

DRAFT

**SIDE IMPACT PROTECTION
IN PRODUCTION VEHICLES**

**MDB-TO-VEHICLE SIDE IMPACT TEST OF
A 27° CRABBED MOVING DEFORMABLE BARRIER
TO A 1989 DODGE RAM D50
AT 33.5 MPH**

MOBILITY SYSTEMS AND EQUIPMENT COMPANY
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SEPTEMBER 20, 1991

TEST REPORT

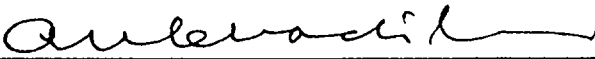
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For

U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Office of Crashworthiness Research
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16. Abstract This test report documents a crash test to evaluate Side Impact Protection. Testing was conducted on 1989 Dodge D-50 at Mobility Systems and Equipment Company Test Facility, San Bernardino, California. The test vehicle was impacted on the left side by a moving deformable barrier, crabbed to 27°, at 33.40 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 04, 1991. <u>DRIVER</u> HEAD INJURY CRITERION - THORACIC TRAUMA INDEX - PELVIC ACCELERATION - National Technical Information Service Springfield, Virginia 22161			
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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	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha

MASS (weight)

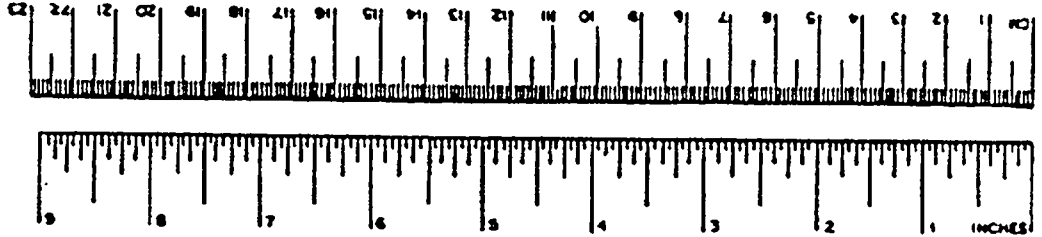
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t

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	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
fl 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

m	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	y
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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SECTION 1

PURPOSE AND INTRODUCTION

This testing program is a part of an investigation and evaluation of side impact protection in production light trucks and vans. The test is specifically intended to simulate a 90 deg. intersection collision with the striking vehicle moving at 30 MPH. This is accomplished by towing a Moving Deformable Barrier (MDB) crabbed at a 27° 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 1989 Dodge Ram D50. The test was performed on September 4, 1991 at an actual impact speed of 33.4 MPH. The leading left-hand edge of the MDB contacted the test vehicle 19.8 inches rearward of front axle centerline.

Change to — inches forward of the midpoint of the

Section 2 contains a general test summary and vehicle *whose* 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 1989 Dodge Ram D50, Test No. 5, was tested on 04 September 1991. General test vehicle information and pretest conditions are given in Tables 2-1 and 2-2. A crash test summary is shown in Table 2-3. The vehicle was instrumented with 10 accelerometer channels, two seat belt load cells 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 20 inches rearward of the front axle centerline.

One side impact anthropomorphic dummy (SID) was placed in the vehicles 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 27° 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 30 channels of information was recorded on two (2) FM data tape recorders.

[illegible]

Tire Pressure (at capacity): 26 psi Front; 35 psi Rear

Recommended Tire Size: P195/75R 14

Tires On Vehicle: 195/75R14 ; Manufacturer: FALLS ROADMASTER

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

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

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

Vehicle Maximum Capacity Loading = 2,000 lb (A)

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

Cargo Capacity (A - B) - - - - = 1,550 lb

*GVWR - Delivered Weight

Right Front = 755 lb
Left Front = 865 lb TOTAL FRONT = 1620 lb (56.9% of TOTAL)
Right Rear = 640 lb
Left Rear = 585 lb TOTAL REAR = 1225 lb (43.1% of TOTAL)
TOTAL WEIGHT = 2,845 lb

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

CALCULATION OF TEST VEHICLE TARGET WEIGHT:

Total Test Vehicle Delivered Weight With Maximum Fluids = 2845 lb
Maximum Cargo Carrying Capacity Of Test Vehicles* - - - = 300 lb
Weight Of One P.572 Dummies (1 x 174 lb)- - - - - = 174 lb
TEST VEHICLE TARGET WEIGHT- - - - - = 3319 lb
* 300 lb for light trucks and MPVs

ACTUAL WEIGHT OF TEST VEHICLE WITH 1 DUMMY AND CARGO:

Right Front = 878 lb
Left Front = 967 lb TOTAL FRONT = 1845 lb (55.5% of TOTAL)
Right Rear = 780 lb
Left Rear = 700 lb TOTAL REAR = 1480 lb (44.5% of TOTAL)
TOTAL WEIGHT = 3,325 lb (which includes 160 lb of cargo ballast weight)

TEST VEHICLE ATTITUDE:

As Delivered -----Right Front = 29.2 in
Left Front = 28.8 in
Right Rear = 31.5 in
Left Rear = 31.1 in

Test Vehicle Wheelbase: 116.5 in; C.G.=50.2 in rearward of front wheel centerline

Ready For Test -- Right Front = 28.0 in
Left Front = 28.1 in
Right Rear = 30.4 in
Left Rear = 30.1 in

TOTAL VEHICLE LENGTH:

Right Side = 186.0 in
Left Side = 186.3 in
Centerline = 188.3 in

TABLE 2-2 PRETEST CONDITIONS

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1989/DODGE/RAM D50/PICKUP

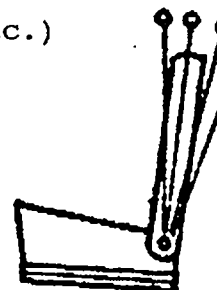
VEH. NHTSA NO. RK0301; TEST DATE: 09/04/91

FRONT SEAT CUSHION PLACEMENT: Midpoint of forward/aft travel 12 notch
TOTAL NUMBER OF ADJUSTMENT POSITIONS OR DETENTS: 23 notches

FRONT SEAT BACK ADJUSTMENT POSITION: 1st notch after 25° angle

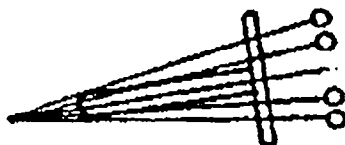
(latch position, knob rotations, etc.)

TORSO ANGLE 25°



ADJUSTABLE STEERING COLUMN POSITION:

Not Applicable



Midpoint of swing

WINDOW POSITIONS: Left Front -- closed
Left Rear --- n/a
Right Front - open
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 15.5 Gal
Rear Optional Tank n/a Gal
(92 to 94% of USABLE CAPACITY)

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

Wheelbase = 116.5 in

Impact point is 20.0 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: 1989/DODGE/RAM/D-50/PICKUP

VEH. NHTSA NO. RK0301; VIN: JB7FL25E4KP004323

TEST DATE: 09/04/91; BUILD DATE: 06/88

OVERALL LENGTH = 188.3 inches; OVERALL WIDTH = 66.0 inches

TEST WEIGHT: Left Front = 967 lb; Left Rear = 700 lb

Right Front = 878 lb; Right Rear = 780 lb

SUBTOTALS - - - Front = 1845 lb; Rear = 1480 lb

TOTAL VEHICLE WEIGHT - - - - - 3325 lb

WHEELBASE = 116.5 inches

LONGITUDINAL C.G. FROM CENTER OF FRONT AXLE = 50.2 inches

IMPACT ANGLE WITH RESPECT TO IMPACTOR = 90 degrees

MAXIMUM EXTERIOR STATIC CRUSH:

1. LEVEL 1 (13.75" above ground) = 6.7 inches

2. LEVEL 2 (26.00" above ground) = 7.5 inches

3. LEVEL 3 (26.13" above ground) = 7.4 inches

4. LEVEL 4 (38.50" above ground) = 4.0 inches

5. LEVEL 5 (55.13" above ground) = -5.6 inches

MAXIMUM POSTTEST INTRUSION = 7.5 inches

OCCUPANTS:

DRIVER

RIGHT REAR

TYPE OF DUMMY - - - - SID S/N ? N/A

RESTRAINT USED- - - - TYPE 2 ? N/A

INSTRUMENTATION:

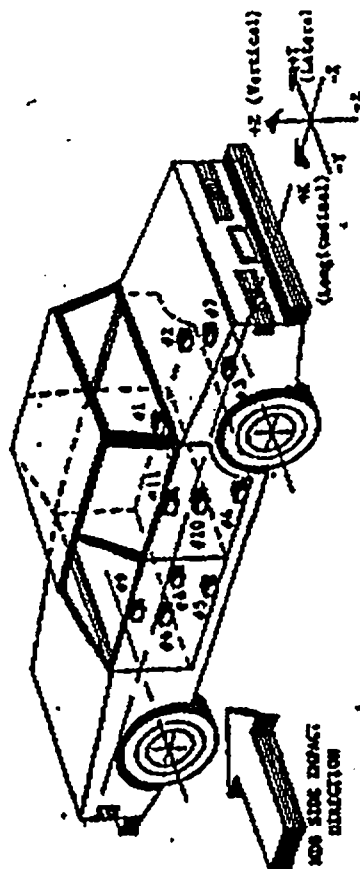
NUMBER OF DATA CHANNELS = 30

NUMBER OF CAMERAS: ONBOARD = 2 High-speed

OFFBOARD = 4 High-speed, 1 Real-time

TABLE 2-4 TEST VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

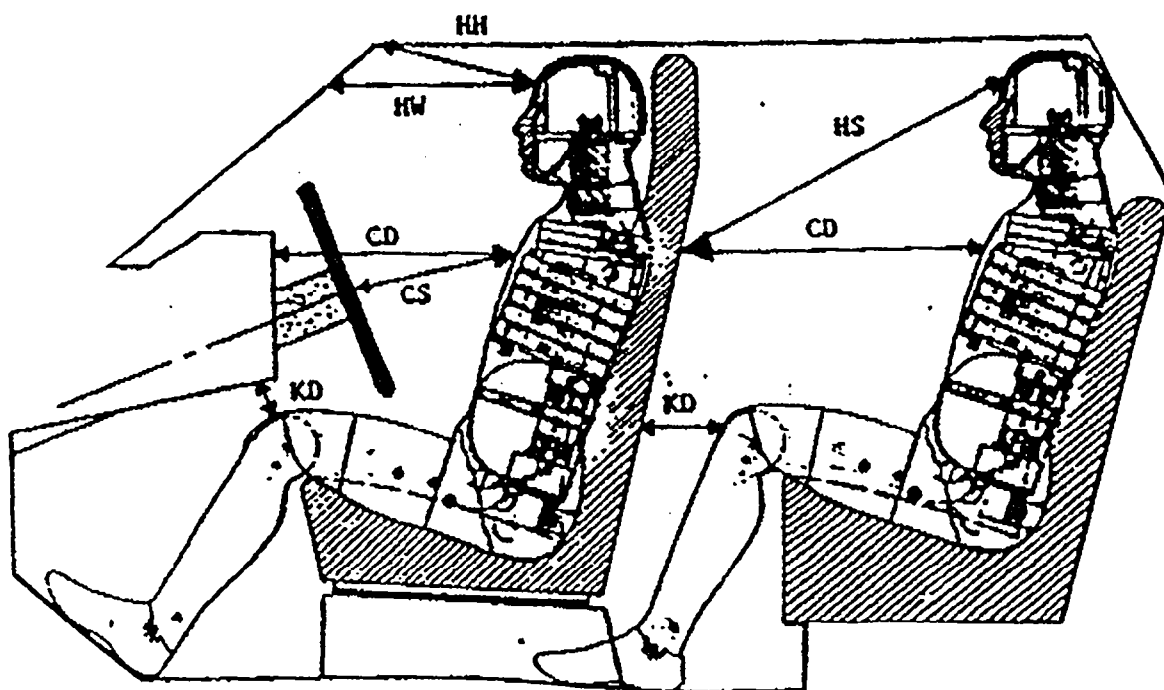
TEST VEHICLE: 1989 DODGE RAM D-50 NHTSA NO.: RK0301 TEST DATE: 09/04/91



ACCEL. NO.	LOCATION	COORDINATES (")			LONG. (X)		LAT. (Y)		VERT. (Z)		RESULTANT	
		X*	Y*	Z*	POS. / NEG. MAX	TIME (msec)	POS. / NEG. MAX	TIME (msec)	POS. / NEG. MAX	TIME (msec)	MAX (g)	TIME (msec)
1	Right Side Sill At Front Seat	127.5	25.0	14.0	-7.80	19.30	24.02	5.50	11.77	8.90	25.36	5.80
2	Right Side Sill At Rear Seat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	Floorplan Above Rear Axle	42.0	1.5	27.0	-15.85	14.50	14.45	45.20	31.48	68.10	31.89	68.10
4	Left Side Sill At Rear Seat	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	Left Side Sill At Front Seat	126.5	-25.0	14.0	NA	NA	86.39	2.50	NA	NA	NA	NA
6	Left Front Door on Centerline	119.8	-28.5	23.0	NA	NA	190.94	4.90	NA	NA	NA	NA
7	Right Rear Occ. Compartment	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
8	Midrear of Left Front Door	102.8	-28.5	26.0	NA	NA	188.44	1.60	NA	NA	NA	NA
9	Left Front Door Upper Centerline	121.3	-28.5	32.3	NA	NA	183.80	7.10	NA	NA	NA	NA
10	Midrear of Right Front Door	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
11	Right Rear Door Upper Centerline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

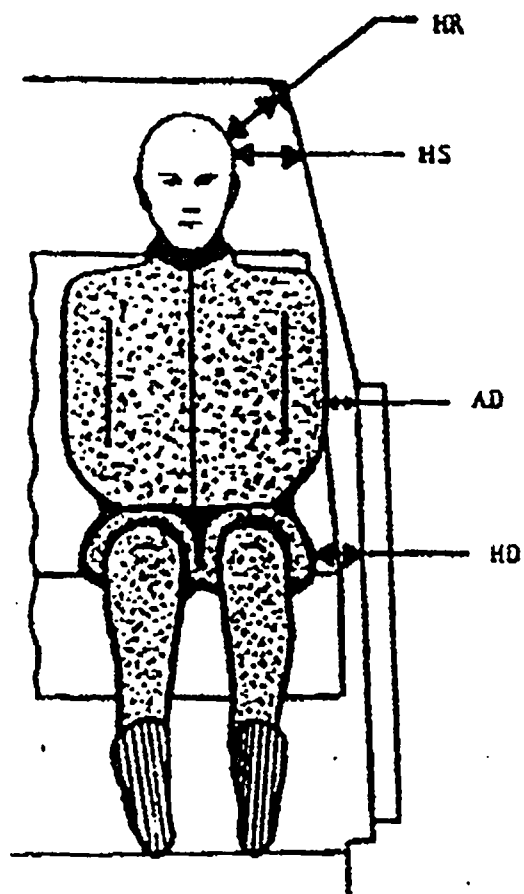
* Reference: X - Rear Bumper (+ Forward)
Y - Vehicle Centerline (+ To Right)
Z - Ground Level (+ Up)

TABLE 2-5 SIDE IMPACT DUMMY (SID) LONGITUDINAL CLEARANCE DIMENSIONS
1989 DODGE RAM D-50, RK0301



	FRONT PASSENGER ID # 319	REAR PASSENGER ID # N/A
HH	20.4 in	NA in
HW	23.8 in	NA in
HS	NA in	NA in
CD	25.3 in	NA in
CS	14.0 in	NA in
KDL	6.8 in	NA in
KDR	2.9 in	NA in

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



	FRONT PASSENGER ID # 319	REAR PASSENGER ID # N/A
HR	5.9 in	NA in
HS	9.0 in	NA in
AD	4.0 in	NA in
HD	6.4 in	NA in

1989 DODGE RAM D-50, RK0301

TABLE 2-6 SIDE IMPACT DUMMY (SID) TEST DATA SUMMARY
1989 DODGE RAM D-50, RK0301

TEST DATE: 09/04/91

	FRONT DUMMY -- ID # 319				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	23.96	39.00	18.83	43.60	N/A	N/A	N/A	N/A
Lateral ----- Y	188.80	39.20	19.86	49.00	N/A	N/A	N/A	N/A
Vertical ----- Z	23.78	38.40	28.50	45.50	N/A	N/A	N/A	N/A
RESULTANT ----- R	190.63	39.20	N/A	N/A	N/A	N/A	N/A	N/A
HIC -----*	1116.67	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Time Interval)								
RIB ACCELERATIONS:								
1.Upper Rib Lateral Y*	77.24	25.63	13.07	76.25	N/A	N/A	N/A	N/A
2.Upper Rib Lateral Y*	77.87	25.63	12.10	76.25	N/A	N/A	N/A	N/A
1.Lower Rib Lateral Y*	65.97	25.63	22.16	63.13	N/A	N/A	N/A	N/A
2.Lower Rib Lateral Y*	66.50	25.63	21.19	63.13	N/A	N/A	N/A	N/A
SPINE ACCELERATIONS:								
1.Upper Lateral Y*	62.72	40.00	18.30	70.63	N/A	N/A	N/A	N/A
2.Upper Lateral Y*	61.92	40.00	18.68	70.63	N/A	N/A	N/A	N/A
1.Lower Lateral Y*	88.37	29.38	18.14	68.75	N/A	N/A	N/A	N/A
2.Lower Lateral Y*	86.86	29.38	18.56	68.75	N/A	N/A	N/A	N/A
PELVIS ACCELERATIONS:								
Lateral Y*	72.02	30.00	13.20	94.38	N/A	N/A	N/A	N/A
RIB DEFLECTION:								
Lateral (inches)	1.54	56.40	.02	194.50	N/A	N/A	N/A	N/A

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

REFERENCE: Positive Direction -- Longitudinal (X) = forward
Lateral (Y) = to right
Vertical (Z) = down

Negative Direction -- Longitudinal (X) = rearward
Lateral (Y) = to left
Vertical (Z) = up

Thoracic Trauma Index

TABLE 2-7 CRASH TEST SUMMARY FOR SIDE IMPACTOR

TYPE OF TEST: 90°, 30 MPH/15 MPH SIMULATION; TEST DATE 09/04/91
NHTSA NO. FOR TARGET VEHICLE: RK0301; VEHICLE: 1989 DODGE RAM D-50
POSITION OF IMPACTOR (MDB) ON MONORAIL: CRABBED 27° 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 = 44.5 in.

MDB Weight -- Left Front = 1013 lb; Left Rear = 442 lb

Right Front = 638 lb; Right Rear = 838 lb

SUBTOTAL: Front = 1651 lb; Rear = 1280 lb

TOTAL MDB WEIGHT = 2931 lb

IMPACT ANGLE (MDB C/L to Target Vehicle C/L) = 90 Deg.

IMPACT SPEED = 33.4 MPH

MAXIMUM STATIC CRUSH OF HONEYCOMB IMPACT FACE:

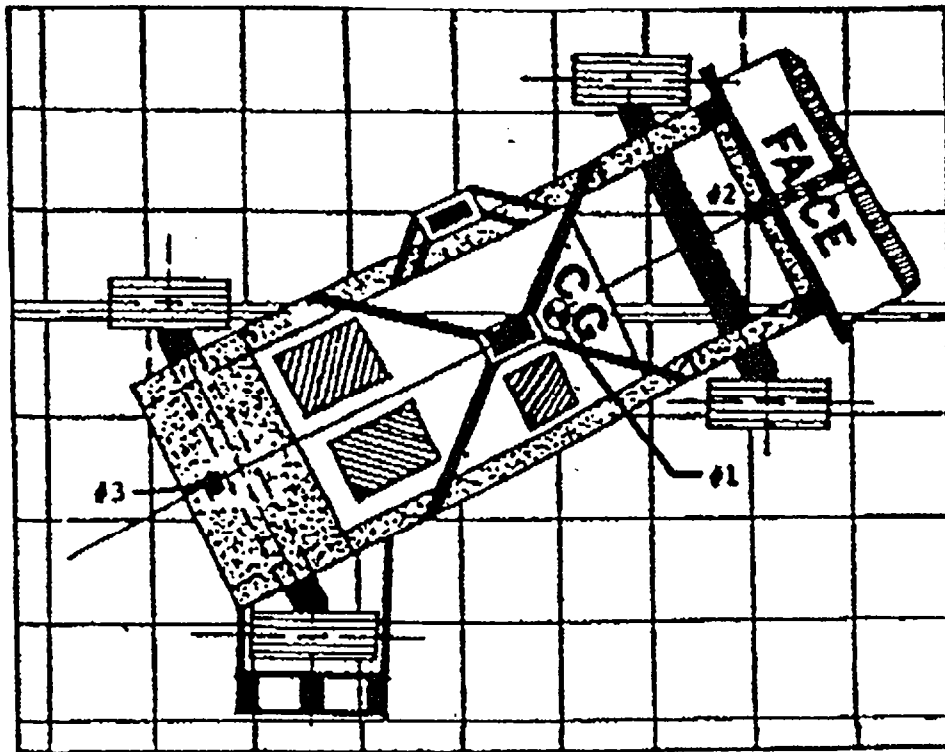
1. ROW A at bumper level = 4.25 in.
2. ROW B at mid-stack level = 11.50 in.
3. ROW C at top of stack level = 8.80 in.

INSTRUMENTATION:

Number of MDB Data Channels = 5 accelerometer channels

Number of Onboard Cameras = 2 high speed

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



1989 DODGE RAM D-50, CK0301

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	74.0	0.0	14.0	2.70	103.80	20.4	34.50
	Lateral Y				6.53	61.80	8.6	36.50
	Vertical Z				15.94	19.10	21.5	20.30
	Resultant R				24.43	20.60	.2	206.10
2	Front Frame Member Longitudinal X	131.0	0.0	26.5	.90	122.10	13.2	115.10
3	Rear Frame Member Longitudinal X	13.0	0.0	17.0	2.58	113.10	17.3	34.30

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

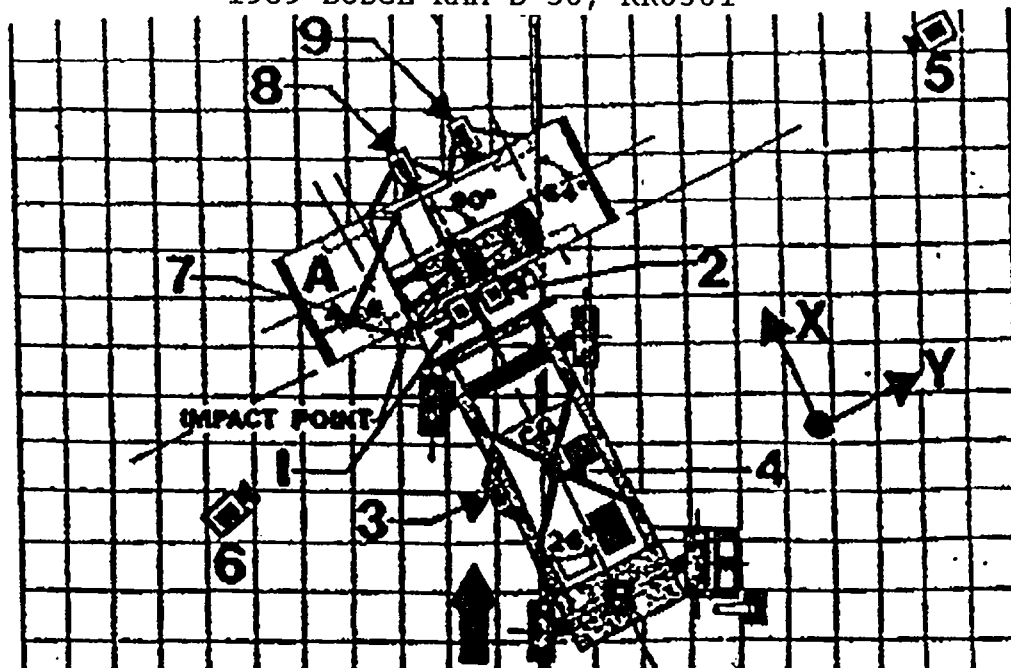
TABLE 2-9 HIGH-SPEED CAMERA LOCATIONS AND DATA

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	COORDINATES (in)		
					X*	Y*	Z*
1	Overhead view of test vehicle dynamics	Fastax	28	600	0	60	252
2	Overhead Closeup view of impact plane	Fastax	16	600	20	35	252
3	MDB Onboard Closeup view of impact point	Himac	28	600	-121	0	29.5
4	MDB Onboard view of driver dummy kinematics	Himac	16	600	-150	37	54
5	Right side view of test area overall	Fastax	16	600	-12.5	576	51
6	Left Side Ground Level-Close-Up View	Fastax	28	600	0	-330	24
7	Test Vehicle Onboard-driver front view dummy kinematics	Fastax	16	600	55	19	52
8	Test Vehicle Onboard-passenger side view dummy kinematics	Fastax	16	600	-26.5	100	51
9	Test Vehicle Onboard-passenger side view dummy kinematics	NA	NA	NA	NA	NA	NA

NOTE: Real time (24 fps) * Reference (from point of impact)
 film coverage of pre-test +X = Forward
 test, and post-test event +Y = To Right
 included in final print +Z = Upward

SAMPLE

1989 DODGE RAM D-50, RK0301



ANGLES INDICATED ARE HYPOTHETICAL

SECTION 3

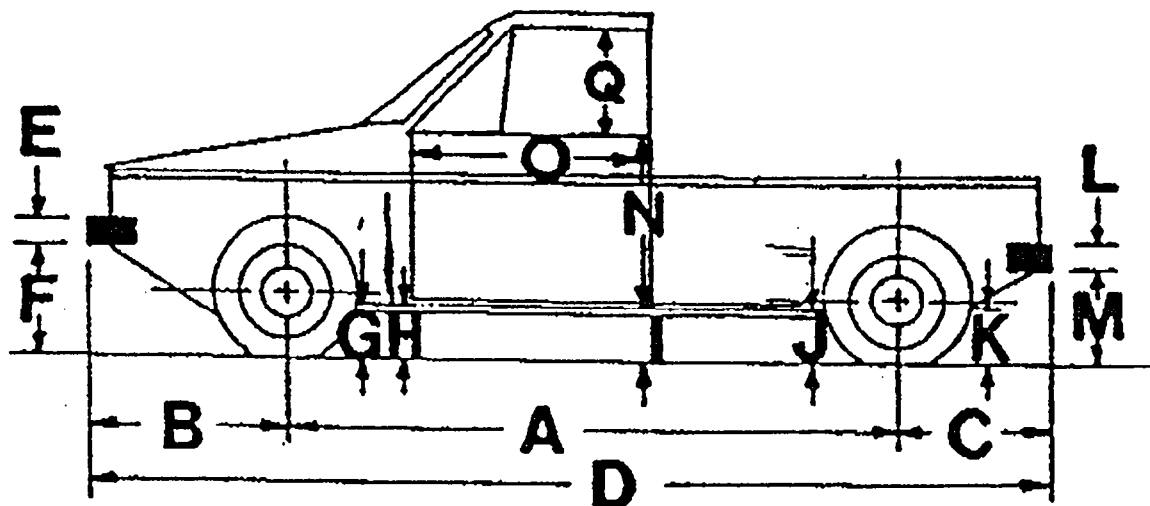
TEST RESULTS

The 1989 Dodge Ram D50 was impacted at 33.4 MPH by the 27° crabbed MDB on 04 September 1991. The MDB's left edge contacted the test vehicle 0.2 inches forward of the impact line. The test vehicle was spun around counterclockwise, the back end of the vehicle rotating around the heavier front. The vehicle driver side door and bed were crushed inwards a maximum of 7.4 inches. Pre-test and posttest vehicle dimensions are shown in Tables 3-1 to 3-5.

The SID impacted the driver door with the left knee, hip and shoulder. The head of the SID contacted the "B" pillar of the vehicle. The solid contact with the "B" pillar, prevented SID from rotating out the drivers window, therefore there was no head rotation to the left. The SID then rotated slightly to the right while recoiling from the impact with the door and "B" pillar. Secondary impact of SID's head occurred, when he rotated to the right, his head contacted the passenger head rest. The SID ended up sitting upright facing forward. SID contact is documented in Table 3-6.

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 overall damage with a maximum crush of 11.5 inches on the right-hand corner at mid level. The crush details for the MDB are given in Table 3-7.

TABLE 3-1 PRE AND POSTTEST MEASUREMENTS
1989 DODGE RAM D-50, RK0301



NOTE: All dimensions are in inches

	PRETEST	POSTTEST	CHANGE
A	116.5	116.6	+0.1
B	30.0	29.8	-0.2
C	42.0	42.4	+0.4
D	188.5	188.8	+0.3
E	5.9	5.9	+0.0
F	17.2	17.1	-0.1
G	13.1	13.3	+0.2
H	13.1	13.4	+0.3
I	13.8	15.8	+2.0
J	14.3	14.8	+0.5
K	17.0	18.5	+1.5
L	6.0	6.0	+0.0
M	18.8	20.3	+1.5
N	25.5	22.0	-3.5
O	39.3	38.9	-0.4
P	N/A	N/A	N/A
Q	19.5	17.0	-2.5

TABLE 3-2 VEHICLE SIDE MEASUREMENT

TEST VEHICLE NHTSA NO.: RK0301 TEST VEHICLE: 1989 DODGE RAM D50

LEVEL 5 @ Window Top - - - - - 55.1 in

LEVEL 4 @ Window Sill - - - - - 38.5 in

LEVEL 3 @ Mid Door - - - - - 26.1 in

LEVEL 2 @ Occupant H-Point - - - - - 26.0 in

LEVEL 1 @ Axle Centerline Height - - 13.8 in

(or Sill Top Height)

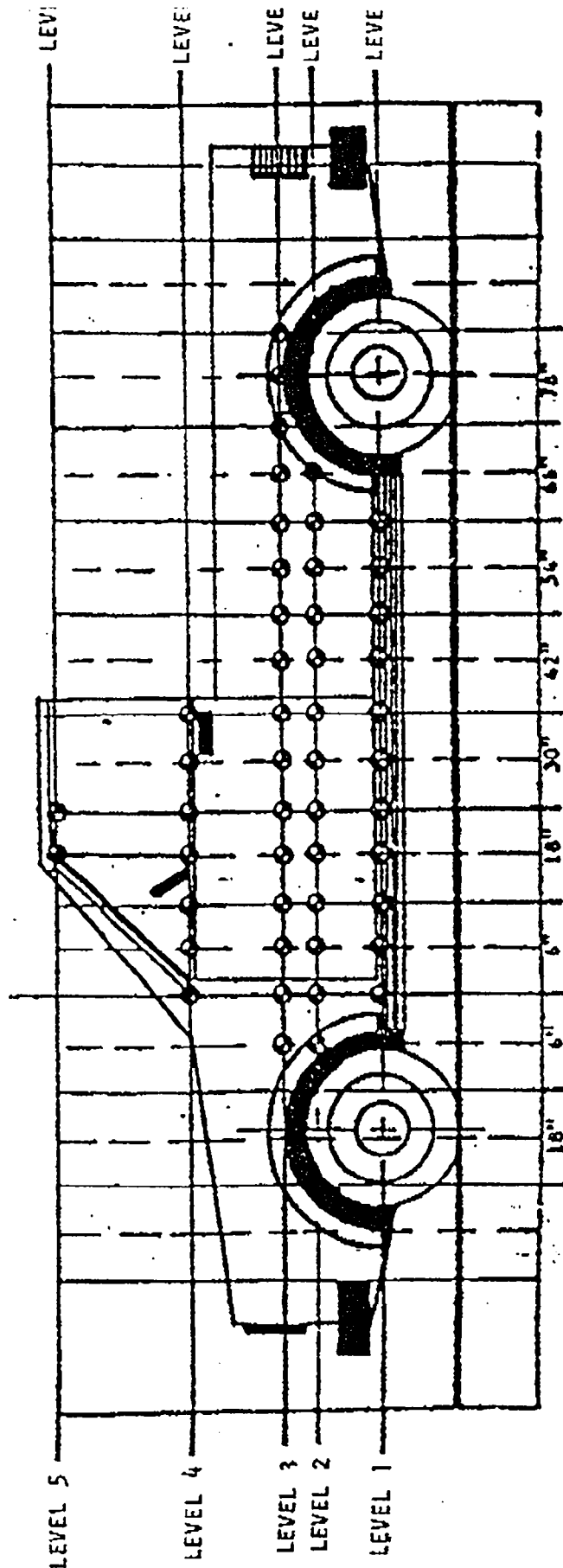
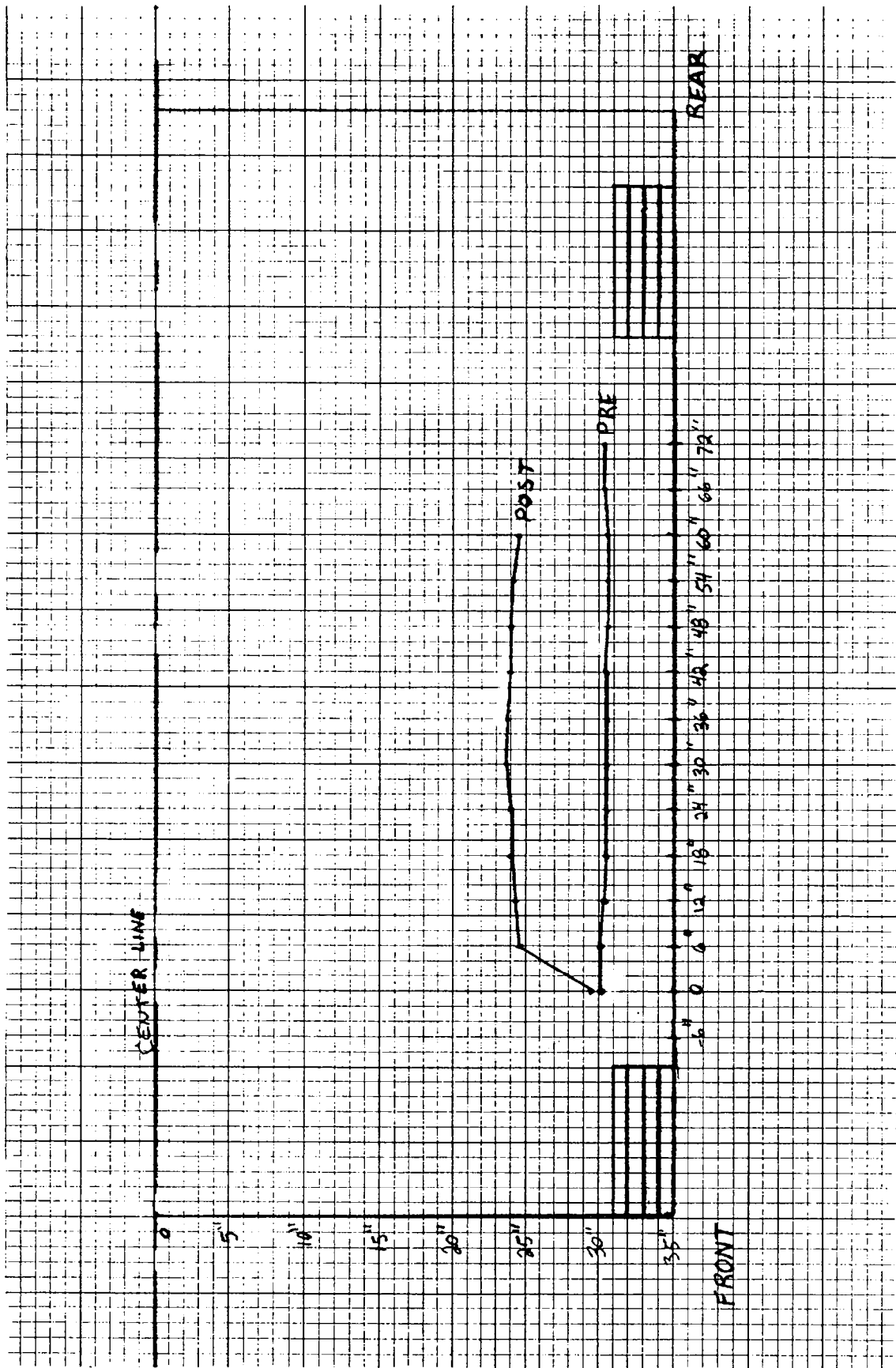


TABLE 3-3 TEST VEHICLE EXTERIOR PROFILES FROM REFERENCE PLANE* AND STATIC CRUSH DATA
1989 DODGE RAM D-50, RK0301

TEST DATE 09/04/91		IMPACT POINT															
LOCATION		HEIGHT (in)	FORWARD/REARWARD														
=====		=====	PROFILES/ CRUSH	6"	0"	6"	12"	18"	24"	30"	36"	42"	48"	54"	60"	66"	7
=====		=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
1.Window Top LEVEL 5	55.1	Posttest- - - Pretest - - - Static Crush-	NA NA NA	NA NA NA	NA NA NA	NA NA NA	NA NA NA	NA NA NA	24.1 29.7 -5.6	24.5 29.7 -5.2	25.0 29.7 -4.7	NA NA NA	NA NA NA	NA NA NA	NA NA NA	NA NA NA	N N N
2.Window Sill LEVEL 4	38.5	Posttest- - - Pretest - - - Static Crush-	NA NA NA	NA NA NA	25.0 23.2 1.8	26.5 22.9 3.6	26.6 22.9 3.7	27.0 23.0 4.0	26.8 22.9 3.9	26.5 23.3 3.2	27.1 23.2 3.9	26.8 23.3 3.5	NA NA NA	NA NA NA	NA NA NA	NA NA NA	N N N
3.Mid-Door LEVEL 3	26.1	Posttest- - - Pretest - - - Static Crush-	23.4 24.3 -0.9	25.4 24.2 1.2	31.5 24.3 7.2	31.6 24.2 7.4	31.1 24.5 6.6	30.9 24.5 6.4	30.6 24.6 6.0	30.4 24.7 5.7	30.2 24.7 5.5	30.8 24.6 6.2	30.4 24.5 5.9	30.0 24.5 5.5	24.9 24.2 0.7	24 24 -0	
4.H-Point LEVEL 2	26.0	Posttest- - - Pretest - - - Static Crush-	23.4 24.3 -0.9	25.5 24.2 1.3	31.6 24.3 7.3	31.7 24.2 7.5	31.2 24.5 6.7	31.0 24.5 6.5	30.7 24.6 6.1	30.4 24.7 5.7	30.2 24.7 5.5	30.8 24.6 6.2	30.4 24.5 5.9	30.0 24.5 5.5	24.8 24.2 0.6	24 24 -0	
5.Axle C/L LEVEL 1	13.8	Posttest- - - Pretest - - - Static Crush-	NA NA NA	24.4 23.9 0.5	29.3 23.9 5.4	29.6 23.7 5.9	30.0 23.5 6.5	30.0 23.5 6.5	30.2 23.5 6.7	30.1 23.5 6.6	30.0 23.5 6.5	30.0 23.4 6.6	29.8 23.4 6.4	29.5 23.4 6.1	NA 23.7 NA	N 23 N	

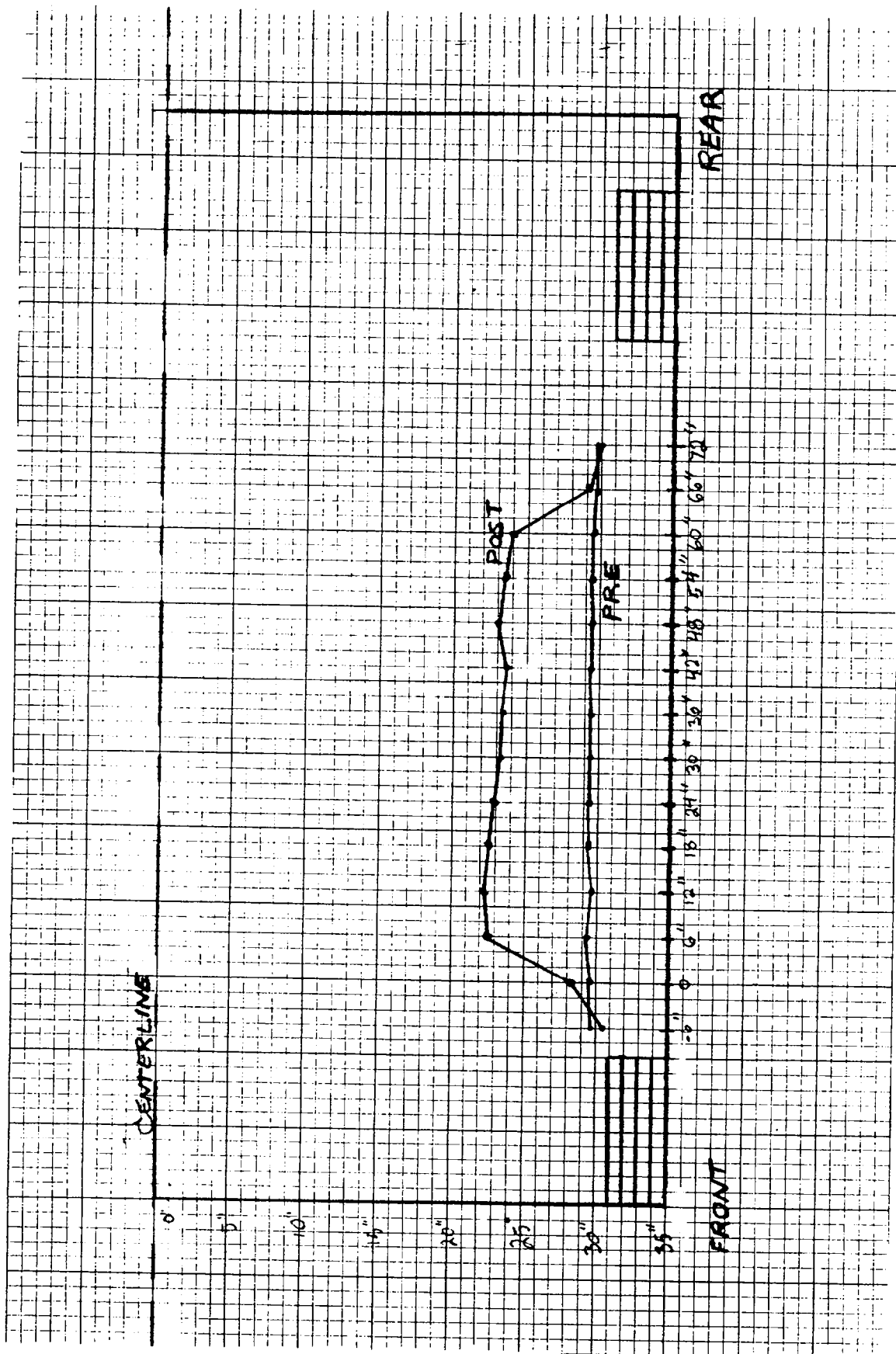
*Reference Plane is parallel to and 54 inches from test vehicle longitudinal centerline.
 **Measured from ground.
 ***Impact point.

