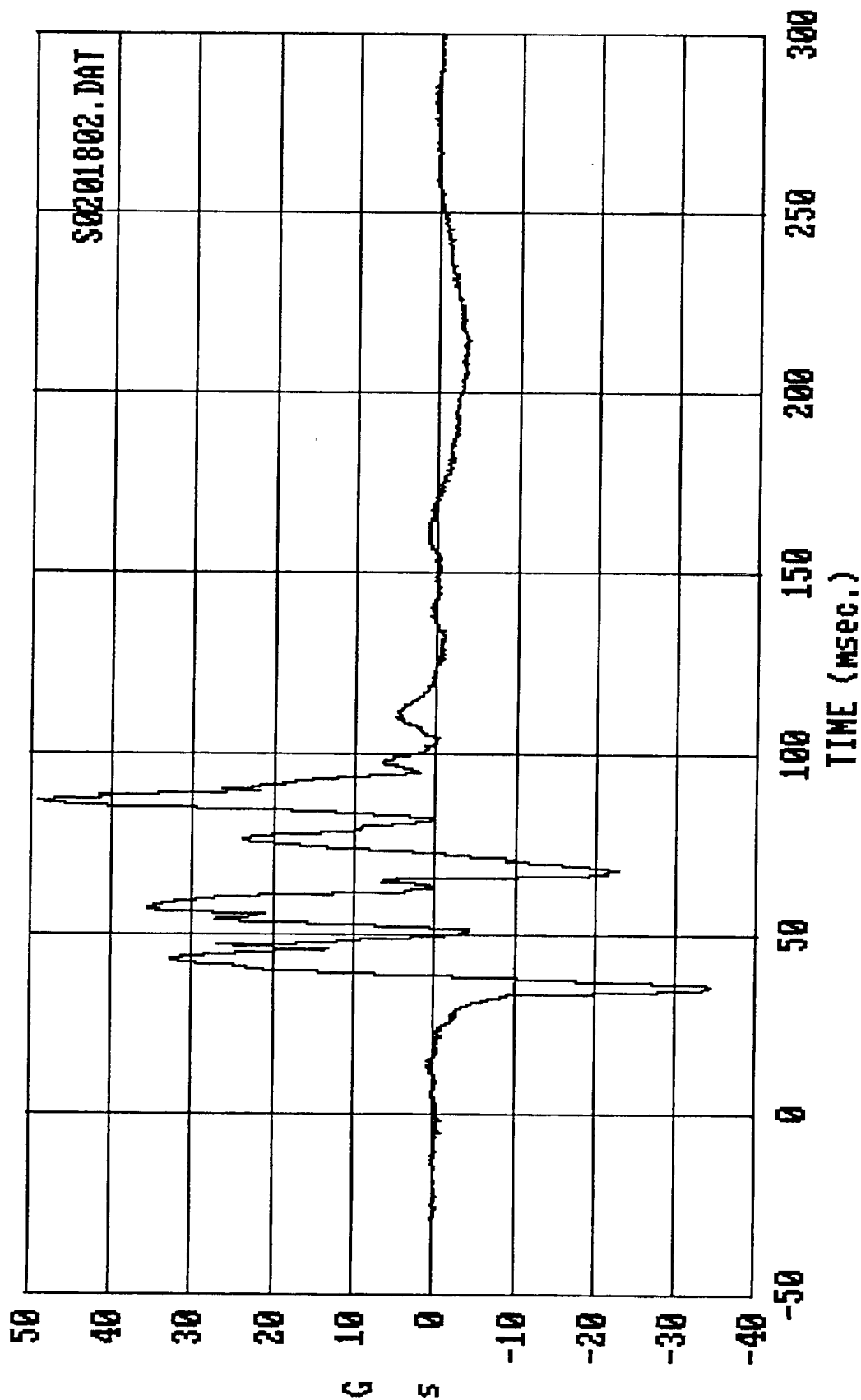
FIGURE A-24 MDB FACE, VIEW NO. 4 - POSTTEST

APPENDIX B
DATA PLOTS



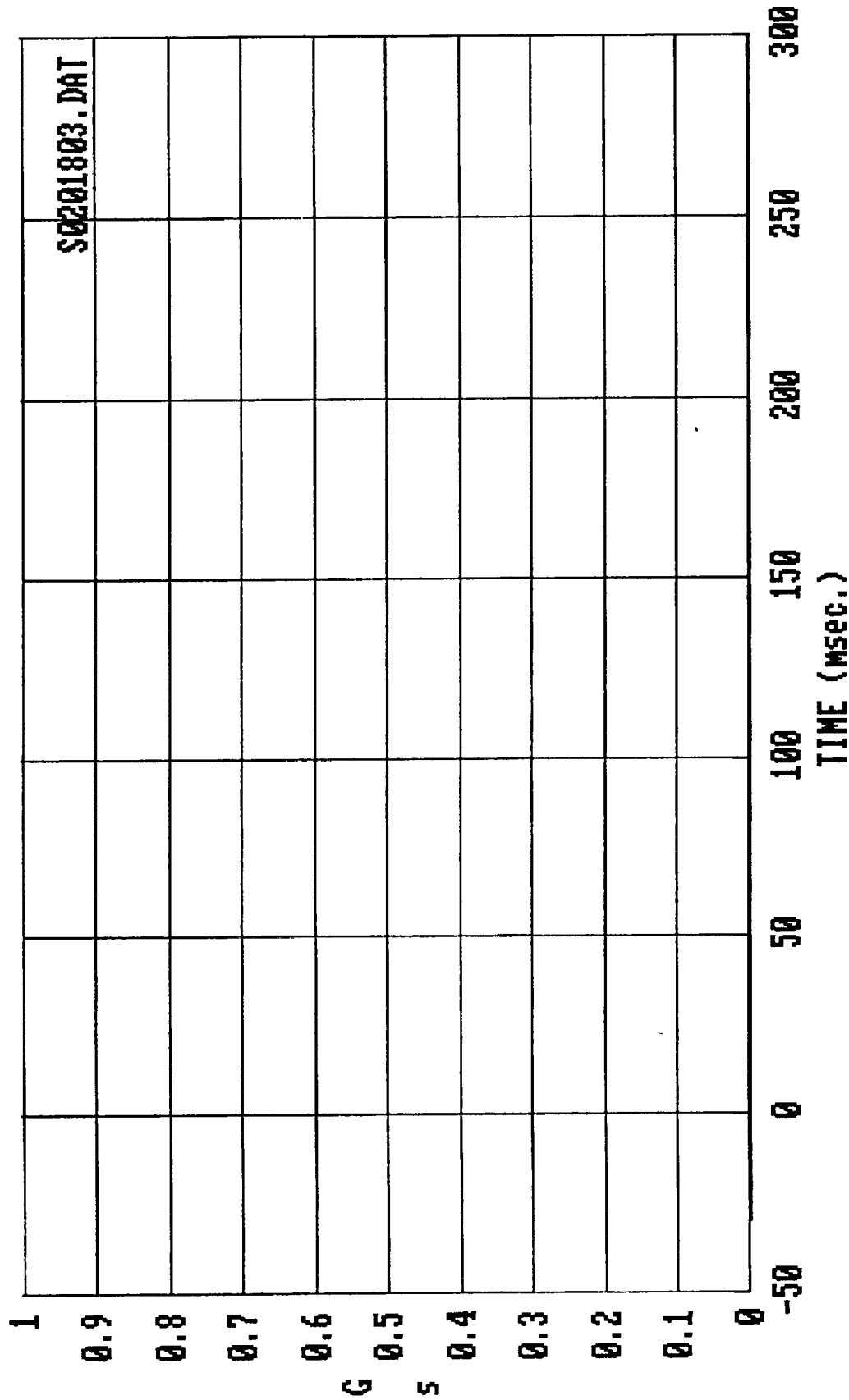
Max = 37.900 Min = -99.108

MSE 09/30/88 -- 1984 Ford Ranger : Driver Head acceleration, X-axis



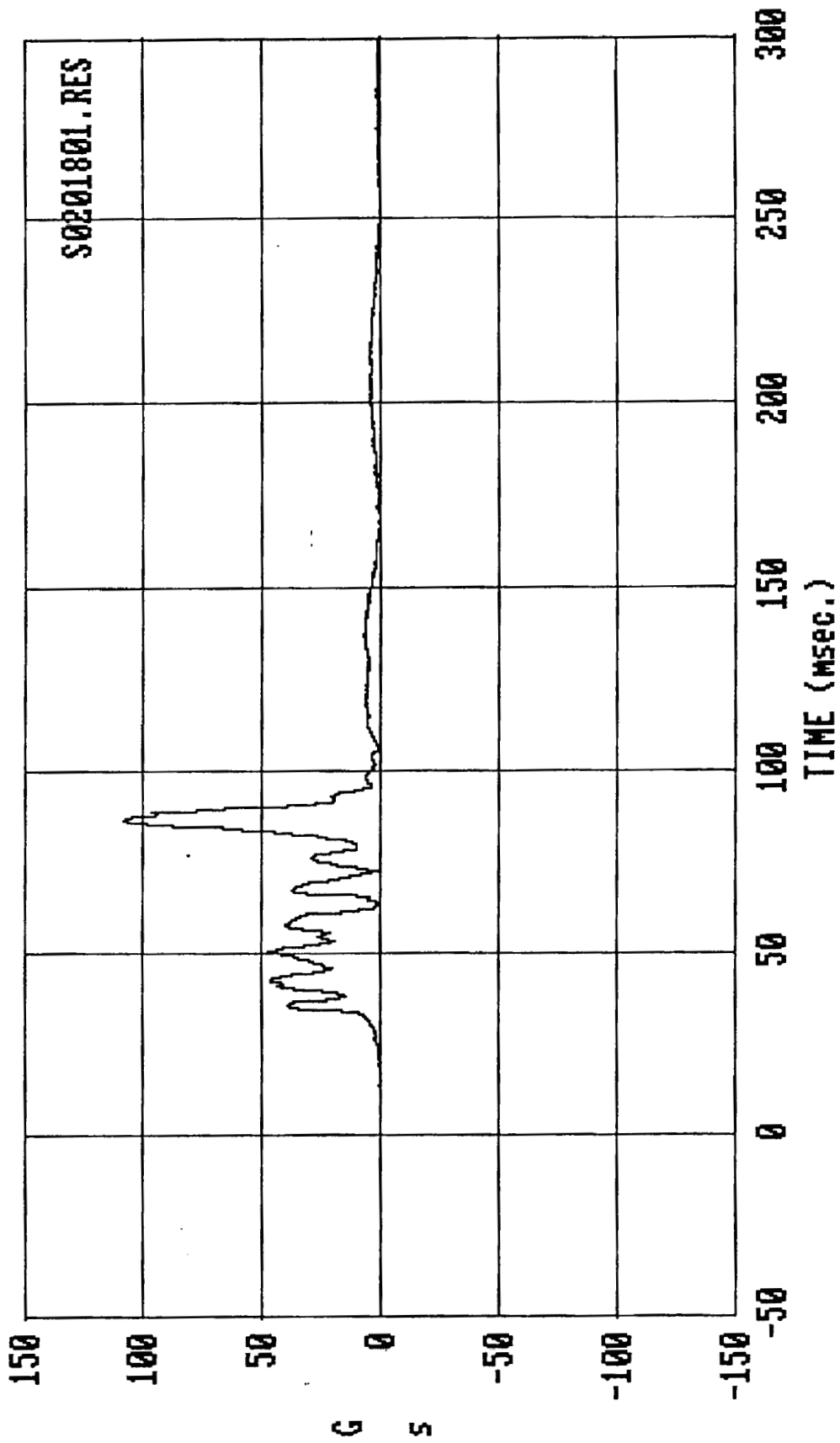
Max = 49.206 Min = -34.286

MSE 09/30/88 -- 1984 Ford Ranger : Driver Head acceleration, Y-axis



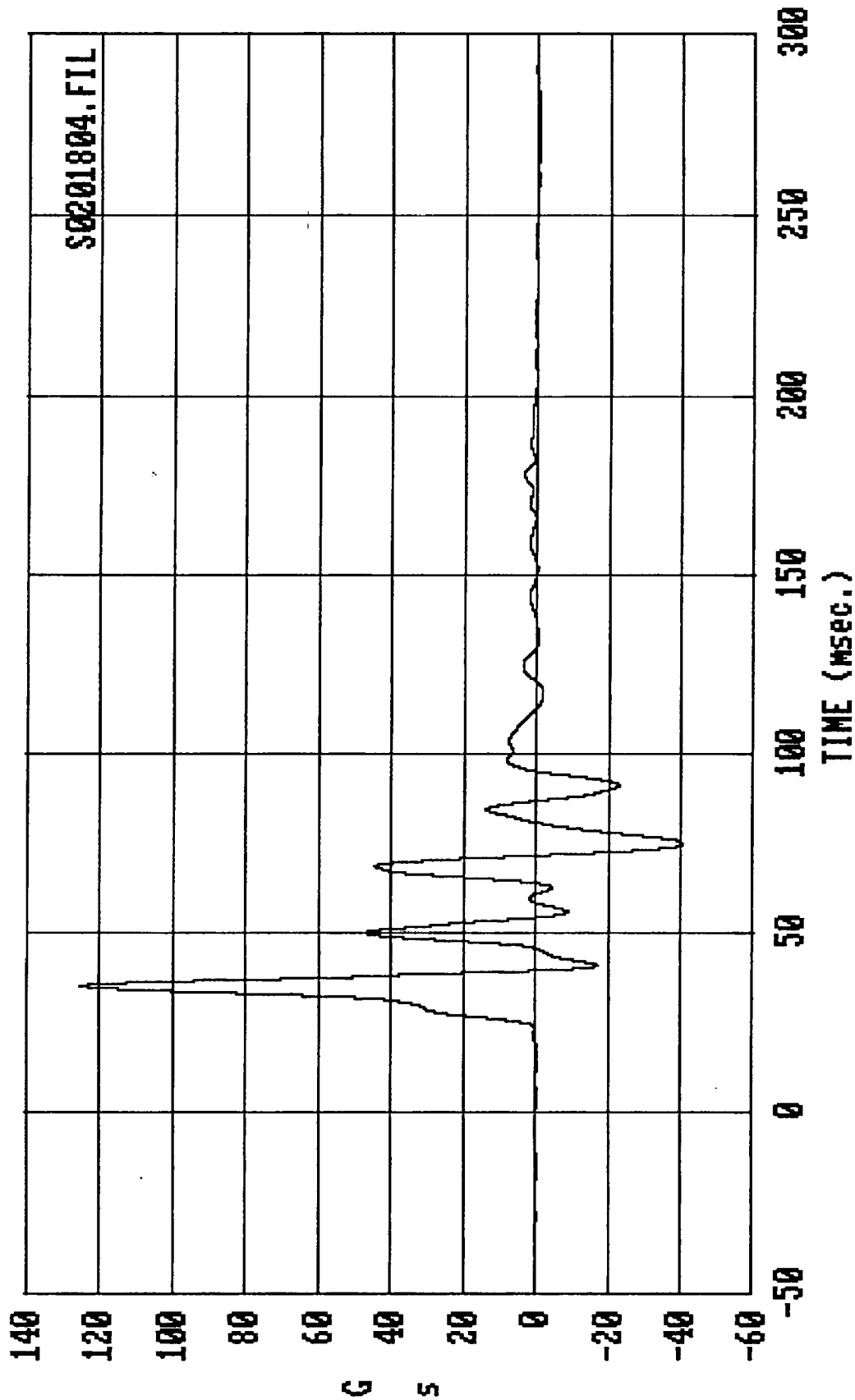
Max = .00000 Min = .00000

MSE 09/30/88 -- 1984 Ford Ranger : Driver Head acc., Z-axis (No data)



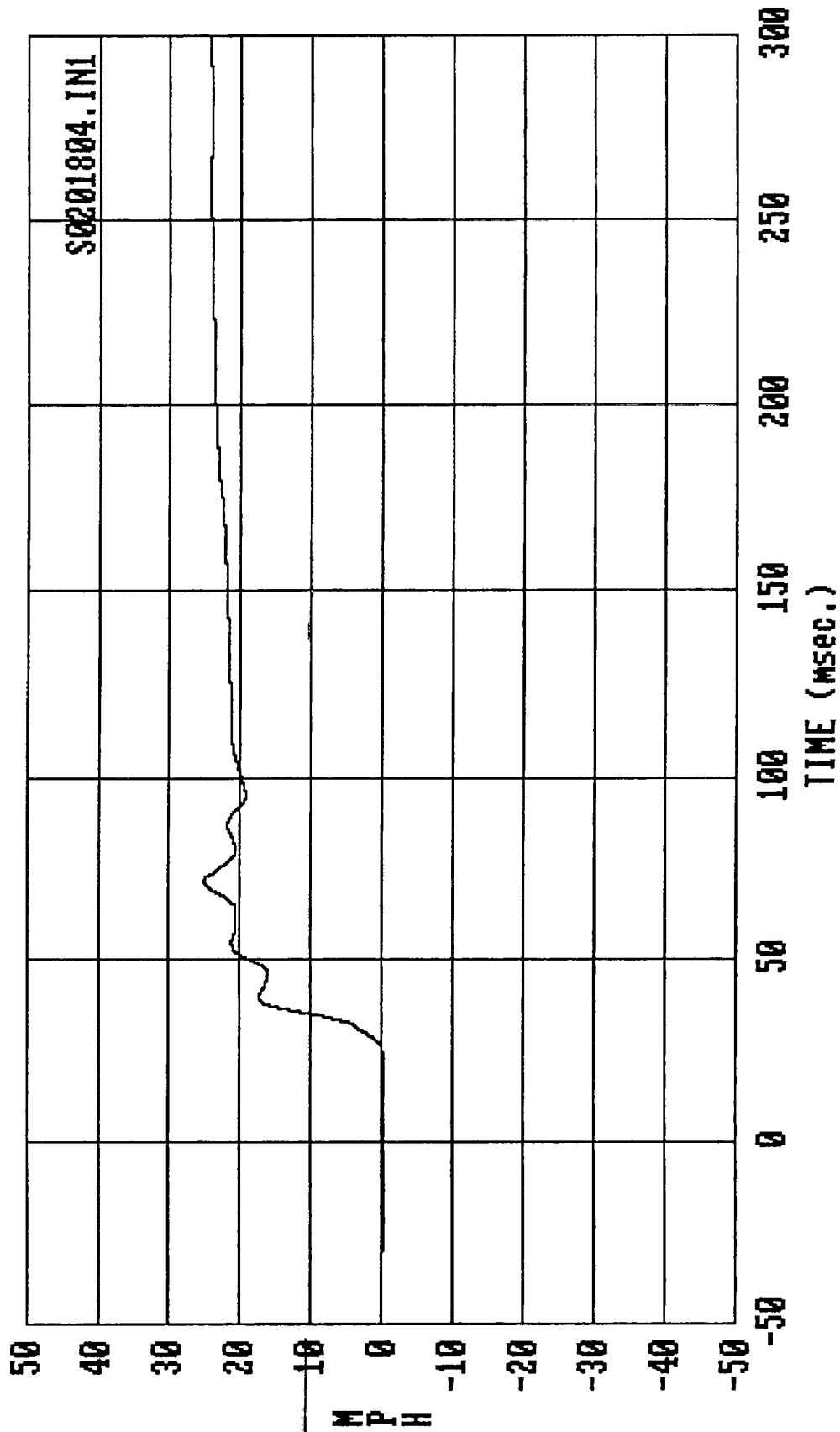
B4

Filter: SAE CLASS 1000 Max = 110.06 Min = .56585E-01
MSE 09/30/88 -- 1984 Ford Ranger : Driver Head resultant acceleration

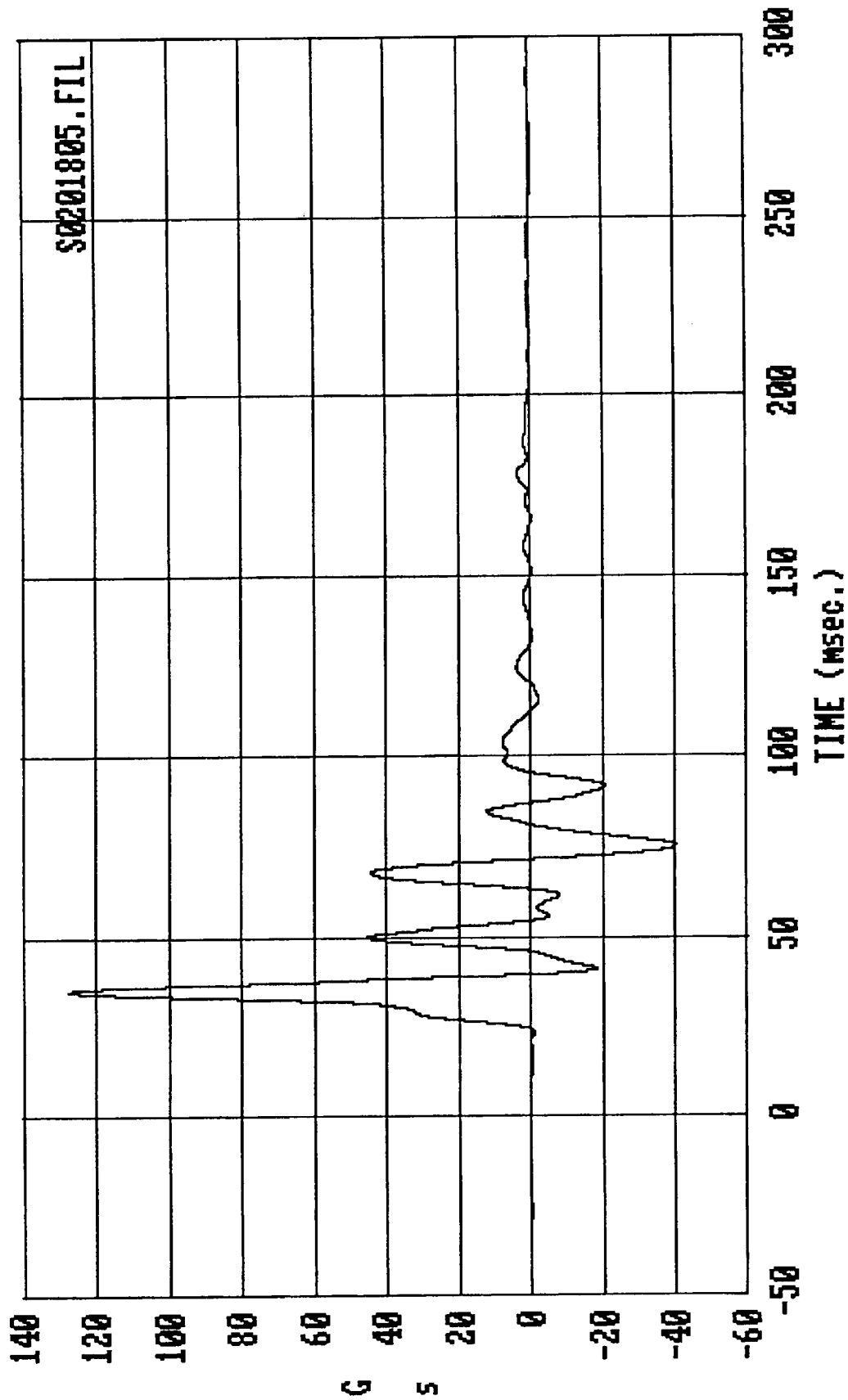


Max = 125.62 Min = -40.161

MSE 09/30/88 -- 1984 Ford Ranger : Driver Upper Rib acc., Y-axis (Primary)

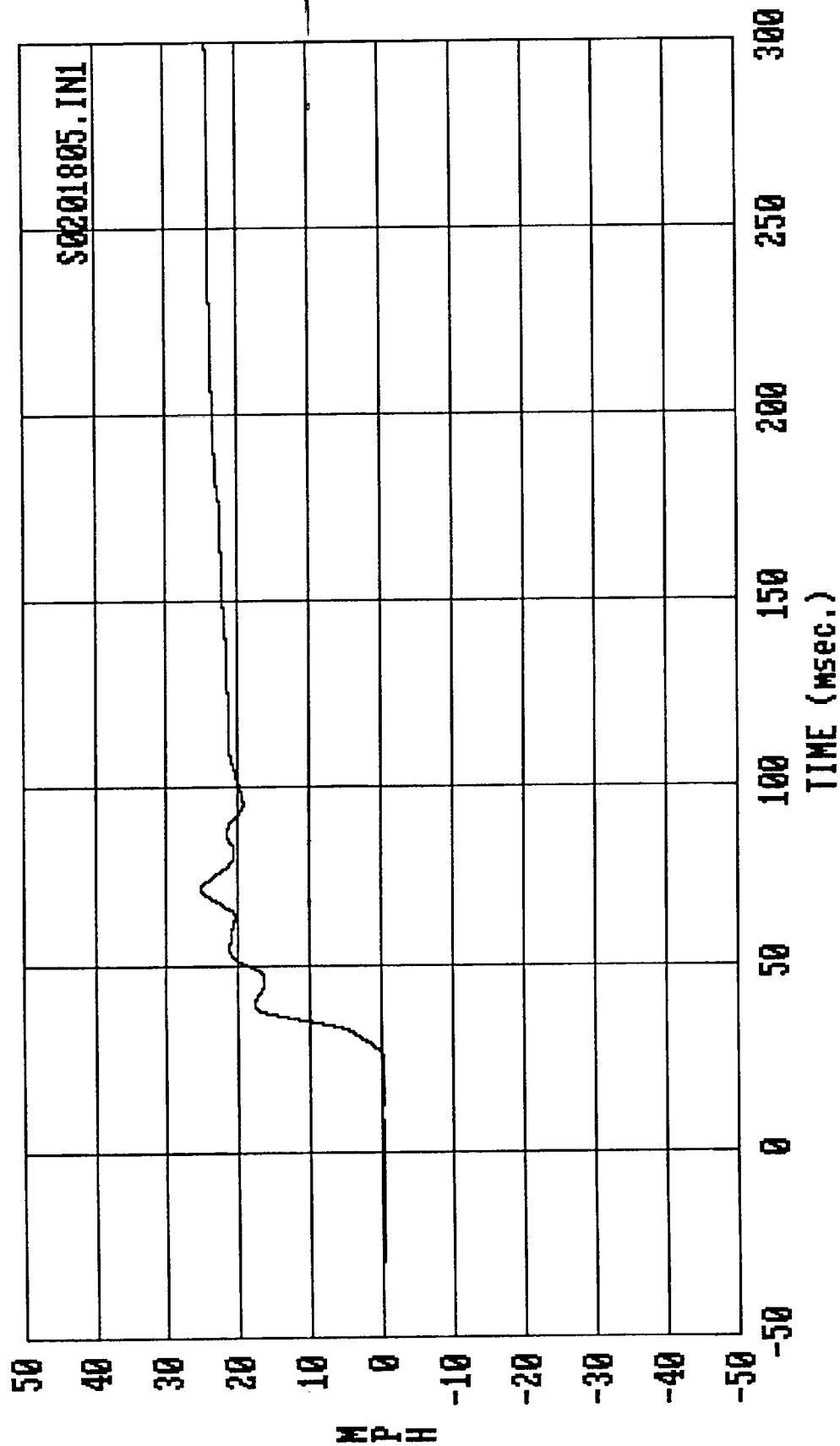


Filter: FIR 100 Max = 25.260 Min = -.54168E-01
MSE 09/30/88 -- 1984 Ford Ranger : Driver Upper Rib delt U, Y-ax. (Primary)



