

V1669

REPORT NUMBER: CAL-92-N06

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

CHRYSLER CORPORATION
1992 DODGE CARAVAN FWD
7-PASSENGER MPV

NHTSA NUMBER: MNO300

CALSPAN TEST NUMBER: 7946-6

CALSPAN CORPORATION
ADVANCED TECHNOLOGY CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225

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FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
Office of Market Incentives
400 Seventh Street, S.W.
Room No. 5313 (NRM-20)
Washington, DC 20590

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Prepared: Michael J. Kilgallon
Michael J. Kilgallon, Project Engineer

Approved: Walter E. Levan
Walter E. Levan, Program Manager
Transportation Research/
Physical Sciences Department

FINAL REPORT ACCEPTED BY:

[Signature]
Manager, New Car Assessment Program (NCAP)

FEB 06 1992

Date of Report Acceptance

Han Su Chan
Contracting Officer's Tech. Rep. (COTR)

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<p>16. Abstract</p> <p>A frontal load cell barrier test on a 1992 Dodge Caravan FWD 7-Passenger MPV was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on November 20, 1991.</p> <p>The impact speed was 35.0 mph and the ambient temperature at the barrier face at the time of impact was 67°F. The maximum post-test vehicle crush was 25.3 inches. The test vehicle was equipped with a 3-point continuous belt system at each of the front outboard seating positions. The test vehicle was also equipped with a driver side airbag as a supplemental restraint device.</p> <p>With regard to FMVSS 208 "Occupant Crash Protection", injury criteria, both the driver and passenger dummies appear to comply with the maximum head, chest and femur requirements.</p>			
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Section 1
PURPOSE AND TEST PROCEDURE

This 35 mph frontal barrier impact test is part of the Composite FY 90 Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-90-D-02121. The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for an impact speed in excess of the current 30 mph requirements.

The 35 mph frontal barrier impact test was conducted in accordance with the Office of Market Incentives (OMI) Laboratory Indicant Test procedure.

Section 2

SUMMARY OF TEST NUMBER MN0300

A load cell barrier consisting of 36 load cells was impacted by a 1992 Dodge Caravan MPV at a velocity of 35.0 mph. The test was performed at the Calspan Corporation Advanced Technology Center on November 20, 1991. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by one real-time camera and 15 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 45) and the right-front passenger ATD (Serial No. 150) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 83 channels of data were recorded on six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces. Vehicle accelerometers 4(X)—Engine Bottom and 6(X)—Instrument Panel did not record accurately. Position #2—Belt Elongation did not record accurately.

The driver's head struck the air bag; the HIC was 407.3. The maximum chest deceleration over 3 milliseconds was 50.0 g's and femur loads were 459.6 and 1561.1 pounds.

The right front passenger's HIC was 427.3 and maximum chest deceleration over 3 milliseconds was 38.5 g's. Femur loads were 1396.0 and 585.6 pounds.

Table 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1992 Dodge Caravan MPV
NHTSA Test No.: MN0300 VIN.: 2B4GH25K3NR533483
Body Color: Blue Date of Manufacture: 9/91
Engine: 4 Cylinders; - C.I.D.; 2.5 Liters; - CC
✓ Gas; - Diesel; - Turbocharged
- Longitudinal; ✓ Transverse
Transmission: 3 Speed; - Manual; ✓ Automatic; - Overdrive
Final Drive: ✓ Front Wheel; - Rear Wheel; - Four Wheel
Date Received: 10/15/91 Odometer Reading: 026
✓ A/C; ✓ P/S; ✓ P/B; - P/wdo;
- Tilt Wheel - P/seats; - Cruise Control
Type of Occupant Restraint: Driver side airbag; 3-point continuous manual belt restraint

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 35 psi, Rear 35 psi
Recommended Tire Size: P195/75R14
Recommended Cold Tire Pressure: Front 35 psi, Rear 35 psi
Tires on Vehicle: P195/75R14; Manufacturer: Goodyear Invicta
Number of Occupants: 2 Front; 2 Rear; 3 3rd Seat; 7 TOTAL
Type of Seats: ✓ Bucket (front); ✓ Bench (rear); - Split Bench
Type of Front Seat Back: - Fixed; ✓ Adj. With ✓ Lever - Rot. Knob
Rated Cargo and Luggage
Weight (RCLW) A-B = 300 lbs.
GVWR 5040 lbs. GAWR: Front 2544 lbs. Rear 2544 lbs.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 1000 lbs. Right Rear = 690 lbs.
Left Front = 1040 lbs. Left Rear = 710 lbs.
TOTAL FRONT WEIGHT = 2040 lbs. (59.3 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1400 lbs. (40.7 % of Total Vehicle Weight)
TOTAL DELIVERED WEIGHT = 3440 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3440 lbs.)
DSC = Designated Seating Capacity (7)
RCLW = 300 lbs.
Target Test Weight = UDW + RCLW + (2 dummies x 167 lbs./dummy)
Target Test Weight = 4074 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 286 POUNDS CARGO:

Right Front = 1130 lbs. Right Rear = 910 lbs.
Left Front = 1120 lbs. Left Rear = 900 lbs.
TOTAL FRONT WEIGHT = 2250 lbs. (55.4 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1810 lbs. (44.6 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 4060 lbs.
Weight of ballast secured in vehicle trunk area = 200 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 28.8" LF 29.0" RR 29.2" LR 29.5"
Test Attitude: RF 28.0" LF 28.2" RR 27.8" LR 28.0"
Wheel Base: 111.8 in.; C.G. = 49.8 in. rearward of front wheel C/L
Remarks: 18.6 gallons of Stoddard solution was placed in fuel tank.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0 °
 Date of Test: November 20, 1991 Time of Test: 9:30
 Ambient Temperature: 67 °F at impact area
 Temperature in Occupant Compartment: 71 °F
 Windshield Molding Temperature: 70 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.0 mph, secondary = 35.1 mph
 Distance From Front Bumper to Barrier Face When
 Entering Speed Trap: 52 inches
 Exiting Speed Trap: 12 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length: Pre-test = R 174.2 C_L 177.5 L 174.0
 Post-test = R 151.0 C_L 152.2 L 151.7
 Crush = R 23.2 C_L 25.3 L 22.3

Distance from front of test vehicle to point of impact:

R 24.5 C_L 24.7 L 25.4

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Airbag</u>	<u>No contact</u>
Chest	<u>Airbag</u>	<u>No contact</u>
Abdomen	<u>No Contact</u>	<u>No contact</u>
Left Knee	<u>Lower dash panel</u>	<u>Dash panel</u>
Right Knee	<u>Lower dash panel</u>	<u>Dash panel</u>

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening	<u>Operable</u>	<u>Operable</u>	<u>-</u>	<u>Operable</u>

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
<u>Seat Movement</u>				
Seat Back Failure	<u>None</u>	<u>None</u>	<u>-</u>	<u>-</u>
Seat Shift (in.)	<u>3.6" rearward</u> <u>of mid-position</u>	<u>0.0</u>	<u>-</u>	<u>-</u>

Glazing Damage

Backlight/Windshield Windshield sustained stress fractures but remained intact.

Other Notable Impact Effects: None

Section 3
OMI FINAL DATA

Occupant and Vehicle Information

I. OMI DATA

1. Dummy Injury Criteria Data Summary
2. Dummy Positioning Data
3. Seat Belt Positioning Data
4. Seat Belt Performance Assessment Data
5. Driver Dummy to Steering Column Dimensions
6. Camera Locations
7. Vehicle Target Locations

II. OVR DATA

1. Load Cell Barrier Data
2. Vehicle Accelerometer Data
3. Test Vehicle Measurements

Table 2

DUMMY INJURY CRITERIA VALUESNHTSA No.: MN0300 Vehicle: 1992 Dodge Caravan FWD 7-Passenger MPV

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-56.9	-9.2	23.9	57.2
Position #2 - Passenger	-35.5	5.4	43.4	47.3

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-51.2	10.5	-10.0	50.0
Position #2 - Passenger	-40.2	15.8	7.5	38.5

The maximum chest resultant acceleration is defined as the maximum acceleration which exceeds 0.003 seconds in duration.

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Position #1 - Driver	459.6	1561.1
Position #2 - Passenger	1396.0	585.6

	MAXIMUM FORCE - SEAT BELT LOADS (lbs.)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	1919.8	-	2252.4
Position #2 - Passenger	1824.5	1659.2	-

	HEAD INJURY CRITERIA (HIC)			
	HIC	t ₁ (SEC)	t ₂ (SEC)	Average Acceleration t ₁ TO t ₂
Position #1 - Driver	407.3	.05292	.08880	41.9
Position #2 - Passenger	427.4	.07248	.10836	42.7

HIC is as defined in FMVSS 208. The maximum time interval from t₁ to t₂ is 36 milliseconds.

Table 3
HYBRID III NECK AND CHEST DATA SHEET

Vehicle Year/Make/Model/Body Style: 1992 Dodge Caravan FWD 7-Passenger MPV

Vehicle NHTSA No.: MN0300 Test Date: November 20, 1991

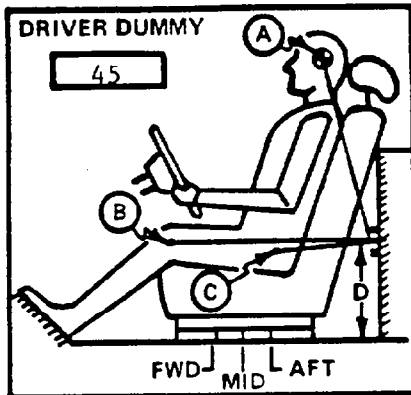
MAXIMUM VALUES	DRIVER DUMMY ID # <u>45</u>	PASSENGER DUMMY ID # <u>150</u>
Neck Load X (lbs.)	138.4	305.2
Neck Load Y (lbs.)	65.2	-126.7
Neck Load Z (lbs.)	420.3	385.5
Neck Moment X (in.-lbs.)	-100.7	-126.5
Neck Moment Y (in.-lbs.)	-473.2	652.0
Neck Moment Z (in.-lbs.)	-57.0	-103.4
Chest Deflection X (in.)	1.2	1.4
Time of Max. Occurrence (msec.)	55.2	95.2

NOTE: All values listed must be occurring during primary impact event.

Figure 1
PART 572 DUMMY IN-VEHICLE POSITION

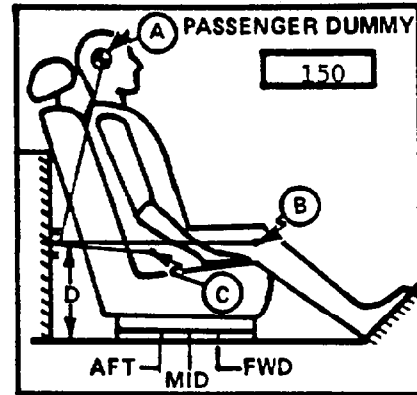
Test No.: MNO300 Vehicle: 1992 Dodge Caravan FWD 7-Passenger MPV

<u>SEAT TYPE:</u>	<u>ADJUSTER TYPE:</u>	<u>SEAT BACK TYPE:</u>
<u> </u> Bench	<u> </u> <input checked="" type="checkbox"/> Manual	<u> </u> Fixed
<u> </u> <input checked="" type="checkbox"/> Bucket	<u> </u> <u> </u> Power	<u> </u> <input checked="" type="checkbox"/> Adjustable Reclining
<u> </u> Split Bench		



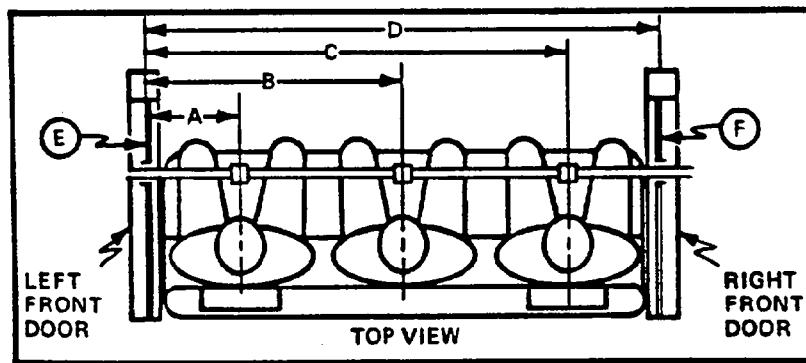
MEASUREMENT LOCATION

- A - Head Target
- B - Knee Joint
- C - Approximate 'H' Point
- D - Sill to Reference Point



A = 23.0 in. 10 Degrees
 B = 25.5 in. 90 Degrees
 C = 9.5 in. 109 Degrees
 D = 15.8 in.

A = 23.3 in. 7 Degrees
 B = 24.5 in. 90 Degrees
 C = 9.0 in. 108 Degrees
 D = 15.8 in.



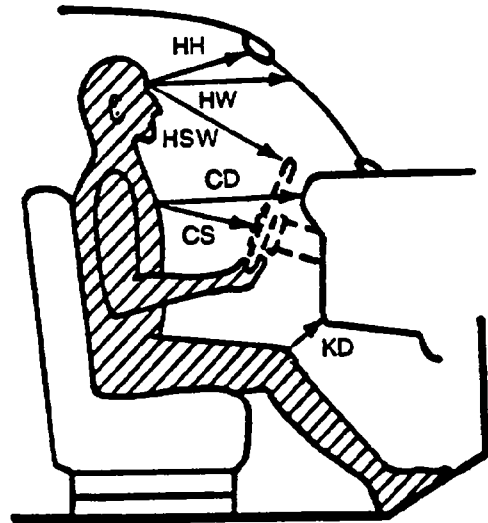
S/N 45 DUMMY ID S/N 150

A = Left Door to Driver Centerline 12.2 in.
 B = Left Door to Center Passenger Centerline in.
 C = Left Door to Right Passenger Centerline 45.0 in.
 D = Left Door to Right Door 57.4 in.
 E,F = Window Glass Height (Right and Left Must Be Equal) 12.5 in.

Figure 2

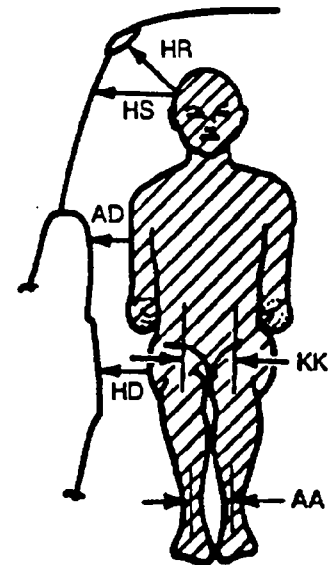
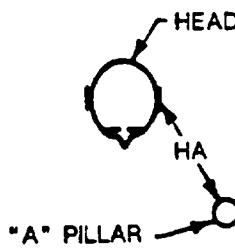
OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	17.7	18.1
HW	25.3	25.1
CD	20.2	22.5
CS	17.8	-
KDL	5.9	6.7
KDR	5.3	6.5
SA	See Note	See Note
TA	25°	25°
HSW	18.2	-



- HH = Head to Windshield Header
- HW = Head to Windshield
- HSW = Head to Steering Wheel
- CD = Chest to Dash
- CS = Chest to Steering Wheel
- KD(L/R) = Knee to Dash (Left/Right)
- SA = Seat Back Angle
- TA = Torso Angle

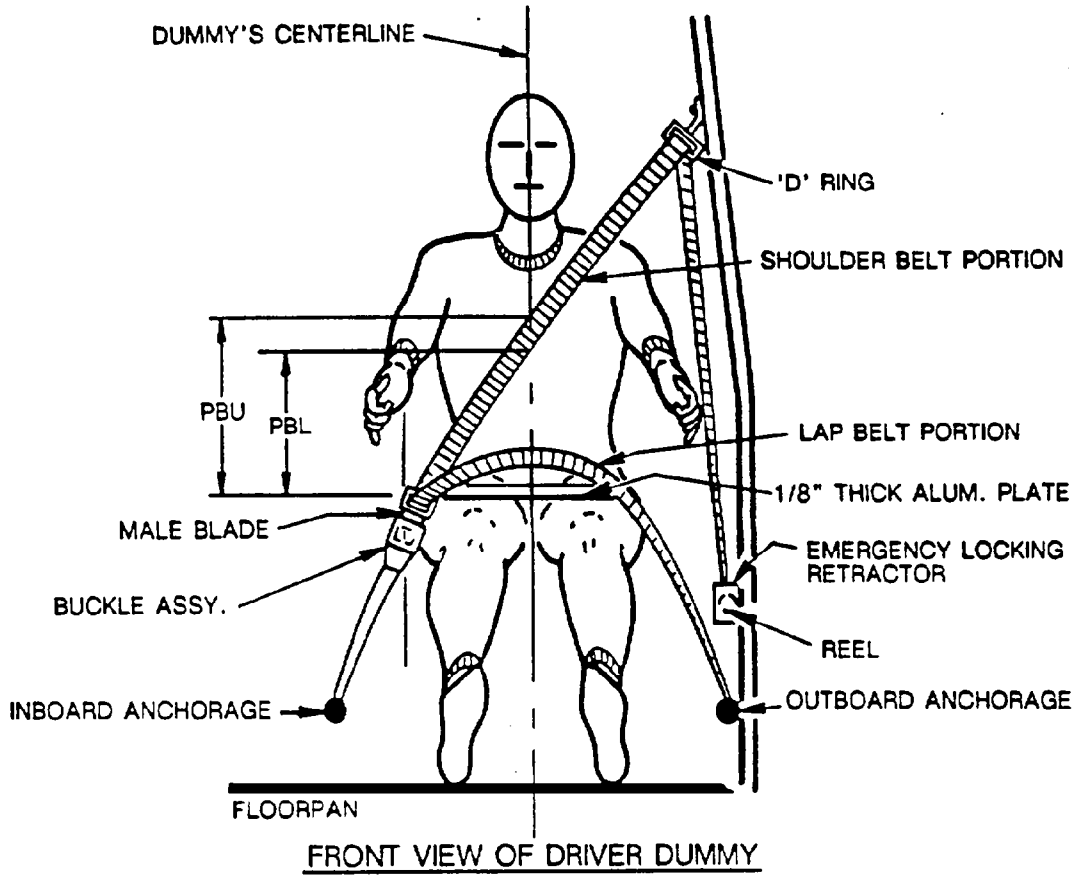
- HA = Head Target to "A" Pillar
- HR = Head to Side Roof
- HS = Head to Side Window
- AD = Arm to Door
- HD = Hip to Door
- KK = Knee to Knee
- AA = Ankle to Ankle



	DRIVER	PASSENGER
HR	8.4	8.2
HS	9.4	9.7
AD	3.0	3.0
HD	5.6	5.4
KK	8.5	7.8
HA	20.9	21.3
AA	11.5	6.6

Note: Seat back was set according to manufacturer specifications (27° from vertical).

Figure 3
SEAT BELT POSITIONING DATA



	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	13.5	13.5
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	11.0	11.0
<u>LAP BELT TENSION</u>	-	-
<u>SHOULDER BELT TENSION</u>	-	-

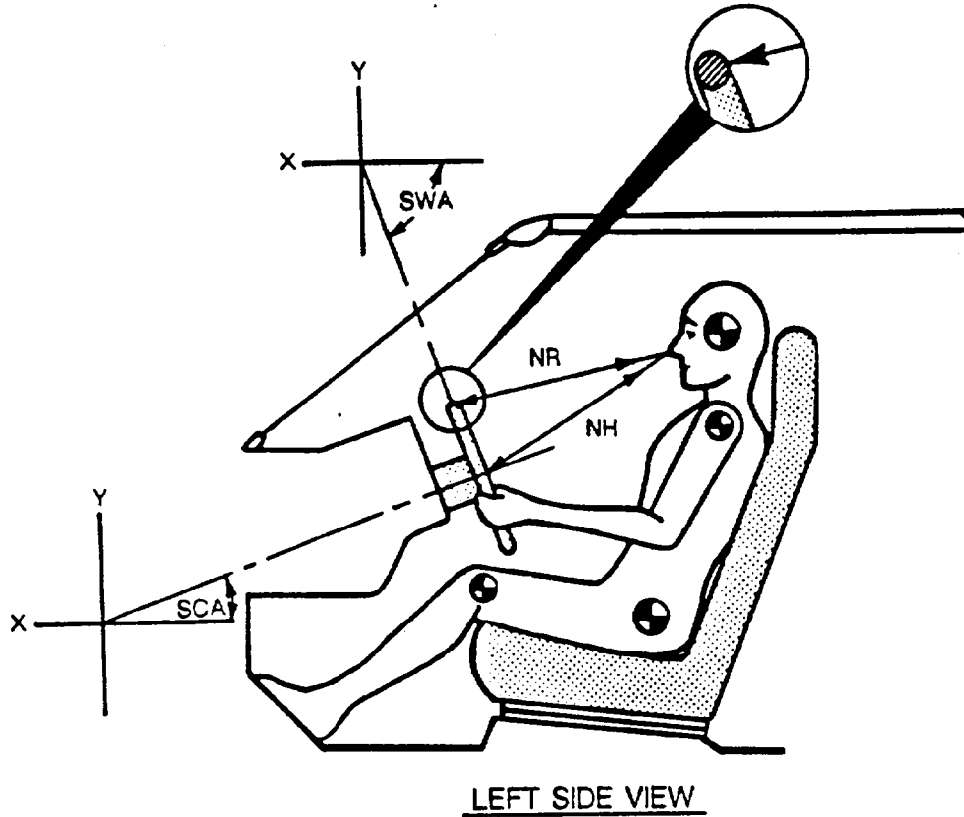
Table 4
SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

<u>BELT LENGTH DATA:</u>	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>84.0</u> in.	<u>82.5</u> in.
Shoulder belt length as measured on Part 572 Dummy.	<u>37.0</u> in.	<u>35.5</u> in.
Lap belt length as measured on Part 572 Dummy.	<u>34.5</u> in.	<u>34.5</u> in.
 <u>SHOULDER BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>1.3</u> in.	<u>1.5</u> in.
As determined mechanically.	<u>1.0</u> in.	<u>1.3</u> in.
As determined electronically.	<u>0.7</u> in.	<u>1.1</u> in.
 <u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>0.82</u> in/ft	<u>*</u> in/ft
Measured mechanically	<u>0.0</u> in/ft	<u>0.6</u> in/ft

* Passenger belt elongation potentiometer did not record accurately during test.

Figure 4

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY REFERENCE DIMENSIONS



		MEASUREMENTS	
<u>NR</u>	-- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	16.6	Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	15.5	Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	35	Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	-55	Degrees

Figure 5
CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

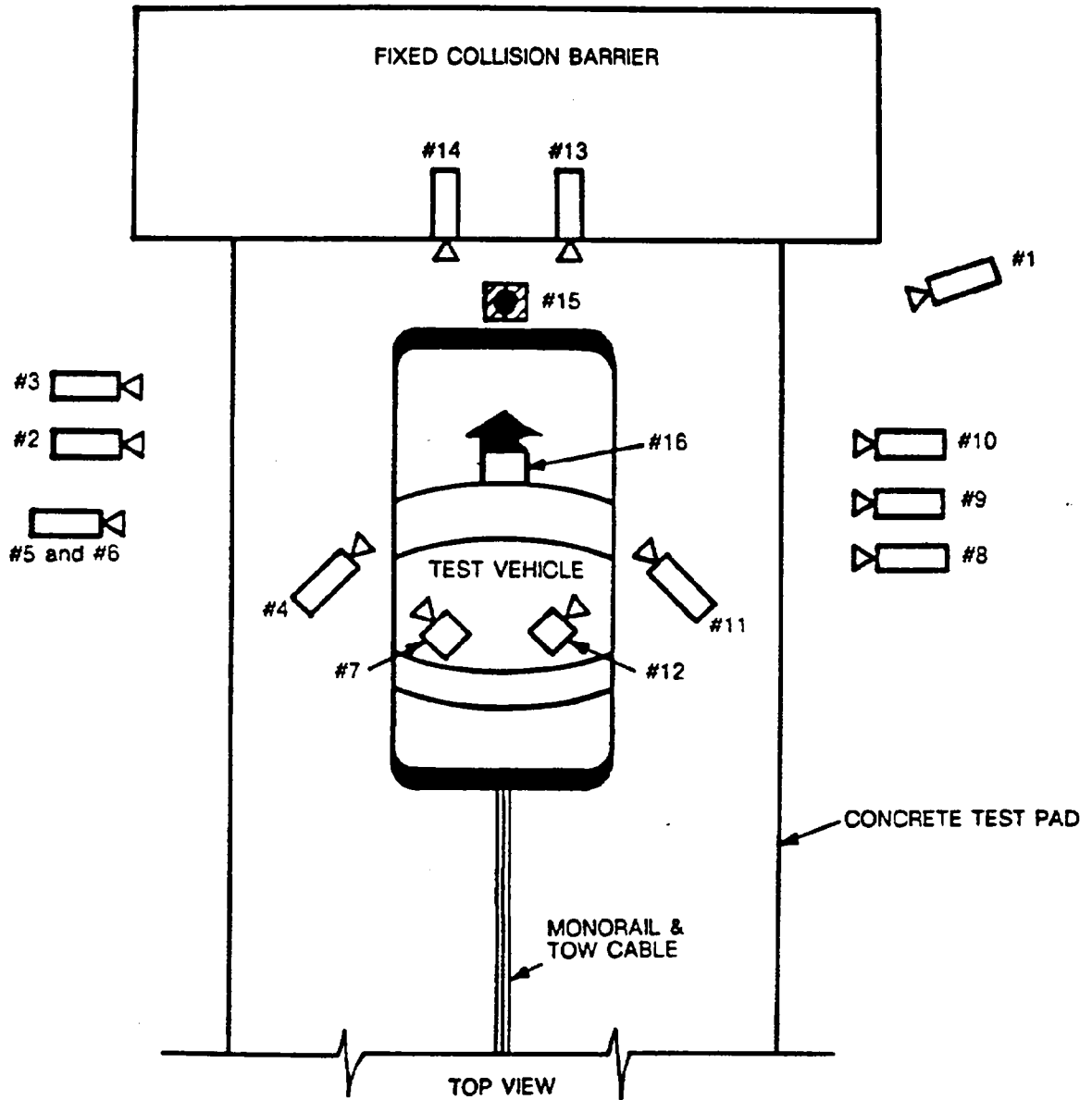


Table 5

HIGH-SPEED CAMERA LOCATIONS

Test No. MN0300 Vehicle: 1992 Dodge Caravan FWD 7-Passenger MPV

CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	24	
2	Overall Left Side	227	56	41	-5	210	545	
3	Left Side View	299	31	41	-1	193	570	
4	Driver and Interior View	103	89	69	-17	86	590	
5	Steering Column (Bottom)	286	70	46	-2	269	530	
6	Steering Column (Top)	286	70	70	-8	269	510	
7	Left Belt	-	-	-	-	-	N.T.	
8	Overall Right Side	234	63	42	-2	217	590	
9	Right Side View	292	45	41	-1	275	580	
10	Right Passenger View	312	64	55	-3	295	525	
11	Passenger and Interior View	104	87	67	-15	87	500	
12	Right Belt	-	-	-	-	-	620	
13	Passenger Front View	24	-5	70	-37	-	560	
14	Driver Front View	24	-5	71	-36	-	530	
15	Windshield View	0	0	120	-45	-	530	
16	Pit View of Engine	0	42	-120	90	-	665	

*X = film plane to monorail centerline

Y = film plane to impact location

Z = film plan to ground

** = referenced to horizontal plane

N.T. = No Timing

Date on Placard Incorrect

Figure 6

VEHICLE TARGET LOCATIONS

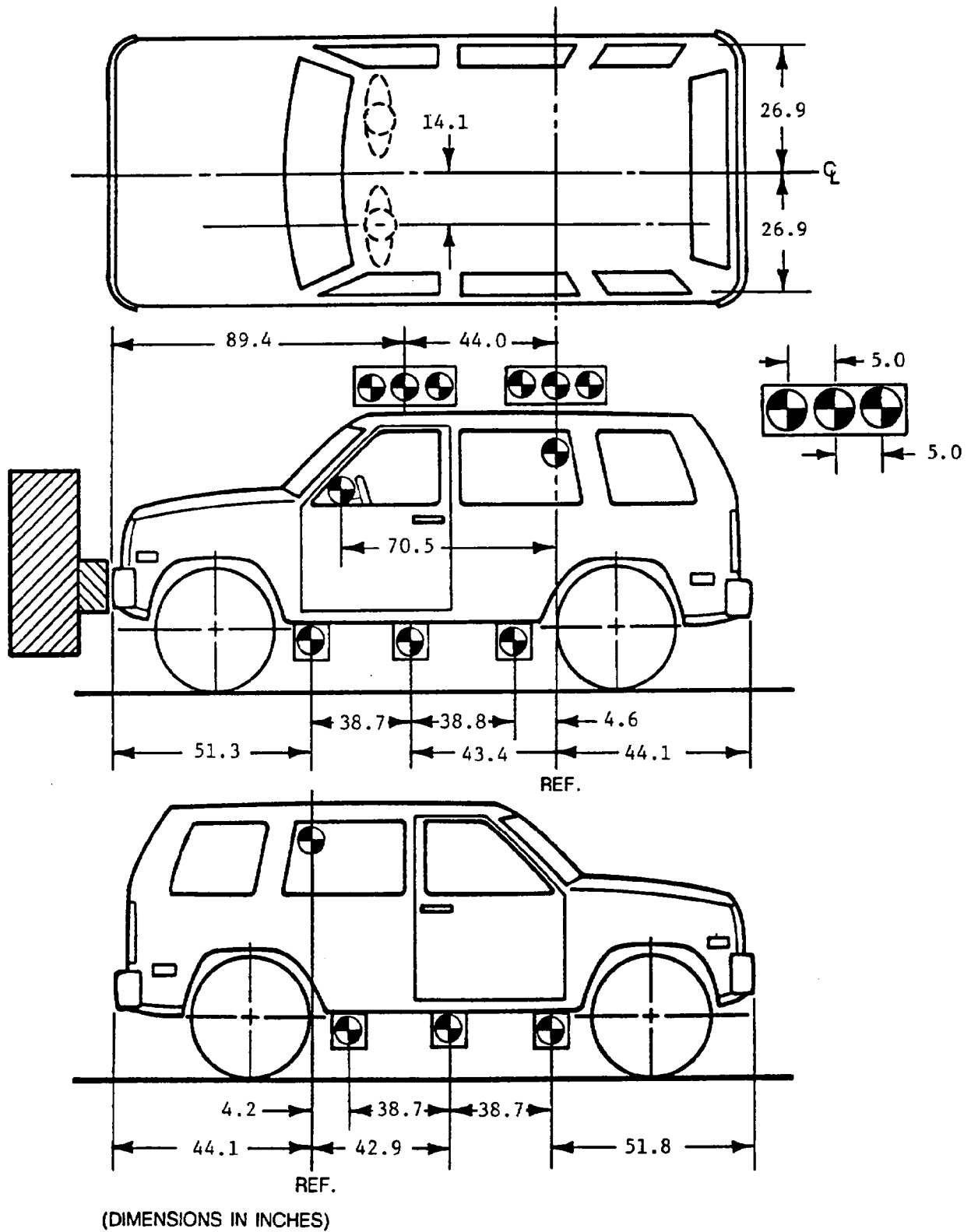
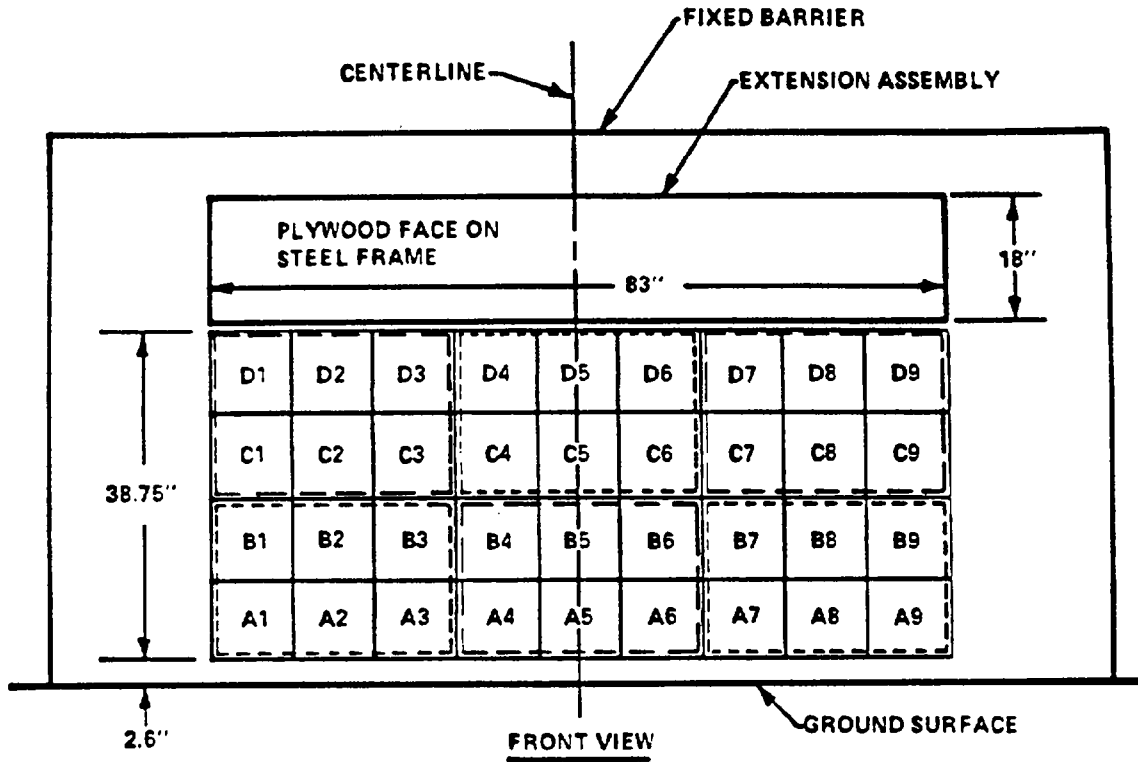


Figure 7

LOAD CELL LOCATIONS ON FIXED BARRIER

- 36 Load Cells
- 4 Rows
- 9 Columns
- 6 Groupings (6 cells/group)



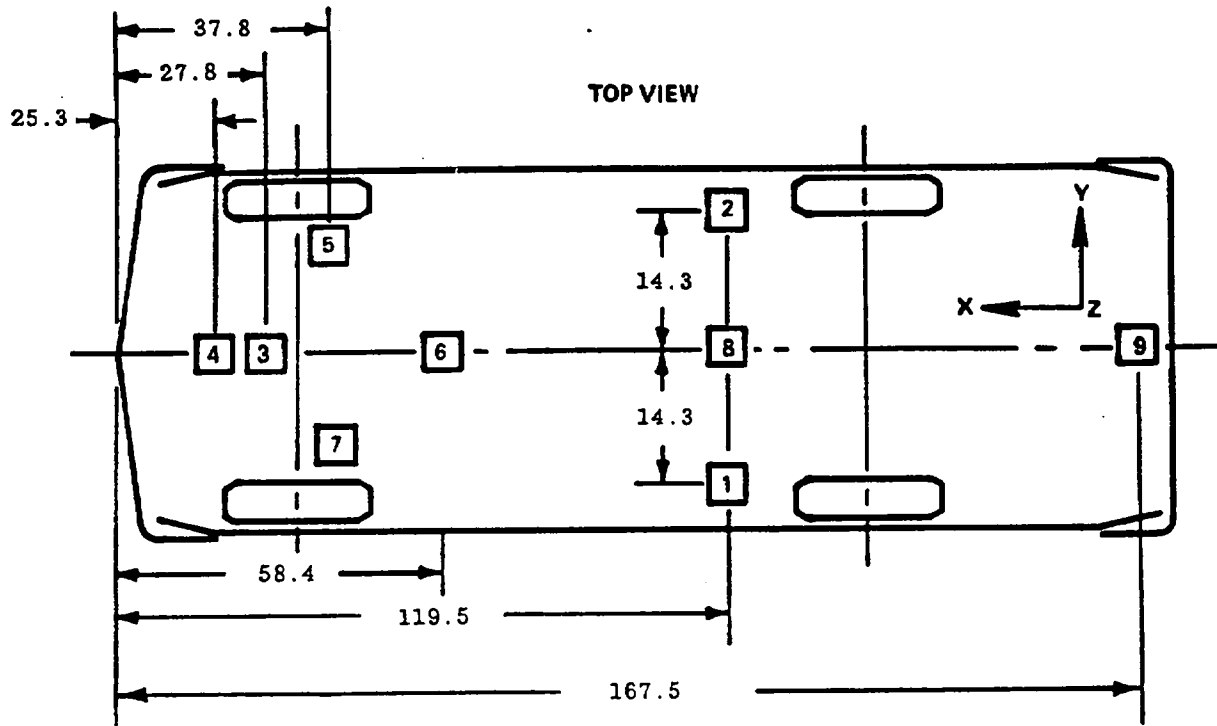
6 GROUPS OF 6 LOAD CELLS EACH

Group 4	Group 5	Group 6
C1 thru D3	C4 thru D6	C7 thru D9
Group 1	Group 2	Group 3
A1 thru B3	A4 thru B6	A7 thru B9

The following data is presented in Appendix B:

- (1) Data from 36 individual load cells
- (2) Total or Sum of 36 individual load cells
- (3) Data from 6 Groupings shown above (6 cells/group)

Figure 8
VEHICLE ACCELEROMETER LOCATIONS



ACCELEROMETER NUMBER*	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Left Rear Seat Crossmember	X		
2	Right Rear Seat Crossmember	X		
3	Top of Engine	X		
4	Bottom of Engine	X		
5	Right Disc Brake Caliper	X		
6	Left Disc Brake Caliper	X		
7	Instrument Panel	X		
8	Rear Seat Crossmember			X
9	Trunk Centerline			X

*The accelerometer pack number can be correlated with the vehicle response data traces found in Appendix B.

Table 6

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	177.5	152.2	25.3
X2	Rear Surface of Vehicle to Front of Engine	155.2	143.7	11.5
X3	Rear Surface of Vehicle to Firewall	142.0	133.4	8.6
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	129.0	128.4	0.6
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	128.5	129.4	-0.9
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	125.6	125.0	0.6
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	125.2	124.8	0.4
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	86.4	86.5	-0.1
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	86.0	86.2	-0.2
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	85.9	85.5	0.4
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	85.4	85.6	-0.2
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	125.8	125.4	0.4
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	125.8	126.8	-1.0
X14	Rear Surface of Vehicle to Firewall, Right Side	139.6	138.2	1.4
X15	Rear Surface of Vehicle to Firewall, Left Side	140.0	137.2	2.8
X16	Rear Surface of Vehicle to Steering Column	109.0	109.3	-0.3
X17	Center of Steering Column to "A" Post	17.3	15.6	1.7
X18	Center of Steering Column to Headliner	17.9	13.2	4.7
X19	Rear Surface of Vehicle to Right Side of Front Bumper	174.2	151.0	23.2
X20	Rear Surface of Vehicle to Left Side of Front Bumper	174.0	151.7	22.3
X21	Length of Engine Block	17.0	17.0	0.0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	118.4	116.5	1.9
CD	Rear Surface of Vehicle to Center of Dash Panel	119.5	117.5	2.0
LD	Rear Surface of Vehicle to Left Side of Dash Panel	118.8	116.6	2.2

Appendix A

PHOTOGRAPHS

PHOTOGRAPHS

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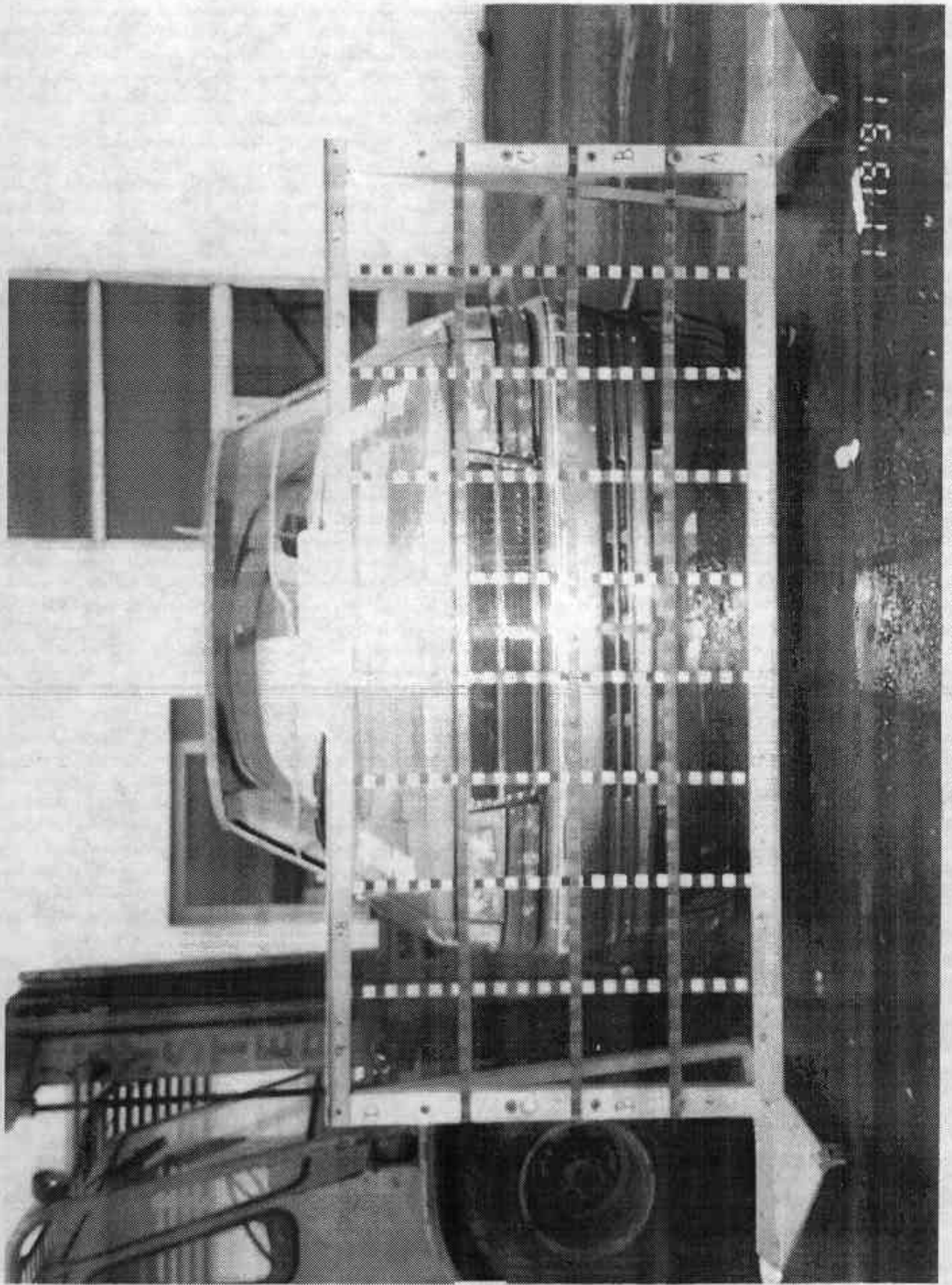


Figure A-1 LOAD CELL LOCATIONS



Figure A-2 PRE-TEST FRONT VIEW



Figure A-3 POST TEST FRONT VIEW

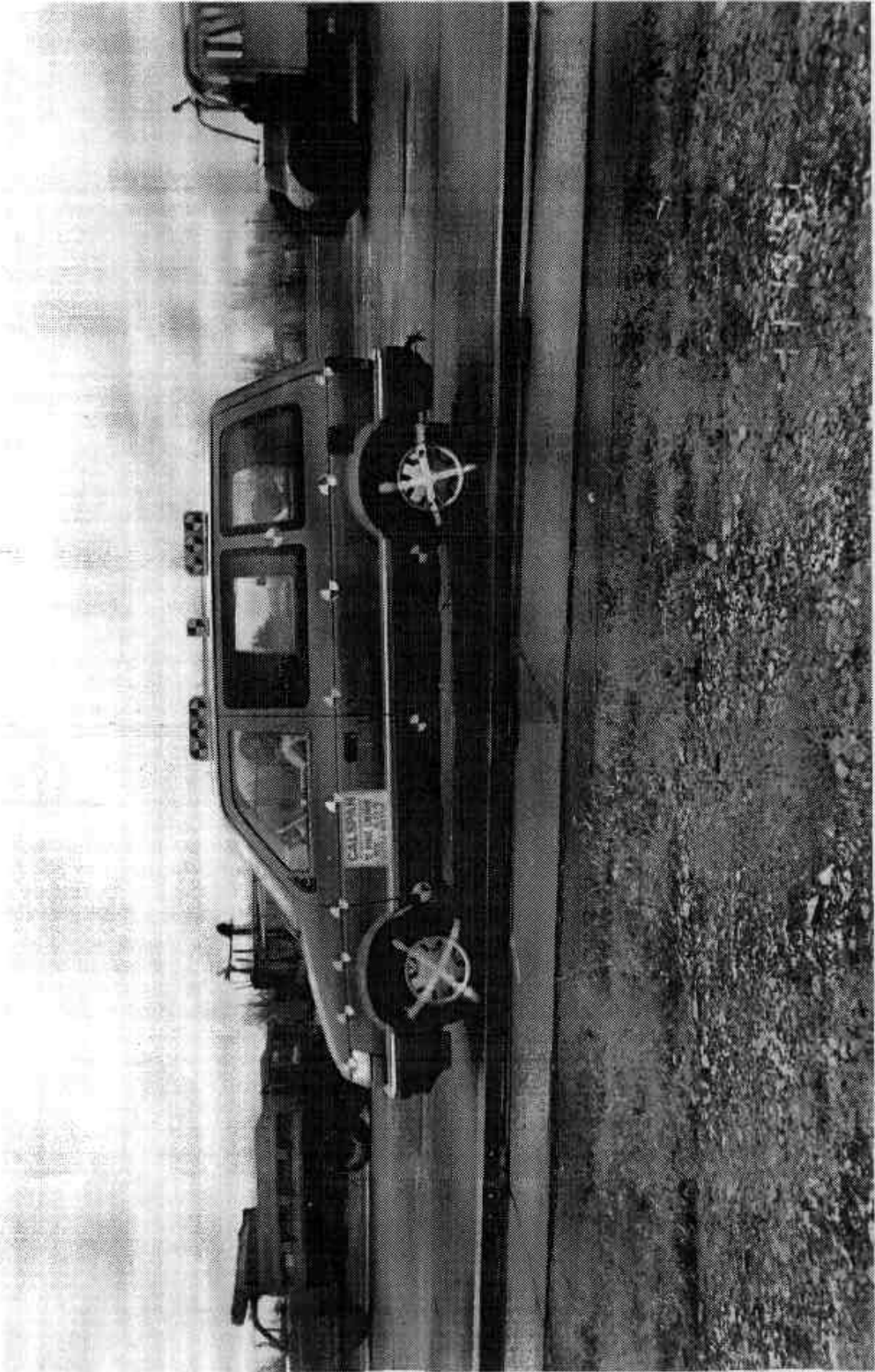


Figure A-4 PRE-TEST LEFT SIDE VIEW

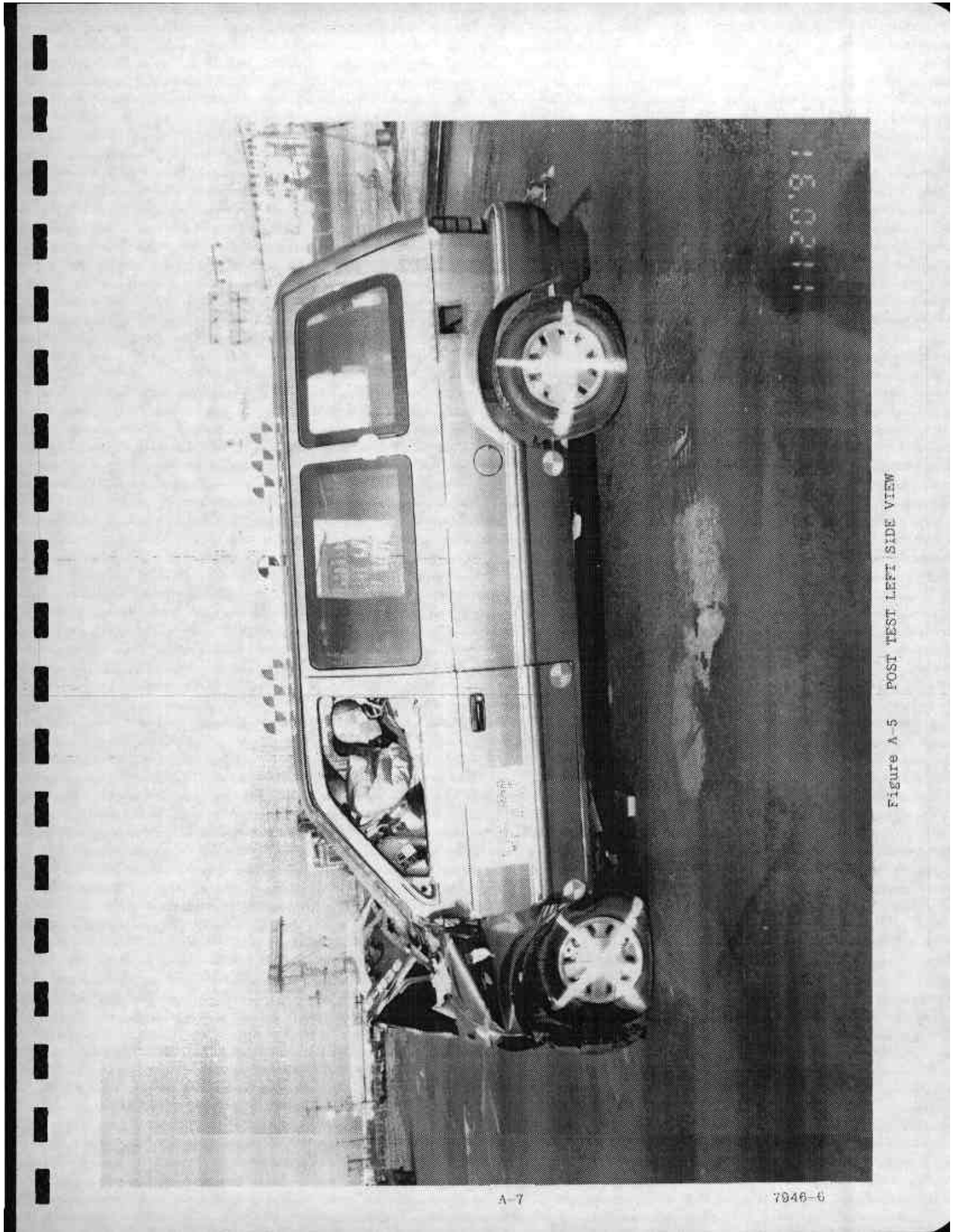
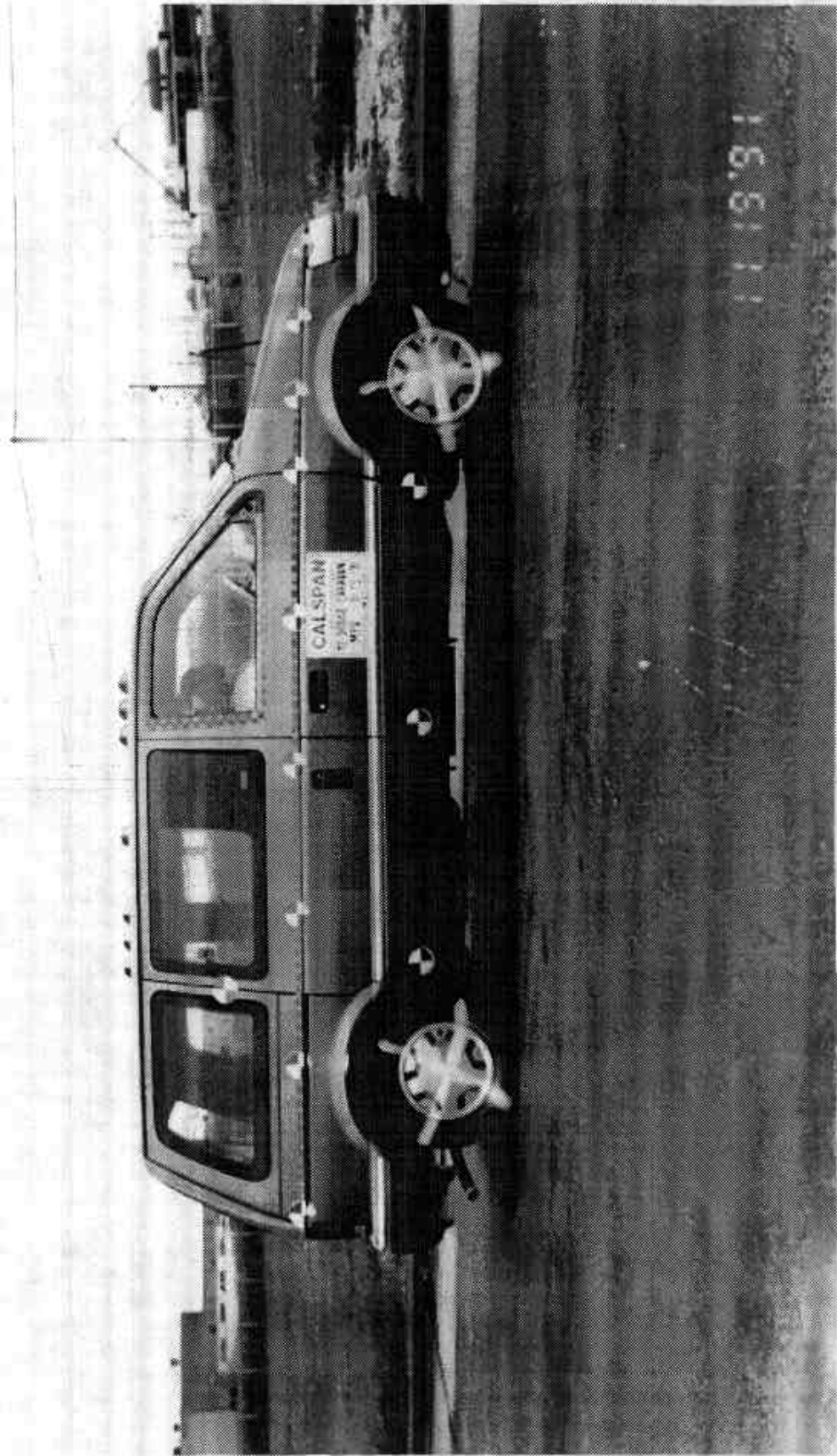


