

REPORT NUMBER: CAL-93-N12

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

**ISUZU MOTORS LIMITED
1993 ISUZU RODEO
4-DOOR MPV**

NHTSA NUMBER: MP5700

CALSPAN TEST NUMBER: 8058-8

MARCH 23, 1993

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FINAL REPORT

PREPARED FOR:

**U. S. Department of Transportation
National Highway Traffic Safety Administration
Office of Market Incentives
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16. Abstract A frontal load cell barrier test of a 1993 Isuzu Rodeo 4-Door MPV was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on March 23, 1993. The impact velocity was 57.0 kph and the temperature at the barrier face was 10 deg. C. The maximum post-test vehicle crush was 491 mm. The test vehicle was equipped with a 3-point continuous belt system at each of the front outboard seating positions. With regard to FMVSS 208 "Occupant Crash Protection", injury criteria, the driver dummy appeared to exceed the maximum head injury criteria.					
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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 MP5700

A load cell barrier consisting of 36 load cells was impacted by a 1993 Isuzu Rodeo 4-Door MPV at a velocity of 57.0 kph. The test was performed at the Calspan Corporation Advanced Technology Center on March 23, 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 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the Laboratory Indicant Test Procedure.

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 45) and the right-front passenger ATD (Serial No. 245) were calibrated prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C and D.

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 1-Left Femur Load Cell sustained a cut wire at approximately 56 milliseconds. This data plot was removed from this report.

The driver's head struck the steering wheel rim; the HIC was 1083.9. The maximum chest deceleration over 3 milliseconds was 55.8 g's and maximum chest deflection was 44 mm. Femur loads were -9163.5 newtons on the left femur and -3230.2 newtons on the right femur.

The right front passenger's HIC was 901.1. Maximum chest deceleration over 3 milliseconds was 54.9 g's and maximum chest deflection was 36 mm. The right femur had a maximum load of -4253.8 lbs. The left femur maximum load could not be measured accurately due to above data anomaly.

Table 1

GENERAL TEST AND VEHICLE DATA

Vehicle Year/Make/Model/Body Style: 1993 Isuzu Rodeo 4-Door MPV

NHTSA Test No.: MP5700 VIN.: 4S2CY58V6P4308588

Body Color: Black Date of Manufacture: 2/93

Date Received: 3-2-93

Odometer Reading: 16 km

Engine: 6 Cylinders; - C.I.D.; 3.2 Liters; - CC
X Gas; - Diesel; - Turbocharged
X Longitudinal; - Transverse

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

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

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

Type of Occupant Restraint: 3-Point Continuous Belt System

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 176 kPa, Rear 176 kPa

Recommended Tire Size: P225/75R15

Recommended Cold Tire Pressure: Front 176 kPa, Rear 176 kPa

Tires on Vehicle: P225/75R15 Manufacturer: B F Goodrich

Number of Occupants: 2 Front; 3 Rear; - 3rd Seat; 5 TOTAL

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

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

Rated Cargo and Luggage Weight = 136.1 kgs.

GVWR 2223 kgs. GAWR: Front 1043 kgs. Rear 1270 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>463</u>	kgs.	Right Rear =	<u>431</u>	kgs.
Left Front =	<u>458</u>	kgs.	Left Rear =	<u>472</u>	kgs.
TOTAL FRONT WEIGHT =	<u>921</u>	kgs.	(	<u>50</u>	% of Total Vehicle Weight)
TOTAL REAR WEIGHT =	<u>903</u>	kgs.	(	<u>50</u>	% of Total Vehicle Weight)
TOTAL DELIVERED WEIGHT =	<u>1824</u>	kgs.			

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight 1824 kgs.
 RCLW = VCW - 68 (DSC) = 136.1 kgs.
 Target Test Weight = UDW + RCLW + (2 dummies x 75.8 kgs./ dummy)
 Target Test Weight = 2112 kgs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 129 KGS CARGO:

Right Front =	<u>490</u>	kgs.	Right Rear =	<u>558</u>	kgs.
Left Front =	<u>472</u>	kgs.	Left Rear =	<u>585</u>	kgs.
TOTAL FRONT WEIGHT =	<u>962</u>	kgs.	(	<u>46</u>	% of Total Vehicle Weight)
TOTAL REAR WEIGHT =	<u>1143</u>	kgs.	(	<u>54</u>	% of Total Vehicle Weight)
TOTAL TEST WEIGHT =	<u>2105</u>	kgs.			
Weight of ballast secured in vehicle trunk area =	<u>91</u>	kgs.			

VEHICLE ATTITUDE (all dimensions in mm):

Delivered Attitude:	RF	<u>841</u>	LF	<u>825</u>	RR	<u>864</u>	LR	<u>846</u>
Test Attitude:	RF	<u>845</u>	LF	<u>835</u>	RR	<u>825</u>	LR	<u>810</u>
Wheel Base:	<u>2968</u>	mm.;	C.G. =	<u>1612</u>	mm. rearward of front wheel C/L			
Remarks:	<u>75 liters of stoddard solution was placed in the fuel tank</u>							

Table 1

GENERAL TEST AND VEHICLE DATA (cont'd)POST -IMPACT DATA:

Type of Test:	Frontal Barrier	Impact Angle:	0 deg.
Date of Test:	March 23, 1993	Time of Test;	12:18
Ambient Temperature:	10	° C at impact area	
Temperature in Occupant Compartment:	21	° C	
Windshield Molding Temperature:	21	° C	
Required Impact Velocity Range:	55.5	to	57.1 kph
Impact Velocity:	primary = 57.0 kph,	secondary =	57.0 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	4430	C _L	4488	L	4440
	Post-test = R	3991	C _L	3997	L	3997
	Crush = R	439	C _L	491	L	443

Distance from front of test vehicle to point of impact:

R	491	C _L	485	L	484
---	-----	----------------	-----	---	-----

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	Face with upper steering wheel rim	Top of head with dashpanel
Chest	Steering wheel hub	No contact
Abdomen	Lower steering wheel rim	No contact
Left Knee	Dashpanel	Glove box door
Right Knee	Dashpanel	Glove box door

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>operable</u>	<u>closed- operable</u>	<u>closed- operable</u>
	<u>Front</u>		<u>Rear</u>	
<u>Seat Movement</u>	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Seat Back Failure	<u>None</u>	<u>None</u>	<u>N/A</u>	<u>N/A</u>
Seat Shift (mm.)	<u>0.0</u>	<u>0.0</u>	<u>N/A</u>	<u>N/A</u>
<u>Glazing Damage</u>				
Backlight/Windshield:	<u>Sustained stress fractures but remained intact</u>			
Other Notable Impact Effects:	<u>Severe roof deformation to B-Pillar</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.: MP5700 Vehicle: 1993 Isuzu Rodeo 4-Door MPV

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-101.9	18.8	57.0	116.2
Position #2 - Passenger	-72.0	-7.2	61.9	78.6

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R*
Position #1 - Driver	-60.3	13.9	26.9	55.8
Position #2 - Passenger	-55.7	-15.0	25.0	54.9

* 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	-9163.5	-3230.2
Position #2 - Passenger	***	-4253.8

	MAXIMUM FORCE - SEAT BELT LOADS (nwt)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	7626.7	----	6455.4
Position #2 - Passenger	10152.4	13586.0	----

	HEAD INJURY CRITERIA (HIC)			
	HIC**	t ₁ (mSec)	t ₂ (mSec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	1083.9	54.240	90.120	61.95
Position #2 - Passenger	901.1	60.600	96.480	57.54

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

*** Transducer experienced a cut wire at approximately 56 milliseconds.

Table 3

HYBRID III NECK AND CHEST DATA SHEETVehicle Year/Make/Model/Body Style: 1993 Isuzu Rodeo 4-Door MPVVehicle NHTSA No.: MP5700 Test Date; March 23, 1993

MAXIMUM VALUES	DRIVER DUMMY ID # : 45	PASSENGER DUMMY ID # : 245
Neck Load X (nwt)	1199.4	1746.0
Neck Load Y (nwt)	-388.3	-361.1
Neck Load Z (nwt)	4900.1	2563.3
Neck Moment X (nwt-m)	-25.0	-21.9
Neck Moment Y (nwt-m)	58.8	69.0
Neck Moment Z (nwt-m)	-25.0	-14.7
Chest Deflection X (mm.)	44	36
Time of Max. Occurrence (msec)	72.2	64.0

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

Figure 1

DUMMY MEASUREMENTS FOR FRONT SEAT PASSENGERS

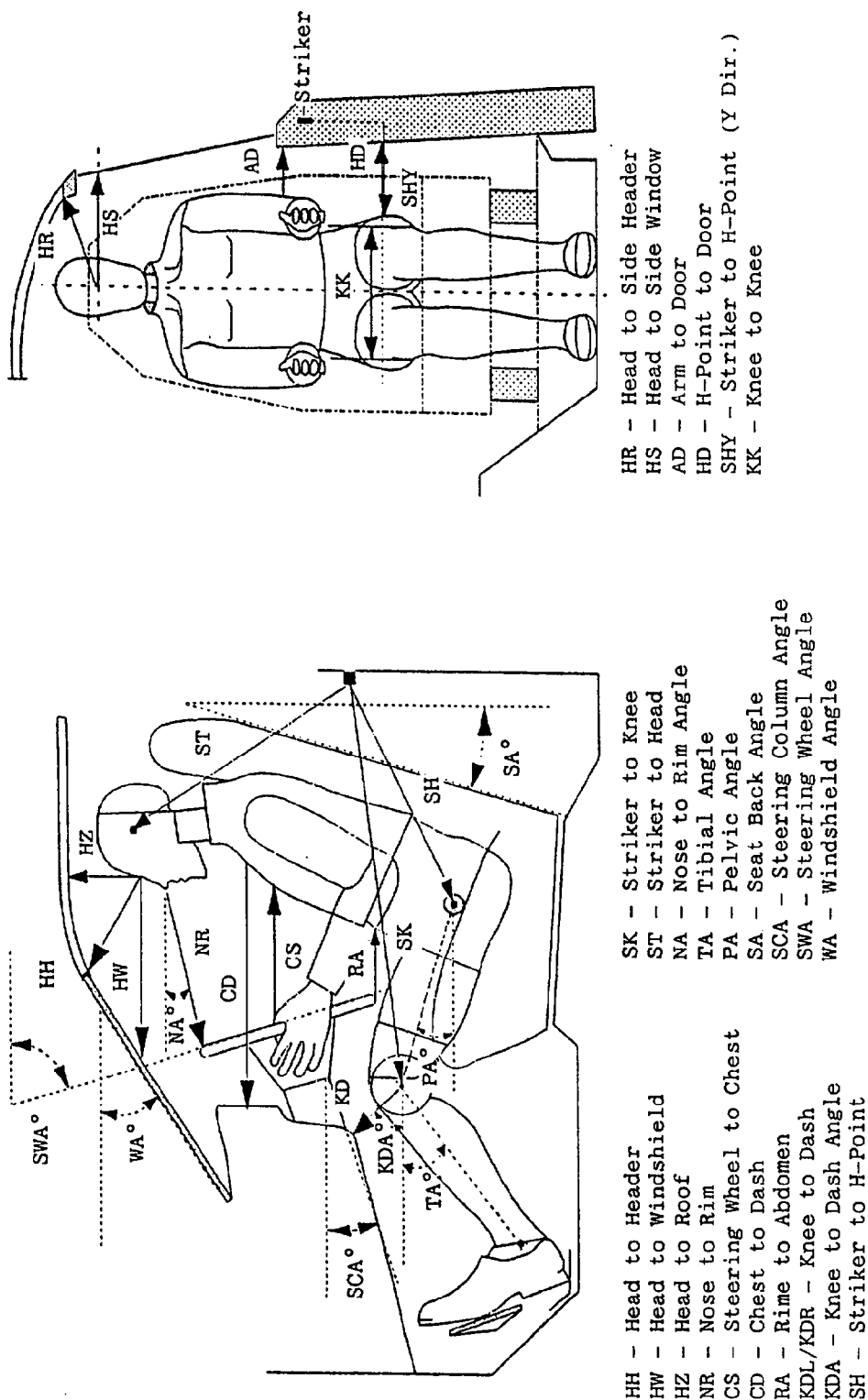


Table 4

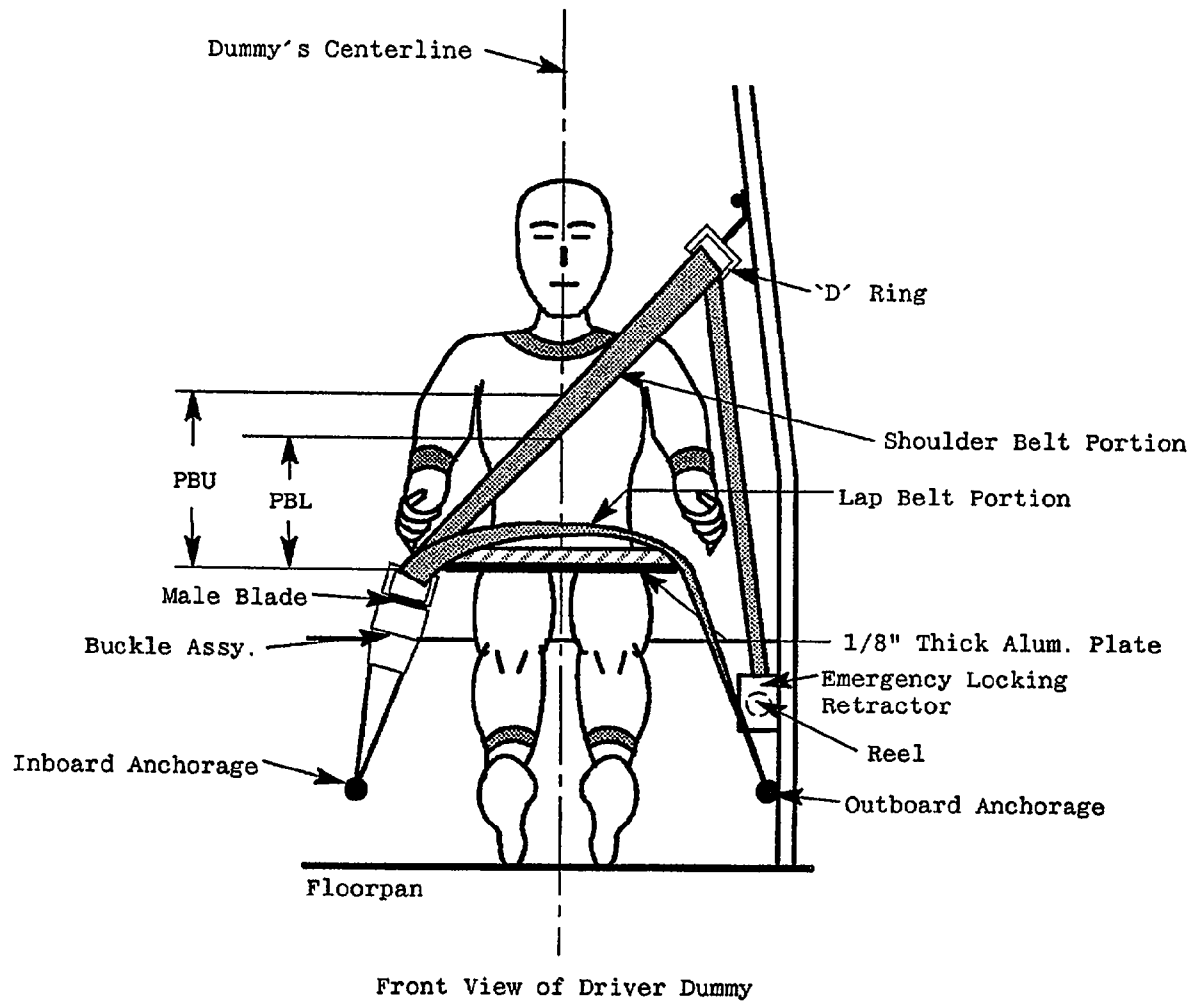
FRONT SEAT OCCUPANT MEASUREMENTS

	DRIVER (Serial # 45)			PASS. (Serial # 245)		
WA°	35 deg.			-----		
SWA°	65 deg.			N/A		
SCA°	25 deg.			N/A		
SA°	See Note			See Note		
HZ	204 mm.			204 mm.		
HH	368 mm.			382 mm.		
HW	514 mm.			518 mm.		
HR	263 mm.			249 mm.		
NR	385 mm.	Angle	13 deg.	N/A		
CD	504 mm.			548 mm.		
CS	316 mm.			N/A		
RA	187 mm.			N/A		
KDL	154 mm.	Angle (KDA)	30 deg.	162 mm.		
KDR	187 mm.			180 mm.	Angle (KDA)	26 deg.
PA°	21 deg.			25 deg.		
TA°	43 deg.			43 deg.		
KK	267 mm.			250 mm.		
ST	610 mm.	Angle	77 deg.	599 mm.	Angle	70 deg.
SK	704 mm.	Angle	0 deg.	691 mm.	Angle	0 deg.
SH	251 mm.	Angle	13 deg.	231 mm.	Angle	15 deg.
SHY	204 mm.			204 mm.		
HS	241 mm.			238 mm.		
HD	140 mm.			144 mm.		
AD	90 mm.			102 mm.		

Note: Seat back was positioned according to manufacturer specifications.

Figure 2

SEAT BELT POSITIONING DATA



	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
<u>PBU</u> -- Top surface of alum. plate to upper edge	346	345
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	260	260
<u>LAP BELT TENSION</u>	-	-
<u>SHOULDER BELT TENSION</u>	0.9 nwt	0.9 nwt

Table 5

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

<u>BELT LENGTH DATA:</u>	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>2160 mm.</u>	<u>2125 mm.</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>885 mm.</u>	<u>880 mm.</u>
Lap belt length as measured on Part 572 Dummy.	<u>910 mm.</u>	<u>880 mm.</u>
<u>SHOULDER BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>127 mm.</u>	<u>113 mm.</u>
As determined mechanically.	<u>132 mm.</u>	<u>126 mm.</u>
As determined electronically.	<u>85 mm.</u>	<u>82 mm.</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>109 mm/M</u>	<u>95 mm/M</u>
Measured mechanically.	<u>79 mm/M</u>	<u>0.0 mm/M</u>

Figure 3

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

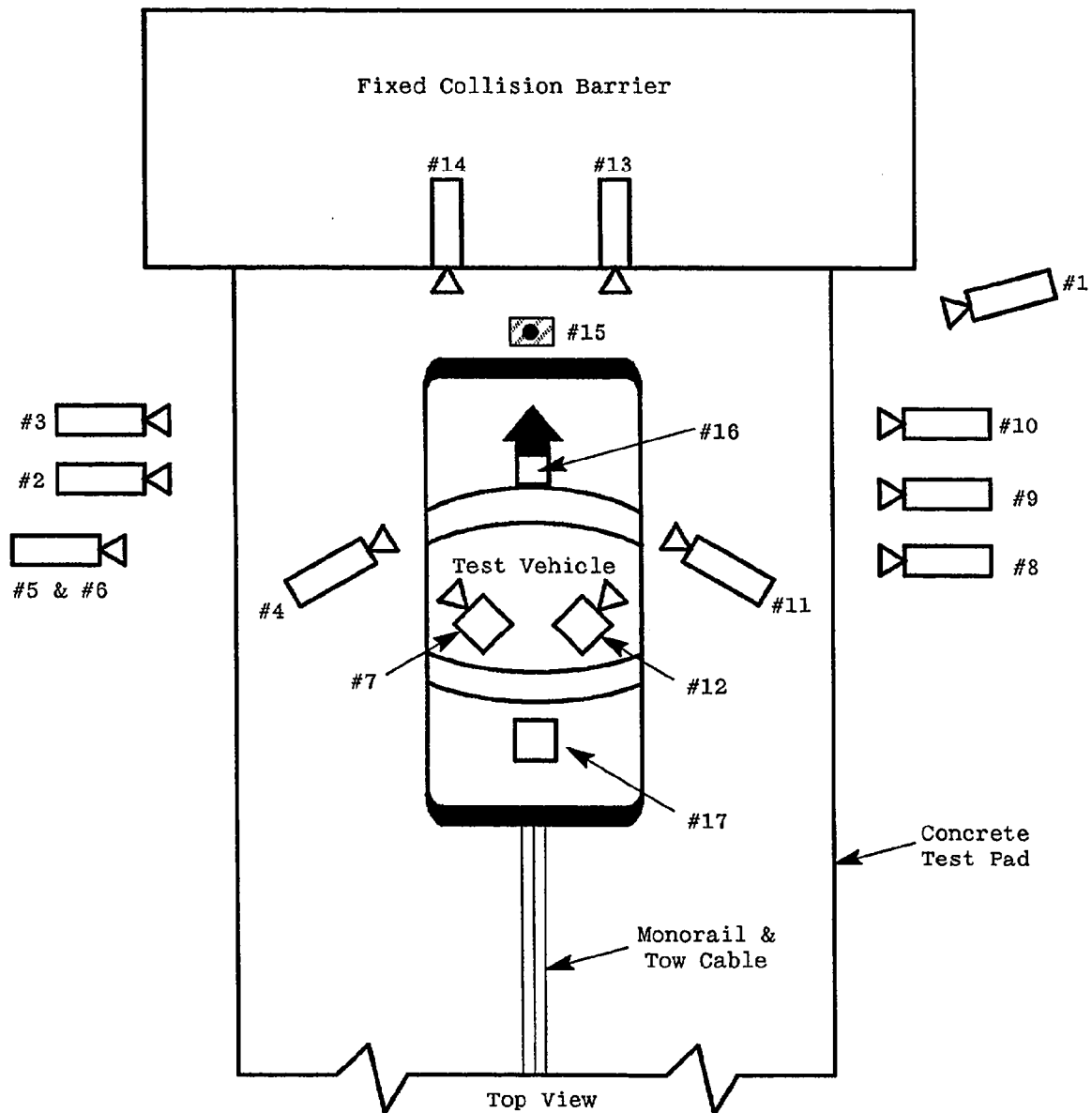


Table 6

HIGH-SPEED CAMERA LOCATIONS

CAMERA NO.	VIEW	CAMERA POSITIONS (MM.)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	--	--	--	--	--	--	24
2	Overall Left Side	6045	1499	1067	-3	5587	13	550
3	Left Side View	7950	914	1041	-2	7492	25	620
4	Driver and Interior View	2921	2438	1727	-15	2463	13	570
5	Steering Column (Bottom)	6960	1778	1168	-2	6502	25	820
6	Steering Column (Top)	6960	1778	1778	-7	6502	25	770
7	Left Belt	--	--	--	--	--	8	N.T.
8	Overall Right Side	6020	1880	1067	-4	5562	13	560
9	Right Side View	7391	1372	1041	-1	6933	35	560
10	Right Passenger View	7391	1778	1422	-5	6933	25	510
11	Passenger and Interior View	2769	2565	1753	-16	2311	13	580
12	Right Belt	--	--	--	--	--	8	640
13	Passenger Front View	610	-127	1778	-35	--	13	630
14	Driver Front View	610	-127	1778	-31	--	13	N.T.
15	Windshield View	0	0	3048	-48	--	13	610
16	Pit View of Engine	0	508	-3048	90	--	13	670
17	Pit View of Fuel Tank	0	3432	-3048	90	--	13	850

*X = film plane to monorail centerline

** = referenced to horizontal plane

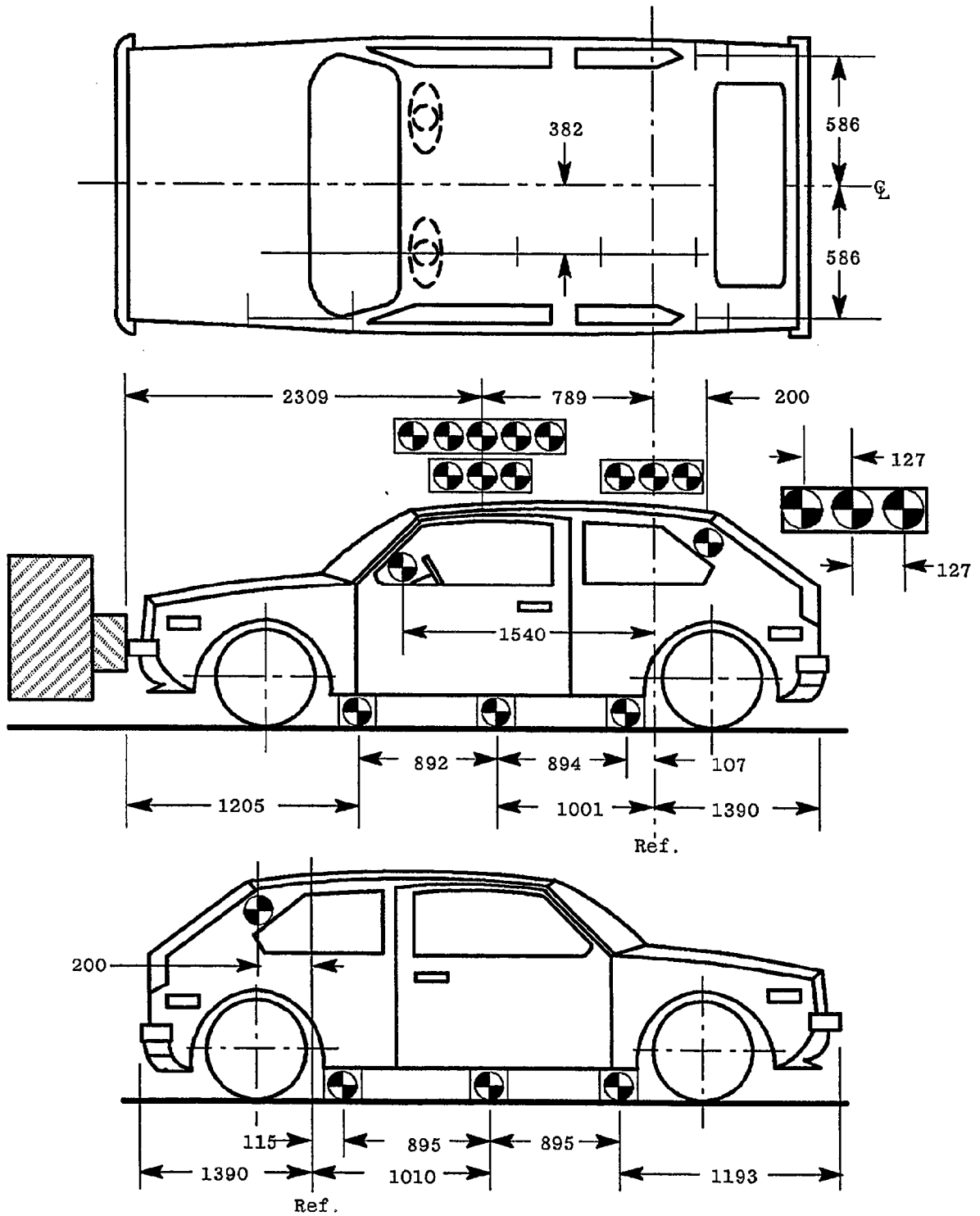
Y = film plane to impact location

N.T. indicates No Timing

Z = film plane to ground

Figure 4

VEHICLE TARGET LOCATIONS

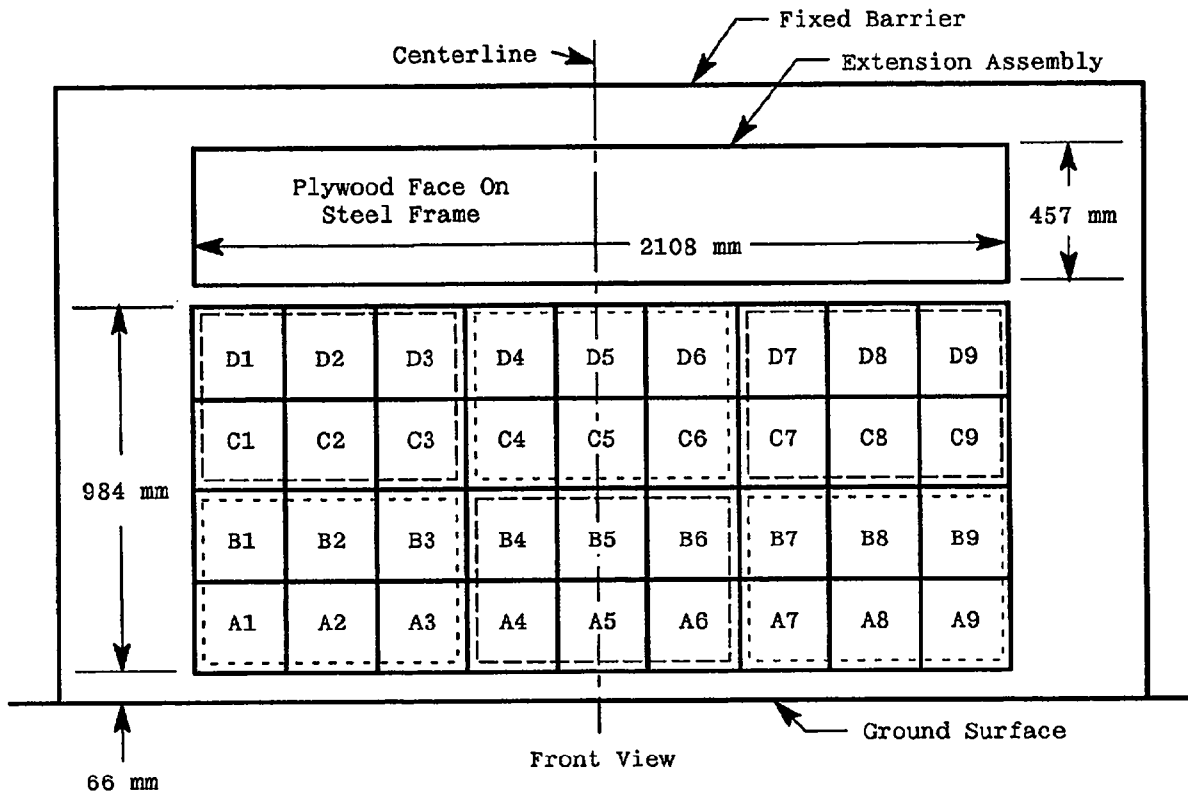


(Dimensions in millimeters)

Figure 5

LOAD CELL LOCATIONS ON FIXED BARRIER

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



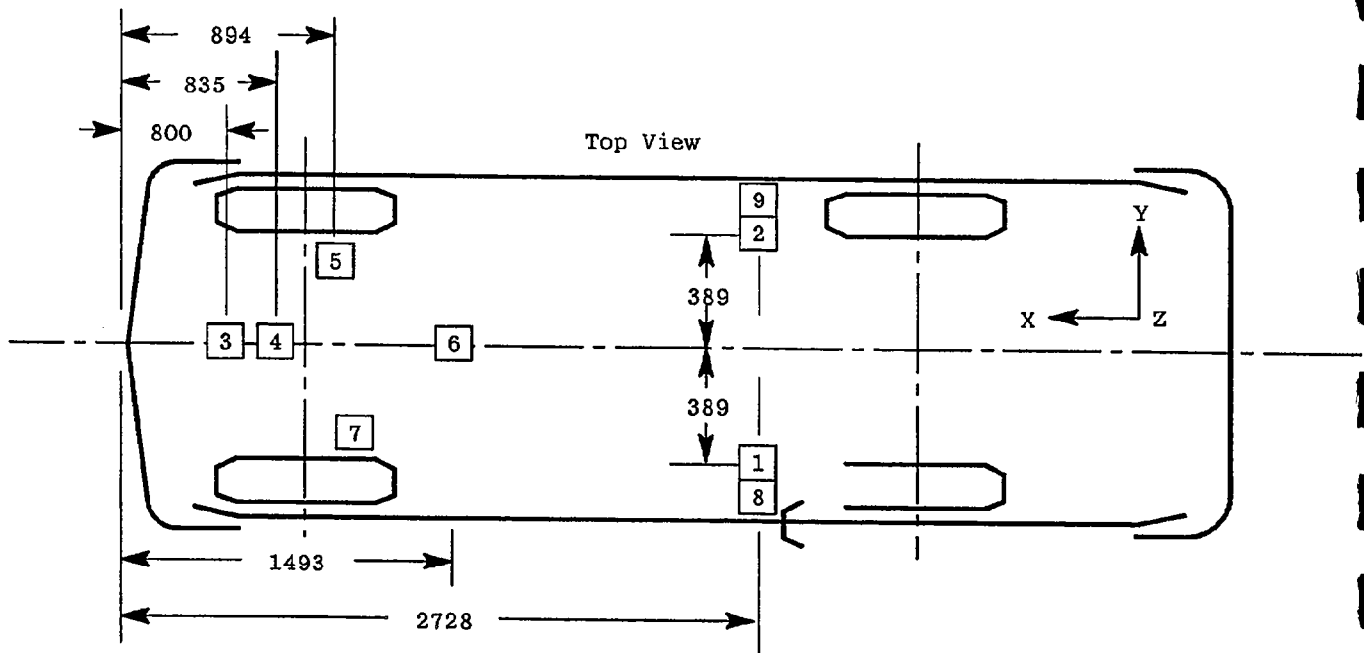
6 GROUPS OF 6 LOAD CELLS EACH

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	DIRECTION		
		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

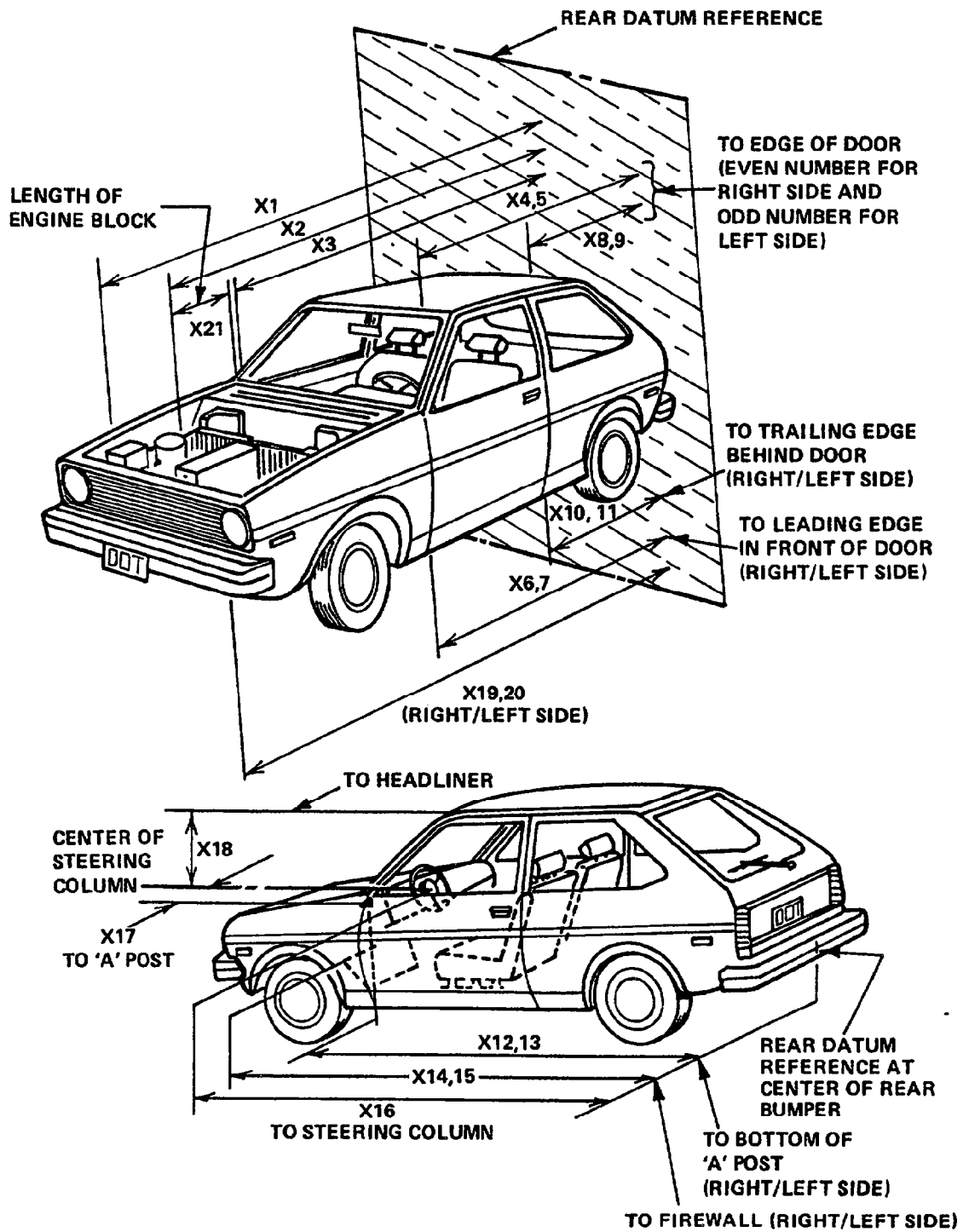


Table 7

VEHICLE MEASUREMENTS

No.		All Dimensions in mm			Differences
		Pre-Test	Post-Test		
X1	Total Length of Vehicle at Centerline	4488	3997		491
X2	Rear Surface of Vehicle to Front of Engine	3965	3765		200
X3	Rear Surface of Vehicle to Firewall	3500	3360		140
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	3250	3269		-19
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	3250	3265		-15
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	3238	3239		-1
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	3248	3245		3
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	2090	2123		-33
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	2100	2119		-19
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	2090	2099		-9
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	2100	2100		0
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	3226	3220		6
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	3235	3215		20
X14	Rear Surface of Vehicle to Firewall, Right Side	3500	3460		40
X15	Rear Surface of Vehicle to Firewall, Left Side	3500	3450		50
X16	Rear Surface of Vehicle to Steering Column	2790	2730		60
X17	Center of Steering Column to "A" Post	369	419		-50
X18	Center of Steering Column to Headliner	442	512		-70
X19	Rear Surface of Vehicle to Right Side of Front Bumper	4430	3991		439
X20	Rear Surface of Vehicle to Left Side of Front Bumper	4440	3997		443
X21	Length of Engine Block	420	420		0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	2980	2870		110
CD	Rear Surface of Vehicle to Center of Dash Panel	2978	2905		73
LD	Rear Surface of Vehicle to Left Side of Dash Panel	2980	2990		-10

Table 8

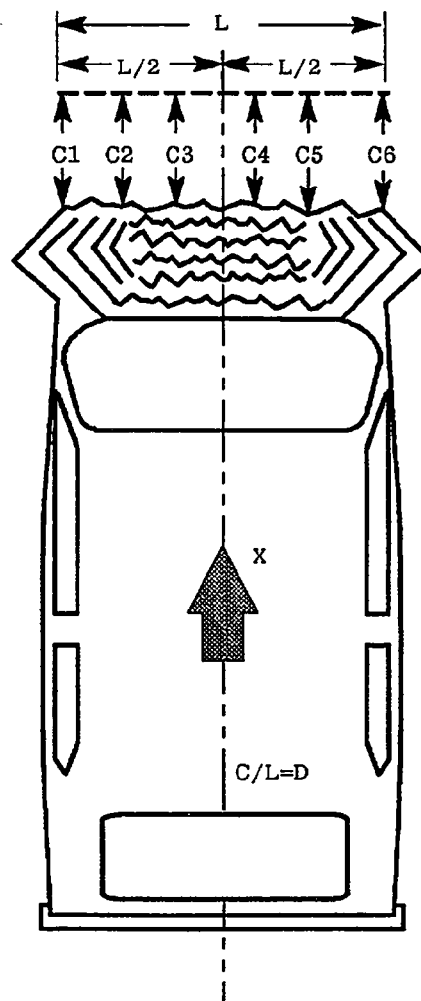
ACCIDENT INVESTIGATION DIVISION DATA
FOR 56.3 KPH FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: 1993 Isuzu Rodeo 4-Door MPV
 Vehicle NHTSA No.: MP5700 VIN: 4S2CY58V6P4308588
 Model Year: 1993 Build Date: 2/93 Test Date: March 23, 1993
 Vehicle Size Category: MPV Test Weight: 2105 Kgs
 Vehicle Wheelbase: 2968 mm; Front Overhang: 1484 mm; Overall Width: 1740 mm
 Collision Deformation Classification (CDC) Code: 12FDEW3

Crush Depth C1 = 440 mm
 Dimensions: C2 = 470 mm
 C3 = 496 mm
 C4 = 496 mm
 C5 = 469 mm
 C6 = 435 mm

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

Length of Damaged Region: L = 1470 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 with 12 mm plastic covering top of windshield and 23 mm rubber trim covering both sides of windshield. A plastic shroud covers the bottom of windshield.

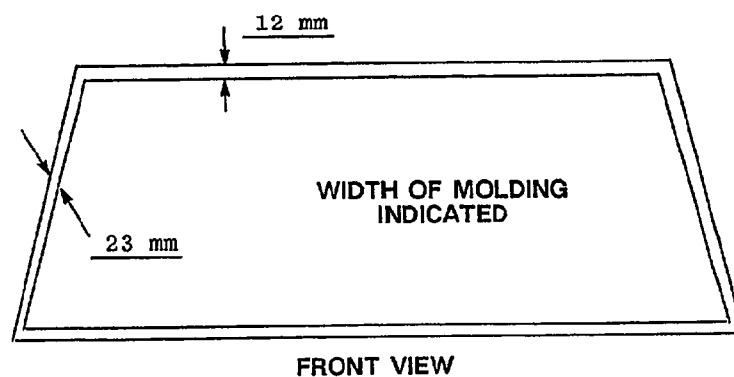
FMVSS 212 REQUIREMENTS:

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

FMVSS 212 TEST DATA

	WINDSHIELD PERIPHERY		% OF RETENTION
	PRE-TEST (mm)	POST-TEST(mm)	
RIGHT SIDE	1995	1995	100 %
LEFT SIDE	1995	1995	100 %
TOTAL	3990	3990	100 %

AREA OF RETENTION FAILURE:



FAILURE DETAILS:

None

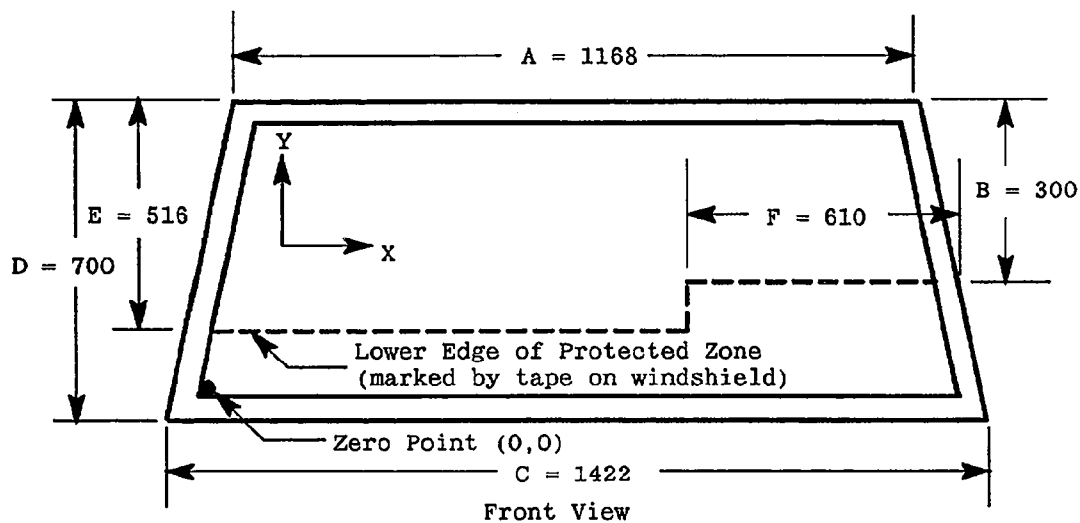
Figure 9

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 weighting 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)



DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 1/4":

(Show location of penetration on the above sketch)

None

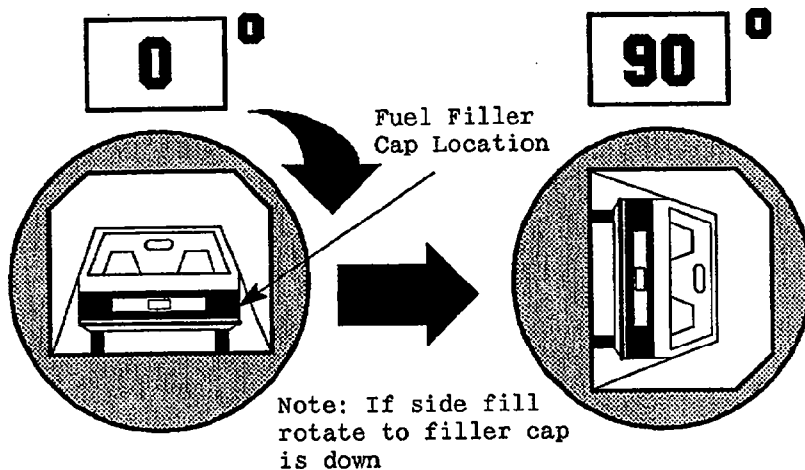
COORDINATES		
	X	Y
1.		
2.		
3.		
4.		

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEETTEST PHASE:

Vehicle NHTSA ID No.

MP5700

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

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

2 minutes 00 seconds

FMVSS 301 Position Hold Time +

5 minutes 00 seconds

TOTAL

7 minutes 00 seconds

Next whole minute interval

8 minutes 00 seconds

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

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

IV. SOLVENT SPILLAGE LOCATION (S):

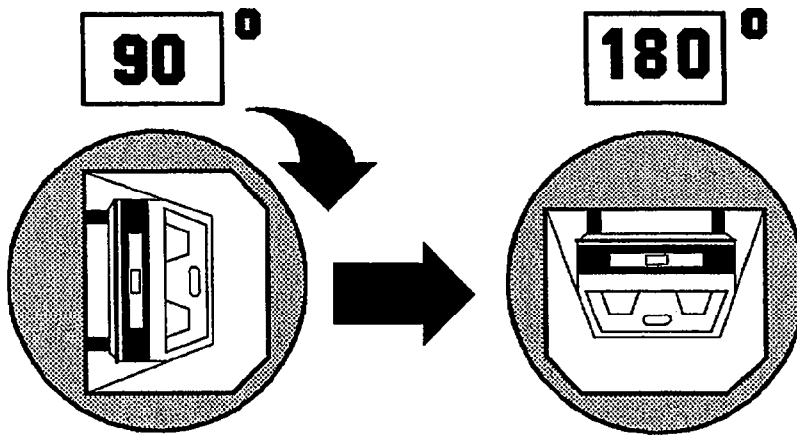
None.

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont'd)TEST PHASE:

Vehicle NHTSA ID No.:

MP5700

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

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

FMVSS 301 Position Hold Time +

TOTAL

Next whole minute interval

2	minutes	30	seconds
5	minutes	00	seconds
7	minutes	30	seconds
8	minutes	00	seconds

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

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

IV. SOLVENT SPILLAGE LOCATION (S):

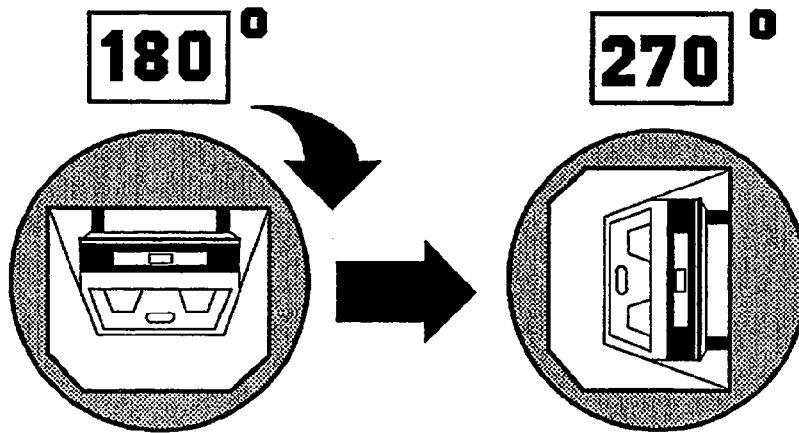
None.

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont'd)TEST PHASE:

Vehicle NHTSA ID No.:

MP5700

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

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

FMVSS 301 Position Hold Time +

TOTAL

Next whole minute interval

2	minutes	20	seconds
5	minutes	00	seconds
7	minutes	20	seconds
8	minutes	00	seconds

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

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

IV. SOLVENT SPILLAGE LOCATION (S):

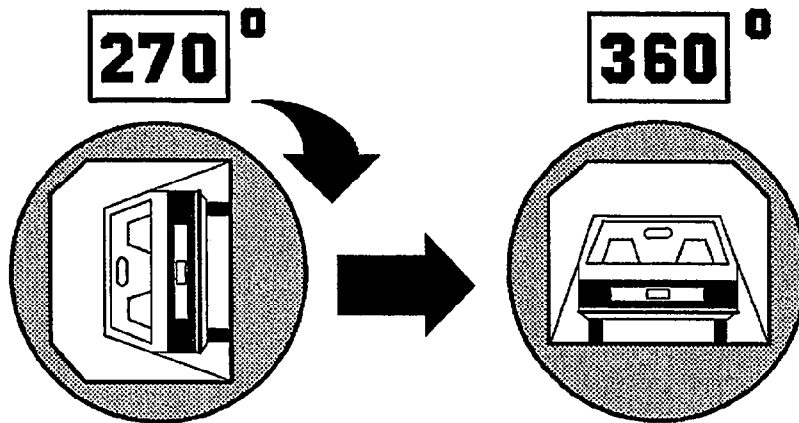
None.

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont'd)TEST PHASE:

Vehicle NHTSA ID No.:

MP5700

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

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

FMVSS 301 Position Hold Time +

TOTAL

Next whole minute interval

<u>2</u>	minutes	<u>30</u>	seconds
<u>5</u>	minutes	<u>00</u>	seconds
<u>7</u>	minutes	<u>30</u>	seconds
<u>8</u>	minutes	<u>00</u>	seconds

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

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

IV. SOLVENT SPILLAGE LOCATION (S):

None.

Appendix A
PHOTOGRAPHS

PHOTOGRAPHS

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A-1	LOAD CELL LOCATIONS.....	A-3
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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-30	PRE-TEST DRIVER HEAD LOCATION.....	A-32
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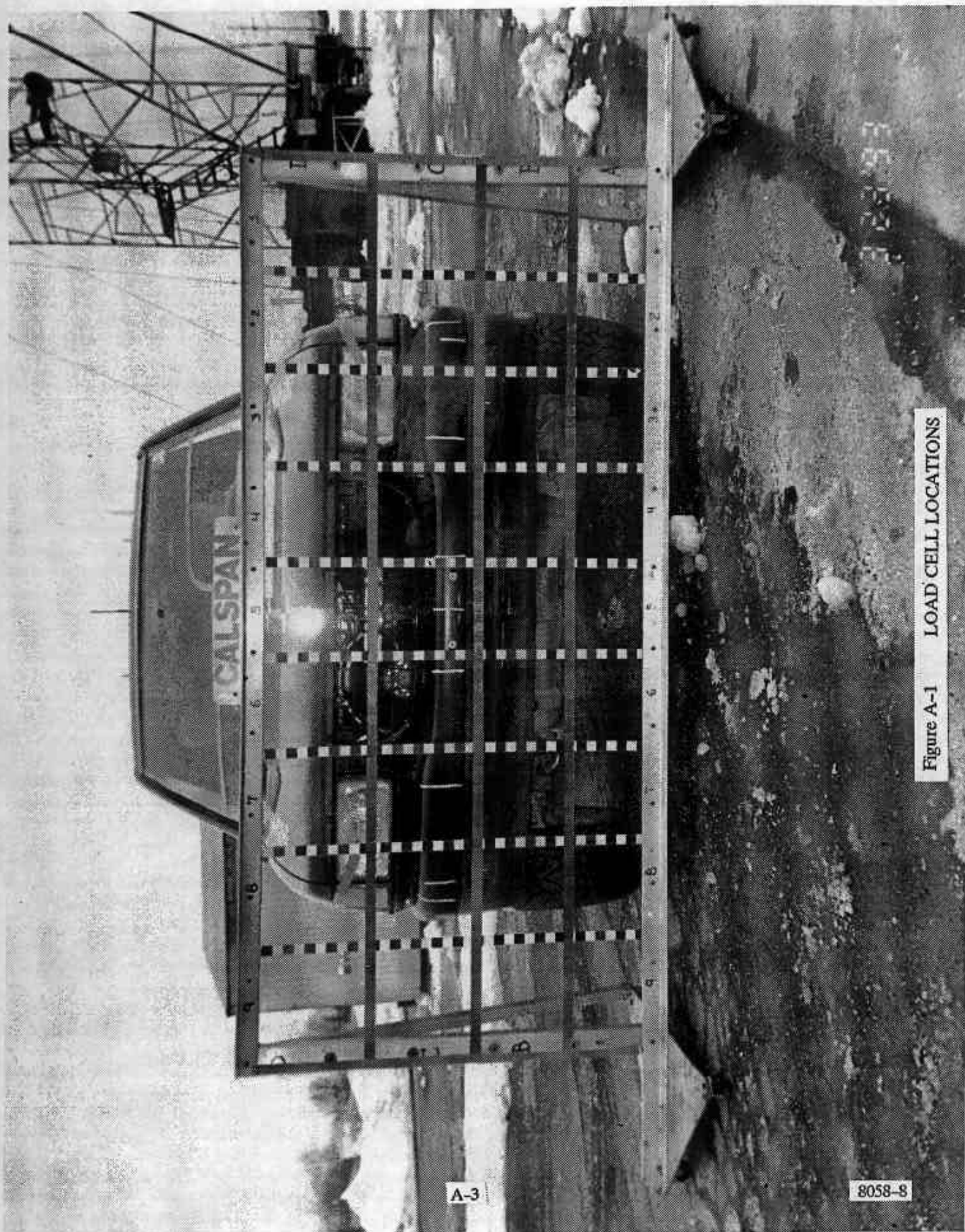


Figure A-1 LOAD CELL LOCATIONS

TEST NO. MP5700

VEHICLE DATA

FILTER CHANNEL CLASS

60



Figure A-3 POST TEST FRONT VIEW

A-5

8058-8



Figure A-2 PRE-TEST FRONT VIEW

A-4

8058-8

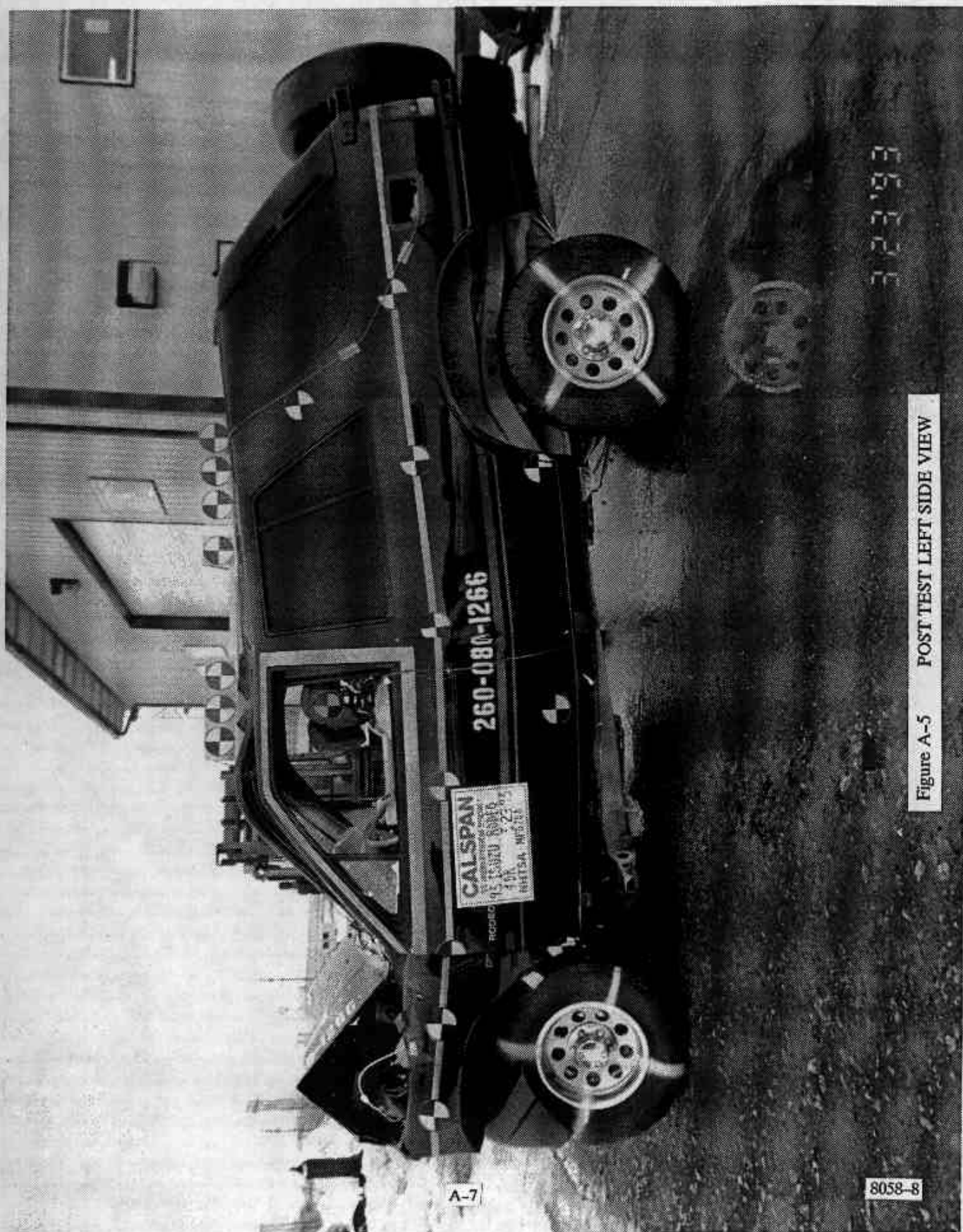


Figure A-5 POST TEST LEFT SIDE VIEW



Figure A-4 PRE-TEST LEFT SIDE VIEW

A-6

8058-8



Figure A-7 POST-TEST RIGHT SIDE VIEW

A-9

8058-8



Figure A-6 PRE-TEST RIGHT SIDE VIEW

A-8

8058-8

8058-8



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

A-11

8058-8



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

A-10

8058-8



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

A-13

8058-8



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

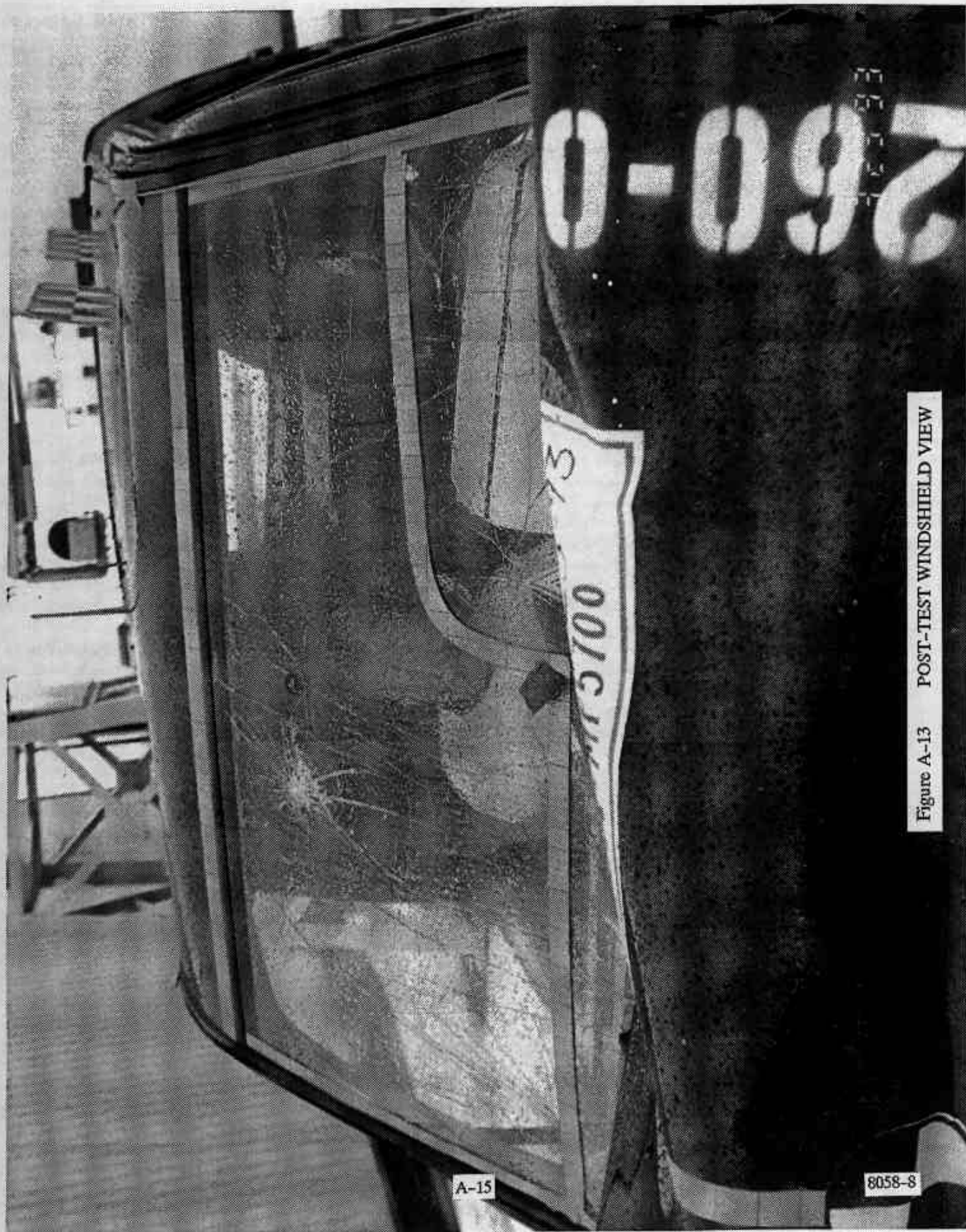


Figure A-13 POST-TEST WINDSHIELD VIEW

A-15

8058-8

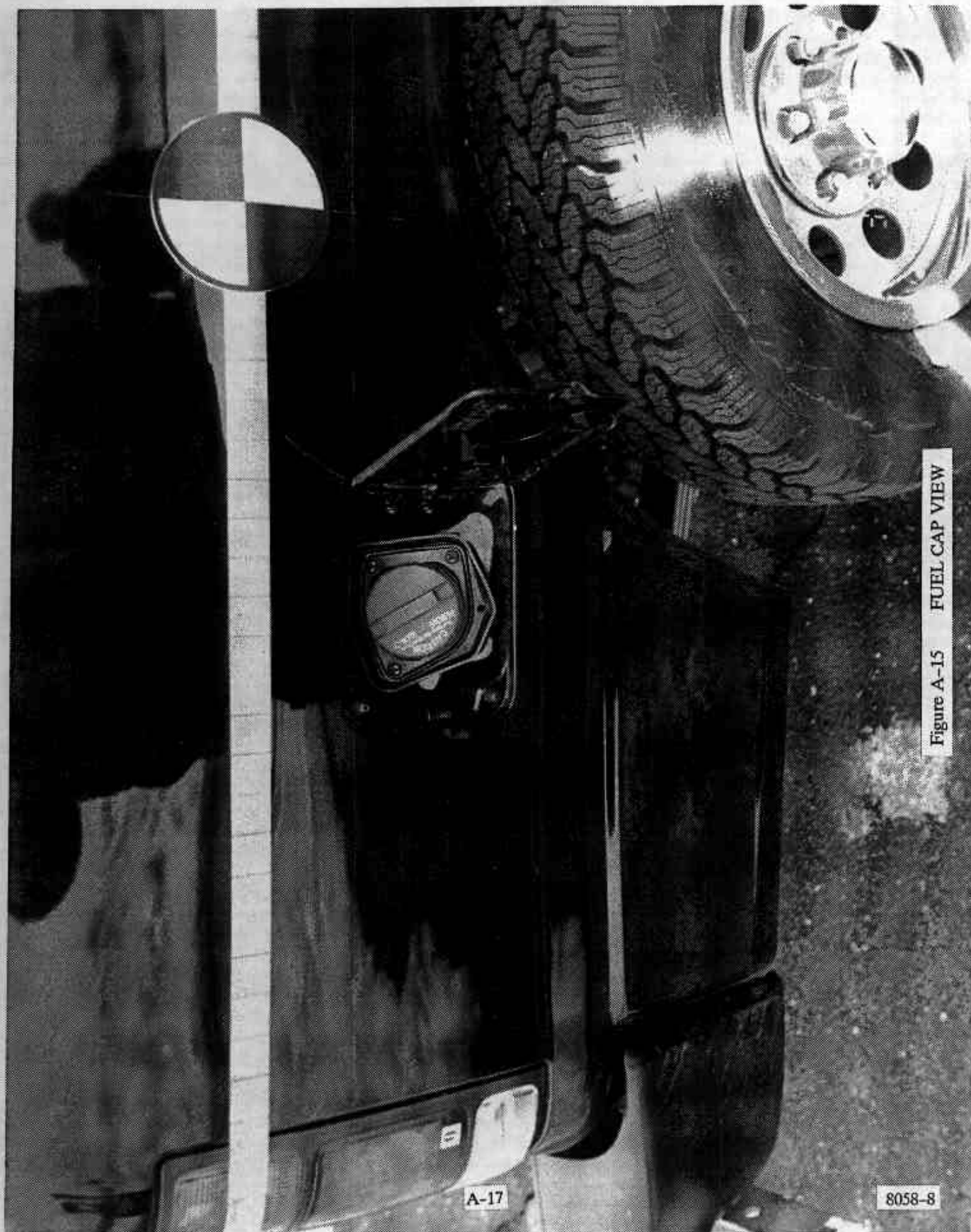


A-14

8058-8

Figure A-12 PRE-TEST WINDSHIELD VIEW

Figure A-15 FUEL CAP VIEW



A-17

8058-8

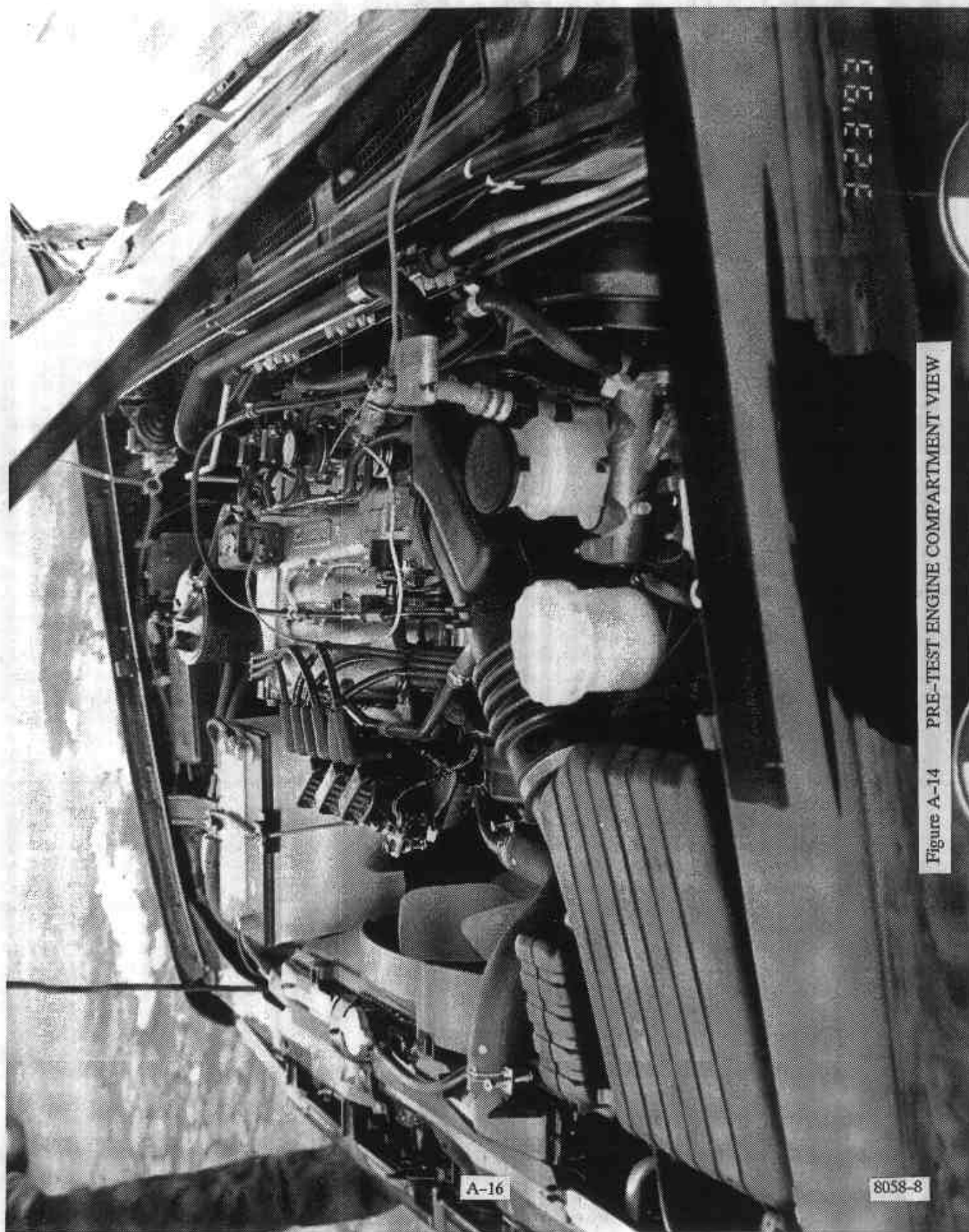
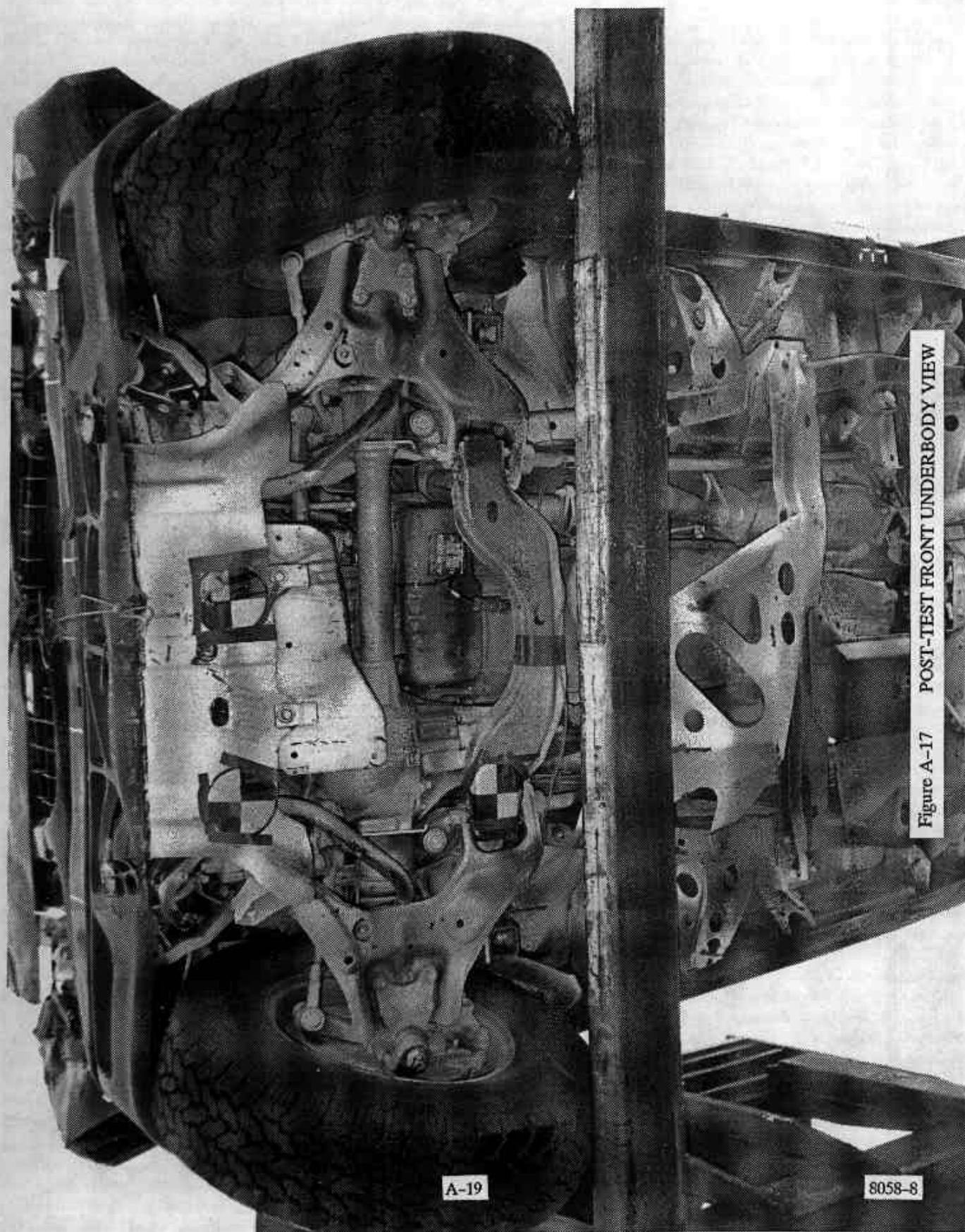


