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REPORT NUMBER: CAL-94-N02

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

**GENERAL MOTORS CORPORATION
1993 CHEVROLET CAMARO
2-DOOR HATCHBACK**

NHTSA NUMBER: MP0106

CALSPAN TEST NUMBER: 8120-2

August 24, 1993

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FINAL REPORT

PREPARED FOR:

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

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TECHNICAL REPORT STANDARD TITLE PAGE

1. <i>Report No.</i> CAL-94-N02	2. <i>Government Accession No.</i>	3. <i>Recipient's Catalog No.</i>	
4. <i>Title and Subtitle</i> NHTSA New Car Assessment Program (NCAP) Frontal Barrier Impact Test of a 1993 Chevrolet Camaro 2-Door Hatchback		5. <i>Report Date</i> August 24, 1993	
		6. <i>Performing Organization Code</i> CAL	
7. <i>Author(s)</i> Michael J. Kilgallon, Project Engineer Walter E. Levan, Program Manager		8. <i>Performing Organization Report No.</i> 8120-2	
9. <i>Performing Organization Name and Address</i> Calspan Advanced Technology Center 4455 Genesee Street Buffalo, New York 14225		10. <i>Work Unit No.</i> X035-020-1310	
		11. <i>Contract or Grant No.</i> DTNH22-90-D-02121	
12. <i>Sponsoring Agency Name and Address</i> U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh , S.W. Washington, D.C. 20590		13. <i>Type of Report and Period Covered</i> Final Report August - September 1993	
		14. <i>Sponsoring Agency Code</i> DOT/NHTSA/RM/OMI	
15. <i>Supplementary Notes</i>			
16. <i>Abstract</i> A frontal load cell barrier test of a 1993 Chevrolet Camaro 2-Door Hatchback was performed at the Calspan Advanced Technology Center Crash Test Facility in Buffalo, New York on August 24, 1993. The impact velocity was 56.9 kph and the temperature at the barrier face was 26.1°C. The maximum post-test vehicle crush was 515 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 supplemental airbags at each of the front outboard seating positions. With regard to FMVSS 208 "Occupant Crash Protection" , injury criteria, both the driver and passenger dummies appear to comply with the head, chest, and femur requirements.			
17. <i>Key Words</i>		18. <i>Distribution Statement</i>	
19. <i>Security Classif. (of this report)</i> UNCLASSIFIED	20. <i>Security Classif. (of this page)</i> UNCLASSIFIED	21. <i>No. of Pages</i>	22. <i>Price</i>

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Section 1

PURPOSE AND TEST PROCEDURE

This 56.3 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 56.3 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 MP0106

A load cell barrier consisting of 36 load cells was impacted by a 1993 Chevrolet Camaro 2-Door Hatchback at a velocity of 56.9 kph. The test was performed at the Calspan Corporation Advanced Technology Center on August 24, 1993. 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. 150) and the right-front passenger ATD (Serial No. 245) were used in one previous test (MR0300). Injuring criteria were not exceeded in test MR0300. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 83 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. Position #2 - Upper Neck Fx and Position #1 - Belt Elongation did not record accurately. The following data channels contain intermittent data spikes:

- Position #1 - Head Y
- Position #1 - Head Z
- Position #1 - Head Resultant
- Position #1 - Right Femur
- Position #2 - Upper Neck Fx
- Position #2 - Upper Neck Fy
- Position #2 - Upper Neck Fz
- Position #2 - Left Femur
- Position #2 - Right Femur

Vehicle Accelerometer #4 is not accurate after 100 mSec.

The driver's head struck the airbag; the HIC was 308.3. The maximum chest deceleration over 3 milliseconds was 40.3 g's and maximum chest deflection was 39.3 mm. Femur loads were 3678.6 newtons on the left femur and 2072.0 newtons on the right femur.

The right front passenger's HIC was 402.6. Maximum chest deceleration over 3 milliseconds was 41.5 g's and maximum chest deflection was 33.9 mm. Femur loads were 3086.0 newtons on the left and 2295.2 newtons on the right.

Table 1

GENERAL TEST AND VEHICLE DATA

Vehicle Year/Make/Model/Body Style: 1993 Chevrolet Camaro 2-Door Hatchback

NHTSA Test No.: MP0106 VIN.: 2G1FP225XP2127971

Body Color: Red Date of Manufacture: 6/93

Date Received: 7-6-93

Odometer Reading: 27.3 Km

Engine: 6 Cylinders; NA C.I.D.; 3.4 Liters; --- CC
X Gas; --- Diesel; --- Turbocharged
X Longitudinal; --- Transverse

Transmission: 4 Speed; --- Manual; X Automatic; X Overdrive

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

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

Type of Occupant Restraint: 3-point restraint system with supplemental driver and passenger airbags.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 207 kPa, Rear 207 kPa

Recommended Tire Size: P215/60R16

Recommended Cold Tire Pressure: Front 207 kPa, Rear 207 kPa

Tires on Vehicle: P215/60R16 Manufacturer: Goodyear

Number of Occupants: 2 Front; 2 Rear; --- 3rd Seat; 4 TOTAL

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

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

Vehicle Capacity Weight (VCW) = 318 kgs. (A)

No. of Occupants x 68 kgs. = 272 kgs. (B)

Rated Cargo and Luggage Weight (RCLW) A-B = 46 kgs.

GVWR 1857 kgs. GAWR: Front 933 kgs. Rear 924 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>444</u>	kgs.	Right Rear =	<u>340</u>	kgs.
Left Front =	<u>417</u>	kgs.	Left Rear =	<u>345</u>	kgs.
TOTAL FRONT WEIGHT =	<u>861</u>	kgs.	(	<u>56</u>	% of Total Vehicle Weight)
TOTAL REAR WEIGHT =	<u>685</u>	kgs.	(	<u>44</u>	% of Total Vehicle Weight)
TOTAL DELIVERED WEIGHT =	<u>1546</u>	kgs.			

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight	<u>1546</u>	kgs.
VCW = Vehicle Capacity Weight	<u>318</u>	kgs.
DSC = Designated Seating Capacity	<u>4</u>	
RCLW = VCW - 68 (DSC) =	<u>46</u>	kgs.
Target Test Weight = UDW + RCLW + (2 dummies x 76 kgs./ dummy)		
Target Test Weight =	<u>1744</u>	kgs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 44 KGS CARGO:

Right Front =	<u>454</u>	kgs.	Right Rear =	<u>417</u>	kgs.
Left Front =	<u>454</u>	kgs.	Left Rear =	<u>413</u>	kgs.
TOTAL FRONT WEIGHT =	<u>908</u>	kgs.	(	<u>52</u>	% of Total Vehicle Weight)
TOTAL REAR WEIGHT =	<u>830</u>	kgs.	(	<u>48</u>	% of Total Vehicle Weight)
TOTAL TEST WEIGHT =	<u>1738</u>	kgs.			
Weight of ballast secured in vehicle trunk area =	<u>0</u>	kgs.			

VEHICLE ATTITUDE (all dimensions in mm):

Delivered Attitude:	RF	<u>709</u>	LF	<u>719</u>	RR	<u>725</u>	LR	<u>729</u>
Test Attitude:	RF	<u>702</u>	LF	<u>710</u>	RR	<u>682</u>	LR	<u>685</u>

Wheel Base: 2566 mm.; C.G. = 1232 mm. rearward of front wheel C/L

Remarks: Rear deck lid was removed to achieve test weight. 54.6 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: August 24, 1993 Time of Test: 12:45

Ambient Temperature: 26.1 ° C at impact area

Temperature in Occupant Compartment: 21.1 ° C

Windshield Molding Temperature: 21.1 ° C

Required Impact Velocity Range: 55.5 to 57.1 kph

Impact Velocity: primary = 56.9 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>4615</u>	C _L	<u>4885</u>	L	<u>4600</u>
	Post-test = R	<u>4195</u>	C _L	<u>4385</u>	L	<u>4085</u>
	Crush = R	<u>420</u>	C _L	<u>500</u>	L	<u>515</u>

Distance from front of test vehicle to point of impact:

R 140 C_L 20 L 225

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>face with airbag center</u>	<u>face with airbag</u>
Chest	<u>with airbag</u>	<u>with airbag</u>
Abdomen	<u>with lower steering wheel rim</u>	<u>no contact</u>
Left Knee	<u>lower dash</u>	<u>glove box door</u>
Right Knee	<u>lower dash</u>	<u>glove box door</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>closed/operable</u>	<u>closed/operable</u>	<u>N/A</u>	<u>N/A</u>
	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Seat Movement	<u>None</u>	<u>None</u>	<u>N/A</u>	<u>N/A</u>
Seat Back Failure	<u>None</u>	<u>None</u>	<u>N/A</u>	<u>N/A</u>
Seat Shift (mm.)	<u>0</u>	<u>0</u>	<u>N/A</u>	<u>N/A</u>
<u>Glazing Damage</u>				
Backlight/Windshield:	<u>The windshield sustained stress fractures but remained intact.</u>			
Other Notable Impact Effects:	<u>The steering column stroked.</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.: MP0106 Vehicle: 1993 Chevrolet Camaro 2-Door Hatchback

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-42.1	-11.2	-18.2	42.9
Position #2 - Passenger	-45.4	4.6	29.5	53.4

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R*
Position #1 - Driver	-41.3	-5.8	-22.9	40.3
Position #2 - Passenger	-40.6	22.2	-24.2	41.5

* 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	3678.6	2072.0
Position #2 - Passenger	3086.0	2295.2

	MAXIMUM FORCE - SEAT BELT LOADS (nwt)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	5623.8	---	5963.7
Position #2 - Passenger	7542.5	6355.2	----

	HEAD INJURY CRITERIA (HIC)			
	HIC**	t ₁ (mSec)	t ₂ (mSec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	308.3	73.68	109.56	37.47
Position #2 - Passenger	402.6	70.44	106.32	41.69

** 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 SHEETVehicle Year/Make/Model/Body Style: 1993 Chevrolet Camaro 2-Door HatchbackVehicle NHTSA No.: MP0106Test Date: August 24, 1993

MAXIMUM VALUES	DRIVER DUMMY ID # : 150	PASSENGER DUMMY ID # : 245
Neck Load X (nwt)	621.2	580.0
Neck Load Y (nwt)	245.0	-222.0
Neck Load Z (nwt)	1710.0	1974.0
Neck Moment X (nwt-m)	22.4	15.8
Neck Moment Y (nwt-m)	47.4	45.5
Neck Moment Z (nwt-m)	23.6	-19.6
Chest Deflection X (mm.)	39.3	33.9
Time of Max. Occurrence (msec)	113.2	103.4

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

Figure 1

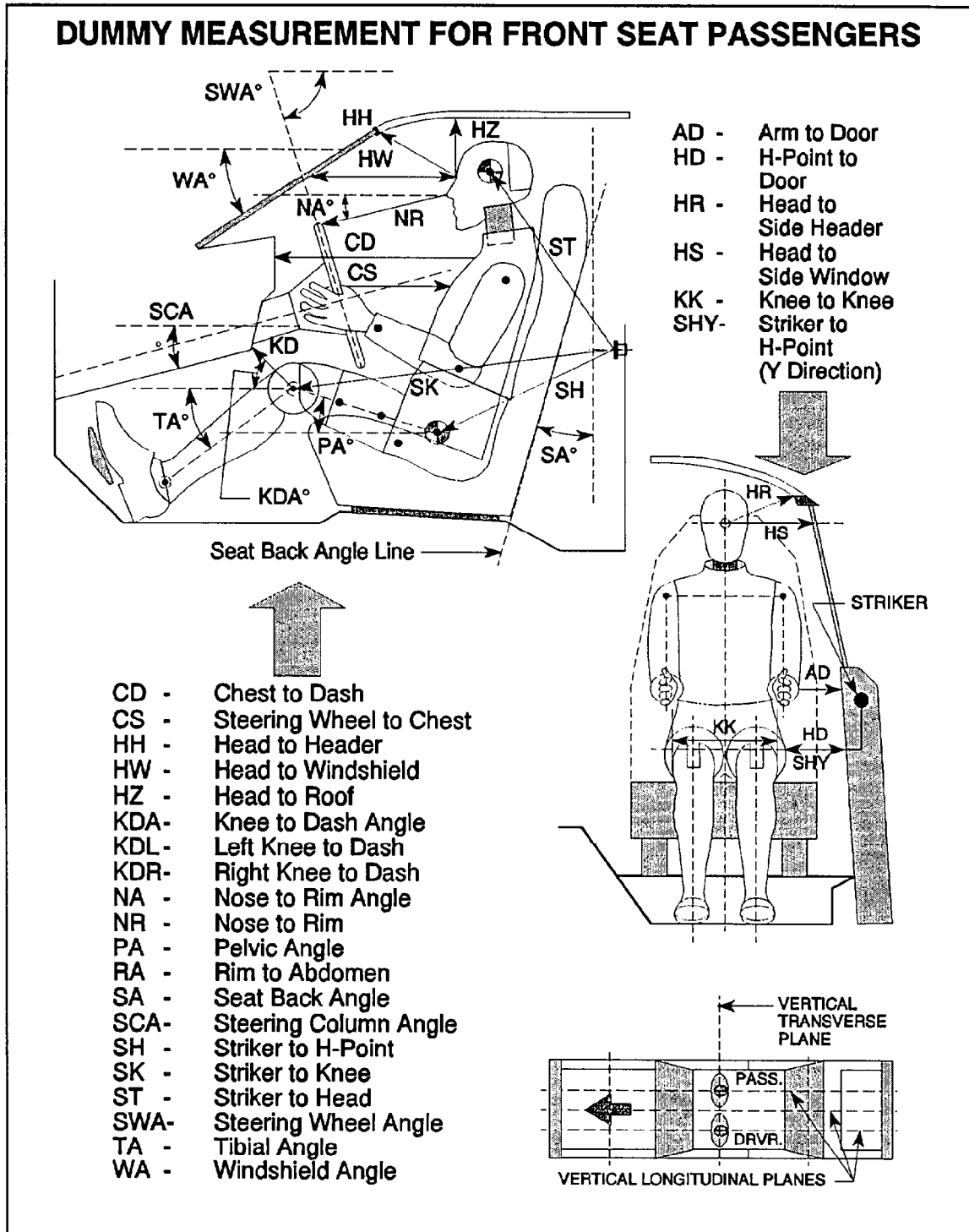
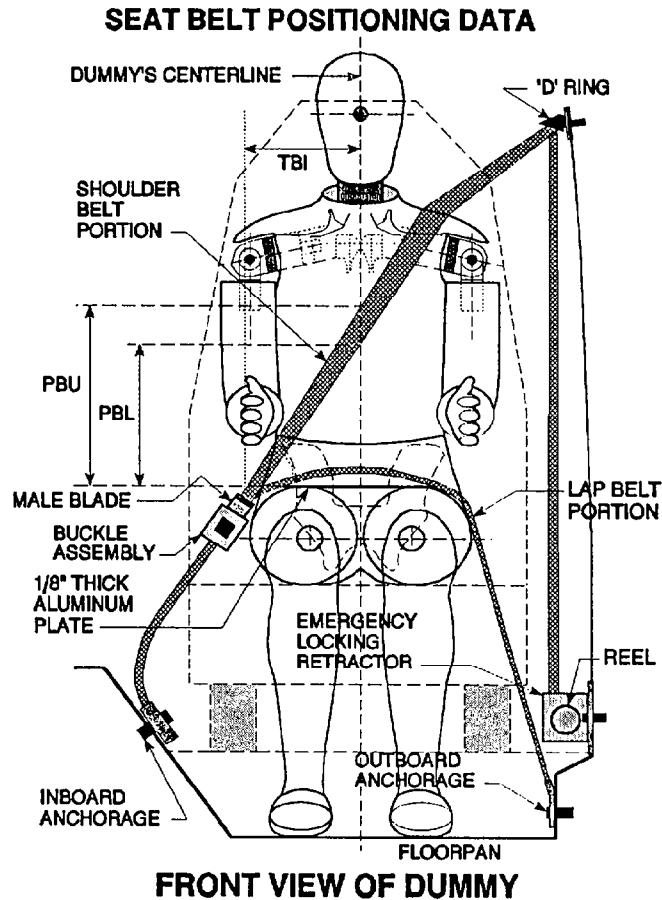


Table 4
FRONT SEAT OCCUPANT MEASUREMENTS

	DRIVER (Serial # 150)			PASS. (Serial # 245)		
WA°	19°			19°		
SWA°	72°			N/A		
SCA°	18°			N/A		
SA°	26°			26°		
HZ	137 mm			154 mm		
HH	313 mm			340 mm		
HW	610 mm			638 mm		
HR	122 mm			167 mm		
NR	353 mm	Angle	10°	N/A		
CD	464 mm			499 mm		
CS	241 mm			N/A		
RA	174 mm			N/A		
KDL	190 mm	Angle (KDA)	45°	165 mm		
KDR	185 mm			166 mm	Angle (KDA)	46°
PA°	22°			25°		
TA°	24°			35°		
KK	260 mm			286 mm		
ST	622 mm	Angle	46°	560 mm	Angle	47°
SK	986 mm	Angle	99°	956 mm	Angle	98°
SH	624 mm	Angle	110°	591 mm	Angle	114°
SHY	236 mm			216 mm		
HS	300 mm			310 mm		
HD	195 mm to door pocket			121 mm to door pocket		
AD	116 mm			109 mm		

Figure 2

SEAT BELT POSITIONING DATA



	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	360	340
PBL-- Top surface of alum. plate to belt lower edge	275	242
<u>LAP BELT TENSION</u>	retractor	retractor
<u>SHOULDER BELT TENSION</u>	retractor	retractor

Table 5

SEAT BELT PERFORMANCE ASSESSMENT TEST DATABELT LENGTH DATA:

Belt length from trim panel exit
to bolt hole anchor point for
continuous webbing systems.

DriverPassenger

N/A

N/A

Shoulder belt length as measured
on Part 572 Dummy.

1091 mm

1075 mm

Lap belt length as measured
on Part 572 Dummy.

582 mm

672 mm

SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis.

51 mm

N/A

As determined mechanically.

56 mm

92 mm

BELT STRETCH DATA:

Measured electronically between shoulder
belt load cell and the "D" ring.

N/A

31 mm/M

Measured mechanically.

Figure 3

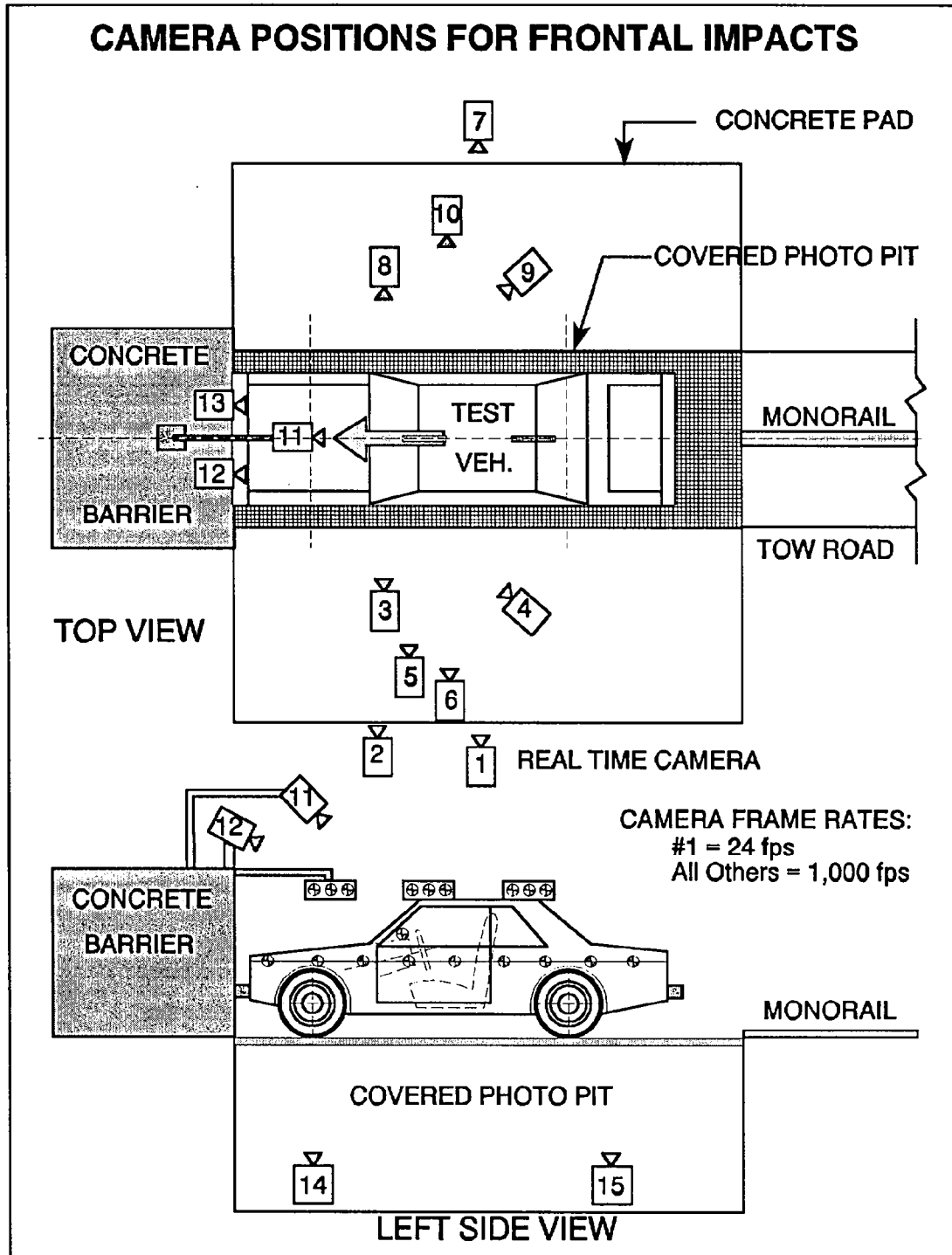


Table 6

HIGH-SPEED CAMERA LOCATIONS

Test No. MP0106		Vehicle: 1993 Chevrolet Camaro 2-Door Hatchback						
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	6452	1067	1092	-4	5996	13	1015
3	Left Side View	8915	1930	1067	-3	8459	25	1015
4	Driver and Interior View	3073	2946	1753	-18	2617	13	1000
5	Steering Column (Bottom)	7061	2159	1168	-5	6605	25	1000
6	Steering Column (Top)	7061	2159	1778	-10	6605	25	1005
7	Left Belt	----	----	----	----	----	8	500
8	Overall Right Side	6426	1676	1092	0	5970	13	520
9	Right Side View	8661	2159	1041	0	8205	35	550
10	Right Passenger View	7976	2057	1422	-5	7520	25	1015
11	Passenger and Interior View	3023	3175	1753	-20	2567	13	1005
12	Right Belt	----	----	----	----	----	8	N.T.
13	Passenger Front View	610	-127	1778	-34	----	13	1000
14	Driver Front View	610	-127	1778	-35	----	13	995
15	Windshield View	0	0	3048	-45	----	13	1080
16	Pit View of Engine	0	508	-3048	90	----	13	740
17	Pit View of Fuel Tank	0	3432	-3048	90	----	13	725

*X = film plane to monorail centerline

** = referenced to horizontal plane

Y = film plane to impact location

N.T. indicates No Timing

Z = film plane to ground

Figure 4

VEHICLE TARGET LOCATIONS

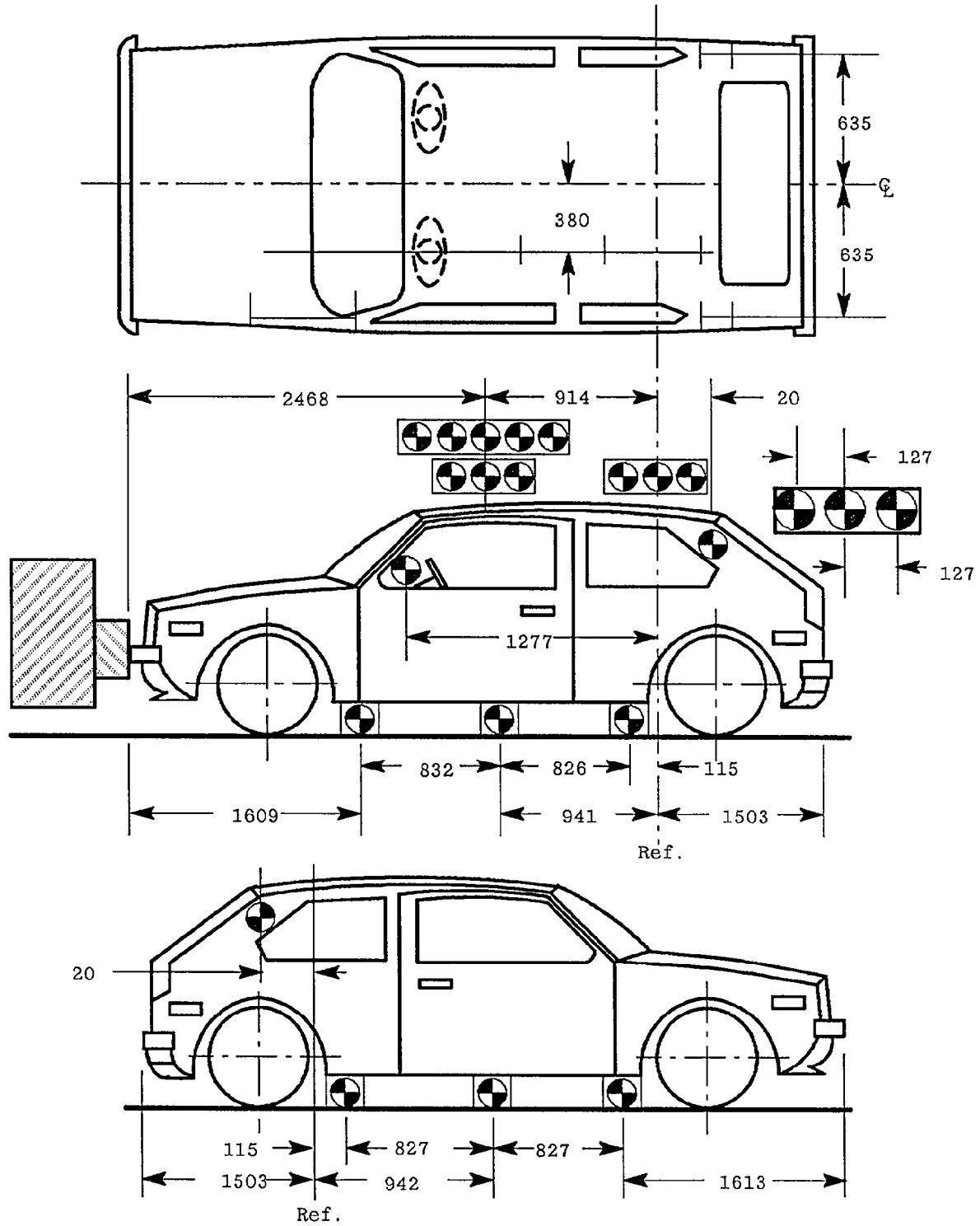
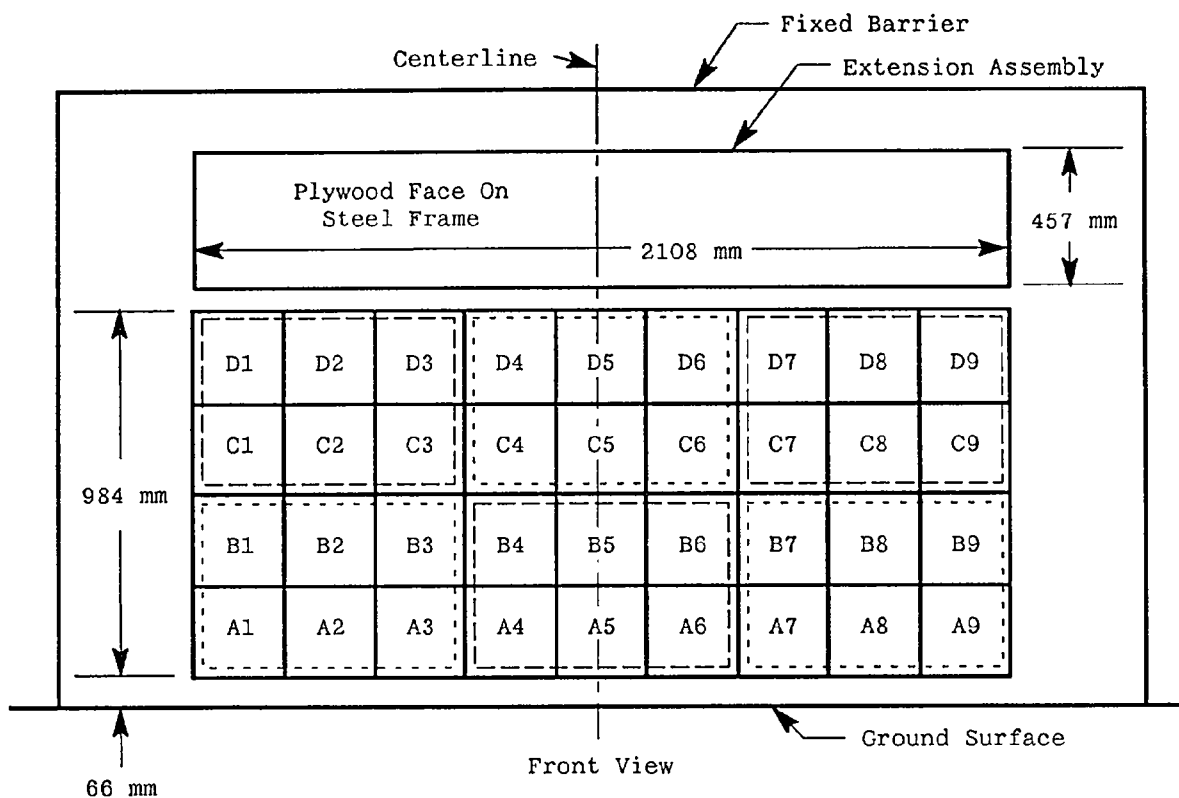


Figure 5

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

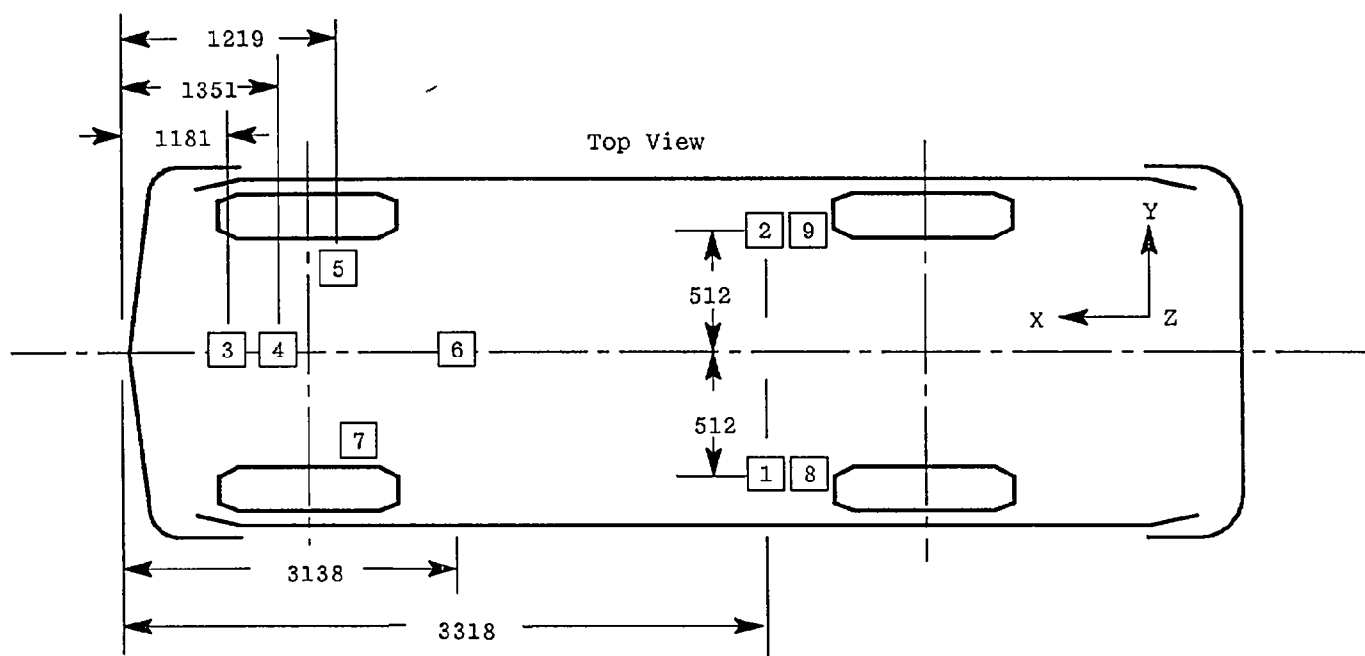
Group 4 C1 thru D3	Group 5 C4 thru D6	Group 6 C7 thru D9
Group 1 A1 thru B3	Group 2 A4 thru B6	Group 3 A7 thru B9

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



All dimensions are in millimeters

All dimensions are in millimeters

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

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

Figure 7

TEST VEHICLE MEASUREMENTS

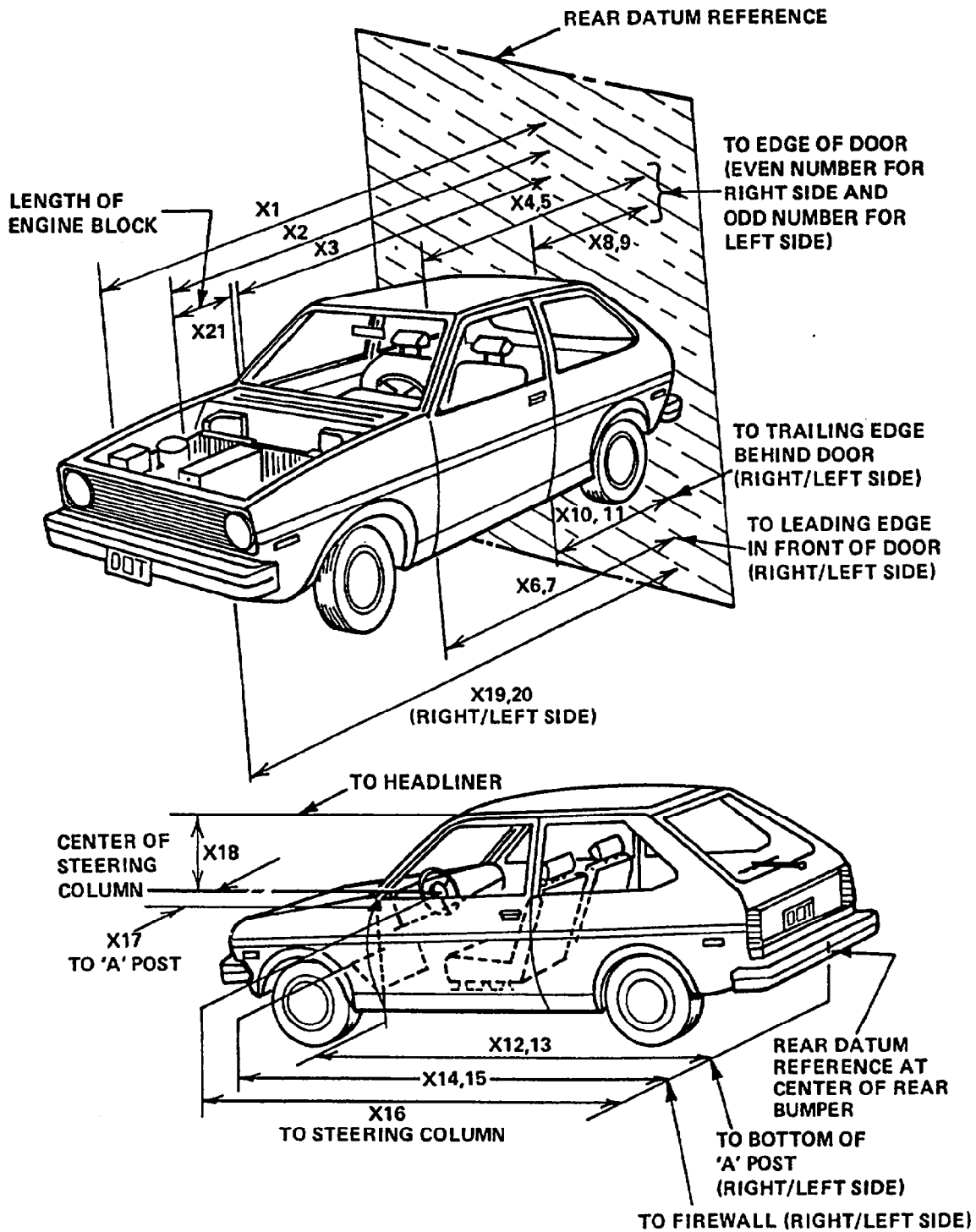


Table 7

VEHICLE MEASUREMENTS

No.		All Dimensions in mm		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	4885	4385	500
X2	Rear Surface of Vehicle to Front of Engine	3885	3687	198
X3	Rear Surface of Vehicle to Firewall	3335	3240	95
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	3087	3100	-13
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	3107	3085	22
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	3088	3065	23
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	3100	3058	42
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	1735	1732	3
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	1748	1754	-6
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	1770	1735	35
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	1772	1738	34
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	3175	3137	38
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	3180	3145	35
X14	Rear Surface of Vehicle to Firewall, Right Side	3330	3260	70
X15	Rear Surface of Vehicle to Firewall, Left Side	3355	3340	15
X16	Rear Surface of Vehicle to Steering Column	2625	2600	25
X17	Center of Steering Column to "A" Post	380	400	-20
X18	Center of Steering Column to Headliner	385	420	-35
X19	Rear Surface of Vehicle to Right Side of Front Bumper	4615	4195	420
X20	Rear Surface of Vehicle to Left Side of Front Bumper	4600	4085	515
X21	Length of Engine Block	700	700	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	2820	2730	90
CD	Rear Surface of Vehicle to Center of Dash Panel	2825	2730	95
LD	Rear Surface of Vehicle to Left Side of Dash Panel	2825	2765	60

Table 8

ACCIDENT INVESTIGATION DIVISION DATA
FOR 56.3 KPH FRONTAL BARRIER IMPACT

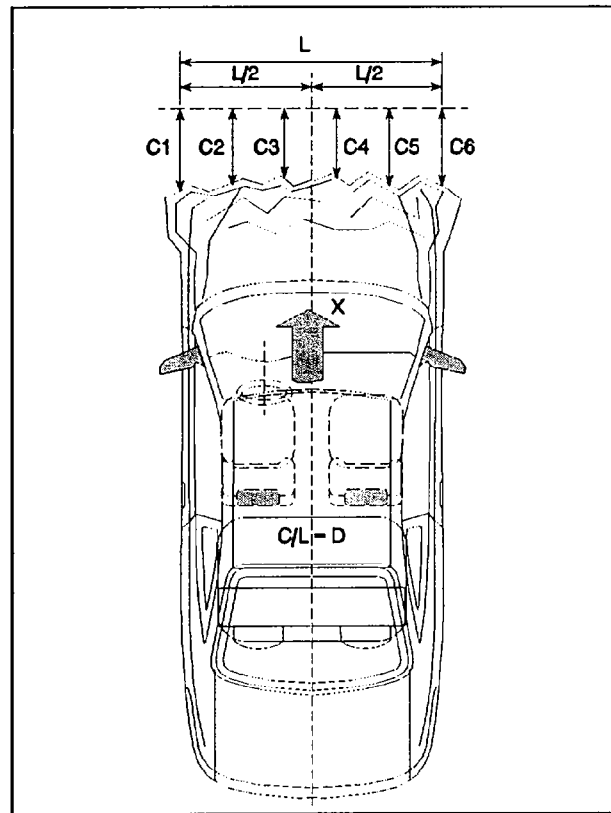
Vehicle Make/Model/Body Style: 1993 Chevrolet Camaro 2-Door Hatchback
 Vehicle NHTSA No.: MP0106 VIN: 2G1FP225XP2127971
 Model Year: 1993 Build Date: 6/93 Test Date: 8/24
 Vehicle Size Category: Mid-size Test Weight: 1738 Kgs
 Vehicle Wheelbase: 2566 mm; Front Overhang: 1613 mm; Overall Width: 1883 mm
 Collision Deformation Classification (CDC) Code: 12 FDEW2

Crush Depth Dimensions:

C1 = 415 mm
 C2 = 475 mm
 C3 = 505 mm
 C4 = 463 mm
 C5 = 485 mm
 C6 = 522 mm

Midpoint of Damage: D = Vehicle Centerline
(Longitud.)

Length of Damaged Region: L = 1883 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.

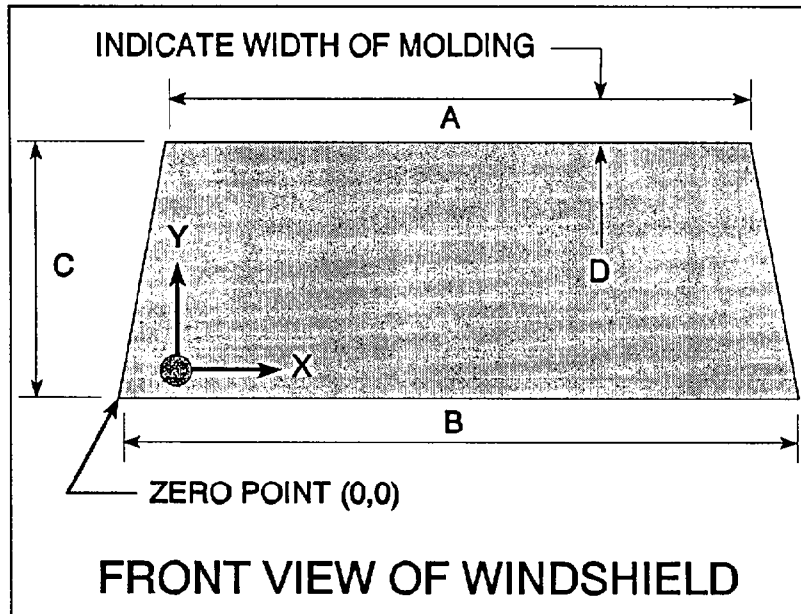
FMVSS 212 REQUIREMENTS:

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	2320	2320	100
LEFT SIDE	2320	2320	100
TOTAL	4640	4640	100

AREA OF RETENTION FAILURE:



DIMENSIONS	
A	1250
B	1930
C	730
D	20

FAILURE DETAILS: NONE

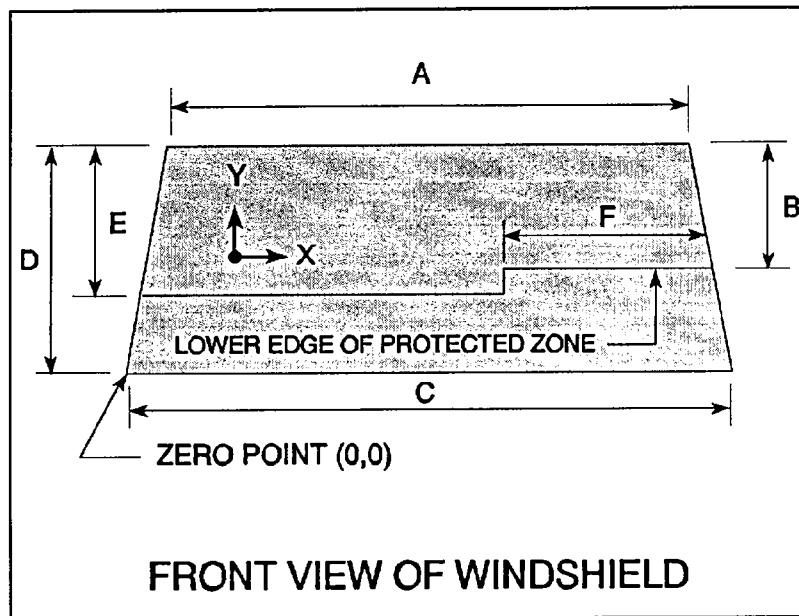
Figure 9

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	1250
B	400
C	1930
D	730
E	516
F	666

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.		

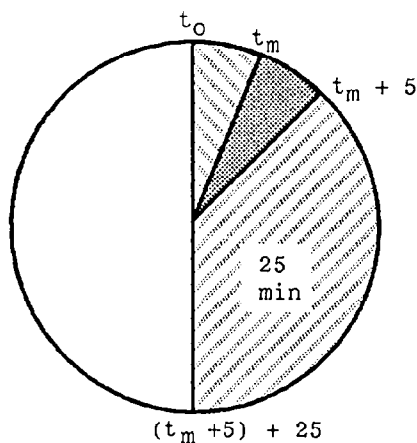
Table 10

FMVSS NO. 301-75 "FUEL SYSTEM INTEGRITY" POST IMPACT TEST DATATEST VEHICLE NHTSA NO.: MP0106TEST DATE: 8/24/93Vehicle Make/Model: 1993 Chevrolet Camaro 2-Door Hatchback

The test vehicle was filled from 92% to 94% of the manufacture's "usable" capacity. The electric fuel pump was operating if it will operate without engine operation. Two Part 572 anthropomorphic test devices were located at each of the front designated seating positions.

=====

TEST VEHICLE IMPACT TYPE: X Frontal (35 mph)
Oblique (30 mph) with _____ deg. barrier face first
(driver/passenger) side
Rear Moving Barrier (30 mph)
Lateral Moving Barrier (20 mph)

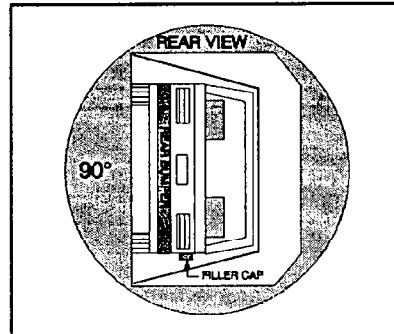
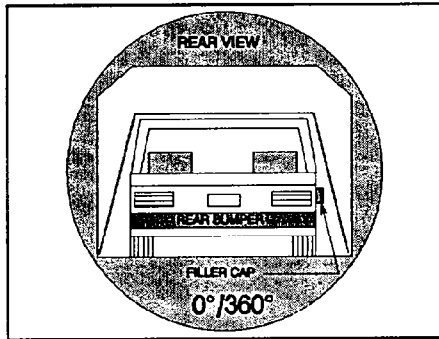
FUEL SPILLAGE MEASUREMENT:

1. From impact until vehicle motion ceases
2. For 5 minute period after vehicle motion ceases
3. For next 25 minutes

ACTUAL	MAX ALLOWED
0	1 oz
0	5 oz
0	1 oz/min

SOLVENT SPILLAGE DETAILS: None

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEETTEST PHASE:Vehicle NHTSA ID No.
MP0106I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)

<u>2</u>	minutes	<u>50</u>	seconds
----------	---------	-----------	---------

FMVSS 301 Position Hold Time +

<u>5</u>	minutes	<u>00</u>	seconds
----------	---------	-----------	---------

TOTAL

<u>7</u>	minutes	<u>50</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
----------	---------	---------	---------

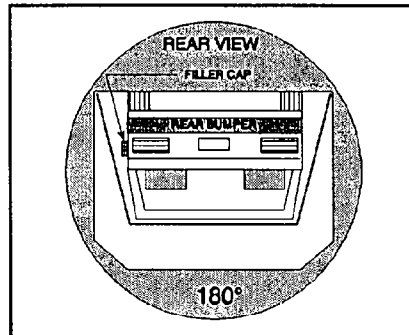
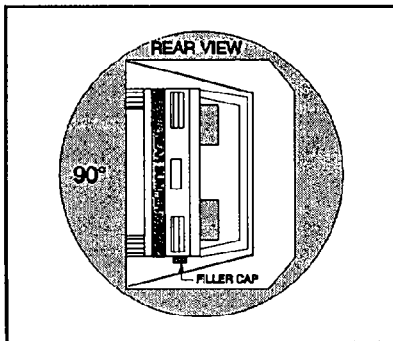
III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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.
MP0106**I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:**Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)2

minutes

50

seconds

FMVSS 301 Position Hold Time +

5

minutes

00

seconds

TOTAL7

minutes

50

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
----------	---------	---------	---------

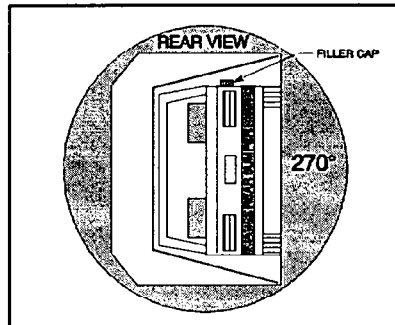
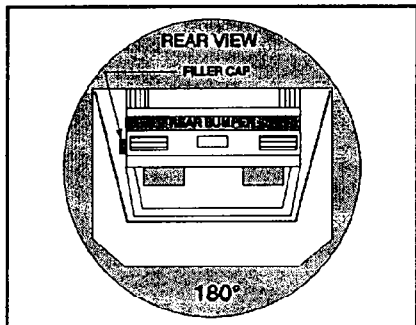
III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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 SHEETTEST PHASE:Vehicle NHTSA ID No.
MP0106I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)

2	minutes	45	seconds
---	---------	----	---------

FMVSS 301 Position Hold Time +

5	minutes	00	seconds
---	---------	----	---------

TOTAL

7	minutes	45	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
----------	---------	---------	---------

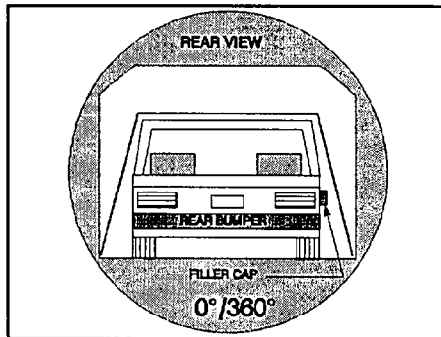
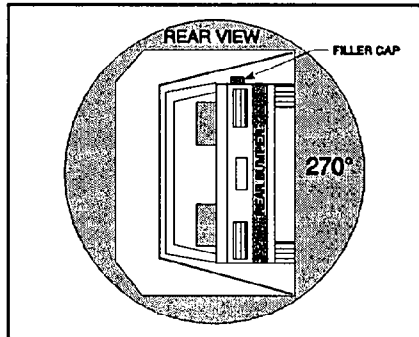
III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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 SHEETTEST PHASE:Vehicle NHTSA ID No.
MP0106I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)

2	minute	45	seconds
---	--------	----	---------

FMVSS 301 Position Hold Time +

5	minutes	00	seconds
---	---------	----	---------

TOTAL

7	minutes	45	seconds
---	---------	----	---------

Next whole minute interval

8	minutes	0.0	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

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A-1	LOAD CELL LOCATIONS.....	A-3
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A-3	POST TEST FRONT VIEW.....	A-5
A-4	PRE-TEST LEFT SIDE VIEW.....	A-6
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A-23	POST TEST DRIVER POSITION VIEW.....	A-25
A-24	PRE-TEST PASSENGER POSITION VIEW.....	A-26
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A-29	POST TEST PASSENGER AND INTERIOR VIEW.....	A-31
A-30	PRE-TEST DRIVER HEAD LOCATION.....	A-32
A-31	PRE-TEST PASSENGER HEAD LOCATION.....	A-33
A-32	IMPACT VIEW.....	A-34