Figure A-5 POST TEST LEFT SIDE VIEW



15.6111

FIGURE A-0 PRE-TEST RIGHT SIDE VIEW

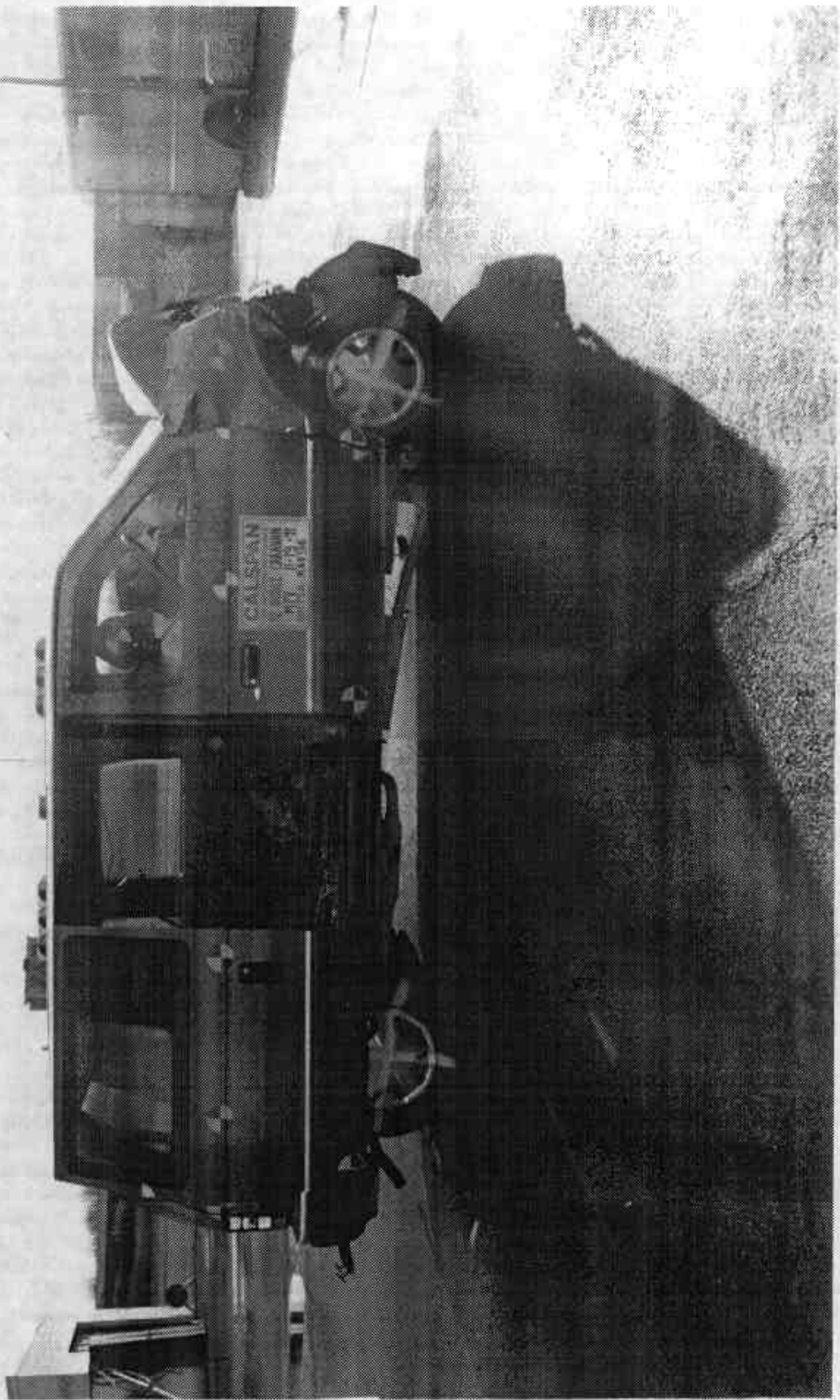


Figure A-7 POST-TEST RIGHT SIDE VIEW



11991

Figure A-8 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-10

7046-6



Figure A-9 POST-TEST RIGHT FRONT THREE-QUARTER VIEW



Figure A-10 PRE-TEST LEFT REAR THREE-QUARTER VIEW

Figure A-11

POST-TEST LEFT REAR THREE-QUARTER VIEW

Photograph is not available



FIGURE A-12 PRE-TEST WINDSHIELD VIEW



Figure A-13 POST-TEST WINDSHIELD VIEW

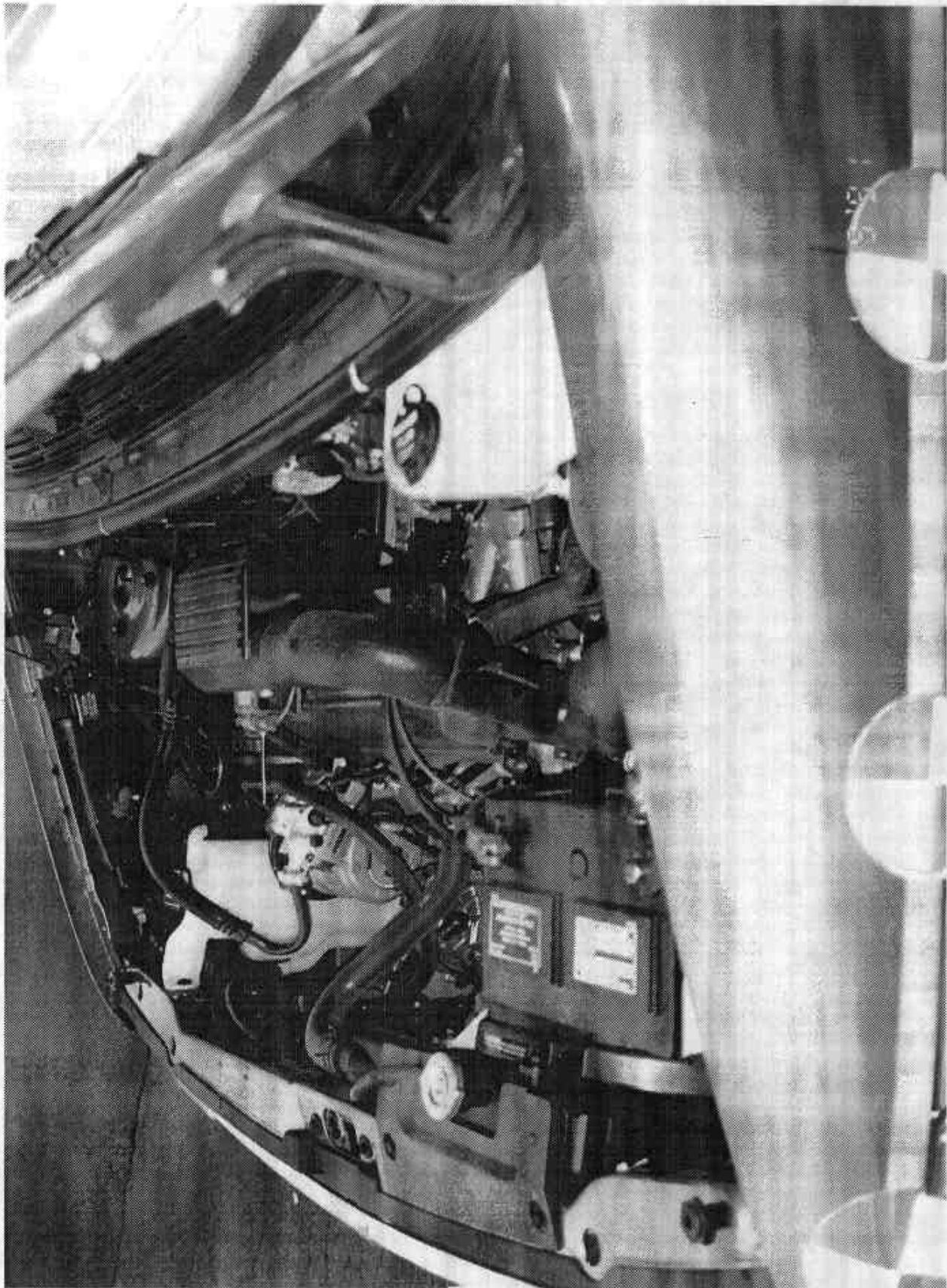


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

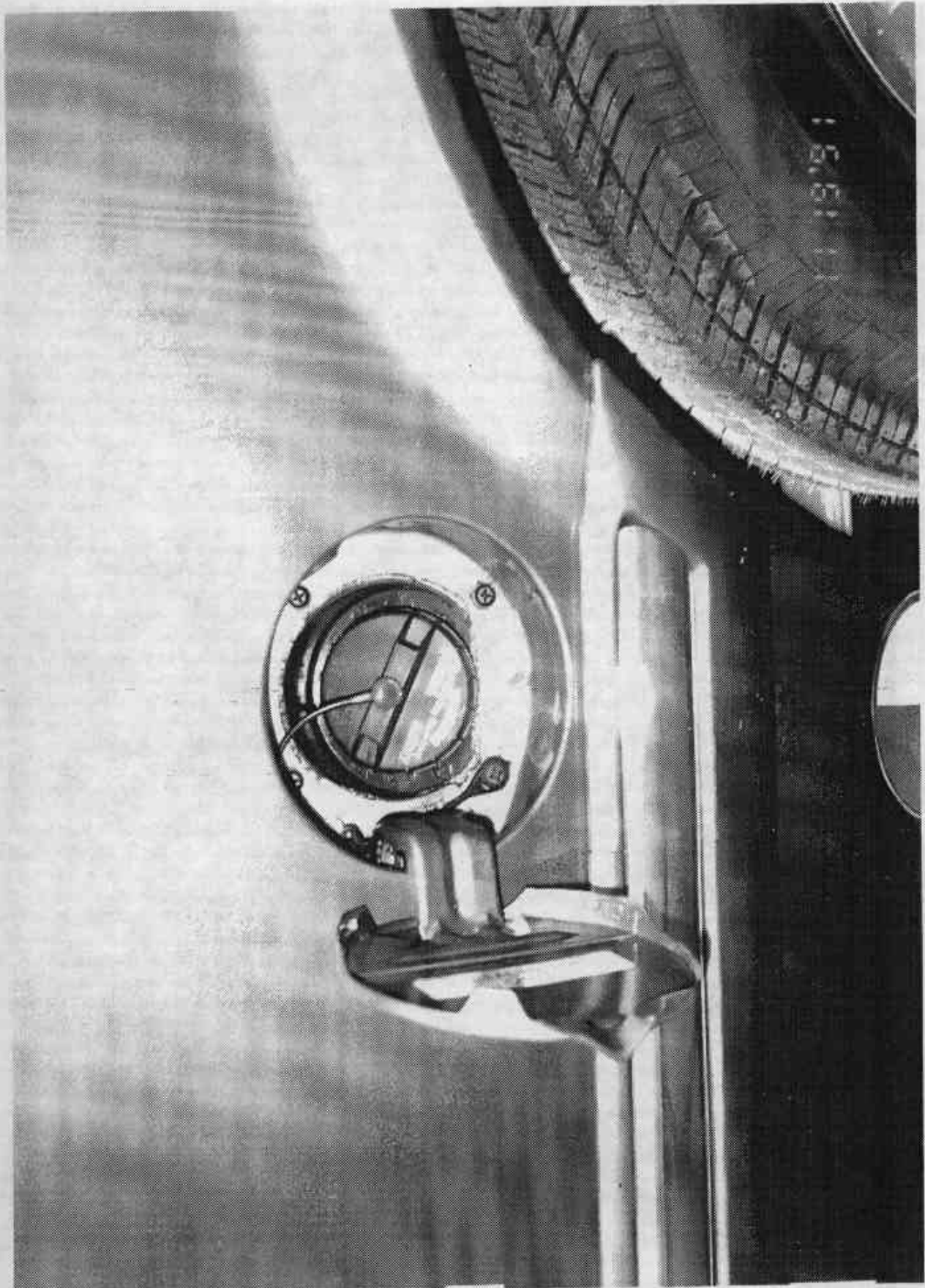


Figure A-15 FUEL CAP VIEW

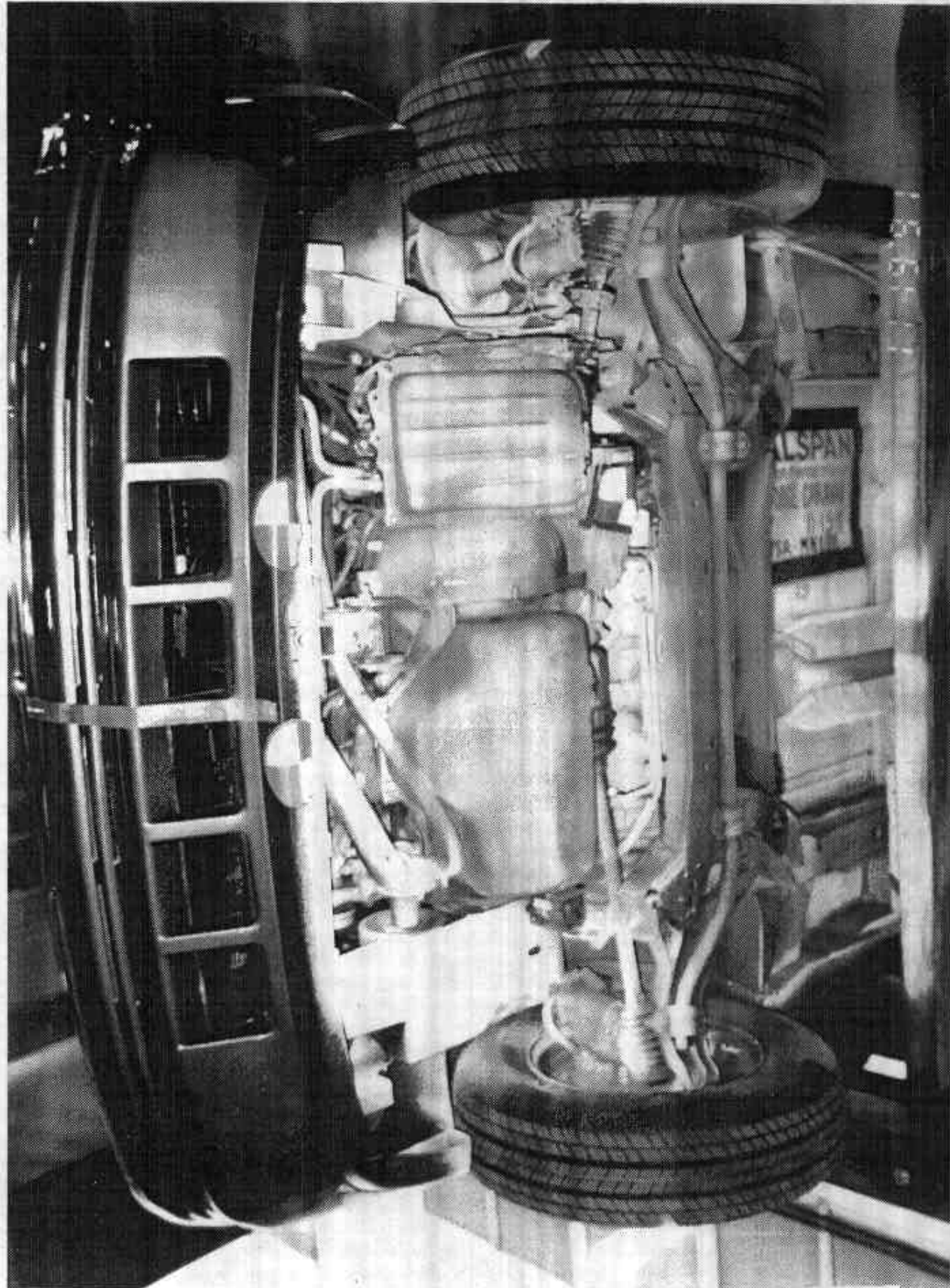


FIGURE A-16 PRE-TEST FRONT UNDERBODY VIEW

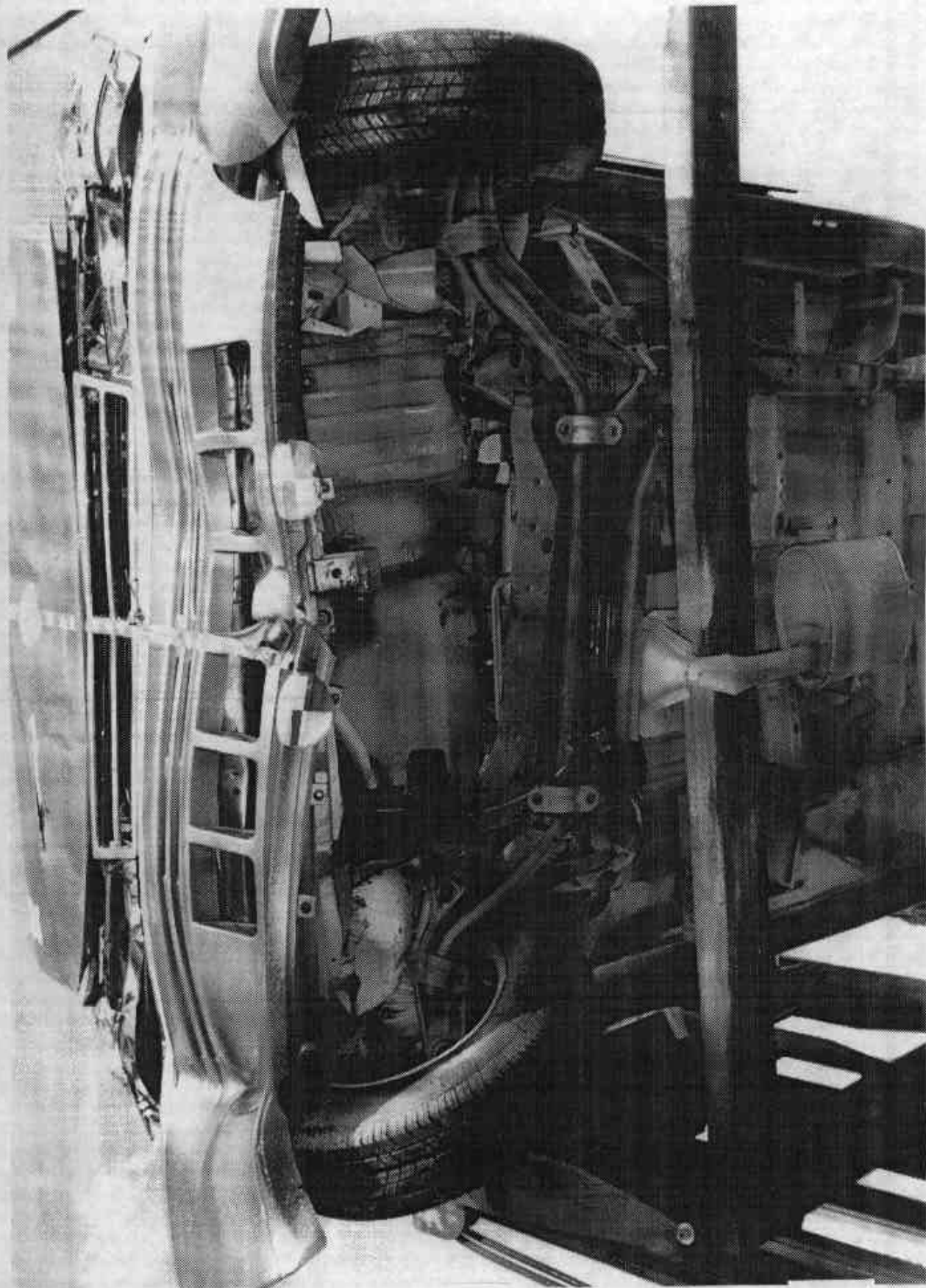


Figure A-17 POST-TEST FRONT UNDERBODY VIEW

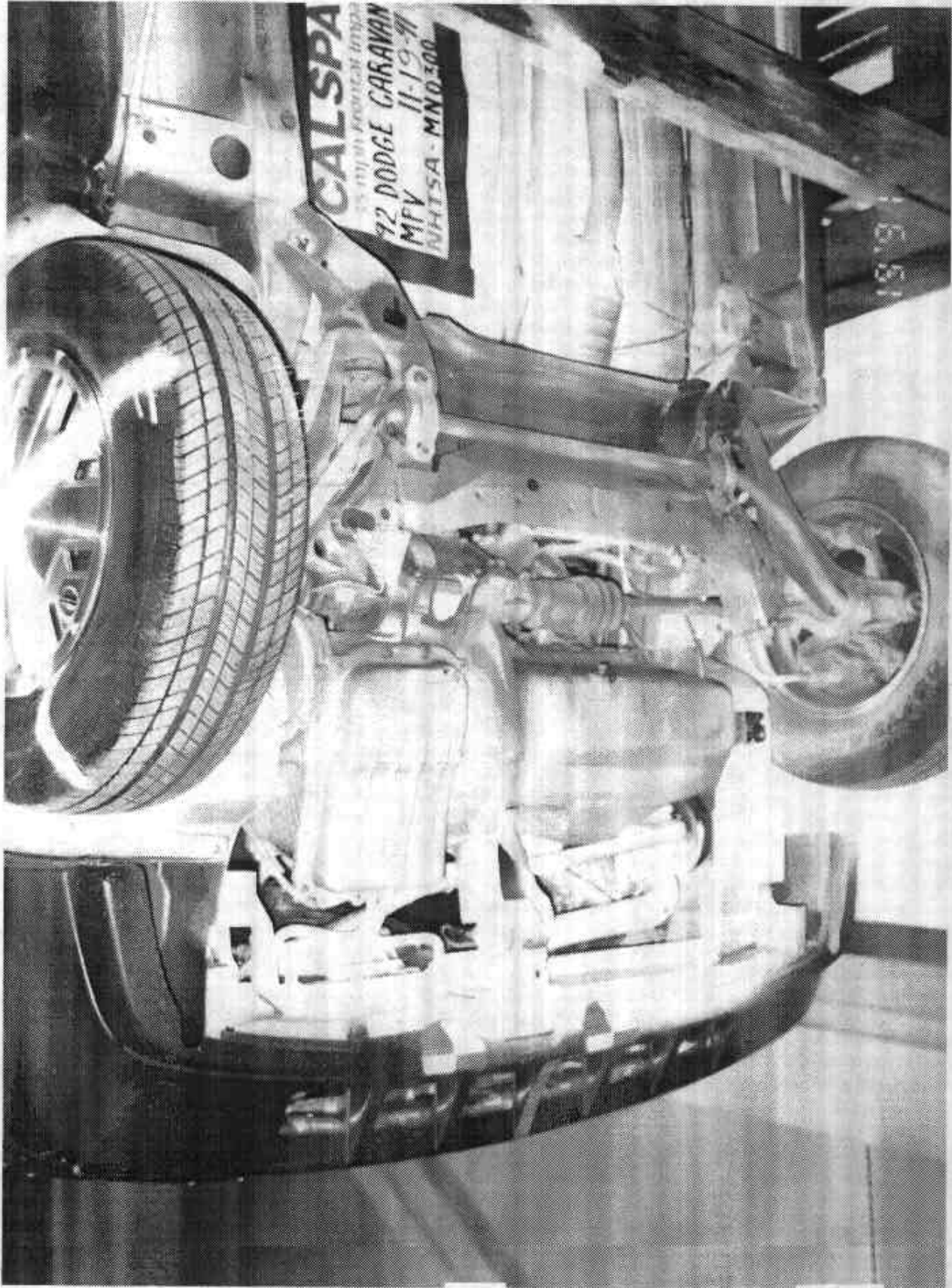


Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW

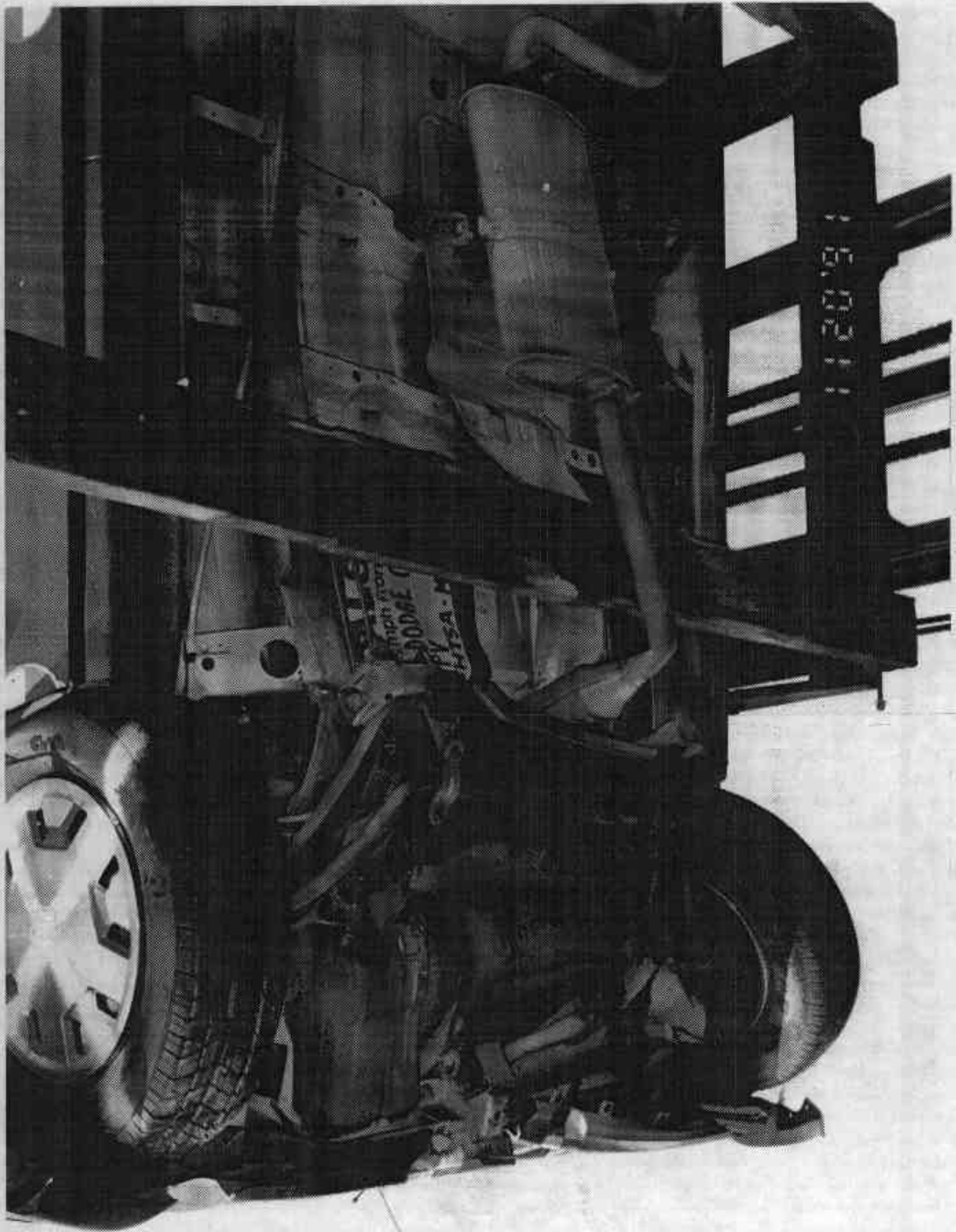


Figure A-19 POST-TEST FRONT SIDE UNDERBODY VIEW

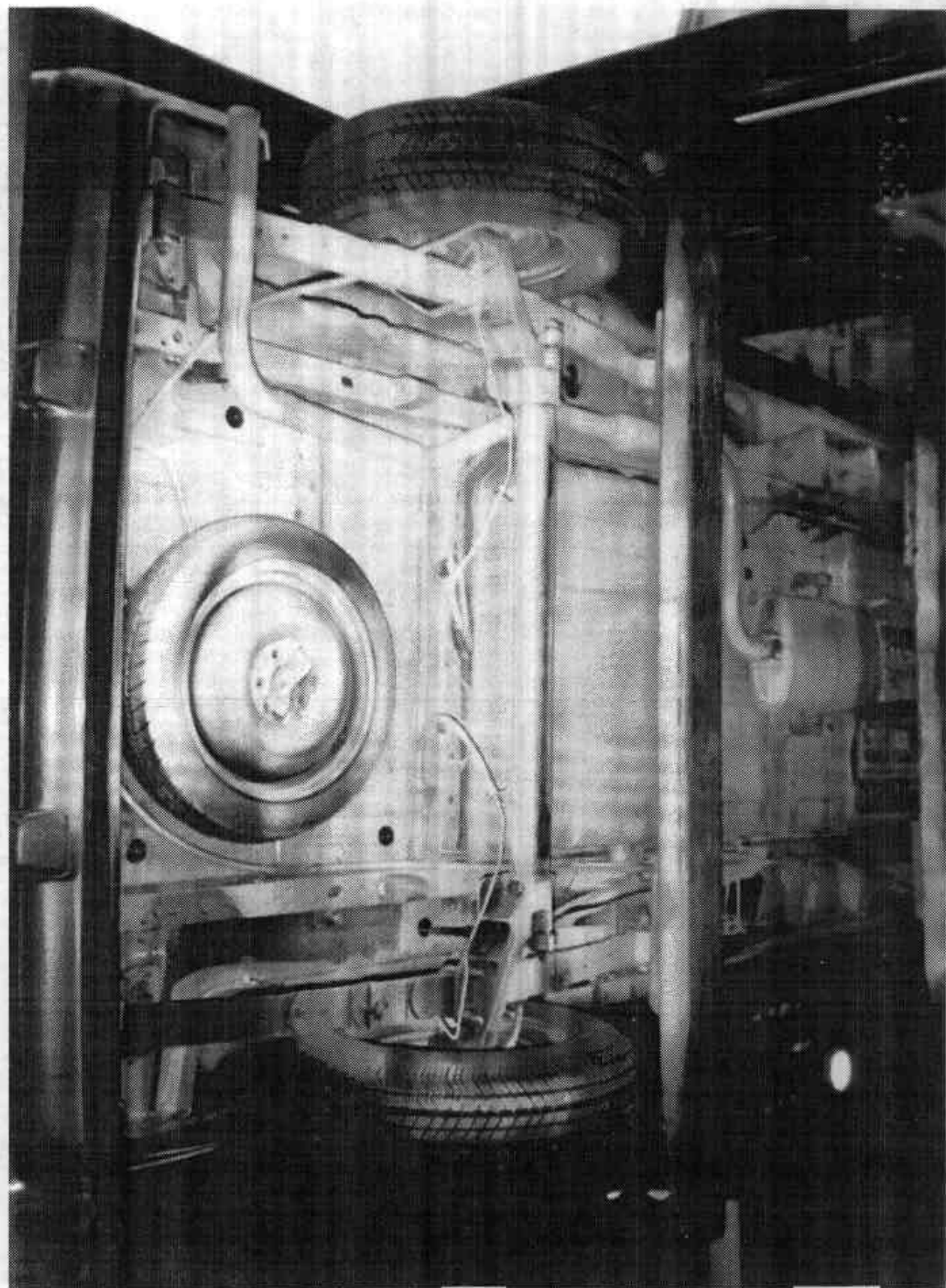


FIGURE A-20 PRE-TEST REAR UNDERBODY VIEW



Figure A-21 POST-TEST REAR UNDERBODY VIEW

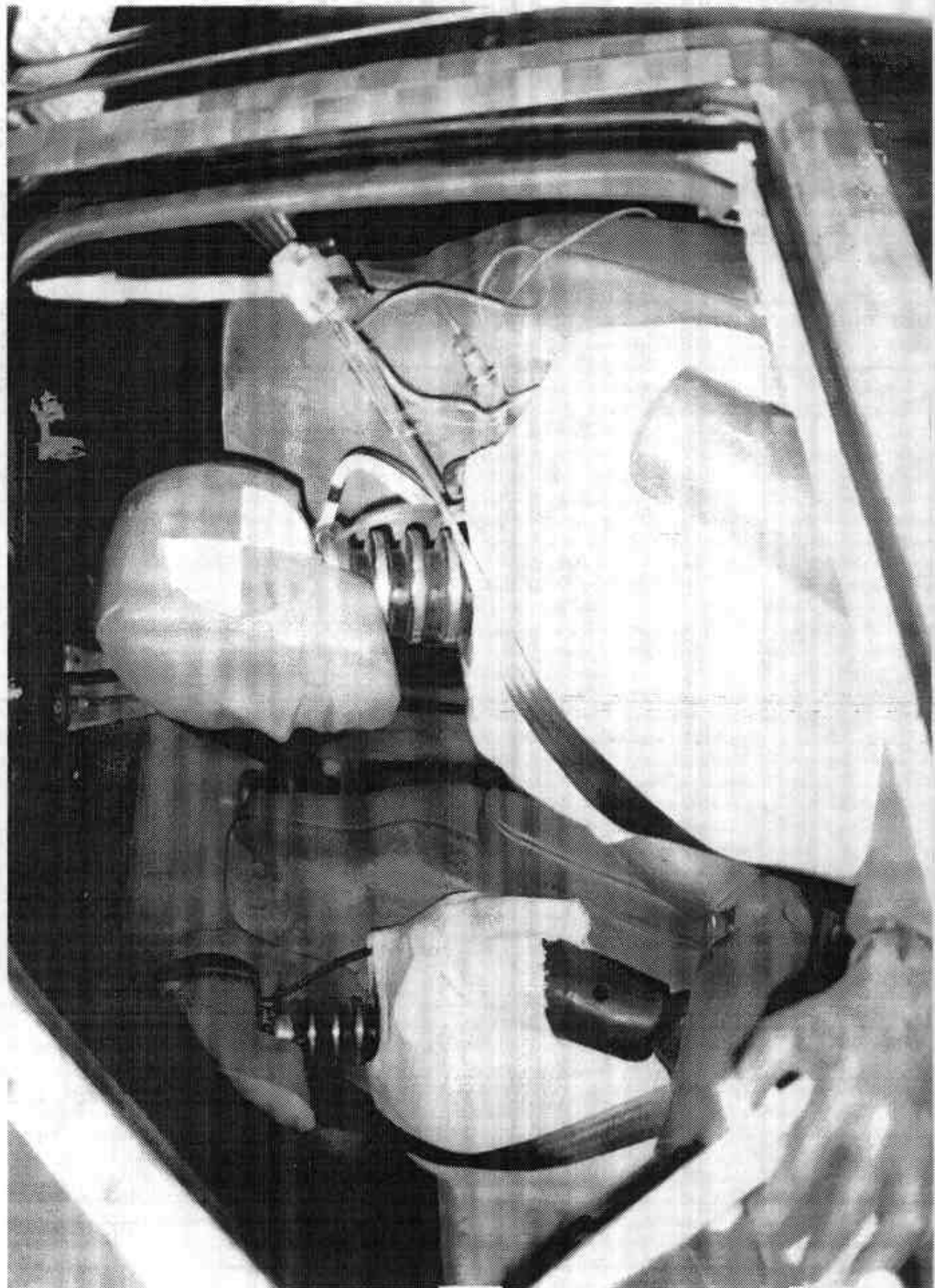


Figure A-22 PRE-TEST DRIVER POSITION VIEW



Figure A-23 POST-TEST DRIVER POSITION VIEW

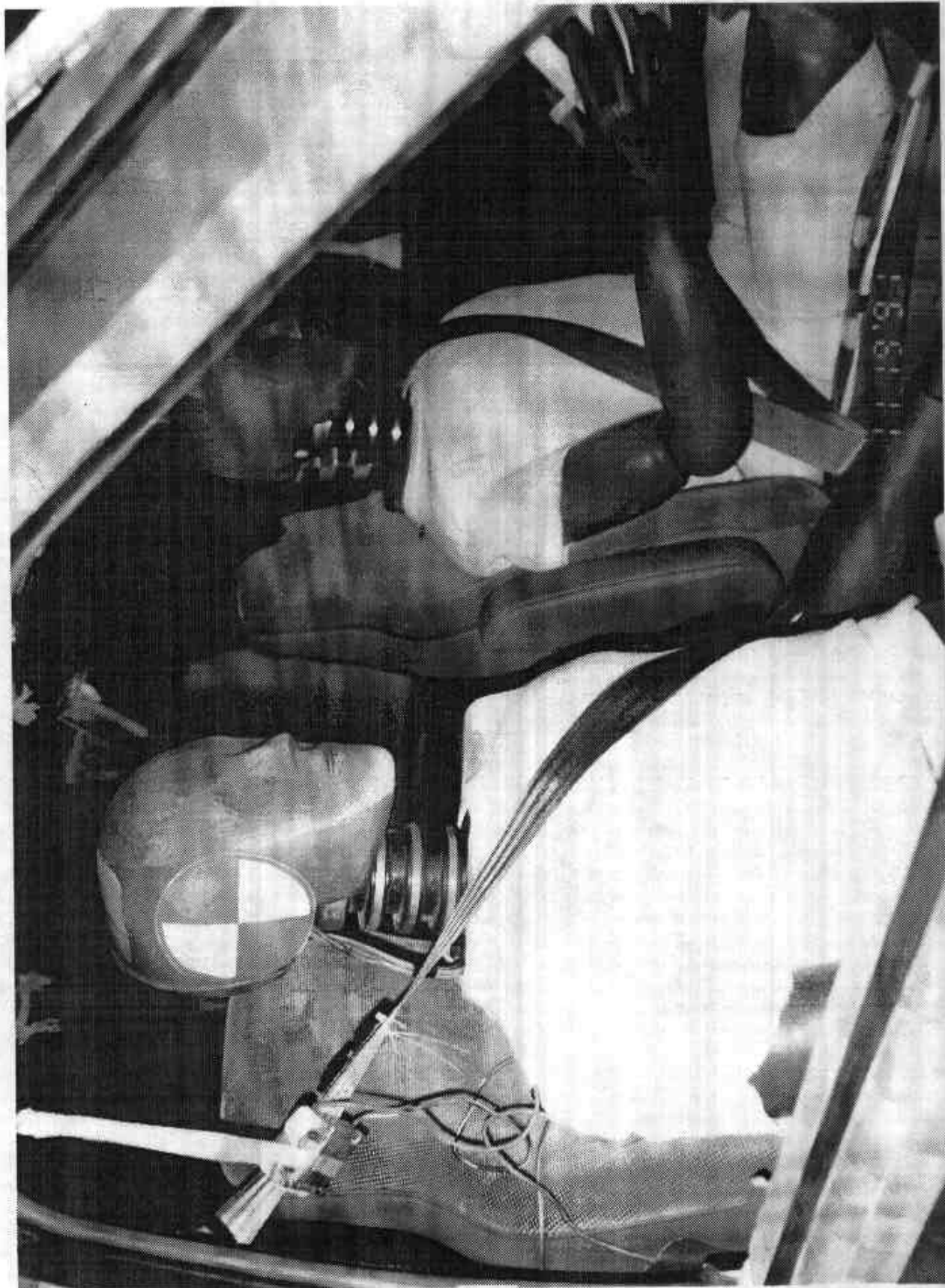


FIGURE A-24 PRE-TEST PASSENGER POSITION VIEW

A-26

7945-6



Figure A-25 POST-TEST PASSENGER POSITION VIEW



FIGURE A-26 PRE-TEST DRIVER AND INTERIOR VIEW



Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW



Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW

Figure A-30

PRE-TEST DRIVER HEAD LOCATION

Photograph is not available

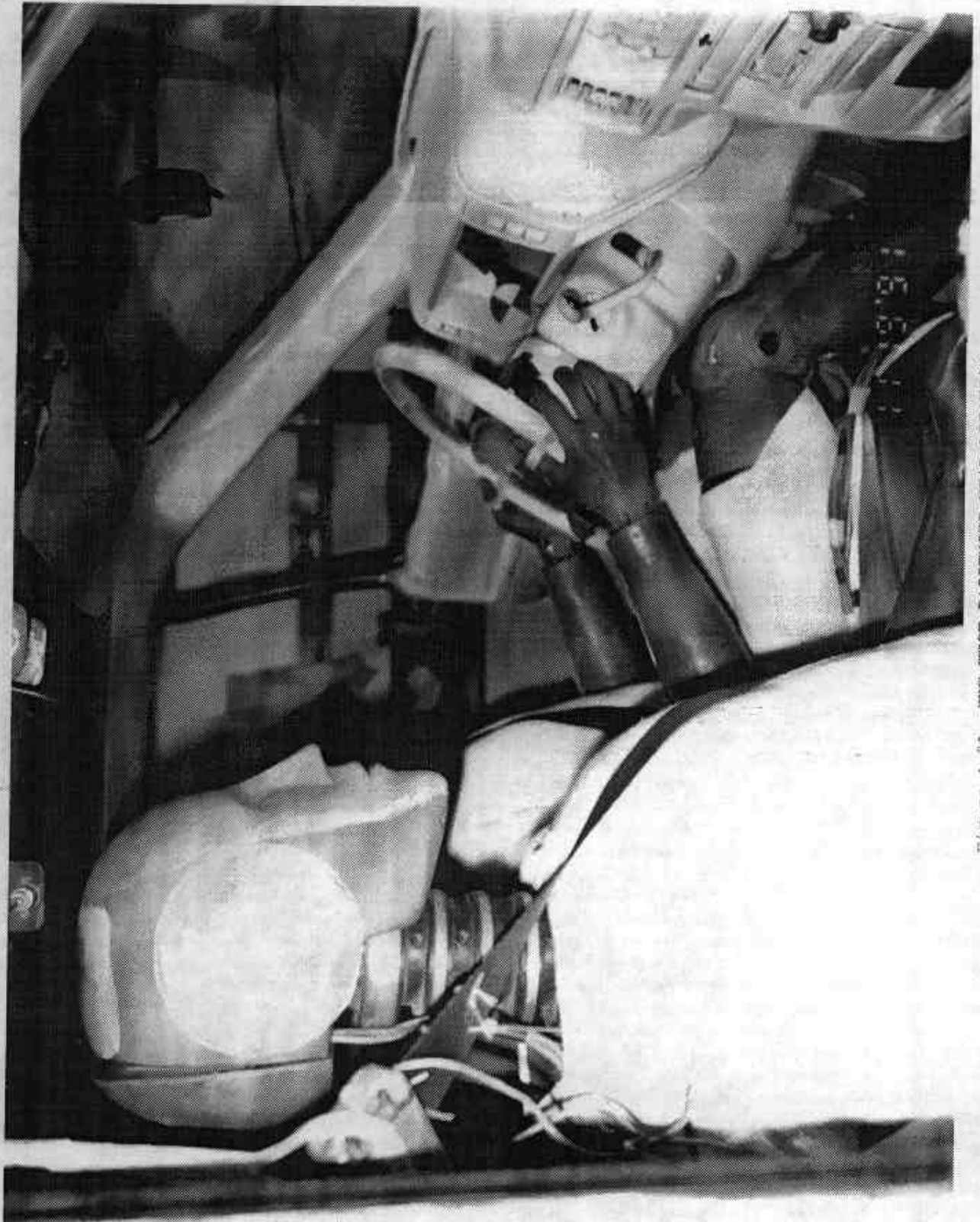
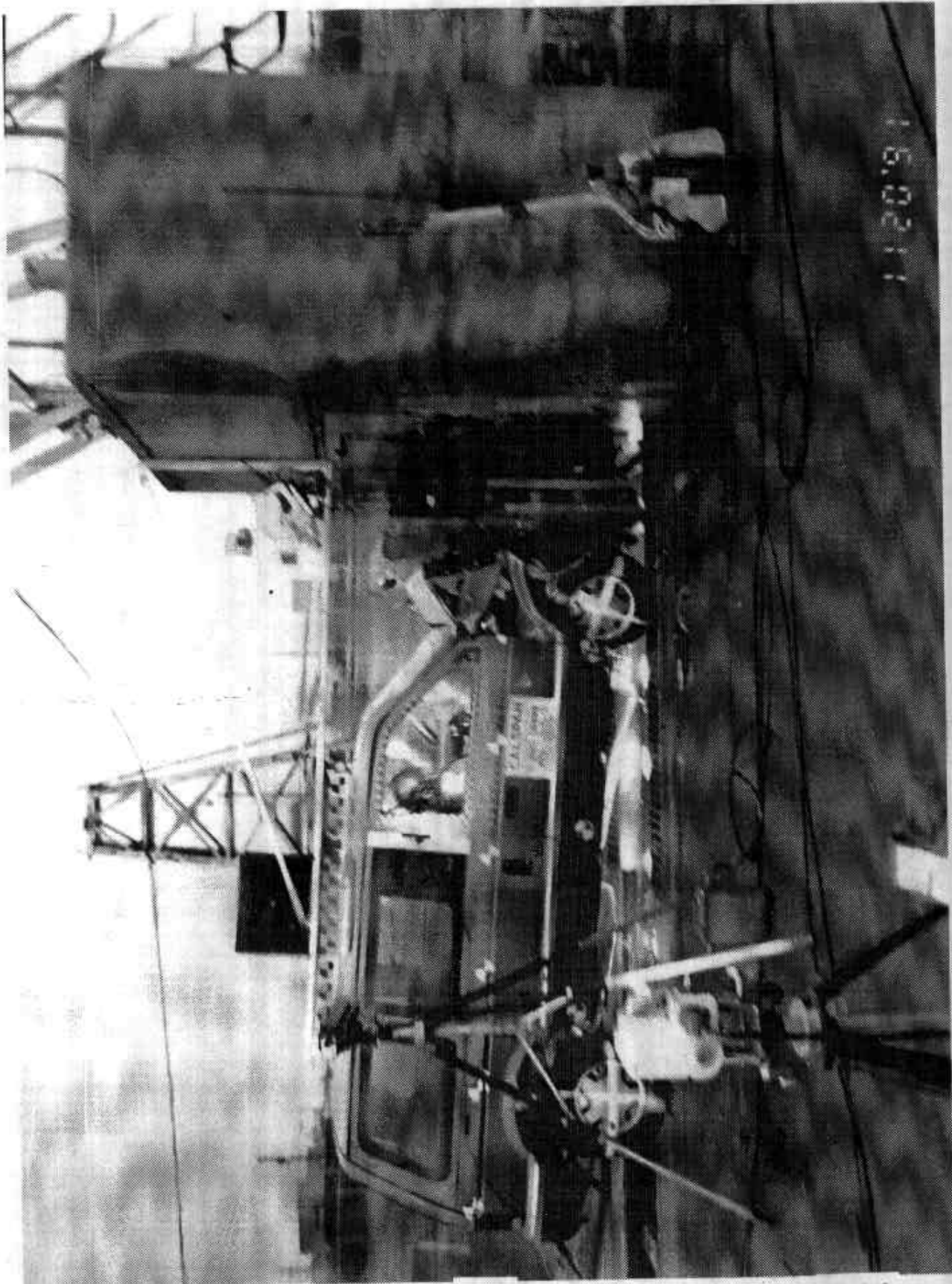


Figure A-31 PRE-TEST PASSENGER HEAD LOCATION



11:20:31

Figure A-32 IMPACT VIEW

A-34

7946-6

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST NO. MN0300

VEHICLE DATA

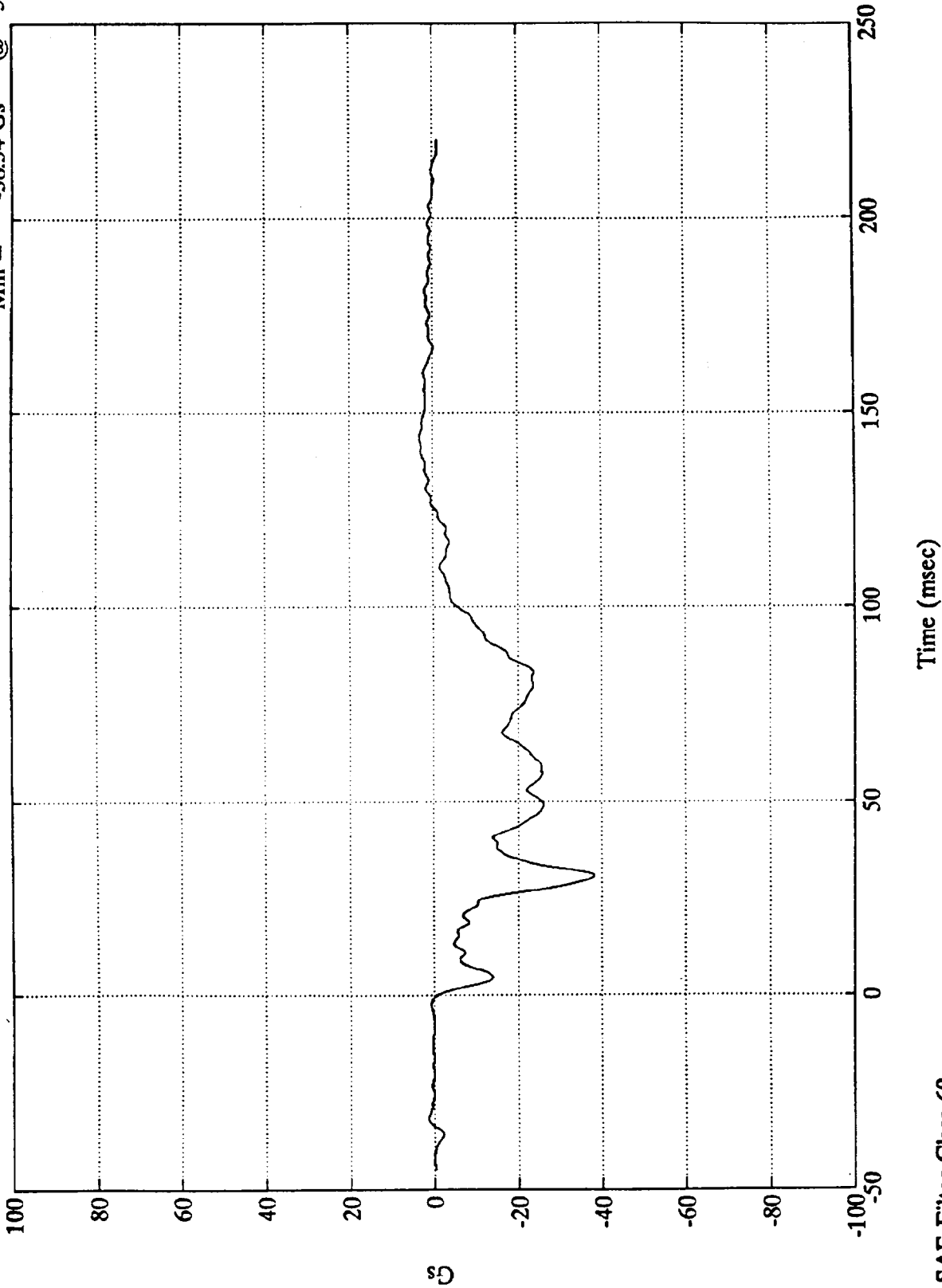
SAE FILTER CHANNEL CLASS

60

NCAP TEST #6 1992 DODGE CARAVAN

Acc. #1(x)

Max = 3.18 Gs @ 143.39 msec
Min = -38.34 Gs @ 30.71 msec

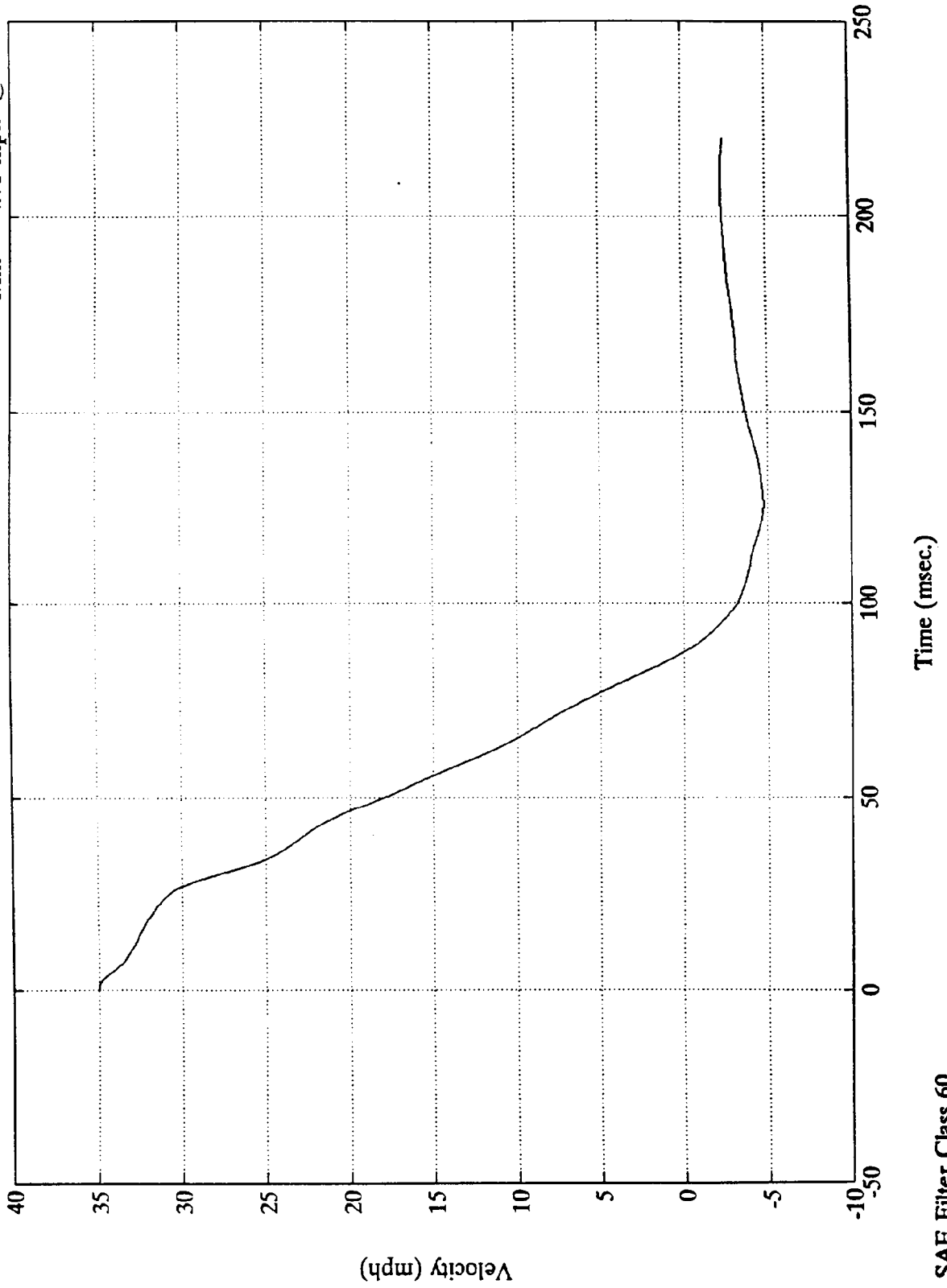


SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Max = 35.00 mph @ 0.24 msec
Min = -4.78 mph @ 125.76 msec

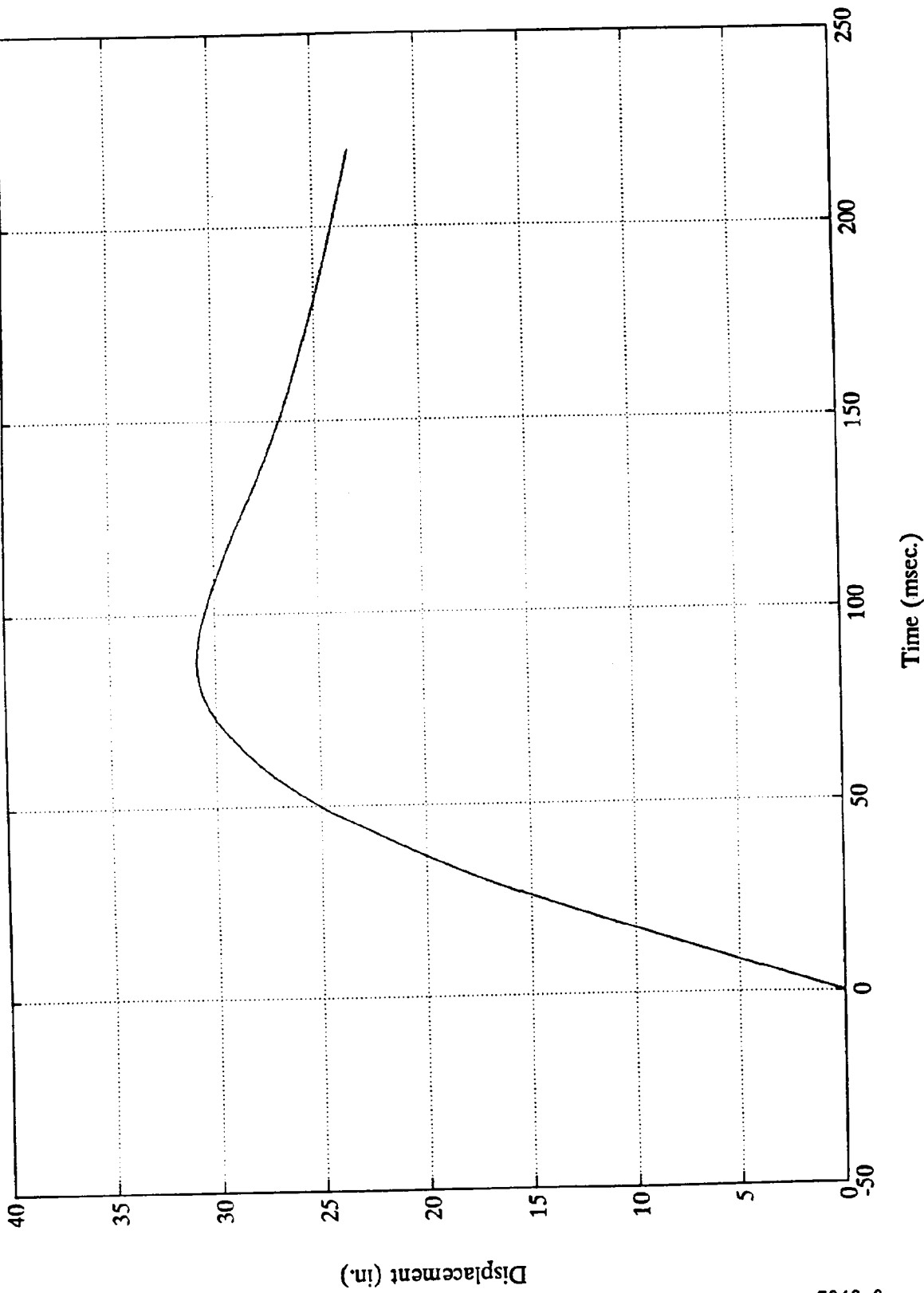
Acc. #1(x)



NCAP TEST #6 1992 DODGE CARAVAN

Acc. #1(x)

Max = 30.86 in. @ 88.56 msec
Min = 0.00 in. @ -0.00 msec

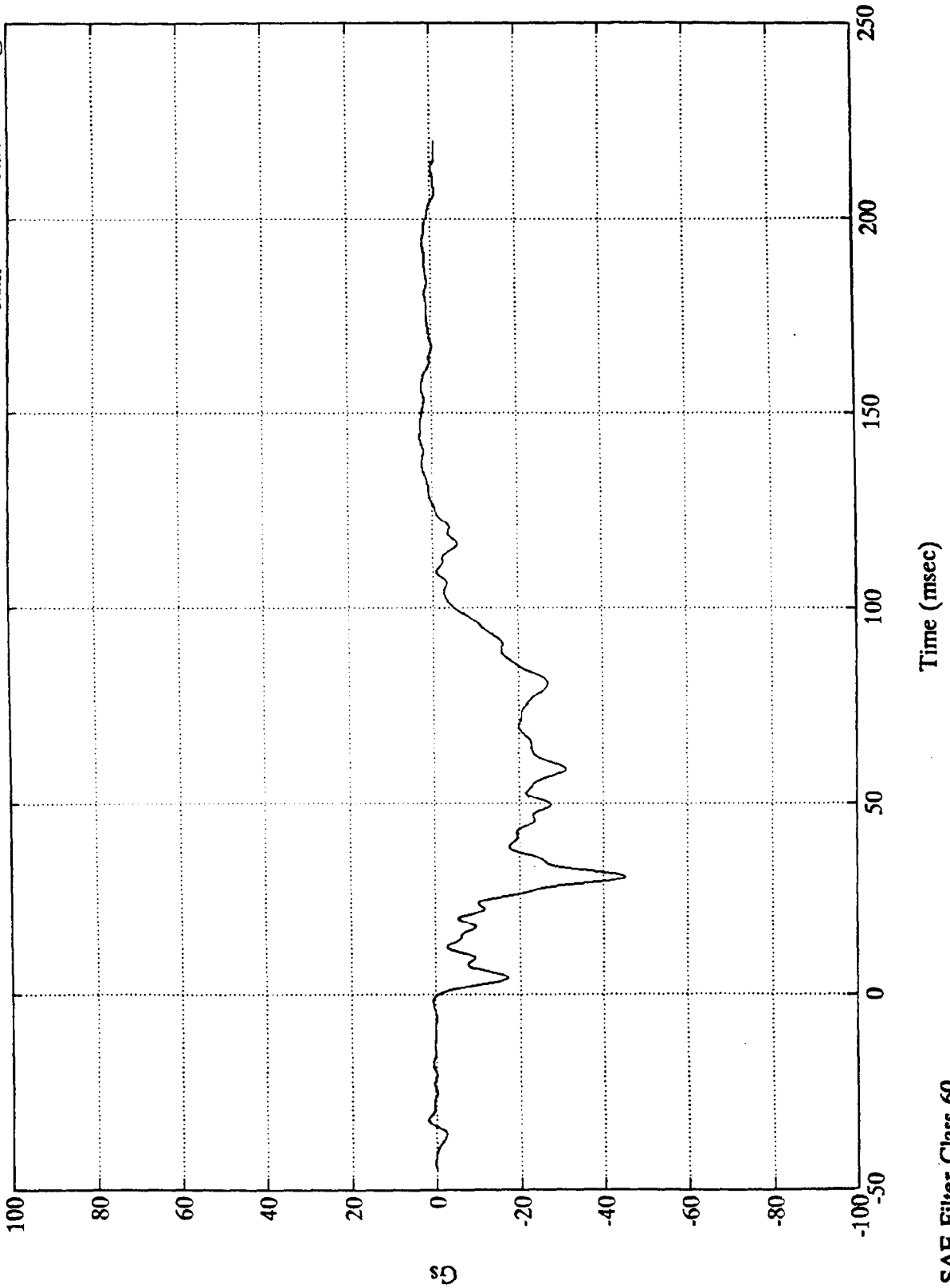


SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Acc. #2(x)

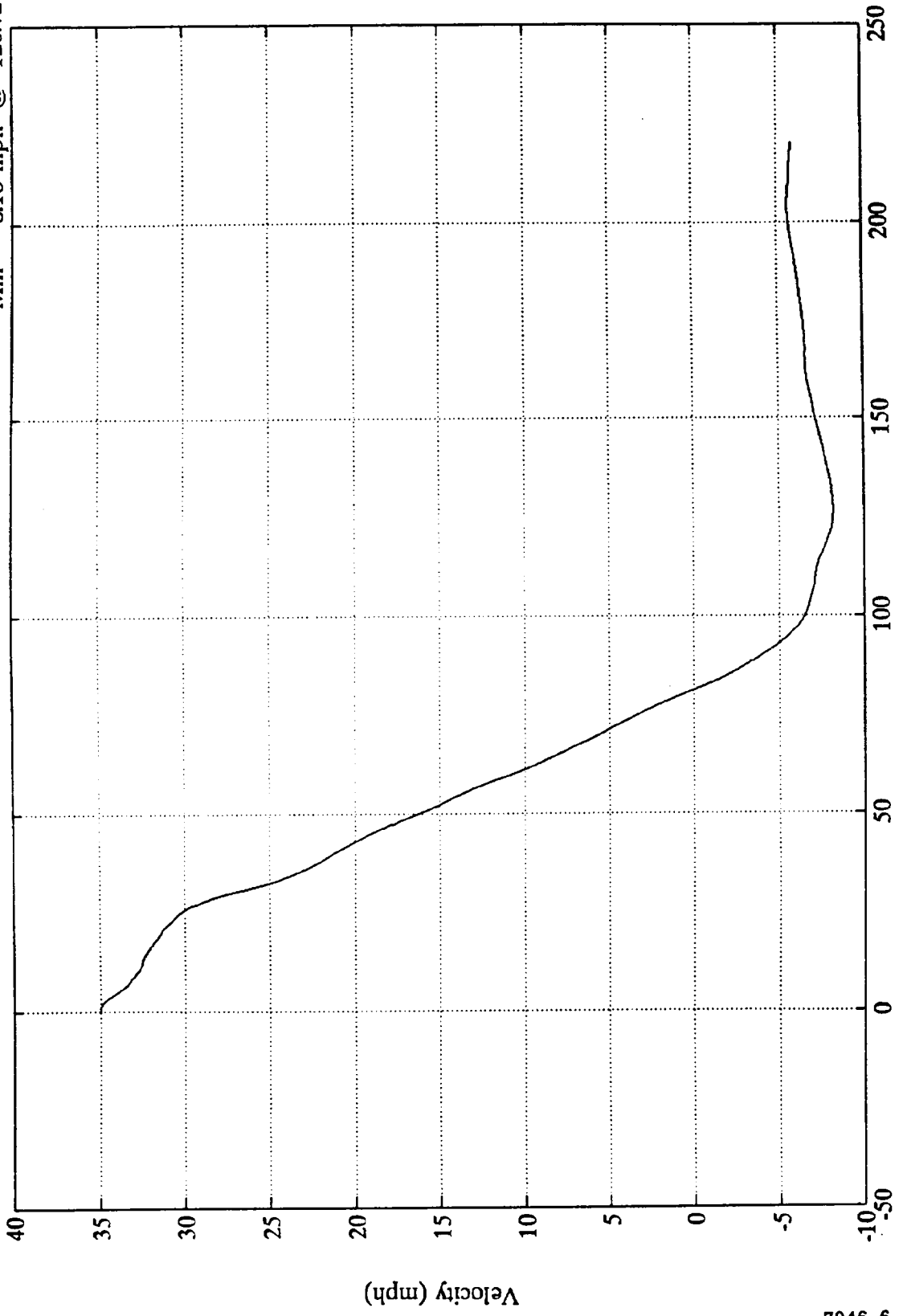
Max = 2.89 Gs @ 143.52 msec
Min = -45.18 Gs @ 30.95 msec



NCAP TEST #6 1992 DODGE CARAVAN

Acc. #2(x)

Max = 35.00 mph @ 0.24 msec
Min = -8.18 mph @ 126.72 msec



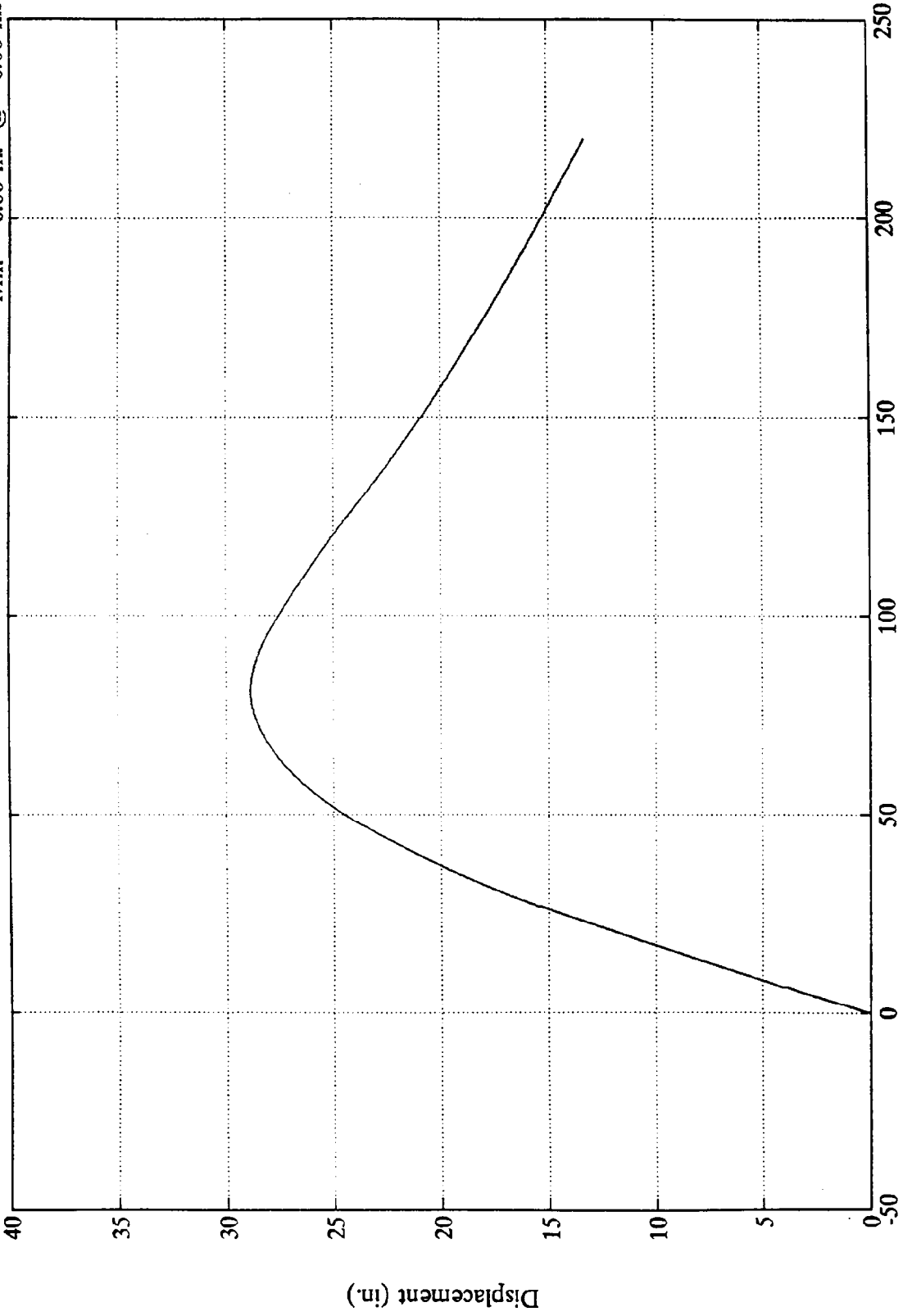
Time (msec.)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Acc. #2(x)

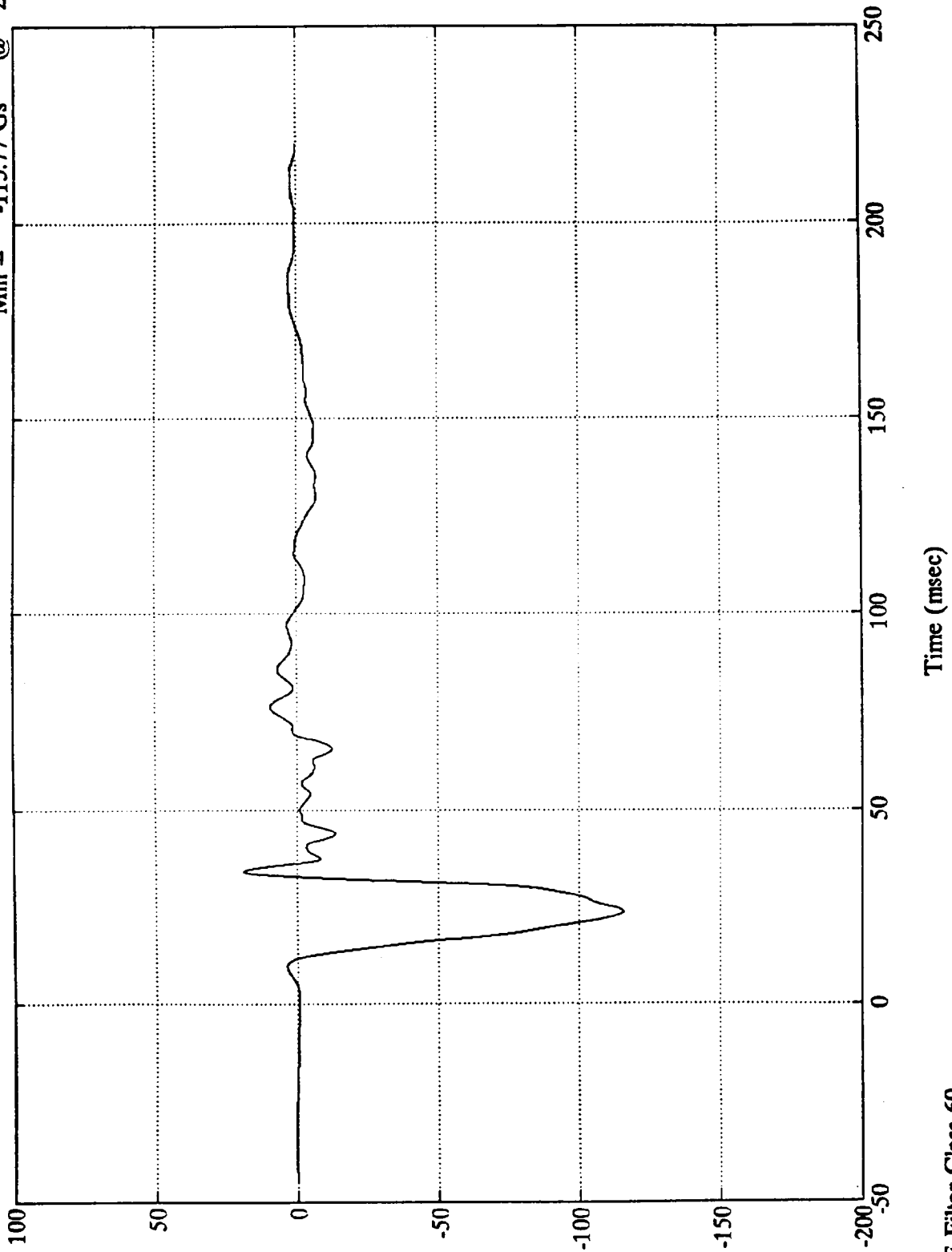
Max = 28.86 in. @ 81.84 msec
Min = 0.00 in. @ -0.00 msec



NCAP TEST #6 1992 DODGE CARAVAN

Acc. #3(x)

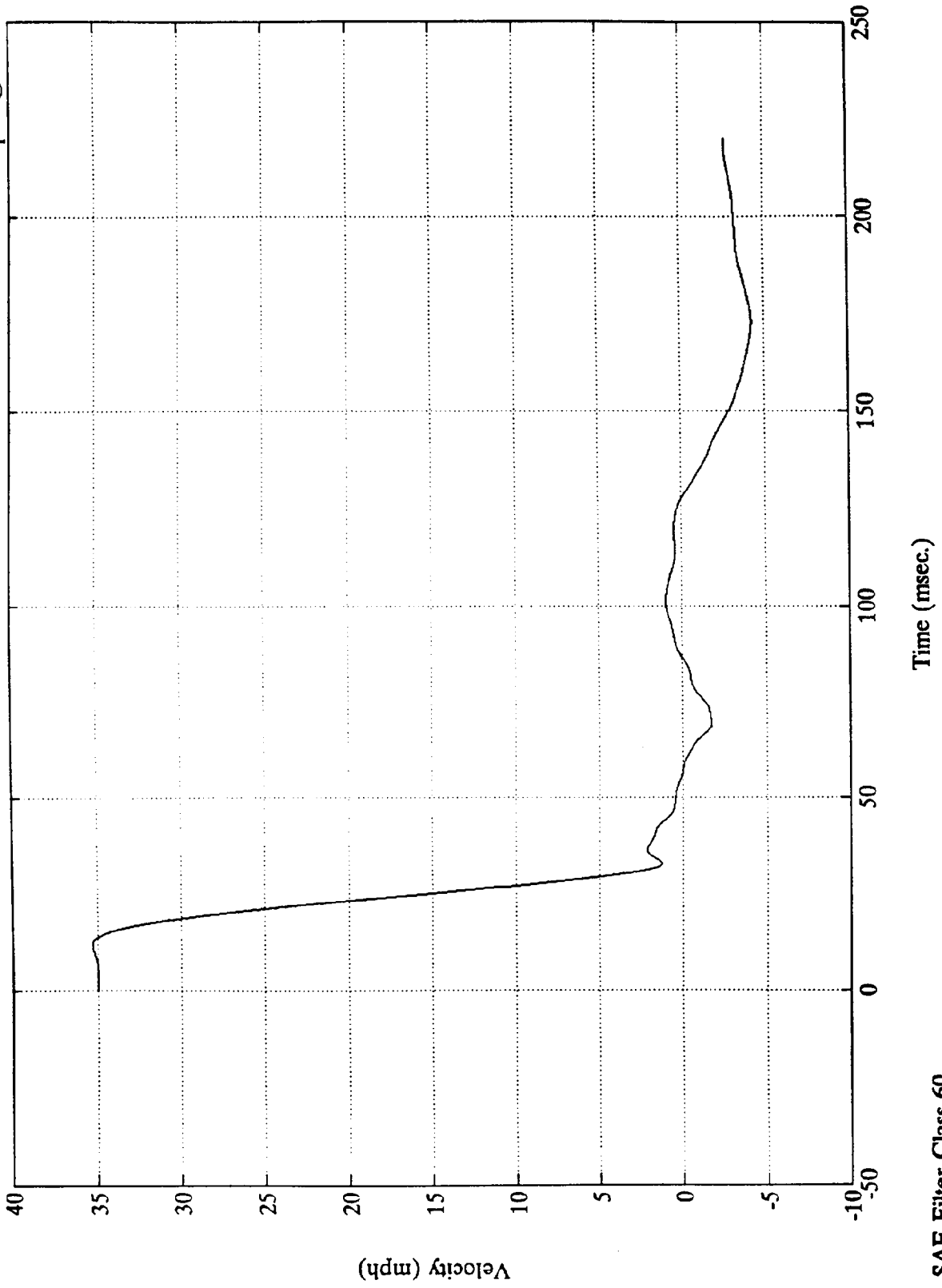
Max = 18.80 Gs @ 34.43 msec
Min = -115.77 Gs @ 23.87 msec



NCAP TEST #6 1992 DODGE CARAVAN

Acc. #3(x)

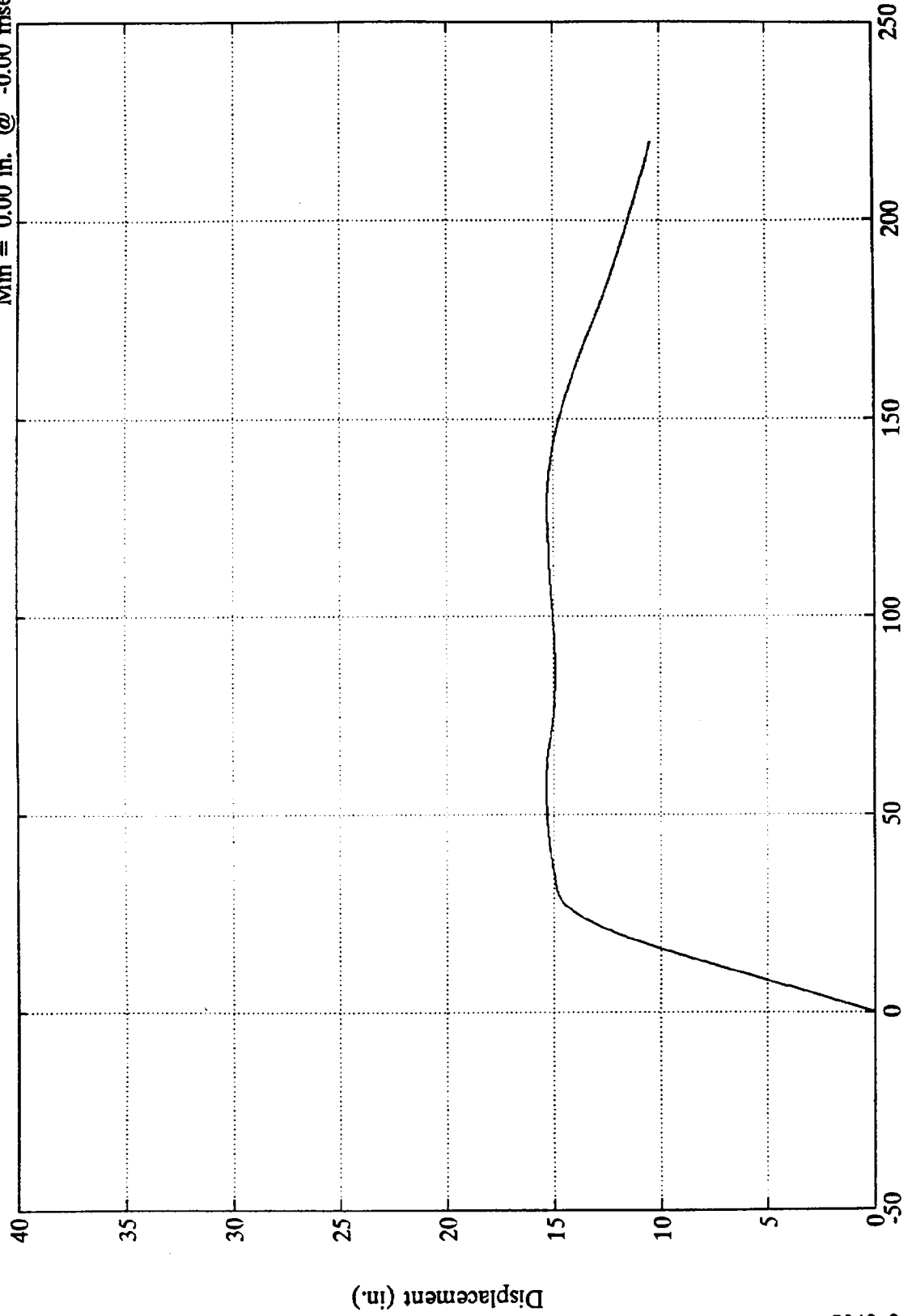
Max = 35.28 mph @ 12.00 msec
Min = -4.26 mph @ 173.04 msec