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

A-16

8058-8

Figure A-17 POST-TEST FRONT UNDERBODY VIEW



A-19

8058-8

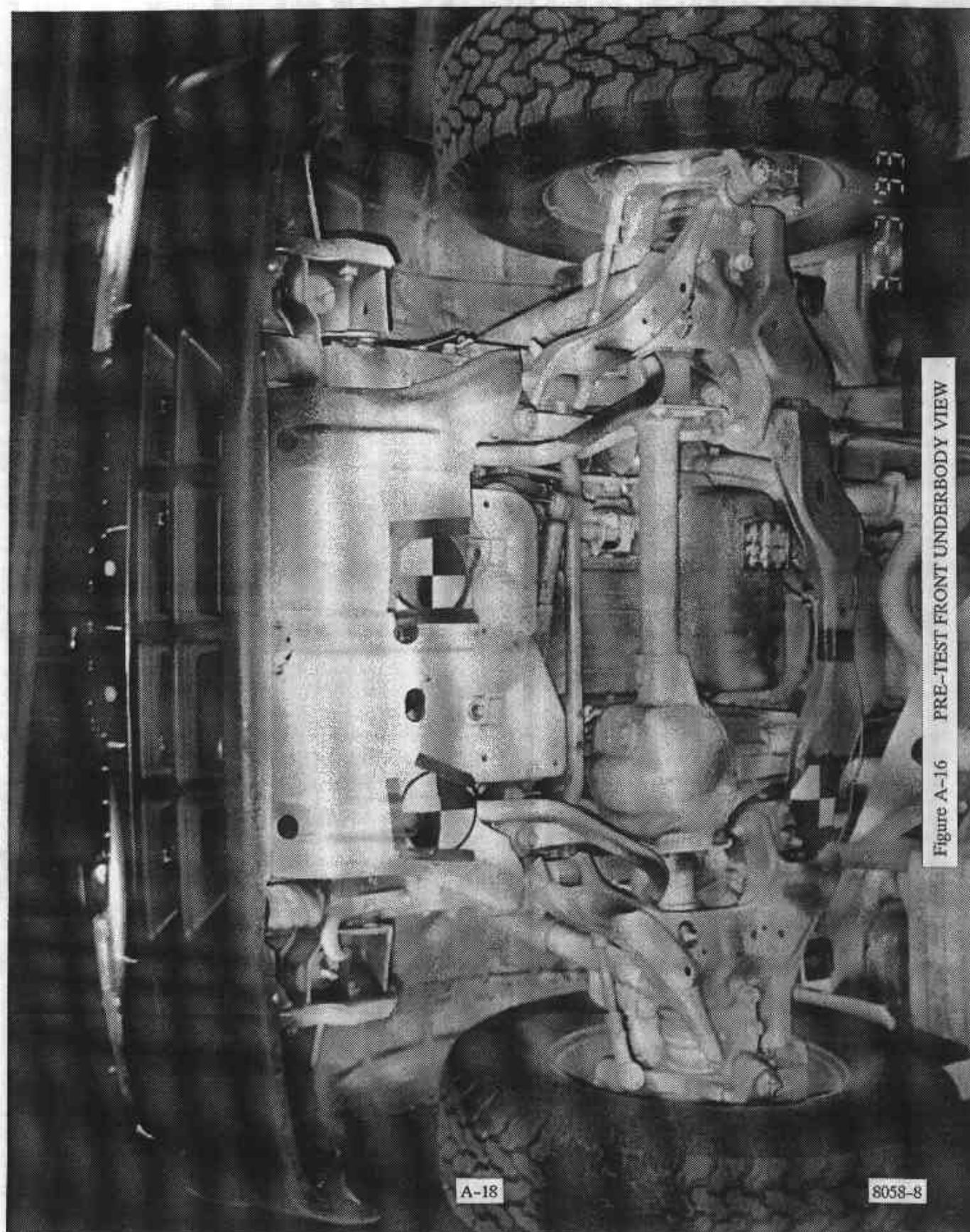


Figure A-16 PRE-TEST FRONT UNDERBODY VIEW

A-18

8058-8



Figure A-19 POST-TEST FRONT SIDE UNDERBODY VIEW

A-21

8058-8

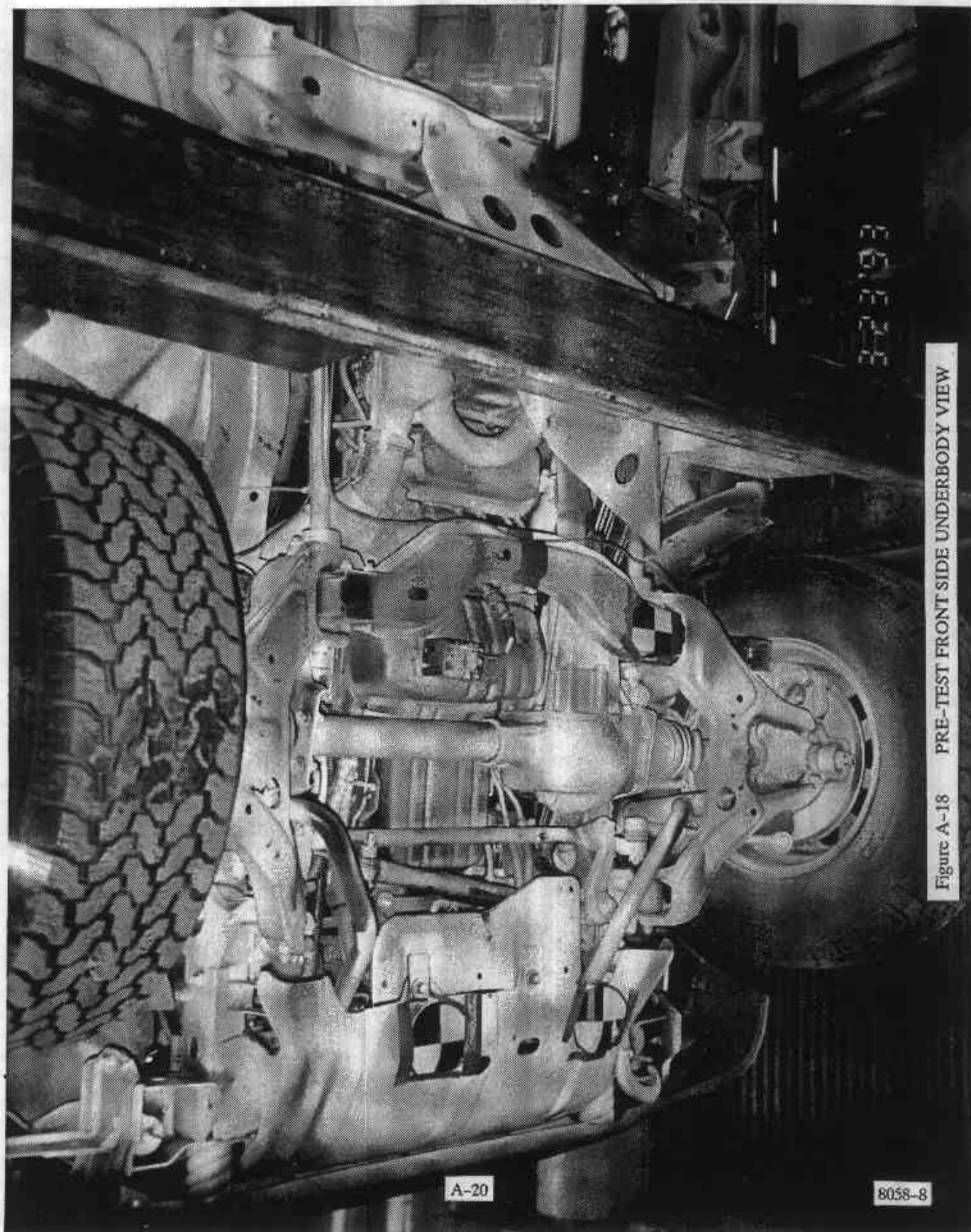


Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW

A-20

8058-8

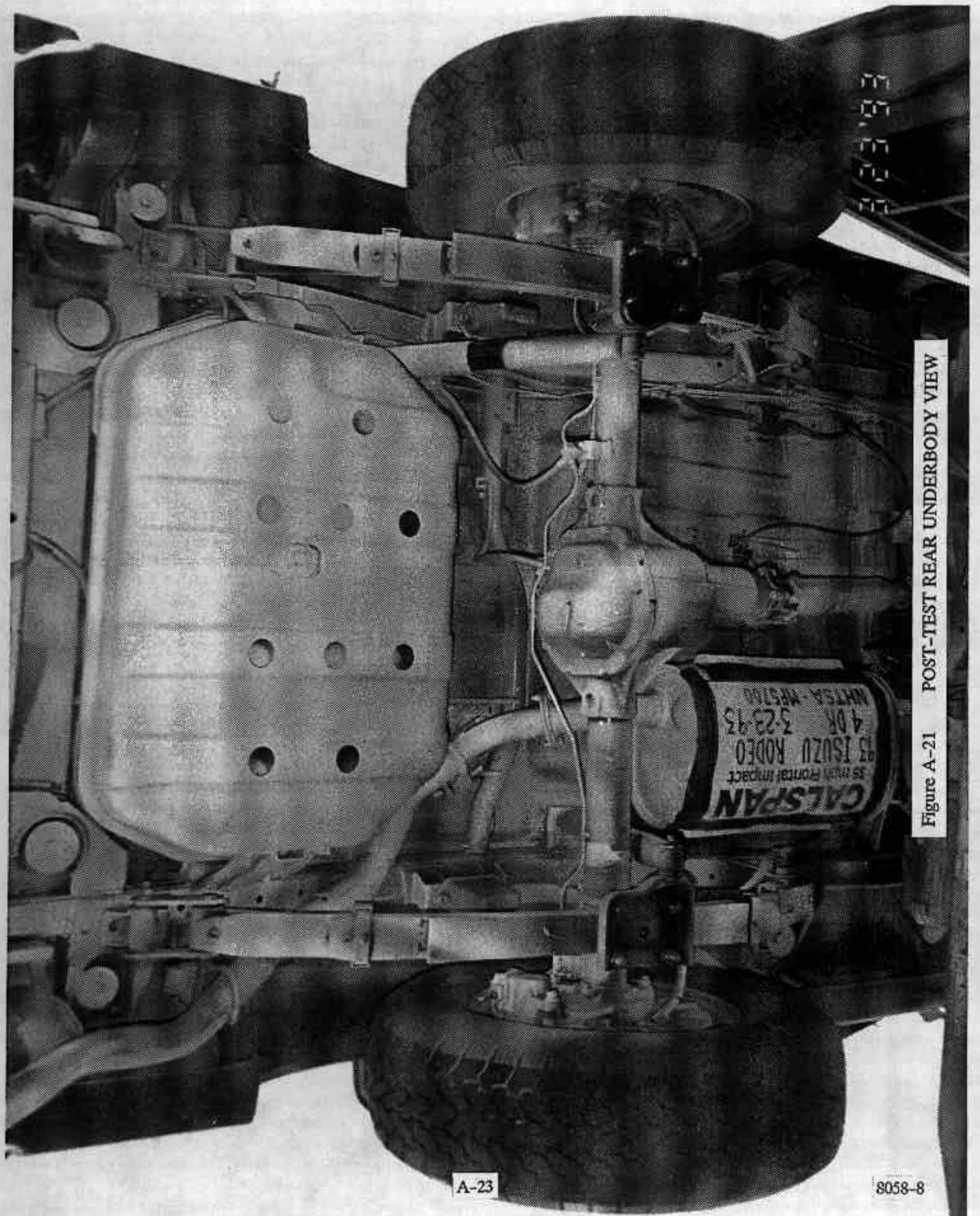


Figure A-21 POST-TEST REAR UNDERBODY VIEW

A-23

8058-8

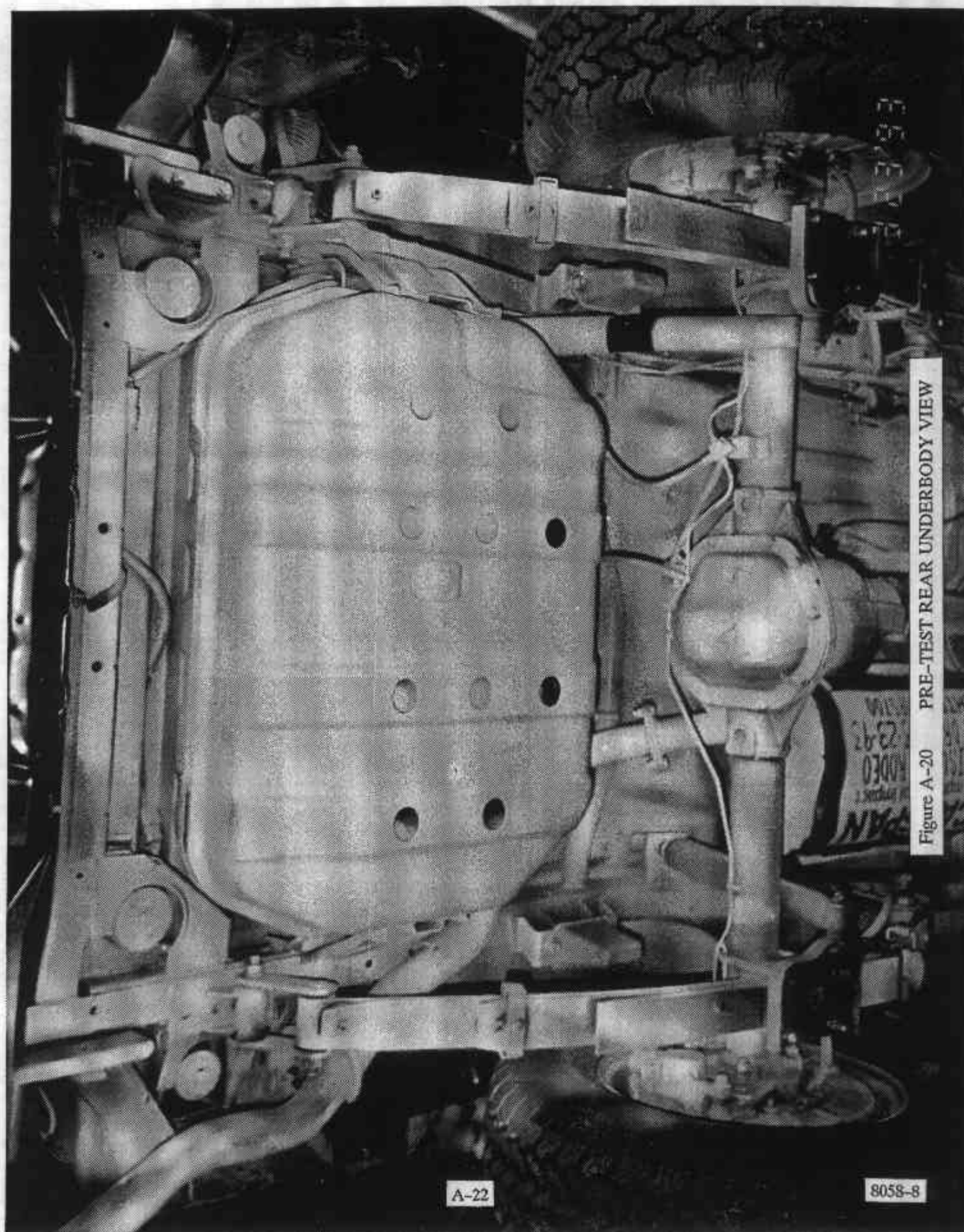


Figure A-20 PRE-TEST REAR UNDERBODY VIEW

A-22

8058-8

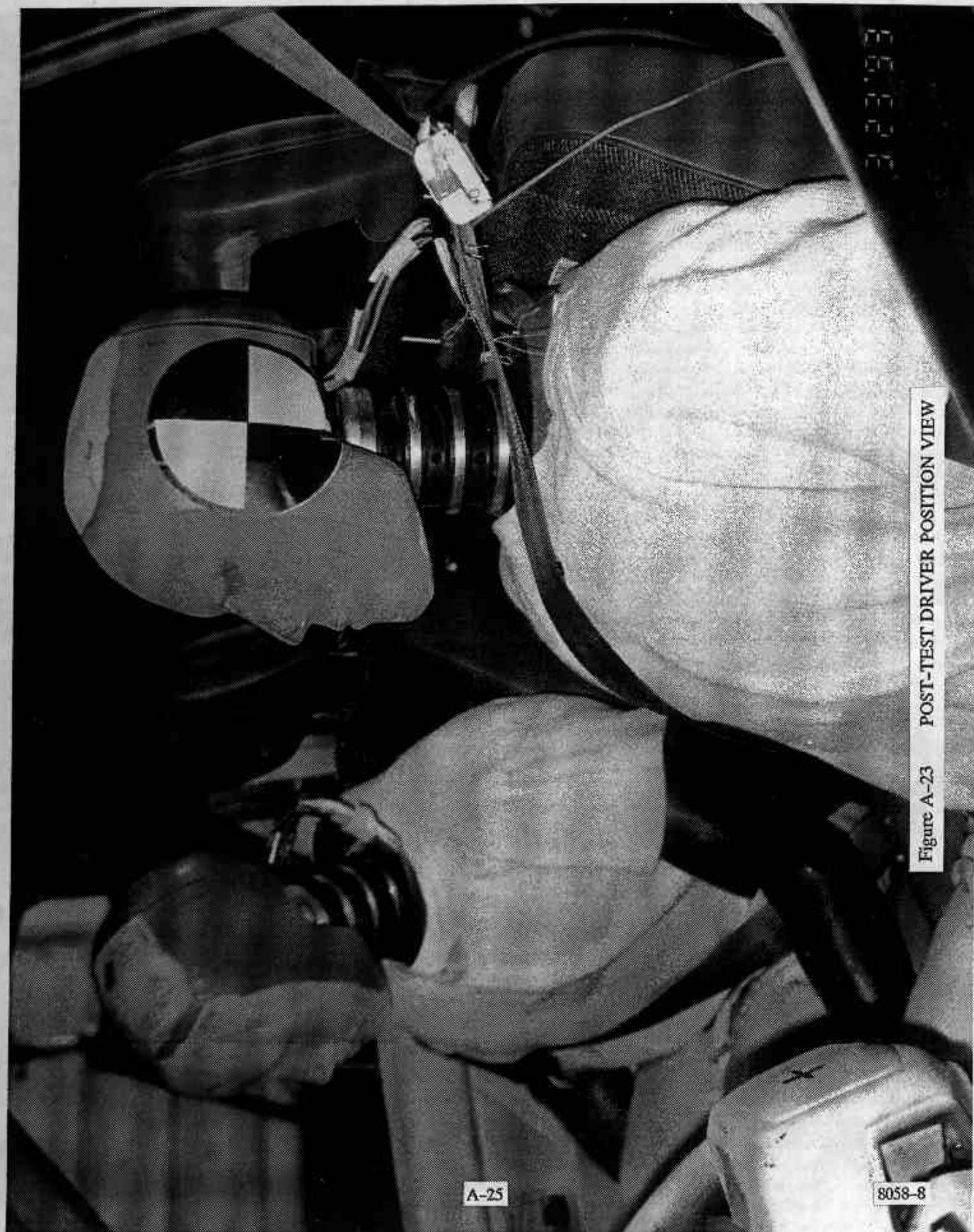


Figure A-23 POST-TEST DRIVER POSITION VIEW

A-25

8058-8

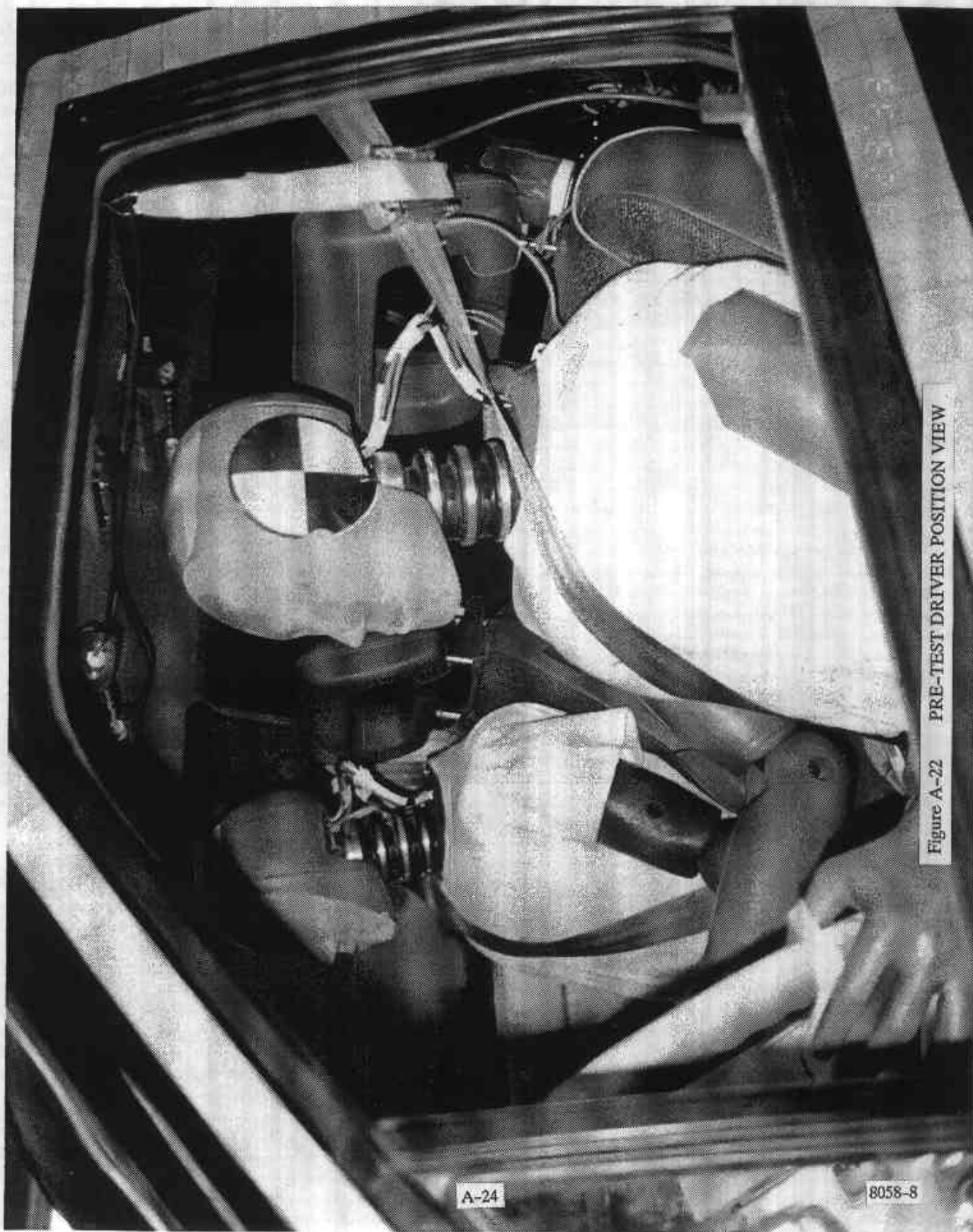


Figure A-22 PRE-TEST DRIVER POSITION VIEW

A-24

8058-8

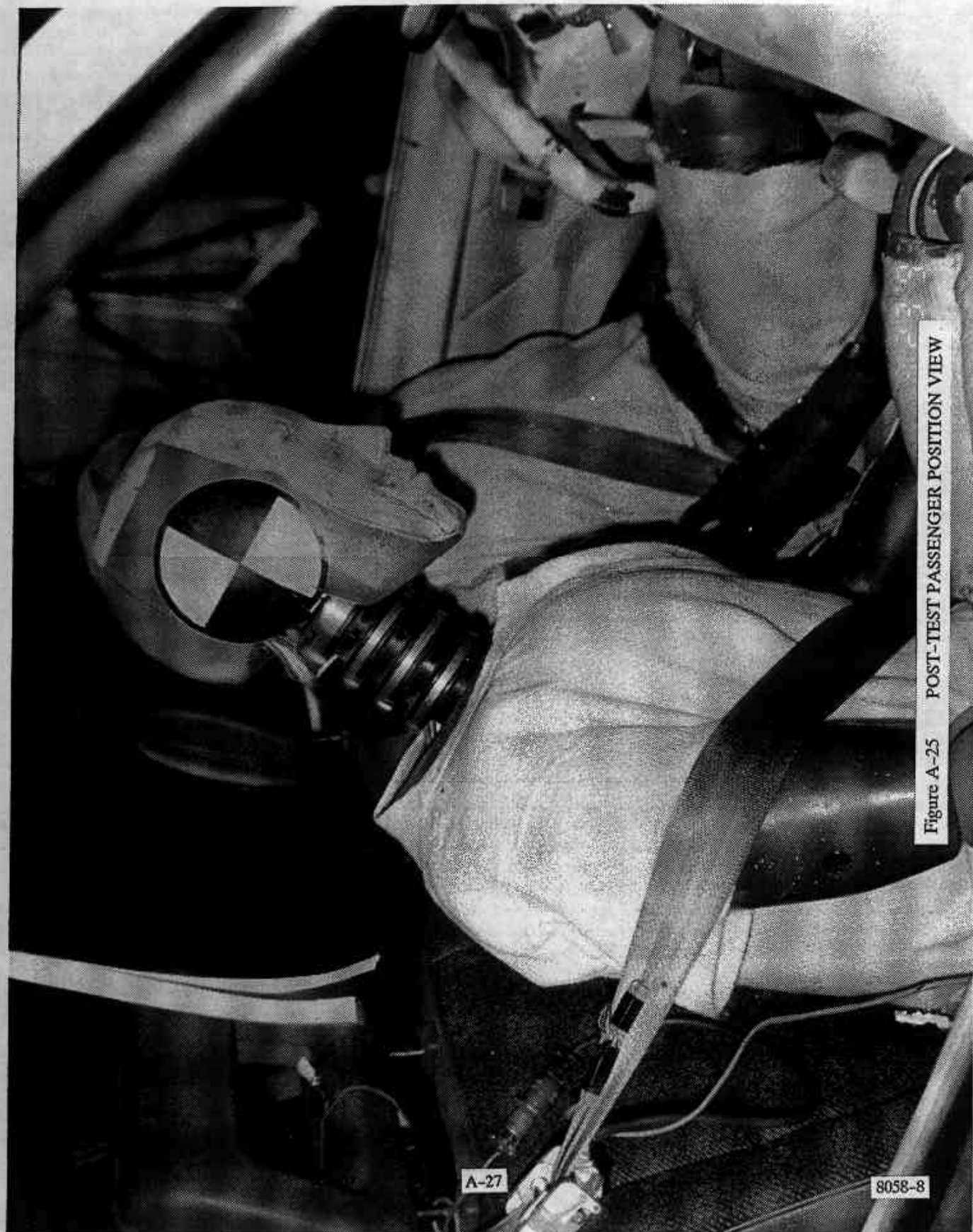


Figure A-25 POST-TEST PASSENGER POSITION VIEW

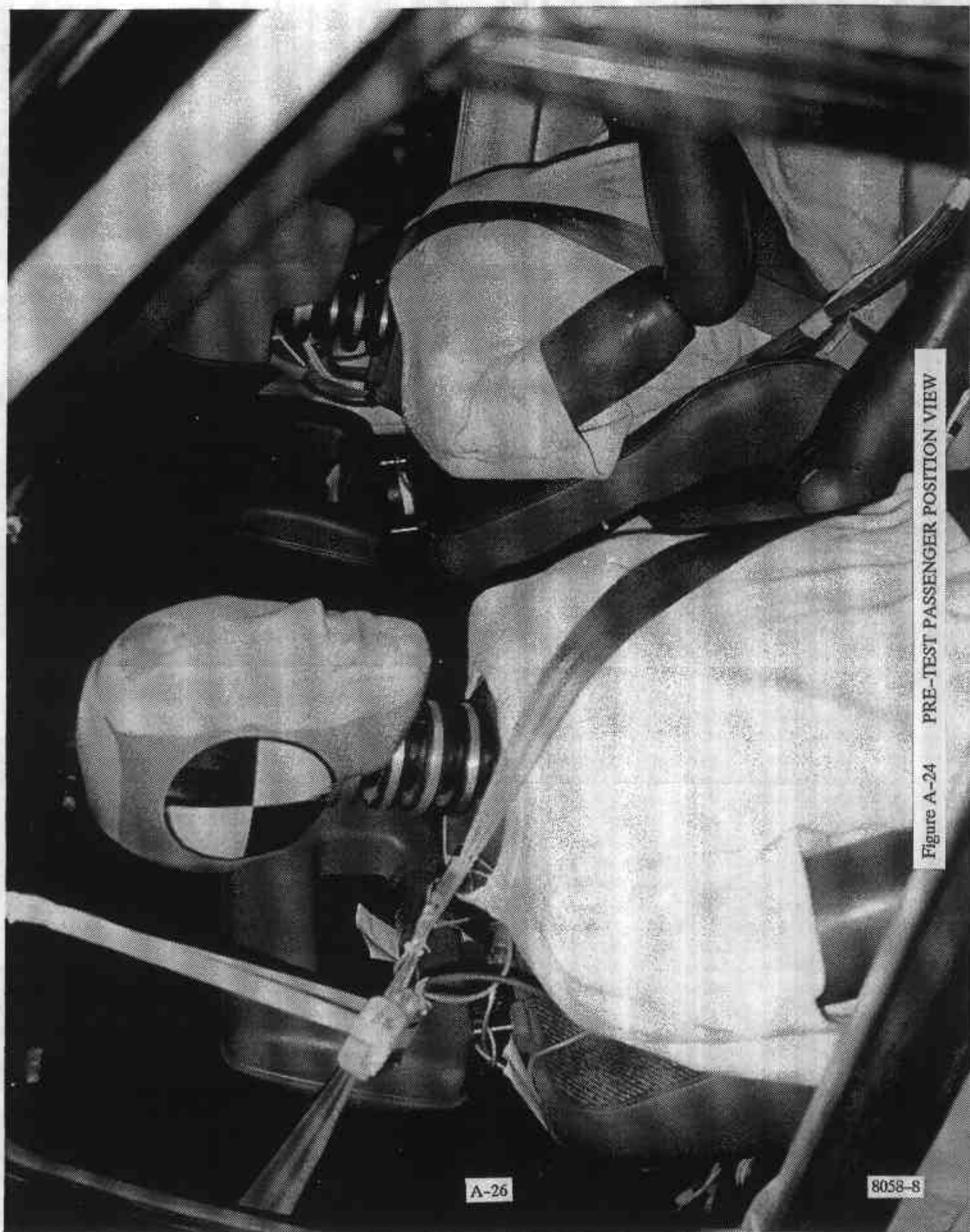


Figure A-24 PRE-TEST PASSENGER POSITION VIEW

A-26

8058-8

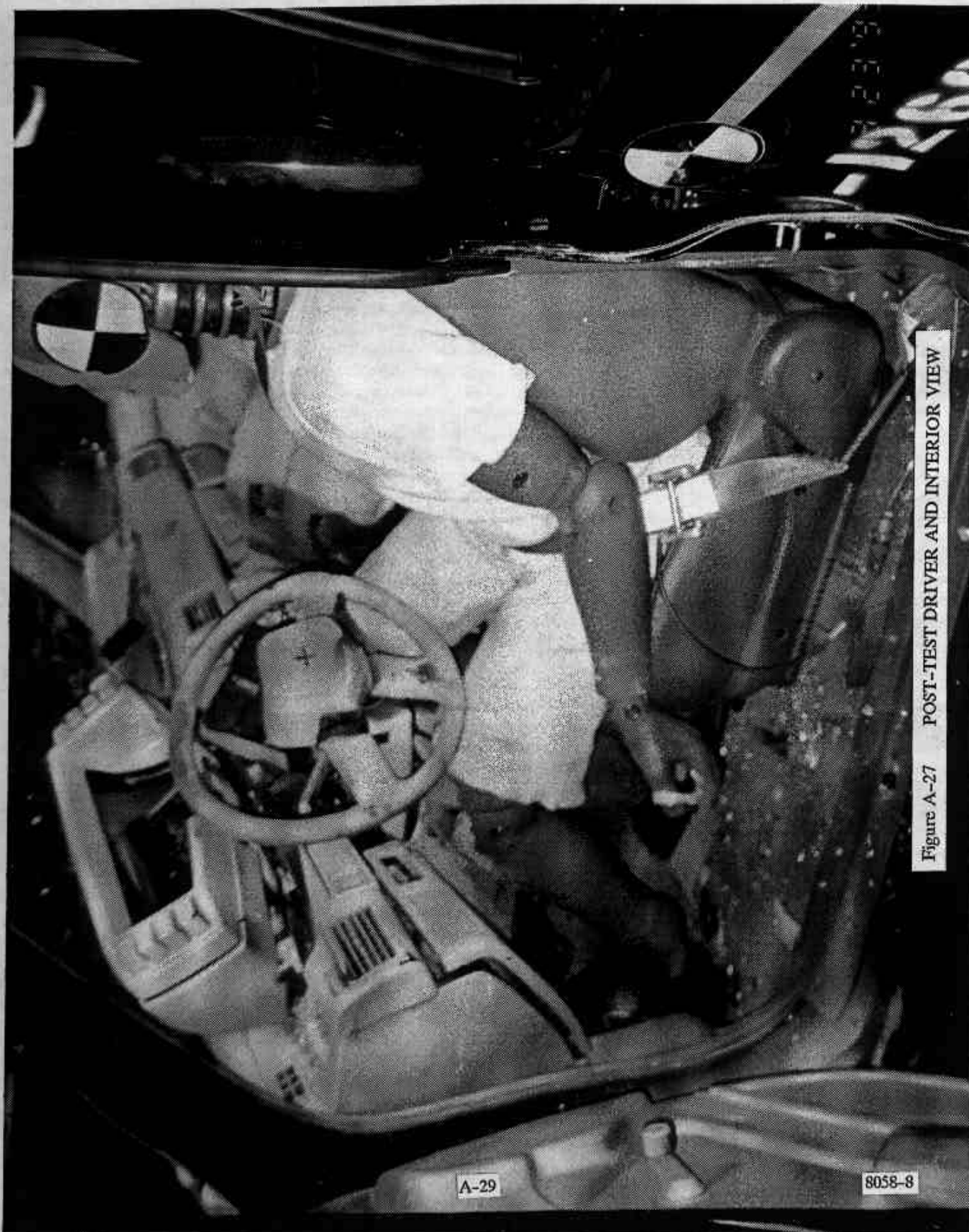


Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW

A-29

8058-8



Figure A-26 PRE-TEST DRIVER AND INTERIOR VIEW

A-28

8058-8



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW

A-31

8058-8



Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW

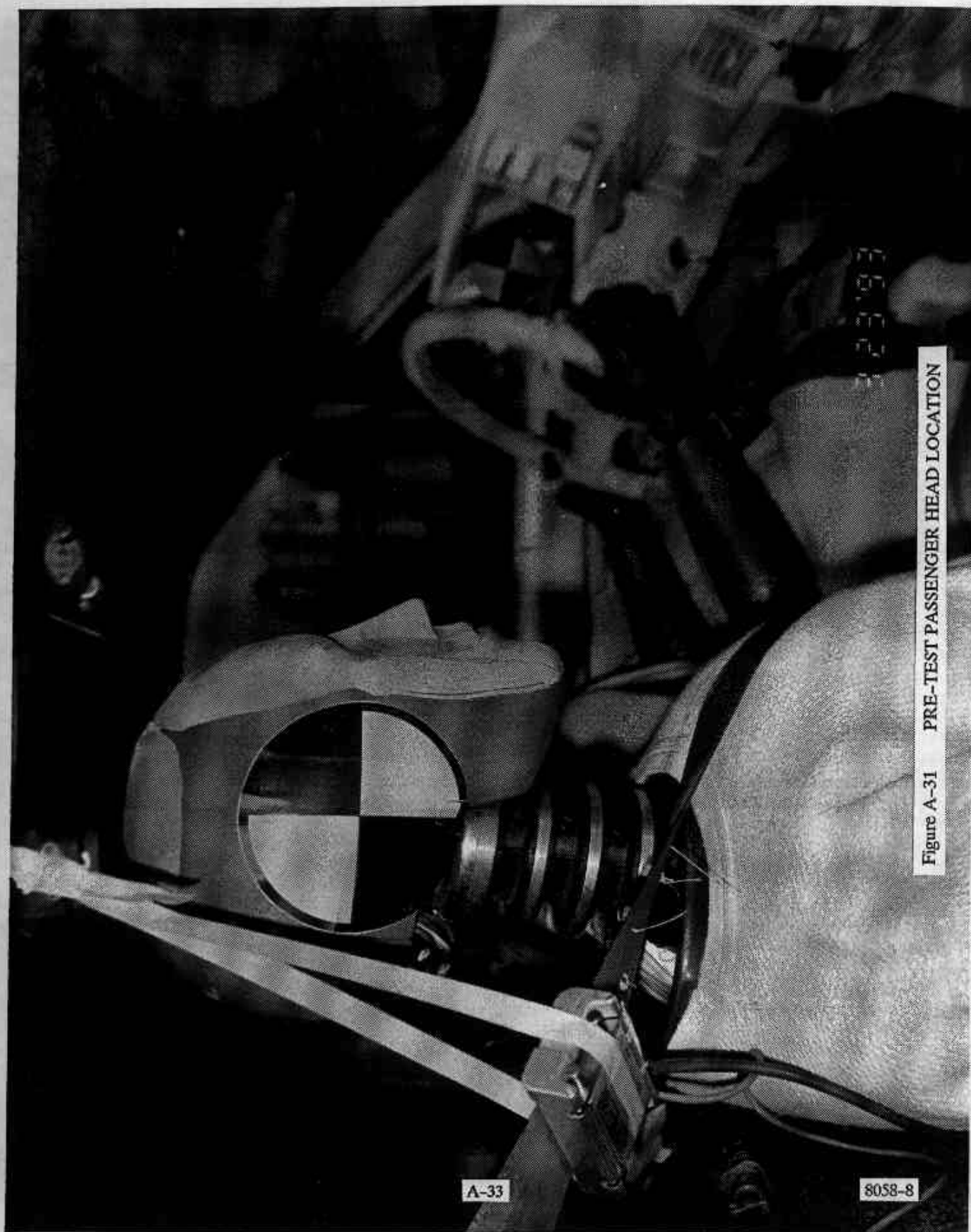
Figure A-30 PRE-TEST DRIVER HEAD LOCATION



A-32

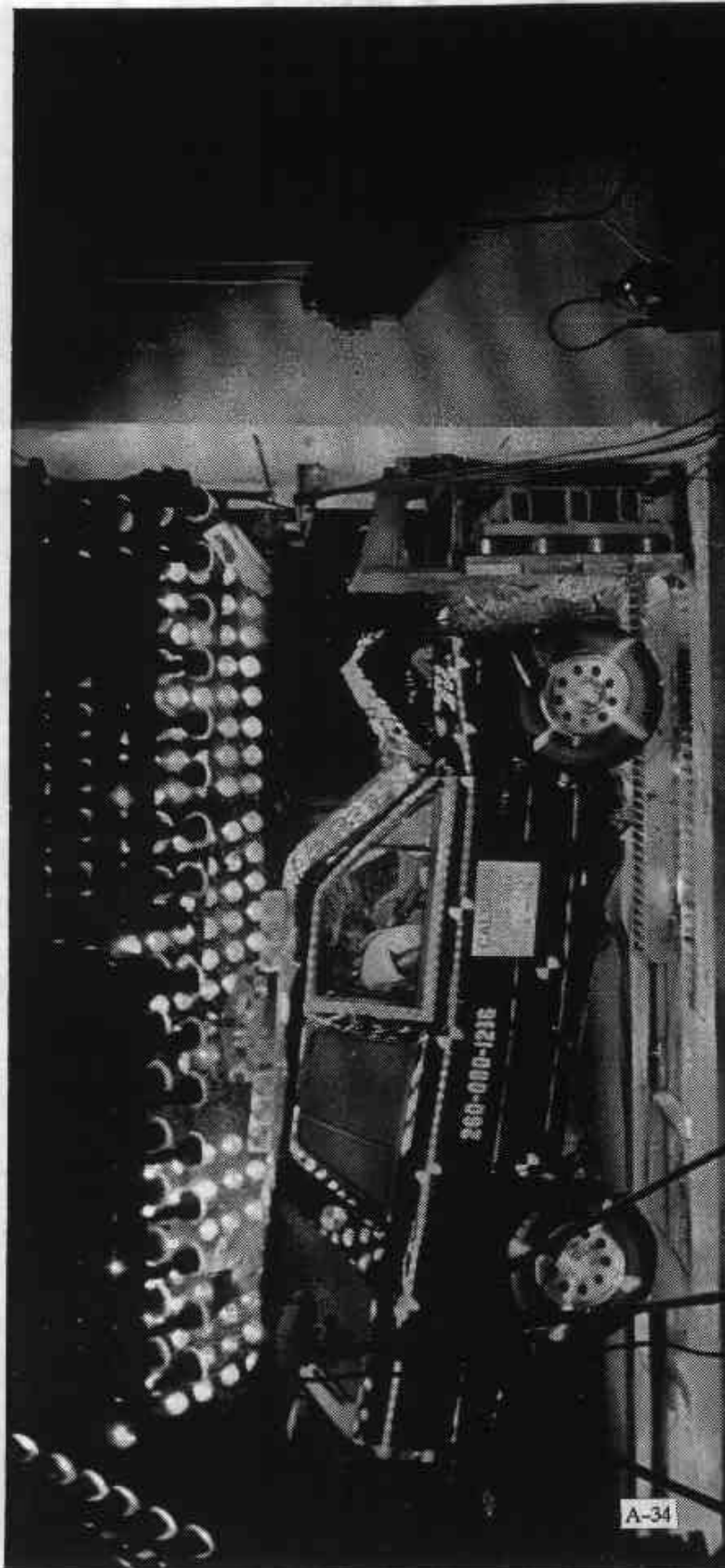
8058-8

Figure A-31 PRE-TEST PASSENGER HEAD LOCATION



A-33

8058-8



9 23 '93

Figure A-32 IMPACT VIEW

A-34

8058-8

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST NO. MP5700

VEHICLE DATA

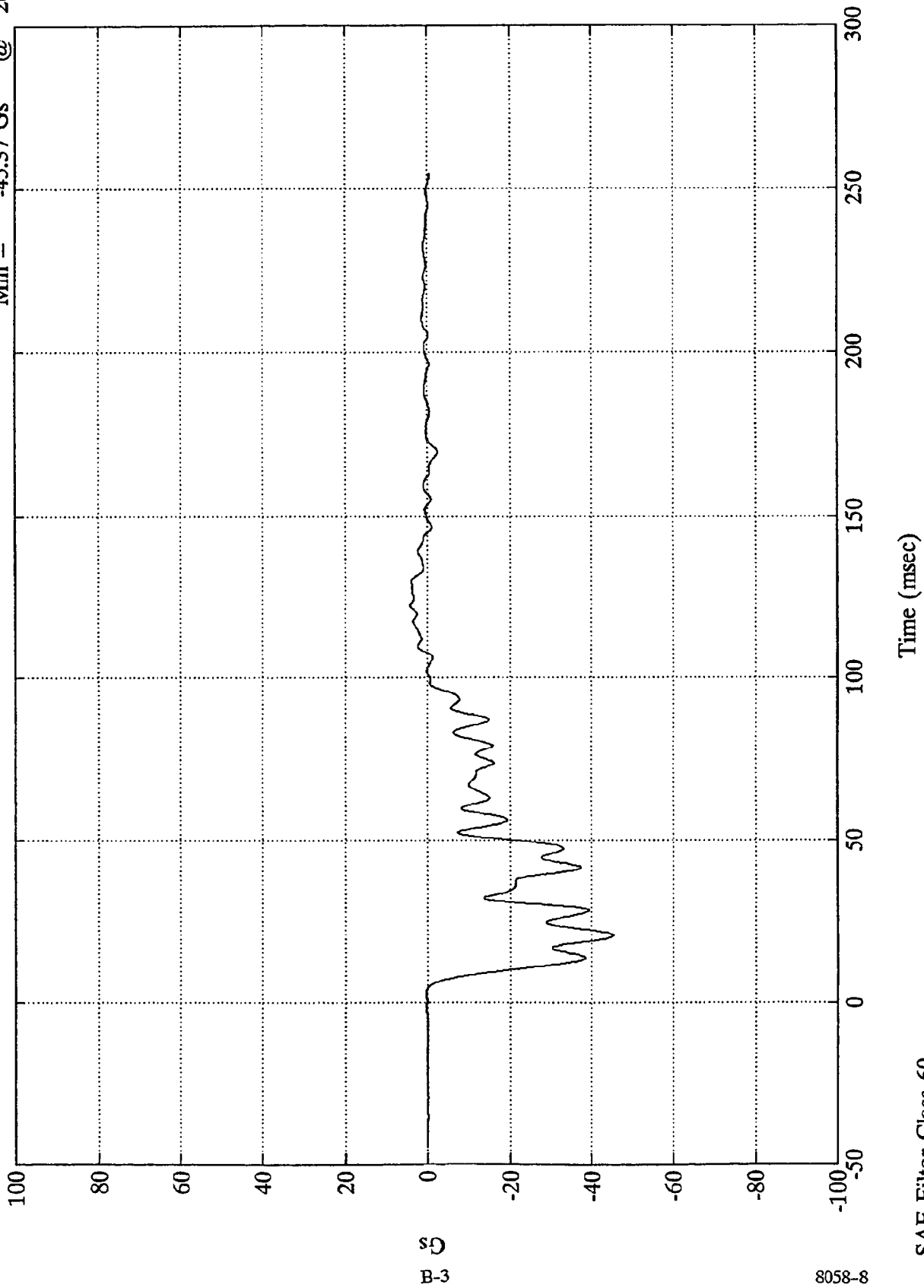
FILTER CHANNEL CLASS

60

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 4.25 Gs @ 122.40 msec
Min = -45.37 Gs @ 20.76 msec

Acc. #1(x)

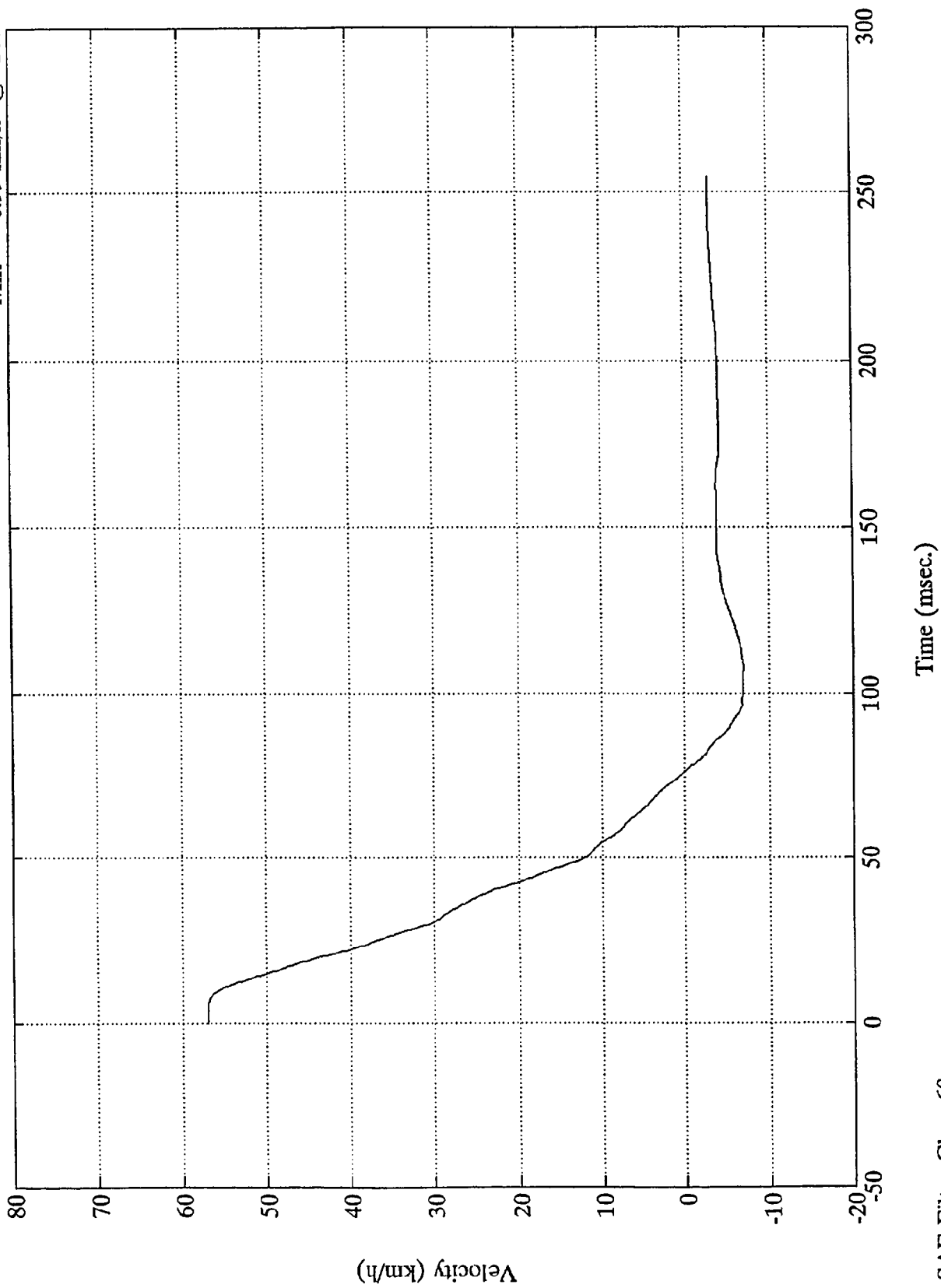


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #1(x)

Max = 57.00 km/h @ 4.80 msec
Min = -6.99 km/h @ 107.76 msec

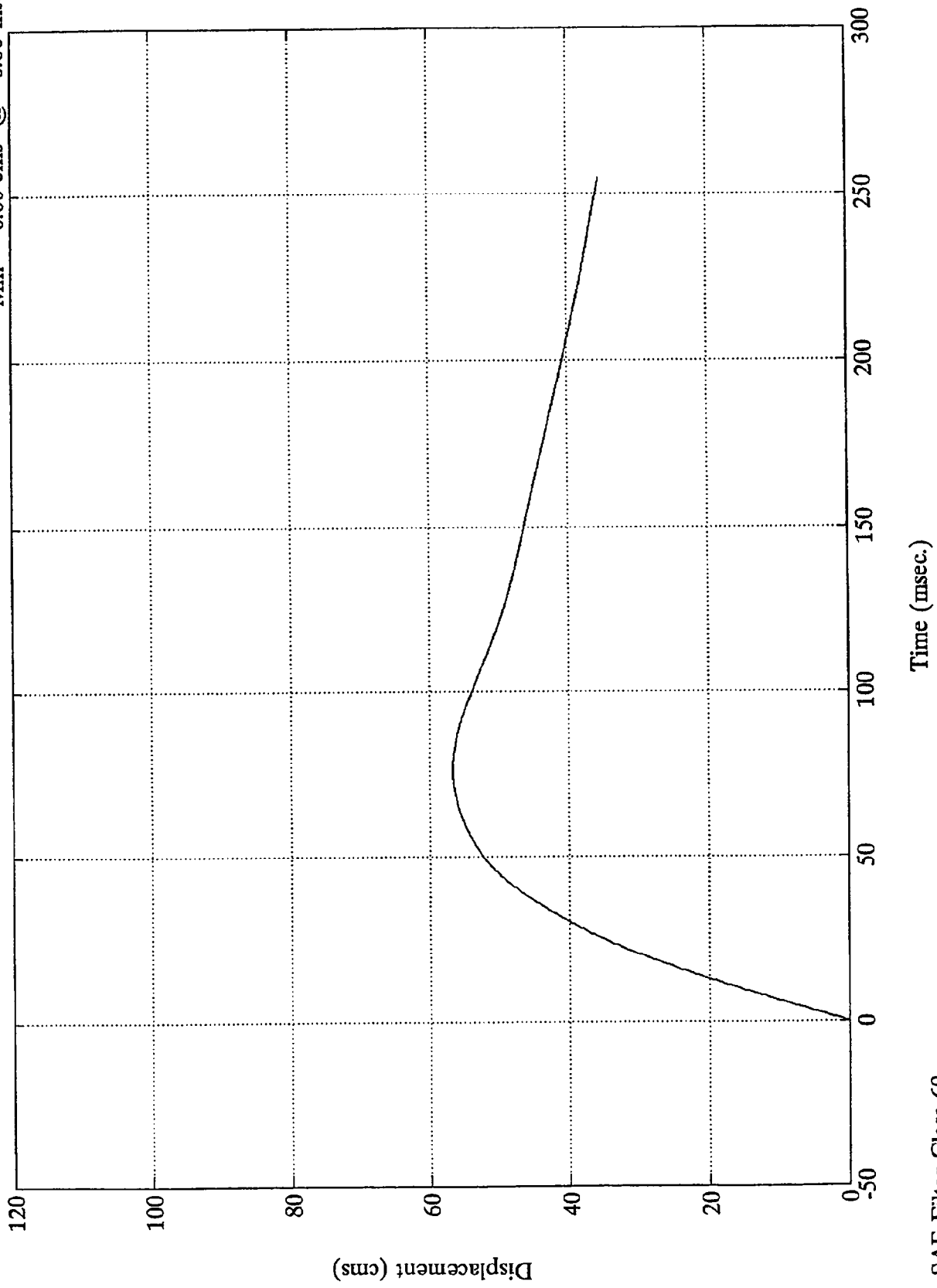


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 56.65 cms @ 77.04 msec
Min = 0.00 cms @ -0.00 msec

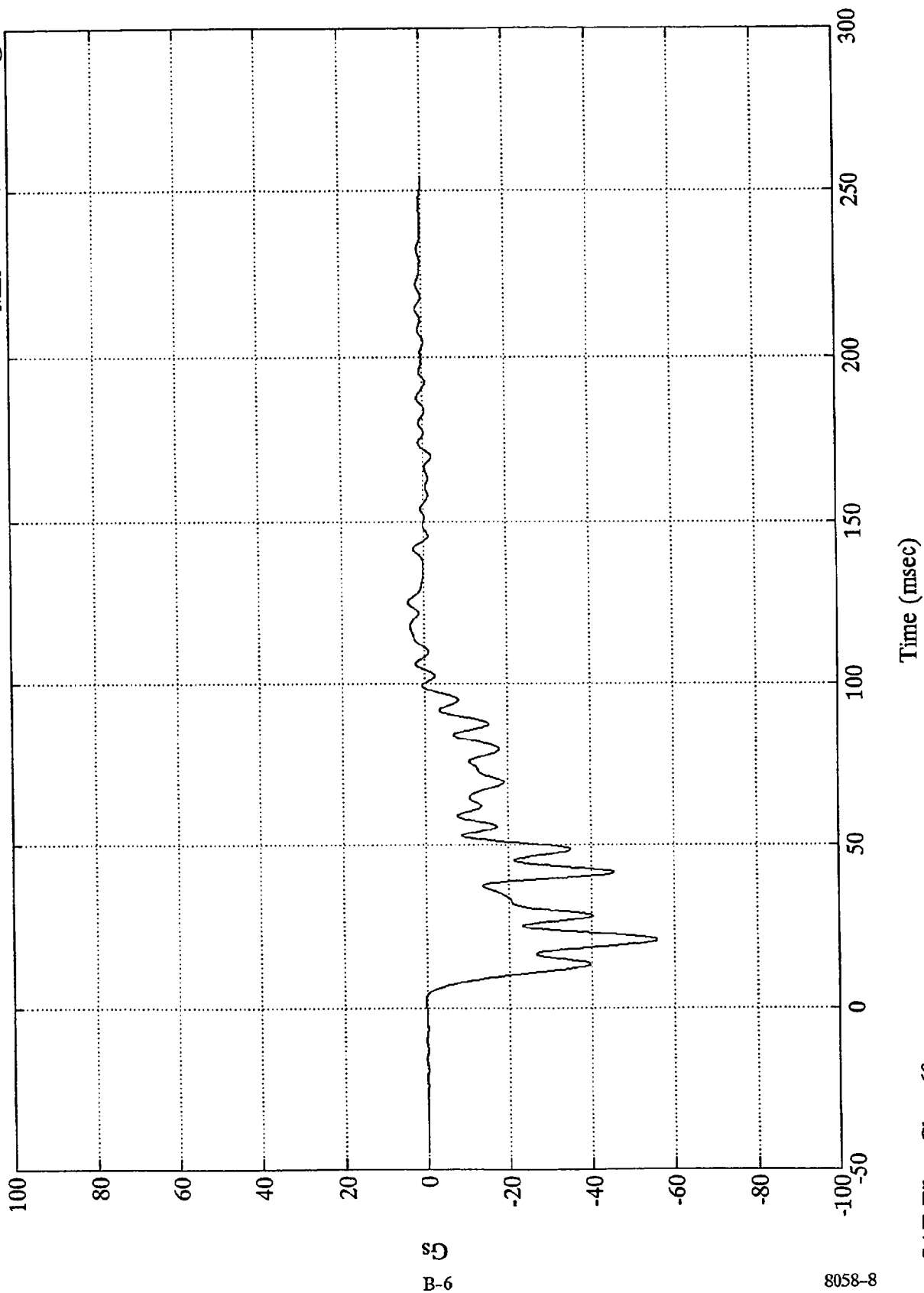
Acc. #1(x)



NCAP TEST #12 - 1993 ISUZU RODEO

Max = 4.02 Gs @ 125.16 msec
 Min = -55.74 Gs @ 20.63 msec

Acc. #2(x)

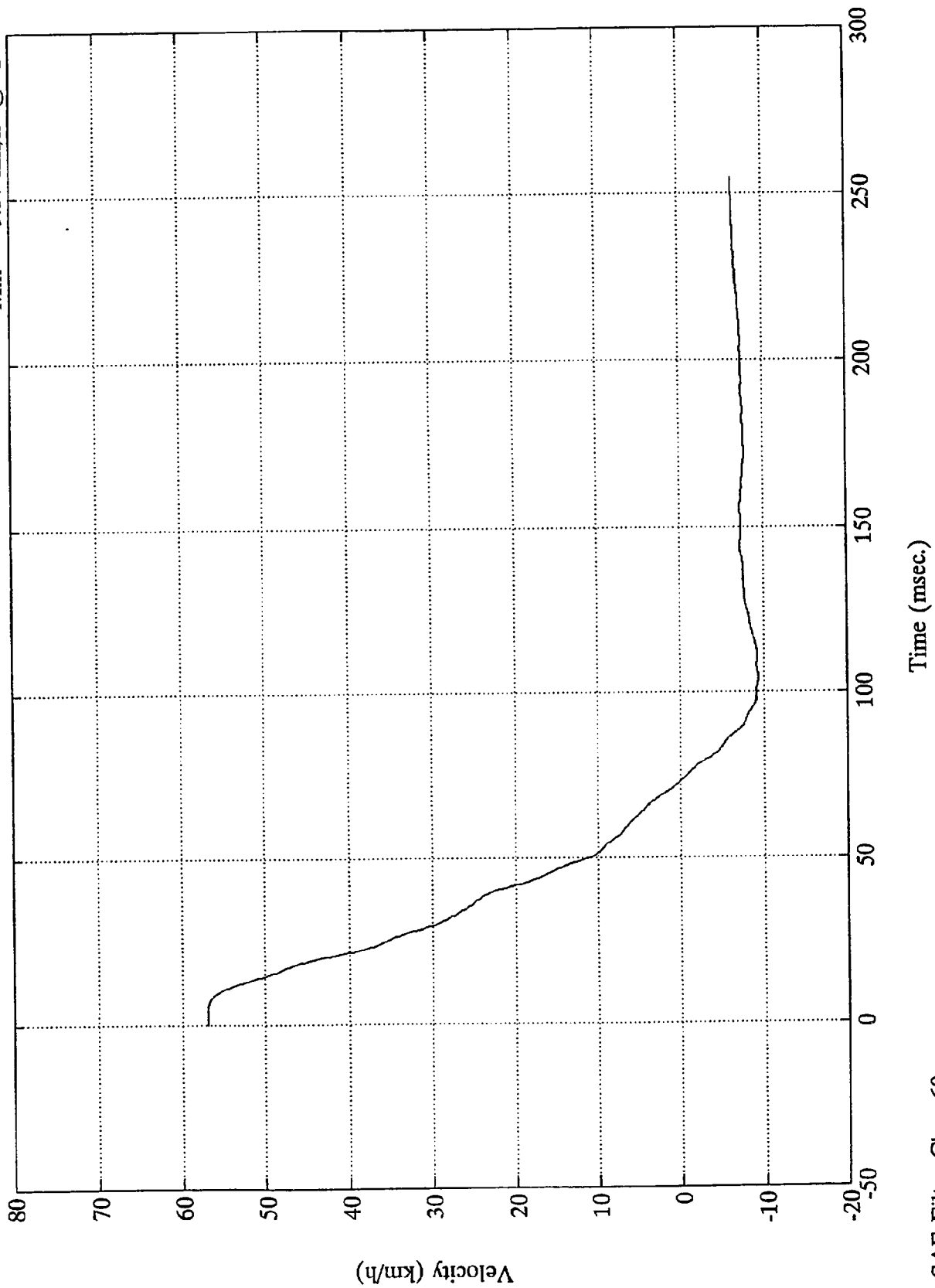


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

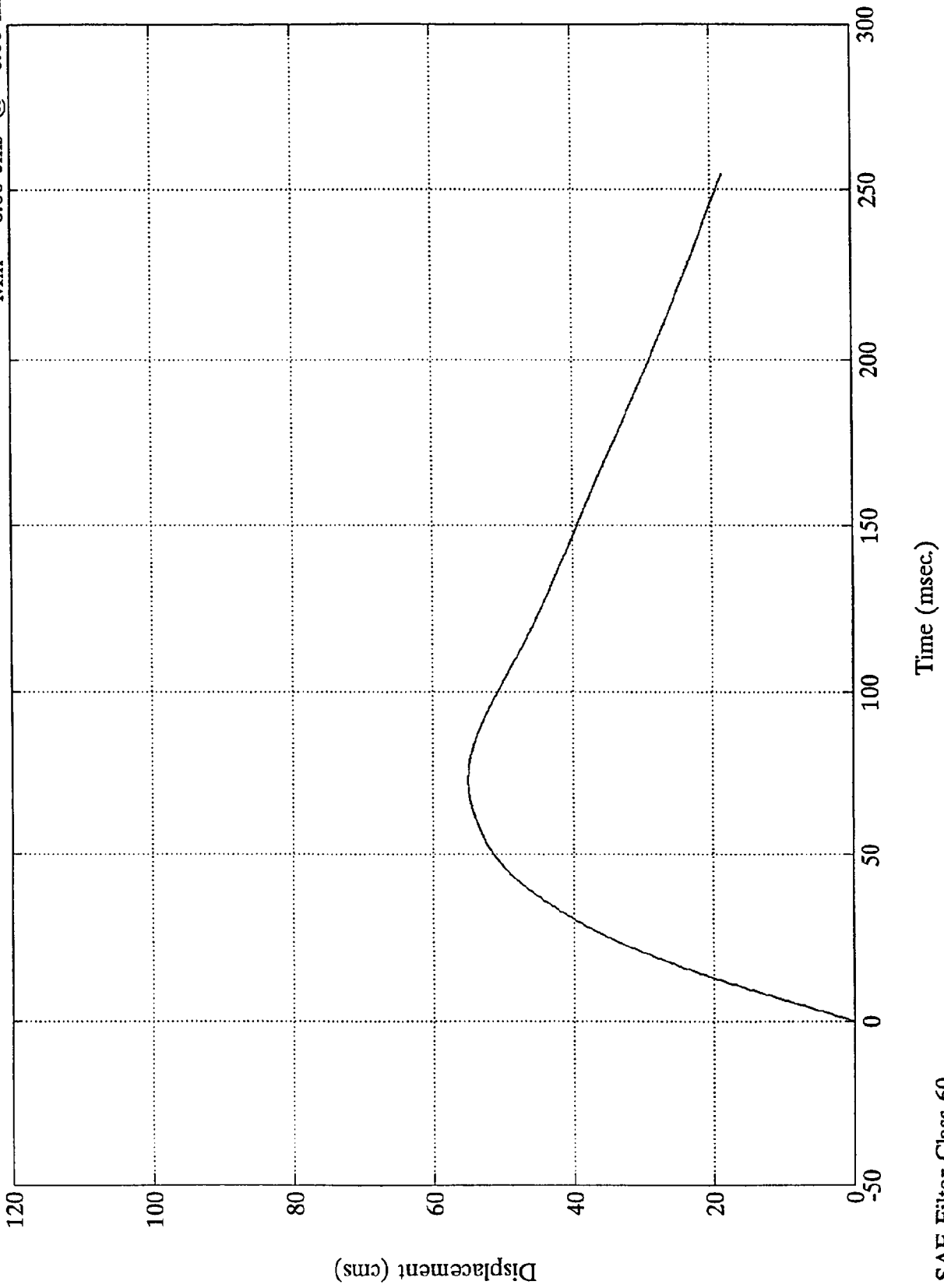
Acc. #2(x)

Max = 56.99 km/h @ 4.56 msec
Min = -9.37 km/h @ 104.16 msec



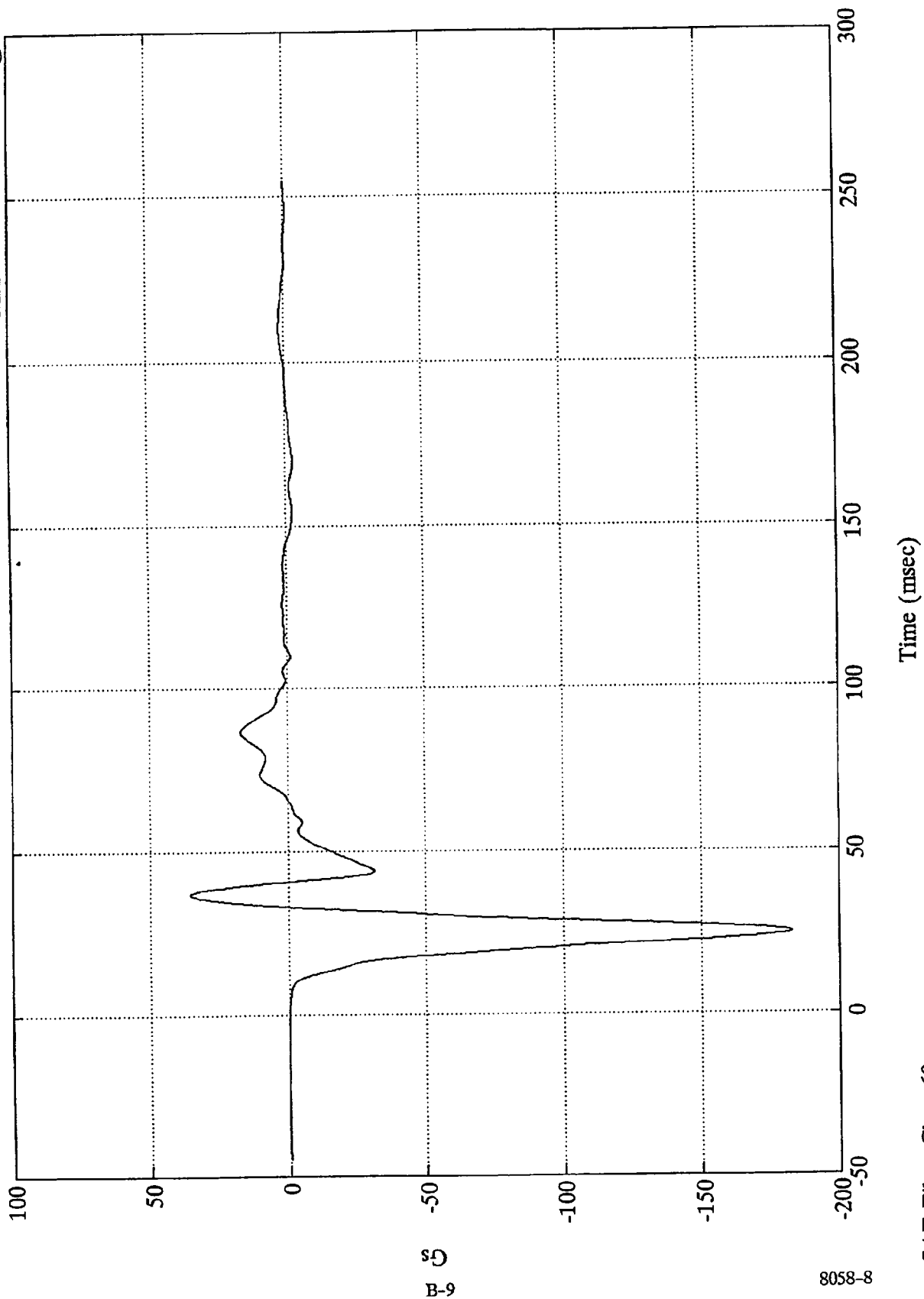
NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #2(x)
Max = 55.00 cms @ 73.44 msec
Min = 0.00 cms @ -0.00 msec



