

V2487

REPORT NUMBER: CAL-96-N14

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

**VOLVO
1997 VOLVO 960
4-DOOR SEDAN**

NHTSA NUMBER: MV5900

CALSPAN TEST NUMBER: 8313-14

November 26, 1996

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FINAL REPORT

PREPARED FOR:

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16. <i>Abstract</i> A frontal load cell barrier test of a 1997 Volvo 960 4-Door Sedan was performed at Calspan SRL Corporation crash test facility in Buffalo, New York, on November 26, 1996. The impact velocity was 56.2 kph and the temperature at the barrier face was 20°C. The maximum post-test vehicle crush was 536 mm. The test vehicle was equipped with a 3-point continuous belt system as well as front and side airbags at both front outboard seating positions. With respect to FMVSS 208 "Occupant Crash Protection - Injury Criteria" both the driver and passenger appear to comply with head, chest and femur requirements.			
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Section 1

PURPOSE AND TEST PROCEDURE

This 56.2 kph frontal barrier impact test is part of the Composite FY 96 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 56.2 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 MV5900

A load cell barrier consisting of 36 load cells was impacted by a 1997 Volvo 960 4-Door Sedan at a velocity of 56.2 kph. The test was performed at the Calspan SRL Corporation on November 26, 1996. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by 1 real-time camera and 16 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

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

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver (position 1) ATD (Serial No. 150) and the right-front passenger (position 2) ATD (Serial No. 064) were calibrated previous to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 129 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 and 2 Belt Spool Out and Torso Belt Loads were not recorded as requested by manufacturer. Vehicle accelerometer number 3 (Top of Engine), Position 1 Left Foot X, Position 2 Left Foot Z and Barrier Load Cell B9, C4 and C7 did not record accurately and are being omitted from this report. Position 1 Right Foot X data is not accurate after 60 msec.

The driver's HIC was 511.5. The maximum chest deceleration over 3 milliseconds was 44.6 g's and maximum chest deflection was -24.6 mm. Femur loads were -3081.9 newtons on the left and -1284.1 newtons on the right.

The right front passenger's HIC was 698.9. Maximum chest deceleration over 3 milliseconds was 53.2 g's and maximum chest deflection was -21.6 mm. Femur loads were -3779.2 newtons on the left and -4087.6 newtons on the right.

Table 1

GENERAL TEST AND VEHICLE DATA

Vehicle Year/Make/Model/Body Style: 1997 Volvo 960 4-Door Sedan

NHTSA Test No.: MV5900 VIN.: YV1KS9600V1104997

Body Color: Pewter Date of Manufacture: 8/96

Date Received: 9/18/96

Odometer Reading: 93

Engine: 6 Cylinders; - C.I.D.; 2.9 Liters; - CC
X Gas; - Diesel; - Turbocharged
X Longitudinal; X Transverse

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

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

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

Type of Occupant Restraint: Driver front and side impact airbags with 3-point belt system
Passenger front and side impact airbags with 3-point belt system

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 248 kPa, Rear 248 kPa

Recommended Tire Size: P205/55R16

Recommended Cold Tire Pressure: Front 248 kPa, Rear 248 kPa

Tires on Vehicle: P205/55R16 Manufacturer: Michelin

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

Vehicle Capacity Weight (VCW) = 415 kgs. (A)

No. of Occupants x 68 kgs. = 340 kgs. (B)

Rated Cargo and Luggage Weight (RCLW) A-B = 75 kgs.

GVWR 2019 kgs. GAWR: Front 984 kgs. Rear 1048 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>436</u>	kgs.	Right Rear	=	<u>362</u>	kgs.
Left Front	=	<u>441</u>	kgs.	Left Rear	=	<u>358</u>	kgs.
TOTAL FRONT WEIGHT	=	<u>877</u>	kgs.	(<u>54.9</u> % of Total Vehicle Weight)			
TOTAL REAR WEIGHT	=	<u>720</u>	kgs.	(<u>45.1</u> % of Total Vehicle Weight)			
TOTAL DELIVERED WEIGHT	=	<u>1,597</u>	kgs.				

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight	<u>1597</u>	kgs.
VCW = Vehicle Capacity Weight	<u>415</u>	kgs.
DSC = Designated Seating Capacity	<u>5</u>	
RCLW = VCW - 68 (DSC) =	<u>75</u>	kgs.
Target Test Weight = UDW + RCLW + (2 dummies x 74.4 kgs./ dummy)		
Target Test Weight =	<u>1821</u>	kgs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 68 KGS CARGO:

Right Front	=	<u>458</u>	kgs.	Right Rear	=	<u>469</u>	kgs.
Left Front	=	<u>437</u>	kgs.	Left Rear	=	<u>450</u>	kgs.
TOTAL FRONT WEIGHT	=	<u>895</u>	kgs.	(<u>49.3</u> % of Total Vehicle Weight)			
TOTAL REAR WEIGHT	=	<u>919</u>	kgs.	(<u>50.7</u> % of Total Vehicle Weight)			
TOTAL TEST WEIGHT	=	<u>1,814</u>	kgs.				
Weight of ballast secured in vehicle trunk area = <u>0</u> kgs.							

VEHICLE ATTITUDE (all dimensions in mm):

Delivered Attitude:	RF	<u>693</u>	LF	<u>692</u>	RR	<u>681</u>	LR	<u>683</u>
Test Attitude:	RF	<u>673</u>	LF	<u>676</u>	RR	<u>636</u>	LR	<u>646</u>

Wheel Base: 2775 mm.; C.G. = 1406 mm. rearward of front wheel C/L

Remarks: 71.2 liters of stoddard solution was placed in the fuel tank.

Table 1

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

Type of Test: Frontal Barrier Impact Angle: 0°

Date of Test: November 26, 1996 Time of Test: 13:57

Ambient Temperature: 20 ° C at impact area

Temperature in Occupant Compartment: 21 ° C

Windshield Molding Temperature: 21 ° C

Required Impact Velocity Range: 55.5 to 57.1 kph

Impact Velocity: primary = 56.3 kph, secondary = 56.2 kph

Distance From Front Bumper to Barrier Face When

Entering Speed Trap: 1321 mm

Exiting Speed Trap: 305 mm

VEHICLE REBOUND AND CRUSH (mm):

Vehicle Length:	Pre-test = R	<u>4785</u>	C _L	<u>4870</u>	L	<u>4780</u>
	Post-test = R	<u>4305</u>	C _L	<u>4334</u>	L	<u>4295</u>
	Crush = R	<u>480</u>	C _L	<u>536</u>	L	<u>485</u>

Distance from front of test vehicle to point of impact:

R	<u>285</u>	C _L	<u>273</u>	L	<u>273</u>
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VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	Face to left center of airbag / back of head to head rest	Face to airbag / back of head to headrest
Chest	<u>Airbag</u>	<u>Airbag</u>
Abdomen	<u>-</u>	<u>-</u>
Left Knee	<u>Knee Bolster</u>	<u>Glove Box</u>
Right Knee	<u>Knee Bolster</u>	<u>Glove Box</u>

Table 1

GENERAL TEST AND VEHICLE DATA (cont'd)

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
Door Opening	<u>Operable</u>	<u>Operable</u>	<u>Operable</u>	<u>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>-</u>	<u>-</u>
Seat Shift (mm.)	<u>10 mm</u>	<u>10 mm</u>	<u>-</u>	<u>-</u>
<u>Glazing Damage</u>				
Backlight/Windshield:	<u>Full retention</u>			
Other Notable Impact Effects:	<u>Deformation of roof before 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 Test No.: MV5900 Vehicle: 1997 Volvo 960 4-Door Sedan

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-51.7	-17.8	20.2	56.3
Position #2 - Passenger	-70.0	-11.1	20.5	72.6

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R*
Position #1 - Driver	-45.0	-6.9	-13.6	44.6
Position #2 - Passenger	-54.1	-7.4	-9.9	53.2

* 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	-3081.9	-1284.1
Position #2 - Passenger	-3779.2	-4087.6

	MAXIMUM FORCE - SEAT BELT LOADS (nwt)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	***	-	6090.9
Position #2 - Passenger	***	4745.6	-

	HEAD INJURY CRITERIA (HIC)			
	HIC**	t ₁ (mSec)	t ₂ (mSec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	511.5	48.84	84.84	45.81
Position #2 - Passenger	698.9	54.36	88.08	53.29

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

*** Torso Belt Loads were not recorded as requested by manufacturer.

Table 3

HYBRID III NECK AND CHEST DATA SHEETVehicle Year/Make/Model/Body Style: 1997 Volvo 960 4-Door SedanNHTSA Test No.: MV5900 Test Date: November 26, 1996

MAXIMUM VALUES	DRIVER DUMMY ID #150:	PASSENGER DUMMY ID #064:
Neck Load X (nwt)	-516.9	-292.4
Neck Load Y (nwt)	-283.5	399.4
Neck Load Z (nwt)	1582.4	-1637.4
Neck Moment X (nwt-m)	19.6	16.4
Neck Moment Y (nwt-m)	41.9	-32.5
Neck Moment Z (nwt-m)	15.6	15.1
Chest Deflection X (mm.)	-24.6	-21.6
Time of Max. Occurrence (msec)	74.4	70.1

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

Figure 1

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS

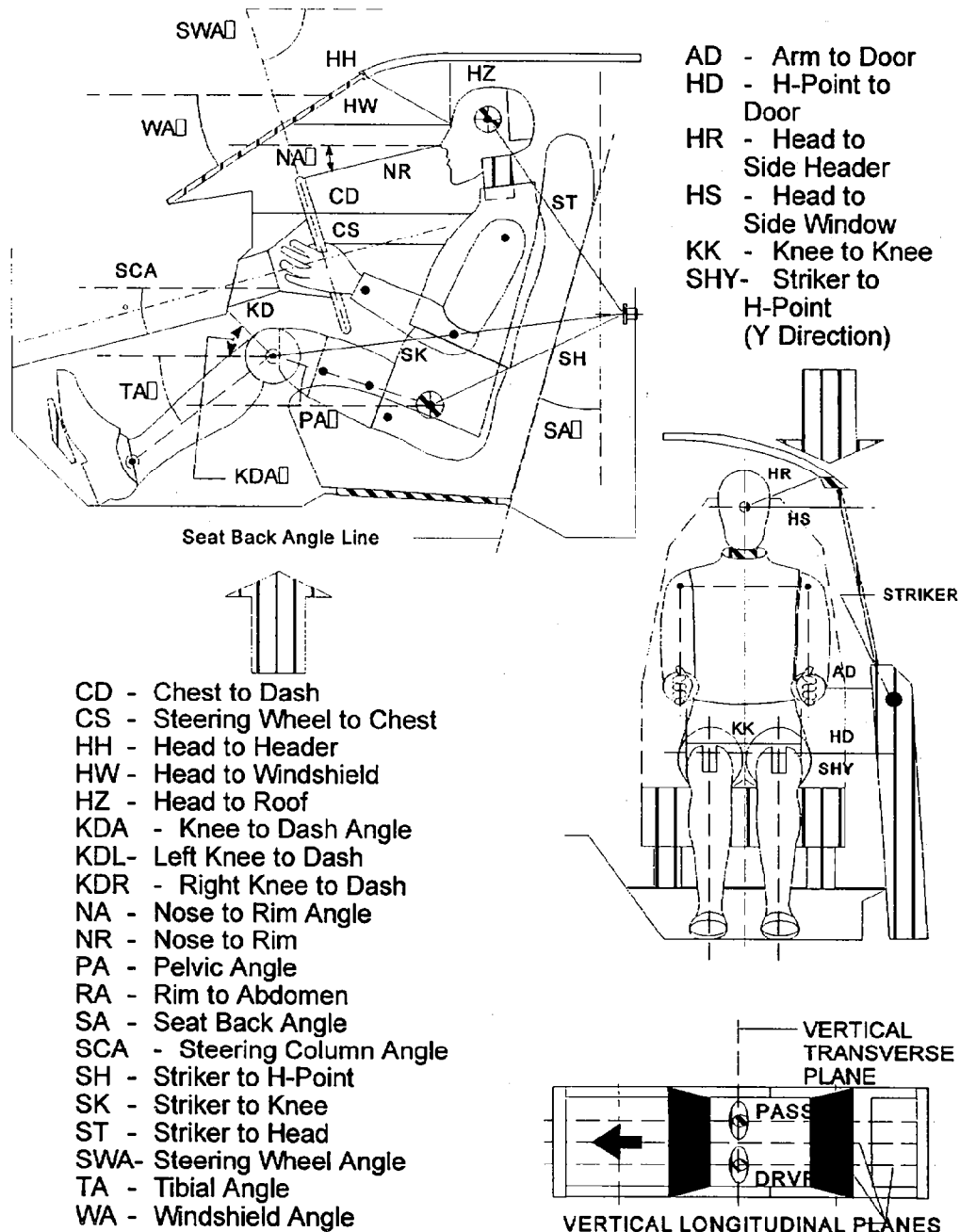


Table 4

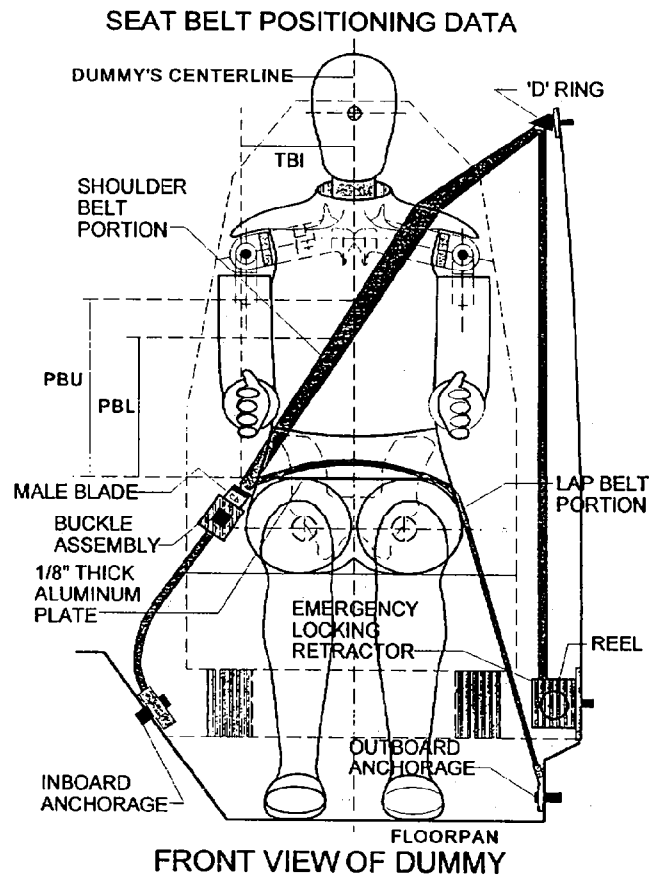
FRONT SEAT OCCUPANT MEASUREMENTS

	DRIVER (Serial #150)			PASS. (Serial # 064)		
WA ^o	32 deg.			N/A		
SWA ^o	54 deg.			N/A		
SCA ^o	36 deg.			N/A		
SA ^o	16 deg.			16 deg.		
HZ	125			119		
HH	363			372		
HW	511			515		
HR	223			235		
NR	372	Angle	15 deg.	N/A		
CD	533			551		
CS	287			N/A		
RA	173			N/A		
KDL	162	Angle (KDA)	45 deg.	147		
KDR	150			153	Angle (KDA)	35 deg.
PA ^o	21 deg.			23 deg.		
TA ^o	42 deg.			45 deg.		
KK	280			200		
ST	566	Angle	12 deg.	551	Angle	12 deg.
SK	612	Angle	90 deg.	640	Angle	93 deg.
SH	206	Angle	125 deg.	254	Angle	118 deg.
SHY	235			230		
HS	290			290		
HD	123			131		
AD	70			74		

Dimensions in millimeters

Figure 2

SEAT BELT POSITIONING DATA



	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	297	301
PBL-- Top surface of alum. plate to belt lower edge	225	232
<u>LAP BELT TENSION</u>	10 nwts	10 nwts
<u>SHOULDER BELT TENSION</u>	Retractor	Retractor

Table 5

SEAT BELT PERFORMANCE ASSESSMENT TEST DATABELT LENGTH DATA:

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

DriverPassenger

1520

1540

Shoulder belt length as measured
on Part 572 Dummy.

860

870

Lap belt length as measured
on Part 572 Dummy.

660

670

SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis.

76.2 mm

50.8 mm

As determined mechanically.

69 mm

58 mm

As determined electronically.

*

*

BELT STRETCH DATA:

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

80 mm

20 mm

Measured mechanically.

0 mm

0 mm

* Belt Spool Out's were not recorded as requested by manufacturer.

Dimensions in millimeters

Figure 3

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera information shown in Table 6.

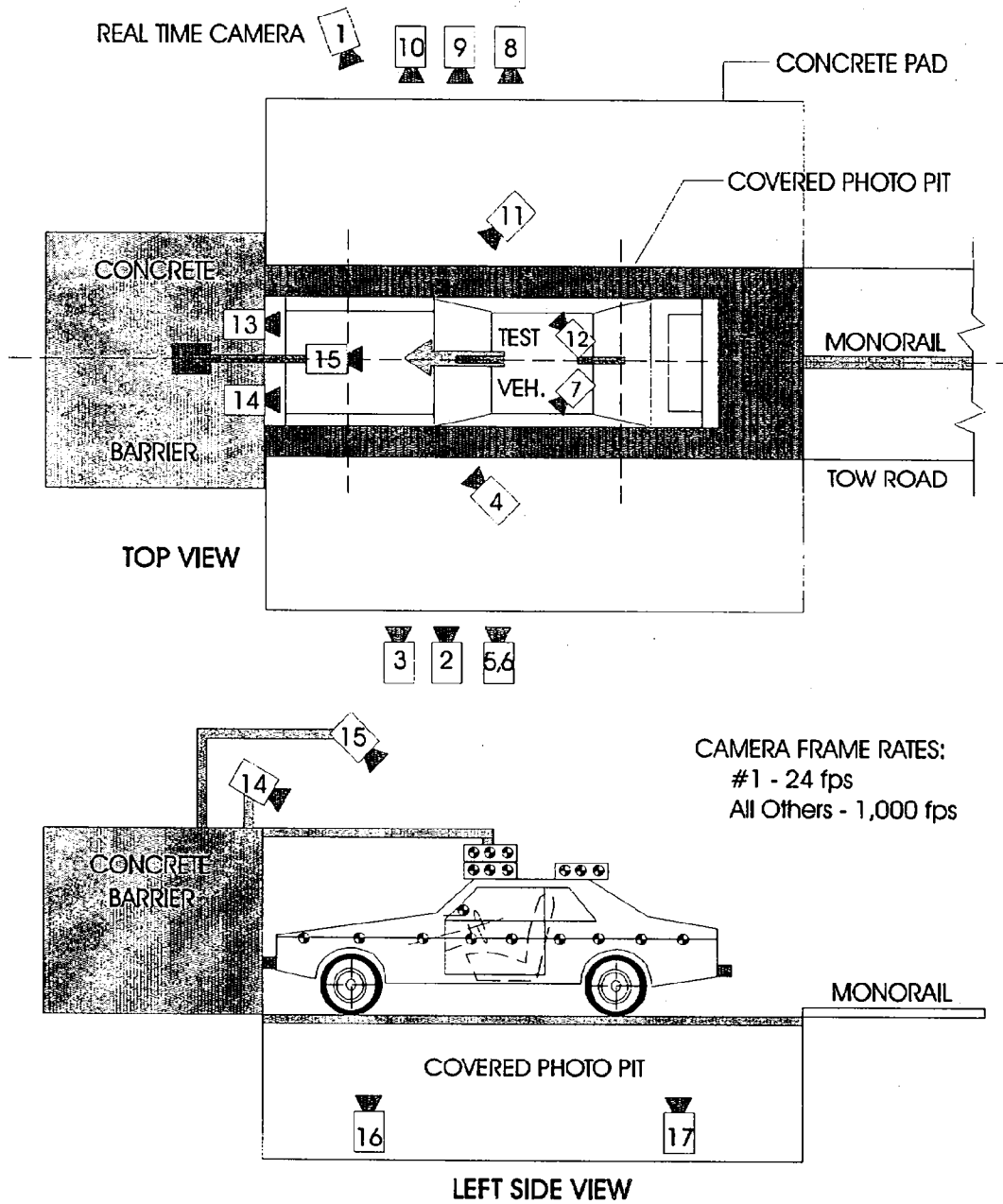


Table 6
HIGH-SPEED CAMERA LOCATIONS

NHTSA Test No.: MV5900 Vehicle: 1997 Volvo 960 4-Door Sedan

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	6299	1524	1143	-5	5901	13	1030
3	Left Side View	8357	991	1092	-3.5	7959	25	1060
4	Driver and Interior View	5461	2845	1905	-11	-	25	970
5	Steering Column (Bottom)	9804	2286	1168	-3	9406	35	860
6	Steering Column (Top)	9804	2286	1778	-8	9406	35	850
7	Left Belt	-	-	-	-	-	13	560
8	Overall Right Side	6528	2032	1118	-4	6130	13	1000
9	Right Side View	8280	1372	1118	-3	7882	25	1150
10	Right Passenger View	8280	1854	1473	-4	7882	35	1080
11	Passenger and Interior View	5309	3073	1930	-12	-	25	1110
12	Right Belt	-	-	-	-	-	13	700
13	Passenger Front View	580	0	2000	-35	-	13	1050
14	Driver Front View	580	0	2000	-35	-	13	1050
15	Windshield View	0	530	3048	-90	-	13	1050
16	Pit View of Engine	0	505	-3048	-90	-	13	960
17	Pit View of Fuel Tank	0	3432	-3048	-90	-	13	900

*X = film plane to monorail centerline

Y = film plane to impact location

Z = film plane to ground

** = referenced to horizontal plane

N.T. indicates No Timing

Figure 4

VEHICLE TARGET LOCATIONS

(Dimensions in millimeters)

A	322
B	682
C	1219
D	2189
E	311
F	1598
G	926
H	926
I	130
J	1330
K	1056
L	1558
M	311
N	105
O	927
P	926
Q	1558
R	1032
S	1354

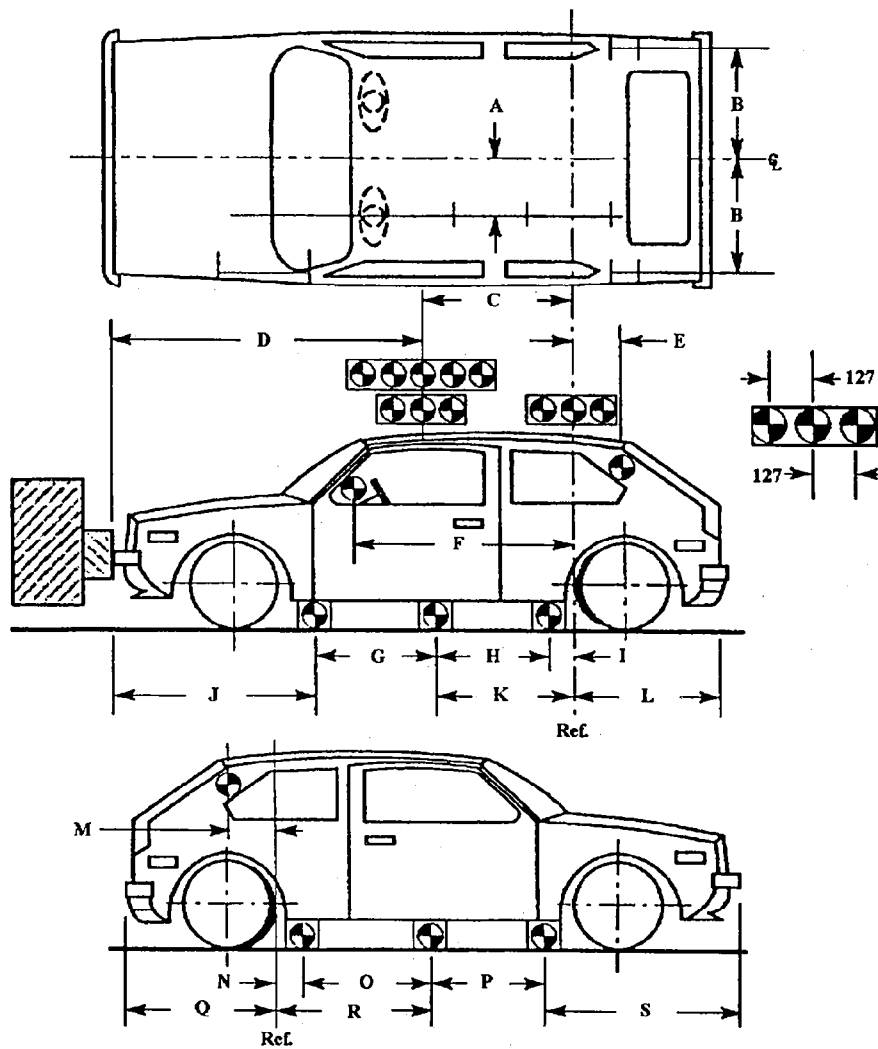
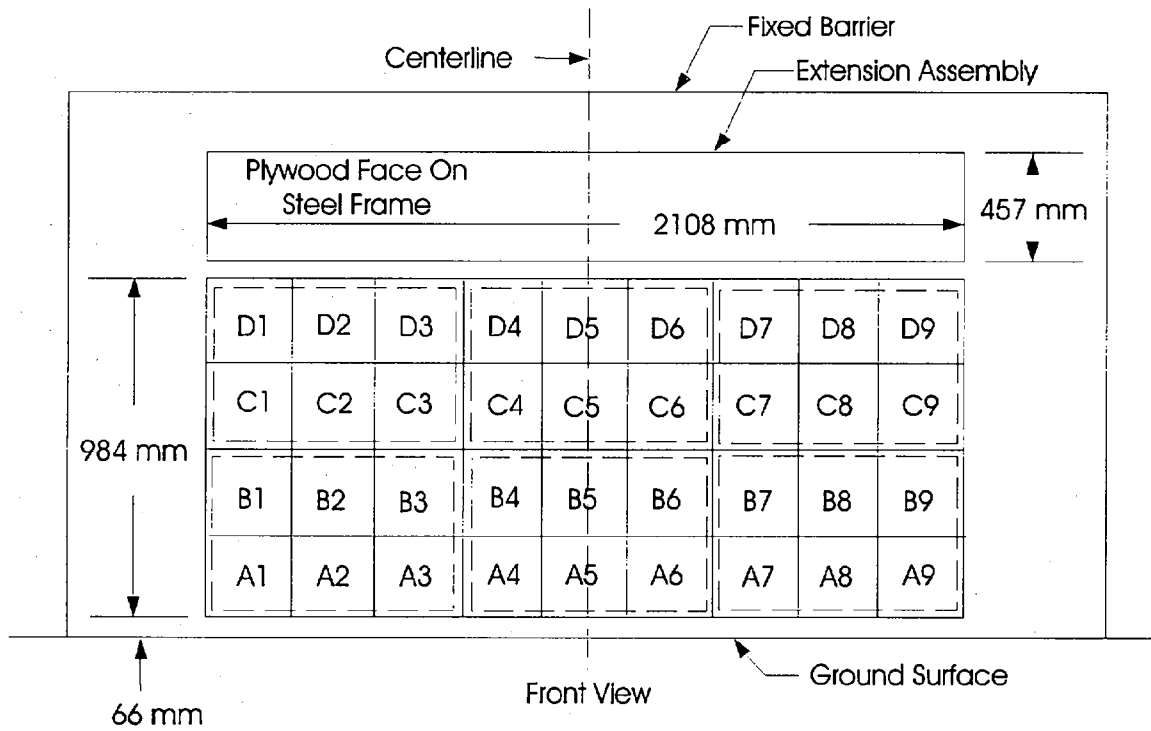


