

REPORT NUMBER: CAL-92-N08

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

GENERAL MOTORS CORPORATION
1992 GEO METRO
2-DOOR HATCHBACK

NHTSA NUMBER: MN0102

CALSPAN TEST NUMBER: 7951-2

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FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
Office of Market Incentives
400 Seventh Street, S.W.
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Washington, DC 20590

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16. Abstract A frontal load cell barrier test of a 1992 Geo Metro 2-Door Hatchback was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on December 10, 1991. The impact speed was 35.0 mph and the ambient temperature at the barrier face at the time of impact was 43°F. The maximum post-test vehicle crush was 20.4 inches. The test vehicle was equipped with a 3-point passive belt system at each of the front outboard seating positions. With regard to FMVSS 208 "Occupant Crash Protection", injury criteria, the driver dummy's left femur appears to exceed the maximum femur requirements. The passenger dummy appears to comply with the maximum head, chest, and femur requirements.					
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Section 1

PURPOSE AND TEST PROCEDURE

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

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

Section 2

SUMMARY OF TEST NUMBER MN0102

A load cell barrier consisting of 36 load cells was impacted by a 1992 Geo Metro 2-Door Hatchback at a velocity of 35.0 mph. The test was performed at the Calspan Corporation Advanced Technology Center on December 10, 1991. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 45) was used in a previous test (MN0300). Injury criteria values were not exceeded in that test. The right-front passenger ATD (Serial No. 150) was calibrated prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C. .

The 83 channels of data were recorded on seven 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces. Position 2 Belt Elongation potentiometer did not record accurately during test, therefore the data curve was removed from this report. Position 2 Chest Displacement contained questionable data after approximately 79 milliseconds. Accelerometer #3 (X), located on the top of engine block, contained questionable data after approximately 25 milliseconds. Accelerometer #4 (X), located on the bottom of engine block, contained questionable data after approximately 34 milliseconds. The velocity and displacement data curves were removed from this report for both accelerometers.

The driver's head struck the steering wheel rim and horn pad; the HIC was 859.7. The maximum chest deceleration over 3 milliseconds was 56.8 g's and

the maximum chest deflection was 1.6 inches. The maximum femur loads were 2489.0 and 809.9 pounds on the left and right femur, respectively.

The right front passenger's HIC was 870.2 and maximum chest deceleration over 3 milliseconds was 38.5 g's. The maximum femur load on the left femur was 422.1 pounds and the maximum femur load on the right femur was 486.3 pounds. The maximum chest deflection is not available due to questionable data on this channel.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1992 Geo Metro 2-Door Hatchback

NHTSA Test No.: MN0102 VIN.: 2C1MR246XN6709242

Body Color: Bright Red Date of Manufacture: 9/91

Engine: 3 Cylinders; - C.I.D.; 1.0 Liters; - CC
✓ Gas; - Diesel; - Turbocharged
- Longitudinal; - Transverse

Transmission: 5 Speed; ✓ Manual; - Automatic; ✓ Overdrive

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

Date Received: 10/14/91 Odometer Reading: 31 miles

No A/C; No P/S; ✓ P/B; No P/wdo;
No Tilt Wheel No P/seats; No Cruise Control

Type of Occupant Restraint: 3 Point Passive Restraint System

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): 220 Front 32 psi, 220 Rear 32 psi

Recommended Tire Size: P145/80R12

Recommended Cold Tire Pressure: 220 Front 32 psi, 220 Rear 32 psi

Tires on Vehicle: P145/80R12; Manufacturer: Goodyear

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

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

Type of Front Seat Back: - Fixed; ✓ Adj. With ✓ Lever - Rot. Knob

Vehicle Capacity Weight (VCW) = 688 lbs. (A)

No. of Occupants x 150 lbs. = 600 lbs. (B)

Rated Cargo and Luggage
Weight (RCLW) A-B = 88 lbs.

GVWR 2447 lbs. GAWR: Front 1245 lbs. Rear 1201 lbs.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 470 lbs. Right Rear = 330 lbs.
 Left Front = 480 lbs. Left Rear = 330 lbs.
 TOTAL FRONT WEIGHT = 950 lbs. (59.0 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 660 lbs. (41.0 % of Total Vehicle Weight)
 TOTAL DELIVERED WEIGHT = 1610 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (1610 lbs.)
 VCW = Vehicle Capacity Weight (688 lbs.)
 DSC = Designated Seating Capacity (4)
 RCLW = VCW - 150 (DSC) = 88 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 167 lbs./dummy)
 Target Test Weight = 2032 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 86 POUNDS CARGO:

Right Front = 510 lbs. Right Rear = 500 lbs.
 Left Front = 510 lbs. Left Rear = 510 lbs.
 TOTAL FRONT WEIGHT = 1020 lbs. (50.2 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1010 lbs. (49.8 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 2030 lbs.
 Weight of ballast secured in vehicle trunk area = 0 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 24.4" LF 24.3" RR 24.4" LR 24.2"
 Test Attitude: RF 23.1" LF 24.0" RR 21.7" LR 22.7"
 Wheel Base: 89.2 in.; C.G. = 44.4 in. rearward of front wheel C/L
 Remarks: Rear hatch was removed to achieve test weight.

9.8 gallons of stoddard solution was placed in fuel tank

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0°
 Date of Test: December 10, 1991 Time of Test: 12:45
 Ambient Temperature: 43 °F at impact area
 Temperature in Occupant Compartment: 70 °F
 Windshield Molding Temperature: 70 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.0 mph, secondary = 35.0 mph
 Distance From Front Bumper to Barrier Face When
 Entering Speed Trap: 52 inches
 Exiting Speed Trap: 12 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length: Pre-test = R 144.4 C_L 147.0 L 144.6
 Post-test = R 124.2 C_L 126.7 L 124.2
 Crush = R 20.2 C_L 20.3 L 20.4

Distance from front of test vehicle to point of impact:

R 19.9 C_L 18.5 L 22.2

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
	1) Upper steering wheel rim	
Head	2) Dummy chin with horn pad	<u>Upper dash panel</u>
Chest	<u>Steering wheel</u>	<u>No contact</u>
Abdomen	<u>Lower steering wheel rim</u>	<u>No contact</u>
Left Knee	<u>Dash panel</u>	<u>Glove compartment door</u>
Right Knee	<u>Dash panel</u>	<u>Glove compartment door</u>

Table 1
GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

	<u>Front</u>	
<u>Seat Movement</u>	<u>Left</u>	<u>Right</u>
Seat Back Failure	<u>None</u>	<u>None</u>
Seat Shift (in.)	<u>None</u>	<u>None</u>

Glazing Damage

Backlight/Windshield Windshield sustained stress fractures but remained intact

Other Notable Impact Effects: None

Section 3
OMI FINAL DATA

Occupant and Vehicle Information

I. OMI DATA

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

II. OVR DATA

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

Table 2
DUMMY INJURY CRITERIA VALUES

NHTSA No.: MNQ102

Vehicle: 1992 Geo Metro 2-Door Hatchback

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-198.0	-29.9	44.0	198.6
Position #2 - Passenger	-82.5	9.3	48.0	88.1

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-63.9	-12.6	-16.1	56.8
Position #2 - Passenger	-41.9	-12.6	9.4	38.5

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

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Position #1 - Driver	2489.0	809.9
Position #2 - Passenger	422.1	486.3

	MAXIMUM FORCE - SEAT BELT LOADS (lbs.)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	1765.2	-	1099.5
Position #2 - Passenger	1696.8	1150.2	-

	HEAD INJURY CRITERIA (HIC)			
	HIC	t ₁ (SEC)	t ₂ (SEC)	Average Acceleration t ₁ TO t ₂
Position #1 - Driver	859.7	.06360	.09060	63.3
Position #2 - Passenger	870.2	.07080	.10668	56.7

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

Table 3
HYBRID III NECK AND CHEST DATA SHEET

Vehicle Year/Make/Model/Body Style: 1992 Geo Metro 2-Door Hatchback

Vehicle NHTSA No.: MN0102 Test Date: December 10, 1991

MAXIMUM VALUES	DRIVER DUMMY ID # <u>45</u>	PASSENGER DUMMY ID # <u>150</u>
Neck Load X (lbs.)	245.7	411.4
Neck Load Y (lbs.)	153.2	230.6
Neck Load Z (lbs.)	1041.7	868.2
Neck Moment X (in.-lbs)	-334.0	-189.8
Neck Moment Y (in.-lbs.)	1005.5	432.0
Neck Moment Z (in.-lbs.)	555.5	-397.3
Chest Deflection X (in.)	1.6	***
Time of Max. Occurance (msec.)	88.1	***

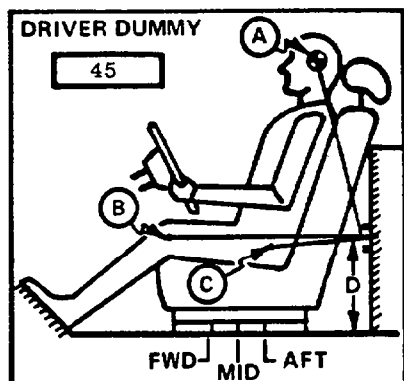
NOTE: All values listed must be occurring during primary impact event.

***Position 2 chest displacement contained questionable data after
79 milliseconds.

Figure 1
PART 572 DUMMY IN-VEHICLE POSITION

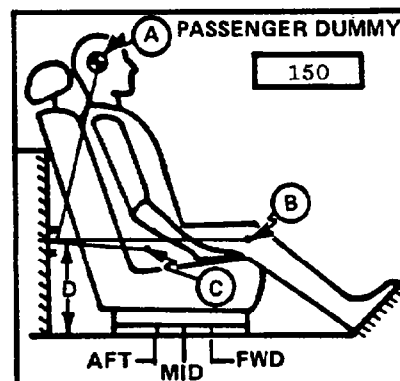
Test No.: MN0102 Vehicle: 1992 Geo Metro 2-Door Hatchback

<u>SEAT TYPE:</u>	<u>ADJUSTER TYPE:</u>	<u>SEAT BACK TYPE:</u>
<u>-</u> Bench	<u>X</u> Manual	<u>-</u> Fixed
<u>X</u> Bucket	<u>-</u> Power	<u>X</u> Adjustable Reclining
<u>-</u> Split Bench		



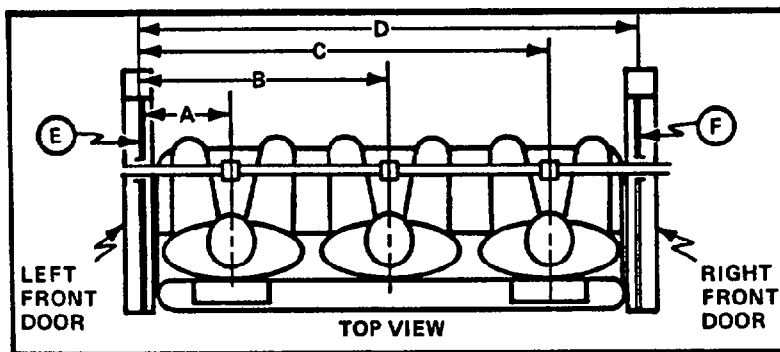
MEASUREMENT
LOCATION

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



A = 22.3 in. 28 Degrees
B = 31.8 in. 93 Degrees
C = 16.8 in. 110 Degrees
D = 12.8 in.

A = 22.6 in. 26 Degrees
B = 31.8 in. 93 Degrees
C = 16.4 in. 108 Degrees
D = 12.8 in.



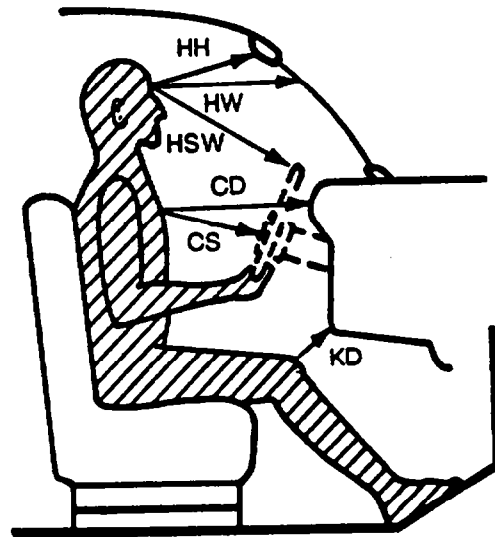
S/N 45 DUMMY ID S/N 150

A = Left Door to Driver Centerline	<u>12.0</u> in.
B = Left Door to Center Passenger Centerline	<u>-</u> in.
C = Left Door to Right Passenger Centerline	<u>37.1</u> in.
D = Left Door to Right Door	<u>49.2</u> in.
E, F = Window Glass Height (Right and Left Must Be Equal)	<u>9.5</u> in.

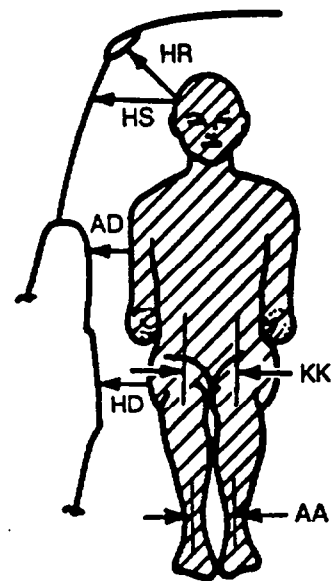
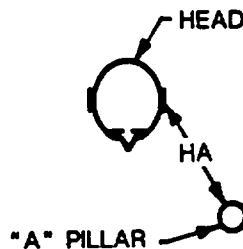
Figure 2

OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	13.1	13.1
HW	19.3	19.4
CD	20.2	21.3
CS	13.3	-
KDL	4.3	4.5
KDR	5.0	4.6
SA	See Note	See Note
TA	25°	24°
HSW	18.6	-



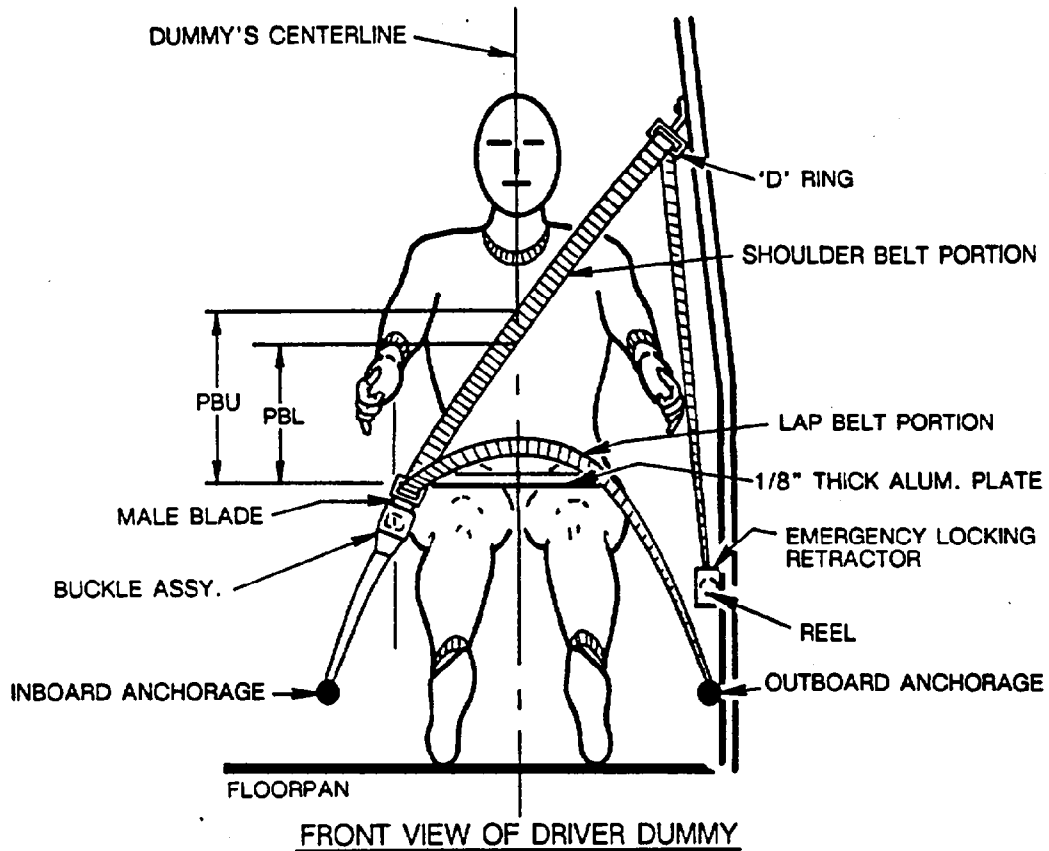
- HH = Head to Windshield Header
 HW = Head to Windshield
 HSW = Head to Steering Wheel
 CD = Chest to Dash
 CS = Chest to Steering Wheel - Horn Pad was Removed
 KD(L/R) = Knee to Dash (Left/Right)
 SA = Seat Back Angle
 TA = Torso Angle
 HIP = Head to I.P. Centerline
 HA = Head Target to "A" Pillar
 HR = Head to Side Roof
 HS = Head to Side Window
 AD = Arm to Door
 HD = Hip to Door
 KK = Knee to Knee
 AA = Ankle to Ankle



	DRIVER	PASSENGER
HR	6.3	6.5
HS	9.2	9.6
AD	3.1	3.3
HD	5.6	5.2
KK	8.0	7.2
HA	18.9	18.7
AA	11.5	6.4

Note: Seat back was set according to manufacturer specification

Figure 3
SEAT BELT POSITIONING DATA



	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	12.7	12.5
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	9.4	9.3
<u>LAP BELT TENSION</u>	-	-
<u>SHOULDER BELT TENSION</u>	-	-

Table 4

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis.	<u>2.0</u> in.	<u>1.8</u> in.
As determined mechanically.	<u>1.8</u> in.	<u>1.8</u> in.
As determined electronically.	<u>2.2</u> in.	<u>2.3</u> in.

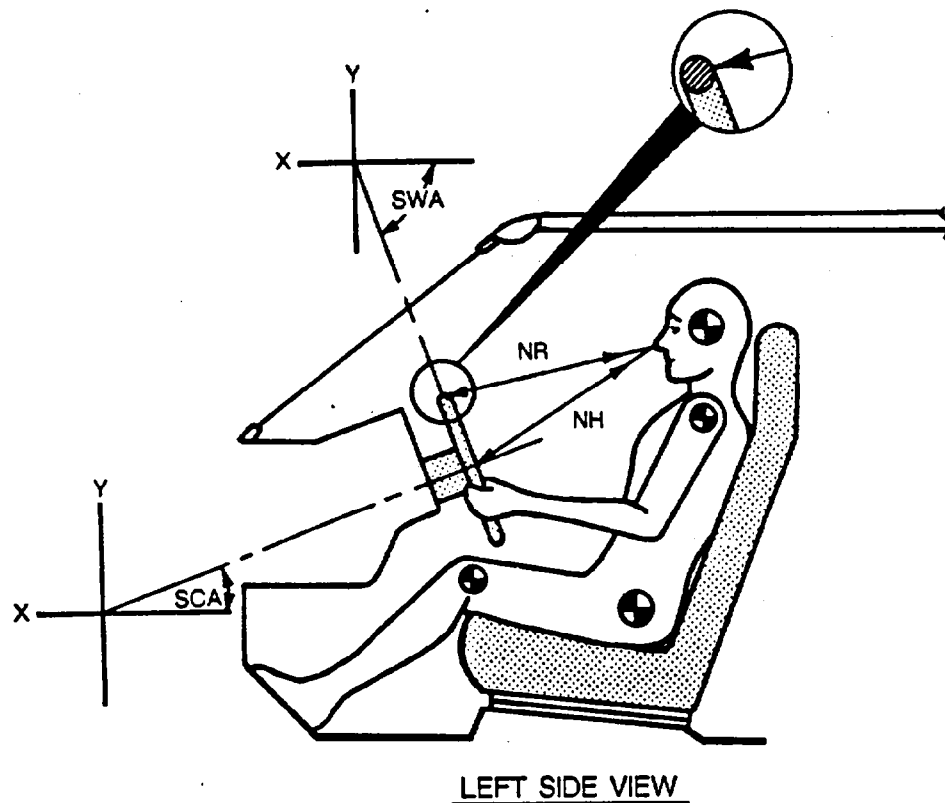
BELT STRETCH DATA:

Measured electronically between shoulder belt load cell and the "D" ring.	<u>1.1</u> in/ft	<u>*</u> in/ft
Measured mechanically	<u>0</u> in/ft	<u>0</u> in/ft

*Position 2 Belt Elongation potentiometer did not record accurately during test.

Figure 4

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



		MEASUREMENTS	
<u>NR</u>	-- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	17.3	Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	17.6	Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	26	Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	-64	Degrees

Figure 5
CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

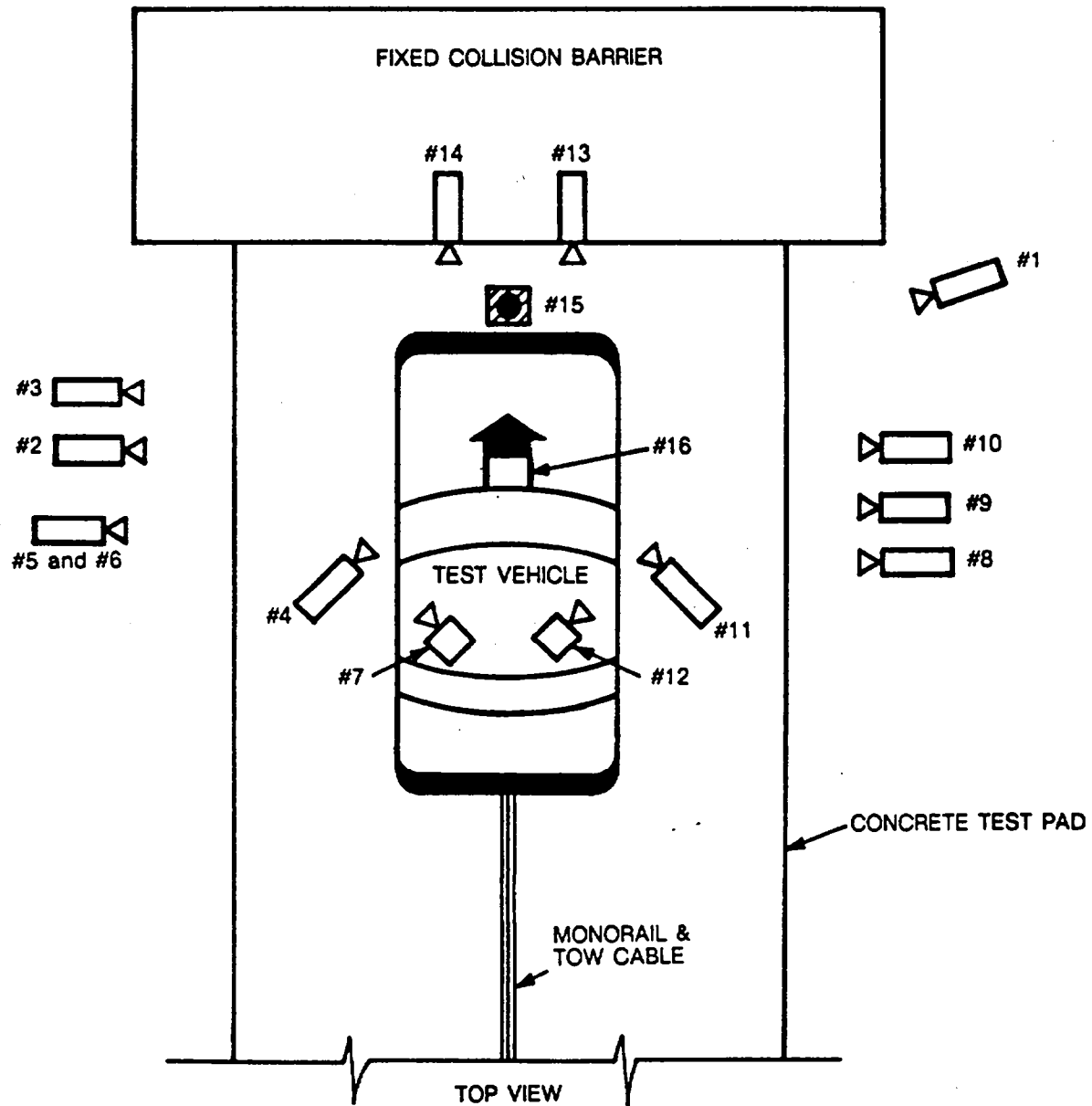


Table 5
HIGH-SPEED CAMERA LOCATIONS

Test No. MN0102 Vehicle: 1992 Geo Metro 2-Door Hatchback

CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	205	57	41	-6	191	13	555
3	Left Side View	287	39	41	-5	273	25	570
4	Driver and Interior View	106	94	63	-17	92	13	590
5	Steering Column (Bottom)	240	69	46	-5	226	25	500
6	Steering Column (Top)	240	69	70	-12	226	25	485
7	Left Belt	-	-	-	-	-	8	720
8	Overall Right Side	209	61	42	-3	195	13	620
9	Right Side View	279	41	41	-2	265	25	580
10	Right Passenger View	294	56	59	-5	280	35	520
11	Passenger and Interior View	107	95	65	-20	93	25	490
12	Right Belt	-	-	-	-	-	8	480
13	Passenger Front View	24	-5	72	-44	-	13	570
14	Driver Front View	24	-5	72	-44	-	13	530
15	Windshield View	0	0	120	-52	-	13	520
16	Pit View of Engine	0	30	-120	90	-	13	N.T.

*X = film plane to monorail centerline
Y = film plane to impact location
Z = film plane to ground
** = referenced to horizontal plane

Figure 6
VEHICLE TARGET LOCATIONS

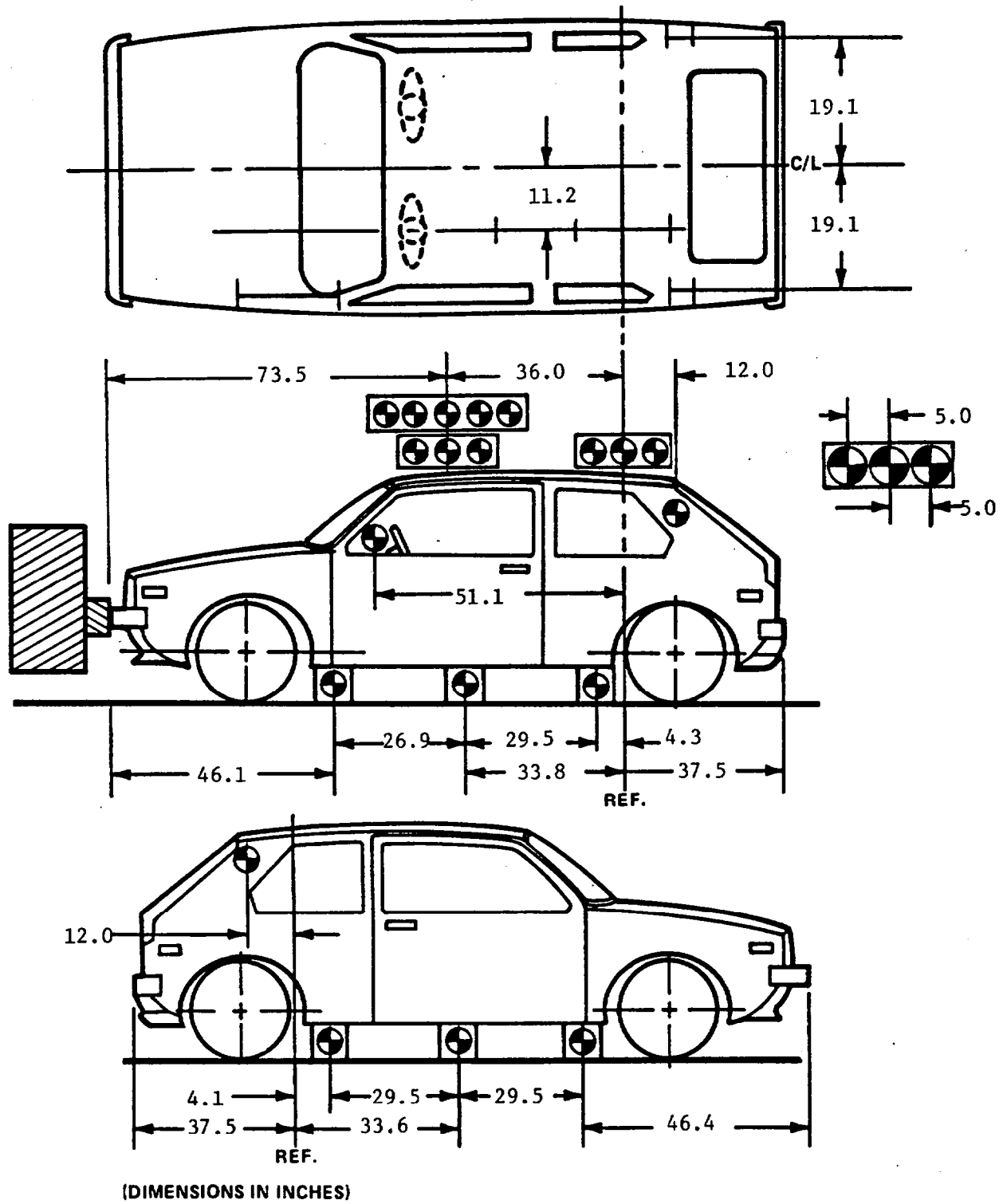
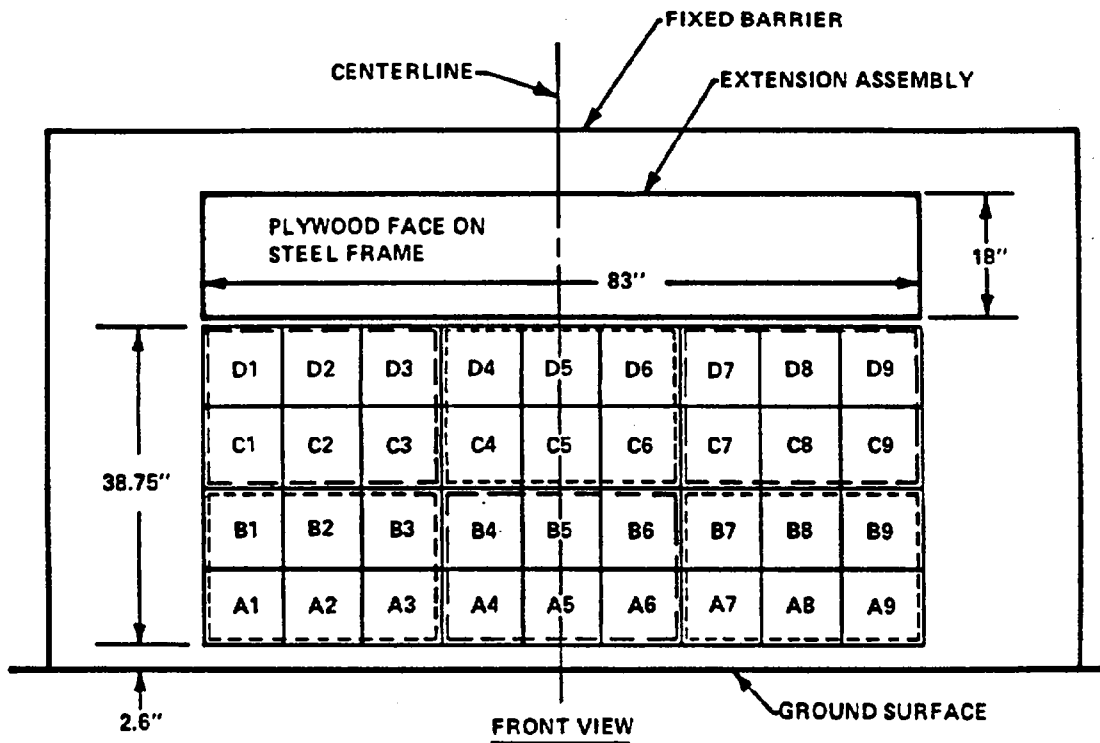


Figure 7

LOAD CELL LOCATIONS ON FIXED BARRIER

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



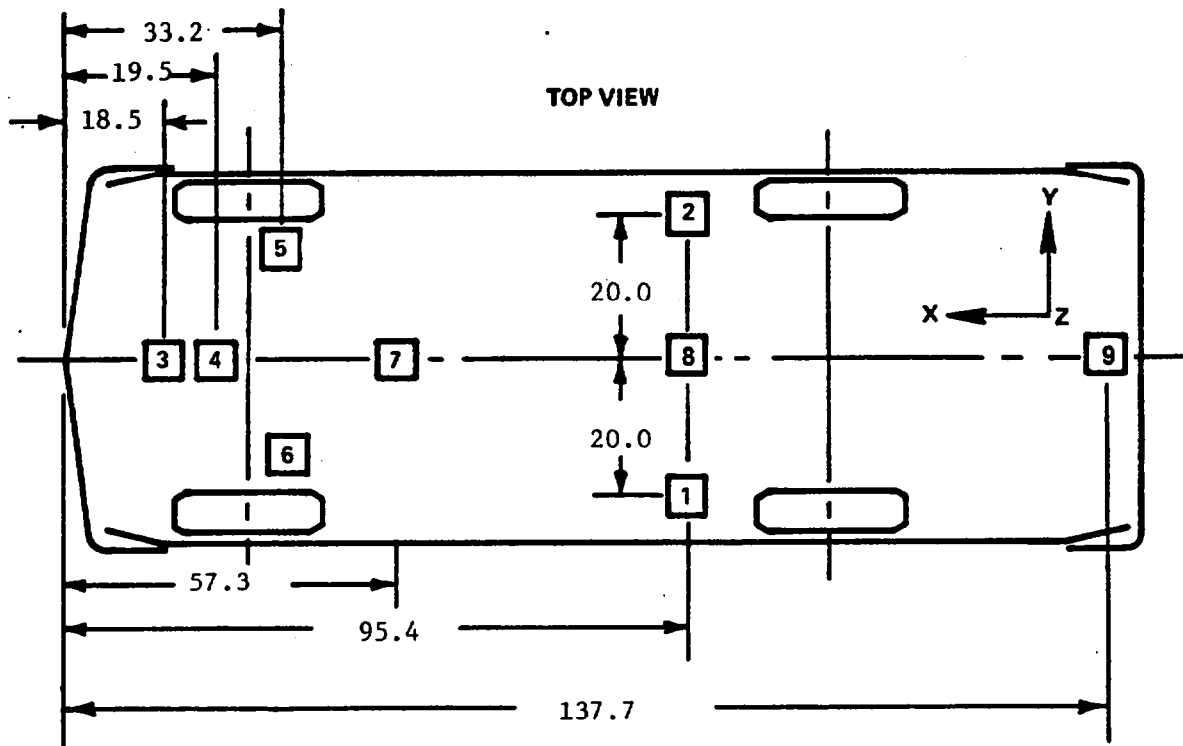
6 GROUPS OF 6 LOAD CELLS EACH

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

The following data is presented in Appendix B:

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

Figure 8
VEHICLE ACCELEROMETER LOCATIONS



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

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

Figure 9
TEST VEHICLE MEASUREMENTS

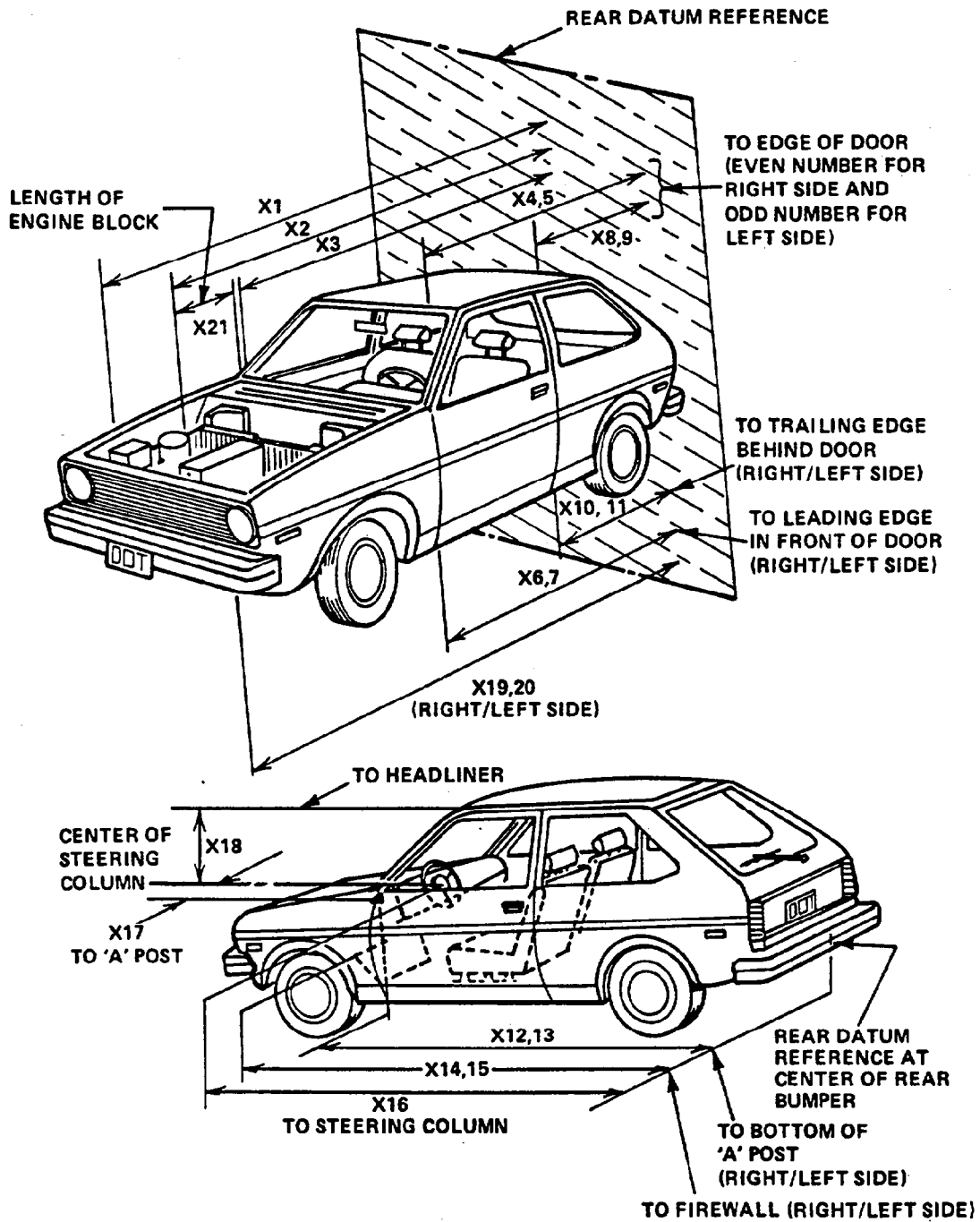


Table 6

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	147.0	126.7	20.3
X2	Rear Surface of Vehicle to Front of Engine	134.6	118.0	16.6
X3	Rear Surface of Vehicle to Firewall	112.5	108.5	4.0
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	100.4	100.2	0.2
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	100.6	99.9	0.7
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	99.3	98.3	1.0
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	99.6	98.3	1.3
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	51.2	51.2	0.0
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	51.6	51.3	0.3
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	52.3	51.6	0.7
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	52.3	51.0	1.3
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	99.2	97.8	1.4
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	99.8	98.5	1.3
X14	Rear Surface of Vehicle to Firewall, Right Side	111.7	105.5	6.2
X15	Rear Surface of Vehicle to Firewall, Left Side	111.5	107.1	4.4
X16	Rear Surface of Vehicle to Steering Column	83.8	80.6	3.2
X17	Center of Steering Column to "A" Post	15.3	12.6	2.7
X18	Center of Steering Column to Headliner	16.5	16.5	0.0
X19	Rear Surface of Vehicle to Right Side of Front Bumper	144.4	124.2	20.2
X20	Rear Surface of Vehicle to Left Side of Front Bumper	144.6	124.2	20.4
X21	Length of Engine Block	10.0	10.0	0.0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	90.9	87.0	3.9
CD	Rear Surface of Vehicle to Center of Dash Panel	91.0	86.9	4.1
LD	Rear Surface of Vehicle to Left Side of Dash Panel	91.0	88.0	3.0

Appendix A

PHOTOGRAPHS

PHOTOGRAPHS

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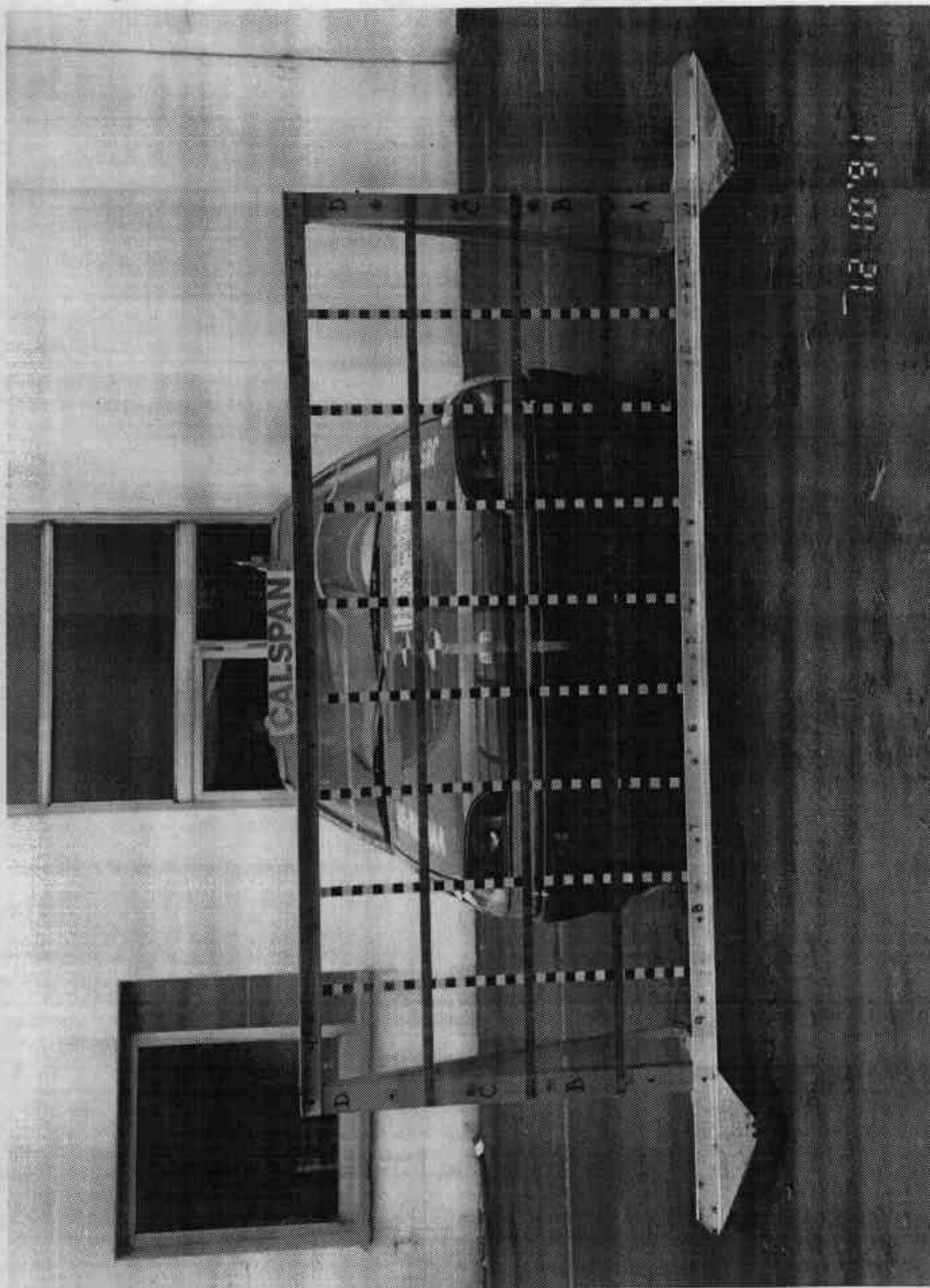


Figure A-1 LOAD CELL LOCATIONS



Figure A-3 POST TEST FRONT VIEW

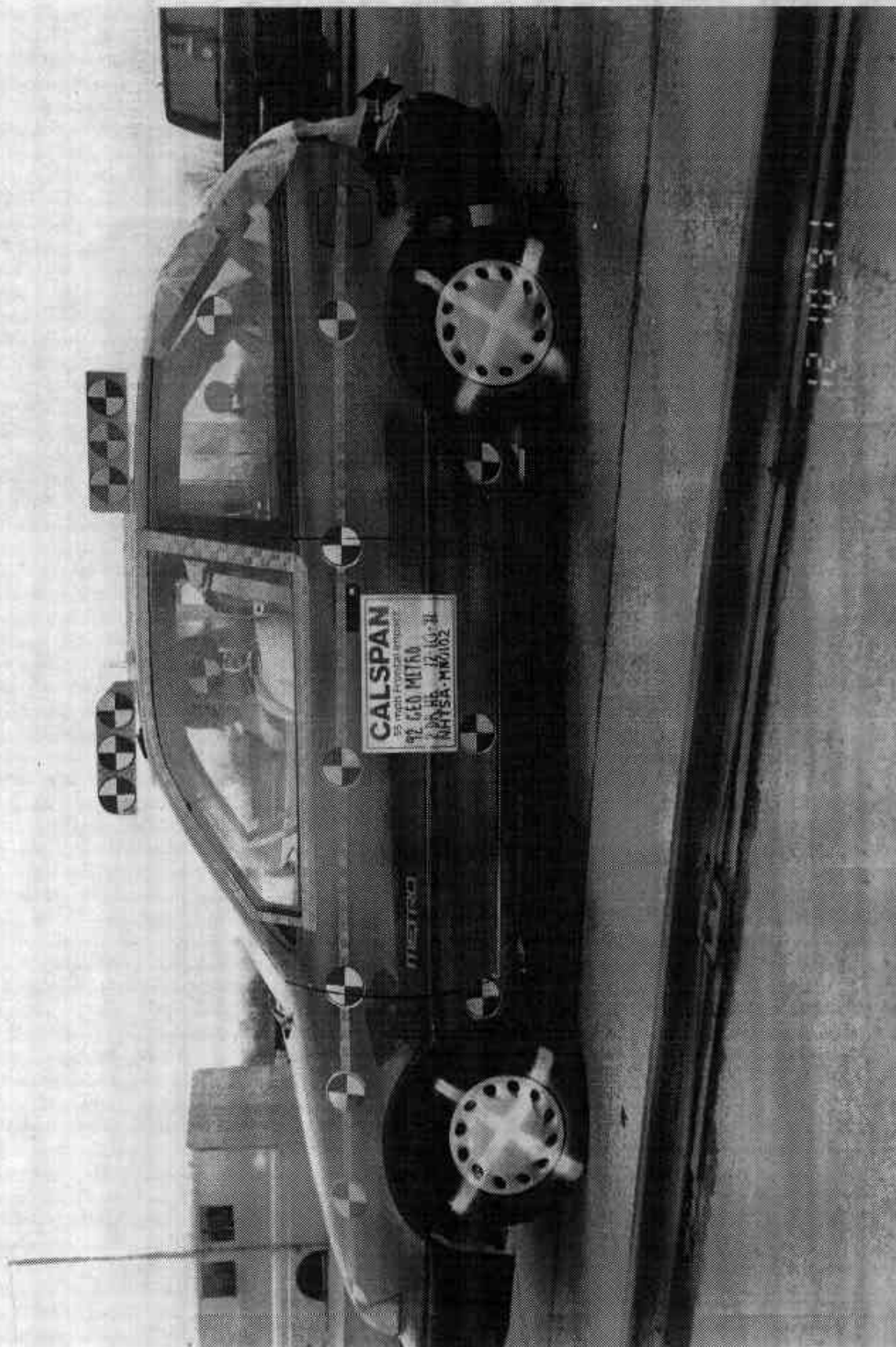


Figure A-4 PRE-TEST LEFT SIDE VIEW



Figure A-5 POST TEST LEFT SIDE VIEW



Figure A-6 PRE-TEST RIGHT SIDE VIEW



Figure A-7 POST-TEST RIGHT SIDE VIEW

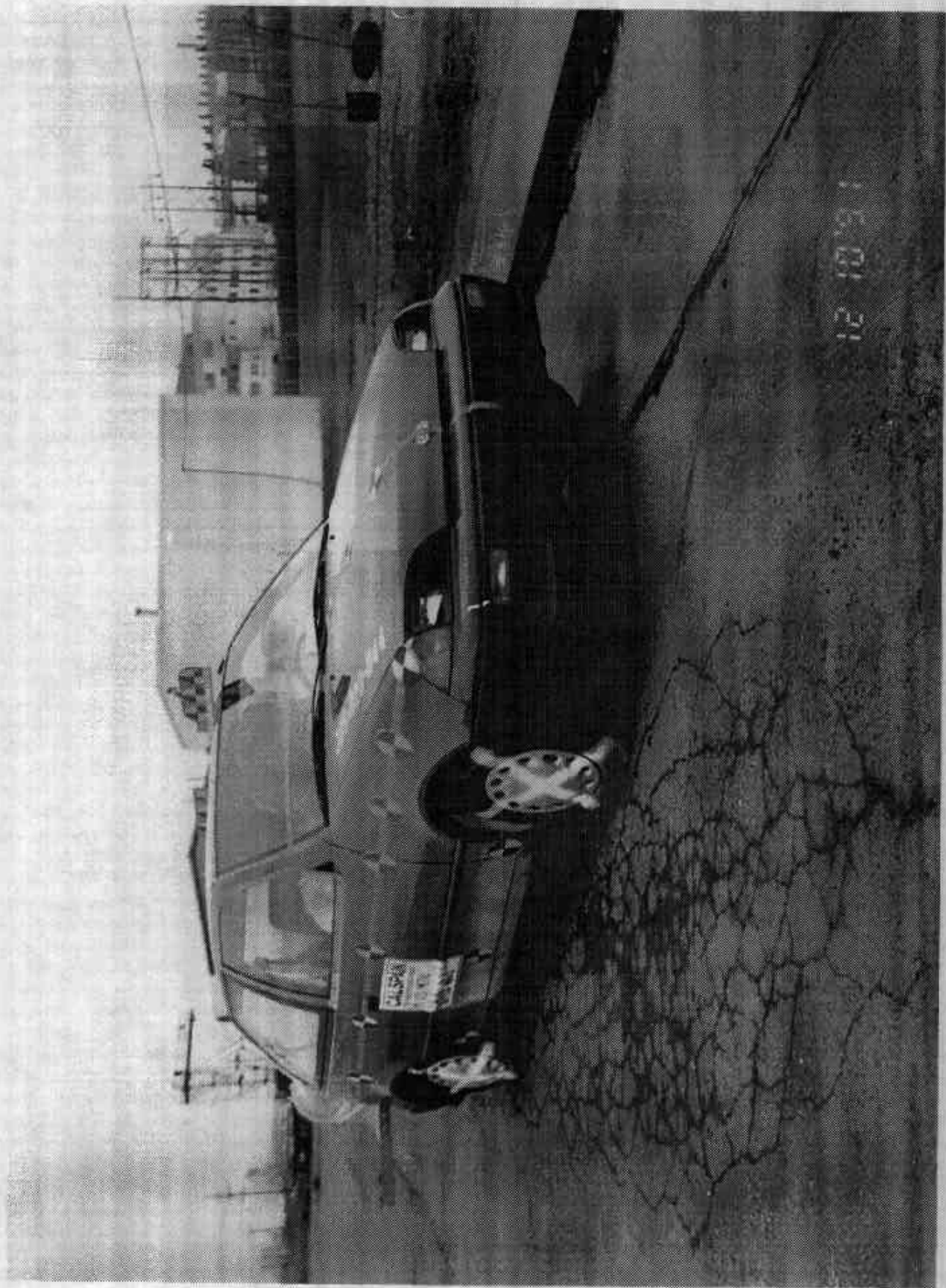


Figure A-8 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-10

7051-2



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

A-11

7951-2

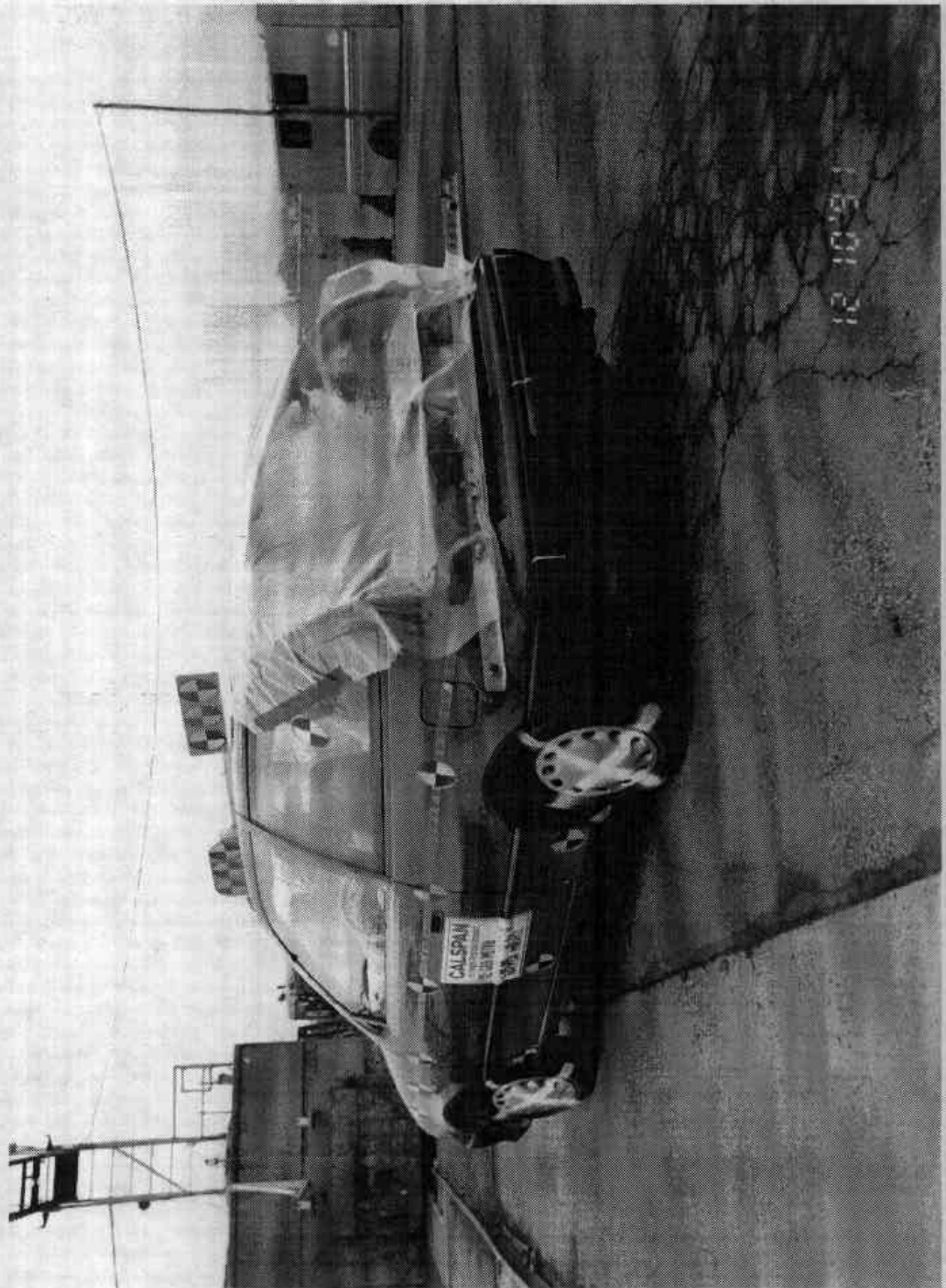


Figure A-10 PRE-TEST LEFT REAR THREE-QUARTER VIEW



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



Figure A-12 PRE-TEST WINDSHIELD VIEW



Figure A-13 POST-TEST WINDSHIELD VIEW

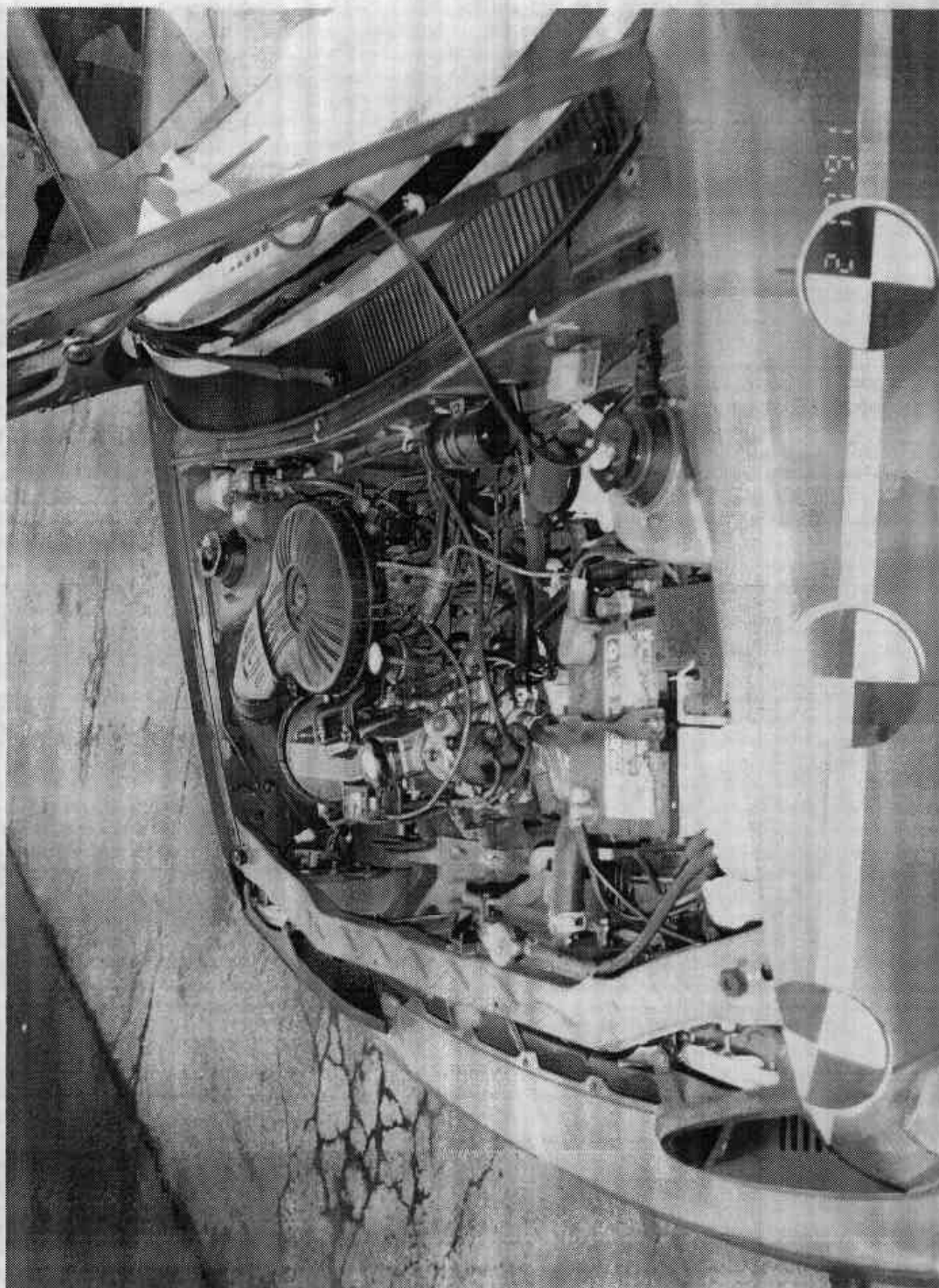


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

A-16

7951-2

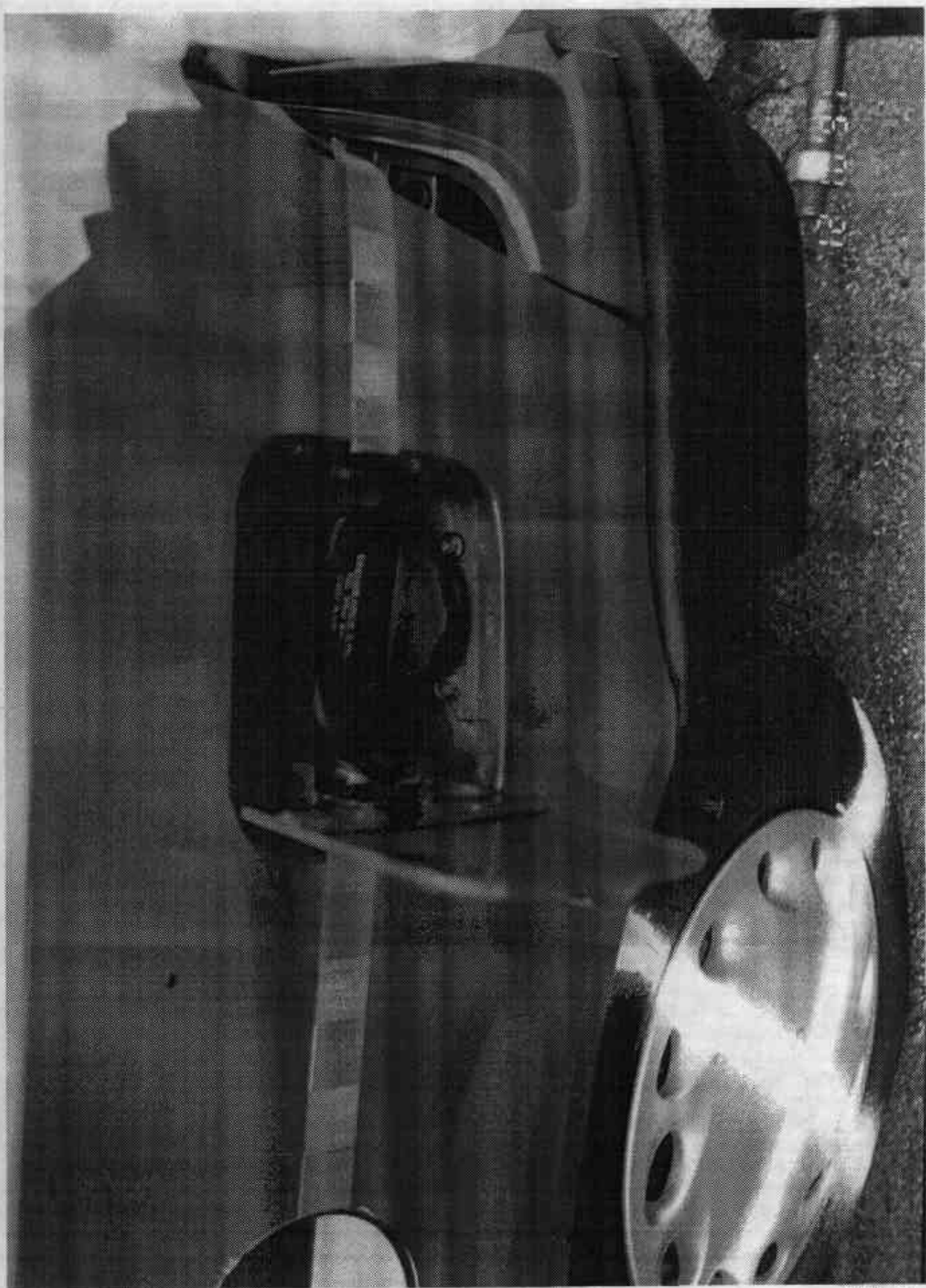


FIGURE A-15 FUEL CAP VIEW

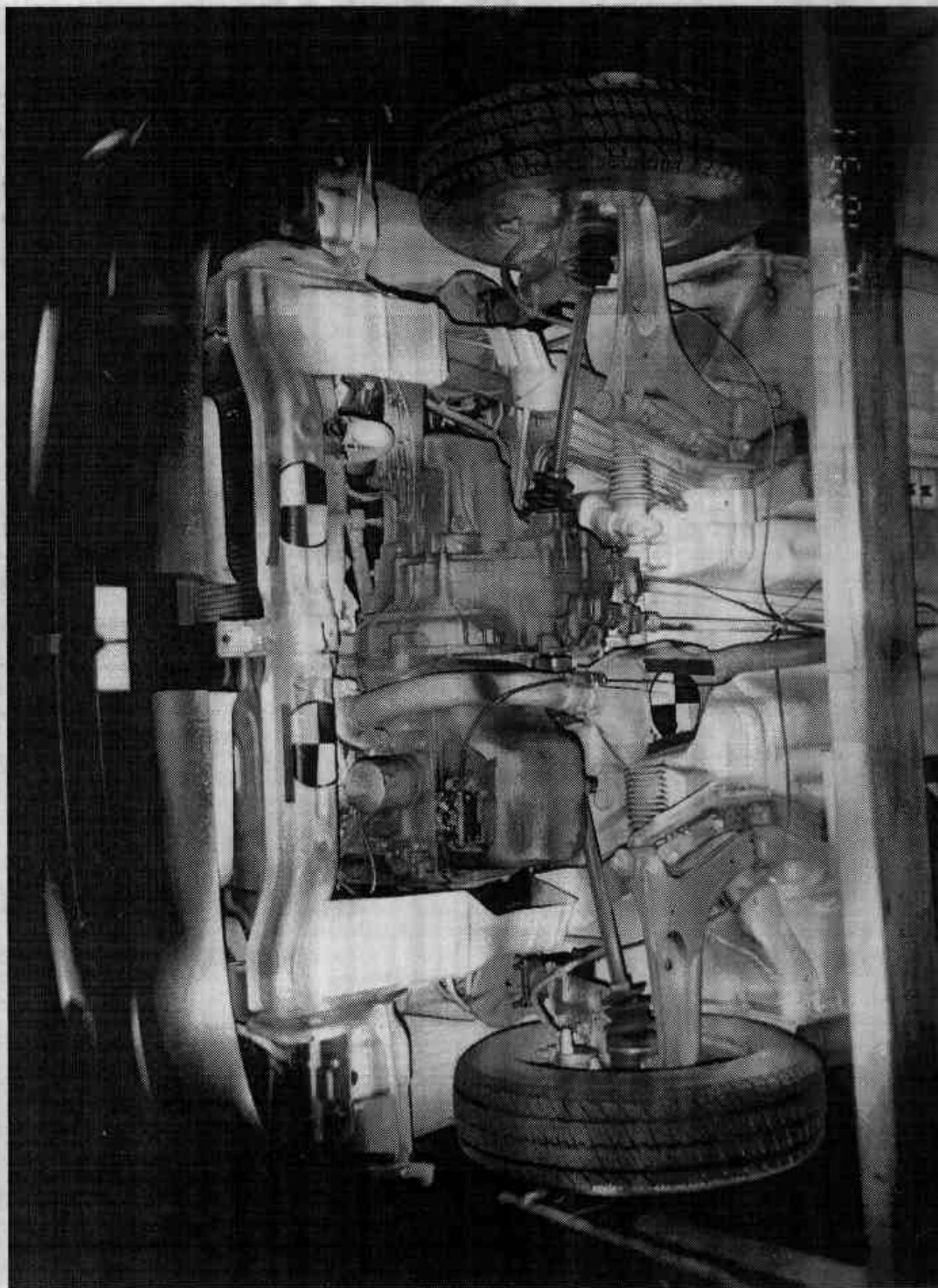


Figure A-18 PRE-TEST FRONT UNDERBODY VIEW



Figure A-17 POST-TEST FRONT UNDERBODY VIEW

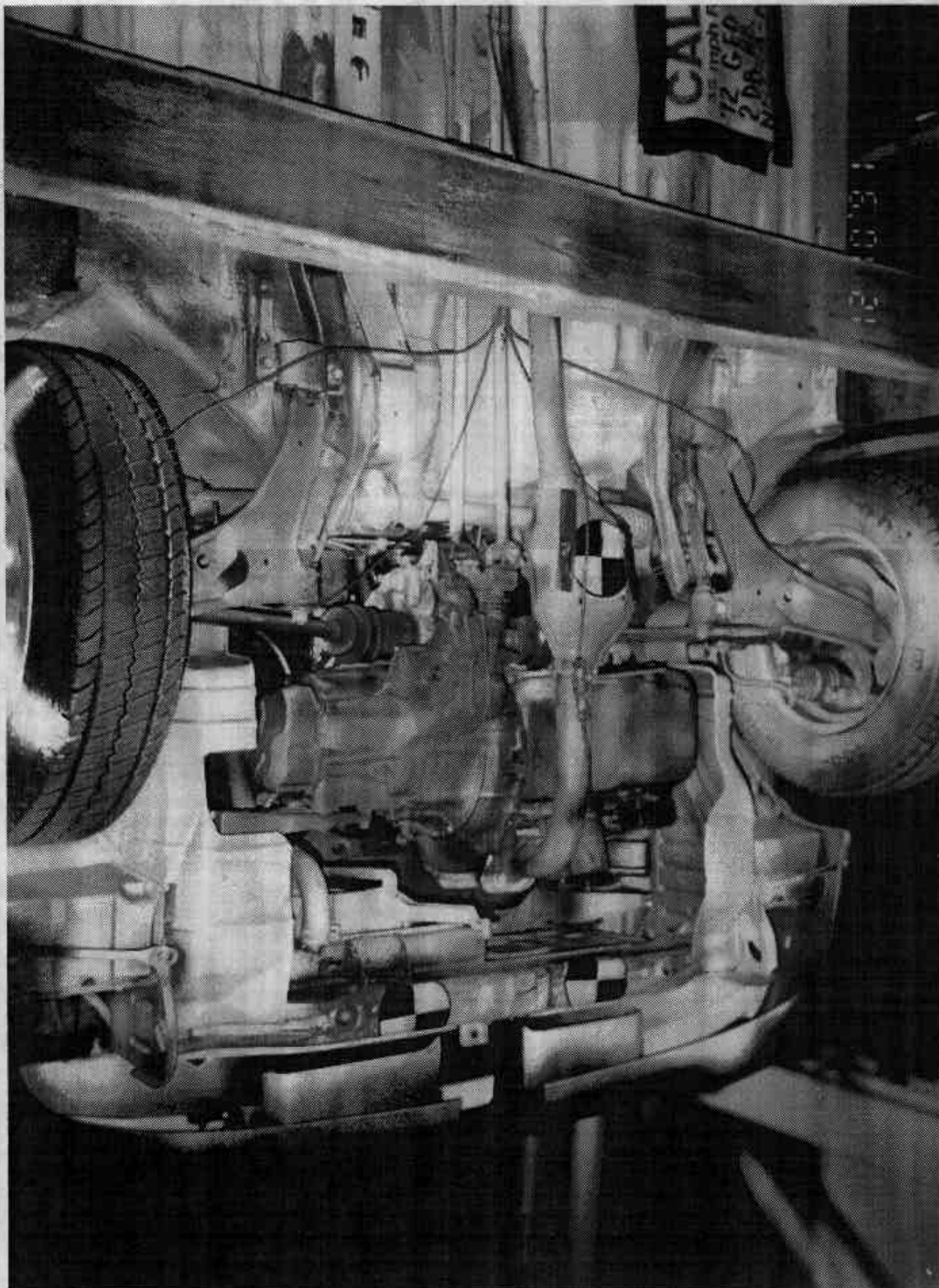


Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW

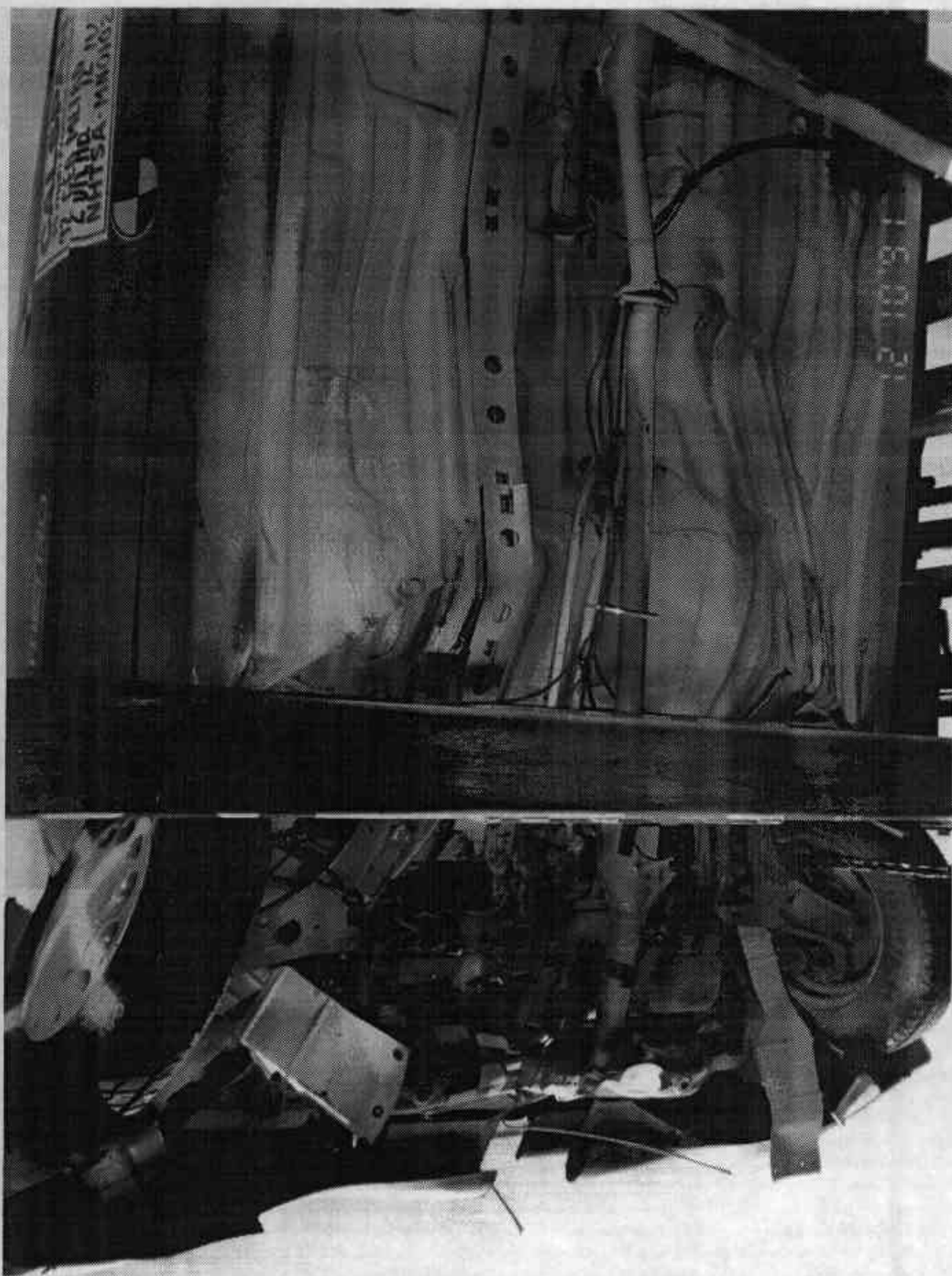
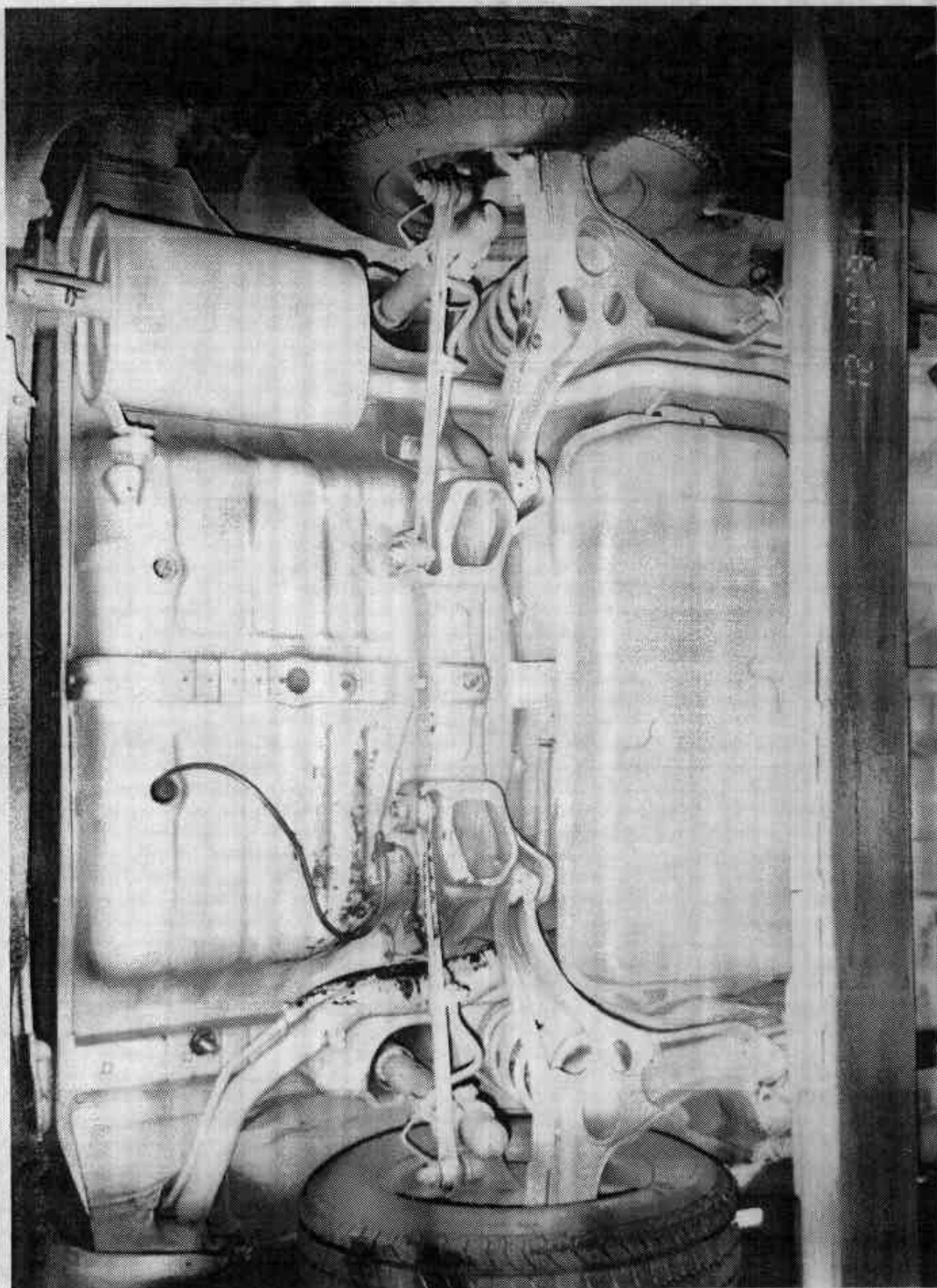