NCAP TEST #6 1992 DODGE CARAVAN

Acc. #3(x)

Max = 15.34 in. @ 59.52 msec
Min = 0.00 in. @ -0.00 msec



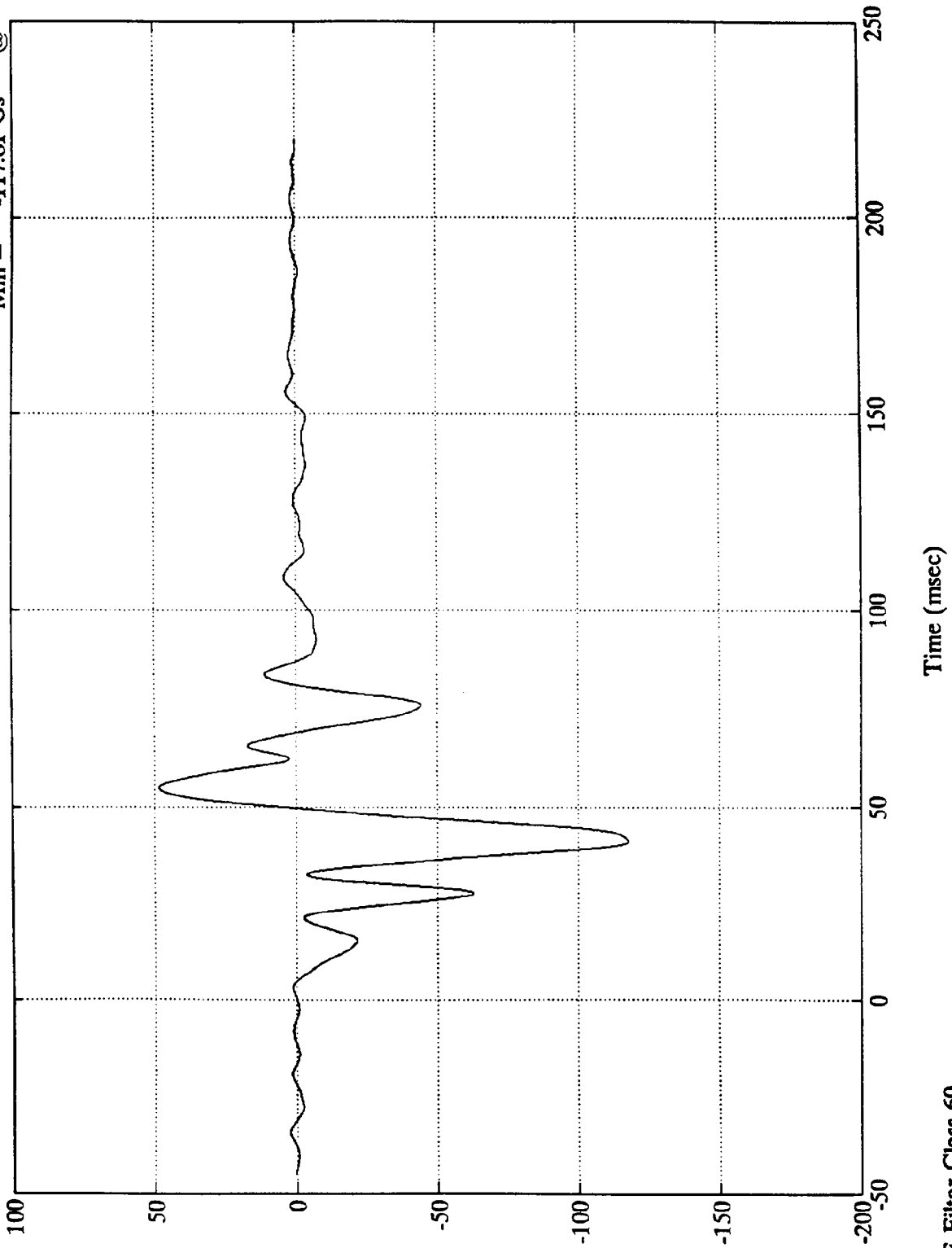
Time (msec.)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Acc. #5(x)

Max = 48.42 Gs @ 54.96 msec
Min = -117.81 Gs @ 41.28 msec

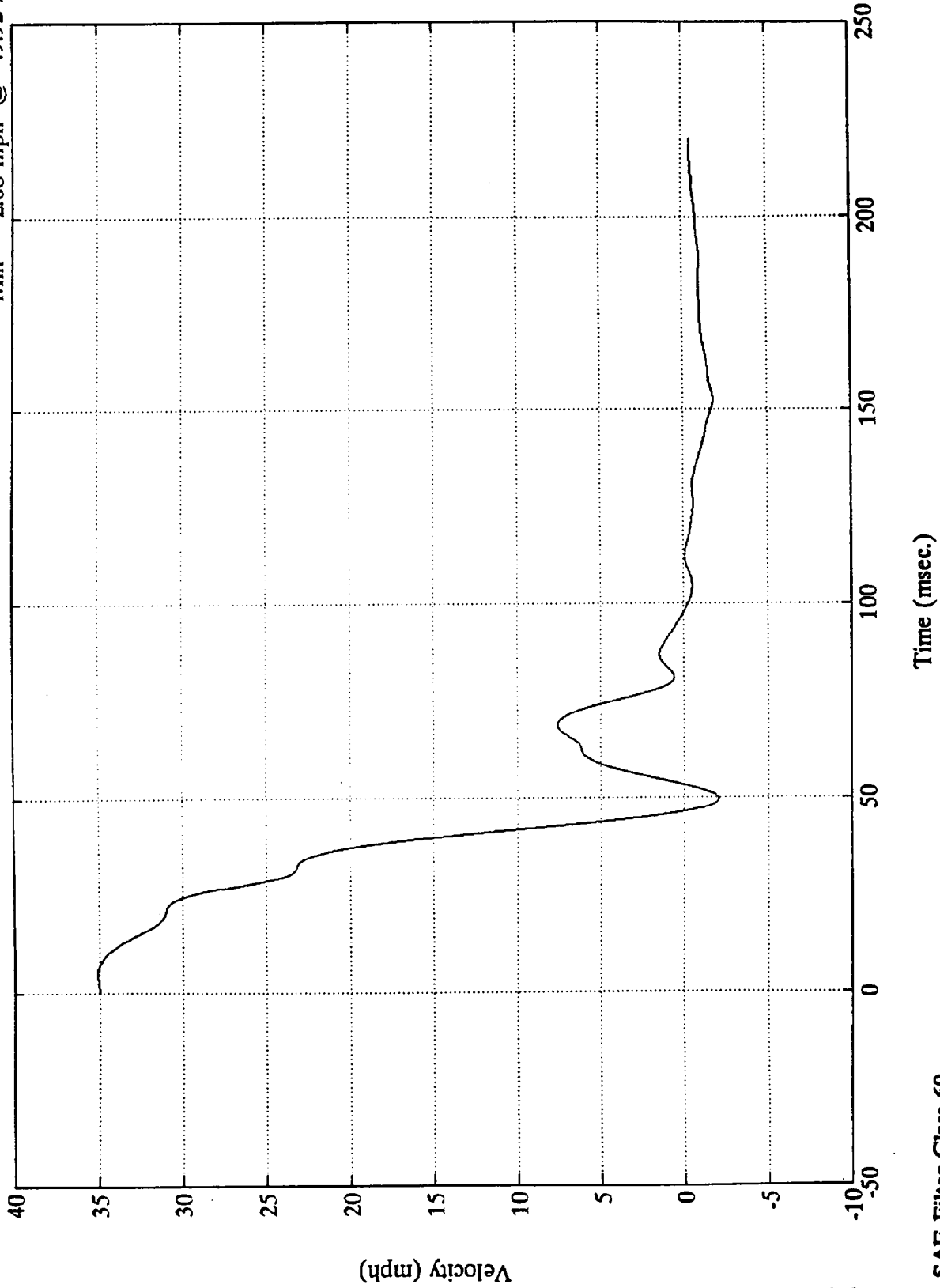


SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Acc. #5(x)

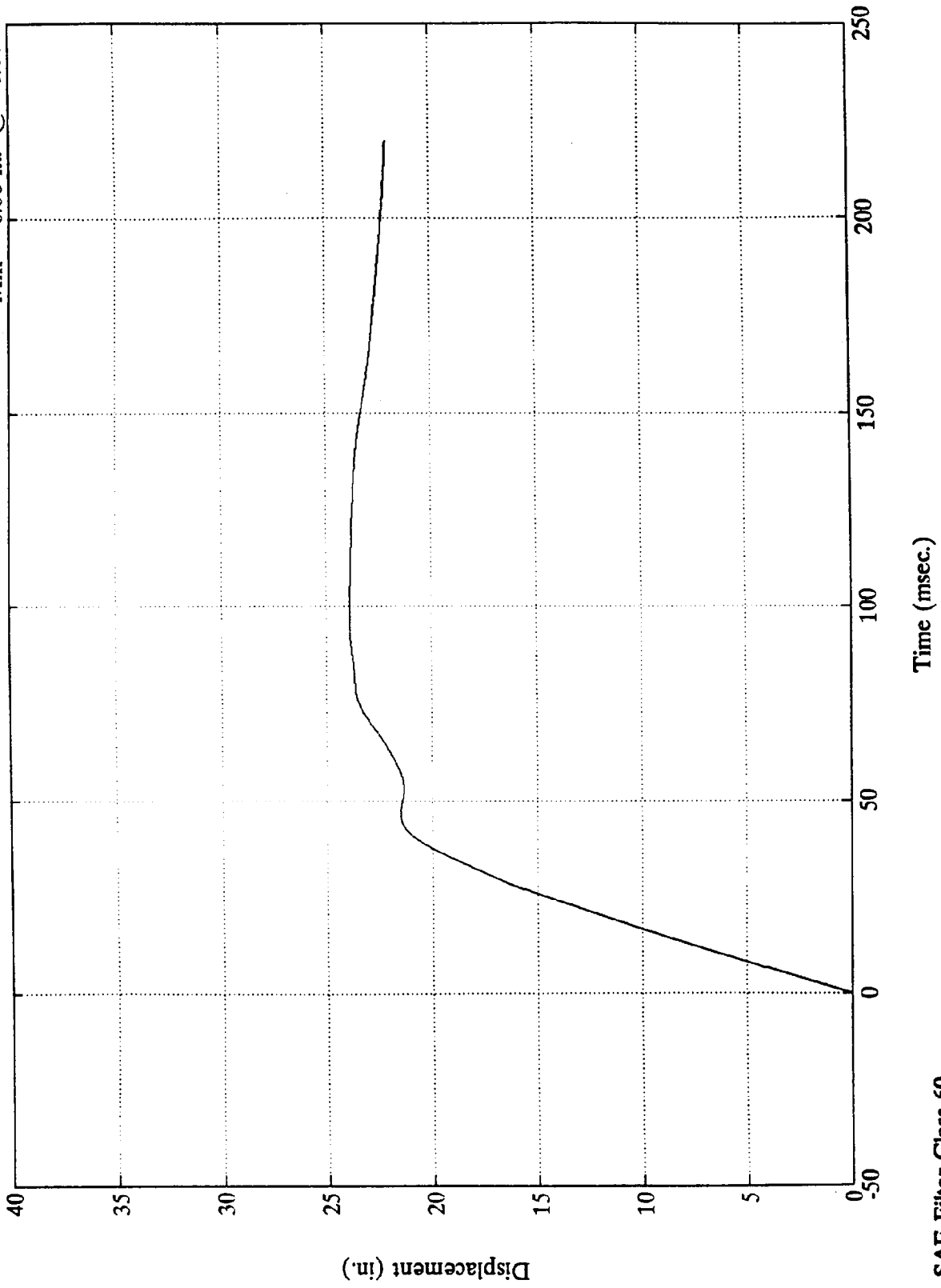
Max = 35.08 mph @ 5.28 msec
Min = -2.08 mph @ 49.92 msec



NCAP TEST #6 1992 DODGE CARAVAN

Acc. #5(x)

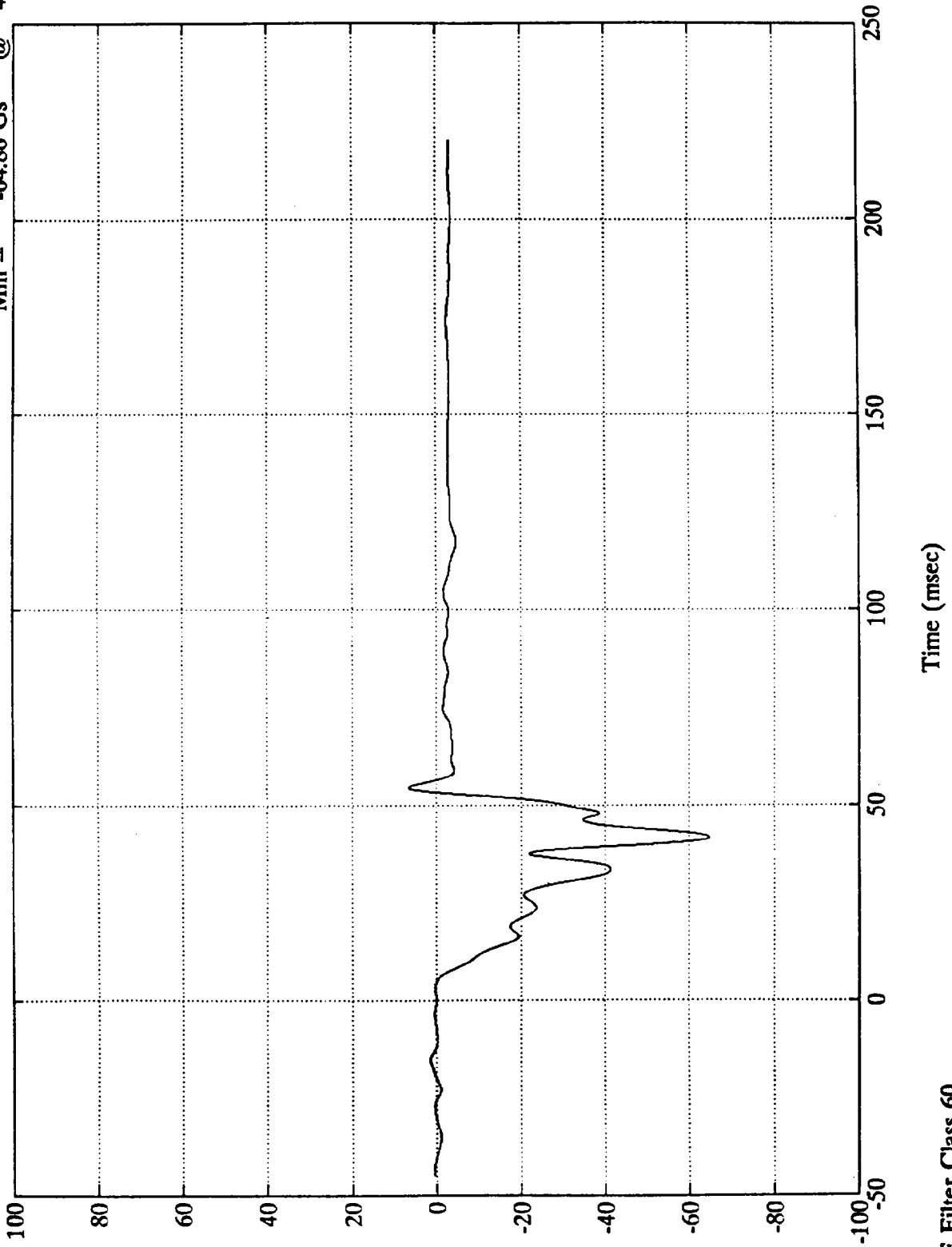
Max = 23.92 in. @ 100.32 msec
Min = 0.00 in. @ -0.00 msec



NCAP TEST #6 1992 DODGE CARAVAN

Acc. #7(x)

Max = 6.55 Gs @ 54.59 msec
Min = -64.86 Gs @ 41.88 msec



50
B-15

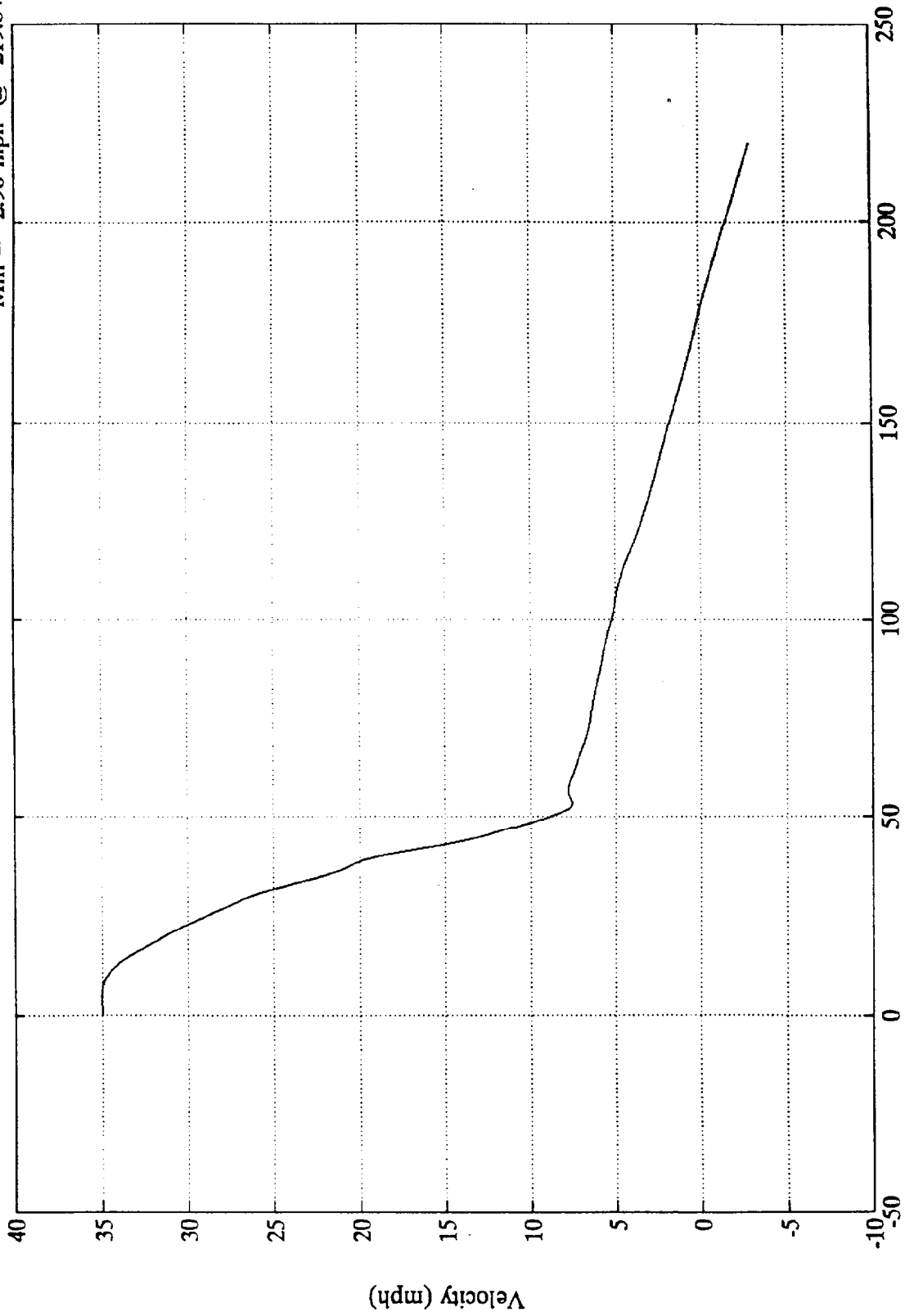
7946-6

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Max = 35.02 mph @ 5.52 msec
Min = -2.96 mph @ 219.84 msec

Acc. #7(x)



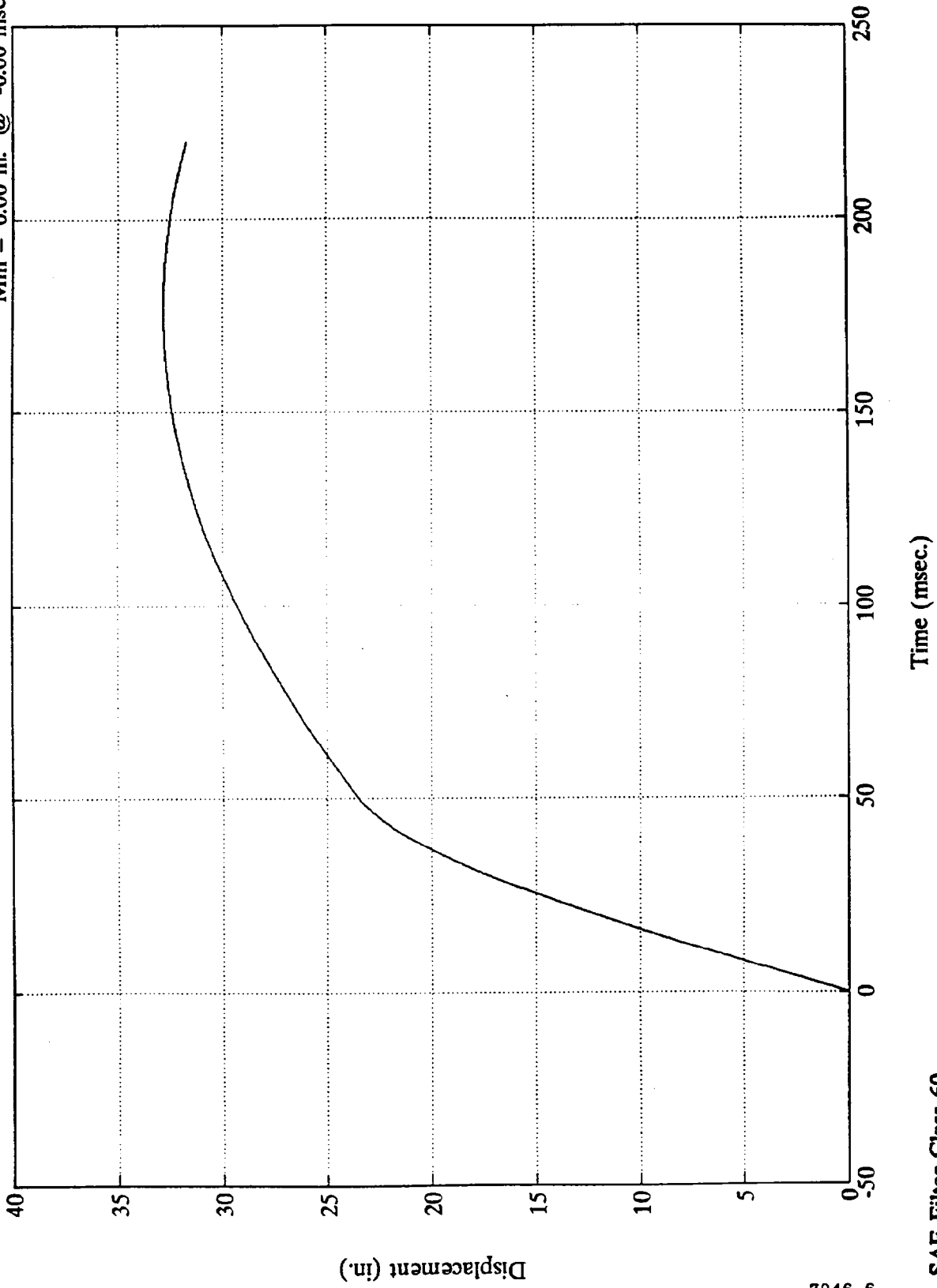
Time (msec.)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Acc. #7(x)

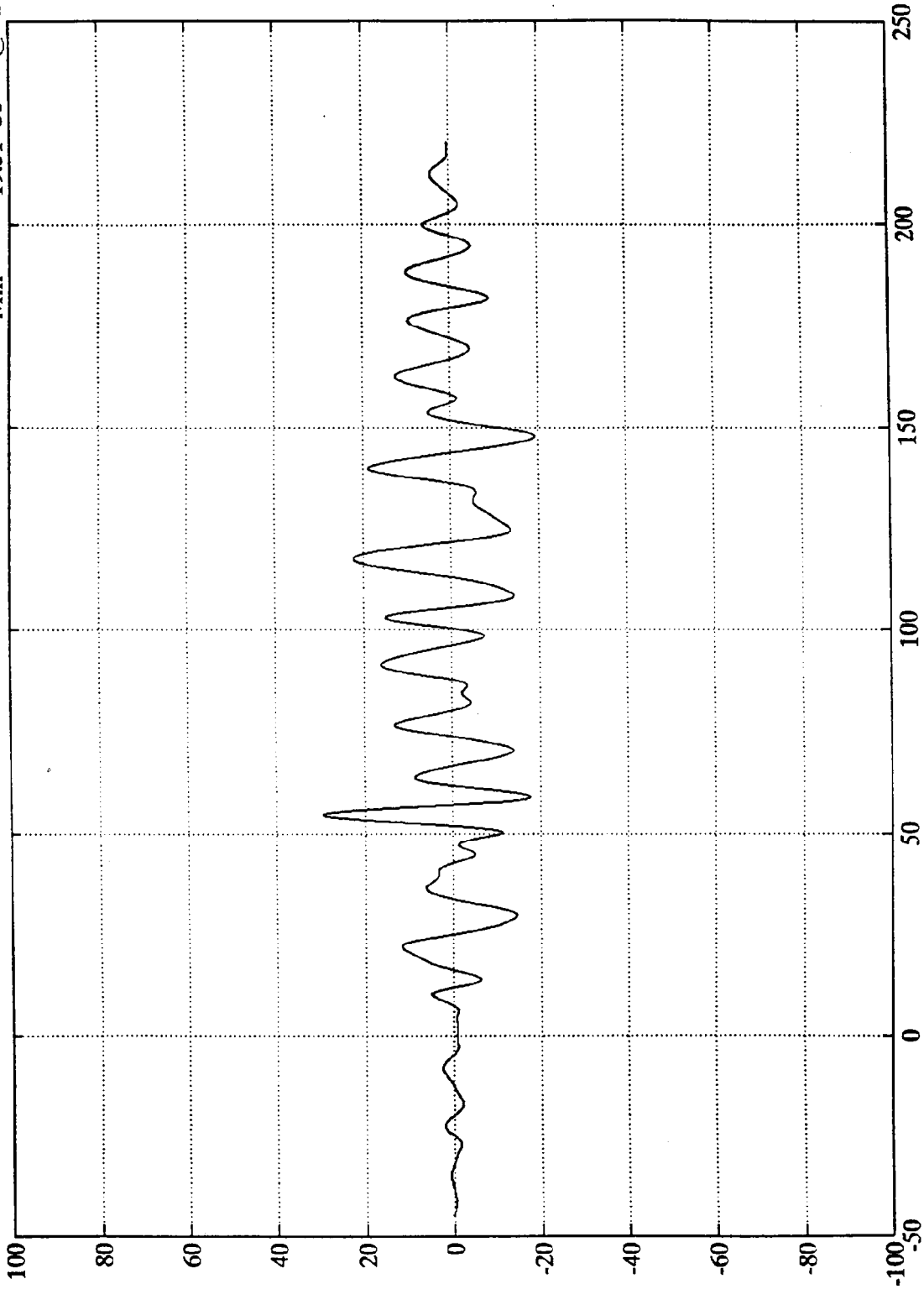
Max = 32.81 in. @ 178.32 msec
Min = 0.00 in. @ -0.00 msec



NCAP TEST #6 1992 DODGE CARAVAN

Acc. #8(z)

Max = 29.38 Gs @ 54.72 msec
Min = -19.31 Gs @ 147.48 msec



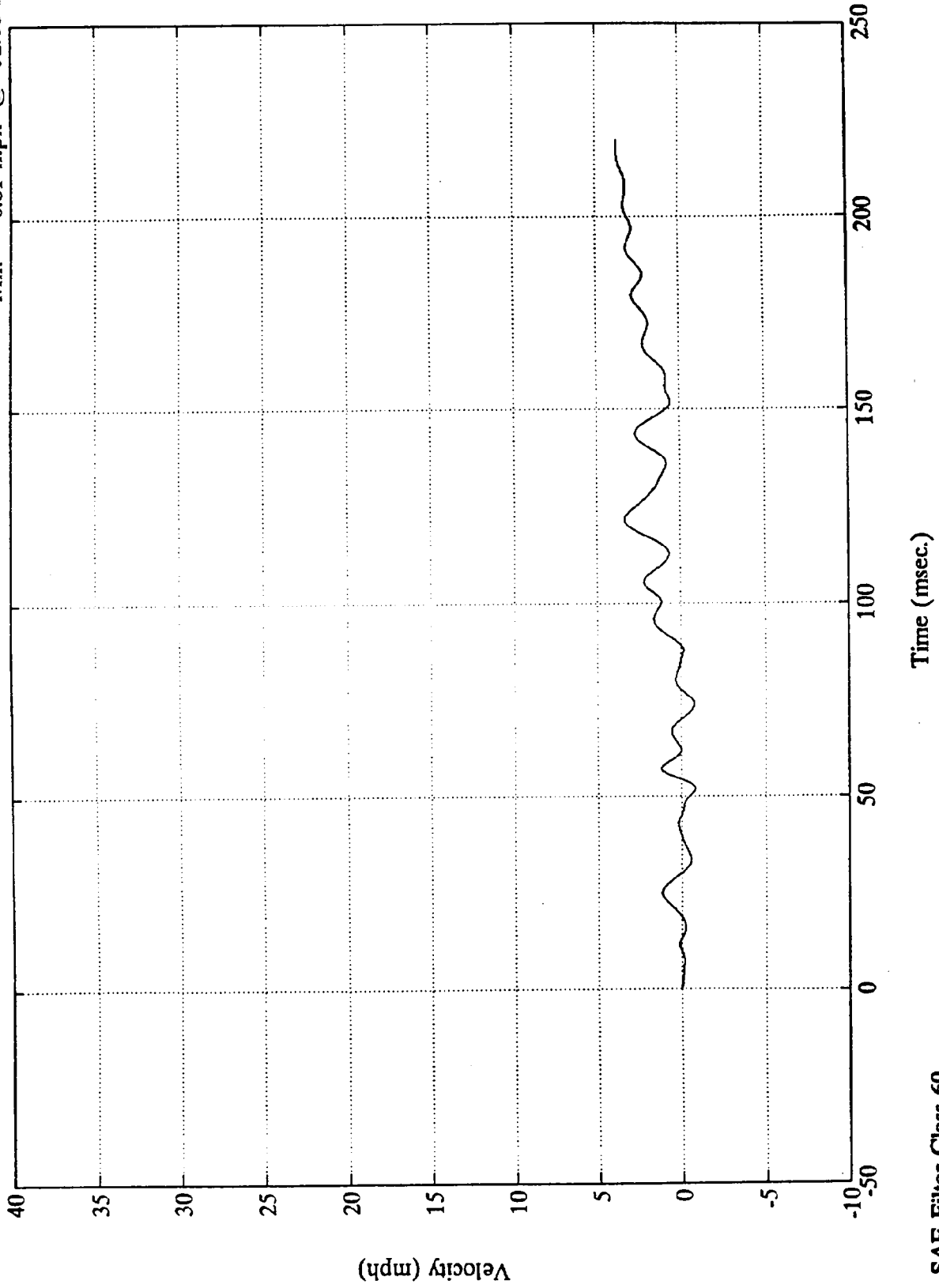
Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Acc. #8(z)

Max = 3.73 mph @ 219.84 msec
Min = -0.81 mph @ 52.08 msec



Velocity (mph)

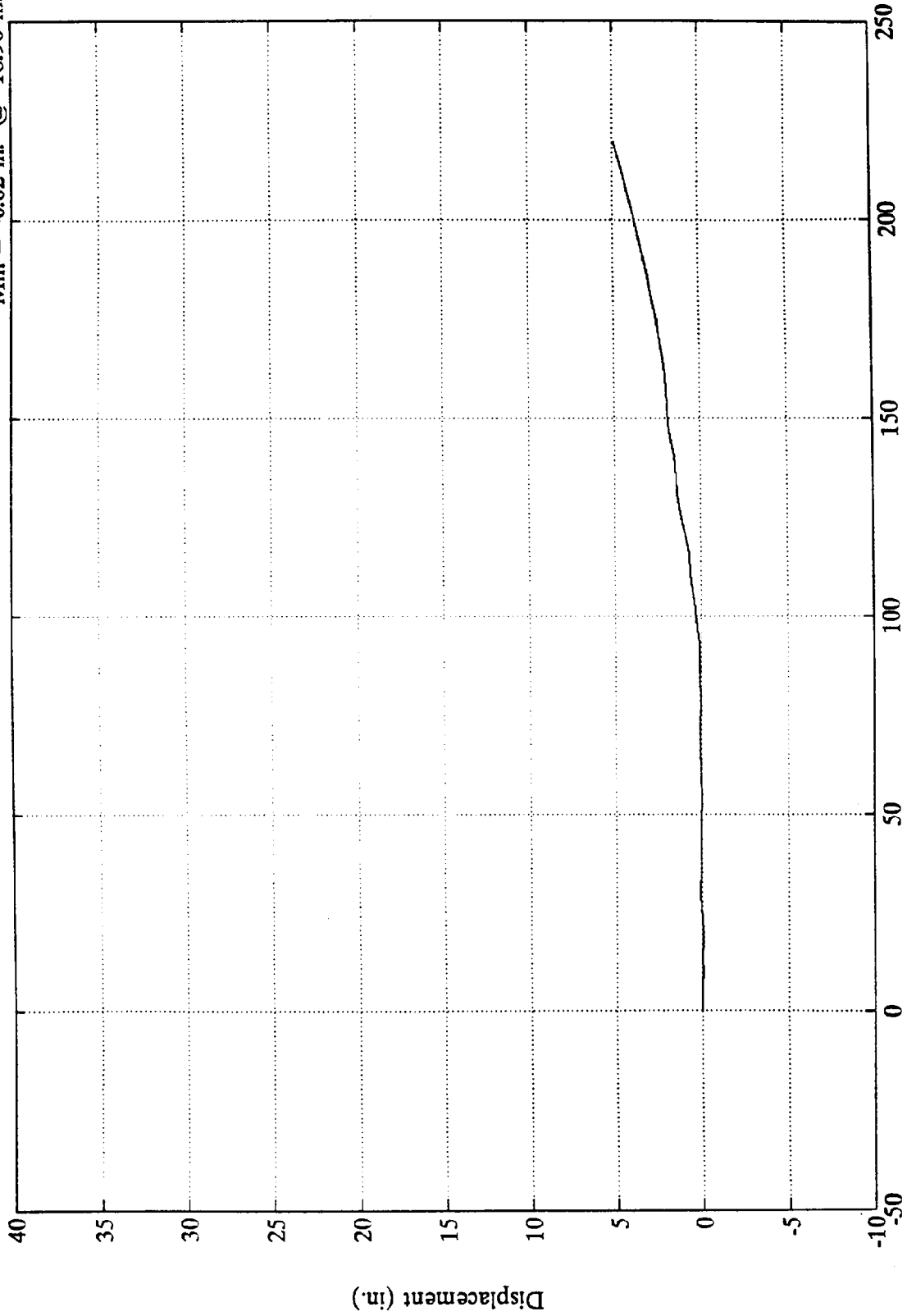
Time (msec.)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Acc. #8(z)

Max = 4.90 in. @ 219.84 msec
Min = -0.02 in. @ 18.96 msec



Displacement (in.)

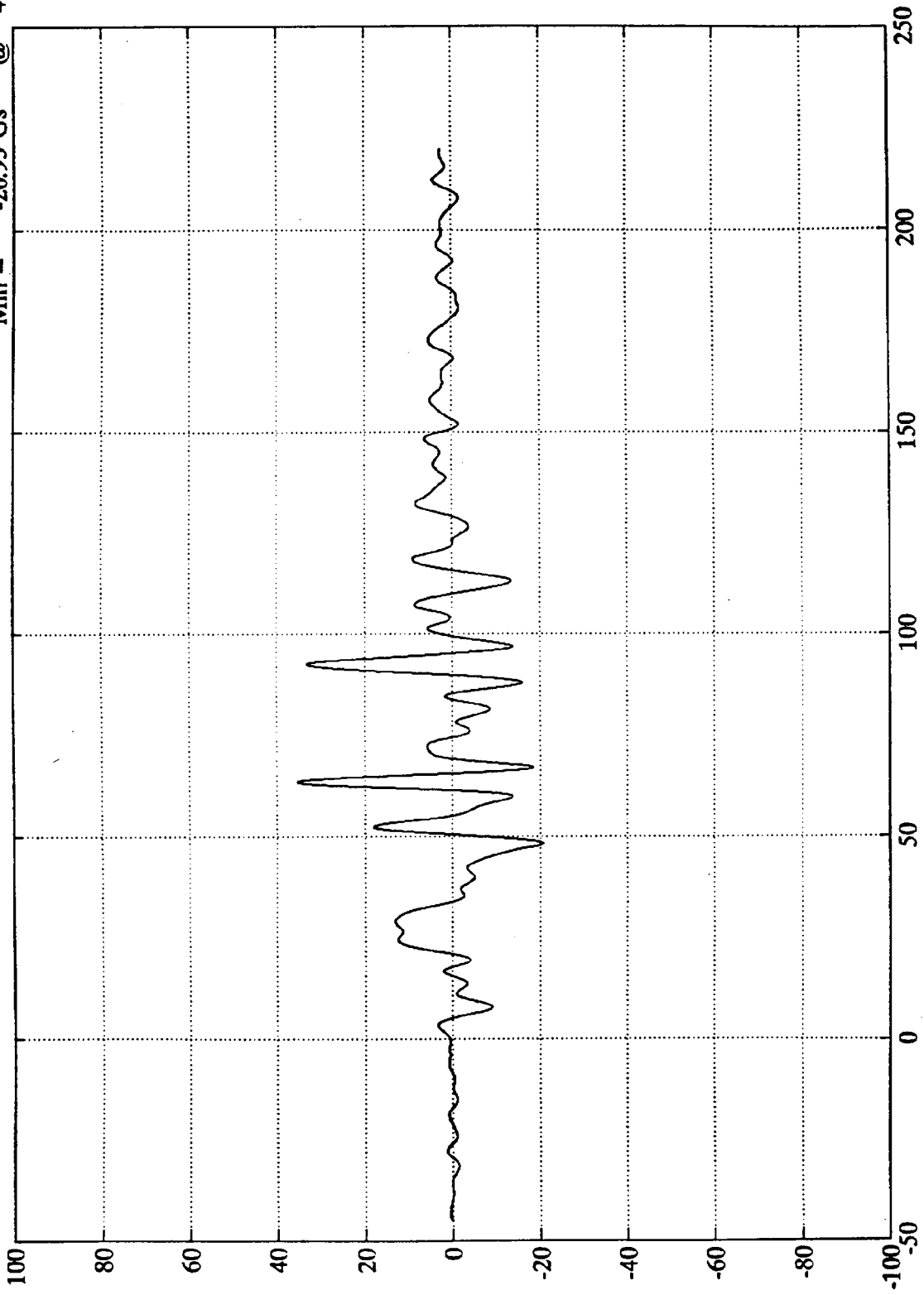
Time (msec.)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Acc. #9(z)

Max = 35.36 Gs @ 63.84 msec
Min = -20.93 Gs @ 48.36 msec



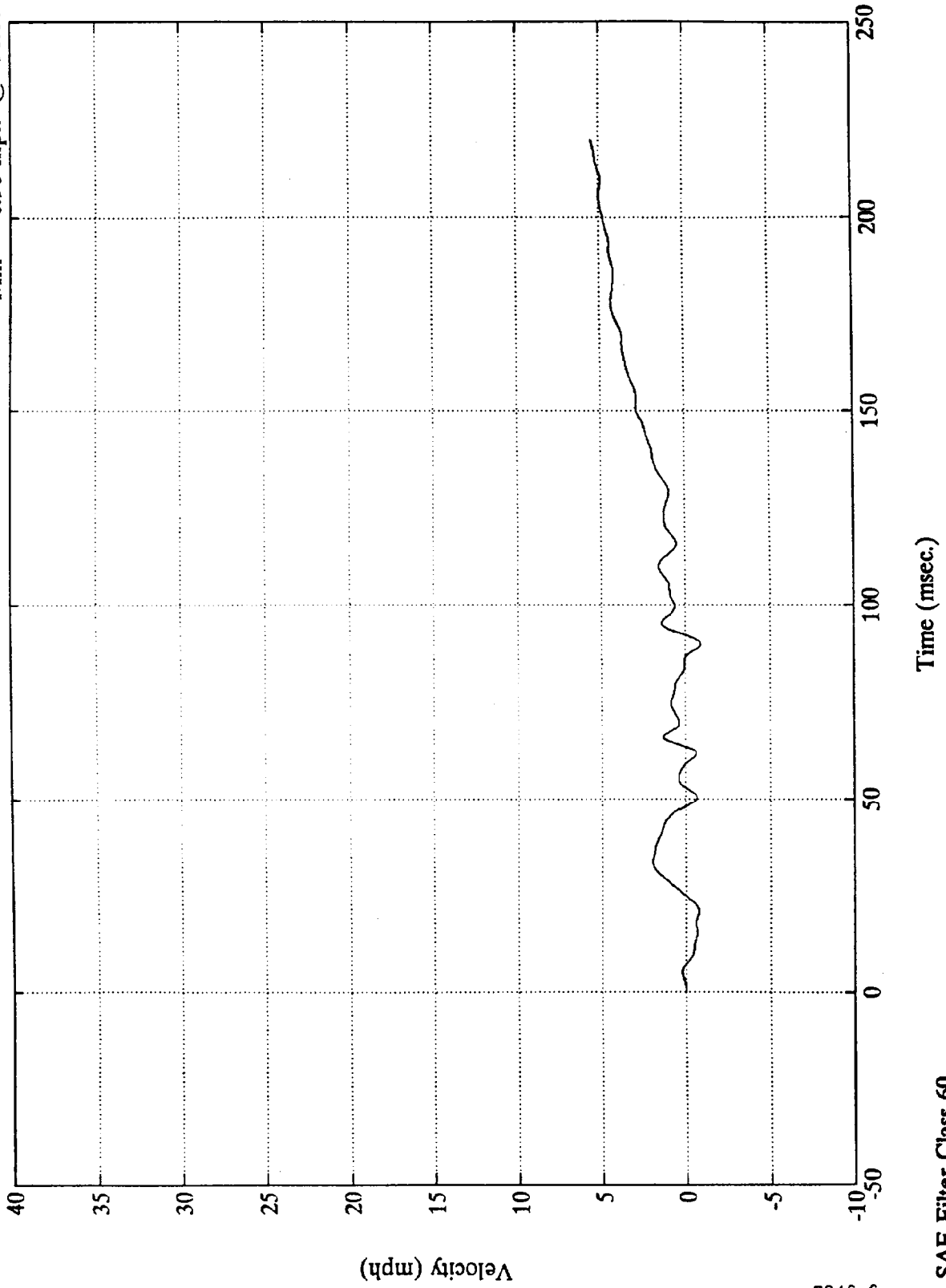
Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Acc. #9(z)

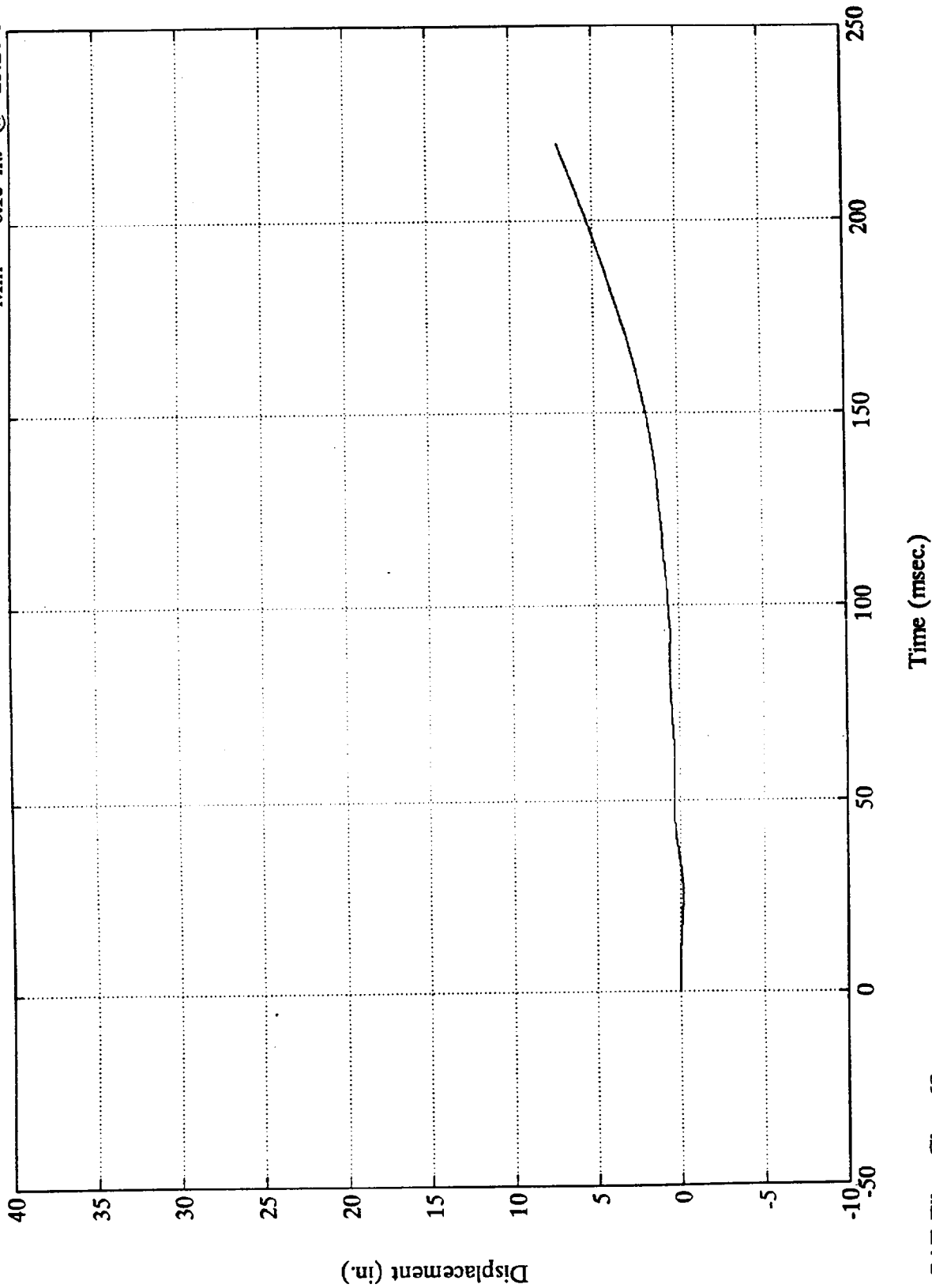
Max = 5.44 mph @ 219.84 msec
Min = -0.90 mph @ 90.00 msec



NCAP TEST #6 1992 DODGE CARAVAN

Acc. #9(z)

Max = 7.10 in. @ 219.84 msec
Min = -0.15 in. @ 25.20 msec



TEST NO. MN0300

LOAD CELL BARRIER DATA

SAE FILTER CHANNEL CLASS

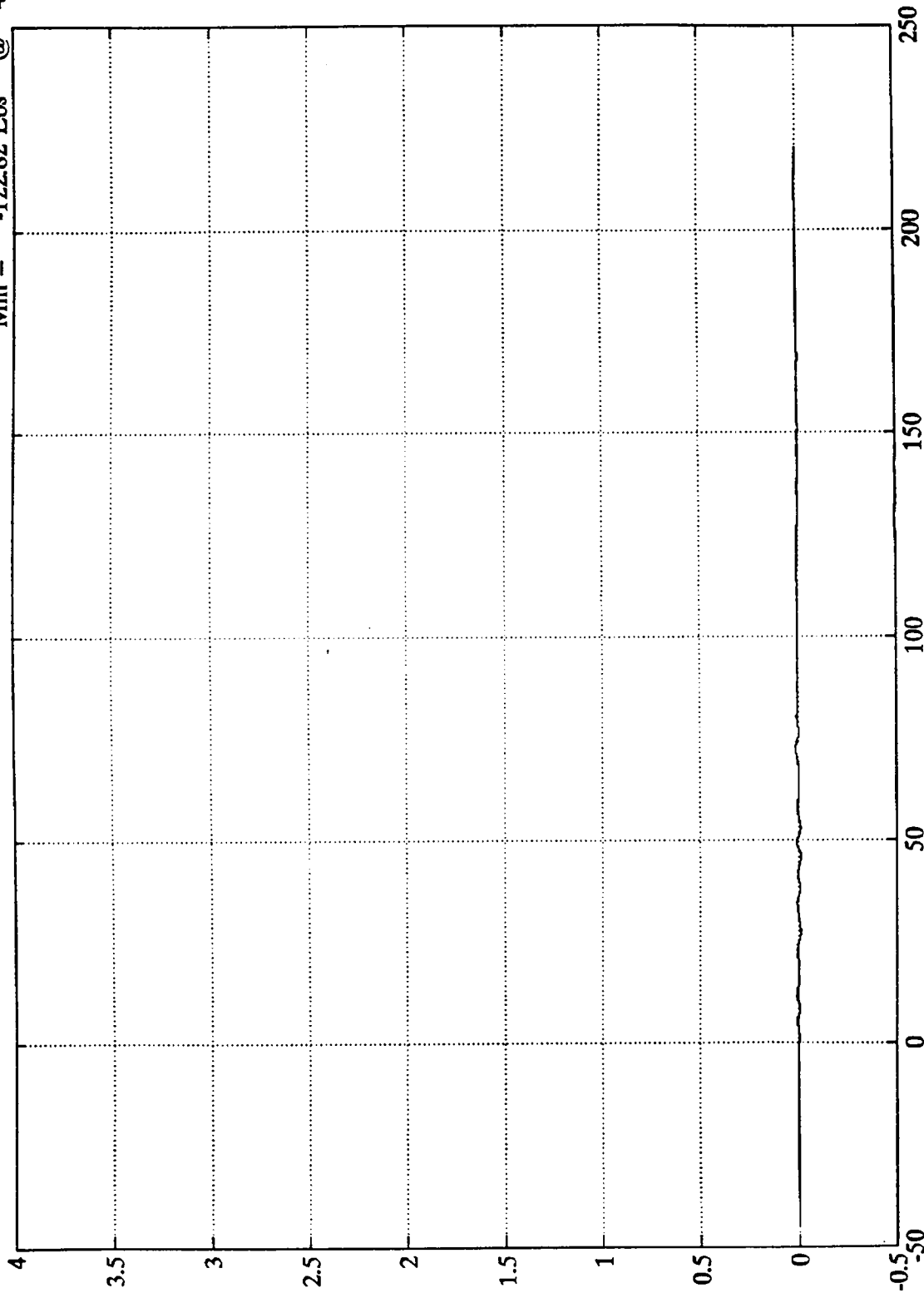
60

NCAP TEST #6 1992 DODGE CARAVAN

Max = 132.45 Lbs @ 72.12 msec
Min = -122.82 Lbs @ 45.96 msec

Barrier Load Cell A1

x10⁴



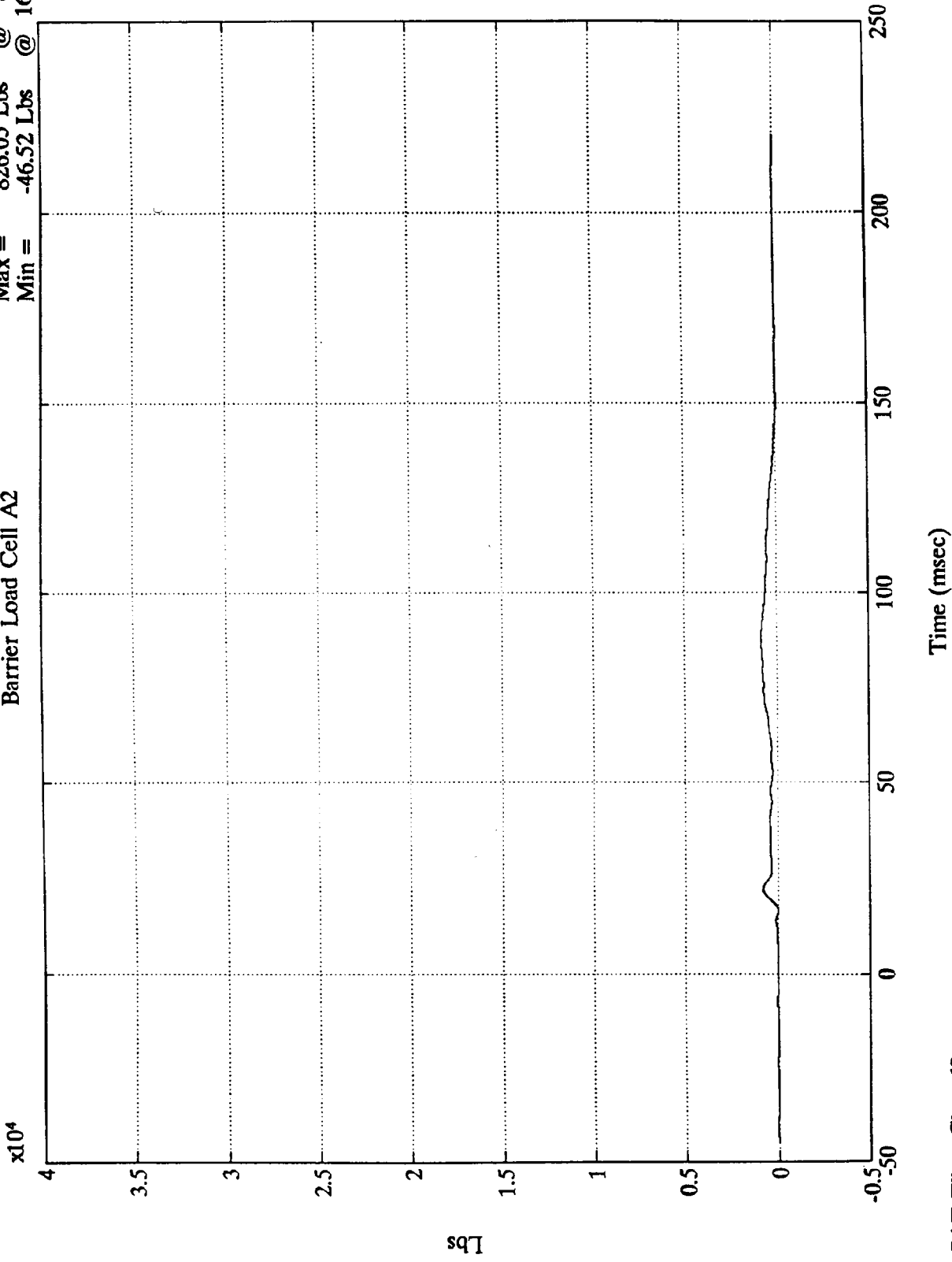
Lbs

Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell A2
Max = 826.05 Lbs @ 88.55 msec
Min = -46.52 Lbs @ 168.48 msec



Lbs
B-26

7946-6

SAE Filter Class 60

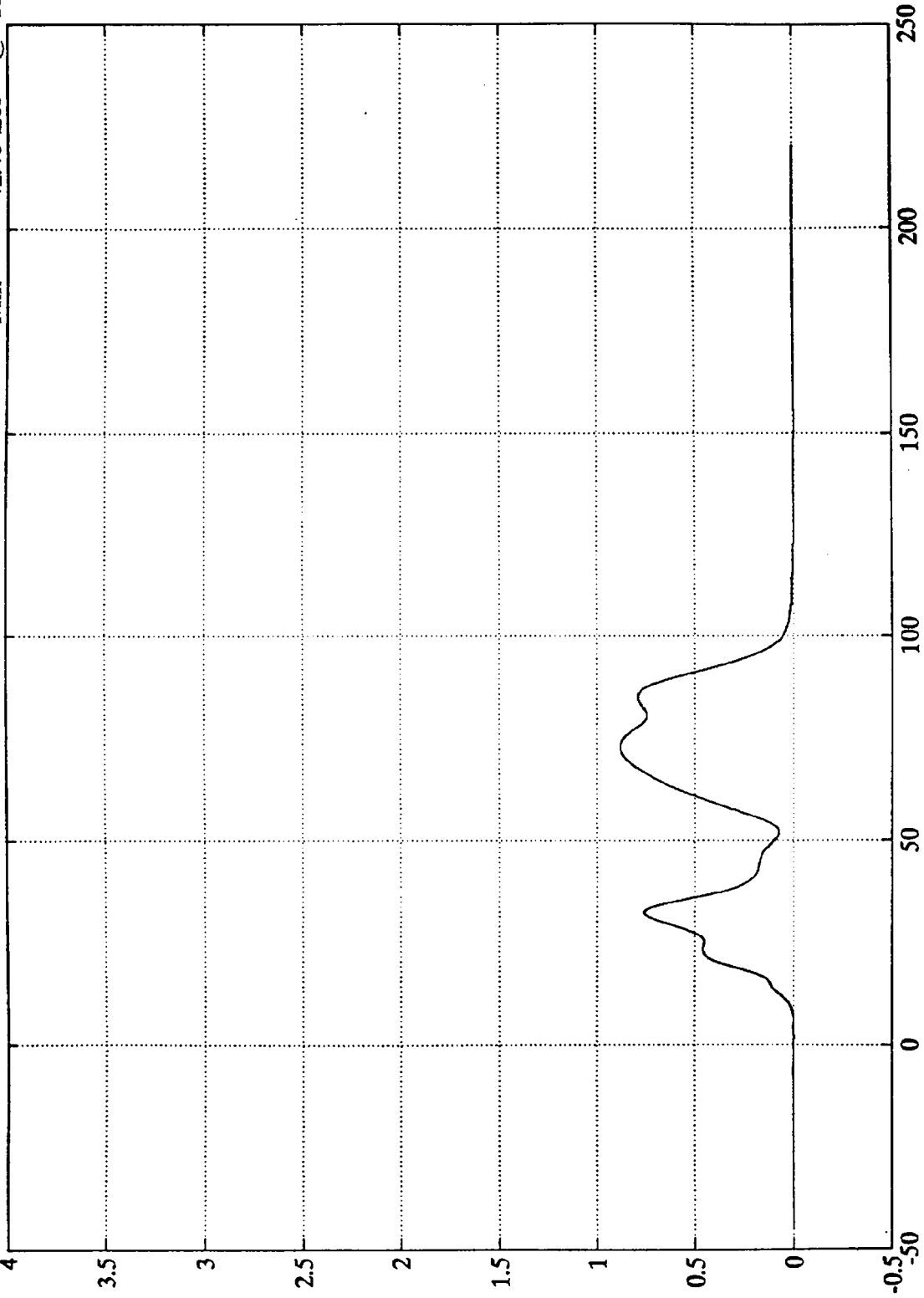
Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

$\times 10^4$

Barrier Load Cell A3

Max = 8791.59 Lbs @ 73.08 msec
Min = -42.40 Lbs @ 150.00 msec



Lbs

B-27

7946-6

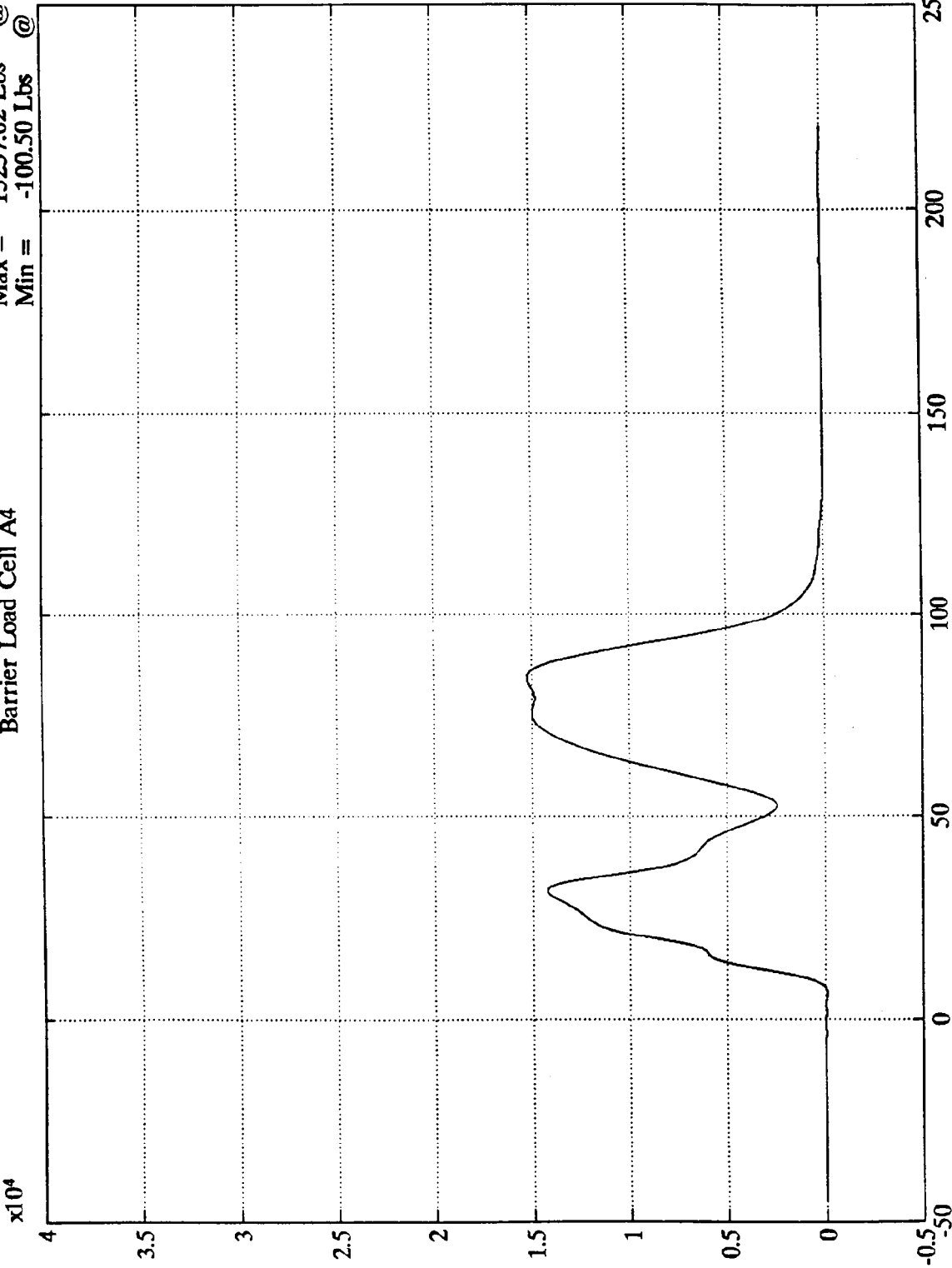
Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

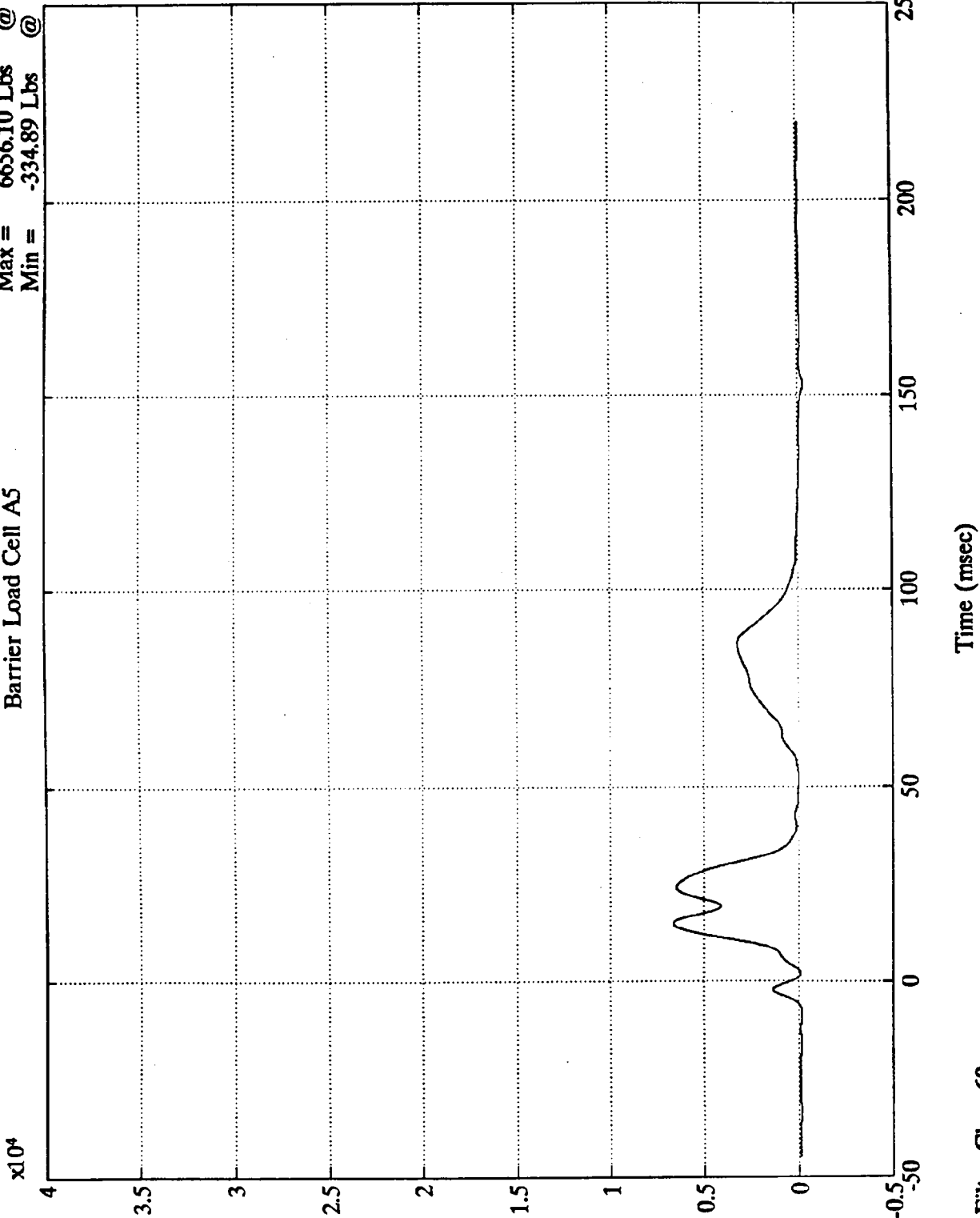
Max = 15257.02 Lbs @ 84.00 msec
Min = -100.50 Lbs @ 6.23 msec

Barrier Load Cell A4



NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell A5
Max = 6656.10 Lbs @ 14.75 msec
Min = -334.89 Lbs @ 152.63 msec