Figure 5

LOAD CELL LOCATIONS ON FIXED BARRIER

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



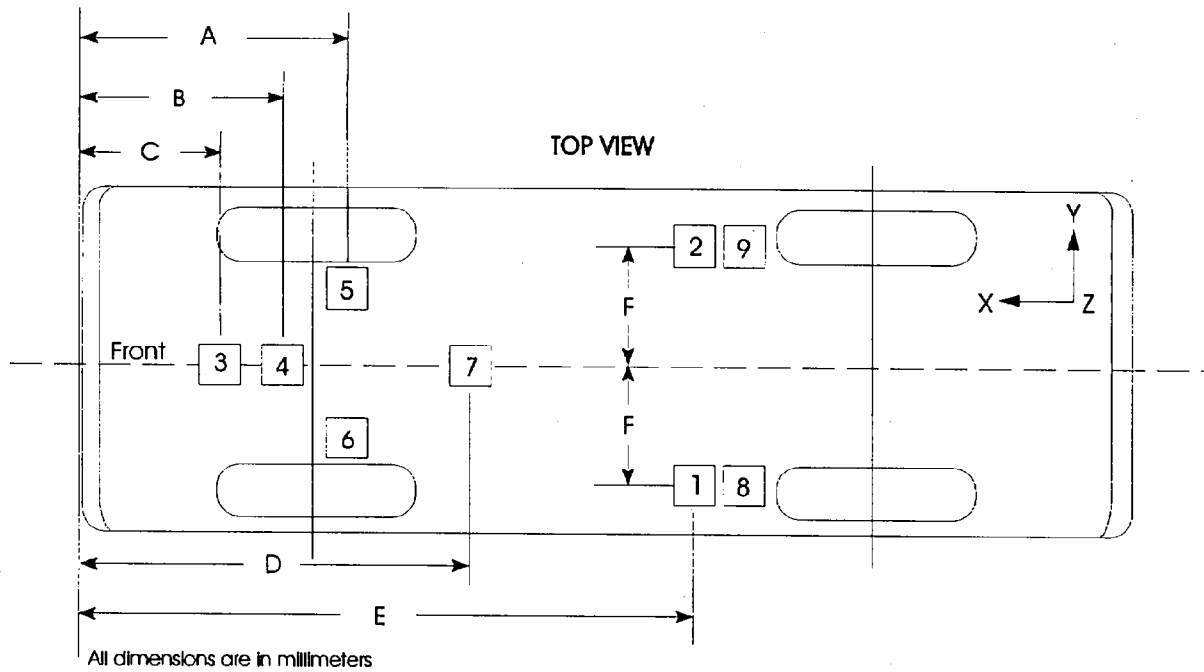
6 GROUPS OF 6 LOAD CELLS EACH

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

The following data is presented in Appendix B:

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

Figure 6
VEHICLE ACCELEROMETER LOCATIONS



ACCELEROMETER NUMBER*	ACCELEROMETER LOCATION	Distances From Vehicle Front	
		All dimensions in millimeters	
1	Left Rear Seat Crossmember [E/F]	X = 2910	Y = 541
2	Right Rear Seat Crossmember [E/F]	X = 2910	Y = 541
3	Top of engine [C]	681	
4	Bottom of engine [B]	1166	
5	Right Disc Brake Caliper [A]	1071	
6	Left Disc Brake Caliper [A]	1071	
7	Instrument Panel [D]	1819	
8	Left Rear Seat Crossmember [E/F]	X = 2935	Y = 541
9	Right Rear Seat Crossmember [E/F]	X = 2935	Y = 541

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

Figure 7

TEST VEHICLE MEASUREMENTS

REAR DATUM REFERENCE

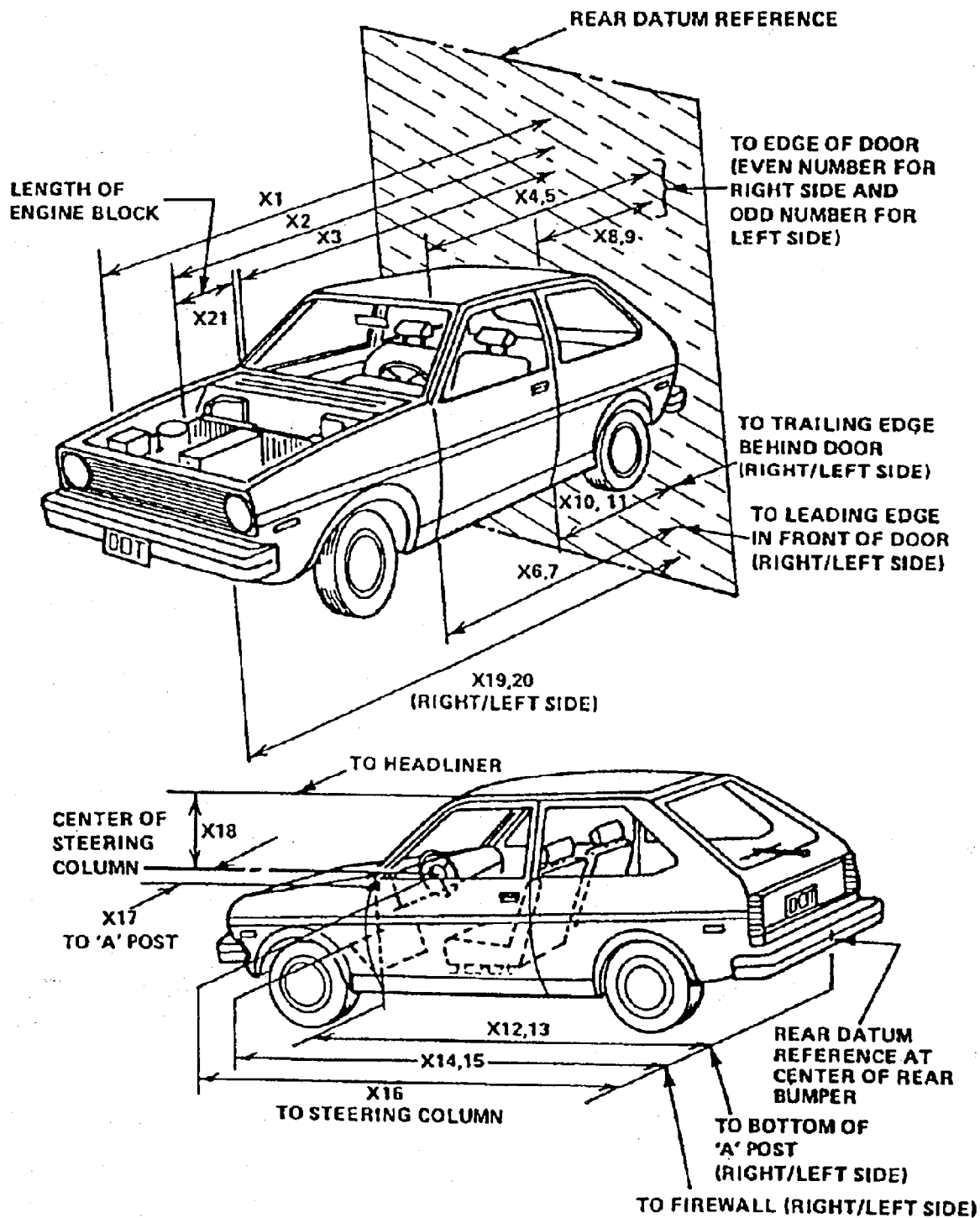


Table 7

VEHICLE MEASUREMENTS

No.		All Dimensions in mm		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	4870	4334	536
X2	Rear Surface of Vehicle to Front of Engine	4265	4085	180
X3	Rear Surface of Vehicle to Firewall	3553	3350	203
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	3273	3254	19
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	3265	3256	9
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	3266	3257	9
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	3257	3261	-4
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	2250	2185	65
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	2244	2234	10
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	2252	2231	21
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	2237	2248	-11
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	3190	3235	-45
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	3189	3190	-1
X14	Rear Surface of Vehicle to Firewall, Right Side	3575	3494	81
X15	Rear Surface of Vehicle to Firewall, Left Side	3570	3530	40
X16	Rear Surface of Vehicle to Steering Column	2815	2805	10
X17	Center of Steering Column to "A" Post	425	420	5
X18	Center of Steering Column to Headliner	420	395	25
X19	Rear Surface of Vehicle to Right Side of Front Bumper	4785	4305	480
X20	Rear Surface of Vehicle to Left Side of Front Bumper	4780	4295	485
X21	Length of Engine Block	615	615	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	3085	3050	35
CD	Rear Surface of Vehicle to Center of Dash Panel	3000	2970	30
LD	Rear Surface of Vehicle to Left Side of Dash Panel	3010	3005	5

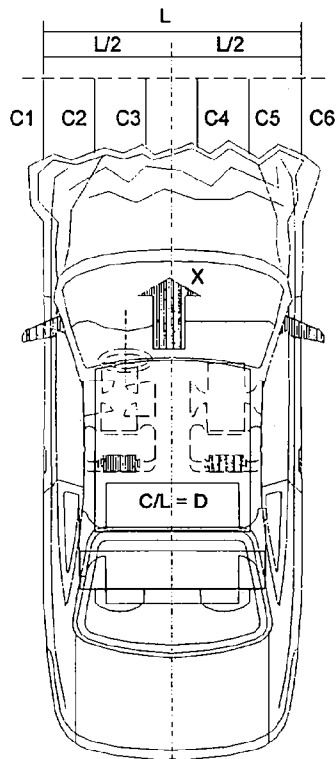
Table 8

ACCIDENT INVESTIGATION DIVISION DATA
FOR 56.3 KPH FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: Volvo 960 4-Door Sedan
 NHTSA Test No.: MV5900 VIN: YV1KS9600V1104997
 Model Year: 1997 Build Date: 8/96 Test Date: November 26, 1996
 Vehicle Size Category: Sedan Test Weight: 1814 Kgs
 Vehicle Wheelbase: 2775 mm; Front Overhang: 1330 mm; Overall Width: 1748 mm
 Collision Deformation Classification (CDC) Code: 12FDEW2

Crush Depth Dimensions:

C1 = 480 mm
 C2 = 505 mm
 C3 = 523 mm
 C4 = 518 mm
 C5 = 500 mm
 C6 = 475 mm



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

Longitude Length of Damaged Region: L = 1748 mm

Section 4

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

"Windshield Mounting" FMVSS No. 212 Data

"Windshield Zone Intrusion" FMVSS No. 219 Data

"Fuel System Integrity" FMVSS No. 301

Figure 8

FMVSS NO. 212 - "WINDSHIELD MOUNTING" DATA

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

Windshield is bonded in place and covered with 24 mm molding.

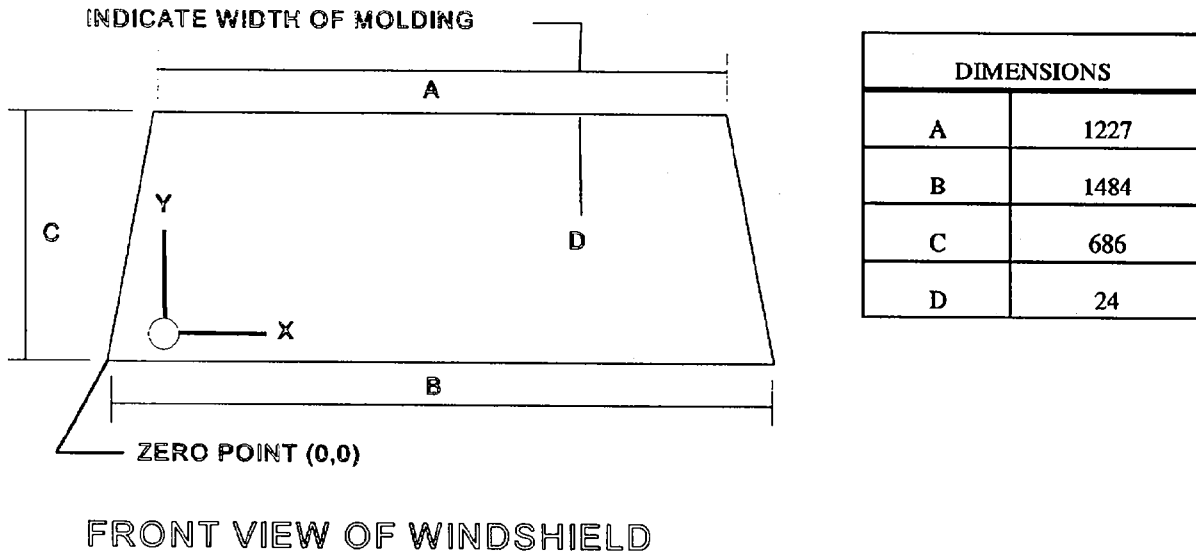
FMVSS 212 REQUIREMENTS:

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

FMVSS 212 TEST DATA

	WINDSHIELD PERIPHERY		% OF RETENTION
	PRE-TEST (mm)	POST-TEST(mm)	
RIGHT SIDE	2041.5	2041.5	100
LEFT SIDE	2041.5	2041.5	100
TOTAL	4,083	4,083	100

AREA OF RETENTION FAILURE: None



FAILURE DETAILS:None

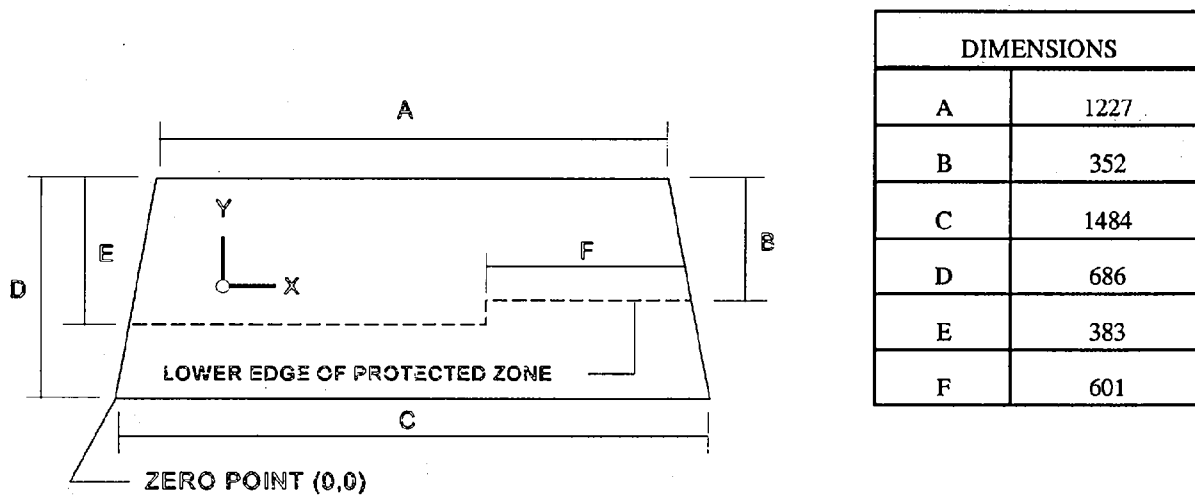
Figure 9

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

PROTECTED ZONE LOWER EDGE REQUIREMENT:

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

FMVSS 219 TEST DATA: (Dimensions in mm)



FRONT VIEW OF WINDSHIELD

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

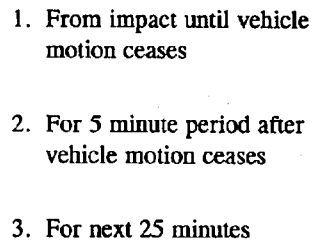
(Show location of penetration on the above sketch)

COORDINATES		
	X	Y
1.		
2.		
3.		
4.		

FMVSS NO. 301-75 "FUEL SYSTEM INTEGRITY" POST IMPACT TEST DATA

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

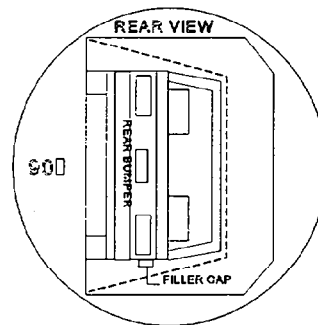
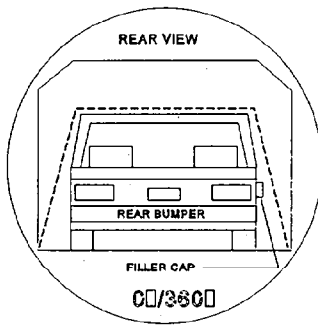
FUEL SPILLAGE MEASUREMENT:



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

8313-14

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEETTEST PHASE:NHTSA Test No.:
MV5900I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

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

1 minutes 58 seconds

FMVSS 301 Position Hold Time +

5 minutes 00 seconds

TOTAL

6 minutes 58 seconds

Next whole minute interval

7 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
----------	---------	---------	---------

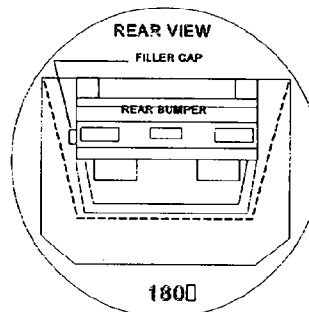
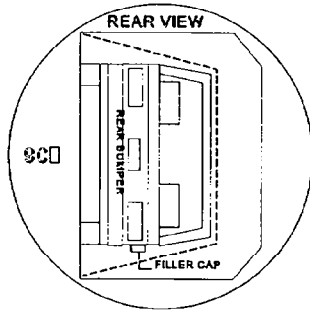
III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a
---	---	---	-----

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

IV. SOLVENT SPILLAGE LOCATION(S): None

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEETTEST PHASE:NHTSA Test No.:
MV5900I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)

<u>1</u>	minutes	<u>52</u>	seconds
----------	---------	-----------	---------

FMVSS 301 Position Hold Time +

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

TOTAL

<u>6</u>	minutes	<u>52</u>	seconds
----------	---------	-----------	---------

Next whole minute interval

<u>7</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
----------	---------	---------	---------

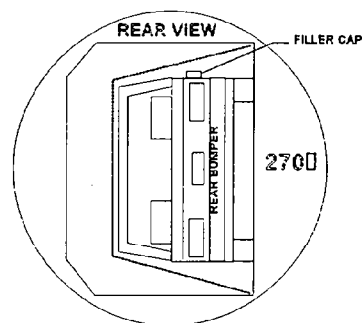
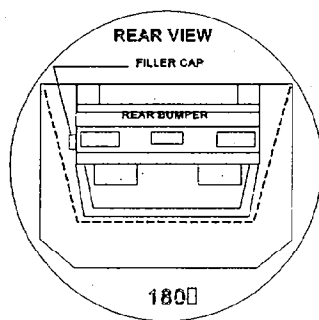
III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a
---	---	---	-----

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

IV. SOLVENT SPILLAGE LOCATION(S): None

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEETTEST PHASE:NHTSA Test No.:
MV5900I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)1 minutes 57 seconds

FMVSS 301 Position Hold Time +

5 minutes 00 seconds**TOTAL**6 minutes 57 seconds

Next whole minute interval

7 minutes 00 secondsII. 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
----------	---------	---------	---------

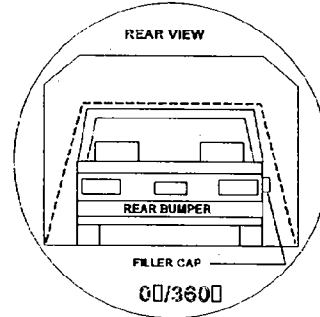
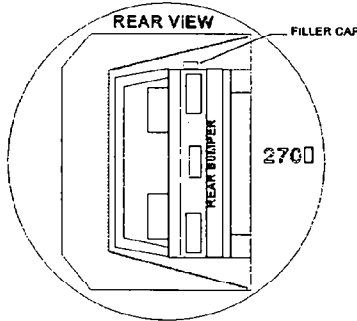
III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a
---	---	---	-----

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

IV. SOLVENT SPILLAGE LOCATION(S): None

Table 10

FMVSS NO. 301 STATIC ROLLOVER DATA SHEETTEST PHASE:NHTSA Test No.:
MV5900I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)2 minutes 02 seconds

FMVSS 301 Position Hold Time +

5 minutes 00 seconds**TOTAL**7 minutes 2 seconds

Next whole minute interval

8 minutes 00 secondsII. 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
----------	---------	---------	---------

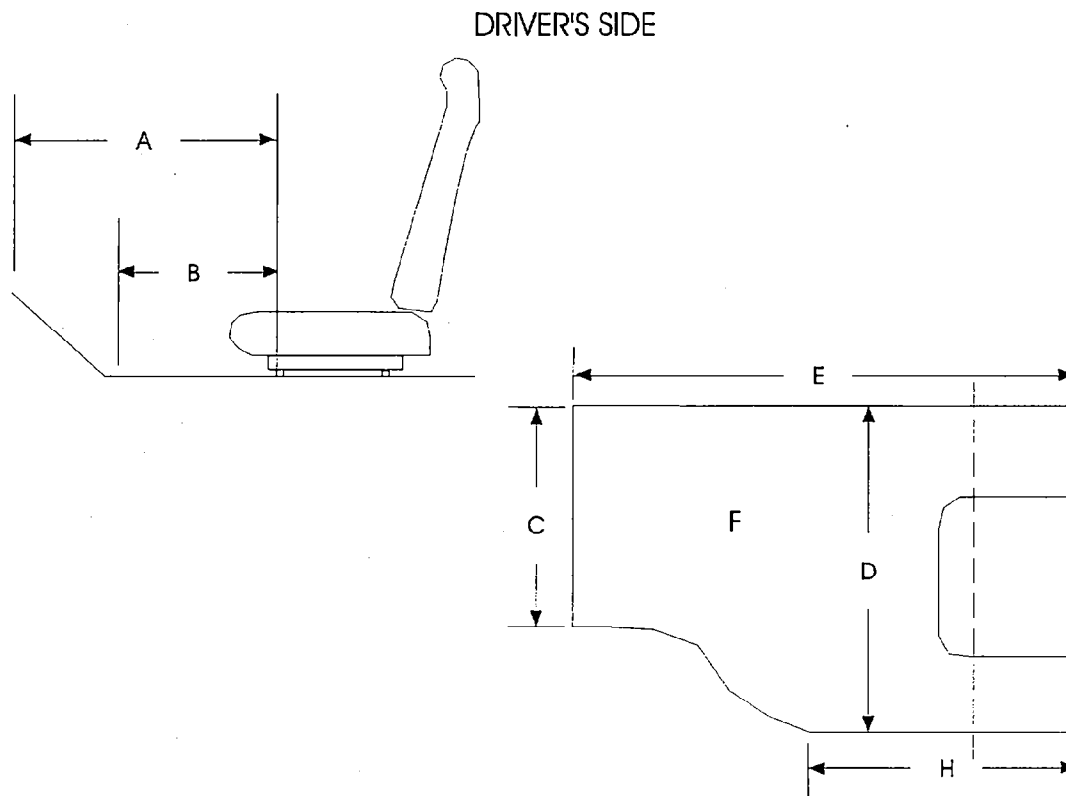
III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

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

IV. SOLVENT SPILLAGE LOCATION(S): None

Figure 10
DRIVER SIDE FLOORBOARD DEFORMATION



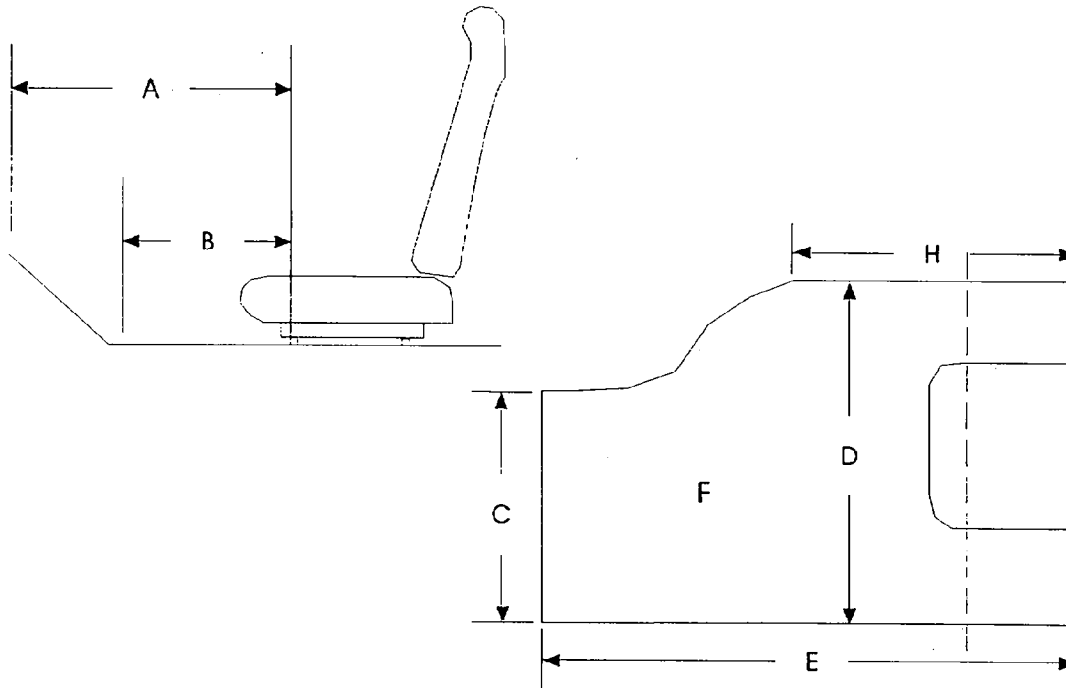
Measurement	Pre-Test	Post-Test	Difference
A	600	585	15
B	505	505	0
C	385	370	15
D	395	390	5
E	940	935	5
H	250	N/A	N/A
F (cm) ²	3644	N/A	N/A

Units = mm

$$F = H \times D + (E - H) \times C$$

Figure 11
PASSENGER SIDE FLOORBOARD DEFORMATION

PASSENGER'S SIDE

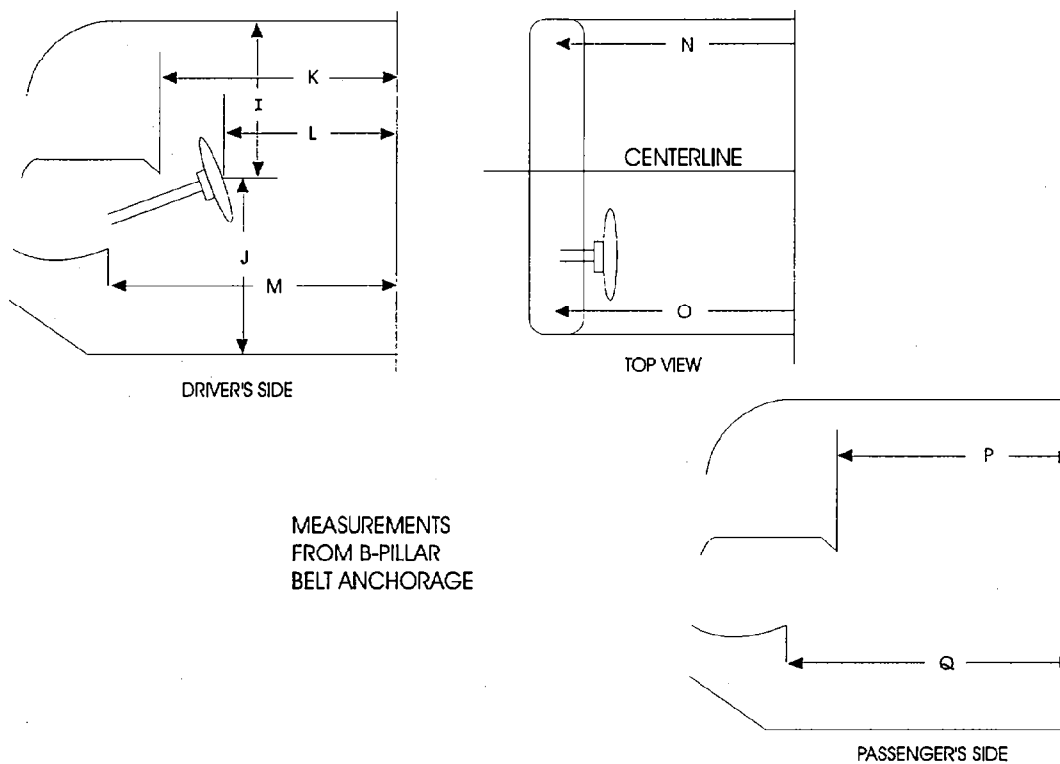


Measurement	Pre-Test	Post-Test	Difference
A	660	635	25
B	590	580	10
C	355	340	15
D	400	370	30
E	1040	1030	10
H	260	N/A	N/A
F (cm) ²	3809	N/A	N/A