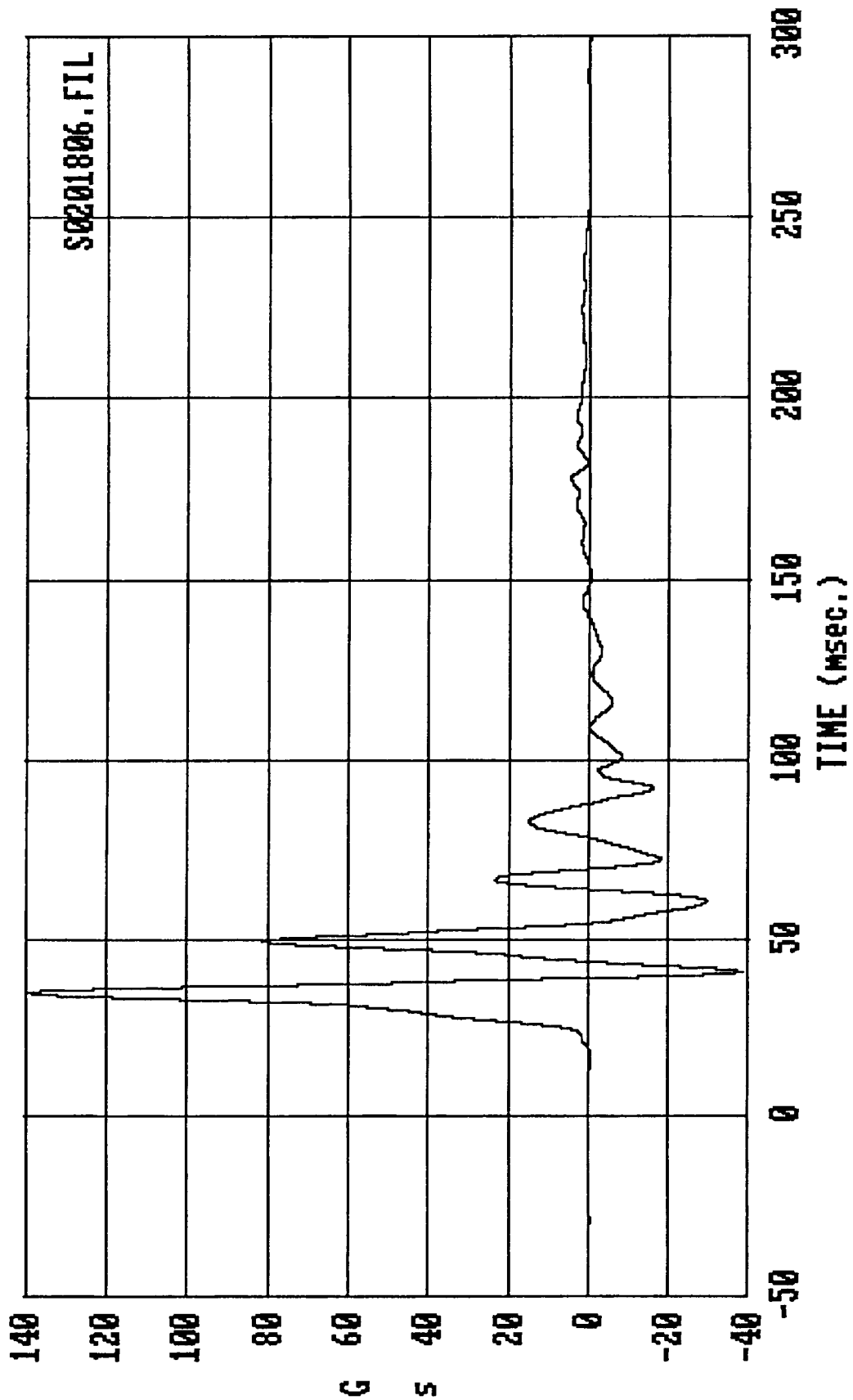
Max = 128.12 Min = -40.097

MSE 09/30/88 -- 1984 Ford Ranger : Driver Upper Rib acc., Y-axis (Second)



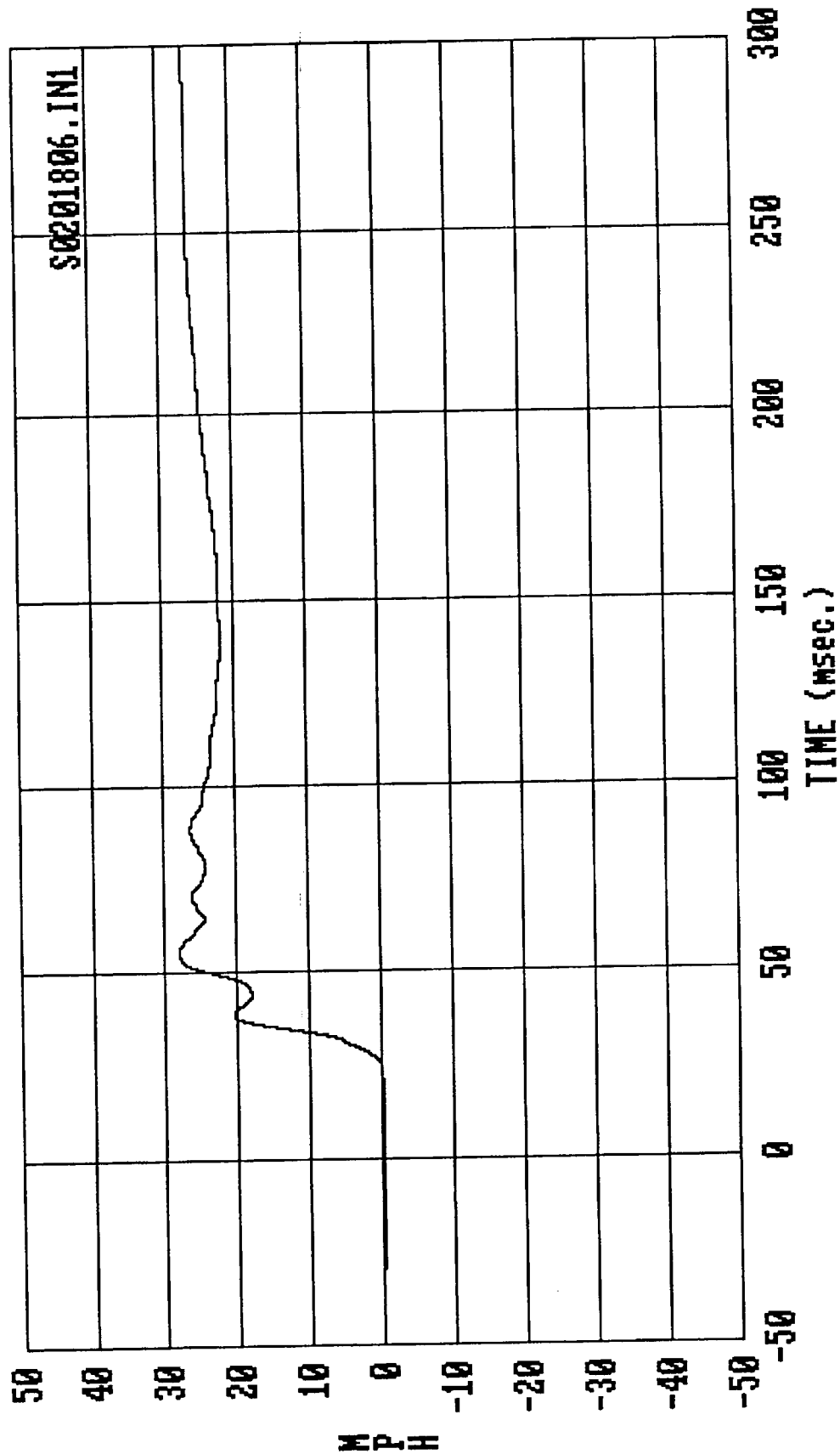
Filter: FIR 100 Max = 25.407 Min = -.62554E-01

MSE 09/30/88 -- 1984 Ford Ranger : Driver Upper Rib delt V, Y-ax.(Second)



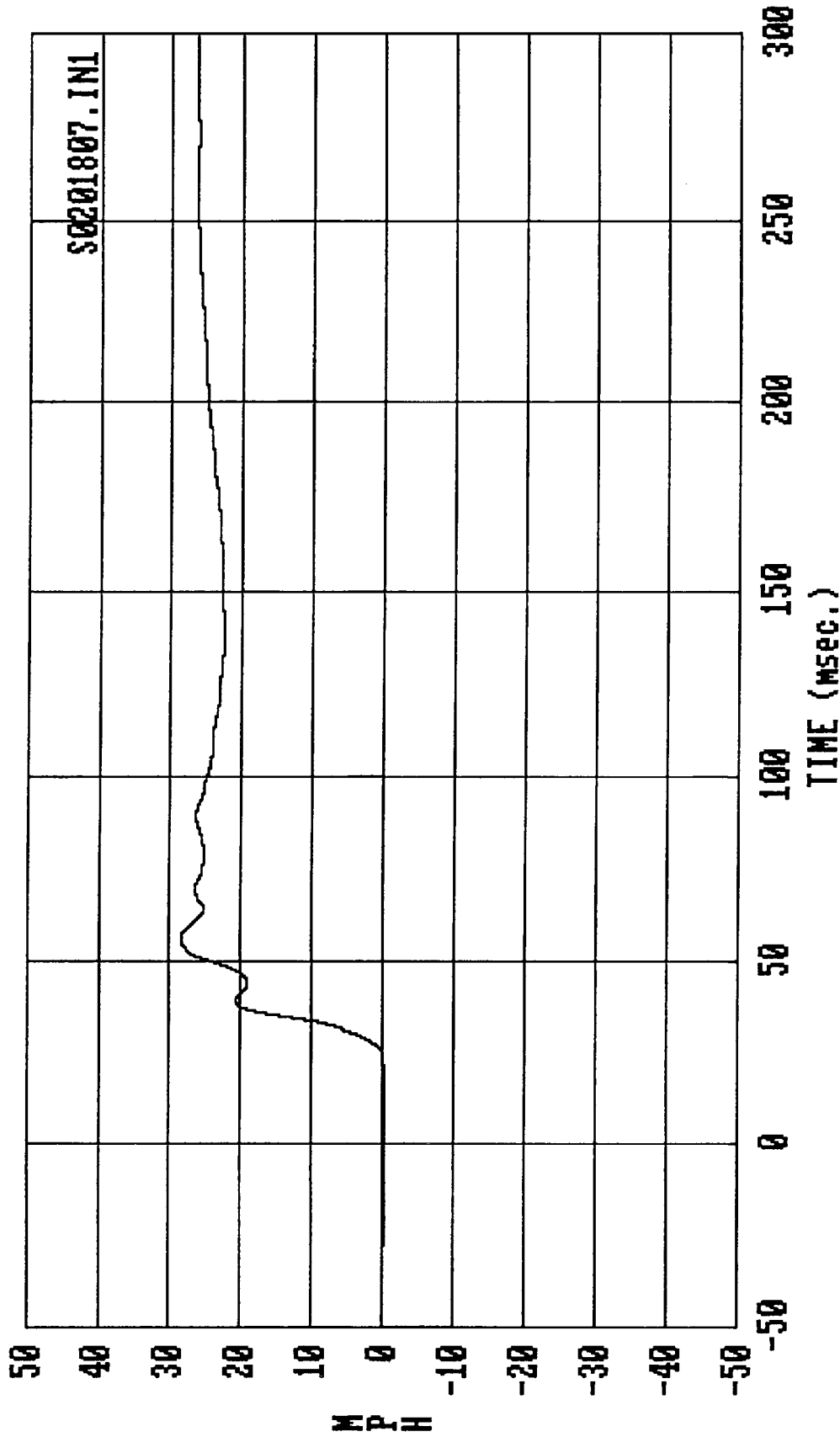
Max = 139.91 Min = -38.476

MSE 09/30/88 -- 1984 Ford Ranger : Driver Lower Rib acc., Y-axis (Primary)

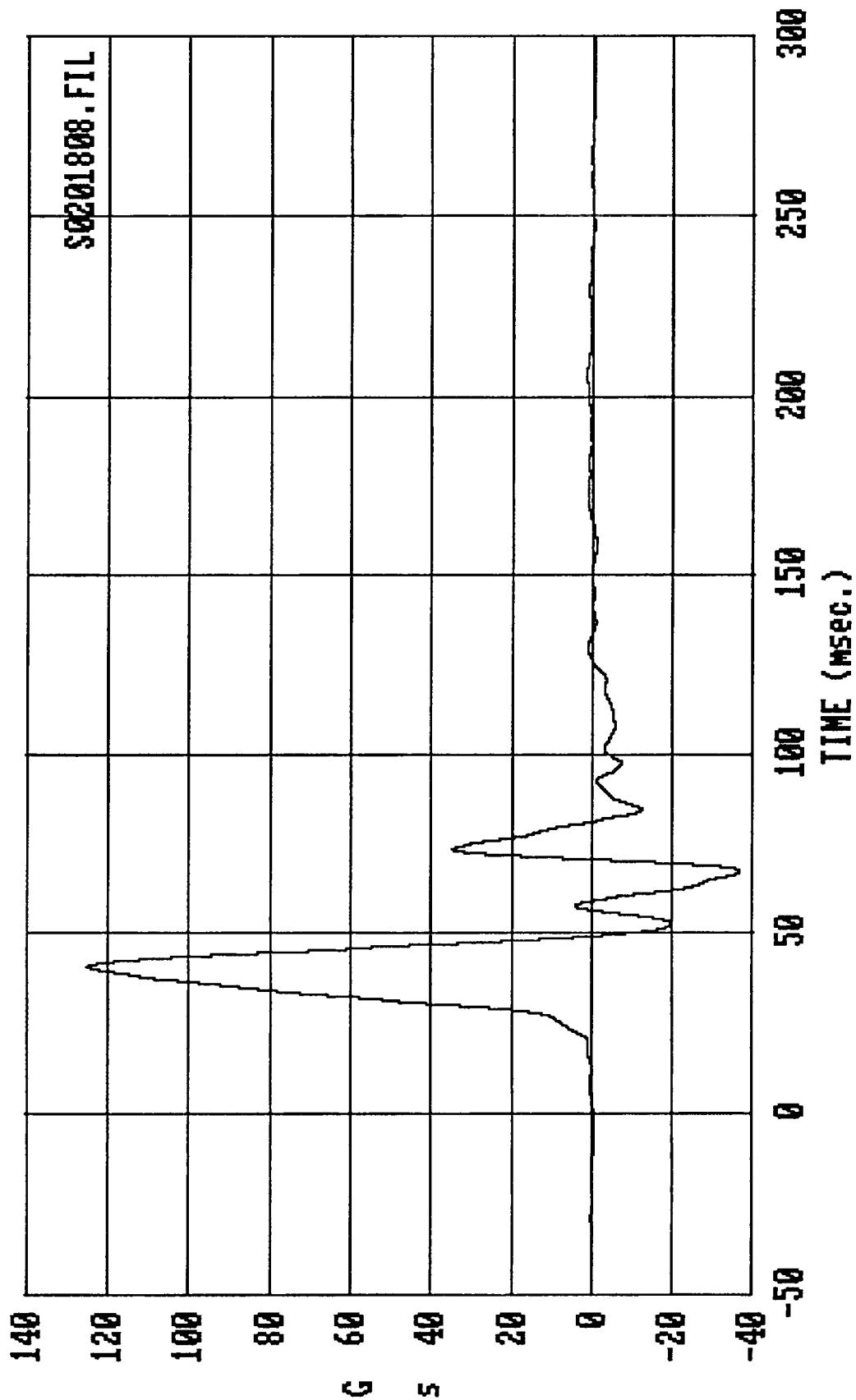


Filter: FIR 100 Max = 28.196 Min = -.34633E-01

MSE 09/30/88 -- 1984 Ford Ranger : Driver Lower Rib delt U, Y-ax. (Primary)

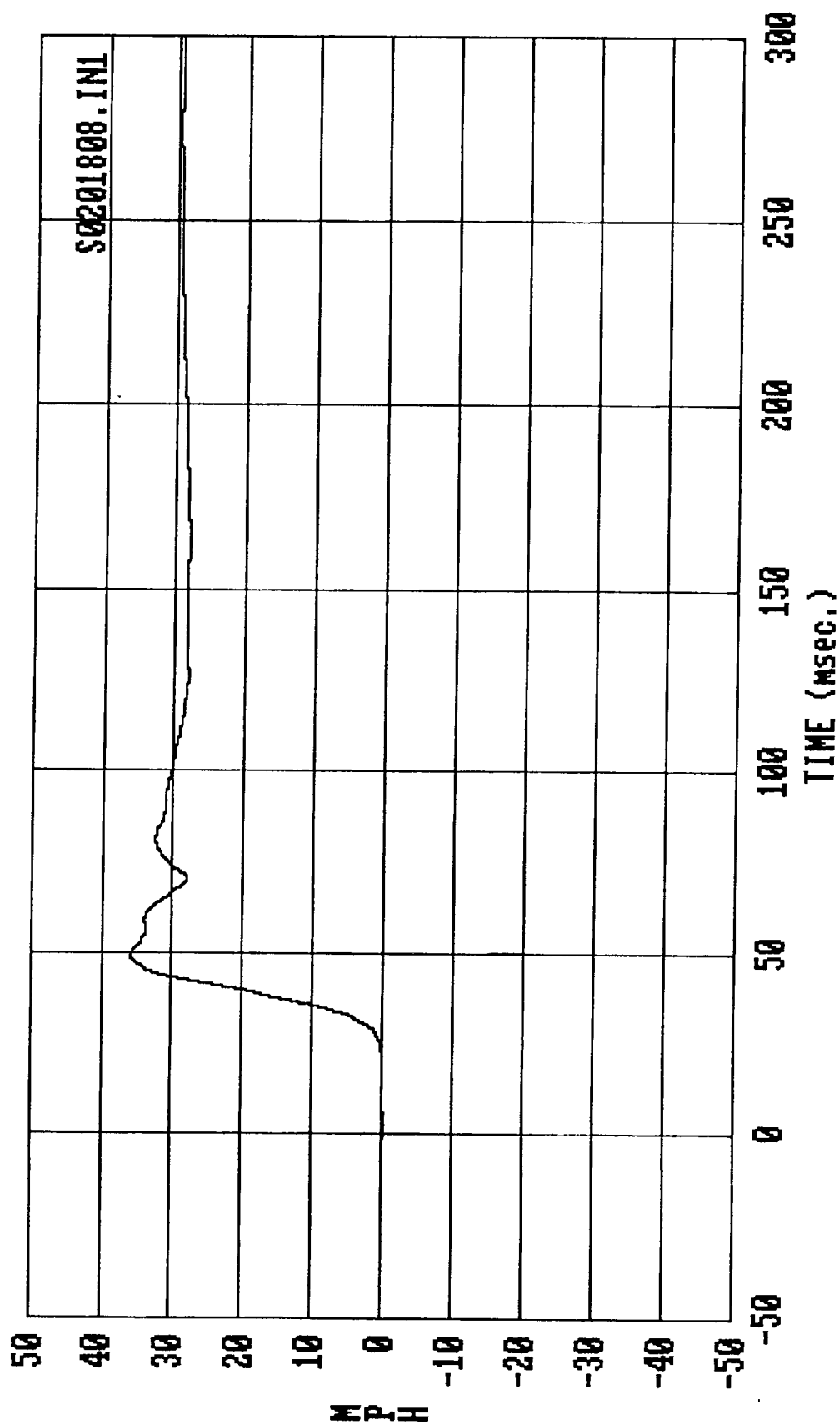


Filter: FIR 100 Max = 28.421 Min = -.32814E-01
MSE 09/30/88 -- 1984 Ford Ranger : Driver Lower Rib delt V, Y-ax.(Second)



Max = 125.22 Min = -36.575

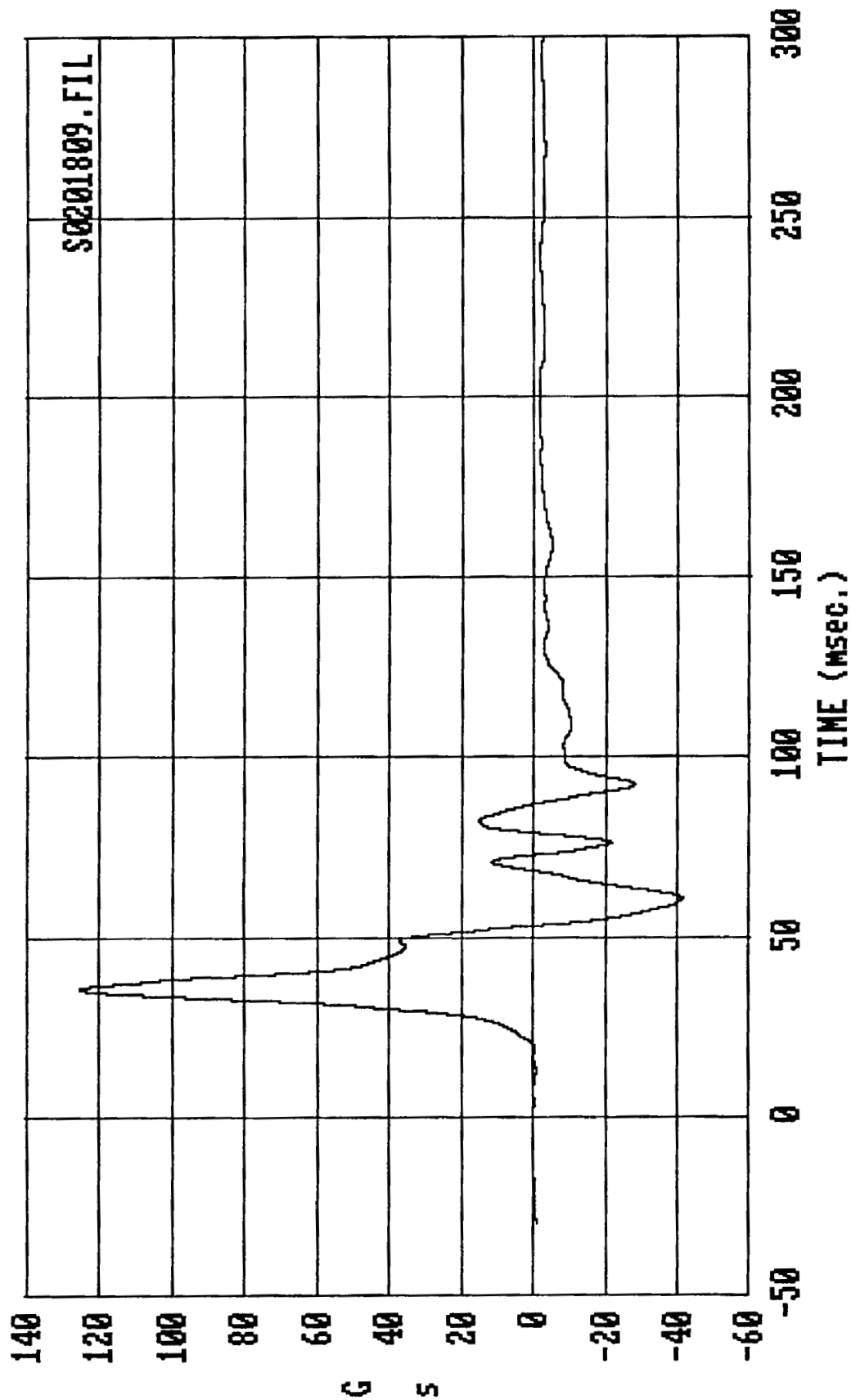
MSE 09/30/88 -- 1984 Ford Ranger : Driver Lower Spine acc., Y-ax. (Primary)



Filter: FIR 100

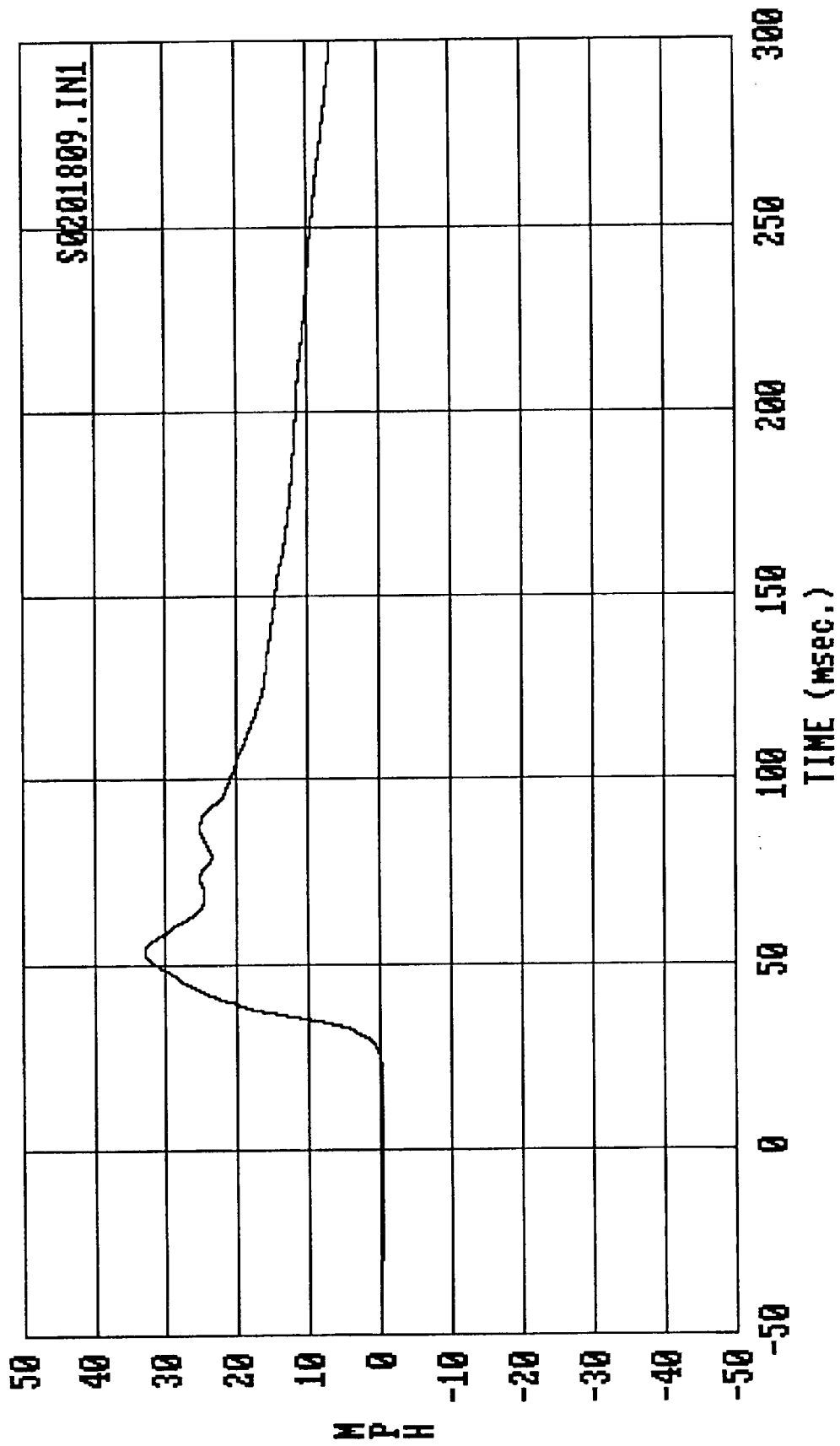
Max = 35.921 Min = -.60693E-02

MSE 09/30/88 -- 1984 Ford Ranger : Driver Lower Spine delt U,Y-ax(Primary)