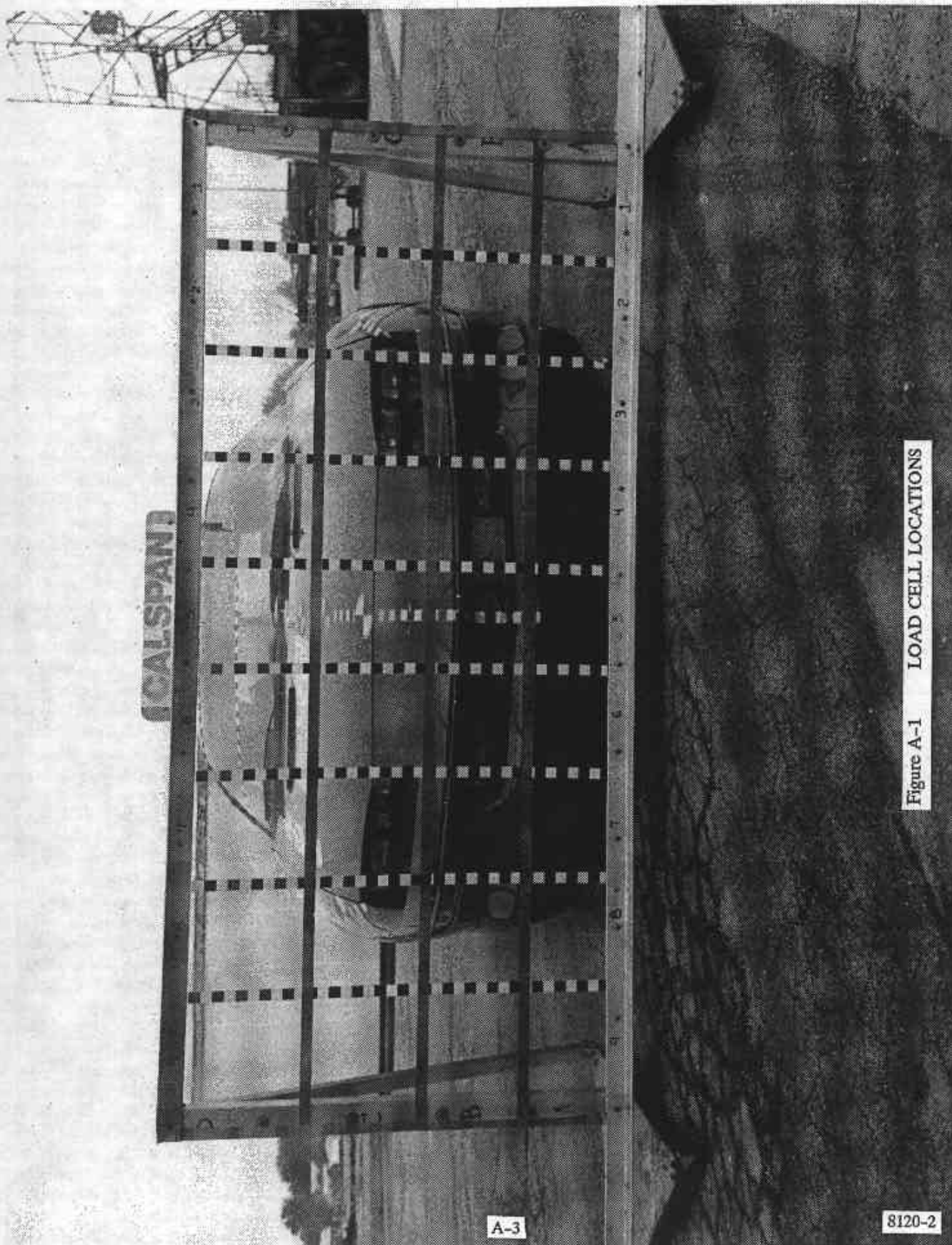


Figure A-1 LOAD CELL LOCATIONS



Figure A-2 PRE-TEST FRONT VIEW

A-4

8120-2



Figure A-3 POST TEST FRONT VIEW

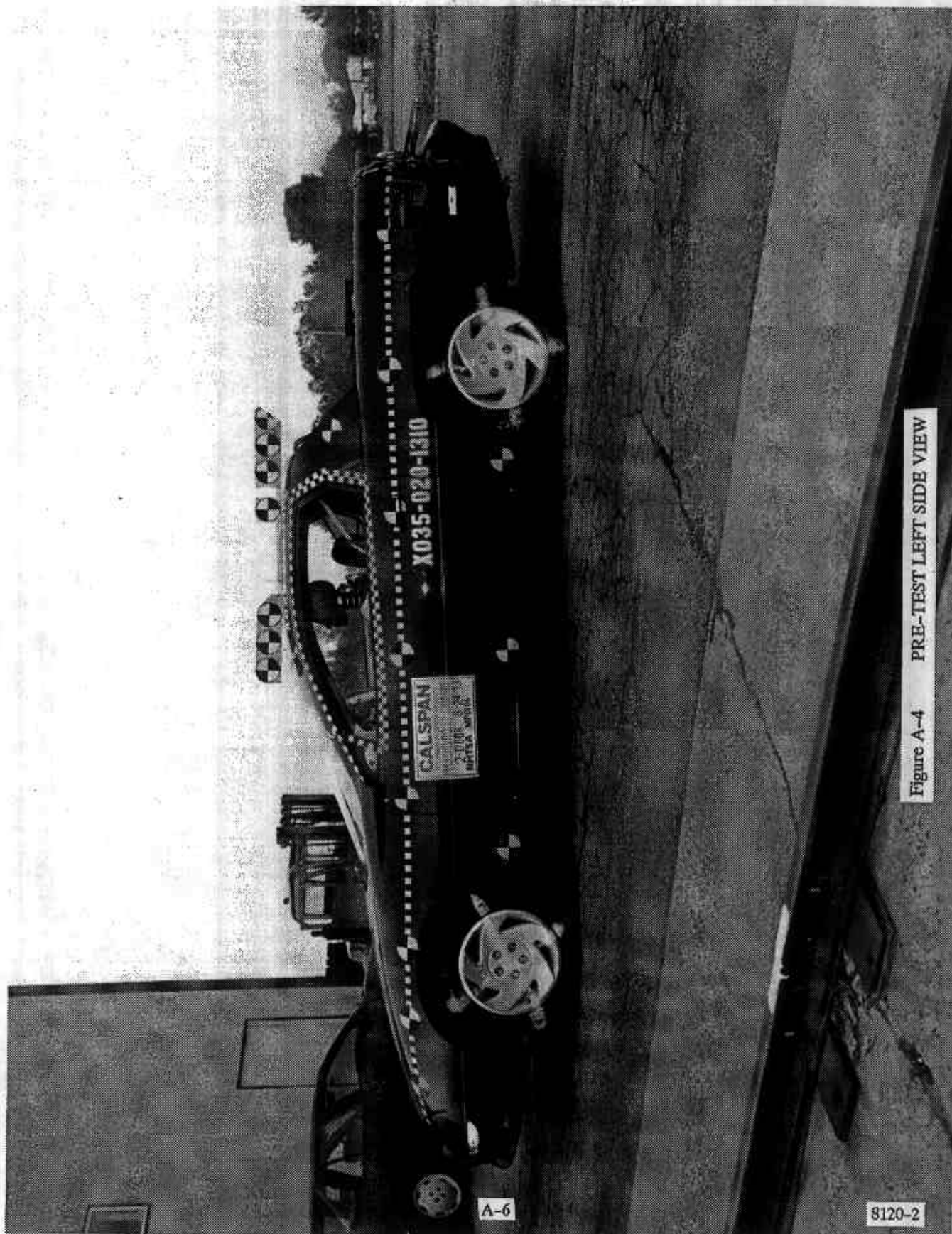


Figure A-4 PRE-TEST LEFT SIDE VIEW

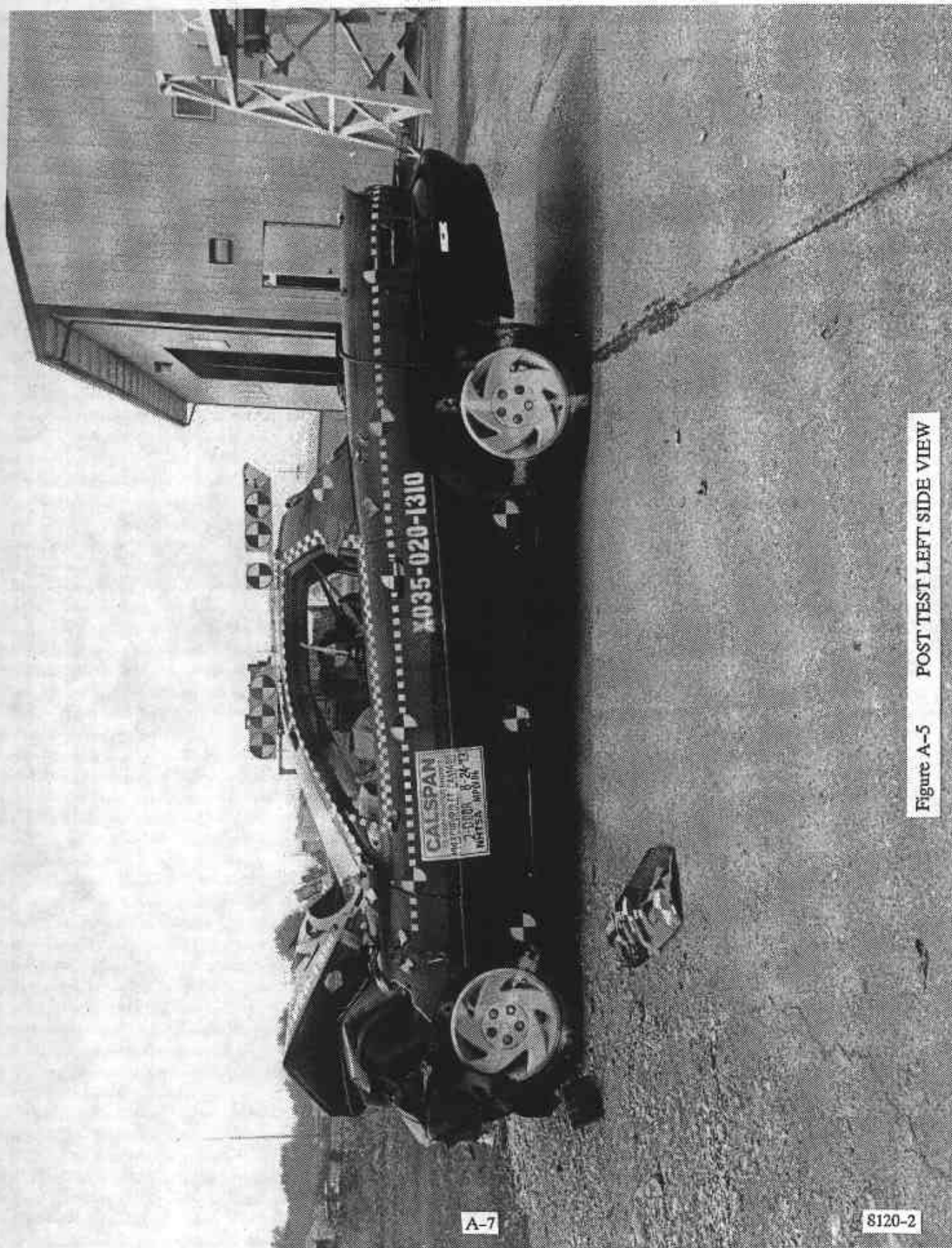


Figure A-5 POST TEST LEFT SIDE VIEW

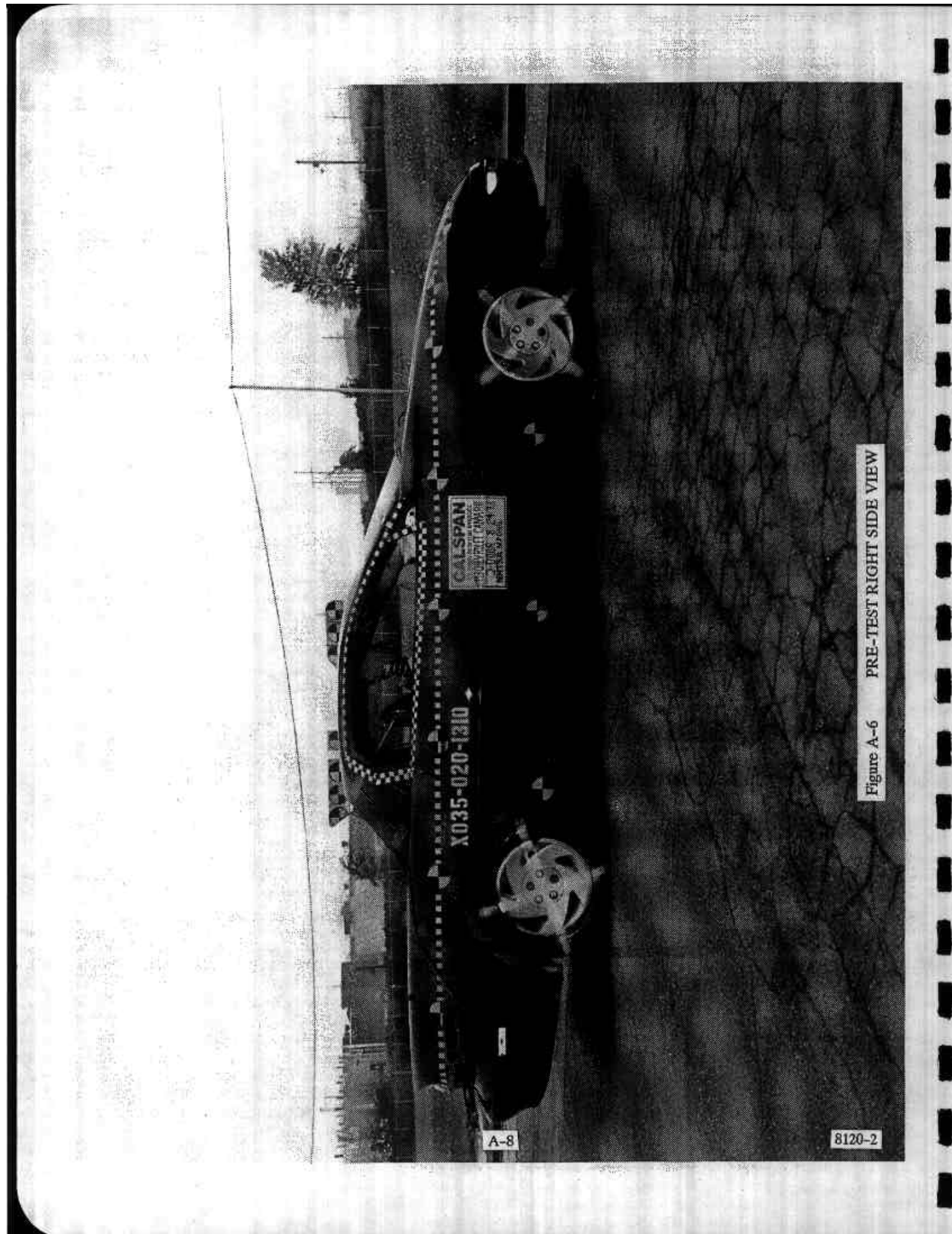


Figure A-6 PRE-TEST RIGHT SIDE VIEW

A-8

8120-2

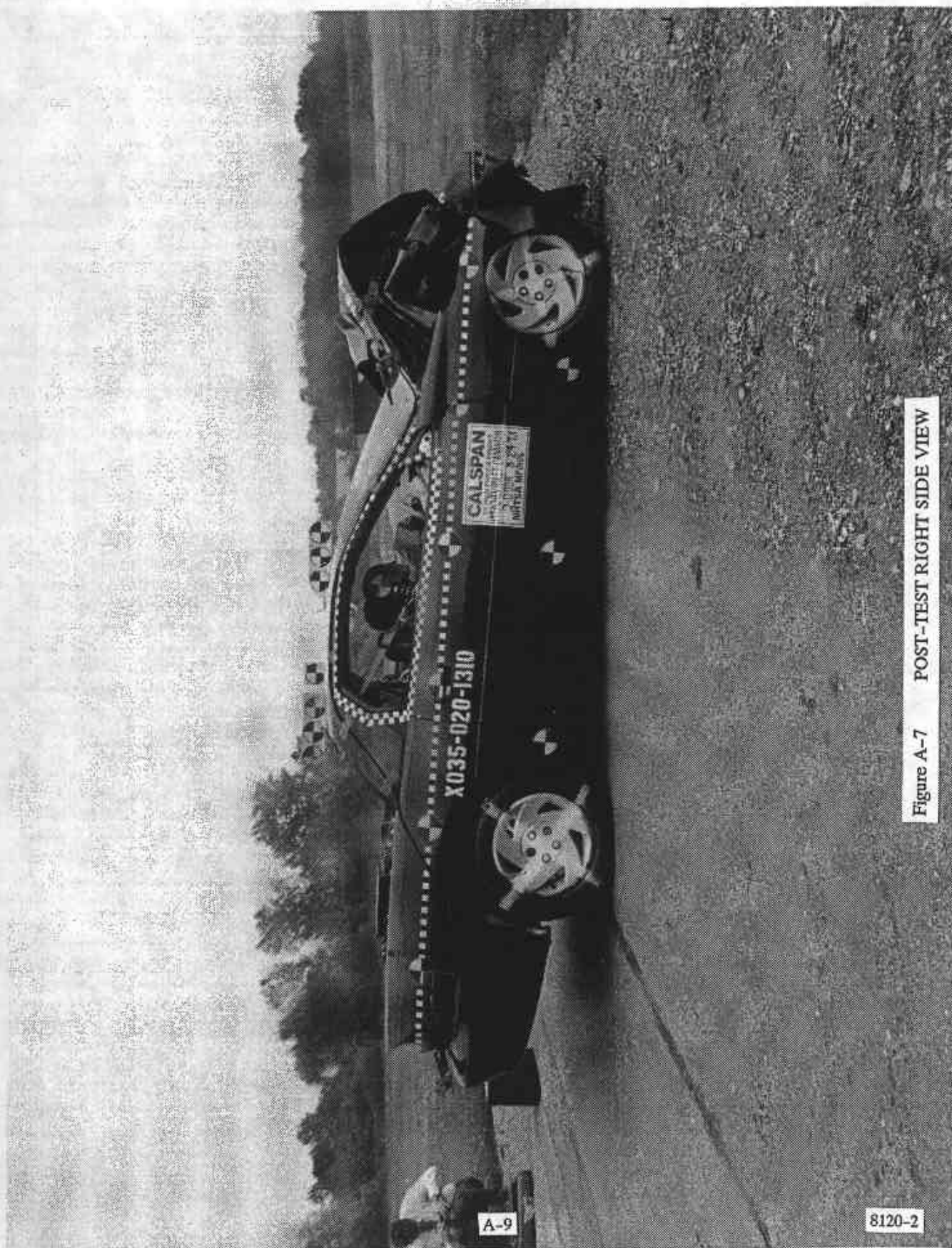


Figure A-7 POST-TEST RIGHT SIDE VIEW

A-9

8120-2



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

A-10

8120-2



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

A-11

8120-2



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



Figure A-11 POST TEST LEFT REAR THREE-QUARTER VIEW

A-13

8120-2

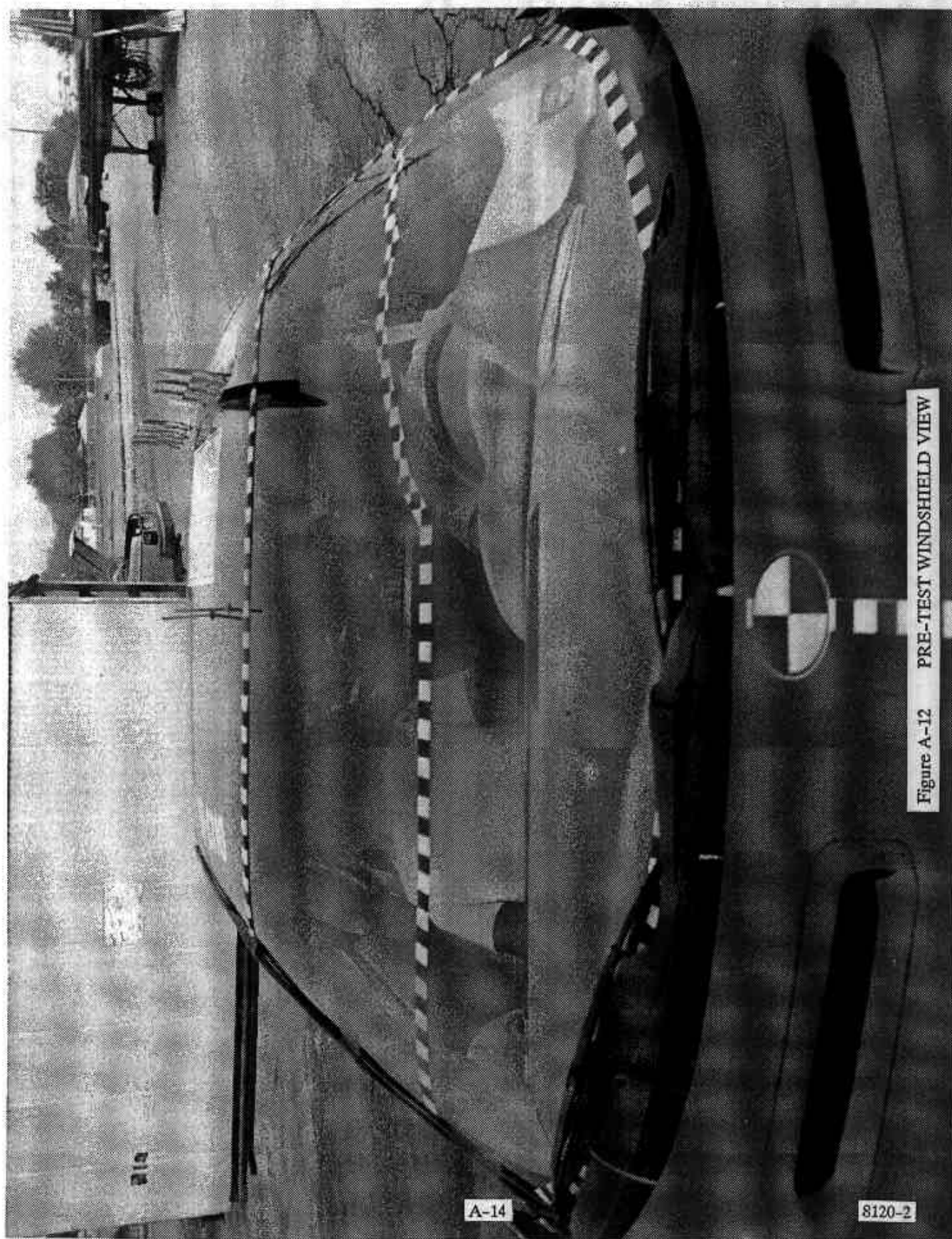


Figure A-12 PRE-TEST WINDSHIELD VIEW

A-14

8120-2



Figure A-13 POST TEST WINDSHIELD VIEW

A-15

8120-2



Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

A-16

8120-2

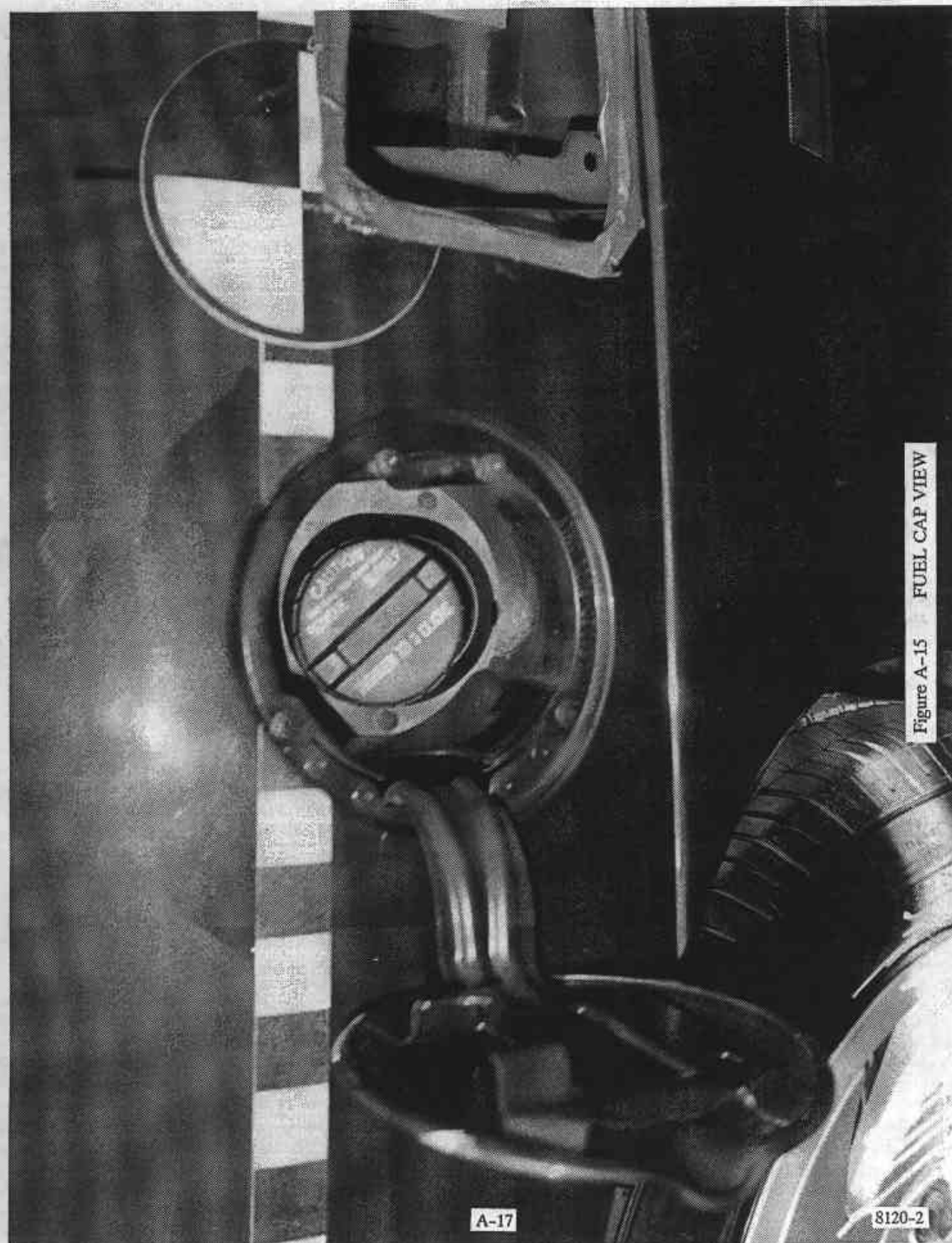


Figure A-15 FUEL CAP VIEW

A-17

8120-2

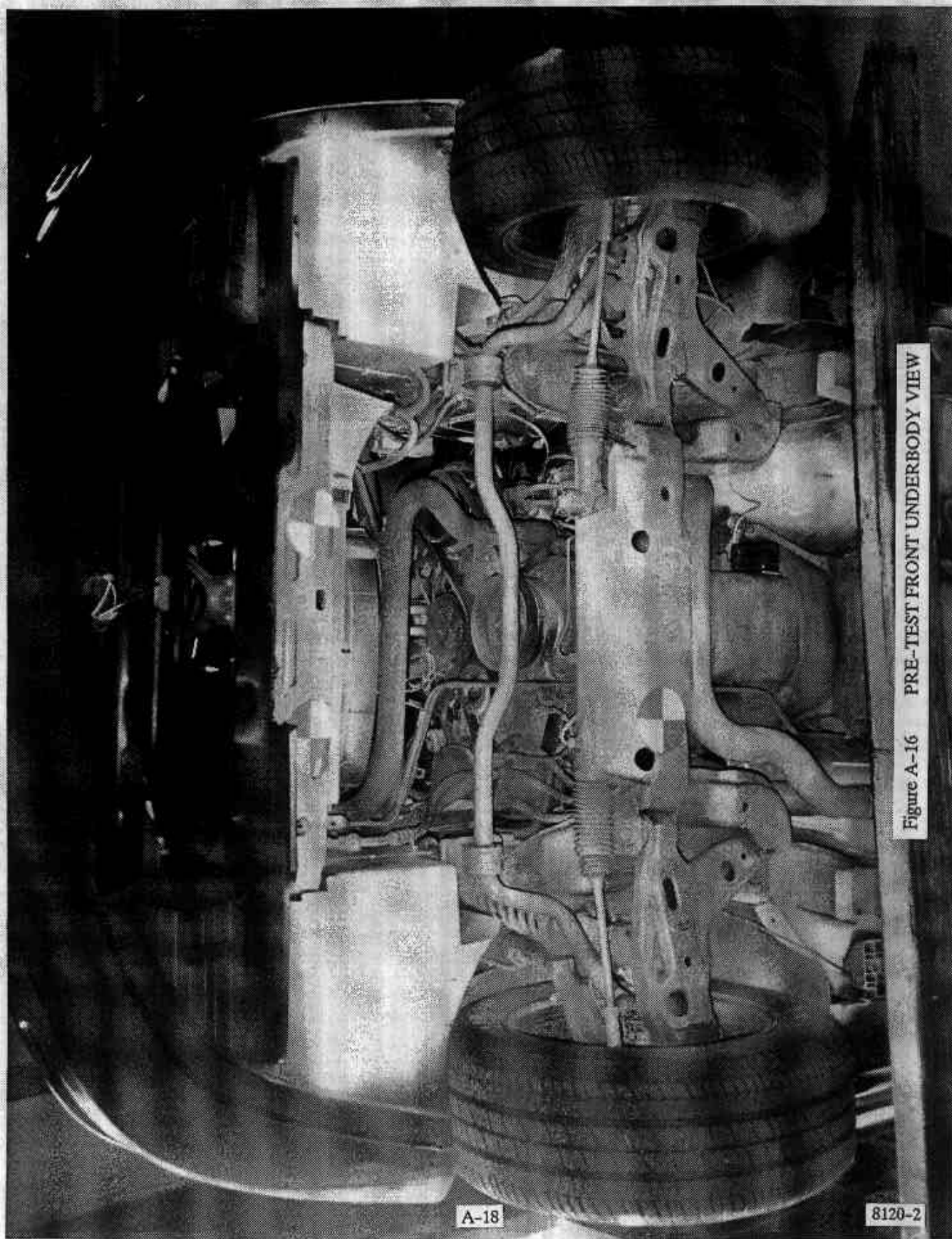


Figure A-16 PRE-TEST FRONT UNDERBODY VIEW

A-18

8120-2

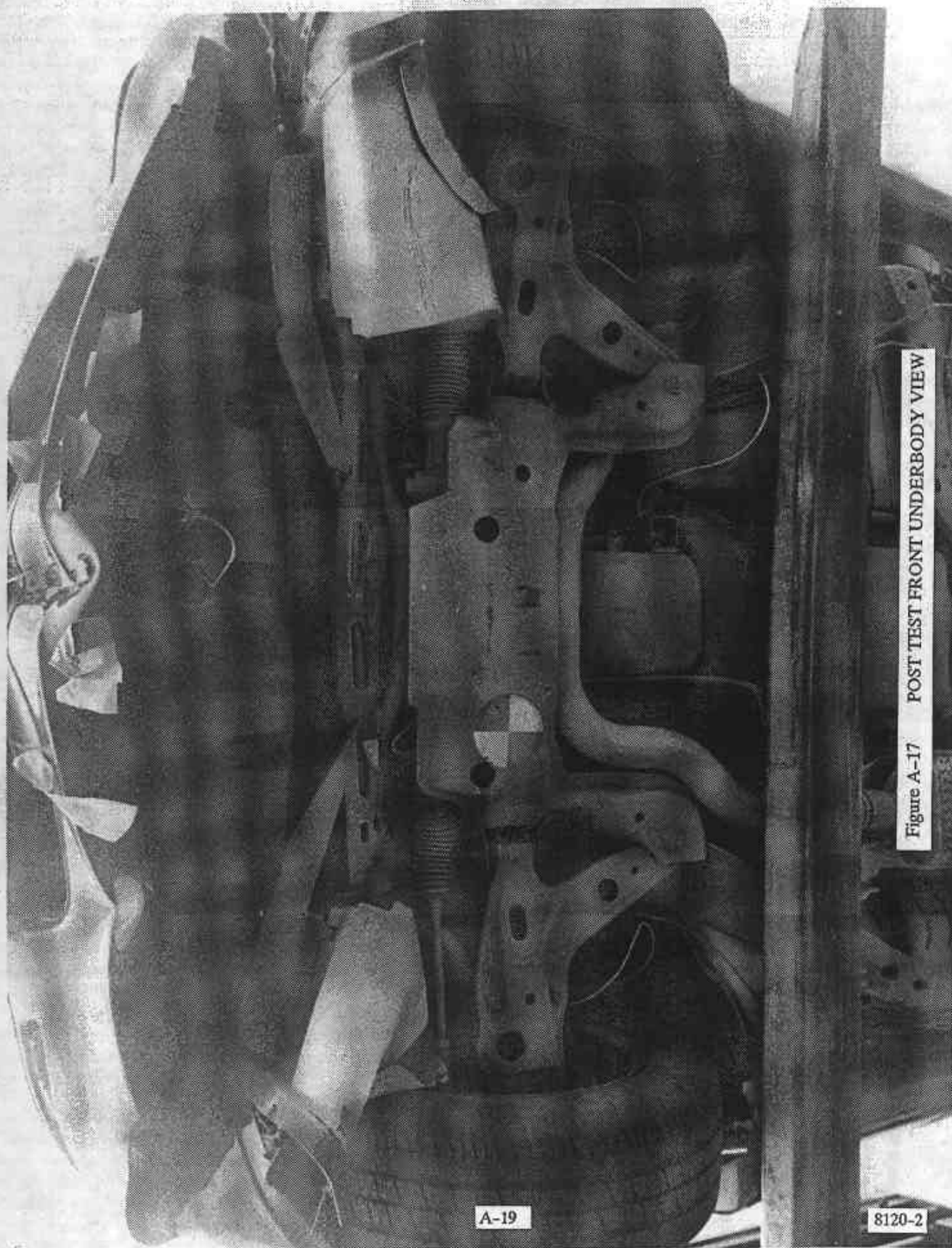


Figure A-17 POST TEST FRONT UNDERBODY VIEW

A-19

8120-2

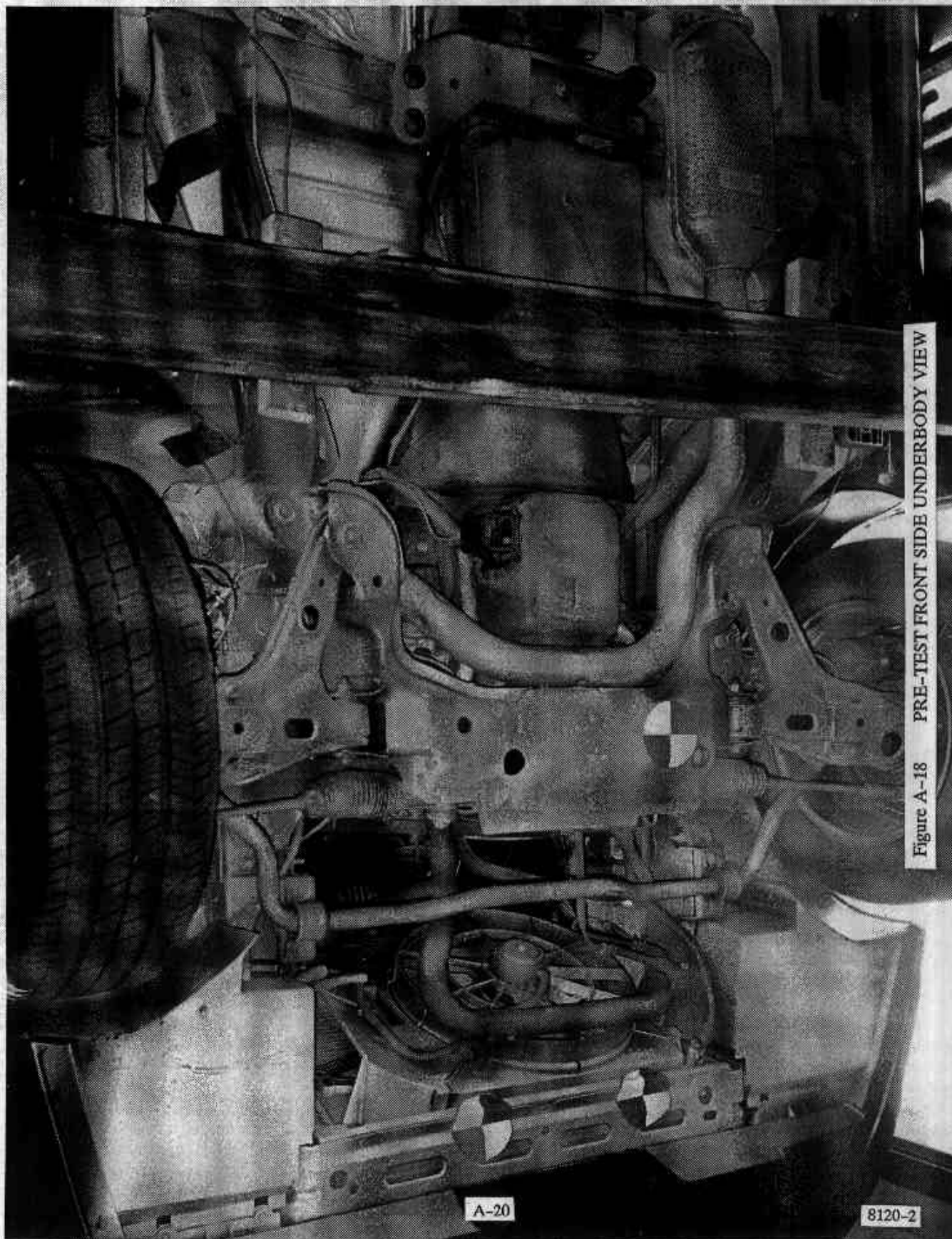


Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW

A-20

8120-2

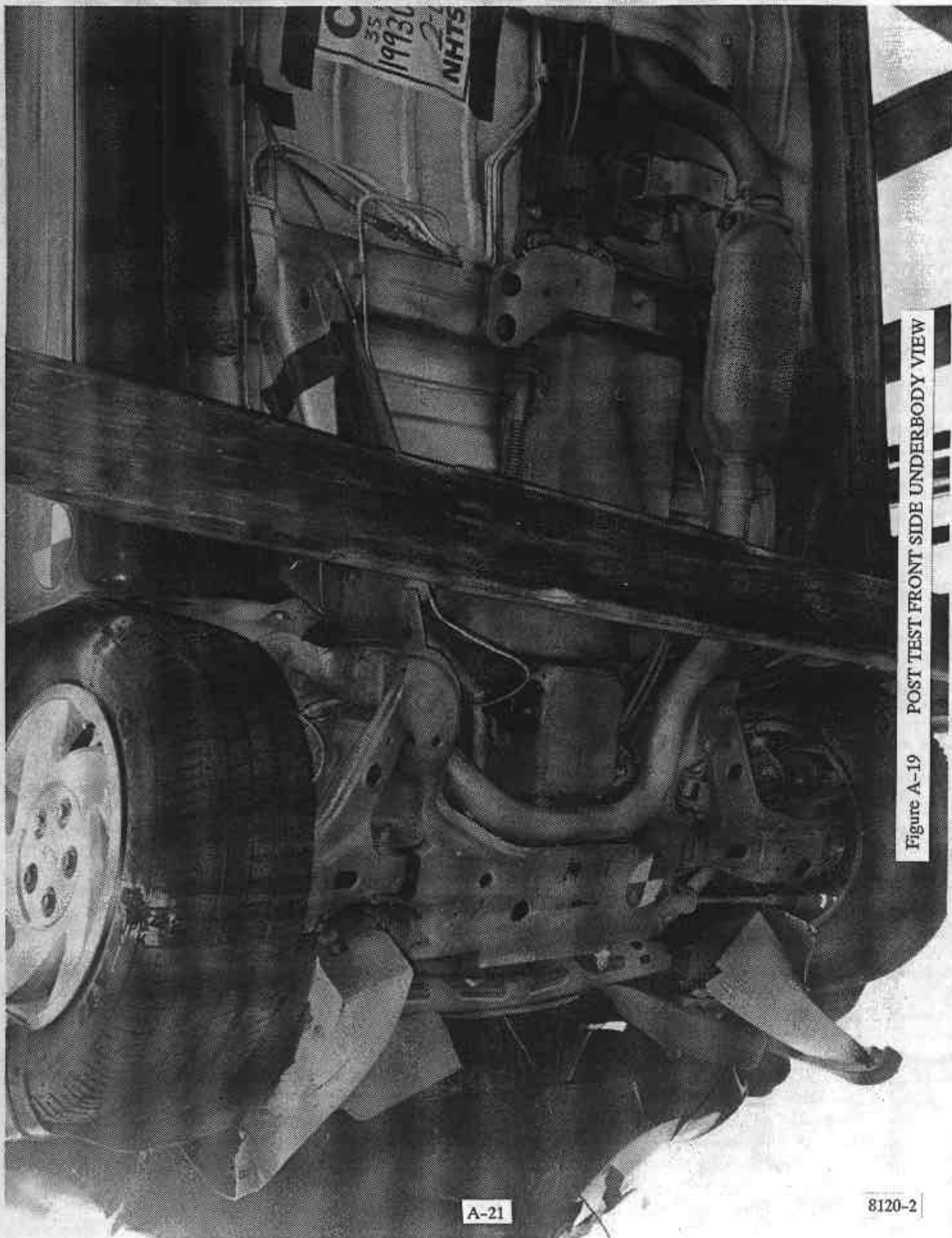


Figure A-19 POST TEST FRONT SIDE UNDERBODY VIEW

A-21

8120-2

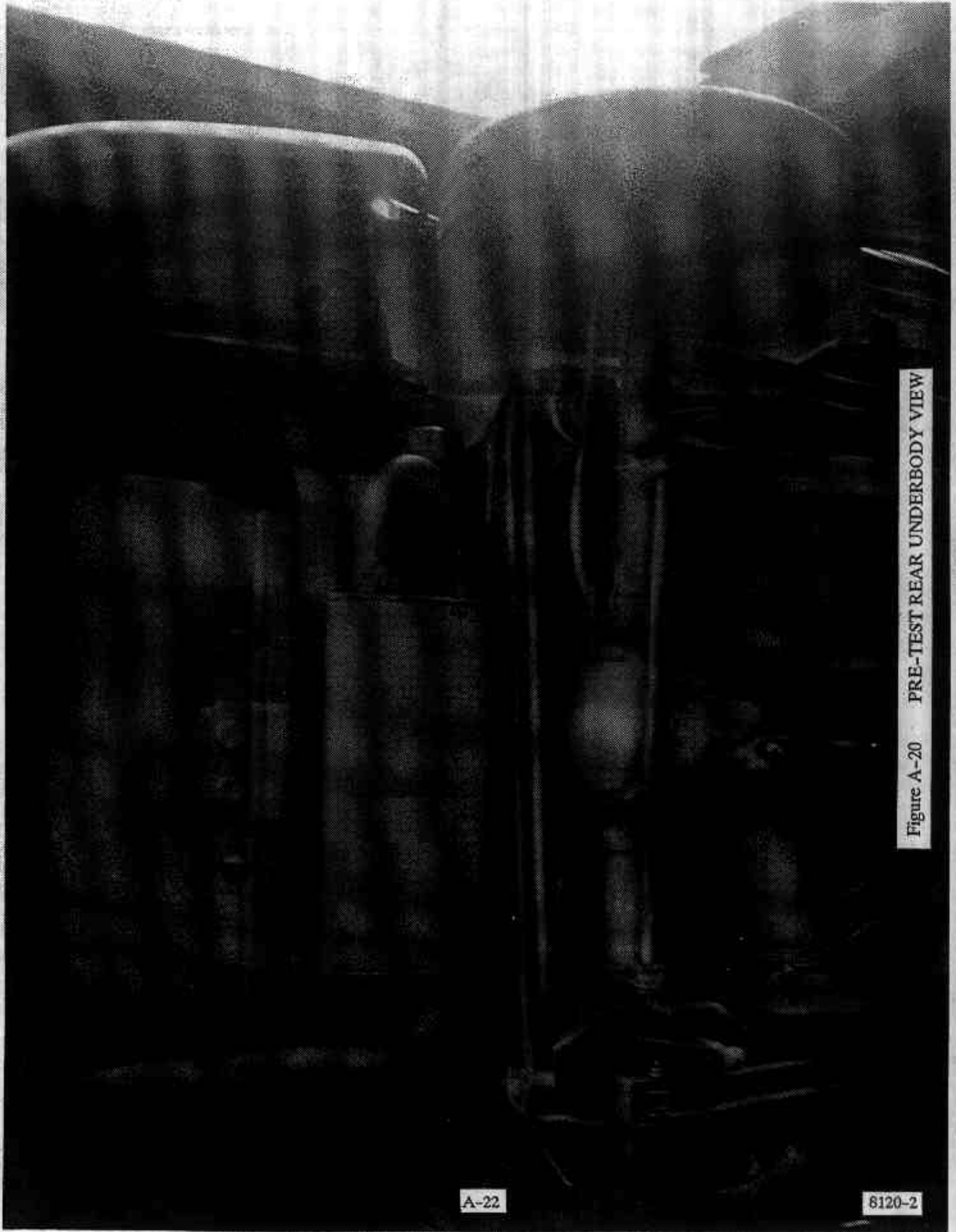


Figure A-20 PRE-TEST REAR UNDERBODY VIEW

A-22

8120-2

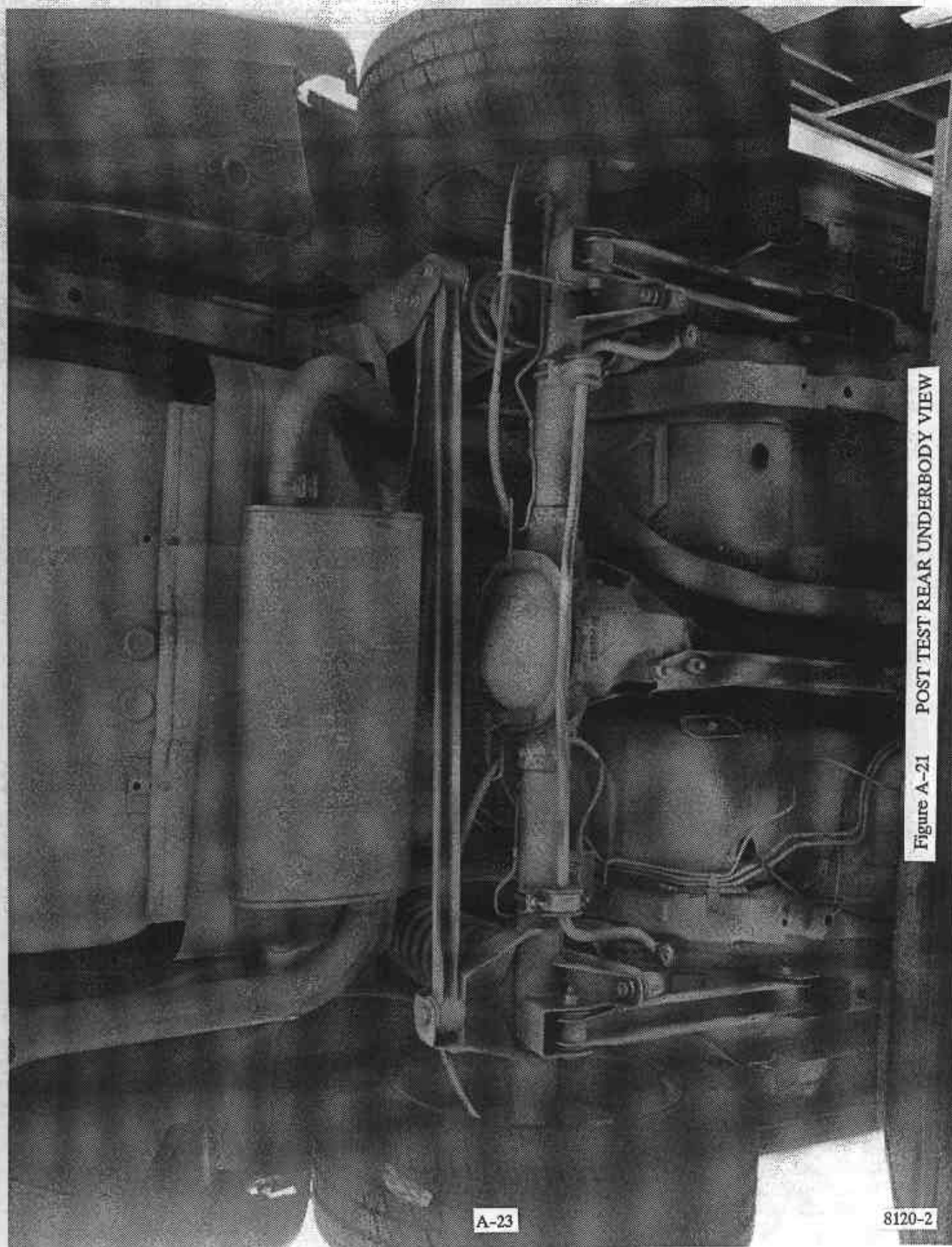


Figure A-21 POST TEST REAR UNDERBODY VIEW

A-23

8120-2

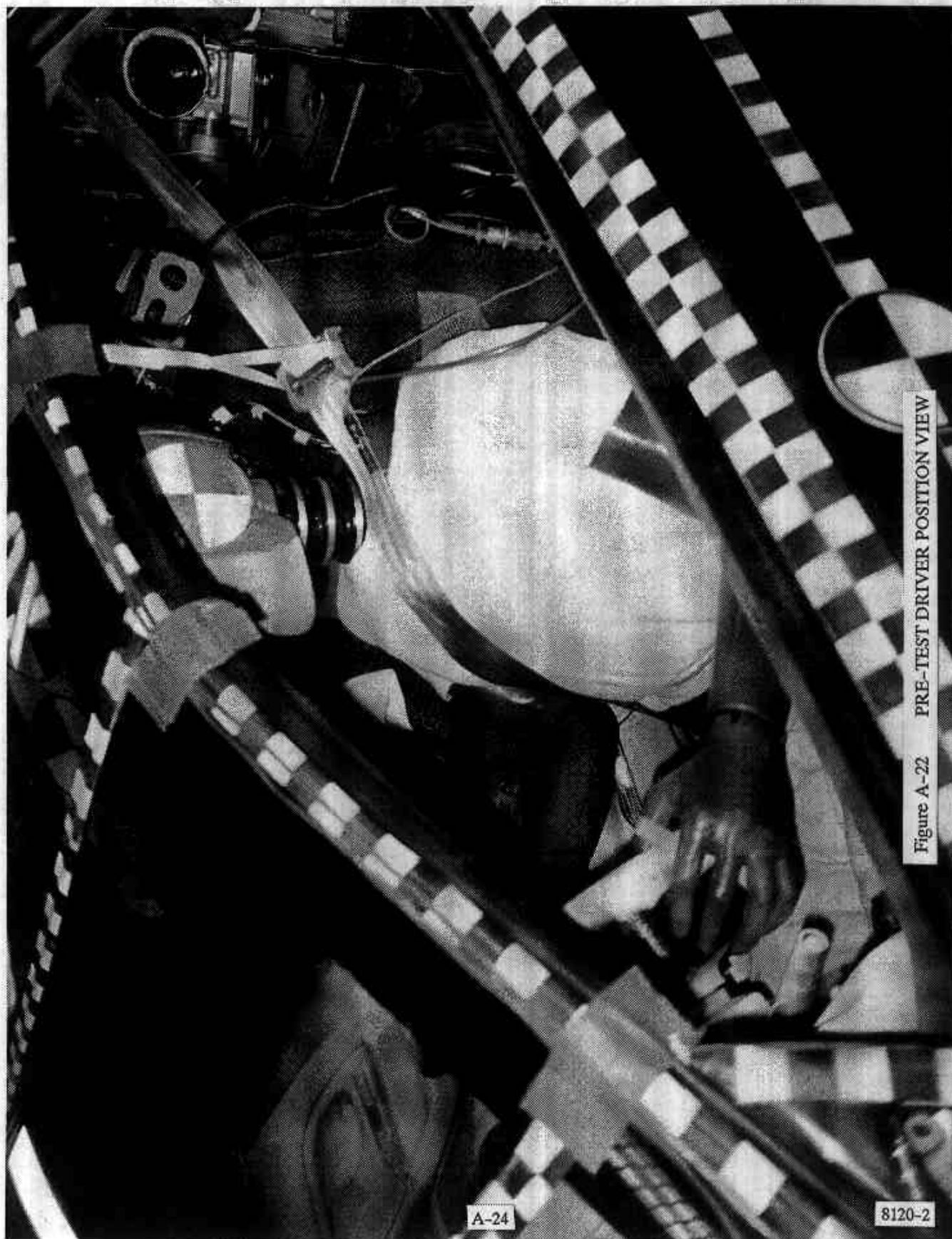


Figure A-22 PRE-TEST DRIVER POSITION VIEW

A-24

8120-2

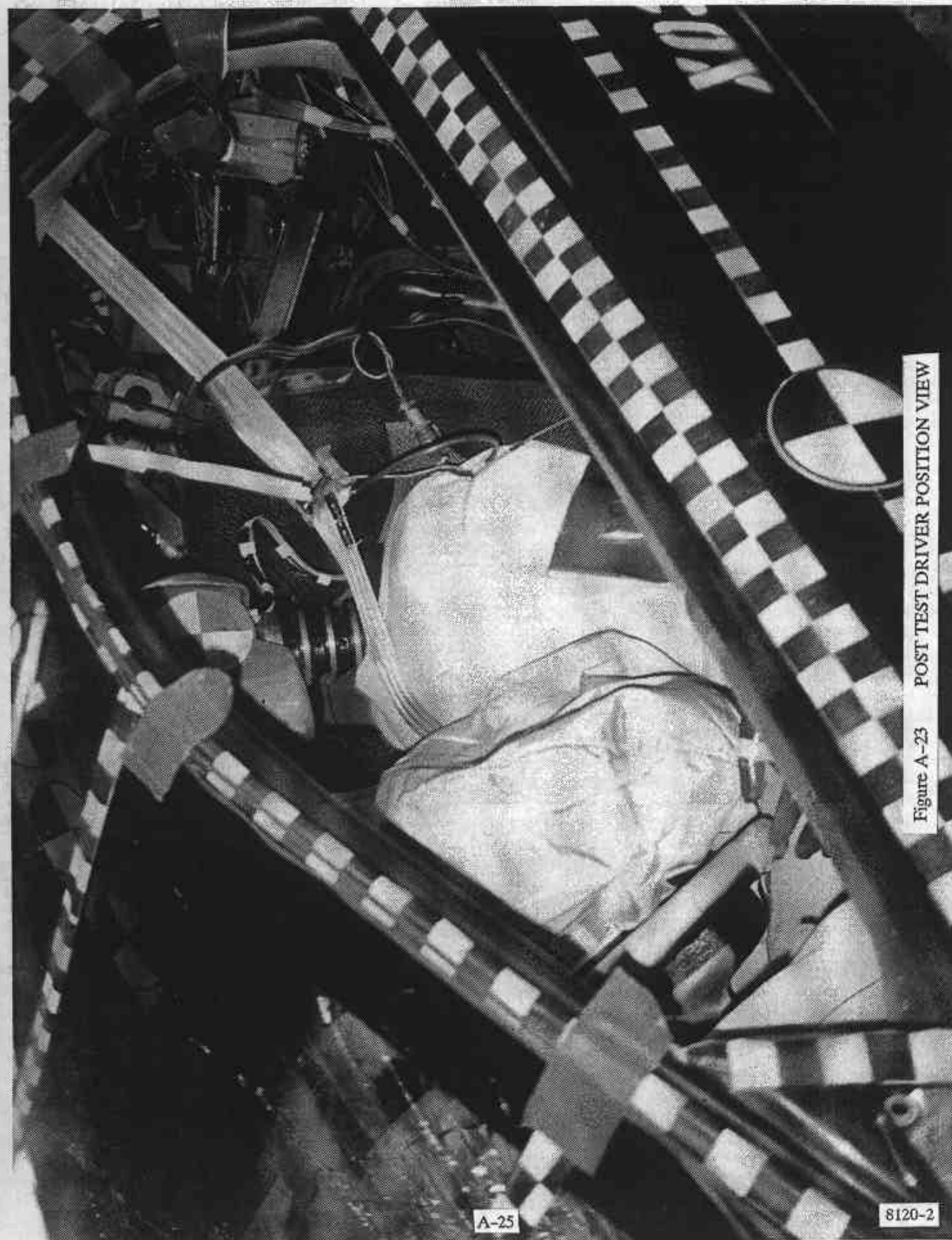


Figure A-23 POST TEST DRIVER POSITION VIEW

A-25

8120-2

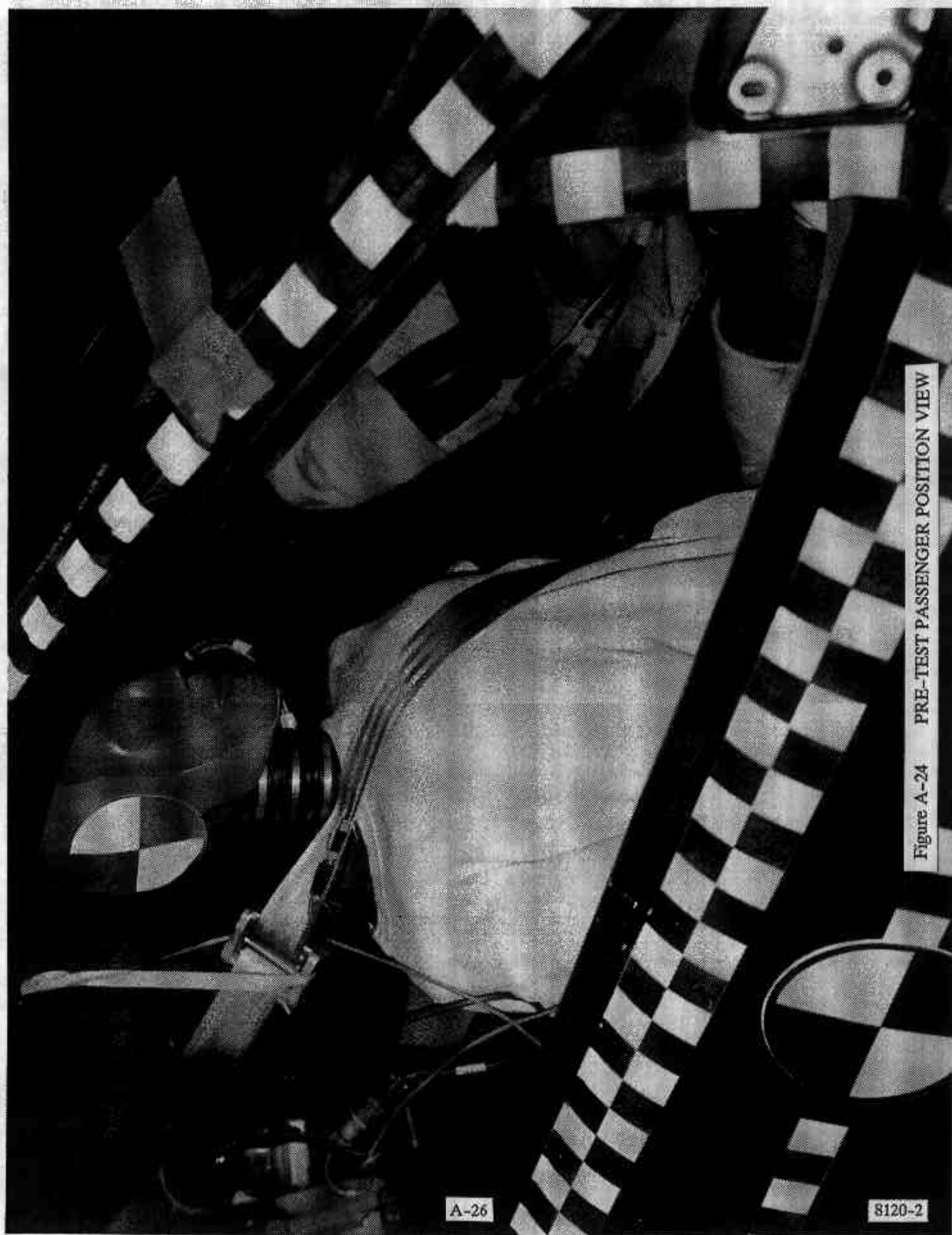


Figure A-24 PRE-TEST PASSENGER POSITION VIEW

A-26

8120-2



Figure A-25 POST TEST PASSENGER POSITION VIEW

A-27

8120-2

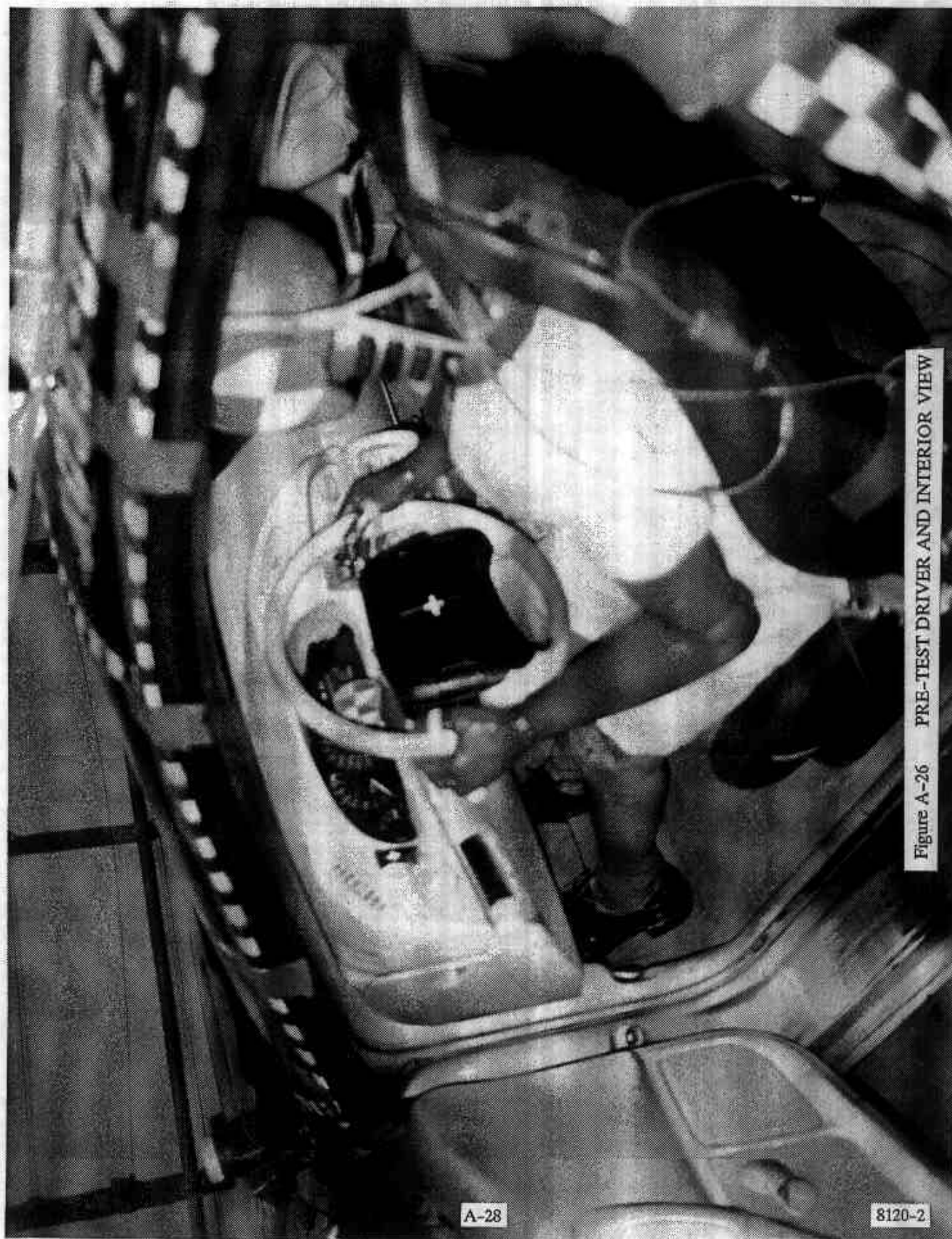


Figure A-26 PRE-TEST DRIVER AND INTERIOR VIEW

A-28

8120-2

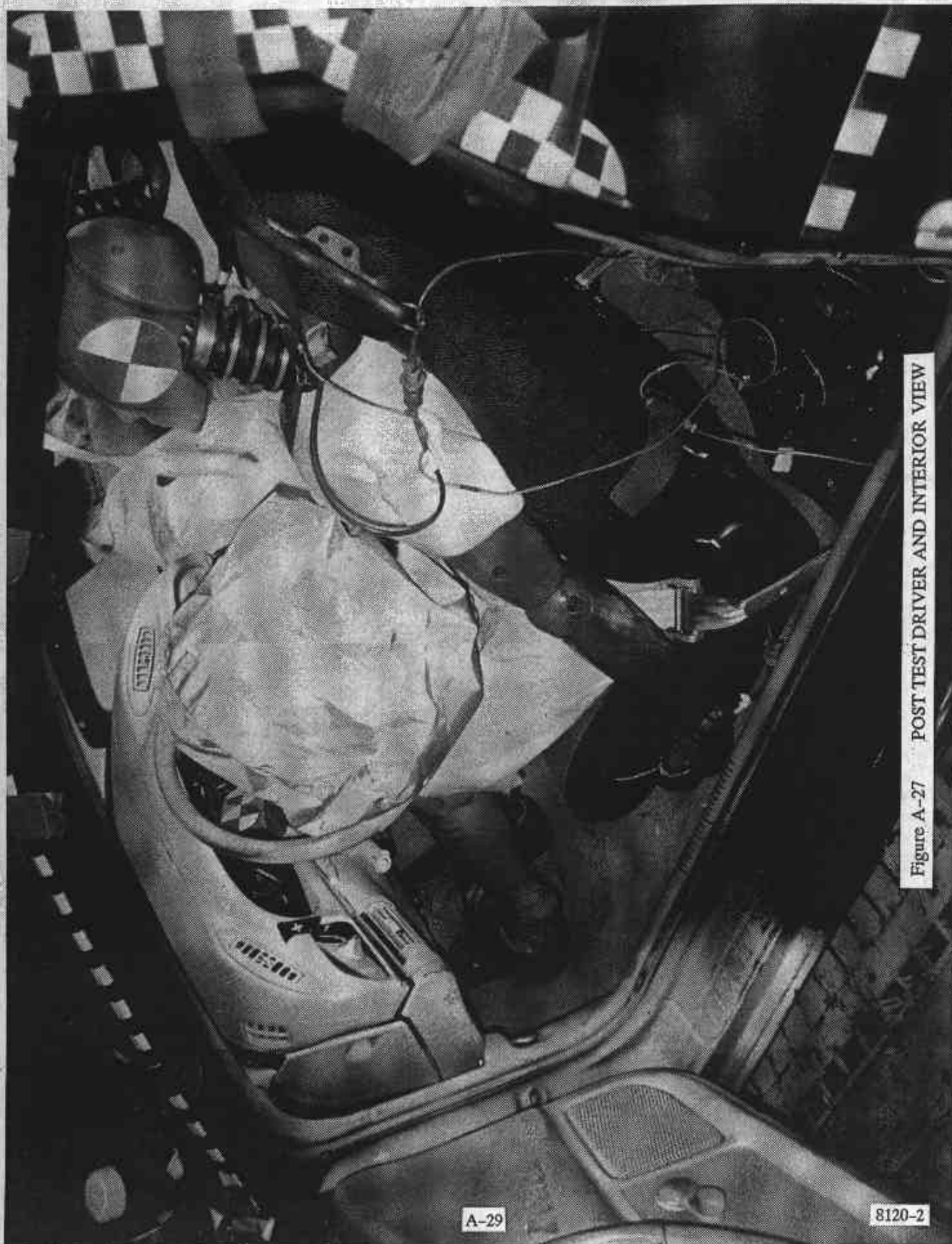


Figure A-27 POST TEST DRIVER AND INTERIOR VIEW

A-29

8120-2



Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW

A-30

8120-2

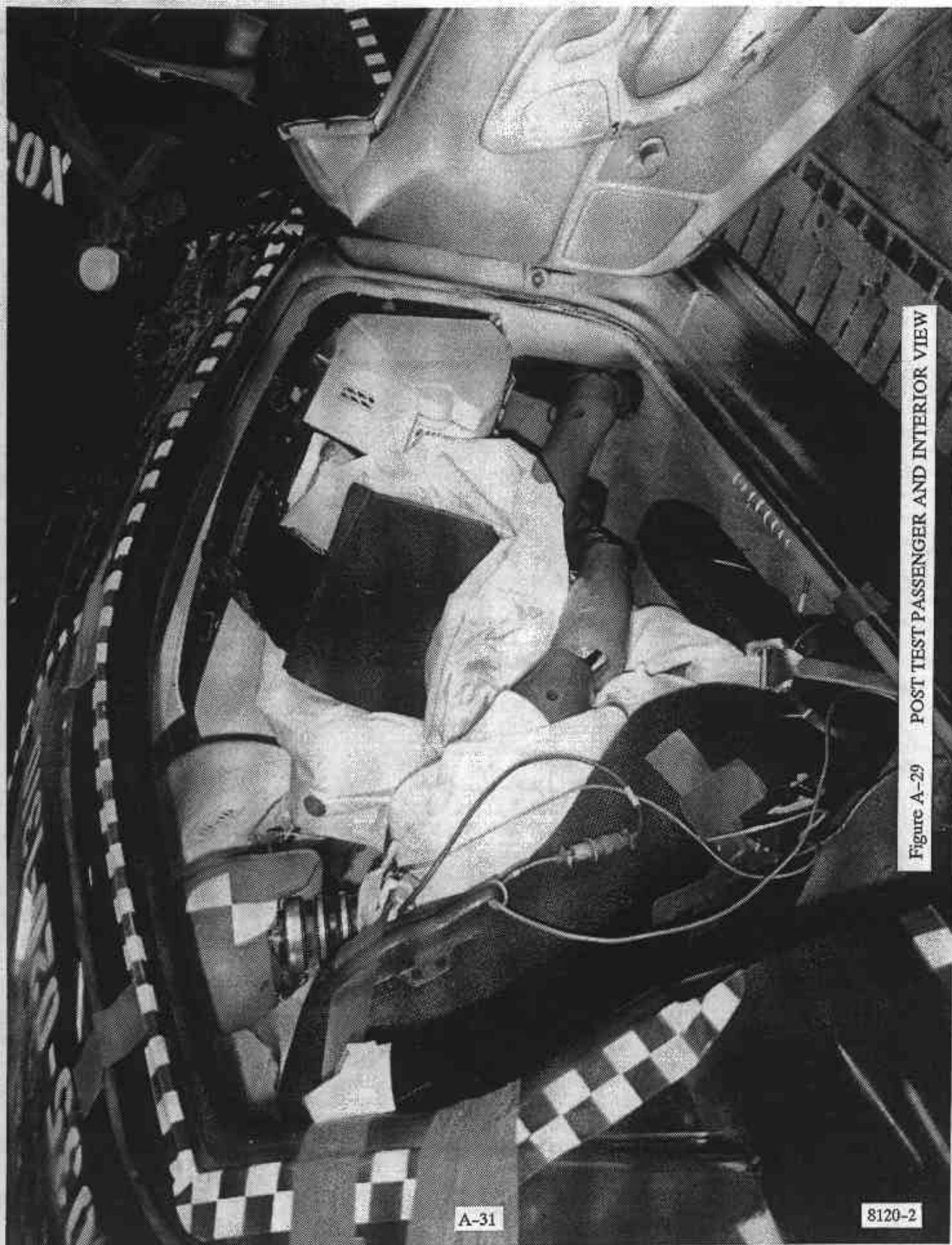


Figure A-29 POST TEST PASSENGER AND INTERIOR VIEW

A-31

8120-2

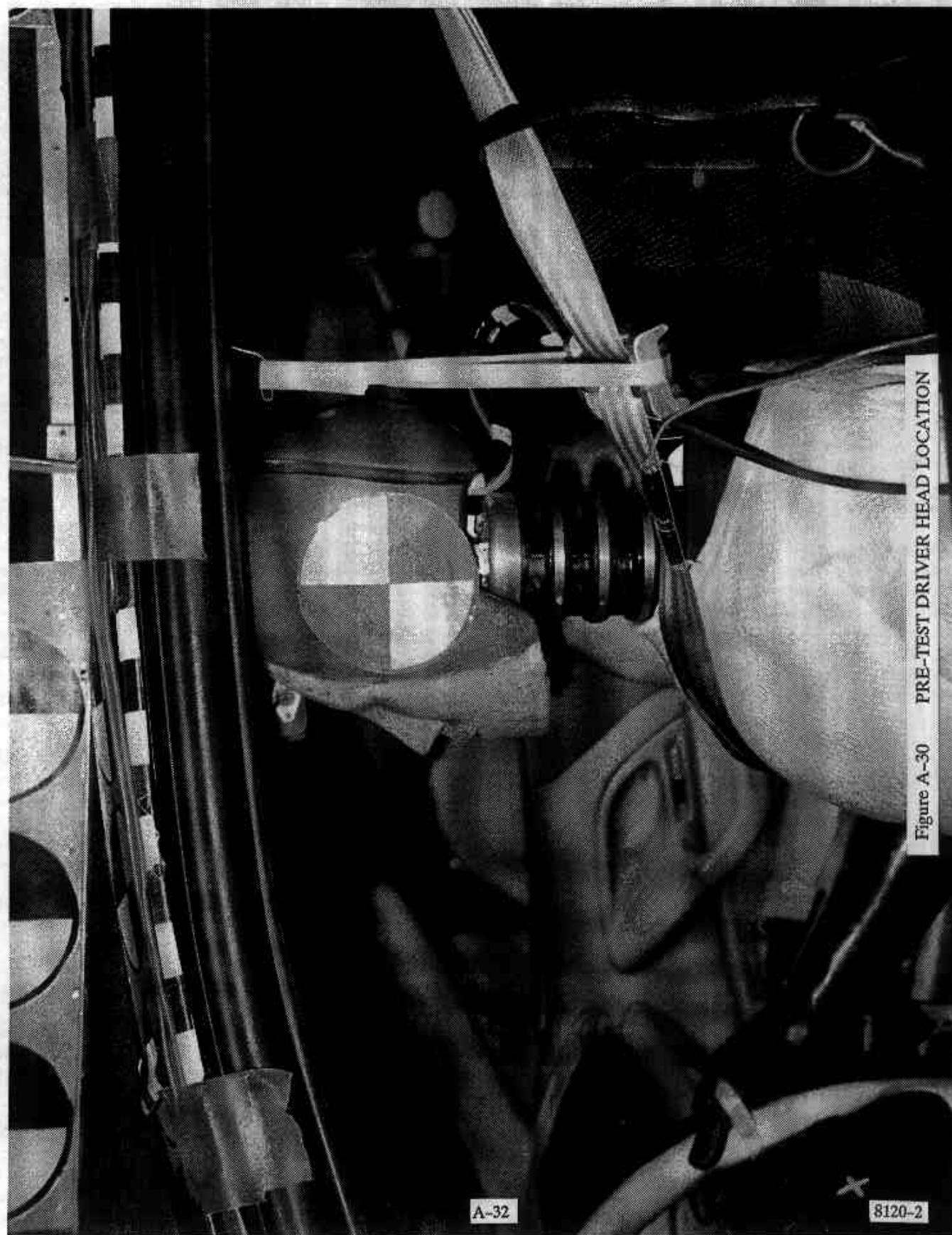


Figure A-30 PRE-TEST DRIVER HEAD LOCATION

A-32

8120-2



Figure A-31 PRE-TEST PASSENGER HEAD LOCATION

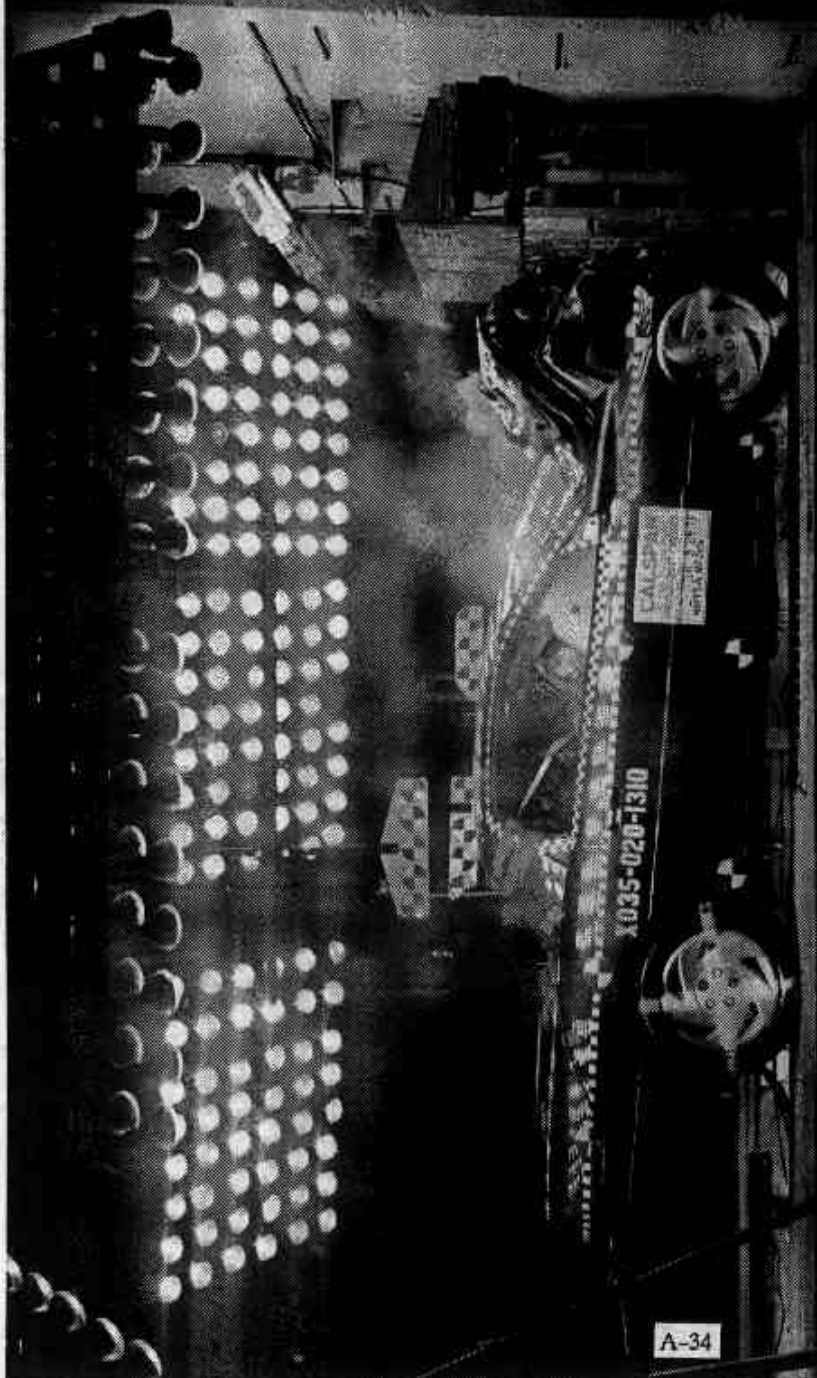


Figure A-32 IMPACT VIEW

A-34

8120-2

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST NO. MP0106

VEHICLE DATA

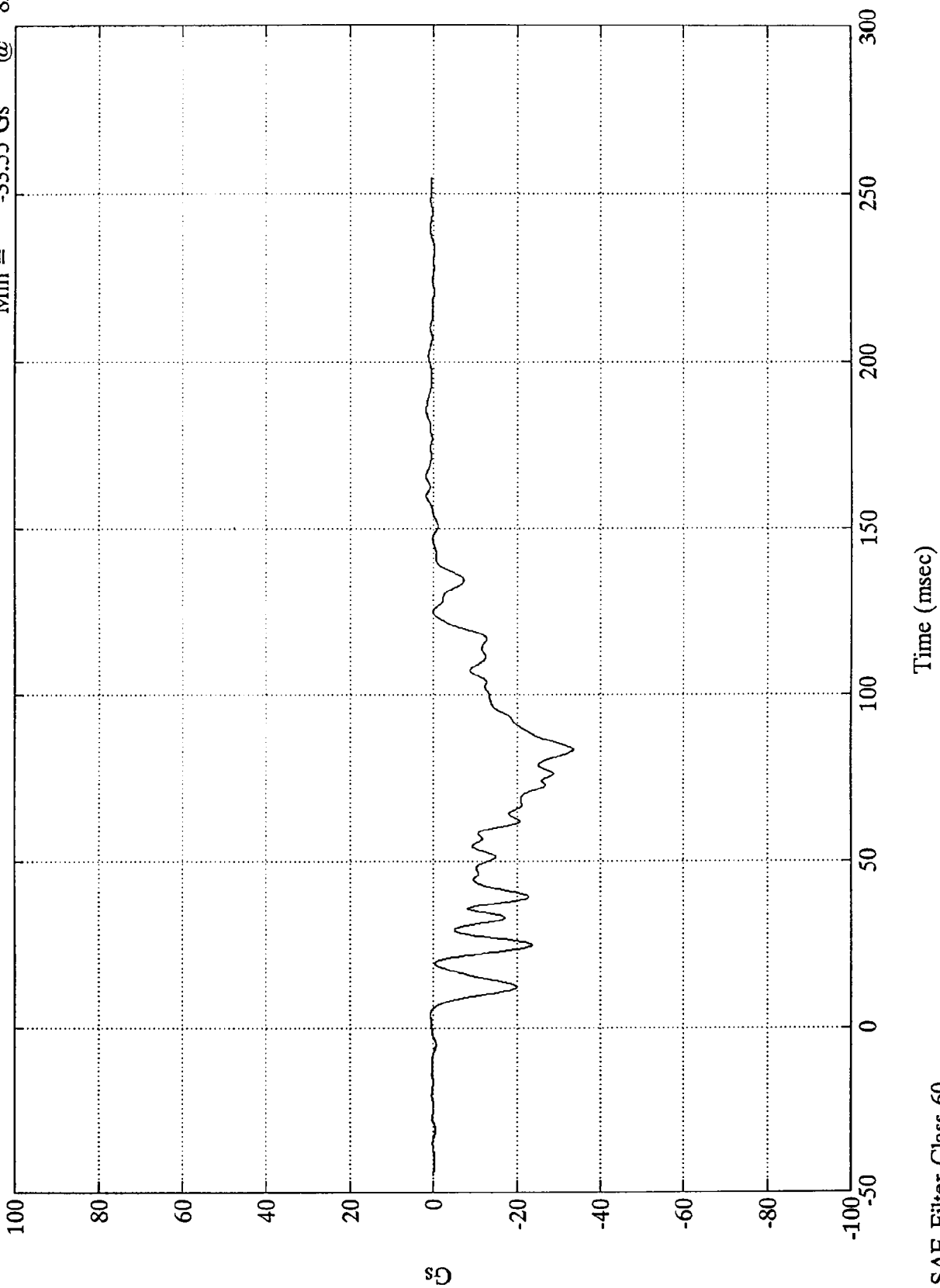
FILTER CHANNEL CLASS

60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 1.81 Gs @ 165.83 msec
Min = -33.55 Gs @ 83.76 msec

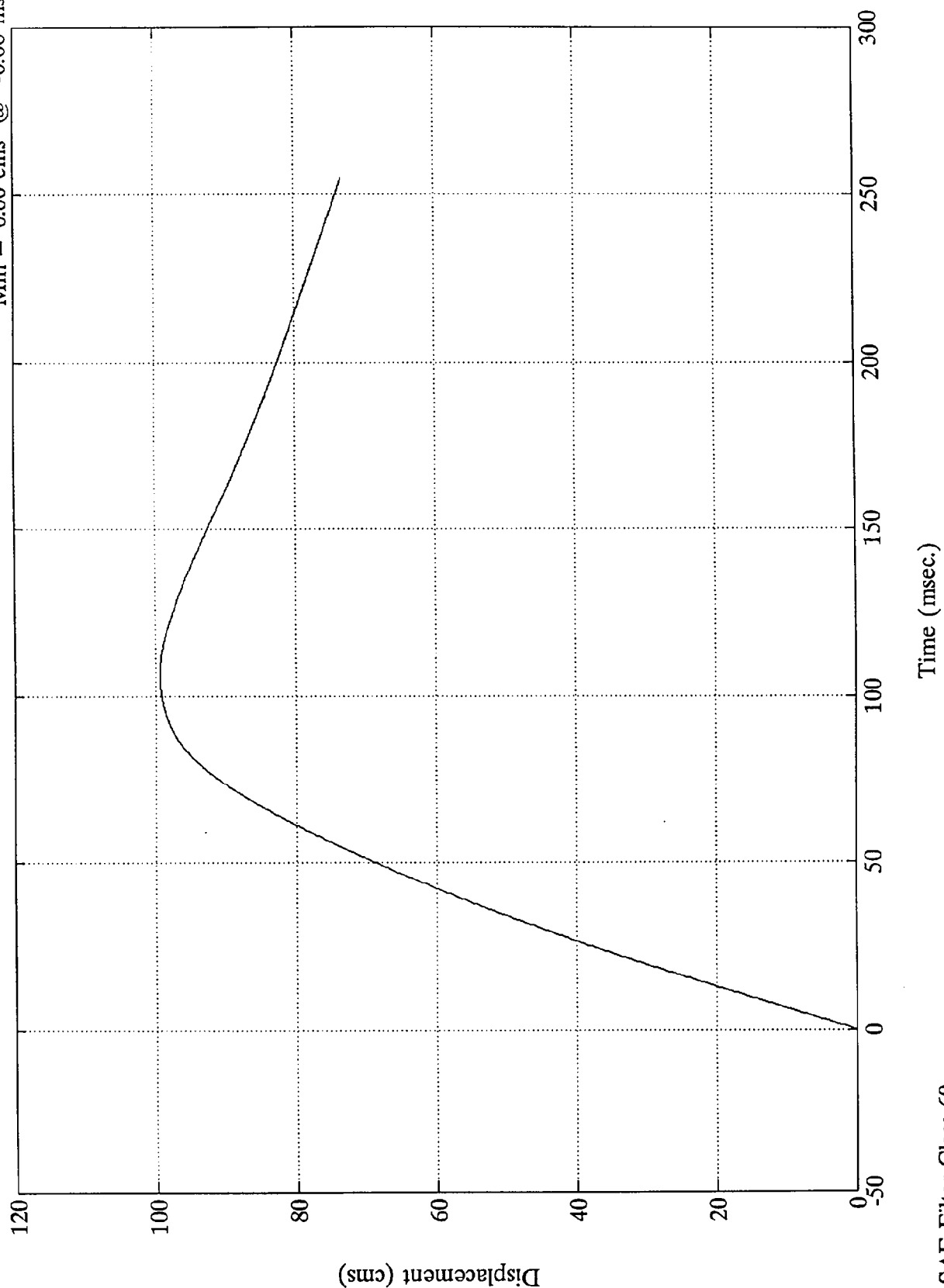
Acc. #1(x)



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 99.36 cms @ 107.52 msec
Min = 0.00 cms @ -0.00 msec

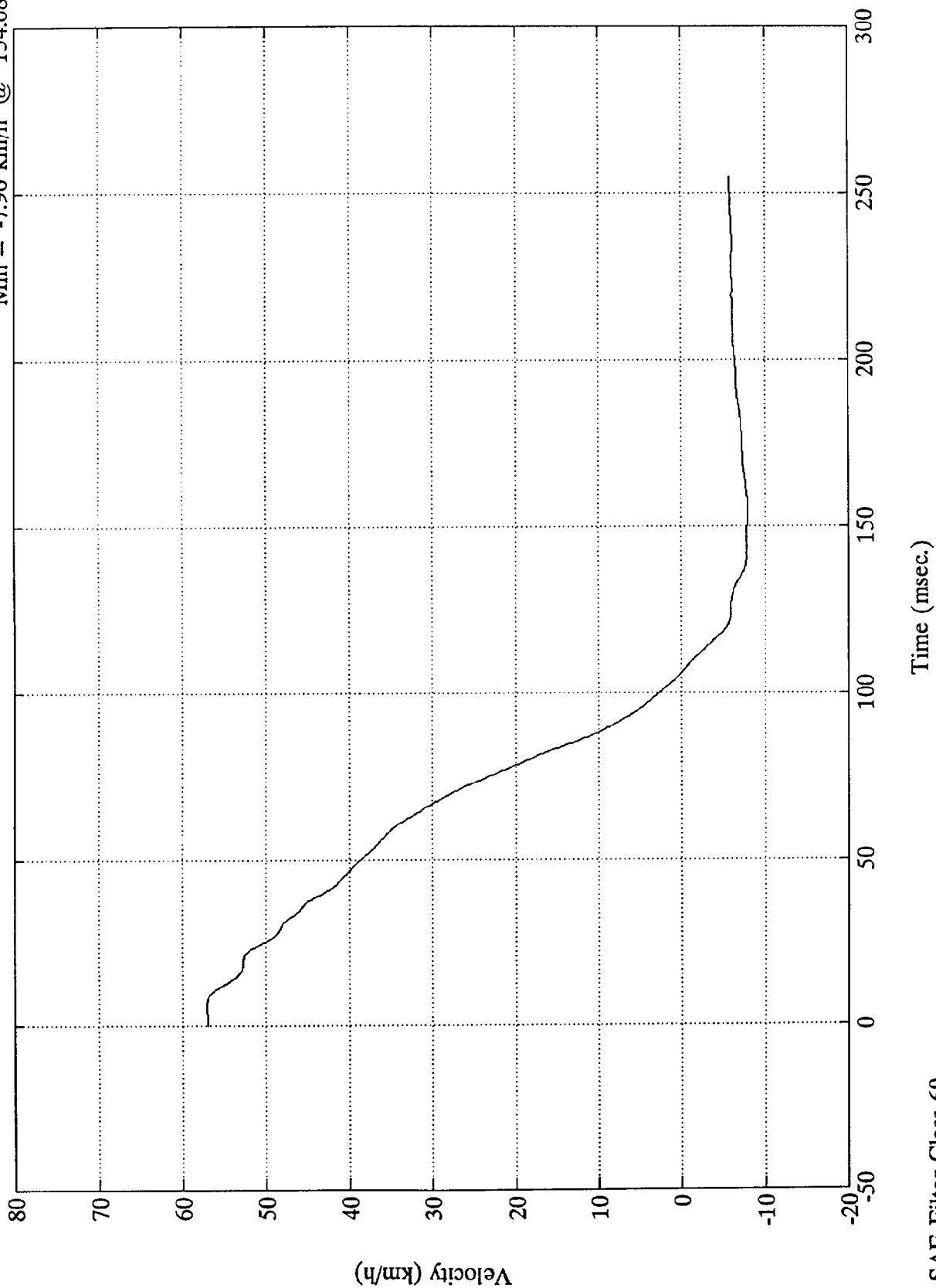
Acc. #1(x)



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Acc. #1(x)