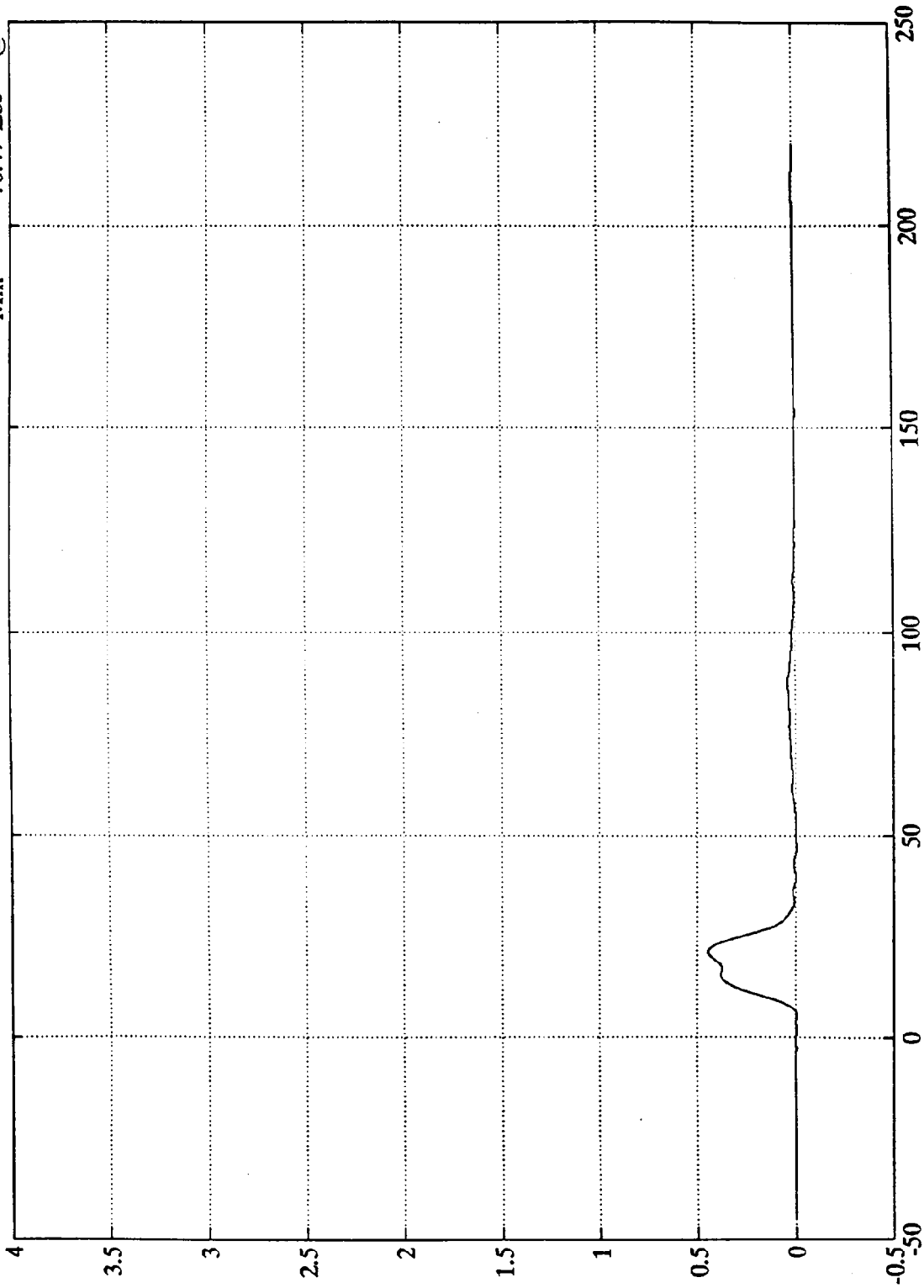


NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Barrier Load Cell A6

Max = 4468.20 Lbs @ 21.35 msec
Min = -70.47 Lbs @ 5.63 msec



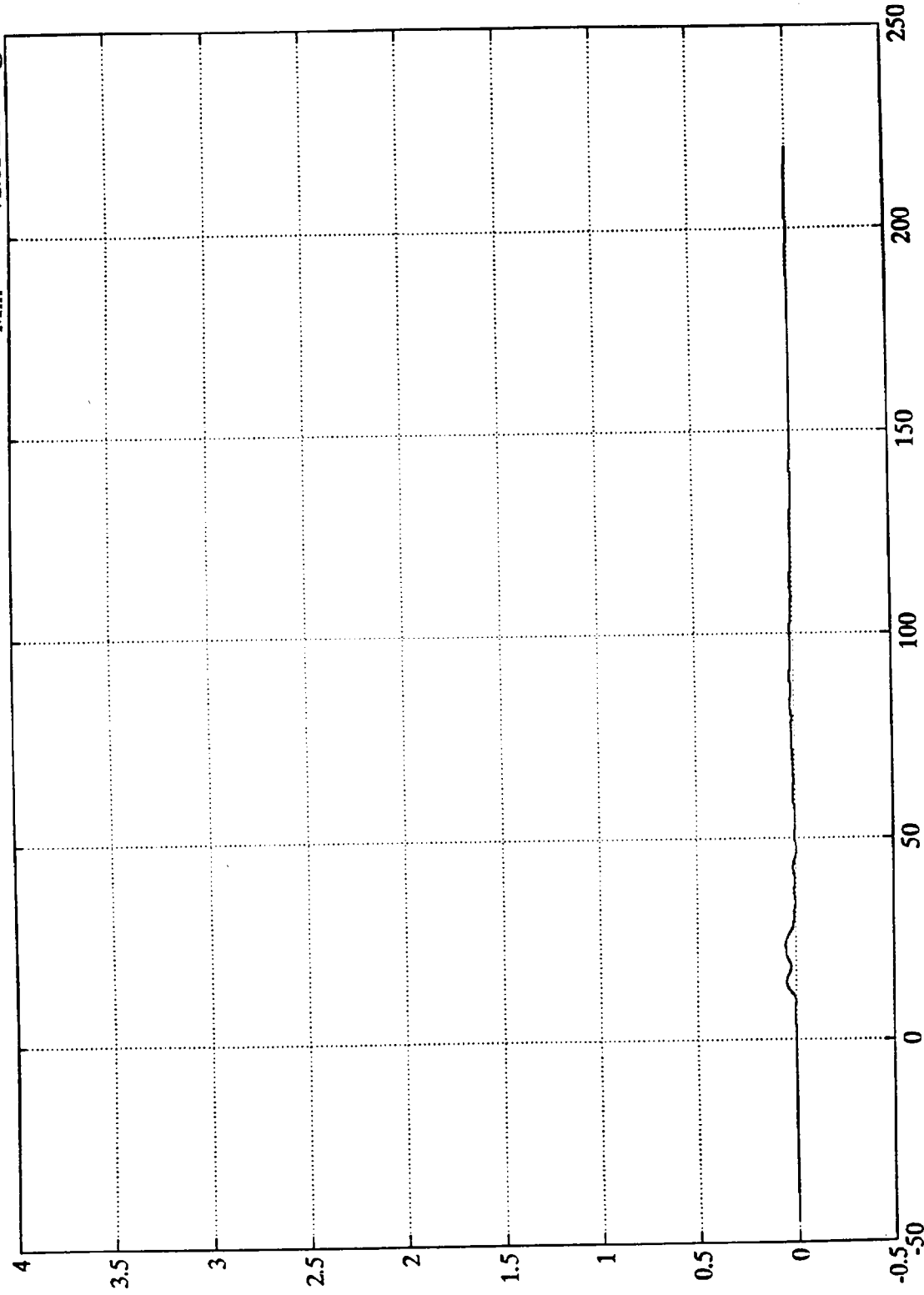
Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN
x10⁴

Barrier Load Cell A7

Max = 519.78 Lbs @ 23.28 msec
Min = -72.81 Lbs @ 47.04 msec



B-31
Lbs

7946-6

Time (msec)

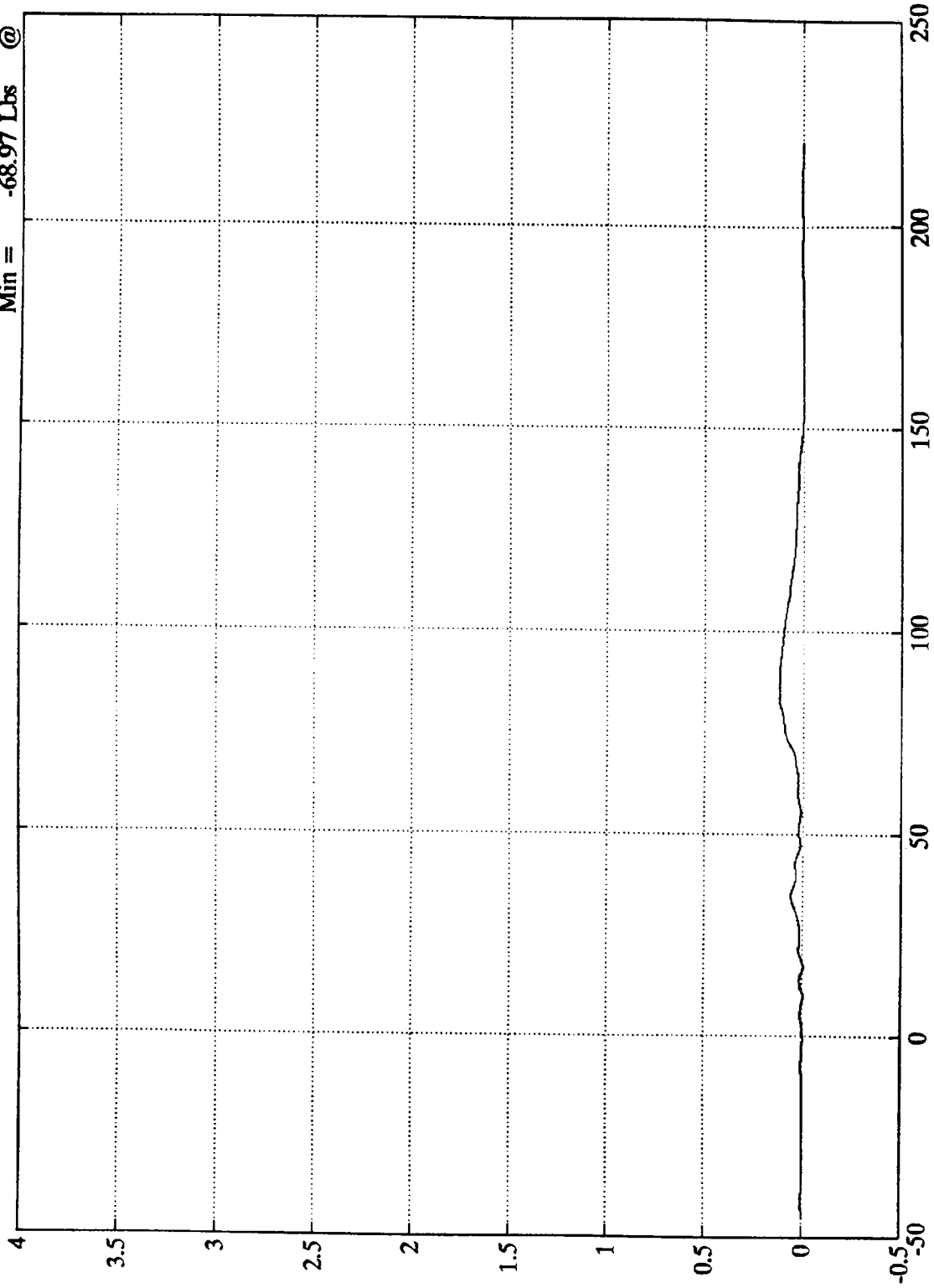
SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Barrier Load Cell A8

Max = 1214.44 Lbs @ 89.16 msec
Min = -68.97 Lbs @ 17.27 msec



lbs

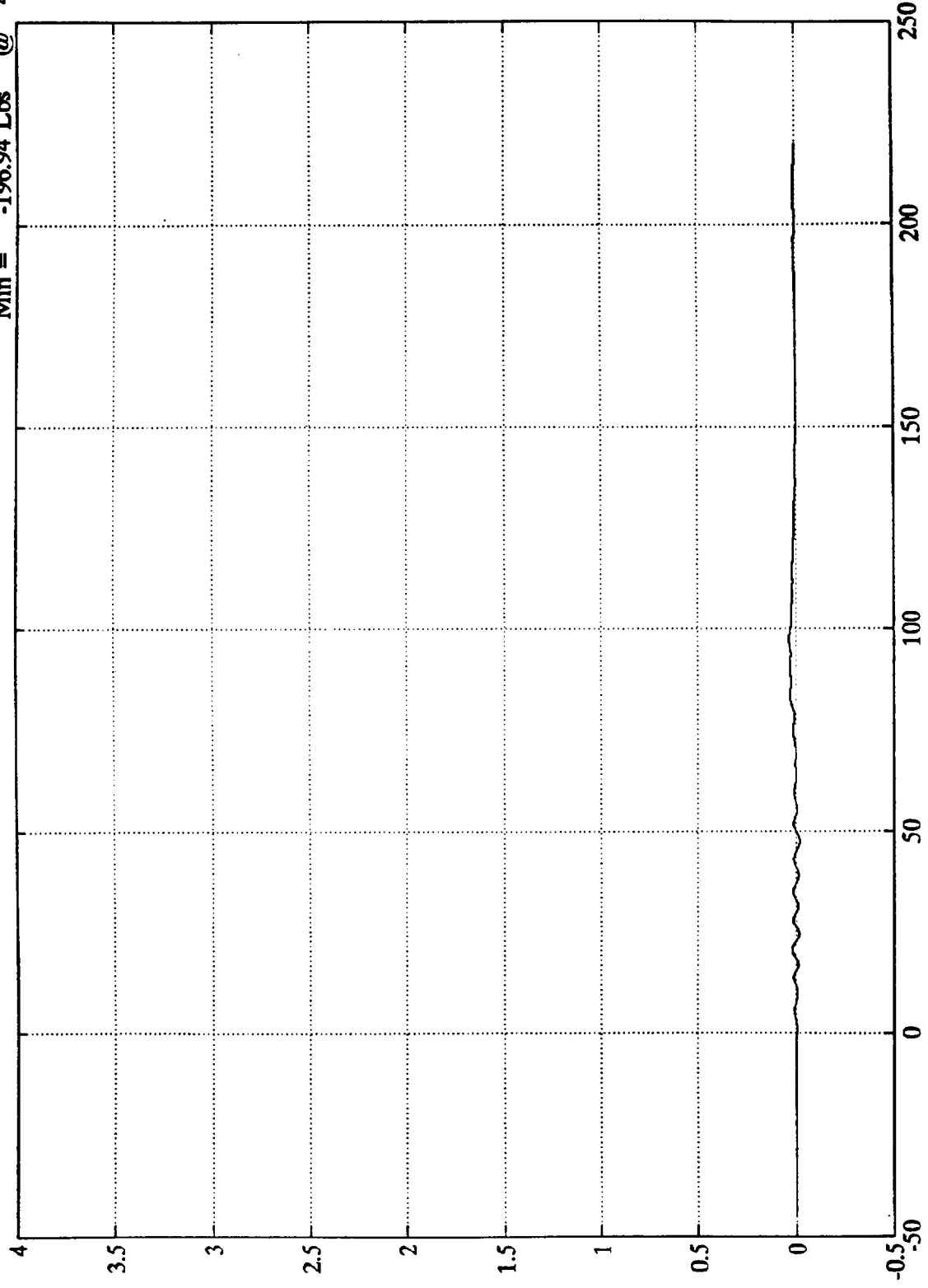
Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN
x10⁴

Barrier Load Cell A9

Max = 327.33 Lbs @ 97.44 msec
Min = -196.94 Lbs @ 47.52 msec



B-33

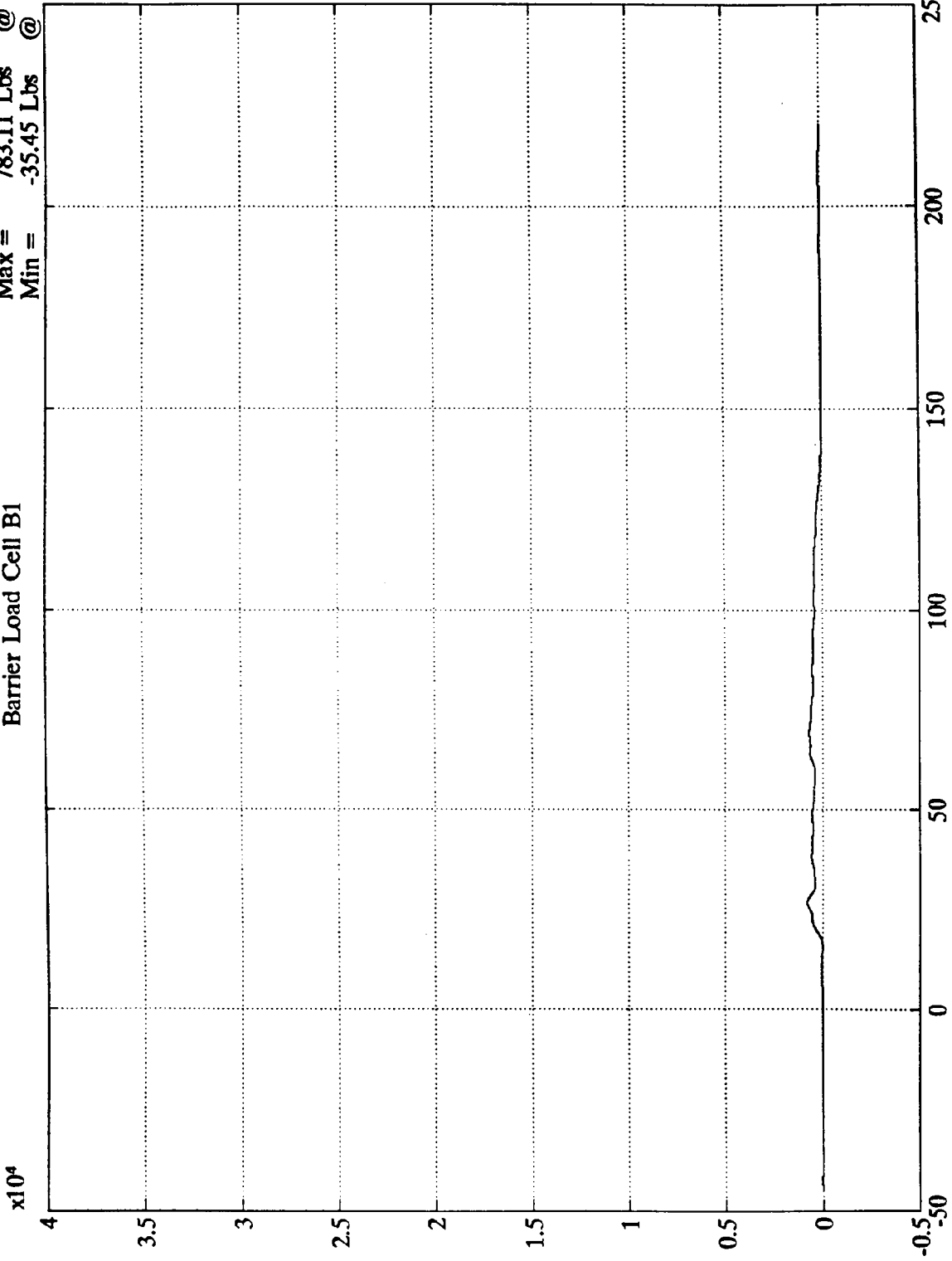
7846-6

SAE Filter Class 60

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell B1
Max = 783.11 Lbs @ 26.87 msec
Min = -35.45 Lbs @ 151.32 msec



B-34
Lbs

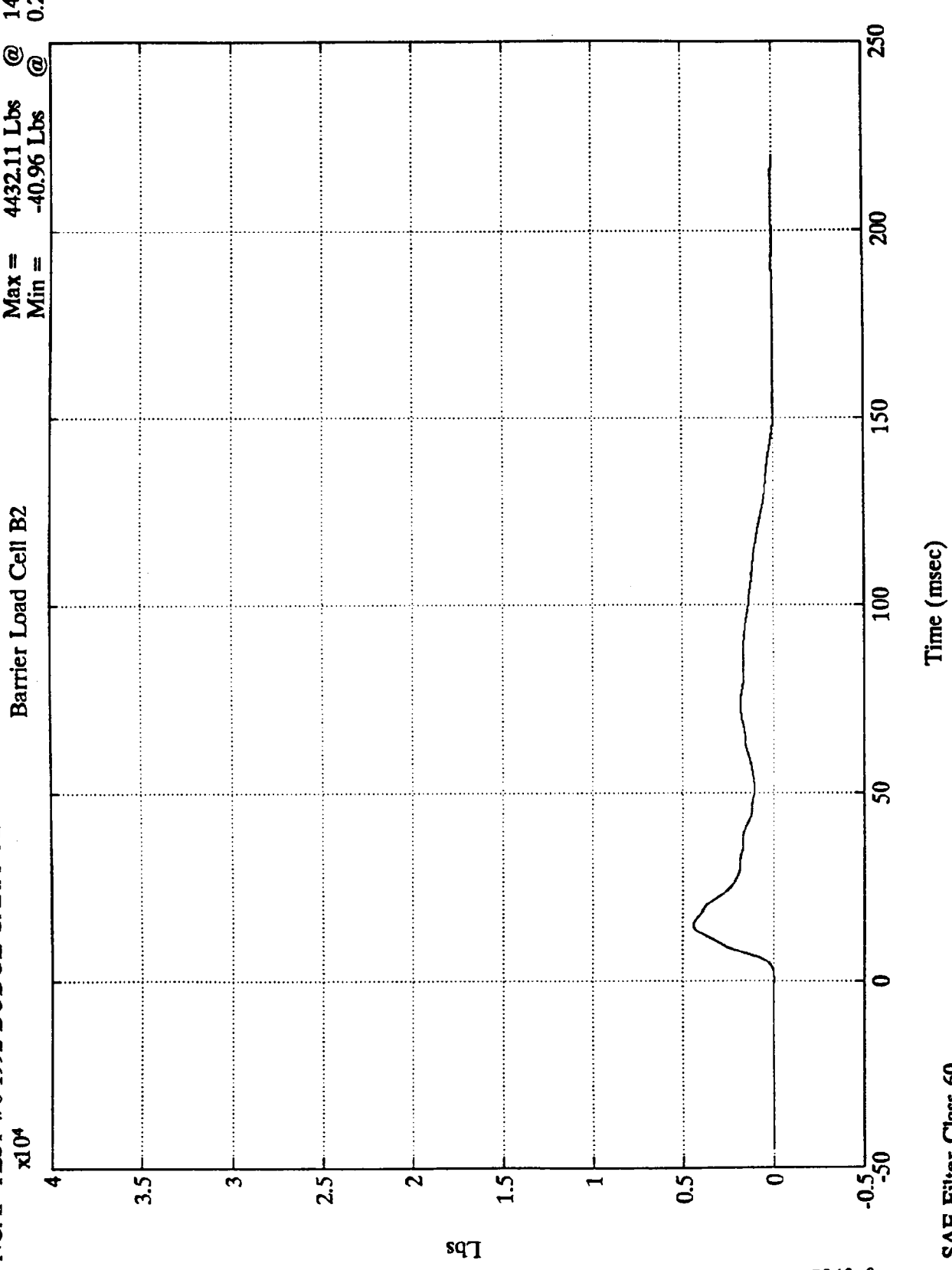
Time (msec)

SAE Filter Class 60

7946-6

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell B2
Max = 4432.11 Lbs @ 14.75 msec
Min = -40.96 Lbs @ 0.23 msec



lbs
B-35

7946-6

SAE Filter Class 60

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Barrier Load Cell B3

Max = 13170.51 Lbs @ 37.08 msec
Min = -176.13 Lbs @ -0.84 msec



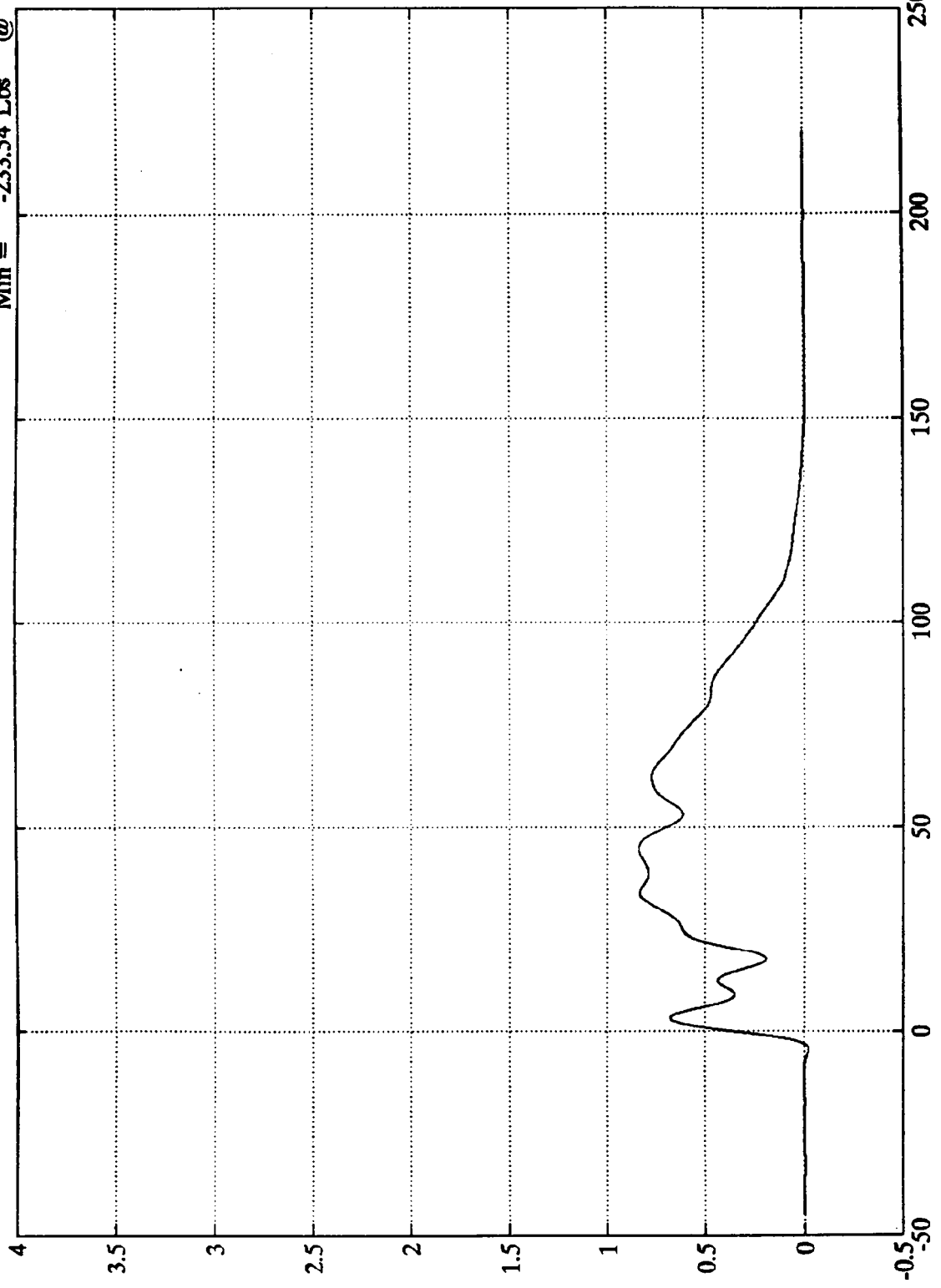
NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Barrier Load Cell B4

Max = 8393.85 Lbs
Min = -233.54 Lbs

@ 44.63 msec
@ -4.44 msec



Lbs
B-37

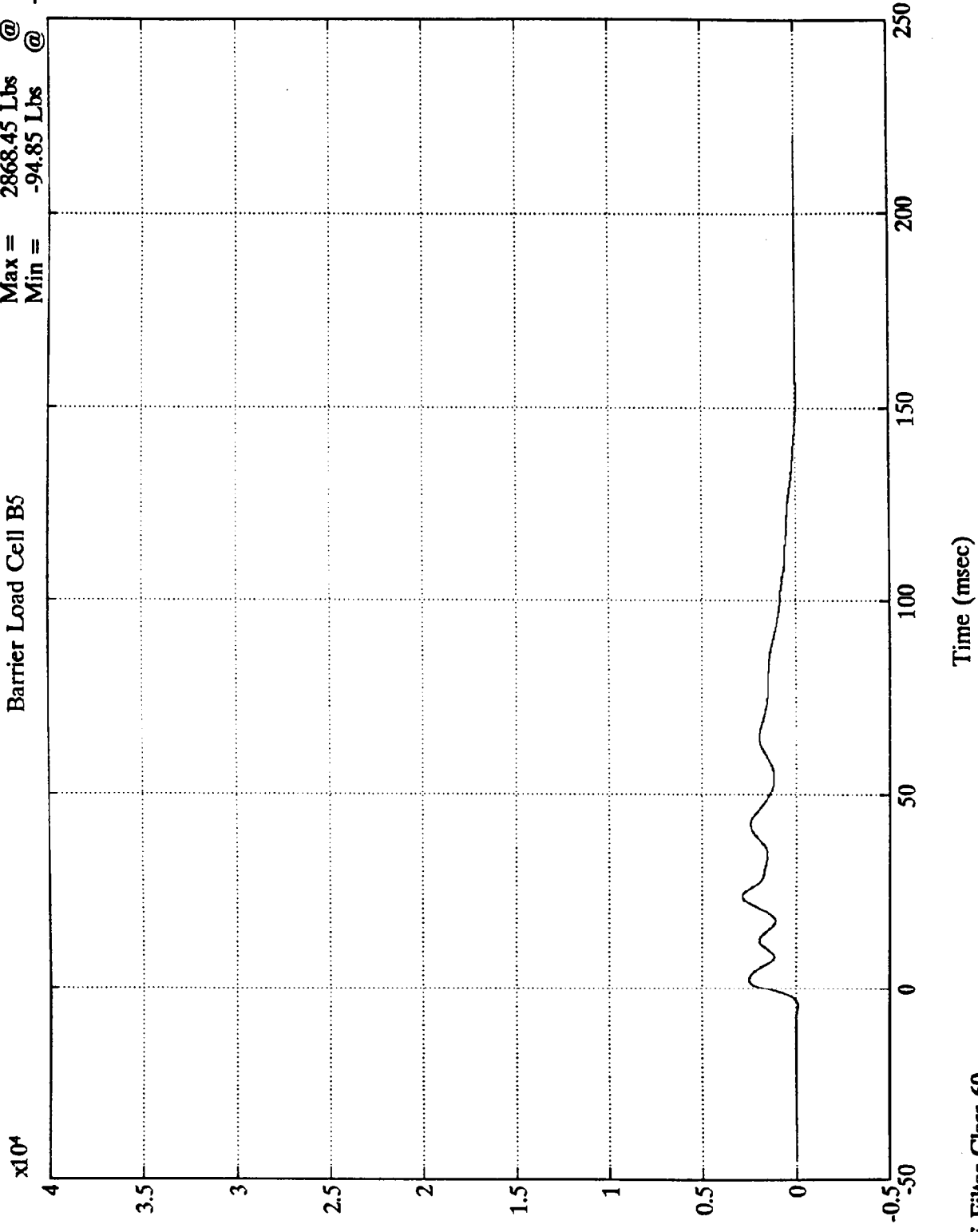
7946-6

Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell B5
Max = 2868.45 Lbs @ 23.63 msec
Min = -94.85 Lbs @ -4.56 msec



lbs
B-38

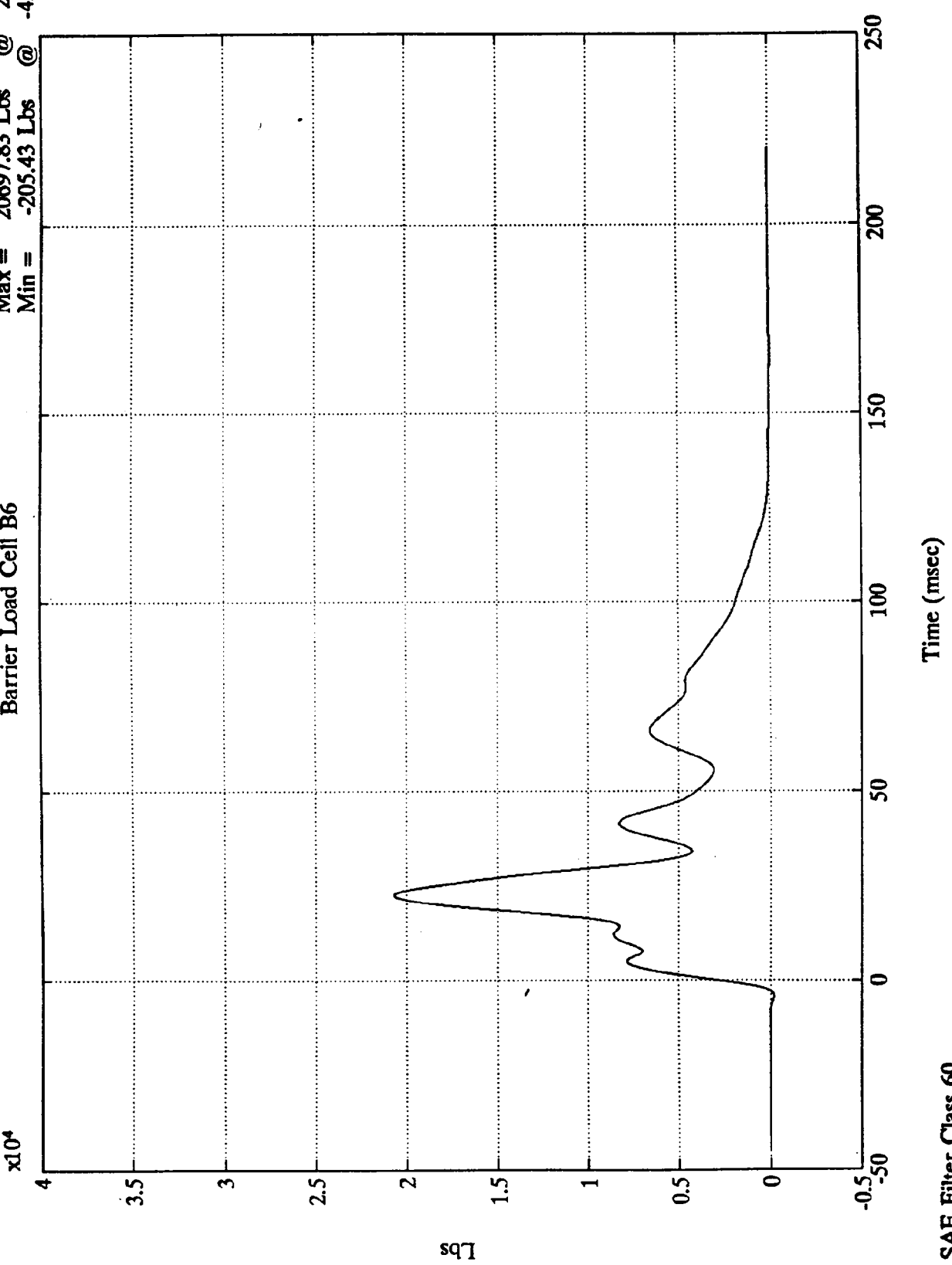
7946-6

SAE Filter Class 60

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell B6
Max = 20697.83 Lbs @ 22.80 msec
Min = -205.43 Lbs @ -4.08 msec



B-39
lbs

7946-6

SAE Filter Class 60

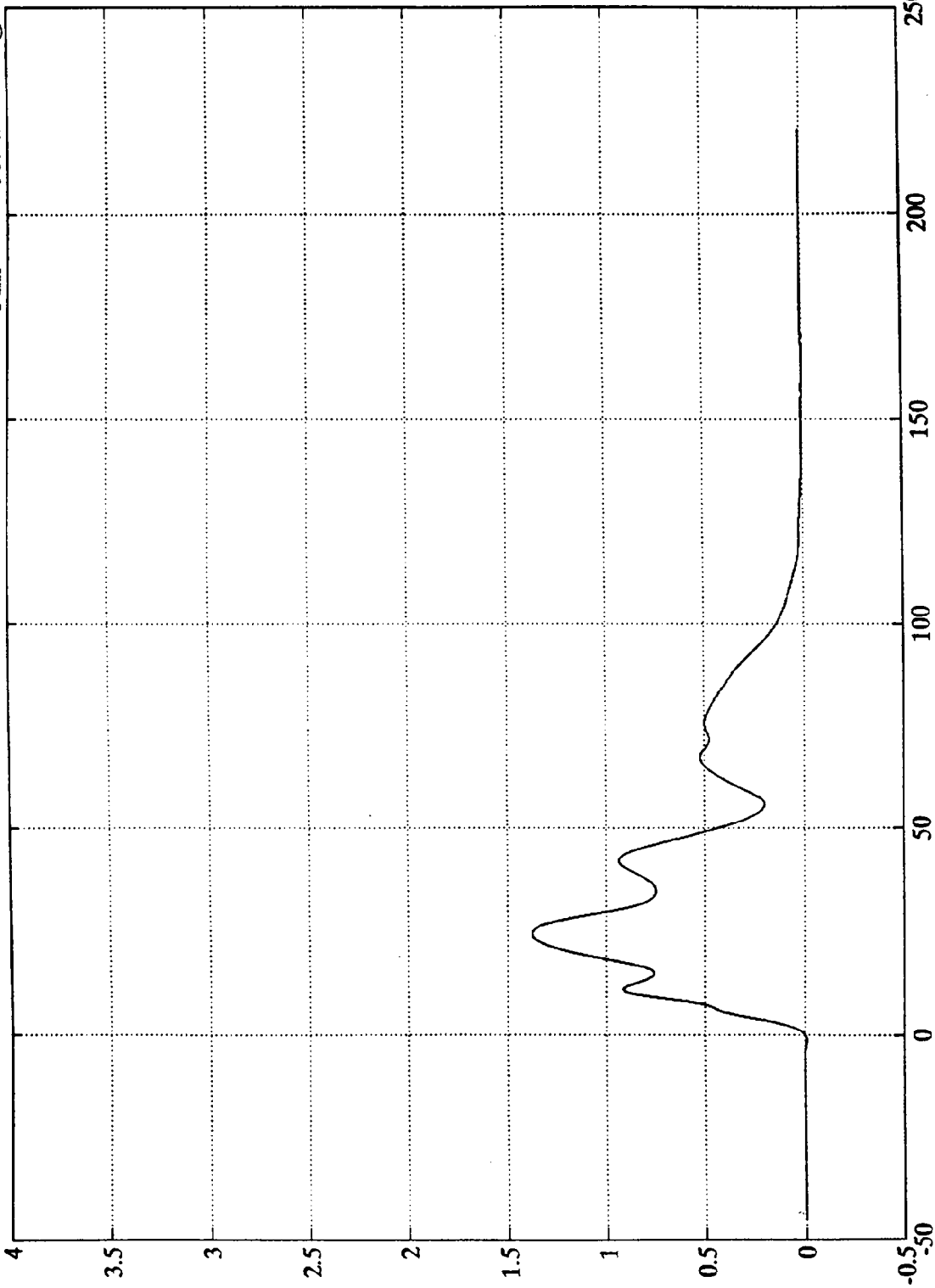
Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Barrier Load Cell B7

Max = 13737.68 Lbs @ 24.35 msec
Min = -93.41 Lbs @ -1.20 msec



lbs
B-40

7946-6

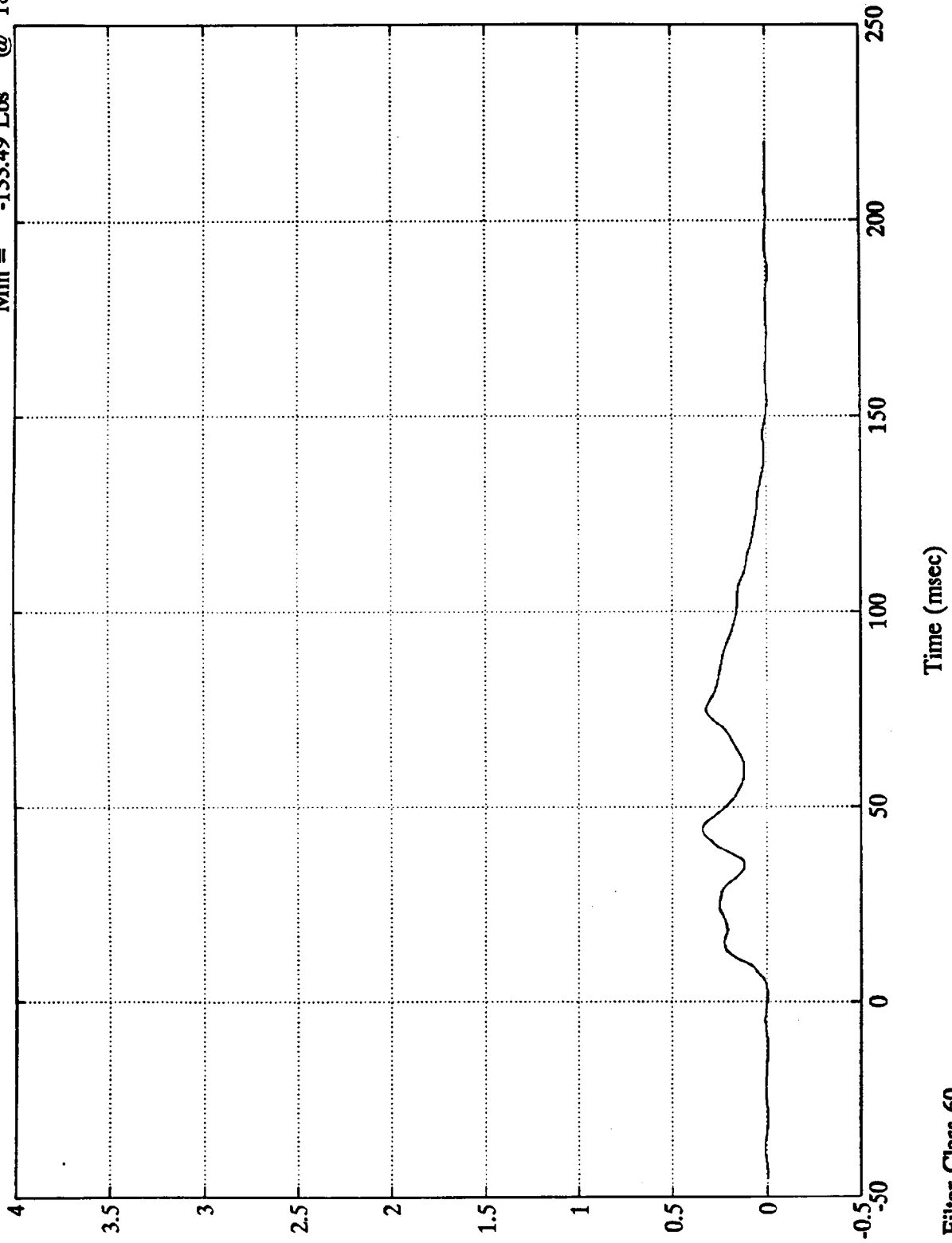
Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN
x10⁴

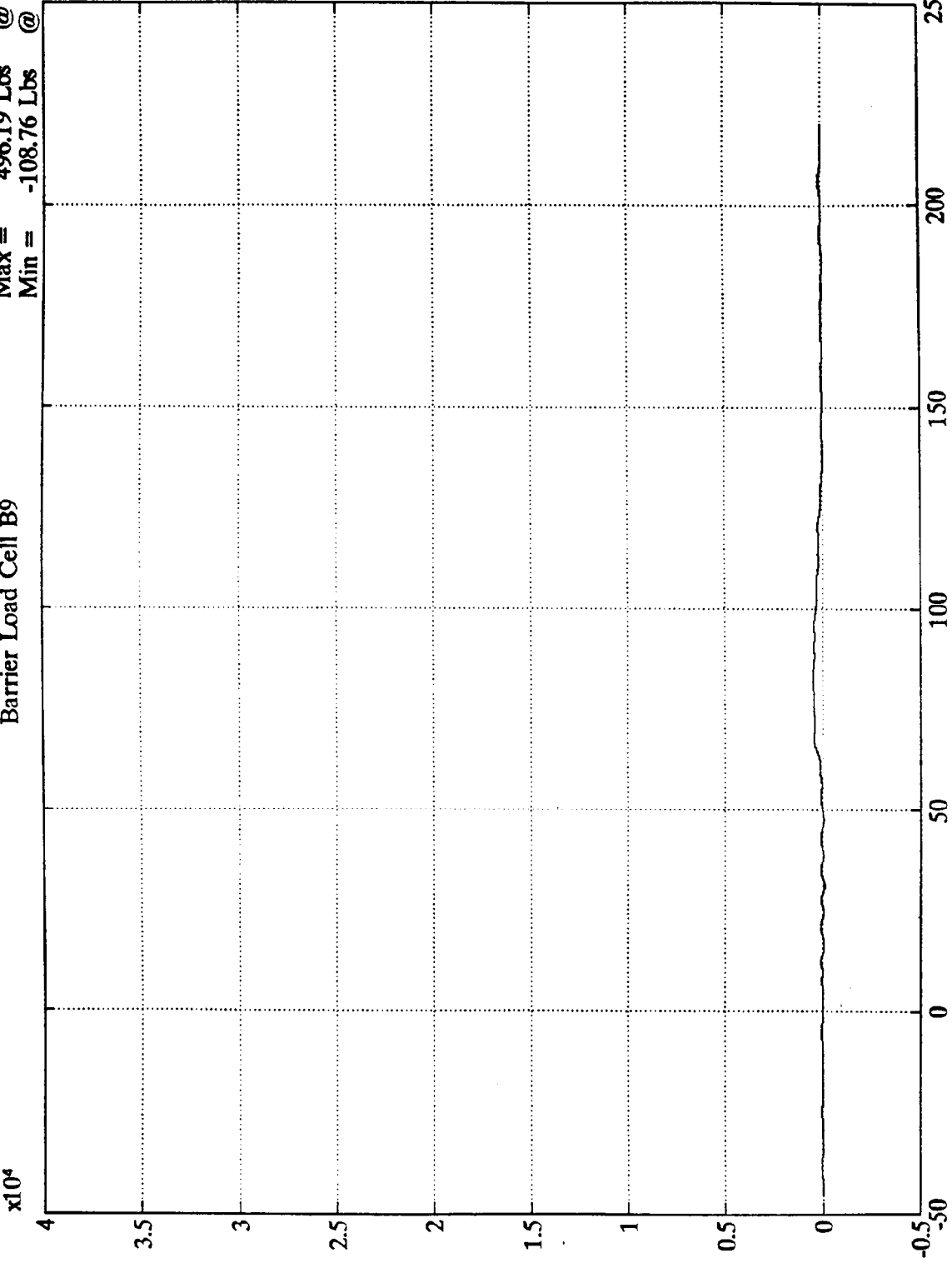
Max = 3426.30 Lbs @ 44.27 msec
Min = -133.49 Lbs @ 186.47 msec

Barrier Load Cell B8



NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell B9
Max = 496.19 Lbs @ 82.44 msec
Min = -108.76 Lbs @ 31.44 msec



B-42

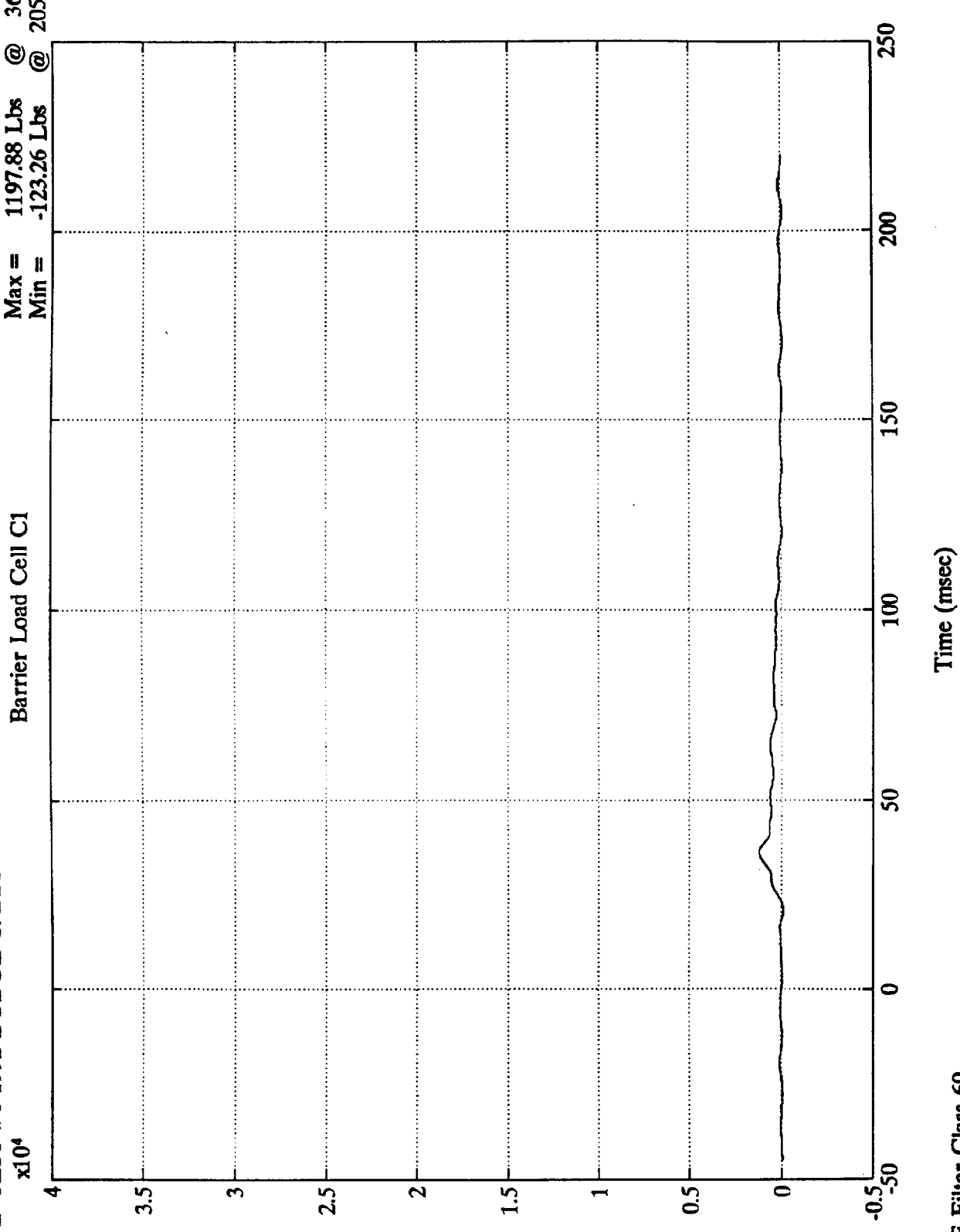
7946-6

Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell C1
Max = 1197.88 Lbs @ 36.47 msec
Min = -123.26 Lbs @ 205.08 msec



$\times 10^4$

lbs
B-43

7946-6

SAE Filter Class 60

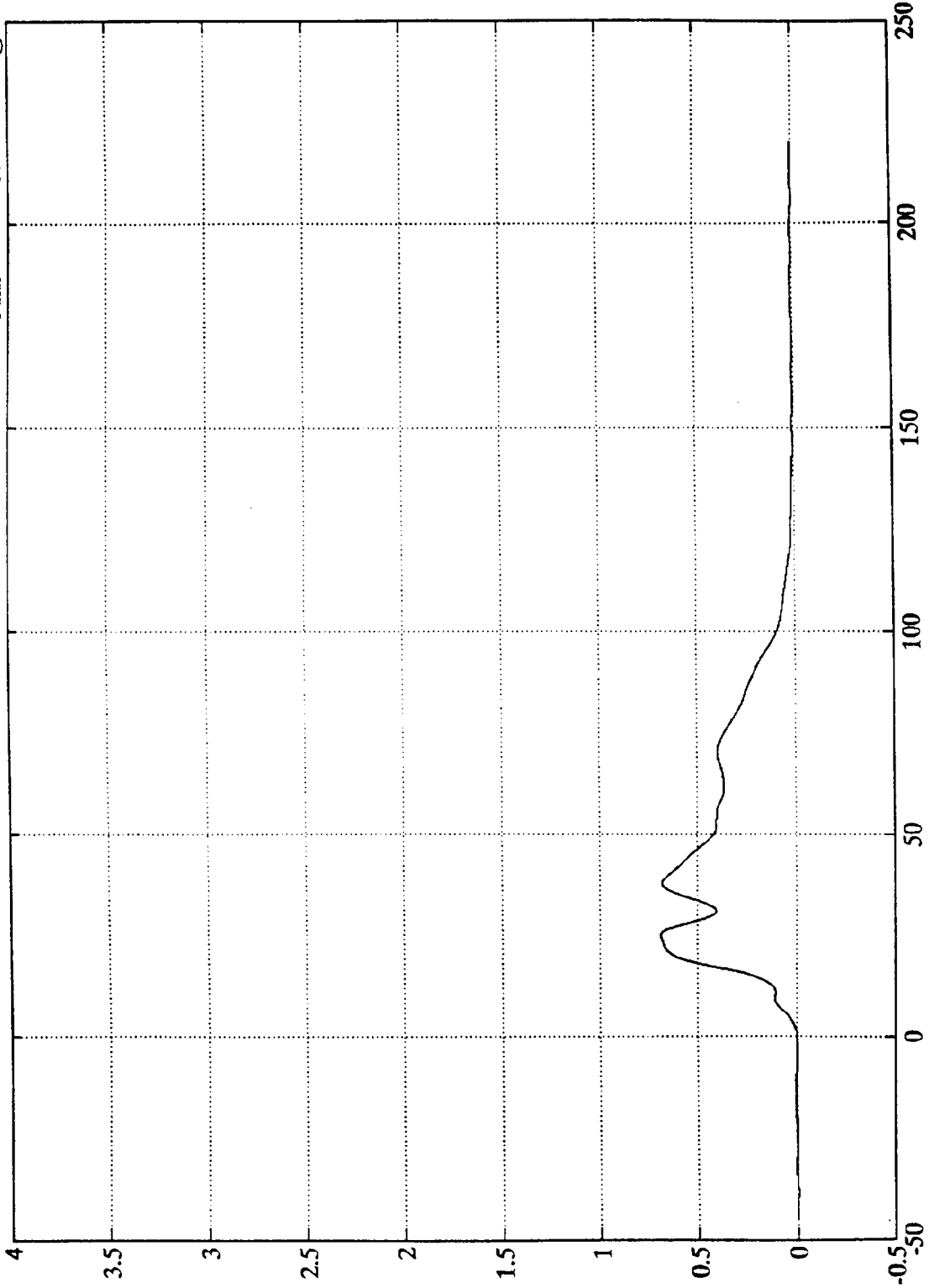
Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Barrier Load Cell C2

Max = 6905.00 Lbs @ 24.96 msec
Min = -43.04 Lbs @ -38.64 msec



B-44

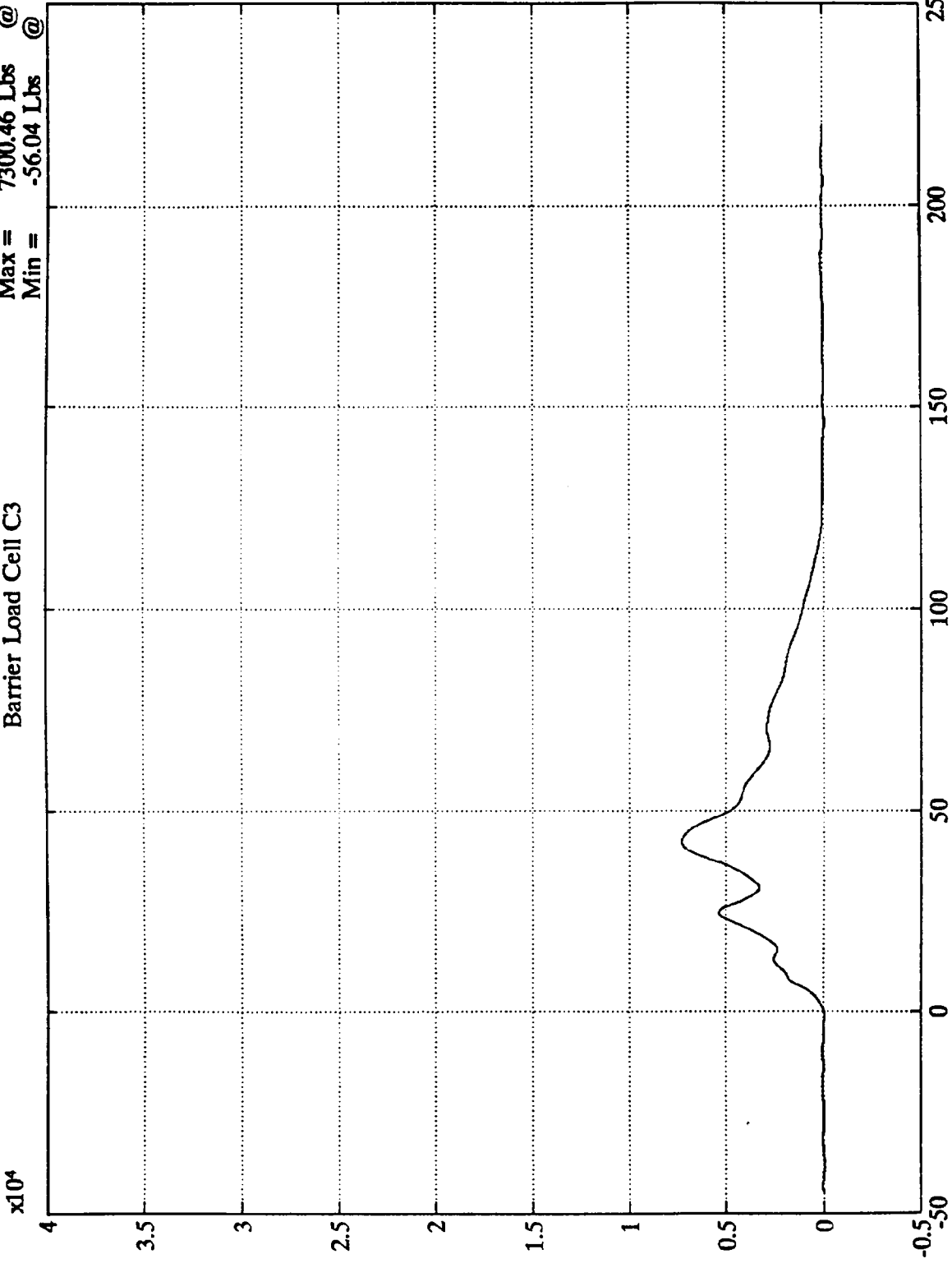
7946-6

Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell C3
Max = 7300.46 Lbs @ 42.36 msec
Min = -56.04 Lbs @ -0.84 msec



B-45
lbs

Time (msec)

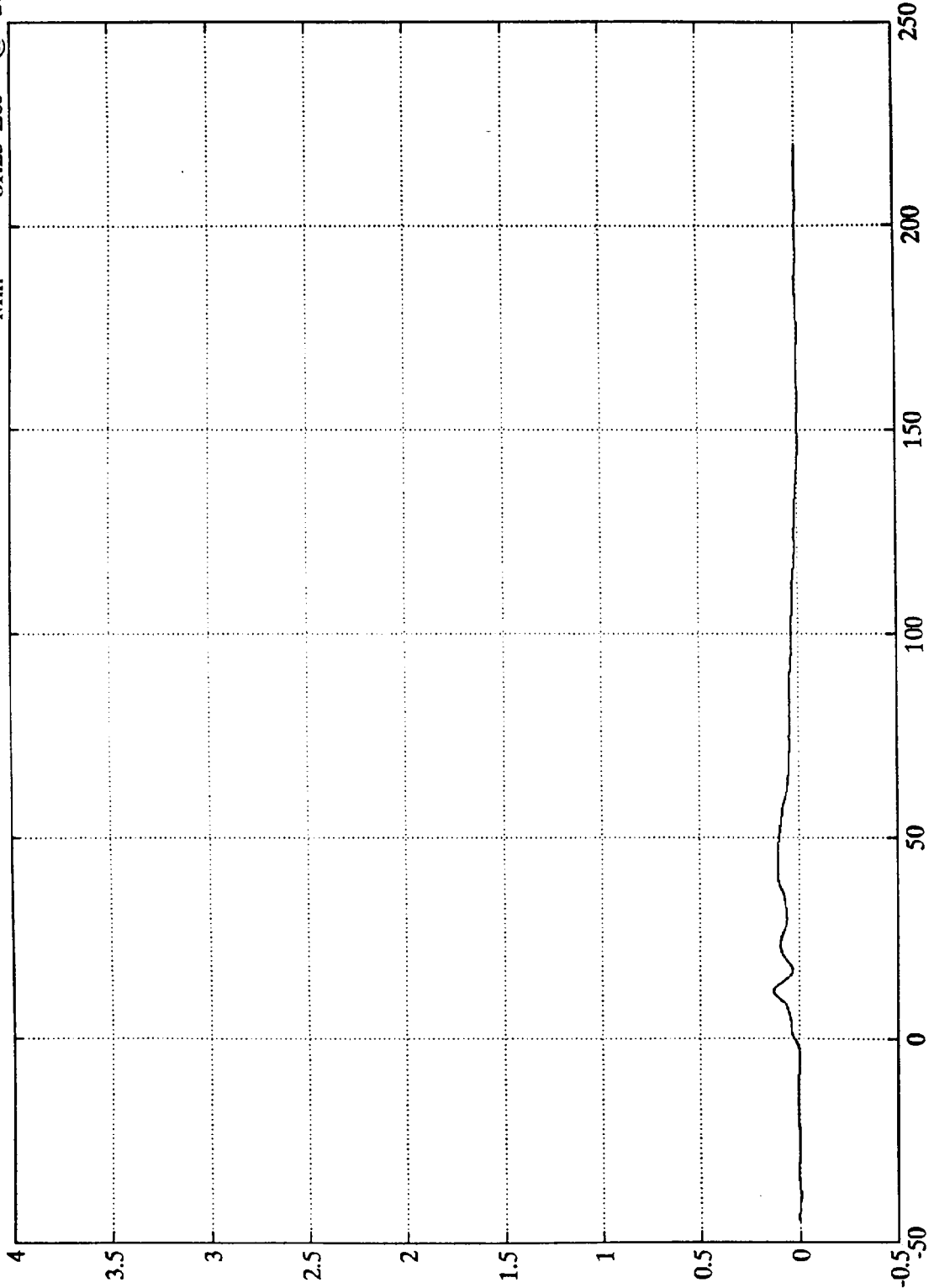
SAE Filter Class 60

7946-6

NCAP TEST #6 1992 DODGE CARAVAN
x10⁴

Barrier Load Cell C4

Max = 1300.05 Lbs @ 11.75 msec
Min = -81.23 Lbs @ 206.28 msec



Lbs
B-46

Time (msec)

SAE Filter Class 60

7946-6

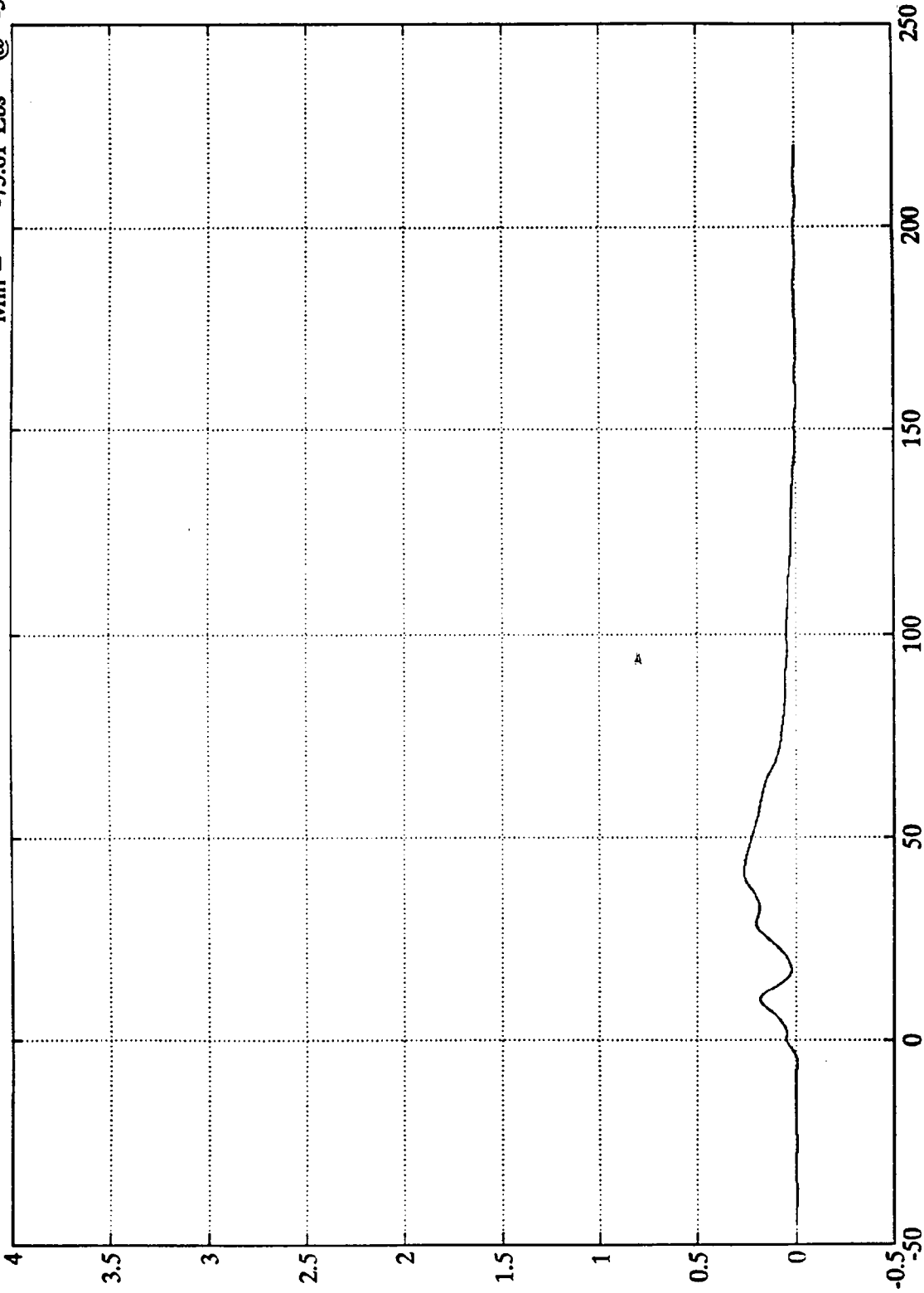


NCAP TEST #6 1992 DODGE CARAVAN

$\times 10^4$

Barrier Load Cell C5

Max = 2611.56 Lbs @ 41.63 msec
Min = -75.61 Lbs @ -38.04 msec



B-47

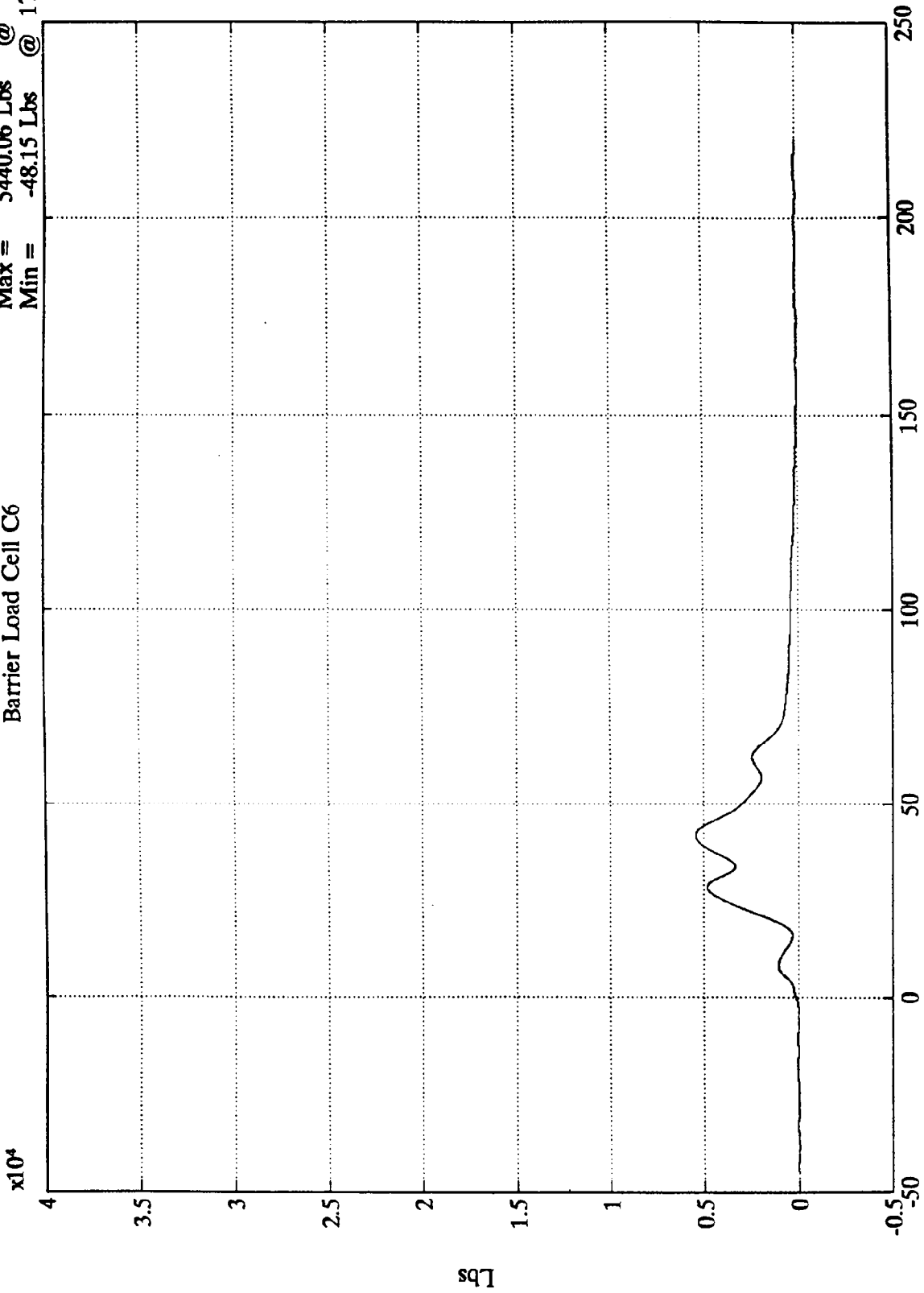
7946-6

SAE Filter Class 60

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell C6
Max = 5440.06 Lbs @ 41.76 msec
Min = -48.15 Lbs @ 174.12 msec



