

V 2142

REPORT NUMBER: CAL-94-N04

**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

**CHRYSLER CORPORATION
1995 DODGE RAM 2500
CARGO VAN**

NHTSA NUMBER: MS0304

CALSPAN TEST NUMBER: 8227-4

October 6, 1994

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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.
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16. <i>Abstract</i> A frontal load cell barrier test of a 1995 Dodge Ram 2500 Cargo Van was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York, on October 6, 1994. The impact velocity was 56.8 kph and the temperature at the barrier face was 15°C. The maximum post-test vehicle crush was 600 mm. The test vehicle was equipped with a 3-point continuous belt system at each of the front outboard seating positions. The vehicle was also equipped with a supplemental airbag at the driver's position. With respect to FMVSS 208 "Occupant Crash Protection - Injury Criteria" the driver dummy appears to exceed the maximum head injury criteria (HIC) and the maximum chest resultant over 3 milliseconds.					
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Section 1

PURPOSE AND TEST PROCEDURE

This 56.8 kph frontal barrier impact test is part of the Composite FY 92 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 48.3 kph requirements.

The 56.8 kph frontal barrier impact test was conducted in accordance with the Office of Market Incentives (OMI) Laboratory Indicant Test procedure.

Section 2

SUMMARY OF TEST MS0304

A load cell barrier consisting of 36 load cells was impacted by a 1995 Dodge Ram 2500 Cargo Van at a velocity of 56.8 kph. The test was performed at the Calspan Corporation Advanced Technology Center on October 6, 1994. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by 1 real-time camera and 16 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. 245) and the right-front passenger ATD (Serial No. 45) used in one previous test (MS5201). Injury Criteria were not exceeded in that test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 81 channels of data were recorded on a P.C. based data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces. Pos. 1 Upper Neck Fz did not record accurately. Load Cell B1 did not record accurately.

The driver's HIC was 1474.3. The maximum chest deceleration over 3 milliseconds was 67.0 g's and maximum chest deflection was 47.7 mm. Femur loads were -8765.1 newtons on the left femur and -7936.6 newtons on the right femur.

The right front passenger's HIC was 572.1. Maximum chest deceleration over 3 milliseconds was 59.1 g's and maximum chest deflection was 36.6 mm. Femur loads were -3663.8 newtons on the left and -2526.4 newtons on the right.

Table 1

GENERAL TEST AND VEHICLE DATA

Vehicle Year/Make/Model/Body Style: 1995 Dodge Ram 2500 Cargo Van

NHTSA Test No.: MS0304 VIN.: 2B7HB21Y5SK501139

Body Color: Maroon Date of Manufacture: 8/94

Date Received: 9/22/94

Odometer Reading: 00096

Engine: 8 Cylinders; - C.I.D.; 5.2 Liters; - CC
X Gas; - Diesel; - Turbocharged
X Longitudinal; - Transverse

Transmission: 3 Speed; - Manual; X Automatic; - Overdrive

Final Drive: - Front Wheel; X Rear Wheel; - Four Wheel

Accessories: - A/C; - P/S; - P/B; - P/wdo
- Tilt Wheel; - P/seats; - Cruise Control - Other

Type of Occupant Restraint: 3-point manual belt system, with a driver side airbag.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

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

Recommended Tire Size: P225/75R15

Recommended Cold Tire Pressure: Front 35 psi, Rear 35 psi

Tires on Vehicle: P225/75R15 Manufacturer: Goodyear Invicta

Number of Occupants: 2 Front; - Rear; - 3rd Seat; 2 TOTAL

Type of Front Seats: X Bucket; - Bench; - Split Bench

Type of Front Seat Back: - Fixed; X Adj. with X Lever - Rot. Knob

Rated Cargo and Luggage Weight (RCLW) = 136 kgs.

GVWR 2727 kgs. GAWR: Front 1497 kgs. Rear 1545 kgs.

Table 1

GENERAL TEST AND VEHICLE DATA (cont'd)

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with maximum fluids) = UDW:

Right Front	=	<u>554</u>	kgs.	Right Rear	=	<u>403</u>	kgs.
Left Front	=	<u>533</u>	kgs.	Left Rear	=	<u>398</u>	kgs.
TOTAL FRONT WEIGHT	=	<u>1,087</u>	kgs.	(<u>57.6</u> % of Total Vehicle Weight)			
TOTAL REAR WEIGHT	=	<u>801</u>	kgs.	(<u>42.4</u> % of Total Vehicle Weight)			
TOTAL DELIVERED WEIGHT	=	<u>1,888</u>	kgs.				

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight		<u>1888</u>	kgs.
RCLW = VCW - 68 (DSC) =		<u>136</u>	kgs.
Target Test Weight = UDW + RCLW + (2 dummies x 74.4 kgs./ dummy)			
Target Test Weight =		<u>2172</u>	

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 126 KGS CARGO:

Right Front	=	<u>590</u>	kgs.	Right Rear	=	<u>506</u>	kgs.
Left Front	=	<u>575</u>	kgs.	Left Rear	=	<u>491</u>	kgs.
TOTAL FRONT WEIGHT	=	<u>1,165</u>	kgs.	(<u>53.9</u> % of Total Vehicle Weight)			
TOTAL REAR WEIGHT	=	<u>997</u>	kgs.	(<u>46.1</u> % of Total Vehicle Weight)			
TOTAL TEST WEIGHT	=	<u>2,162</u>	kgs.				
Weight of ballast secured in vehicle trunk area =		<u>34</u>	kgs.				

VEHICLE ATTITUDE (all dimensions in mm):

Delivered Attitude:	RF	<u>808</u>	LF	<u>805</u>	RR	<u>846</u>	LR	<u>840</u>
Test Attitude:	RF	<u>790</u>	LF	<u>790</u>	RR	<u>805</u>	LR	<u>800</u>

Remarks: 77 liters of Stoddard solution was placed in the fuel tank.

Table 1

GENERAL TEST AND VEHICLE DATA (cont'd)

POST -IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0°
 Date of Test: October 6, 1994 Time of Test: 14:05
 Ambient Temperature: 15 ° C at impact area
 Temperature in Occupant Compartment: 21 ° C
 Windshield Molding Temperature: 21 ° C
 Required Impact Velocity Range: 55.5 to 57.1 kph
 Impact Velocity: primary = 56.8 kph, secondary = 56.8 kph
 Distance From Front Bumper to Barrier Face When
 Entering Speed Trap: 1321 mm
 Exiting Speed Trap: 305 mm

VEHICLE REBOUND AND CRUSH (mm):

Vehicle Length:	Pre-test = R	<u>5075</u>	C _L	<u>5220</u>	L	<u>5082</u>
	Post-test = R	<u>4625</u>	C _L	<u>4620</u>	L	<u>4580</u>
	Crush = R	<u>450</u>	C _L	<u>600</u>	L	<u>502</u>

Distance from front of test vehicle to point of impact:

R 143 C_L 175 L 185

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>Dash panel</u>	<u>Dash panel</u>
Right Knee	<u>Dash panel</u>	<u>Dash panel</u>

Table 1

GENERAL TEST AND VEHICLE DATA (cont'd)

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening	<u>not operable</u>	<u>not operable</u>	<u>-</u>	<u>-</u>
	<u>Front</u>		<u>Rear</u>	
<u>Seat Movement</u>	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Seat Back Failure	<u>None</u>	<u>None</u>	<u>-</u>	<u>-</u>
Seat Shift (mm.)	<u>0.0</u>	<u>0.0</u>	<u>-</u>	<u>-</u>
<u>Glazing Damage</u>				
Backlight/Windshield:	<u>Windshield sustained stress fractures but remained intact.</u>			
Other Notable Impact Effects:	<u>None</u>			

Section 3

OCCUPANT AND VEHICLE INFORMATION

I.

DATA

1. Dummy Injury Criteria Data Summary
2. Dummy Positioning Data
3. Seat Belt Performance Assessment Data
4. Camera Locations
5. Vehicle Target Locations
6. Load Cell Barrier Data
7. Vehicle Accelerometer Data
8. Test Vehicle Measurements

Table 2

DUMMY INJURY CRITERIA VALUESNHTSA No.: MS0304 Vehicle: 1995 Dodge Ram 2500 Cargo Van

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-99.0	-13.4	44.8	99.6
Position #2 - Passenger	-68.9	-8.9	24.2	69.4

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R*
Position #1 - Driver	-69.6	7.4	20.3	67.0
Position #2 - Passenger	-59.9	-13.8	-24.2	59.1

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

	MAXIMUM FORCE - FEMUR LOAD (nwt)	
	LEFT FEMUR	RIGHT FEMUR
Position #1 - Driver	-8765.1	-7936.6
Position #2 - Passenger	-3663.8	-2526.4

	MAXIMUM FORCE - SEAT BELT LOADS (nwt)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	8133.0	-	3419.0
Position #2 - Passenger	9705.8	10769.6	-

	HEAD INJURY CRITERIA (HIC)			
	HIC**	t ₁ (mSec)	t ₂ (mSec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	1474.3	48.0	76.8	76.5
Position #2 - Passenger	572.1	73.68	109.56	48.0

** 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: 1995 Dodge Ram 2500 Cargo Van
 Vehicle NHTSA No.: MS0304 Test Date: October 6, 1994

MAXIMUM VALUES	DRIVER DUMMY ID #245:	PASSENGER DUMMY ID #45:
Neck Load X (nwt)	550.4	2040.7
Neck Load Y (nwt)	308.1	-494.8
Neck Load Z (nwt)	N/A	2815.1
Neck Moment X (nwt-m)	-29.9	27.5
Neck Moment Y (nwt-m)	-28.1	116.5
Neck Moment Z (nwt-m)	11.5	-11.7
Chest Deflection X (mm.)	47.7	36.6
Time of Max. Occurrence (msec)	59.2	70.6

Note: All values listed occur during the primary impact event.

Figure 1

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS

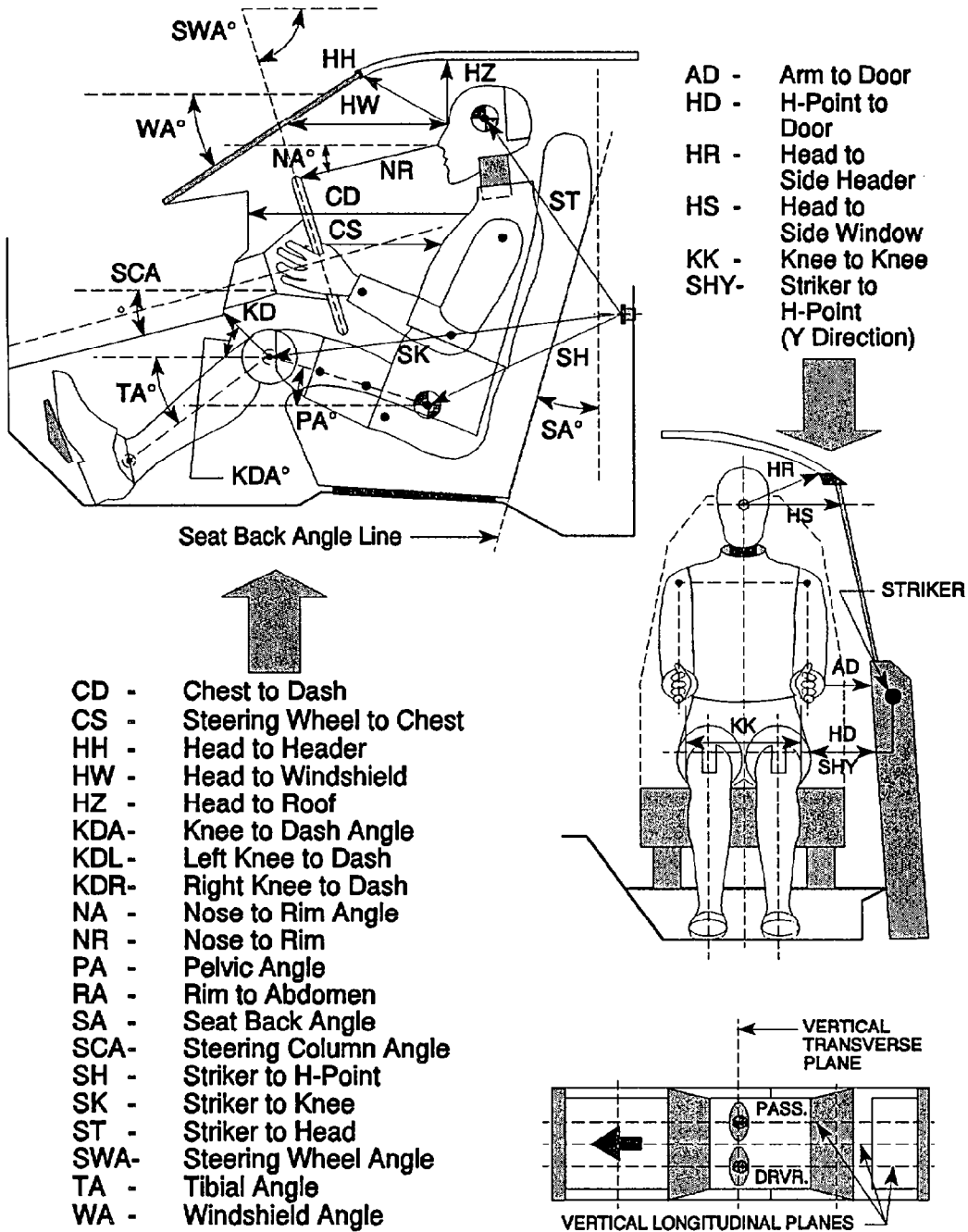


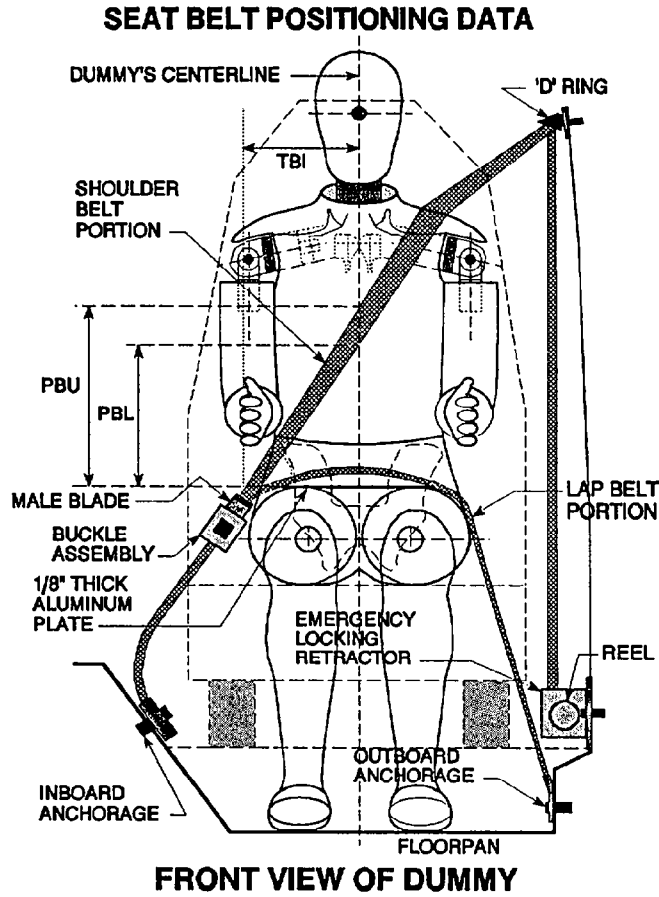
Table 4

FRONT SEAT OCCUPANT MEASUREMENTS

	DRIVER (Serial #245)			PASS. (Serial # 45)		
WA°	42 deg.			42 deg.		
SWA°	42 deg.			N/A		
SCA°	38 deg.			N/A		
SA°	as specified by manufacturer			as specified by manufacturer		
HZ	235			245		
HH	606			692		
HW	726			823		
HR	300			253		
NR	459	Angle	20 deg.	N/A		
CD	616			753		
CS	345			N/A		
RA	203			N/A		
KDL	176	Angle (KDA)	35 deg.	345		
KDR	185			362	Angle (KDA)	18 deg.
PA°	21 deg.			N/A		
TA°	52 deg.			50 deg.		
KK	228			200		
ST	673	Angle	8 deg.	660	Angle	0 deg.
SK	541	Angle	85 deg.	457	Angle	75 deg.
SH	134	Angle	100 deg.	50	Angle	89 deg.
SHY	240			190		
HS	272			235		
HD	168			113		
AD	128			50		

Figure 2

SEAT BELT POSITIONING DATA



	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	290	295
PBL-- Top surface of alum. plate to belt lower edge	220	220
<u>LAP BELT TENSION</u>	-	-
<u>SHOULDER BELT TENSION</u>	Retractor	Retractor

Table 5

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:

	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>2920 mm</u>	<u>2720 mm</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>1040 mm</u>	<u>820 mm</u>
Lap belt length as measured on Part 572 Dummy.	<u>1000 mm</u>	<u>1020 mm</u>

SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis.	<u>38 mm</u>	<u>102 mm</u>
As determined mechanically.	<u>40 mm</u>	<u>75 mm</u>
As determined electronically.	<u>65 mm</u>	<u>117 mm</u>

BELT STRETCH DATA:

Measured electronically between shoulder belt load cell and the "D" ring.	<u>N/A</u>	<u>N/A</u>
Measured mechanically.	<u>0 mm/M</u>	<u>0.1 mm/M</u>

Figure 3

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 6.

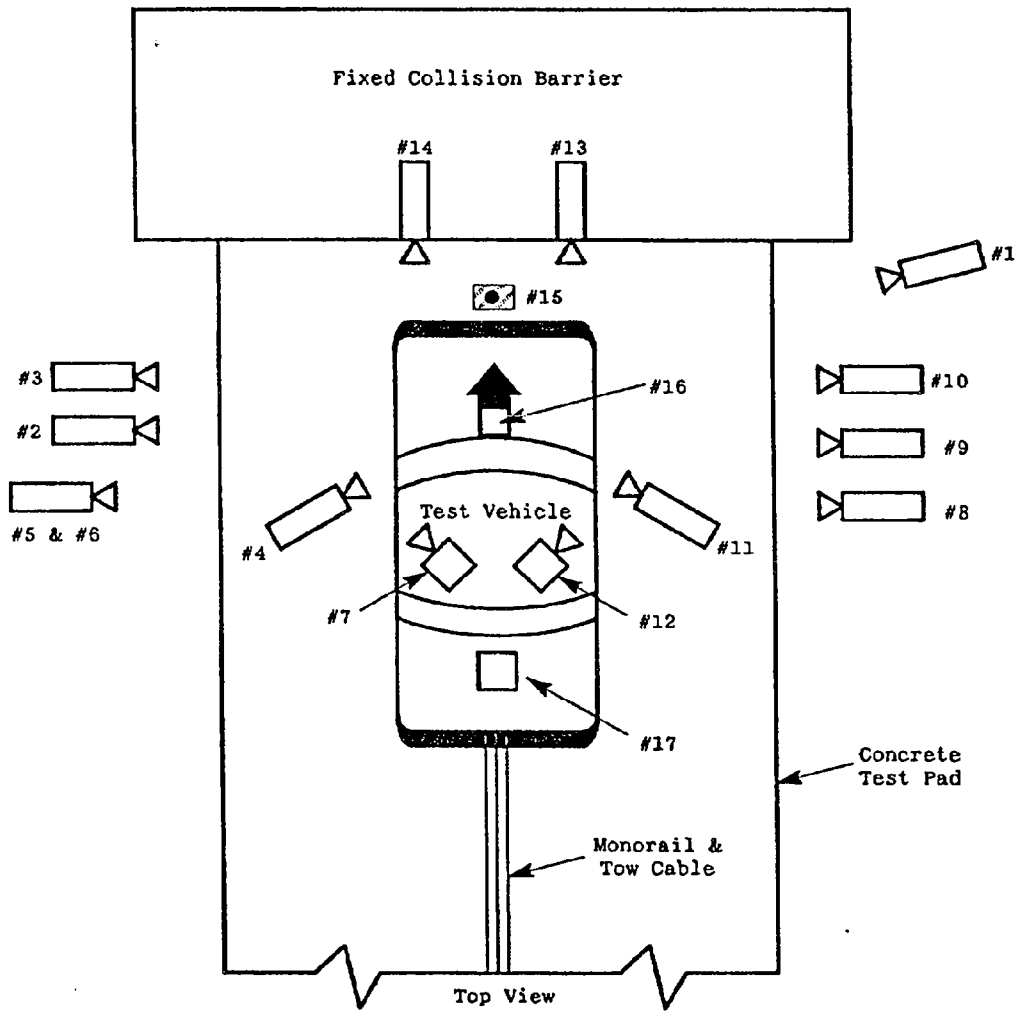


Table 6
HIGH-SPEED CAMERA LOCATIONS

CAMERA NO.	VIEW	CAMERA POSITIONS (MM.)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	24	
2	Overall Left Side	6807	1702	1041	-3	6236	1010	
3	Left Side View	8636	1422	1041	-1	8065	980	
4	Driver and Interior View	2743	1905	1981	-18	2172	960	
5	Steering Column (Bottom)	7823	1067	1068	0	7252	1100	
6	Steering Column (Top)	7823	1067	1778	-6	7252	1070	
7	Left Belt	-	-	-	-	-	530	
8	Overall Right Side	6807	2134	1067	-2	6236	1060	
9	Right Side View	8255	1270	1041	-2	7684	1000	
10	Right Passenger View	8788	1498	1498	-3	8217	900	
11	Passenger and Interior View	2845	2007	1905	-15	2274	1100	
12	Right Belt	-	-	-	-	-	N/A	
13	Passenger Front View	560	127	1778	-35	-	990	
14	Driver Front View	560	127	1778	-28	-	1000	
15	Windshield View	0	0	3048	-53	-	1090	
16	Pit View of Engine	0	505	-3048	90	-	870	
17	Pit View of Fuel Tank	0	3432	-3048	90	-	970	

Test No. MS0304 Vehicle: 1995 Dodge Ram 2500 Cargo Van

*X = film plane to monorail centerline ** = referenced to horizontal plane

Y = film plane to impact location

Z = film plane to ground

N.T. indicates No Timing

Figure 4

VEHICLE TARGET LOCATIONS

A	495
B	855
C	N/A
D	1587
E	N/A
F	N/A
G	1143
H	1137
I	121
J	1343
K	1258
L	1476
M	N/A
N	127
O	1137
P	1133
Q	1476
R	1264
S	1347

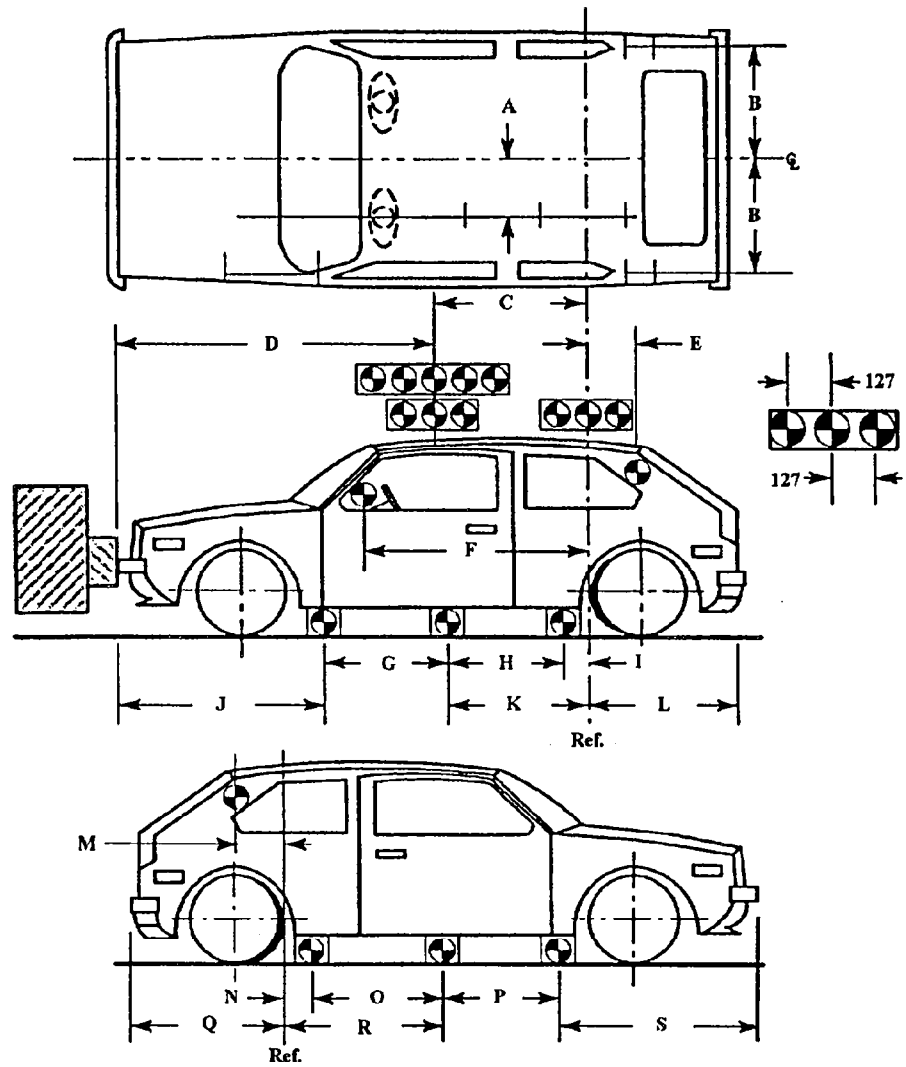
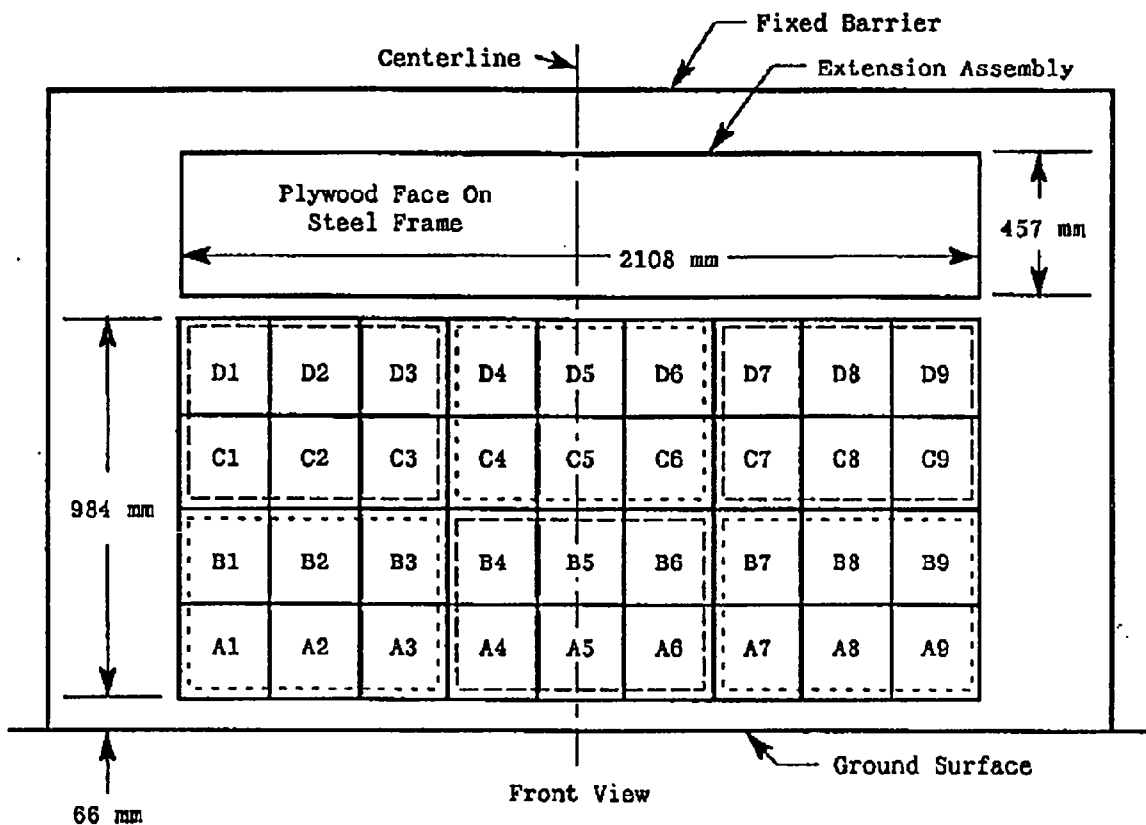


Figure 5

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

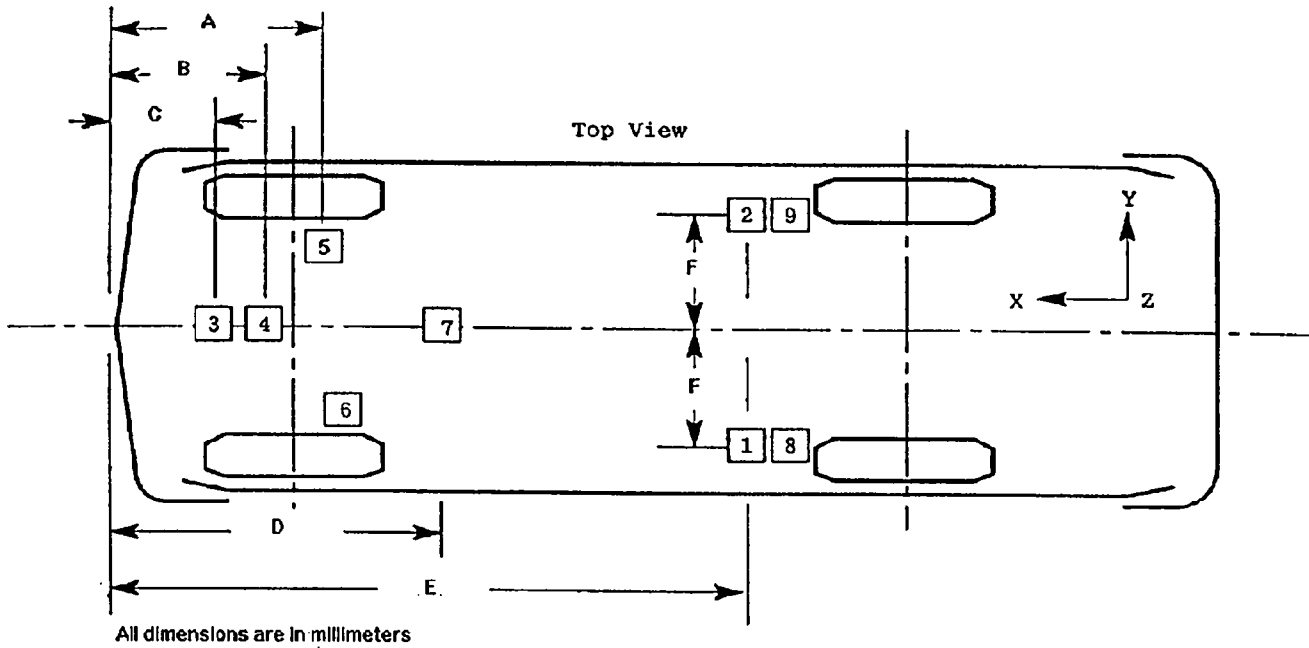
Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

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 6

VEHICLE ACCELEROMETER LOCATIONS



ACCELEROMETER NUMBER*	ACCELEROMETER LOCATION	Distances From Vehicle Front	
		All dimensions in millimeters	
1	Left Rear Seat Crossmember [E/F]	X = 3520	Y = 635
2	Right Rear Seat Crossmember [E/F]	X = 3520	Y = 635
3	Top of engine [C]	1181	
4	Bottom of engine [B]	1161	
5	Right Disc Brake Caliper [A]	991	
6	Left Disc Brake Caliper [A]	991	
7	Instrument Panel [D]	1067	
8	Left Rear Seat Crossmember [E/F]	X = 3520	Y = 635
9	Right Rear Seat Crossmember [E/F]	X = 3520	Y = 635

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

Figure 7

TEST VEHICLE MEASUREMENTS

REAR DATUM REFERENCE

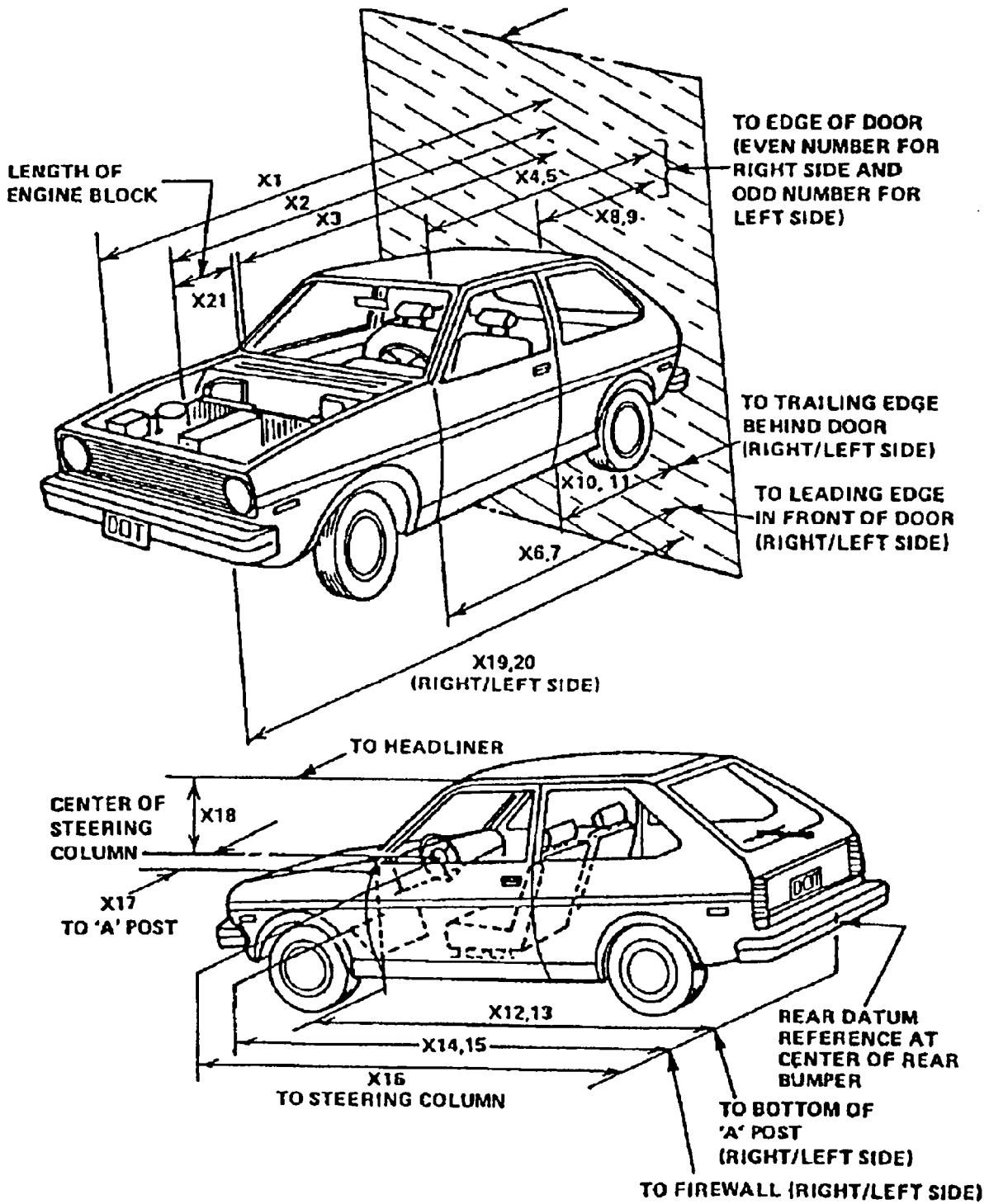


Table 7

VEHICLE MEASUREMENTS

No.		All Dimensions in mm		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	5220	4620	600
X2	Rear Surface of Vehicle to Front of Engine	4499	4440	59
X3	Rear Surface of Vehicle to Firewall	3518	4330	-812
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	4360	4320	40
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	4360	4310	50
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	4350	4333	17
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	4360	4330	30
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	3321	3310	11
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	3332	3300	32
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	3330	3310	20
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	3331	3325	6
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	3752	3775	-23
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	3765	3765	0
X14	Rear Surface of Vehicle to Firewall, Right Side	4422	4320	102
X15	Rear Surface of Vehicle to Firewall, Left Side	4555	4390	165
X16	Rear Surface of Vehicle to Steering Column	3891	3880	11
X17	Center of Steering Column to "A" Post	369	424	-55
X18	Center of Steering Column to Headliner	495	485	10
X19	Rear Surface of Vehicle to Right Side of Front Bumper	5075	4625	450
X20	Rear Surface of Vehicle to Left Side of Front Bumper	5082	4580	502
X21	Length of Engine Block	625	625	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	3381	4150	-769
CD	Rear Surface of Vehicle to Center of Dash Panel	3380	4115	-735
LD	Rear Surface of Vehicle to Left Side of Dash Panel	3800	4088	-288

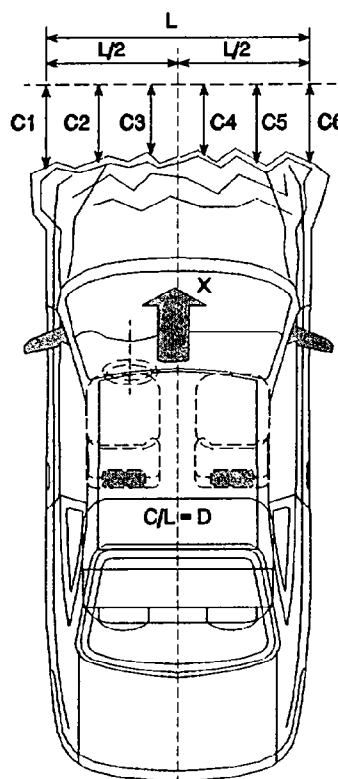
Table 8

ACCIDENT INVESTIGATION DIVISION DATA
FOR 56.3 KPH FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: Dodge Ram 2500 Cargo Van
 Vehicle NHTSA No.: MS0304 VIN: 2B7HB21Y5SK501139
 Model Year: 1995 Build Date: 8/94 Test Date: October 6, 1994
 Vehicle Size Category: Full Size Van Test Weight: 2162 Kgs
 Vehicle Wheelbase: - mm; Front Overhang: 1340 mm; Overall Width: 1790 mm
 Collision Deformation Classification (CDC) Code: 12FDEW3

Crush Depth Dimensions:

C1 = 495 mm
 C2 = 560 mm
 C3 = 592 mm
 C4 = 589 mm
 C5 = 515 mm
 C6 = 429 mm



Midpoint of Damage: $D = \frac{\text{Vehicle Centerline}}{\text{(Longitud.)}}$

Longitude Length of Damaged Region: $L = \underline{1790}$ mm

Section 4

SUMMARY OF RESULTS OF FMVSS 212, 219 (Partial) AND 301

"Windshield Mounting" FMVSS No. 212 Data

"Windshield Zone Intrusion" FMVSS No. 219 Data

"Fuel System Integrity" FMVSS No. 301

Figure 8

FMVSS NO. 212 - "WINDSHIELD MOUNTING" DATA

DETAILS OF WINDSHIELD MOUNTING SUCH AS RETENTION METHOD, TRIM TYPE, ETC.:

Windshield is bonded in place and covered with 20 mm. molding on top and sides of windshield. A plastic shroud covers the bottom of windshield.

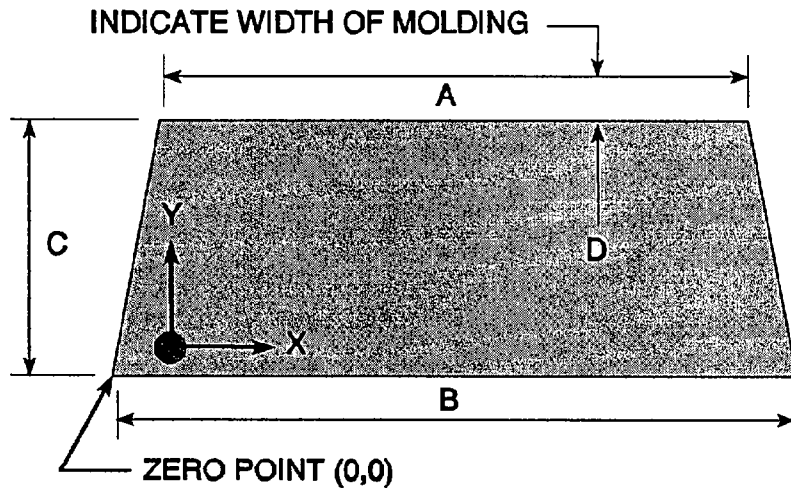
FMVSS 212 REQUIREMENTS:

The Post-Test periphery retention amount must be at least 75% of the Pre-Test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of the windshield for vehicles equipped with automatic restraint systems for front occupants,

FMVSS 212 TEST DATA

	WINDSHIELD PERIPHERY		% OF RETENTION
	PRE-TEST (mm)	POST-TEST(mm)	
RIGHT SIDE	2383	2383	100
LEFT SIDE	2383	2383	100
TOTAL	4,766	4,766	100

AREA OF RETENTION FAILURE:



DIMENSIONS	
A	1676
B	1930
C	580
D	20

FRONT VIEW OF WINDSHIELD

FAILURE DETAILS: None

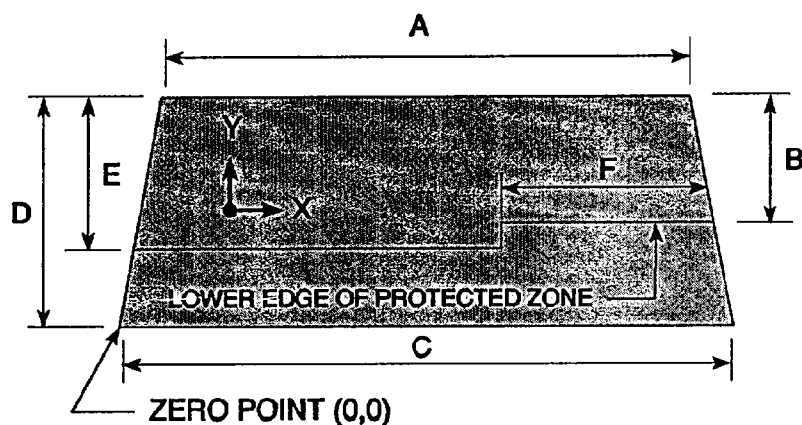
Figure 9

FMVSS NO. 219 (PARTIAL) - "WINDSHIELD ZONE INTRUSION" DATA

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 6.5" diameter rigid sphere weighing 15 pounds in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. The locus of points is drawn on the inner surface of the windshield contacted by the sphere across the width of the instrument panel. From the outermost contactable points extend the locus line horizontally to the edges of the windshield, then draw a line on the inner surface of the windshield below and 1/2" distant from the locus line. The LOWER EDGE OF THE PROTECTED ZONE is the longitudinal projection of this line onto the outer surface of the windshield.

FMVSS 219 TEST DATA: (Dimensions in mm)



DIMENSIONS	
A	1676
B	350
C	1930
D	580
E	450
F	1070

FRONT VIEW OF WINDSHIELD

DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4": None

(Show location of penetration on the above sketch)

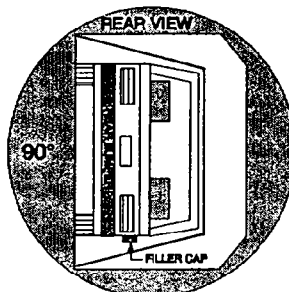
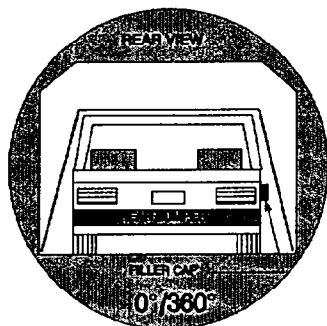
	COORDINATES	
	X	Y
1.		
2.		
3.		
4.		

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE:

Vehicle NHTSA ID No.
MS0304



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90 deg. Rotation Time (Spec. Range = 1 to 3 minutes)	2	minutes	30	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	7	minutes	30	seconds
Next whole minute interval	8	minutes	00	seconds

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min. from onset of rotation	6th min.	7th min.	8th min. if reqd.
-------------------------------------	----------	----------	-------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

Note: Record spillage for whole minute intervals only as determined above.

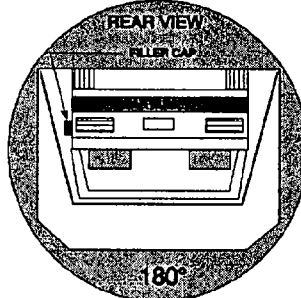
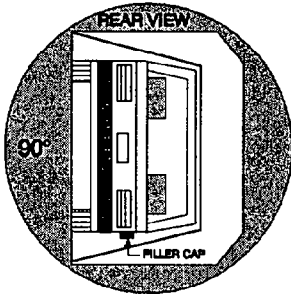
IV. SOLVENT SPILLAGE LOCATION(S): None

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE:

Vehicle NHTSA ID No.
MS0304



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90 deg. Rotation Time (Spec. Range = 1 to 3 minutes)	<u>2</u>	minutes	<u>55</u>	seconds
FMVSS 301 Position Hold Time +	<u>5</u>	minutes	<u>00</u>	seconds
TOTAL	<u>7</u>	minutes	<u>55</u>	seconds
Next whole minute interval	<u>8</u>	minutes	<u>00</u>	seconds

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min. from onset of rotation	6th min.	7th min.	8th min. if reqd.
-------------------------------------	----------	----------	-------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

Note: Record spillage for whole minute intervals only as determined above.

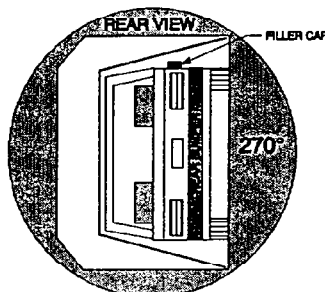
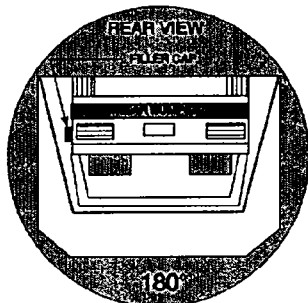
IV. SOLVENT SPILLAGE LOCATION(S): None

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE:

Vehicle NHTSA ID No.
MS0304



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90 deg. Rotation Time (Spec. Range = 1 to 3 minutes)	<u>2</u>	minutes	<u>35</u>	seconds
FMVSS 301 Position Hold Time +	<u>5</u>	minutes	<u>00</u>	seconds
TOTAL	<u>7</u>	minutes	<u>35</u>	seconds
Next whole minute interval	<u>8</u>	minutes	<u>00</u>	seconds

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min. from onset of rotation	6th min.	7th min.	8th min. if reqd.
-------------------------------------	----------	----------	-------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

Note: Record spillage for whole minute intervals only as determined above.

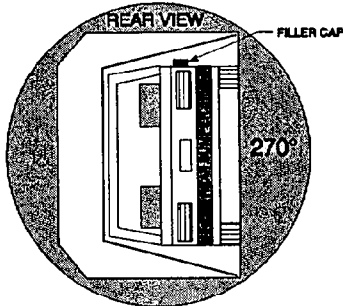
IV. SOLVENT SPILLAGE LOCATION(S): None

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE:

Vehicle NHTSA ID No.
MS0304



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90 deg. Rotation Time (Spec. Range = 1 to 3 minutes)	<u>2</u>	minutes	<u>45</u>	seconds
FMVSS 301 Position Hold Time +	<u>5</u>	minutes	<u>00</u>	seconds
TOTAL	<u>7</u>	minutes	<u>45</u>	seconds
Next whole minute interval	<u>8</u>	minutes	<u>00</u>	seconds

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

First 5 min. from onset of rotation	6th min.	7th min.	8th min. if reqd.
-------------------------------------	----------	----------	-------------------

(2) Maximum Allowable Solvent Spillage

5 ounces	1 ounce	1 ounce	1 ounce
----------	---------	---------	---------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	0
---	---	---	---

Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S): None

Appendix A
PHOTOGRAPHS

PHOTOGRAPHS

<u>Figure</u>	<u>Title</u>	<u>Page</u>
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A-28	PRE-TEST PASSENGER AND INTERIOR VIEW	A-30
A-29	POST TEST PASSENGER AND INTERIOR VIEW	A-31



FIGURE A-1 LOAD CELL LOCATIONS

A-3

8227-4



FIGURE A-2 PRE-TEST FRONT VIEW

A-4

8227-4

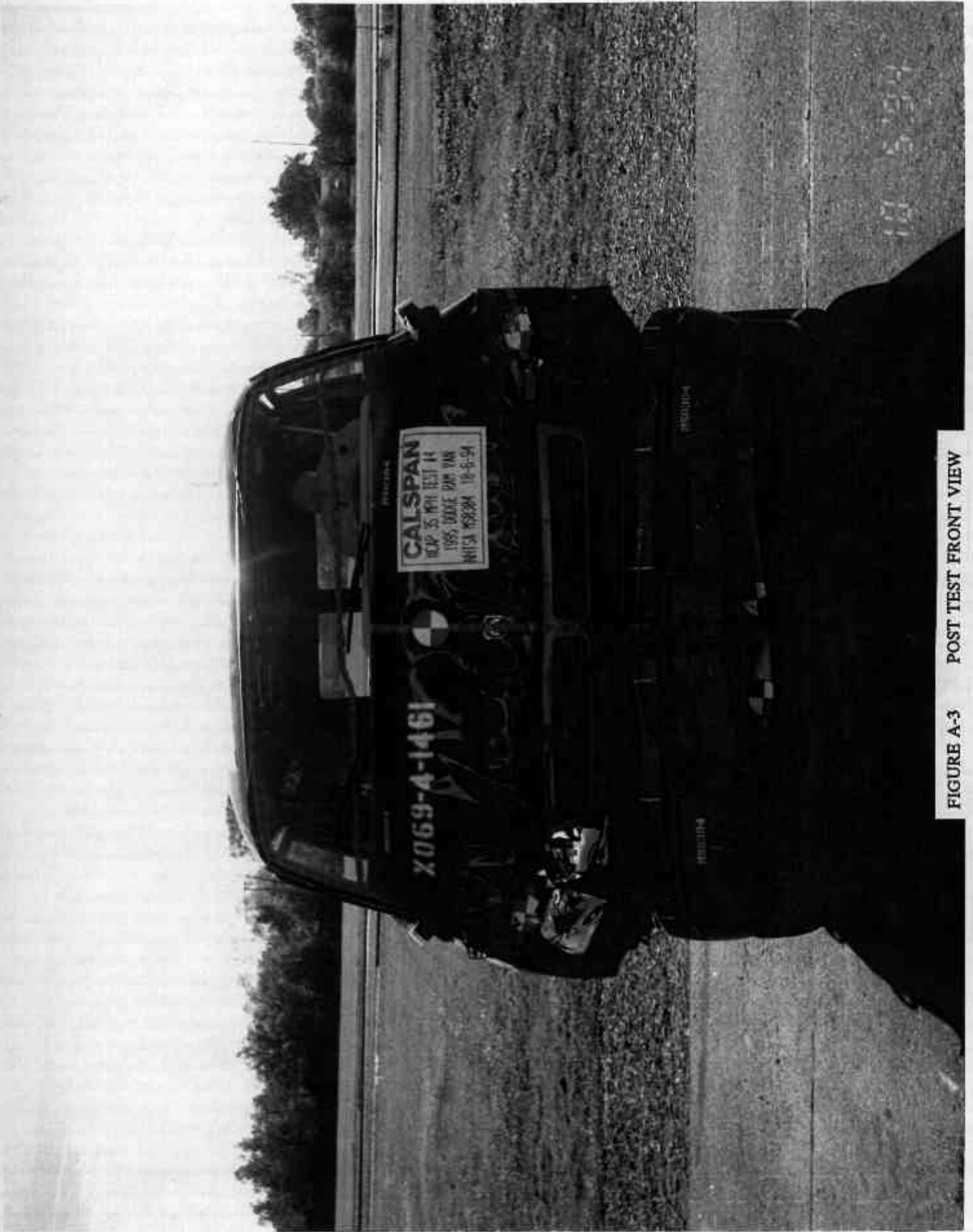


FIGURE A-3 POST TEST FRONT VIEW

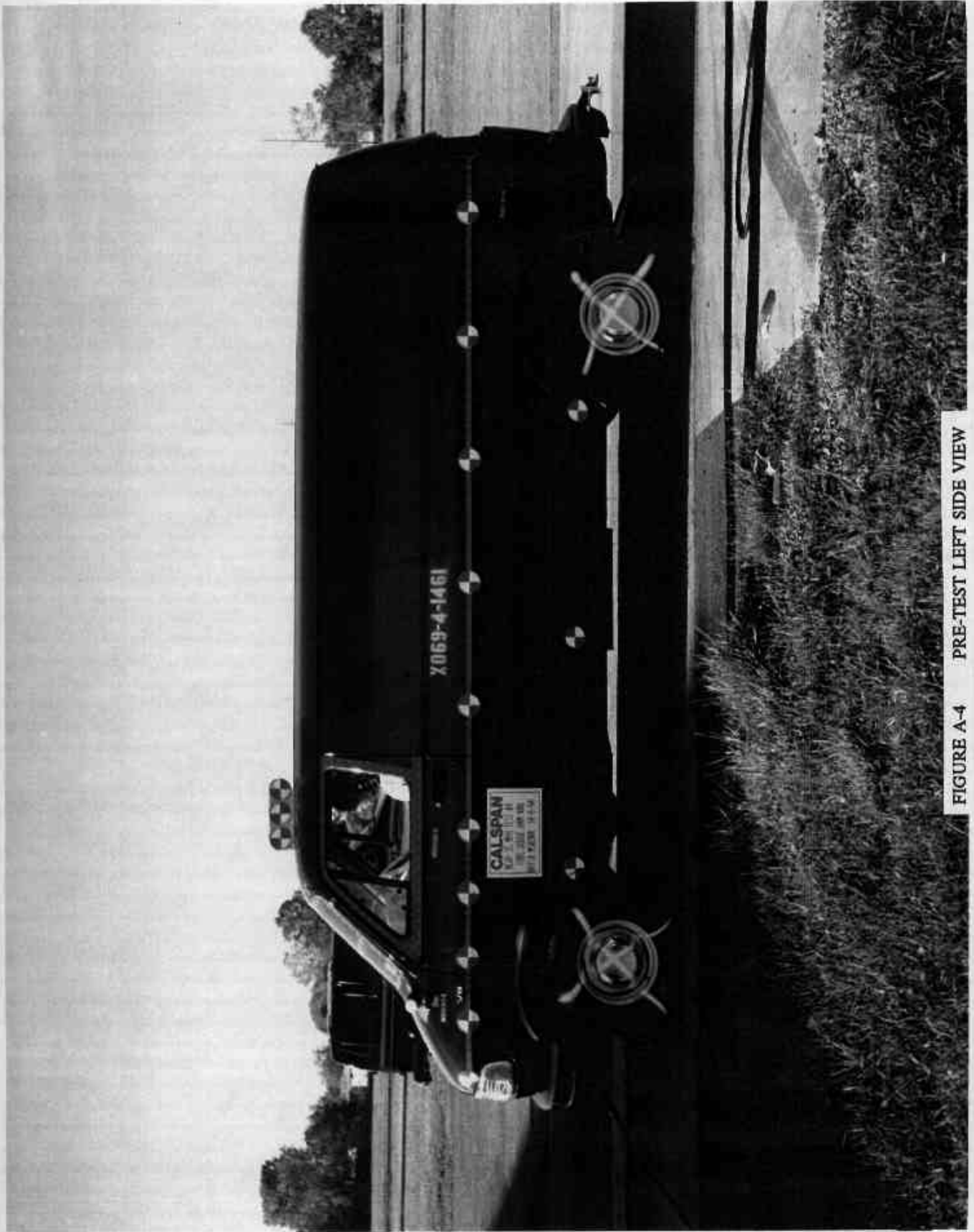


FIGURE A-4 PRE-TEST LEFT SIDE VIEW

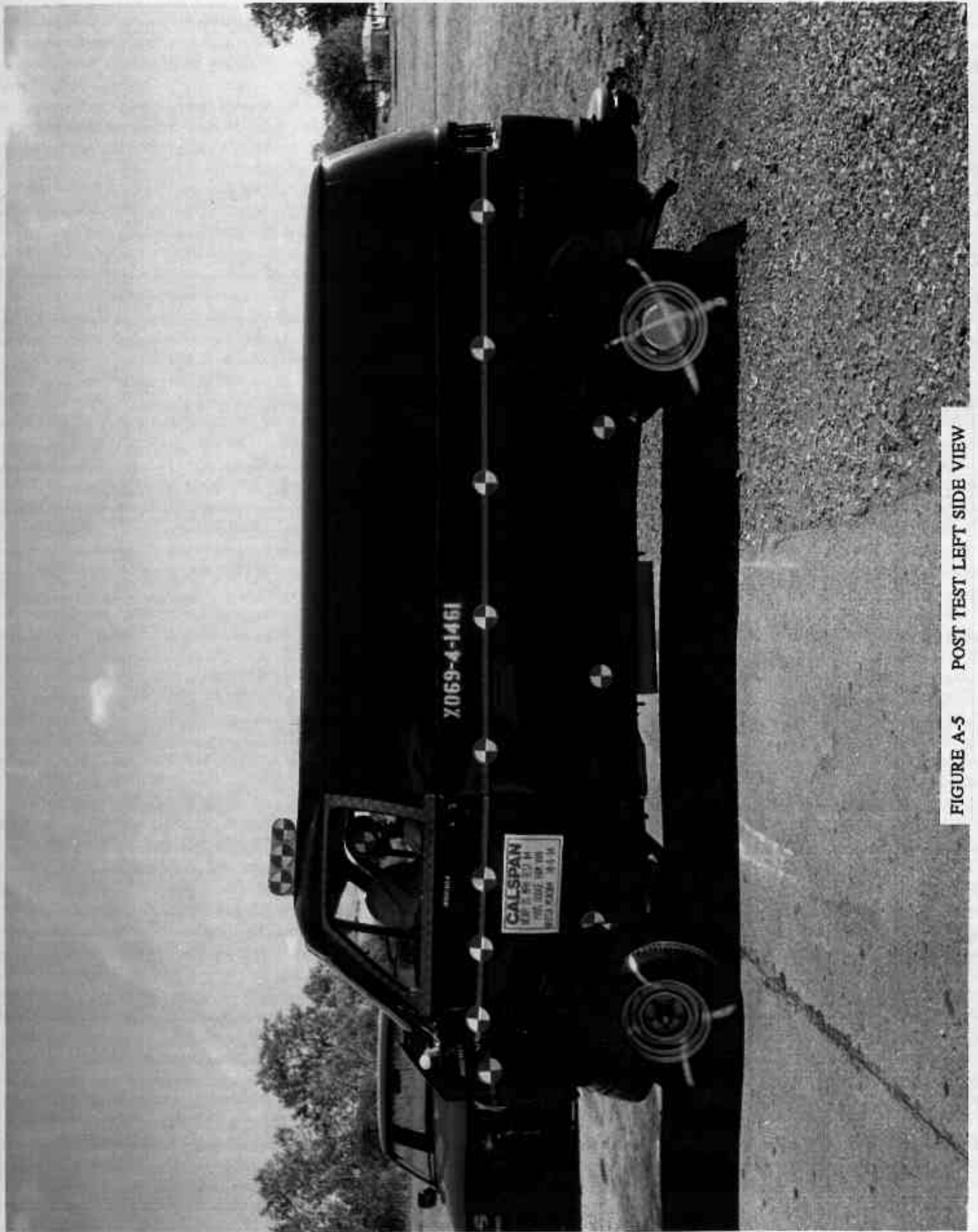


FIGURE A-5 POST TEST LEFT SIDE VIEW

A-7

8227-4



FIGURE A-6 PRE-TEST RIGHT SIDE VIEW

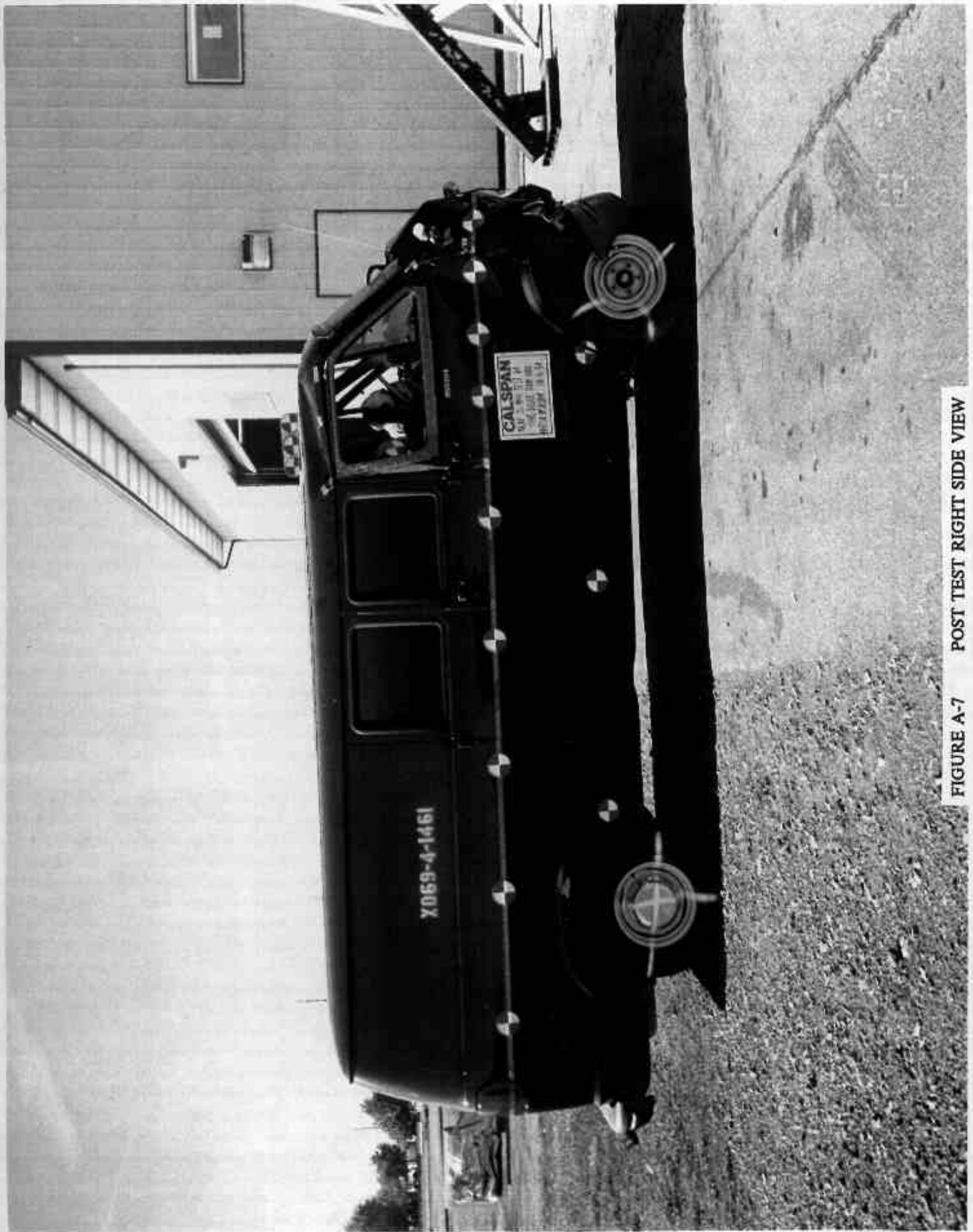
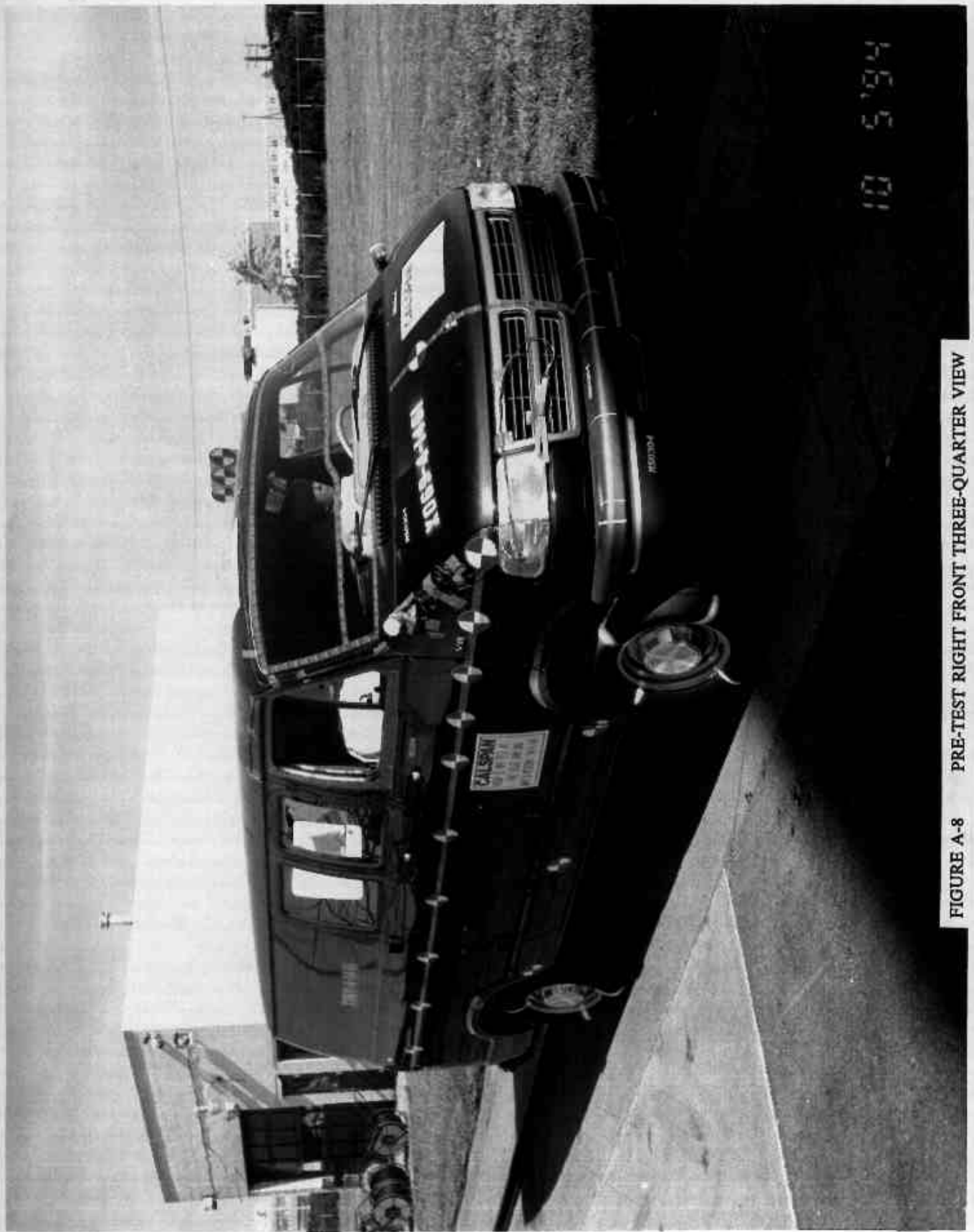