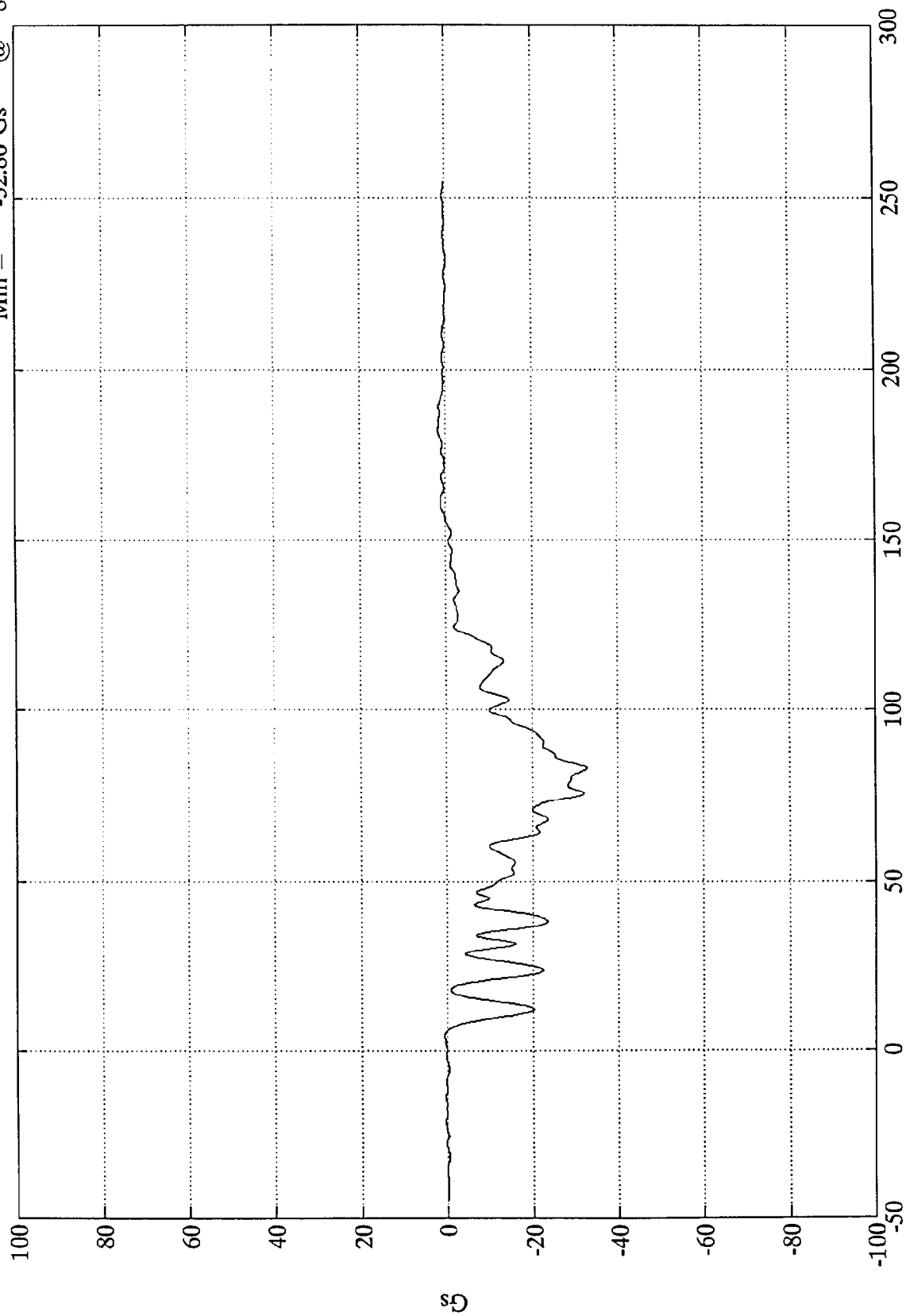
Max = 57.07 km/h @ 6.24 msec
Min = -7.96 km/h @ 154.08 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 1.76 Gs @ 181.80 msec
 Min = -32.86 Gs @ 82.91 msec

Acc. #2(x)



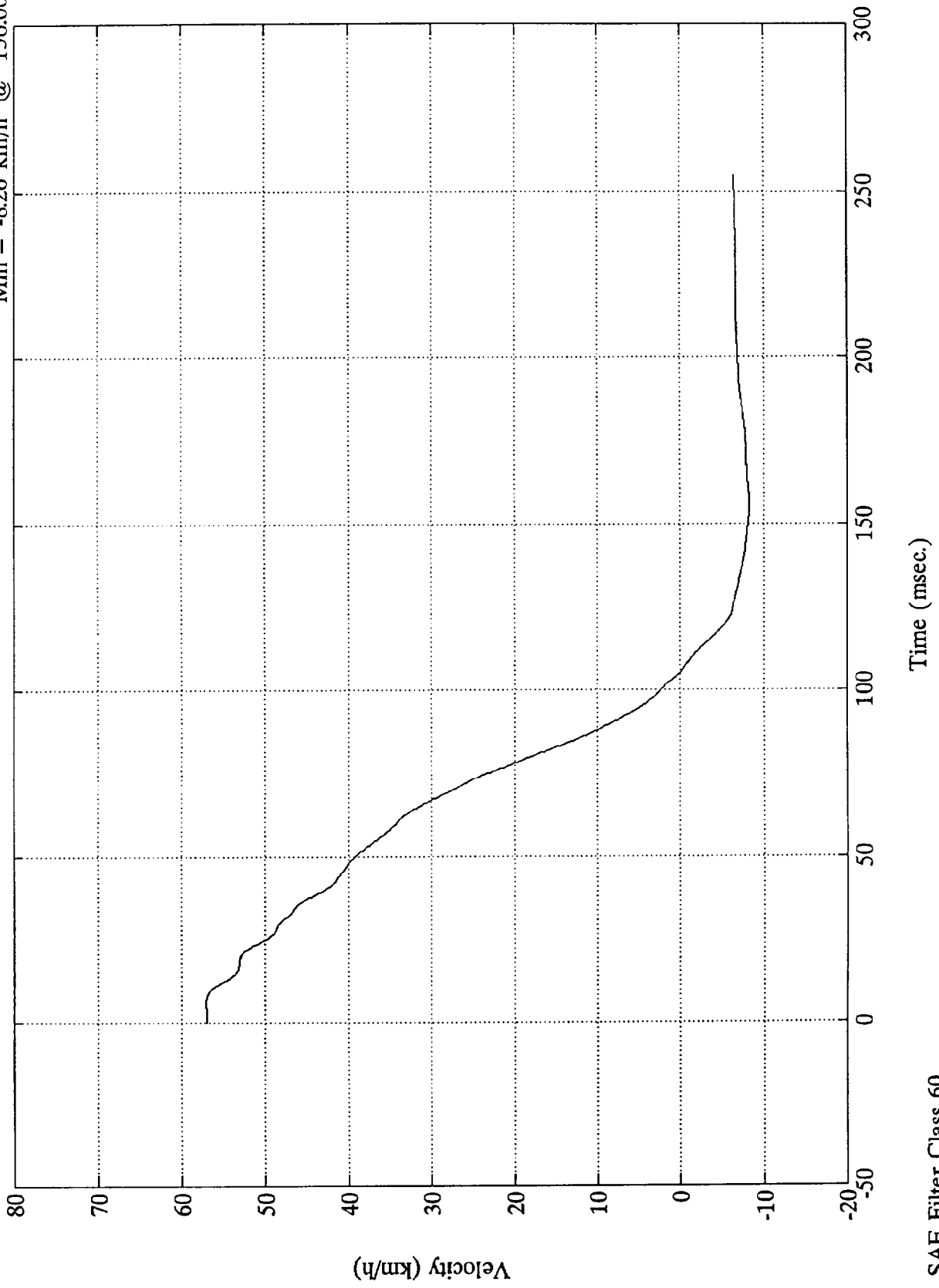
Time (msec)

SAE Filter Class 60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

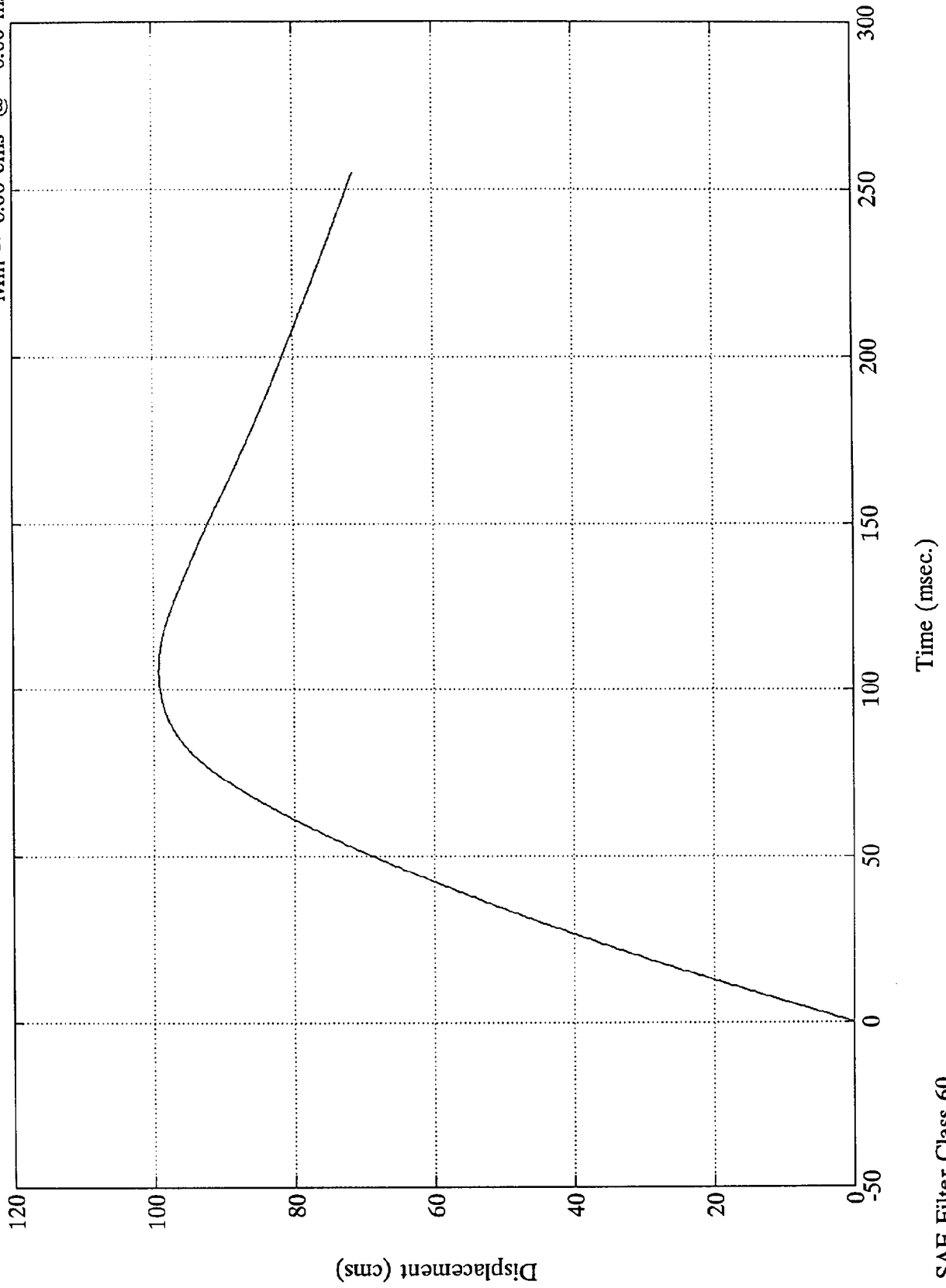
Acc. #2(x)

Max = 57.06 km/h @ 6.00 msec
Min = -8.26 km/h @ 156.00 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

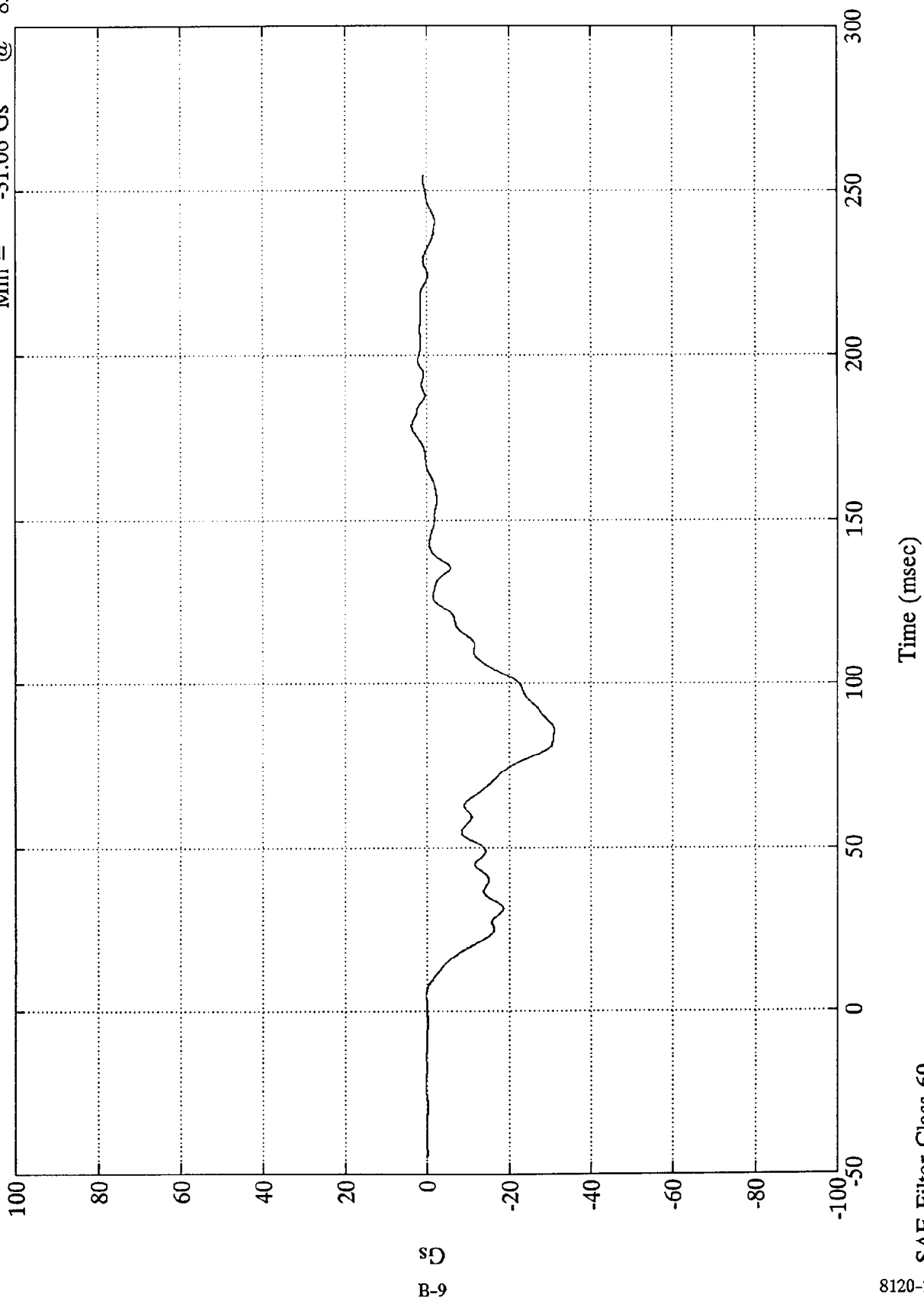
Acc. #2(x)
Max = 99.29 cms @ 105.84 msec
Min = 0.00 cms @ -0.00 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Acc. #3(x)

Max = 3.74 Gs @ 178.55 msec
Min = -31.06 Gs @ 85.68 msec

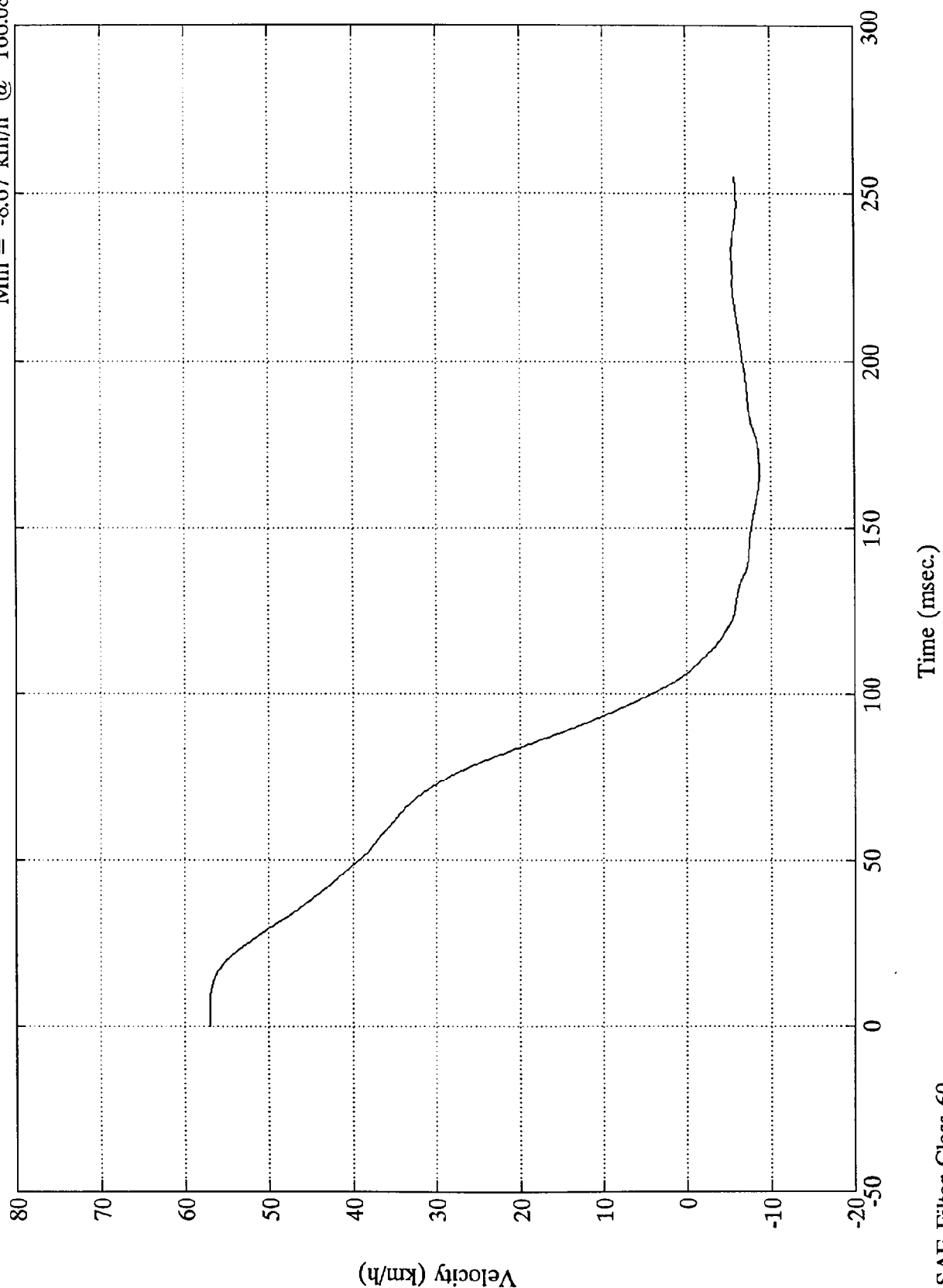


SAE Filter Class 60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

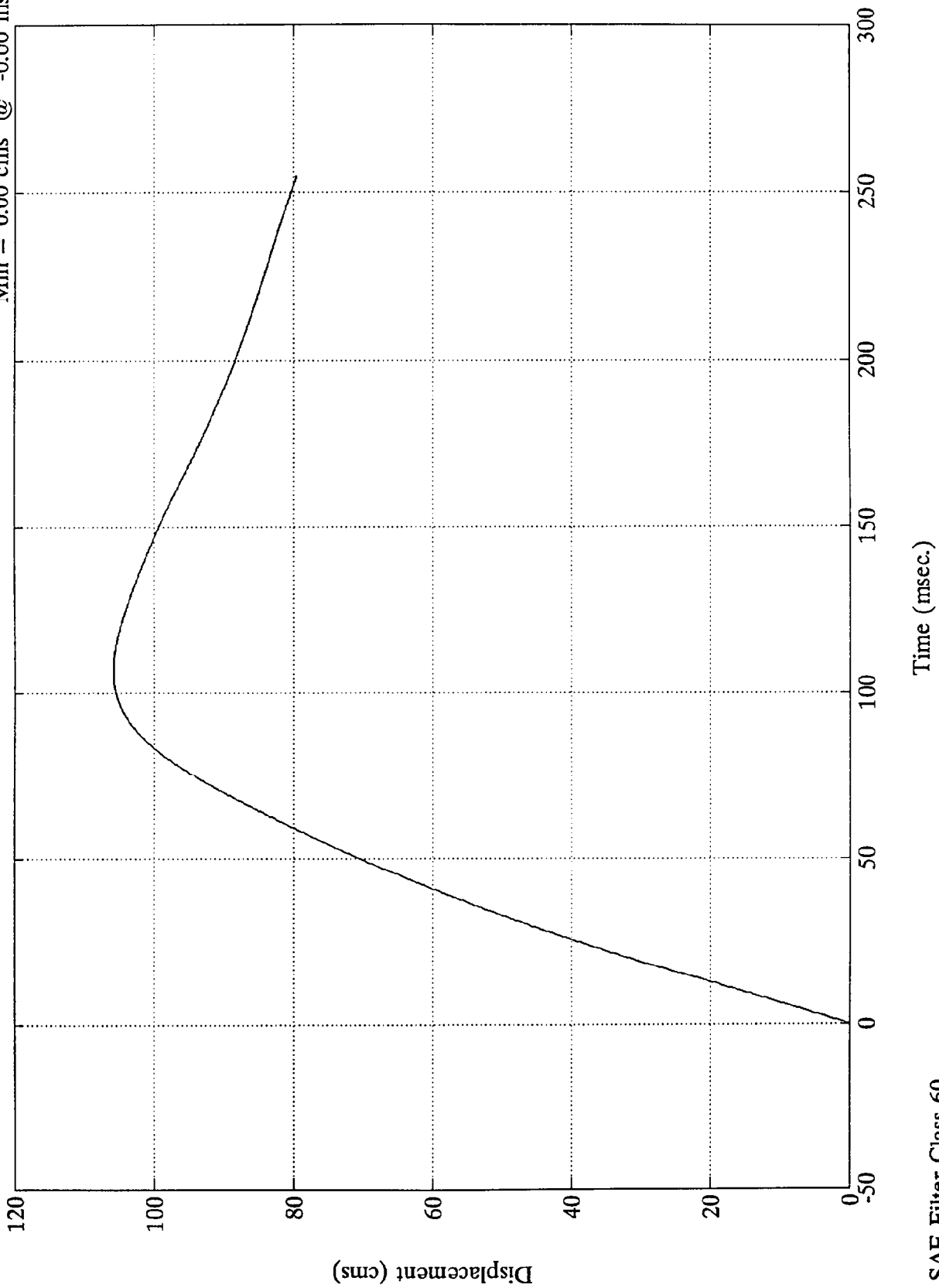
Max = 57.00 km/h @ 7.20 msec
Min = -8.67 km/h @ 166.08 msec

Acc. #3(x)



NCAP TEST #2 - 1993 CHEVROLET CAMARO

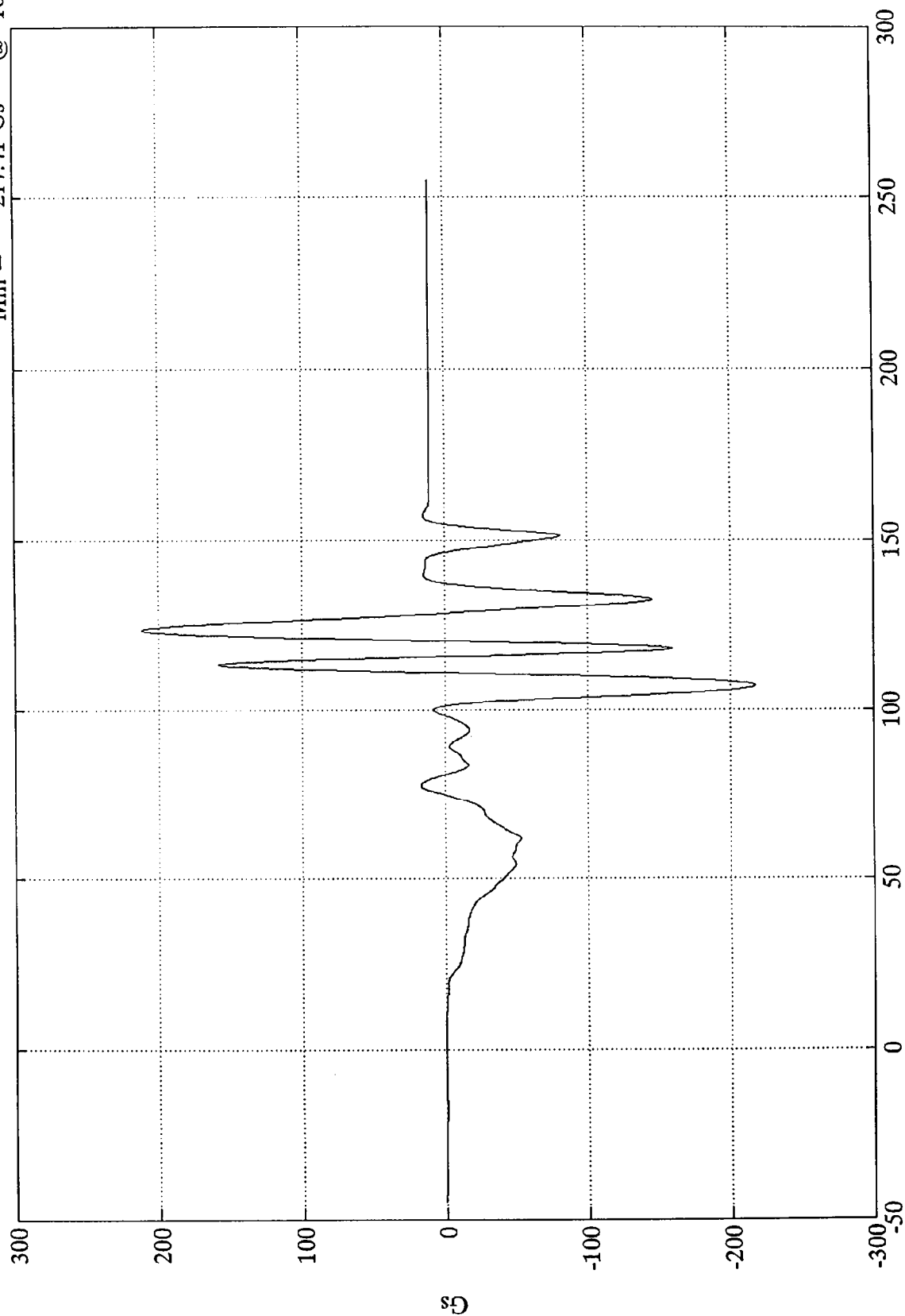
Acc. #3(x)
Max = 105.84 cms @ 108.24 msec
Min = 0.00 cms @ -0.00 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 211.76 Gs @ 123.84 msec
Min = -217.41 Gs @ 107.27 msec

Acc. #4(x)



8120-2
SAE Filter Class 60

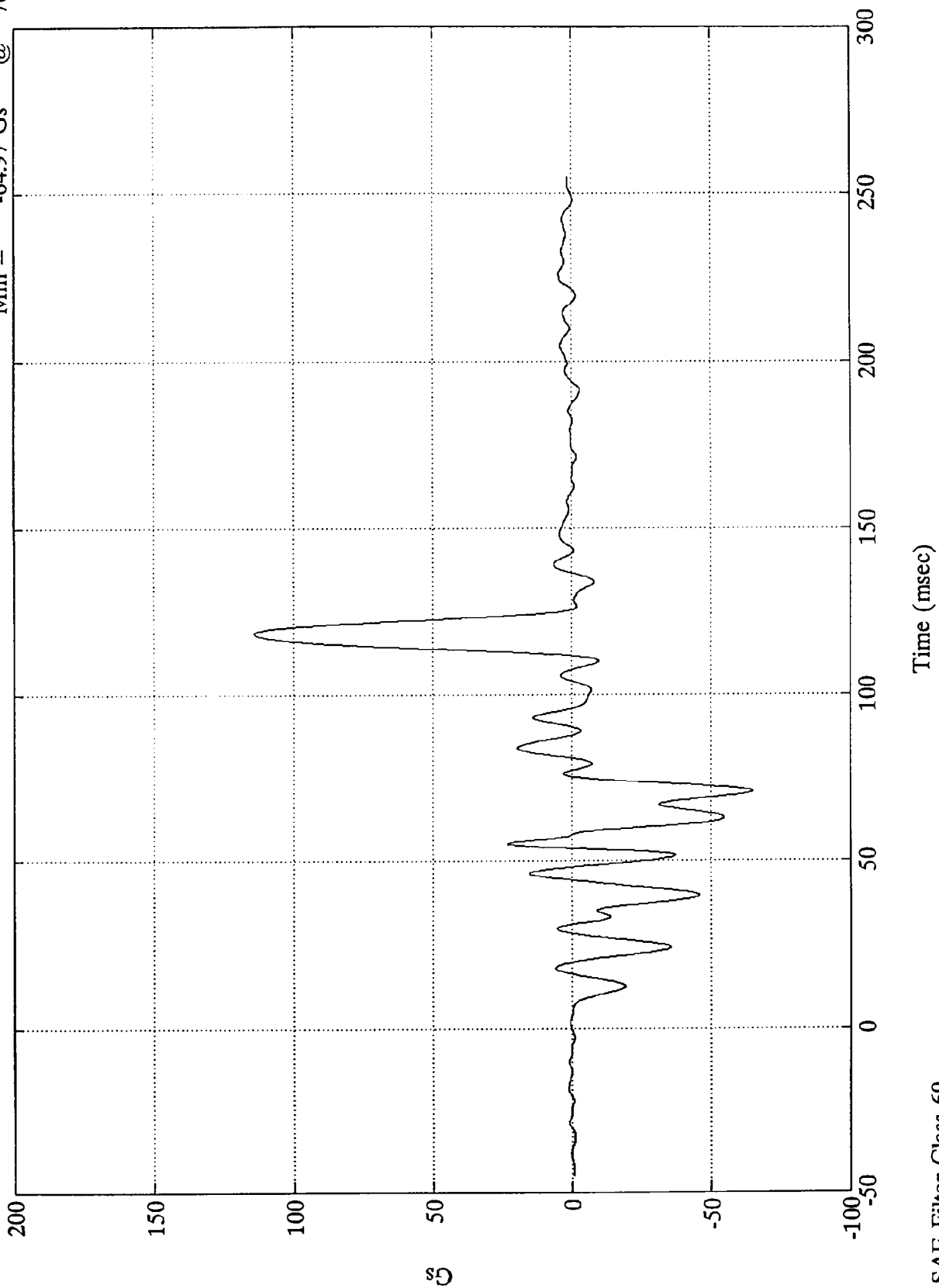
Time (msec)

DATA IS NOT ACCURATE AFTER 100 mSEC

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 114.15 Gs @ 118.31 msec
Min = -64.97 Gs @ 70.79 msec

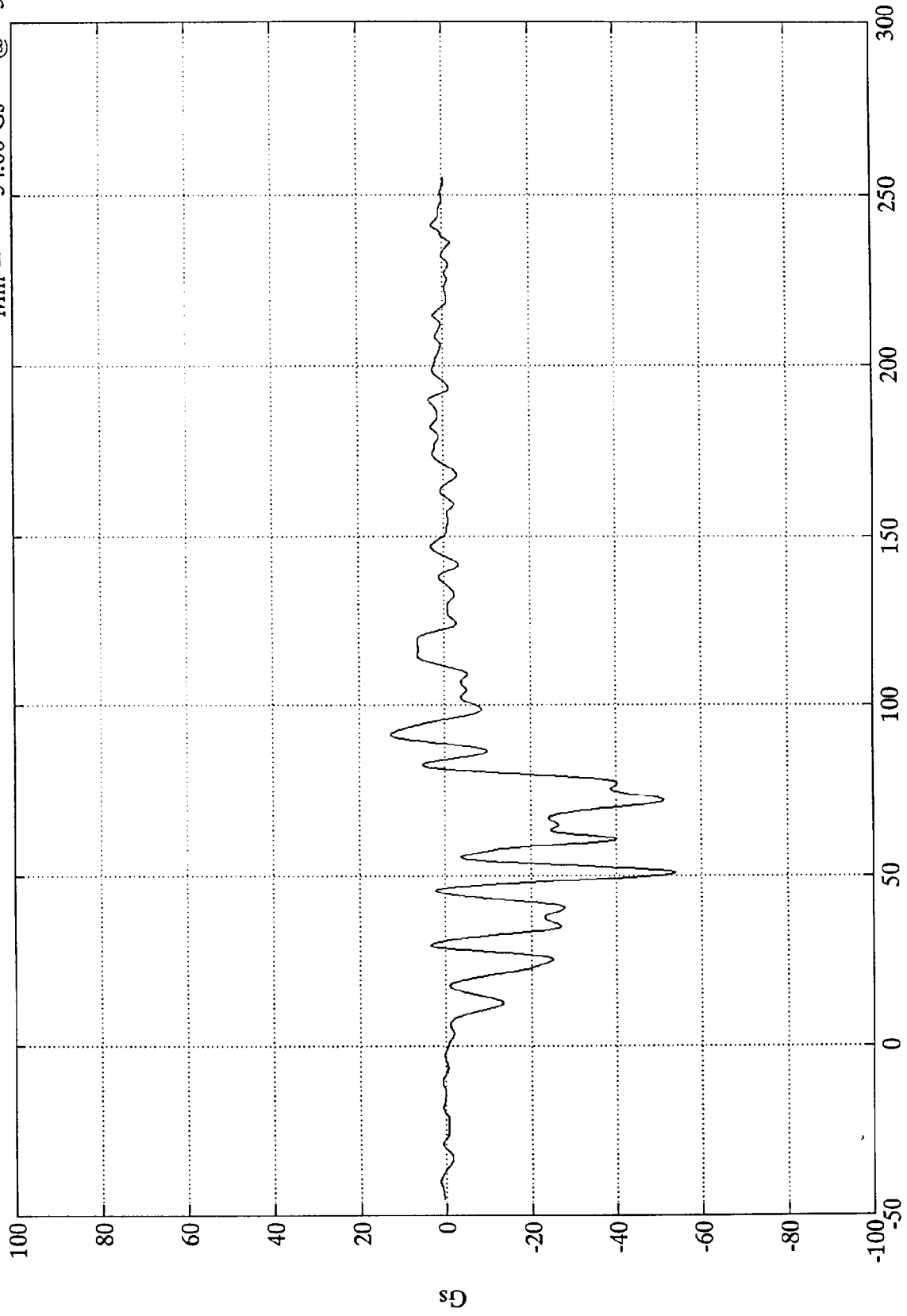
Acc. #5(x)



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 12.65 Gs @ 91.08 msec
Min = -54.00 Gs @ 50.88 msec

Acc. #6(x)



Time (msec)

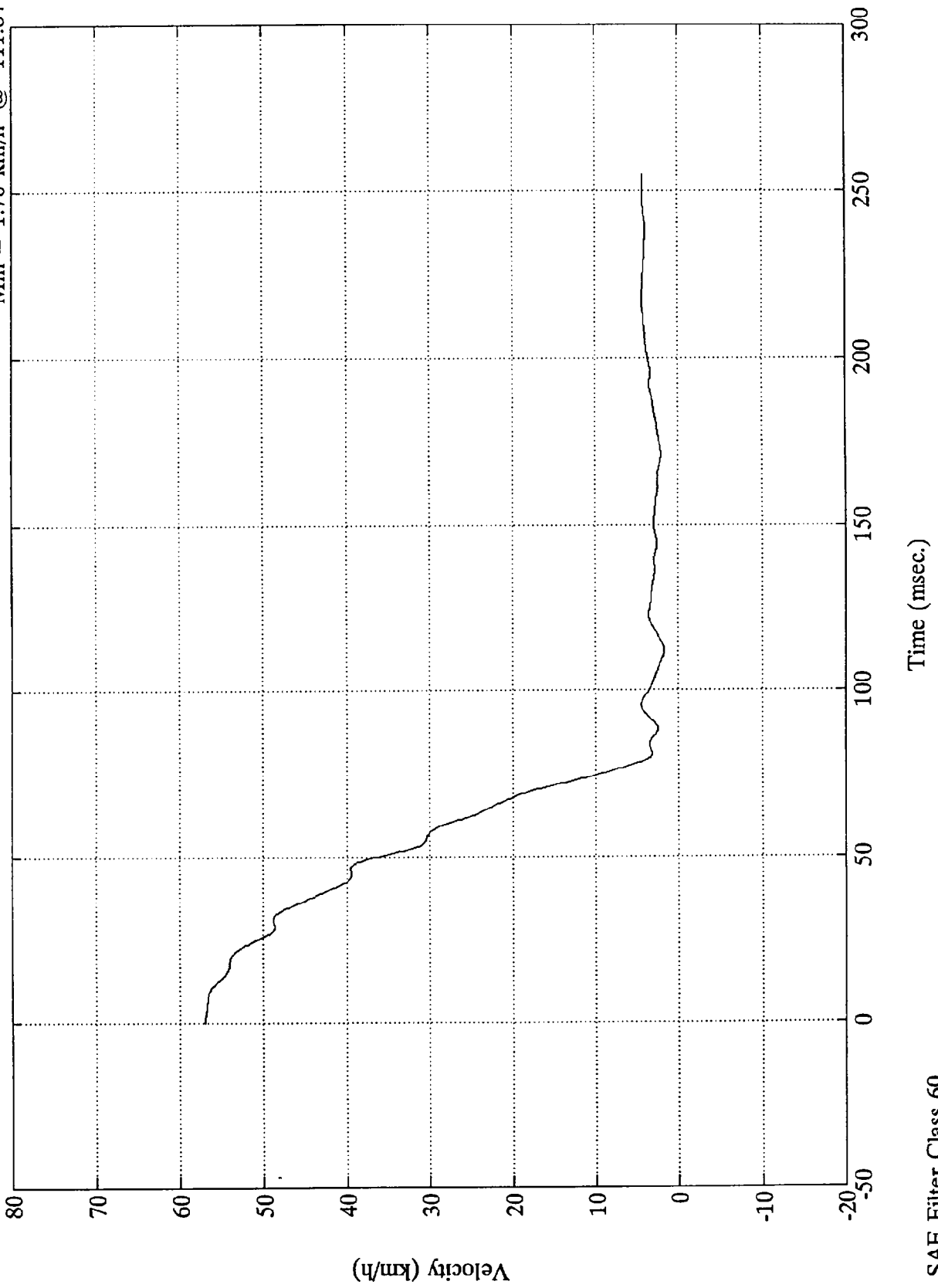
SAE Filter Class 60

8120-2

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Acc. #6(x)

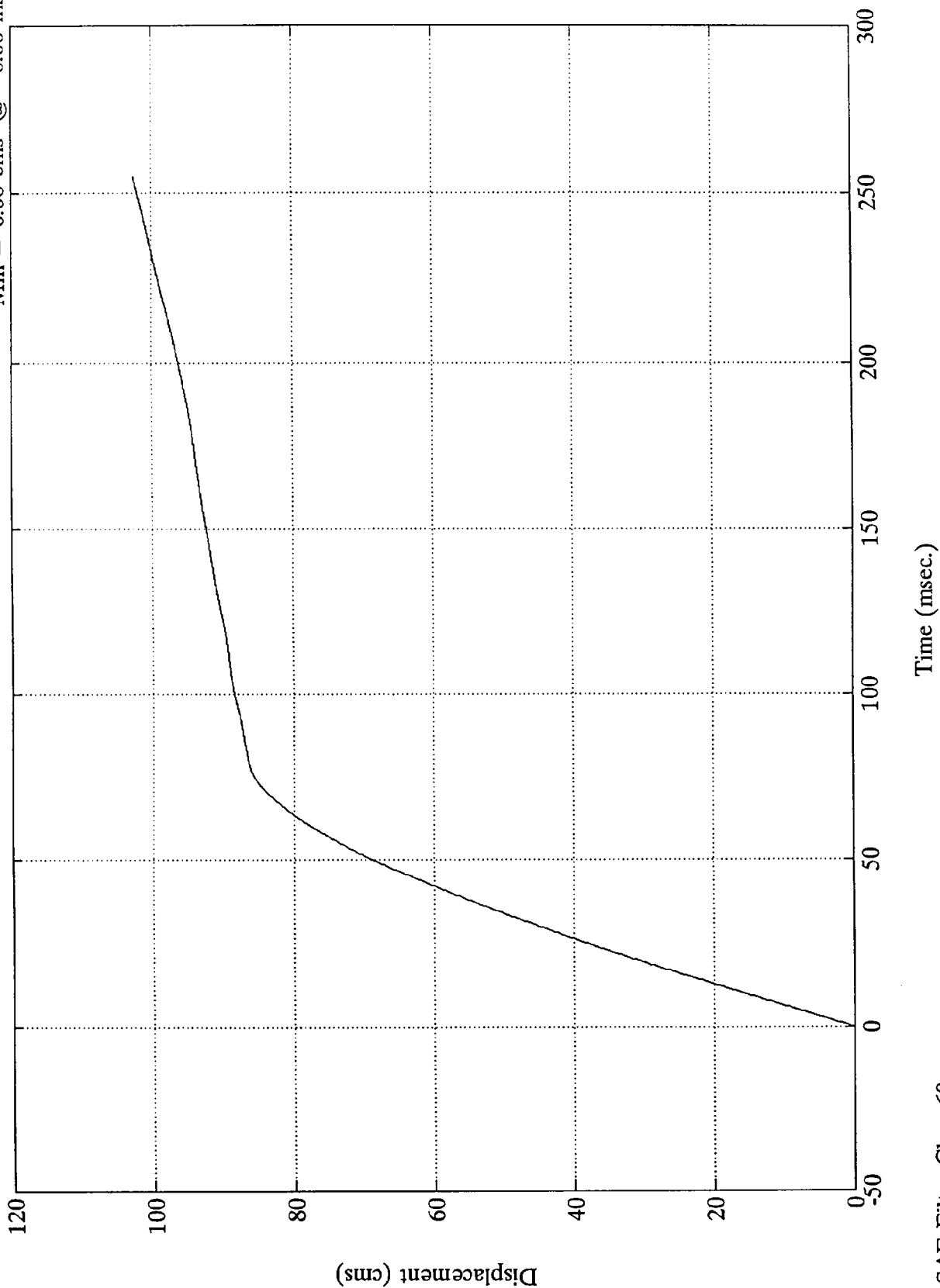
Max = 56.97 km/h @ 0.24 msec
Min = 1.70 km/h @ 111.84 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Acc. #6(x)

Max = 102.59 cms @ 254.88 msec
Min = 0.00 cms @ -0.00 msec

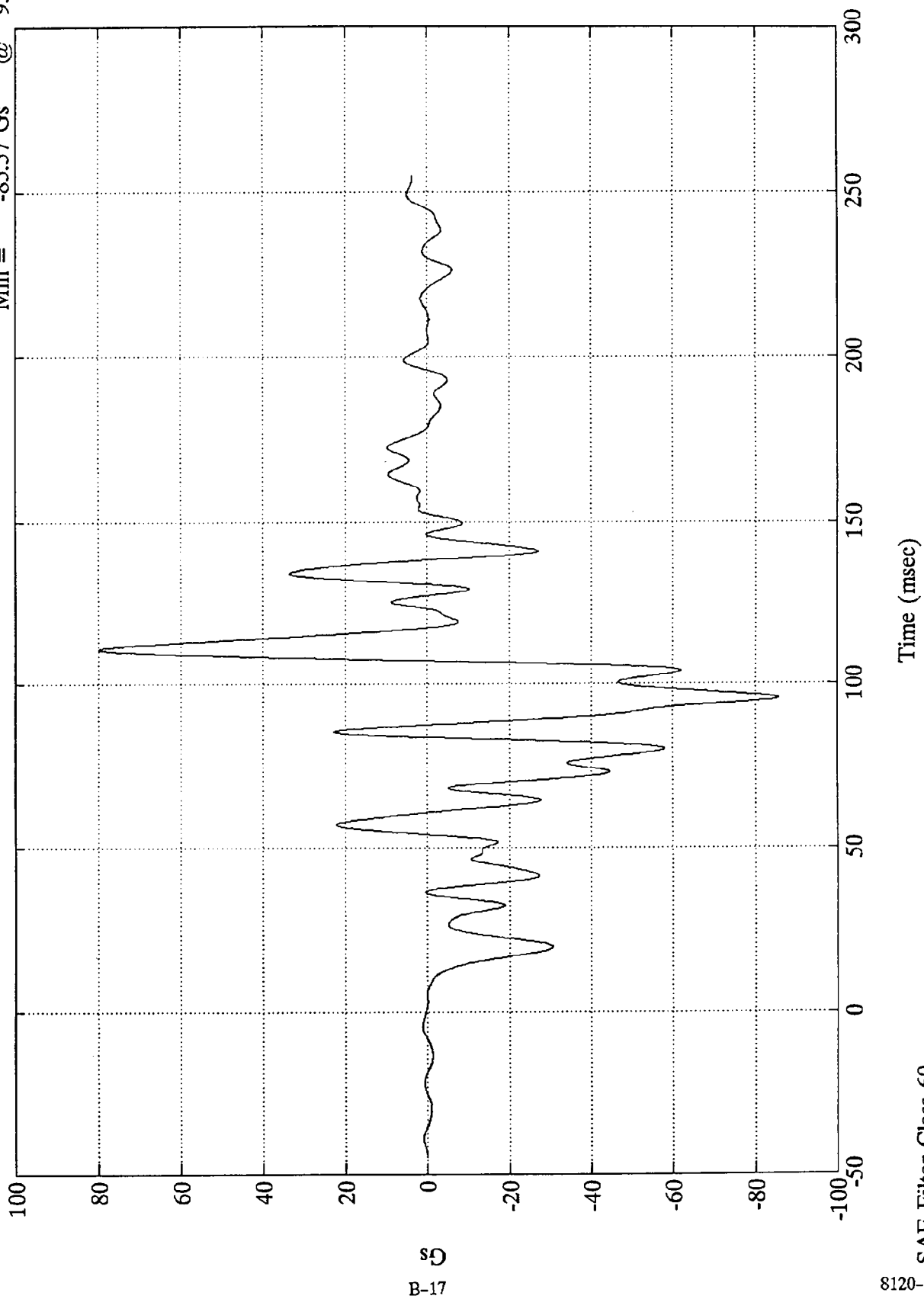


SAE Filter Class 60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 79.88 Gs @ 110.64 msec
Min = -85.57 Gs @ 95.40 msec

Acc. #7(x)

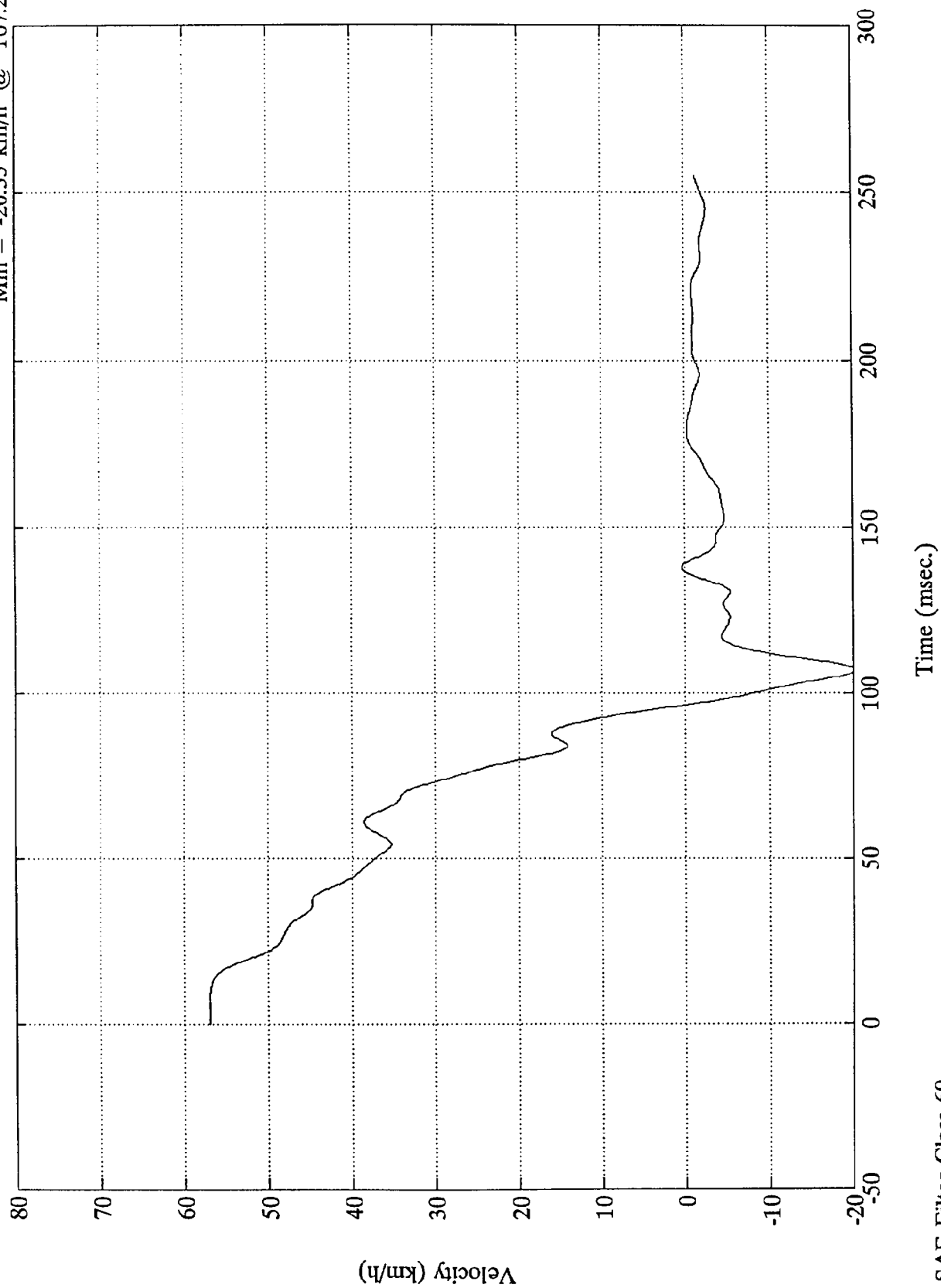


B-17

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Acc. #7(x)

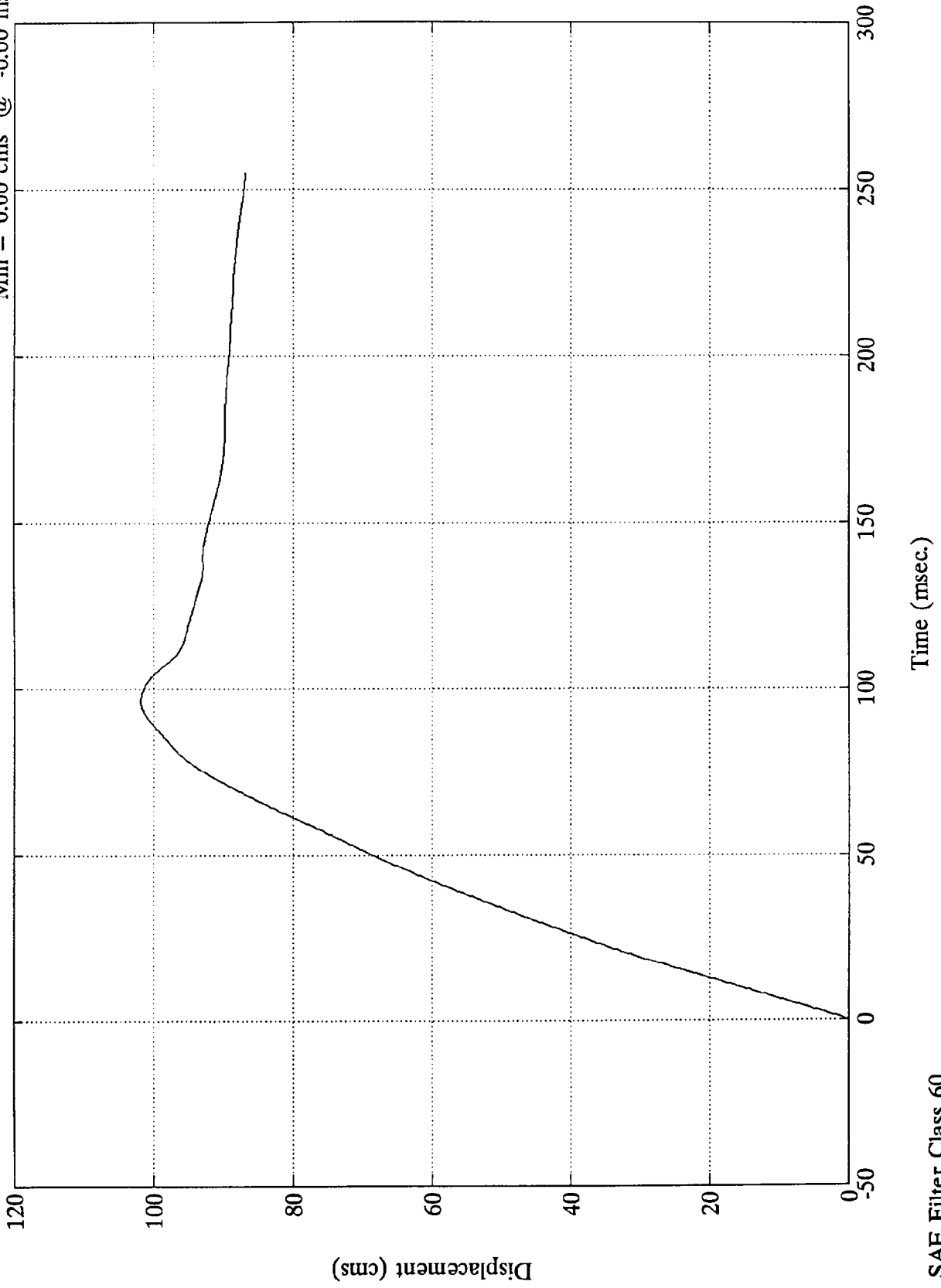
Max = 56.98 km/h @ 3.60 msec
Min = -20.35 km/h @ 107.28 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Acc. #7(x)

Max = 101.90 cms @ 96.24 msec
Min = 0.00 cms @ -0.00 msec

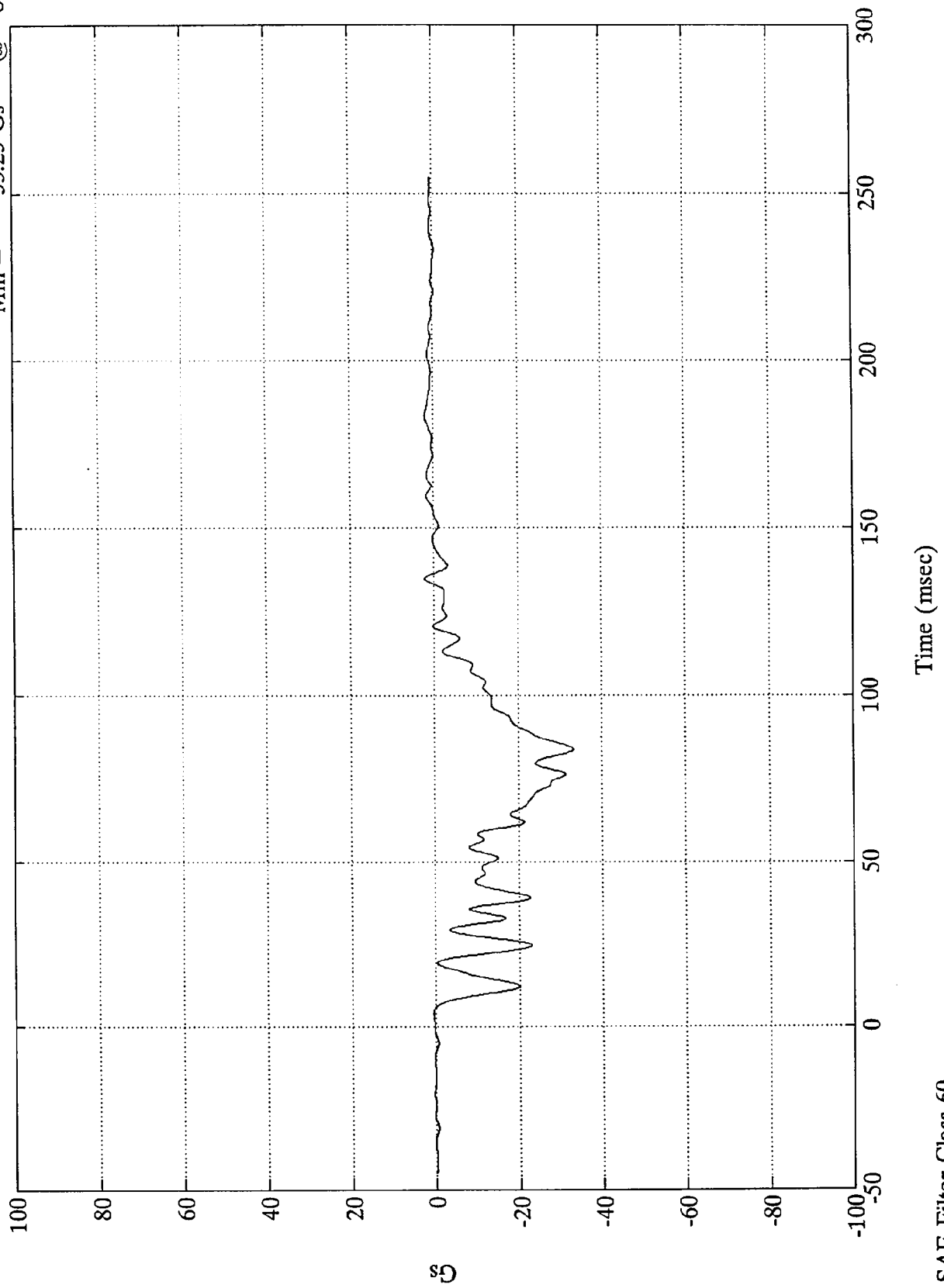


SAE Filter Class 60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 2.18 Gs @ 135.00 msec
Min = -33.23 Gs @ 83.87 msec

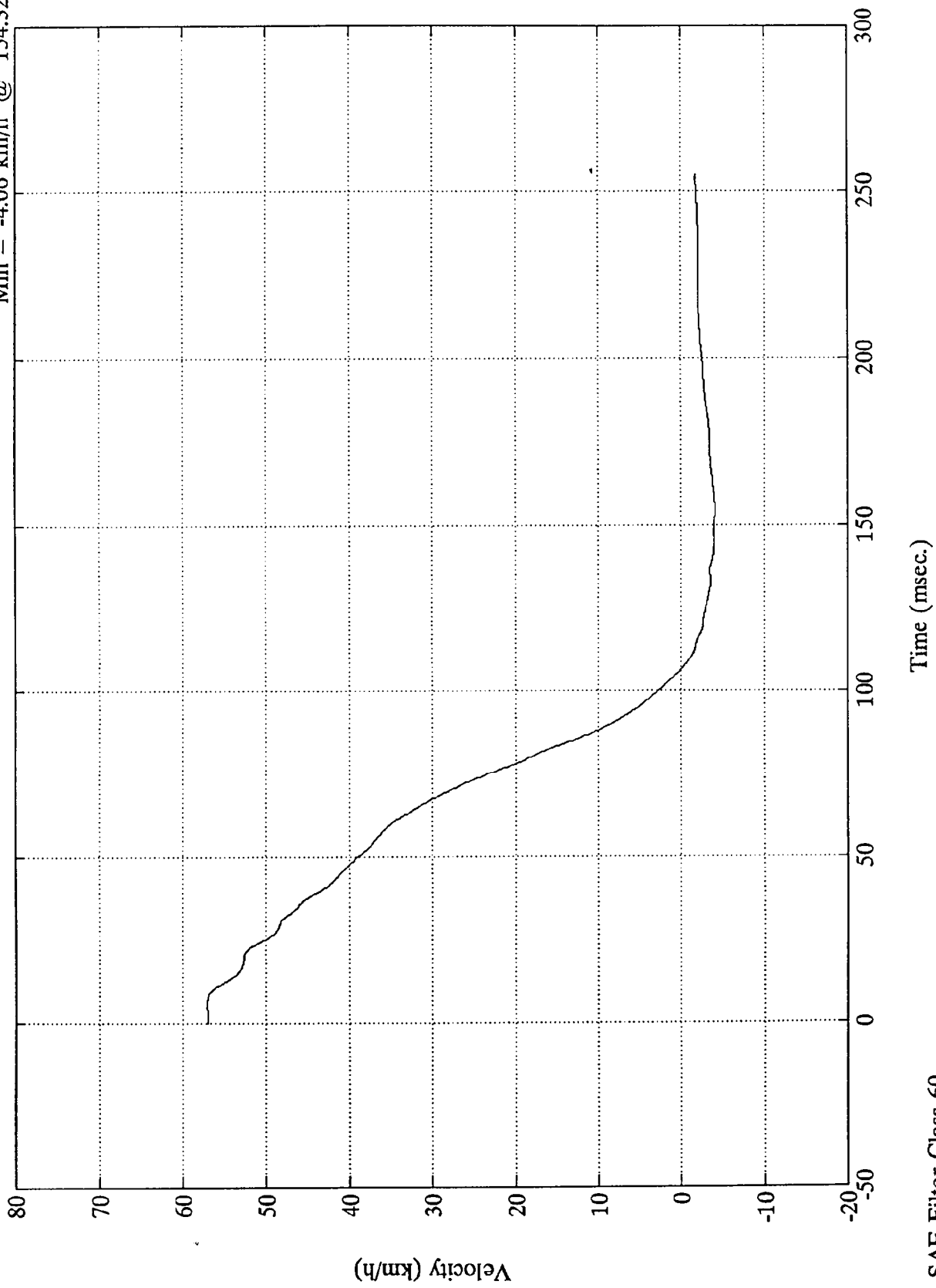
Acc. #8(x)



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Acc. #8(x)

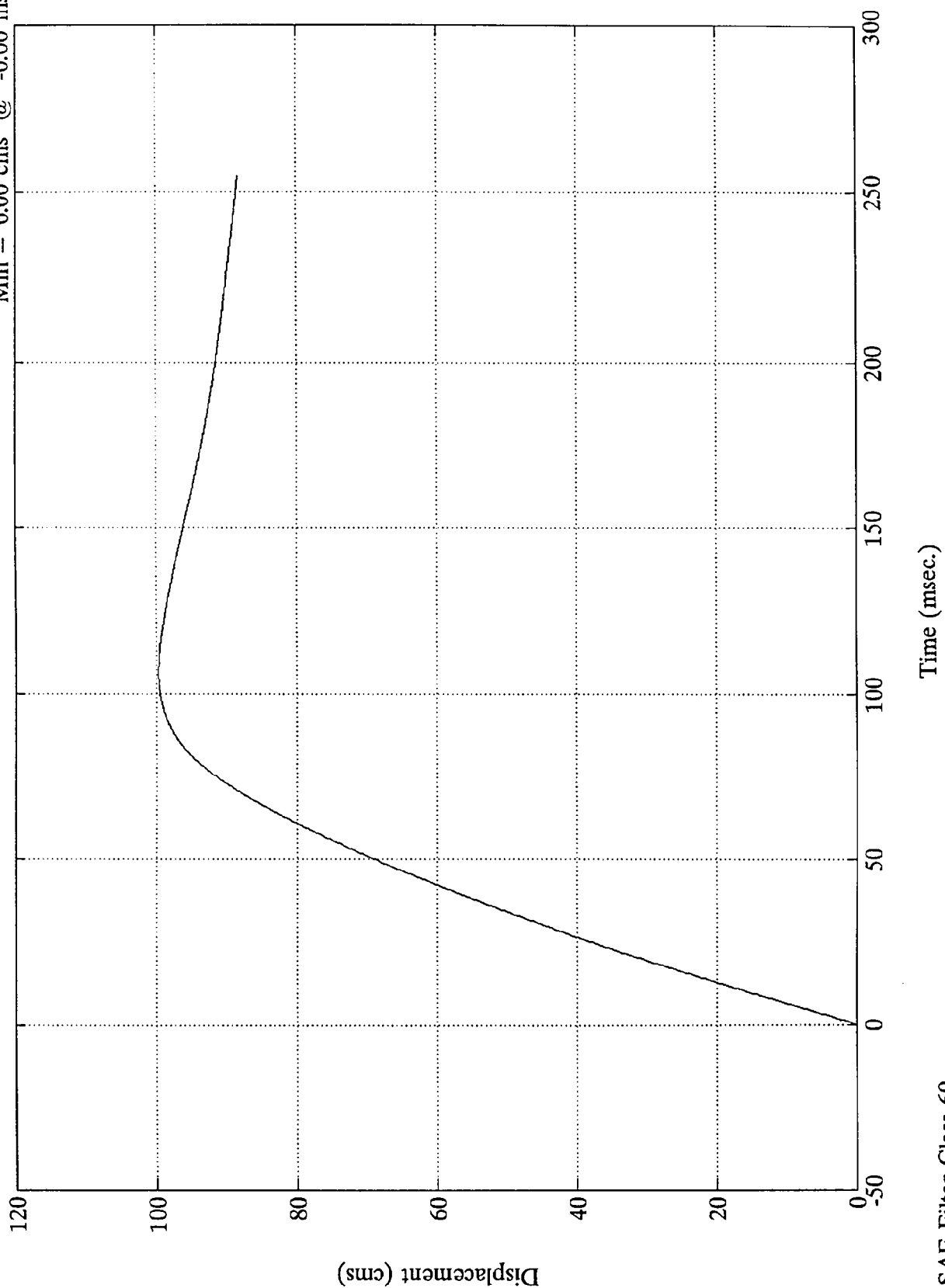
Max = 57.06 km/h @ 6.00 msec
Min = -4.06 km/h @ 154.32 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 99.70 cms @ 108.24 msec
Min = 0.00 cms @ -0.00 msec

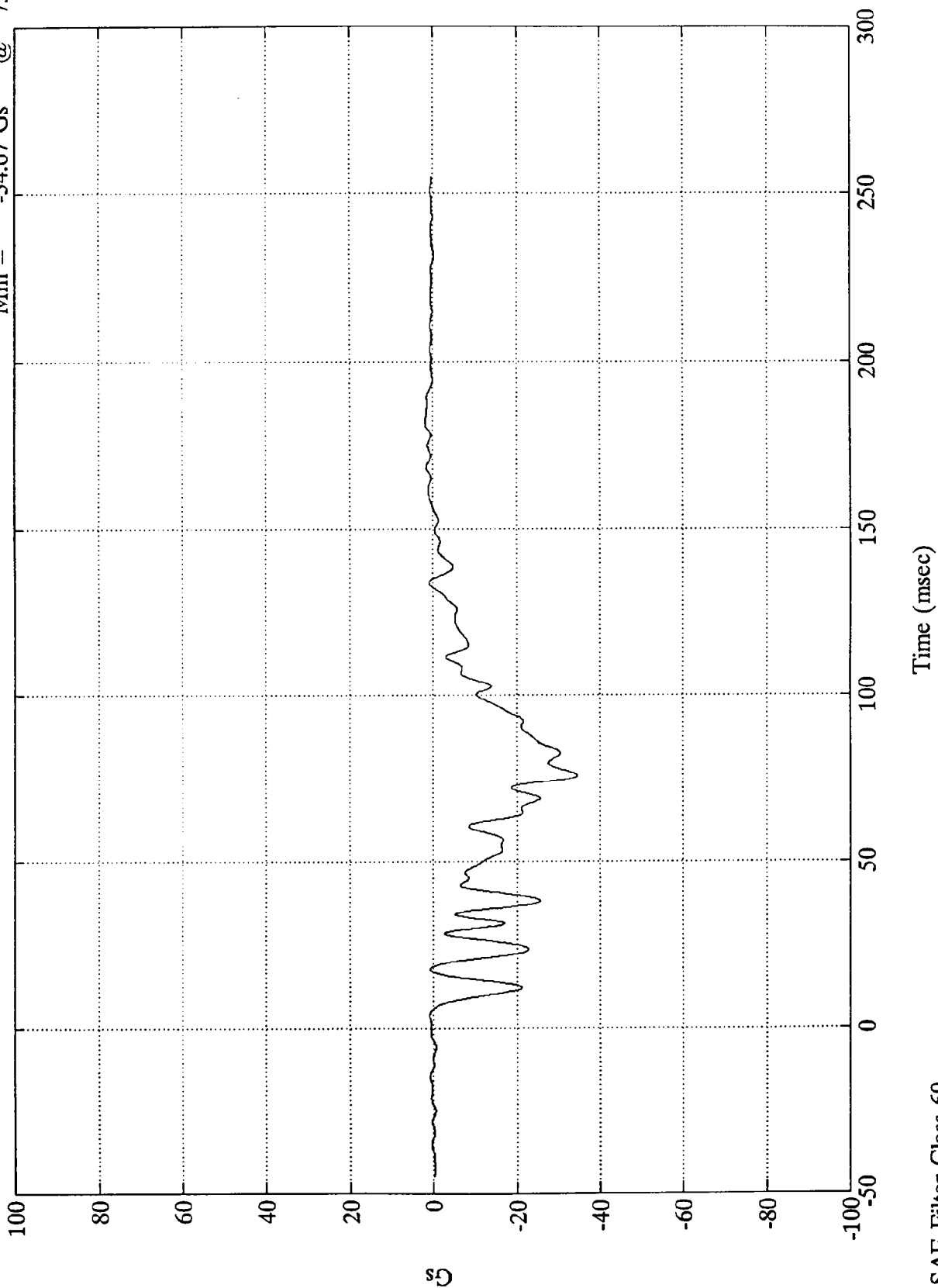
Acc. #8(x)



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 1.93 Gs @ 181.44 msec
 Min = -34.67 Gs @ 75.84 msec

Acc. #9(x)