NCAP TEST #12 - 1993 ISUZU RODEO

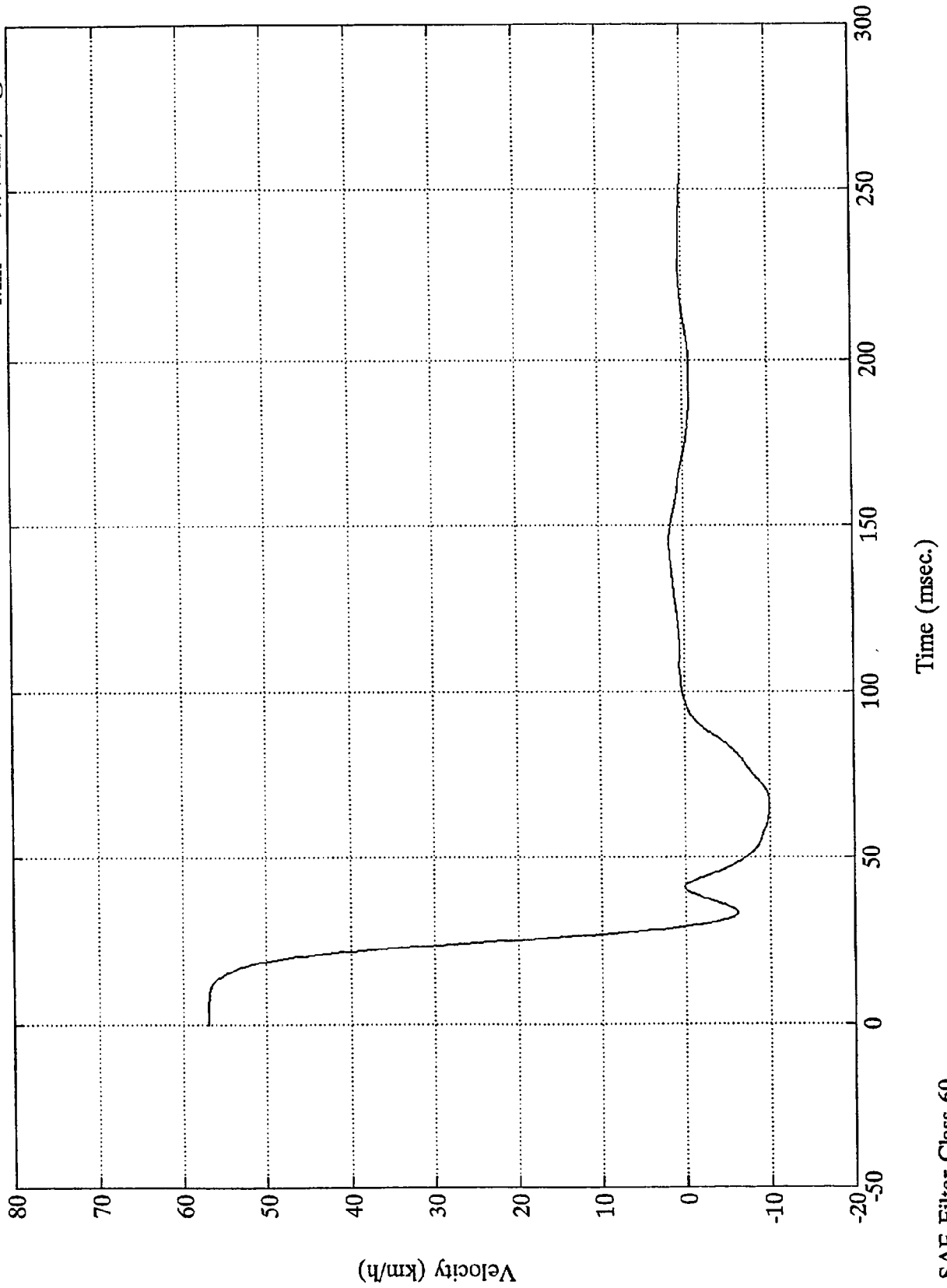
Acc. #3(x) Max = 35.52 Gs @ 37.08 msec
Min = -182.83 Gs @ 24.96 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Max = 56.97 km/h @ 3.84 msec
Min = -9.97 km/h @ 65.76 msec

Acc. #3(x)

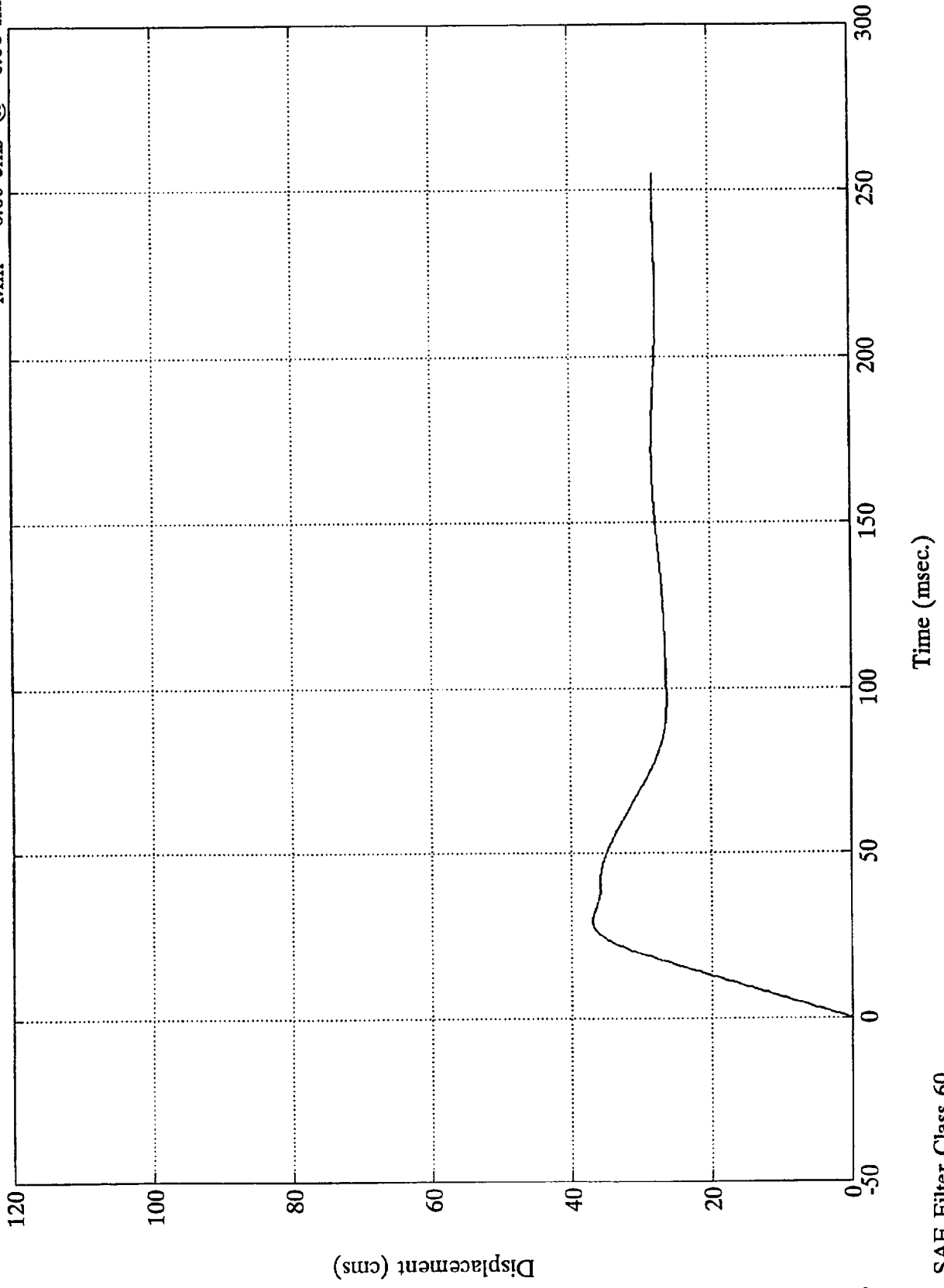


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

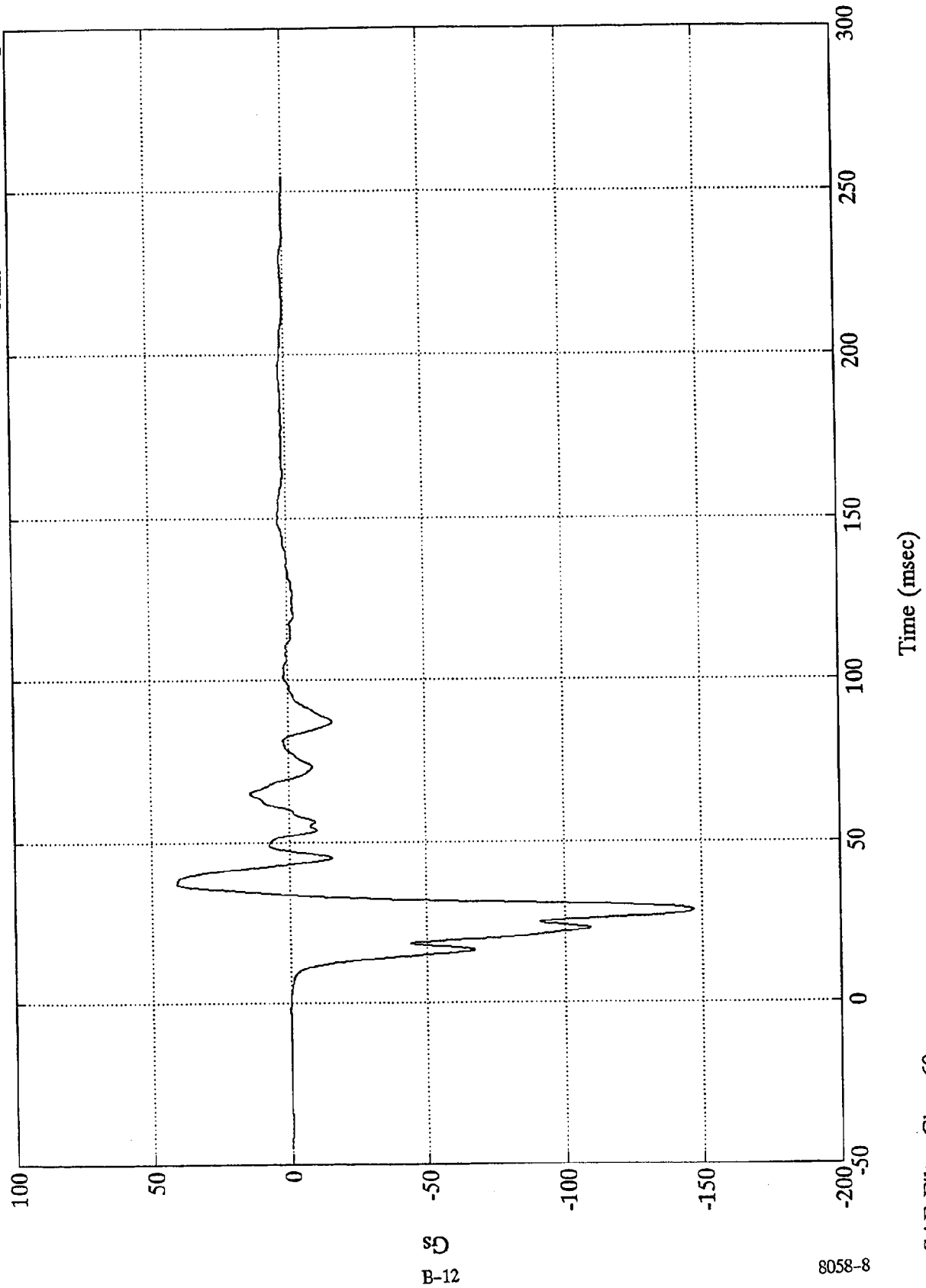
Max = 36.91 cms @ 29.28 msec
Min = 0.00 cms @ -0.00 msec

Acc. #3(x)



NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #4(x) Max = 40.89 Gs @ 37.20 msec
 Min = -146.83 Gs @ 28.44 msec

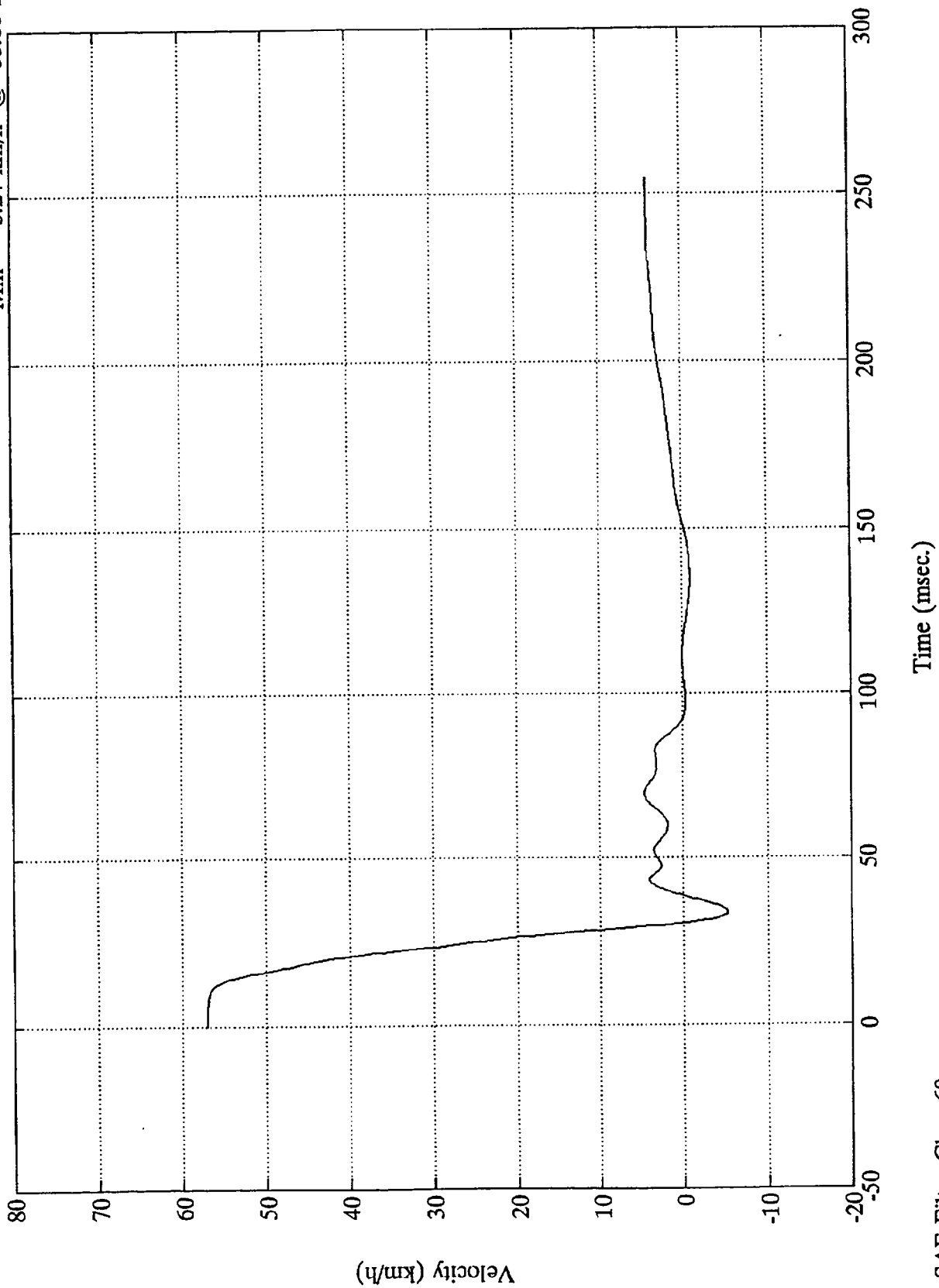


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #4(x)

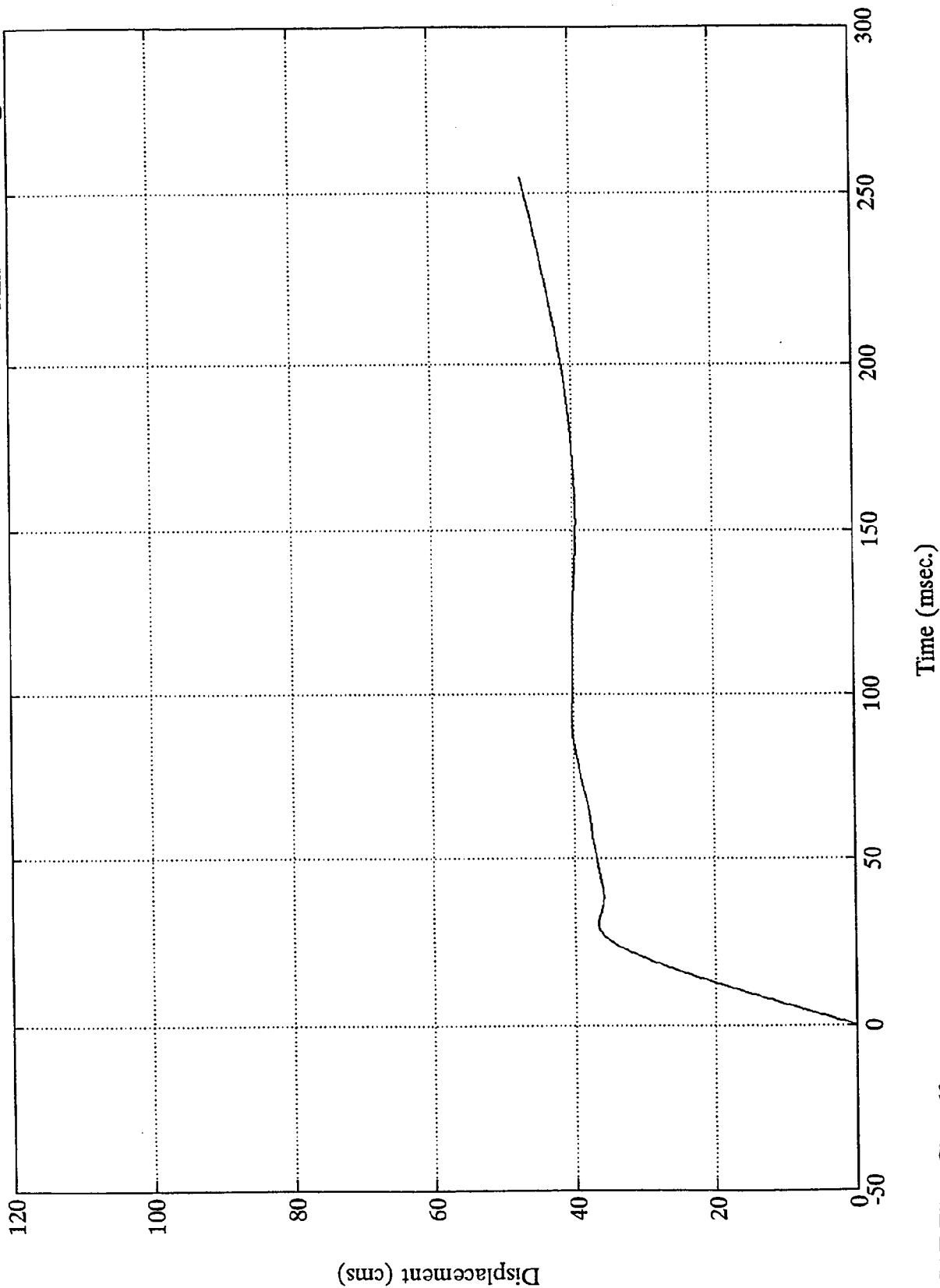
Max = 56.97 km/h @ 3.60 msec
Min = -5.24 km/h @ 33.60 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #4(x)

Max = 46.97 cms @ 254.88 msec
Min = 0.00 cms @ -0.00 msec

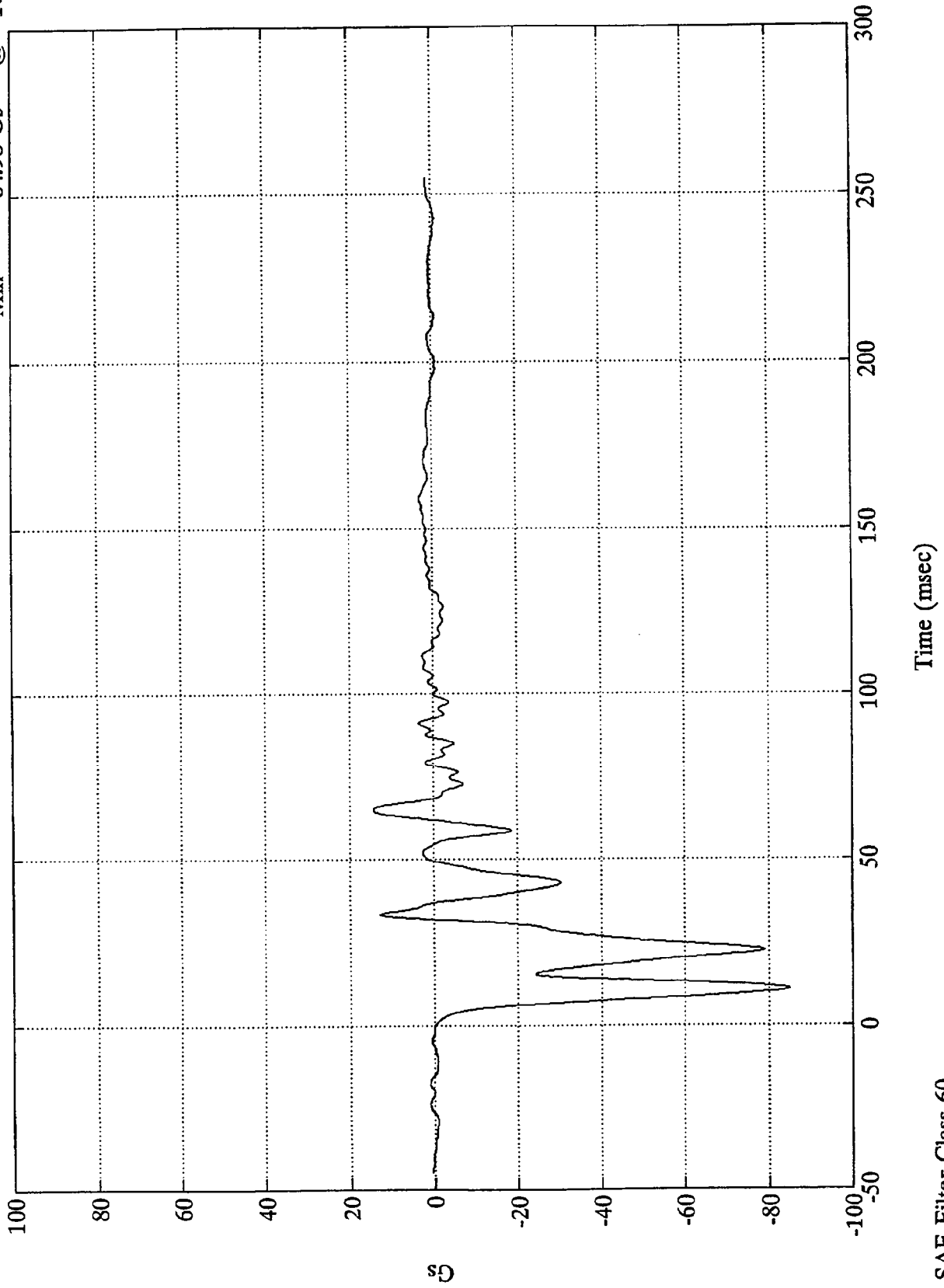


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #5(x)

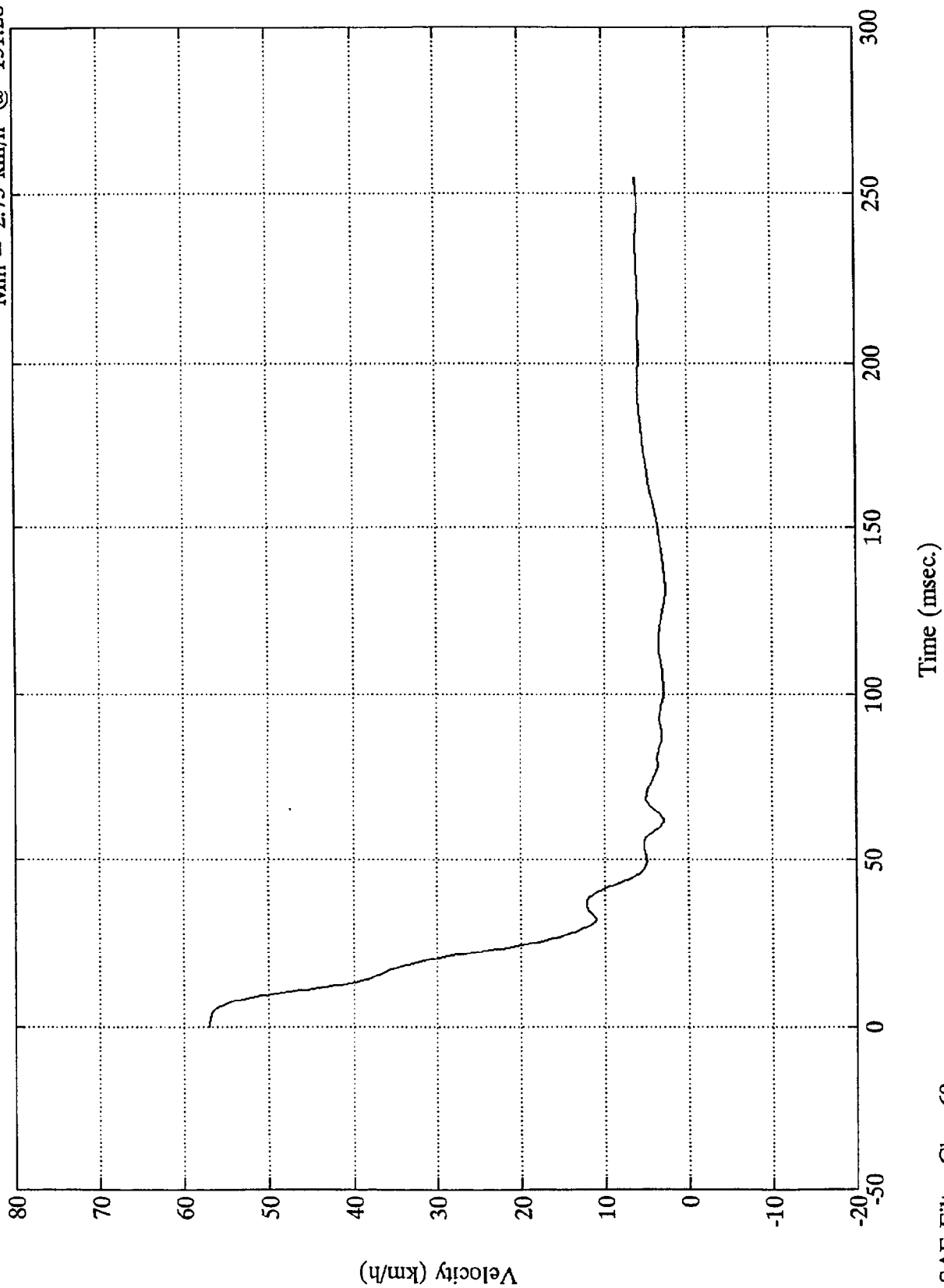
Max = 14.24 Gs @ 65.04 msec
Min = -84.98 Gs @ 10.91 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Max = 56.97 km/h @ 0.24 msec
Min = 2.73 km/h @ 131.28 msec

Acc. #5(x)

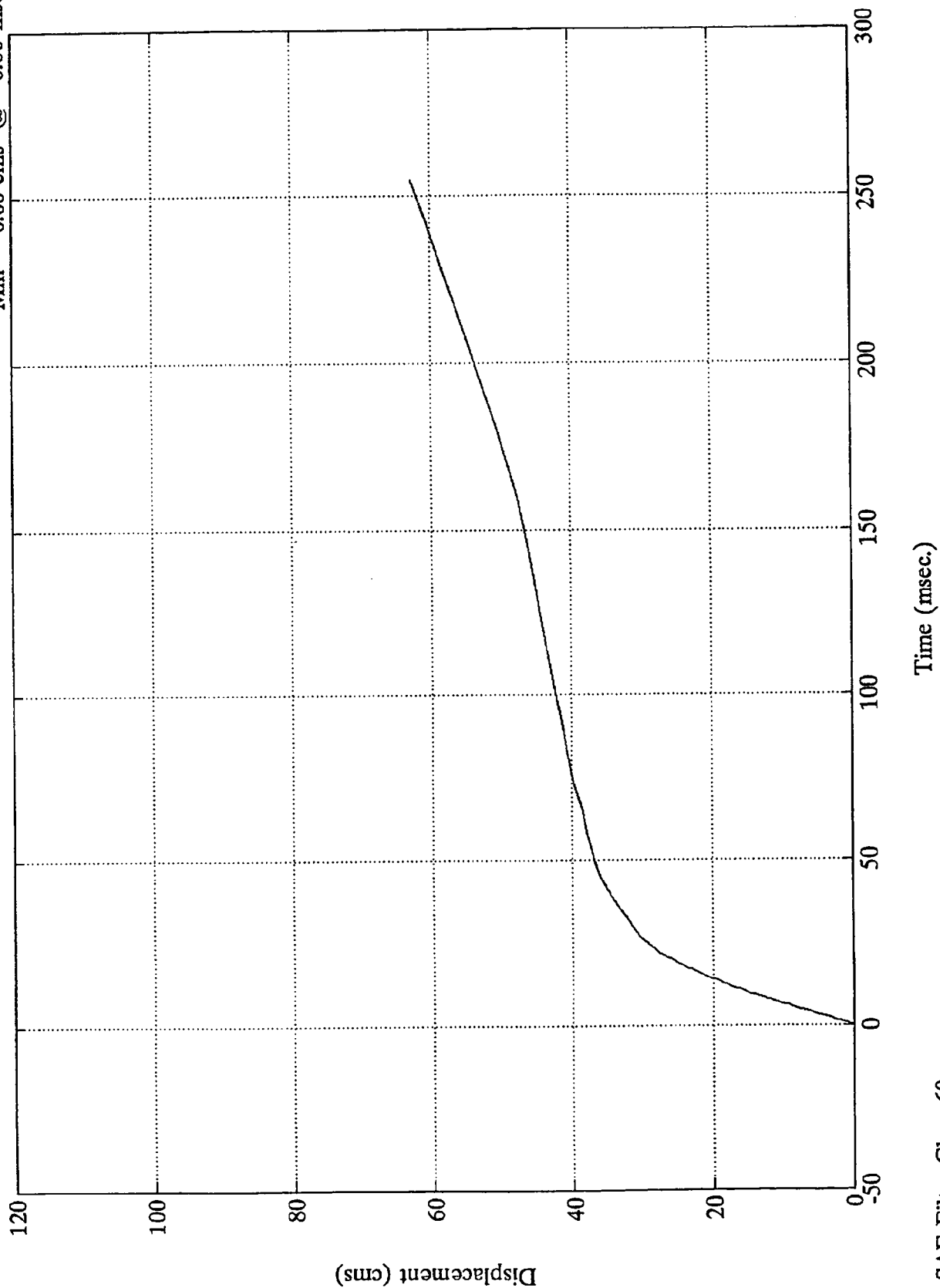


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #5(x)

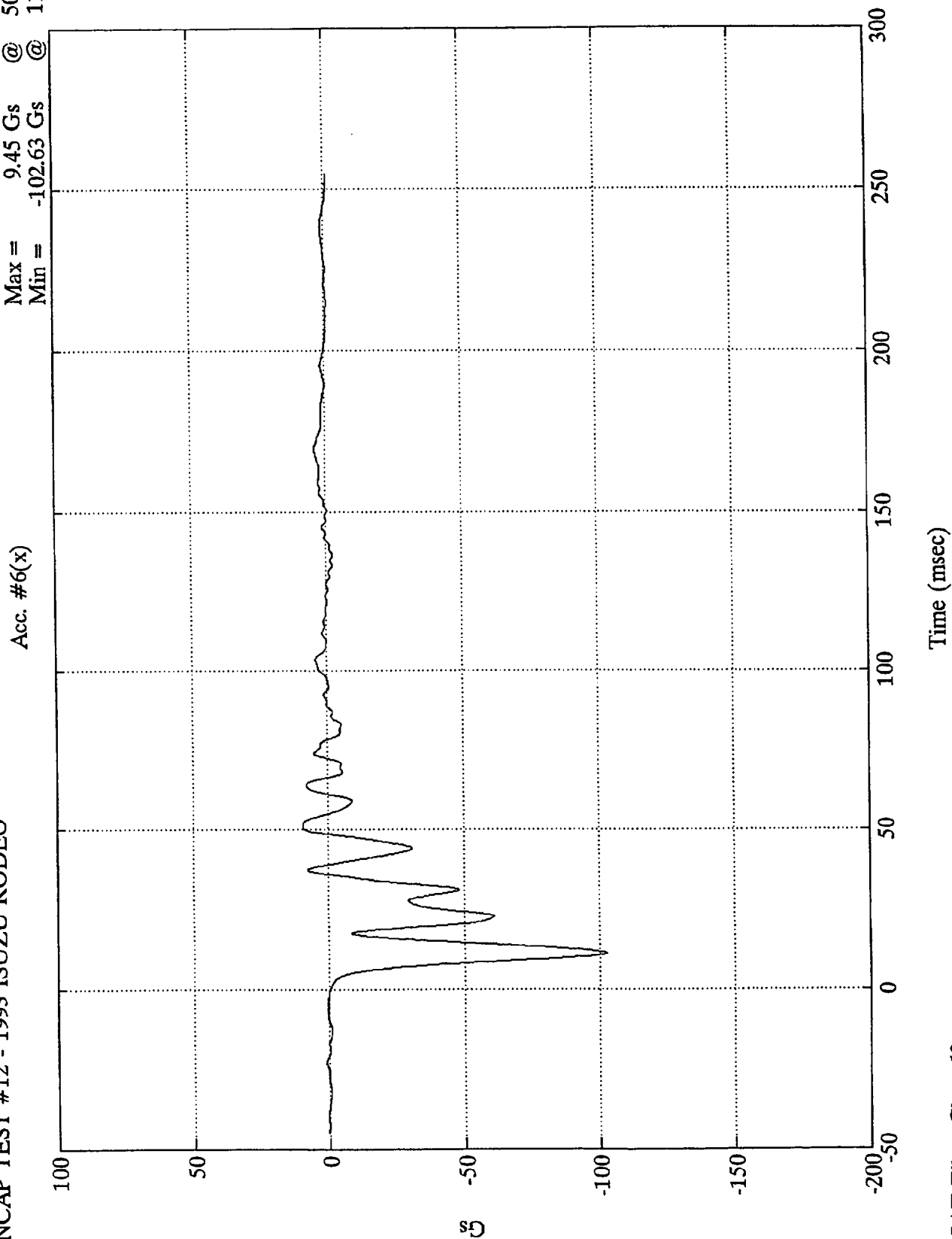
Max = 62.72 cms @ 254.88 msec
Min = 0.00 cms @ -0.00 msec



SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 9.45 Gs @ 50.64 msec
 Min = -102.63 Gs @ 11.03 msec

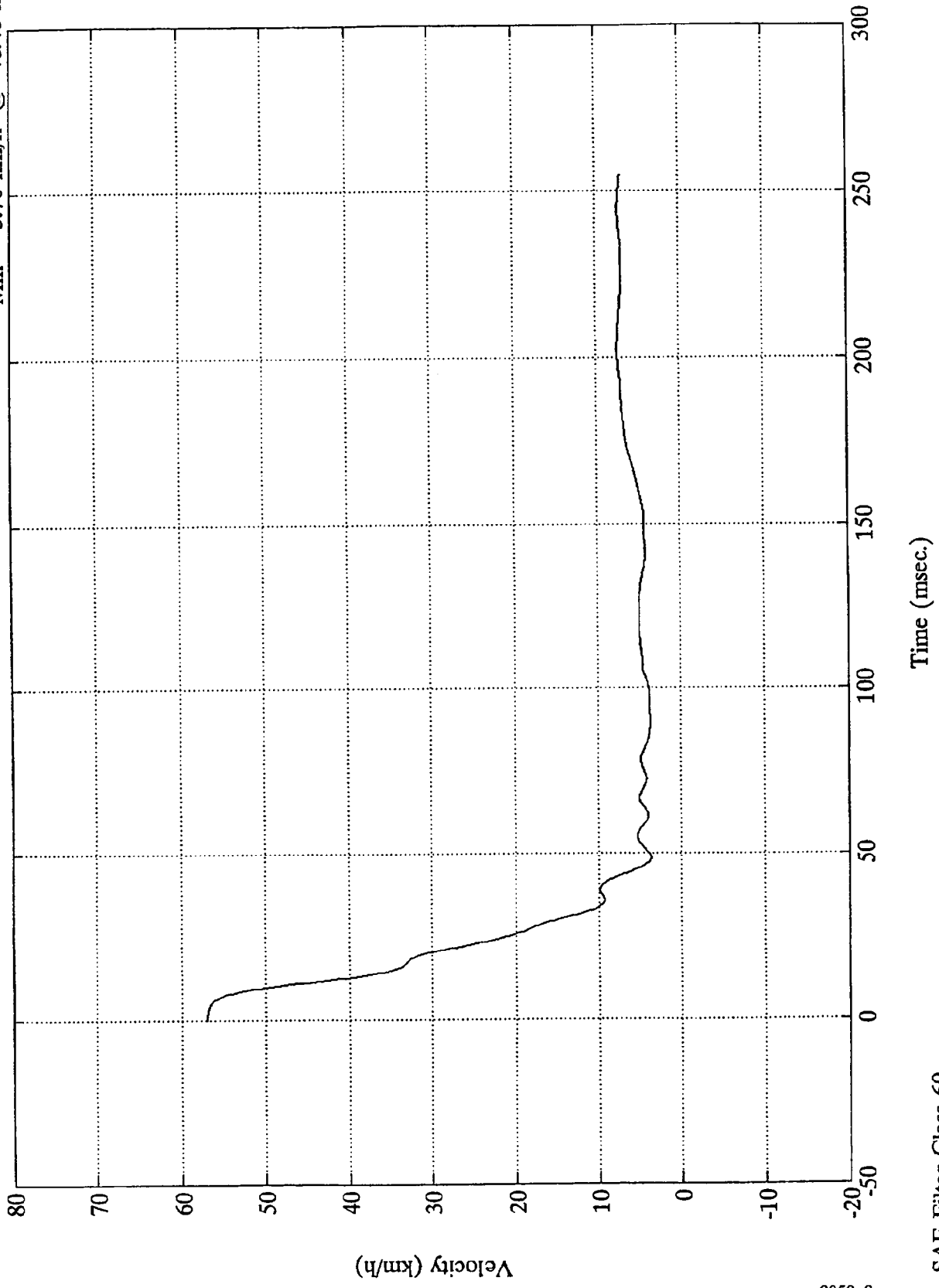


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 56.97 km/h @ 0.24 msec
Min = 3.70 km/h @ 48.48 msec

Acc. #6(x)

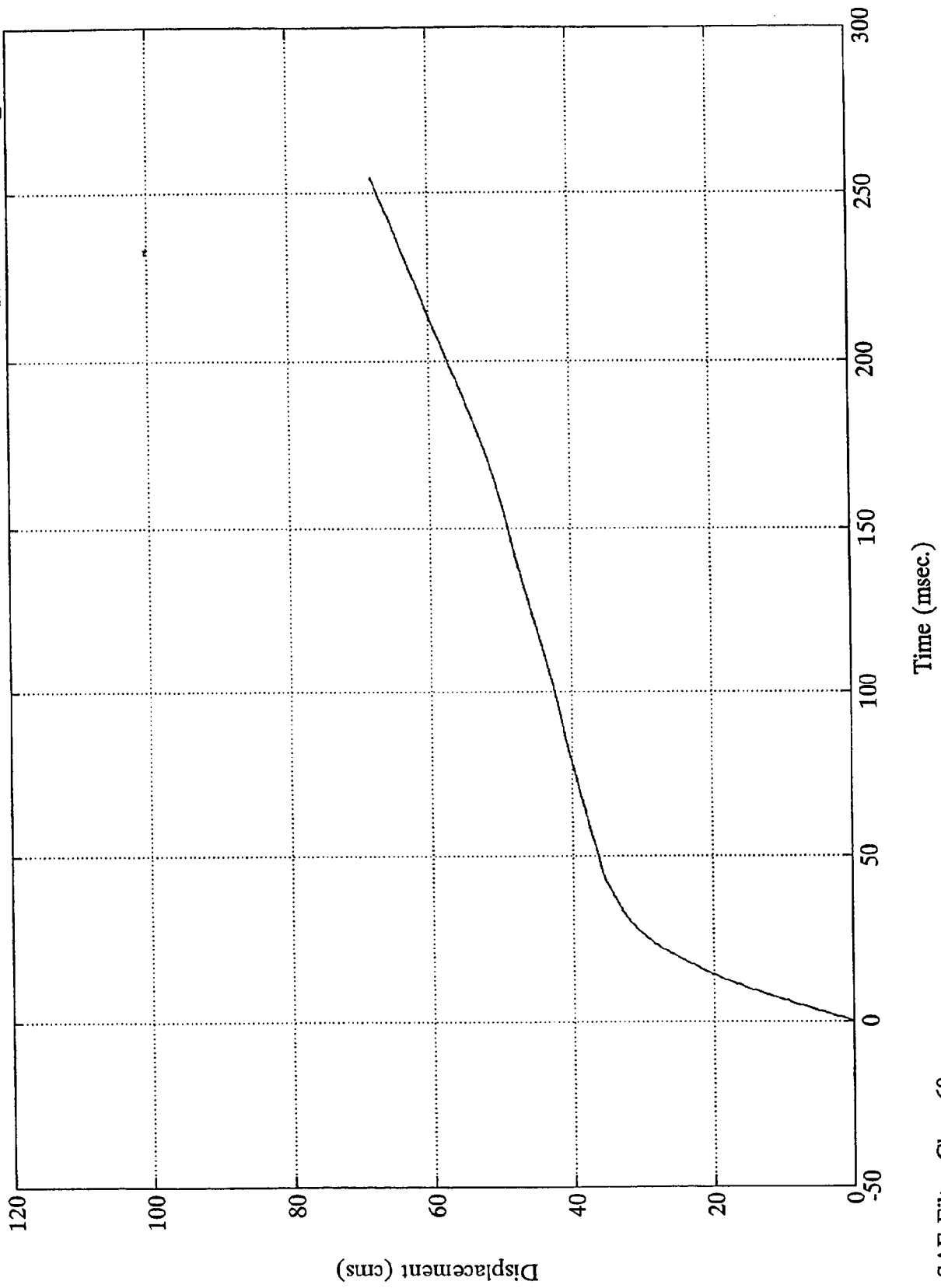


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #6(x)

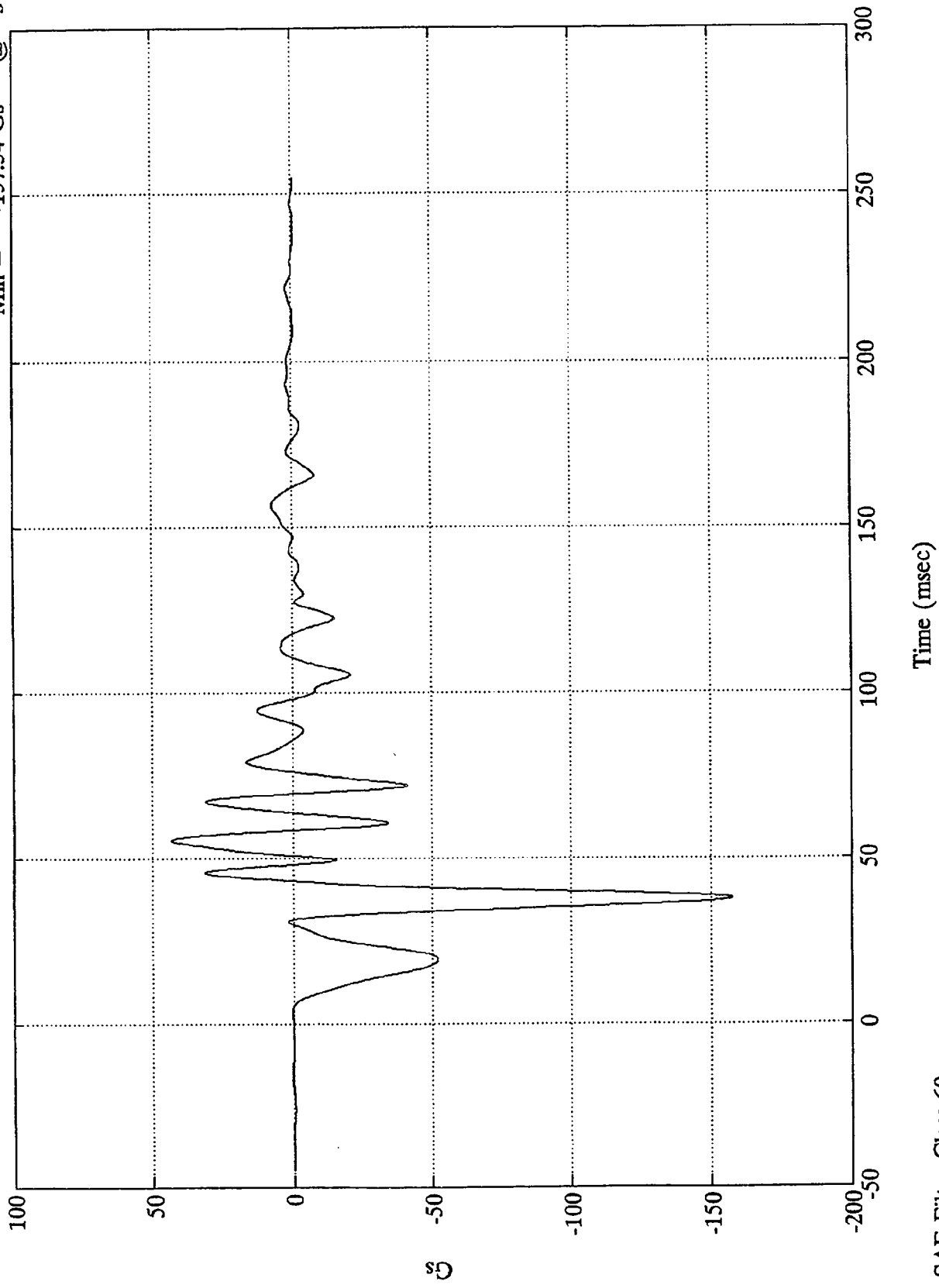
Max = 68.23 cms @ 254.88 msec
Min = 0.00 cms @ -0.00 msec



SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

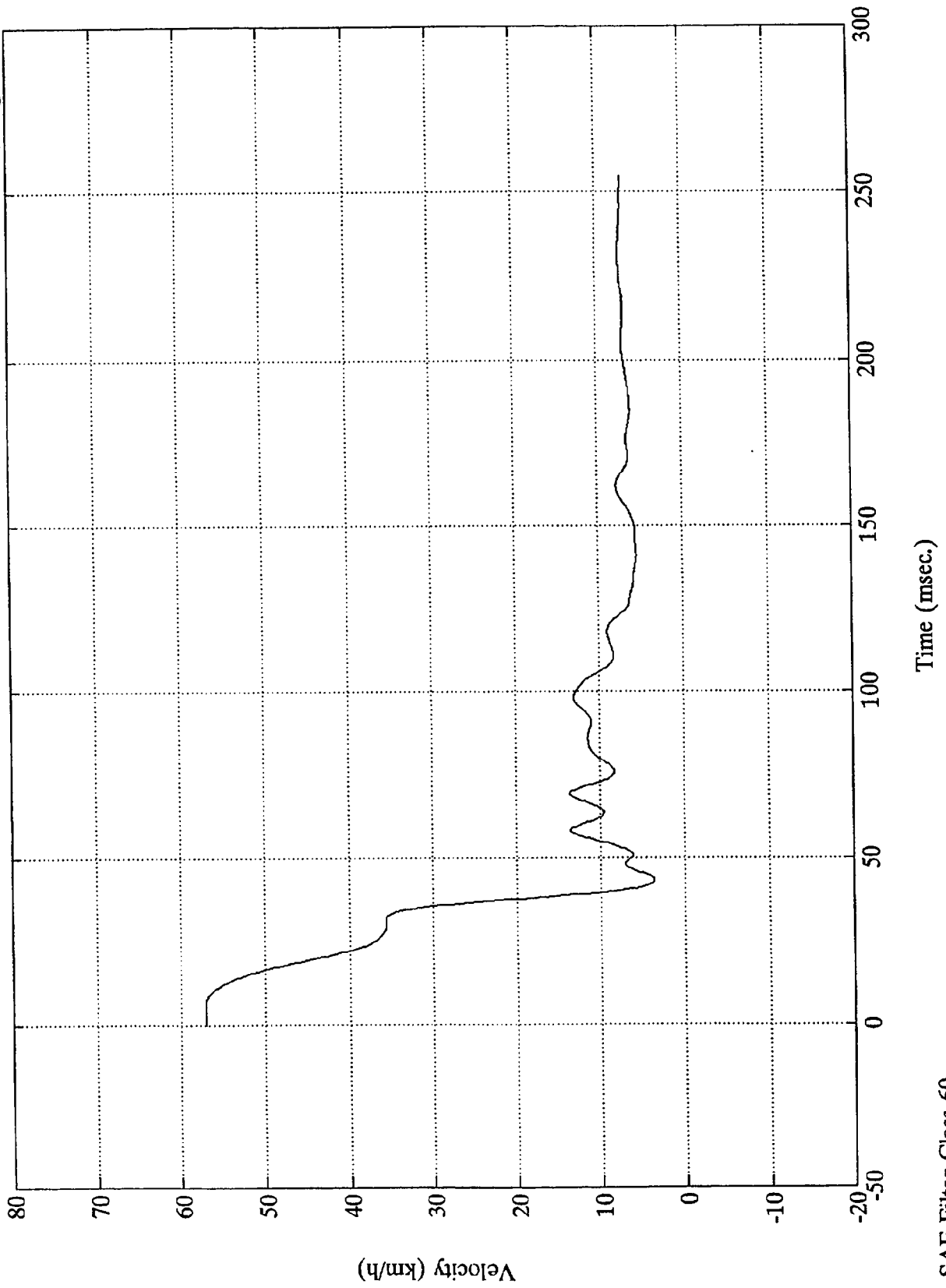
Acc. #7(x) Max = 43.36 Gs @ 55.56 msec
Min = -157.54 Gs @ 37.92 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Max = 57.02 km/h @ 5.52 msec
Min = 3.69 km/h @ 43.20 msec

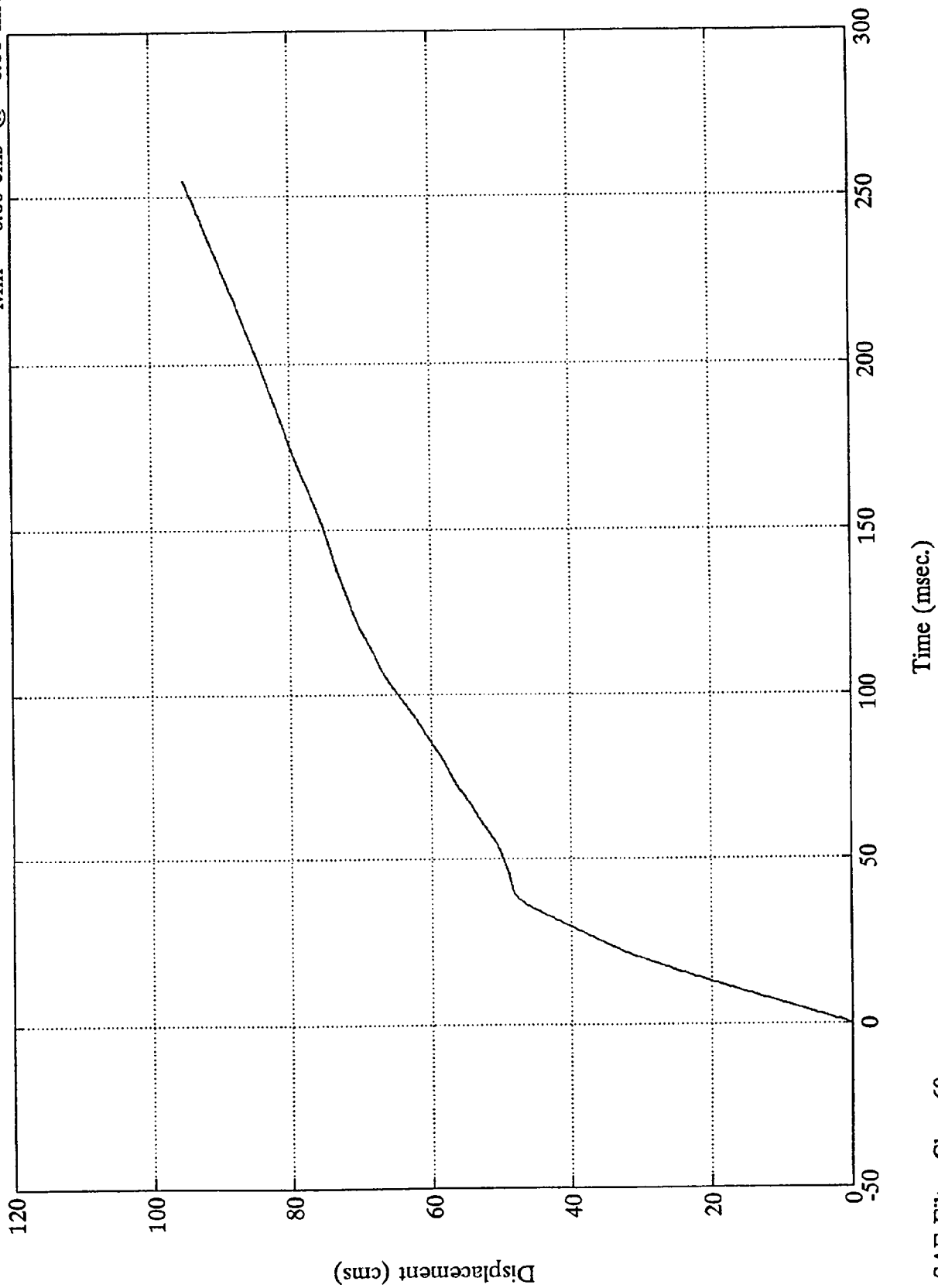
Acc. #7(x)



NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #7(x)

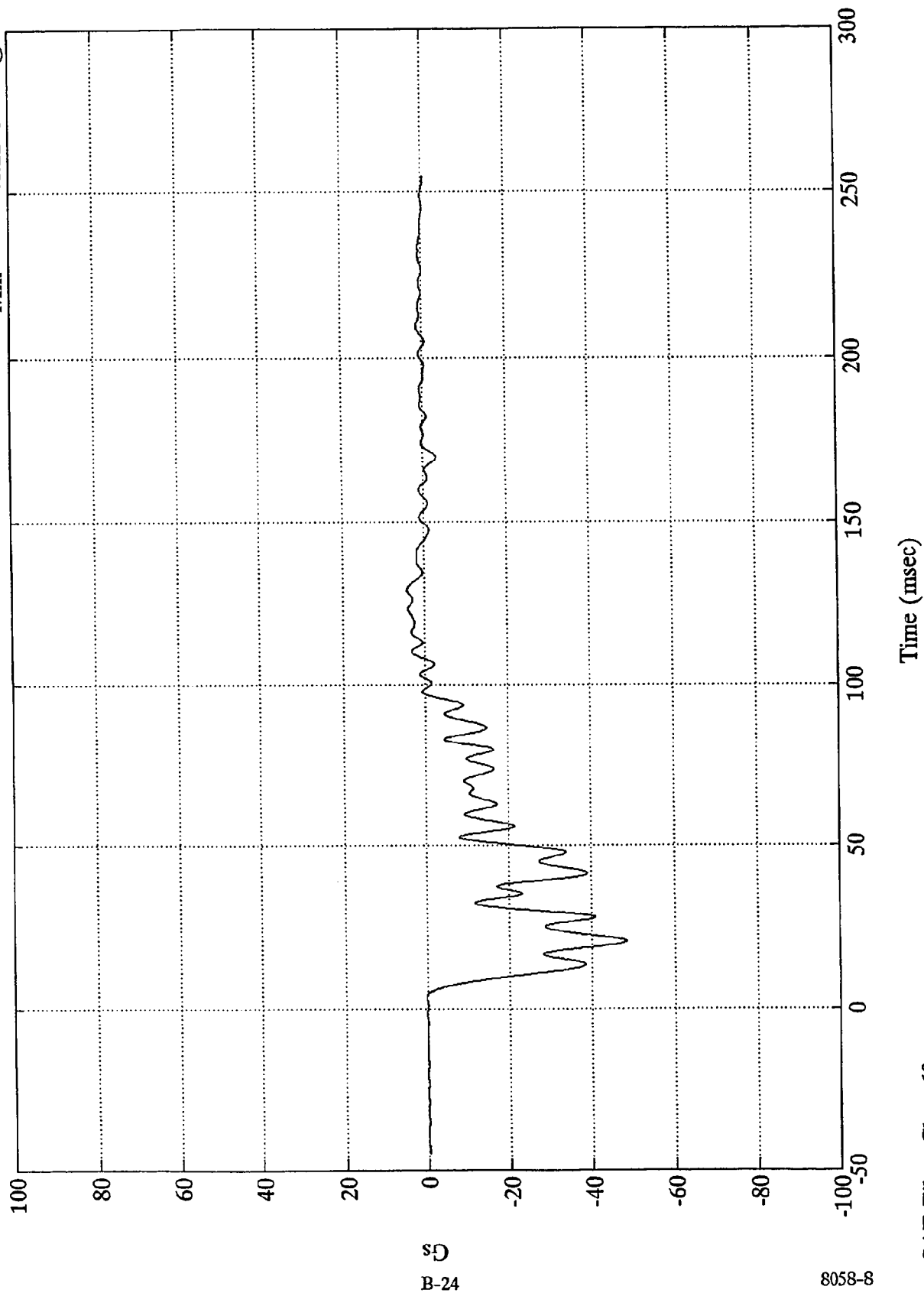
Max = 95.16 cms @ 254.88 msec
Min = 0.00 cms @ -0.00 msec



SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #8(x) Max = 4.25 Gs @ 129.12 msec
 Min = -48.22 Gs @ 20.52 msec

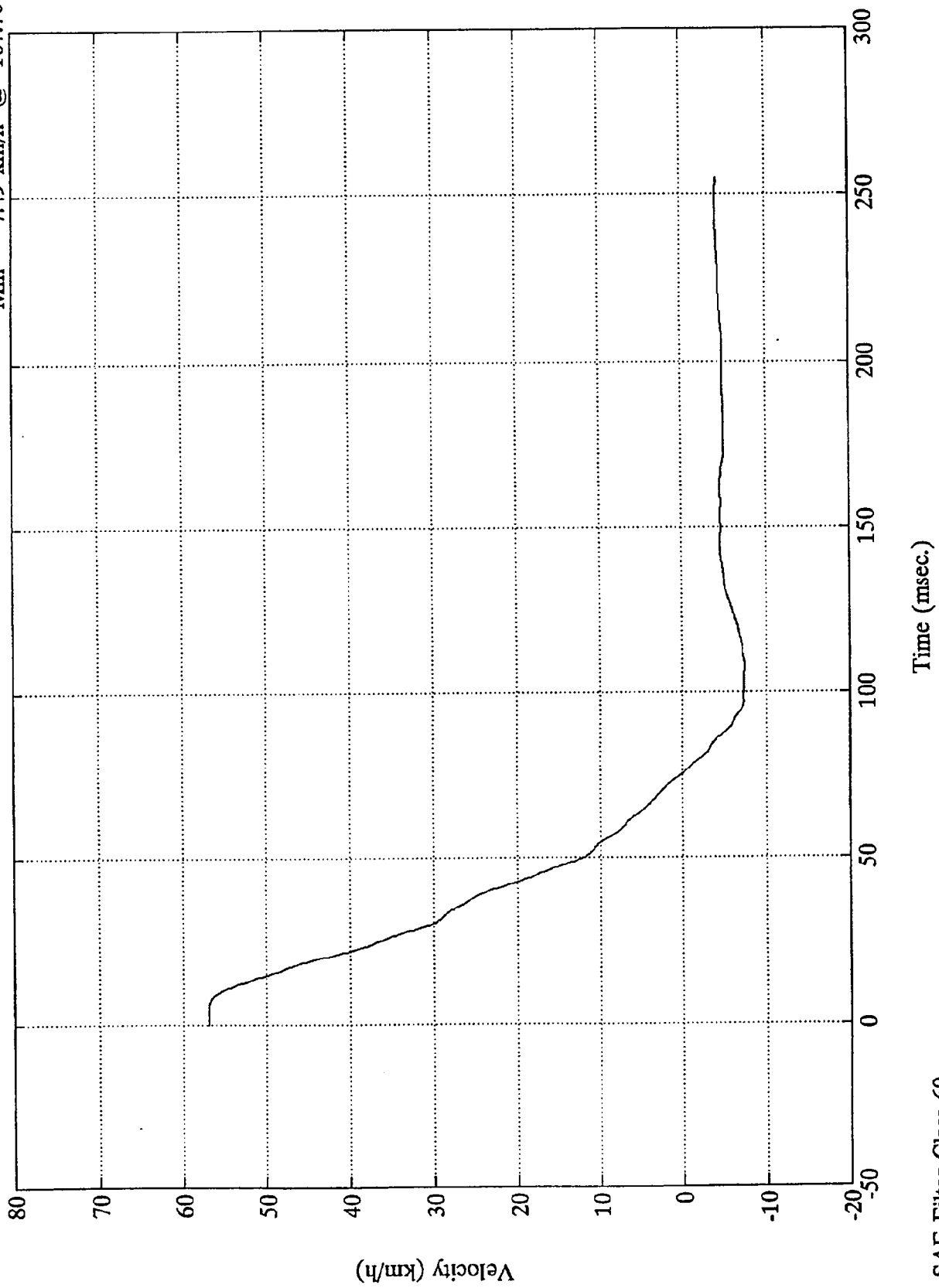


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 56.98 km/h @ 4.80 msec
Min = -7.49 km/h @ 107.76 msec

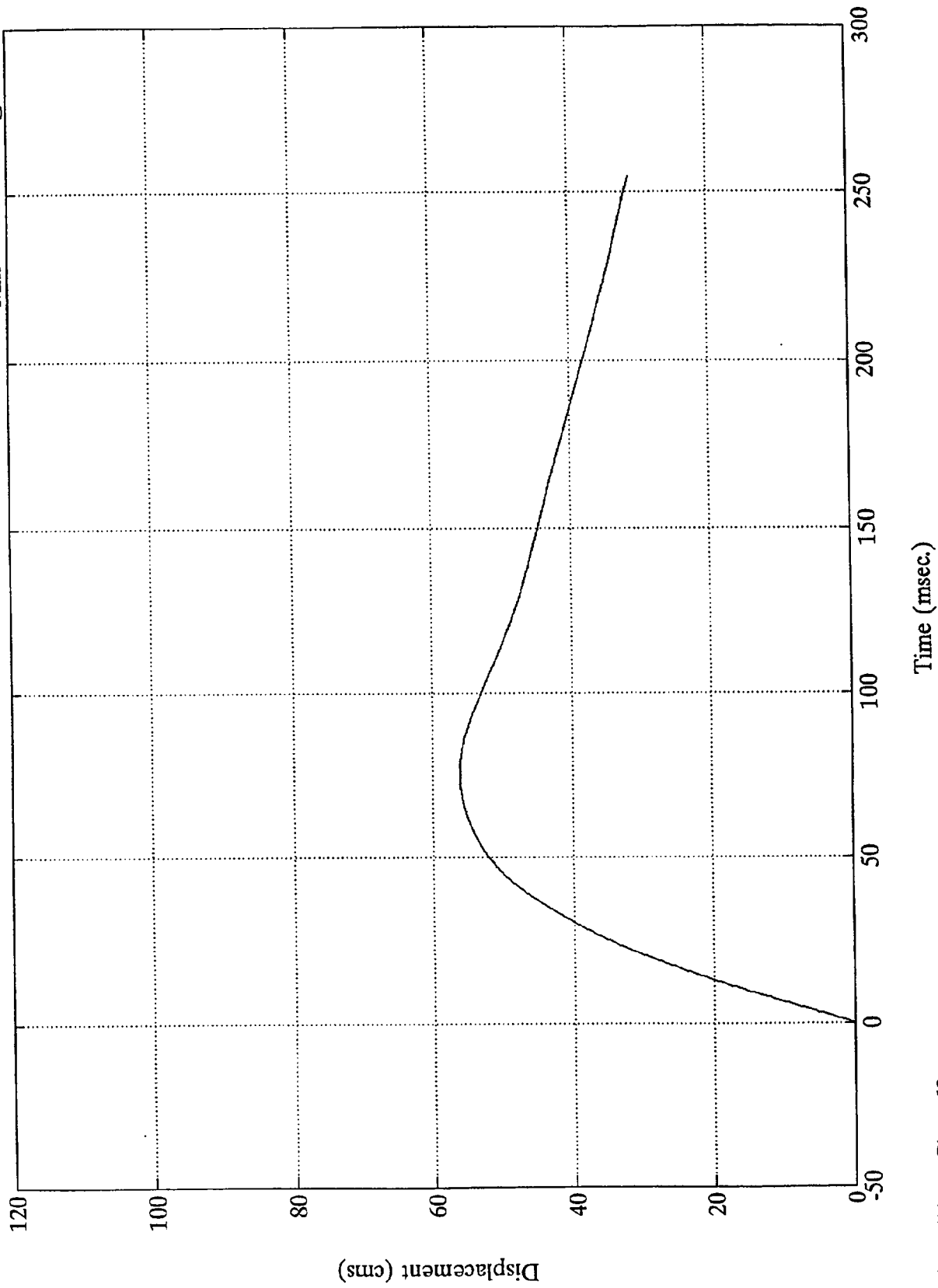
Acc. #8(x)



NCAP TEST #12 - 1993 ISUZU RODEO

Max = 56.19 cms @ 76.32 msec
Min = 0.00 cms @ -0.00 msec

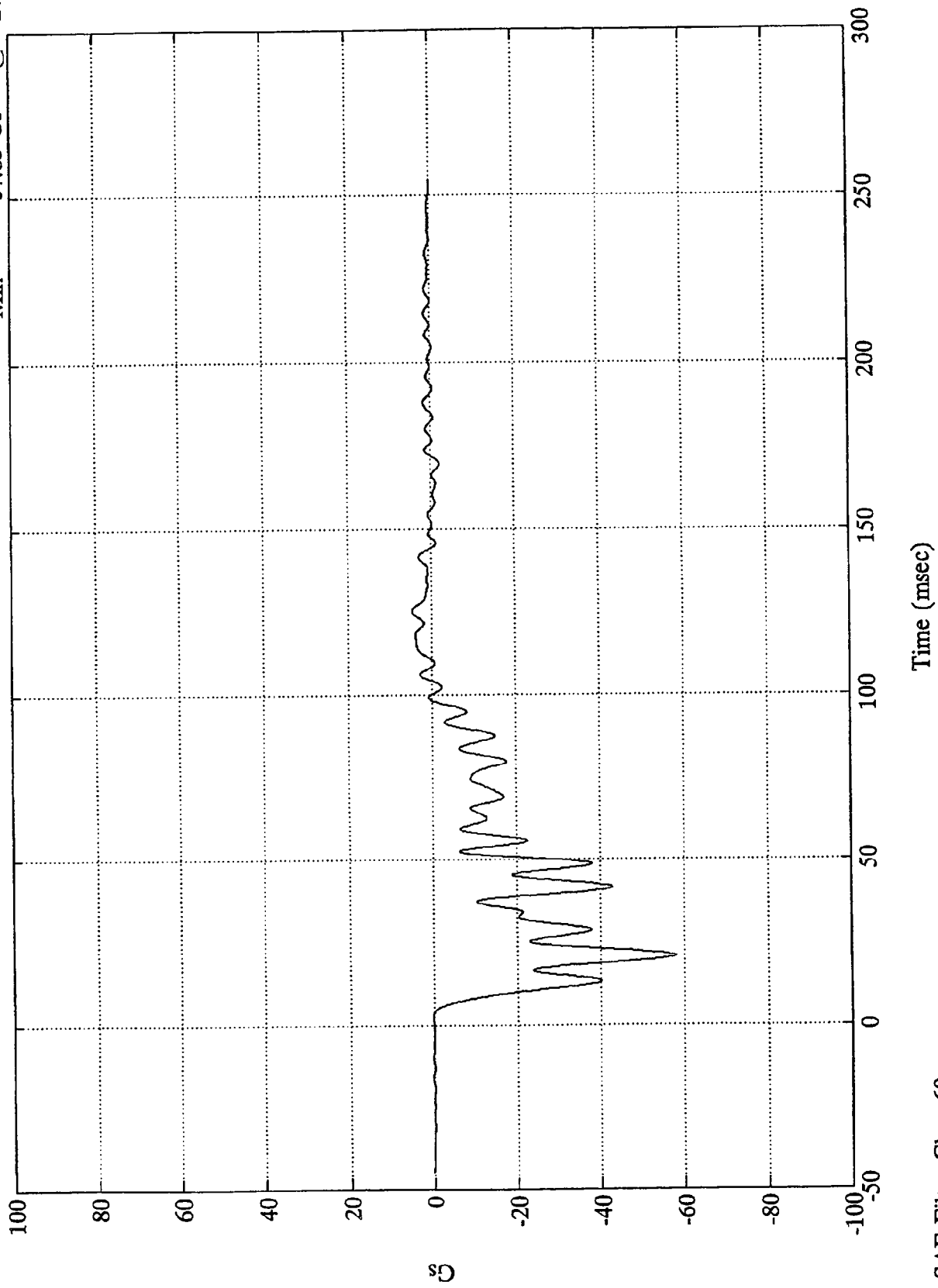
Acc. #8(x)



NCAP TEST #12 - 1993 ISUZU RODEO

Acc. #9(x)