FIGURE A-7 POST TEST RIGHT SIDE VIEW

A-9

8227-4



10 5'94

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

A-10

8227-4

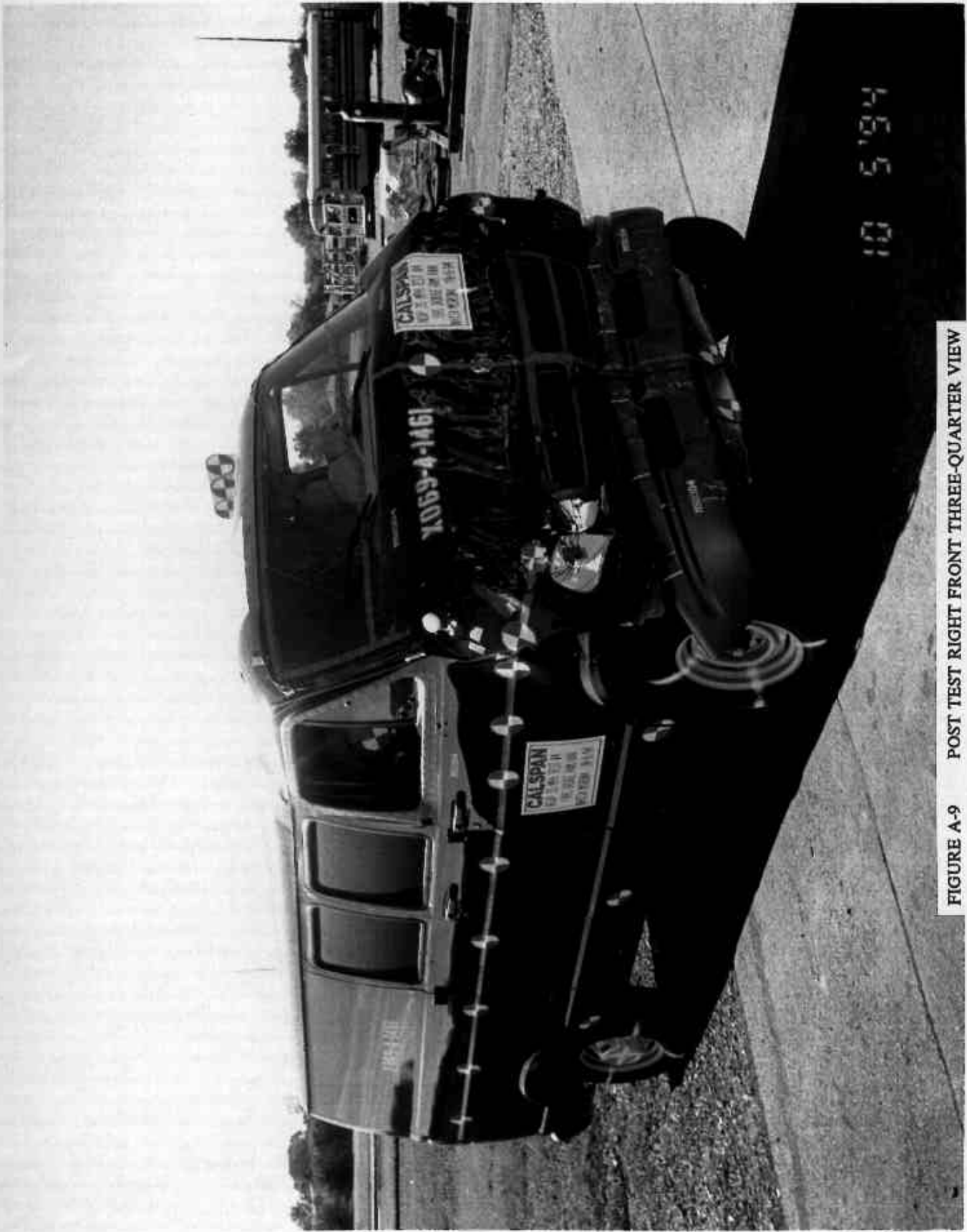


FIGURE A-9 POST TEST RIGHT FRONT THREE-QUARTER VIEW

A-11

8227-4



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



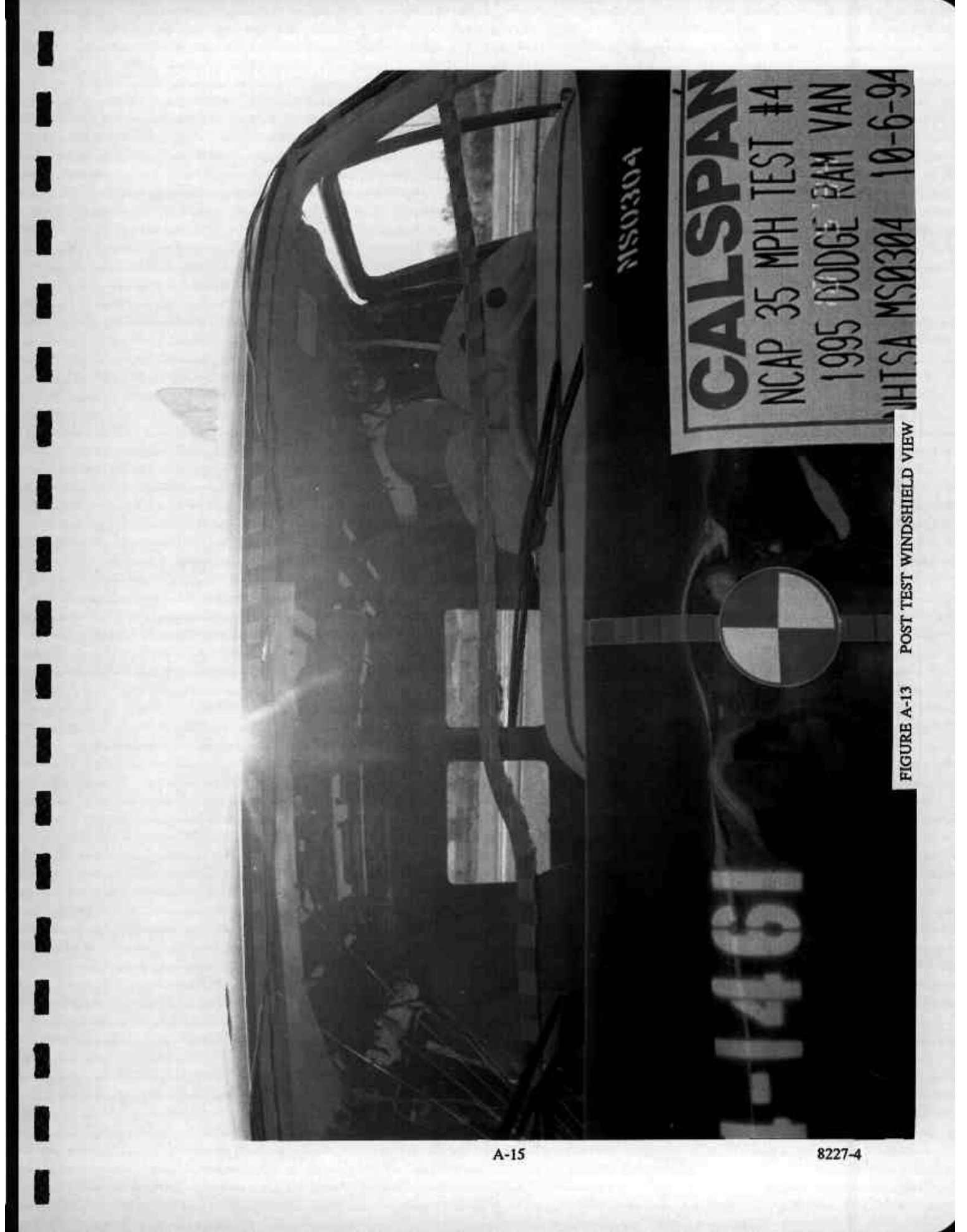
FIGURE A-11 POST TEST REAR THREE-QUARTER VIEW

A-13

8227-4



FIGURE A-12 PRE-TEST WINDSHIELD VIEW



MS0304

CALSPAN
NCAP 35 MPH TEST #4
1995 DODGE RAM VAN
NHTSA MS0304 10-6-94

FIGURE A-13 POST TEST WINDSHIELD VIEW

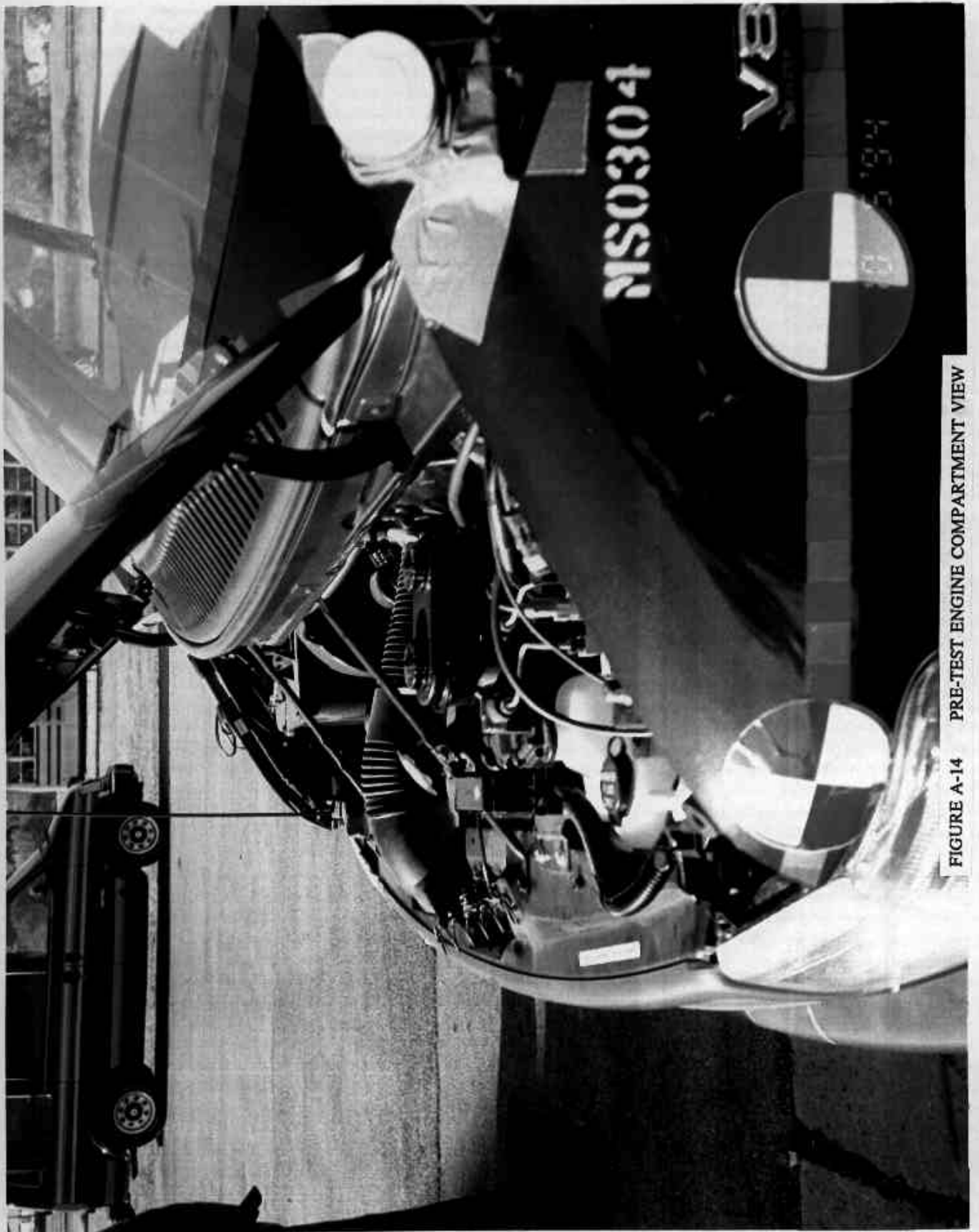


FIGURE A-14 PRE-TEST ENGINE COMPARTMENT VIEW

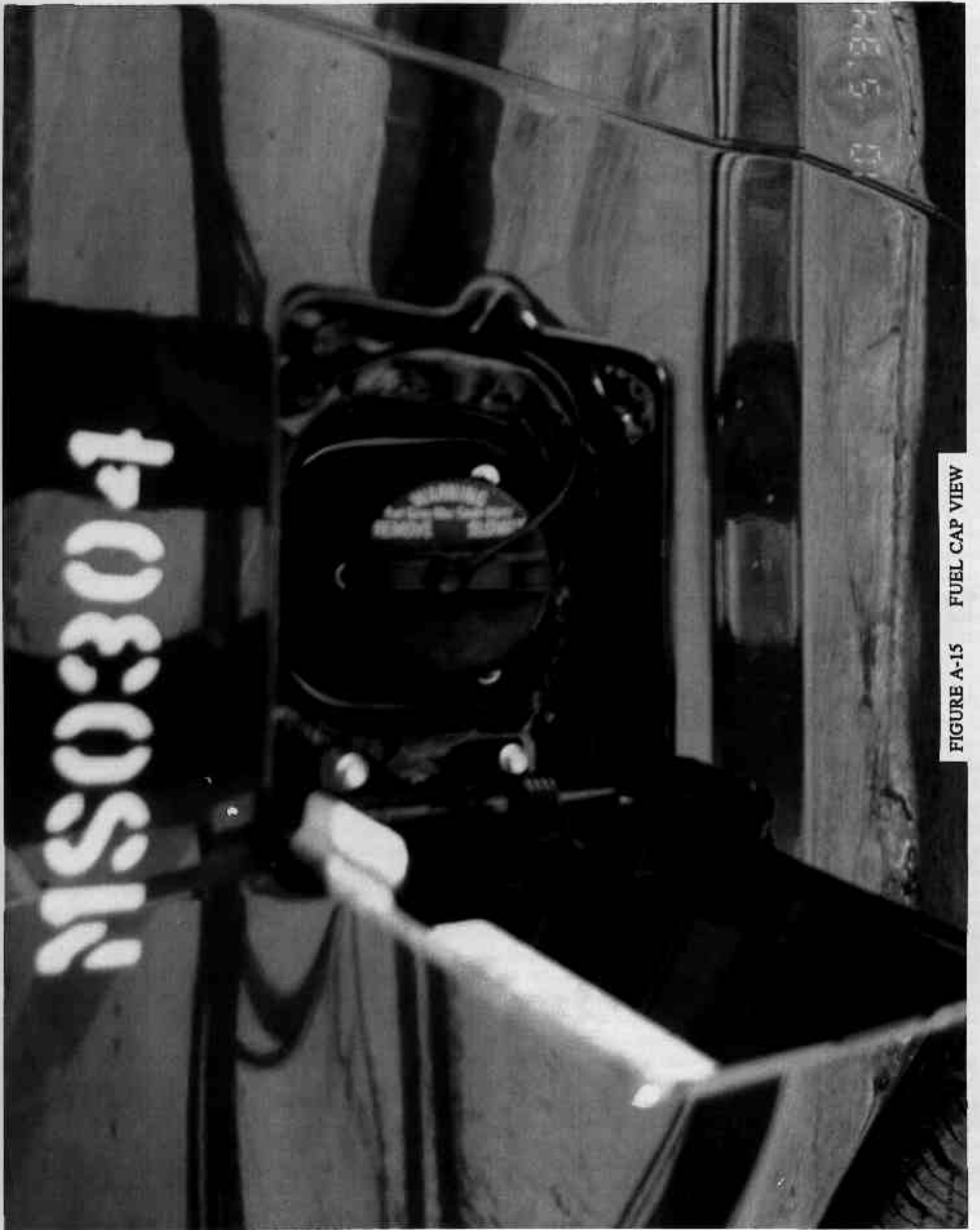


FIGURE A-15 FUEL CAP VIEW



FIGURE A-16 PRE-TEST FRONT UNDERBODY VIEW



FIGURE A-17 POST TEST FRONT UNDERBODY VIEW

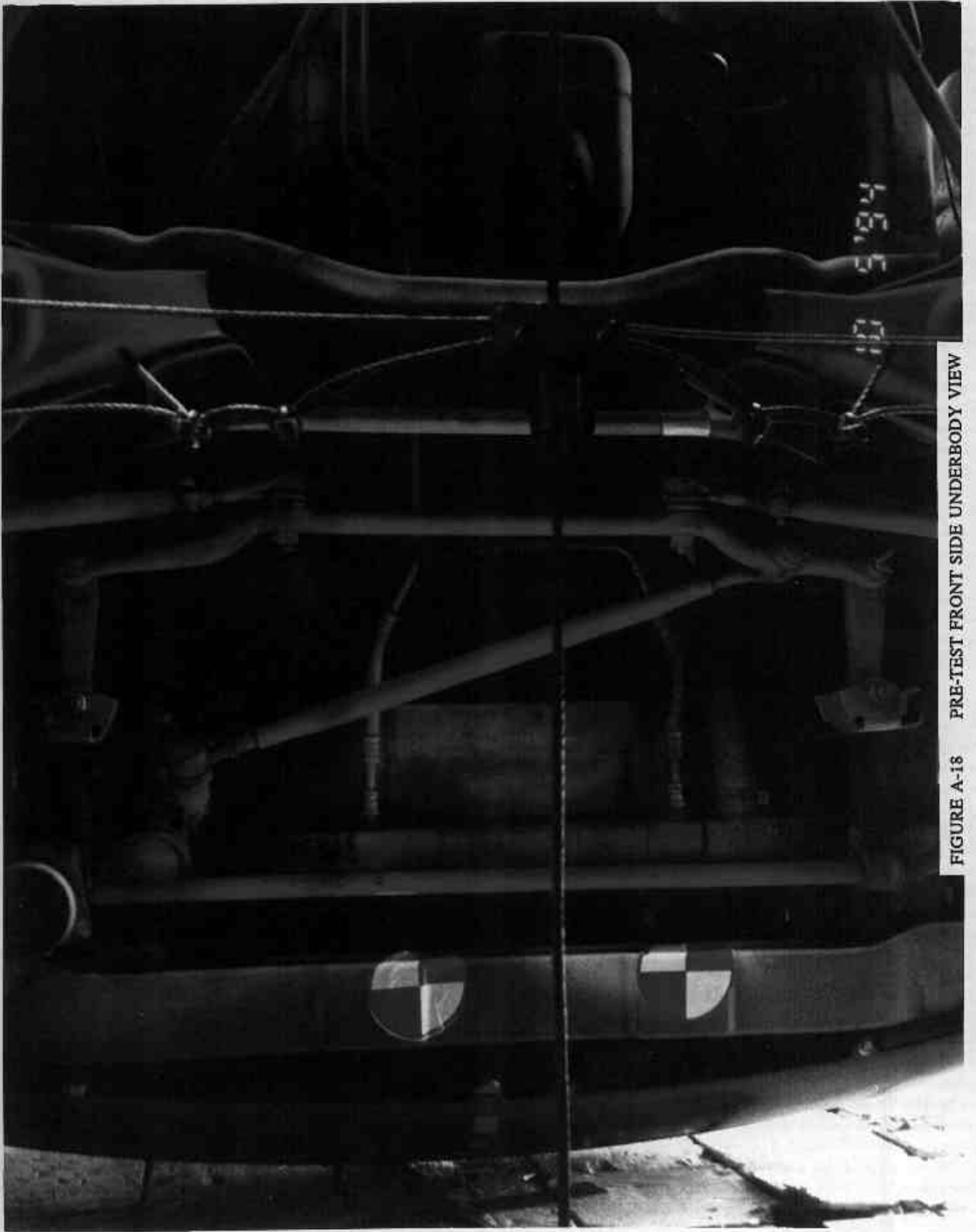


FIGURE A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW



FIGURE A-19 POST TEST FRONT SIDE UNDERBODY VIEW

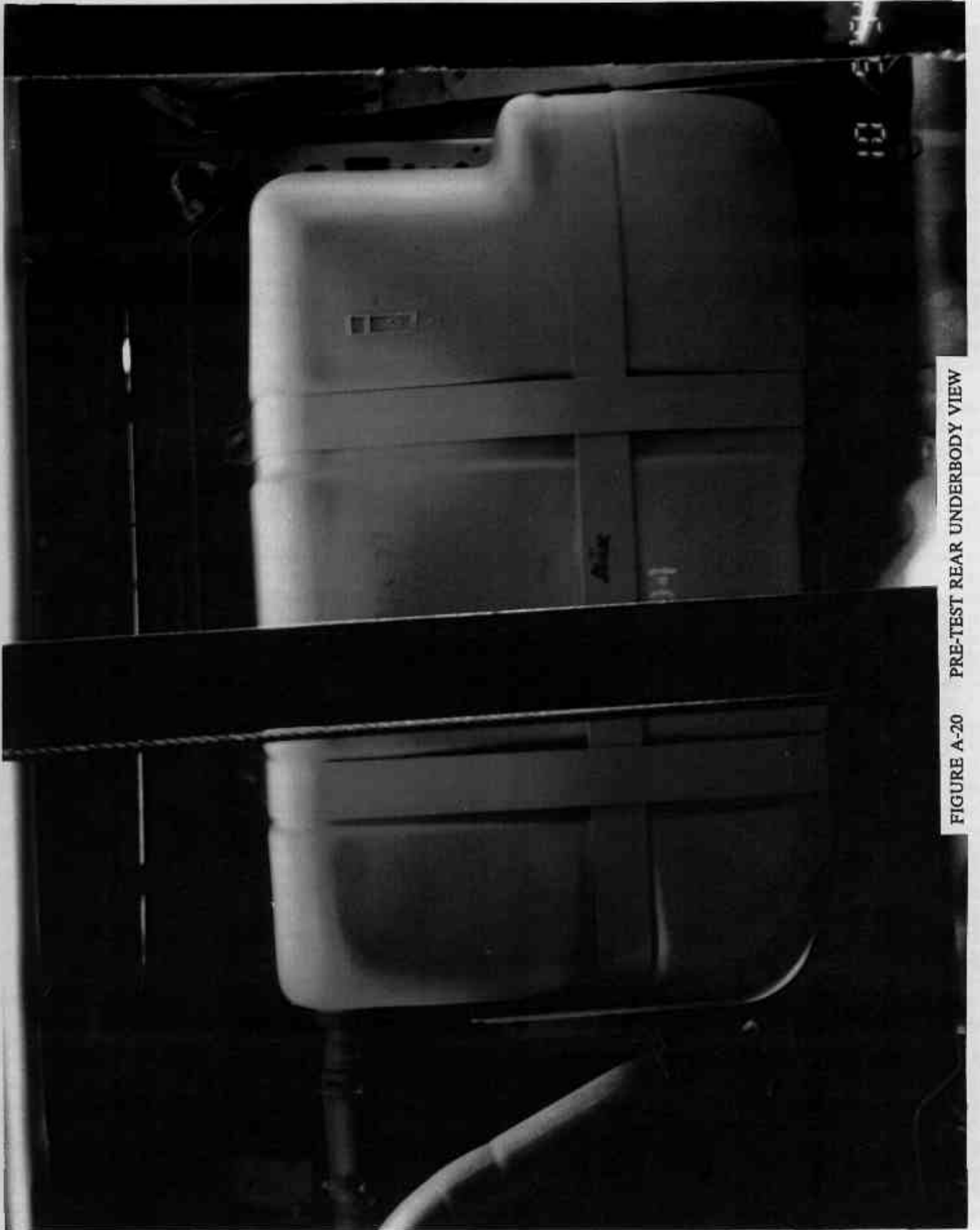
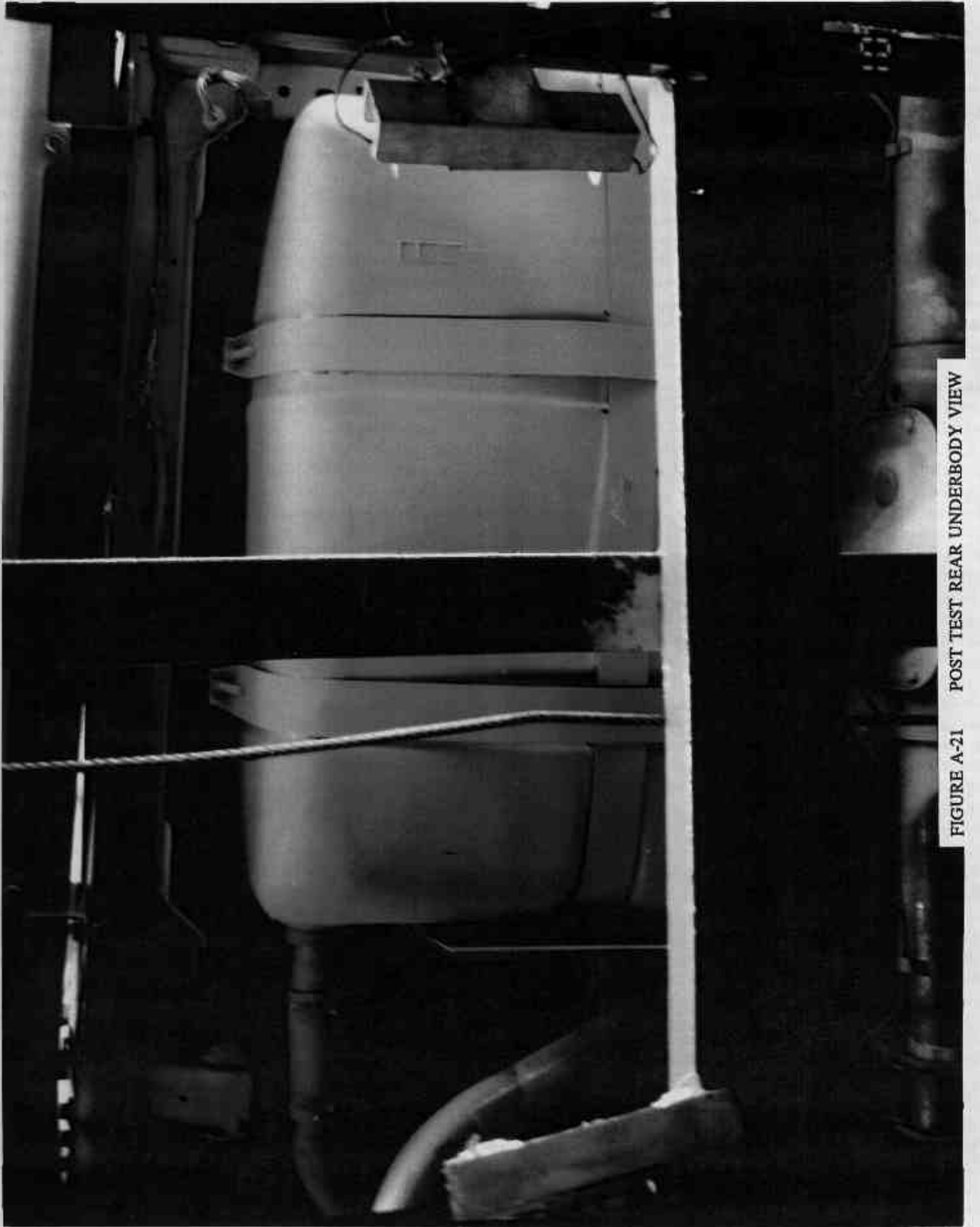


FIGURE A-20 PRE-TEST REAR UNDERBODY VIEW

FIGURE A-21 POST TEST REAR UNDERBODY VIEW



A-23

8227-4



FIGURE A-22 PRE-TEST DRIVER POSITION VIEW

A-24

8227-4



FIGURE A-23 POST TEST DRIVER POSITION VIEW

A-25

8227-4

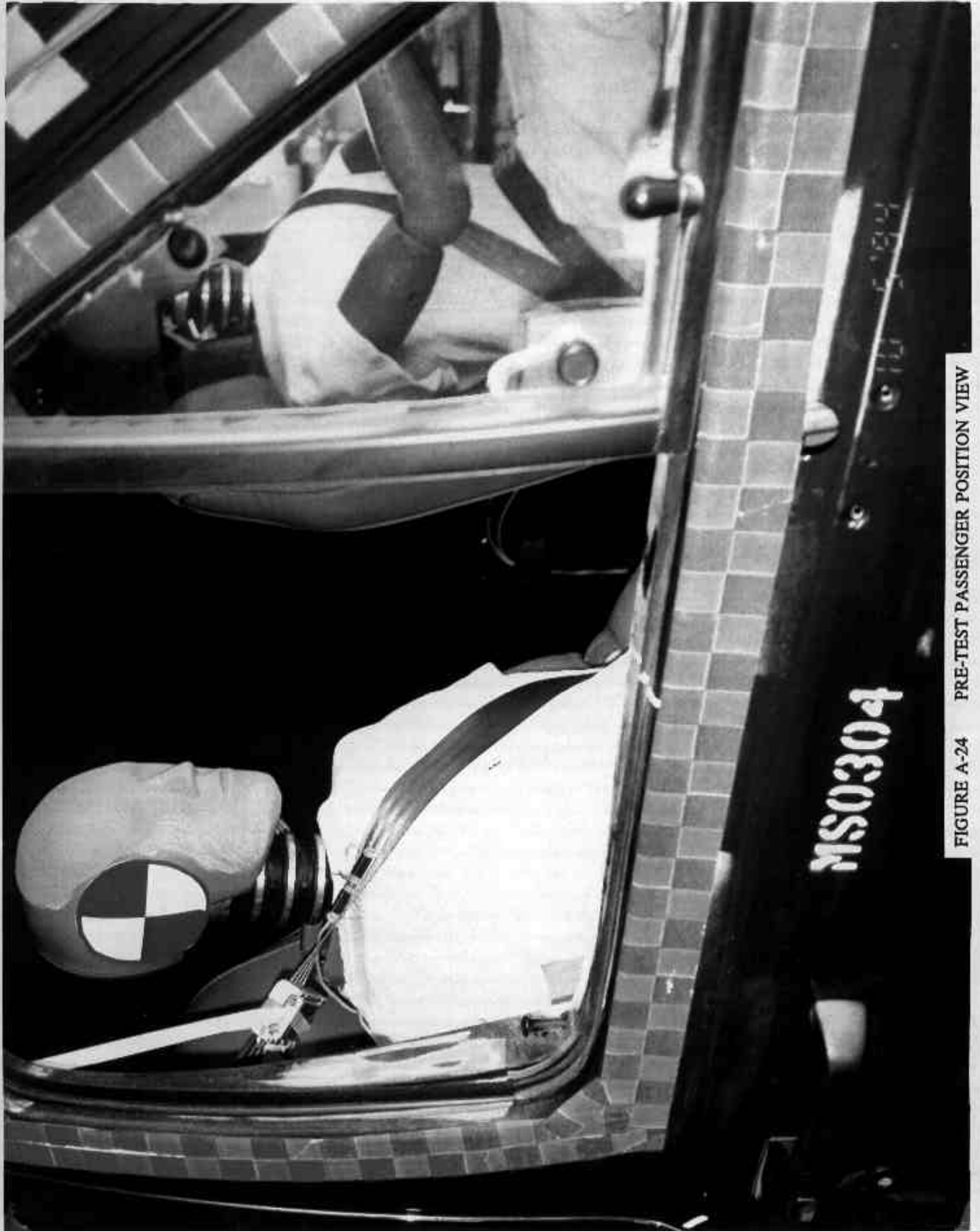


FIGURE A-24 PRE-TEST PASSENGER POSITION VIEW



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

A-29

8227-4



FIGURE A-28 PRE-TEST PASSENGER AND INTERIOR VIEW



FIGURE A-29 POST TEST PASSENGER AND INTERIOR VIEW

A-31

8227-4

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST NO. MS0304

VEHICLE DATA

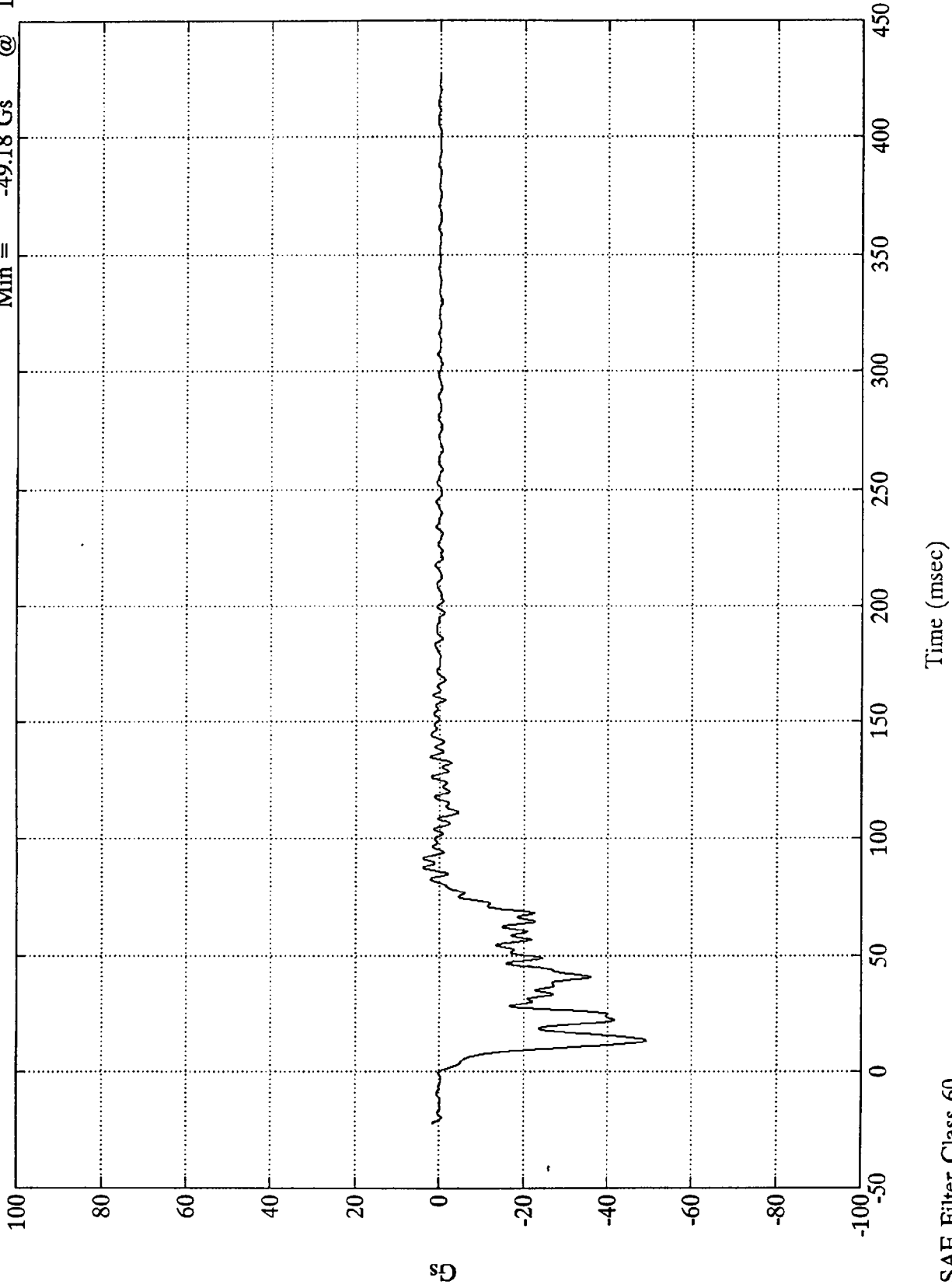
FILTER CHANNEL CLASS

60

NCAP TEST #4 - 1995 DODGE RAM VAN

Acc. #1(x)

Max = 3.91 Gs @ 87.48 msec
Min = -49.18 Gs @ 13.07 msec

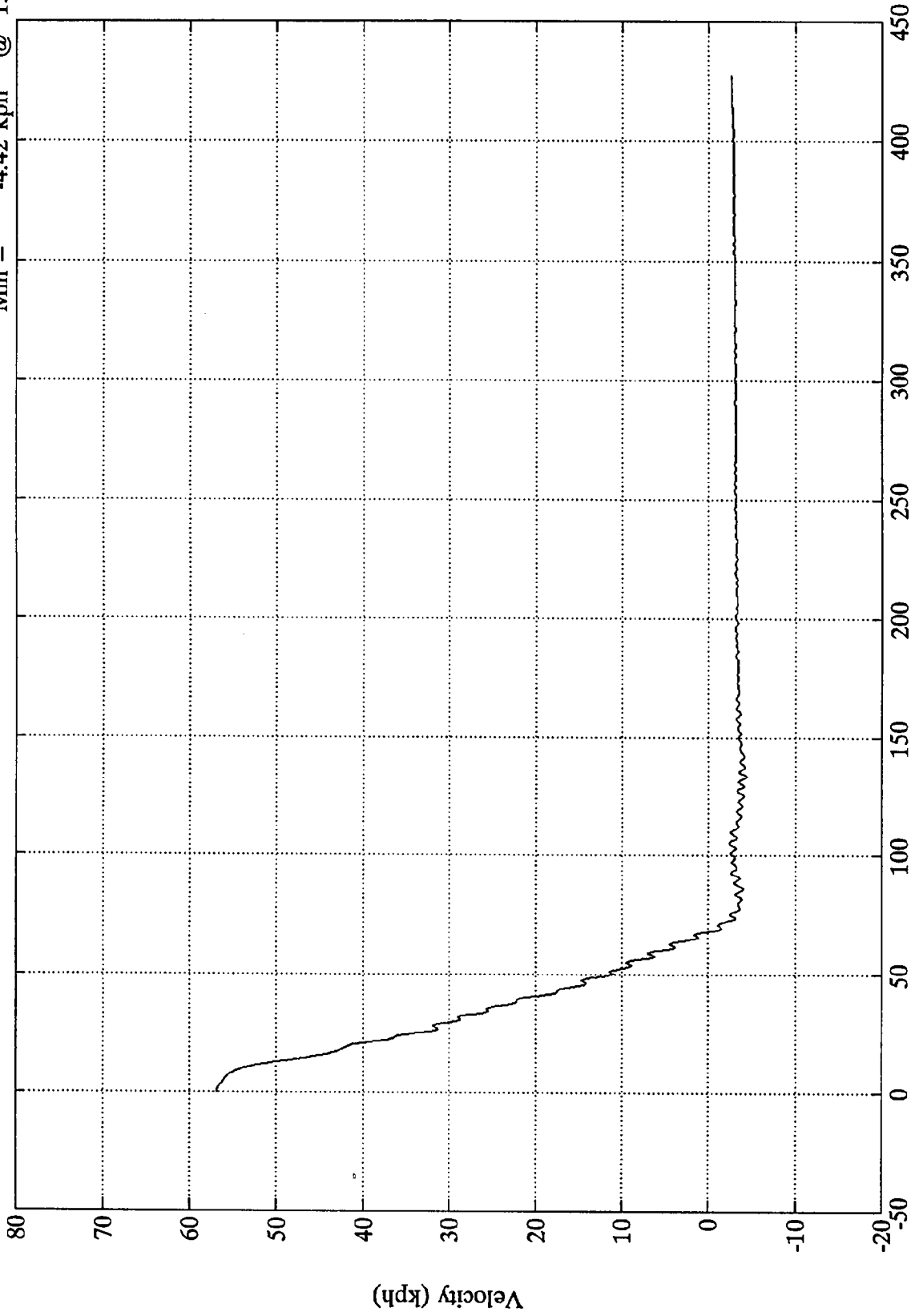


SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 56.86 kph @ 0.83 msec
Min = -4.42 kph @ 133.56 msec

Acc. #1(x)



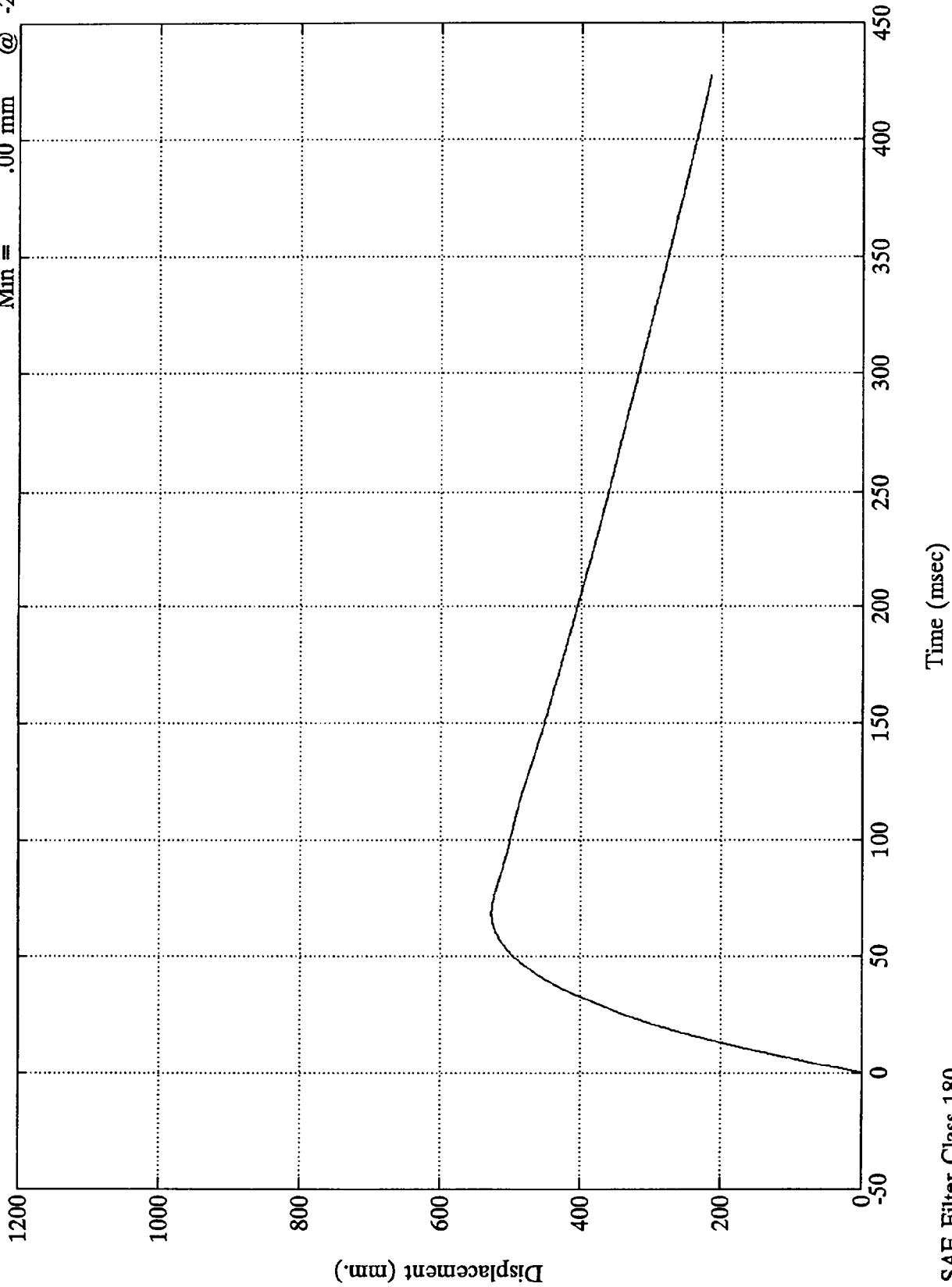
Time (msec)

SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 527.45 mm @ 68.16 msec
Min = .00 mm @ -22.44 msec

Acc. #1(x)

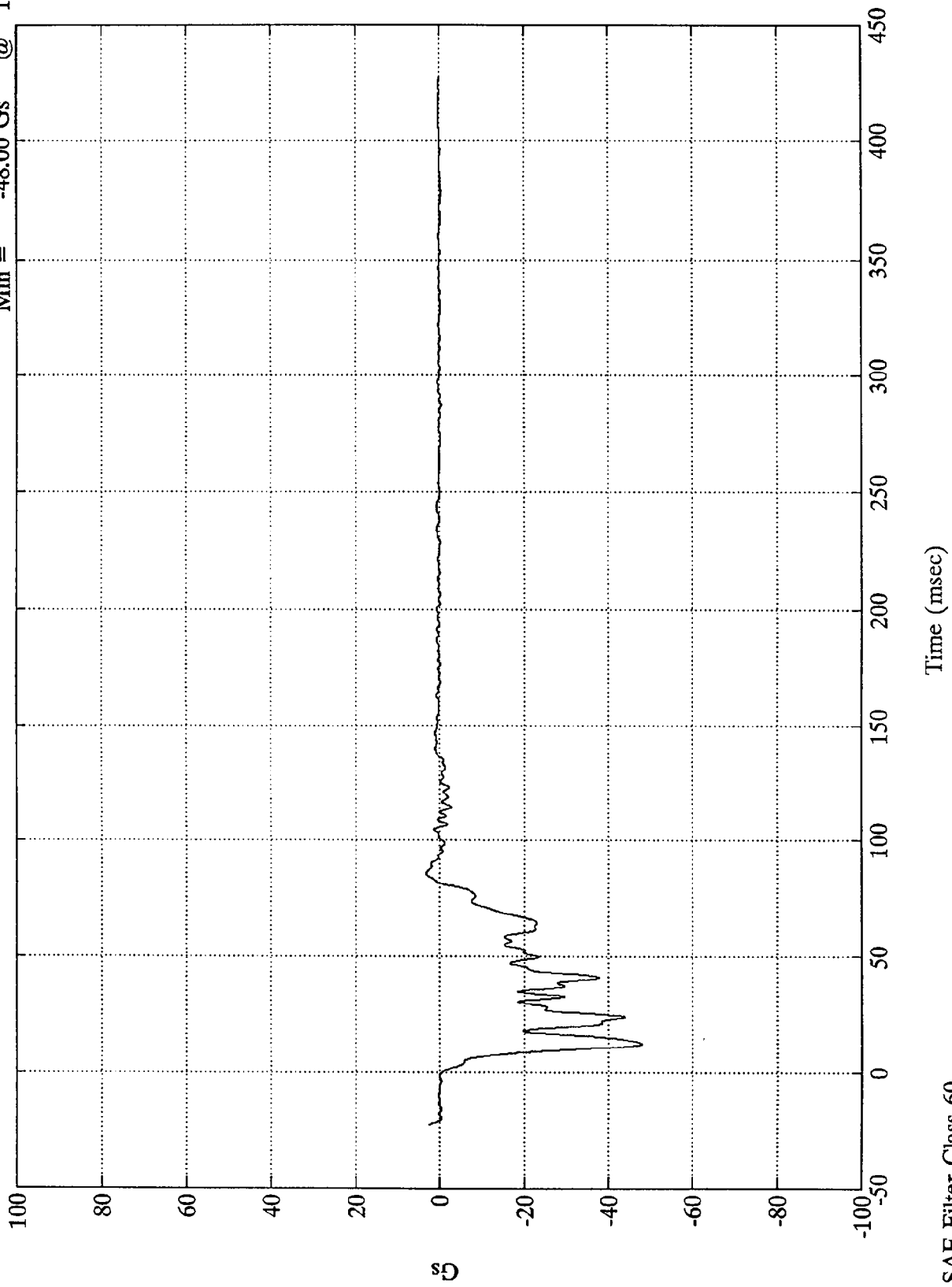


SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 3.27 Gs @ 85.31 msec
Min = -48.00 Gs @ 12.60 msec

Acc. #2(x)

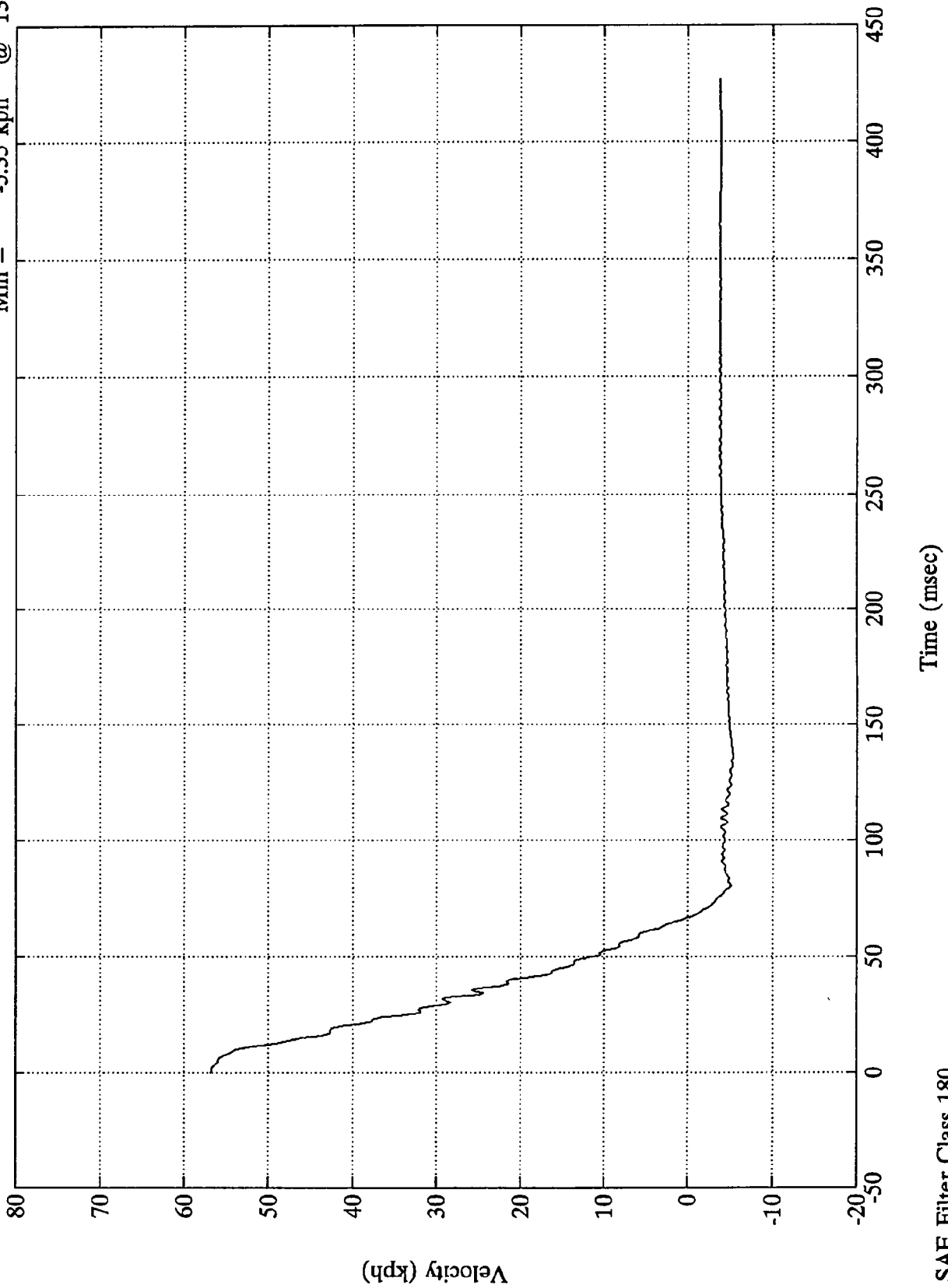


SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 56.81 kph @ -0.00 msec
Min = -5.35 kph @ 136.44 msec

Acc. #2(x)

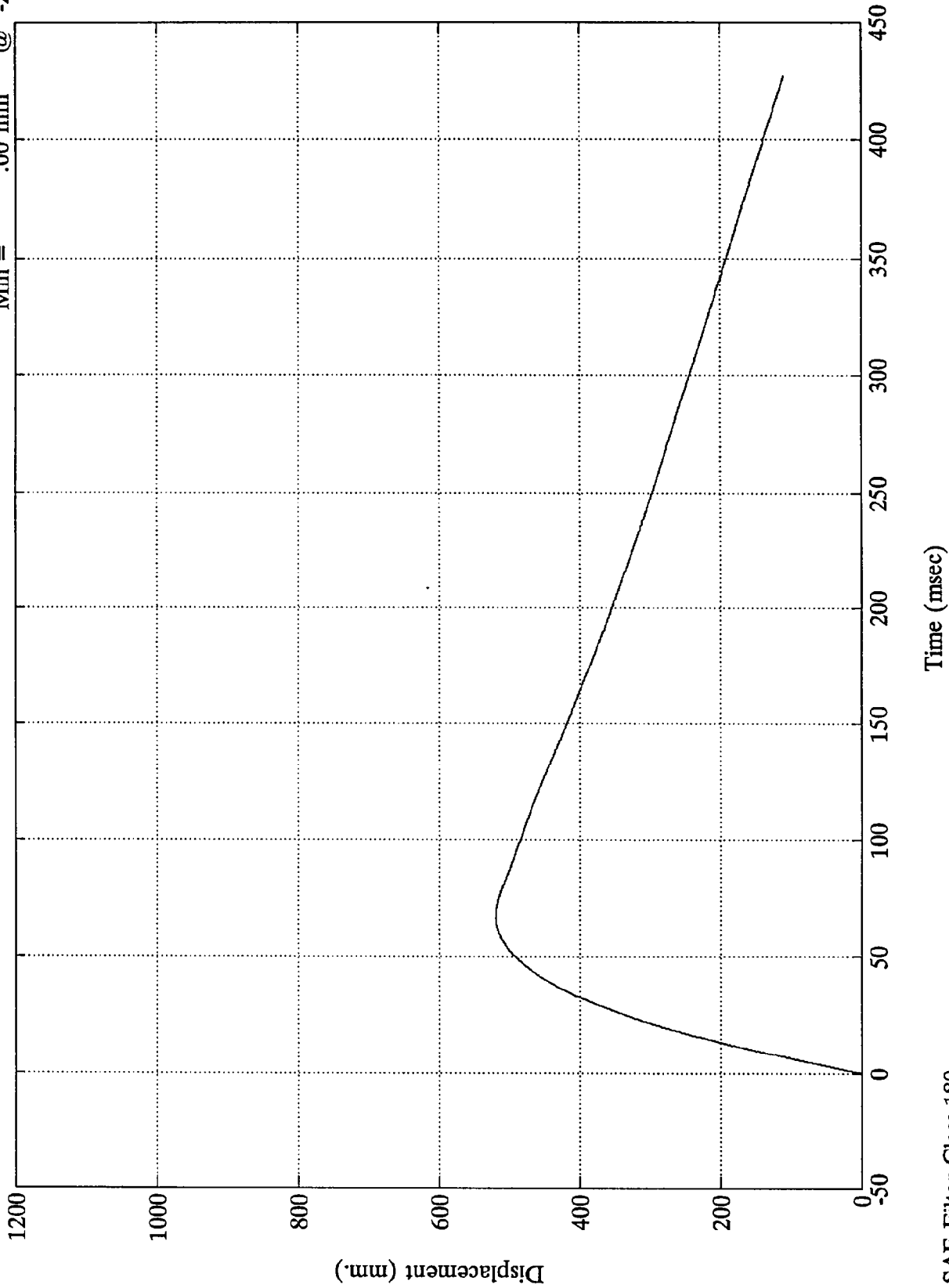


SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 520.11 mm @ 66.72 msec
Min = .00 mm @ -22.44 msec

Acc. #2(x)

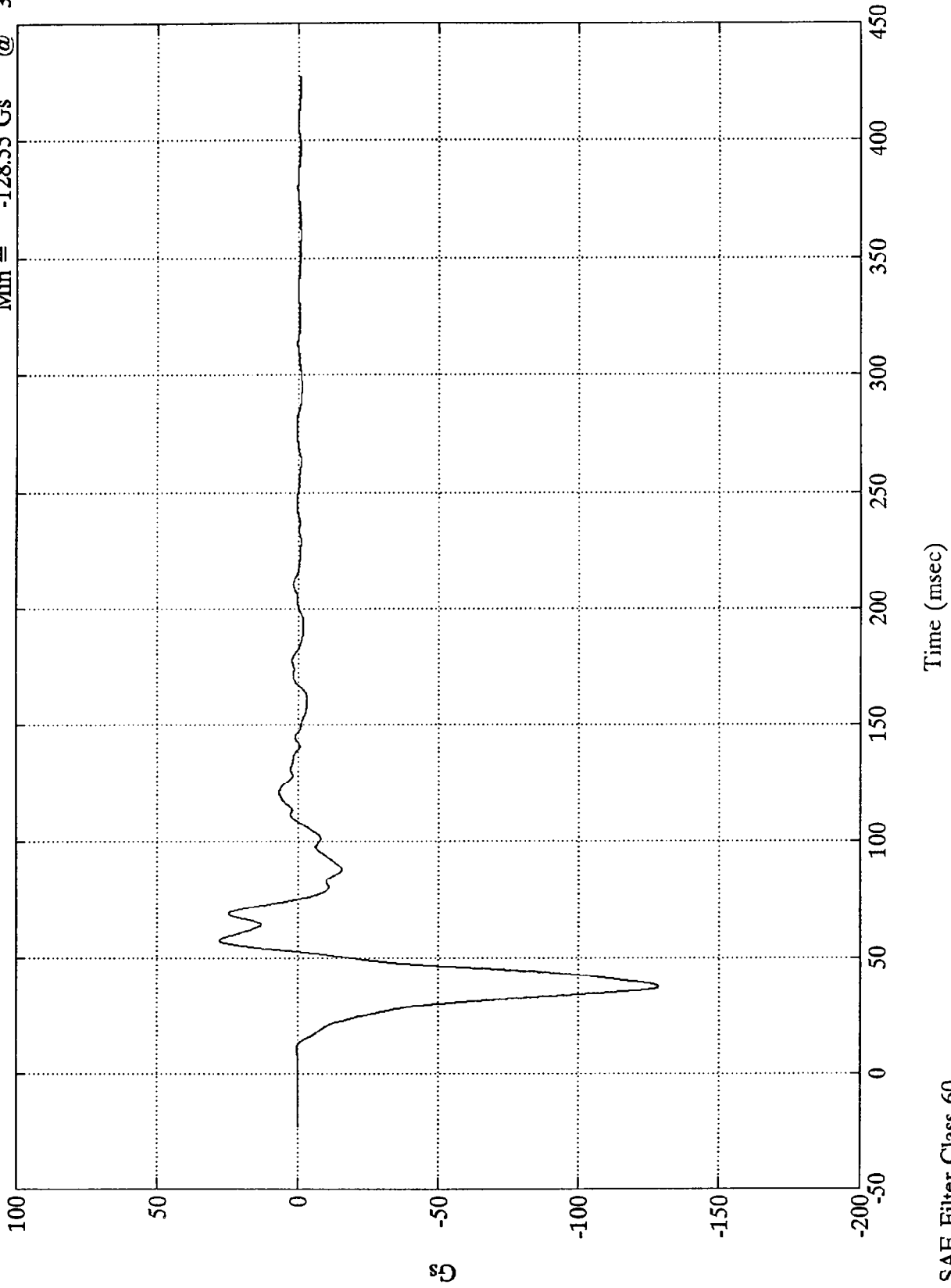


SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Acc. #3(x)

Max = 27.93 Gs @ 57.60 msec
Min = -128.55 Gs @ 37.56 msec

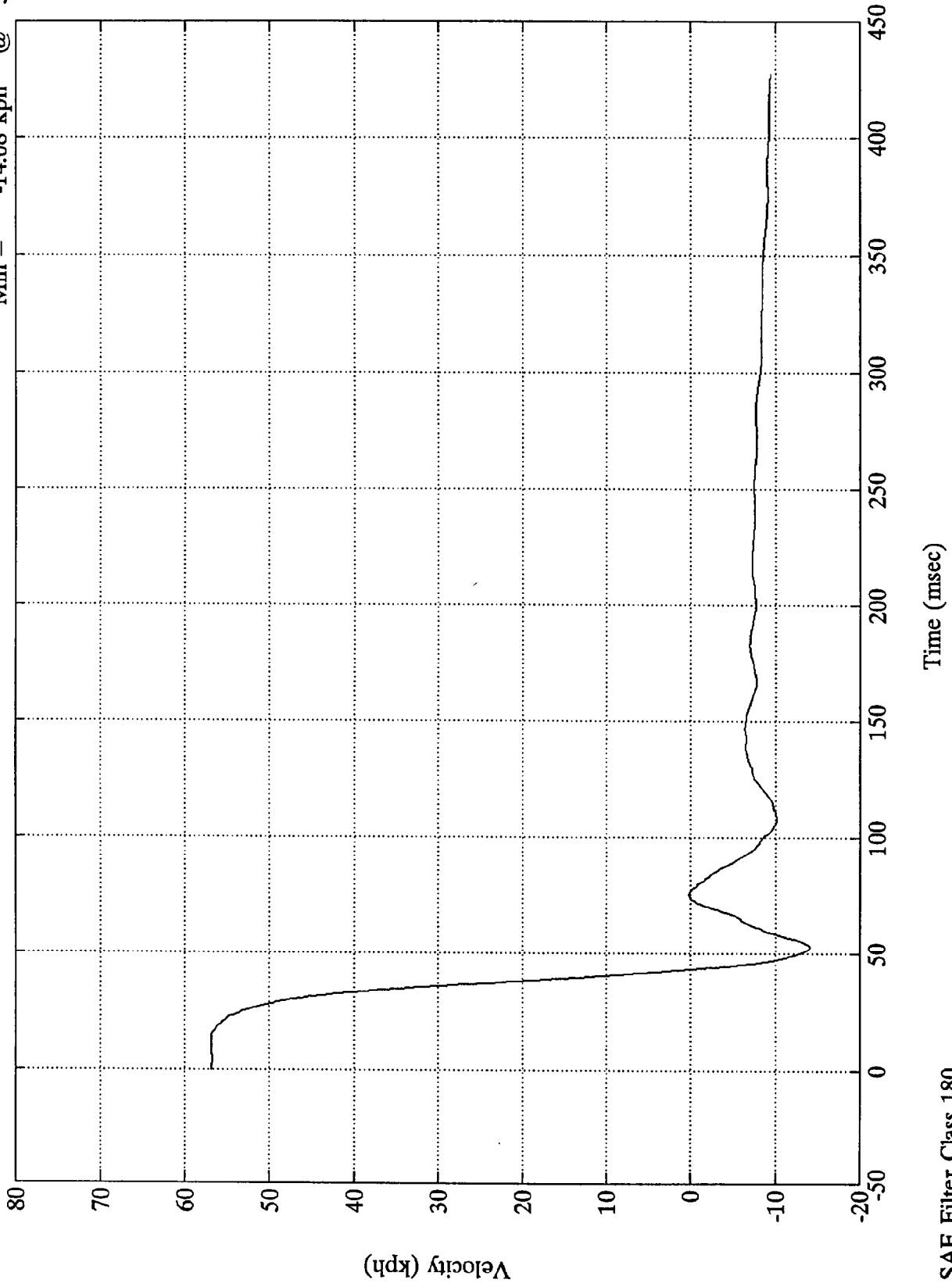


SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 56.86 kph @ 14.03 msec
Min = -14.08 kph @ 53.28 msec

Acc. #3(x)

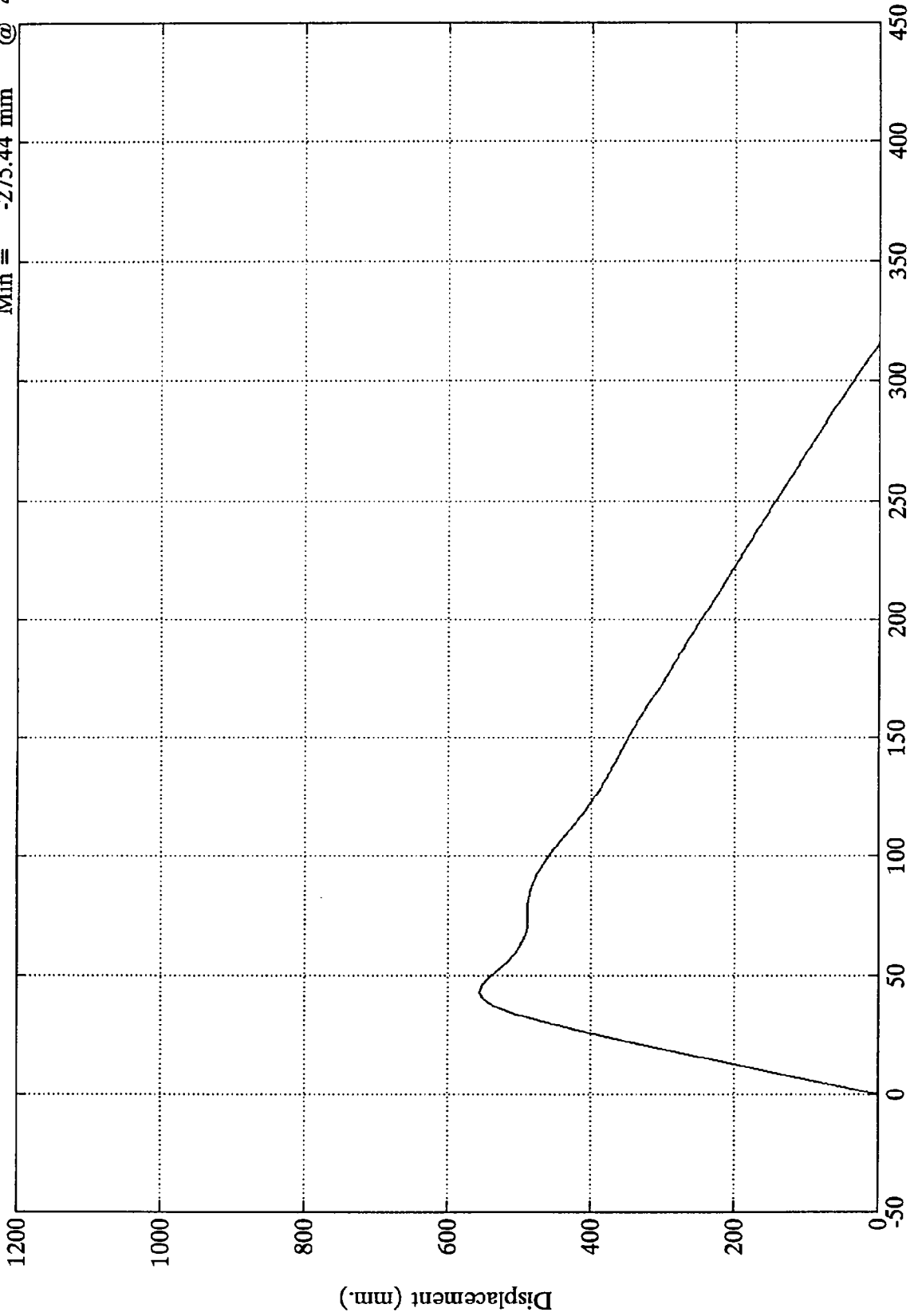


SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 555.31 mm @ 43.20 msec
Min = -275.44 mm @ 427.32 msec

Acc. #3(x)



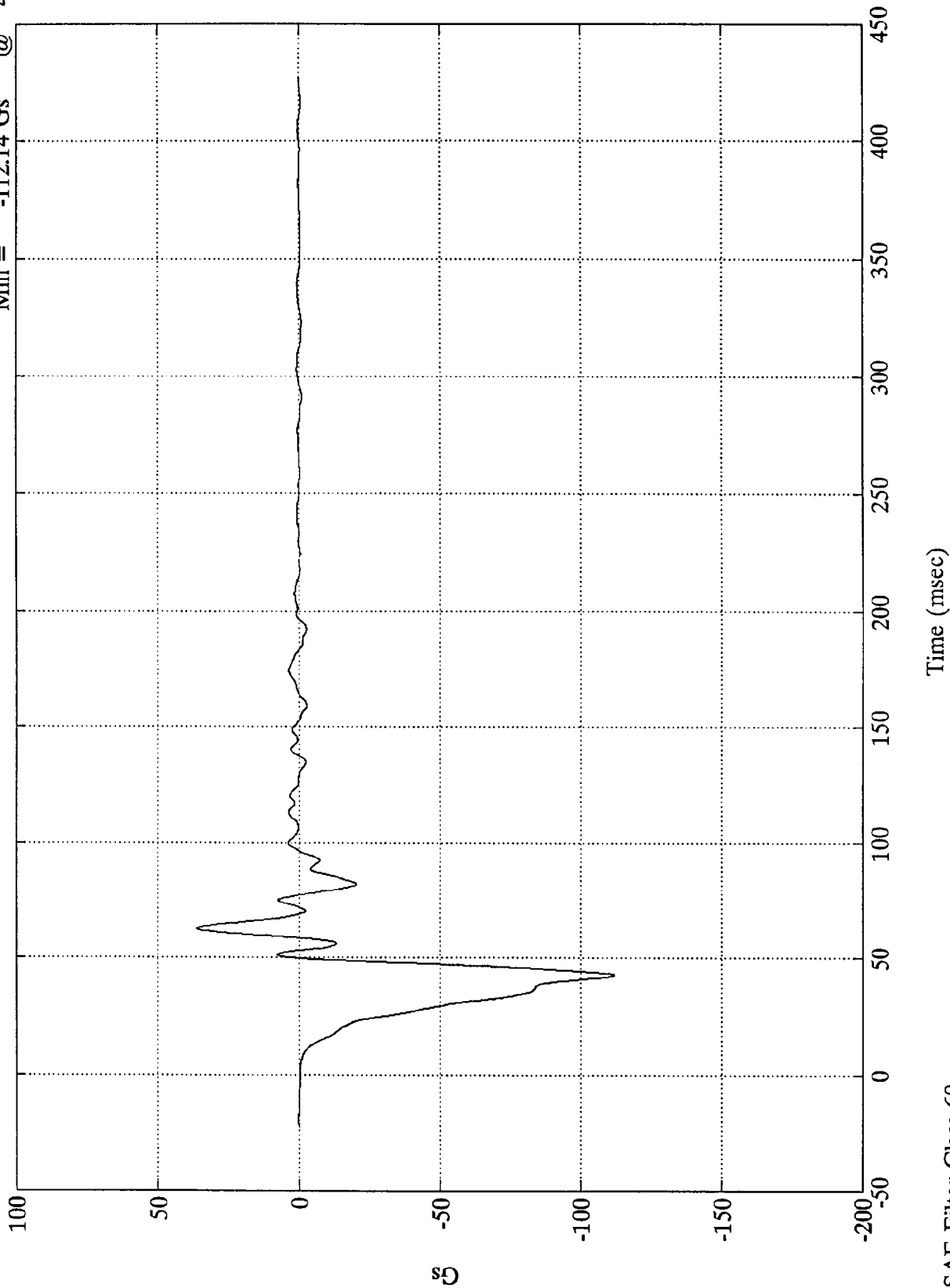
Time (msec)

SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 36.29 Gs @ 62.64 msec
Min = -112.14 Gs @ 42.36 msec

Acc. #4(x)

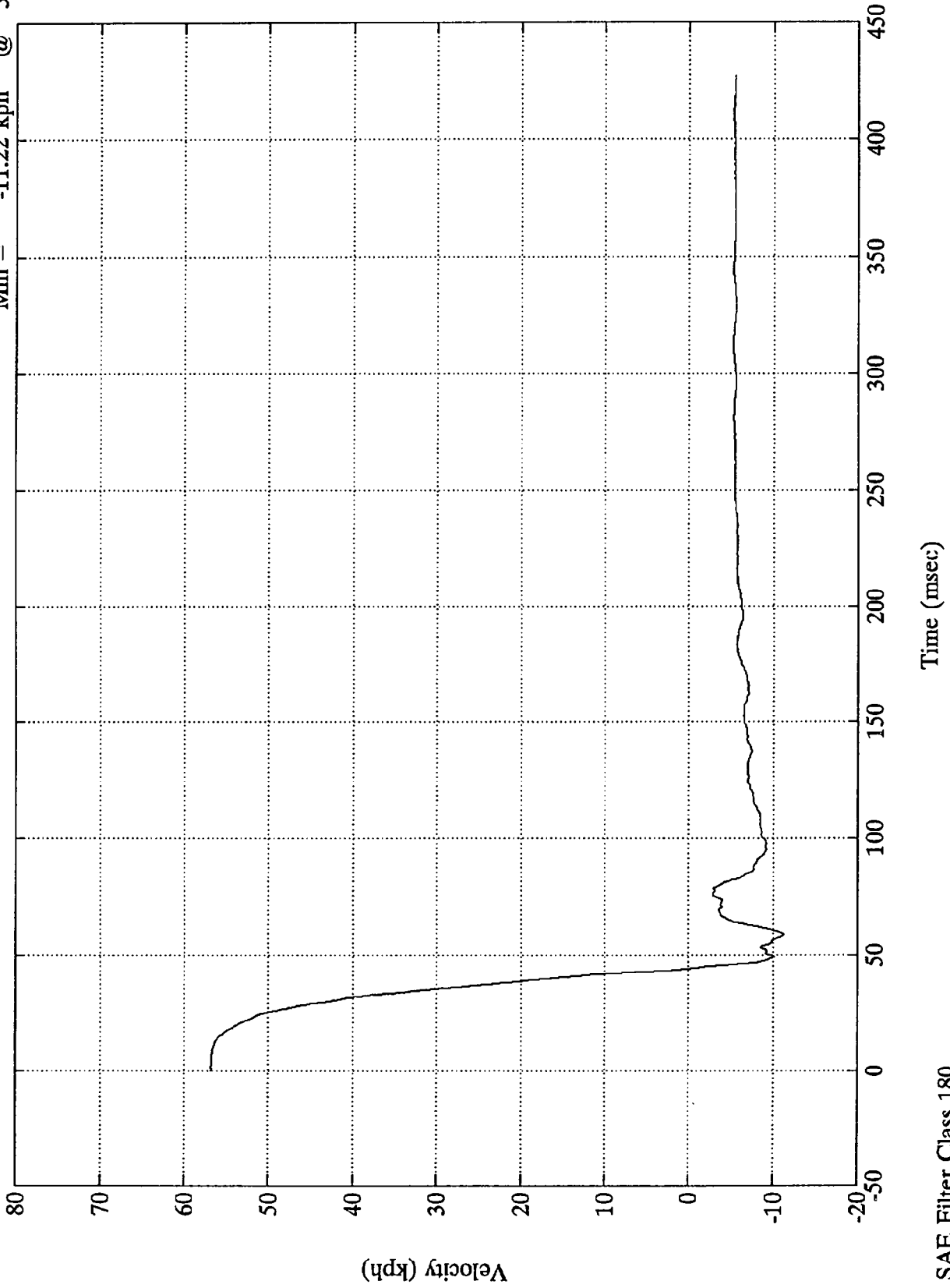


SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 56.81 kph @ 1.67 msec
Min = -11.22 kph @ 58.68 msec