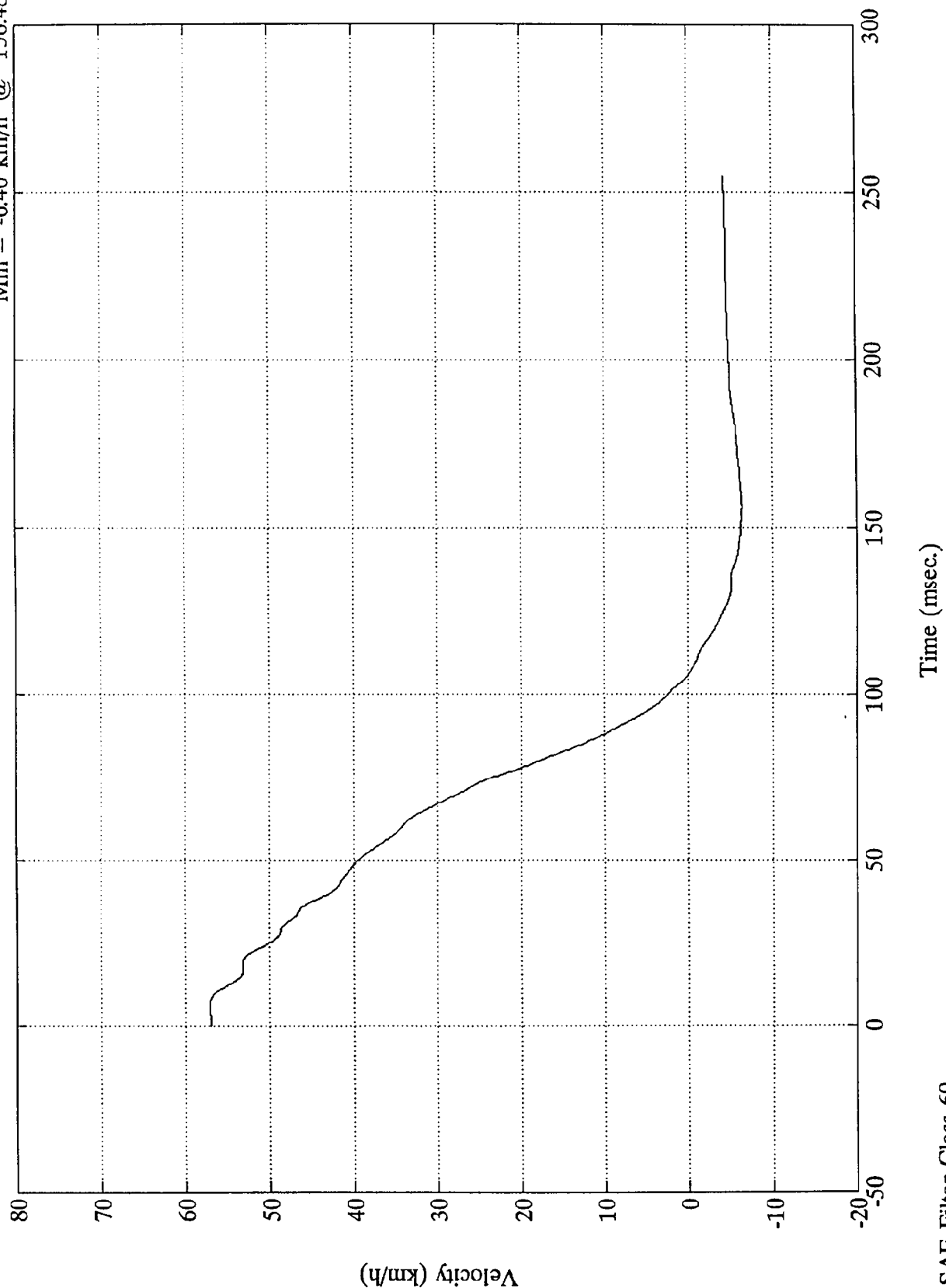
B-23

8120-2
 SAE Filter Class 60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 57.08 km/h @ 6.24 msec
Min = -6.40 km/h @ 156.48 msec

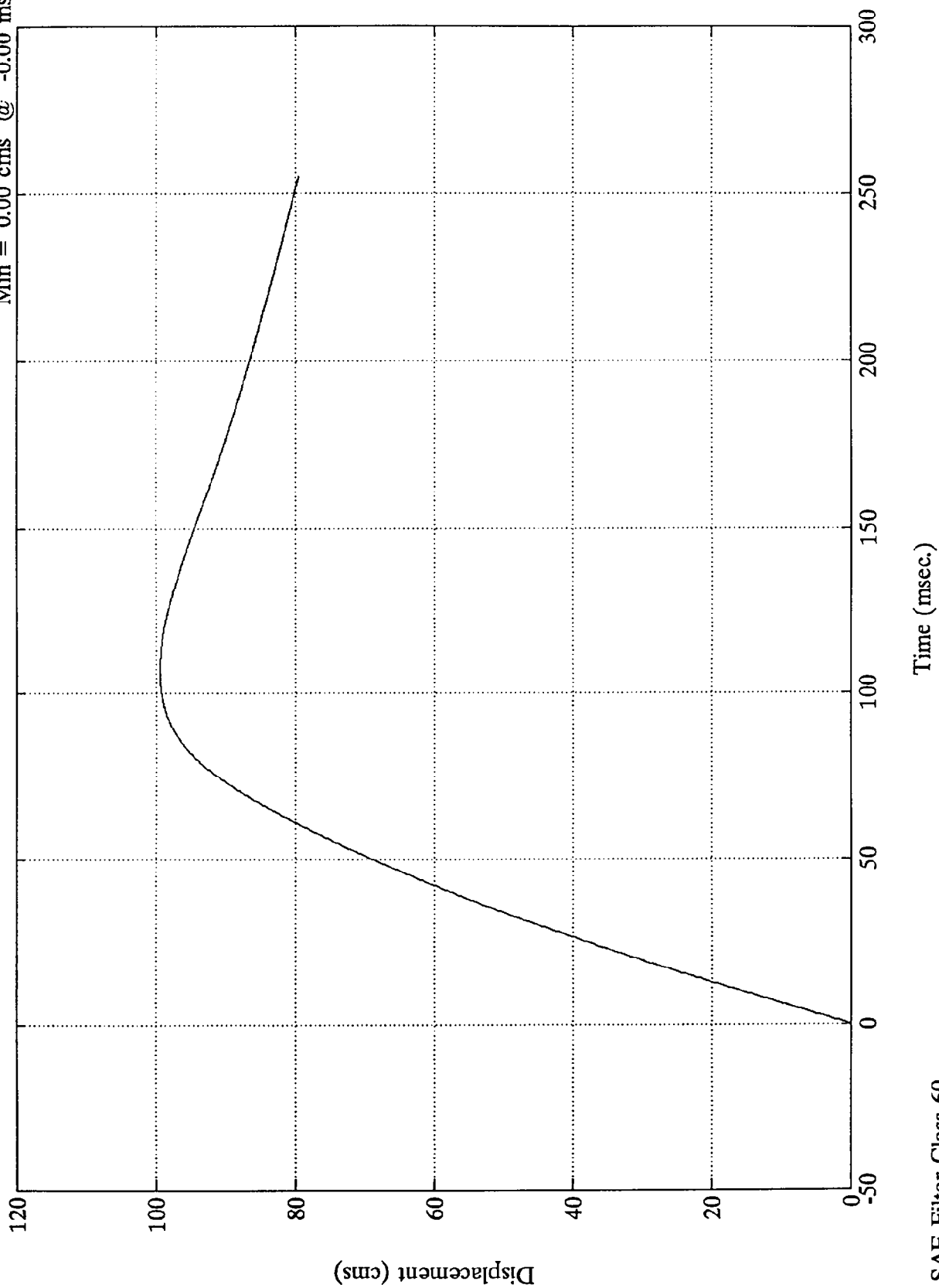
Acc. #9(x)



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Acc. #9(x)

Max = 99.47 cms @ 108.24 msec
Min = 0.00 cms @ -0.00 msec



TEST NO. MP0106

LOAD CELL BARRIER DATA

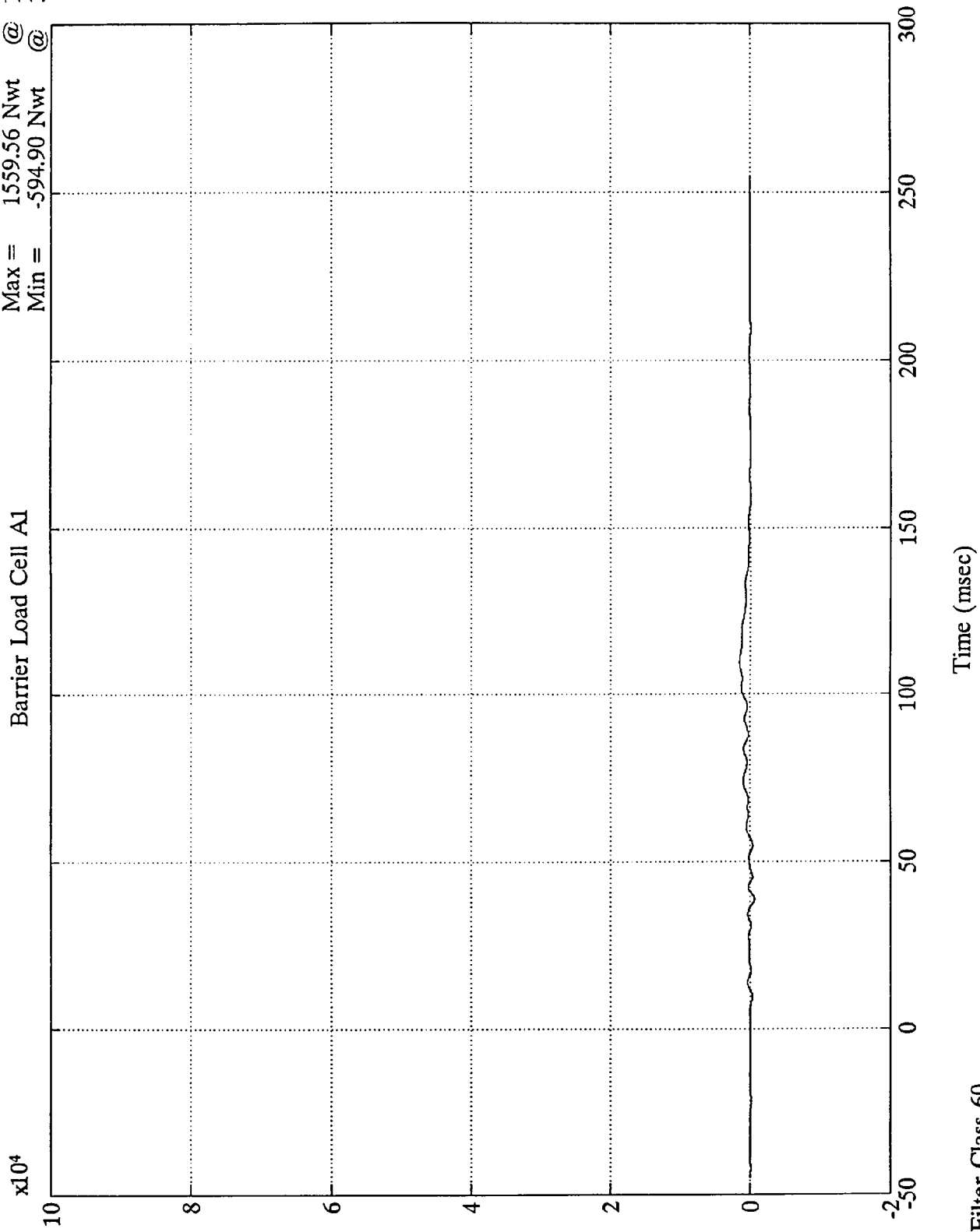
FILTER CHANNEL CLASS

60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell A1

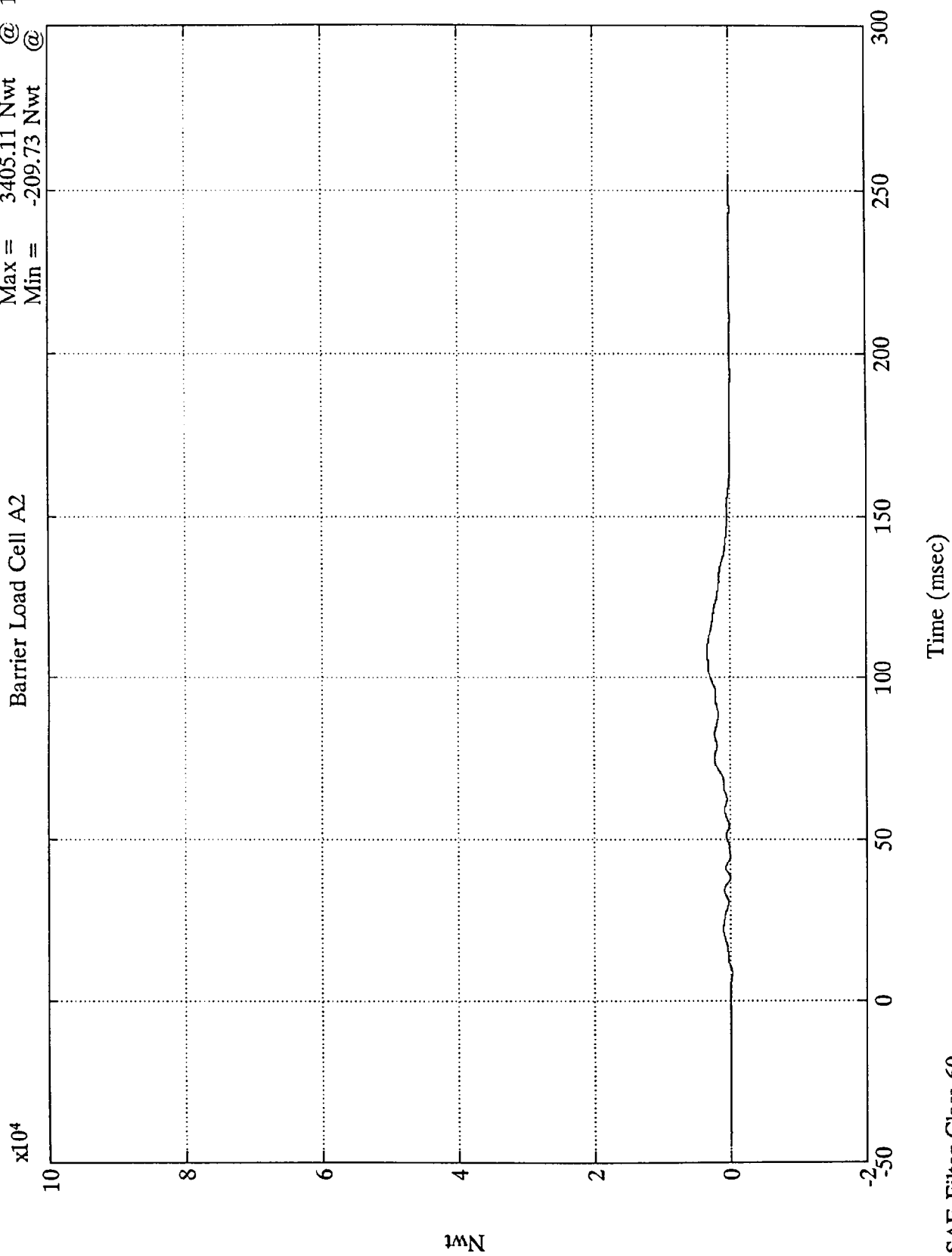
Max = 1559.56 Nwt @ 109.56 msec
Min = -594.90 Nwt @ 38.63 msec



11N
B-27

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell A2
Max = 3405.11 Nwt @ 108.36 msec
Min = -209.73 Nwt @ 8.39 msec

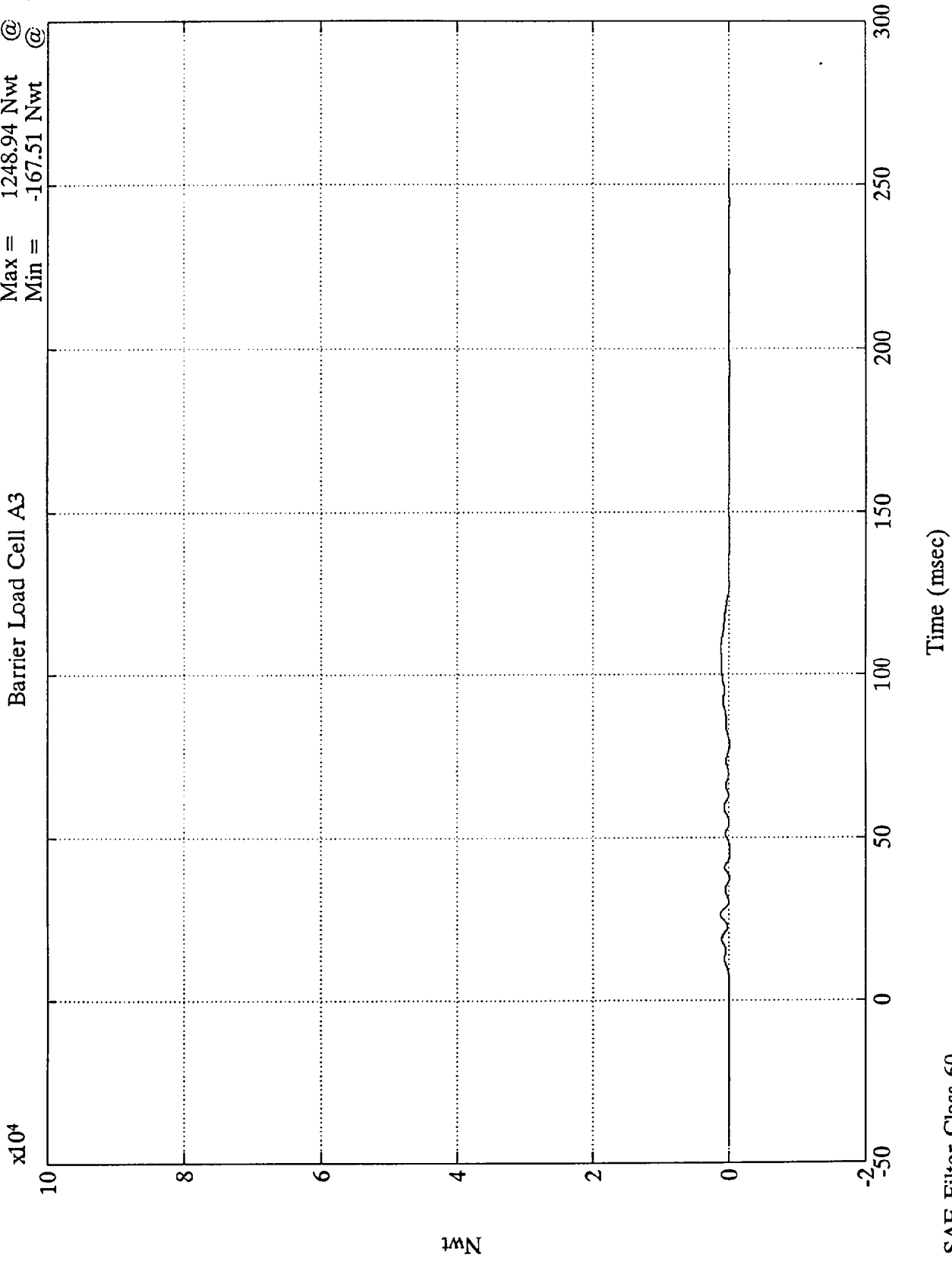


B-28

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell A3

Max = 1248.94 Nwt @ 26.51 msec
Min = -167.51 Nwt @ 78.36 msec



B-29

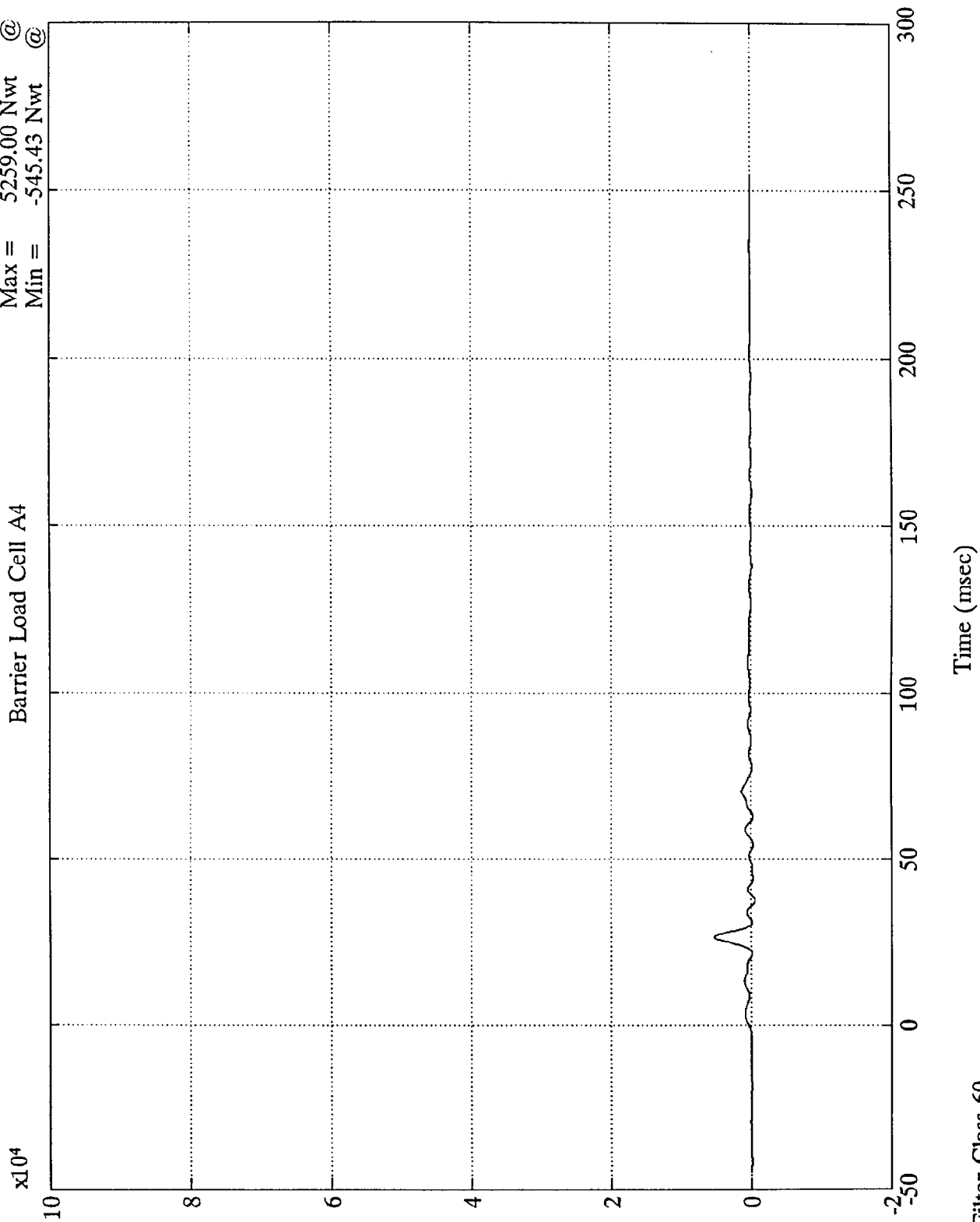
SAE Filter Class 60

8120-2

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell A4

Max = 5259.00 Nwt @ 26.39 msec
Min = -545.43 Nwt @ 37.44 msec

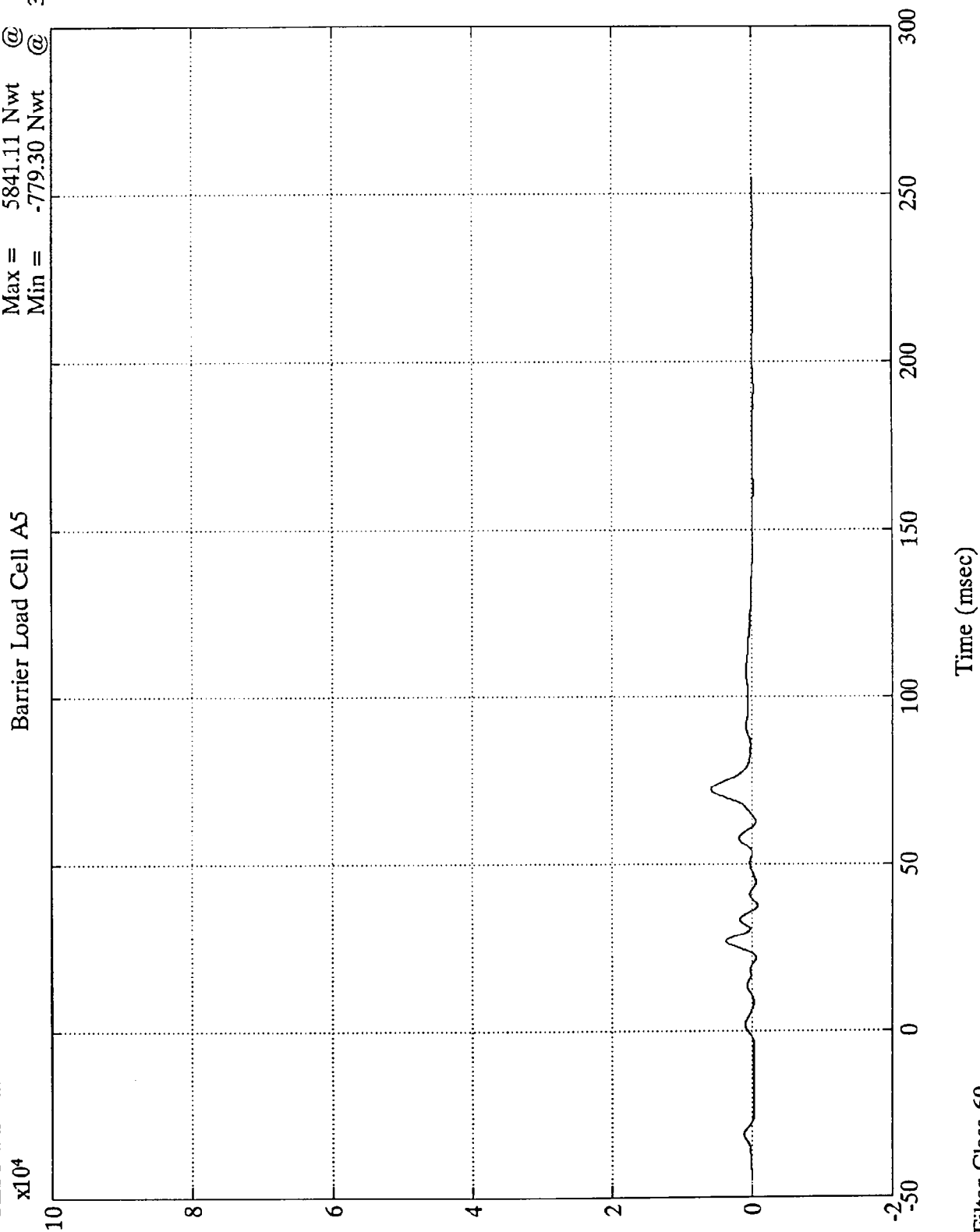


B-30

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell A5

Max = 5841.11 Nwt @ 72.48 msec
Min = -779.30 Nwt @ 37.44 msec



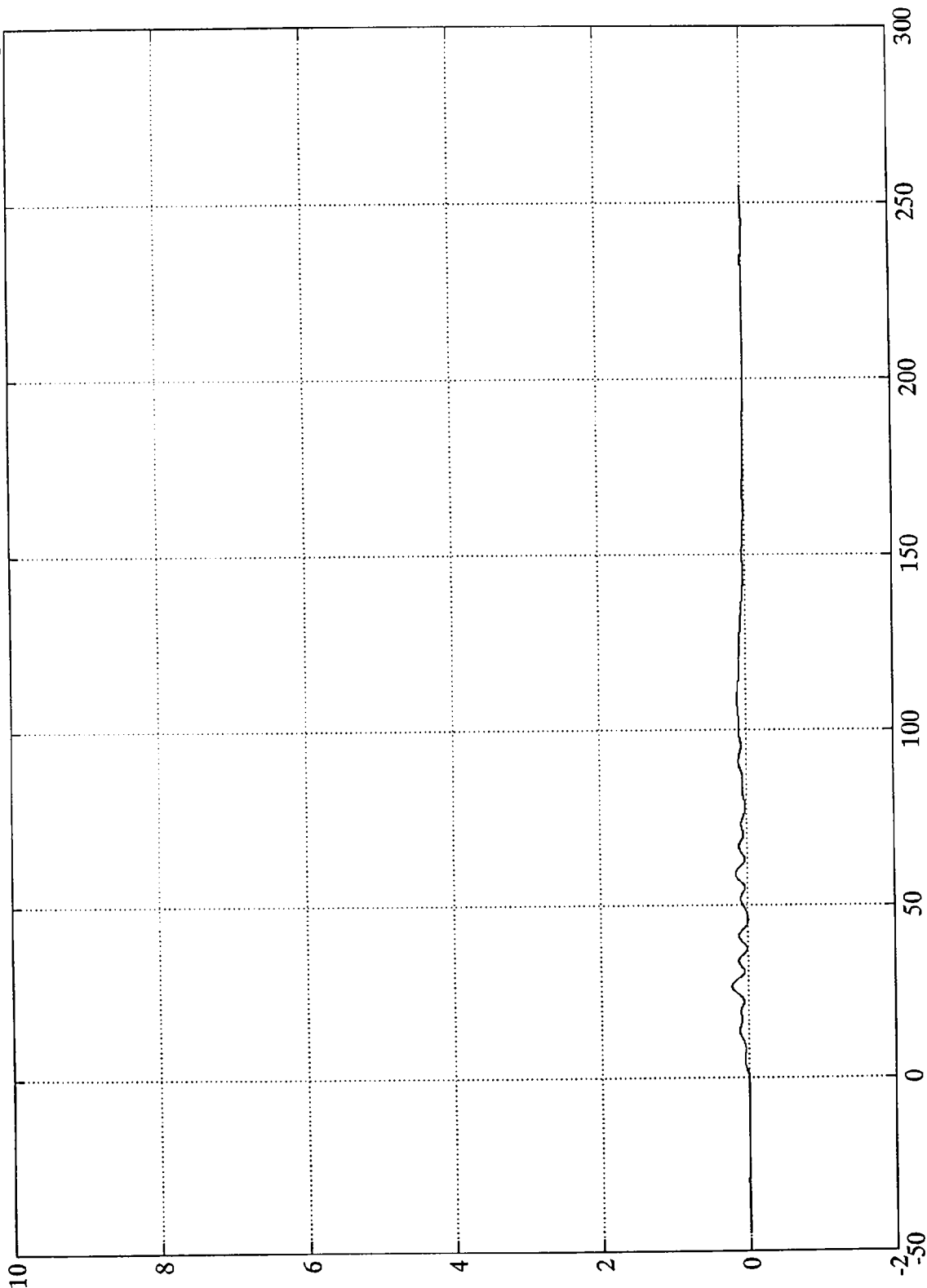
1wN
B-31

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell A6

x10⁴

Max = 2248.37 Nwt @ 26.27 msec
Min = -62.07 Nwt @ 244.44 msec



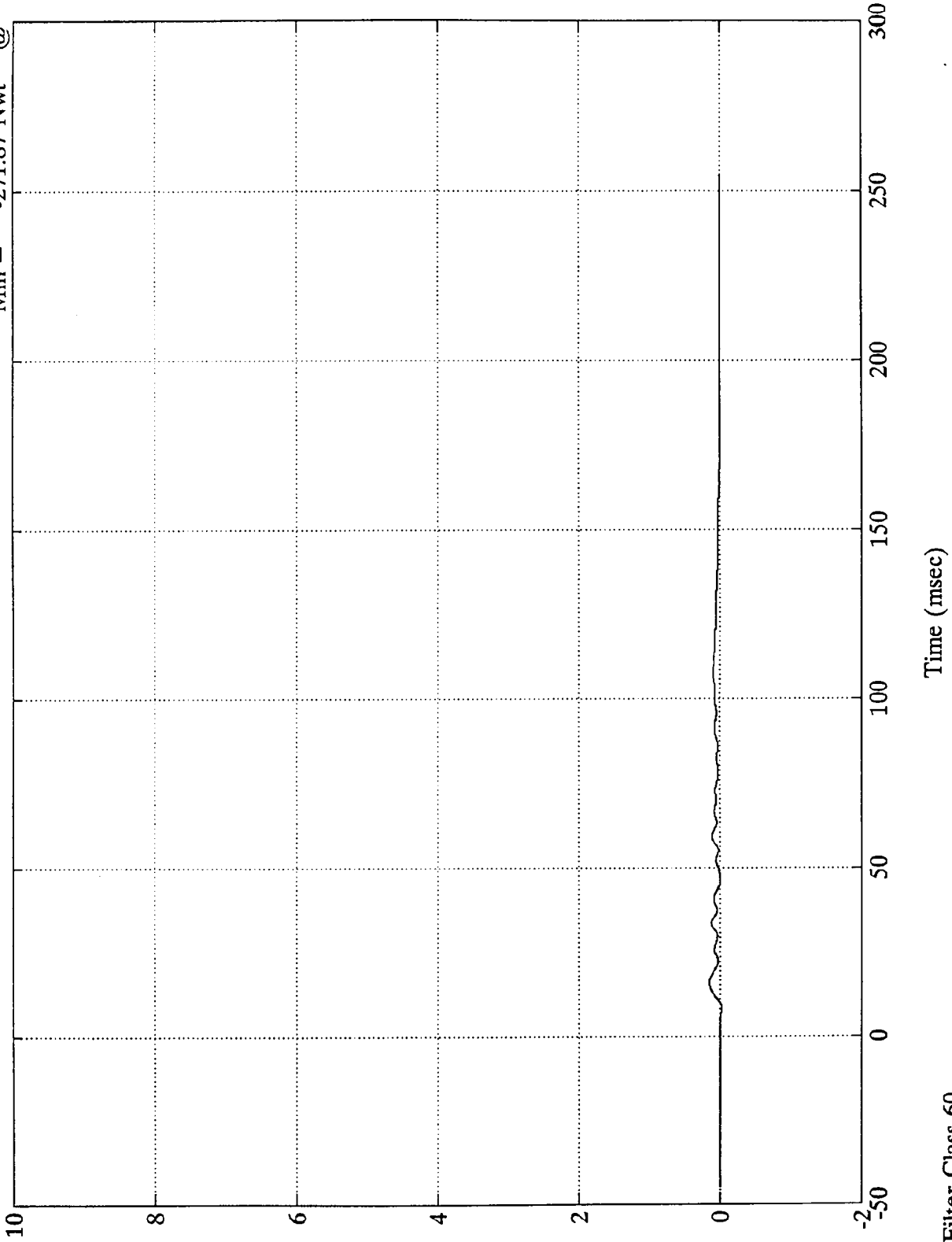
B-32

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 1475.99 Nwt @ 15.95 msec
Min = -271.87 Nwt @ 8.15 msec

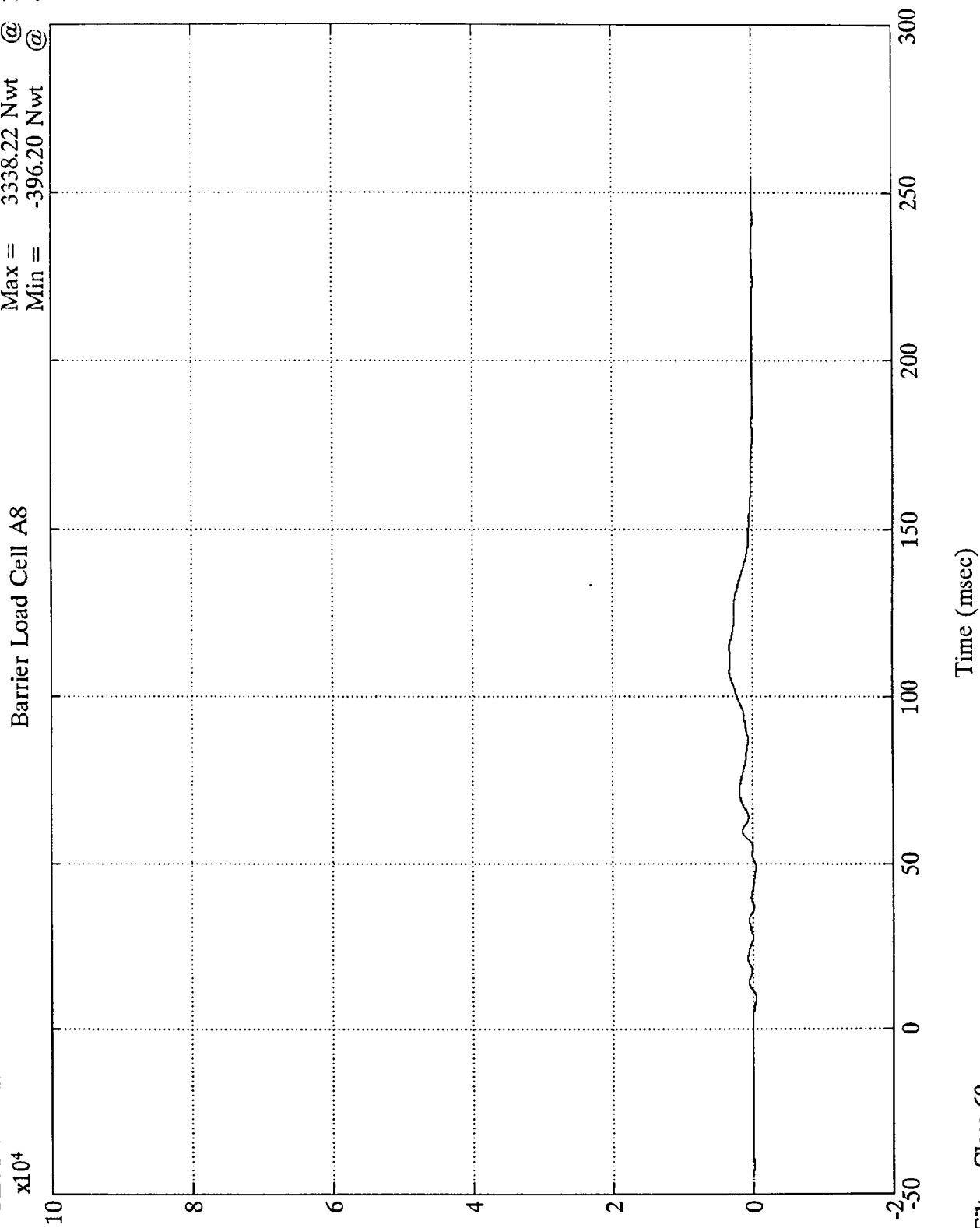
Barrier Load Cell A7

$\times 10^4$



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell A8
 Max = 3338.22 Nwt @ 114.84 msec
 Min = -396.20 Nwt @ 48.95 msec



10N
 B-34

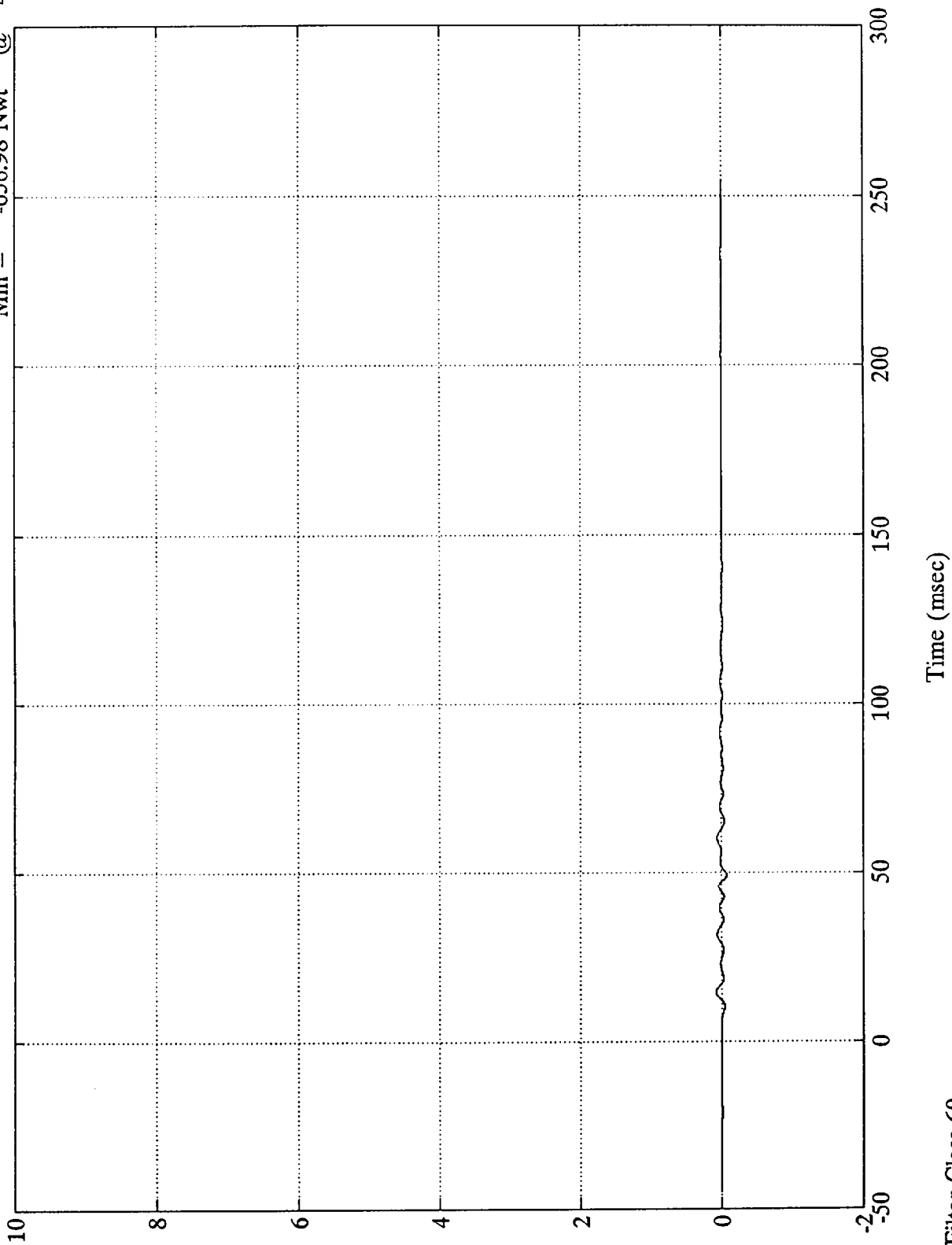
8120-2 SAE Filter Class 60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 843.37 Nwt @ 14.27 msec
Min = -656.98 Nwt @ 49.20 msec

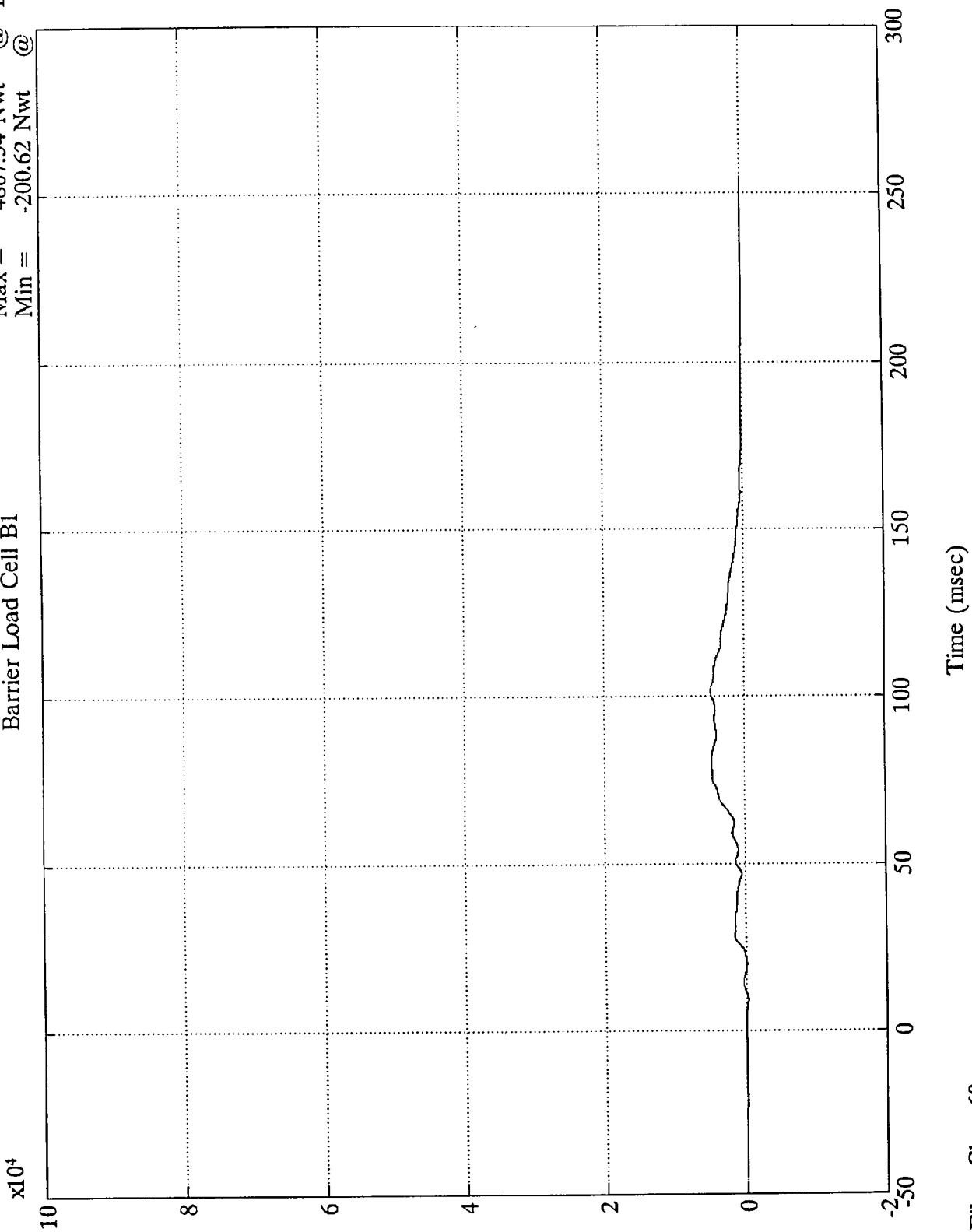
Barrier Load Cell A9

x10⁴



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell B1
Max = 4807.34 Nwt @ 101.40 msec
Min = -200.62 Nwt @ 9.23 msec

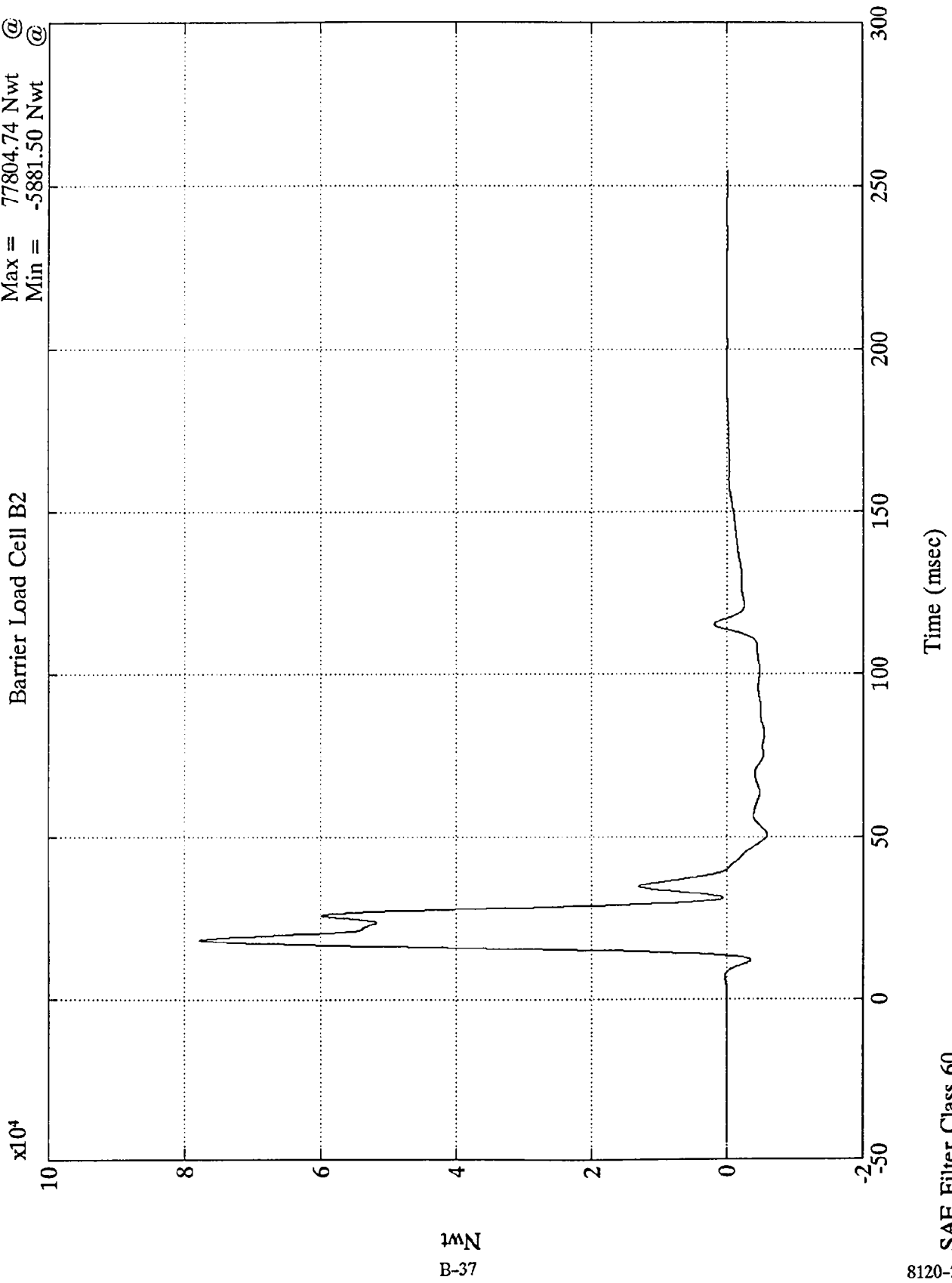


1wN
B-36

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell B2

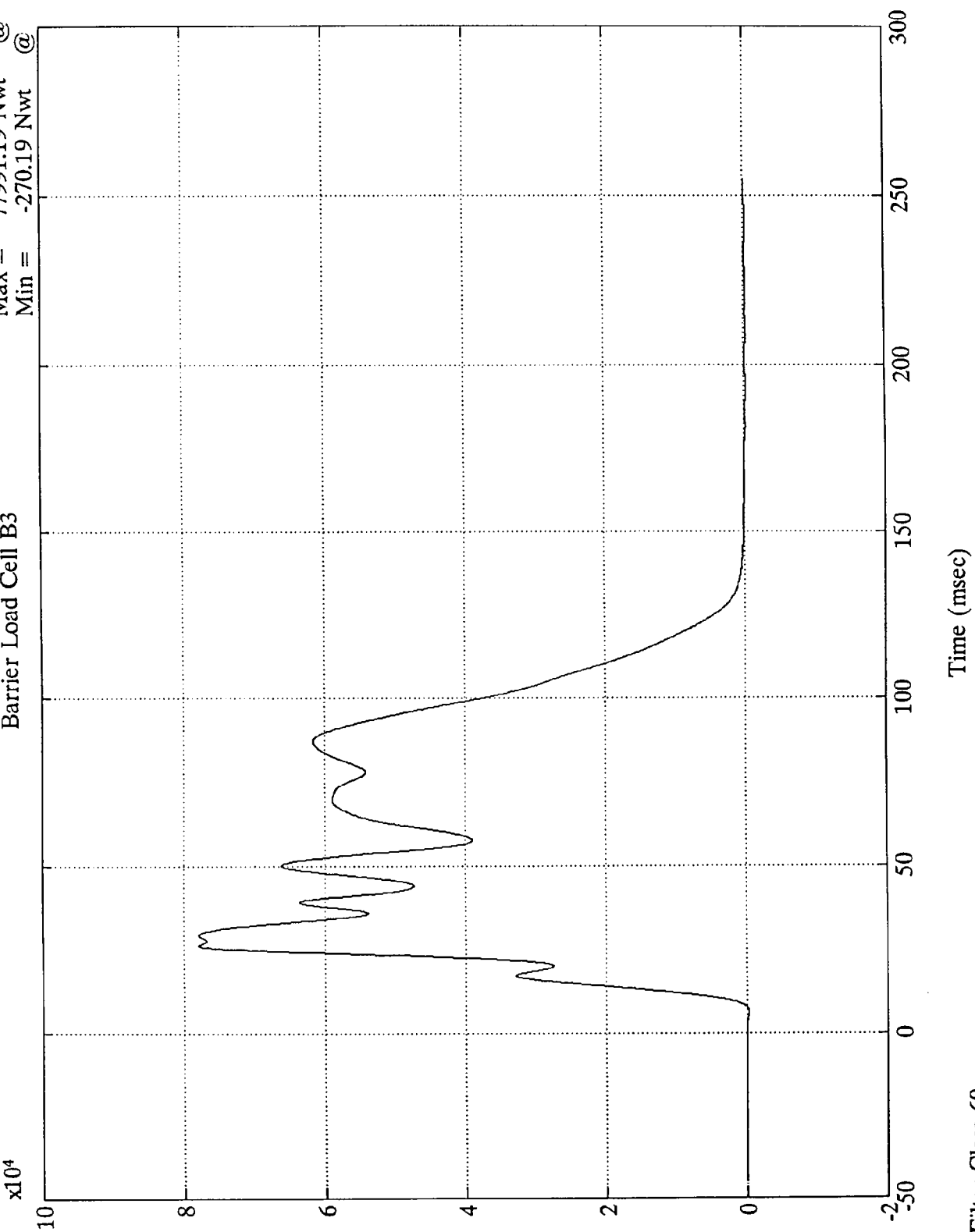
Max = 77804.74 Nwt @ 18.36 msec
Min = -5881.50 Nwt @ 50.76 msec



B-37

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell B3
 Max = 77991.19 Nwt @ 26.15 msec
 Min = -270.19 Nwt @ 6.11 msec

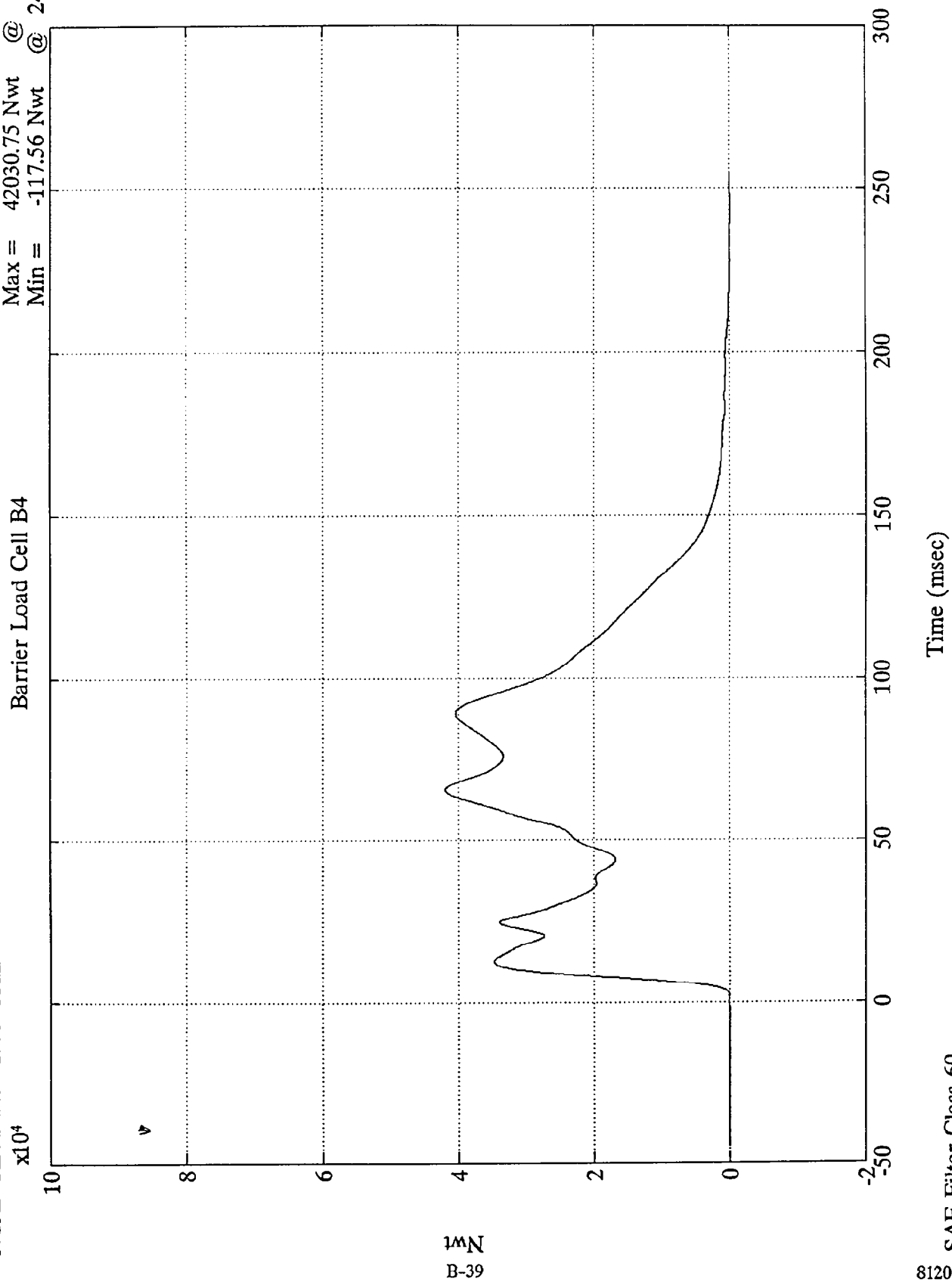


B-38

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell B4

Max = 42030.75 Nwt @ 65.40 msec
Min = -117.56 Nwt @ 244.20 msec

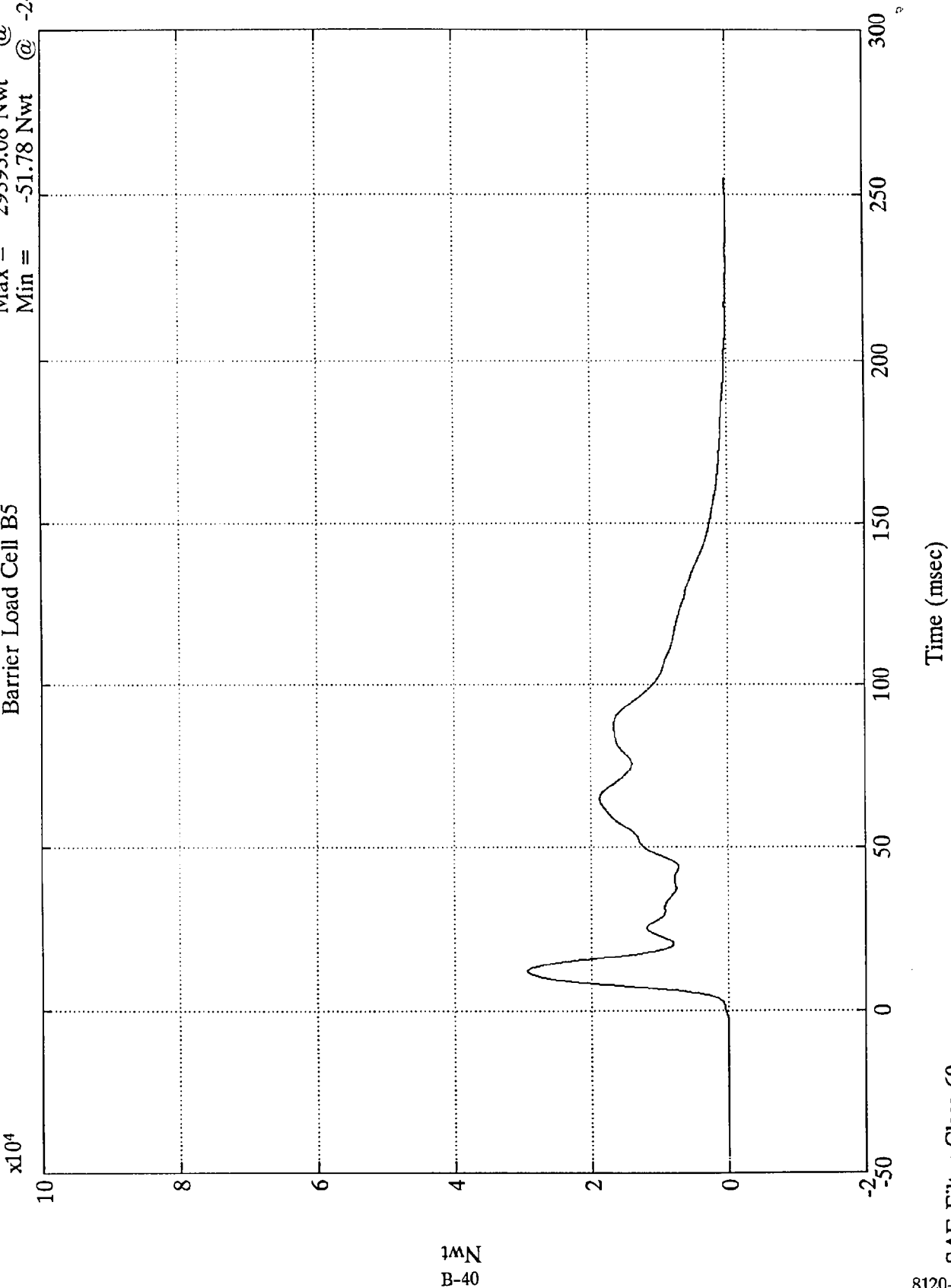


B-39

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell B5

Max = 29393.08 Nwt @ 12.11 msec
Min = -51.78 Nwt @ -24.36 msec



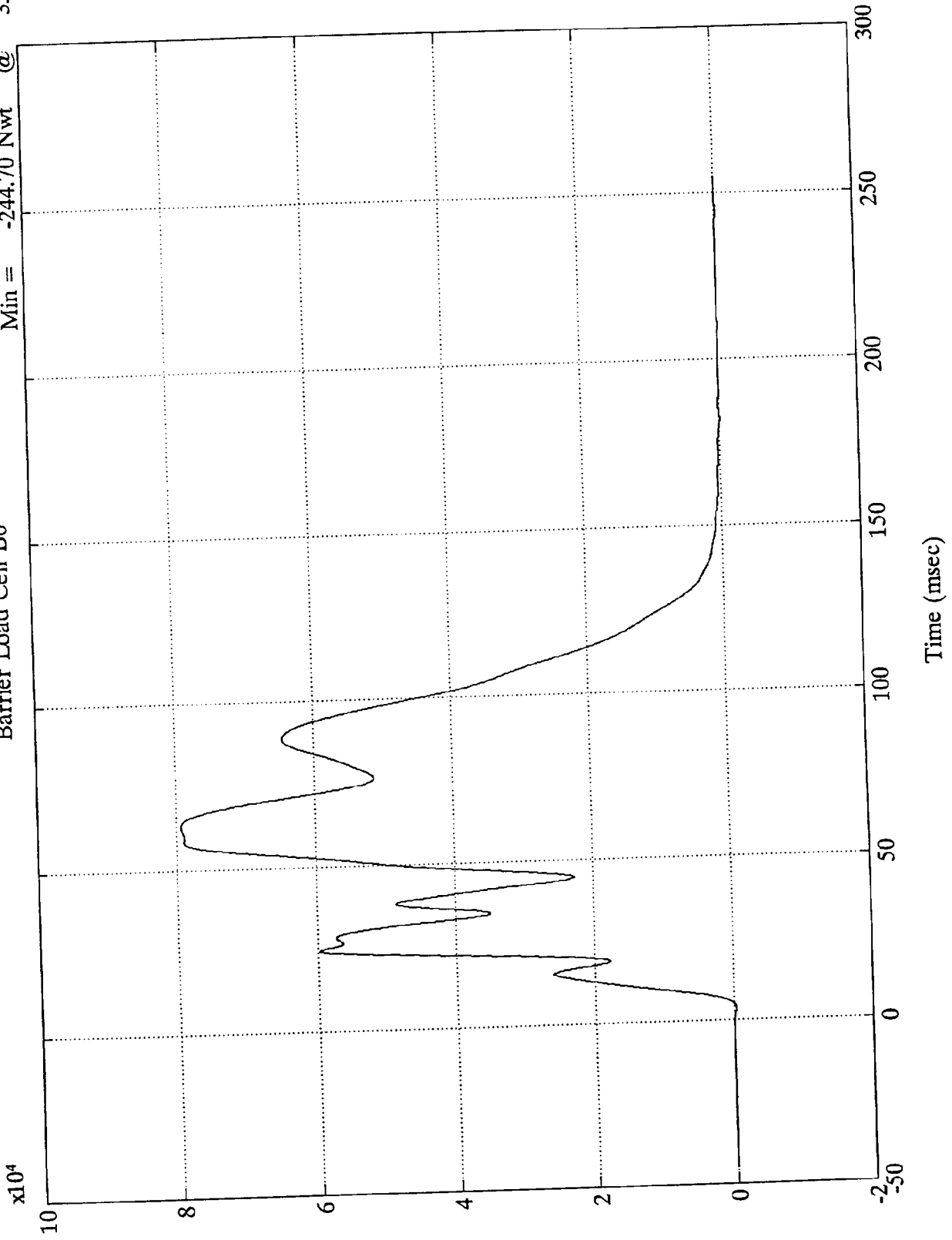
10⁴N
B-40

NCAP TEST #2 - 1993 CHEVROLET CAMARO

63.11 msec
3.35 msec

Max = 79331.63 Nwt @
Min = -244.70 Nwt @

Barrier Load Cell B6

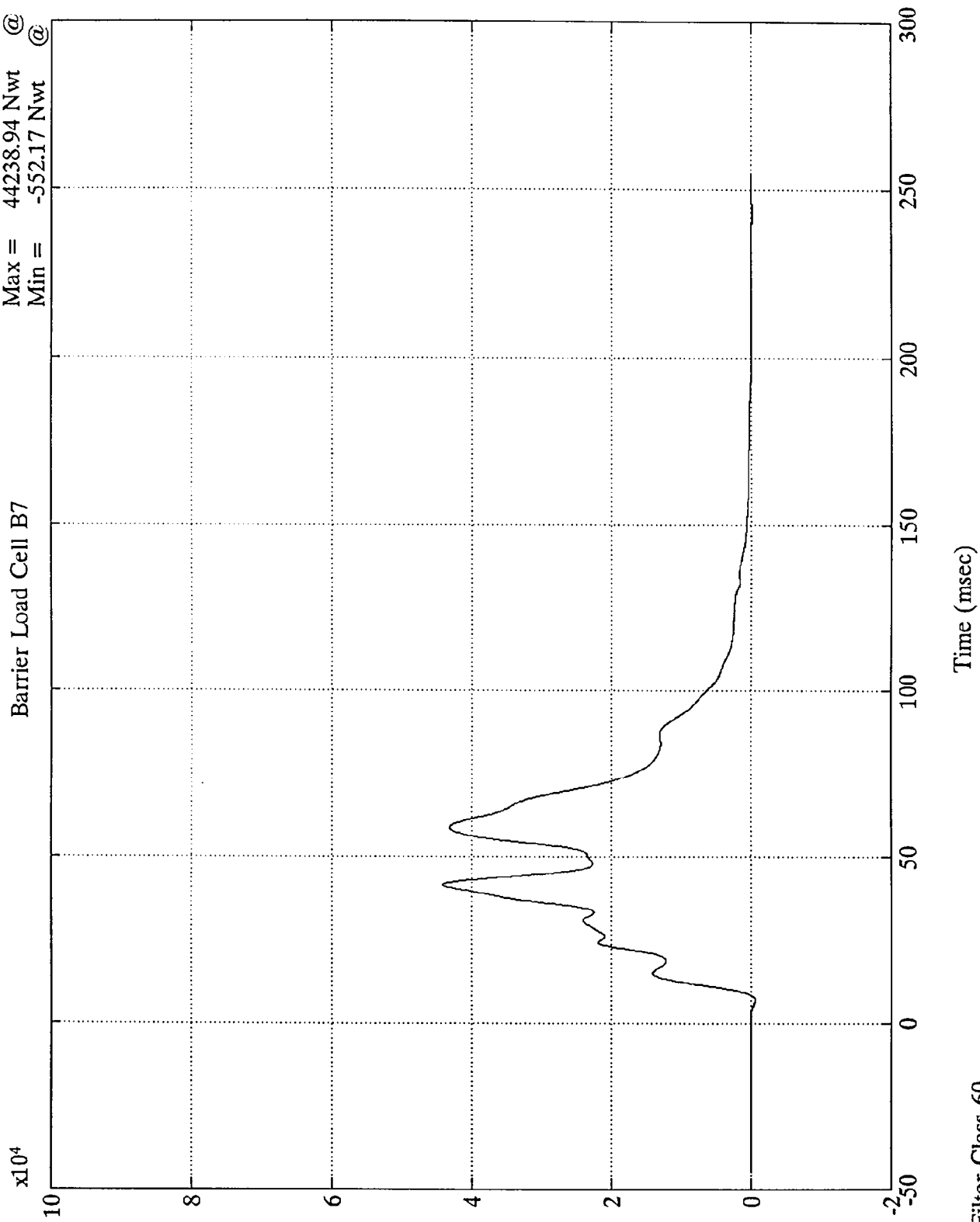


10N
B-41

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 44238.94 Nwt @ 41.40 msec
 Min = -552.17 Nwt @ 6.83 msec

Barrier Load Cell B7



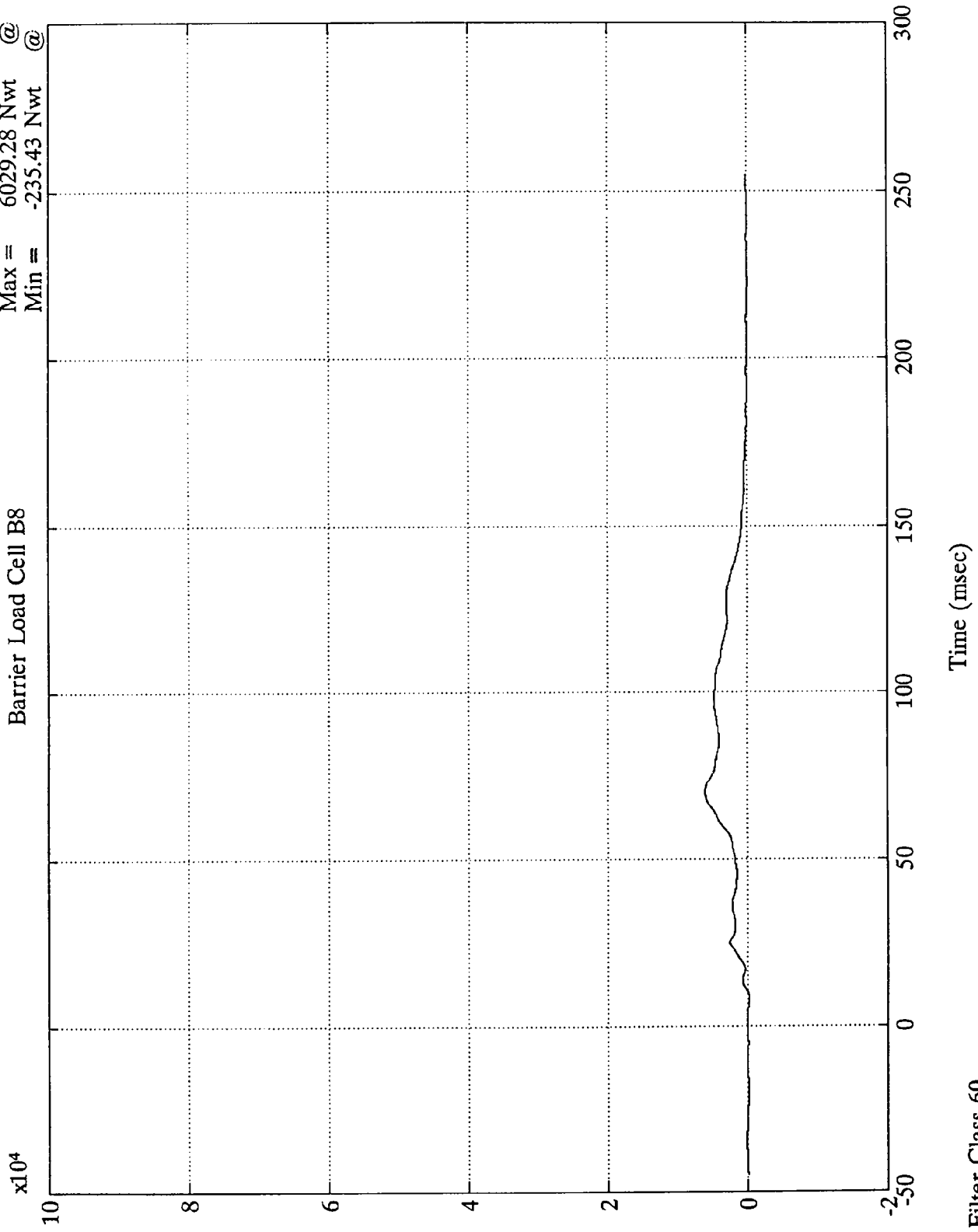
1wN
 B-42

8120-2
 SAE Filter Class 60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell B8