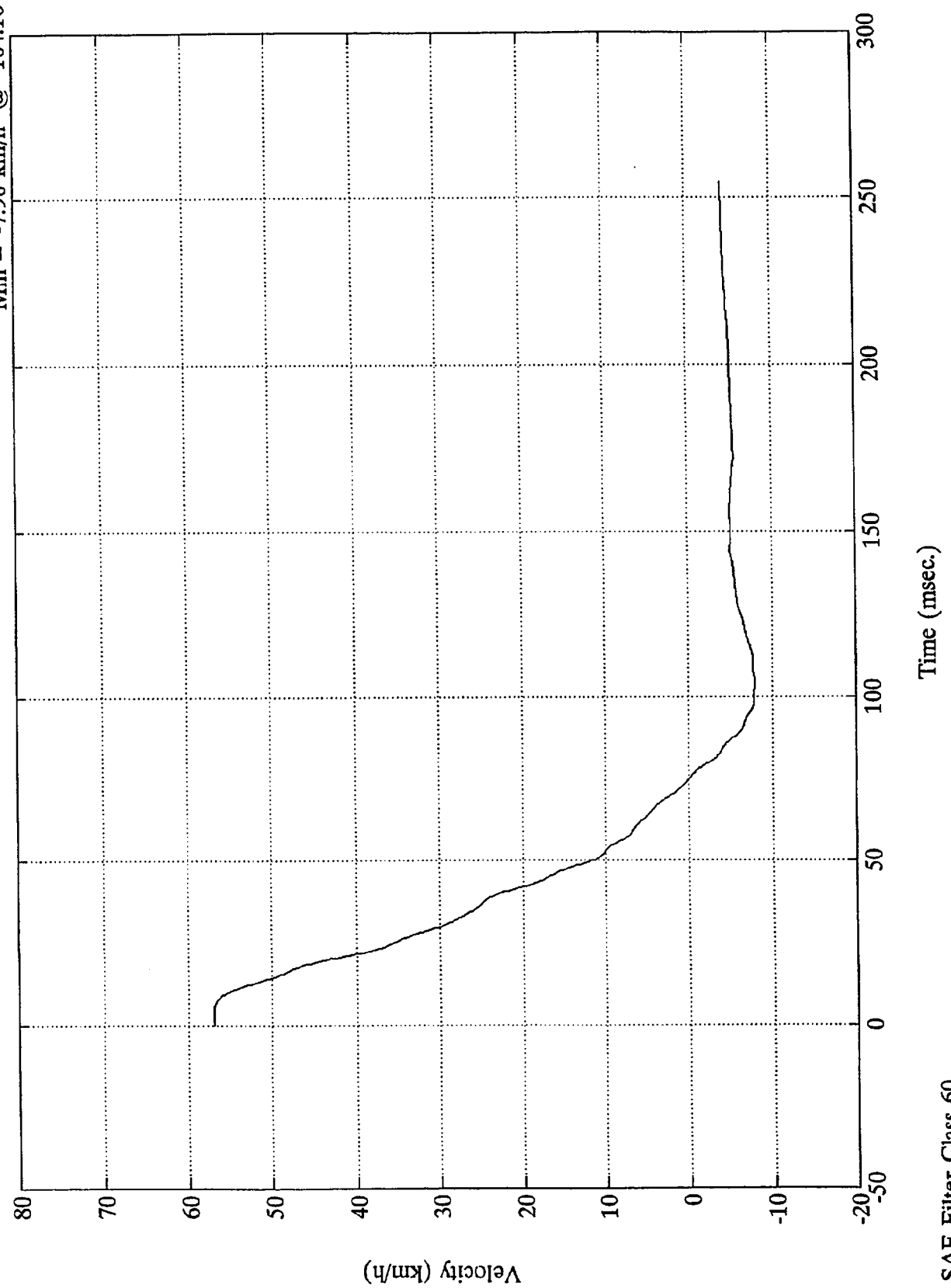
Max = 4.78 Gs @ 125.16 msec
Min = -57.85 Gs @ 20.76 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Max = 56.99 km/h @ 4.32 msec
Min = -7.96 km/h @ 104.16 msec

Acc. #9(x)

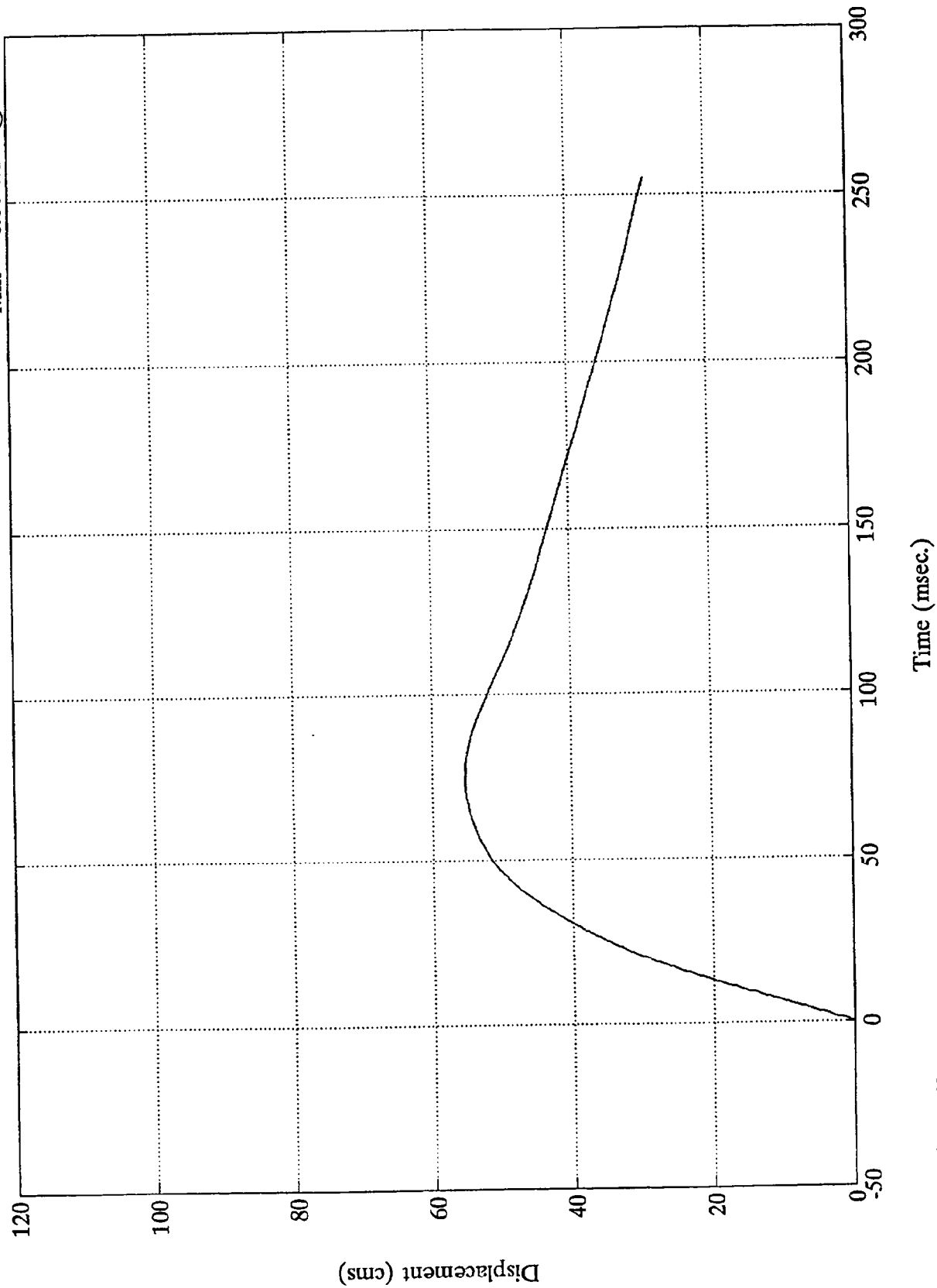


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 55.38 cms @ 75.84 msec
Min = 0.00 cms @ -0.00 msec

Acc. #9(x)



SAE Filter Class 60

TEST NO. MP5700

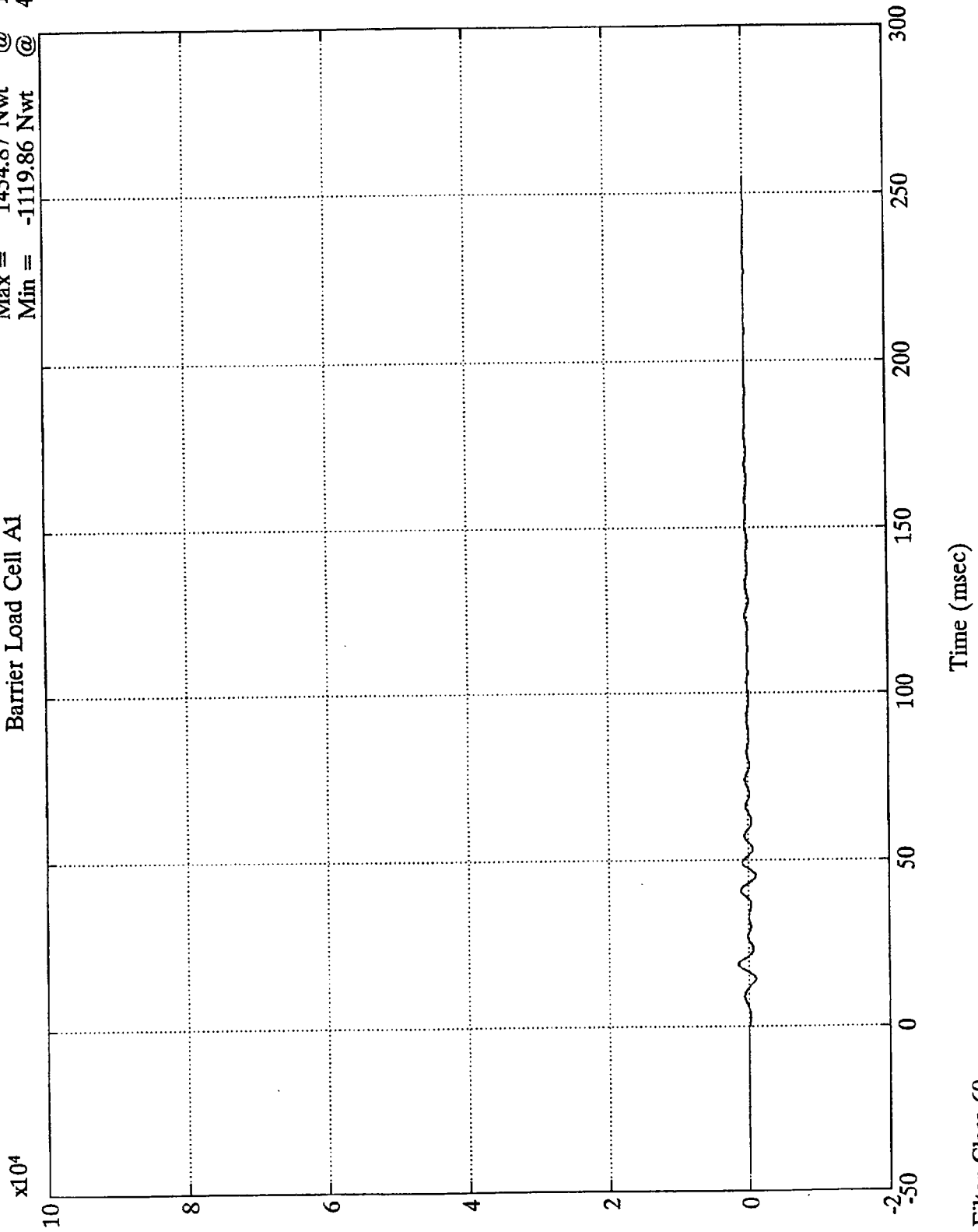
LOAD CELL BARRIER DATA

FILTER CHANNEL CLASS

60

NCAP TEST #12 - 1993 ISUZU RODEO

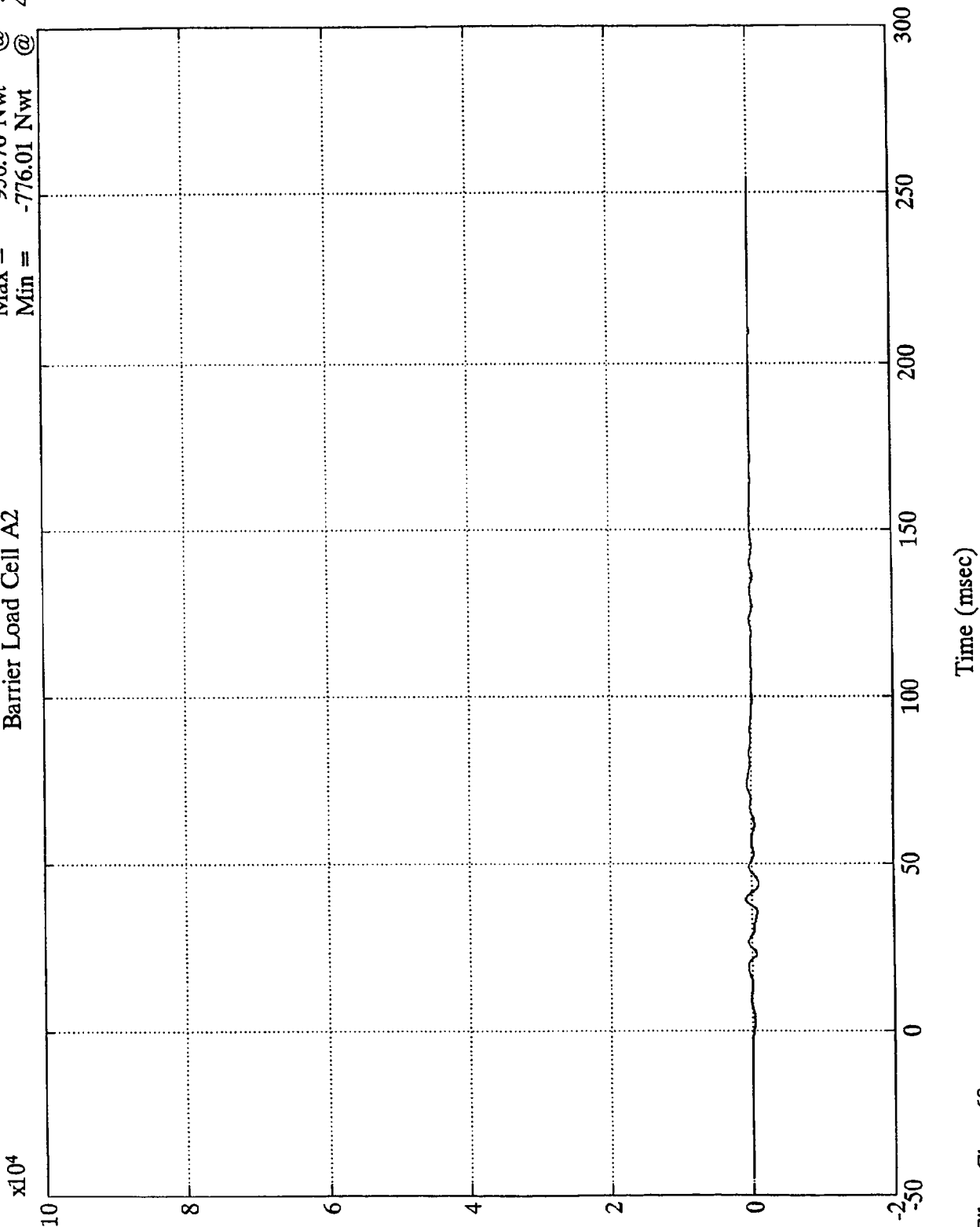
Barrier Load Cell A1
Max = 1454.87 Nwt @ 18.60 msec
Min = -1119.86 Nwt @ 45.12 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell A2

Max = 950.76 Nwt @ 39.47 msec
 Min = -776.01 Nwt @ 44.04 msec



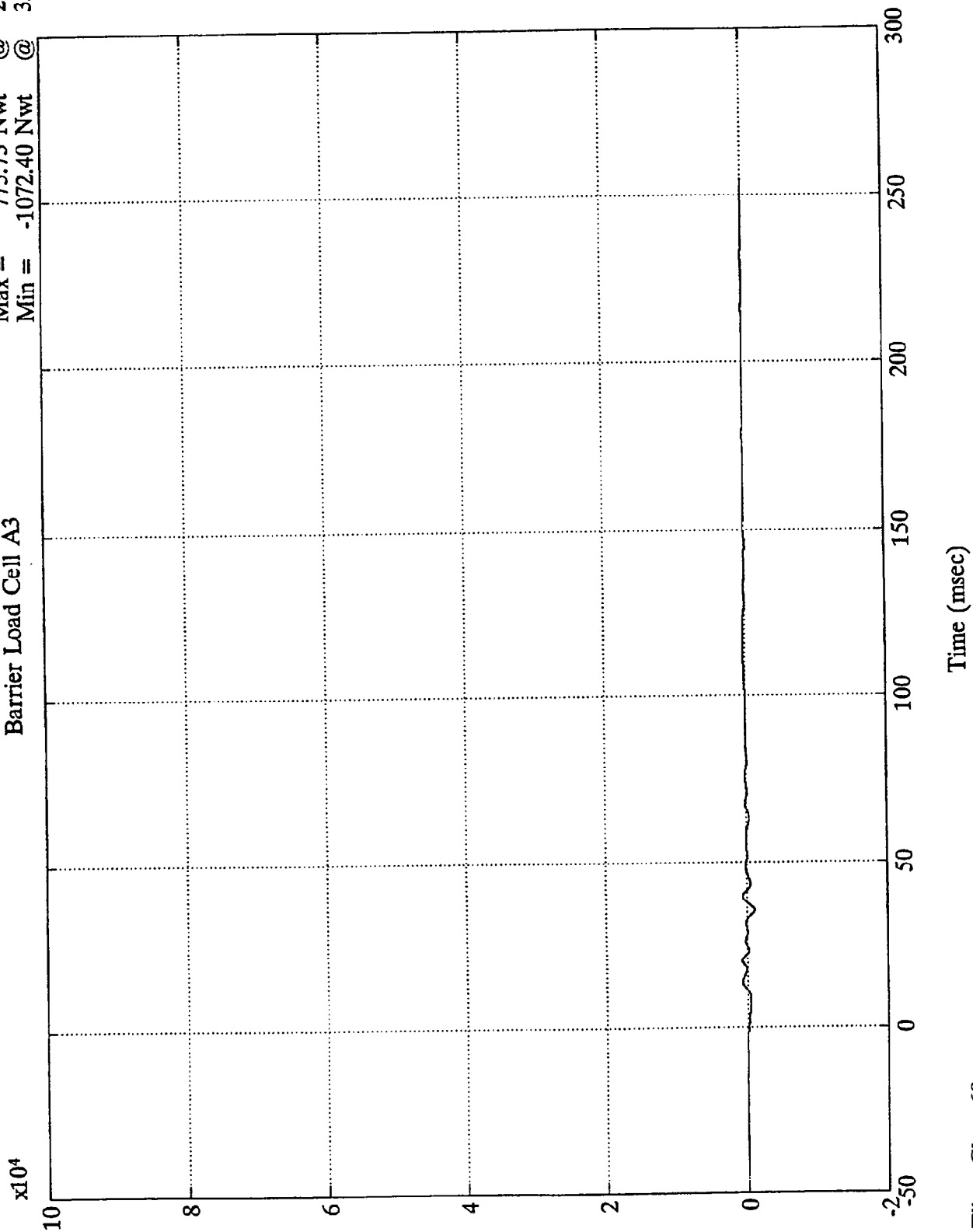
10⁴ N
 B-32

8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell A3
Max = 775.73 Nwt @ 20.03 msec
Min = -1072.40 Nwt @ 35.63 msec



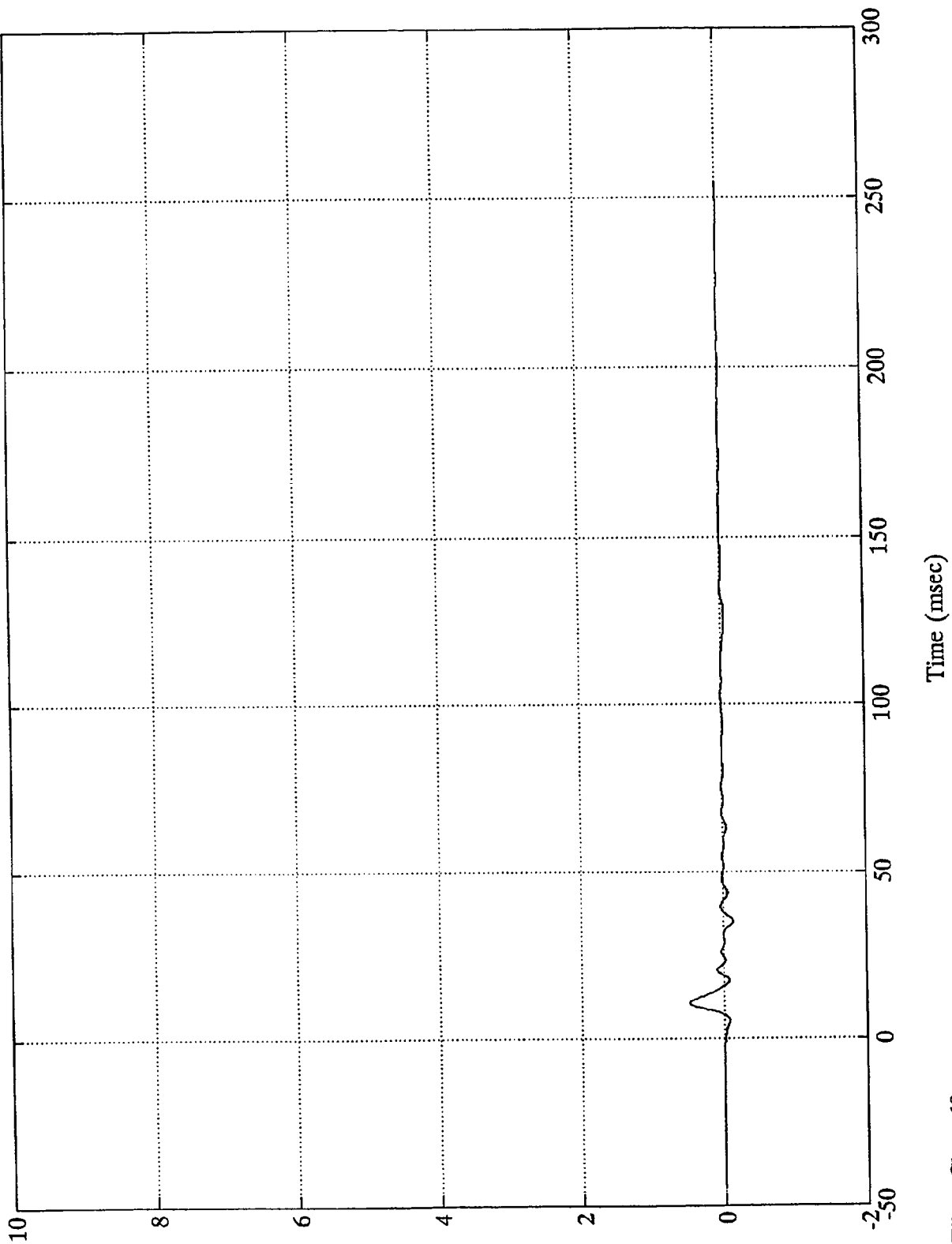
NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell A4

Max = 4911.65 Nwt @ 10.31 msec
 Min = -1308.91 Nwt @ 35.15 msec

Barrier Load Cell A4

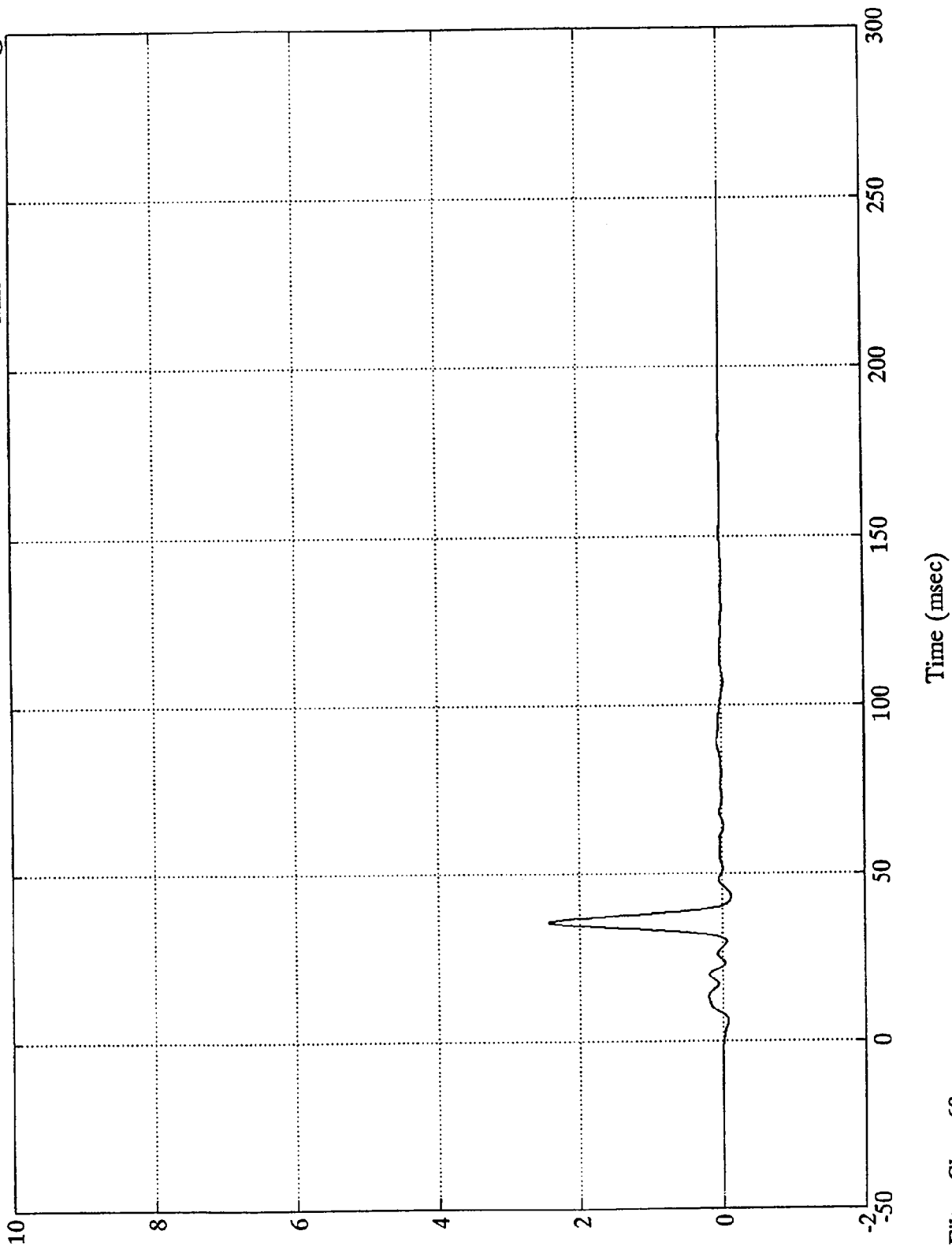
x10⁴



NCAP TEST #12 - 1993 ISUZU RODEO
x10⁴

Barrier Load Cell A5

Max = 24458.51 Nwt @ 35.51 msec
Min = -1171.12 Nwt @ 42.95 msec



B-35

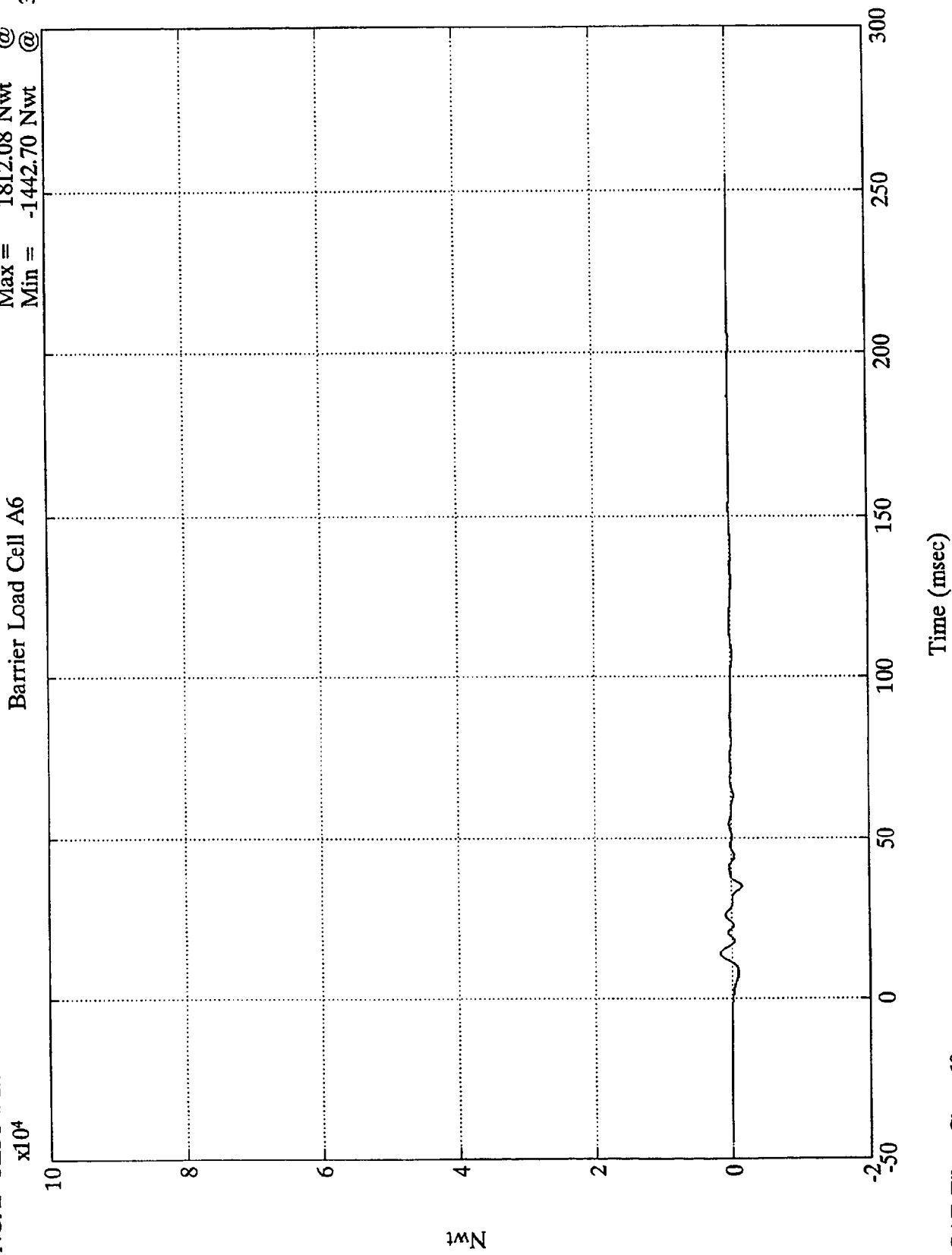
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

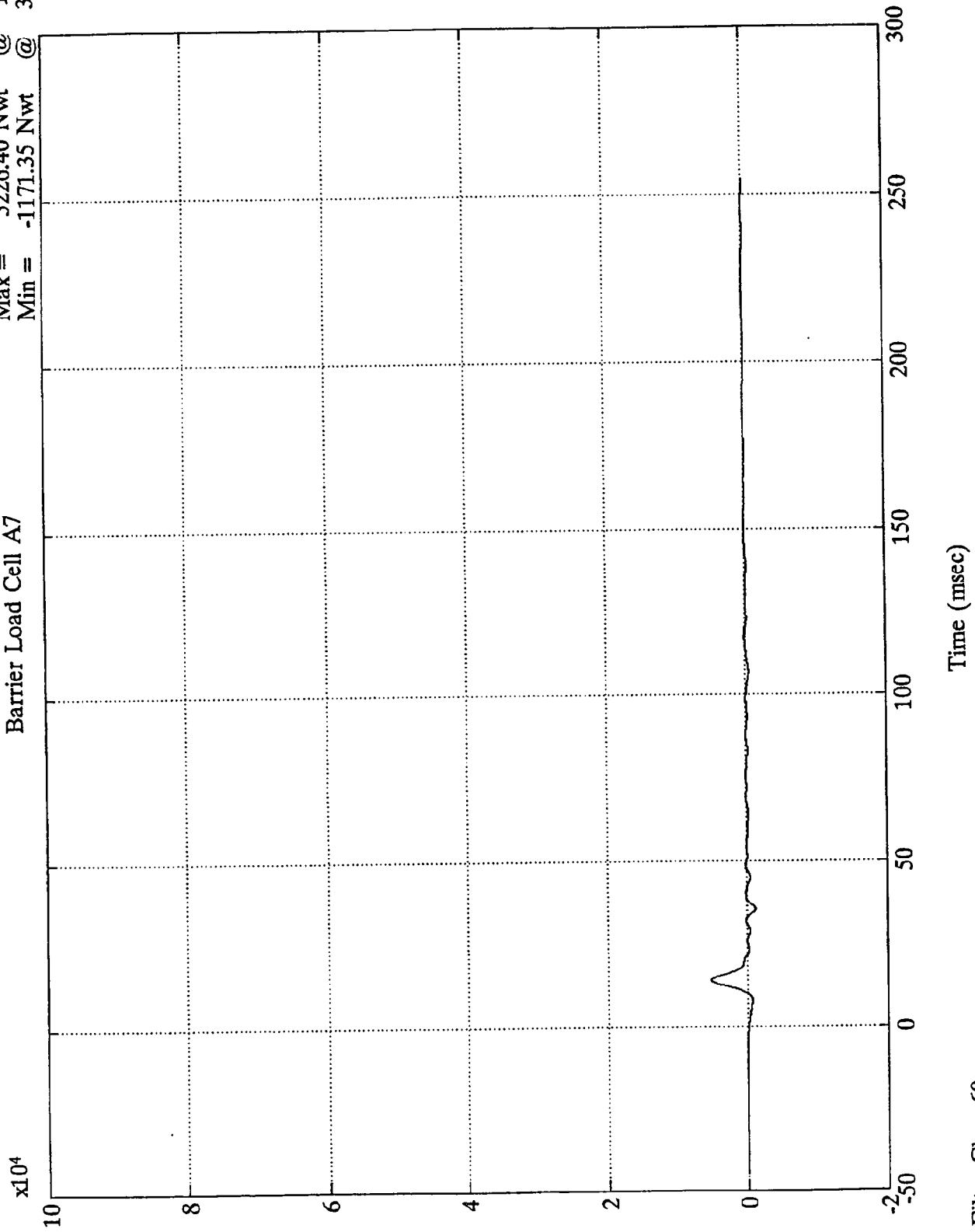
Barrier Load Cell A6

Max = 1812.08 Nwt @ 13.67 msec
 Min = -1442.70 Nwt @ 34.91 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell A7
Max = 5226.40 Nwt @ 13.79 msec
Min = -1171.35 Nwt @ 35.51 msec



1N
B-37

8058-8

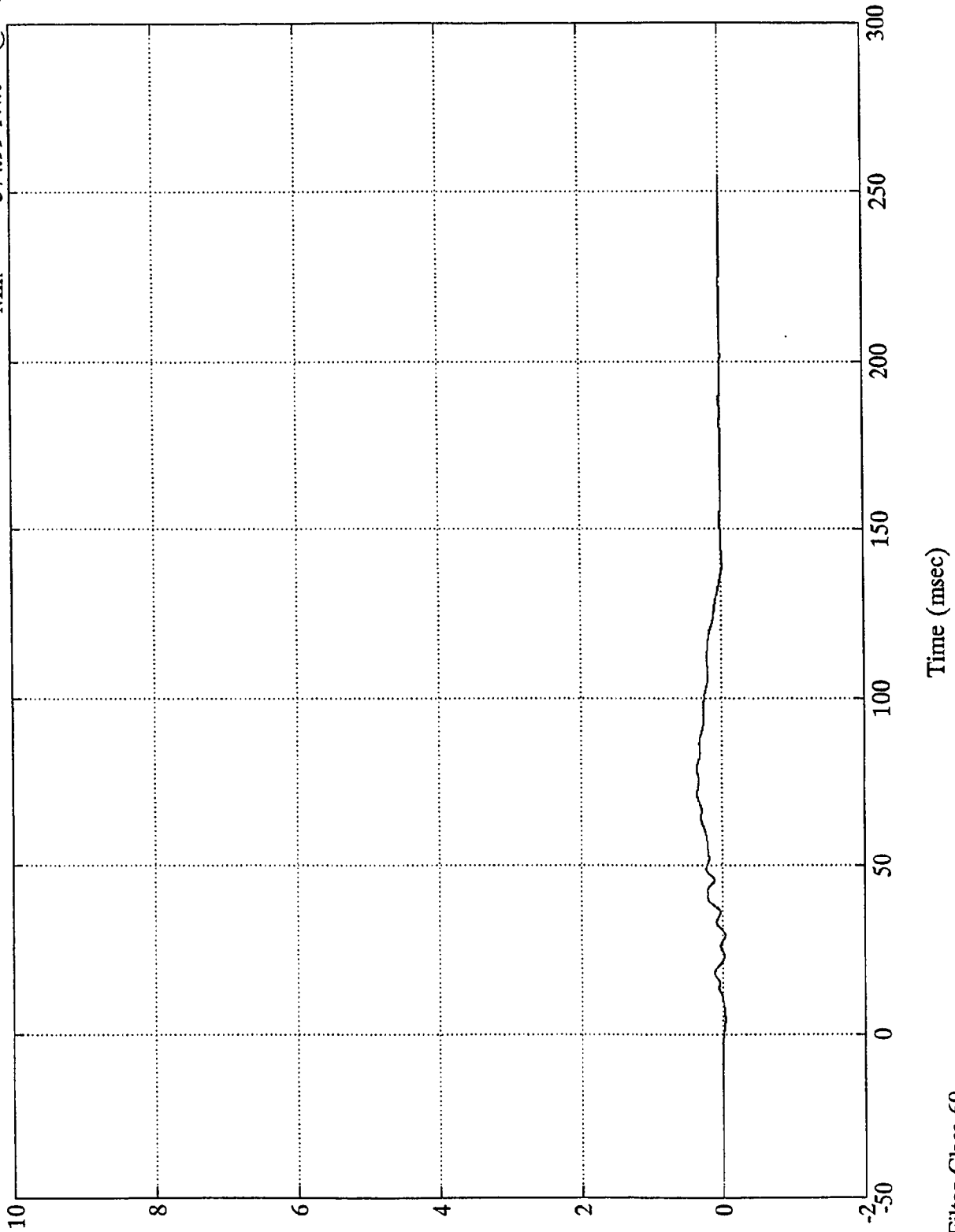
SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 3531.50 Nwt @ 78.95 msec
Min = -374.99 Nwt @ 29.39 msec

Barrier Load Cell A8

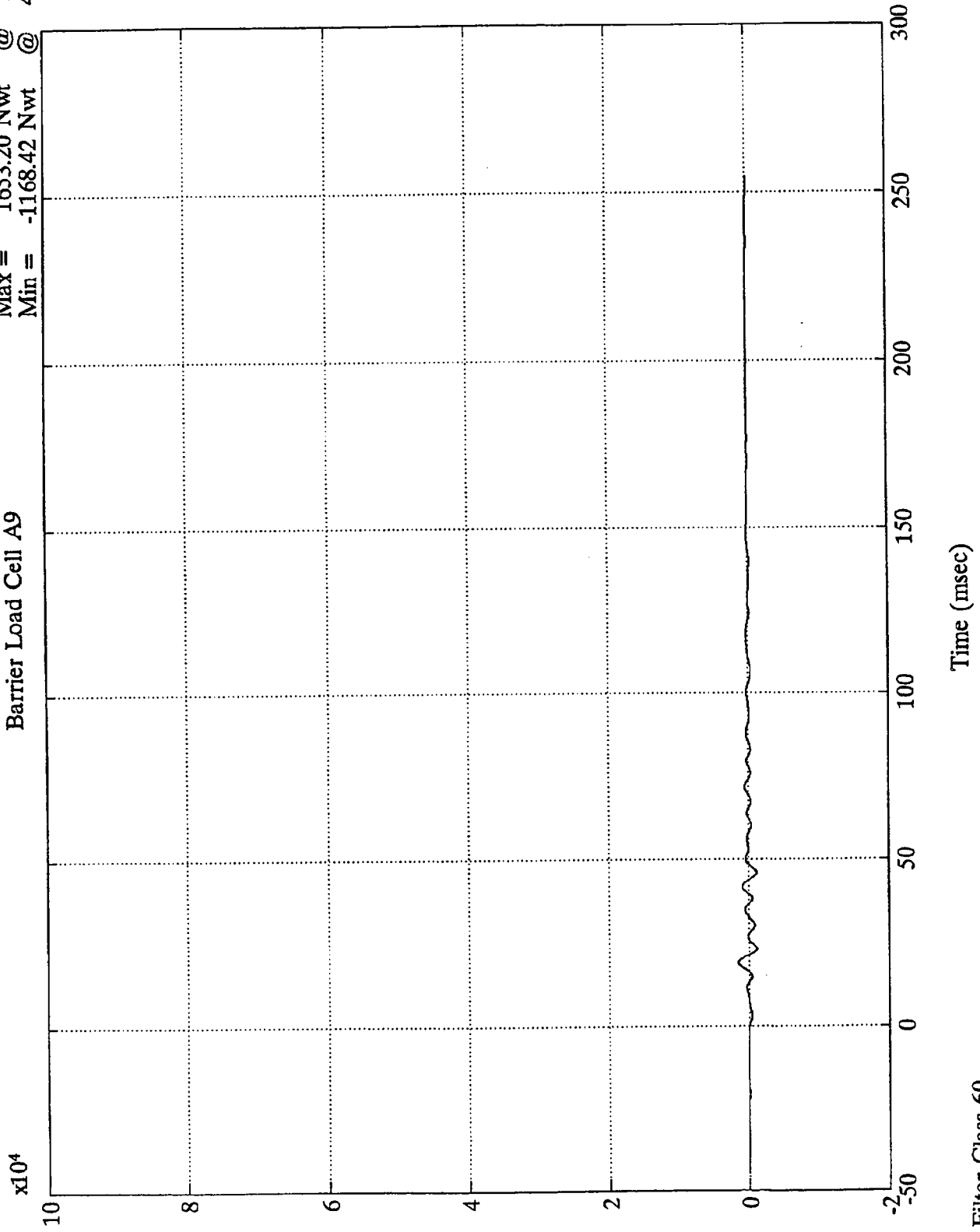
$\times 10^4$



SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell A9
Max = 1653.20 Nwt @ 19.07 msec
Min = -1168.42 Nwt @ 46.08 msec

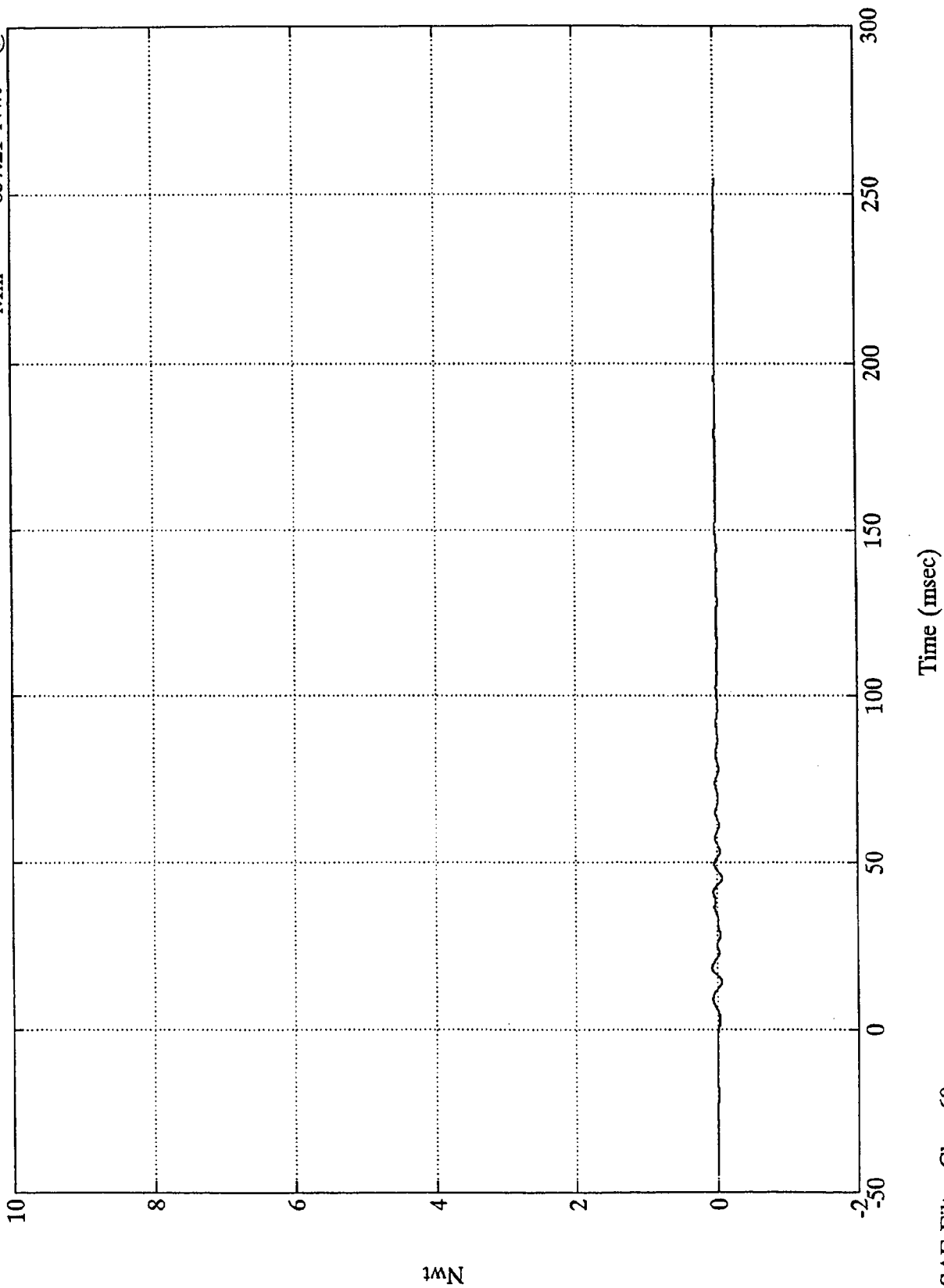


NCAP TEST #12 - 1993 ISUZU RODEO

Max = 765.23 Nwt @ 18.00 msec
Min = -657.21 Nwt @ 45.24 msec

Barrier Load Cell B1

x10⁴



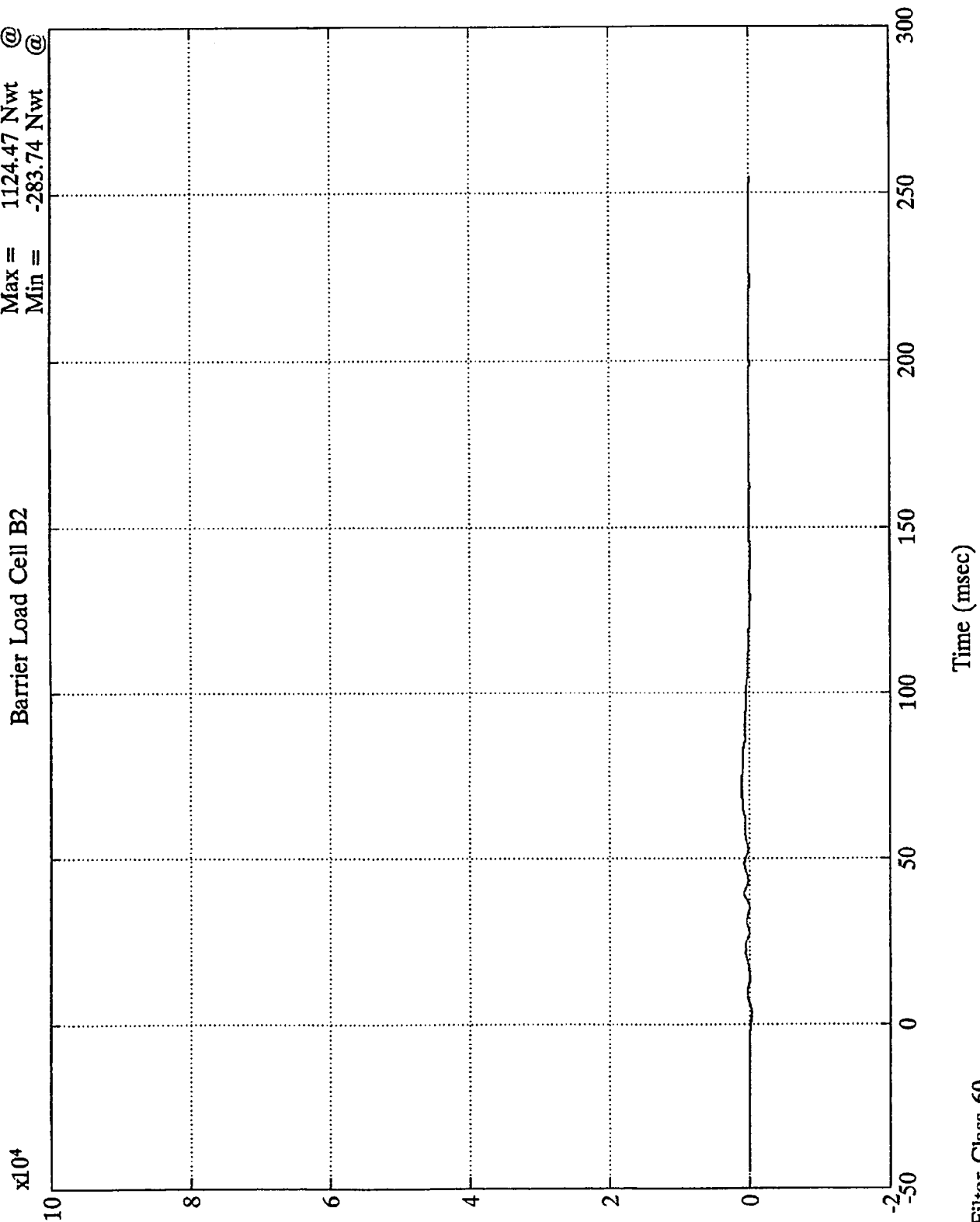
10N
B-40

8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

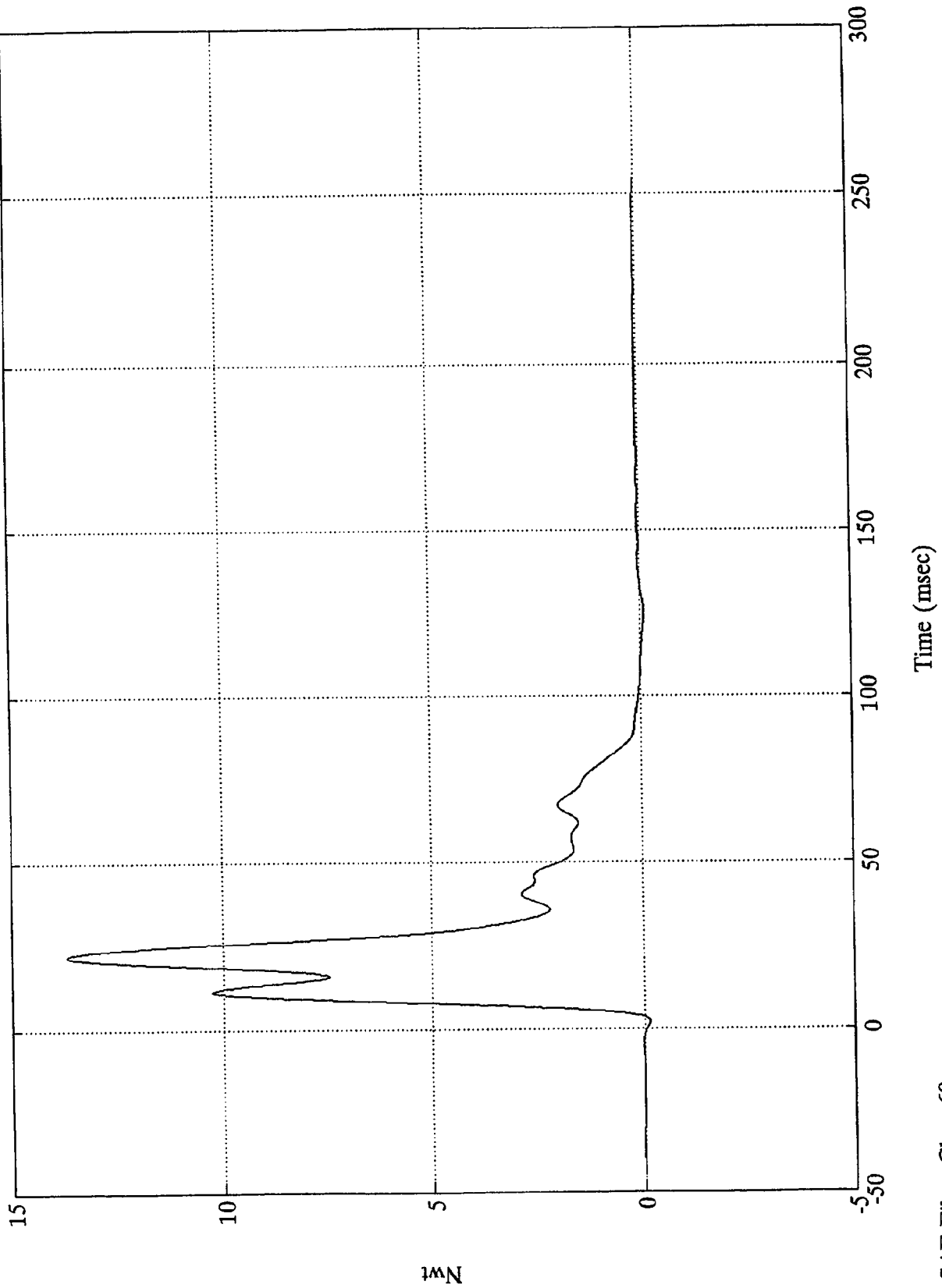
Barrier Load Cell B2
Max = 1124.47 Nwt @ 70.55 msec
Min = -283.74 Nwt @ 2.99 msec



NCAP TEST #12 - 1993 ISUZU RODEO
x10⁴

Max = 136891.94 Nwt @ 21.84 msec
Min = -1541.96 Nwt @ 2.03 msec

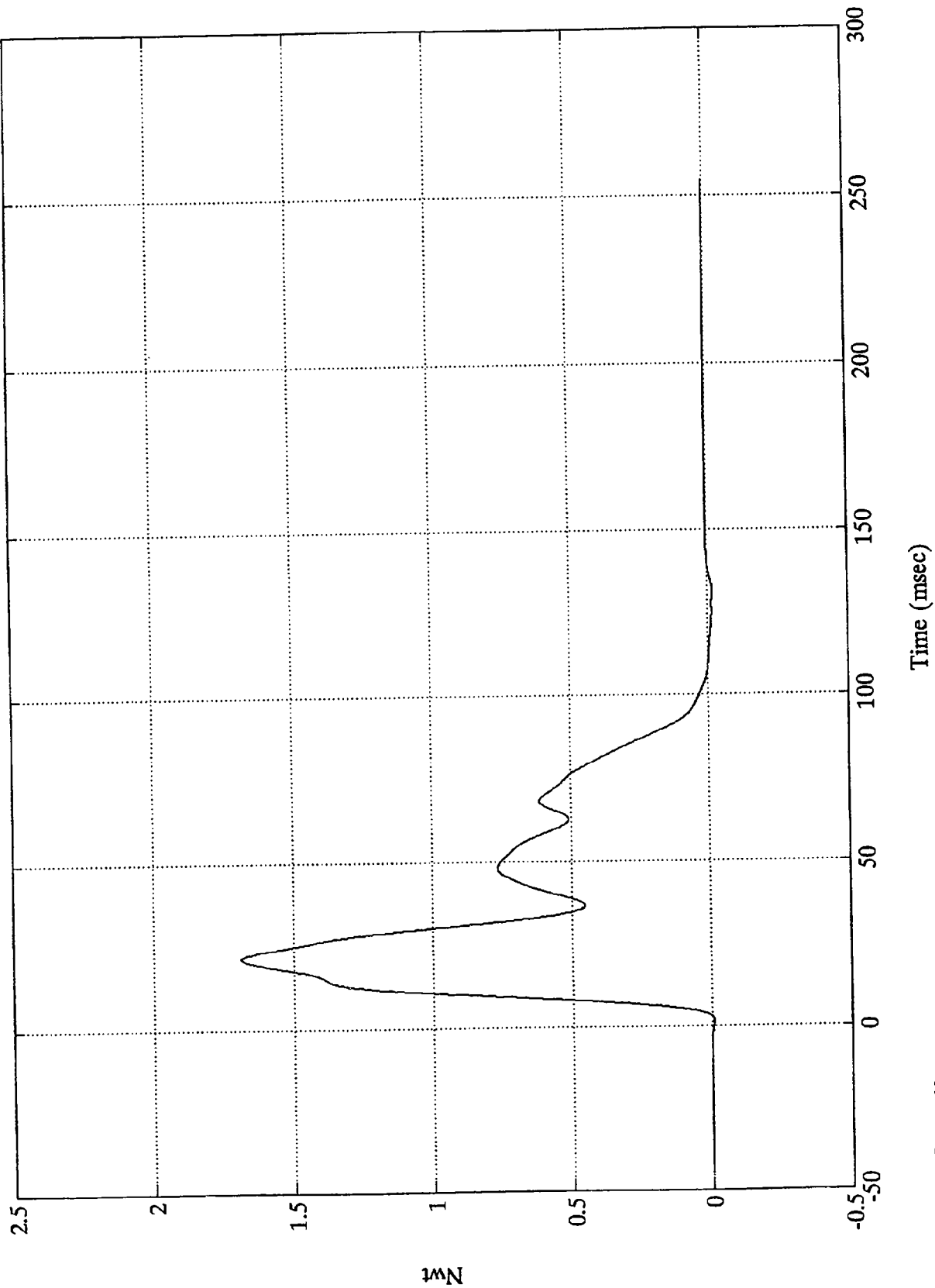
Barrier Load Cell B3



SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO
x10⁵

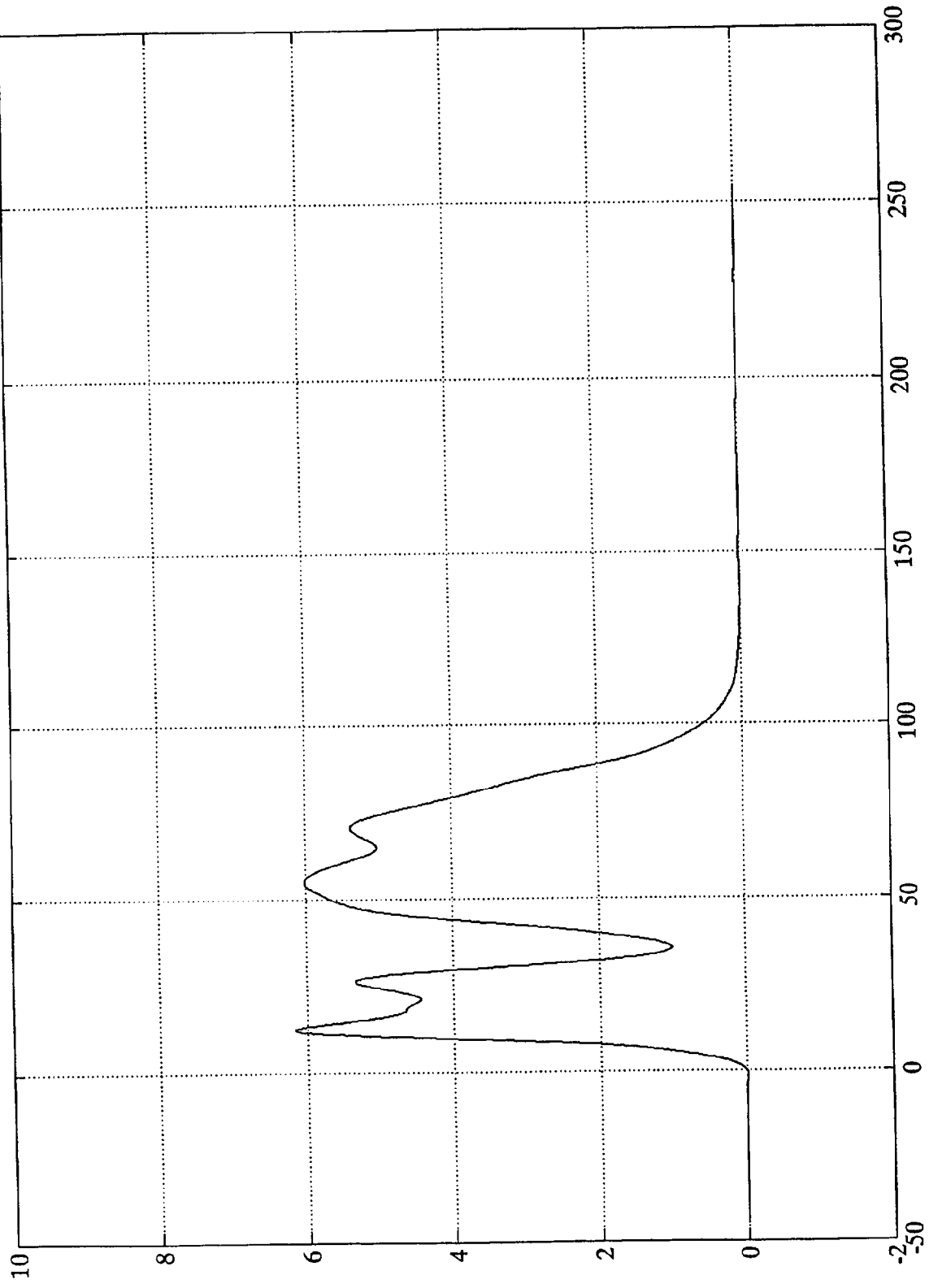
Barrier Load Cell B4
Max = 168909.52 Nwt @ 21.35 msec
Min = -1671.02 Nwt @ 131.52 msec



NCAP TEST #12 - 1993 ISUZU RODEO
x10⁴

Max = 61752.00 Nwt @ 12.11 msec
Min = -185.16 Nwt @ -1.56 msec

Barrier Load Cell B5



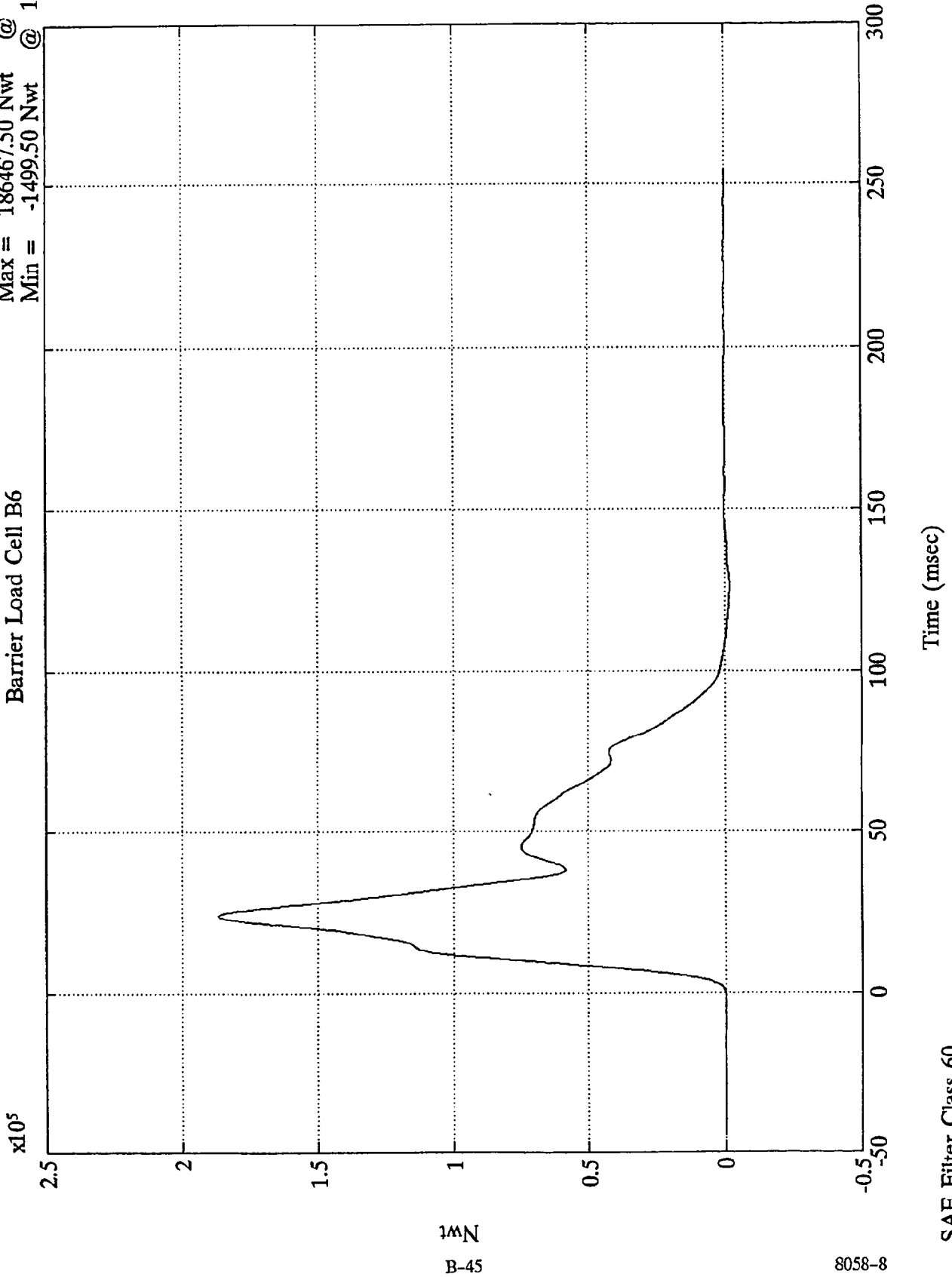
Time (msec)

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell B6

Max = 186467.50 Nwt @ 24.00 msec
Min = -1499.50 Nwt @ 126.59 msec



18N
B-45

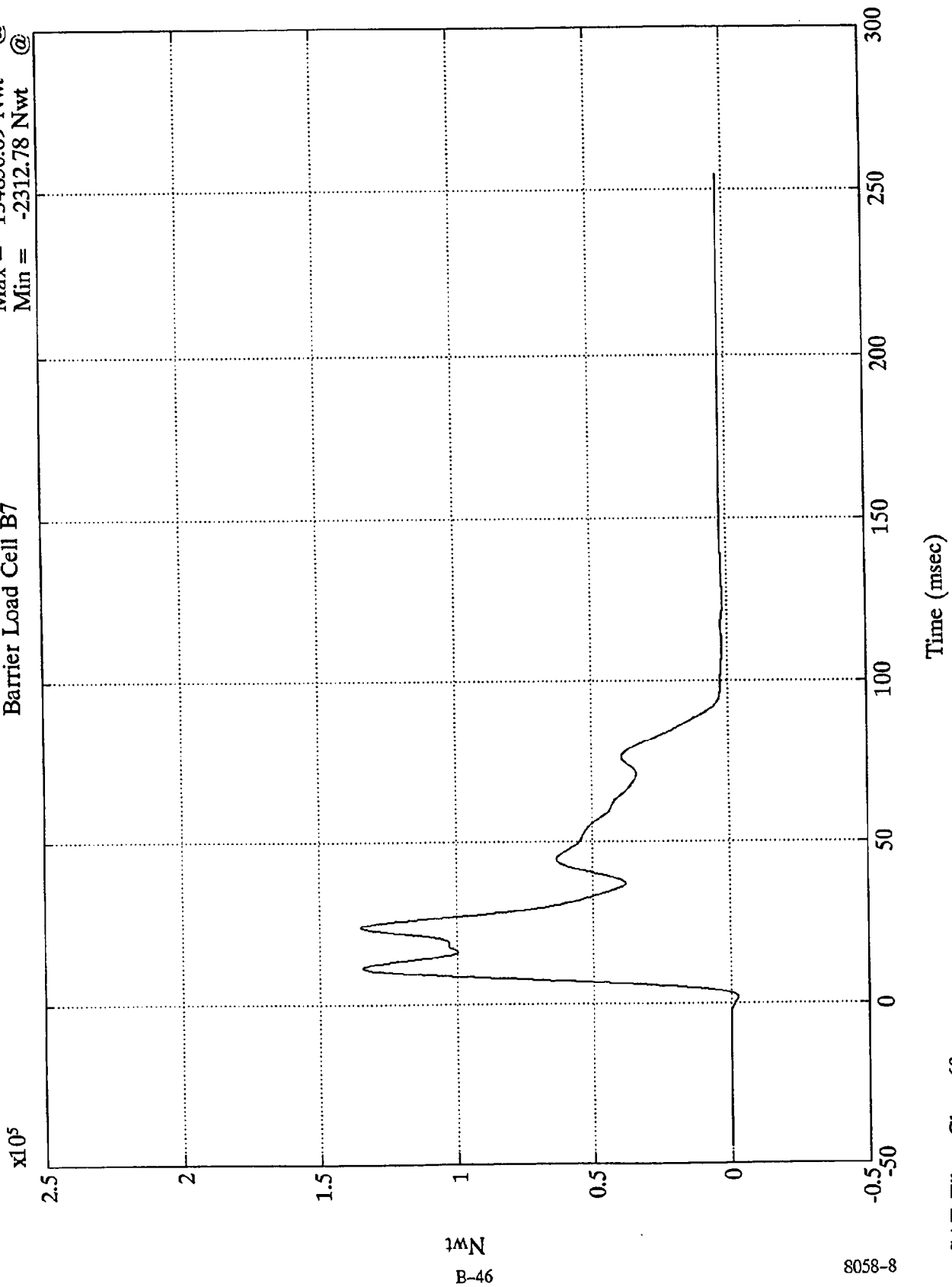
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell B7