B-48

7946-6

Time (msec)

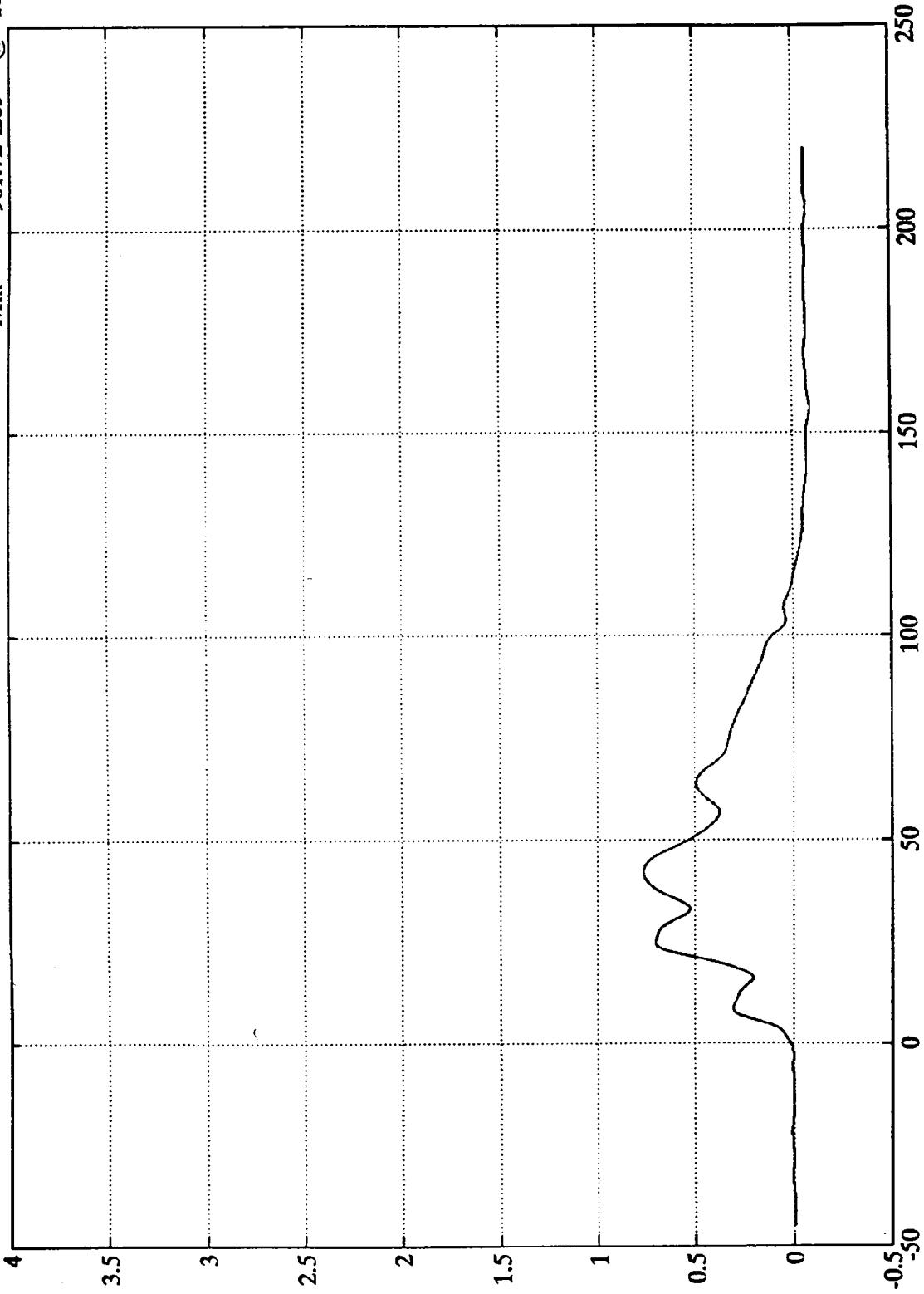
SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

$\times 10^4$

Barrier Load Cell C7

Max = 7642.09 Lbs @ 42.00 msec
Min = -901.72 Lbs @ 155.88 msec



Lbs
B-49

Time (msec)

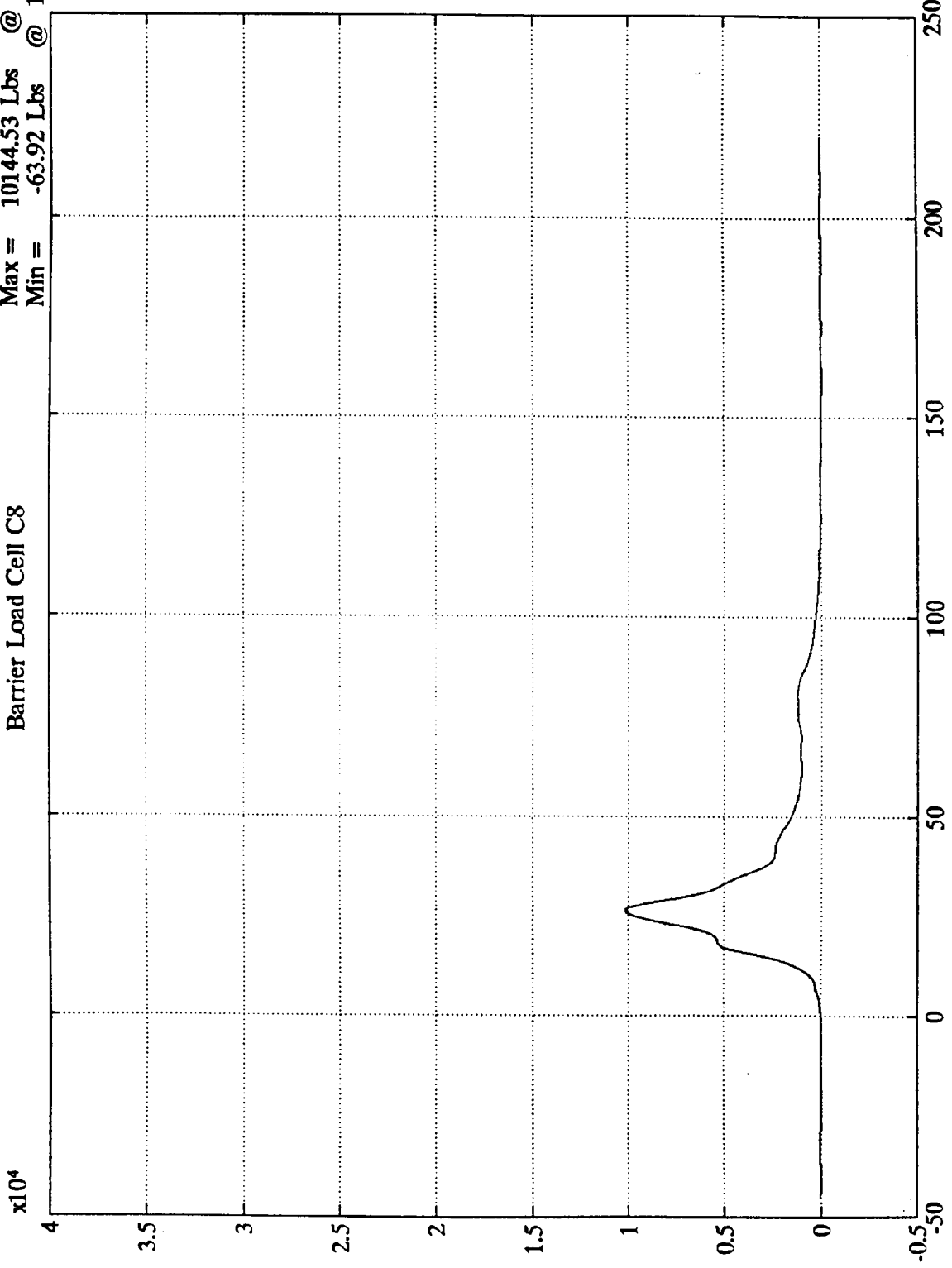
SAE Filter Class 60

7946-6

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell C8

Max = 10144.53 Lbs @ 26.51 msec
Min = -63.92 Lbs @ 189.00 msec



x10⁴

Lbs
B-50

Time (msec)

SAE Filter Class 60

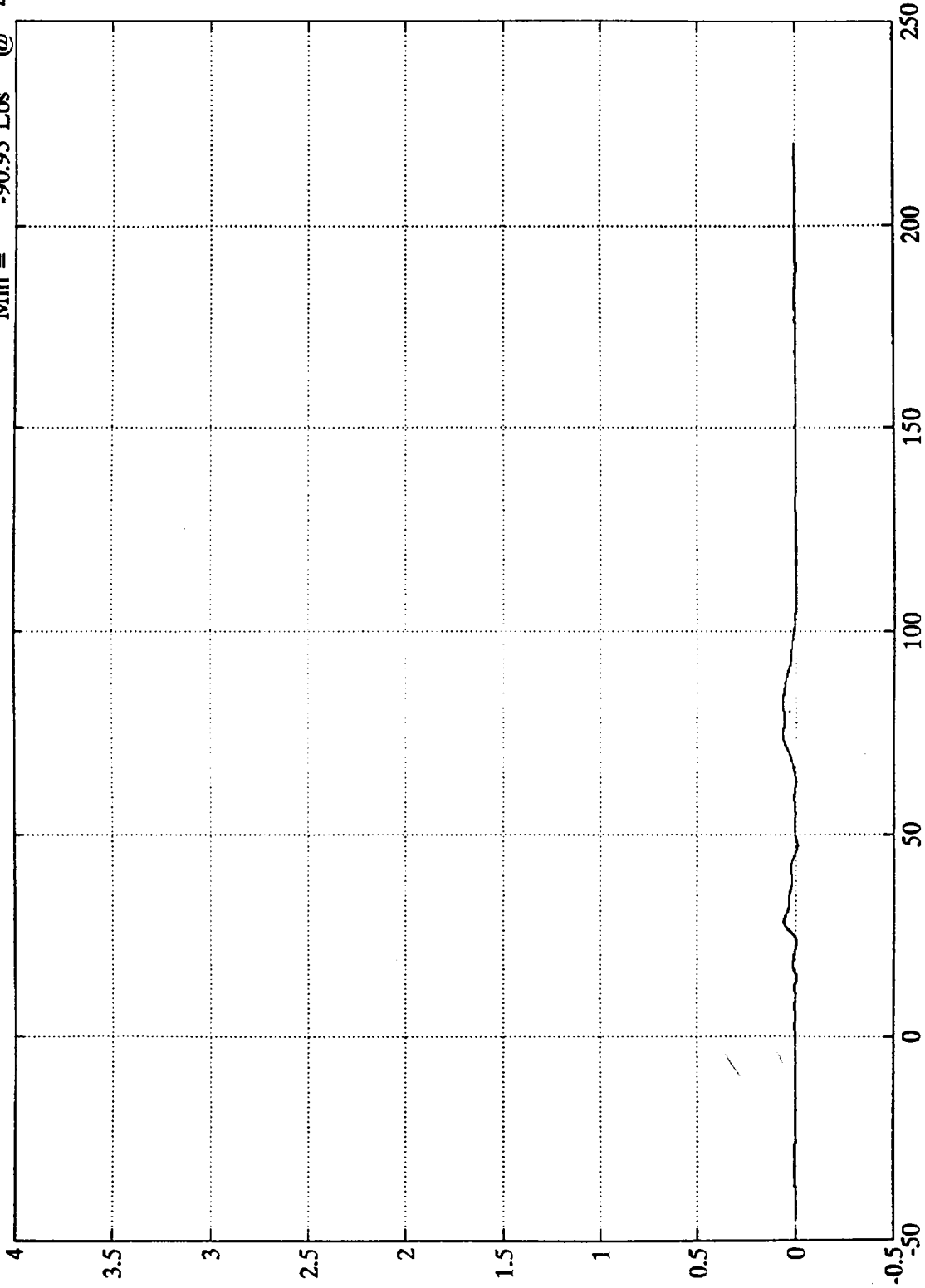
7946-6

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell C9

Max = 650.72 Lbs @ 74.51 msec
Min = -90.95 Lbs @ 47.40 msec

x10⁴



B-51
Lbs

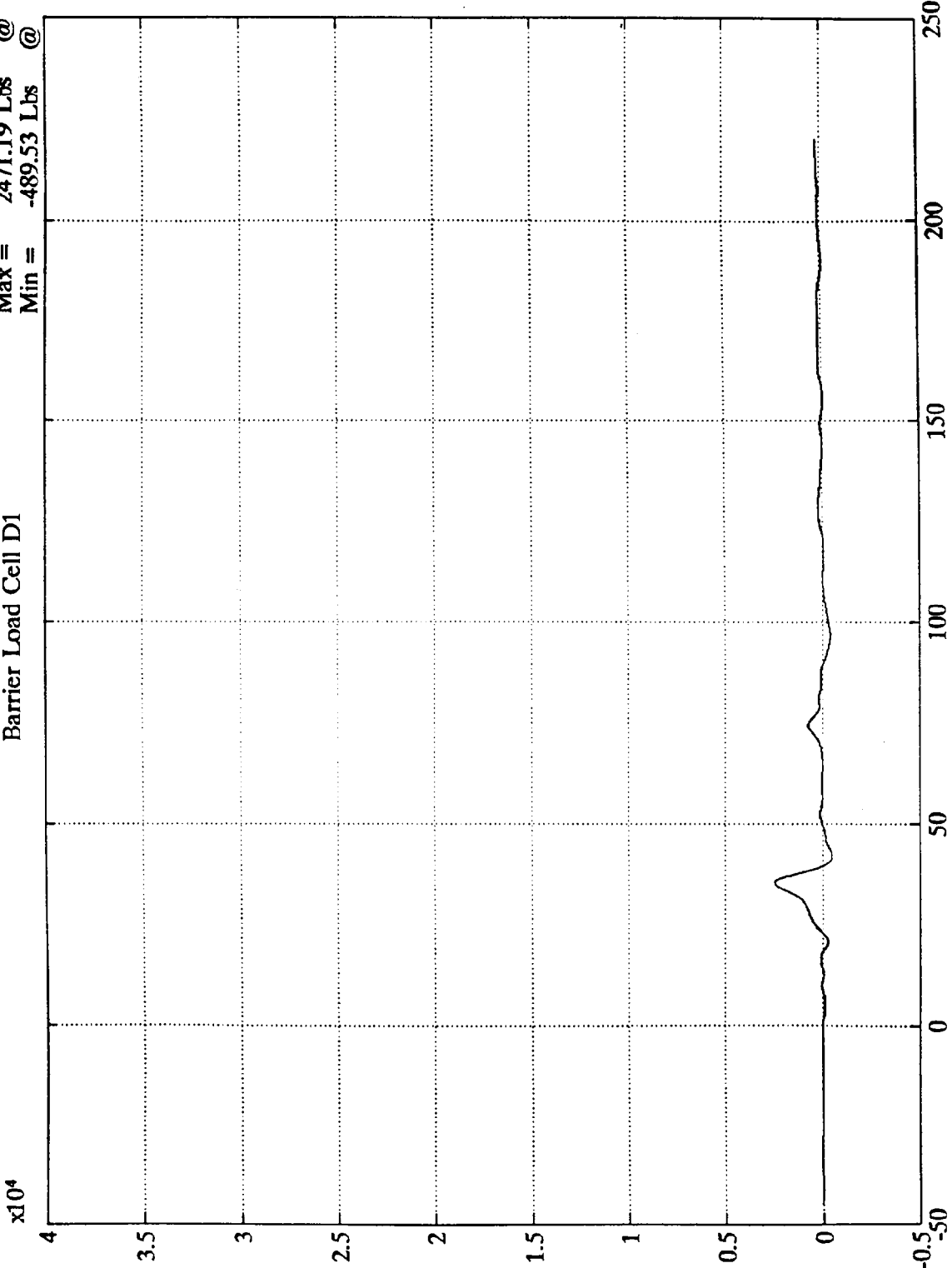
7946-6

Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell D1
Max = 2471.19 Lbs @ 35.51 msec
Min = -489.53 Lbs @ 42.11 msec



B-52

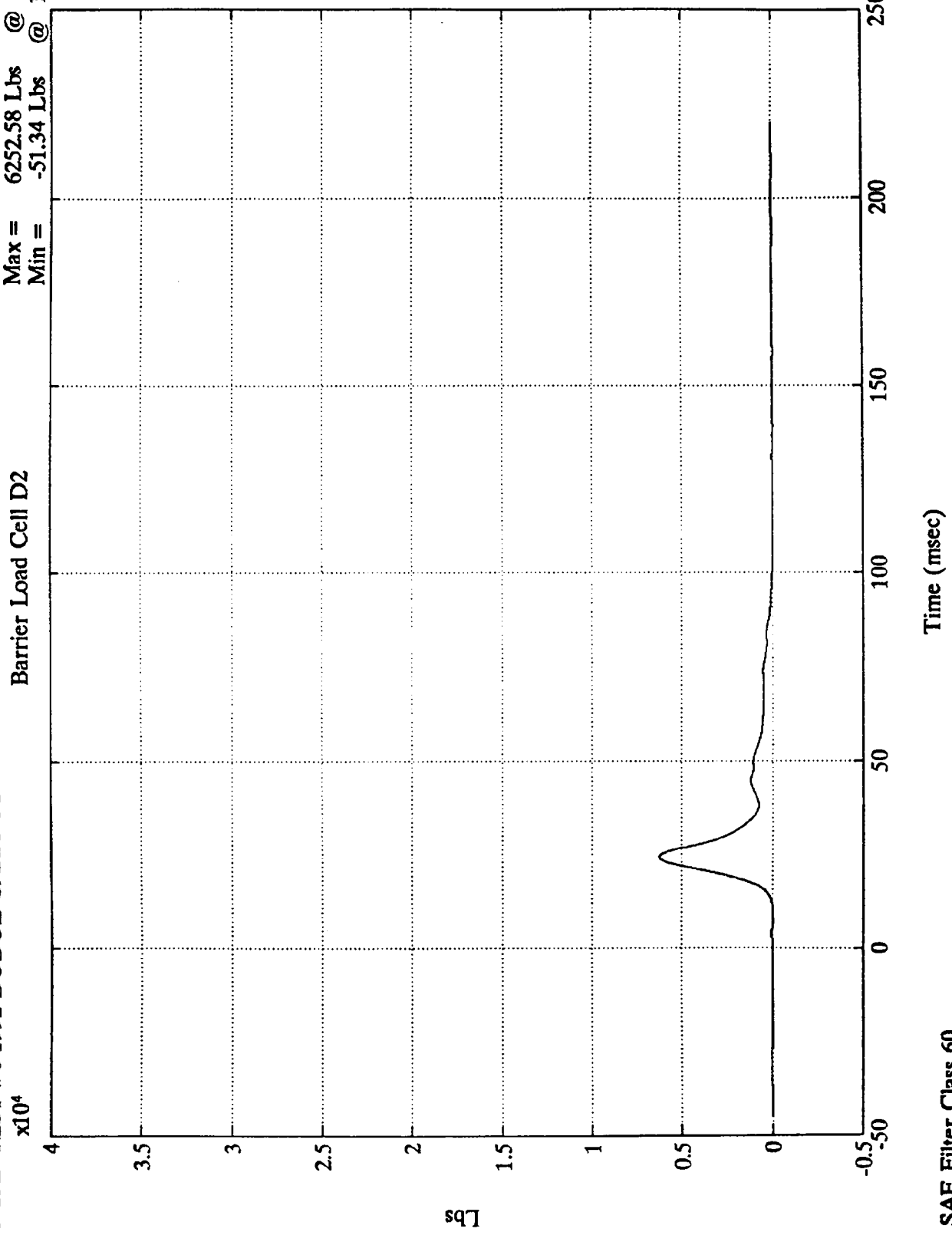
7946-6

Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell D2
Max = 6252.58 Lbs @ 24.35 msec
Min = -51.34 Lbs @ 190.19 msec



B-53

7946-6

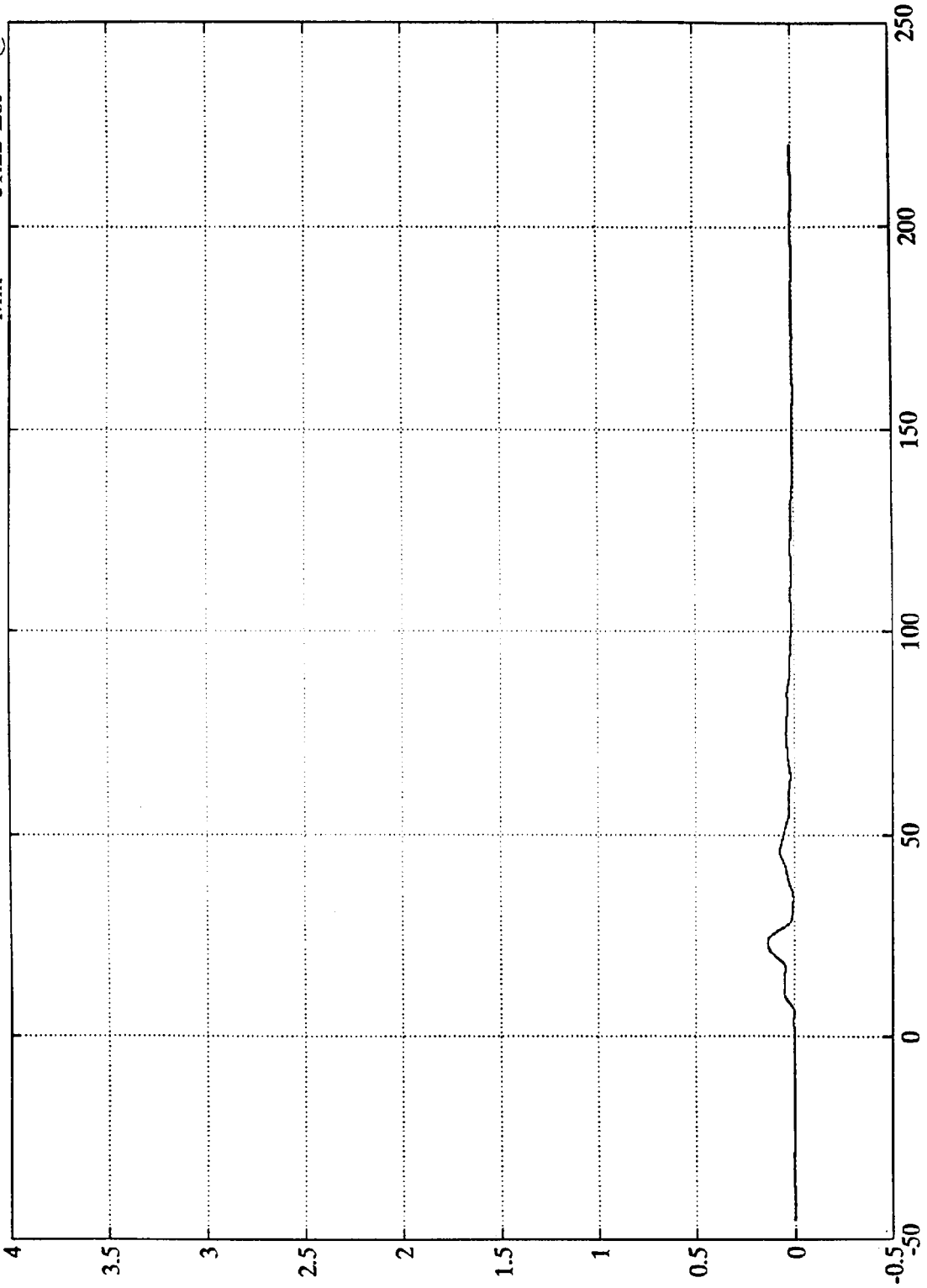
SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Barrier Load Cell D3

Max = 1365.54 Lbs @ 23.39 msec
Min = -31.22 Lbs @ -6.96 msec



B-54

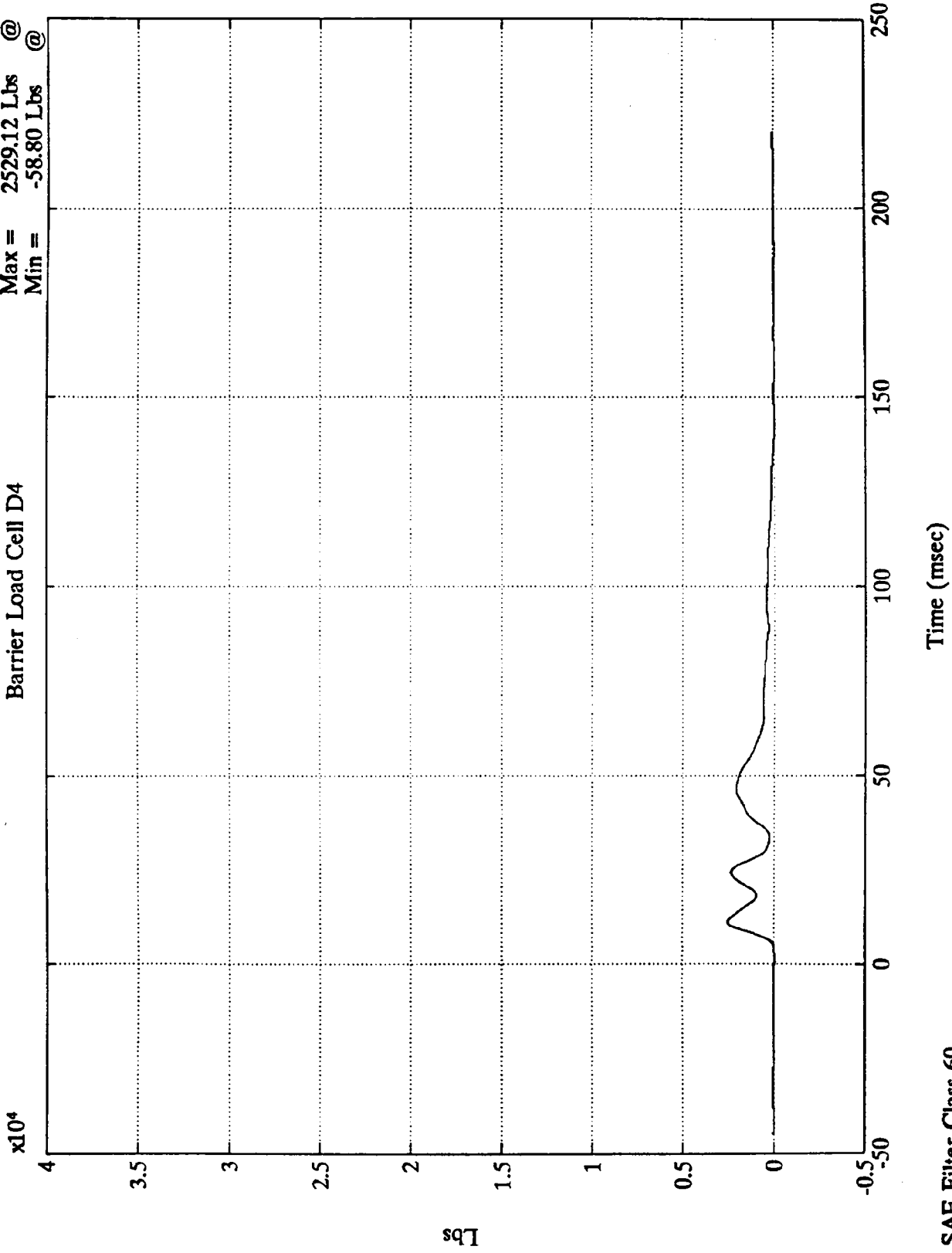
7946-6

SAE Filter Class 60

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell D4
Max = 2529.12 Lbs @ 11.03 msec
Min = -58.80 Lbs @ 1.31 msec



x10⁴

Lbs

Time (msec)

SAE Filter Class 60

7946-6

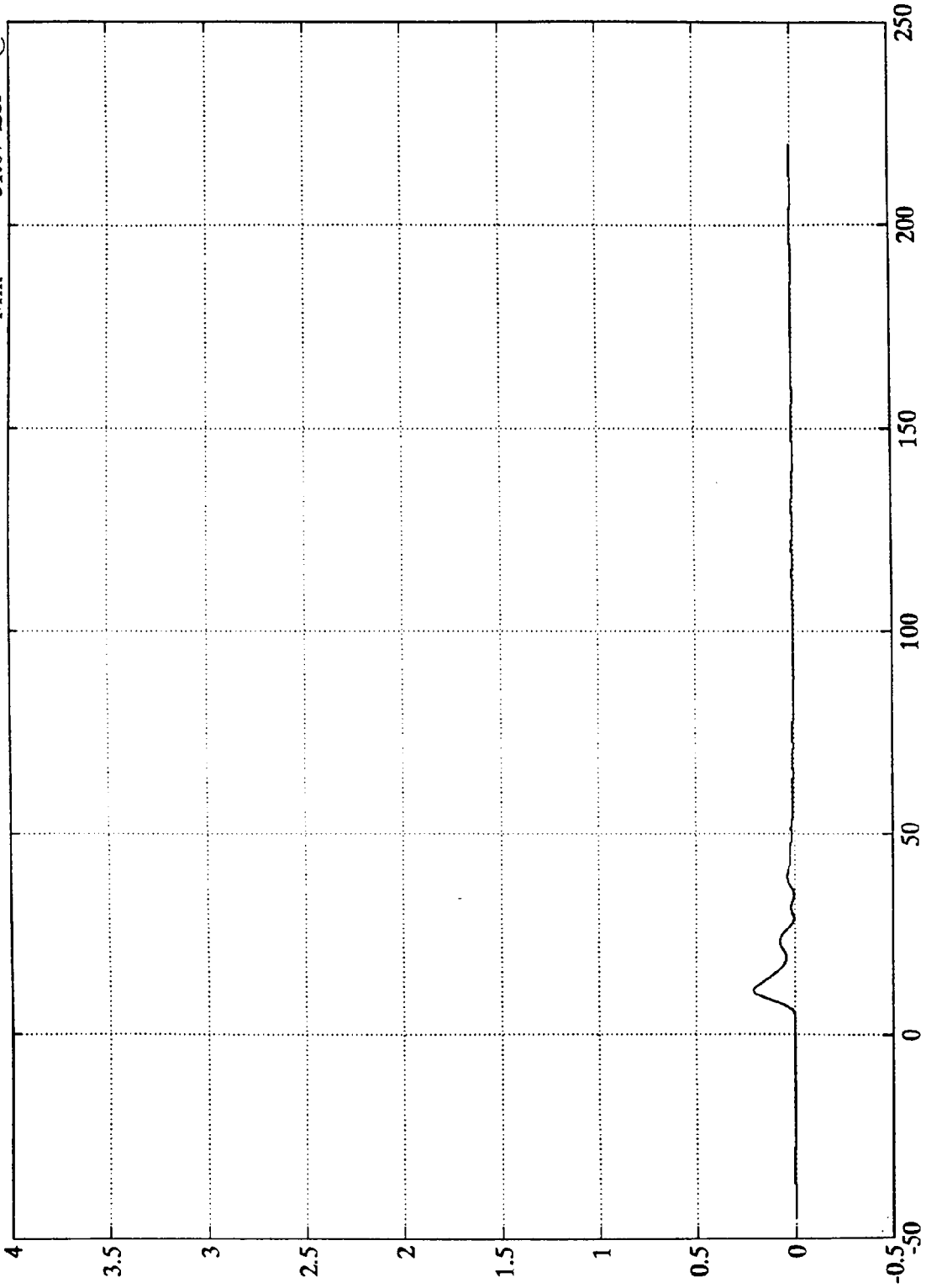
B-55

NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Barrier Load Cell D5

Max = 2115.93 Lbs @ 10.91 msec
Min = -31.67 Lbs @ 1.07 msec



Lbs
B-56

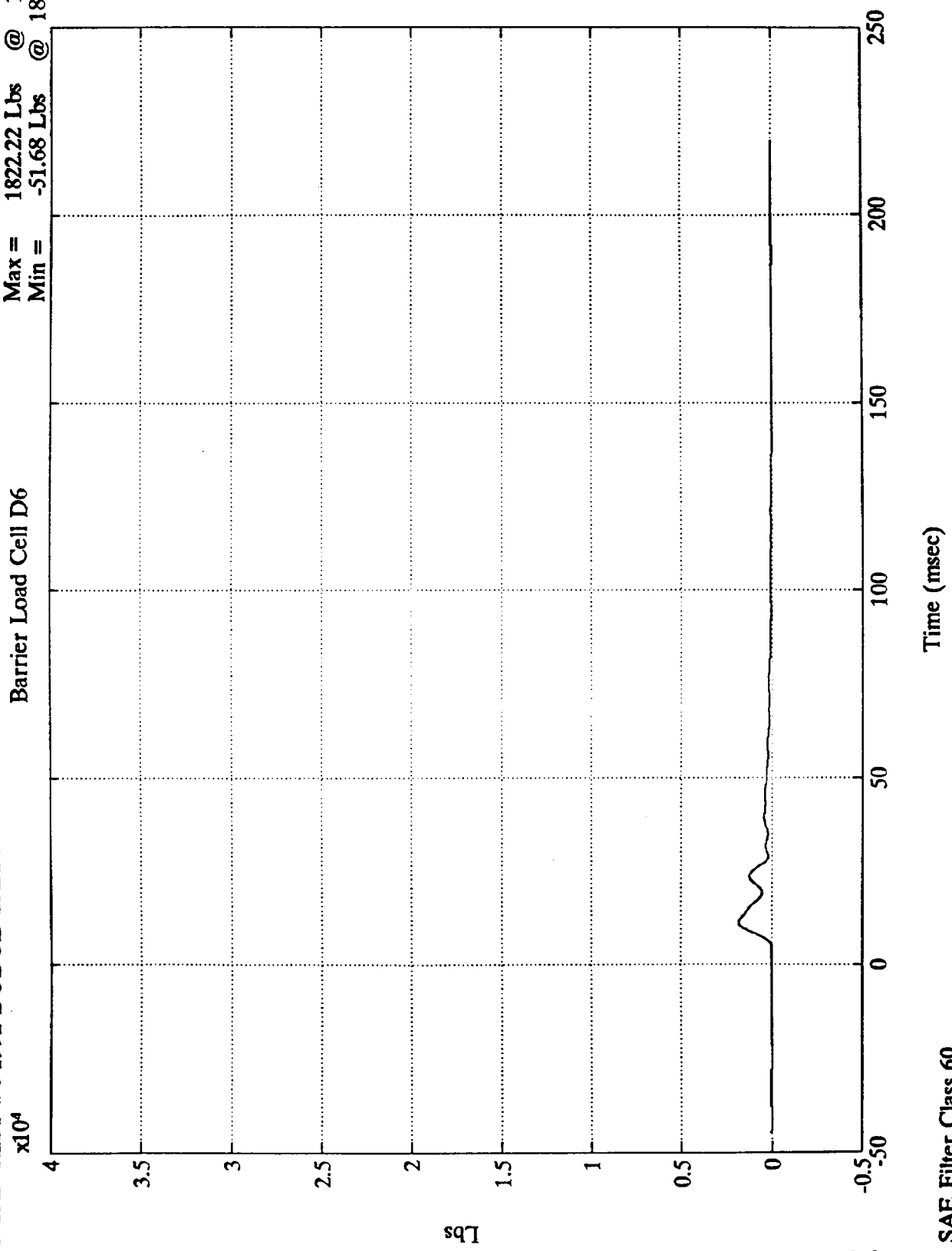
Time (msec)

SAE Filter Class 60

7946-6

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell D6
Max = 1822.22 Lbs @ 11.03 msec
Min = -51.68 Lbs @ 188.52 msec



B-57

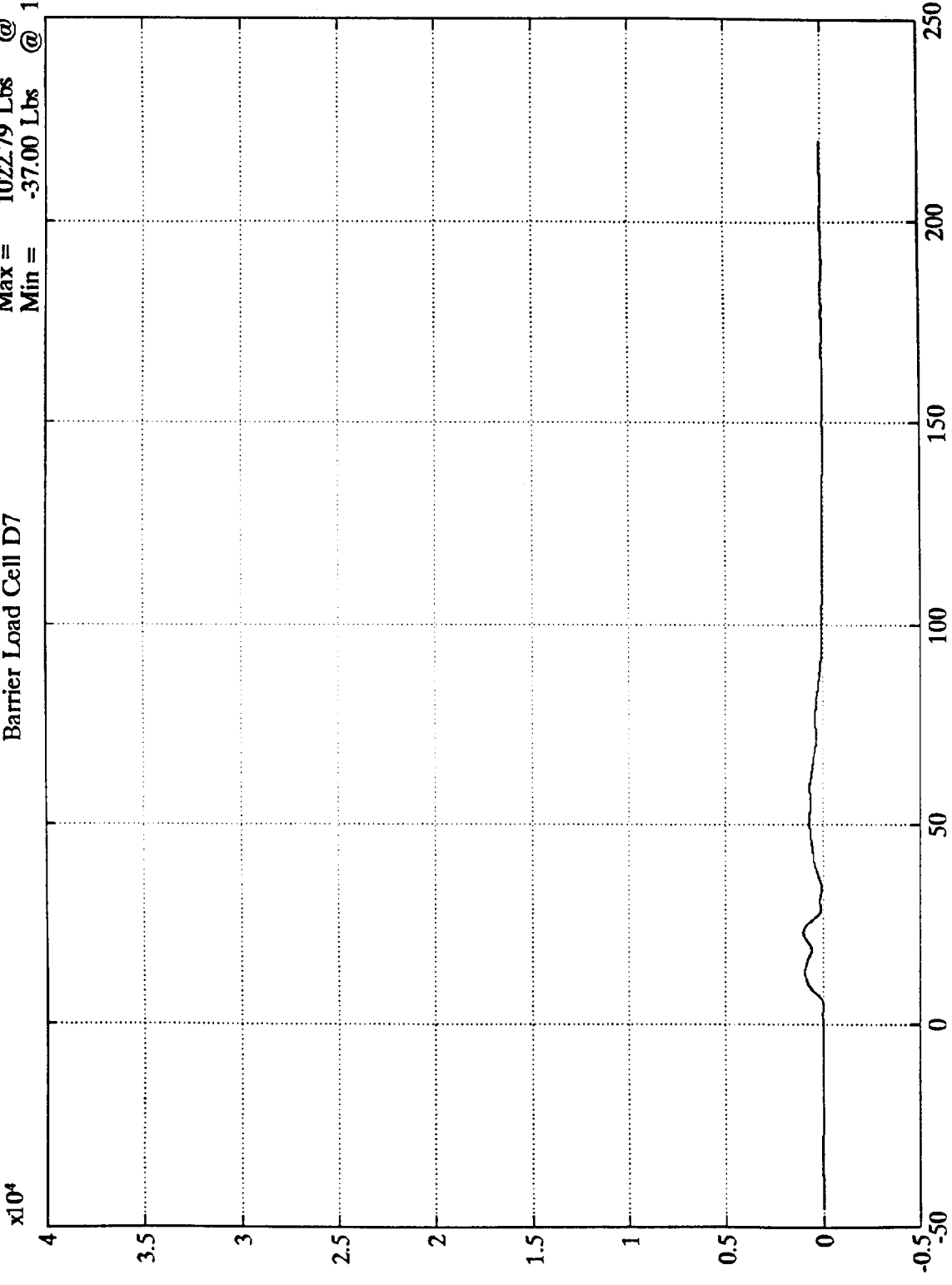
7946-6

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Barrier Load Cell D7

Max = 1022.79 Lbs @ 23.04 msec
Min = -37.00 Lbs @ 189.83 msec



x10⁴

Lbs

Time (msec)

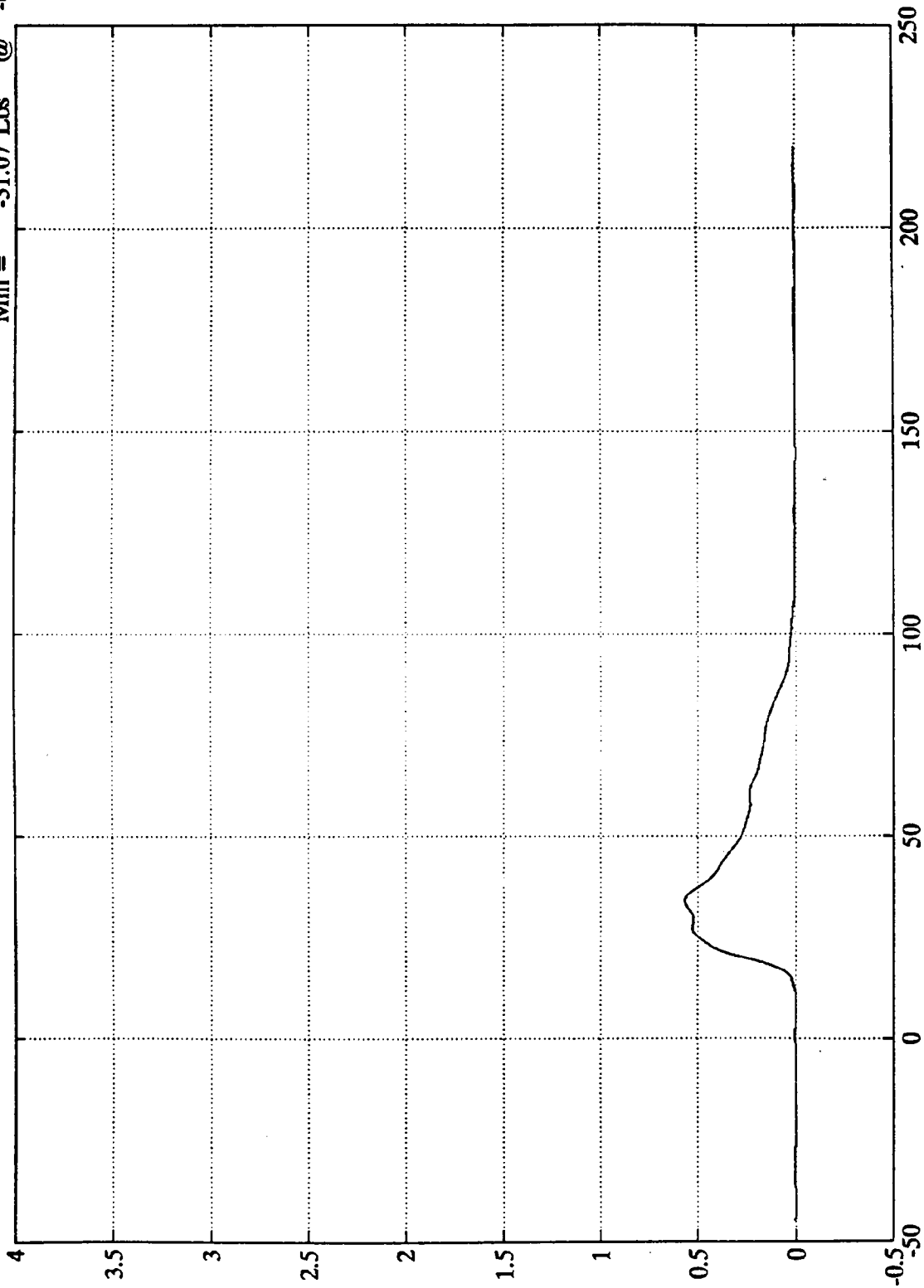
SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Barrier Load Cell D8

Max = 5664.78 Lbs @ 34.07 msec
Min = -31.07 Lbs @ -6.72 msec



Lbs

Time (msec)

B-59

7946-6

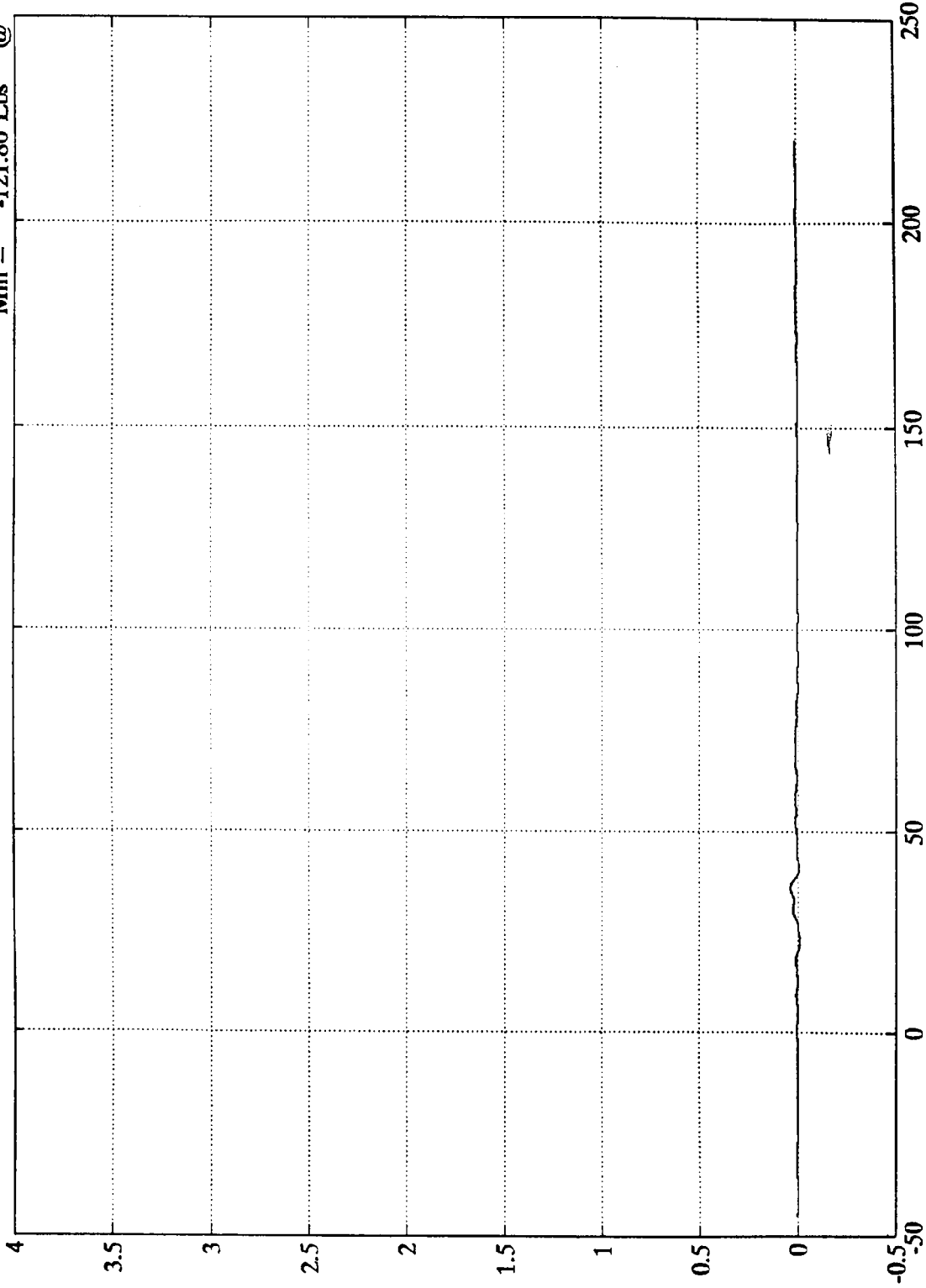
SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Barrier Load Cell D9

Max = 375.50 Lbs @ 36.12 msec
Min = -121.80 Lbs @ 22.56 msec



B-60

7946-6

SAE Filter Class 60

Time (msec)

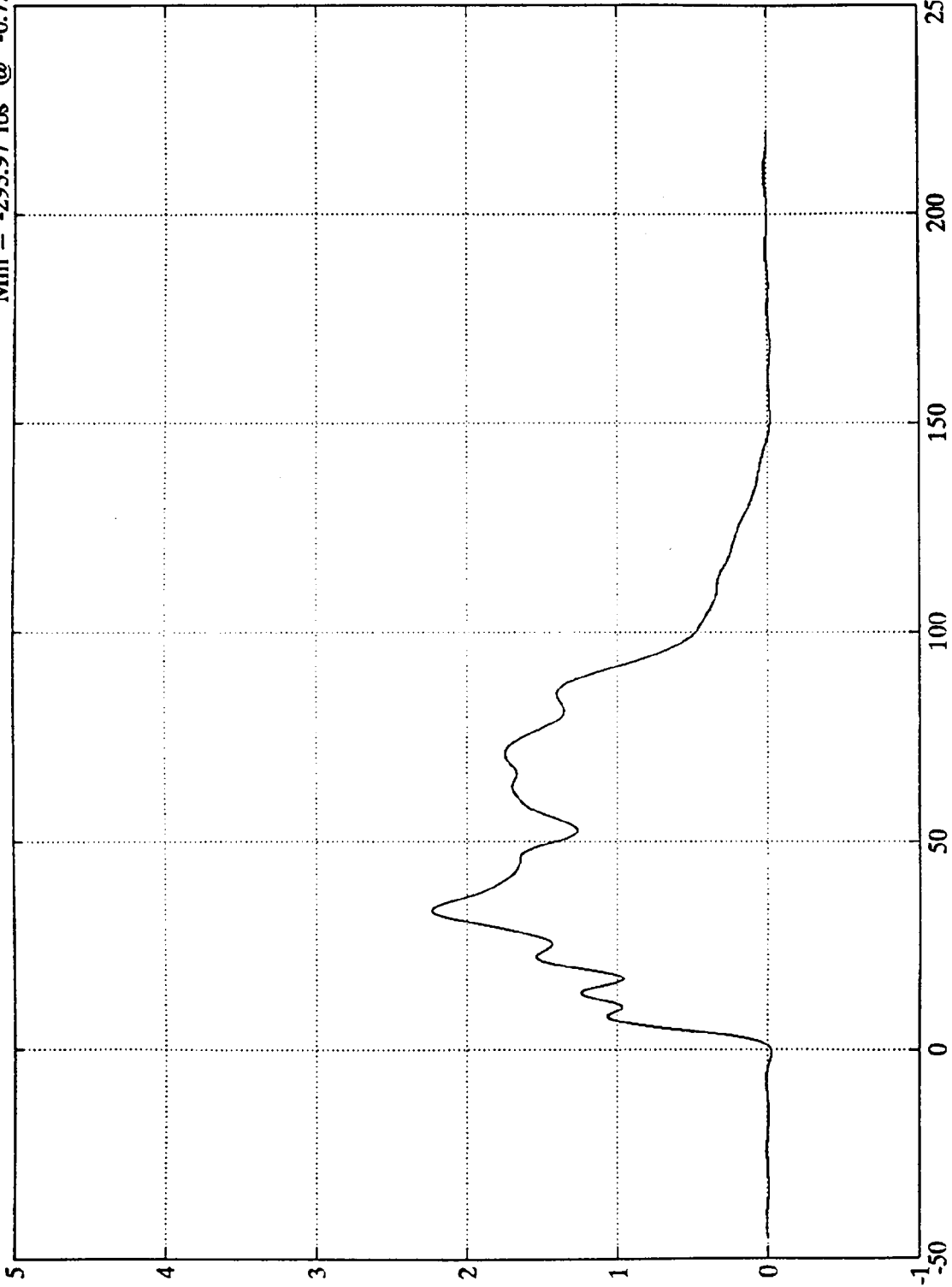
NCAP TEST #6 1992 DODGE CARAVAN

$\times 10^4$

Group 1 Load Cell Sum

Max = 22341.00 lbs @ 33.48 msec

Min = -293.97 lbs @ -0.72 msec



sqi
B-61

7946-6

Time (msec)

SAE Filter Class 60

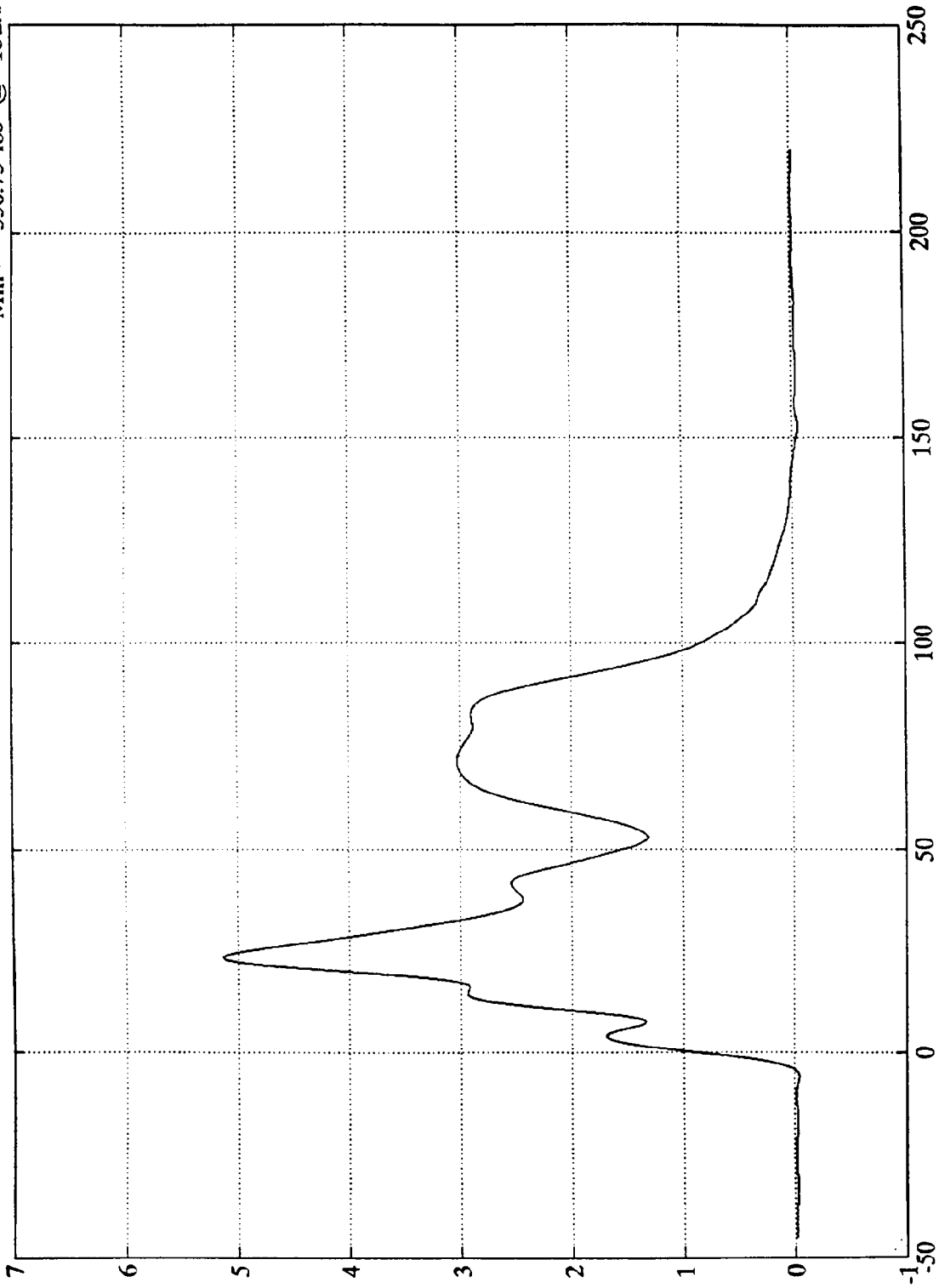
Load Cells (A1,A2,A3,B1,B2,B3)

NCAP TEST #6 1992 DODGE CARAVAN

$\times 10^4$

Group 2 Load Cell Sum

Max = 51301.00 lbs @ 23.40 msec
Min = -530.75 lbs @ 152.64 msec



lbs
B-62

7946-6

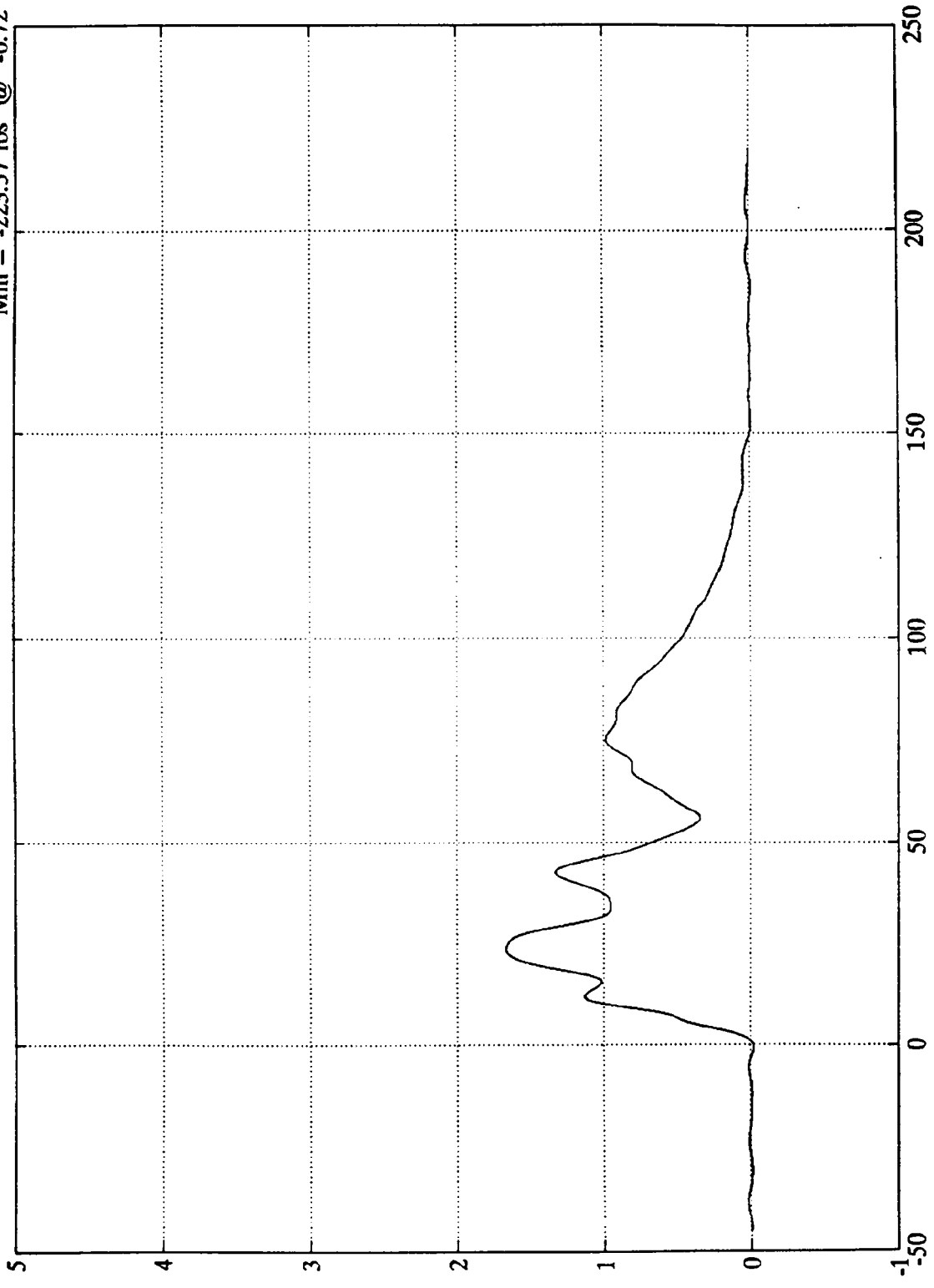
SAE Filter Class 60
Time (msec)
Load Cells (A4,A5,A6,B4,B5,B6)

NCAP TEST #6 1992 DODGE CARAVAN

$\times 10^4$

Group 3 Load Cell Sum

Max = 16659.00 lbs @ 24.00 msec
Min = -223.57 lbs @ -0.72 msec



lbs
B-63

7946-6

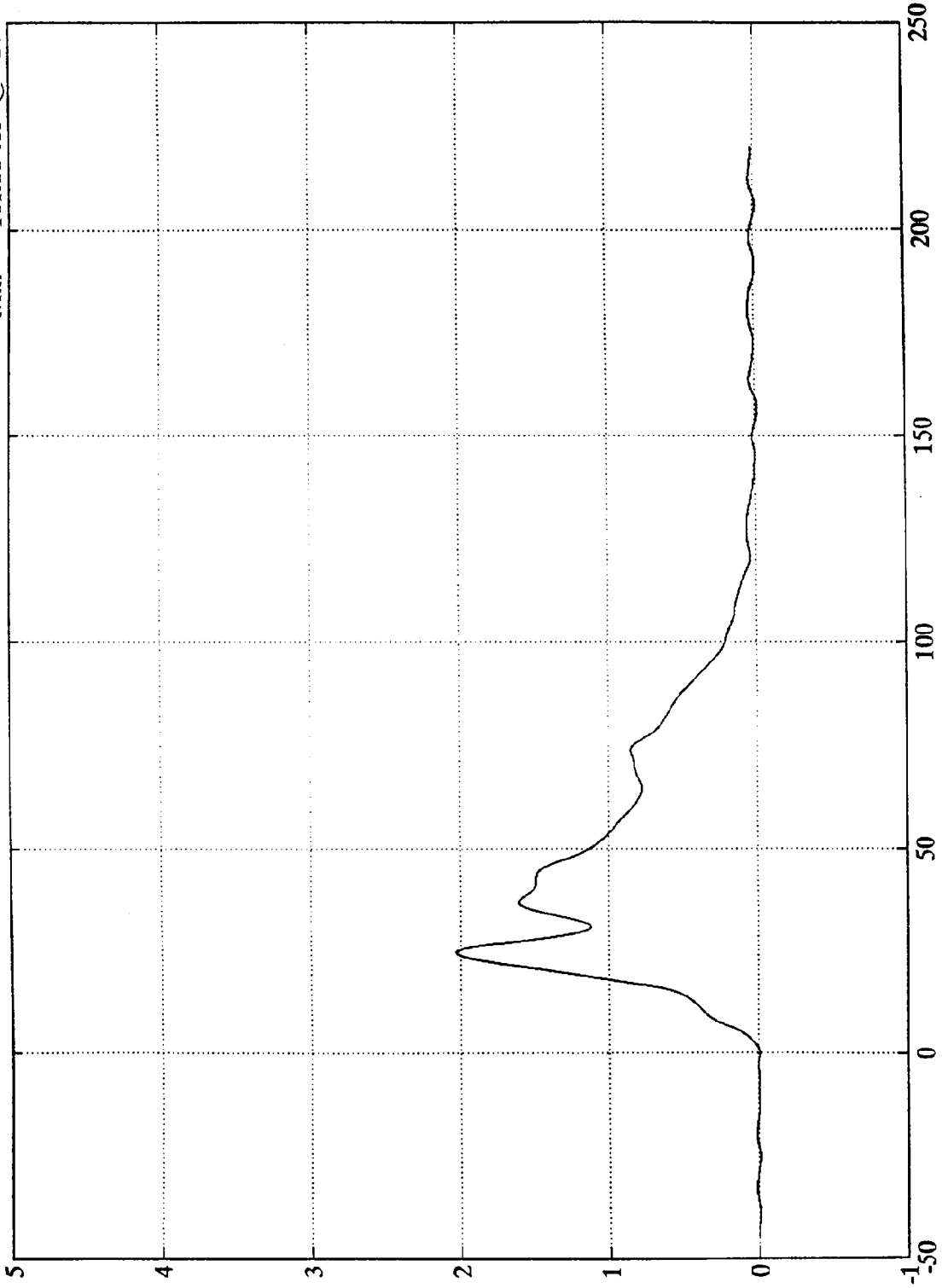
SAE Filter Class 60
Load Cells (A7, A8, A9, B7, B8, B9)

NCAP TEST #6 1992 DODGE CARAVAN

$\times 10^4$

Group 4 Load Cell Sum

Max = 20250.00 lbs @ 24.72 msec
Min = -161.88 lbs @ 206.04 msec



lbs

B-64

7946-6

Time (msec)

Load Cells (C1,C2,C3,D1,D2,D3)

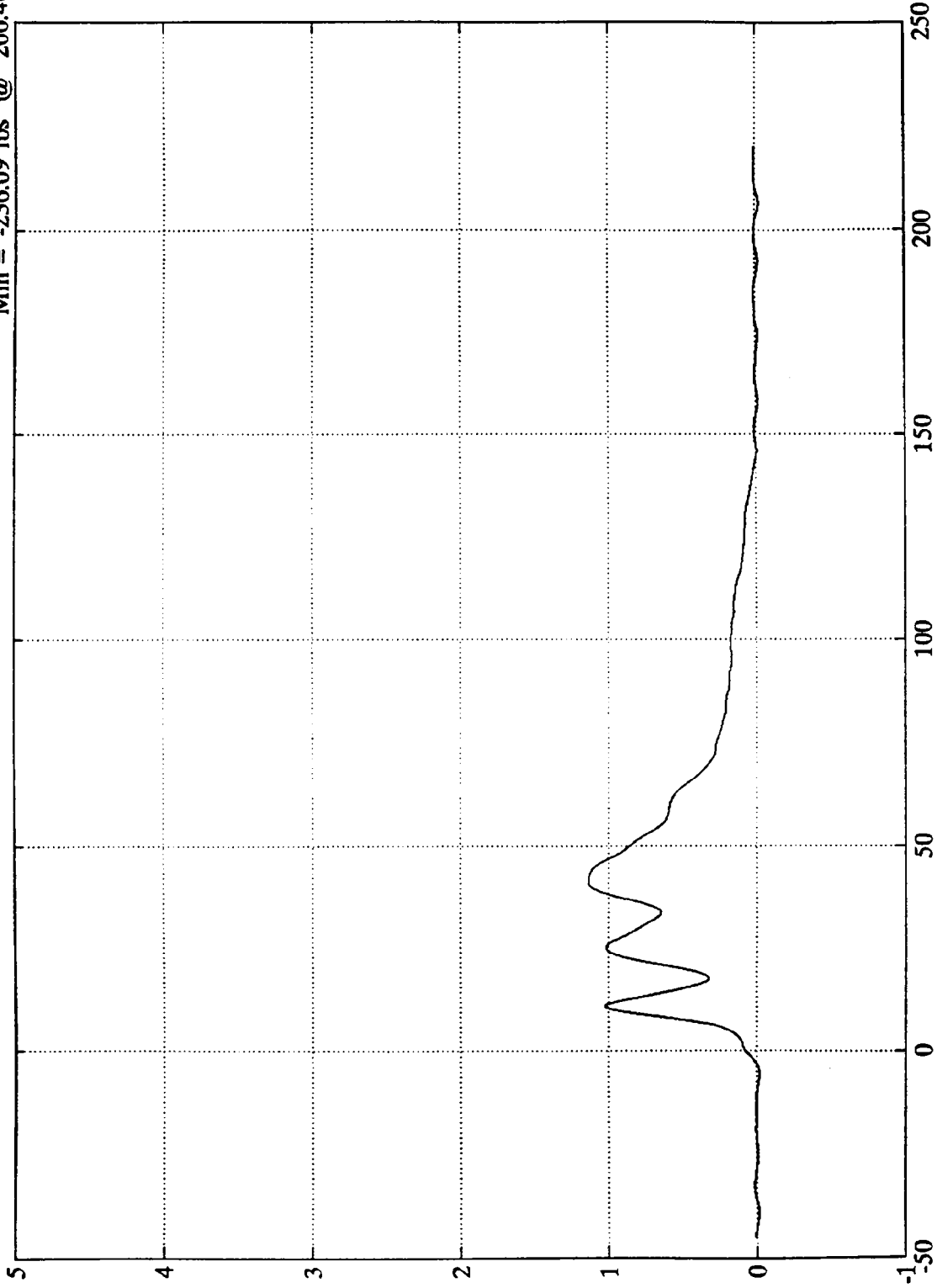
SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

x10⁴

Group 5 Load Cell Sum

Max = 11379.00 lbs @ 41.76 msec
Min = -236.09 lbs @ 206.40 msec



sq|
B-65

Load Cells (C4,C5,C6,D4,D5,D6)