FIGURE 3-4A PRE AND POSTTEST EXTERIOR PROFILE AT LEVEL 1
AXLE CENTERLINE 13.8" ABOVE GROUND LEVEL



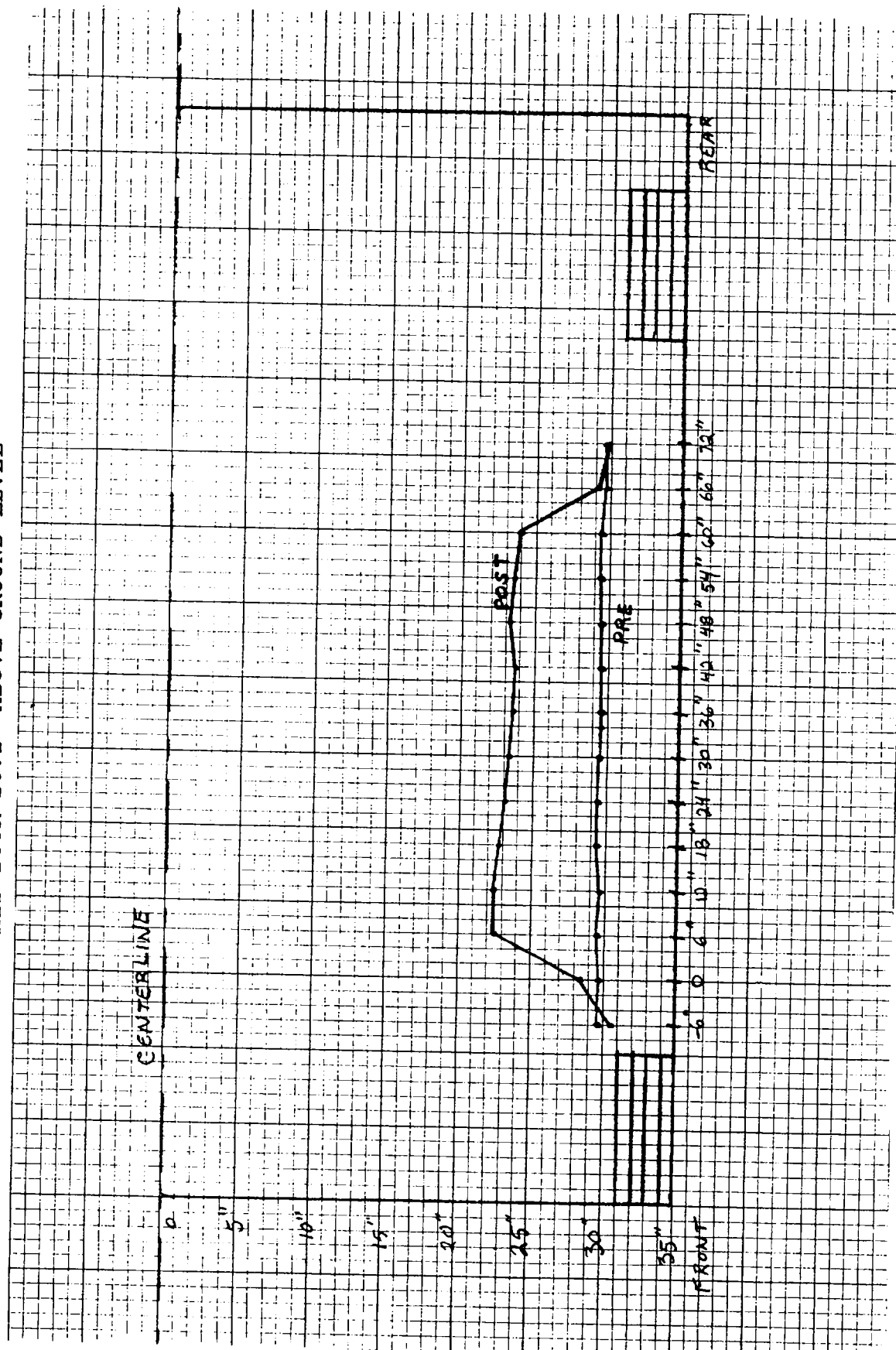
1991 DODGE RAM D-50, RK0301

FIGURE 3-4B PRE AND POSTTEST EXTERIOR PROFILE AT LEVEL 2
H-POINT 26.1" ABOVE GROUND LEVEL



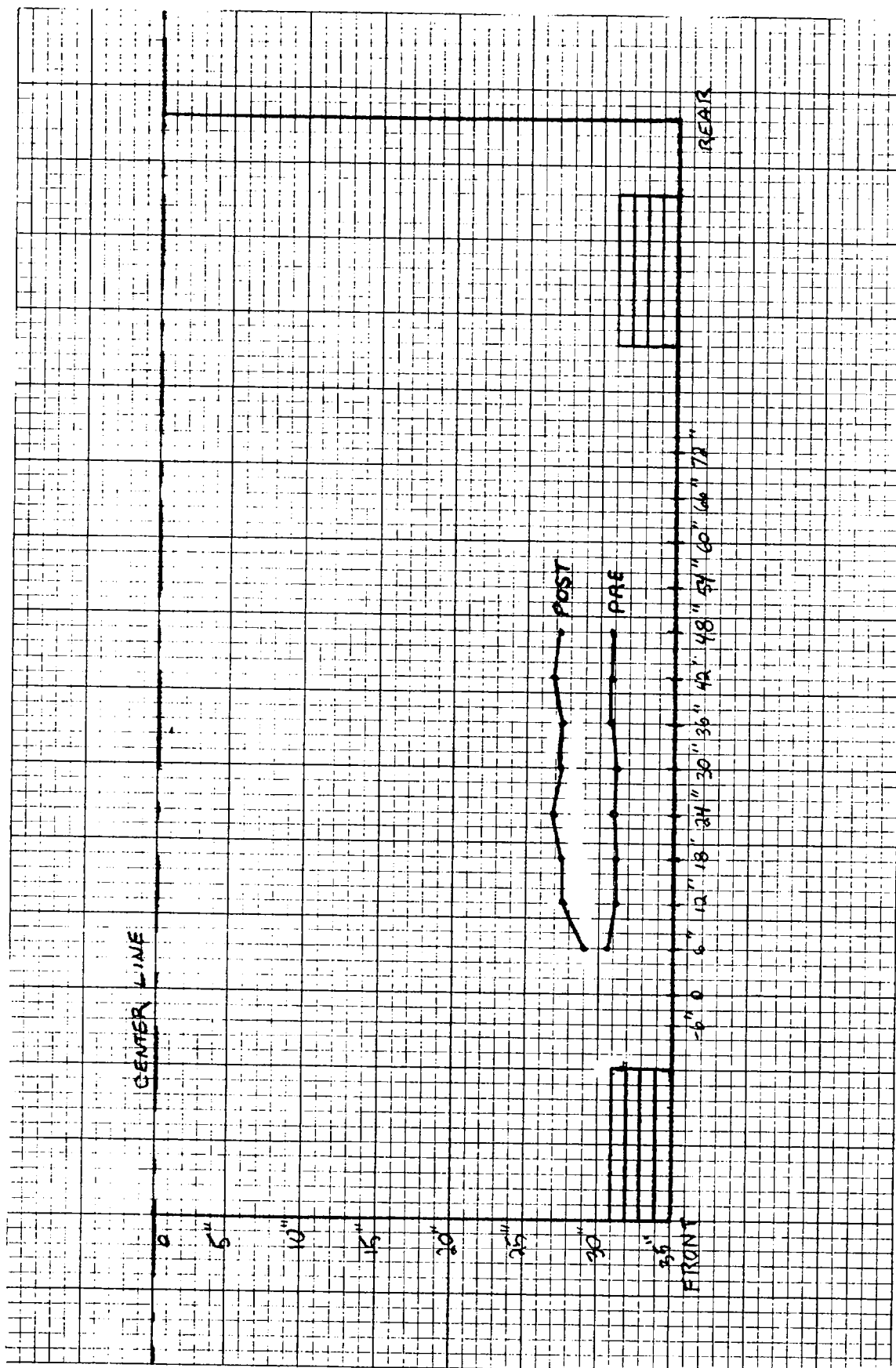
1991 DODGE RAM D-50, RK0301

FIGURE 3-4C PRE AND POSTTEST EXTERIOR PROFILE AT LEVEL 3
MID DOOR 26.1" ABOVE GROUND LEVEL



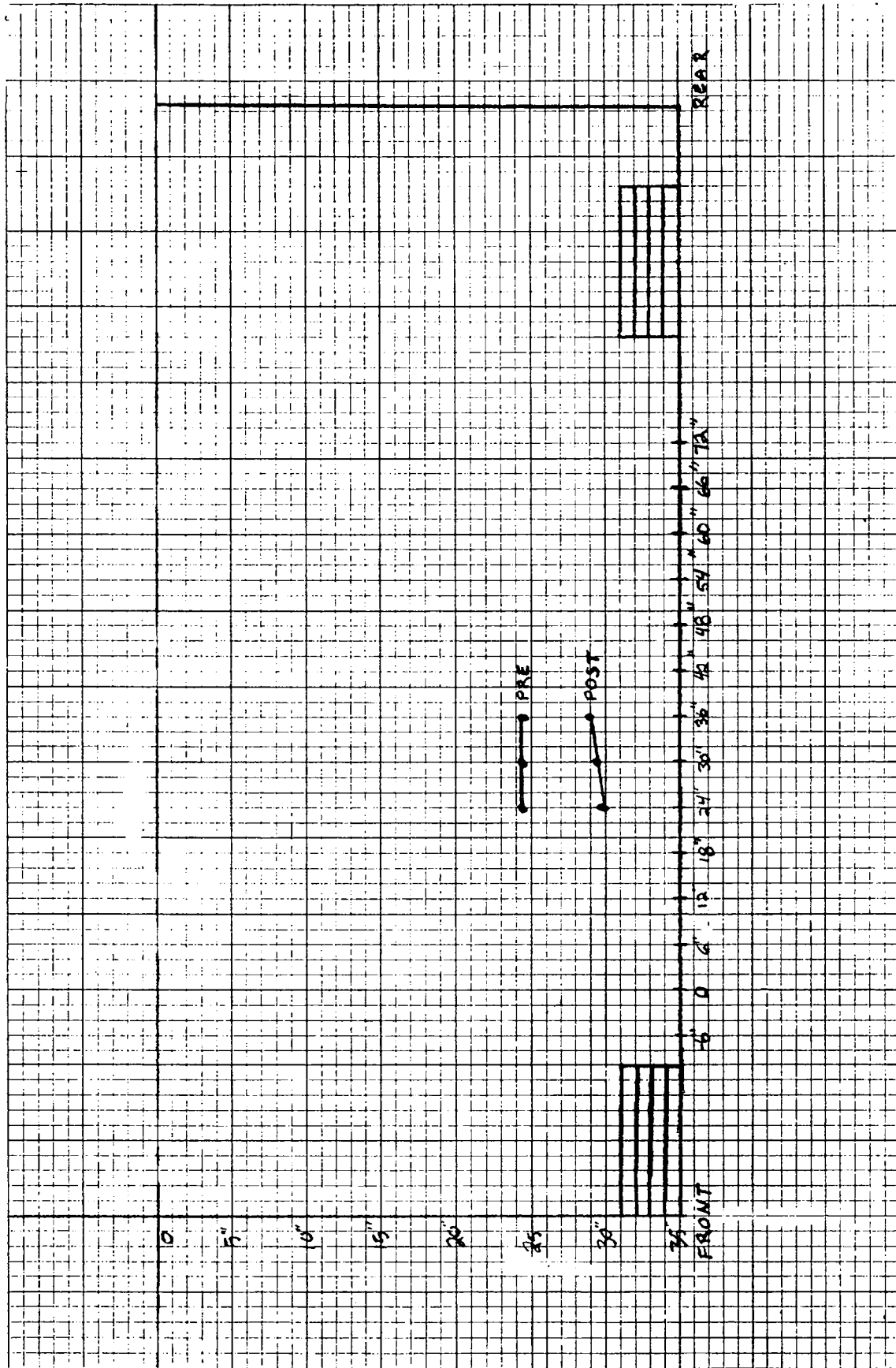
1991 DODGE RAM D-50, RK0301

FIGURE 3-4D PRE AND POSTTEST EXTERIOR PROFILE AT LEVEL 4
WINDOW SILL 38.5" ABOVE GROUND LEVEL



1991 DODGE RAM D-50, RK0301

FIGURE 3-4E PRE AND POSTTEST EXTERIOR PROFILE AT LEVEL 5
WINDOW TOP 55.1" ABOVE GROUND LEVEL



1991 DODGE RAM D-50, RK0301

TABLE 3-5 TEST VEHICLE MEASUREMENTS
1989 DODGE RAM D-50, RK0301

NO.	MEASUREMENT DESCRIPTION	Pre-Test (in.)	Post-Test (in.)	Diff. (in.)
X1	Total Length of Test Vehicle at Centerline	188.5	188.8	+0.3
X2	Rear Surface of Vehicle to Front of Engine	170.1	170.5	+0.4
X3	Rear Surface of Vehicle to Firewall	142.5	143.0	+0.5
X4	Rear Surface to Upr. Leading Edge of Right Door	118.3	118.3	0.0
X5	Rear Surface to Upr. Leading Edge of Left Door	118.3	116.3	-2.0
X6	Rear Surface to Lwr. Leading Edge of Right Door	137.4	137.5	+0.1
X7	Rear Surface to Lwr. Leading Edge of Left Door	137.3	135.0	-2.3
X8	Rear Surface to Upr. Trailing Edge of Right Door	98.0	98.4	+0.4
X9	Rear Surface to Upr. Trailing Edge of Left Door	97.5	97.0	-0.5
X10	Rear Surface to Lwr. Trailing Edge of Right Door	97.5	97.5	+0.0
X11	Rear Surface to Lwr. Trailing Edge of Left Door	97.5	96.6	-0.9
X12	Rear Surface to Bottom 'A' Post on Right Side	136.1	136.6	+0.5
X13	Rear Surface to Bottom 'A' Post on Left Side	136.3	135.3	-1.0
X14	Rear Surface to Firewall on Right Side	141.0	141.9	+0.9
X15	Rear Surface to Firewall on Left Side	141.5	140.0	-1.5
X16	Rear Surface to Steering Column	118.8	118.1	-0.7
X17	Center of Steering Column to 'A' Post	16.3	20.0	+3.7
X18	Center Steering Column to Headlining	17.9	18.4	+0.5
X19	Rear Surface to Right Side of Front Bumper	184.5	185.0	+0.5
X20	Rear Surface to Left Side of Front Bumper	185.3	184.8	-0.5
X21	Length of Engine Block	21.0	21.0	0.0
X22	Steering Wheel Hub C/L to W/Shld. Header Interior Moulding	17.8	18.5	+0.7
X23	Steering Wheel Hub C/L to Rr.Wdo. Upper Interior Trim Moulding	43.0	43.1	+0.1

TABLE 3-6 POSTTEST OBSERVATIONS

TEST VEHICLE: 1989 DODGE RAM D-50 ; NHTSA NO.: RK0301

<u>VISIBLE DUMMY CONTACT POINT:</u>	<u>FRONT SID</u>	<u>REAR SID</u>
HEAD - - - - -	<u>B Pillar, Cab Ceiling</u>	<u>N/A</u>
CHEST- - - - -	<u>None</u>	<u>N/A</u>
ABDOMEN- - - - -	<u>None</u>	<u>N/A</u>
LEFT KNEE- - - - -	<u>Left Front Door</u>	<u>N/A</u>
RIGHT KNEE - - - - -	<u>None</u>	<u>N/A</u>

<u>DOOR OPENING:</u>	<u>LEFT SIDE</u>	<u>RIGHT SIDE</u>
FRONT - - - - -	<u>None</u>	<u>N/A</u>
REAR - - - - -	<u>N/A</u>	<u>N/A</u>

SEAT MOVEMENT:

Driver Seat displaced slightly to the right.

GLAZING DAMAGE:

Windshield is intact. Cracks if any, are not visible.

OTHER NOTABLE IMPACT EFFECTS:

- o The left knee also brushed against the steering column.
- o Contact of the door on SIDs left leg resulted in seperation of his left femer.
- o Fuel leakage was observed immediately after impact.

TABLE 3-7 EXTERIOR STATIC CRUSH FOR SIDE IMPACTOR
1989 DODGE RAM D-50, RK0301

		DISTANCE RIGHT OF CENTER								DISTANCE LEFT OF CENTER**							
LOCATION =====	HEIGHT at CL* =====	32" =====	28" =====	24" =====	20" =====	16" =====	12" =====	8" =====	4" =====	0" =====	4" =====	8" =====	12" =====	16" =====	20" =====	24" =====	28" =====
Top of Stack Level Row C	32"	8.8	8.80	4.25	1.75	1.25	0.25	0.75	0.5	0.0	0.0	0.00	0.00	0.00	0.00	.25	1.0
Mid-Stack Level Row B	22"	11.5	10.75	3.00	2.75	2.75	1.75	1.75	1.50	1.0	0.75	0.75	0.75	0.50	0.25	.25	0.0
Bumper Level Row A	17"	4.25	4.25	4.00	3.75	3.50	3.25	3.00	2.75	2.25	1.75	1.50	1.50	1.25	1.00	.75	.50

* Heights measured above ground level.