Figure A-19 POST-TEST FRONT SIDE UNDERBODY VIEW



A-22

7951-2

Figure A-20 PRE-TEST REAR UNDERBODY VIEW



Figure A-21 POST-TEST REAR UNDERBODY VIEW



Figure A-23. PRE-TEST DRIVER POSITION VIEW

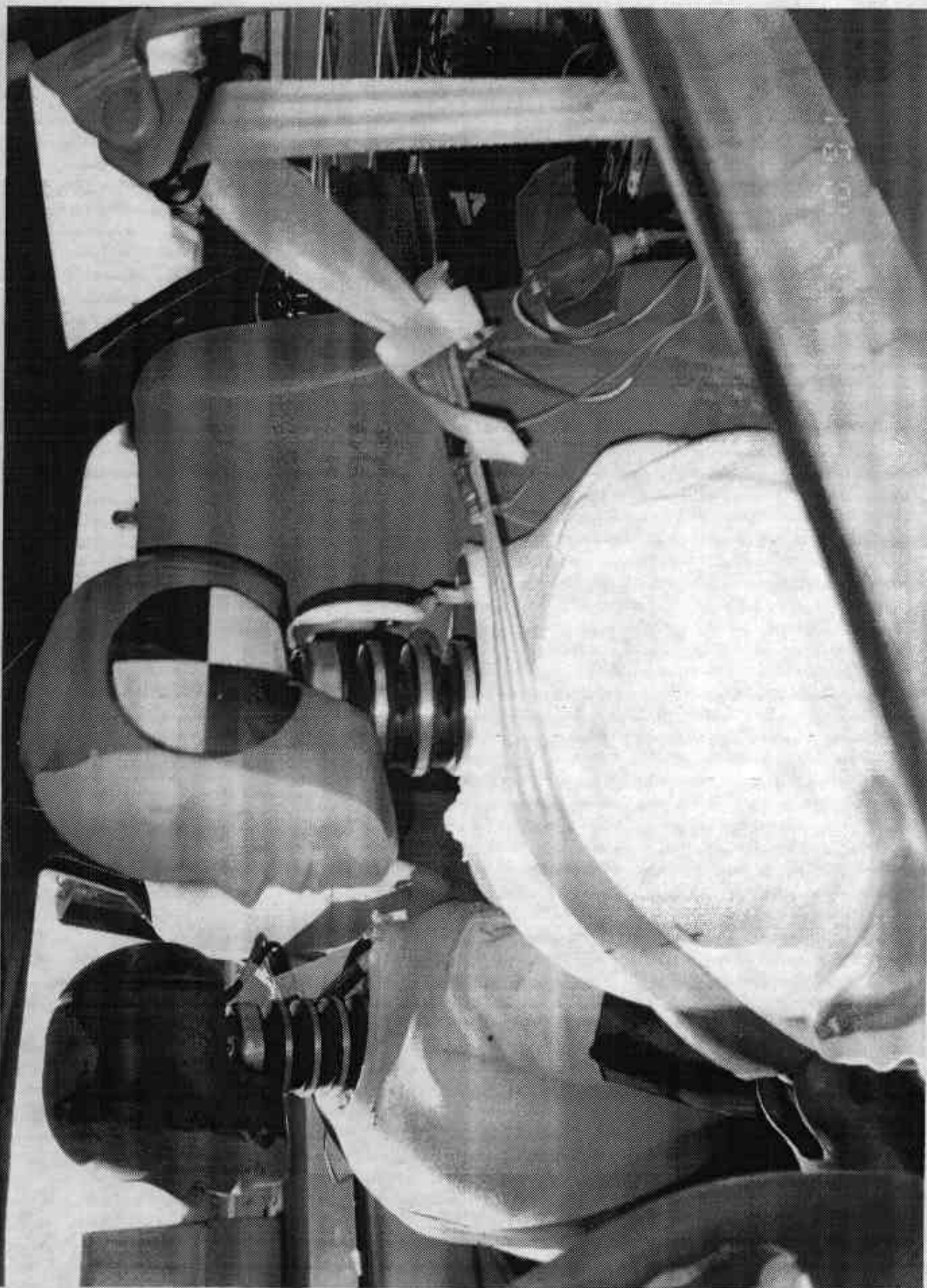


Figure A-23 POST-TEST DRIVER POSITION VIEW



Figure A-24 PRE-TEST PASSENGER POSITION VIEW



Figure A-25 POST-TEST PASSENGER POSITION VIEW

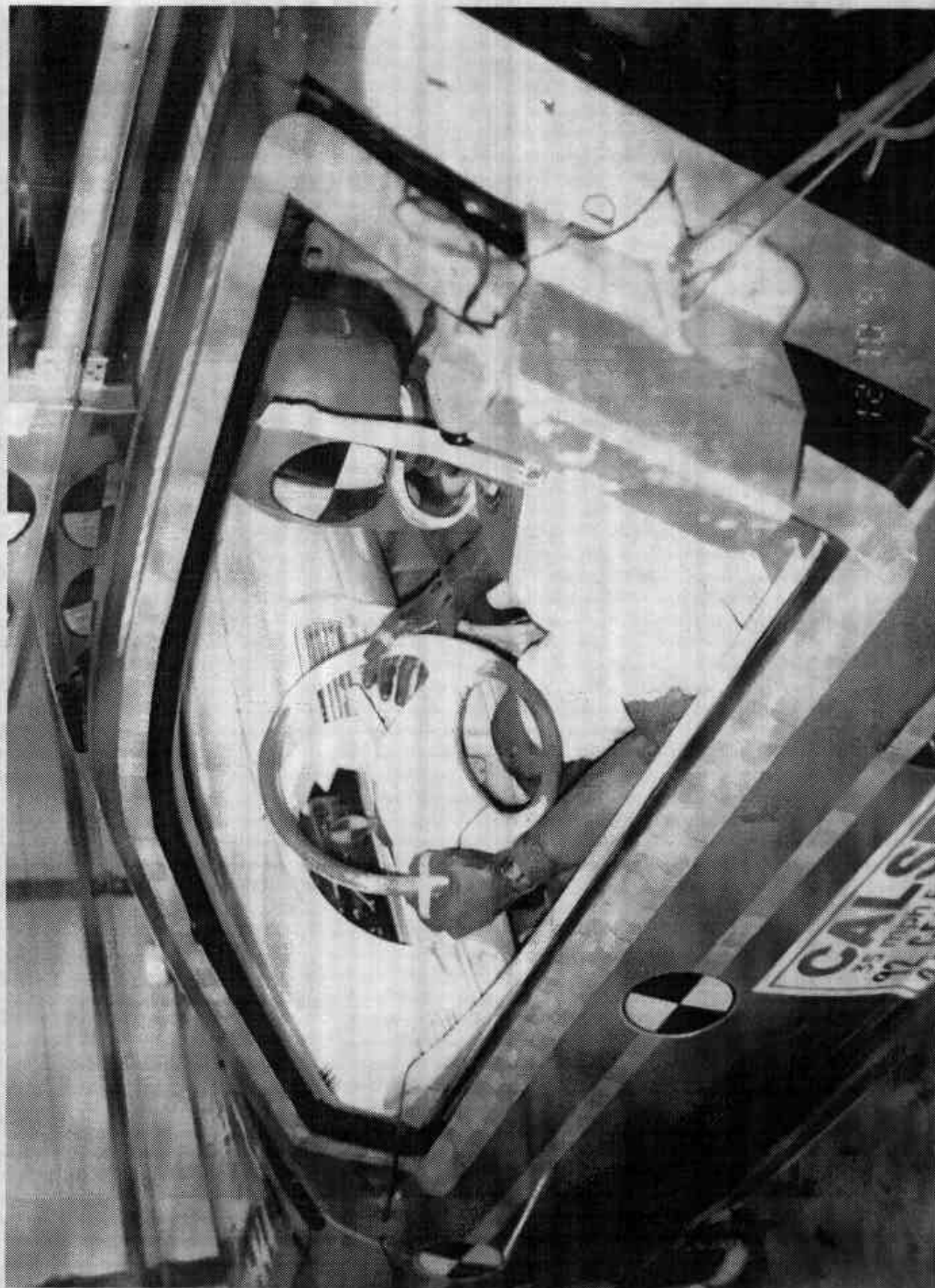


FIGURE A-20 PRE-TEST DRIVER AND INTERIOR VIEW

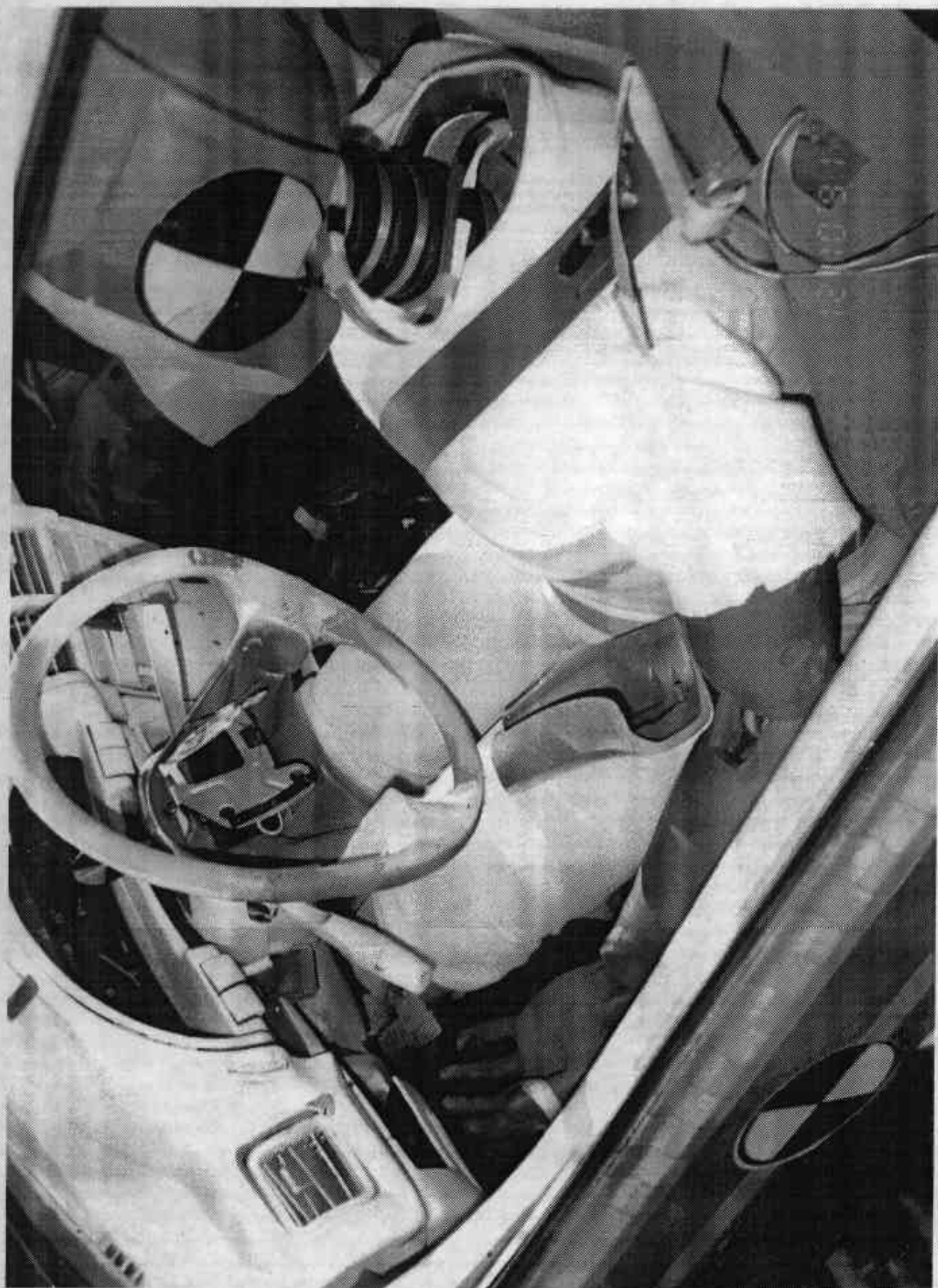


FIGURE A-27 POST-TEST DRIVER AND INTERIOR VIEW



Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW

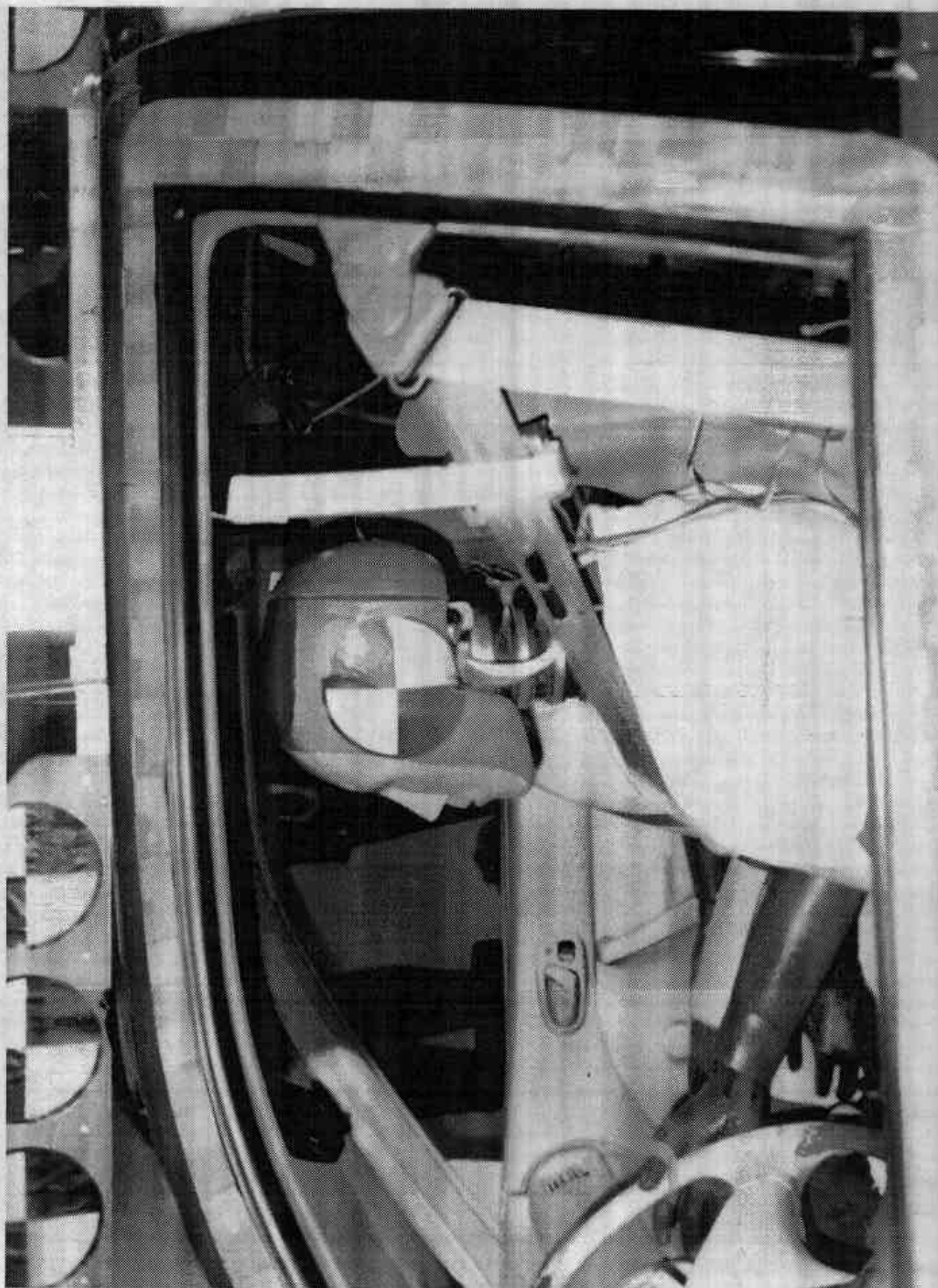


FIGURE A-30 PRE-TEST DRIVER HEAD LOCATION

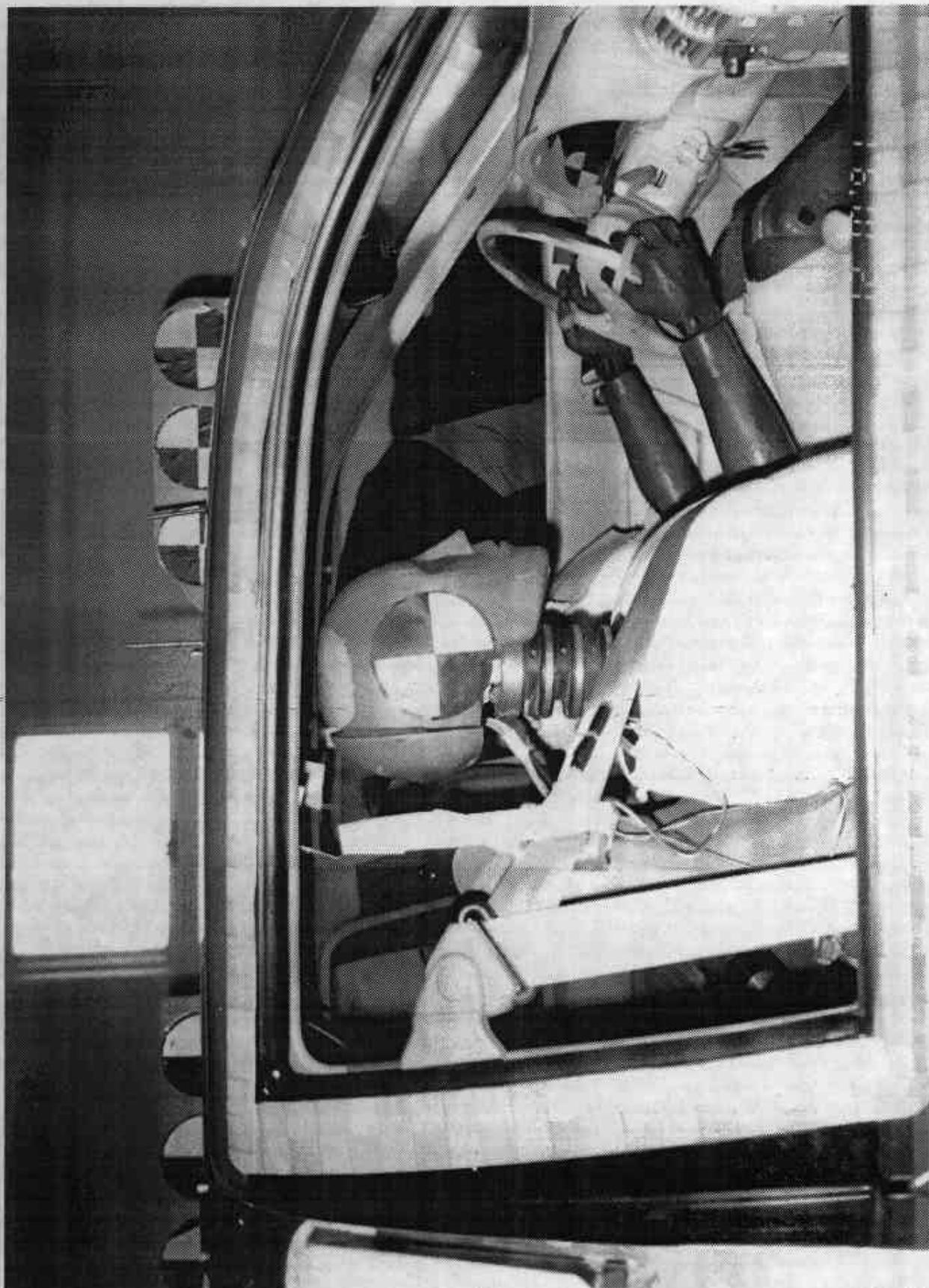


Figure A-31 PRE-TEST PASSENGER HEAD LOCATION



Figure A-32. IMPACT VIEW

A-24

7951-2

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST NO. MN0102

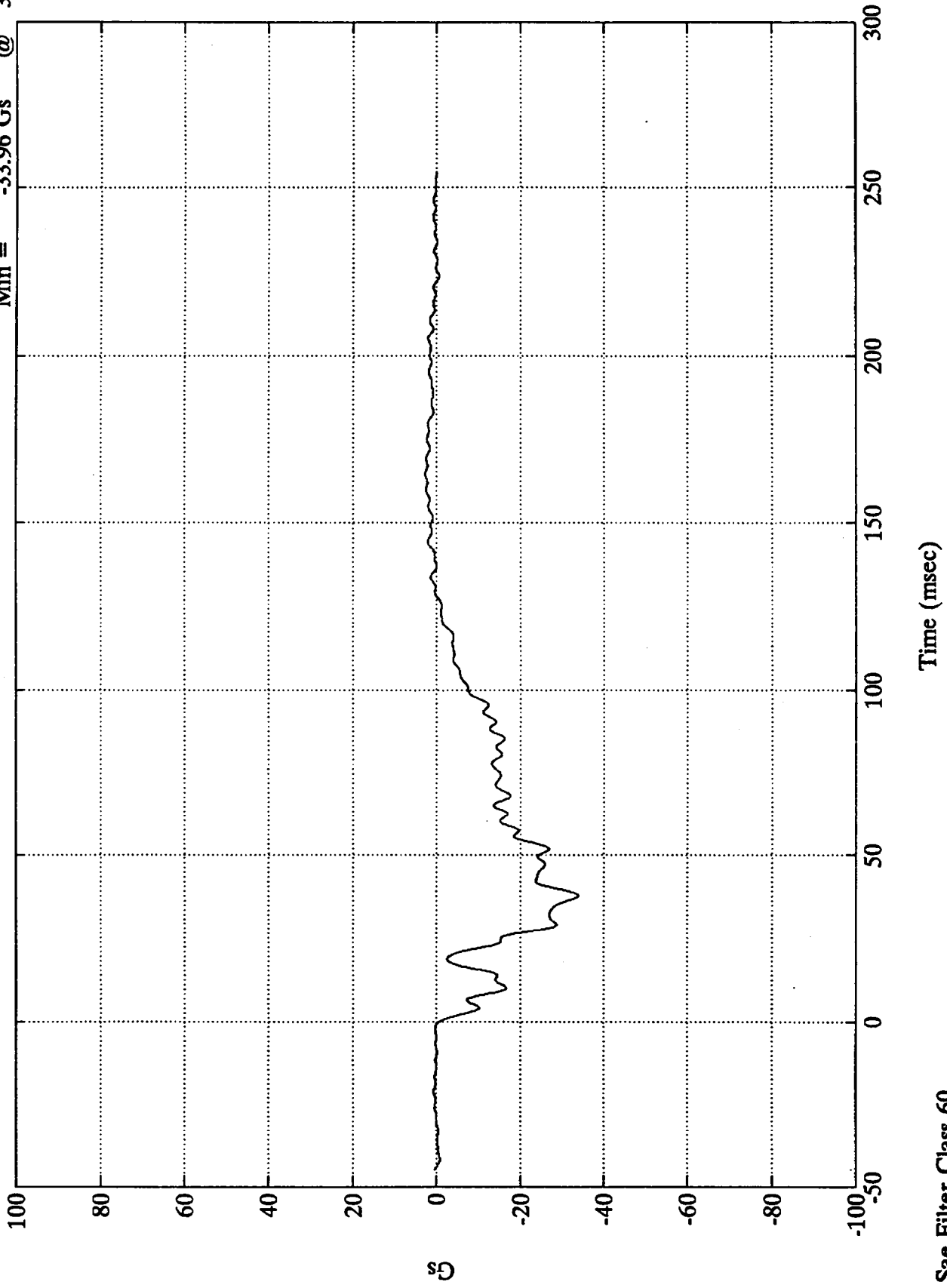
VEHICLE DATA

FILTER CHANNEL CLASS

60

NCAP TEST #8 1992 GEO METRO

Acc. #1(x)
Max = 2.65 Gs @ 164.64 msec
Min = -33.96 Gs @ 38.04 msec



B-3

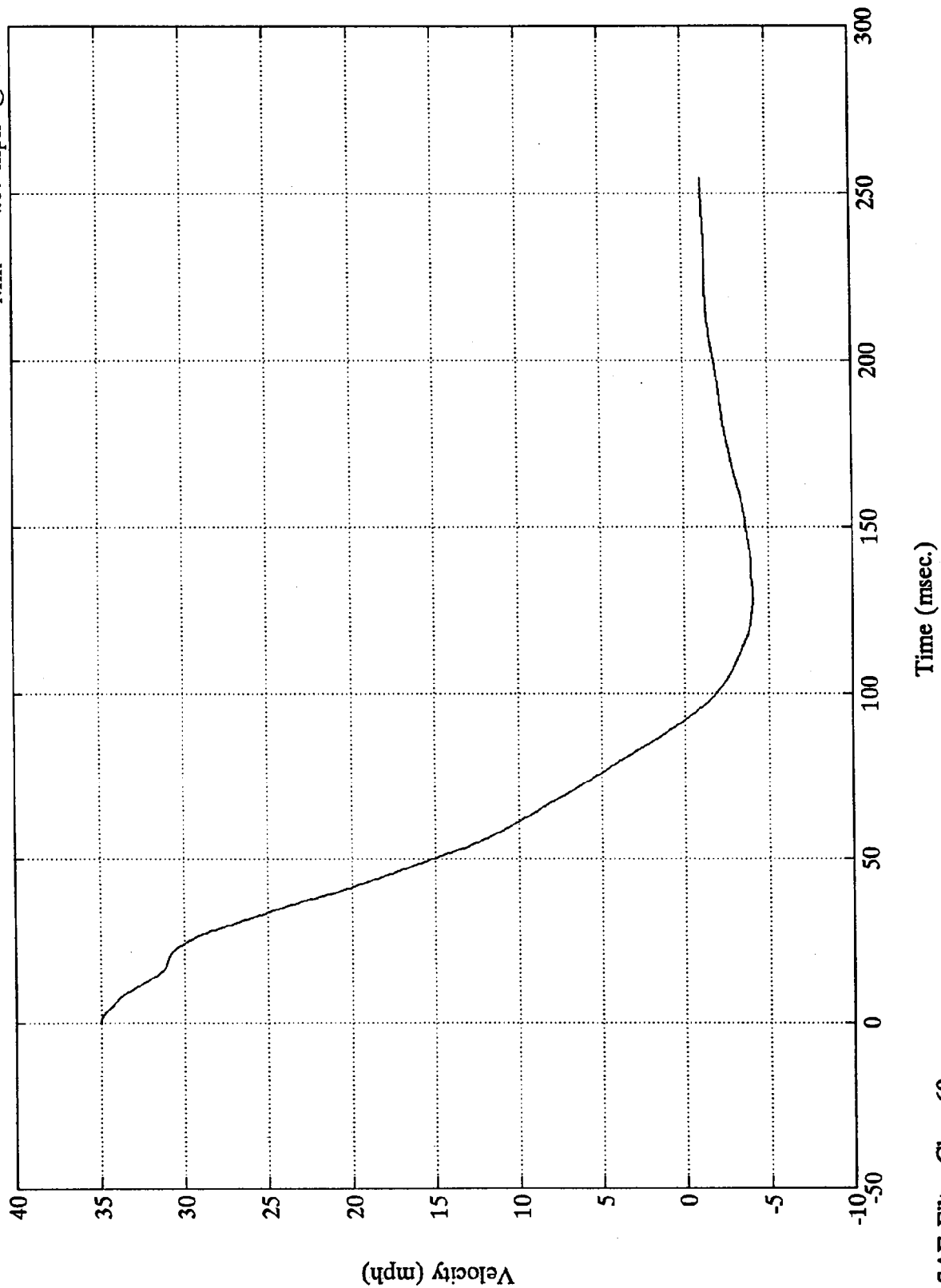
7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

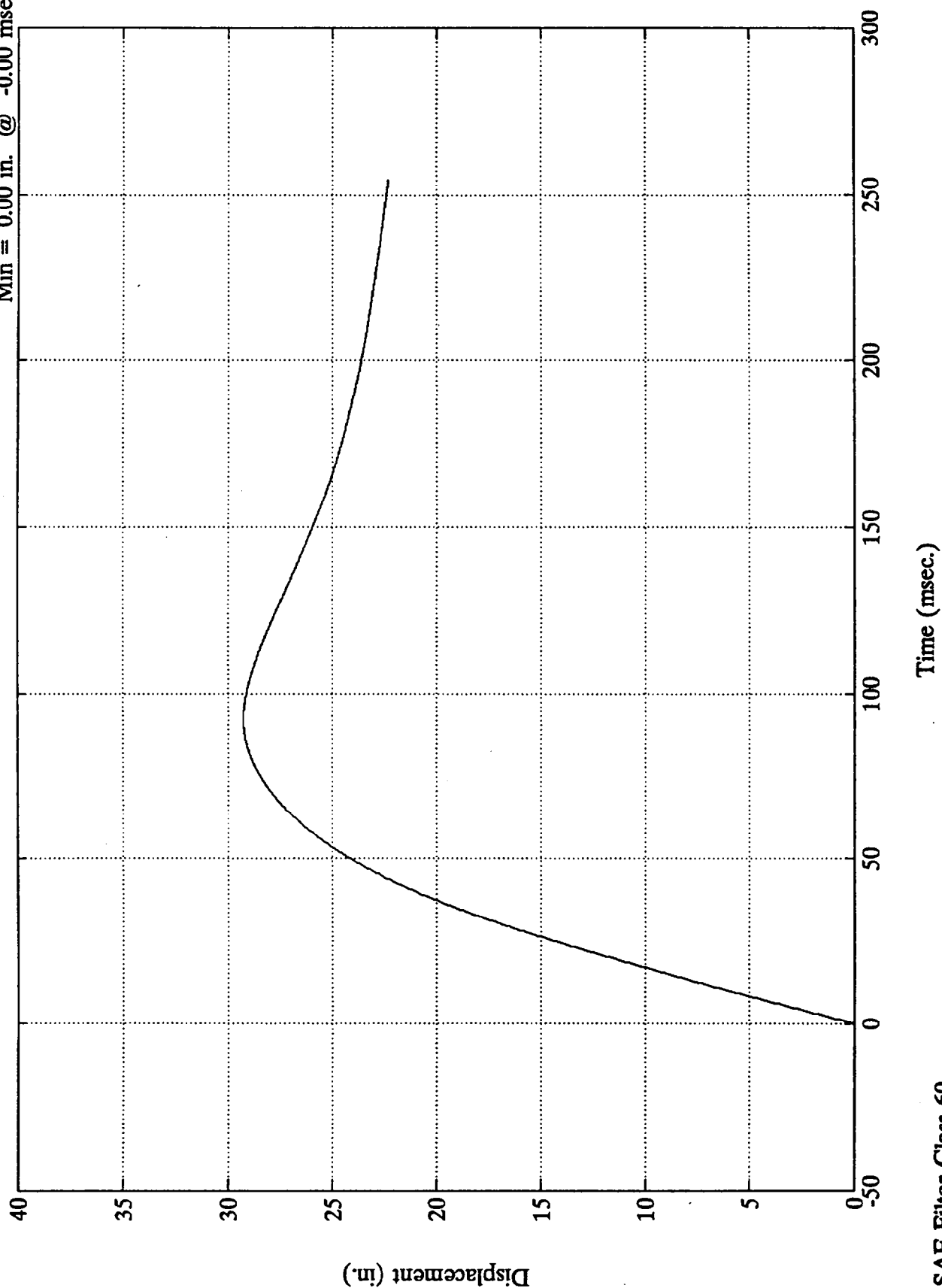
Max = 35.00 mph @ -0.00 msec
Min = -4.07 mph @ 128.40 msec

Acc. #1(x)



NCAP TEST #8 1992 GEO METRO

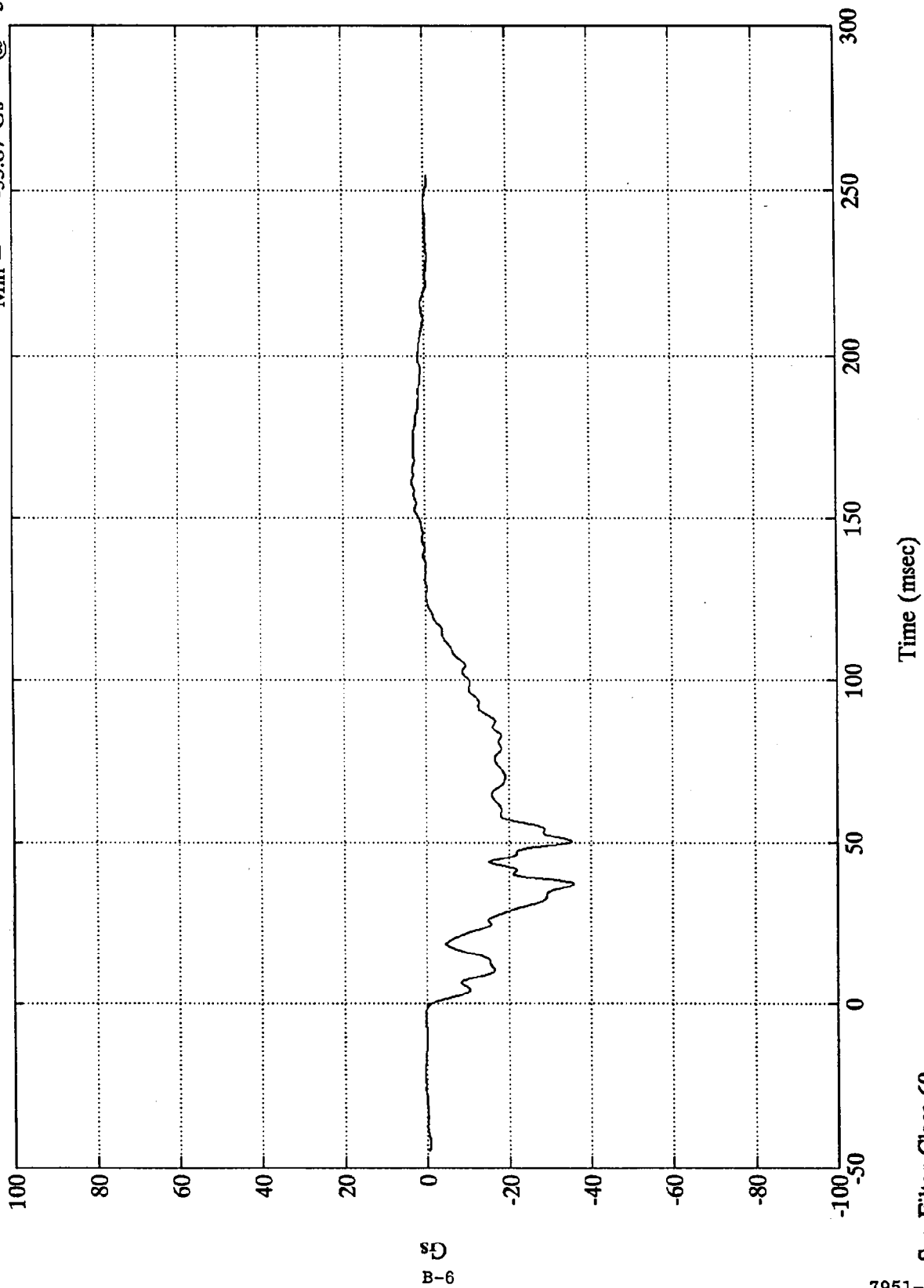
Acc. #1(x)
Max = 29.26 in. @ 93.60 msec
Min = 0.00 in. @ -0.00 msec



NCAP TEST #8 1992 GEO METRO

Max = 3.18 Gs @ 160.92 msec
 Min = -35.87 Gs @ 36.95 msec

Acc. #2(x)

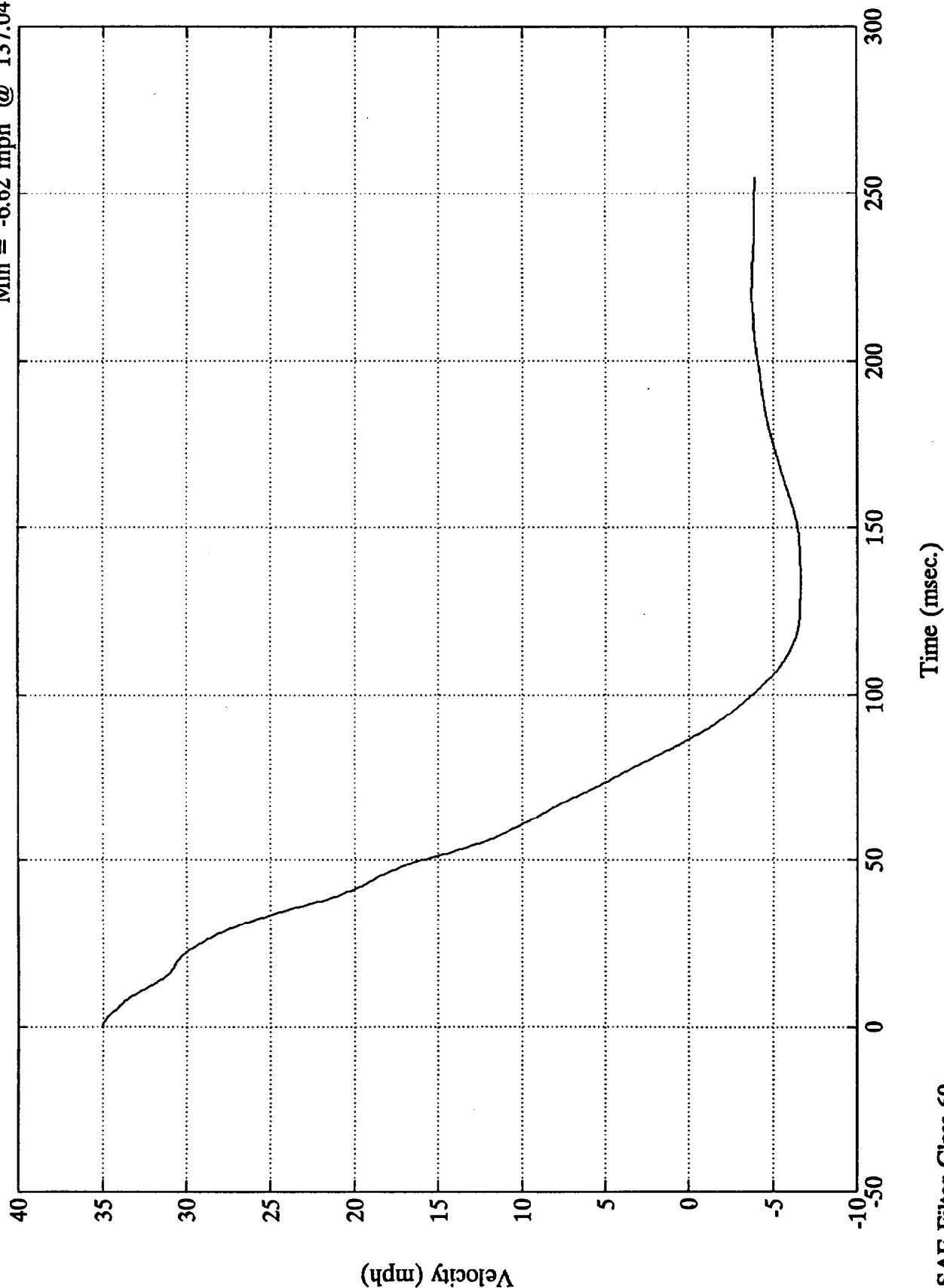


B-6

NCAP TEST #8 1992 GEO METRO

Max = 35.00 mph @ -0.00 msec
Min = -6.62 mph @ 137.04 msec

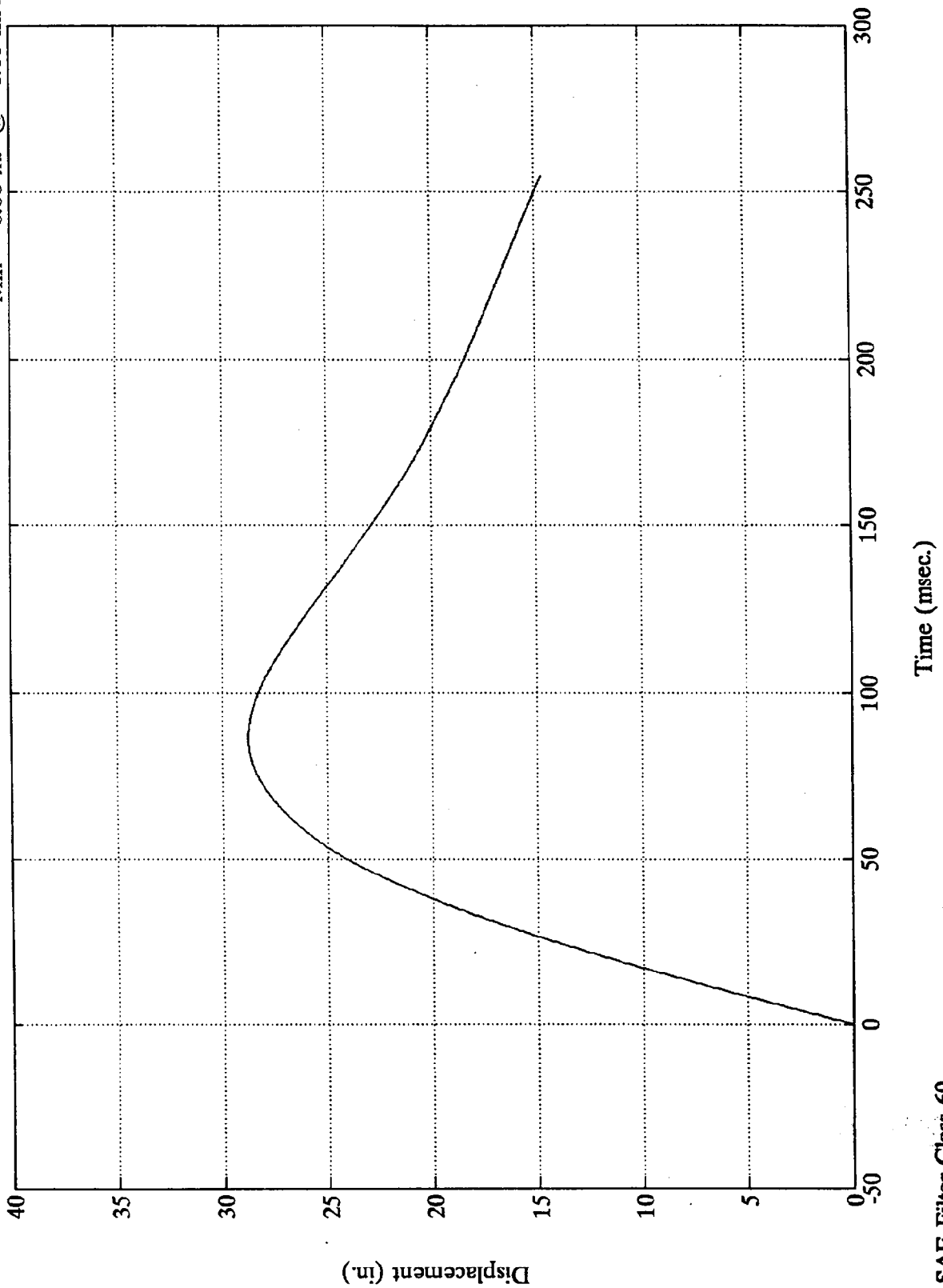
Acc. #2(x)



NCAP TEST #8 1992 GEO METRO

Max = 28.77 in. @ 87.60 msec
Min = 0.00 in. @ -0.00 msec

Acc. #2(x)

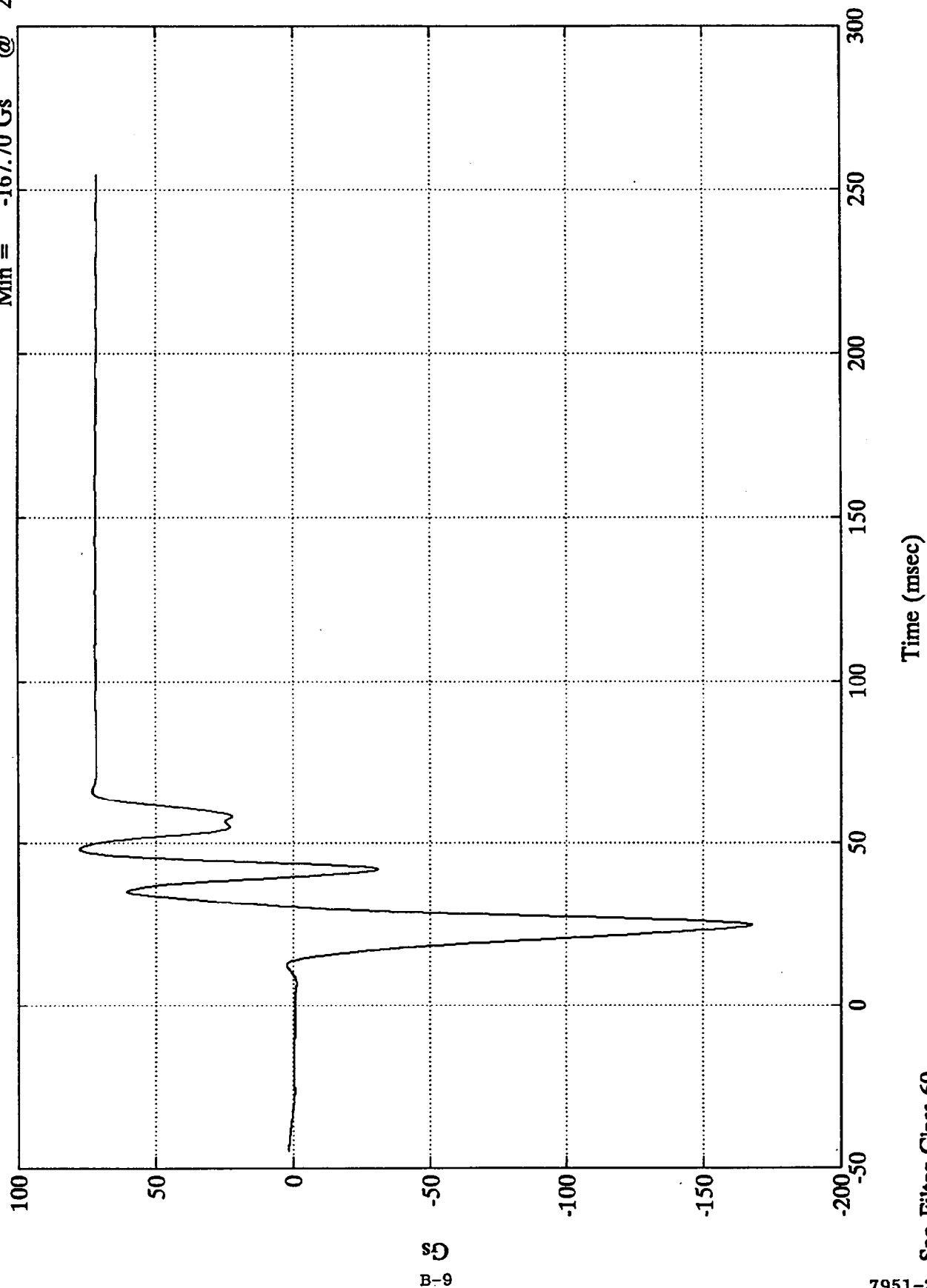


SAE Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 77.46 Gs @ 48.24 msec
 Min = -167.70 Gs @ 24.83 msec

Acc. #3(x)



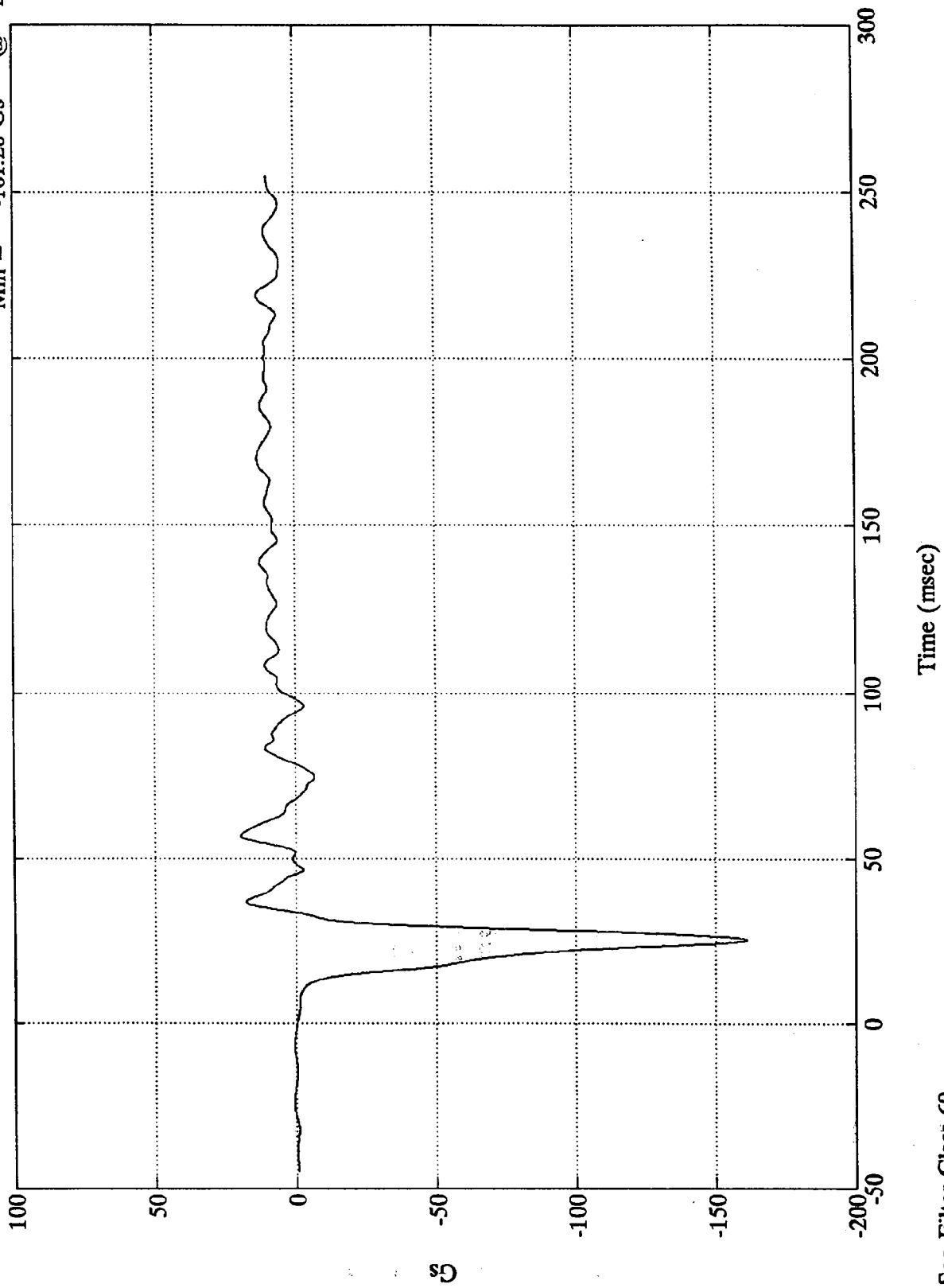
B-9

7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Acc. #4(x) Max = 19.59 Gs @ 56.88 msec
 Min = -161.20 Gs @ 25.55 msec

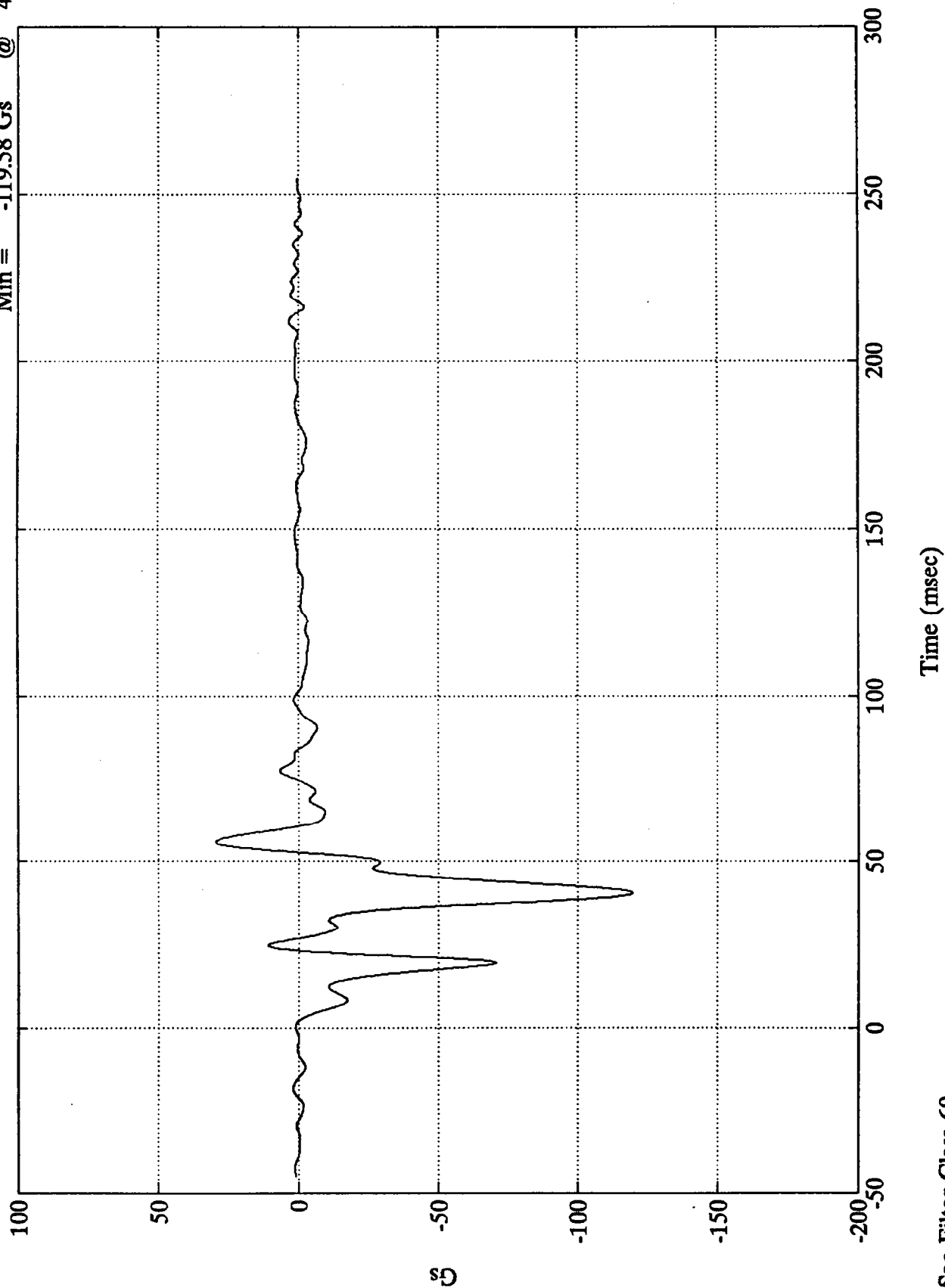


B-10

NCAP TEST #8 1992 GEO METRO

Acc. #5(x)

Max = 29.72 Gs @ 55.80 msec
Min = -119.58 Gs @ 40.44 msec



B-11

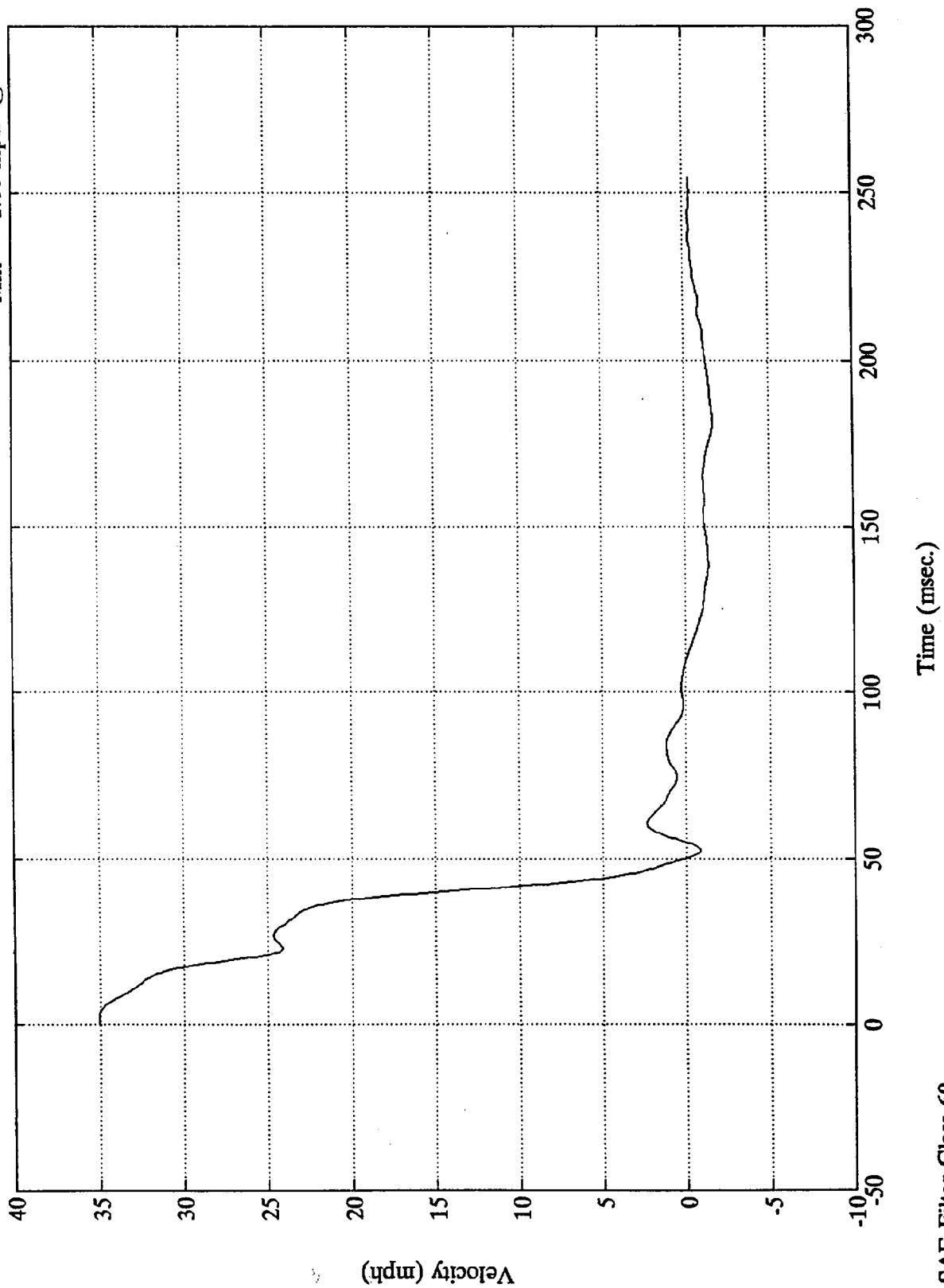
7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Acc. #5(x)

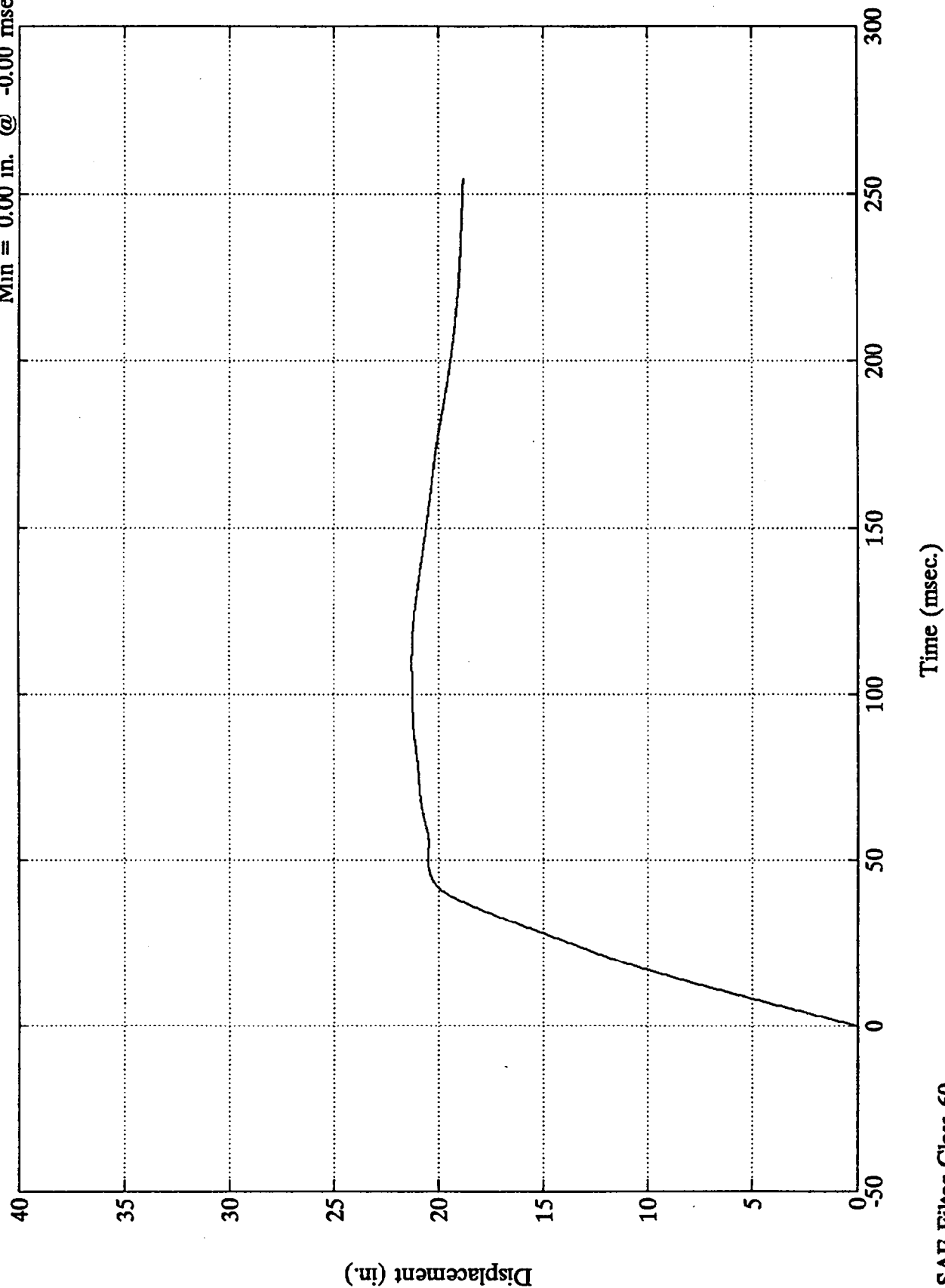
Max = 35.04 mph @ 2.16 msec
Min = -1.66 mph @ 181.68 msec