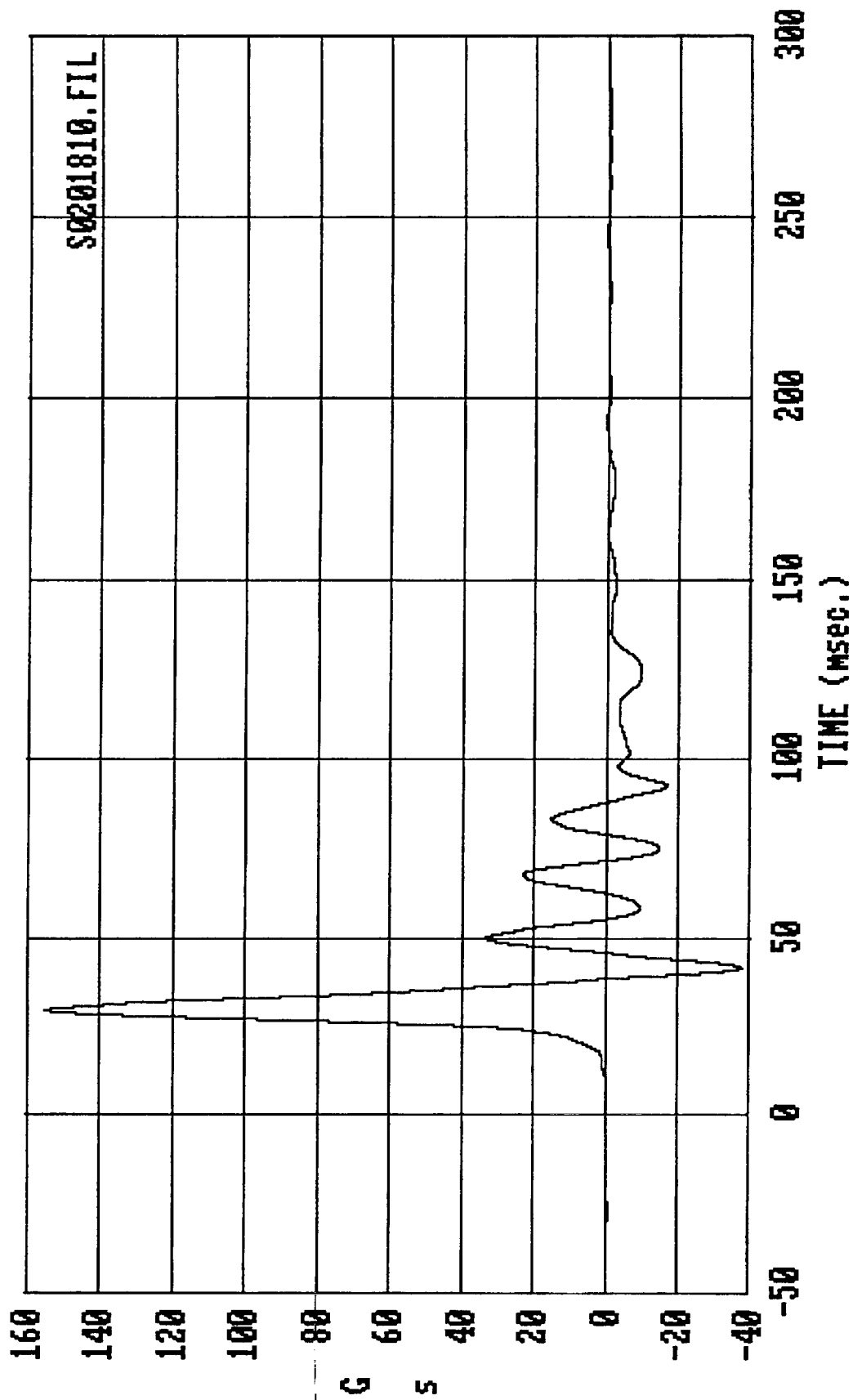
Max = 125.71 Min = -41.289

MSE 09/30/88 -- 1984 Ford Ranger : Driver Lower Spine acc., Y-axis (Second)



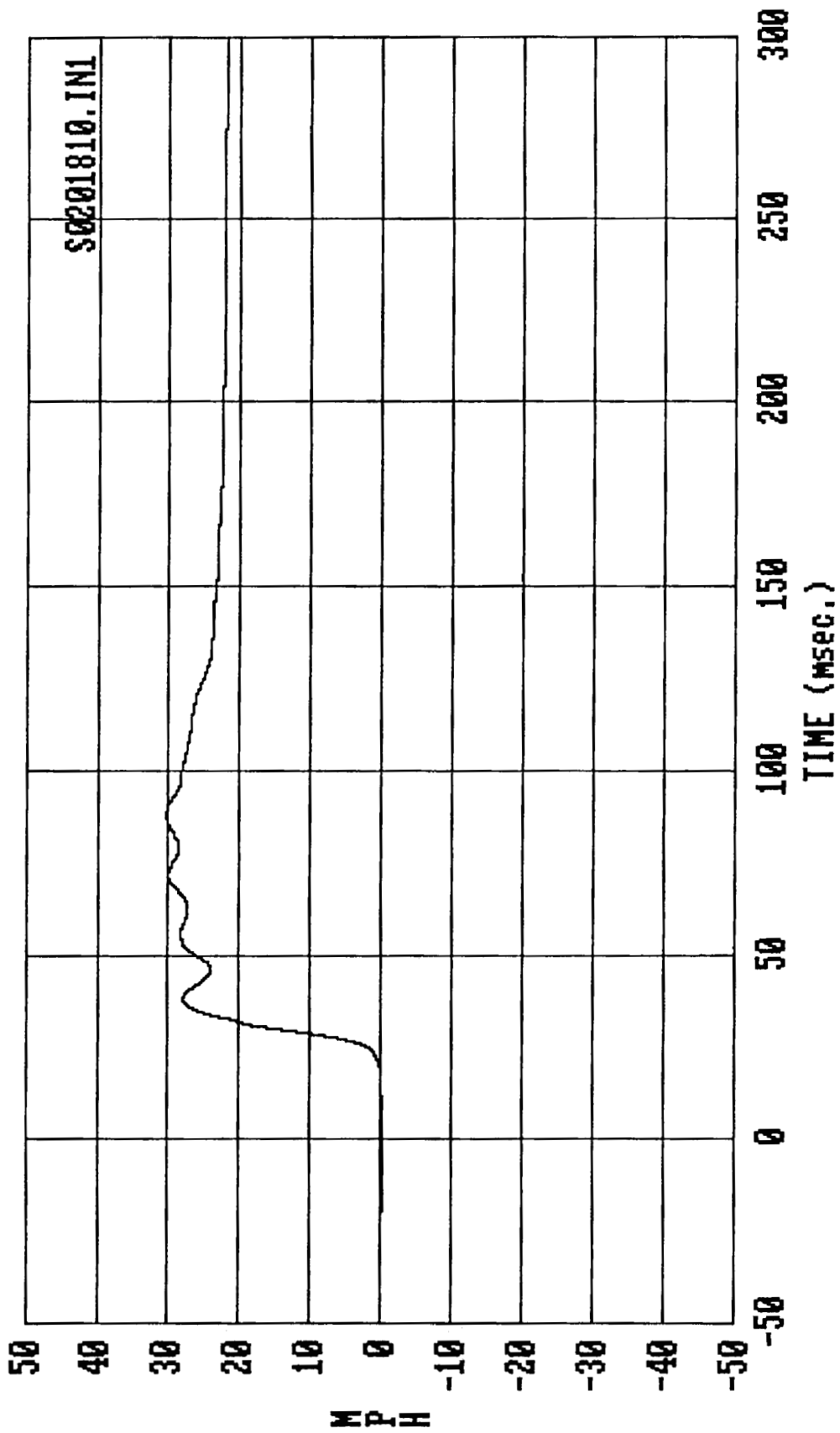
Filter: FIR 100 Max = 33.023 Min = -.71709E-01

MSE 09/30/88 -- 1984 Ford Ranger : Driver Lower Spine delt V,Y-ax (Second)

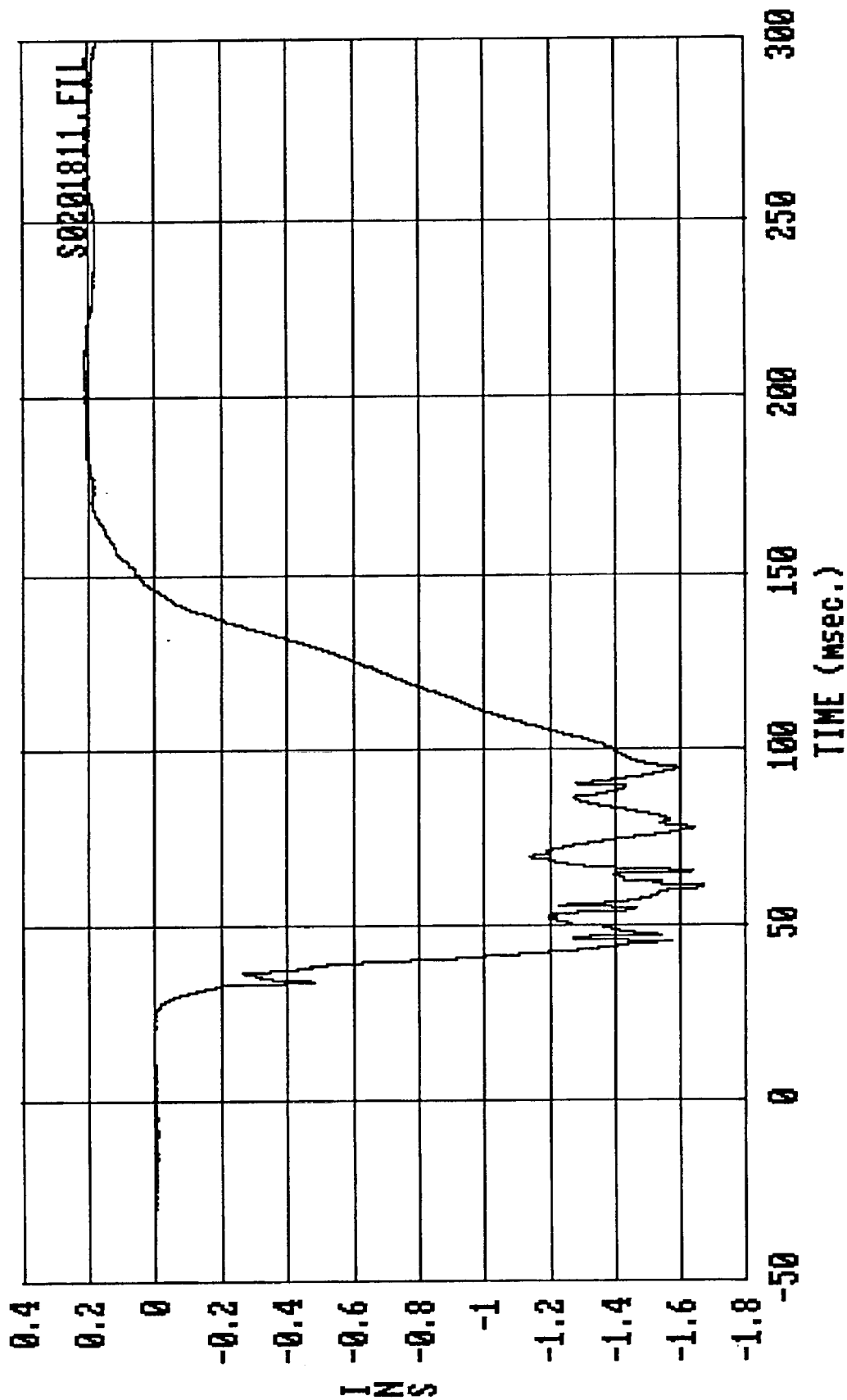


Max = 155.22 Min = -37.570

MSE 09/30/88 -- 1984 Ford Ranger : Driver Pelvis acceleration, Y-axis

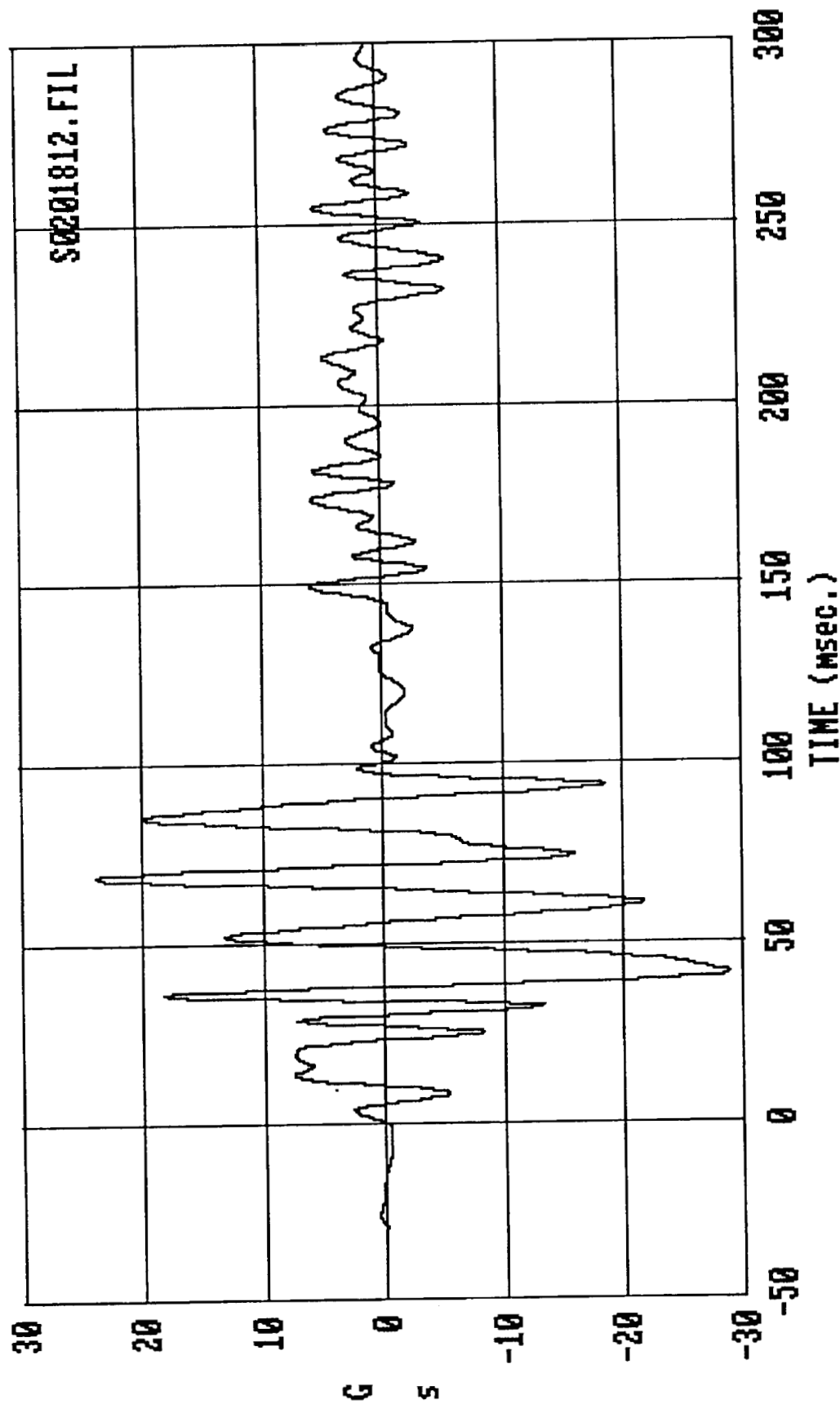


Filter: FIR 100 Max = 30.442 Min = -.80274E-02
 MSE 09/30/88 -- 1984 Ford Ranger : Driver Pelvis delta V, Y-axis



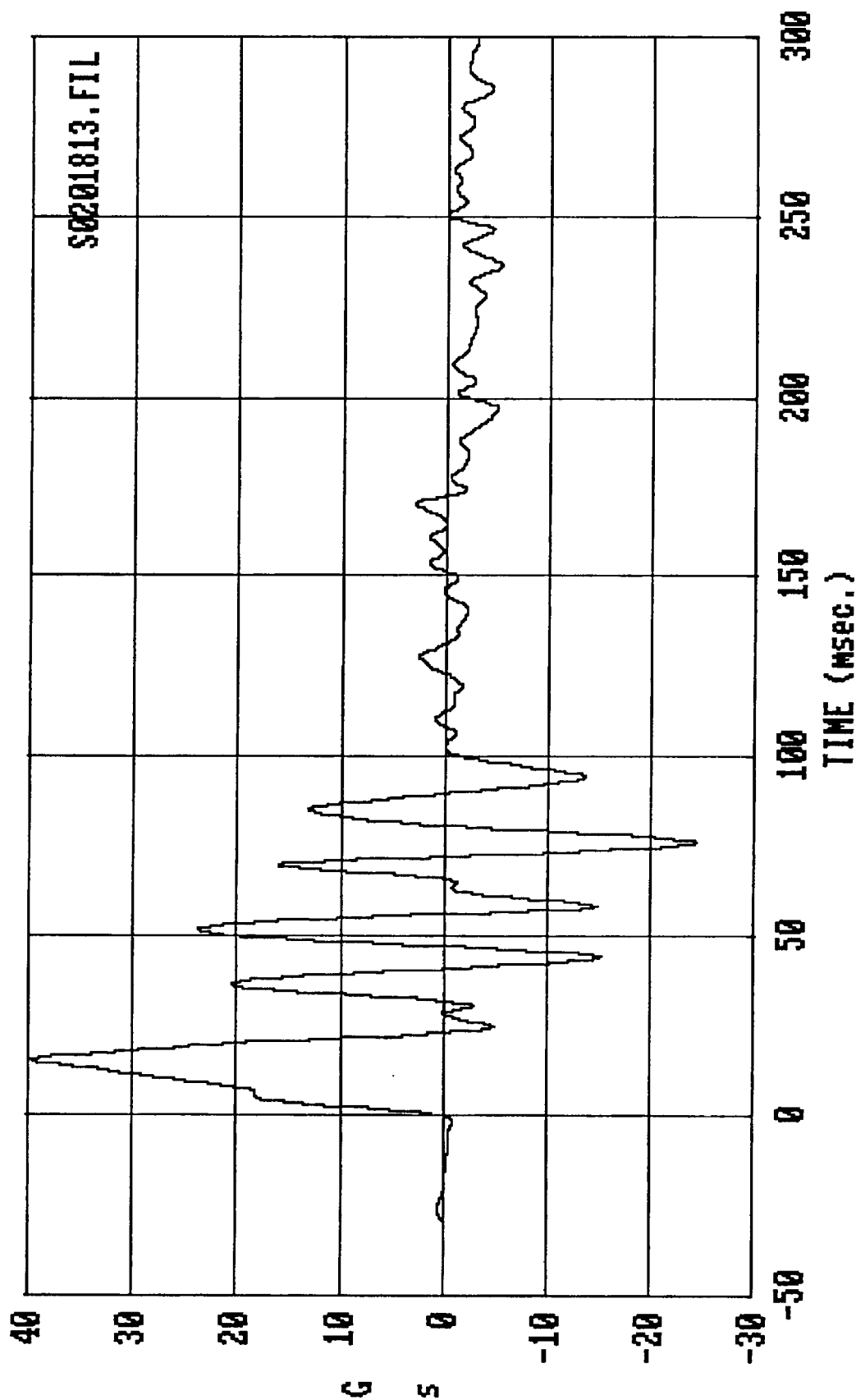
Max = .21744 Min = -1.6662

MSE 09/30/88 -- 1984 Ford Ranger : Driver Chest disp. (Compression is -)