** Impact side

APPENDIX A
PHOTOGRAPHIC COVERAGE

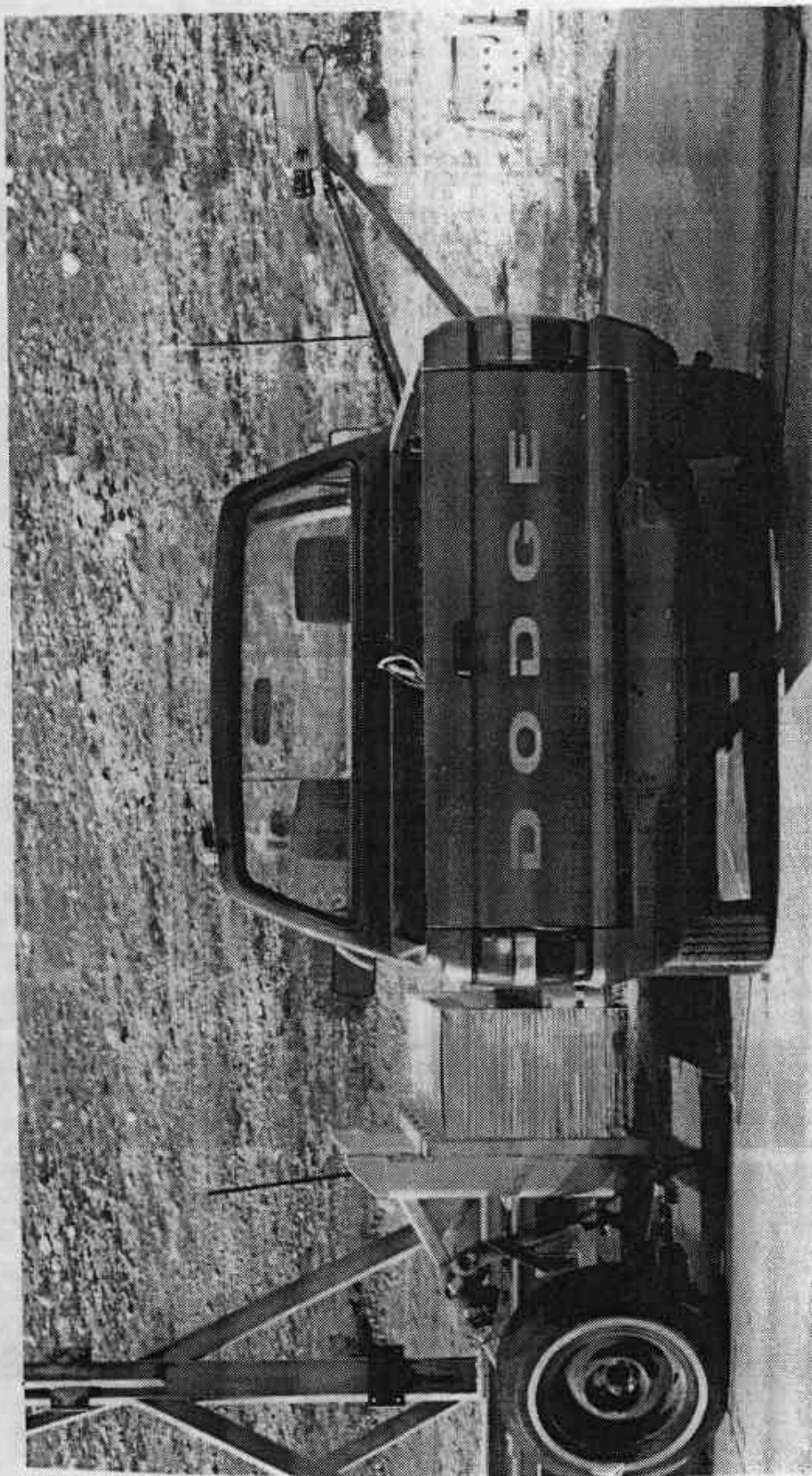


FIGURE A-1 MDB AT TEST VEHICLE, OVERALL VIEW PRETEST

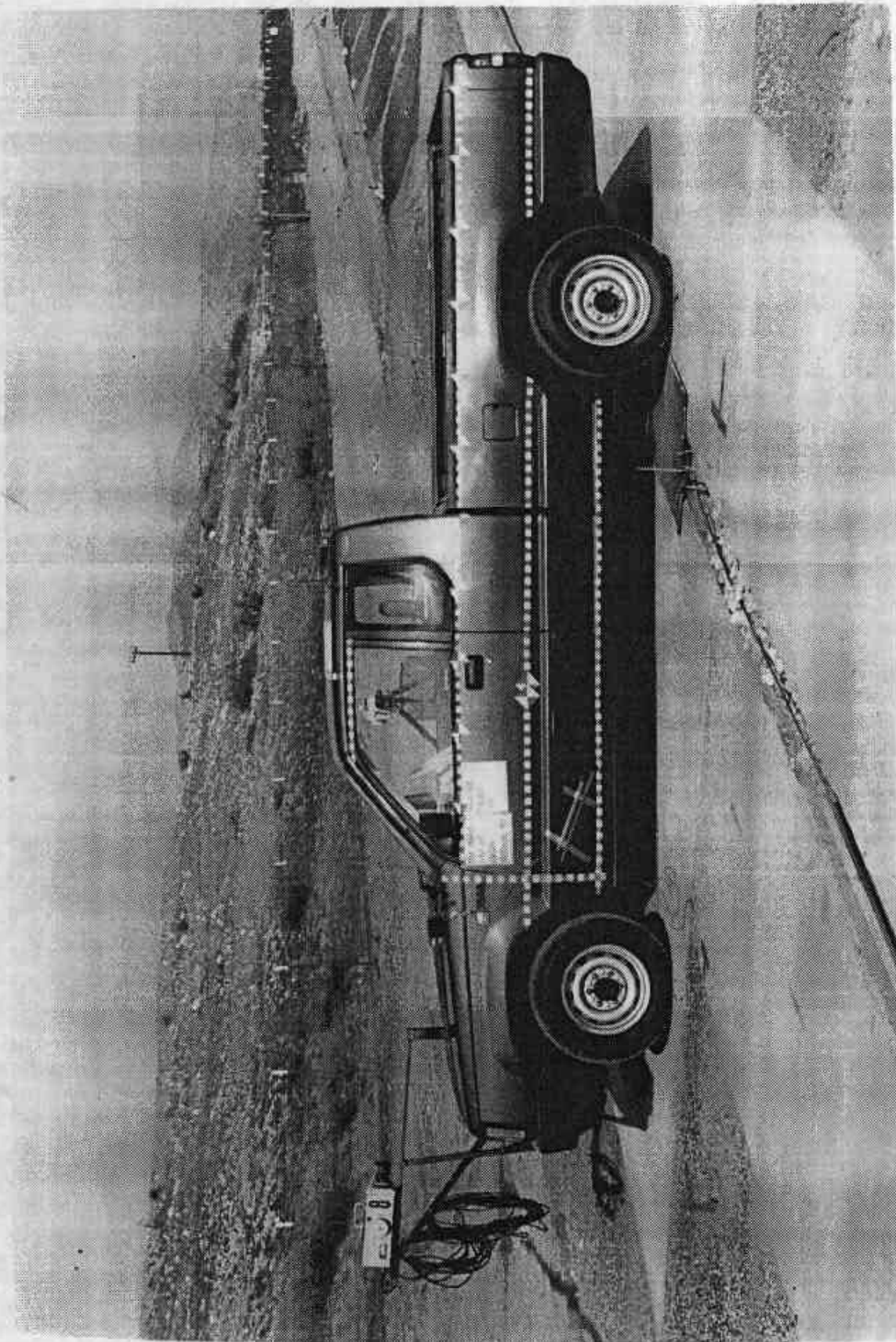


FIGURE A-2 TEST VEHICLE, LEFT SIDE VIEW - PRETEST

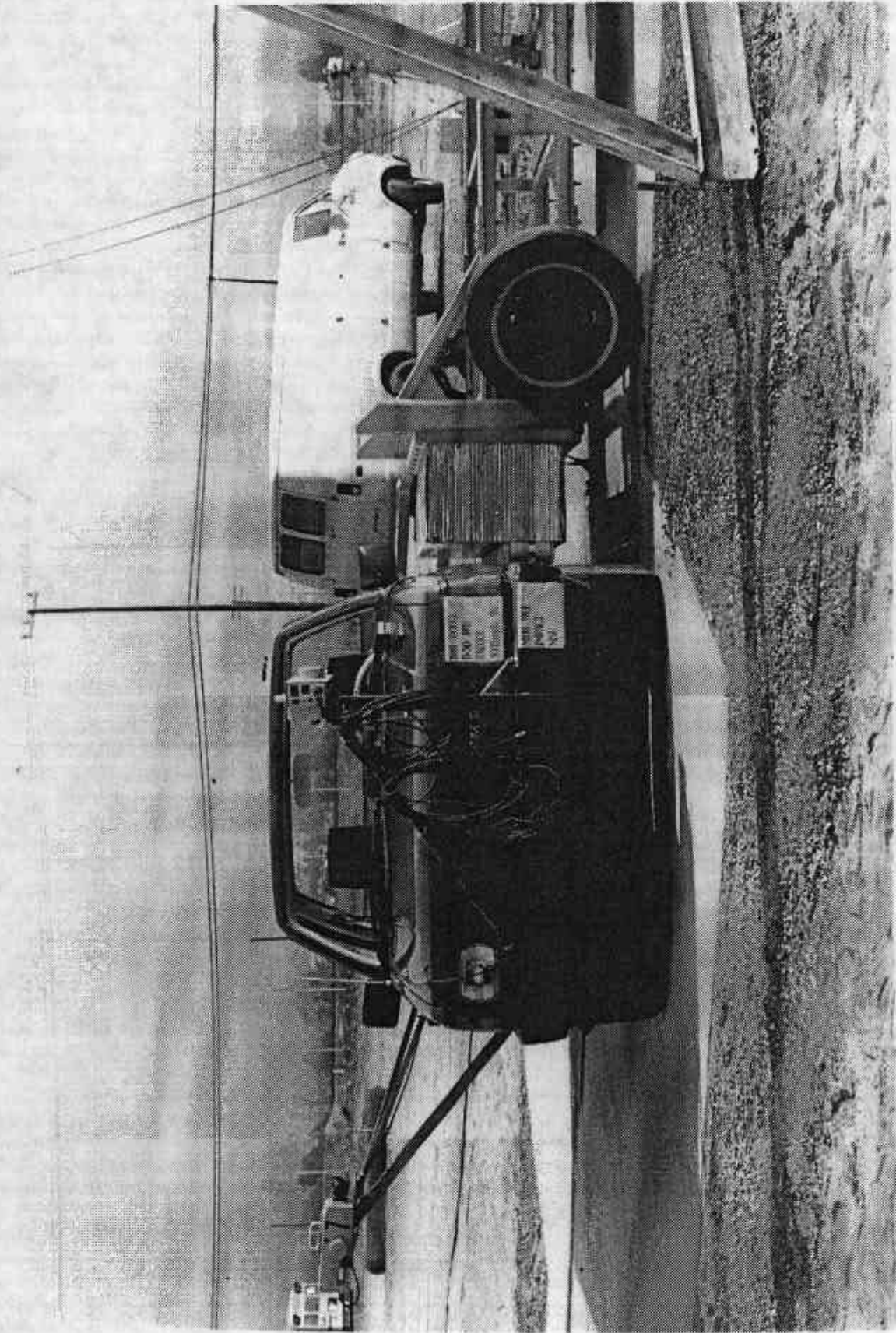


FIGURE A-3 TEST VEHICLE AND MDB, FRONT VIEW - PRETEST

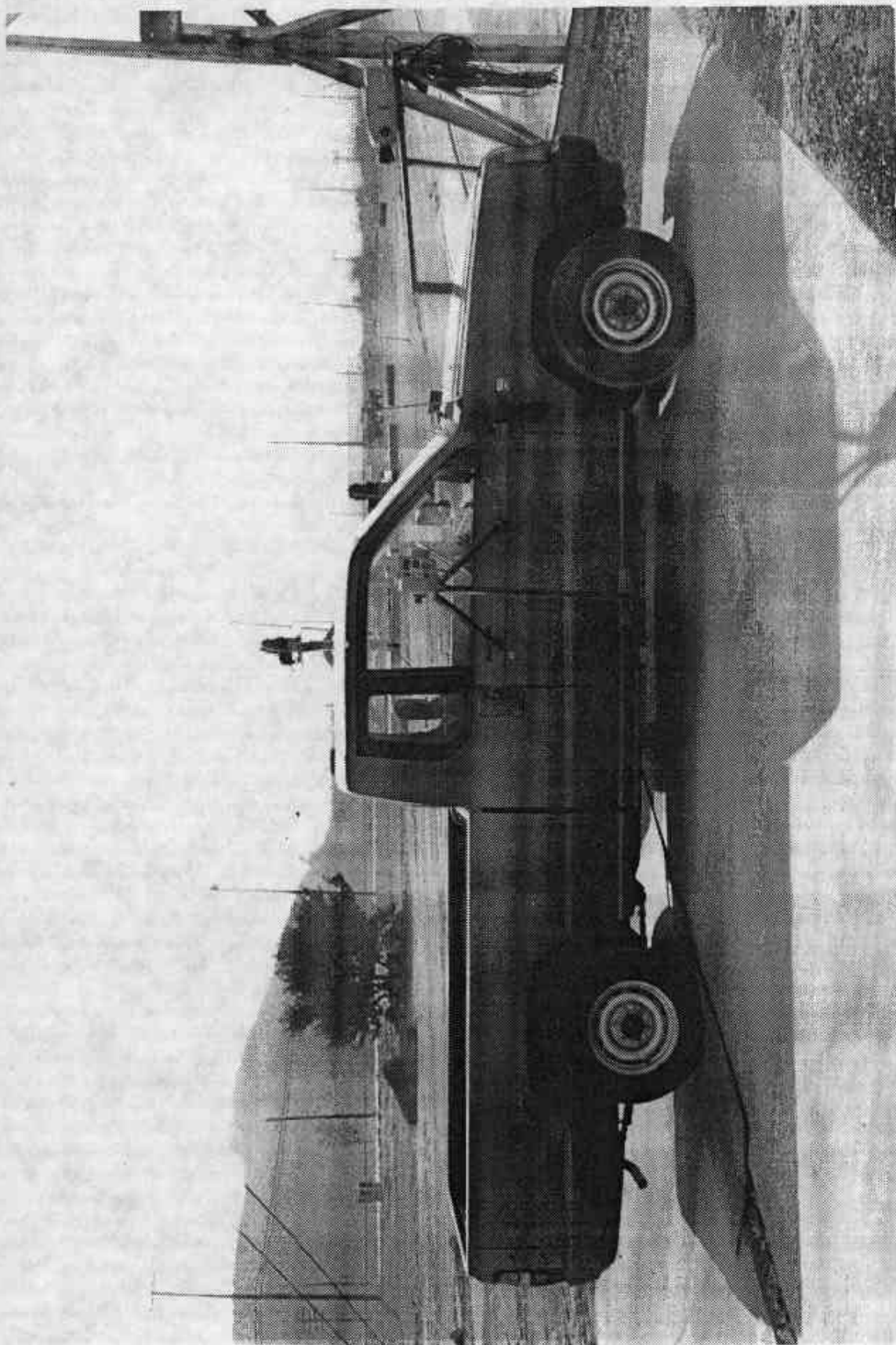


FIGURE A-4 TEST VEHICLE, RIGHT SIDE VIEW - PRETEST

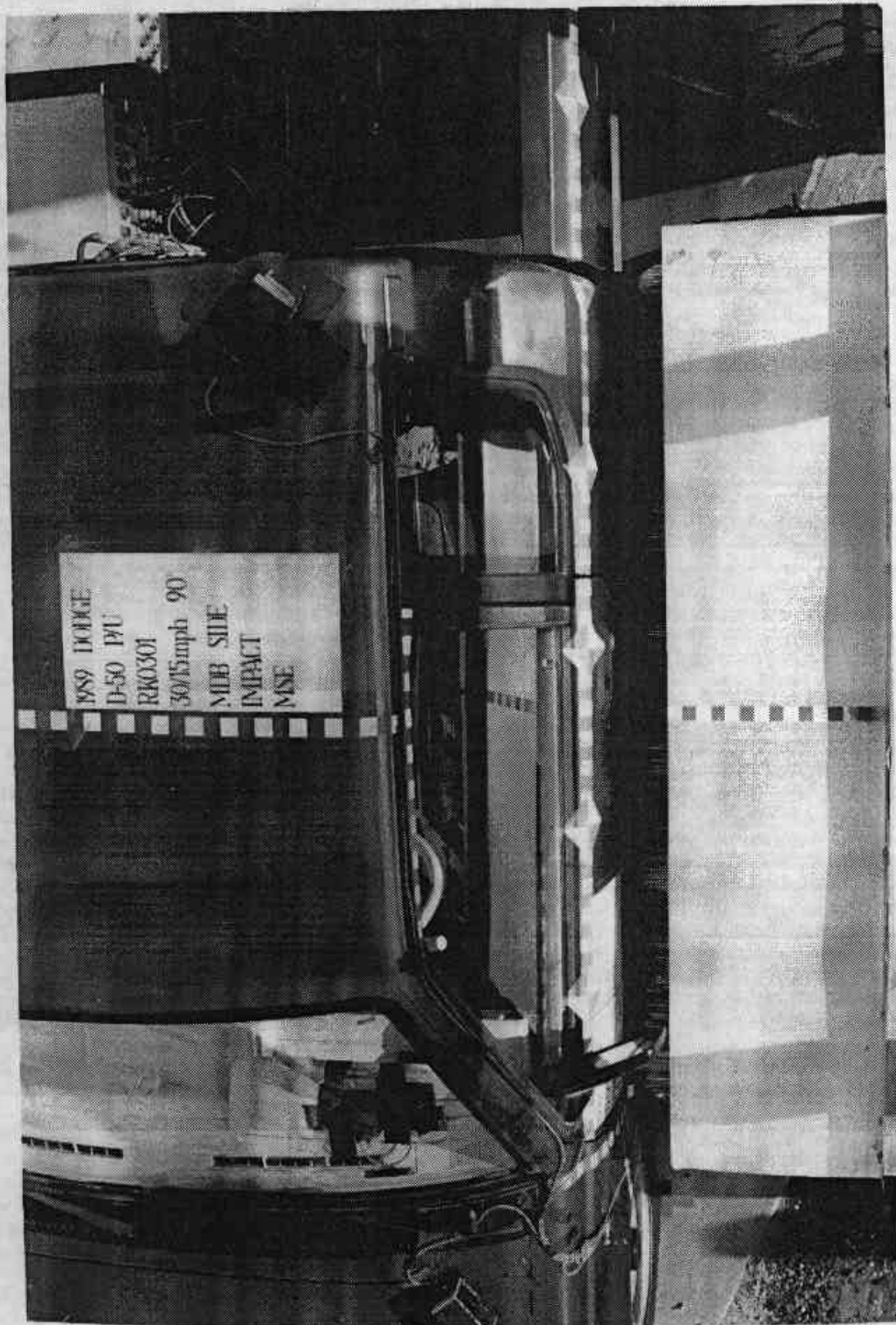


FIGURE A-5 TEST VEHICLE AND MDB, OVERHEAD VIEW - PRETEST



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



FIGURE A-7 SID IN DRIVER POSITION, PRETEST

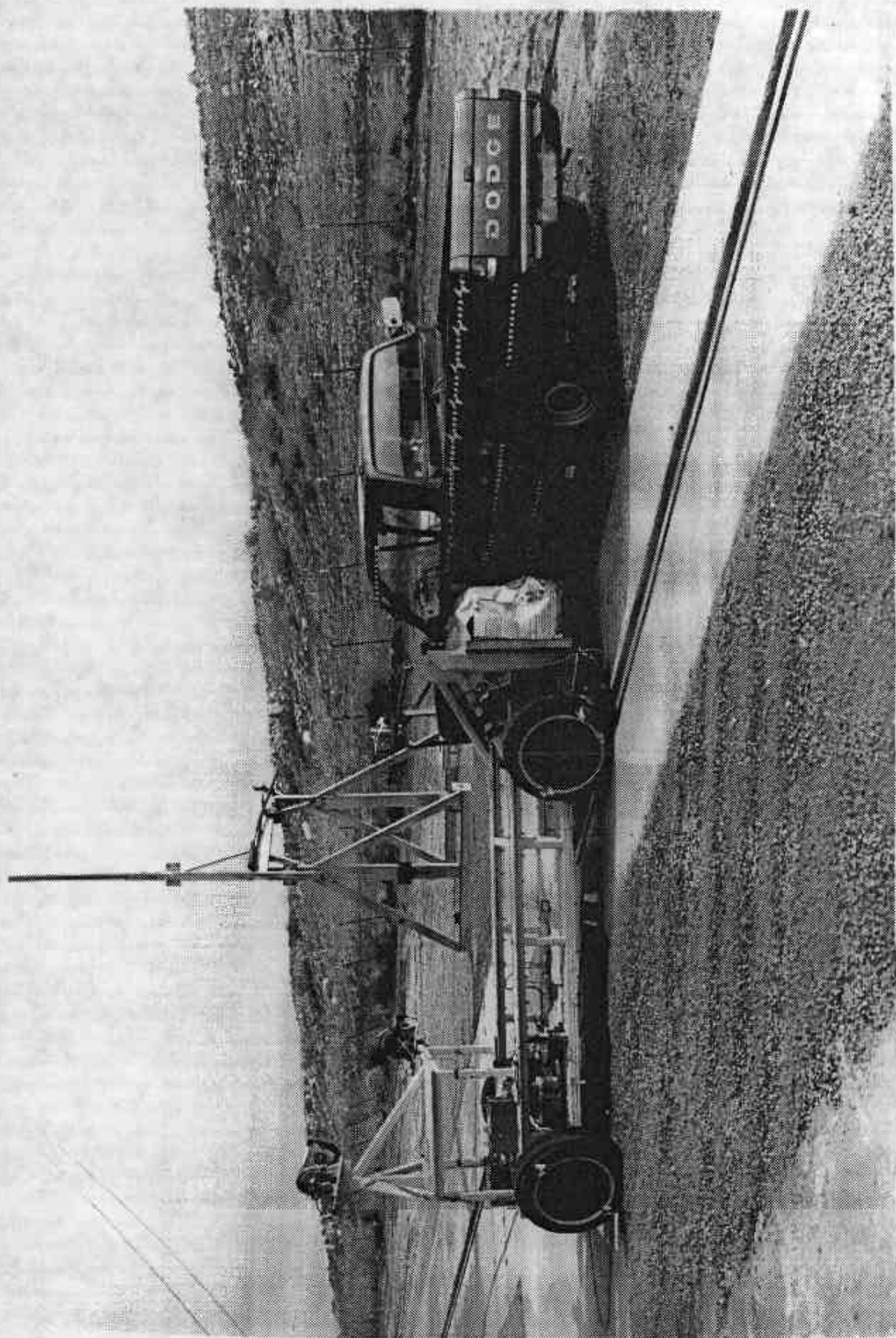


FIGURE A-8 MDB AND TEST VEHICLE, OVERALL VIEW - POSTTEST

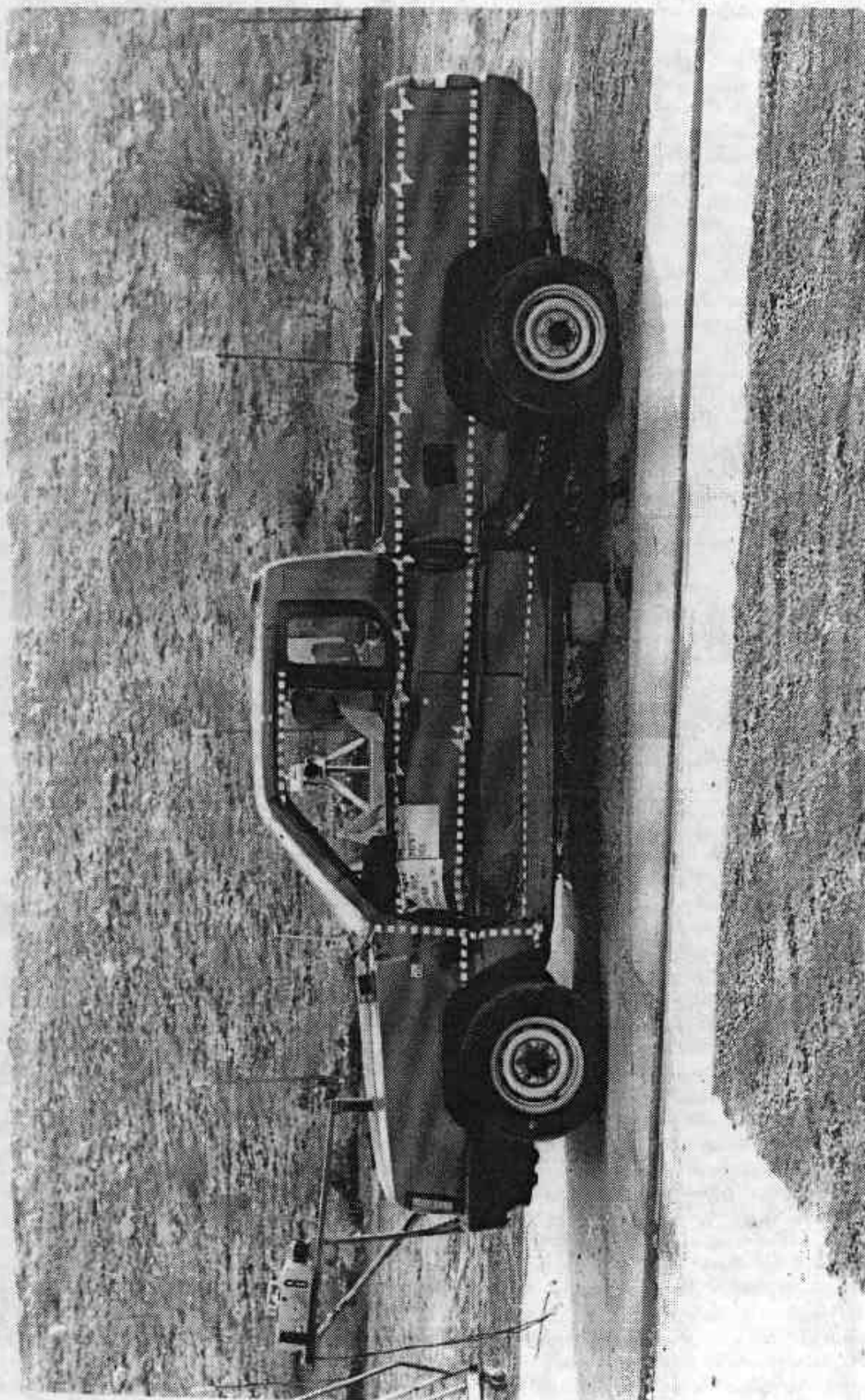


FIGURE A-9 TEST VEHICLE, LEFT SIDE VIEW - POSTTEST

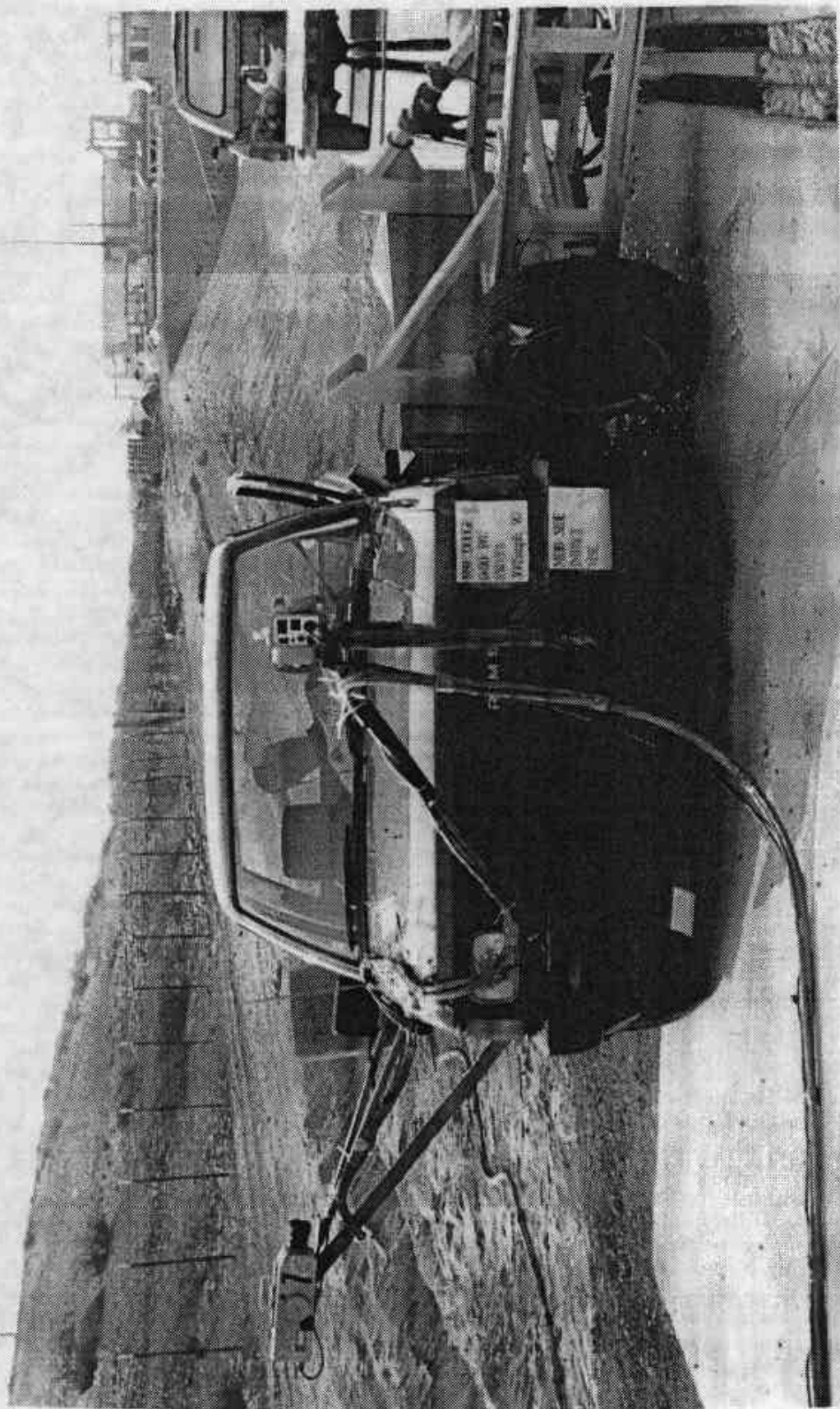


FIGURE A-10 TEST VEHICLE AND MDB, FRONT VIEW - POSTTEST

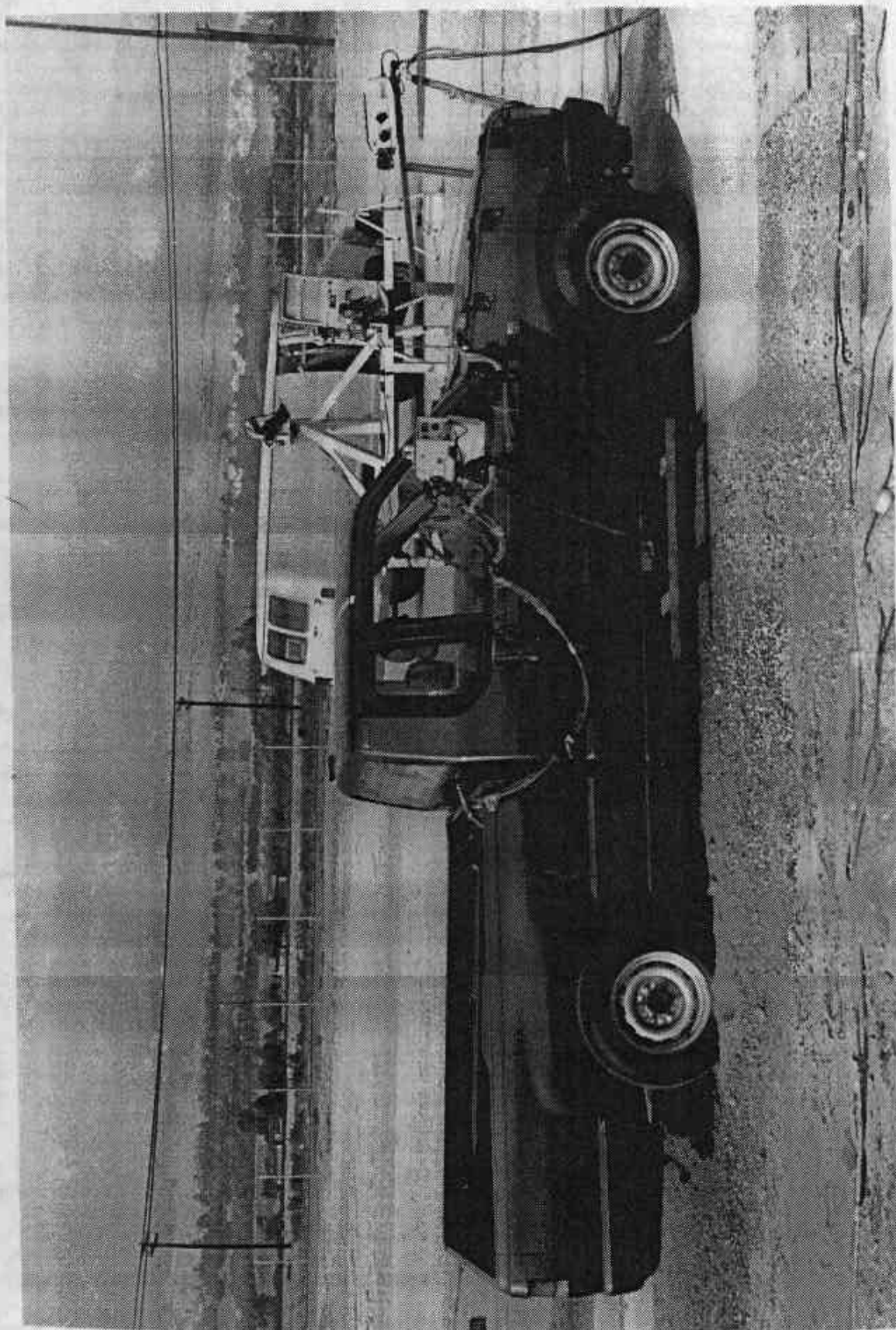


FIGURE A-11 TEST VEHICLE, RIGHT SIDE VIEW - POSTTEST

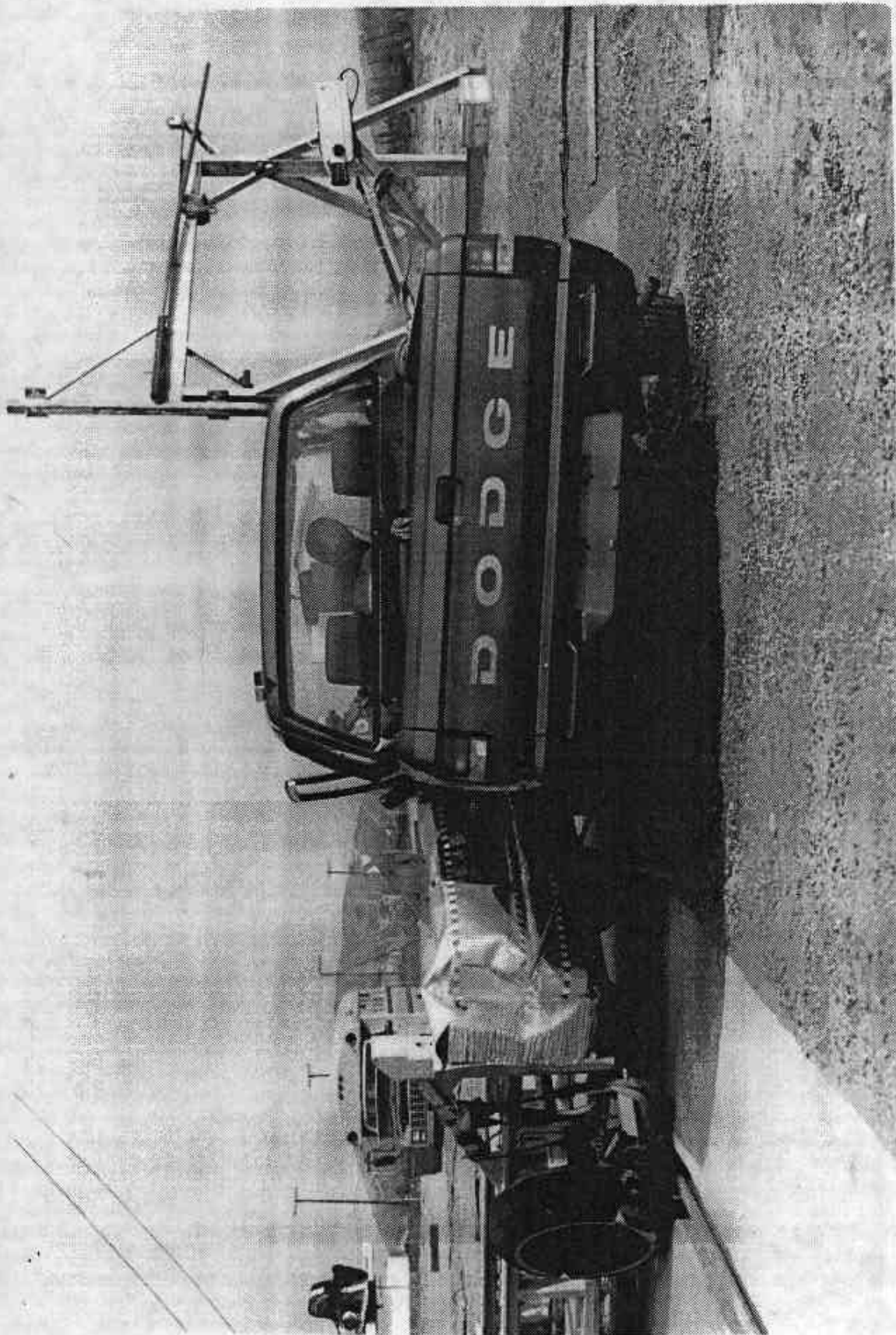


FIGURE A-12 MDB AND TEST VEHICLE, REAR VIEW - POSTTEST



FIGURE A-13 SID FINAL POSITION - POSTTEST

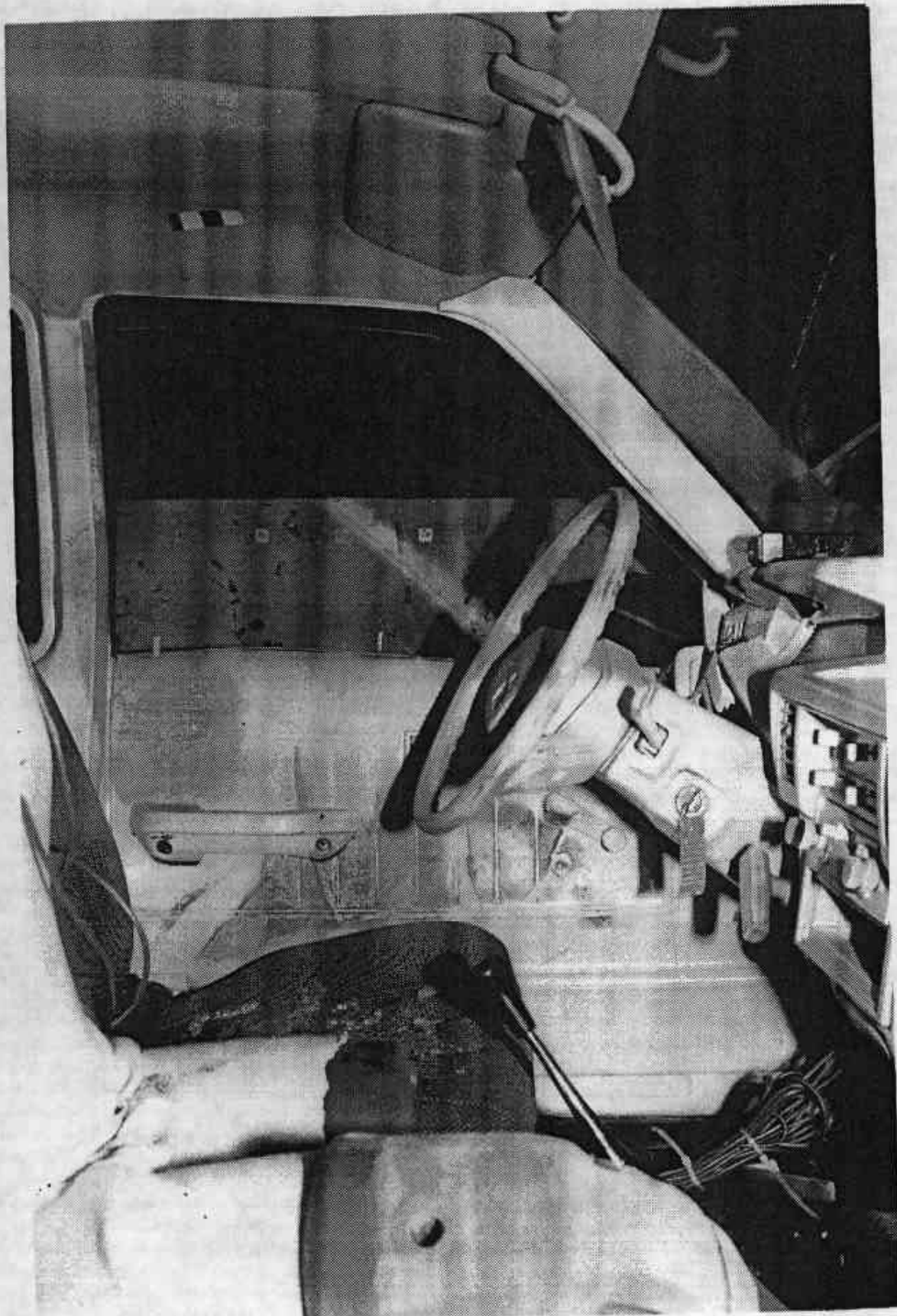


FIGURE A-14 OCCUPANT COMPARTMENT INTERIOR - POSTTEST

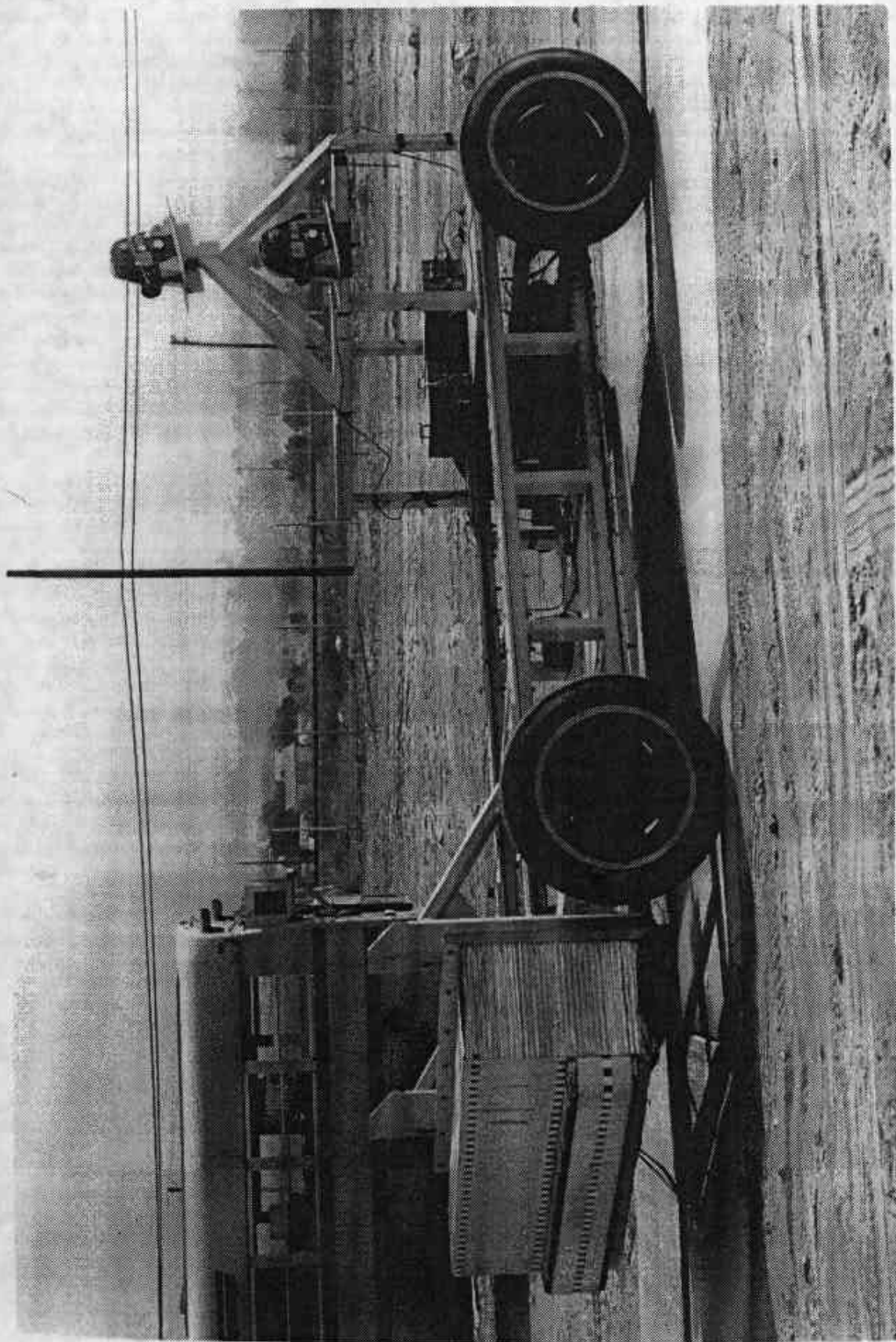


FIGURE A-15 MDB, VIEW NO. 1 - PRETEST

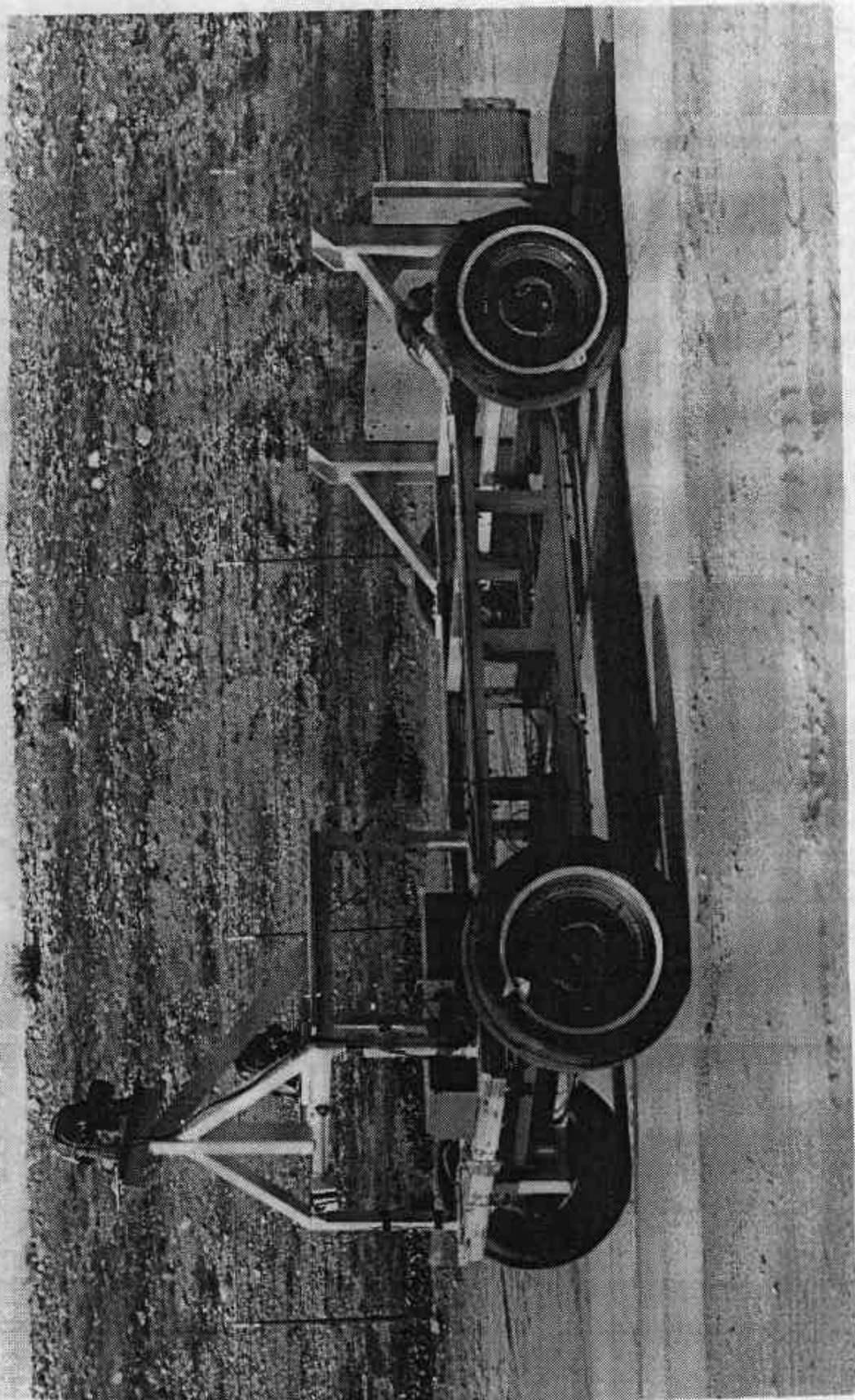


FIGURE A-16 MDB, VIEW NO. 2 - PRETEST

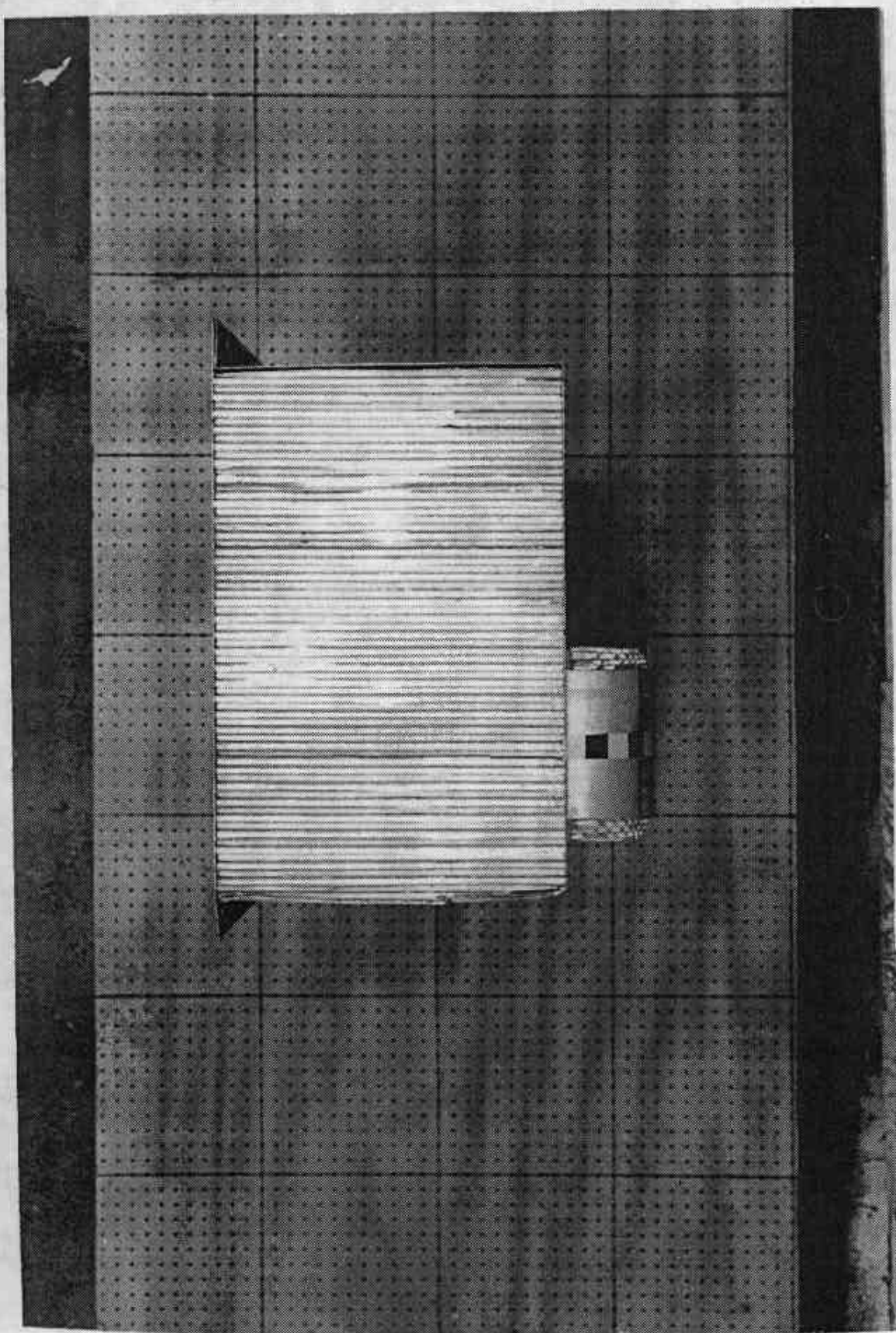


FIGURE A-17 MDB FACE, VIEW NO. 1 - PRETEST

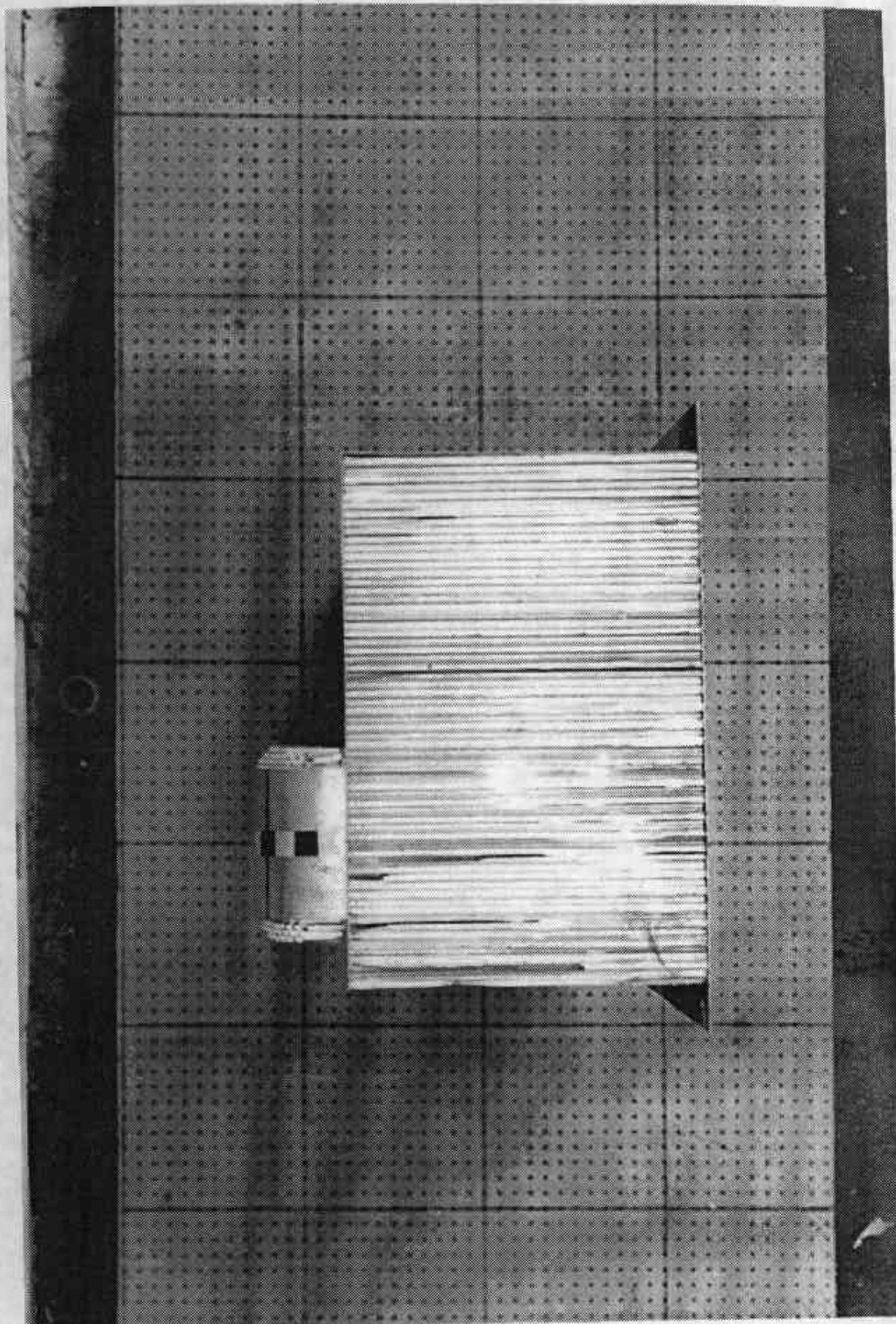


FIGURE A-18 MDB FACE, VIEW NO. 2 - PRETEST

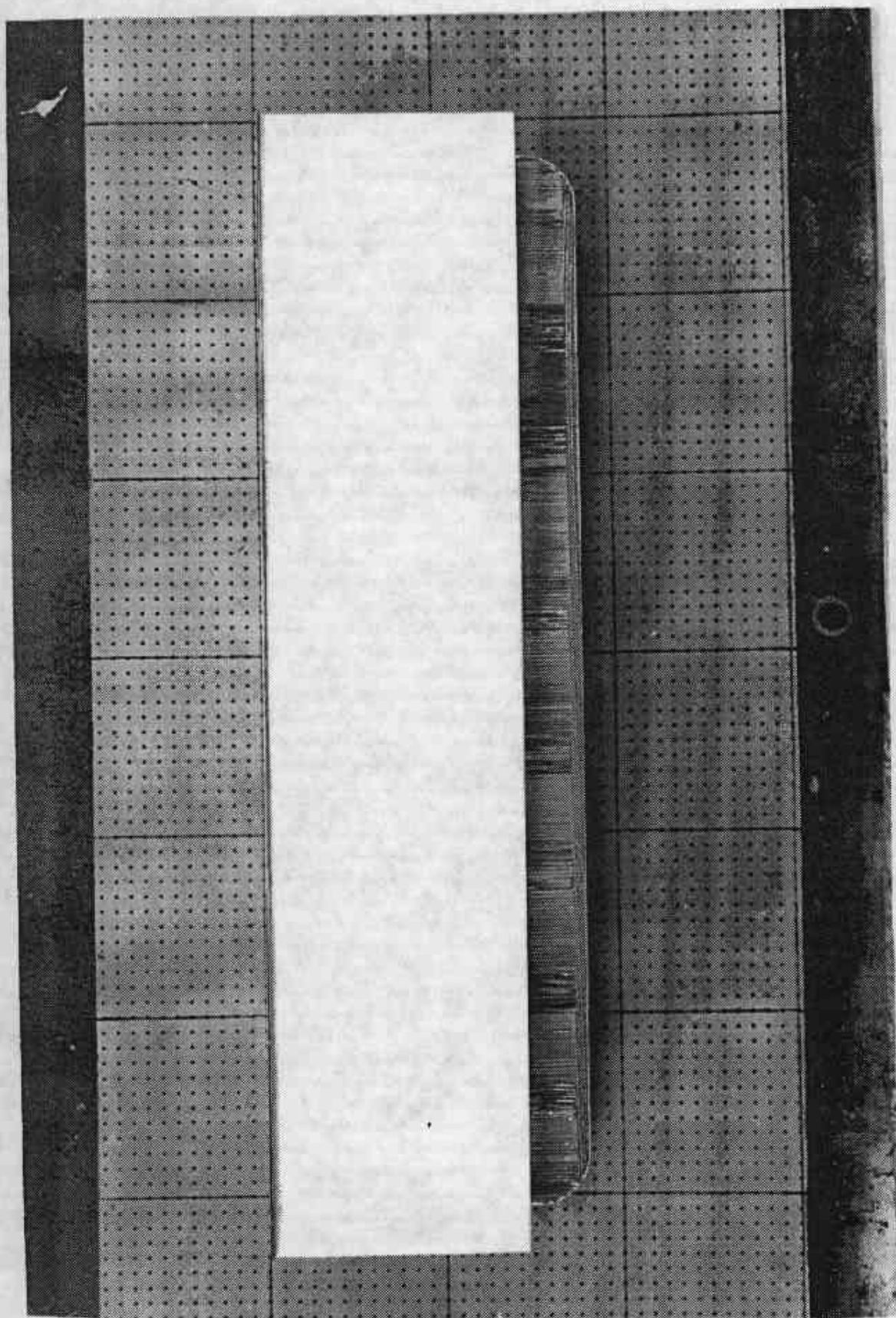


FIGURE A-19 MDB FACE, VIEW NO. 3 - PRETEST

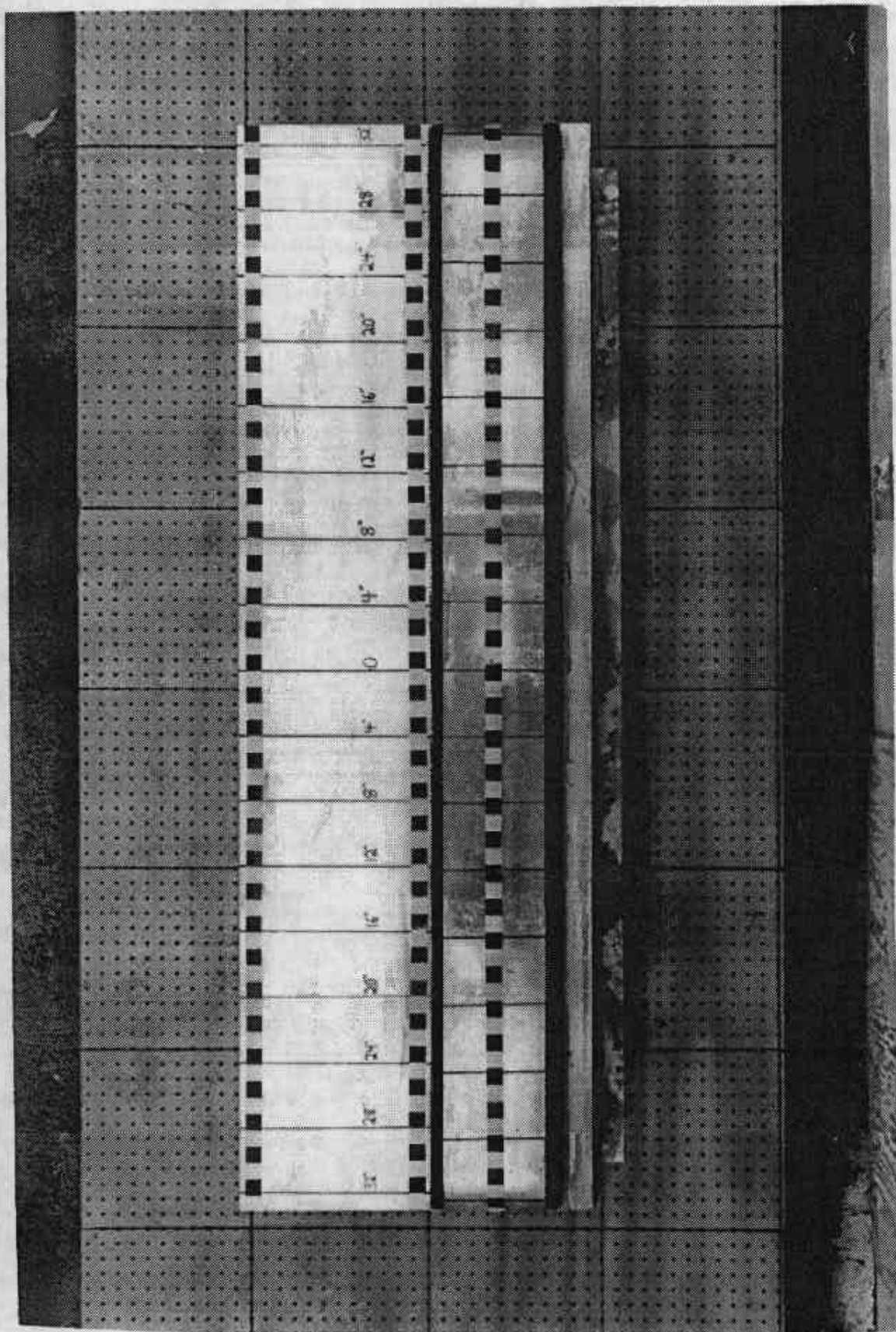


FIGURE A-20 MDB FACE, VIEW NO. 4 - PRETTY

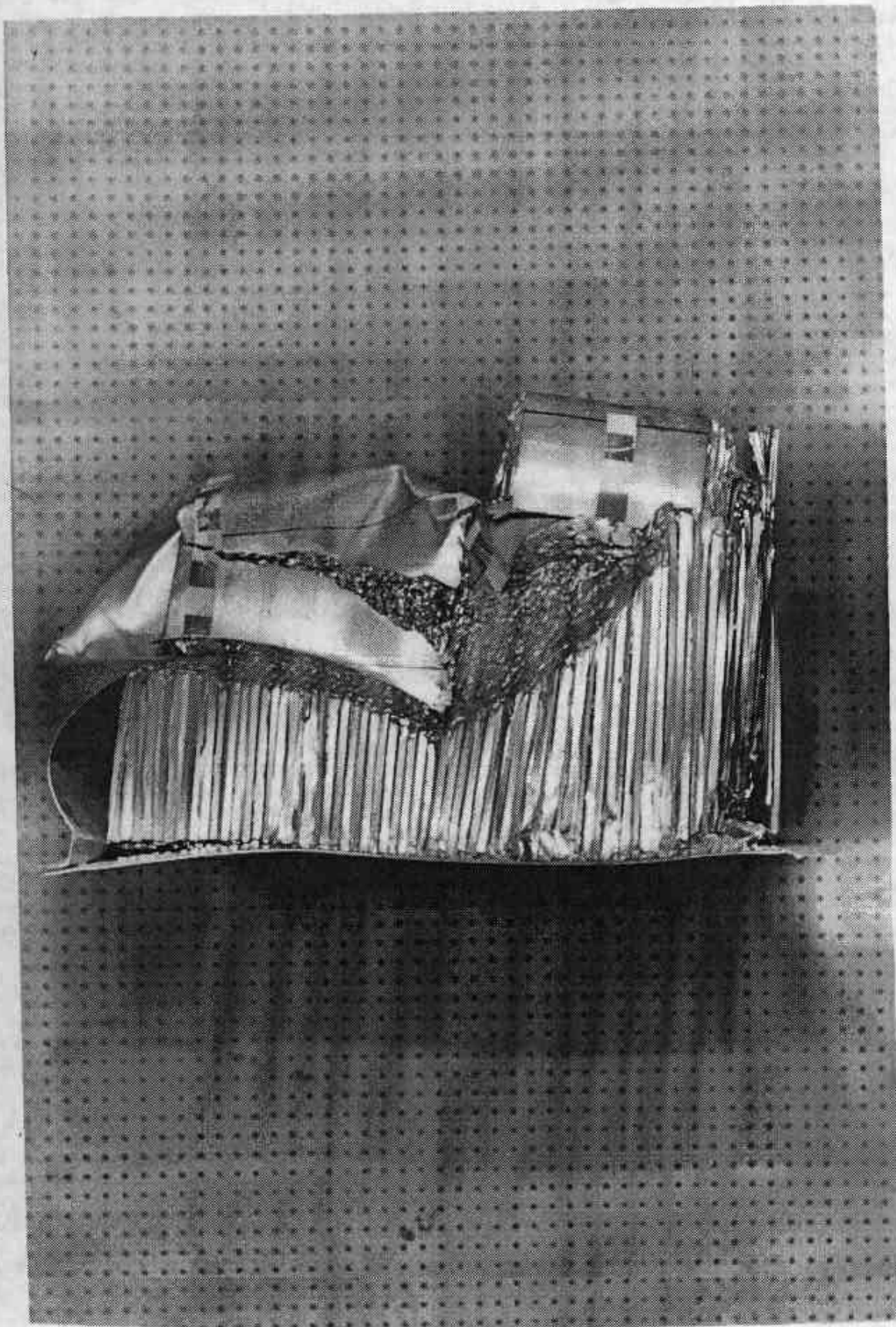


FIGURE A-21 MDB FACE, VIEW NO. 1 - POSTTEST