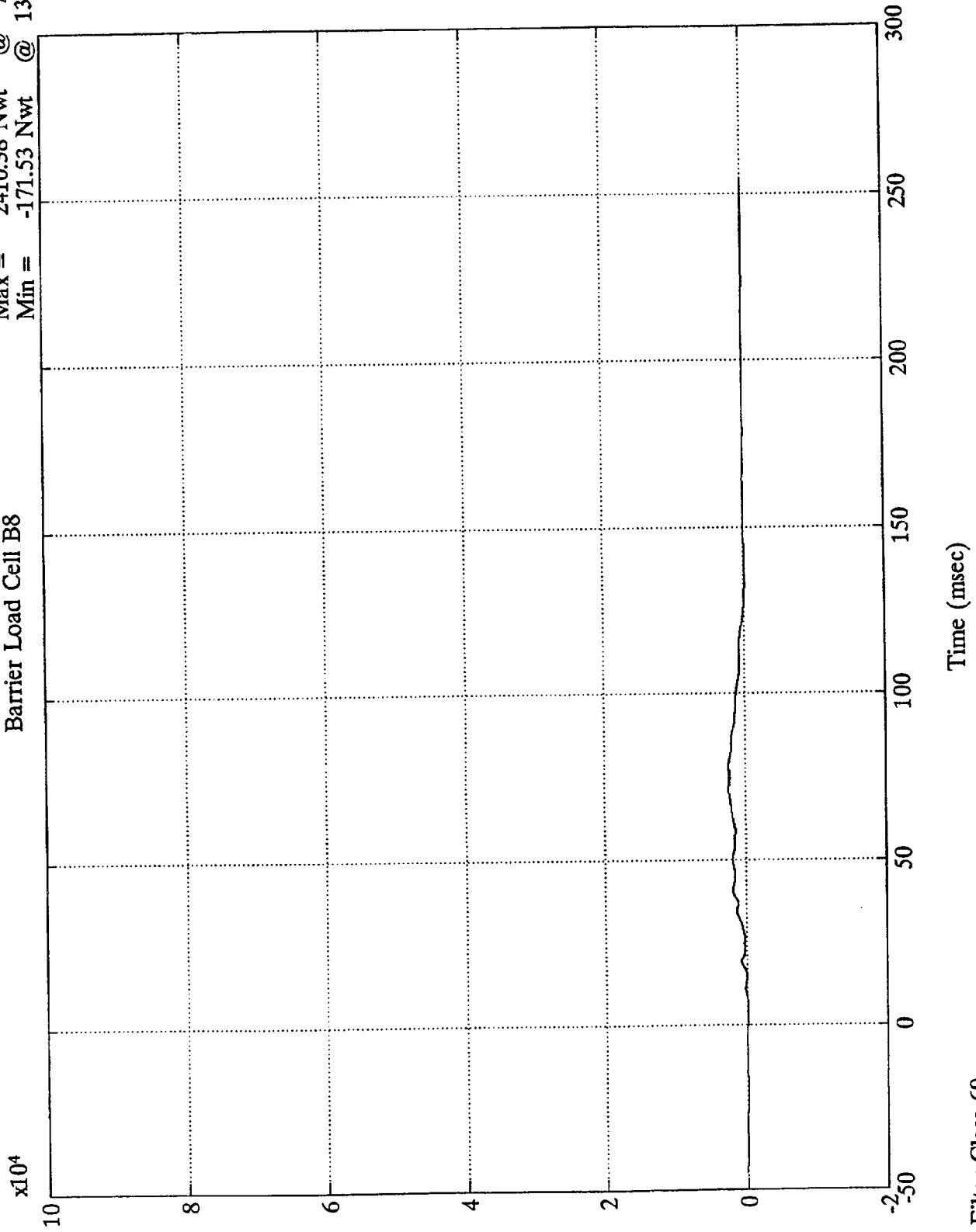
Max = 134830.69 Nwt @ 23.76 msec
 Min = -2312.78 Nwt @ 1.67 msec



SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell B8
Max = 2410.38 Nwt @ 70.91 msec
Min = -171.53 Nwt @ 139.67 msec



10N
B-47

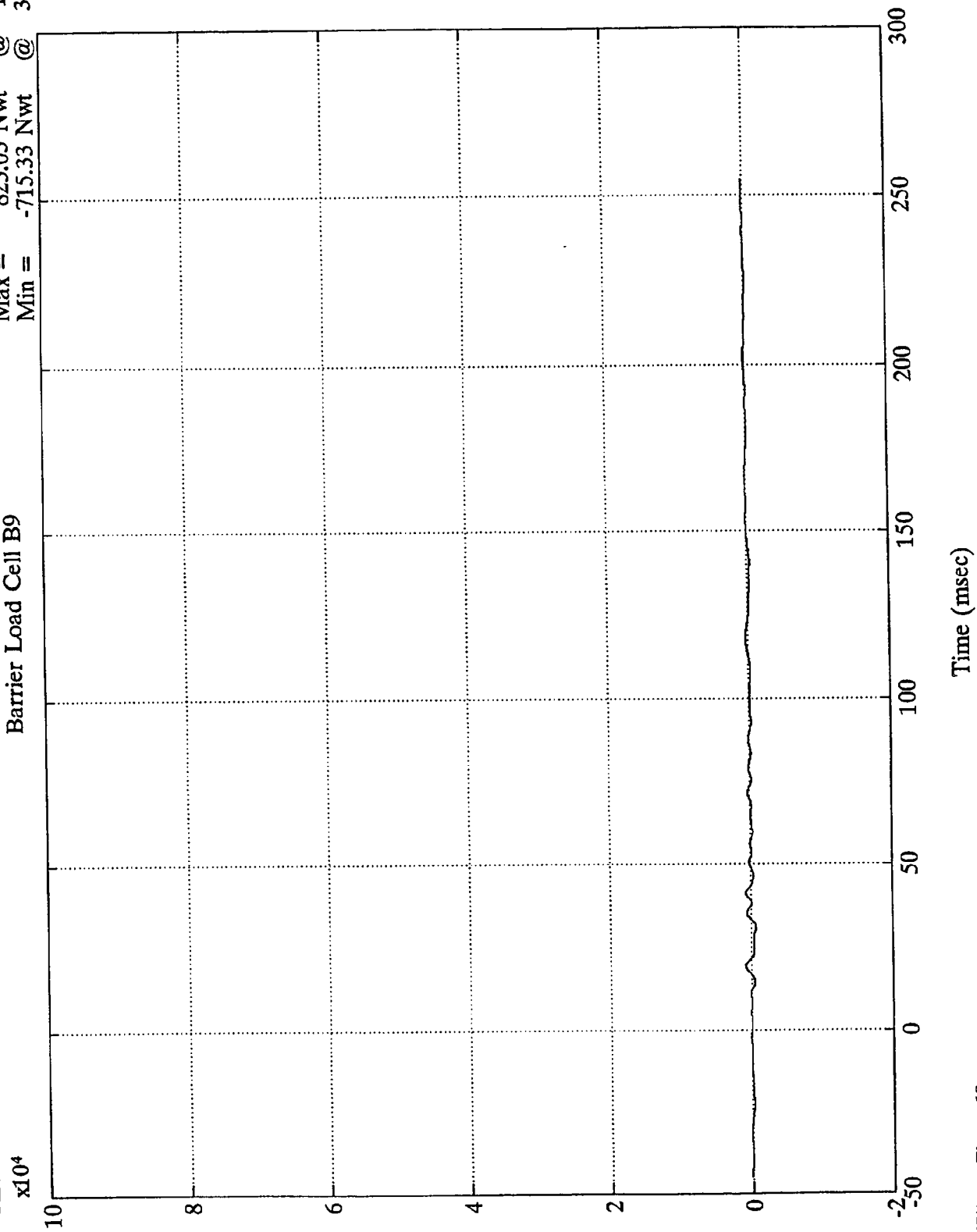
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell B9

Max = 823.03 Nwt @ 19.19 msec
Min = -715.33 Nwt @ 31.19 msec



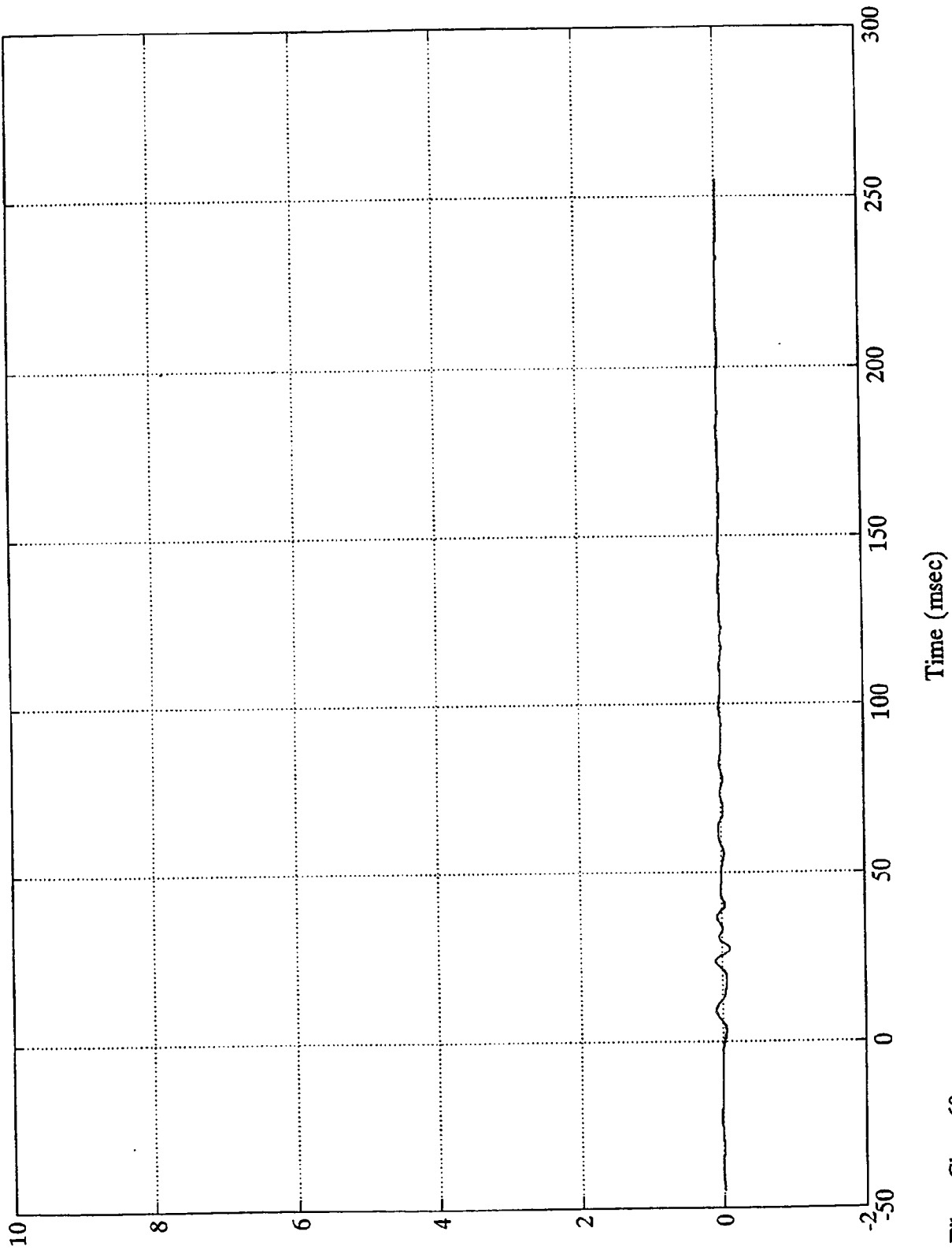
1Nwt
B-48

8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO
x10⁴

Barrier Load Cell C1
Max = 977.76 Nwt @ 23.87 msec
Min = -1092.67 Nwt @ 27.48 msec

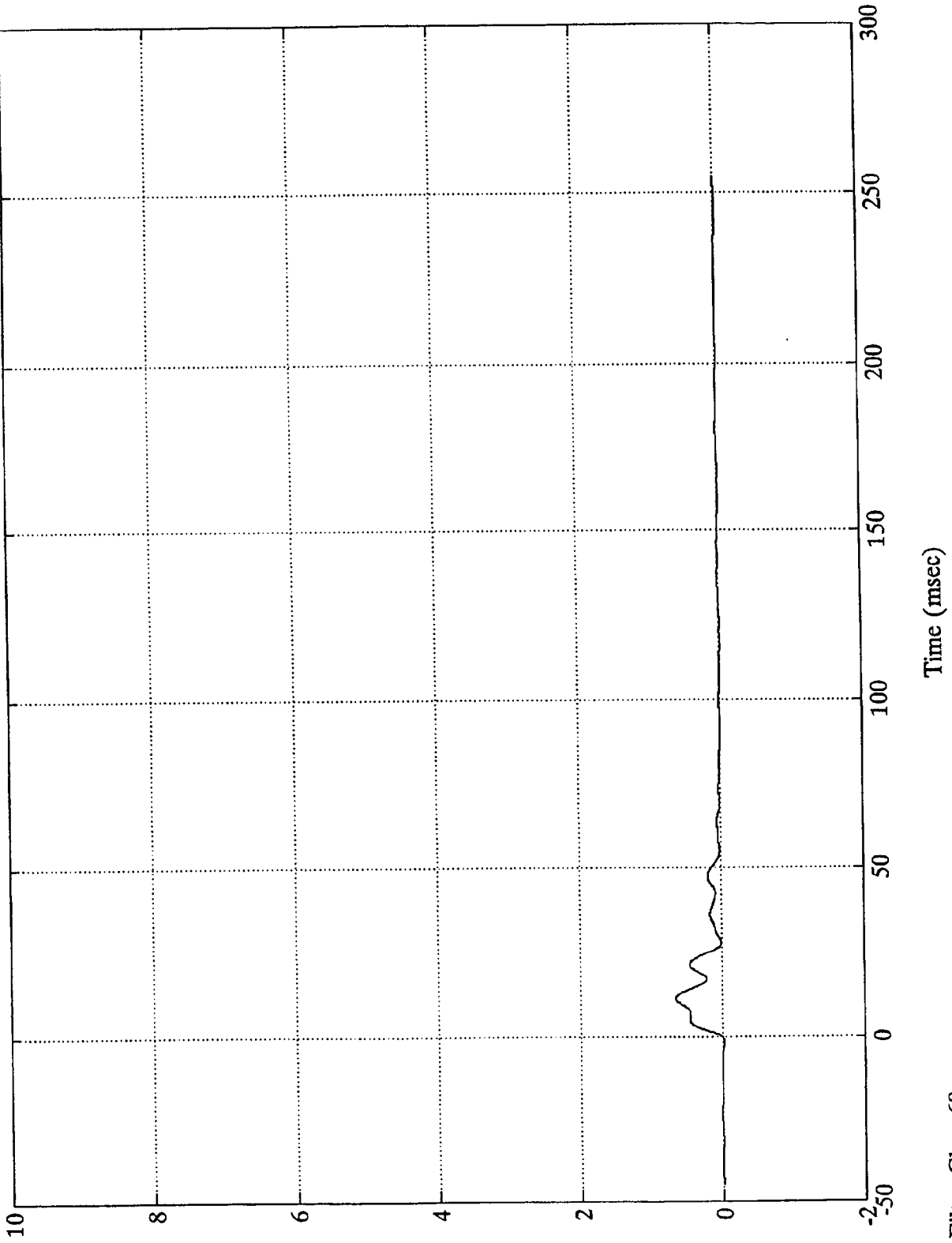


NCAP TEST #12 - 1993 ISUZU RODEO

Max = 6632.28 Nwt @ 11.27 msec
Min = -262.95 Nwt @ -1.80 msec

Barrier Load Cell C2

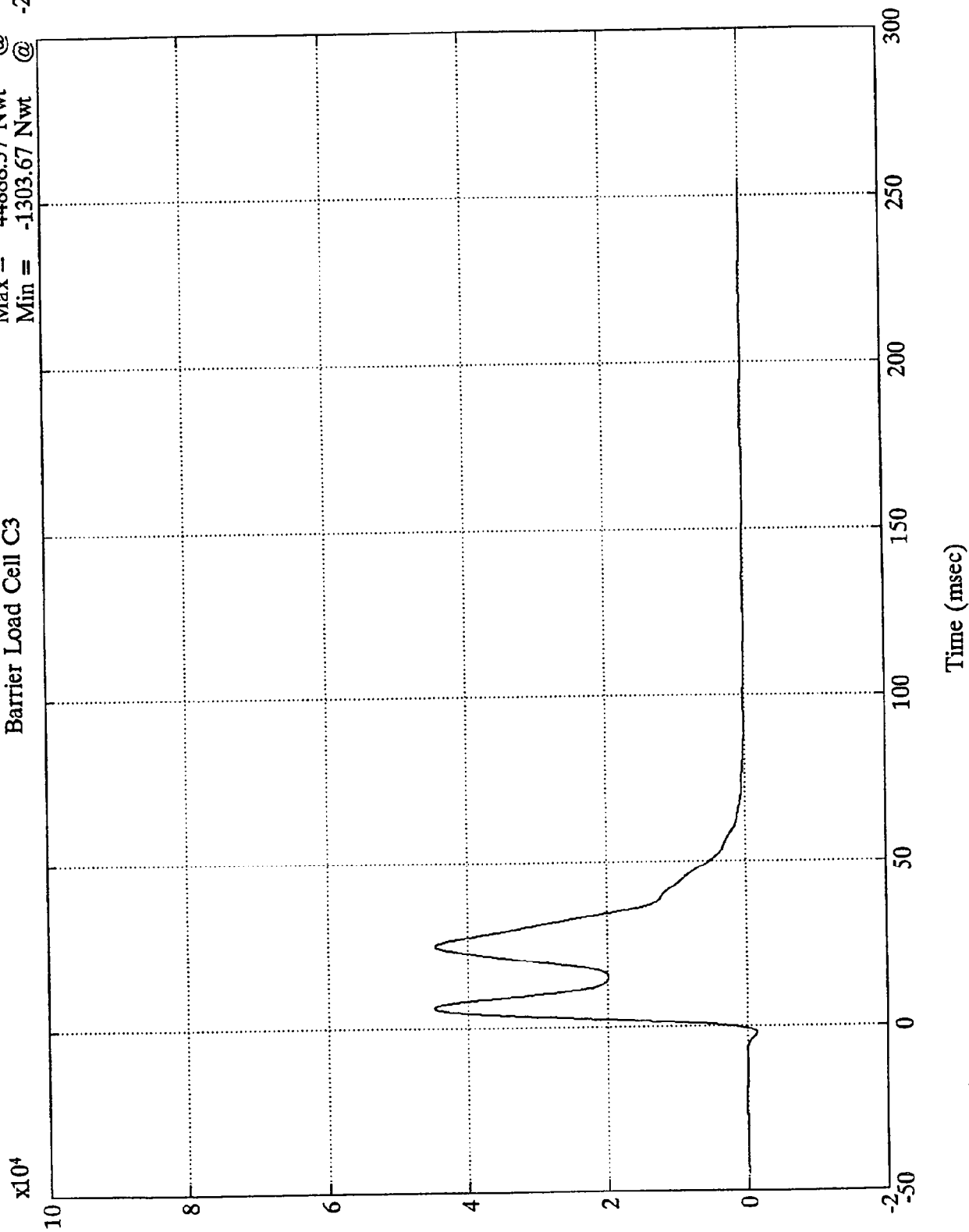
$\times 10^4$



NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell C3

Max = 44888.57 Nwt @ 5.99 msec
Min = -1303.67 Nwt @ -2.28 msec



10N
B-51

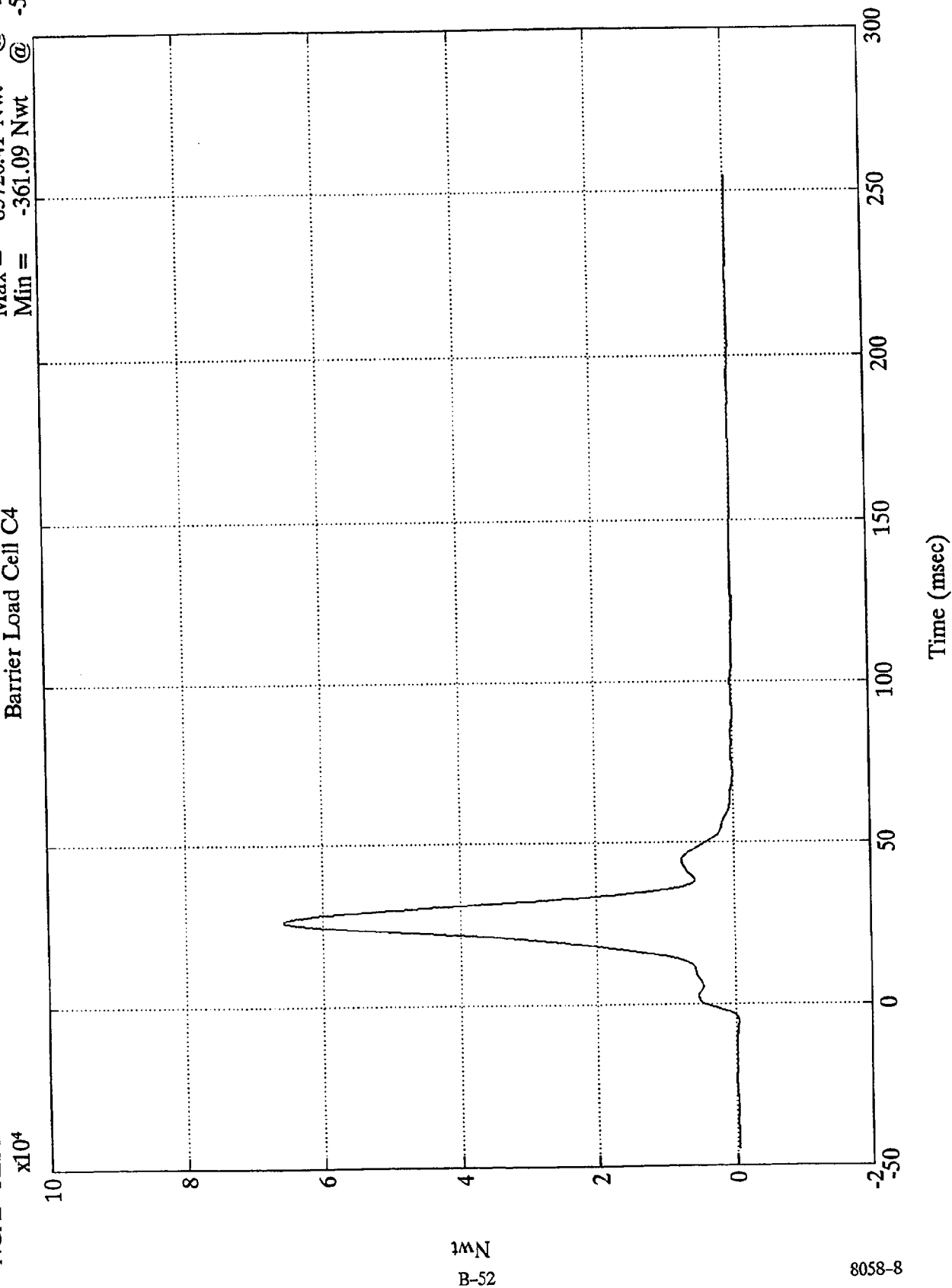
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell C4

Max = 65720.41 Nwt @ 26.27 msec
Min = -361.09 Nwt @ -5.52 msec



1Nwt
B-52

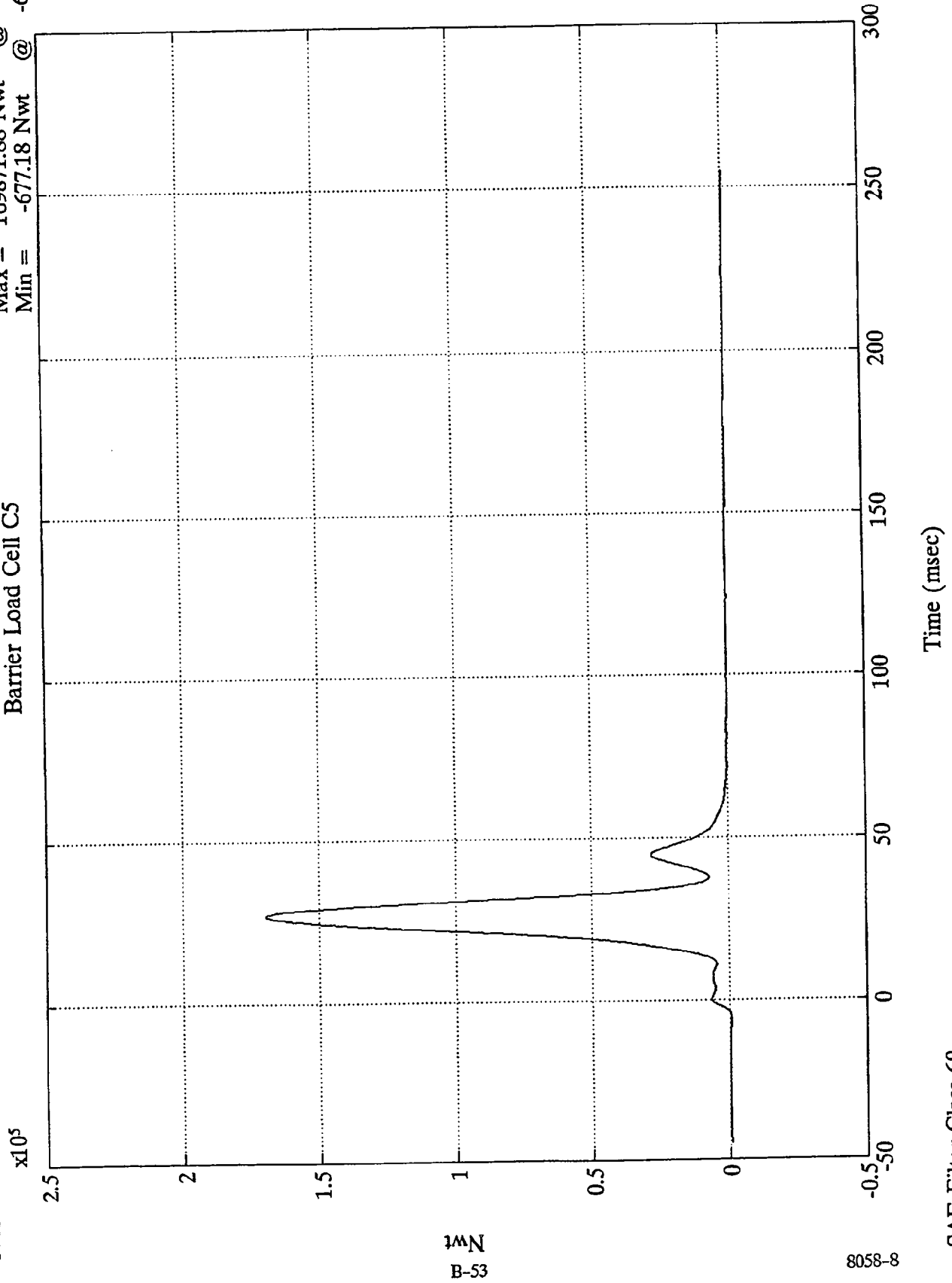
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell C5

Max = 169871.88 Nwt @ 26.87 msec
Min = -677.18 Nwt @ -6.00 msec



1N
B-53

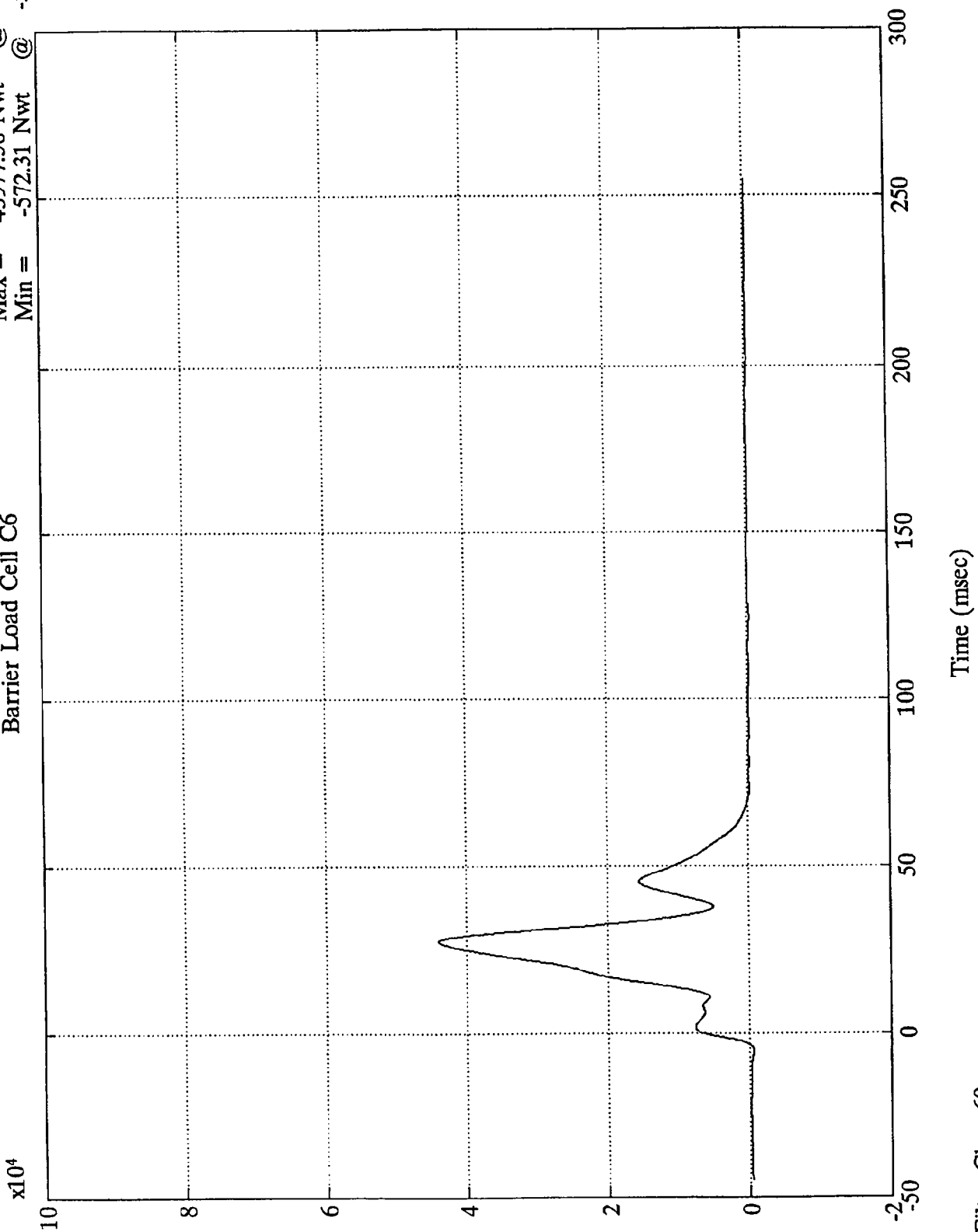
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 43977.56 Nwt @ 27.60 msec
 Min = -572.31 Nwt @ -5.40 msec

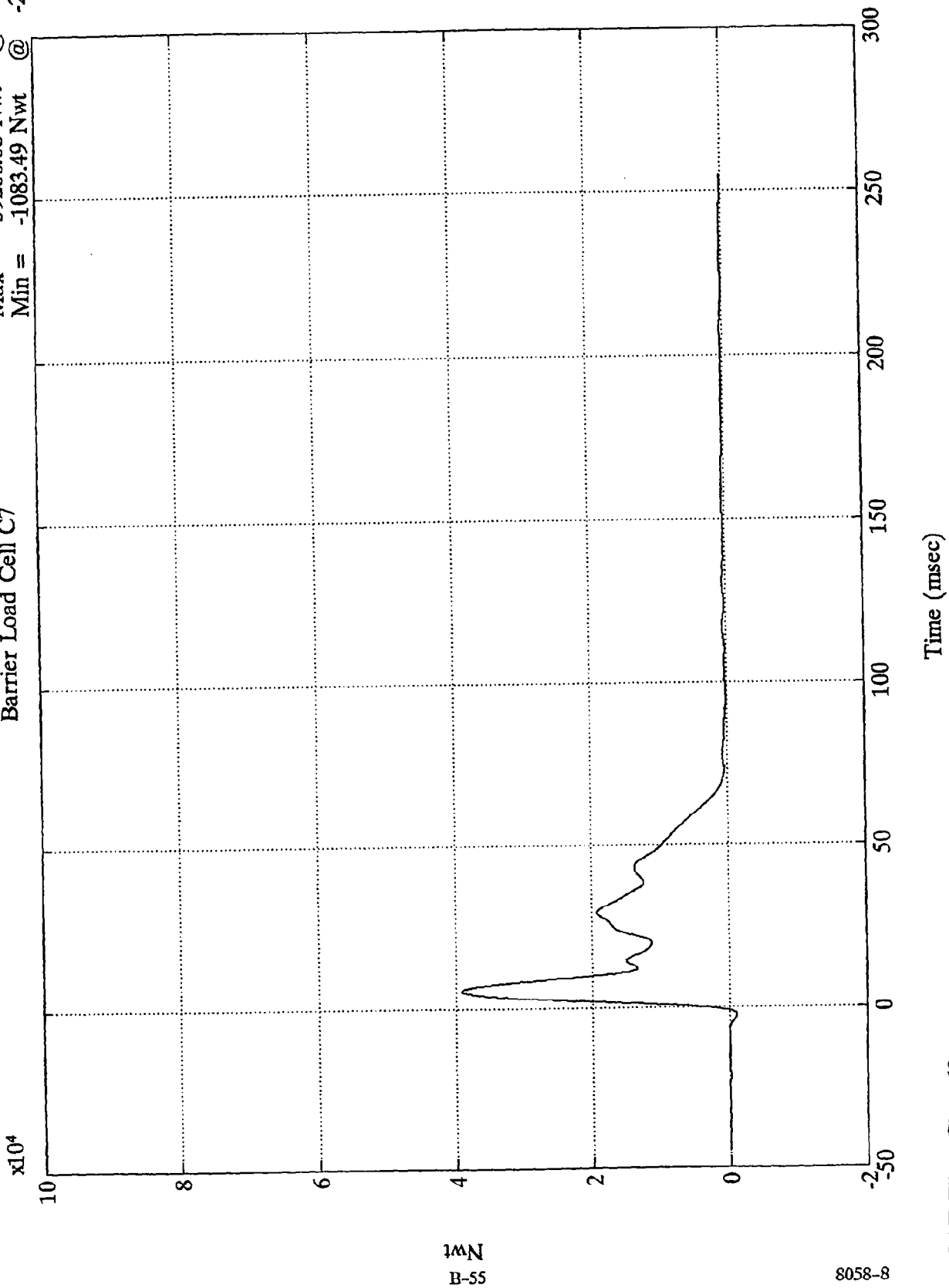
Barrier Load Cell C6



NCAP TEST #12 - 1993 ISUZU RODEO

Max = 39200.08 Nwt @ 5.51 msec
Min = -1083.49 Nwt @ -2.64 msec

Barrier Load Cell C7



1N
B-55

8058-8

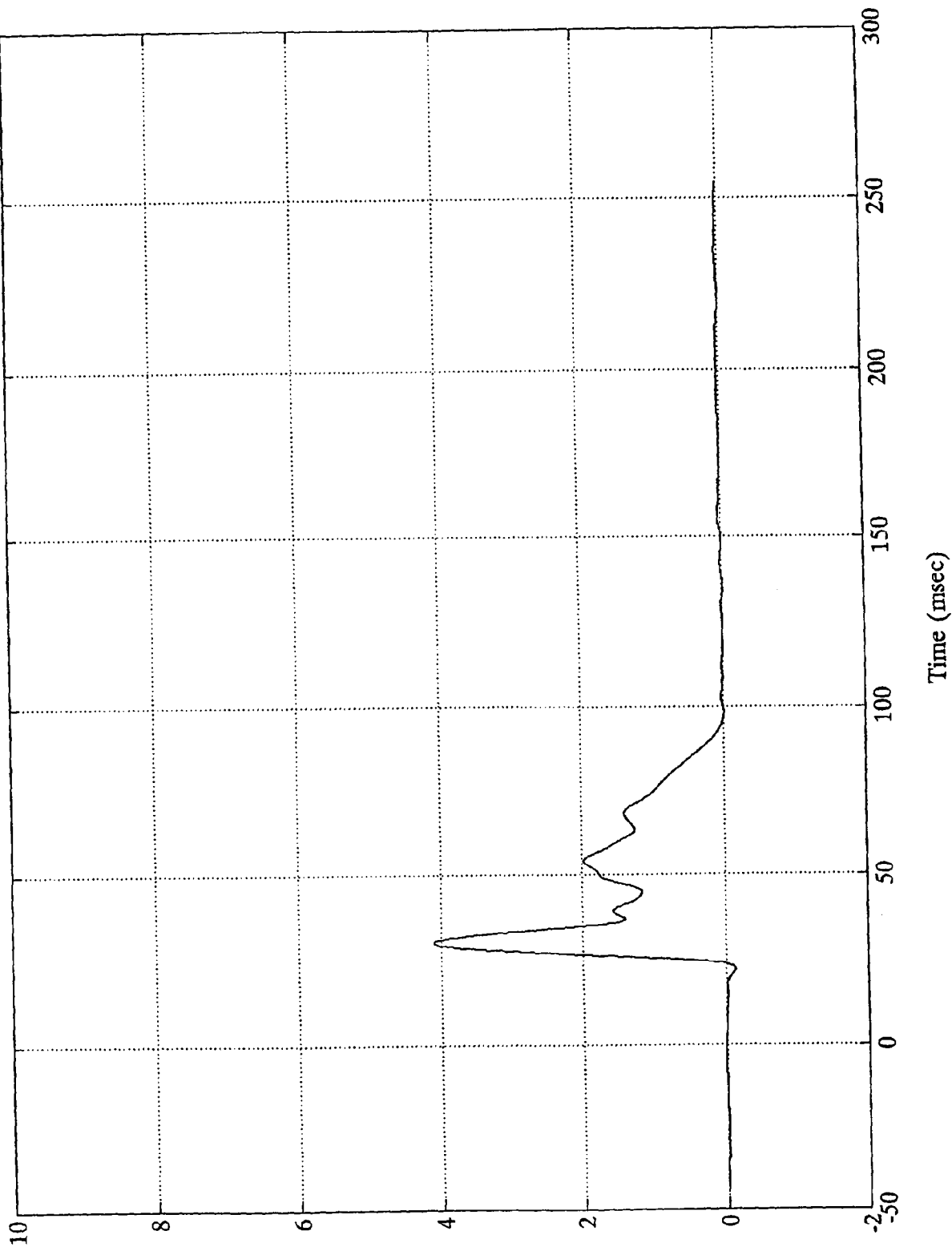
SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

$\times 10^4$

Barrier Load Cell C8

Max = 41122.20 Nwt @ 30.47 msec
Min = -1310.17 Nwt @ 22.31 msec



1N
B-56

8058-8

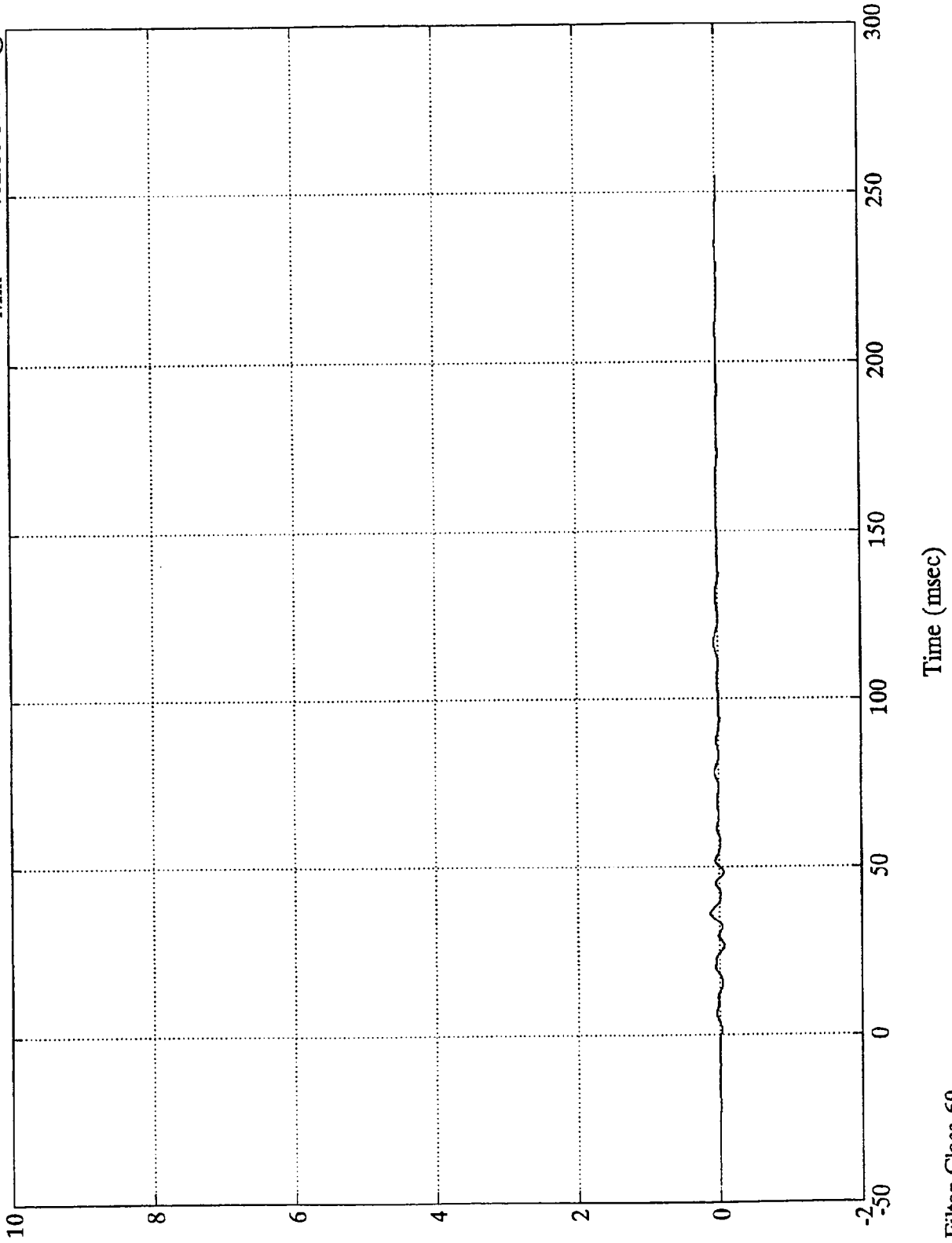
SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

$\times 10^4$

Barrier Load Cell C9

Max = 1201.55 Nwt @ 36.12 msec
Min = -702.66 Nwt @ 26.39 msec

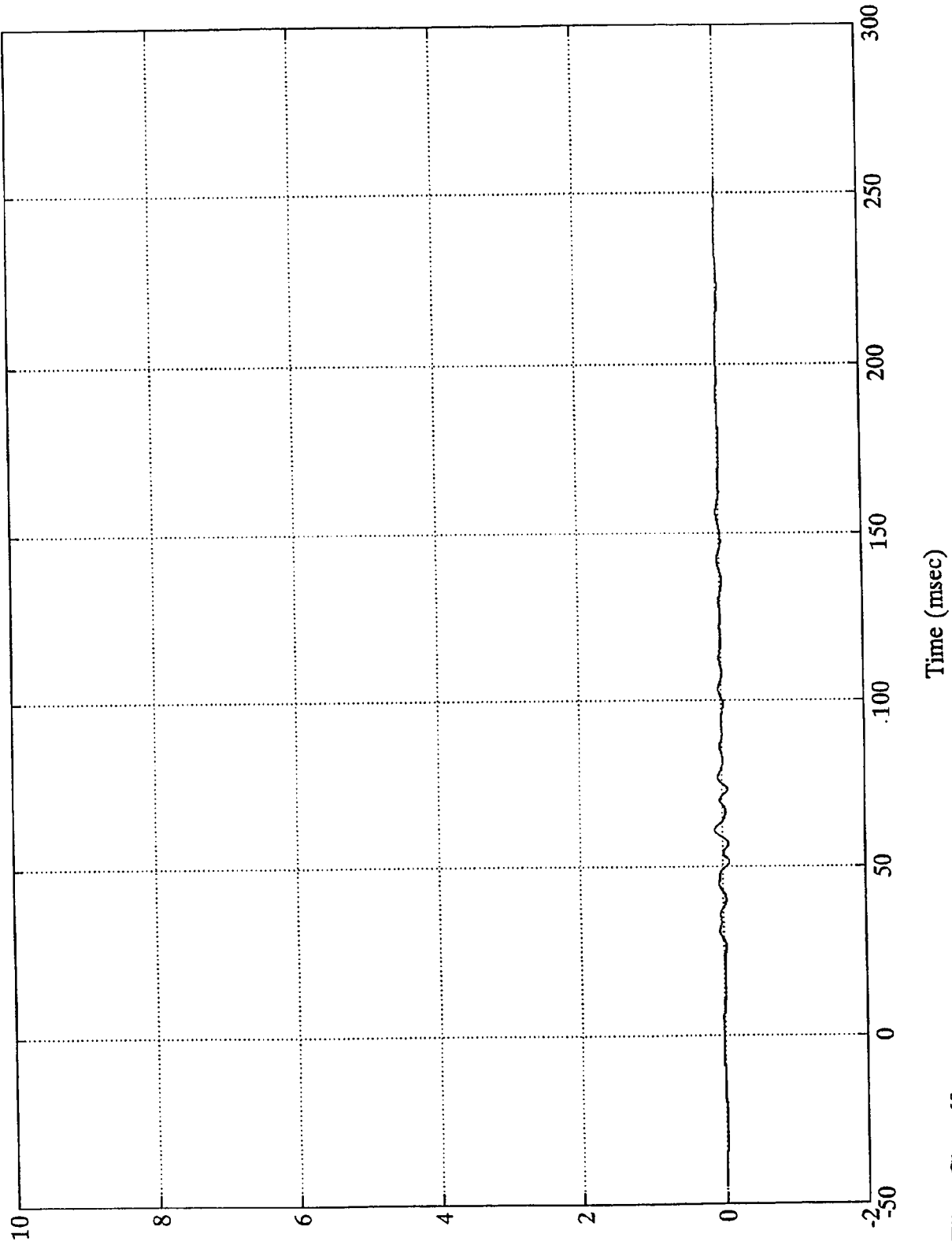


NCAP TEST #12 - 1993 ISUZU RODEO

$\times 10^4$

Barrier Load Cell D1

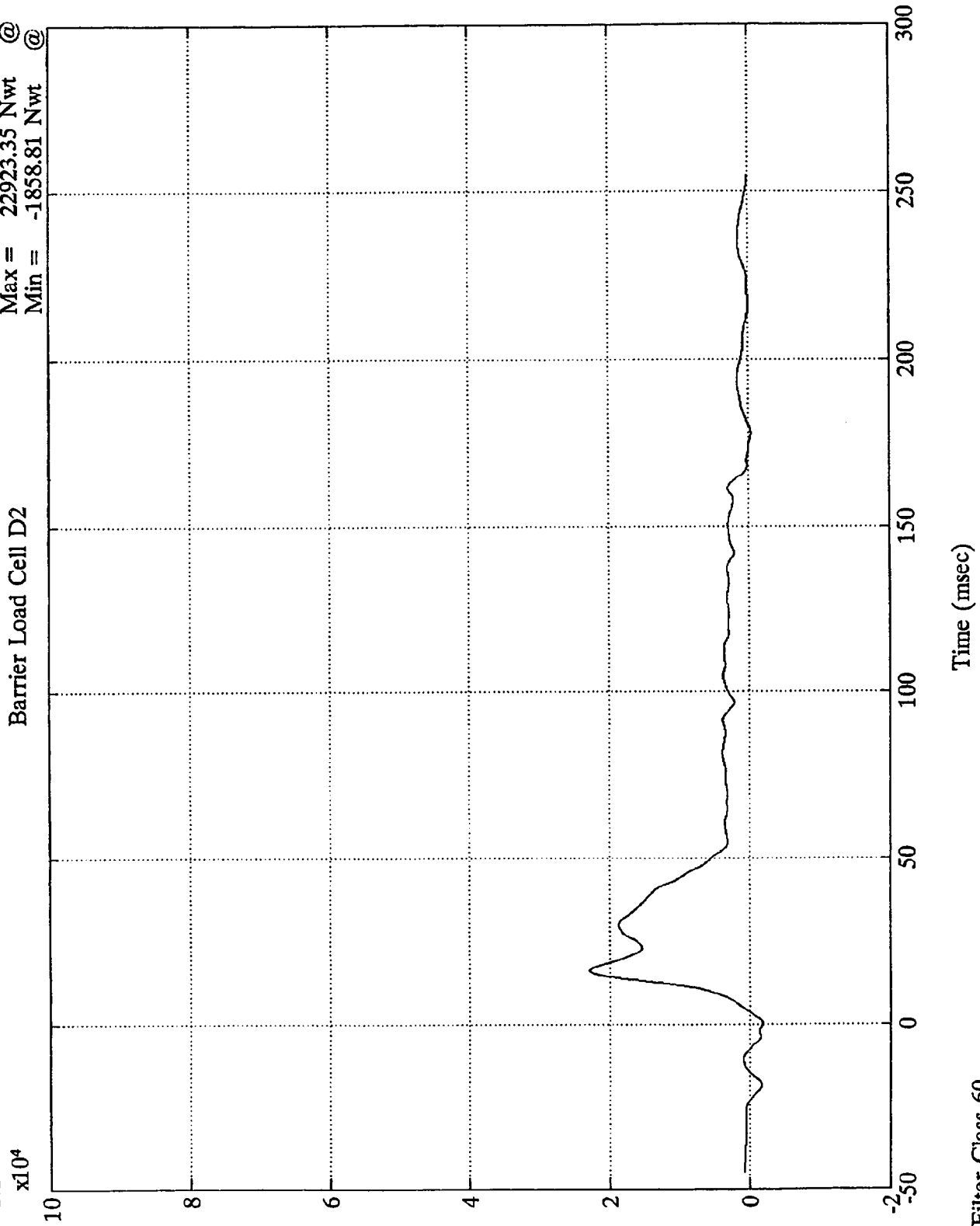
Max = 1067.26 Nwt @ 61.08 msec
Min = -806.93 Nwt @ 51.47 msec



SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

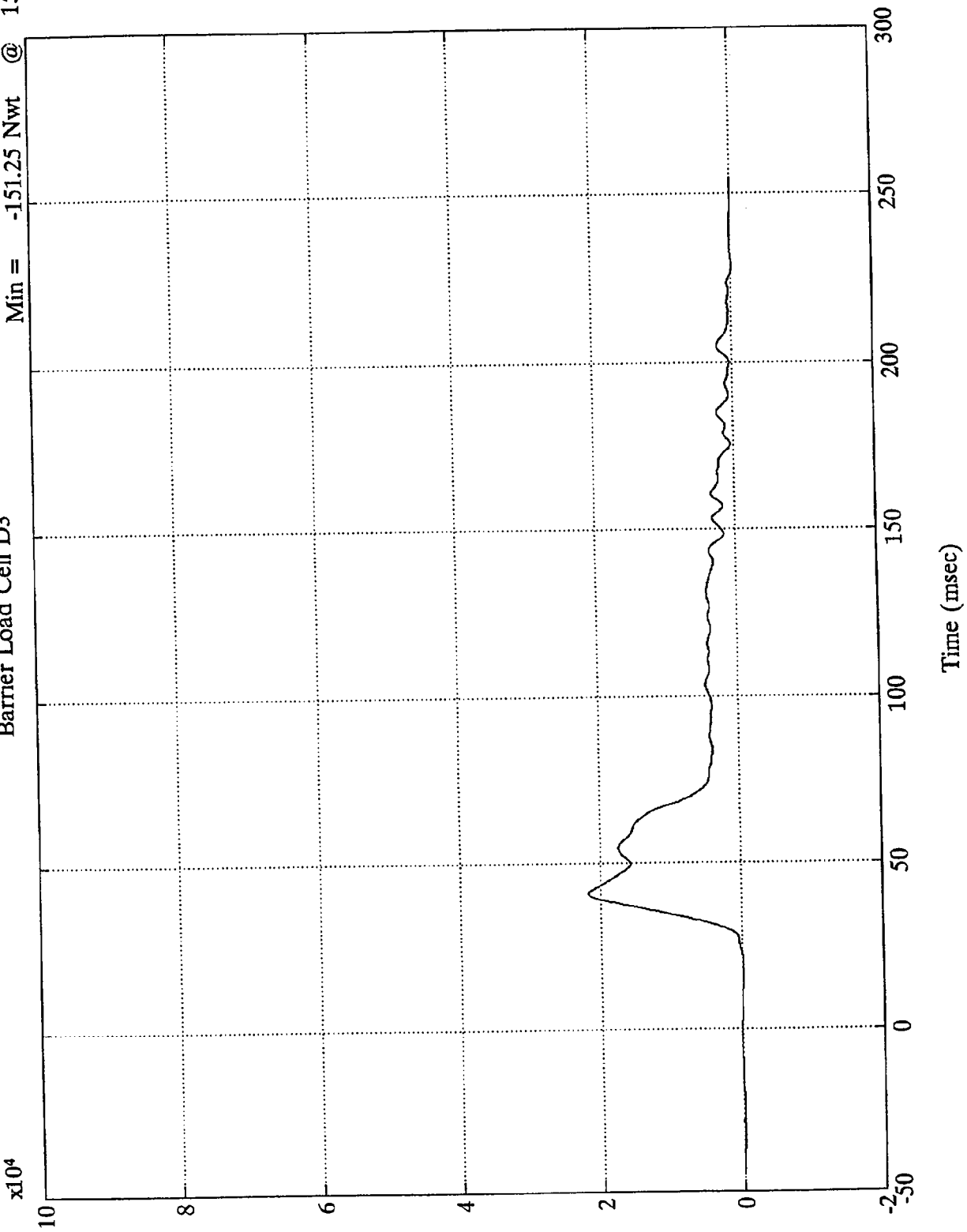
Barrier Load Cell D2
Max = 22923.35 Nwt @ 15.95 msec
Min = -1858.81 Nwt @ 0.11 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell D3

Max = 21805.55 Nwt @ 40.92 msec
Min = -151.25 Nwt @ 15.83 msec



1WV
B-60

8058-8

SAE Filter Class 60

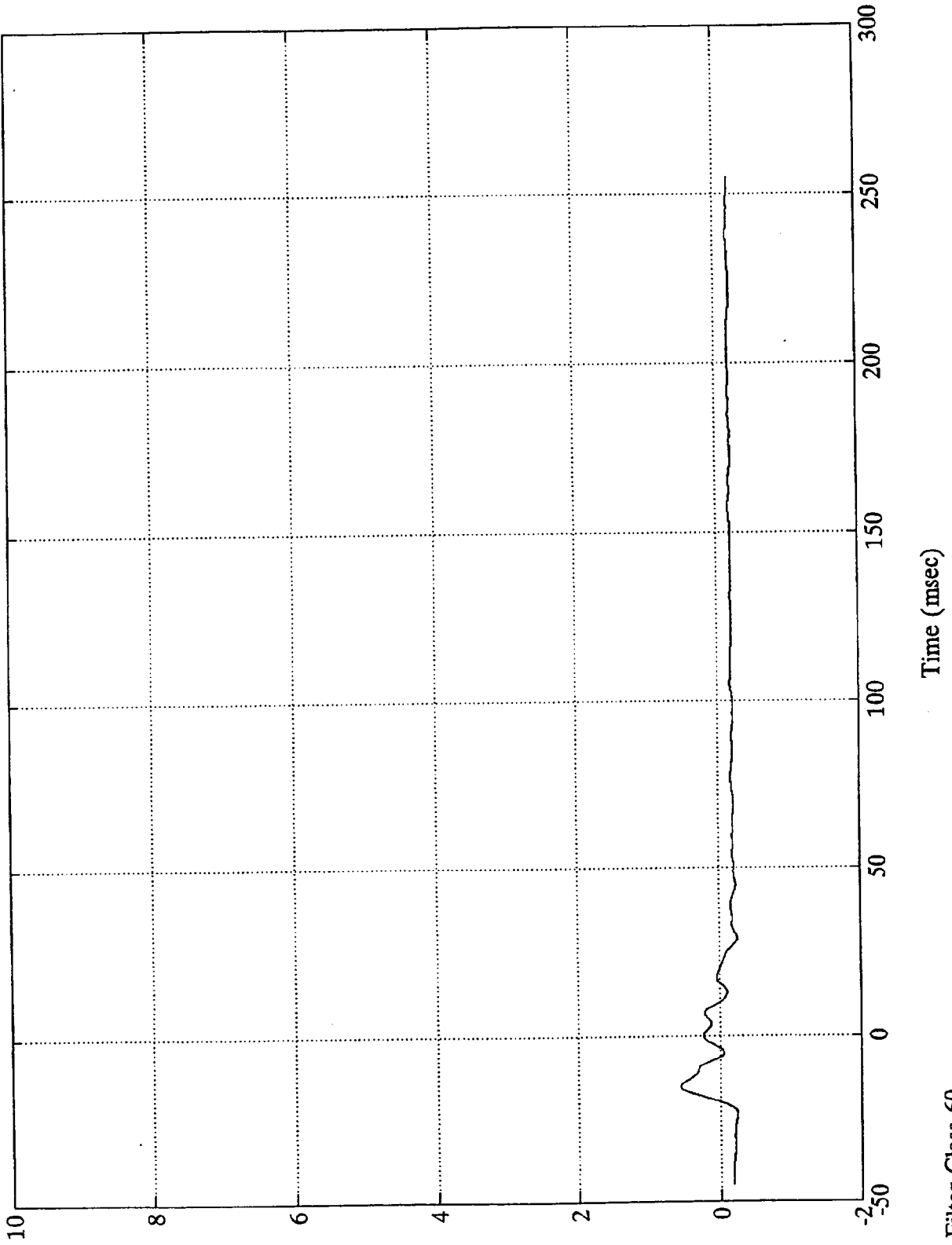


NCAP TEST #12 - 1993 ISUZU RODEO

$\times 10^4$

Barrier Load Cell D4

Max = 5585.18 Nwt @ -15.48 msec
Min = -2516.20 Nwt @ 29.03 msec



1wN
B-61

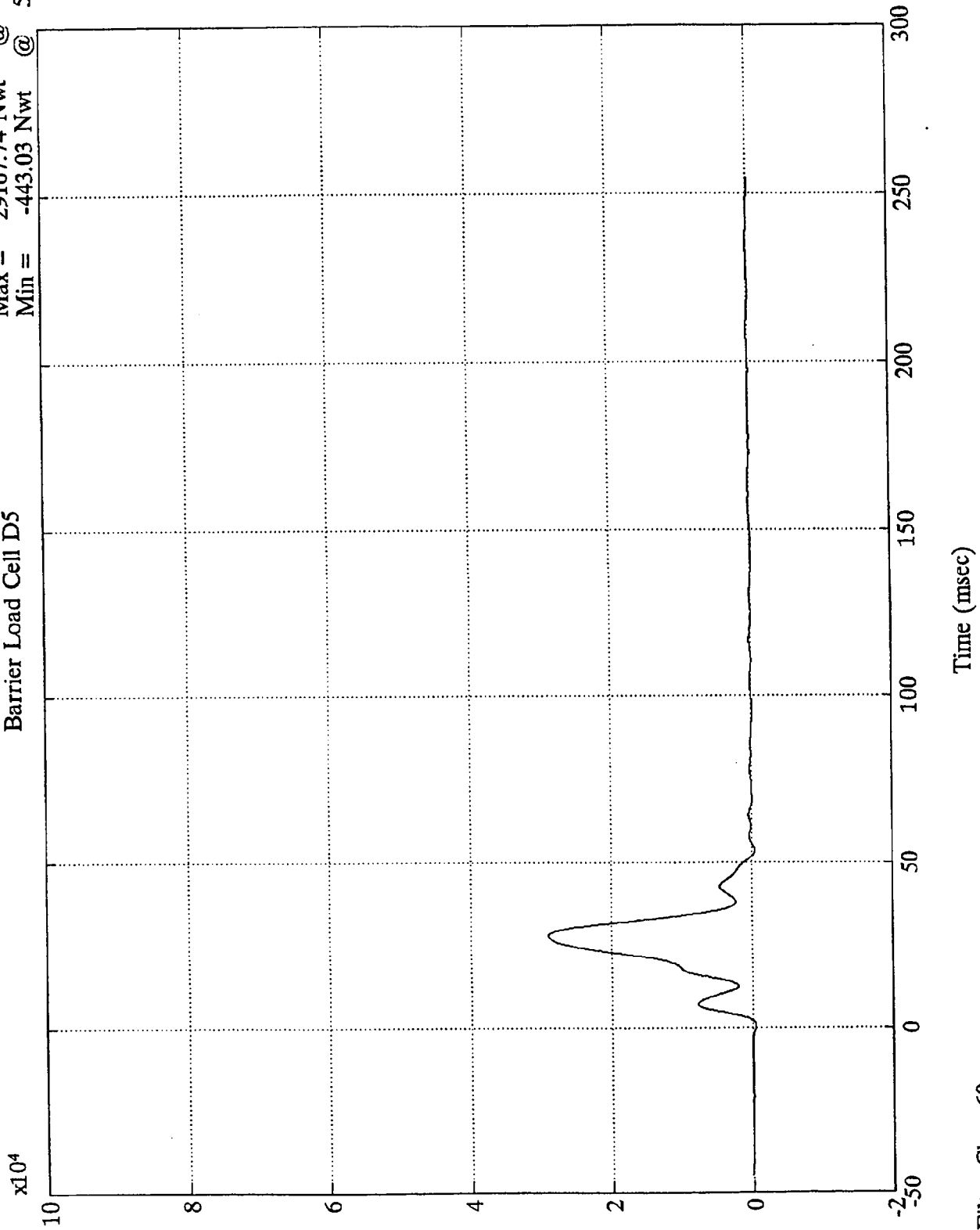
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell D5

Max = 29107.74 Nwt @ 27.84 msec
Min = -443.03 Nwt @ 53.88 msec



14N
B-62

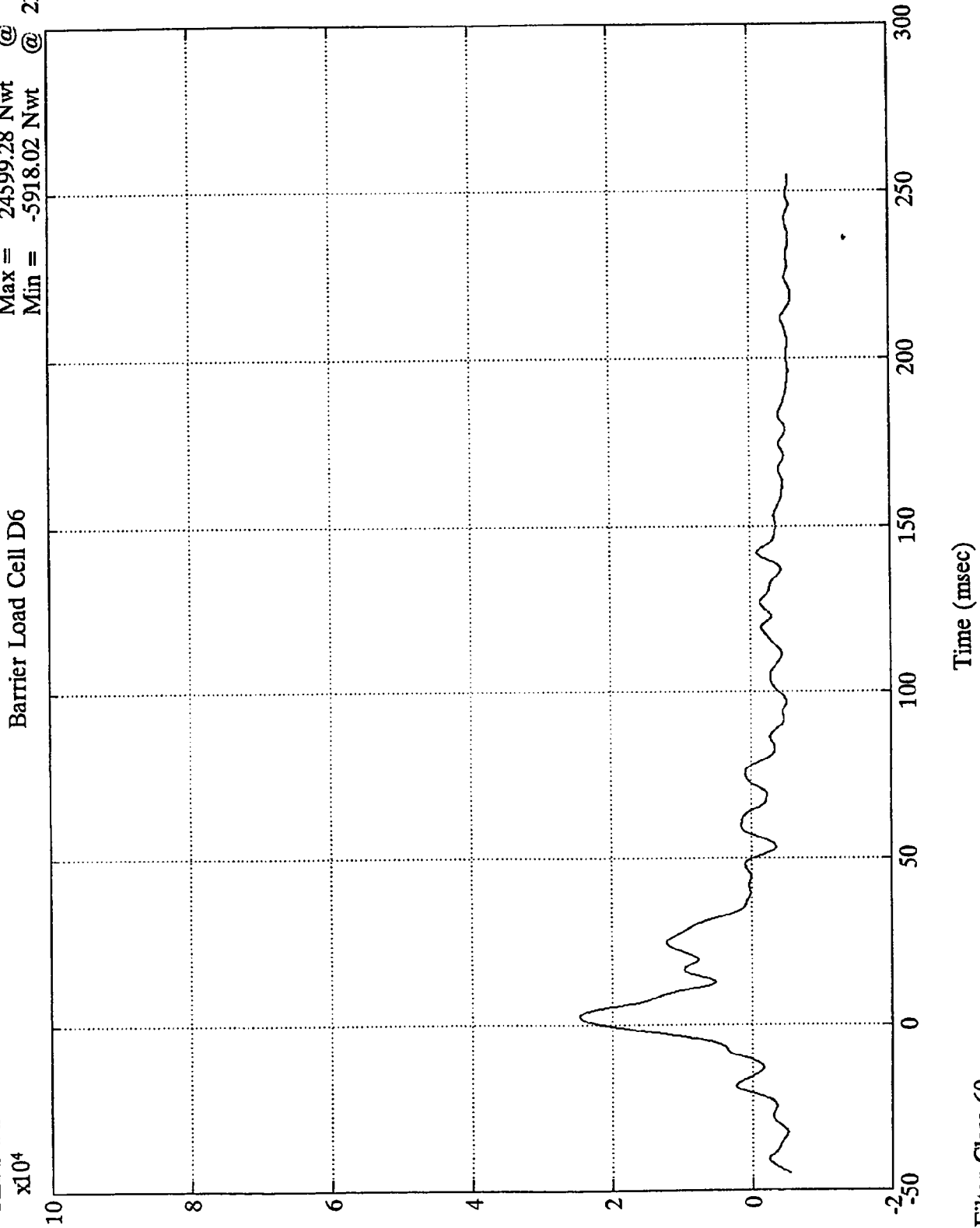
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell D6

Max = 24599.28 Nwt @ 2.39 msec
Min = -5918.02 Nwt @ 217.68 msec



1W
B-63

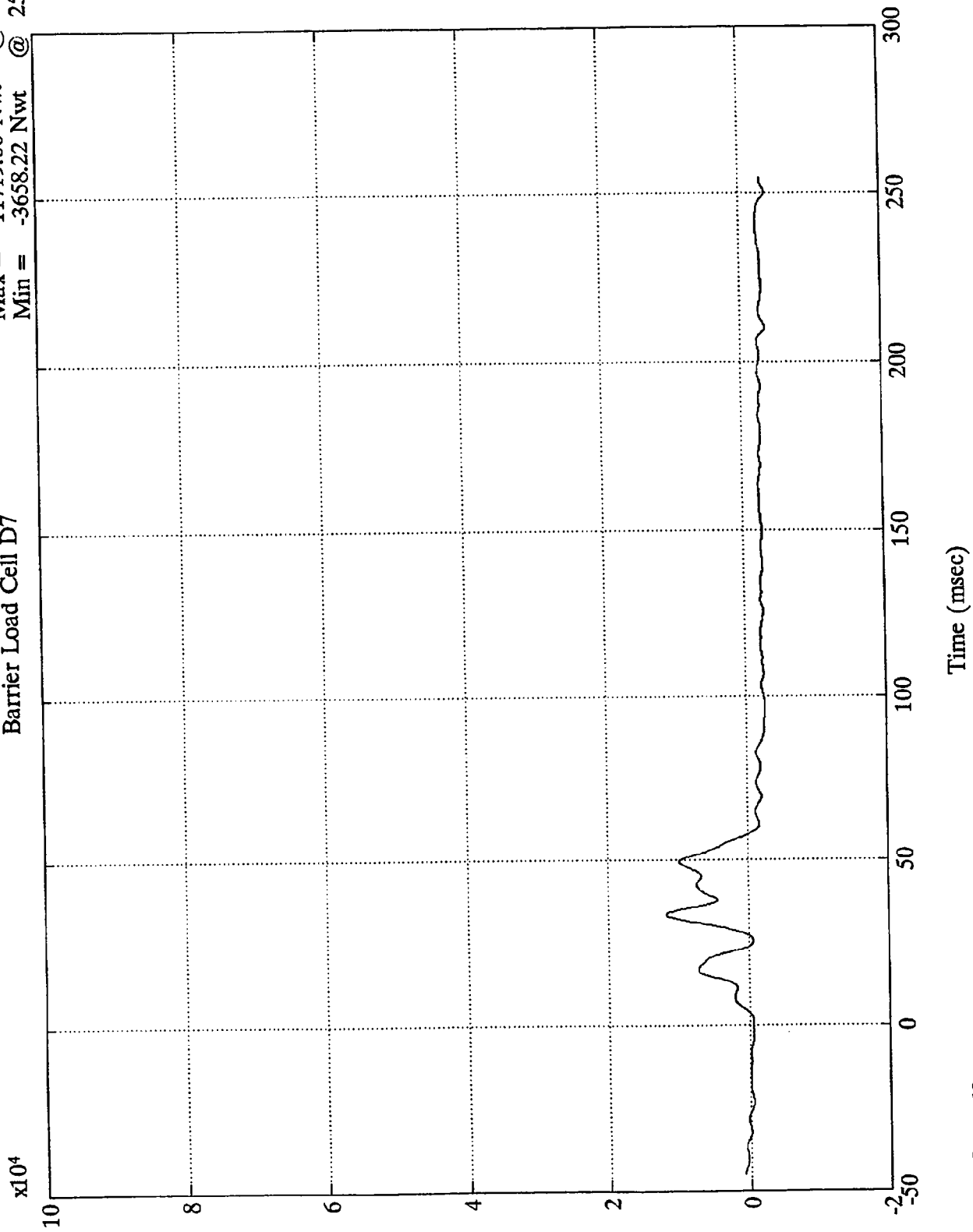
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell D7

Max = 11719.00 Nwt @ 33.59 msec
Min = -3658.22 Nwt @ 250.32 msec



11N
B-64

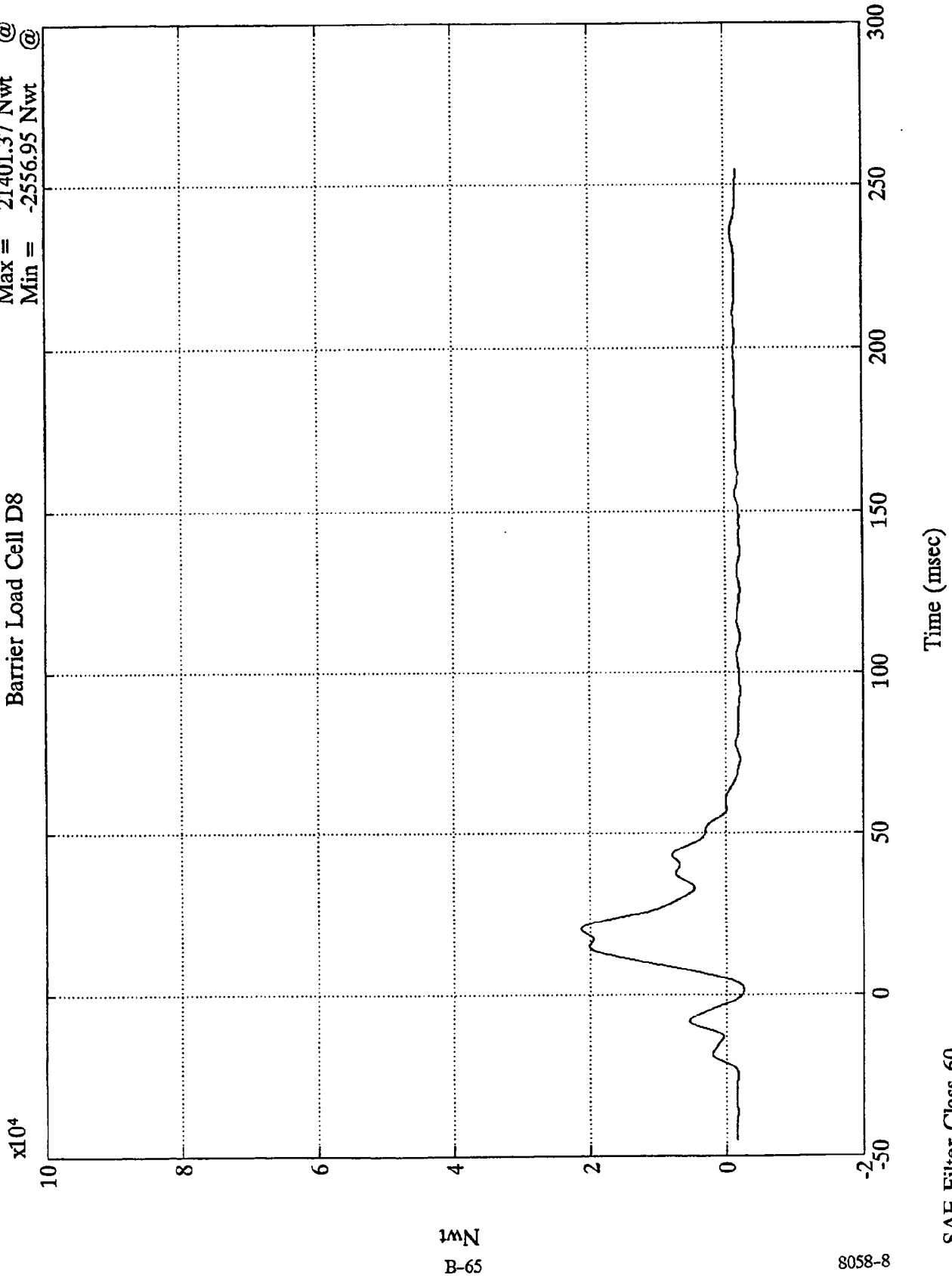
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Barrier Load Cell D8