NCAP TEST #8 1992 GEO METRO

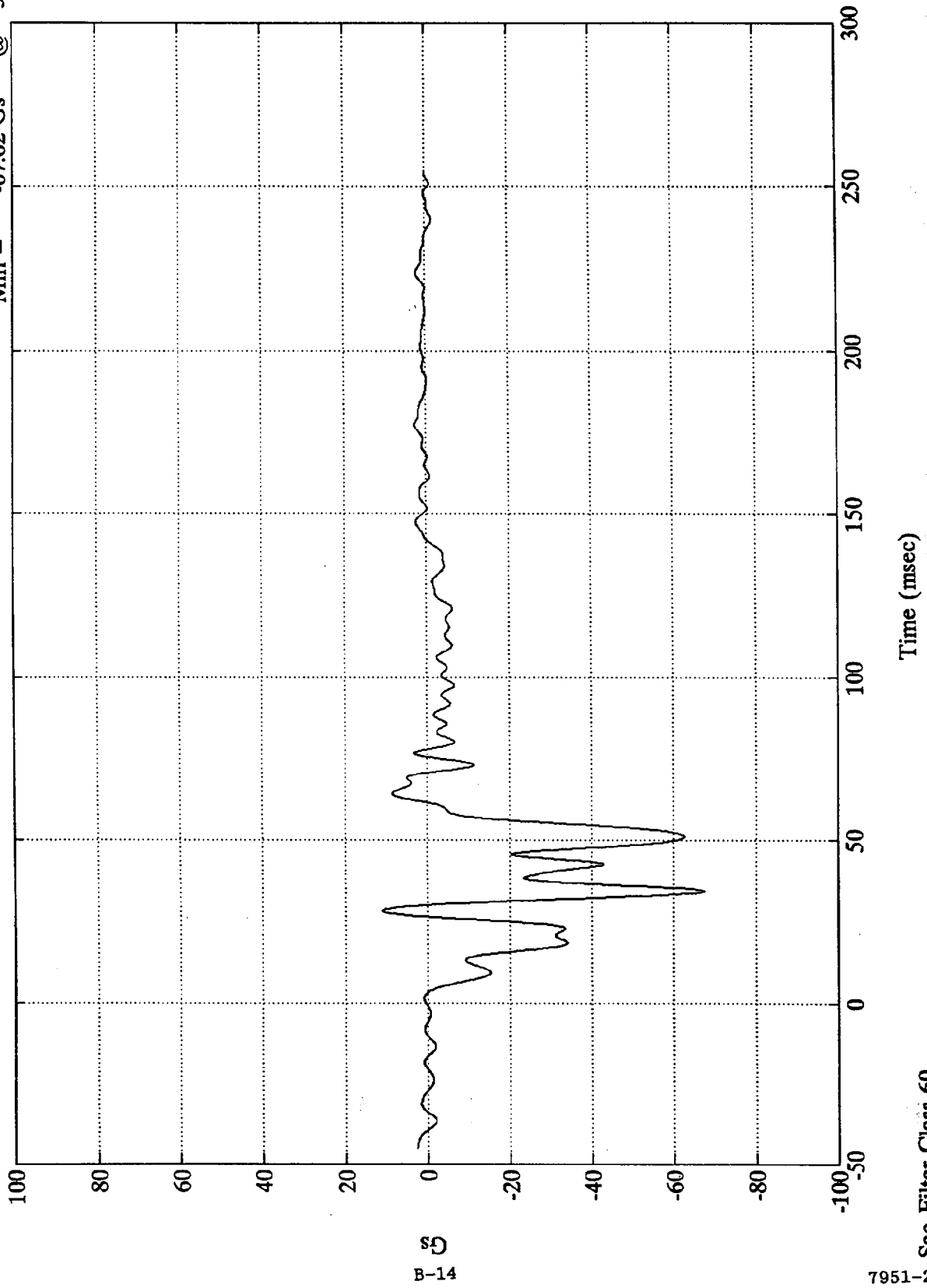
Acc. #5(x)

Max = 21.29 in. @ 111.60 msec
Min = 0.00 in. @ -0.00 msec



NCAP TEST #8 1992 GEO METRO

Acc. #6(x) Max = 10.97 Gs @ 28.20 msec
 Min = -67.62 Gs @ 34.31 msec

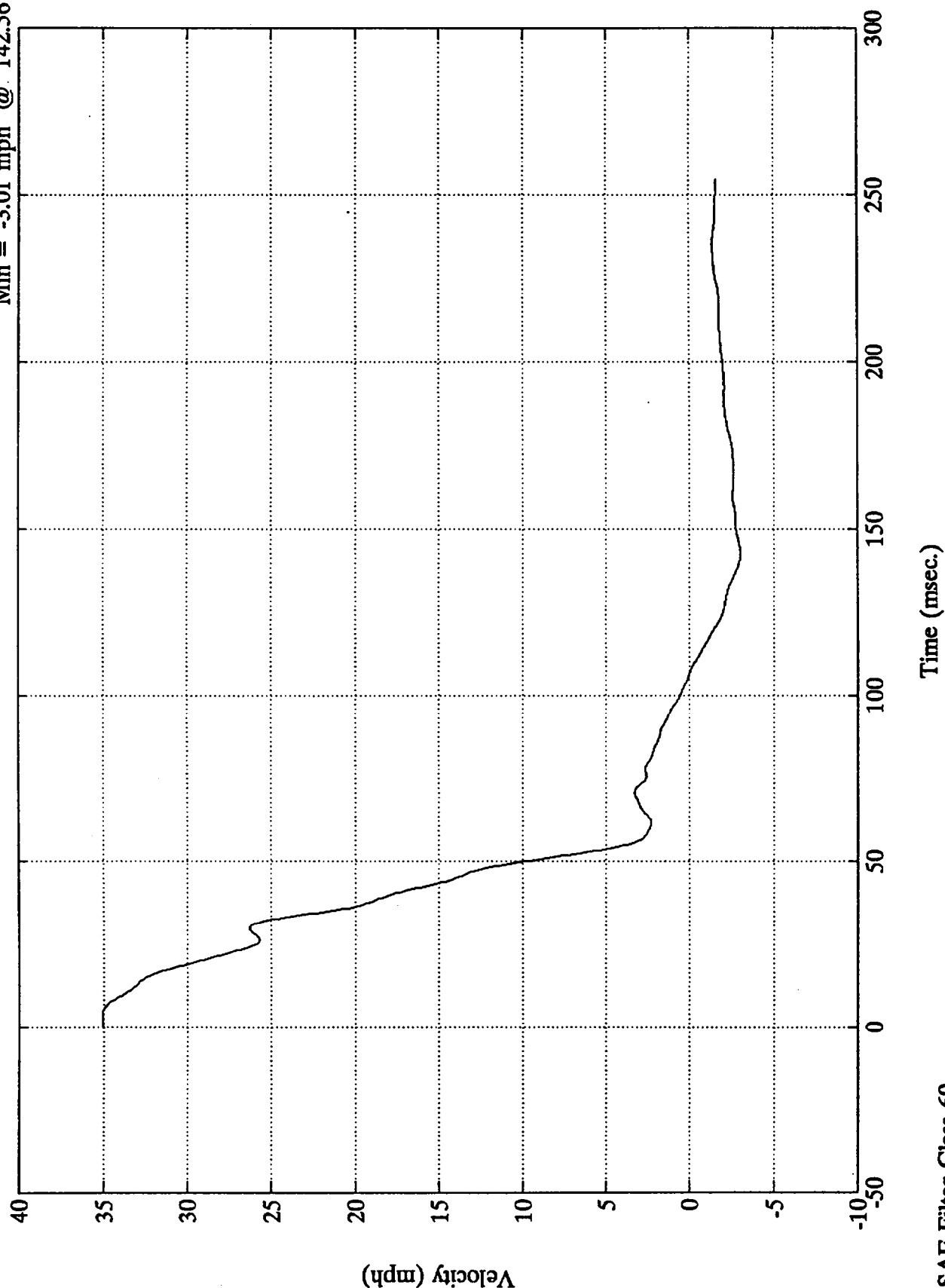


B-14

NCAP TEST #8 1992 GEO METRO

Acc. #6(x)

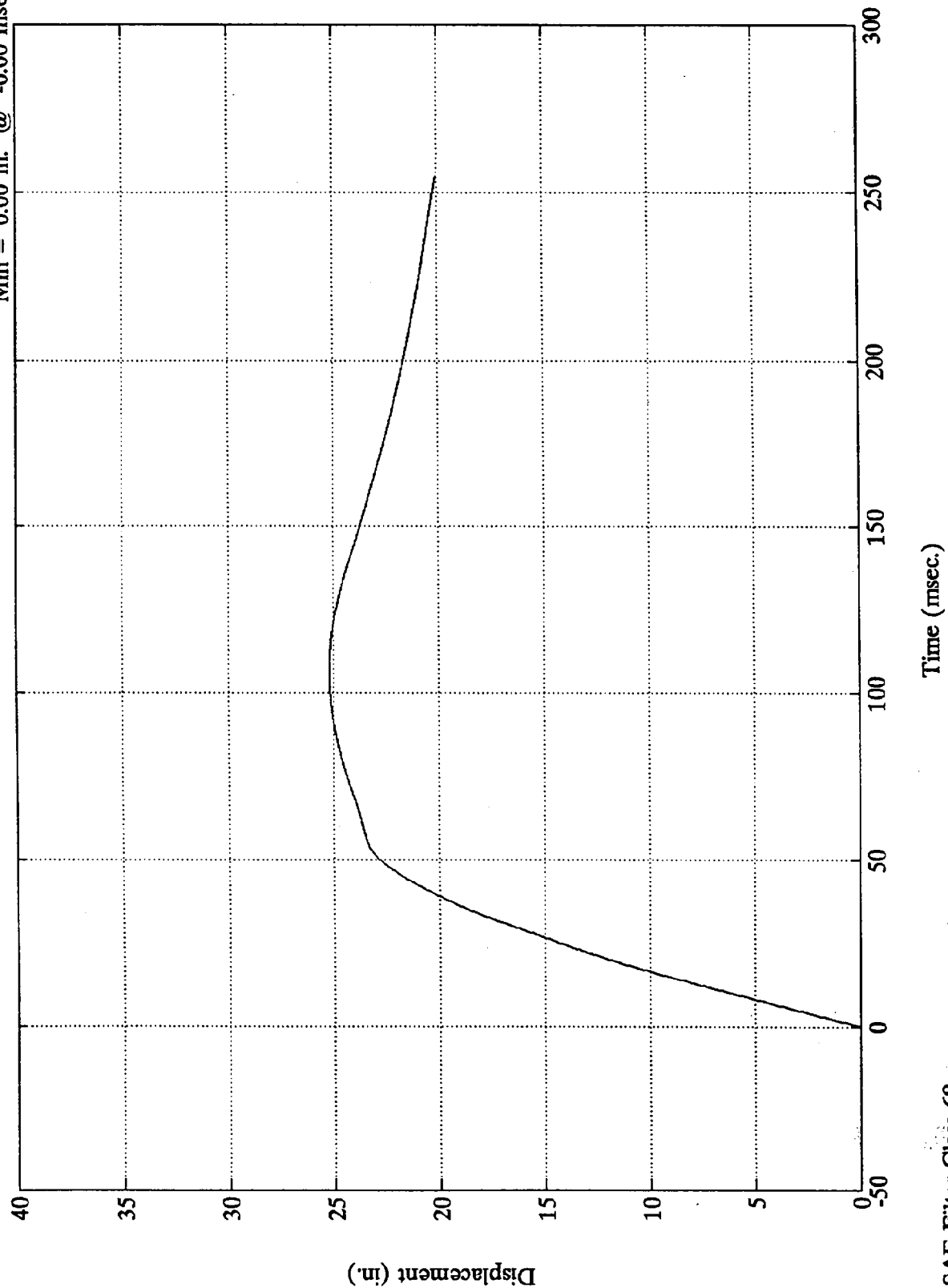
Max = 35.05 mph @ 3.60 msec
Min = -3.01 mph @ 142.56 msec



NCAP TEST #8 1992 GEO METRO

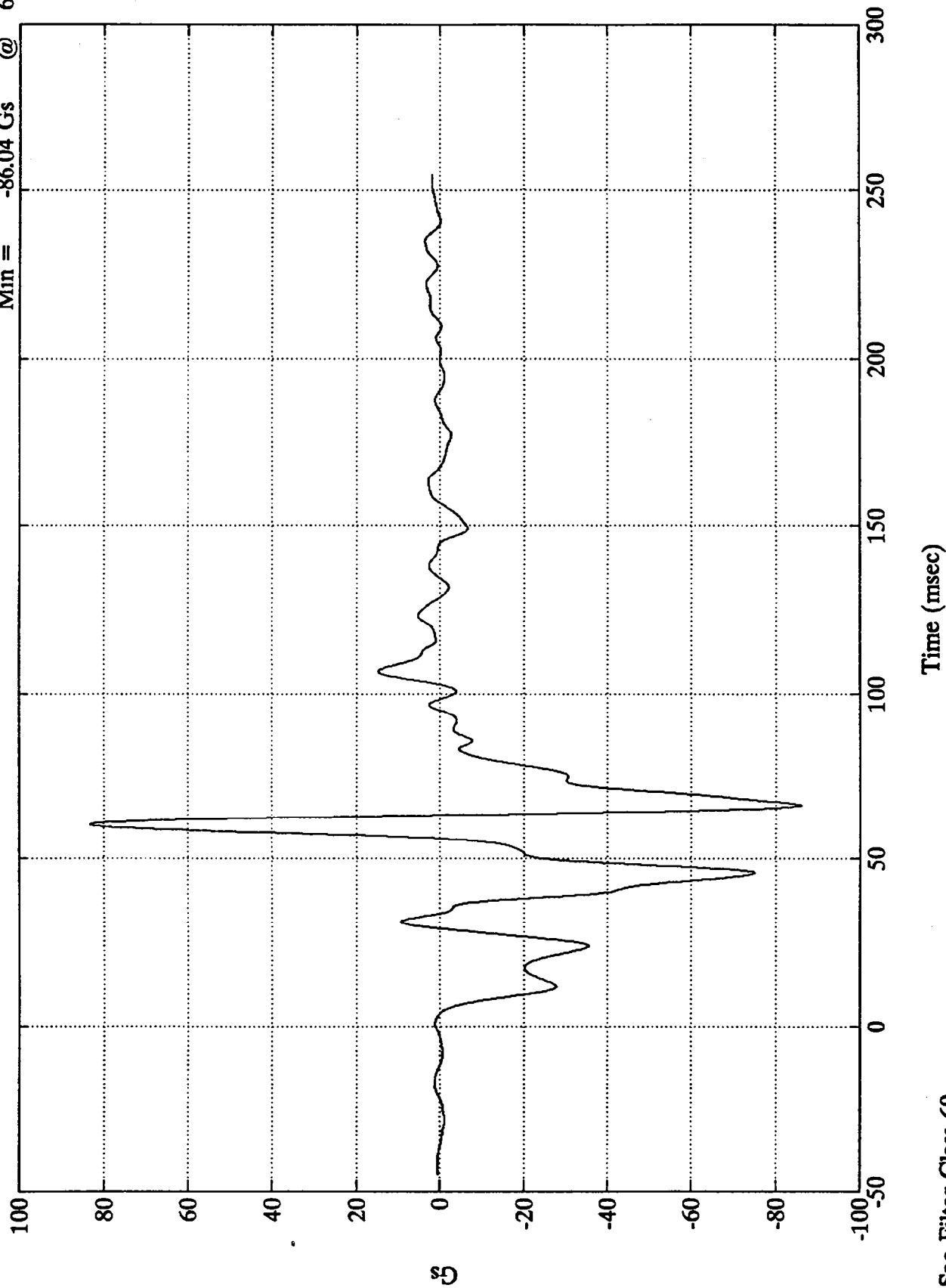
Max = 25.21 in. @ 109.68 msec
Min = 0.00 in. @ -0.00 msec

Acc. #6(x)



NCAP TEST #8 1992 GEO METRO

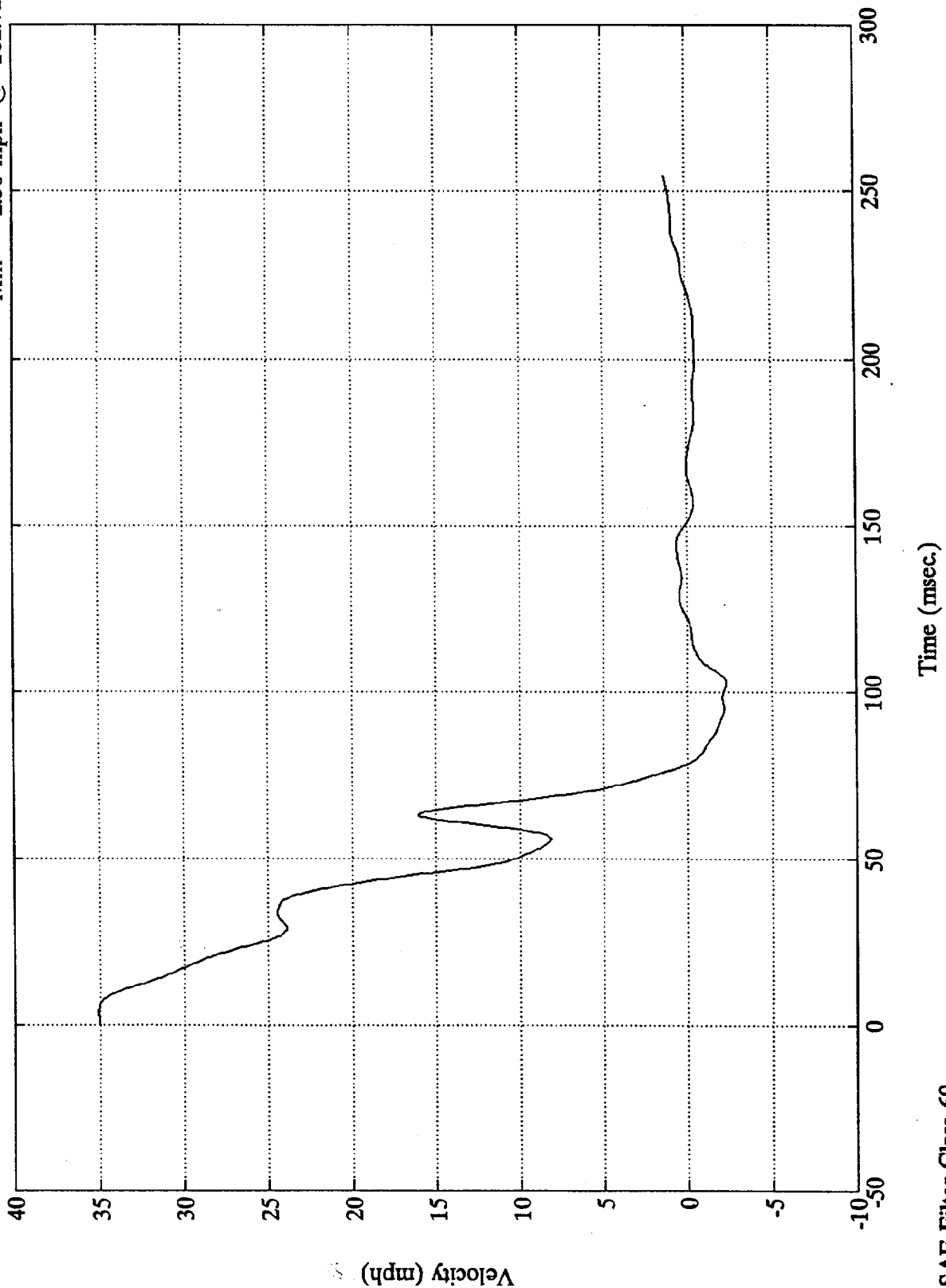
Acc. #7(x) Max = 83.21 Gs @ 60.36 msec
Min = -86.04 Gs @ 66.23 msec



NCAP TEST #8 1992 GEO METRO

Max = 35.07 mph @ 3.84 msec
Min = -2.30 mph @ 102.72 msec

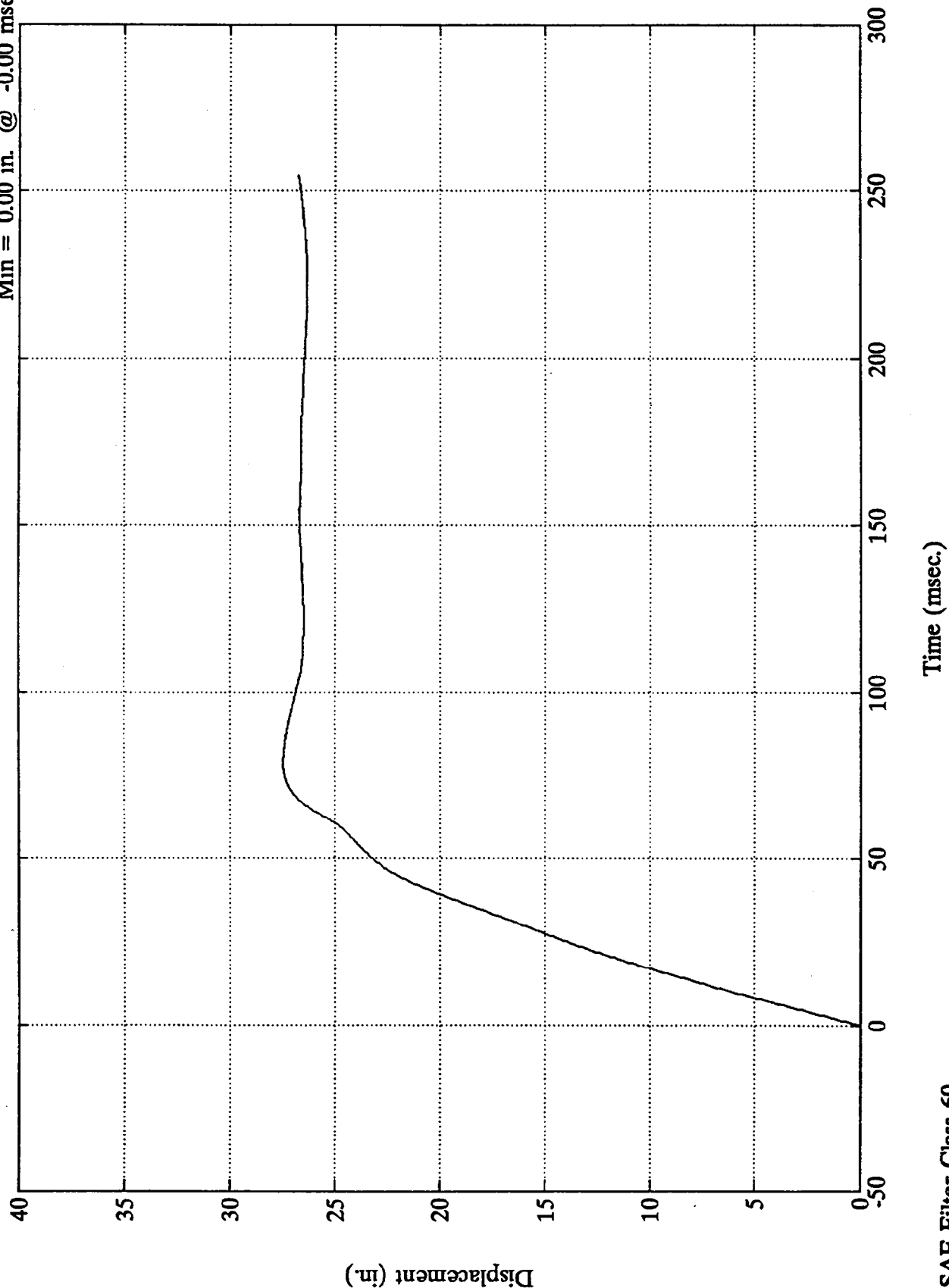
Acc. #7(x)



SAE Filter Class 60

NCAP TEST #8 1992 GEO METRO

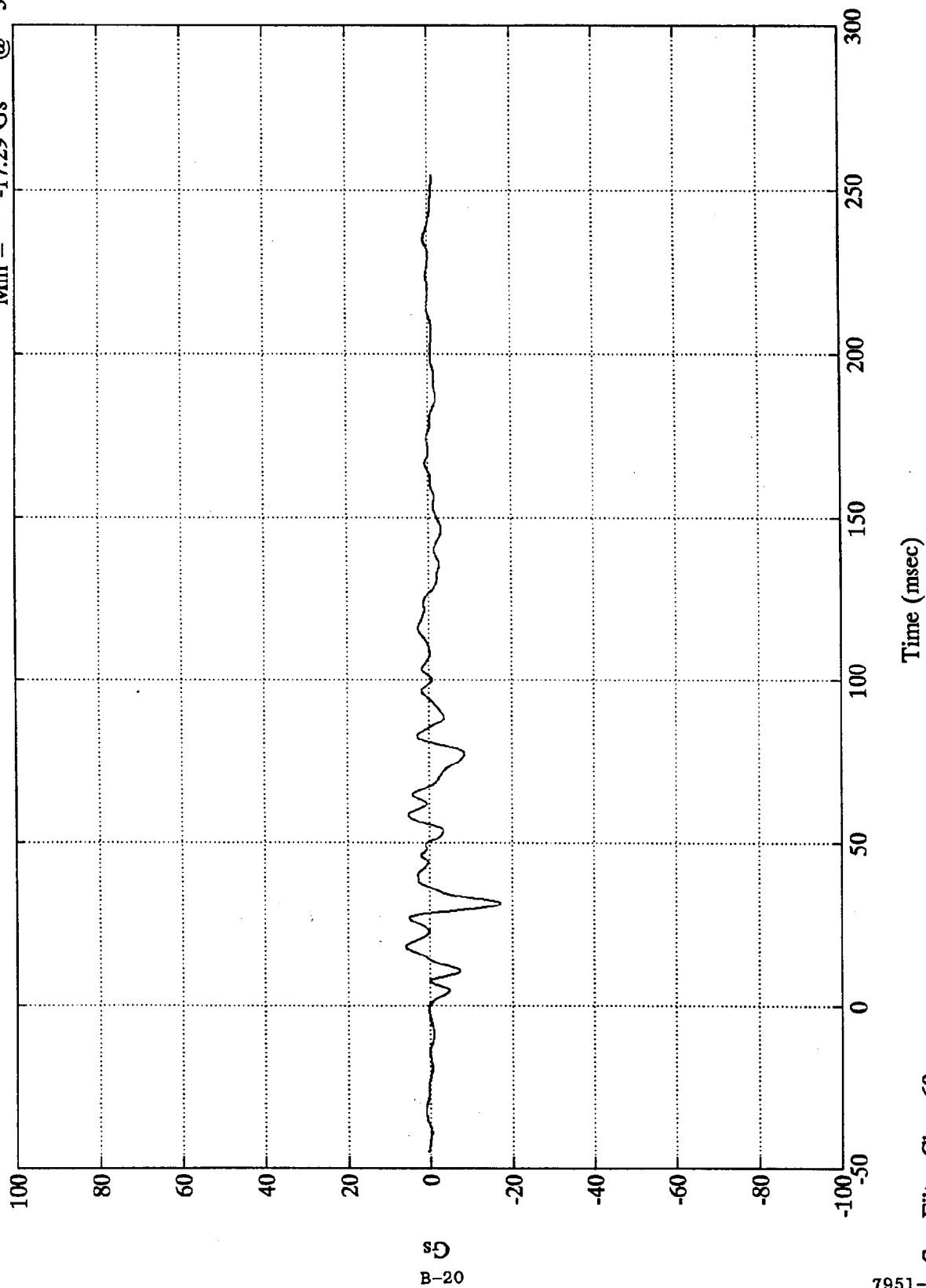
Acc. #7(x)
Max = 27.46 in. @ 80.16 msec
Min = 0.00 in. @ -0.00 msec



NCAP TEST #8 1992 GEO METRO

Max = 5.93 Gs @ 17.88 msec
 Min = -17.29 Gs @ 31.31 msec

Acc. #8(z)

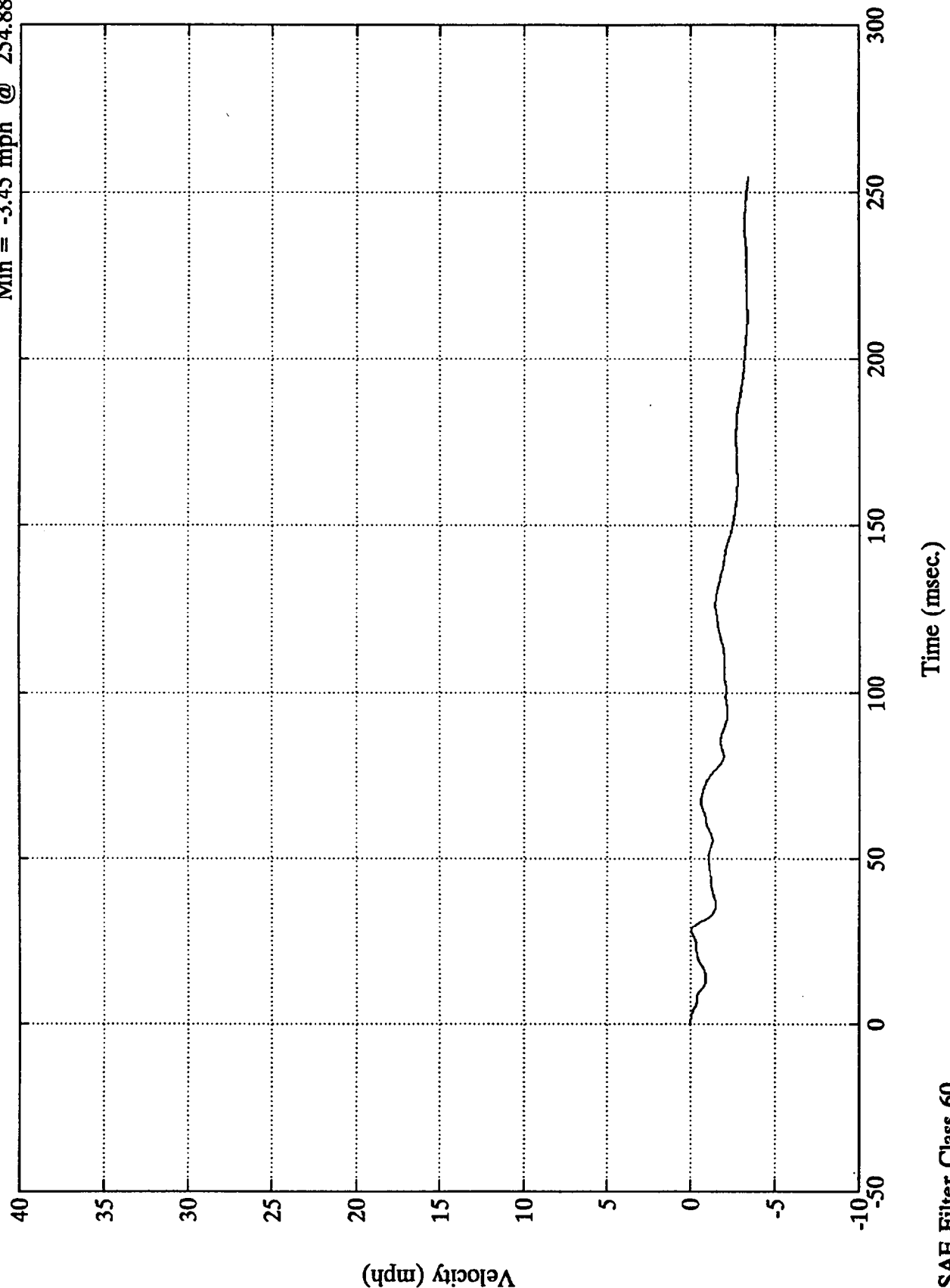


Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Acc. #8(z)

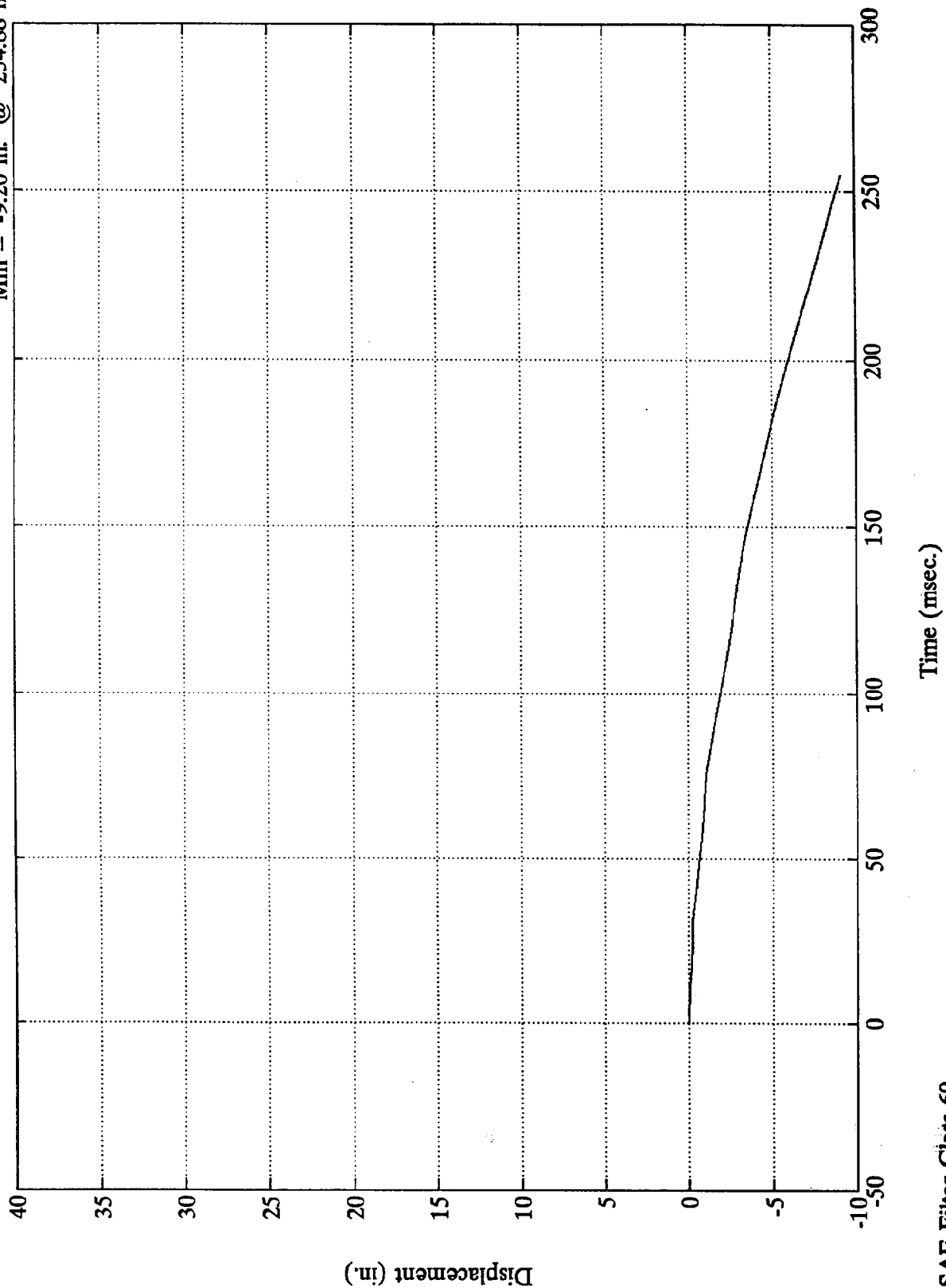
Max = 0.00 mph @ 0.24 msec
Min = -3.45 mph @ 254.88 msec



NCAP TEST #8 1992 GEO METRO

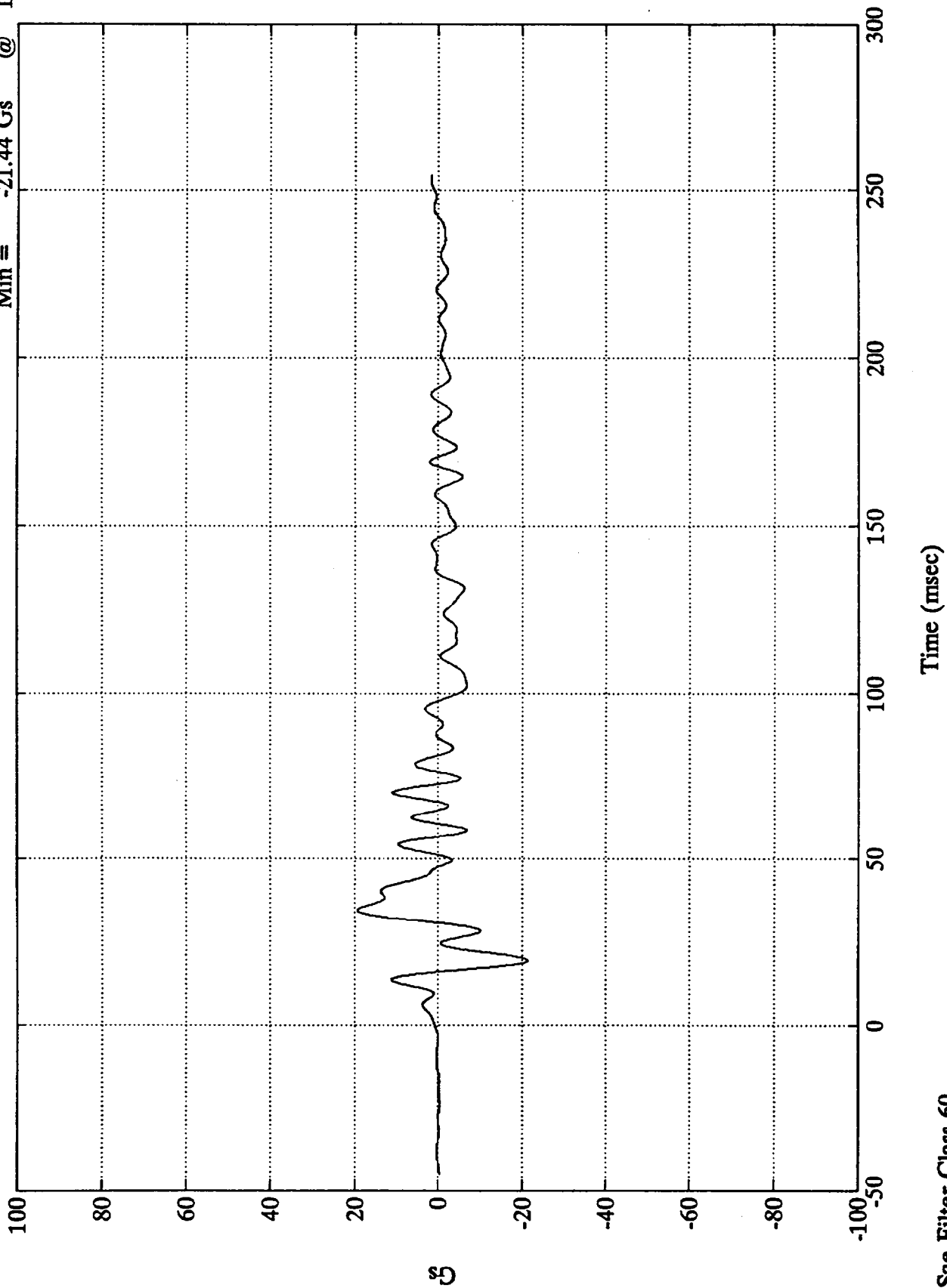
Max = 0.00 in. @ 0.48 msec
Min = -9.20 in. @ 254.88 msec

Acc. #8(z)



NCAP TEST #8 1992 GEO METRO

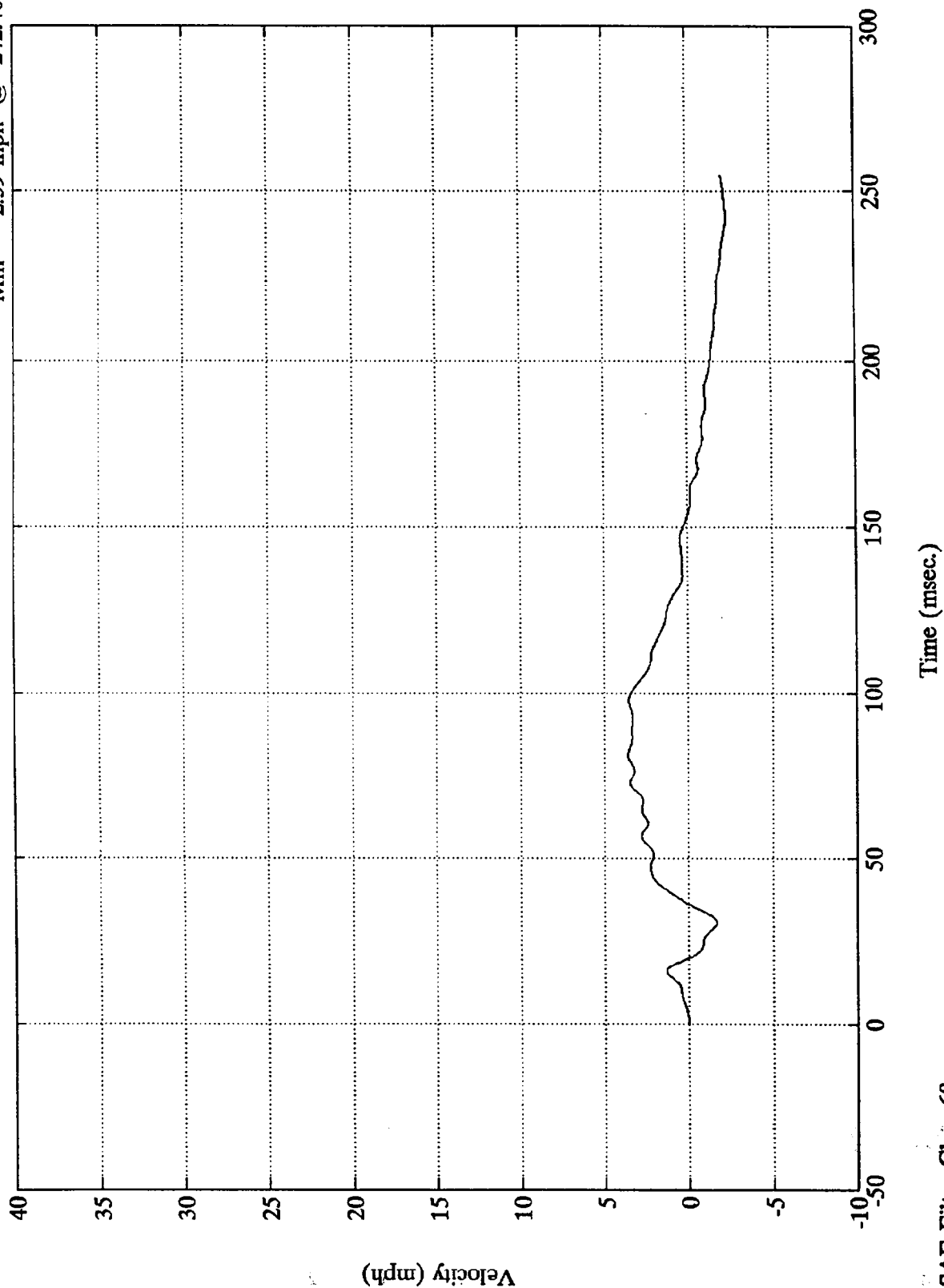
Acc. #9(z) Max = 19.31 Gs @ 34.20 msec
Min = -21.44 Gs @ 19.31 msec



NCAP TEST #8 1992 GEO METRO

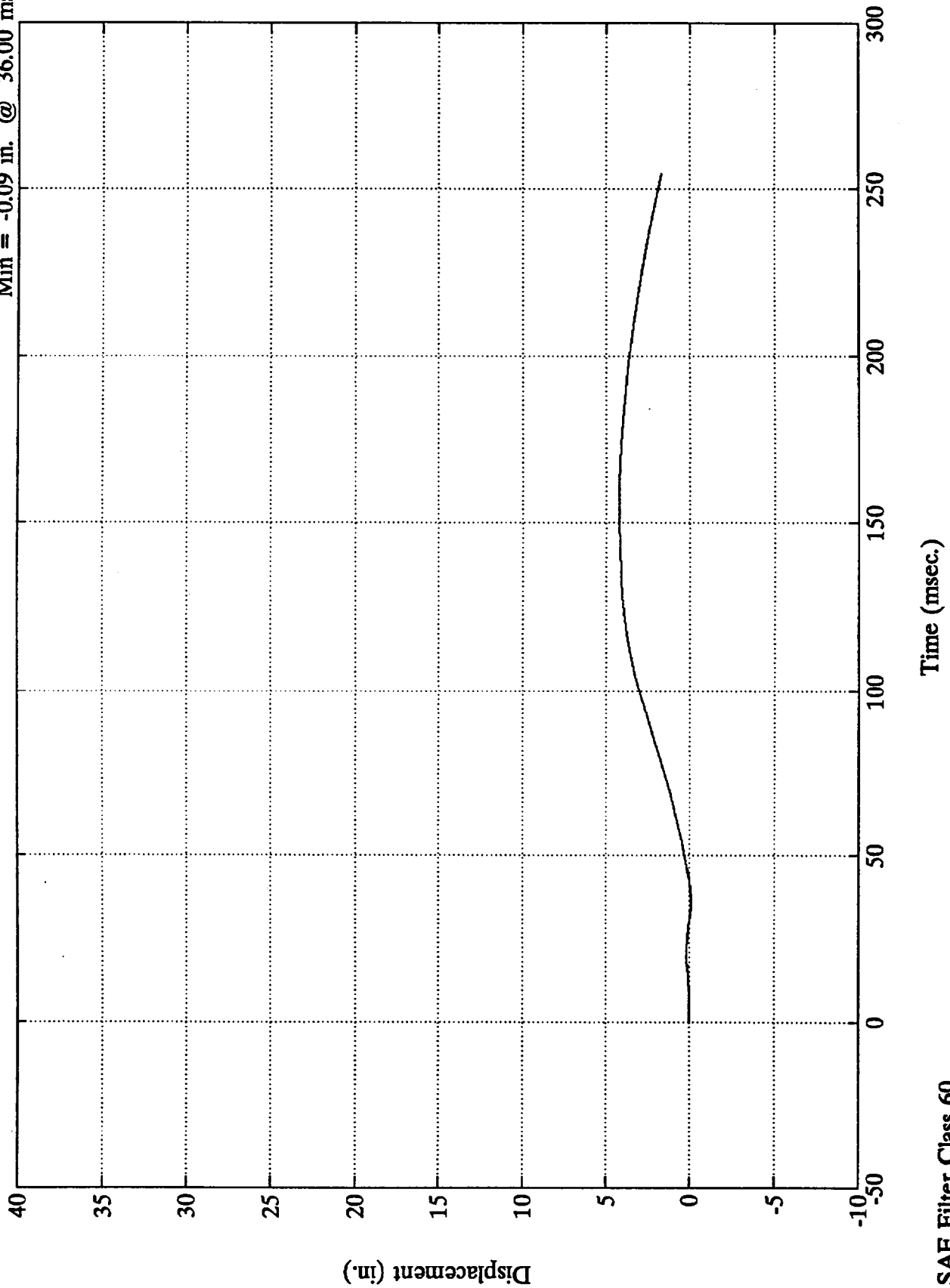
Max = 3.59 mph @ 81.36 msec
Min = -2.39 mph @ 242.40 msec

Acc. #9(z)



NCAP TEST #8 1992 GEO METRO

Acc. #9(z)
Max = 4.22 in. @ 154.80 msec
Min = -0.09 in. @ 36.00 msec



TEST NO. MN0102

LOAD CELL BARRIER DATA

FILTER CHANNEL CLASS

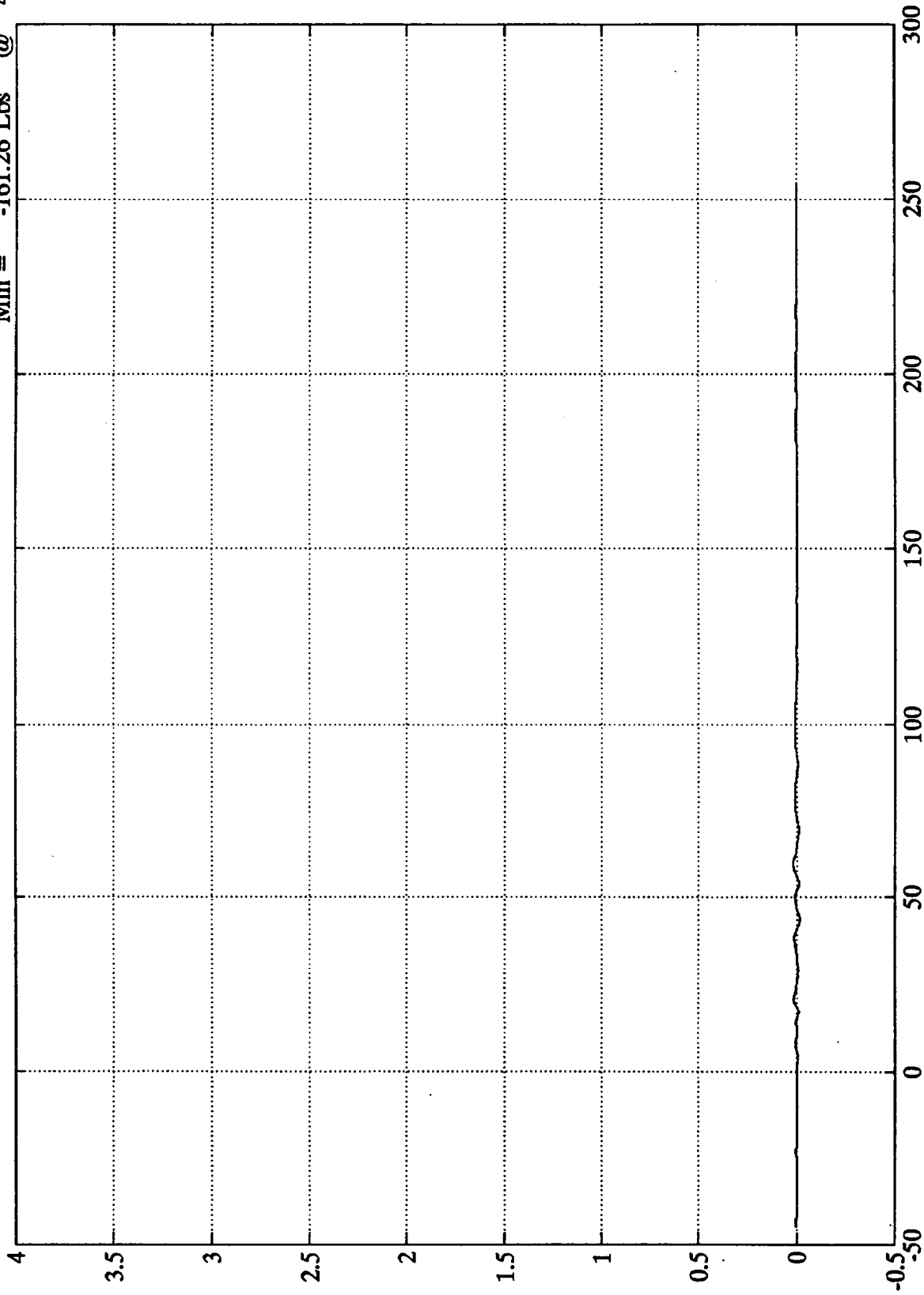
60

NCAP TEST #8 1992 GEO METRO

Max = 181.57 Lbs @ 59.76 msec
 Min = -161.26 Lbs @ 43.56 msec

Barrier Load Cell A1

x10⁴



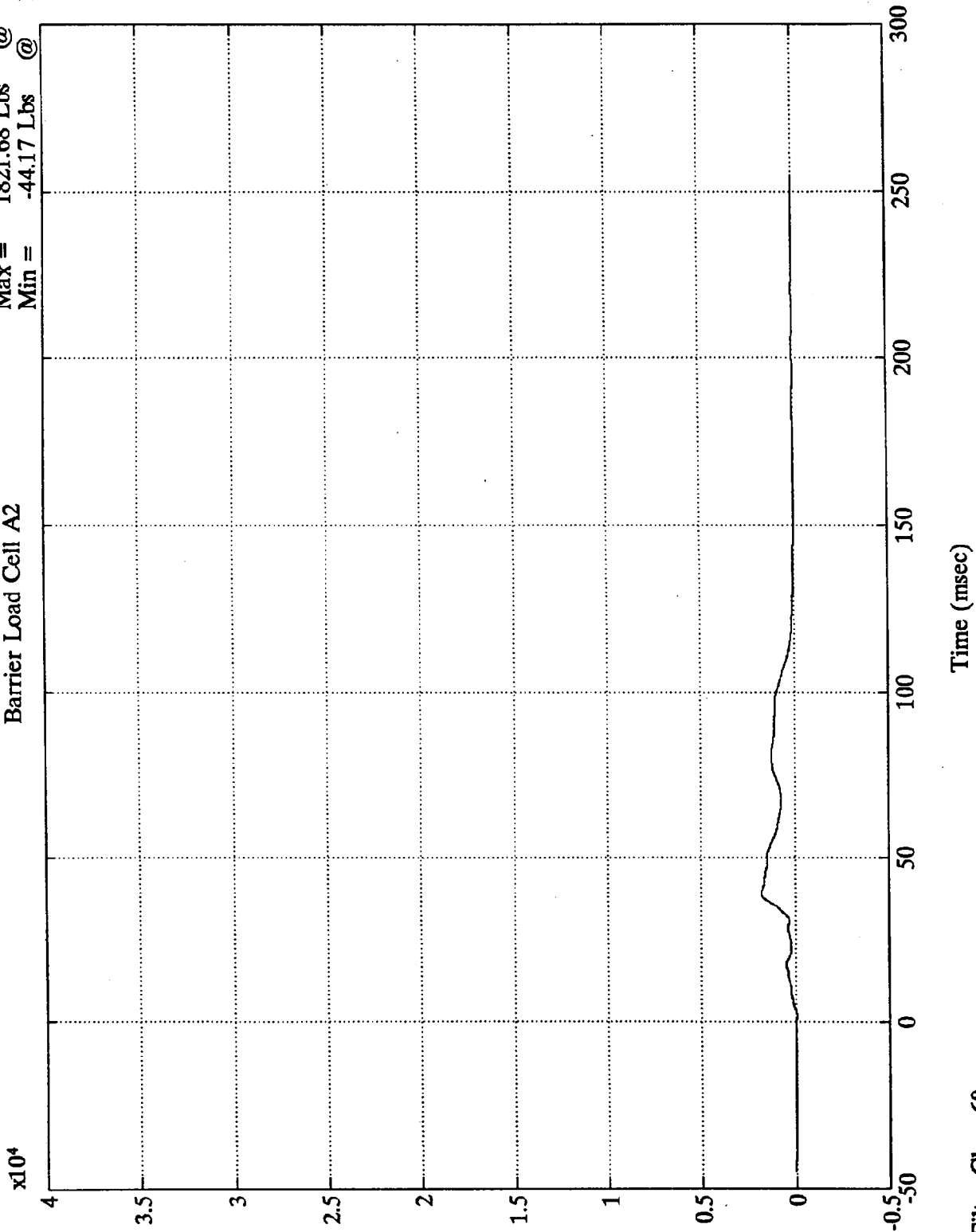
B-27

Sae Filter Class 60

7951-2

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell A2
Max = 1821.68 Lbs @ 39.00 msec
Min = -44.17 Lbs @ 1.67 msec

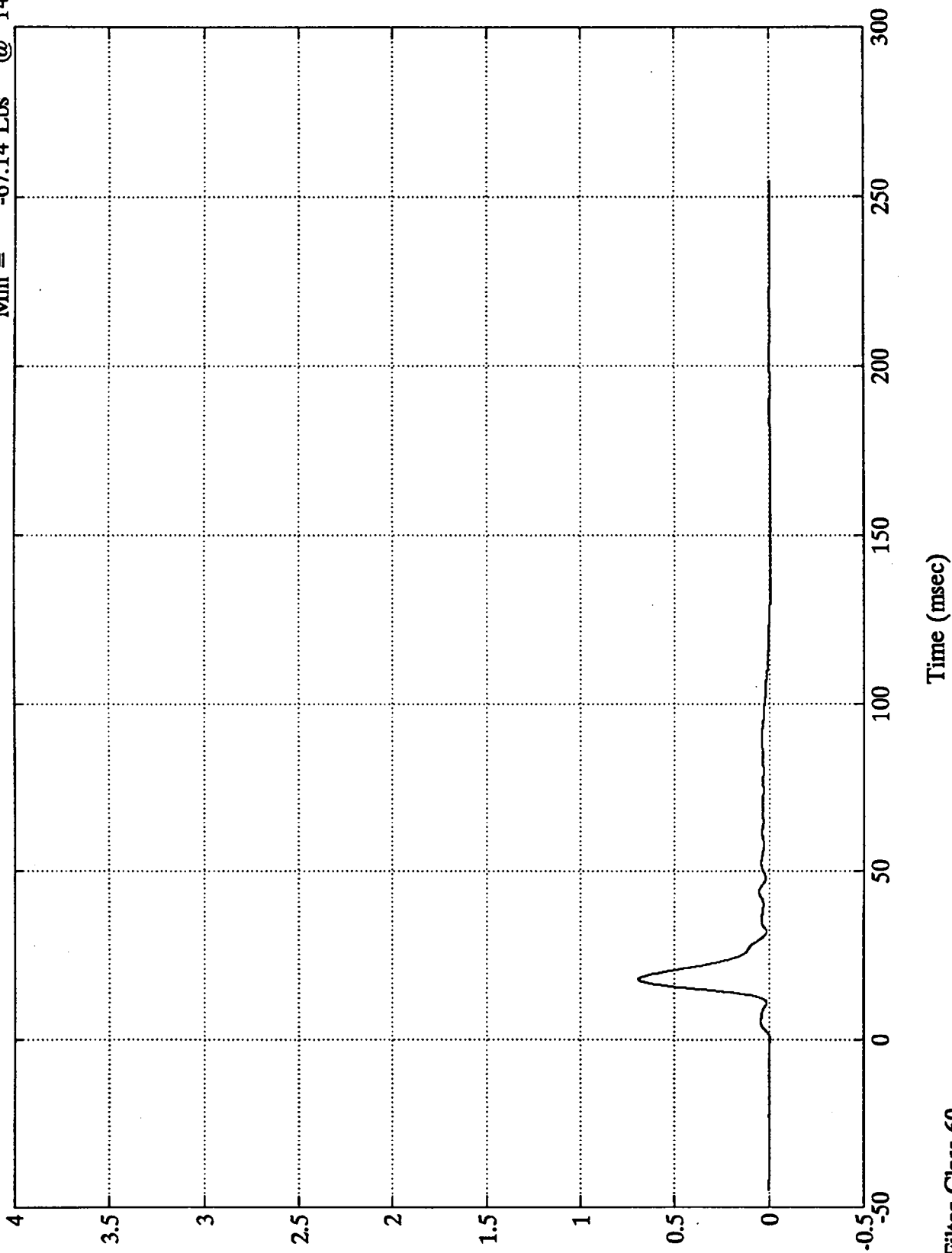


B-28

7951-2 Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

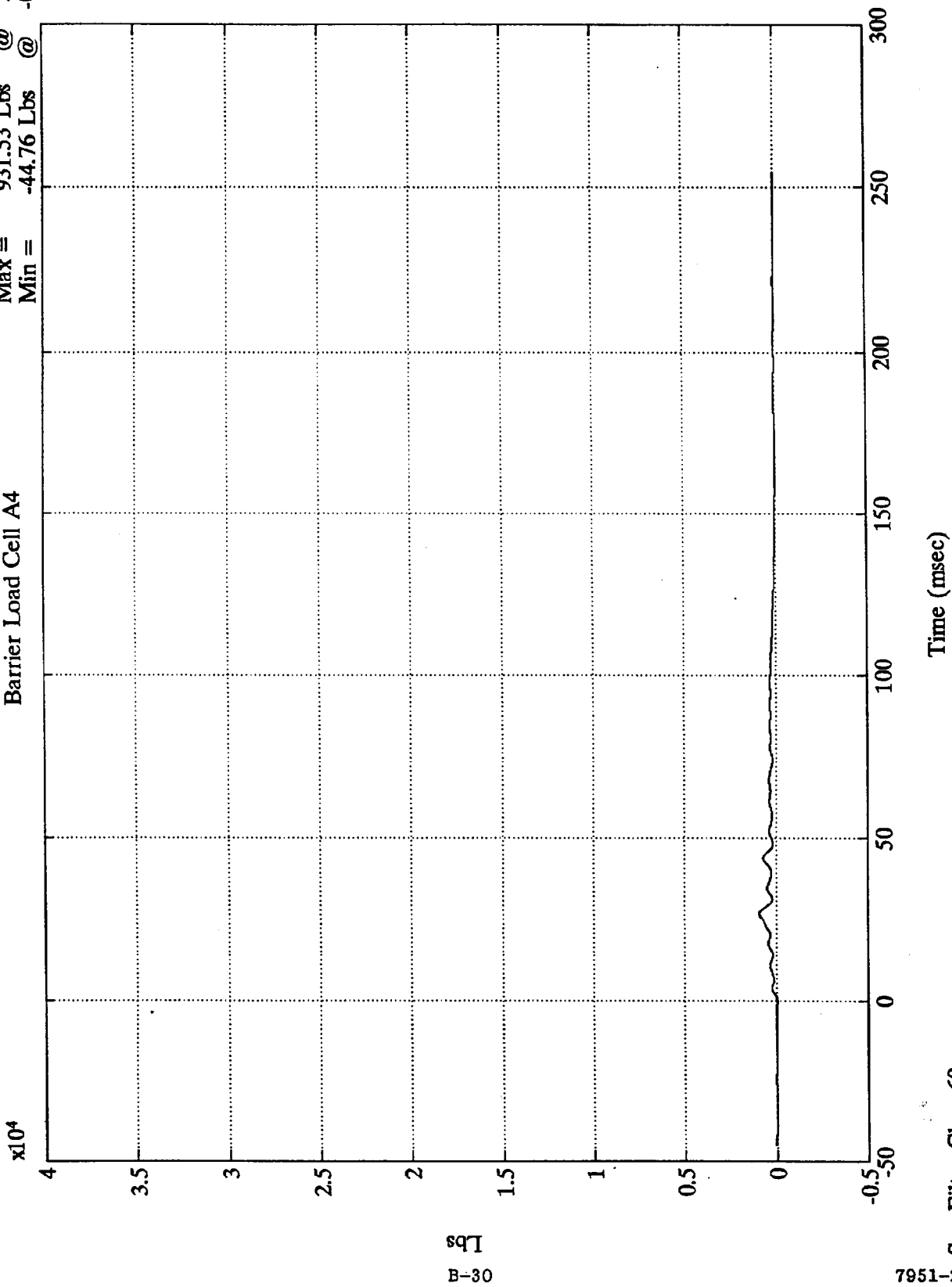
Barrier Load Cell A3
 Max = 6916.29 Lbs @ 17.75 msec
 Min = -67.14 Lbs @ 146.52 msec



NCAP TEST #8 1992 GEO METRO

Max = 931.53 Lbs @ 26.87 msec
Min = -44.76 Lbs @ -0.24 msec

Barrier Load Cell A4



B-30

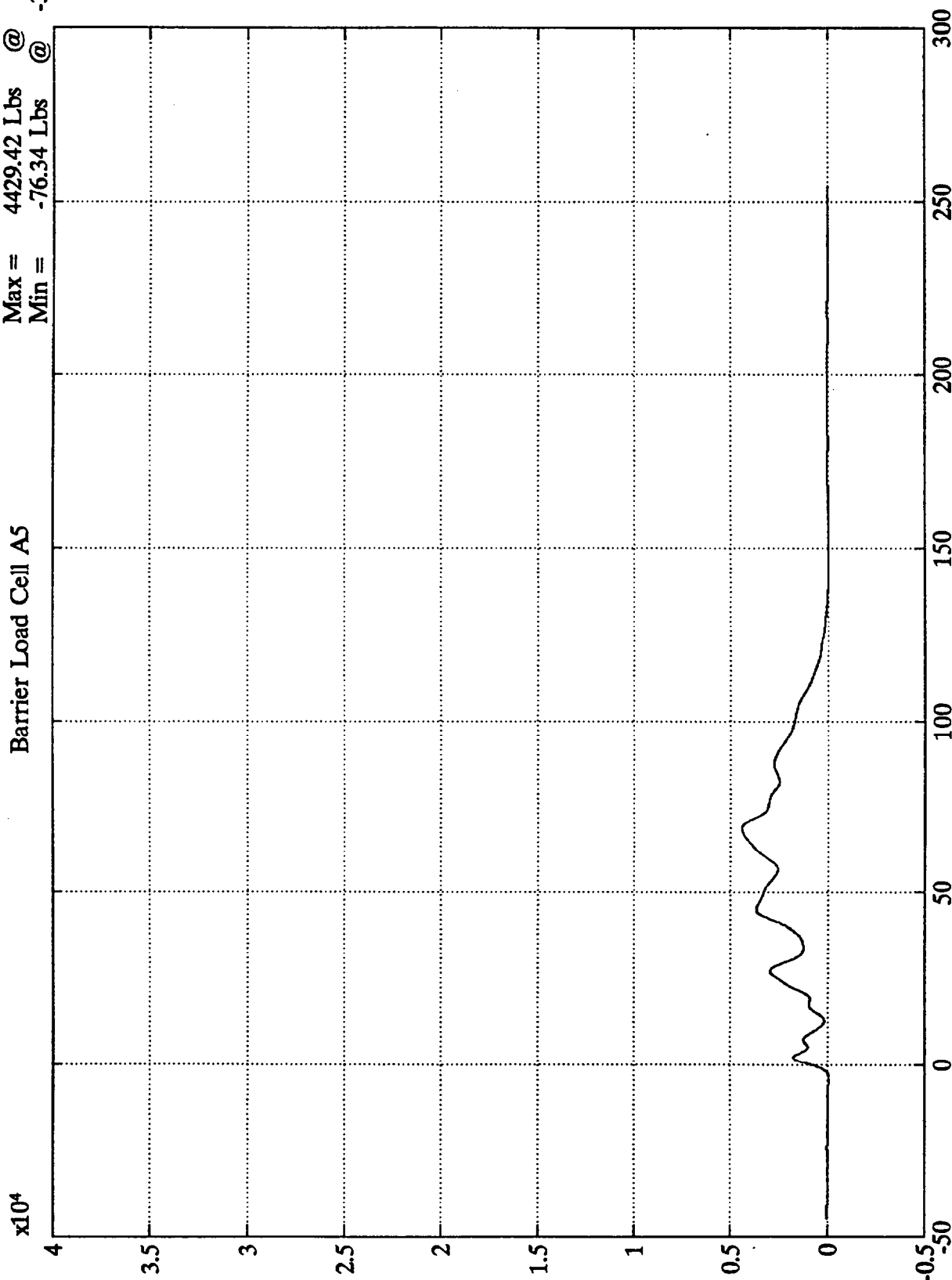
7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 4429.42 Lbs @ 68.63 msec
Min = -76.34 Lbs @ -3.84 msec

Barrier Load Cell A5



Time (msec)