Max = 6029.28 Nwt @ 70.08 msec
Min = -235.43 Nwt @ 8.39 msec



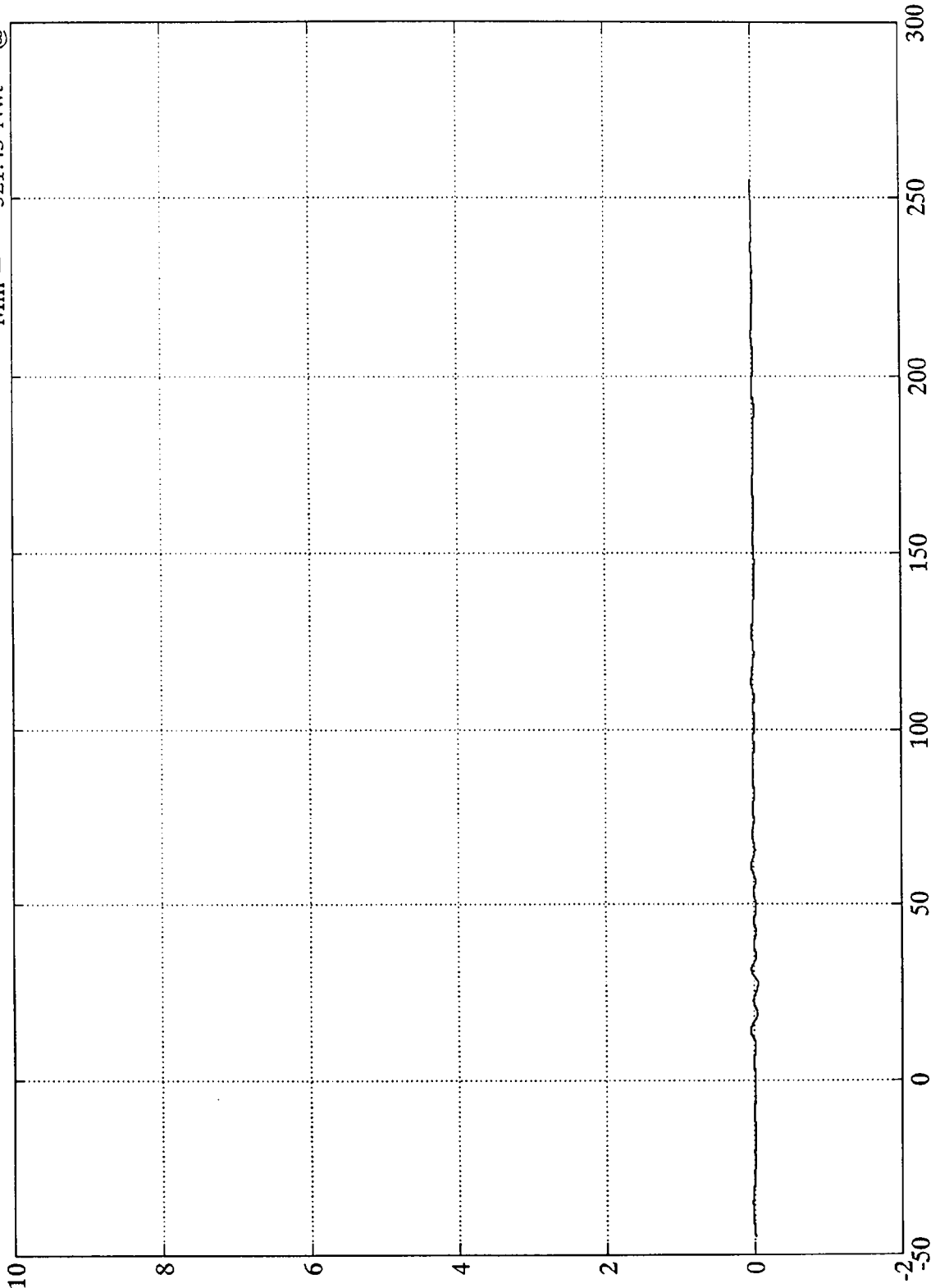
13N
B-43

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 460.07 Nwt @ 13.67 msec
Min = -521.43 Nwt @ 27.11 msec

Barrier Load Cell B9

x10⁴



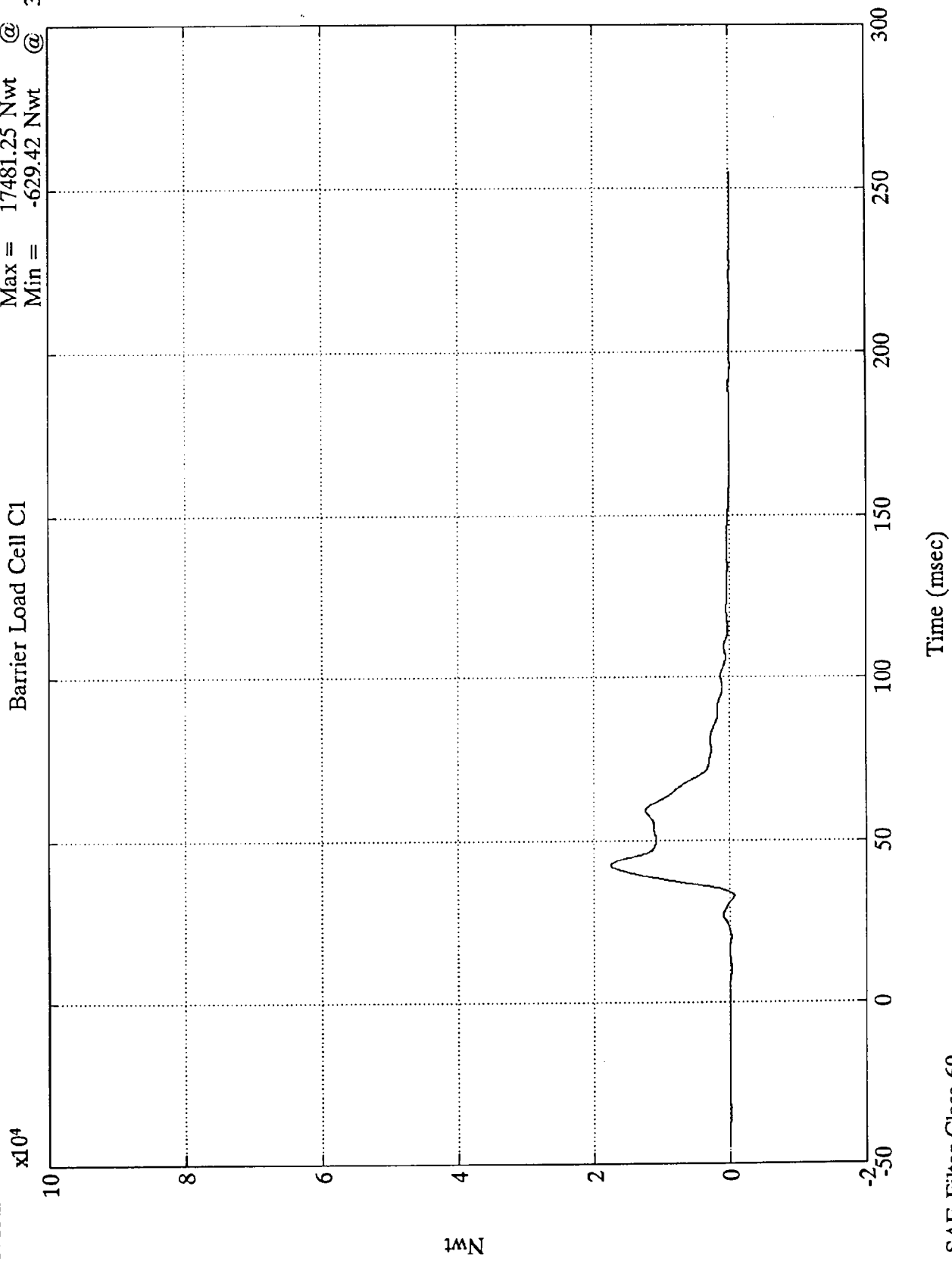
Time (msec)

SAE Filter Class 60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell C1

Max = 17481.25 Nwt @ 42.36 msec
Min = -629.42 Nwt @ 32.88 msec



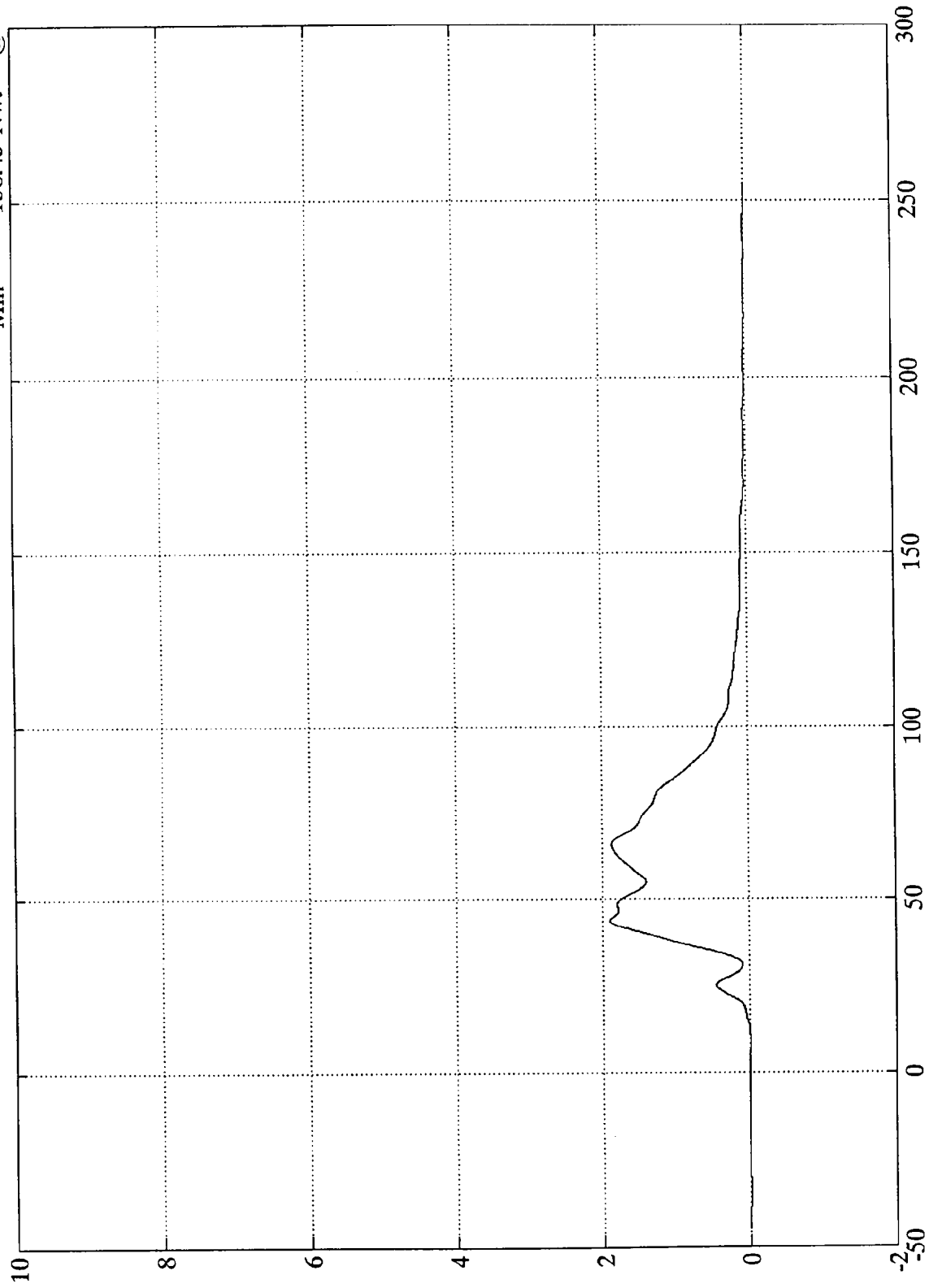
1W
B-45

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 19033.76 Nwt @ 43.68 msec
 Min = -156.45 Nwt @ 8.51 msec

Barrier Load Cell C2

x10⁴



Time (msec)

SAE Filter Class 60

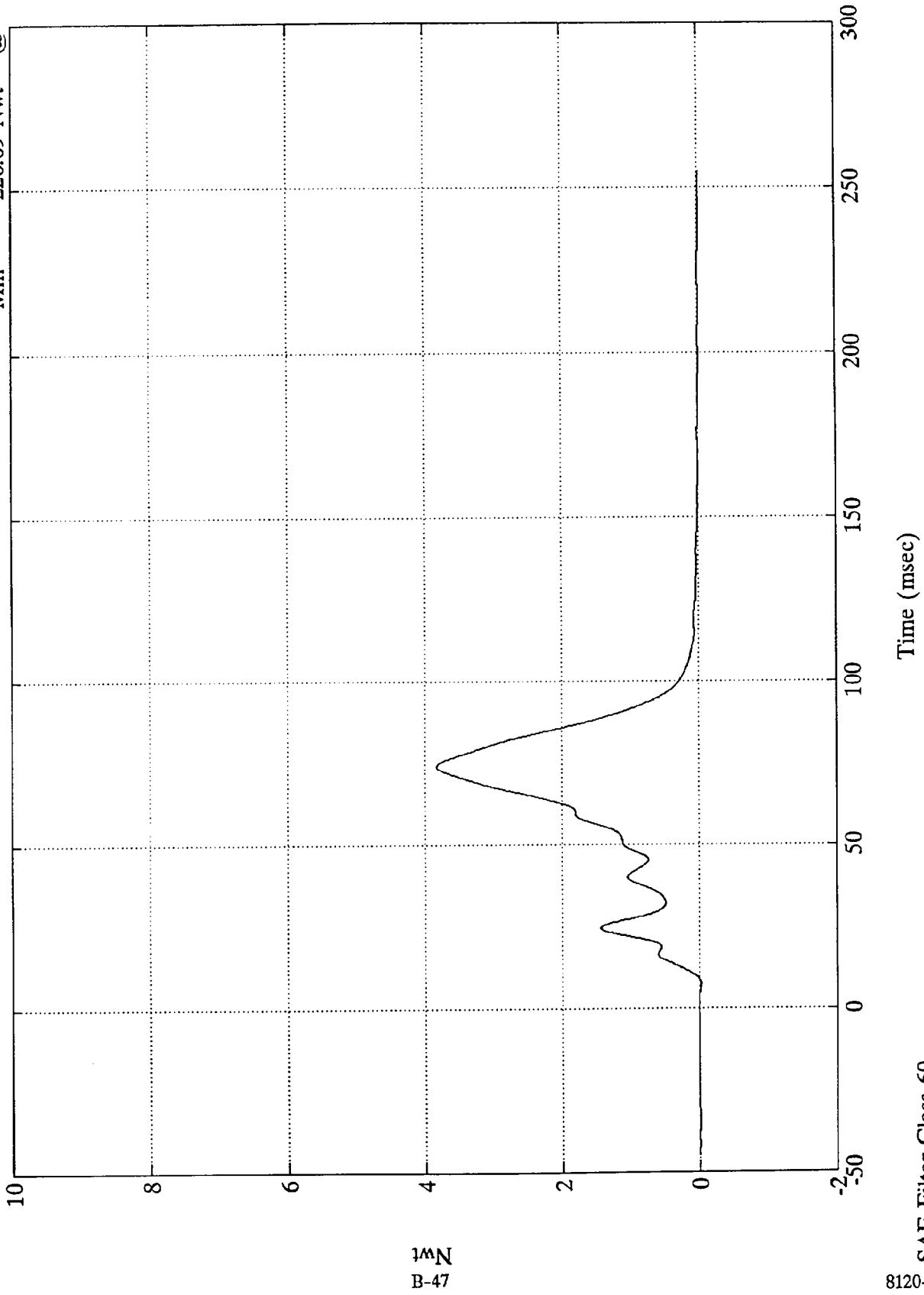
8120-2

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 38294.10 Nwt @ 74.04 msec
Min = -226.69 Nwt @ 7.19 msec

Barrier Load Cell C3

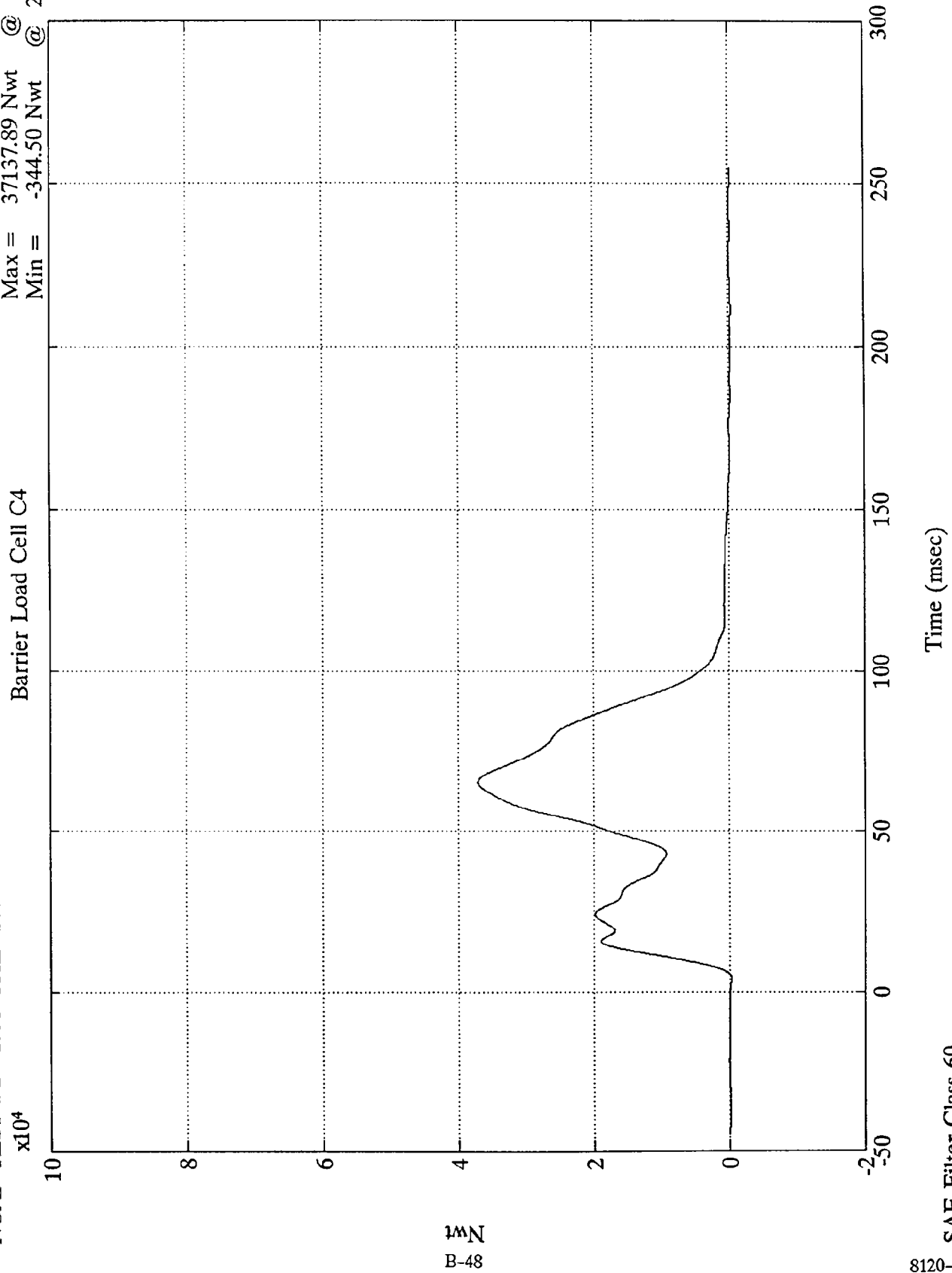
x10⁴



1wN
B-47

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell C4
Max = 37137.89 Nwt @ 65.27 msec
Min = -344.50 Nwt @ 211.32 msec

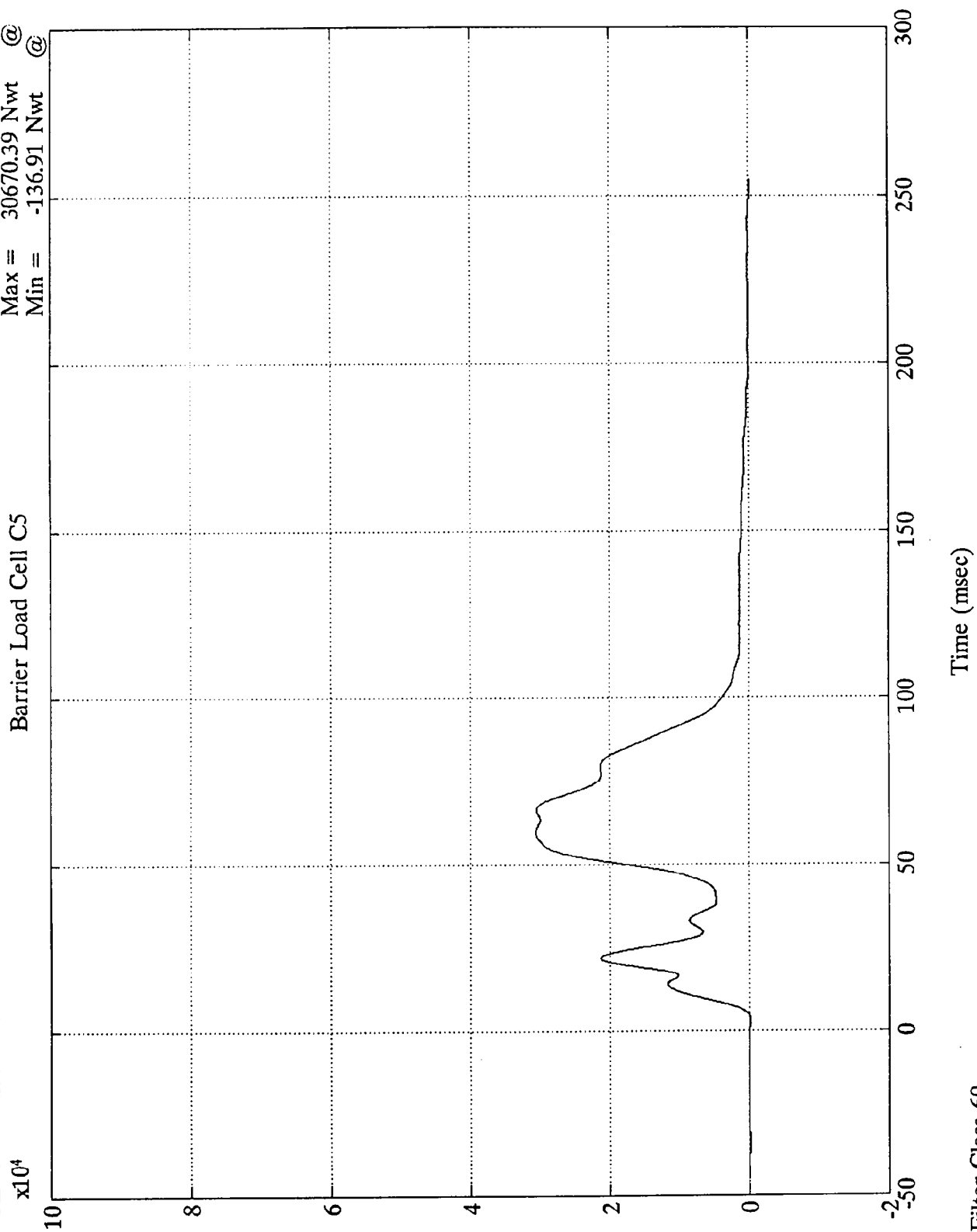


11N
B-48

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell C5

Max = 30670.39 Nwt @ 59.52 msec
Min = -136.91 Nwt @ 2.99 msec

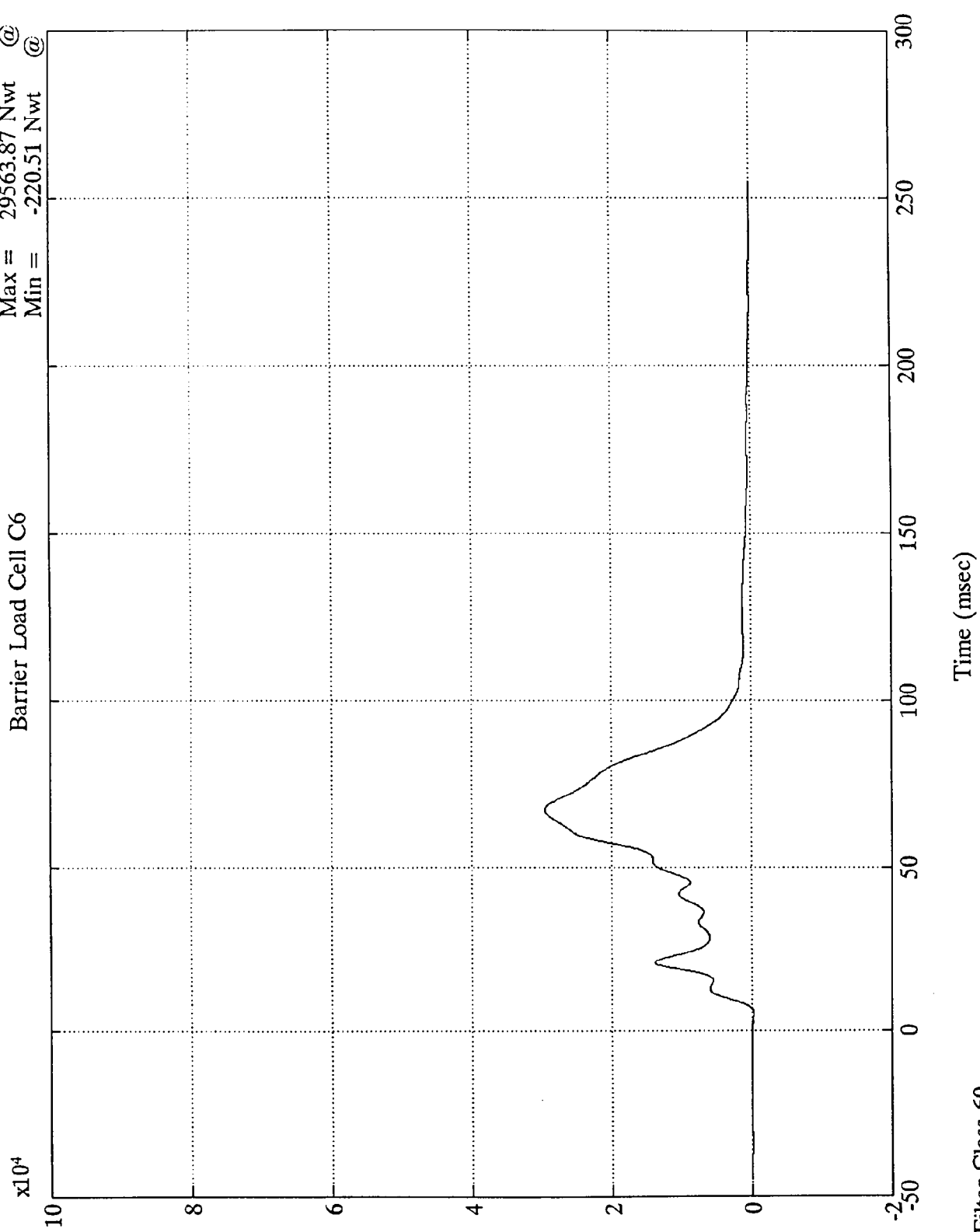


B-49

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 29563.87 Nwt @ 67.08 msec
Min = -220.51 Nwt @ 5.15 msec

Barrier Load Cell C6

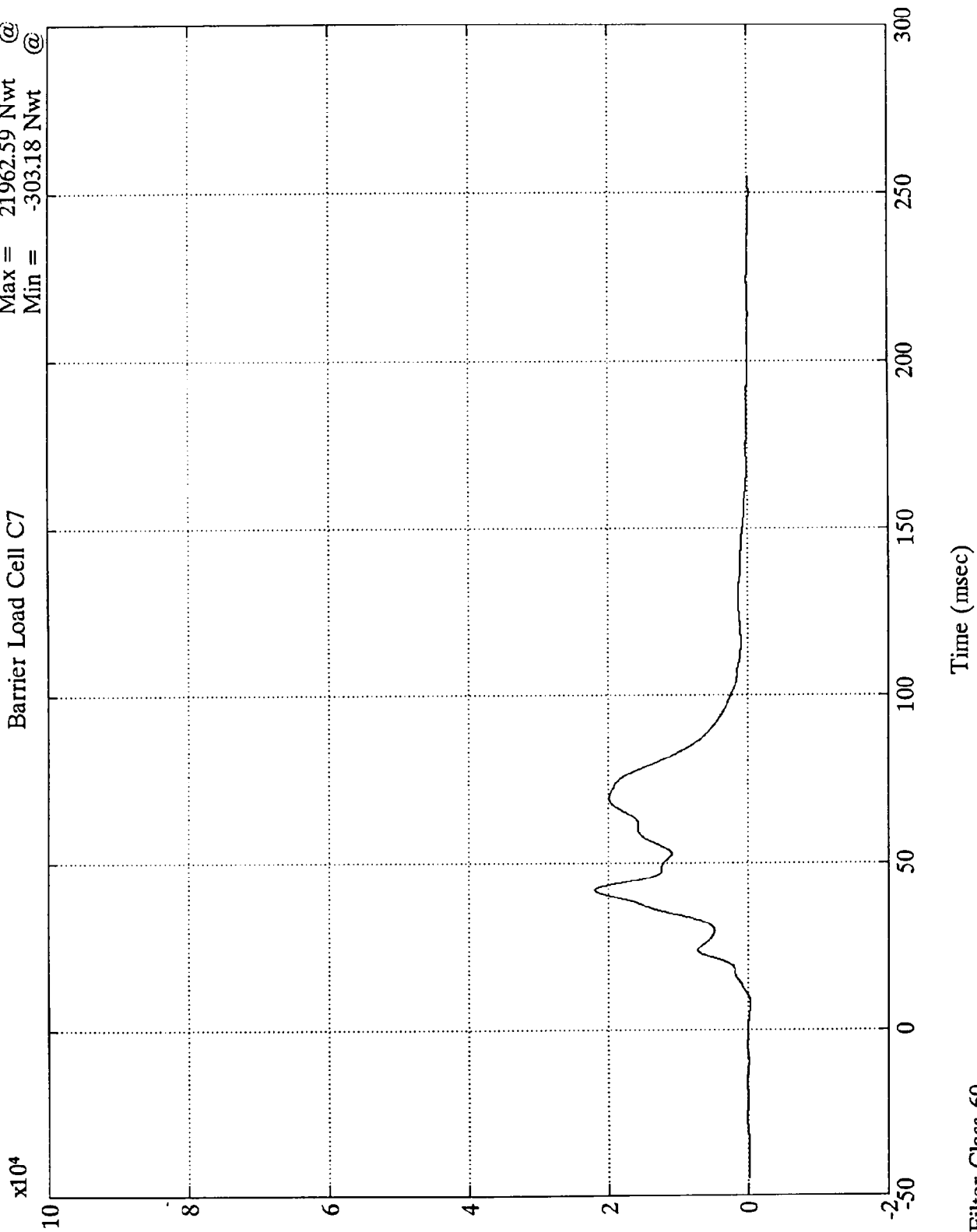


Nwt
B-50

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell C7

Max = 21962.59 Nwt @ 41.76 msec
Min = -303.18 Nwt @ 7.79 msec



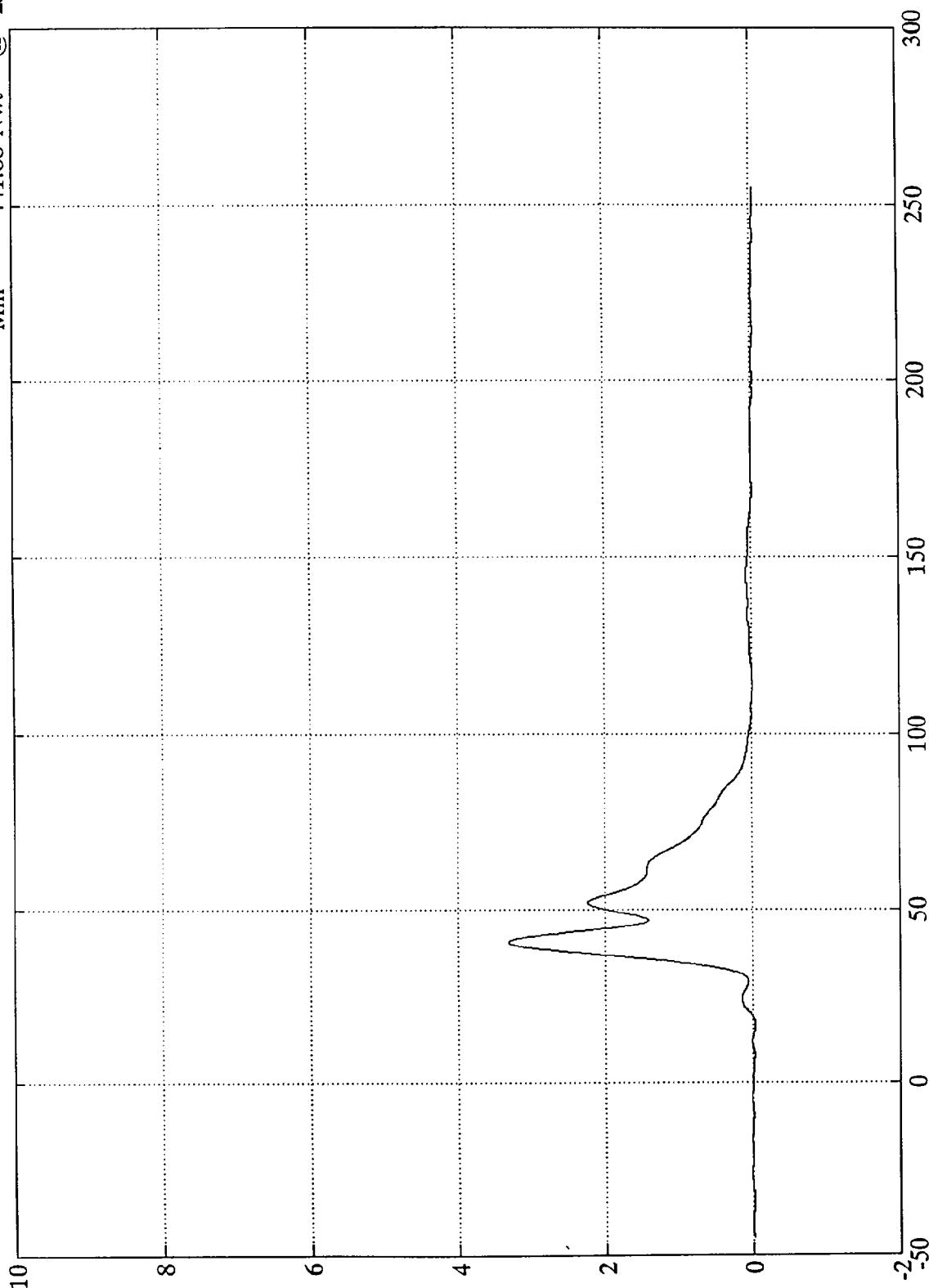
10^4
B-51

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 33184.74 Nwt @ 40.44 msec
Min = -441.88 Nwt @ 250.80 msec

Barrier Load Cell C8

$\times 10^4$

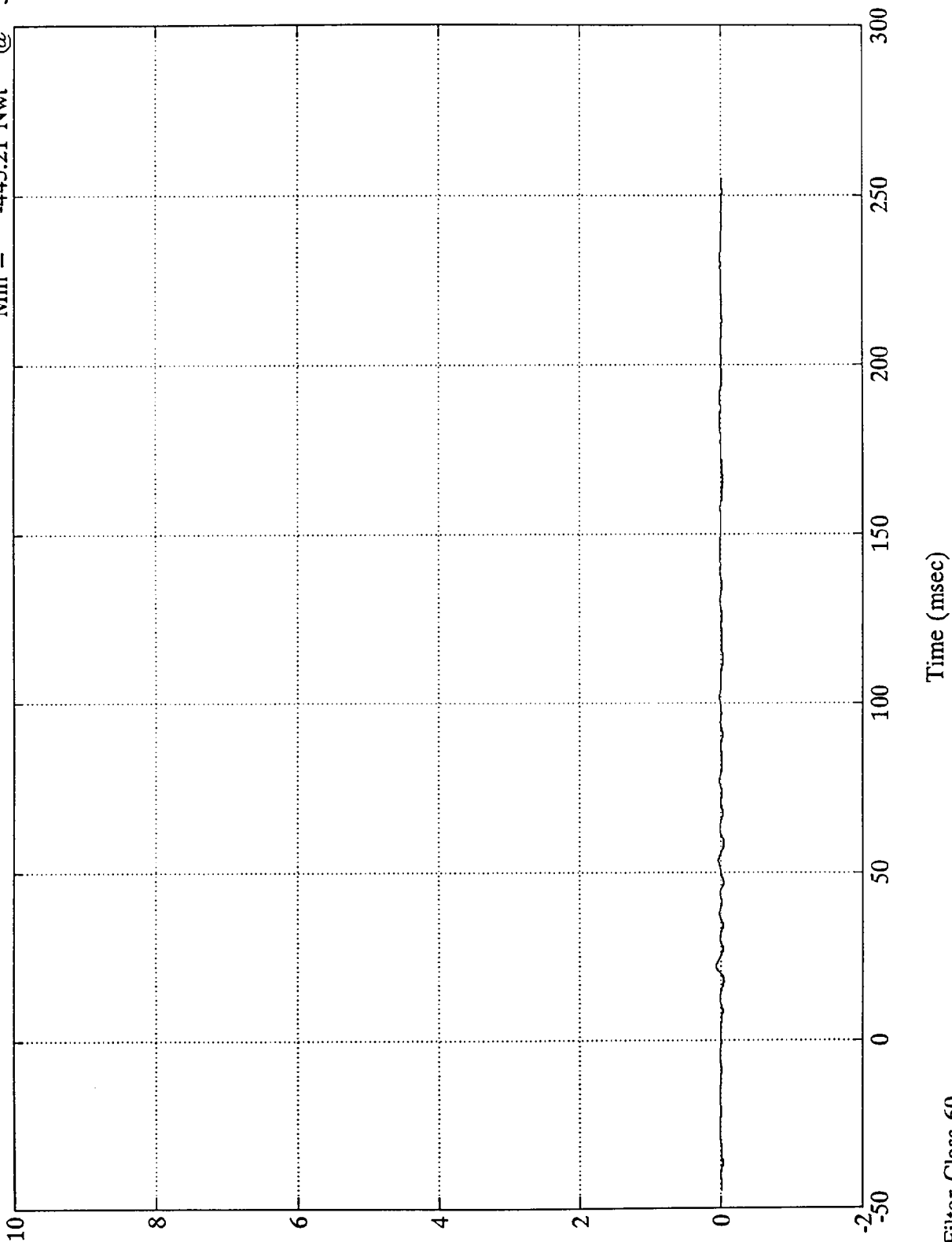


NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 696.05 Nwt @ 22.19 msec
Min = -445.21 Nwt @ 58.68 msec

Barrier Load Cell C9

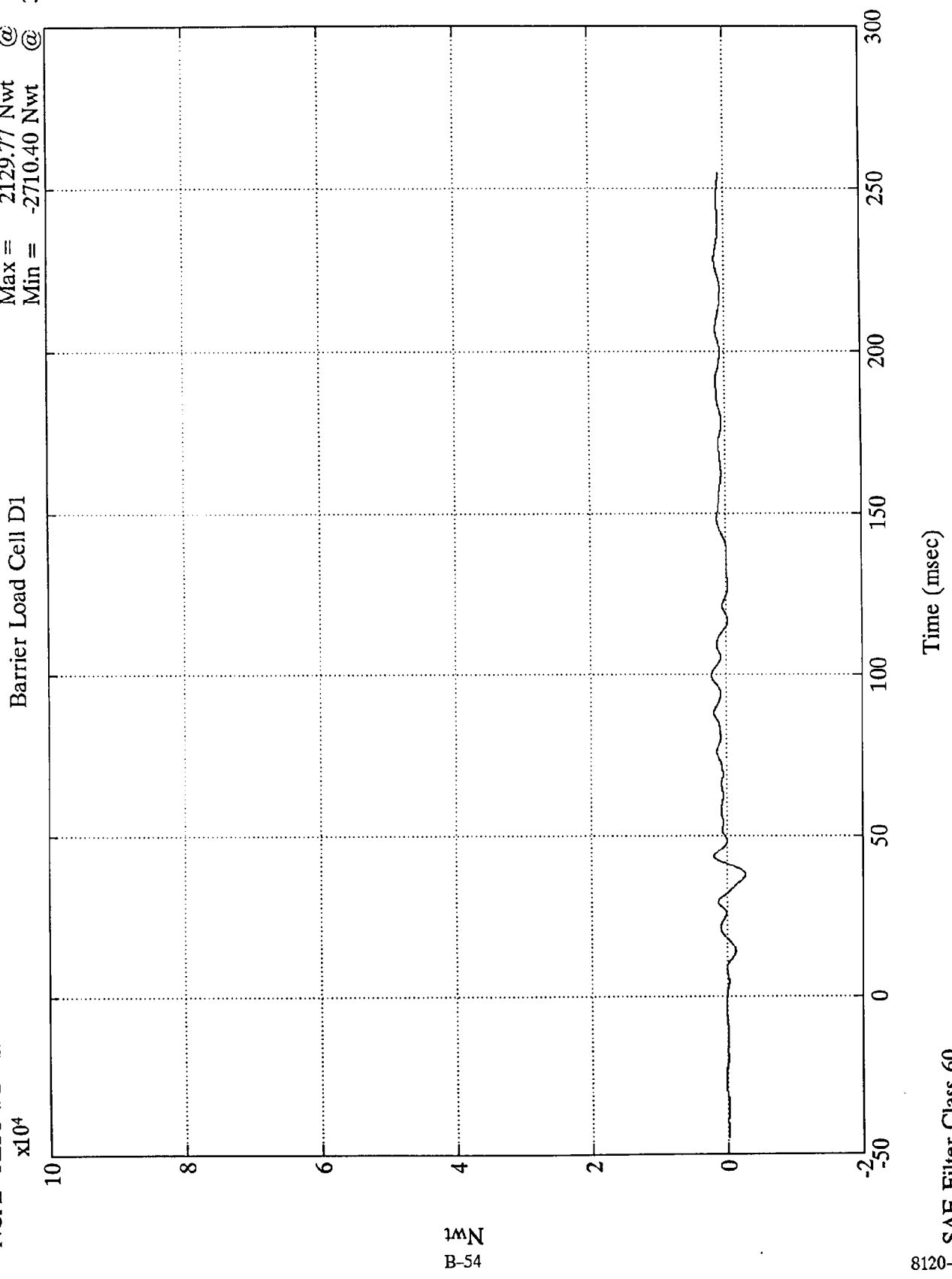
$\times 10^4$



1MN
B-53

NCAP TEST #2 - 1993 CHEVROLET CAMARO

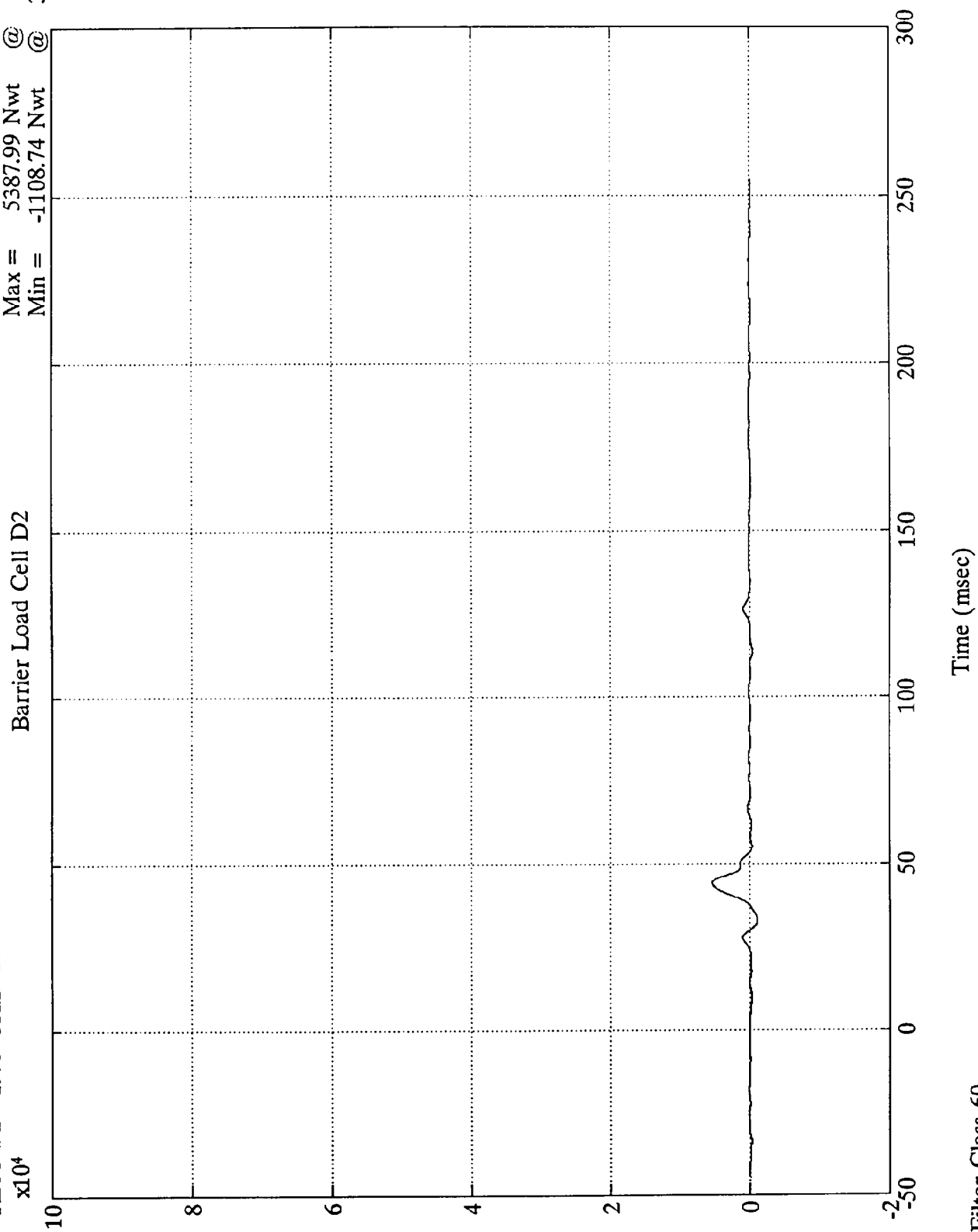
Barrier Load Cell D1
Max = 2129.77 Nwt @ 99.48 msec
Min = -2710.40 Nwt @ 37.92 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell D2

Max = 5387.99 Nwt @ 44.15 msec
Min = -1108.74 Nwt @ 33.00 msec



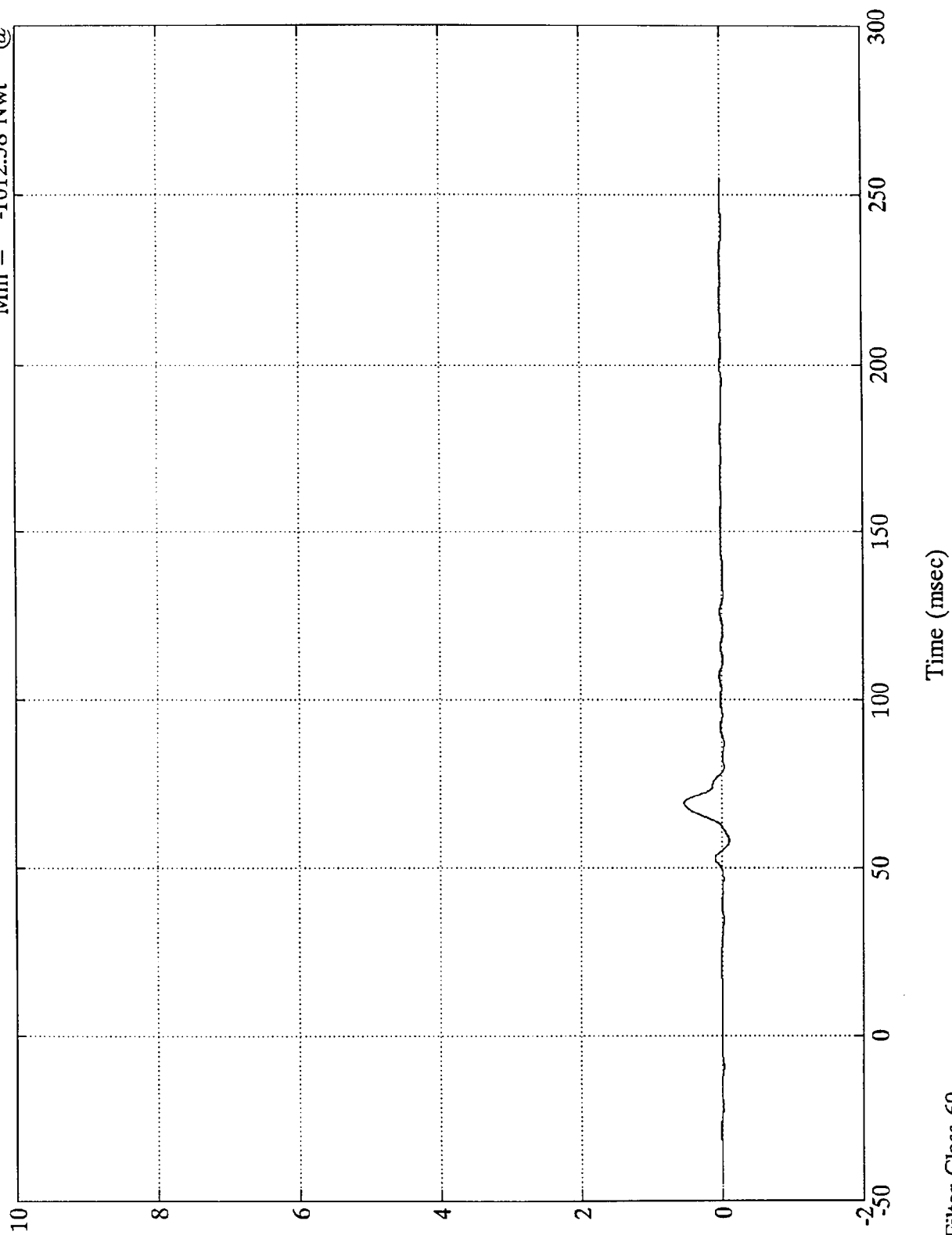
11N
B-55

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell D3

Max = 5330.08 Nwt @ 69.12 msec
Min = -1012.58 Nwt @ 58.08 msec

$\times 10^4$

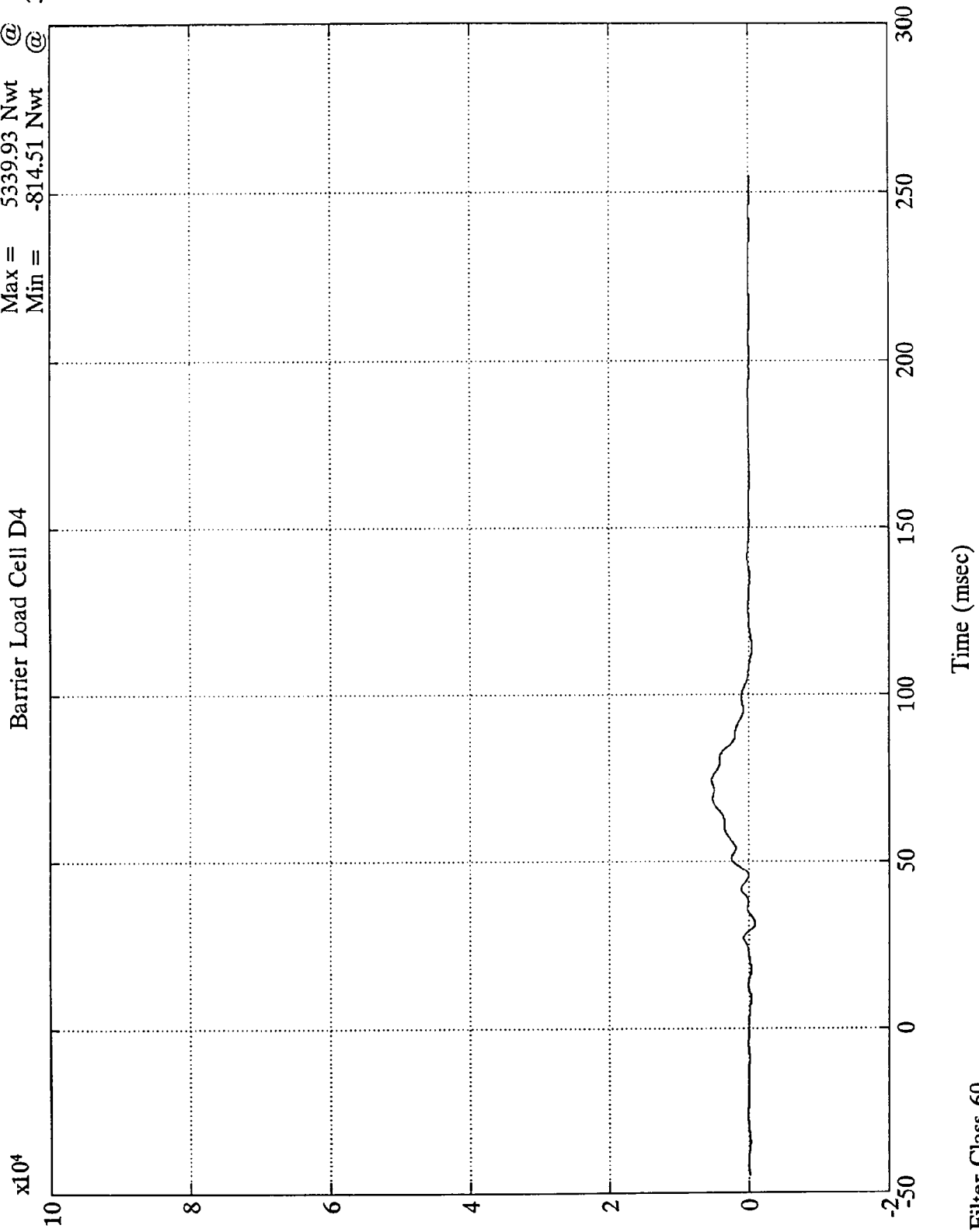


B-56

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell D4

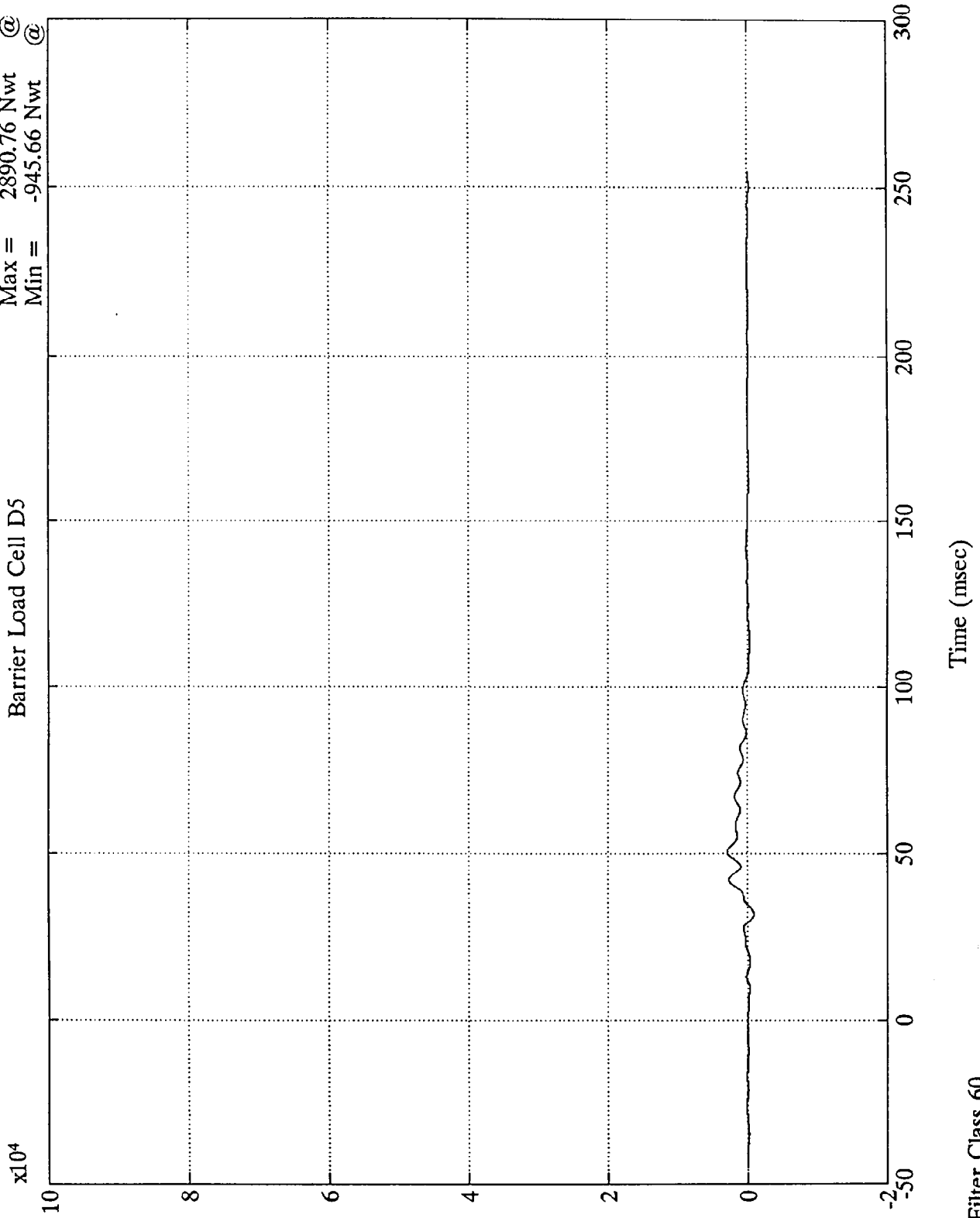
Max = 5339.93 Nwt @ 74.16 msec
Min = -814.51 Nwt @ 31.31 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell D5

Max = 2890.76 Nwt @ 50.52 msec
Min = -945.66 Nwt @ 31.55 msec

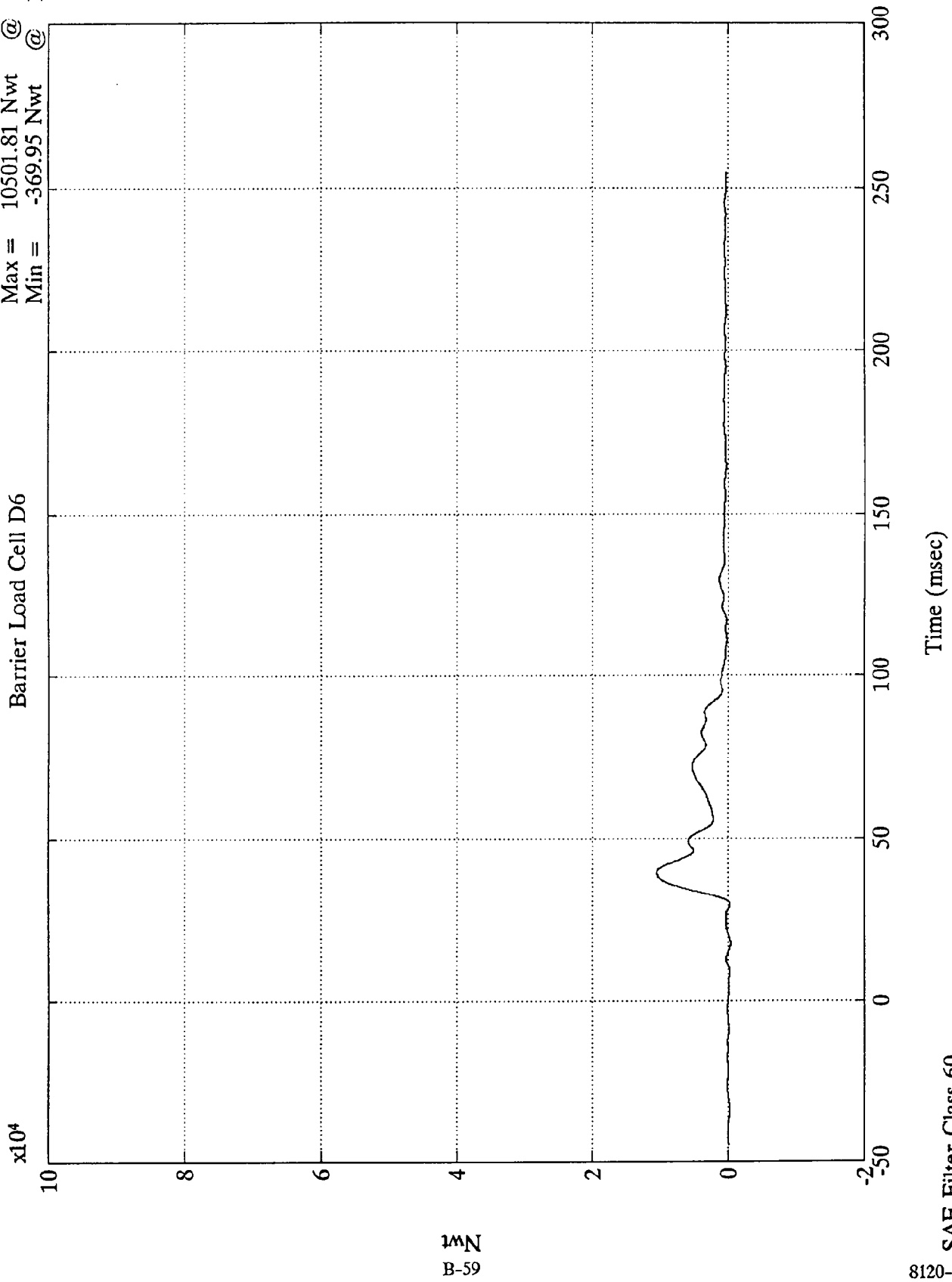


1W
B-58

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell D6

Max = 10501.81 Nwt @ 39.47 msec
Min = -369.95 Nwt @ 17.51 msec



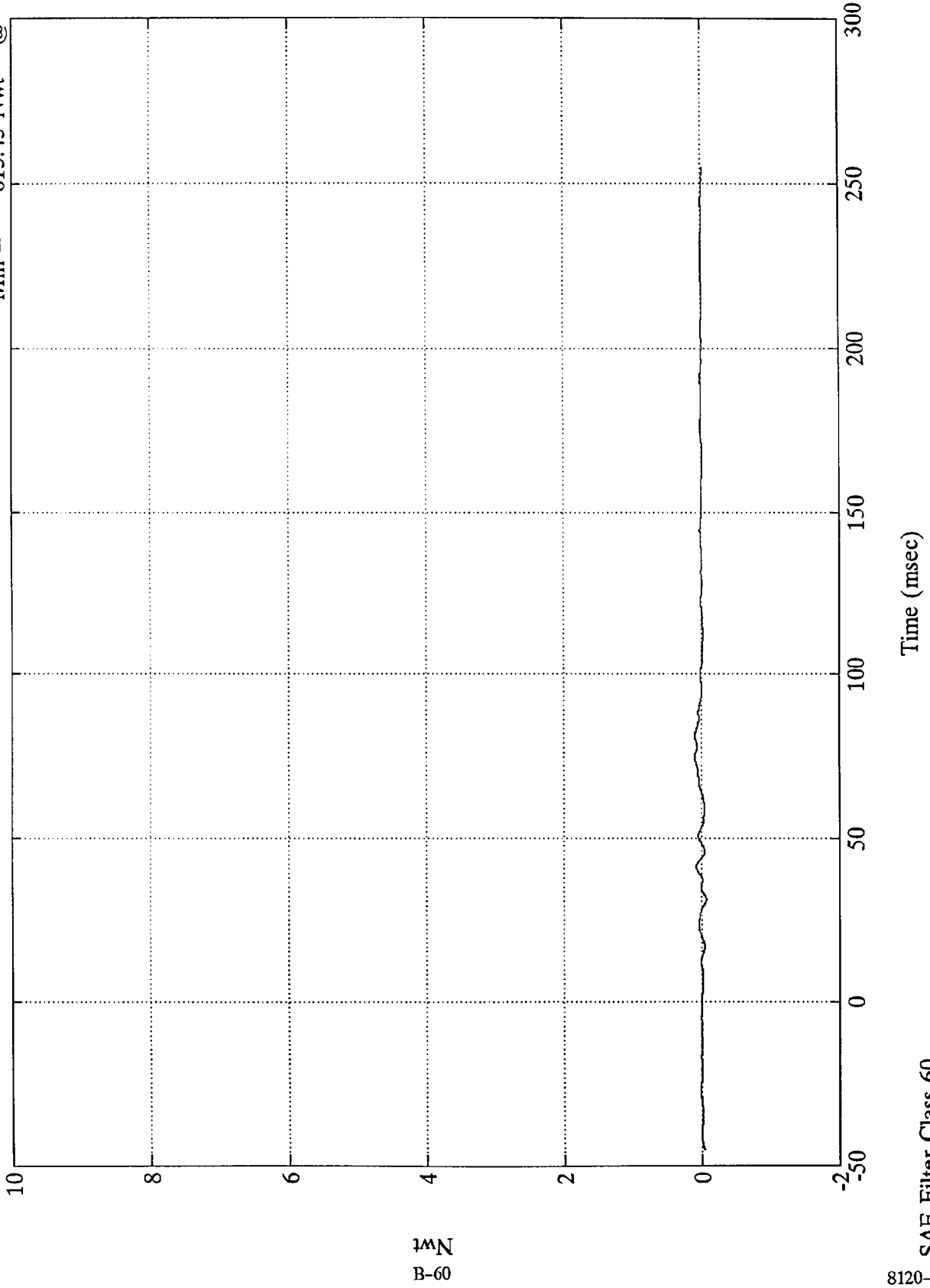
B-59

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell D7

Max = 1003.95 Nwt @ 74.51 msec
Min = -615.45 Nwt @ 31.31 msec

x10⁴

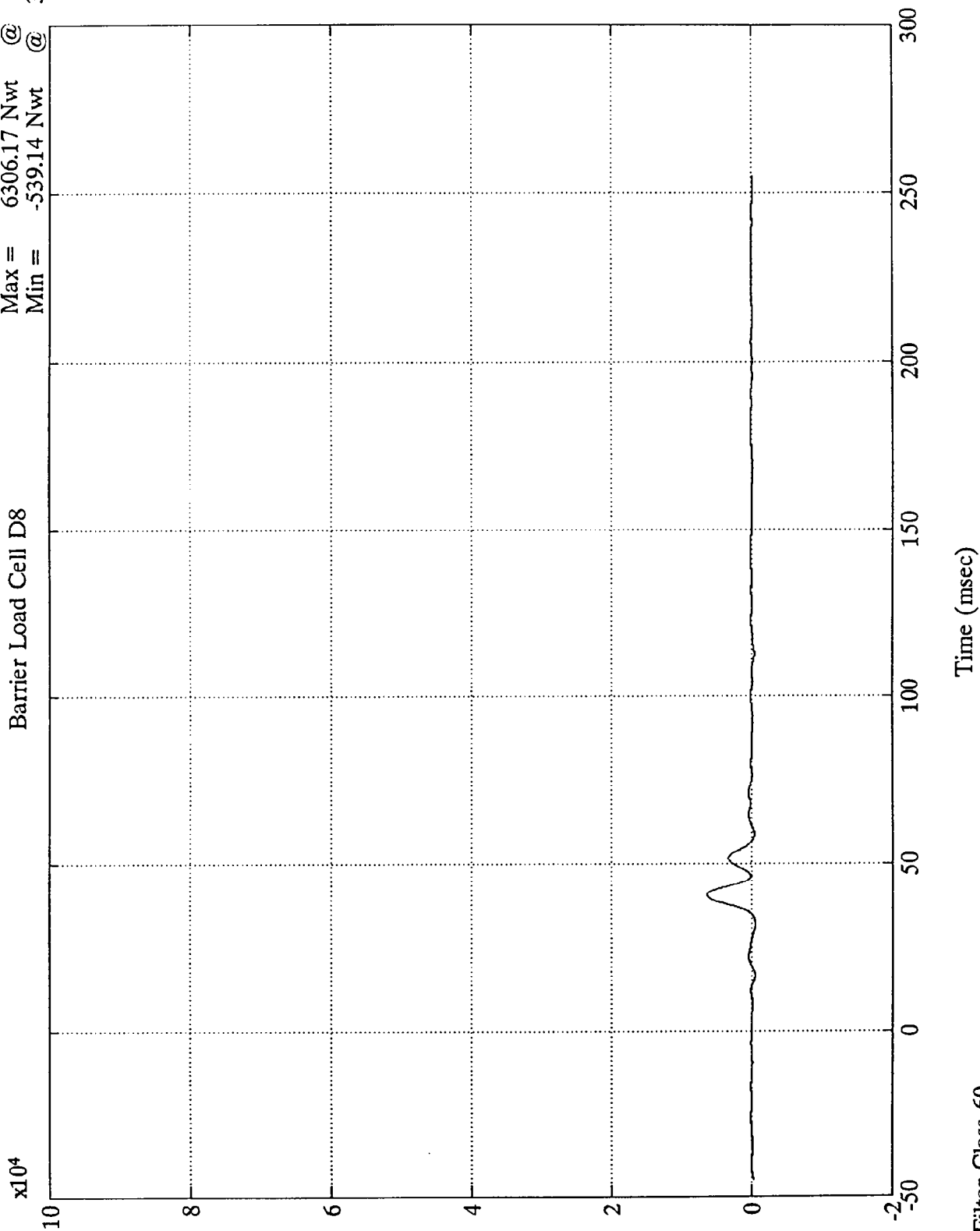


B-60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell D8

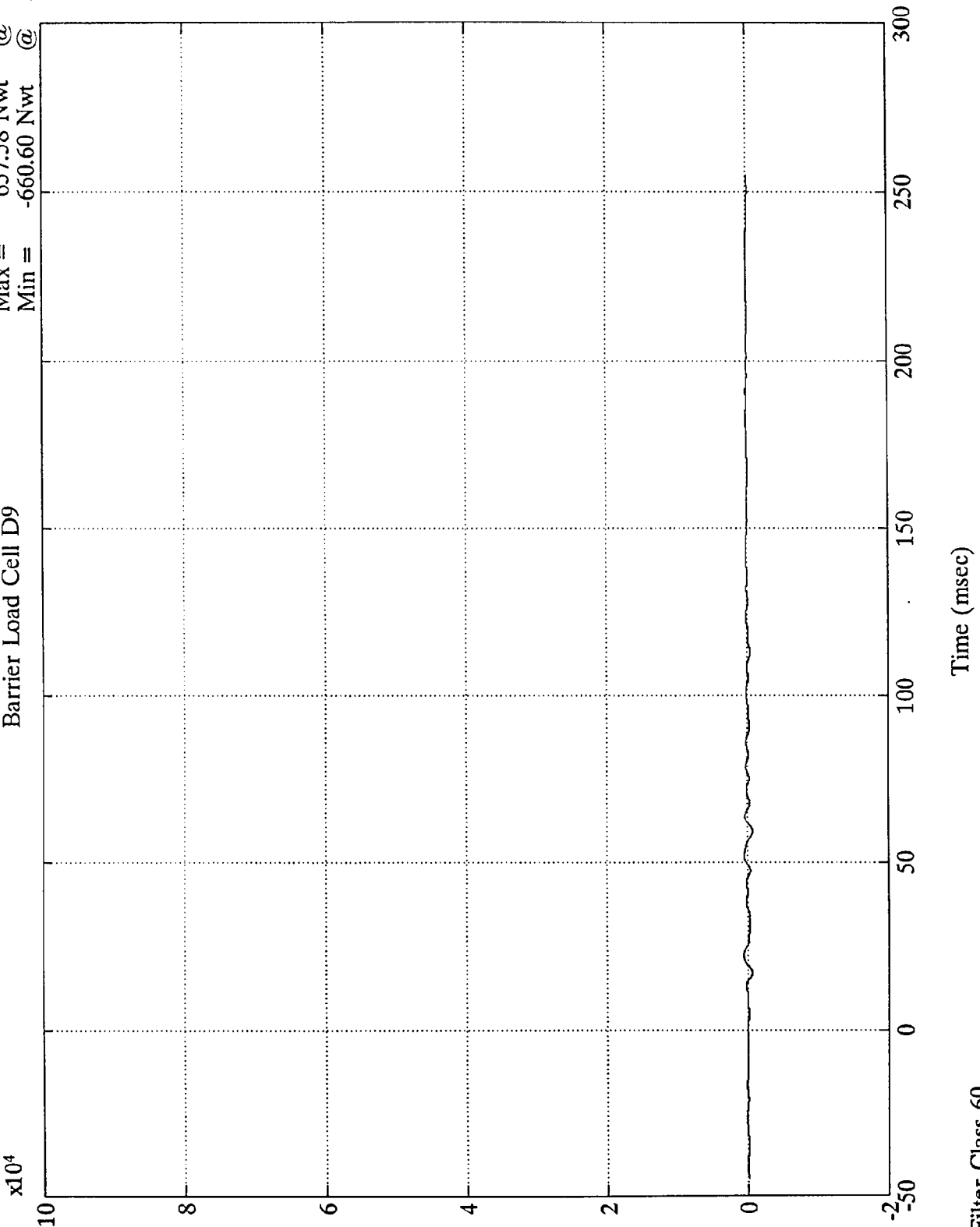
Max = 6306.17 Nwt @ 40.68 msec
Min = -539.14 Nwt @ 32.04 msec