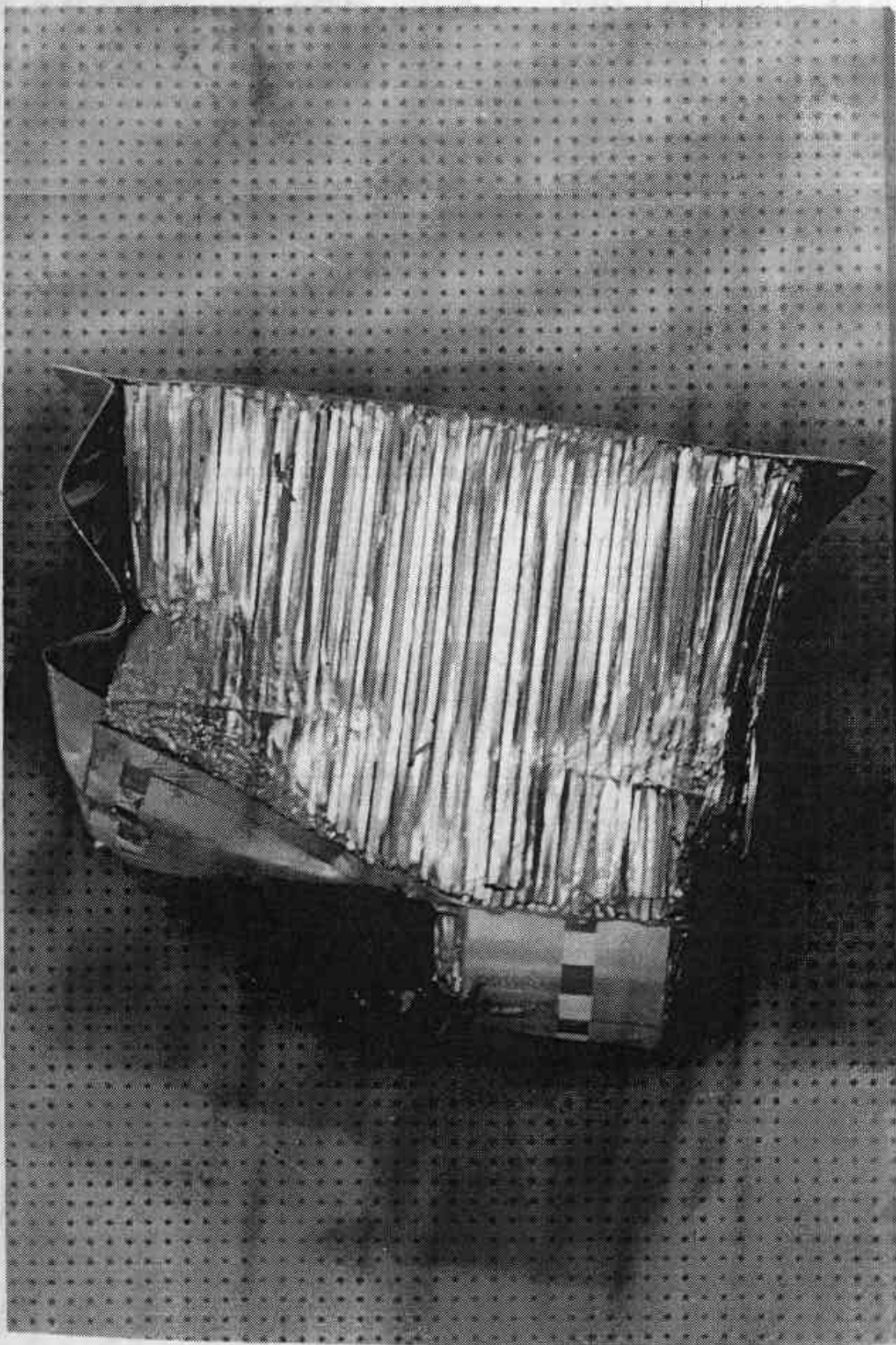


FIGURE A-22 MDB FACE, VIEW NO. 2 - POSTTEST

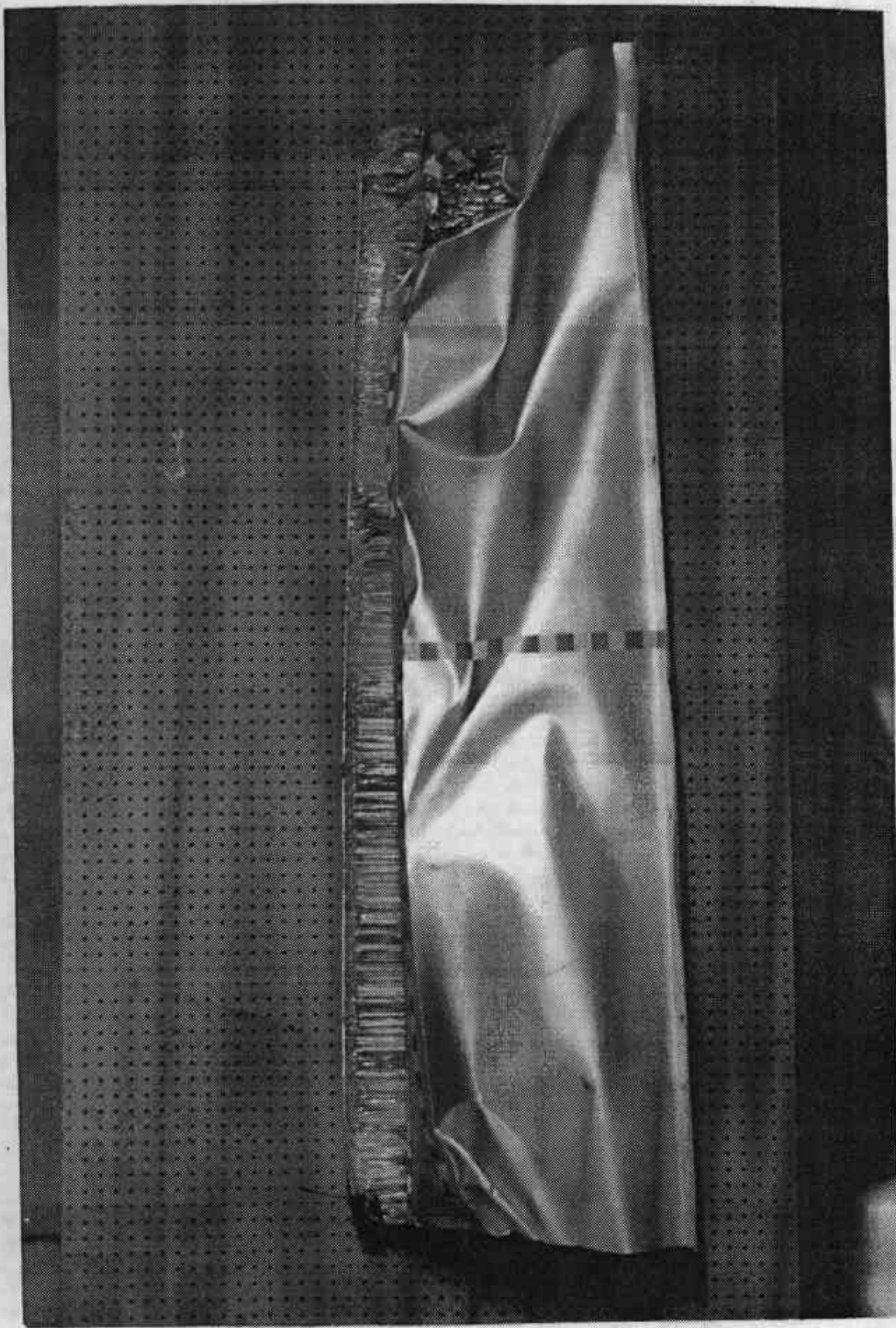


FIGURE A-23 MDB FACE, VIEW NO. 3 - POSTTEST

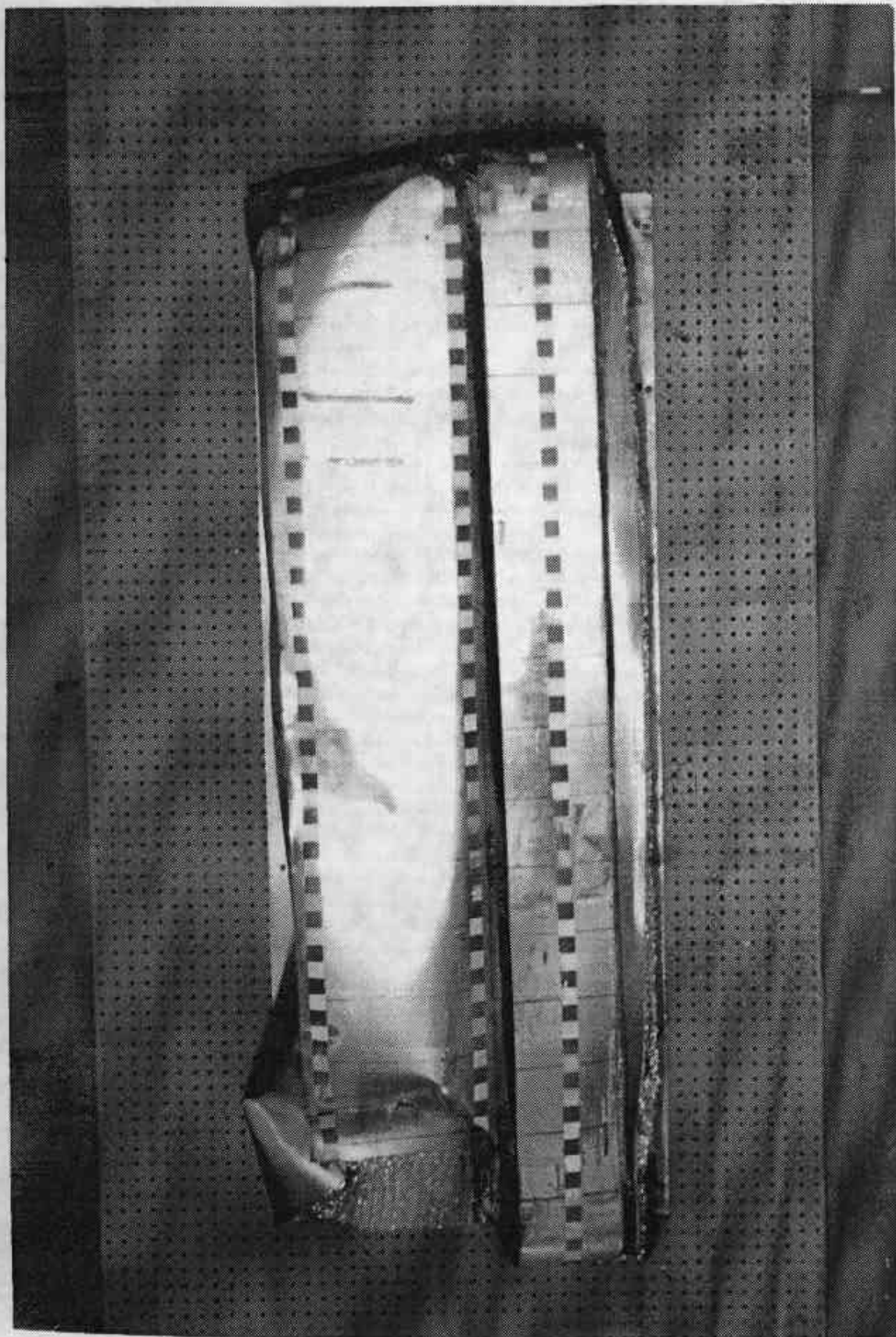
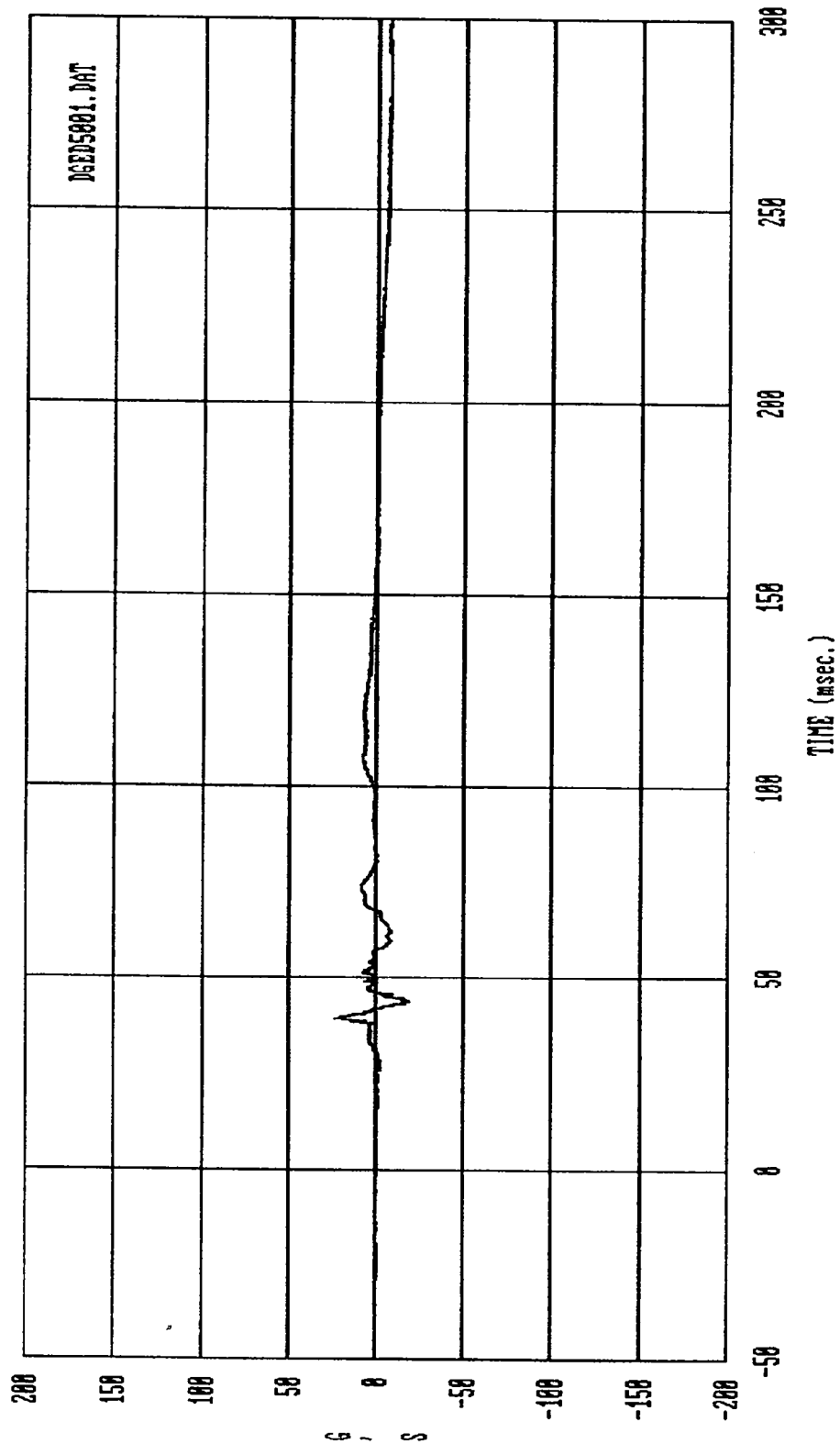


FIGURE A-24 MDB FACE, VIEW NO. 4 - POSTTEST

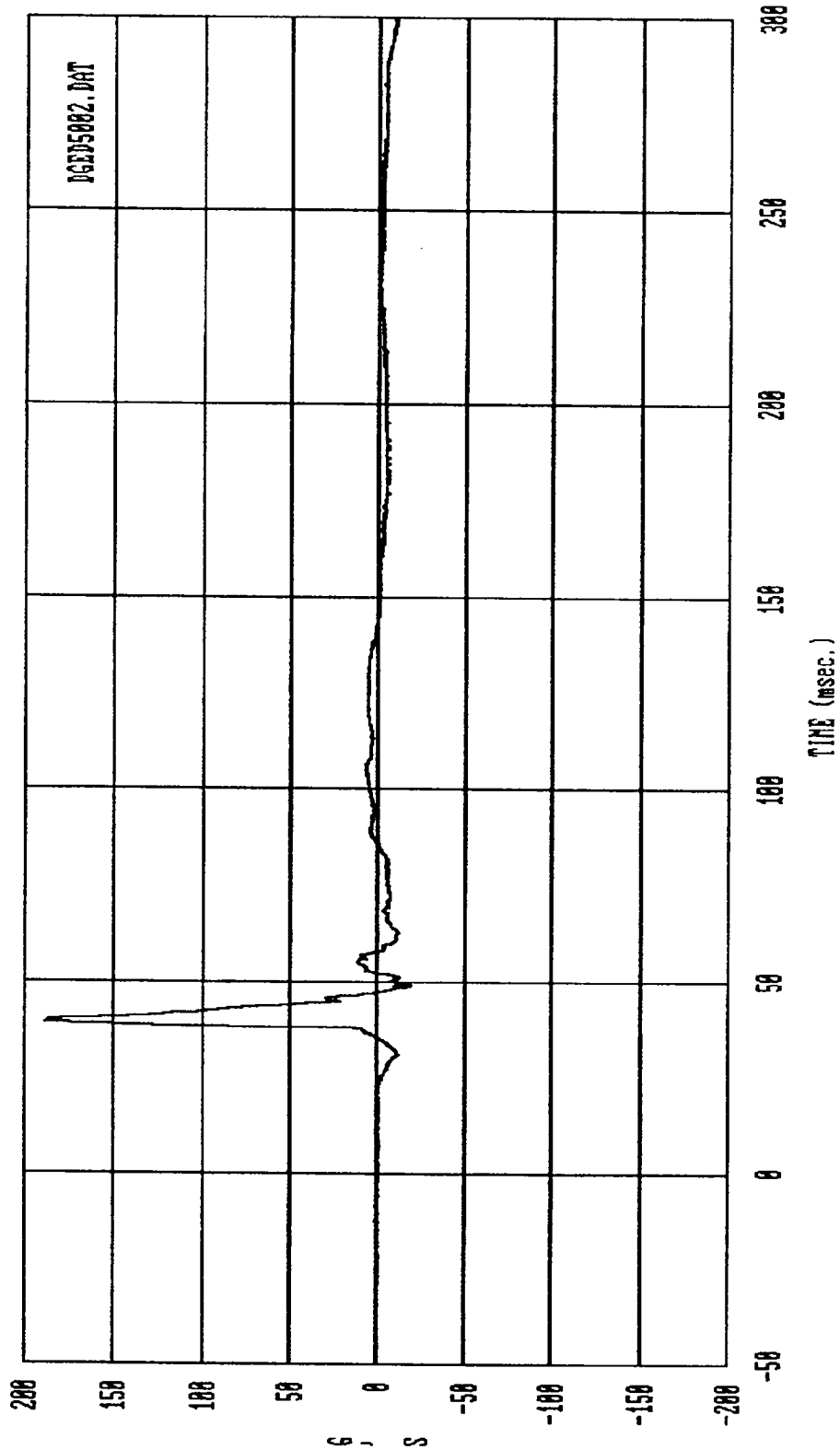
APPENDIX B

DATA PLOTS



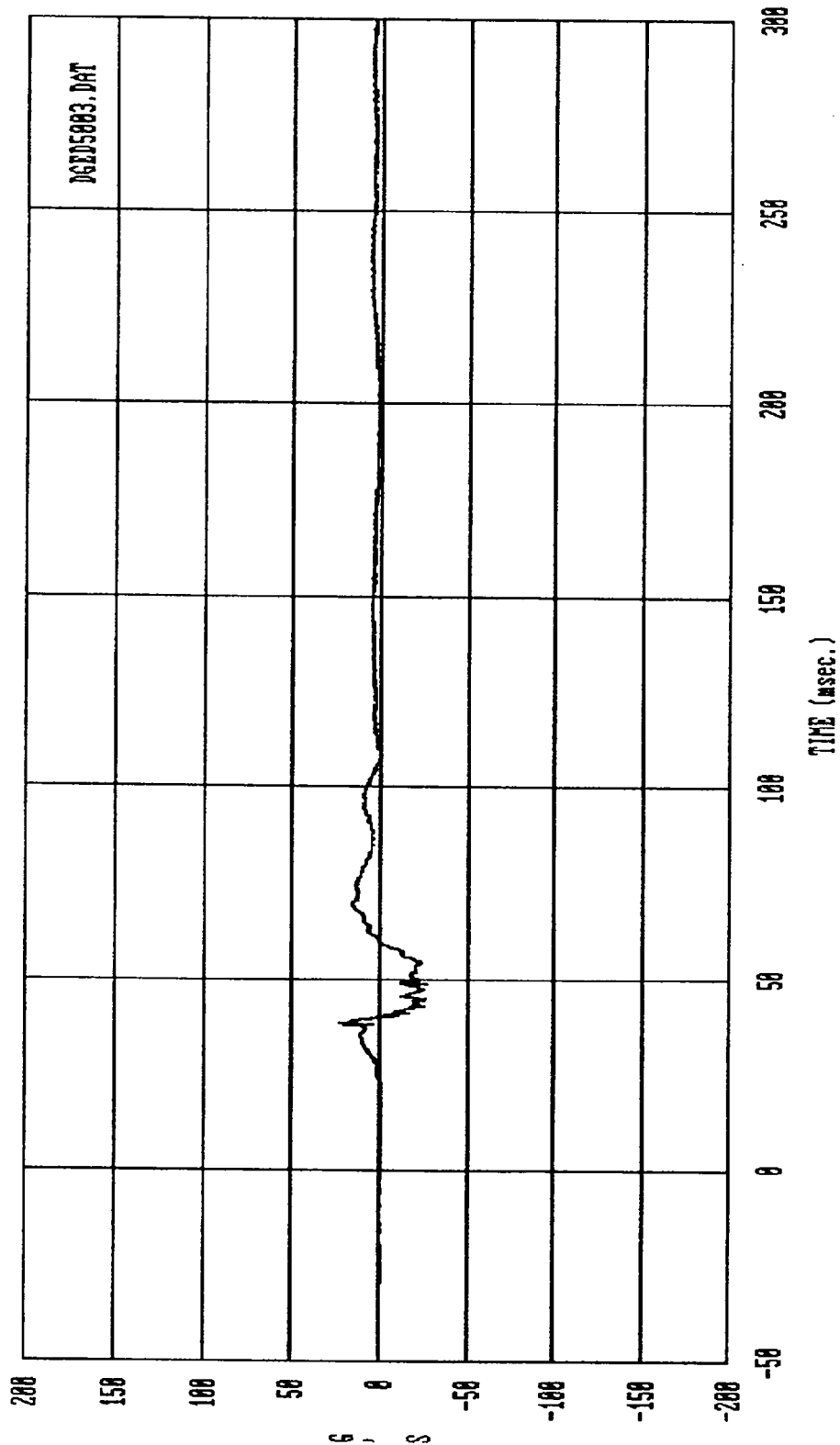
Curve: Driver Head acceleration -- X axis Filter: SAE CLASS 1000 Max = 23.963 Min = -18.828

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

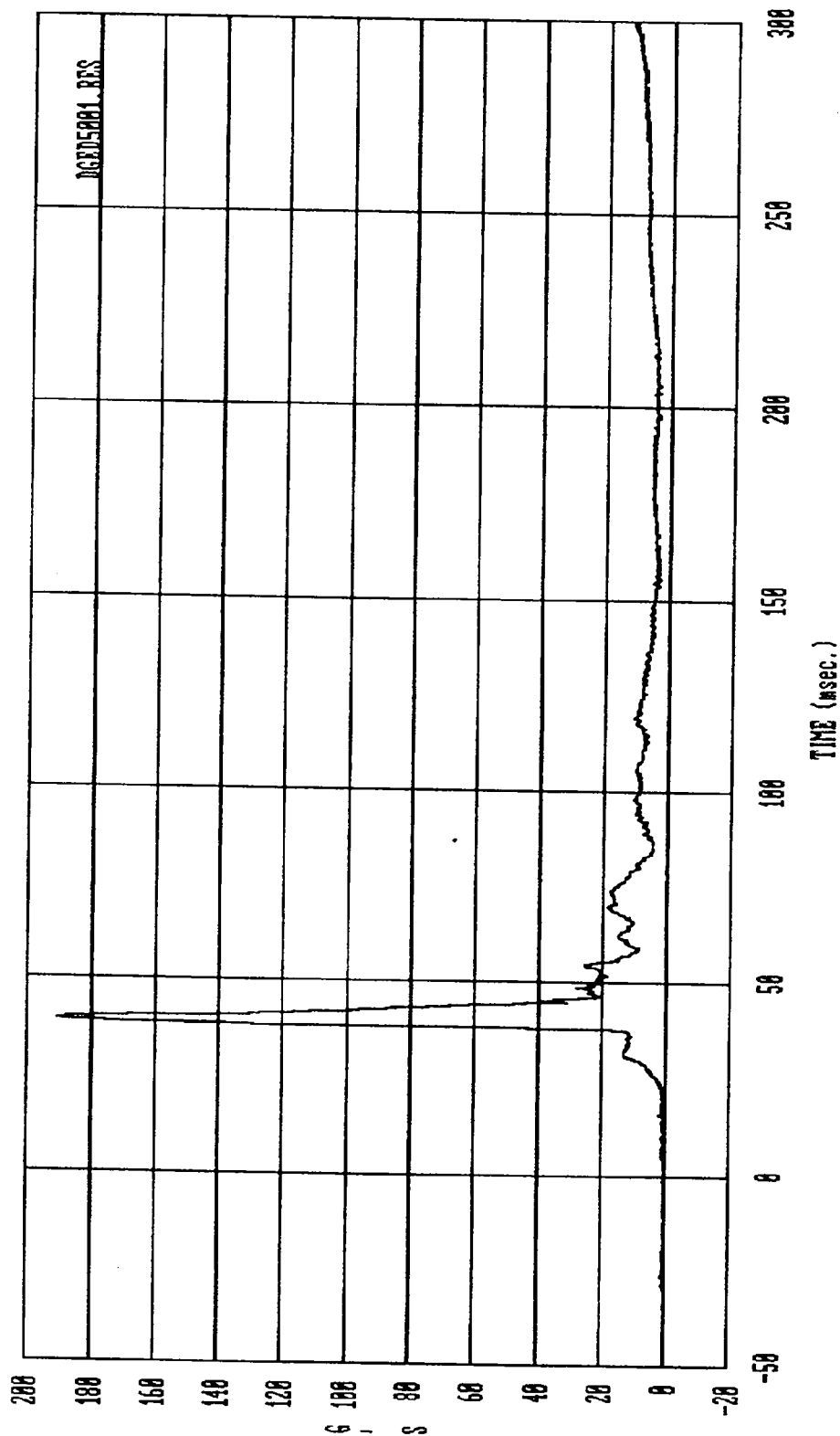


Curve: Driver Head acceleration -- Y axis Filter: SAE CLASS 1000 Max = 188.86 Min = -19.859

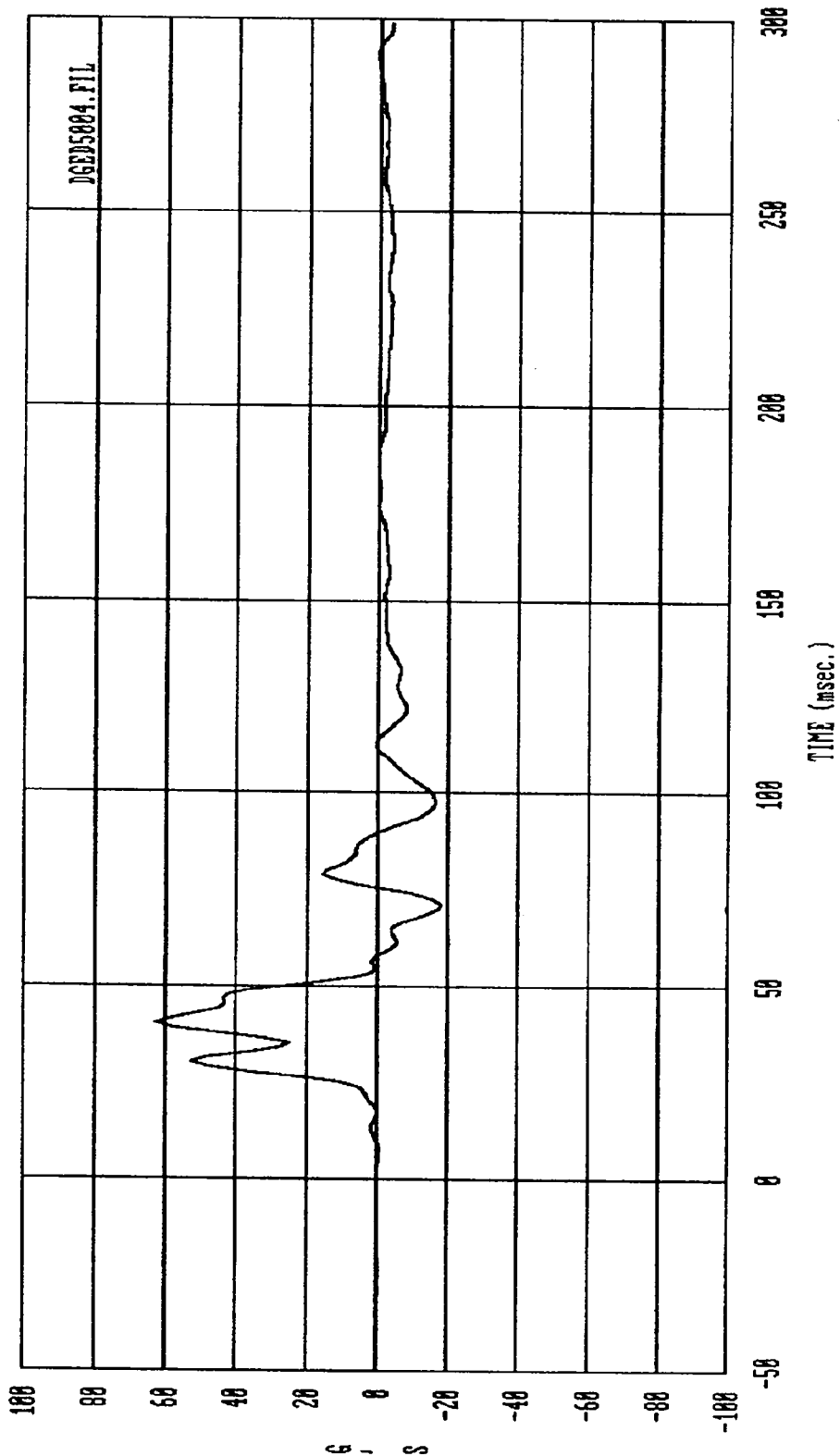
MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



Curve: Driver Head acceleration - Z axis Filter: SAE CLASS 1000 Max = 23.781 Min = -28.501
 MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



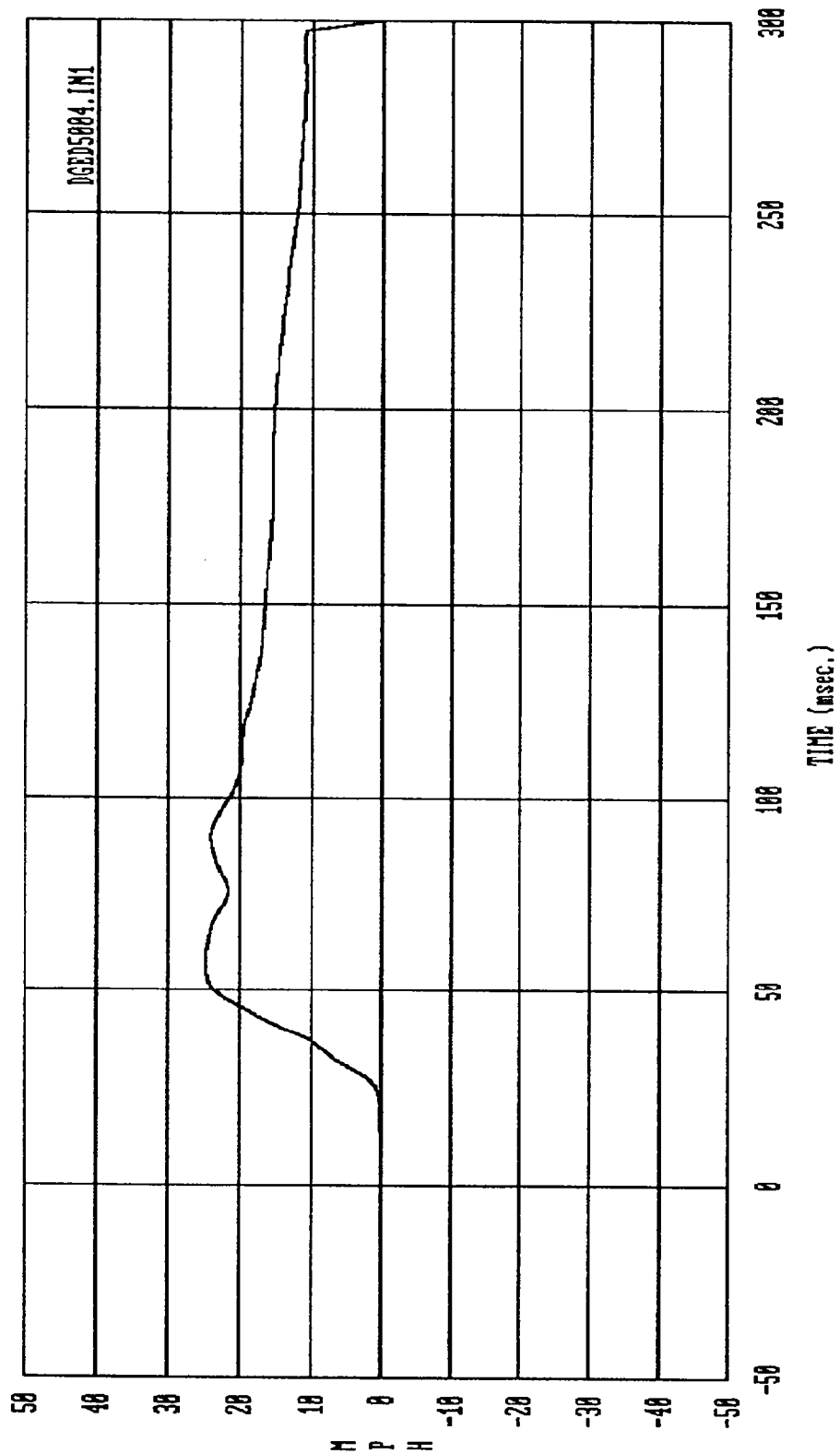
Curve: Driver Head resultant acceleration Filter: SAE CLASS 1000 Max = 190.63 Min = .18153
 MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1991 Dodge D-50 Pickup



B-5

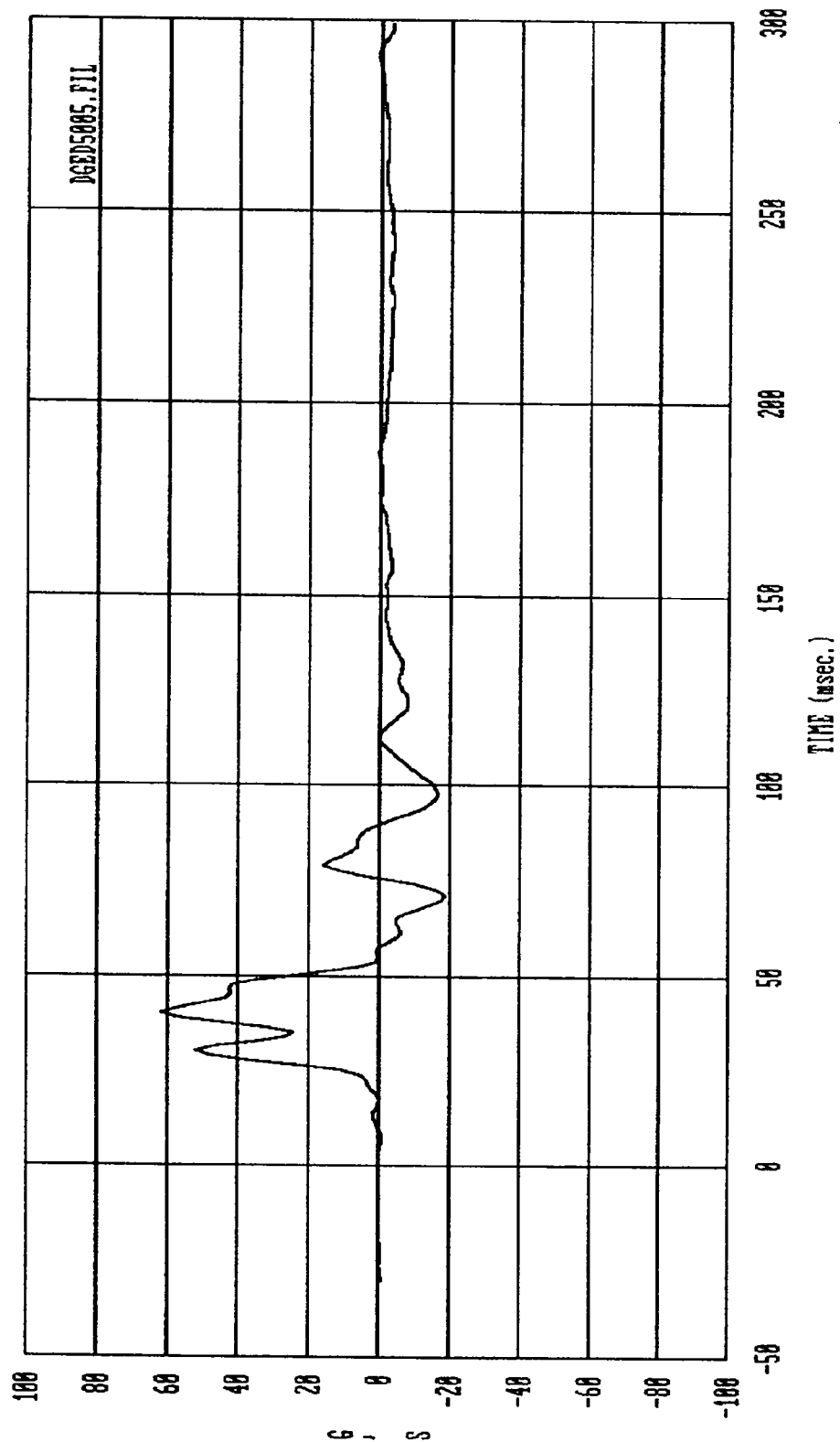
Curve: Driver Upper Spine 1 acceleration -- Primary Filter: FIR 100 Max = 62.716 Min = -18.301

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



Curve: Driver Upper Spine 1 delta V -- Primary Filter: FIR 100 Max = 24.798 Min = -.259782-01

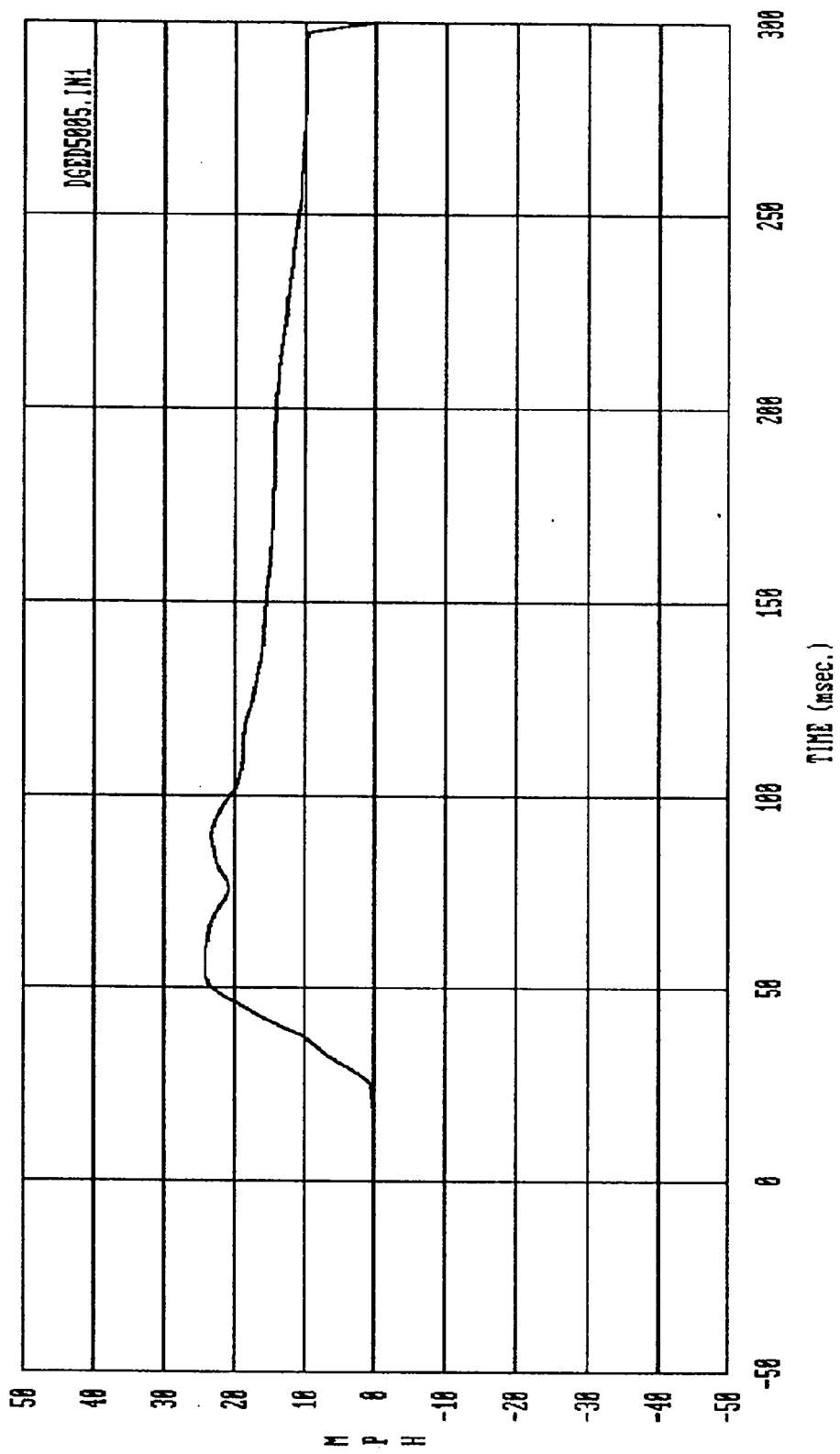
MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



B-7

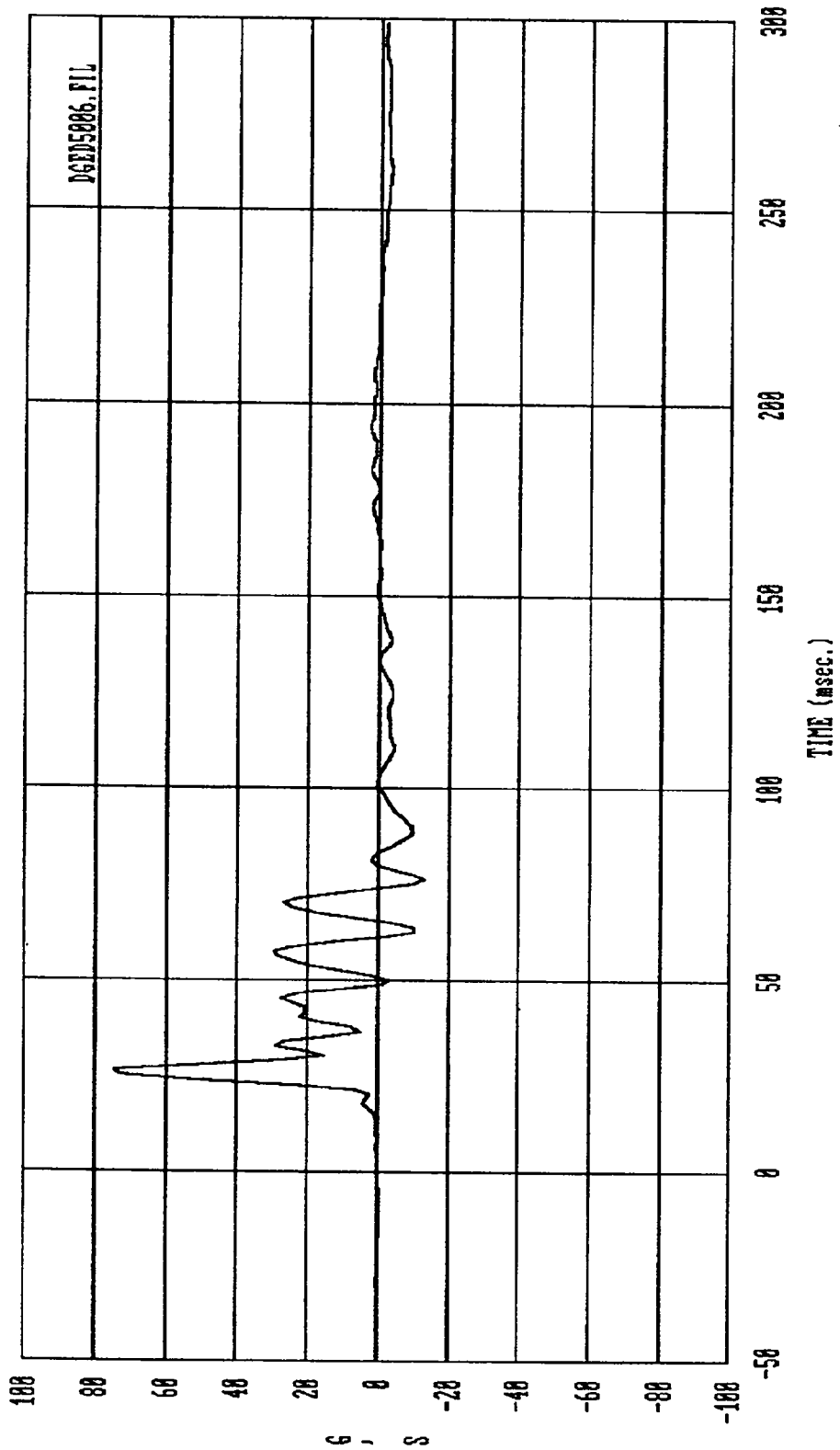
Curve: Driver Upper Spine 2 acceleration -- Redundant Filter: FIR 100 Max = 61.915 Min = -18.684

HSE Date: 89/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



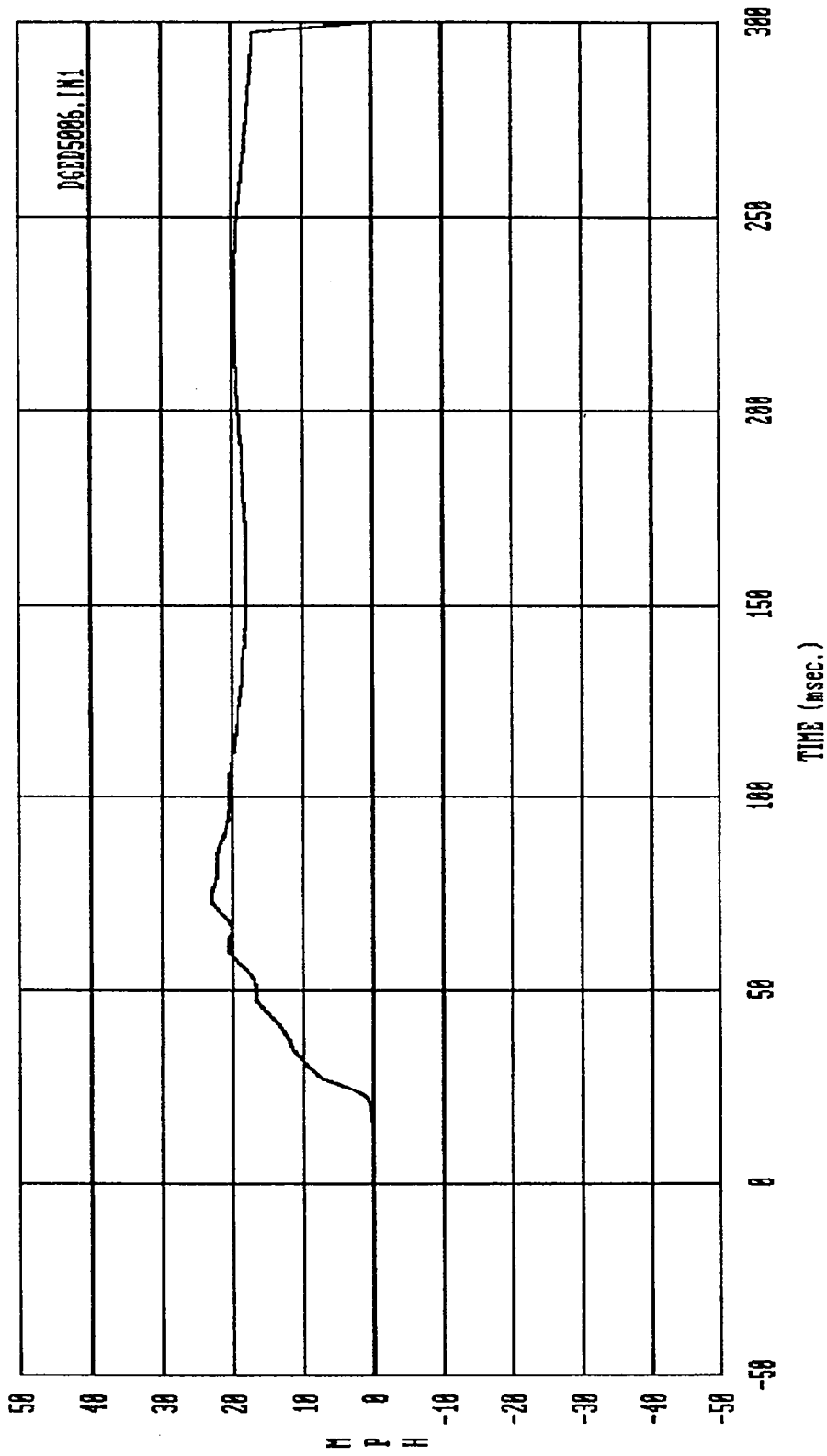
Curve: Driver Upper Spine 2 delta V -- Redundant Filter: FIR 100 Max = 24.259 Min = -.46533E-01