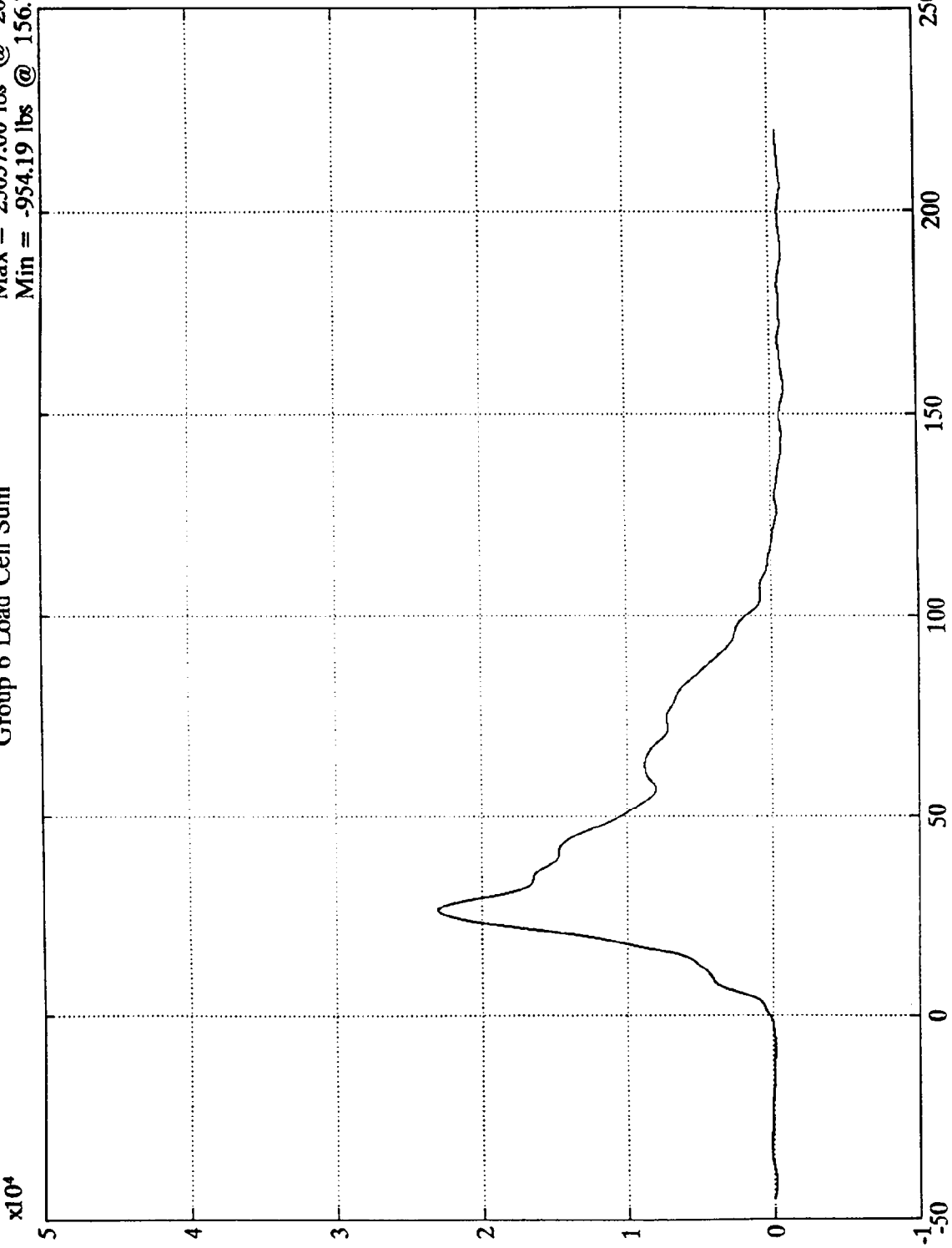
Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Group 6 Load Cell Sum

Max = 23057.00 lbs @ 26.52 msec
Min = -954.19 lbs @ 156.72 msec



sqj

B-66

7946-6

SAE Filter Class 60

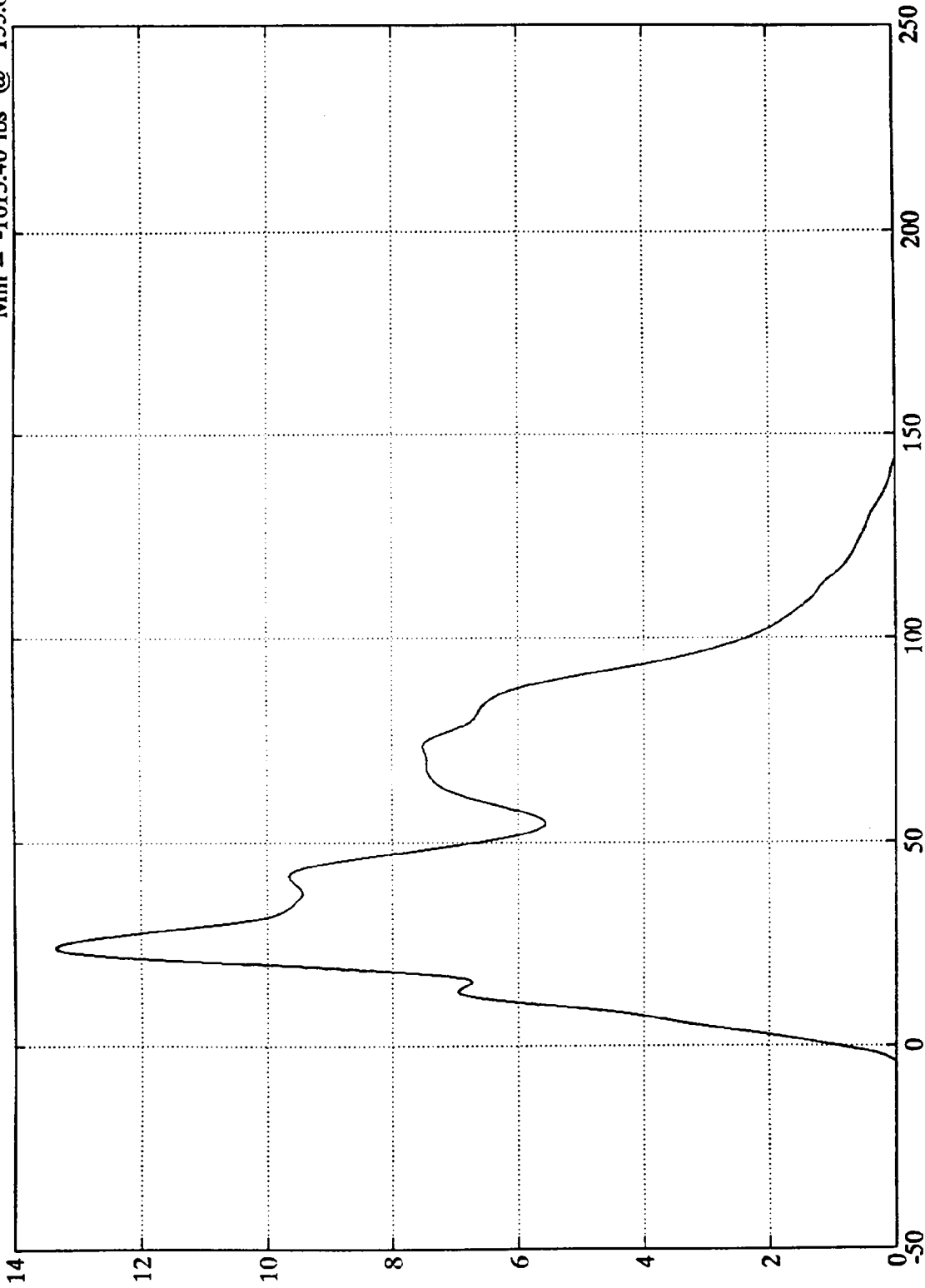
Load Cells (C7,C8,C9,D7,D8,D9)

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Max = 133520.00 lbs @ 24.24 msec
Min = -1613.40 lbs @ 155.88 msec

Total Load Cell Sum



sqi
B-67

7946-6

Time (msec)

SAE Filter Class 60

TEST NO. MN0300

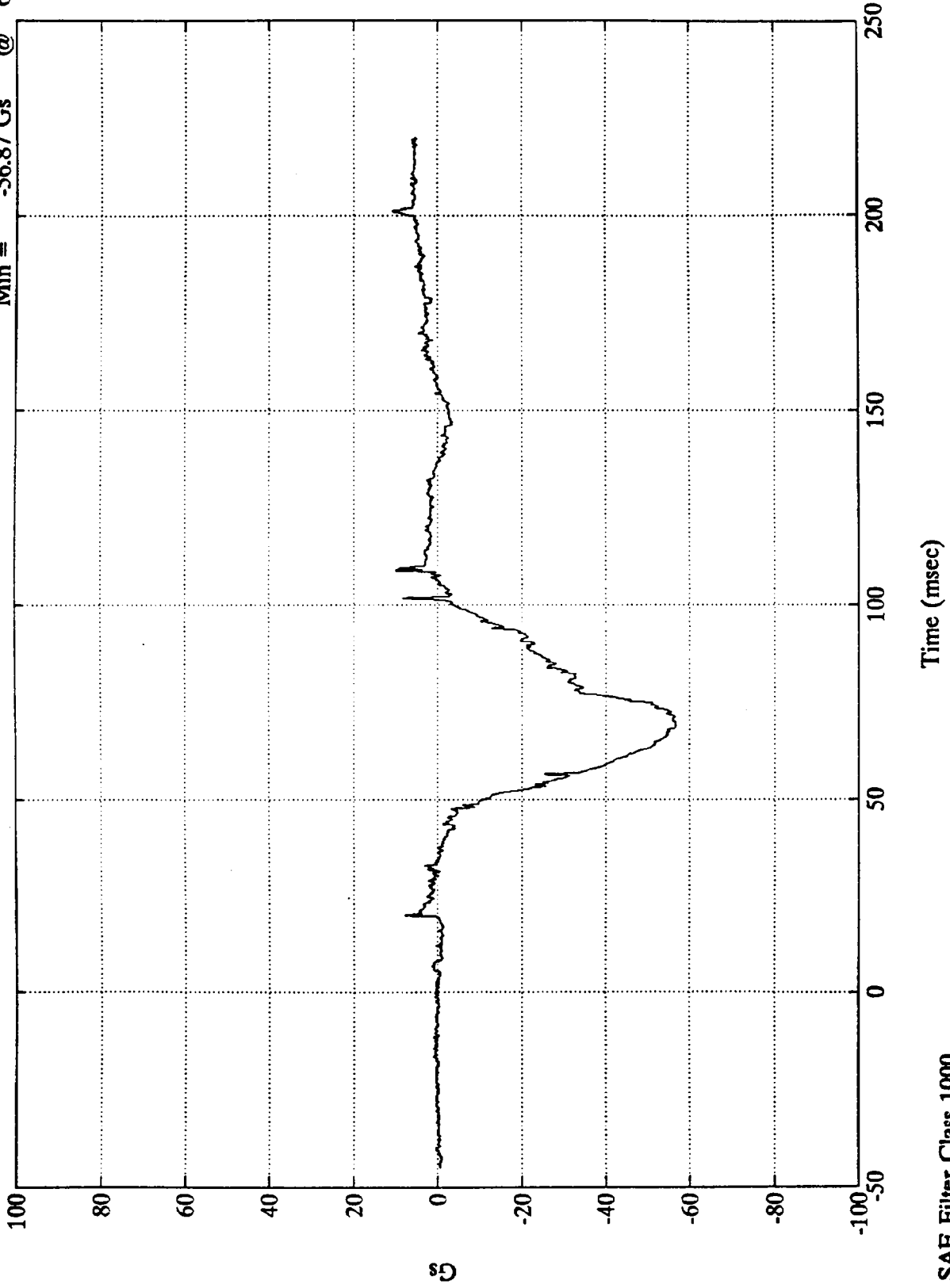
DUMMY DATA

CLASS	FILTER CHANNEL
Head Accelerations	1000
Chest Accelerations	180
Chest Displacements	60
Femur Forces	600
Belt Loads	60
Belt Displacements	180
Neck Forces	1000
Neck Moments	600

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Head X

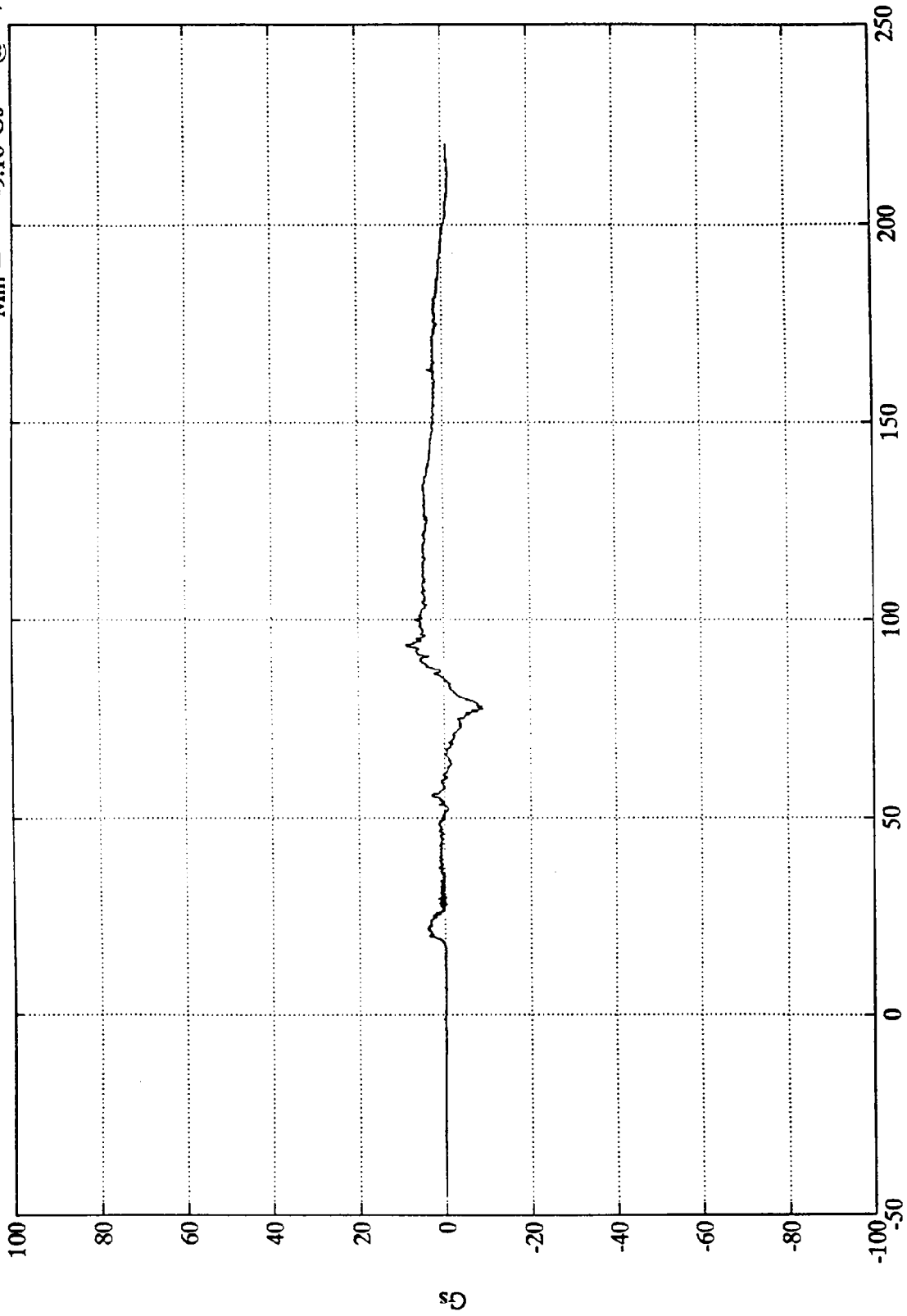
Max = 10.68 Gs @ 201.24 msec
Min = -56.87 Gs @ 69.00 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Head Y

Max = 8.80 Gs @ 93.72 msec
Min = -9.16 Gs @ 77.64 msec



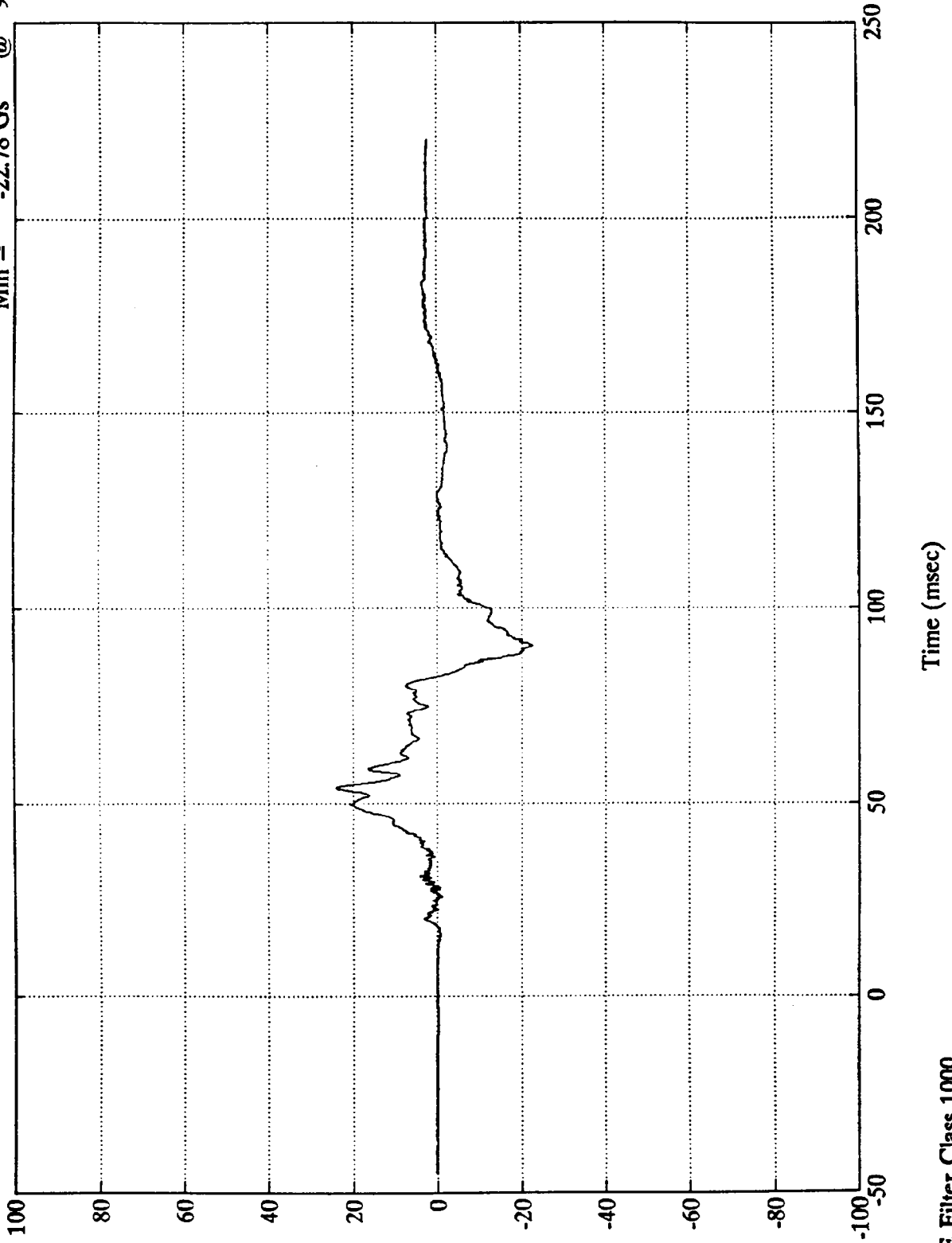
Time (msec)

SAE Filter Class 1000

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Head Z

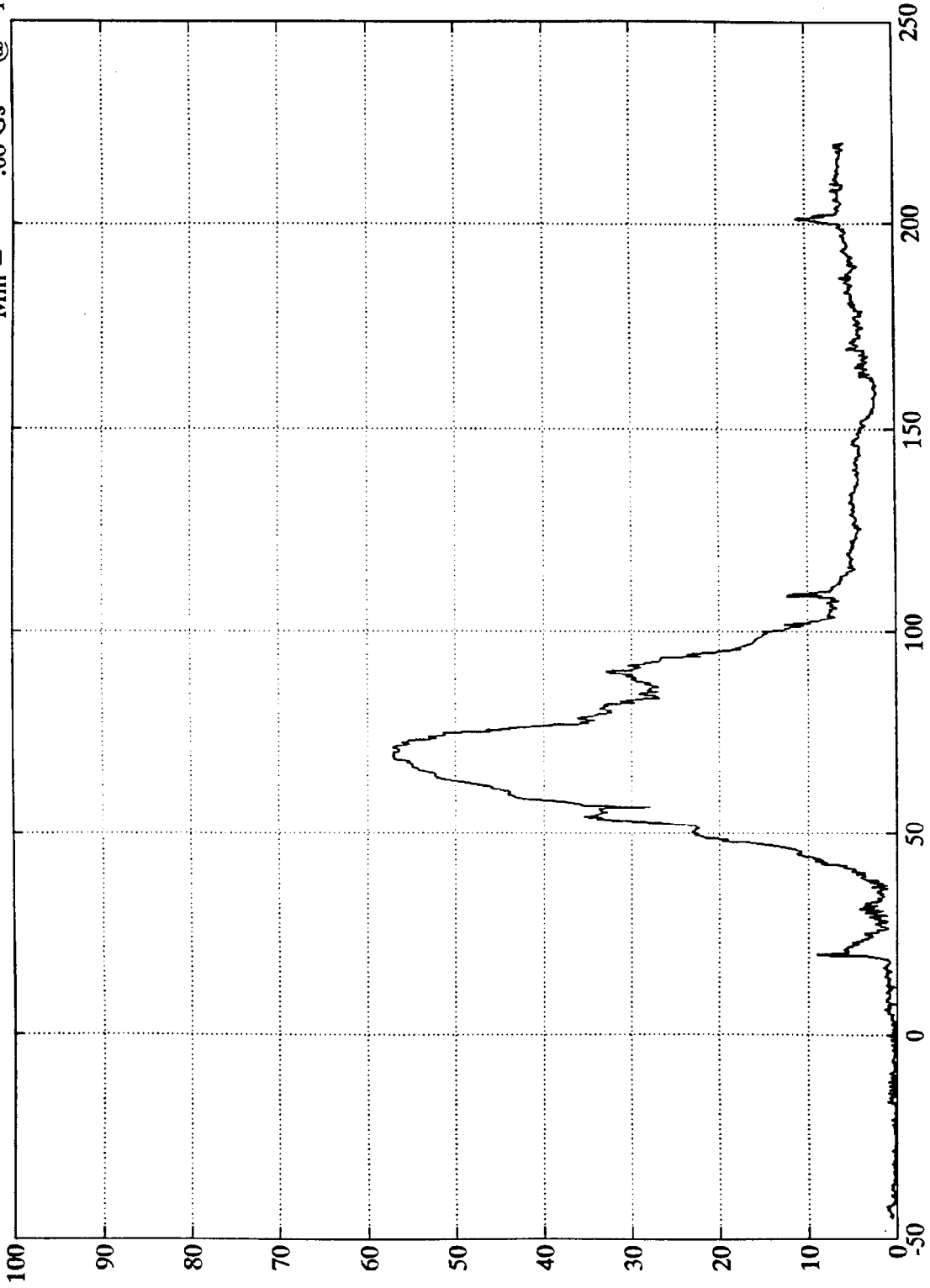
Max = 23.86 Gs @ 54.11 msec
Min = -22.78 Gs @ 90.48 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Head Resultant

Max = 57.22 Gs @ 69.00 msec
Min = .08 Gs @ -12.96 msec



B-72

7946-6

Time (msec)

SAE Filter Class 1000

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Chest X

Max = 5.46 Gs @ 141.36 msec
Min = -51.20 Gs @ 87.83 msec



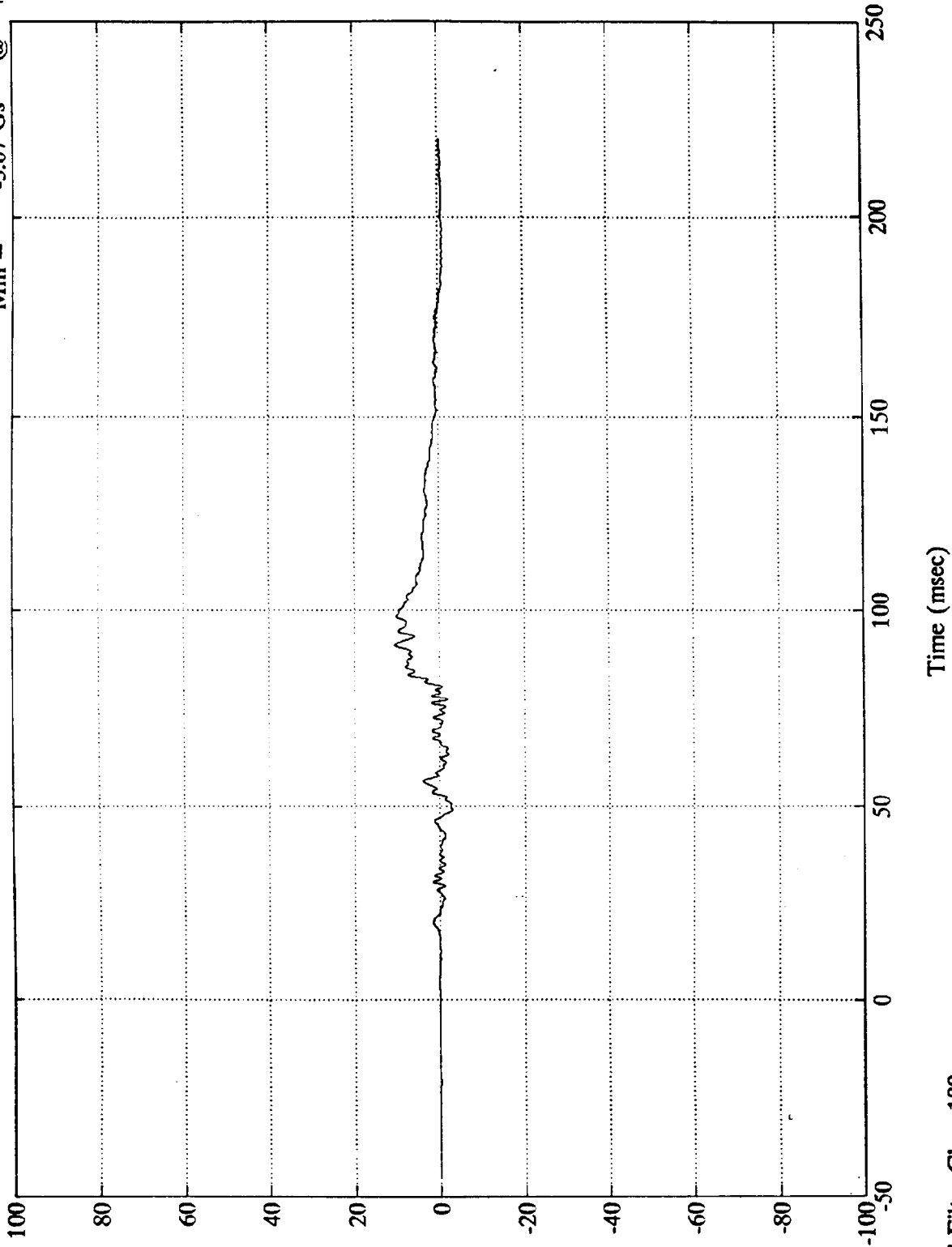
Time (msec)

SAE Filter Class 180

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Chest Y

Max = 10.45 Gs @ 91.44 msec
Min = -3.07 Gs @ 49.20 msec



SD

B-74

7946-6

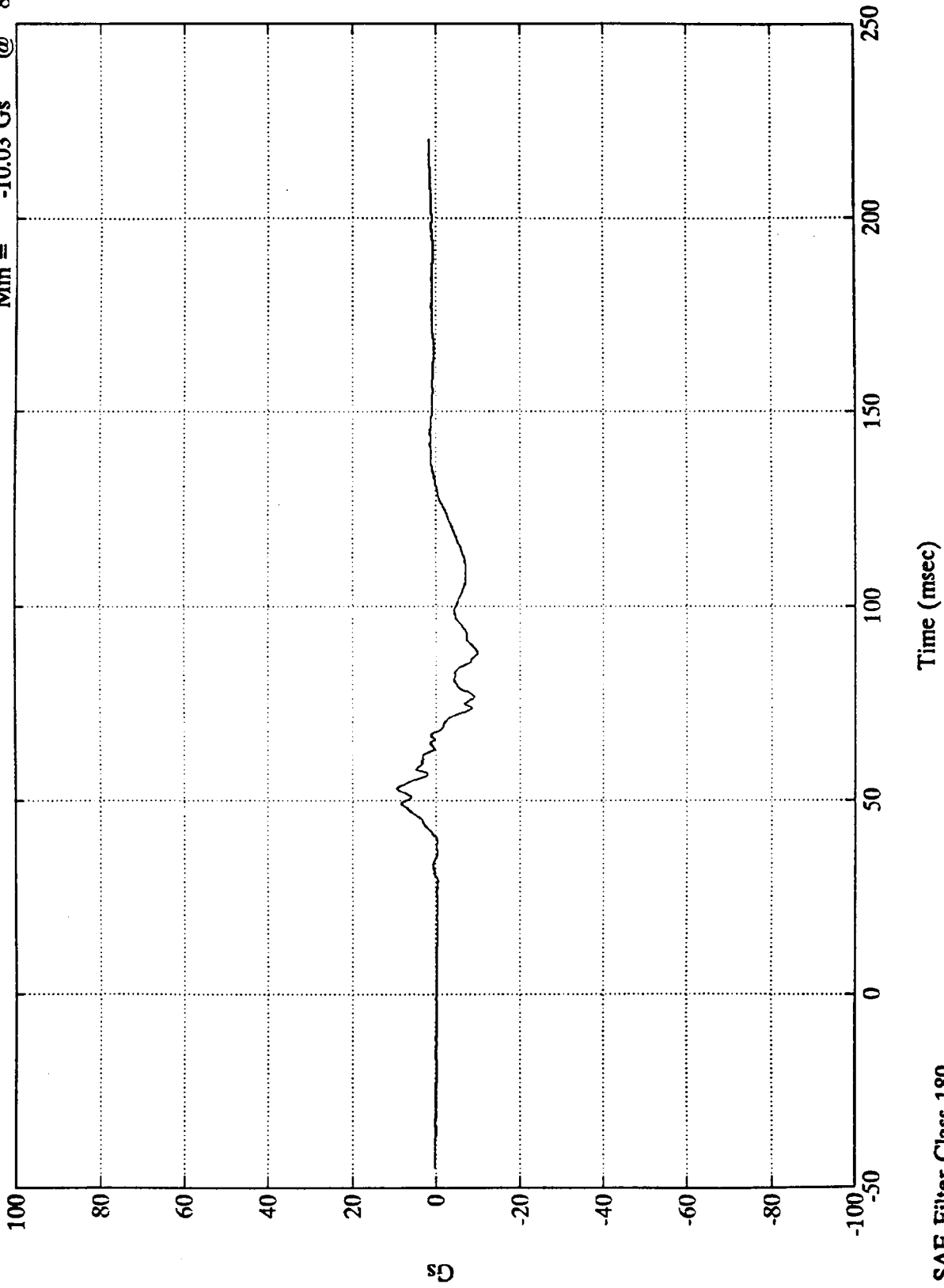
SAE Filter Class 180

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Chest Z

Max = 9.21 Gs @ 53.04 msec
Min = -10.03 Gs @ 88.08 msec



B-75

7946-6

SAE Filter Class 180

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Chest Resultant

Max = 52.65 Gs @ 87.72 msec
Min = .03 Gs @ -26.28 msec



G

B-76

7946-6

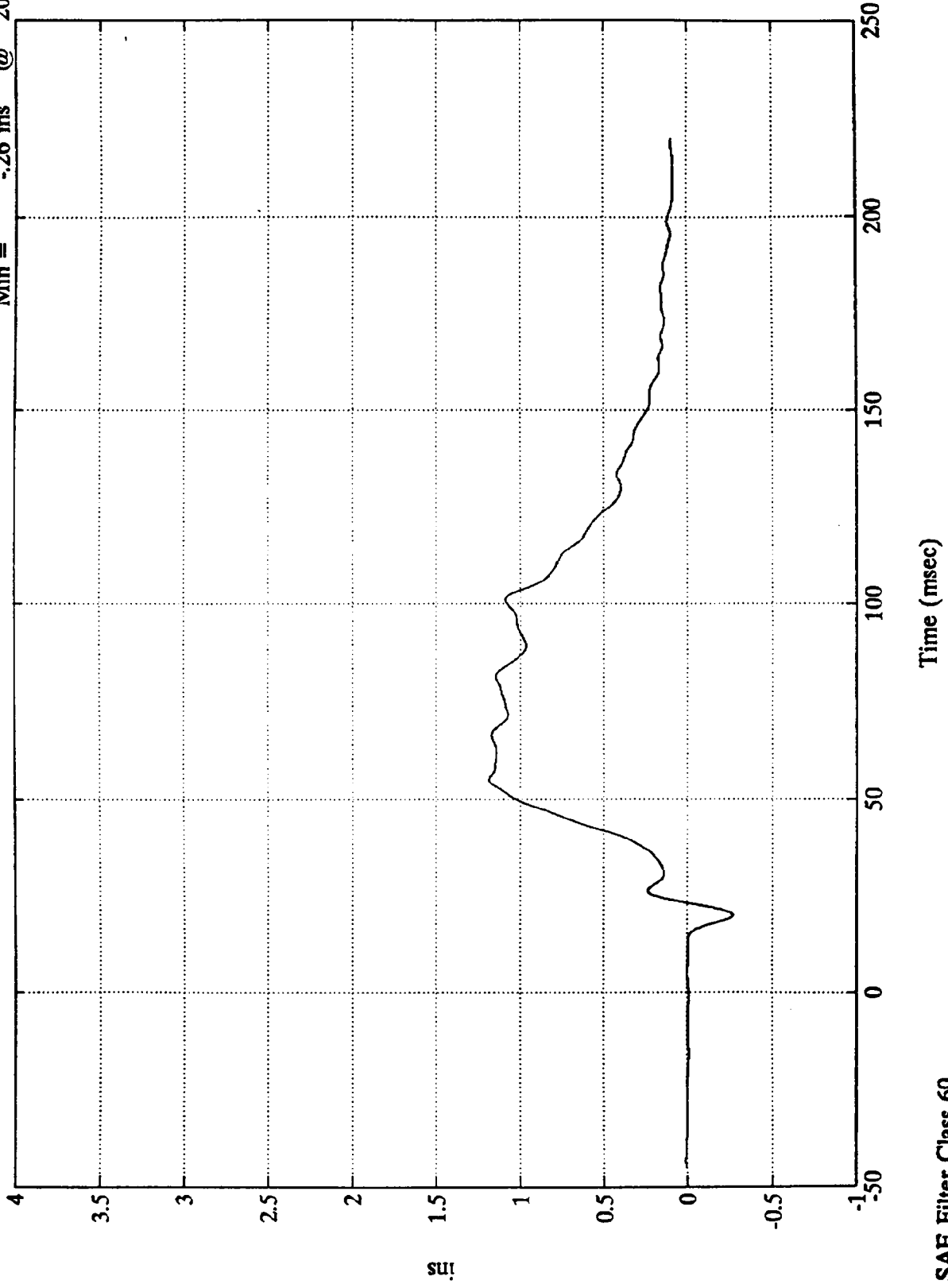
Time (msec)

SAE Filter Class 180

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Chest Disp.

Max = 1.18 ins @ 55.20 msec
Min = -.26 ins @ 20.28 msec



su
B-77

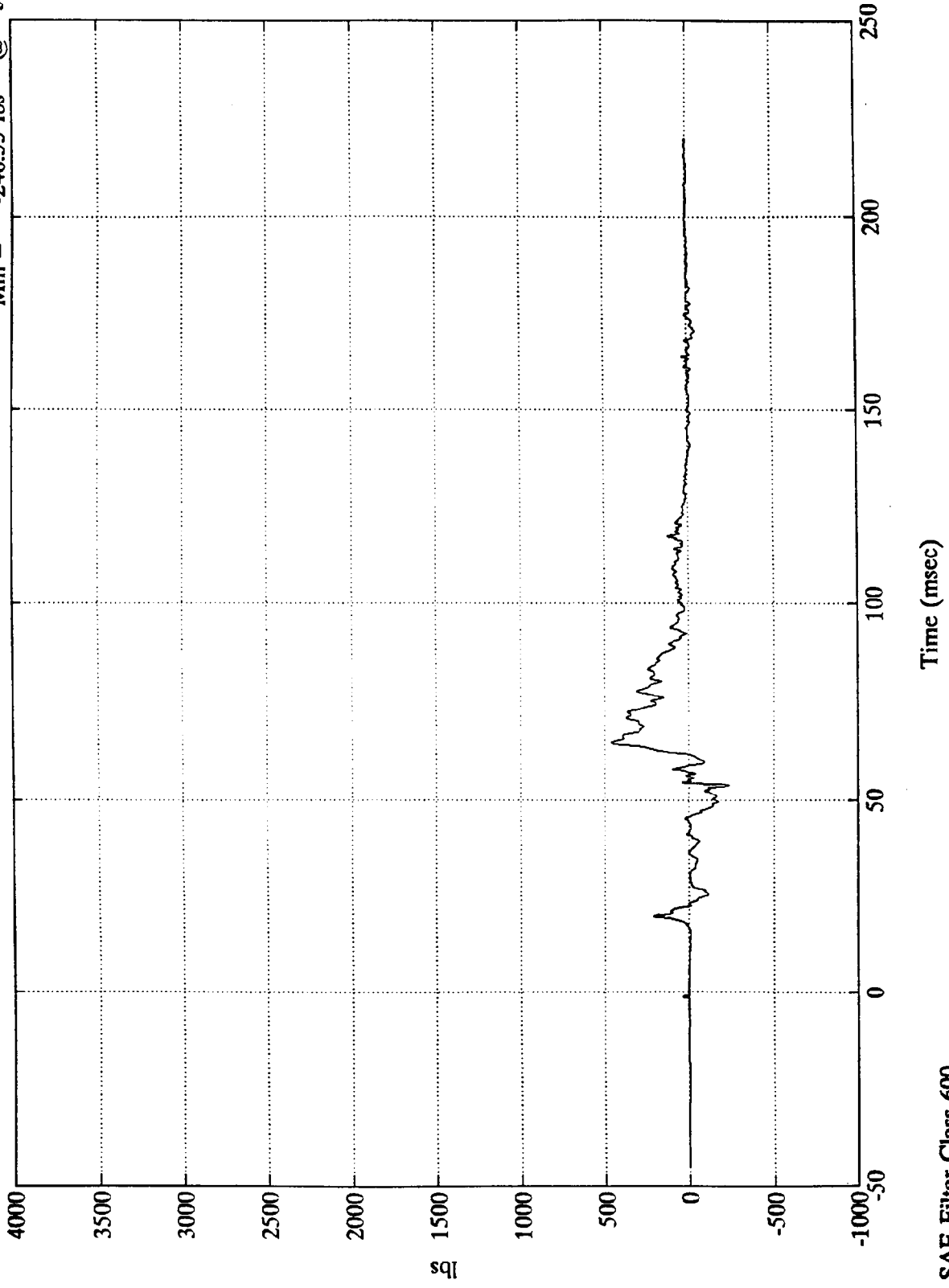
7946-6

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Left Femur

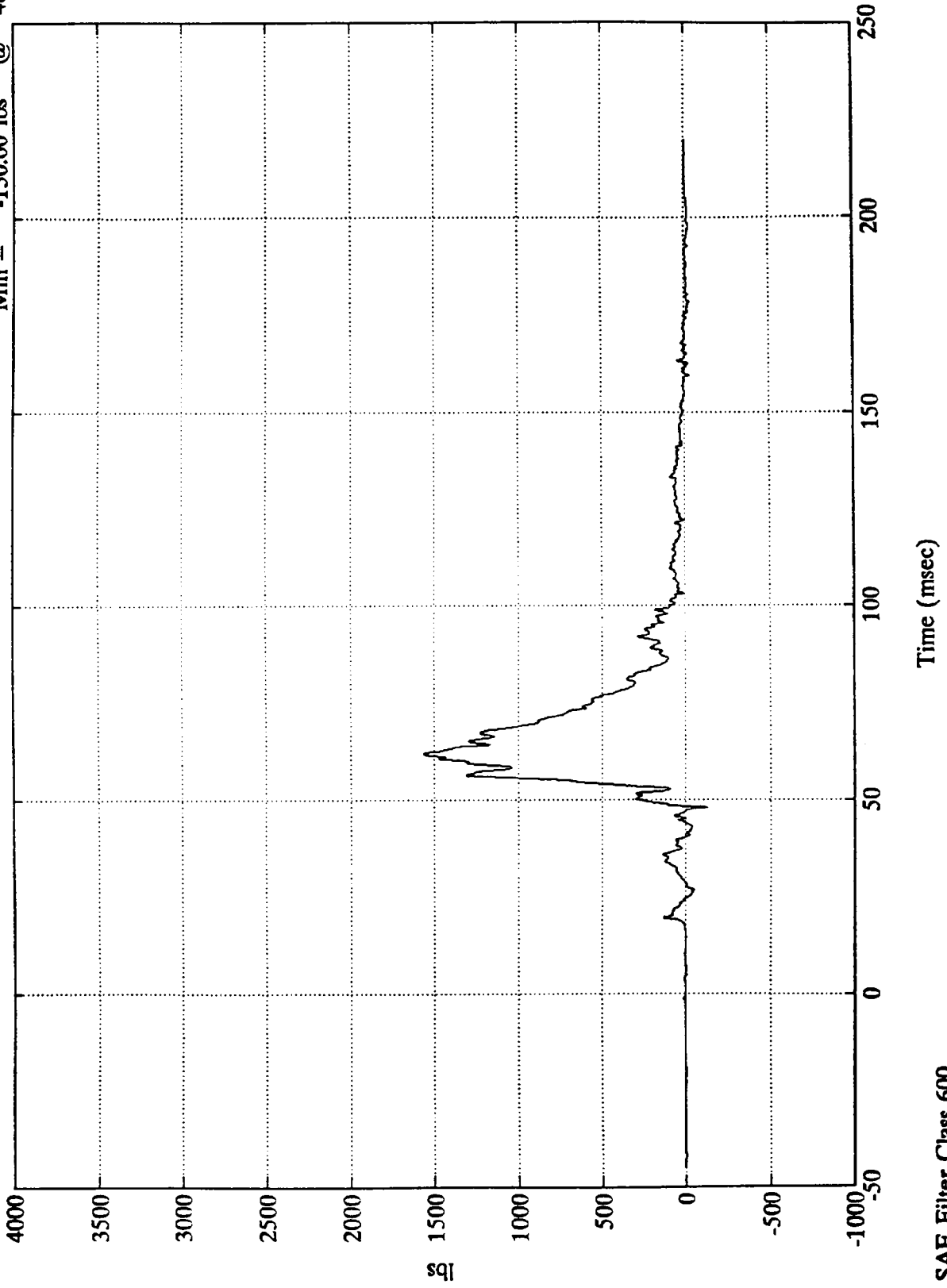
Max = 459.57 lbs @ 64.68 msec
Min = -240.55 lbs @ 53.88 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Right Femur

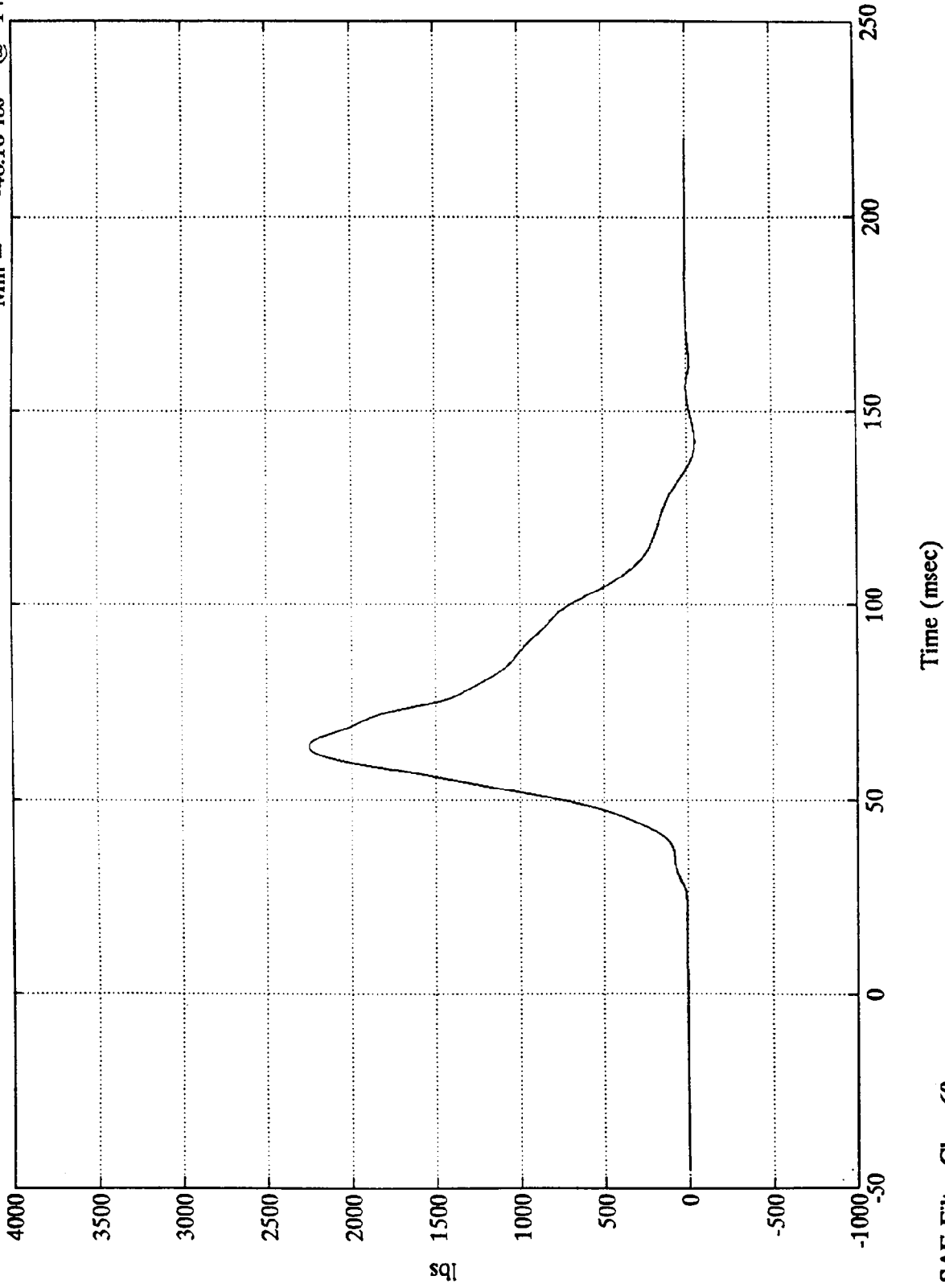
Max = 1561.12 lbs @ 62.04 msec
Min = -130.60 lbs @ 48.24 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Left Belt Load

Max = 2252.37 lbs @ 63.60 msec
Min = -46.16 lbs @ 142.08 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Torso Belt Load

Max = 1919.80 lbs @ 76.68 msec
Min = -4.64 lbs @ 159.60 msec



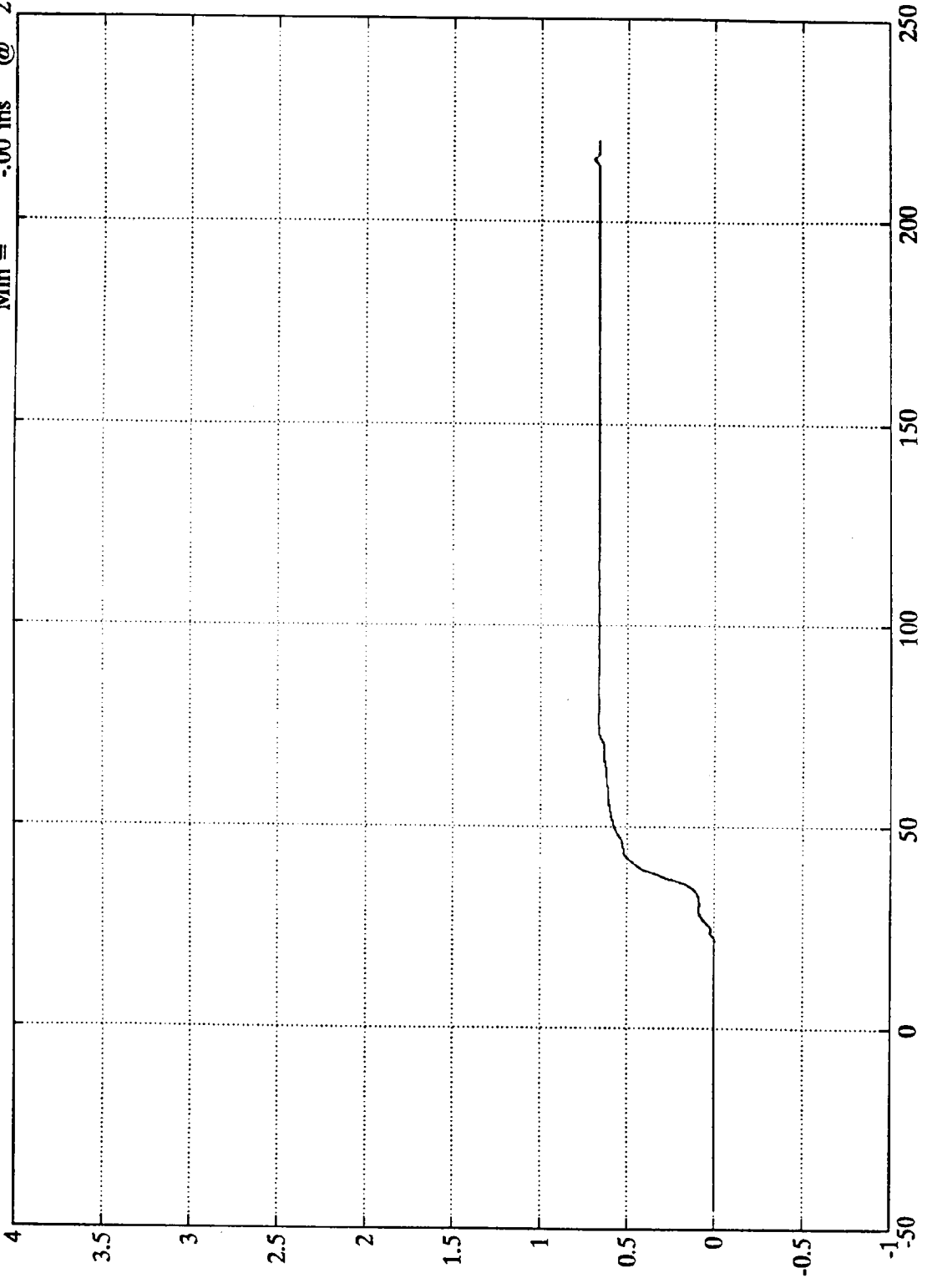
Time (msec)

SAE Filter Class 60

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Belt Spool Out

Max = .68 ins @ 215.40 msec
Min = -.00 ins @ 21.59 msec



sui
B-82

7946-6

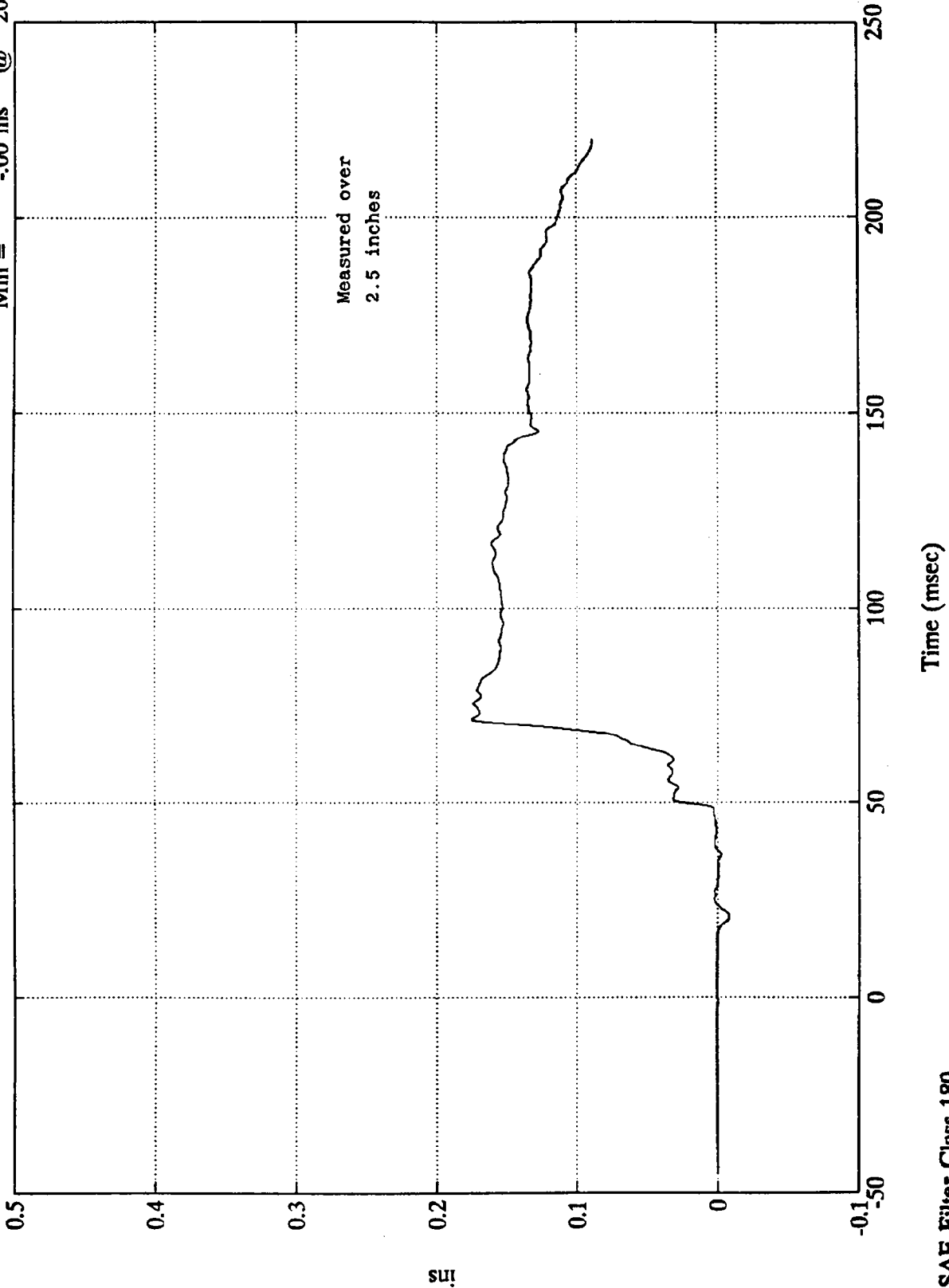
SAE Filter Class 180

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Belt Elongation

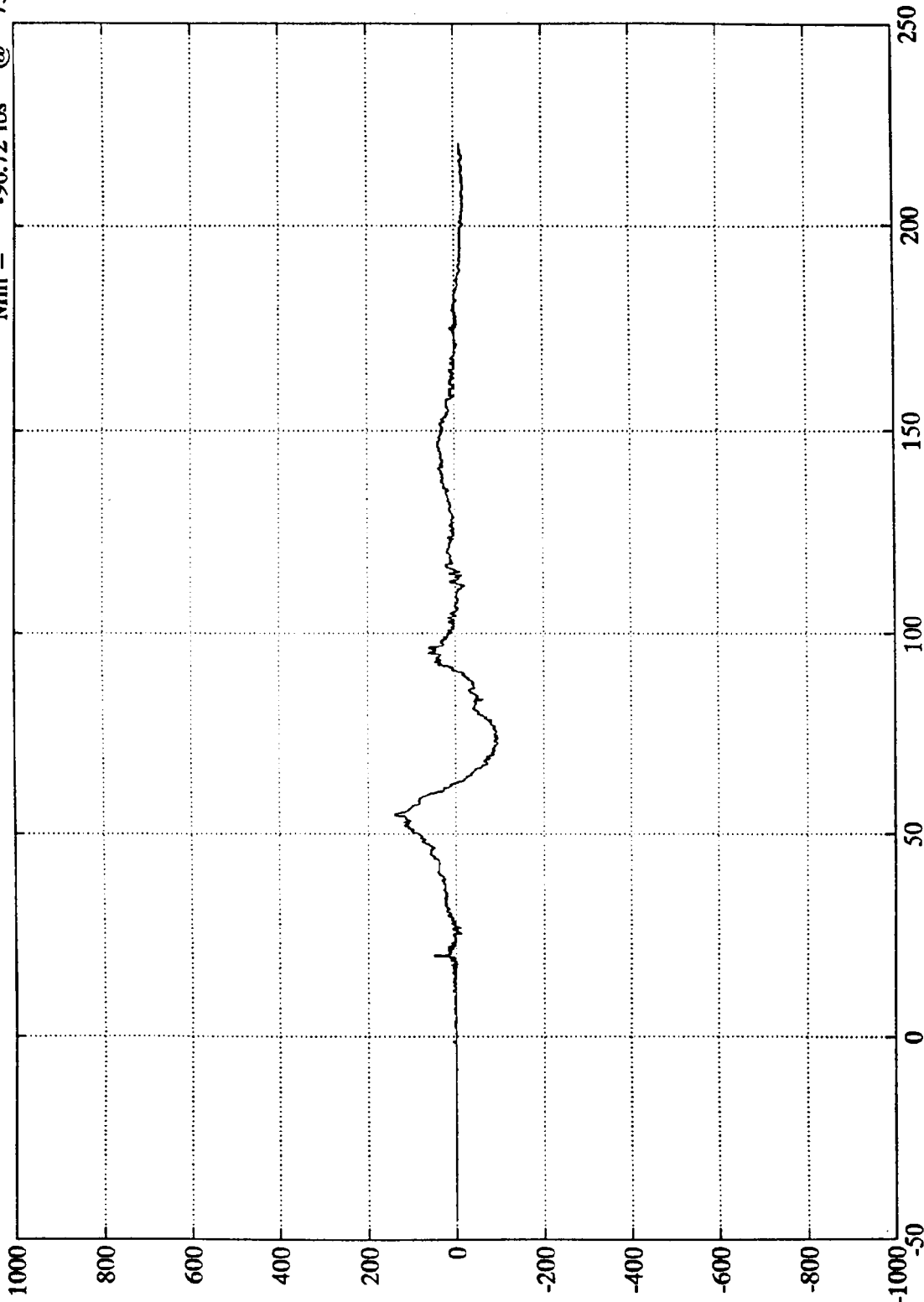
Max = .17 ins @ 71.40 msec
Min = -.00 ins @ 20.76 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Upper Neck Fx

Max = 138.39 lbs @ 55.08 msec
Min = -96.72 lbs @ 73.92 msec



sqi
B-84

7946-6

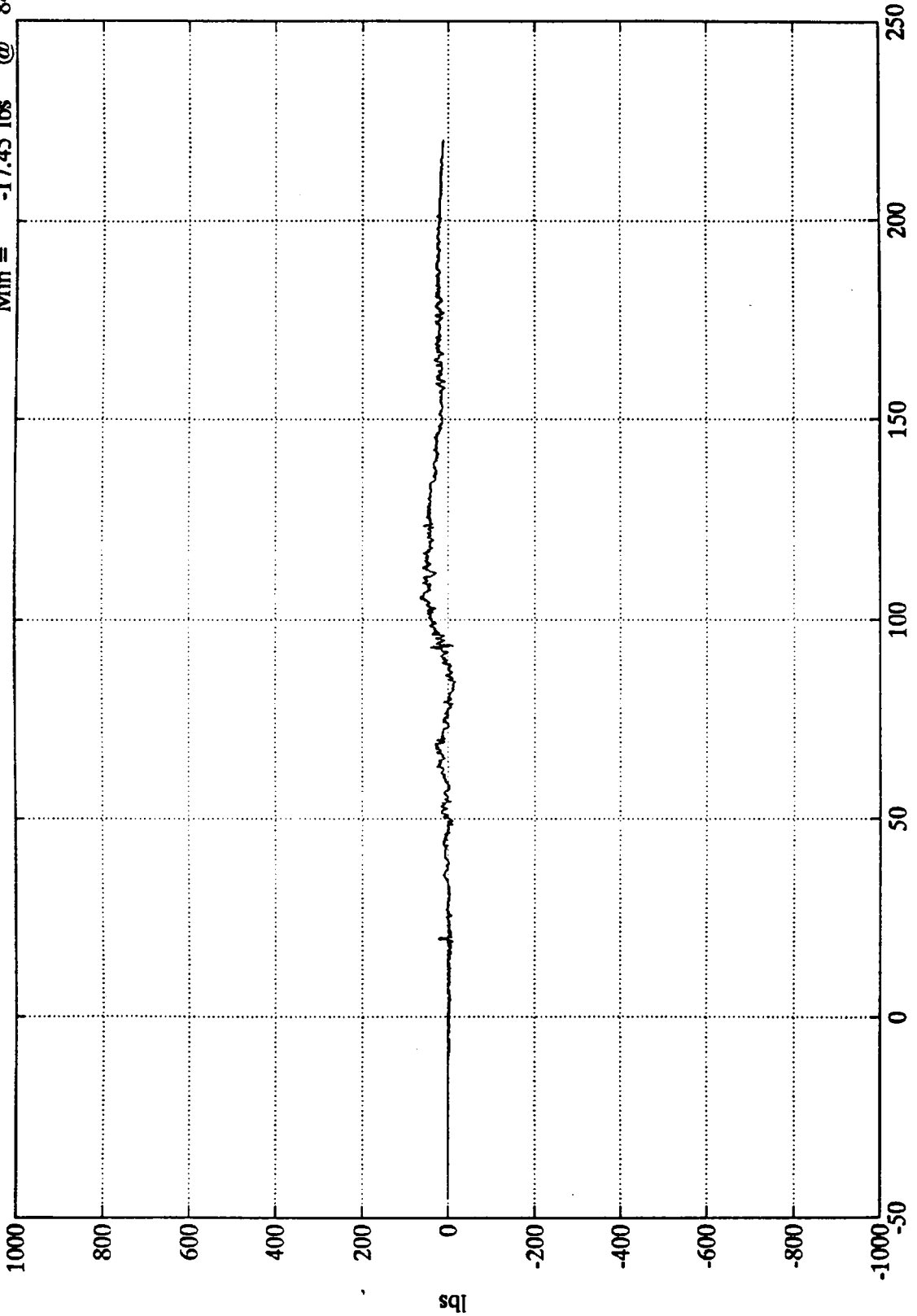
Time (msec)

SAE Filter Class 1000

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Upper Neck Fy

Max = 65.23 lbs @ 105.72 msec
Min = -17.45 lbs @ 84.12 msec



B-85

7946-6

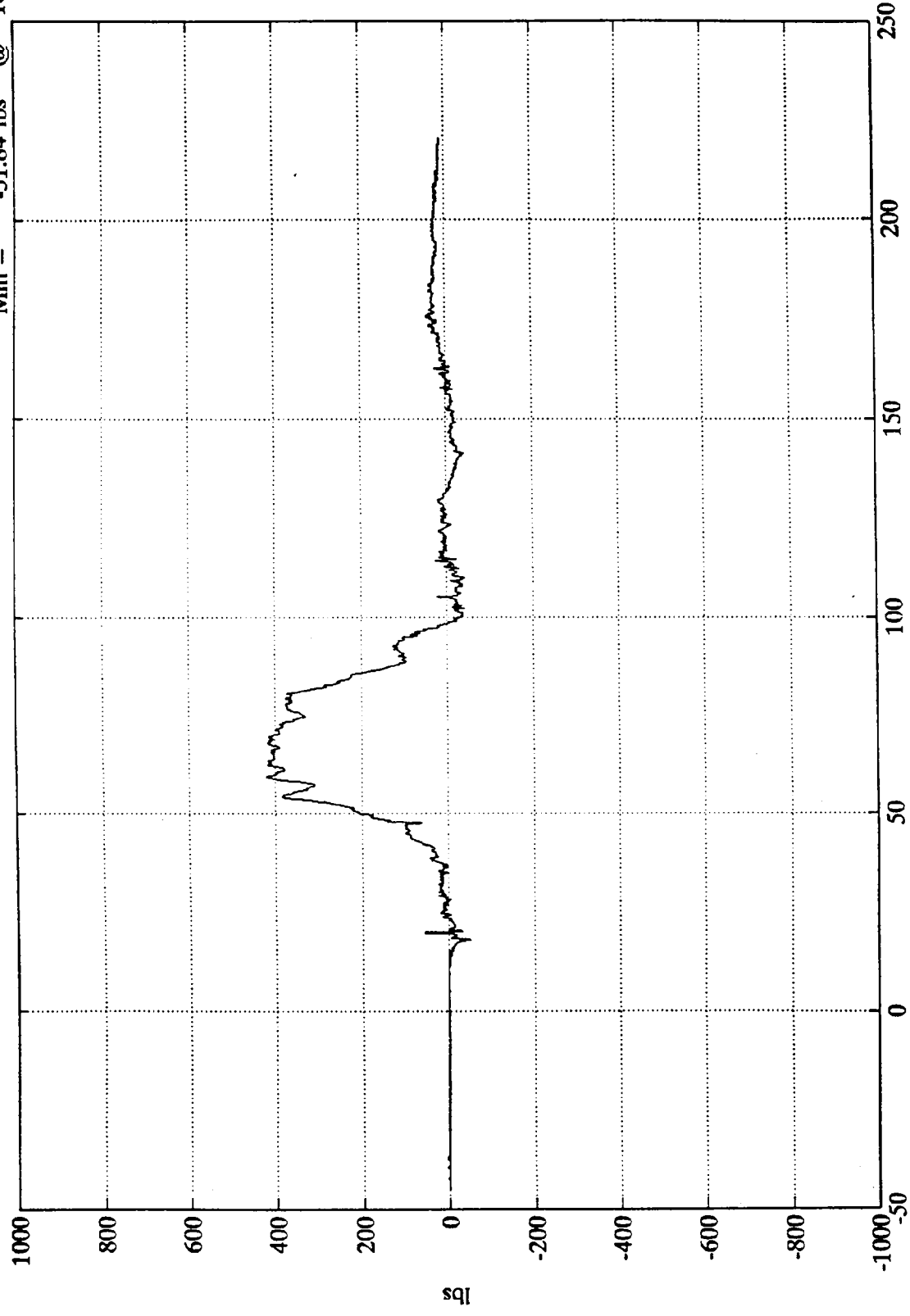
SAE Filter Class 1000

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Upper Neck Fz

Max = 420.26 lbs @ 59.64 msec
Min = -51.84 lbs @ 18.12 msec



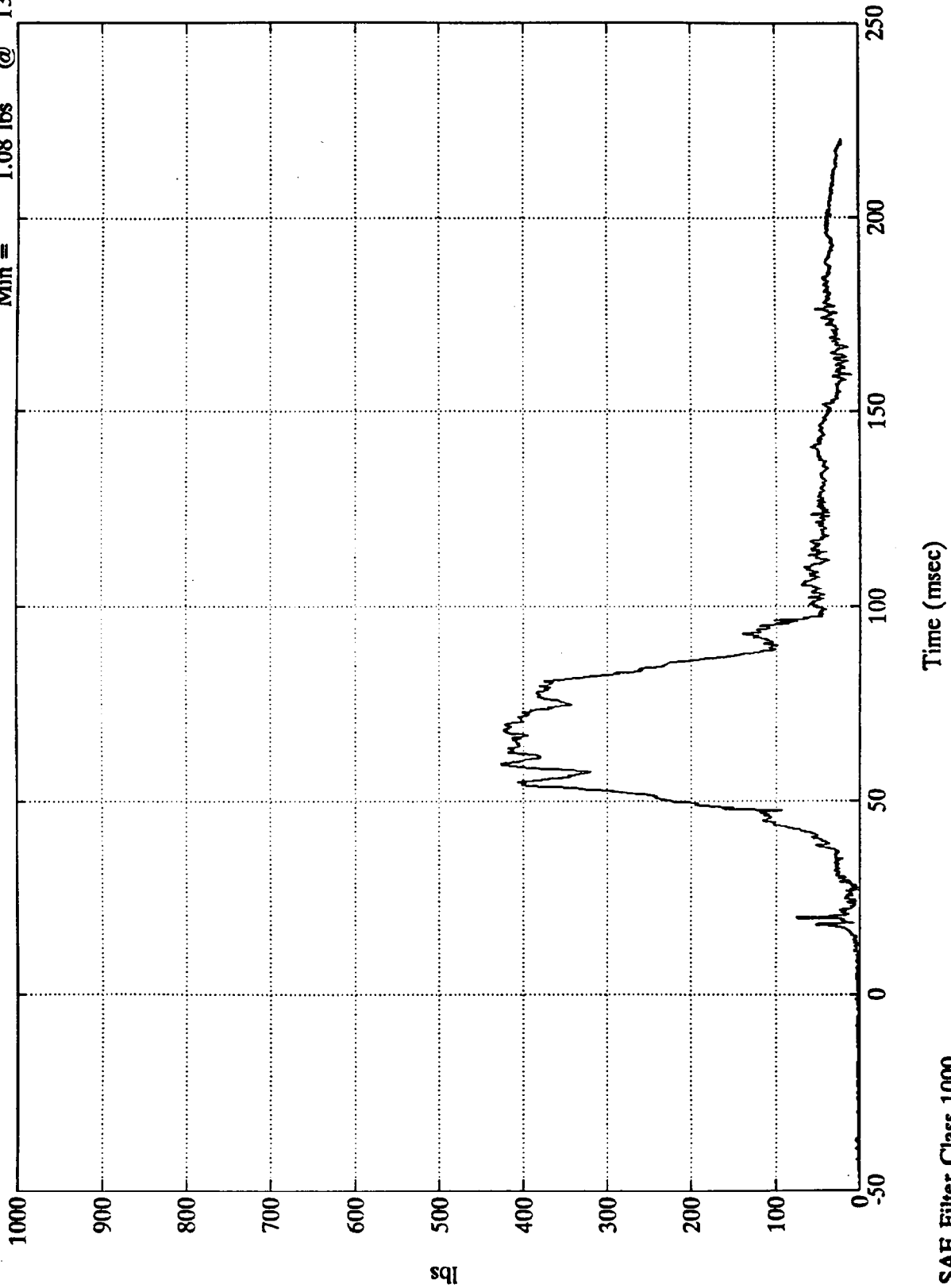
Time (msec)

SAE Filter Class 1000

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Neck Force Res.