11N
B-61

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Barrier Load Cell D9
Max = 657.58 Nwt @ 22.31 msec
Min = -660.60 Nwt @ 59.15 msec

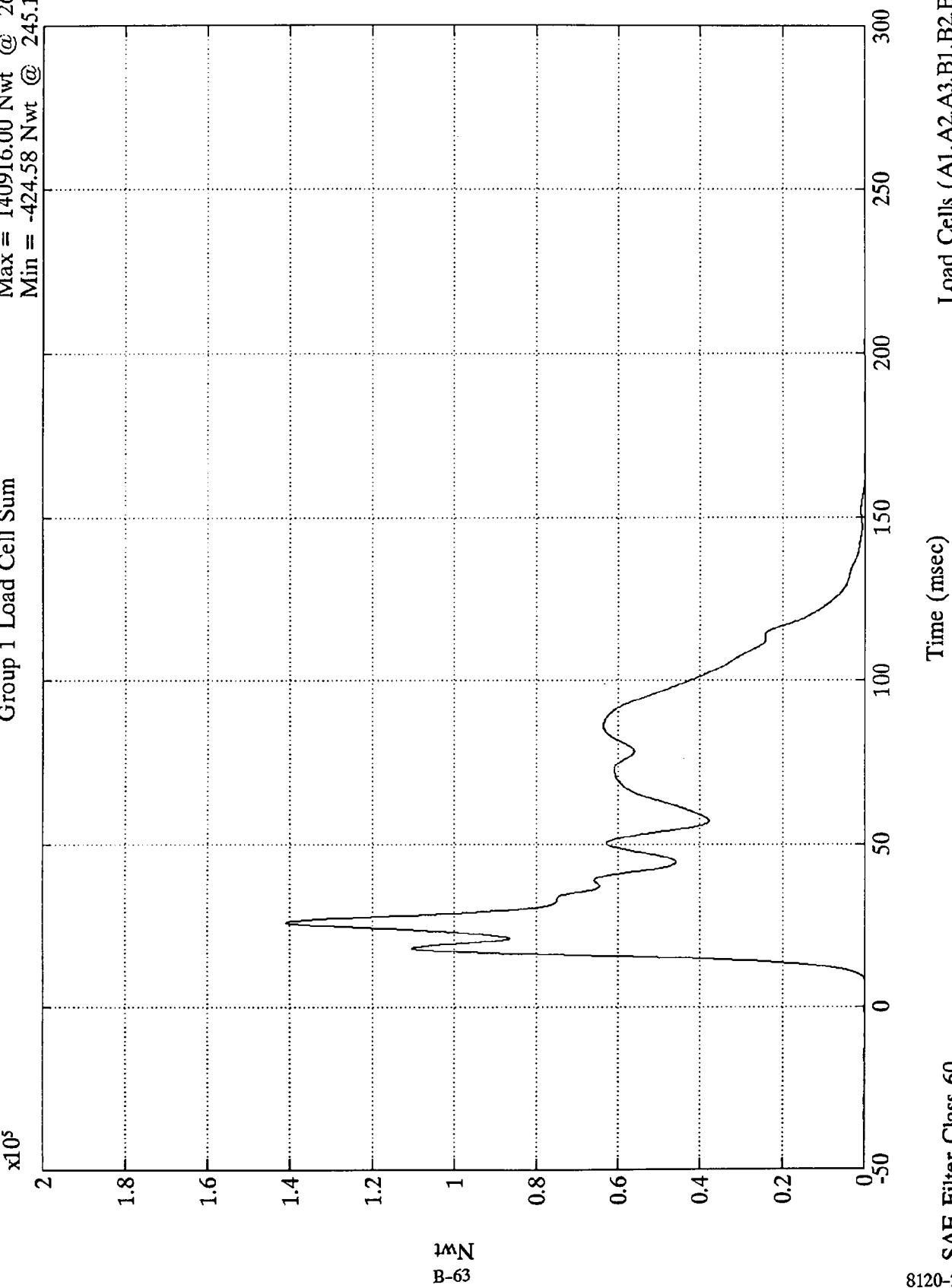


10⁴
B-62

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Group 1 Load Cell Sum

Max = 140916.00 Nwt @ 26.04 msec
Min = -424.58 Nwt @ 245.16 msec

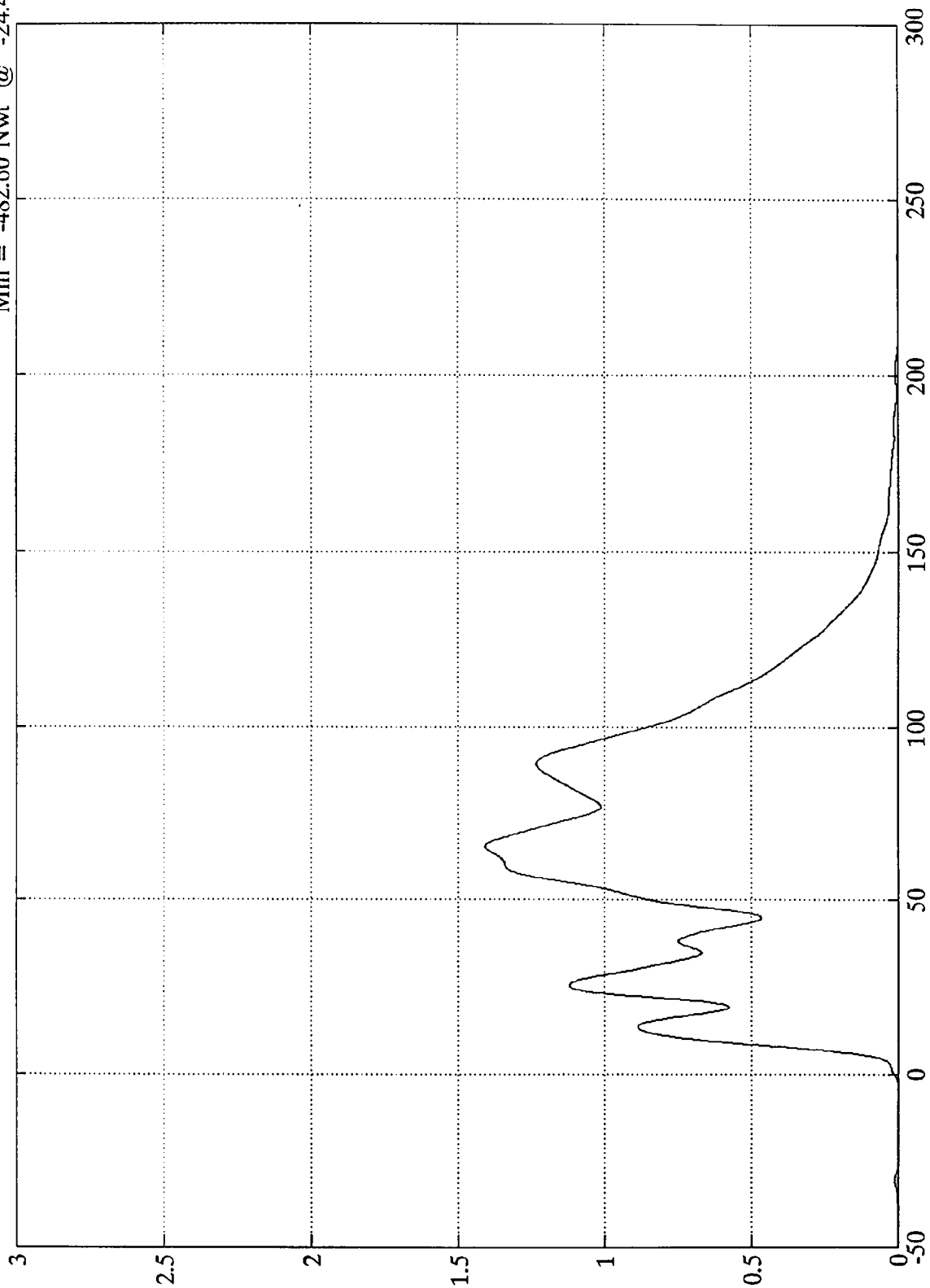


NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 140861.00 Nwt @ 65.28 msec
Min = -482.60 Nwt @ -24.48 msec

Group 2 Load Cell Sum

$\times 10^5$



8120-2 SAE Filter Class 60

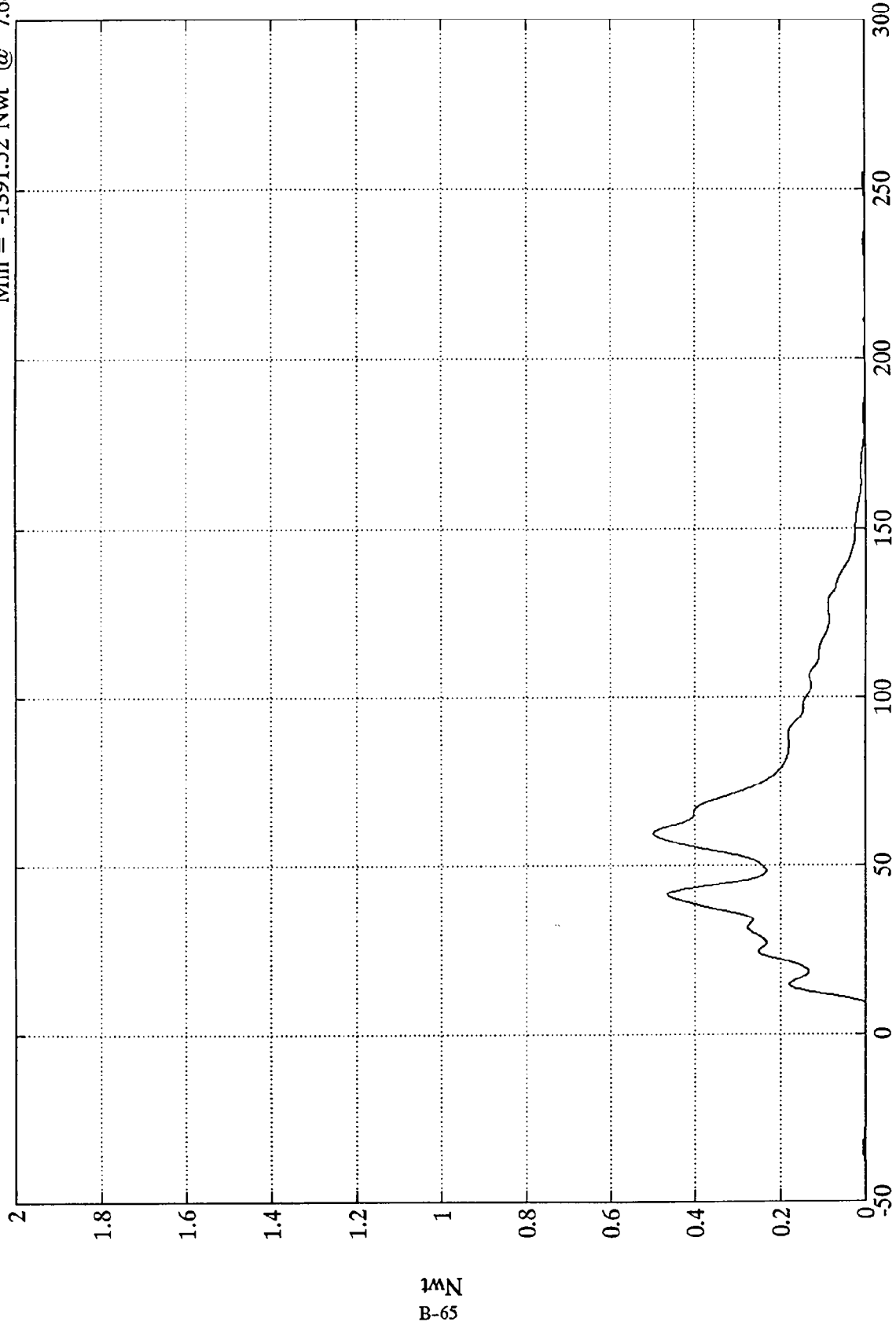
Load Cells (A4,A5,A6,B4,B5,B6)

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Group 3 Load Cell Sum

Max = 49839.00 Nwt @ 59.40 msec
Min = -1391.52 Nwt @ 7.68 msec

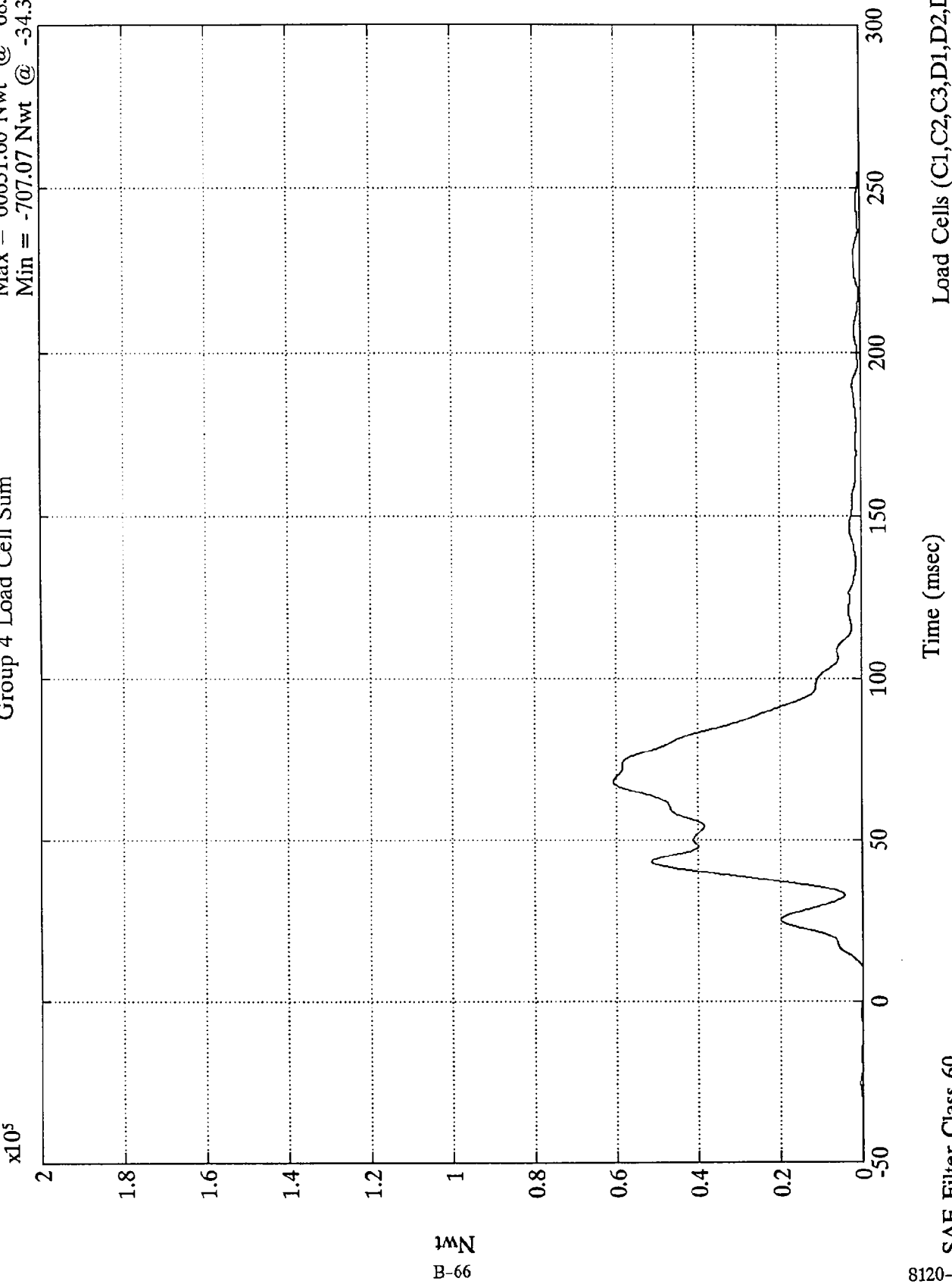
x10⁵



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Group 4 Load Cell Sum

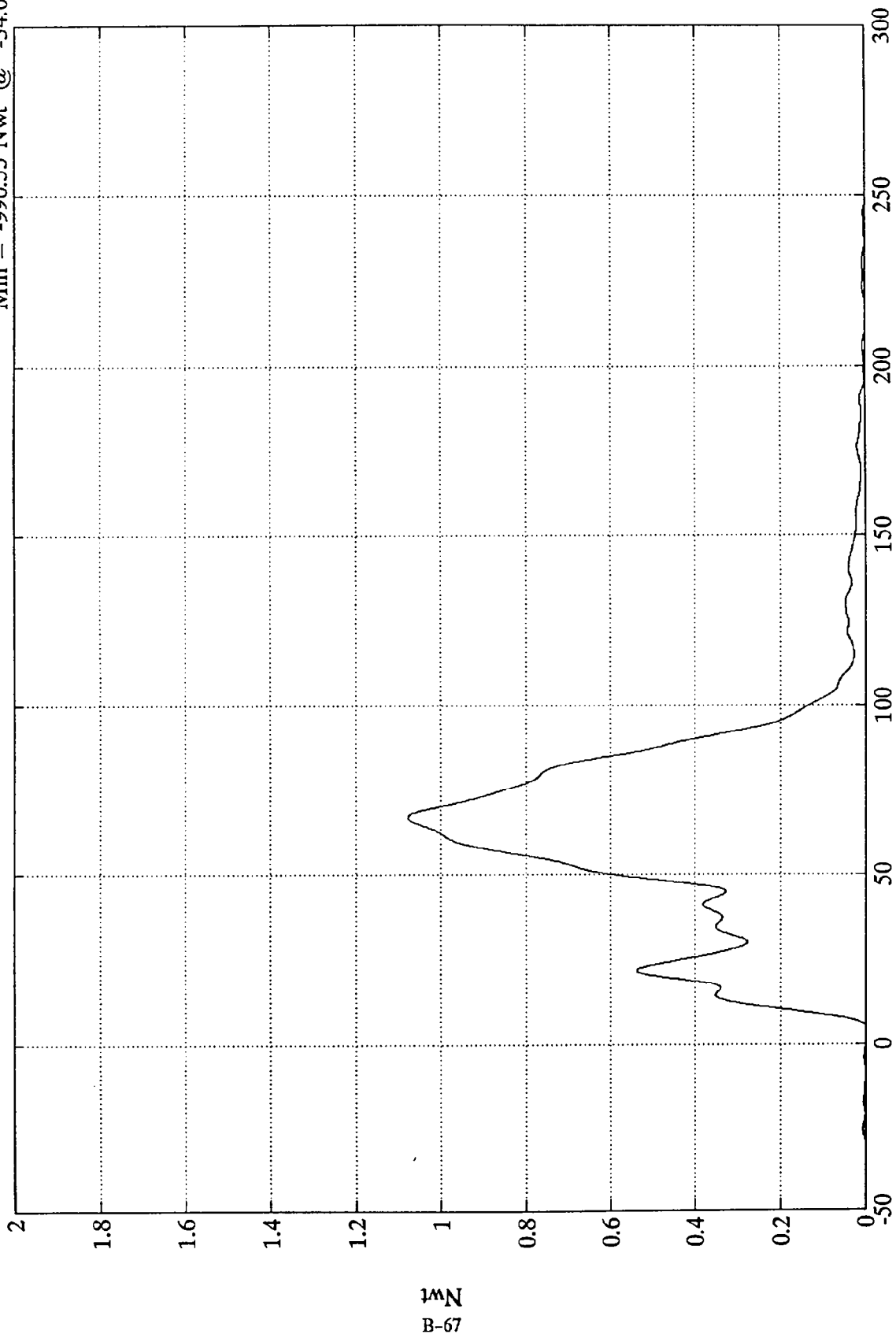
Max = 60631.60 Nwt @ 68.28 msec
Min = -707.07 Nwt @ -34.32 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO
x10⁵

Group 5 Load Cell Sum

Max = 107742.00 Nwt @ 66.84 msec
Min = -990.55 Nwt @ -34.08 msec



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

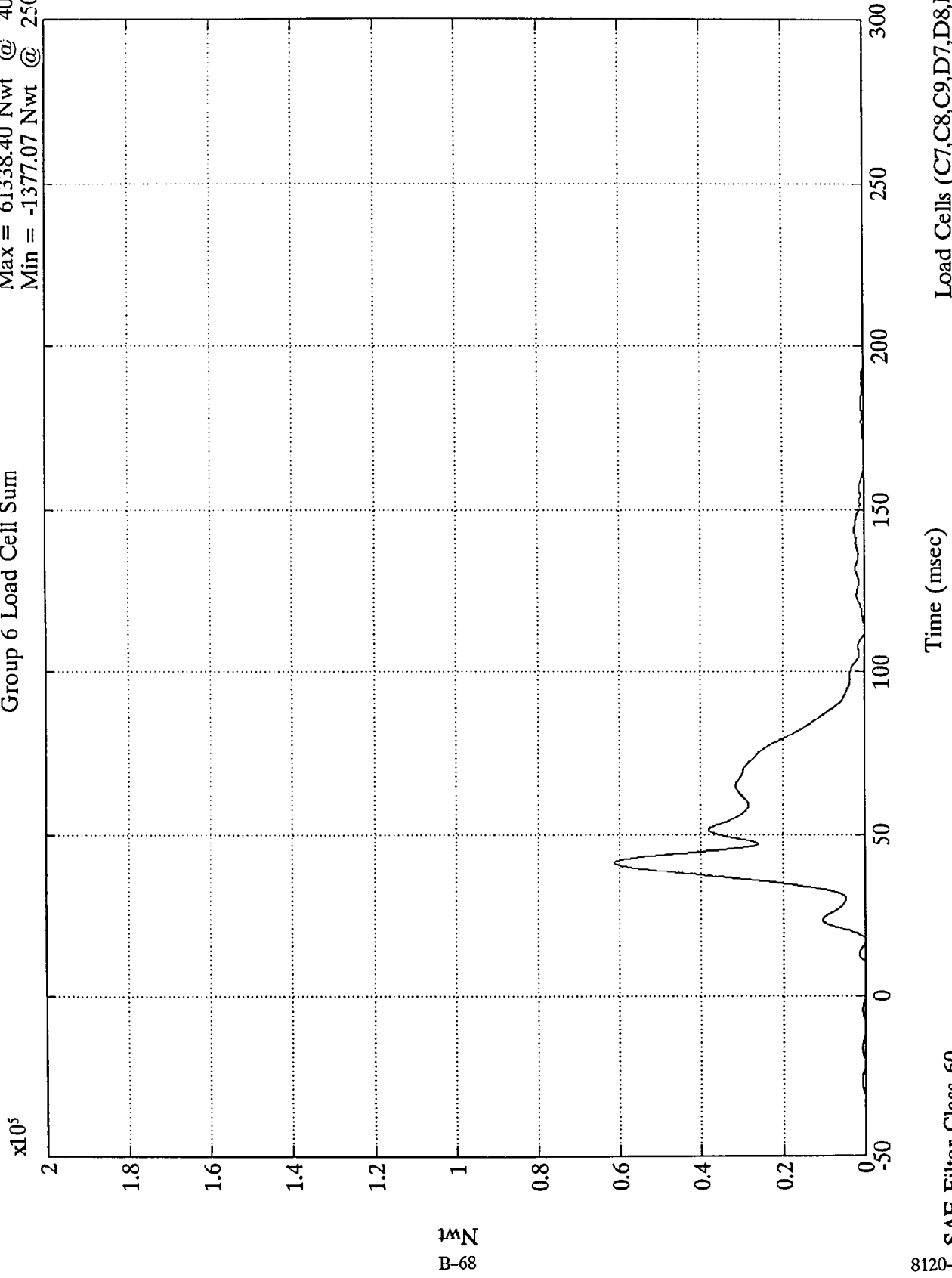
Time (msec)

SAE Filter Class 60

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 61338.40 Nwt @ 40.92 msec
Min = -1377.07 Nwt @ 250.92 msec

Group 6 Load Cell Sum



SAE Filter Class 60

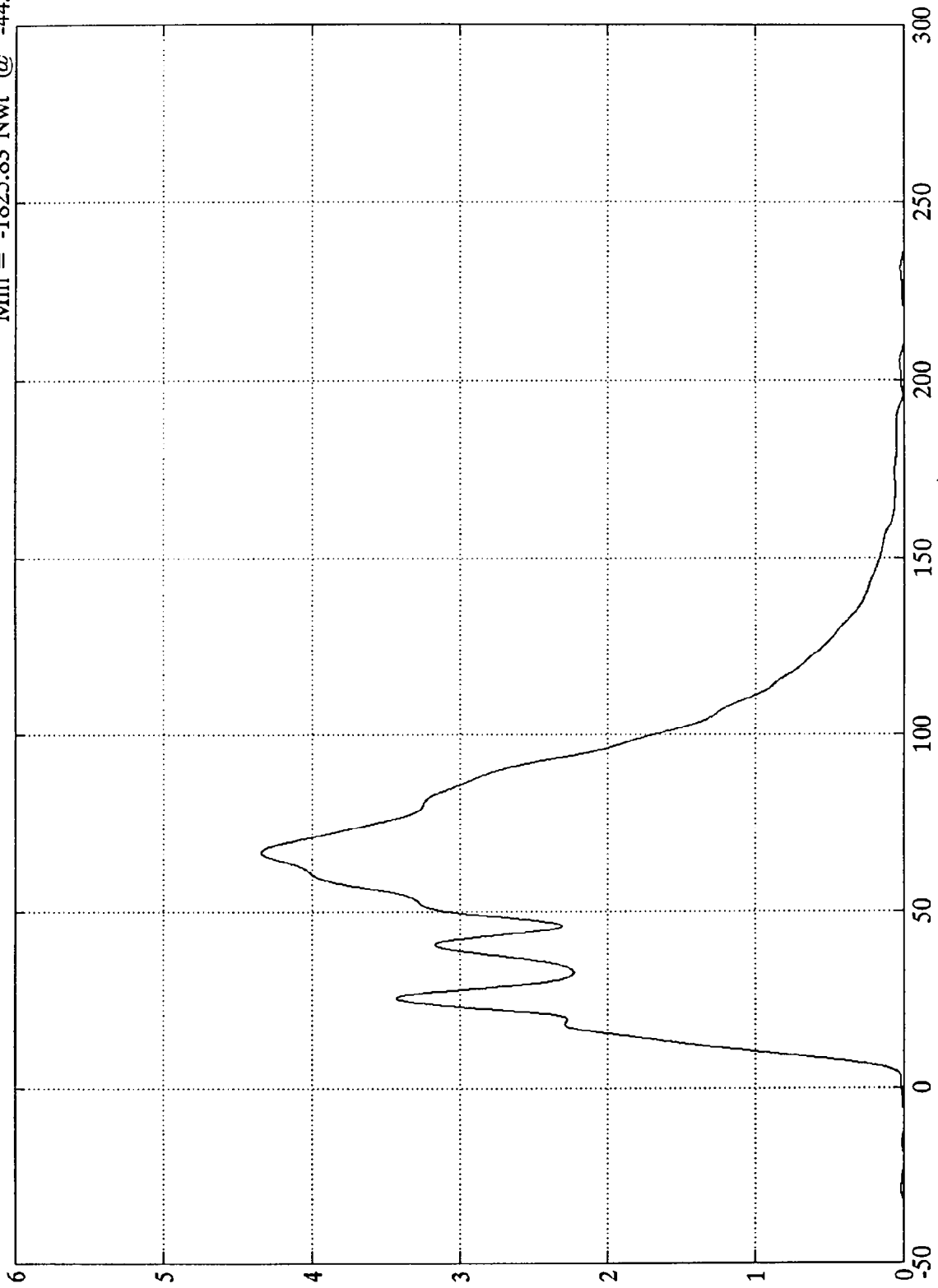
8120-2

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 434577.00 Nwt @ 66.60 msec
Min = -1825.83 Nwt @ -44.88 msec

Total Load Cell Sum

$\times 10^5$



Time (msec)

SAE Filter Class 60

8120-2

Nwt
B-69

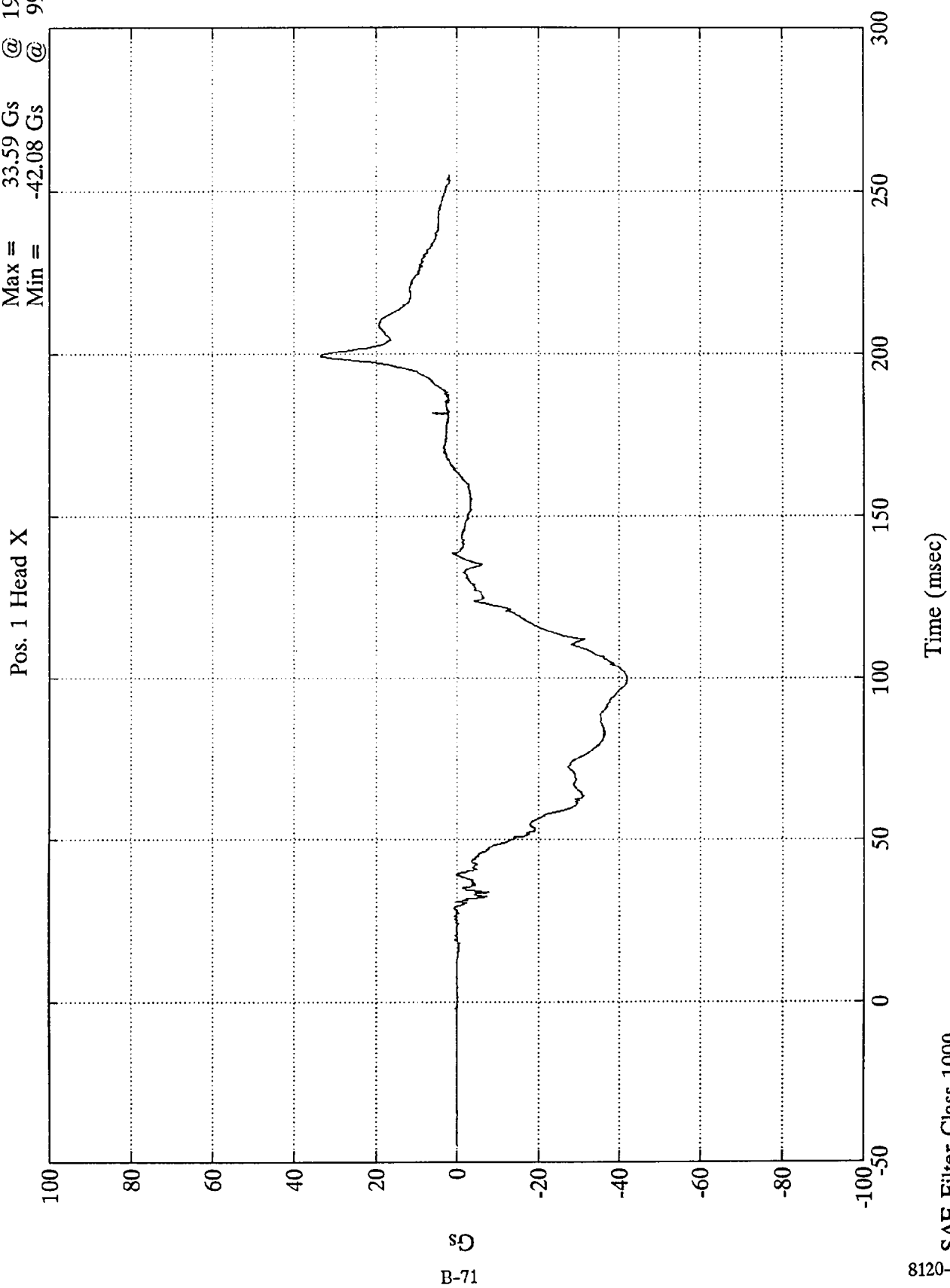
TEST NO. MP0106

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 #2 - 1993 CHEVROLET CAMARO

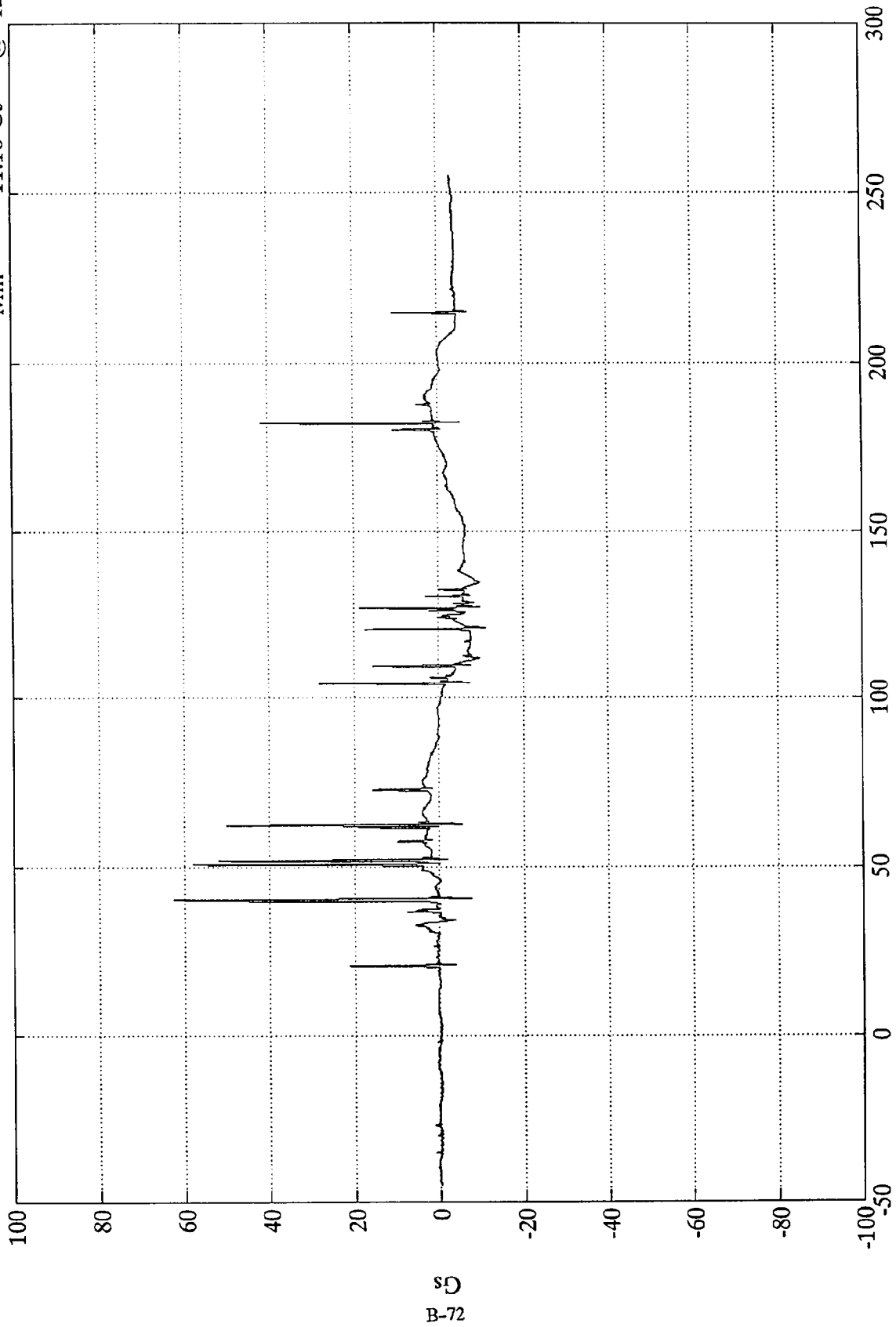
Max = 33.59 Gs @ 199.44 msec
Min = -42.08 Gs @ 99.72 msec



B-71

NCAP TEST #2 - 1993 CHEVROLET CAMARO

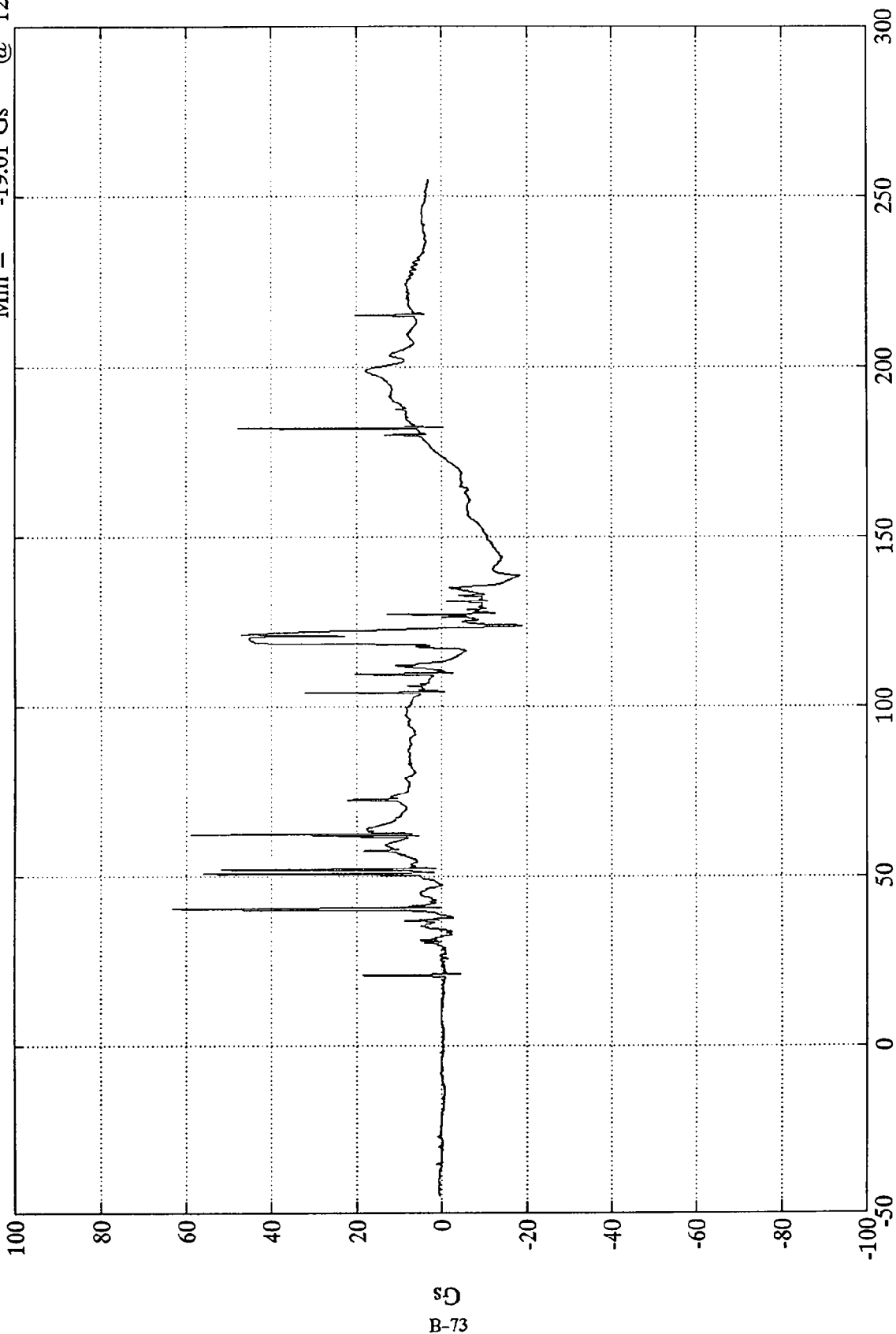
Pos. 1 Head Y
Max = 62.38 Gs @ 40.31 msec
Min = -11.16 Gs @ 121.20 msec



DATA CONTAINS INTERMITTENT SPIKES

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Head Z
Max = 63.03 Gs @ 40.31 msec
Min = -19.01 Gs @ 123.60 msec



8120-2
SAE Filter Class 1000

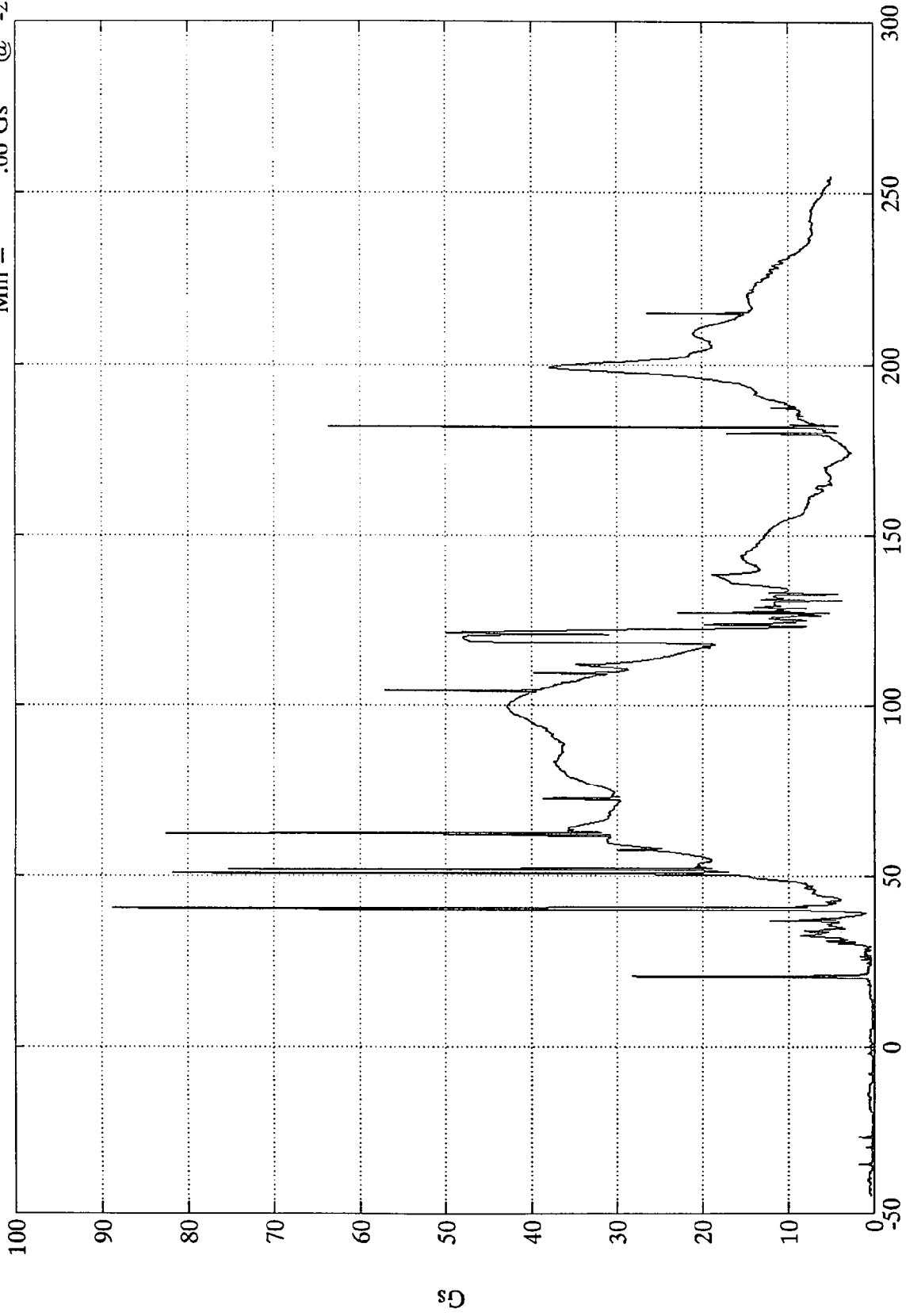
Time (msec)

DATA CONTAINS INTERMITTENT SPIKES

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Head Resultant

Max = 88.72 Gs @ 40.31 msec
Min = .06 Gs @ -22.92 msec



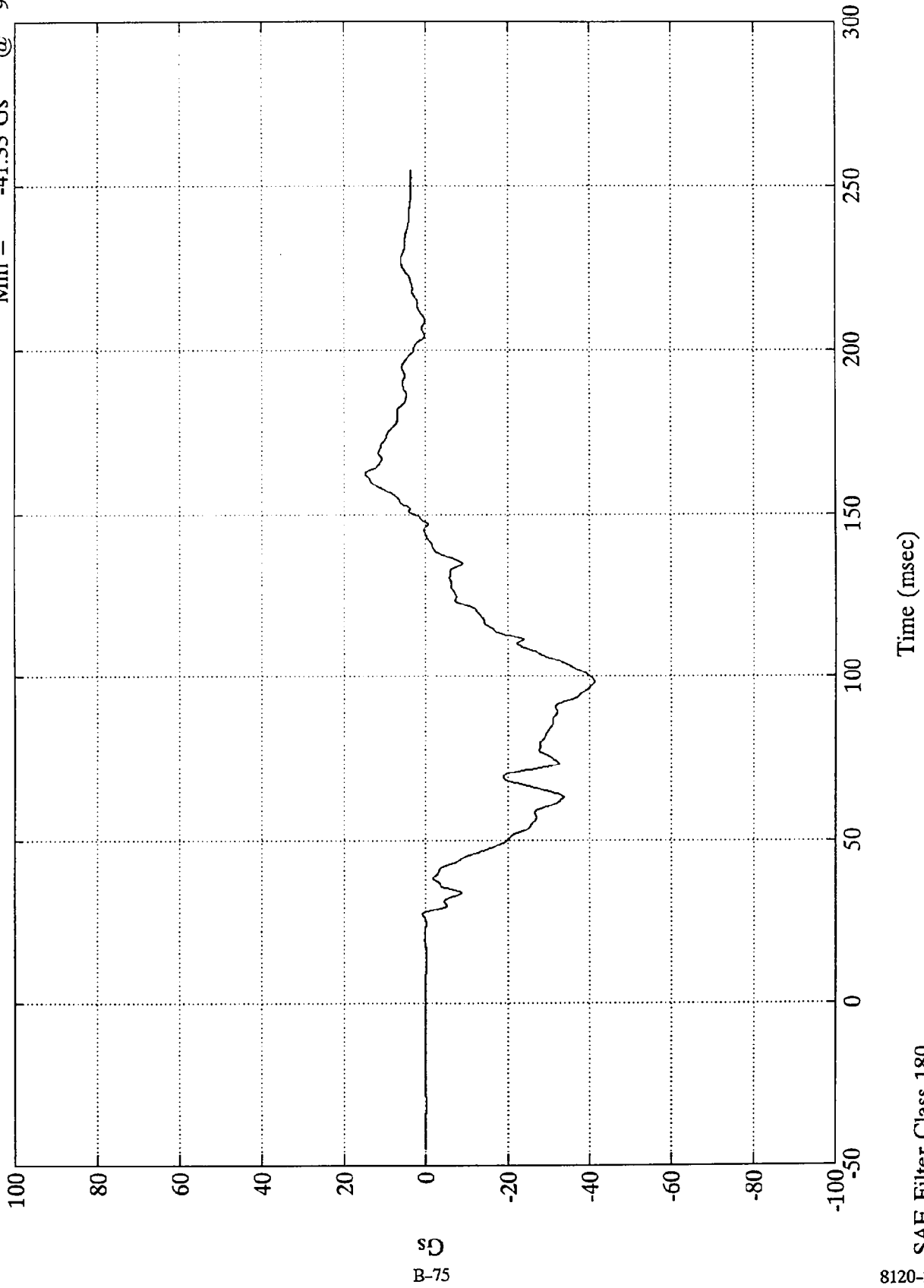
8120-2
SAE Filter Class 1000

Time (msec)

DATA CONTAINS INTERMITTENT SPIKES

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Chest X
Max = 14.89 Gs @ 162.72 msec
Min = -41.33 Gs @ 98.15 msec

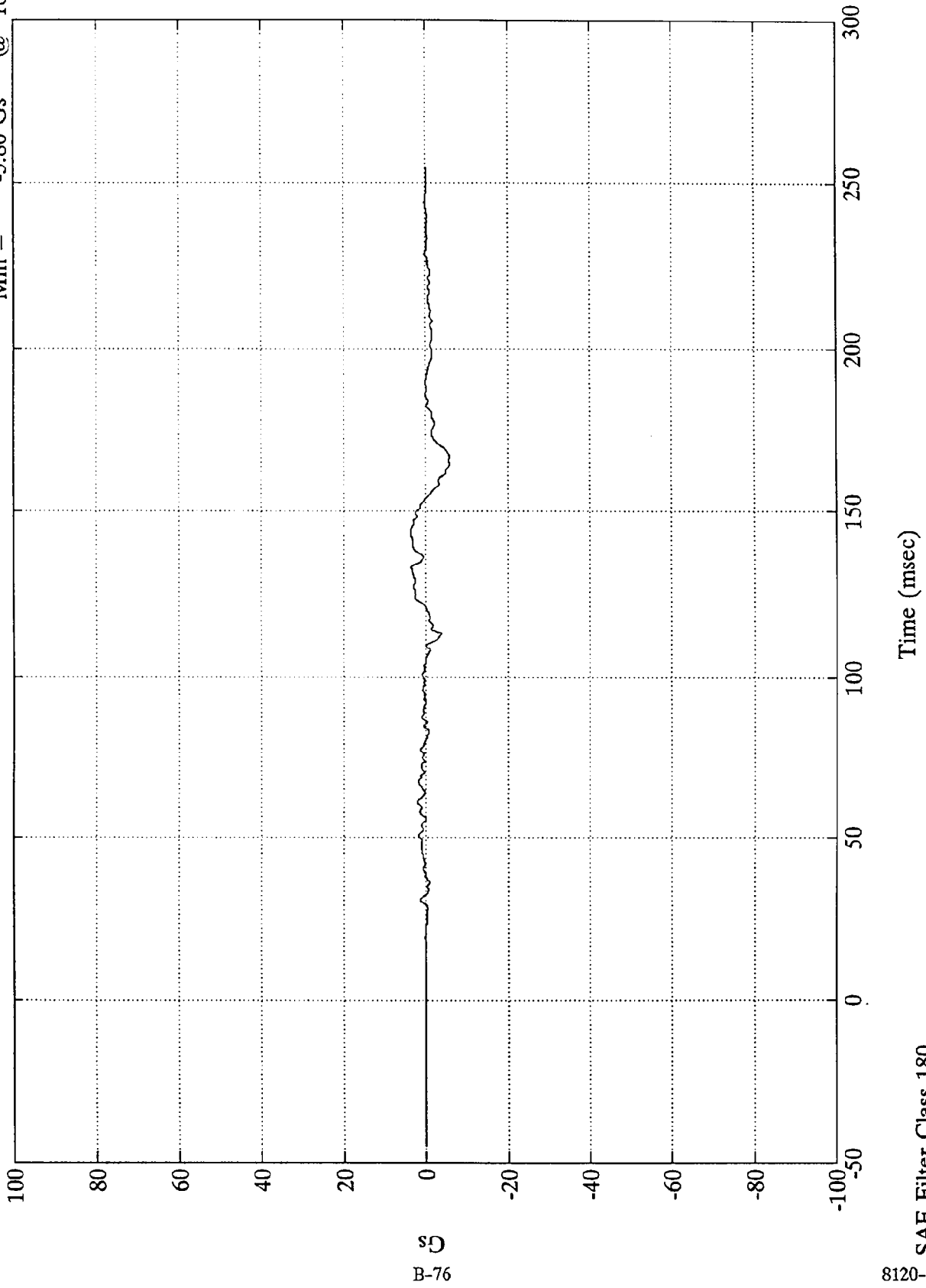


B-75

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 3.70 Gs @ 133.20 msec
Min = -5.80 Gs @ 164.88 msec

Pos. 1 Chest Y

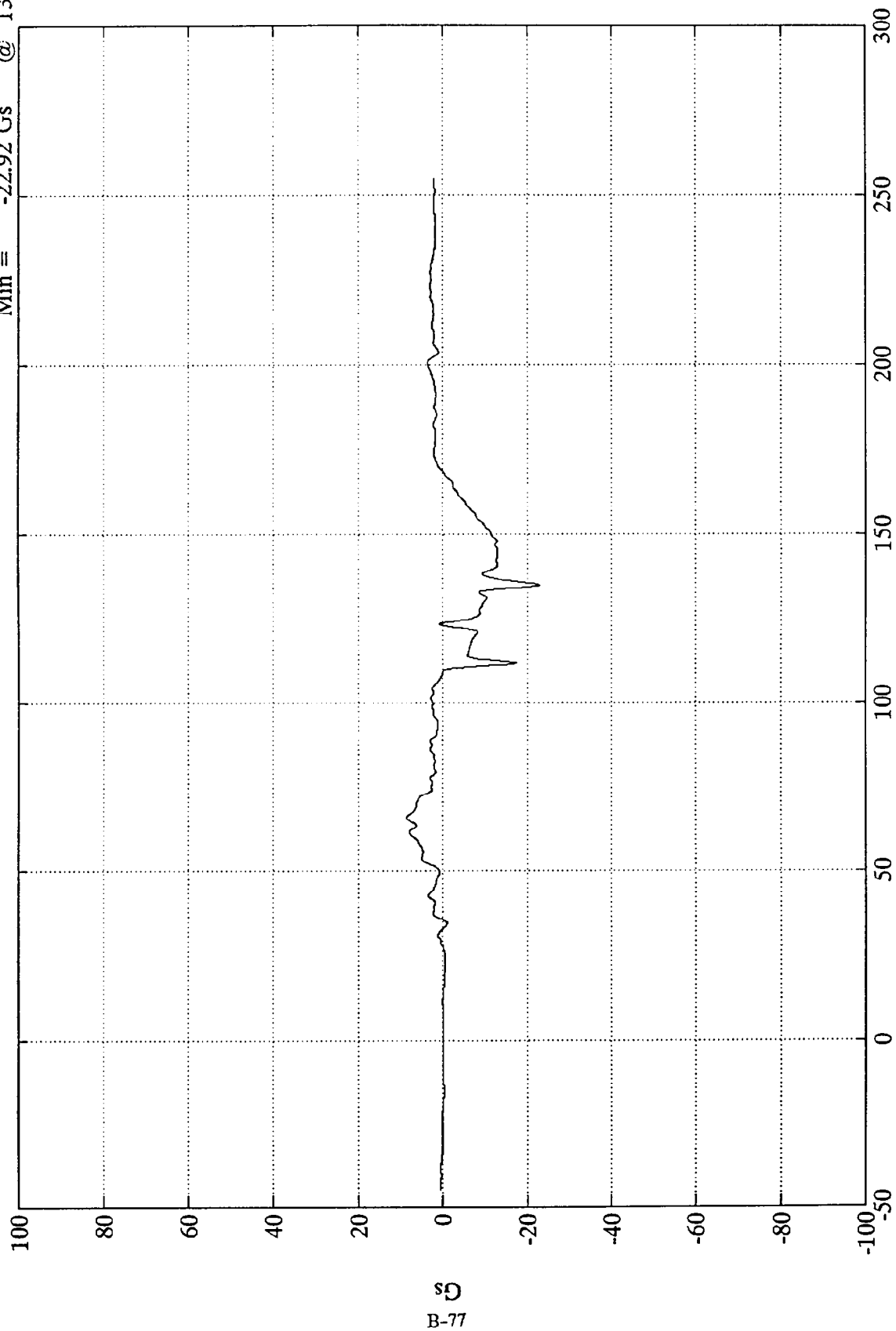


B-76

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 8.53 Gs @ 65.63 msec
Min = -22.92 Gs @ 135.00 msec

Pos. 1 Chest Z

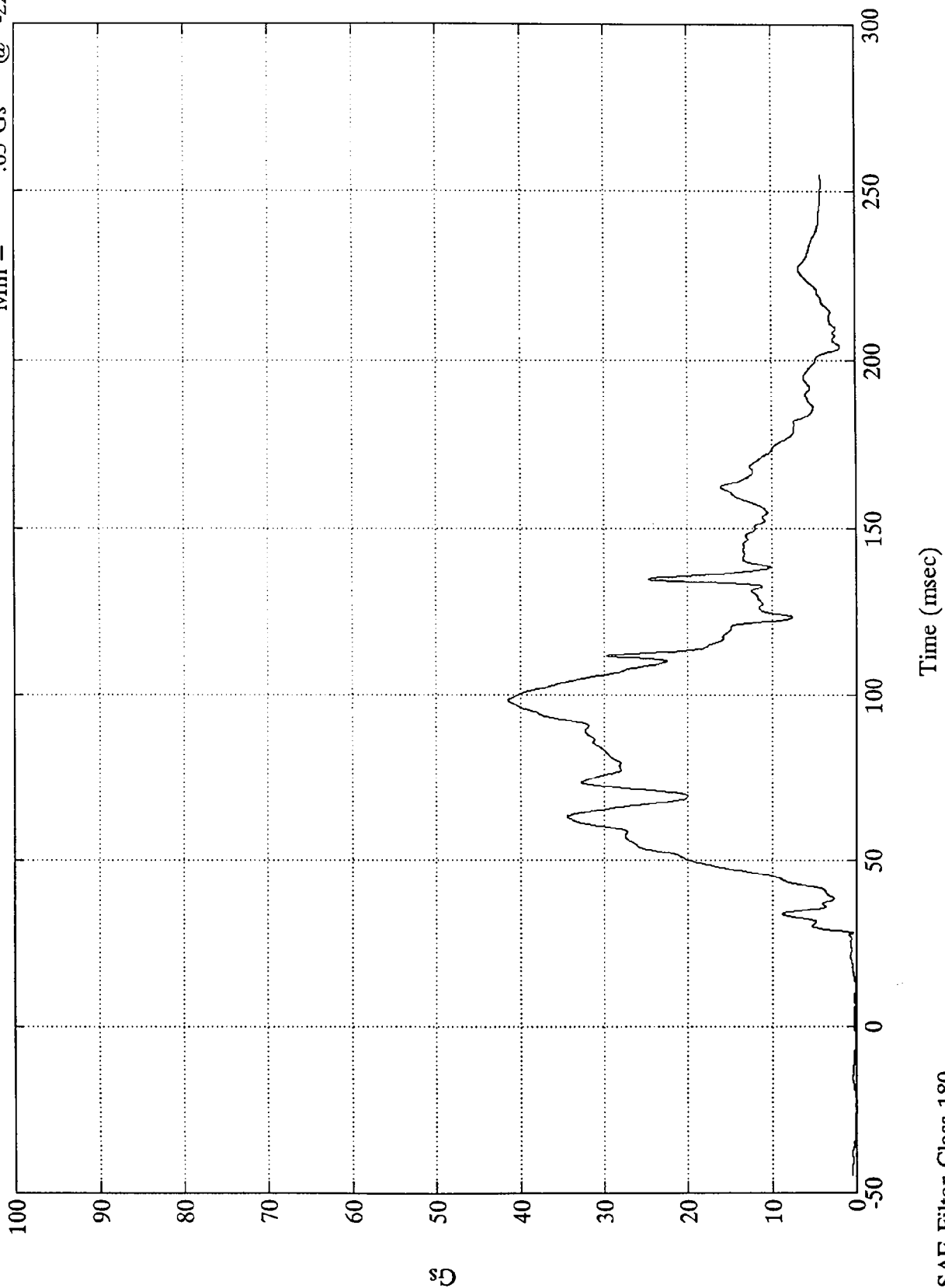


Time (msec)

SAE Filter Class 180

NCAP TEST #2 - 1993 CHEVROLET CAMARO

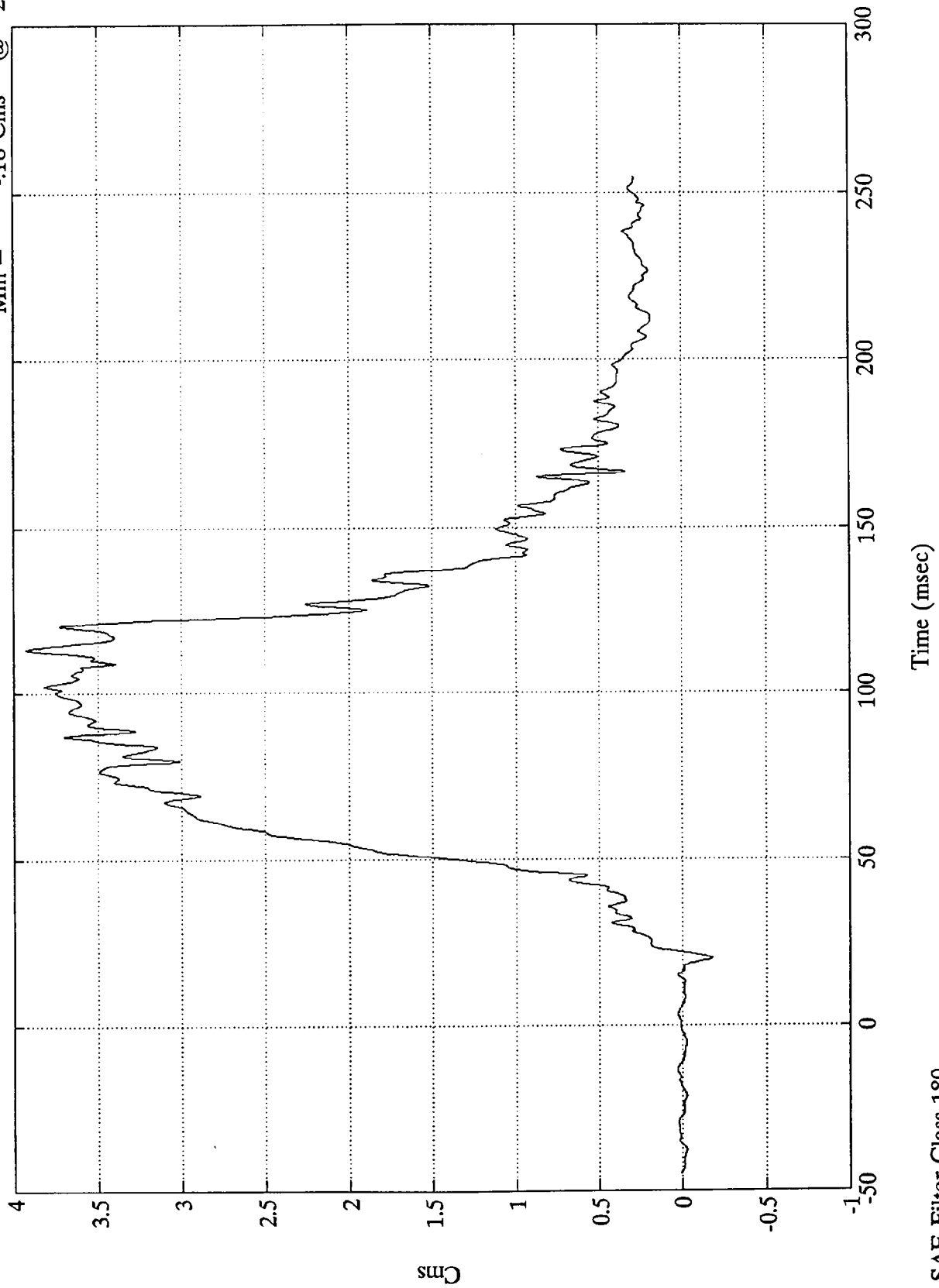
Pos. 1 Chest Resultant
Max = 41.40 Gs @ 98.15 msec
Min = .03 Gs @ -22.44 msec



B-78

NCAP TEST #2 - 1993 CHEVROLET CAMARO

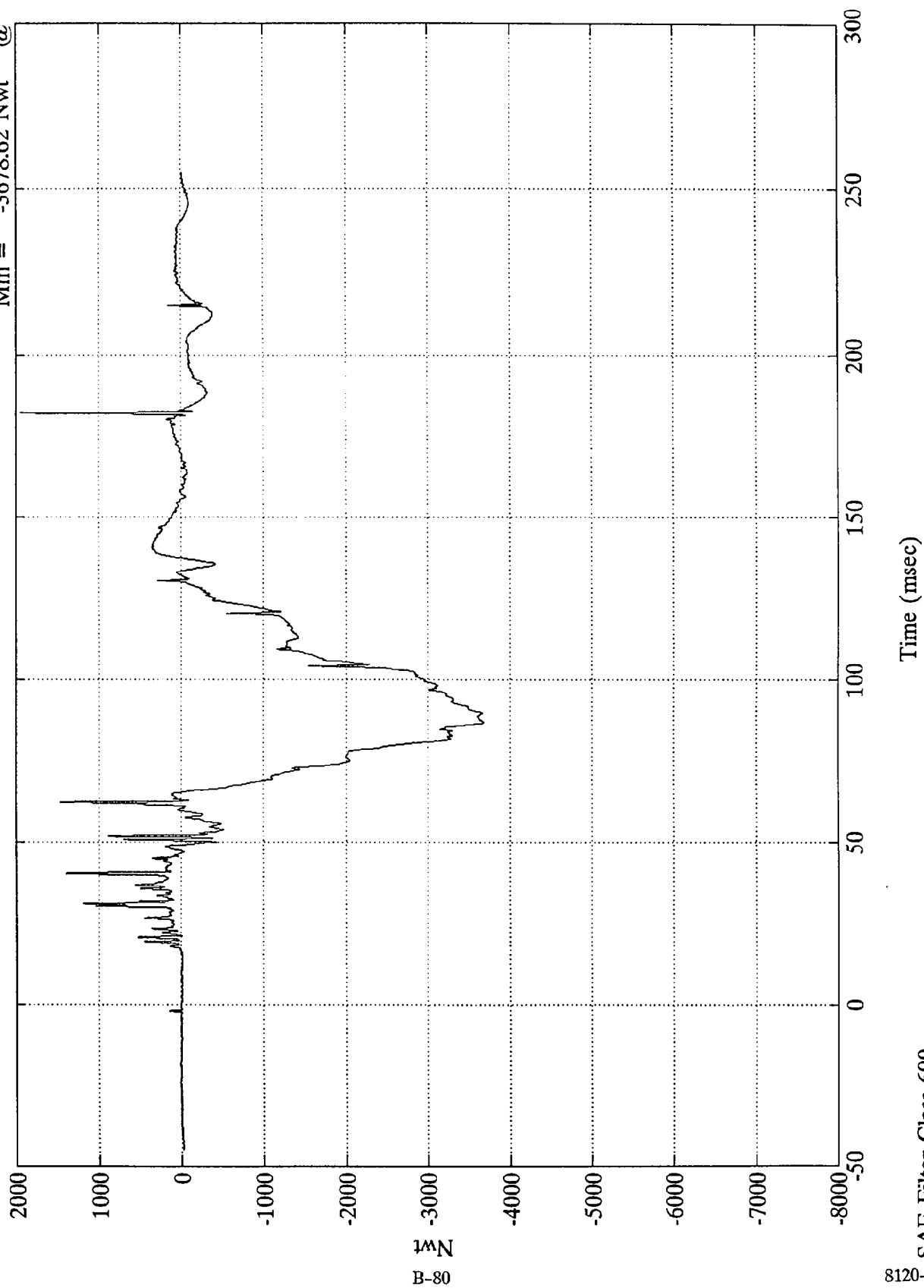
Pos. 1 Chest Disp. Max = 3.93 Cms @ 113.15 msec
Min = -.18 Cms @ 20.03 msec



B-79
Cms

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Left Femur Max = 1941.58 Nwt @ 181.92 msec
Min = -3678.62 Nwt @ 86.63 msec