HSE Date: 89/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

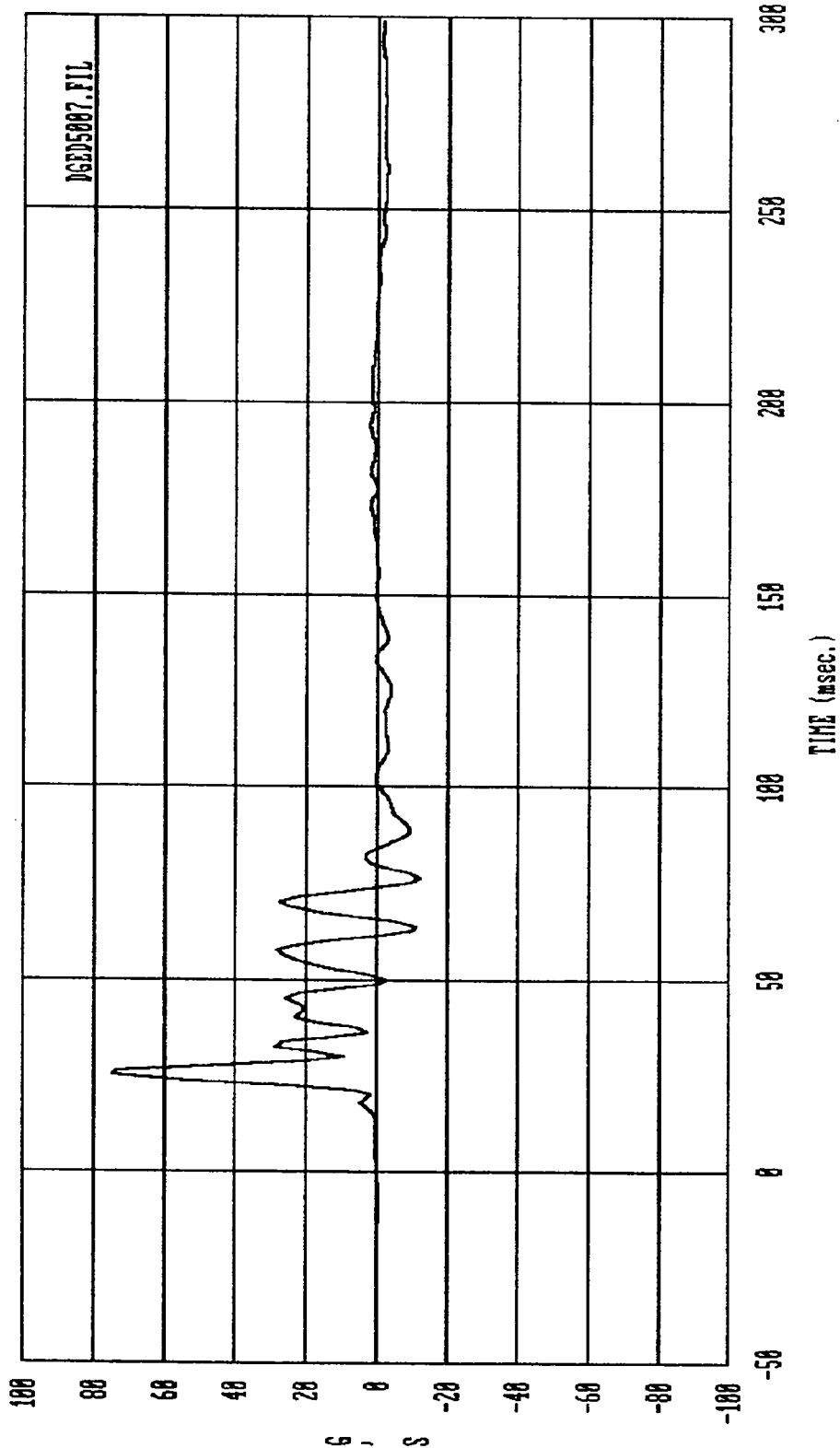


B-9

Curve: Driver Upper Rib 1 acceleration -- Primary Filter: FIR 100 Max = 77.237 Min = -13.076
 MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

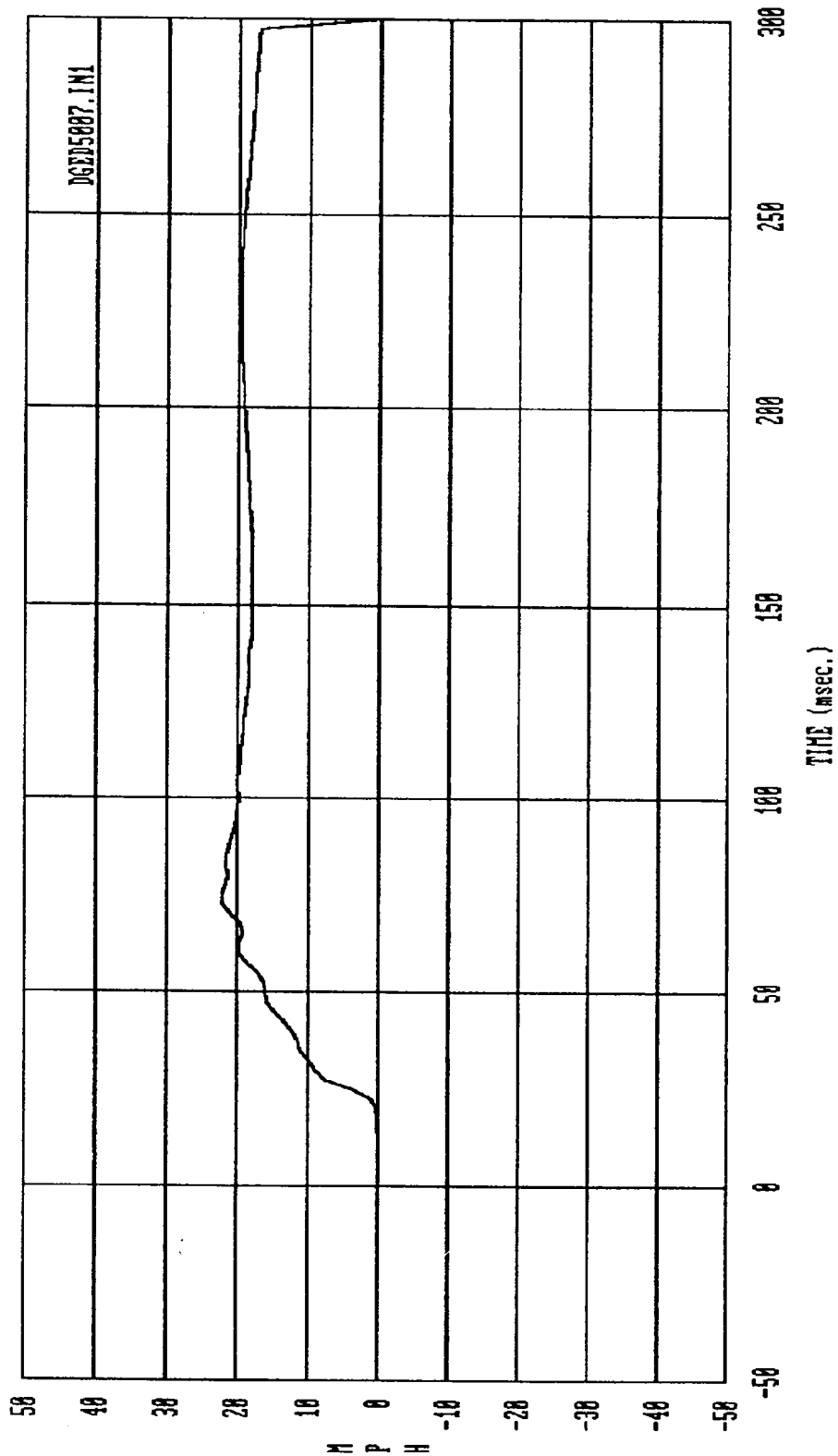


Curve: Driver Upper Rib 1 delta V -- Primary Filter: FIR 100 Max = 23.179 Min = -.35404E-02
 MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



Curve: Driver Upper Rib 2 acceleration -- Redundant Filter: FIR 100 Max = 77.867 Min = -12.102

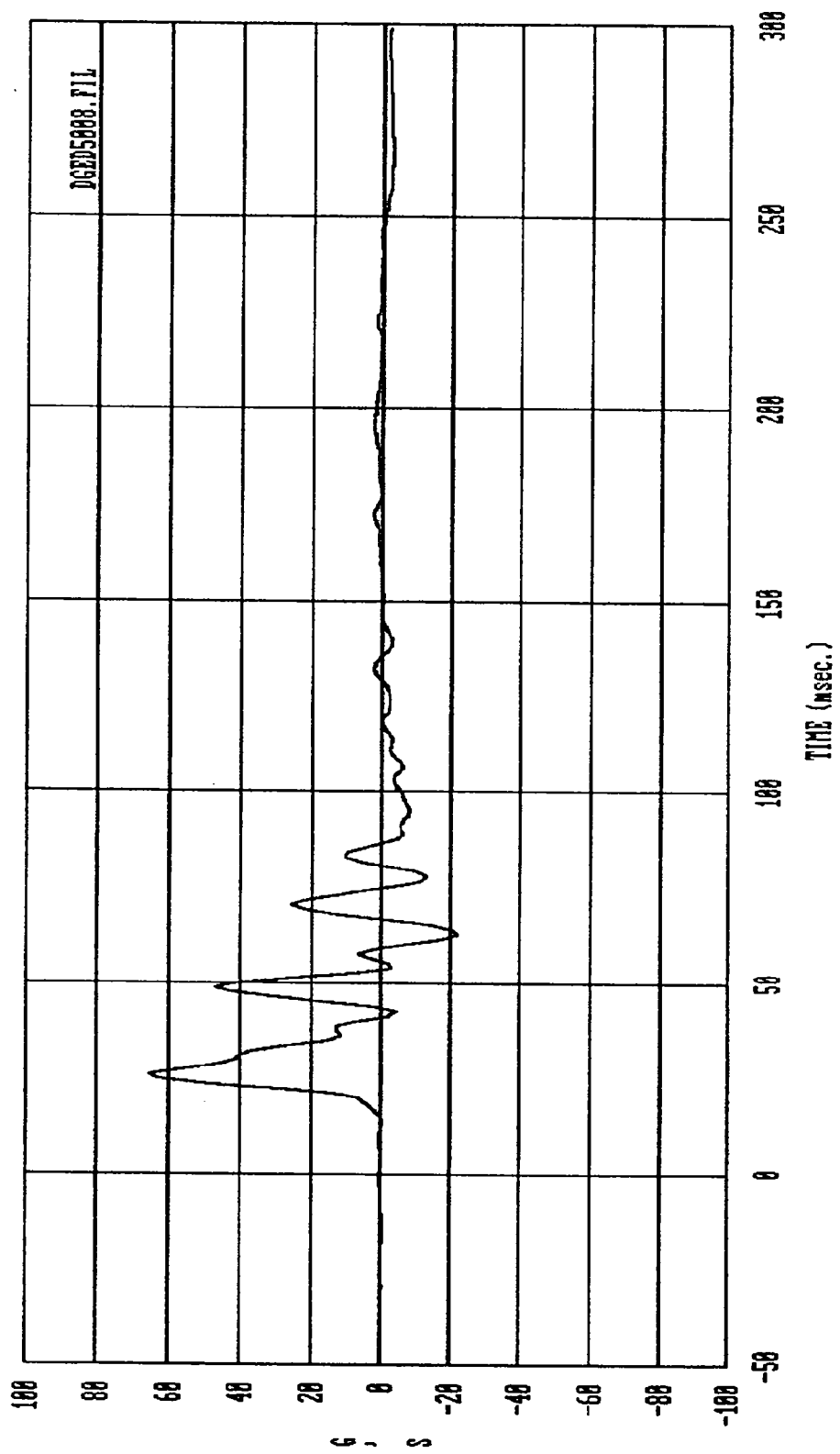
MSE Date: 89/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



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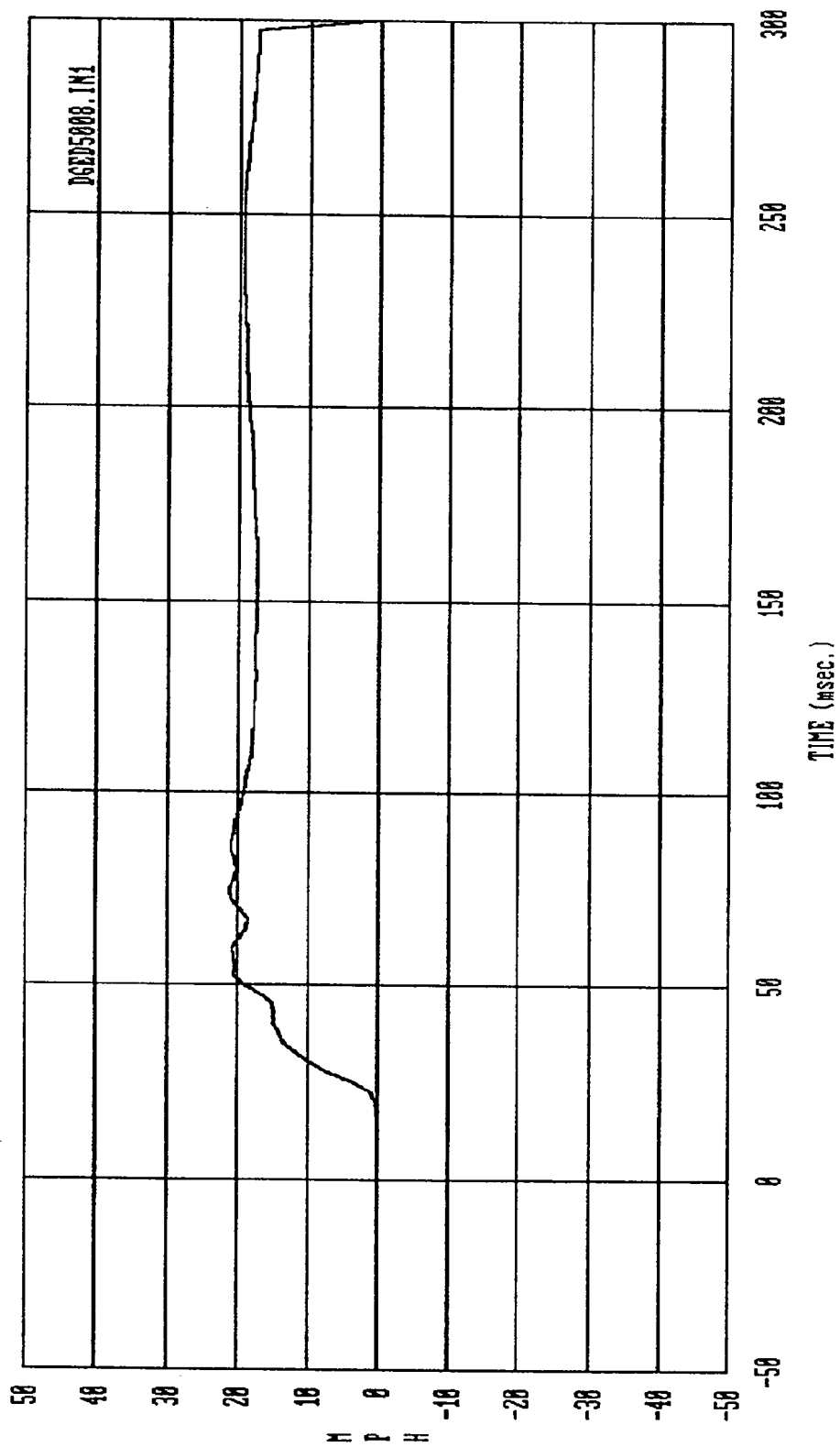
Curve: Driver Upper Rib 2 delta V -- Redundant Filter: FIR 100 Max = 22.336 Min = 16.047

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

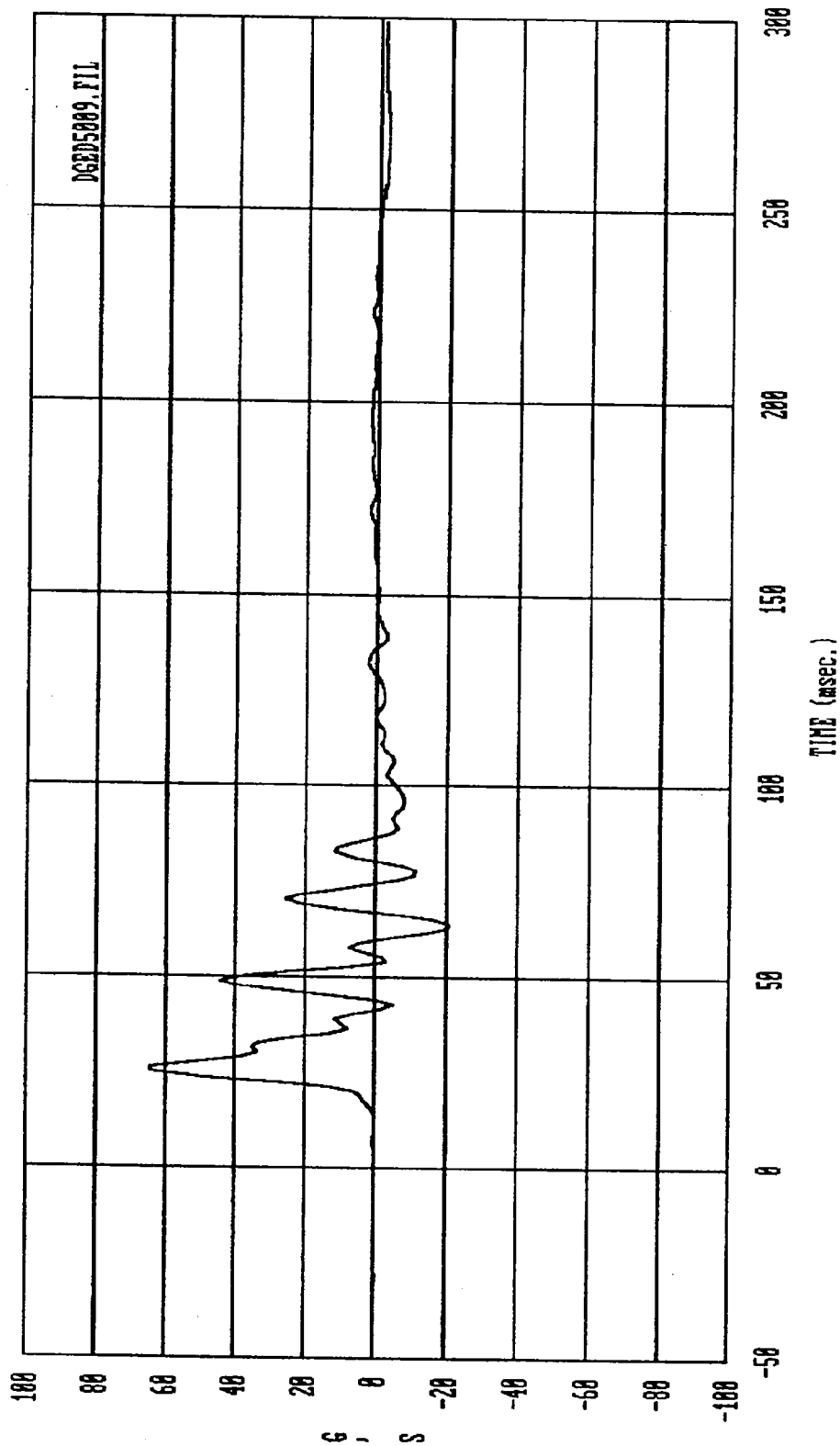


Curve: Driver Lower Rib 1 acceleration -- Primary Filter: FIR 100 Max = 65.966 Min = -22.159

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



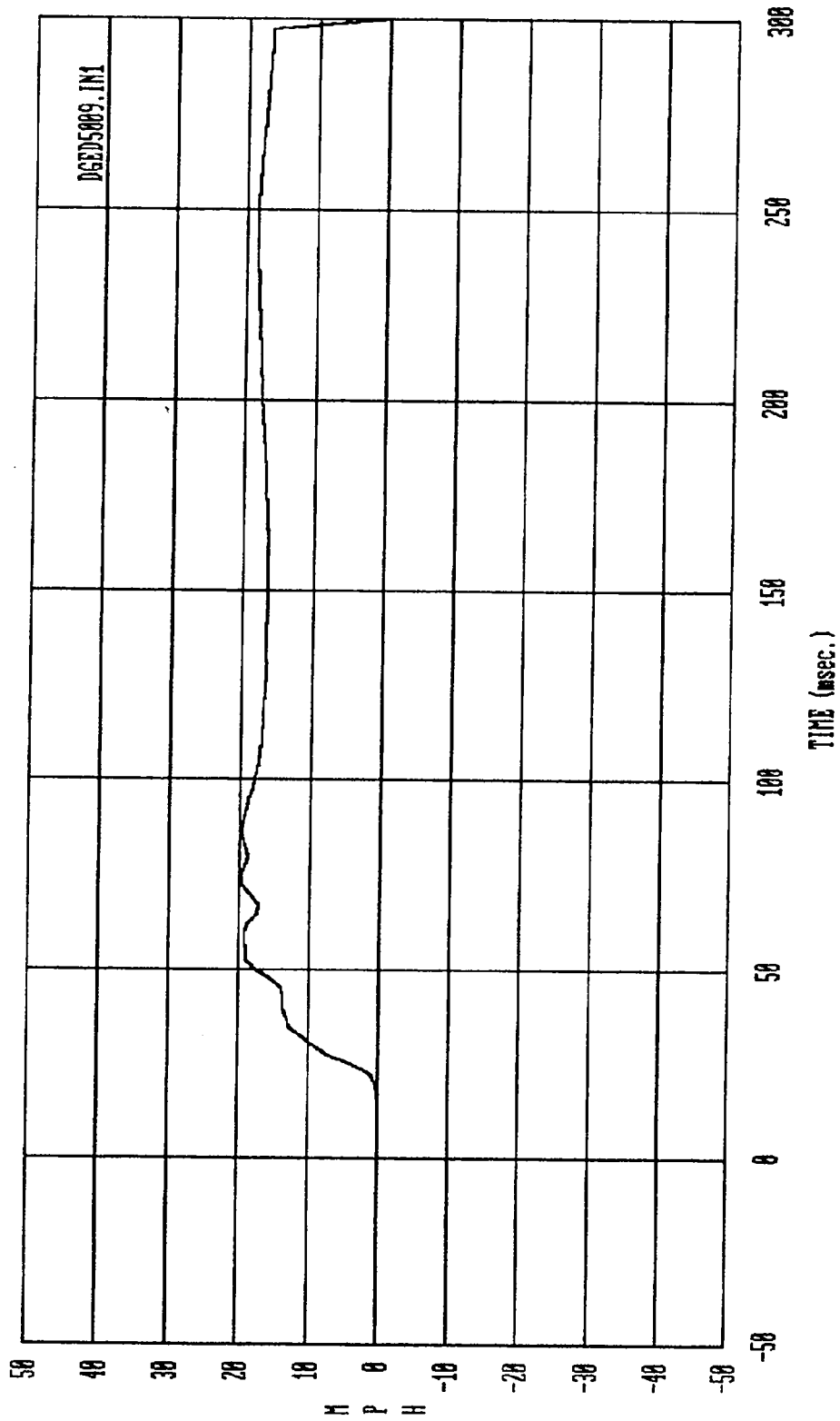
Curve: Driver Lower Rib 1 delta V — Primary Filter: FIR 100 Max = 21.303 Min = .89903E-02
 MSE Date: 89/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



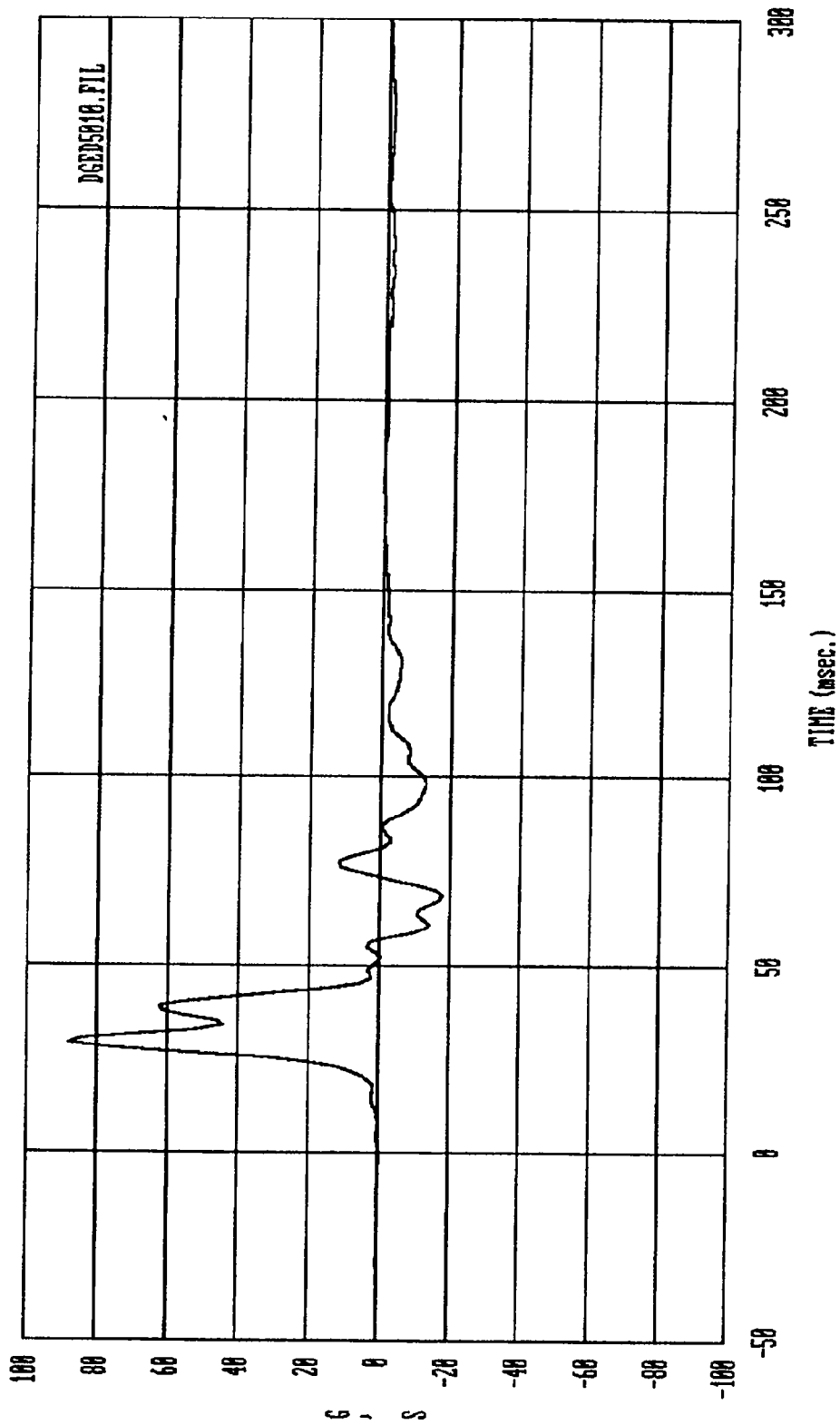
B-15

Curve: Driver Lower Rib 2 acceleration — Redundant Filter: FIR 100 Max = 66.498 Min = -21.190

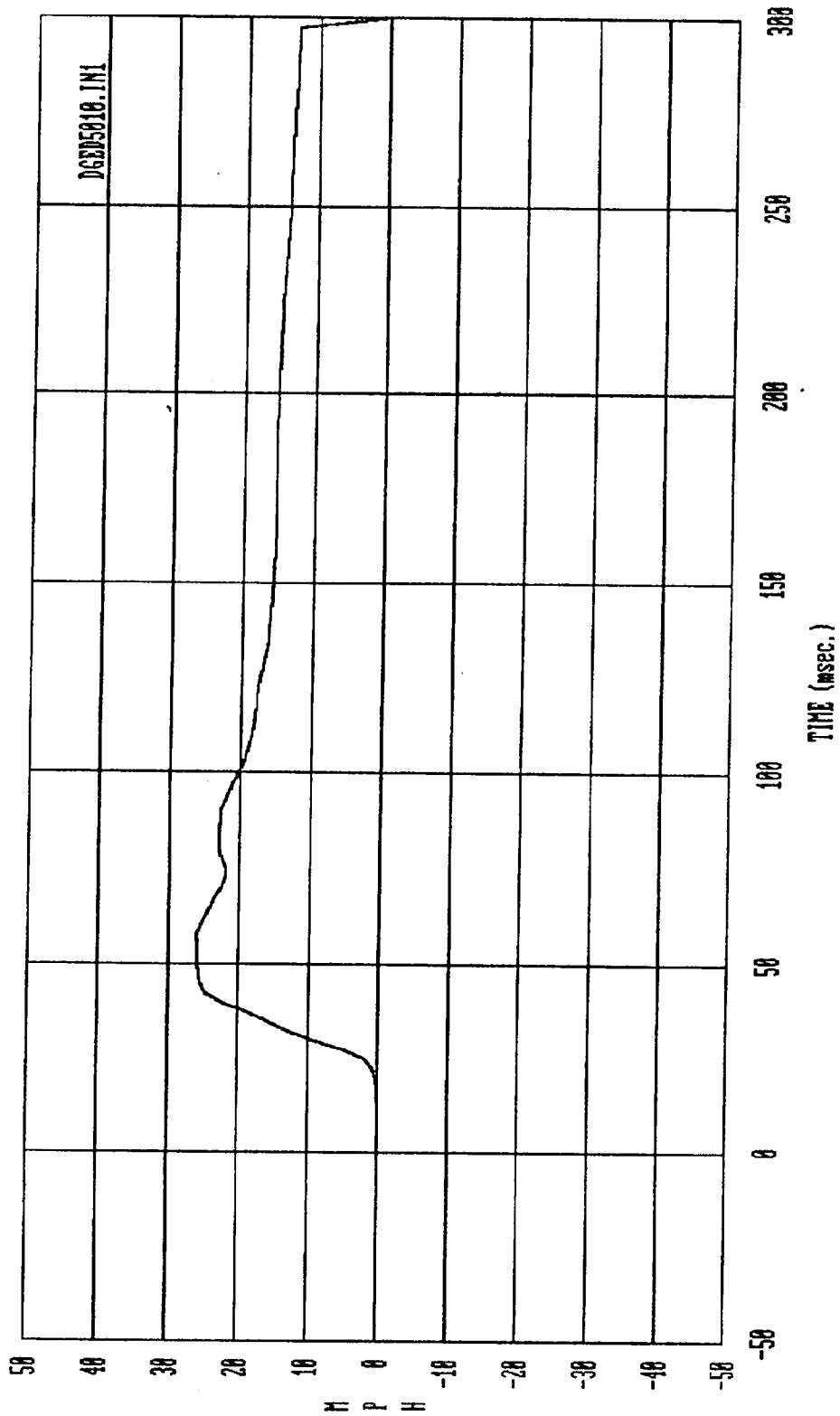
HSE Date: 89/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



Curve: Driver Lower Rib 2 delta V -- Redundant Filter: FIR 100 Max = 19.839 Min = 13.711
 Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

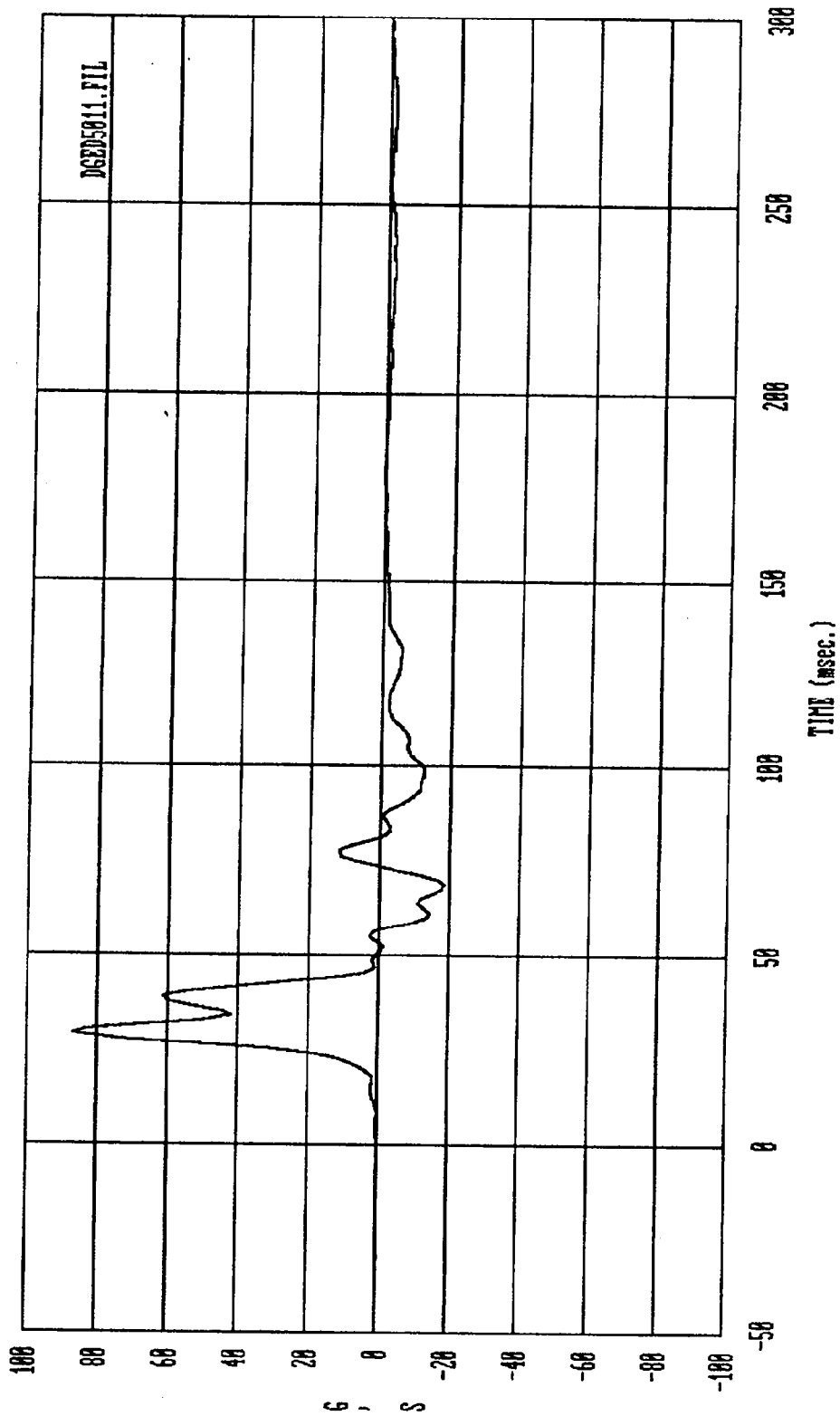


Curve: Driver Lower Spine 1 acceleration — Primary Filter: FIR 100 Max = 88.371 Min = -18.141
 HSE Date: 89/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

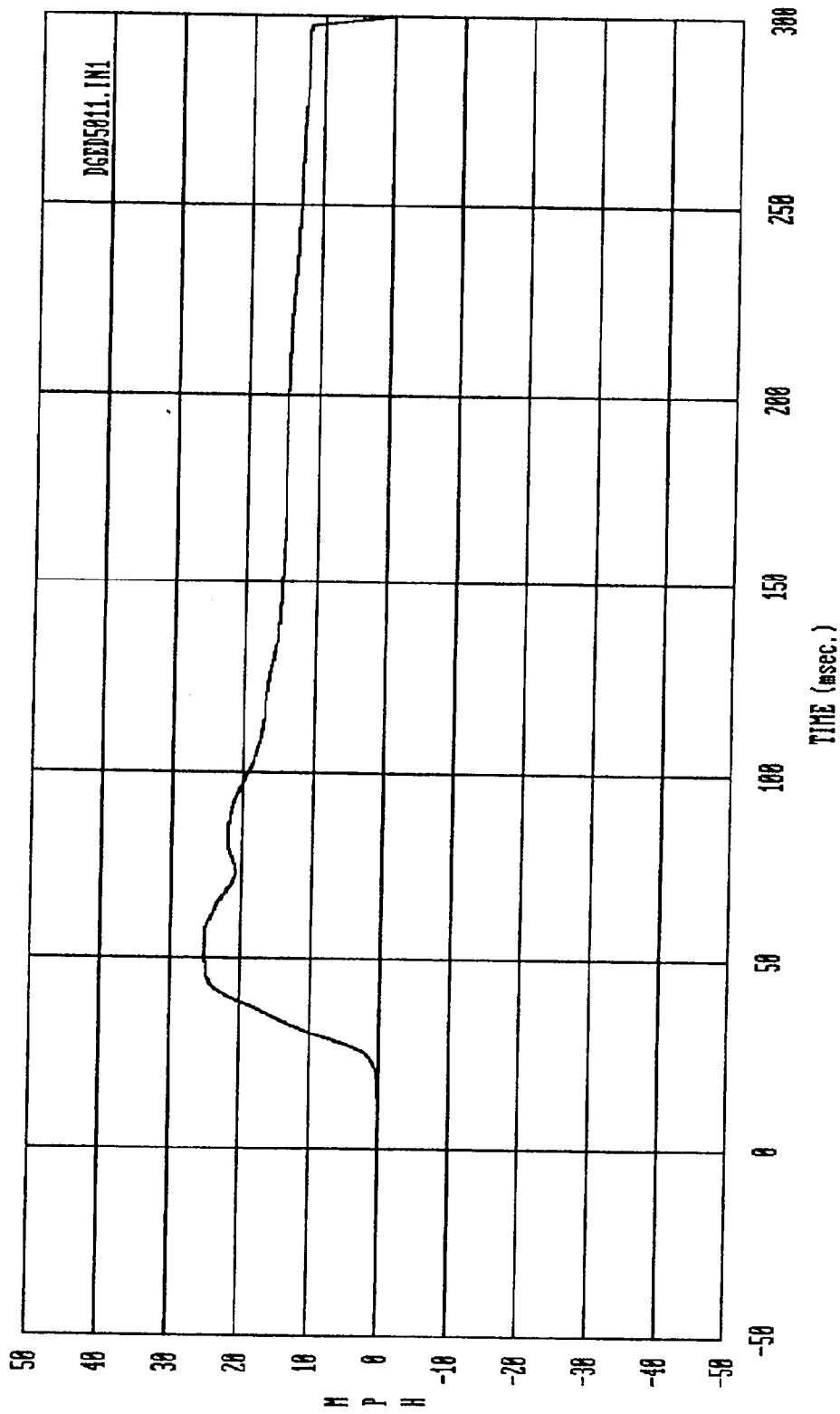


Curve: Driver Lower Spine 1 delta V -- Primary Filter: FIR 100 Max = 26.883 Min = -.4664E-02

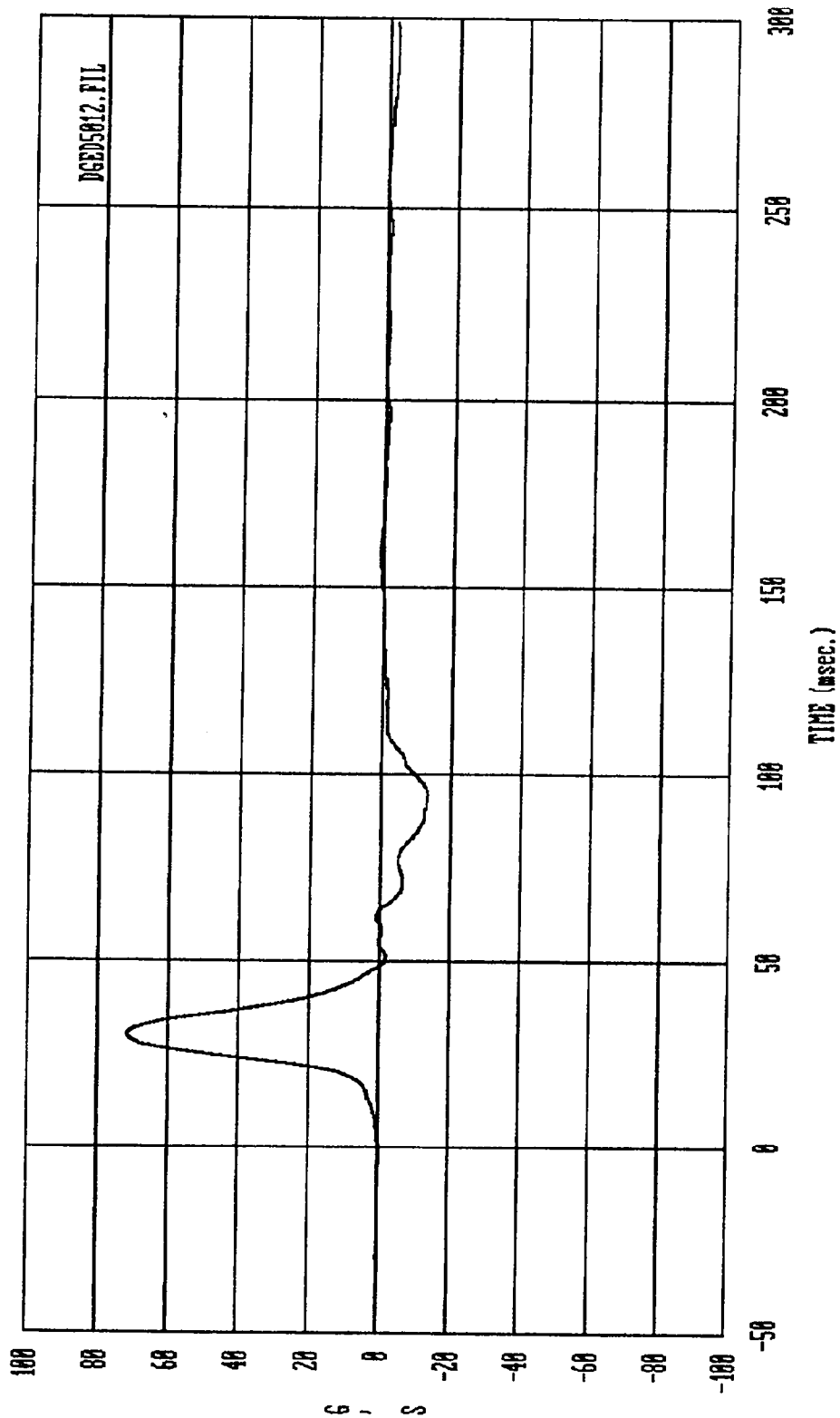
MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



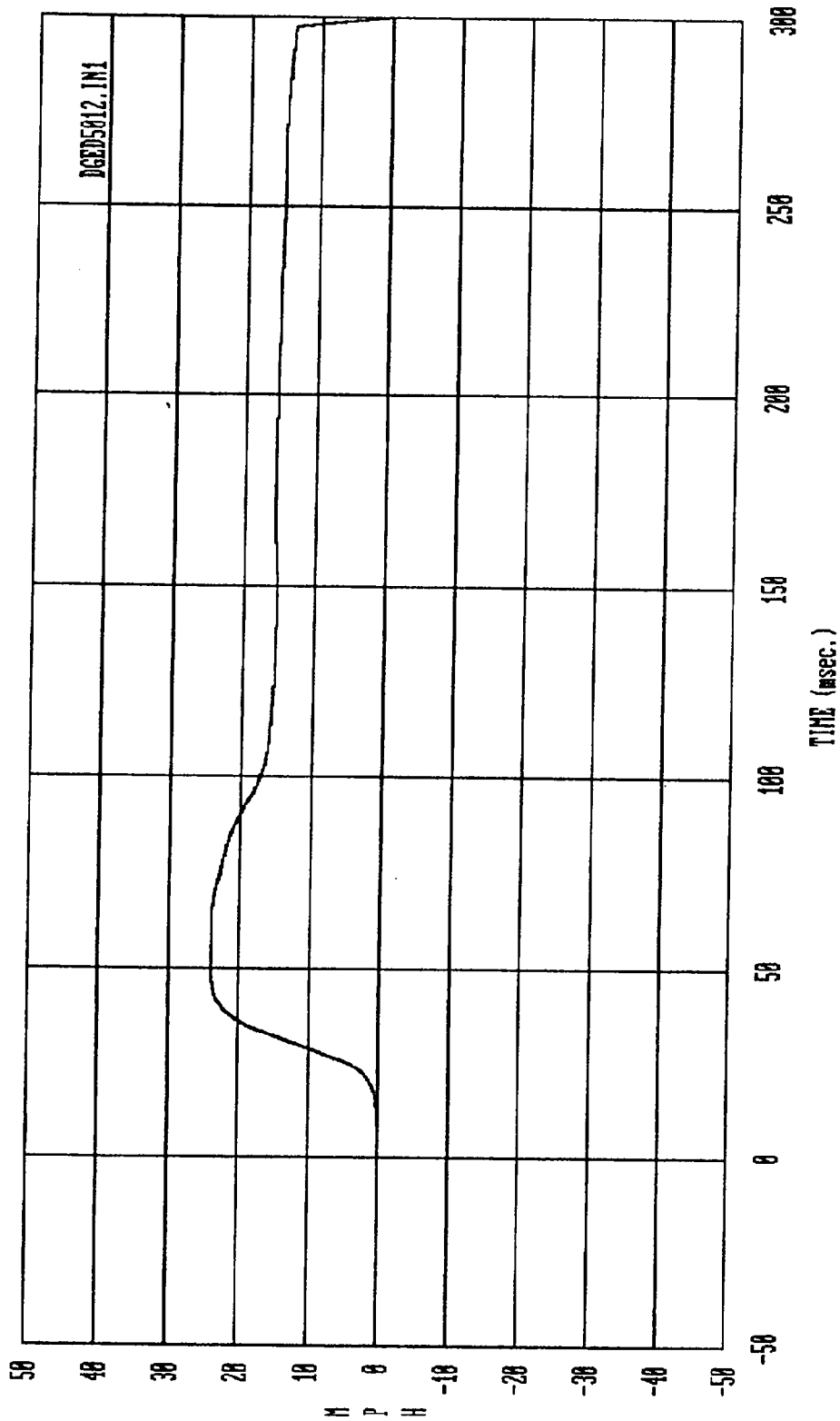
Curve: Driver Lower Spine 2 acceleration -- Redundant Filter: FIR 100 Max = 86.855 Min = -18.556
 HSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