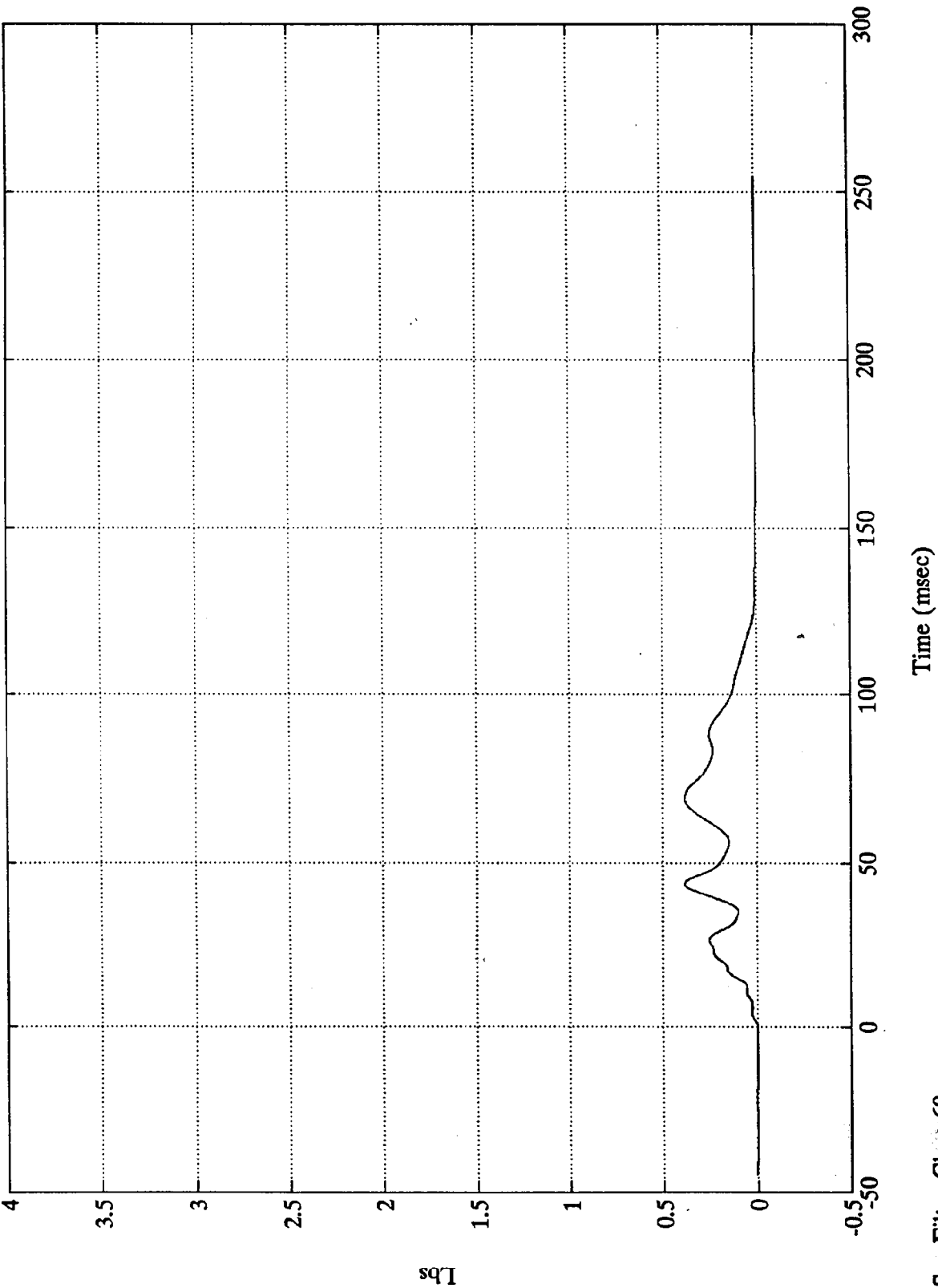
Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

$\times 10^4$

Barrier Load Cell A6

Max = 3871.43 Lbs @ 69.12 msec
Min = -33.40 Lbs @ -35.04 msec



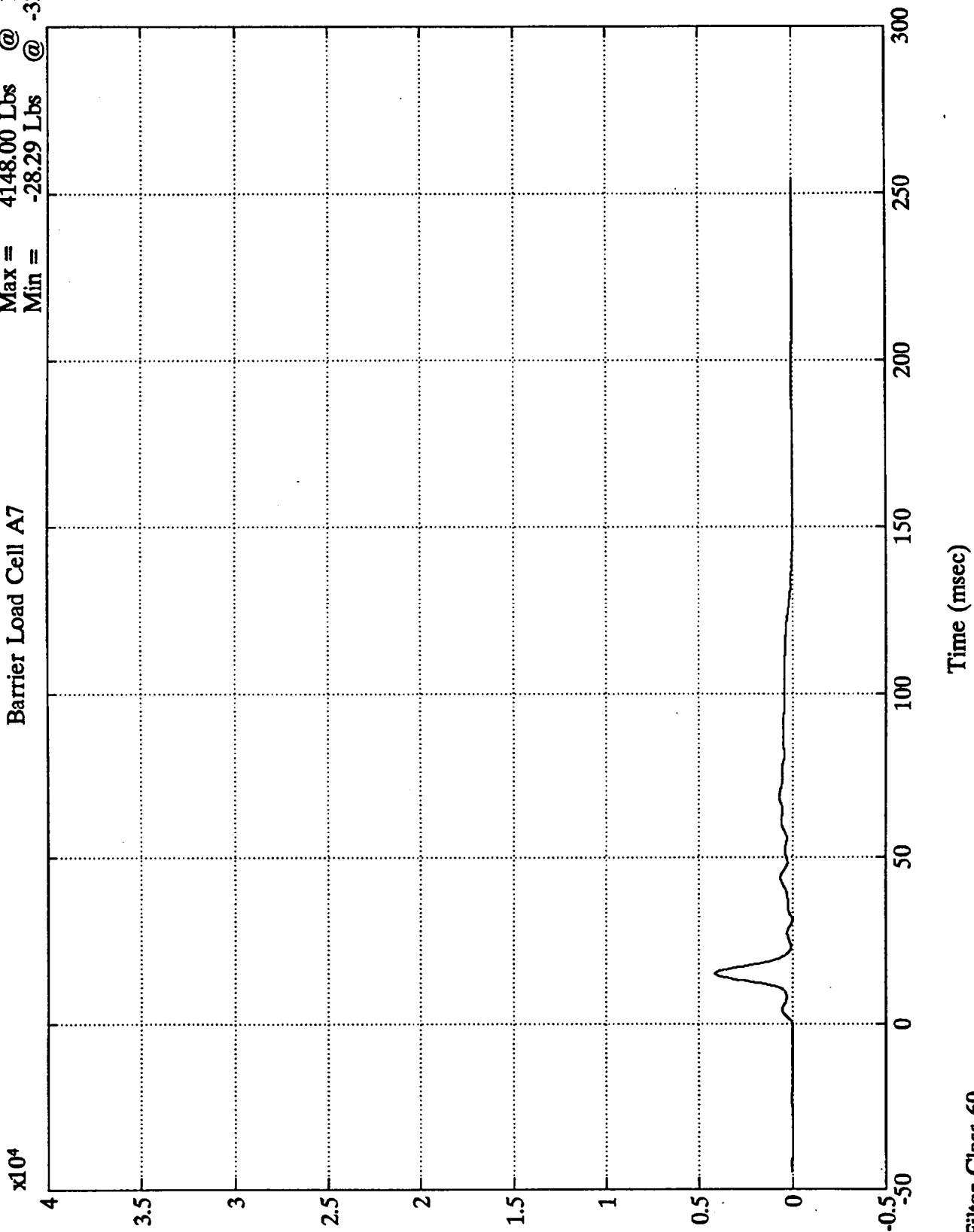
B-32

7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell A7
Max = 4148.00 Lbs @ 15.23 msec
Min = -28.29 Lbs @ -33.84 msec



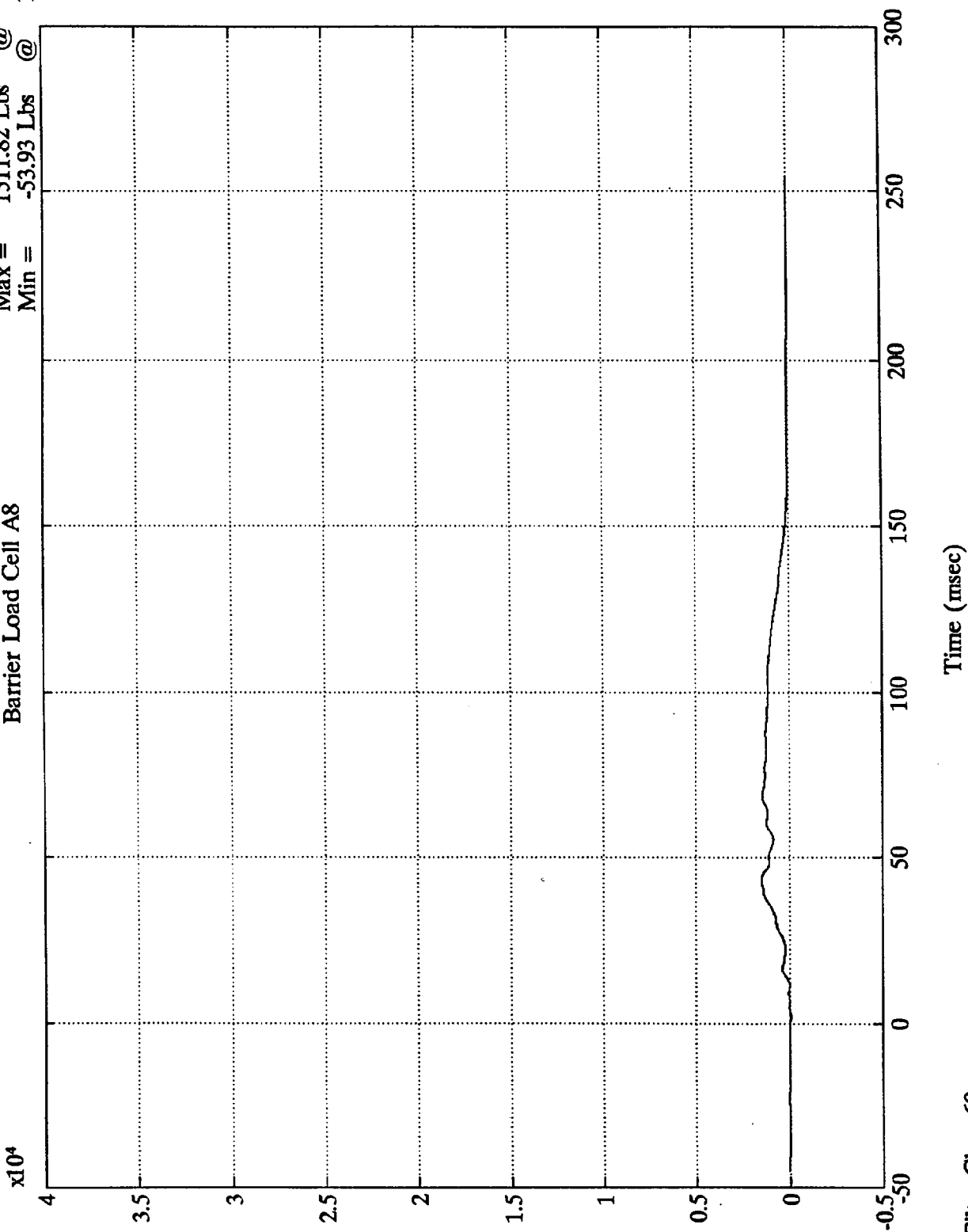
B-33

7951-2 Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

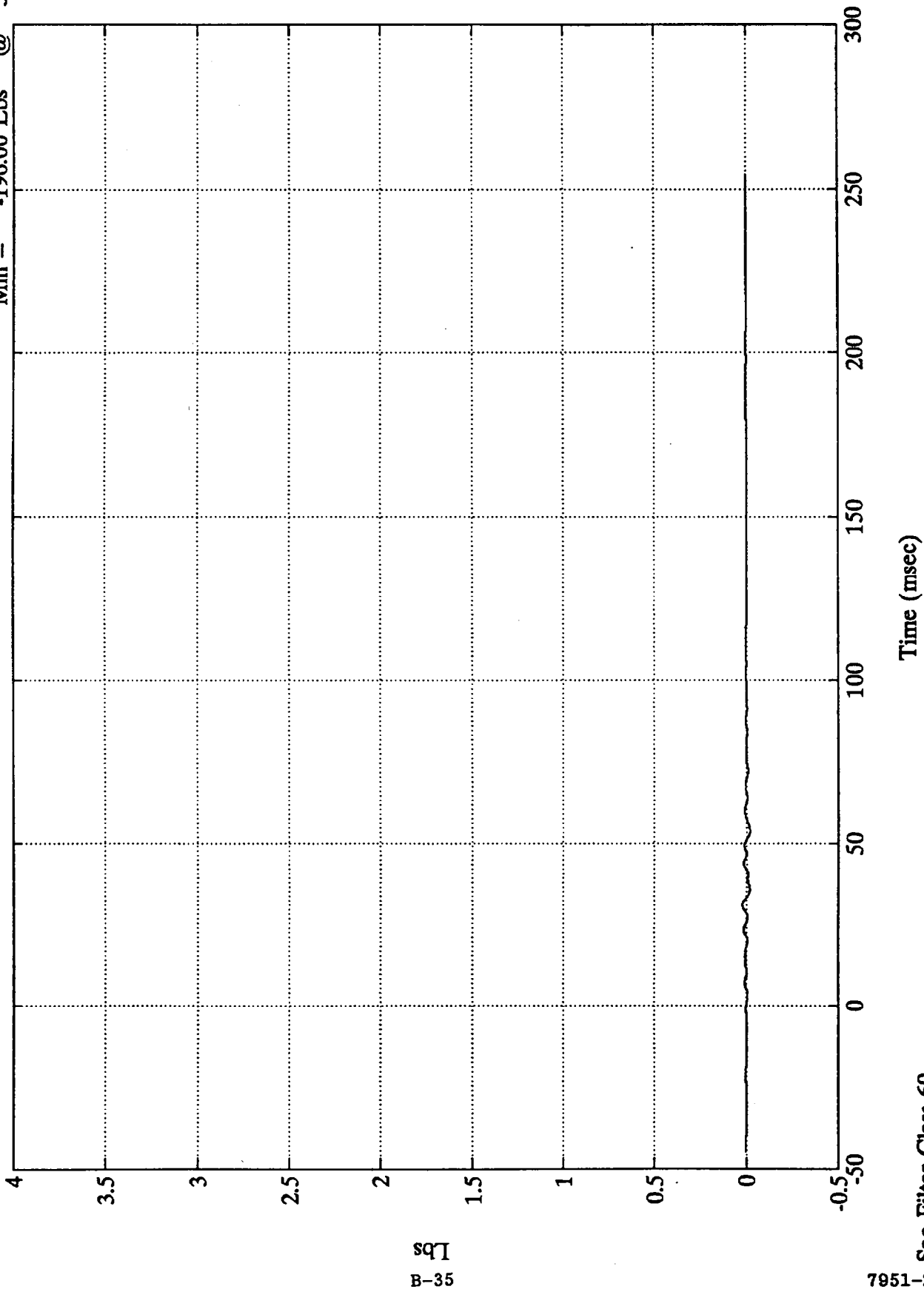
Max = 1511.82 Lbs @ 42.95 msec
Min = -53.93 Lbs @ 1.91 msec

Barrier Load Cell A8



NCAP TEST #8 1992 GEO METRO

Barrier Load Cell A9
Max = 220.61 Lbs @ 30.71 msec
Min = -196.00 Lbs @ 53.75 msec



B-35

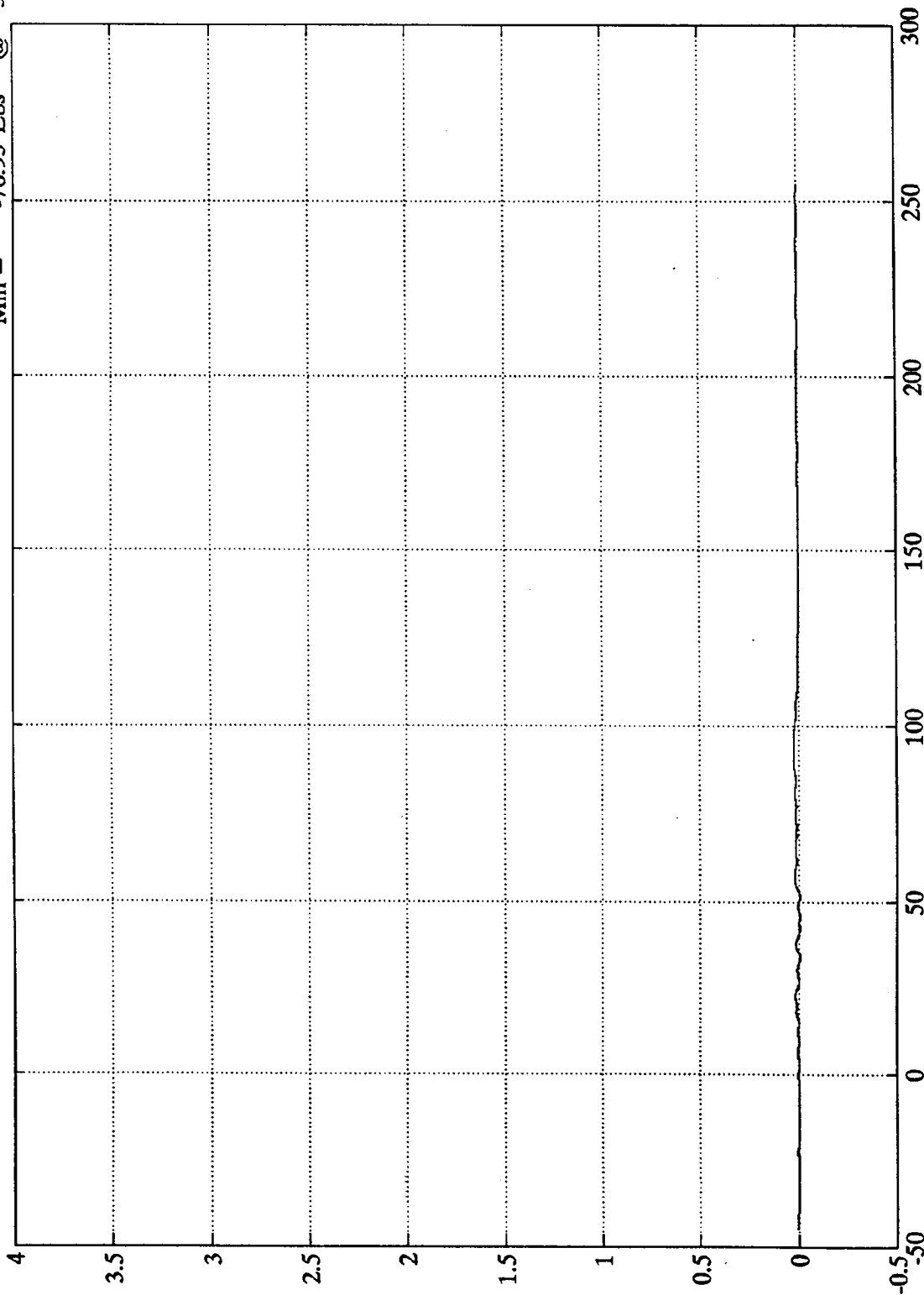
7951-2 Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 239.68 Lbs @ 91.80 msec
 Min = -76.95 Lbs @ 33.95 msec

Barrier Load Cell B1

x10⁴



B-36

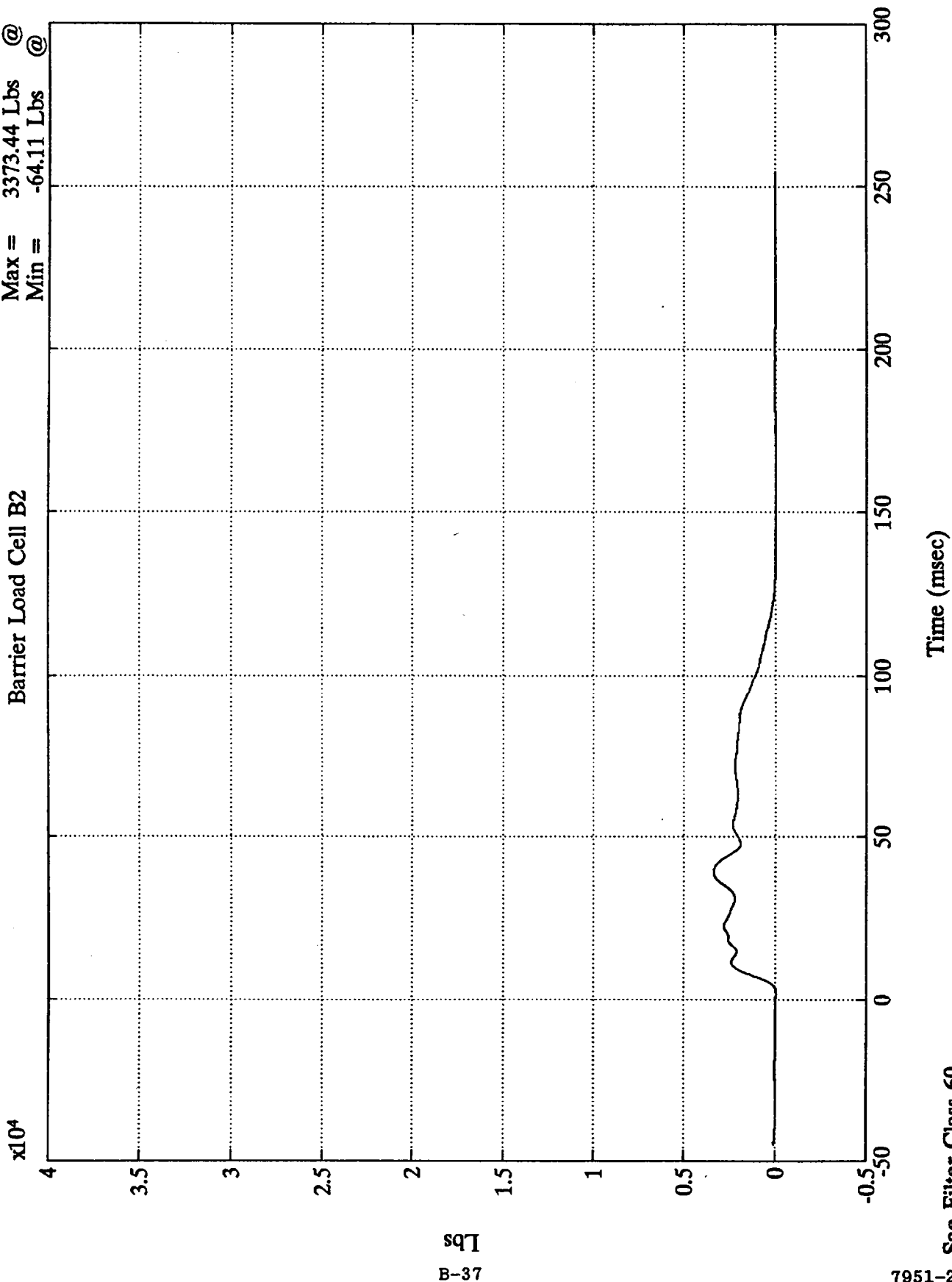
7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 3373.44 Lbs @ 39.23 msec
Min = -64.11 Lbs @ 2.27 msec

Barrier Load Cell B2



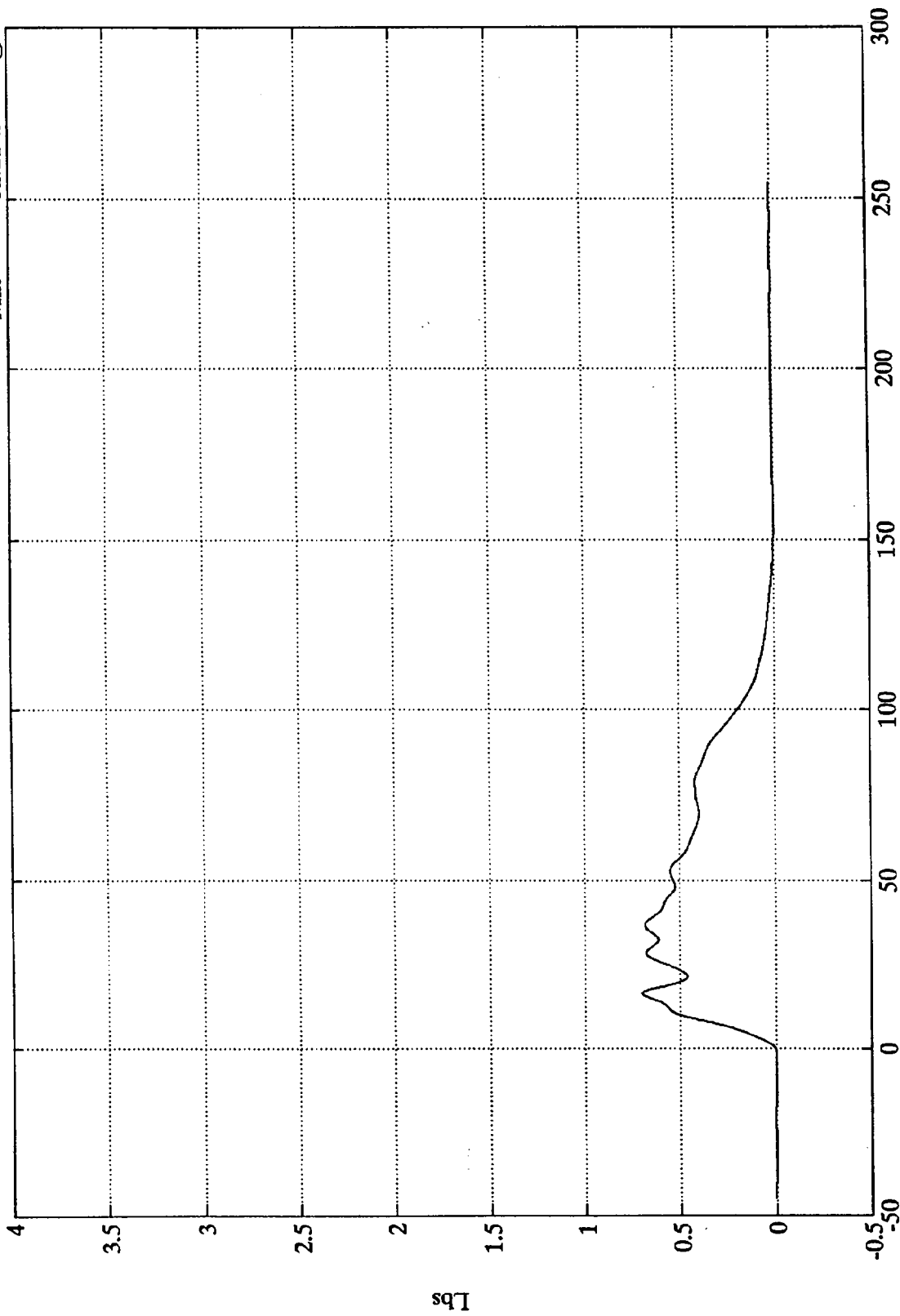
Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

$\times 10^4$

Barrier Load Cell B3

Max = 7026.69 Lbs @ 16.43 msec
Min = -32.21 Lbs @ -1.92 msec



B-38
Lbs

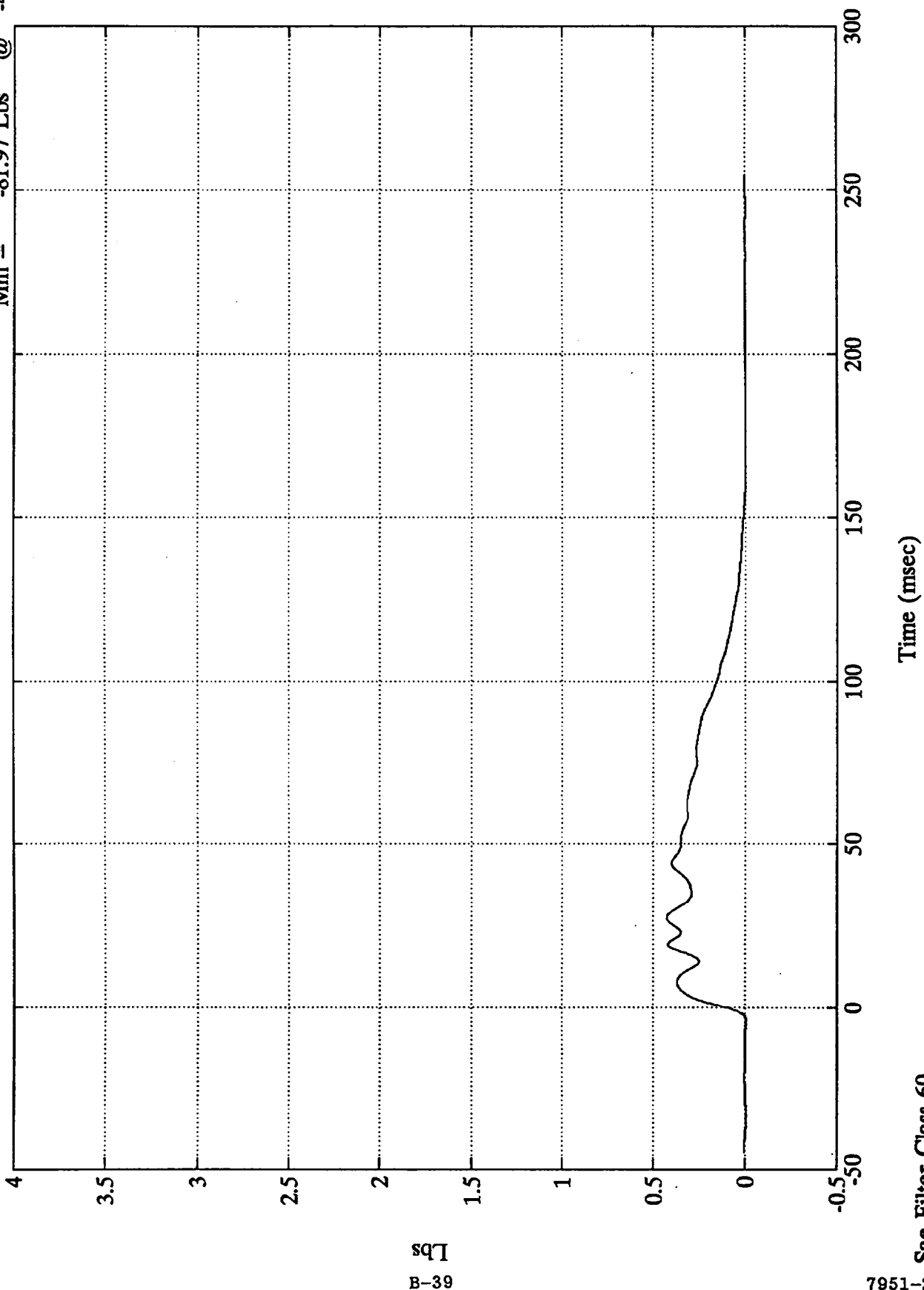
Time (msec)

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 4291.45 Lbs @ 27.36 msec
 Min = -81.97 Lbs @ -4.20 msec

Barrier Load Cell B4



B-39

7951-2

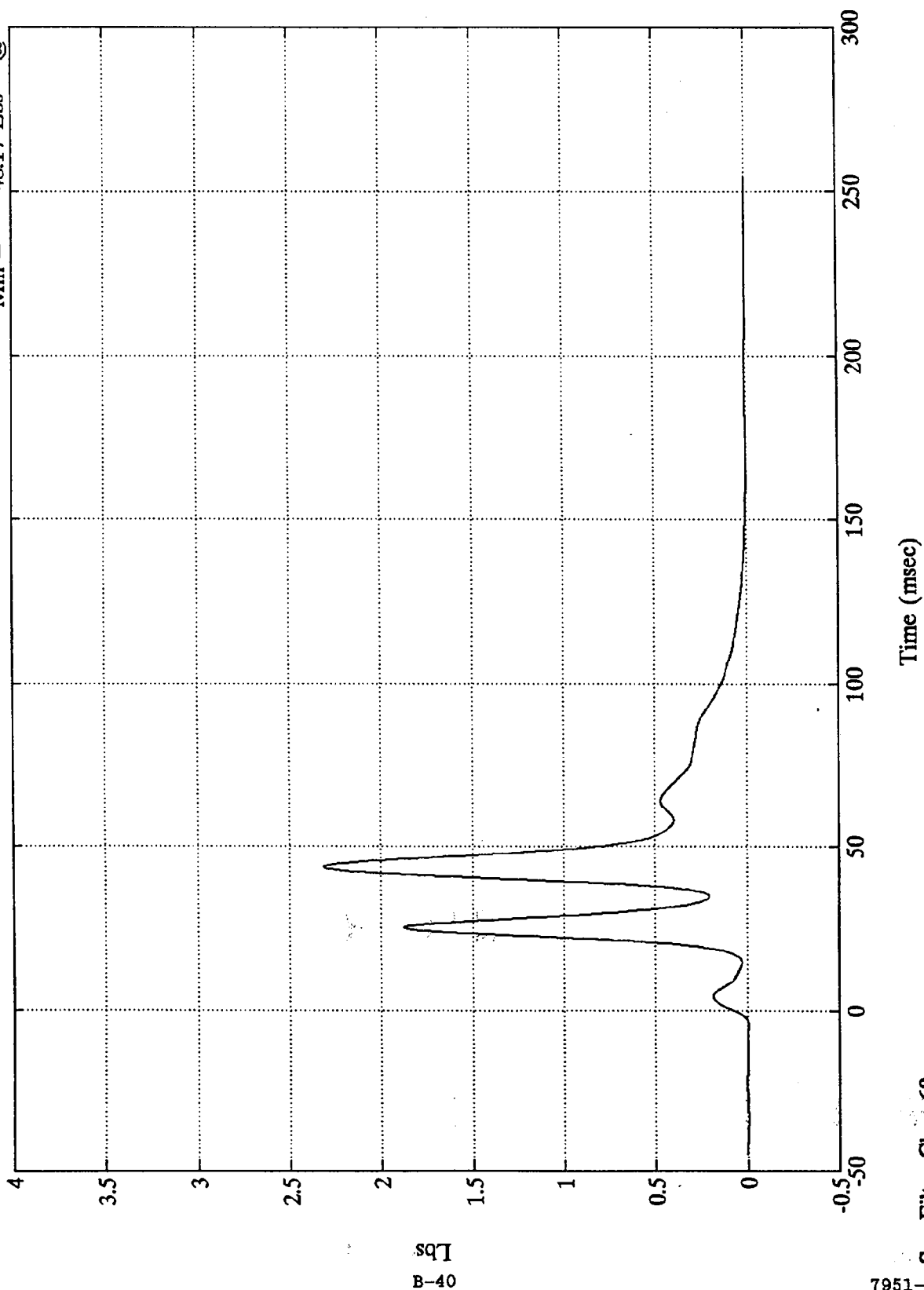
Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

$\times 10^4$

Barrier Load Cell B5

Max = 23150.87 Lbs @ 43.56 msec
Min = -48.17 Lbs @ -4.56 msec

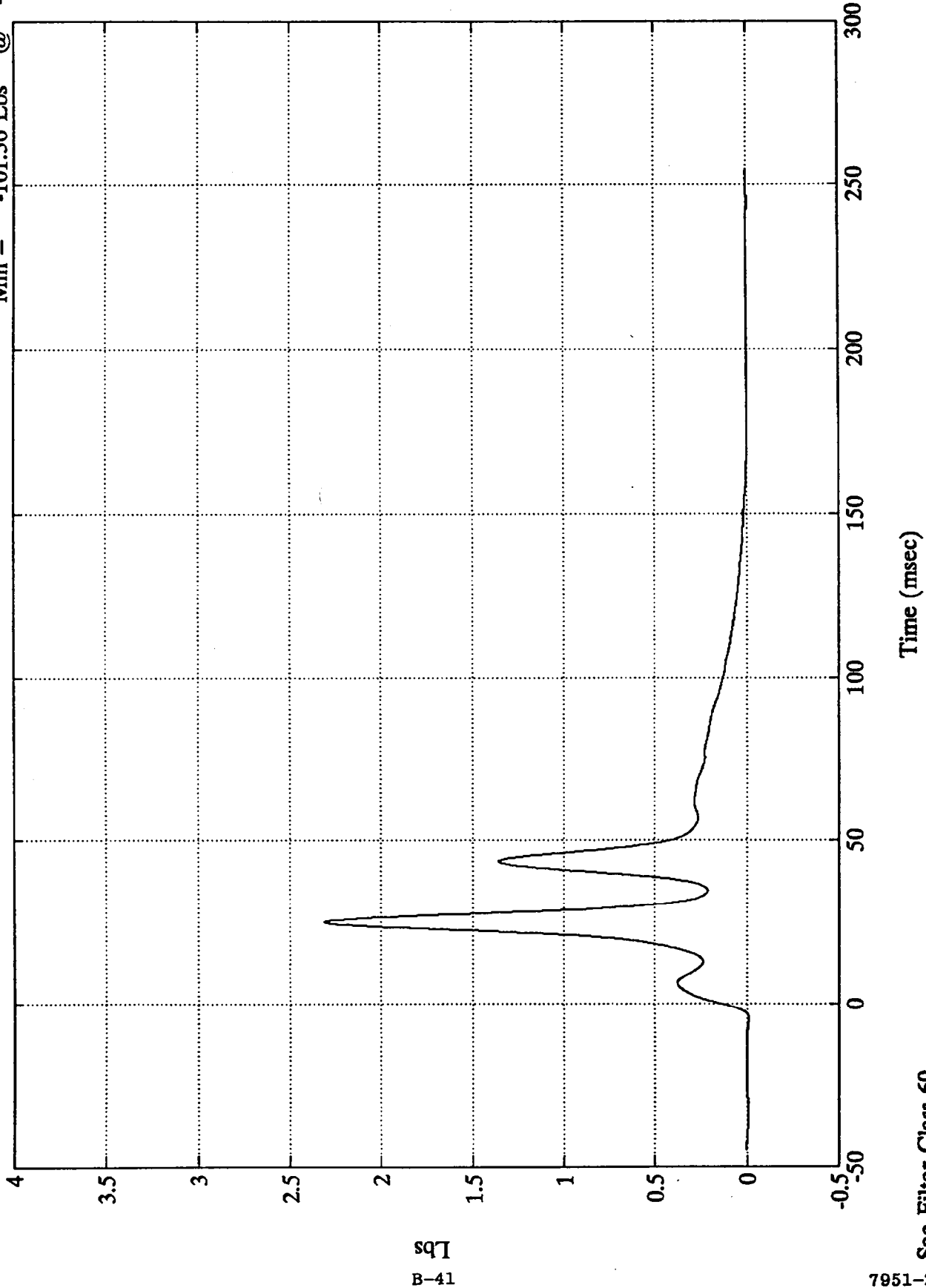


Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell B6

Max = 23140.06 Lbs @ 25.07 msec
Min = -101.36 Lbs @ -4.68 msec



B-41
Lbs

7951-2

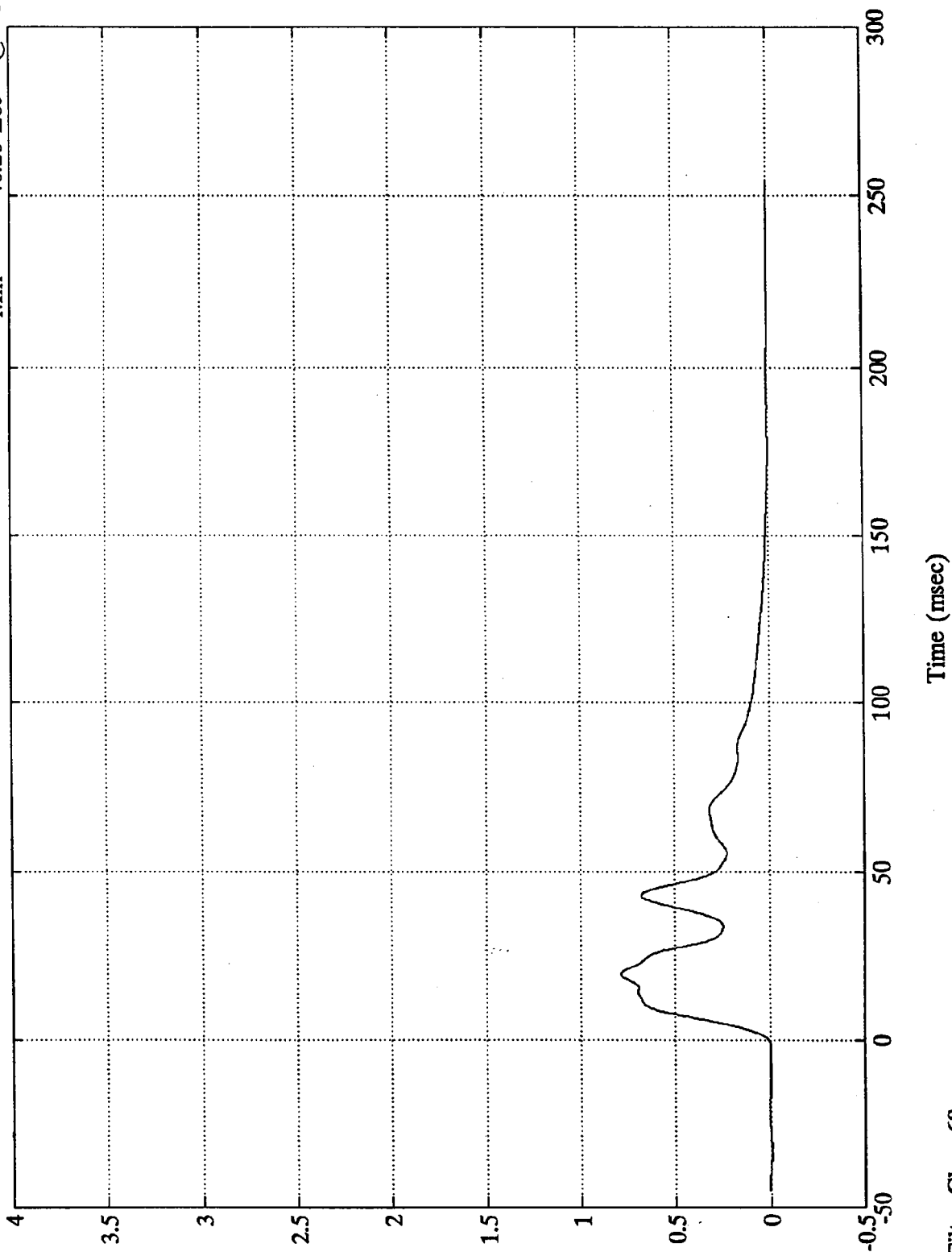
Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

$\times 10^4$

Barrier Load Cell B7

Max = 7882.52 Lbs @ 19.55 msec
Min = -46.20 Lbs @ -33.60 msec



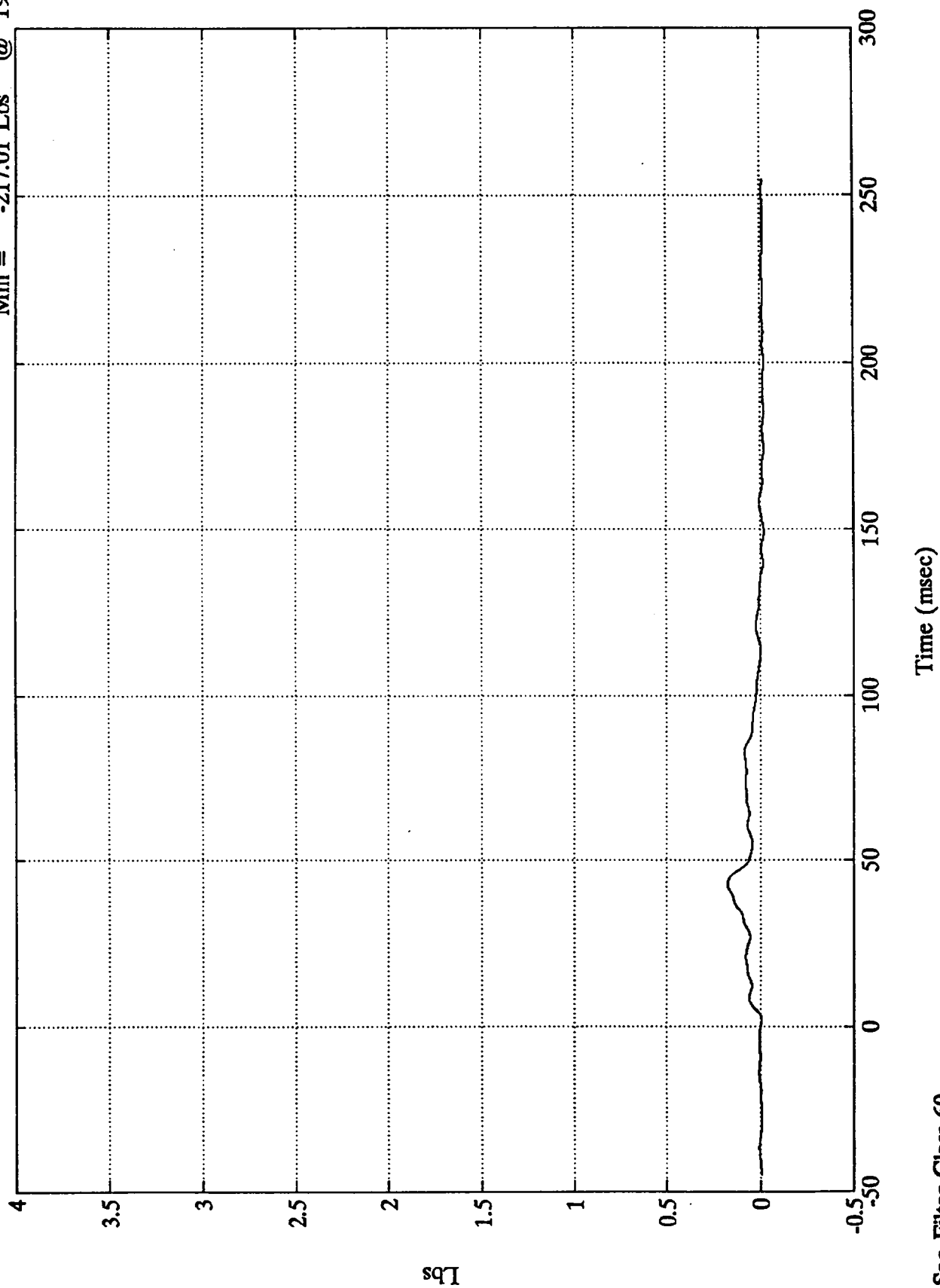
Lbs
B-42

7951-2 Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 1763.56 Lbs @ 42.84 msec
Min = -217.01 Lbs @ 199.91 msec

Barrier Load Cell B8

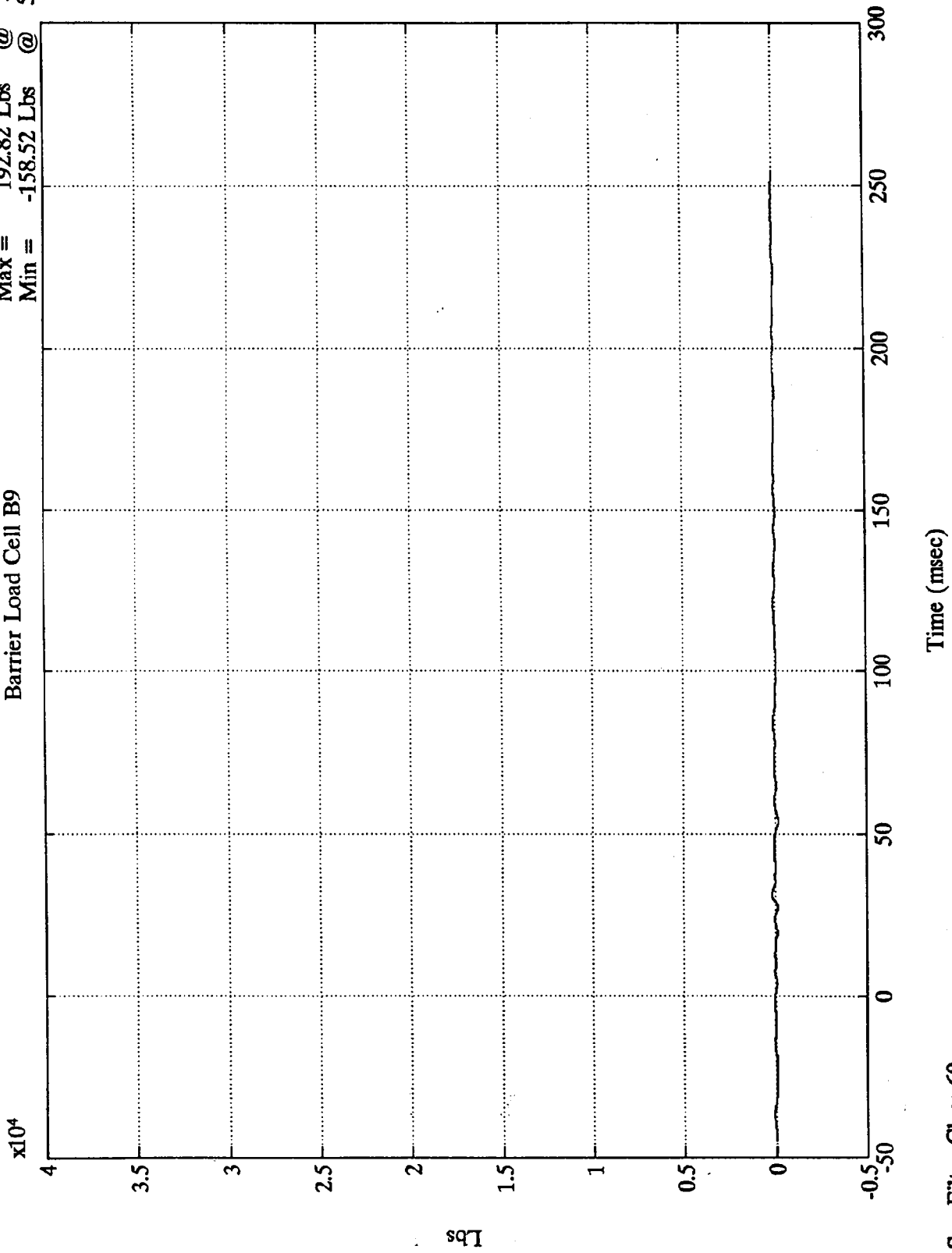


B-43

7951-2 Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

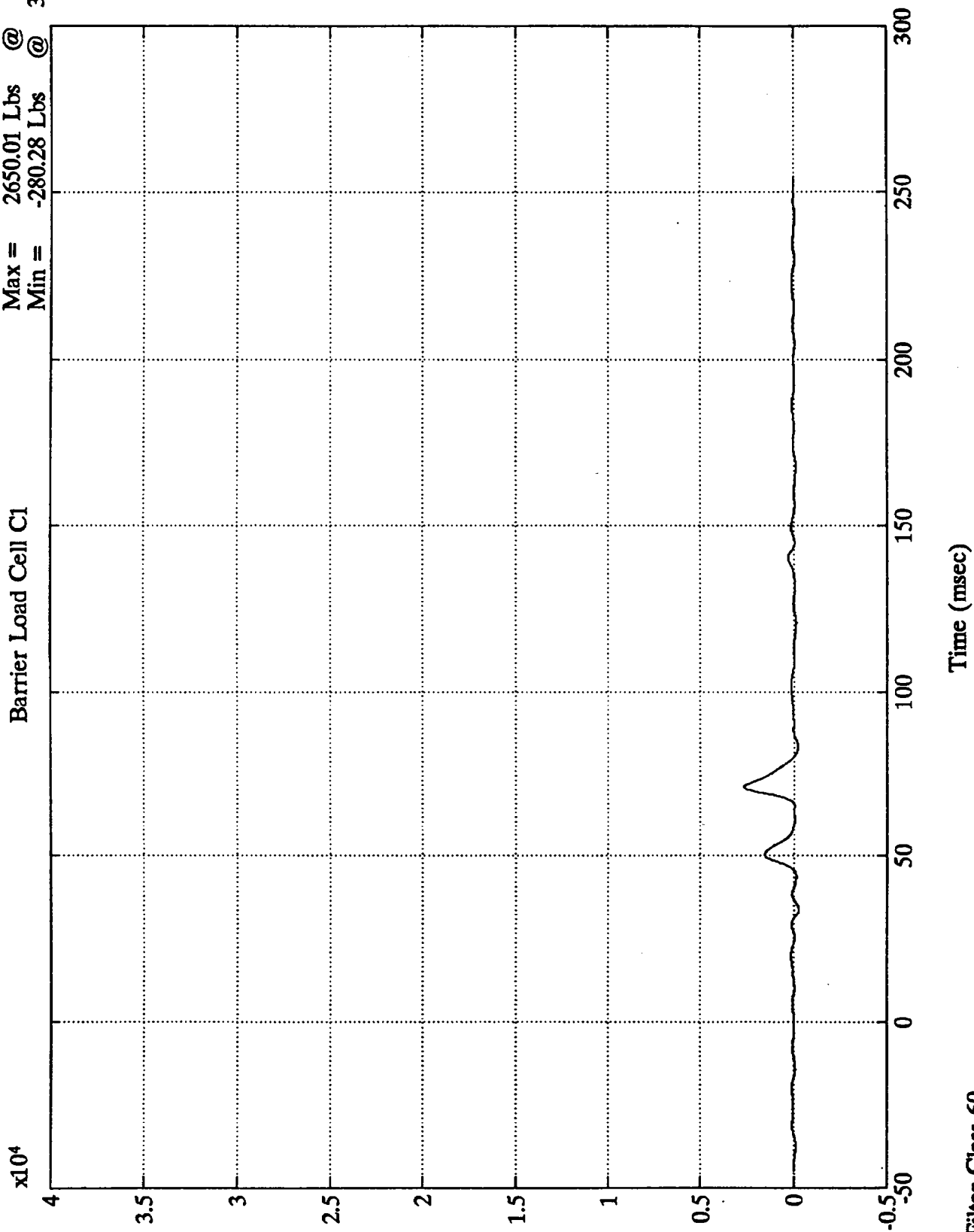
Barrier Load Cell B9
Max = 192.82 Lbs @ 31.31 msec
Min = -158.52 Lbs @ 54.00 msec



sqT
B-44

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell C1
Max = 2650.01 Lbs @ 71.27 msec
Min = -280.28 Lbs @ 33.84 msec

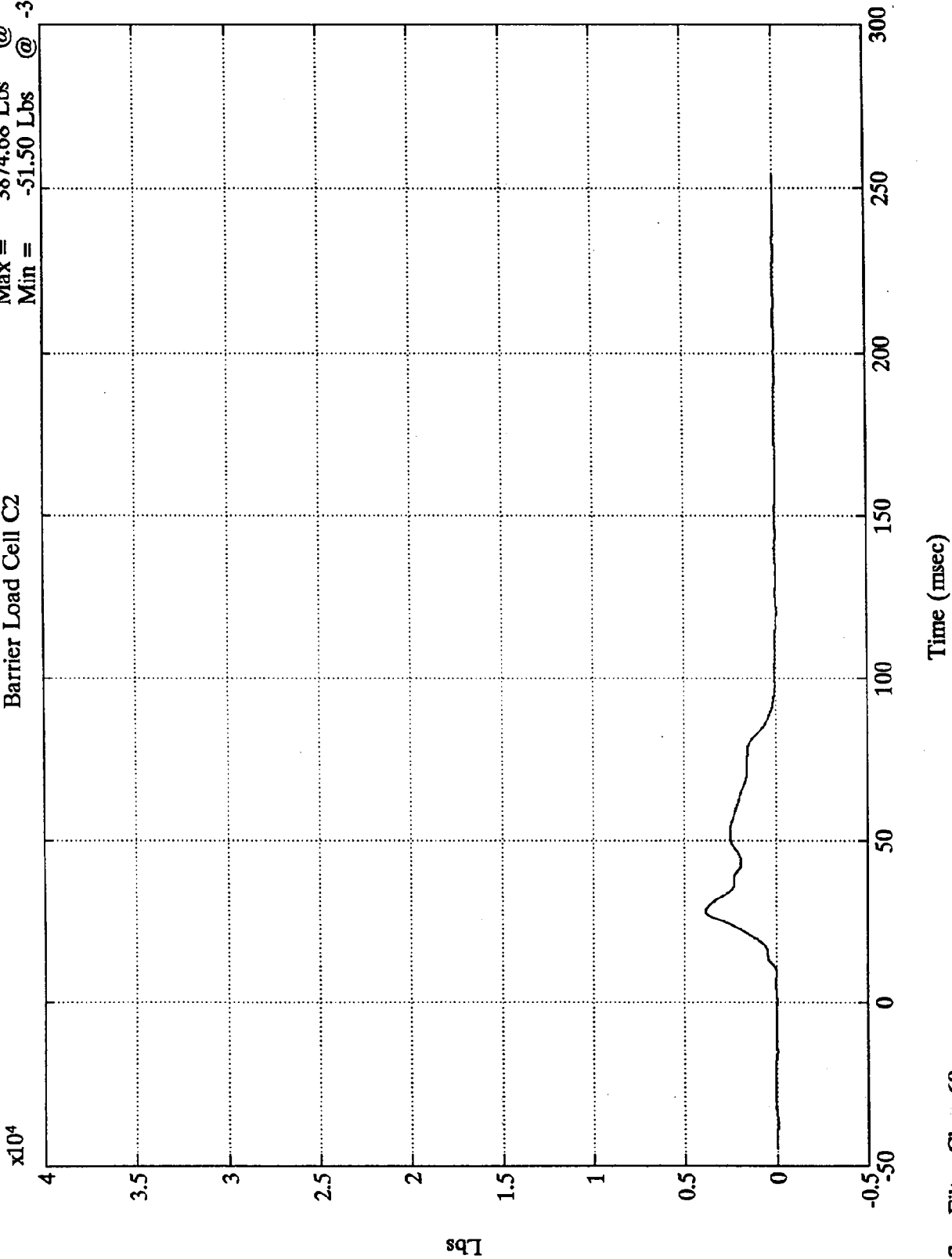


B-45

7951-2 Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell C2
Max = 3874.68 Lbs @ 27.48 msec
Min = -51.50 Lbs @ -36.48 msec



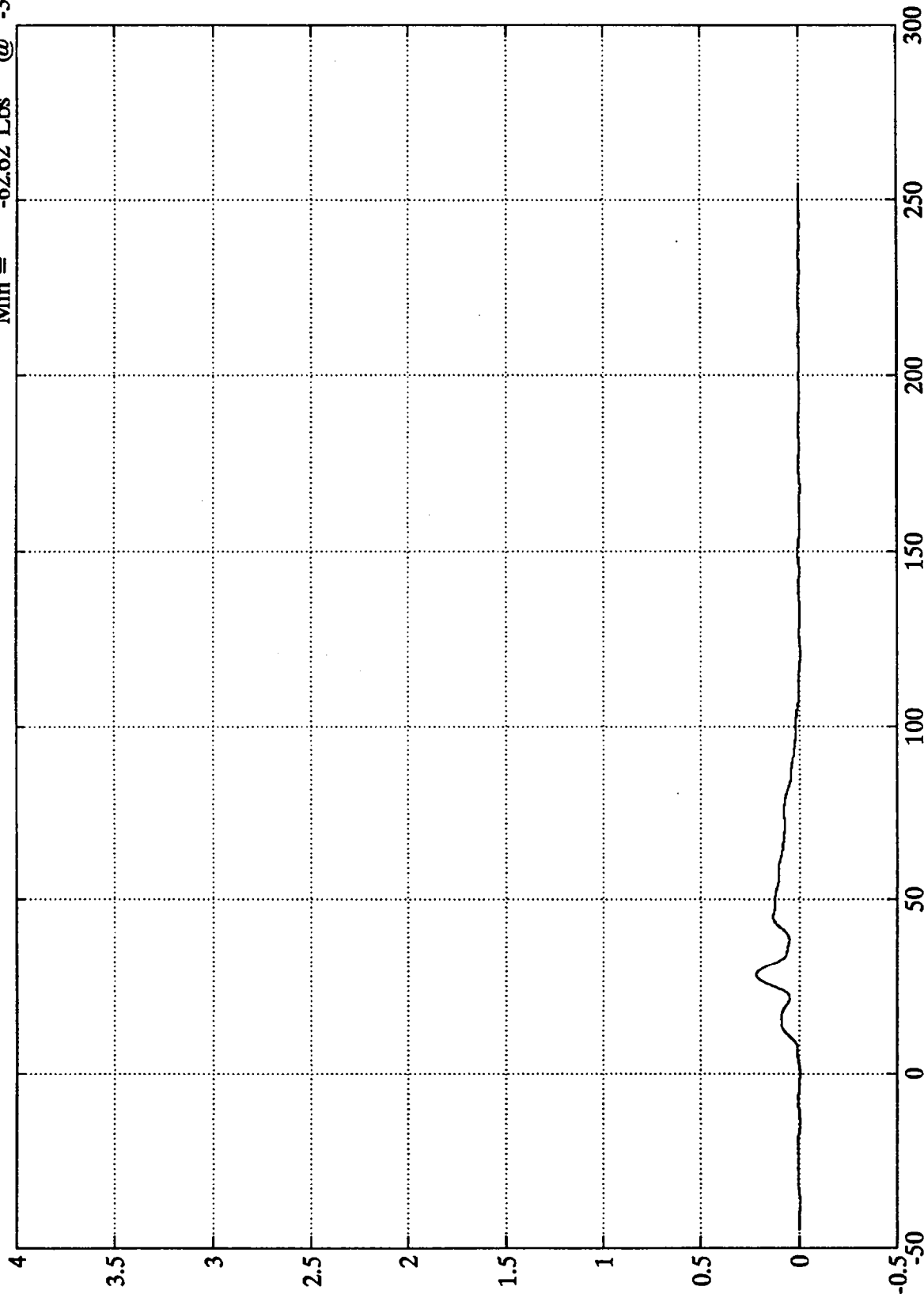
B-46
Lbs

7951-2
Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 2185.86 Lbs @ 28.31 msec
Min = -62.62 Lbs @ -36.96 msec

Barrier Load Cell C3



B-47

Time (msec)

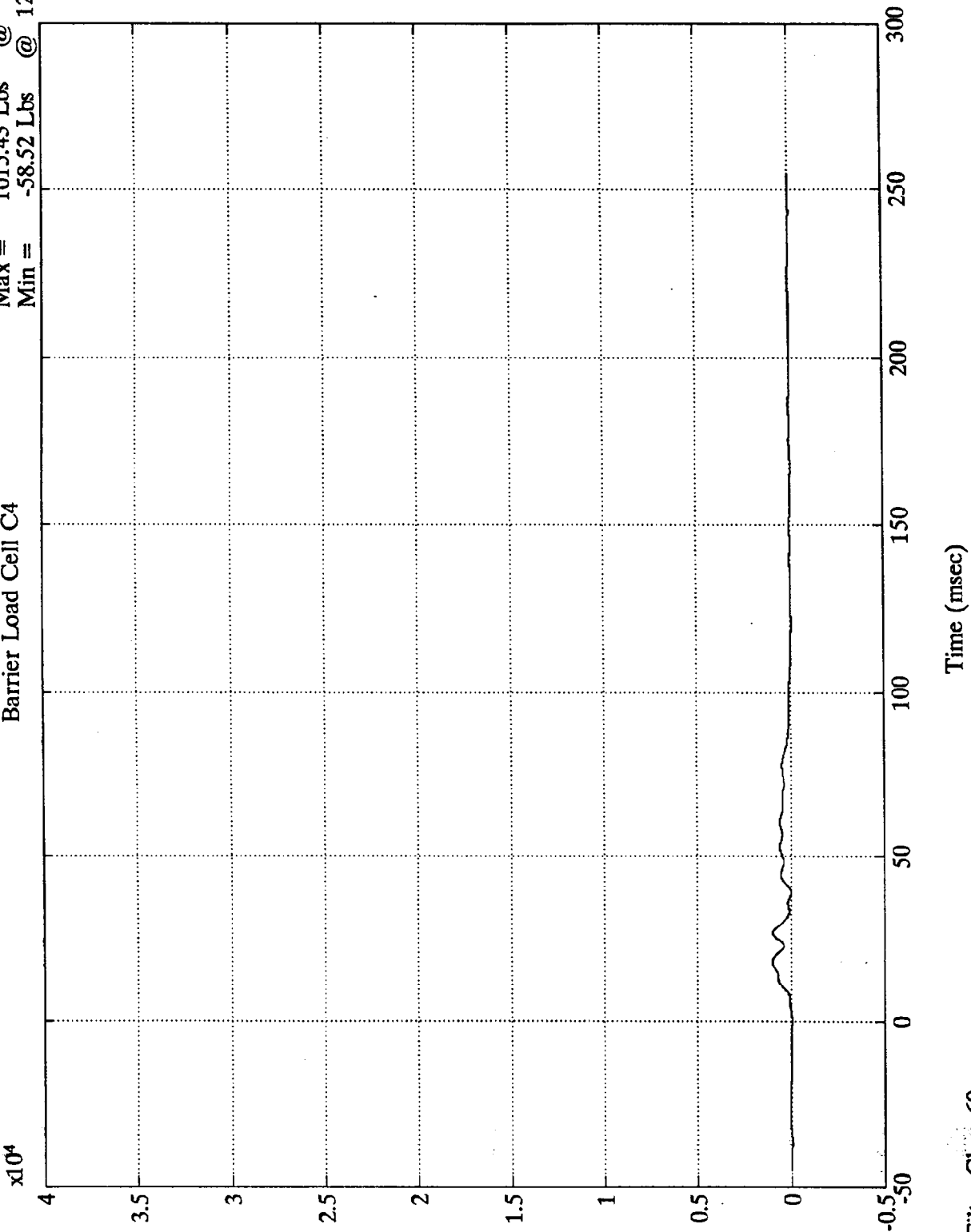
Sae Filter Class 60

7951-2

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell C4

Max = 1015.43 Lbs @ 18.00 msec
Min = -58.52 Lbs @ 120.84 msec

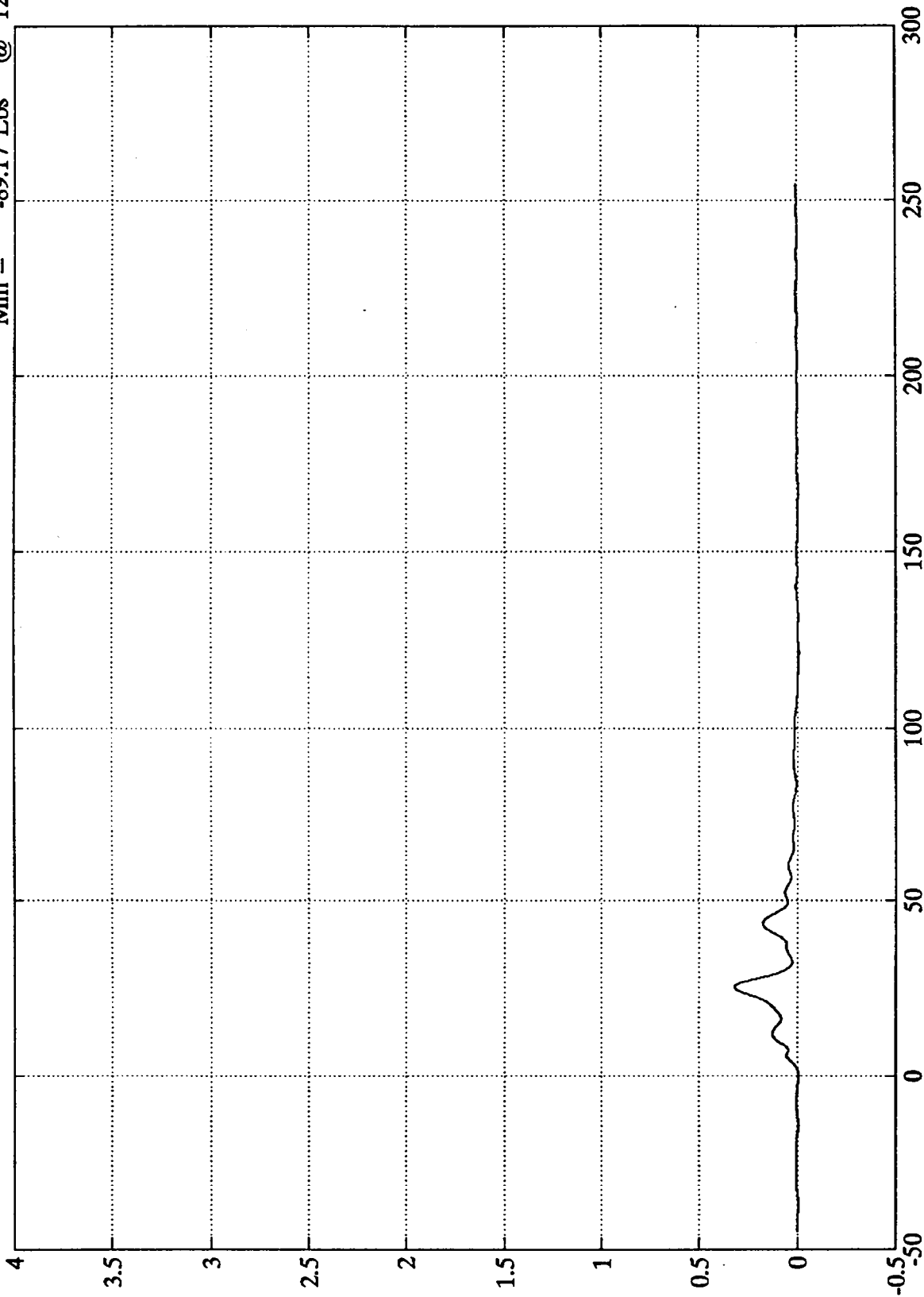


B-48
Lbs

7951-2 Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell C5
Max = 3182.38 Lbs @ 25.20 msec
Min = -89.17 Lbs @ 121.31 msec