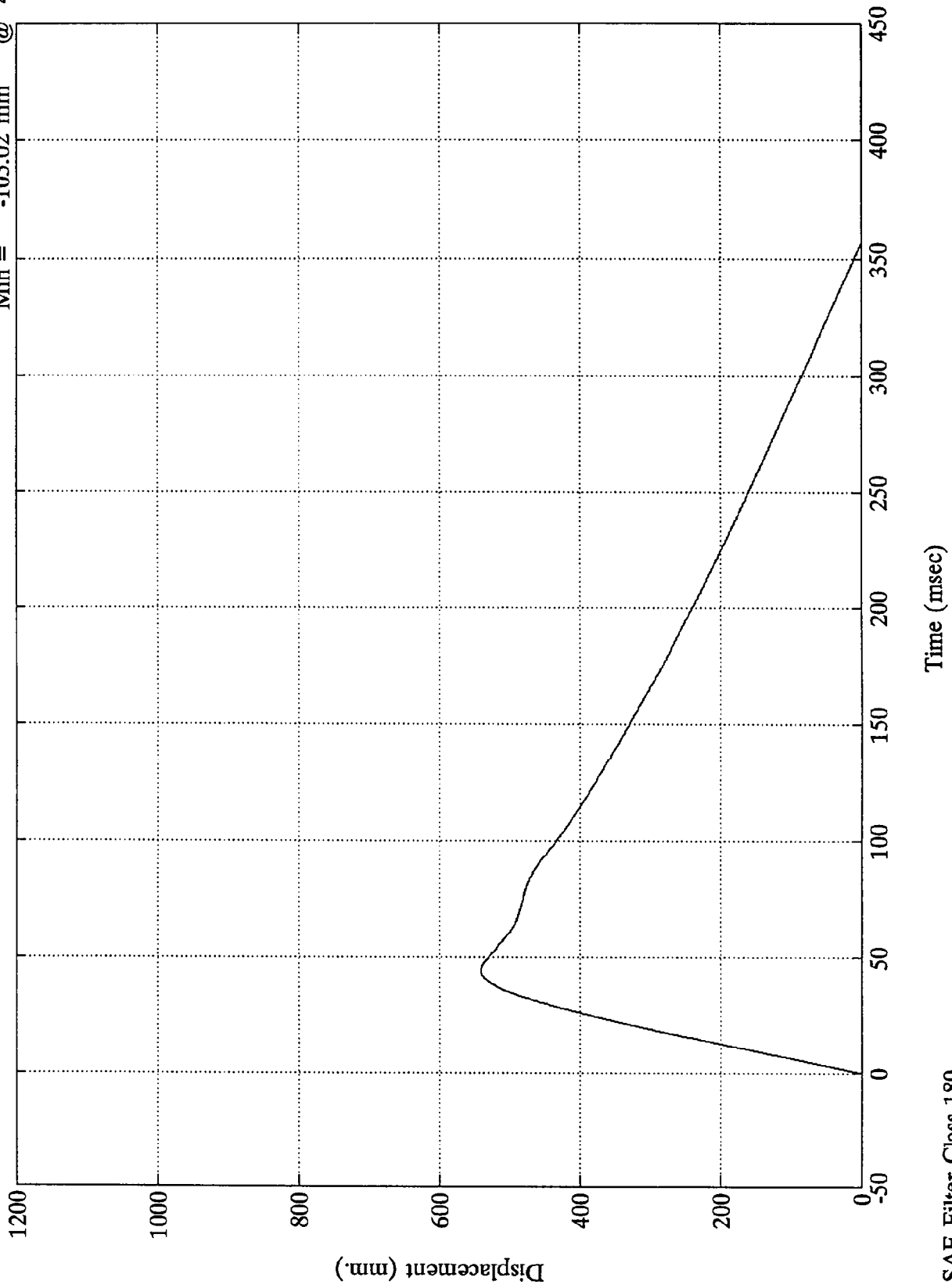
Acc. #4(x)



NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 541.27 mm @ 43.92 msec
Min = -105.02 mm @ 427.32 msec

Acc. #4(x)

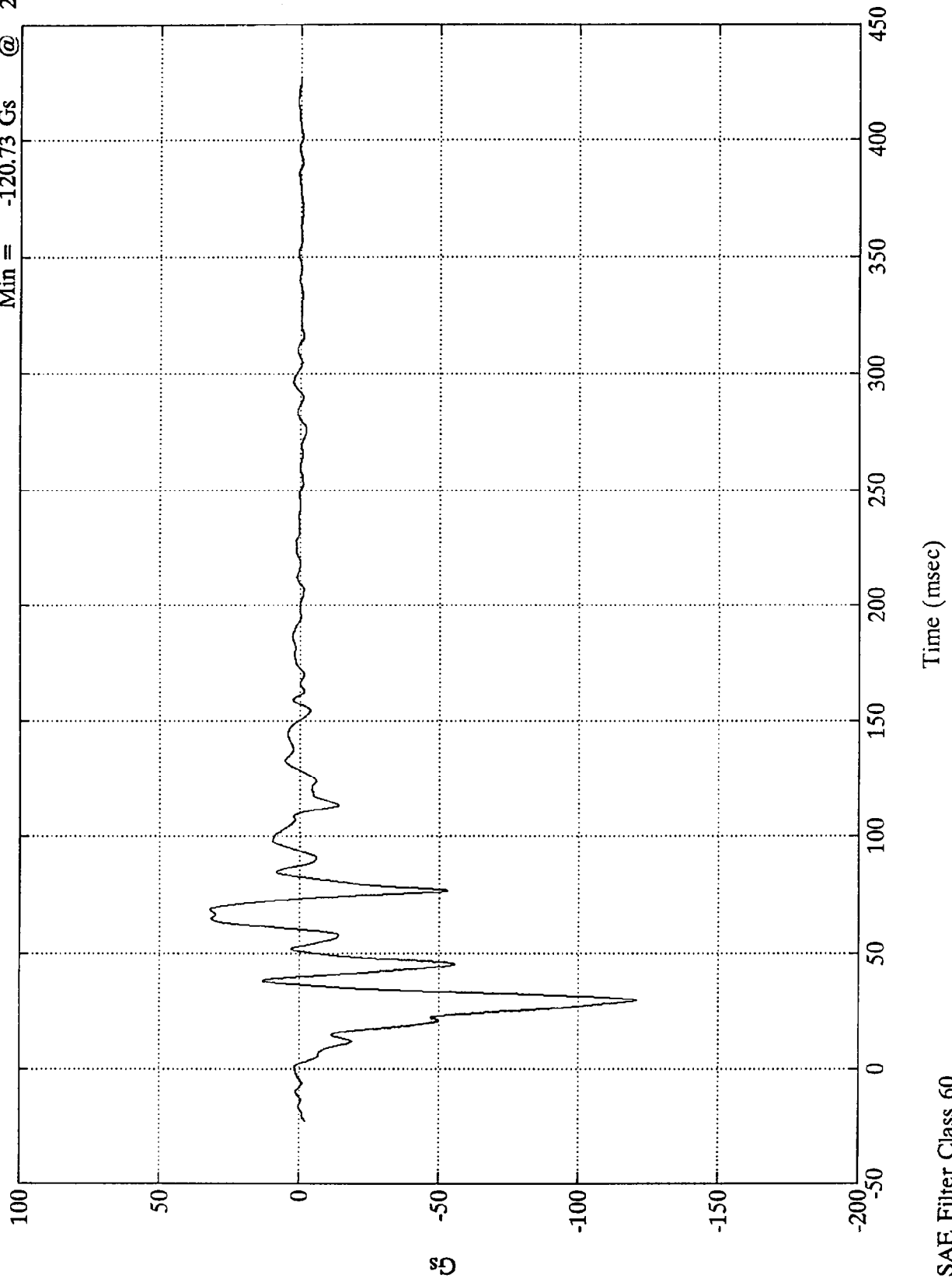


SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Acc. #5(x)

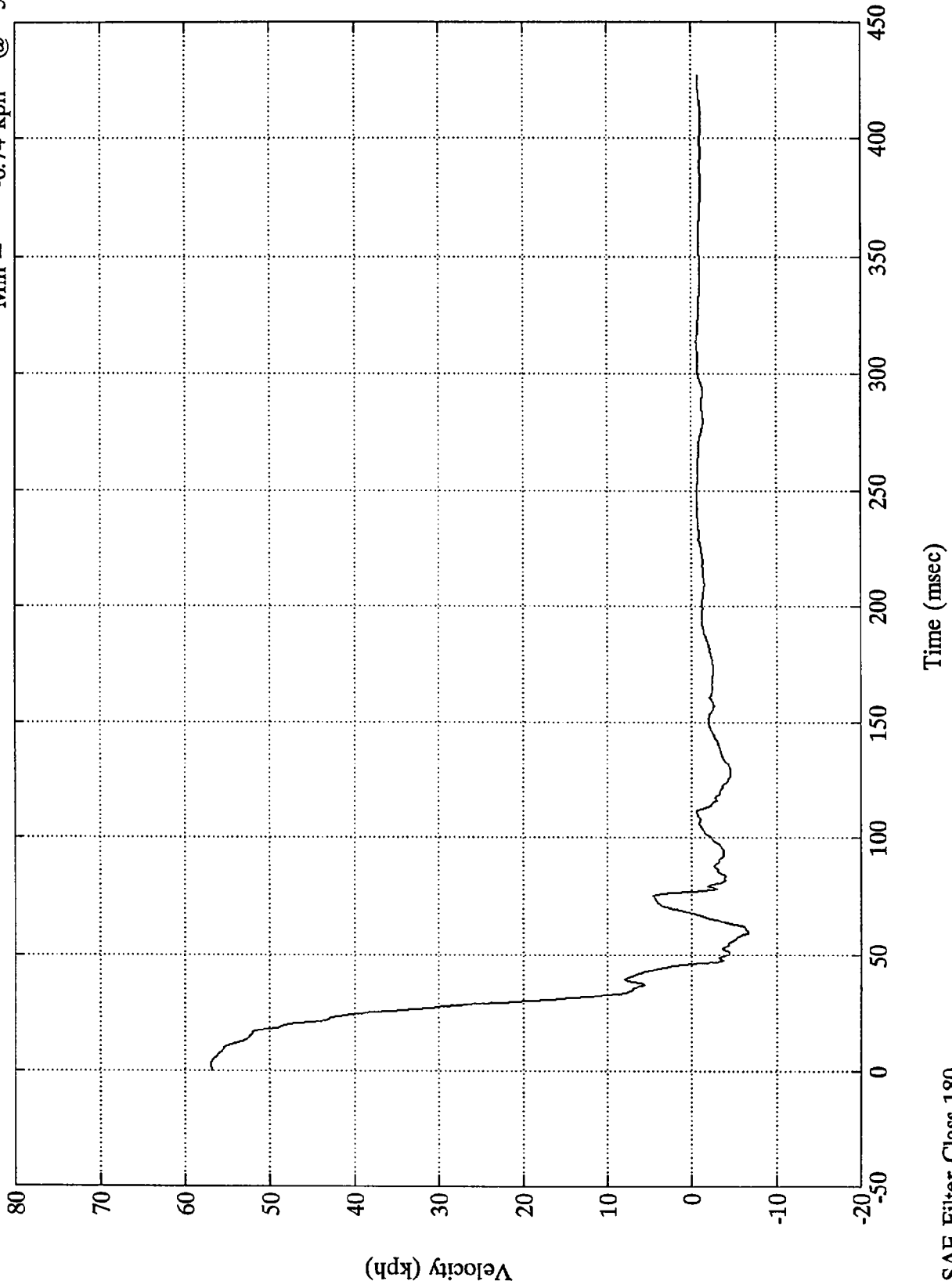
Max = 31.97 Gs @ 68.63 msec
Min = -120.73 Gs @ 29.52 msec



NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 57.02 kph @ 2.63 msec
Min = -6.74 kph @ 59.76 msec

Acc. #5(x)

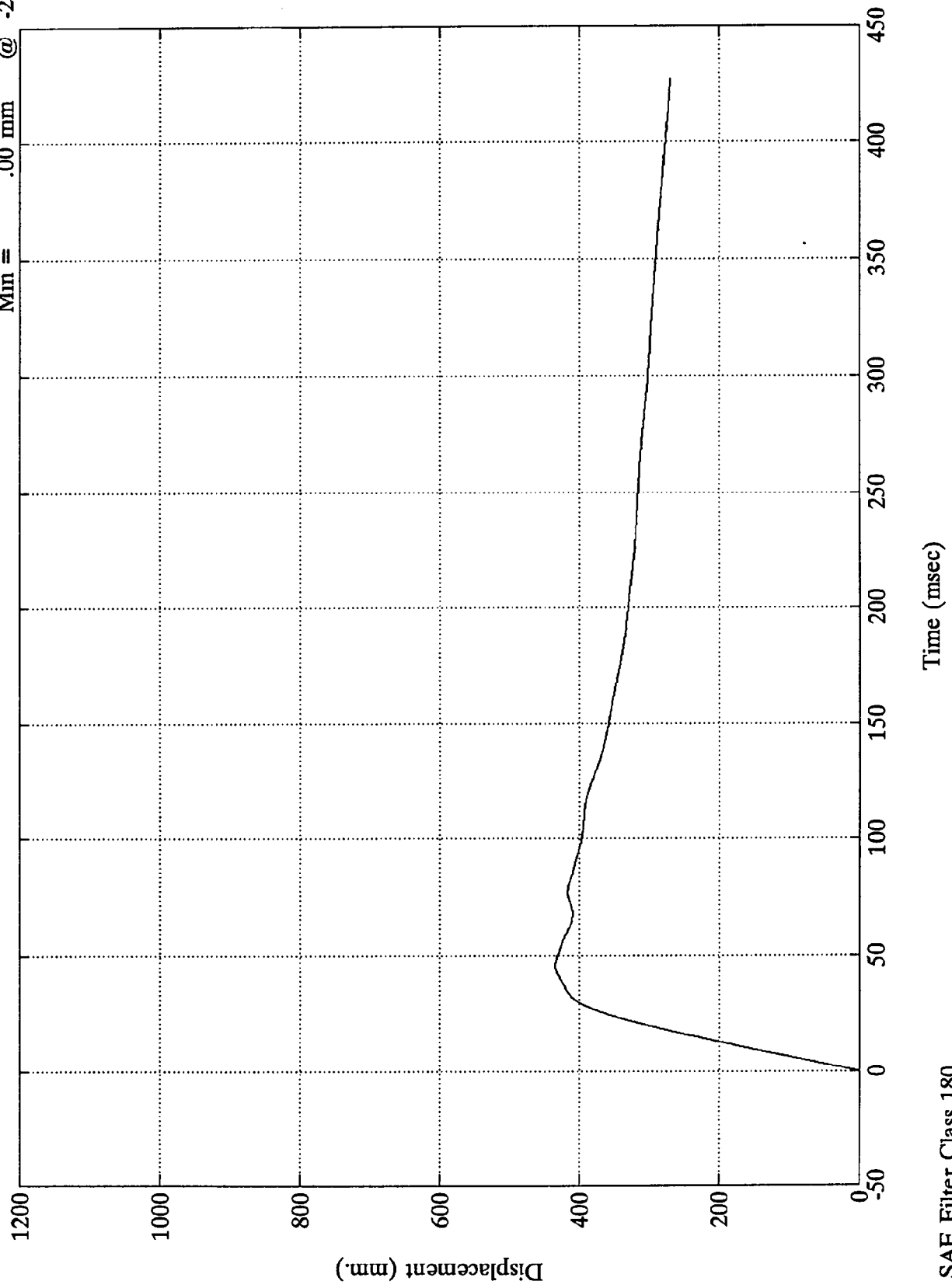


SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 435.09 mm @ 45.84 msec
Min = .00 mm @ -22.44 msec

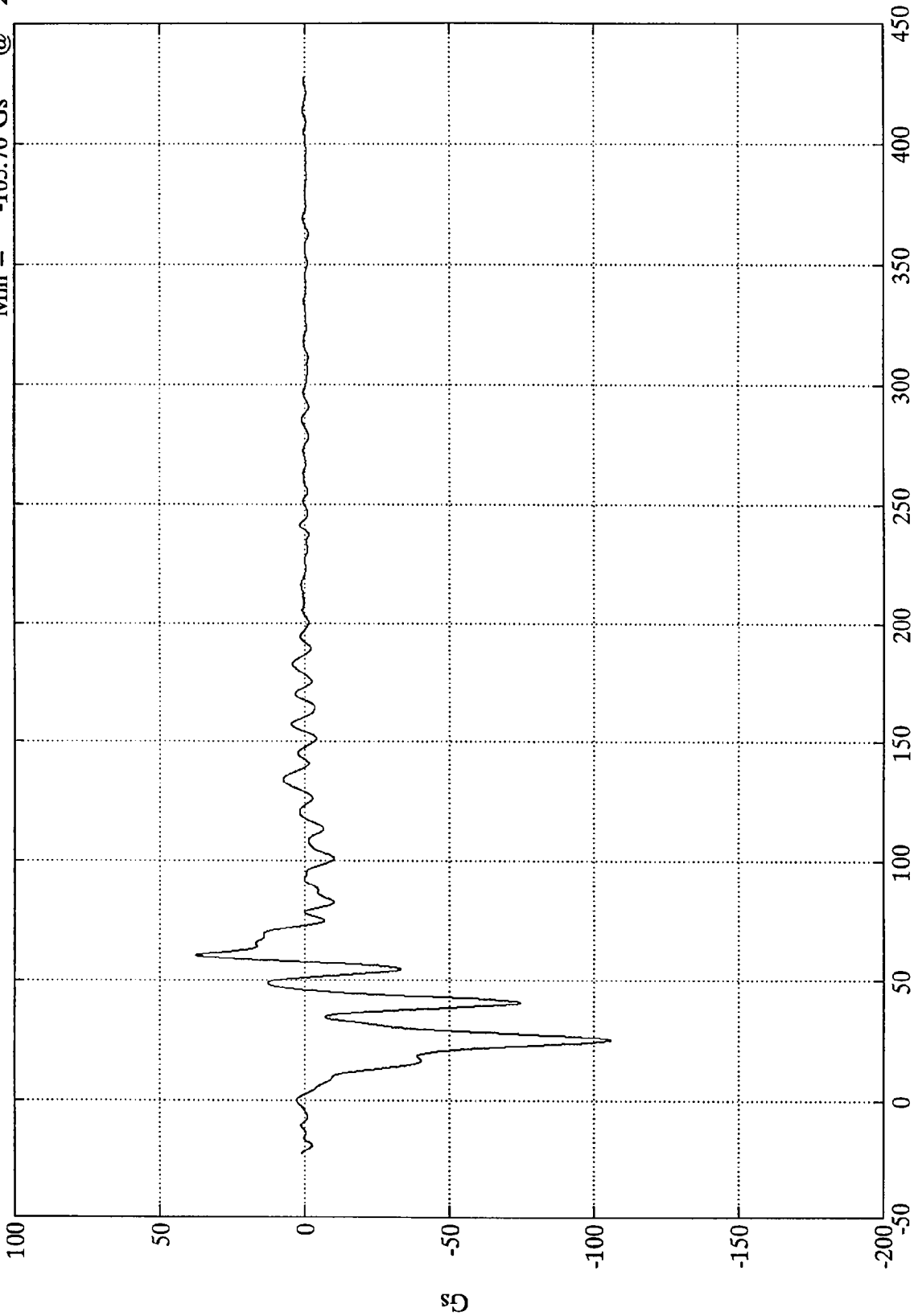
Acc. #5(x)



NCAP TEST #4 - 1995 DODGE RAM VAN

Acc. #6(x)

Max = 37.75 Gs @ 60.60 msec
Min = -105.70 Gs @ 25.20 msec



SAE Filter Class 60

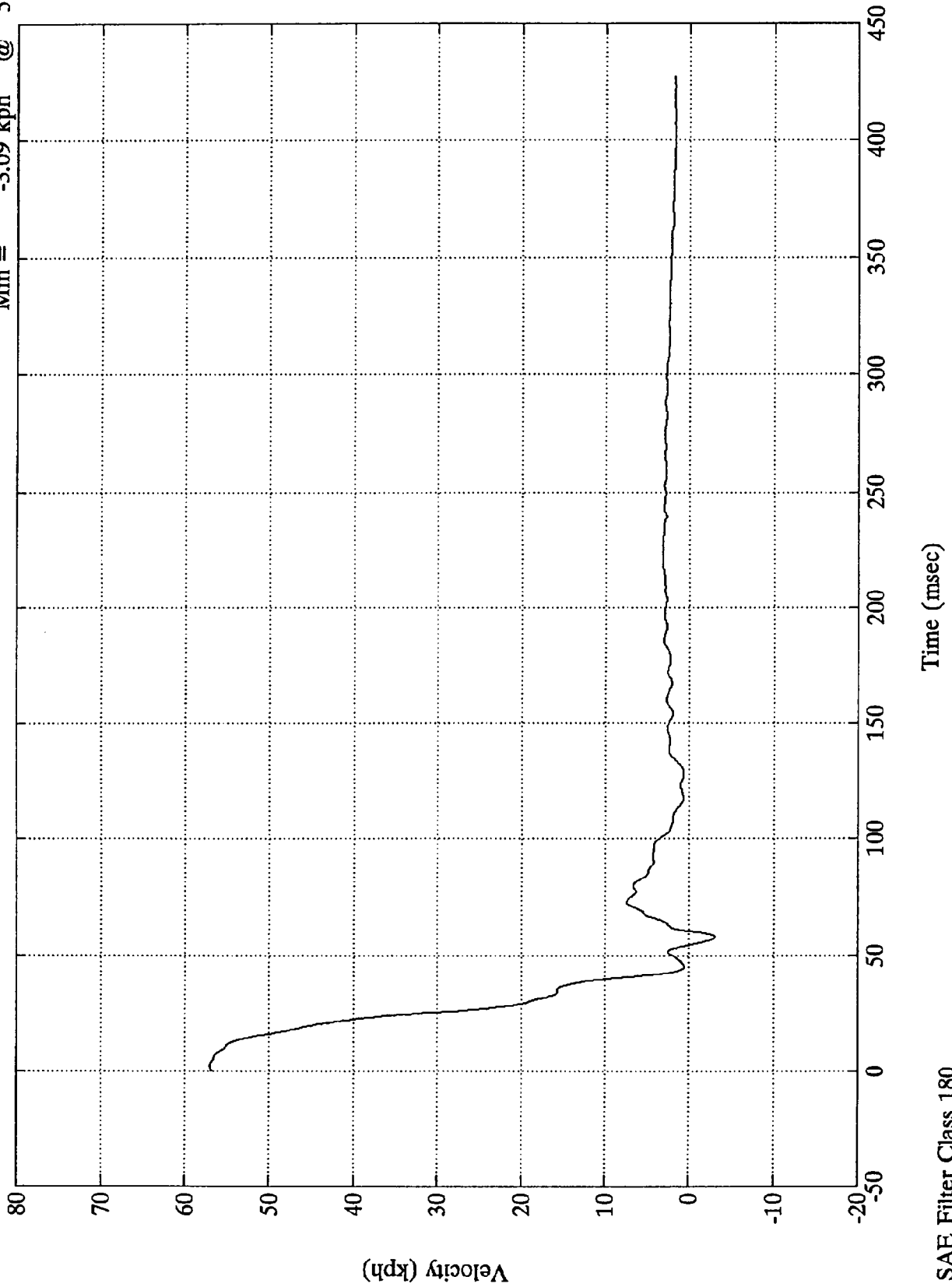
Time (msec)

Gs

NCAP TEST #4 - 1995 DODGE RAM VAN

Acc. #6(x)

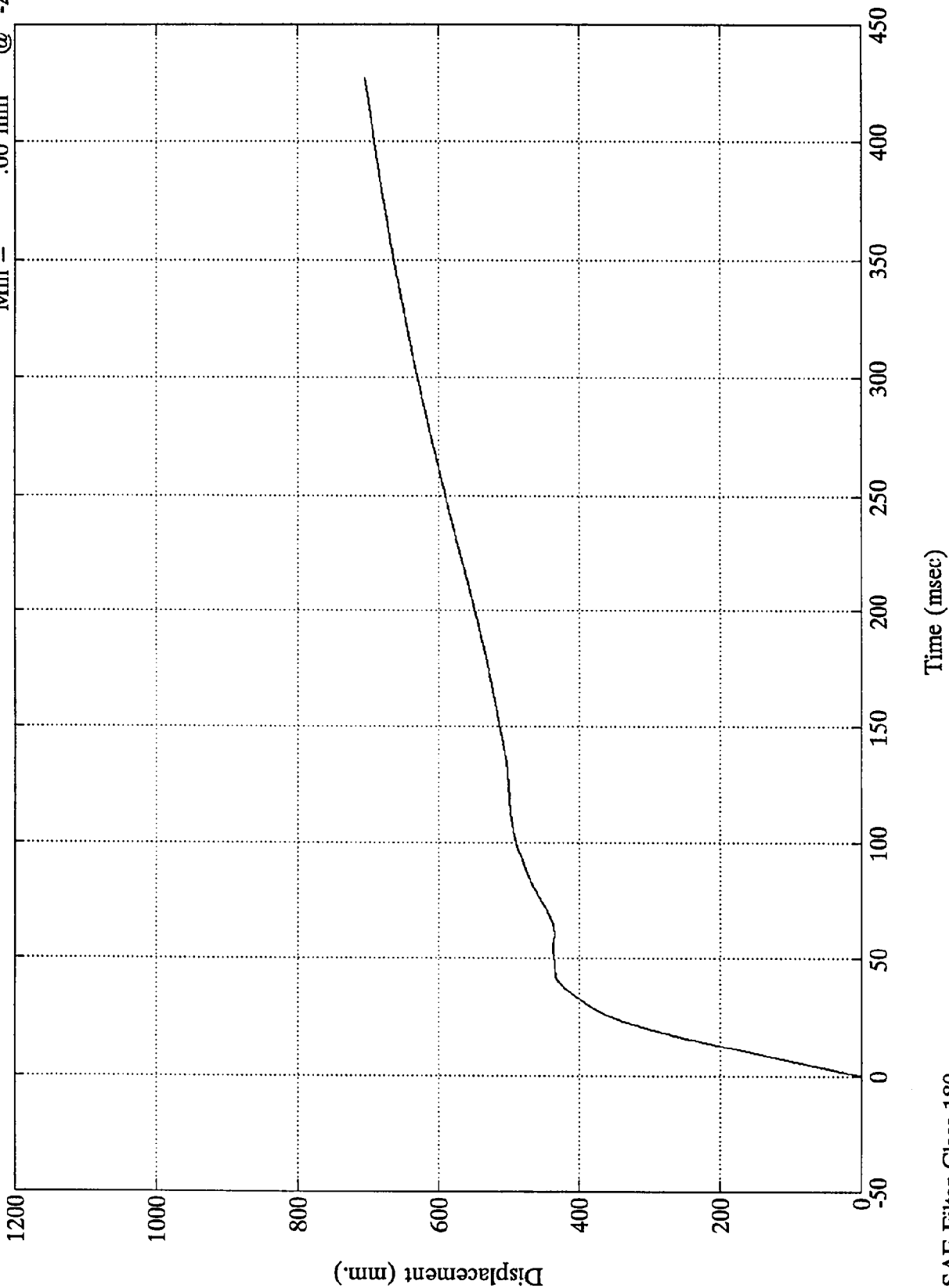
Max = 57.03 kph @ 2.51 msec
Min = -3.09 kph @ 57.96 msec



NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 704.70 mm @ 427.32 msec
Min = .00 mm @ -22.44 msec

Acc. #6(x)

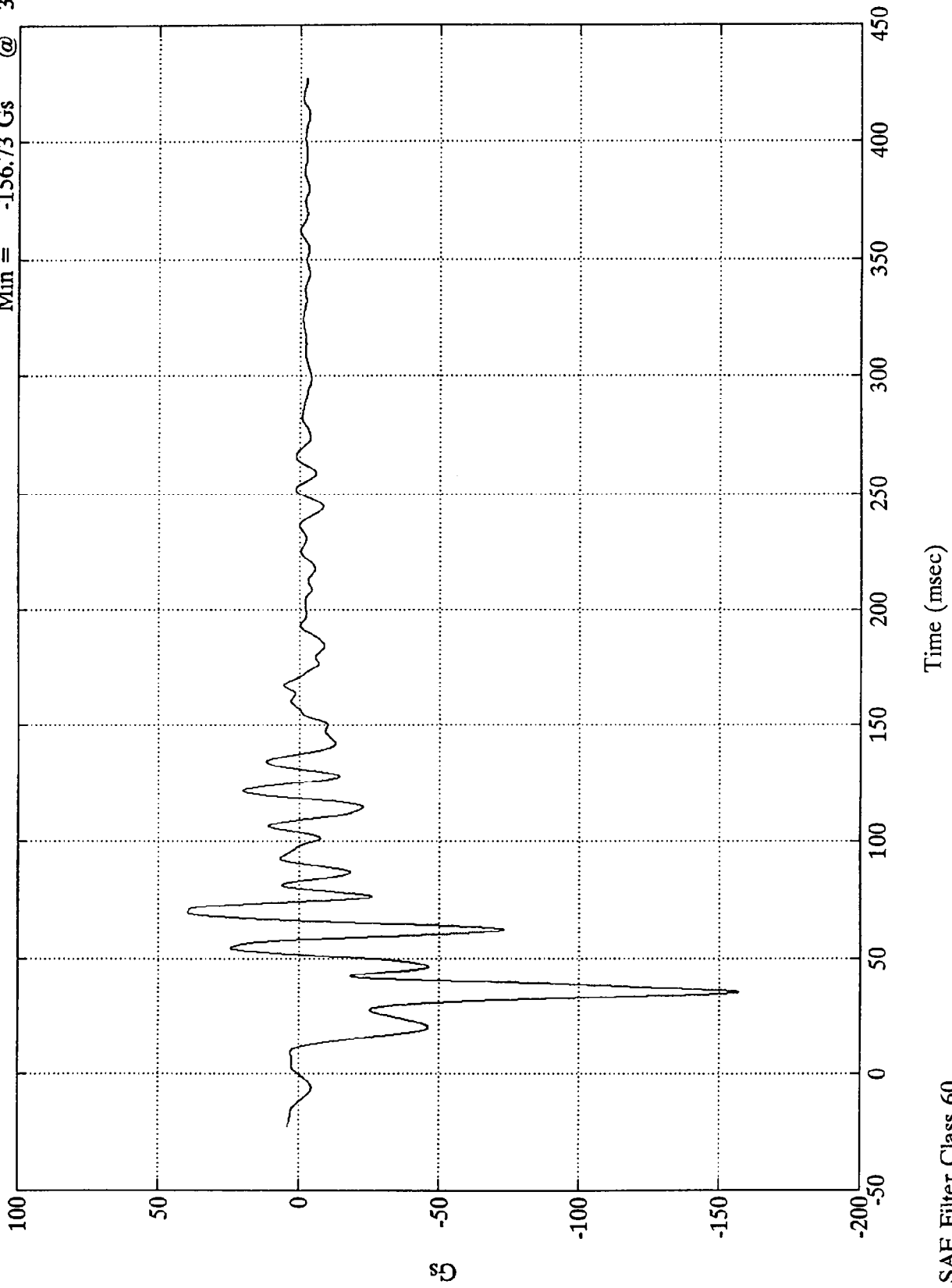


SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Acc. #7(x)

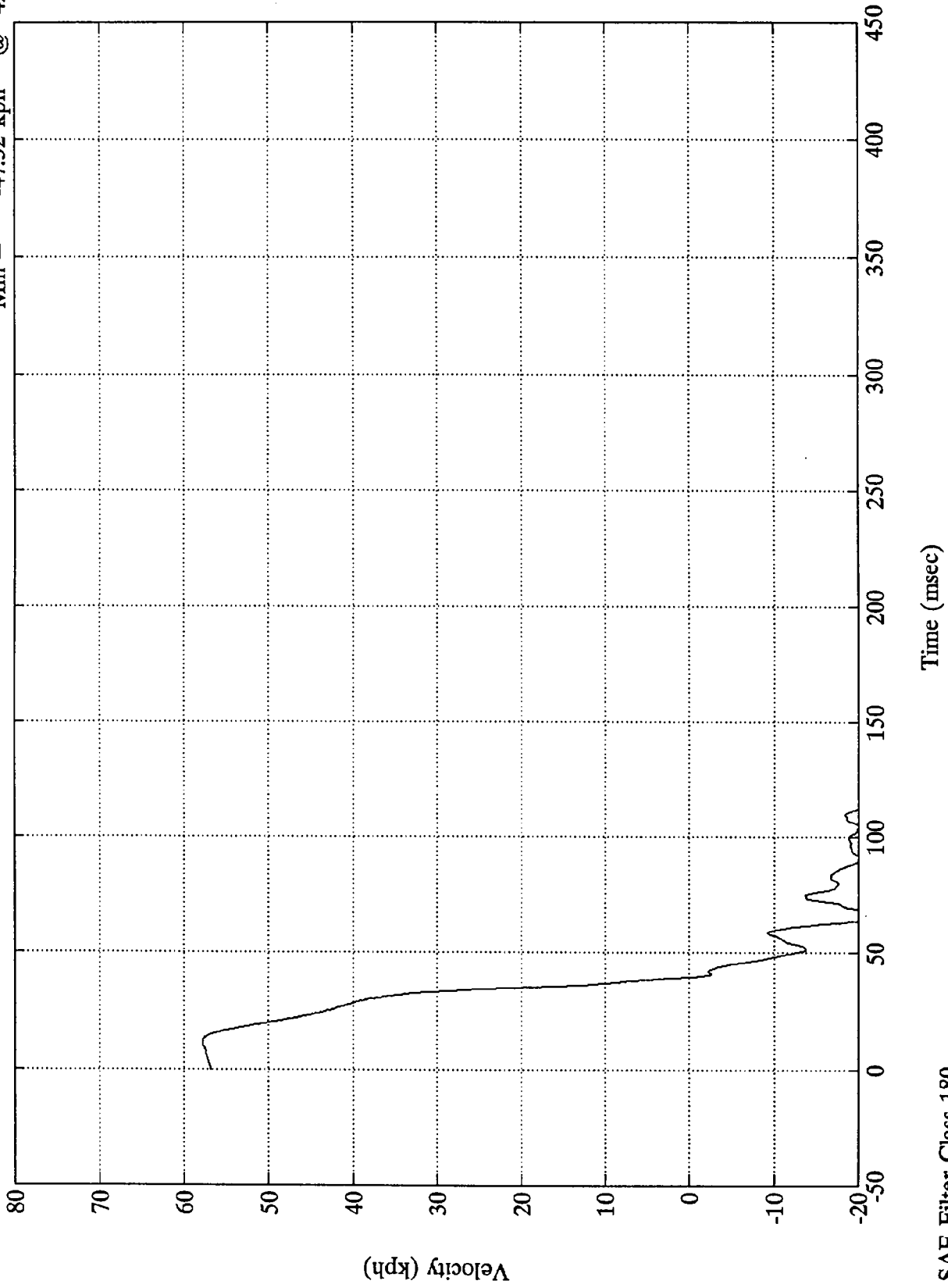
Max = 39.68 Gs @ 69.96 msec
Min = -156.73 Gs @ 34.91 msec



NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 57.80 kph @ 11.52 msec
Min = -47.32 kph @ 427.32 msec

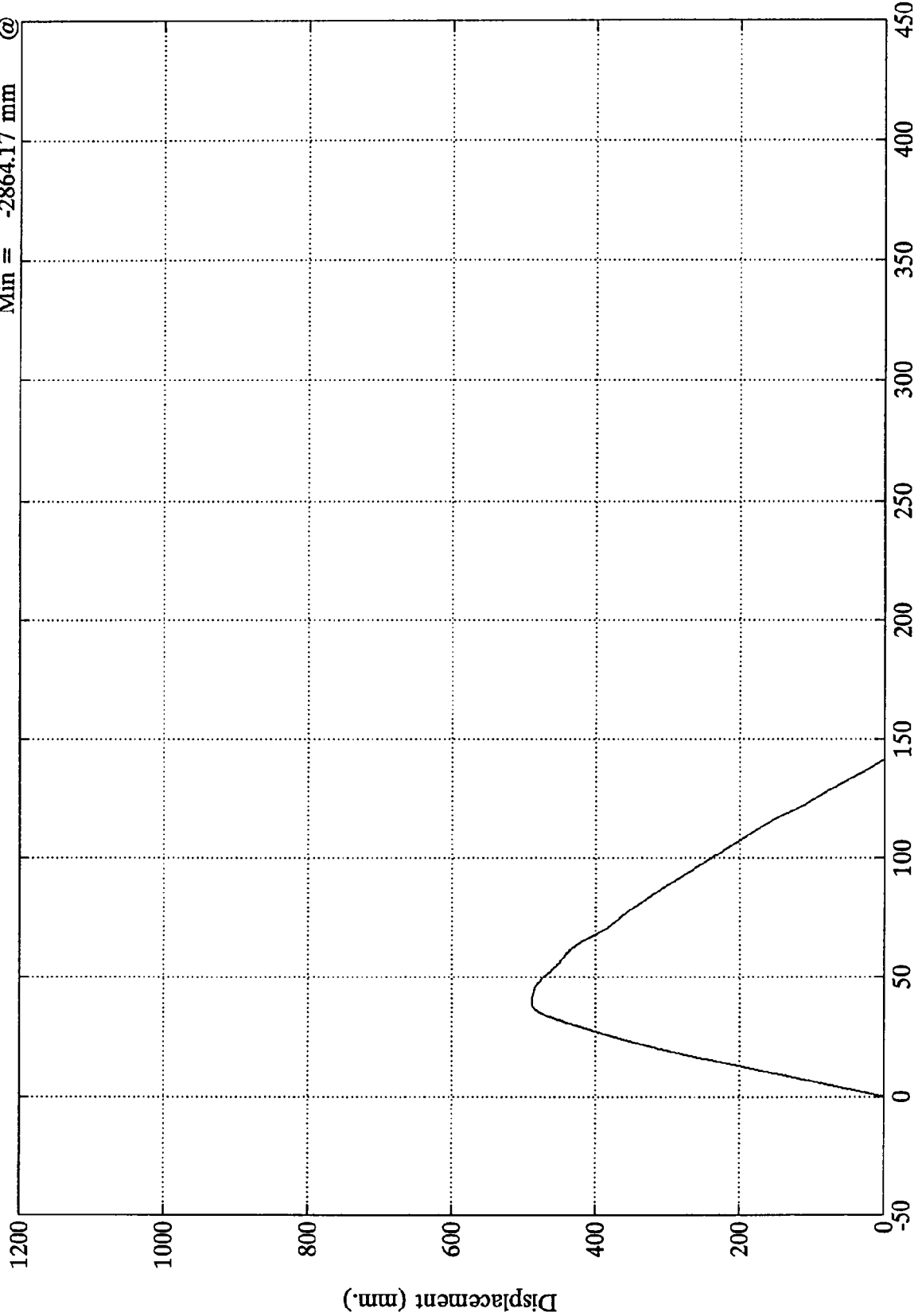
Acc. #7(x)



NCAP TEST #4 - 1995 DODGE RAM VAN

Acc. #7(x)

Max = 489.42 mm @ 39.48 msec
Min = -2864.17 mm @ 427.32 msec



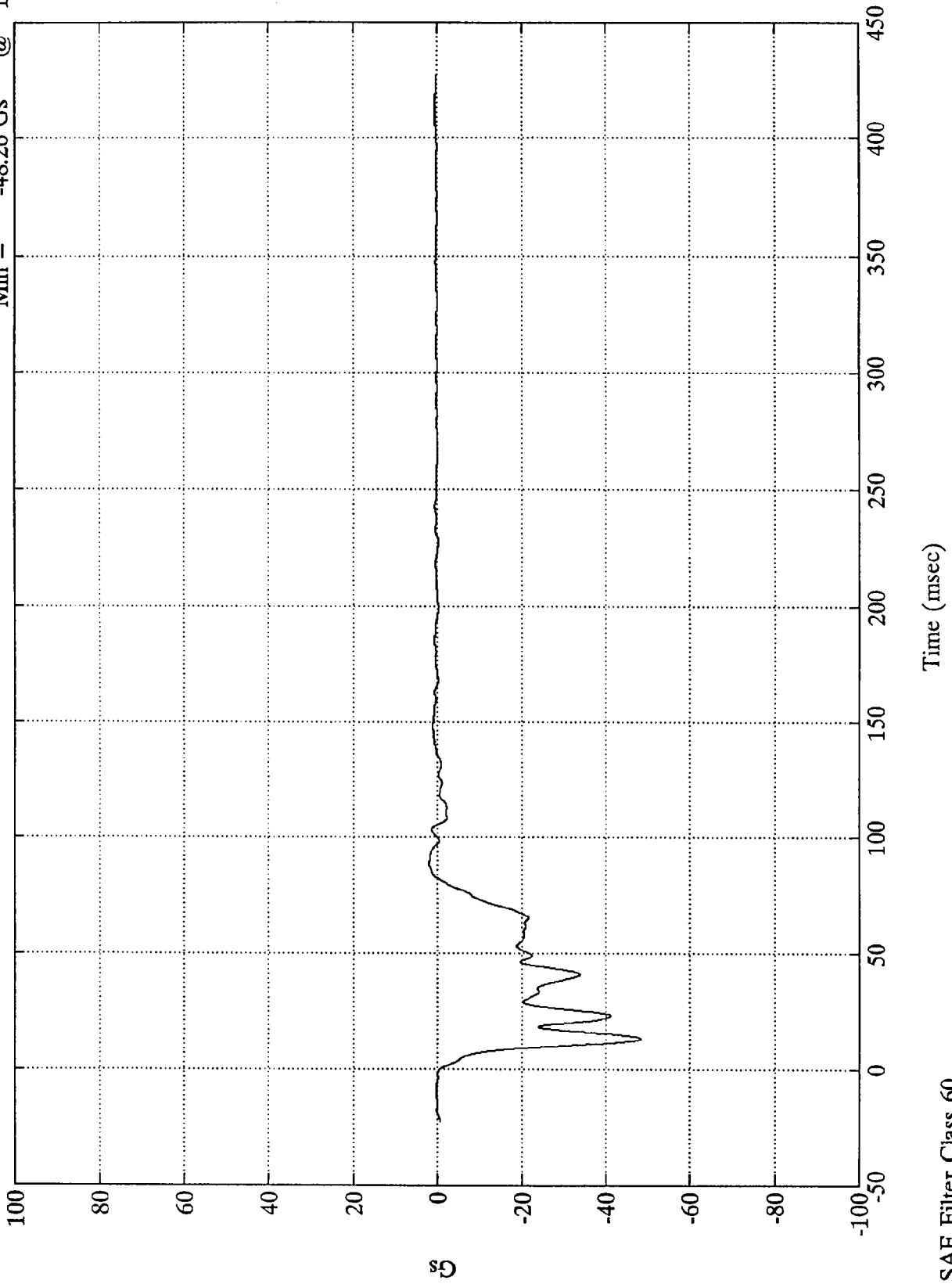
Time (msec)

SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 2.03 Gs @ 88.80 msec
Min = -48.26 Gs @ 13.07 msec

Acc. #8(x)

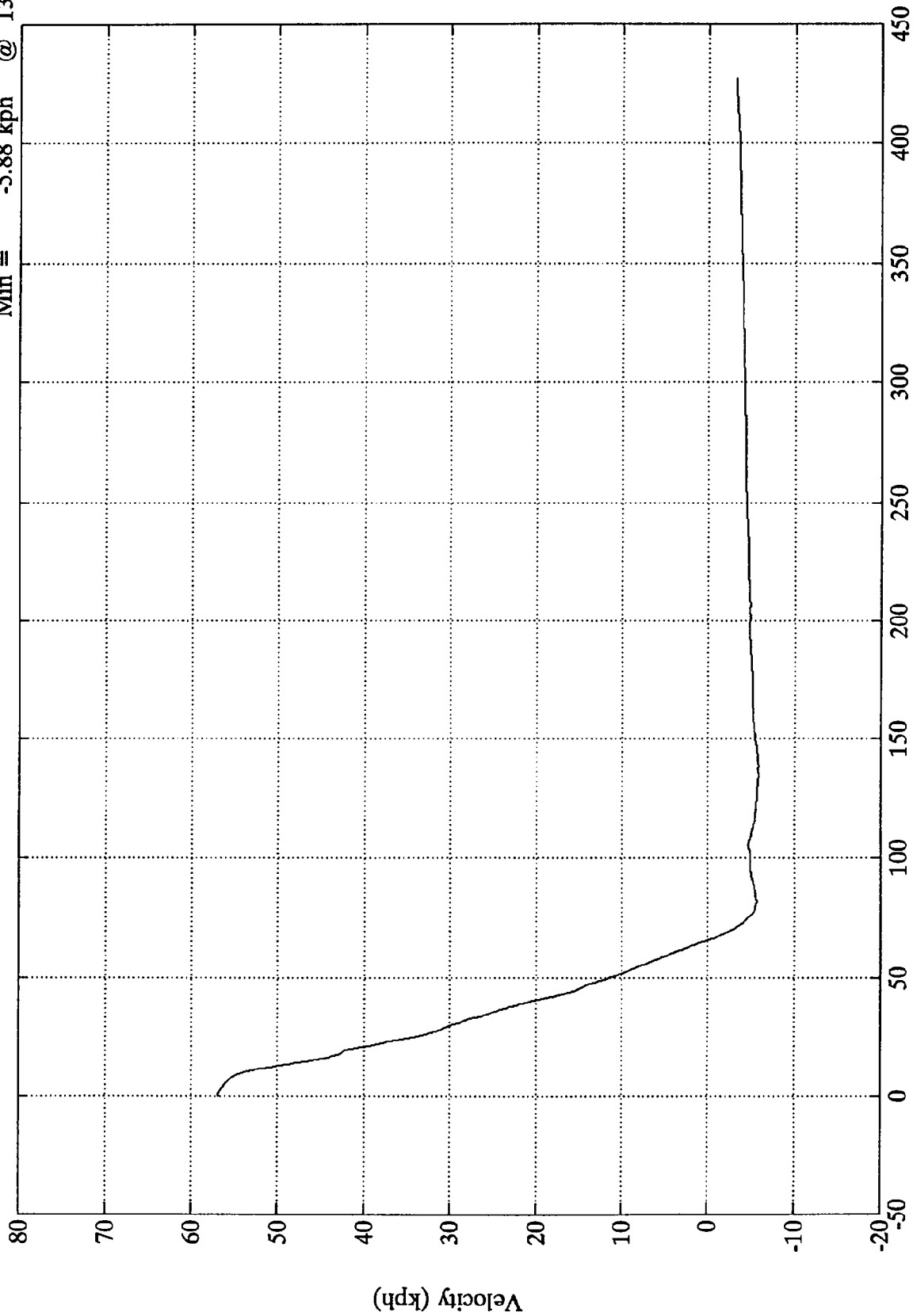


SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 56.81 kph @ 0.11 msec
Min = -5.88 kph @ 135.36 msec

Acc. #8(x)



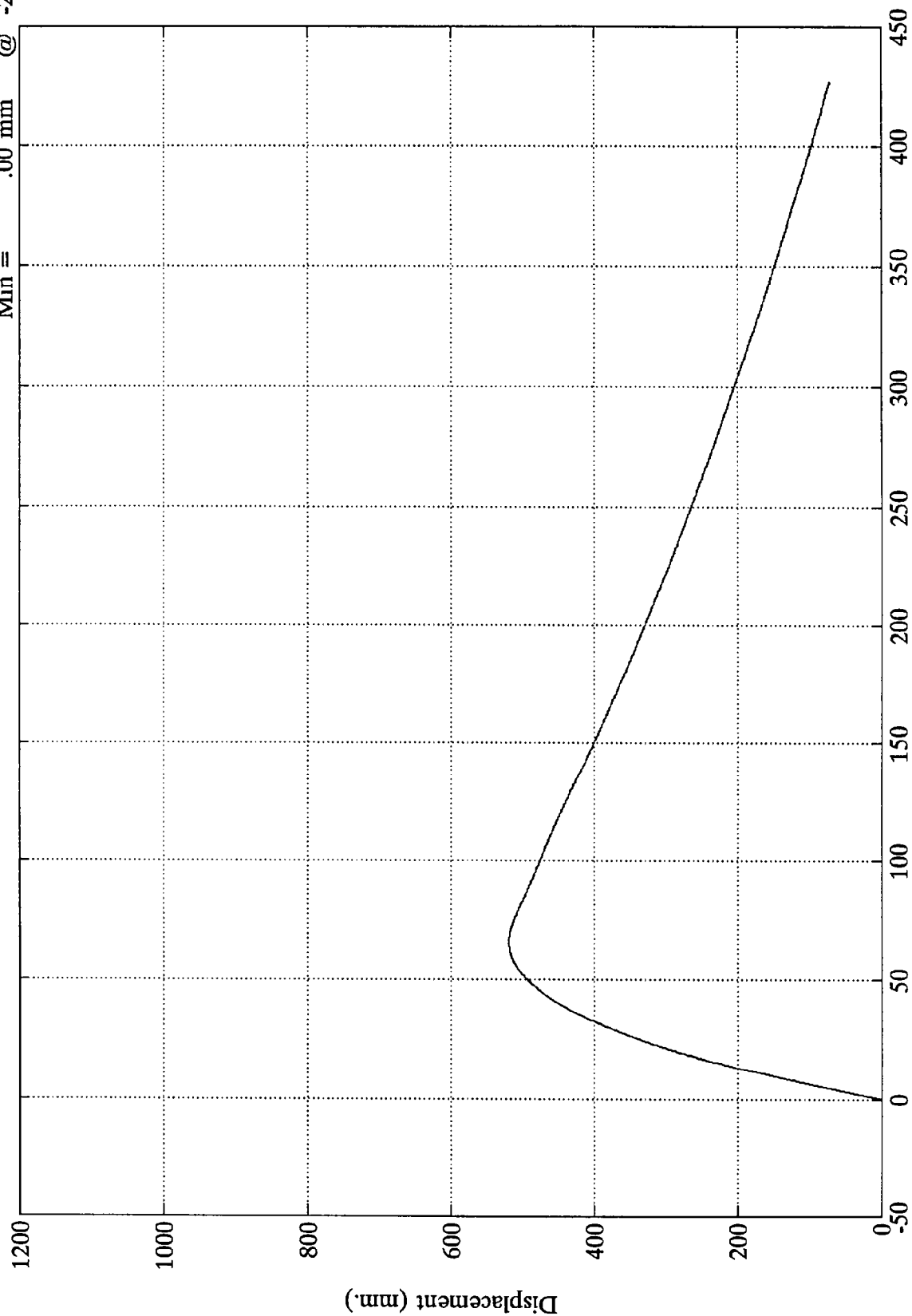
Time (msec)

SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 519.50 mm @ 65.88 msec
Min = .00 mm @ -22.44 msec

Acc. #8(x)



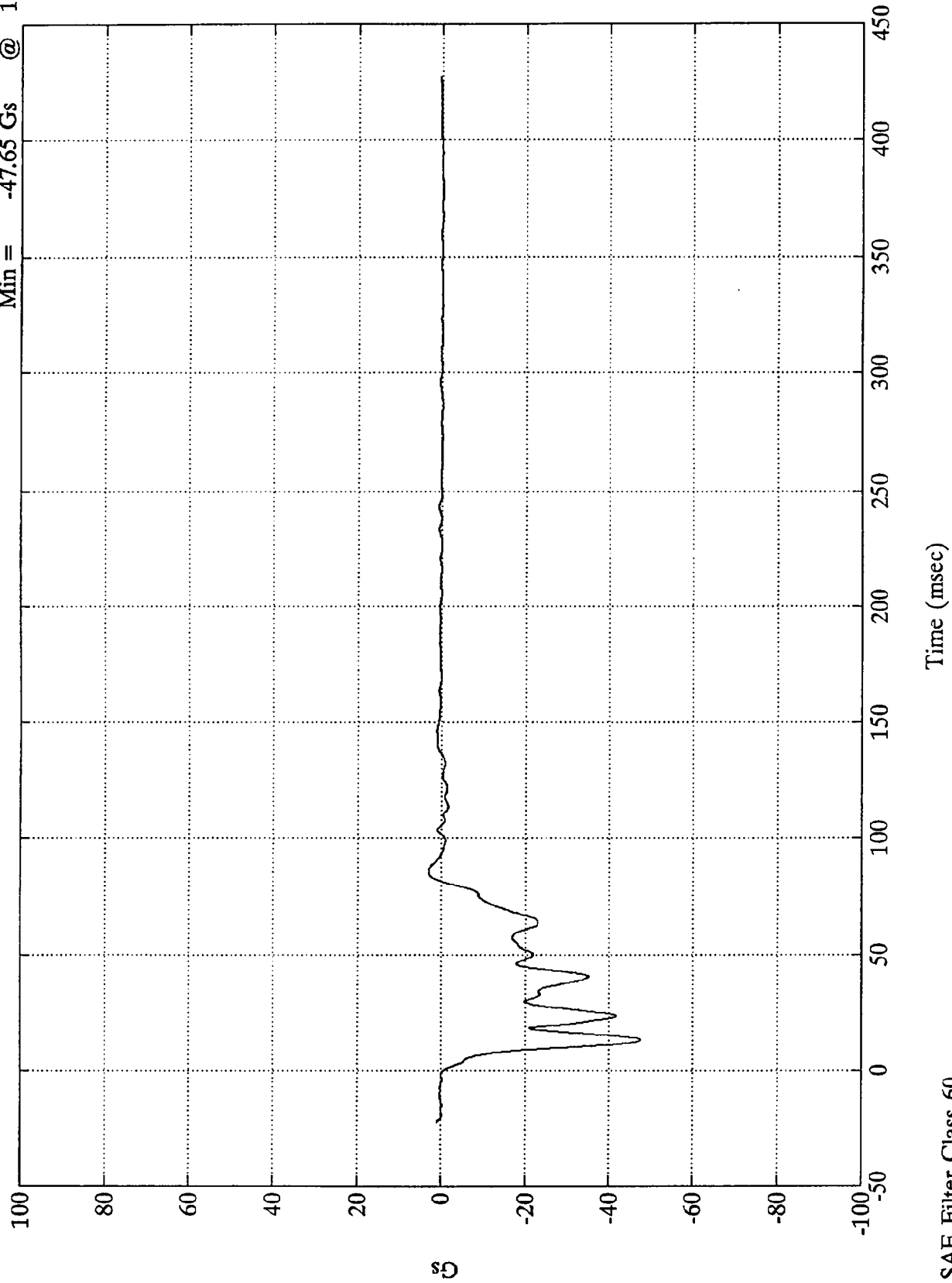
Time (msec)

SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Acc. #9(x)

Max = 2.93 Gs @ 85.08 msec
Min = -47.65 Gs @ 13.07 msec

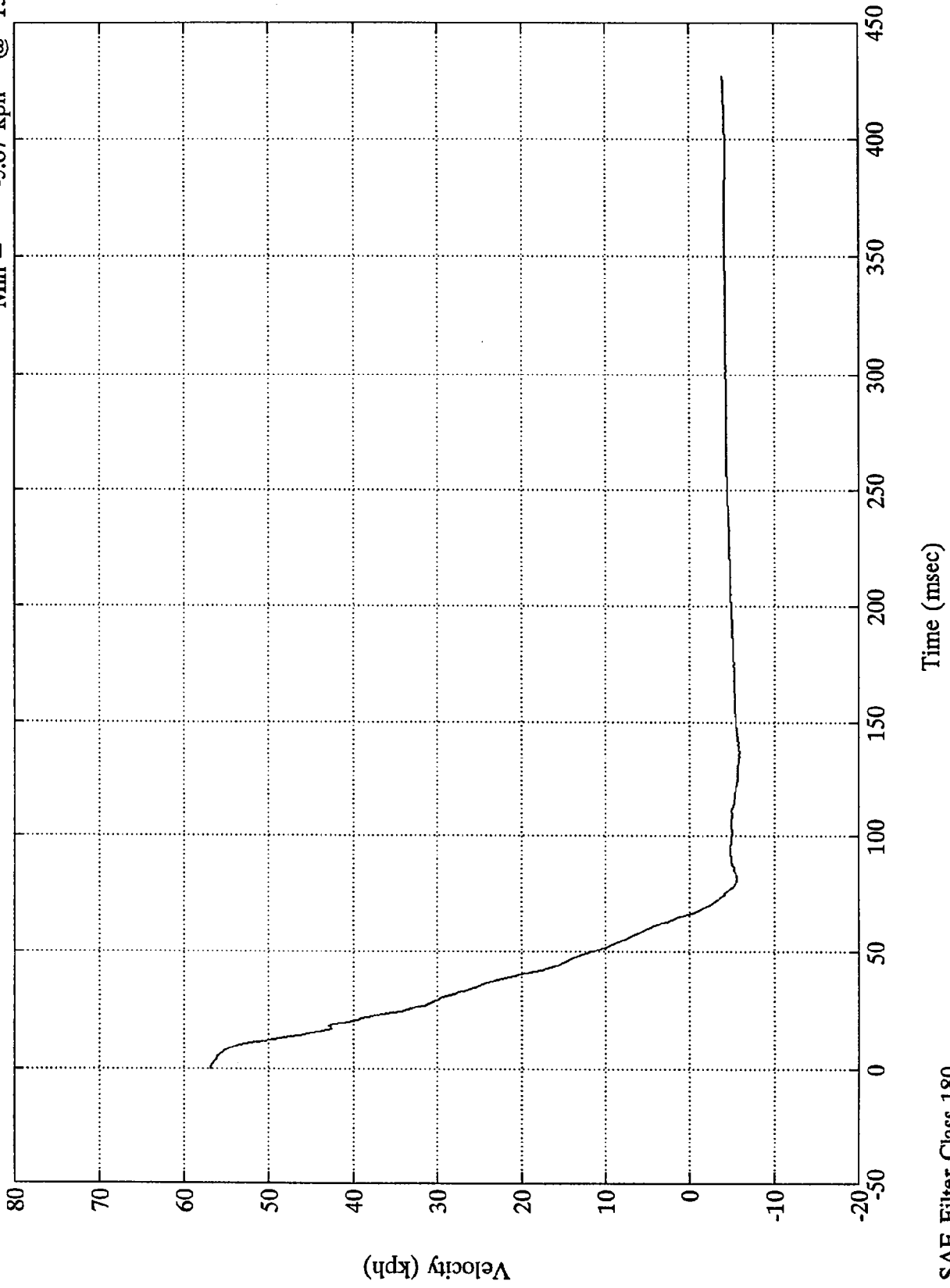


SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 56.81 kph @ 0.83 msec
Min = -5.87 kph @ 137.40 msec

Acc. #9(x)

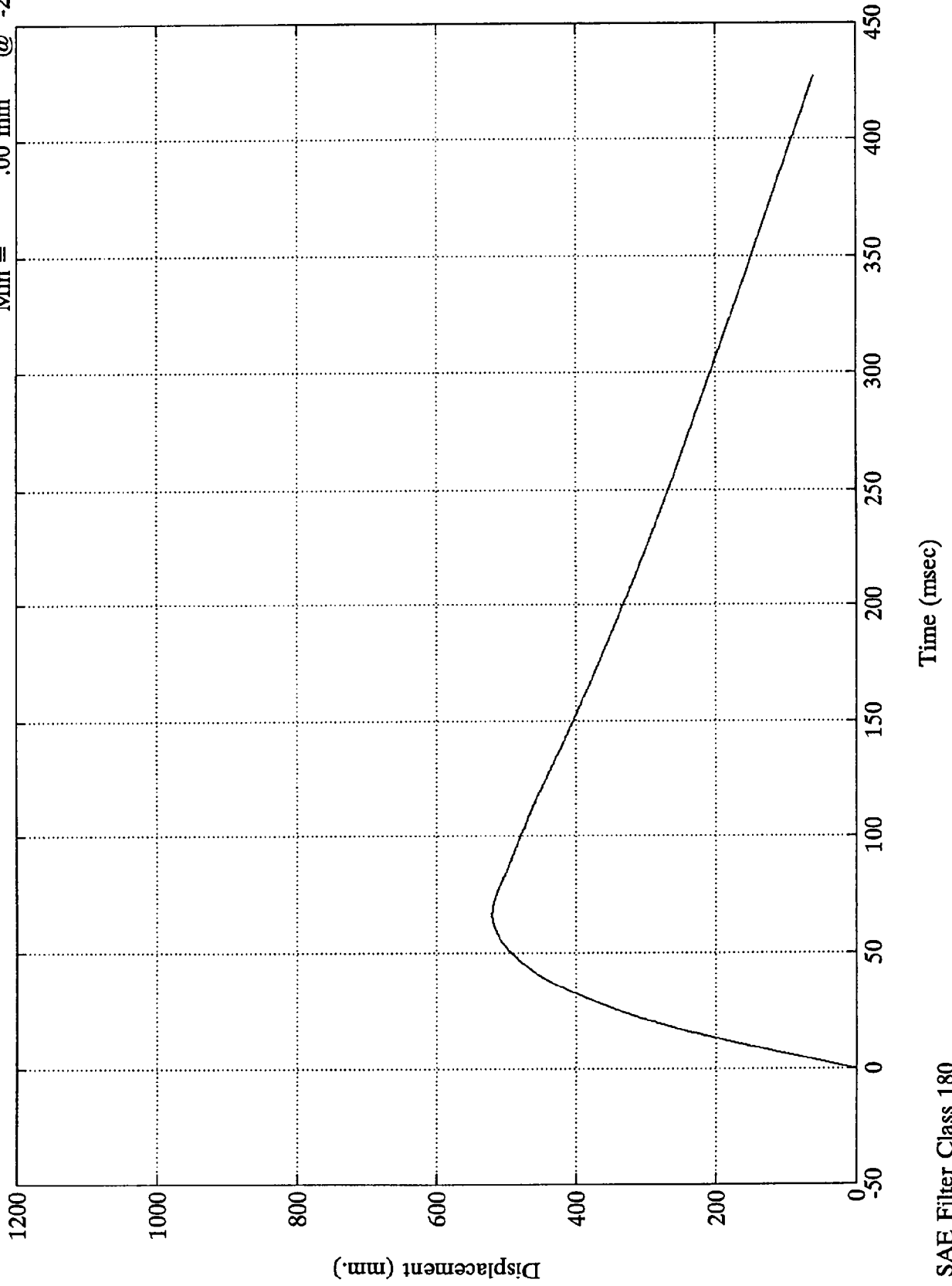


SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 520.43 mm @ 66.36 msec
Min = .00 mm @ -22.44 msec

Acc. #9(x)



TEST NO. MS0304

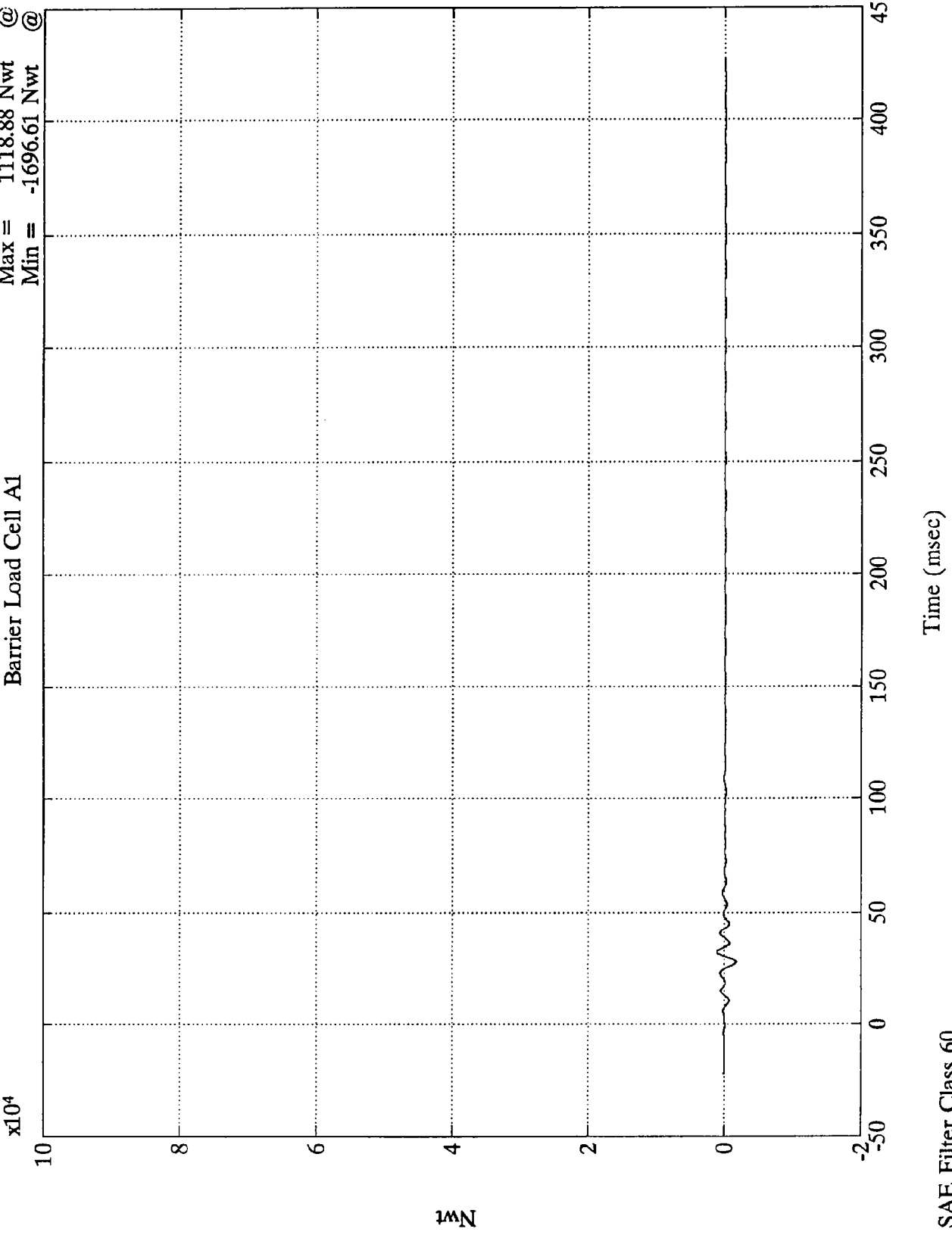
LOAD CELL BARRIER DATA

FILTER CHANNEL CLASS

60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell A1
Max = 1118.88 Nwt @ 32.40 msec
Min = -1696.61 Nwt @ 27.84 msec



Nwt

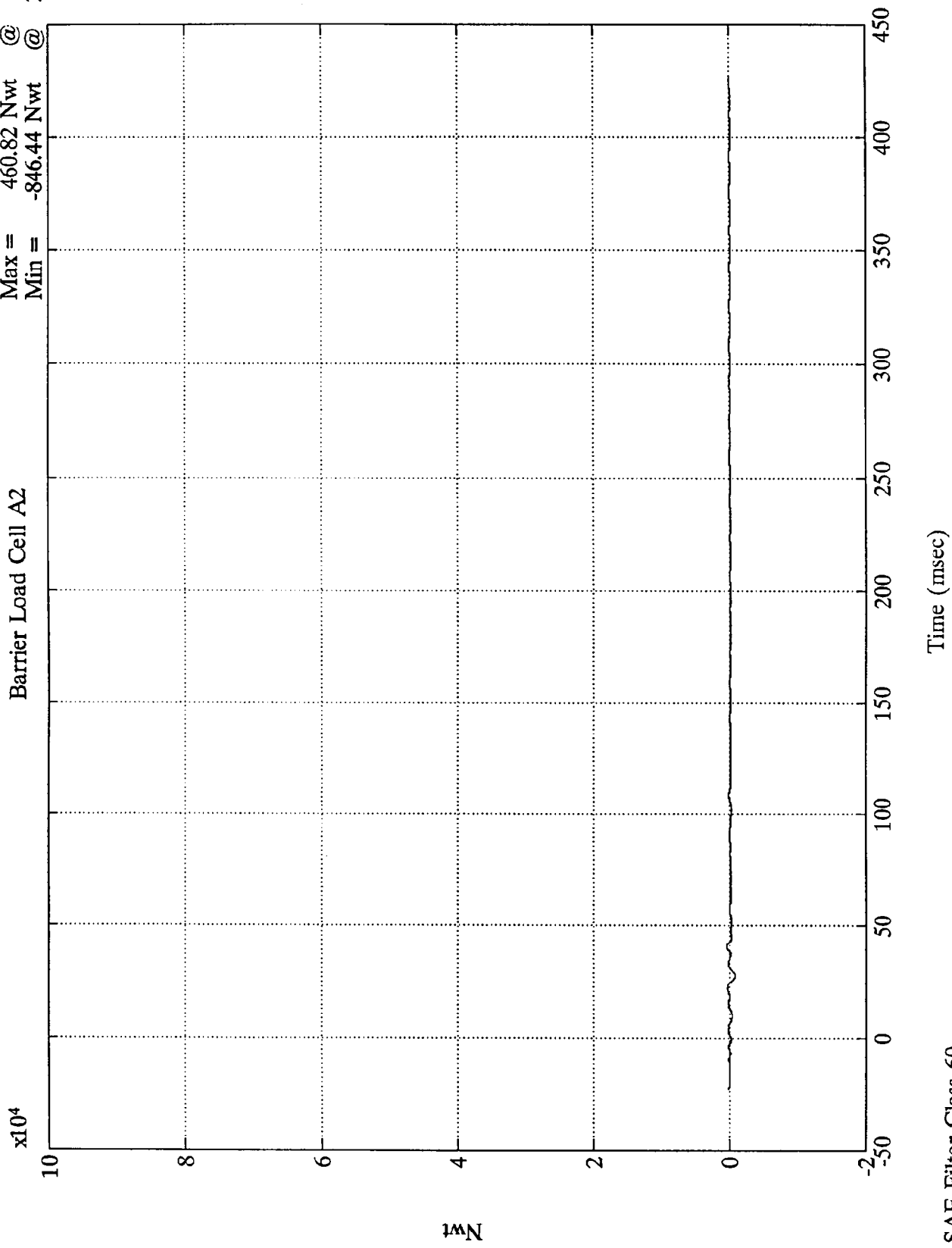
Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell A2