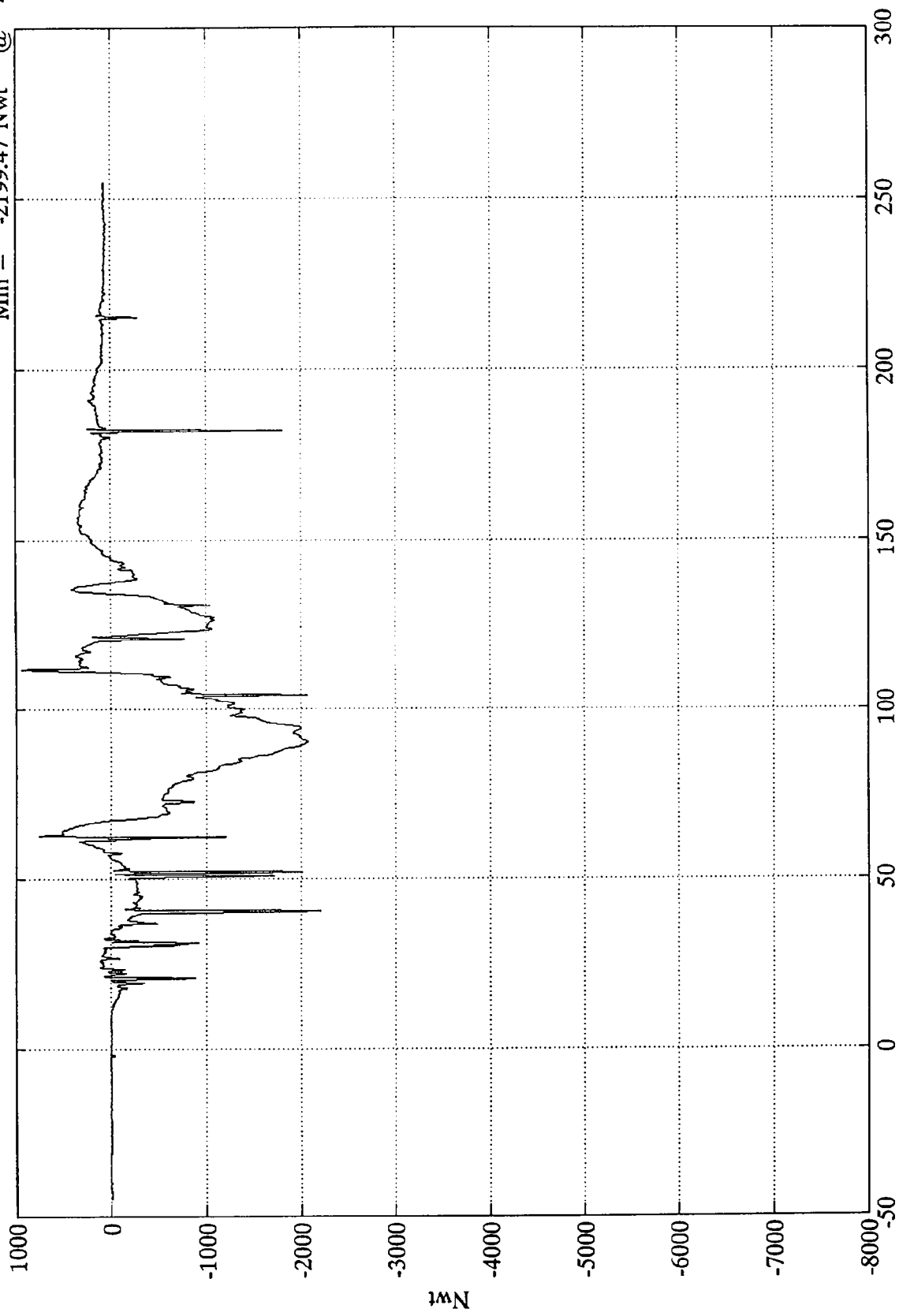


14N
B-80

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Right Femur

Max = 937.57 Nwt @ 111.84 msec
Min = -2199.47 Nwt @ 40.31 msec



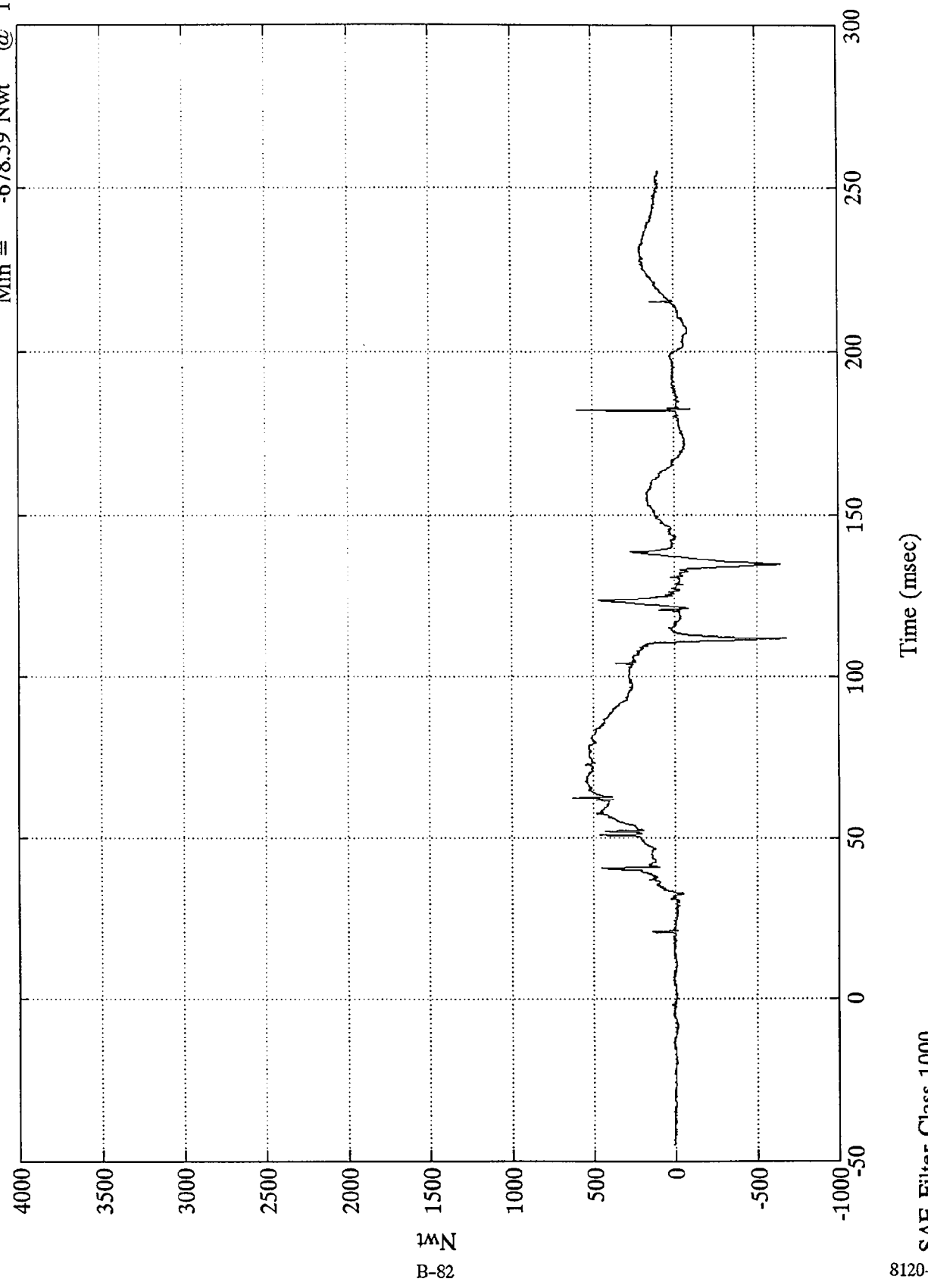
Time (msec)

SAE Filter Class 600

DATA CONTAINS INTERMITTENT SPIKES

NCAP TEST #2 - 1993 CHEVROLET CAMARO

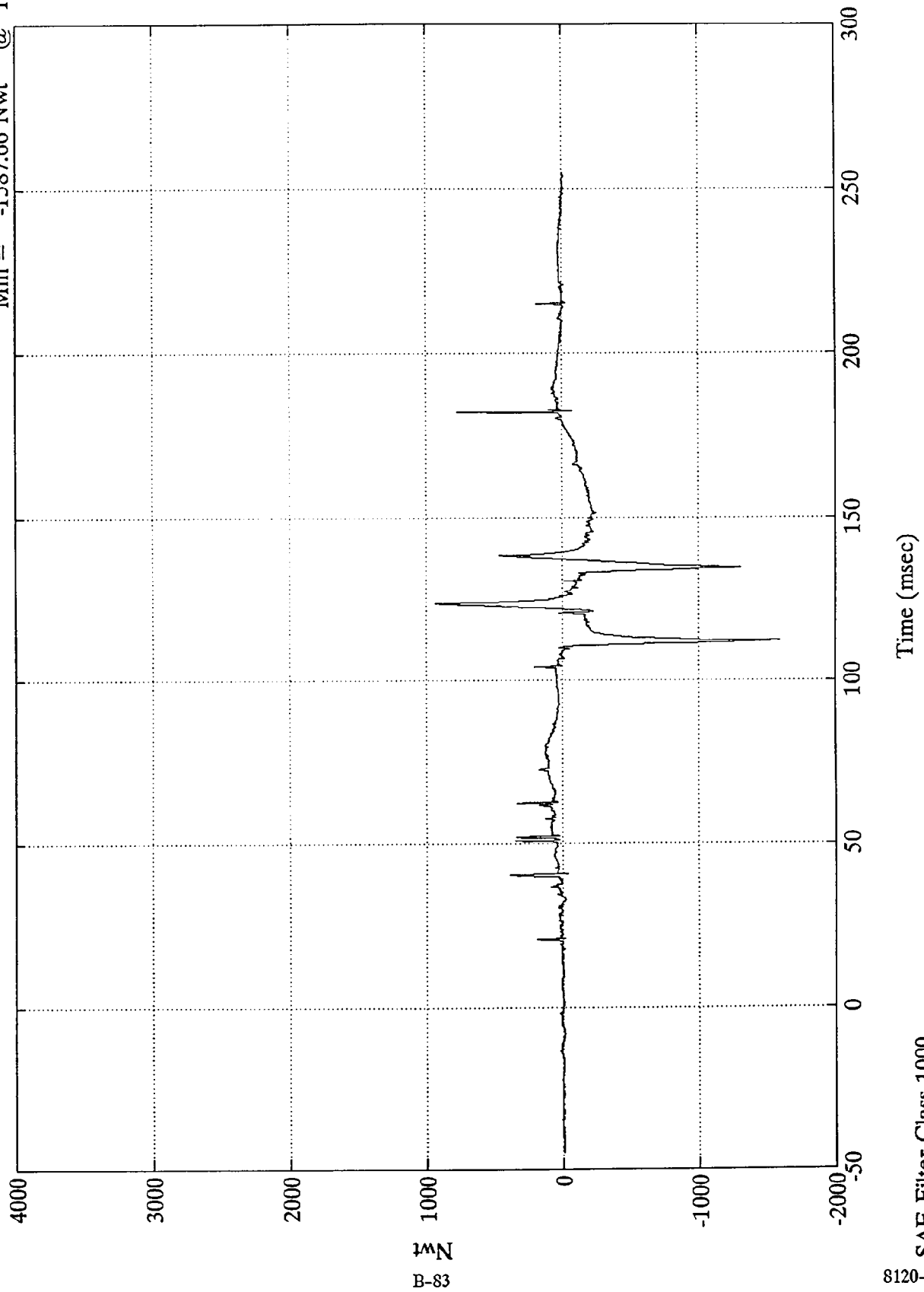
Pos. 1 Upper Neck Fx
Max = 621.21 Nwt @ 62.27 msec
Min = -678.59 Nwt @ 111.95 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Upper Neck Fy

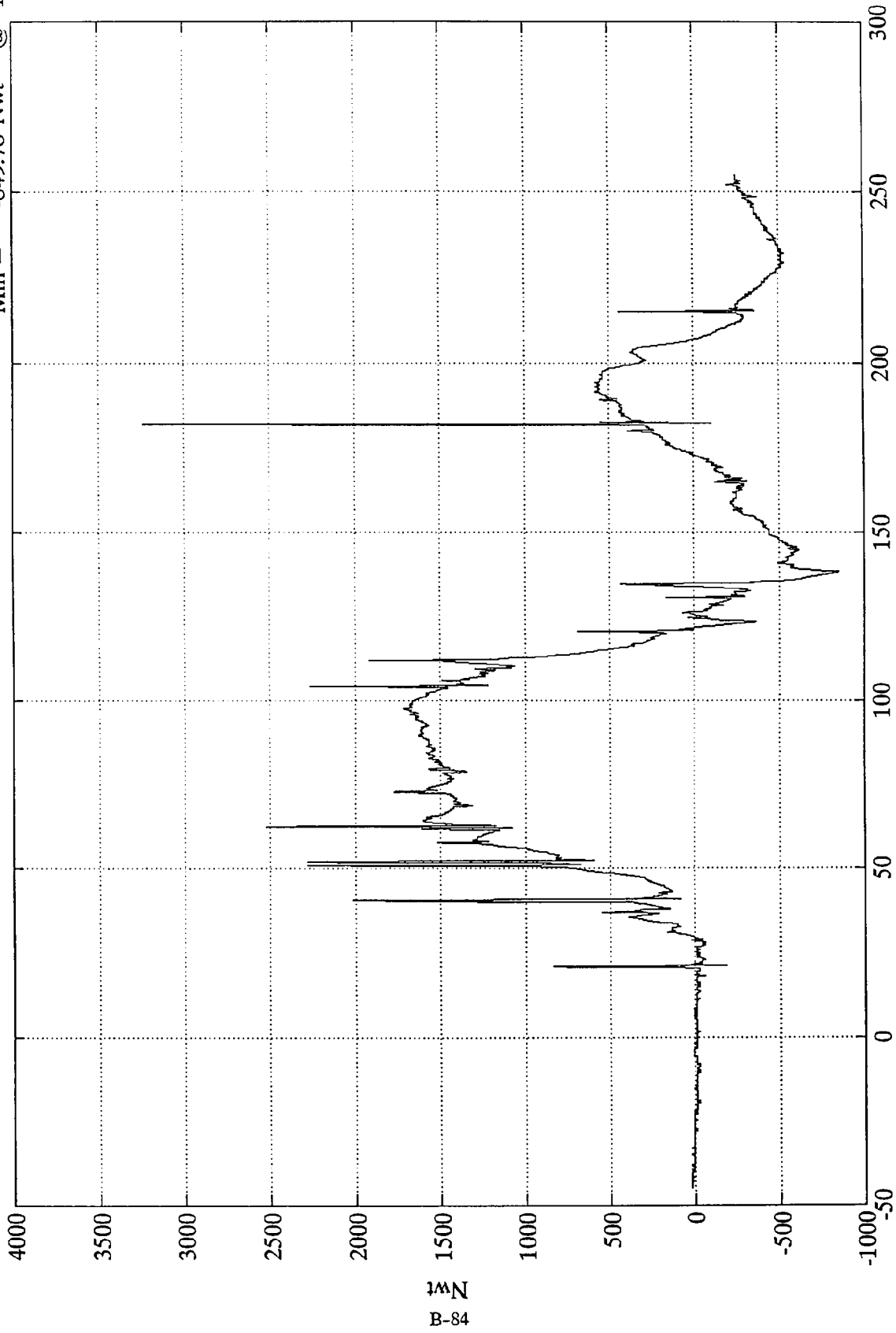
Max = 936.07 Nwt @ 123.60 msec
Min = -1587.66 Nwt @ 111.95 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Upper Neck Fz

Max = 3240.44 Nwt @ 181.92 msec
Min = -849.78 Nwt @ 138.60 msec



8120-2
SAE Filter Class 1000

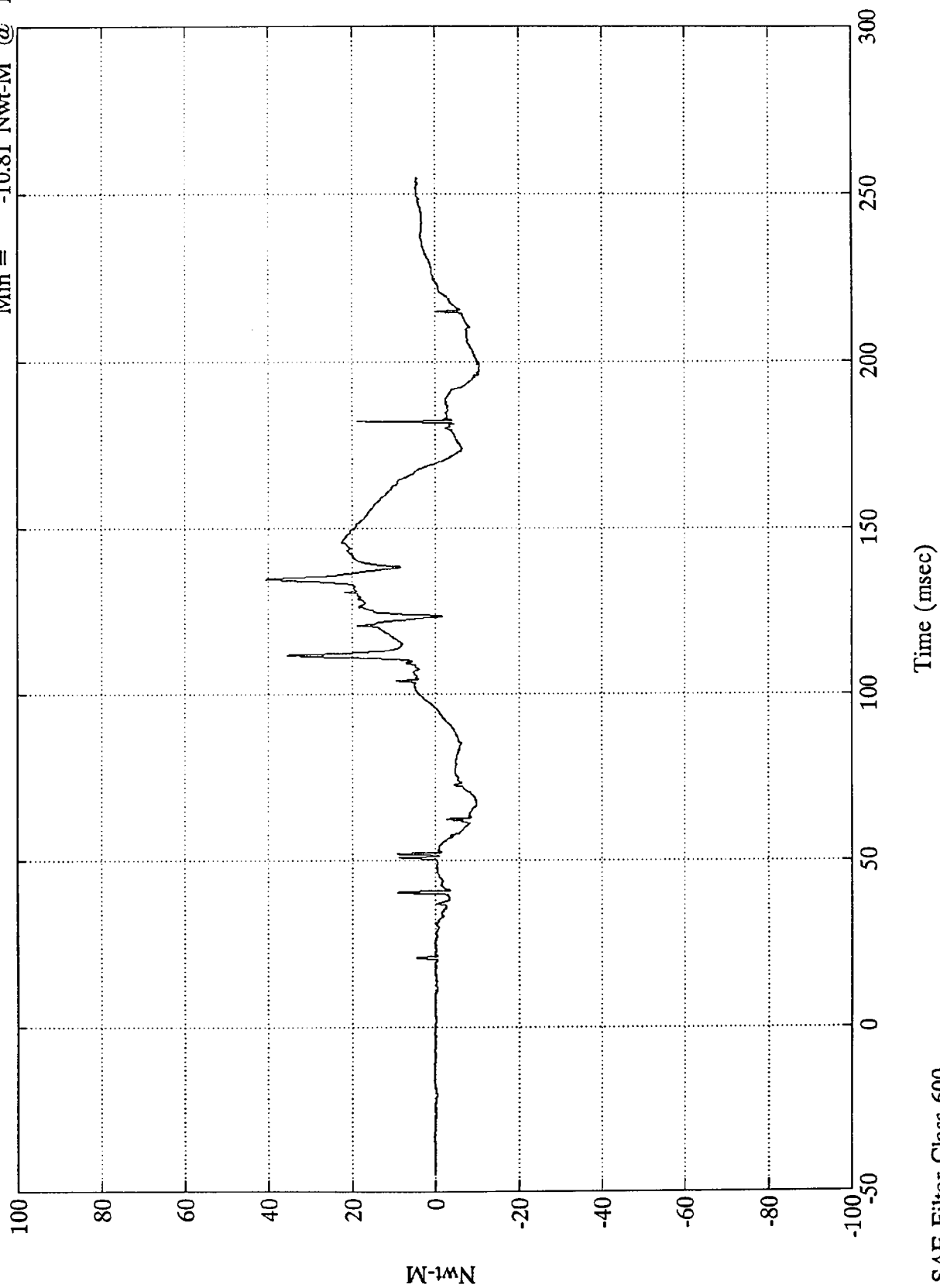
Time (msec)

DATA CONTAINS INTERMITTENT SPIKES

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Upper Neck Mx

Max = 40.84 Nwt-M @ 134.88 msec
Min = -10.81 Nwt-M @ 198.72 msec



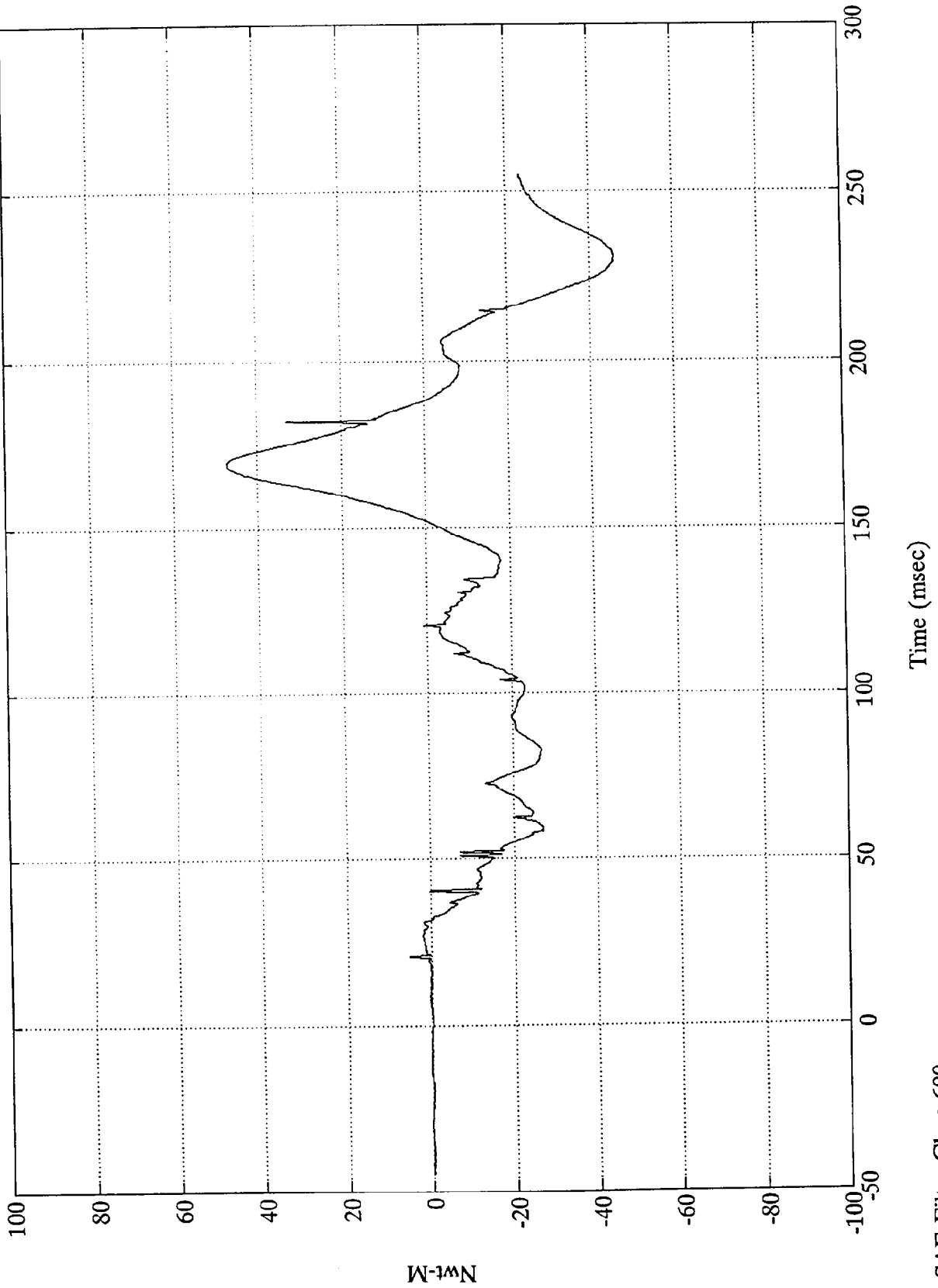
B-85
Nwt-M

8120-2
SAE Filter Class 600

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Upper Neck My

Max = 47.36 Nwt-M @ 169.91 msec
Min = -45.94 Nwt-M @ 230.88 msec

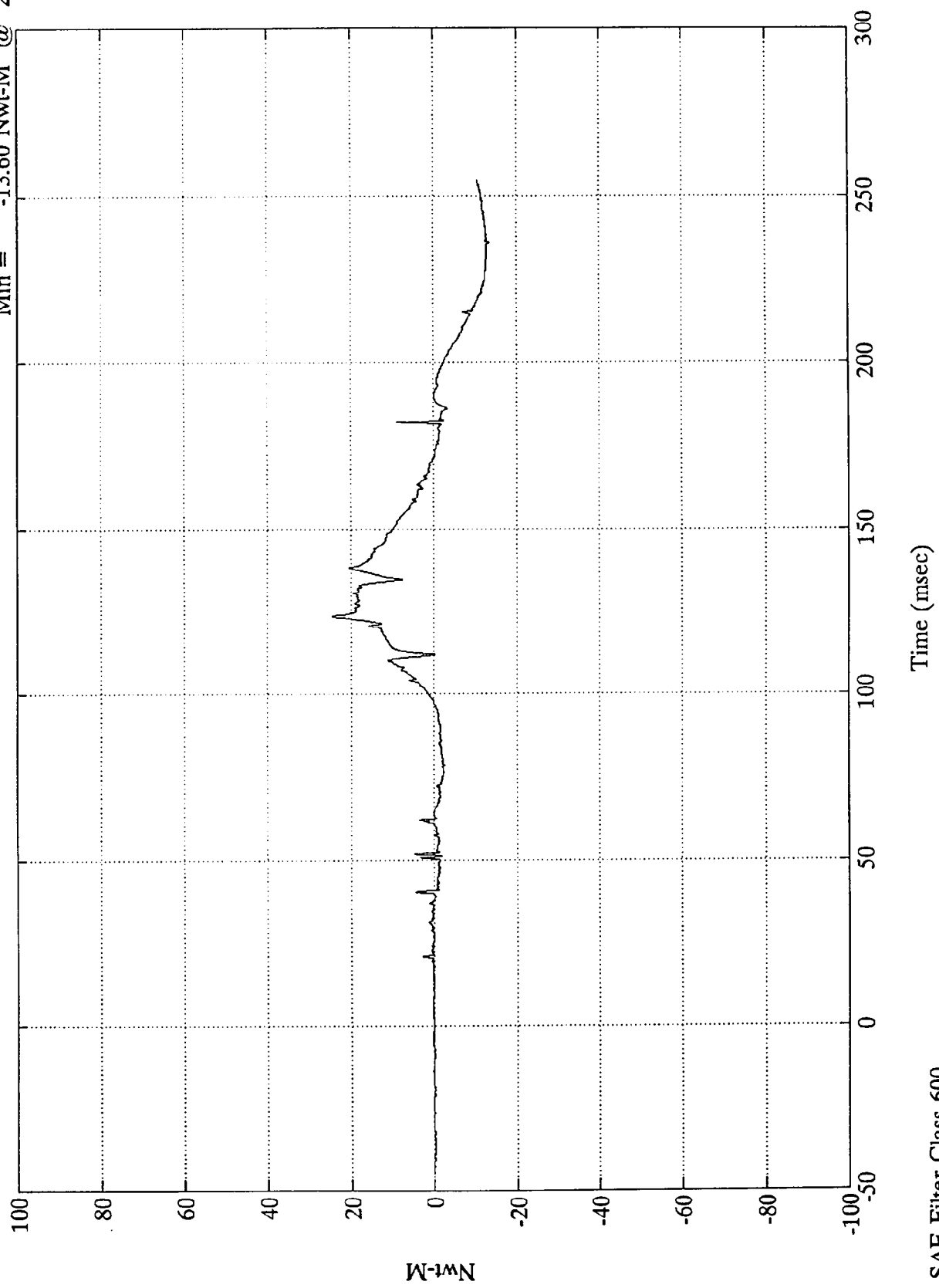


B-86
Nwt-M

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Upper Neck Mz

Max = 24.53 Nwt-M @ 123.60 msec
Min = -13.60 Nwt-M @ 235.92 msec

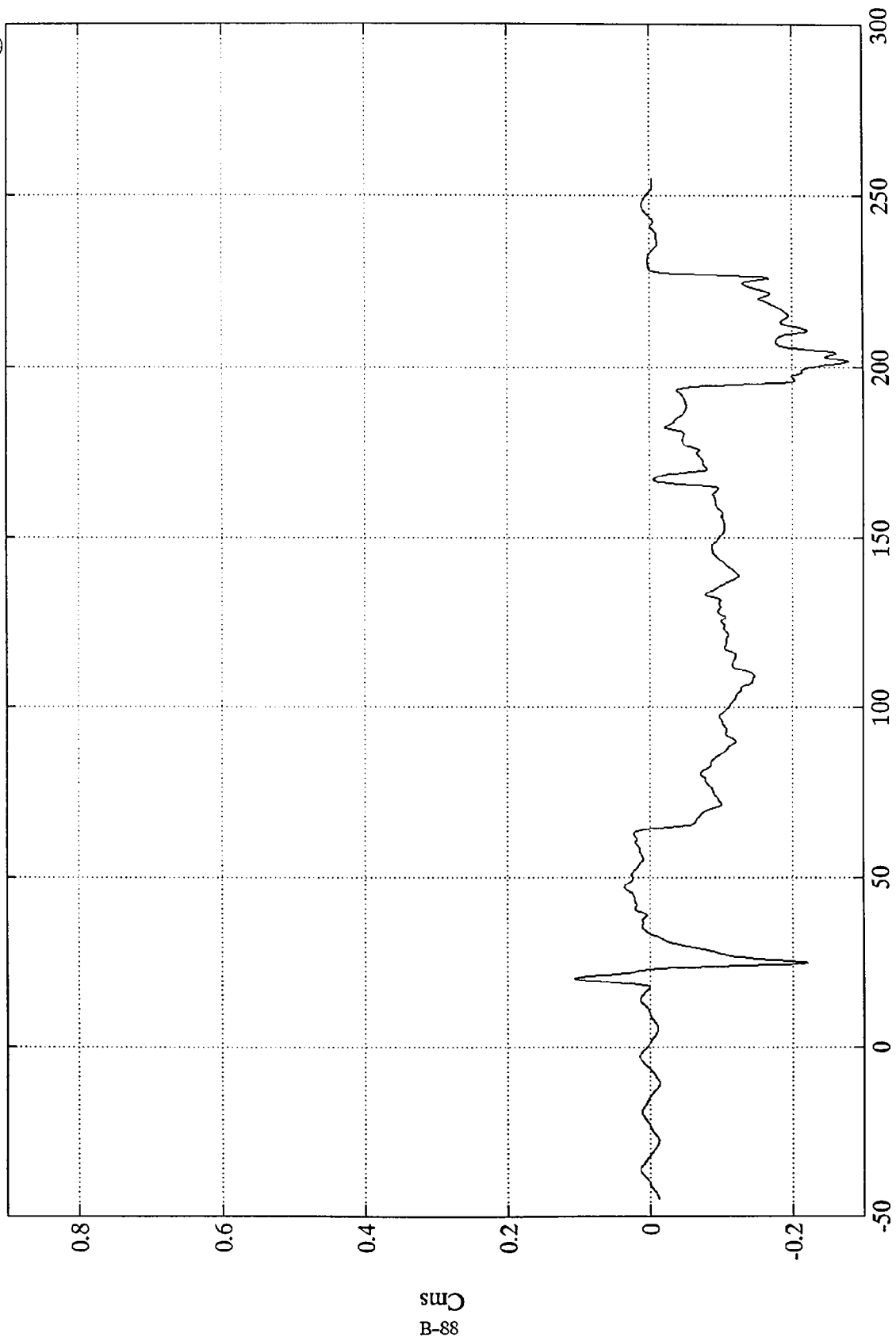


B-87
Nwt-M

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Belt Elongation

Max = .11 Cms @ 20.15 msec
Min = -.28 Cms @ 201.72 msec



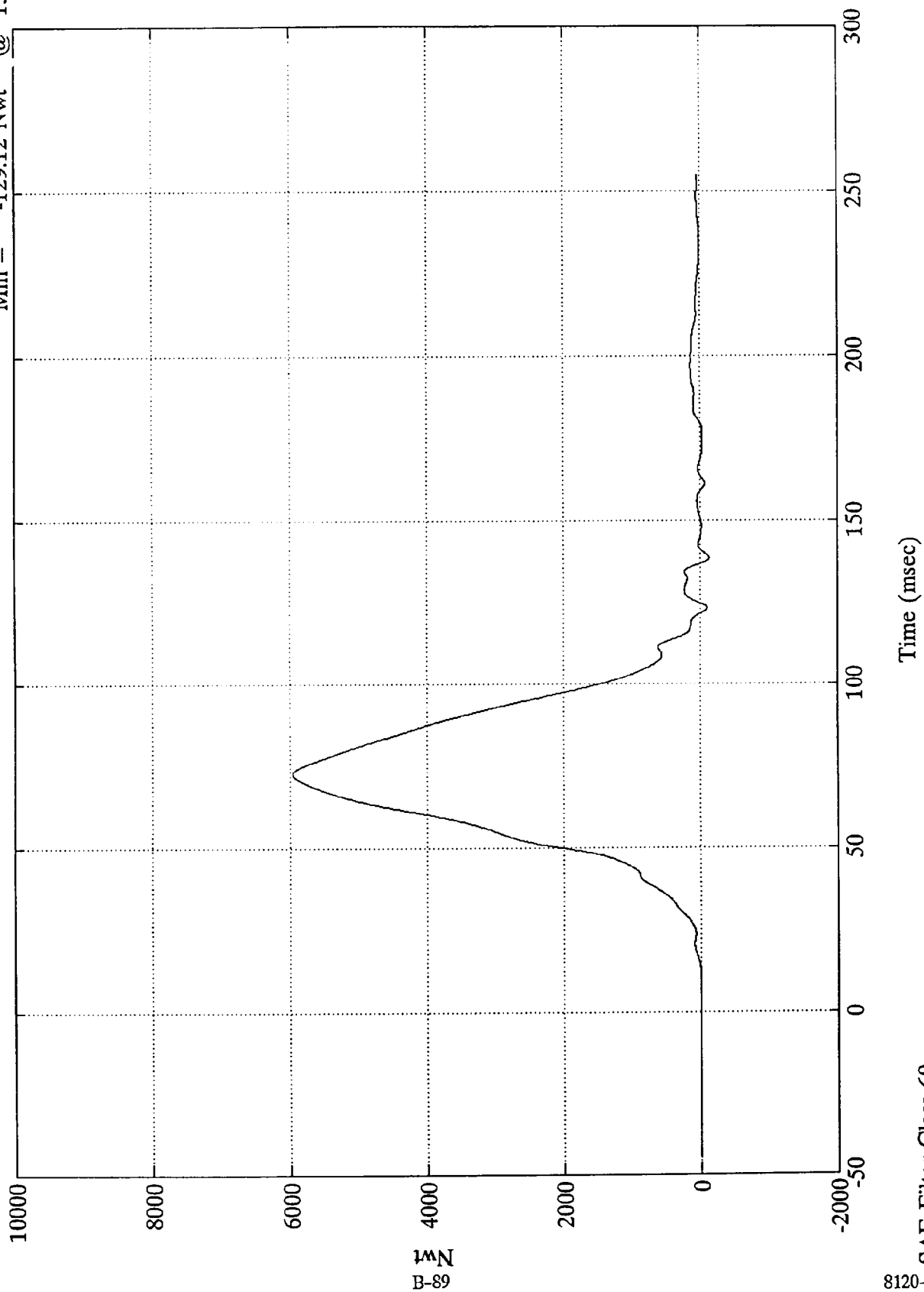
DATA IS NOT ACCURATE

8120-2
SAE Filter Class 180

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Left Belt Load

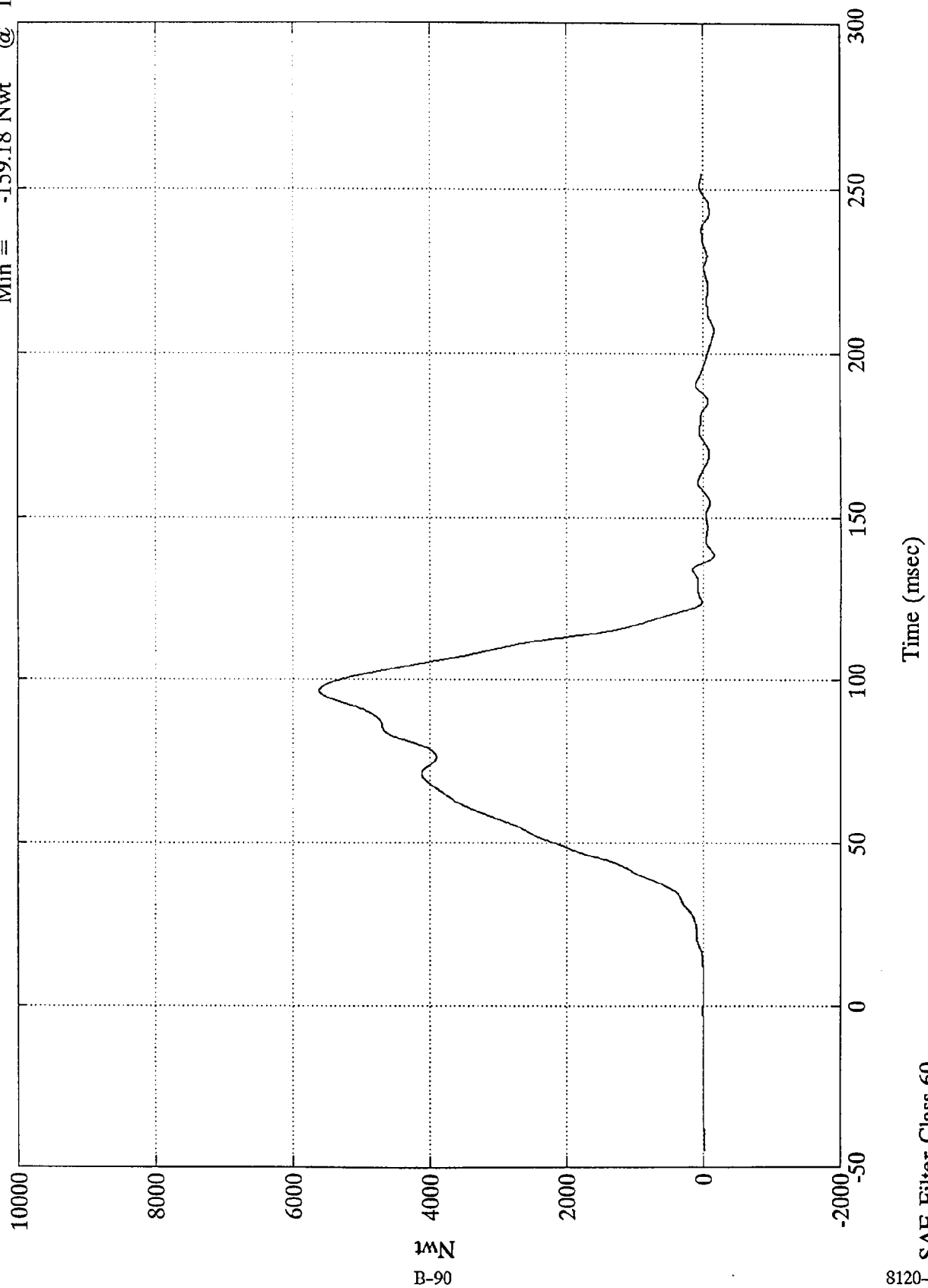
Max = 5963.75 Nwt @ 72.72 msec
Min = -129.12 Nwt @ 138.60 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 1 Torso Belt Load

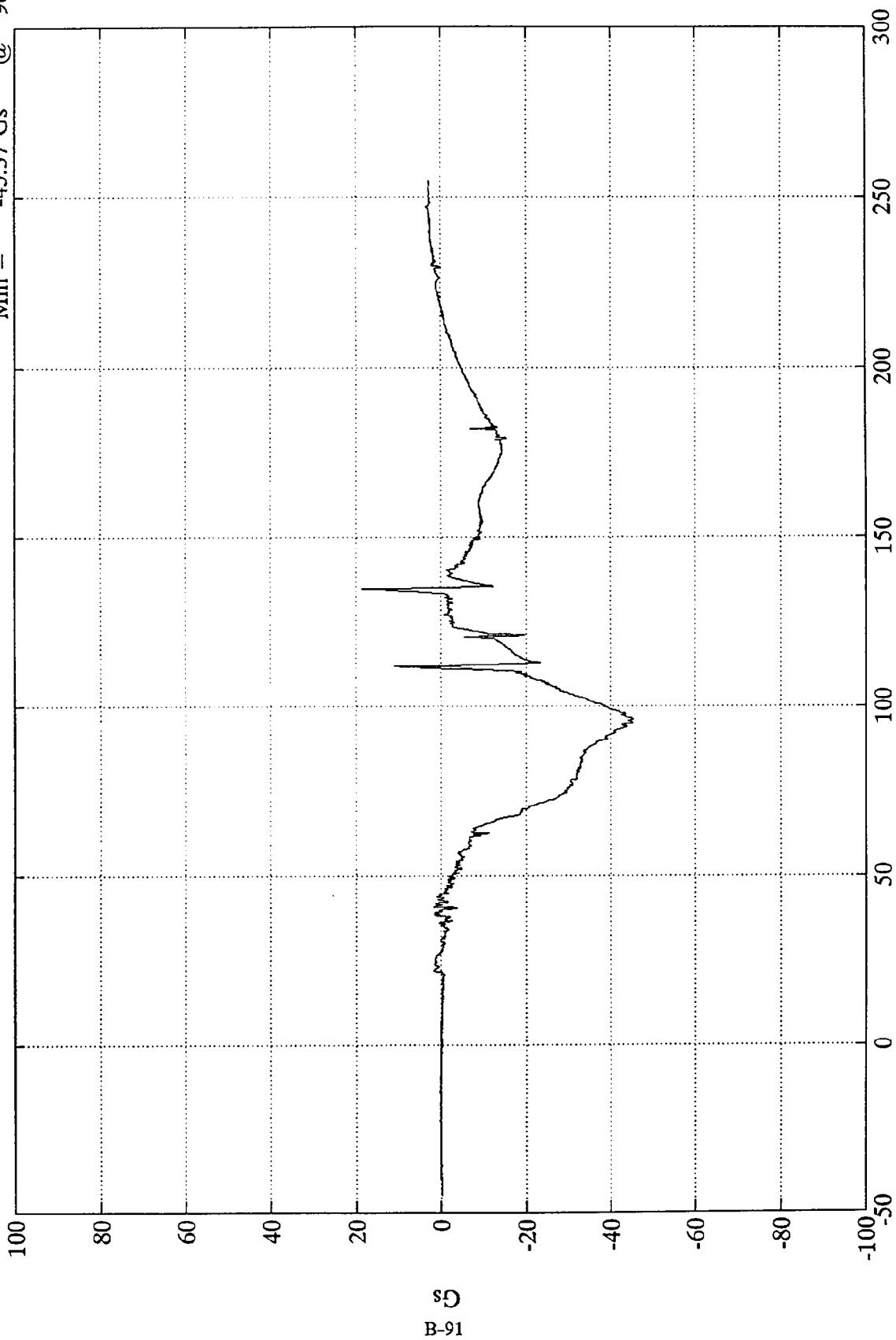
Max = 5623.82 Nwt @ 96.36 msec
Min = -159.18 Nwt @ 138.72 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 18.61 Gs @ 135.00 msec
Min = -45.37 Gs @ 96.00 msec

Pos. 2 Head X



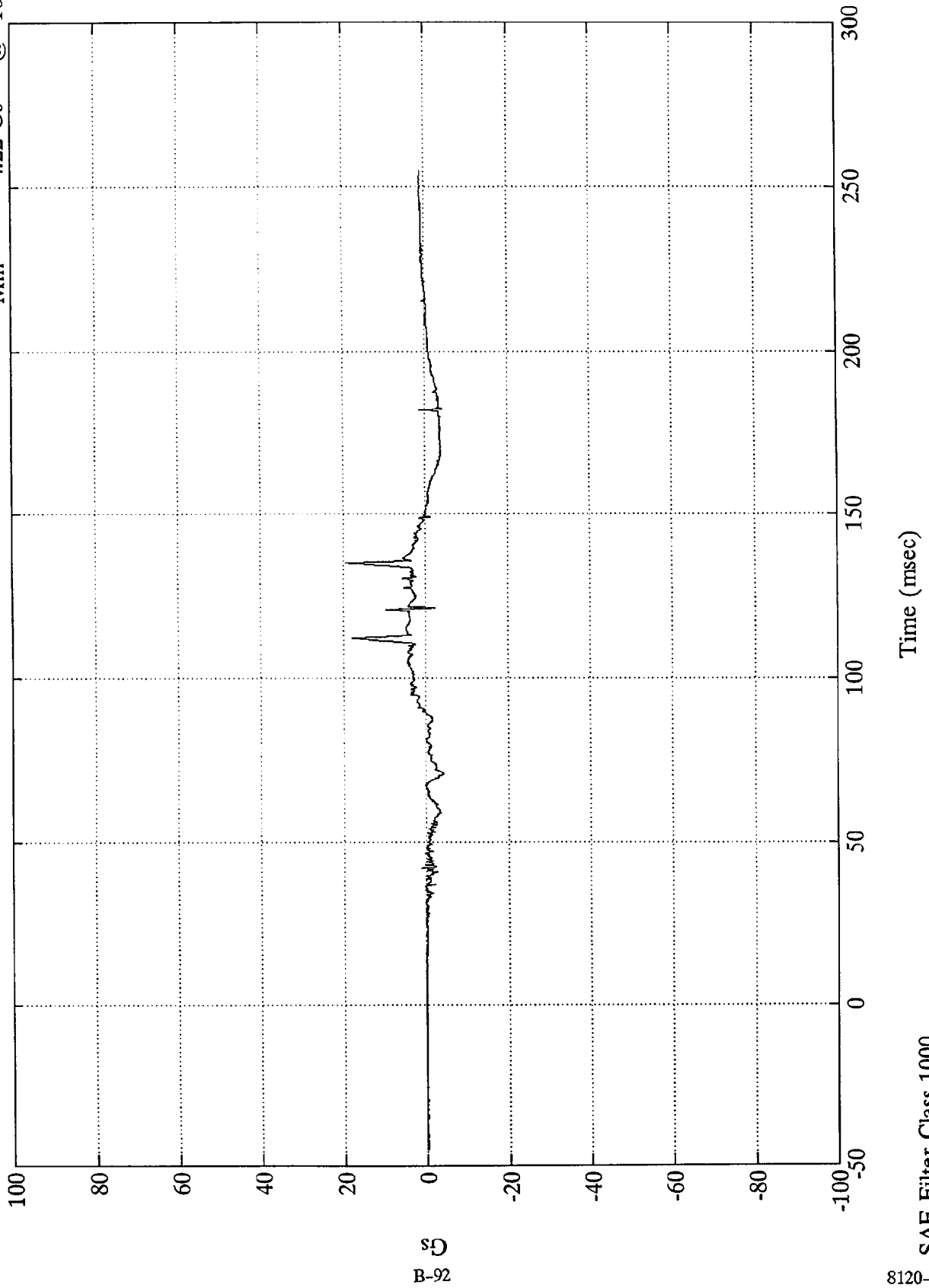
B-91

8120-2

SAE Filter Class 1000

NCAP TEST #2 - 1993 CHEVROLET CAMARO

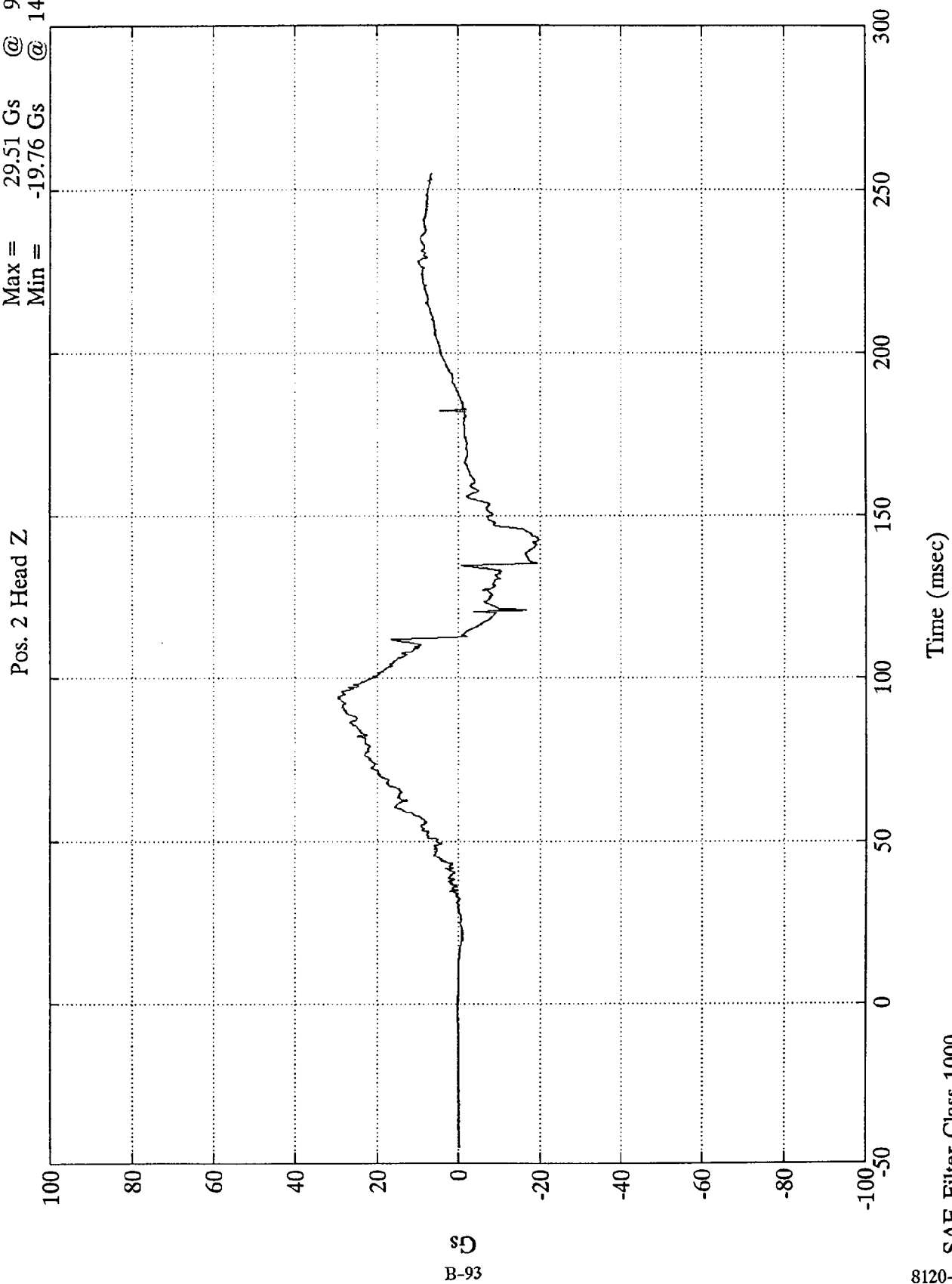
Pos. 2 Head Y
Max = 19.50 Gs @ 135.00 msec
Min = -4.22 Gs @ 182.40 msec



B-92

NCAP TEST #2 - 1993 CHEVROLET CAMARO

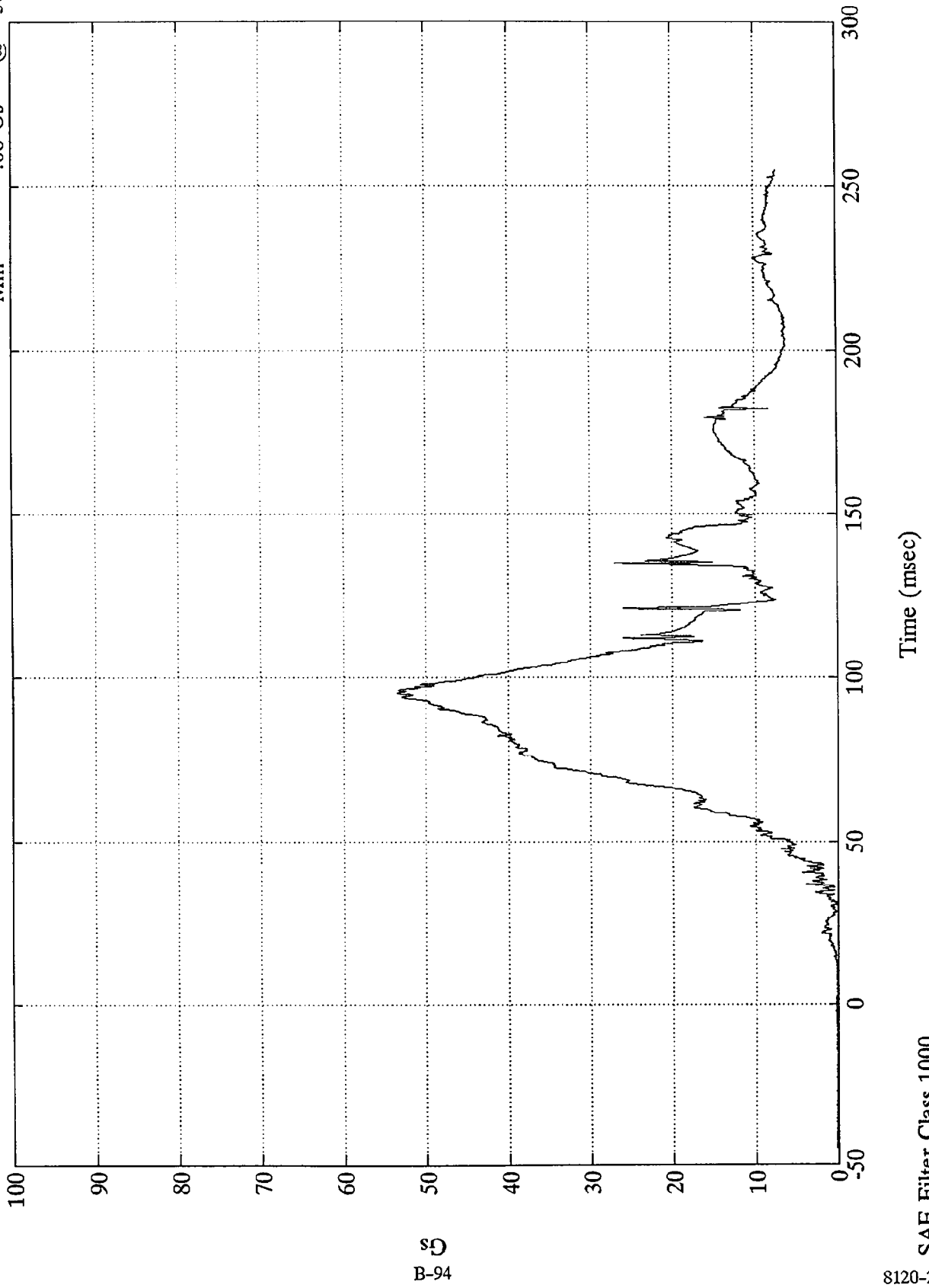
Max = 29.51 Gs @ 94.19 msec
Min = -19.76 Gs @ 142.68 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Head Resultant

Max = 53.43 Gs @ 95.16 msec
 Min = .06 Gs @ 30.71 msec

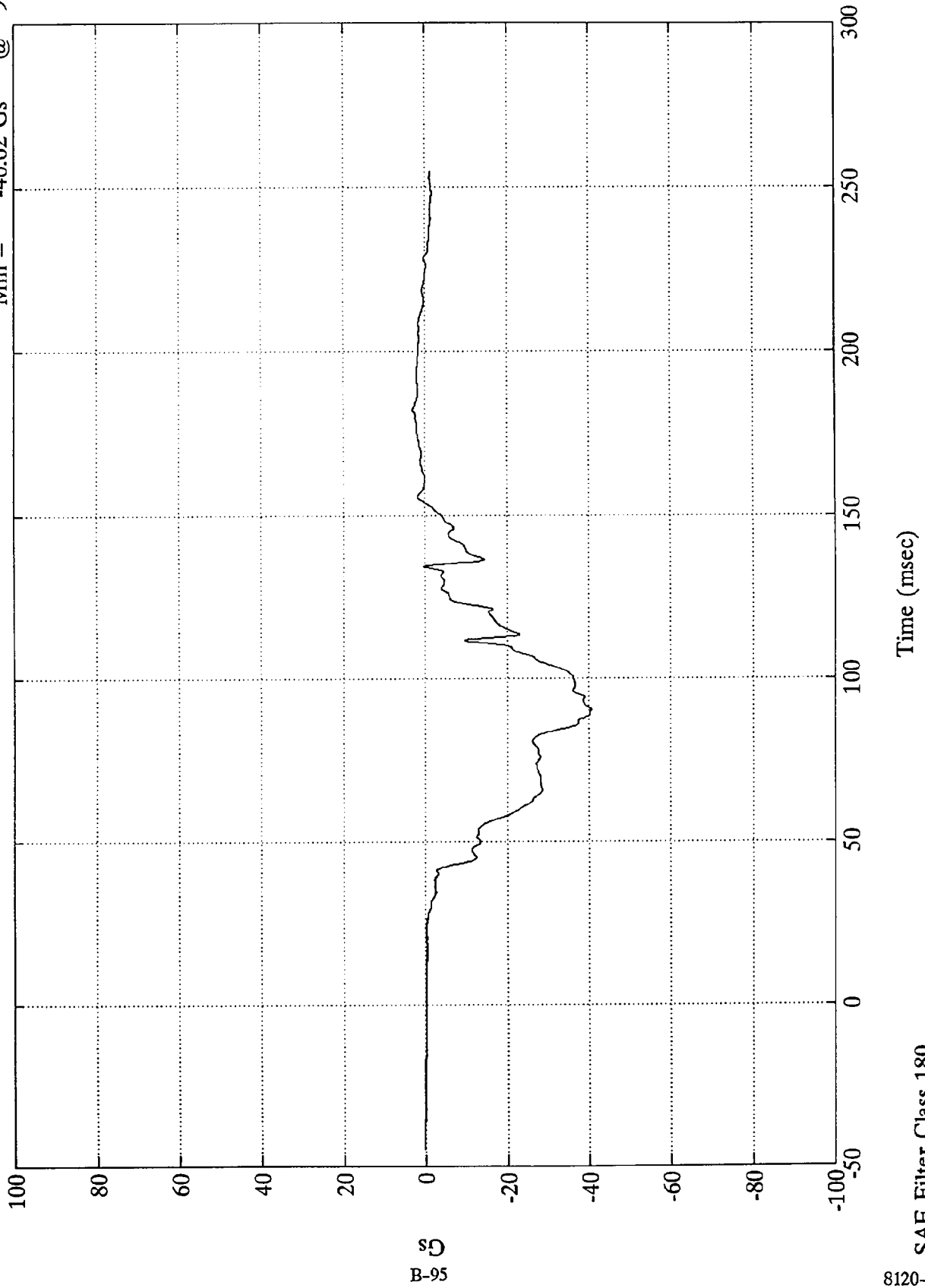


8D
B-94

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 3.13 Gs @ 182.04 msec
Min = -40.62 Gs @ 90.48 msec

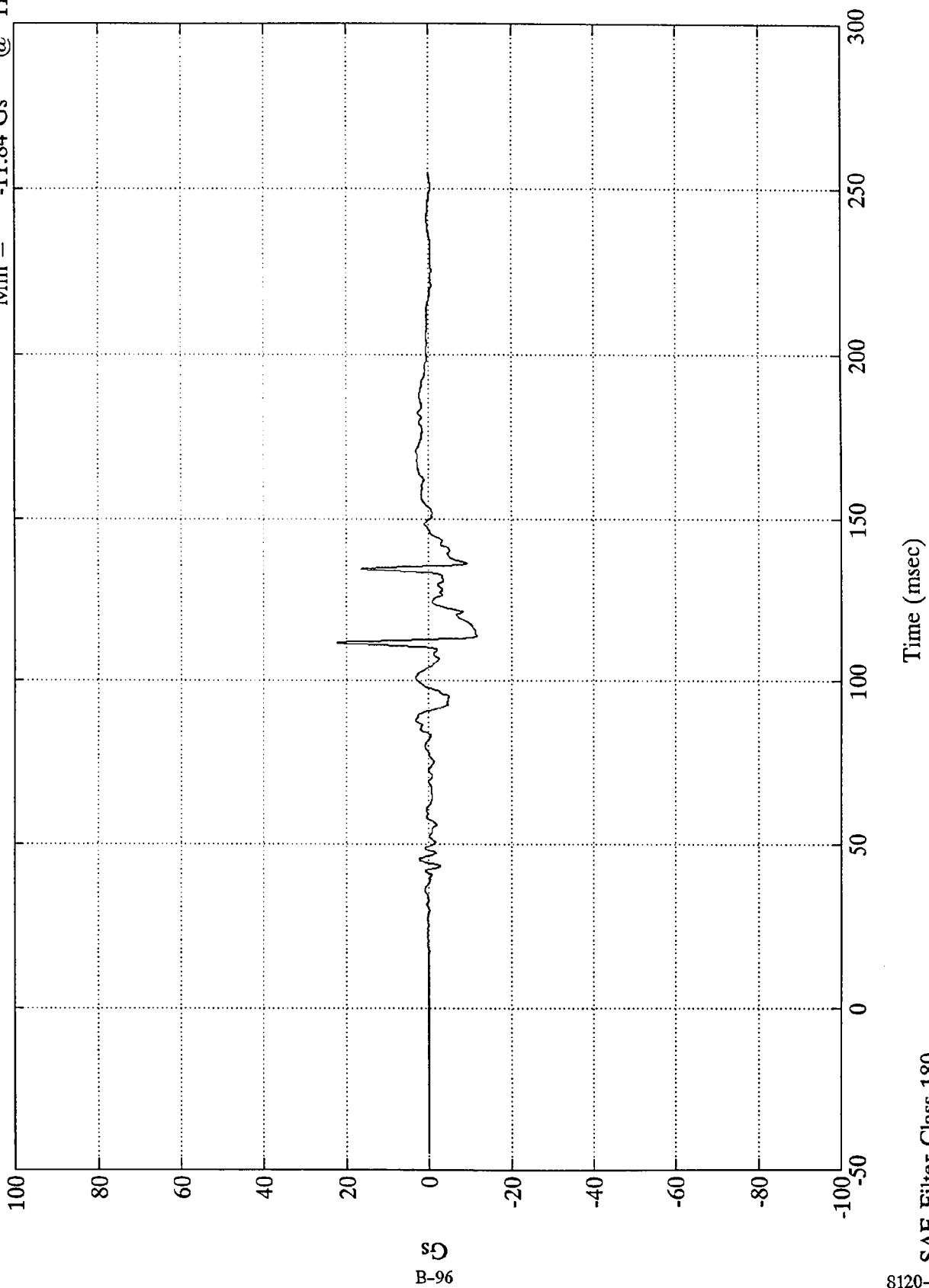
Pos. 2 Chest X



B-95

NCAP TEST #2 - 1993 CHEVROLET CAMARO

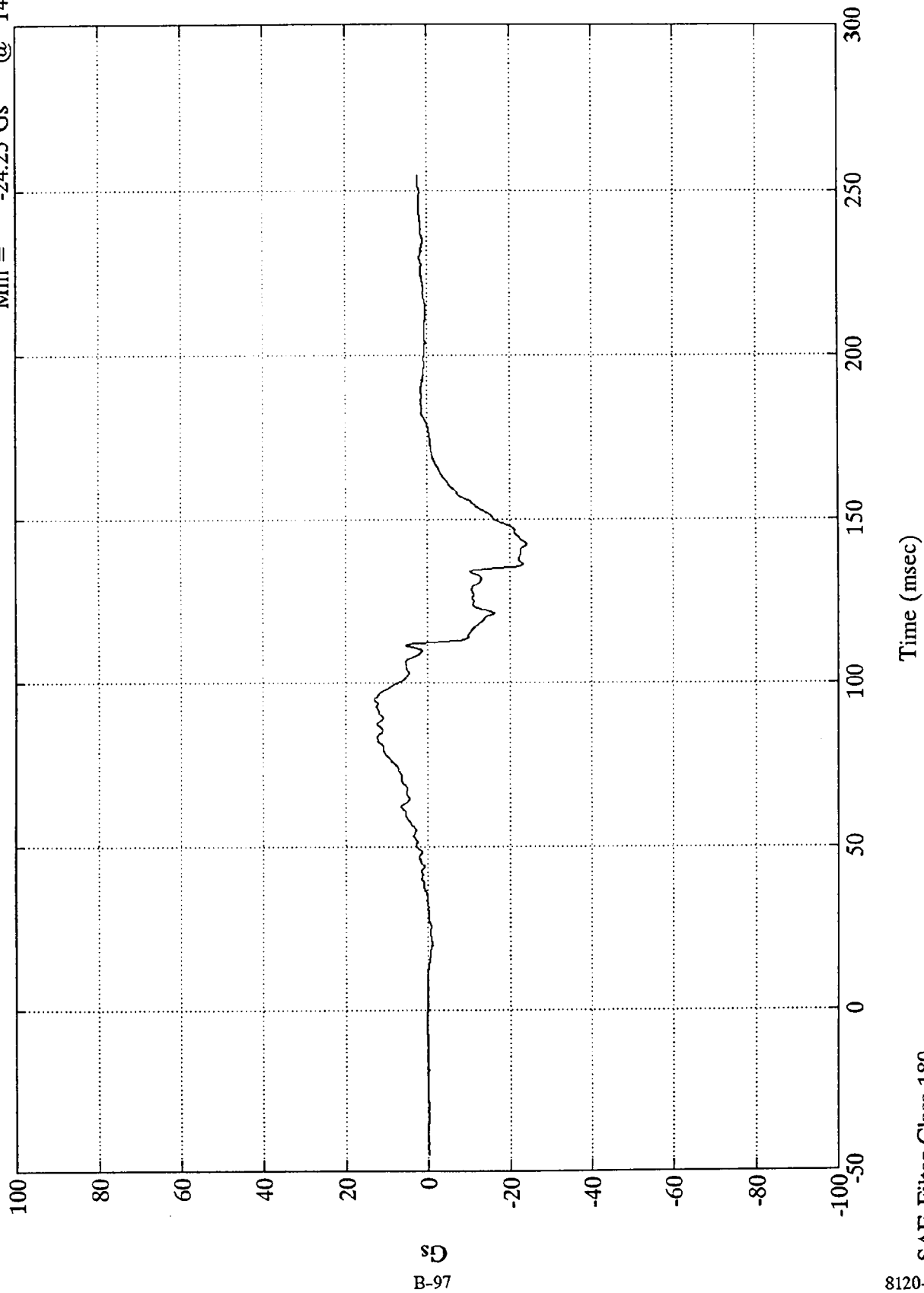
Pos. 2 Chest Y
Max = 22.18 Gs @ 111.60 msec
Min = -11.84 Gs @ 113.76 msec



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Max = 13.08 Gs @ 94.80 msec
Min = -24.25 Gs @ 142.55 msec

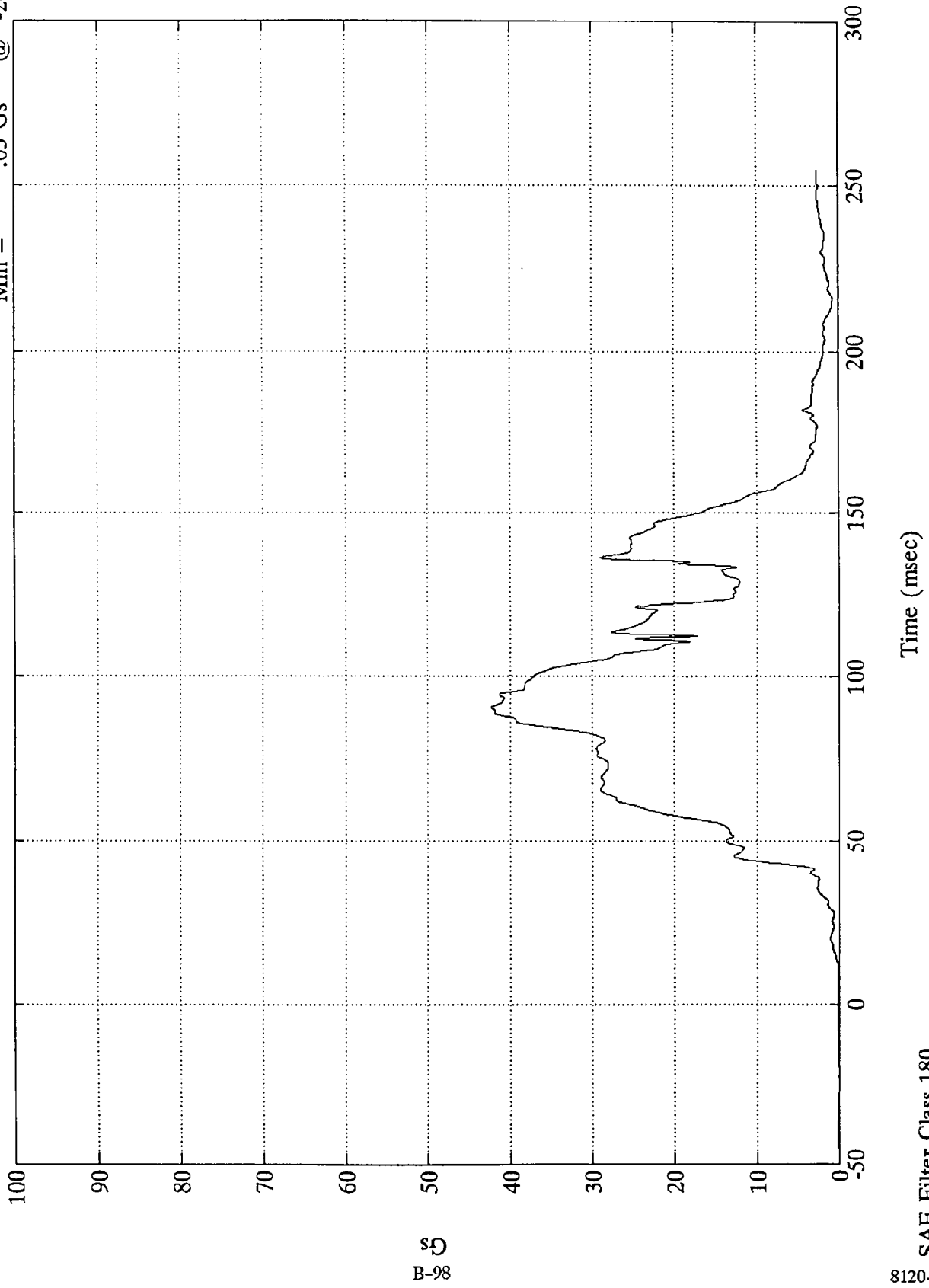
Pos. 2 Chest Z



B-97

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Chest Resultant
Max = 42.33 Gs @ 90.48 msec
Min = .03 Gs @ -20.40 msec

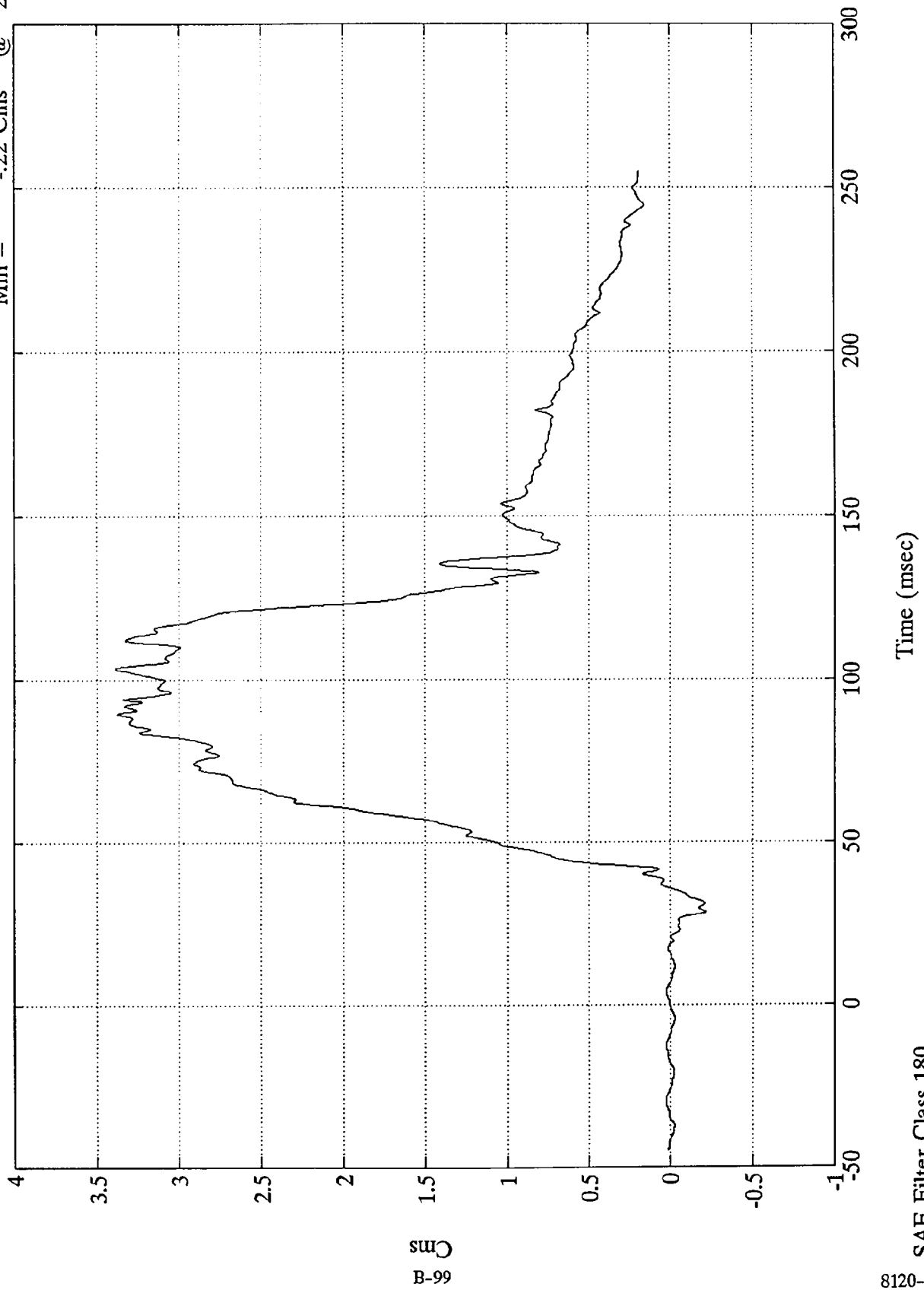


B-98

NCAP TEST #2 - 1993 CHEVROLET CAMARO

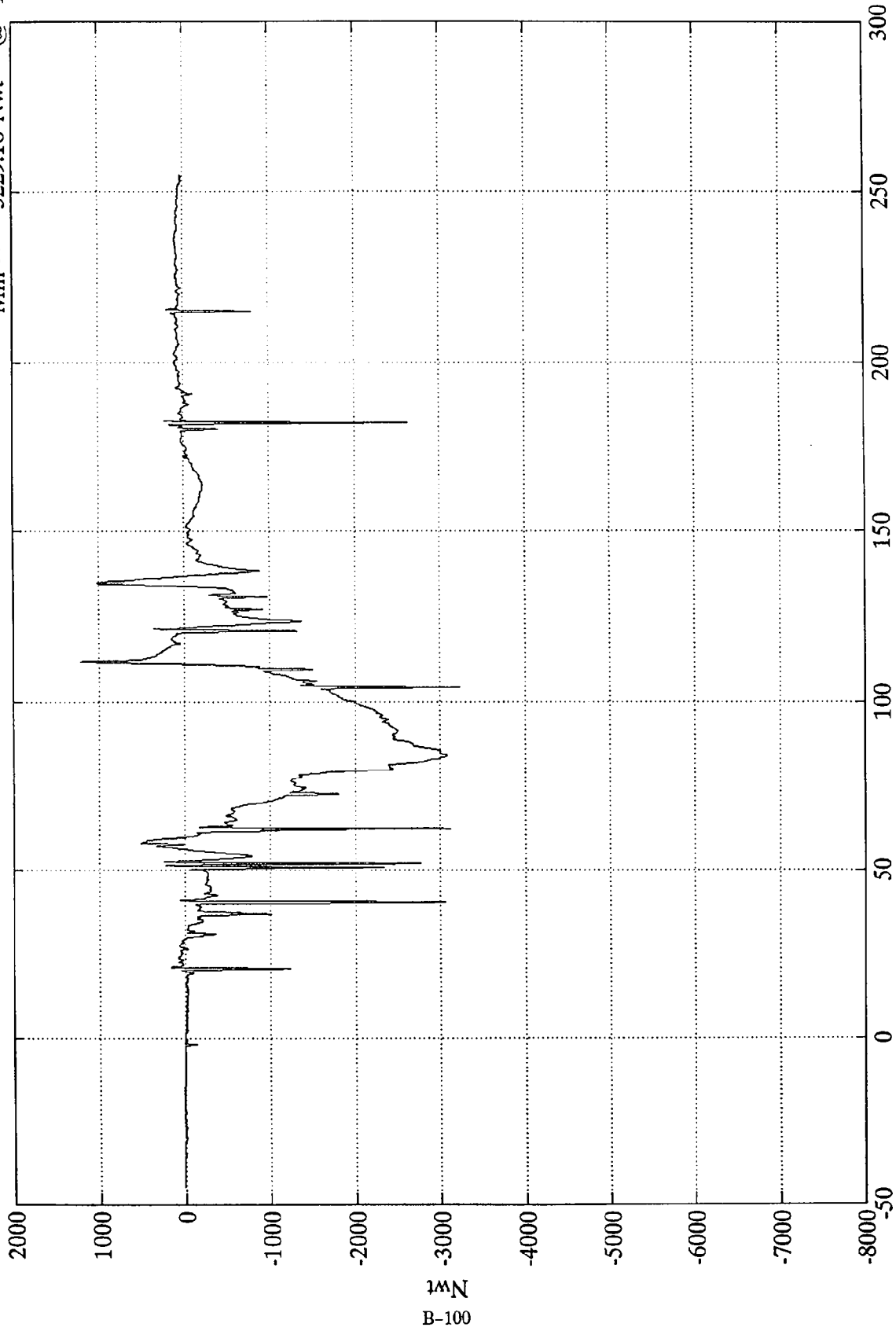
Max = 3.39 Cms @ 103.44 msec
Min = -.22 Cms @ 28.55 msec

Pos. 2 Chest Disp.



NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Left Femur
Max = 1221.29 Nwt @ 111.84 msec
Min = -3229.18 Nwt @ 104.16 msec

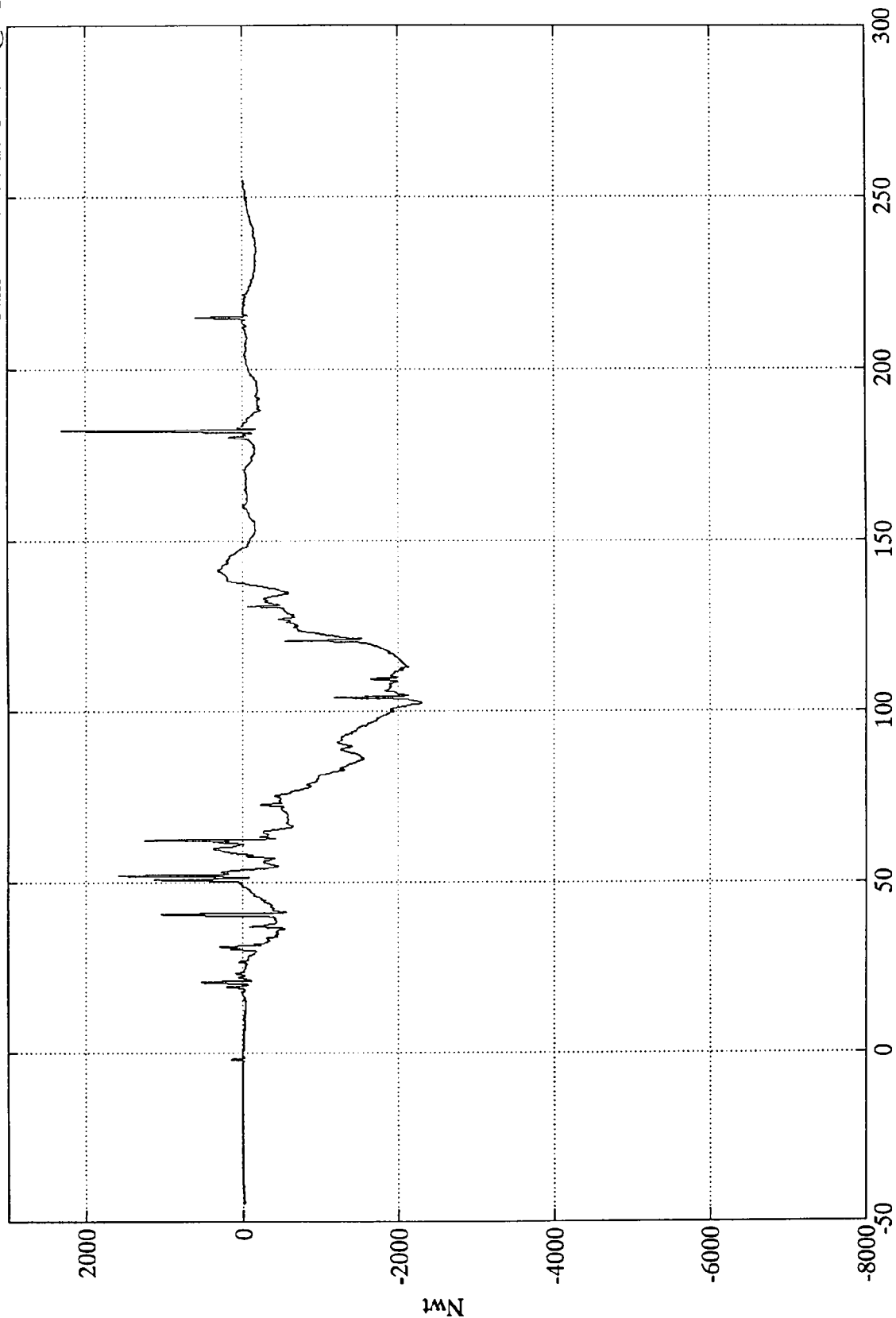


SAE Filter Class 600
Time (msec)
DATA CONTAINS INTERMITTENT SPIKES

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Right Femur

Max = 2313.08 Nwt @ 181.92 msec
Min = -2295.25 Nwt @ 102.36 msec



SAE Filter Class 600

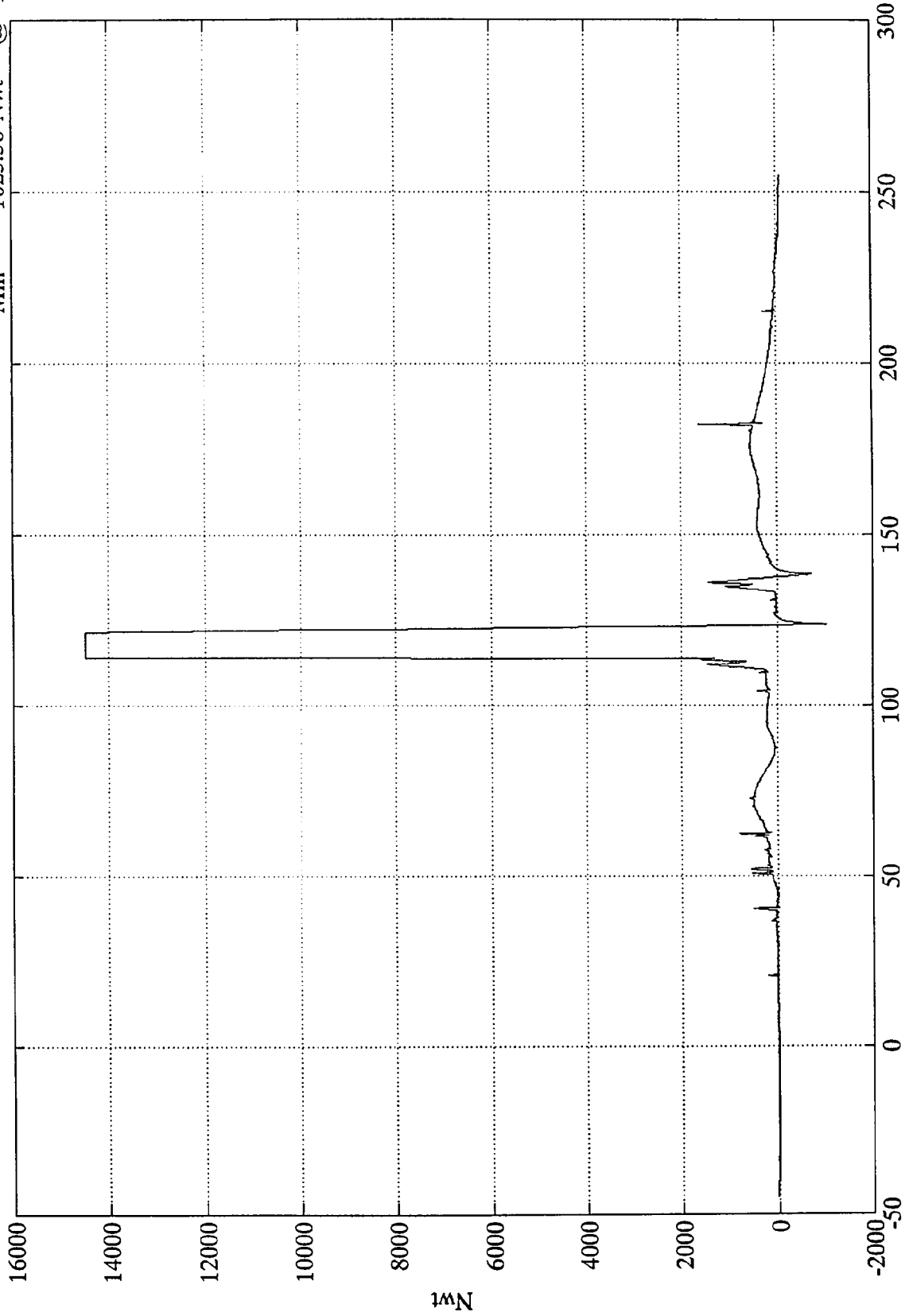
8120-2

DATA CONTAINS INTERMITTENT SPIKES

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Upper Neck Fx

Max = 14500.37 Nwt @ 121.55 msec
Min = -1025.56 Nwt @ 123.72 msec



1wN
B-102

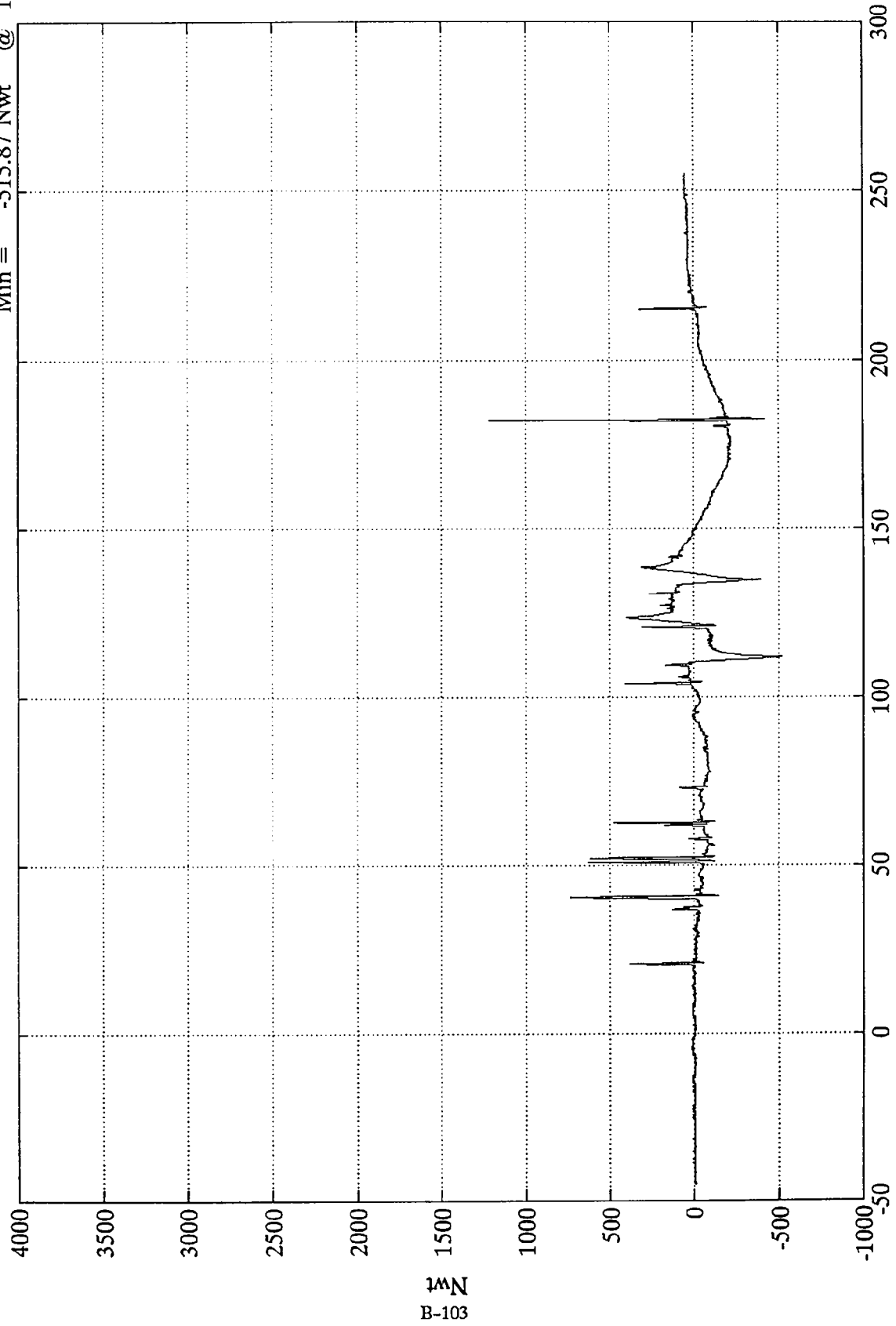
8120-2
SAE Filter Class 1000

Time (msec)
DATA CONTAINS INTERMITTENT SPIKES

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Upper Neck Fy

Max = 1217.27 Nwt @ 182.04 msec
Min = -515.87 Nwt @ 111.95 msec

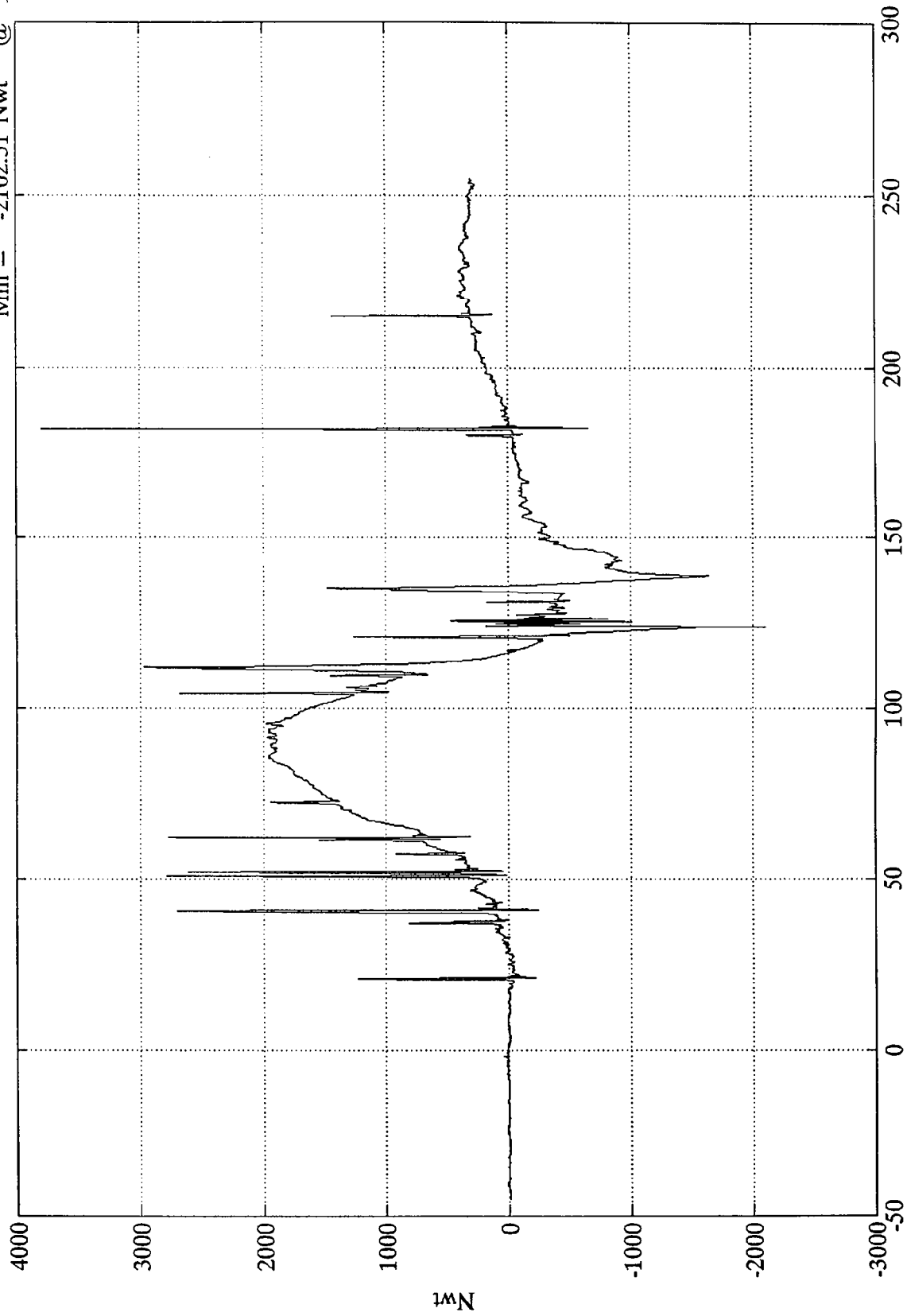


SAE Filter Class 1000 DATA CONTAINS INTERMITTENT SPIKES

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Upper Neck Fz

Max = 3796.53 Nwt @ 182.04 msec
Min = -2102.51 Nwt @ 123.72 msec



8120-2 SAE Filter Class 1000

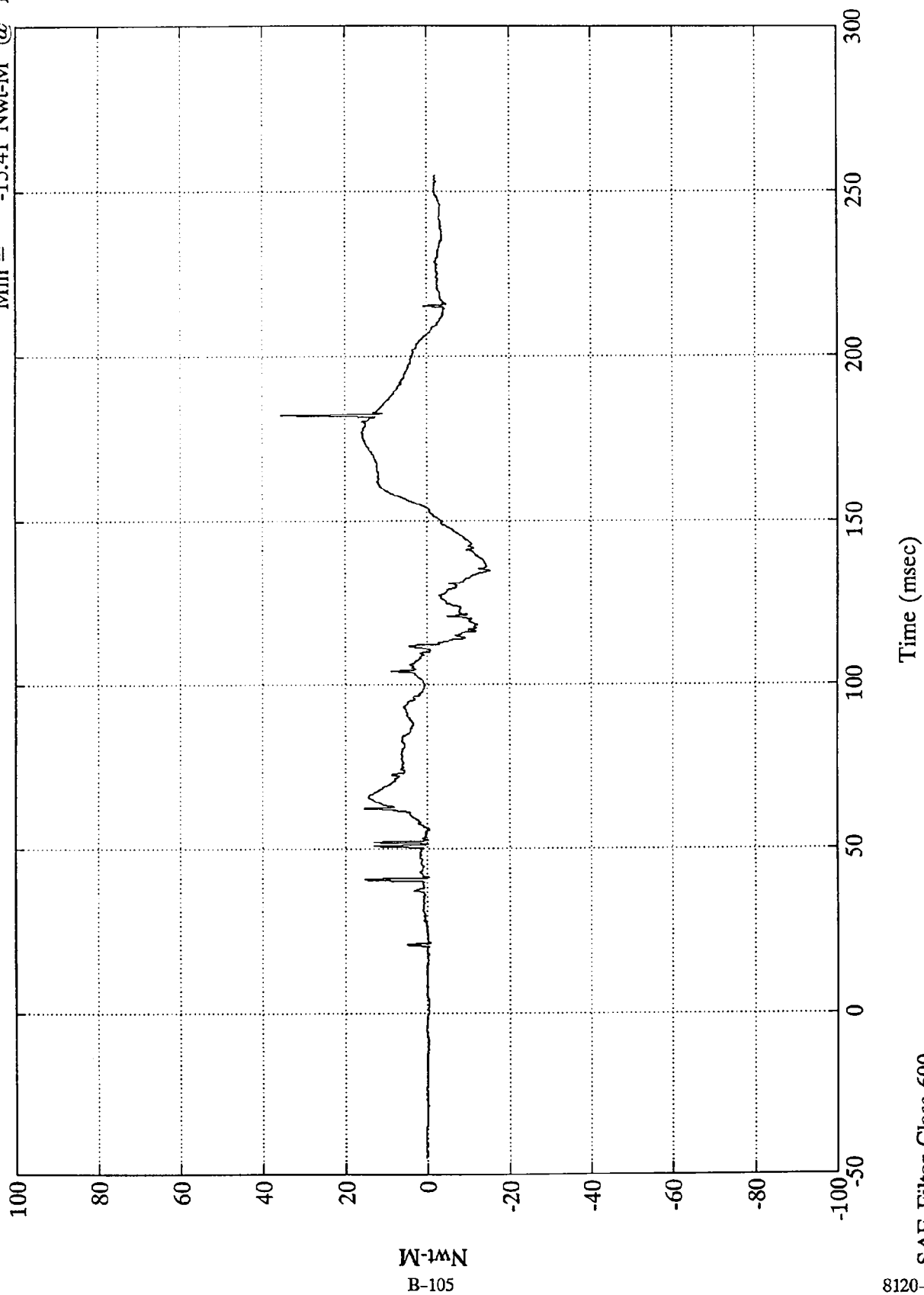
Time (msec)

DATA CONTAINS INTERMITTENT SPIKES

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Upper Neck Mx

Max = 35.58 Nwt-M @ 182.04 msec
Min = -15.41 Nwt-M @ 134.88 msec

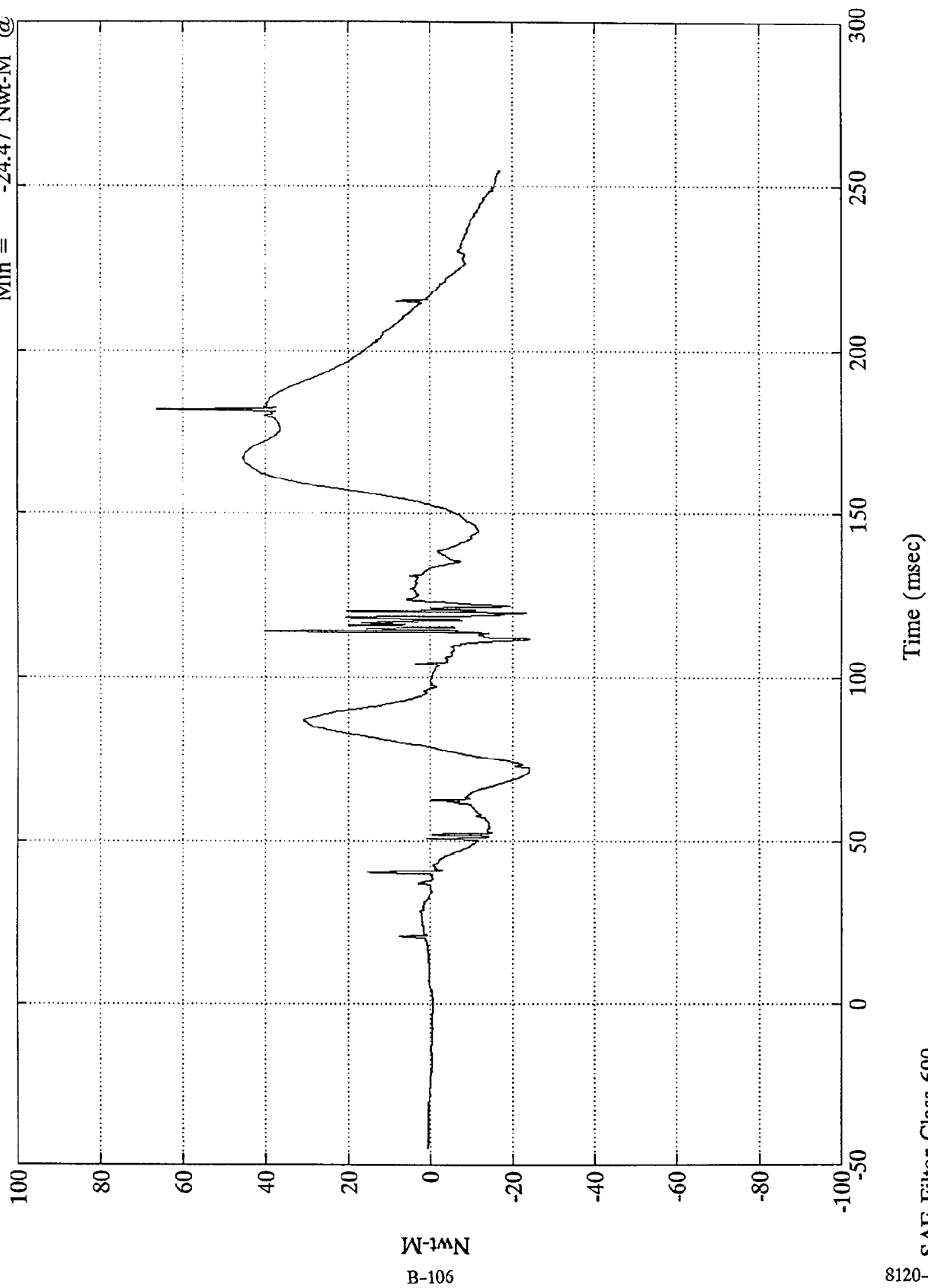


B-105

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Upper Neck My

Max = 66.25 Nwt-M @ 182.04 msec
Min = -24.47 Nwt-M @ 111.84 msec

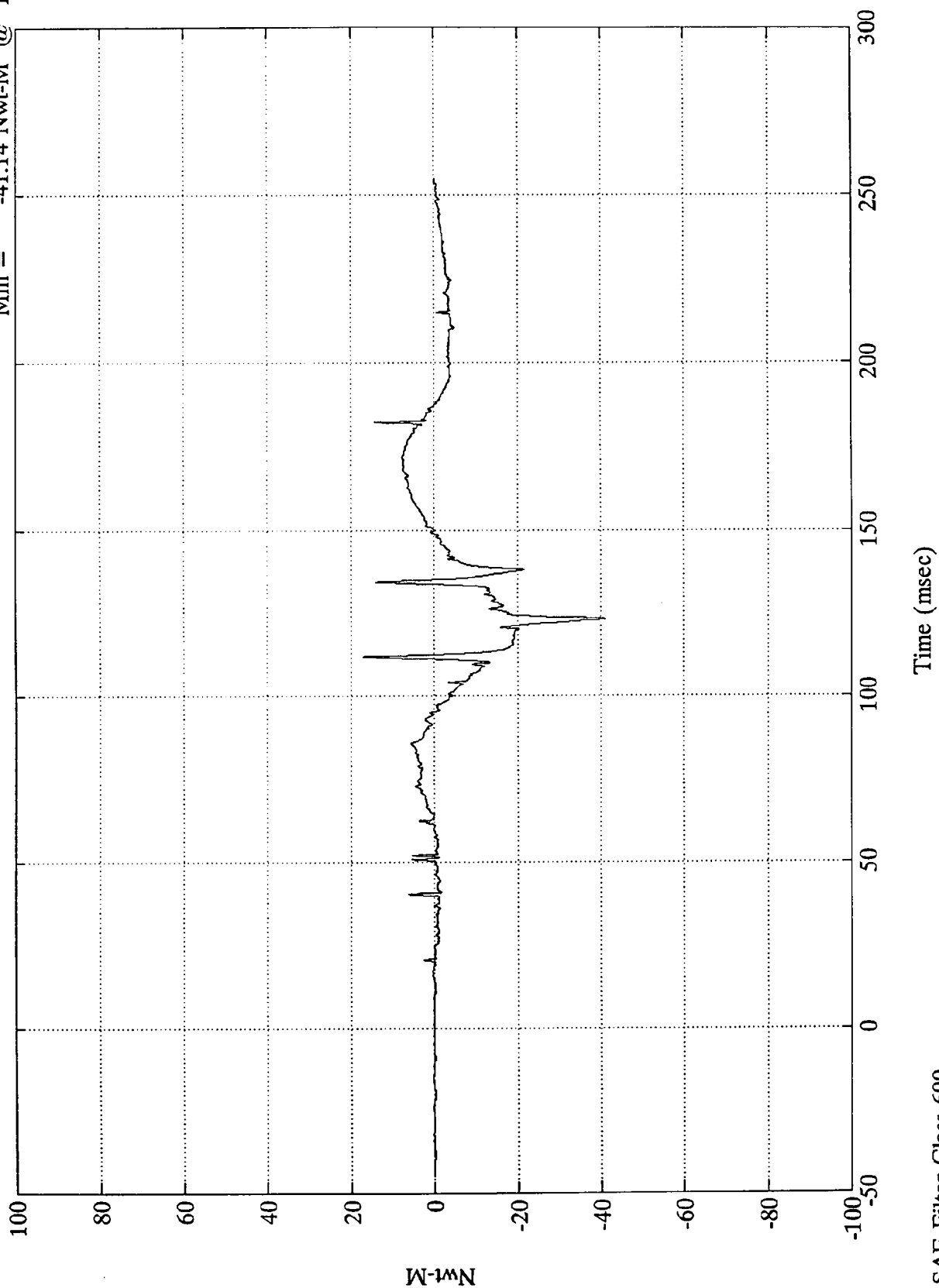


B-106

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Upper Neck Mz

Max = 16.99 Nwt-M @ 111.84 msec
Min = -41.14 Nwt-M @ 123.48 msec

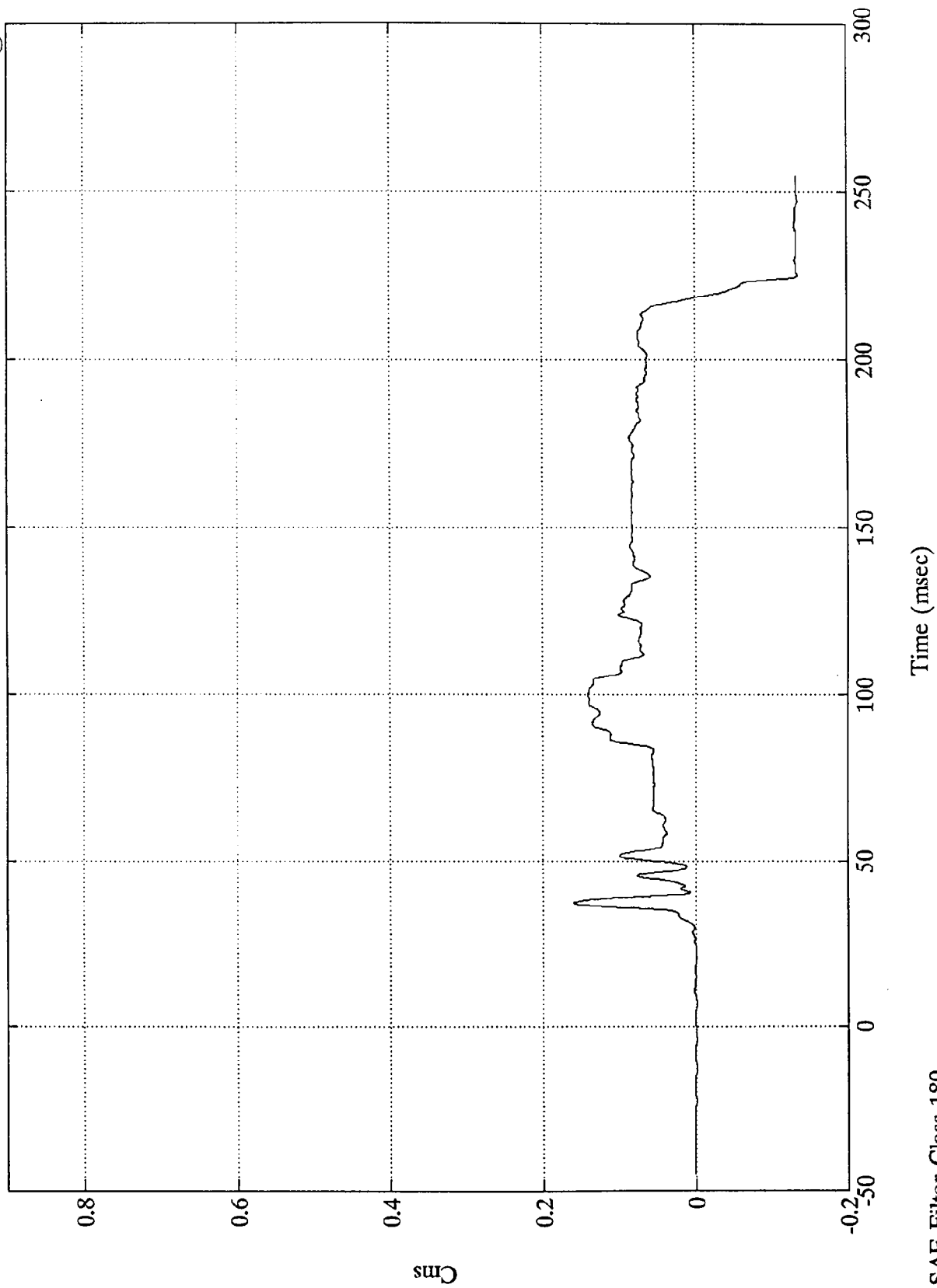


B-107

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Belt Elongation

Max = .16 Cms @ 37.31 msec
Min = -.14 Cms @ 247.32 msec

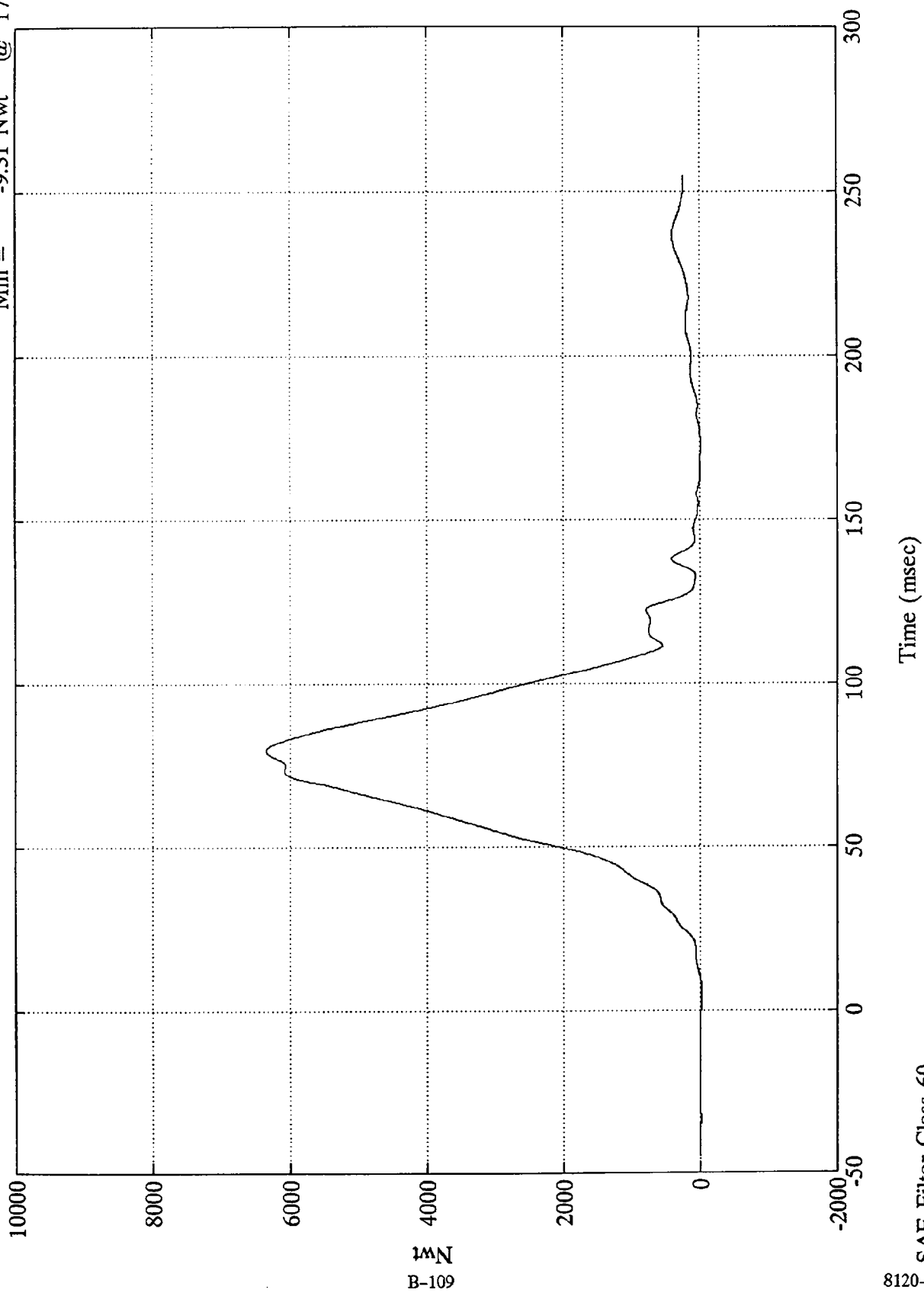


B-108

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Right Belt Load

Max = 6355.17 Nwt @ 79.56 msec
Min = -9.31 Nwt @ 172.91 msec

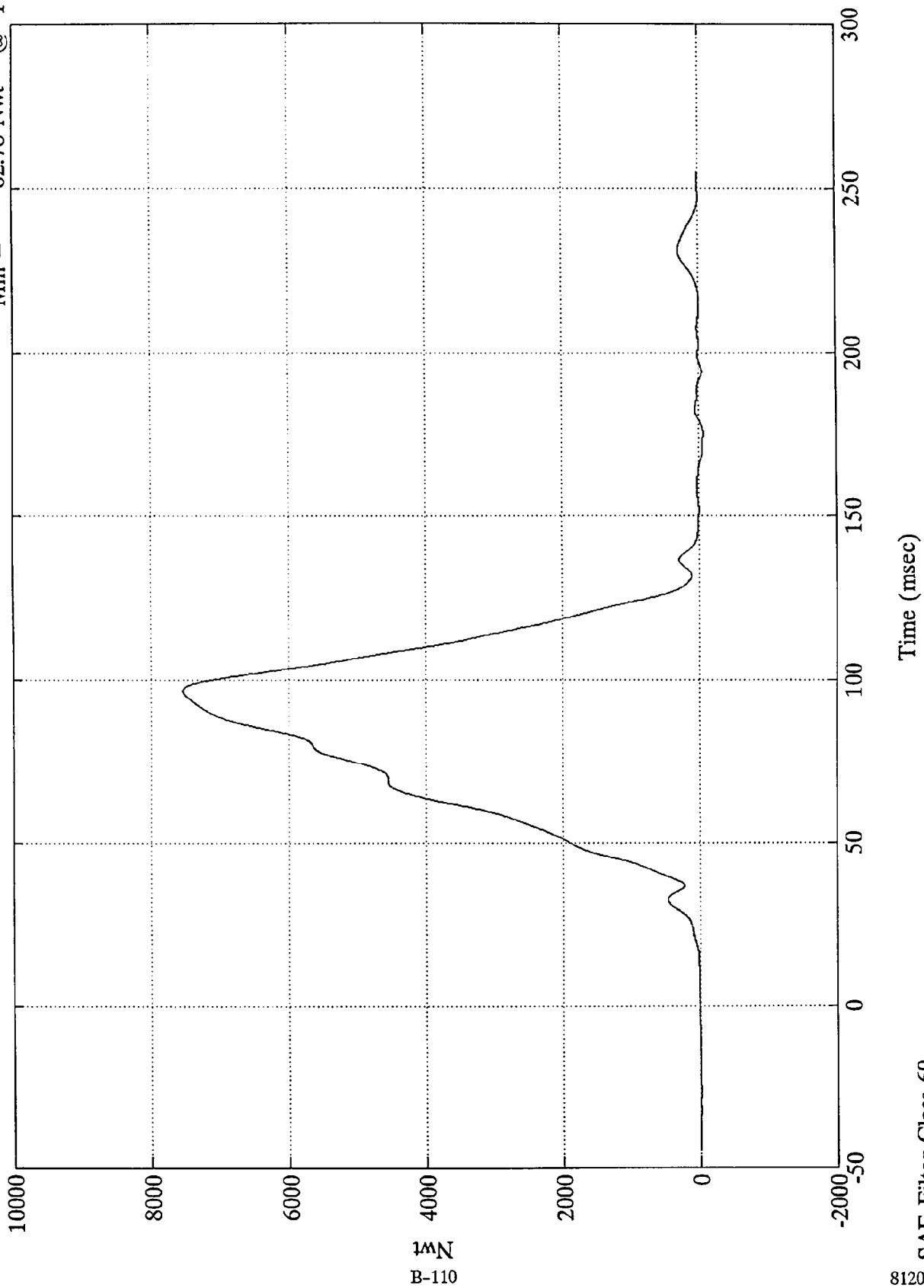


B-109

NCAP TEST #2 - 1993 CHEVROLET CAMARO

Pos. 2 Torso Belt Load

Max = 7542.47 Nwt @ 96.48 msec
Min = -62.78 Nwt @ 175.19 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:

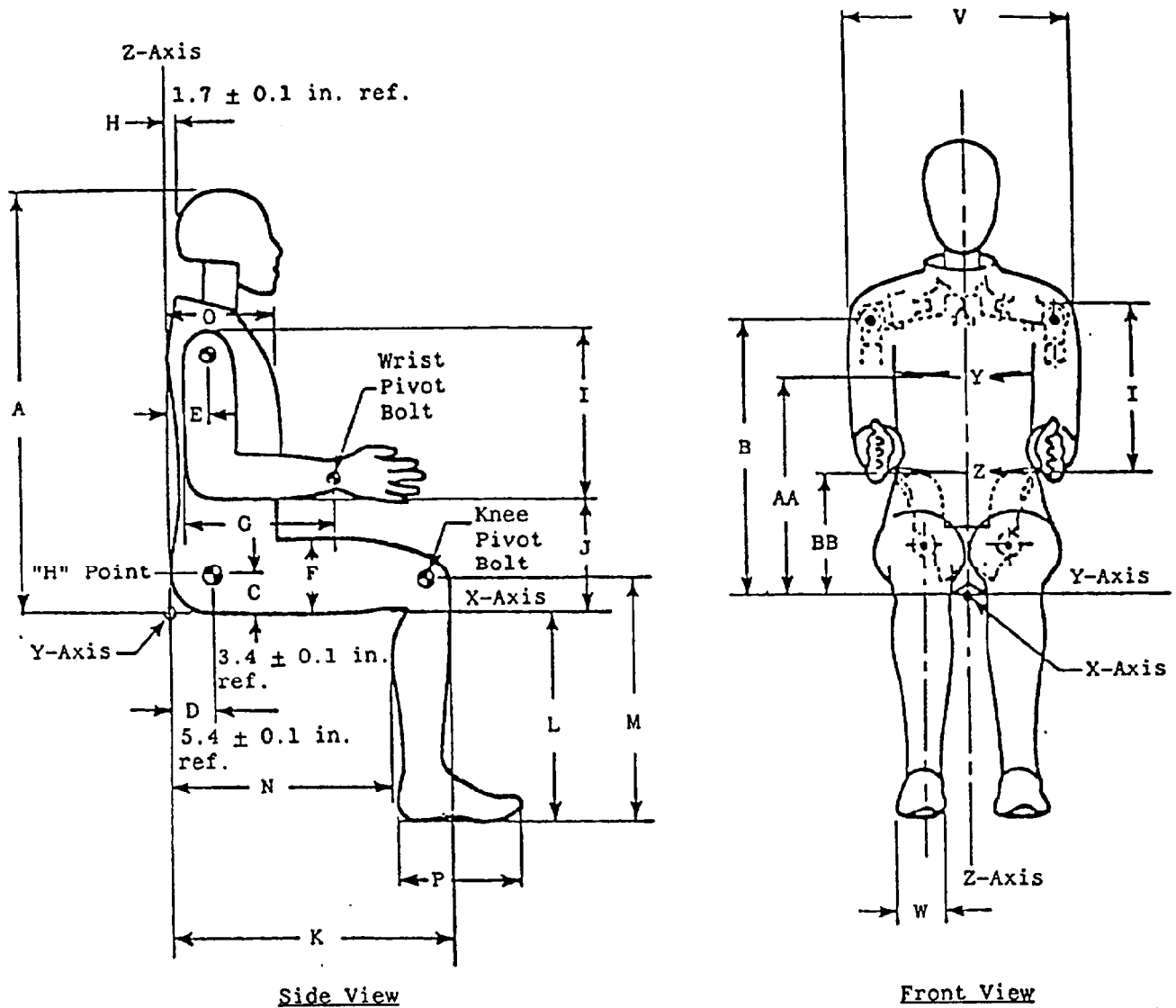
Serial No.	Completion Date
150	7-30-93
245	5-5-93

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 Inducant Testing Final Report No. 6525-V-1.

Figure 7

DUMMY CONFIGURATION DIMENSIONS



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.

HYBRID III EXTERNAL DIMENSIONS

S/N 150 HUMANOID

DUMMY SERIAL NO. 150

DATE: 7/30/93

TEMPERATURE		20.5 DEG. C
RELATIVE HUMIDITY		26 %
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	88 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	881 mm
THIGH CLEARANCE (F)	140-155 mm	142 mm
BUTTOCK KNEE LENGTH (K)	580-605 mm	591 mm
BUTTOCK POPLITAL LENGTH (N)	452-477 mm	470 mm
POPLITEAL LENGTH (L)	430-455 mm	452 mm
KNEE PIVOT HEIGHT (M)	485-501 mm	500 mm
FOOT LENGTH (P)	252-267 mm	259 mm
FOOT BREADTH (W)	91-107 mm	96 mm
SHOULDER PIVOT FROM BACKLINE (E)	84-94 mm	94 mm
SHOULDER BREADTH (V)	422-437 mm	429 mm
SHOULDER PIVOT HEIGHT (B)	505-521 mm	513 mm
ELBOW REST HEIGHT (J)	190-211 mm	208 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 : 7/27/93

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 150 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	21.6 DEG. C
RELATIVE HUMIDITY	10% - 70%	51 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	242.2 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	11.8 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 : 7/28/93

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN:150 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10% - 70%	53 %
IMPACT VELOCITY		24.8 - 25.7 KPH	24.9 KPH
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	25.89 G'S
	20 MS	17.60 - 22.60 G'S	21.36 G'S
	30 MS	12.50 - 18.50 G'S	17.36 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	17.36 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	39.38 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	70.76 DEG.
	TIME	57 - 64 MS	59.13 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88 - 108 N-M	100.6 N-M
	TIME	47 - 58 MS	52.88 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	113.25 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	99 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 7/28/93

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN:150 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5 - 22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY		10% - 70%	53 %
IMPACT VELOCITY		21.4 - 22.3 KPH	21.94 KPH
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	17.43 G'S
	20 MS	14.00 - 19.00 G'S	17.19 G'S
	30 MS	11.00 - 16.00 G'S	14.09 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	17.29 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 DEG.
	TIME	72 - 82 MS	74.5 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-80.0/-52.9 N-M	-77.87 N-M
	TIME	65 - 79 MS	69.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	153.13 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	128.38 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 7/28/93

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN 150 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.5 - 22.2 DEG. C	21.6 DEG. C
RELATIVE HUMIDITY	10% - 70%	52 %
PENDULUM VELOCITY	23.7 - 24.6 KPH	23.7 KPH
MAXIMUM DEFLECTION	64 - 73 mm	68.3 mm
MAXIMUM RESISTIVE FORCE	4804 - 5538 NEWTONS	5488 NEWTONS
INTERNAL HYSTERESIS	69% - 85%	71.1 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 7/29/93

KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 150 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	21.6 DEG. C
RELATIVE HUMIDITY	10% - 70%	49 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	5048 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 7/29/93

KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 150 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	21.6 DEG. C
RELATIVE HUMIDITY	10% - 70%	49 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	4746 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY I.D. NUMBER: 150

A. DUMMY INSTRUMENTS

1. HEAD ACCELEROMETER

HX LONGITUDINAL

HY LATERAL

HZ VERTICAL

2. CHEST ACCELEROMETER

CX LONGITUDINAL

CY LATERAL

CZ VERTICAL

3. FEMUR LOAD CELLS

LEFT SIDE

RIGHT SIDE

MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	ADMB8	3/93	9/93
ENDEVCO	ADL44	3/93	9/93
ENDEVCO	AC2J3	3/93	9/93
ENDEVCO	ADMB6	3/93	9/93
ENDEVCO	AC209	3/93	9/93
ENDEVCO	ADL98	3/93	9/93
GSE	951	5/93	11/93
GSE	952	5/93	11/93

B. CALIBRATION LABORATORY
INSTRUMENTS

1. PENDULUM ACC.

2. TEST PROBE
ACCELEROMETER

MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
CEC	A160	6/93	12/93
CEC	A161	6/93	12/93

HYBRID III EXTERNAL DIMENSIONS

S/N 245 HUMANOID

DUMMY SERIAL NO. 245

DATE: 5/5/93

TEMPERATURE		21.6 DEG. C
RELATIVE HUMIDITY		35 %
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 : 4/18/93

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 245 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10% - 70%	41 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	235.4 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	4.2 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 : 5/5/93

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN:245 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5-22.2 DEG. C	21.6 DEG. C
RELATIVE HUMIDITY		10% - 70%	43 %
IMPACT VELOCITY		24.8 - 25.7 KPH	25 KPH
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	24.36 G'S
	20 MS	17.60 - 22.60 G'S	20.66 G'S
	30 MS	12.50 - 18.50 G'S	17.21 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	17.21 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	40.75 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	71.15 DEG.
	TIME	57 - 64 MS	57.13 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88 - 108 N-M	96 N-M
	TIME	47 - 58 MS	53.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	113.88 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	99 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 5/5/93

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN:245 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5 - 22.2 DEG. C	21.6 DEG. C
RELATIVE HUMIDITY		10% - 70%	43 %
IMPACT VELOCITY		21.4 - 22.3 KPH	22.16 KPH
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	17.41 G'S
	20 MS	14.00 - 19.00 G'S	17.05 G'S
	30 MS	11.00 - 16.00 G'S	14.36 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	17.27 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		38 - 46 MS	44.88 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	99.41 DEG.
	TIME	72 - 82 MS	74 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-80.0/-52.9 N-M	-77.6 N-M
	TIME	65 - 79 MS	69.25 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	150.75 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	125.13 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 4/30/93

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN 245 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.5 - 22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10% - 70%	39 %
PENDULUM VELOCITY	23.7 - 24.6 KPH	23.7 KPH
MAXIMUM DEFLECTION	64 - 73 mm	64 mm
MAXIMUM RESISTIVE FORCE	4804 - 5538 NEWTONS	5444 NEWTONS
INTERNAL HYSTERESIS	69% - 85%	70.7 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 5/4/93

KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 245 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	21.6 DEG. C
RELATIVE HUMIDITY	10% - 70%	40 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	5004 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 5/4/93

KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 245 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	21.6 DEG. C
RELATIVE HUMIDITY	10% - 70%	40 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	5084 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY I.D. NUMBER: 245

A. DUMMY INSTRUMENTS

1. HEAD ACCELEROMETER

HX LONGITUDINAL

HY LATERAL

HZ VERTICAL

2. CHEST ACCELEROMETER

CX LONGITUDINAL

CY LATERAL

CZ VERTICAL

3. FEMUR LOAD CELLS

LEFT SIDE

RIGHT SIDE

MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
ENDEVCO	A39J	3/93	9/93
ENDEVCO	A33F	3/93	9/93
ENDEVCO	A27F	3/93	9/93
ENDEVCO	A12C	3/93	9/93
ENDEVCO	A60C	3/93	9/93
ENDEVCO	A84G	3/93	9/93
GSE	954	5/93	11/93
GSE	955	5/93	11/93

B. CALIBRATION LABORATORY
INSTRUMENTS

1. PENDULUM ACC.

2. TEST PROBE
ACCELEROMETER

MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
CEC	A160	6/93	12/93
CEC	A161	6/93	12/93

Appendix D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY

(6 Month Calibration Minimum)

DRIVER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head				
X	ADMB8	ENDEVCO	3-93	9-93
Y	ADL44	ENDEVCO	3-93	9-93
Z	AC2J3	ENDEVCO	3-93	9-93
Chest				
X	ADMB6	ENDEVCO	3-93	9-93
Y	AC209	ENDEVCO	3-93	9-93
Z	ADL98	ENDEVCO	3-93	9-93
Right Femur Load Cell	952	GSE	5-93	11-93
Left Femur Load Cell	951	GSE	5-93	11-93
Neck Load Cell				
X	269	DENTON	11-92	5-93
Y	269	DENTON	11-92	5-93
Z	269	DENTON	11-92	5-93
Neck Moment				
X	269	DENTON	11-92	5-93
Y	269	DENTON	11-92	5-93
Z	269	DENTON	11-92	5-93
Chest Deflection Gauge				
Hybrid III Use Only	150	HUMANOID	8-93	2-94
Lap Belt Load Cells	706	LEBOW	5-93	11-93
Shoulder Belt Load Cells	707	LEBOW	5-93	11-93
Spool-Out Potentiometer	N/A	SERVONIC INST.	----	----
Belt Stretch Transducer	E1	CALSPAN	8-93	2-94

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(6 Month Calibration Minimum)

PASSENGER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head				
X	A39J	ENDEVCO	3-93	9-93
Y	A33F	ENDEVCO	3-93	9-93
Z	A27F	ENDEVCO	3-93	9-93
Chest				
X	A12C	ENDEVCO	3-93	9-93
Y	A60C	ENDEVCO	3-93	9-93
Z	A84G	ENDEVCO	3-93	9-93
Right Femur Load Cell	955	GSE	5-93	11-93
Left Femur Load Cell	954	GSE	5-93	11-93
Neck Load Cell				
X	076	DENTON	11-92	5-93
Y	076	DENTON	11-92	5-93
Z	076	DENTON	11-92	5-93
Neck Moment				
X	076	DENTON	11-92	5-93
Y	076	DENTON	11-92	5-93
Z	076	DENTON	11-92	5-93
Chest Deflection Gauge				
Hybrid III Use Only	245	HUMANOID	8-93	2-94
Lap Belt Load Cells	710	LEBOW	5-93	11-93
Shoulder Belt Load Cells	711	LEBOW	5-93	11-93
Spool-Out Potentiometer	----	SERVONIC INST.		
Belt Stretch Transducer	E2	CALSPAN	8-93	2-94

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS

(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration	
			Last	Next
Left Seat Rear Crossmember	A89	CEC	5-93	11-93
Right Rear Seat Crossmember	A157	CEC	5-93	11-93
Top of Engine	A164	CEC	5-93	11-93
Bottom of Engine	A149	CEC	5-93	11-93
Left Disc Brake Caliper	A183	CEC	5-93	11-93
Right Disc Brake Caliper	A152	CEC	5-93	11-93
Instrument Panel	A182	CEC	5-93	11-93
Left Rear Crossmember Red	A185	CEC	5-93	11-93
Right Rear Crossmember Red	A178	CEC	5-93	11-93

Appendix E

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

Seats & Safety Belts



This figure lights up when you turn the key to **Run** or **Start** when your safety belt isn't buckled, and you'll hear a chime, too. It's the reminder to buckle up. In many states and Canadian provinces, the law says to wear safety belts. Here's why: **They work.**

CAUTION
 Don't let anyone ride where they can't wear a safety belt properly. If you are in a crash and you're not wearing a safety belt, your injuries can be much worse. You can hit things inside the vehicle or be ejected from it. You can be seriously injured or killed. In the same crash, you might not be if you are buckled up. Always fasten your safety belt, and check that your passengers' belts are fastened properly too.



You never know if you'll be in a crash. If you do have a crash, you don't know if it will be a bad one.

A few crashes are very mild. In them, you won't get hurt even if you're not buckled up. And some crashes can be so serious, like being hit by a train, that even buckled up a person wouldn't survive. But most crashes are in between. In many of them, people who buckle up can survive and sometimes walk away. Without belts they could be badly hurt or killed.

After 25 years of safety belts in vehicles, the facts are clear. In most crashes buckling up does matter ... a lot!

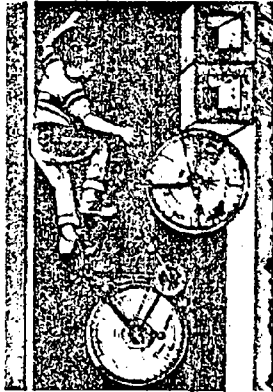
... 16



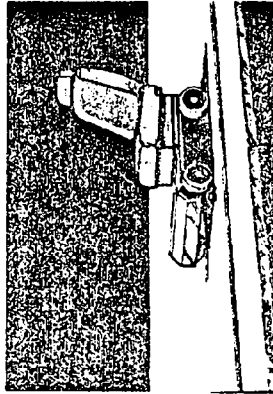
■ *Why Safety Belts Work*

When you ride in or on anything, you go as fast as it goes.

For example, if the bike is going 10 mph (16 km/h), so is the child.

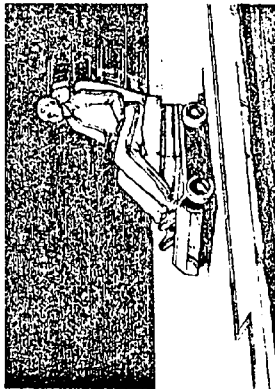


When the bike hits the block, it stops. But the child keeps going!

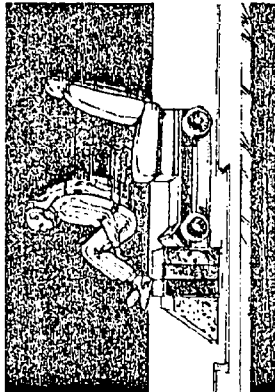


Take the simplest "car." Suppose it's just a seat on wheels.

Seats & Safety Belts



Put someone on it.



Get it up to speed. Then stop the "car."
The rider doesn't stop.



The person keeps going until stopped by something.
In a real vehicle, it could be the windshield ...

... 18



or the instrument panel ...



or the safety belts!

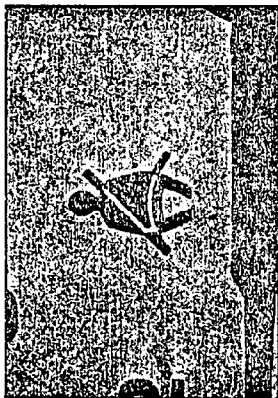
With safety belts, you slow down as the vehicle does. You get more time to stop. You stop over more distance, and your strongest bones take the forces. That's why safety belts make such good sense.

■ *Here Are Questions Many People Ask about Safety Belts — and the Answers*

Q: Won't I be trapped in the vehicle after an accident if I'm wearing a safety belt?

A: You could be — whether you're wearing a safety belt or not. But you can easily unbuckle a safety belt, even if you're upside down. And your chance of being conscious during and after an accident, so you can unbuckle and get out, is much greater if you are belted.

Seats & Safety Belts



■ *Safety Belt Reminder Light*

When the key is turned to Run or Start, a light will come on for about eight seconds to remind people to fasten their safety belts. Unless the driver's safety belt is buckled, a chime will also sound.

Q: If I'm a good driver, and I never drive far from home, why should I wear safety belts?

A: You may be an excellent driver, but if you're in an accident — even one that isn't your fault — you and your passengers can be hurt. Being a good driver doesn't protect you from things beyond your control, such as bad drivers.

Most accidents occur within 25 miles (40 km) of home. And the greatest number of serious injuries and deaths occur at speeds of less than 40 mph (65 km/h).

Safety belts are for everyone.

Q: Why don't they just put in air bags so people won't have to wear safety belts?

A: "Air bags," or Supplemental Inflatable Restraint systems, are in some vehicles today and will be in more of them in the future. But they are supplemental systems only — so they work with safety belts, not instead of them. Every "air bag" system ever offered for sale has required the use of safety belts. Even if you're in a vehicle that has "air bags," you still have to buckle up to get the most protection. That's true not only in frontal collisions, but especially in side and other collisions.

... 20

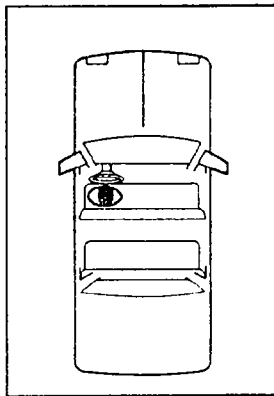
■ *How to Wear Safety Belts Properly*

Adults

This section is only for people of adult size.

CAUTION

There are special things to know about safety belts and children. And there are different rules for babies and smaller children. If a child will be riding in your Chevrolet, see the section after this one, called "Children." Follow those rules for everyone's protection.



First, you'll want to know which restraint systems your vehicle has. We'll start with the driver position.

Driver Position

This section describes the driver's restraint system.



Lap-Shoulder Belt

The driver has a lap-shoulder belt. Here's how to wear it properly.

1. Close and lock the door.
2. Adjust the seat (to see how, see "Seats" in the Index) so you can sit up straight.

Seats & Safety Belts



3. Pick up the latch plate and pull the belt across you. Don't let it get twisted.

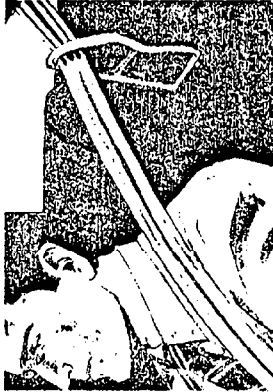
4. Push the latch plate into the buckle until it clicks.

If the belt isn't long enough, see "Safety Belt Extender" at the end of this section.

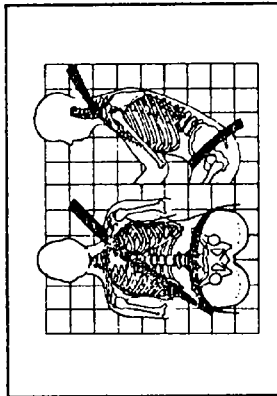
Make sure the release button on the buckle faces upward or outward so you would be able to unbuckle it quickly if you ever had to.



5. To make the lap part tight, pull down on the buckle end of the belt as you pull up on the shoulder belt.

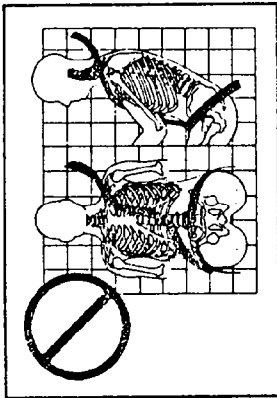


If the shoulder belt is too tight, move the shoulder belt to the upper or lower guide loop. Choose the one that makes the shoulder belt more comfortable.



The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

The safety belt locks if there's a sudden stop or crash.

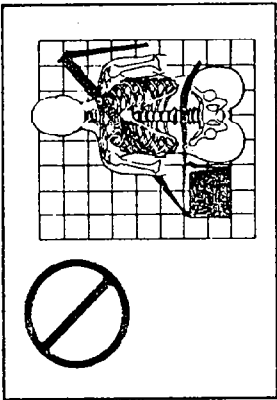


Q: What's wrong with this?

A: The shoulder belt is too loose. It won't give nearly as much protection this way.

CAUTION

You can be seriously hurt if your shoulder belt is too loose. In a crash, you would move forward too much, which could increase injury. The shoulder belt should fit against your body.



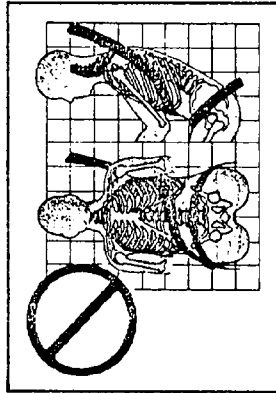
Q: What's wrong with this?

A: The belt is buckled in the wrong place.

CAUTION

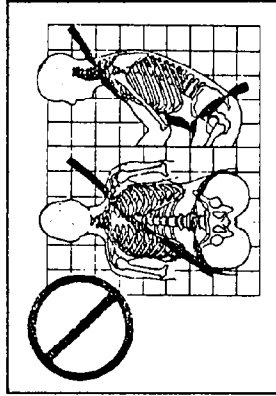
You can be seriously injured if your belt is buckled in the wrong place like this. In a crash, the belt would go up over your abdomen. The belt forces would be there, not at the pelvic bones. This could cause serious internal injuries. Always buckle your belt into the buckle nearest you.

Seats & Safety Belts



Q: What's wrong with this?

A: The shoulder belt is worn under the arm. It should be worn over the shoulder at all times.



Q: What's wrong with this?

A: The belt is twisted across the body.

CAUTION:

⚠ You can be seriously injured by a twisted belt. In a crash, you wouldn't have the full width of the belt to spread impact forces. If a belt is twisted, make it straight so it can work properly, or ask your dealer to fix it.

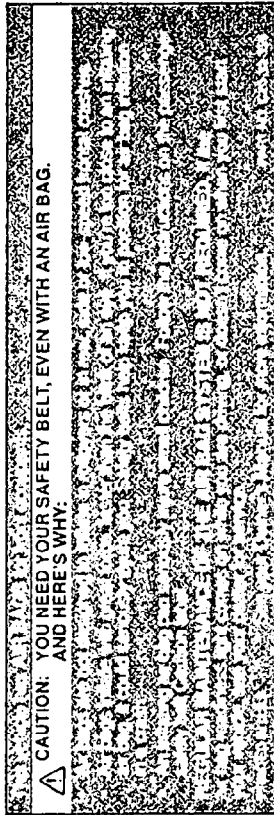
CAUTION:

⚠ You can be seriously injured if you wear the shoulder belt under your arm. In a crash, your body would move too far forward, which would increase the chance of head and neck injury. Also, the belt would apply too much force to the ribs, which aren't as strong as shoulder bones. You could also severely injure internal organs like your liver or spleen.



To unlatch the belt, just push the button on the buckle. The belt should go back out of the way.

Before you close the door, be sure the belt is out of the way. If you slam the door on it, you can damage both the belt and your vehicle.



CAUTION: YOU NEED YOUR SAFETY BELT, EVEN WITH AN AIR BAG.

AND HERE'S WHY:

Supplemental Inflatable Restraint System (Air Bags)

This section explains the Supplemental Inflatable Restraint (SIR), or "air bag," system. Your Chevrolet has an air bag for both the driver and the right-front passenger.

Here's the most important thing to know:

CAUTION

Even with an air bag, if you're not wearing a safety belt and you're in a crash, your injuries may be much worse. Air bags are not designed to inflate in rollovers or in rear, side or low-speed frontal crashes. You need to wear your safety belt to reduce the chance of hitting things inside the vehicle or being ejected from it. Always wear your safety belt, even with an air bag.