Units = mm

$$F = H \times D + (E - H) \times C$$

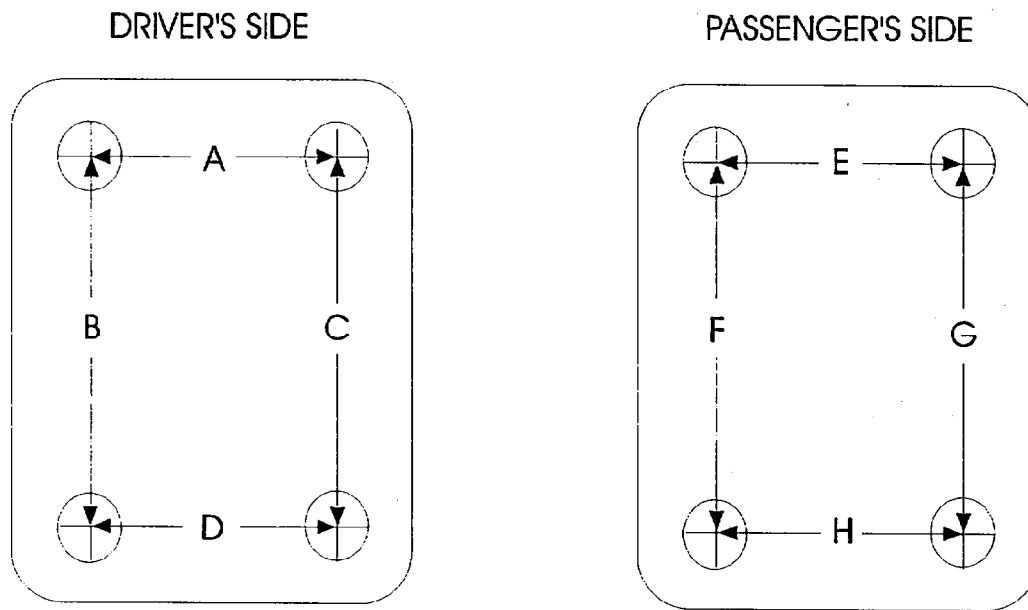
Figure 12
INTERIOR DEFORMATION



Measurement	Pre-Test	Post-Test	Difference
I	410	395	15
J	630	710	-80
K	755	725	30
L	525	515	10
M	780	730	50
N	795	760	35
O	720	715	5
P	810	770	40
Q	780	730	50

Units = mm

Figure 13
FLOORBOARD DEFORMATION



TOP VIEW THROUGH FLOOR PAN

Measurement	Pre-Test	Post-Test	Difference
A	318	330	-12
B	867	875	-8
C	861	835	26
D	444	440	4
E	361	300*	61
F	861	850*	11
G	867	850*	17
H	444	300*	144

* - Estimated value
Units = mm

Appendix A
PHOTOGRAPHS

PHOTOGRAPHS

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A-6	PRE-TEST RIGHT SIDE VIEW	A-9
A-7	POST-TEST RIGHT SIDE VIEW	A-10
A-8	PRE-TEST RIGHT FRONT THREE-QUARTER VIEW	A-11
A-9	POST-TEST RIGHT FRONT THREE-QUARTER VIEW	A-12
A-10	PRE-TEST LEFT REAR THREE-QUARTER VIEW	A-13
A-11	POST-TEST LEFT REAR THREE-QUARTER VIEW	A-14
A-12	PRE-TEST WINDSHIELD VIEW	A-15
A-13	POST-TEST WINDSHIELD VIEW	A-16
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A-21	POST-TEST REAR UNDERBODY VIEW	A-24
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A-27	POST-TEST DRIVER AND INTERIOR VIEW	A-30
A-28	PRE-TEST PASSENGER AND INTERIOR VIEW	A-31
A-29	POST-TEST PASSENGER AND INTERIOR VIEW	A-32
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A-32	PRE-TEST PASSENGER HEAD LOCATION	A-35

PHOTOGRAPHS (continued)

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A-36	PRE-TEST PASSENGER FLOOR PAN VIEW	A-39
A-37	POST-TEST PASSENGER FLOOR PAN VIEW	A-40
A-38	ROLLOVER VIEW	A-41
A-39	IMPACT VIEW	A-42