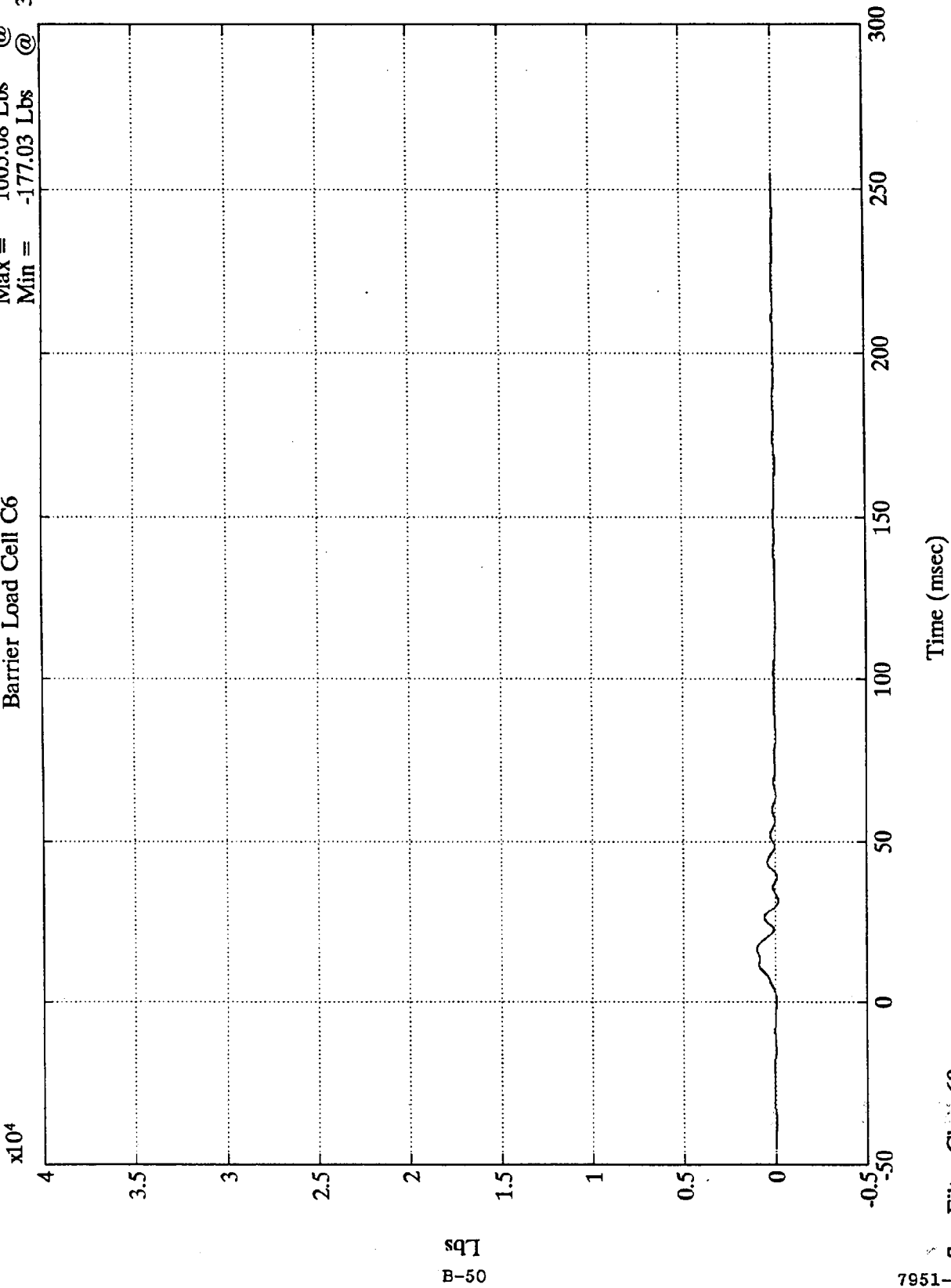


B-49

7951-2 Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell C6
Max = 1005.08 Lbs @ 16.19 msec
Min = -177.03 Lbs @ 31.19 msec

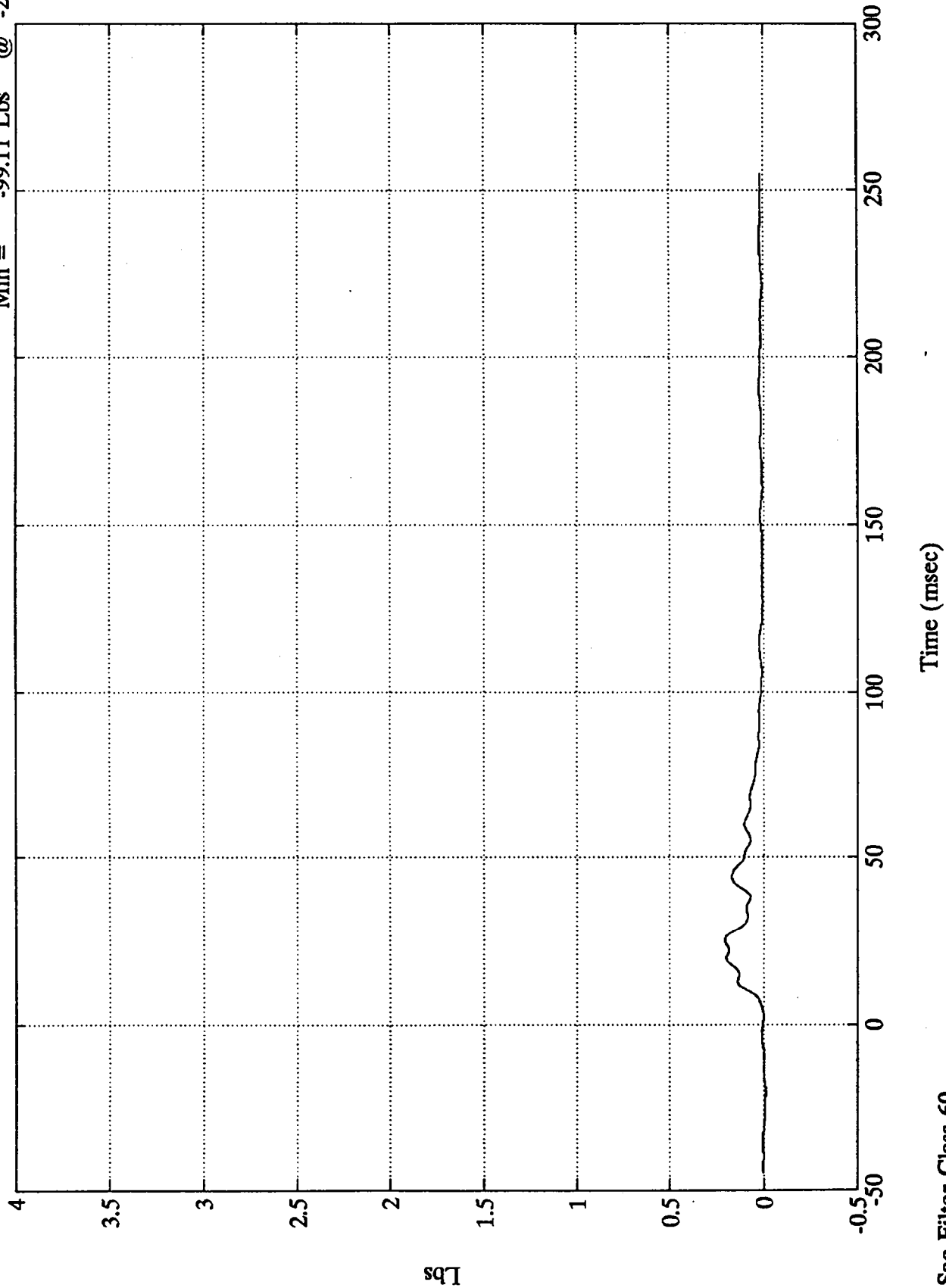


Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 2069.50 Lbs @ 25.07 msec
Min = -99.11 Lbs @ -20.04 msec

Barrier Load Cell C7



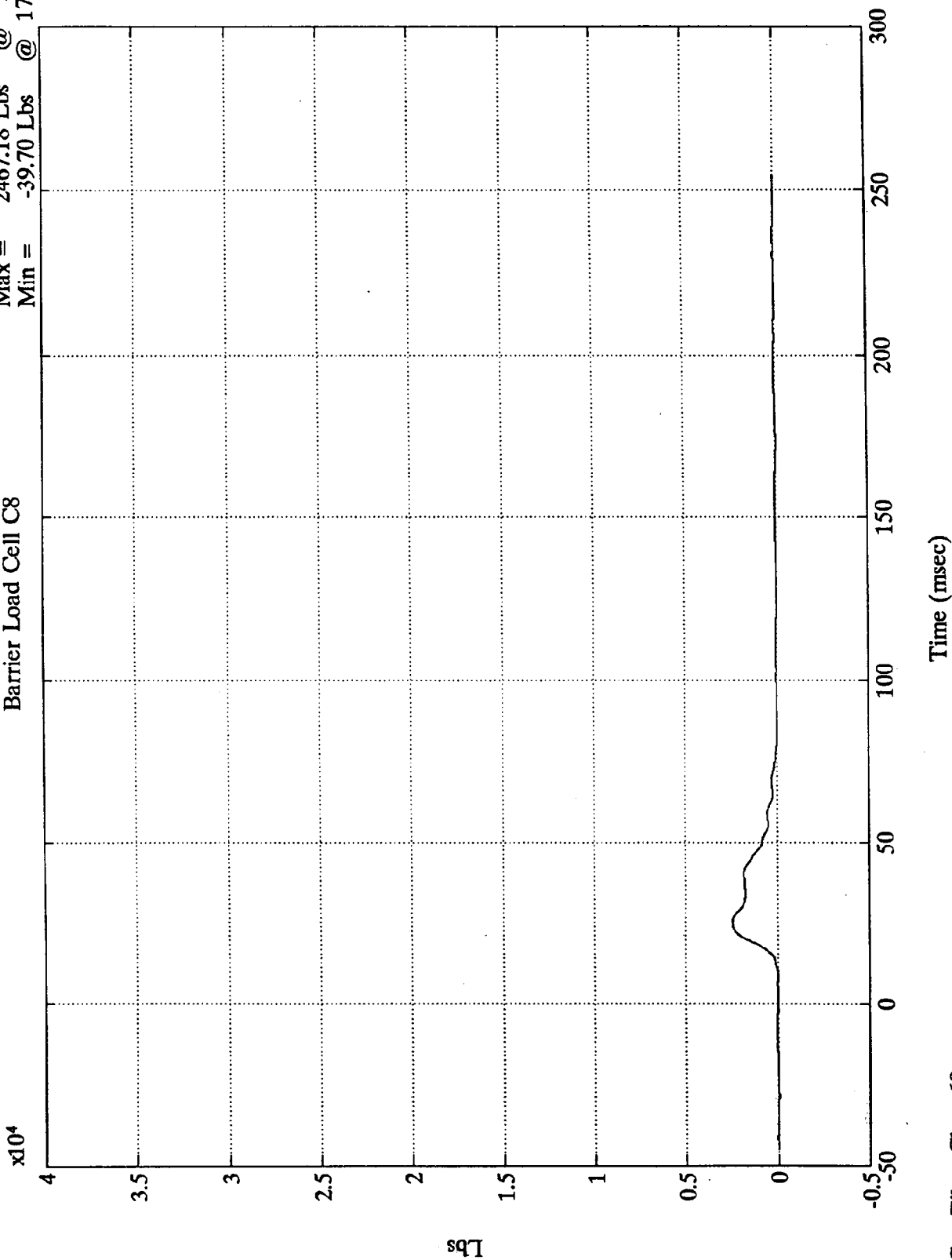
B-51

7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell C8
Max = 2467.18 Lbs @ 25.20 msec
Min = -39.70 Lbs @ 172.44 msec



B-52
Lbs

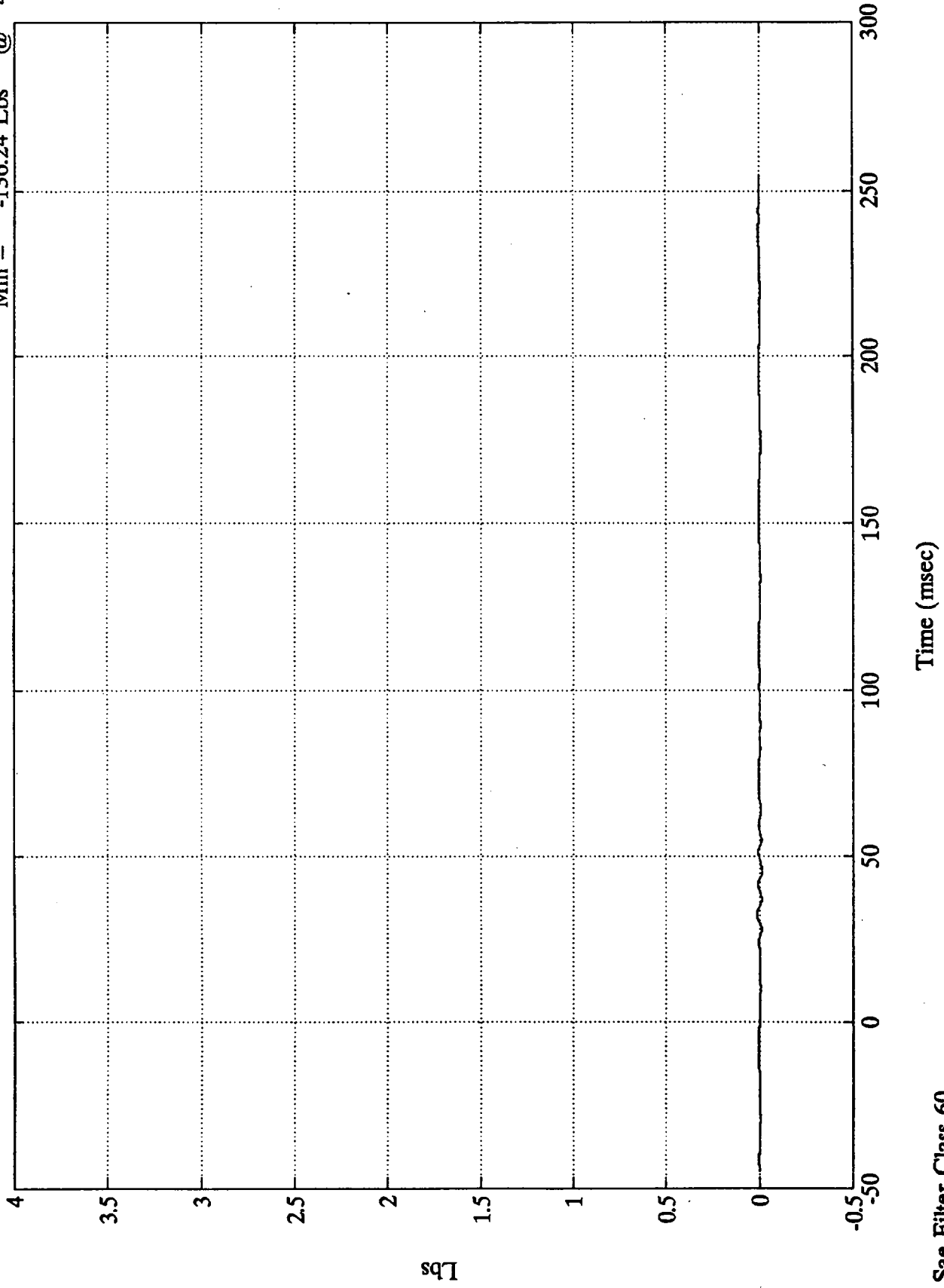
7951-2
Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

x10⁴

Barrier Load Cell C9

Max = 152.03 Lbs @ 32.28 msec
 Min = -136.24 Lbs @ 45.48 msec



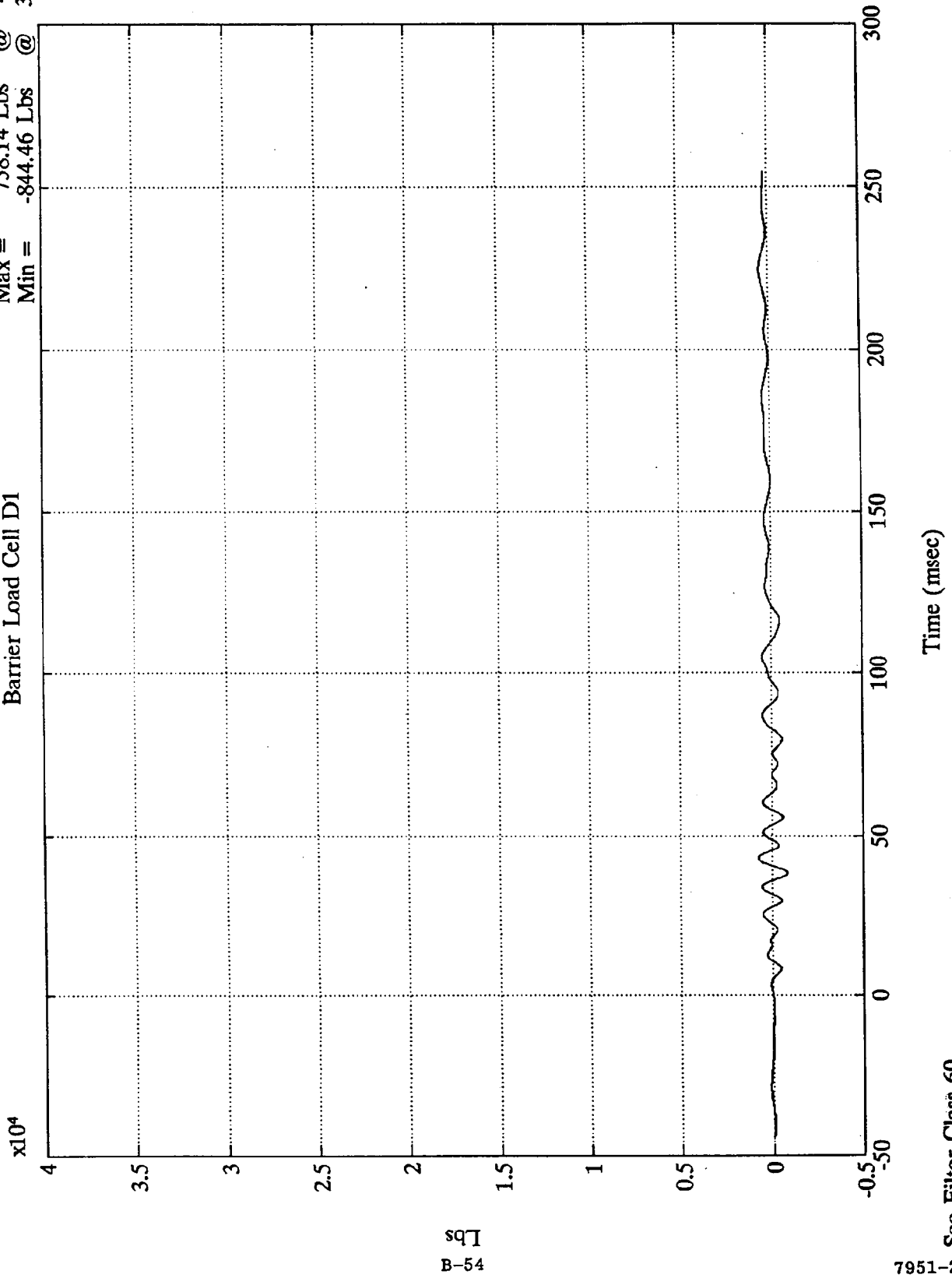
B-53
 Lbs

7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell D1
 Max = 758.14 Lbs @ 42.95 msec
 Min = -844.46 Lbs @ 38.40 msec



B-54

7951-2

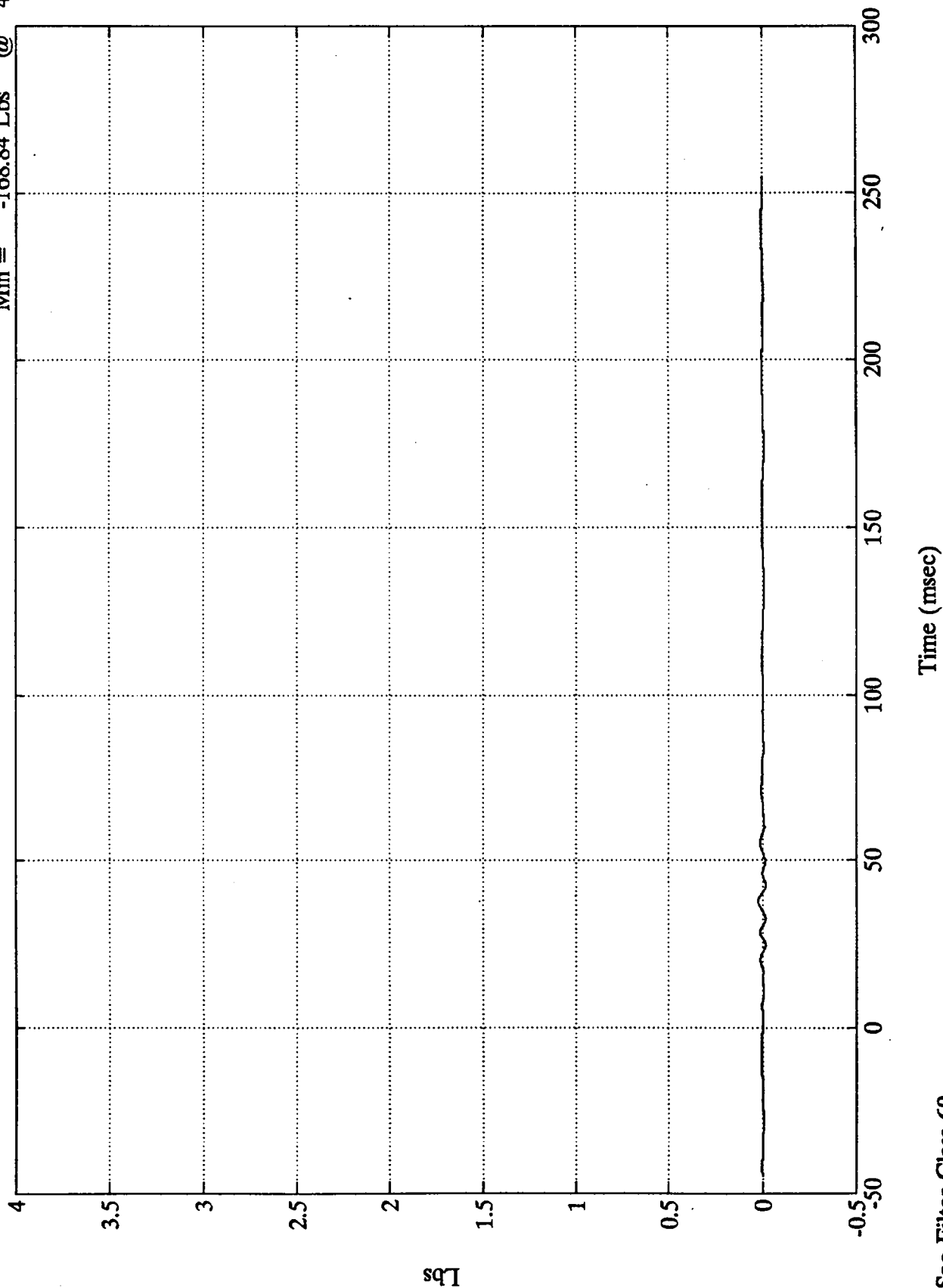
Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

x10⁴

Barrier Load Cell D2

Max = 235.59 Lbs @ 37.56 msec
Min = -168.84 Lbs @ 42.60 msec



B-55

Sae Filter Class 60

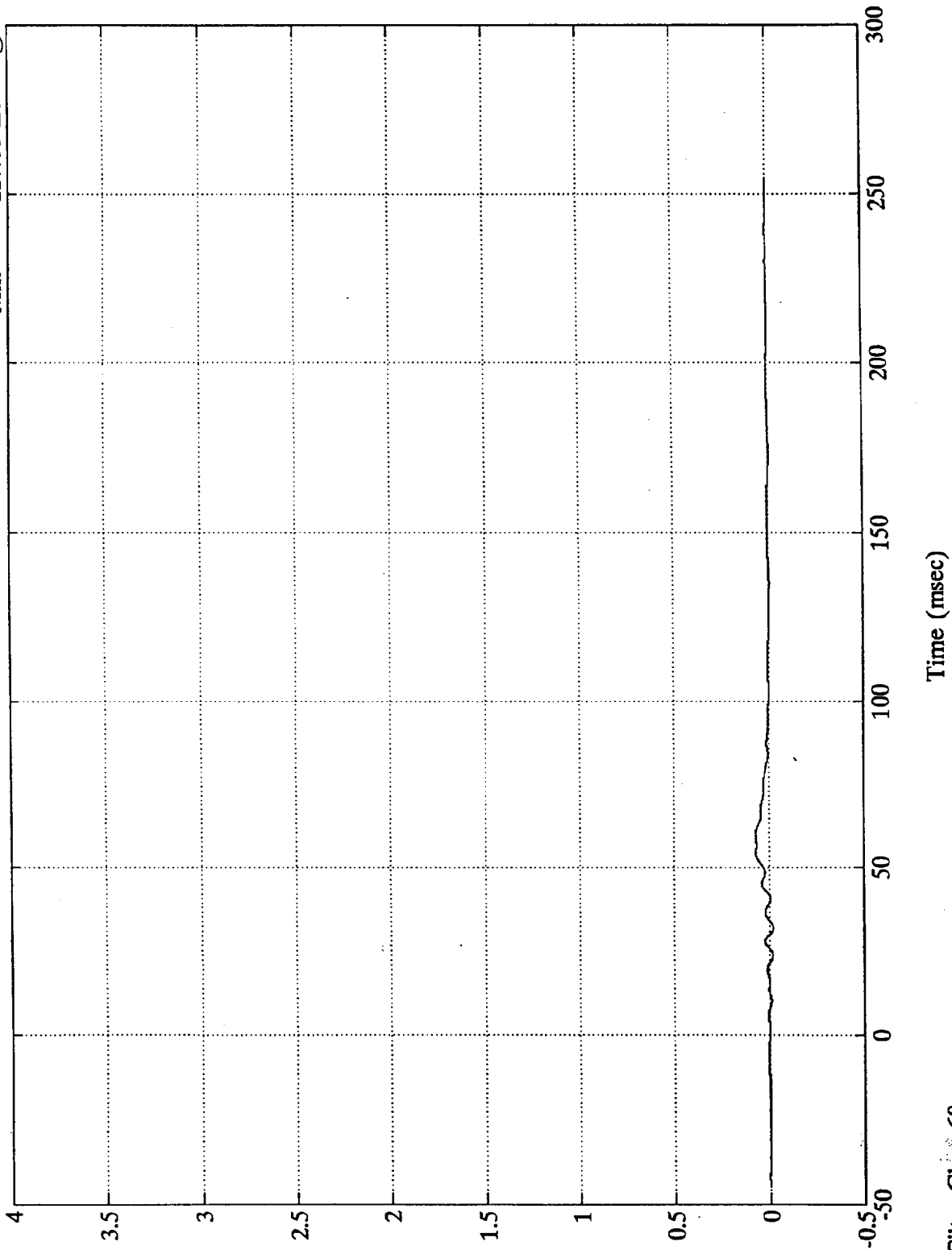
7951-2

NCAP TEST #8 1992 GEO METRO

Max = 699.97 Lbs @ 60.00 msec
Min = -217.08 Lbs @ 31.67 msec

Barrier Load Cell D3

$\times 10^4$



B-56

Sae Filter Class 60

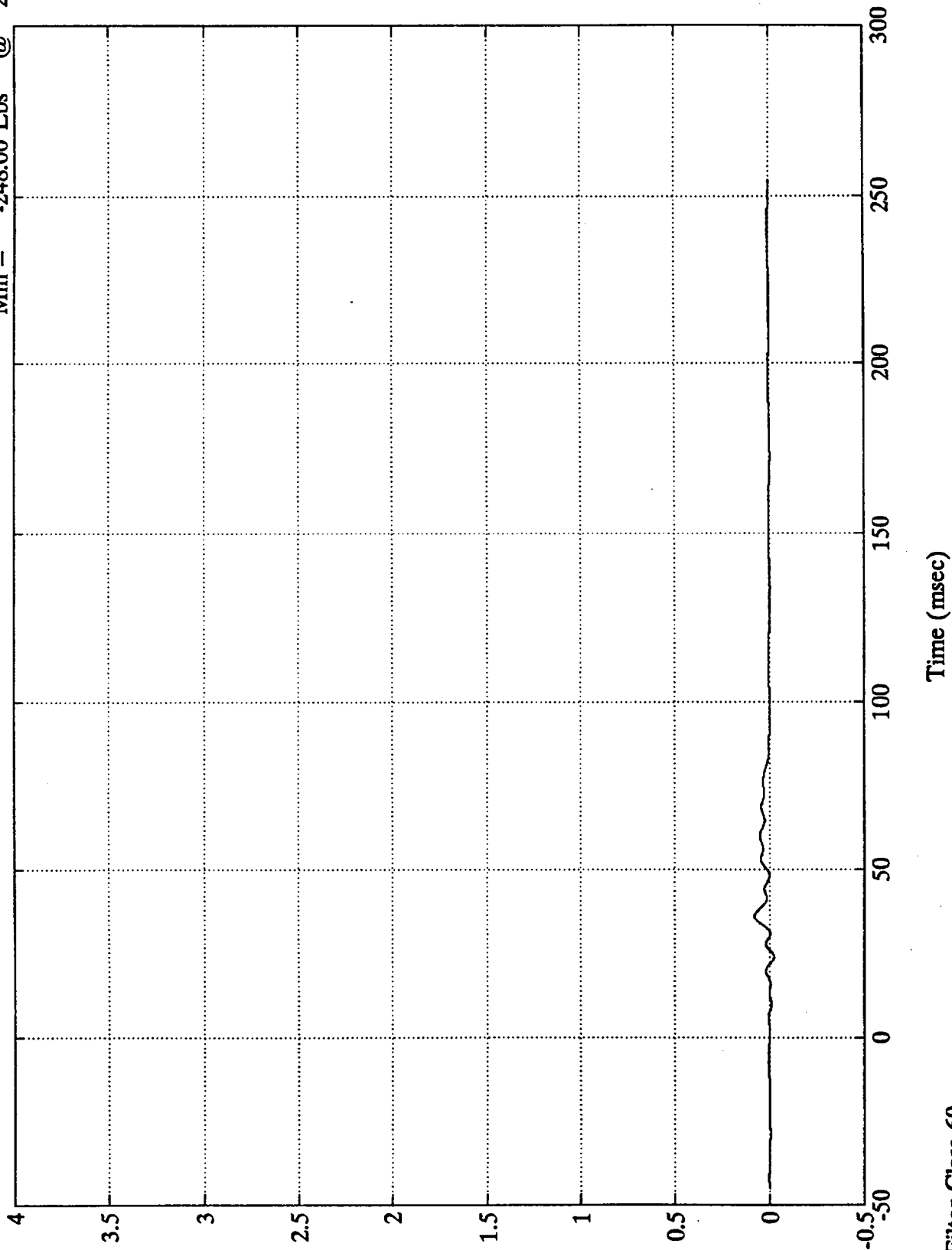
7951-2

NCAP TEST #8 1992 GEO METRO

$\times 10^4$

Barrier Load Cell D4

Max = 787.78 Lbs @ 36.00 msec
Min = -248.00 Lbs @ 23.76 msec



B-57

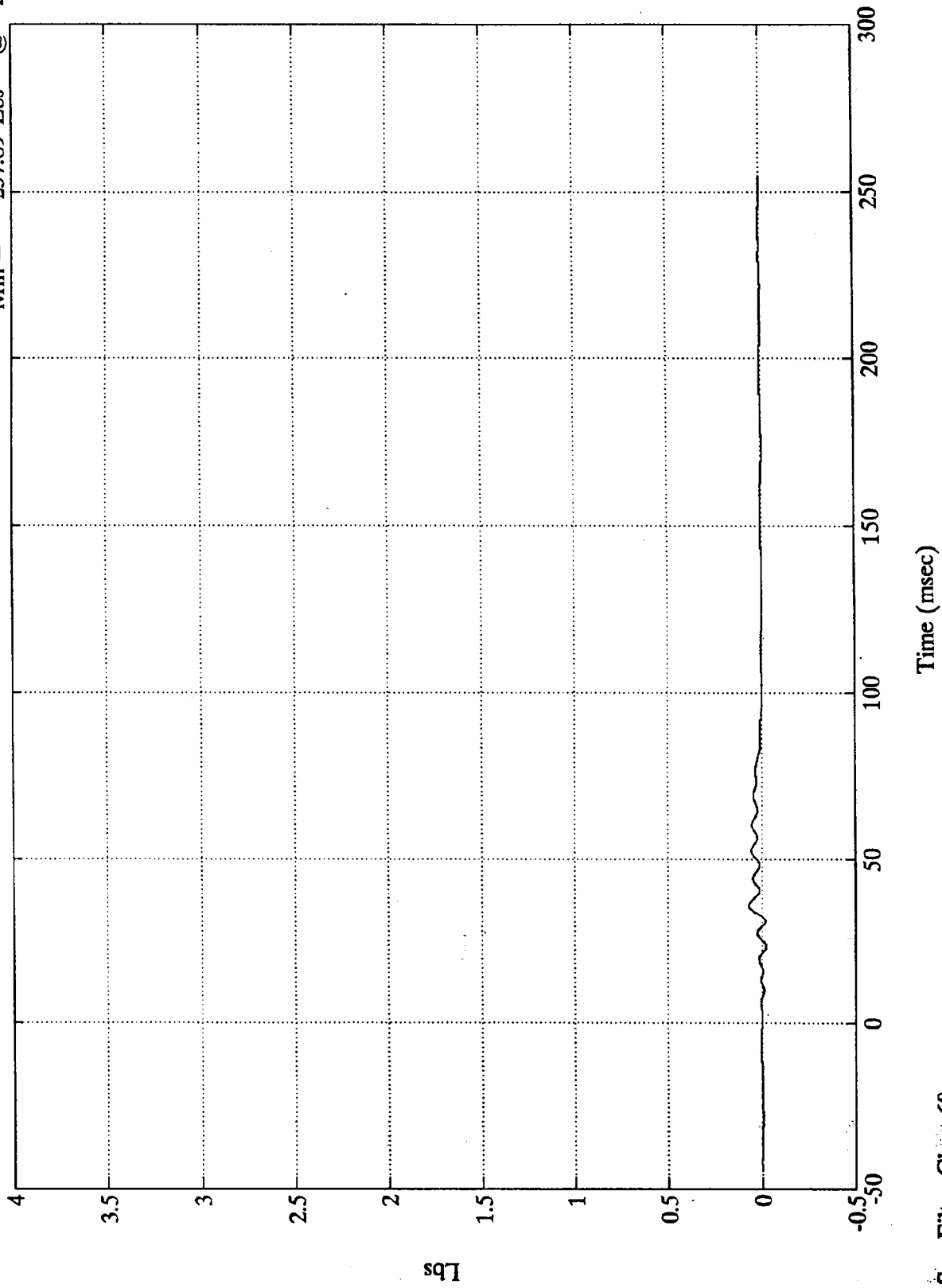
7951-2
Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 702.69 Lbs @ 35.63 msec
Min = -237.89 Lbs @ 23.52 msec

Barrier Load Cell D5

$\times 10^4$



B-58

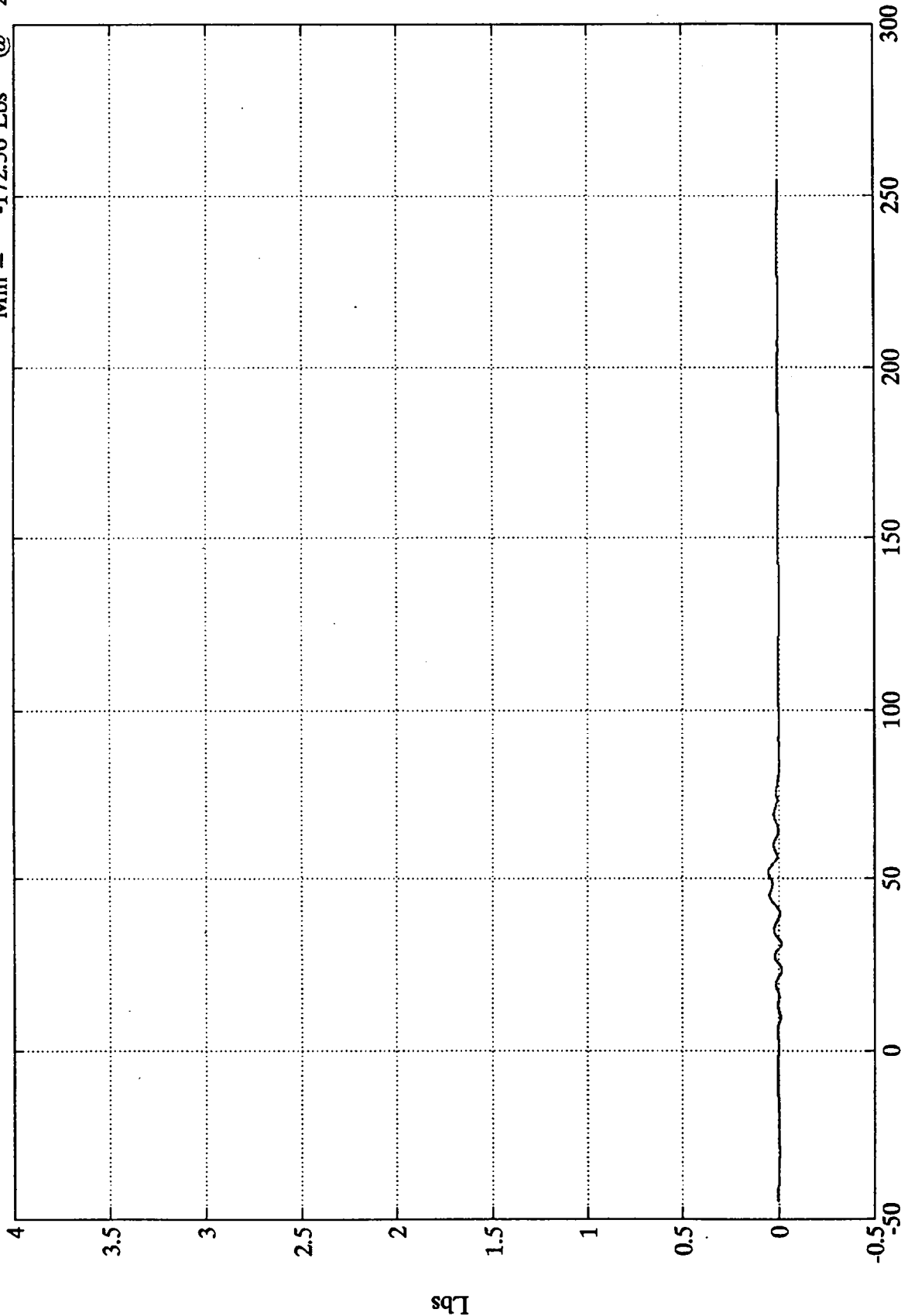
7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 547.65 Lbs @ 51.95 msec
Min = -172.56 Lbs @ 23.39 msec

Barrier Load Cell D6



Time (msec)

Sae Filter Class 60

Lbs
B-59

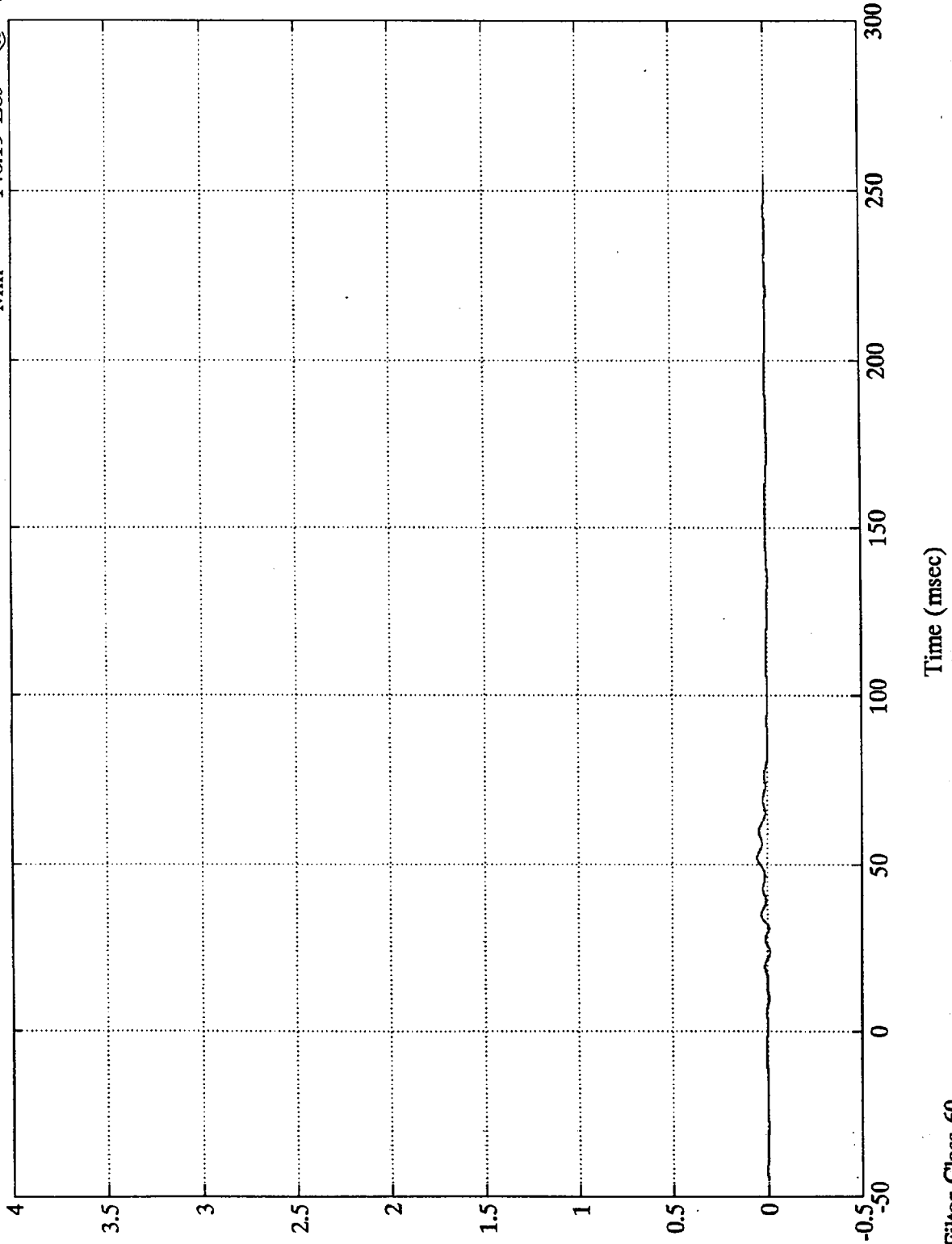
7951-2

NCAP TEST #8 1992 GEO METRO

$\times 10^4$

Barrier Load Cell D7

Max = 529.35 Lbs @ 52.08 msec
Min = -146.19 Lbs @ 23.39 msec



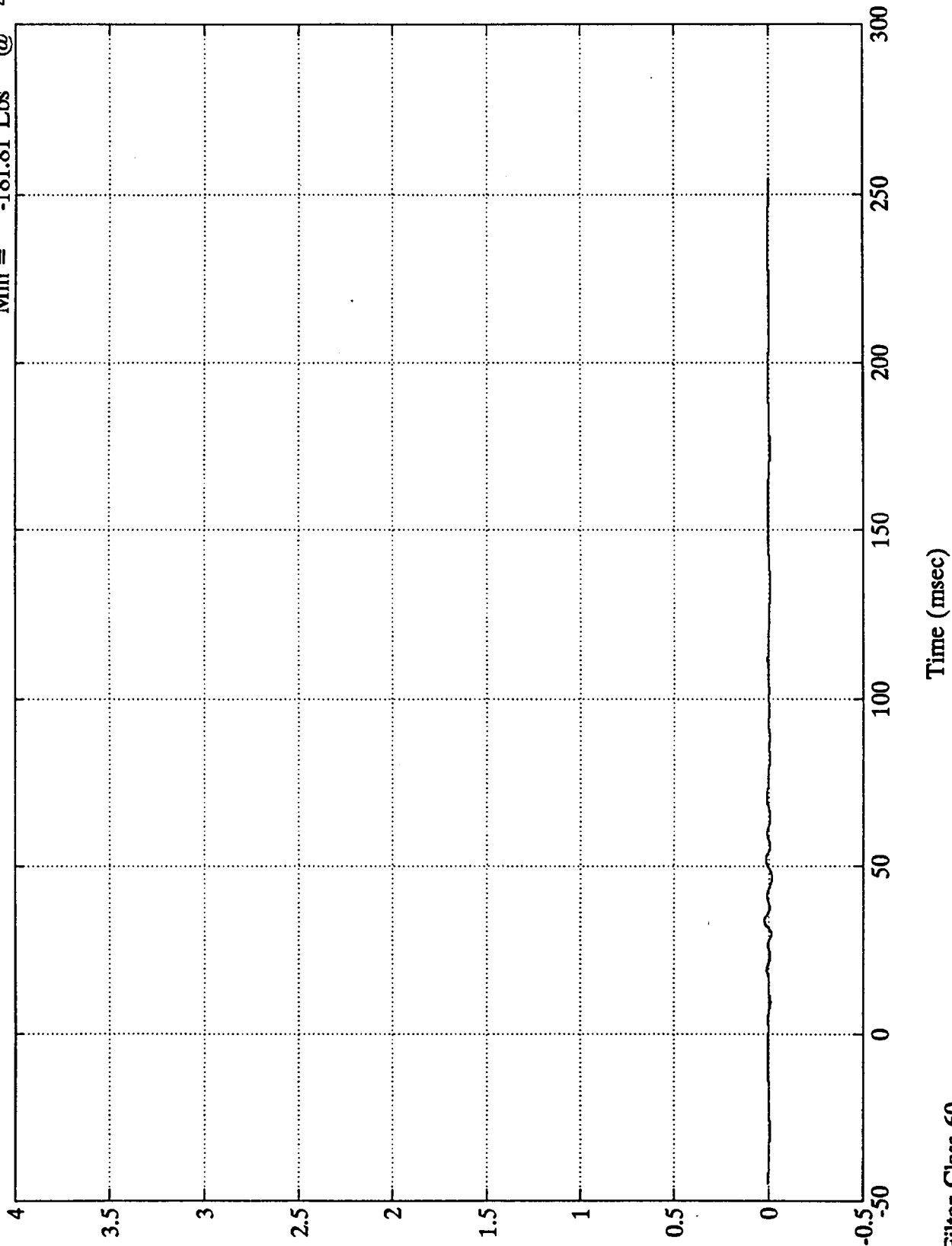
Lbs
B-60

NCAP TEST #8 1992 GEO METRO

$\times 10^4$

Barrier Load Cell D8

Max = 225.57 Lbs @ 33.95 msec
Min = -181.81 Lbs @ 46.68 msec



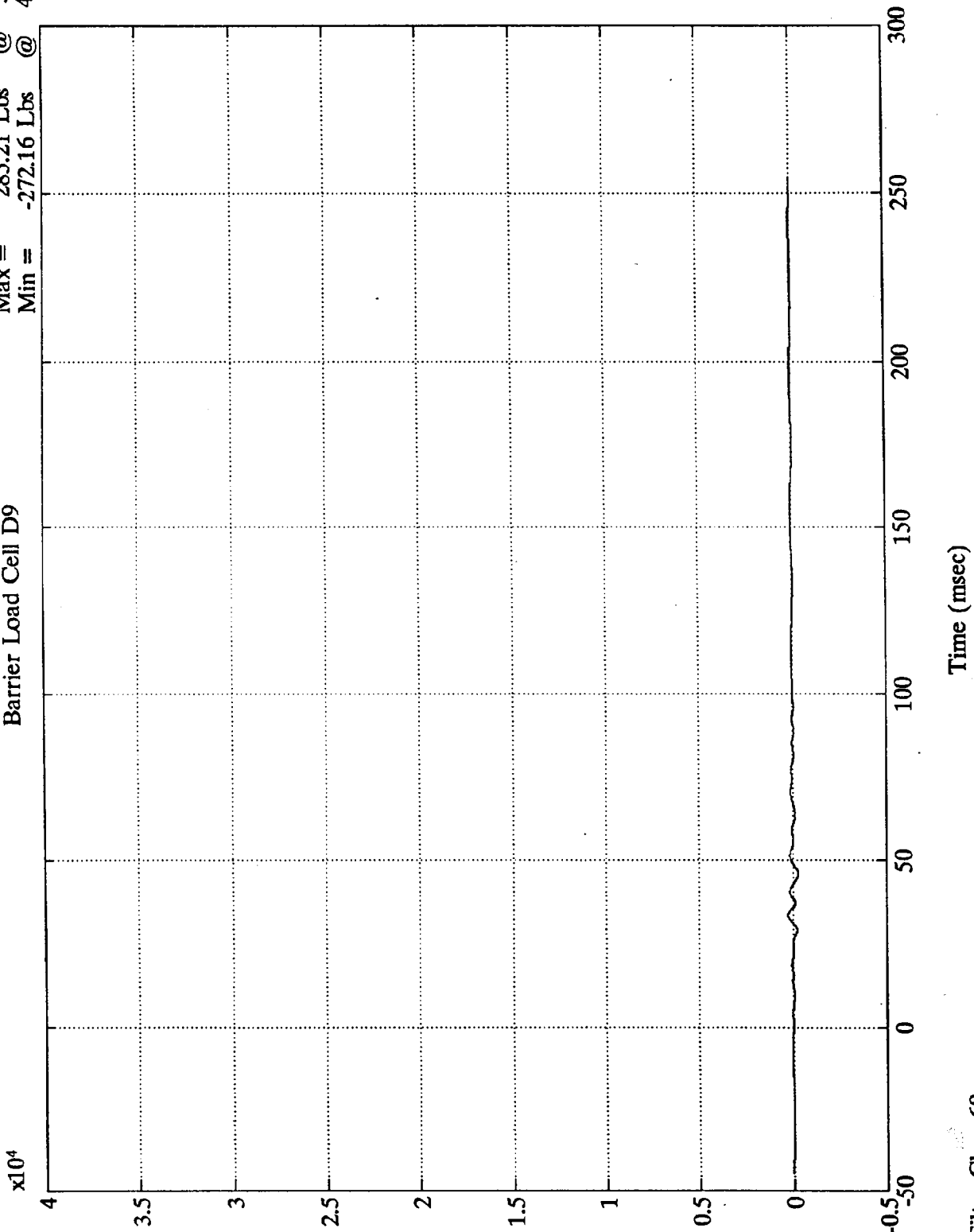
Lbs
B-61

7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Barrier Load Cell D9
Max = 285.21 Lbs @ 33.47 msec
Min = -272.16 Lbs @ 46.08 msec



B-62
lbs

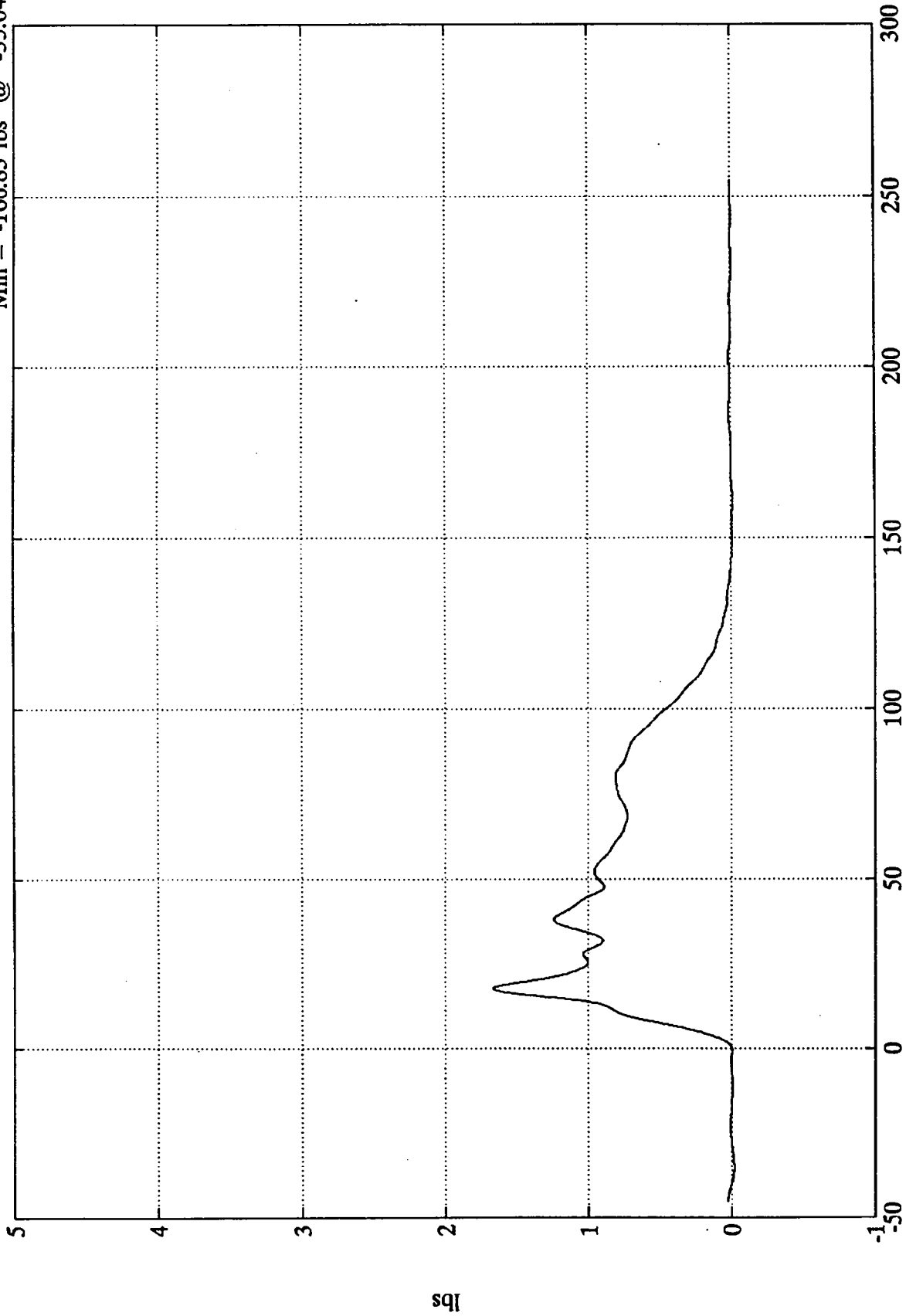
7951-2
Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Group 1 Load Cell Sum

Max = 16668.80 lbs @ 17.40 msec
Min = -166.83 lbs @ -35.04 msec

$\times 10^4$



sqi
B-63

Time (msec)

SAE Filter Class 60

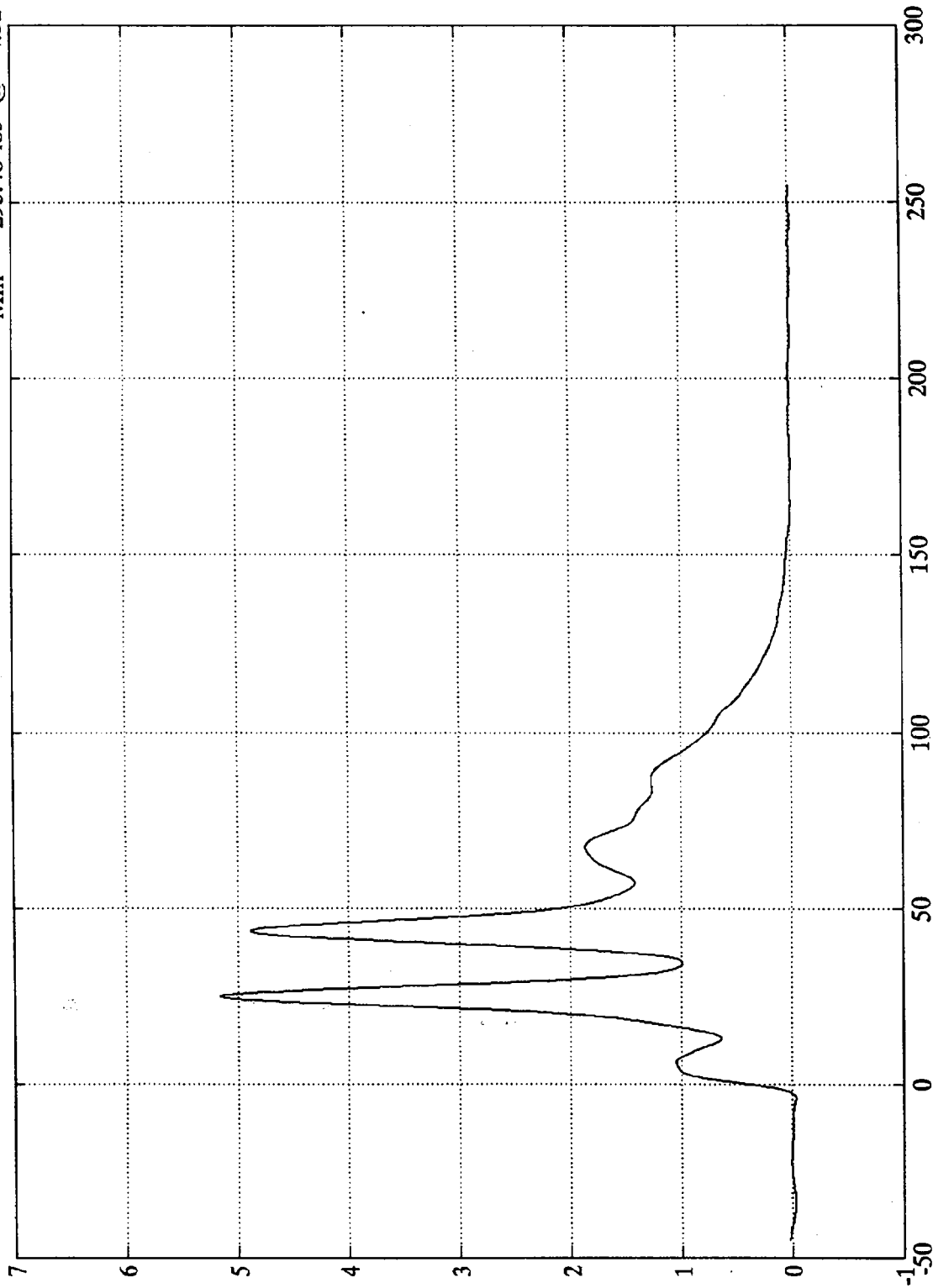
7951-2

NCAP TEST #8 1992 GEO METRO

Max = 51587.10 lbs @ 25.20 msec
Min = -293.48 lbs @ -4.32 msec

Group 2 Load Cell Sum

x10⁴



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

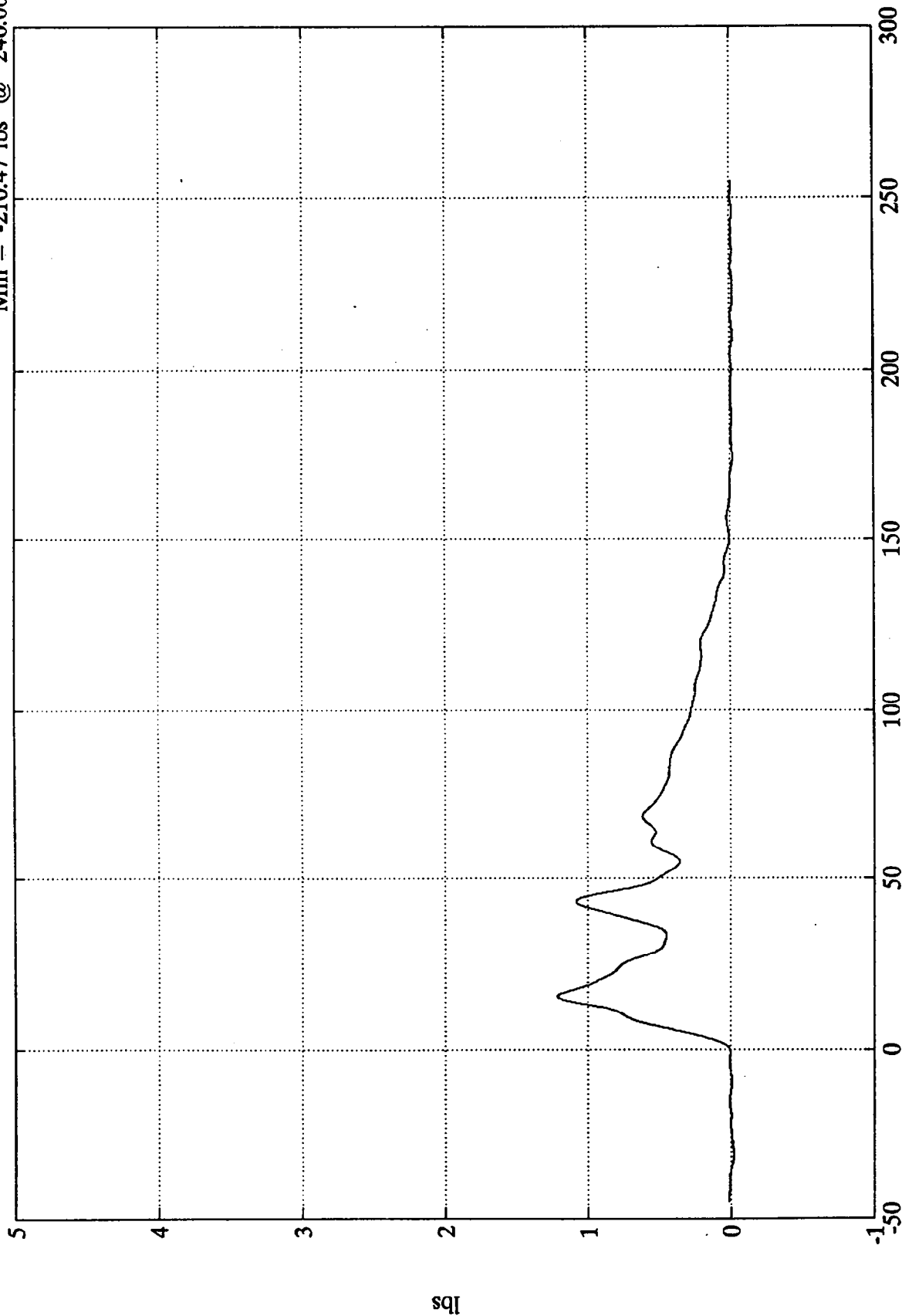
Time (msec)

SAE Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 12135.00 lbs @ 15.36 msec
Min = -210.47 lbs @ 246.00 msec

Group 3 Load Cell Sum



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

Time (msec)

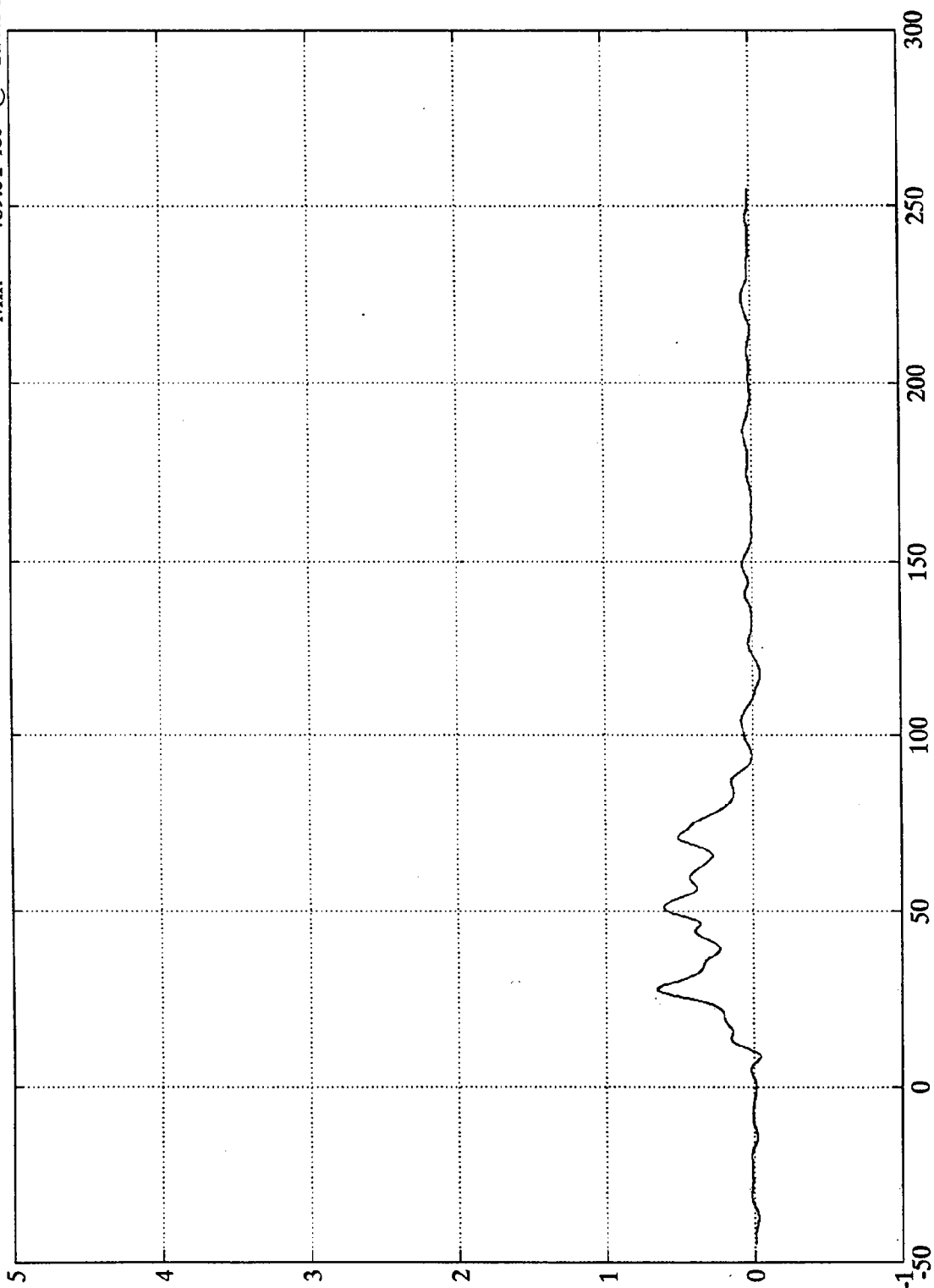
SAE Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 6492.40 lbs @ 27.48 msec
Min = -489.51 lbs @ 117.36 msec

Group 4 Load Cell Sum

$\times 10^4$



Time (msec)

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

SAE Filter Class 60

lbs

B-66

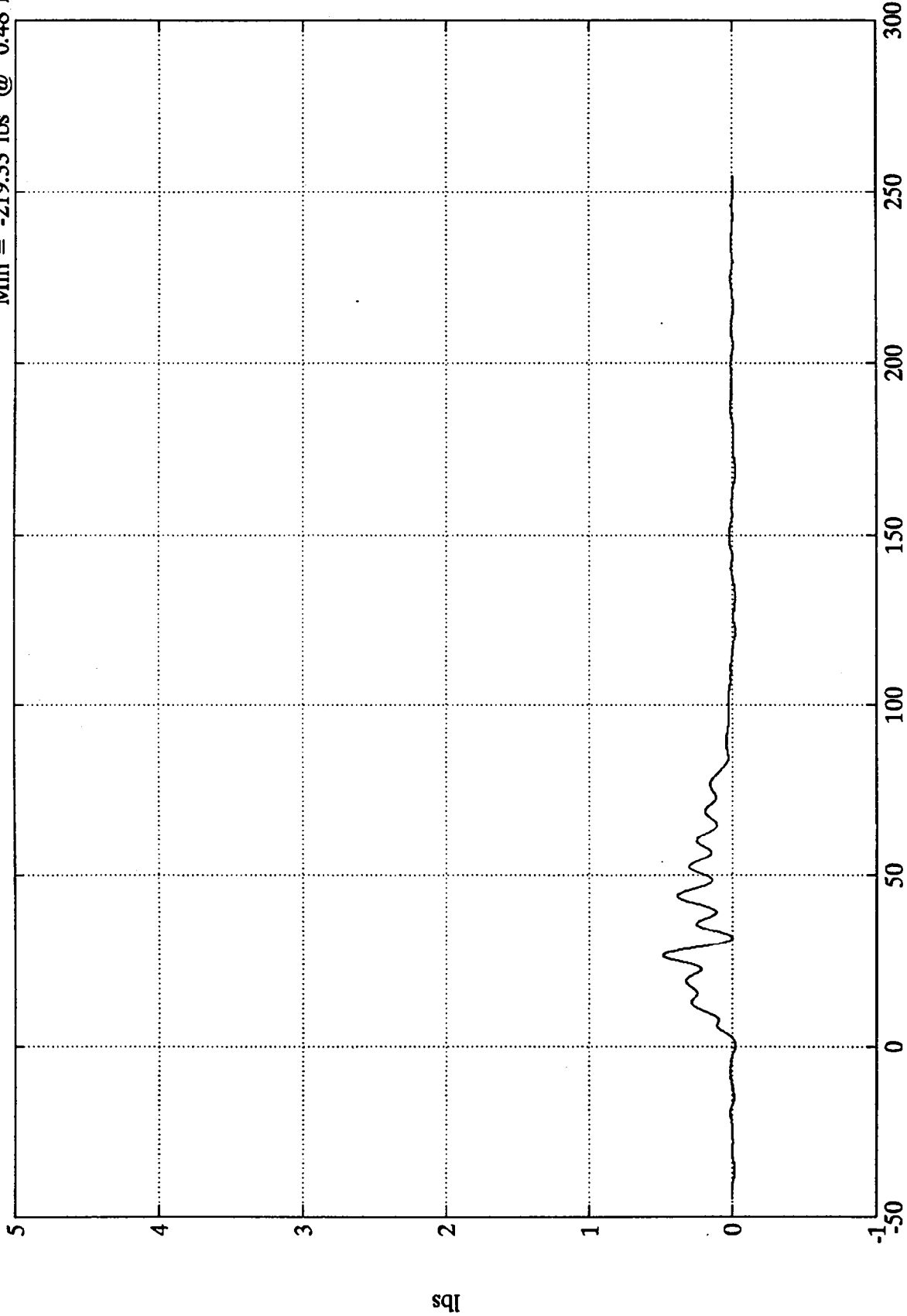
7951-2

NCAP TEST #8 1992 GEO METRO

Group 5 Load Cell Sum

Max = 4856.04 lbs @ 26.28 msec
Min = -219.33 lbs @ 0.48 msec

x10⁴



sqi
B-67

7951-2

SAE Filter Class 60

Time (msec)