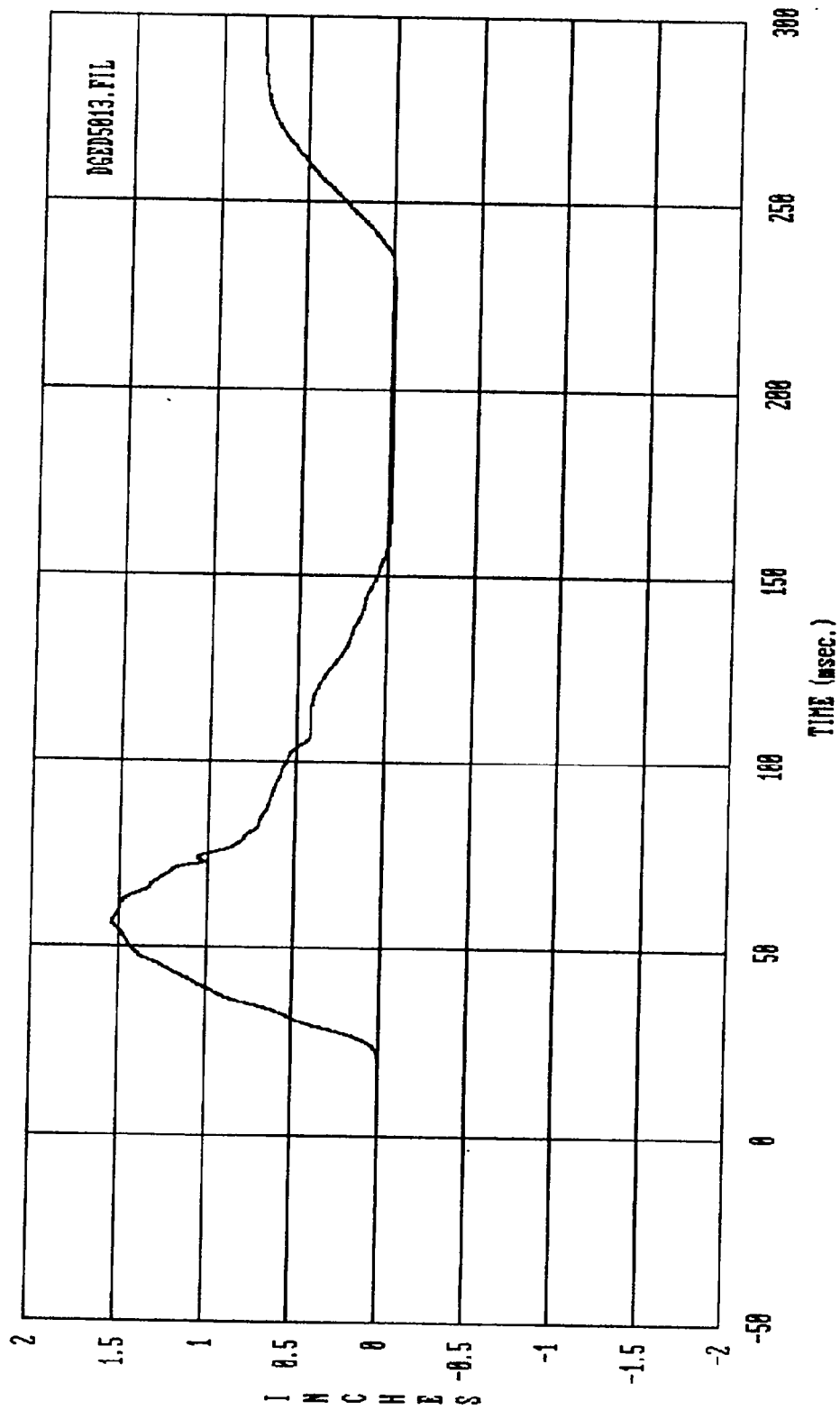
Curve: Driver Lower Spine 2 delta V -- Redundant Filter: FIR 100 Max = 25.217 Min = 12.077
 MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



Curve: Driver Pelvis acceleration Filter: FIR 100 Max = 72.822 Min = -13.199
 MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



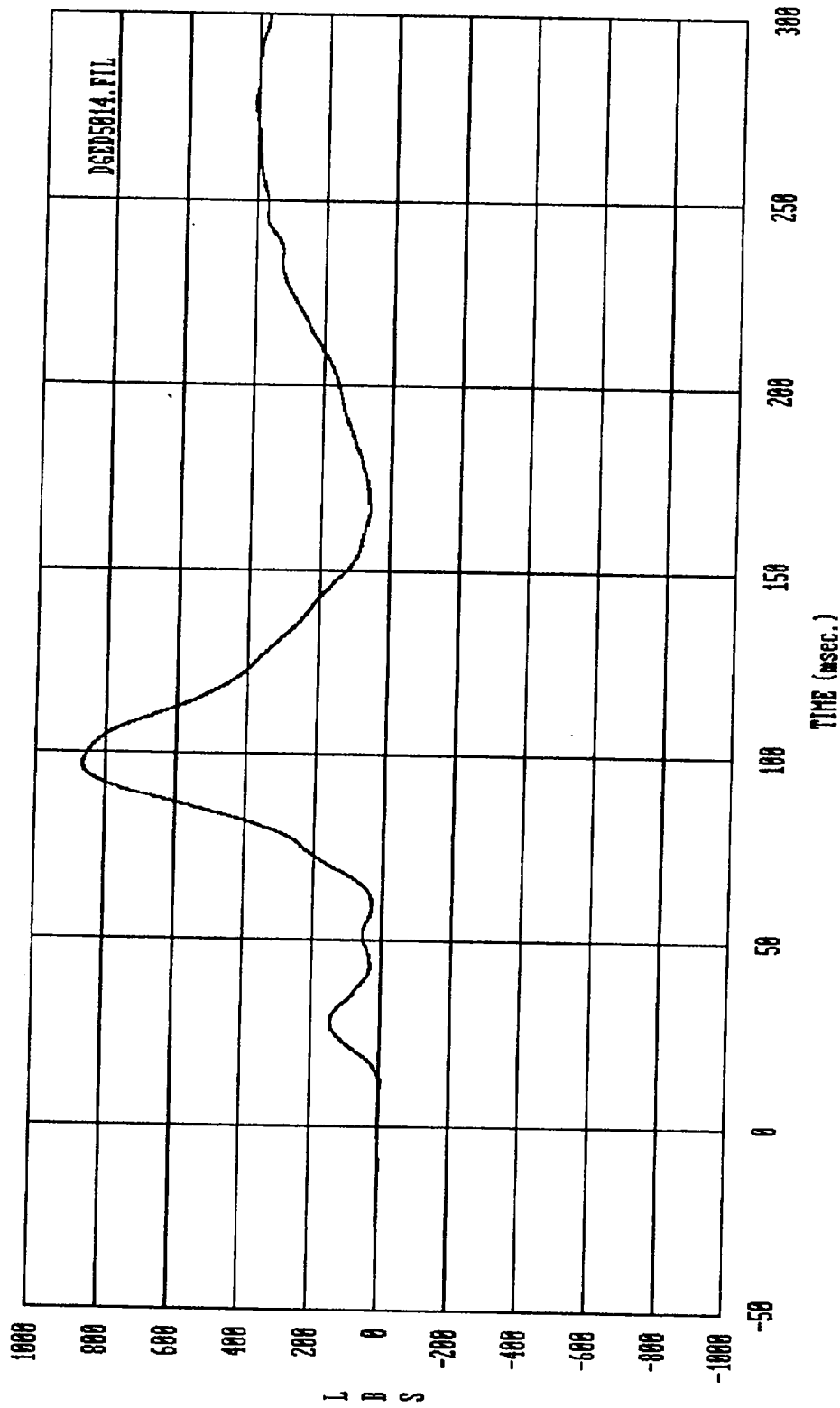
Curve: Driver Pelvis delta V
 Filter: FIR 100
 Max = 24.884 Min = -.35269E-02
 Date: 09/04/91
 Program: 1991 Side Impact
 Vehicle: 1989 Dodge D-50 Pickup
 MSE



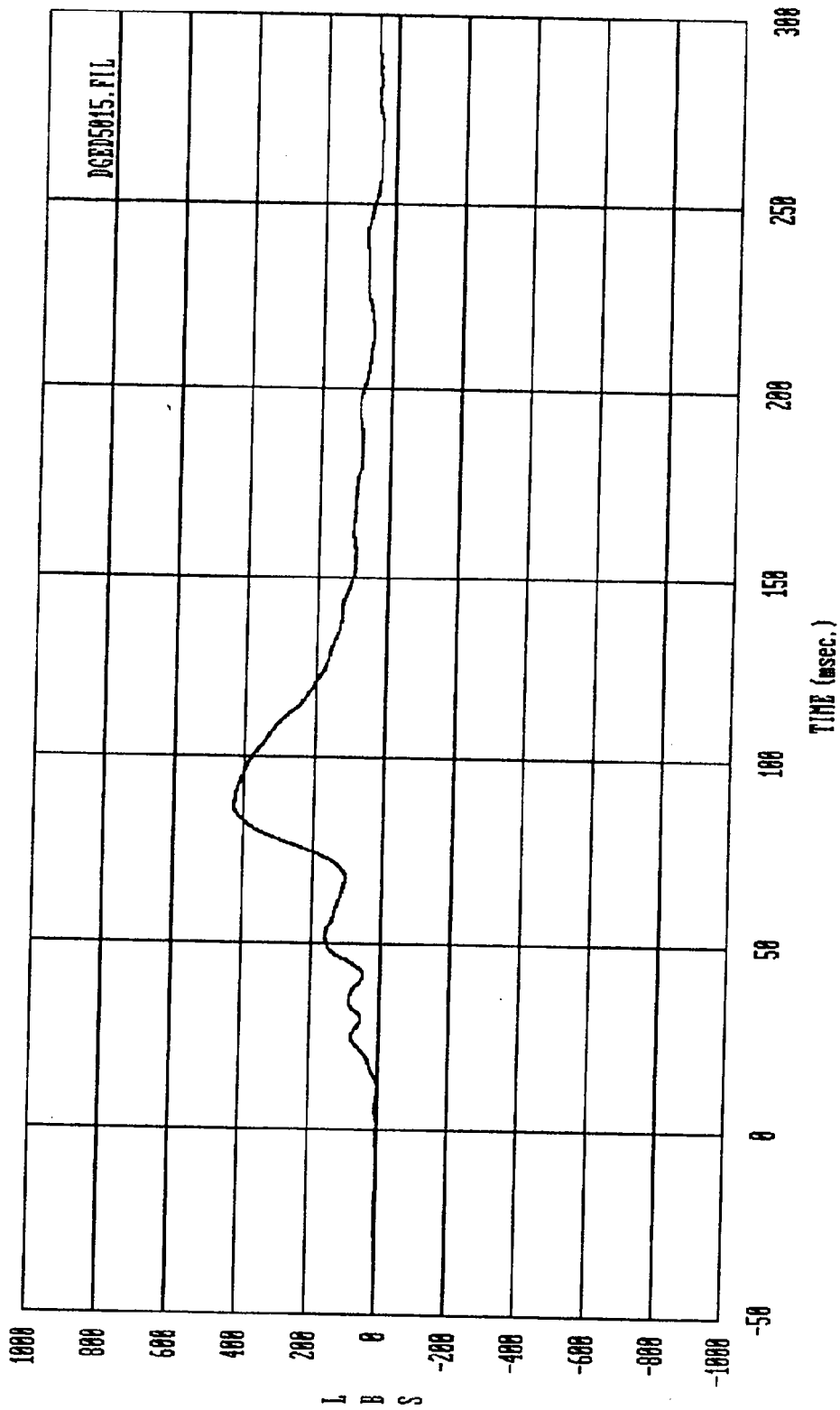
Curve: Driver Rib deflection

Filter: SAE CLASS 180 Max = 1.5393 Min = -.17824E-01

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

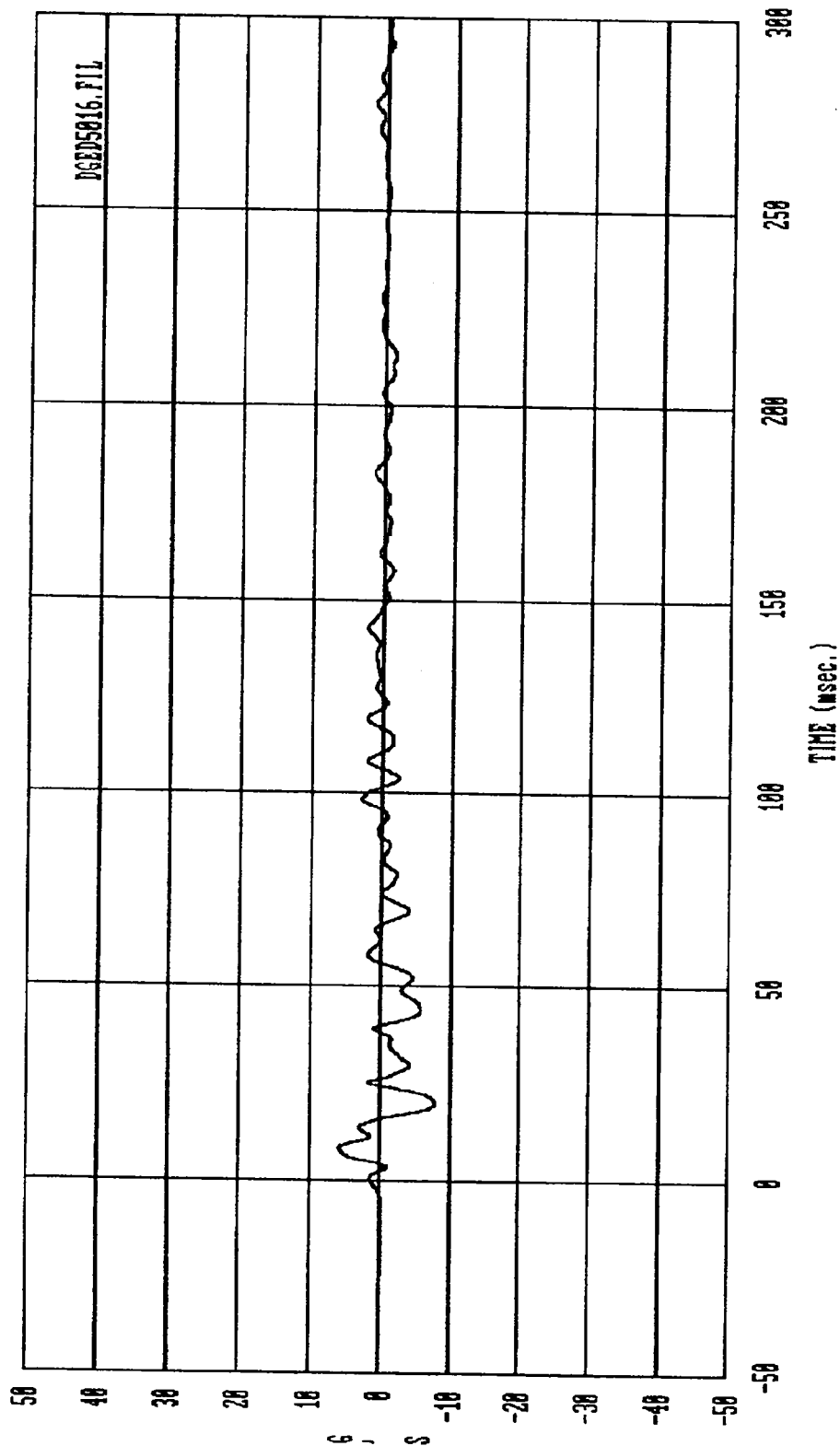


Curve: Driver lap belt load Filter: SAE CLASS 60 Max = 867.57 Min = -4.1141
MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



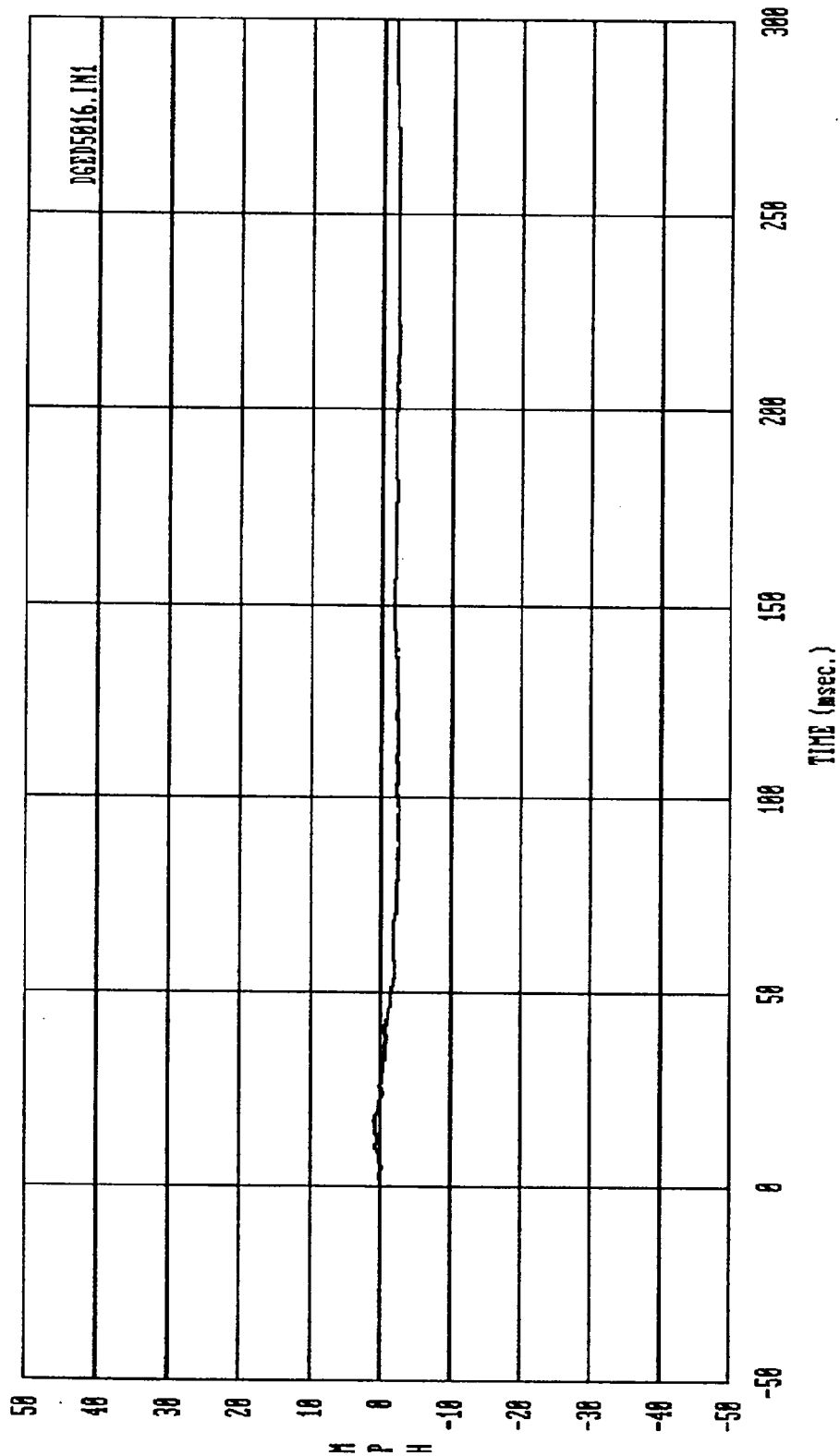
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Curve: Driver shoulder belt load Filter: SAE CLASS 60 Max = 427.75 Min = -.88377
 MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



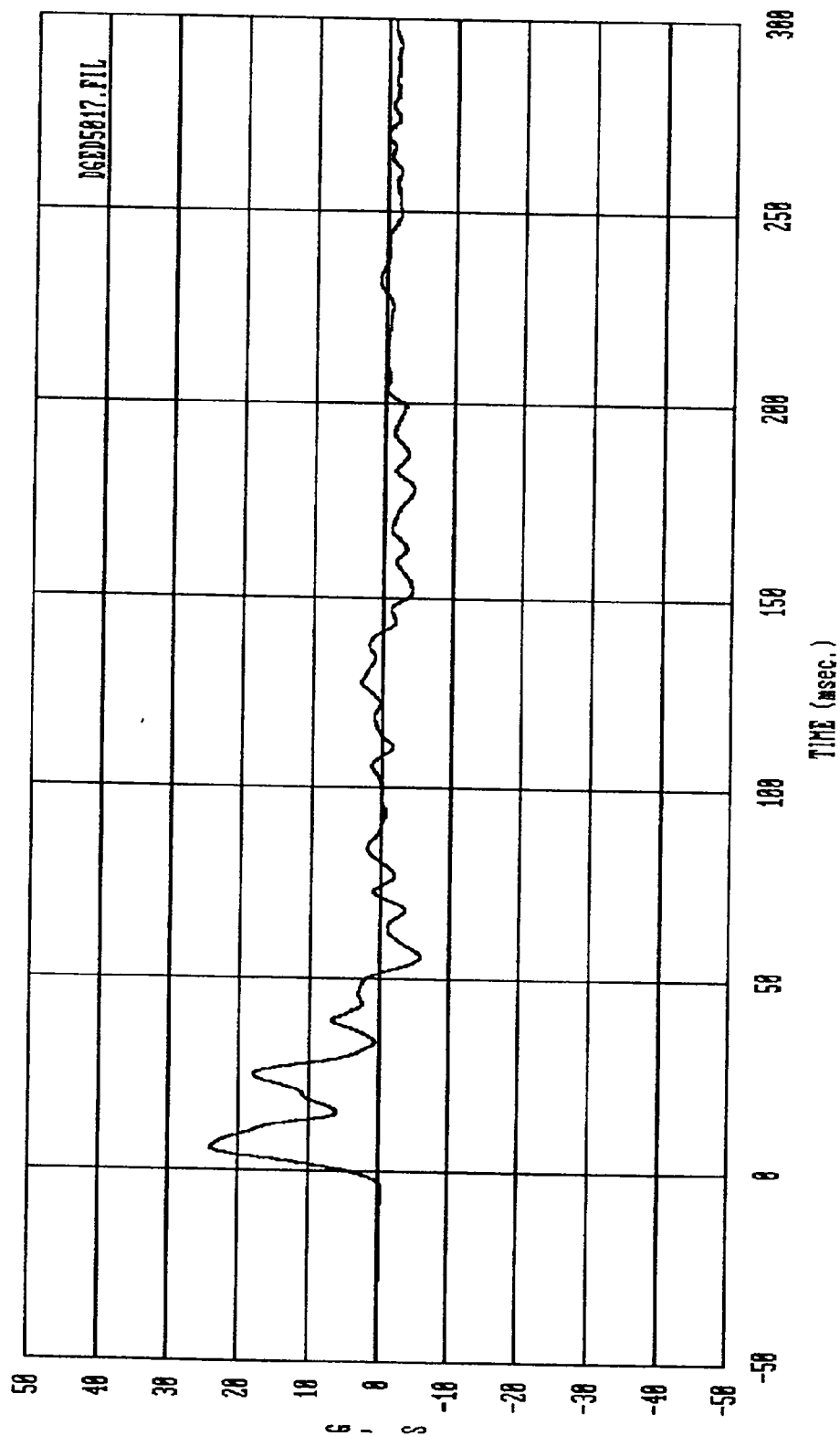
Curve: Front Seat Right sill acceleration -- X axis Filter: SAE CLASS 60 Max: 5.9585 Min: -7.8897

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



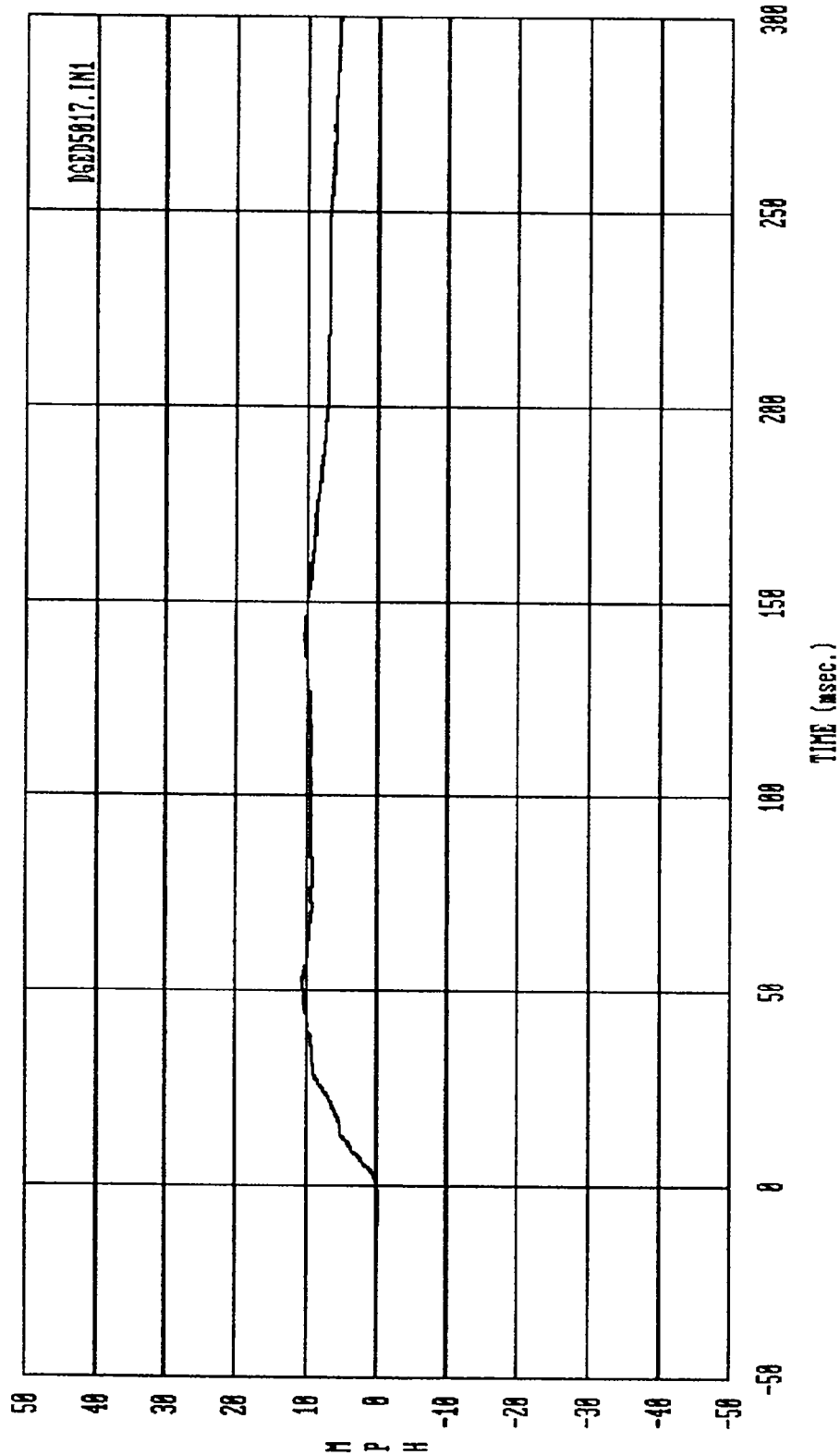
Curve: Front Seat Right still delta V -- X axis Filter: SAE CLASS 180 Max = .98610 Min = -2.5062

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



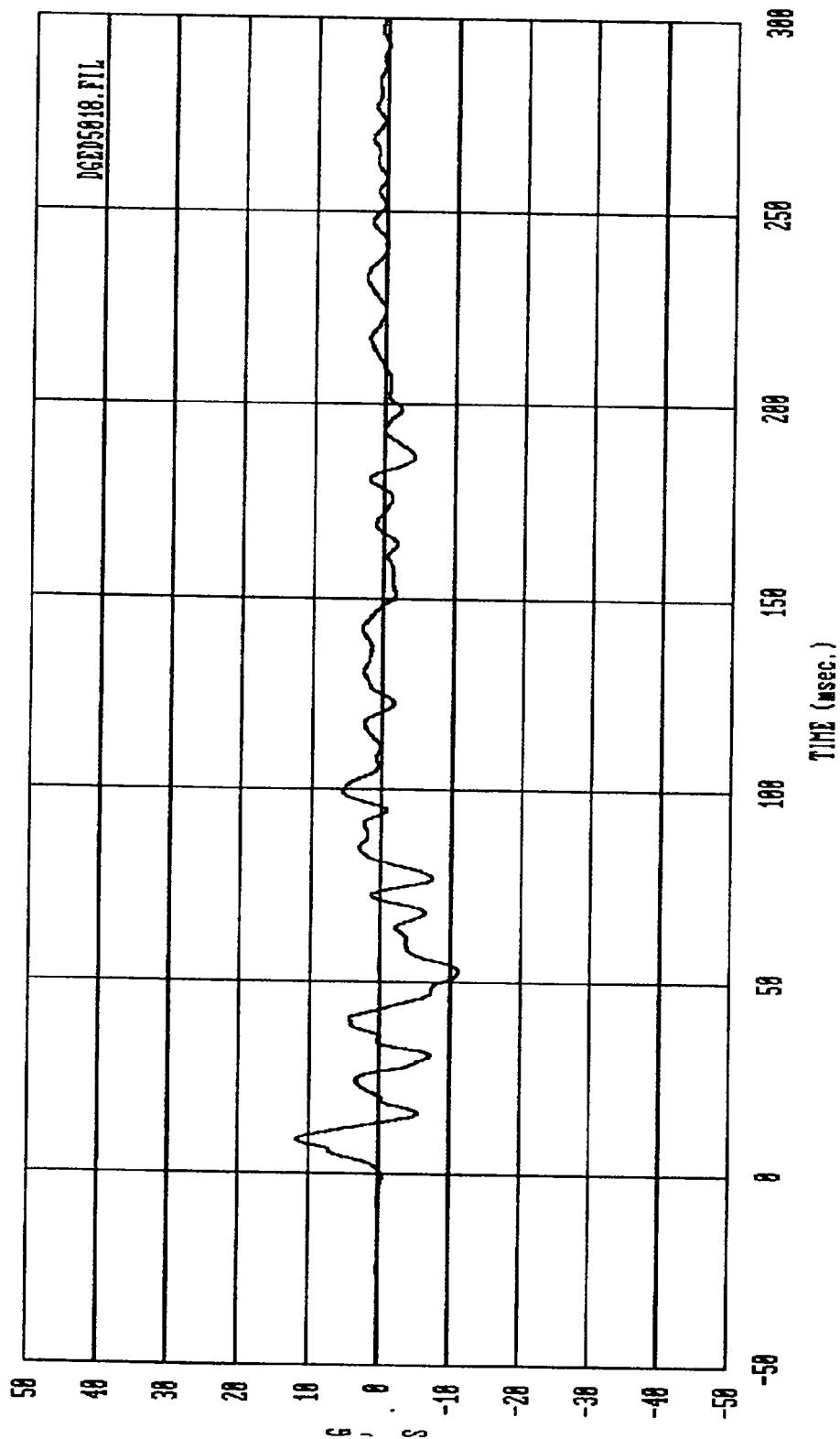
Curve: Front Seat Right sill acceleration — Y axis Filter: SAE CLASS 60 Max = 24.821 Min = -5.9214

HSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



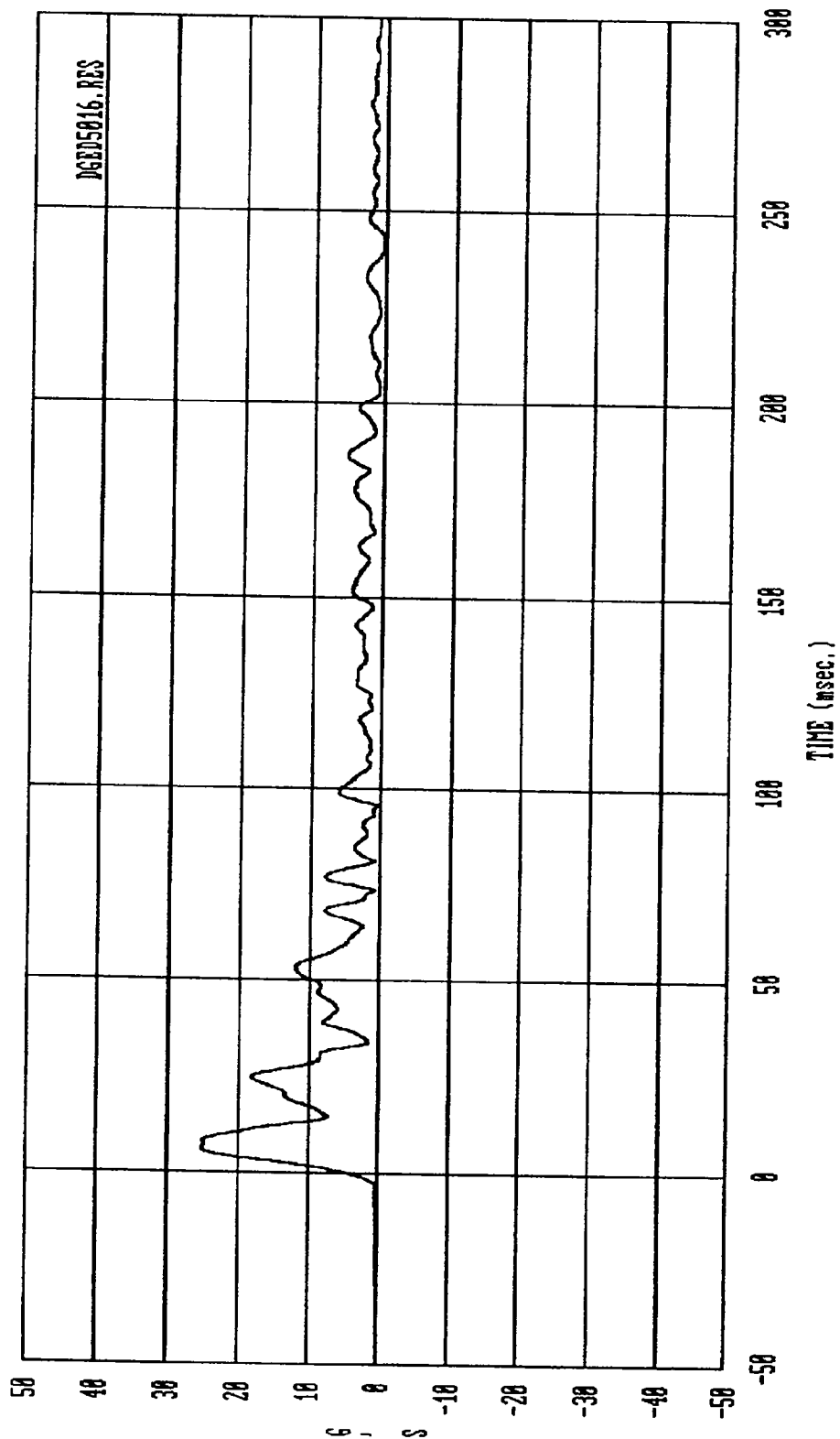
Curve: Front Seat Right sill delta V -- Y axis Filter: SAE CLASS 100 Max = 10.569 Min = 5.1387

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



Curve: Front Seat Right sill acceleration -- Z axis Filter: SAE CLASS 60 Max = 11.769 Min = -11.163

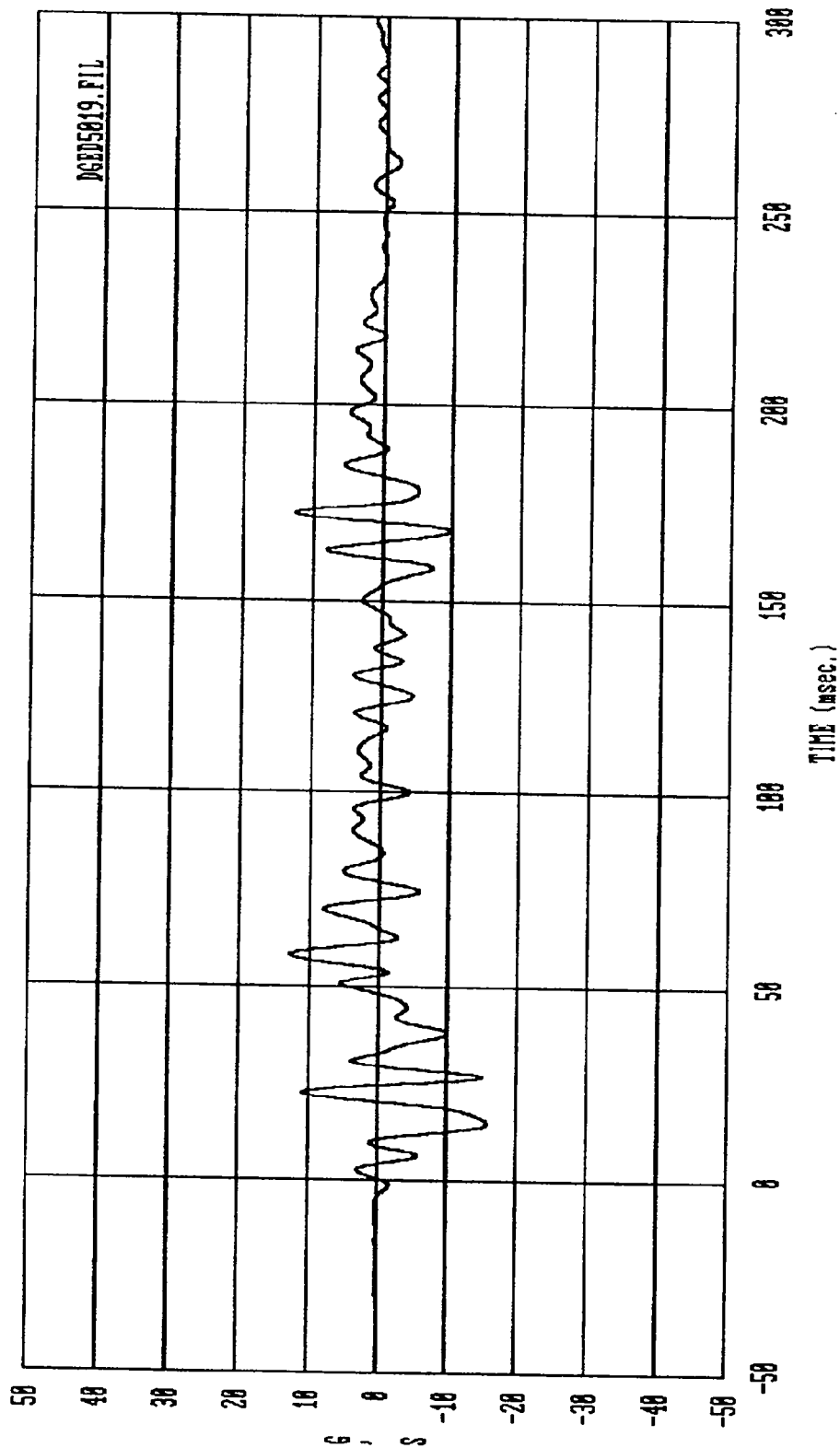
HSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



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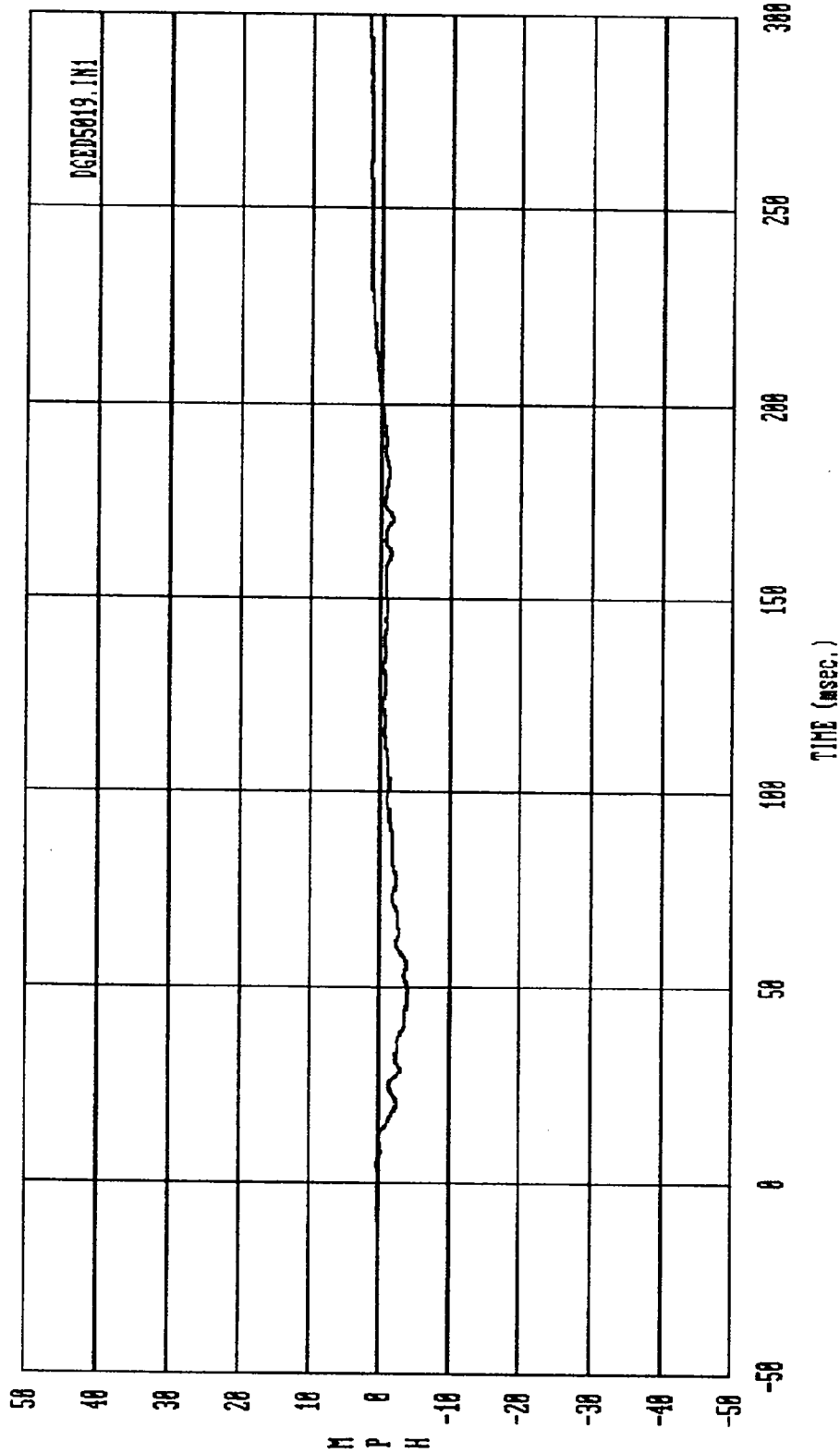
Curve: Front Seat Right sill resultant acceleration Filter: SAE CLASS 60 Max = 25.364 Min = .16975

HSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1991 Dodge D-50 Pickup



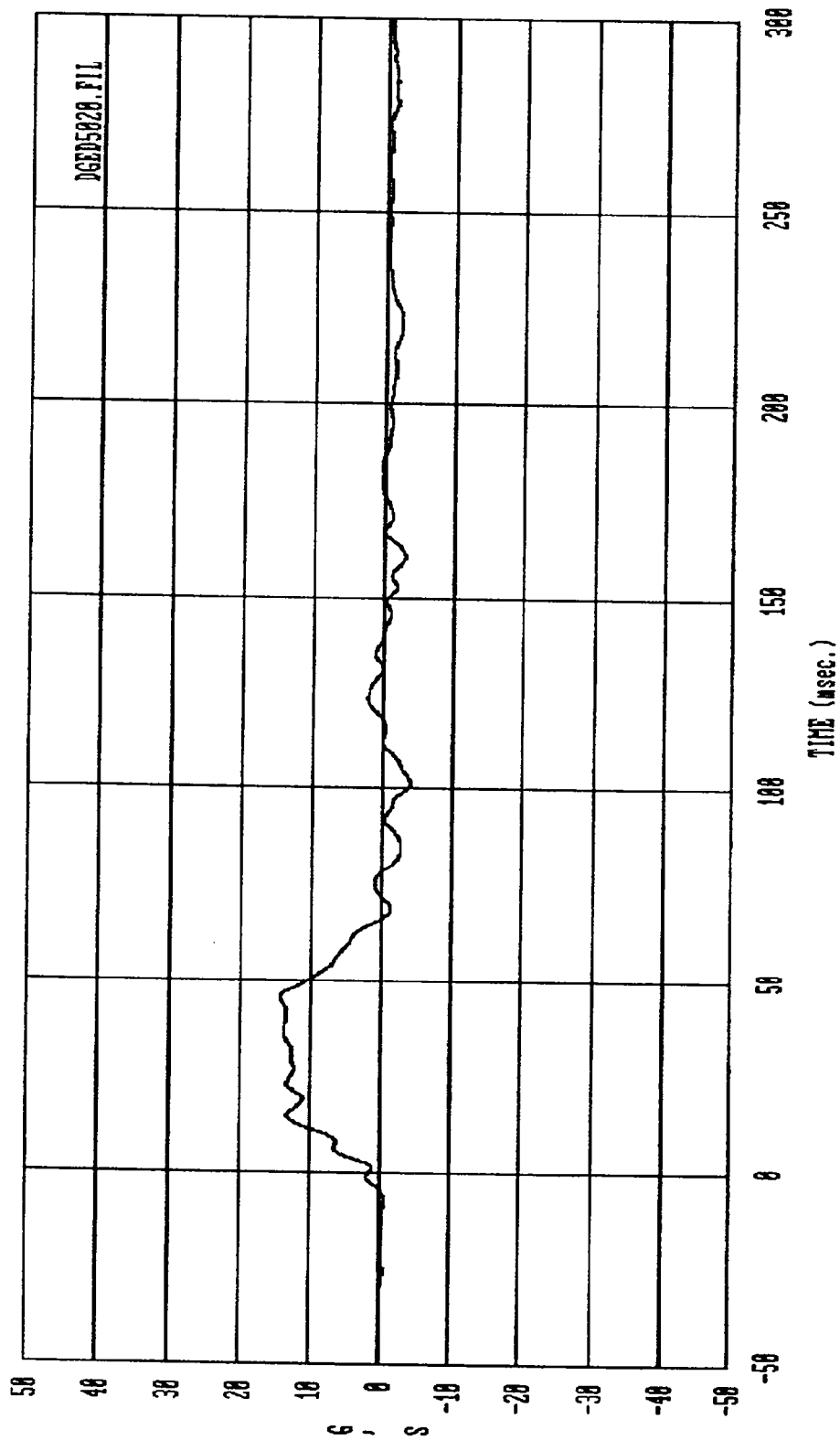
Curve: Rear Floor above axle acceleration -- X axis Filter: SAE CLASS 60 Max = 12.941 Min = -15.854

HSE Date: 09/84/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



Curve: Rear Floor above axle delta V — X axis Filter: SAE CLASS 100 Max = 2.8995 Min = -4.8228

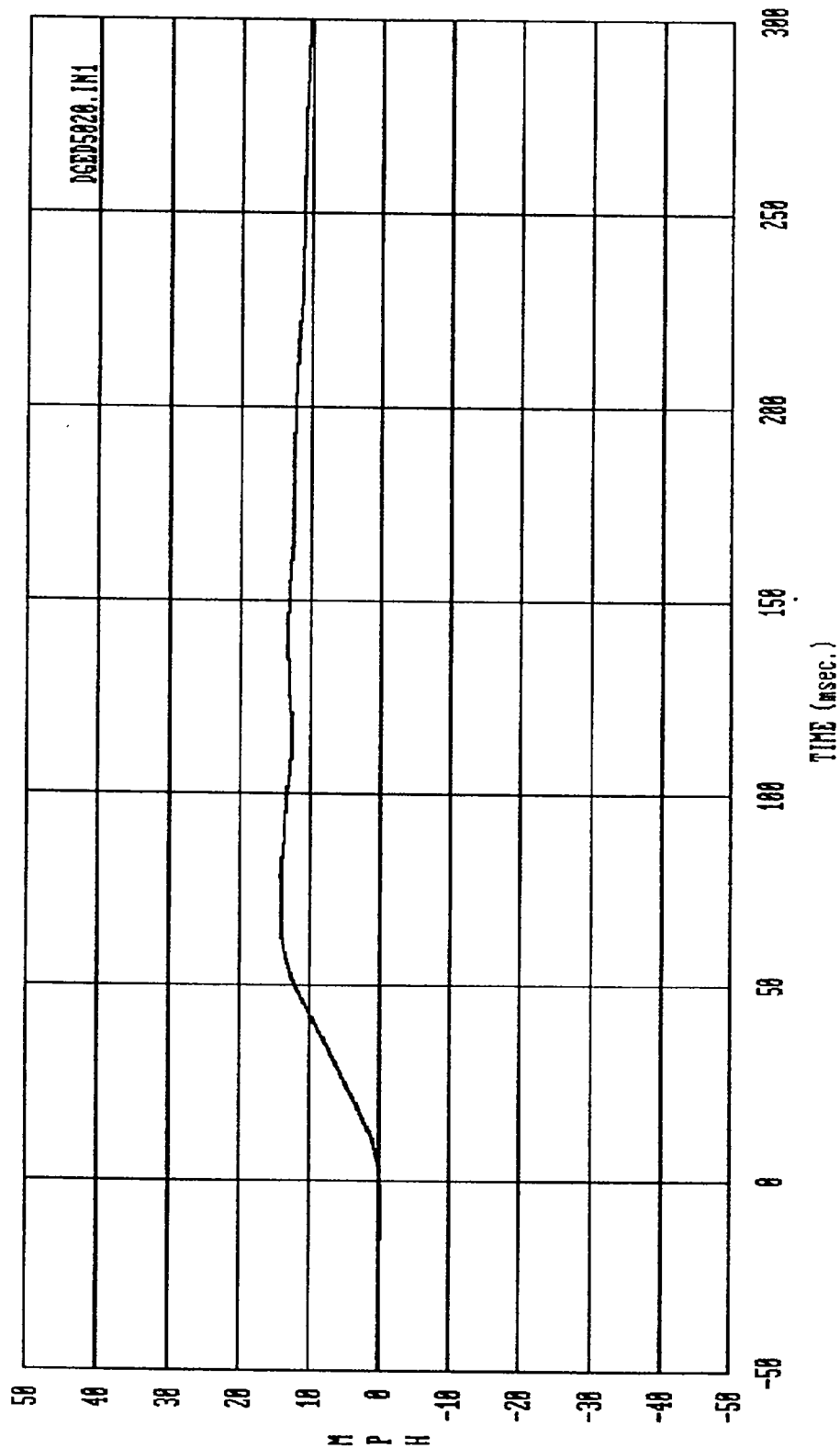
MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



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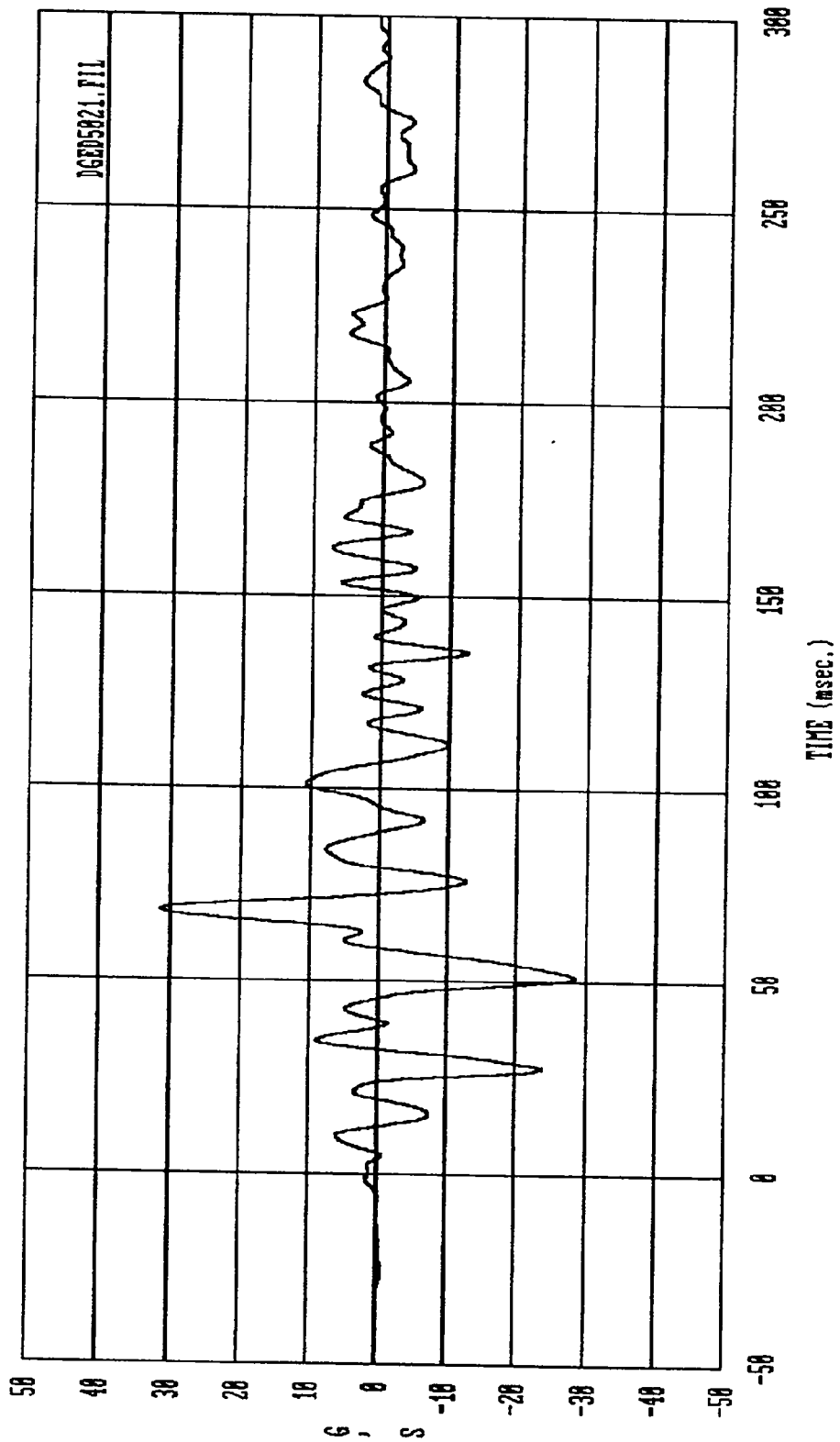
Curve: Rear Floor above axle acceleration — Y axis Filter: SAE CLASS 60 Max = 14.446 Min = -3.9388

HSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



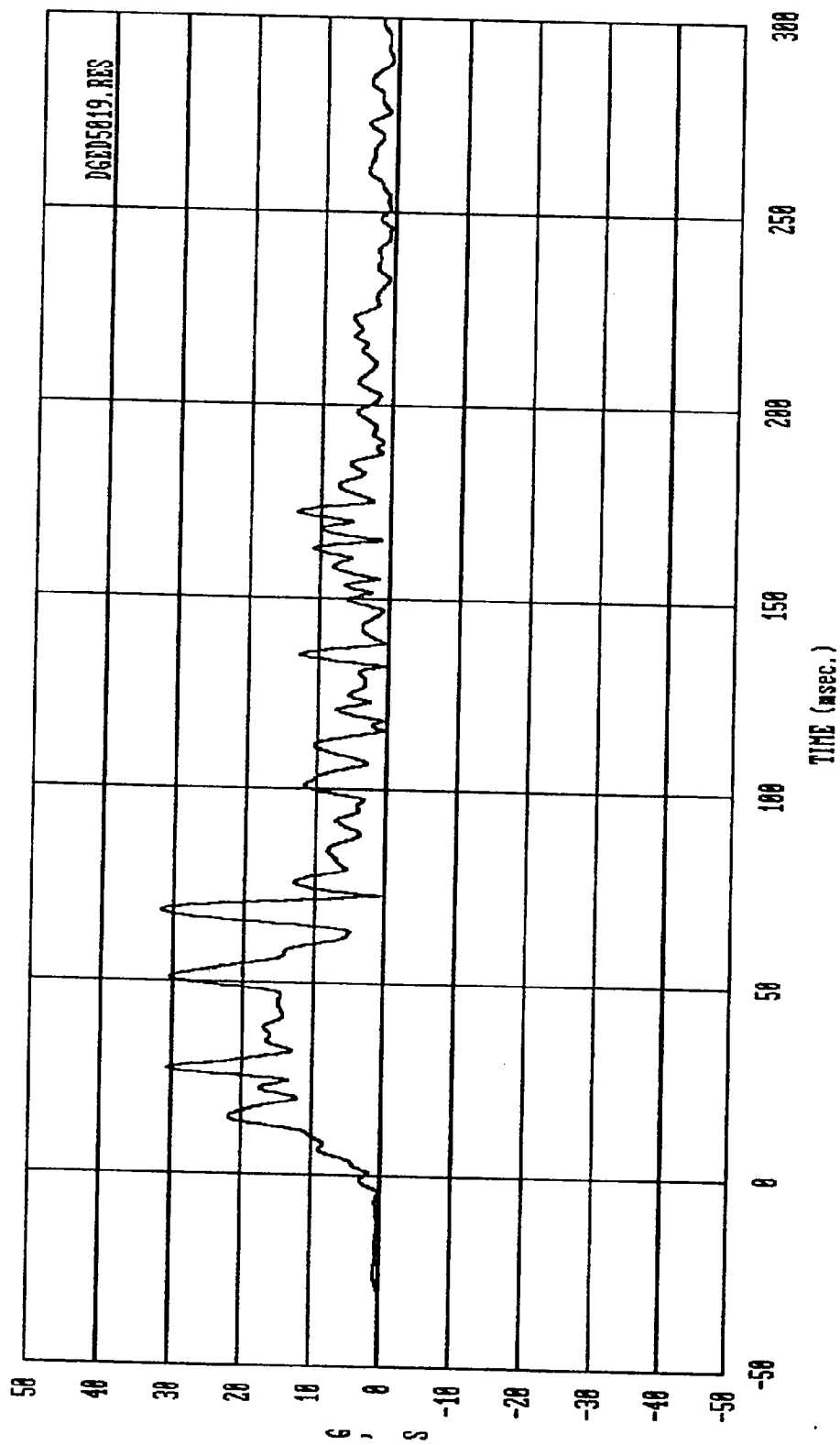
Curve: Rear Floor above axle delta V — Y axis Filter: SAE CLASS 180 Max = 14.258 Min = -237.893-81

HSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

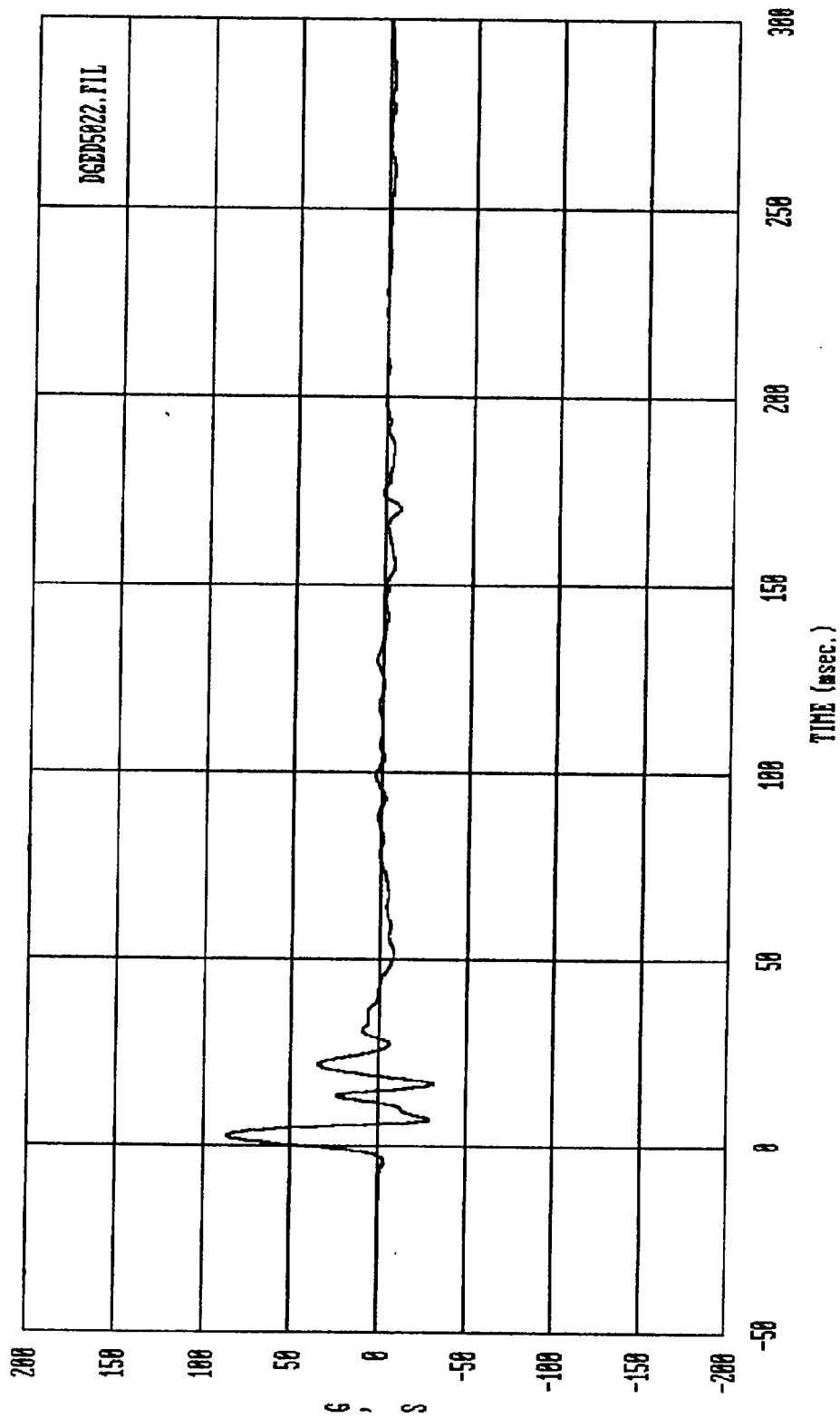


Curve: Near Floor above axle acceleration — Z axis Filter: SAE CLASS 60 Max = 31.488 Min = -28.517

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1993 Dodge B-50 Pickup

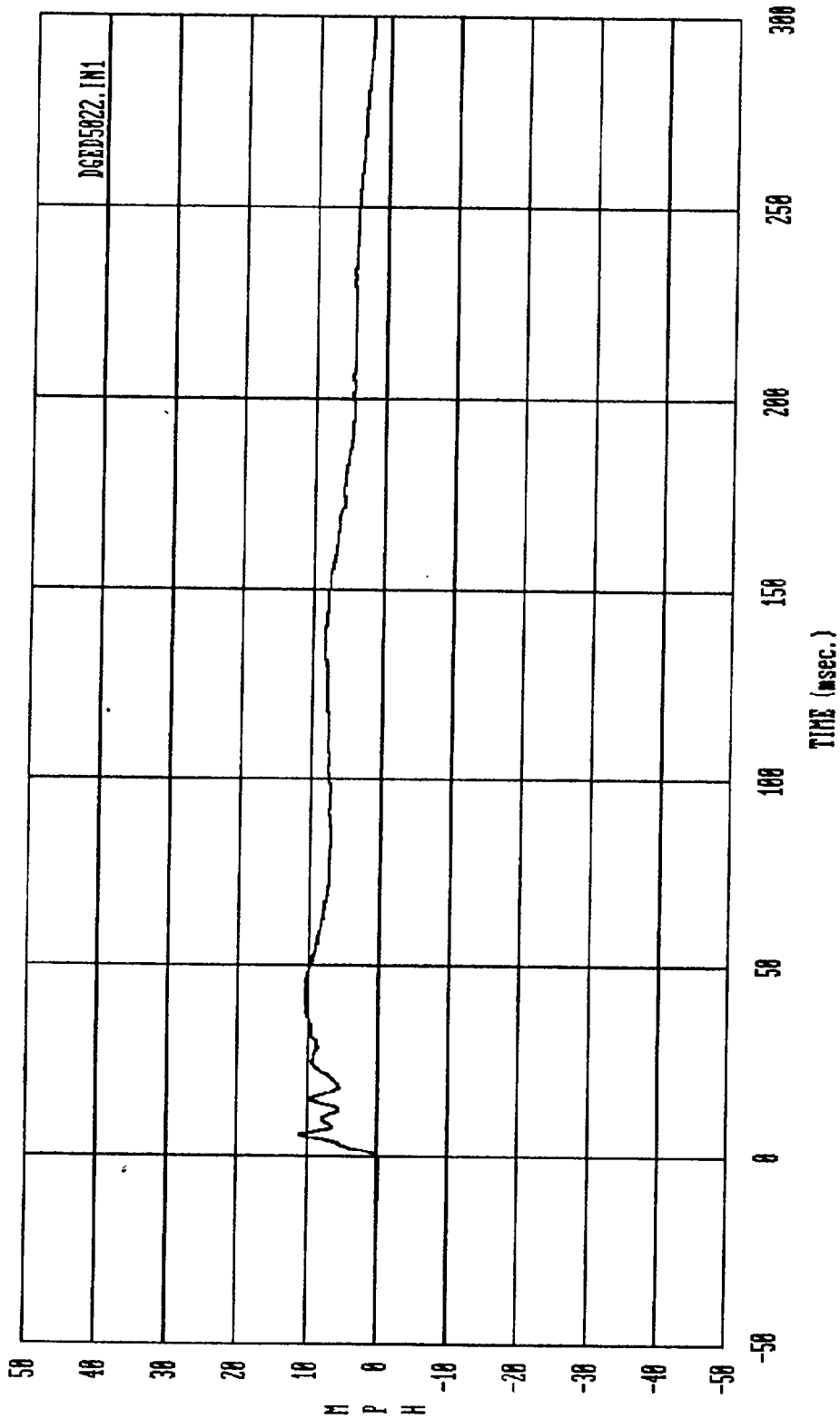


Curve: Rear Floor above axle resultant acceleration Filter: SAE CLASS 60 Max = 31.888 Min = .38664
 MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1991 Dodge D-50 Pickup

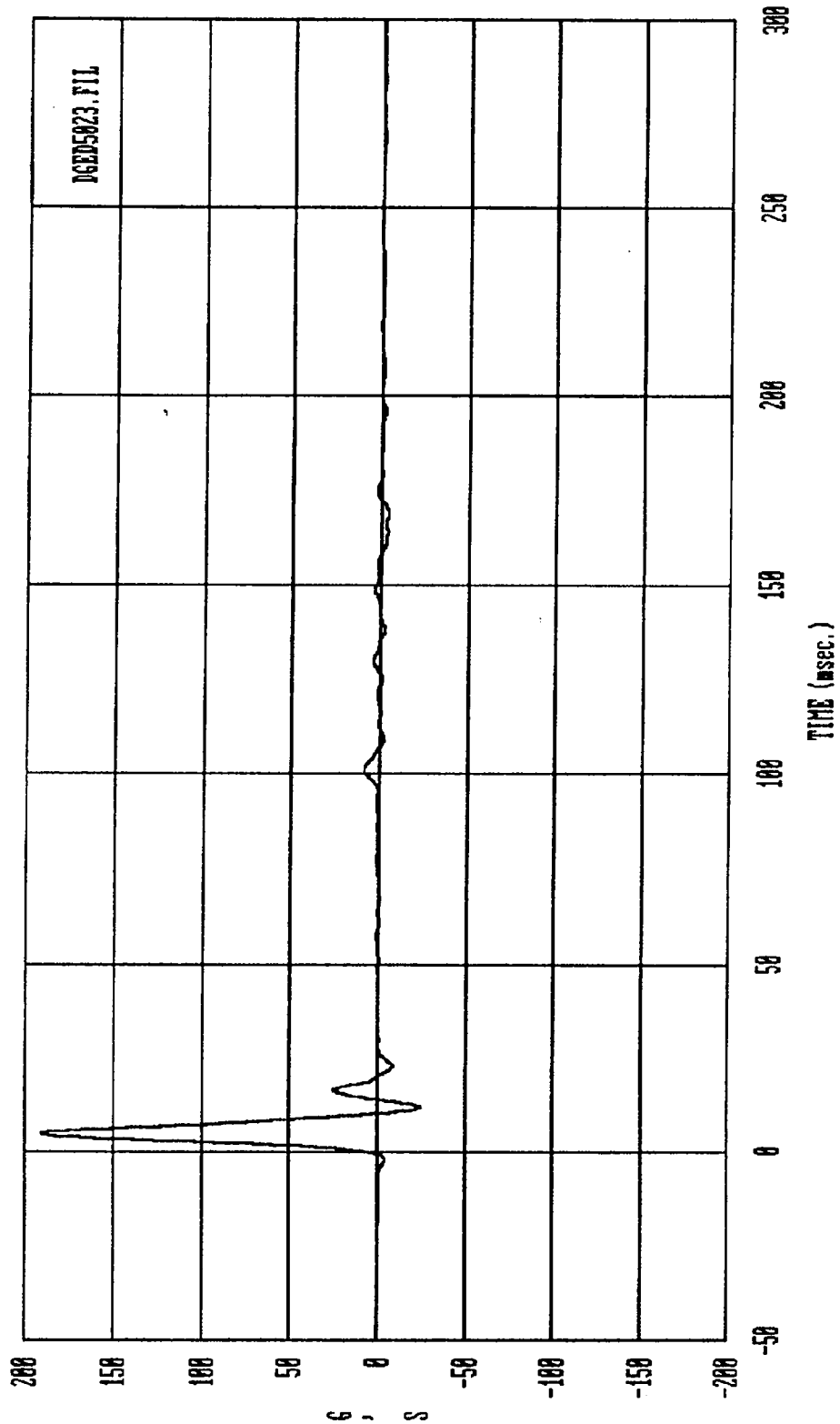


Curve: Front Seat Left Sill acceleration -- Y axis Filter: SAE CLASS 60 Max = 86.392 Min = -31.418

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

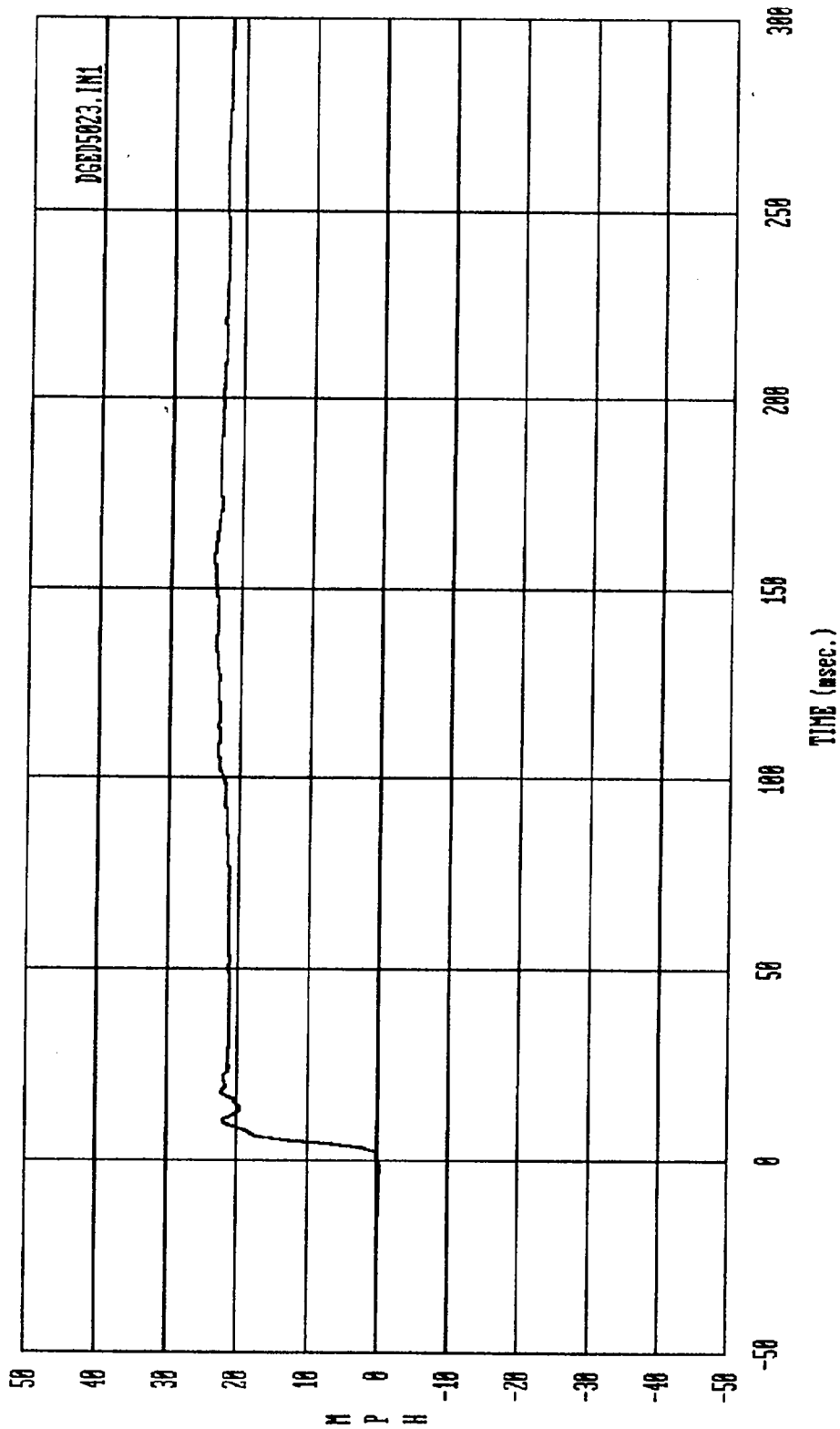


Curve: Front Seat Left Sill delta V -- Y axis Filter: SAE CLASS 180 Max = 11.215 Min = 2.3677
 MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



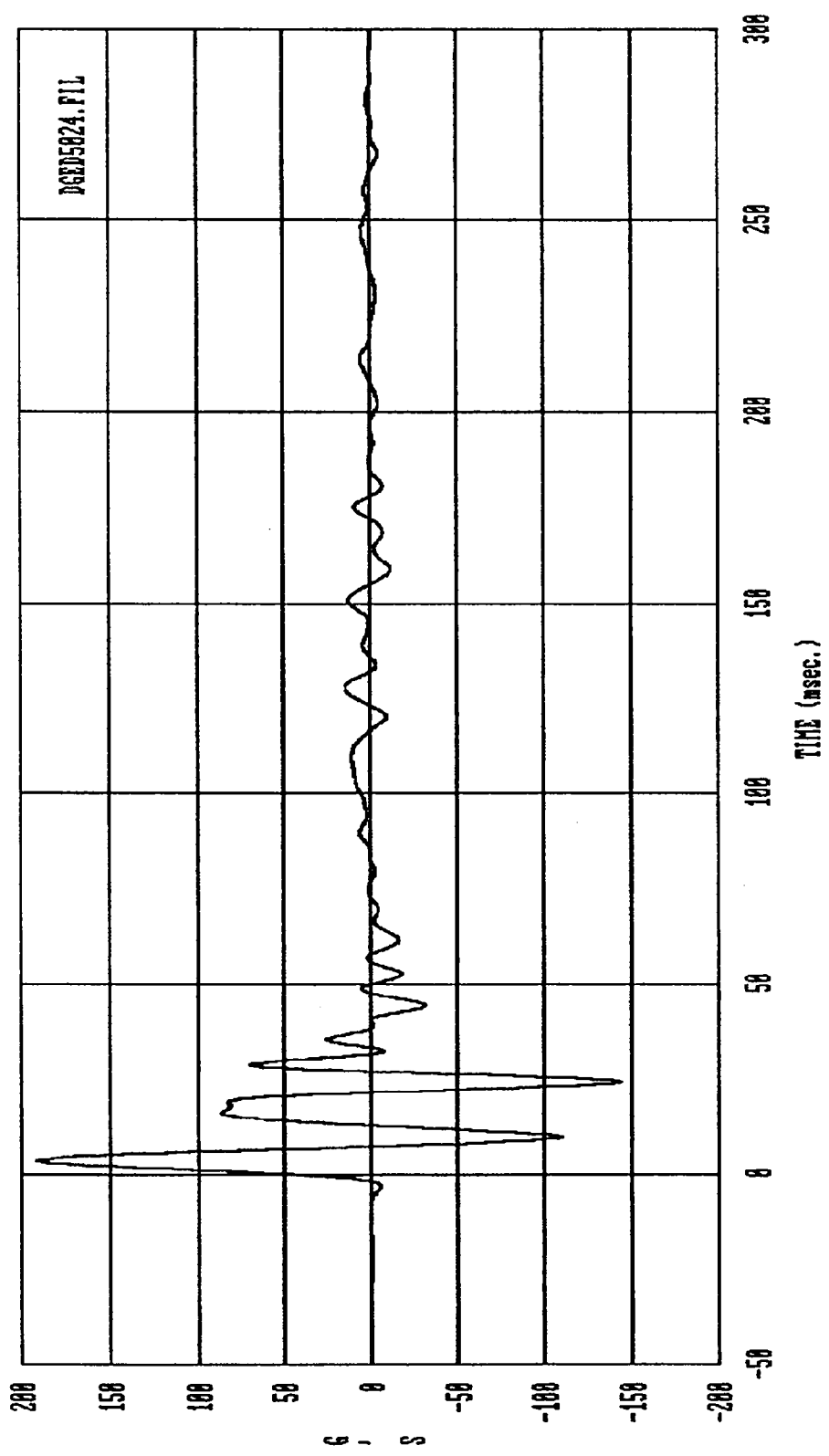
Curve: Left Front Door at centerline -- Y axis Filter: SAE CLASS 60 Max = 190.94 Min = -24.304

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

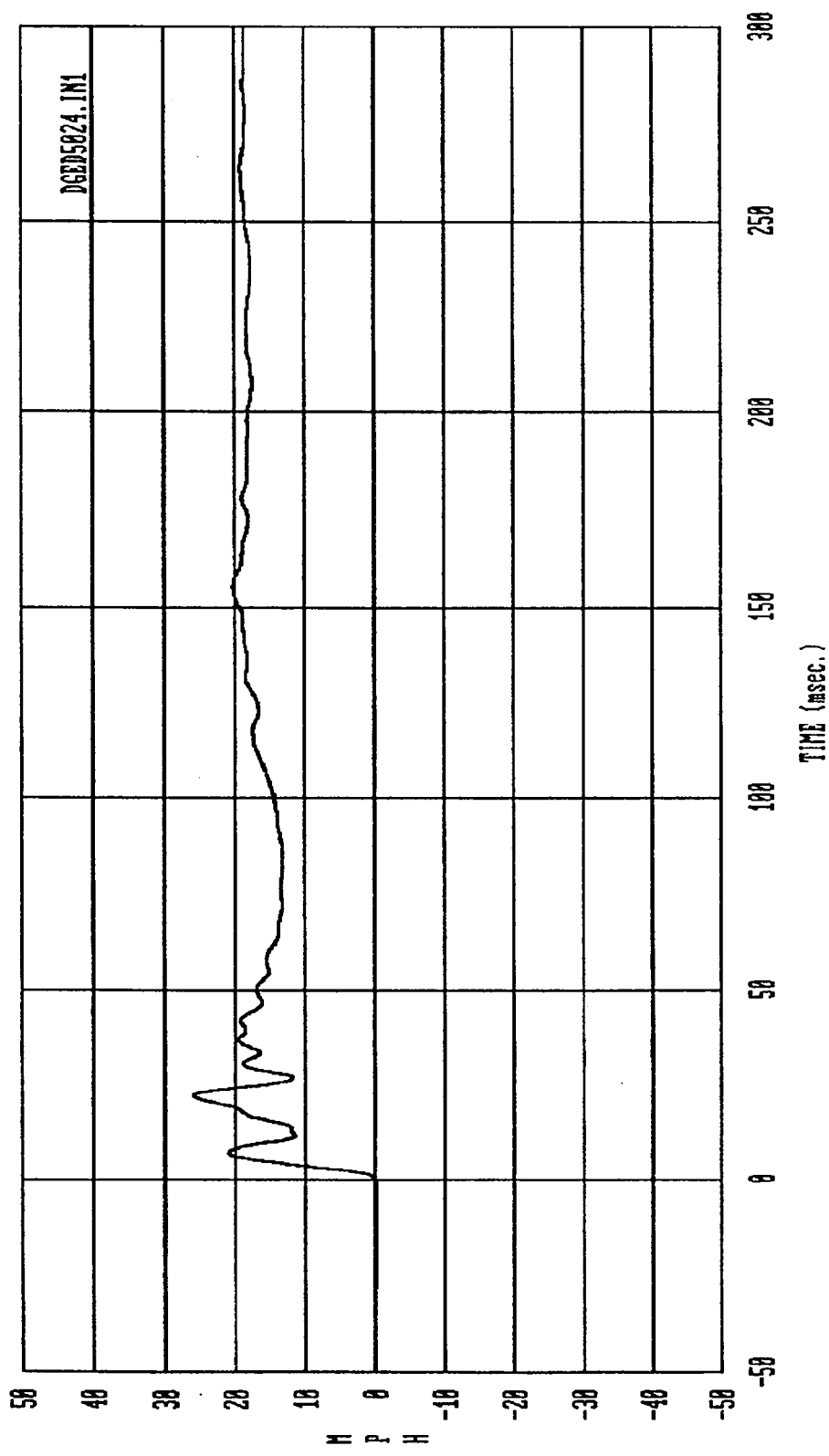


Curve: Left Front Door at centerline delta V Filter: SAE CLASS 180 Max = 23.915 Min = .14217

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

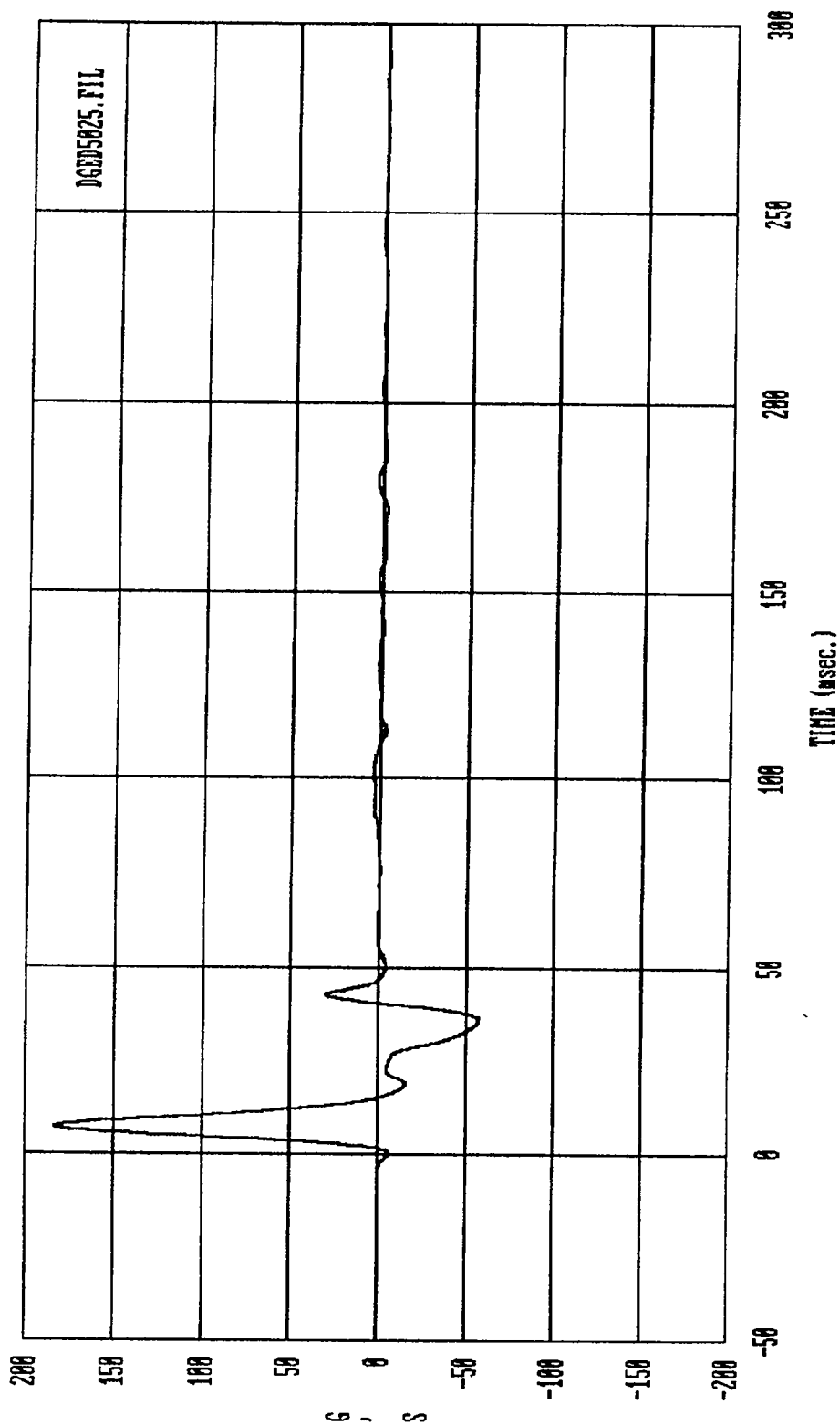


Curve: Left Front Door at mid-rear -- Y axis Filter: SAE CLASS 60 Max = 191.44 Min = -143.93
 MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge B-50 Pickup