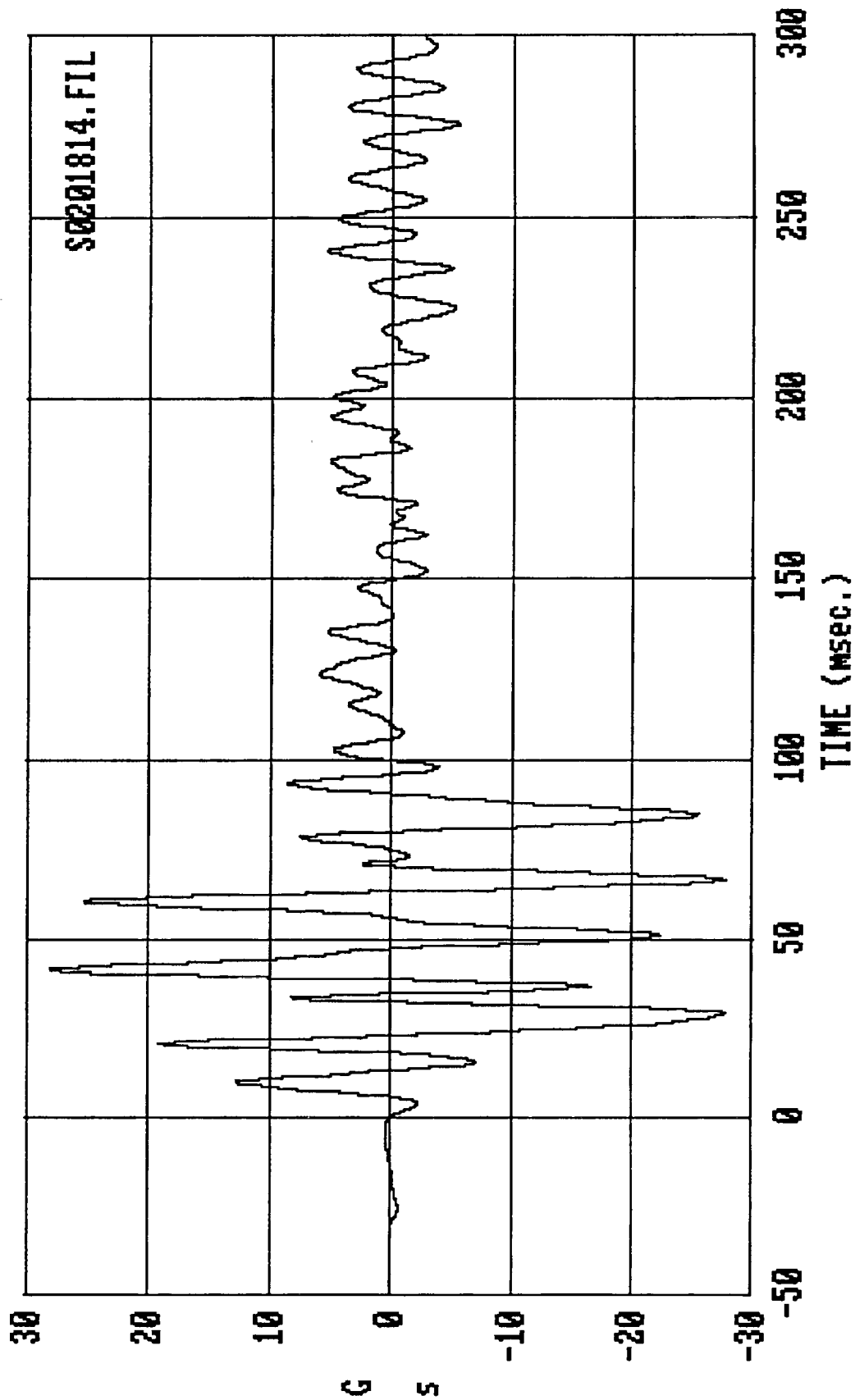
Max = 24.007 Min = -28.857

MSE 09/30/88 -- 1984 Ford Ranger : Front Seat Right Sill, X-axis



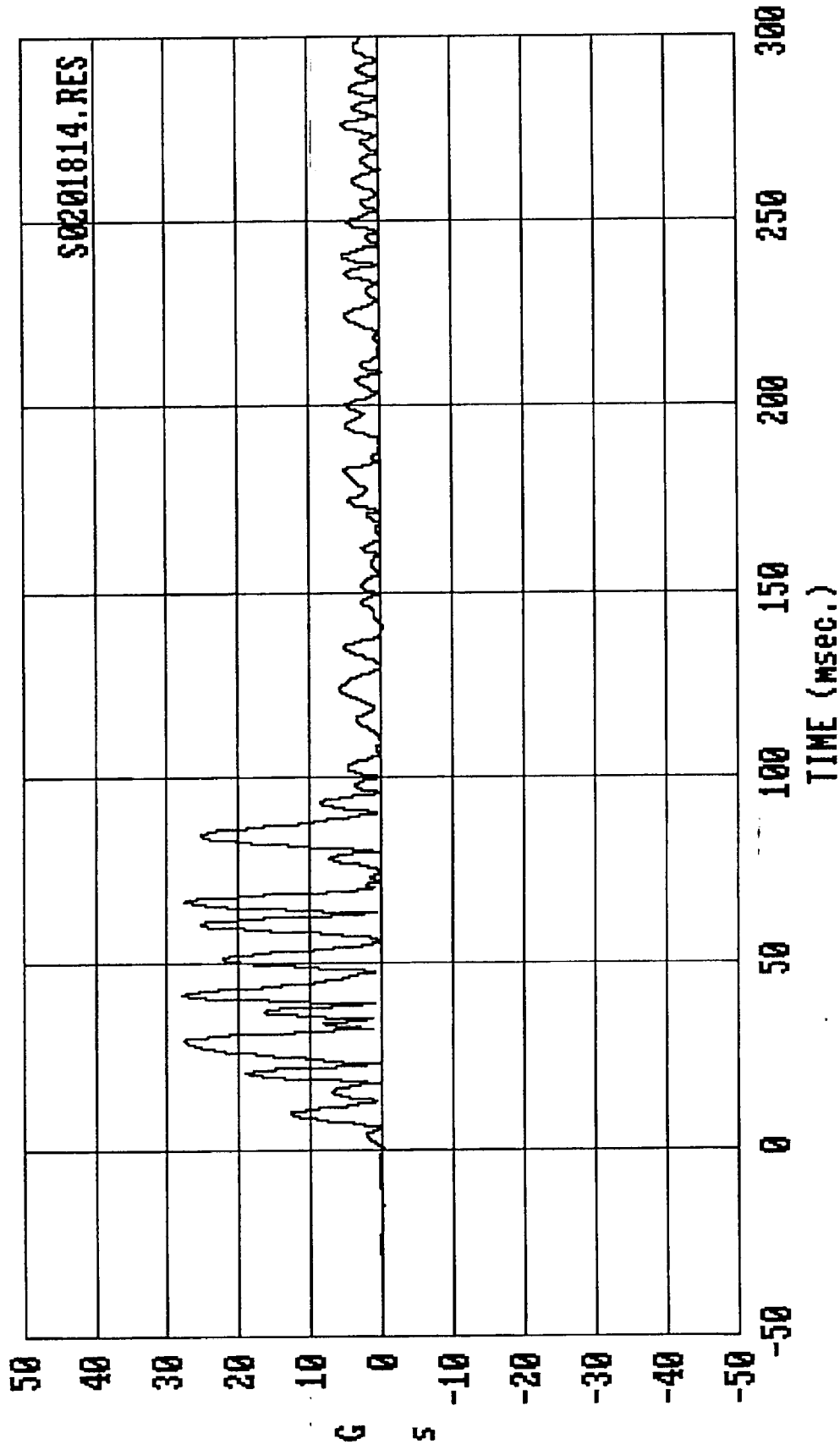
Max = 39.824 Min = -24.448

MSE 09/30/88 -- 1984 Ford Ranger : Front Seat Right Sill, Y-axis



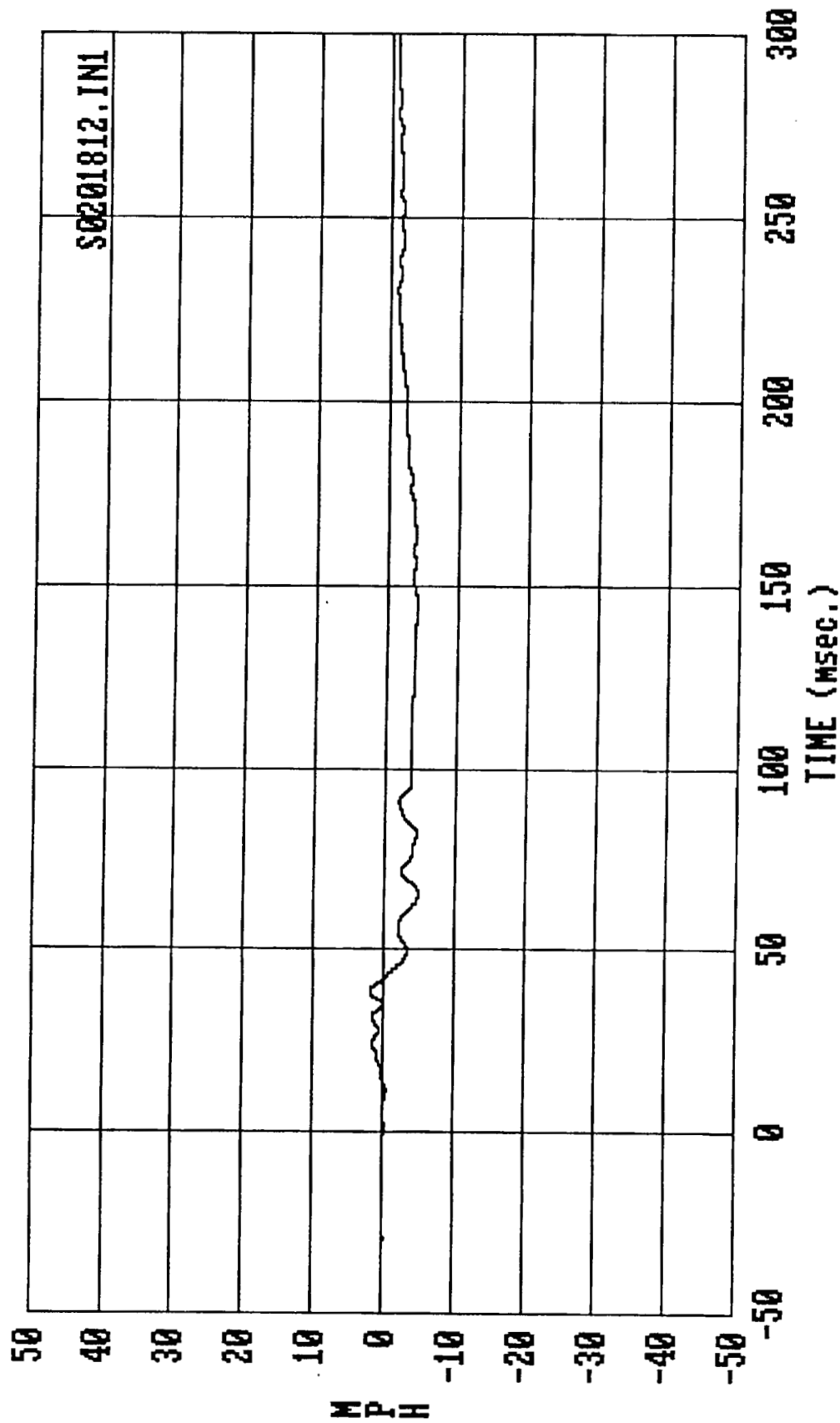
Max = 28.266 Min = -27.822

MSE 09/30/88 -- 1984 Ford Ranger : Front Seat Right Sill, Z-axis

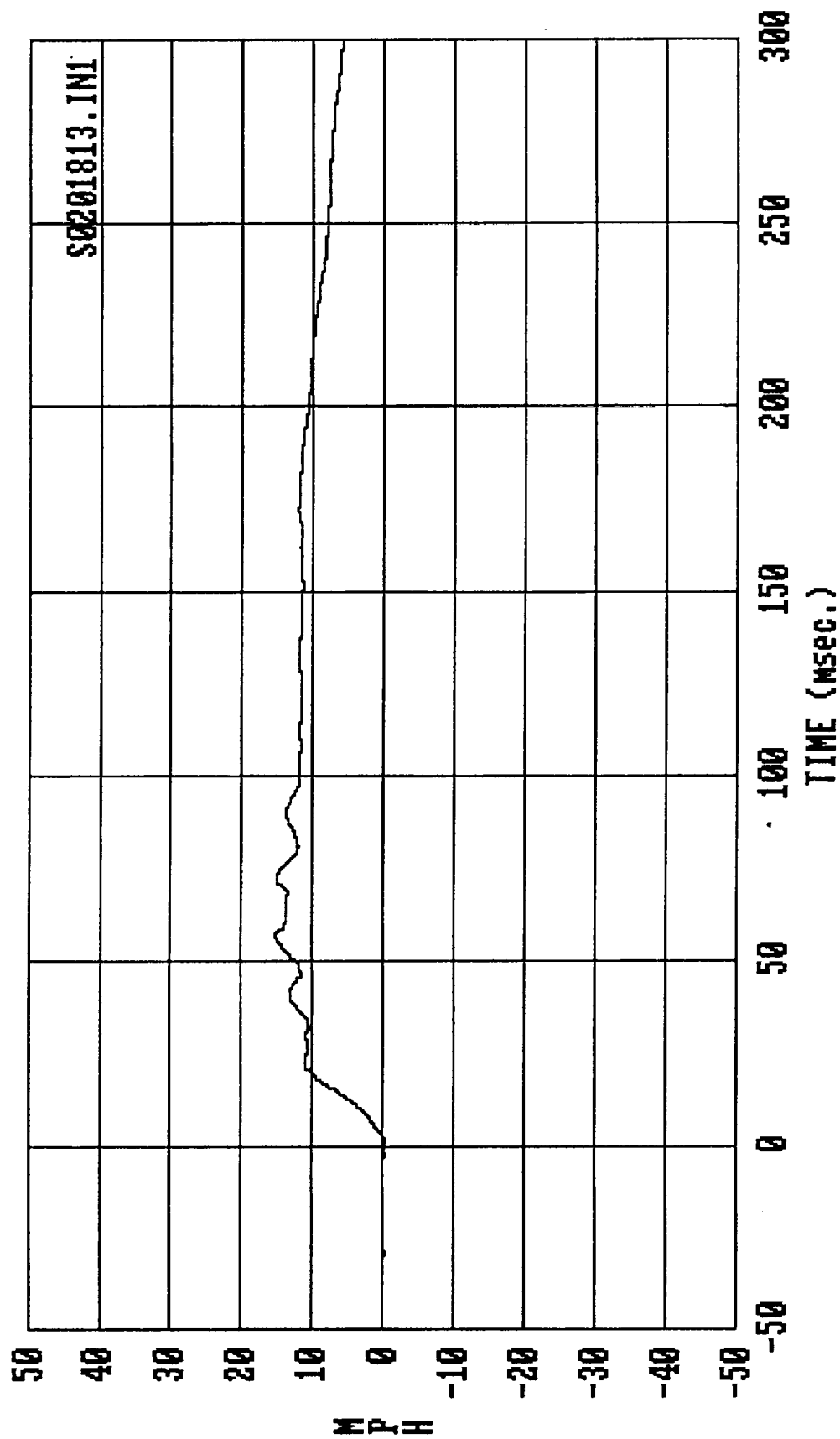


Filter: SAE CLASS 60 Max = 28.266 Min = .83008E-03

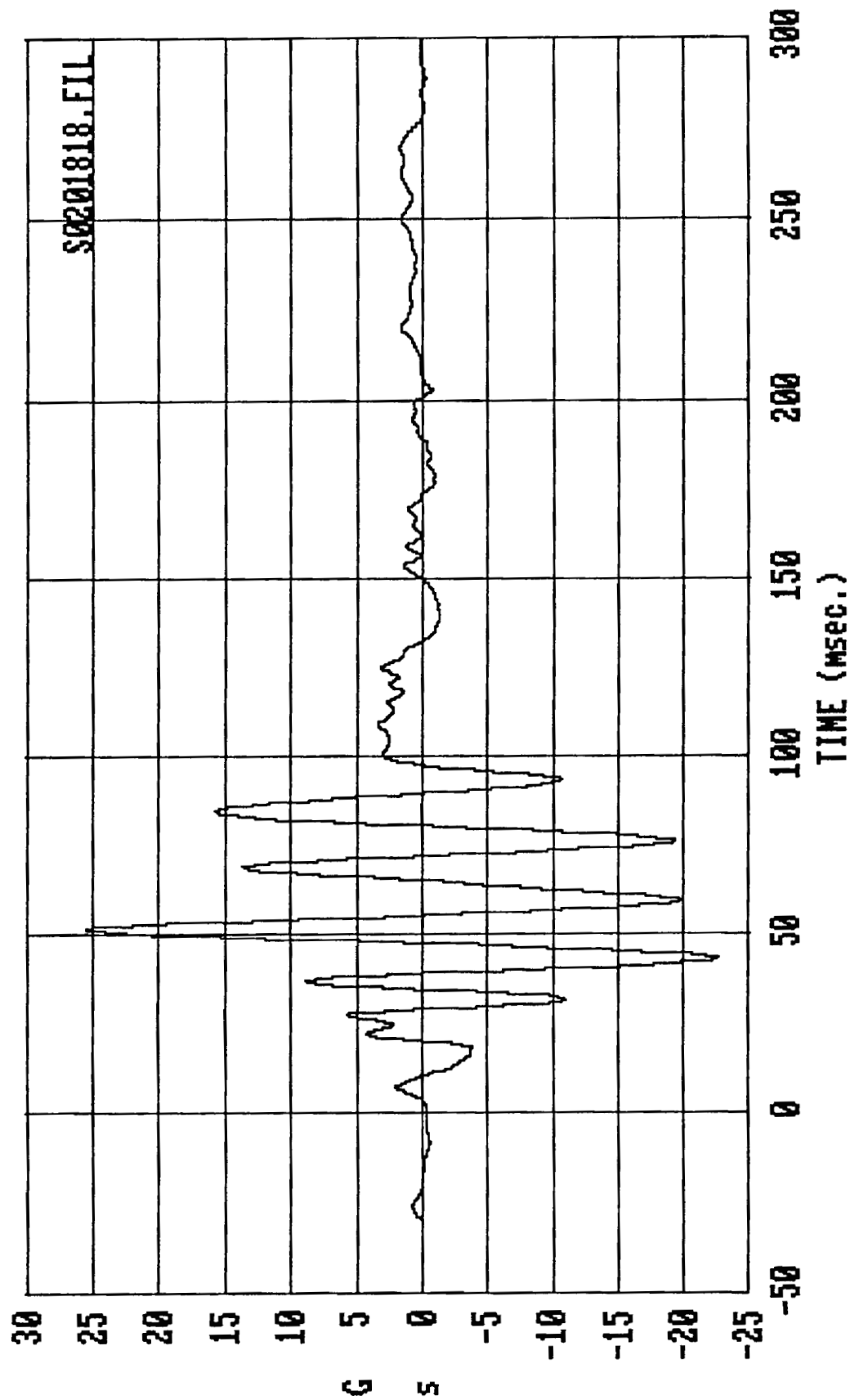
MSE 09/30/88 -- 1984 Ford Ranger : Front Seat Right Sill, resultant accel.



Filter: SAE CLASS 180 Max = 2.1373 Min = -4.6990
MSE 09/30/88 -- 1984 Ford Ranger : Front Seat Right Sill delta V, X-axis



Filter: SAE CLASS 180 Max = 15.284 Min = -.58056E-02
MSE 09/30/88 -- 1984 Ford Ranger : Front Seat Right Sill delta V, Y-axis



Max = 25.608 Min = -22.579

MSE 09/30/88 -- 1984 Ford Ranger : Rear Floor above axle, X-axis

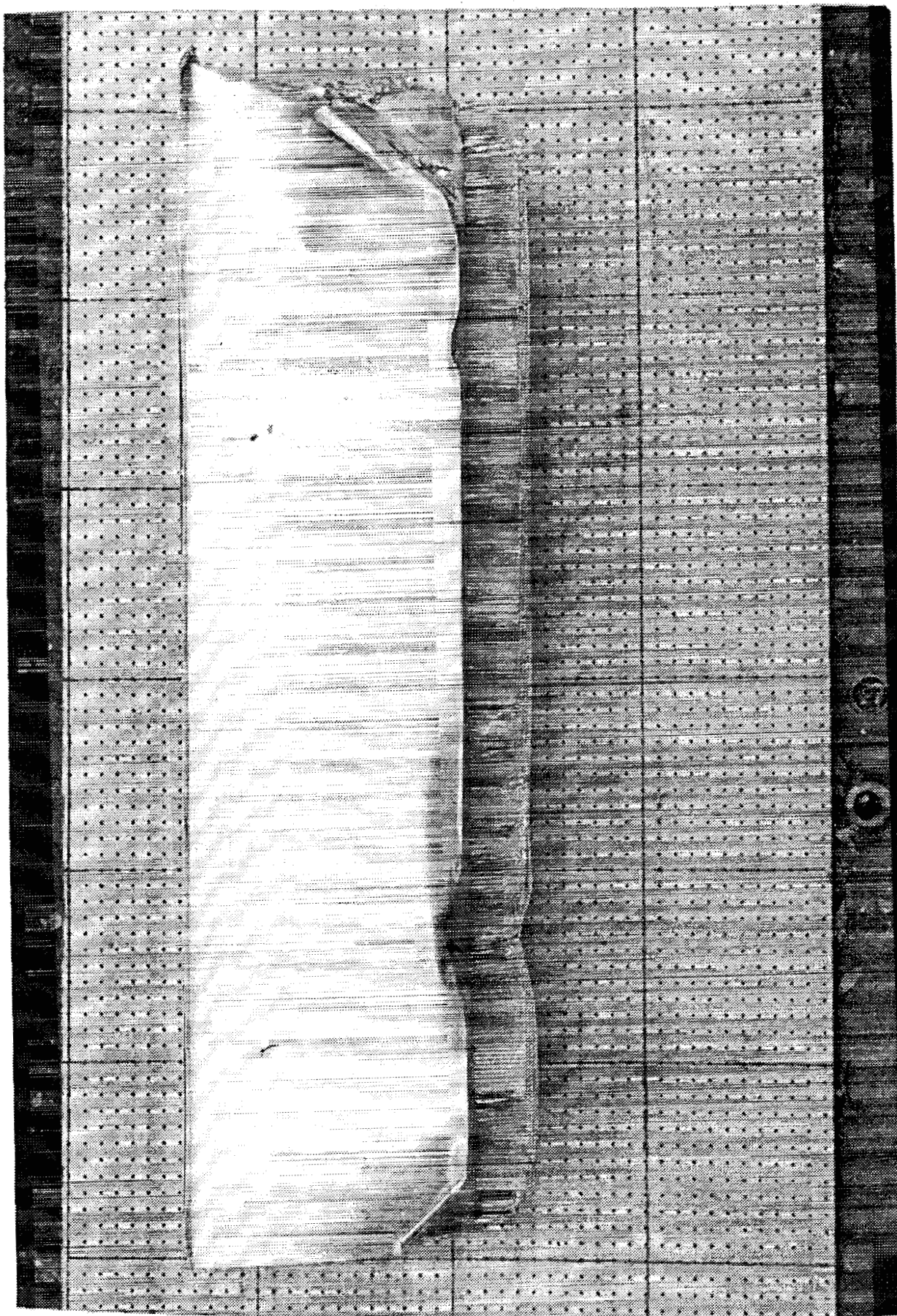
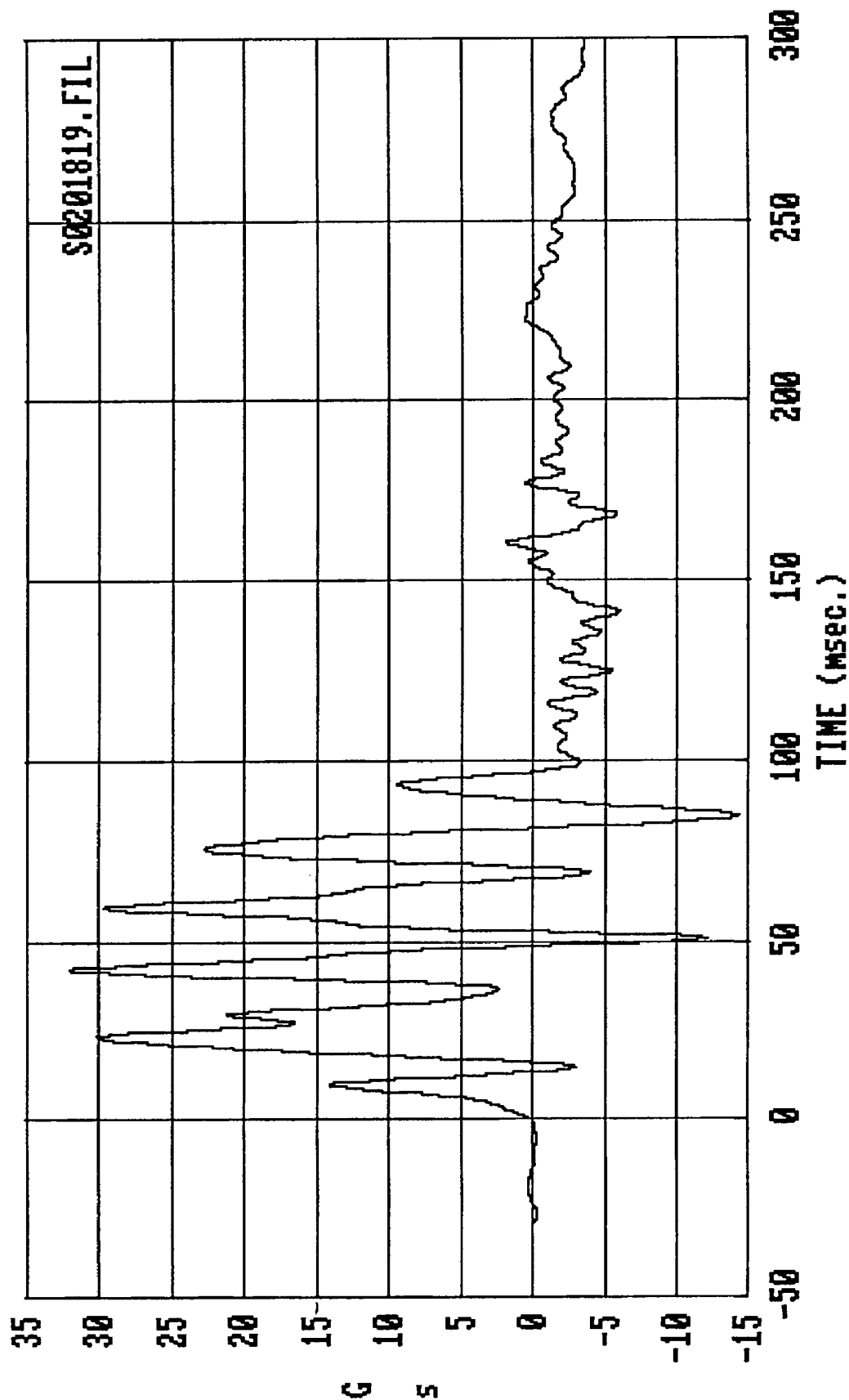
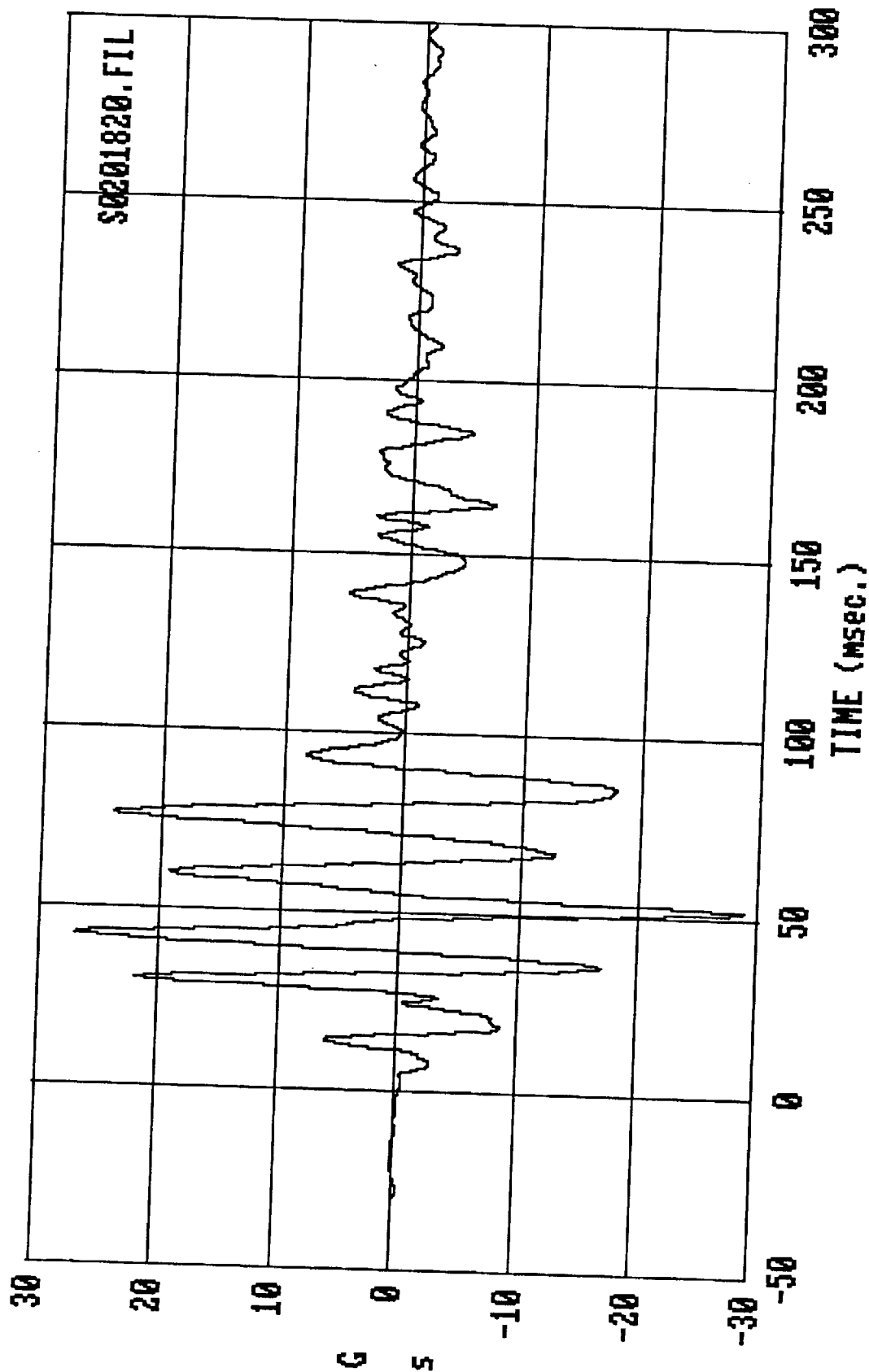