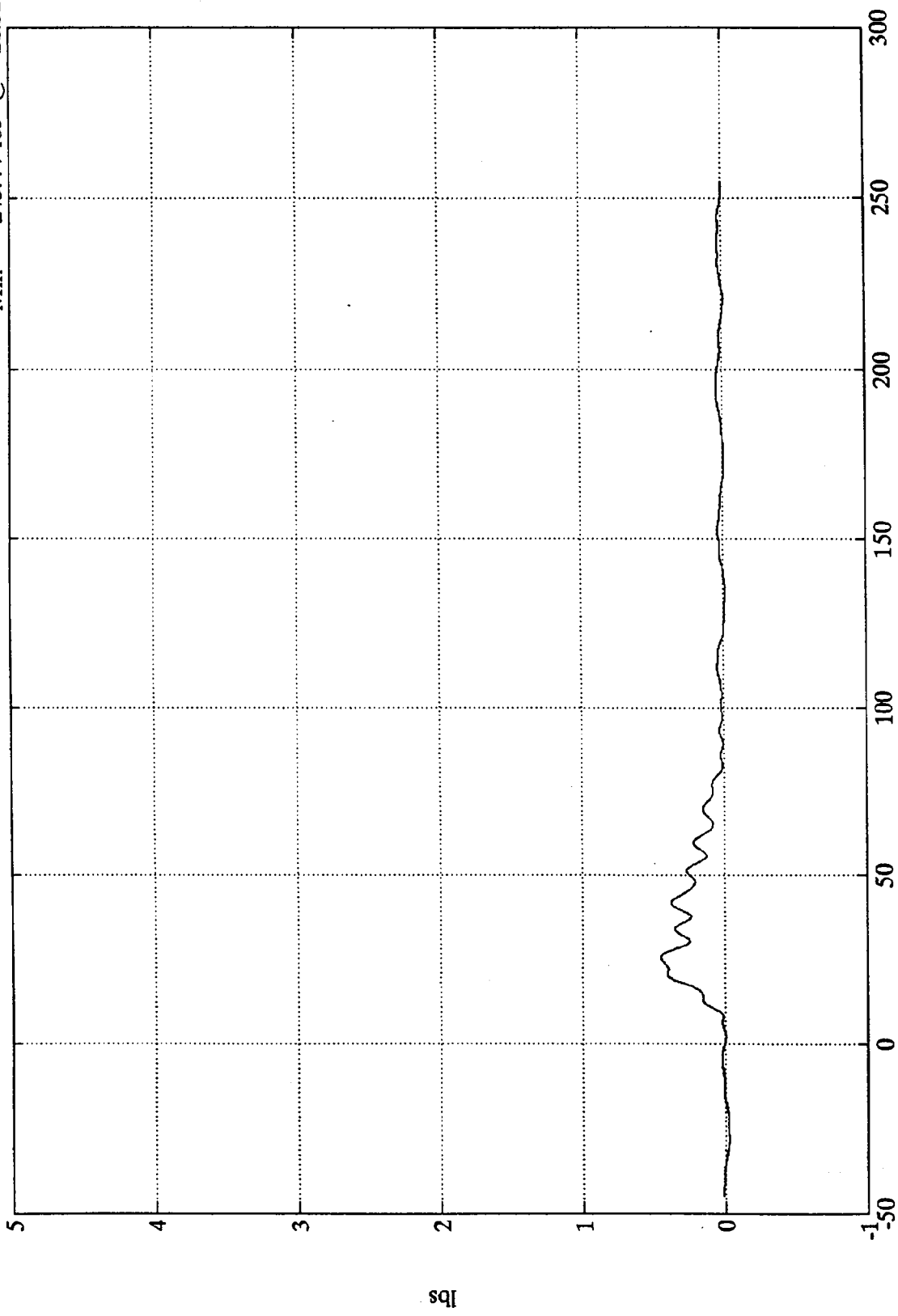
Load Cells (C4,C5,C6,D4,D5,D6)

NCAP TEST #8 1992 GEO METRO

Max = 4532.76 lbs @ 25.44 msec
Min = -243.44 lbs @ -28.32 msec

Group 6 Load Cell Sum

$\times 10^4$



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

Time (msec)

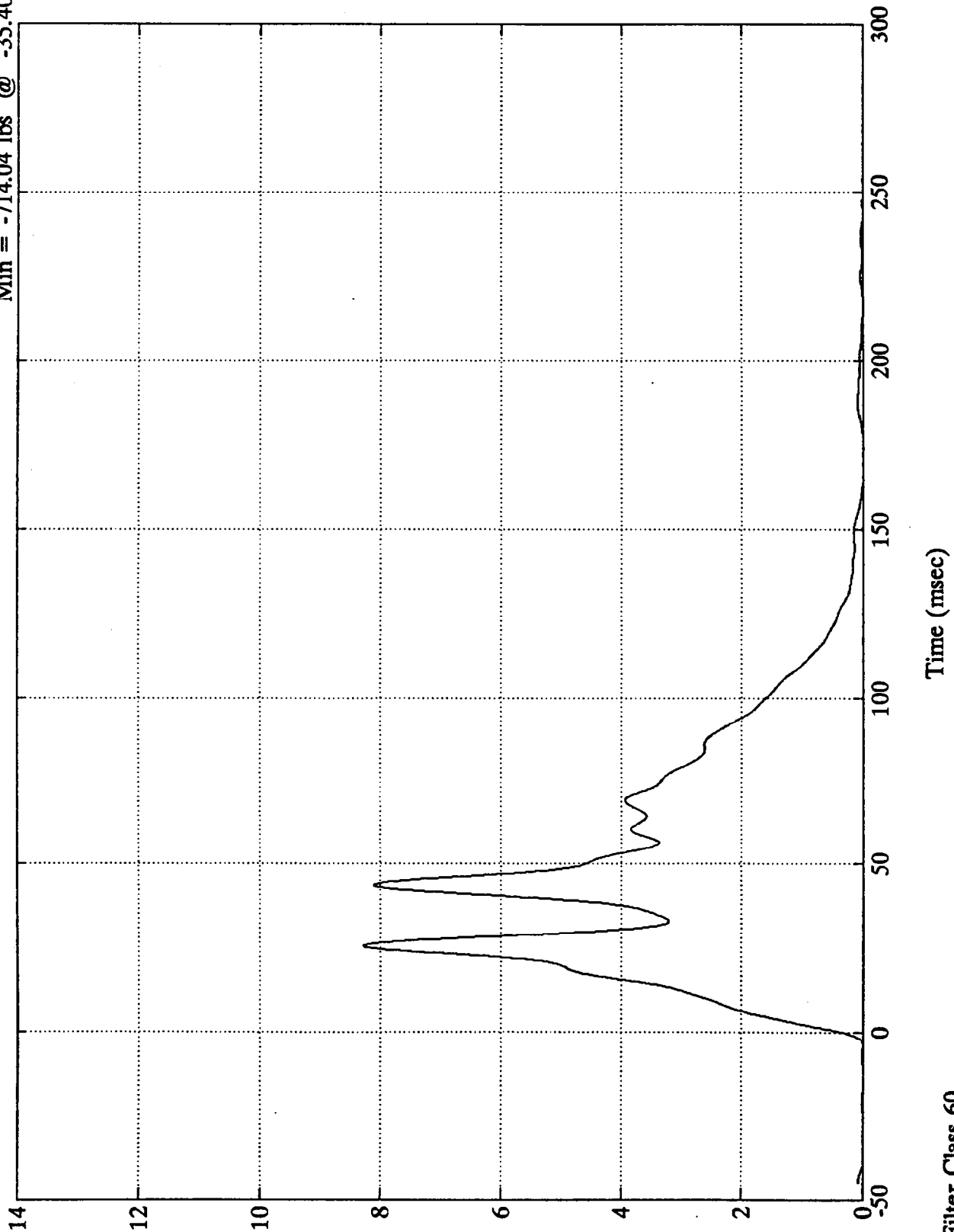
SAE Filter Class 60

NCAP TEST #8 1992 GEO METRO

Max = 82803.80 lbs @ 25.44 msec
 Min = -714.04 lbs @ -35.40 msec

Total Load Cell Sum

x10⁴



sqi
 B-69

7951-2
 SAE Filter Class 60

TEST NO. MN0102

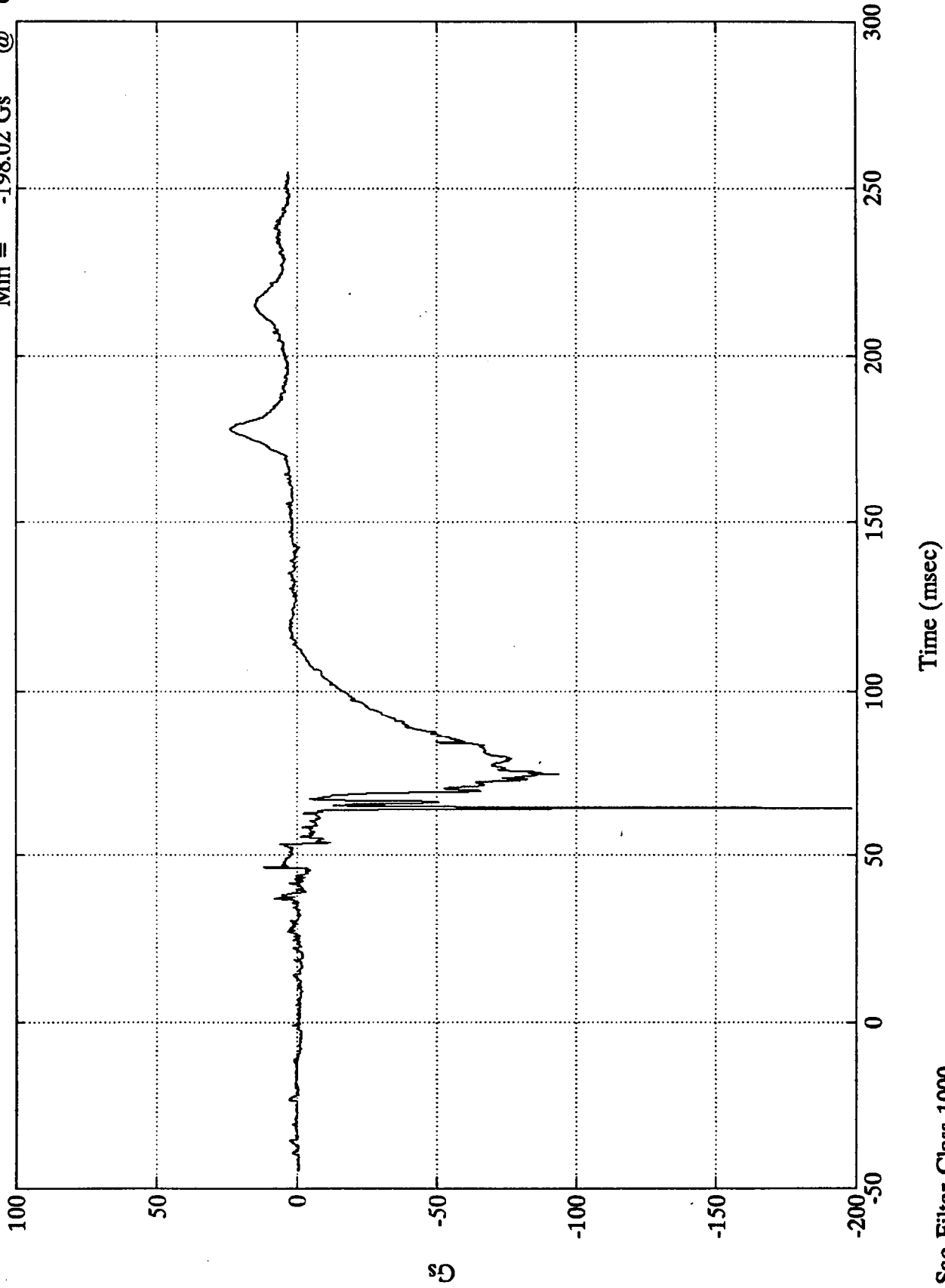
DUMMY DATA

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 #8 1992 GEO METRO

Pos. 1 Head X

Max = 23.80 Gs @ 177.96 msec
 Min = -198.02 Gs @ 64.31 msec

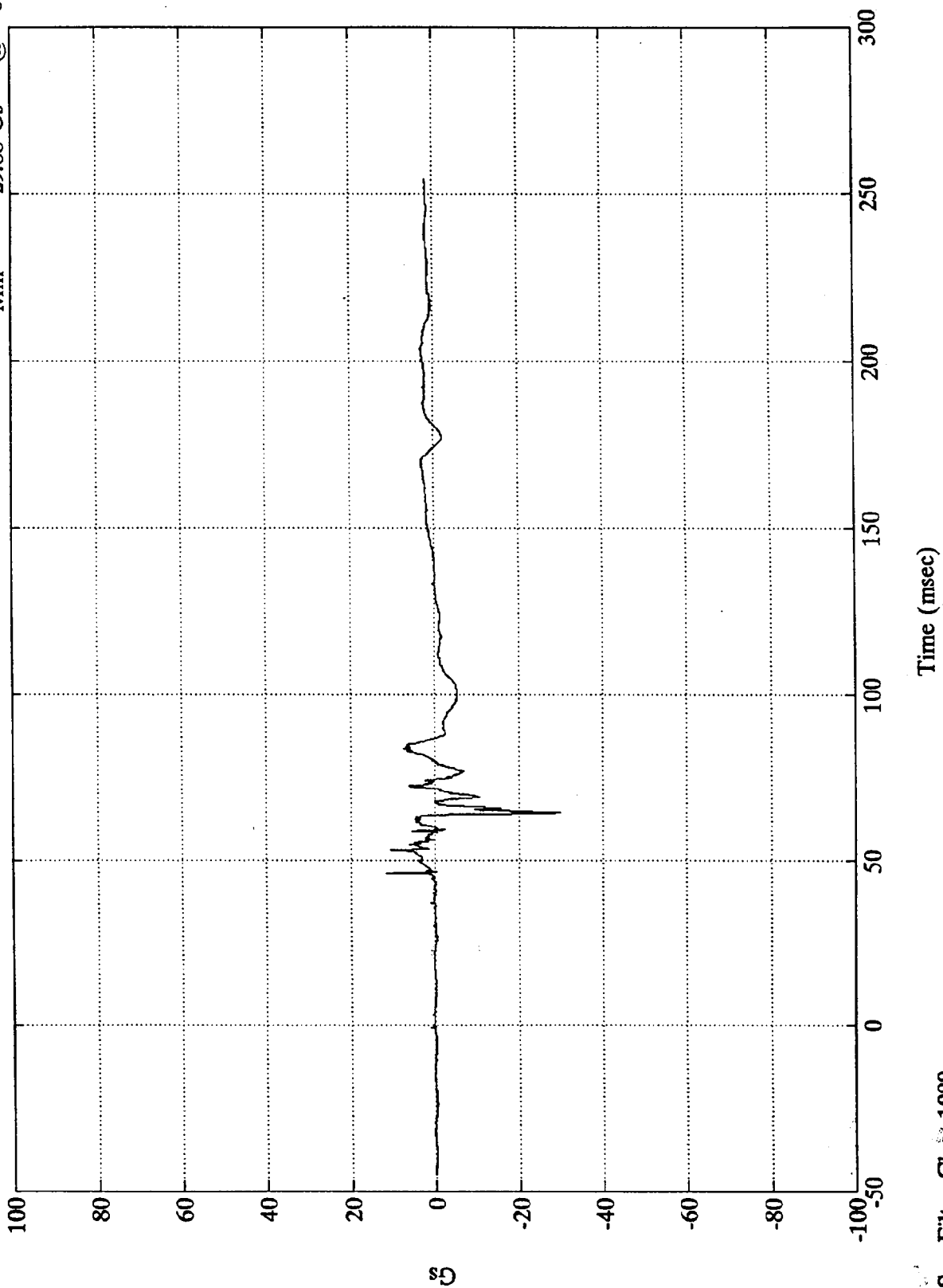


B-71

7951-2 Sae Filter Class 1000

NCAP TEST #8 1992 GEO METRO

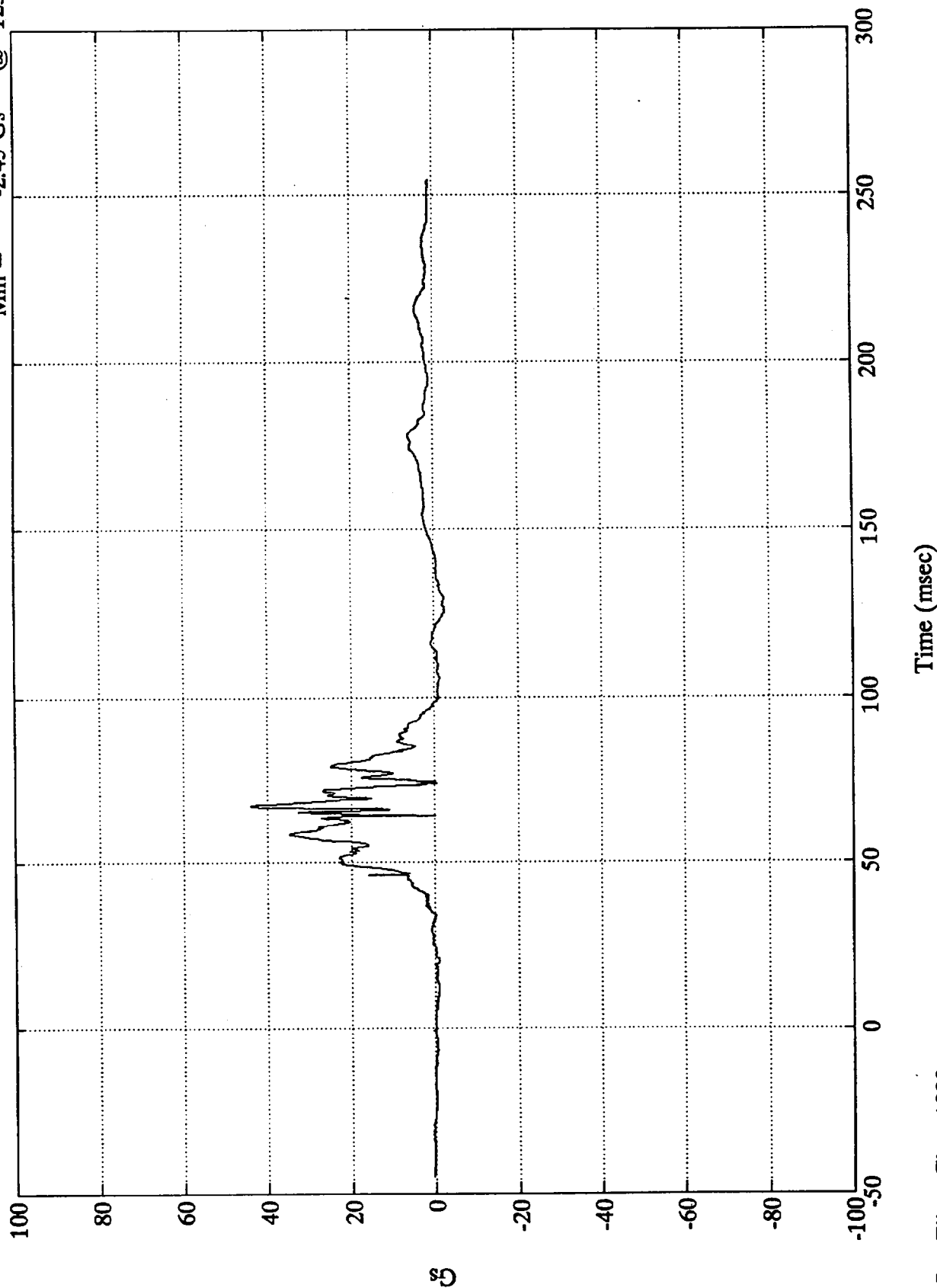
Pos. 1 Head Y
Max = 11.57 Gs @ 46.20 msec
Min = -29.88 Gs @ 64.68 msec



B-72
Gs

NCAP TEST #8 1992 GEO METRO

Pos. 1 Head Z
 Max = 43.96 Gs @ 67.08 msec
 Min = -2.45 Gs @ 125.88 msec



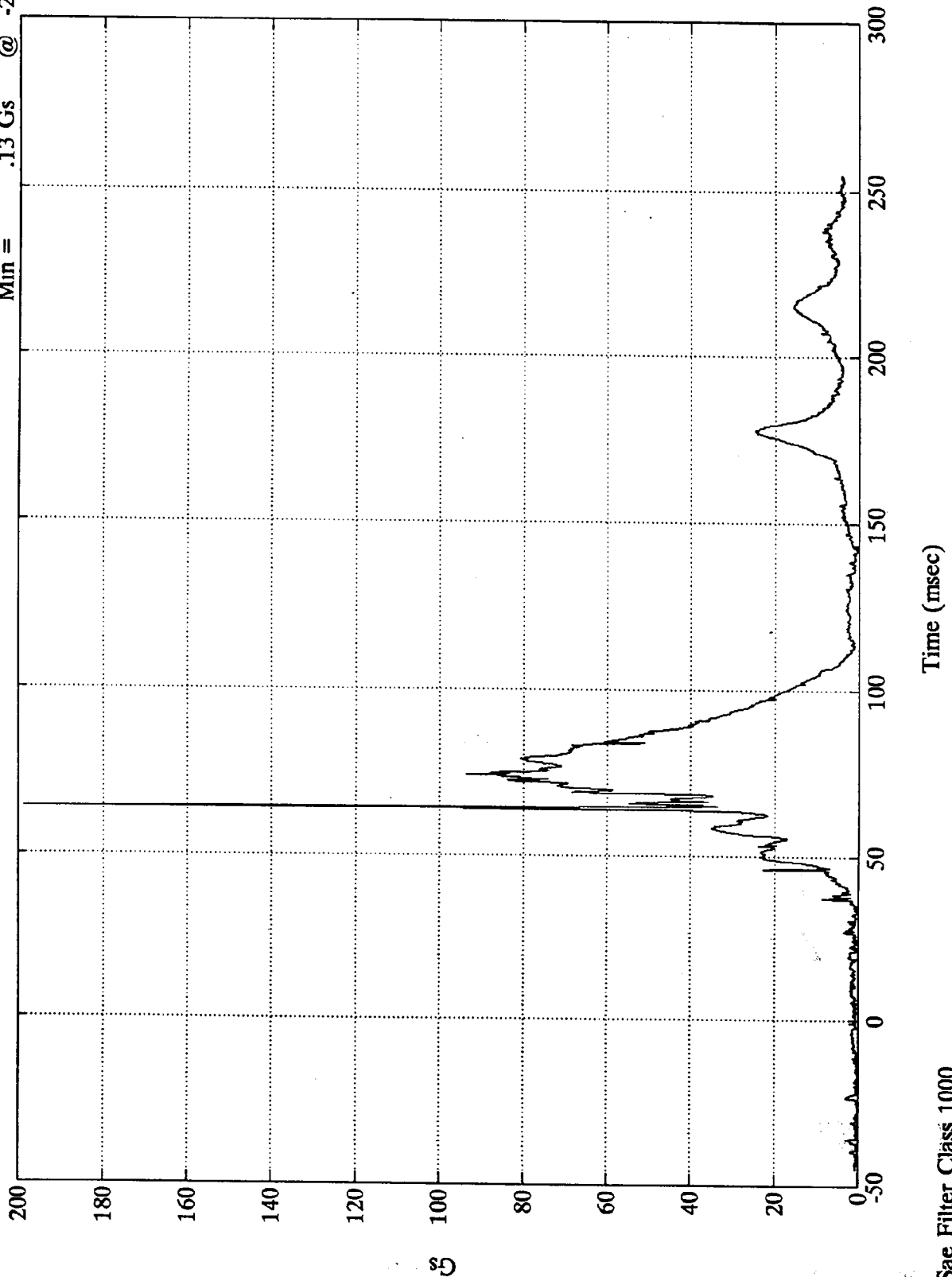
B-73

7951-2
 Sae Filter Class 1000

NCAP TEST #8 1992 GEO METRO

Max = 198.63 Gs @ 64.31 msec
Min = .13 Gs @ -25.80 msec

Pos. 1 Head Resultant

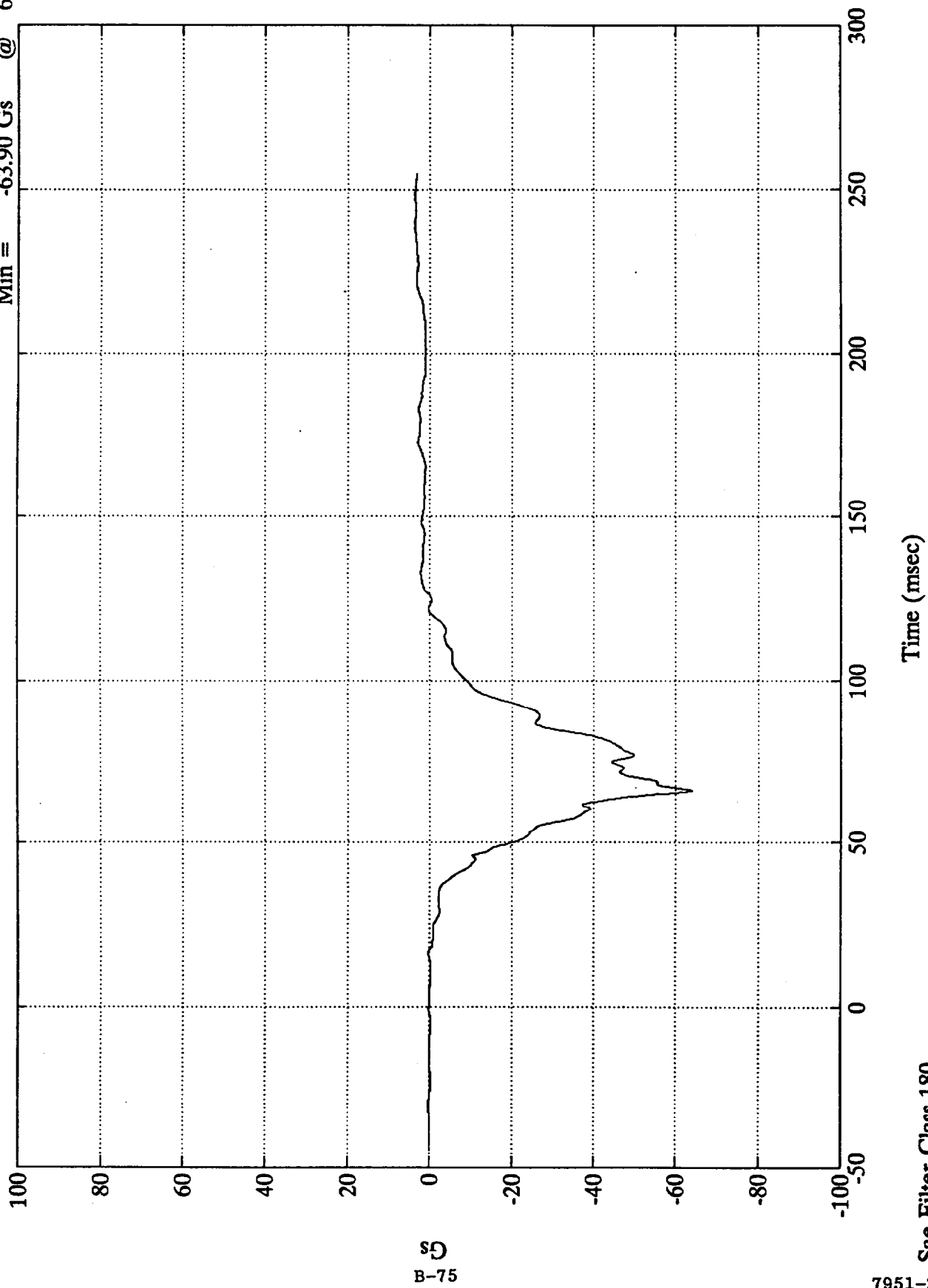


B-74

7951-2

NCAP TEST #8 1992 GEO METRO

Pos. 1 Chest X
Max = 3.69 Gs @ 247.80 msec
Min = -63.90 Gs @ 66.00 msec

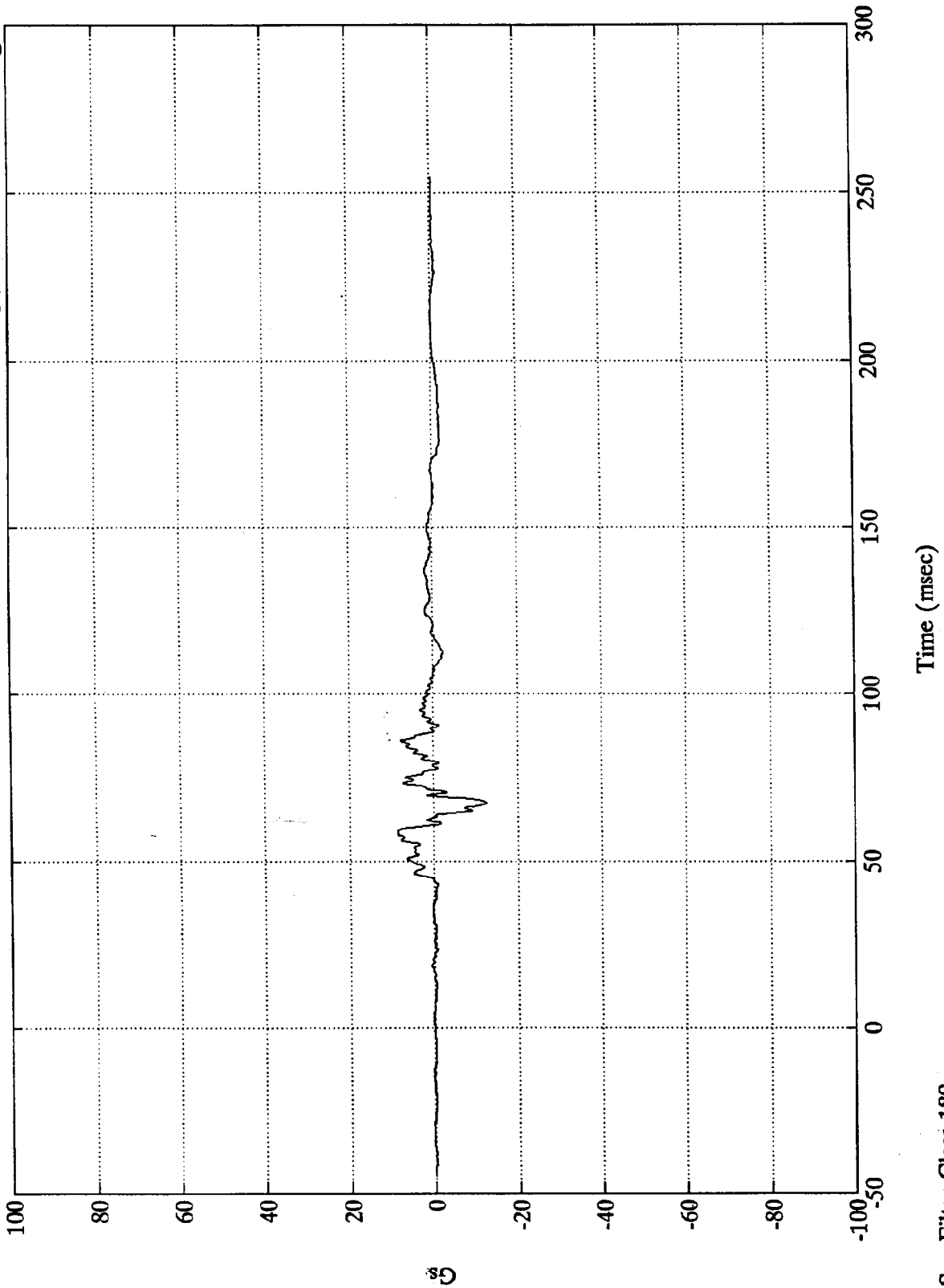


B-75

NCAP TEST #8 1992 GEO METRO

Max = 8.61 Gs @ 58.56 msec
 Min = -12.61 Gs @ 67.44 msec

Pos. 1 Chest Y

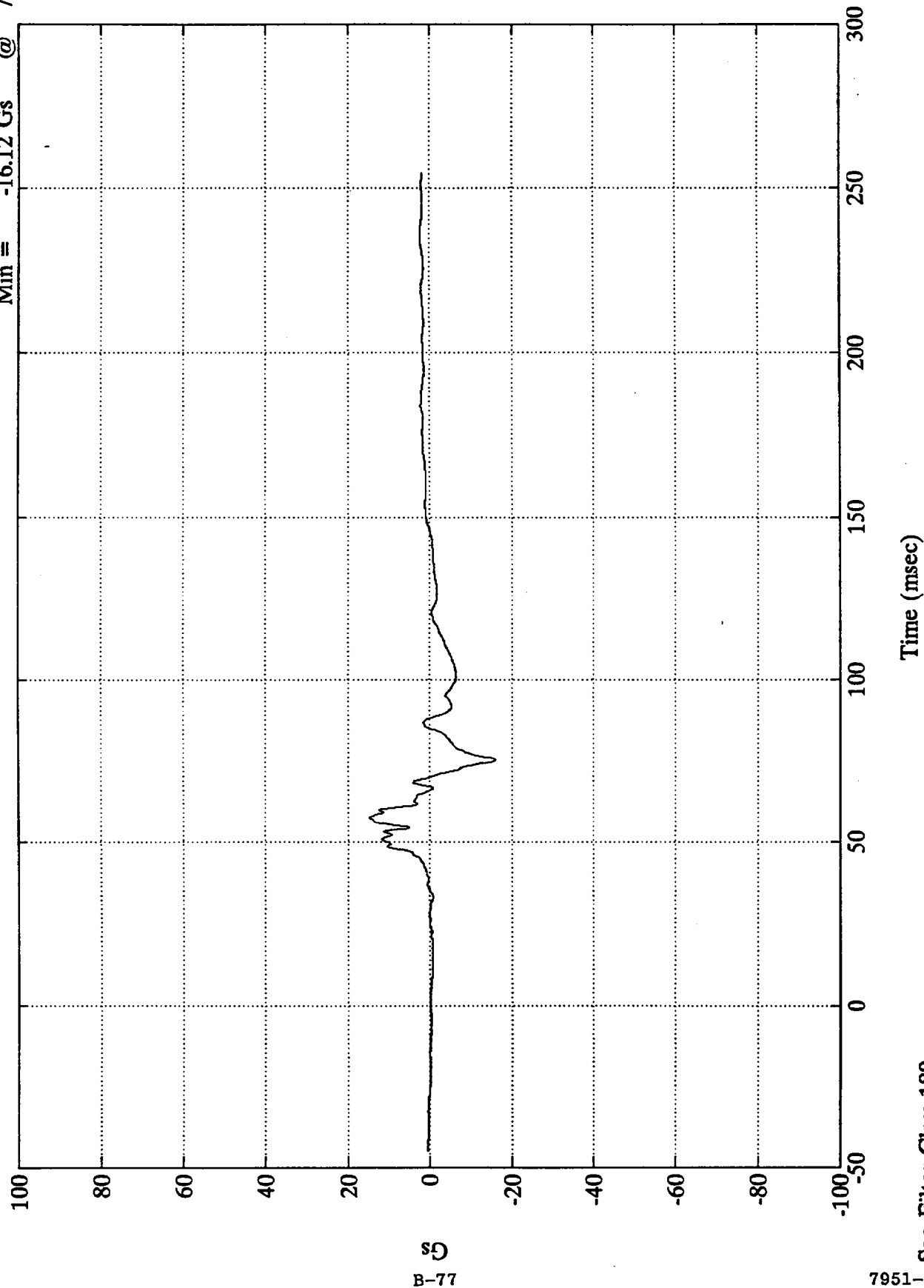


B-76

NCAP TEST #8 1992 GEO METRO

Max = 14.75 Gs @ 57.47 msec
 Min = -16.12 Gs @ 75.36 msec

Pos. 1 Chest Z



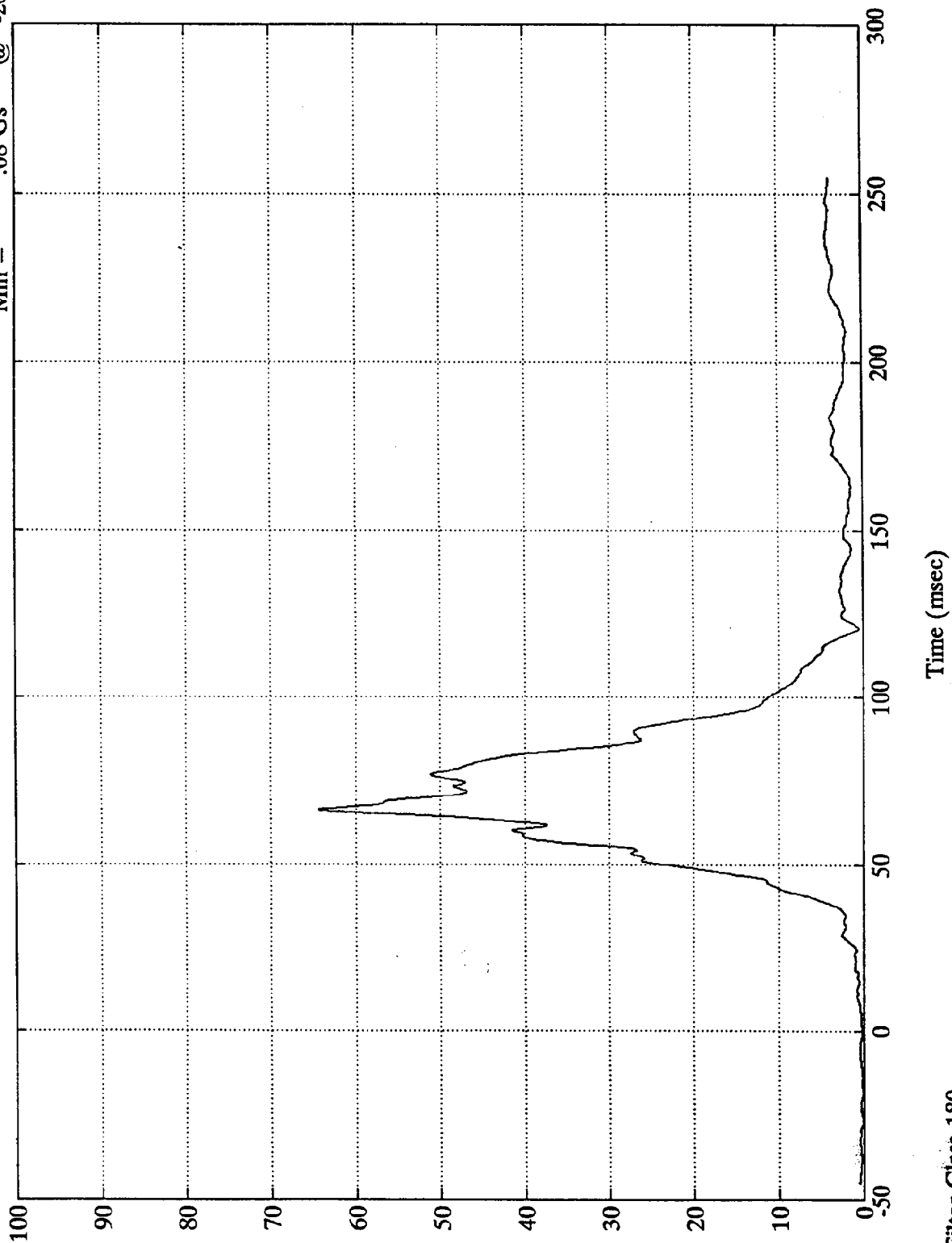
B-77

7951-2 Sae Filter Class 180

NCAP TEST #8 1992 GEO METRO

Pos. 1 Chest Resultant

Max = 64.32 Gs @ 66.00 msec
 Min = .08 Gs @ -26.76 msec



B-78

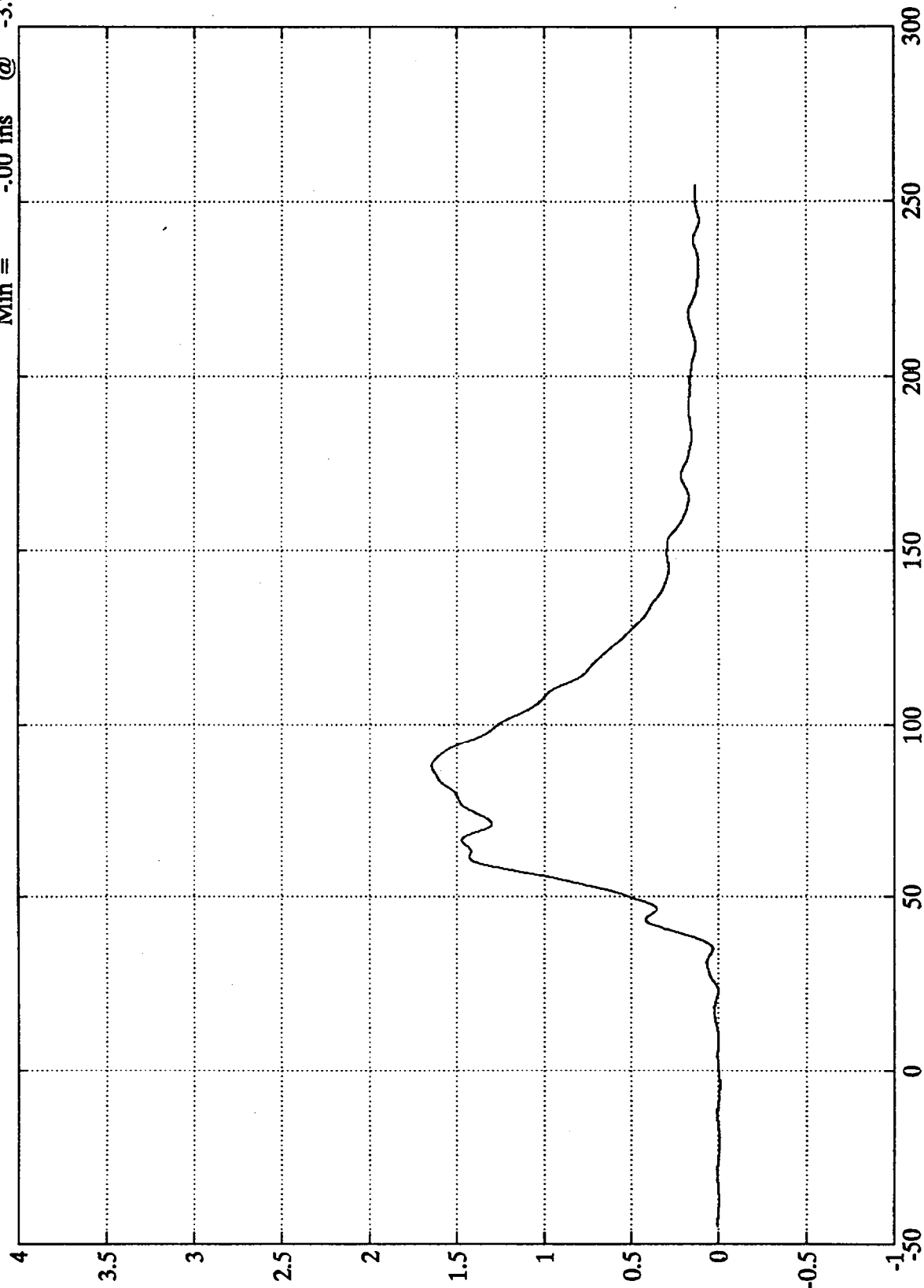
Sae Filter Class 180

7951-2

NCAP TEST #8 1992 GEO METRO

Pos. 1 Chest Disp.

Max = 1.64 ins @ 88.08 msec
Min = -0.00 ins @ -3.96 msec



SU
B-79

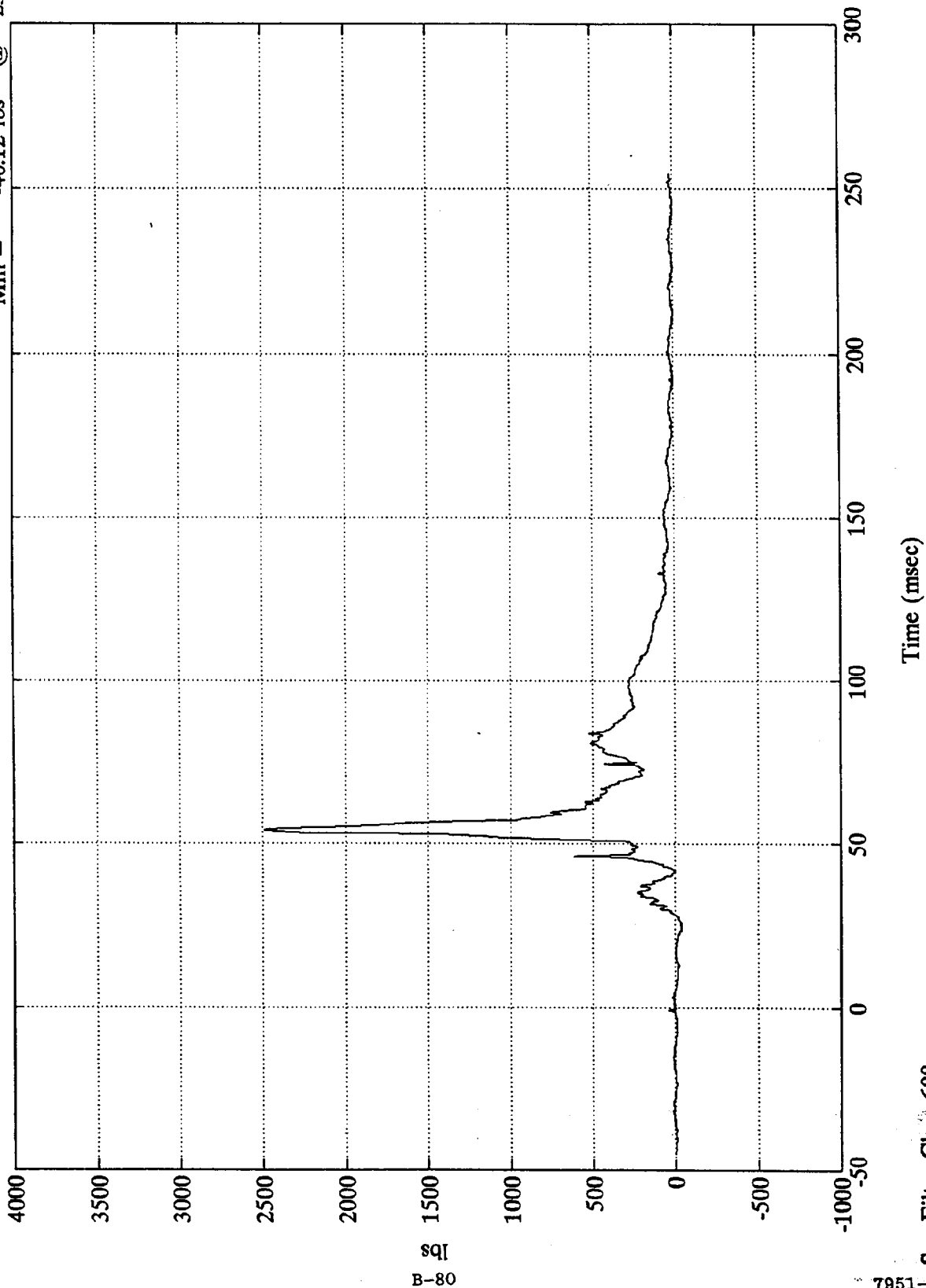
7951-2

Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Pos. 1 Left Femur

Max = 2489.03 lbs @ 54.11 msec
Min = -40.12 lbs @ 23.39 msec



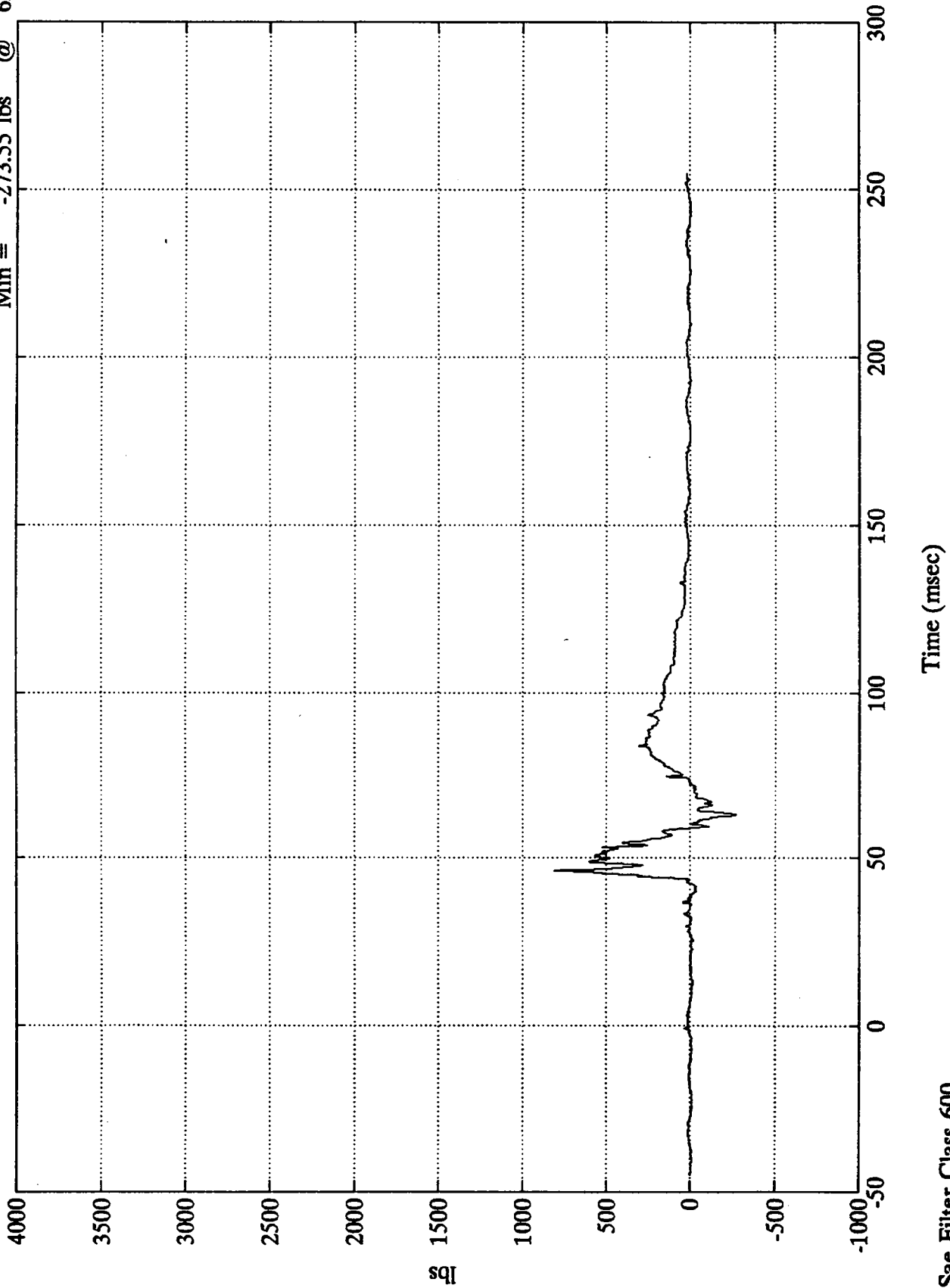
B-80

7951-2 Sae Filter Class 600

NCAP TEST #8 1992 GEO METRO

Pos. 1 Right Femur

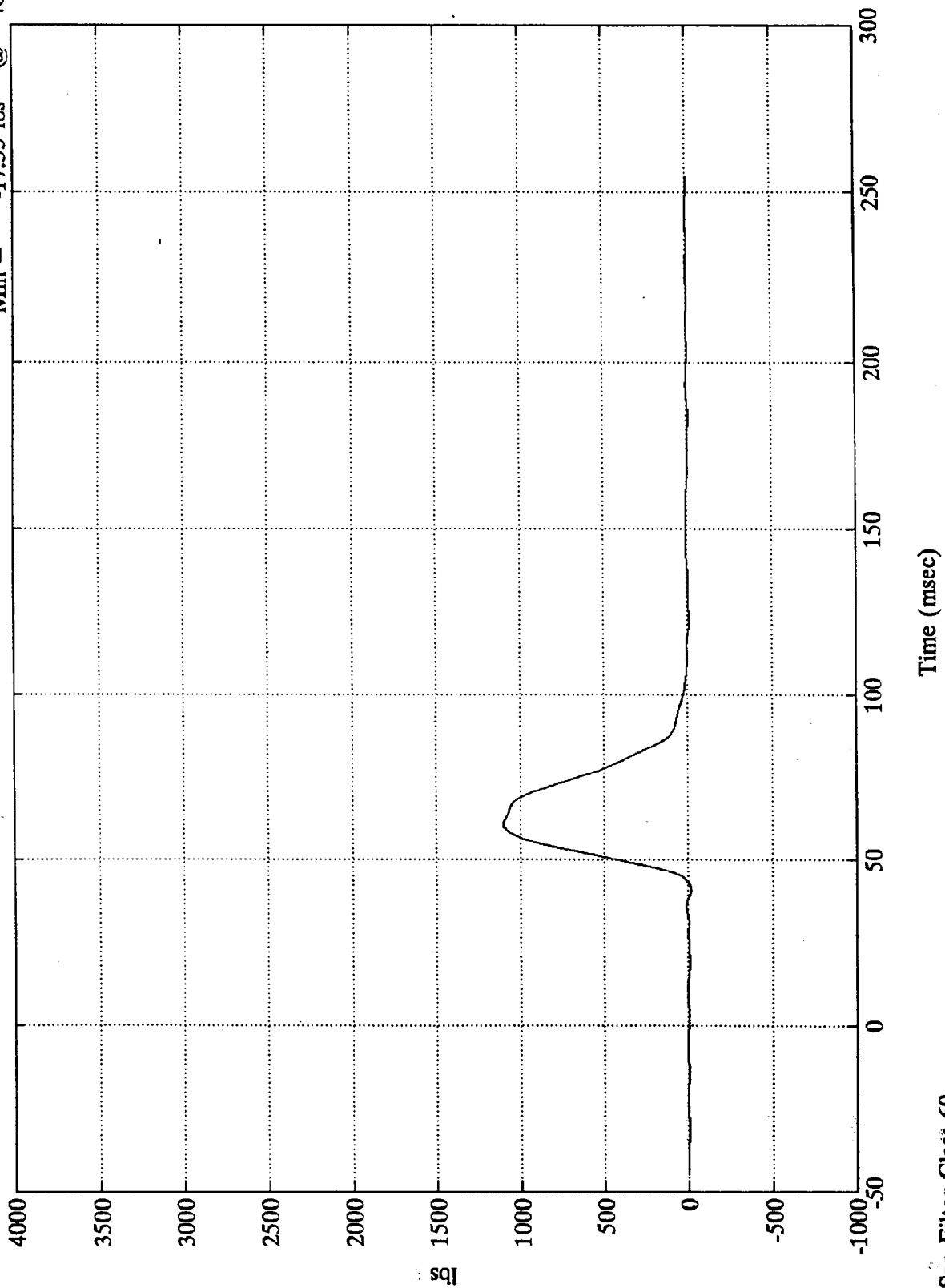
Max = 809.89 lbs @ 46.20 msec
Min = -273.55 lbs @ 63.23 msec



NCAP TEST #8 1992 GEO METRO

Pos. 1 Left Belt Load

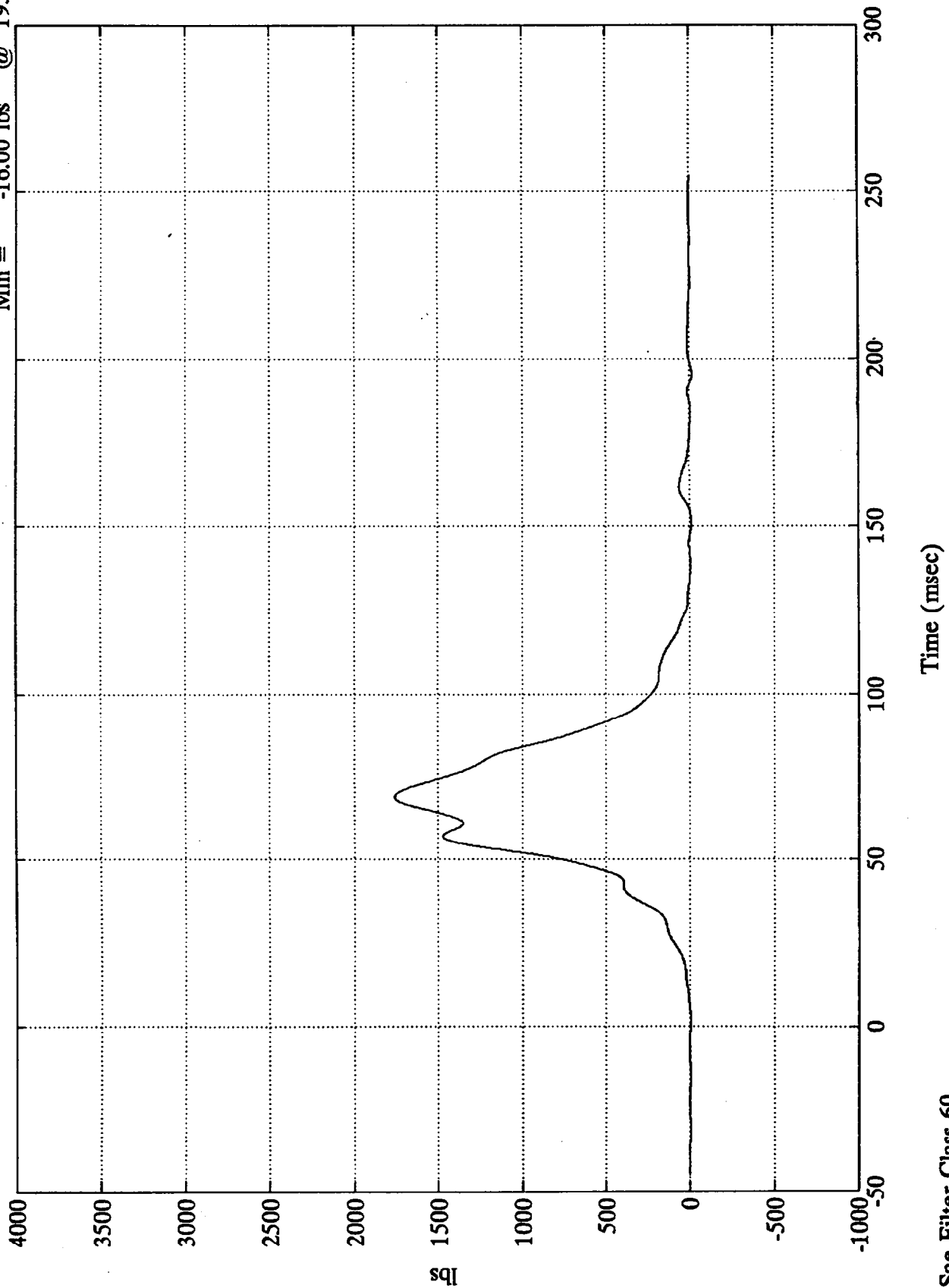
Max = 1099.47 lbs @ 60.60 msec
Min = -17.33 lbs @ 40.68 msec



NCAP TEST #8 1992 GEO METRO

Pos. 1 Torso Belt Load

Max = 1756.24 lbs @ 69.00 msec
Min = -16.00 lbs @ 195.24 msec



B-83

7951-2

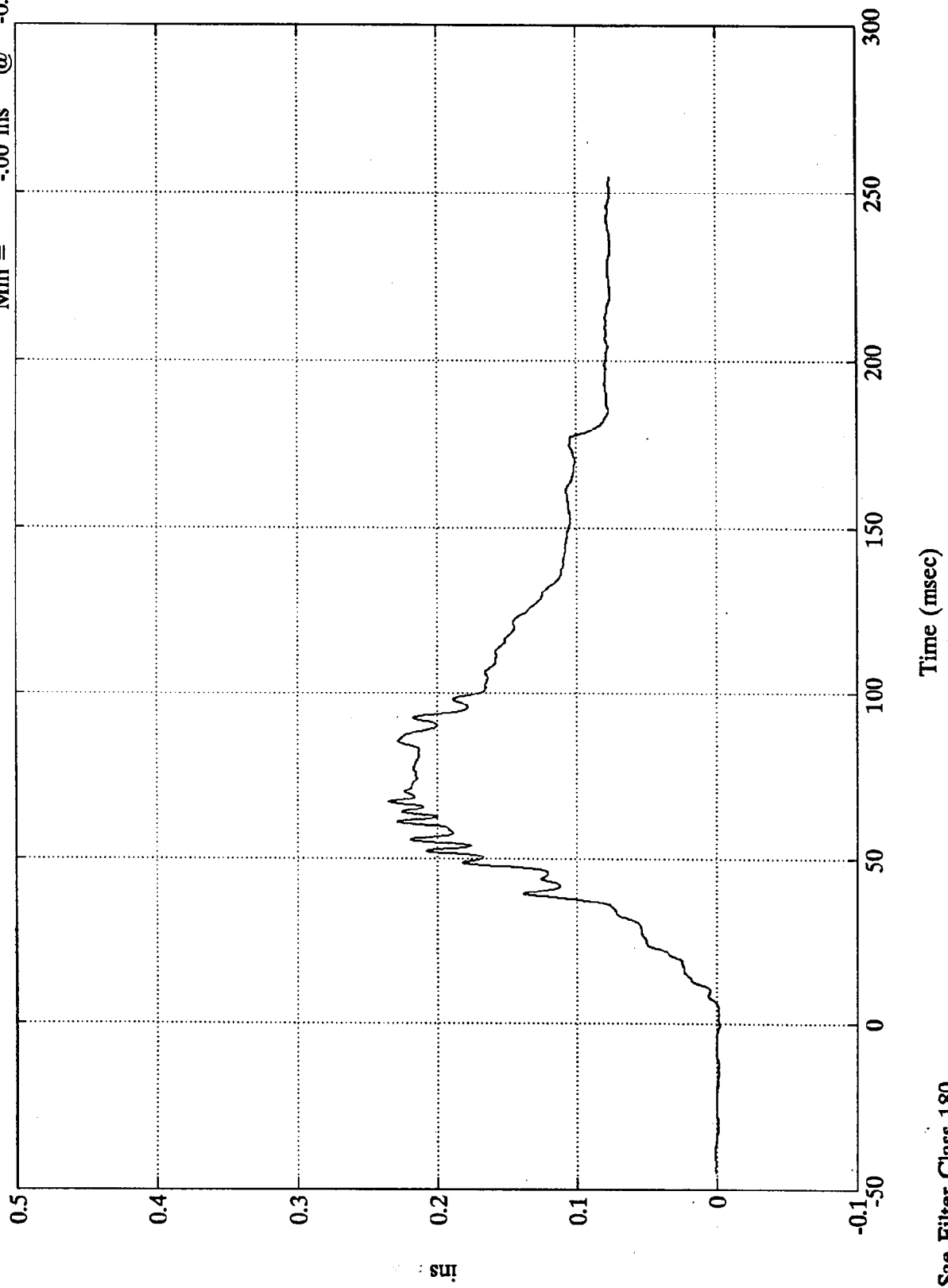
Sae Filter Class 60

NCAP TEST #8 1992 GEO METRO

Pos. 1 Belt Elongation

Max = .23 ins @ 67.32 msec

Min = -.00 ins @ -0.84 msec

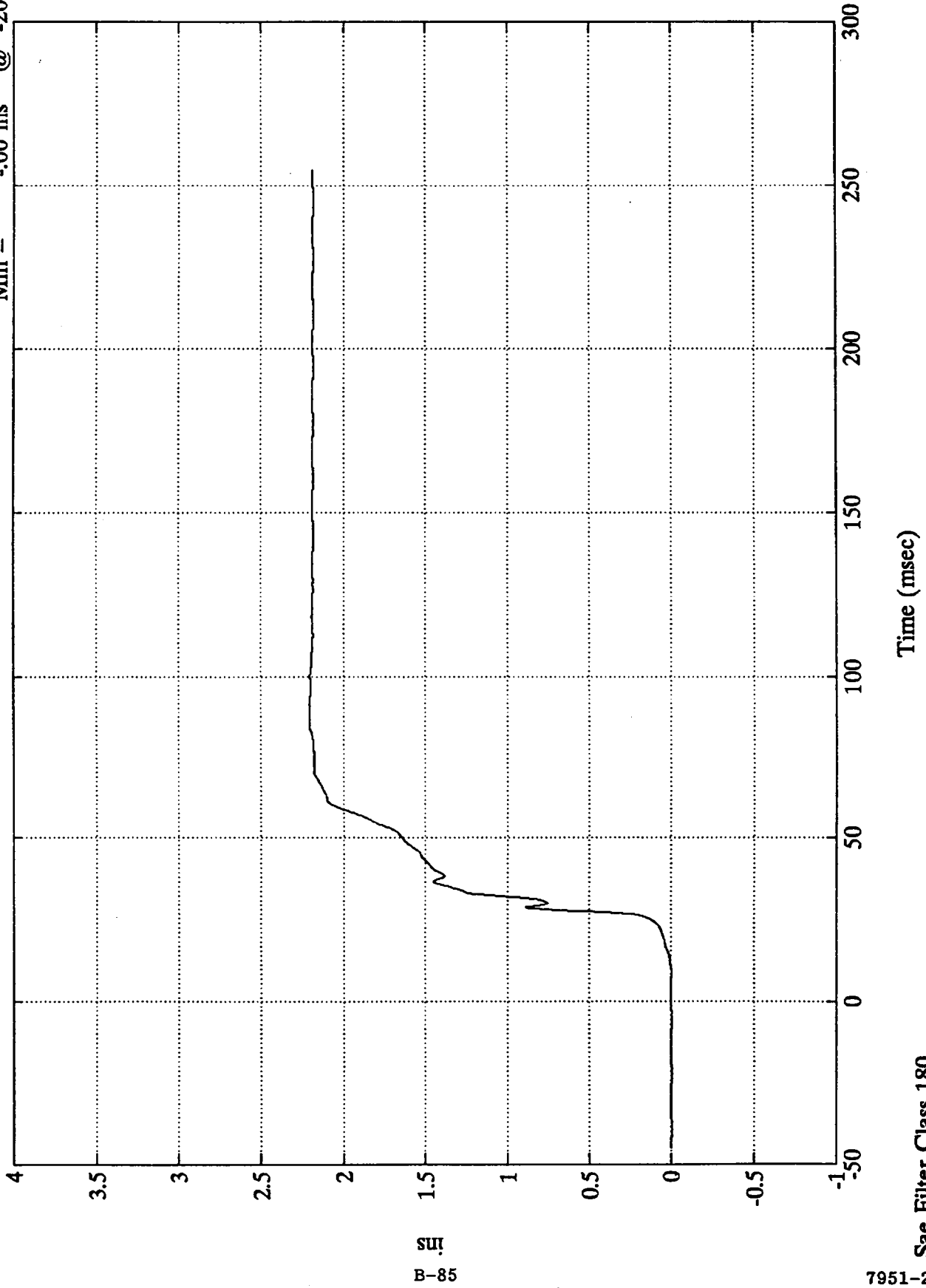


ins
B-84

NCAP TEST #8 1992 GEO METRO

Pos. 1 Belt Spool Out

Max = 2.20 ins @ 84.24 msec
Min = -0.00 ins @ -20.76 msec



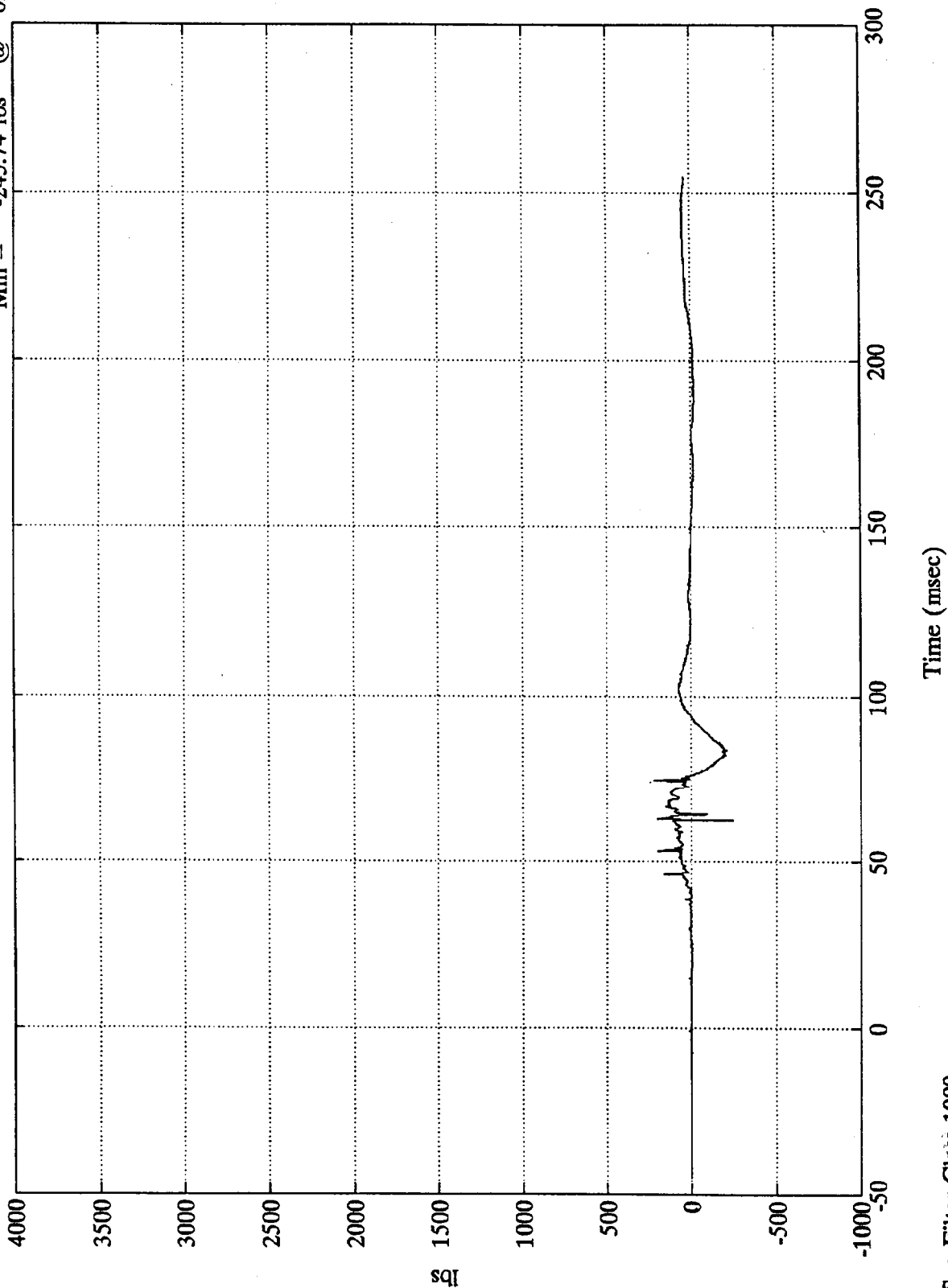
su
B-85

Sae Filter Class 180

NCAP TEST #8 1992 GEO METRO

Pos. 1 Upper Neck Fx

Max = 219.14 lbs @ 74.76 msec
Min = -245.74 lbs @ 62.64 msec



B-86

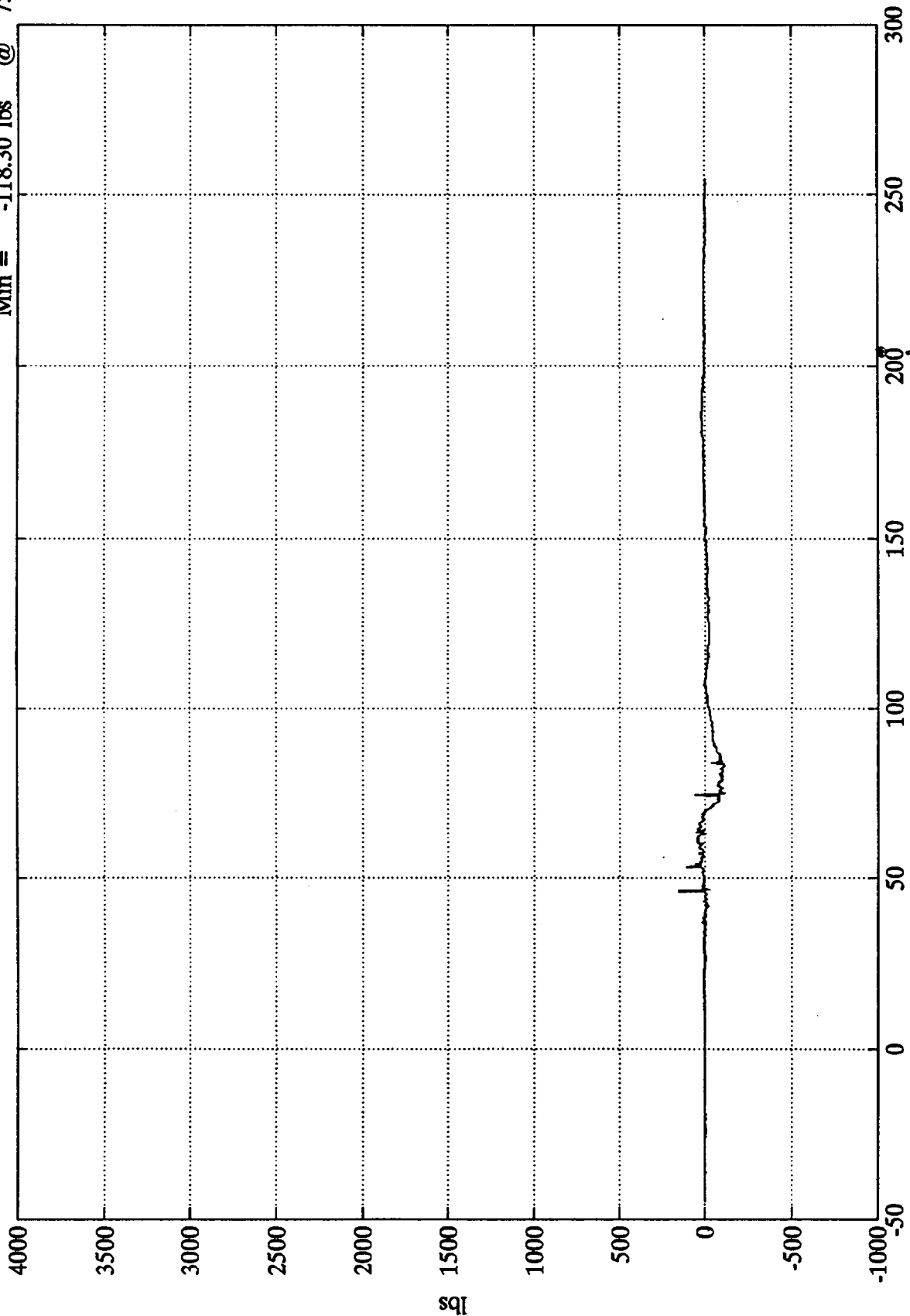
7951-2

Sae Filter Class 1000

NCAP TEST #8 1992 GEO METRO

Pos. 1 Upper Neck Fy

Max = 153.15 lbs @ 46.20 msec
Min = -118.30 lbs @ 75.12 msec



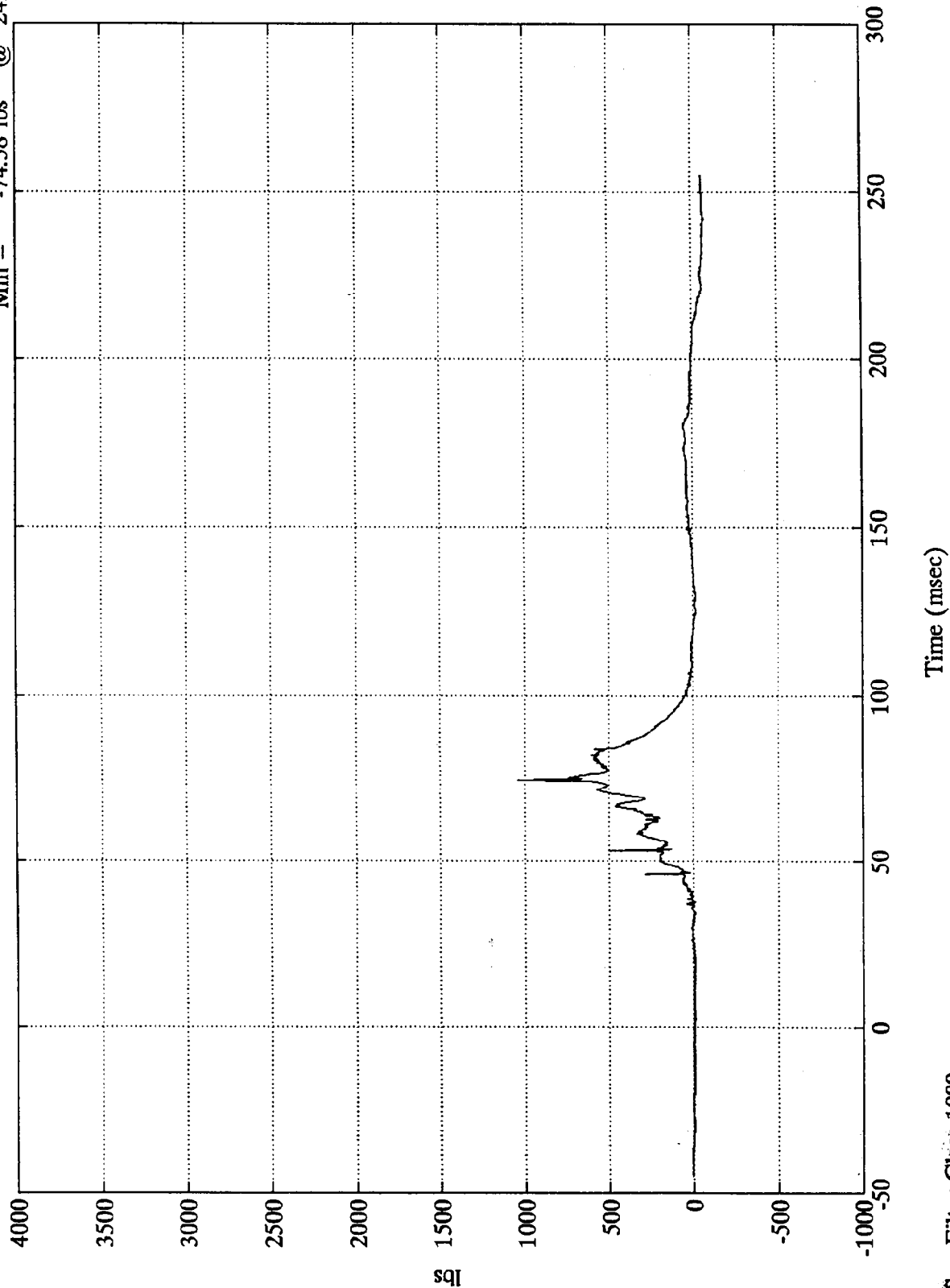
Time (msec)