Max = 460.82 Nwt @ 40.56 msec
Min = -846.44 Nwt @ 27.60 msec



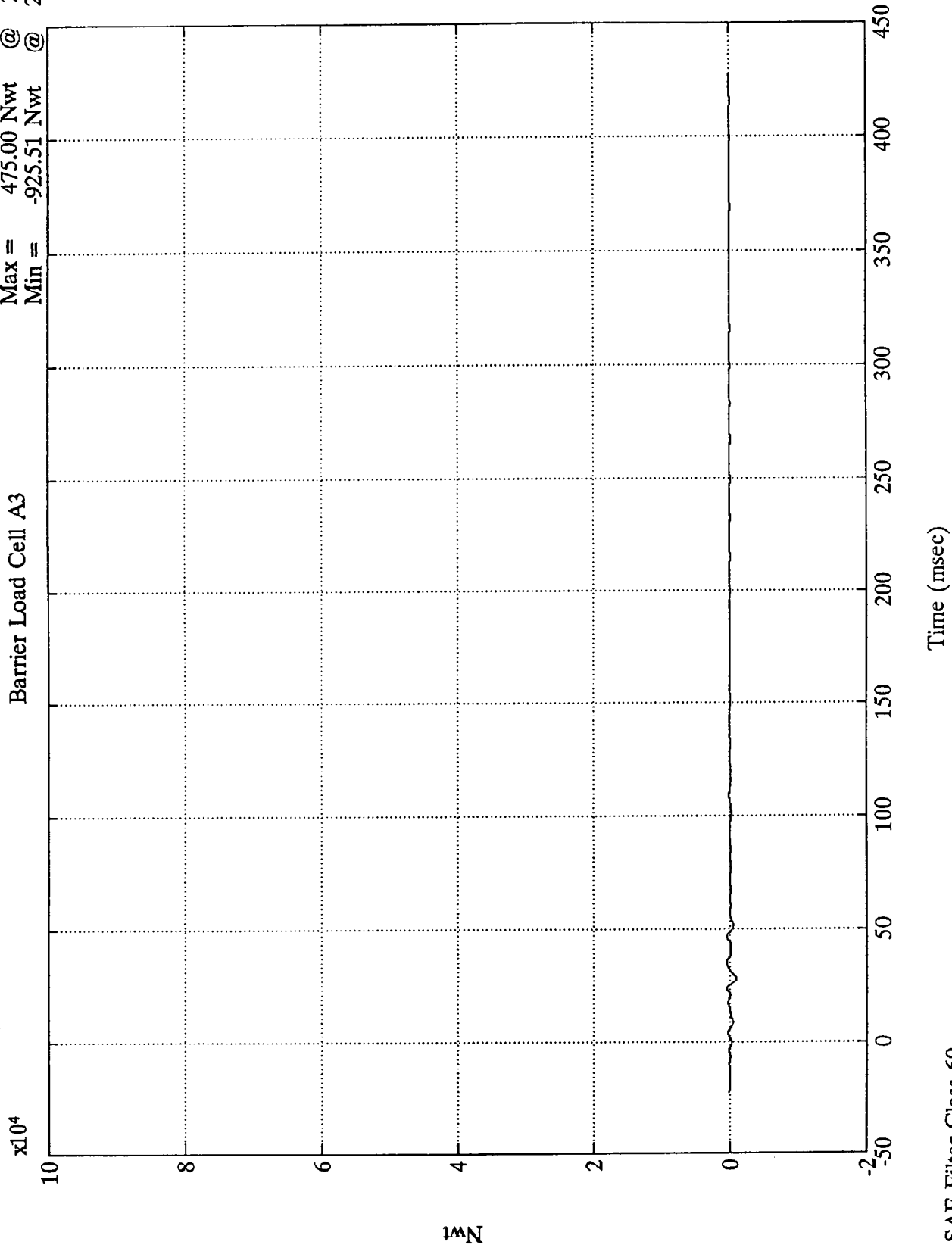
SAE Filter Class 60

Time (msec)

1wN

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell A3
Max = 475.00 Nwt @ 23.39 msec
Min = -925.51 Nwt @ 27.72 msec



Nwt

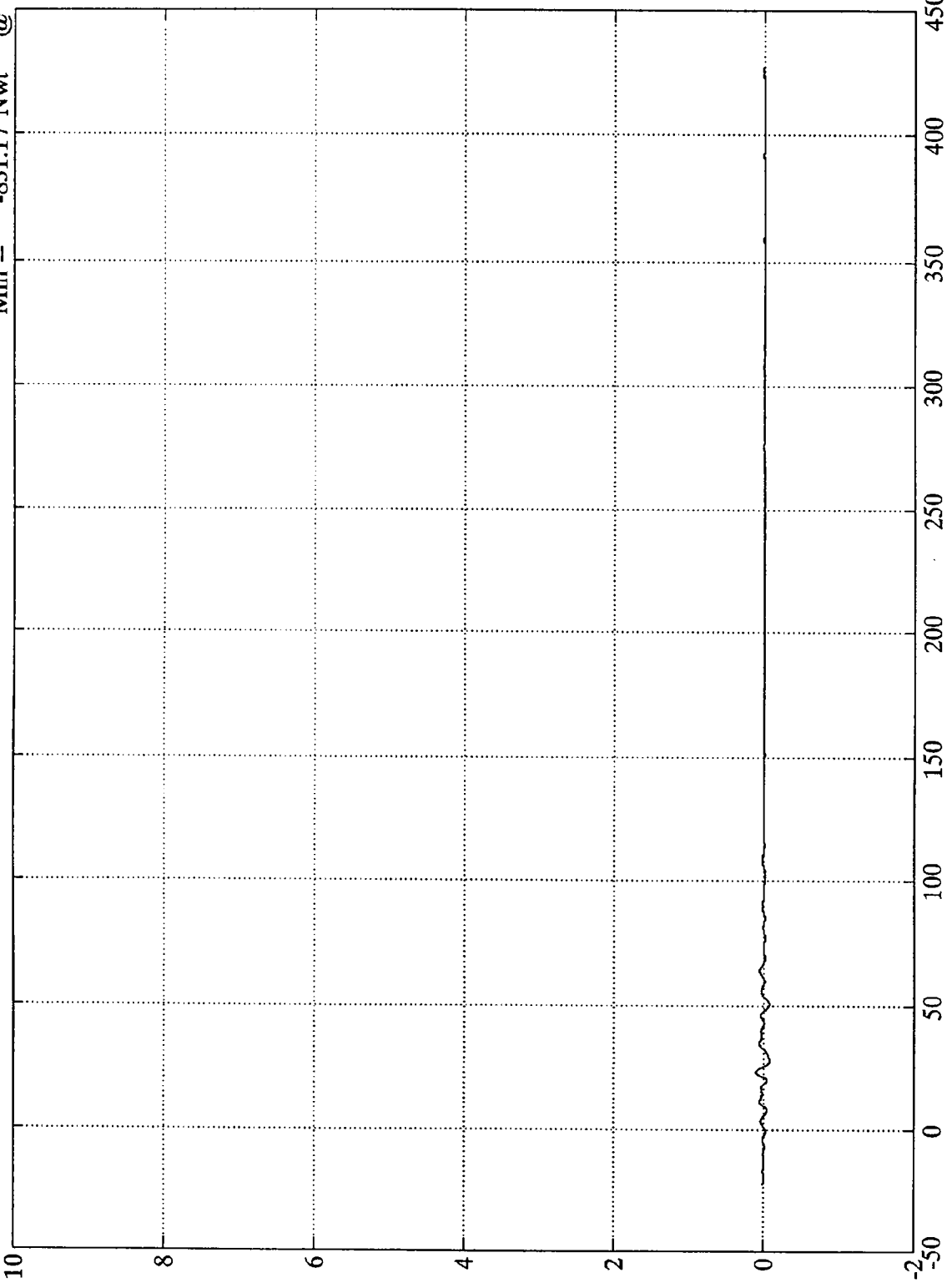
SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 1048.58 Nwt @ 23.52 msec
Min = -831.17 Nwt @ 28.07 msec

Barrier Load Cell A4

x10⁴



Time (msec)

SAE Filter Class 60

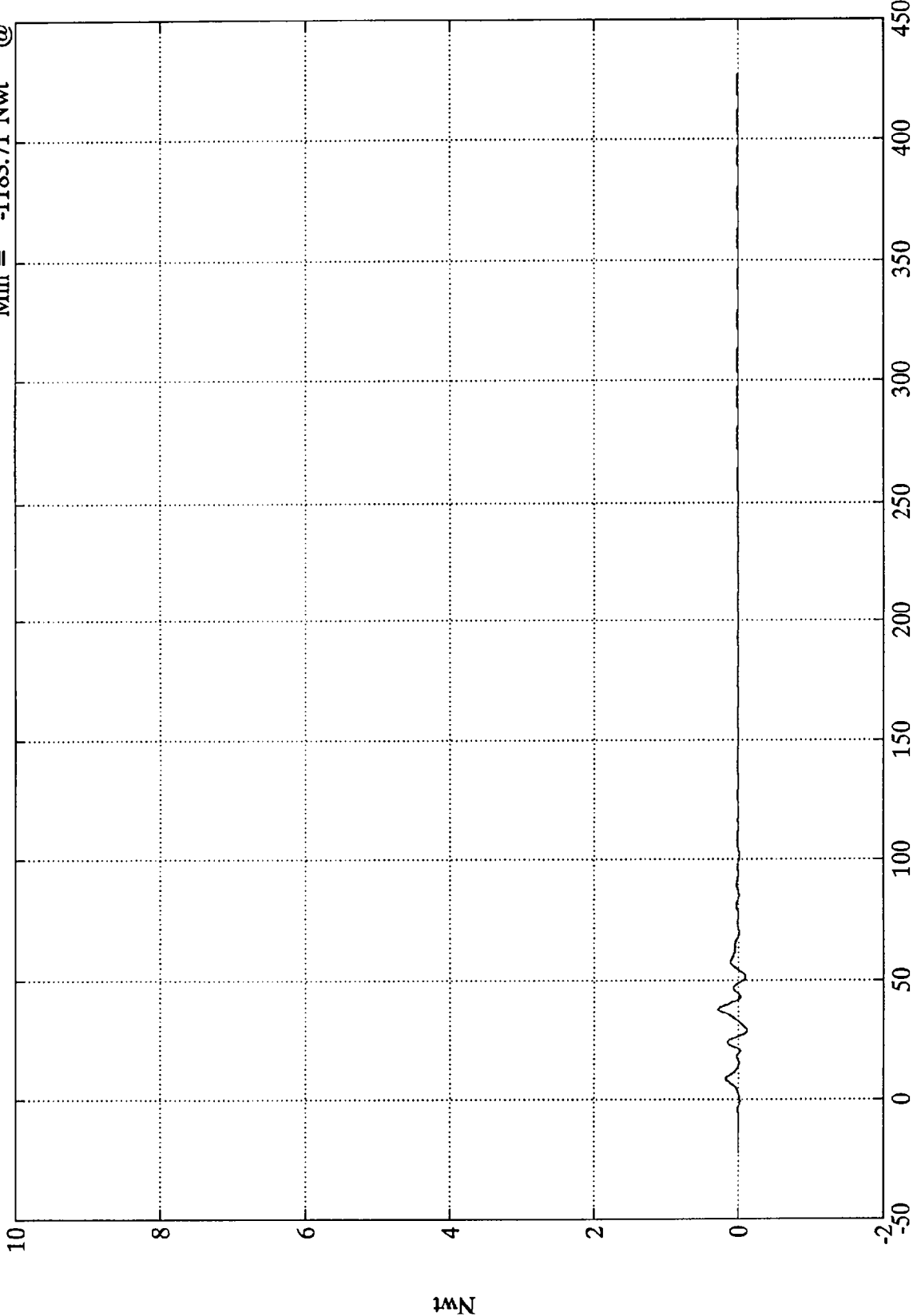
Nwt

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 2830.94 Nwt @ 38.15 msec
Min = -1183.71 Nwt @ 28.80 msec

Barrier Load Cell A5

$\times 10^4$



Time (msec)

SAE Filter Class 60

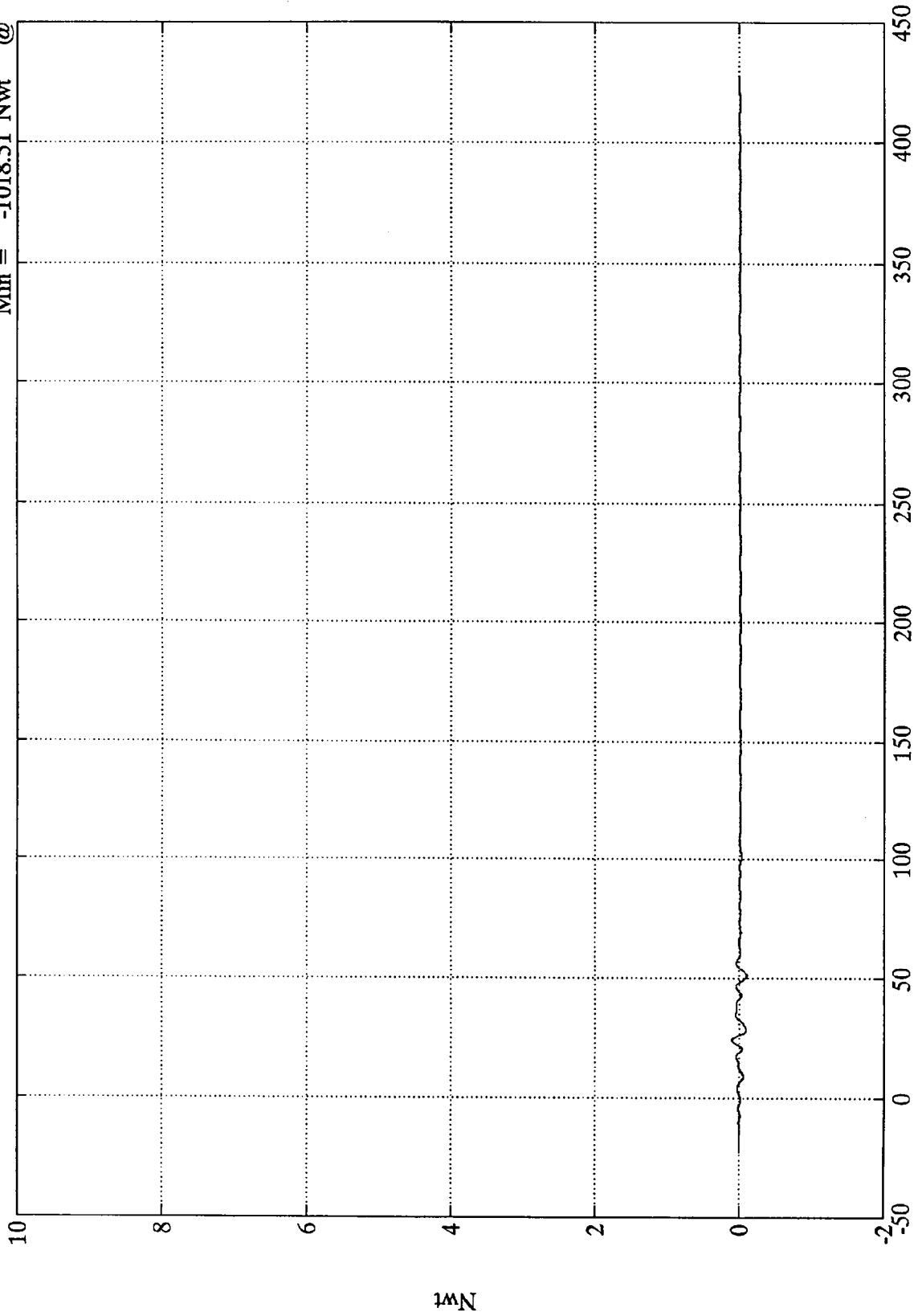
Nwt

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 1035.49 Nwt @ 24.12 msec
Min = -1018.51 Nwt @ 51.12 msec

Barrier Load Cell A6

$\times 10^4$



Time (msec)

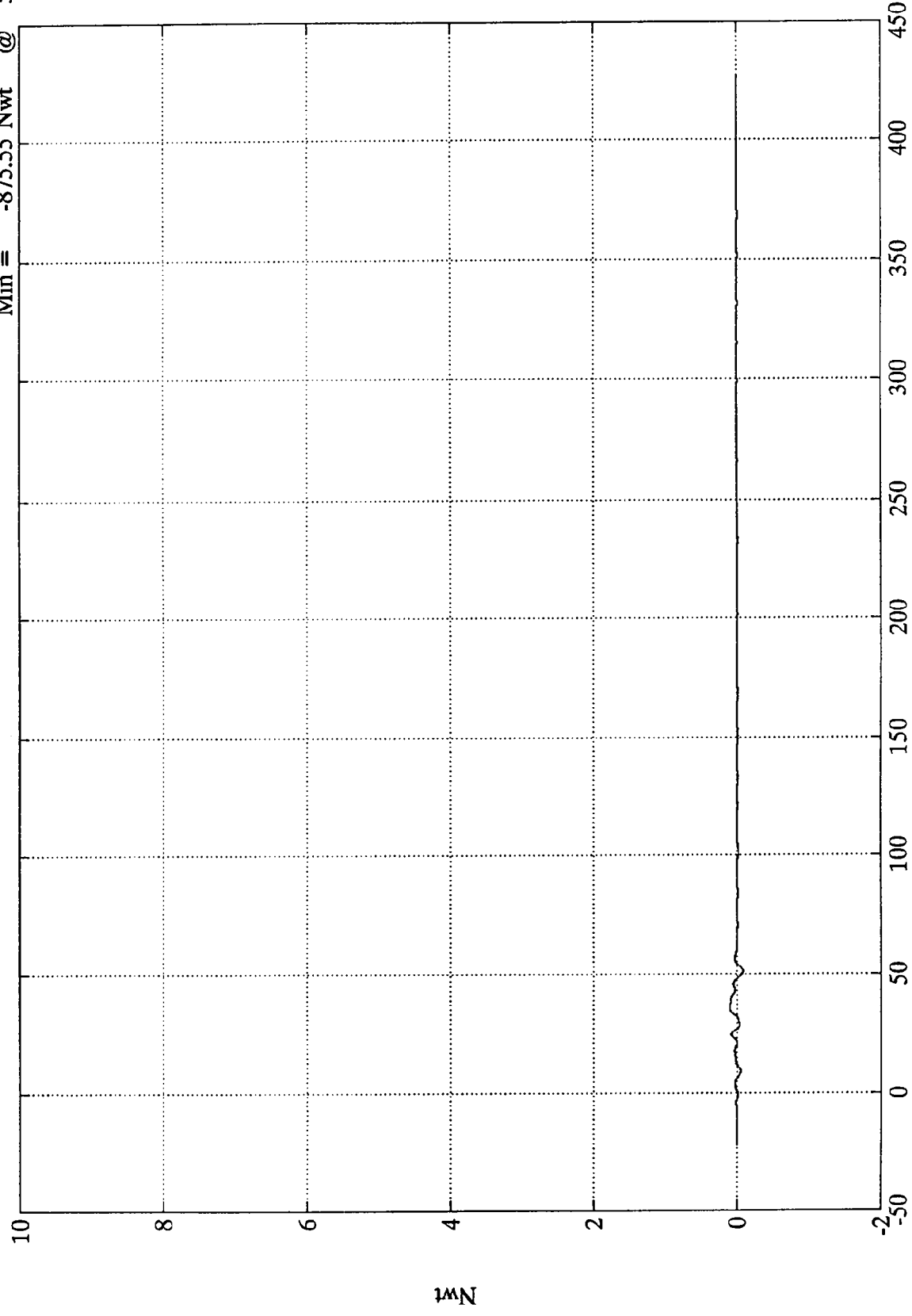
SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 991.34 Nwt @ 35.15 msec
Min = -875.55 Nwt @ 51.24 msec

Barrier Load Cell A7

$\times 10^4$

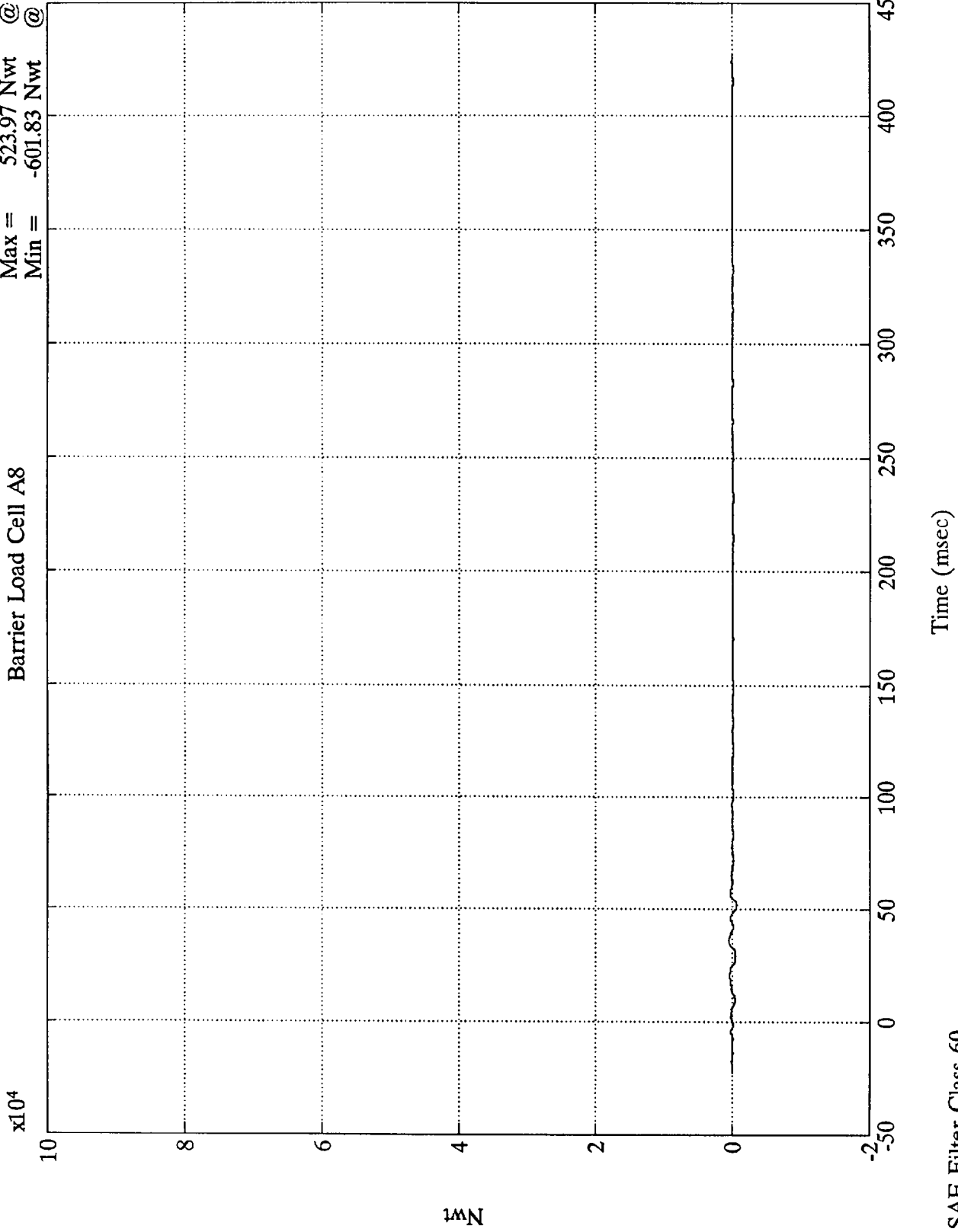


Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

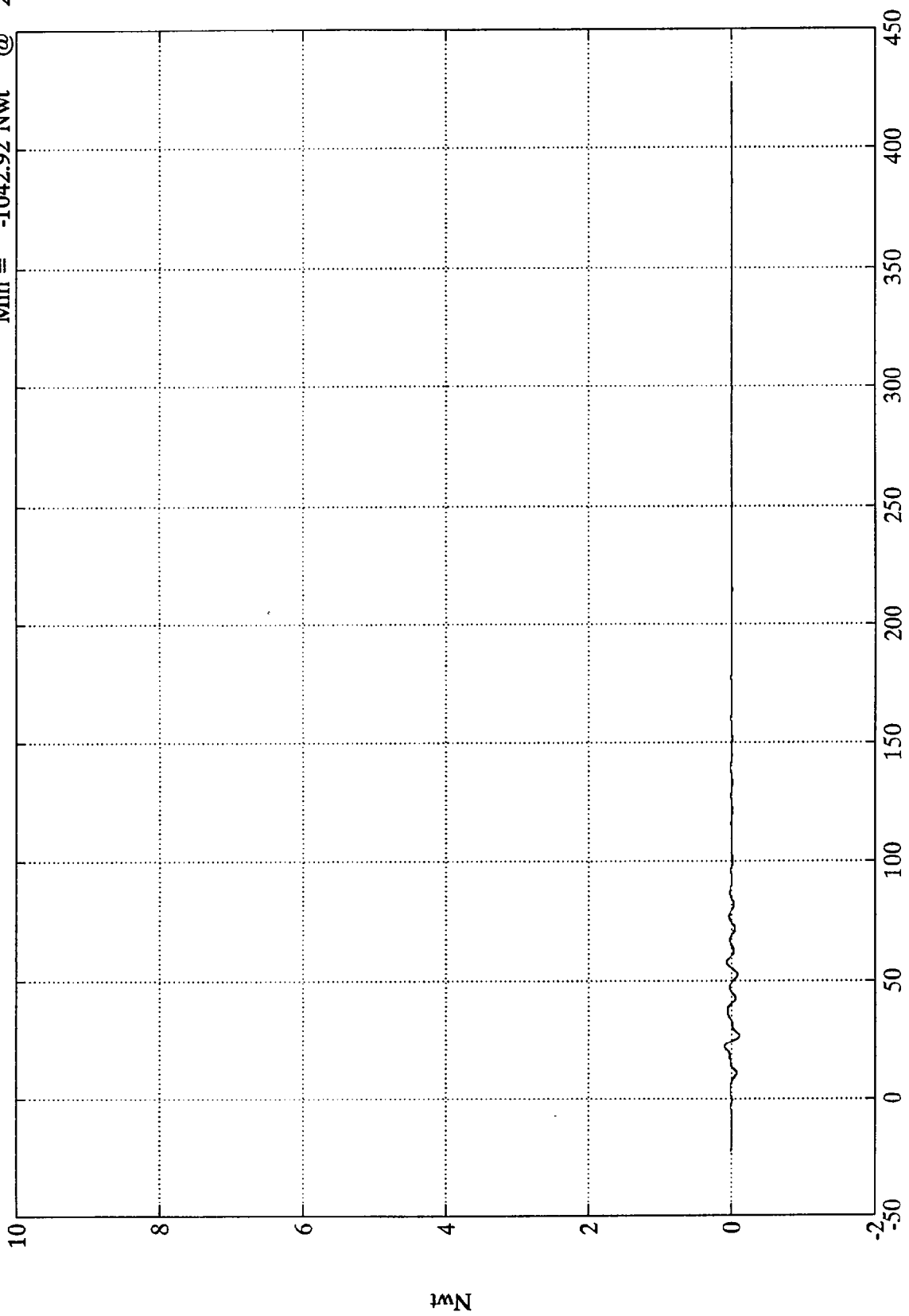
Barrier Load Cell A8
Max = 523.97 Nwt @ 36.24 msec
Min = -601.83 Nwt @ 51.72 msec



SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN
x10⁴

Barrier Load Cell A9
Max = 1006.10 Nwt @ 22.07 msec
Min = -1042.92 Nwt @ 26.39 msec

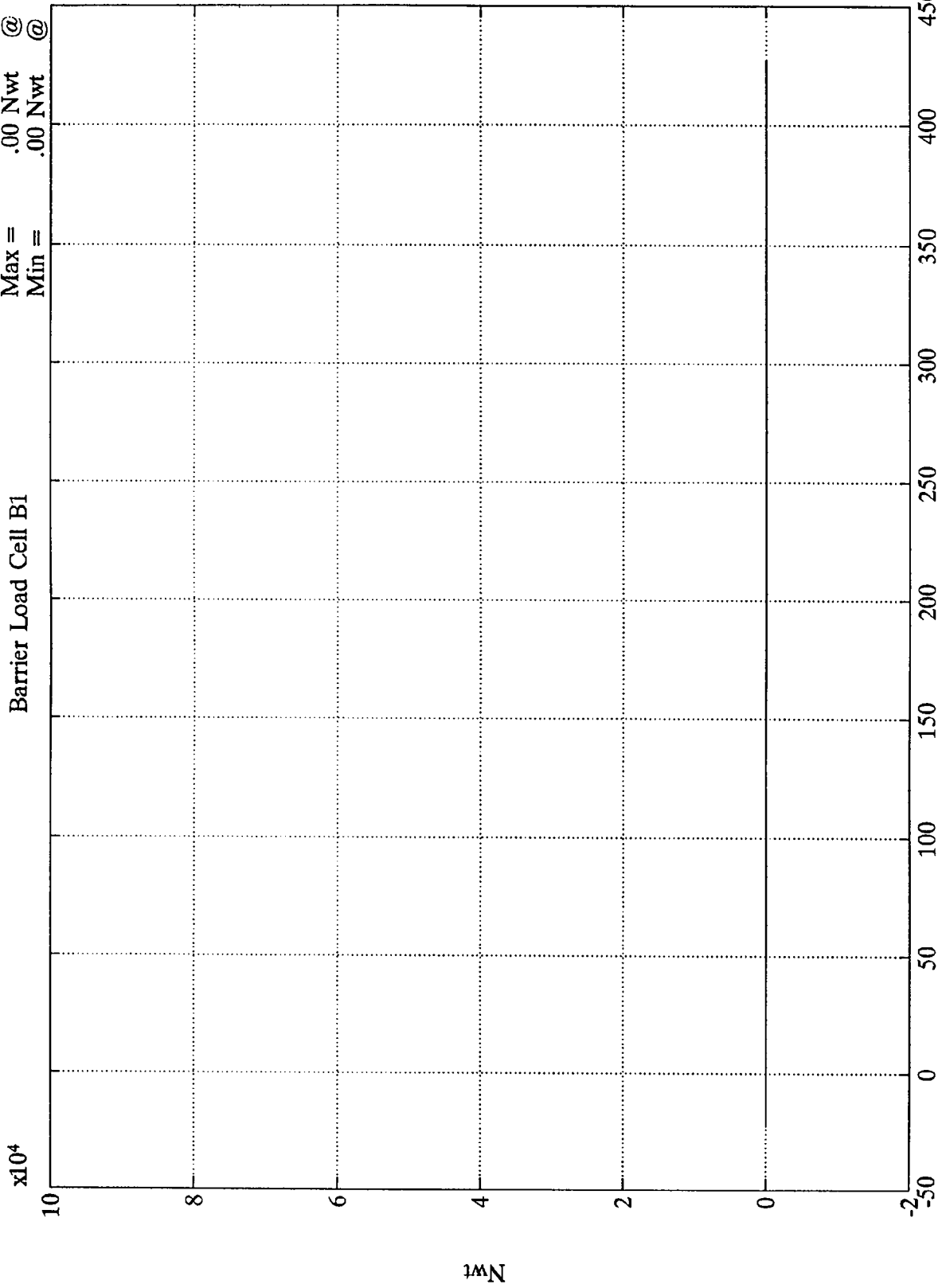


Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

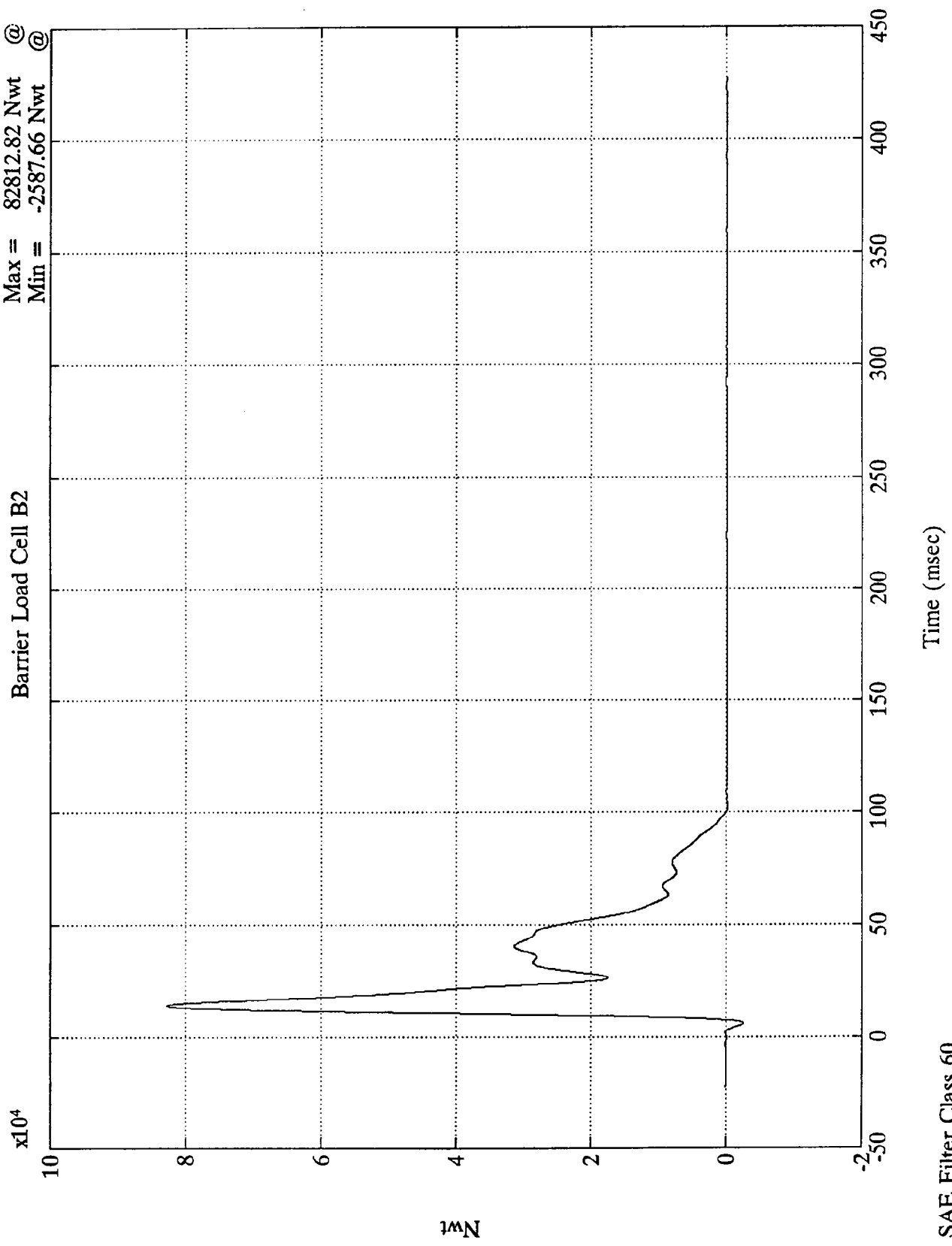
Barrier Load Cell B1
Max = .00 Nwt @ 427.32 msec
Min = .00 Nwt @ 427.32 msec



SAE Filter Class 60
Load Cell Did Not Record

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell B2
Max = 82812.82 Nwt @ 14.03 msec
Min = -2587.66 Nwt @ 6.11 msec



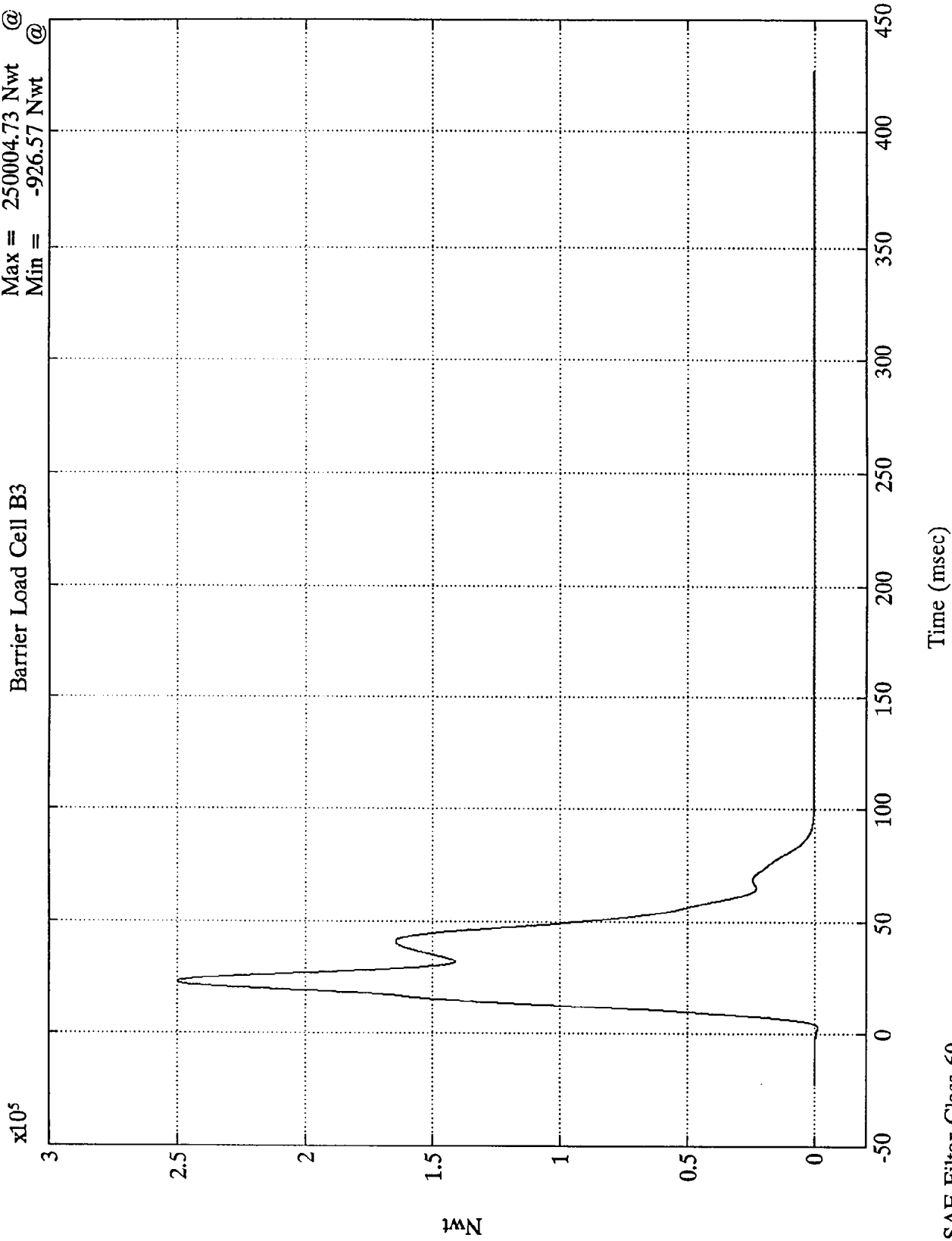
Nwt

Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell B3
Max = 250004.73 Nwt @ 23.04 msec
Min = -926.57 Nwt @ 2.63 msec



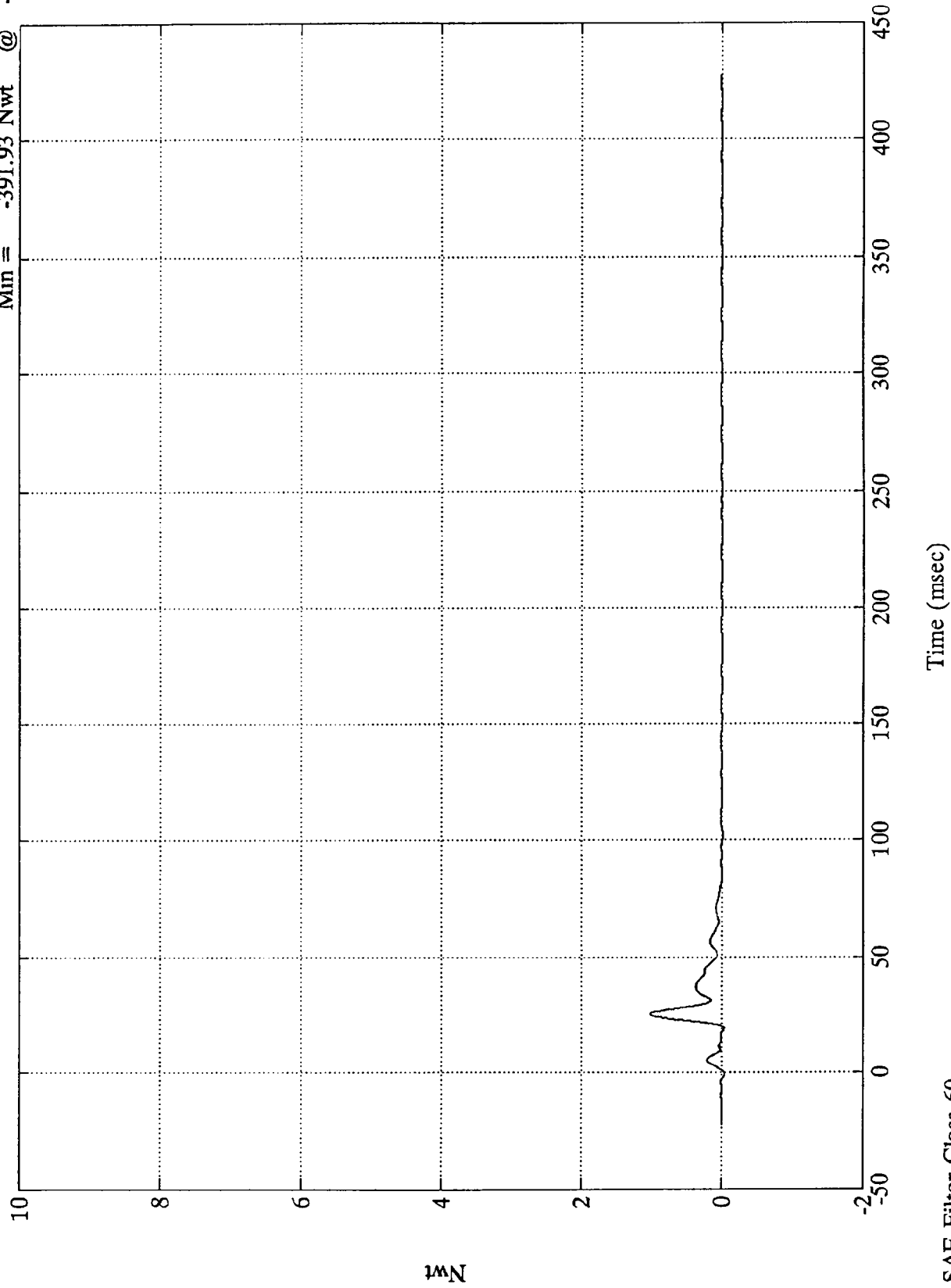
SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 10224.55 Nwt @ 24.96 msec
Min = -391.93 Nwt @ -0.96 msec

Barrier Load Cell B4

x10⁴



SAE Filter Class 60

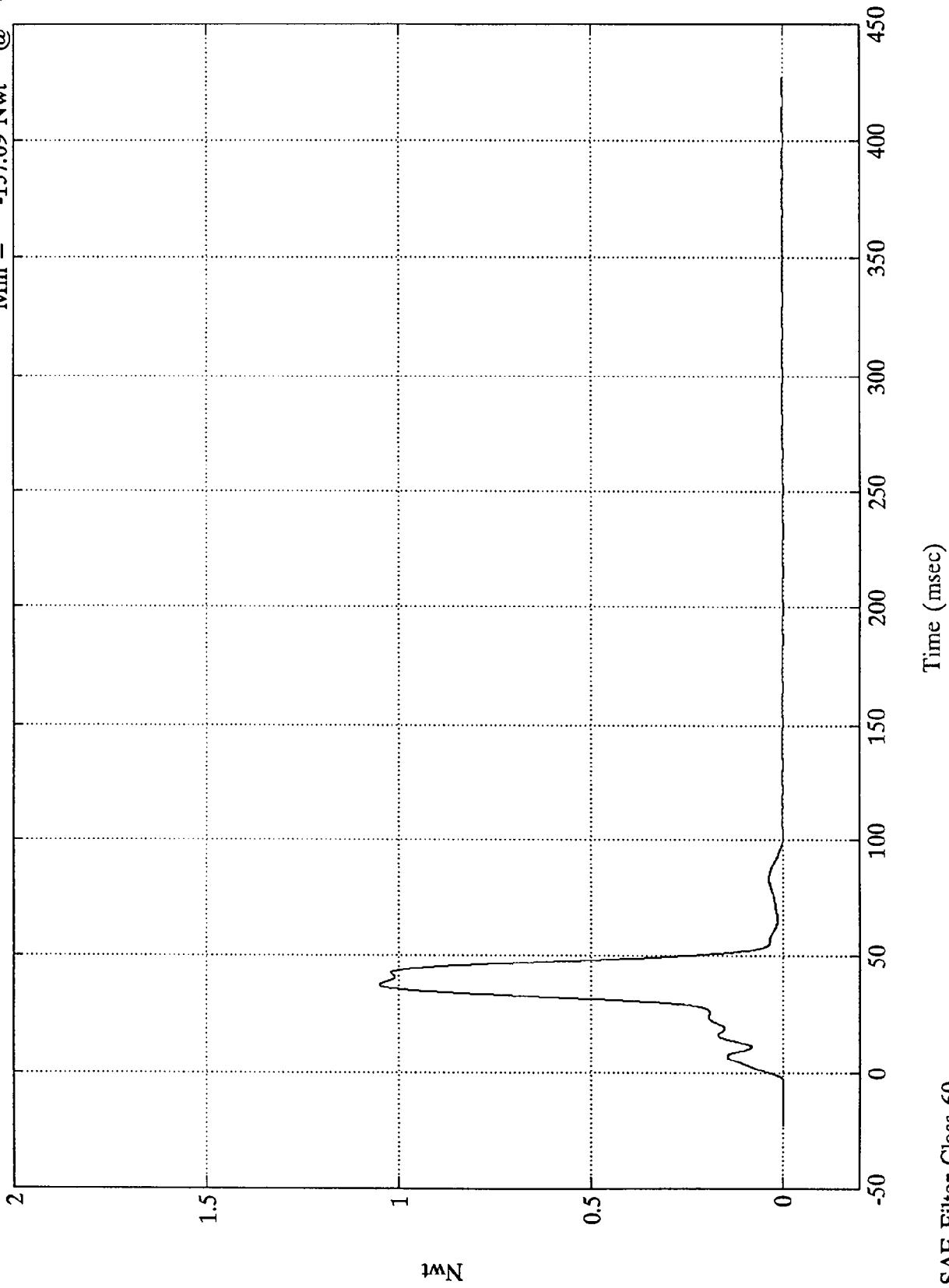
10N

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 105154.15 Nwt @ 37.20 msec
Min = -157.09 Nwt @ -6.12 msec

Barrier Load Cell B5

x10⁵



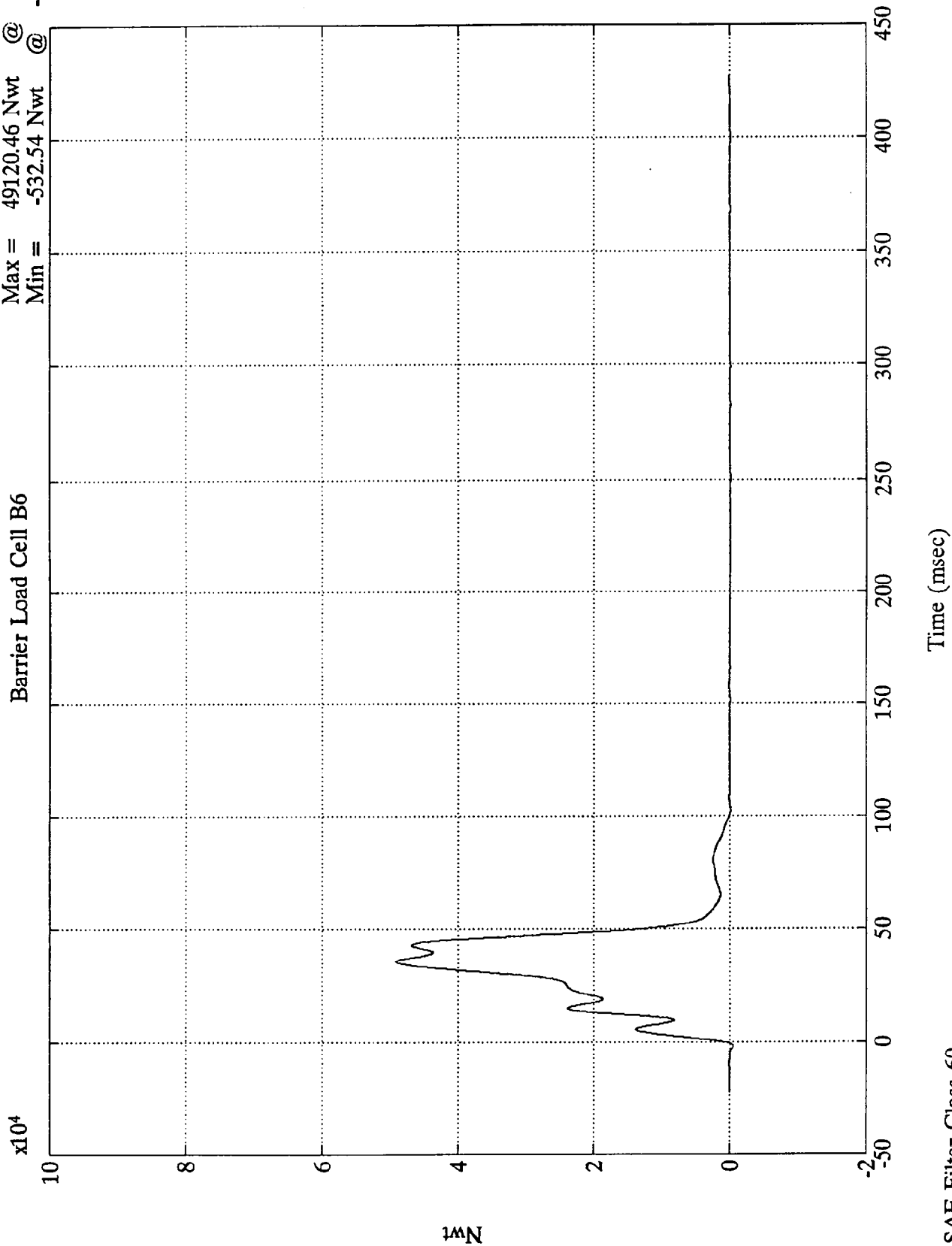
SAE Filter Class 60

Nwt

Time (msec)

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell B6
Max = 49120.46 Nwt @ 35.63 msec
Min = -532.54 Nwt @ -1.92 msec



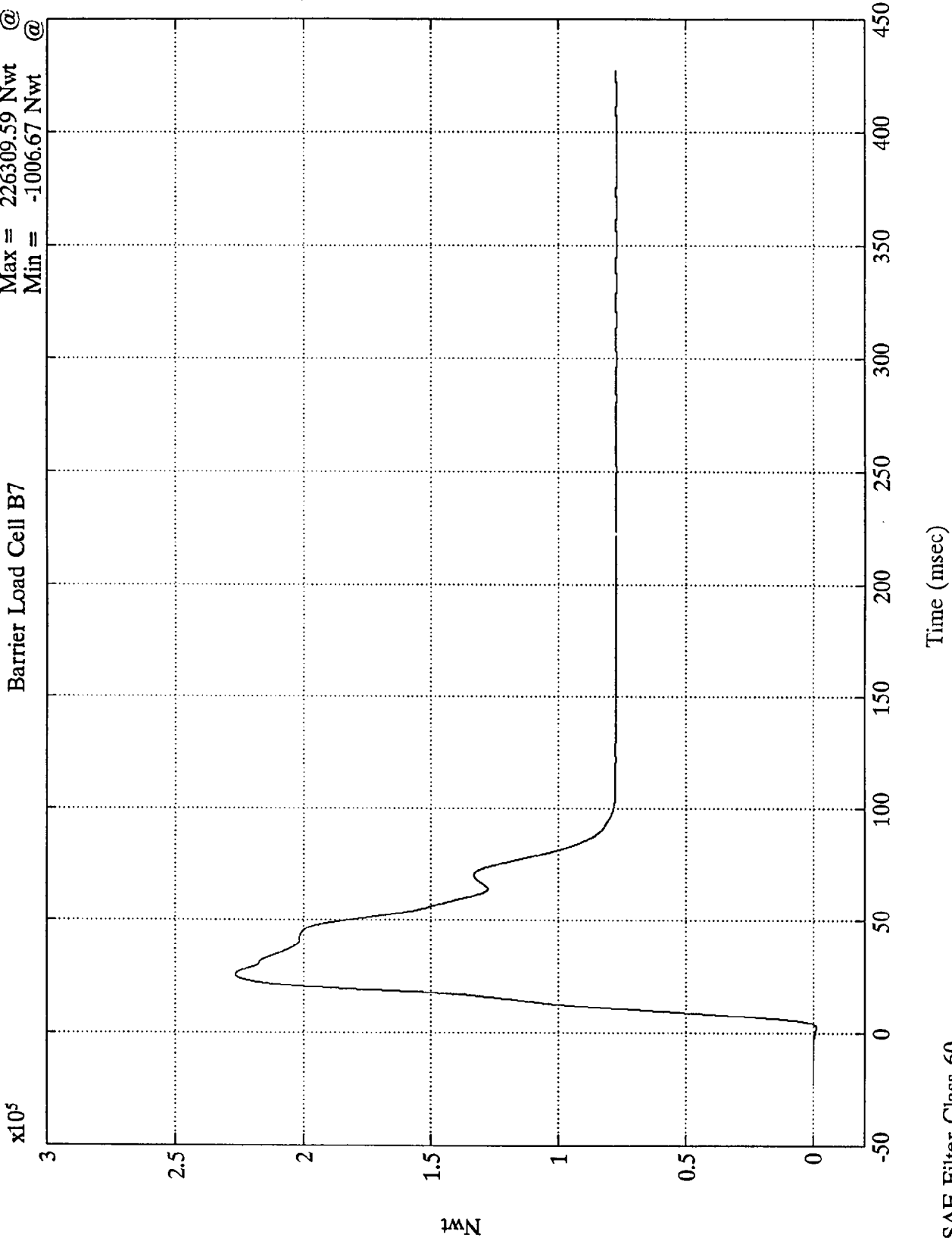
Nwt

Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell B7
Max = 226309.59 Nwt @ 25.68 msec
Min = -1006.67 Nwt @ 2.39 msec



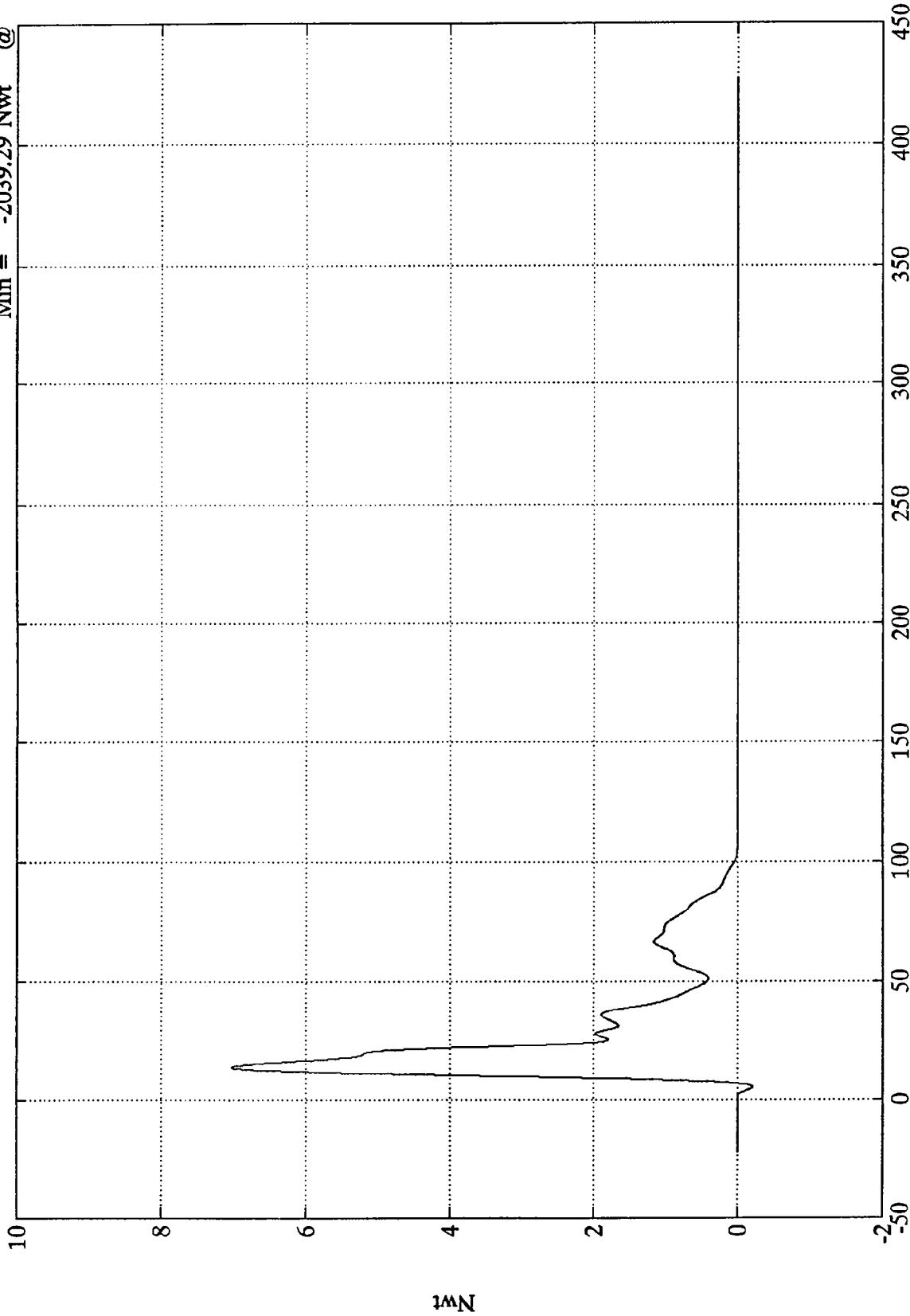
SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

$\times 10^4$

Barrier Load Cell B8

Max = 70297.06 Nwt @ 13.31 msec
Min = -2039.29 Nwt @ 5.15 msec



Nwt

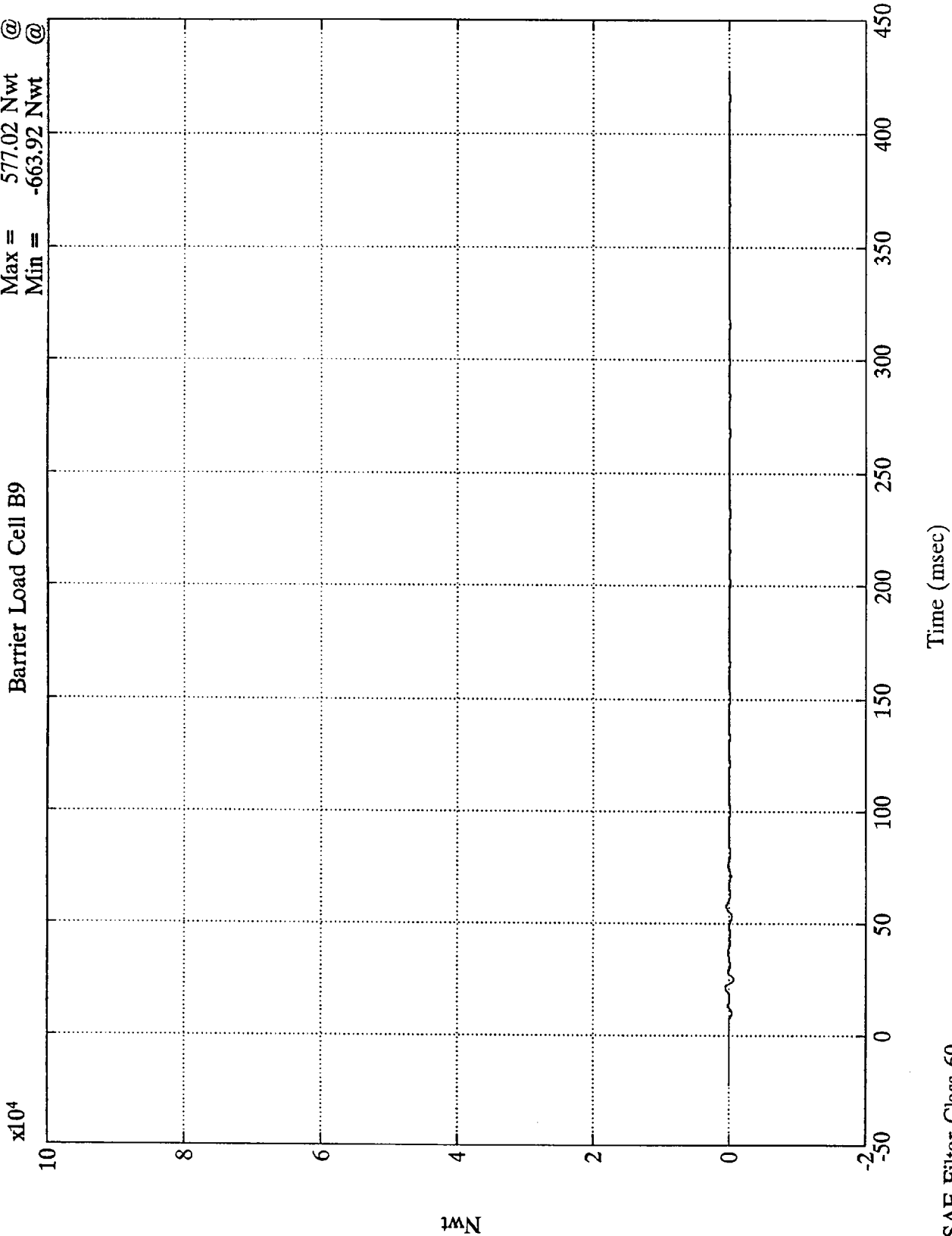
Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell B9

Max = 577.02 Nwt @ 21.47 msec
Min = -663.92 Nwt @ 25.08 msec



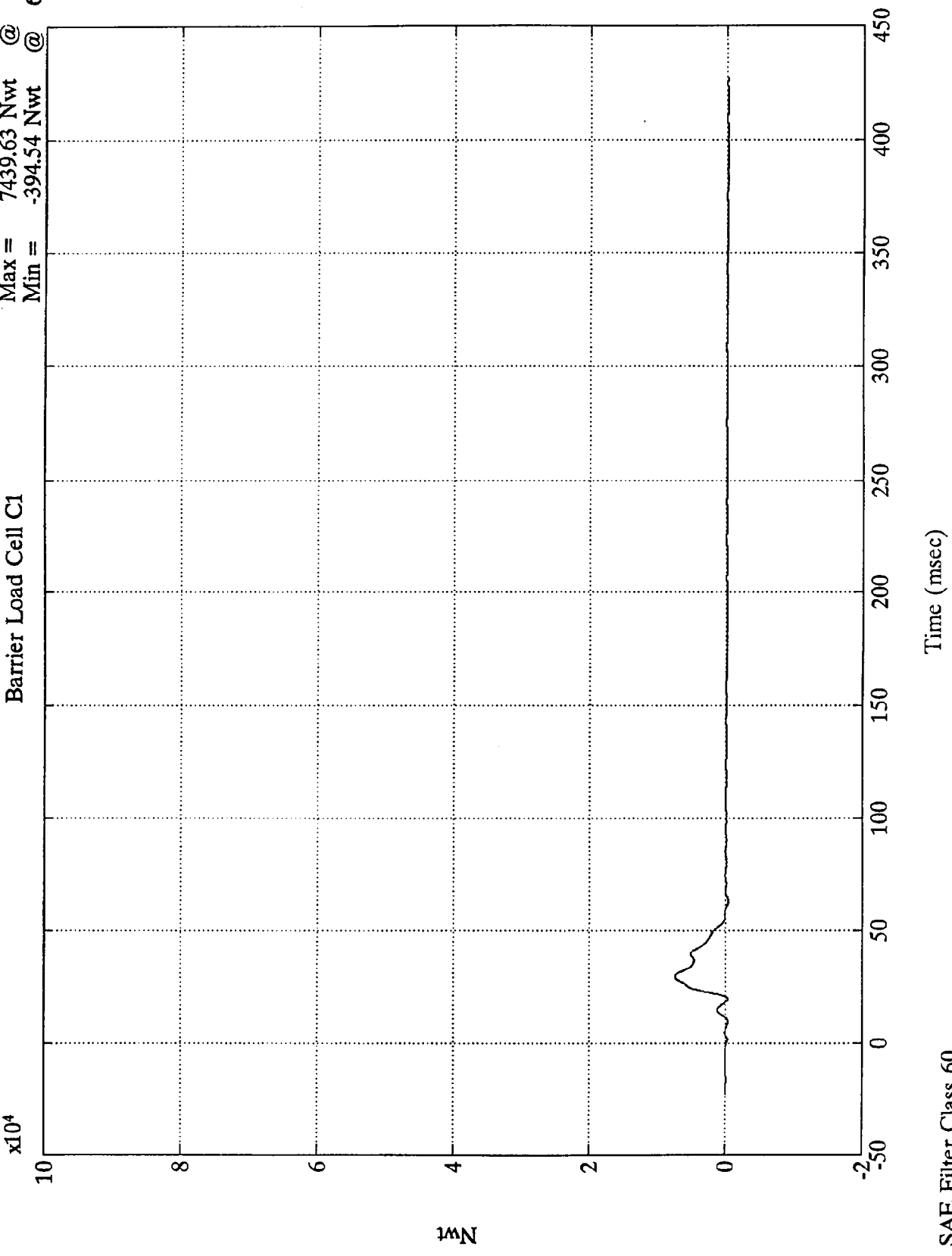
SAE Filter Class 60

Time (msec)

Nwt

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell C1
Max = 7439.63 Nwt @ 29.15 msec
Min = -394.54 Nwt @ 62.88 msec



Nwt

Time (msec)

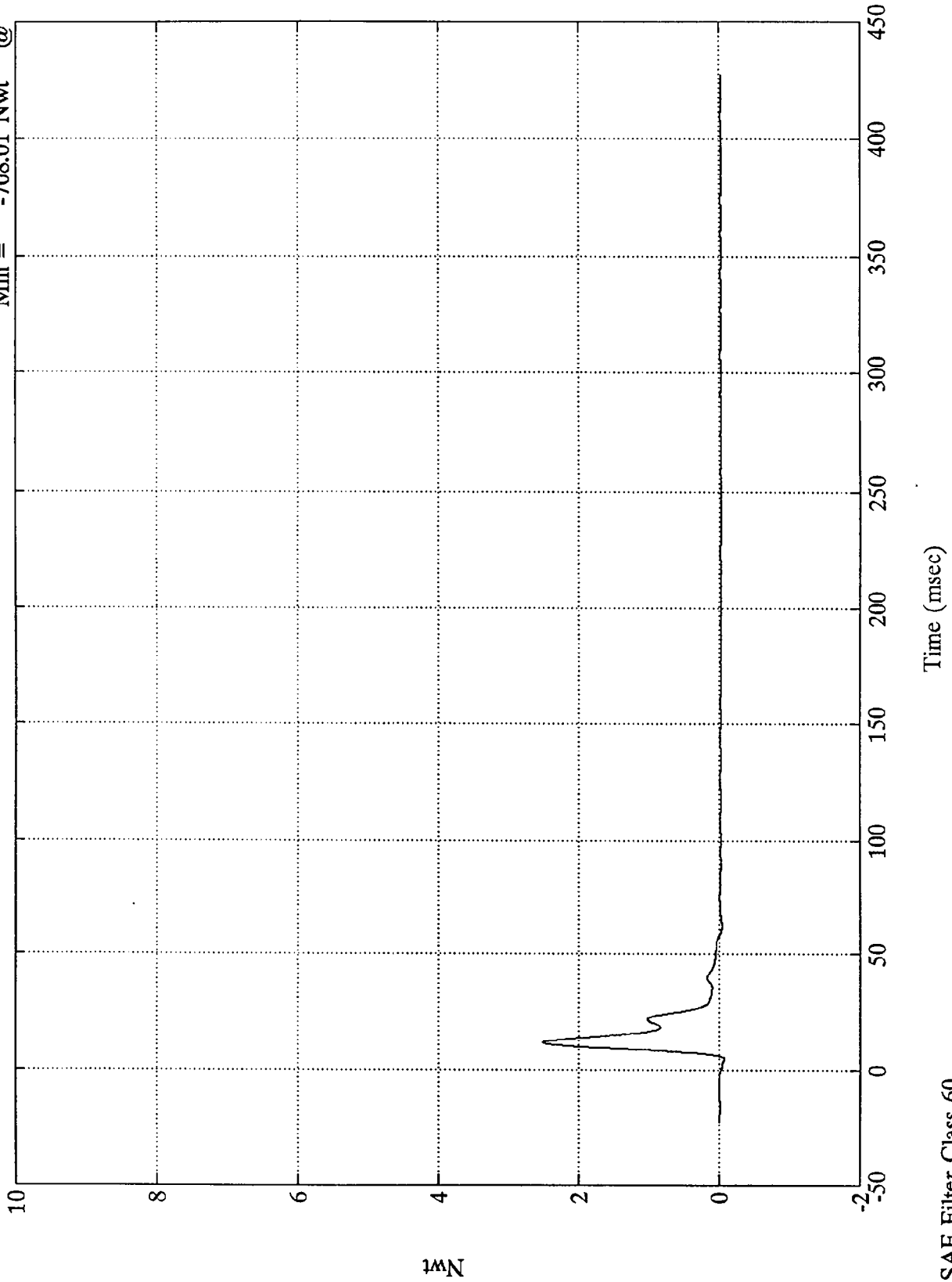
SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