FIGURE A-23 MDB FACE, VIEW NO. 3 - POSTTEST



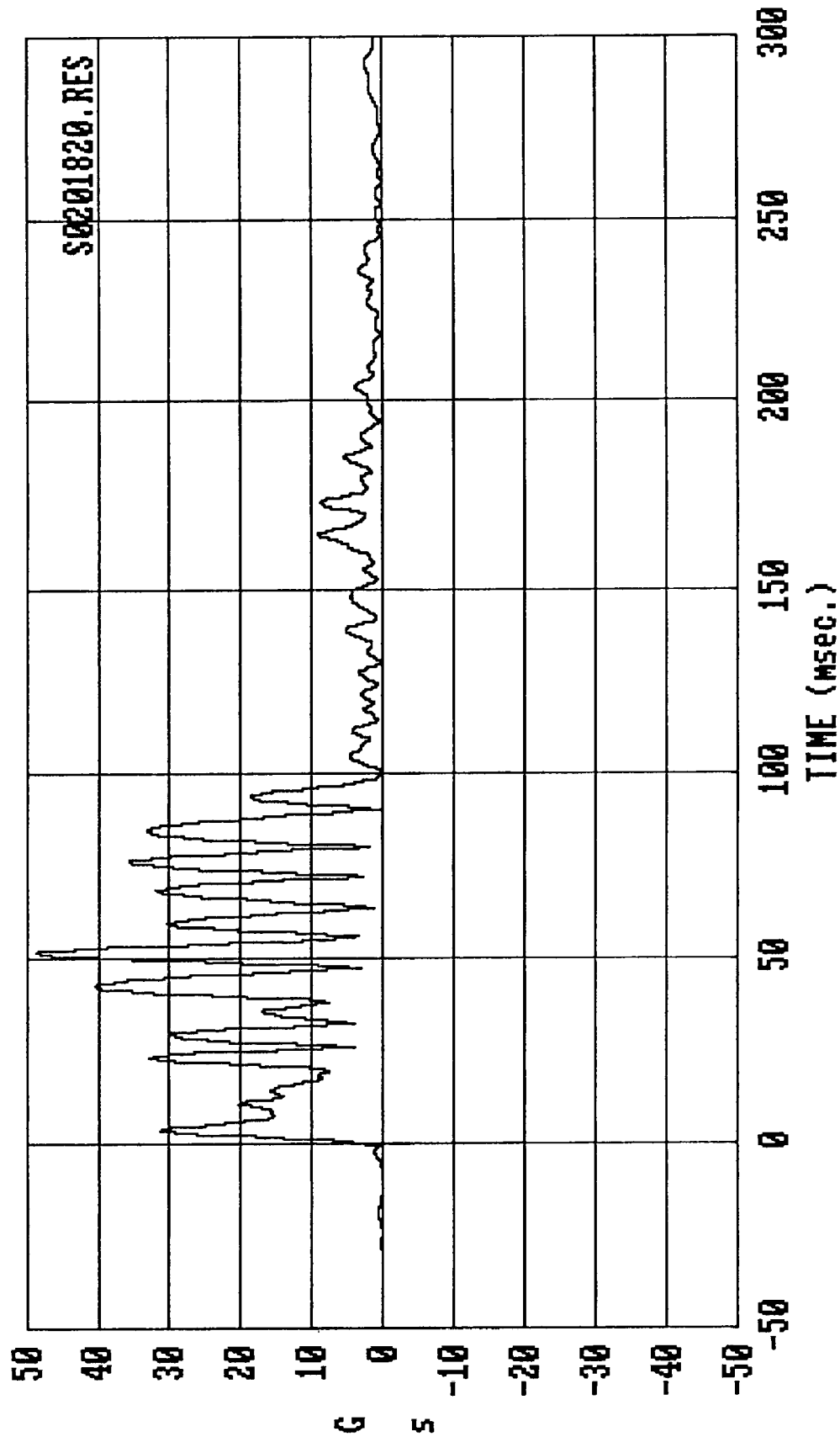
Max = 32.104 Min = -14.229

MSE 09/30/88 -- 1984 Ford Ranger : Rear Floor above axle, Y-axis



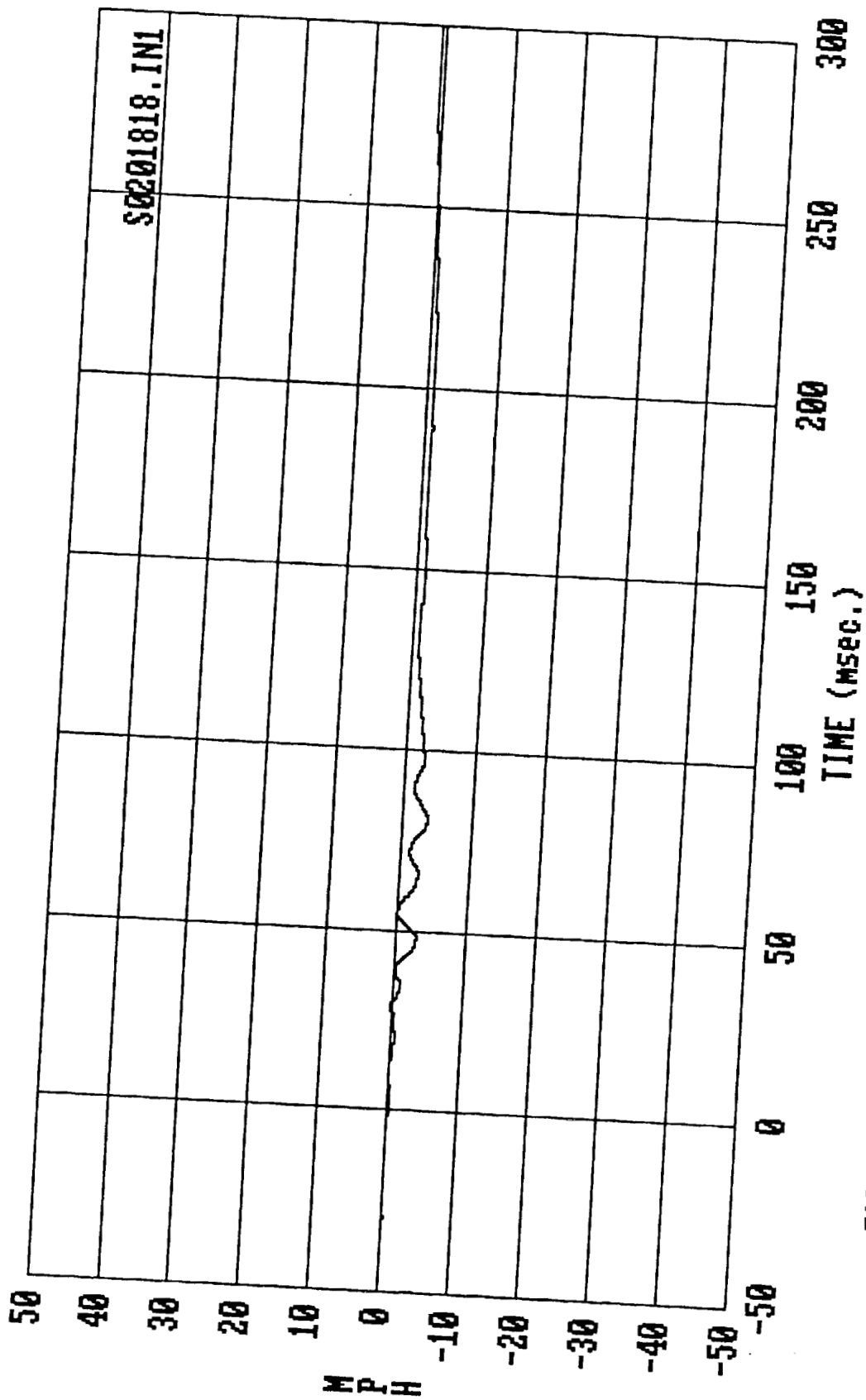
Max = 27.150 Min = -28.821

MSE 09/30/88 -- 1984 Ford Ranger : Rear Floor above axle, Z-axis



Filter: SAE CLASS 60 Max = 48.624 Min = .50888E-01

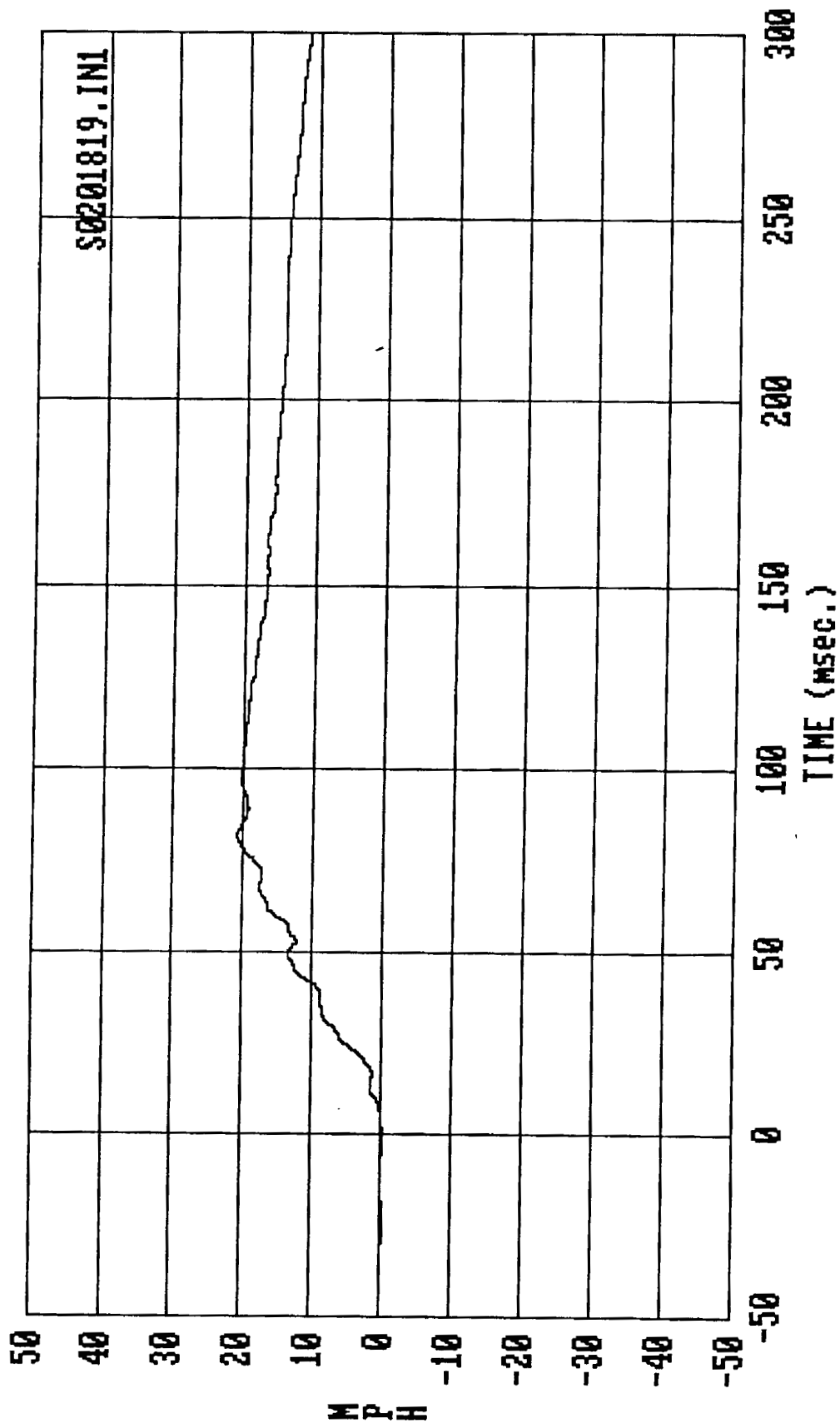
MSE 09/30/88 -- 1984 Ford Ranger : Rear Floor above axle, resultant accel.



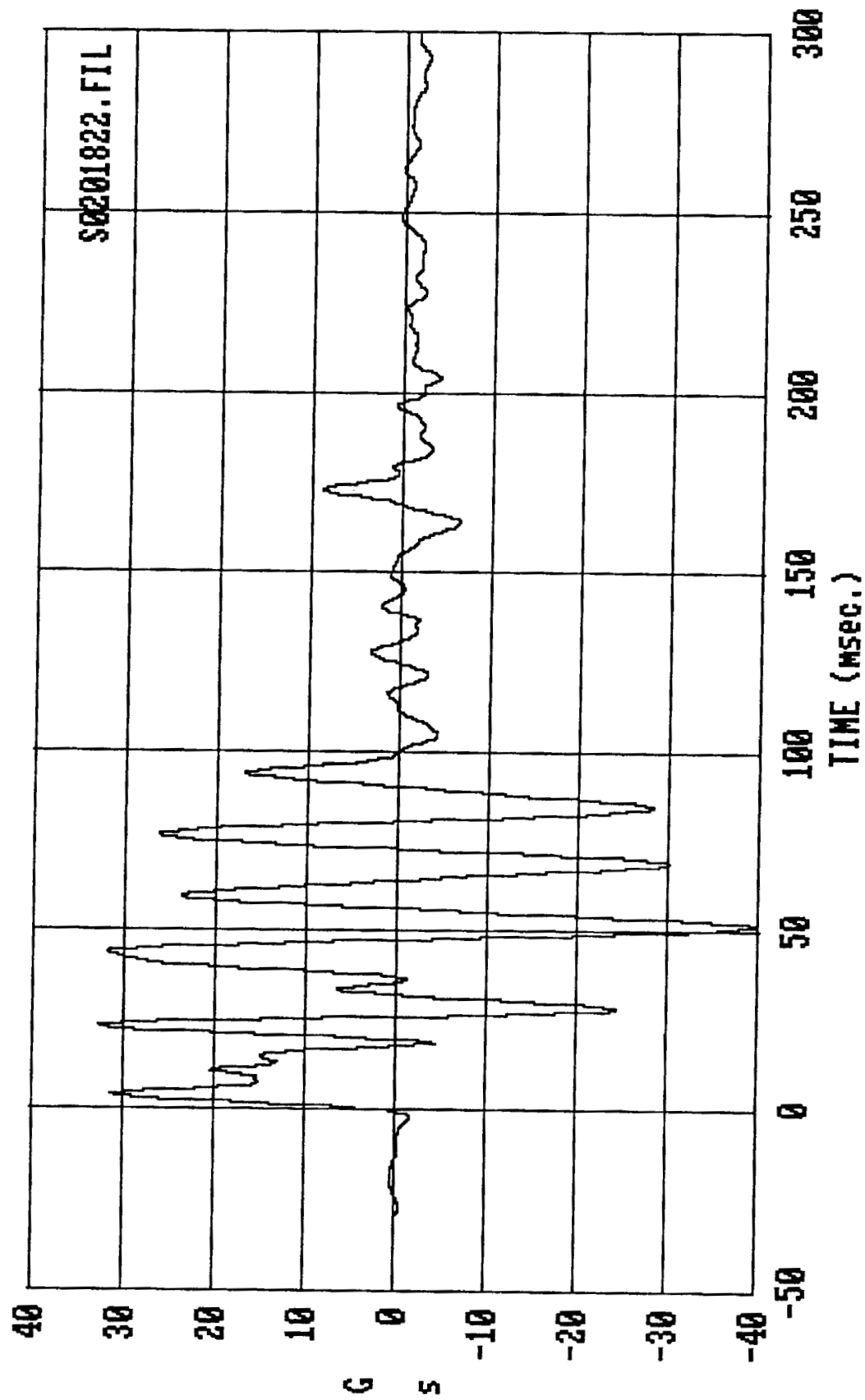
Filter: SAE CLASS 180

Max = .77723 Min = -3.4428

MSE 09/30/88 -- 1984 Ford Ranger : Rear Floor above axle delta U, X-axis

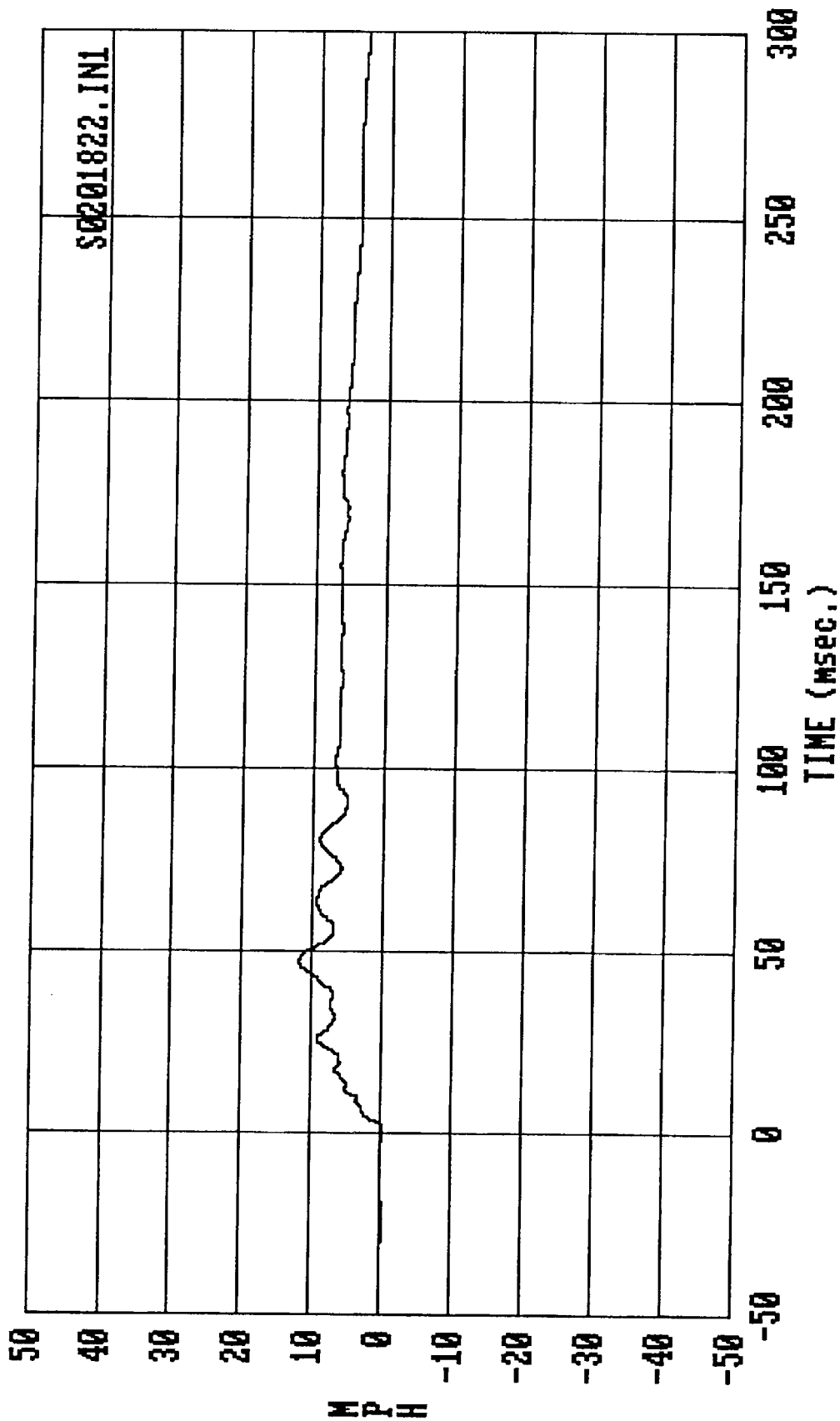


Filter: SAE CLASS 180 Max = 21.023 Min = -.53050E-03
MSE 09/30/88 -- 1984 Ford Ranger : Rear Floor above axle delta V, Y-axis

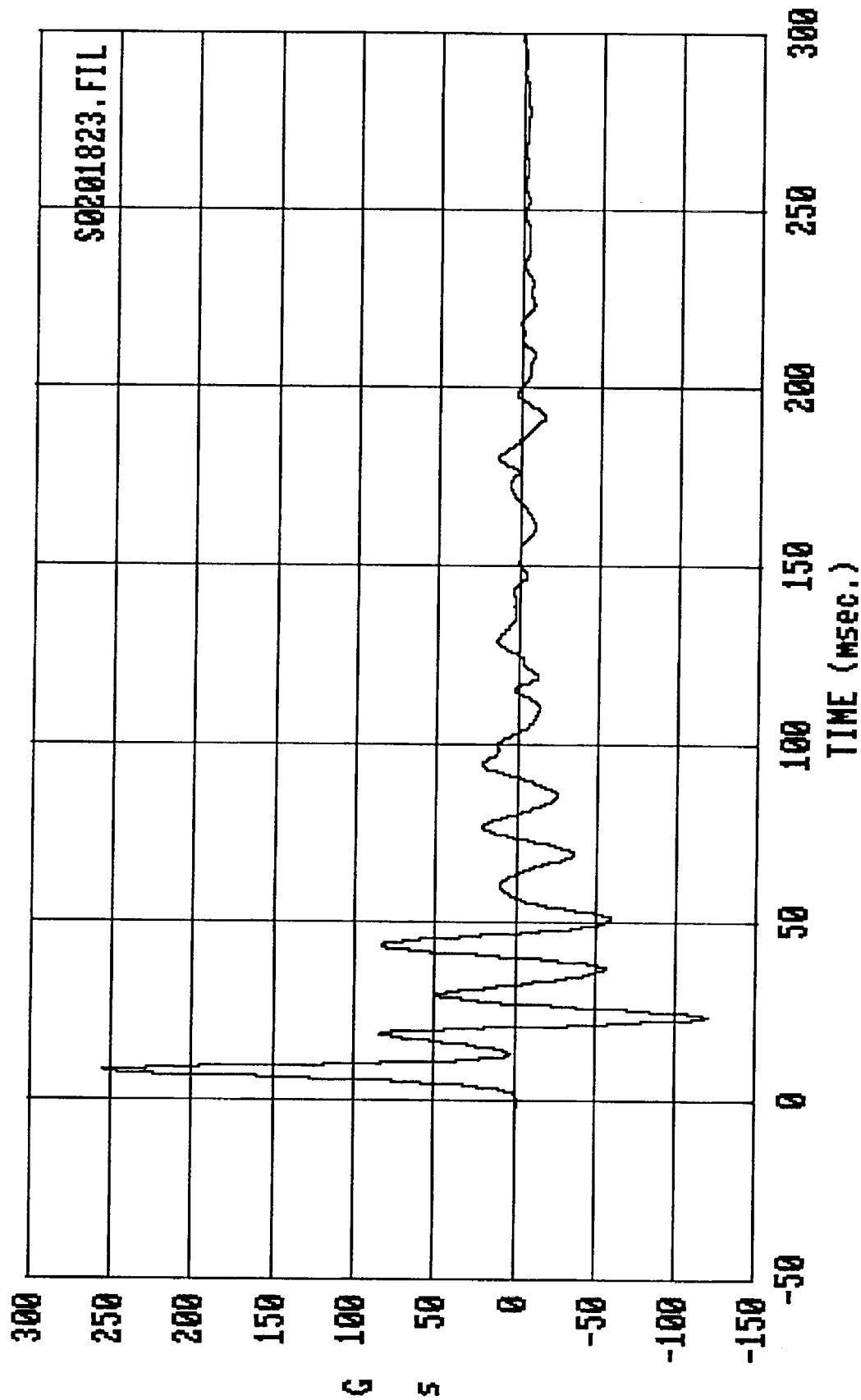


Max = 32.985 Min = -39.639

MSE 09/30/88 -- 1984 Ford Ranger : Front Seat Left Sill, Y-axis

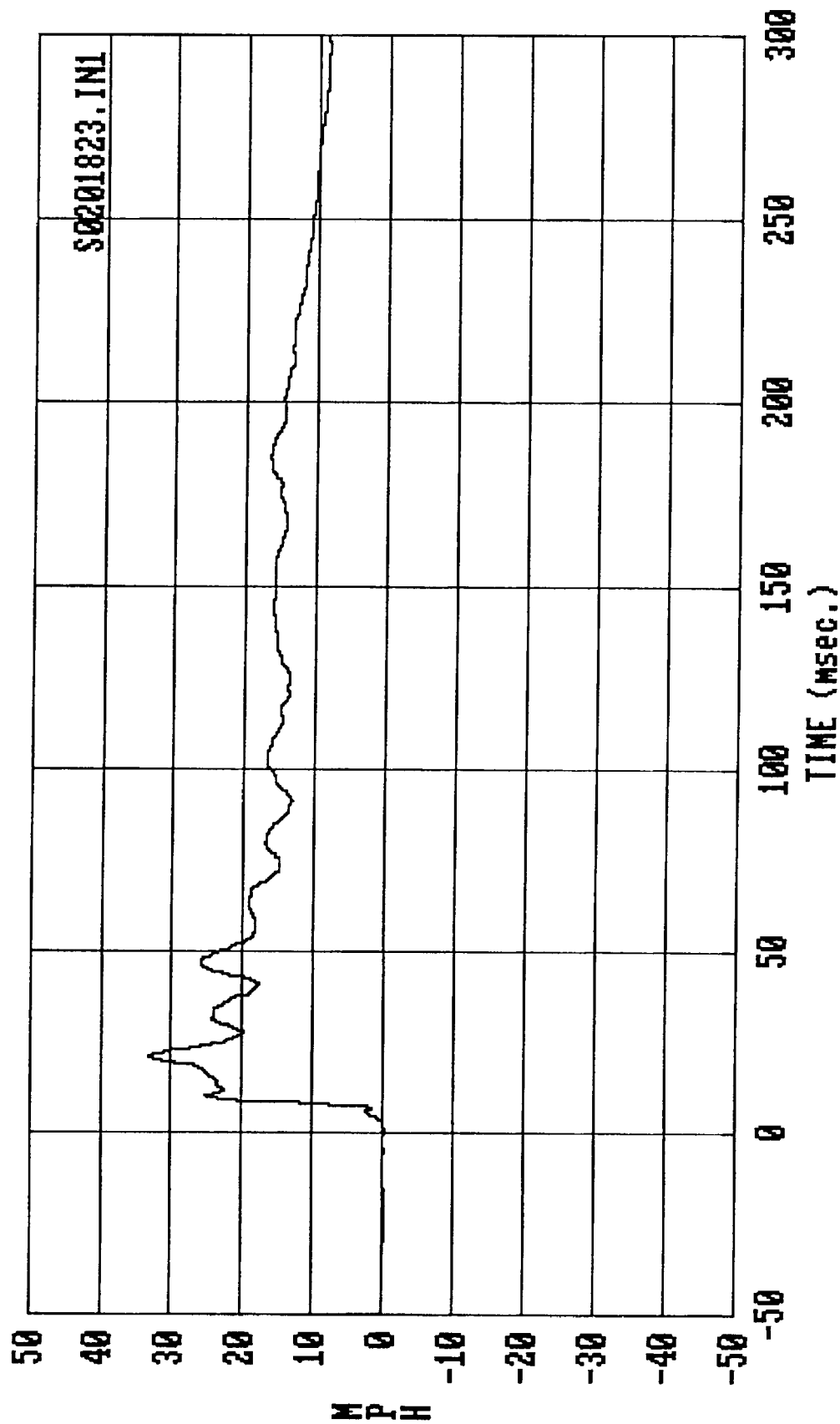


Filter: SAE CLASS 180 Max = 11.891 Min = -.11244E-01
 MSE 09/30/88 -- 1984 Ford Ranger : Front Seat Left Sill delta V, Y-axis



Max = 257.60 Min = -120.57

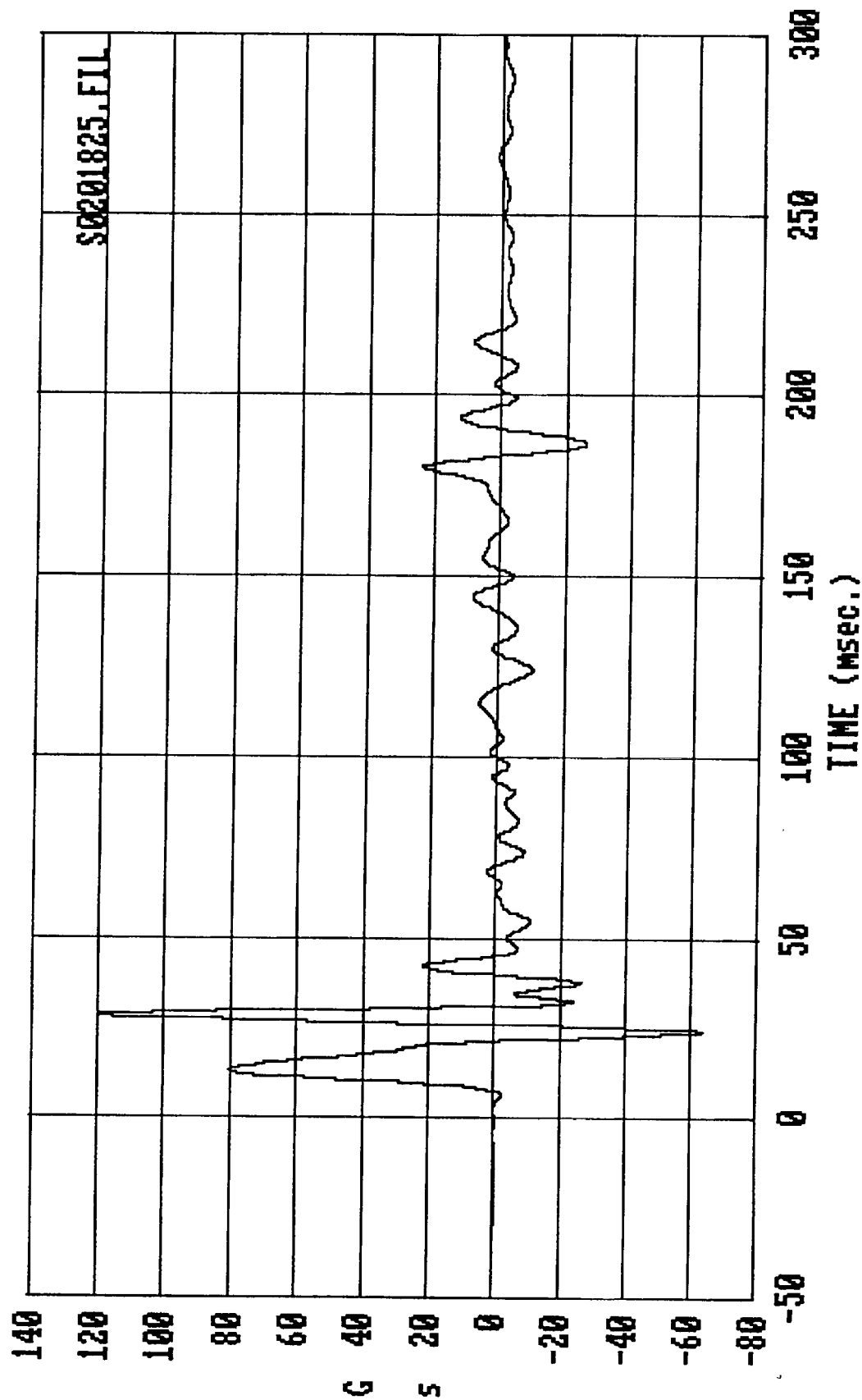
MSE 09/30/88 -- 1984 Ford Ranger : Left Front Door centerline, Y-axis