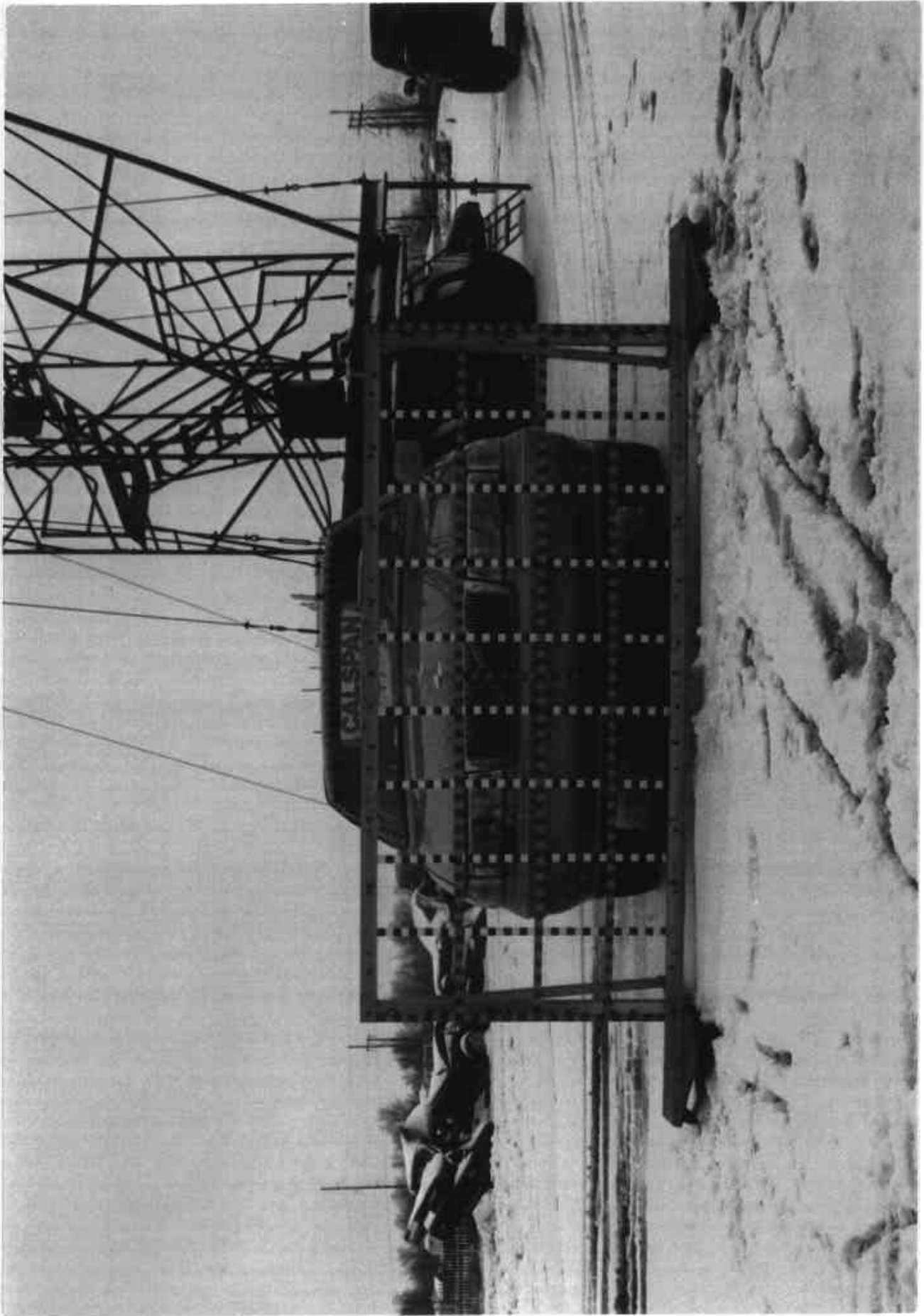


Figure A-1 LOAD CELL LOCATIONS



Figure A-2 PRE-TEST FRONT VIEW



Figure A-3 POST-TEST FRONT VIEW

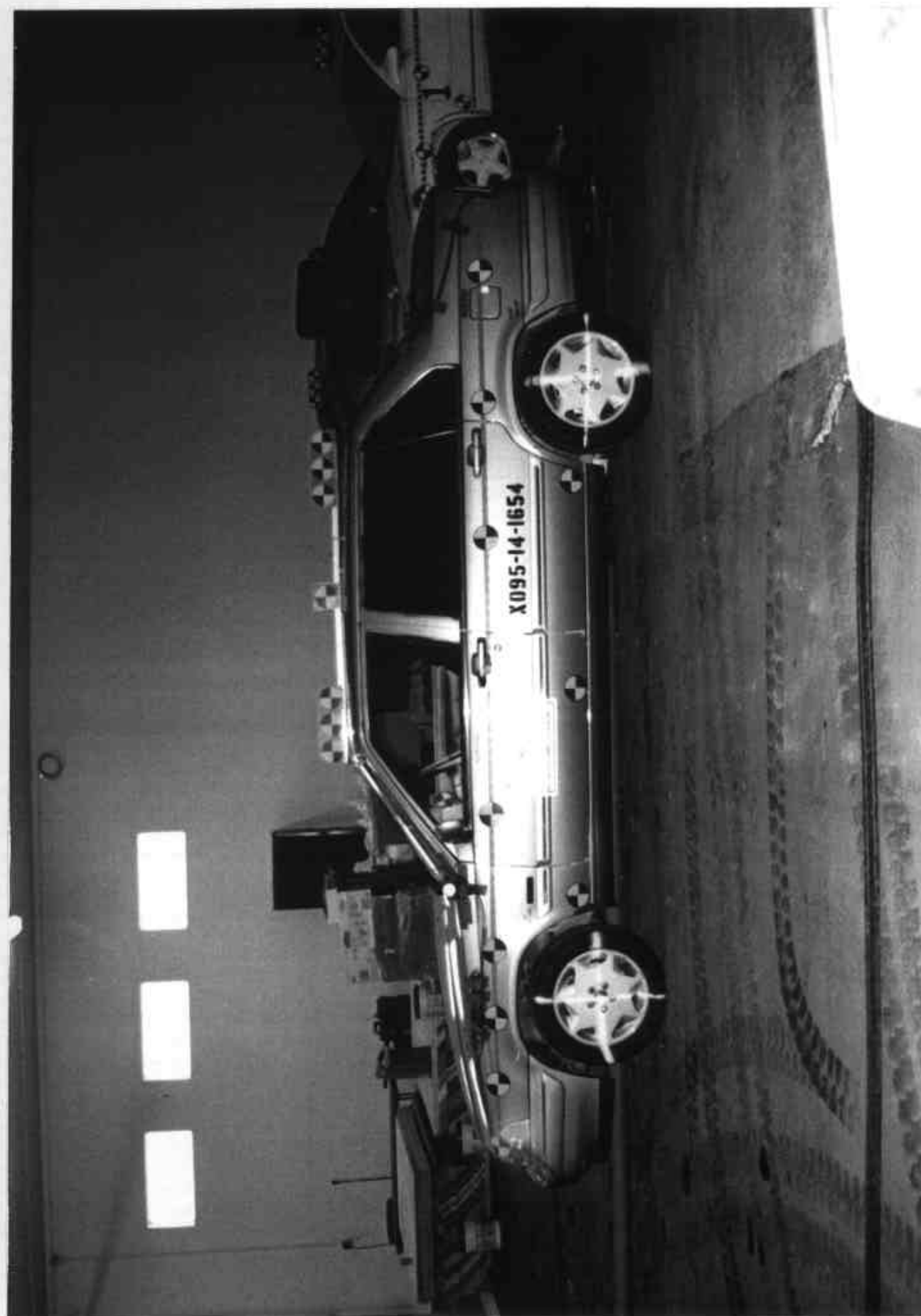


Figure A-4 PRE-TEST LEFT SIDE VIEW



Figure A-5 POST-TEST LEFT SIDE VIEW



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



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

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





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

PHOTOGRAPH NOT AVAILABLE



Figure A-13 POST-TEST WINDSHIELD VIEW

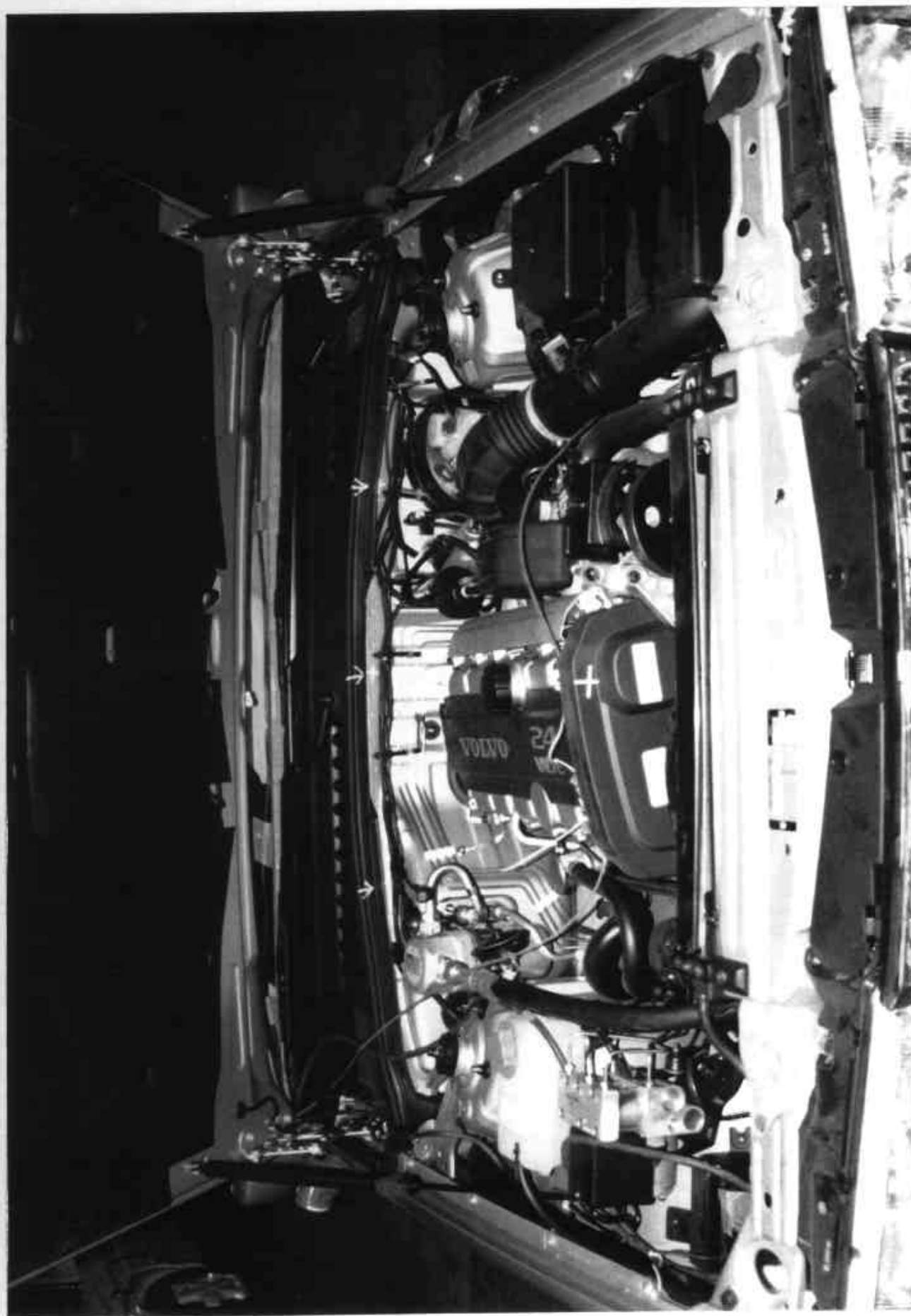


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW



Figure A-15 FUEL CAP VIEW

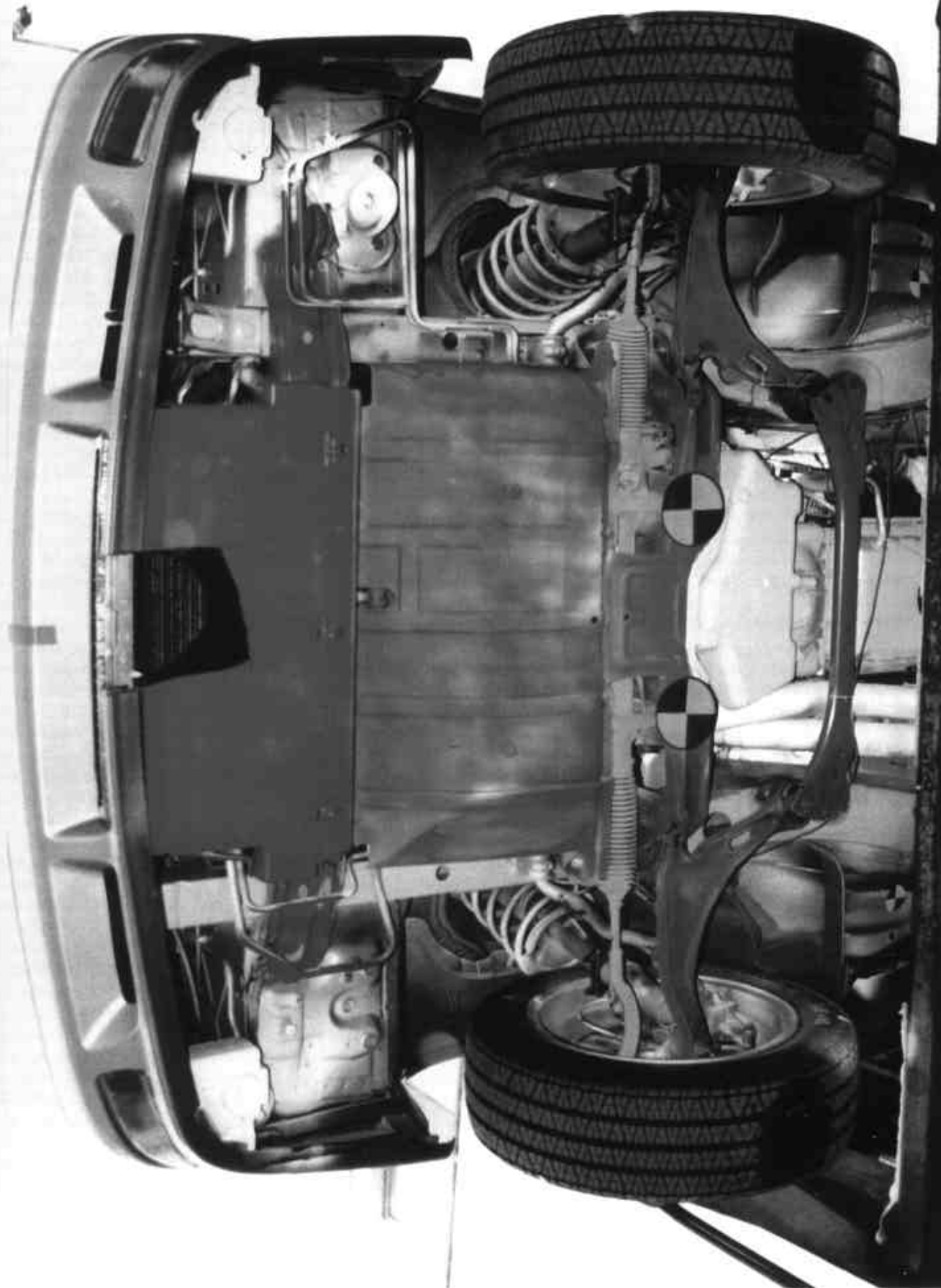


Figure A-16 PRE-TEST FRONT UNDERBODY VIEW

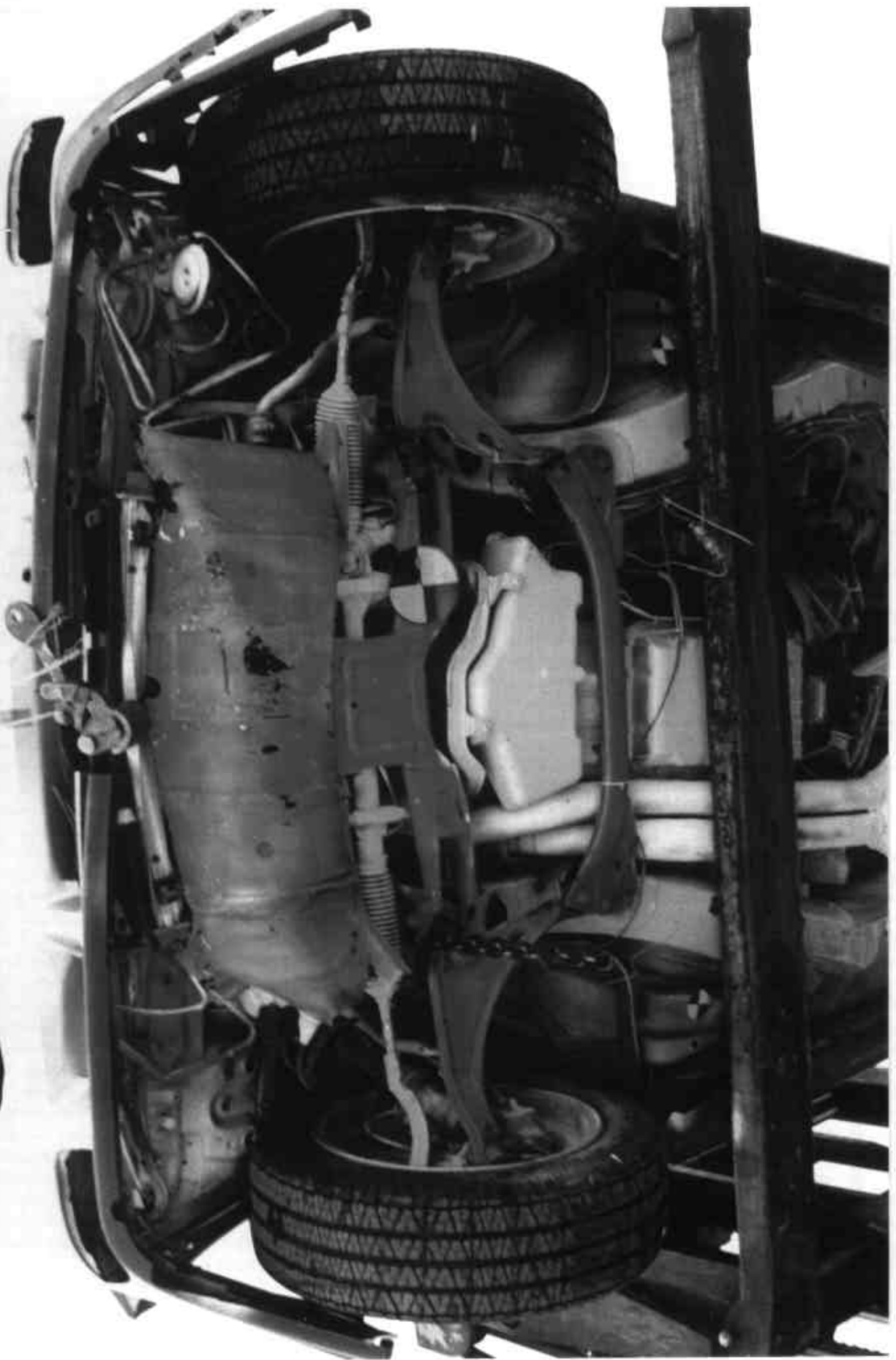


Figure A-17 POST-TEST FRONT UNDERBODY VIEW



Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW



Figure A-19 POST-TEST FRONT SIDE UNDERBODY VIEW

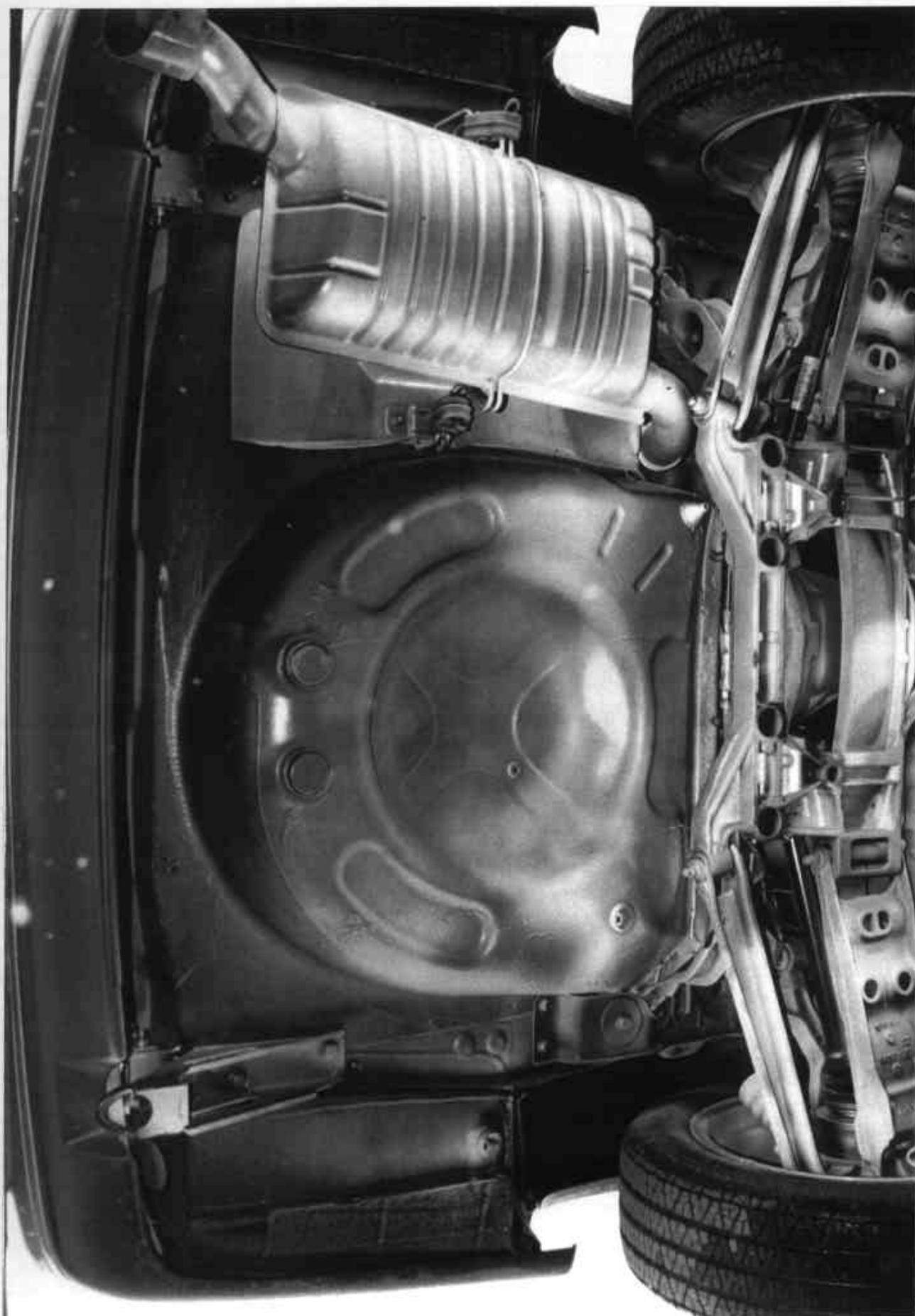


Figure A-20 PRE-TEST REAR UNDERBODY VIEW



Figure A-21 POST-TEST REAR UNDERBODY VIEW

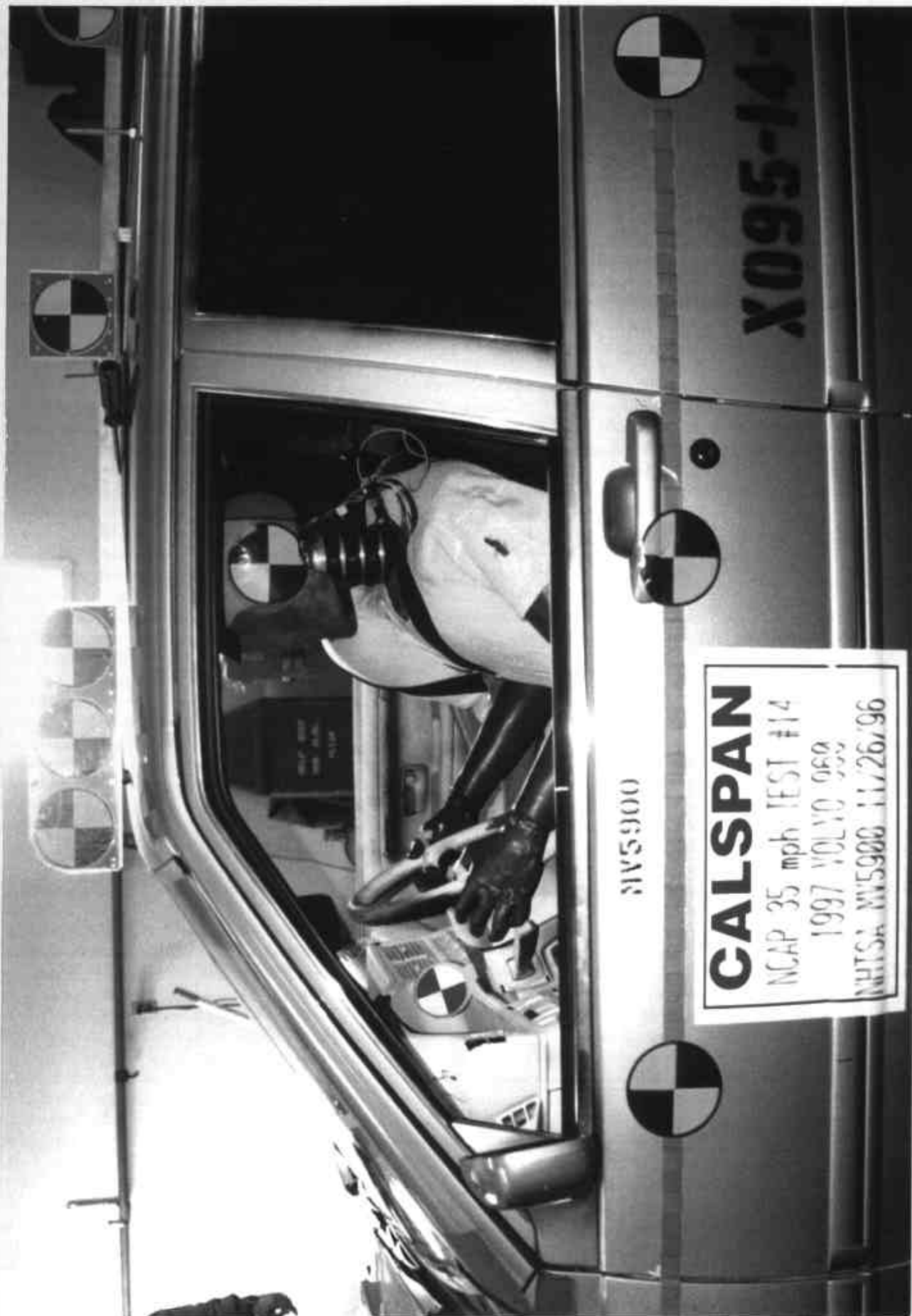


Figure A-22 PRE-TEST DRIVER POSITION VIEW

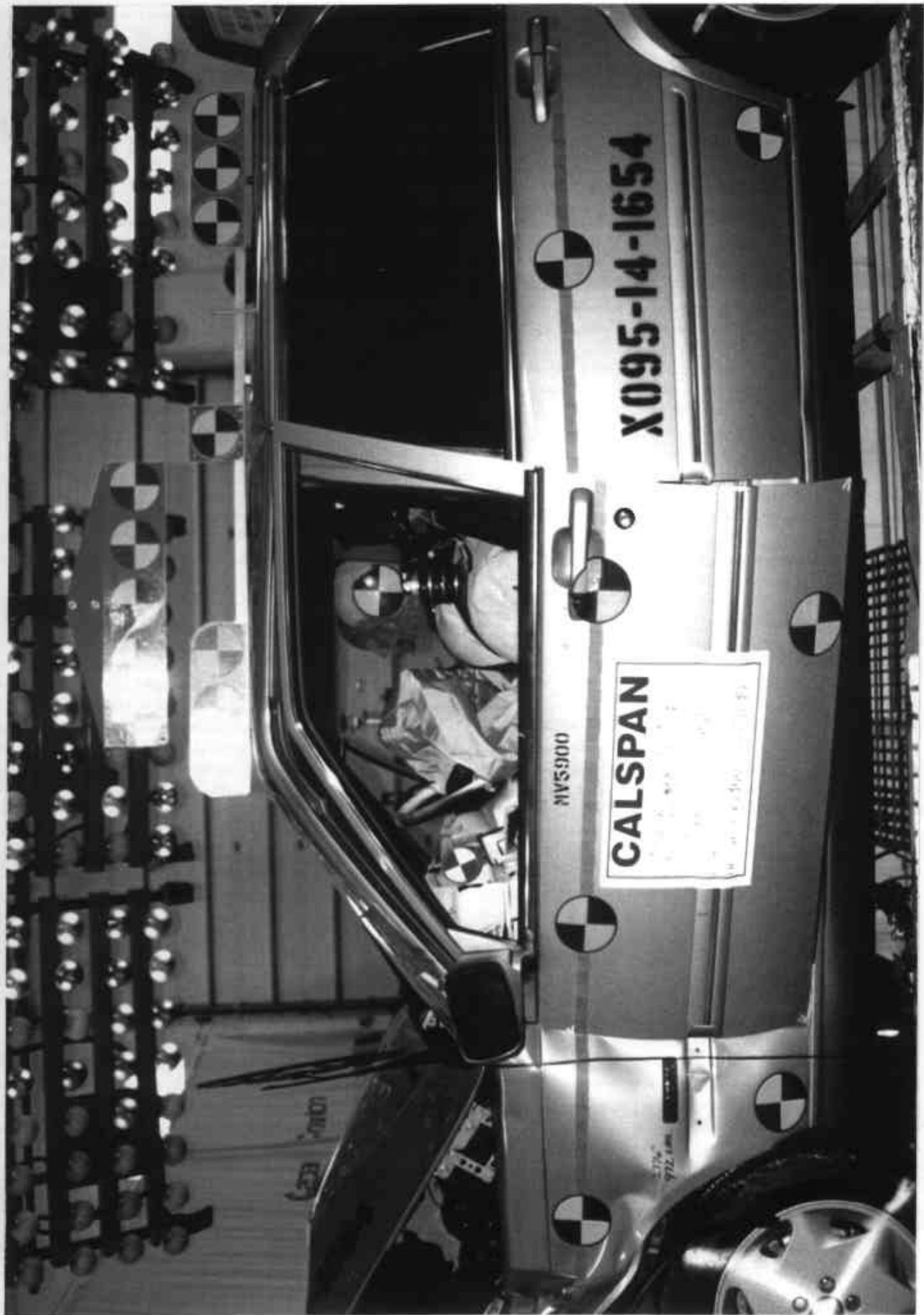


Figure A-23 POST-TEST DRIVER POSITION VIEW



Figure A-24 PRE-TEST PASSENGER POSITION VIEW

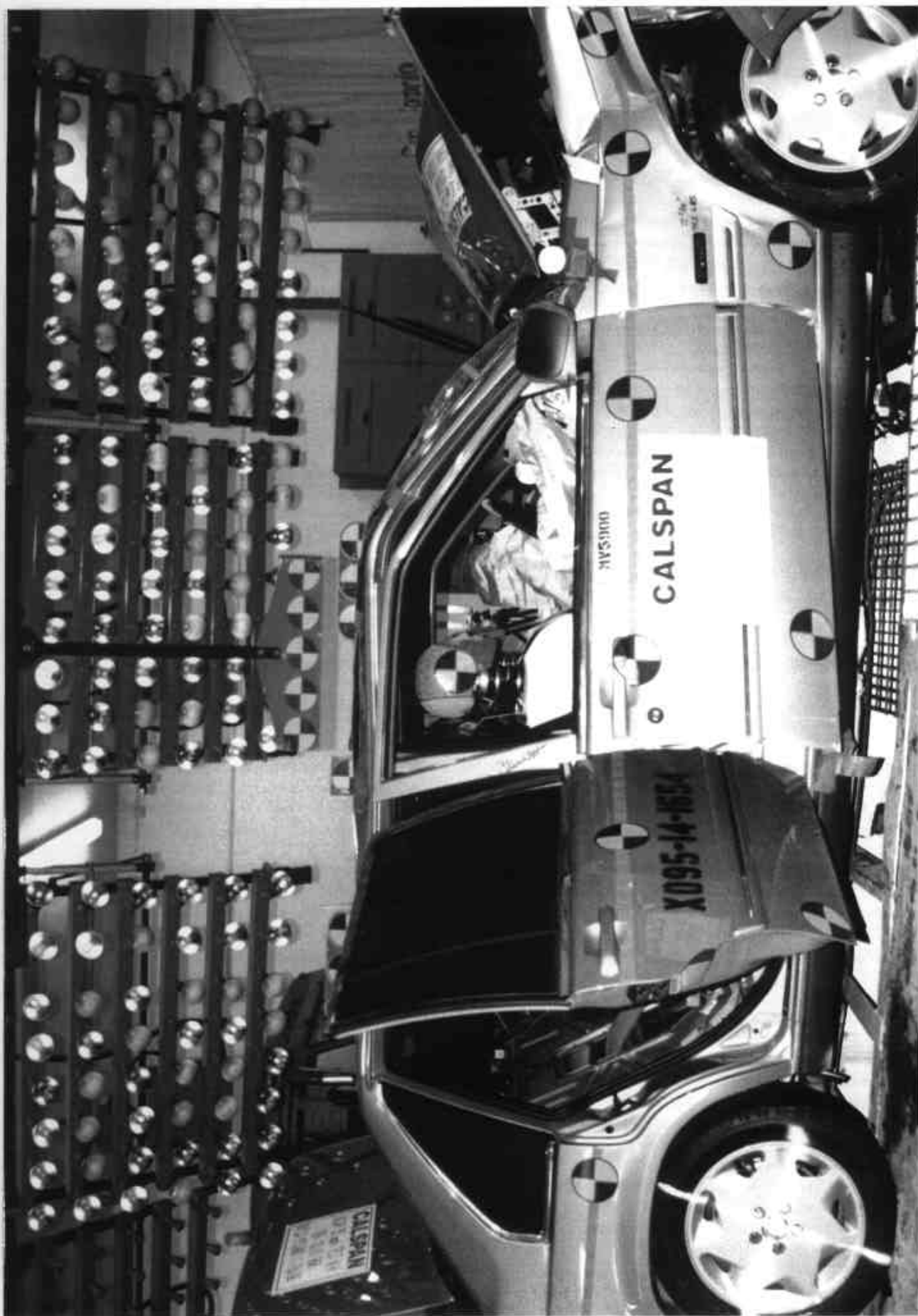


Figure A-25 POST-TEST PASSENGER POSITION VIEW



Figure A-26 PRE-TEST DRIVER AND INTERIOR VIEW
A-29

8313-14



Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW
A-30



Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW
A-31

8313-14



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW
A-32

8313-14



Figure A-30 PRE-TEST DRIVER HEAD LOCATION

Figure A-31 POST-TEST DRIVER HEAD LOCATION





Figure A-32 PRE-TEST PASSENGER HEAD LOCATION

Figure A-33 POST-TEST PASSENGER HEAD LOCATION





Figure A-34 PRE-TEST DRIVER FLOOR PAN VIEW

Figure A-35 POST-TEST DRIVER FLOOR PAN VIEW





Figure A-36 PRE-TEST PASSENGER FLOOR PAN VIEW



Figure A-37 POST-TEST PASSENGER FLOOR PAN VIEW



Figure A-38 ROLLOVER VIEW

PHOTOGRAPH NOT AVAILABLE

Appendix B

DUMMY, VEHICLE AND LOAD CELL BARRIER RESPONSE DATA

NHTSA TEST NO. MV5900

DUMMY DATA

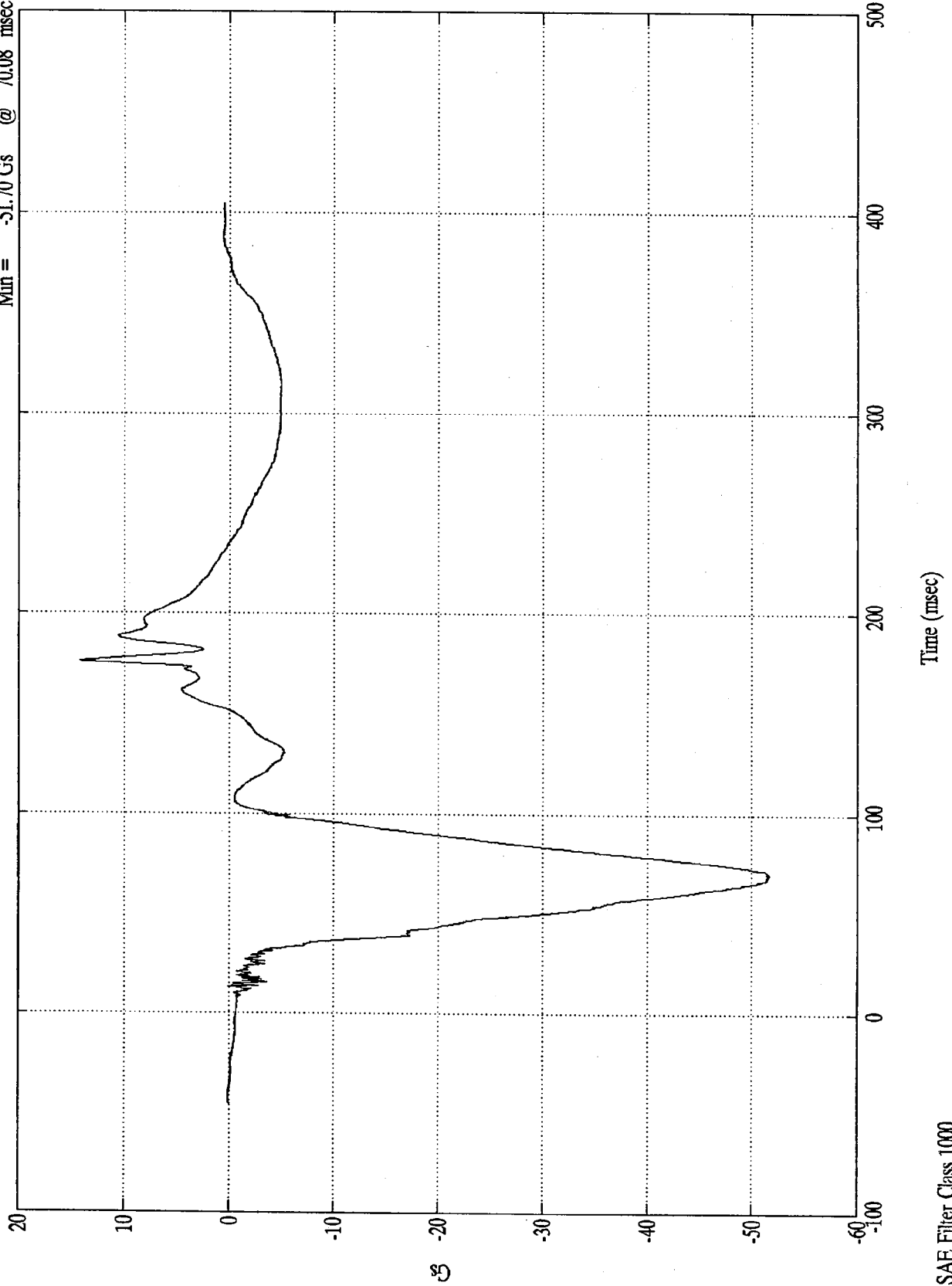
CLASS	FILTER CHANNEL
Head Accelerations	1000
Chest Accelerations	180
Chest Displacements	60
Femur Forces	600
Belt Loads	60
Belt Displacements	180
Neck Forces	1000
Neck Moments	600

**Hybrid III Dummy Sign Conventions
Load Cells and Special Transducers**

Transducer	DOT/NHTSA Sign Convention (positive unless noted)
Upper Neck Load Cell	Fx Head forward Fy Head left Fz Neck in tension Mx Right ear to right shoulder My Chin to chest (flexion) Mz Chin to left shoulder (look left)
Chest Displacement Potentiometer	Compression is negative
Pelvic Load Cell (Lower Lumbar)	Fx Chest forward Fy Chest left Fz Spine in tension
Femur Load Cell	Compression is negative
Upper Tibia Load Cell (right and left leg)	Mx Support tibia, load right side center My Support tibia, load front (shin) center
Lower Tibia Load Cell (right and left leg)	Fy Foot right w/r to left Fz Tibia in tension Mx Support tibia, press right side center

Max = 14.19 Gs @ 176.04 msec
 Min = -51.70 Gs @ 70.08 msec

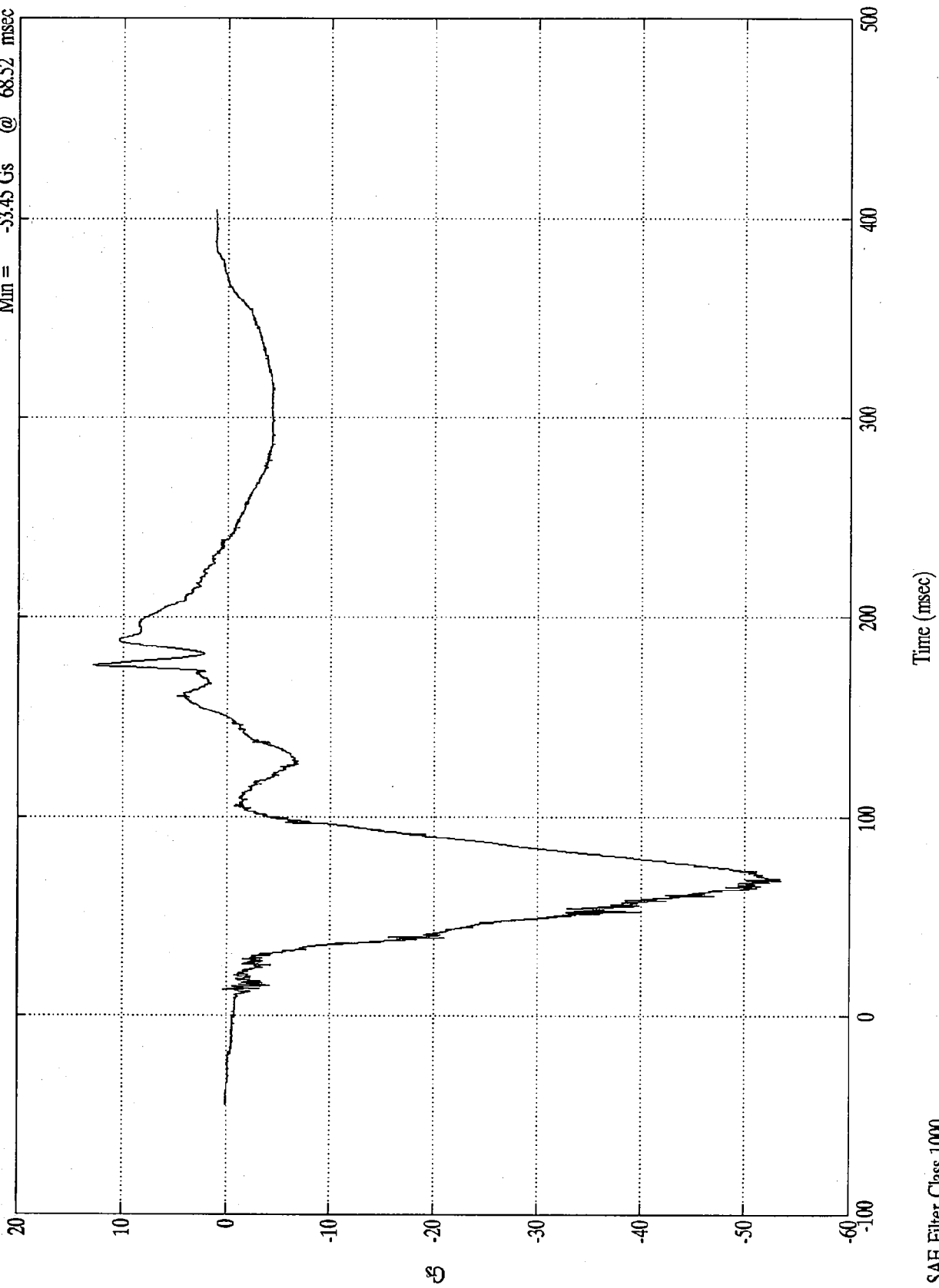
Pos. 1 Head X



NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Head X(R)

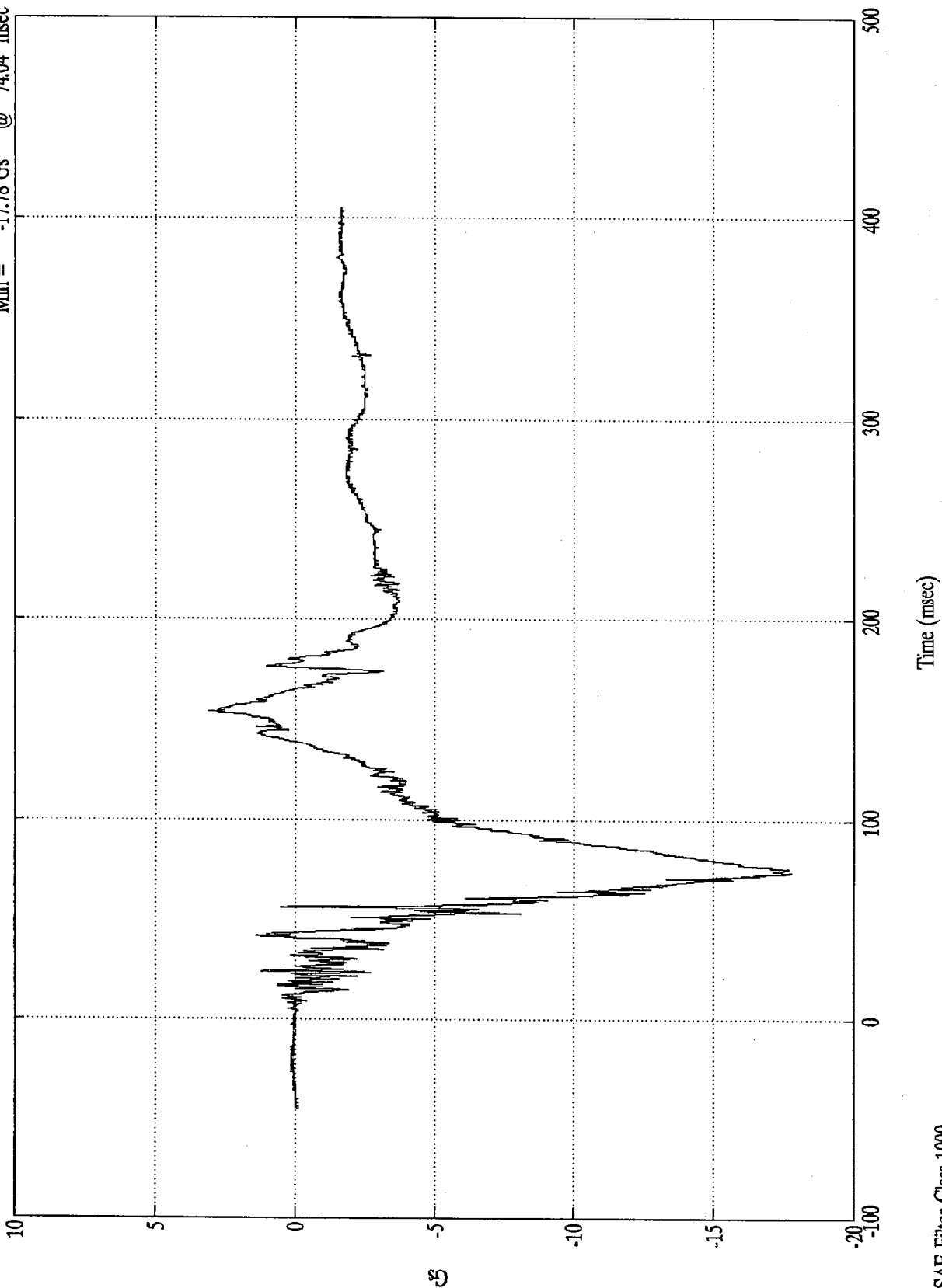
Max = 12.83 Gs @ 176.04 msec
Min = -53.45 Gs @ 68.52 msec



SAE Filter Class 1000

NCAP TEST #14 - 1997 VOLVO 960

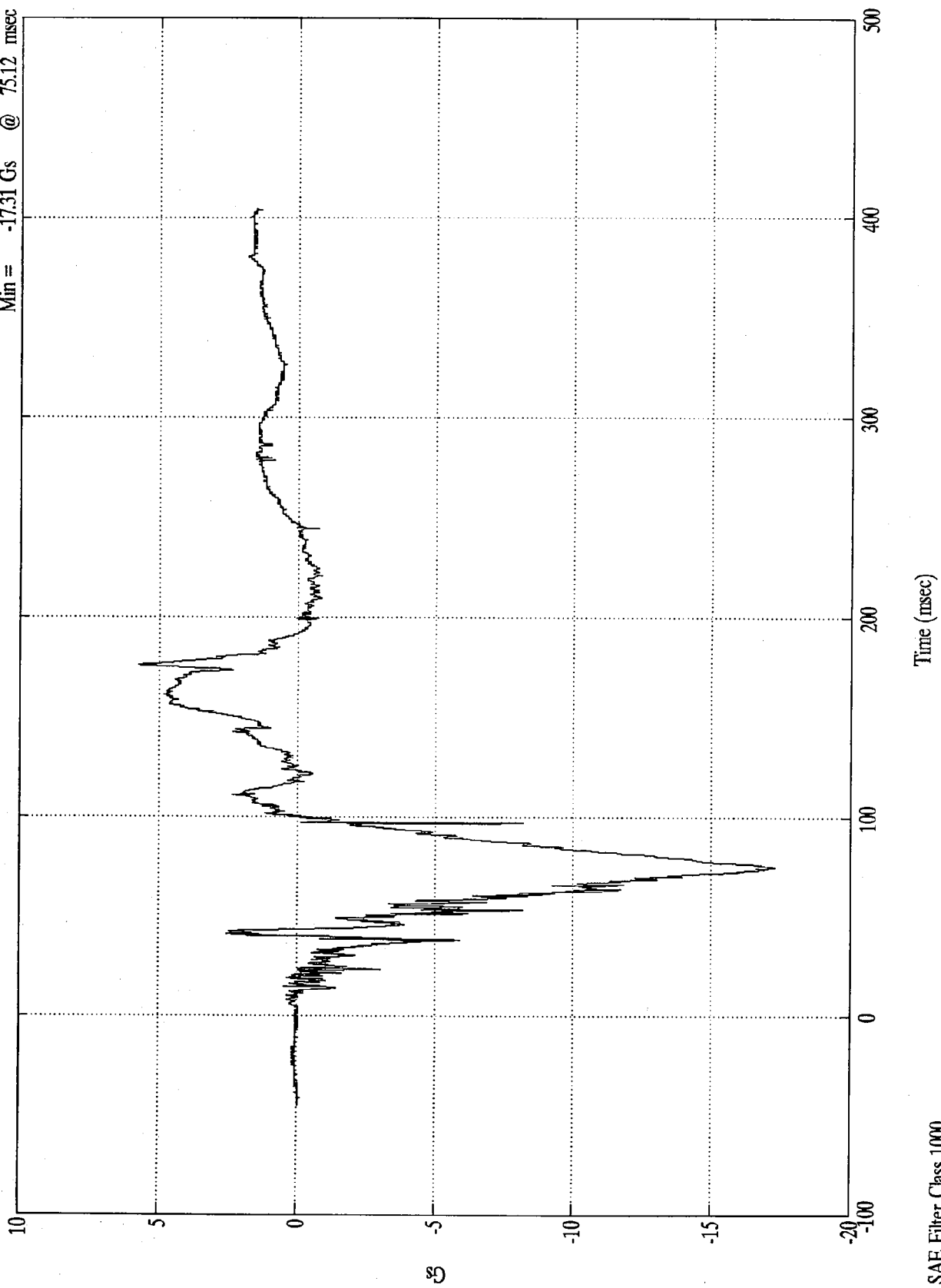
Pos. 1 Head Y
Max = 3.12 Gs @ 153.48 msec
Min = -17.78 Gs @ 74.04 msec



SAE Filter Class 1000

Pos. 1 Head Y(R)