$\times 10^4$

Barrier Load Cell C2

Max = 25206.13 Nwt @ 11.88 msec
Min = -708.01 Nwt @ 4.67 msec

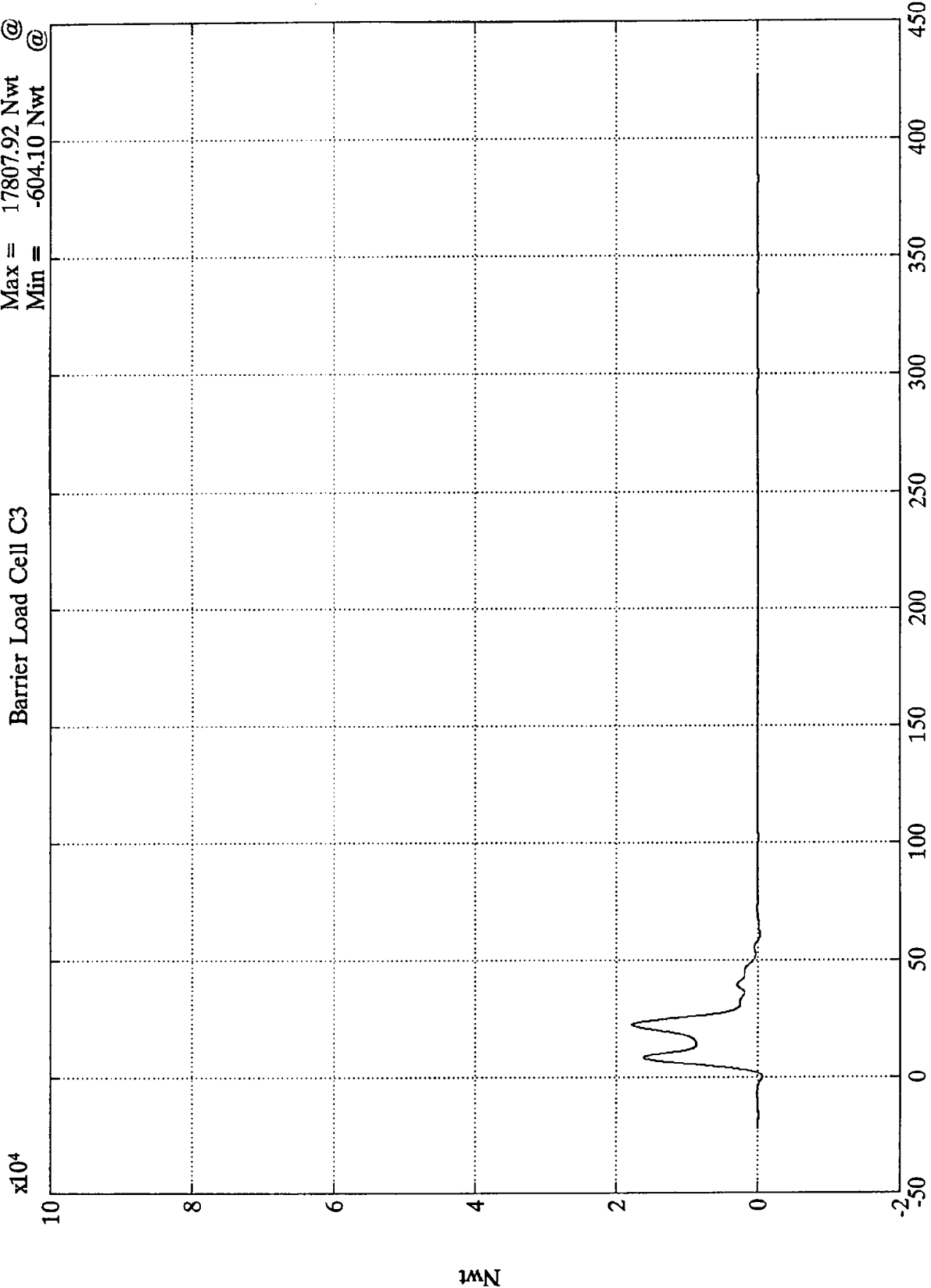


SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 17807.92 Nwt @ 22.31 msec
Min = -604.10 Nwt @ 0.11 msec

Barrier Load Cell C3

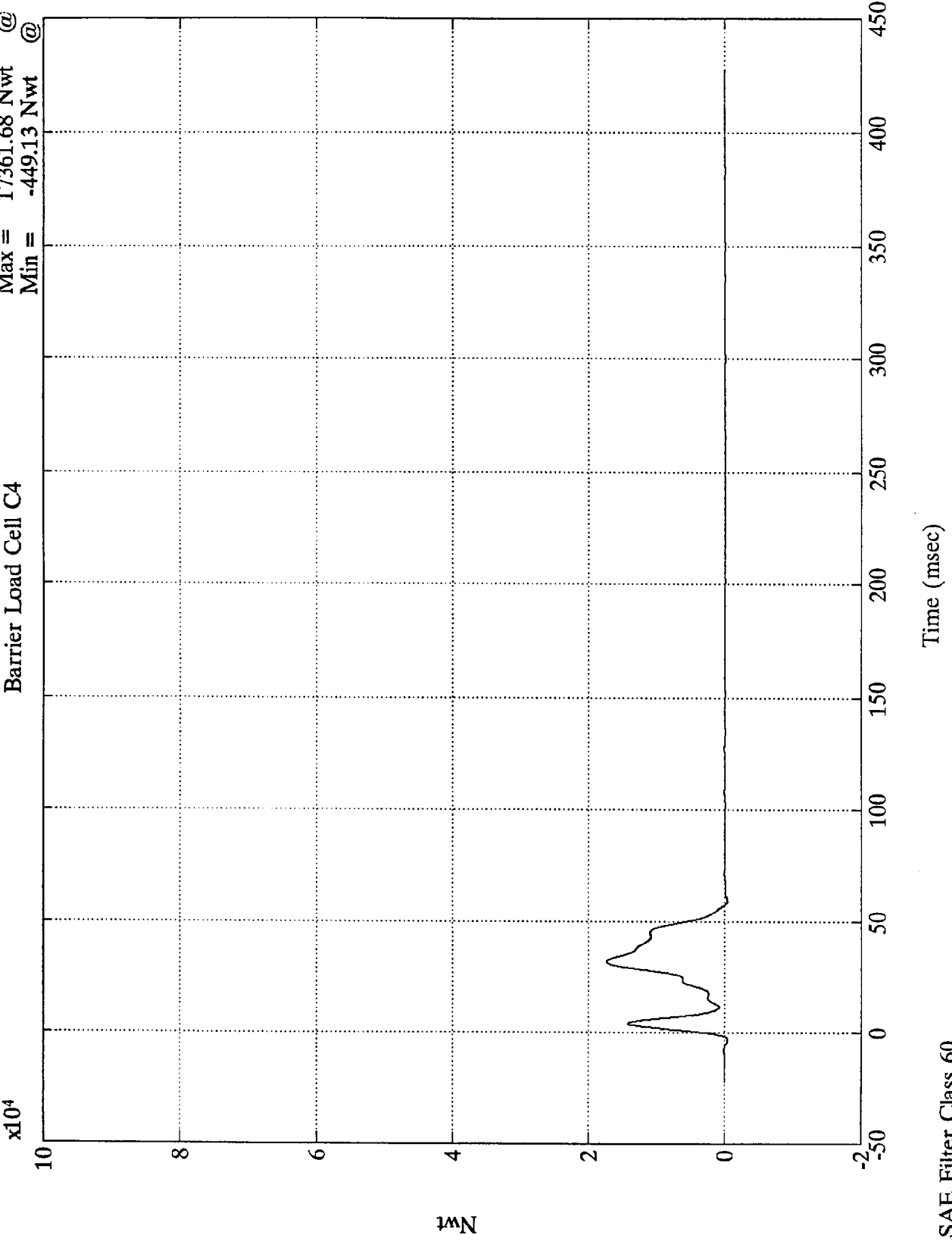


Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell C4
Max = 17361.68 Nwt @ 31.92 msec
Min = -449.13 Nwt @ -3.36 msec



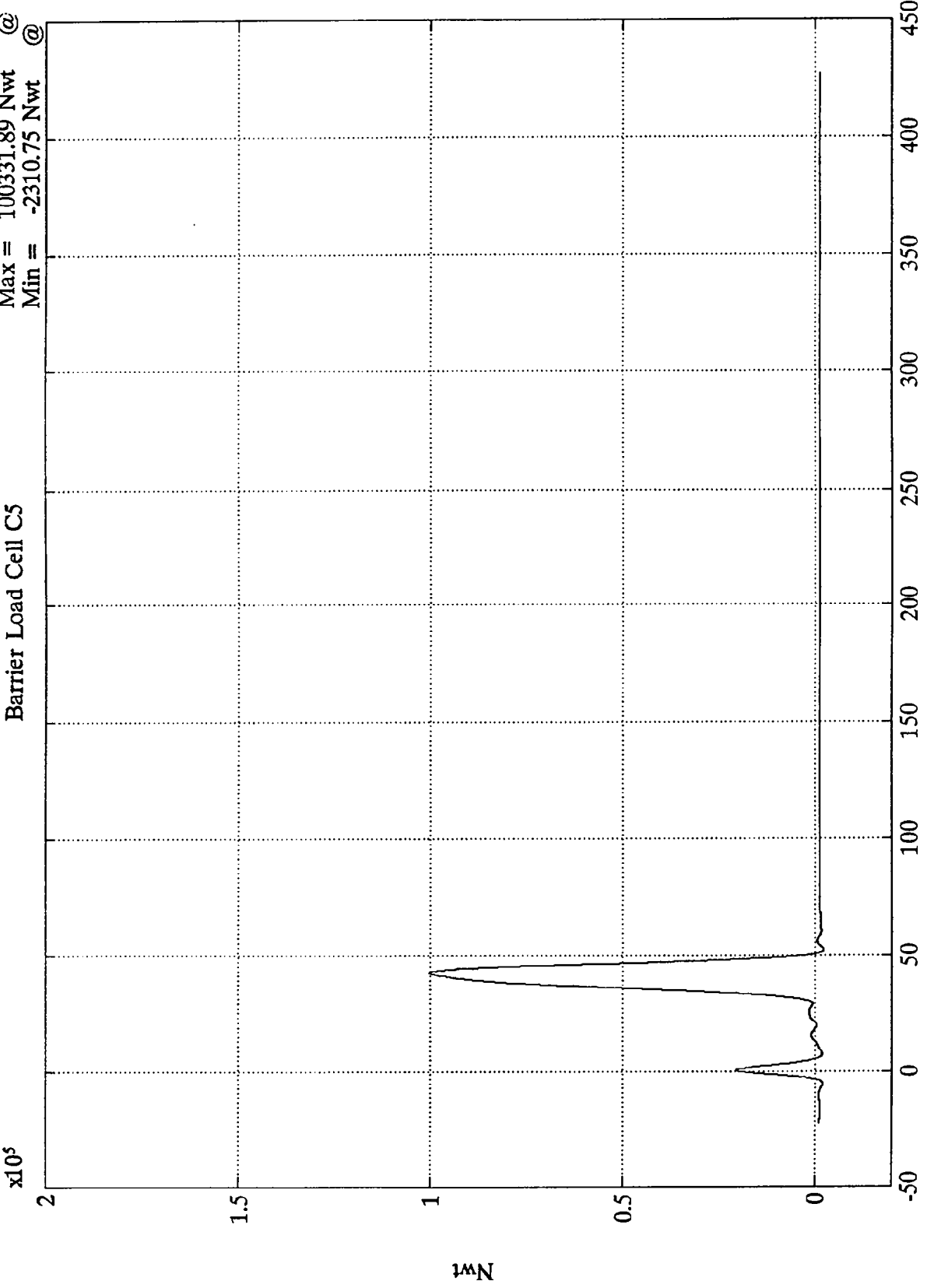
Nwt

Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell C5
Max = 100331.89 Nwt @ 42.47 msec
Min = -2310.75 Nwt @ 52.20 msec



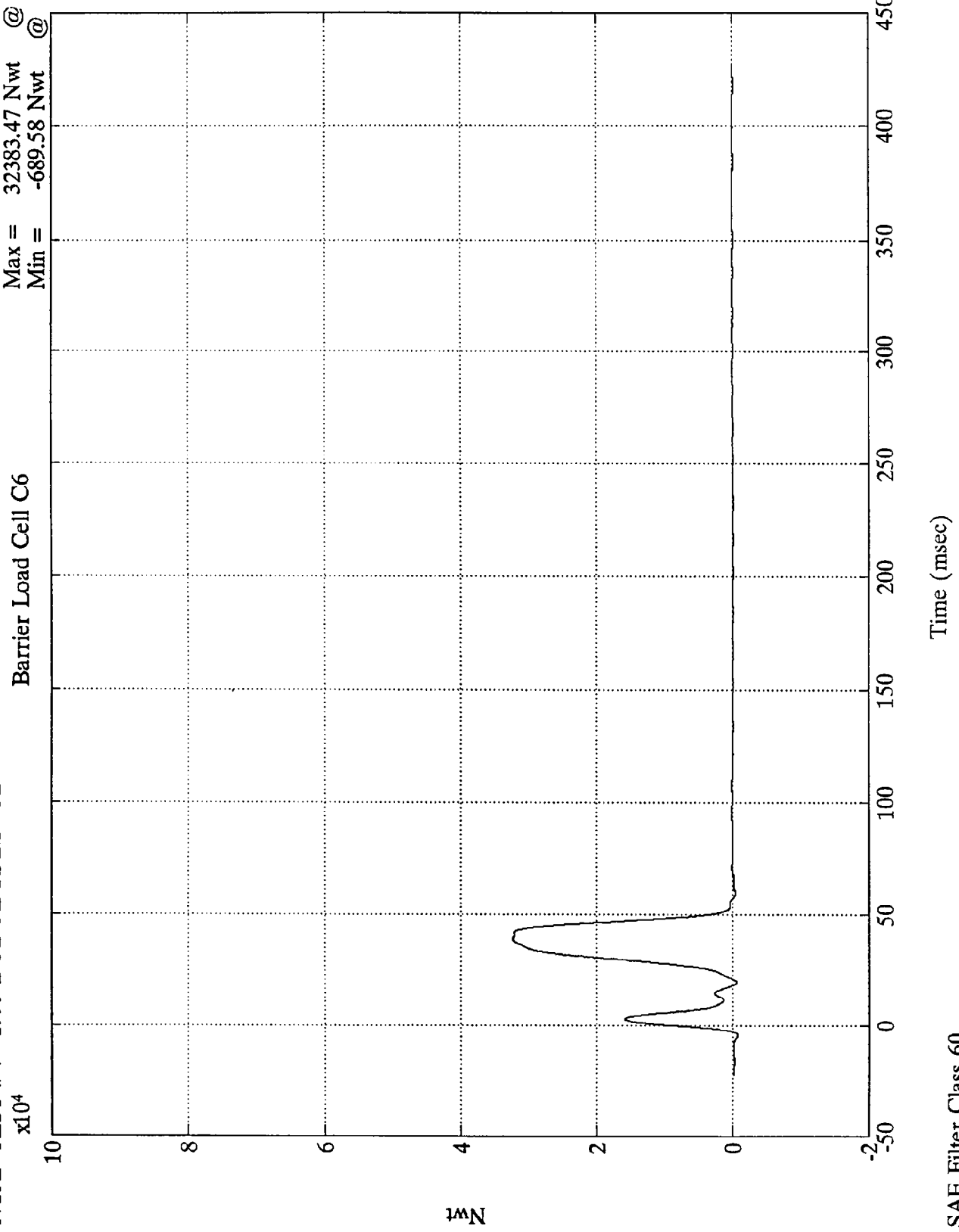
Nwt

Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell C6
Max = 32383.47 Nwt @ 38.75 msec
Min = -689.58 Nwt @ -4.56 msec



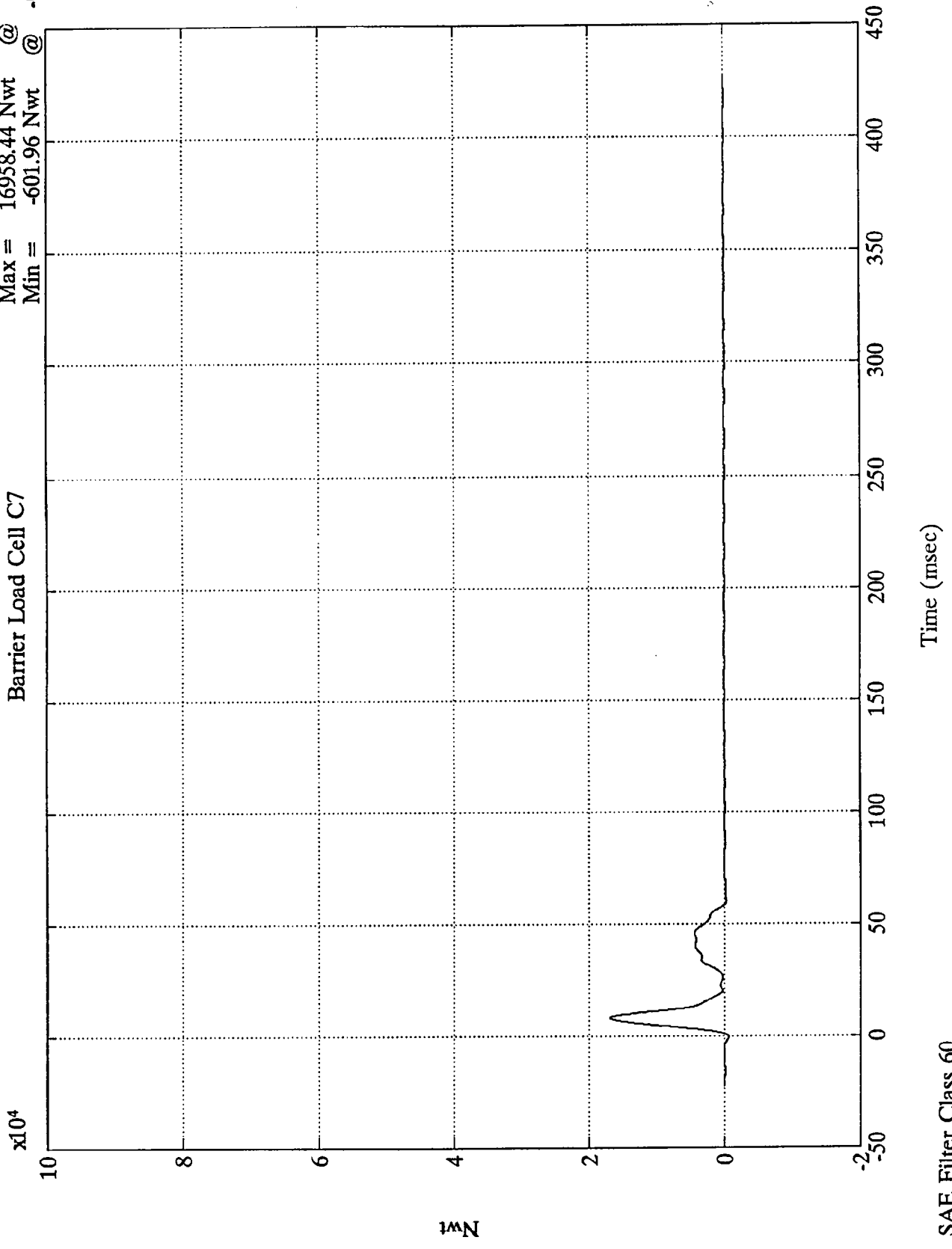
Nwt

Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell C7
Max = 16958.44 Nwt @ 7.91 msec
Min = -601.96 Nwt @ -0.60 msec



Nwt

Time (msec)

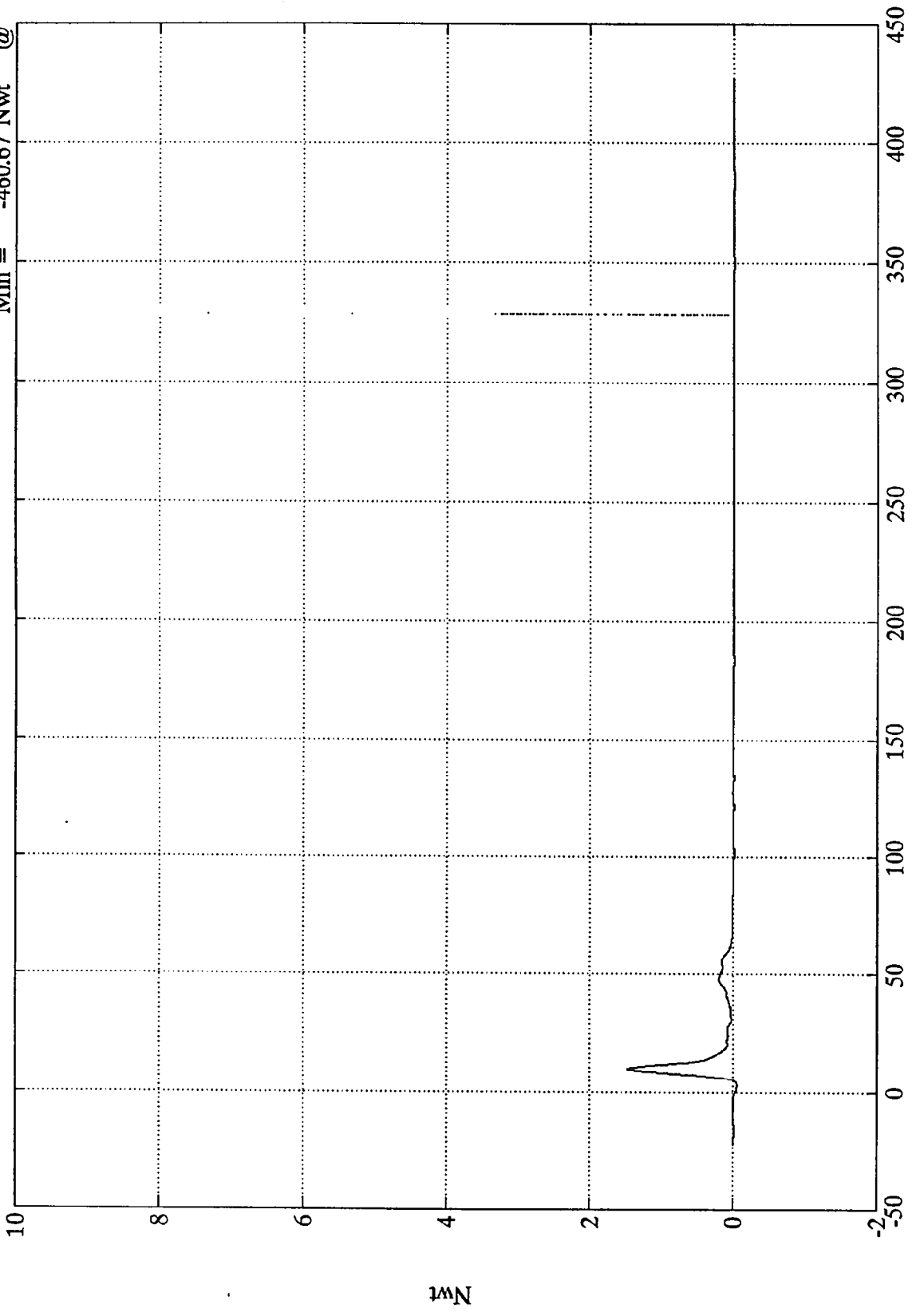
SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 14830.85 Nwt @ 10.07 msec
Min = -460.67 Nwt @ 3.23 msec

Barrier Load Cell C8

$\times 10^4$



Time (msec)

SAE Filter Class 60

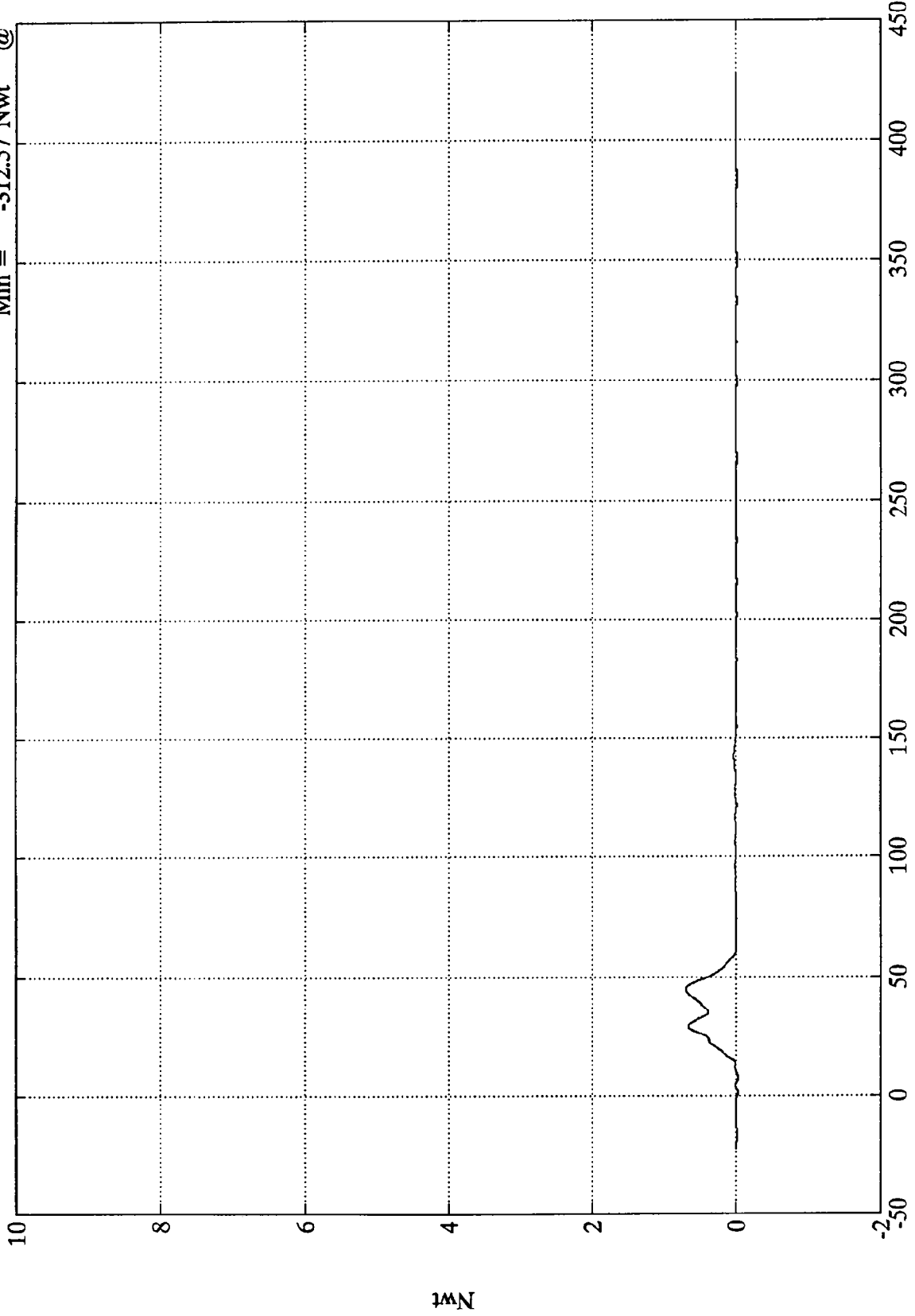
Nwt

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 7050.37 Nwt @ 45.00 msec
Min = -312.57 Nwt @ 1.31 msec

Barrier Load Cell C9

x10⁴



Time (msec)

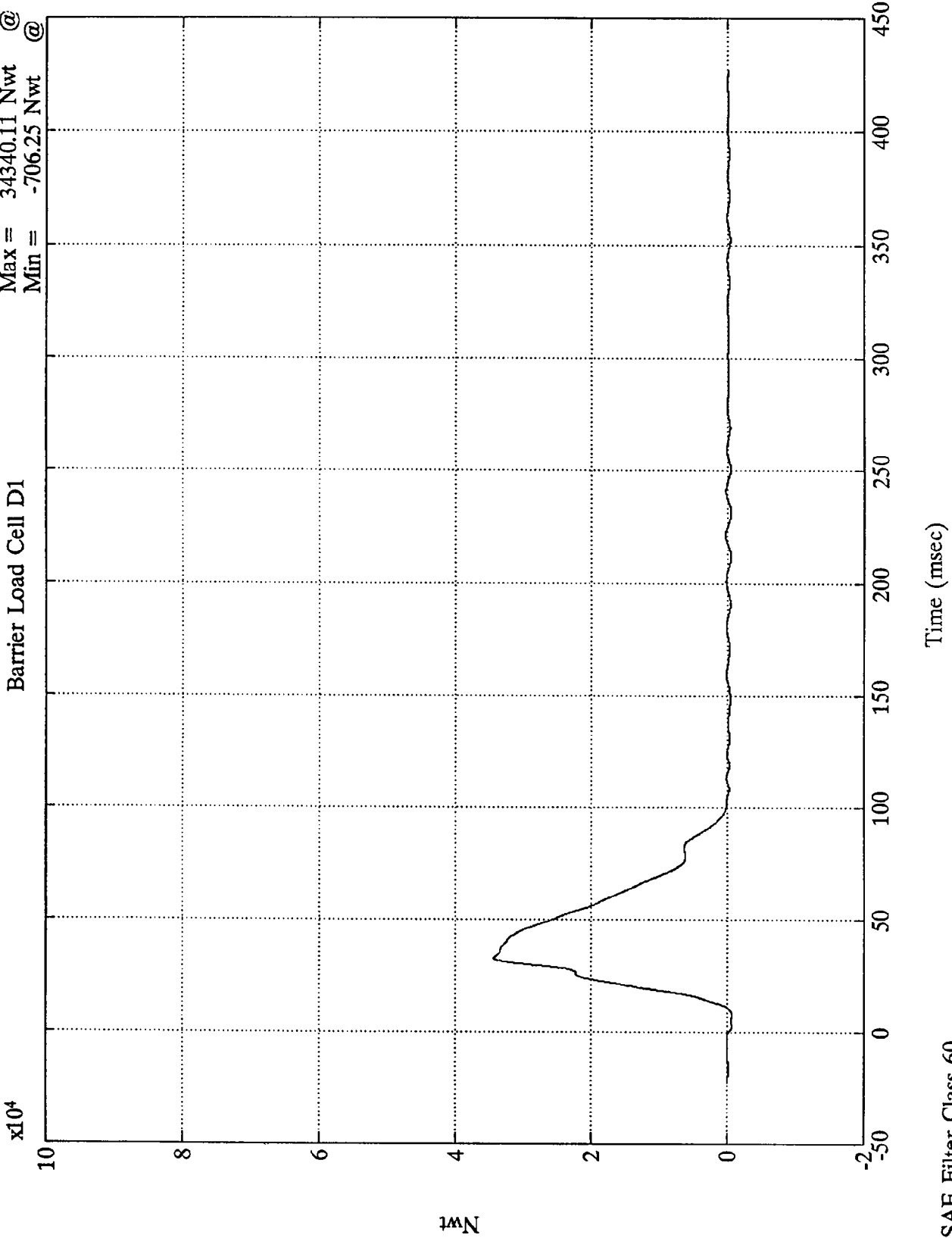
SAE Filter Class 60

1MN

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 34340.11 Nwt @ 32.40 msec
Min = -706.25 Nwt @ 7.55 msec

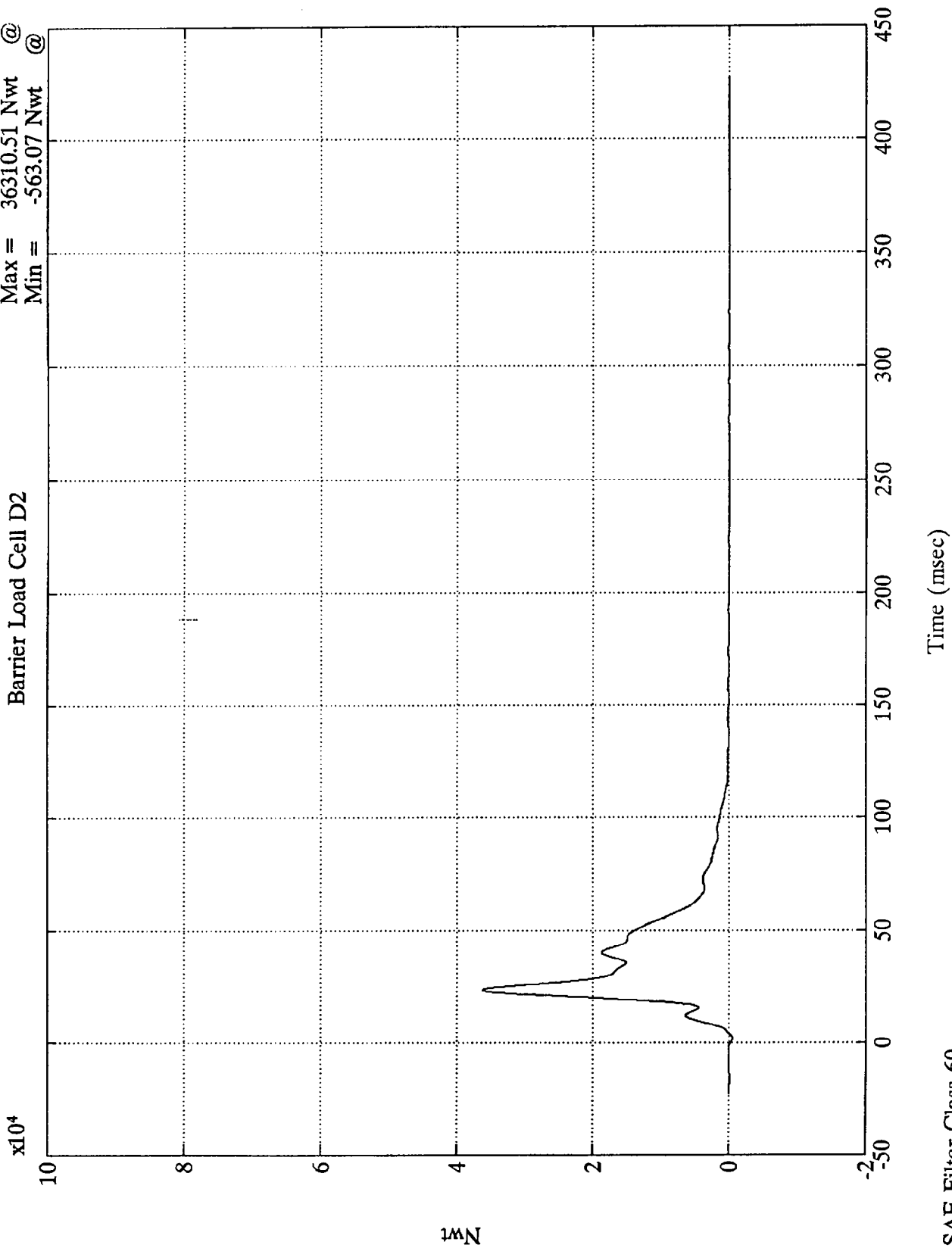
Barrier Load Cell D1



SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell D2
Max = 36310.51 Nwt @ 23.63 msec
Min = -563.07 Nwt @ 1.79 msec



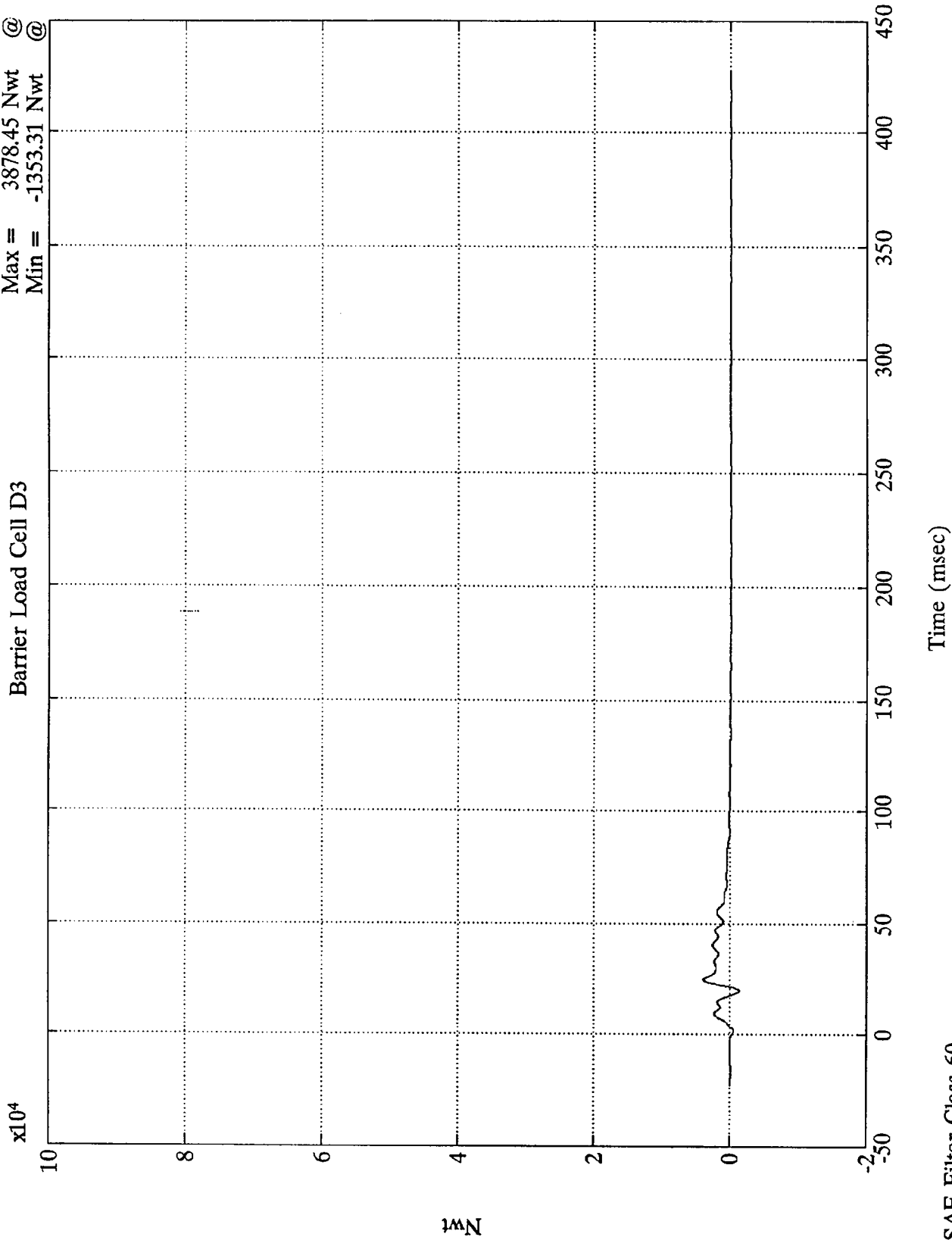
Nwt

Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell D3
Max = 3878.45 Nwt @ 24.96 msec
Min = -1353.31 Nwt @ 20.03 msec



Nwt

Time (msec)

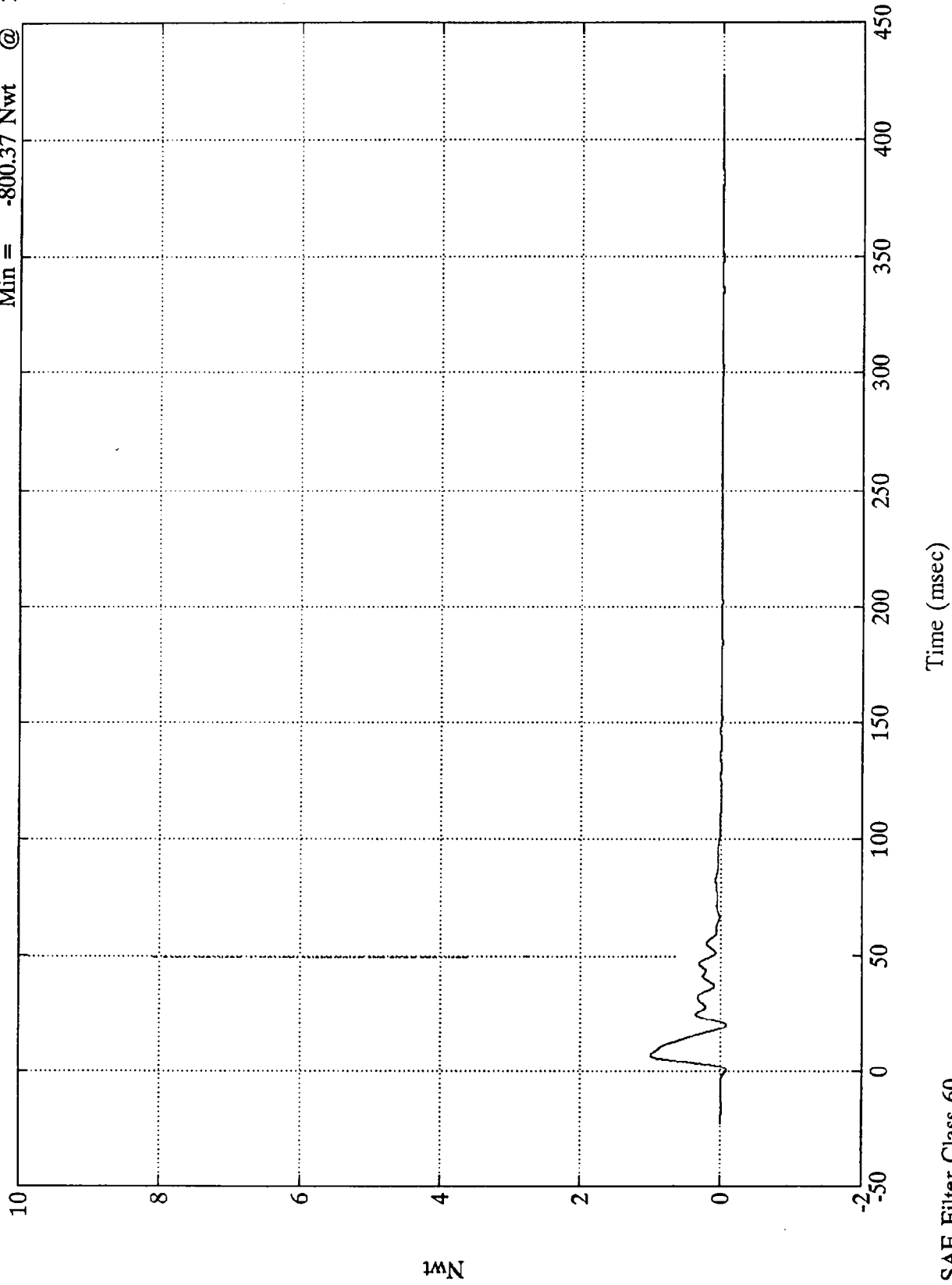
SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 9980.72 Nwt @ 6.83 msec
Min = -800.37 Nwt @ 20.03 msec

Barrier Load Cell D4

x10⁴



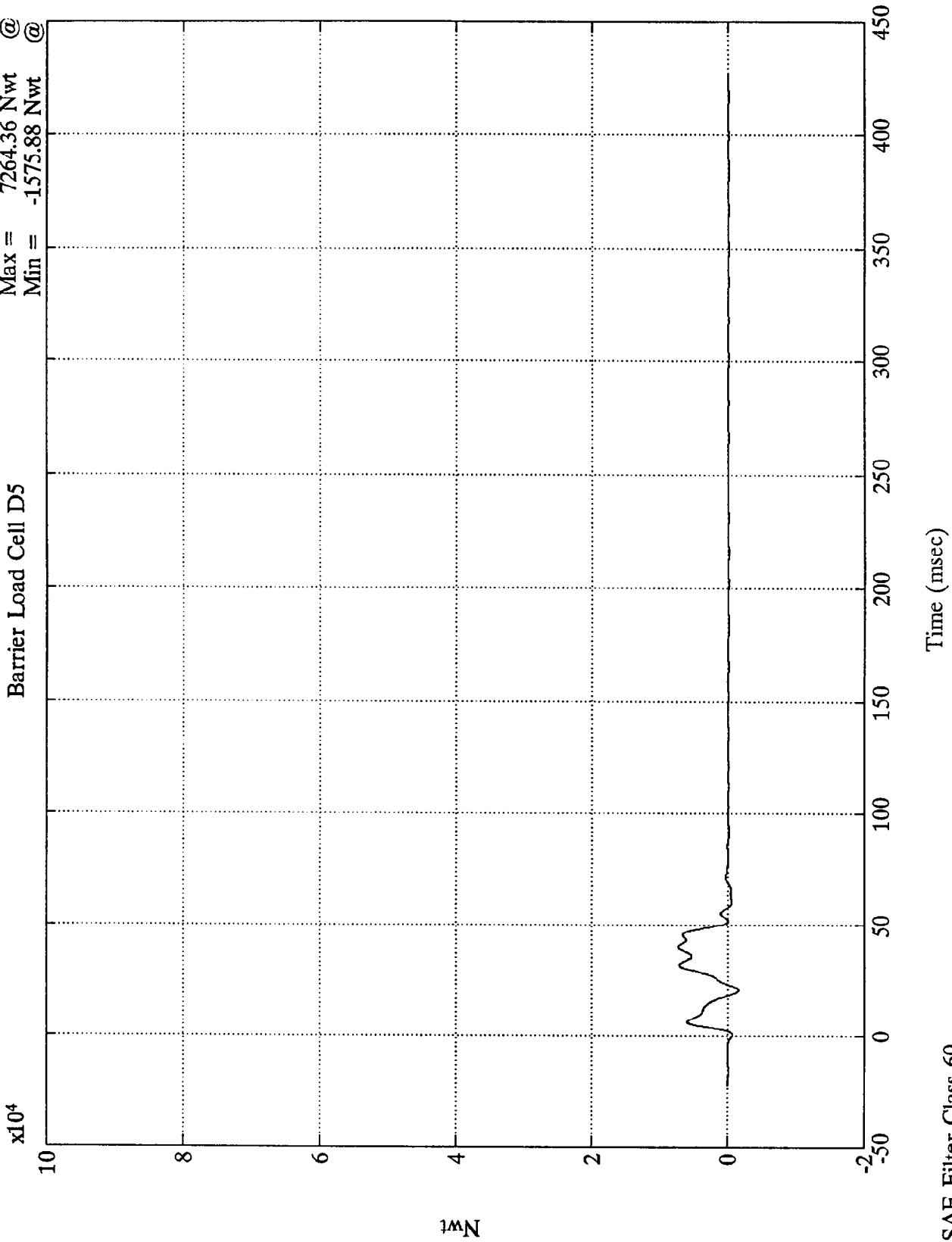
N

Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Barrier Load Cell D5
Max = 7264.36 Nwt @ 39.95 msec
Min = -1575.88 Nwt @ 20.64 msec



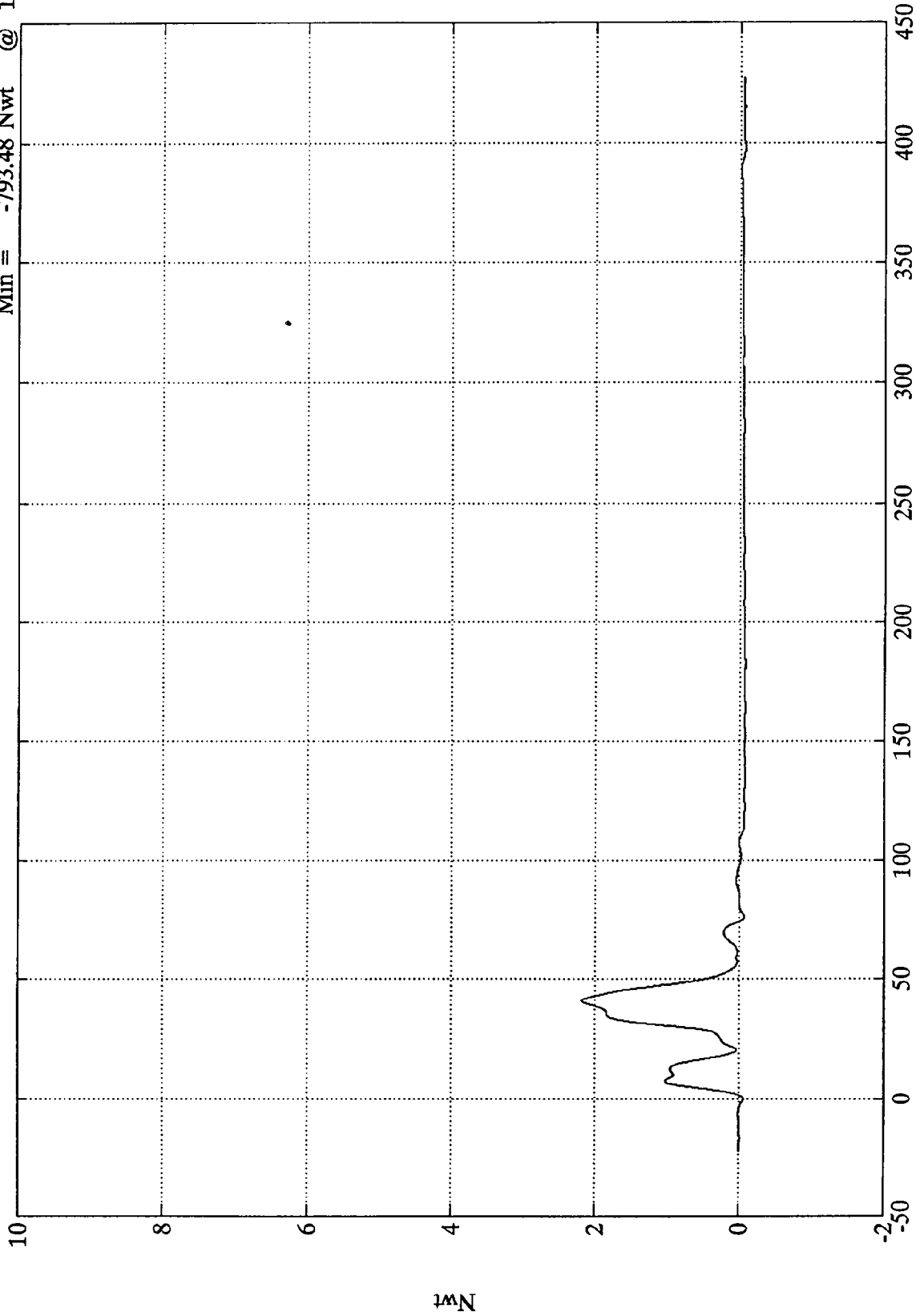
10N

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 21846.14 Nwt @ 40.80 msec
Min = -793.48 Nwt @ 133.32 msec

Barrier Load Cell D6

x10⁴



Time (msec)

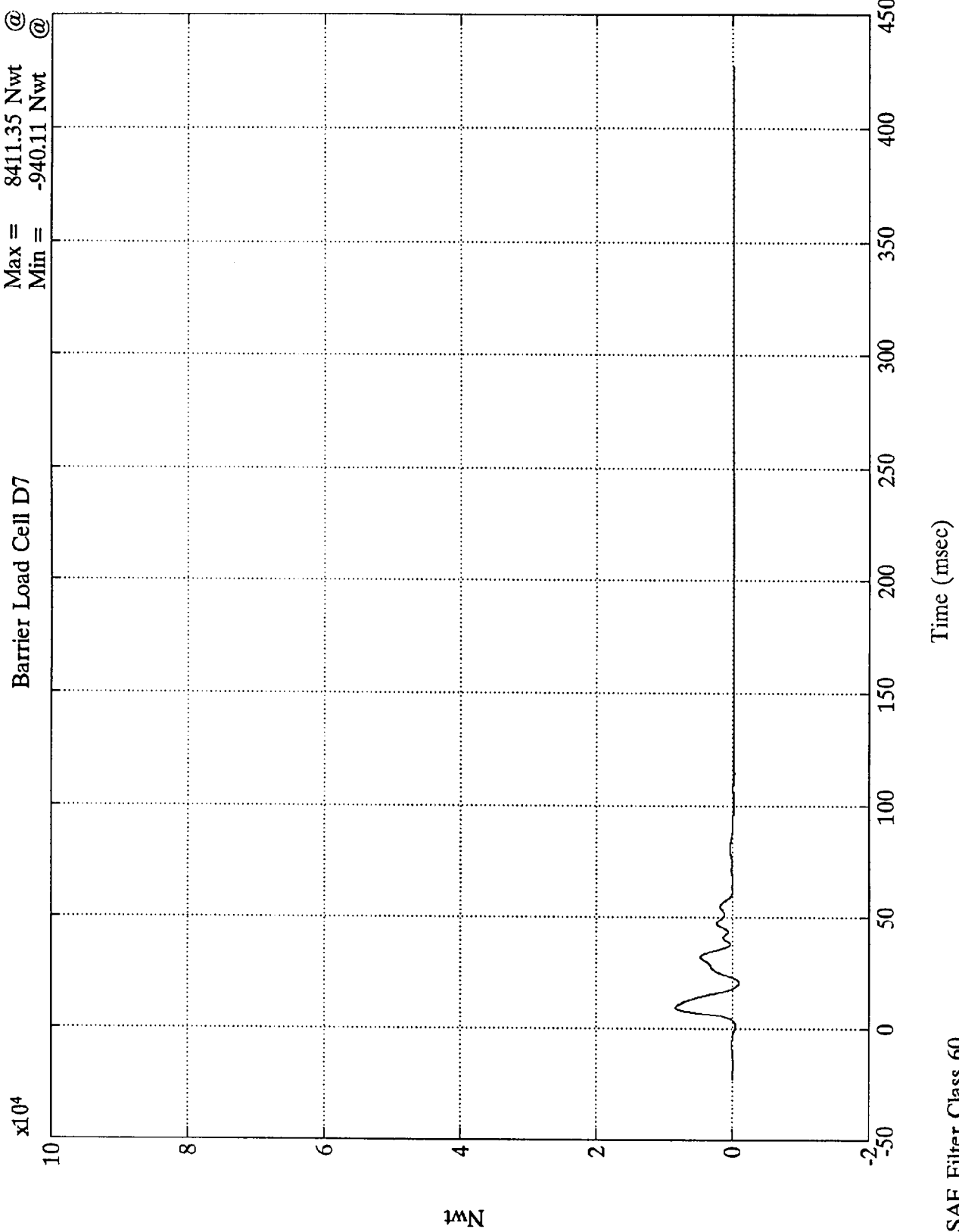
SAE Filter Class 60

Nwt

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 8411.35 Nwt @ 9.11 msec
Min = -940.11 Nwt @ 20.28 msec

Barrier Load Cell D7

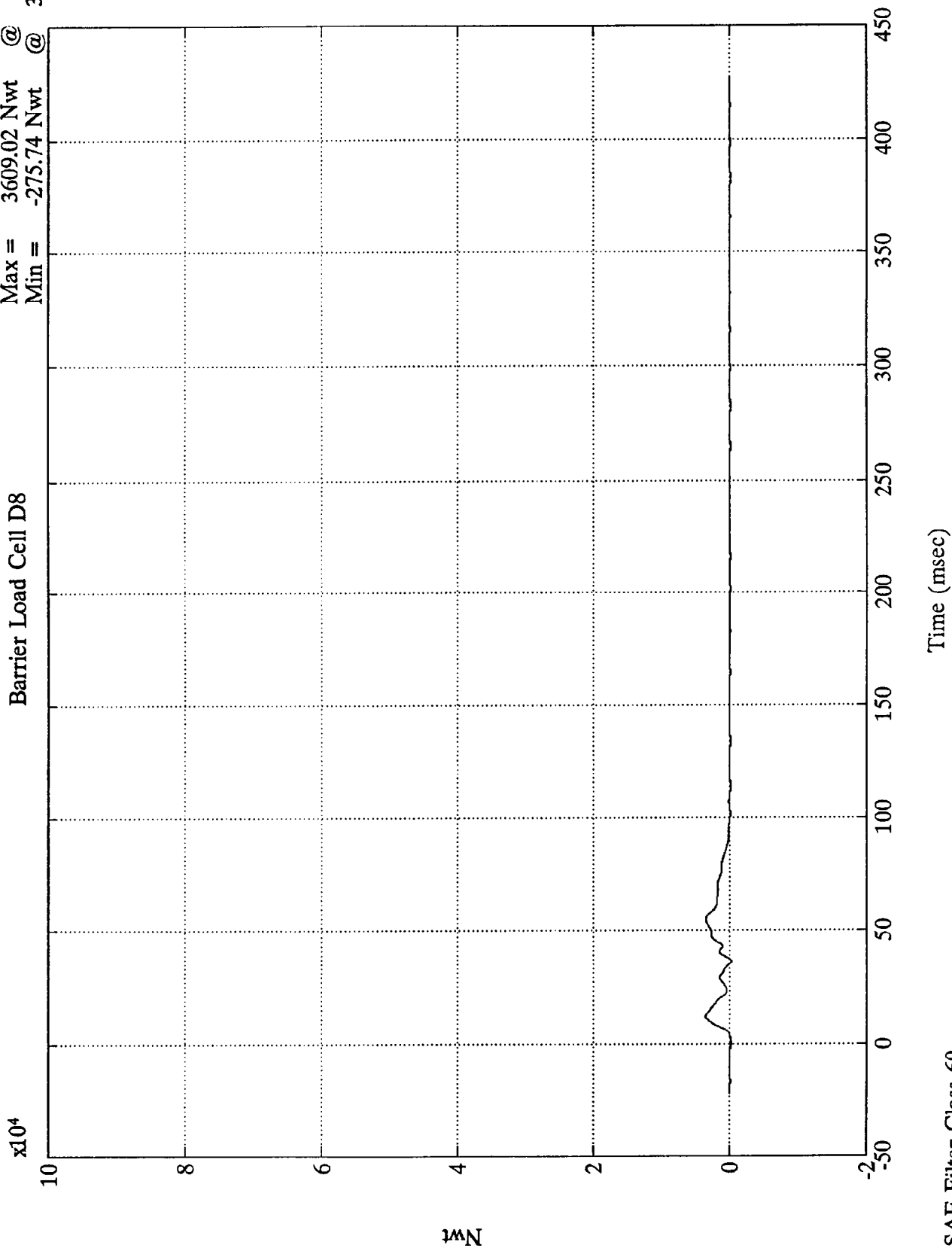


SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 3609.02 Nwt @ 11.64 msec
Min = -275.74 Nwt @ 36.36 msec

Barrier Load Cell D8



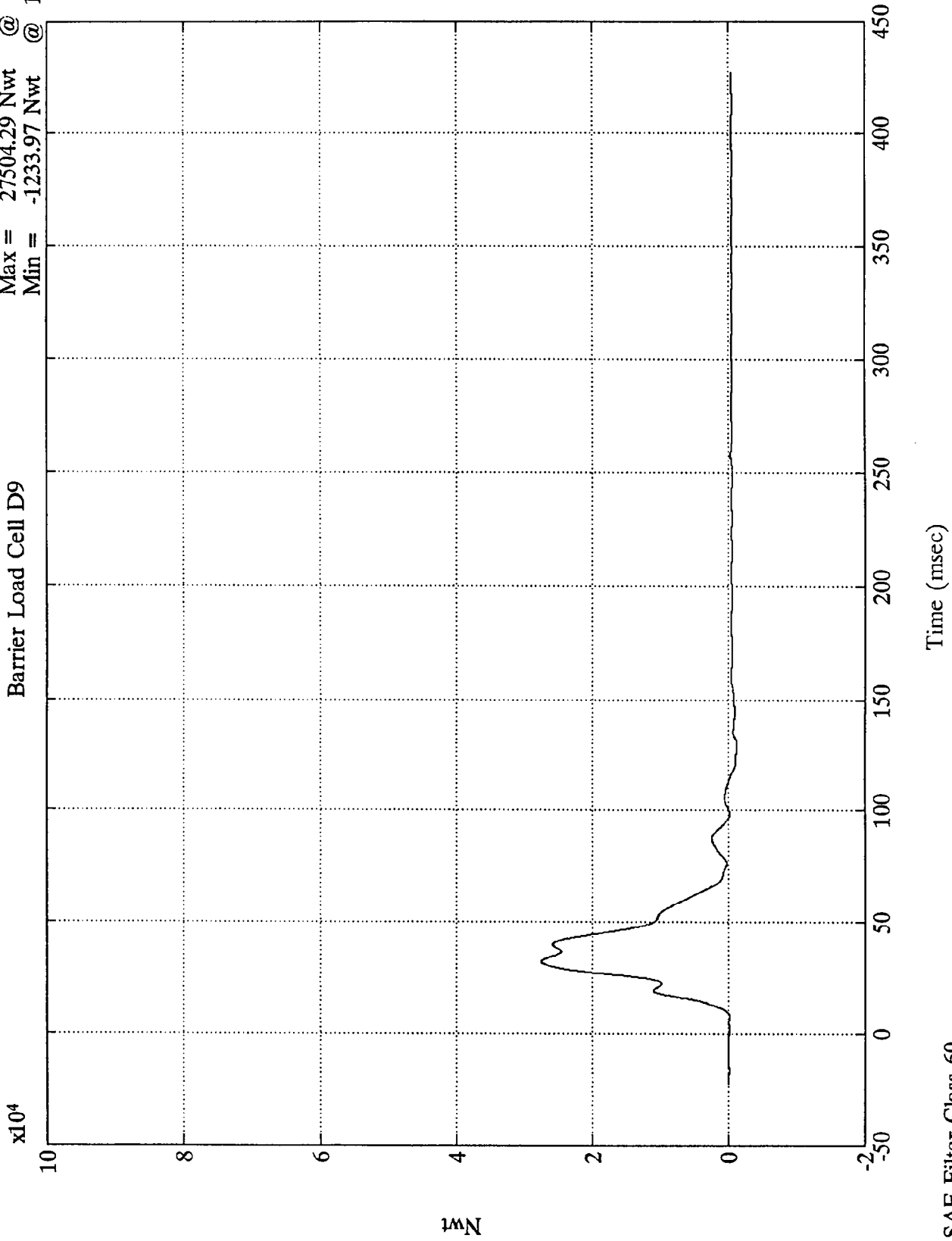
Nwt

Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

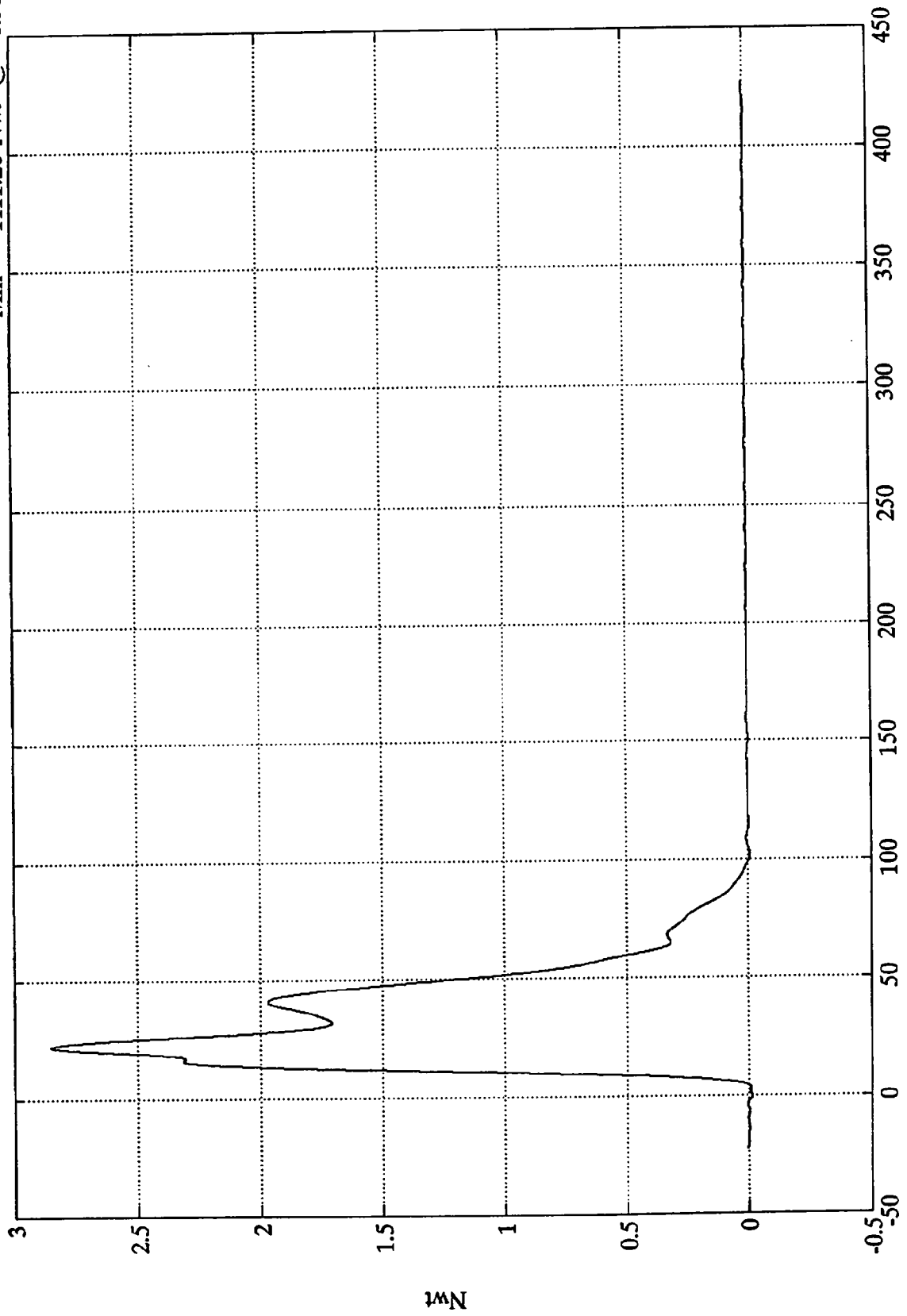
Barrier Load Cell D9
Max = 27504.29 Nwt @ 32.15 msec
Min = -1233.97 Nwt @ 129.72 msec



NCAP TEST #4 - 1995 DODGE RAM VAN
x10⁵

Group 1 Load Cell Sum

Max = 285130.00 Nwt @ 22.20 msec
Min = -1111.20 Nwt @ -0.36 msec



Time (msec)

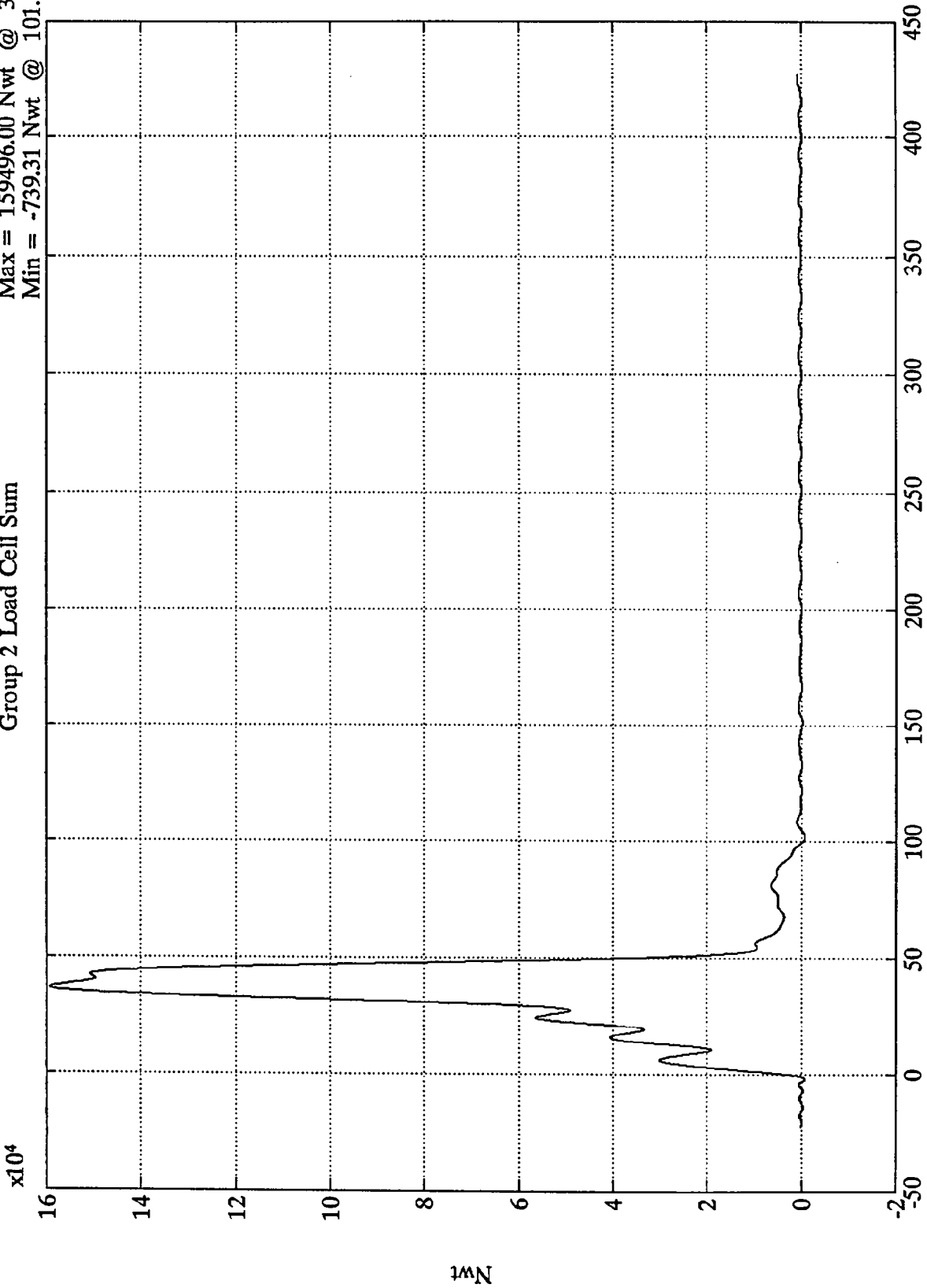
SAE Filter Class 60 - LC B3 is not accurate

Nwt

NCAP TEST #4 - 1995 DODGE RAM VAN

Group 2 Load Cell Sum

Max = 159496.00 Nwt @ 36.84 msec
Min = -739.31 Nwt @ 101.88 msec



Time (msec)

Load Cells (A4,A5,A6,B4,B5,B6)