Filter: SAE CLASS 180

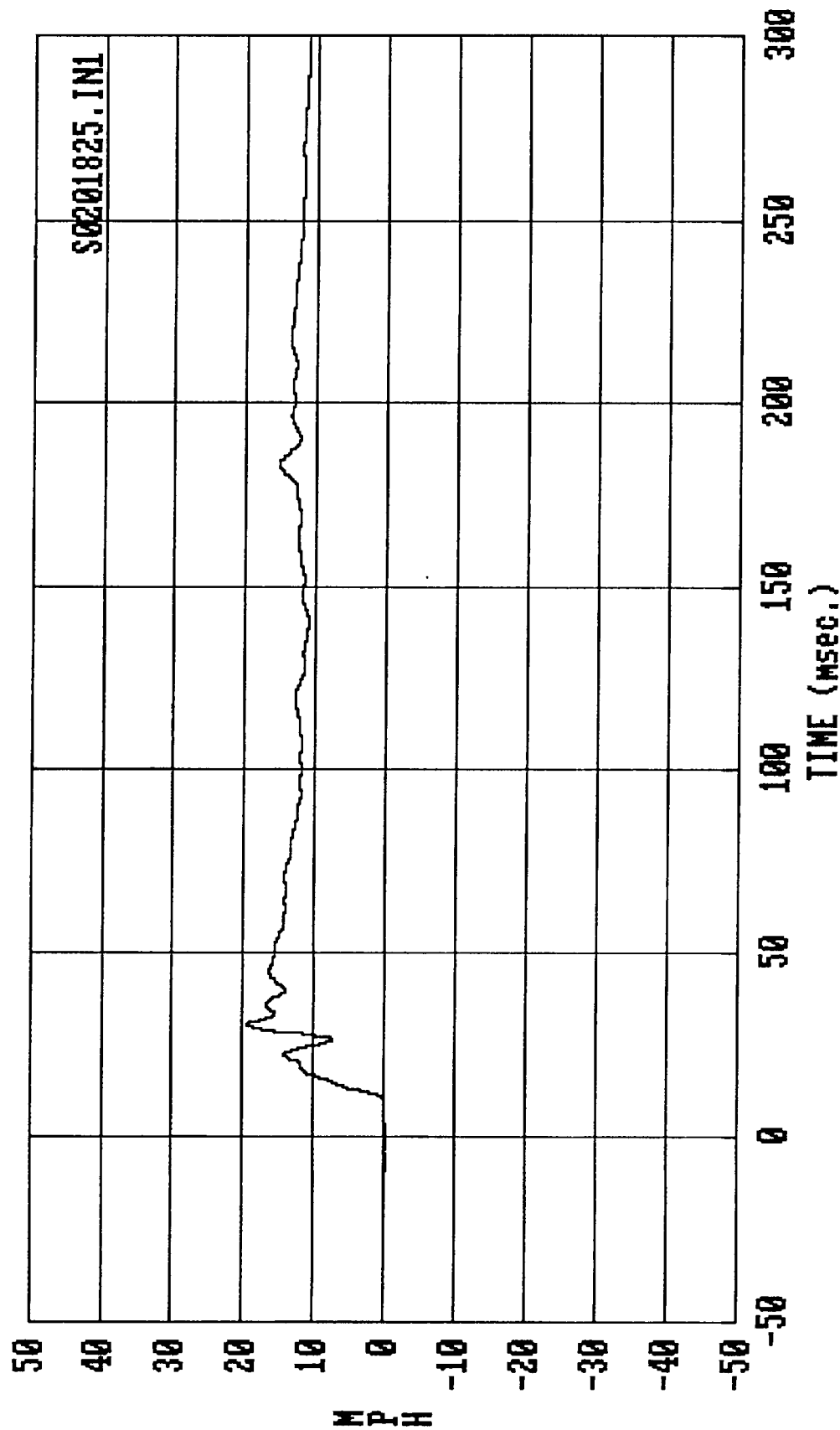
Max = 33.396 Min = -.90409E-02

MSE_09/30/88 -- 1984 Ford Ranger : Left Front Door C/L delta V, Y-axis

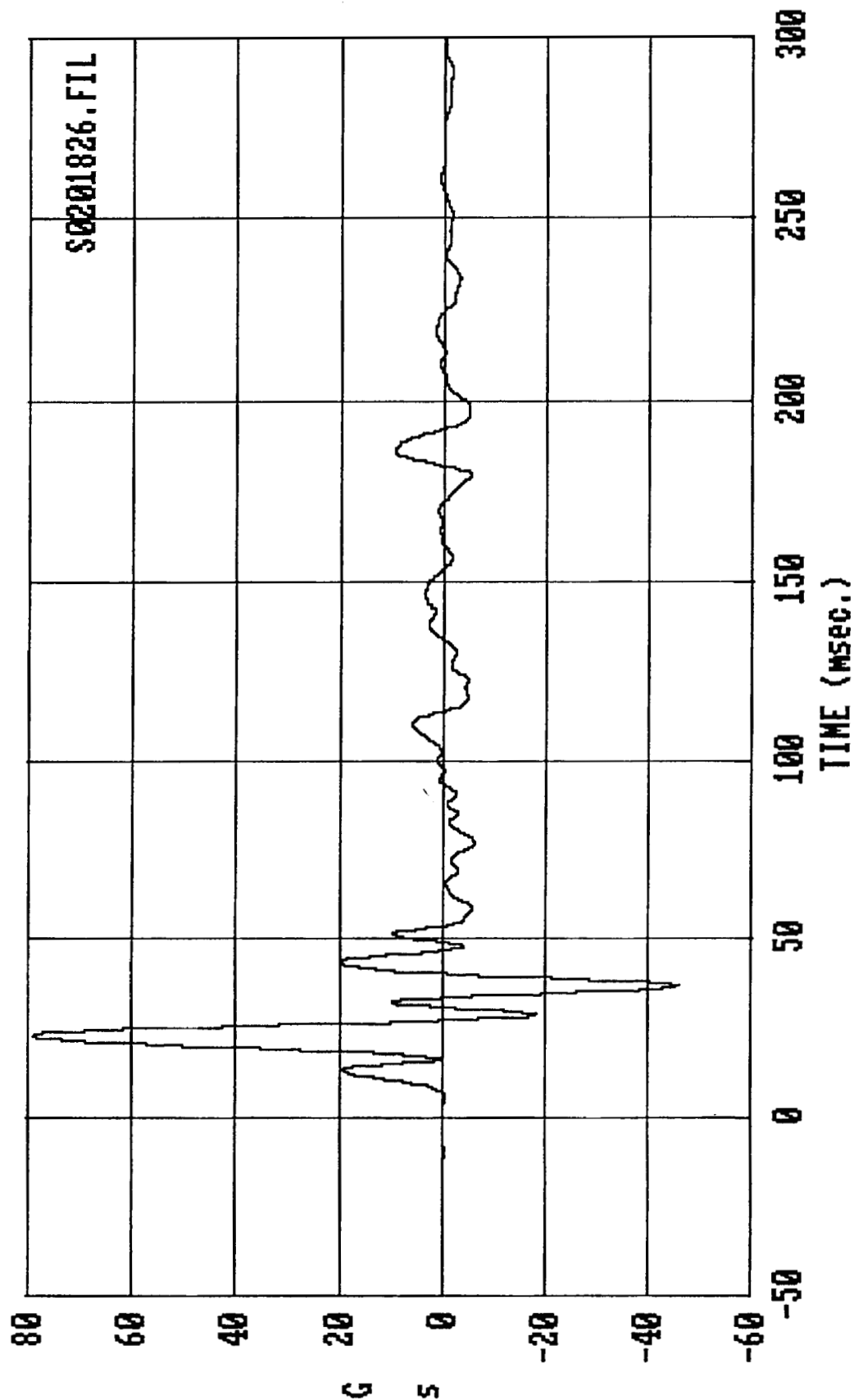


Max = 121.49 Min = -63.558

MSE 09/30/88 -- 1984 Ford Ranger : Left Front Door mid-rear, Y-axis

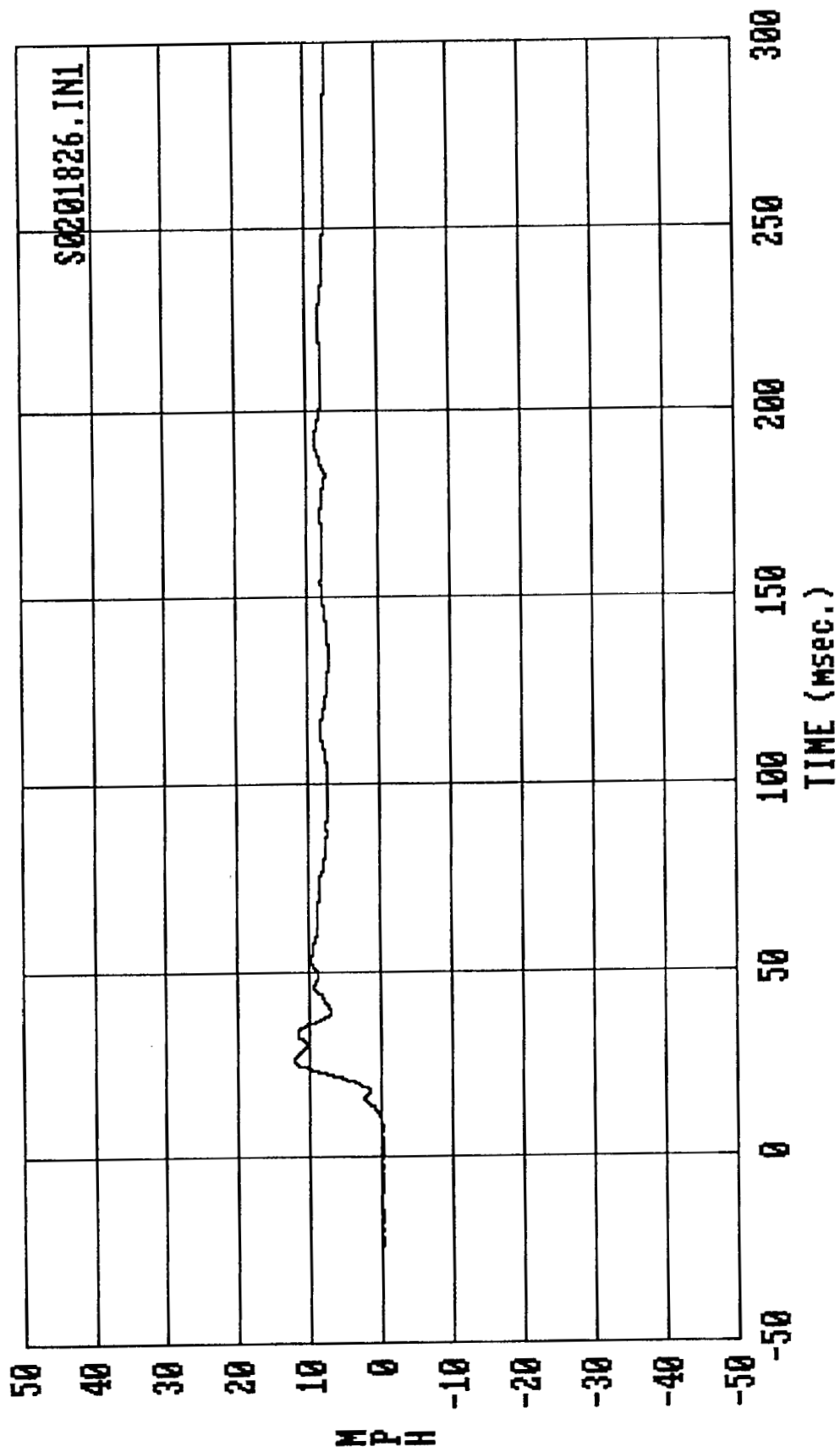


Filter: SAE CLASS 180 Max = 19.682 Min = -.73648E-02
MSE 09/30/88 -- 1984 Ford Ranger : Lft Frnt Door mid-rear delta U, Y-axis

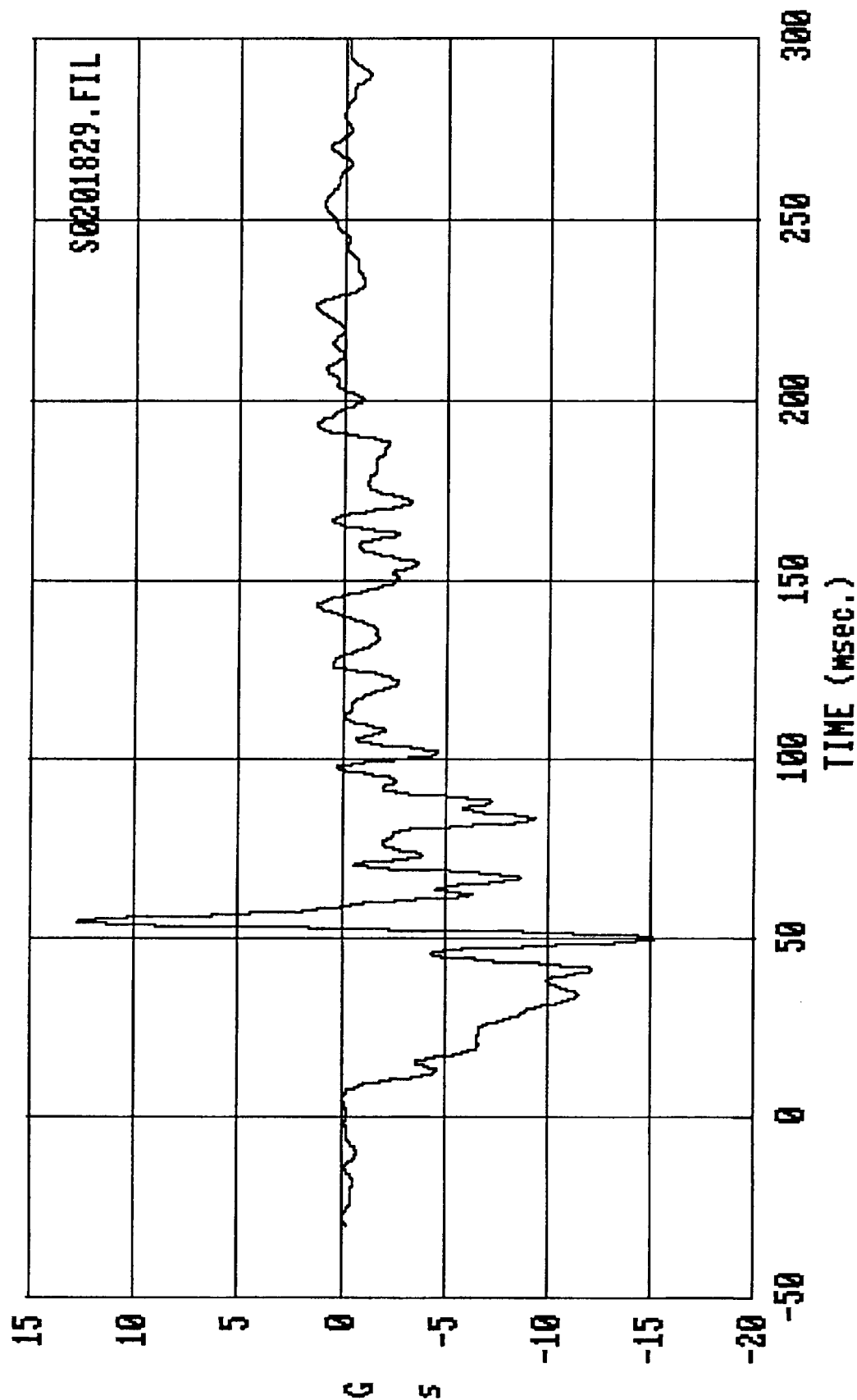


Max = 79.066 Min = -45.917

MSE 09/30/88 -- 1984 Ford Ranger : Left Front Door upper centerline, Y-axis

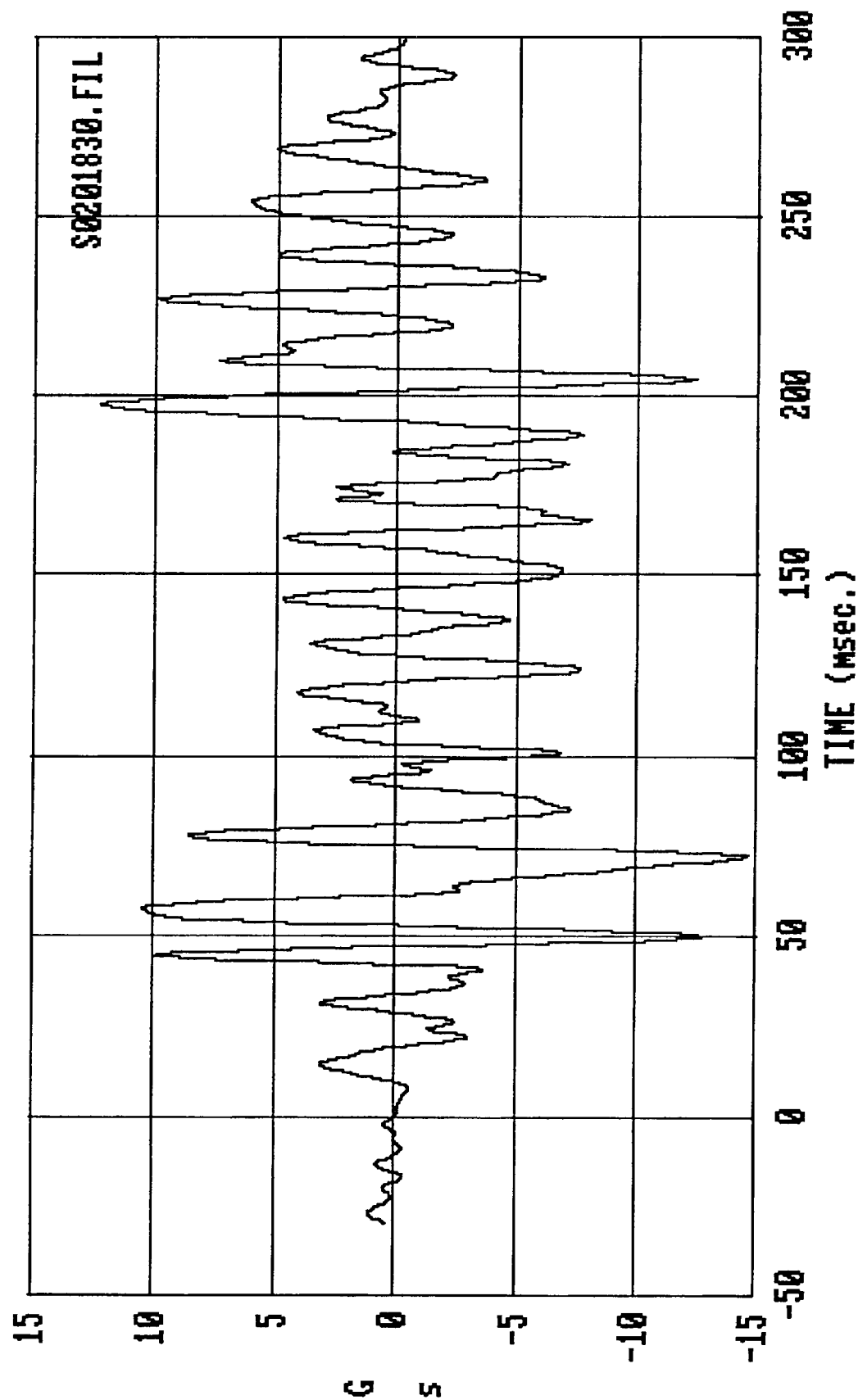


Filter: SAE CLASS 180 Max = 12.428 Min = -.63960E-02
 MSE 09/30/88 -- 1984 Ford Ranger : Lft Frnt Door uppr C/L delta U, Y-axis



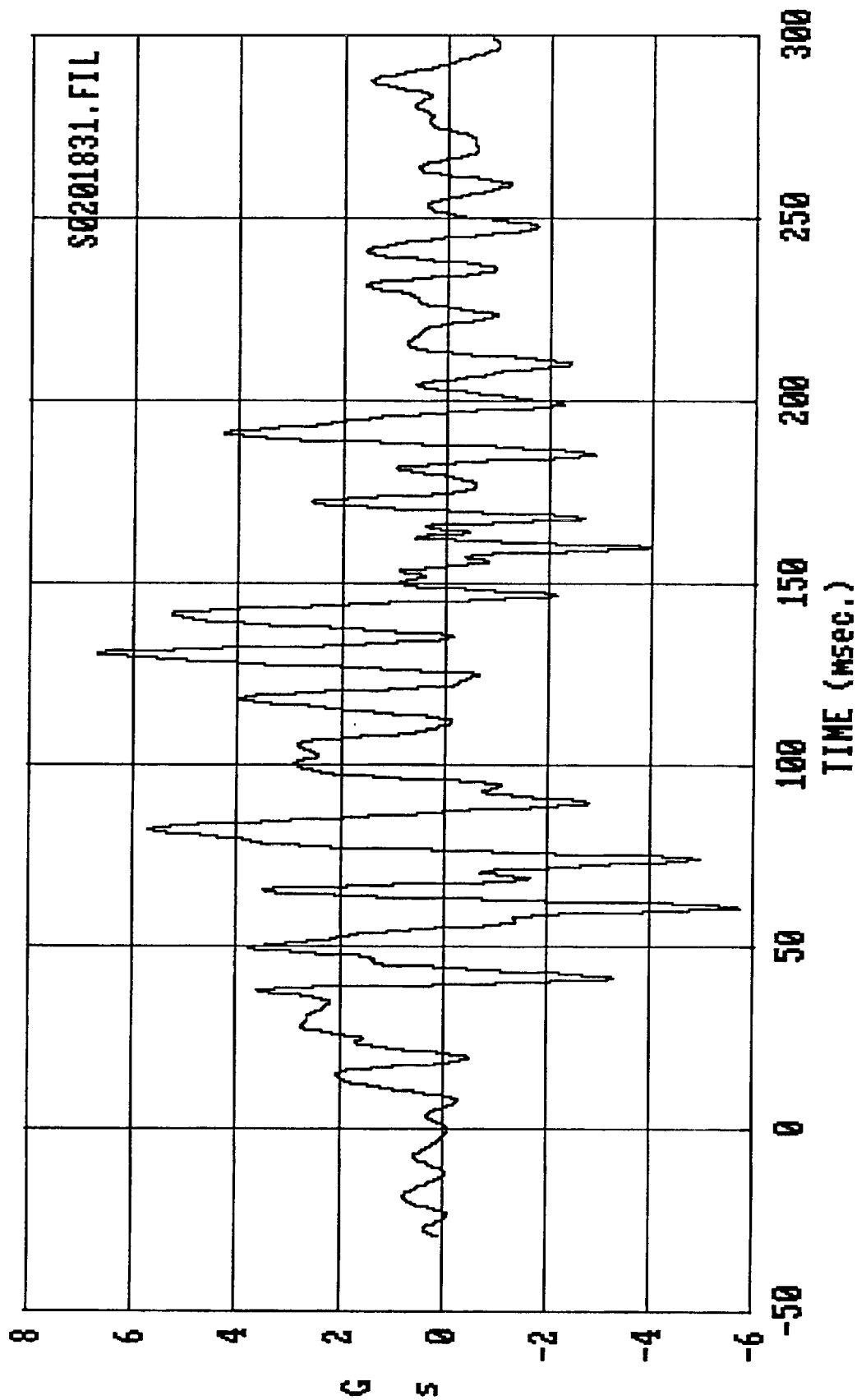
Max = 12.825 Min = -15.281

MSE 09/30/88 -- 1984 Ford Ranger : Moving Deformable Barrier C/G, X-axis



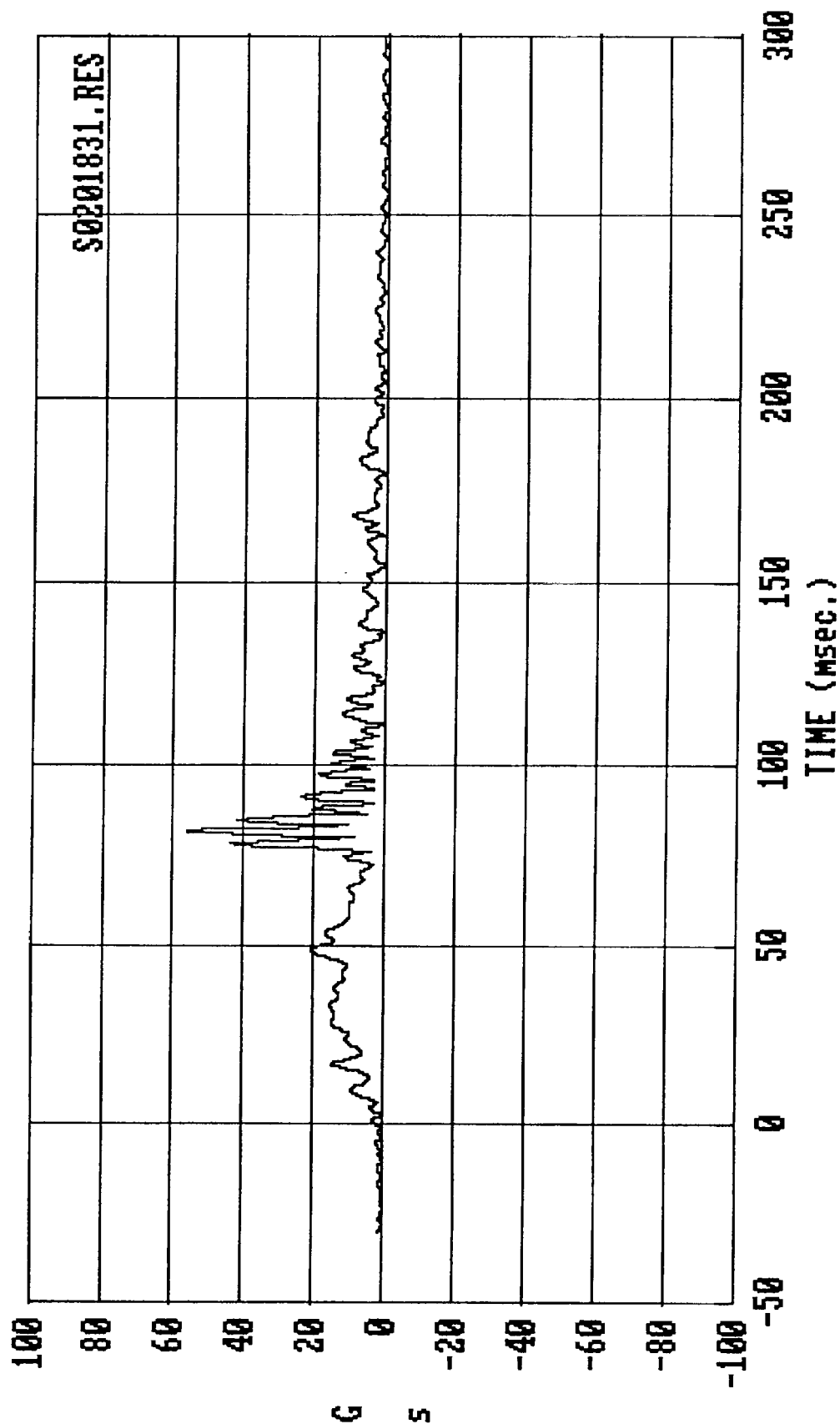
Max = 12.312 Min = -14.664

MSE 09/30/88 -- 1984 Ford Ranger : Moving Deformable Barrier C/G, Y-axis

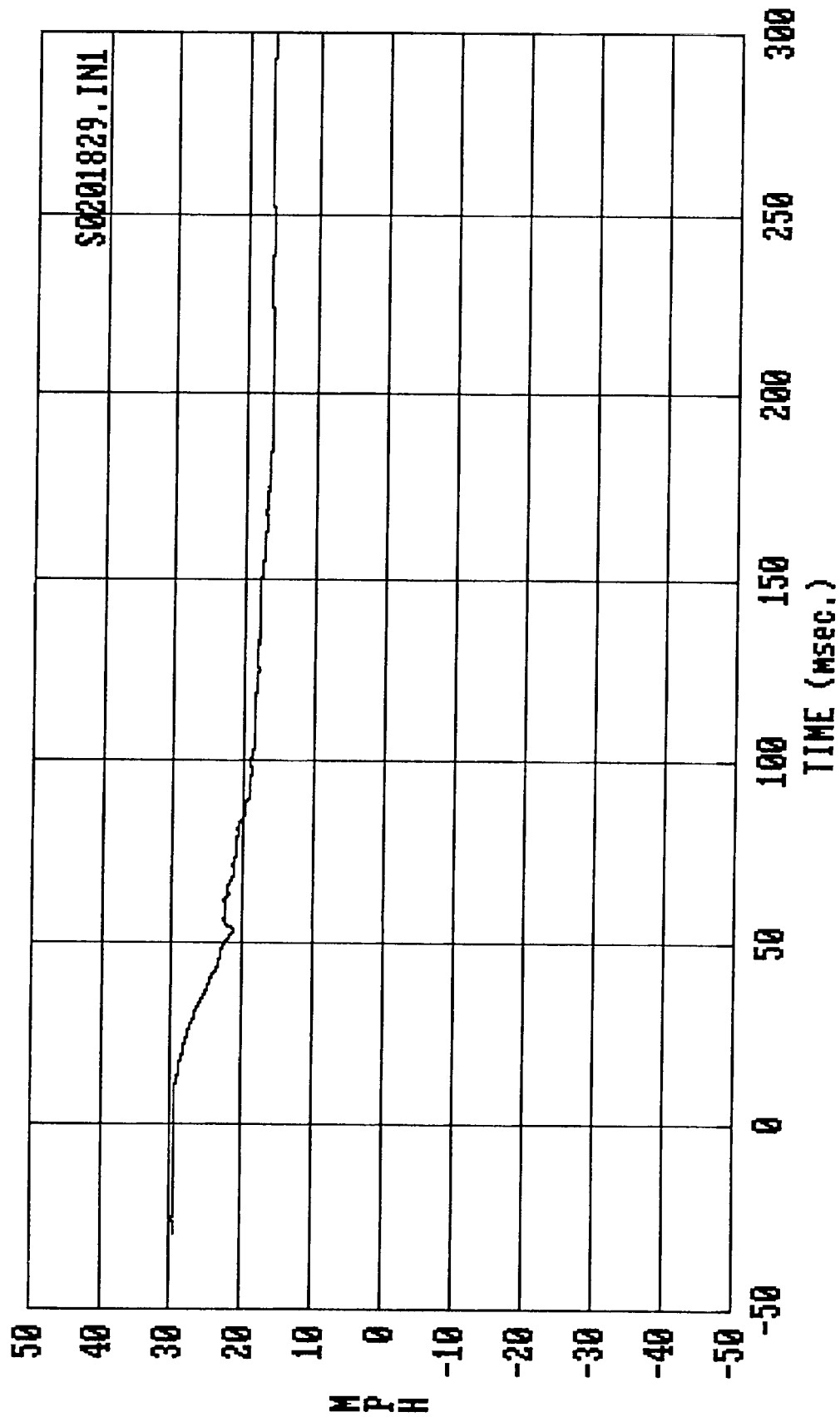


Max = 6.7538 Min = -5.7765

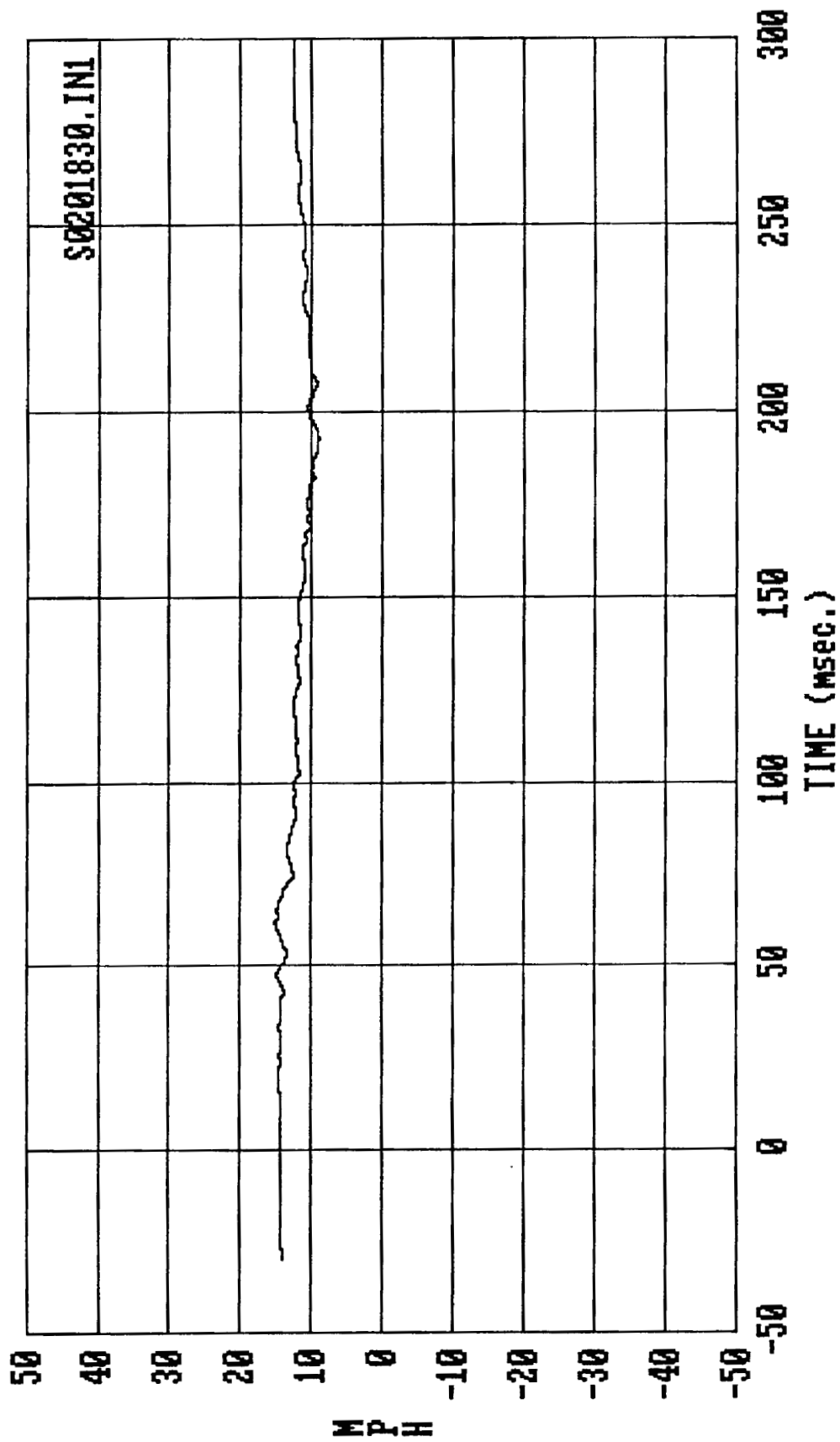
MSE 09/30/88 -- 1984 Ford Ranger : Moving Deformable Barrier C/G, Z-axis