Sae Filter Class 1000

NCAP TEST #8 1992 GEO METRO

Pos. 1 Upper Neck Fz

Max = 1041.73 lbs @ 74.76 msec
Min = -74.58 lbs @ 242.16 msec



B-88

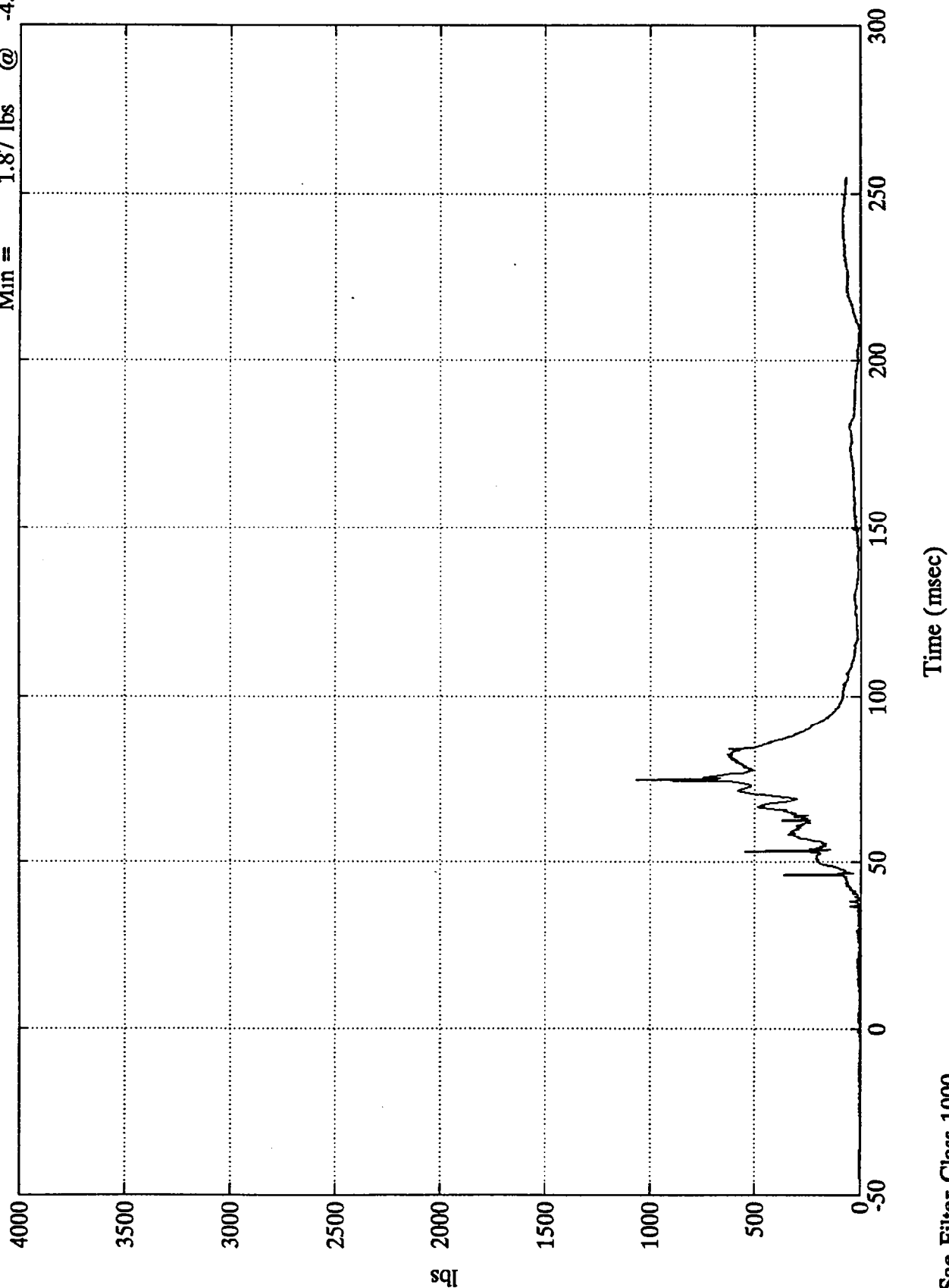
7951-2

Sae Filter Class 1000

NCAP TEST #8 1992 GEO METRO

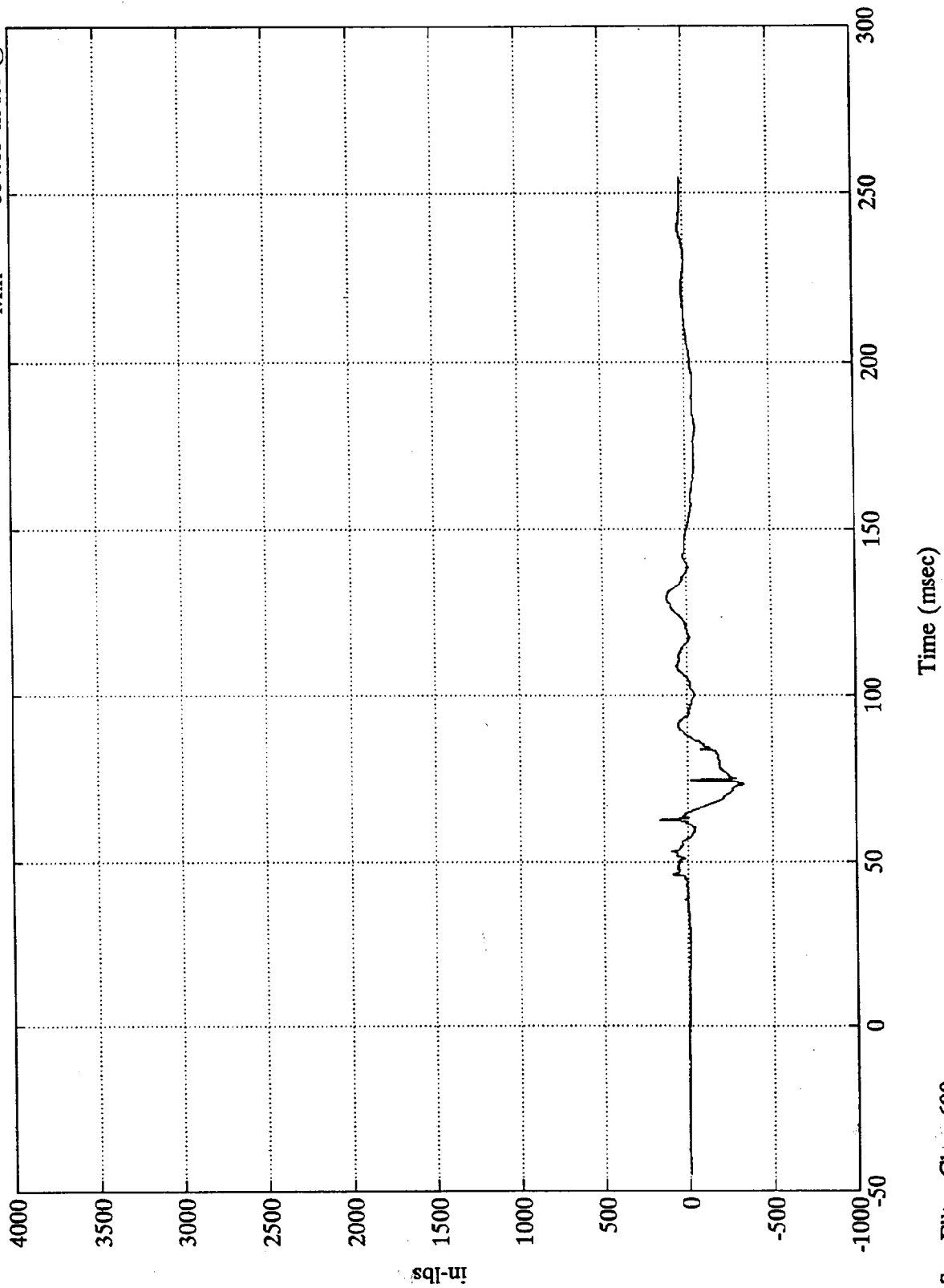
Pos. 1 Neck Force Res.

Max = 1065.88 lbs @ 74.76 msec
 Min = 1.87 lbs @ -4.92 msec



NCAP TEST #8 1992 GEO METRO

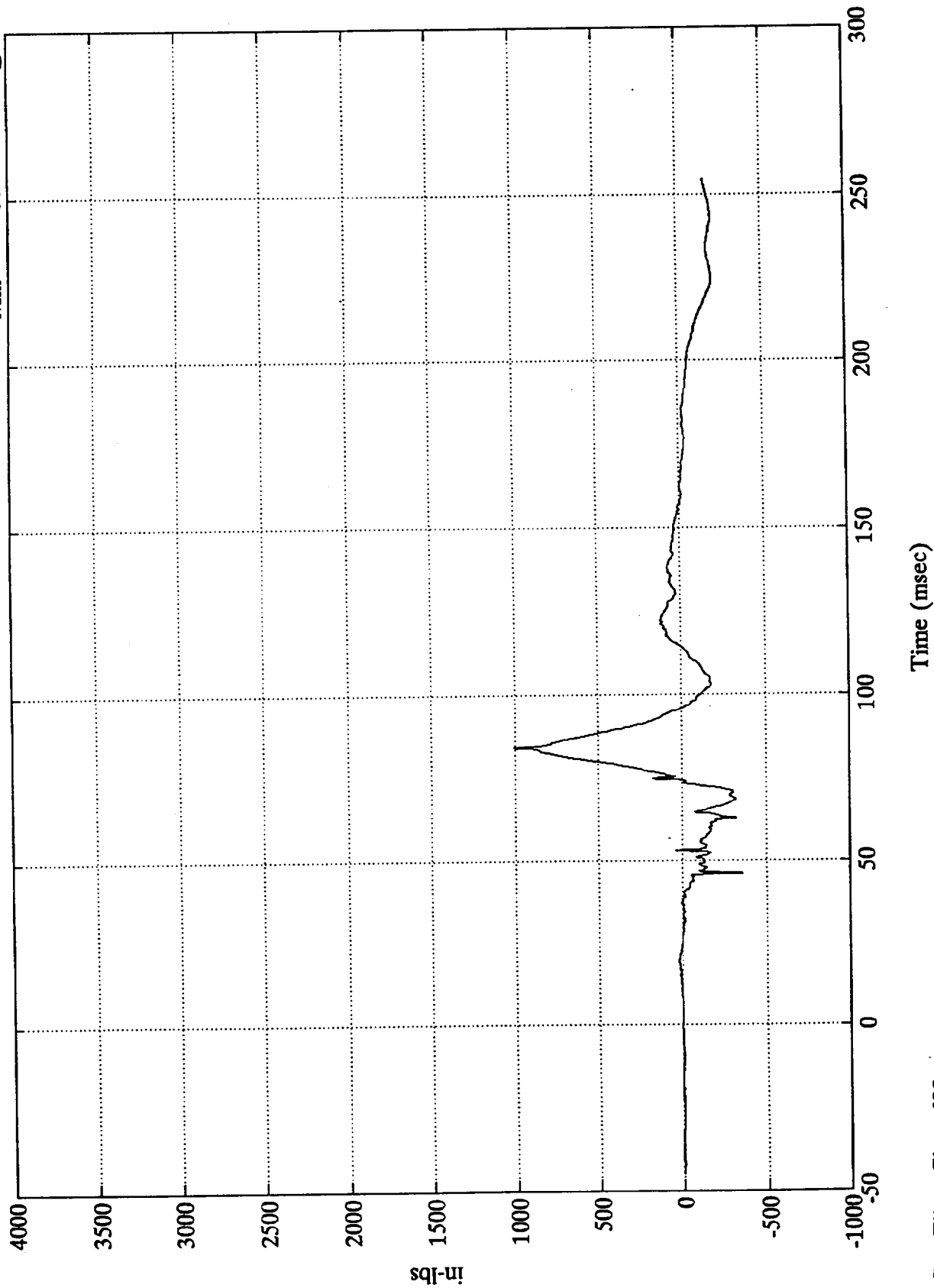
Pos. 1 Upper Neck Mx
Max = 164.53 in-lbs @ 62.64 msec
Min = -334.03 in-lbs @ 73.31 msec



B-90
sqi-ur

7951-2

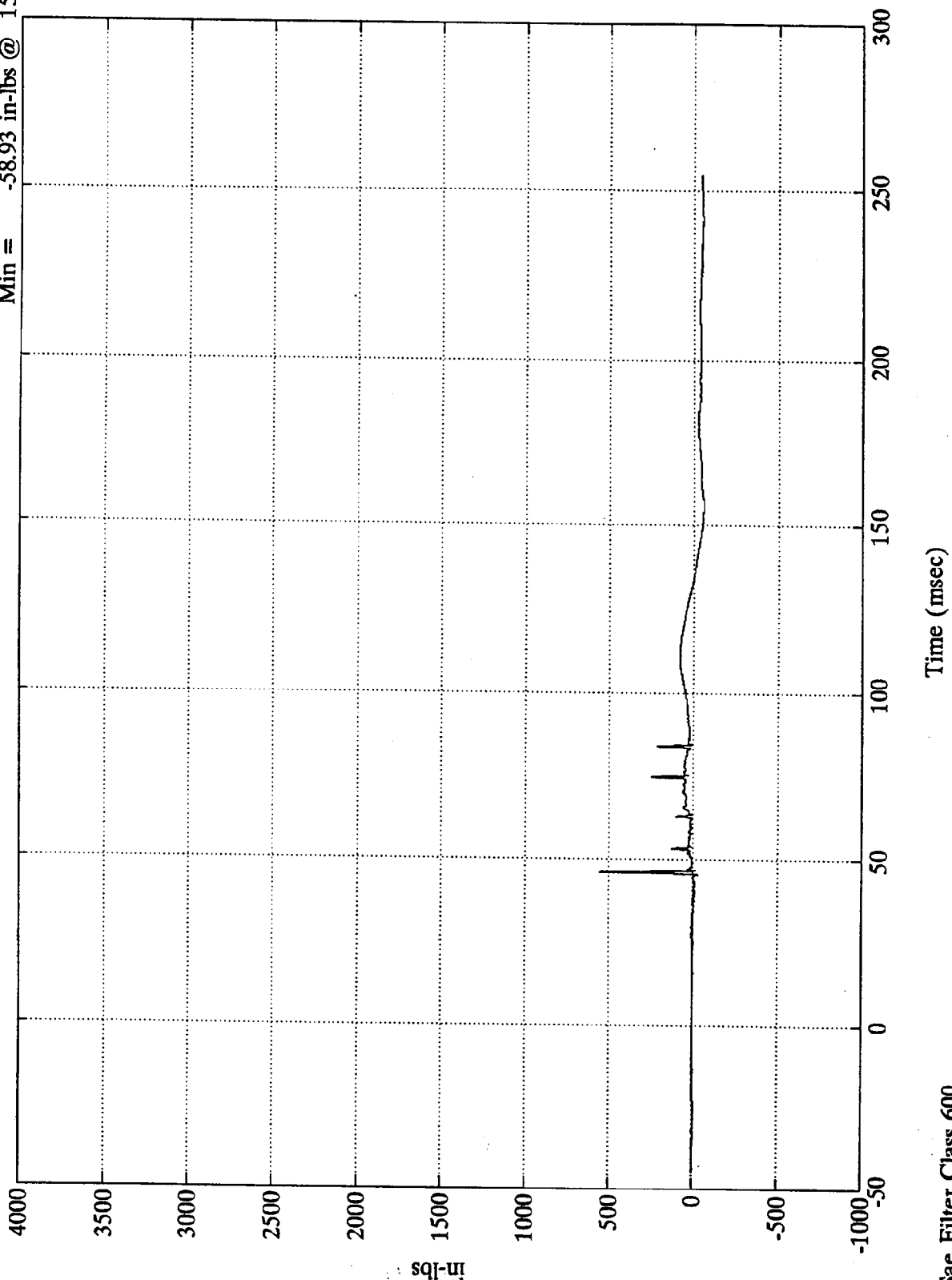
Sae Filter Class 600



NCAP TEST #8 1992 GEO METRO

Pos. 1 Upper Neck Mz

Max = 555.52 in-lbs @ 46.20 msec
Min = -58.93 in-lbs @ 155.16 msec



sqi-ur

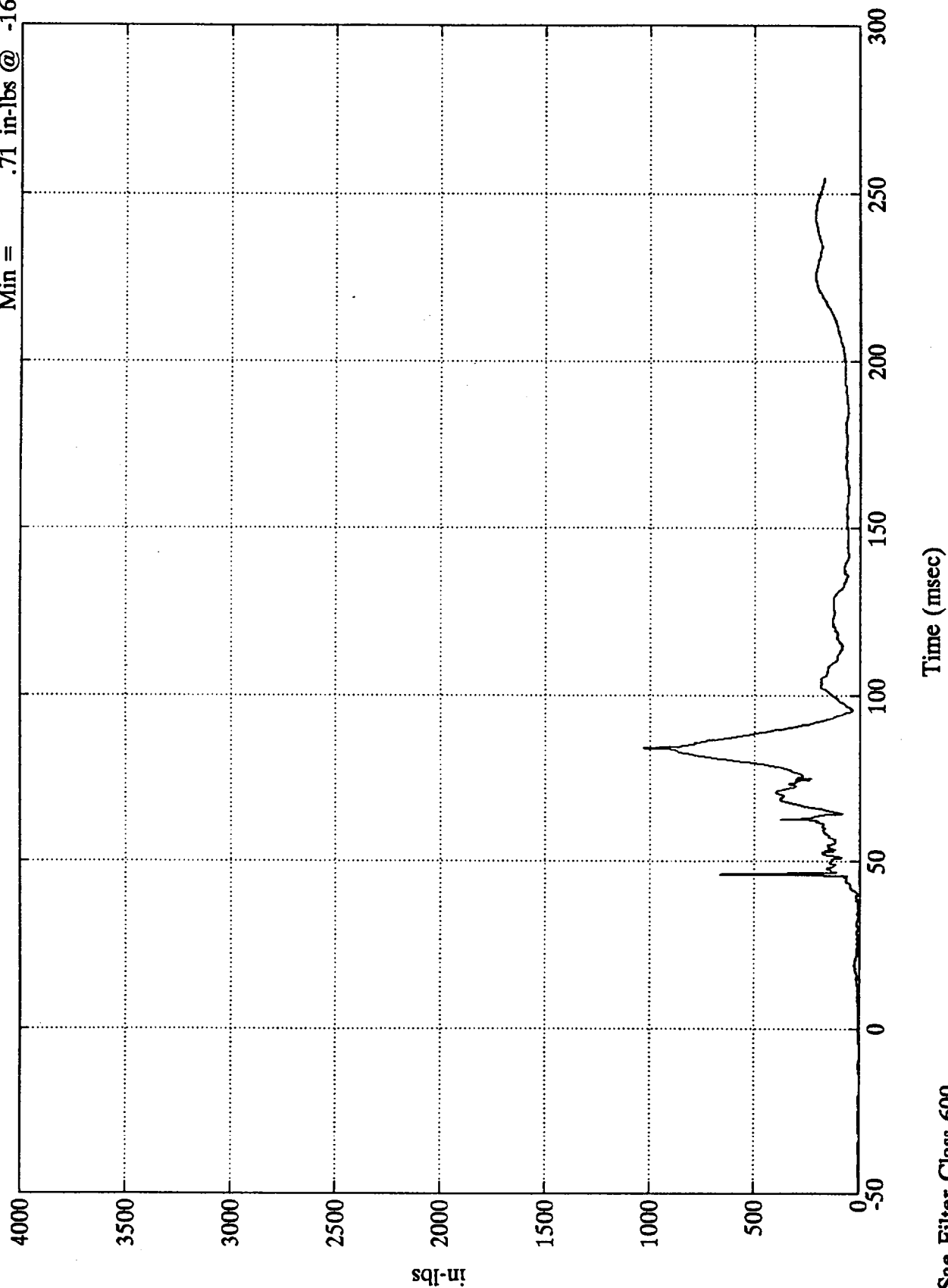
B-92

7951-2 Sae Filter Class 600

NCAP TEST #8 1992 GEO METRO

Pos. 1 Neck Moment Res.

Max = 1030.66 in-lbs @ 84.00 msec
 Min = .71 in-lbs @ -16.92 msec



Sae Filter Class 600

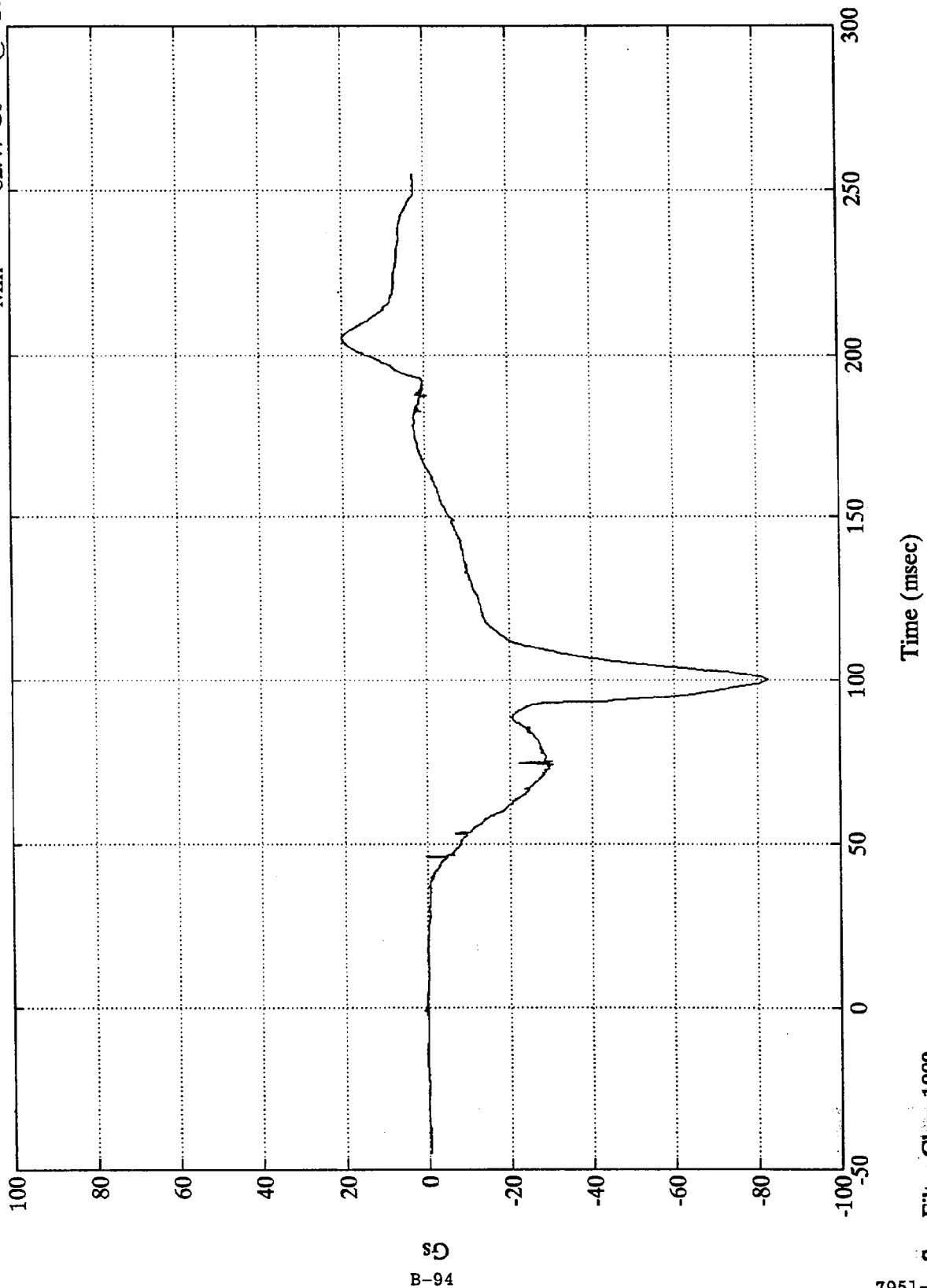
B-93

7951-2

NCAP TEST #8 1992 GEO METRO

Pos. 2 Head X

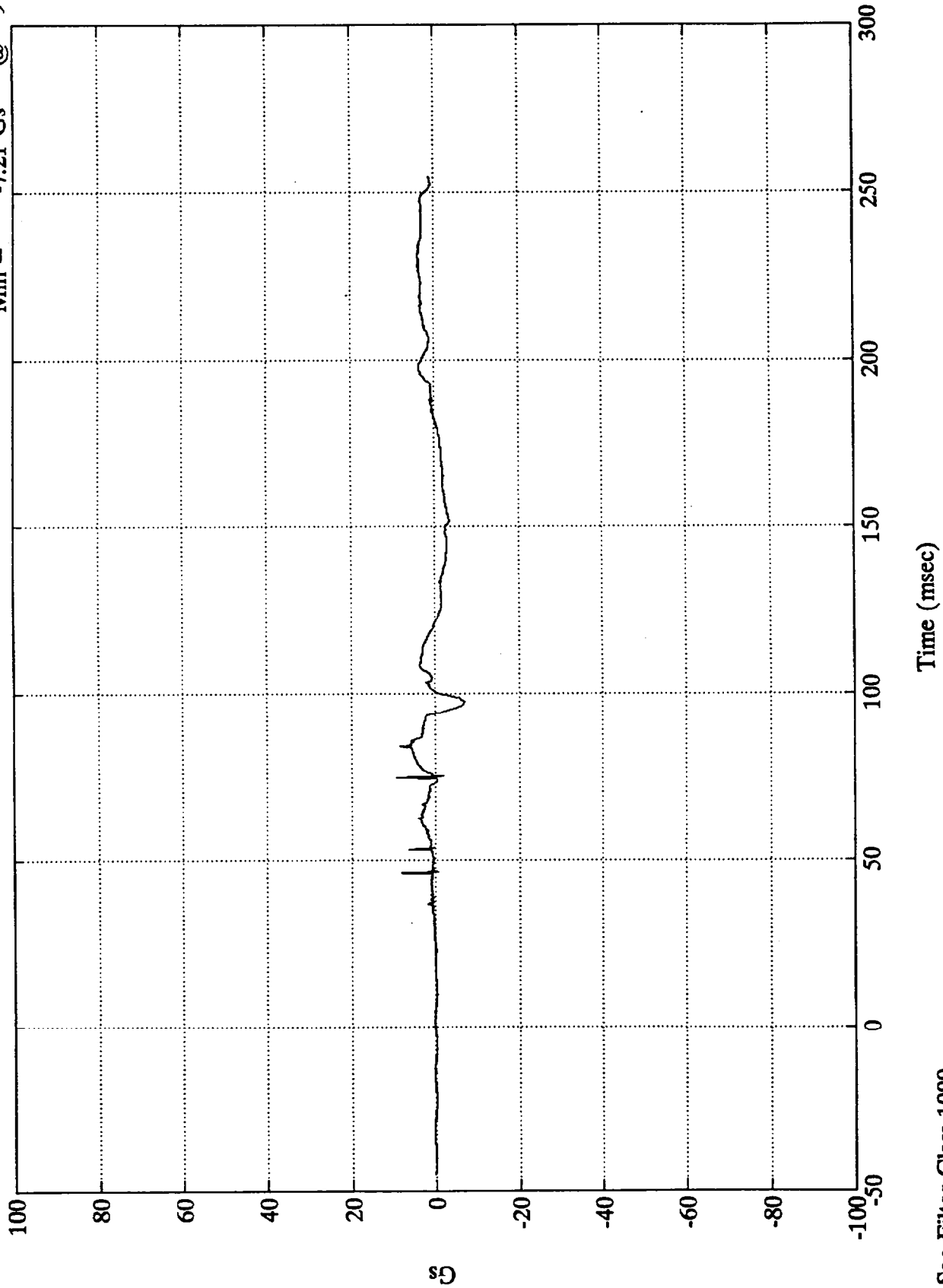
Max = 19.92 Gs @ 205.44 msec
Min = -82.47 Gs @ 100.20 msec



B-94

NCAP TEST #8 1992 GEO METRO

Pos. 2 Head Y
Max = 9.25 Gs @ 74.76 msec
Min = -7.21 Gs @ 97.56 msec



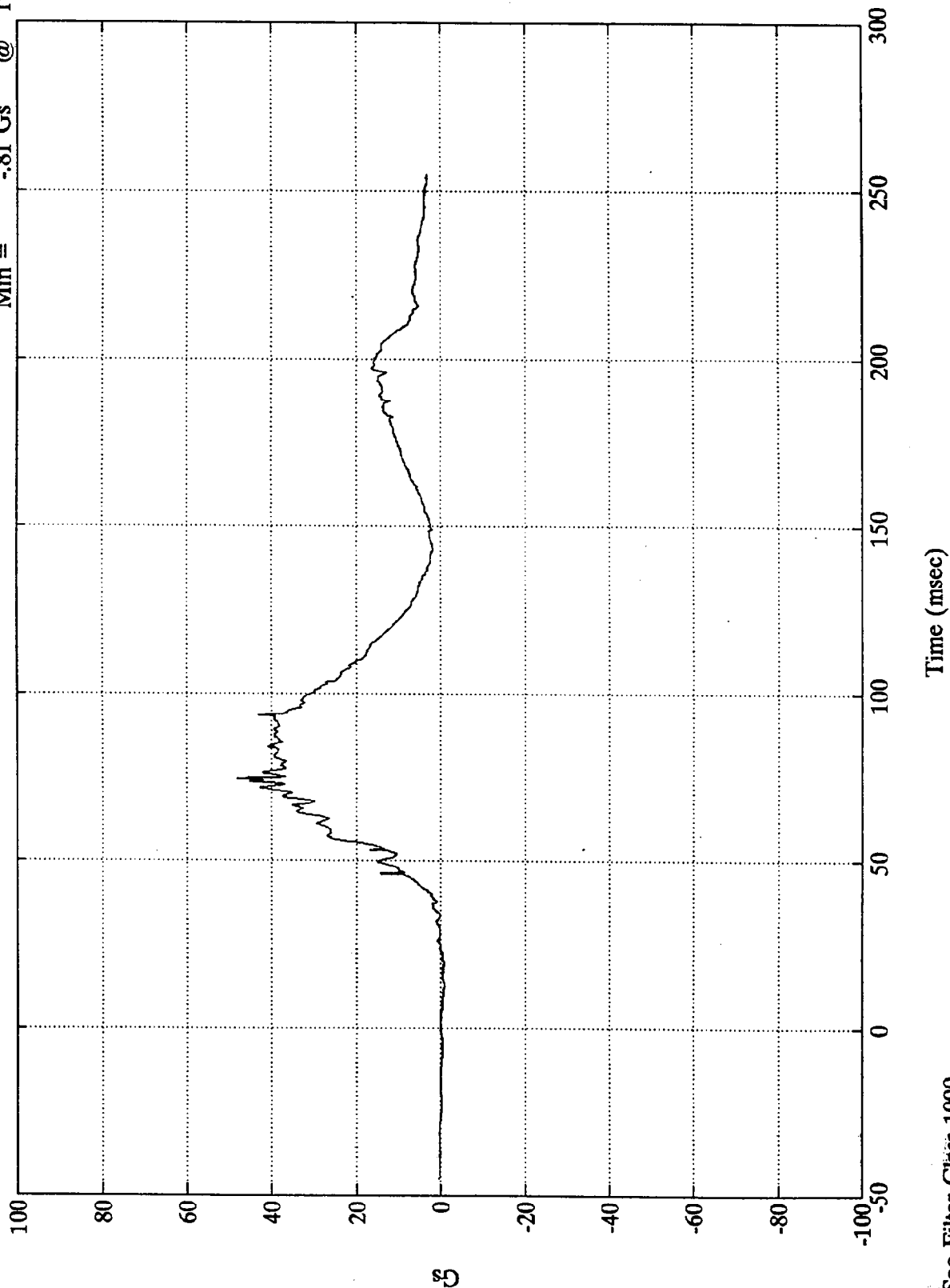
B-95

Sae Filter Class 1000

7951-2

NCAP TEST #8 1992 GEO METRO

Pos. 2 Head Z
 Max = 48.04 Gs @ 74.76 msec
 Min = -81 Gs @ 19.79 msec



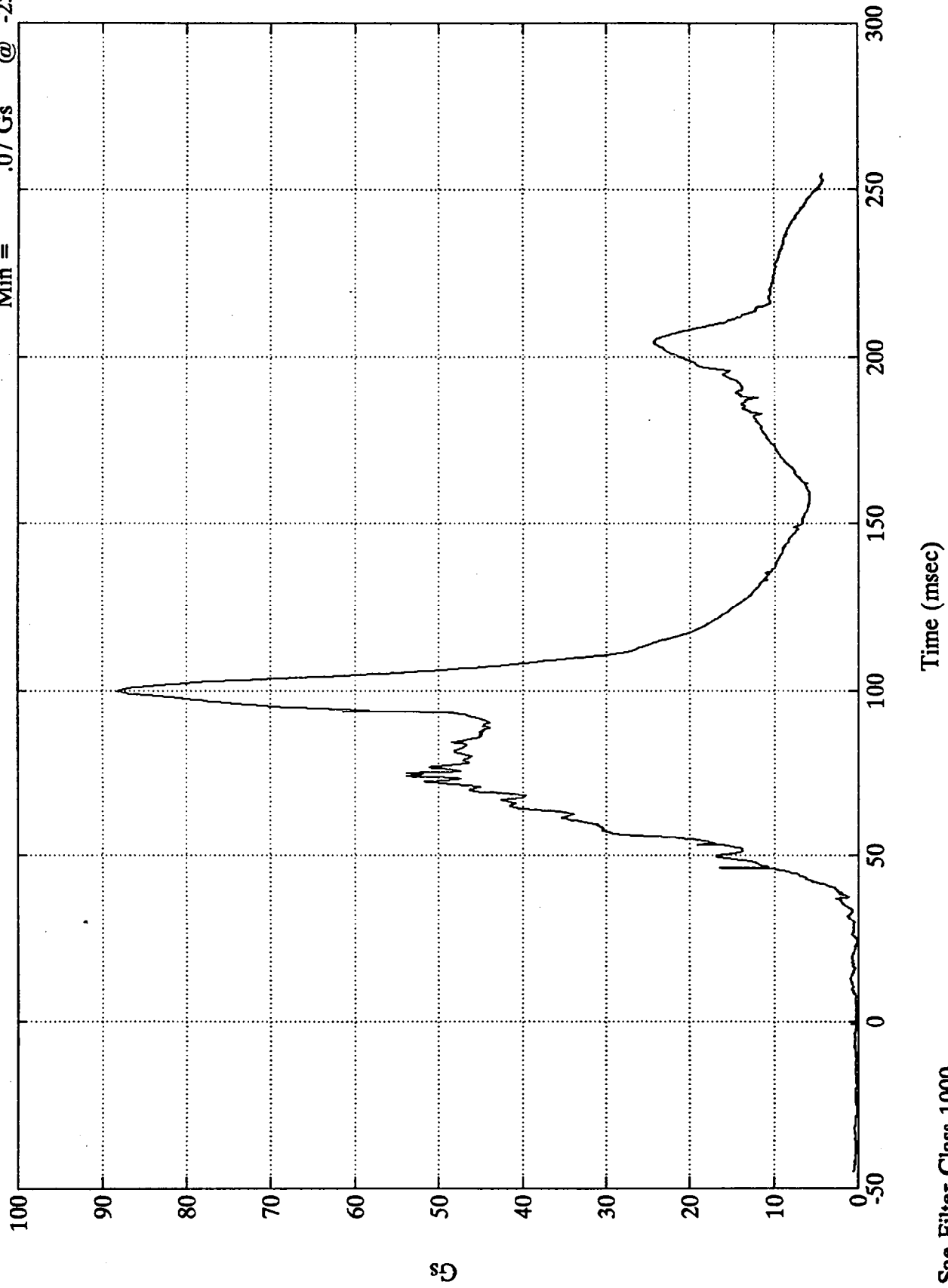
B-96

7951-2
 Sae Filter Class 1000

NCAP TEST #8 1992 GEO METRO

Pos. 2 Head Resultant

Max = 88.11 Gs @ 99.59 msec
 Min = .07 Gs @ -25.44 msec



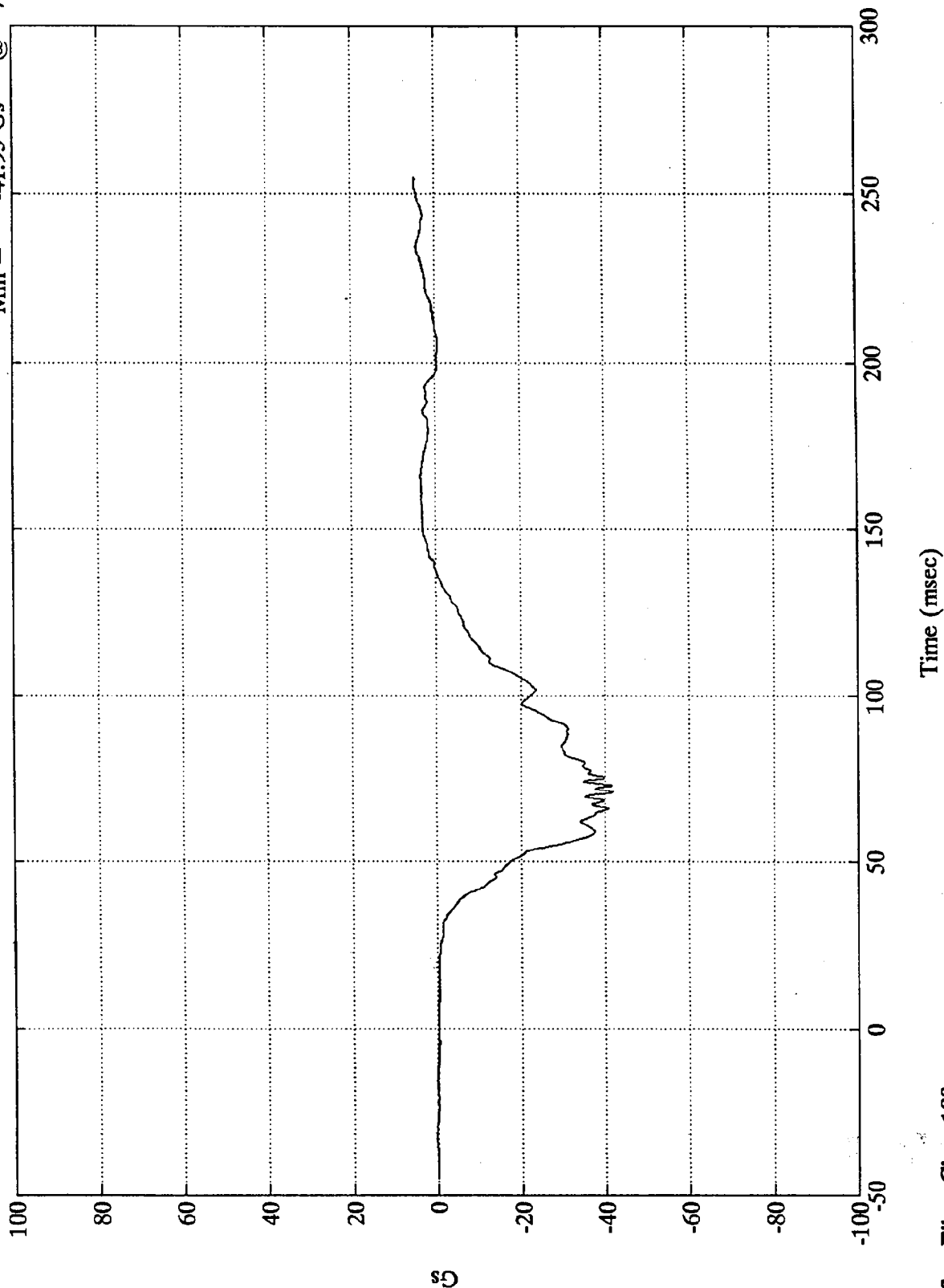
B-97

7951-2 Sae Filter Class 1000

NCAP TEST #8 1992 GEO METRO

Max = 4.67 Gs @ 252.00 msec
Min = -41.93 Gs @ 71.16 msec

Pos. 2 Chest X



B-98

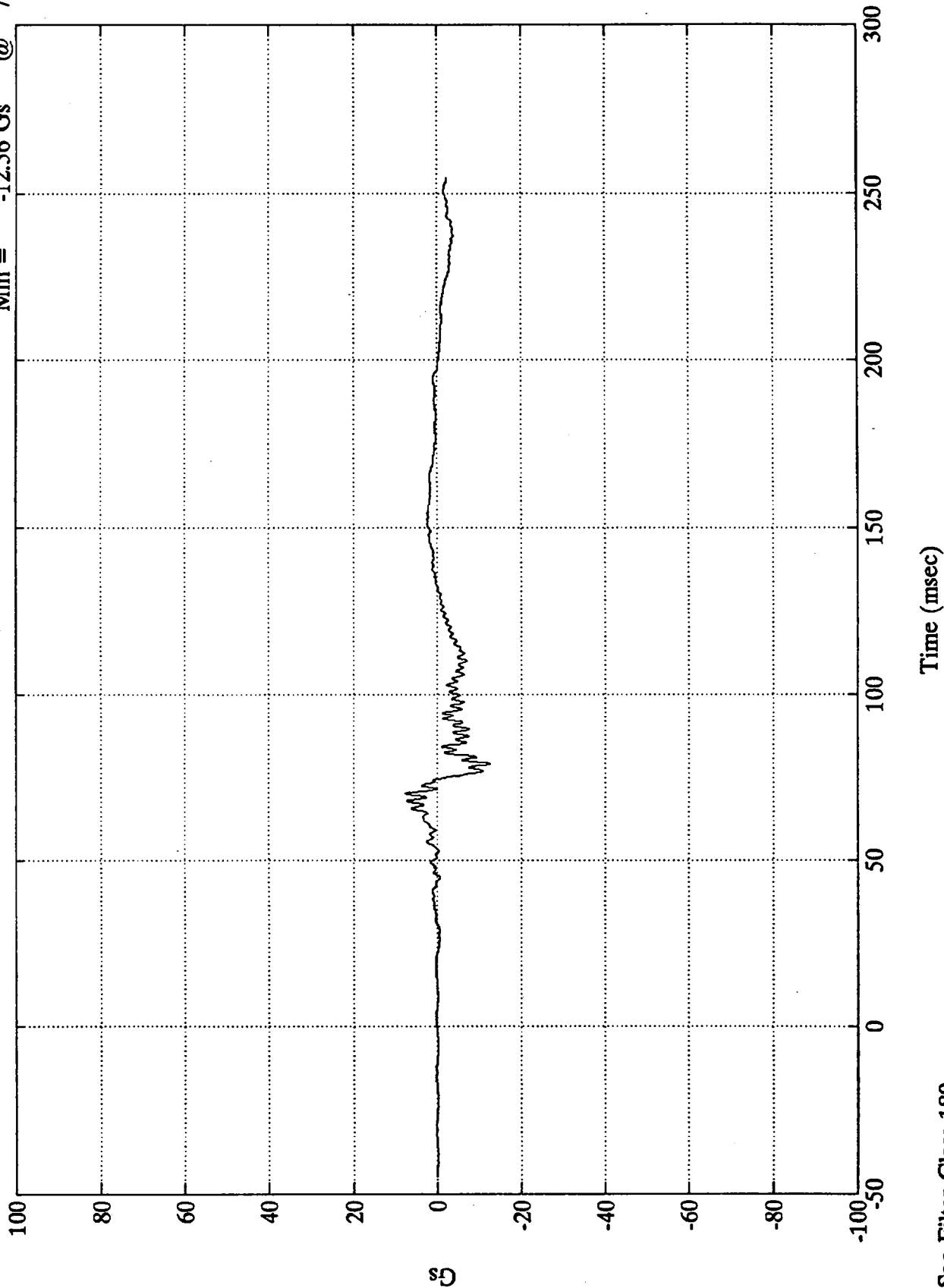
7951-2
Sae Filter Class 180

NCAP TEST #8 1992 GEO METRO

Max = 70.08 msec
Min = 78.84 msec

@ 7.56 Gs
@ -12.56 Gs

Pos. 2 Chest Y



B-99

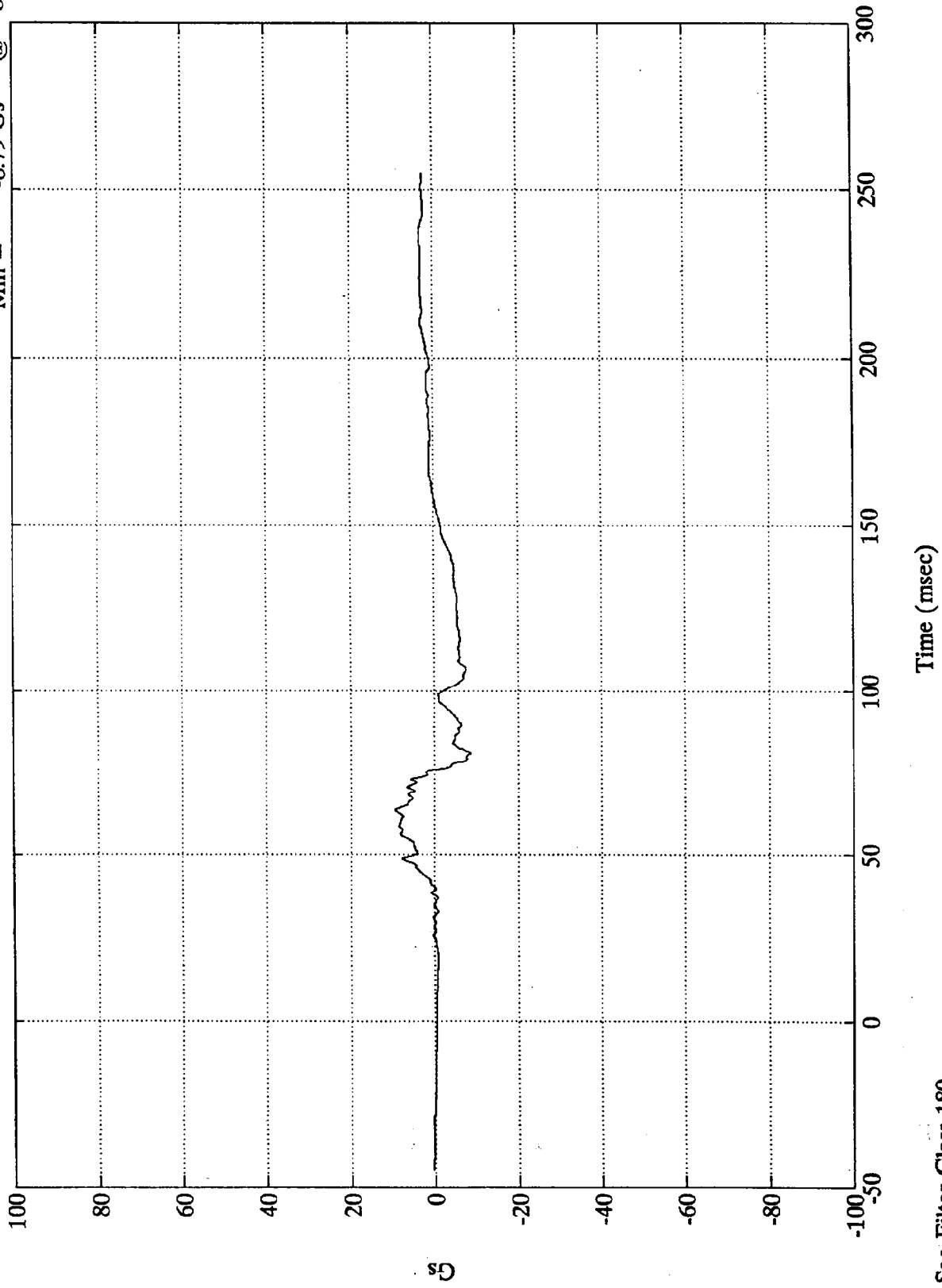
7951-2

Sae Filter Class 180

NCAP TEST #8 1992 GEO METRO

Max = 9.38 Gs @ 63.48 msec
Min = -8.79 Gs @ 81.00 msec

Pos. 2 Chest Z

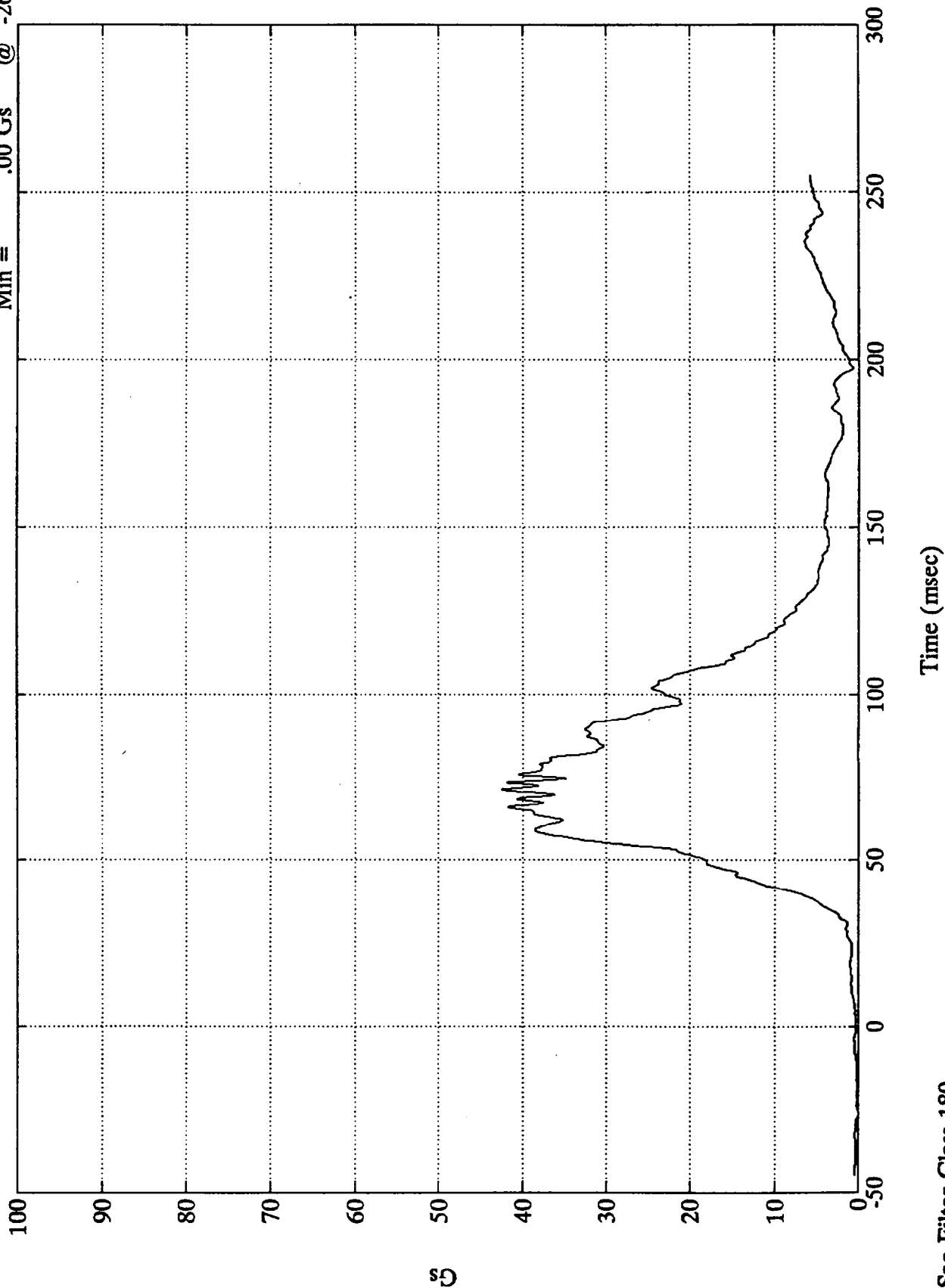


B-100

NCAP TEST #8 1992 GEO METRO

Pos. 2 Chest Resultant

Max = 42.36 Gs @ 71.16 msec
Min = .00 Gs @ -26.16 msec



B-101

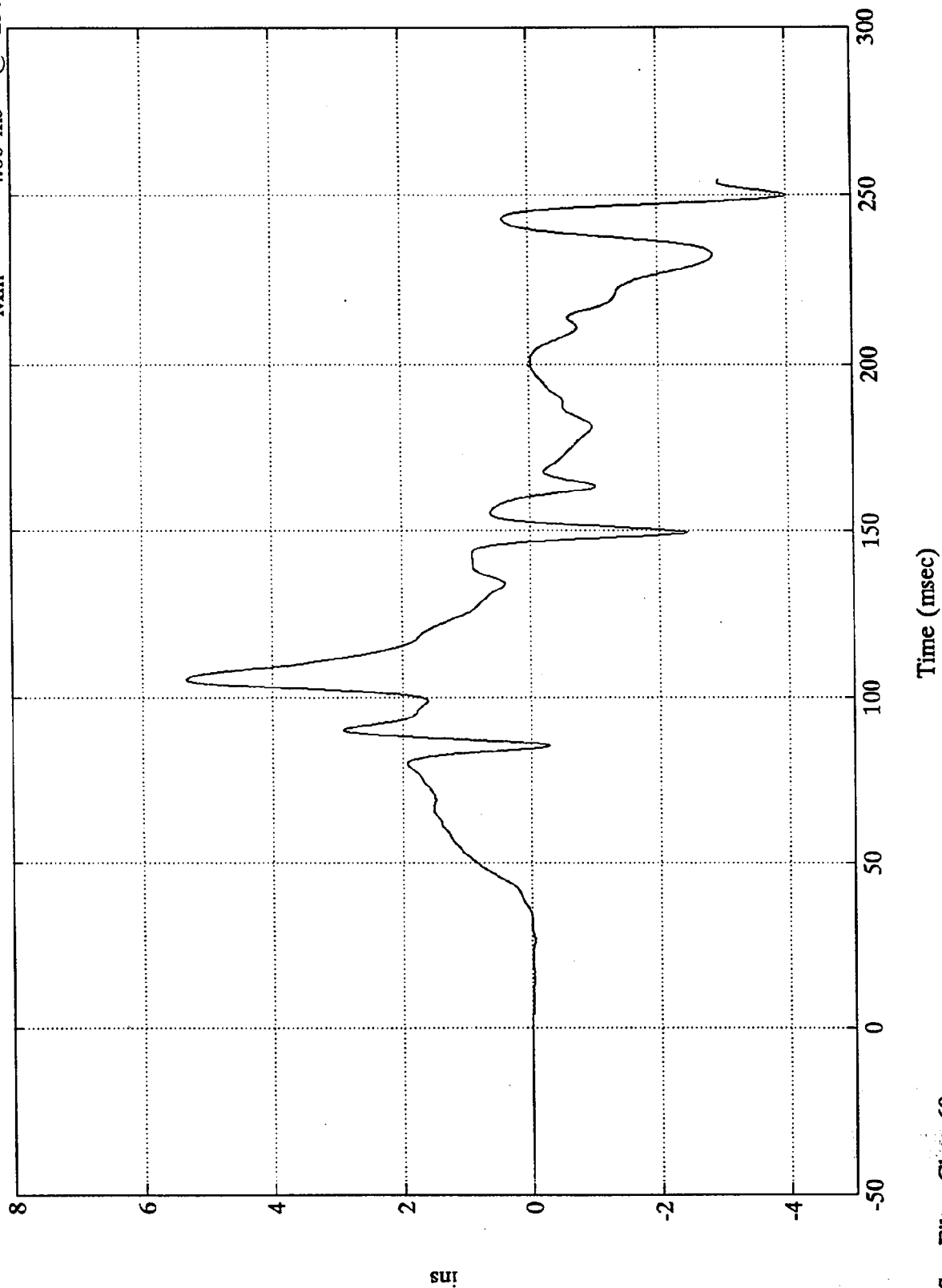
7951-2

Sae Filter Class 180

NCAP TEST #8 1992 GEO METRO

Pos. 2 Chest Disp.