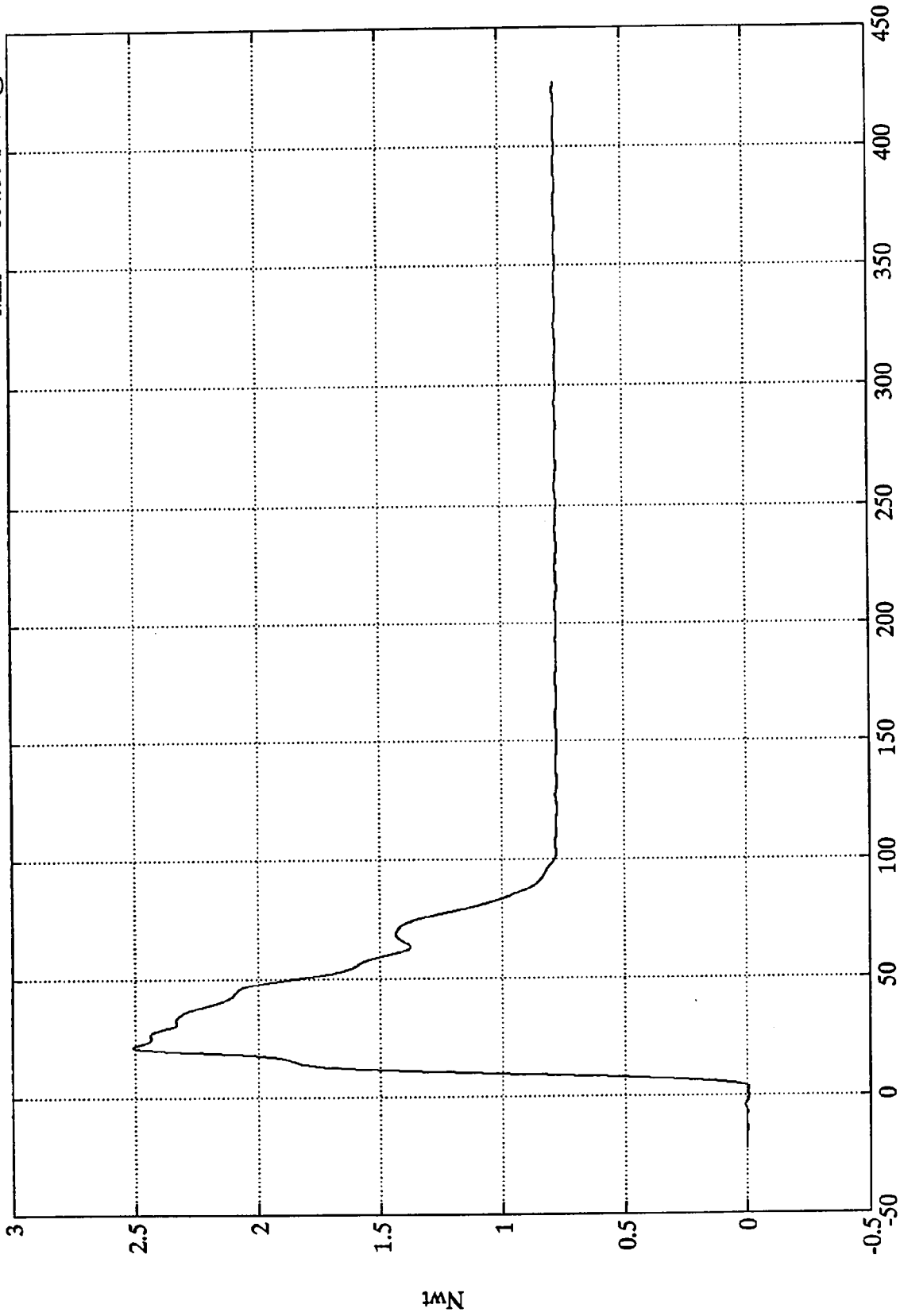
SAE Filter Class 60

Nwt

NCAP TEST #4 - 1995 DODGE RAM VAN
x10⁵

Group 3 Load Cell Sum

Max = 250755.00 Nwt @ 21.48 msec
Min = -804.80 Nwt @ -0.84 msec



Load Cells (A7,A8,A9,B7,B8,B9)

Time (msec)

SAE Filter Class 60

Nwt

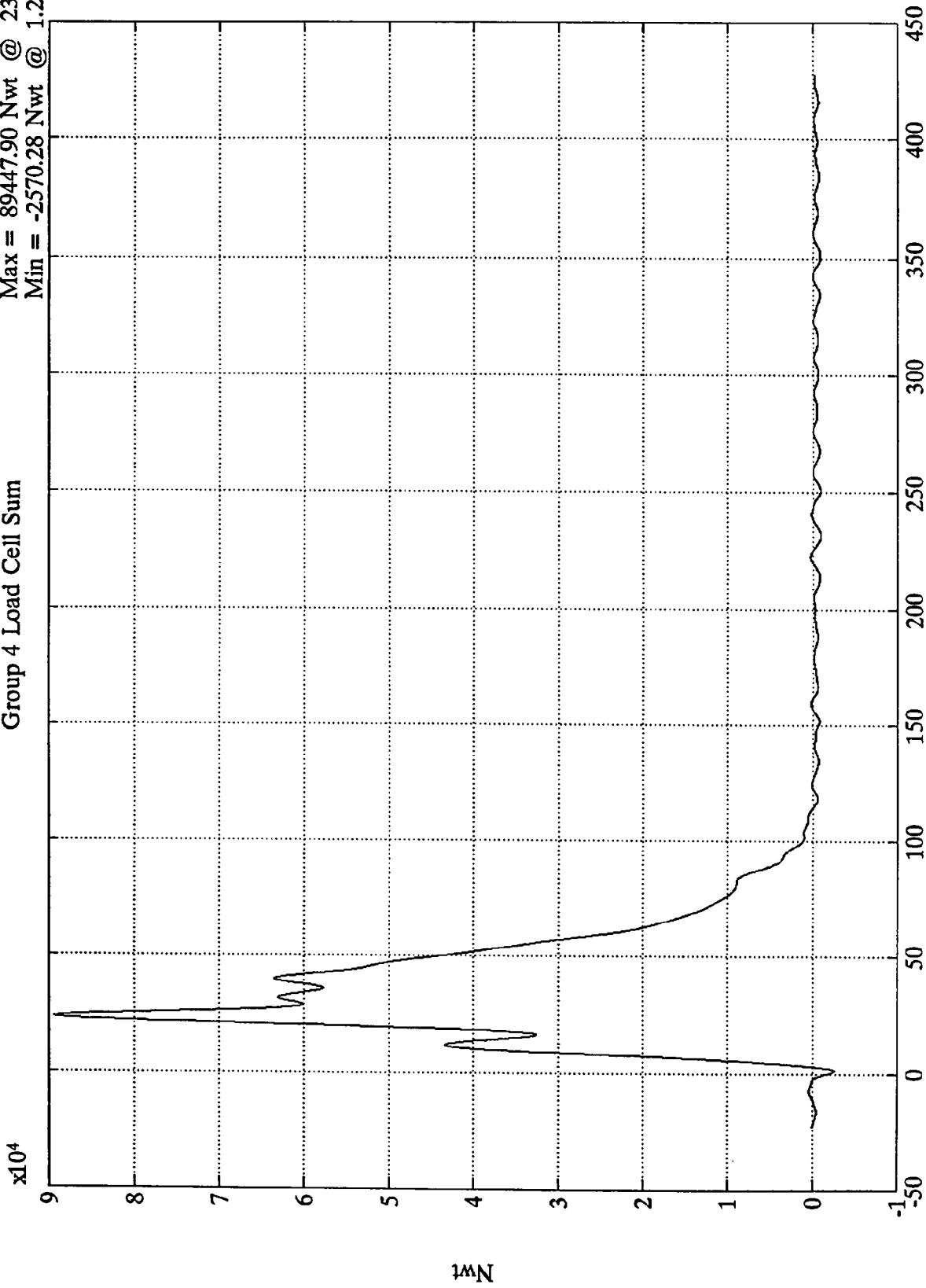
B-69

8227-4

NCAP TEST #4 - 1995 DODGE RAM VAN

Group 4 Load Cell Sum

Max = 89447.90 Nwt @ 23.64 msec
Min = -2570.28 Nwt @ 1.20 msec

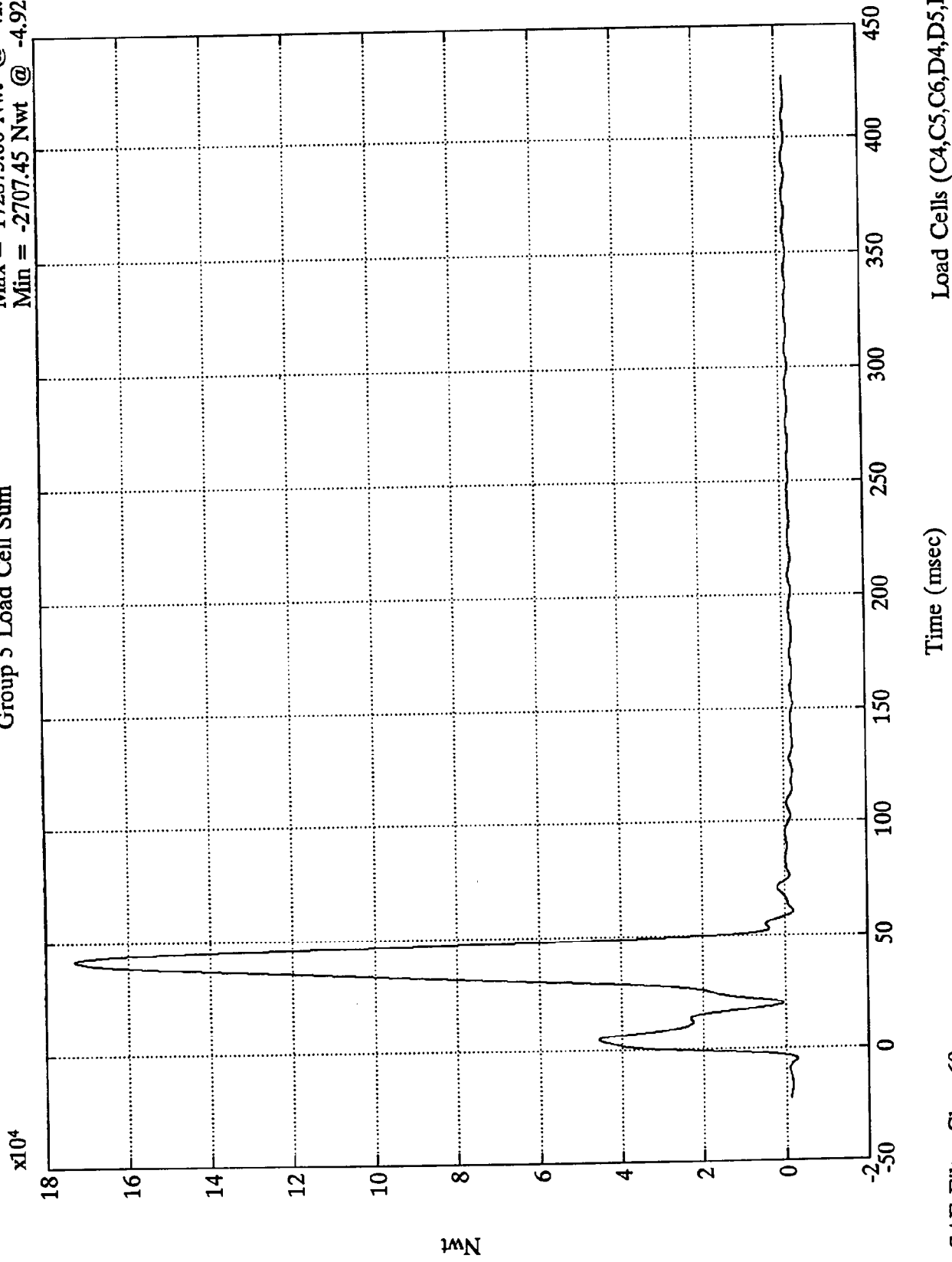


SAE Filter Class 60
Time (msec)
Load Cells (C1,C2,C3,D1,D2,D3)

NCAP TEST #4 - 1995 DODGE RAM VAN

Group 5 Load Cell Sum

Max = 172875.00 Nwt @ 41.88 msec
Min = -2707.45 Nwt @ -4.92 msec



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

Time (msec)

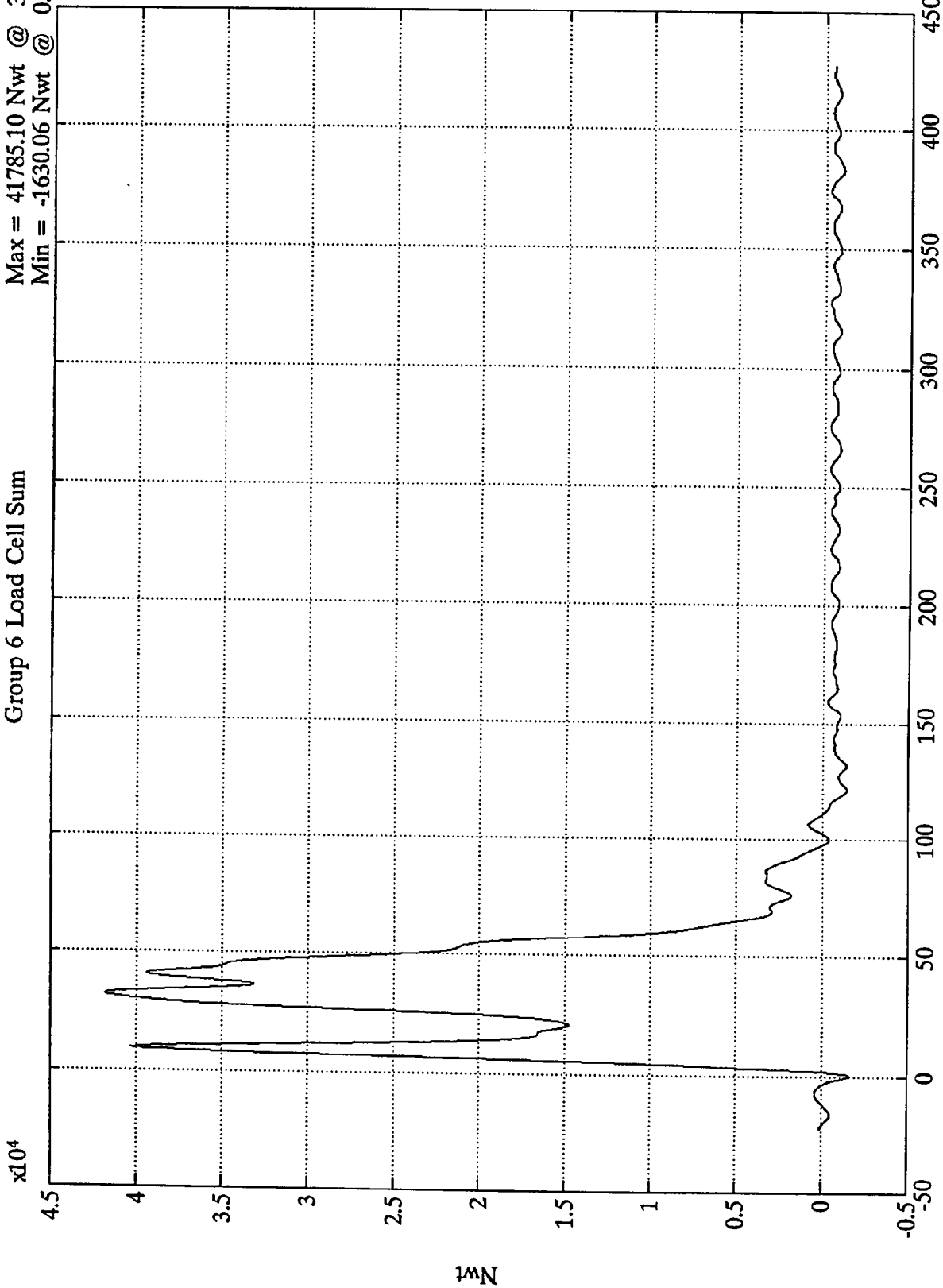
SAE Filter Class 60

Nwt

NCAP TEST #4 - 1995 DODGE RAM VAN

Group 6 Load Cell Sum

Max = 41785.10 Nwt @ 32.04 msec
Min = -1630.06 Nwt @ 0.24 msec



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

Time (msec)

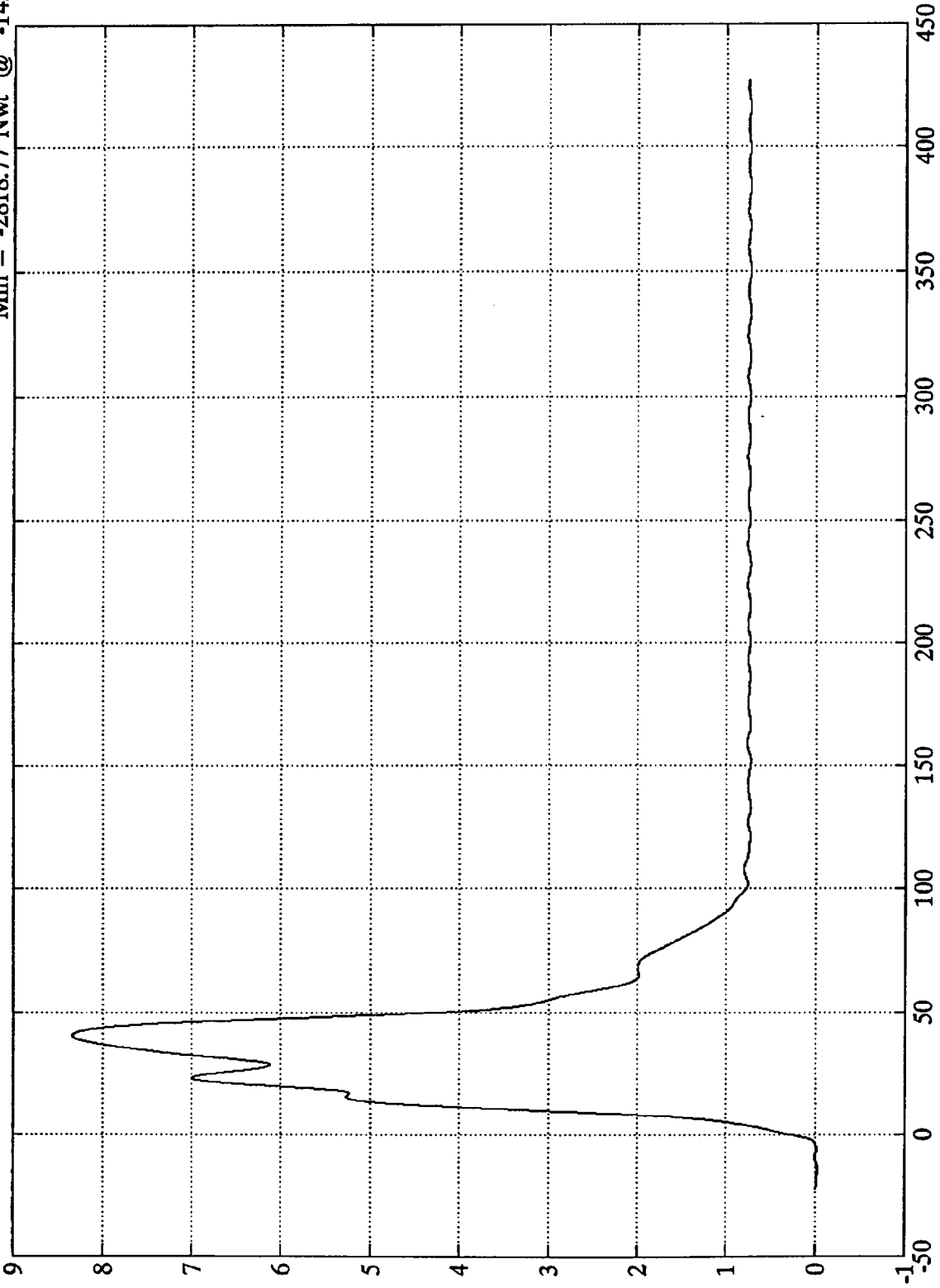
SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

$\times 10^5$

Total Load Cell Sum

Max = 833225.40 Nwt @ 40.32 msec
Min = -2818.77 Nwt @ -14.52 msec



Time (msec)

SAE Filter Class 60

Nwt

TEST NO. MS0304

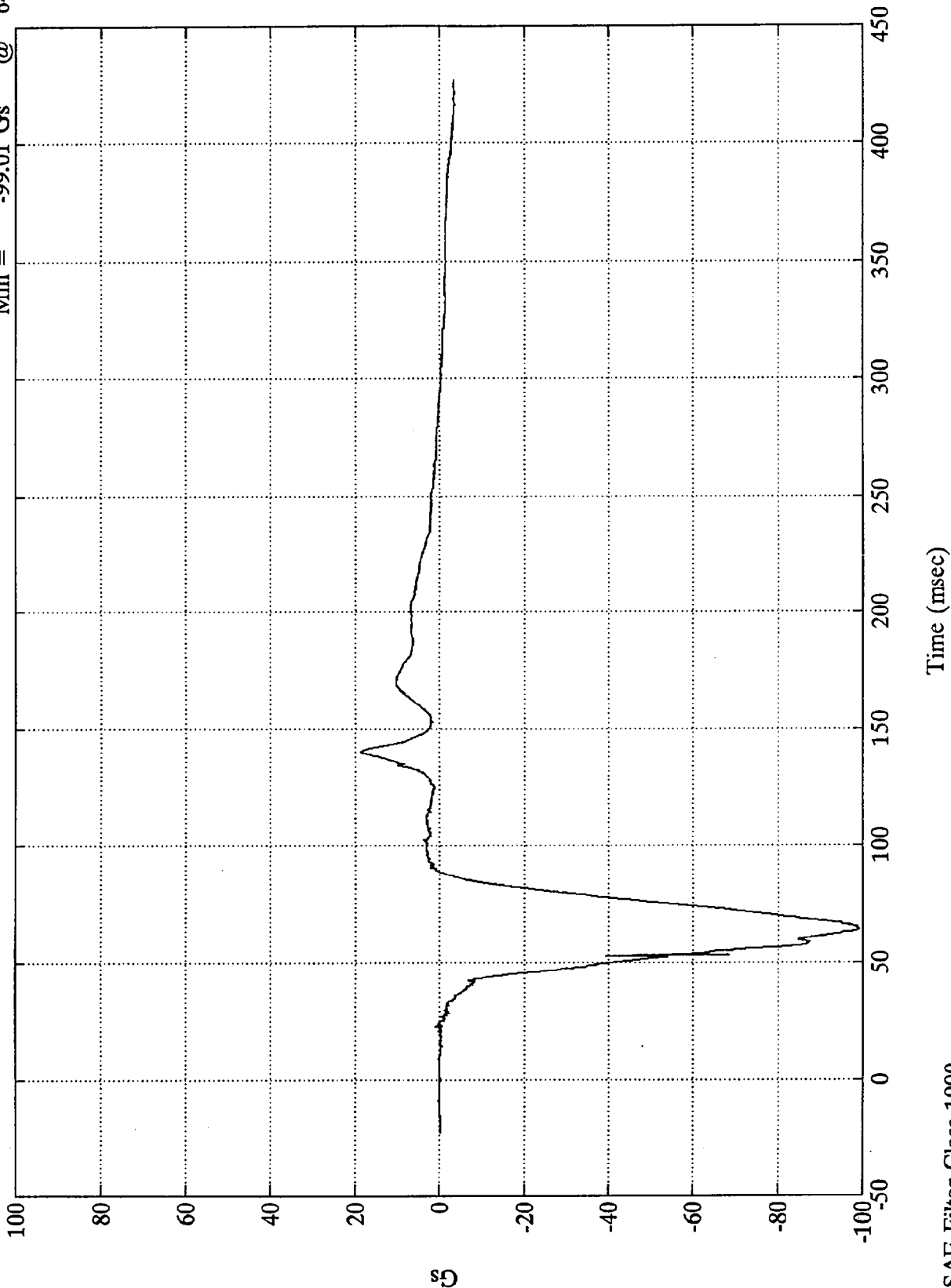
DUMMY DATA

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 #4 - 1995 DODGE RAM VAN

Pos. 1 Head X

Max = 18.76 Gs @ 140.40 msec
Min = -99.01 Gs @ 64.31 msec

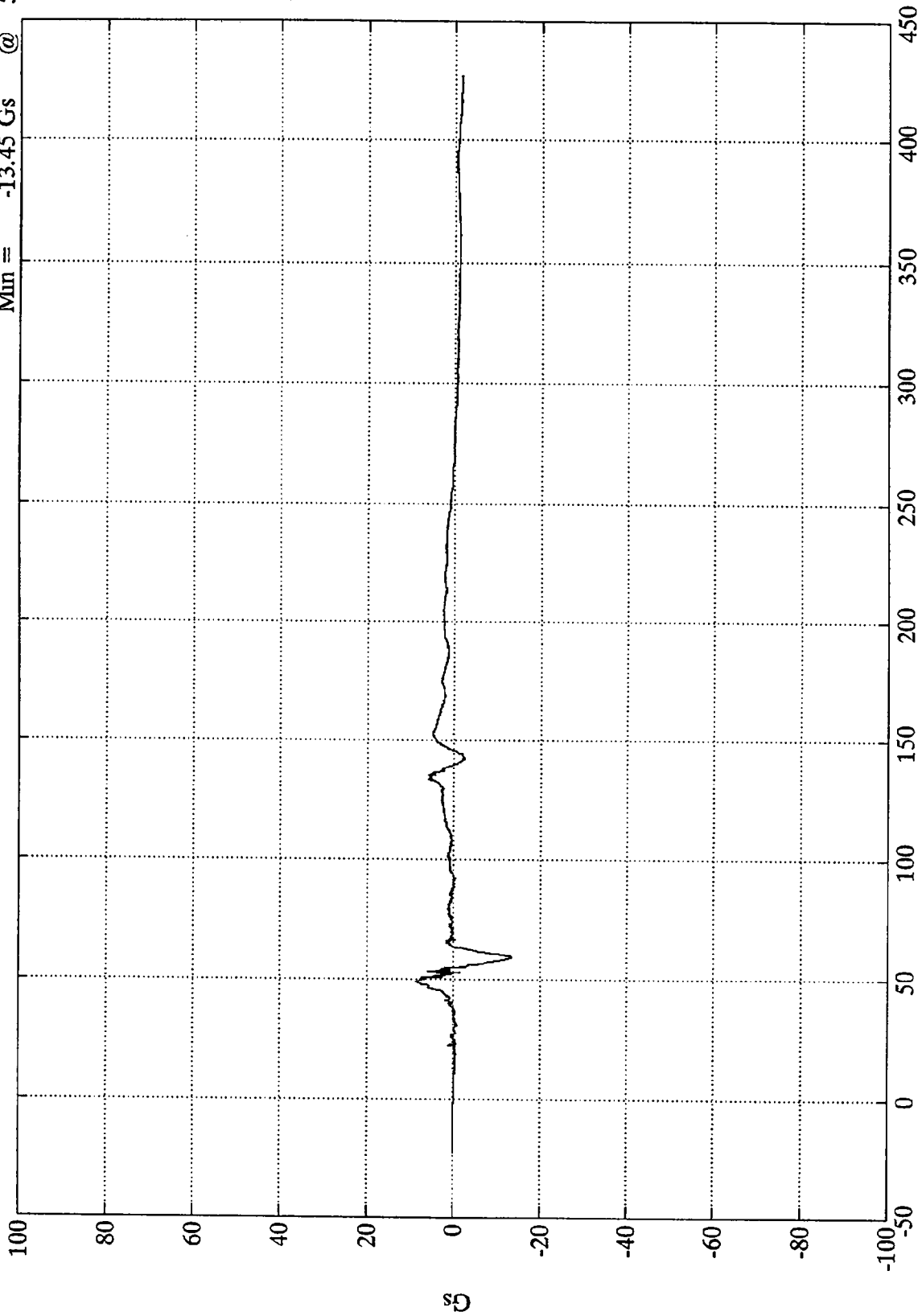


SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Head Y

Max = 8.69 Gs @ 48.95 msec
Min = -13.45 Gs @ 59.15 msec

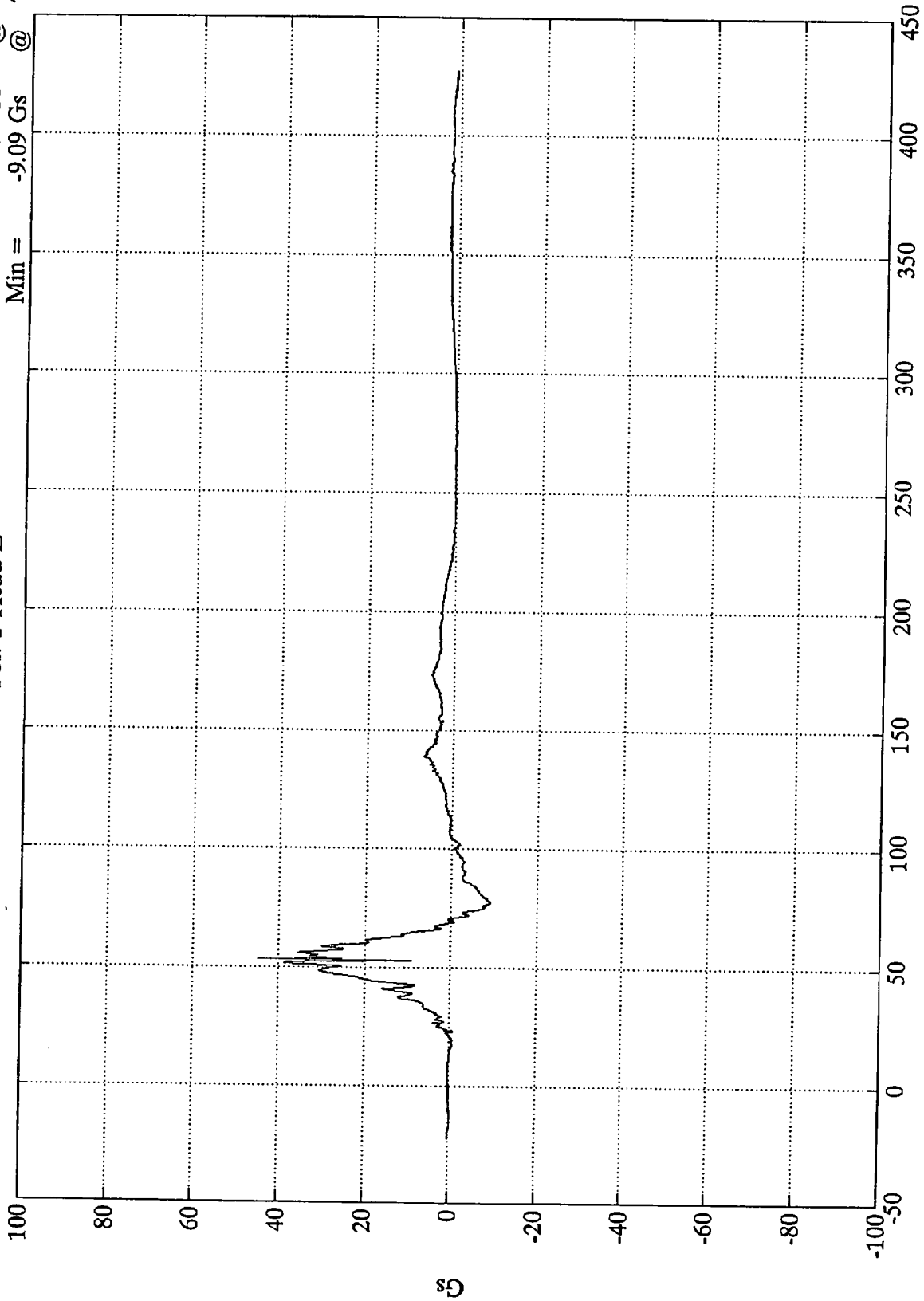


Time (msec)

SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Head Z
Max = 44.85 Gs @ 53.15 msec
Min = -9.09 Gs @ 77.76 msec



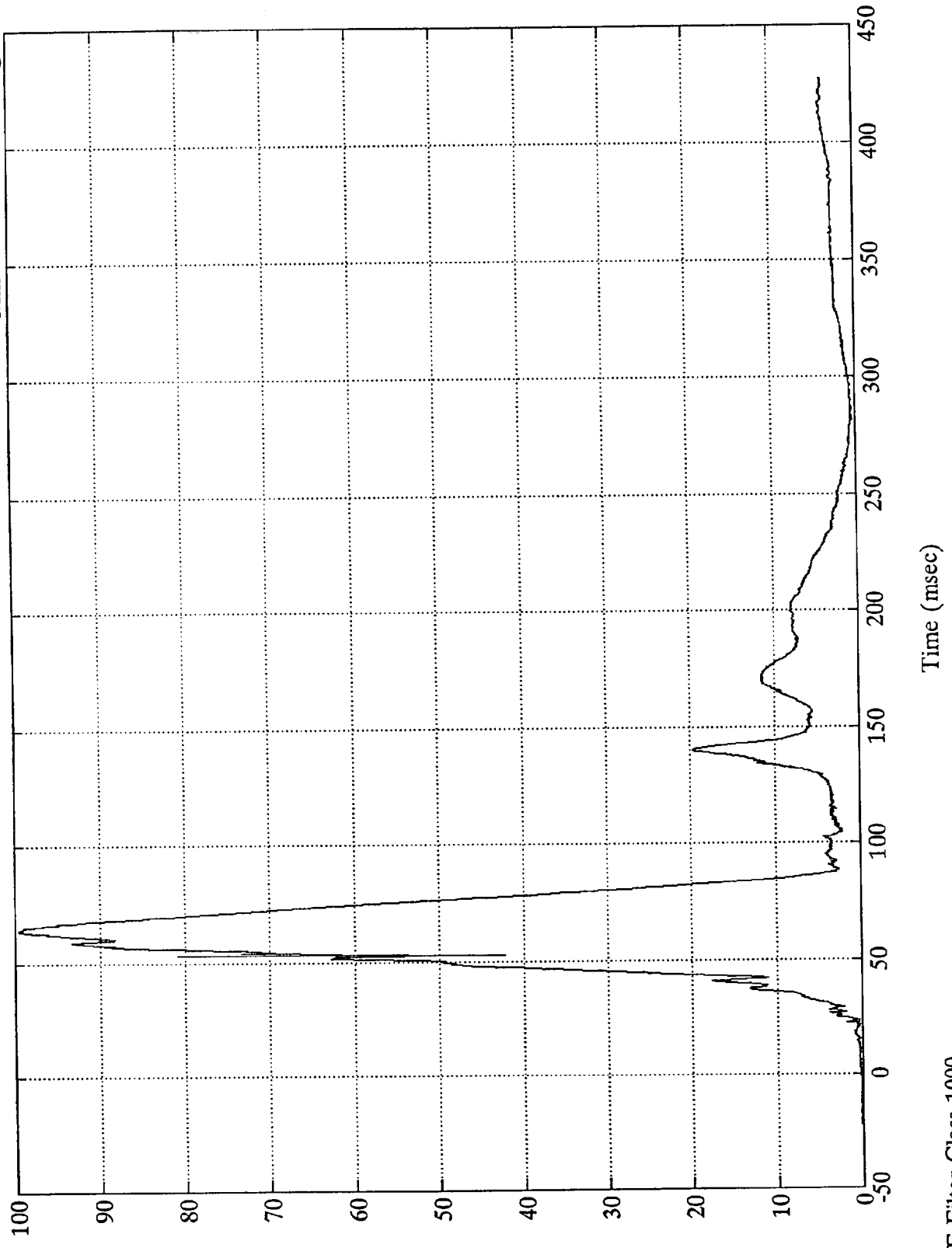
Time (msec)

SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Head Resultant

Max = 99.62 Gs @ 64.19 msec
Min = .05 Gs @ -6.00 msec



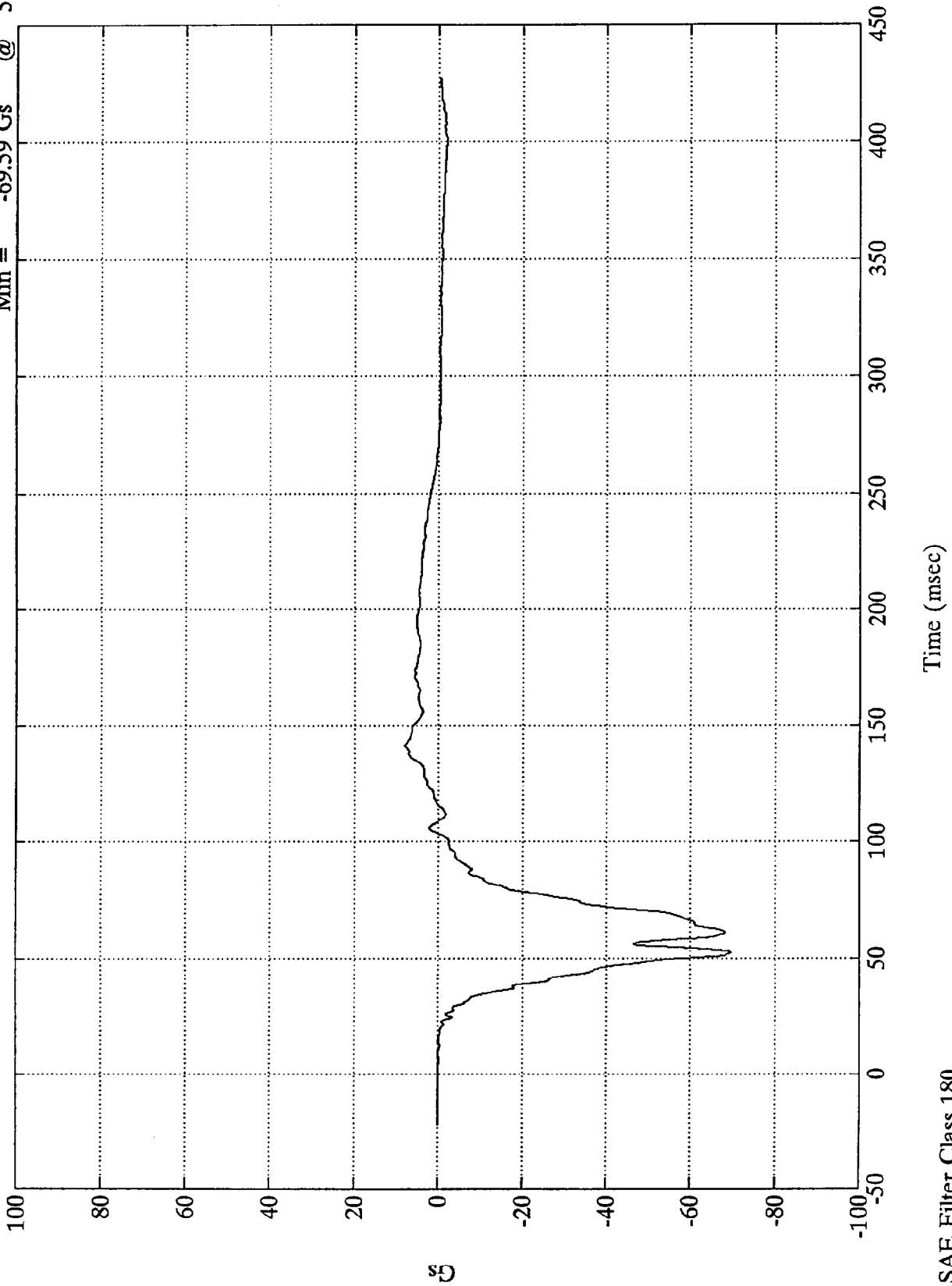
SAE Filter Class 1000

5

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Chest X

Max = 7.97 Gs @ 141.36 msec
Min = -69.59 Gs @ 52.68 msec



Gs

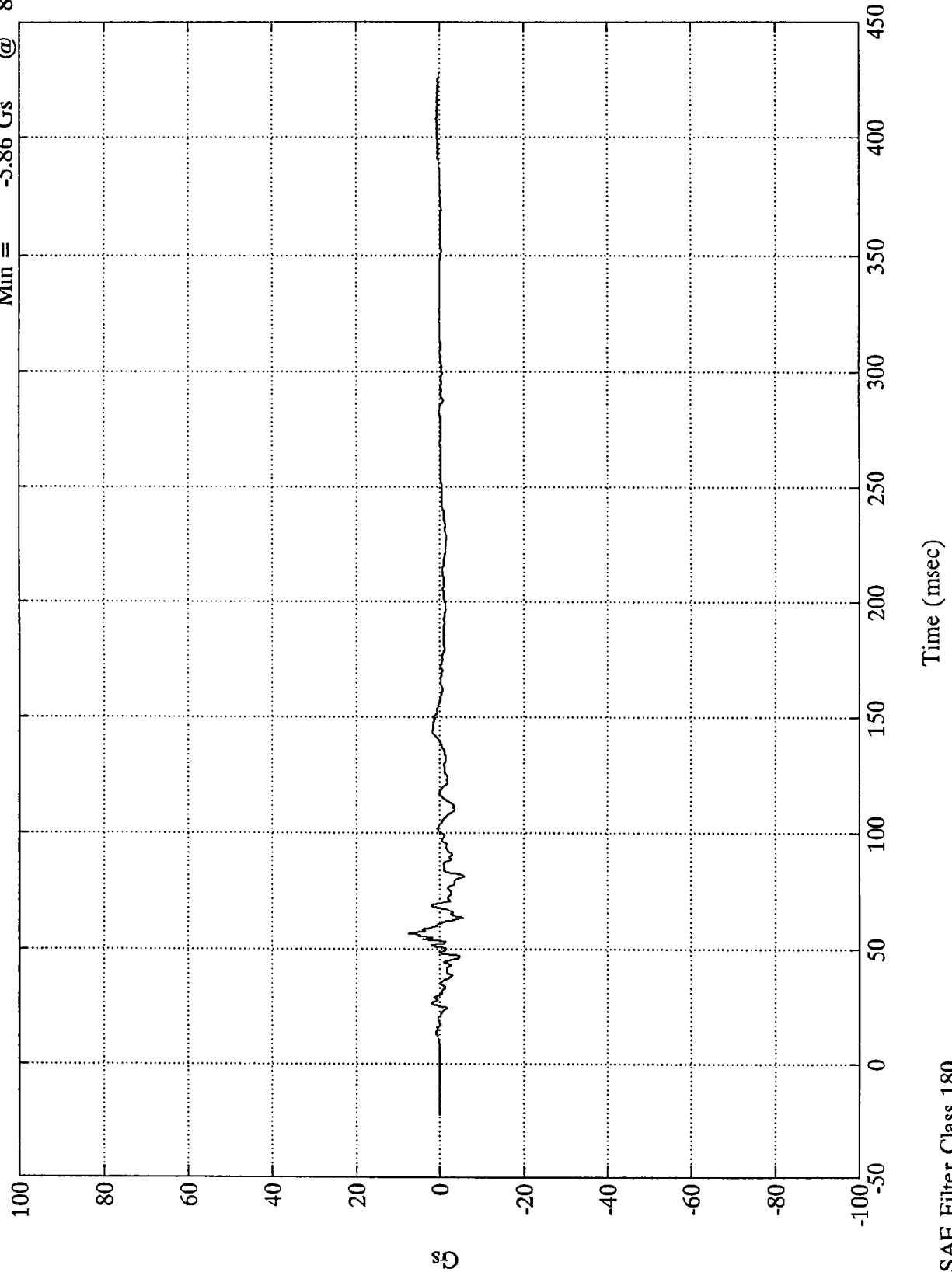
Time (msec)

SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Chest Y

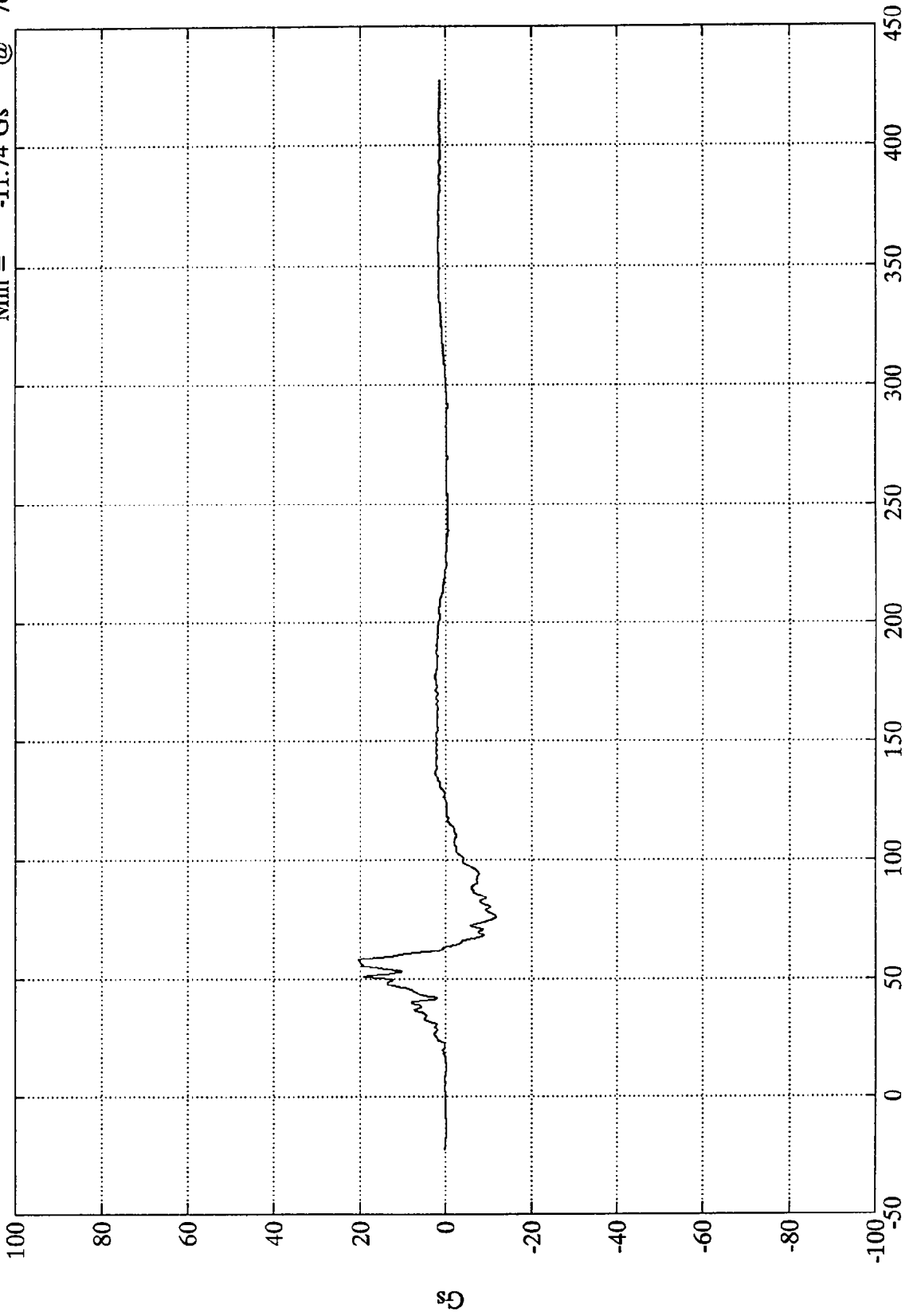
Max = 7.39 Gs @ 56.64 msec
Min = -5.86 Gs @ 81.12 msec



NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 20.33 Gs @ 57.95 msec
Min = -11.74 Gs @ 76.08 msec

Pos. 1 Chest Z



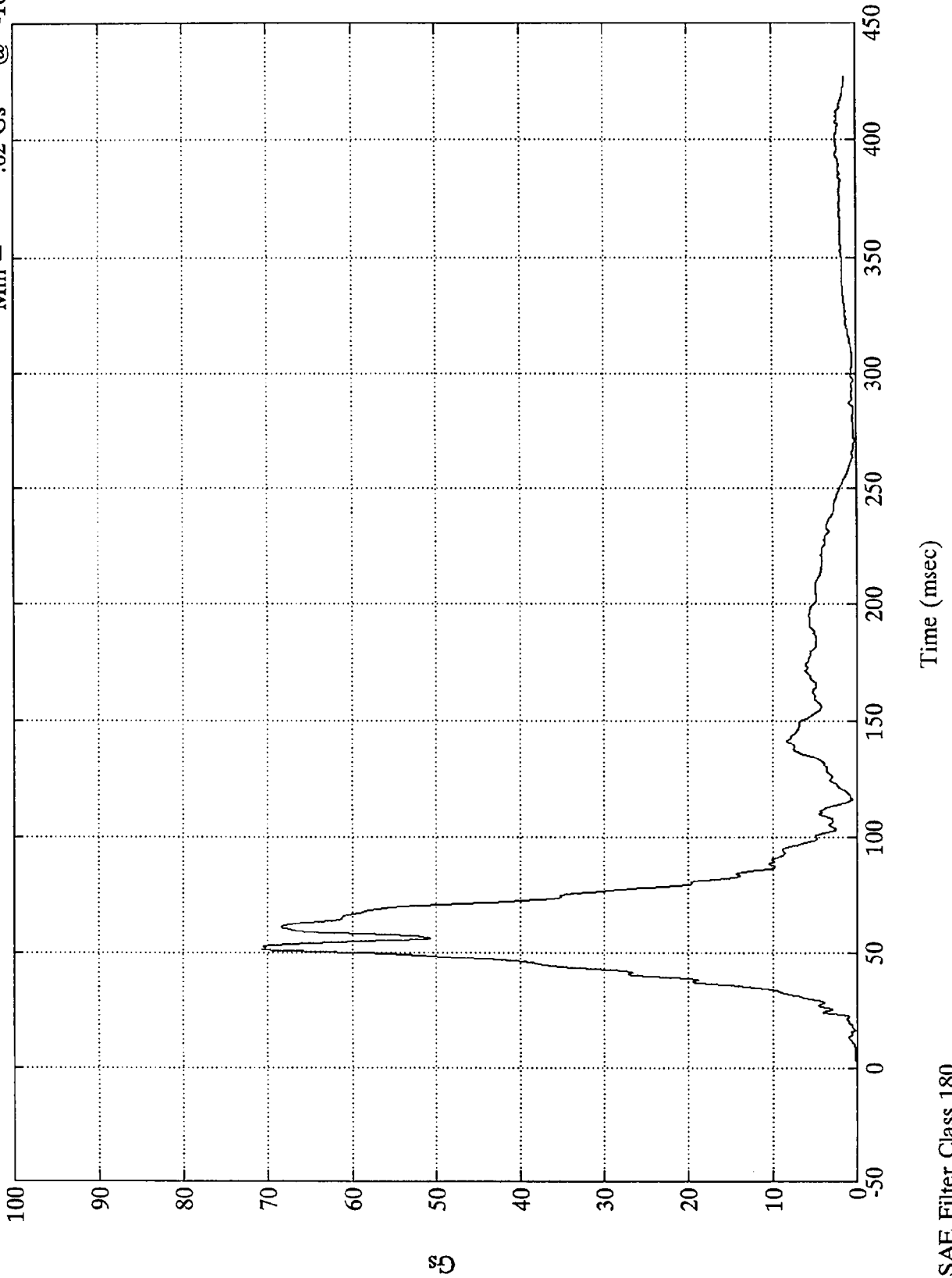
Time (msec)

SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Chest Resultant

Max = 70.76 Gs @ 51.48 msec
Min = .02 Gs @ -18.84 msec



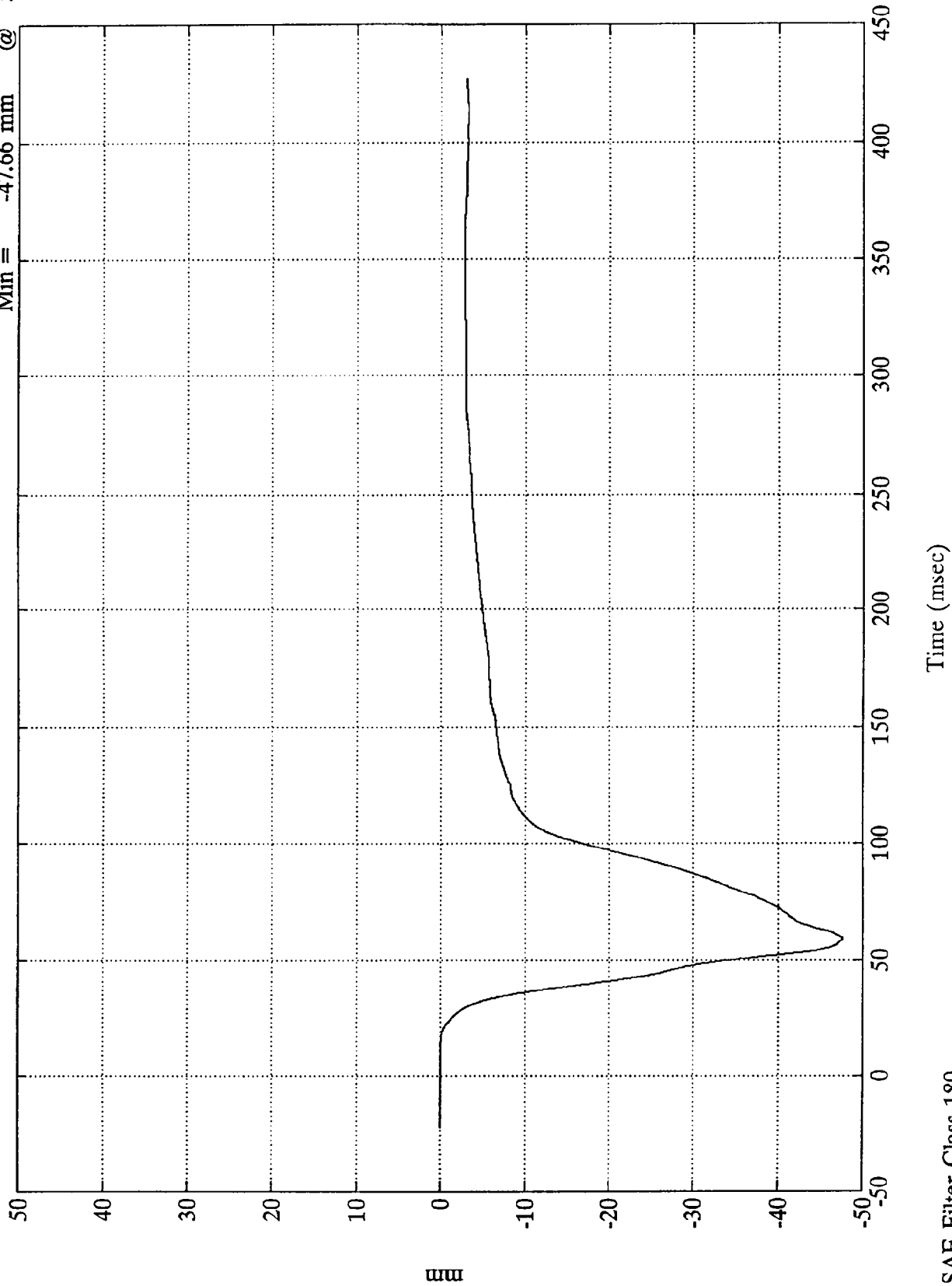
SAE Filter Class 180

5

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Chest Disp.

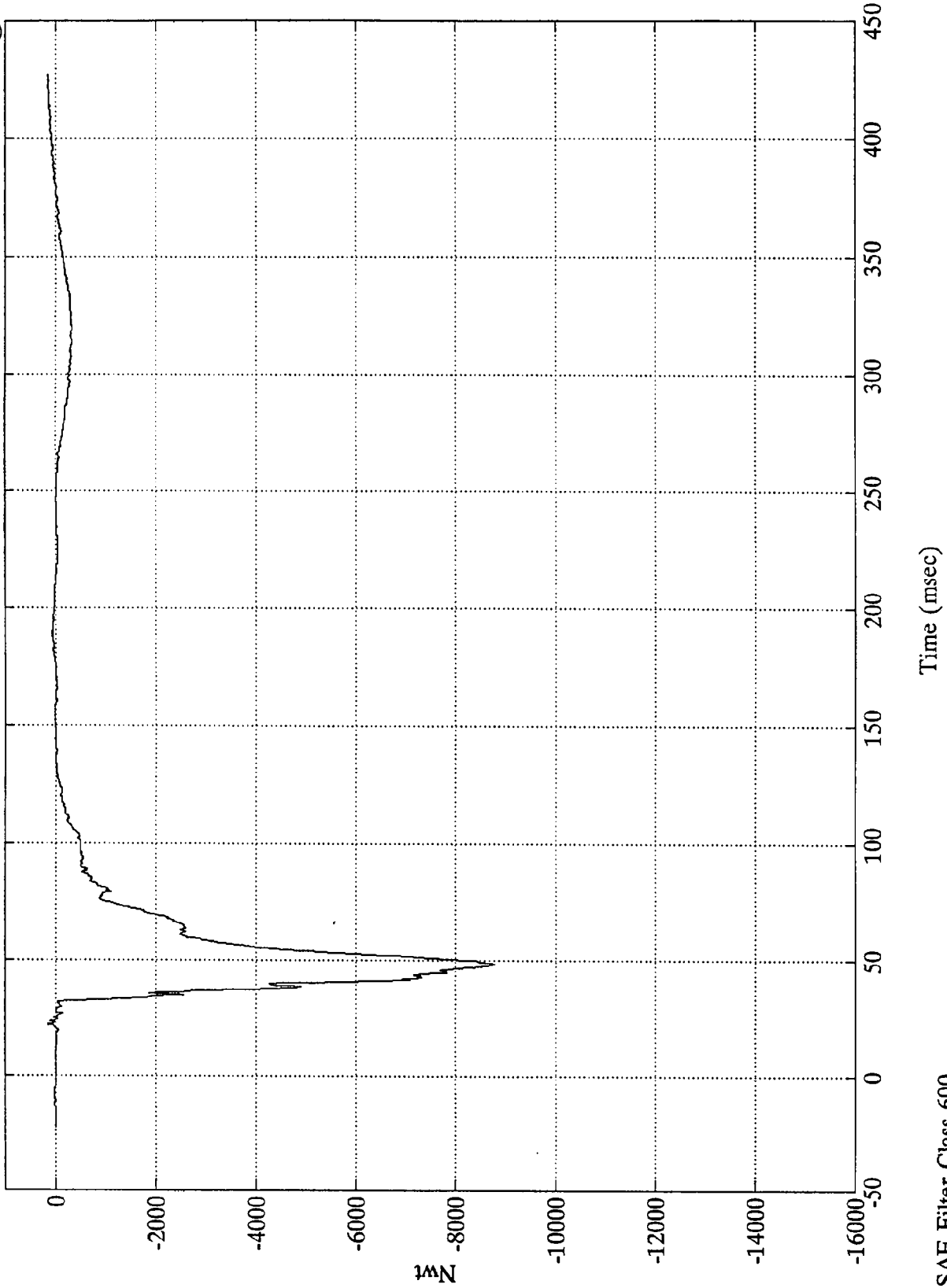
Max = .02 mm @ 7.31 msec
Min = -47.66 mm @ 59.15 msec



NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Left Femur

Max = 152.69 Nwt @ 21.84 msec
Min = -8765.14 Nwt @ 48.36 msec



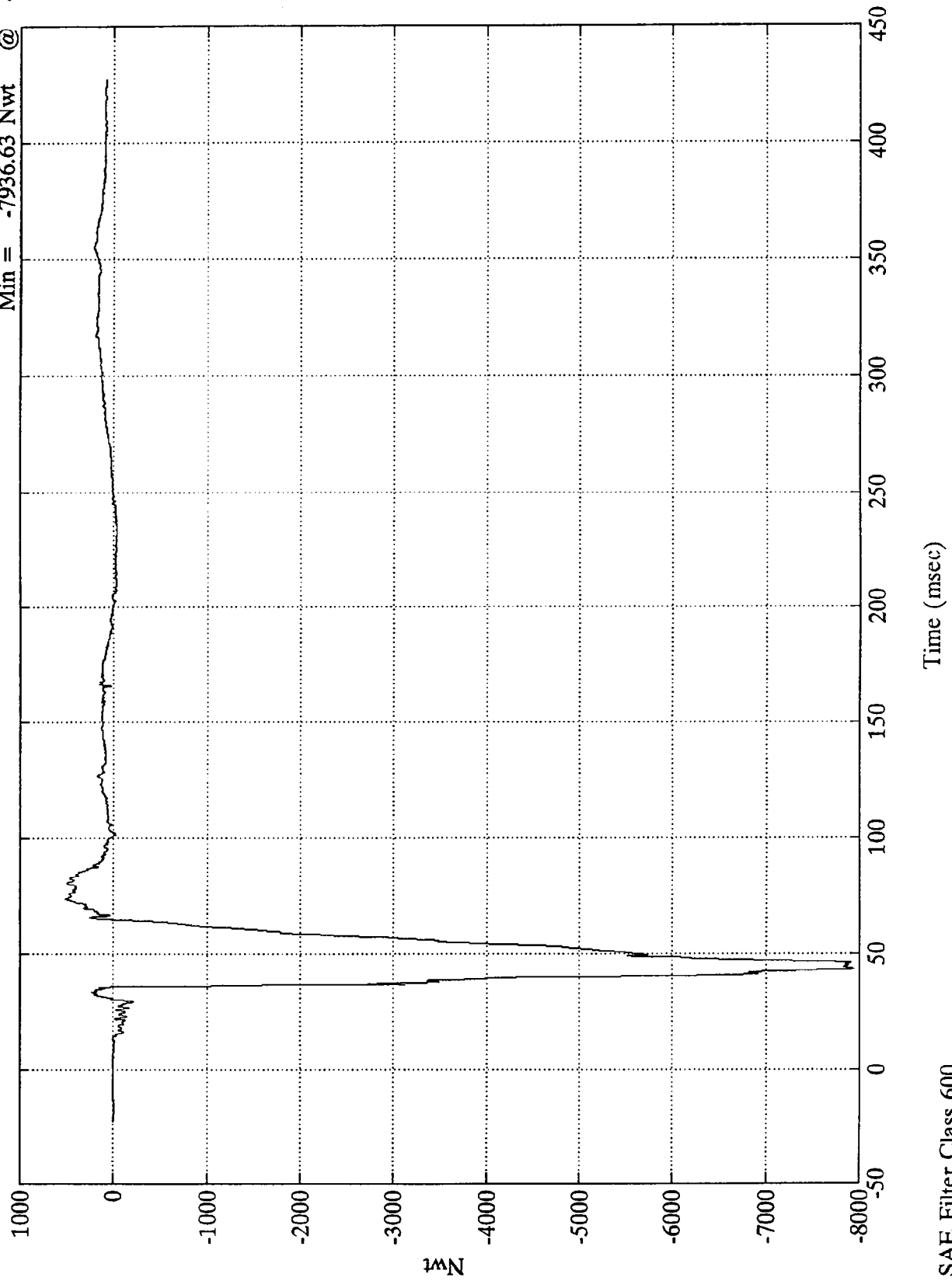
SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Right Femur

Max = 515.82 Nwt @
Min = -7936.63 Nwt @

73.80 msec
43.56 msec



Nwt

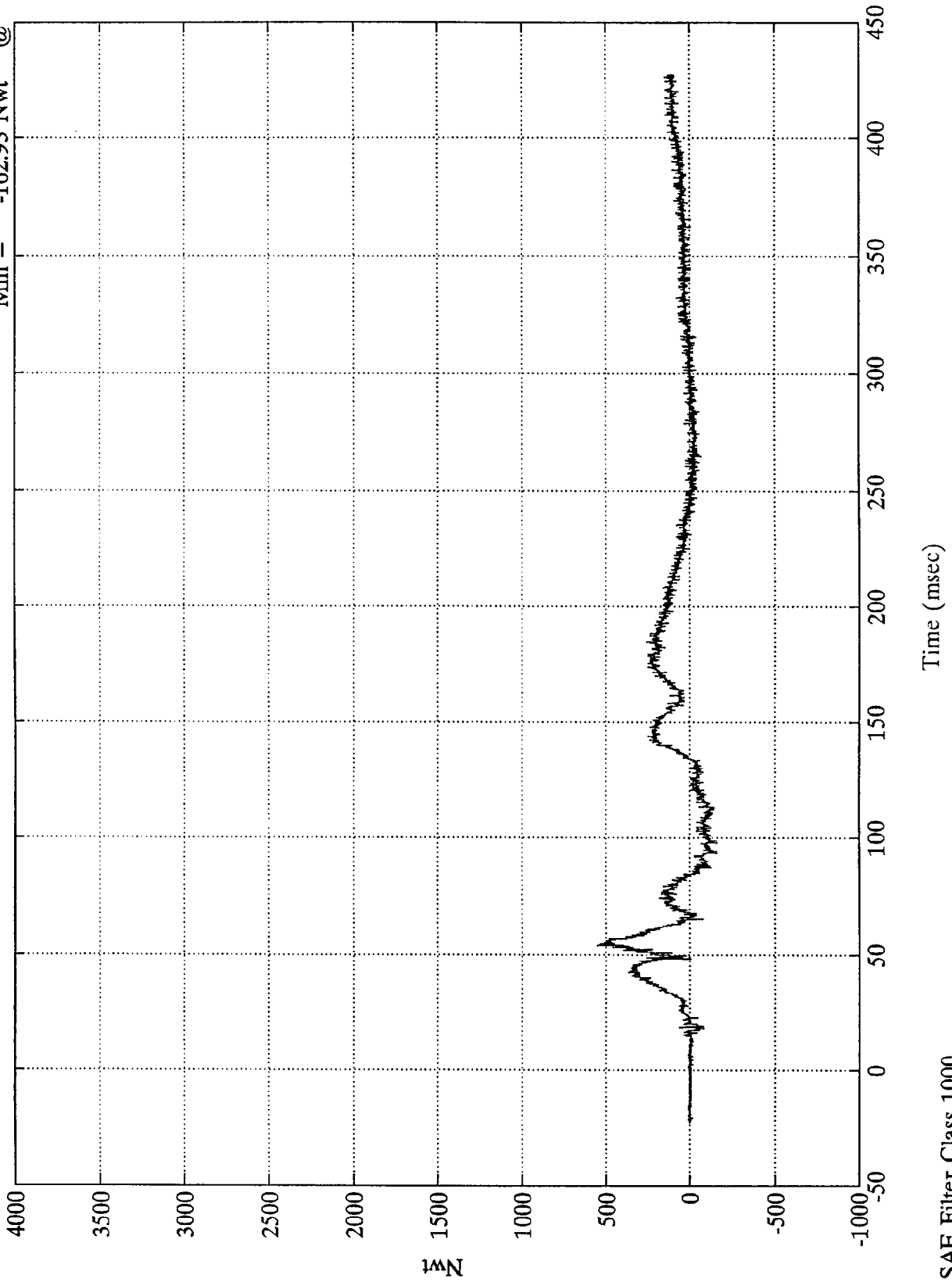
Time (msec)

SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Upper Neck Fx

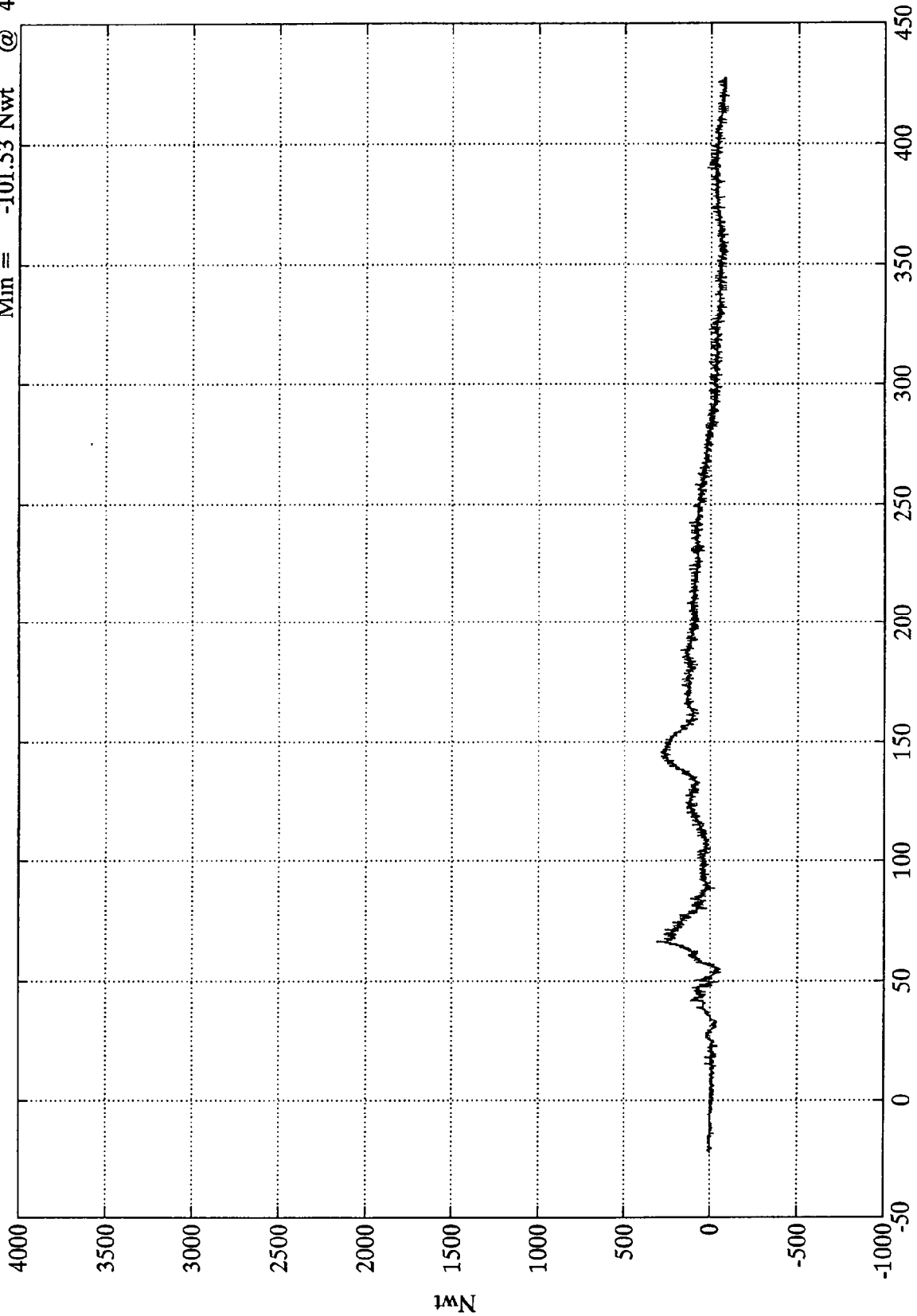
Max = 550.41 Nwt @ 54.23 msec
Min = -162.93 Nwt @ 98.28 msec



SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Upper Neck Fy
Max = 308.08 Nwt @ 66.11 msec
Min = -101.53 Nwt @ 420.11 msec



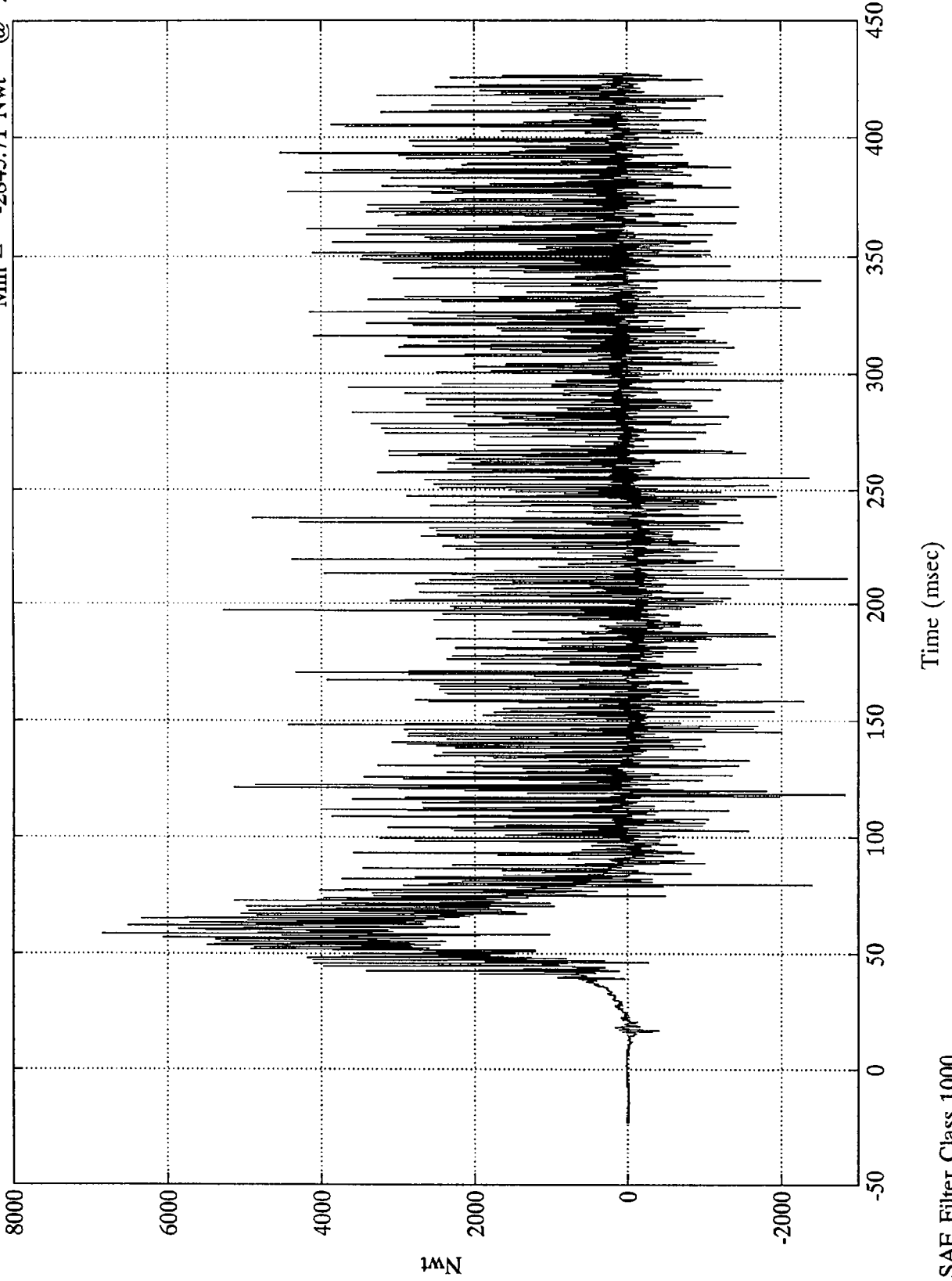
Time (msec)

SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Upper Neck Fz

Max = 6839.97 Nwt @ 58.43 msec
Min = -2845.71 Nwt @ 211.20 msec



Nwt

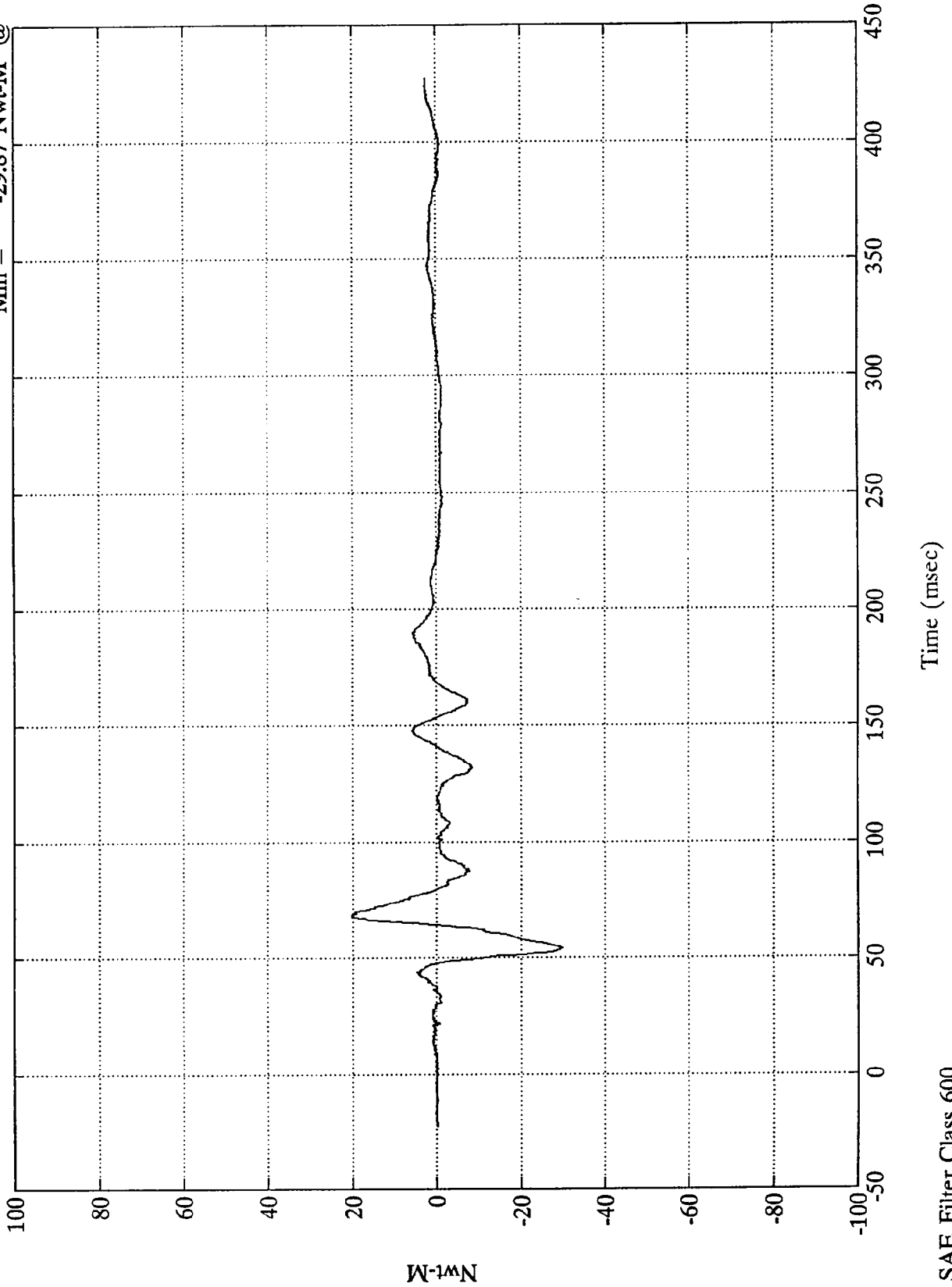
Time (msec)

SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Upper Neck Mx

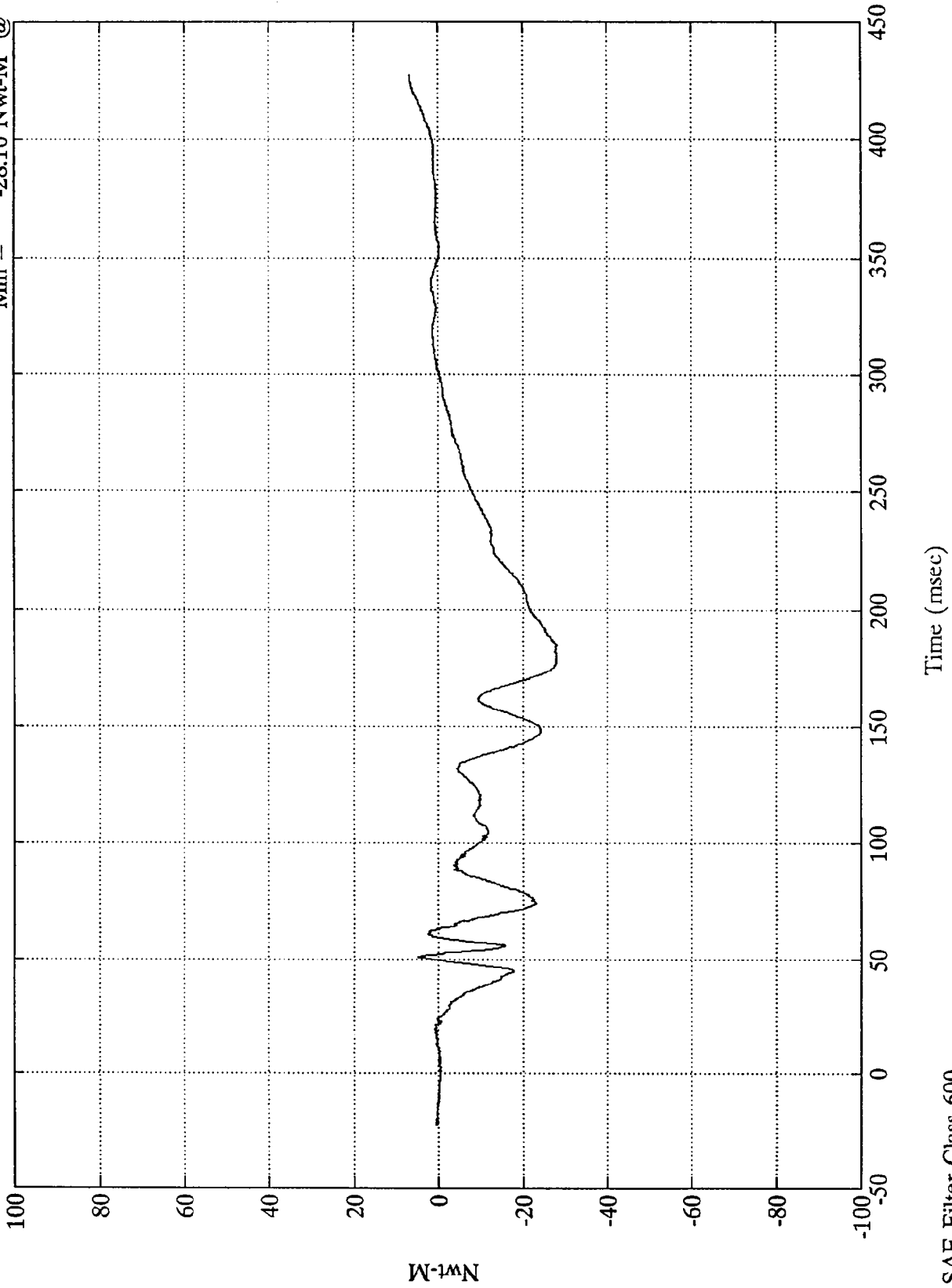
Max = 20.18 Nwt-M @ 67.56 msec
Min = -29.87 Nwt-M @ 54.00 msec



SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Upper Neck My
Max = 6.82 Nwt-M @ 426.00 msec
Min = -28.10 Nwt-M @ 185.04 msec



B-90

8227-4

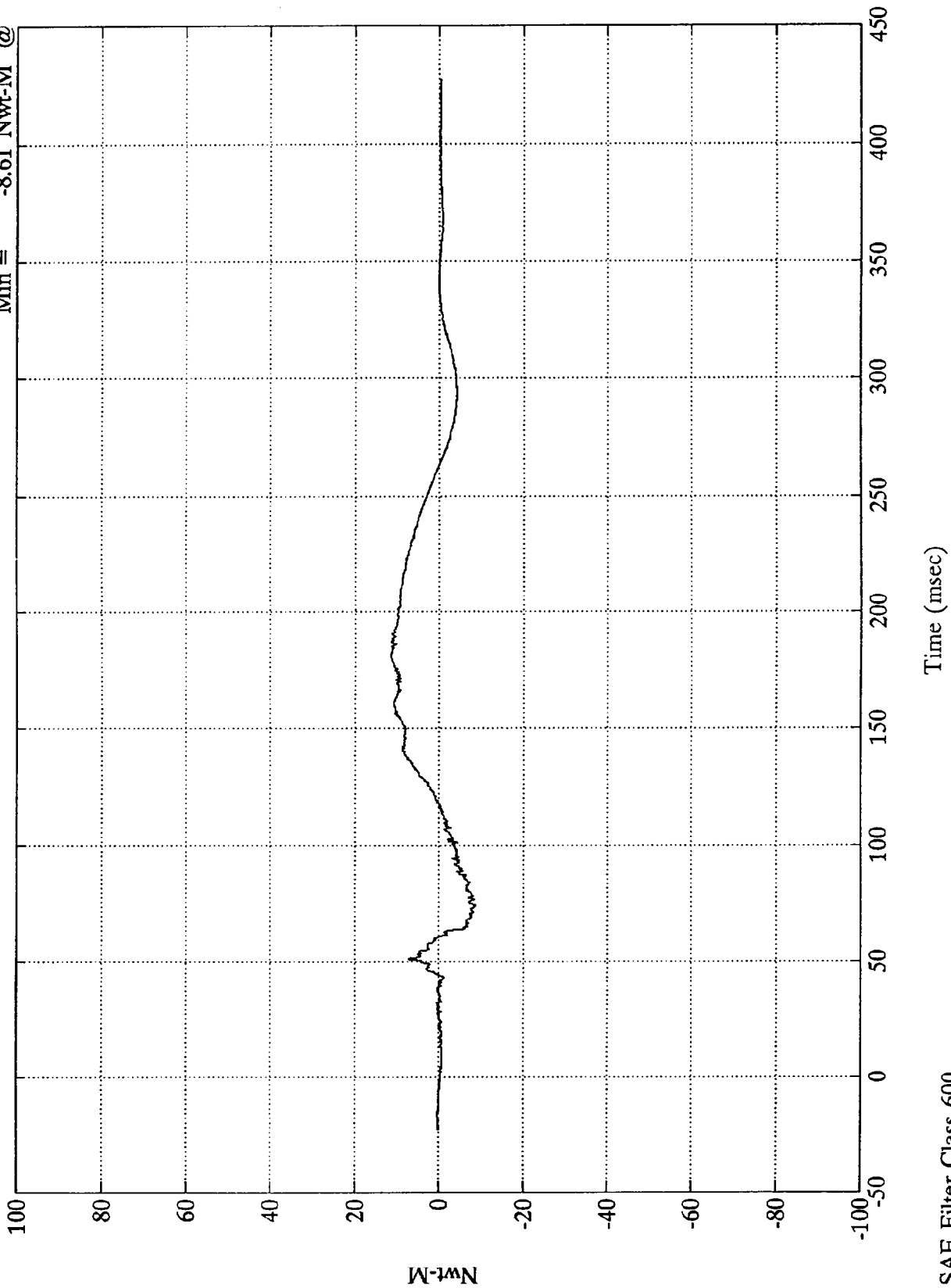
SAE Filter Class 600



NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Upper Neck Mz

Max = 11.48 Nwt-M @ 182.04 msec
Min = -8.61 Nwt-M @ 74.16 msec



Nwt-M

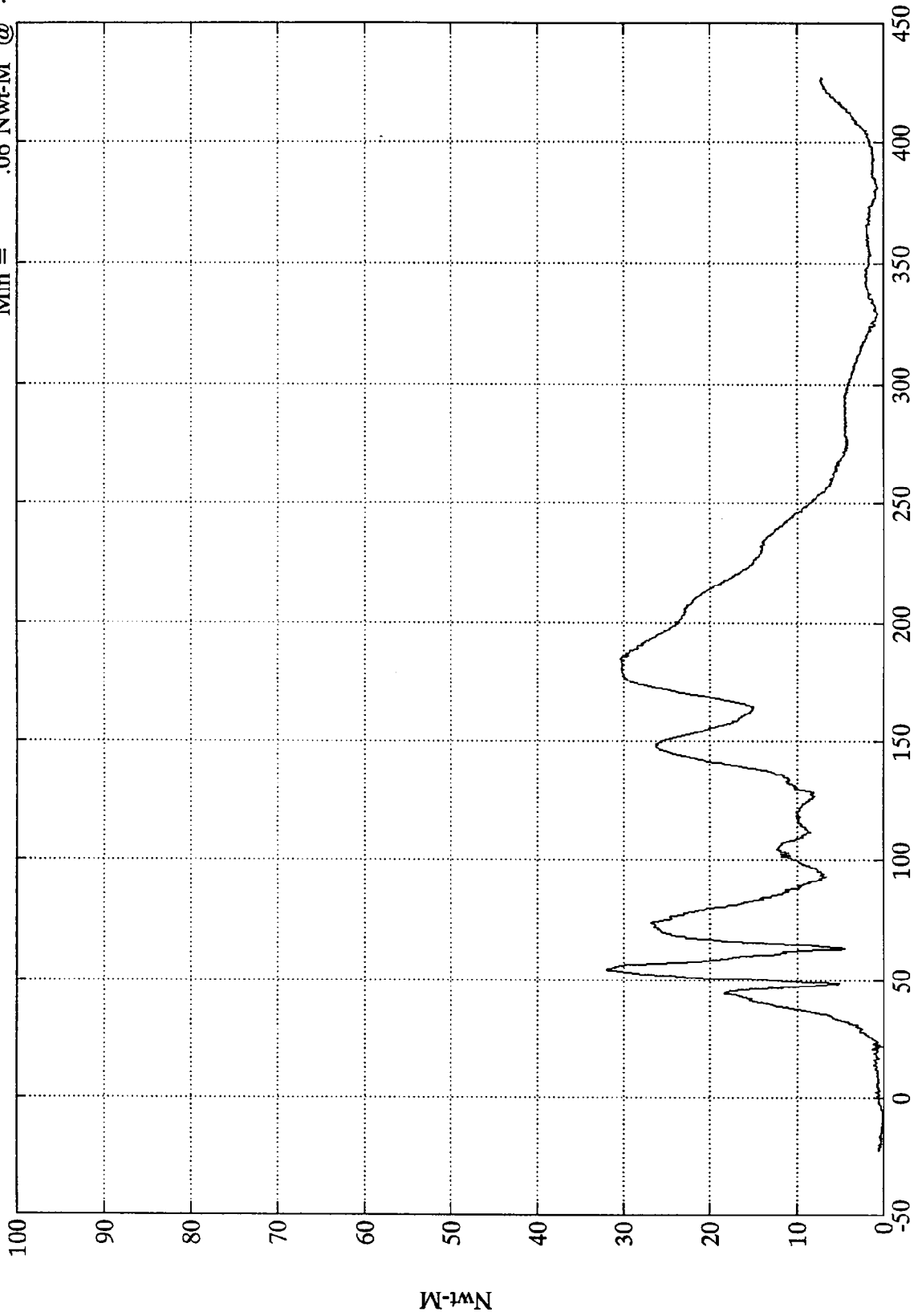
Time (msec)

SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 31.99 Nwt-M @ 54.36 msec
Min = .06 Nwt-M @ -11.88 msec

Pos. 1 Neck Moment Res.



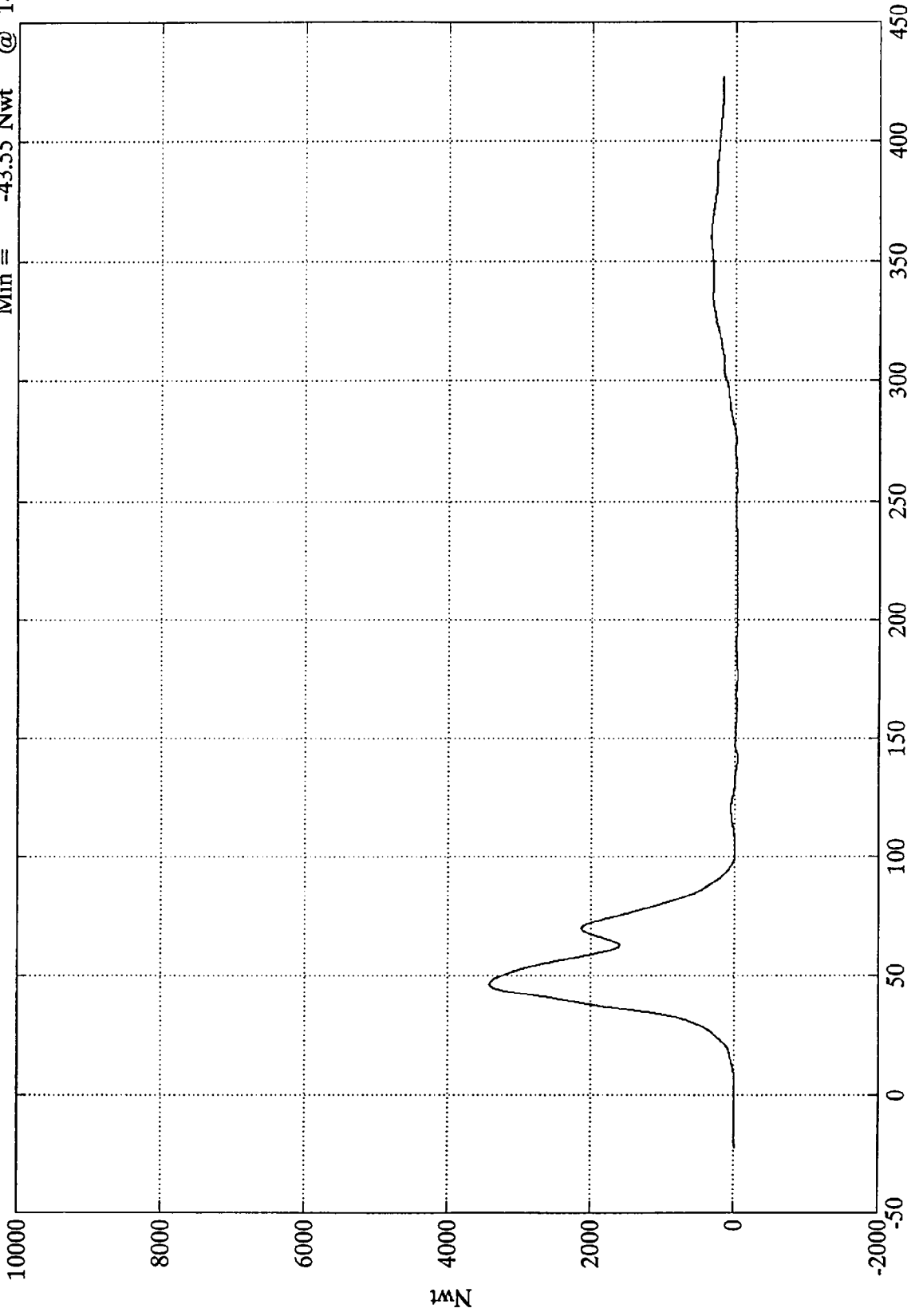
Time (msec)

SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 3418.96 Nwt @ 46.32 msec
Min = -43.55 Nwt @ 141.84 msec

Pos. 1 Left Belt Load



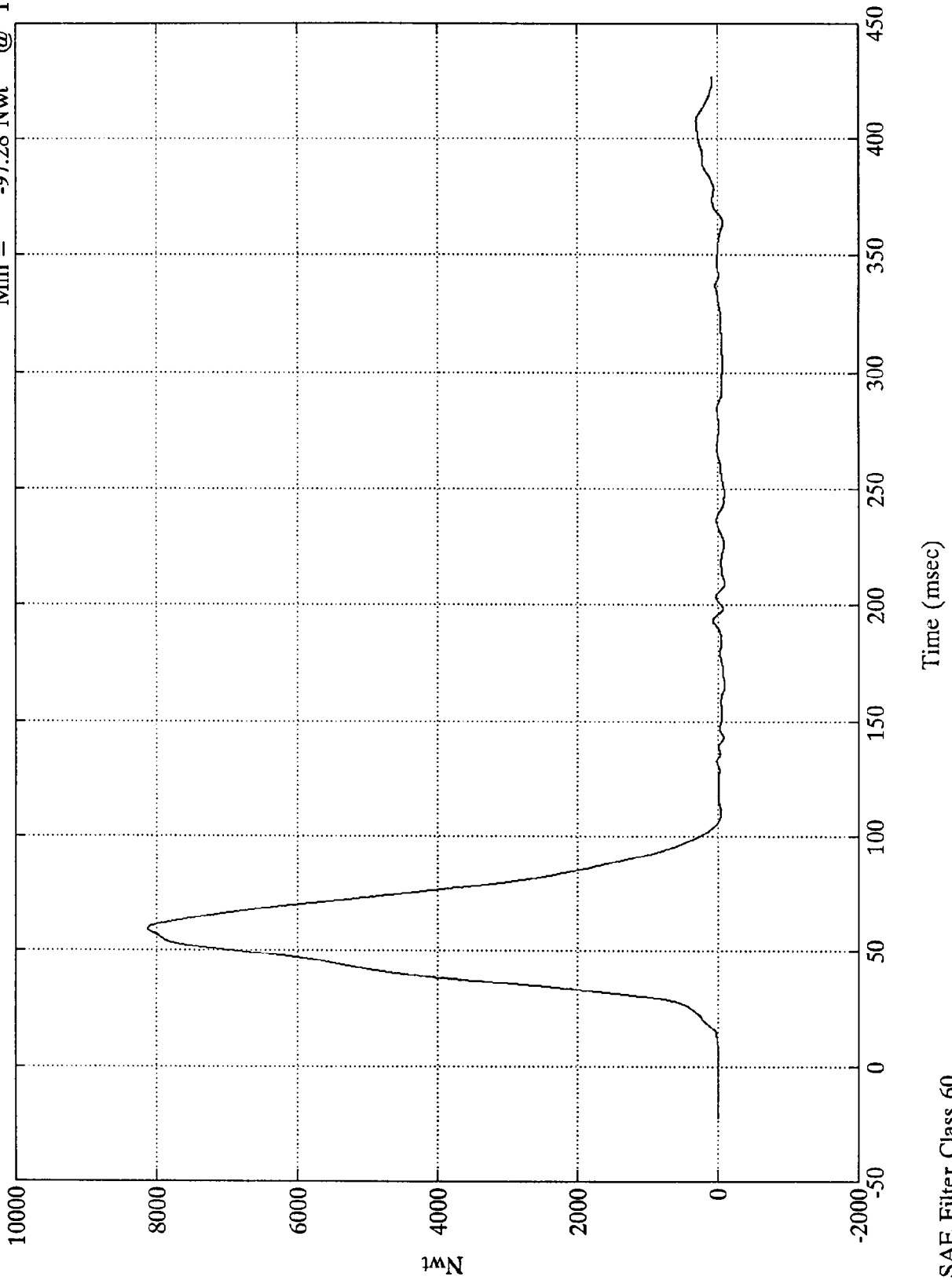
Time (msec)

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 8132.95 Nwt @ 59.15 msec
Min = -97.28 Nwt @ 165.95 msec

Pos. 1 Torso Belt Load



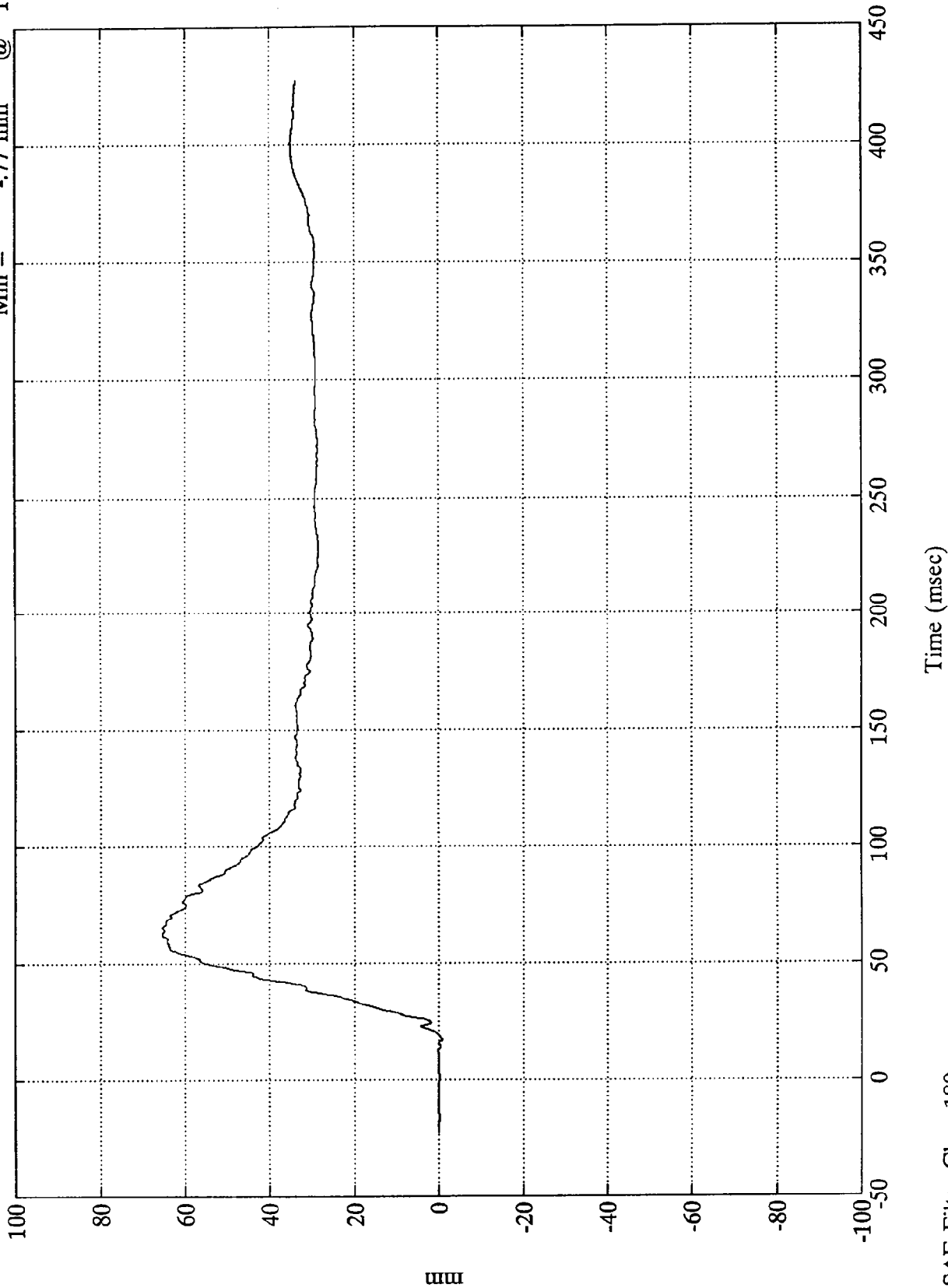
SAE Filter Class 60

Time (msec)

Nwt

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 1 Belt Spool Out
Max = 65.44 mm @ 62.15 msec
Min = -7.77 mm @ 17.15 msec



III

B-95

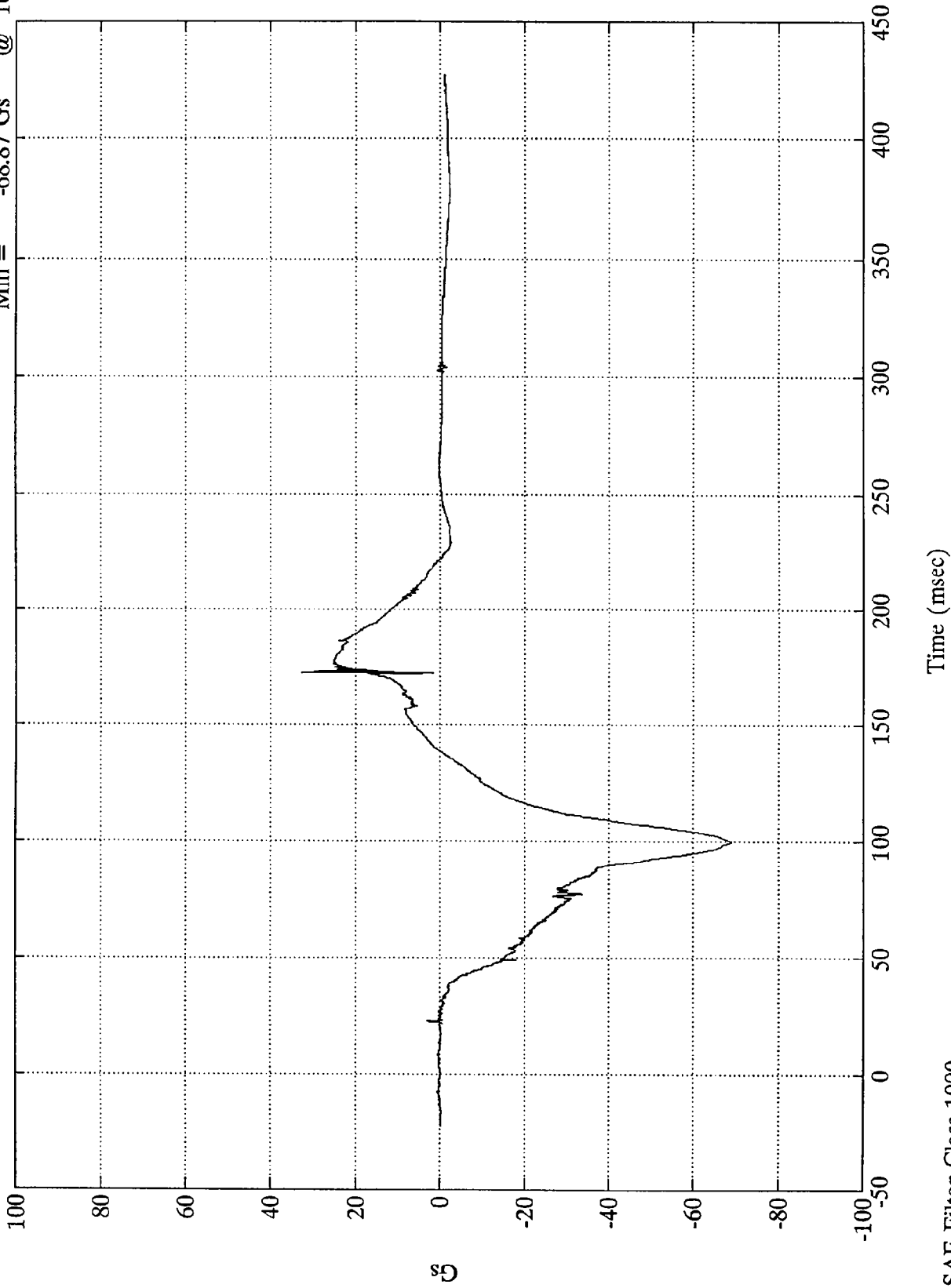
8227-4

SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 32.62 Gs @ 172.32 msec
Min = -68.87 Gs @ 100.20 msec

Pos. 2 Head X

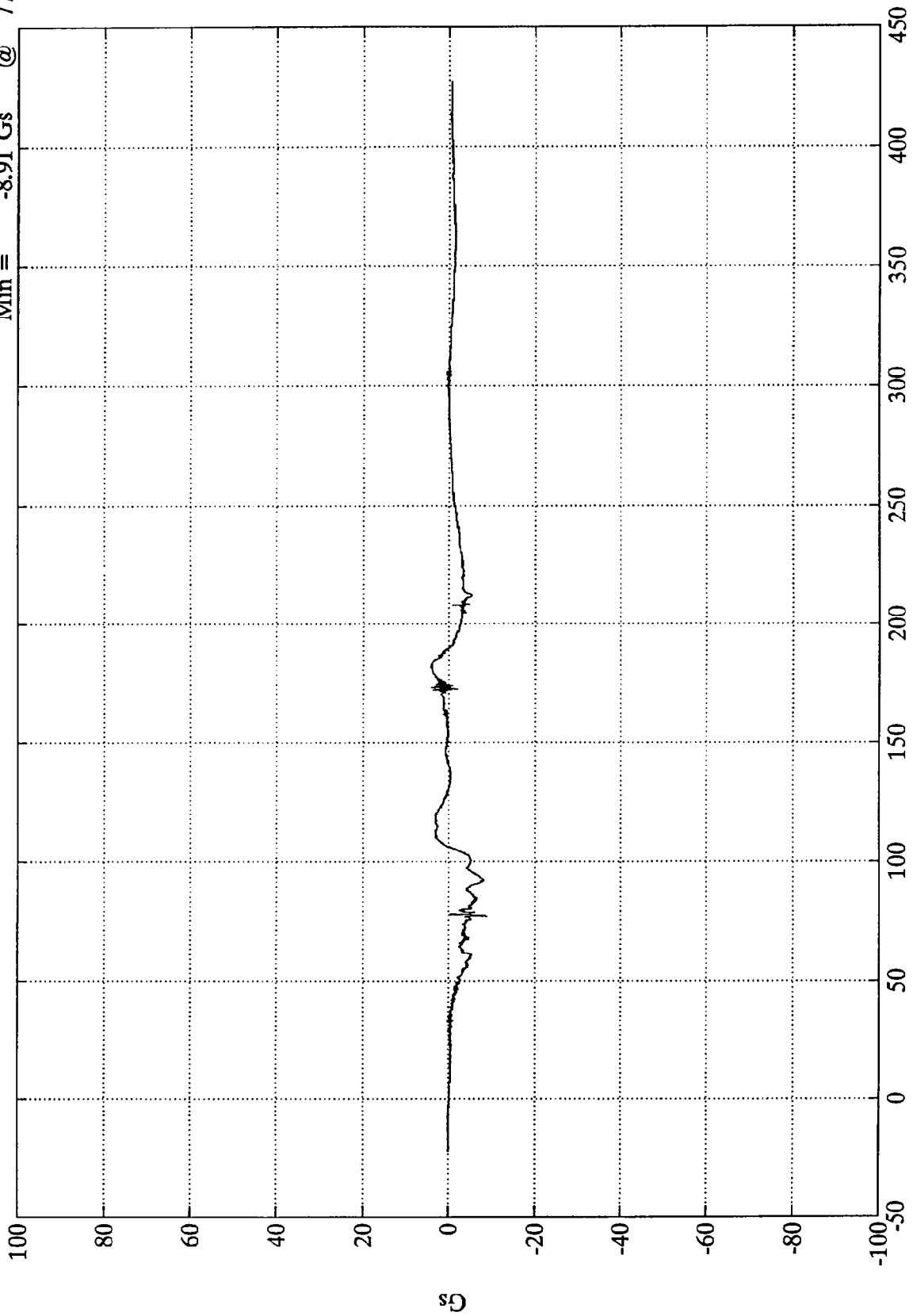


SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Head Y

Max = 4.23 Gs @ 181.80 msec
Min = -8.91 Gs @ 77.27 msec



Time (msec)

SAE Filter Class 1000

Gs

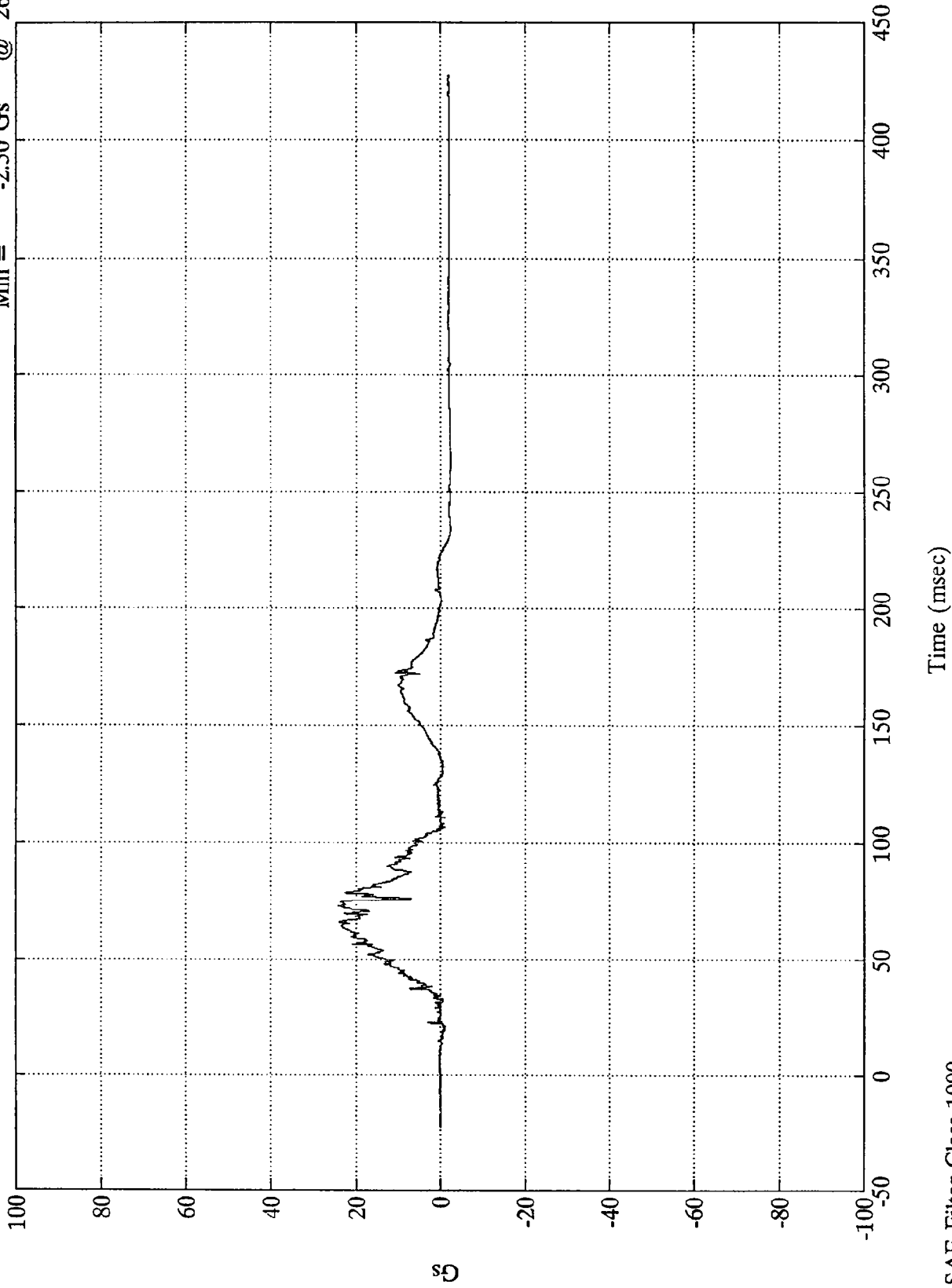
B-97

8227-4

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Head Z

Max = 24.16 Gs @ 73.08 msec
Min = -2.50 Gs @ 265.68 msec

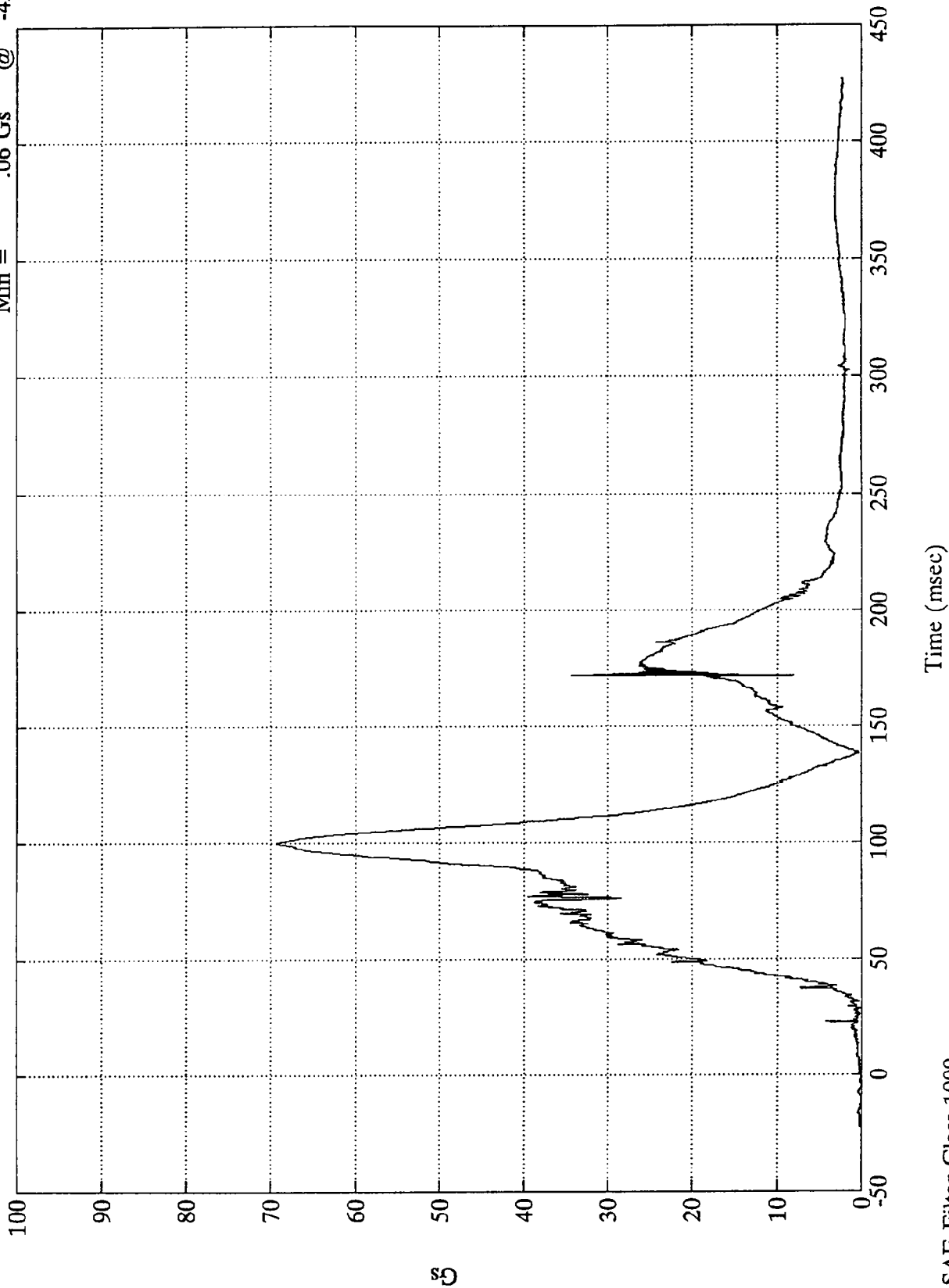


SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 69.35 Gs @ 100.20 msec
Min = .06 Gs @ -4.20 msec

Pos. 2 Head Resultant

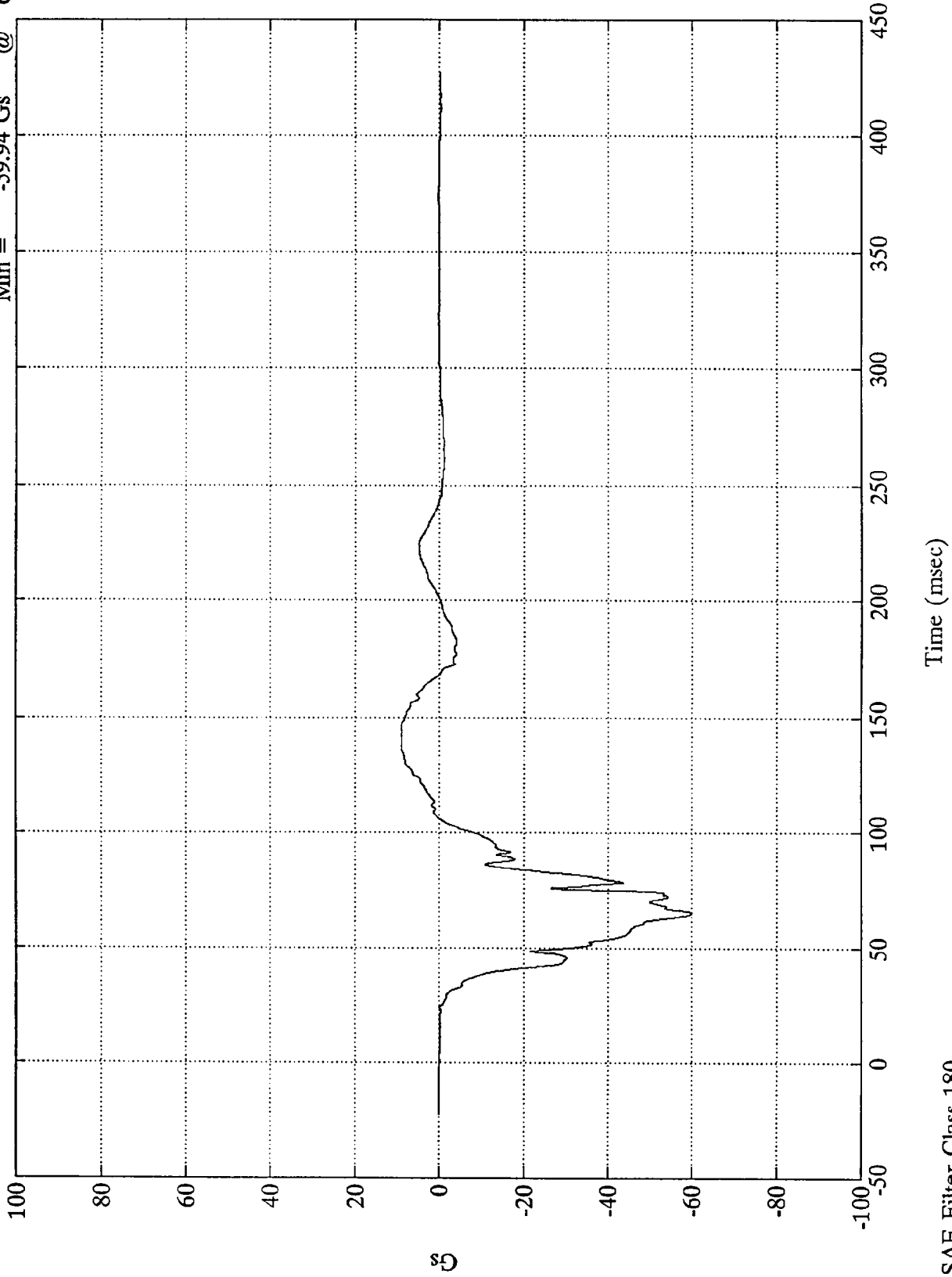


SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Chest X

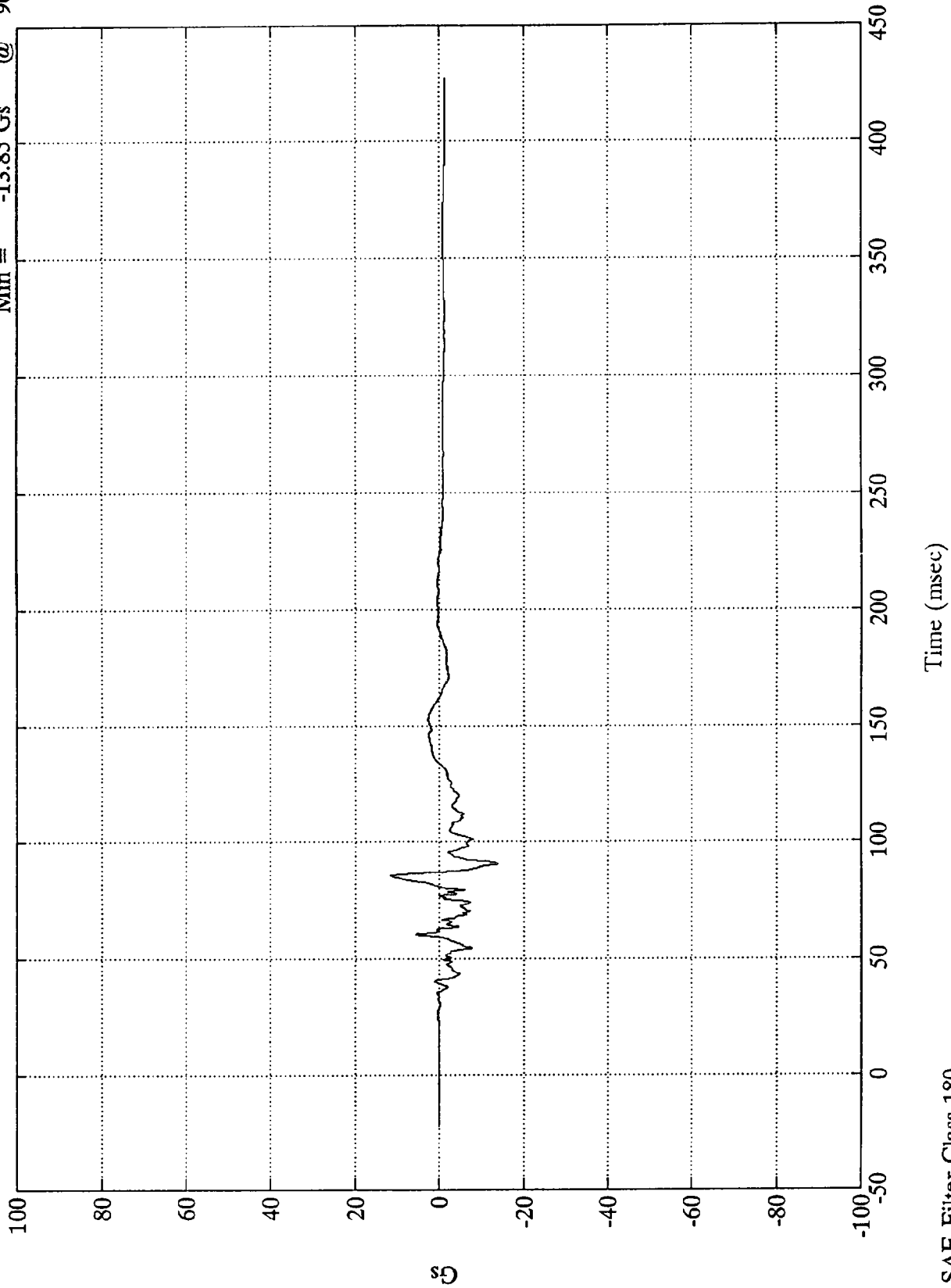
Max = 9.04 Gs @ 146.63 msec
Min = -59.94 Gs @ 65.04 msec



NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Chest Y

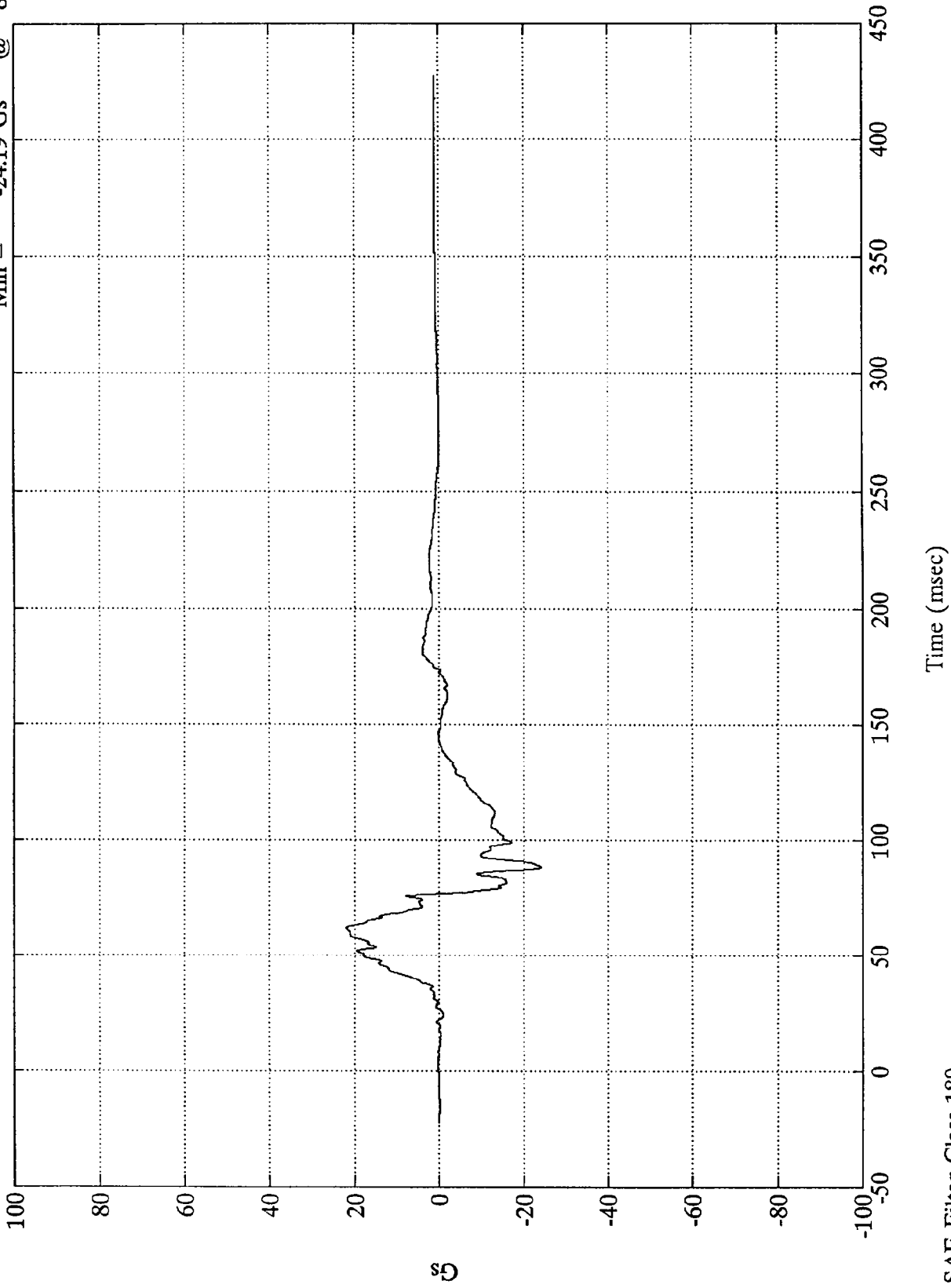
Max = 11.74 Gs @ 85.31 msec
Min = -13.85 Gs @ 90.36 msec



NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 21.93 Gs @ 62.04 msec
Min = -24.19 Gs @ 88.20 msec

Pos. 2 Chest Z

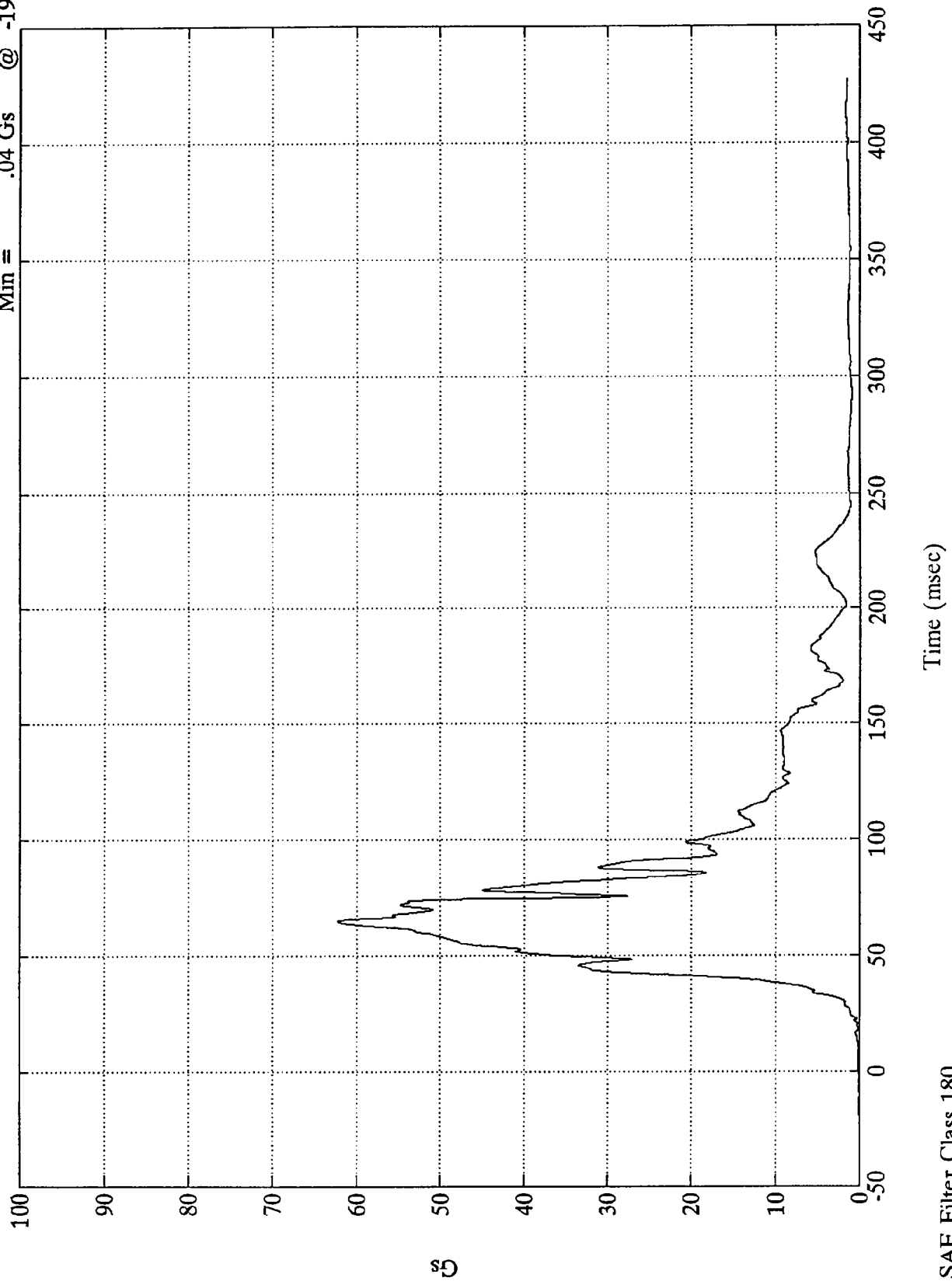


SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Chest Resultant

Max = 62.36 Gs @ 65.04 msec
Min = .04 Gs @ -19.44 msec

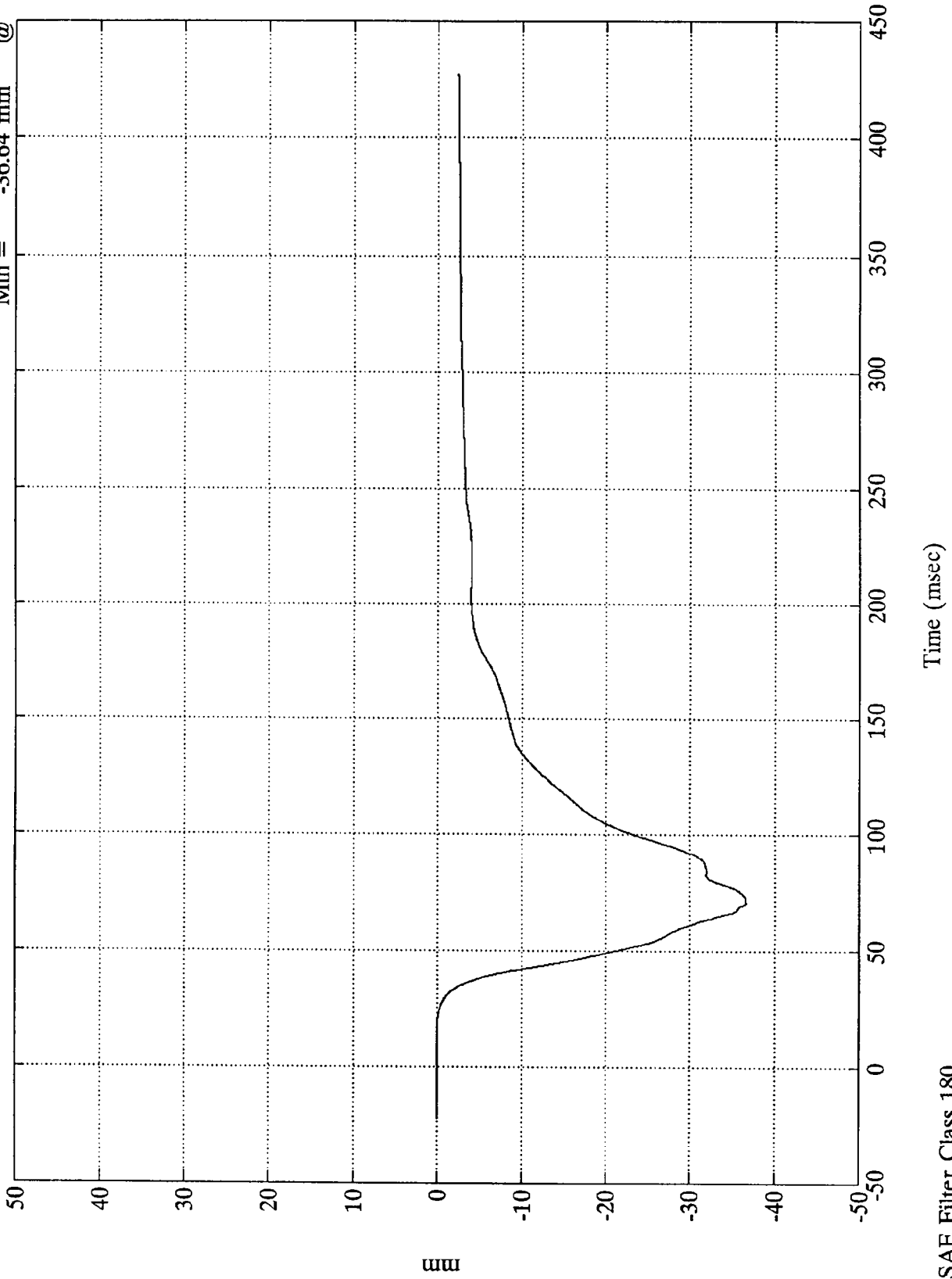


SAE Filter Class 180

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Chest Disp.