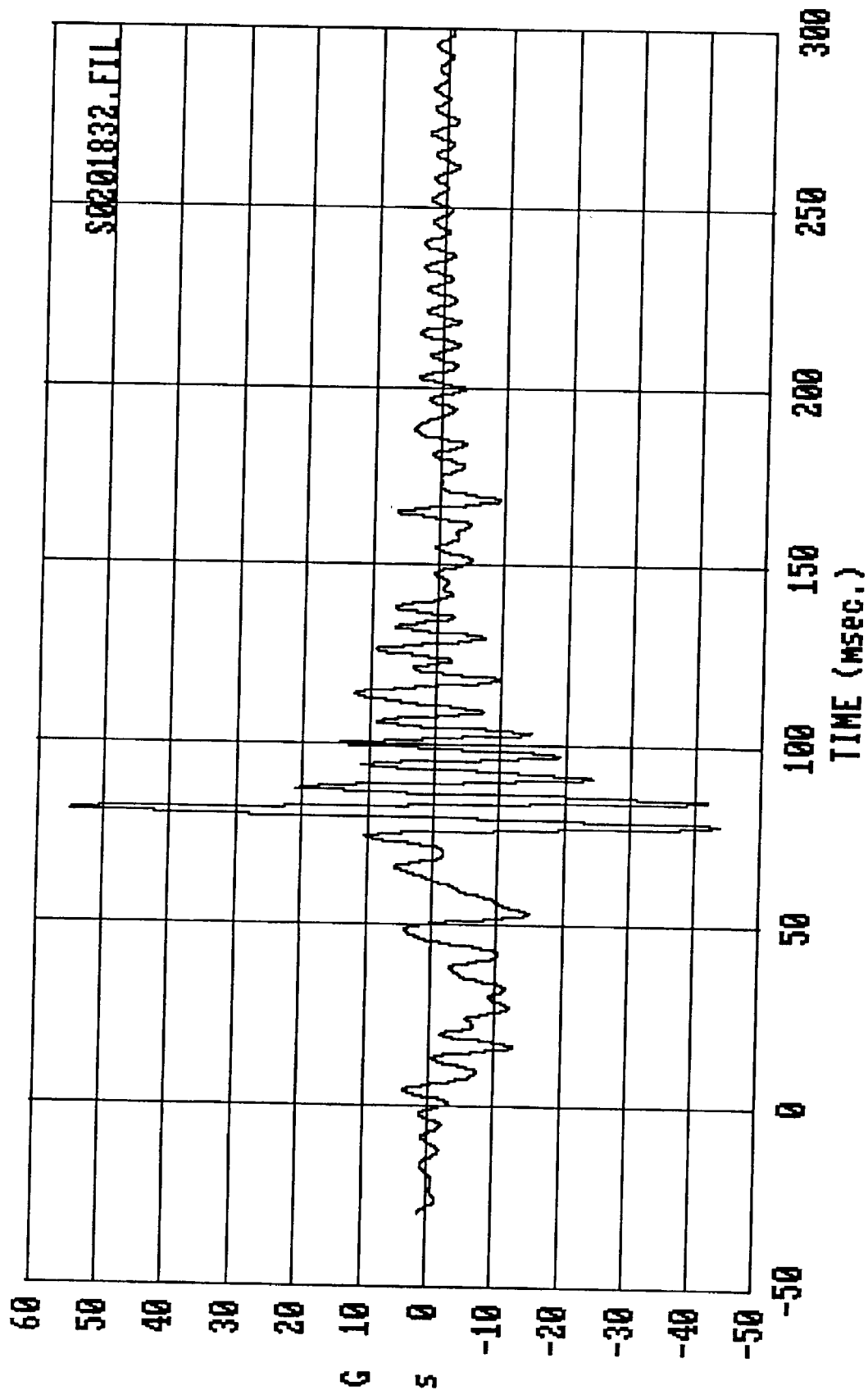
Filter: SAE CLASS 60 Max = 56.875 Min = .80397E-01
MSE 09/30/88 -- 1984 Ford Ranger : MDB C/G resultant acceleration



Filter: SAE CLASS 180 Max = 29.569 Min = 16.459
MSE 09/30/88 -- 1984 Ford Ranger : Moving Barrier C/G delta V, X-axis

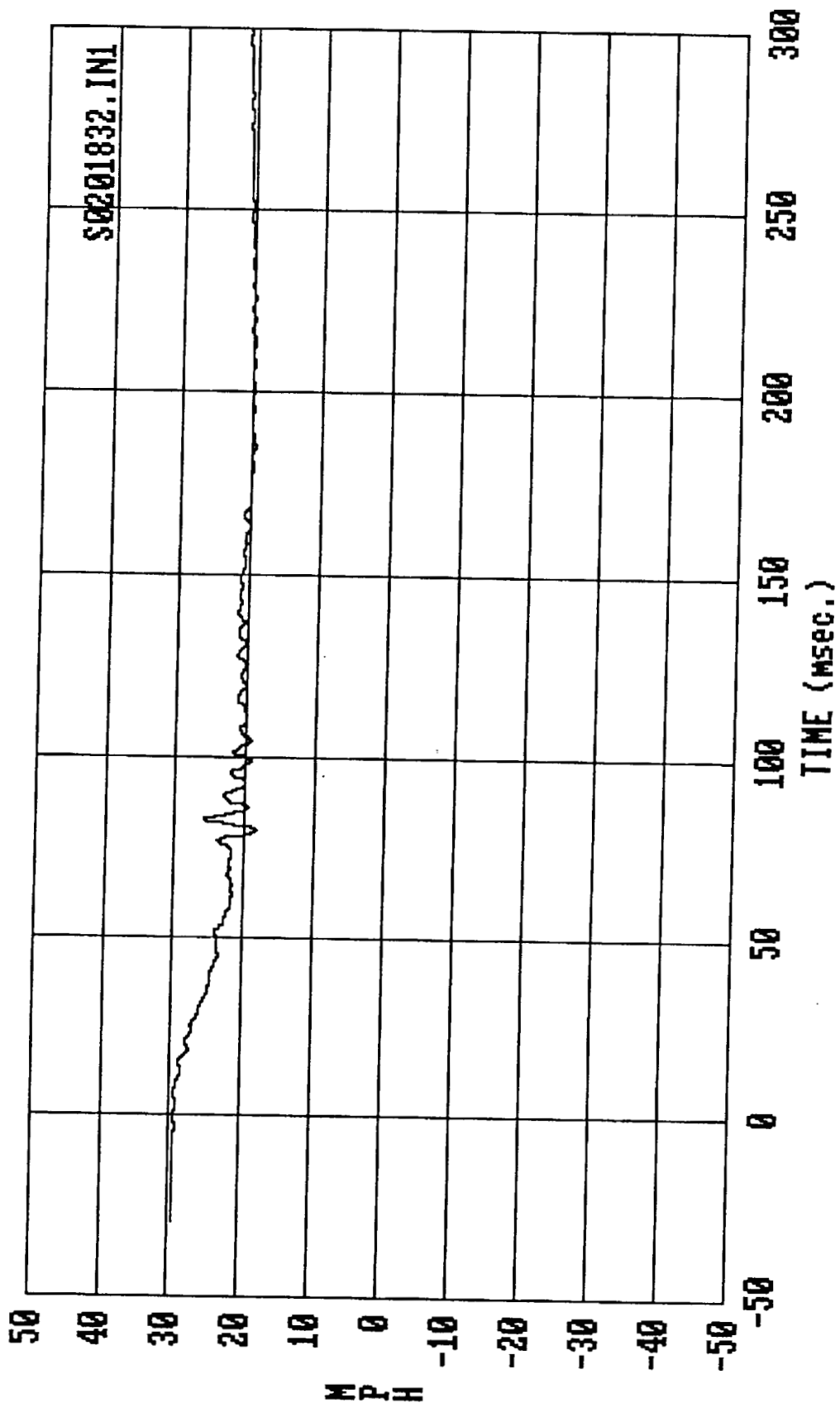


Filter: SAE CLASS 180 Max = 15.220 Min = 9.1135
MSE 09/30/88 -- 1984 Ford Ranger : Moving Barrier C/G delta U, Y-axis



Max = 55.981 Min = -43.729

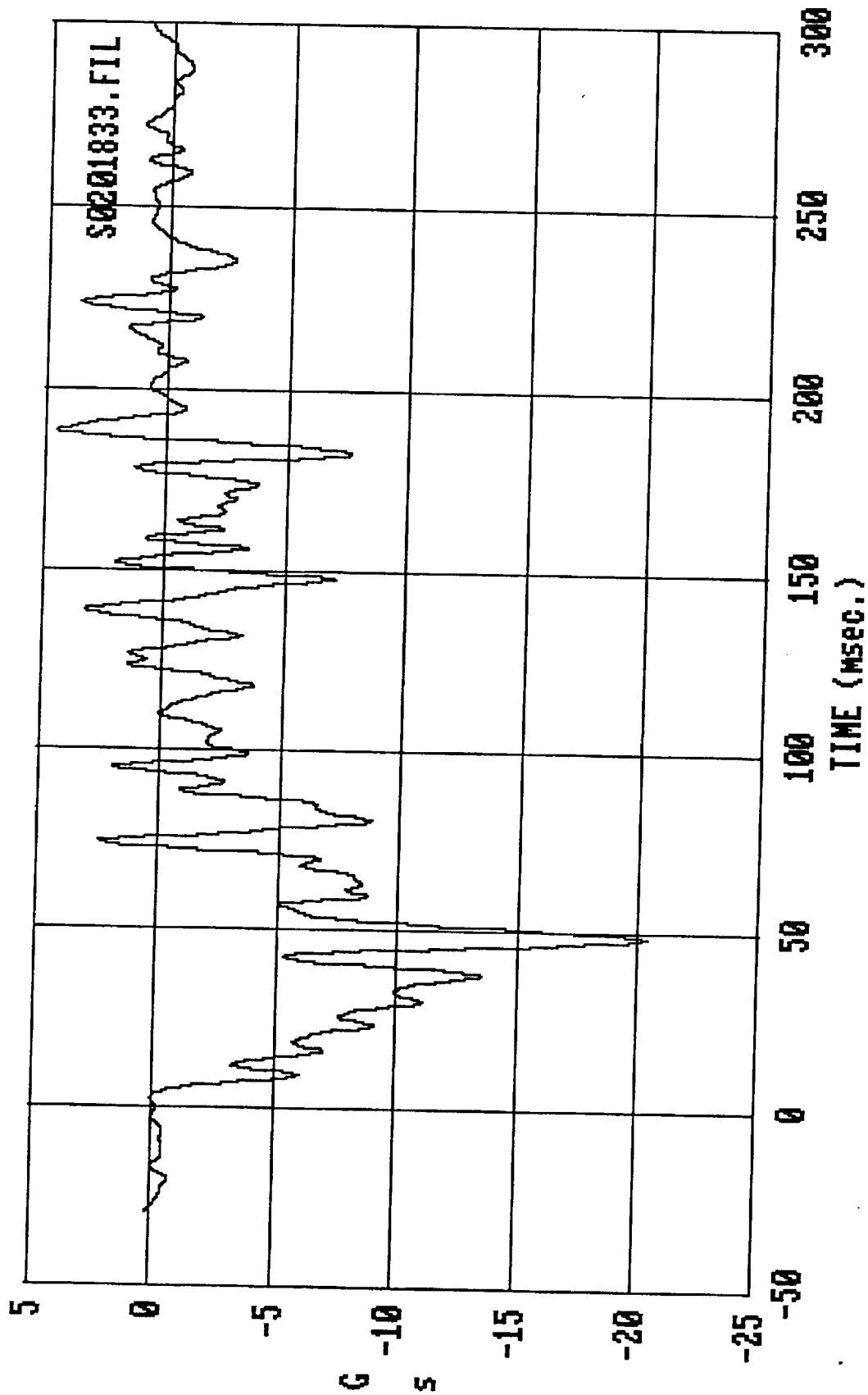
MSE 09/30/88 -- 1984 Ford Ranger : Moving Deform. Barrier Front, X-axis



Filter: SAE CLASS 180

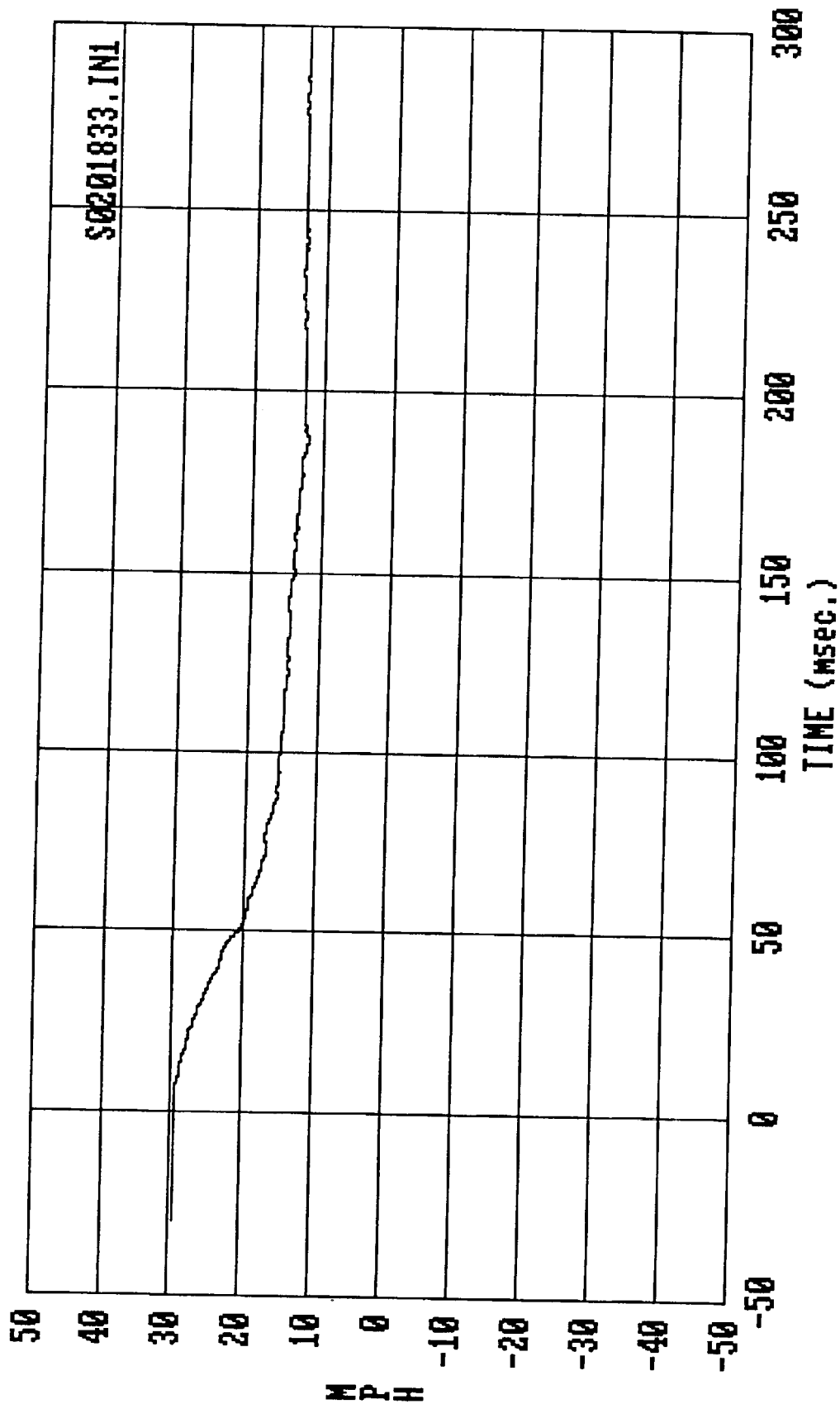
Max = 29.688 Min = 18.436

MSE 09/30/88 -- 1984 Ford Ranger : Moving Barrier Front delta U, X-axis



Max = 4.5972 Min = -20.430

MSE 09/30/88 -- 1984 Ford Ranger : Moving Deform. Barrier Rear, X-axis



Filter: SAE CLASS 180

Max = 29.576 Min = 12.345

MSE 09/30/88 -- 1984 Ford Ranger : Moving Barrier Rear delta U, X-axis

27

SID IMPACT CALIBRATION SUMMARY SHEET

S.I.D. I.D. NO. : 137

LABORATORY TECHNICIAN: MARK WALKER

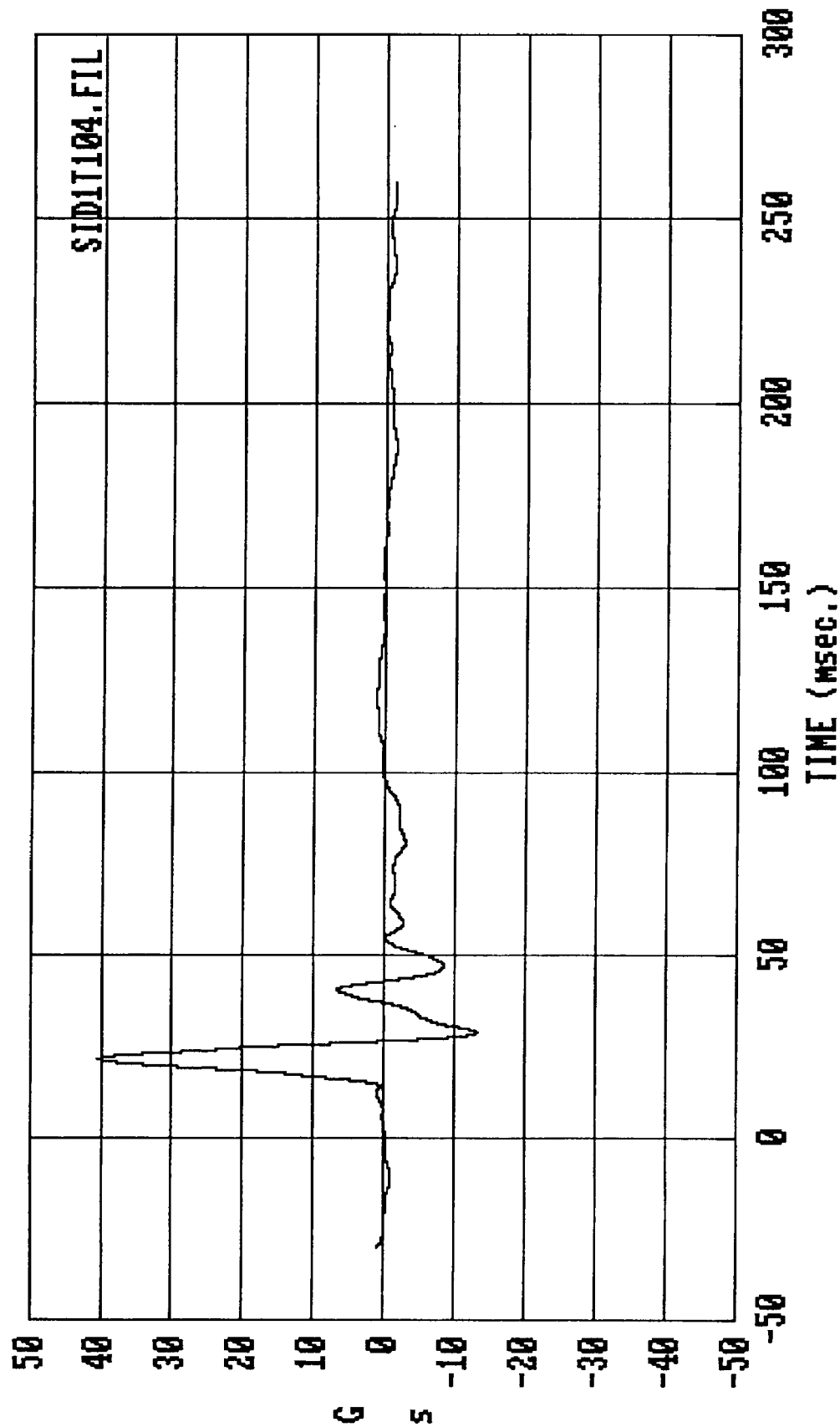
Sheet No. 1 of 3		Pretest Calibration	Posttest Calibration
Date of SID Calibration - - - - -		09/23/88	
Calibration Sequential Number for Dummy		1	
Temperature min Lab. (Spec. =66 to 78' F) - - -		68	
Relative Humidity i n Lab. (Spec. = 10 tp 70%)		25	
TEST PARAMETER	SPECIFICATION		
1. NECK BENDING TEST:			
a. Pendulum Speed - - -	21.5 to 25.5 fps	22.4	
b. Pendulum Avg. Decel (over t3 - t2) - - - -	20 to 24G	23.25	
c. Peak Resultant Head Acceleration- - - - -	26G maximum	25.25	
d. Pendulum Decel. (t2-t1)	<3 ms	3.0	
e. Pendulum Decel. (t2-t2)	25 to 30 ms	26.5	
f. Pendulum Decel. (t2-t3)	<10 ms	9.0	
g. Pendulum Direction Reversal Time - - - -	>123 ms	---	
h. Max. Head Rotation- -	63 to 73°	70°	
i. Chordal Displacement: Head Rotation Angle -			
0° Time	-2 to 2 ms	0.0	
Displ.	.5 to .5 in	0.0	
30° Time	25.6 to 34.4 ms	34.0	
Displ.	2.1 to 3.1 in.	2.49	
Time	40.3 to 51.7 ms	49.0	
60° Displ.	4.3 to 5.3 in	4.65	
Maximum Time	53.2 to 66.8 ms	62.4	
(') Displ.	5.0 to 6.0	5.31	
2. NECK BENDING TEST			
continued:			
i. Chordal Displacement: Head Rotation angle-			
0° Time	67.0 to 83.0 ms	74.2	
Displ.	4.3 to 5.3 in.	4.62	
30° Time	85.4 to 104.6 ms	89.4	
Displ.	2.1 to 3.1 in.	2.2	
Time	101.0 to 123.0 ms	106.0	
60° Displ.	-.5 to 0.5 in.	0.2	

SID IMPACT CALIBRATION SUMMARY SHEET (Continued)

S.I.D. I.D. NO. : 137

LABORATORY TECHNICIAN: MARK WALKER

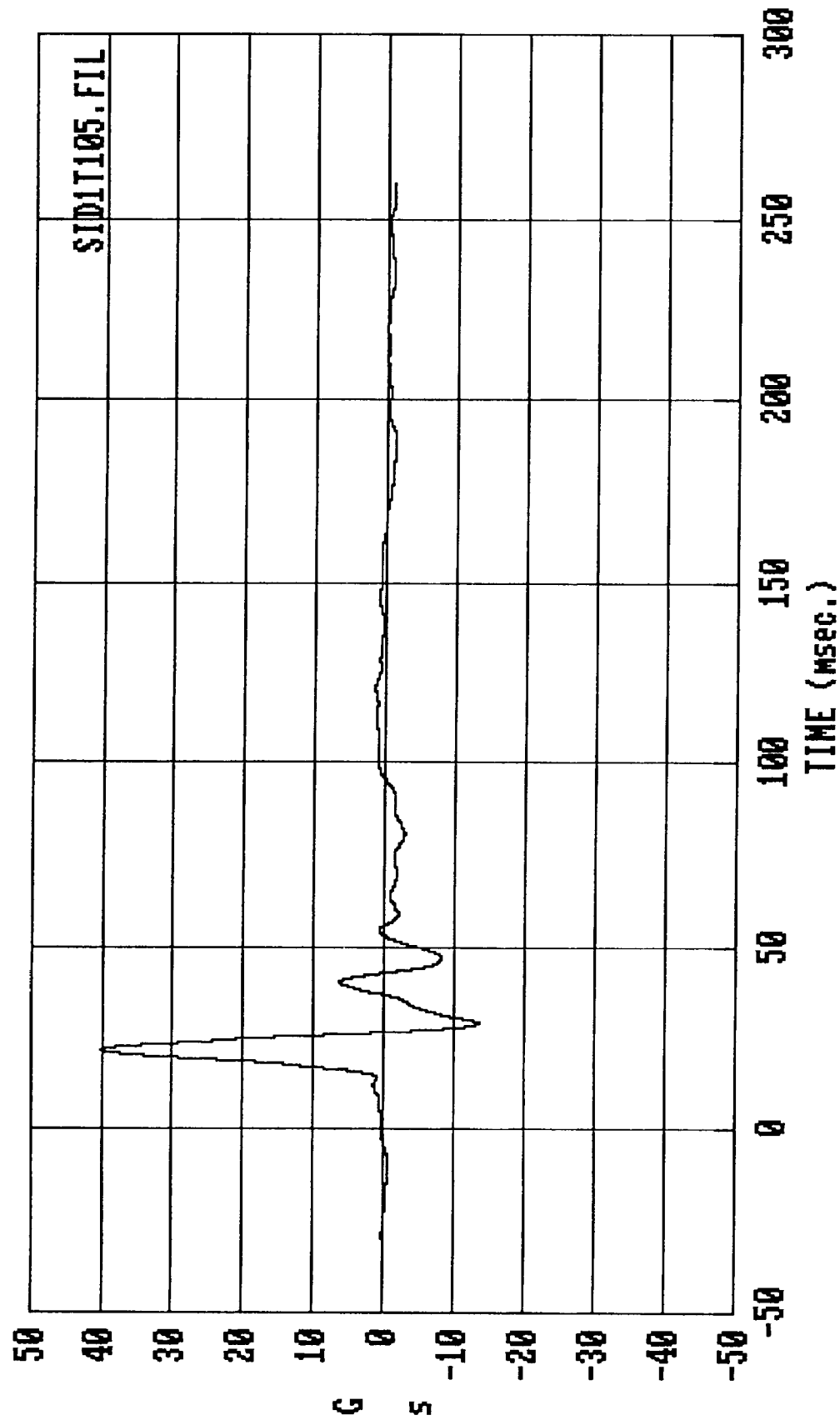
Sheet No. 2 of 3 TEST PARAMETER	SPECIFICATION	Pretest	Posttest
3. ABSOMINAL COMPRESSION TEST (Preload = 10 pounds) a. Force @ .5" - - - - b. Force @ .75"- - - - c. Force @ 1.0"- - - - d. Force @ 1.3"- - - -	23 - 36 lbs. 36 - 50 lbs. 50 - 63 lbs 73 - 88 lbs.	30.0 40.0 54.0 81.0	
4. LUMBAR FLEXION TEST: a. Force @ 20° - - - - b. Force @ 30° - - - - c. Force @ 40° - - - - d. Return Angle - - - -	22 to 34 lbs 34 to 46 lbs 46 to 58 lbs 12 maximum	33.2 41.3 55.2 12.0	
5. THORAX IMPACT TEST: a. Upper Rib accel.- - - b. Lower Rib accel.- - - c. Lower Spine accel - -	Primary 37 - 46g's Sec Primary 37 - 46g's Sec Primary 15 -22 g's Sec	40.414 40.171 39.023 38.669 21.22 20.72	
6. PELVIC IMPACT TEST: Pelvic accel. - - - -	40 - 60g's	58.417	