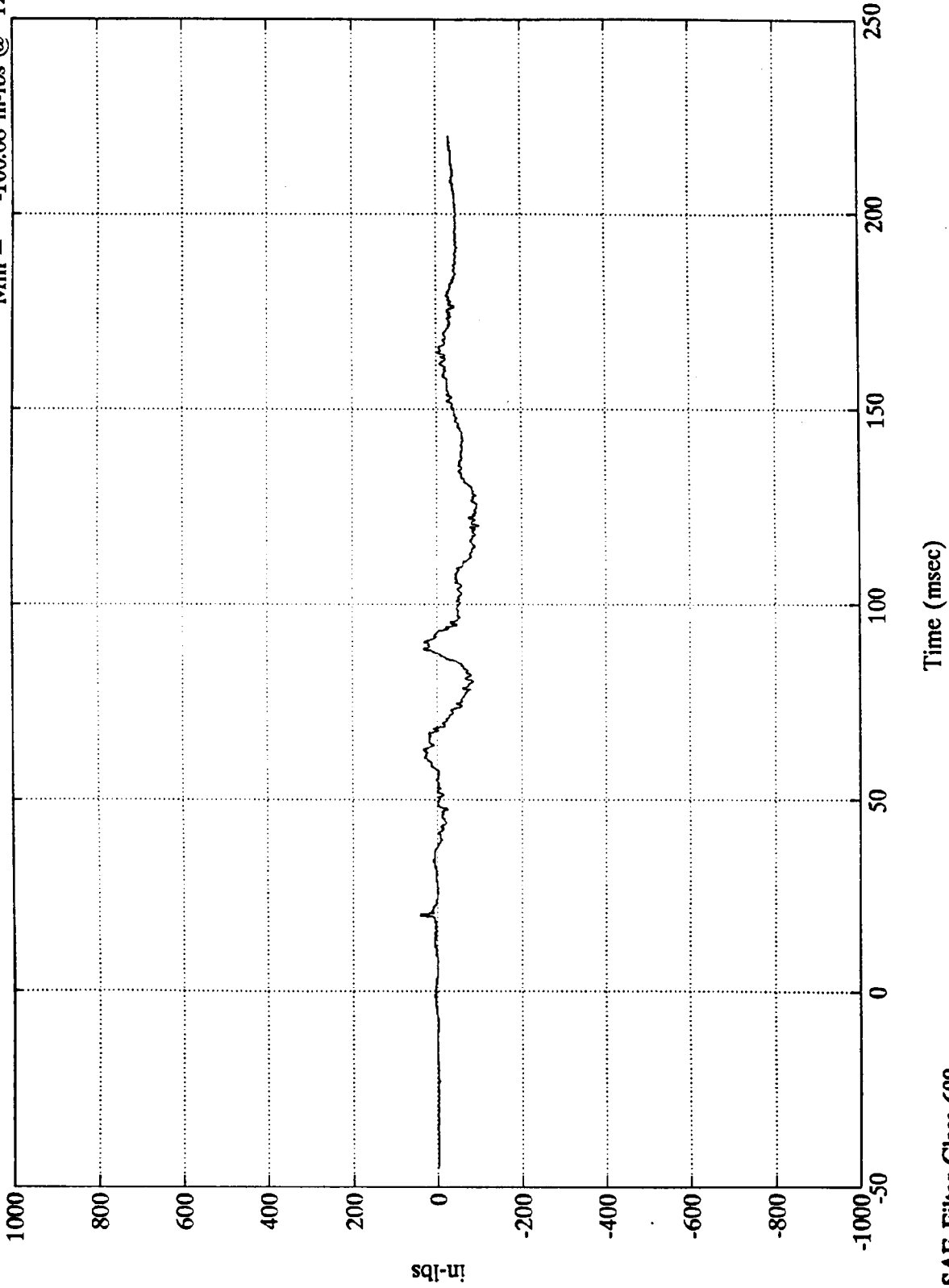
Max = 426.74 lbs @ 59.52 msec
Min = 1.08 lbs @ 13.07 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Upper Neck Mx

Max = 40.29 in-lbs @ 19.79 msec
Min = -100.68 in-lbs @ 120.36 msec



B-88

7946-6

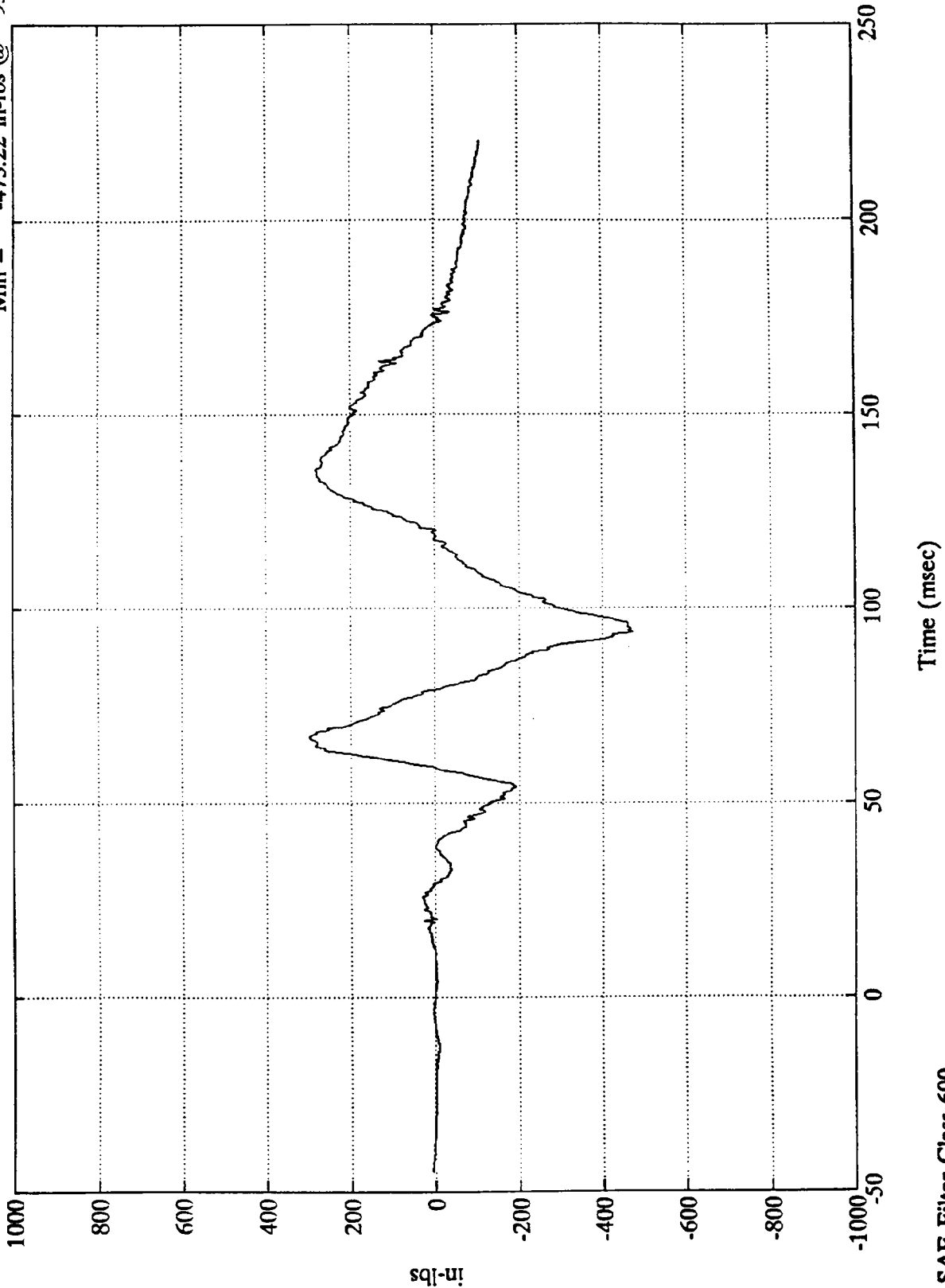
SAE Filter Class 600

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Upper Neck My

Max = 297.42 in-lbs @ 67.19 msec
Min = -473.22 in-lbs @ 93.84 msec



sqi-ui

B-89

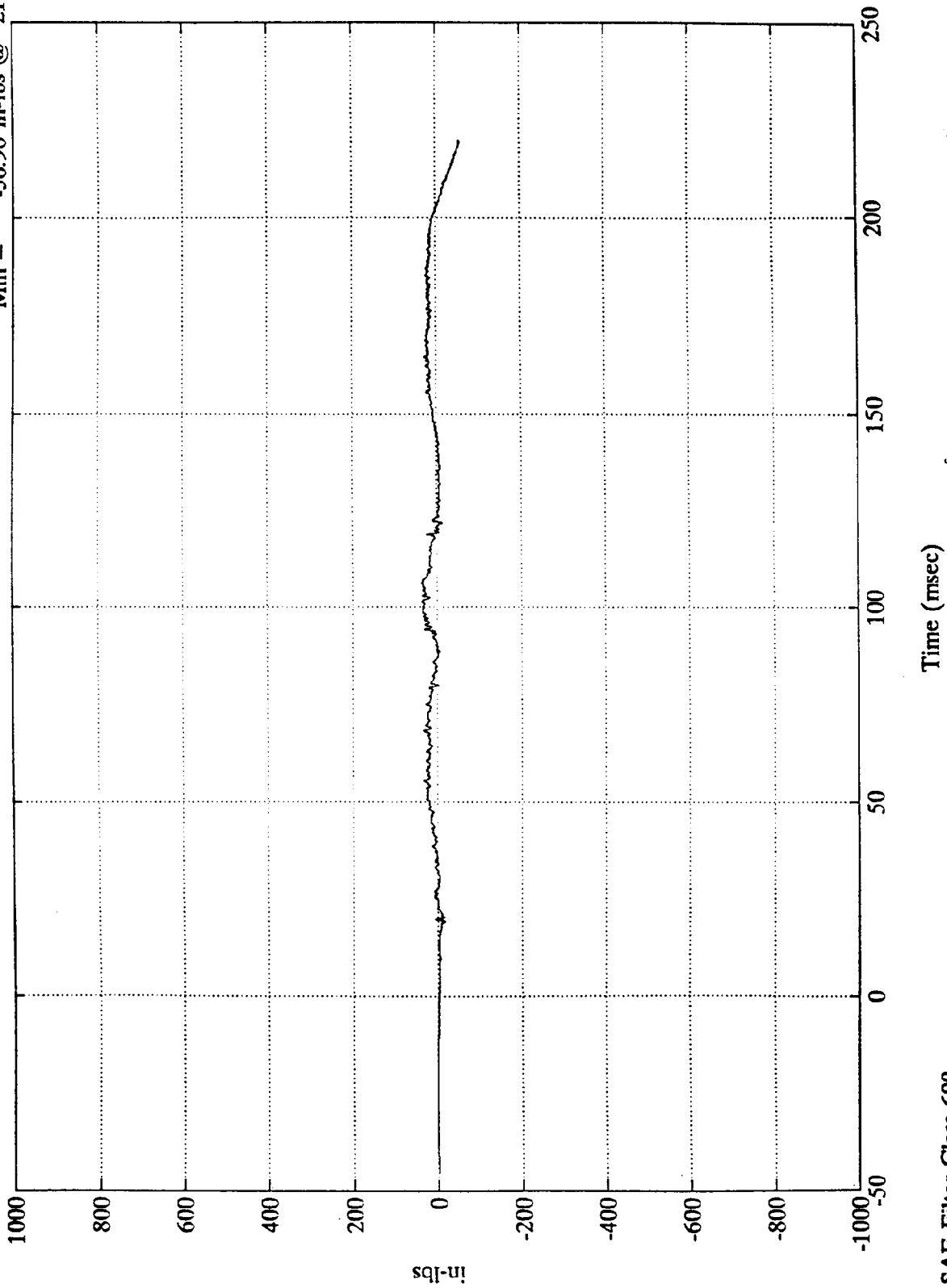
7946-6

SAE Filter Class 600

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Upper Neck Mz

Max = 35.34 in-lbs @ 101.40 msec
Min = -56.96 in-lbs @ 219.48 msec



B-90
sqi-uj

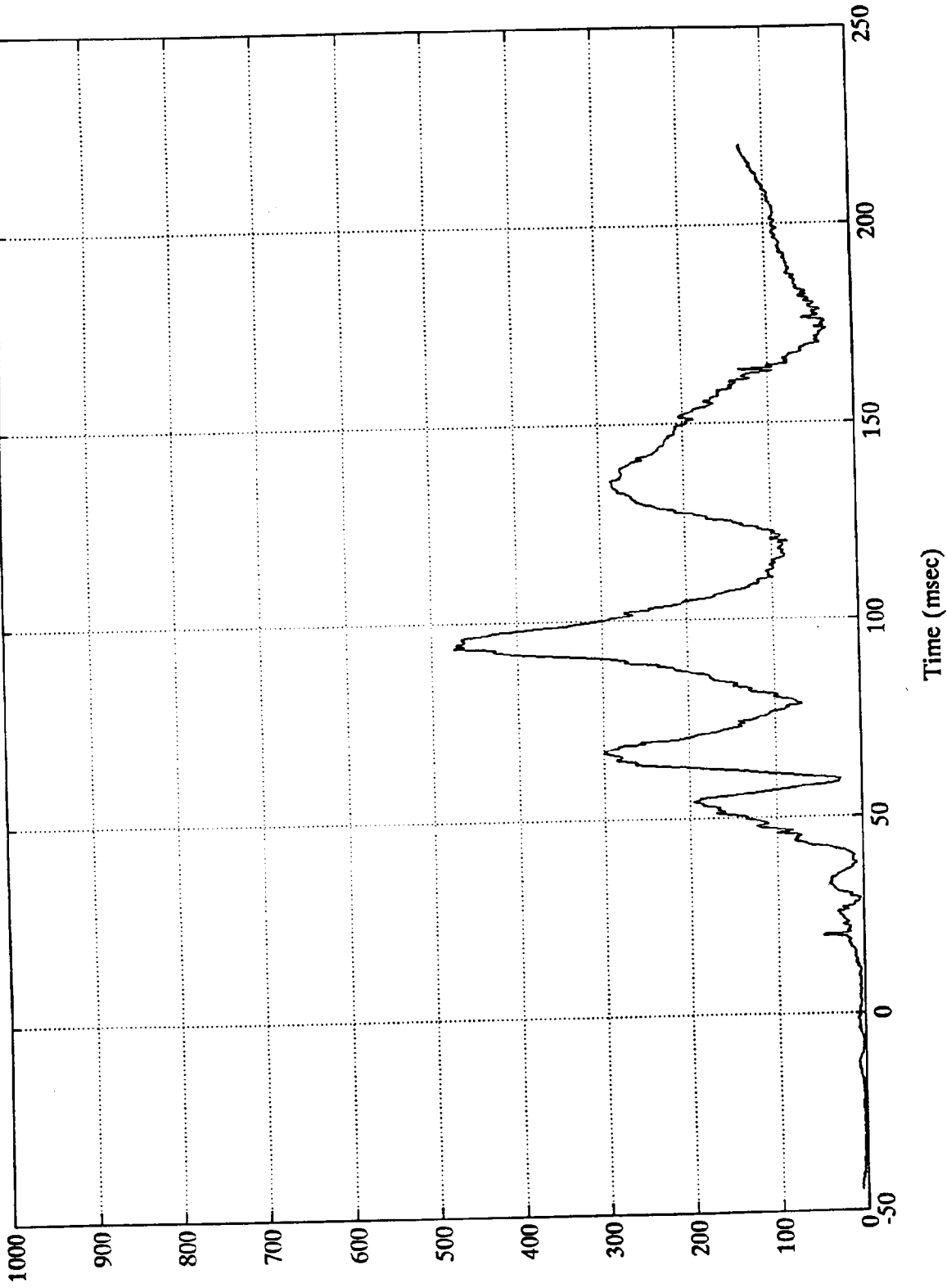
7946-6

SAE Filter Class 600

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 1 Neck Moment Res.

Max = 473.93 in-lbs @ 93.84 msec
Min = 1.52 in-lbs @ -28.08 msec



sqi-ur
B-91

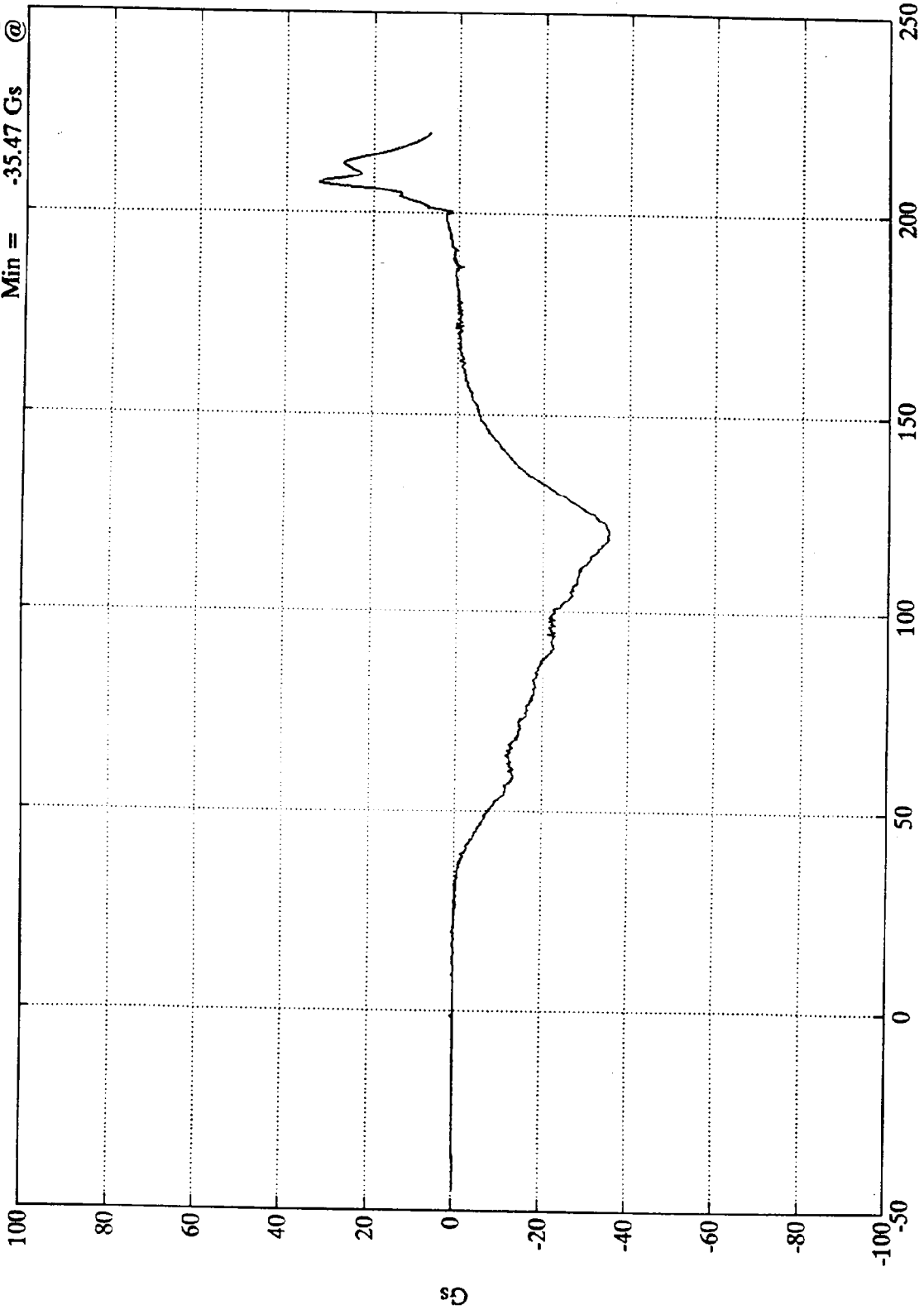
7946-6

SAE Filter Class 600

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Head X

Max = 32.37 Gs @ 207.36 msec
Min = -35.47 Gs @ 120.36 msec



B-92

7946-6

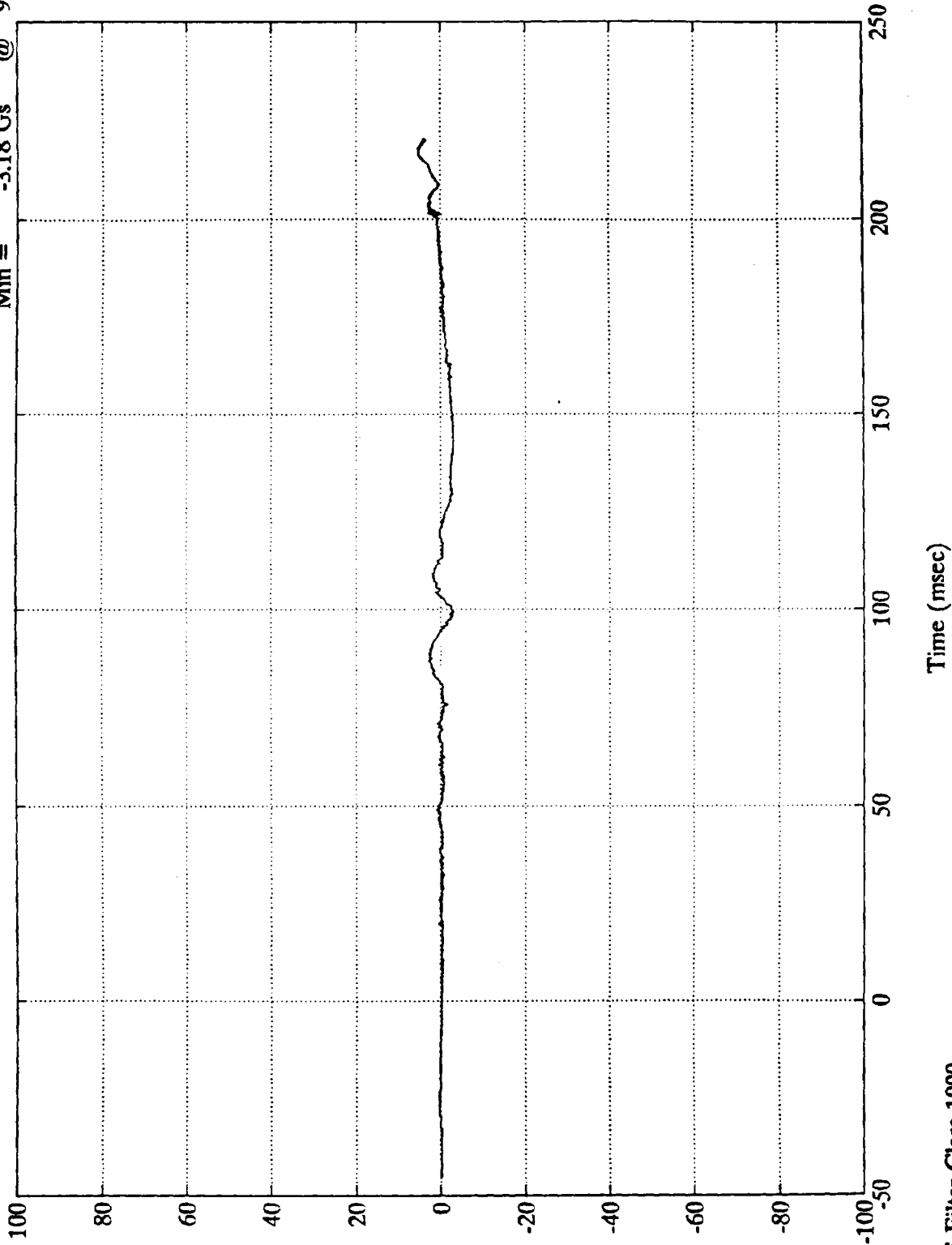
SAE Filter Class 1000

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Head Y

Max = 5.37 Gs @ 217.80 msec
Min = -3.18 Gs @ 99.59 msec



B-93

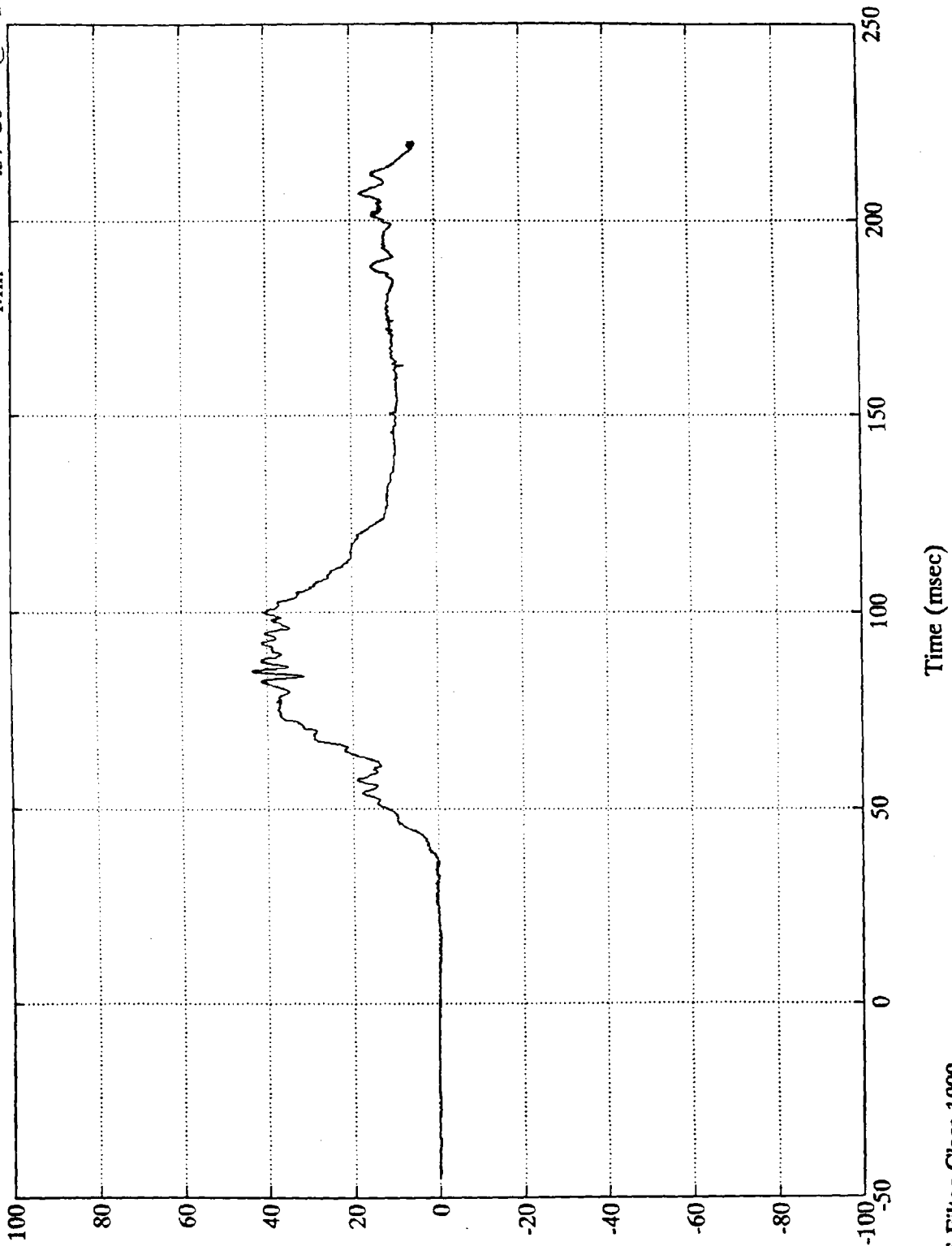
7946-6

SAE Filter Class 1000

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Head Z

Max = 43.38 Gs @ 84.95 msec
Min = -5.7 Gs @ 18.00 msec



85
B-94

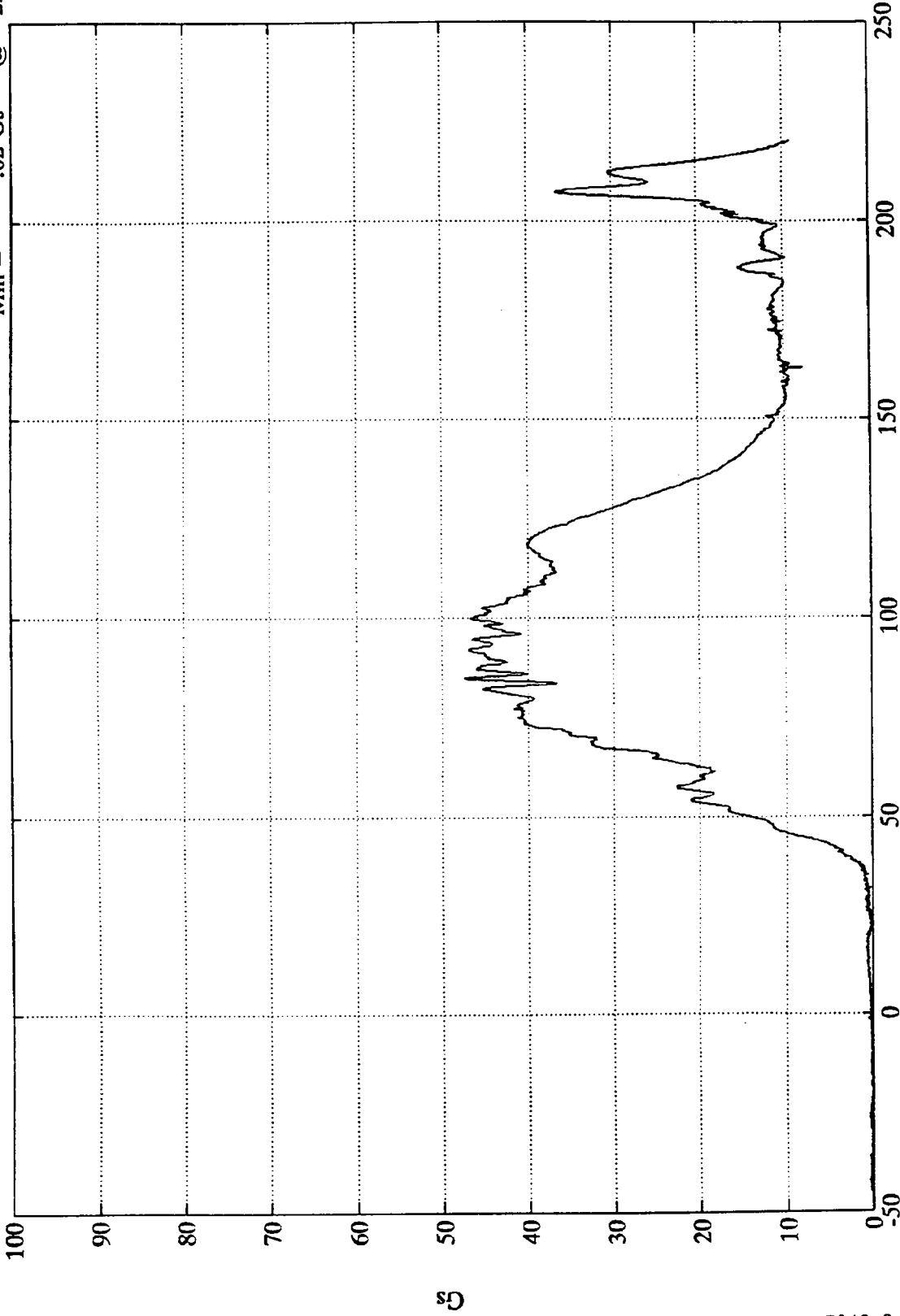
7946-6

SAE Filter Class 1000

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Head Resultant

Max = 47.28 Gs @ 84.95 msec
Min = .02 Gs @ 22.07 msec



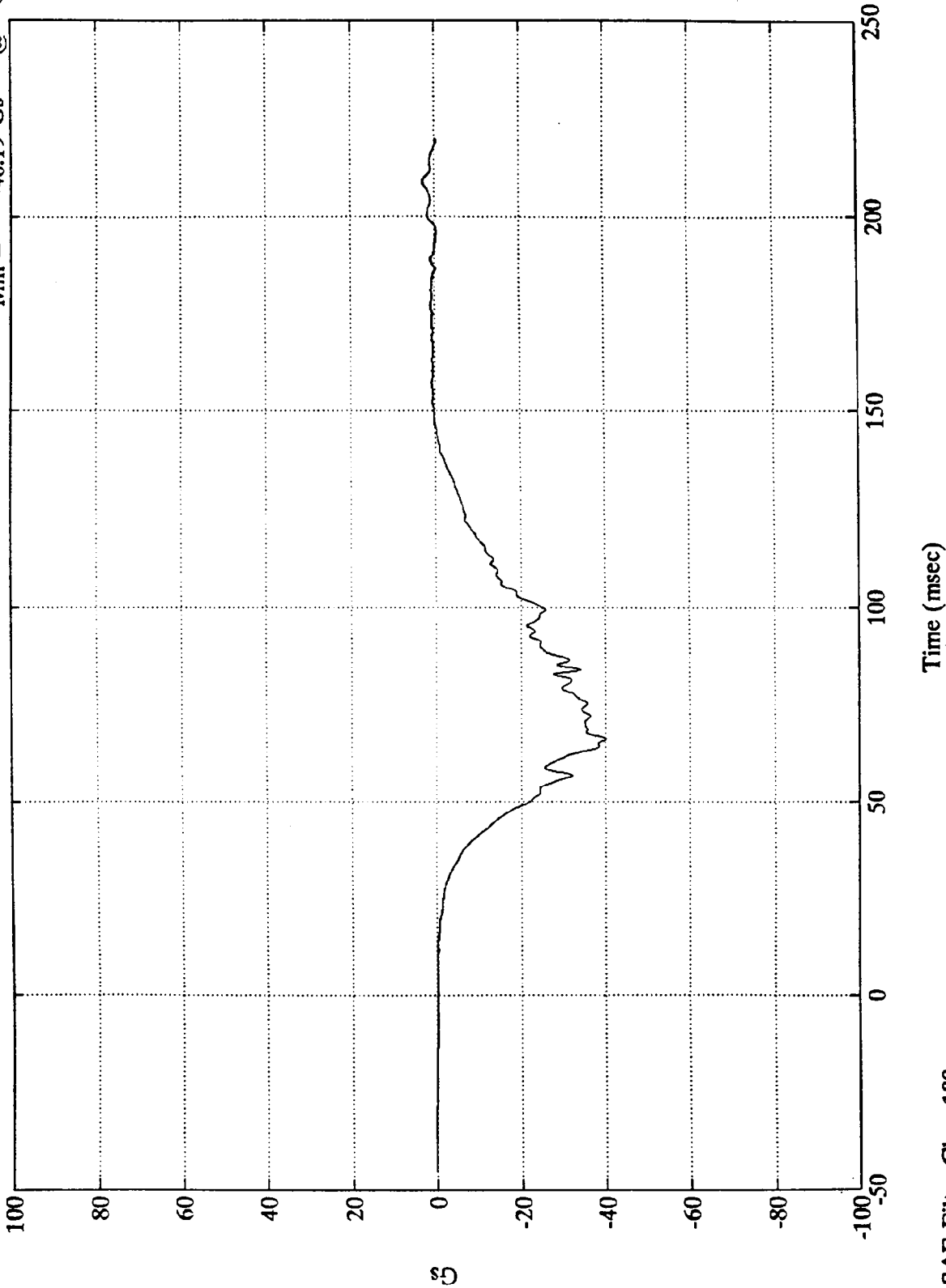
Time (msec)

SAE Filter Class 1000

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Chest X

Max = 2.79 Gs @ 209.04 msec
Min = -40.19 Gs @ 66.23 msec



B-96

7946-6

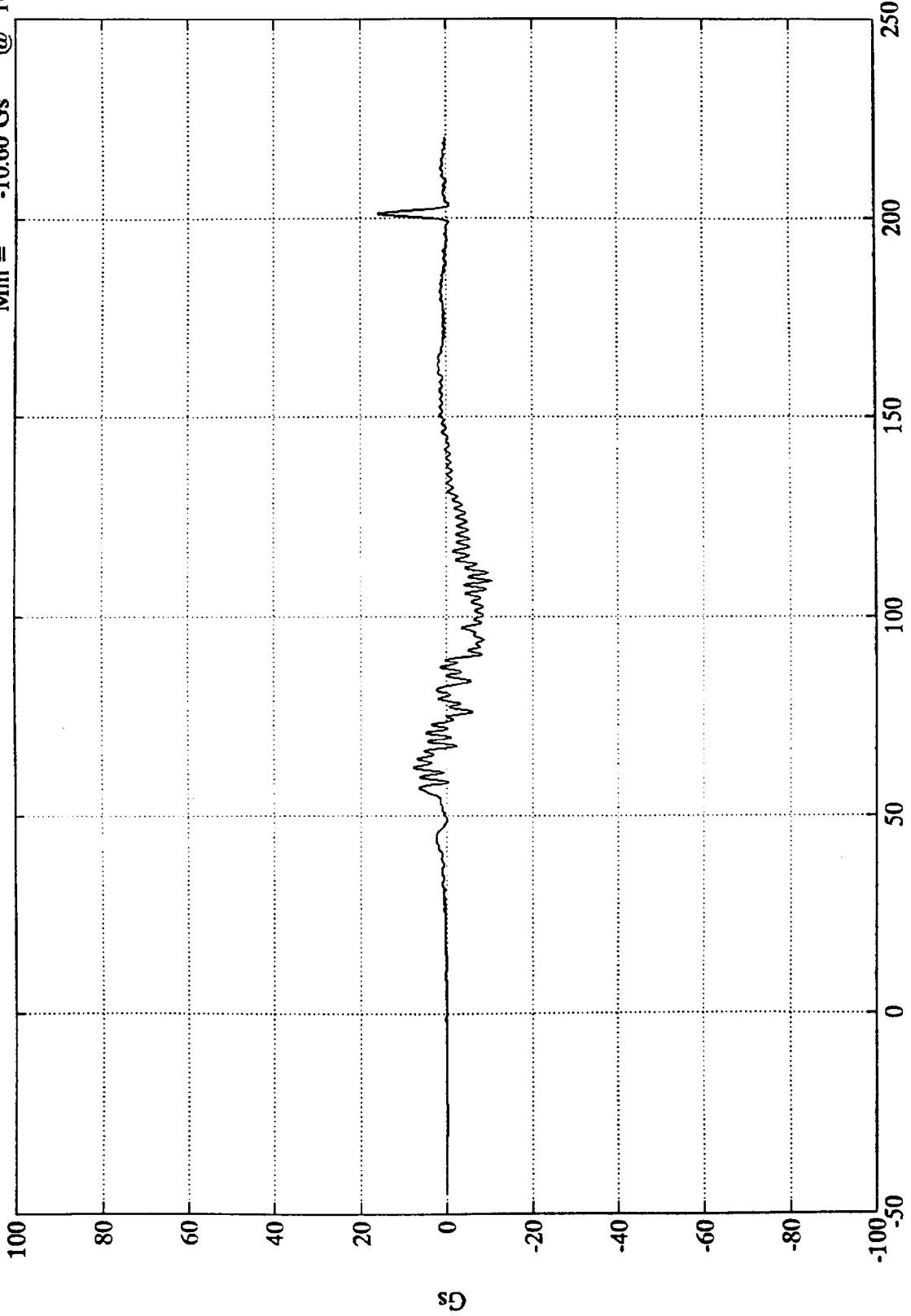
SAE Filter Class 180

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Chest Y

Max = 15.78 Gs @ 201.00 msec
Min = -10.60 Gs @ 109.08 msec



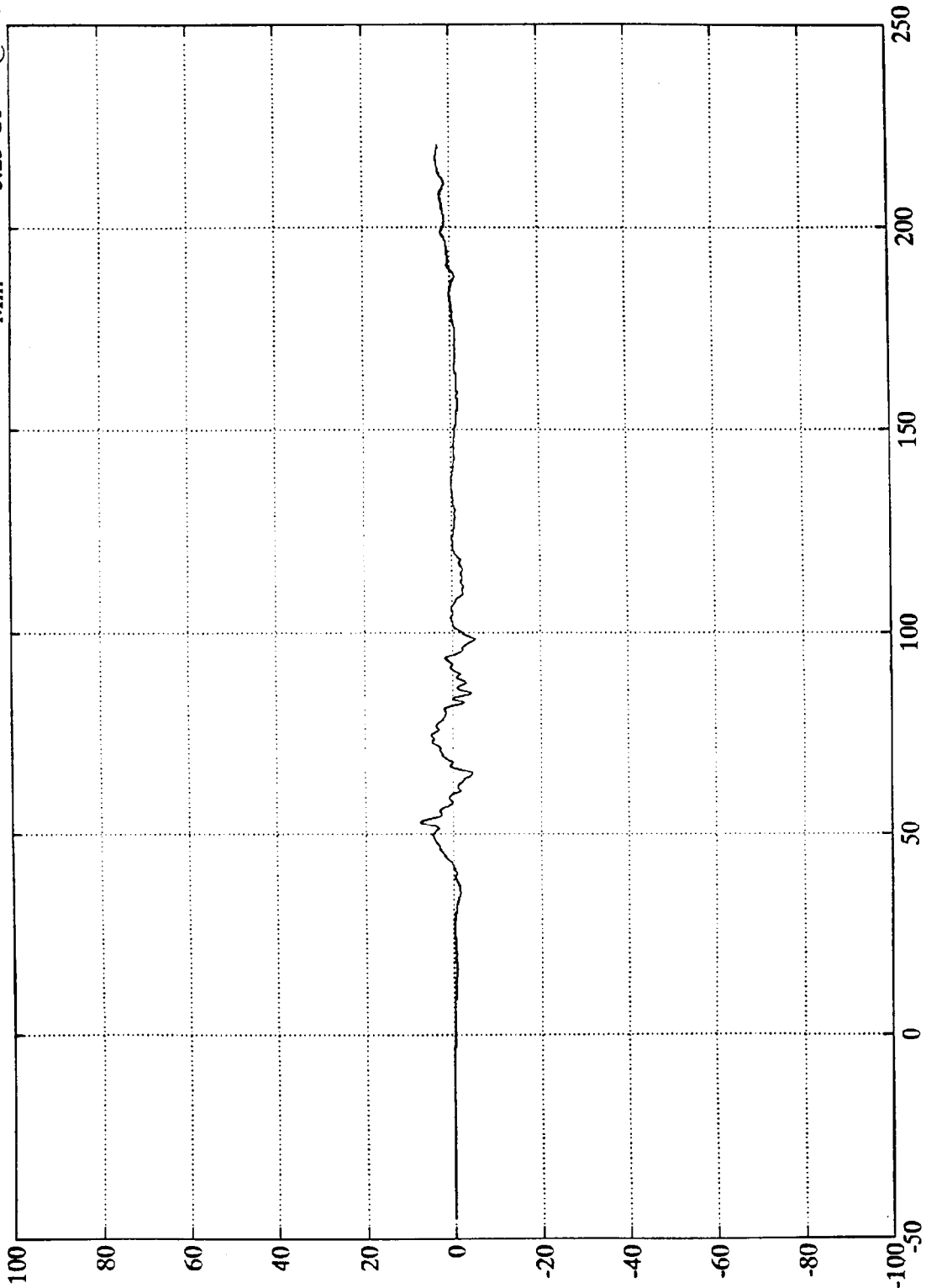
Time (msec)

SAE Filter Class 180

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Chest Z

Max = 7.46 Gs @ 53.15 msec
Min = -5.23 Gs @ 98.52 msec



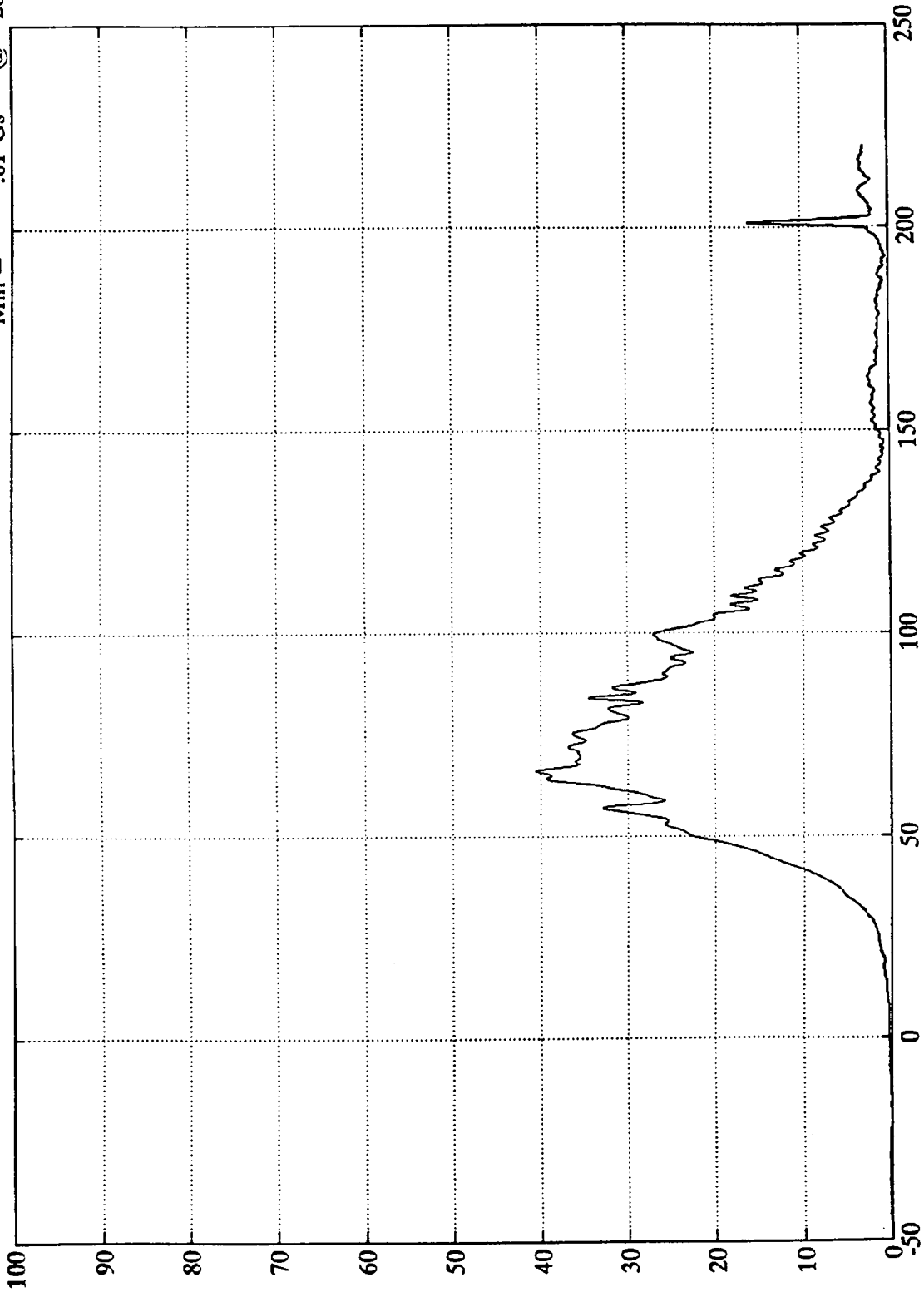
Time (msec)

SAE Filter Class 180

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Chest Resultant

Max = 40.51 Gs @ 66.23 msec
Min = .01 Gs @ -20.76 msec



Time (msec)

SAE Filter Class 180

5

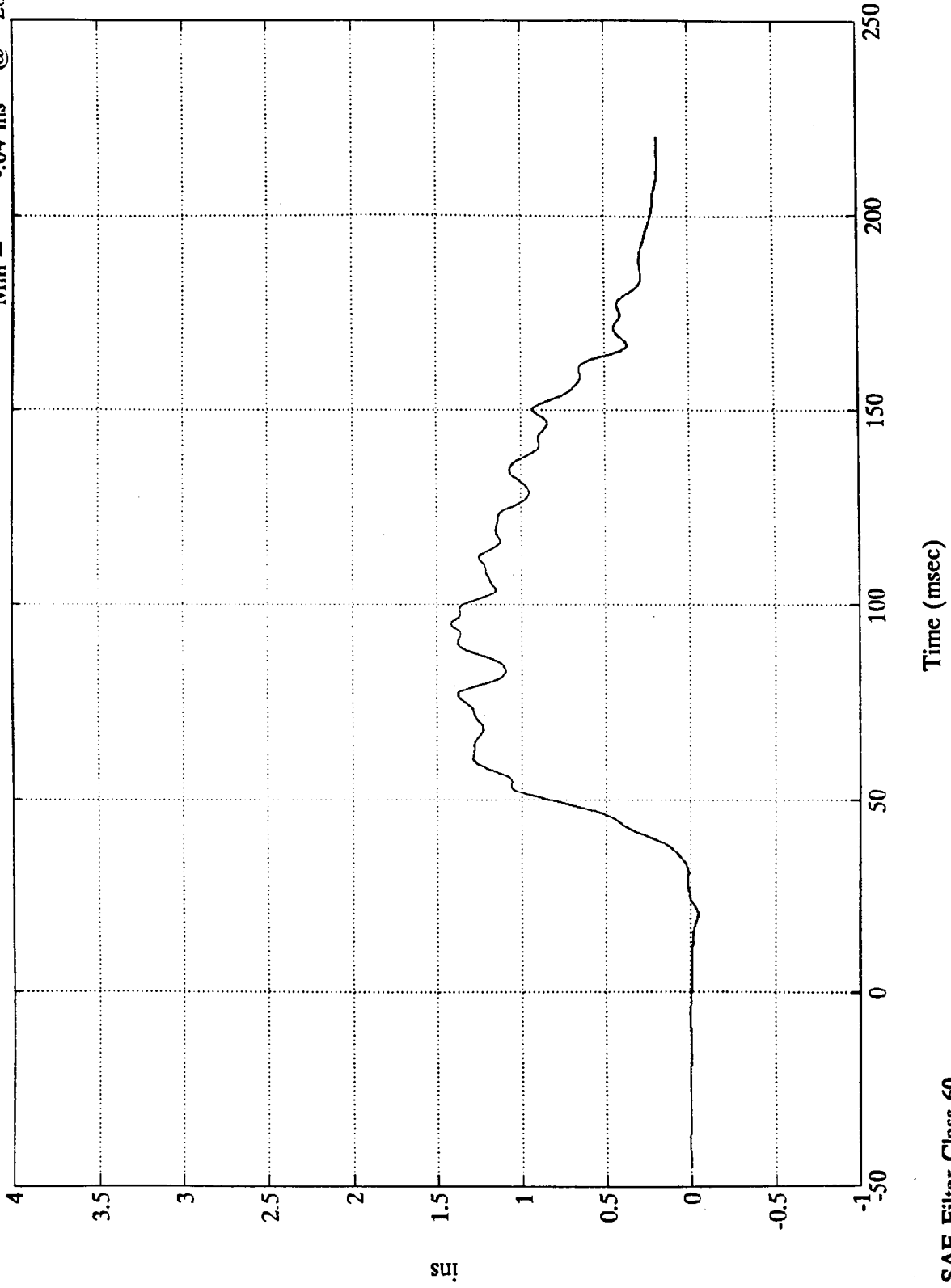
B-99

7946-6

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Chest Disp.

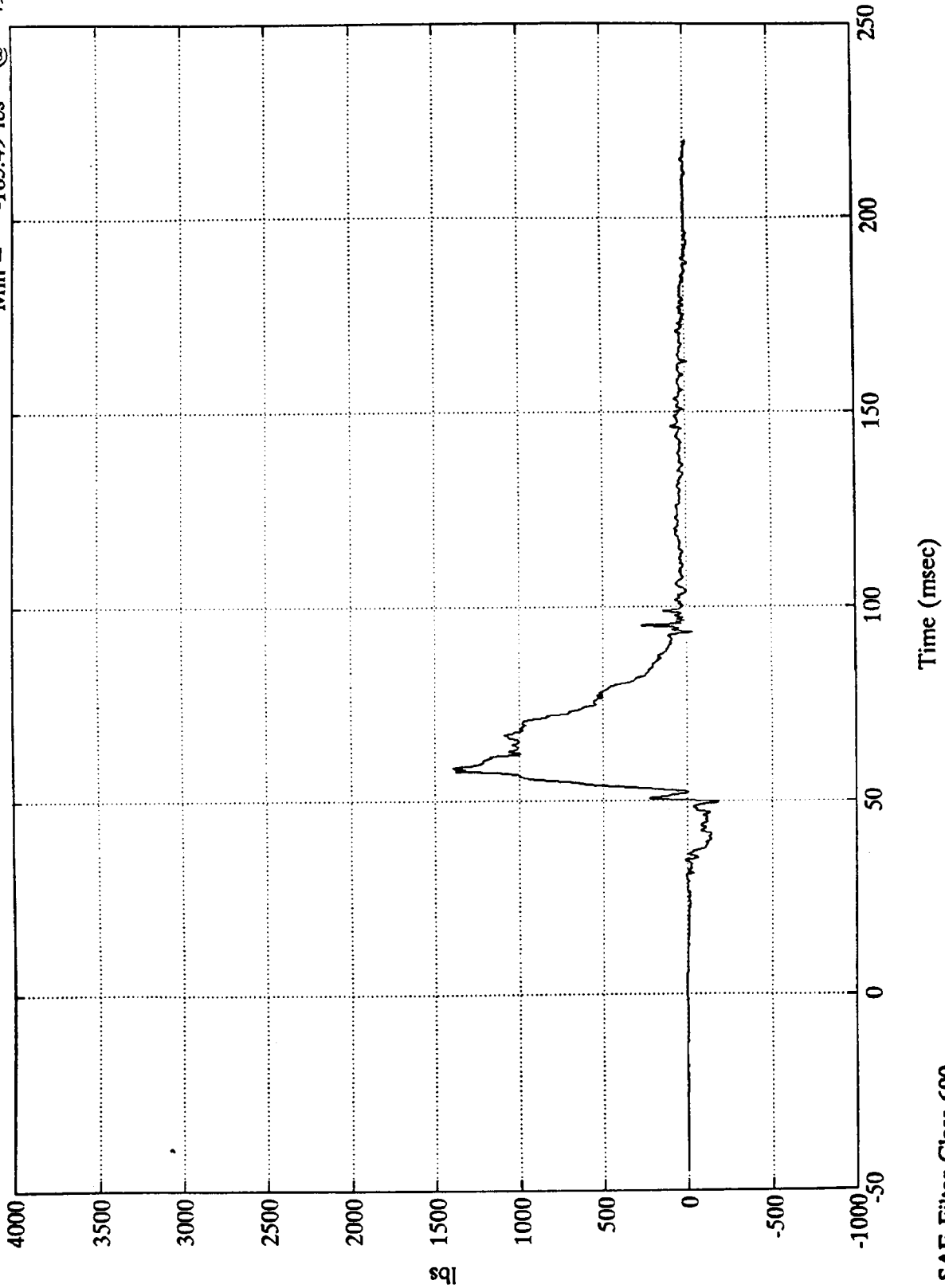
Max = 1.41 ins @ 95.16 msec
Min = -0.04 ins @ 20.39 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Left Femur

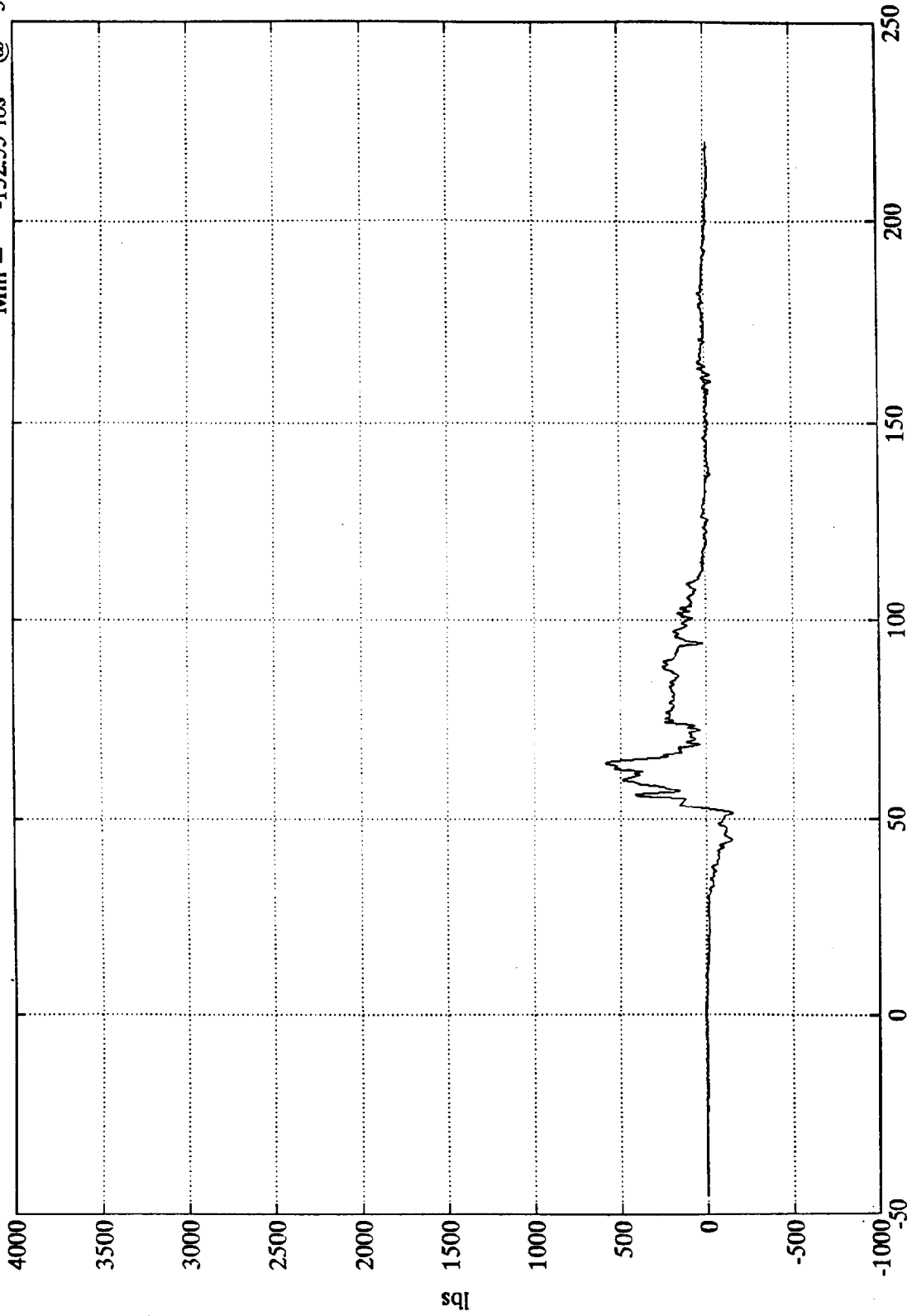
Max = 1396.04 lbs @ 58.79 msec
Min = -185.49 lbs @ 49.68 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Right Femur

Max = 585.58 lbs @ 64.08 msec
Min = -152.55 lbs @ 51.60 msec



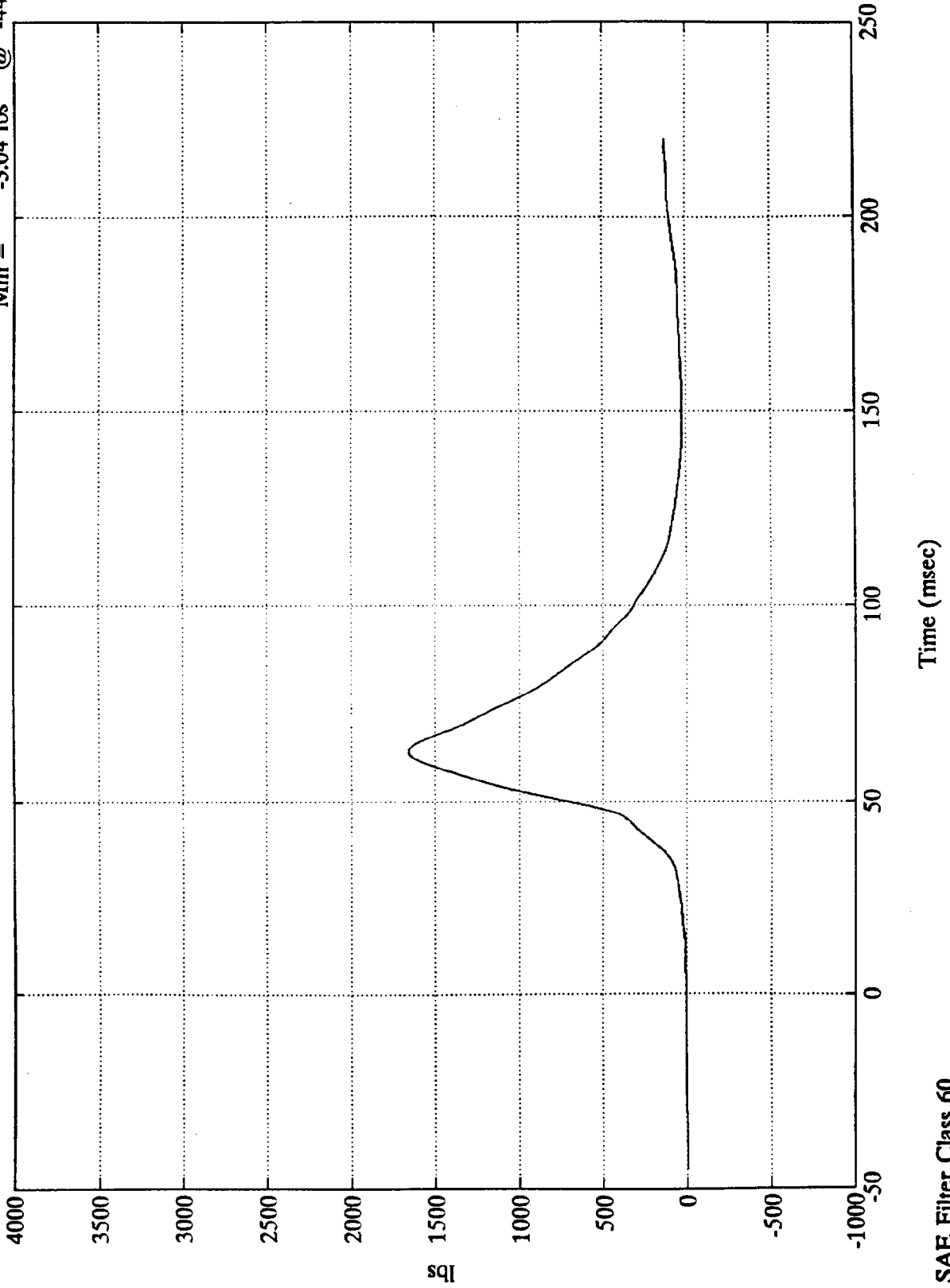
Time (msec)