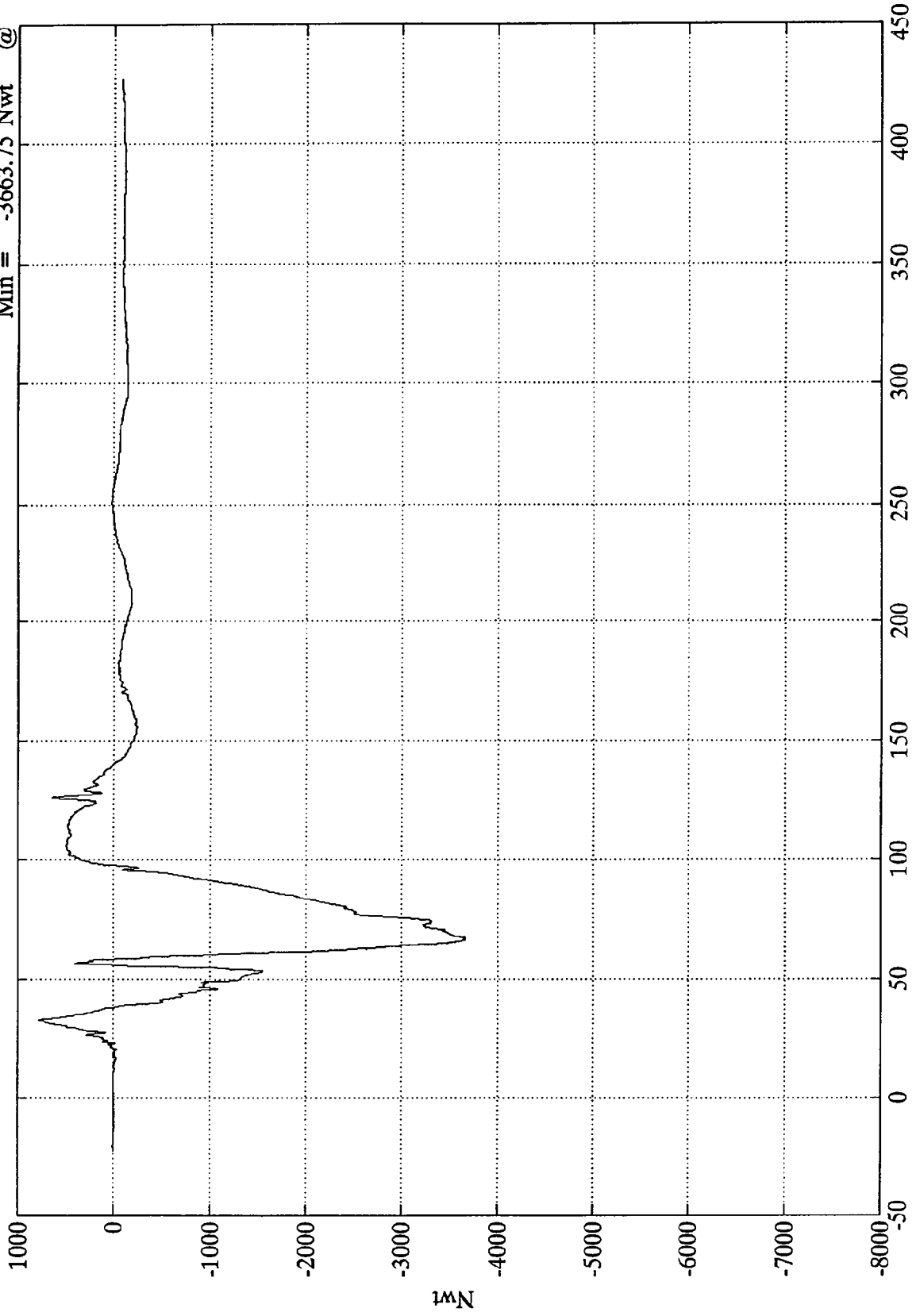
Max = .03 mm @ 12.72 msec
Min = -36.64 mm @ 70.55 msec



NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Left Femur

Max = 783.38 Nwt @ 32.52 msec
Min = -3663.75 Nwt @ 66.36 msec



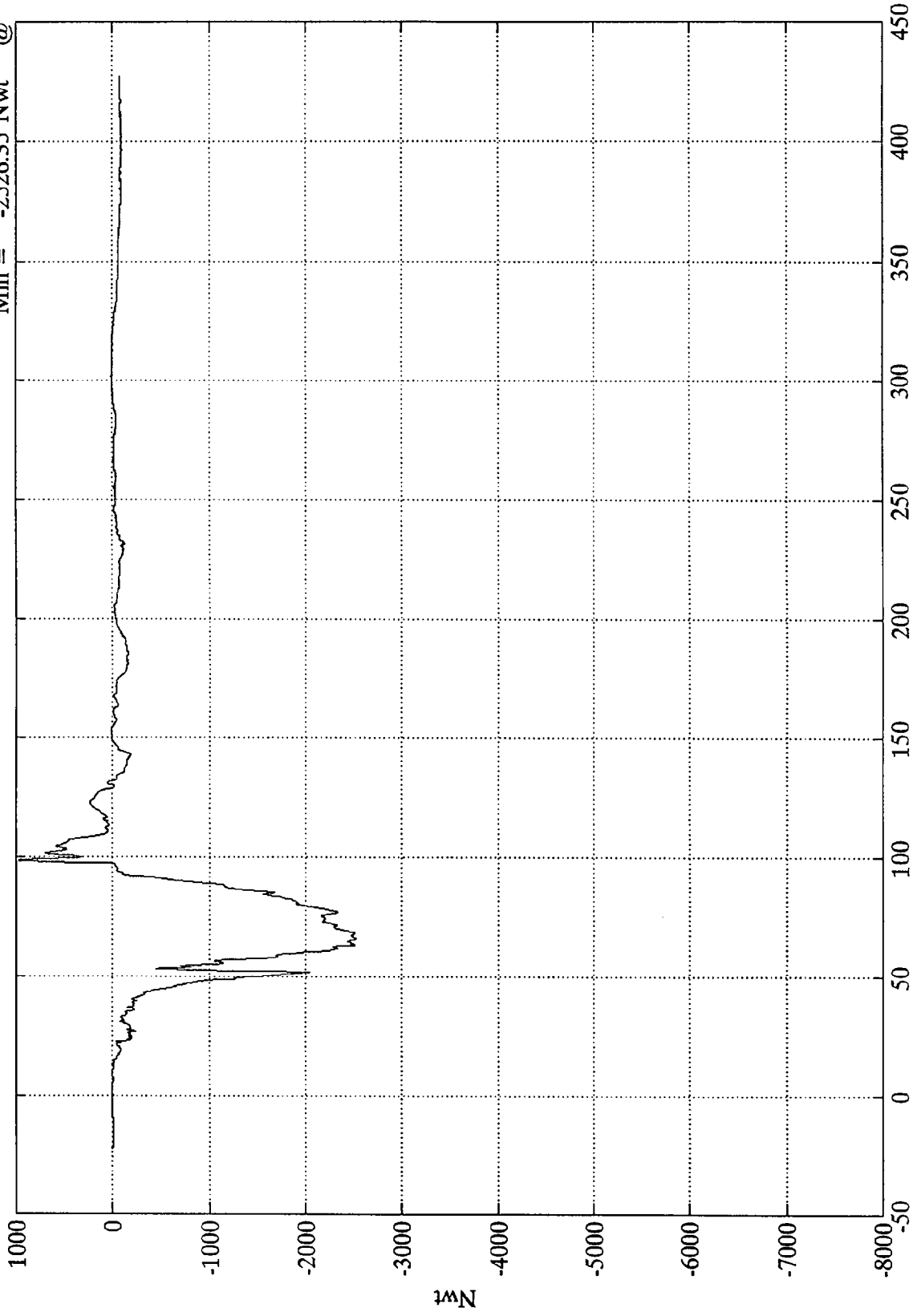
Time (msec)

SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 970.82 Nwt @ 98.76 msec
Min = -2526.35 Nwt @ 65.87 msec

Pos. 2 Right Femur

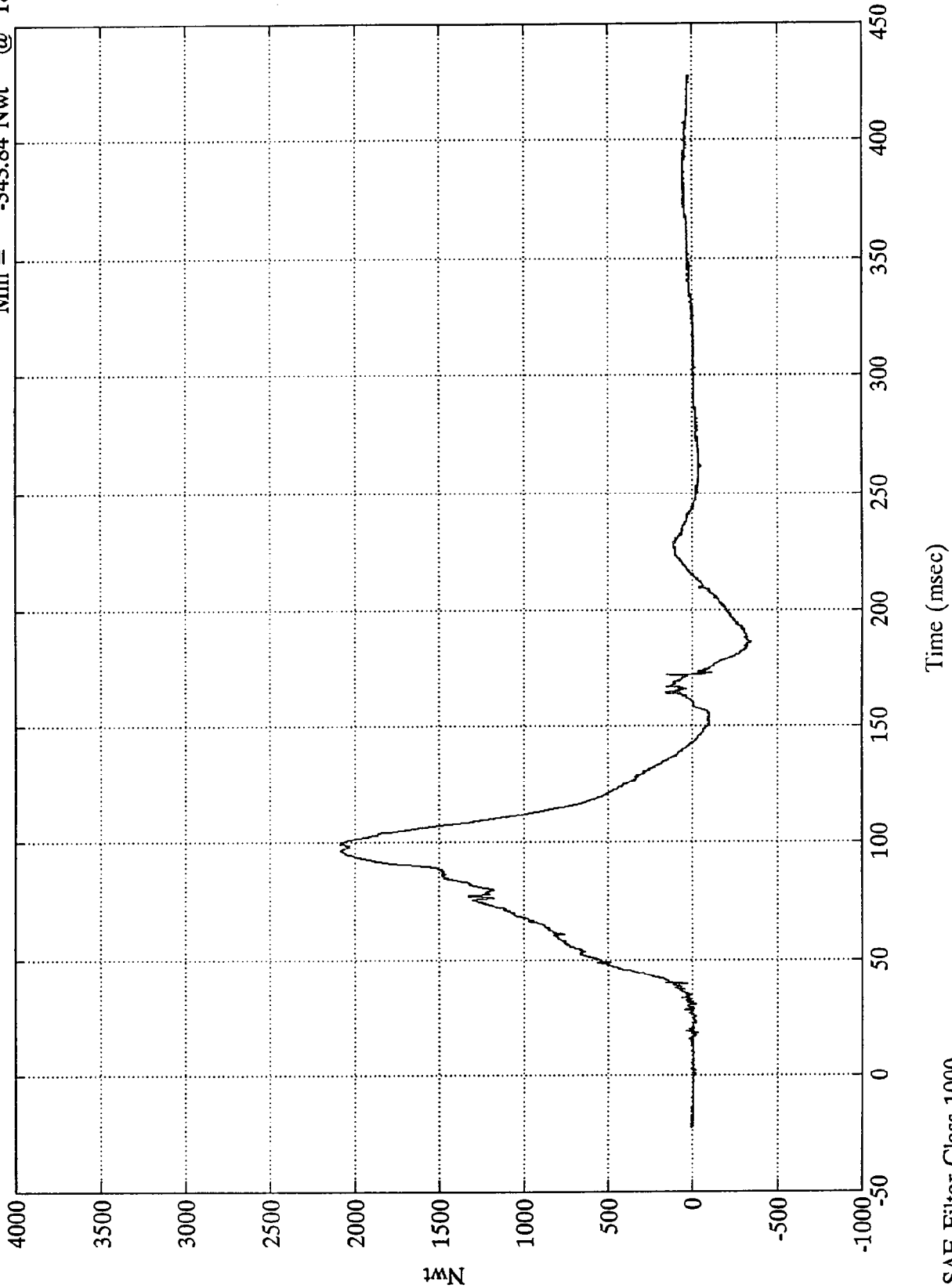


Time (msec)

SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Upper Neck Fx
Max = 2090.73 Nwt @ 99.48 msec
Min = -343.84 Nwt @ 186.84 msec



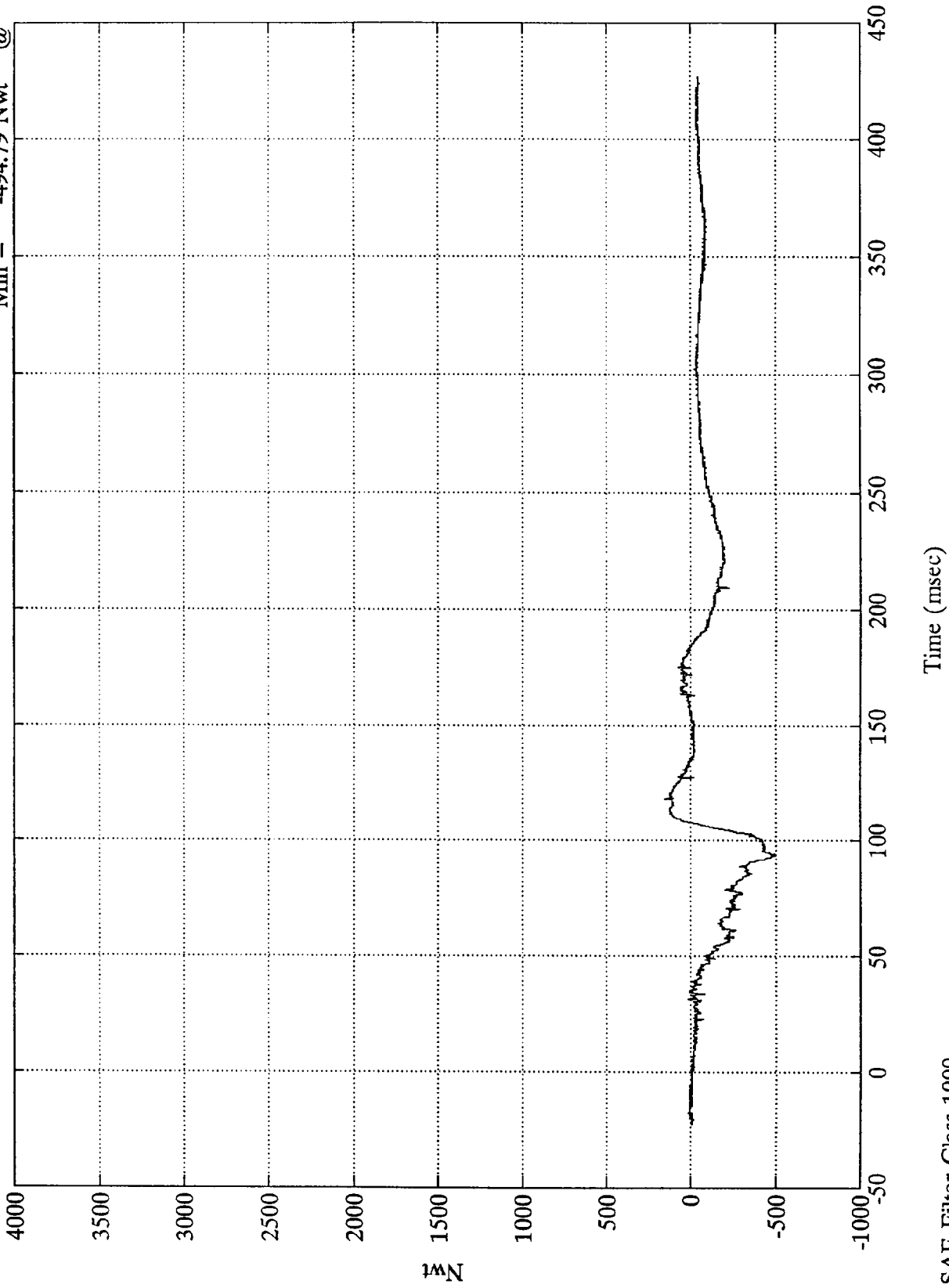
10N

SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Upper Neck Fy

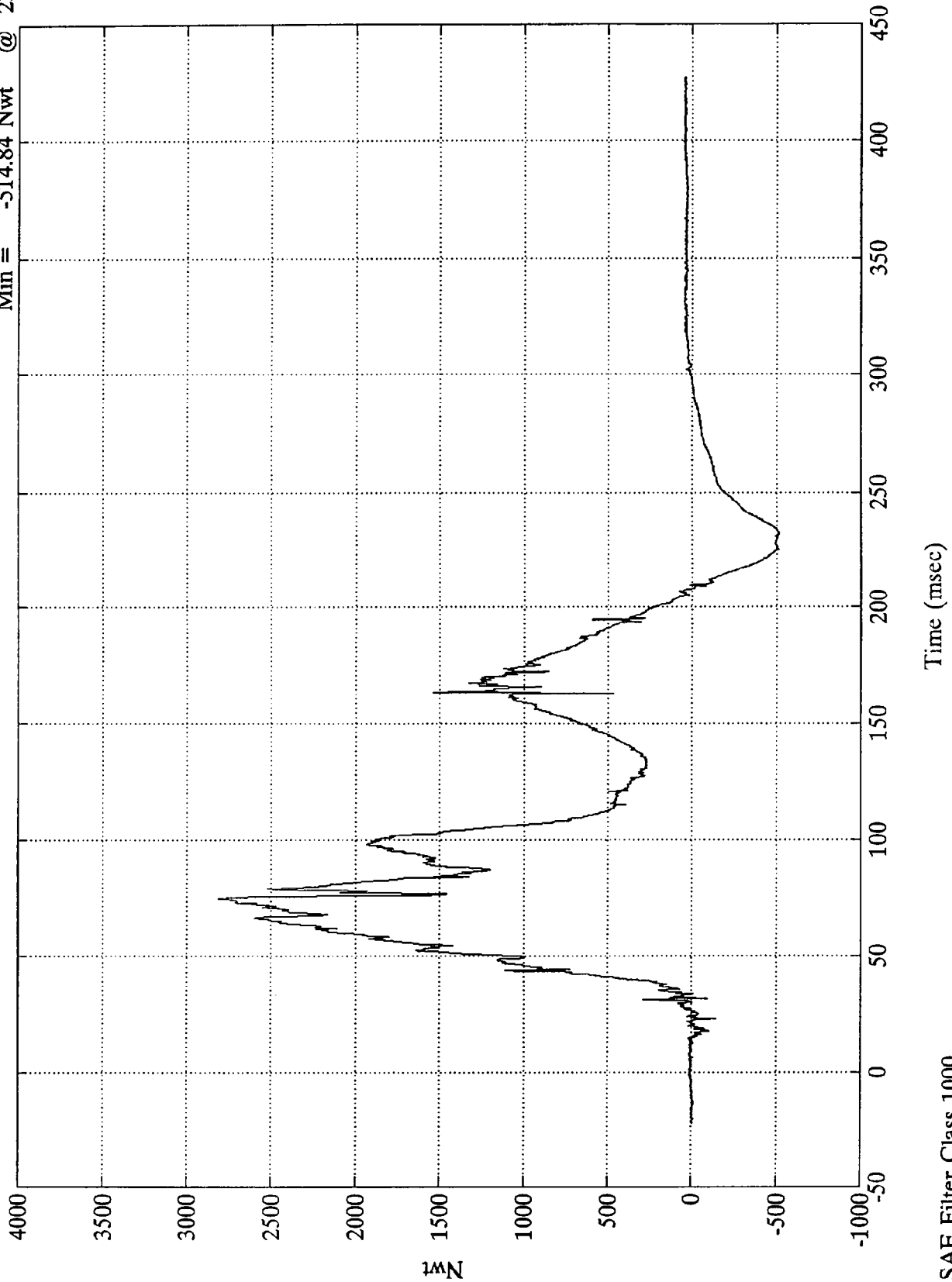
Max = 153.68 Nwt @ 118.08 msec
Min = -494.79 Nwt @ 94.08 msec



SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

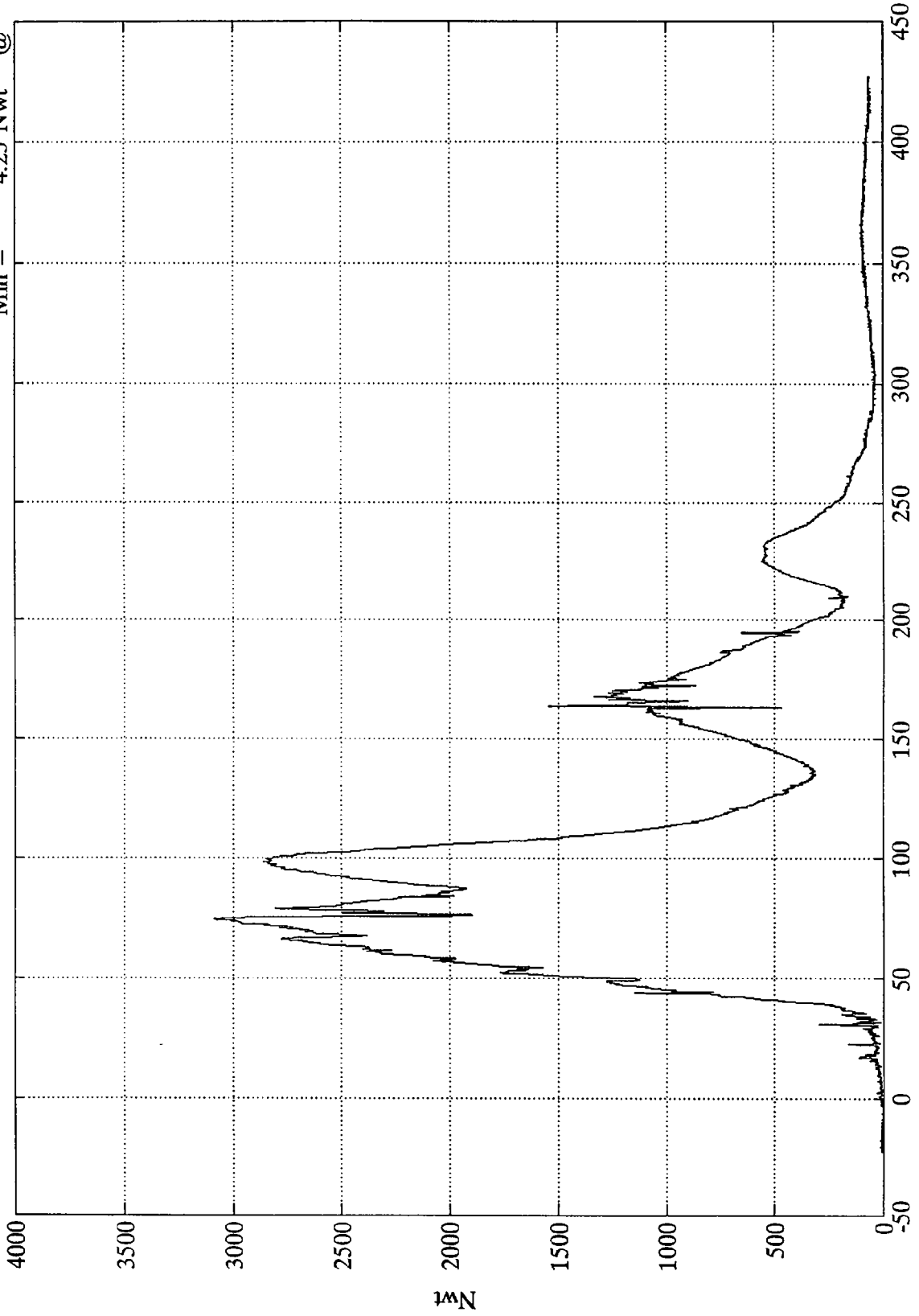
Pos. 2 Upper Neck Fz
Max = 2815.10 Nwt @ 74.51 msec
Min = -514.84 Nwt @ 232.68 msec



NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 3088.73 Nwt @ 74.51 msec
Min = 4.25 Nwt @ 3.35 msec

Pos. 2 Neck Force Res.



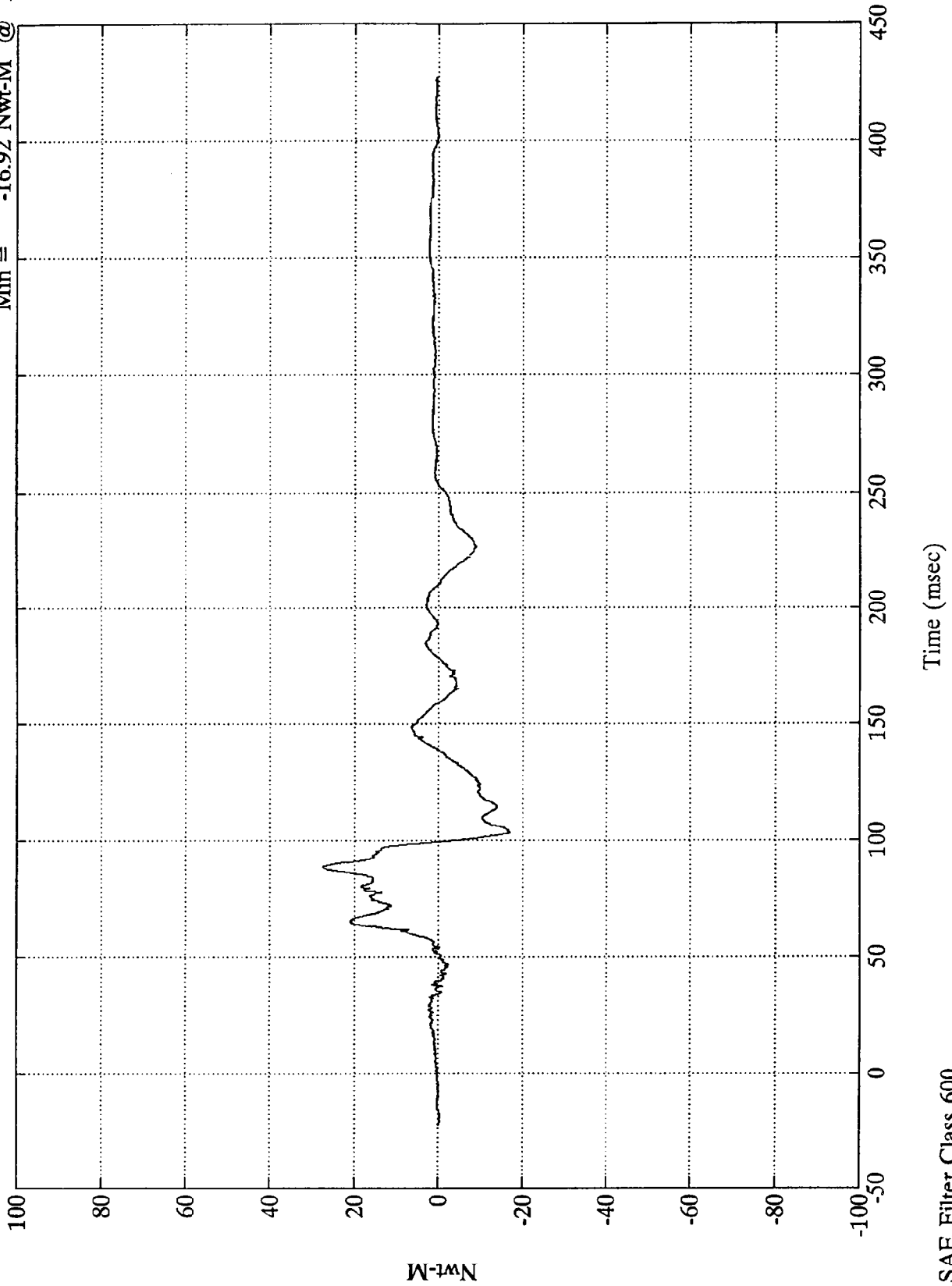
Time (msec)

SAE Filter Class 1000

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Upper Neck Mx

Max = 27.52 Nwt-M @ 88.92 msec
Min = -16.92 Nwt-M @ 103.55 msec



Nwt-M

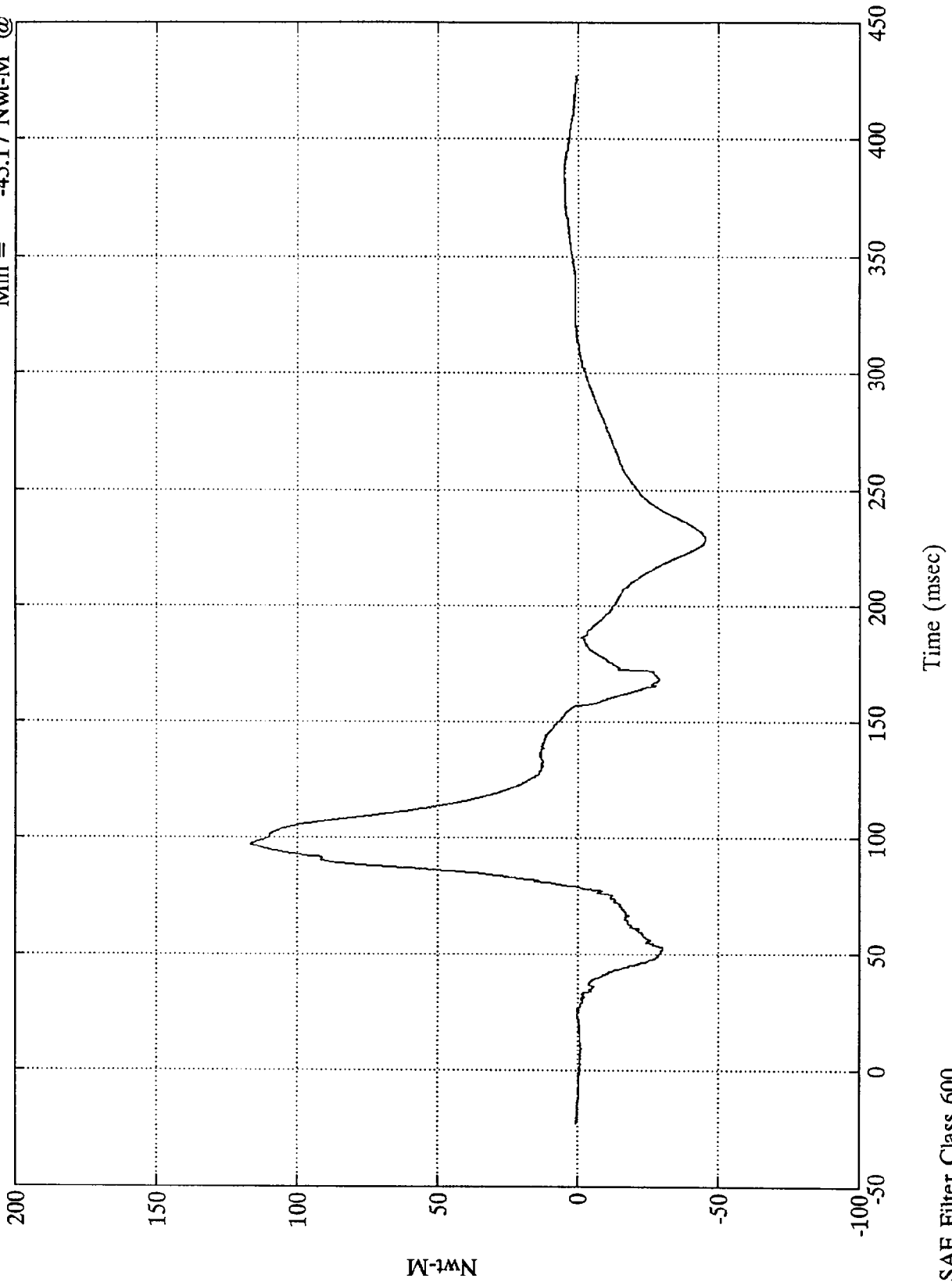
Time (msec)

SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Upper Neck My

Max = 116.52 Nwt-M @ 97.08 msec
Min = -45.17 Nwt-M @ 230.16 msec



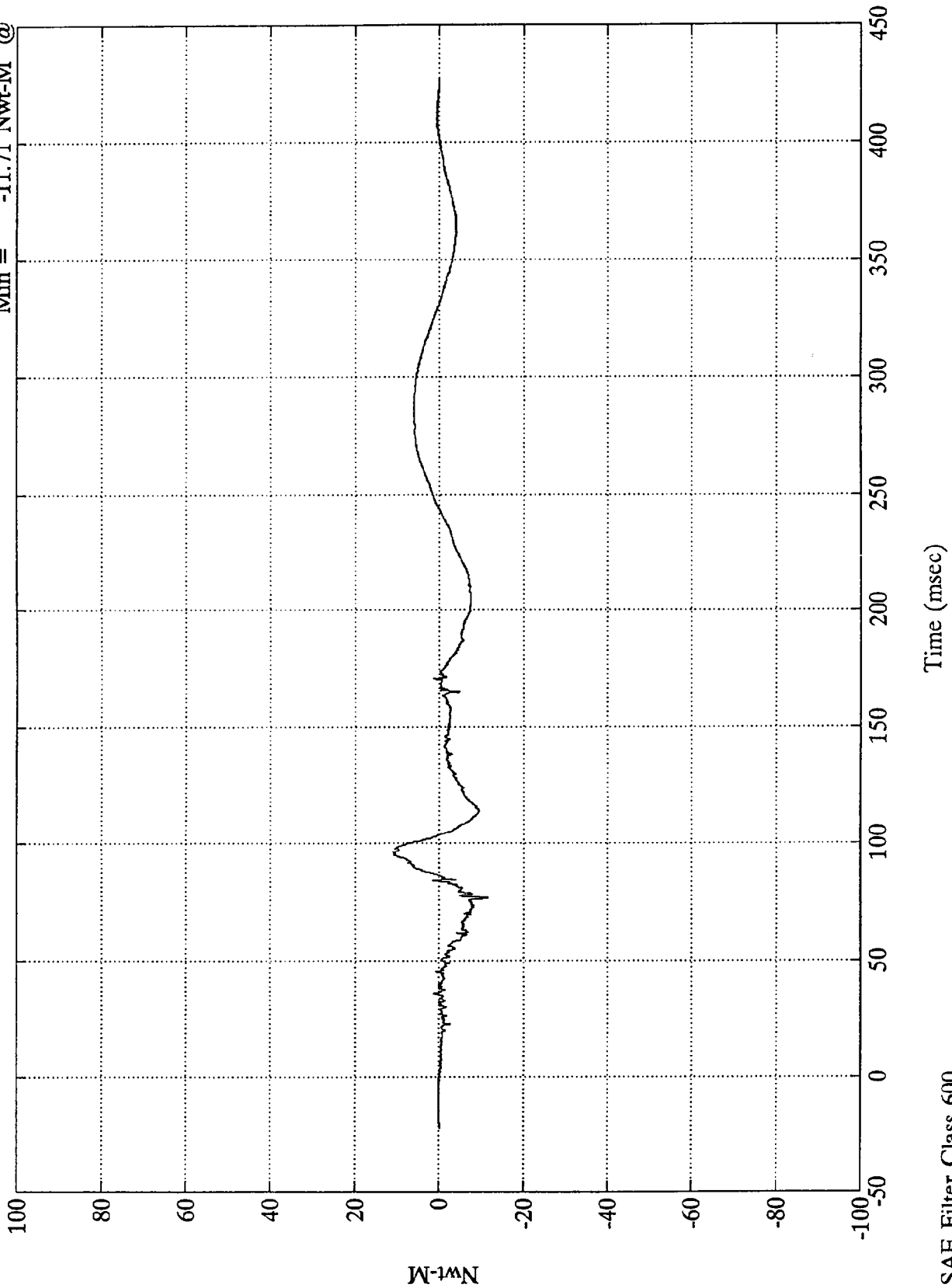
W-1MN

SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Upper Neck Mz

Max = 11.00 Nwt-M @ 96.36 msec
Min = -11.71 Nwt-M @ 76.44 msec



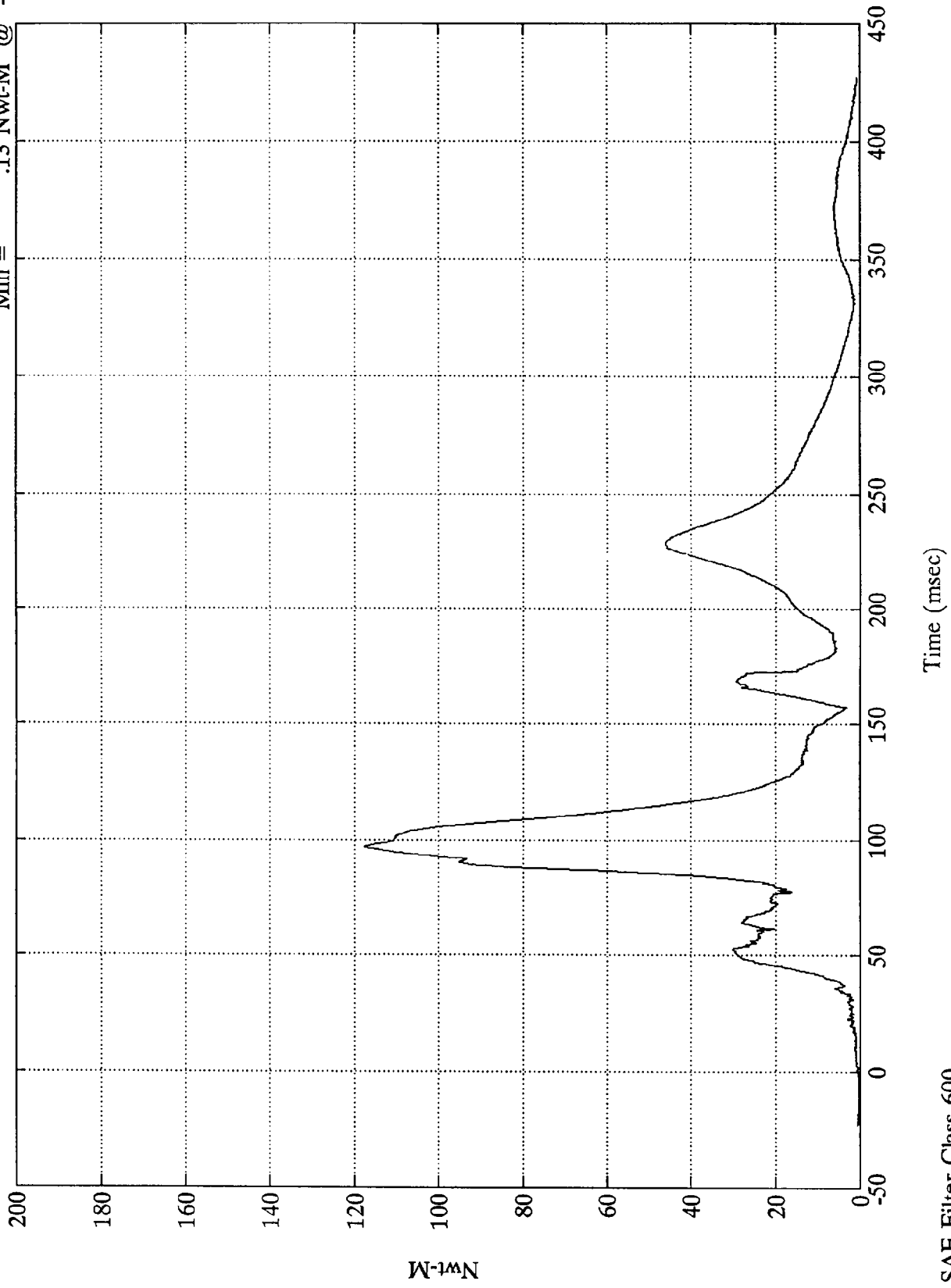
Nwt-M

SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Neck Moment Res.

Max = 117.64 Nwt-M @ 97.08 msec
Min = .13 Nwt-M @ -10.08 msec

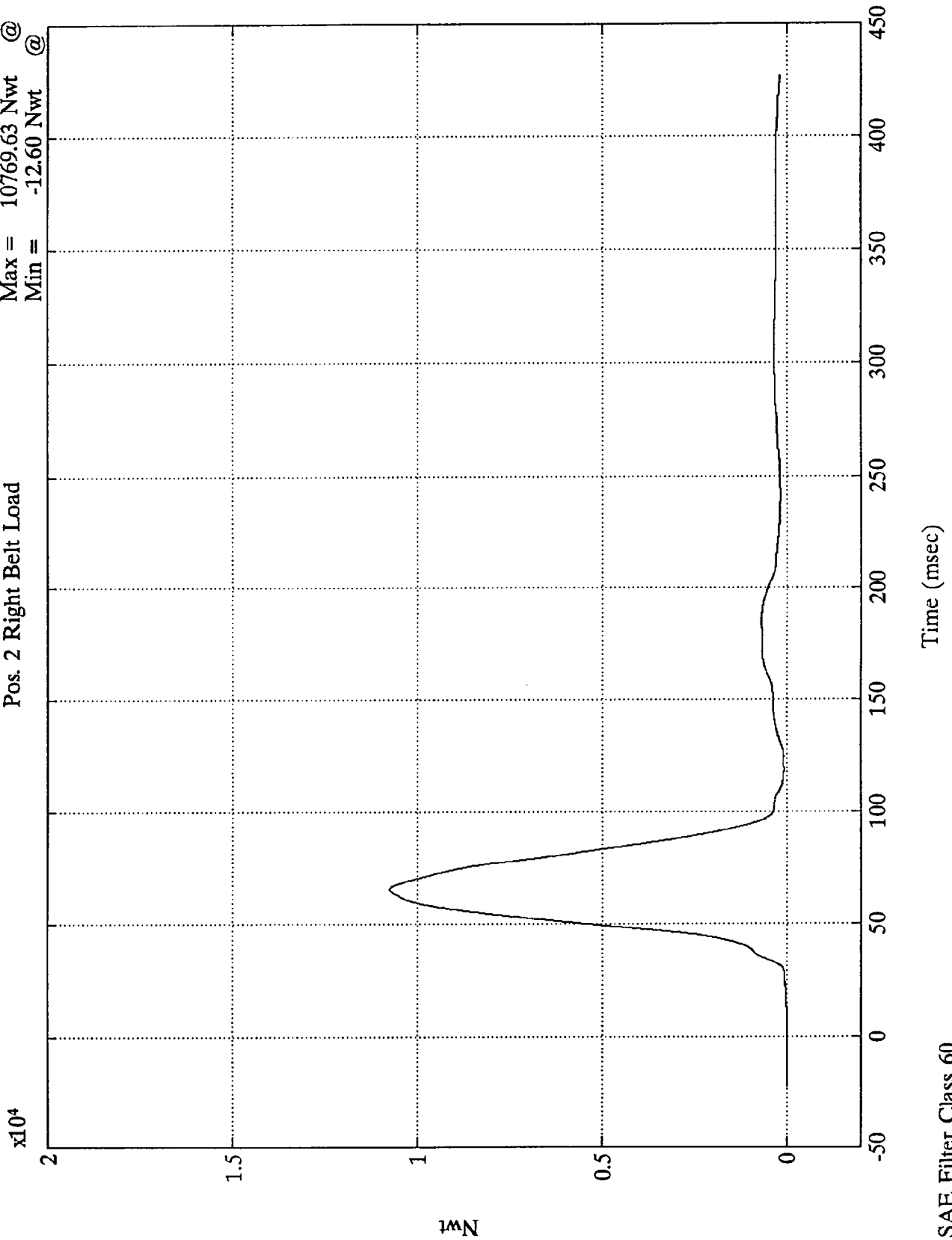


SAE Filter Class 600

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Right Belt Load

Max = 10769.63 Nwt @ 65.52 msec
Min = -12.60 Nwt @ 8.51 msec



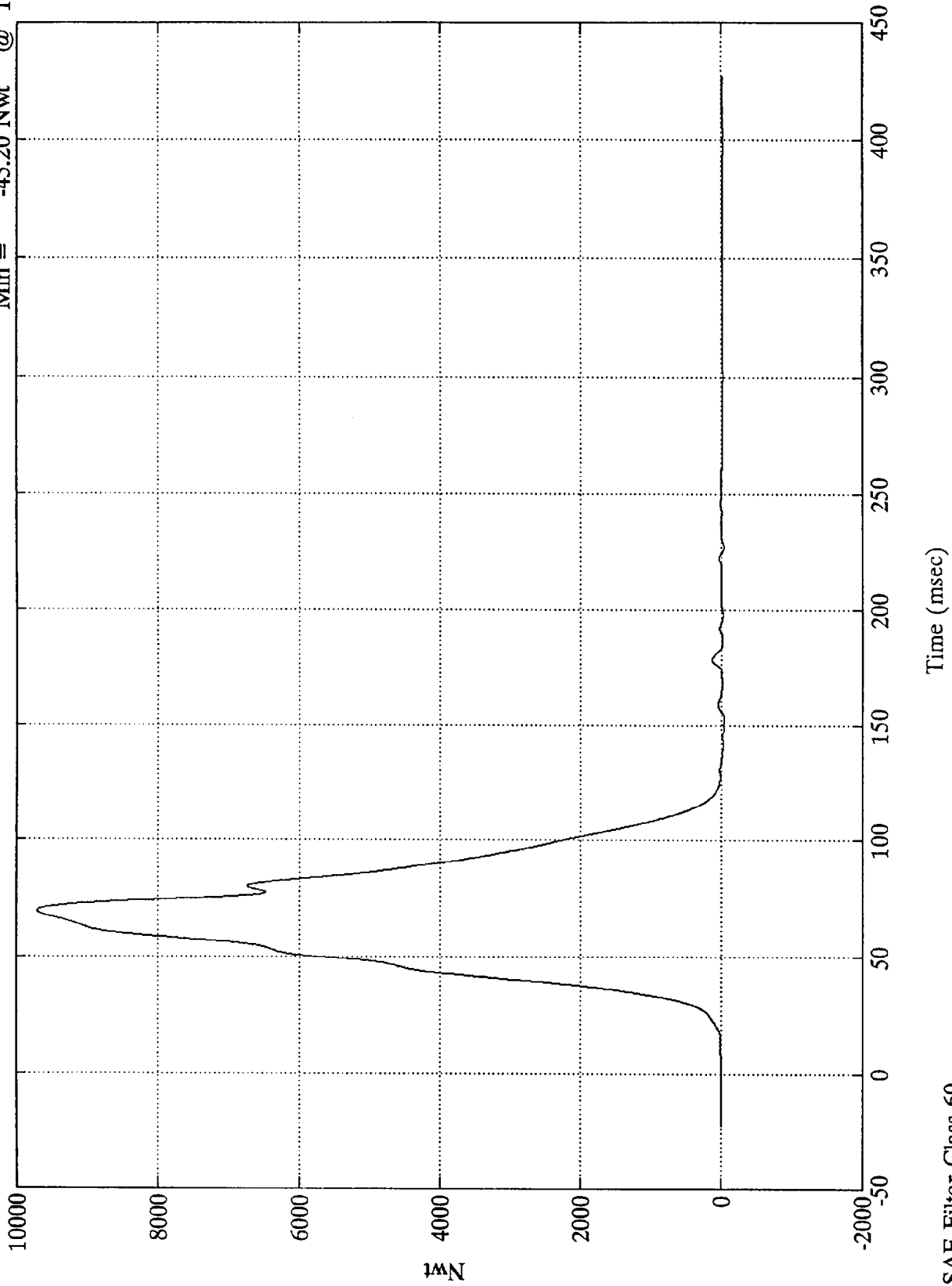
Nwt

SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Max = 9705.80 Nwt @ 69.36 msec
Min = -45.20 Nwt @ 153.00 msec

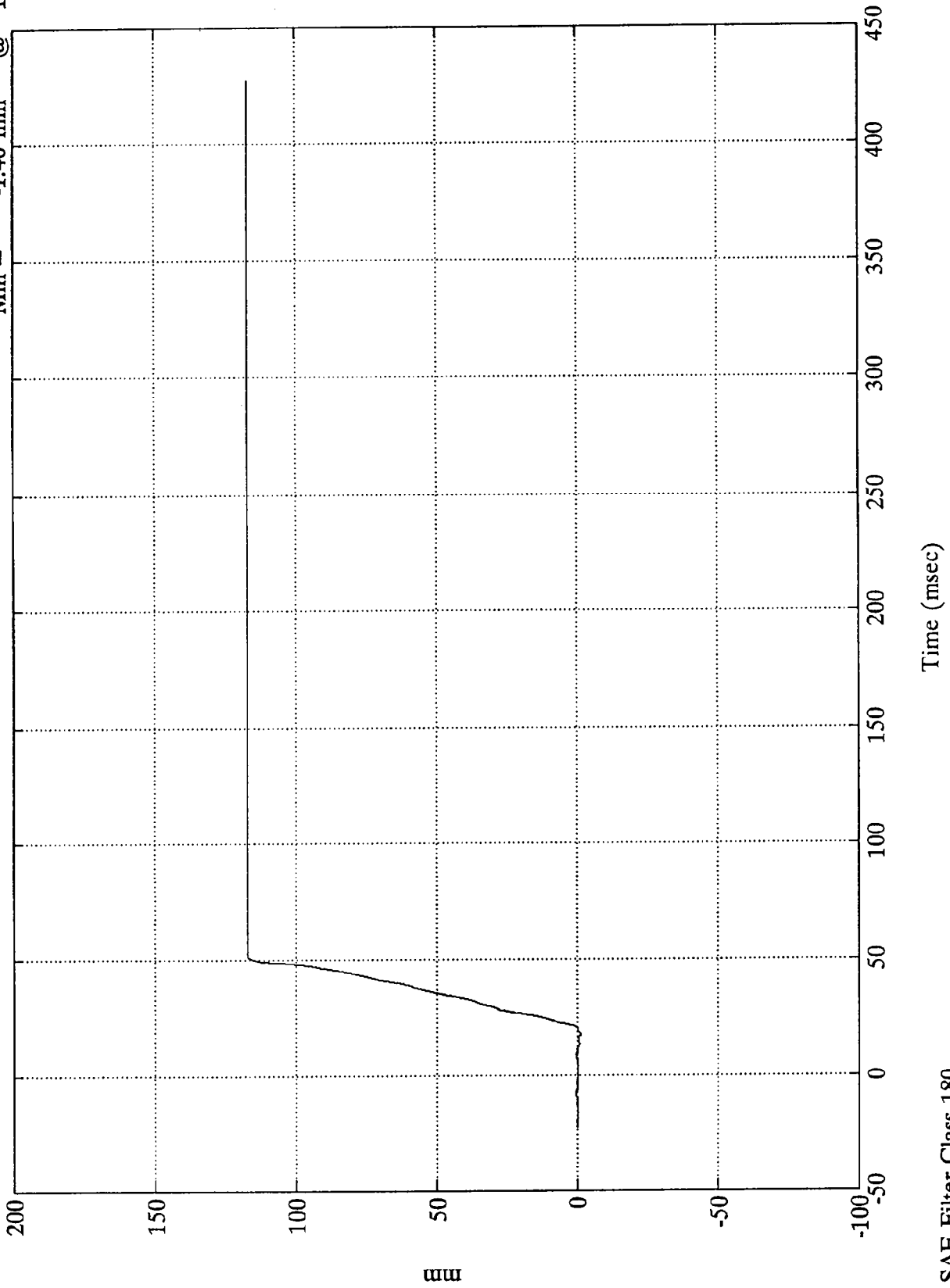
Pos. 2 Torso Belt Load



SAE Filter Class 60

NCAP TEST #4 - 1995 DODGE RAM VAN

Pos. 2 Belt Spool Out
Max = 117.18 mm @ 51.72 msec
Min = -1.40 mm @ 17.63 msec



Appendix C

PART 572B/E 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>
245	10/3/94
45	10/3/94

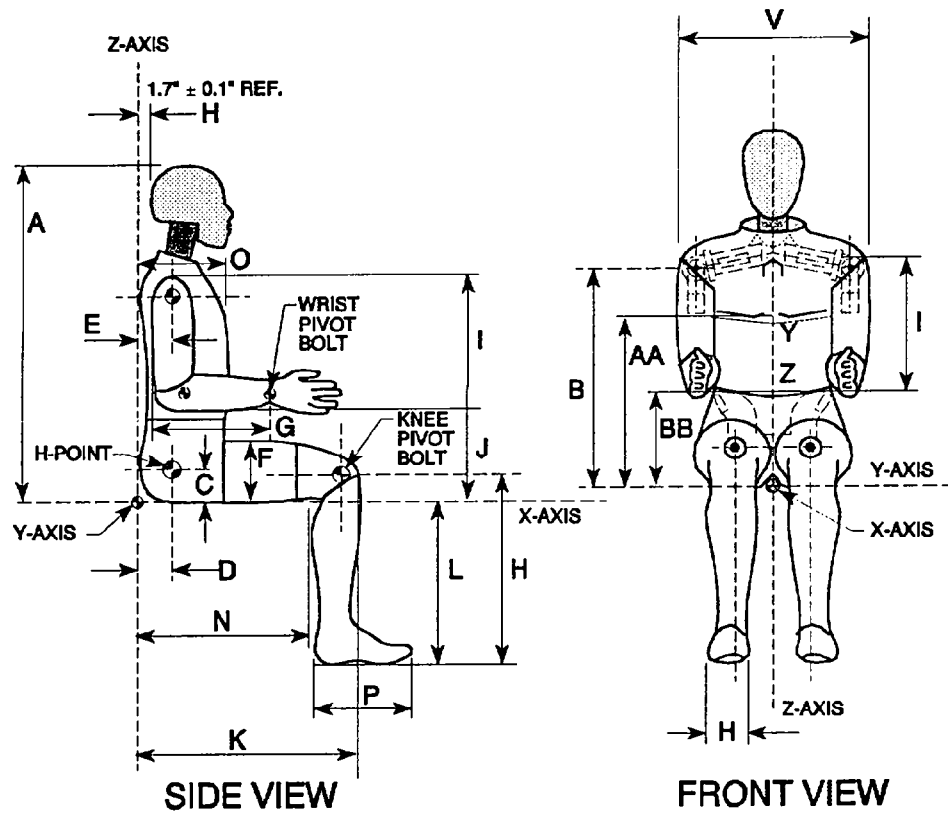
Electronic Test Equipment

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 7

DUMMY CONFIGURATION DIMENSIONS

EXTERNAL DIMENSIONS SPECIFICATIONS



NOTE: Figure is referenced to the erect seated position. The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude. (REF: S572.31(A)(6))

HYBRID III EXTERNAL DIMENSIONS

S/N 245 HUMANOID

DUMMY SERIAL NO. 245

DATE: 10/3/94

TEMPERATURE		20.5 DEG. C
RELATIVE HUMIDITY		51 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)	429-434 mm	431 mm
LOCATION FOR WAIST CIRCUMFERENCE (BB)	226-231 mm	228 mm
CHEST CIRCUMFERENCE (Y)	970-1001 mm	998 mm
WAIST CIRCUMFERENCE (Z)	815-866 mm	863 mm
CHEST DEPTH (O)	213-229 mm	213 mm
H-POINT HEIGHT (C)	84-89 mm	89 mm
H-POINT FROM SEAT BACK (D)	135-140 mm	137 mm
SKULL CAP TO BACKLINE (H)	41-46 mm	43 mm
TOTAL SITTING HEIGHT (A)	879-889 mm	889 mm
THIGH CLEARANCE (F)	140-155 mm	152 mm
BUTTOCK KNEE LENGTH (K)	580-605 mm	596 mm
BUTTOCK POPLITAL LENGTH (N)	452-477 mm	464 mm
POPLITEAL LENGTH (L)	430-455 mm	447 mm
KNEE PIVOT HEIGHT (M)	485-501 mm	487 mm
FOOT LENGTH (P)	252-267 mm	256 mm
FOOT BREADTH (W)	91-107 mm	96 mm
SHOULDER PIVOT FROM BACKLINE (E)	84-94 mm	89 mm
SHOULDER BREADTH (V)	422-437 mm	426 mm
SHOULDER PIVOT HEIGHT (B)	505-521 mm	518 mm
ELBOW REST HEIGHT (J)	190-211 mm	205 mm
SHOULDER-ELBOW LENGTH (I)	330-345 mm	335 mm
BACK OF ELBOW TO WRIST PIVOT (G)	290-305 mm	294 mm

DUMMY MEETS SPECIFICATIONS

TECHNICIAN: IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

HEAD DROP TEST

HYBRID III

DATE : 9/29/94

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 245 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	19 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	55 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	242.1 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	3.8 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 : 9/30/94

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN:245 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5-22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY		10% - 70%	49 %
IMPACT VELOCITY		24.8 - 25.7 KPH	25.45 KPH
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	25.13 G'S
	20 MS	17.60 - 22.60 G'S	20.95 G'S
	30 MS	12.50 - 18.50 G'S	17.35 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	18.73 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	41.88 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	75.43 DEG.
	TIME	57 - 64 MS	58.5 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88 - 108 N-M	105.9 N-M
	TIME	47 - 58 MS	54.13 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	119.13 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	97.5 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

NECK EXTENSION TEST

HYBRID III

DATE : 10/3/94

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN:245 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5 - 22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY		10% - 70%	51 %
IMPACT VELOCITY		21.4 - 22.3 KPH	22.05 KPH
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	17.82 G'S
	20 MS	14.00 - 19.00 G'S	17.23 G'S
	30 MS	11.00 - 16.00 G'S	13.79 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	14.33 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		38 - 46 MS	46 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	91.63 DEG.
	TIME	72 - 82 MS	75 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-80.0/-52.9 N-M	-68.6 N-M
	TIME	65 - 79 MS	71.75 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	152.25 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	132.25 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 9/29/94

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN 245 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.5 - 22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	52 %
PENDULUM VELOCITY	23.7 - 24.6 KPH	23.7 KPH
MAXIMUM DEFLECTION	64 - 73 mm	64 mm
MAXIMUM RESISTIVE FORCE	5160 - 5894 NEWTONS	5858 NEWTONS
INTERNAL HYSTERESIS	69% - 85%	75.1 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 10/29/94

KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 245 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	19 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	54 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4715 - 5782 N	5262 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 9/29/94

KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 245 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	19 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	54 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4715 - 5782 N	5235 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

HYBRID III EXTERNAL DIMENSIONS

S/N 45 HUMANOID

DUMMY SERIAL NO. 45

DATE: 10/3/94

TEMPERATURE		20.5 DEG. C
RELATIVE HUMIDITY		51 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)	429-434 mm	432 mm
LOCATION FOR WAIST CIRCUMFERENCE (BB)	226-231 mm	228 mm
CHEST CIRCUMFERENCE (Y)	970-1001 mm	1000 mm
WAIST CIRCUMFERENCE (Z)	815-866 mm	866 mm
CHEST DEPTH (O)	213-229 mm	213 mm
H-POINT HEIGHT (C)	84-89 mm	89 mm
H-POINT FROM SEAT BACK (D)	135-140 mm	137 mm
SKULL CAP TO BACKLINE (H)	41-46 mm	43 mm
TOTAL SITTING HEIGHT (A)	879-889 mm	879 mm
THIGH CLEARANCE (F)	140-155 mm	147 mm
BUTTOCK KNEE LENGTH (K)	580-605 mm	602 mm
BUTTOCK POPLITAL LENGTH (N)	452-477 mm	475 mm
POPLITEAL LENGTH (L)	430-455 mm	447 mm
KNEE PIVOT HEIGHT (M)	485-501 mm	487 mm
FOOT LENGTH (P)	252-267 mm	259 mm
FOOT BREADTH (W)	91-107 mm	101 mm
SHOULDER PIVOT FROM BACKLINE (E)	84-94 mm	94 mm
SHOULDER BREADTH (V)	422-437 mm	426 mm
SHOULDER PIVOT HEIGHT (B)	505-521 mm	510 mm
ELBOW REST HEIGHT (J)	190-211 mm	195 mm
SHOULDER-ELBOW LENGTH (I)	330-345 mm	337 mm
BACK OF ELBOW TO WRIST PIVOT (G)	290-305 mm	292 mm

DUMMY MEETS SPECIFICATIONS

TECHNICIAN: IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

HEAD DROP TEST

HYBRID III

DATE : 9/28/94

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 045 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	19 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	53 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	226.5 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	3.4 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 : 10/3/94

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN:045 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5-22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY		10% - 70%	52 %
IMPACT VELOCITY		24.8 - 25.7 KPH	25.45 KPH
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	23.49 G'S
	20 MS	17.60 - 22.60 G'S	18.59 G'S
	30 MS	12.50 - 18.50 G'S	18.36 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	21.96 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	42 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	68.8 DEG.
	TIME	57 - 64 MS	59.88 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88 - 108 N-M	104.2 N-M
	TIME	47 - 58 MS	52.5 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	119.5 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	98 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
 TRANSPORTATION RESEARCH DEPARTMENT

NECK EXTENSION TEST

HYBRID III

DATE : 10/3/94

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN:045 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5 - 22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY		10% - 70%	51 %
IMPACT VELOCITY		21.4 - 22.3 KPH	22.05 KPH
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	17.97 G'S
	20 MS	14.00 - 19.00 G'S	16.16 G'S
	30 MS	11.00 - 16.00 G'S	12.97 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	20.06 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		38 - 46 MS	45.25 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	87.08 DEG.
	TIME	72 - 82 MS	76.13 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-80.0/-52.9 N-M	-65.6 N-M
	TIME	65 - 79 MS	69.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	148 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	126.25 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 9/27/94

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN 045 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.5 - 22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	57 %
PENDULUM VELOCITY	23.7 - 24.6 KPH	23.7 KPH
MAXIMUM DEFLECTION	64 - 73 mm	64 mm
MAXIMUM RESISTIVE FORCE	5160 - 5894 NEWTONS	5782 NEWTONS
INTERNAL HYSTERESIS	69% - 85%	72.7 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 9/27/94

KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 045 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	19 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	54 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4715 - 5782 N	5280 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 9/27/94

KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 045 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	19 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	55 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4715 - 5782 N	5080 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

Appendix D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY

(6 Month Calibration Minimum)

DRIVER DUMMY	Serial #245	Manufacturer	Calibration	
			Last	Next
Head				
X	AF5B3	ENDEVCO	6-94	12-94
Y	AF5F7	ENDEVCO	8-94	2-95
Z	AF5E1	ENDEVCO	8-94	2-95
Chest				
X	A12C	ENDEVCO	4-94	10-94
Y	A60C	ENDEVCO	4-94	10-94
Z	A84G	ENDEVCO	4-94	10-94
Right Femur Load Cell	952	GSE	7-94	1-95
Left Femur Load Cell	951	GSE	7-94	1-95
Neck Load Cell				
X	269	DENTON	8-94	2-95
Y	269	DENTON	8-94	2-95
Z	269	DENTON	8-94	2-95
Neck Moment				
X	269	DENTON	8-94	2-95
Y	269	DENTON	8-94	2-95
Z	269	DENTON	8-94	2-95
Chest Deflection Gauge				
Hybrid III Use Only	245	HUMANOID	8-94	2-95
Lap Belt Load Cells				
	706	LEBOW	7-94	1-95
Shoulder Belt Load Cells				
	707	LEBOW	7-94	1-95
Spool-Out Potentiometer	E1	MAGNETEK	10-94	4-95
Belt Stretch Transducer				
	7	CALSPAN	8-94	2-95

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY

(6 Month Calibration Minimum)

PASSENGER DUMMY	Serial #45	Manufacturer	Calibration	
			Last	Next
Head				
X	ADL50	ENDEVCO	8-94	2-95
Y	A59J	ENDEVCO	8-94	2-95
Z	A73A	ENDEVCO	8-94	2-95
Chest				
X	ADL98	ENDEVCO	8-94	2-95
Y	AC209	ENDEVCO	8-94	2-95
Z	ADB6	ENDEVCO	8-94	2-95
Right Femur Load Cell	955	GSE	7-94	1-95
Left Femur Load Cell	954	GSE	7-94	1-95
Neck Load Cell	076	DENTON	8-94	2-95
X	076	DENTON	8-94	2-95
Y	076	DENTON	8-94	2-95
Z	076	DENTON	8-94	2-95
Neck Moment	076	DENTON	8-94	2-95
X	076	DENTON	8-94	2-95
Y	076	DENTON	8-94	2-95
Z	076	DENTON	8-94	2-95
Chest Deflection Gauge	45	HUMANOID	8-94	2-95
Hybrid III Use Only				
Lap Belt Load Cells	713	LEBOW	7-94	1-95
Shoulder Belt Load Cells	714	LEBOW	7-94	1-95
Spool-Out Potentiometer	8	MAGNETEK	10-94	4-95
Belt Stretch Transducer	E5	CALSPAN	8-94	2-95

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS

(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration	
			Last	Next
Left Seat Rear Crossmember	A44	CEC	8-94	2-95
Right Rear Seat Crossmember	A145	CEC	8-94	2-95
Top of Engine	A89	CEC	7-94	1-95
Bottom of Engine	A69	CEC	9-94	3-95
Left Disc Brake Caliper	A70	CEC	8-94	2-95
Right Disc Brake Caliper	A29	CEC	7-94	1-95
Instrument Panel	A152	CEC	5-94	11-94
Center Rear Crossmember	A149	CEC	8-94	2-95
Vehicle Rear Z	A178	CEC	9-94	3-95

Appendix E

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

- (b) Or bring outside air into the vehicle by the side panel air inlets, or fully open door vent windows as far as they will go to force outside air into the front of the vehicle. A partially-open vent window will increase the possibility of entrance of exhaust fumes through the rear vented window openings.
- (c) If passengers are riding in the rear area, the rear vented windows and/or doors should be fully closed at all times.

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. Your seat belts can also be used to 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 of the inside of the 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 else on the road may be a poor driver and cause a collision which involves you. And this can happen far from home or on your own street.

Research has shown that seat belts save lives. And they

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 outboard front and rear seats of your vehicle have combination lap/shoulder belts, or unibelts. The retractor is designed to lock 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.

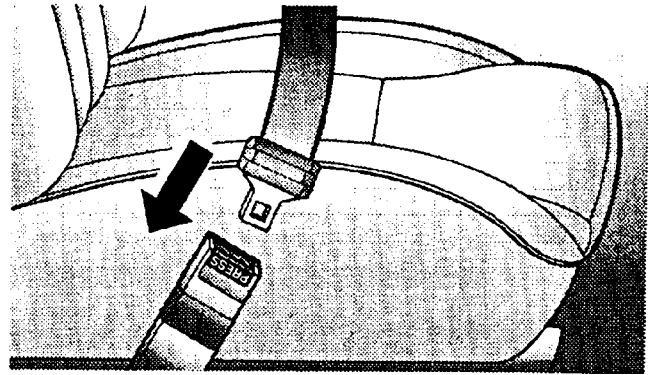
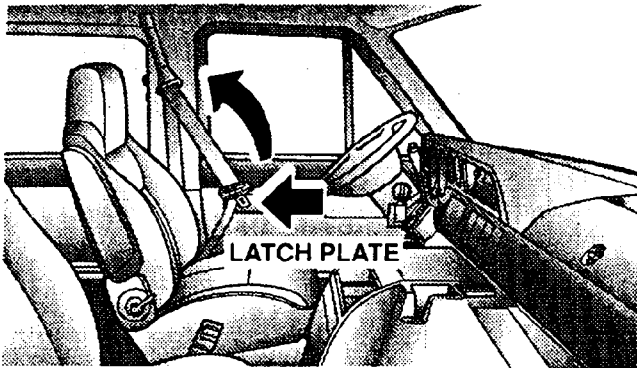
WARNING!

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 latch plate of the belt 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.



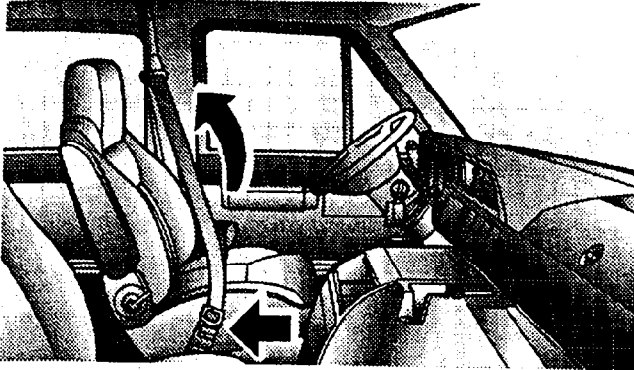
3. When the belt is long enough to fit, insert the latch plate into the buckle until you hear a "click."

WARNING!

A belt 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.

WARNING!

- 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 shoulder belt 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 can cause internal injuries. 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.
- 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 part as low as possible and keep it snug.



4. Position the lap belt across your thighs, below your abdomen. If you need the lap portion tighter, pull up a bit on the shoulder part. A snug belt reduces the risk of sliding under the belt in a collision.
5. Position the shoulder belt on your chest so that it is

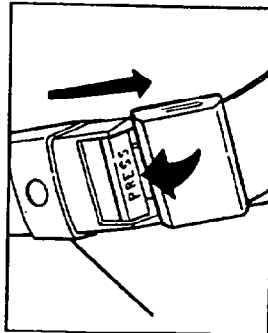
comfortable and not resting on your neck. The retractor will withdraw any slack in the belt.

WARNING!

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

6. To release the belt, push the red button marked "Press" on the buckle. The belt will automatically retract to its stowed position.

If necessary, slide the latch plate down the webbing to allow the belt to retract fully.



WARNING!

A frayed or torn belt could rip apart in a collision. It could leave you with no protection. Inspect your belts periodically, checking for cuts, frays, and loose parts. Damaged parts must be replaced immediately. Do not disassemble or modify the system. Seat belt assemblies must be replaced after an accident if they have been damaged (bent retractor, torn webbing, etc.).

Rear Center Lap Belts

Rear center seating positions have a lap belt only.

To fasten a lap belt, slip the latch plate into the buckle.

To lengthen the lap belt, tilt the latch plate and pull. To shorten the belt, pull the loose end of the webbing.

Wear the lap belt snug against the hips. Sit back and erect in the seat, then adjust the belt as tightly as is comfortable.

WARNING!

A lap belt worn too loose or too high is dangerous. A belt worn too loose can allow you to slip down and under the belt in a collision. A belt that is too high will apply crash forces to the abdomen, not to the stronger hip bones. In either case, the risk of internal injuries is greater. Wear a lap belt low and snug.

WARNING!

Belting two people into one seat belt can lead to greater injury. People belted together can crash into one another in an accident, hurting one another badly. Never use a belt for more than one person, no matter what their size.

Seat Belts and Pregnant Women

We recommend that pregnant women use the seat belts during 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 against 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.

Seat Belt Extender

If a seat belt is too short, even when fully extended, your dealer can provide you with a seat belt extender. This extender should be used only if the existing belt is not long enough. When it is not required, remove the extender and stow it.

Don't leave it loose in the vehicle. In a sudden stop or collision it could strike occupants and injure them.

Children Too Large for Child Seats

Children who are too large for child seats and who can sit upright by themselves should use the available lap/shoulder belts for best protection.

- Make sure that the child is seated upright in the seat.
- The lap belt should be fastened low on the hips and as snug as possible.
- Check belt fit periodically. A child's squirming or slouching can move the belt out of position.

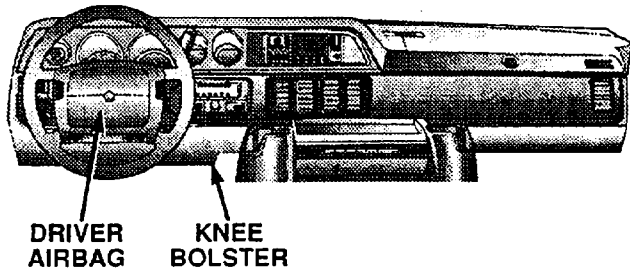
If the shoulder belt contacts the face or neck, move the child closer to the middle of the vehicle. If this doesn't solve the problem, move the child to the center rear seating position and use the lap belt.

Booster seats that may help overcome this problem are

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

DRIVER SUPPLEMENTAL 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. The airbag inflates in higher speed frontal impacts. It works with the instrument panel knee bolster and the seat belt to provide improved protection for the driver.



The seat belt 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 deploys, you need the seat belt to keep you in the right position for the airbag to protect you properly.

WARNING!

- Relying on the airbag alone could lead to more severe injuries in a collision. The airbag works with your seat belt to restrain you properly. In some collisions the airbag won't deploy at all. Wear your seat belt even though you have an airbag.
- Being too close to the steering wheel or instrument panel during airbag deployment could cause serious injury. Airbags need room to inflate. Sit back, comfortably extending your arms to reach the steering wheel or instrument panel.

The airbag system consists of the following:

- All Electric Control Module (AECM)
- AIRBAG Light

- Airbag/Inflator Unit
- Unique Steering Wheel and Column
- Interconnecting Wiring
- Knee Impact Bolster

How The Airbag System Works

- The **All Electric Control Module** is located under the driver's seat and determines if a frontal impact is severe enough to require the airbag. The AECM will not detect side, rollover, or rear impacts.
- The AECM also monitors the readiness of the electronic parts of the system whenever the ignition switch is in the **START** or **RUN** position. These include all of the items listed above except the steering wheel and column and the knee bolster. The AECM 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.

WARNING!

Ignoring the **AIRBAG** light in your instrument panel could mean you won'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/Inflator Unit** is in the center of the steering wheel. When the AECM detects an impact requiring the airbag, it signals 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 AECM detects a moderate-to-severe frontal collision, and then immediately deflates.

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 unfold 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 can't protect you in another collision. 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 need proper knee impact protection in a collision. Do not mount or locate any after market equipment on or behind the knee impact bolster.
- It is dangerous to try to repair any part of the airbag system yourself. Be sure to tell anyone who works on your vehicle that it has an airbag.

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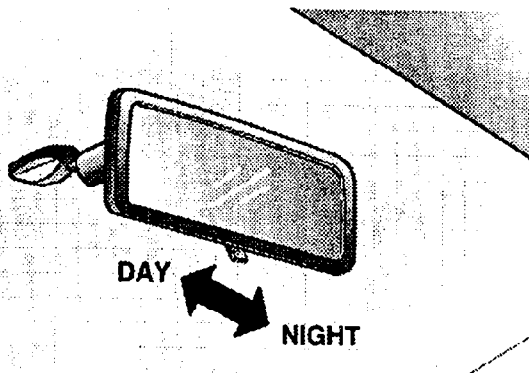
Airbag Light

You will want to have the airbag ready to inflate for your protection in an impact. While the airbag system is designed to be maintenance free, 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.

MIRRORS

Inside Mirror



The mirror should be adjusted to center on the view through the rear window. A two point pivot system allows for vertical and horizontal mirror adjustment. Annoying headlight glare can be reduced by moving the small control under the mirror to the night position