Filter: FIR 100

Max = 40.414 Min = -13.245

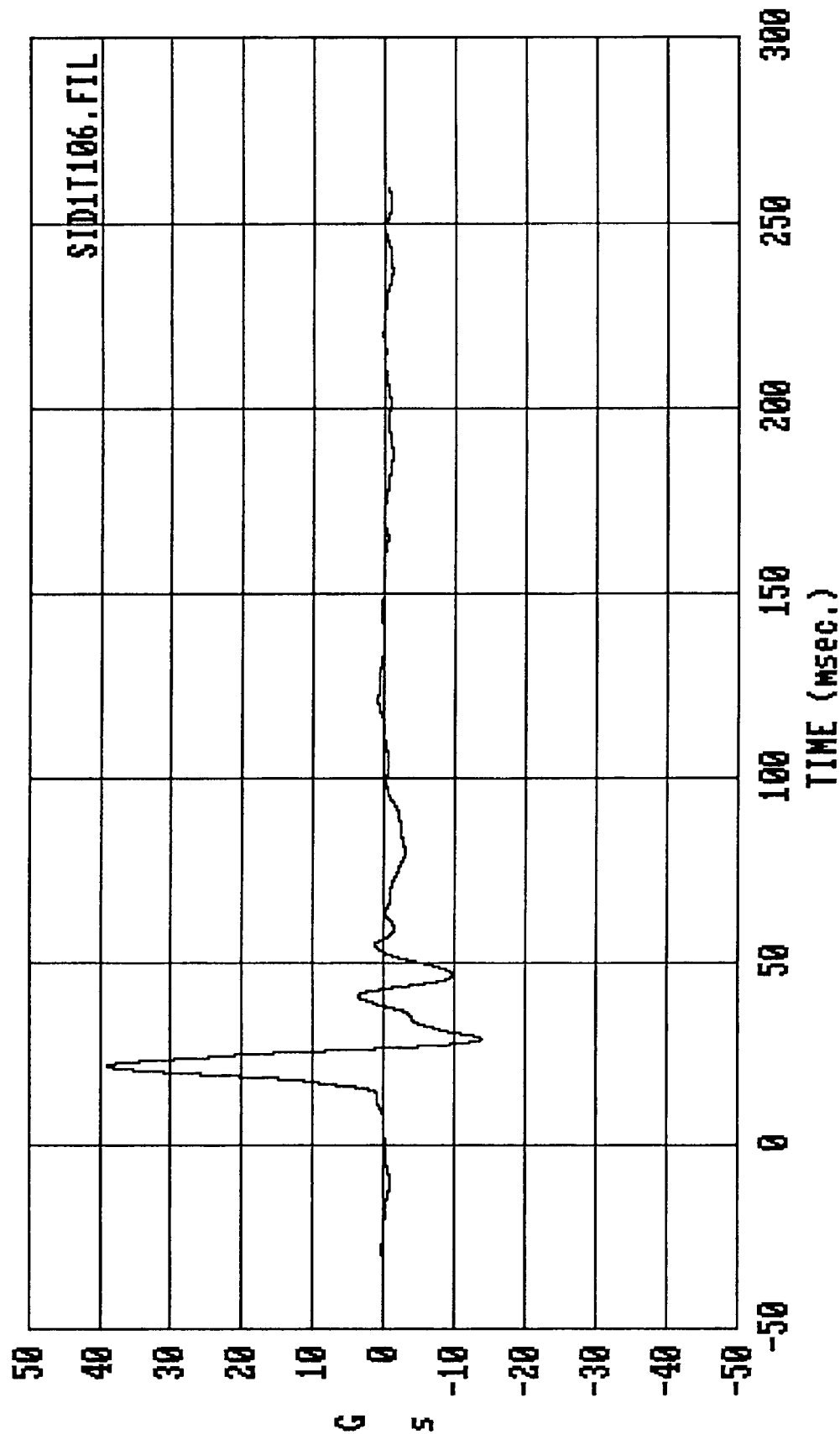
MSE 09/23/88 -- SID-137 THORAX CALL : Driver Upper Rib acc., Y-axis (Primary)



Filter: FIR 100

Max = 40.171 Min = -13.491

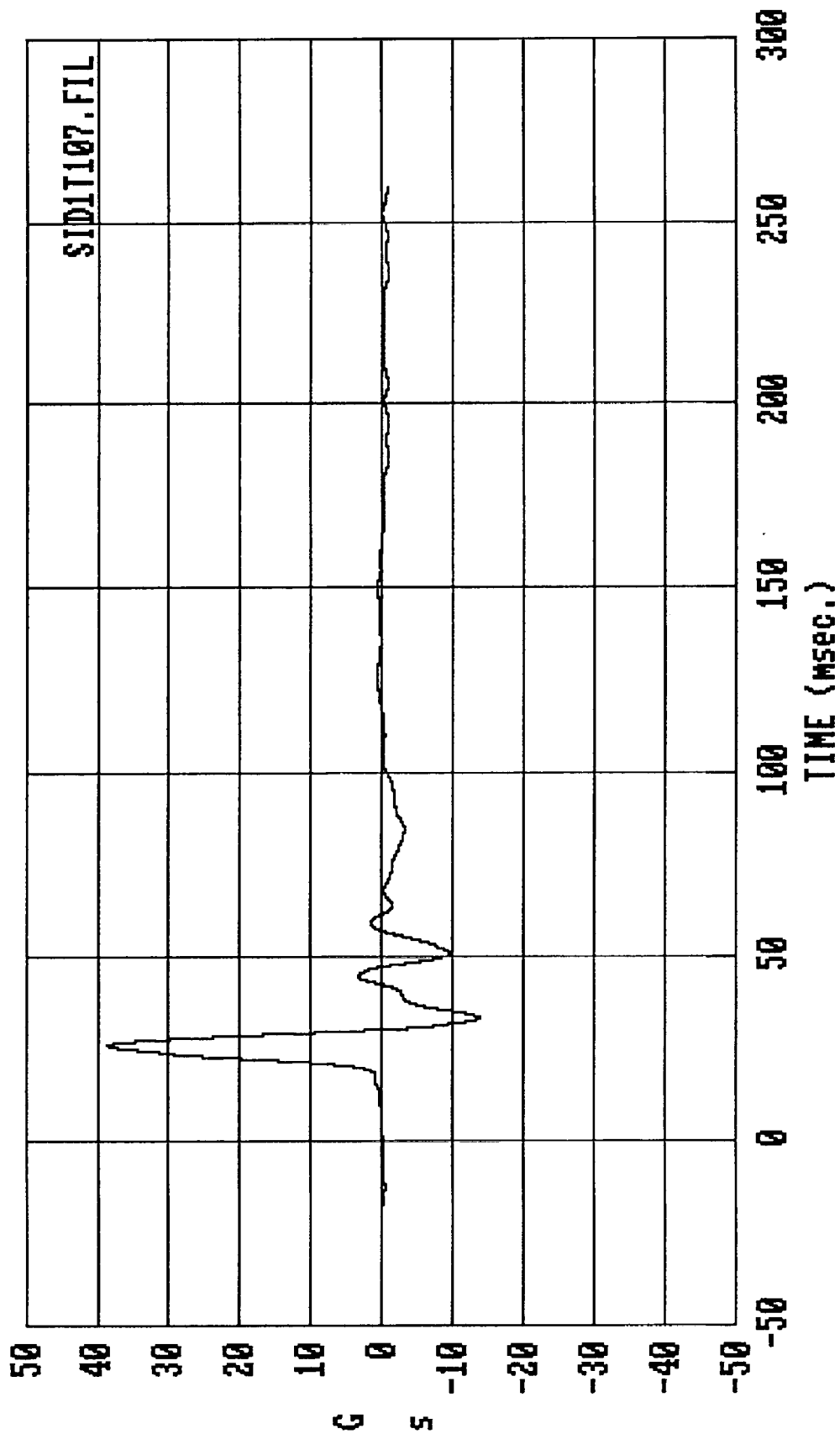
MSE 09/23/88 -- SID-137 THORAX CALL : Driver Upper Rib acc., y-axis (Second)



Filter: FIR 100

Max = 39.023 Min = -13.740

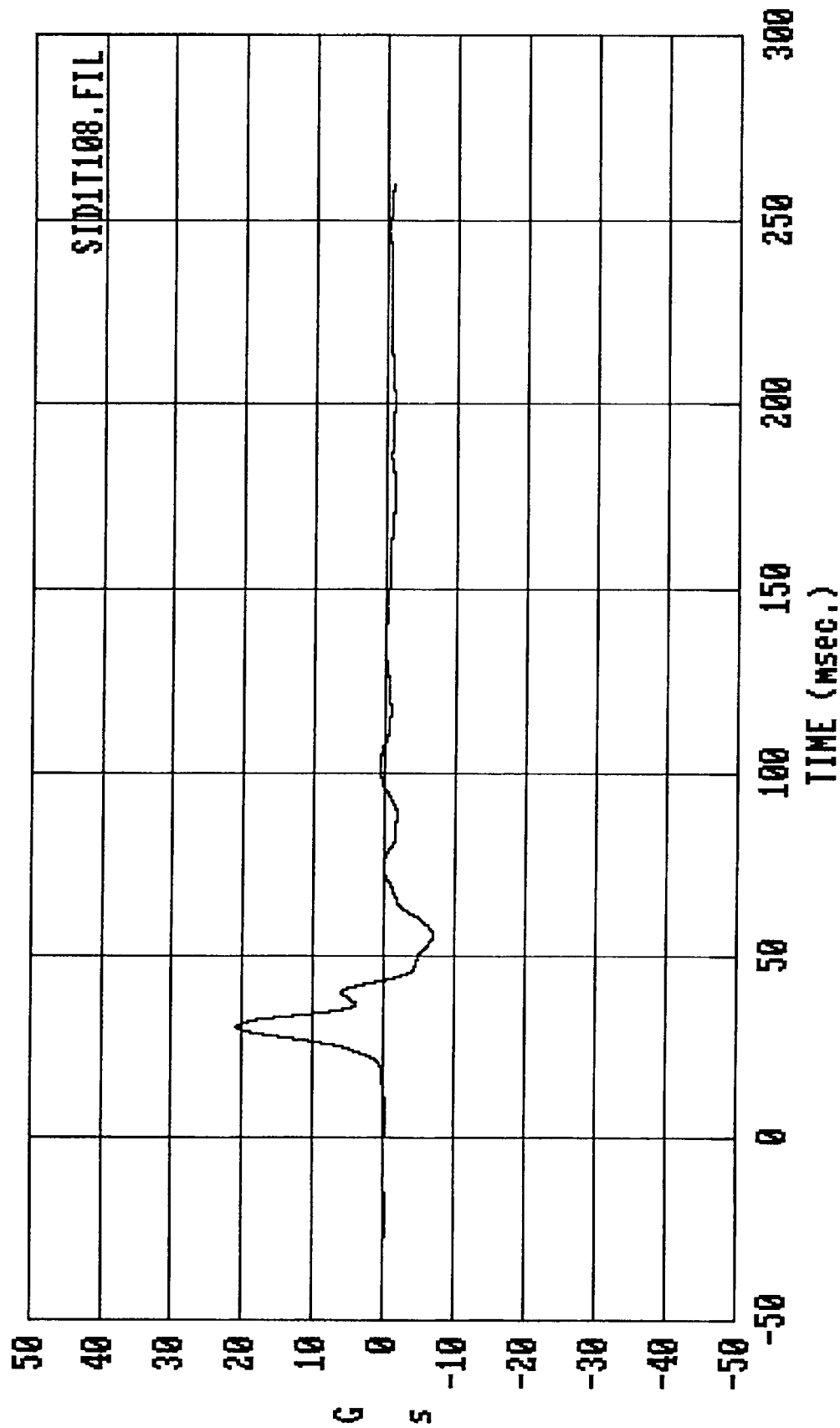
MSE 09/23/88 -- SID-137 THORAX CALL : Driver Lower Rib acc., Y-axis (Primary)



Filter: FIR 100

Max = 38.669 Min = -13.873

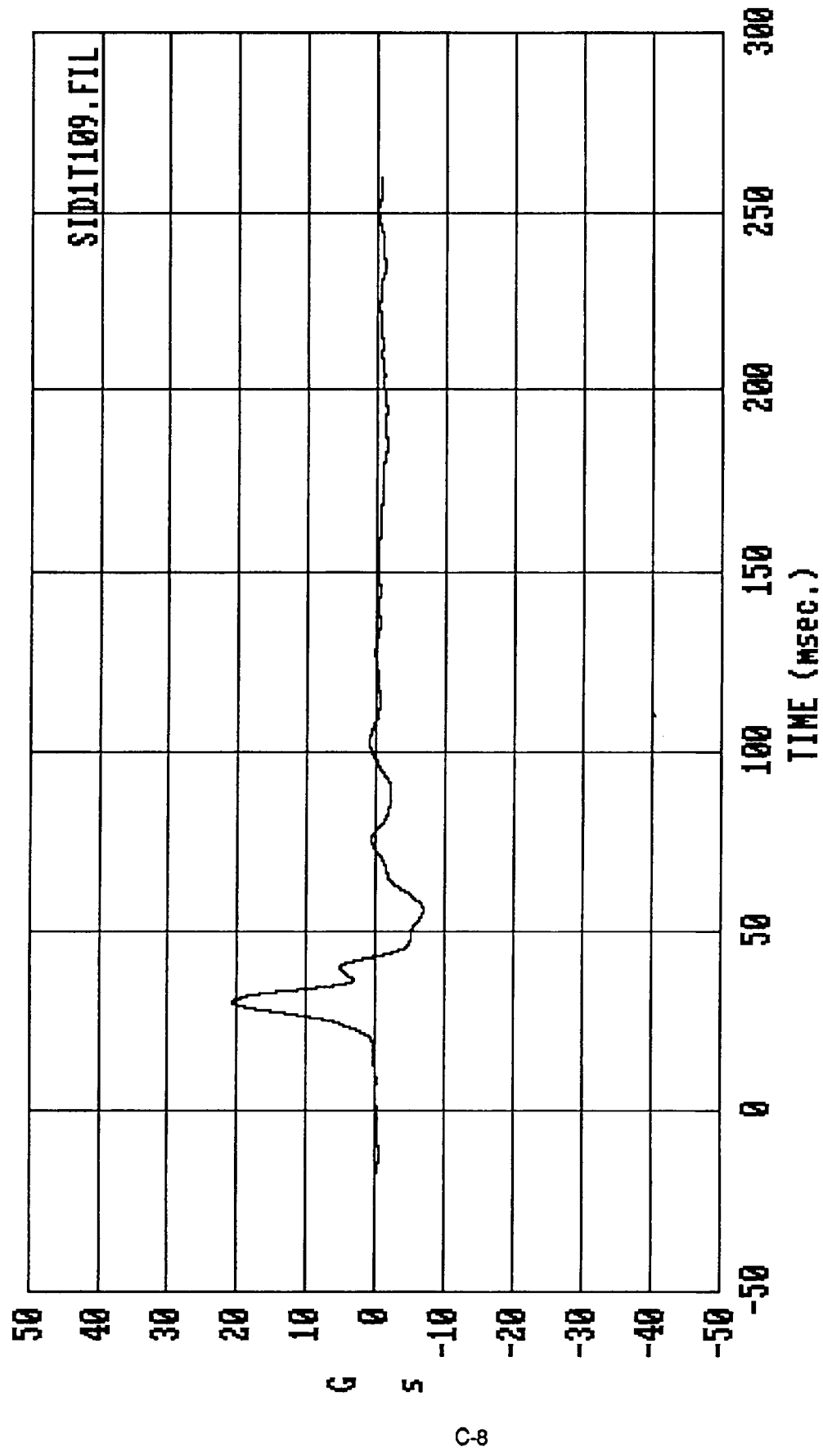
MSE 09/23/88 -- SID-137 THORAX CALL : Driver Lower Rib acc., Y-axis (Second)



Filter: FIR 100

Max = 21.220 Min = -6.8302

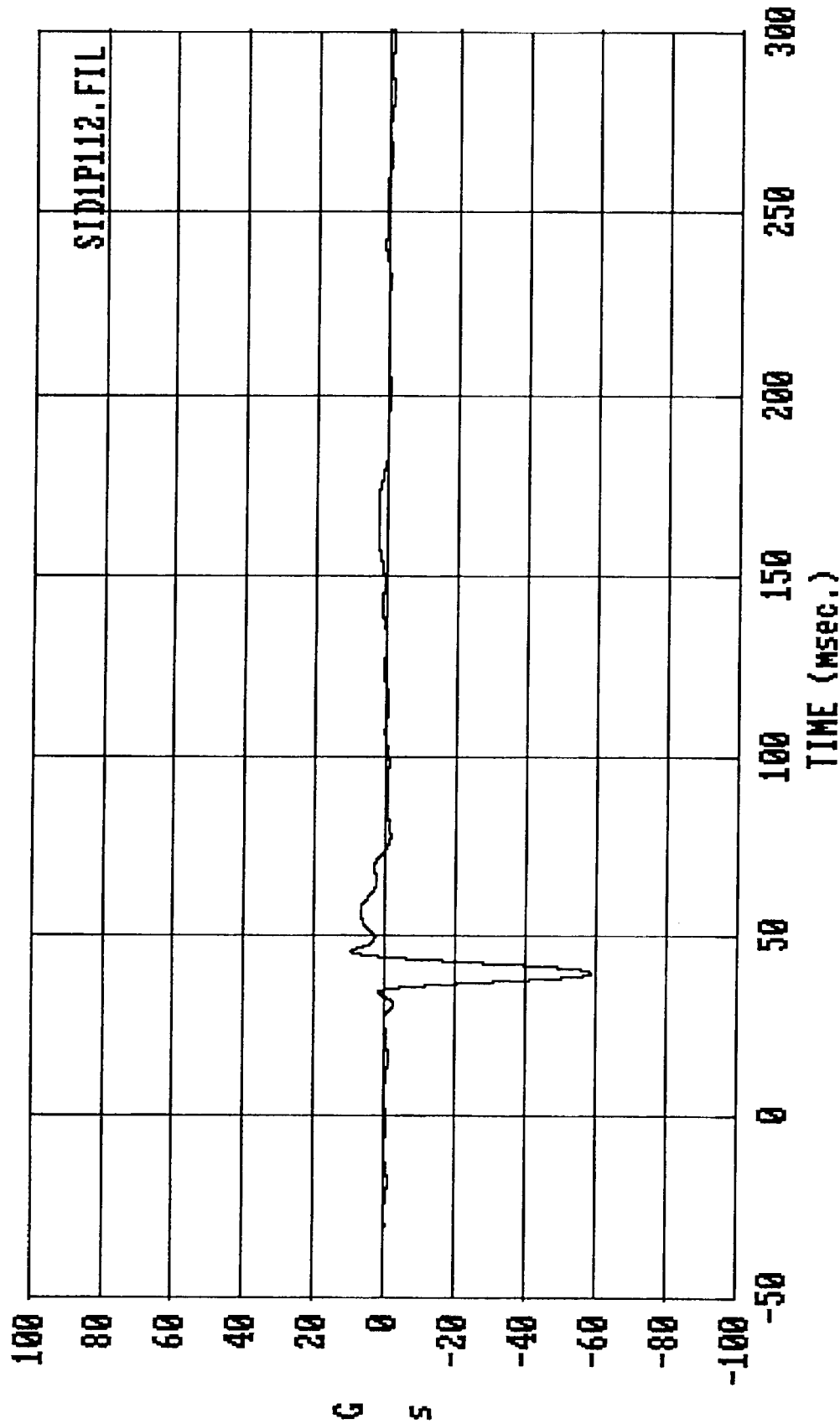
MSE 09/23/88 -- SID-137 THORAX CALL : Driver Lower Spine acc., Y-ax.(Primary)



Filter: FIR 100

Max = 20.720 Min = -6.7926

MSE 09/23/88 -- SID-137 THORAX CALL : Driver Lower Spine acc., Y-ax. (Second)



Filter: FIR 100

Max = 9.9481 Min = -58.417

MSE 09/23/88 -- SID-137 PELVIS CALL : Driver Pelvis acceleration, Y-axis

APPENDIX D
SID POSITIONING PROCEDURE

SIDE IMPACT DUMMY SEATING PROCEDURE

1. Seat Positioning

- A. Place seat at the longitudinal midpoint of fore to aft adjustment (forward most locking position to rear most locking position). If no locking position is available at mid-travel, use the position immediately rearward of mid-travel.
- B. If the seat back angle is adjustable, place it in the manufacturer's stated nominal design location. If not specified, set it at the first detent rearward of 25°.
- C. Adjustable head restraints are set such that the top surface of the restraint is level with the c.g. of the dummy's head.
- D. If the seat is equipped with adjustable side or lumbar supports, they are set in their "released" or full back positions.
- E. All other seat adjustments are positioned to their mid-travel locations. If locking positions are not available at these mid-points, use the position immediately rearward, down, left, or clockwise of mid-travel. Clockwise is defined looking rear to front or left to right relative to the vehicle. This also applies to adjustable steering columns.

2. H-point Determination

- A. The SAE three-dimensional H-point machine (SAE J826 APR80 - 50th percentile male configuration) is used to locate the H-point for each surrogate (see Appendix A).

8. The H-point machine is positioned on the seat as follows:

1. Bucket or Contoured Seats - The H-point machine is centered on the bucket or contour such that its midsagittal plane is vertical and longitudinal.
2. Bench Seats
 - a. Driver position - The H-point machine is positioned such that its midsagittal plane is vertical, longitudinal, and contains the steering wheel center point.
 - b. Outboard passenger positions - The H-point machine is positioned such that its midsagittal plane is vertical, longitudinal, and the same distance from the longitudinal vehicle centerline as that for the driver position.
 - c. Center passenger positions - The H-point machine is positioned such that its midsagittal plane is vertical and contains the longitudinal vehicle centerline.

C. Locate the H-point position using the steps outlined in sections 4 through 6 of SAE Standard J826 APR80, unless otherwise specified in section 1 or 2 of this document. Record the coordinates of this point, relative to the vehicle, for use in section 4 of this document.

3. Test Dummies

- A. All NHTSA side impact crash test use the NHTSA Side Impact Dummy (SID) as the surrogate(s), unless otherwise specified by the COTR.

- B. All dummy joints are inspected for mobility prior to each test usage and reset to hold between 1 and 2 g's. This amount just barely restrains the weight of the individual limb when it is extended horizontally.
- C. Each test dummy is clothed in form-fitting cotton stretch underwear with short sleeves and mid-calf length pants. Each foot of each dummy is equipped with a size 11EE shoe which meets the configuration, size, sole, and heel thickness specifications of MIL-S-13192 and weighs 1.25 + 0.2 pounds. All the above items are supplied by the contractor.

4. Initial Dummy Placement

The SID dummy(s) is placed in the vehicle seat with its pelvis positioned such that a lateral line passing through the dummy H-point is perpendicular to the longitudinal centerplane of the vehicle.

- A. Bucket or Contoured Seats. The dummy is centered on the bucket or contoured seat such that its midsagittal plane is vertical and longitudinal. The legs are positioned as follows, keeping the femur and tibia centerlines in a plane that is as near to vertical as possible.
 - 1. Driver position placement - The right foot of the dummy is placed on the undepressed accelerator pedal, with the heel resting on the floorpan as far forward as possible. The left knee is positioned such that the distance from the outer surface of the knee pivot bolt to the dummy's midsagittal plane is 6 inches.

2. Passenger positions placement - The knees of the dummy are initially set 11 1/2" apart, measured between the outer surfaces of the knee pivot bolt heads. If a center tunnel prevents this, place the feet on either side of the tunnel.

B. Bench Seats.

1. Driver position placement - The dummy is placed in the seat as outlined in section 4.A.2 except that its midsagittal plane is vertical, longitudinal, and contains the steering wheel center point.
2. Outboard passenger positions - The dummy is placed in the seat as outlined in section 4.A.2 except that its midsagittal plane is vertical, longitudinal, and the same distance from the vehicle centerline as that for the driver position.
3. Center passenger positions - The dummy is positioned in the seat as outlined in section 4.A.2 except that its midsagittal plane is vertical and contains the vehicle centerline.

5. Initial Dummy Positioning

A. H-point Positioning.

1. With the dummy laterally positioned as in section 4, insert the pelvis angle indicator bar in the hole provided above, and to the rear of the dummy H-point. Position the longitudinal pelvis angle between 23° and 25° to the horizontal. This may be accomplished by

raising the legs or flexing the upper torso forward and allowing the pelvis to rotate. The lateral pelvis angle is to be horizontal.

2. Apply sufficient force on the lower torso in a horizontal and vertical direction to place the dummy H-point at the coordinates obtained in section 2.
3. If the H-point cannot be placed at the desired coordinates, adjust the pelvis angle within the 2° band and reposition to the coordinates. After repositioning the H-point, any deviation from the desired coordinates is recorded and used to indicate actual H-point locations. This deviation is not to exceed 1/2".

- B. Upper Torso Positioning. The dummy's upper torso should rest against the seat back. If not, adjust the upper torso, maintaining the H-point location and pelvis angle, so that the dummy's back rests against the seat back. If this cannot be done, modify the H-point location and/or pelvis angle within the allowable bands until the back rests against the seat.

6. Final Dummy Positioning

- A. Driver Position. Without inducing pelvis or torso movement, the dummy's right foot is placed on the undepressed accelerator pedal with the heel resting as far forward as possible on the floorpan. The left foot is set perpendicular to the lower leg with the heel resting on the floorpan in the same lateral line as the right heel. If possible within these constraints, the dummy's thighs should be in contact with the seatpan.

- B. Front Passenger Positions. Without inducing pelvis or torso movement, place the dummy's feet on the vehicle's toeboard with the heel resting on the floorpan as close as possible to the intersection of the toeboard and floorpan. If the feet cannot be placed on the toeboard, they are set perpendicular to the lower legs and placed as far forward as possible such that the heels rest on the floorpan.
- C. Rear Passenger Positions. Without inducing pelvis or torso movement, the feet are placed flat on the floorpan and beneath the front seat as far forward as possible without front seat interference. If necessary, change the distance between the knees as required to place the feet beneath the seat. Record the new distance.
- D. Vehicles with wheelhouse projections in the passenger compartment. The foot(feet) in question is placed in the well of the floorpan/toeboard and not on the wheelhouse projection. This is done by twisting the foot at the ankle, maintaining the upper and lower leg positions outlined in section 4. If this does not resolve the situation, move the leg of the foot in question just enough to achieve the correct position, keeping the femur and tibia centerlines in a plane that is as near to vertical as possible. Record the new distance between the knees.
- F. Prior to conducting the test, the dummy position is visually checked. The dummy is to be properly positioned laterally with its midsagittal plane vertical and longitudinal, and the upper torso resting against the seat back. The H-point and pelvis angle are to be within the specified ranges and the foot, knee, and leg placements are to be as outlined.

The COTR is to be satisfied with the final dummy position and any deviations from this procedure are to be approved by the COTR.

- G. The final dummy position is recorded. These measurements are to include, but not be limited to, pelvis and head angles as well as actual H-point and head c.g. locations relative to the vehicle. The straight line distance from the H-point to the center of the outer ankle bolt is also recorded for one of the legs (eg. left H-point to left ankle bolt).