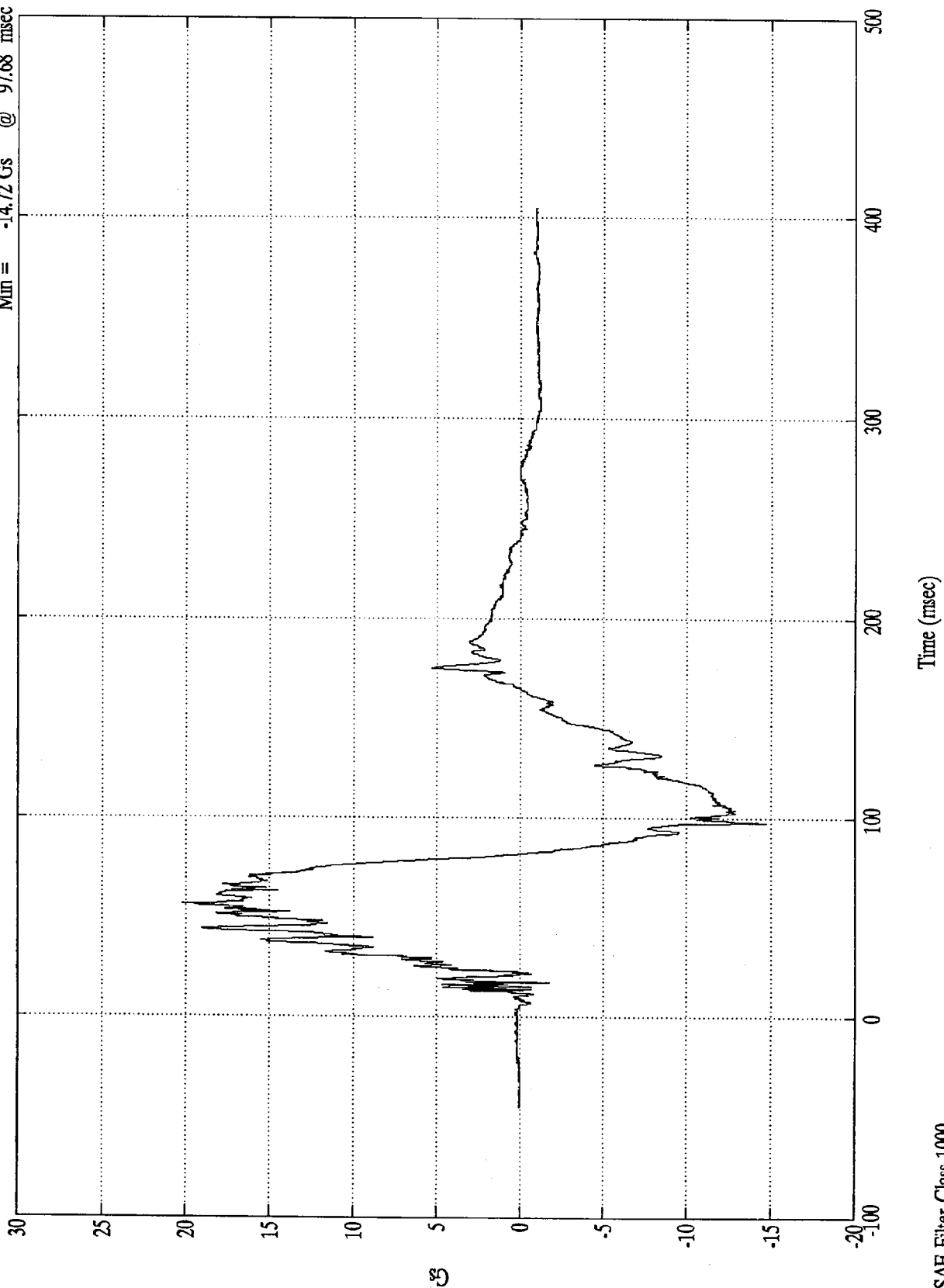
Max = 5.73 Gs @ 176.16 msec
Min = -17.31 Gs @ 75.12 msec



SAE Filter Class 1000

NCAP TEST #14 - 1997 VOLVO 960

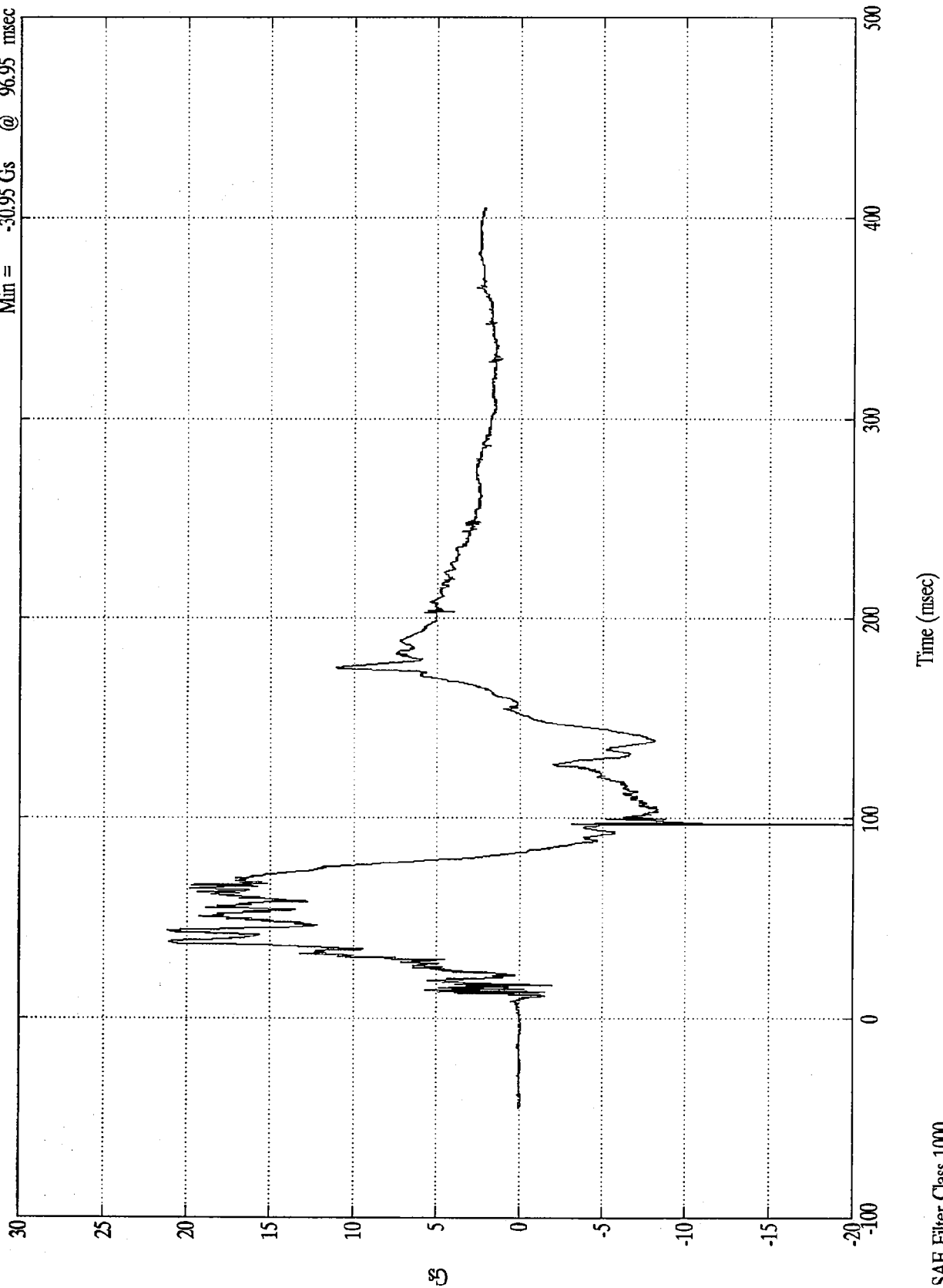
Pos. 1 Head Z
Max = 20.22 Gs @ 56.15 msec
Min = -14.72 Gs @ 97.68 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Head Z(R)

Max = 21.17 Gs @ 43.79 msec
Min = -30.95 Gs @ 96.95 msec

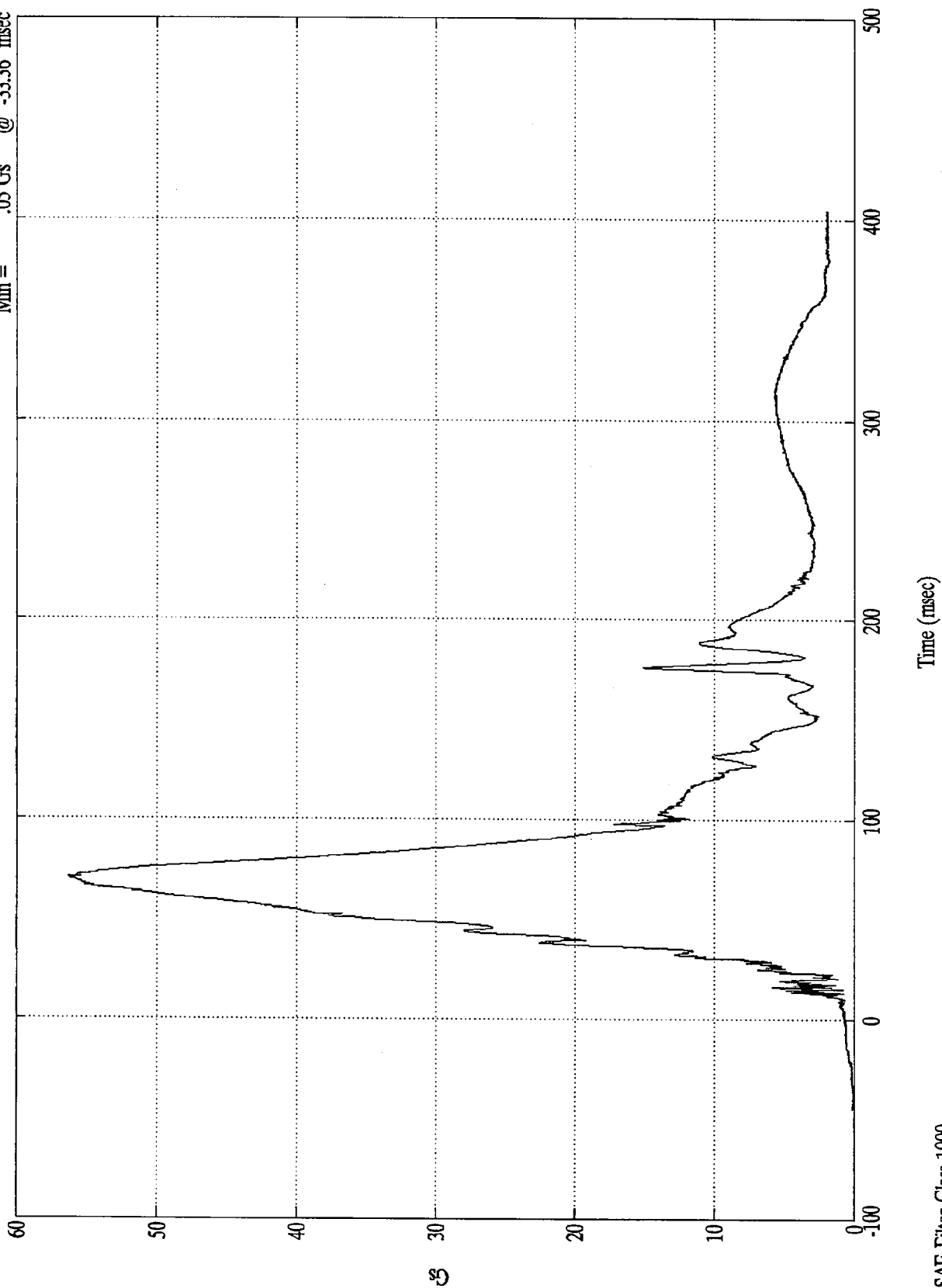


SAE Filter Class 1000

NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Head Resultant

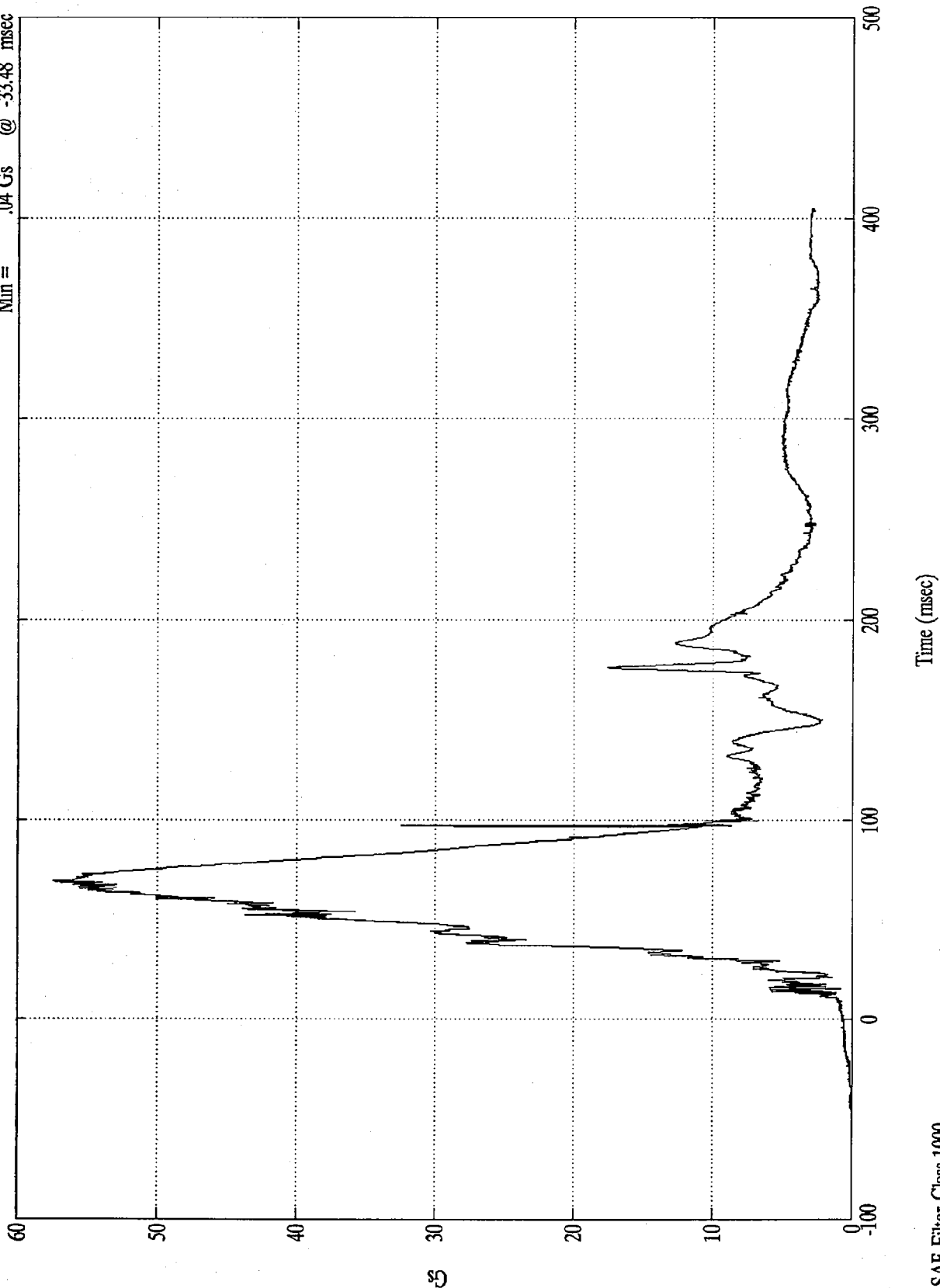
Max = 56.29 Gs @ 70.55 msec
Min = .05 Gs @ -33.36 msec



NCAP TEST #14 - 1997 VOLVO 960

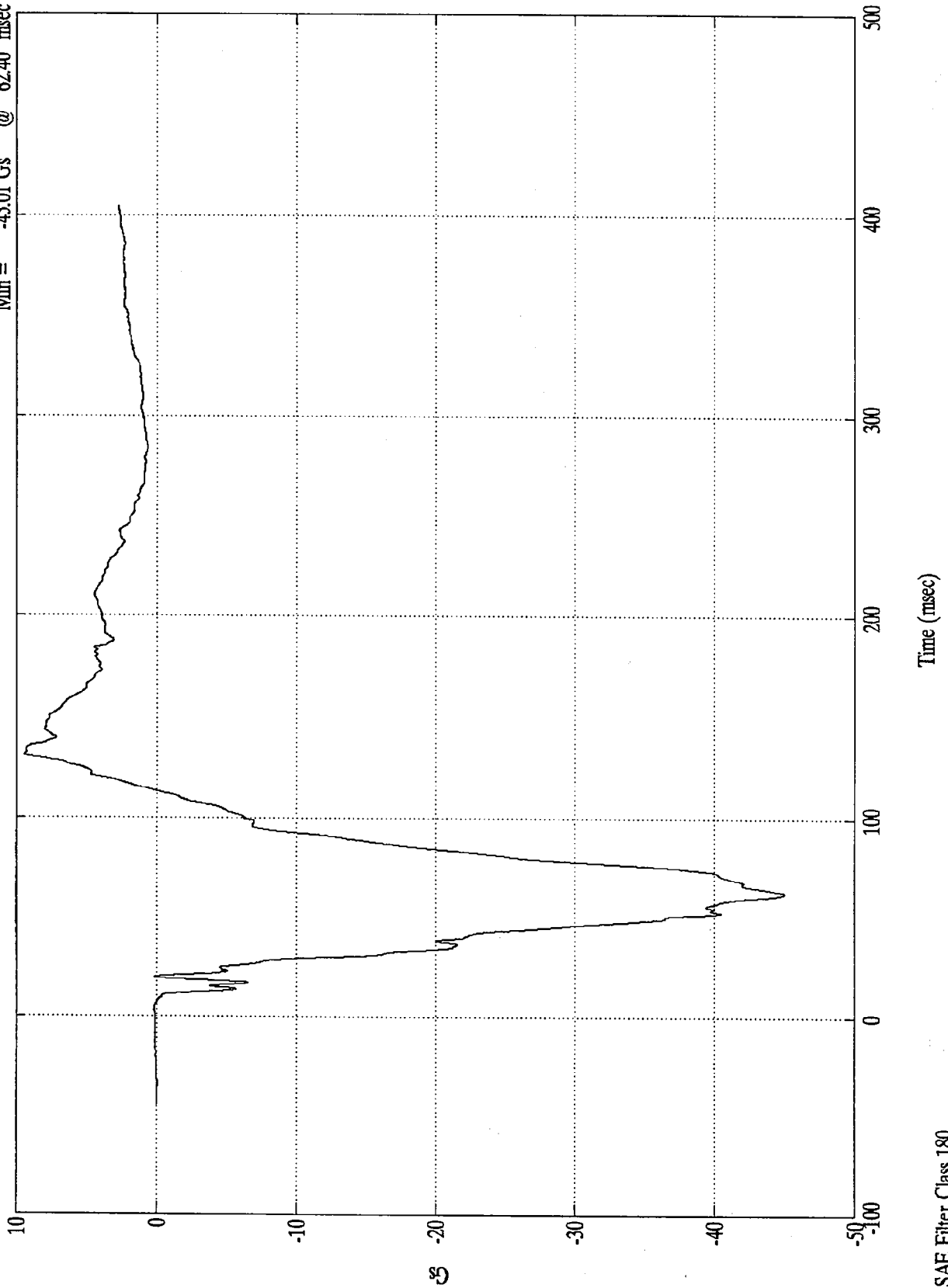
Pos. 1 Head Resultant(RR)

Max = 57.43 Gs @ 69.24 msec
Min = .04 Gs @ -33.48 msec



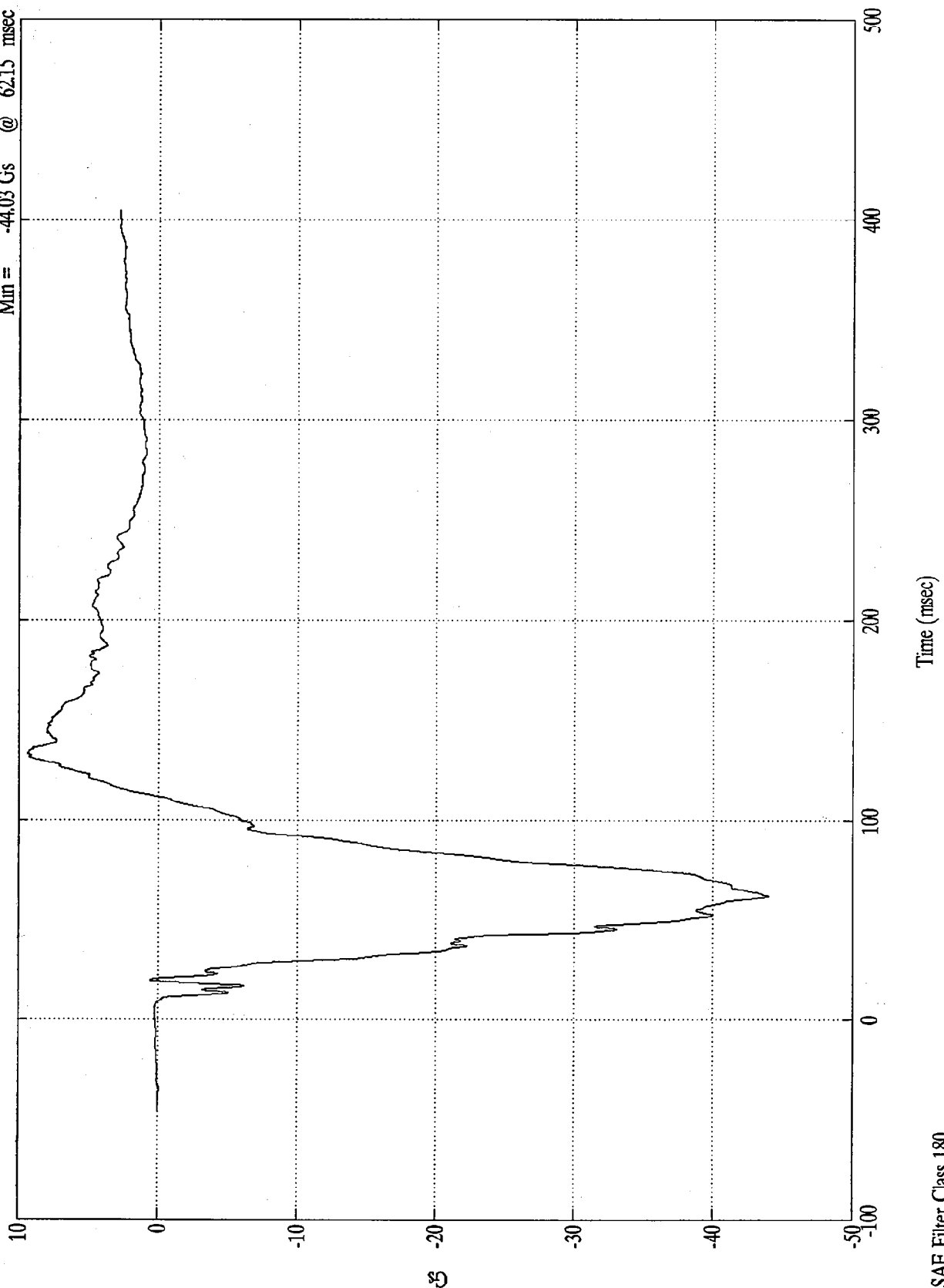
NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Chest X
Max = 9.48 Gs @ 131.40 msec
Min = -45.01 Gs @ 62.40 msec



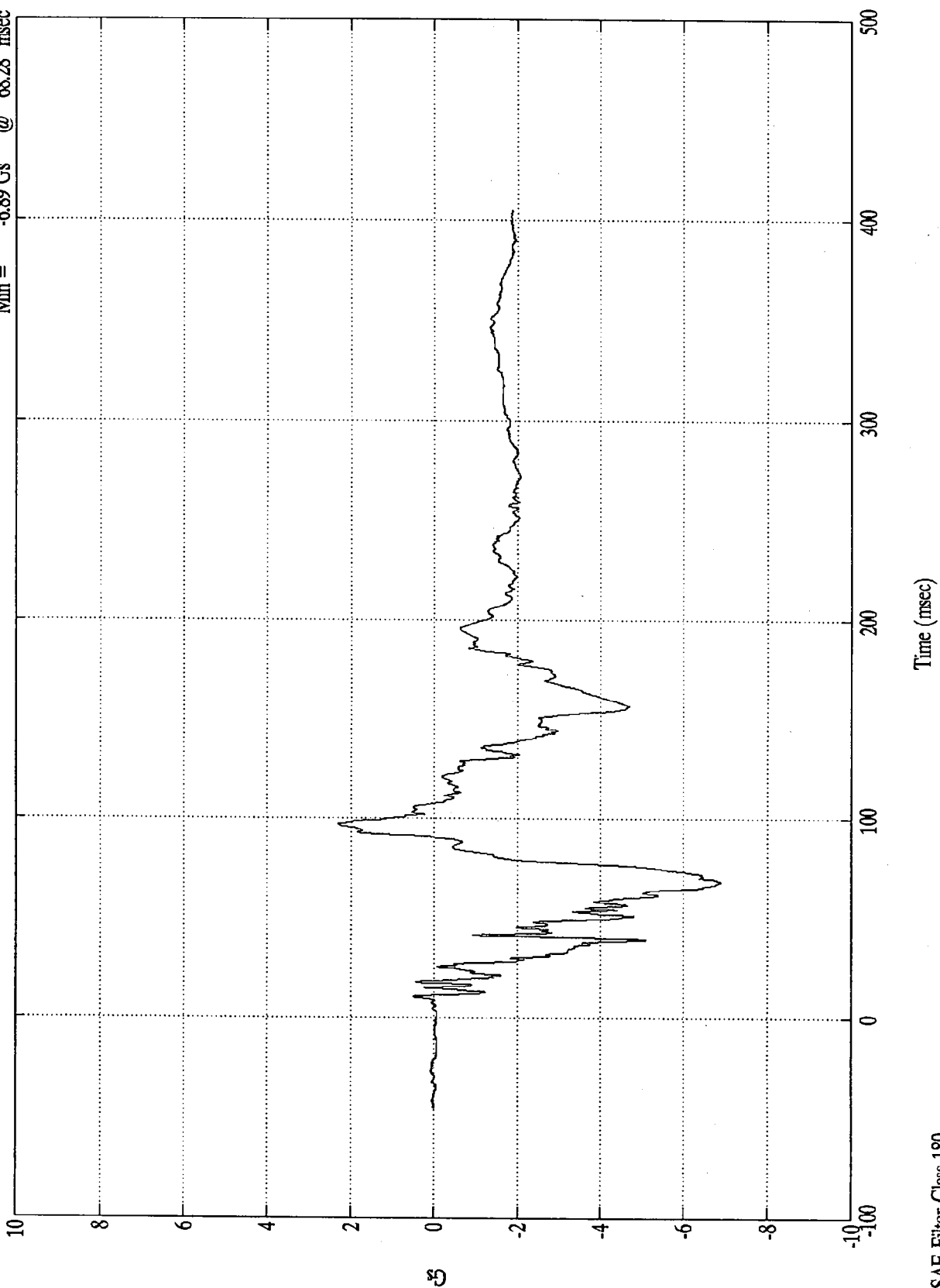
Max = 9.38 Gs @ 133.20 msec
Min = -44.03 Gs @ 62.15 msec

Pos. 1 Chest X(R)