Max = 5.32 ins @ 105.48 msec
Min = -4.00 ins @ 250.08 msec

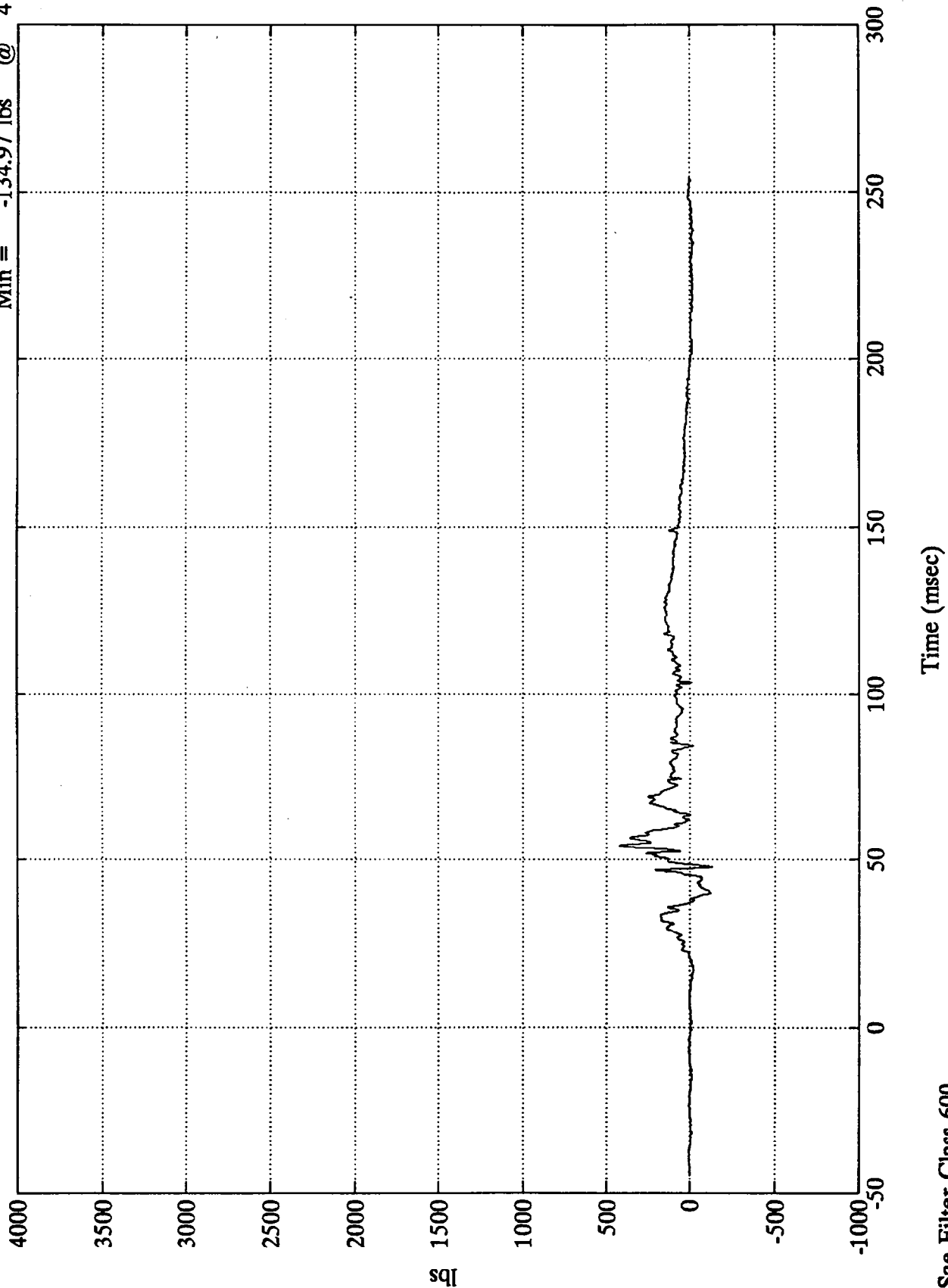


ins
B-102

NCAP TEST #8 1992 GEO METRO

Pos. 2 Left Femur

Max =	422.06 lbs	@	54.11 msec
Min =	-134.97 lbs	@	47.76 msec

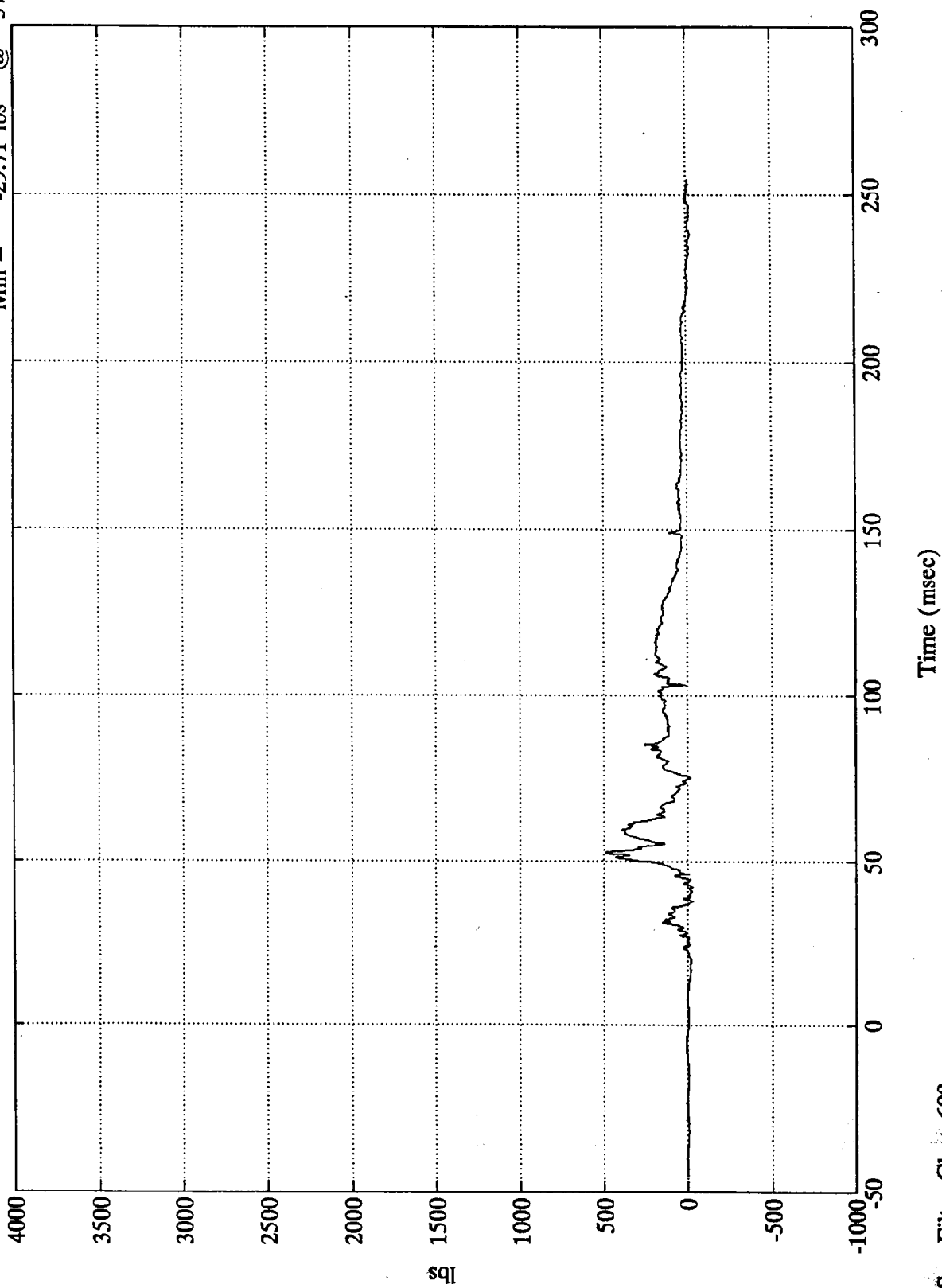


B-103

NCAP TEST #8 1992 GEO METRO

Pos. 2 Right Femur

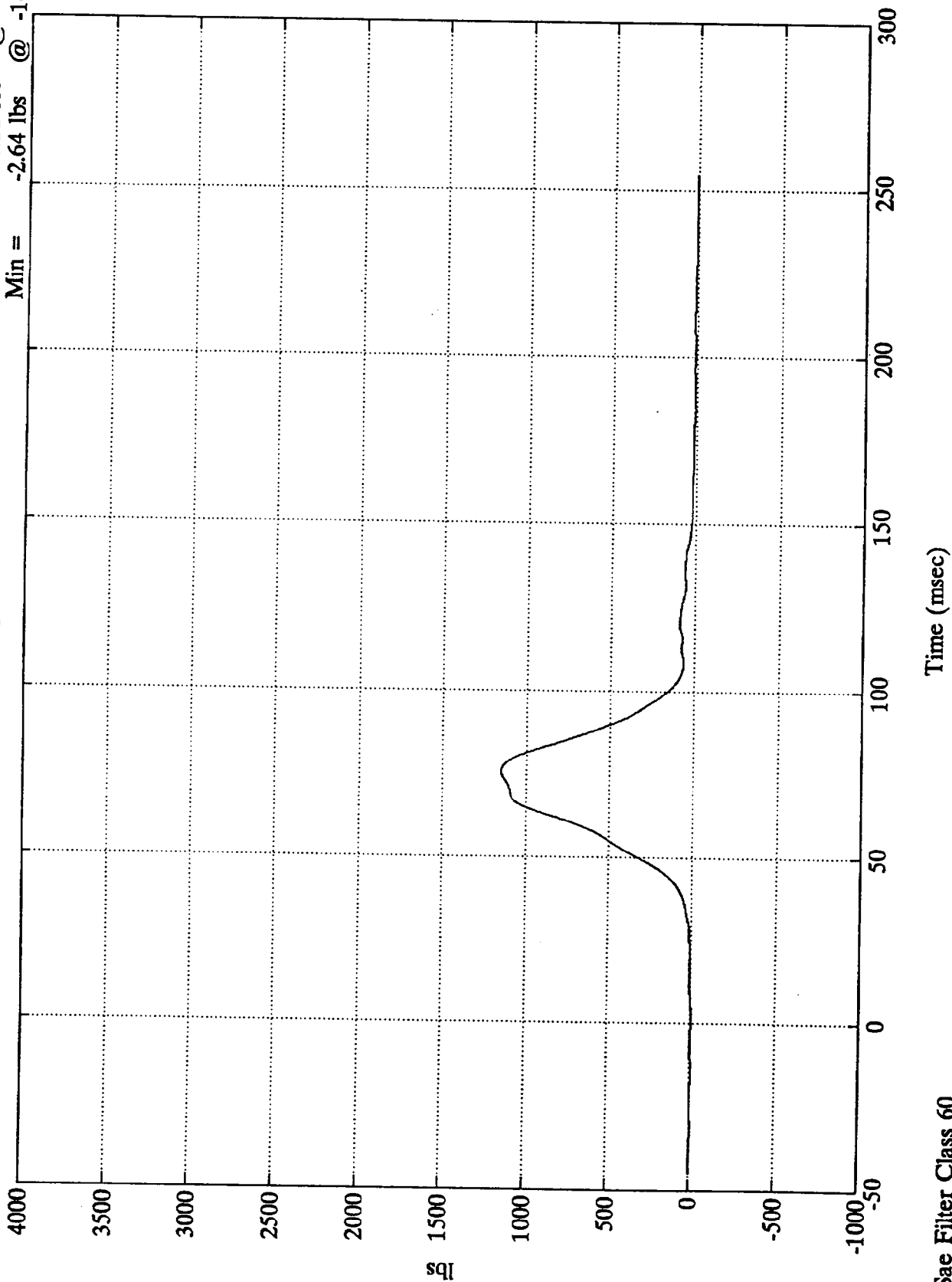
Max = 486.25 lbs @ 52.68 msec
Min = -29.71 lbs @ 37.56 msec



NCAP TEST #8 1992 GEO METRO

Pos. 2 Right Belt Load

Max = 1150.18 lbs @ 75.84 msec
Min = -2.64 lbs @ -14.40 msec



B-105

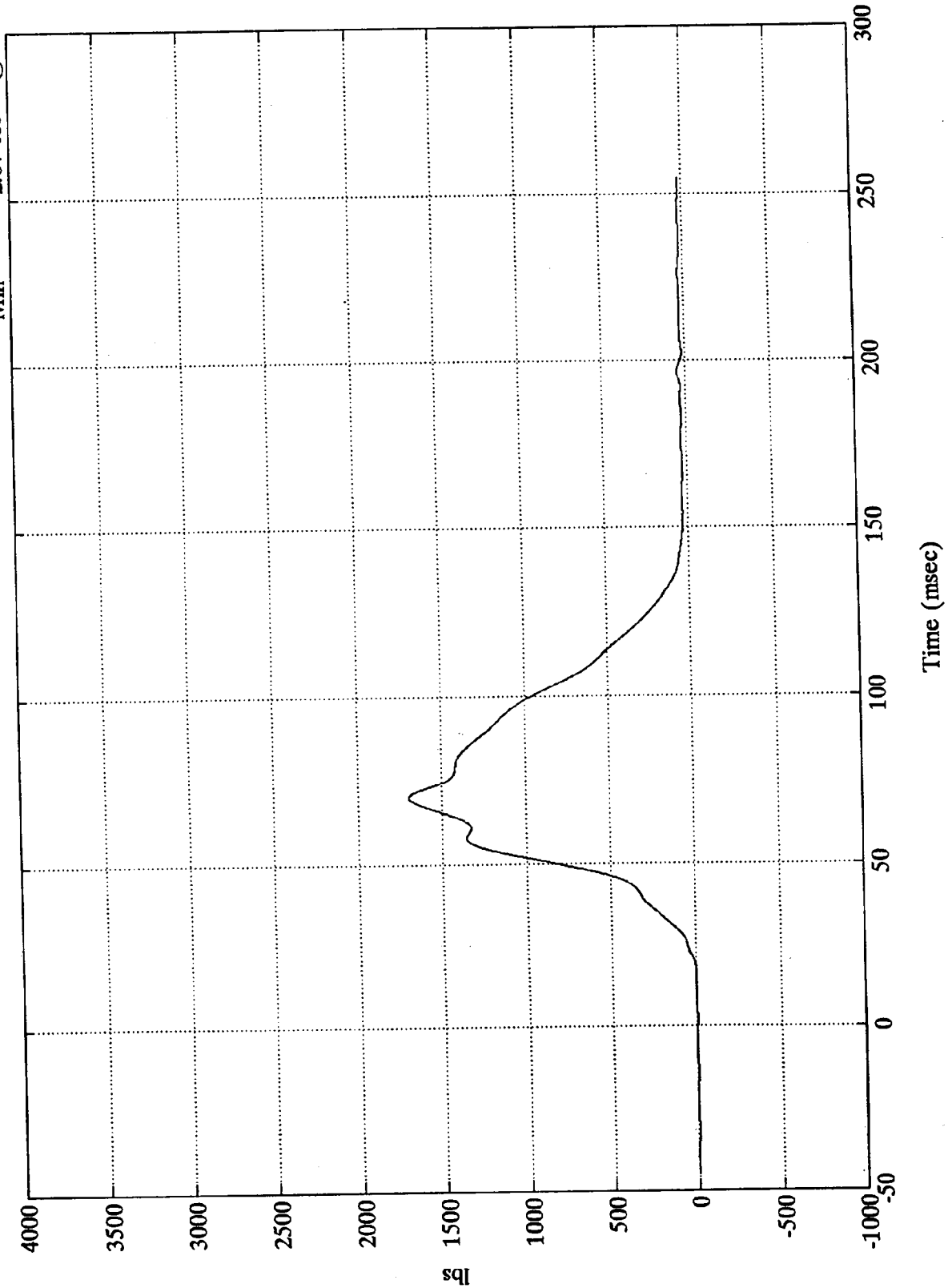
Sae Filter Class 60

7951-2

NCAP TEST #8 1992 GEO METRO

Pos. 2 Torso Belt Load

Max = 1696.76 lbs @ 69.83 msec
Min = -2.07 lbs @ -32.04 msec



B-106

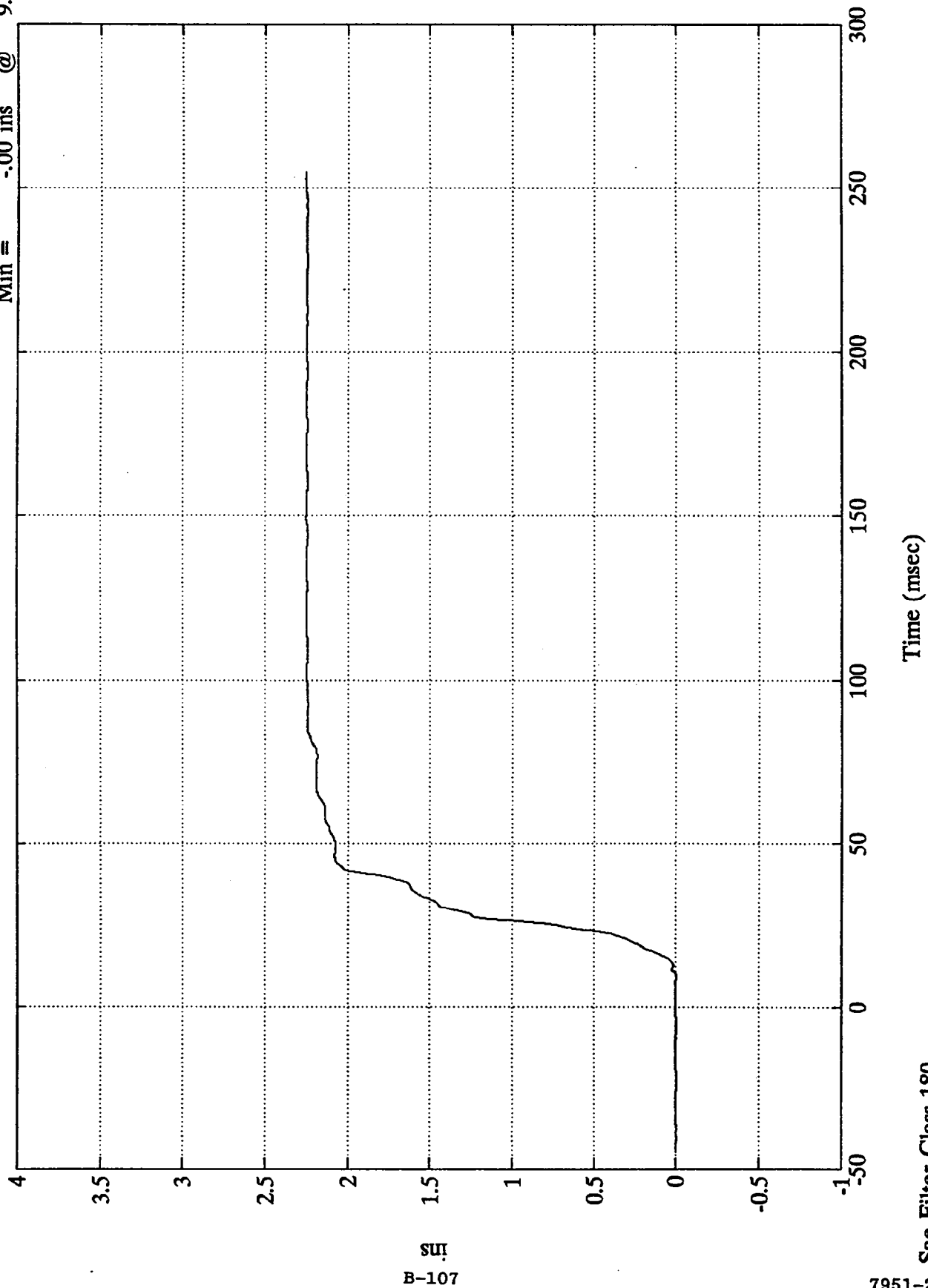
Sae Filter Class 60

7951-2

NCAP TEST #8 1992 GEO METRO

Pos. 2 Belt Spool Out

Max = 2.25 ins @ 252.84 msec
Min = -.00 ins @ 9.59 msec



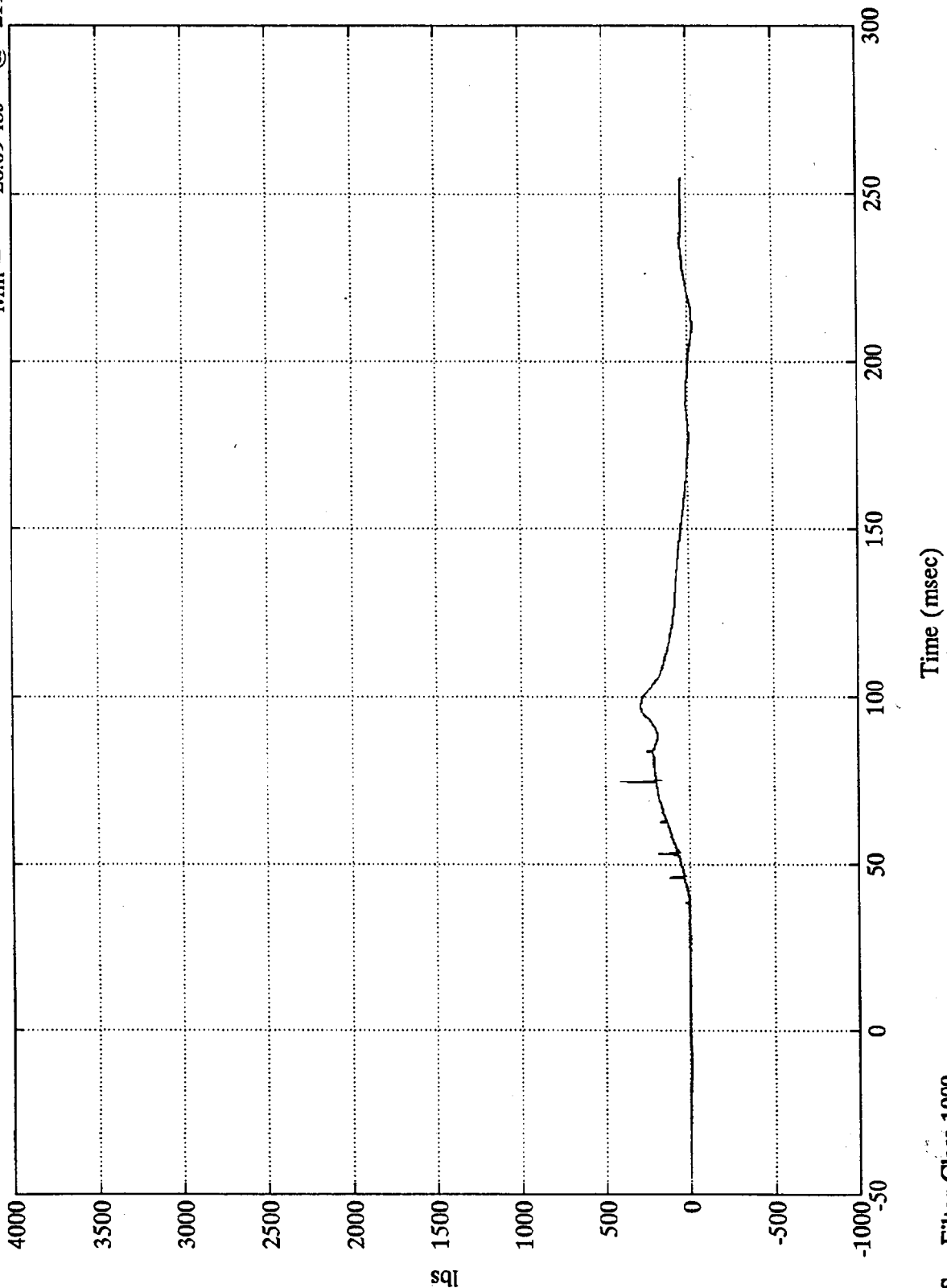
SUI
B-107

7951-2 Sae Filter Class 180

NCAP TEST #8 1992 GEO METRO

Pos. 2 Upper Neck Fx

Max = 411.37 lbs @ 74.63 msec
Min = -26.09 lbs @ 211.44 msec



B-108

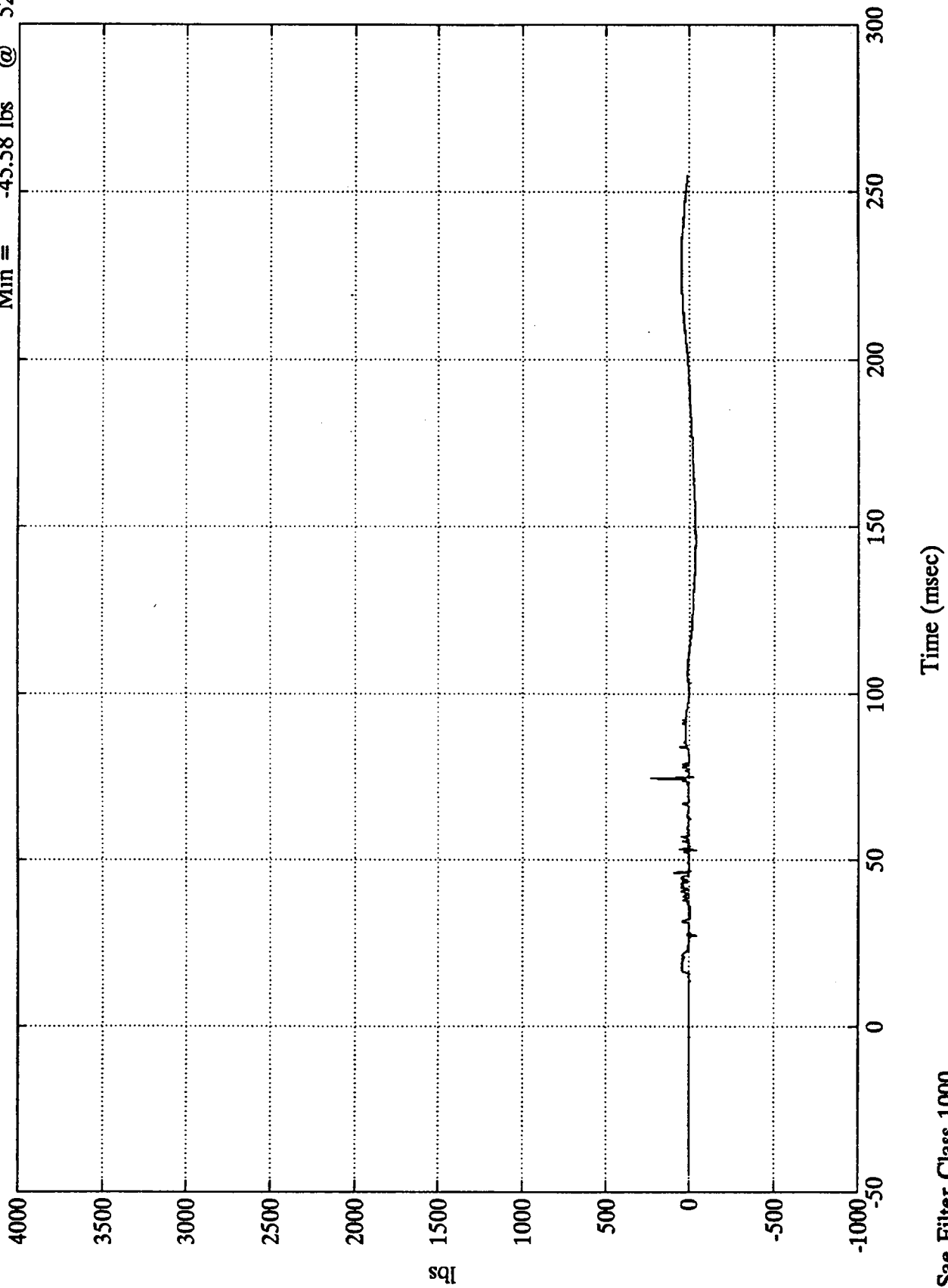
7951-2

Sae Filter Class 1000

NCAP TEST #8 1992 GEO METRO

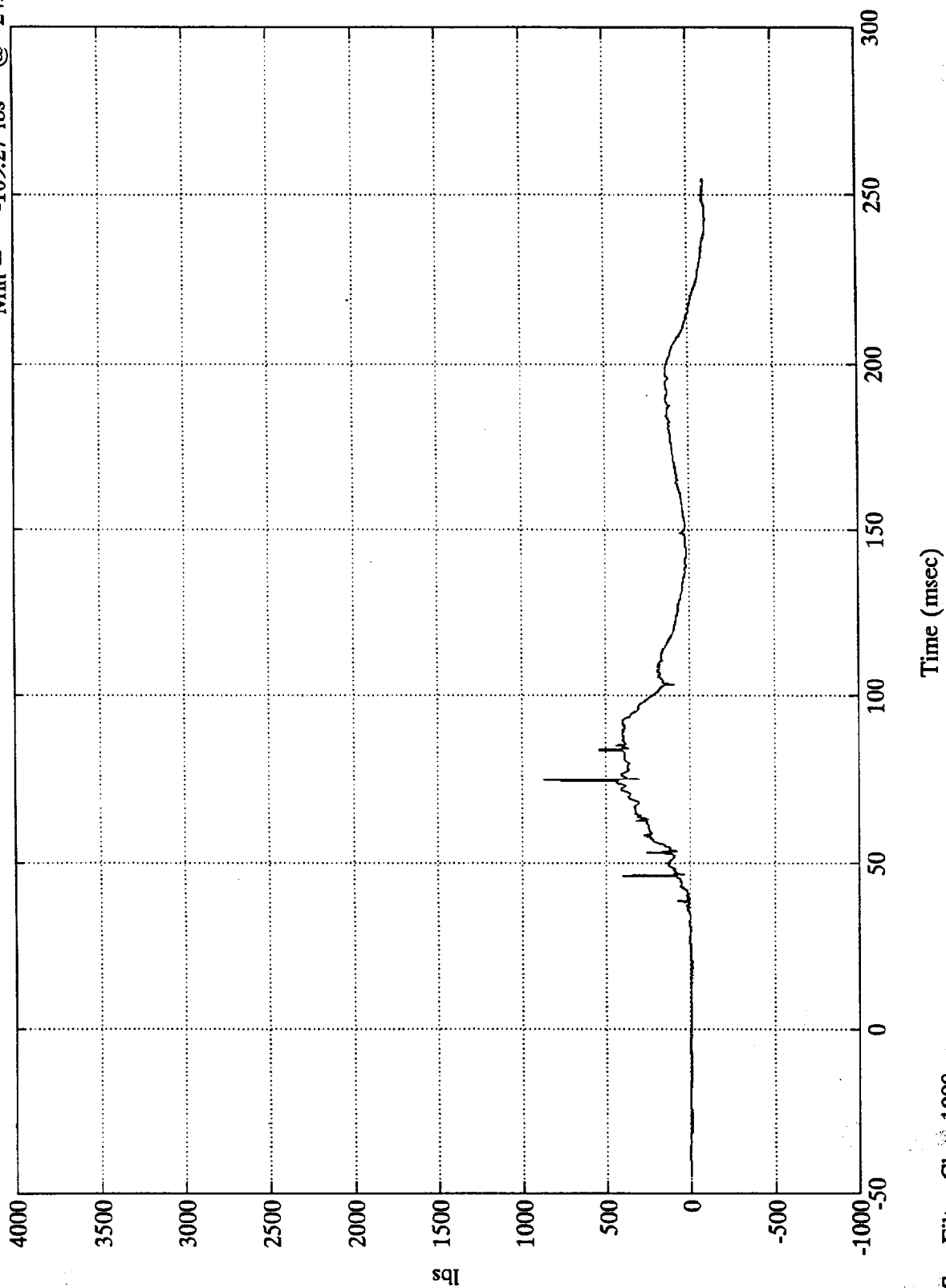
Pos. 2 Upper Neck Fy

Max = 230.58 lbs @ 74.63 msec
 Min = -45.58 lbs @ 52.92 msec



NCAP TEST #8 1992 GEO METRO

Pos. 2 Upper Neck Fz
Max = 868.18 lbs @ 74.63 msec
Min = -109.27 lbs @ 243.36 msec



B-110

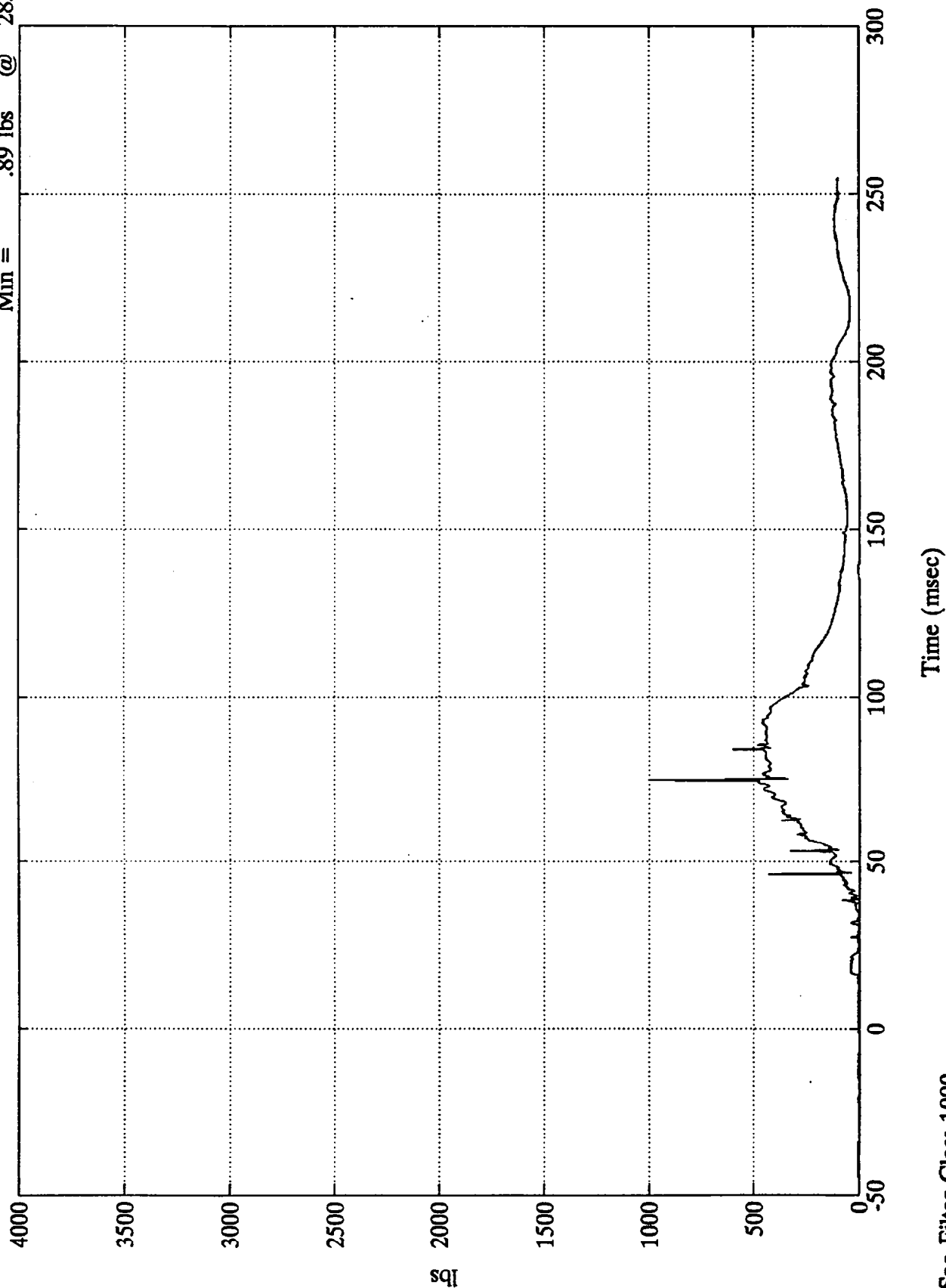
7951-2

Sae Filter Class 1000

NCAP TEST #8 1992 GEO METRO

Pos. 2 Neck Force Res.

Max = 988.00 lbs @ 74.63 msec
 Min = .89 lbs @ 28.55 msec



B-111

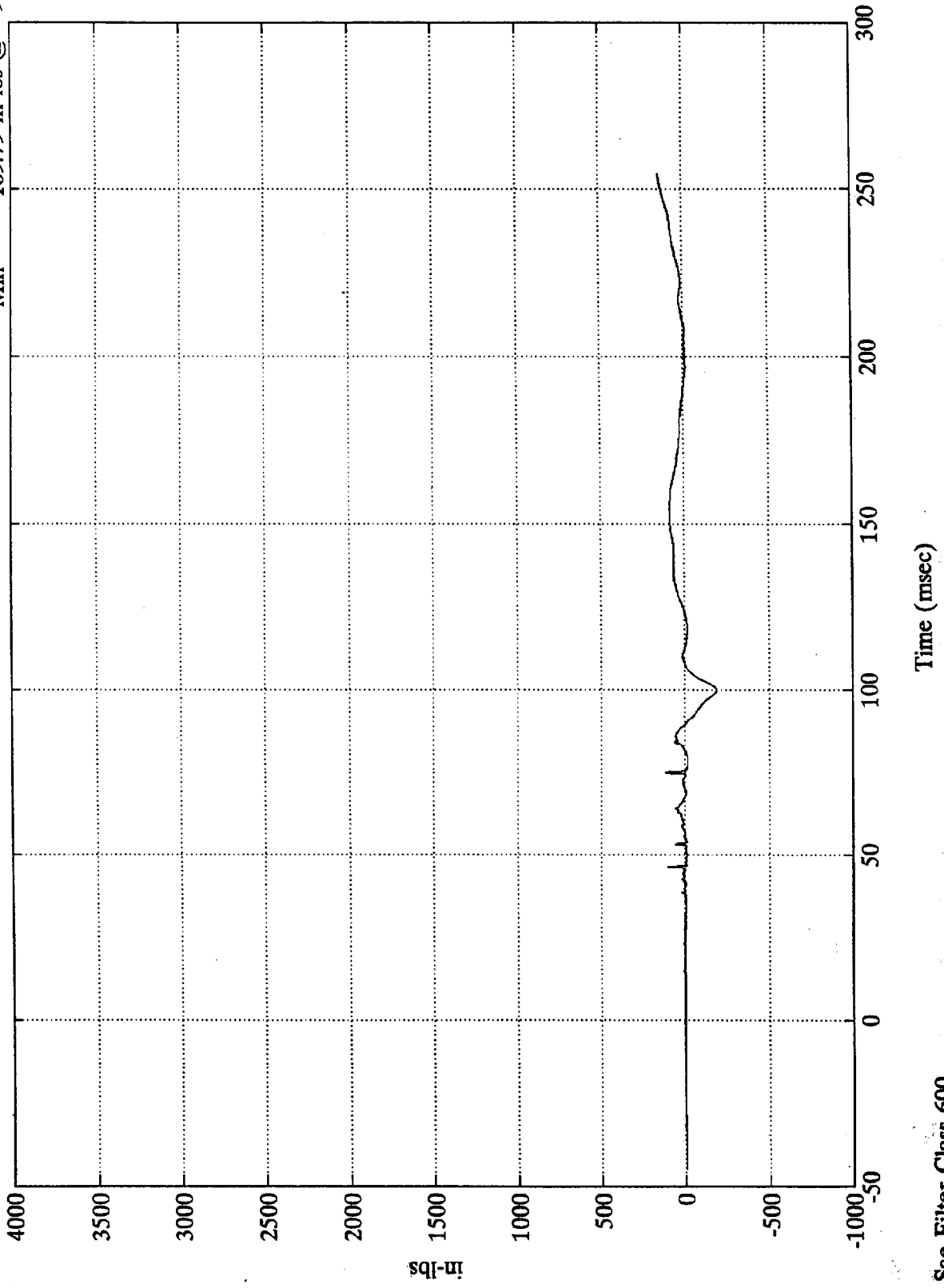
7951-2

Sae Filter Class 1000

NCAP TEST #8 1992 GEO METRO

Pos. 2 Upper Neck Mx

Max = 139.42 in-lbs @ 254.64 msec
Min = -189.79 in-lbs @ 99.84 msec

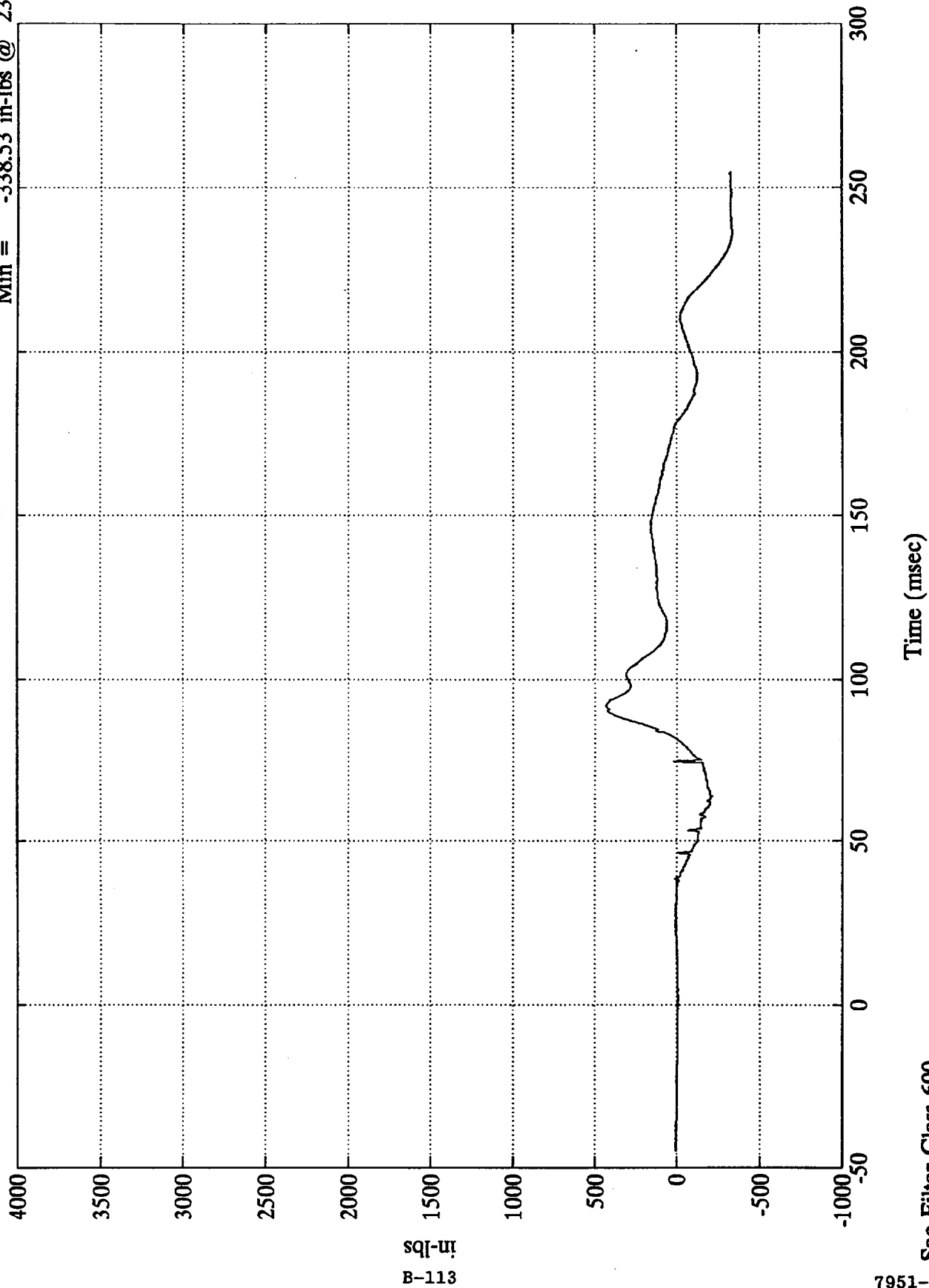


sqi-ii
B-112

NCAP TEST #8 1992 GEO METRO

Pos. 2 Upper Neck My

Max = 432.03 in-lbs @ 91.92 msec
Min = -338.53 in-lbs @ 236.04 msec



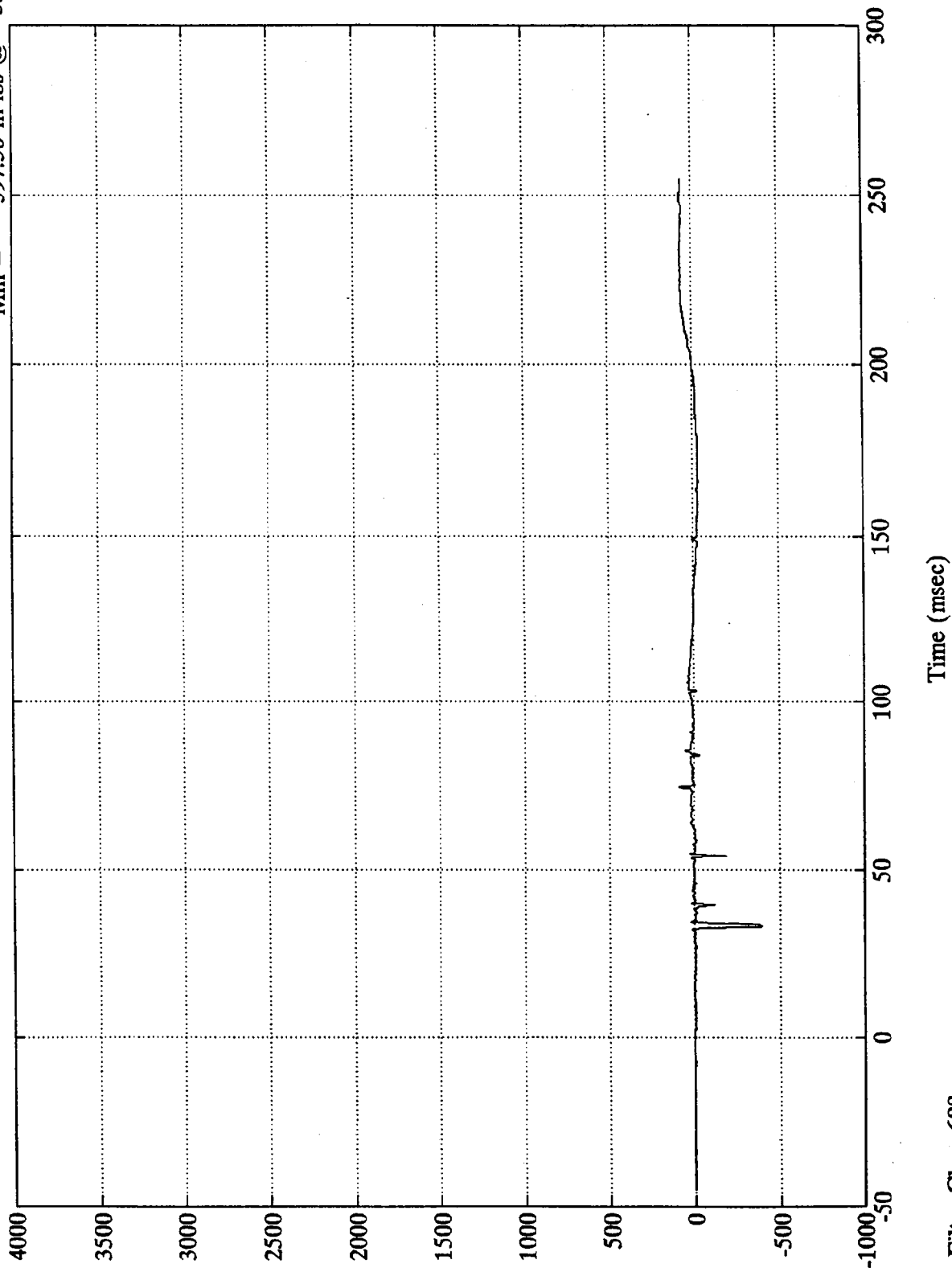
sqi-ur
B-113

7951-2
Sae Filter Class 600

NCAP TEST #8 1992 GEO METRO

Pos. 2 Upper Neck Mz

Max = 88.75 in-lbs @ 74.76 msec
Min = -397.30 in-lbs @ 33.00 msec



sqi-iii

B-114

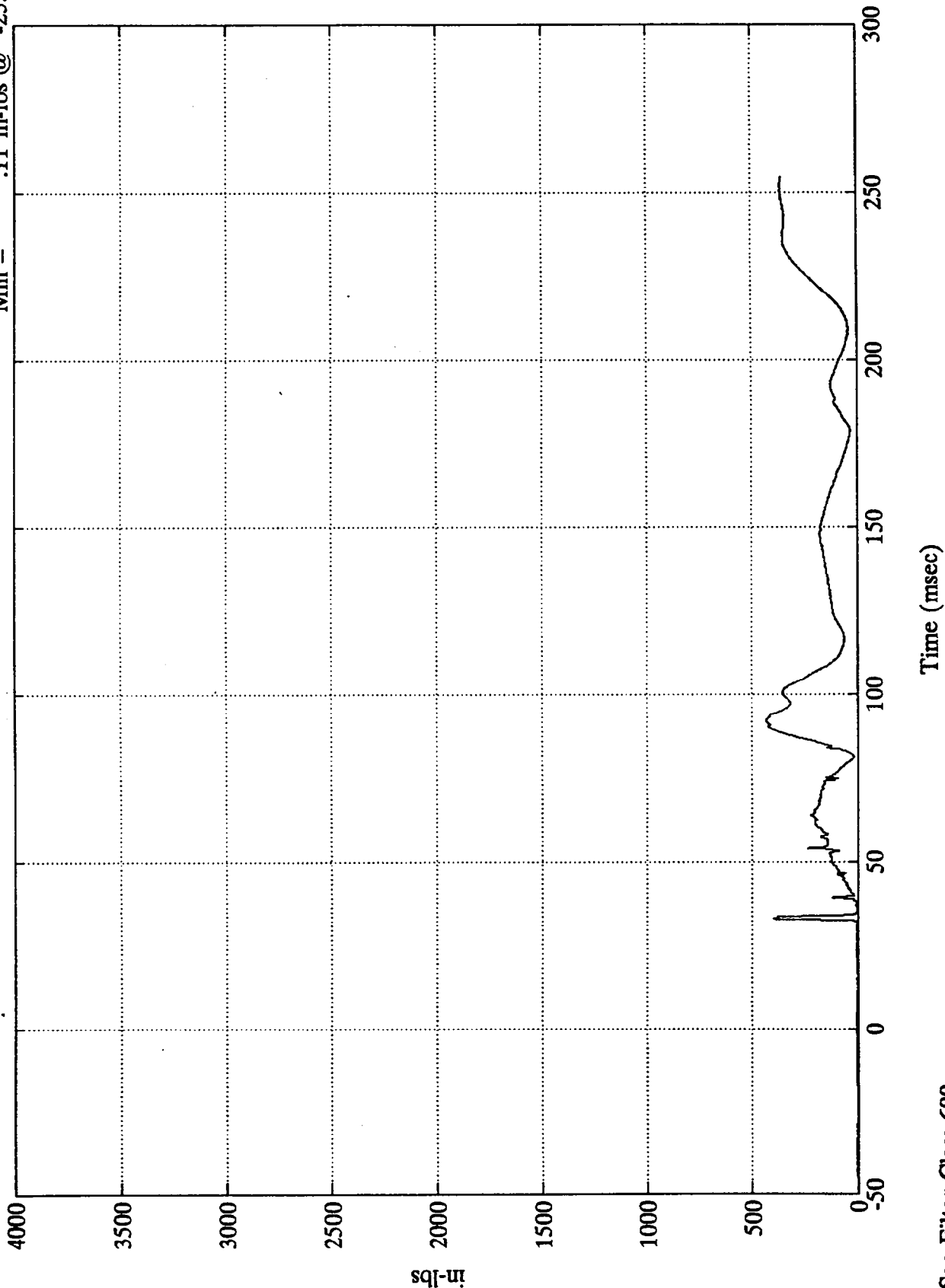
Sae Filter Class 600

7951-2

NCAP TEST #8 1992 GEO METRO

Pos. 2 Neck Moment Res.

Max = 435.28 in-lbs @ 91.92 msec
Min = .11 in-lbs @ -25.08 msec



sqi-ur
B-115

7951-2

Sae Filter Class 600

Appendix C

PART 572E DUMMY CONFIGURATION
AND PERFORMANCE VERIFICATION DATA SHEETS

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

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

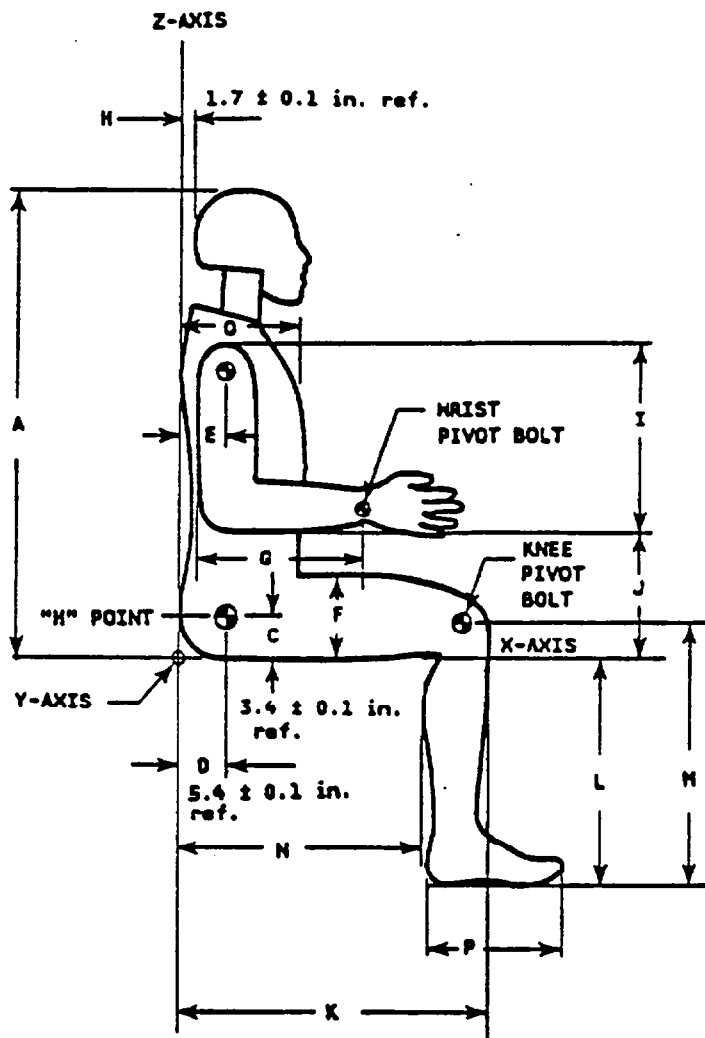
Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
45	11-15-91
150	12-9-91

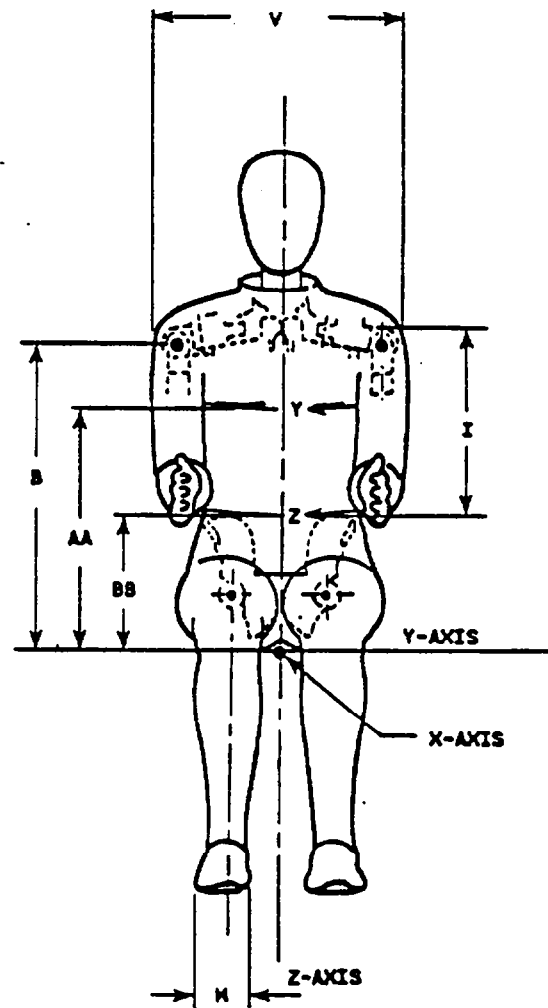
Electronic Test Equipment

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

Figure 10
EXTERNAL DIMENSIONS SETUP SPECIFICATIONS



SIDE VIEW



FRONT VIEW

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 HUMANOID

DUMMY SERIAL NO. 45

DATE: 11-15-91

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

DUMMY MEETS SPECIFICATIONS

TECHNICIAN: IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
HEAD DROP TEST
HYBRID III

DATE : 11-15-91

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 45 HEAD DROP CAL

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

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

NECK FLEXION TEST

HYBRID III

DATE : 11-15-91

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 45 CAL NECK FLEXION

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

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 11-15-91

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 45 CAL NECK EXTENSION

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

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 11-15-91

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN 45

H.S. THORAX

CAL

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

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 11-15-91

KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 45 KNEE 11LB. CAL

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

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 11-15-91

KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN: 45 KNEE 11LB. CAL

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

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY I.D. NUMBER: 45

A. DUMMY INSTRUMENTS

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	CS75	10/91	4/92
ENDEVCO	CY89	10/91	4/92
ENDEVCO	CE76	10/91	4/92
CEC	A147	10/91	4/92
ENDEVCO	CJ54	10/91	4/92
CEC	A148	10/91	4/92
GSE	951	11/91	5/92
GSE	952	11/91	5/92

B. CALIBRATION LABORATORY
INSTRUMENTS

1. PENDULUM ACC.

2. TEST PROBE
ACCELEROMETER

3. LUMBAR FLEXION TEST
PUSH FORCE GAUGE

4. ABDOMINAL COMPRESS.
TEST FORCE GAUGE

5. ABDOMINAL COMPRESS.
TEST FORCE GAUGE

MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
CEC	A160	12/91	6/92
CEC	A161	12/91	6/92
TRANS- DUCER INC	20051	7/91	1/92
BLH	72952	7/91	1/92
CIC	567-11	7/91	1/92

HYBRID III EXTERNAL DIMENSIONS

S/N HUMANOID

DUMMY SERIAL NO. 150

DATE: 12-9-90

TEMPERATURE		70 DEG. F
RELATIVE HUMIDITY		50 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)	16.9-17.1 IN	17.0 IN
LOCATION FOR WAIST CIRCUMFERENCE (BB)	8.9-9.1 IN	9.0 IN
CHEST CIRCUMFERENCE (Y)	38.2-39.4 IN	38.9 IN
WAIST CIRCUMFERENCE (Z)	32.1-34.1 IN	33.1 IN
CHEST DEPTH (O)	8.4-9.0 IN	8.7 IN
H-POINT HEIGHT (C)	3.3-3.5 IN	3.4 IN
H-POINT FROM SEAT BACK (D)	5.3-5.5 IN	5.5 IN
SKULL CAP TO BACKLINE (H)	1.6-1.8 IN	1.6 IN
TOTAL SITTING HEIGHT (A)	34.6-35.0 IN	34.7 IN
THIGH CLEARANCE (F)	5.5-6.1 IN	5.9 IN
BUTTOCK KNEE LENGTH (K)	22.8-23.8 IN	23.1 IN
BUTTOCK POPLITAL LENGTH (N)	17.8-18.8 IN	18.2 IN
POPLITEAL LENGTH (L)	16.9-17.9 IN	17.5 IN
KNEE PIVOT HEIGHT (M)	19.1-19.7 IN	19.4 IN
FOOT LENGTH (P)	9.9-10.5 IN	10.1 IN
FOOT BREADTH (W)	3.6-4.2 IN	4.1 IN
SHOULDER PIVOT FROM BACKLINE (E)	3.3-3.7 IN	3.5 IN
SHOULDER BREADTH (V)	16.6-17.2 IN	16.7 IN
SHOULDER PIVOT HEIGHT (B)	19.9-20.5 IN	20.1 IN
ELBOW REST HEIGHT (J)	7.5-8.3 IN	8.2 IN
SHOULDER-ELBOW LENGTH (I)	13.0-13.6 IN	13.4 IN
BACK OF ELBOW TO WRIST PIVOT (G)	11.4-12.0 IN	11.8 IN

DUMMY MEETS SPECIFICATIONS

TECHNICIAN: IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
HEAD DROP TEST
HYBRID III

DATE : 12/5/91

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 150 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	27 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	268 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	2.7 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 : 12/9/91

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN:150 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	69 DEG. F
RELATIVE HUMIDITY		10% - 70%	42 %
IMPACT VELOCITY		22.60 - 23.40 FPS	22.8 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	24.76 G'S
	20 MS	17.60 - 22.60 G'S	22.19 G'S
	30 MS	12.50 - 18.50 G'S	17.93 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	17.93 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	41.0 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	74.22 DEG.
	TIME	57 - 64 MS	58.5 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.-LBS.	74.56 FT.-LBS.
	TIME	47 - 58 MS	54.25 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	100.0 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 12/9/91

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN:150 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	69 DEG. F
RELATIVE HUMIDITY		10% - 70%	40 %
IMPACT VELOCITY		19.50 - 20.30 FPS	20.2 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	18.96 G'S
	20 MS	14.00 - 19.00 G'S	18.12 G'S
	30 MS	11.00 - 16.00 G'S	14.66 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	14.66 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		38 - 46 MS	45.25 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	97.48 DEG.
	TIME	72 - 82 MS	73.25 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-59.0/-39.0 FT.-LBS.	-58.77 FT.-LBS.
	TIME	65 - 79 MS	68.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	147.25 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	131.25 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 12/3/91

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN 150 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	69 - 72 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	36 %
PENDULUM VELOCITY	21.6 - 22.4 FT/SEC	21.6 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 INCHES	2.57 INCHES
MAXIMUM RESISTIVE FORCE	1080 - 1245 POUNDS	1226 POUNDS
INTERNAL HYSTERESIS	69% - 85%	72.7 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 12/9/91

KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 150 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	40 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1129 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 12/9/91

KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 150 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	40 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1067 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY I.D. NUMBER: 150

A. DUMMY INSTRUMENTS

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

B. CALIBRATION LABORATORY
INSTRUMENTS

	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. PENDULUM ACC.	CEC	A160	12/91	6/92
2. TEST PROBE ACCELEROMETER	CEC	A161	12/91	6/92
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE	TRANS- DUCER INC	20051	7/91	1/92
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE	BLH	72952	7/91	1/92
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE	CIC	567-11	7/91	1/92



Appendix D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(6 Month Calibration Minimum)

DRIVER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head X Y Z	CS75	ENDEVCO	10/91	4/92
	CY89	ENDEVCO	10/91	4/92
	CE76	ENDEVCO	10/91	4/92
Chest X Y Z	A147	CEC	10/91	4/92
	CJ54	ENDEVCO	10/91	4/92
	A148	CEC	10/91	4/92
Right Femur Load Cell	312	GSE	11/91	5/92
Left Femur Load Cell	311	GSE	11/91	5/92
Neck Load Cell X Y Z	269	DENTON	6/91	12/92
	269	DENTON	6/91	12/92
	269	DENTON	6/91	12/92
Neck Moment X Y Z	269	DENTON	6/91	12/92
	269	DENTON	6/91	12/92
	269	DENTON	6/91	12/92
Chest Deflection Gauge Hybrid III Use Only	45	HUMANOID		
Lap Belt Load Cells	123	LEBOW	11/91	5/92
Shoulder Belt Load Cells	127	LEBOW	11/91	5/92
Spool-Out Potentiometer	E1	SERVONIC INST.	10/91	5/92
Belt Stretch Transducer	32	CALSPAN	10/91	5/92

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(6 Month Calibration Minimum)

PASSENGER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head X Y Z	ER72	ENDEVCO	10/91	4/92
	GD54	ENDEVCO	10/91	4/92
	CK11	ENDEVCO	10/91	4/92
Chest X Y Z	A145	CEC	10/91	4/92
	FL04	ENDEVCO	10/91	4/92
	A149	CEC	10/91	4/92
Right Femur Load Cell	549	GSE	11/91	5/92
Left Femur Load Cell	548	GSE	11/91	5/92
Neck Load Cell X Y Z	076	DENTON	7/91	1/92
	076	DENTON	7/91	1/92
	076	DENTON	7/91	1/92
Neck Moment X Y Z	076	DENTON	7/91	1/92
	076	DENTON	7/91	1/92
	076	DENTON	7/91	1/92
Chest Deflection Gauge Hybrid III Use Only	150	HUMANOID		
Lap Belt Load Cells	133	LEBOW	11/91	5/92
Shoulder Belt Load Cells	135	LEBOW	11/91	5/92
Spool-Out Potentiometer	E3	SERVONIC INST.	10/91	4/92
Belt Stretch Transducer	22	CALSPAN	10/91	4/92

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration	
			Last	Next
Left Seat Rear Crossmember	A75	CEC	10/91	2/92
Right Rear Seat Crossmember	A152	CEC	10/91	2/92
Top of Engine	A29	CEC	10/91	2/92
Bottom of Engine	A101	CEC	10/91	2/92
Left Disc Brake Caliper	A188	CEC	11/91	3/92
Right Disc Brake Caliper	A115	CEC	11/91	3/92
Instrument Panel	A142	CEC	10/91	2/92
Center Rear Crossmember Z	A185	CEC	11/91	3/92
Vehicle Rear Z	A144	CEC	10/91	2/92

INSTRUMENT CALIBRATION FOR LABORATORY INSTRUMENTS
(6 Month Calibration Minimum)

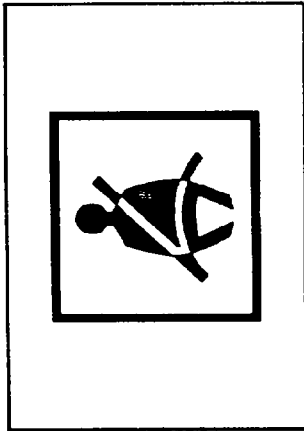
	Serial #	Manufacturer	Calibration	
			Last	Next
Neck Bending Pendulum Accel.	A160	CEC	11/91	5/92
Neck Bending Rotary Potentiometer	None	BOURNS	7/91	1/92
Femur Probe Accelerometer	A161	CEC	12/91	6/92
Chest/Thorax Probe Accel.	A161	CEC	12/91	6/92
Lumbar Flexion Force Gauge	20051	TRANSDUCER INC.	7/91	1/92

Appendix E

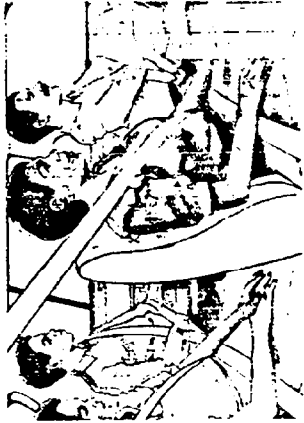
VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

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.



These figures light up when you turn the key to **ON** or **START** when your safety belt isn't buckled, and you'll hear a tone, 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.**



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!

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

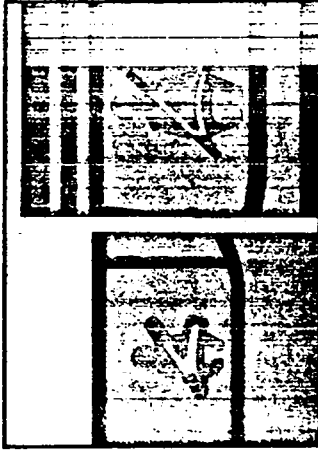
A: "Air bags," or Supplemental Inflatable Restraint systems, are in some vehicles today and will be in more of them in the future. But they are supplemental systems only — so they work with safety belts, not instead of them. Every "air bag" system ever offered for sale has required the use of safety 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.

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.



Safety Belt Warning Light

The safety belt light might come on as you're driving. Or, it might not go off after you start your vehicle. If either of these happens to you, the safety belt retractor might not lock in a crash.

When the key is turned to **ON** or **START**, a tone will come on for about eight seconds to remind people to fasten their safety belts, unless both front seat safety belts are buckled. There are two safety belt warning lights, one on each side of the steering column. The safety belt warning light for each front seat safety belt will also come on and stay on until the belt is buckled. If both front seat safety belts are buckled, neither the tone nor the lights will come on.

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Seats & Safety Belts

CAUTION

 If your safety belt light ever comes on or stays on after both front seat safety belts are buckled, have your vehicle fixed.

If you don't, you might not have the protection you'd need in a crash.

If you have a convertible, your car has one safety belt reminder light. See your Metro Convertible Owner's Manual Supplement.

■ How to Wear Safety Belts Properly

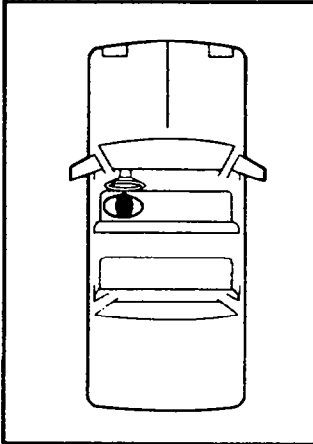
Adults

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 Geo, 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.

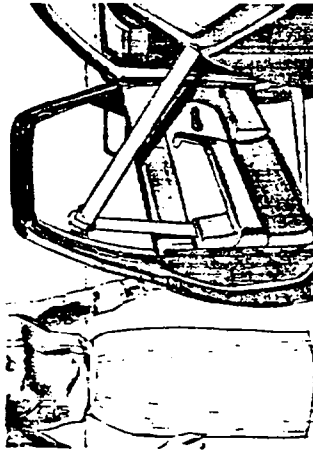


Driver Position

This section describes the driver's restraint system.

If you have a Metro convertible, it has a manual lap-shoulder belt and Supplemental Inflatable Restraint (SIR). See your Metro Convertible Owner's Manual Supplement to see how they work.

If you have a Metro hatchback, it has an automatic lap-shoulder belt, which is mounted on the door. The next section shows how to make your safety belt work for you.



Automatic Lap-Shoulder Belt

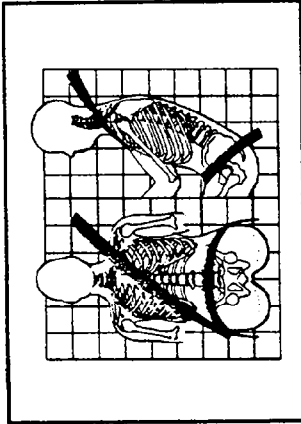
This safety belt is called "automatic" because you don't have to buckle up when you get into your vehicle.



And you don't have to unbuckle when you get out.

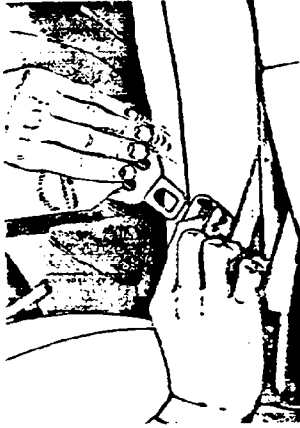
Seats & Safety Belts

Just get into your vehicle. Then close and lock the door. Adjust the seat (to see how, see "Seats" in the Index) so you can sit up straight.



The lap belt should be as low on the hips as possible. 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 a crash.



It's possible that an automatic belt could keep you from fully opening a door.

That can happen if the door was slammed shut very hard. Just close the door all the way, then slowly open it. If that doesn't fix it, then your Geo needs service.

We hope you'll always keep your automatic belt buckled. However, you may need to unbuckle it in an emergency. To unbuckle the automatic belt, just push the button on the buckle.

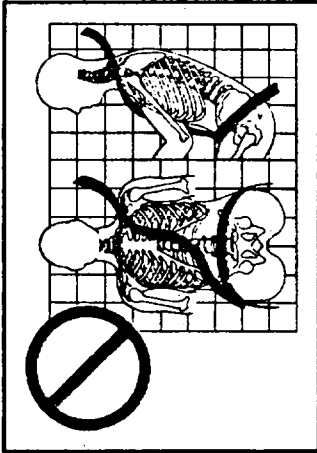
To reattach the automatic belt:

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

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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.

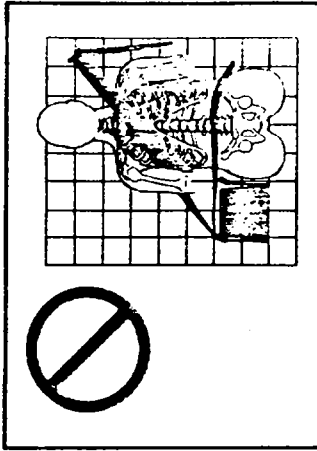


Q: What's wrong with this?

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 significantly increase injury. The shoulder belt should fit against your body.



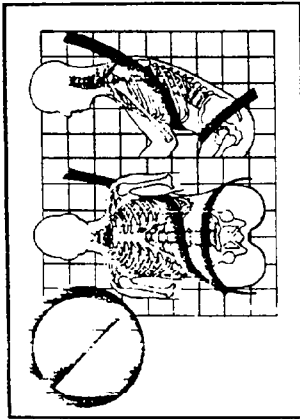
Q: What's wrong with this?

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

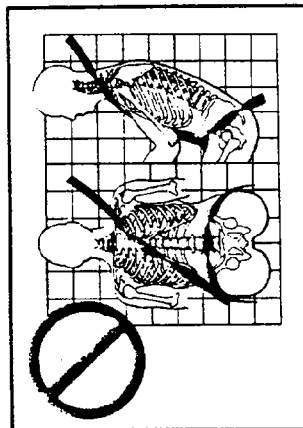


Q: What's wrong with this?

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

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.



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 take impact forces. If a belt is twisted, make it straight so it can work properly, or ask your dealer to fix it.



Safety Belt Use during Pregnancy

Safety belts work for everyone, including pregnant women. Like all occupants, they are more likely to be seriously injured if they don't wear safety belts.

A pregnant woman should wear a lap-shoulder belt, and the lap portion should be worn as low as possible throughout the pregnancy.

The best way to protect the fetus is to protect the mother. When a safety belt is worn properly, it's more likely that the fetus won't be hurt in a crash. For pregnant women, as for anyone, the key to making safety belts effective is wearing them properly.