SAE Filter Class 600

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Right Belt Load

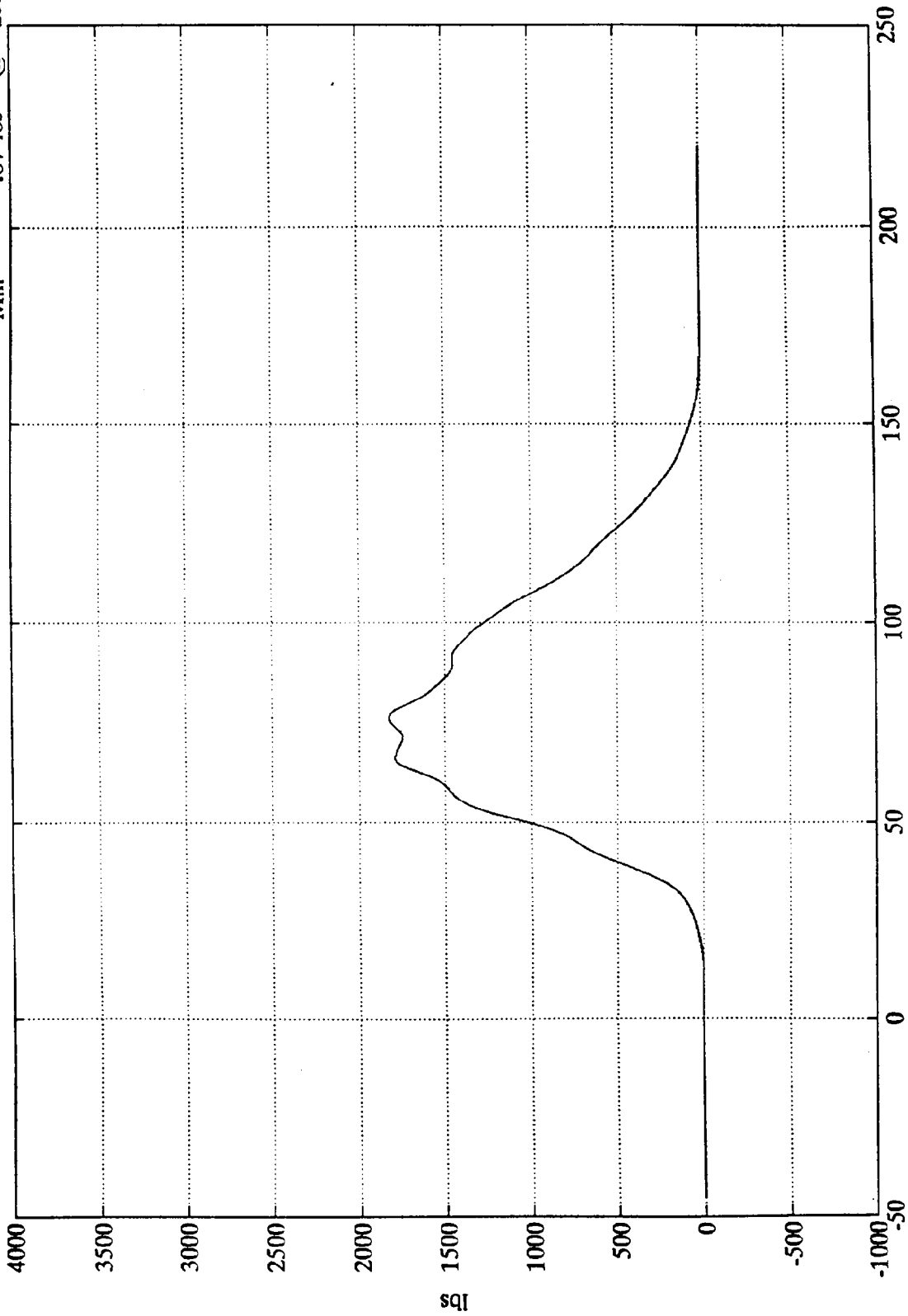
Max = 1659.24 lbs @ 62.88 msec
Min = -3.04 lbs @ -44.88 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Torso Belt Load

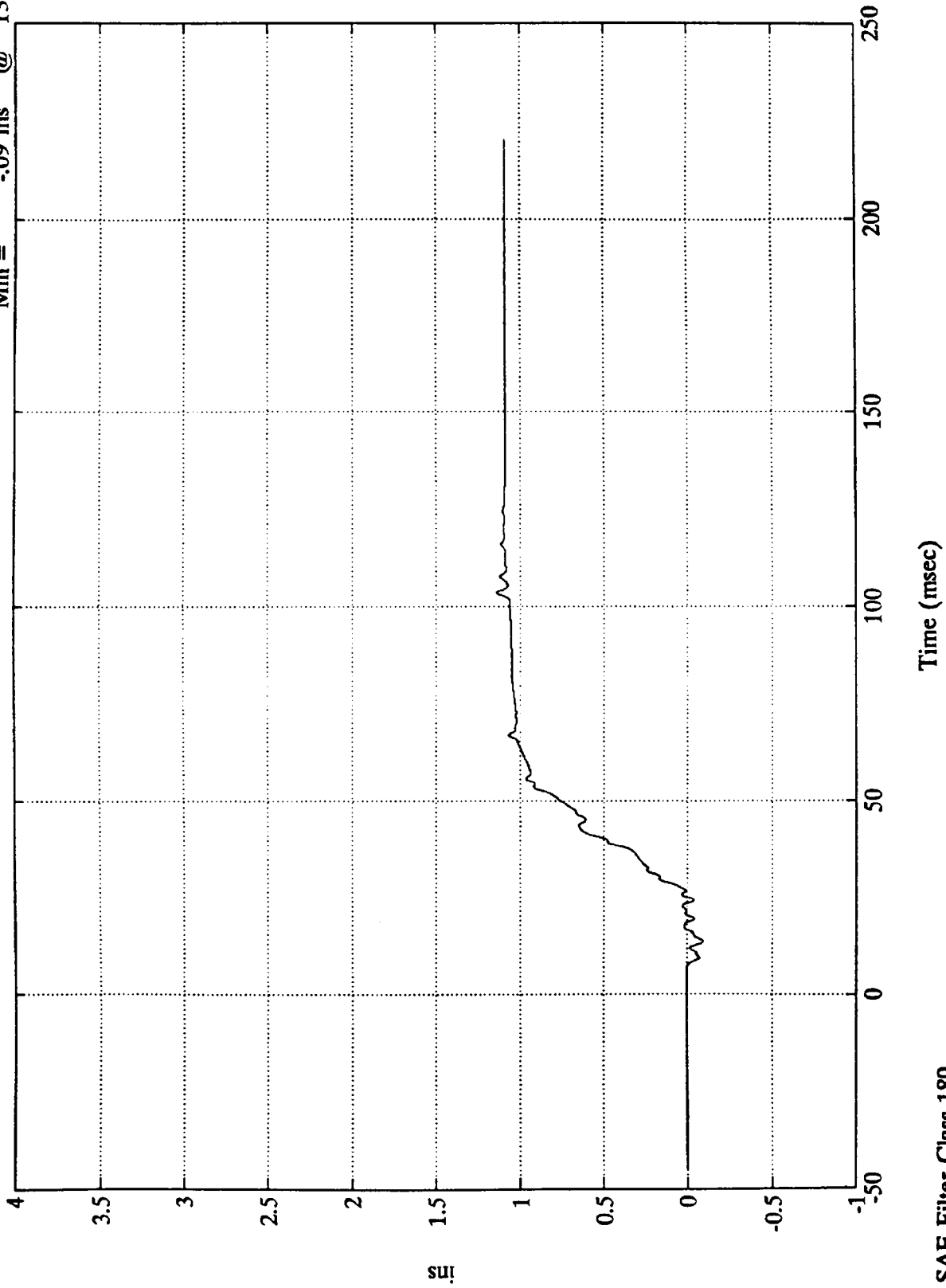
Max = 1824.45 lbs @ 76.08 msec
Min = -87 lbs @ -23.76 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Belt Spool Out

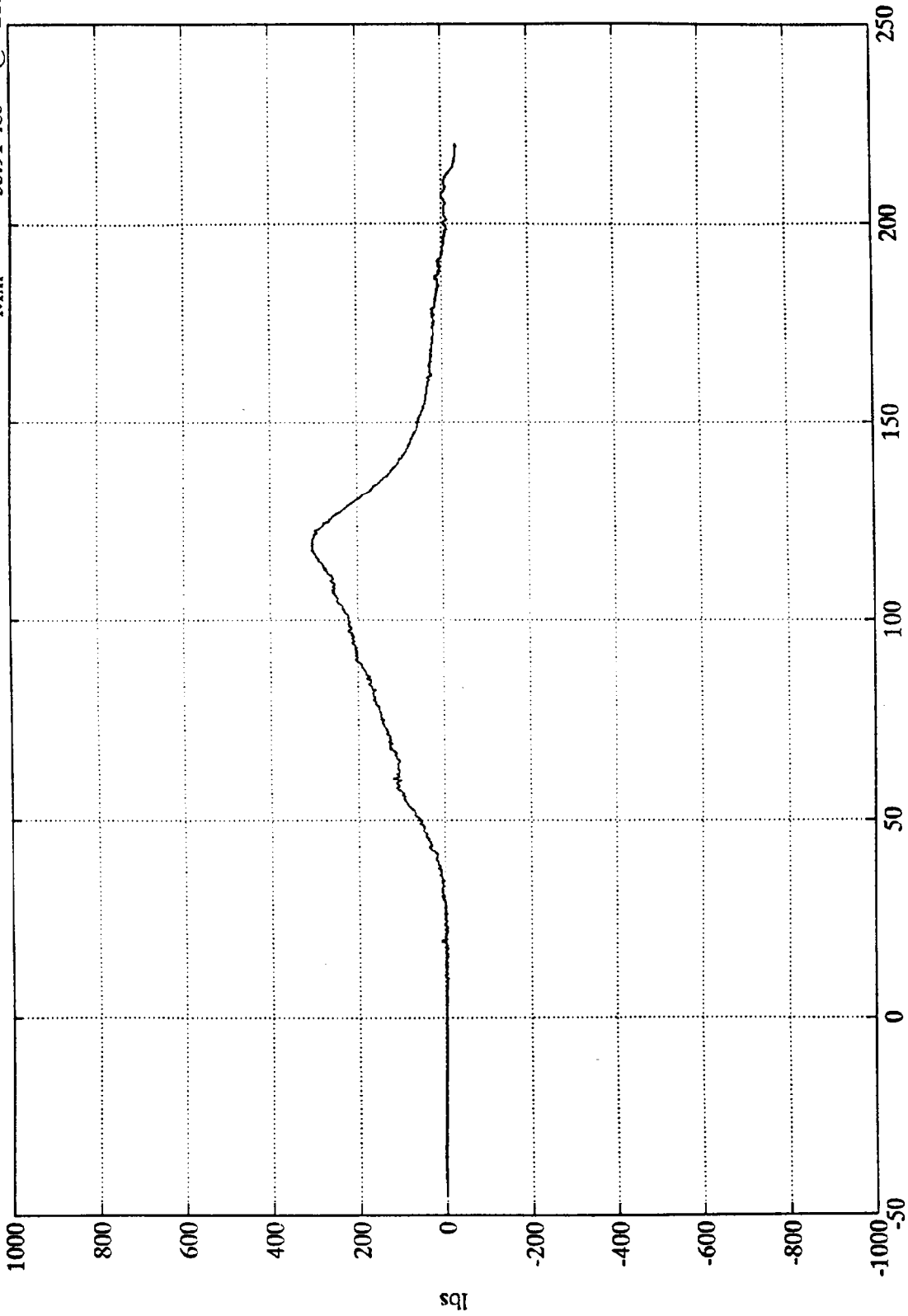
Max = 1.13 ins @ 103.55 msec
Min = -.09 ins @ 13.67 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Upper Neck Fx

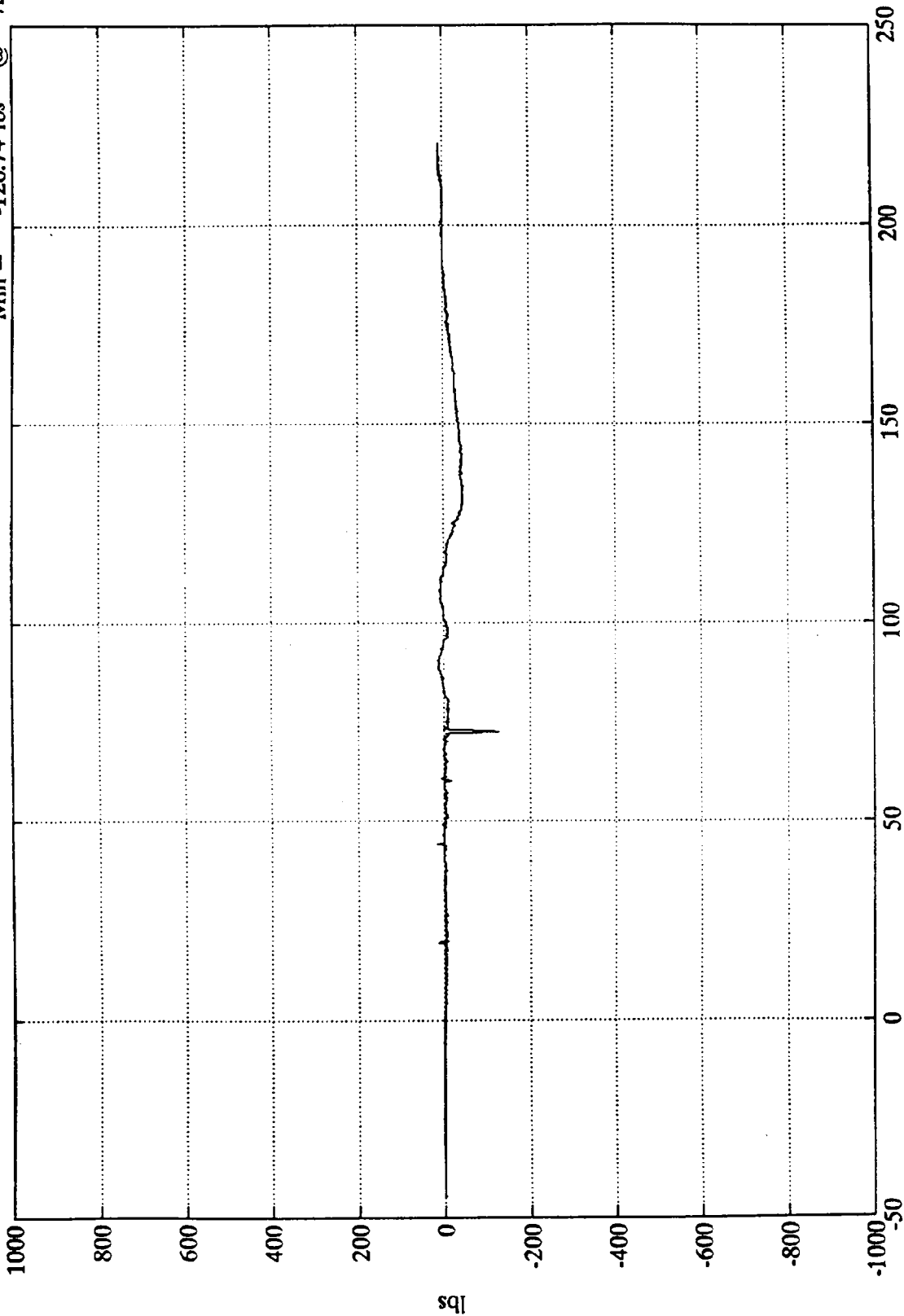
Max = 305.17 lbs @ 119.52 msec
Min = -35.91 lbs @ 219.48 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Upper Neck Fy

Max = 15.69 lbs @ 44.27 msec
Min = -126.74 lbs @ 72.48 msec



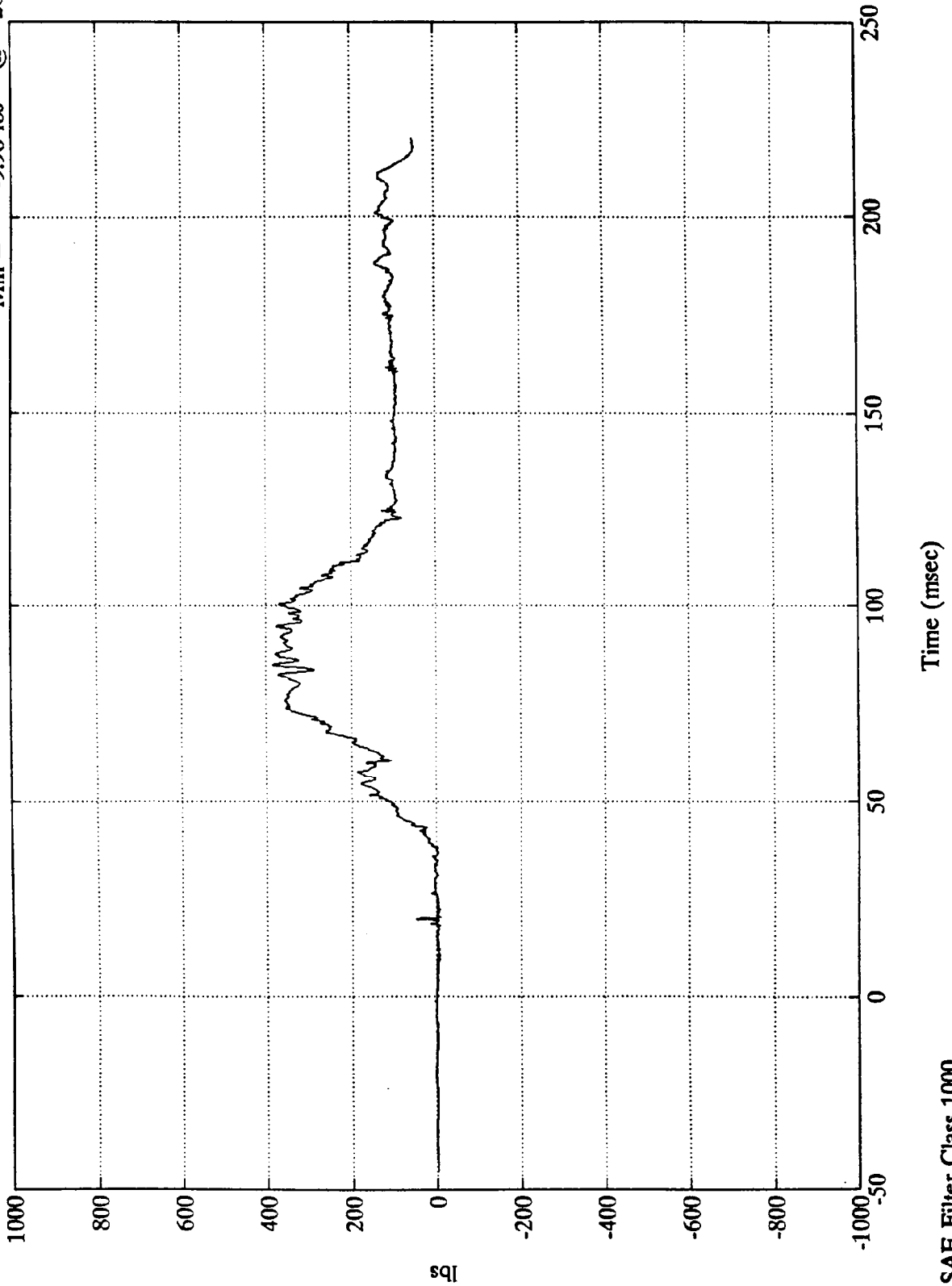
Time (msec)

SAE Filter Class 1000

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Upper Neck Fz

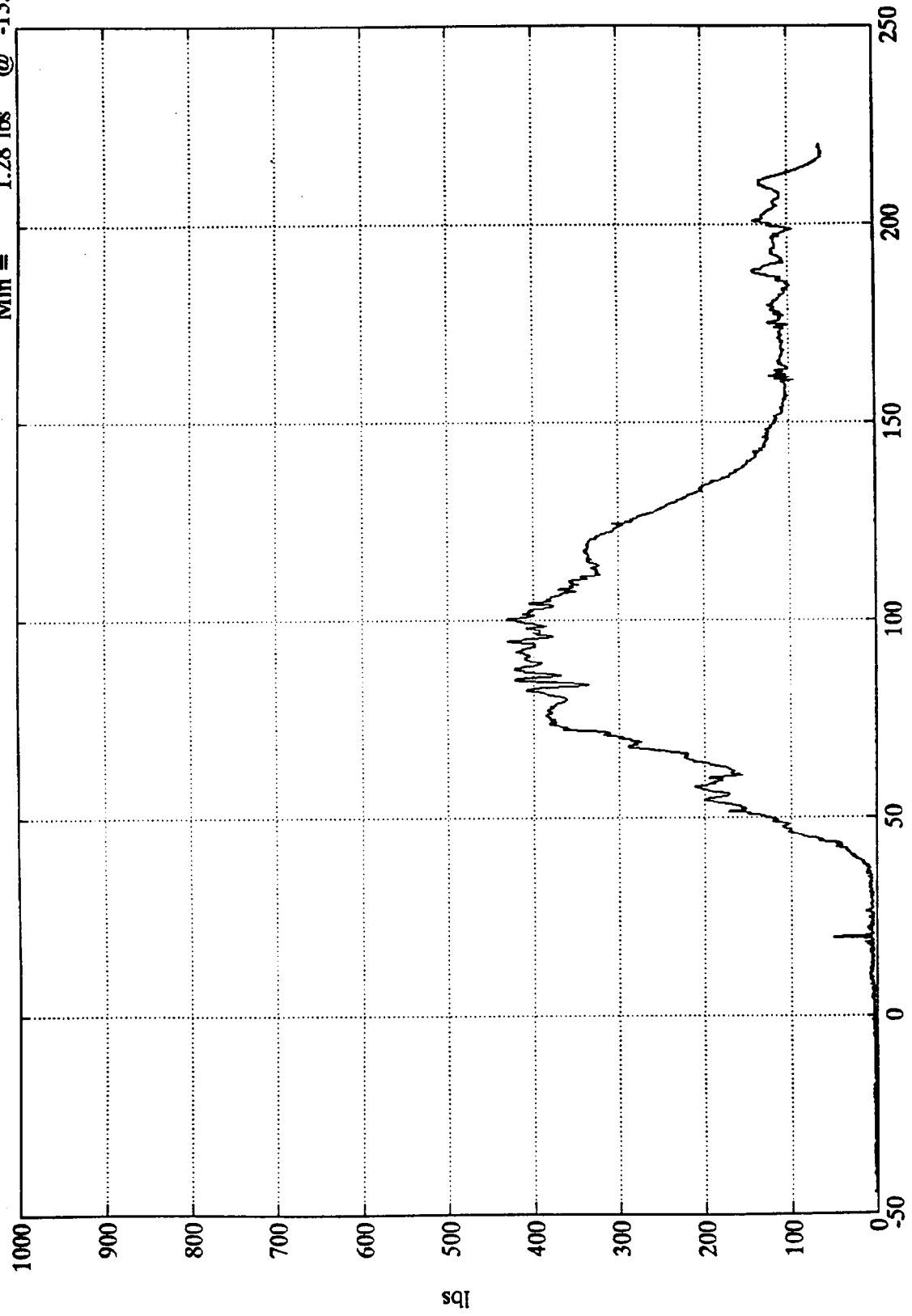
Max = 385.54 lbs @ 85.08 msec
Min = -9.98 lbs @ 20.28 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Neck Force Res.

Max = 430.09 lbs @ 100.32 msec
Min = 1.28 lbs @ -13.56 msec



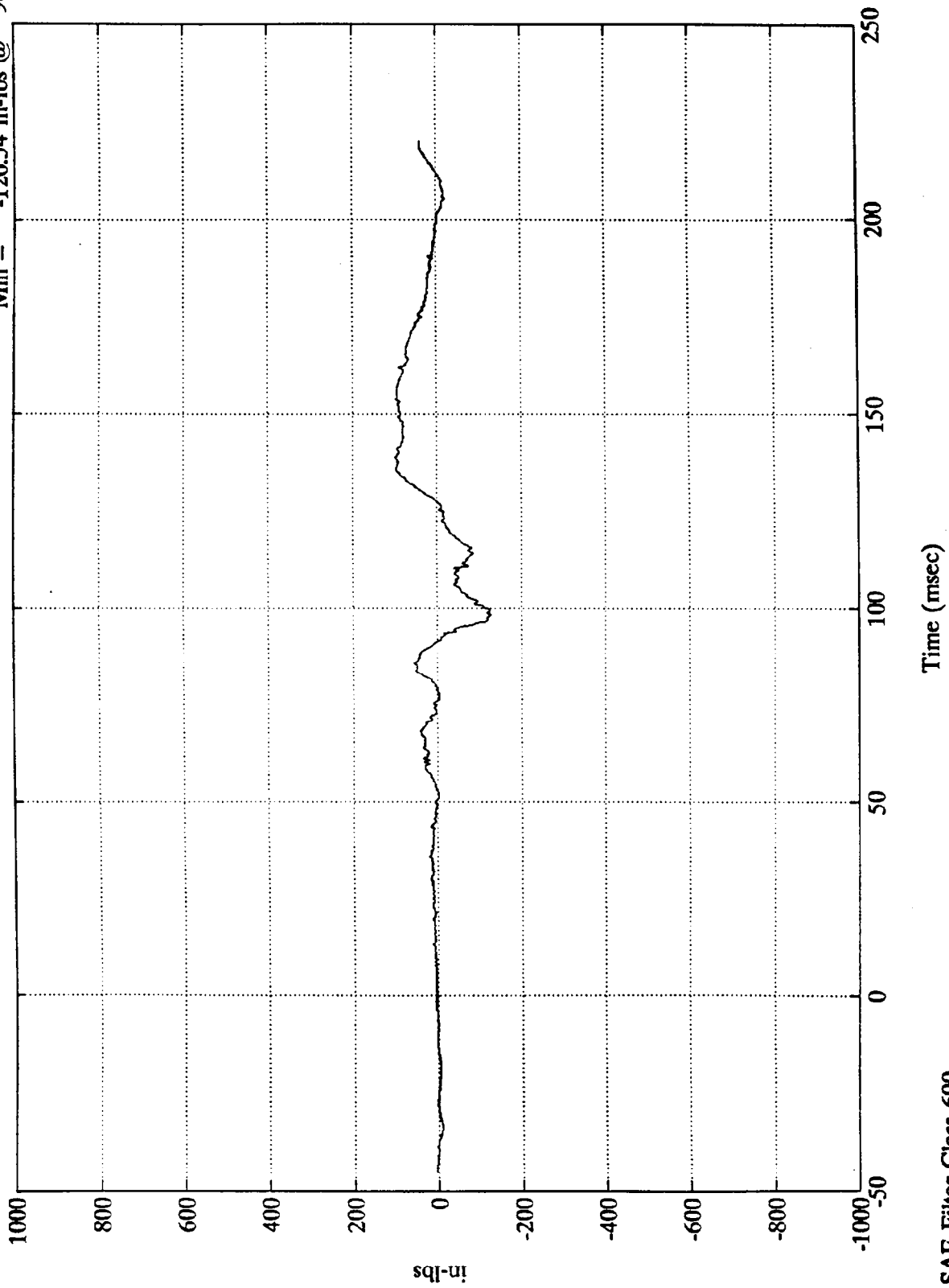
Time (msec)

SAE Filter Class 1000

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Upper Neck Mx

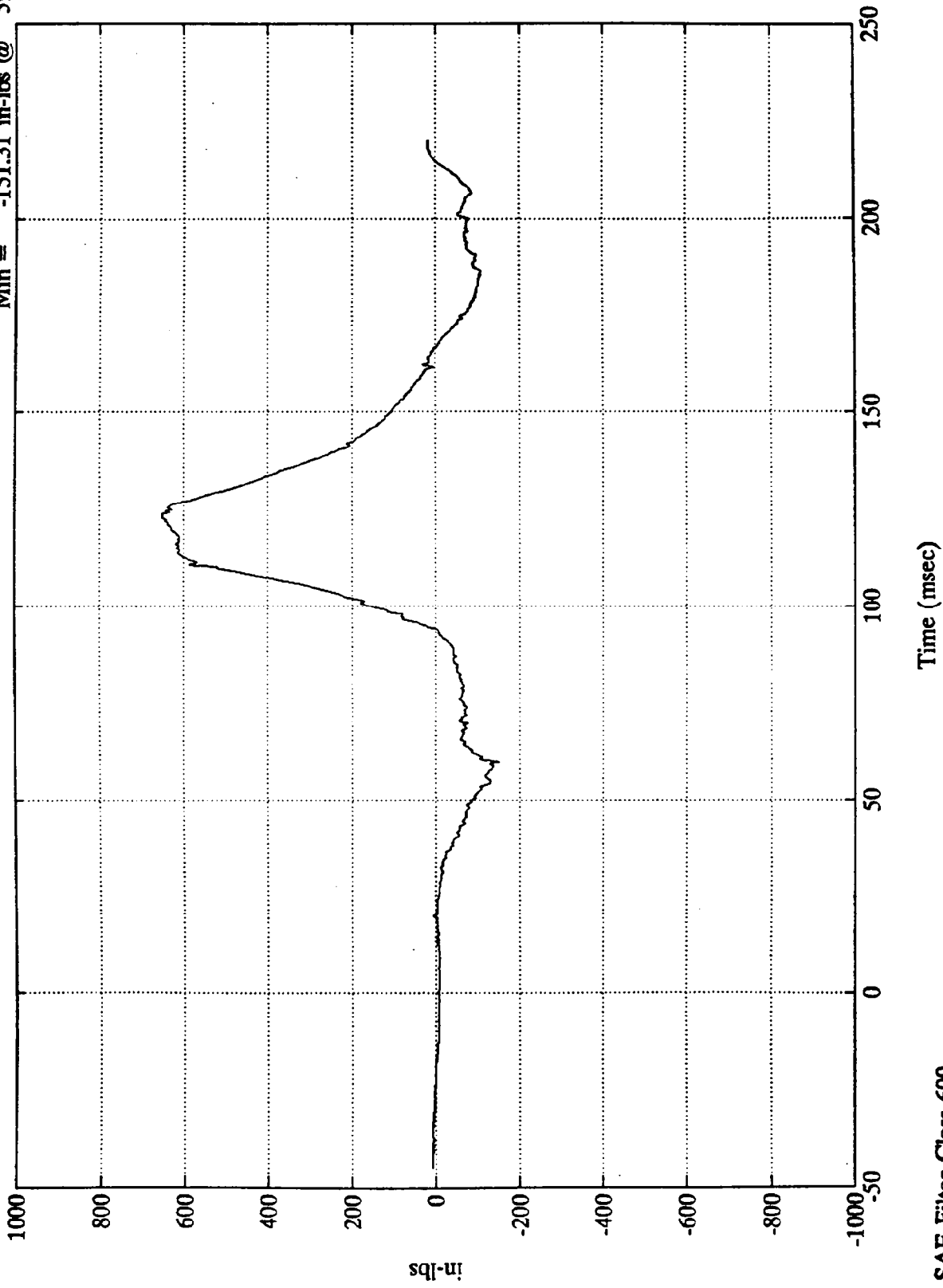
Max = 98.79 in-lbs @ 138.72 msec
Min = -126.54 in-lbs @ 98.28 msec



NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Upper Neck My

Max = 652.01 in-lbs @ 123.96 msec
Min = -151.31 in-lbs @ 59.88 msec



sq-in-lbs
B-111

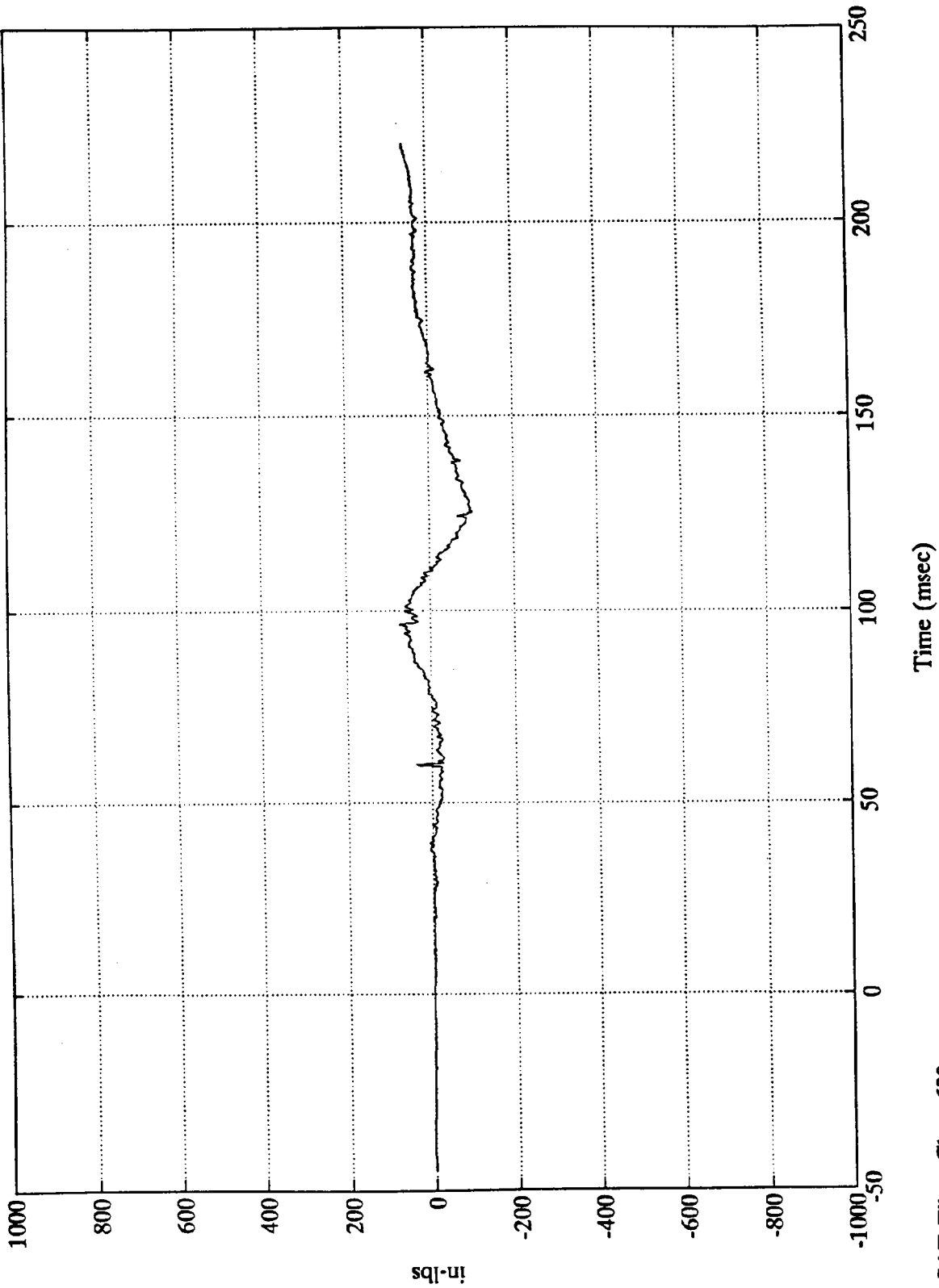
7946-6

SAE Filter Class 600

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Upper Neck Mz

Max = 73.07 in-lbs @ 96.48 msec
Min = -103.39 in-lbs @ 125.64 msec



sqi-ui
B-112

7946-6

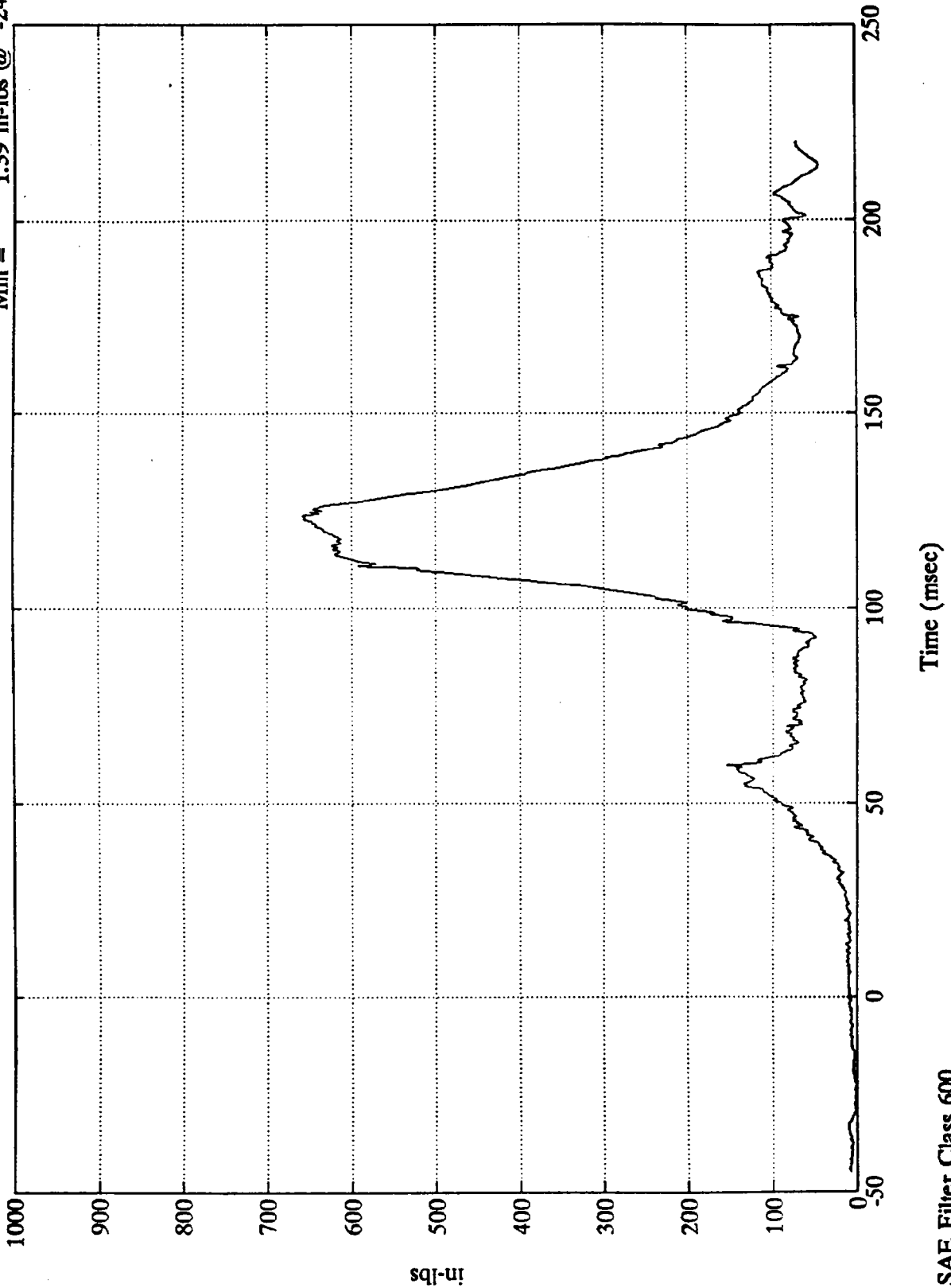
SAE Filter Class 600

Time (msec)

NCAP TEST #6 1992 DODGE CARAVAN

Pos. 2 Neck Moment Res.

Max = 658.37 in-lbs @ 123.96 msec
Min = 1.39 in-lbs @ -24.48 msec



sqj-ui

B-113

7946-6

SAE Filter Class 600

Appendix C

PART 572E DUMMY CONFIGURATION

AND PERFORMANCE VERIFICATION DATA SHEETS

Appendix C contains the results from certification tests performed on the 50th percentile male anthropomorphic test devices utilized for this crash test. The results indicate that the dummies meet all of the performance requirements of the six standard tests as specified in 49 CFR Part 572, Federal Register, Volume 42, No. 25, dated February 7, 1977.

The tests were conducted at the Dummy Certification Test Facility of Calspan Corporation, Advanced Technology Center. A summary of the test results, and Part 572 specifications are included in this Appendix.

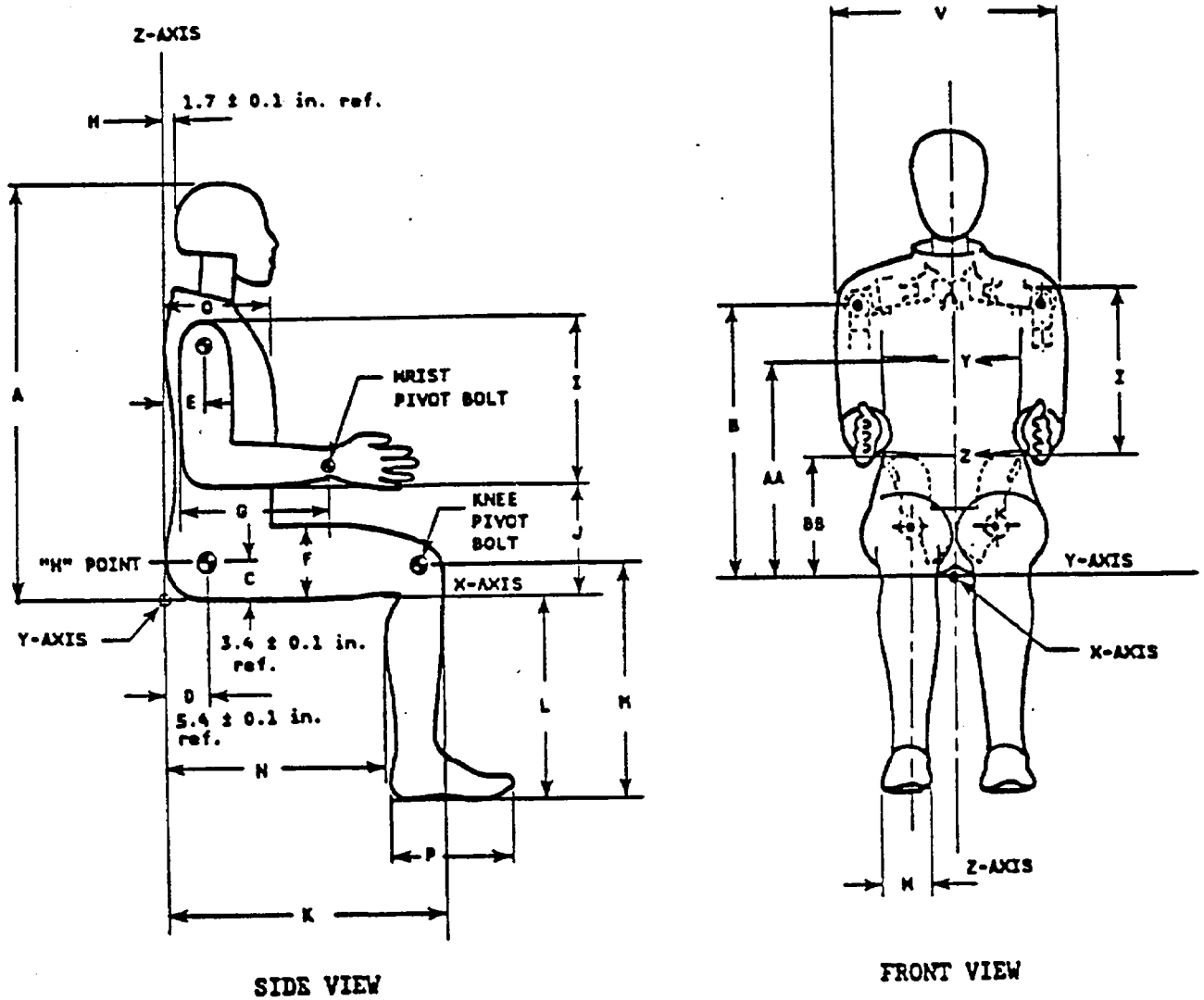
Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
45	11-15-91
150	9-5-91

Electronic Test Equipment

The complement of signal conditioning, recording and display equipment, in conjunction with dummy certification testing, can be found in New Car Assessment and Standards Indicant Testing Final Report No. 6525-V-1.

Figure 10
EXTERNAL DIMENSIONS SETUP SPECIFICATIONS



Note: Figure is referenced to the erect seated position. The curved lumbar does not allow the Bybrid III to be positioned in a perfect erect attitude.

HYBRID III EXTERNAL DIMENSIONS

S/N HUMANOID

DUMMY SERIAL NO. 45

DATE: 11-15-91

TEMPERATURE		70 DEG. F
RELATIVE HUMIDITY		50 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)	16.9-17.1 IN	17.1 IN
LOCATION FOR WAIST CIRCUMFERENCE (BB)	8.9-9.1 IN	9.0 IN
CHEST CIRCUMFERENCE (Y)	38.2-39.4 IN	38.6 IN
WAIST CIRCUMFERENCE (Z)	32.1-34.1 IN	32.9 IN
CHEST DEPTH (O)	8.4-9.0 IN	8.7 IN
H-POINT HEIGHT (C)	3.3-3.5 IN	3.4 IN
H-POINT FROM SEAT BACK (D)	5.3-5.5 IN	5.4 IN
SKULL CAP TO BACKLINE (H)	1.6-1.8 IN	1.7 IN
TOTAL SITTING HEIGHT (A)	34.6-35.0 IN	34.9 IN
THIGH CLEARANCE (F)	5.5-6.1 IN	5.7 IN
BUTTOCK KNEE LENGTH (K)	22.8-23.8 IN	23.5 IN
BUTTOCK POPLITAL LENGTH (N)	17.8-18.8 IN	18.0 IN
POPLITEAL LENGTH (L)	16.9-17.9 IN	17.4 IN
KNEE PIVOT HEIGHT (M)	19.1-19.7 IN	19.4 IN
FOOT LENGTH (P)	9.9-10.5 IN	10.3 IN
FOOT BREADTH (W)	3.6-4.2 IN	4.1 IN
SHOULDER PIVOT FROM BACKLINE (E)	3.3-3.7 IN	3.5 IN
SHOULDER BREADTH (V)	16.6-17.2 IN	16.8 IN
SHOULDER PIVOT HEIGHT (B)	19.9-20.5 IN	20.1 IN
ELBOW REST HEIGHT (J)	7.5-8.3 IN	8.0 IN
SHOULDER-ELBOW LENGTH (I)	13.0-13.6 IN	13.2 IN
BACK OF ELBOW TO WRIST PIVOT (G)	11.4-12.0 IN	11.8 IN

DUMMY MEETS SPECIFICATIONS

TECHNICIAN: IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

HEAD DROP TEST

HYBRID III

DATE : 11-15-91

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 45 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	39 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	251.1 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	7.3 G'S
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
 TRANSPORTATION RESEARCH DEPARTMENT
NECK FLEXION TEST

HYBRID III

DATE : 11-15-91

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 45 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71 DEG. F
RELATIVE HUMIDITY		10% - 70%	38 %
IMPACT VELOCITY		22.60 - 23.40 FPS	22.9 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	23.31 G'S
	20 MS	17.60 - 22.60 G'S	22.31 G'S
	30 MS	12.50 - 18.50 G'S	17.77 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	17.77 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	39.63 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	76.23 DEG.
	TIME	57 - 64 MS	61 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.-LBS.	77.1 FT.-LBS.
	TIME	47 - 58 MS	54.38 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	121.88 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	99.63 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
 TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
 HYBRID III

DATE : 11-15-91

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 45 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71 DEG. F
RELATIVE HUMIDITY		10% - 70%	38 %
IMPACT VELOCITY		19.50 - 20.30 FPS	20.2 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	17.23 G'S
	20 MS	14.00 - 19.00 G'S	18.06 G'S
	30 MS	11.00 - 16.00 G'S	15.86 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	15.86 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		38 - 46 MS	43.88 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	95.16 DEG.
	TIME	72 - 82 MS	75.63 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-59.0/-39.0 FT.-LBS.	-57.03 FT.-LBS.
	TIME	65 - 79 MS	70.25 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	154.13 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	131.63 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 11-15-91

CALSPAN SEQUENTIAL NUMBER 1 HY3 SN 45 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	69 - 72 DEG. F	71 DEG. F
RELATIVE HUMIDITY	10% - 70%	37 %
PENDULUM VELOCITY	21.6 - 22.4 FT/SEC	21.6 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 INCHES	2.55 INCHES
MAXIMUM RESISTIVE FORCE	1080 - 1245 POUNDS	1228 POUNDS
INTERNAL HYSTERESIS	69% - 85%	69.7 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 11-15-91

KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 45 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	44 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1068 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 11-15-91

KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 45 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	44 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1107 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY I.D. NUMBER: 45

A. DUMMY INSTRUMENTS

	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER				
HX LONGITUDINAL	ENDEVCO	CS75	10/91	4/92
HY LATERAL	ENDEVCO	CY89	10/91	4/92
HZ VERTICAL	ENDEVCO	CE76	10/91	4/92
2. CHEST ACCELEROMETER				
CX LONGITUDINAL	CEC	A147	10/91	4/92
CY LATERAL	ENDEVCO	CJ54	10/91	4/92
CZ VERTICAL	CEC	A148	10/91	4/92
3. FEMUR LOAD CELLS				
LEFT SIDE	GSE	951	11/91	5/92
RIGHT SIDE	GSE	952	11/91	5/92

B. CALIBRATION LABORATORY INSTRUMENTS

	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. PENDULUM ACC.	CEC	A160	5/91	11/91
2. TEST PROBE ACCELEROMETER	CEC	A161	5/91	11/91
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE	TRANS-DUCER INC	20051	7/91	1/92
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE	BLH	72952	7/91	1/92
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE	CIC	567-11	7/91	1/92

HYBRID III EXTERNAL DIMENSIONS

S/N HUMANOID

DUMMY SERIAL NO. 150

DATE: 9-3-91

TEMPERATURE		70 DEG. F
RELATIVE HUMIDITY		50 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)	16.9-17.1 IN	17.0 IN
LOCATION FOR WAIST CIRCUMFERENCE (BB)	8.9-9.1 IN	9.0 IN
CHEST CIRCUMFERENCE (Y)	38.2-39.4 IN	38.8 IN
WAIST CIRCUMFERENCE (Z)	32.1-34.1 IN	33.2 IN
CHEST DEPTH (O)	8.4-9.0 IN	8.7 IN
H-POINT HEIGHT (C)	3.3-3.5 IN	3.4 IN
H-POINT FROM SEAT BACK (D)	5.3-5.5 IN	5.5 IN
SKULL CAP TO BACKLINE (H)	1.6-1.8 IN	1.6 IN
TOTAL SITTING HEIGHT (A)	34.6-35.0 IN	34.8 IN
THIGH CLEARANCE (F)	5.5-6.1 IN	5.9 IN
BUTTOCK KNEE LENGTH (K)	22.8-23.8 IN	23.2 IN
BUTTOCK POPLITAL LENGTH (N)	17.8-18.8 IN	18.3 IN
POPLITEAL LENGTH (L)	16.9-17.9 IN	17.6 IN
KNEE PIVOT HEIGHT (M)	19.1-19.7 IN	19.4 IN
FOOT LENGTH (P)	9.9-10.5 IN	10.0 IN
FOOT BREADTH (W)	3.6-4.2 IN	4.1 IN
SHOULDER PIVOT FROM BACKLINE (E)	3.3-3.7 IN	3.5 IN
SHOULDER BREADTH (V)	16.6-17.2 IN	16.7 IN
SHOULDER PIVOT HEIGHT (B)	19.9-20.5 IN	20.0 IN
ELBOW REST HEIGHT (J)	7.5-8.3 IN	8.2 IN
SHOULDER-ELBOW LENGTH (I)	13.0-13.6 IN	13.4 IN
BACK OF ELBOW TO WRIST PIVOT (G)	11.4-12.0 IN	11.7 IN

DUMMY MEETS SPECIFICATIONS

TECHNICIAN: IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

HEAD DROP TEST

HYBRID III

DATE : 9-3-91

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 150 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	72 DEG. F
RELATIVE HUMIDITY	10% - 70%	44 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	248.6 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	10.8 G'S
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
 TRANSPORTATION RESEARCH DEPARTMENT

NECK FLEXION TEST

HYBRID III

DATE : 9-4-91

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN:150 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71 DEG. F
RELATIVE HUMIDITY		10% - 70%	47 %
IMPACT VELOCITY		22.60 - 23.40 FPS	23.1 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	23.86 G'S
	20 MS	17.60 - 22.60 G'S	22.34 G'S
	30 MS	12.50 - 18.50 G'S	18.49 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	18.49 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	40.5 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	77.86 DEG.
	TIME	57 - 64 MS	59.13 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.-LBS.	78.16 FT.-LBS.
	TIME	47 - 58 MS	54.13 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	115.5 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	102.88 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

NECK EXTENSION TEST

HYBRID III

DATE : 9-4-91

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN:150 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71 DEG. F
RELATIVE HUMIDITY		10% - 70%	45 %
IMPACT VELOCITY		19.50 - 20.30 FPS	20.2 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	18.65 G'S
	20 MS	14.00 - 19.00 G'S	18.29 G'S
	30 MS	11.00 - 16.00 G'S	14.81 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	14.81 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		38 - 46 MS	45.63 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	101.66 DEG.
	TIME	72 - 82 MS	75.75 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-59.0/-39.0 FT.-LBS.	-54.15 FT.-LBS.
	TIME	65 - 79 MS	70.13 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	153.25 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	131.63 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 9-5-91

KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 150 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	71 DEG. F
RELATIVE HUMIDITY	10% - 70%	42 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1105 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 9-5-91

KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 150 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	71 DEG. F
RELATIVE HUMIDITY	10% - 70%	42 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1110 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 9-5-91

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN 150 H.S. THORAX

CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	69 - 72 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	46 %
PENDULUM VELOCITY	21.6 - 22.4 FT/SEC	21.6 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 INCHES	2.53 INCHES
MAXIMUM RESISTIVE FORCE	1080 - 1245 POUNDS	1240 POUNDS
INTERNAL HYSTERESIS	69% - 85%	75.8 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY I.D. NUMBER: 150

A. DUMMY INSTRUMENTS

	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER				
HX LONGITUDINAL	ENDEVCO	ER72	10/91	4/92
HY LATERAL	ENDEVCO	GD54	10/91	4/92
HZ VERTICAL	ENDEVCO	CK11	10/91	4/92
2. CHEST ACCELEROMETER				
CX LONGITUDINAL	CEC	A145	10/91	4/92
CY LATERAL	ENDEVCO	FL04	10/91	4/92
CZ VERTICAL	CEC	A149	10/91	4/92
3. FEMUR LOAD CELLS				
LEFT SIDE	GSE	548	11/91	5/92
RIGHT SIDE	GSE	549	11/91	5/92

B. CALIBRATION LABORATORY INSTRUMENTS

	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. PENDULUM ACC.	CEC	A160	5/91	11/91
2. TEST PROBE ACCELEROMETER	CEC	A161	5/91	11/91
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE	TRANS-DUCER INC	20051	7/91	1/92
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE	BLH	72952	7/91	1/92
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE	CIC	567-11	7/91	1/92



Appendix D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(6 Month Calibration Minimum)

DRIVER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head X Y Z	C575	ENDEVCO	10/91	4/92
	CY89	ENDEVCO	10/91	4/92
	CE76	ENDEVCO	10/91	4/92
Chest X Y Z	A147	CEC	10/91	4/92
	CJ54	ENDEVCO	10/91	4/92
	A148	CEC	10/91	4/92
Right Femur Load Cell	312	GSE	11/91	5/92
Left Femur Load Cell	311	GSE	11/91	5/92
Neck Load Cell X Y Z	269	DENTON	6/91	12/91
	269	DENTON	6/91	12/91
	269	DENTON	6/91	12/91
Neck Moment X Y Z	269	DENTON	6/91	12/91
	269	DENTON	6/91	12/91
	269	DENTON	6/91	12/91
Chest Deflection Gauge Hybrid III Use Only	45	HUMANOID	10/91	4/92
Lap Belt Load Cells	123	LEBOW	11/91	5/92
Shoulder Belt Load Cells	127	LEBOW	11/91	5/92
Spool-Out Potentiometer	22	SERVONIC INST.	10/91	4/92
Belt Stretch Transducer	E1	CALSPAN	10/91	4/92

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(6 Month Calibration Minimum)

PASSENGER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head X Y Z	ER72	ENDEVCO	10/91	4/92
	GD54	ENDEVCO	10/91	4/92
	CK11	ENDEVCO	10/91	4/92
Chest X Y Z	A145	CEC	10/91	4/92
	FLO4	ENDEVCO	10/91	4/92
	A149	CEC	10/91	4/92
Right Femur Load Cell	549	GSE	11/91	5/92
Left Femur Load Cell	548	GSE	11/91	5/92
Neck Load Cell X Y Z	076	DENTON	7/91	1/92
	076	DENTON	7/91	1/92
	076	DENTON	7/91	1/92
Neck Moment X Y Z	076	DENTON	7/91	1/92
	076	DENTON	7/91	1/92
	076	DENTON	7/91	1/92
Chest Deflection Gauge Hybrid III Use Only	150	HUMANOID	10/91	4/92
Lap Belt Load Cells	133	LEBOW	11/91	5/92
Shoulder Belt Load Cells	135	LEBOW	11/91	5/92
Spool-Out Potentiometer	32	SERVONIC INST.	10/91	4/92
Belt Stretch Transducer	E3	CALSPAN	10/91	4/92

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration	
			Last	Next
Left Seat Rear Crossmember	A52	CEC	10/91	4/92
Right Rear Seat Crossmember	A184	CEC	10/91	4/92
Top of Engine	A159	CEC	10/91	4/92
Bottom of Engine	A187	CEC	9/91	3/92
Left Disc Brake Caliper	A152	CEC	10/91	4/92
Right Disc Brake Caliper	A29	CEC	10/91	4/92
Instrument Panel	A164	CEC	10/91	4/92
Center Rear Crossmember Z	A175	CEC	10/91	4/92
Vehicle Rear Z	A177	CEC	10/91	4/92

INSTRUMENT CALIBRATION FOR LABORATORY INSTRUMENTS
(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration	
			Last	Next
Neck Bending Pendulum Accel.	A160	CEC	5/91	11/91
Neck Bending Rotary Potentiometer	None	BOURNS	7/91	1/92
Femur Probe Accelerometer	A161	CEC	5/91	11/91
Chest/Thorax Probe Accel.	A161	CEC	5/91	11/91
Lumbar Flexion Force Gauge	20051	TRANSDUCER INC.	7/91	1/92

Appendix E

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

assist the props when opening the gate in cold weather.

WINDOWS

Rear Quarter Windows

A lever at the rear of each window releases the window so that it can be pushed out for ventilation.

Power Vent Windows (If so equipped)

Switches on the overhead console, let you or the front seat passenger operate the two vent windows from the front seat.

Power Windows (if so equipped)

You can control either front window using switches on the door armrest. There is a single switch on the passenger's armrest. The switches will operate only when the ignition is in the ON position.

OCCUPANT RESTRAINTS

One of the most important safety features in your vehicle is the restraint system. This system includes the front and rear seat belts and the driver's side airbag. Your seat belts also can hold infant and child restraint systems if you will be carrying children too small for adult-size belts.

Please pay close attention to the information in this section. It tells you how to use your restraint system properly to keep you and your passengers as safe as possible.

WARNING! In a collision, you and your passengers can suffer much greater injuries if you are not properly buckled up. You can strike parts on the inside of your vehicle or other passengers, or you can be thrown out of the vehicle. Always be

sure you and others in your vehicle are buckled up properly.

Buckle up even though you are an excellent driver. Even on short trips. Someone on the road may be a poor driver and cause a collision that includes you. And this can happen far away from home or on your street.

Research has shown that seat belts save lives. They also can reduce the seriousness of injuries in a collision. Some of the worst injuries happen when people are thrown from the vehicle. Seat belts provide protection against that, and they reduce the risk of injury caused by striking the inside of the vehicle. **Everyone** in a motor vehicle needs to be buckled up **all the time**.

UNIBELTS

The UNIBELT, or single continuous-belt restraint system, is installed for the driver, front seat passenger, and right and left rear seating positions.

Each unibelt is a combined lap/shoulder belt system. The belt webbing retractor will lock only during very sudden stops or impacts. This feature allows the shoulder part of the belt to move freely with you under normal conditions. But in a collision, the belt will lock and reduce the risk of your striking the inside of the vehicle or being thrown out. The front seat belt retractors will also lock if the belt webbing is jerked or pulled rapidly.

WARNING! Wearing a seat belt incorrectly is dangerous. Seat belts are designed to go around the large bones of your body. These are the strongest parts of your body and can take the forces of a

collision the best. Wearing your belt in the wrong place could make your injuries in a collision much worse. You might suffer internal injuries, or you could even slide out of part of the belt. Follow these instructions to wear your seat belt safely and to keep your passengers safe, too.

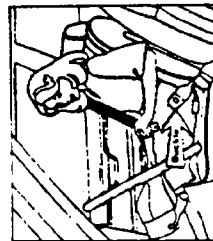
Unibelt Operating Instructions



1. Enter the vehicle and close the door. Sit back and adjust the seat.



2. The seat belt latch plate is above the back of your seat. Grasp the latch plate and pull out the belt. Slide the latch plate up the webbing as far as necessary to make the belt go around your lap.



3. When the belt is long enough to fit, insert the latch plate into the buckle until you hear a "click."

WARNING! A belt that is buckled into the wrong buckle will not protect you properly. The lap portion could ride too

high on your body, possibly causing internal injuries. Always buckle your belt into the buckle nearest you.

A belt that is too loose will not protect you as well. In a sudden stop you could move too far forward, increasing the possibility of injury. Wear your seat belt snugly.

A belt that is worn under your arm is very dangerous. Your body could fall into the inside surfaces of the vehicle in a collision, increasing head and neck injury. And a belt worn under the arm is very likely to break your ribs. Ribs aren't as strong as shoulder bones. Wear the belt over your shoulder so that your strongest bones will take the force in a collision.



4

4. Position the lap belt across your thighs, below your abdomen. To remove slack in the lap belt portion, pull up a bit on the shoulder belt as shown. To loosen the lap belt if it is too tight, tilt the latch plate and pull on the lap belt. A snug lap belt reduces the risk of sliding under the belt in a collision.

WARNING! A lap belt worn too high can increase the risk of internal injury in a collision. The belt forces won't be at the strong hip and pelvic bones, but across your abdomen. Always wear the lap belt as low as possible and keep it snug.



5

5. Position the lap/shoulder belt on your chest so that it is comfortable and not resting on your neck. The retractor will withdraw any slack in the belt.

WARNING! A twisted belt can't do its job as well. In a collision it could even cut into you. Be sure the belt is straight. If you can't straighten a belt in your vehicle, take it to your dealer and have it fixed.



6

6. To release the belt, push the red button on the buckle. The belt will automatically retract to its stowed position. If necessary, slide the latch plate down the webbing to allow it to retract fully.

SEAT BELTS AND PREGNANT WOMEN

We recommend that pregnant women use the seat belts throughout their pregnancy. Keeping the mother safe is the best way to keep the baby safe.

Pregnant women should wear the lap part of the belt across the thighs and as snug across the hips as possible. Keep the belt low so that it does not come across the abdomen. That way the strong bones of the hips will take the force if there is a collision.

Booster seats that may help overcome this problem are also available for use with lap/shoulder belts. Before buying a booster seat, make sure that it has a label certifying that it meets applicable Motor Vehicle Safety Standards. Make sure that is satisfactory for use in this vehicle.

DRIVER SUPPLEMENTAL MINIVAN RESTRAINT SYSTEM - AIRBAG

This vehicle has an airbag for the driver as a supplement to the seat belt restraint system. The airbag is mounted in the steering wheel. It works in more severe frontal collisions to provide additional protection for the head and chest of the seat belted driver.

WARNING! Relying on the airbag alone could lead to more severe injuries in a collision. The airbag is NOT a complete restraint system and does not provide restraint to the lower body in frontal collisions, nor does it provide any restraint in side or rear collisions or rollovers. This Minivan airbag does not qualify as a passenger car passive restraint system. Always wear the seat belt.

The seat belt system is designed to protect you in many types of collisions. The airbag deploys only in frontal collisions. And it will not deploy in collisions at slow speed. But even in collisions where the airbag does work, you need the seat belt to keep you in the right position for the airbag to protect you properly.

Ignoring the AIRBAG light in your instrument panel could mean you don't have

the airbag to protect you in a collision. If the light does not come on, stays on after you start the vehicle, or if it comes on as you drive, have the airbag system checked right away.

The airbag system consists of the following:

- Crash Sensors
- Diagnostic Unit
- AIRBAG Readiness Light
- Airbag/Inflator Unit
- Unique Steering Wheel and Column
- Interconnecting Wiring

How The Airbag System Works

- **Crash Sensors** in the front of the vehicle and in the occupant compartment determine if a frontal impact is severe enough to require the airbag. The sensors will not detect side, rollover, or rear impacts. Switches in the sensors are connected to the diagnostic unit and to the airbag/inflator unit.
- The **Diagnostic Unit** monitors the readiness of the electronic parts of the system whenever the ignition switch is in the START or RUN positions. These include all of the items listed above. The diagnostic unit also turns on the AIRBAG light in the instrument panel for 6 to 8 seconds when the ignition is first turned on, then turns the light off. If it detects a malfunction in any part of the system, it turns on the light either momentarily or continuously.
- The **Airbag/Inflator Unit** is in the center of the steering wheel. When the crash sensors detect an impact requiring the airbag, they signal the inflator unit. A large quantity of non-toxic nitrogen gas is generated to

inflate the airbag. The steering wheel hub trim cover separates and folds out of the way as the bag inflates to its full size. The bag fully inflates in about 50 milliseconds. This is about half of the time it takes to blink your eyes. It then quickly deflates by venting the nitrogen gas through holes in the airbag toward the instrument panel. In this way the bag does not interfere with your control of the vehicle.

If A Deployment Occurs

The airbag system is designed to deploy when the impact sensors detect a moderate-to-severe frontal collision, and then immediately deflate.

NOTE: *A frontal collision that is not severe enough to need airbag protection will not activate the system. This does not mean something is wrong with the airbag system.*

If you do have a collision which deploys the airbag, any or all of the following may occur:

- The nylon airbag material may sometimes cause abrasions and/or skin reddening to the driver as the airbag deploys and unfolds itself from the steering wheel.

The abrasions are similar to friction rope burns or those you might get sliding along a carpet or gymnasium floor. They are not caused by contact with chemicals. They are not permanent and normally heal quickly. However, if you haven't healed significantly within a few days, or if you have any blistering, see your doctor immediately.

- As the airbag deflates you may see some smoke-like particles. The particles are a normal by-product of the process that generates the non-toxic nitrogen gas used for airbag inflation. These airborne particles may irritate the skin, eyes, nose, or throat. If you have skin or eye irritation, rinse the area with cool water. For nose

or throat irritation, move to fresh air. If the irritation continues, see your doctor.

If these particles settle on your clothing, follow the garment manufacturer's instructions for cleaning.

- Your vehicle may be safely driveable after the airbag deploys. If so, you can tuck the deployed airbag inside the opening in the steering wheel hub trim cover to make driving somewhat easier.

WARNING! A deployed airbag cannot protect you in another collision. You could have much worse injuries without a working airbag. Have the airbag replaced by an authorized dealer as soon as possible.

MAINTAINING YOUR AIRBAG SYSTEM

WARNING!

- Modifications to any part of the airbag system could cause it to fail when you need it. You could be injured because the airbag is not there to protect you. Do not modify the components or wiring, including adding any kind of badges or stickers to the steering wheel hub trim cover. Do not modify the front bumper or vehicle body structure.

- You can be injured if you are too close to the steering wheel hub if the airbag inflates. For this reason, it is dangerous to try to repair any part of the airbag system yourself. Don't try to repair the airbag system. Be sure to tell anyone who works on your vehicle that it has an airbag.

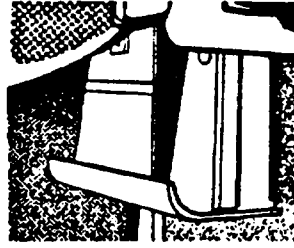
You will want to have the airbag ready to inflate for your protection in an impact. So, if any of the following occurs, have an authorized dealer service the system promptly.

- The AIRBAG light does not come on or flickers during the 6 to 8 seconds when the ignition switch is first turned on.
- The light remains on or flickers after the 6 to 8 second interval.
- The light flickers or comes on and remains on while driving.

The regular maintenance service recommended for every 3 years or 30,000 miles (48 000 km.) includes inspection of the mechanical and electrical components of the airbag system. See the Maintenance Schedule in Section 4.

STORAGE BIN (if so equipped)

The storage bin located under the front passenger's seat can be locked with the master key. If you must leave your vehicle with a parking attendant, give the attendant the "valet" key to maintain secure storage.



A plastic tool retainer is clipped to the inside wall on vehicles equipped with special wheel covers.

SEATS

Reclining Bucket Seats (if so equipped)

Use the control on the inboard side of the seat cushion to operate the recliner. Lean forward slightly before lifting the control, then lean back to the desired position and release the control.