NCAP TEST #14 - 1997 VOLVO 960

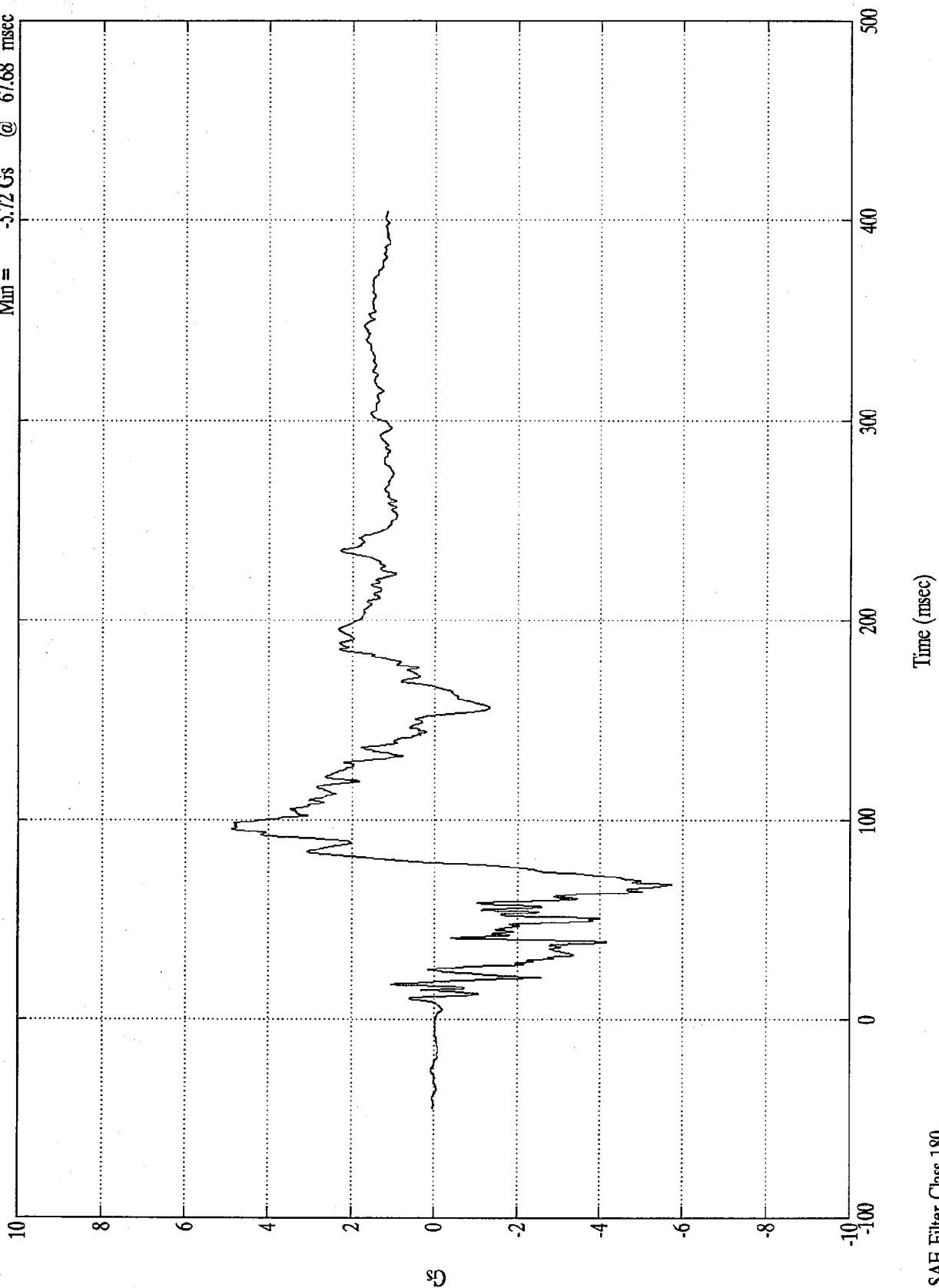
Pos. 1 Chest Y
Max = 2.31 Gs @ 96.84 msec
Min = -6.89 Gs @ 68.28 msec



NCAP TEST #14 - 1997 VOLVO 960

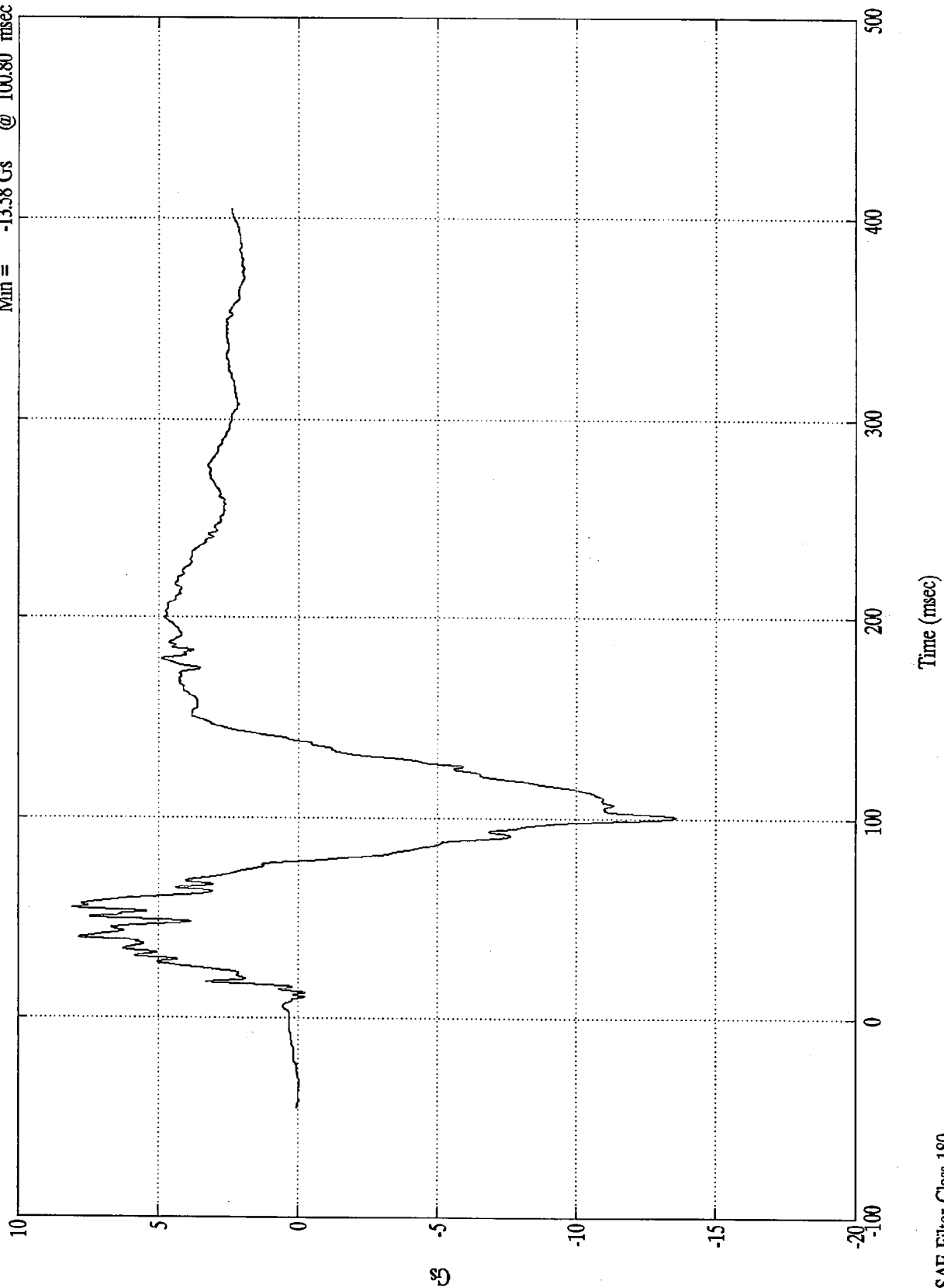
Pos. 1 Chest Y(R)

Max = 4.87 Gs @ 95.40 msec
Min = -5.72 Gs @ 67.68 msec



NCAP TEST #14 - 1997 VOLVO 960

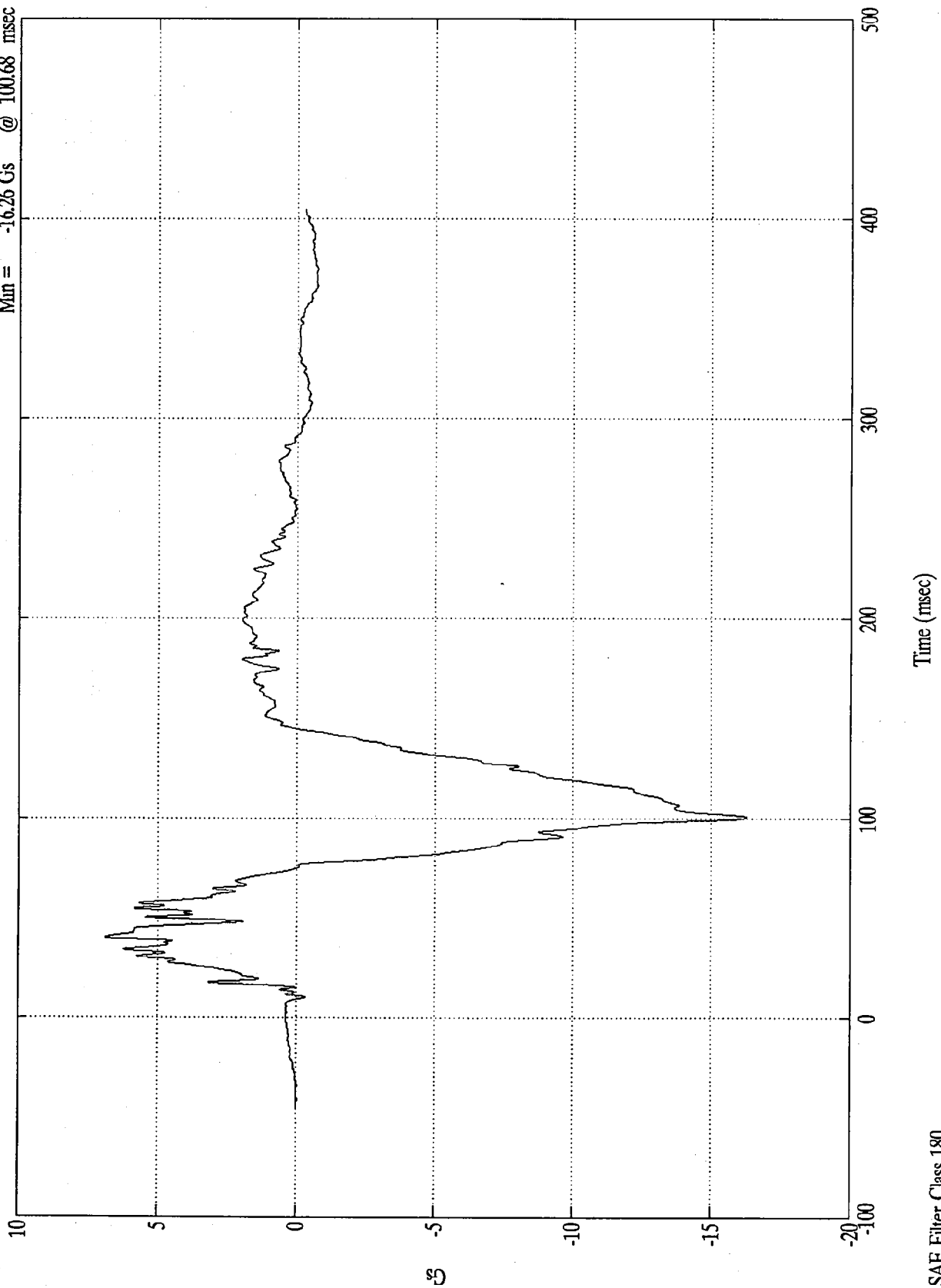
Pos. 1 Chest Z
Max = 8.09 Gs @ 54.96 msec
Min = -13.58 Gs @ 100.80 msec



NCAP TEST #14 - 1997 VOLVO 960

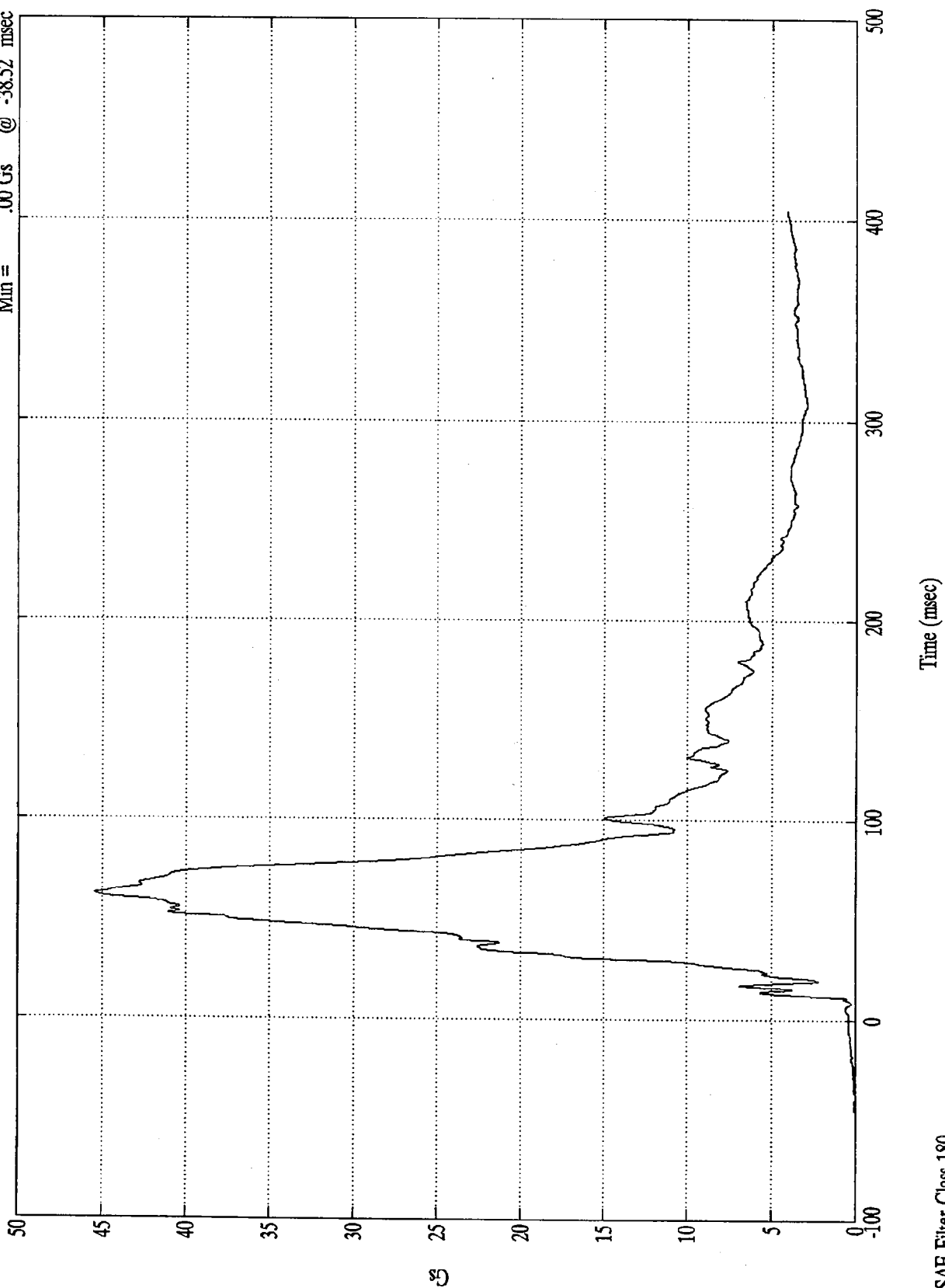
Pos. 1 Chest Z(R)

Max = 6.89 Gs @ 40.31 msec
Min = -16.26 Gs @ 100.68 msec



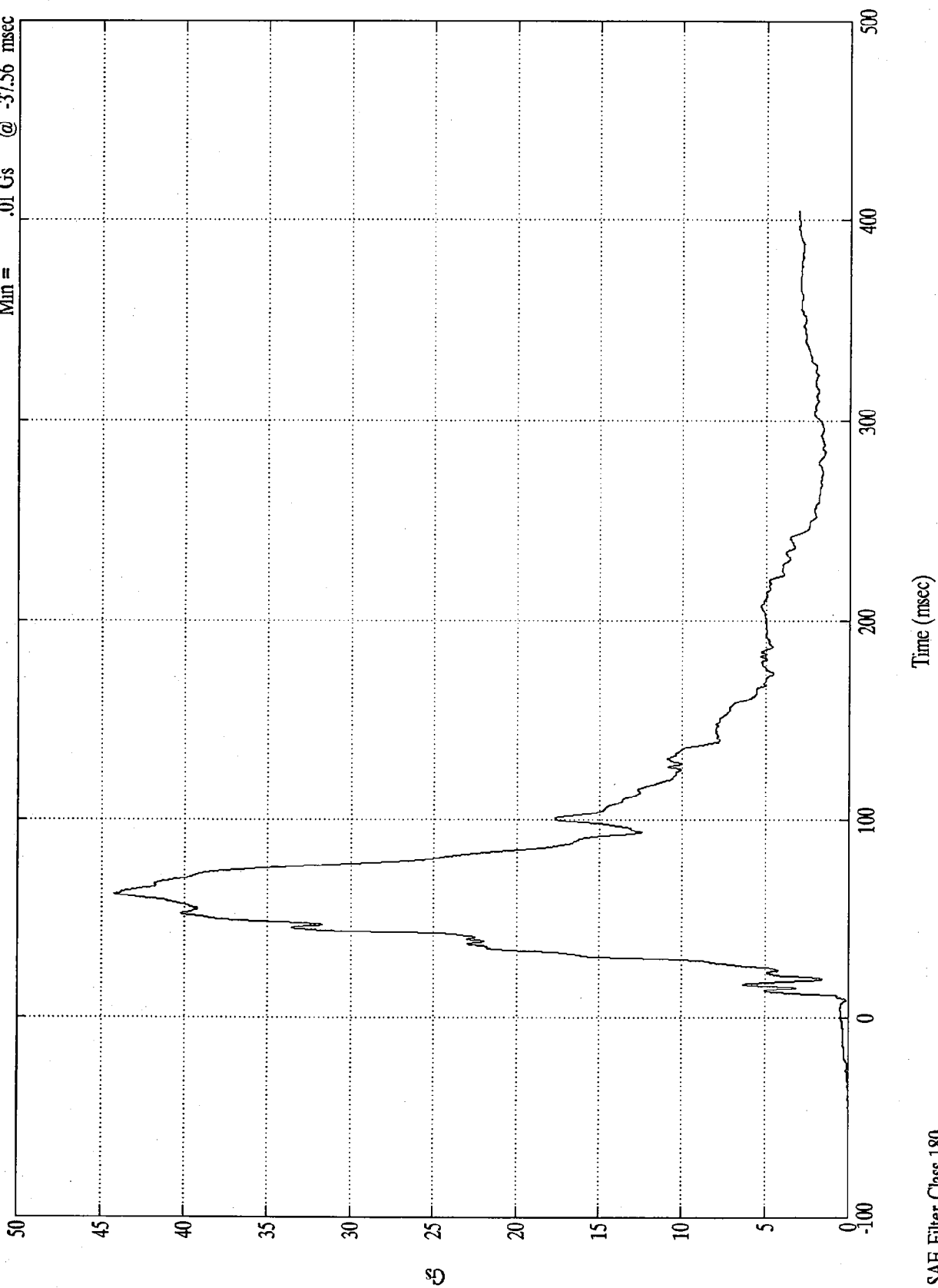
NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Chest Resultant
Max = 45.41 Gs @ 62.27 msec
Min = .00 Gs @ -38.52 msec



Pos. 1 Chest Res(RR)

Max = 44.23 Gs @ 62.15 msec
Min = .01 Gs @ -37.56 msec

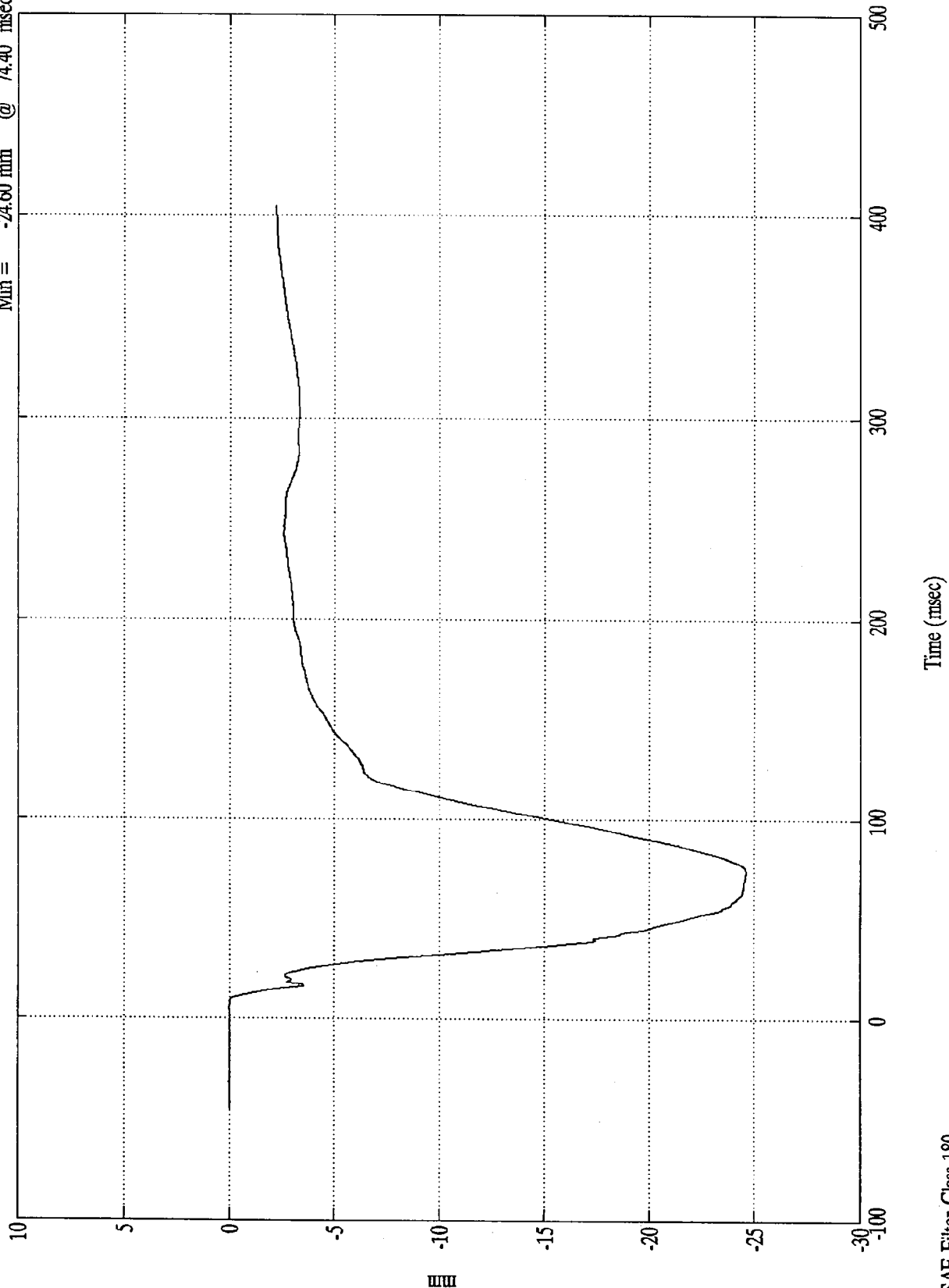


SAE Filter Class 180

NCAP TEST #14 - 1997 VOLVO 960

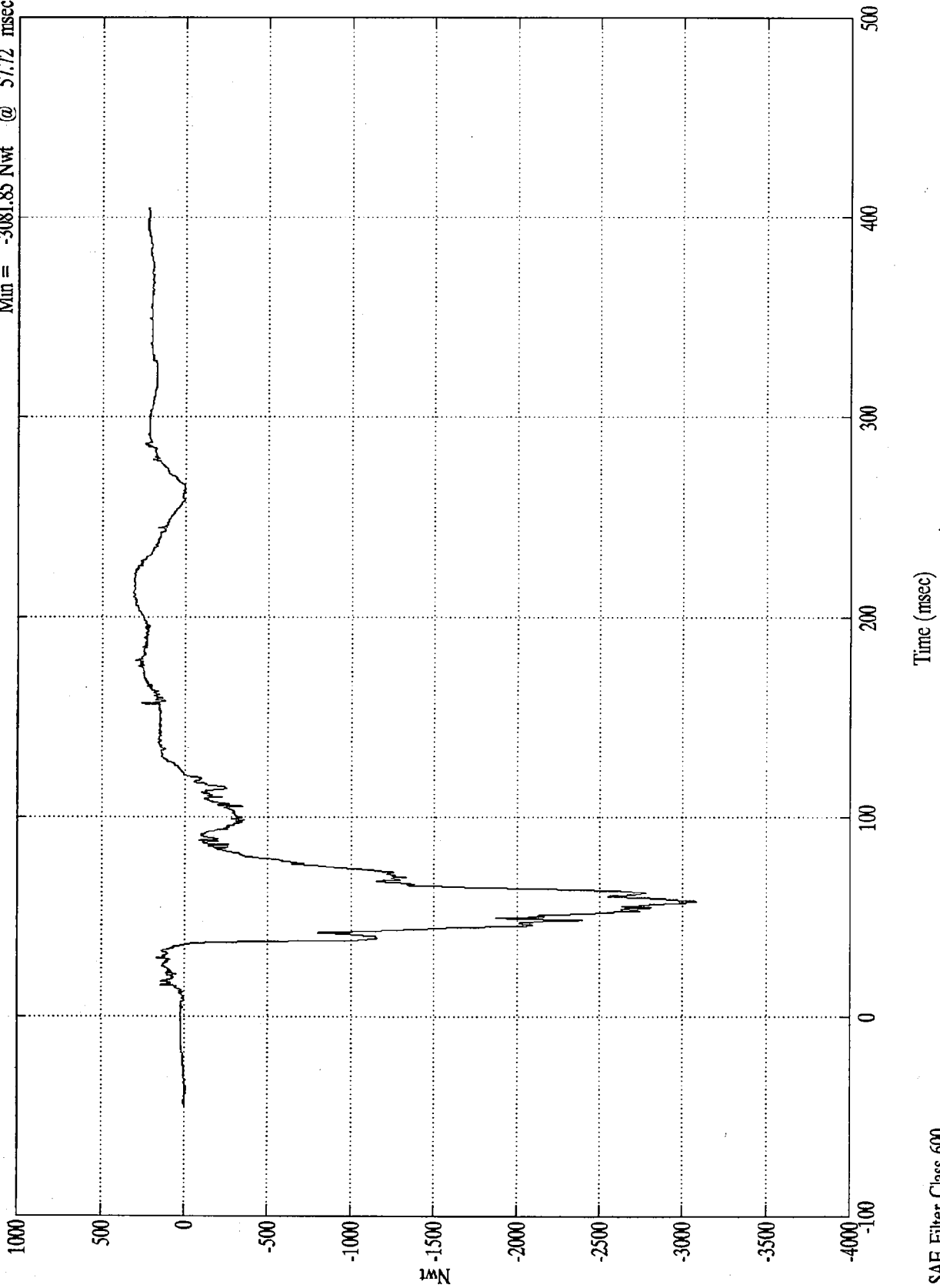
Pos. 1 Chest Disp.