Max = 21401.37 Nwt @ 20.39 msec
Min = -2556.95 Nwt @ 1.55 msec



1N
B-65

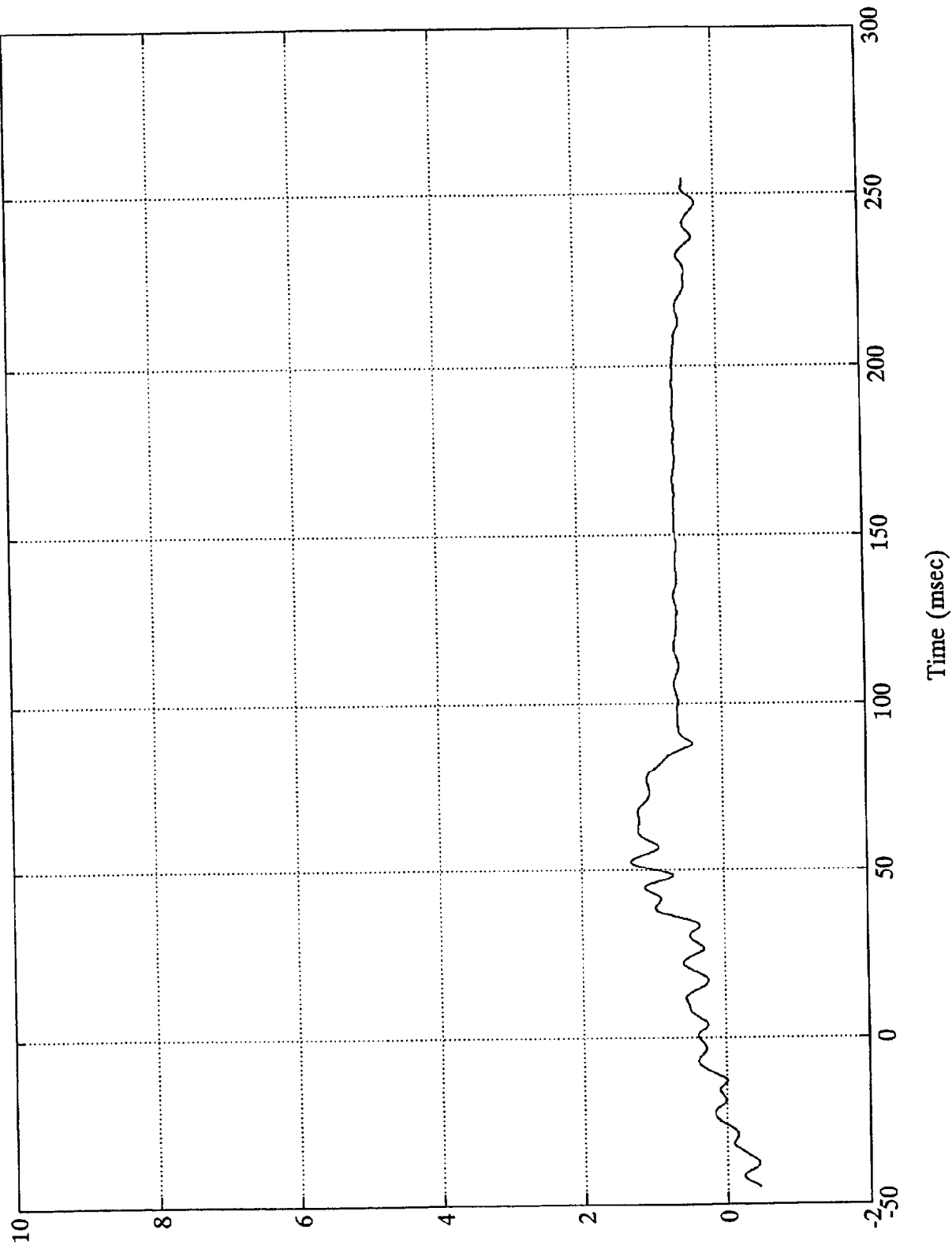
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO
x10⁴

Barrier Load Cell D9

Max = 13057.12 Nwt @ 52.56 msec
Min = -4571.65 Nwt @ -44.88 msec



11N
B-66

8058-8

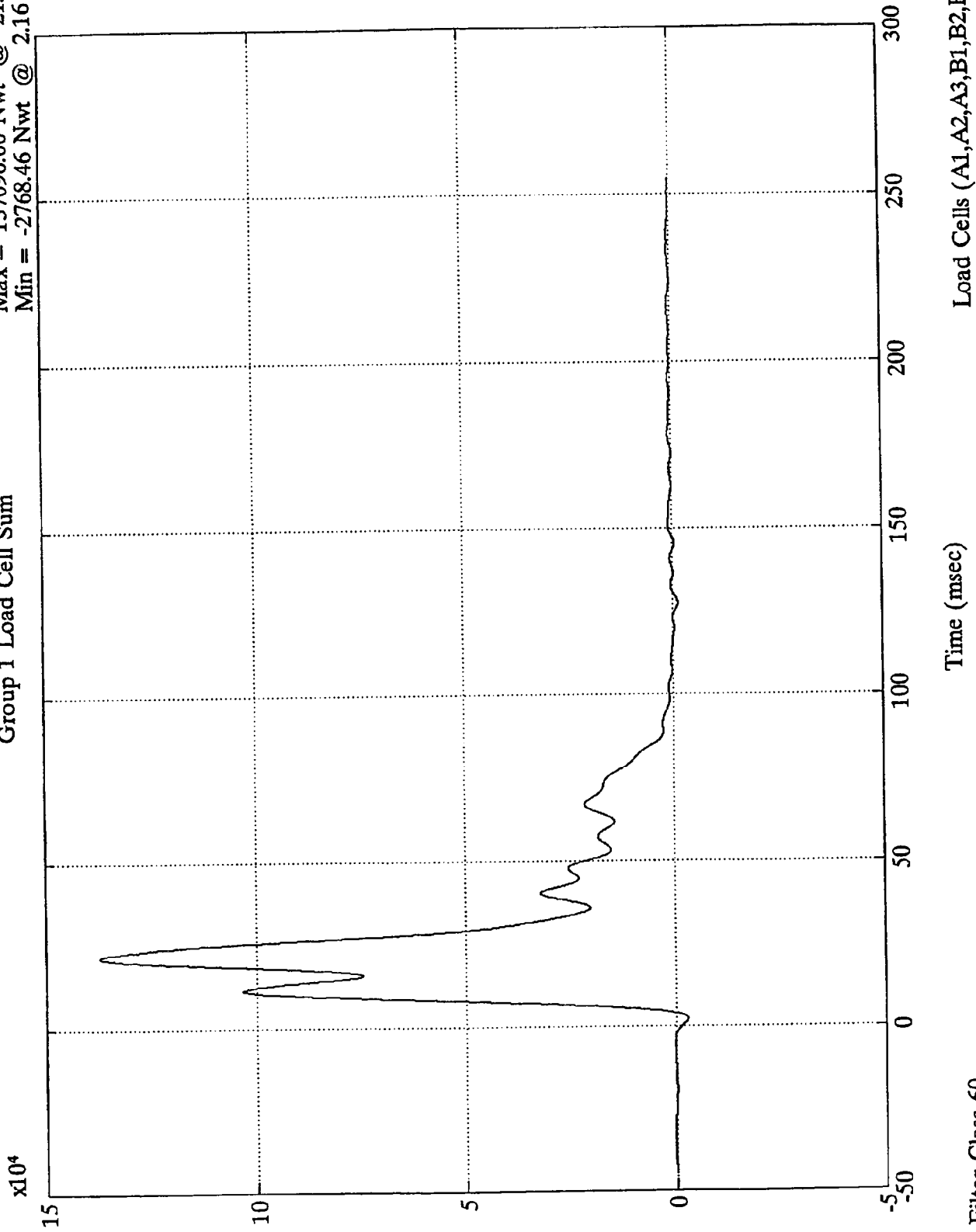
SAE Filter Class 60

Time (msec)

NCAP TEST #12 - 1993 ISUZU RODEO

Group 1 Load Cell Sum

Max = 137090.00 Nwt @ 21.60 msec
Min = -2768.46 Nwt @ 2.16 msec

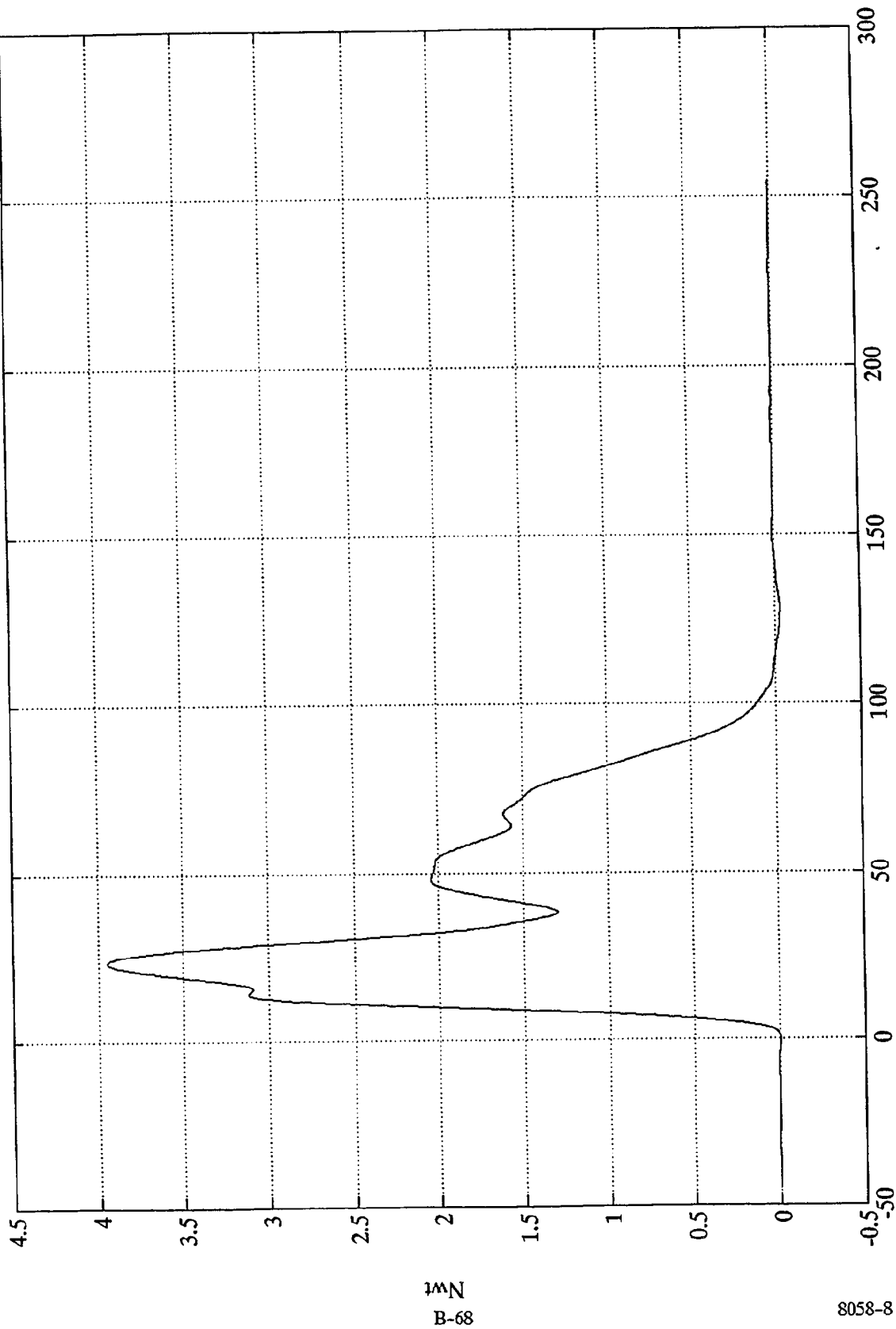


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO
x10⁵

Group 2 Load Cell Sum

Max = 394724.00 Nwt @ 23.28 msec
Min = -3388.48 Nwt @ 128.28 msec



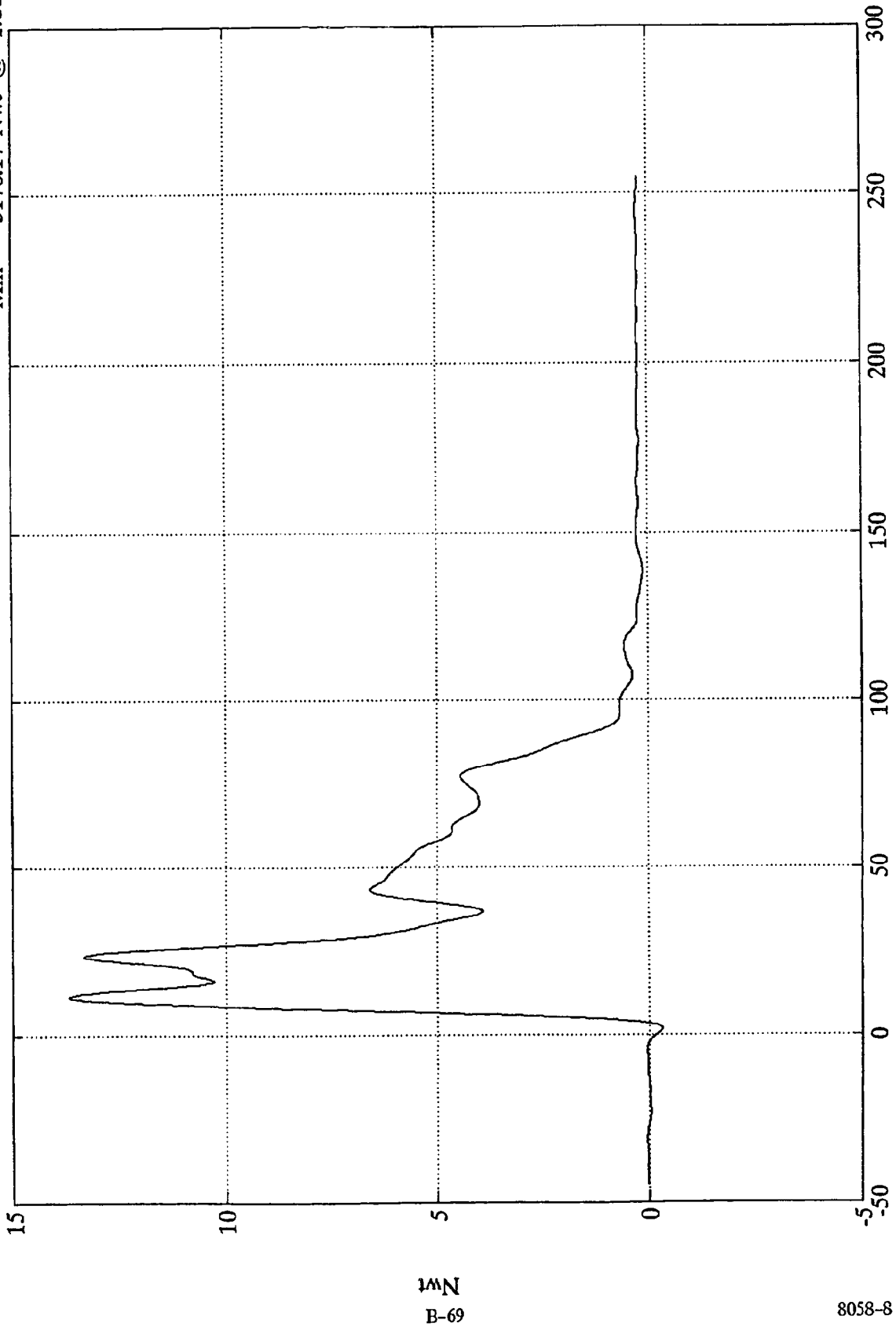
Load Cells (A4,A5,A6,B4,B5,B6)

Time (msec)

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Group 3 Load Cell Sum
Max = 136831.00 Nwt @ 11.28 msec
Min = -3176.17 Nwt @ 1.80 msec



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

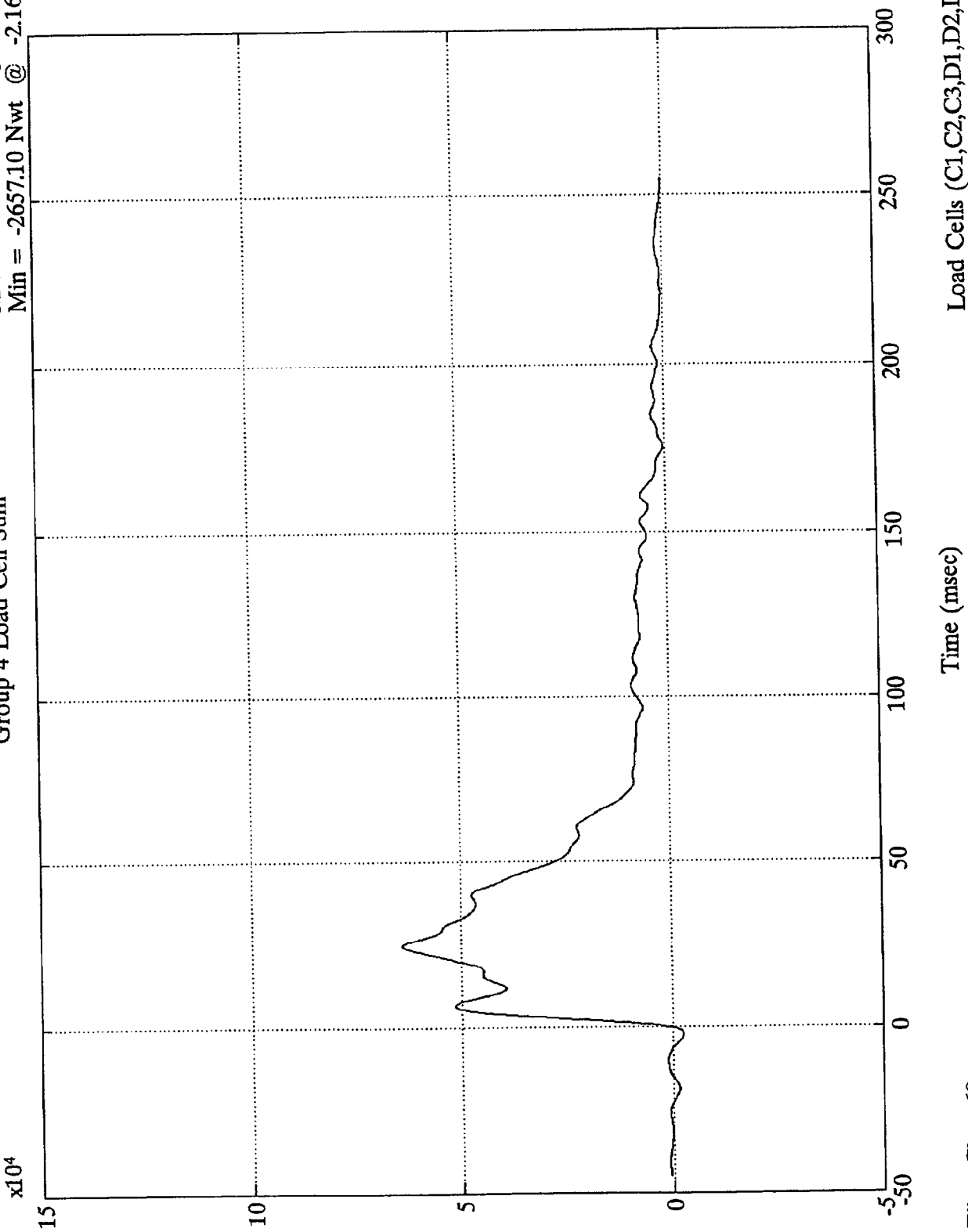
Time (msec)

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Group 4 Load Cell Sum

Max = 64024.50 Nwt @ 24.36 msec
Min = -2657.10 Nwt @ -2.16 msec

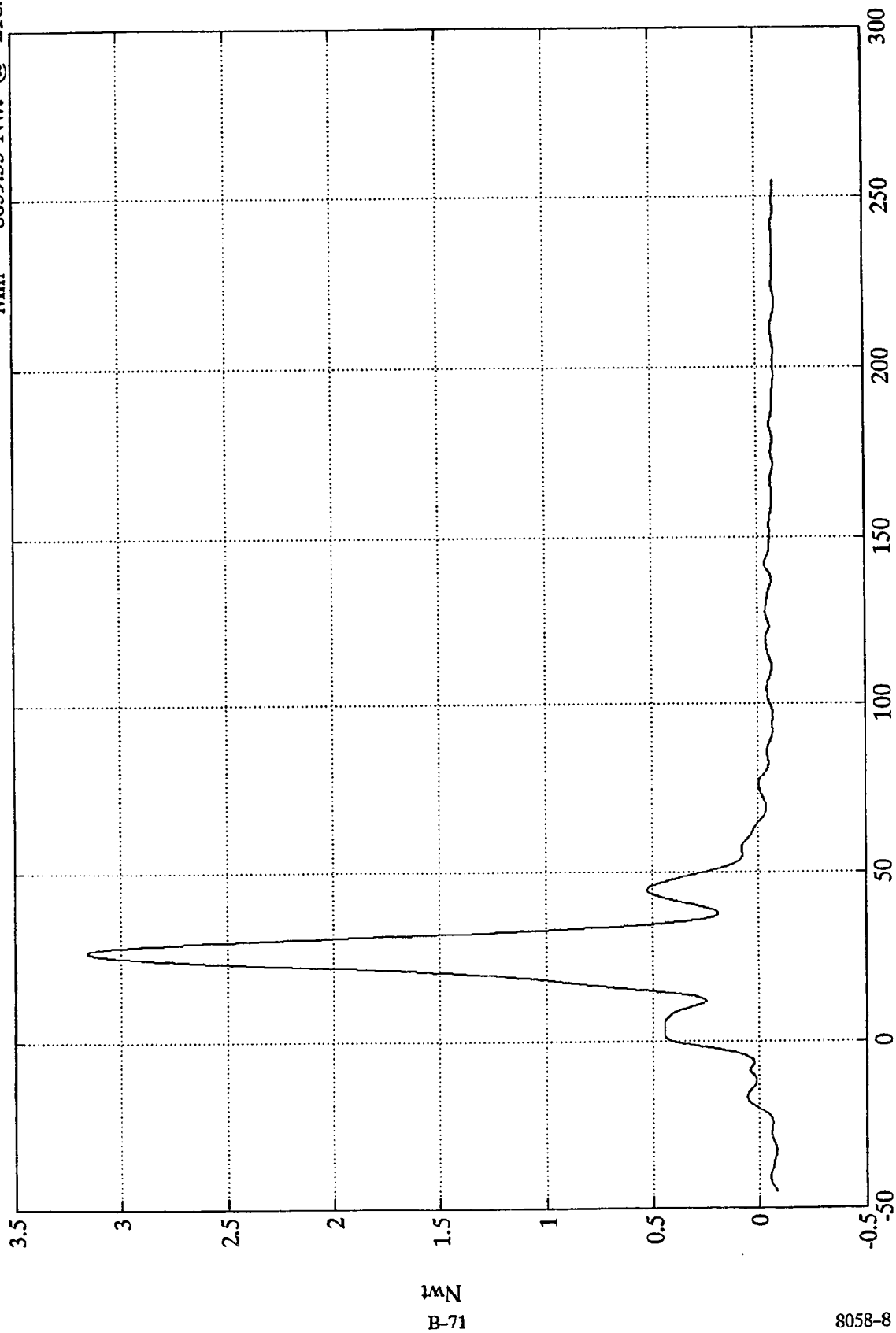


SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO
x10⁵

Group 5 Load Cell Sum

Max = 316065.00 Nwt @ 26.76 msec
Min = -8659.33 Nwt @ 218.04 msec



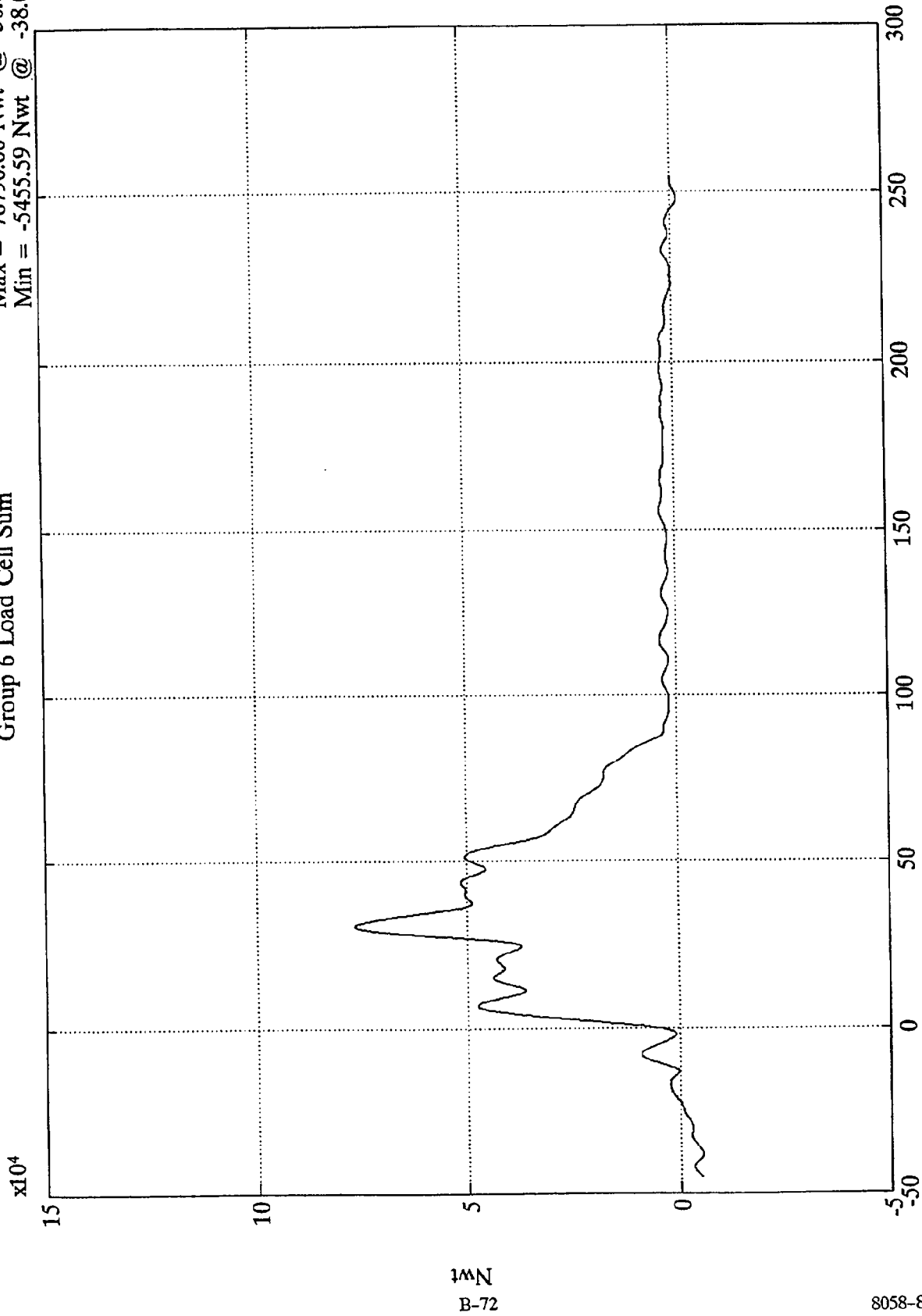
Load Cells (C4,C5,C6,D4,D5,D6)

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 76790.60 Nwt @ 30.60 msec
 Min = -5455.59 Nwt @ -38.04 msec

Group 6 Load Cell Sum



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

Time (msec)

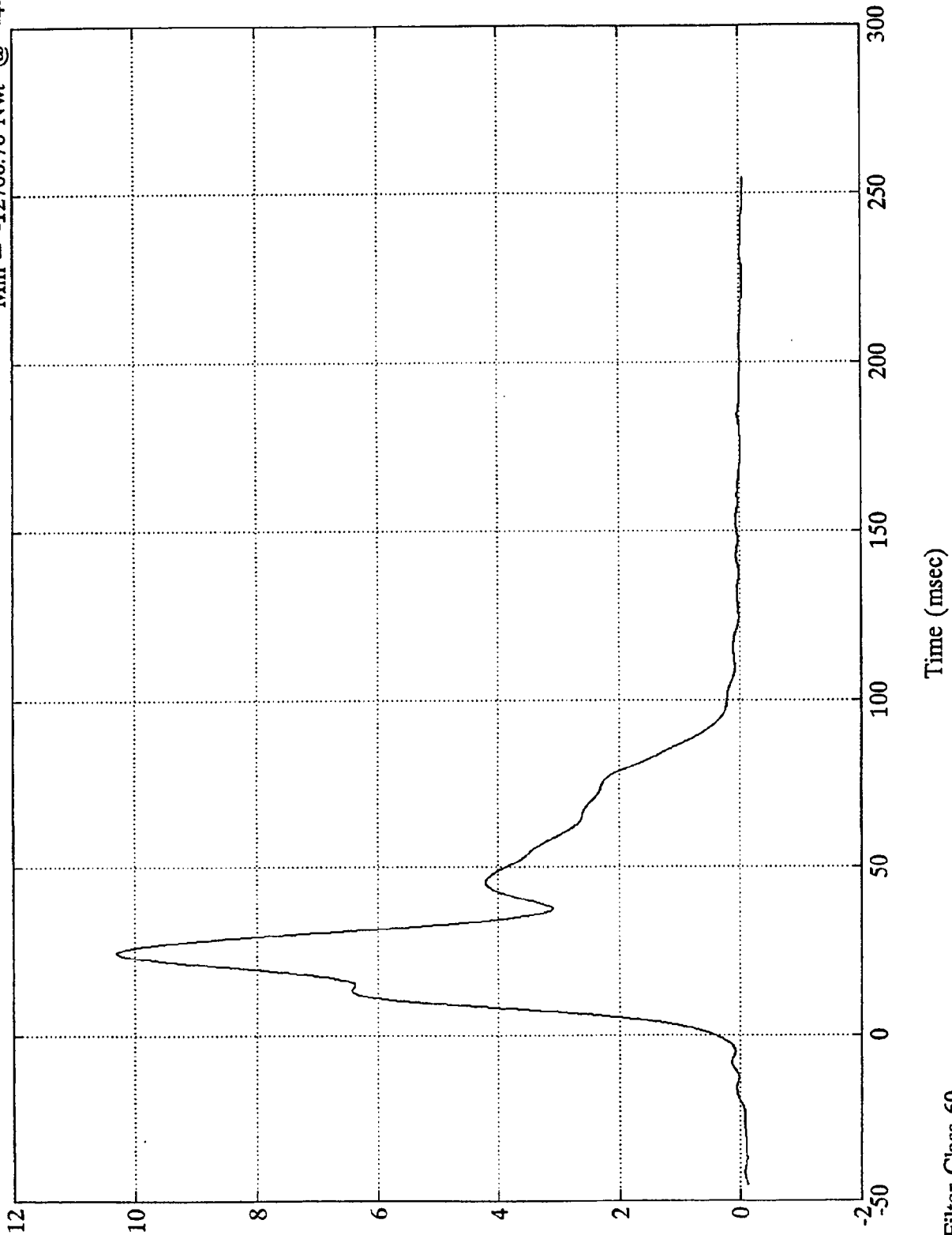
SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 1028750.00 Nwt @ 24.48 msec
Min = -12700.70 Nwt @ -44.88 msec

Total Load Cell Sum

$\times 10^5$



1wN
B-73

8058-8

SAE Filter Class 60

TEST NO. MP5700

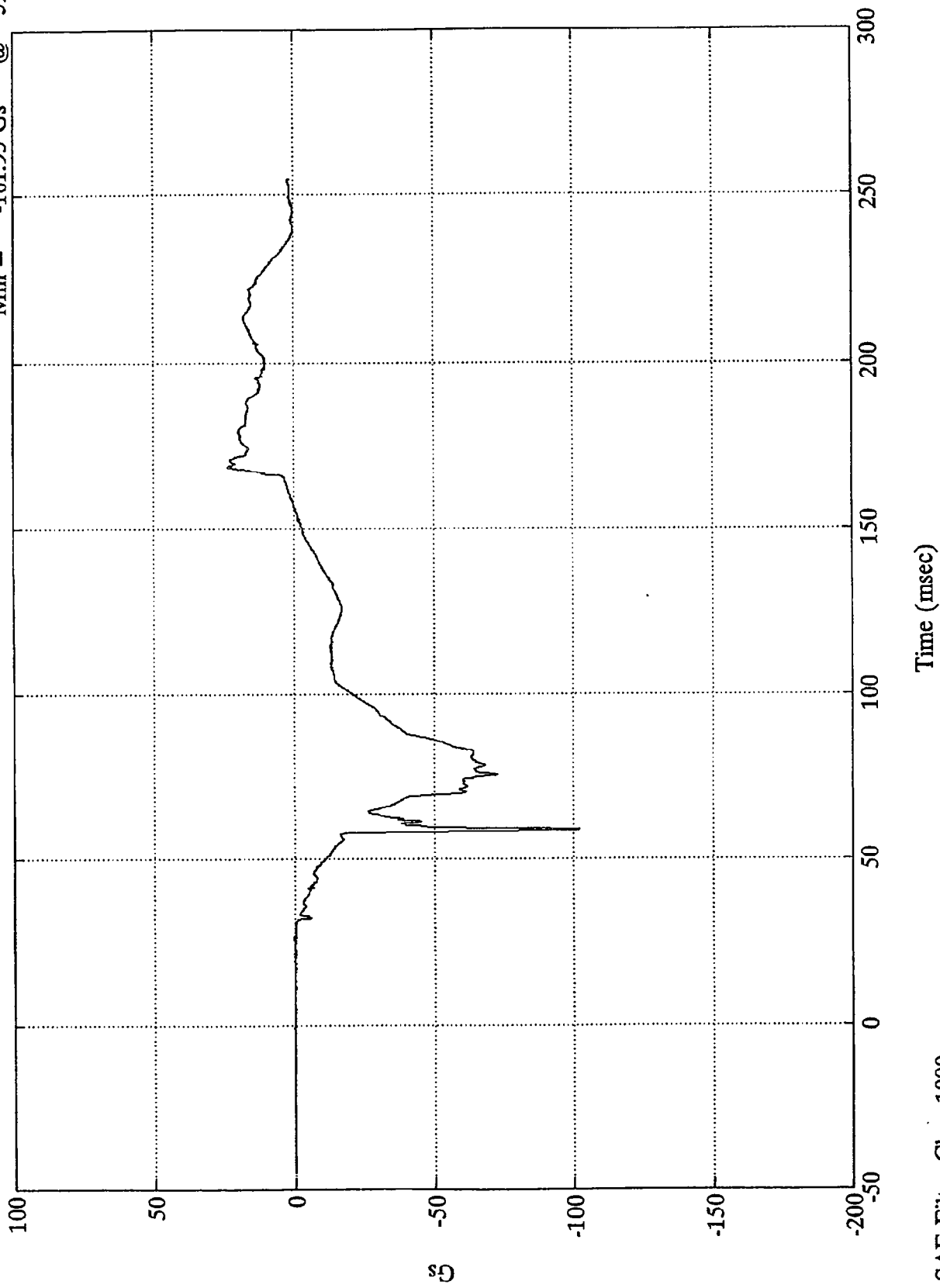
DUMMY DATA

	FILTER CHANNEL CLASS
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 #12 - 1993 ISUZU RODEO

Pos. 1 Head X

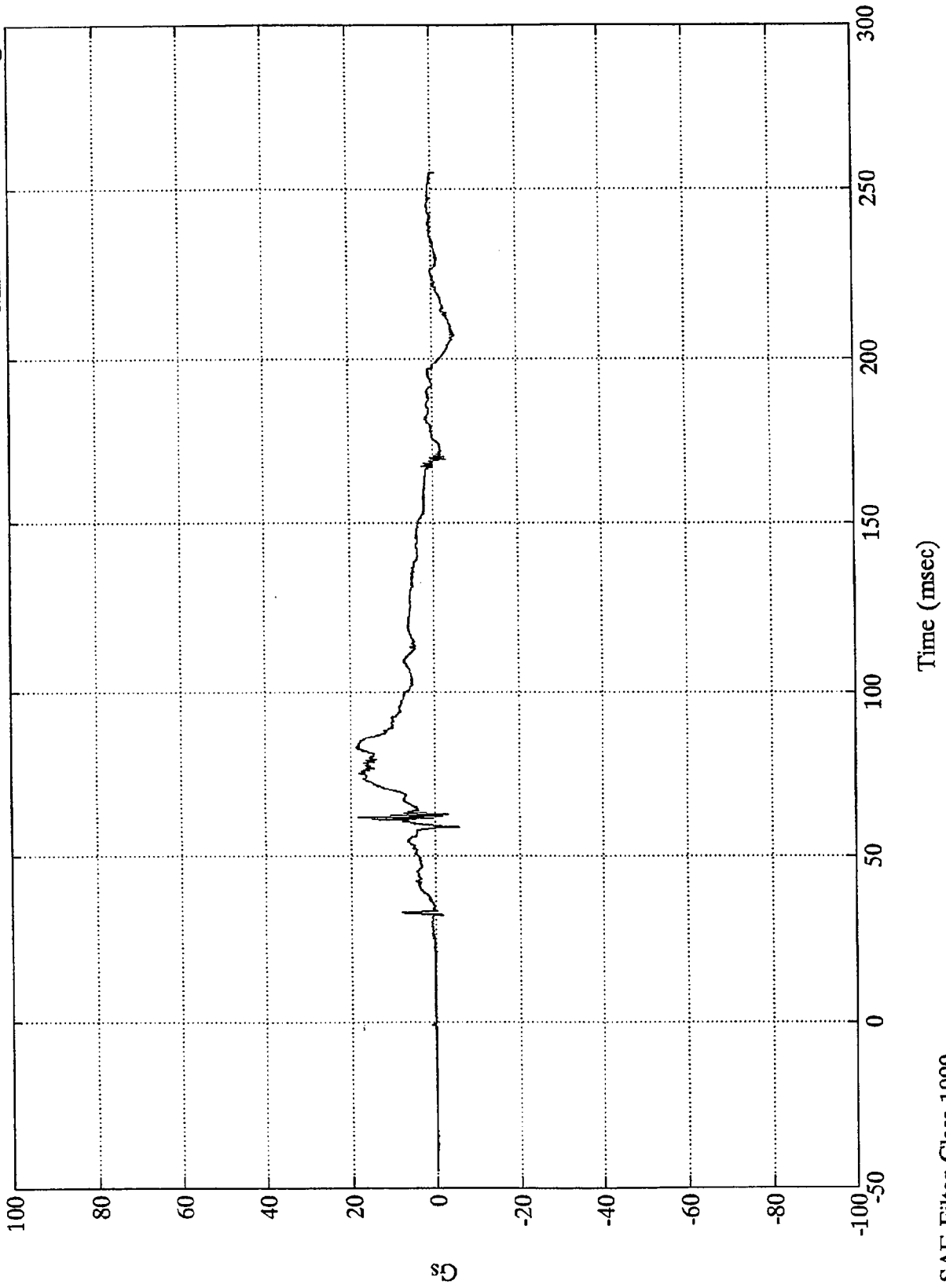
Max = 23.67 Gs @ 168.72 msec
Min = -101.93 Gs @ 59.04 msec



SAE Filter Class 1000

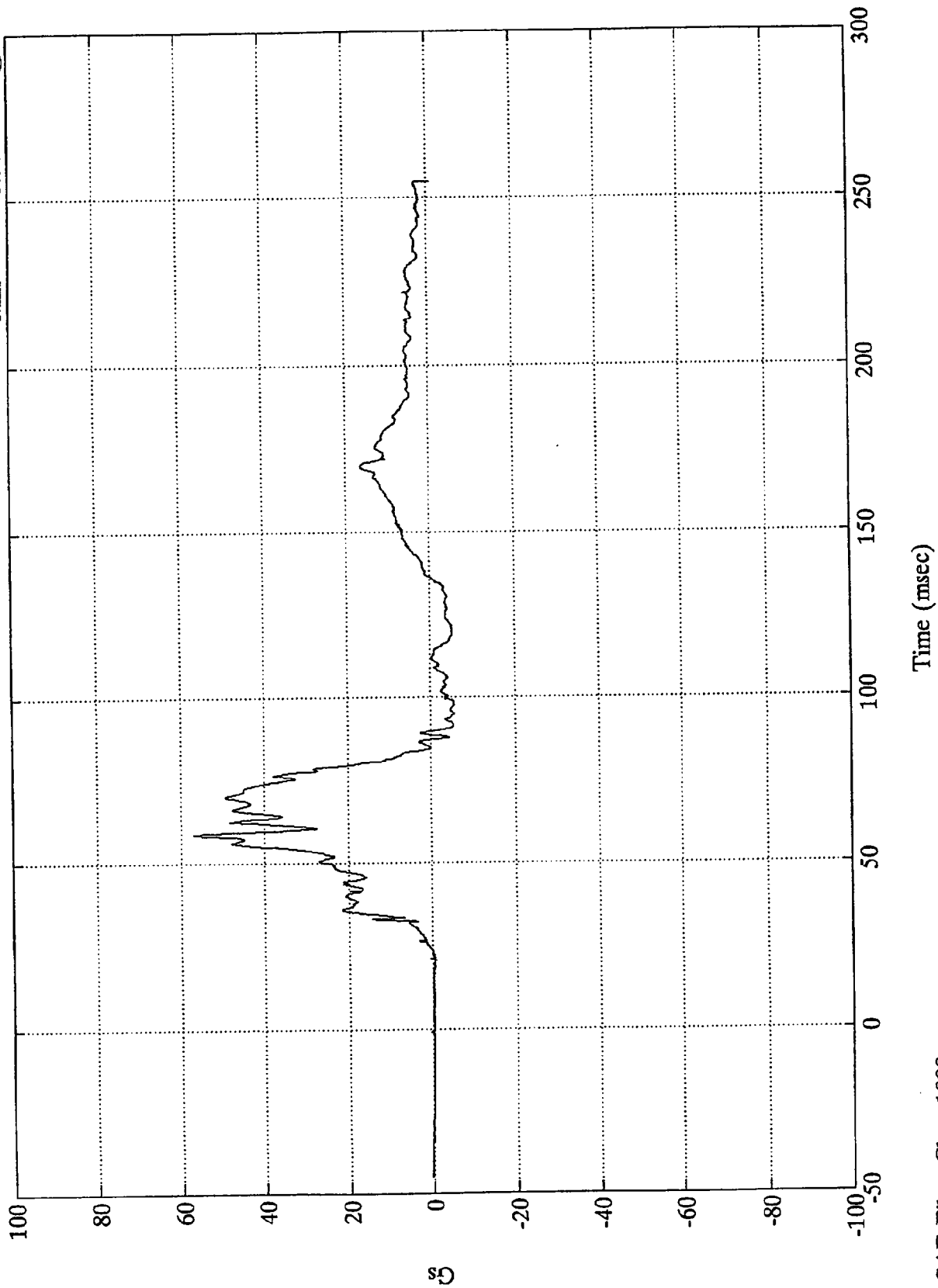
NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Head Y
Max = 18.79 Gs @ 83.28 msec
Min = -5.65 Gs @ 58.91 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Head Z
Max = 56.98 Gs @ 58.68 msec
Min = -5.56 Gs @ 98.40 msec



GS
B-77

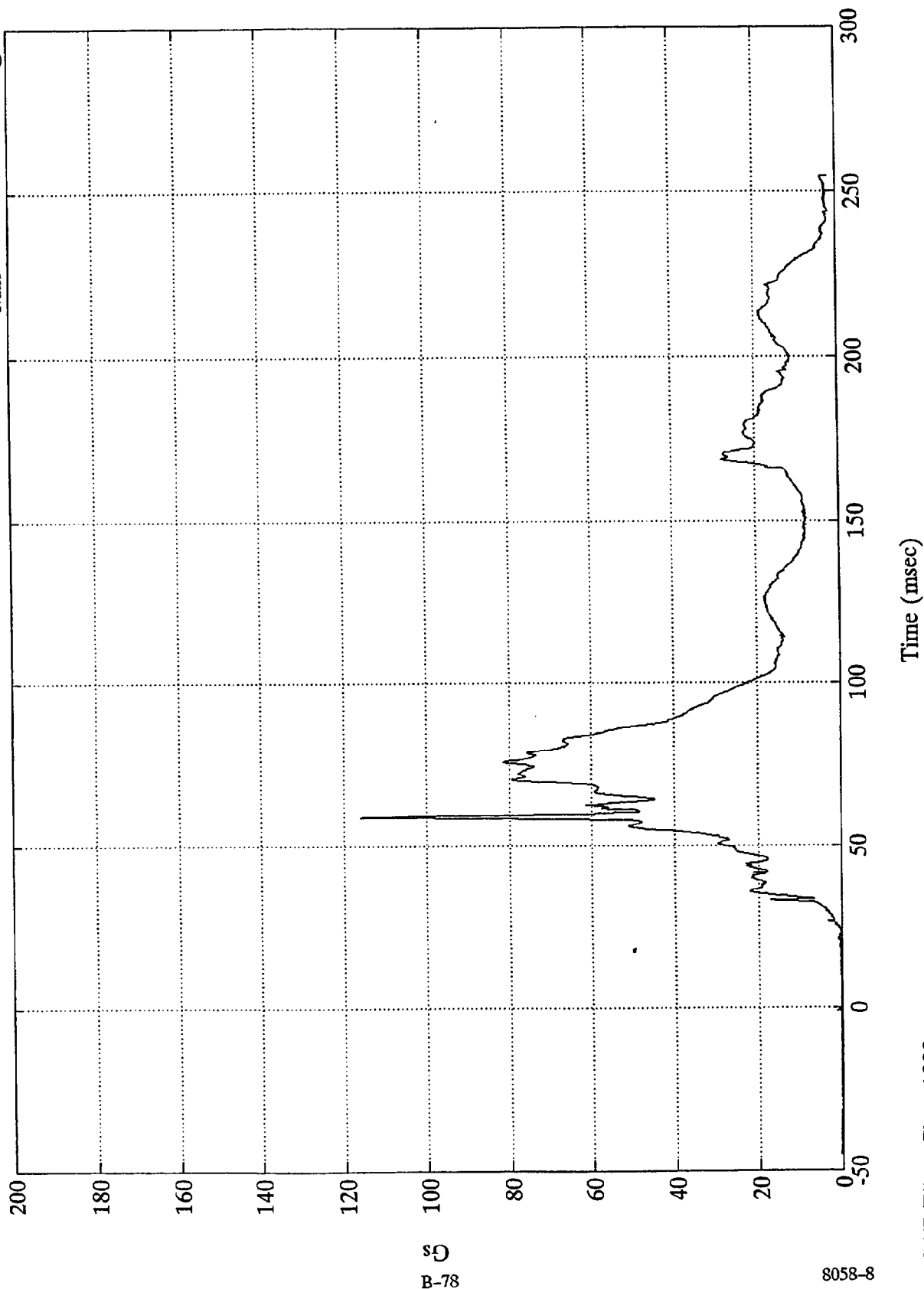
8058-8

SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Head Resultant

Max = 116.17 Gs @ 58.91 msec
Min = .06 Gs @ -20.52 msec



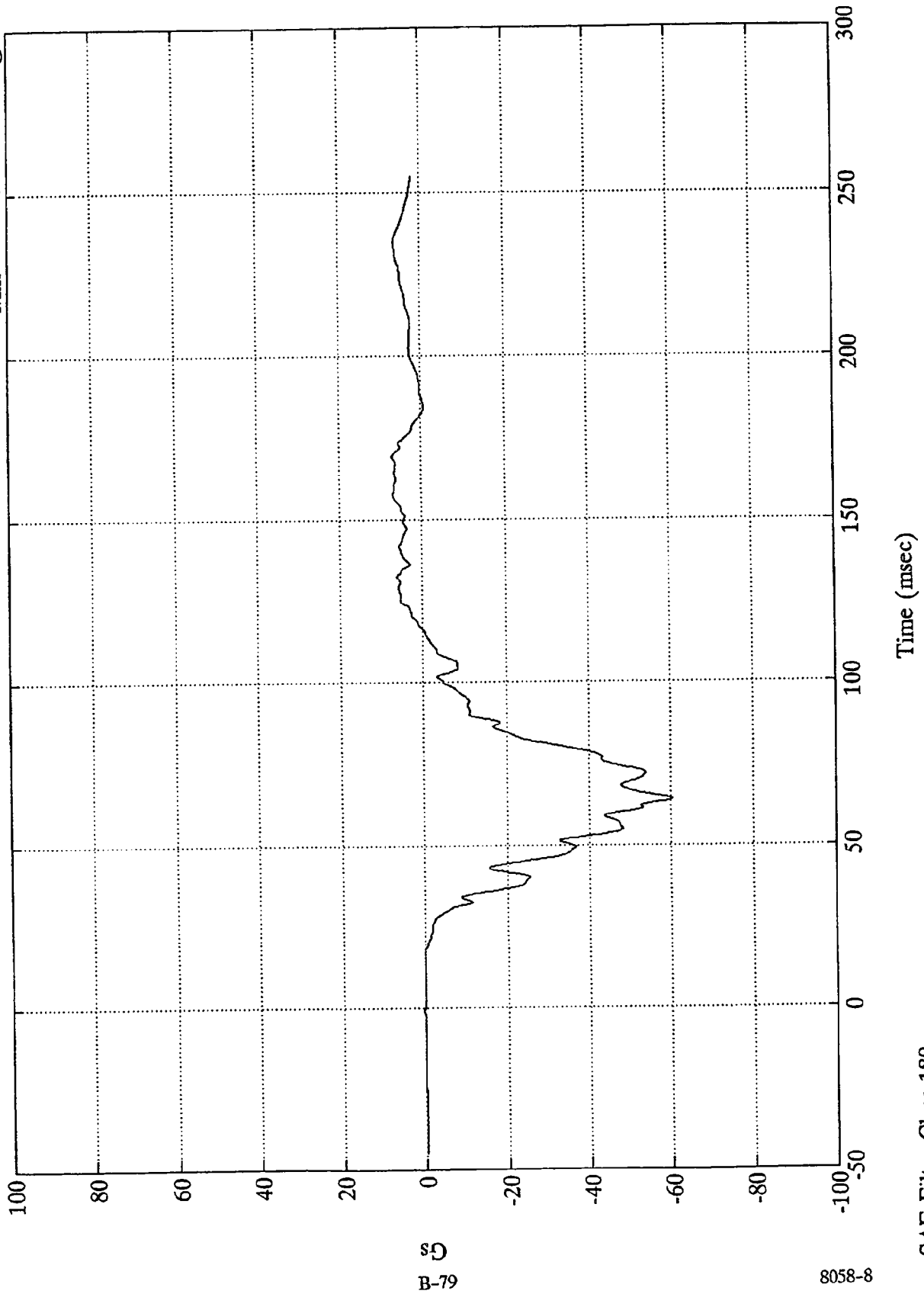
Gs
B-78

8058-8

SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Chest X
Max = 7.13 Gs @ 169.32 msec
Min = -60.29 Gs @ 64.08 msec



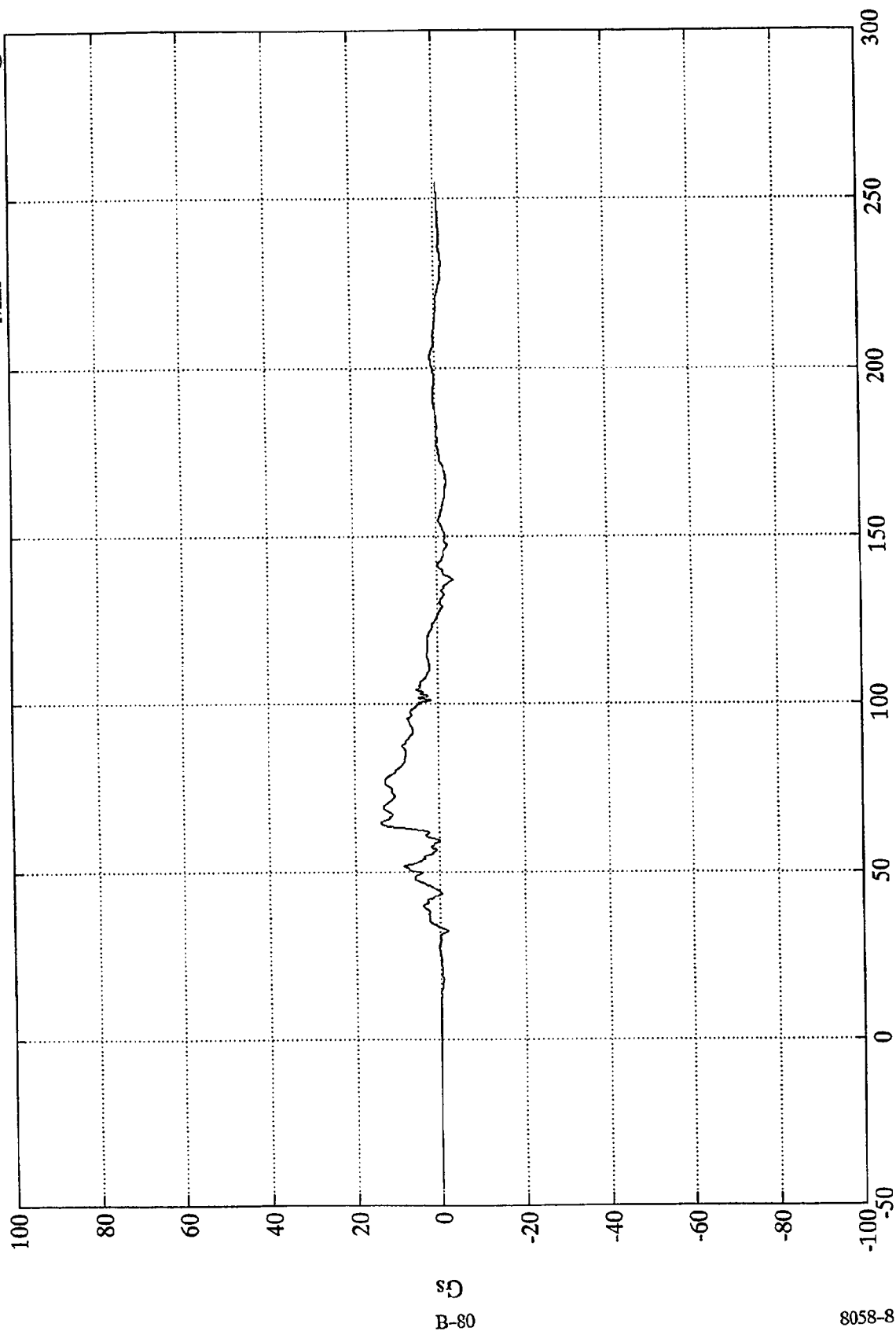
8058-8
B-79

SAE Filter Class 180

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 13.87 Gs @ 64.80 msec
Min = -3.70 Gs @ 137.04 msec

Pos. 1 Chest Y

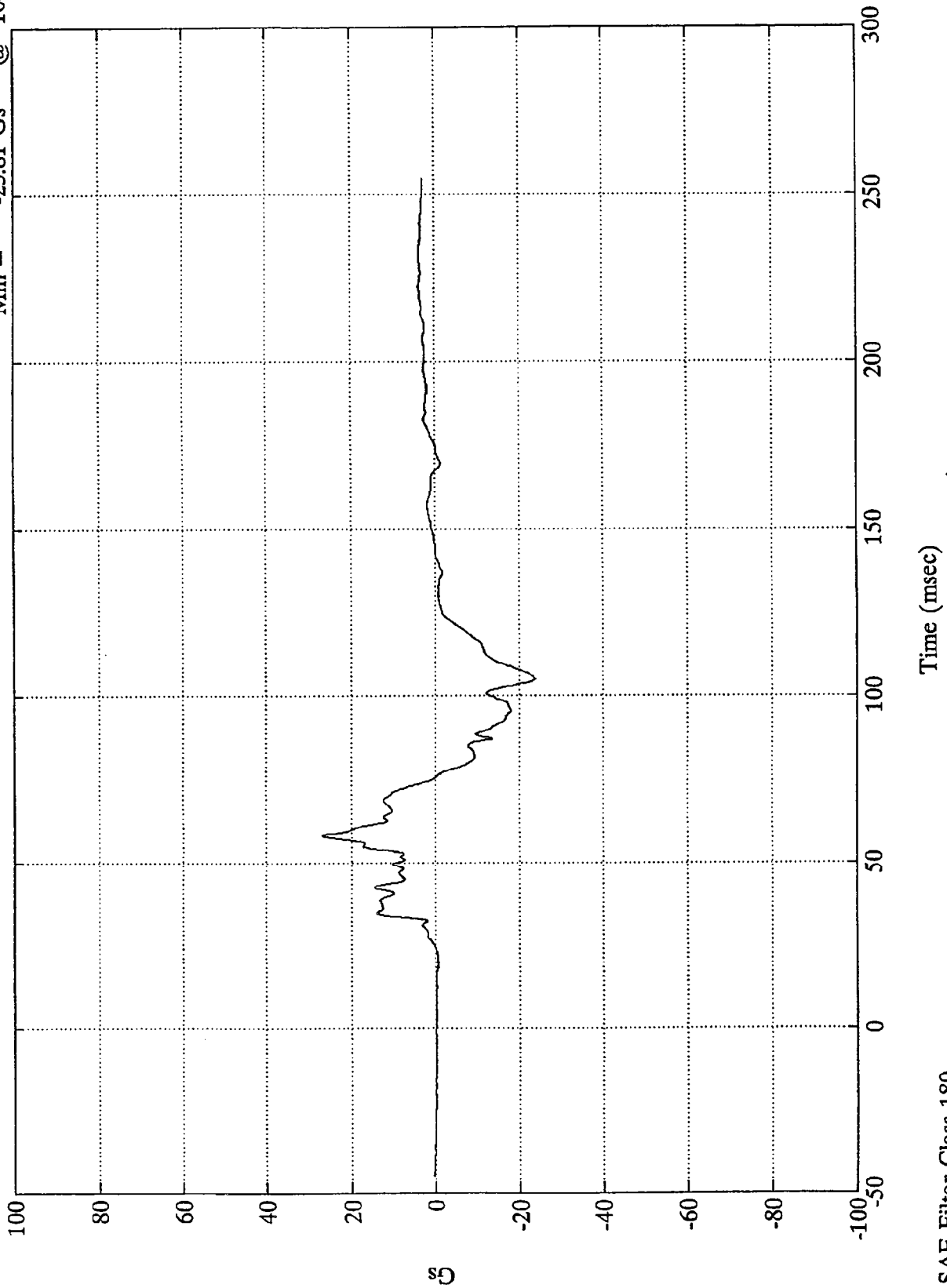


Time (msec)

SAE Filter Class 180

NCAP TEST #12 - 1993 ISUZU RODEO

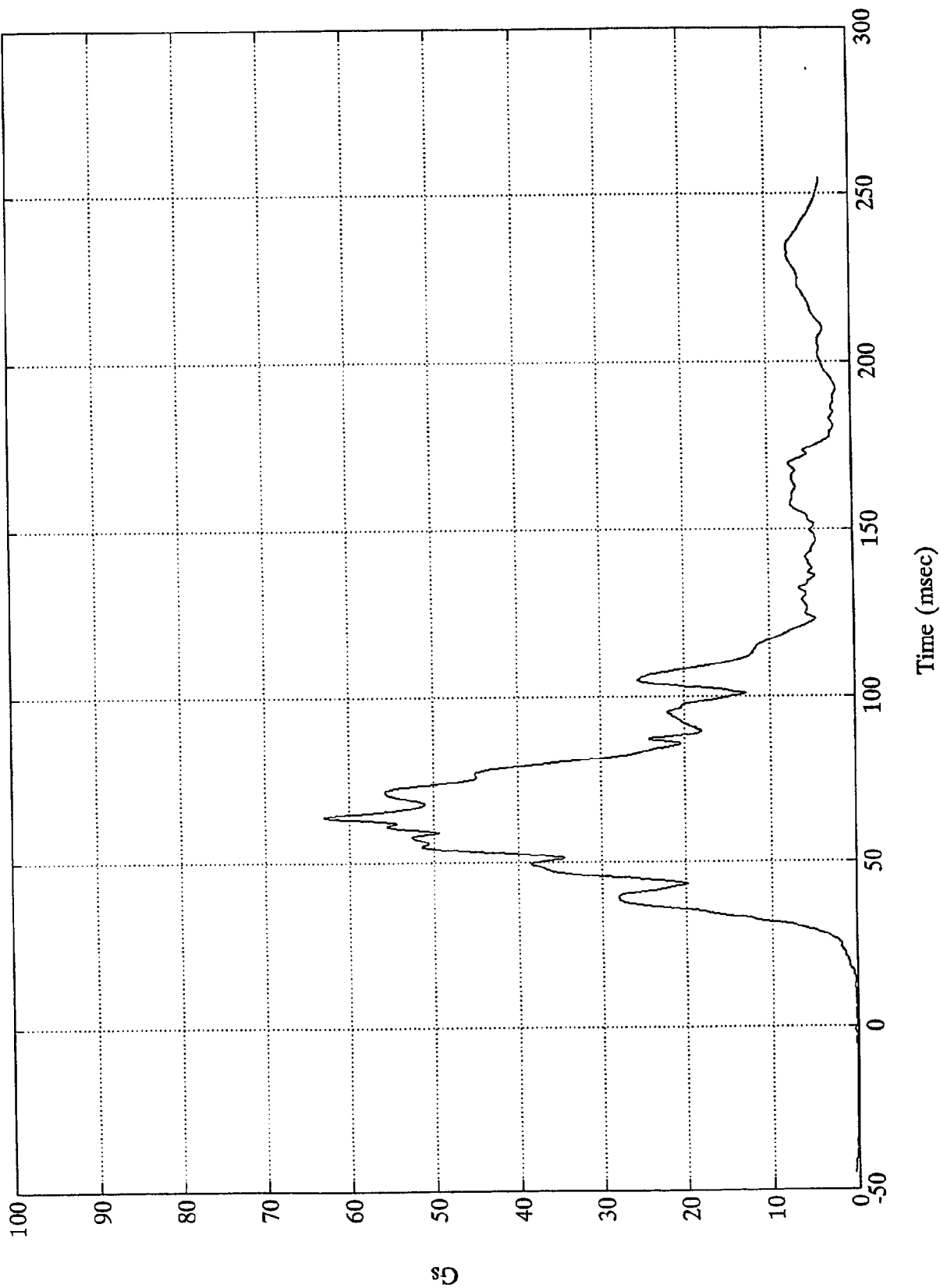
Pos. 1 Chest Z
Max = 26.95 Gs @ 58.20 msec
Min = -23.81 Gs @ 104.88 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Max = 62.98 Gs @ 64.08 msec
Min = .09 Gs @ -24.84 msec

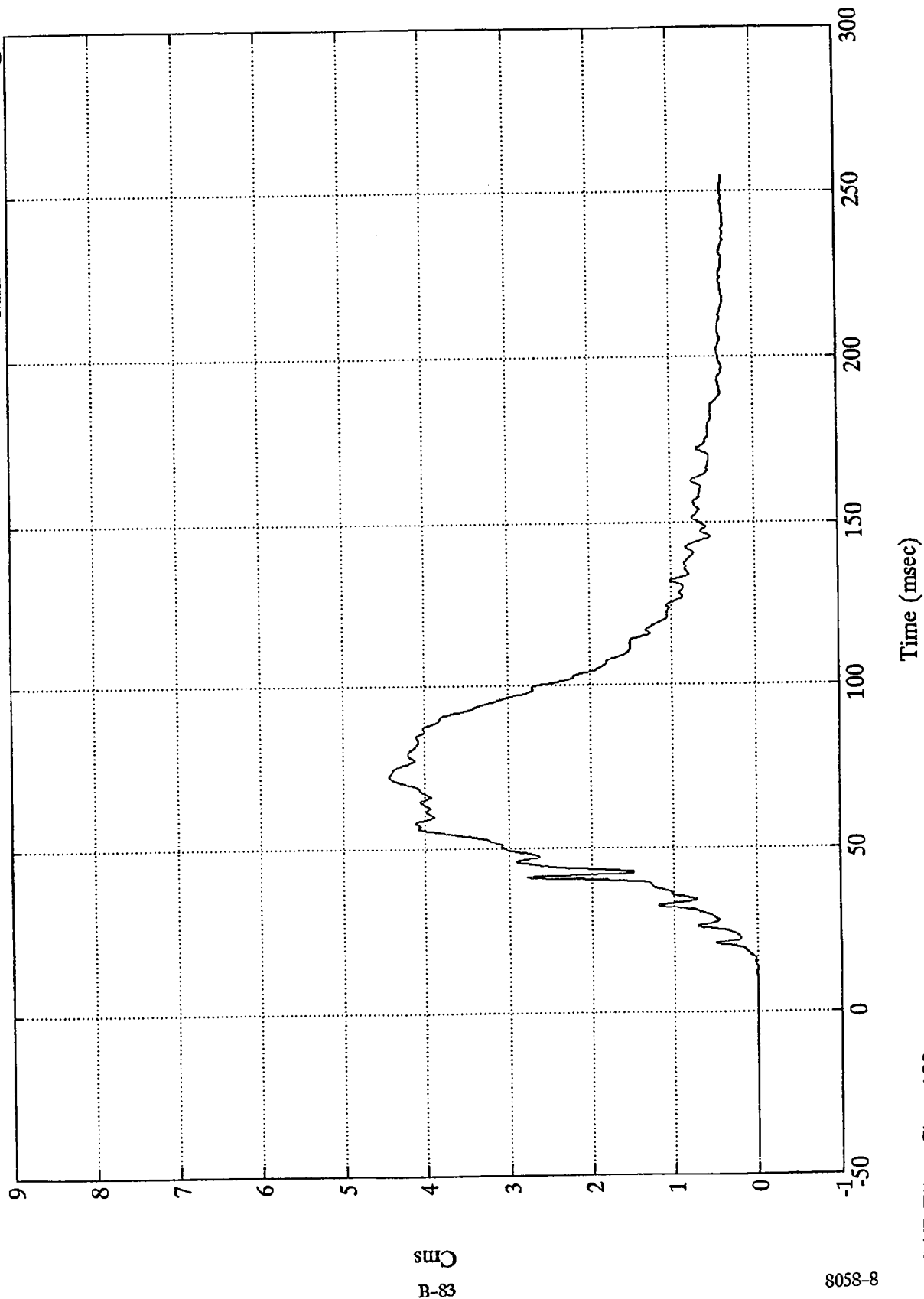
Pos. 1 Chest Resultant



NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Chest Disp.