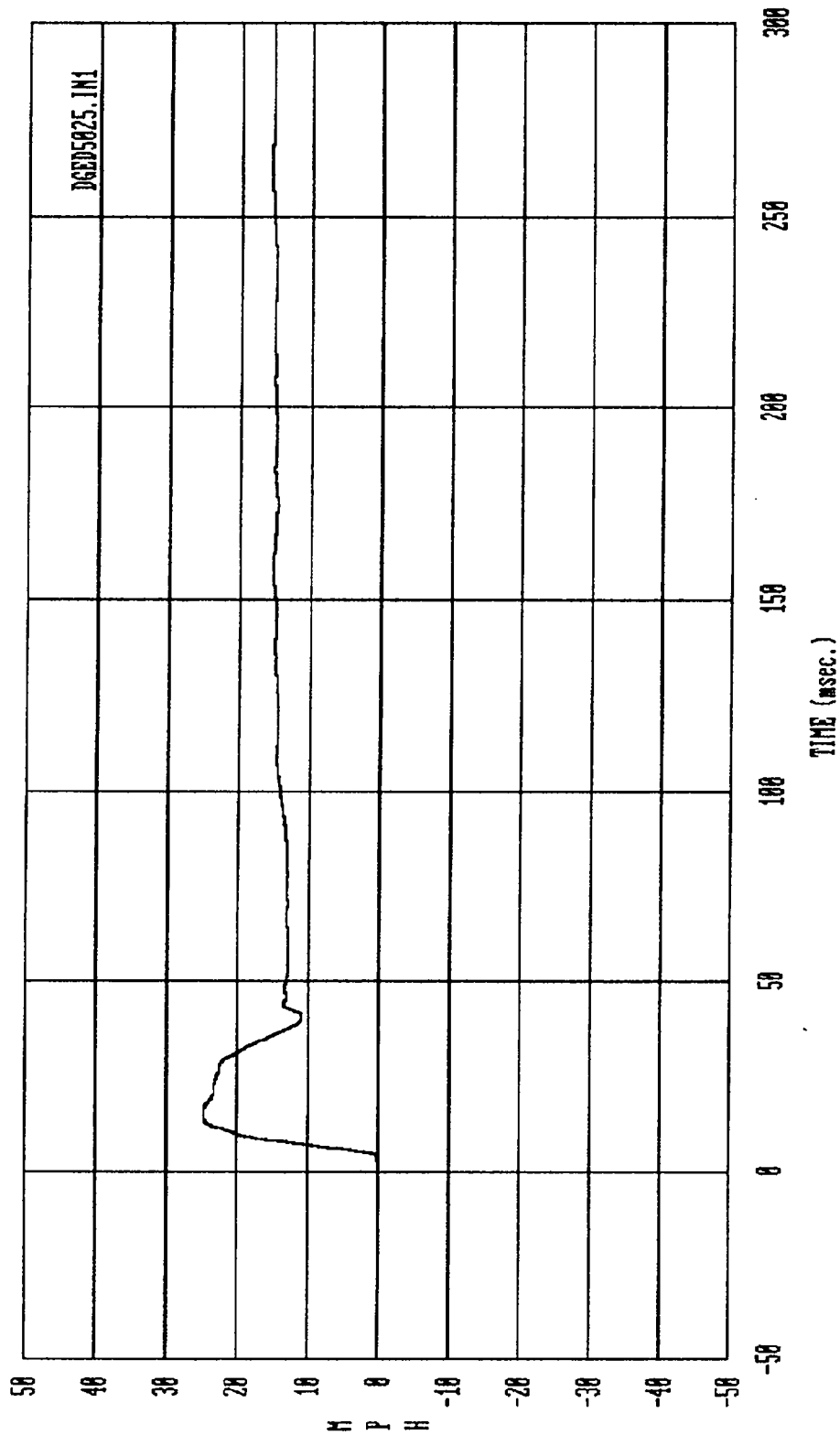
Curve: Left Front Door at mid-rear delta V Filter: SAE CLASS 180 Max = 26.848 Min = 11.495

HSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



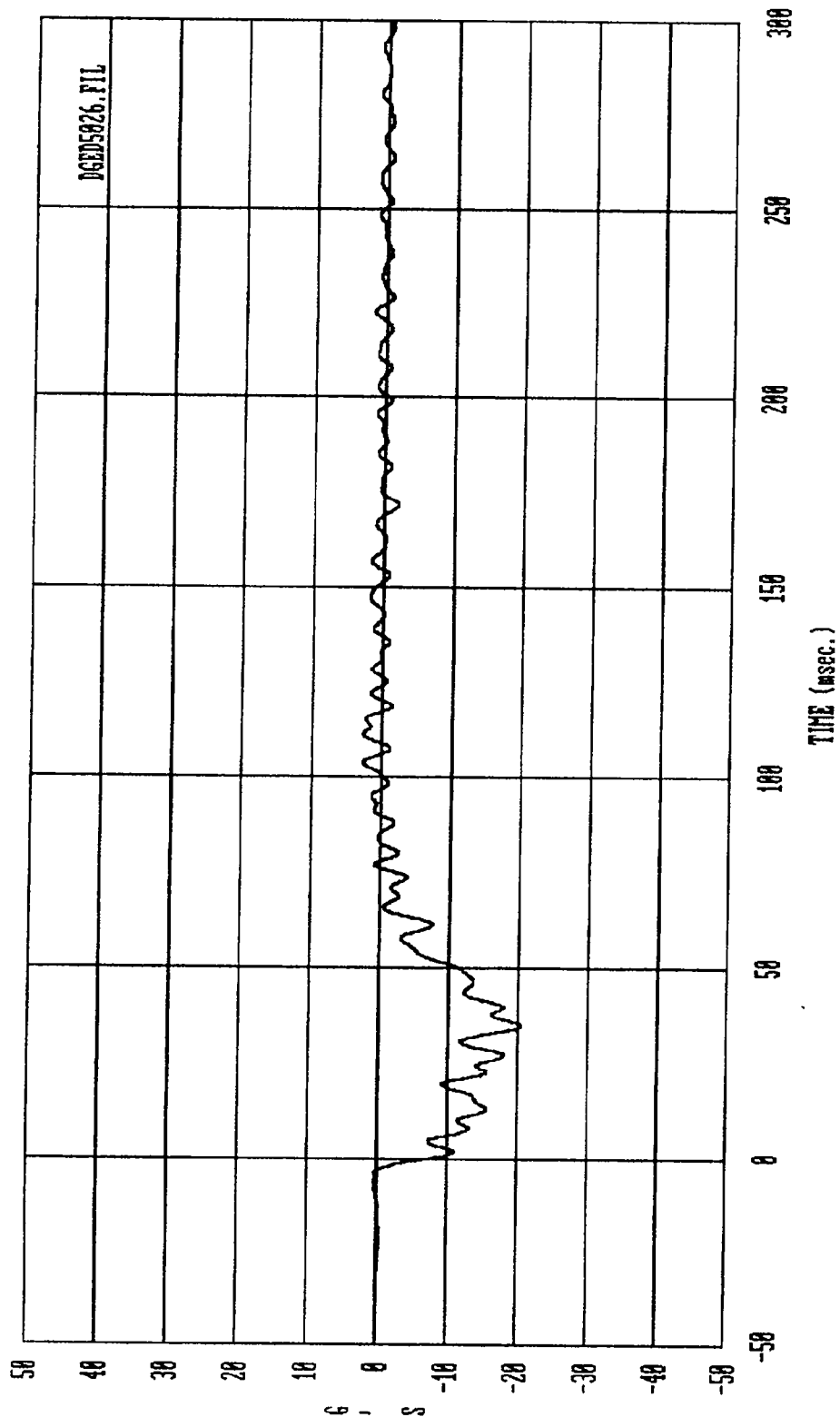
Curve: Left Front Door at upper centerline — Y axis Filter: SAE CLASS 60 Max = 183.80 Min = -57.328

HSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



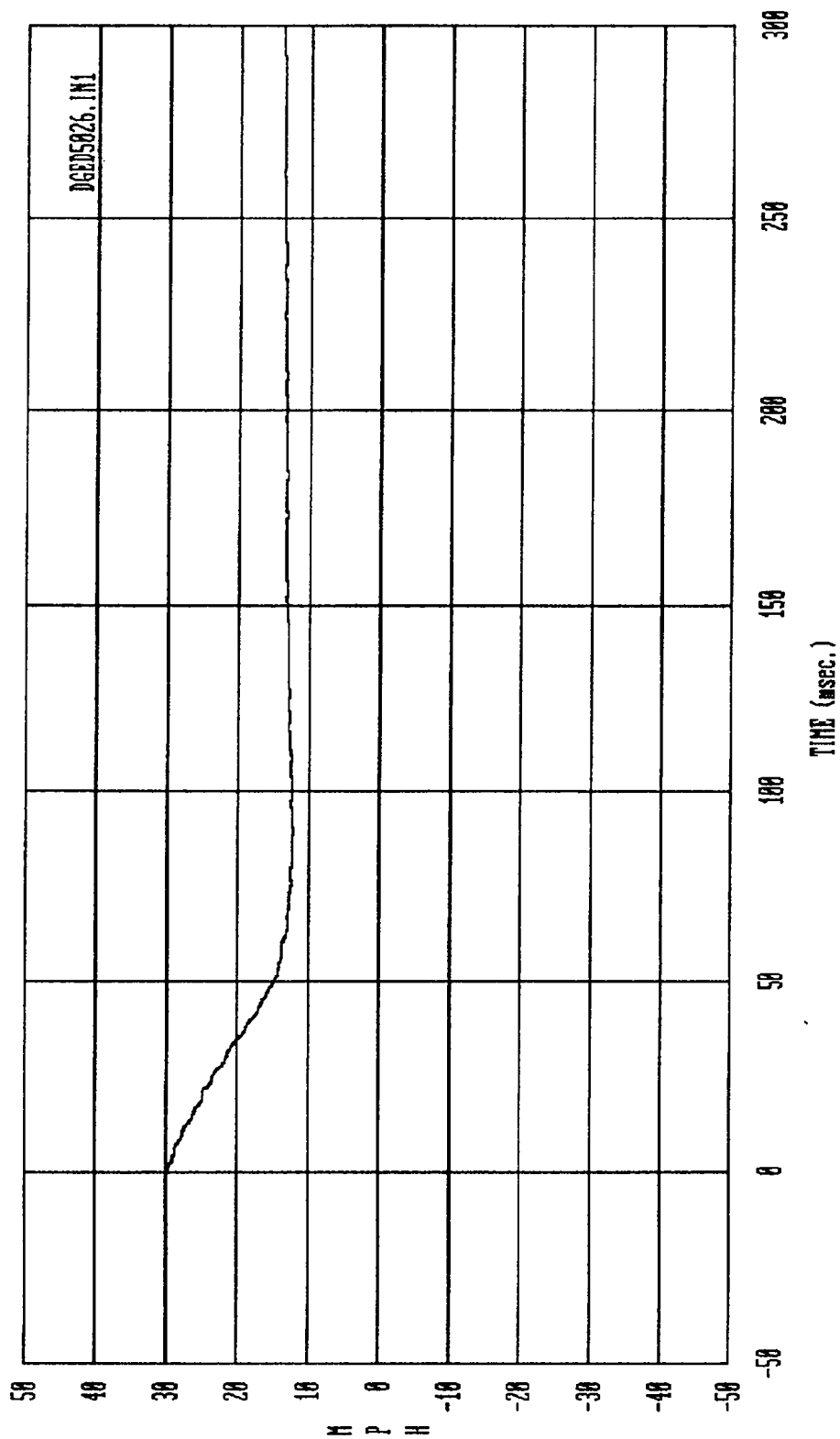
Curve: Left Front Door at upper centerline delta V Filter: SAE CLASS 180 Max = 24.808 Min = -.38373E-01

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



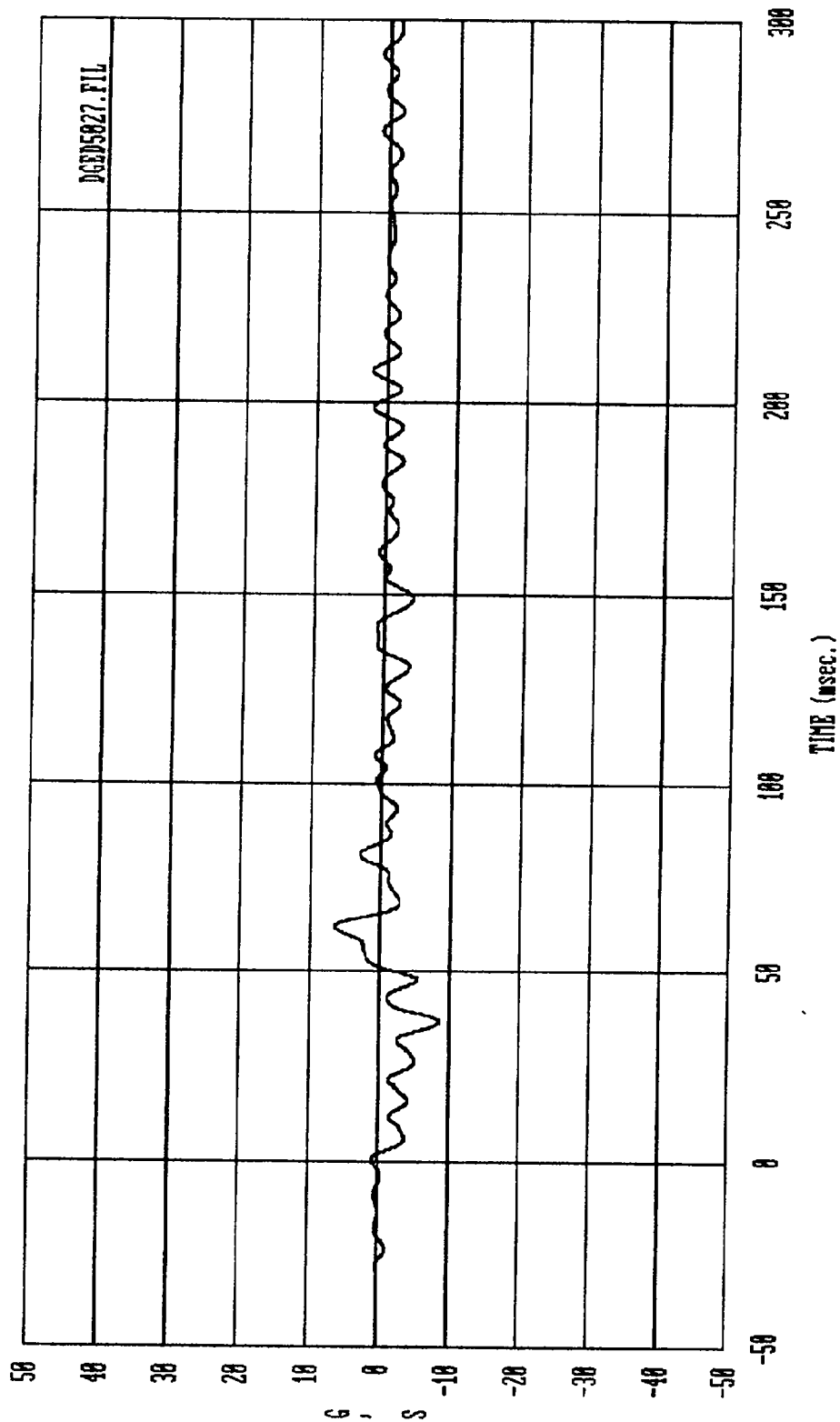
Curve: Movable Deformable Barrier C/G accel. — X axis Filter: SAE CLASS 60 Max = 2.6983 Min = -20.450

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



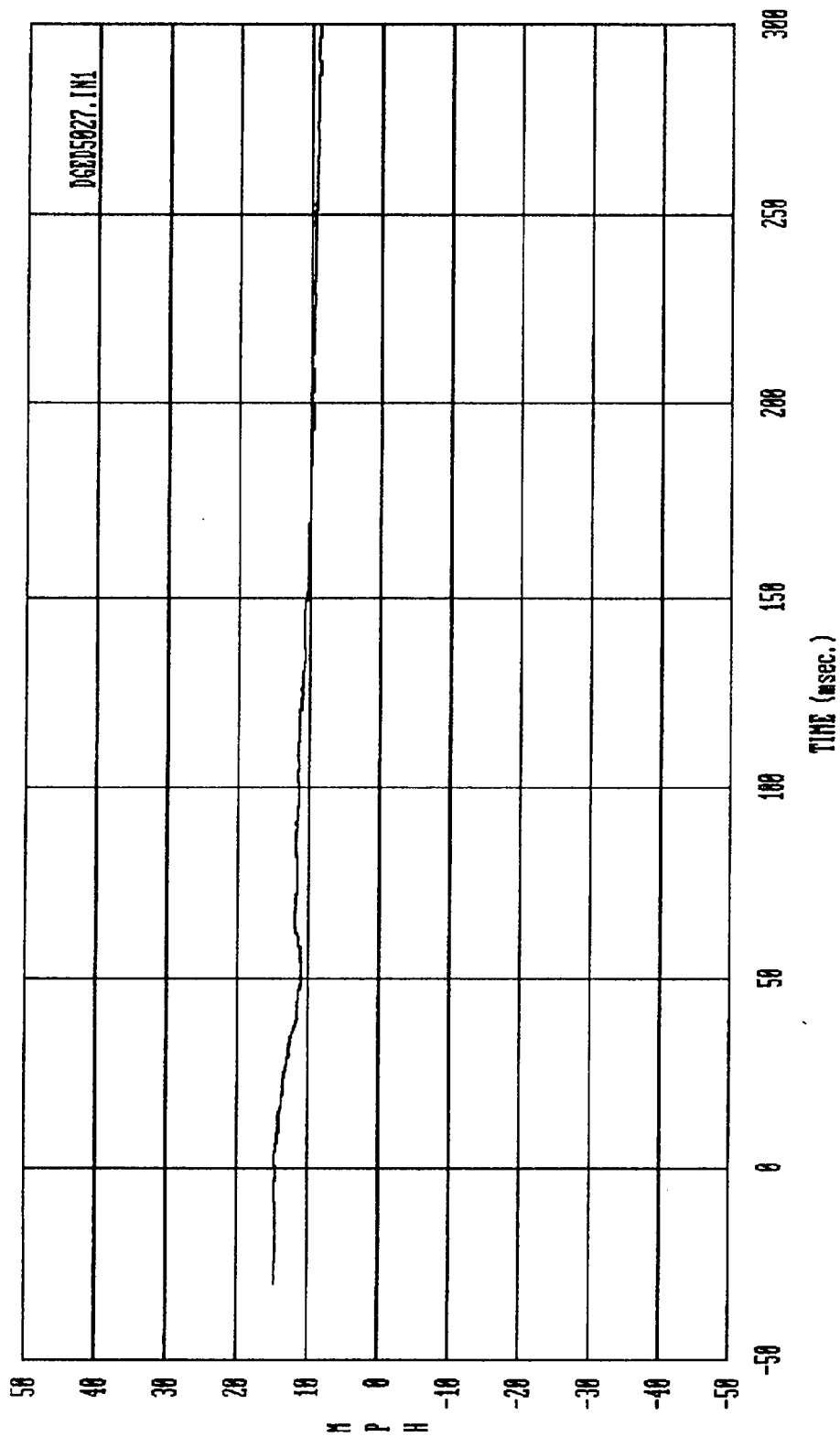
Curve: Movable Deformable Barrier C/G delta V - X axis Filter: SAE CLASS 180 Max = 30.000 Min = 12.225

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



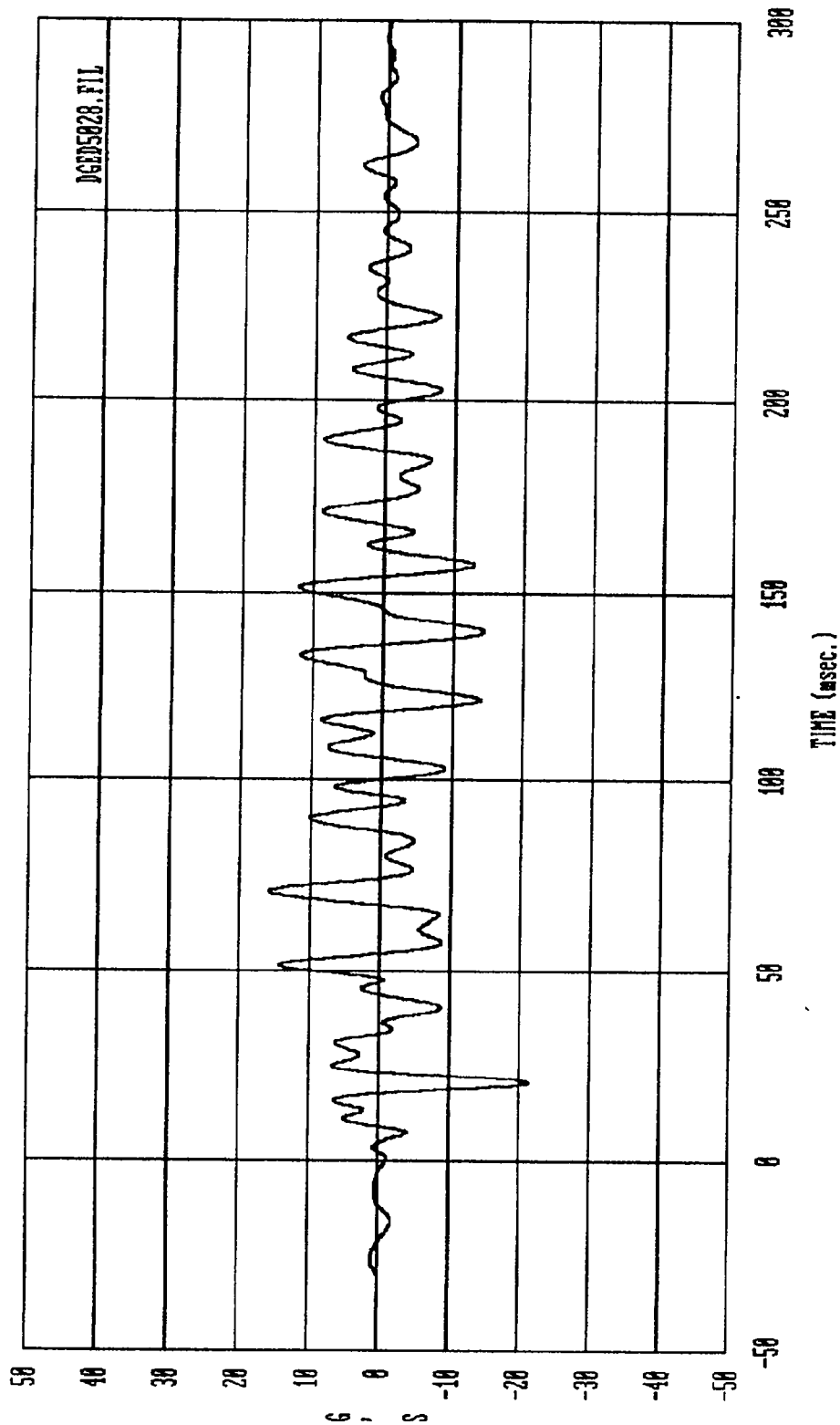
Curve: Movable Deformable Barrier C/G accel. — Y axis Filter: SAE CLASS 60 Max = 6.5355 Min = -8.6358

MSE Date: 89/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



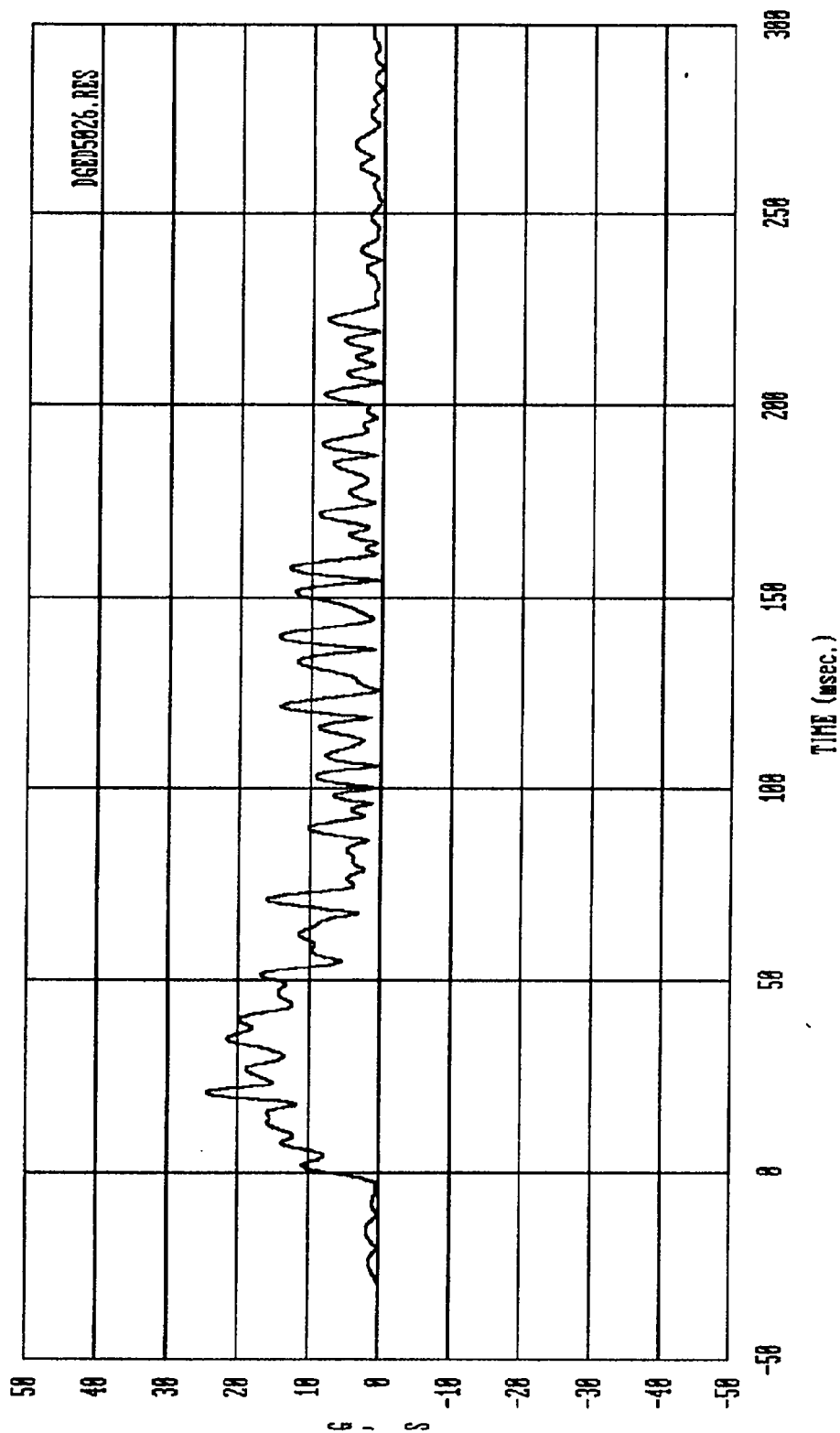
Curve: Movable Deformable Barrier C/G delta U - Y axis Filter: SAE CLASS 180 Max = 14.732 Min = 8.8617

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



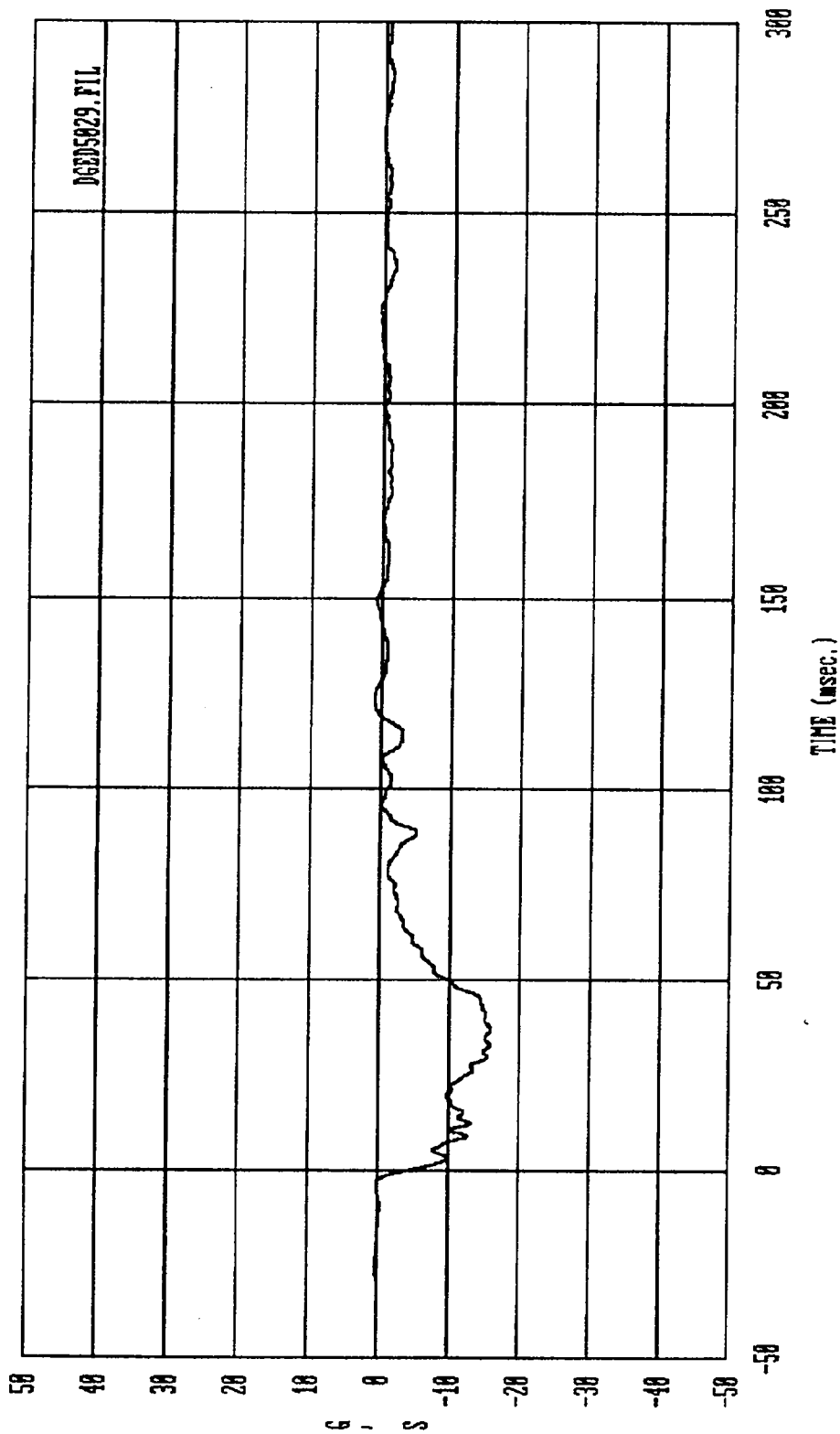
Curve: Movable Deformable Barrier C/G accel. -- Z axis Filter: SAE CLASS 60 Max = 15.940 Min = -21.470

HSE Date: 89/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



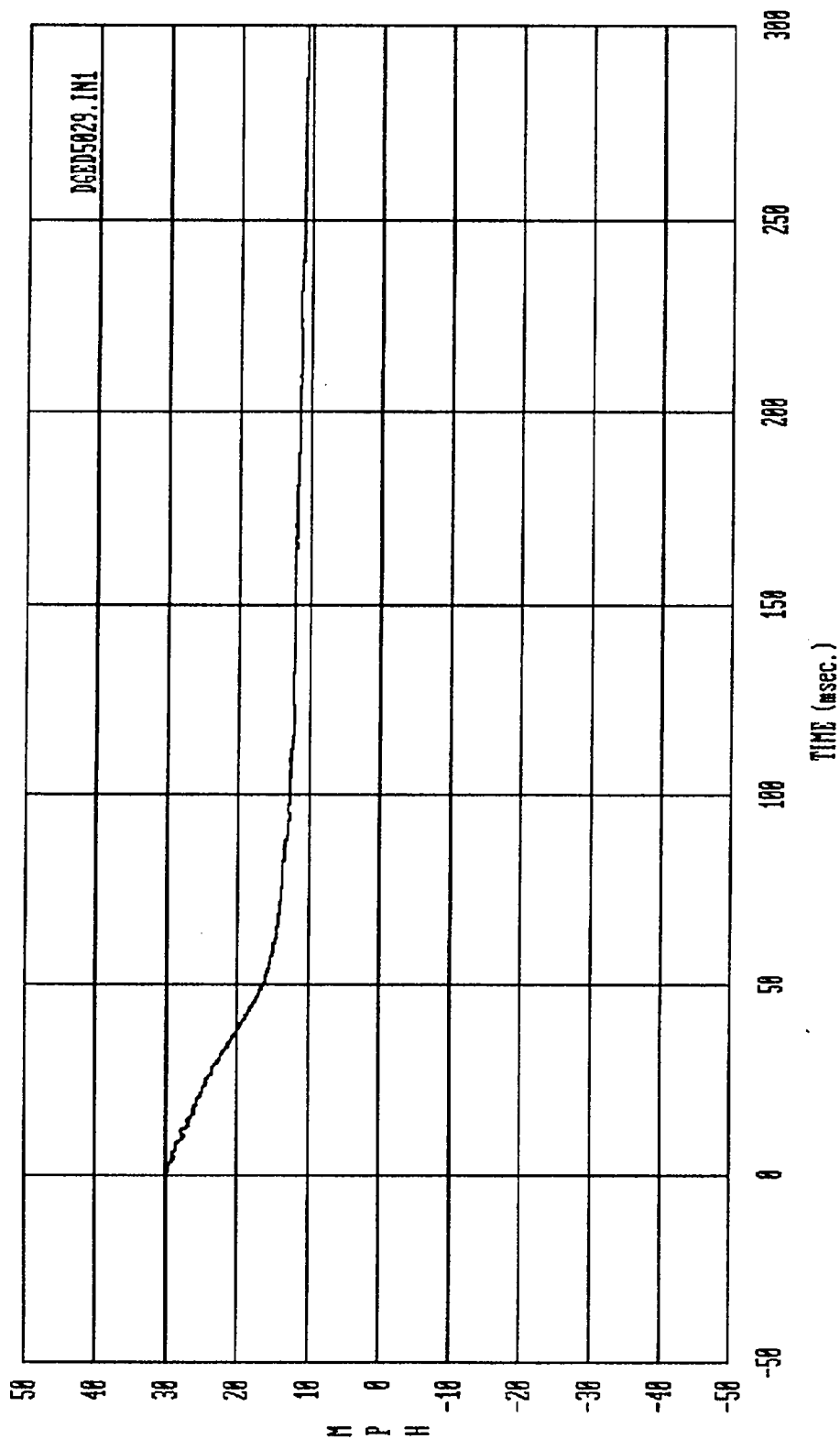
Curve: Movable Deformable Barrier C/G resultant accel. Filter: SAE CLASS 60 Max = 24.434 Min = .20156

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1991 Dodge D-50 Pickup



Curve: Movable Deformable Barrier Front frame - X axis Filter: SAE CLASS 60 Max = 1.0473 Min = -15.948

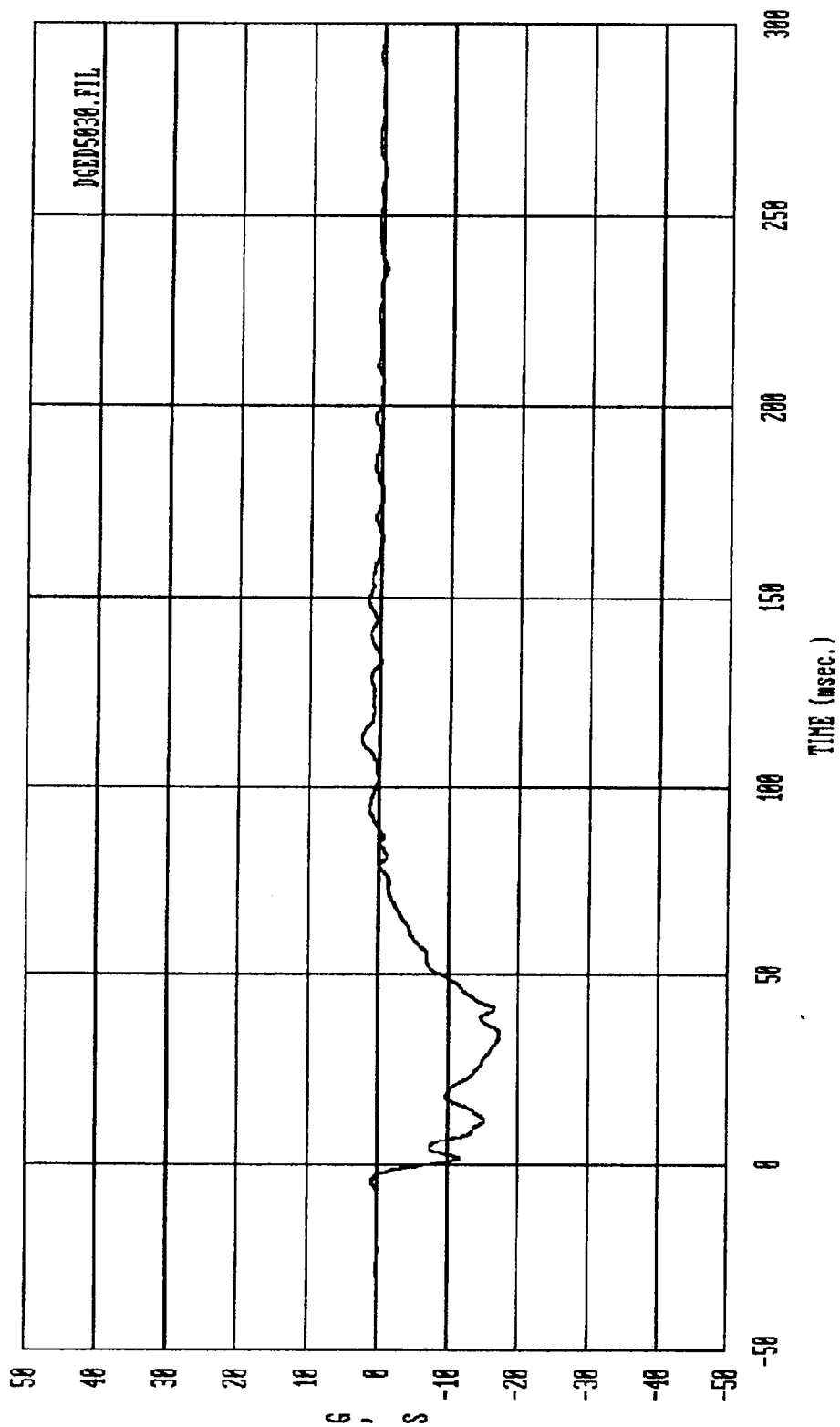
MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



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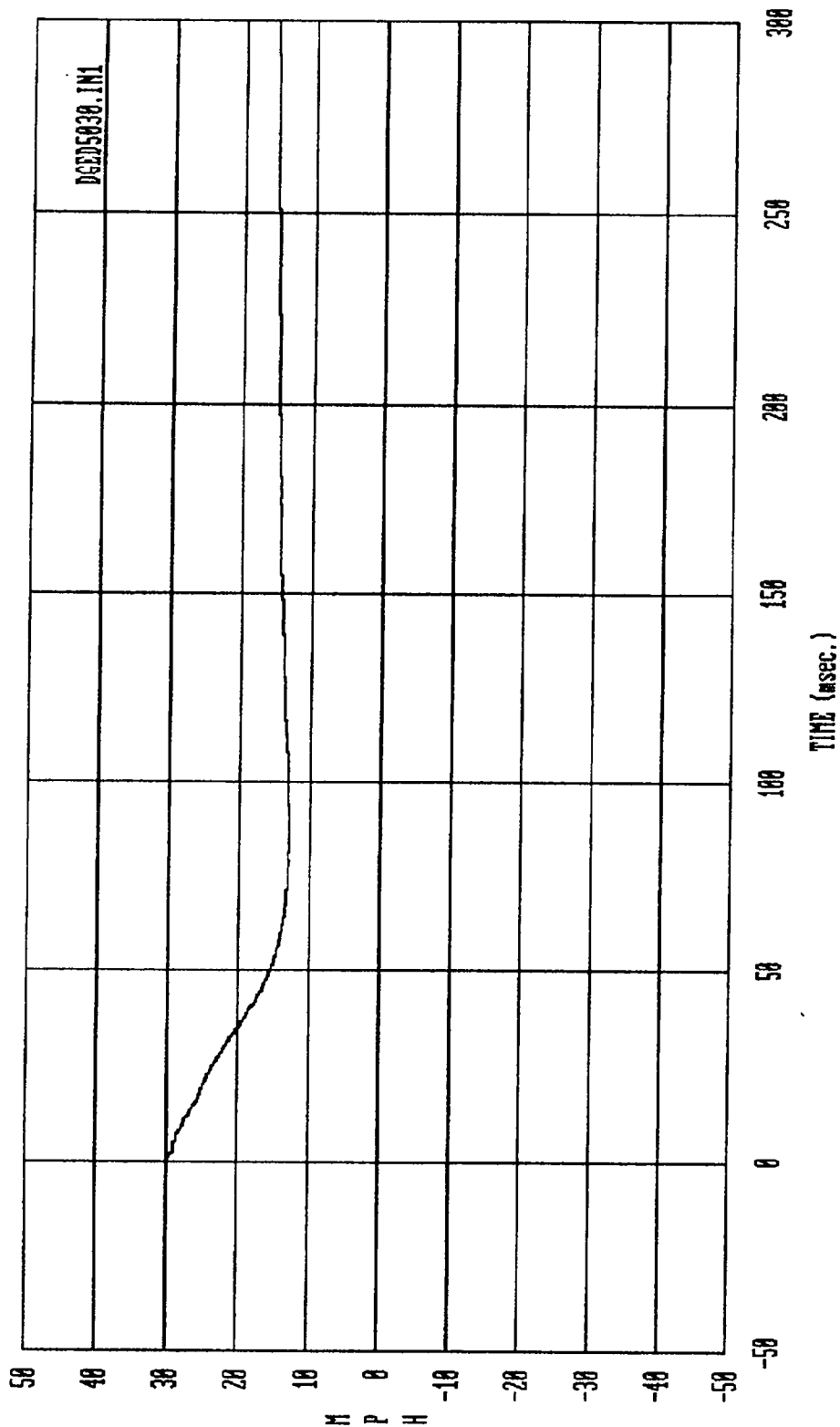
Curve: Movable Deformable Barrier Front frame delta V Filter: SAE CLASS 180 Max = 38.814 Min = 10.731

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



Curve: Movable Deformable Barrier Rear frame -- X axis Filter: SAE CLASS 60 Max = 2.5825 Min = -17.347

MSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup



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Curve: Movable Deformable Barrier Rear frame delta V Filter: SAE CLASS 180 Max = 30.011 Min = 12.930

HSE Date: 09/04/91 Program: 1991 Side Impact Vehicle: 1989 Dodge D-50 Pickup

APPENDIX C
SID CERTIFICATION DATA

SID IMPACT CALIBRATION SUMMARY SHEET

S.I.D. I.D. NO. : 319

LABORATORY TECHNICIAN: APURVA MARAPA

Sheet No. 1 of 2		Pretest Calibration	Posttest Calibration
Date of SID Calibration - - - - -			
Calibration Sequential Number for Dummy			
Temperature min Lab. (Spec. = 66 to 78' F) - -			
Relative Humidity i n Lab. (Spec. = 10 tp 70%)			
TEST PARAMETER	SPECIFICATION		
1. NECK BENDING TEST:			
a. Pendulum Speed - - -	21.5 to 25.5 fps		
b. Pendulum Avg. Decel (over t3 - t2) - - - -	20 to 24G		
c. Peak Resultant Head Acceleration- - - - -	26G maximum		
d. Pendulum Decel. (t2-t1)	3 ms		
e. Pendulum Decel. (t2-t2)	25 to 30 ms		
f. Pendulum Decel. (t2-t3)	10 ms		
g. Pendulum Direction Reversal Time - - - -	123 ms		
h. Max. Head Rotation- -	63 to 73'		
i. Chordal Displacement: Head Rotation Angle -			
0'	Time	-2 to 2 ms	
	Displ.	.5 to .5 in.	
30'	Time	25.6 to 34.4 ms	
	Displ.	2.1 to 3.1 in.	
	Time	40.3 to 51.7 ms	
60'	Displ.	4.3 to 5.3 in.	
Maximum	Time	53.2 to 66.8 ms	
(')	Displ.	5.0 to 6.0 in.	
2. NECK BENDING TEST continued:			
i. Chordal Displacement: Head Angle: --			
0'	Time	67.0 to 83.0 ms	
	Displ.	4.3 to 5.3 in.	
30'	Time	85.4 to 104.6 ms	
	Displ.	2.1 to 3.1 in.	
	Time	101.0 to 123.0 ms	
60'	Displ.	-.5 to 0.5 in.	

SID IMPACT CALIBRATION SUMMARY SHEET (Continued)

S.I.D. I.D. NO. : 319
 LABORATORY TECHNICIAN: APURVA MARAPA

Sheet No. 2 of 2		Pretest	Posttest
TEST PARAMETER	SPECIFICATION		
3. ABSOMINAL COMPRESSION TEST (Preload = 10 pounds)			
a. Force @ .50" - - - -	23 - 36 lbs.		
b. Force @ .75" - - - -	36 - 50 lbs.		
c. Force @ 1.00" - - - -	50 - 63 lbs.		
d. Force @ 1.30" - - - -	73 - 88 lbs.		
LUMBAR FLEXION TEST:			
a. Force @ 20' - - - -	22 to 34 lbs.		
b. Force @ 30' - - - -	34 to 46 lbs.		
c. Force @ 40' - - - -	46 to 58 lbs.		
d. Return Angle - - - -	12 maximum deg. max.		
5. THORAX IMPACT TEST:			
a. Upper Rib accel. - - -	37 - 46g's	Primary 44.95 Sec 45.33	
b. Lower Rib accel. - - -	37 - 46g's	Primary 41.25 Sec 41.85	
c. Lower Spine accel. - -	15 -22 g's	Primary 19.78 Sec 19.94	
6. PELVIC IMPACT TEST:			
Pelvic accel. - - - -	40 - 60g's	49.45	

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 manufactured stated nominal design location. If not specified, set it at the first detent rearward of 25 degrees.
- 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).
- B. 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 tests 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 (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 underpressed 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 11.5" 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 deg. and 25 deg. 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 deg. 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 0.5".

- 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 underpressed 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).