Max = .02 mm @ 5.27 msec
Min = -24.60 mm @ 74.40 msec



Pos. 1 Left Femur

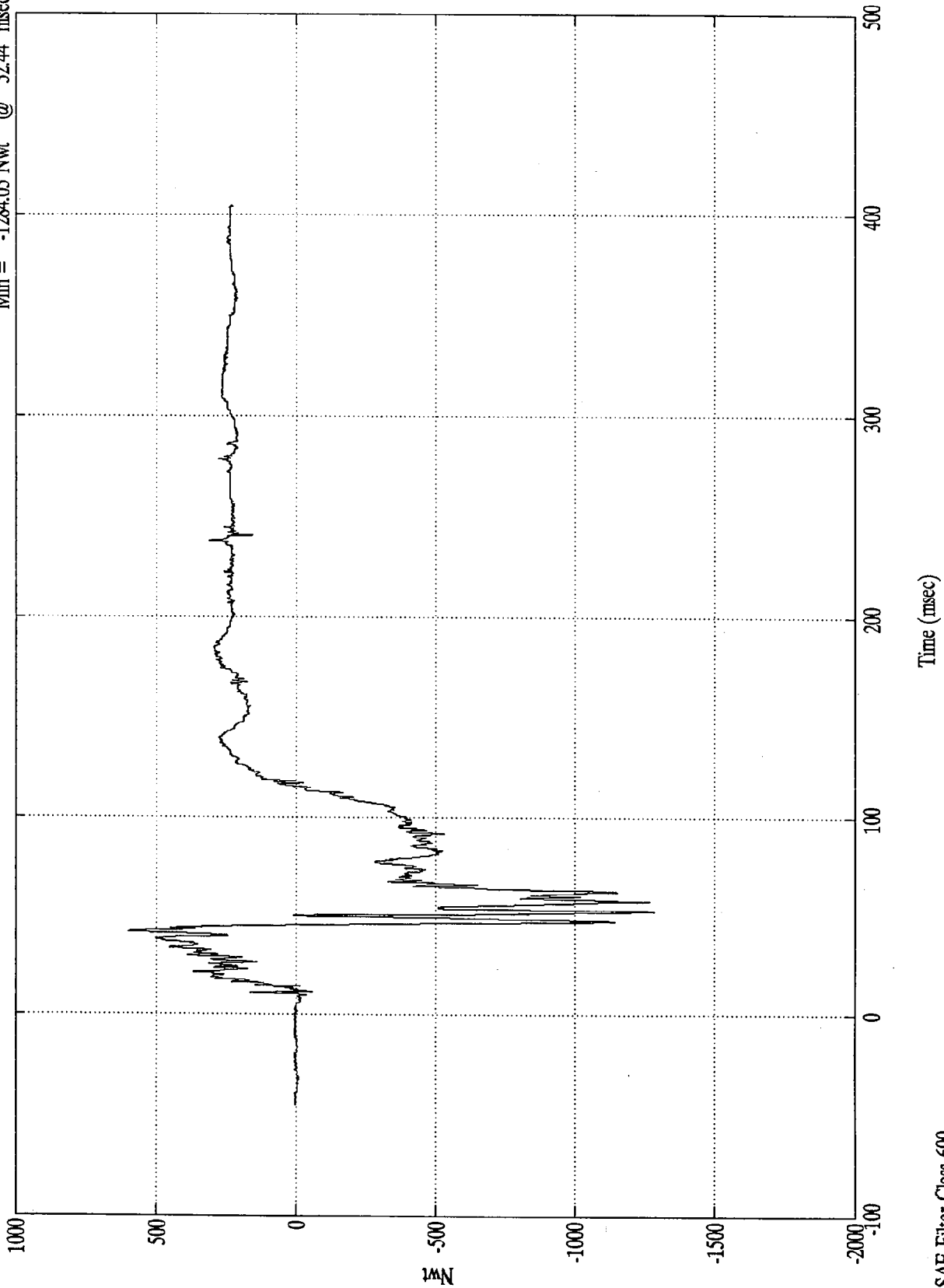
Max = 311.71 Nwt @ 212.63 msec
Min = -3081.85 Nwt @ 57.72 msec



NCAP TEST #14 - 1997 VOLVO 960

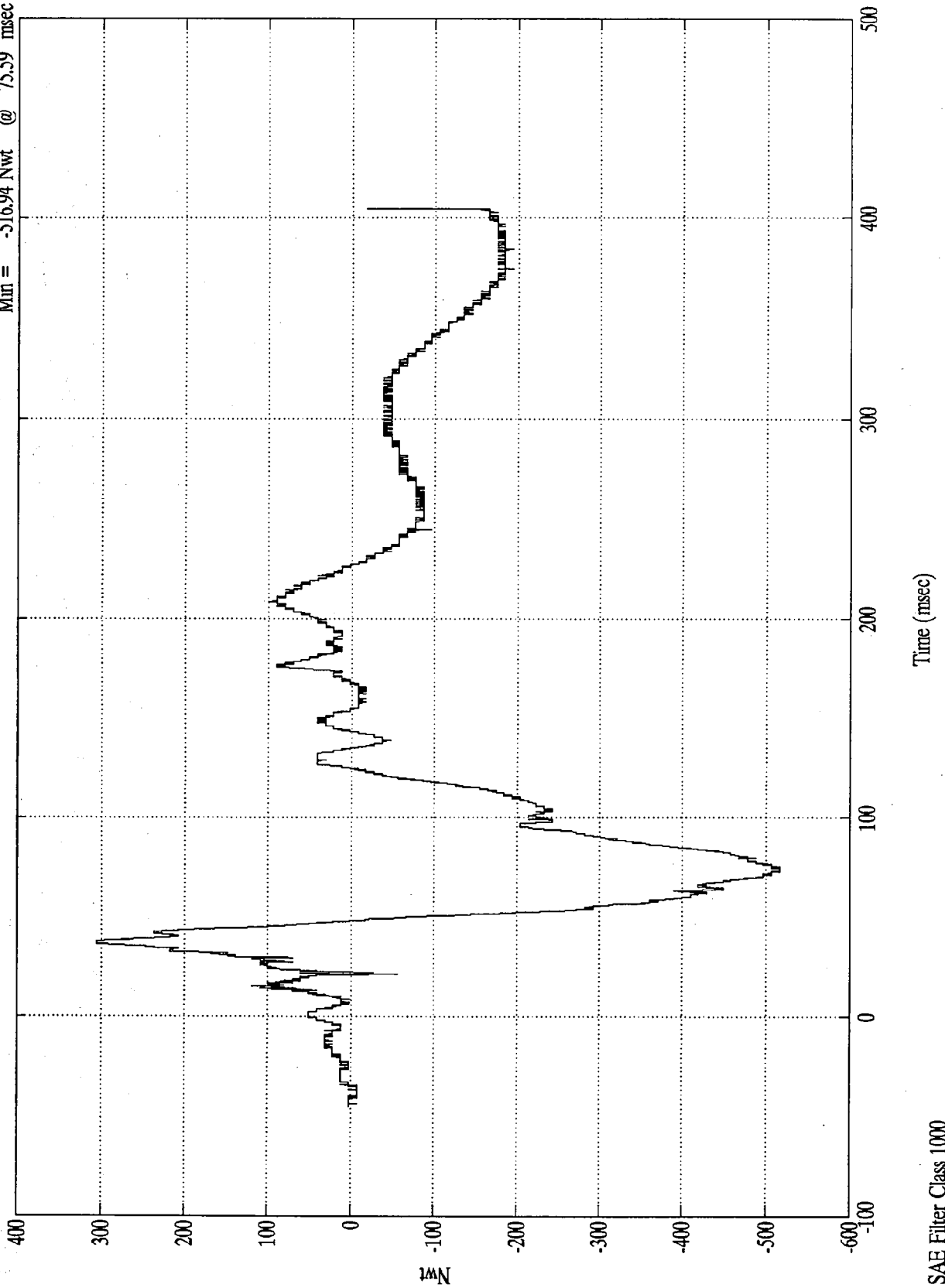
Pos. 1 Right Femur

Max = 600.89 Nwt @ 41.76 msec
Min = -1284.05 Nwt @ 52.44 msec



Pos. 1 Upper Neck Fx

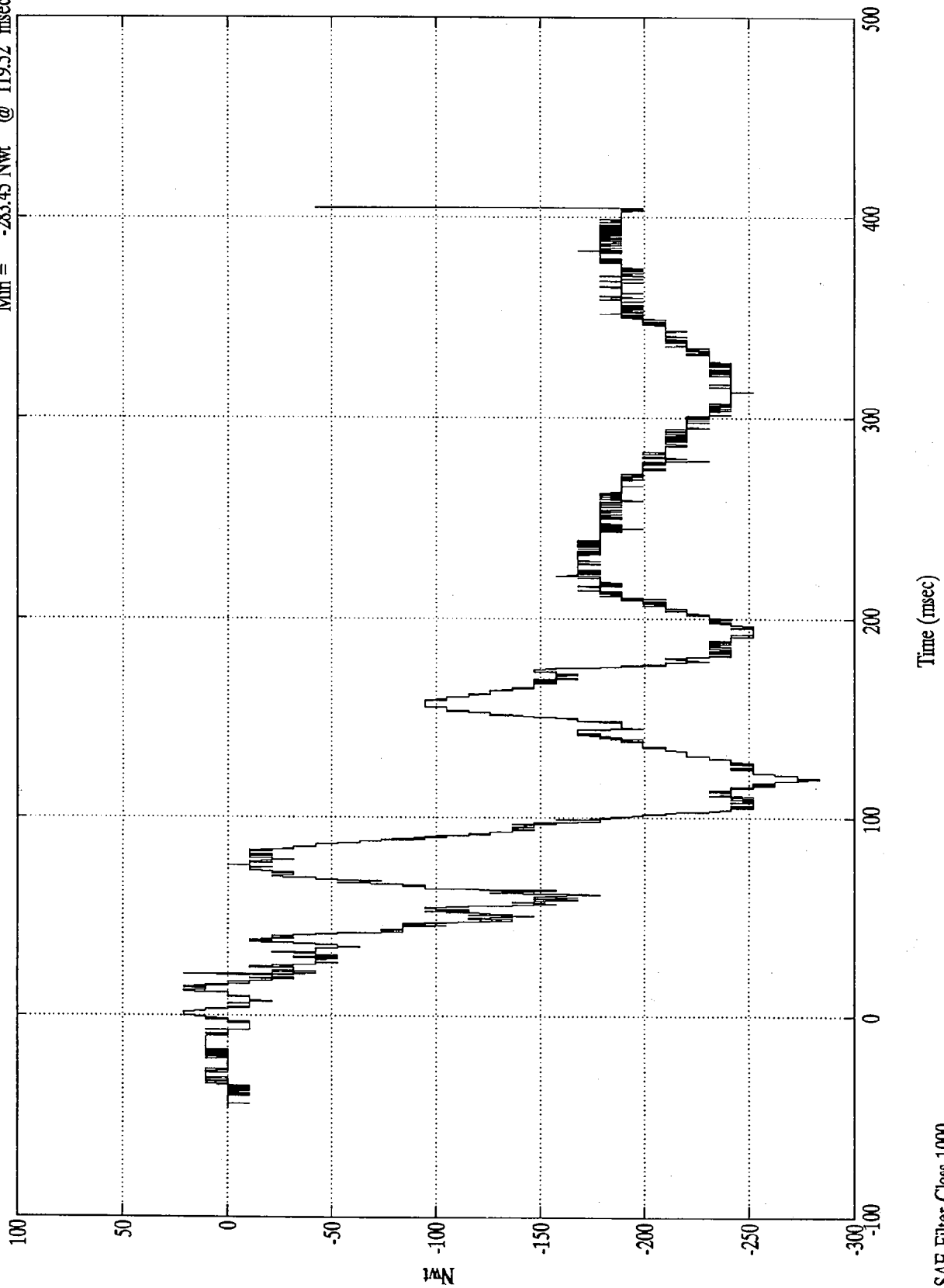
Max = 305.49 Nwt @ 37.92 msec
Min = -516.94 Nwt @ 75.59 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Upper Neck Fy

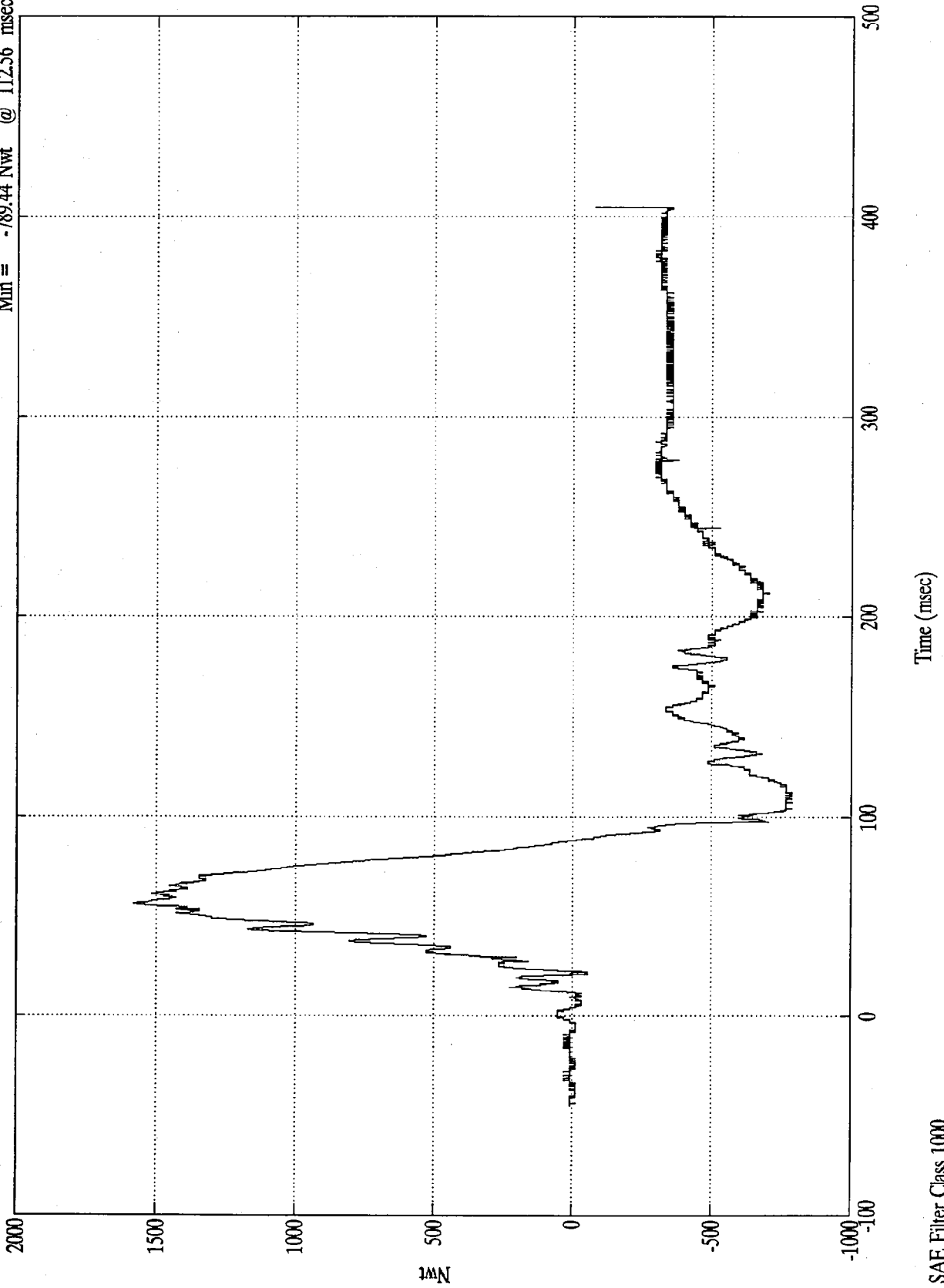
Max = 20.90 Nwt @ 21.35 msec
Min = -283.45 Nwt @ 119.52 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Upper Neck Fz

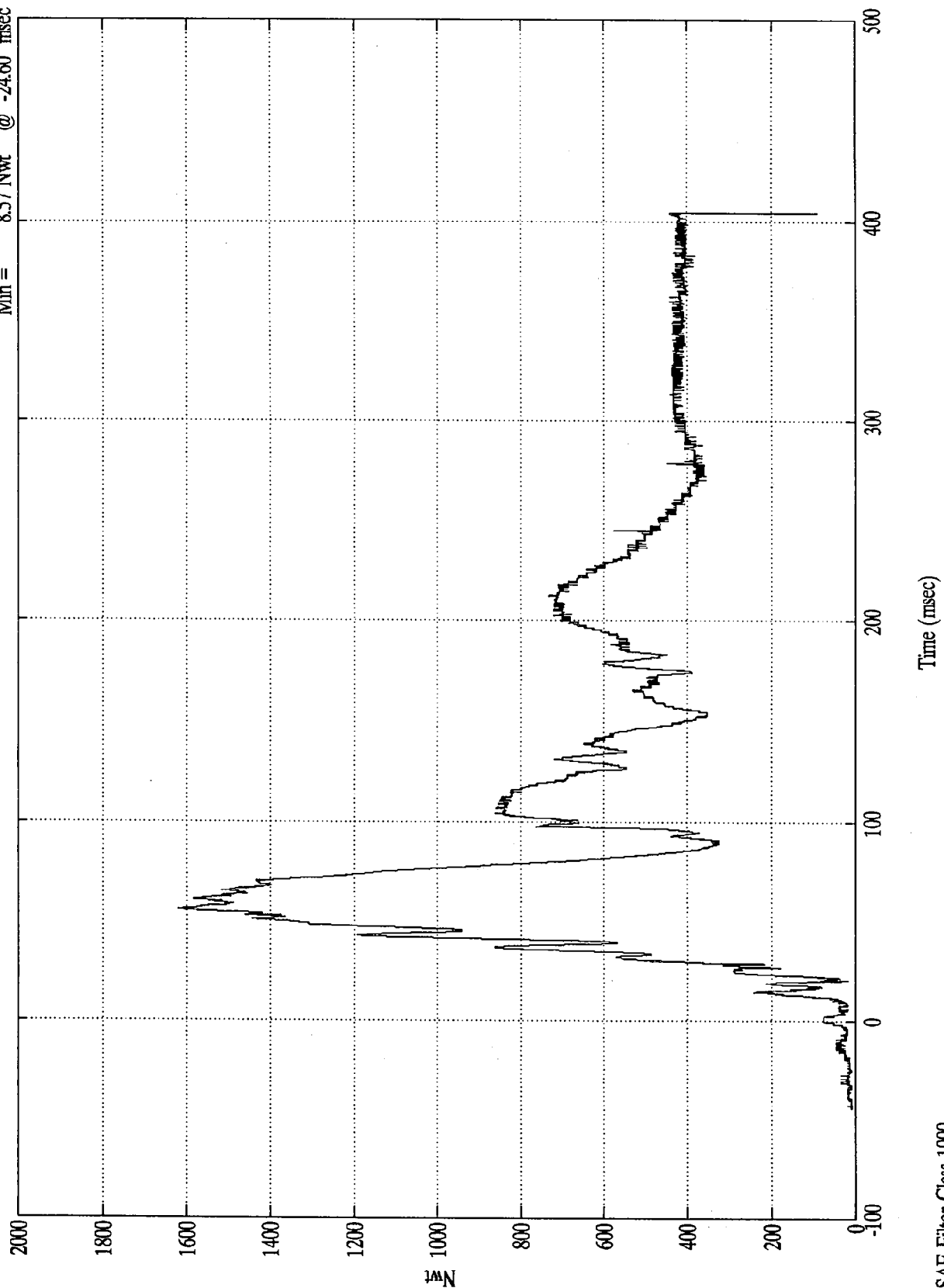
Max = 1582.37 Nwt @ 56.40 msec
Min = -789.44 Nwt @ 112.56 msec



NCAP TEST #14 - 1997 VOLVO 960

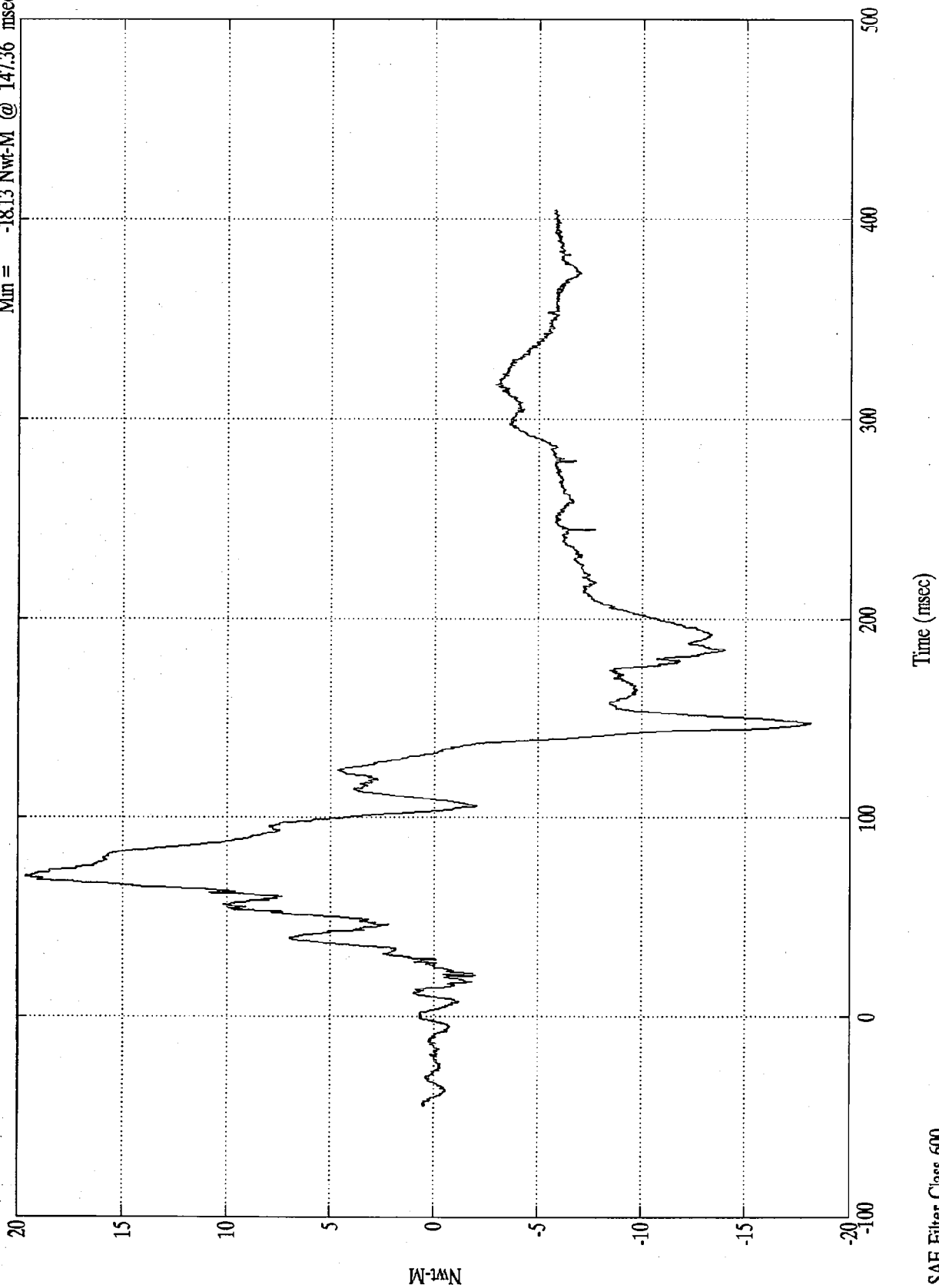
Pos. 1 Neck Force Res.

Max = 1620.38 Nwt @ 56.40 msec
Min = 8.57 Nwt @ -24.60 msec



Pos. 1 Upper Neck Mx

Max = 19.63 Nwt-M @ 70.91 msec
Min = -18.13 Nwt-M @ 147.36 msec



Nwt-M

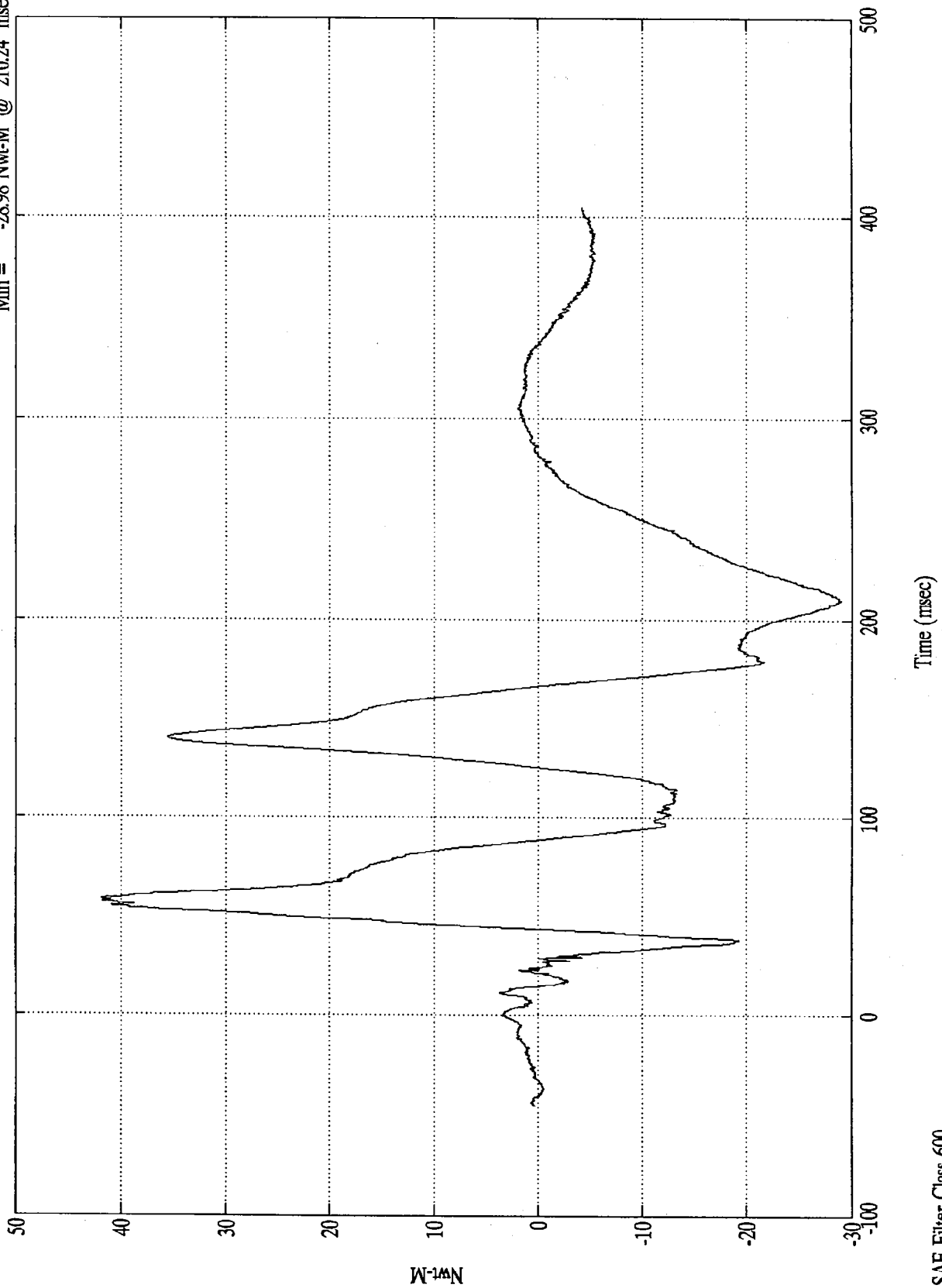
Time (msec)

SAE Filter Class 600

NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Upper Neck My

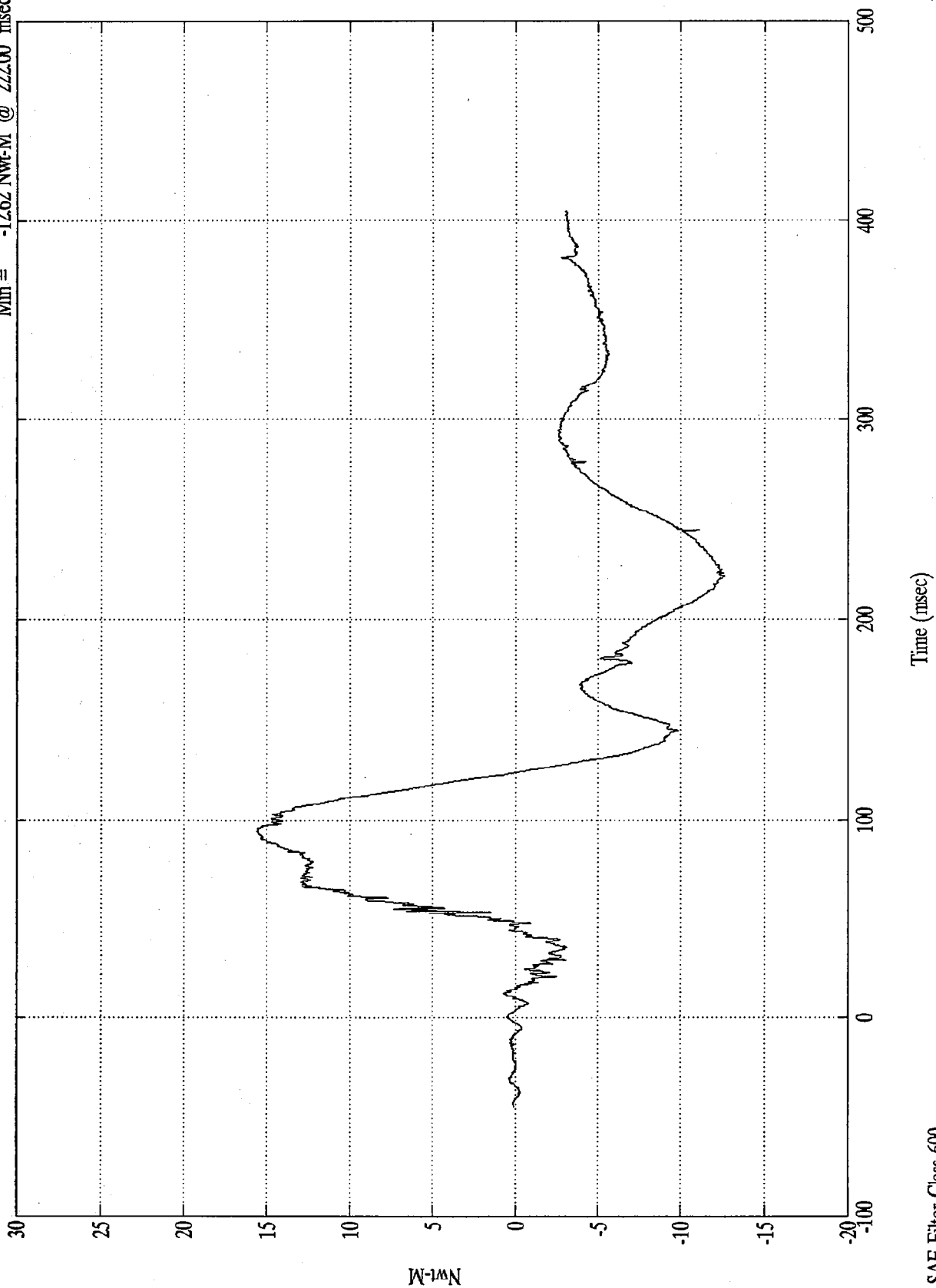
Max = 41.88 Nwt-M @ 58.43 msec
Min = -28.98 Nwt-M @ 210.24 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Upper Neck Mz