Max = 4.43 Cms @ 72.24 msec
Min = -.01 Cms @ -0.96 msec



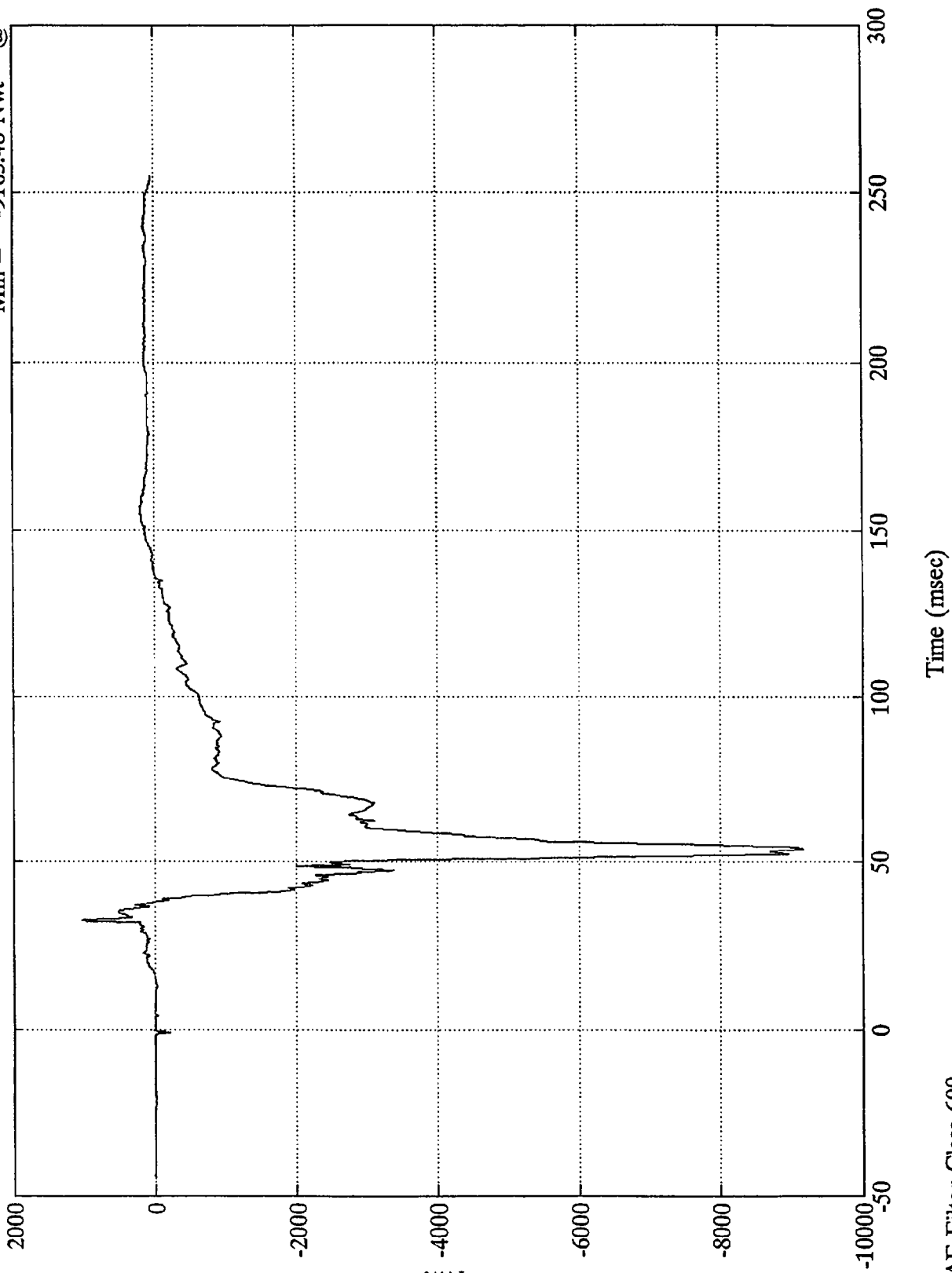
B-83
Cms

8058-8

SAE Filter Class 180

NCAP TEST #12 - 1993 ISUZU RODEO

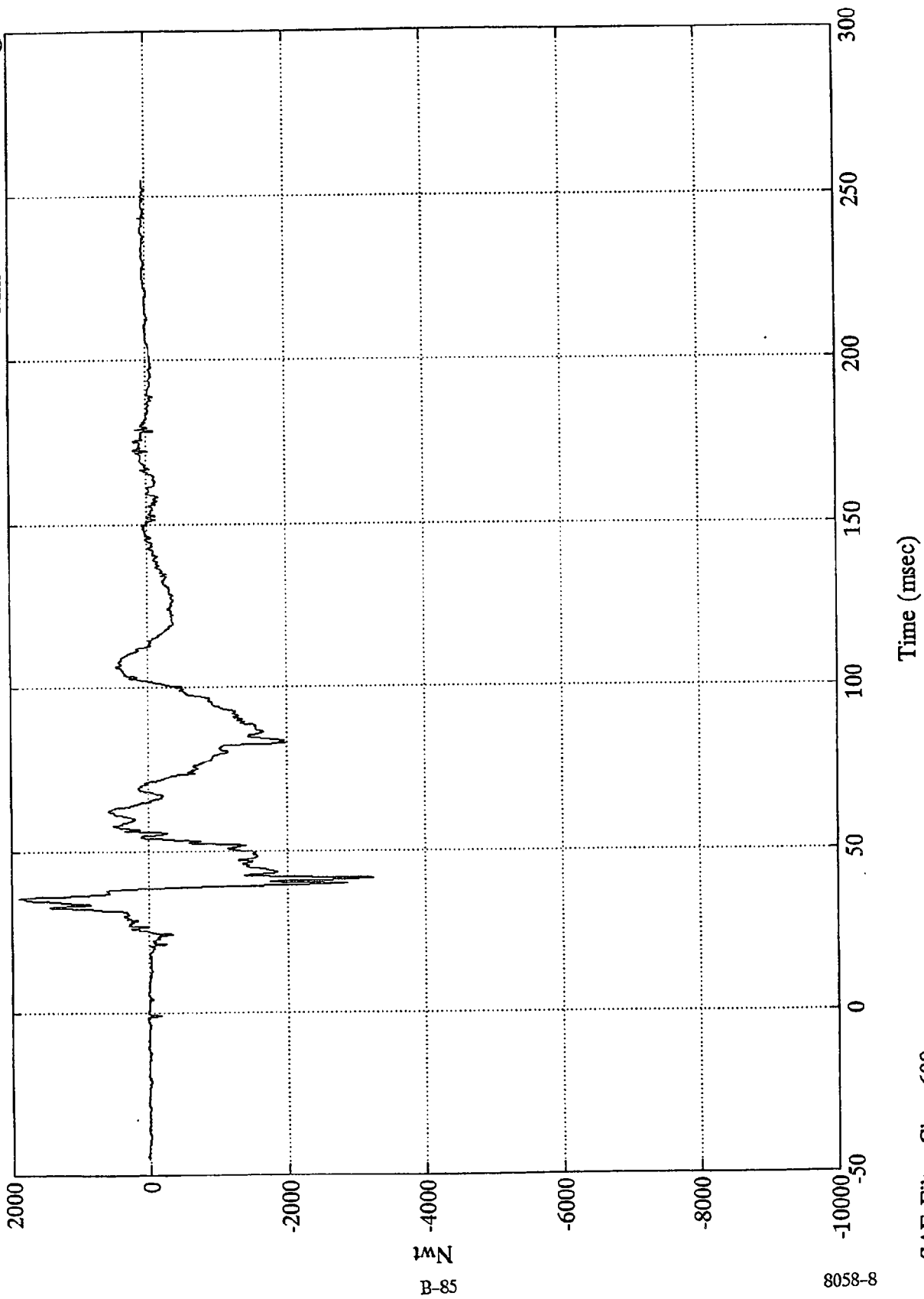
Pos. 1 Left Femur
Max = 1037.02 Nwt @ 32.40 msec
Min = -9163.48 Nwt @ 54.11 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Right Femur

Max = 1894.14 Nwt @ 35.39 msec
Min = -3230.23 Nwt @ 41.28 msec

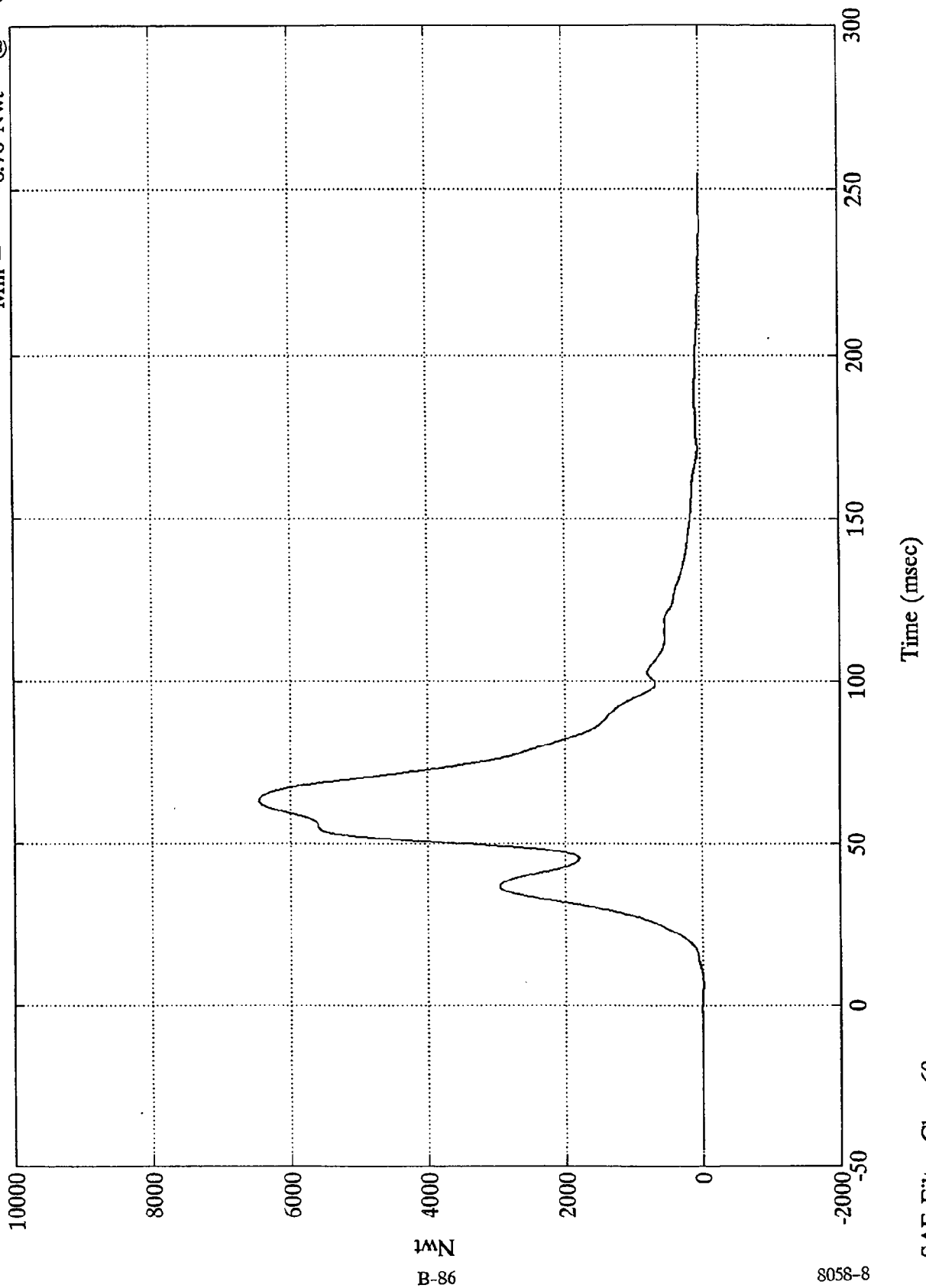


SAE Filter Class 600

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Left Belt Load

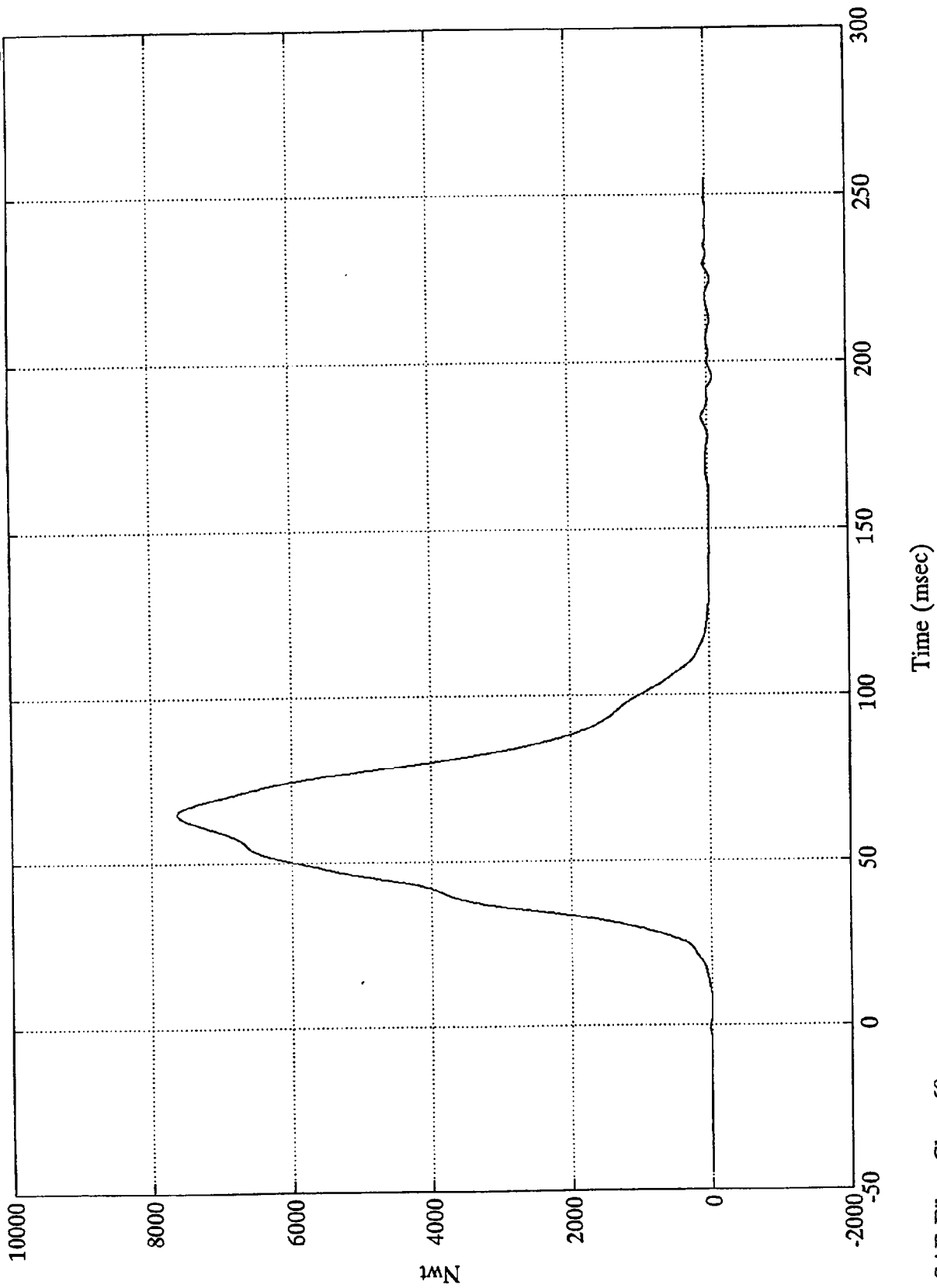
Max =	6455.36 Nwt	@	63.23 msec
Min =	-6.76 Nwt	@	6.23 msec



SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Torso Belt Load Max = 7626.70 Nwt @ 65.04 msec
Min = -77.42 Nwt @ 195.36 msec



1wN
B-87

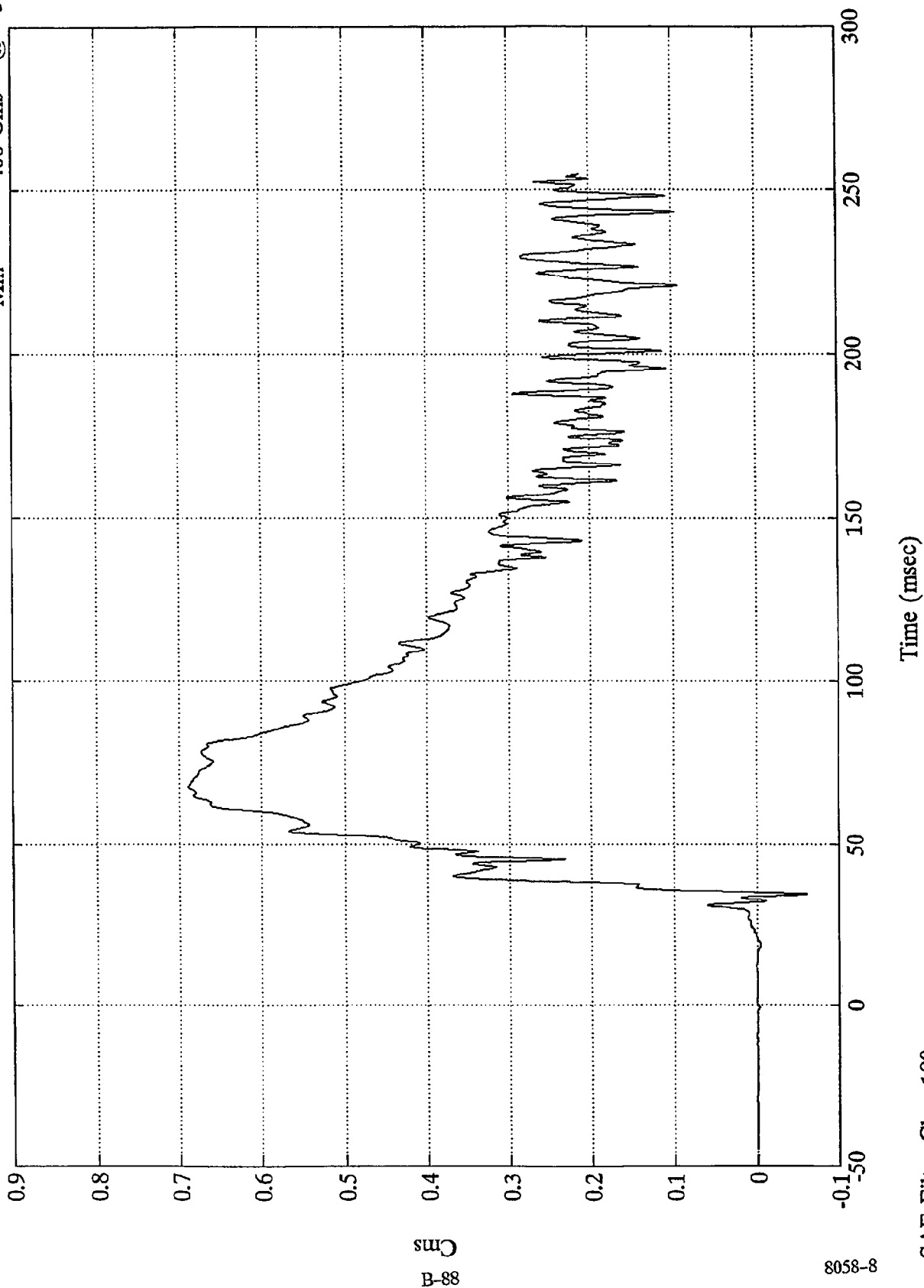
8058-8

SAE Filter Class 60

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Belt Elongation

Max = .69 Cms @ 68.04 msec
Min = -.06 Cms @ 34.20 msec



B-88
Cms

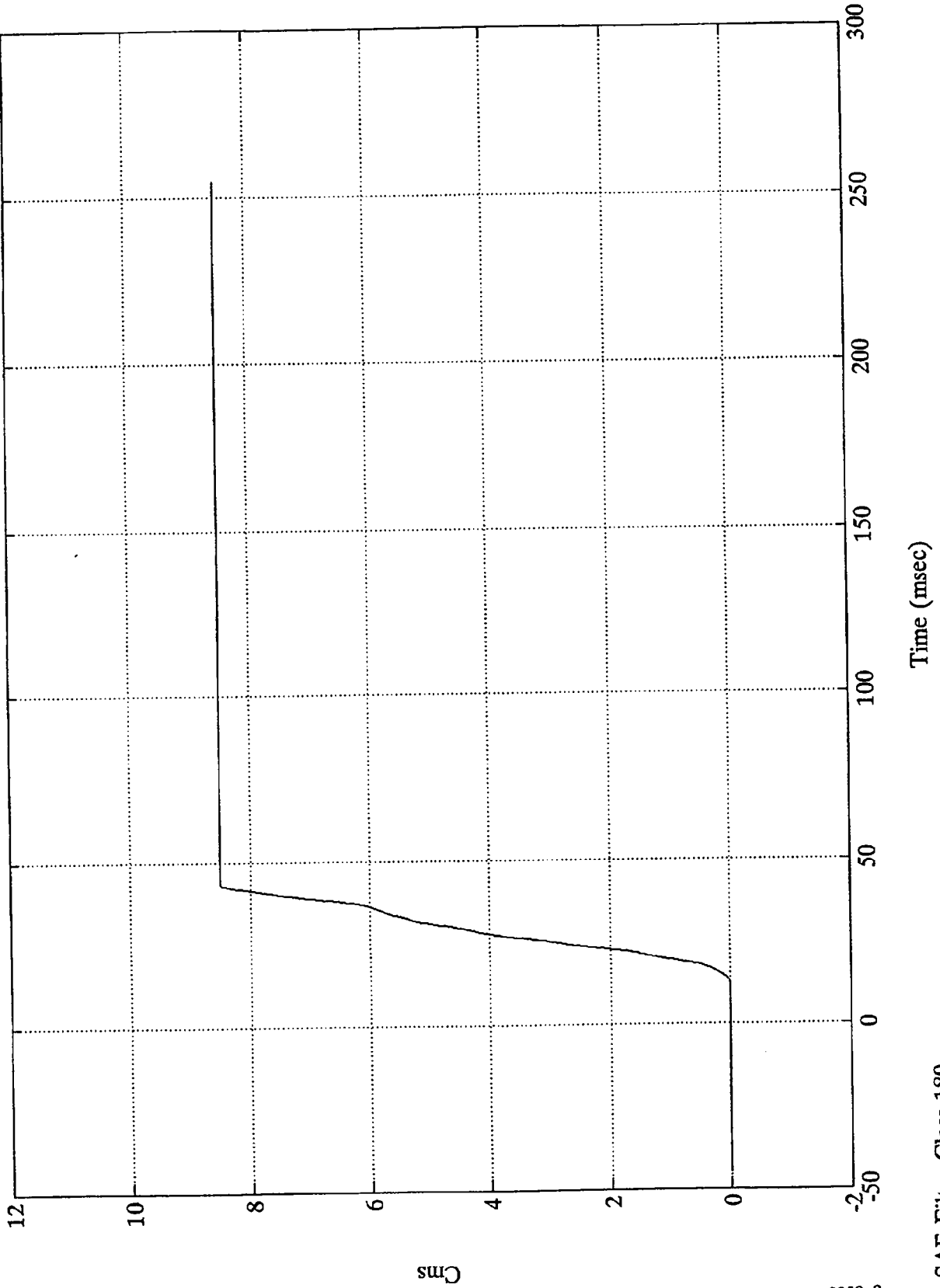
8058-8

SAE Filter Class 180

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Belt Spool Out

Max = 8.50 Cms @ 43.91 msec
Min = -0.00 Cms @ 7.43 msec



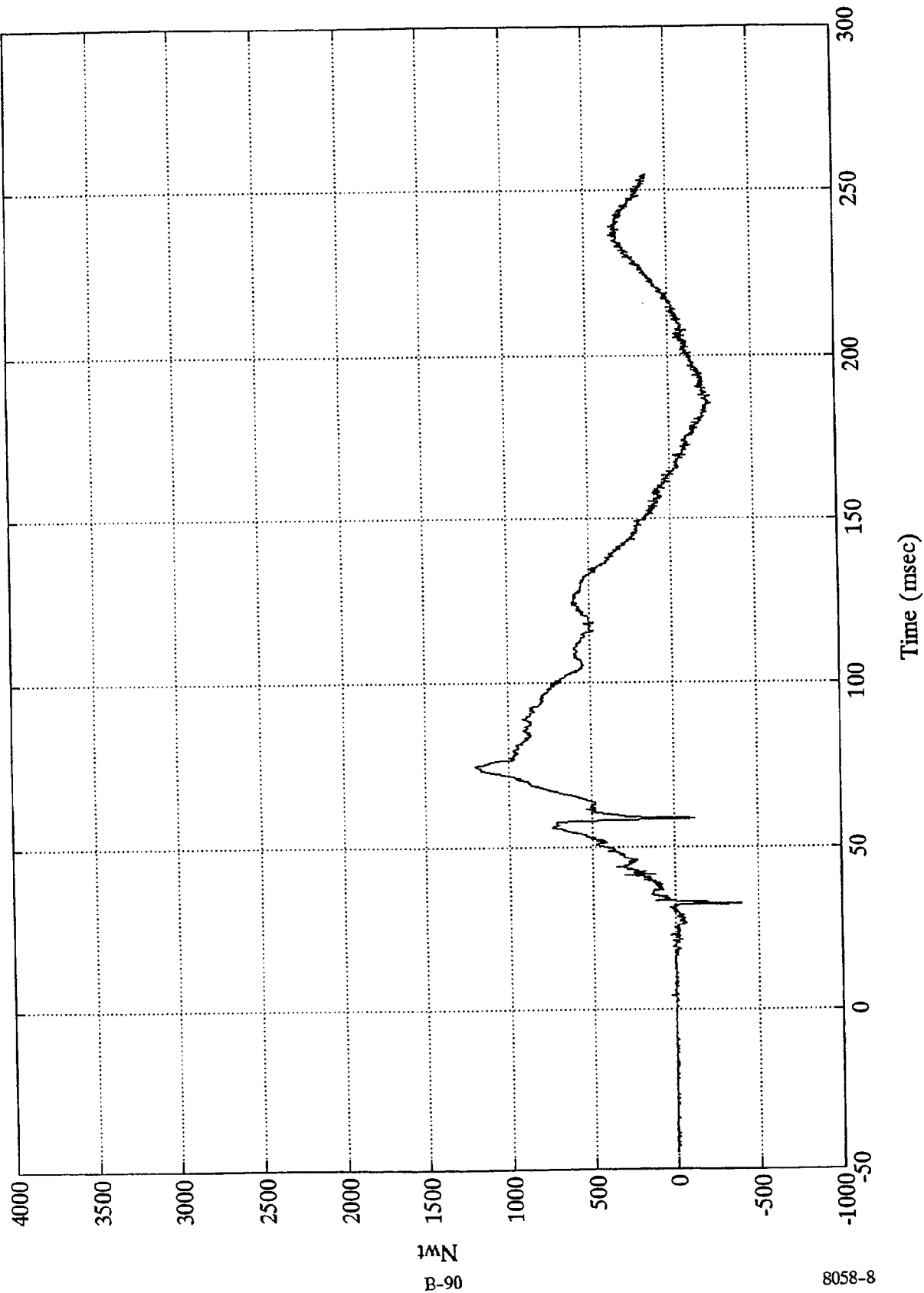
68-B
Cms

8058-8

SAE Filter Class 180

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Upper Neck Fx Max = 1199.45 Nwt @ 74.88 msec
Min = -394.49 Nwt @ 32.40 msec



1N
B-90

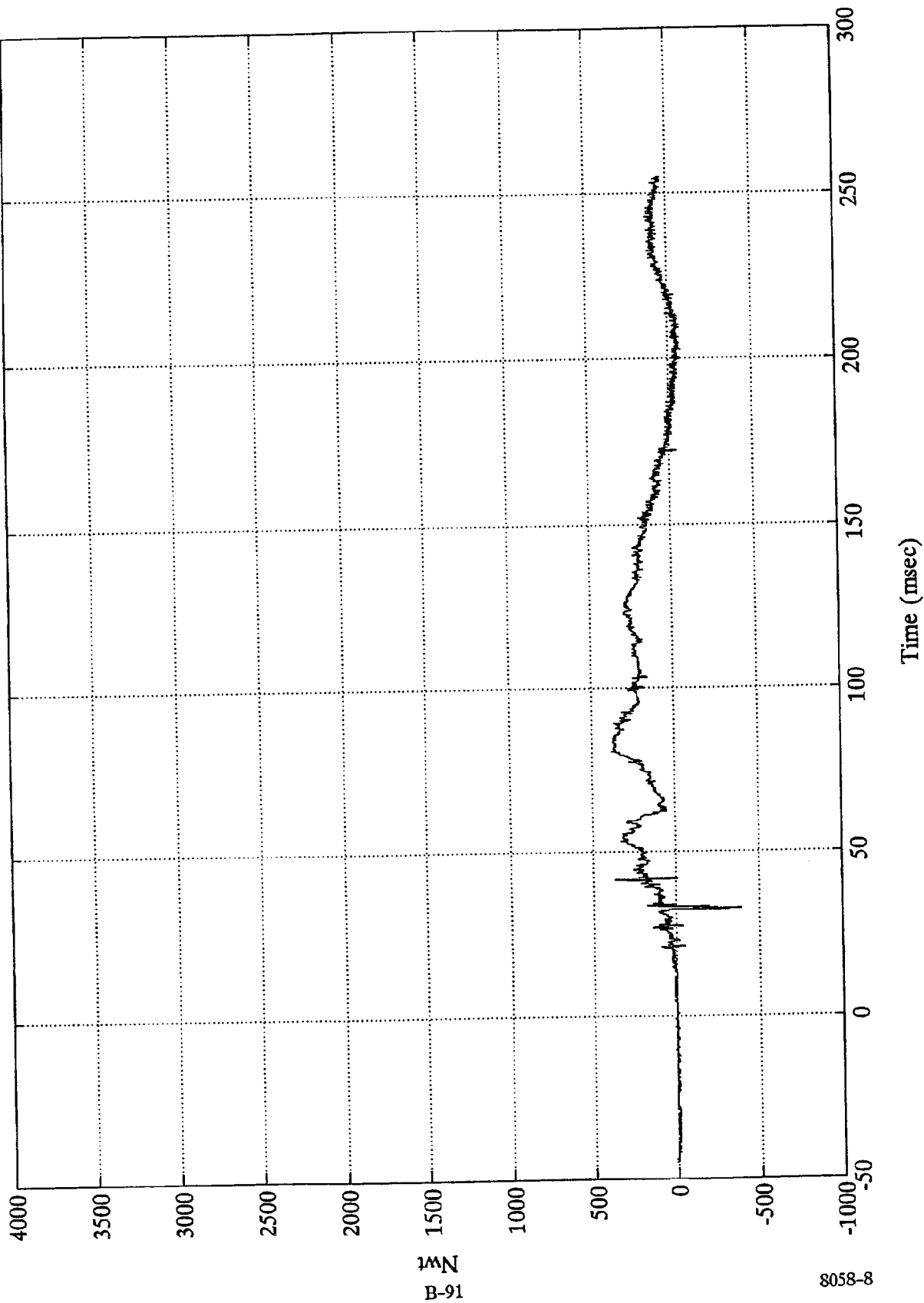
8058-8

SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Upper Neck Fy

Max = 382.91 Nwt @ 80.63 msec
Min = -388.34 Nwt @ 32.40 msec



B-91
1W

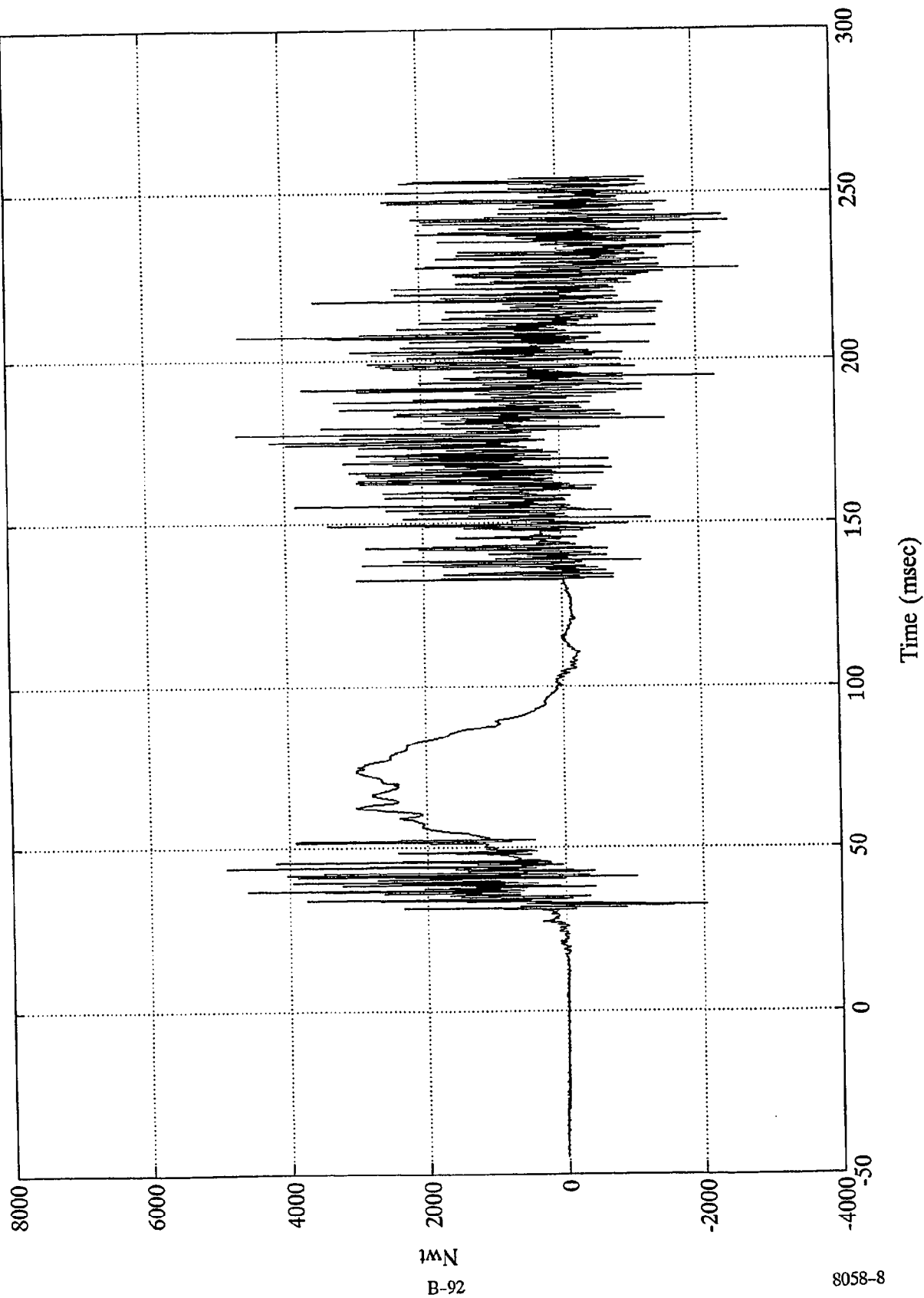
8058-8

SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Upper Neck Fz

Max =	4900.06 Nwt	@	43.79 msec
Min =	-2637.18 Nwt	@	227.52 msec

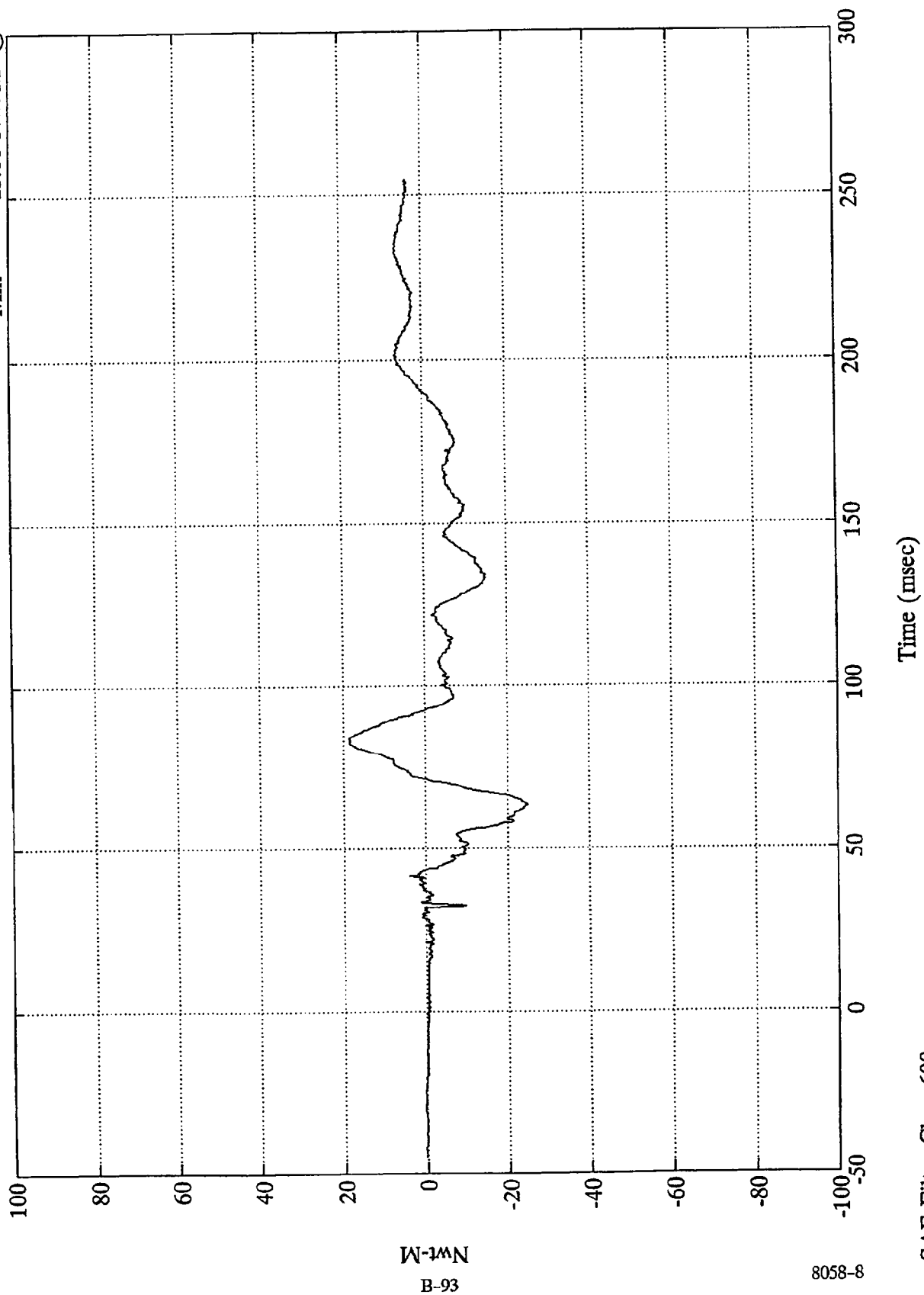


SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Upper Neck Mx

Max = 18.50 Nwt-M @ 83.87 msec
Min = -25.00 Nwt-M @ 63.35 msec



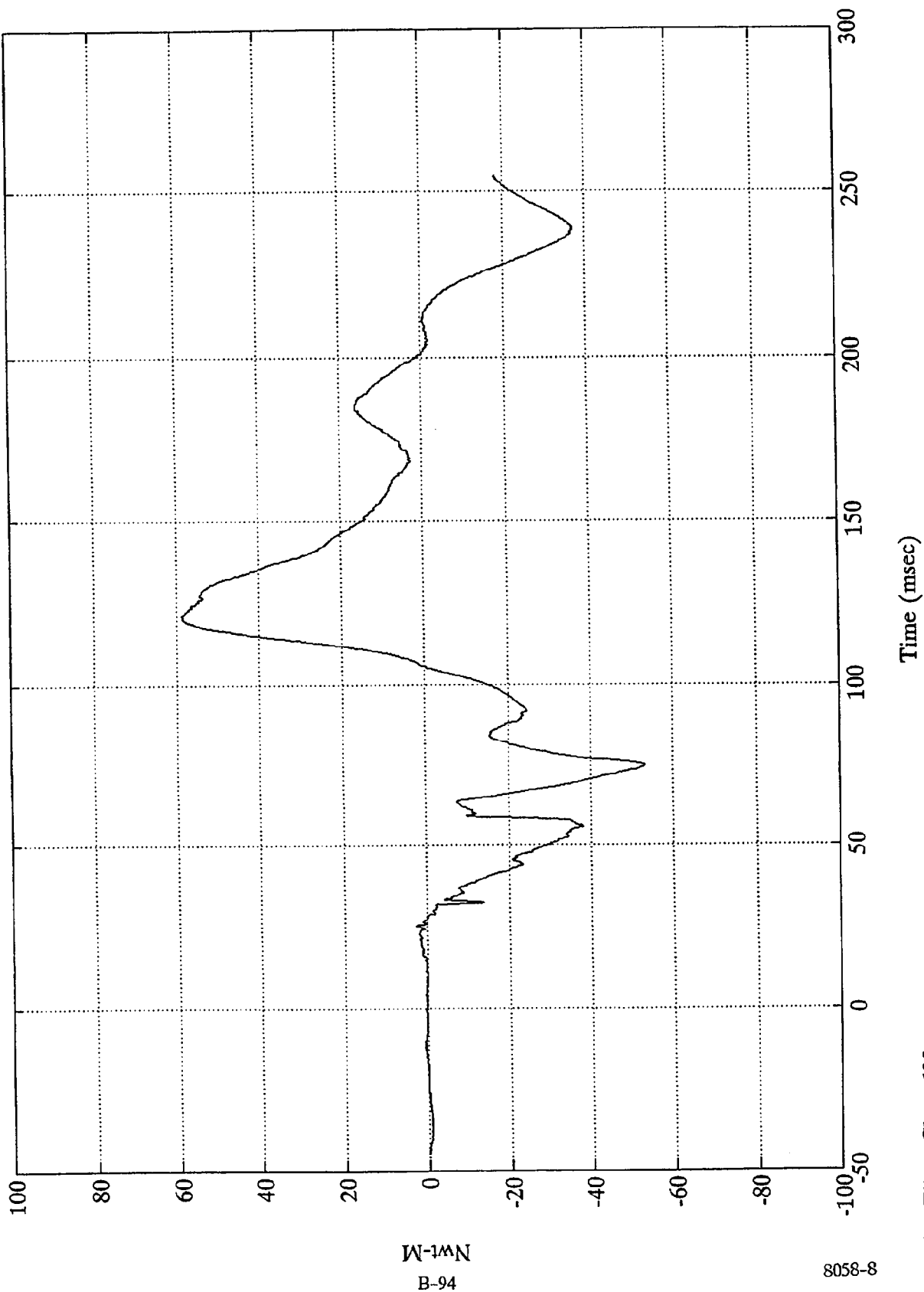
Nwt-M
B-93

8058-8

SAE Filter Class 600

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Upper Neck My
Max = 58.80 Nwt-M @ 121.44 msec
Min = -53.23 Nwt-M @ 75.00 msec



B-94
Nwt-M

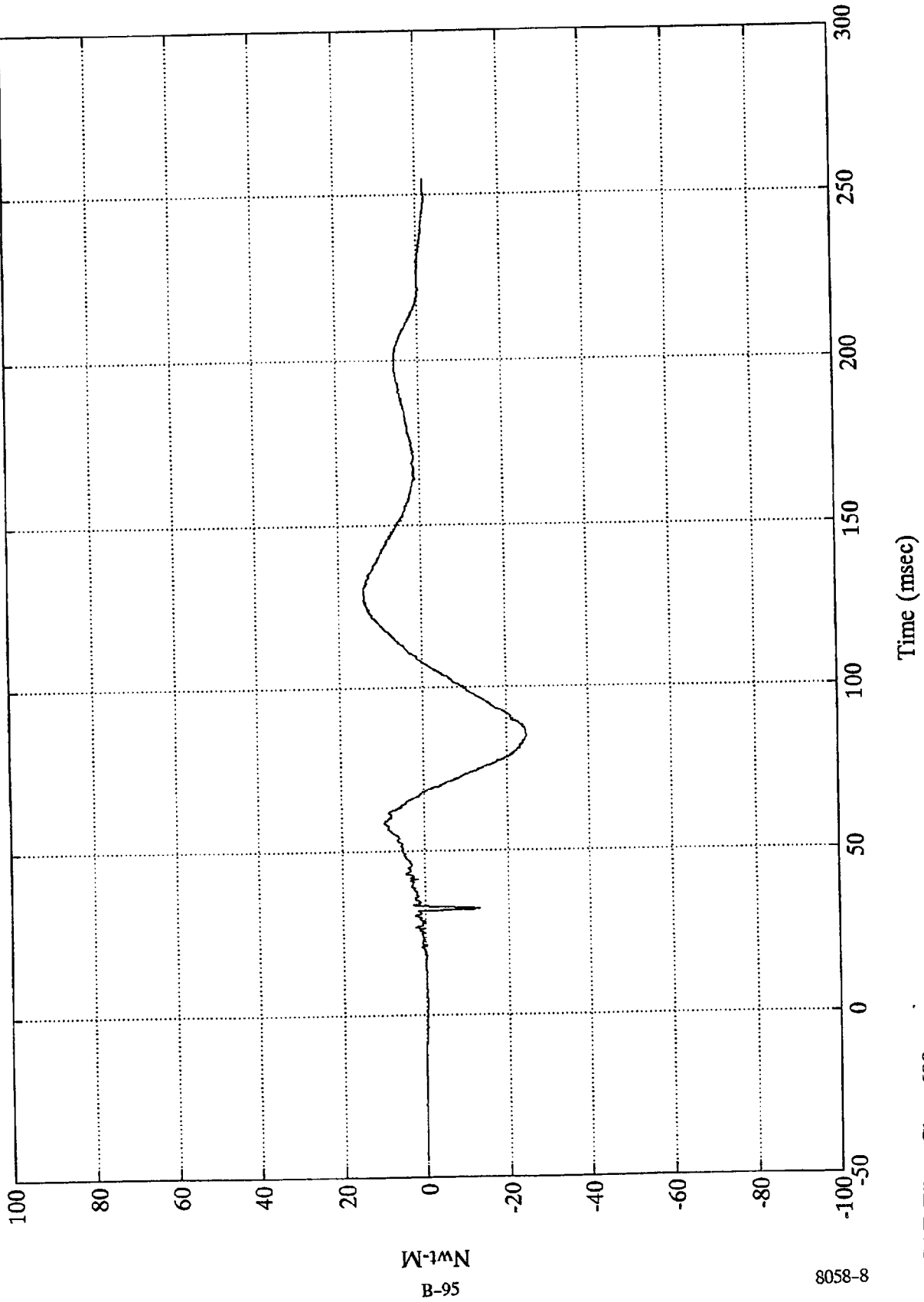
8058-8

SAE Filter Class 600

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 1 Upper Neck Mz

Max = 14.01 Nwt-M @ 127.08 msec
Min = -25.02 Nwt-M @ 85.20 msec



B-95

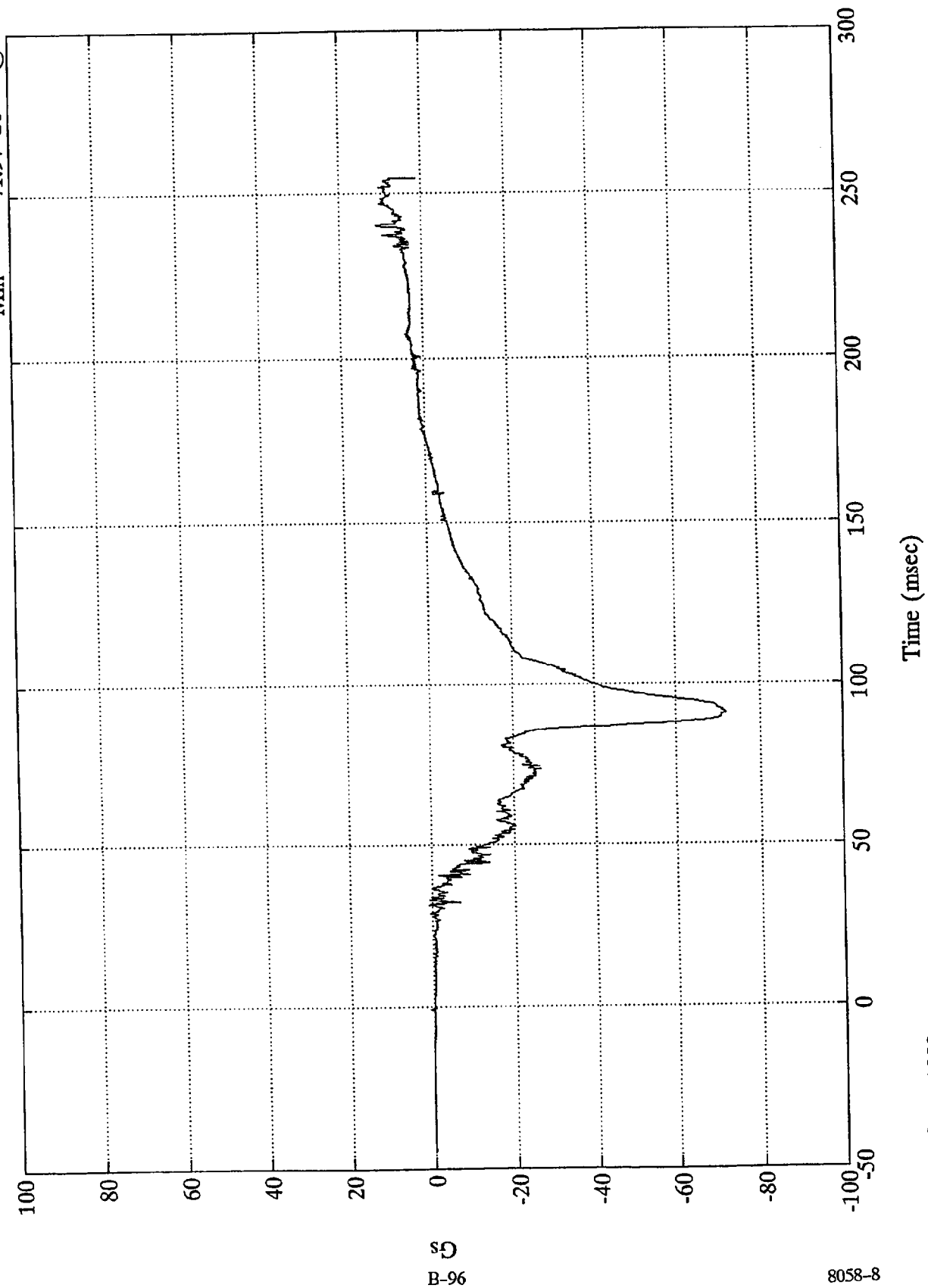
8058-8

SAE Filter Class 600

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Head X

Max = 10.90 Gs @ 240.36 msec
Min = -71.97 Gs @ 91.20 msec



B-96

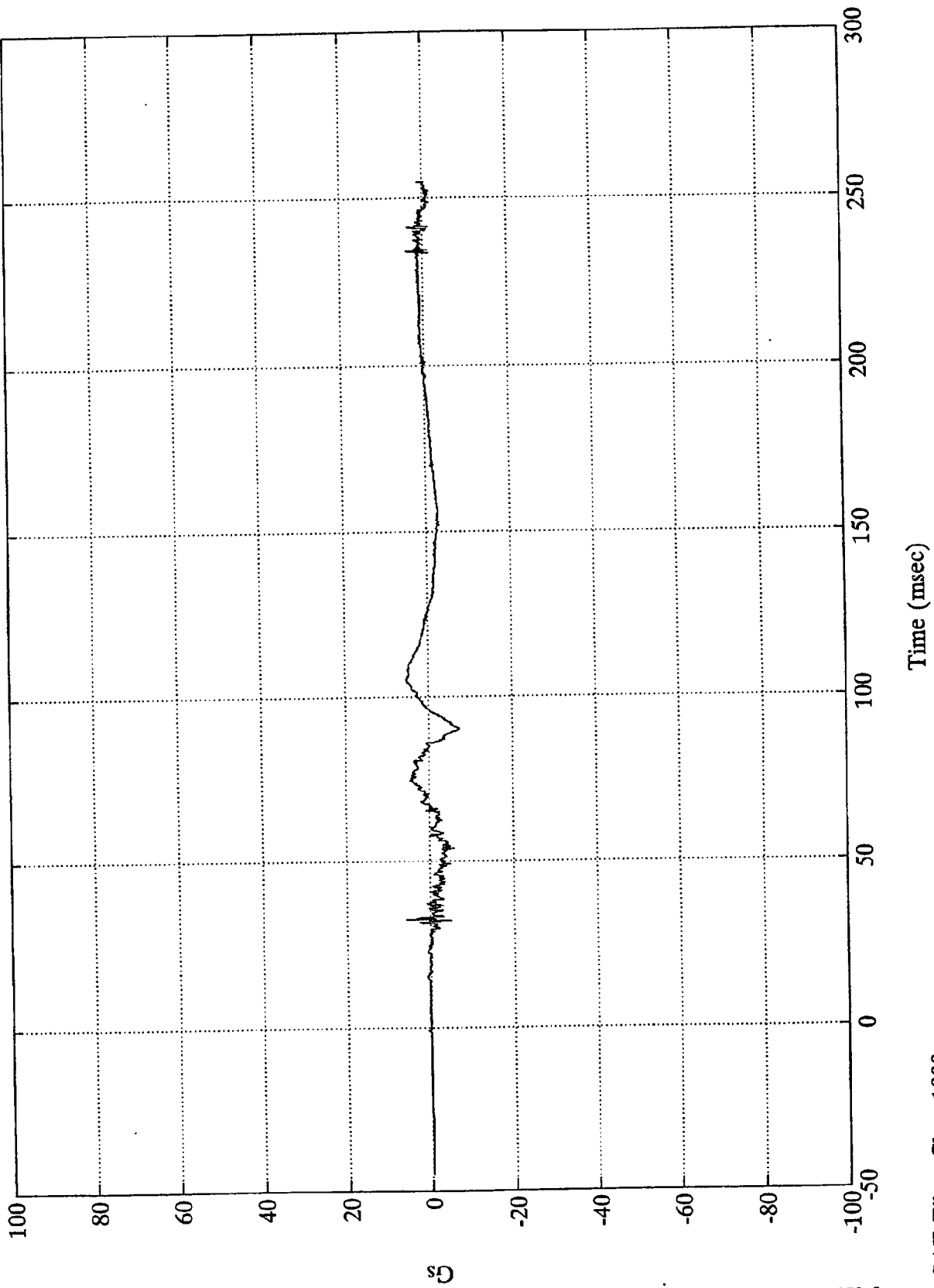
8058-8

SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Head Y

Max = 5.82 Gs @ 32.52 msec
Min = -7.25 Gs @ 90.24 msec



B-97

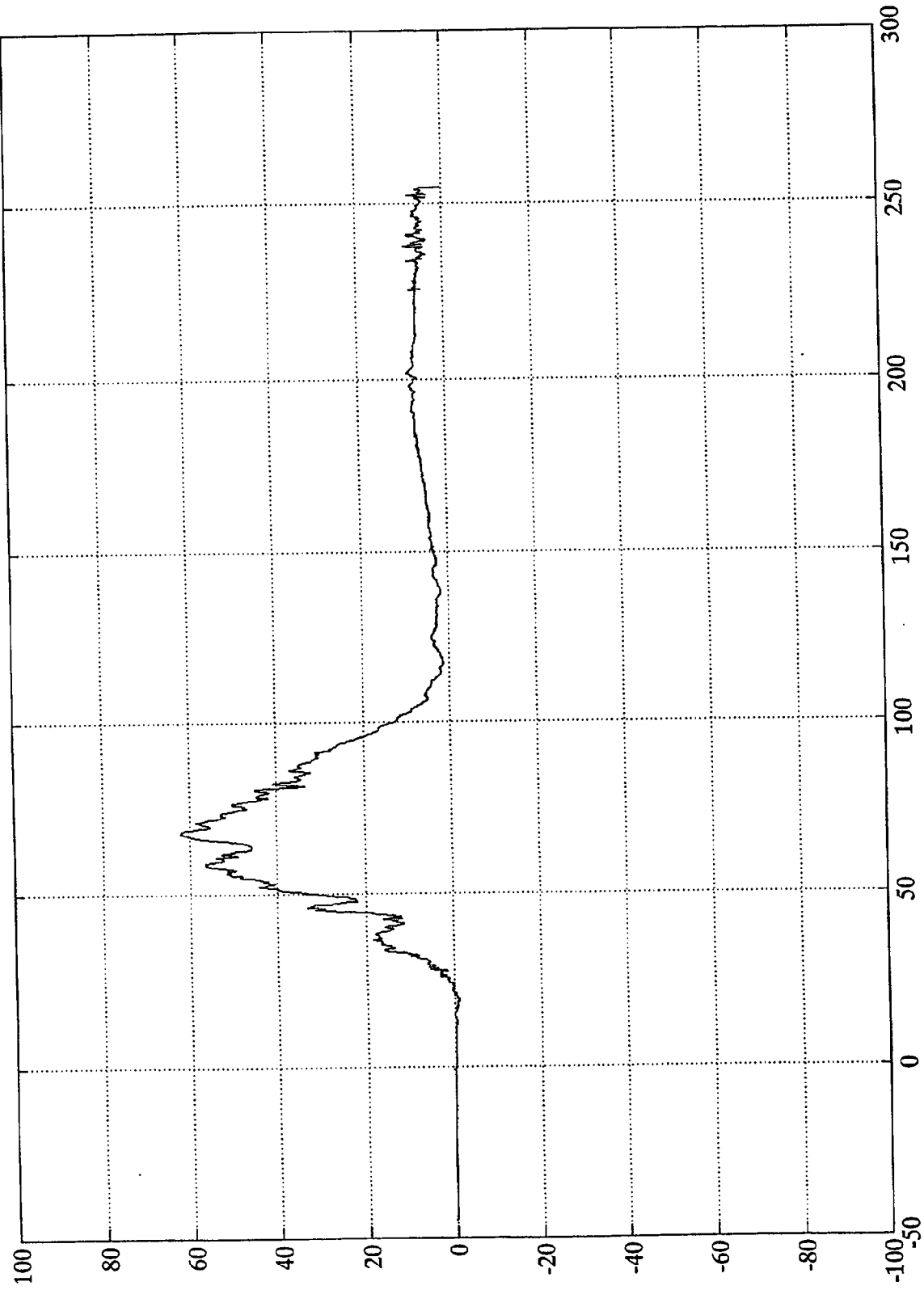
8058-8

SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

Max = 61.94 Gs @ 68.04 msec
Min = -1.04 Gs @ 19.31 msec

Pos. 2 Head Z



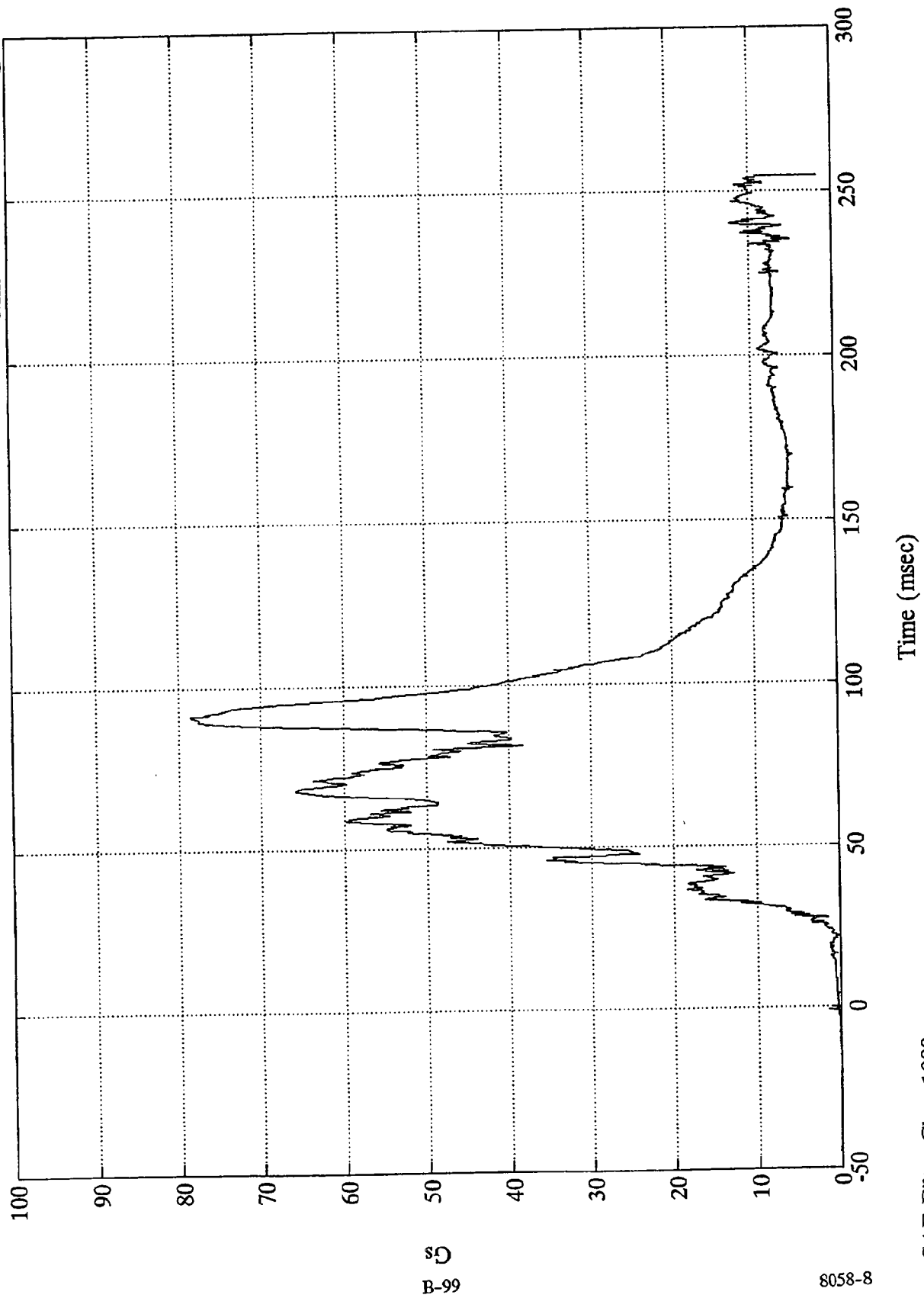
Time (msec)

SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

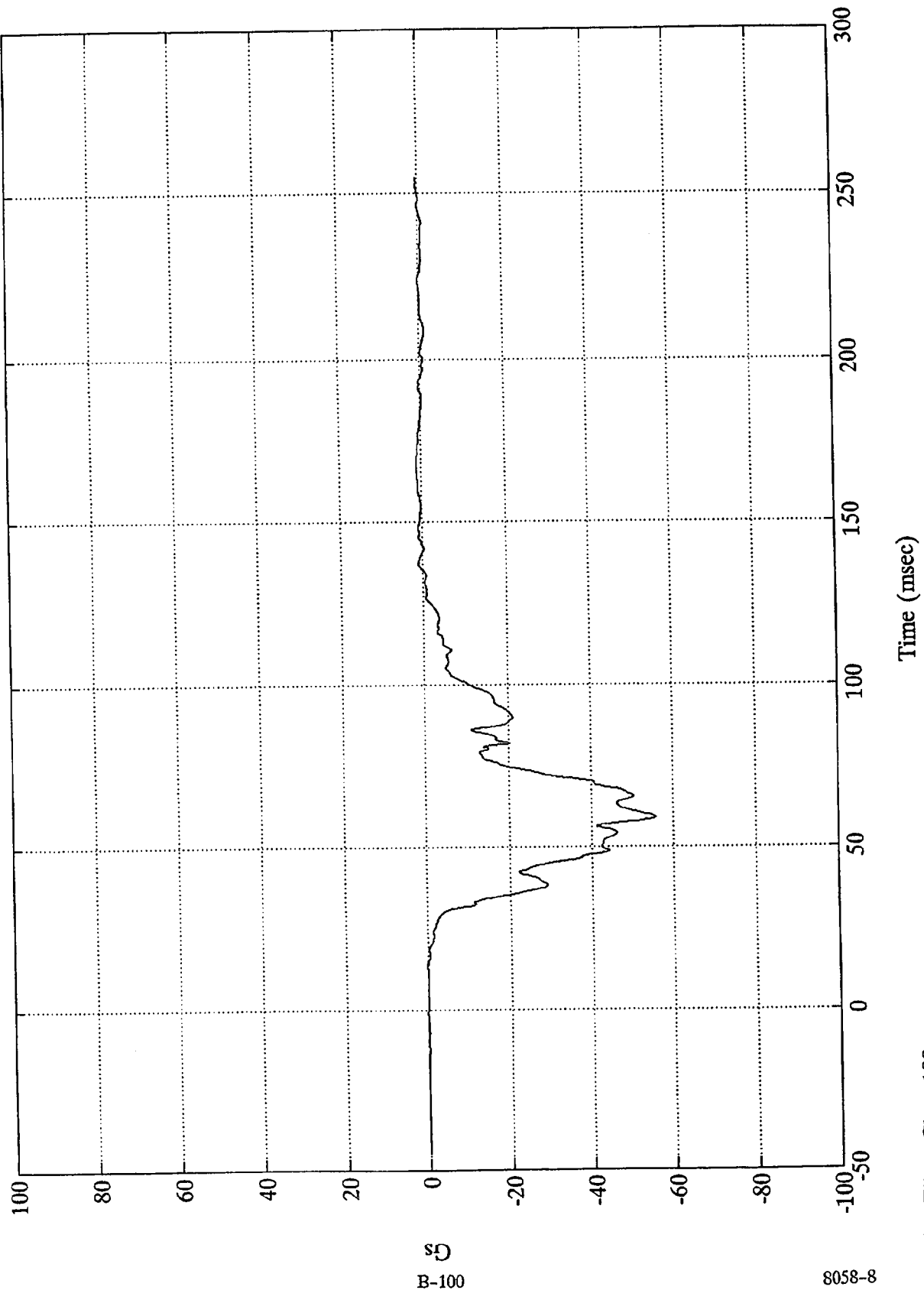
Max = 78.58 Gs @ 91.20 msec
Min = .03 Gs @ -10.80 msec

Pos. 2 Head Resultant



NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Chest X
Max = 1.16 Gs @ 164.40 msec
Min = -55.67 Gs @ 59.27 msec



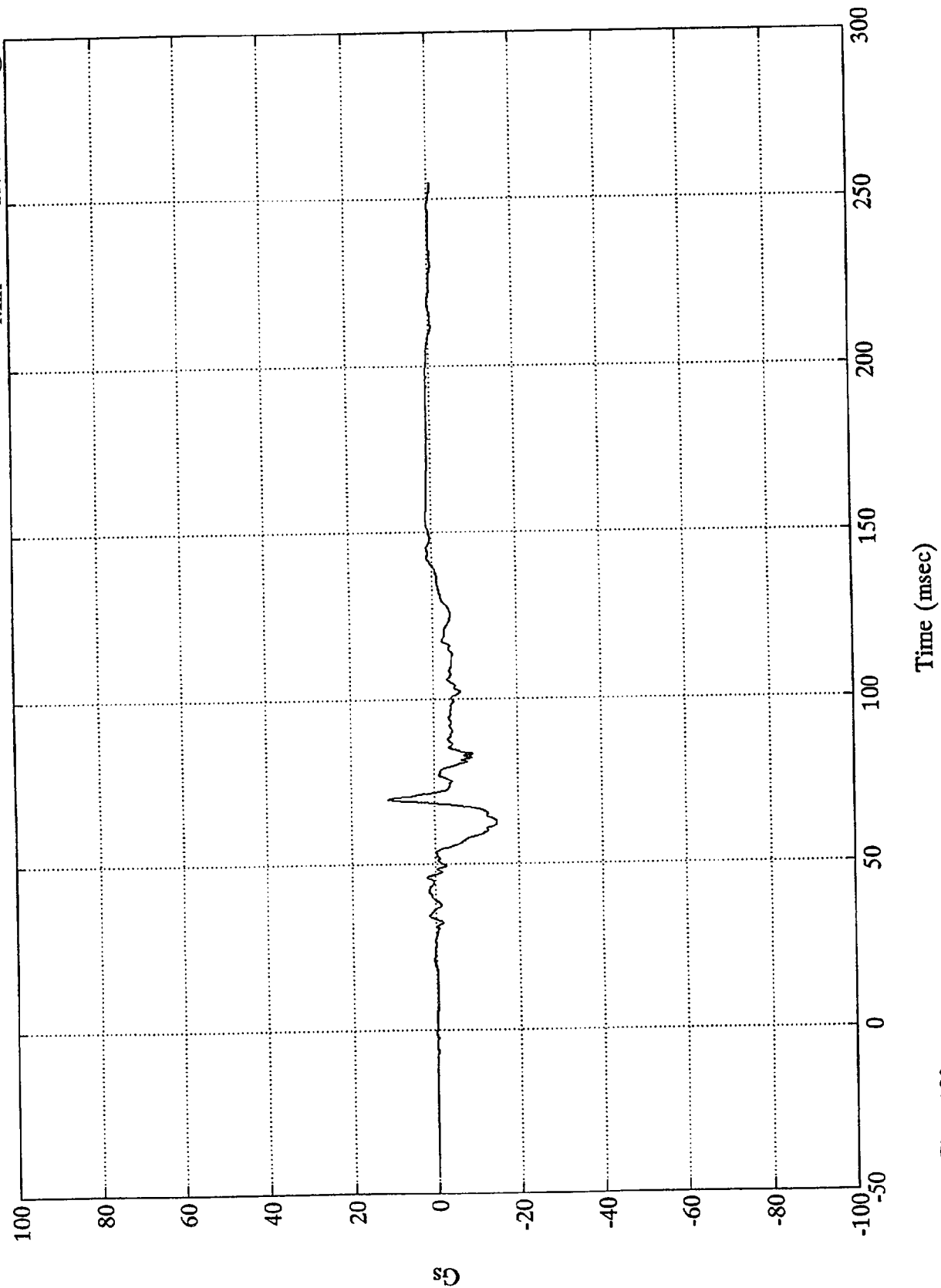
B-100

8058-8

SAE Filter Class 180

NCAP TEST #12 - 1993 ISUZU RODEO

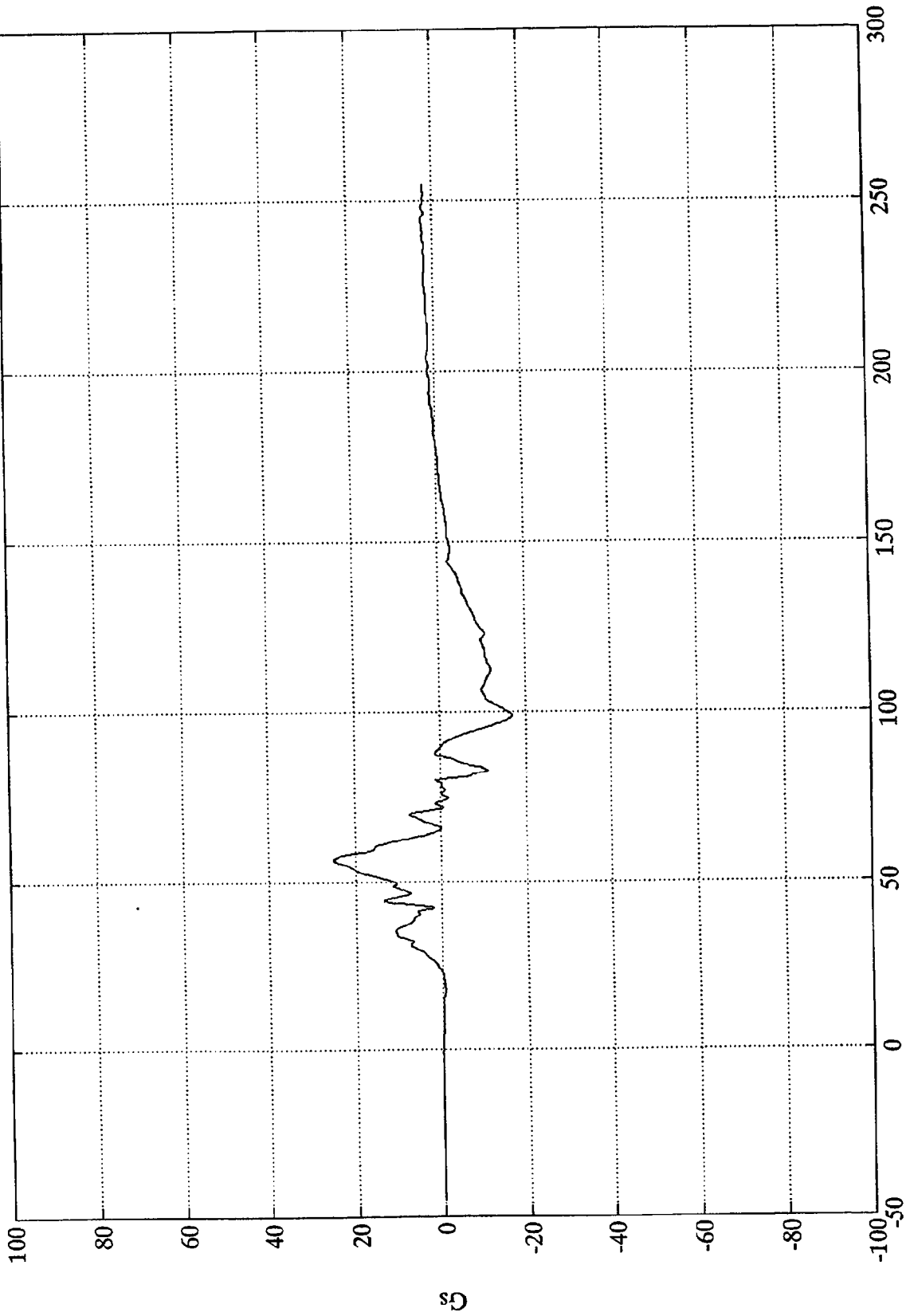
Pos. 2 Chest Y
Max = 11.19 Gs @ 69.72 msec
Min = -15.00 Gs @ 62.64 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Max = 24.95 Gs @ 56.52 msec
Min = -16.99 Gs @ 98.76 msec

Pos. 2 Chest Z



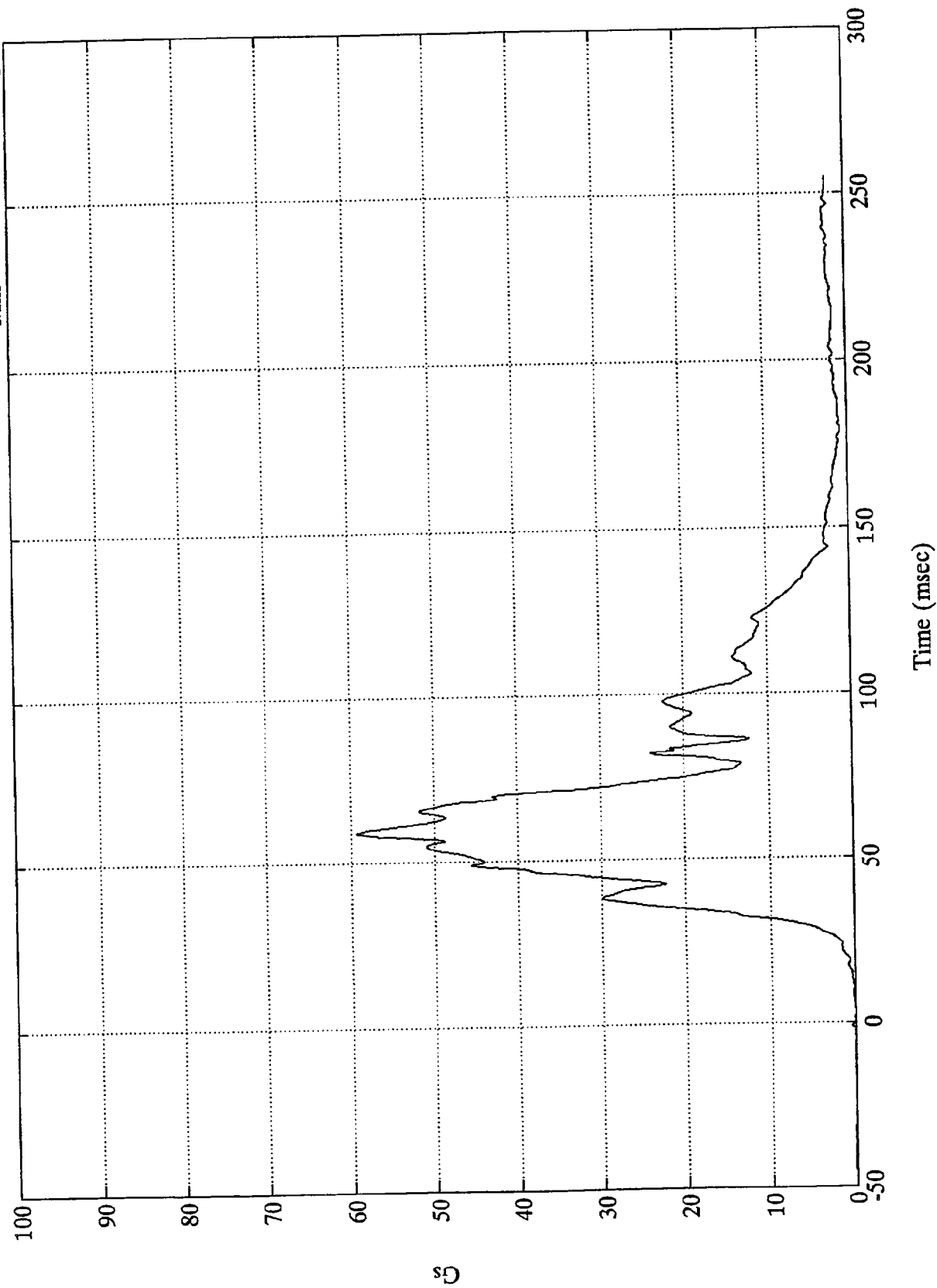
Time (msec)

SAE Filter Class 180

NCAP TEST #12 - 1993 ISUZU RODEO

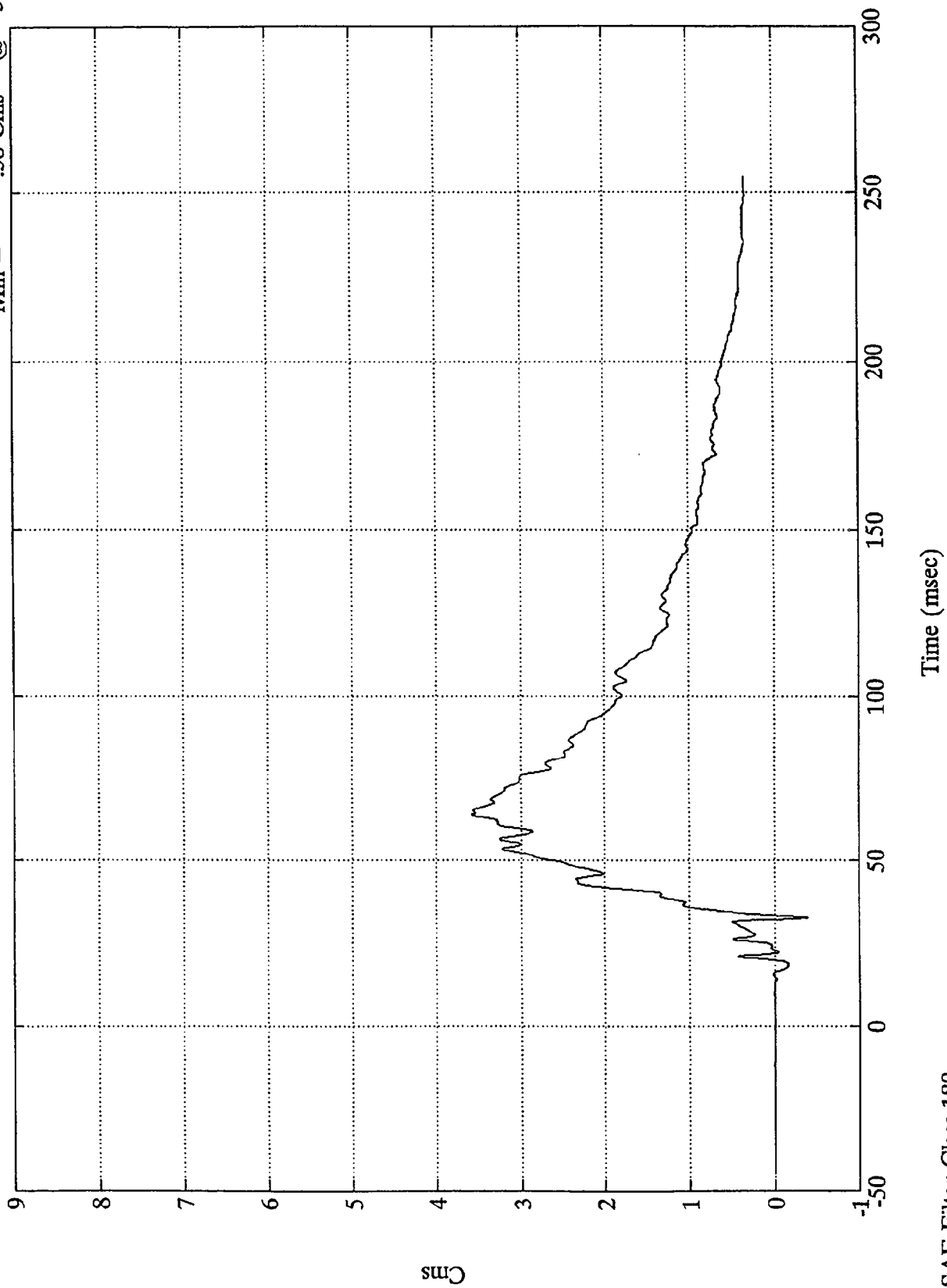
Pos. 2 Chest Resultant

Max = 59.26 Gs @ 59.15 msec
Min = .01 Gs @ -29.88 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Chest Disp. Max = 3.58 Cms @ 63.95 msec
Min = -.38 Cms @ 32.52 msec



B-104
Cms

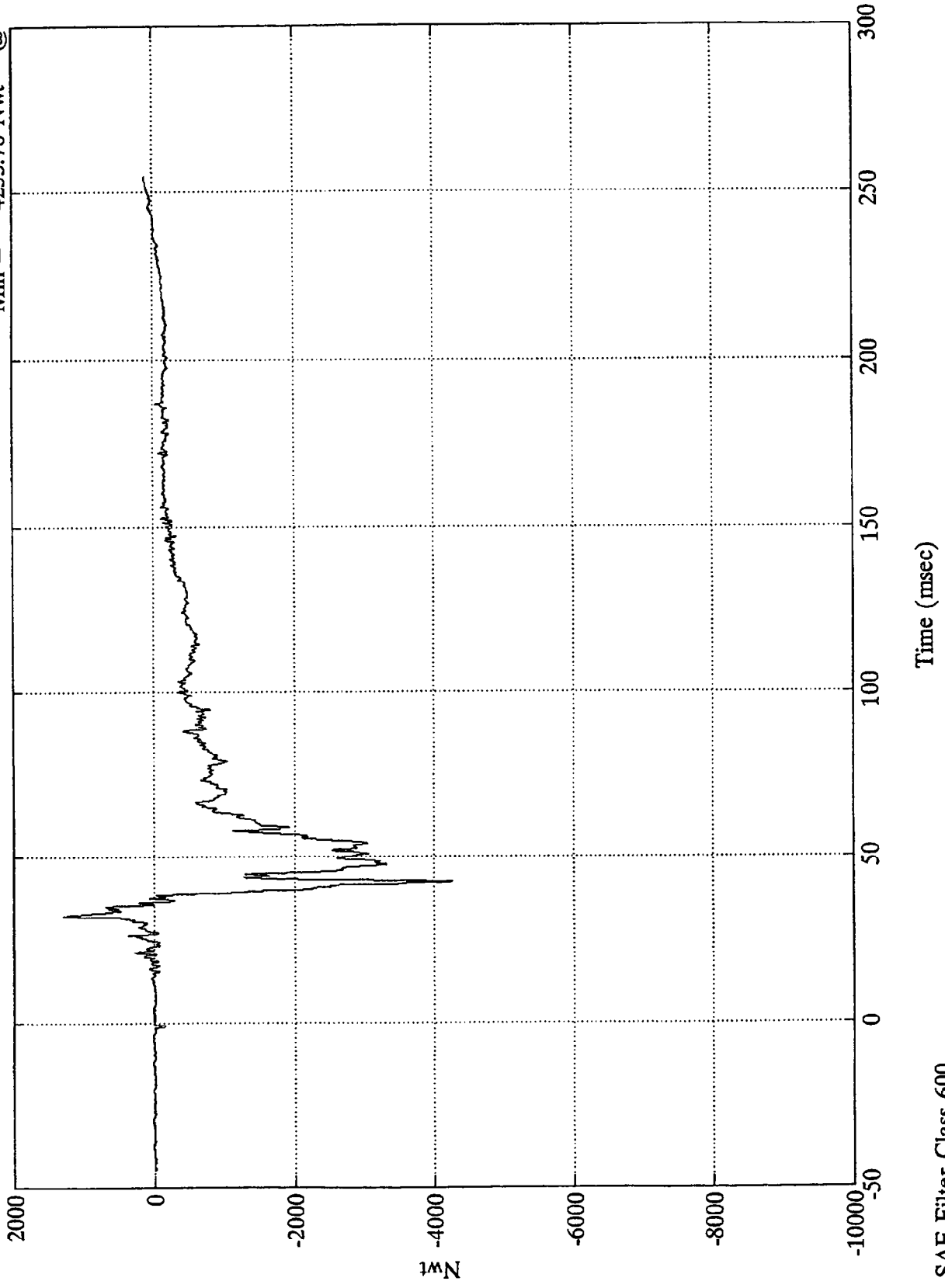
8058-8

SAE Filter Class 180

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Right Femur

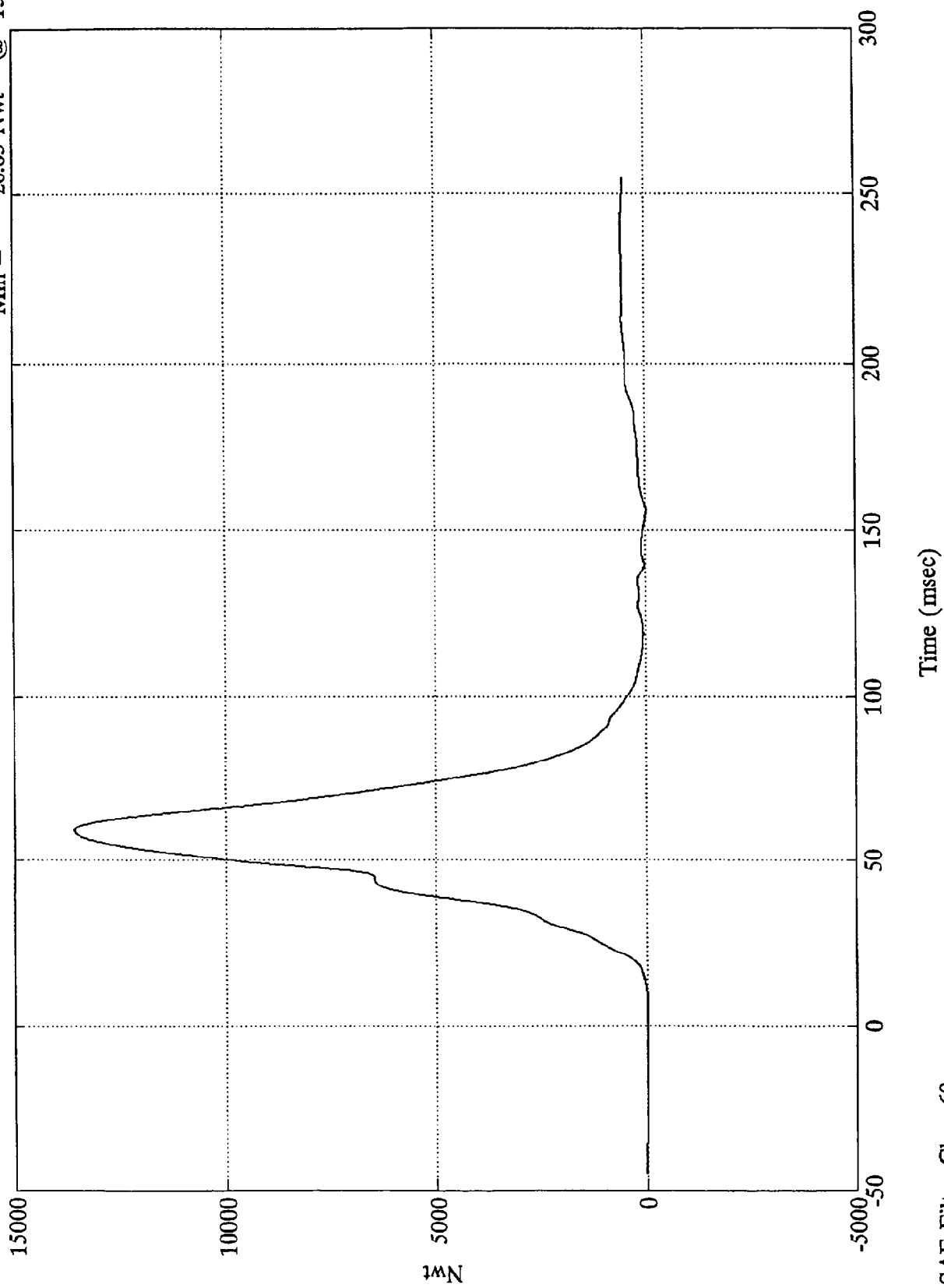
Max = 1294.25 Nwt @ 32.28 msec
Min = -4253.76 Nwt @ 42.36 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Right Belt Load

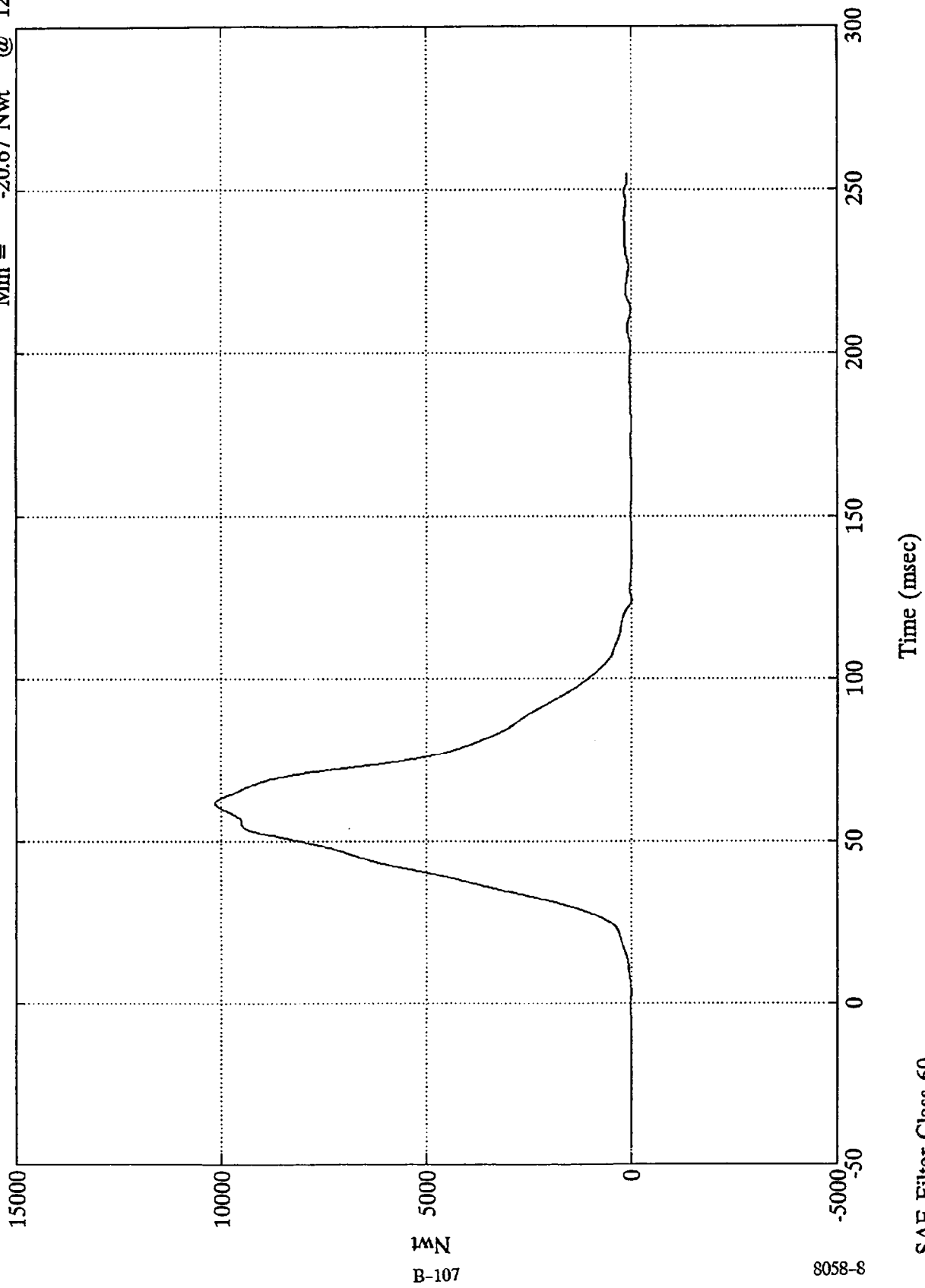
Max = 13586.00 Nwt @ 59.27 msec
Min = -26.63 Nwt @ 156.00 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Torso Belt Load

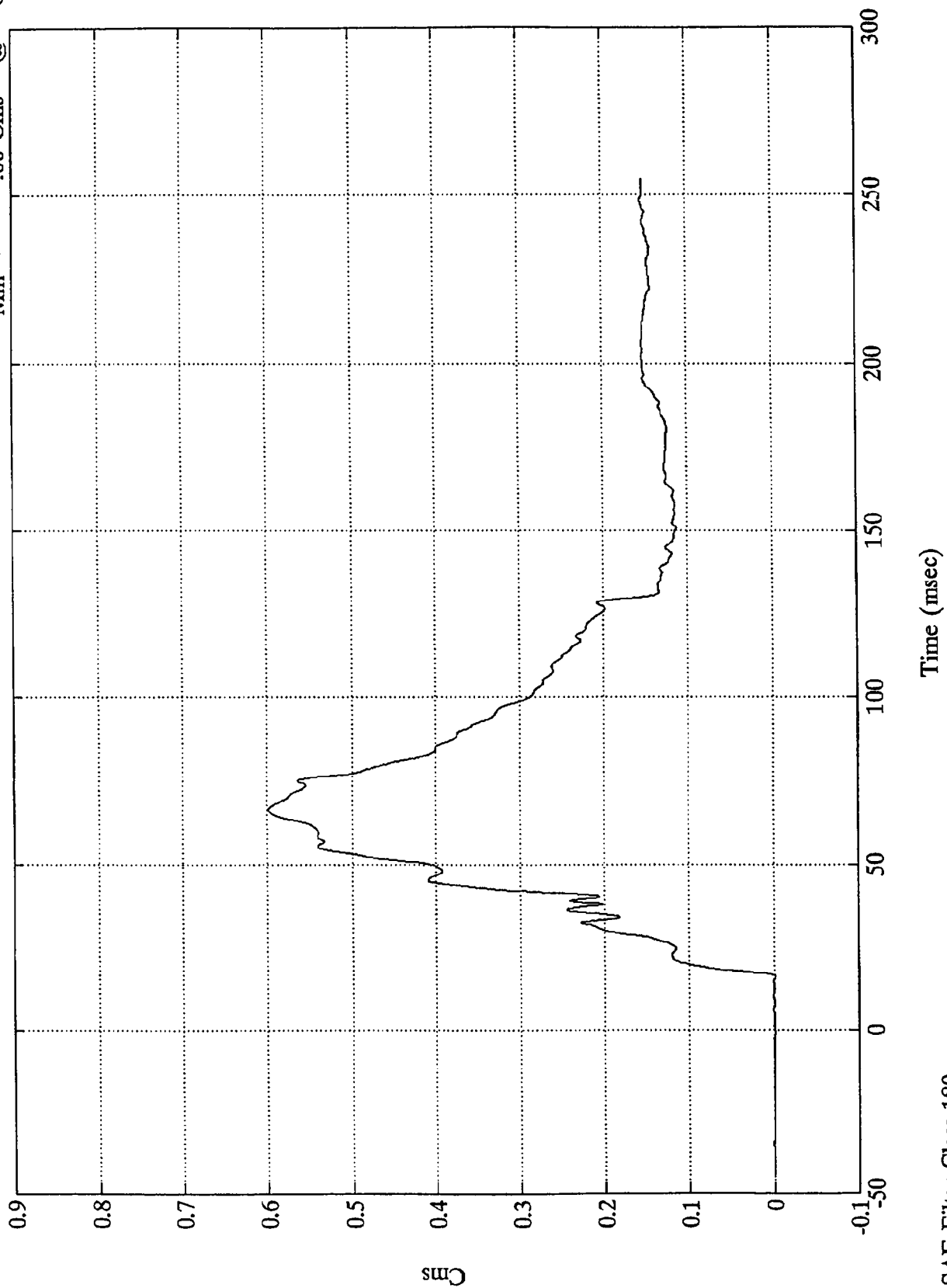
Max = 10152.39 Nwt @ 61.56 msec
Min = -20.67 Nwt @ 124.08 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Belt Elongation

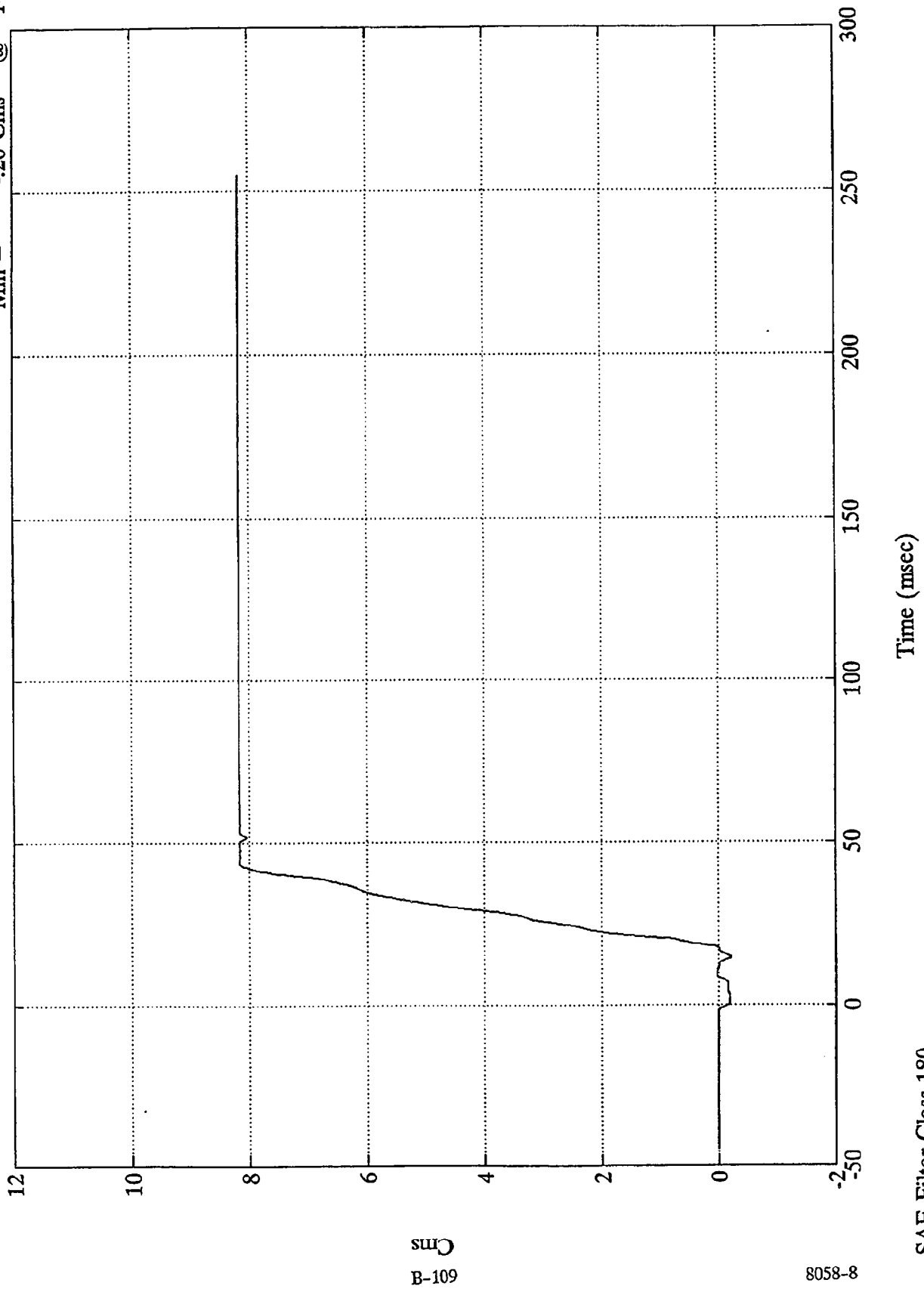
Max =	.60 Cms	@	66.23 msec
Min =	-.00 Cms	@	-0.84 msec



NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Belt Spool Out

Max = 8.16 Cms @ 43.56 msec
Min = -0.20 Cms @ 14.39 msec

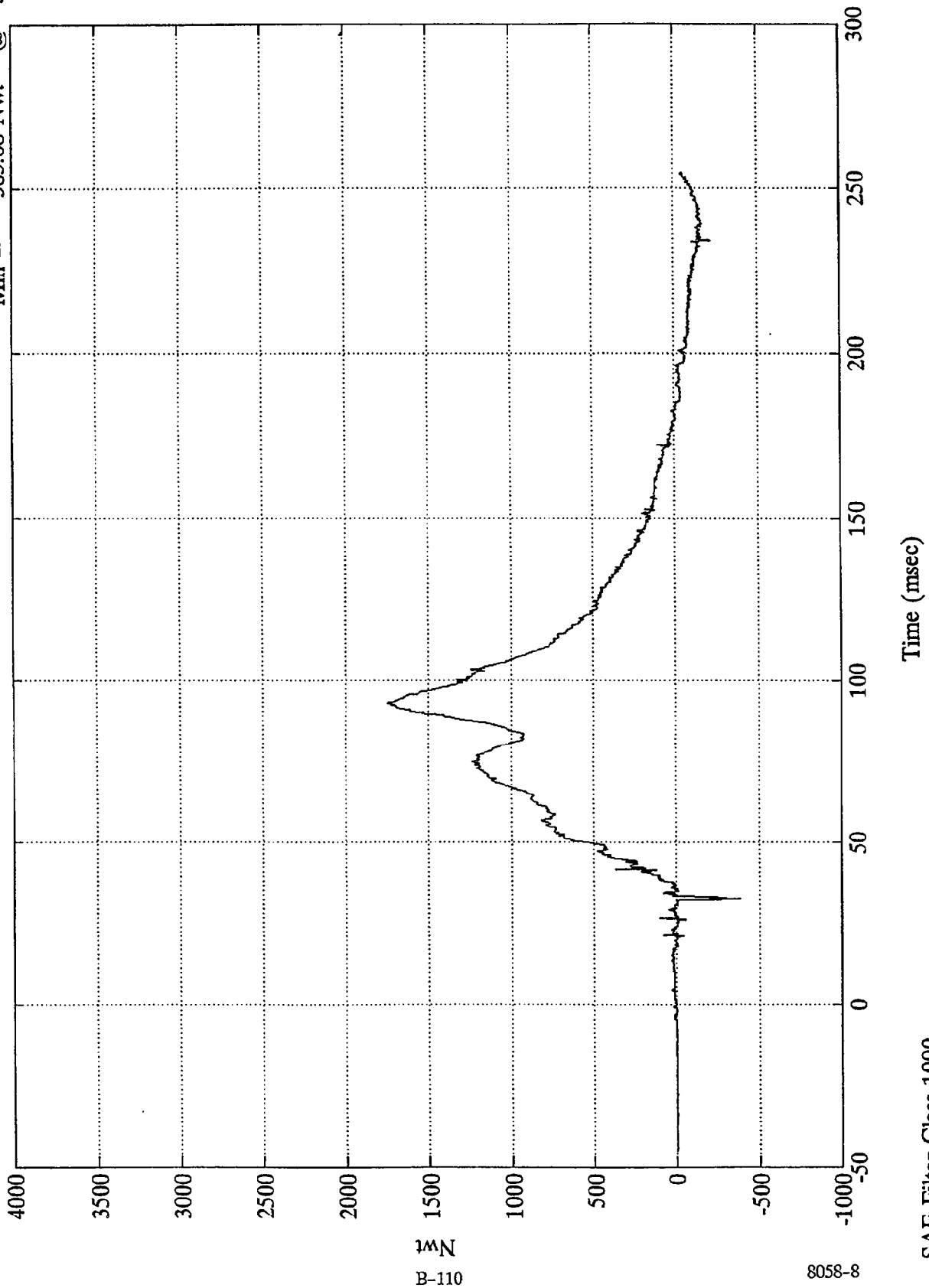


SAE Filter Class 180

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Upper Neck Fx

Max = 1745.95 Nwt @ 92.88 msec
Min = -385.68 Nwt @ 32.52 msec



1wN
B-110

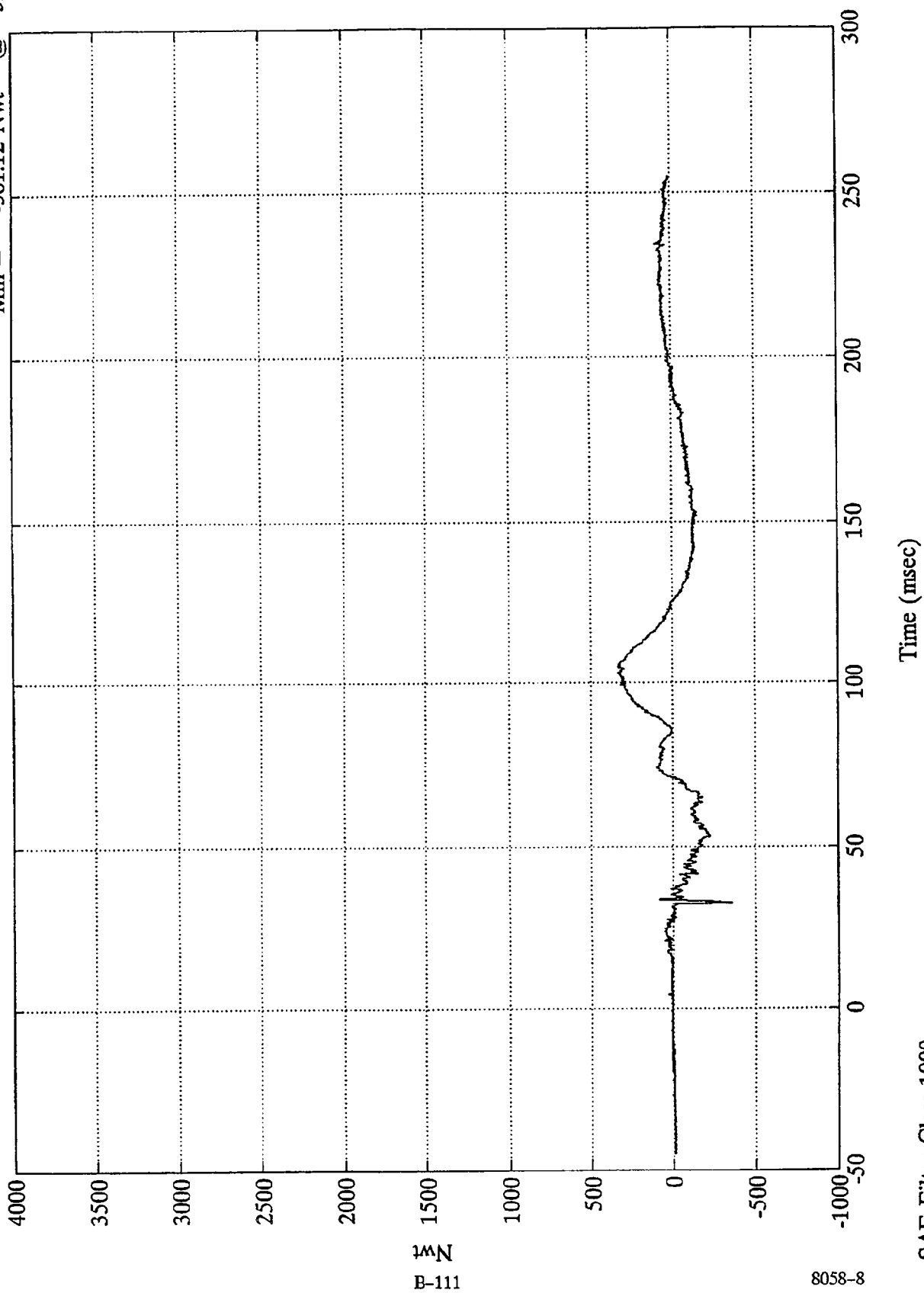
8058-8

SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Upper Neck Fy

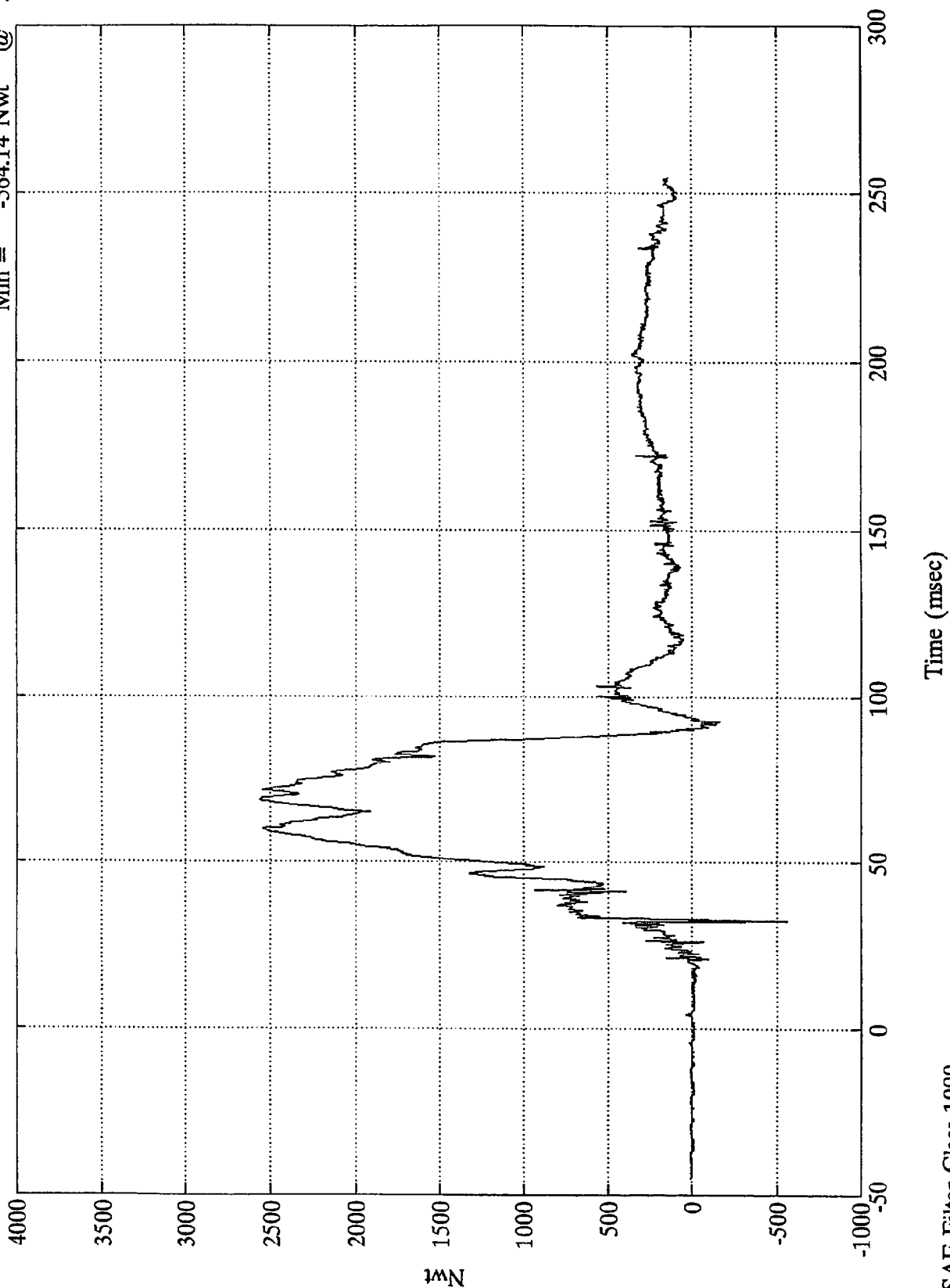
Max = 329.05 Nwt @ 105.48 msec
Min = -361.12 Nwt @ 32.52 msec



SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Upper Neck Fz
Max = 2563.25 Nwt @ 68.52 msec
Min = -564.14 Nwt @ 32.40 msec



1Nwt
B-112

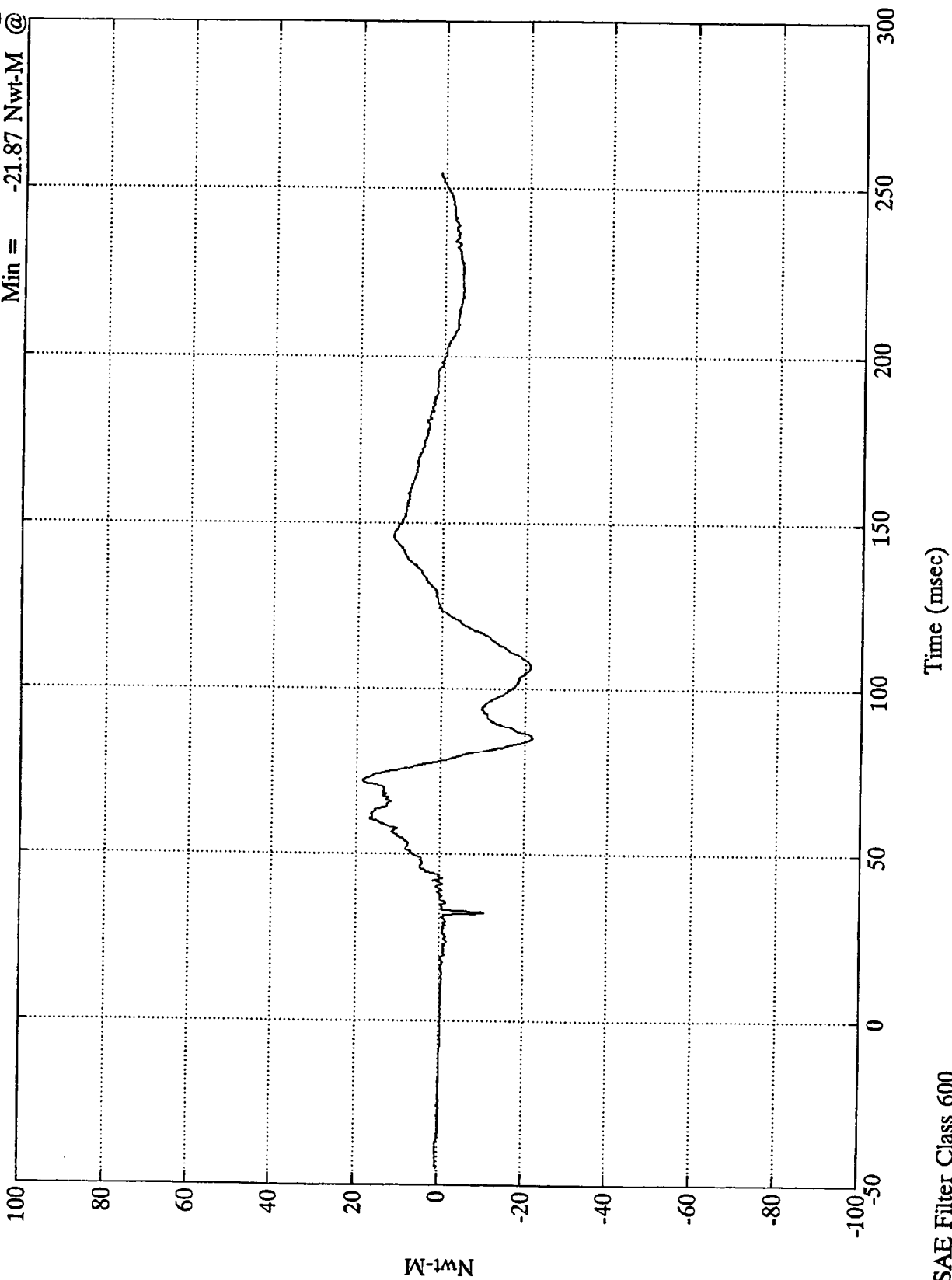
8058-8

SAE Filter Class 1000

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Upper Neck Mx

Max = 18.59 Nwt-M @ 72.24 msec
Min = -21.87 Nwt-M @ 85.31 msec



W-1wN

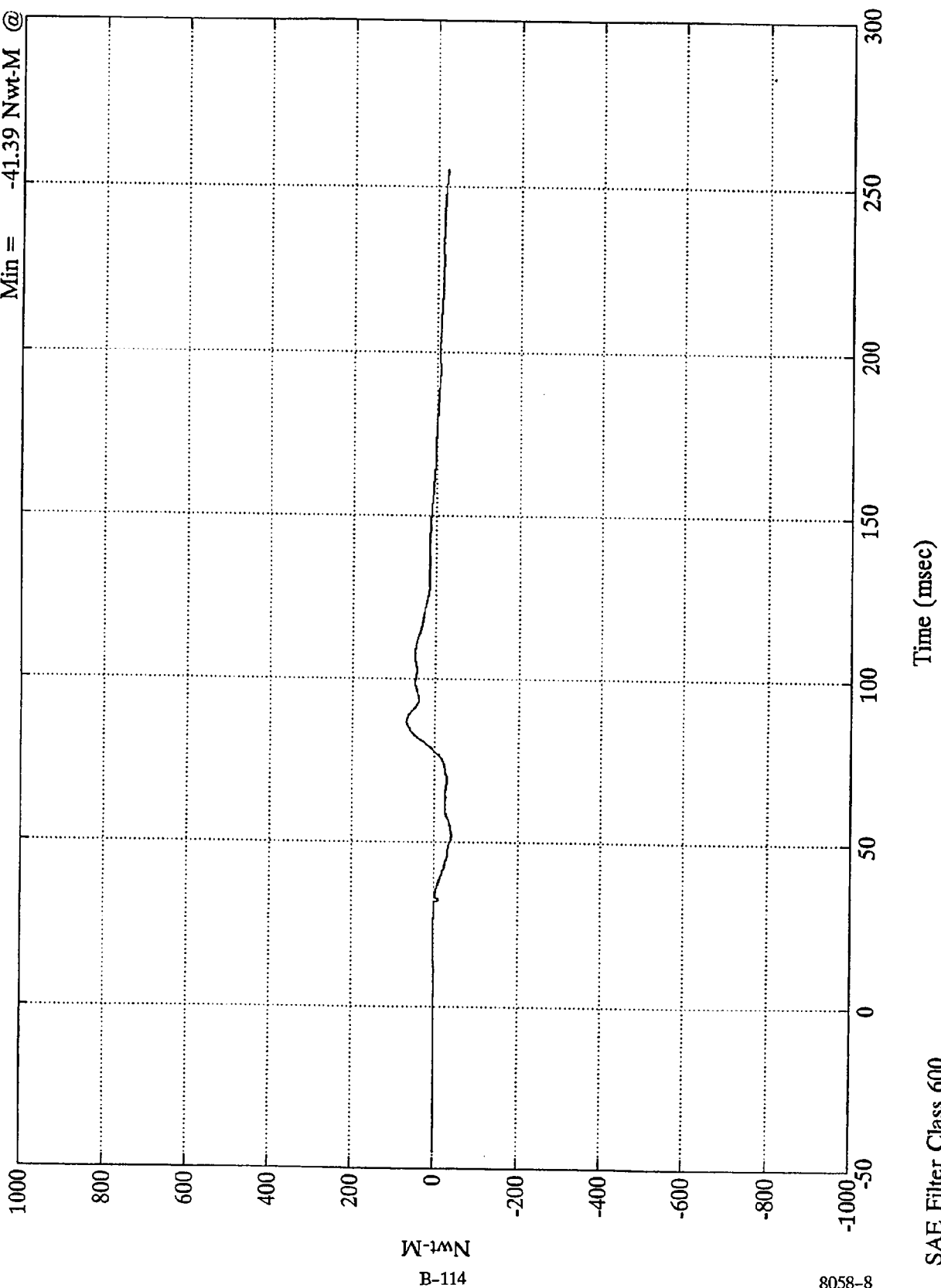
B-113

8058-8

SAE Filter Class 600

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Upper Neck My Max = 68.96 Nwt-M @ 86.76 msec
 Min = -41.39 Nwt-M @ 52.08 msec



B-114

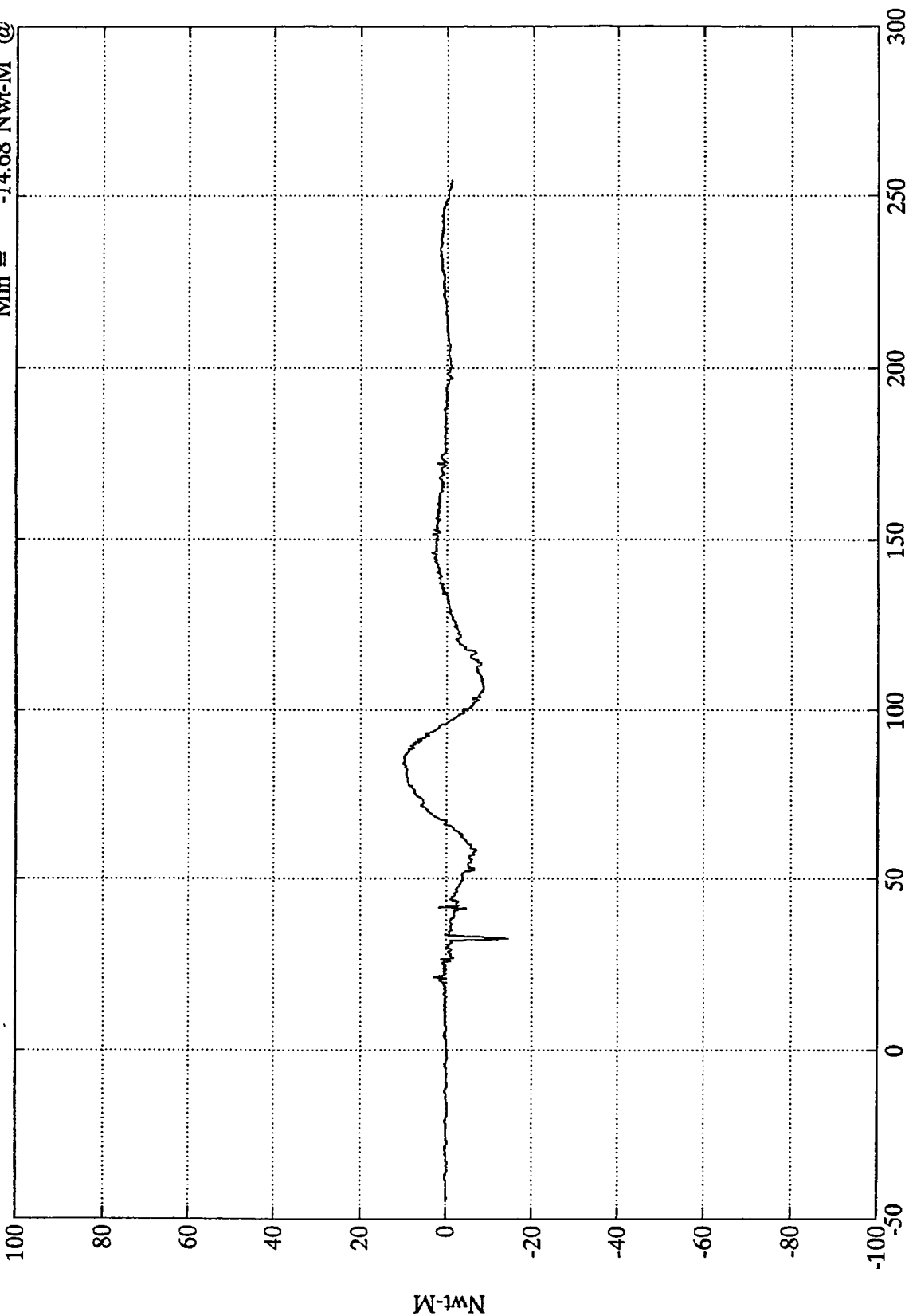
8058-8

SAE Filter Class 600

NCAP TEST #12 - 1993 ISUZU RODEO

Pos. 2 Upper Neck Mz

Max = 10.08 Nwt-M @ 84.12 msec
Min = -14.68 Nwt-M @ 32.52 msec



Time (msec)

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:

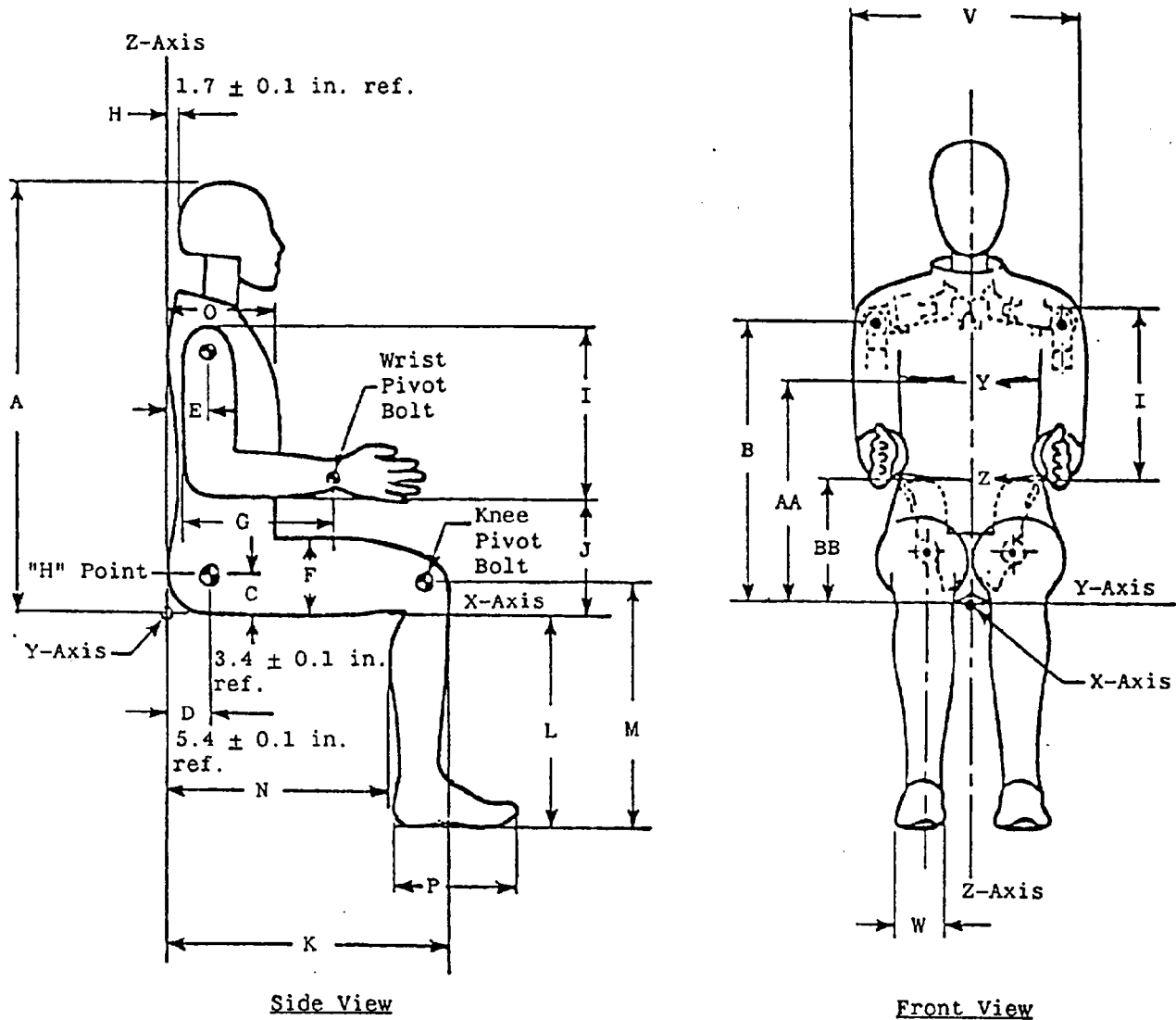
<u>Serial No.</u>	<u>Completion Date</u>
45	3/4/93
245	3/4/93

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 10

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 45 HUMANOID

DUMMY SERIAL NO. 45

DATE: 3/4/93

TEMPERATURE		20.5 DEG. C
RELATIVE HUMIDITY		26 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)	429-434 mm	432 mm
LOCATION FOR WAIST CIRCUMFERENCE (BB)	226-231 mm	228 mm
CHEST CIRCUMFERENCE (Y)	970-1001 mm	1000 mm
WAIST CIRCUMFERENCE (Z)	815-866 mm	866 mm
CHEST DEPTH (O)	213-229 mm	213 mm
H-POINT HEIGHT (C)	84-89 mm	89 mm
H-POINT FROM SEAT BACK (D)	135-140 mm	137 mm
SKULL CAP TO BACKLINE (H)	41-46 mm	43 mm
TOTAL SITTING HEIGHT (A)	879-889 mm	879 mm
THIGH CLEARANCE (F)	140-155 mm	147 mm
BUTTOCK KNEE LENGTH (K)	580-605 mm	602 mm
BUTTOCK POPLITAL LENGTH (N)	452-477 mm	475 mm
POPLITEAL LENGTH (L)	430-455 mm	447 mm
KNEE PIVOT HEIGHT (M)	485-501 mm	487 mm
FOOT LENGTH (P)	252-267 mm	259 mm
FOOT BREADTH (W)	91-107 mm	101 mm
SHOULDER PIVOT FROM BACKLINE (E)	84-94 mm	94 mm
SHOULDER BREADTH (V)	422-437 mm	426 mm
SHOULDER PIVOT HEIGHT (B)	505-521 mm	510 mm
ELBOW REST HEIGHT (J)	190-211 mm	195 mm
SHOULDER-ELBOW LENGTH (I)	330-345 mm	337 mm
BACK OF ELBOW TO WRIST PIVOT (G)	290-305 mm	292 mm

DUMMY MEETS SPECIFICATIONS

TECHNICIAN: IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

HEAD DROP TEST

HYBRID III

DATE : 1/7/93

CALSPAN SEQUENTIAL NUMBER 3

HY3 SN: 45 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	31 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	253.1 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	10.1 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 : 2/24/93

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 3

HY3 SN: 45 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5-22.2 DEG. C	21 DEG. C
RELATIVE HUMIDITY		10% - 70%	22 %
IMPACT VELOCITY		24.8 - 25.7 KPH	24.8 KPH
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	23.52 G'S
	20 MS	17.60 - 22.60 G'S	20.43 G'S
	30 MS	12.50 - 18.50 G'S	15.81 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	15.81 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	41 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	69.81 DEG.
	TIME	57 - 64 MS	58.75 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88 - 108 N-M	98.5 N-M
	TIME	47 - 58 MS	53.38 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	117.63 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	103.5 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 2/24/93

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 3

HY3 SN: 45 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5 - 22.2 DEG. C	21 DEG. C
RELATIVE HUMIDITY		10% - 70%	22 %
IMPACT VELOCITY		21.4 - 22.3 KPH	22.0 KPH
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	17.99 G'S
	20 MS	14.00 - 19.00 G'S	17.9 G'S
	30 MS	11.00 - 16.00 G'S	15.7 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	15.7 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		38 - 46 MS	43.63 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	95.63 DEG.
	TIME	72 - 82 MS	74.75 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-80.0/-52.9 N-M	-76.9 N-M
	TIME	65 - 79 MS	69.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	155.5 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	129.38 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 3/4/93

CALSPAN SEQUENTIAL NUMBER 3

HY3 SN 45

H.S. THORAX

CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.5 - 22.2 DEG. C	21 DEG. C
RELATIVE HUMIDITY	10% - 70%	27 %
PENDULUM VELOCITY	23.7 - 24.6 KPH	23.7 KPH
MAXIMUM DEFLECTION	64 - 73 mm	64.5 mm
MAXIMUM RESISTIVE FORCE	4804 - 5538 NEWTONS	5480 NEWTONS
INTERNAL HYSTERESIS	69% - 85%	70.1 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 1/25/93

KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 3

HY3 SN: 45 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	26 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	4772 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 1/25/93

KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 3

HY3 SN: 45 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	26 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	4875 N
PROBE WEIGHT	4.9 KGS	

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	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	551	11/92	5/93
GSE	552	11/92	5/93

B. CALIBRATION LABORATORY
INSTRUMENTS

1. PENDULUM ACC.

2. TEST PROBE
ACCELEROMETER

MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
CEC	A160	11/92	5/93
CEC	A161	11/92	5/93

HYBRID III EXTERNAL DIMENSIONS

S/N 245 HUMANOID

DUMMY SERIAL NO. 245

DATE: 3/4/93

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	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 MINKIEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

HEAD DROP TEST

HYBRID III

DATE : 1/28/93

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 245 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	29 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	250.7 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	6.1 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 : 2/25/93

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN:245 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5-22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY		10% - 70%	22 %
IMPACT VELOCITY		24.8 - 25.7 KPH	24.9 KPH
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	24.21 G'S
	20 MS	17.60 - 22.60 G'S	20.36 G'S
	30 MS	12.50 - 18.50 G'S	16.62 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	16.62 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	41.75 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	68.66 DEG.
	TIME	57 - 64 MS	57.25 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88 - 108 N-M	98.8 N-M
	TIME	47 - 58 MS	53.25 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	115.75 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	100.38 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 2/25/93

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN:245 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5 - 22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY		10% - 70%	22 %
IMPACT VELOCITY		21.4 - 22.3 KPH	22 KPH
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	17.79 G'S
	20 MS	14.00 - 19.00 G'S	16.75 G'S
	30 MS	11.00 - 16.00 G'S	13.89 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	13.89 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		38 - 46 MS	45.63 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	87.76 DEG.
	TIME	72 - 82 MS	74.38 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-80.0/-52.9 N-M	-77.9 N-M
	TIME	65 - 79 MS	69.63 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	150.63 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	126.88 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 3/4/93

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN 245 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.5 - 22.2 DEG. C	21 DEG. C
RELATIVE HUMIDITY	10% - 70%	27 %
PENDULUM VELOCITY	23.7 - 24.6 KPH	23.7 KPH
MAXIMUM DEFLECTION	64 - 73 mm	65.5 mm
MAXIMUM RESISTIVE FORCE	4804 - 5538 NEWTONS	5431 NEWTONS
INTERNAL HYSTERESIS	69% - 85%	73.5 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 1/25/93

KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 245 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	26 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	4839 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 1/25/93

KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN: 245 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	26 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	4772 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	FB32L	11/93	5/93
ENDEVCO	A33A	1/93	7/93
ENDEVCO	A67A	1/93	7/93
GSE	954	11/92	5/93
GSE	955	11/92	5/93

B. CALIBRATION LABORATORY INSTRUMENTS

1. PENDULUM ACC.

2. TEST PROBE ACCELEROMETER

MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
CEC	A160	11/92	5/93
CEC	A161	11/92	5/93

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	ADM88	ENDEVCO	3/93	9/93
Y	ADL44	ENDEVCO	3/93	9/93
Z	AC213	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	551	GSE	11/92	5/93
Left Femur Load Cell	552	GSE	11/92	5/93
Neck Load Cell				
X	446	DENTON	11/92	5/93
Y	446	DENTON	11/92	5/93
Z	446	DENTON	11/92	5/93
Neck Moment				
X	446	DENTON	11/92	5/93
Y	446	DENTON	11/92	5/93
Z	446	DENTON	11/92	5/93
Chest Deflection Gauge				
Hybrid III Use Only	45	HUMANOID	3/93	9/93
Lap Belt Load Cells	706	LEBOW	11/92	5/93
Shoulder Belt Load Cells	707	LEBOW	11/92	5/93
Spool-Out Potentiometer	22	SERVONIC INST.	11/92	5/93
Belt Stretch Transducer	E1	CALSPAN	11/92	5/93

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	FB32L	ENDEVCO	11/92	5/93
Y	A33A	ENDEVCO	11/92	5/93
Z	A67A	ENDEVCO	11/92	5/93
Right Femur Load Cell	954	GSE	11/92	5/93
Left Femur Load Cell	955	GSE	11/92	5/93
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	150	HUMANOID	10/92	4/93
Lap Belt Load Cells	710	LEBOW	11/92	5/93
Shoulder Belt Load Cells	711	LEBOW	11/92	5/93
Spool-Out Potentiometer	32	SERVONIC INST.	11/92	5/93
Belt Stretch Transducer	E2	CALSPAN	11/92	5/93

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS

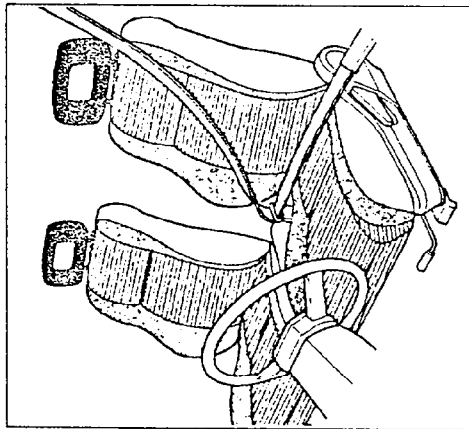
(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration	
			Last	Next
Left Seat Rear Crossmember	A157	CEC	11/92	5/93
Right Rear Seat Crossmember	A44	CEC	1/93	7/93
Top of Engine	A152	CEC	10/92	4/93
Bottom of Engine	A175	CEC	11/92	5/93
Left Disc Brake Caliper	A156	CEC	10/92	4/93
Right Disc Brake Caliper	A73	CEC	1/93	7/93
Instrument Panel	A182	CEC	11/92	5/93
Left Seat Rear Crossmember	A144	CEC	11/92	5/93
Right Rear Seat Crossmember	A70	CEC	2/93	8/93

Appendix E

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

E FRONT AND REAR SEAT LAP/SHOULDER BELTS

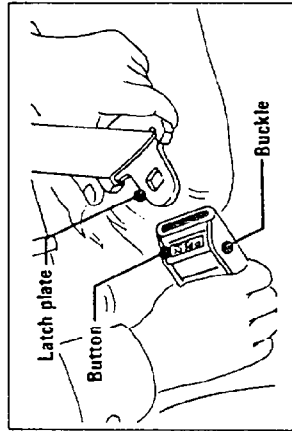
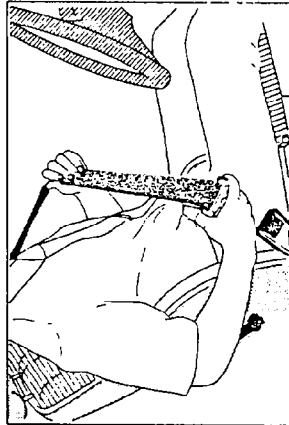


To help lessen the chance of injury in accidents or sudden stops, we urge that people riding in the vehicle be properly restrained at all times, using the seat belts provided. This includes children and pregnant women. See the following

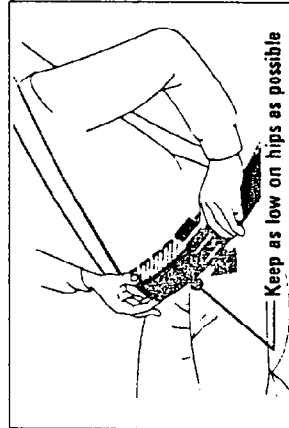
pages for use of restraints by children and pregnant women.

To Fasten the Seats Lap/Shoulder Belt

1. Adjust the front seat as needed. Sit up straight and well back in the seat.
 2. Grasp the latch plate and:
 - Pull the lap-shoulder belt webbing across the body.
- At the same time, slide the latch along the belt until it reaches the buckle. Push the latch plate into the buckle until it clicks.



3. Position the "lap" portion of the belt across the lap as **LOW ON THE HIPS** as possible.



Then, adjust to a **SNUG FIT** by holding the "shoulder" portion of the front seat belt and pulling it **UPWARD** through the latch plate

until the lap portion is snug across the lap. This reduces the risk of sliding under the belt during an accident.

4. To unfasten the belt, push in the button on the buckle. The belt should retract when the buckle is unlatched but hold the latch plate as it does so, to keep it from hitting people or nearby objects. To help prevent damage to the safety belt and interior trim, before closing the door be sure the belt is fully retracted and the latch plate is out of the way.



- A snug fit with the lap belt positioned low on the hips is necessary to lessen the chance of injury and/or the degree of injury in an accident. This spreads the force of the lap belt over the hip bone instead of across the abdomen.
- Never use the same seat belt for more than one person at a time. A seat belt worn by more than one person will not provide adequate protection in the event of a collision.
- Never wear twisted seat belts.
- Be very careful not to damage seat belts or seat belt buckles by pinching them in the seat or the door.
- Too much slack could increase the

amount of injury because the belt would not be able to properly restrain you in an accident. **DO NOT** wear shoulder belt under the arm or out of position. Such use could increase the chance of injury and/or the degree of injury in an accident.

- According to Federal accident statistics, children are safer when properly restrained in rear seating positions than in the front seating positions.

It is advisable to have children seated in the rear center seat and restrained with the vehicle's safety belt.

Children who have outgrown child restraint systems should use the vehicle's safety belts and sit in the rear seat.

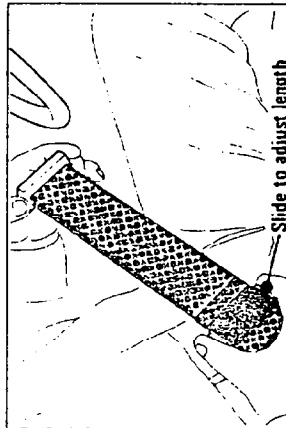
If the child's seating position has a shoulder belt which is on or very close to the face or neck, position the child so that the belt is properly positioned.

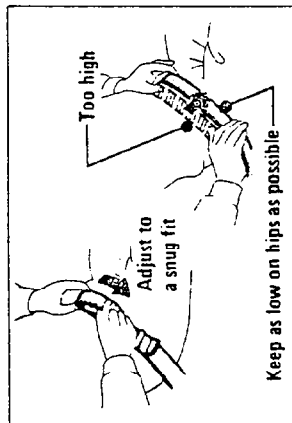
NOTE

- The retractor will lock the belt only during a sudden stop or on impact.
- At other time you can move around freely.
- The seat belts for the front and

rear passenger seats have an additional locking mechanism designed for securing child restraint seats. When the belt is pulled all the way out, the locking mechanism will only permit the belt to retract. Do not pull the belt all the way out except when using it to secure a child restraint seat. If the belt is inadvertently pulled all the way out, let the belt fully retract before using it.

CENTER SEAT LAP BELTS (Bench seat only)





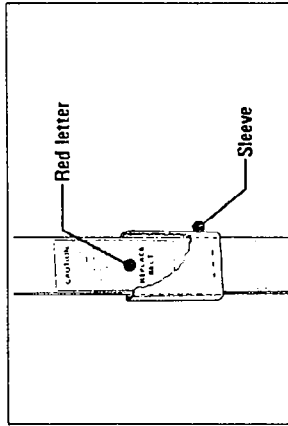
1. Sit up straight and well back in the seat.
2. Take hold of the latch plate at an angle to the webbing and slide it toward the front of vehicle. Then pull it slowly across your lap and push the latch plate into the buckle until it clicks.
3. Position the belt across the lap as **LOW ON THE HIPS** as possible. Then, adjust to **SNUG FIT** by holding the free end of the webbing and pulling it through the latch plate until the belt is snug across the lap. This reduces the risk of sliding under the belt during an accident.
4. To unfasten the belt, push in the button on the buckle.

H SEAT BELT REMINDER

When the key is turned to "ON" position, a light will come on for four to eight seconds to remind people to fasten their safety belts. Unless the driver's safety belt is buckled, a buzzer will sound at the same time.

I SEAT BELT REPLACEMENT LABEL

The front seat safety belts have a loop of webbing under the sleeve for effectiveness of the entire restraint system.



WARNING

• Replace the front seat safety belt when the loop has been pulled out and the red letter words "REPLACE BELT" are visible at the top edge of the sleeve.

J SEAT BELT INSPECTION

- Occasionally check that the belts, buckles, latch plates, retractors, reminder systems, guide loops, and anchors work properly. Also check for damage that could keep the restraint system from doing its job.
- Keep sharp edges and damaging objects away from the belts and other parts of the restraint system.
- Replace belts if cut, weakened, or frayed. Also, have belts replaced if they have been worn in a collision.
- If there is any doubt, have all related parts including belts replaced.
- Keep belts clean and dry.
- Clean only with mild soap and lukewarm water.
- Do not bleach or dye belts since this may badly weaken them.