Max = 15.63 Nwt-M @ 93.95 msec
Min = -12.62 Nwt-M @ 222.00 msec

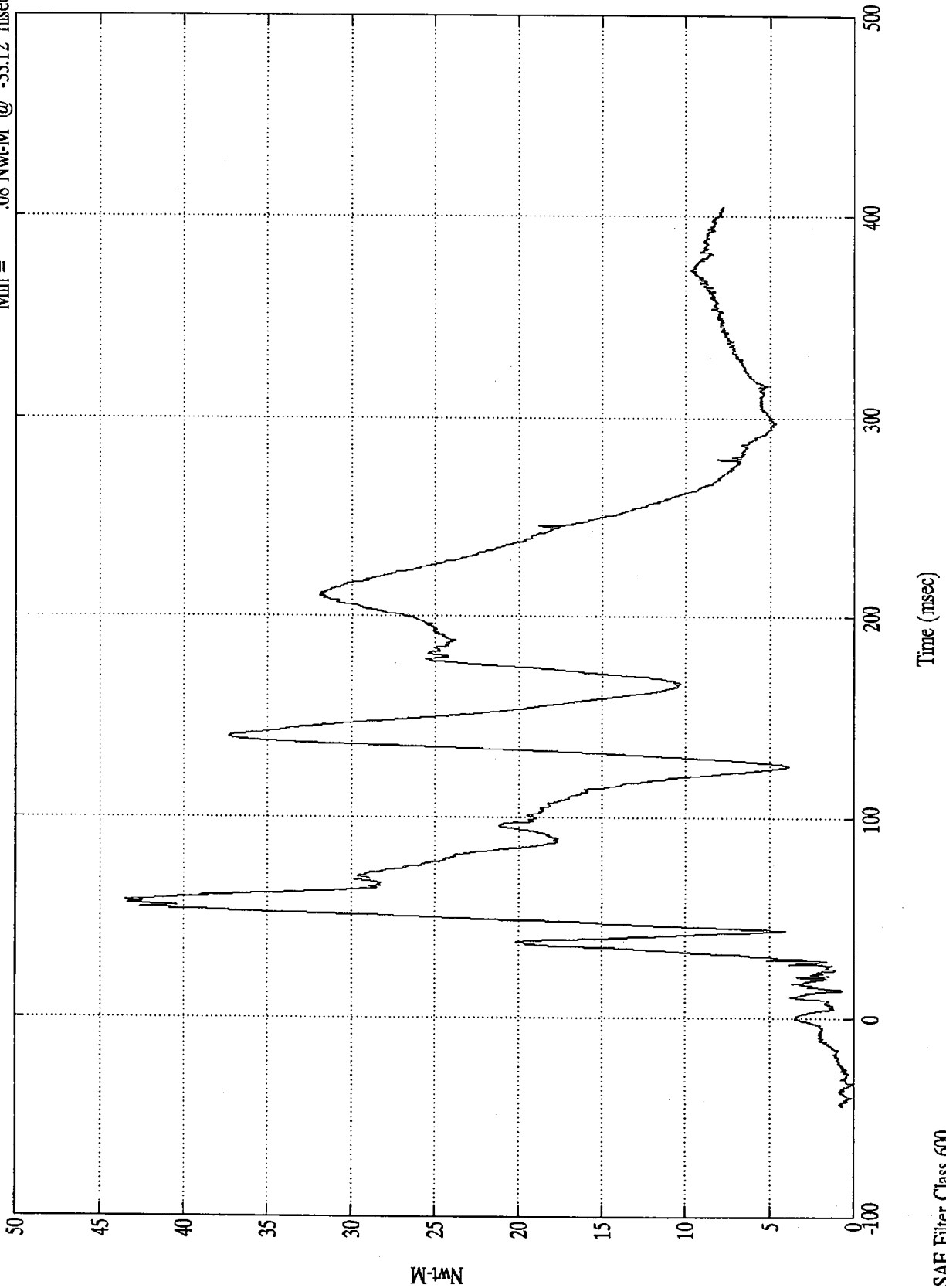


Mz-Nwt-M

SAE Filter Class 600

Pos. 1 Neck Moment Res.

Max = 43.45 Nwt-M @ 58.31 msec
Min = .08 Nwt-M @ -33.12 msec



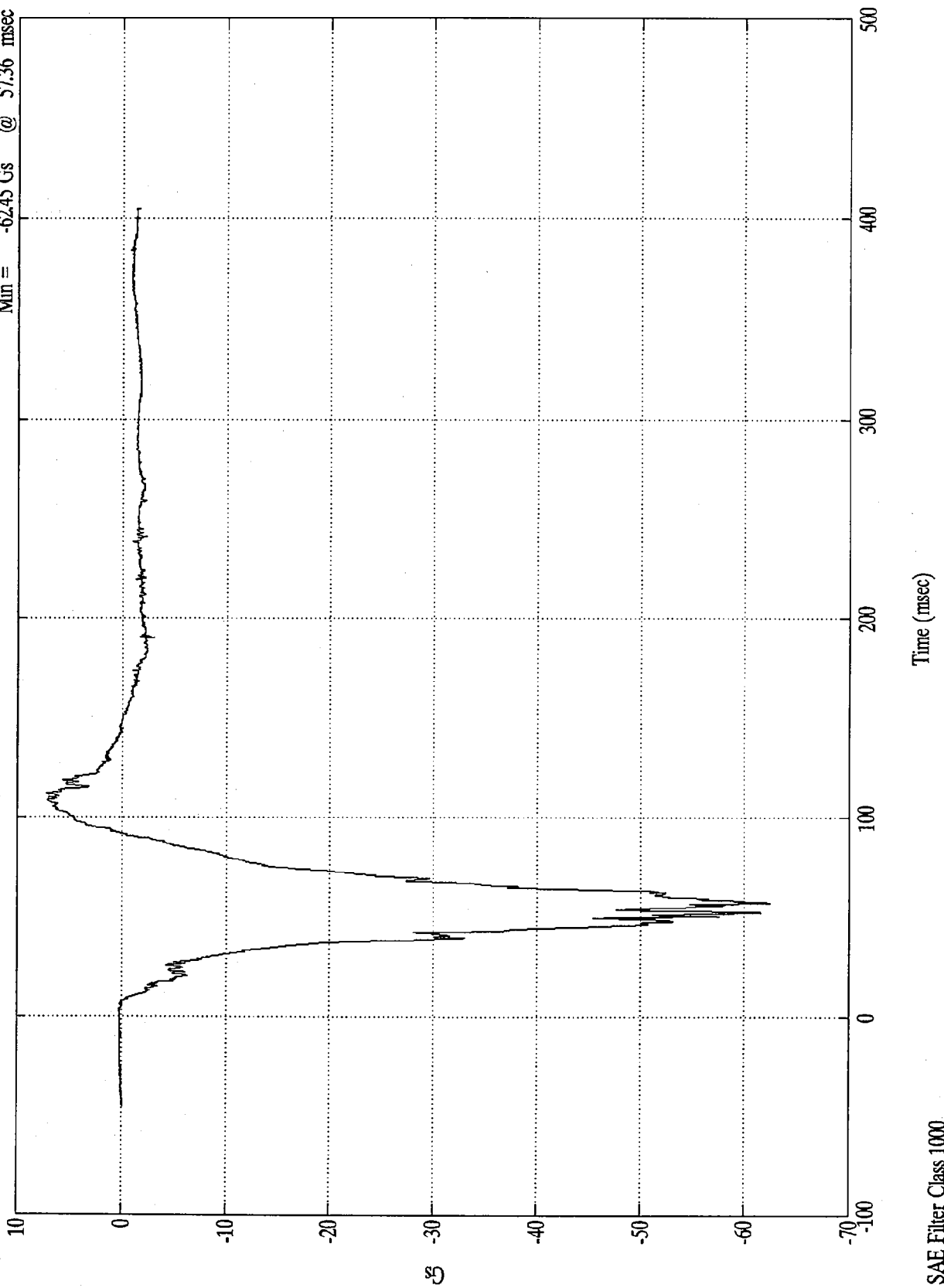
Nwt-M

Time (msec)

SAE Filter Class 600

Pos. 1 Pelvic (X)

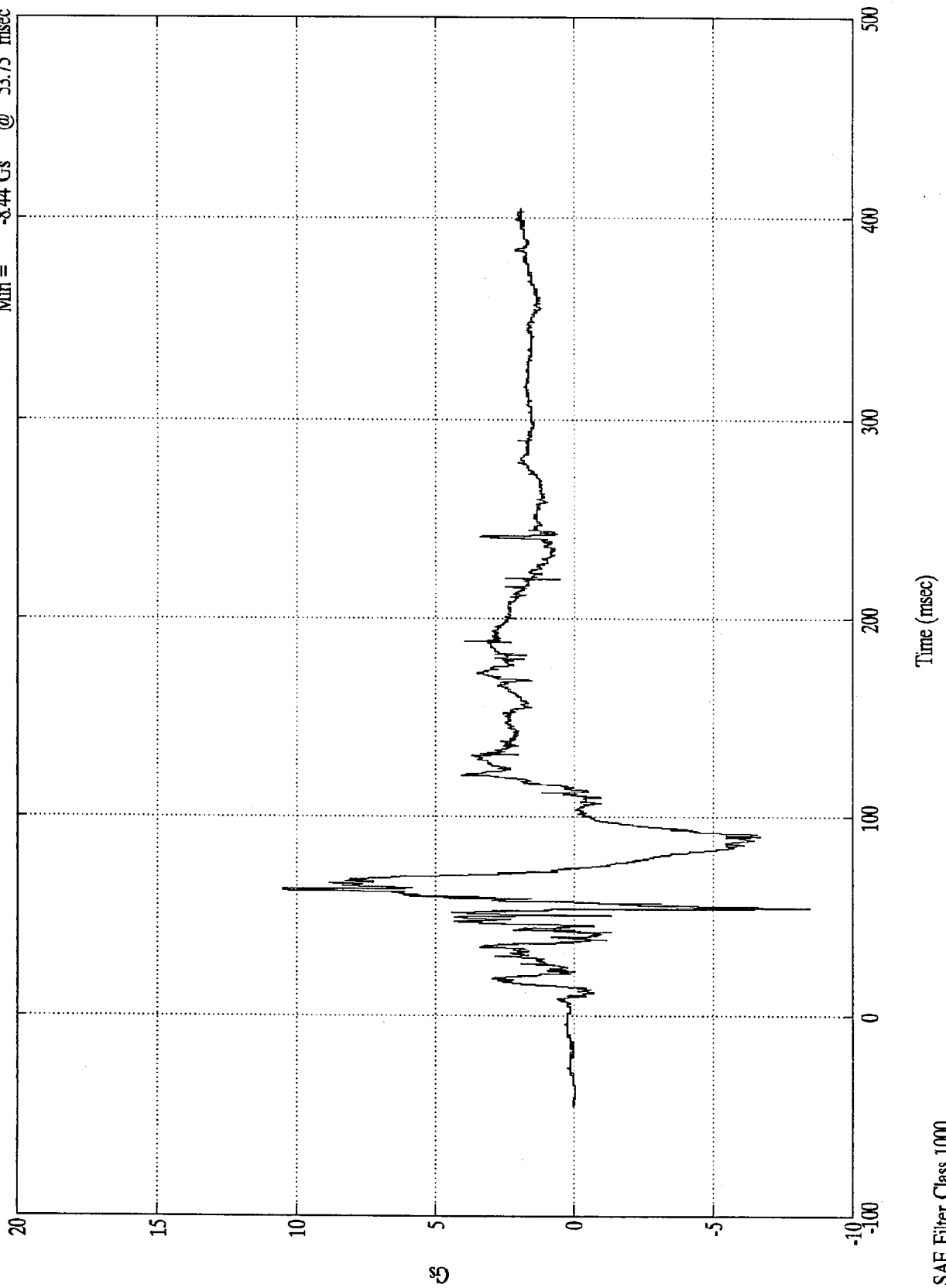
Max = 7.23 Gs @ 111.48 msec
Min = -62.45 Gs @ 57.36 msec



NCAP TEST #14 - 1997 VOLVO 960

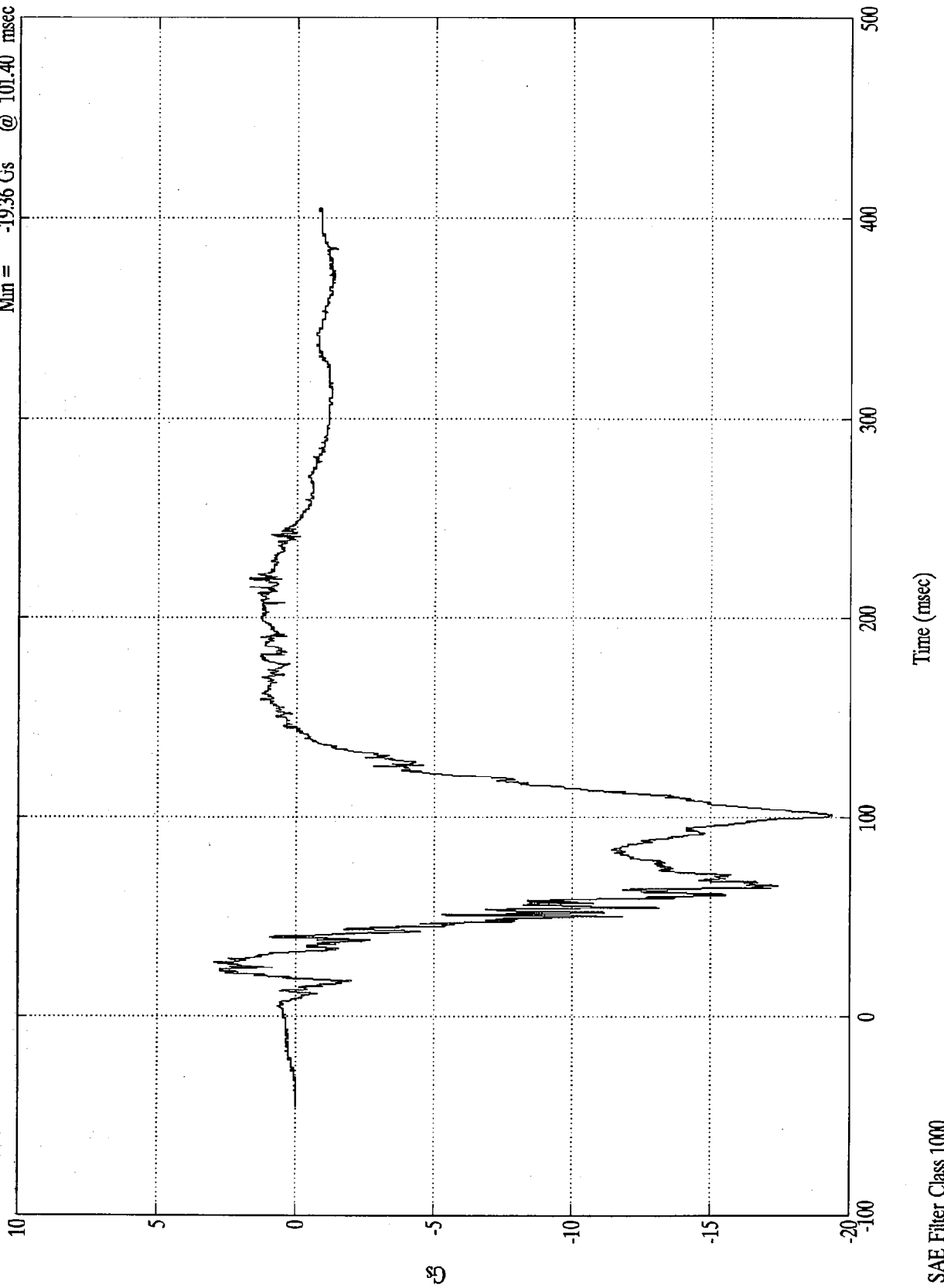
Pos. 1 Pelvic (Y)

Max = 10.50 Gs @ 63.11 msec
Min = -8.44 Gs @ 53.75 msec



Pos. 1 Pelvic (Z)

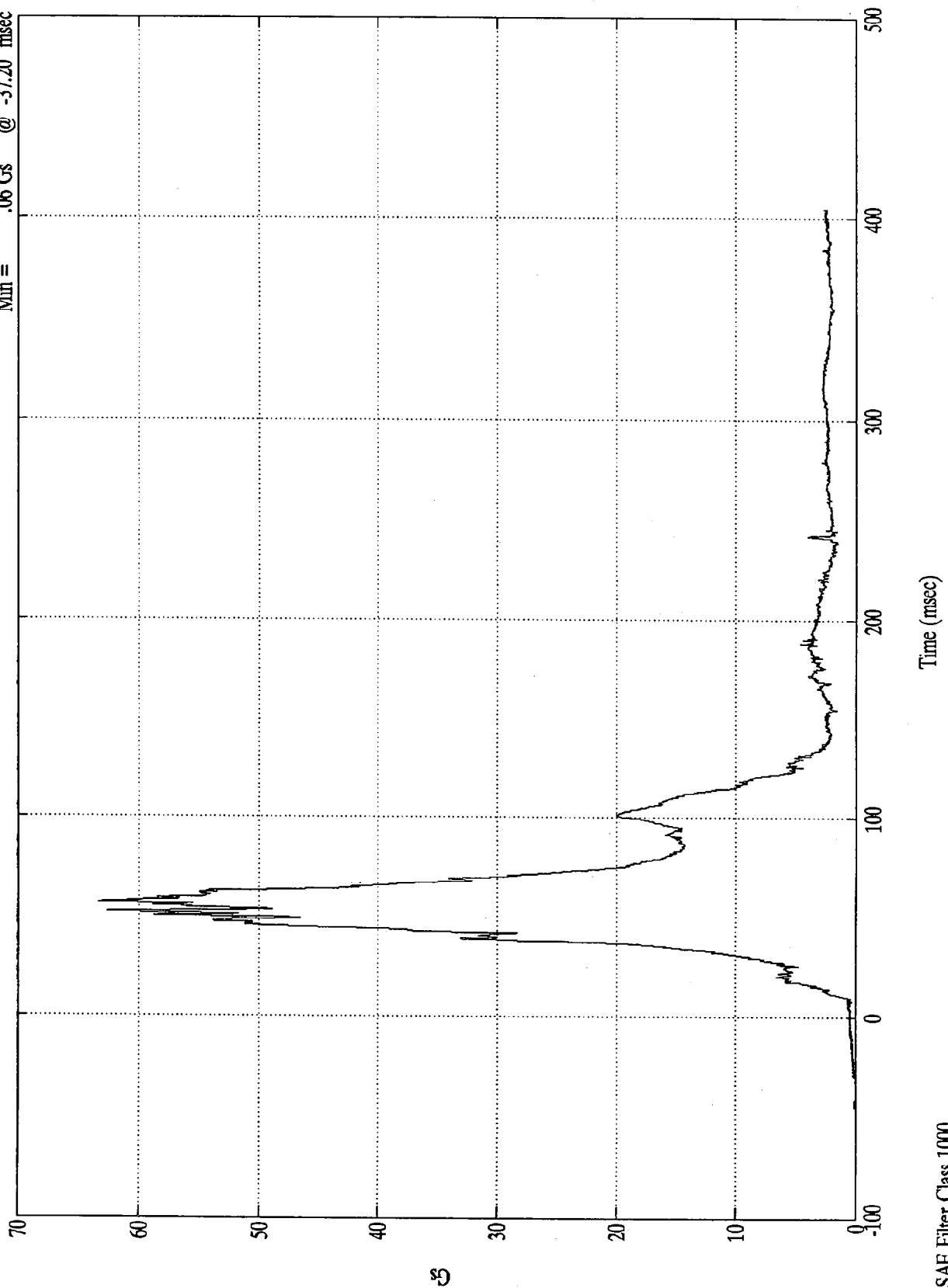
Max = 2.94 Gs @ 27.48 msec
Min = -19.36 Gs @ 101.40 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Pelvic (R)

Max = 63.38 Gs @ 57.36 msec
Min = .06 Gs @ -37.20 msec



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B-34

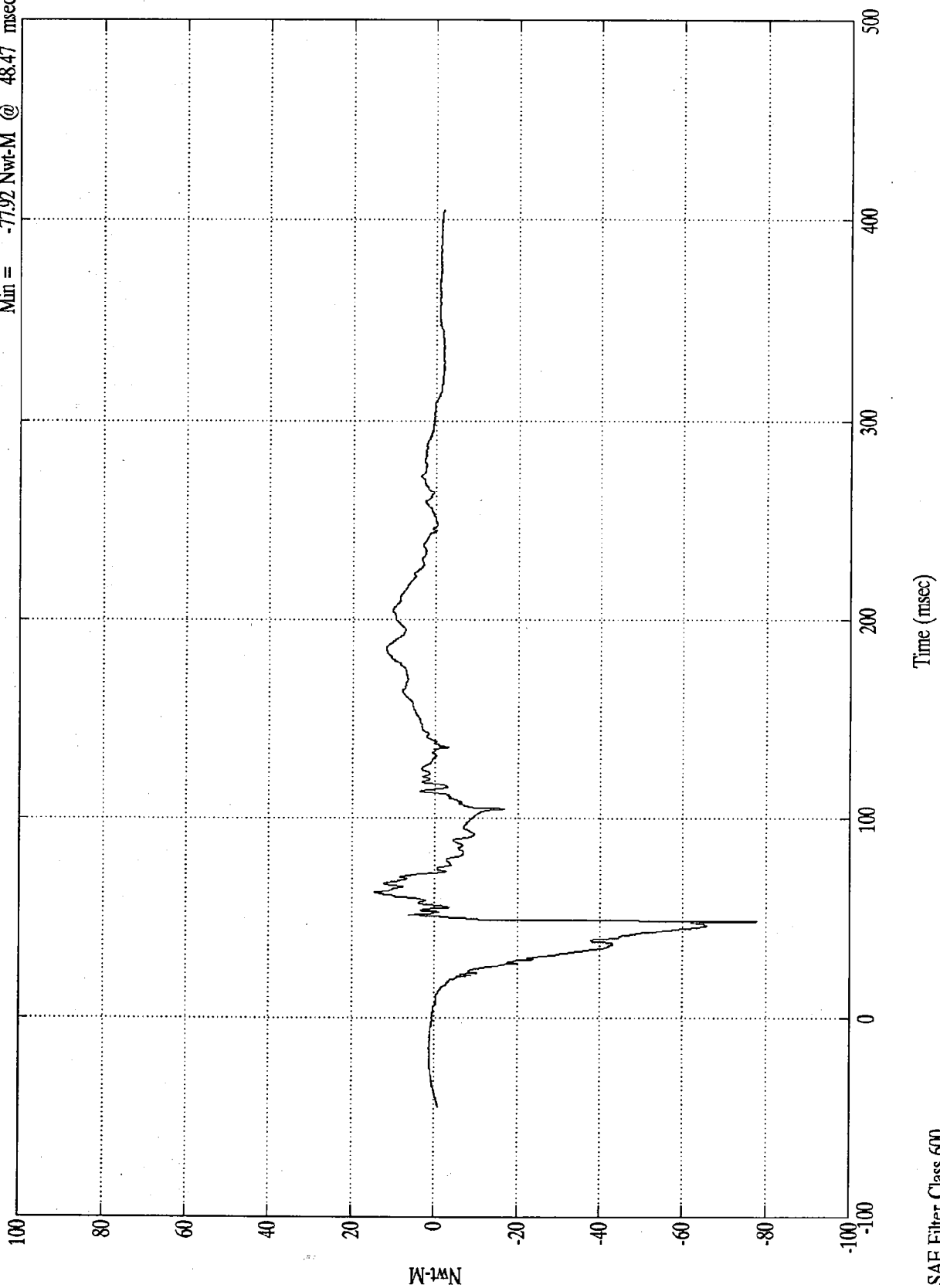
8313-14

SAE Filter Class 1000

NCAP TEST #14 - 1997 VOLVO 960

P1 Lt Upper Tibia Mx

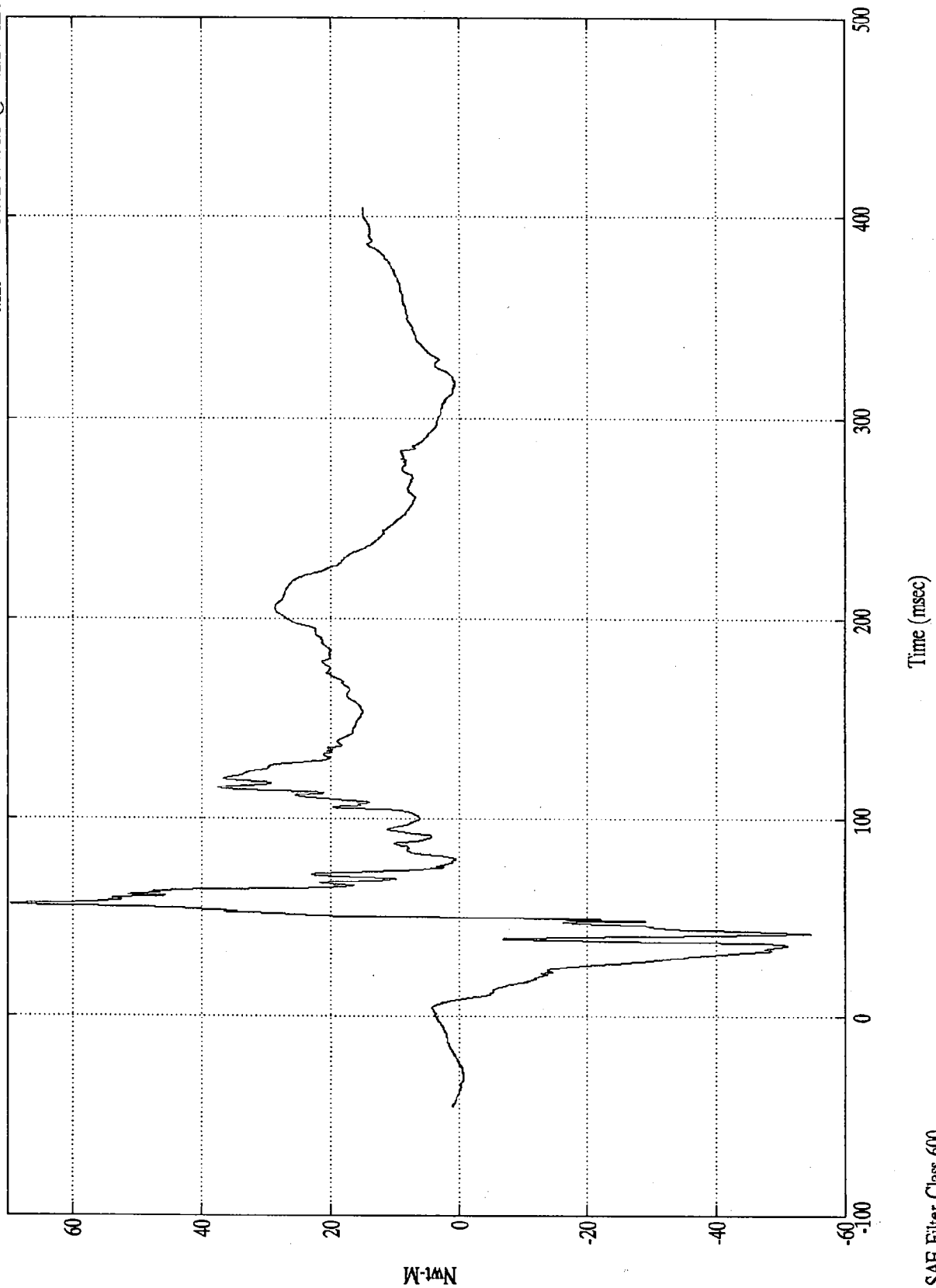
Max = 14.46 Nwt-M @ 62.64 msec
Min = -77.92 Nwt-M @ 48.47 msec



NCAP TEST #14 - 1997 VOLVO 960

P1 Lt Upper Tibia My

Max = 69.54 Nwt-M @ 56.52 msec
Min = -54.72 Nwt-M @ 42.24 msec



W-M

B-36

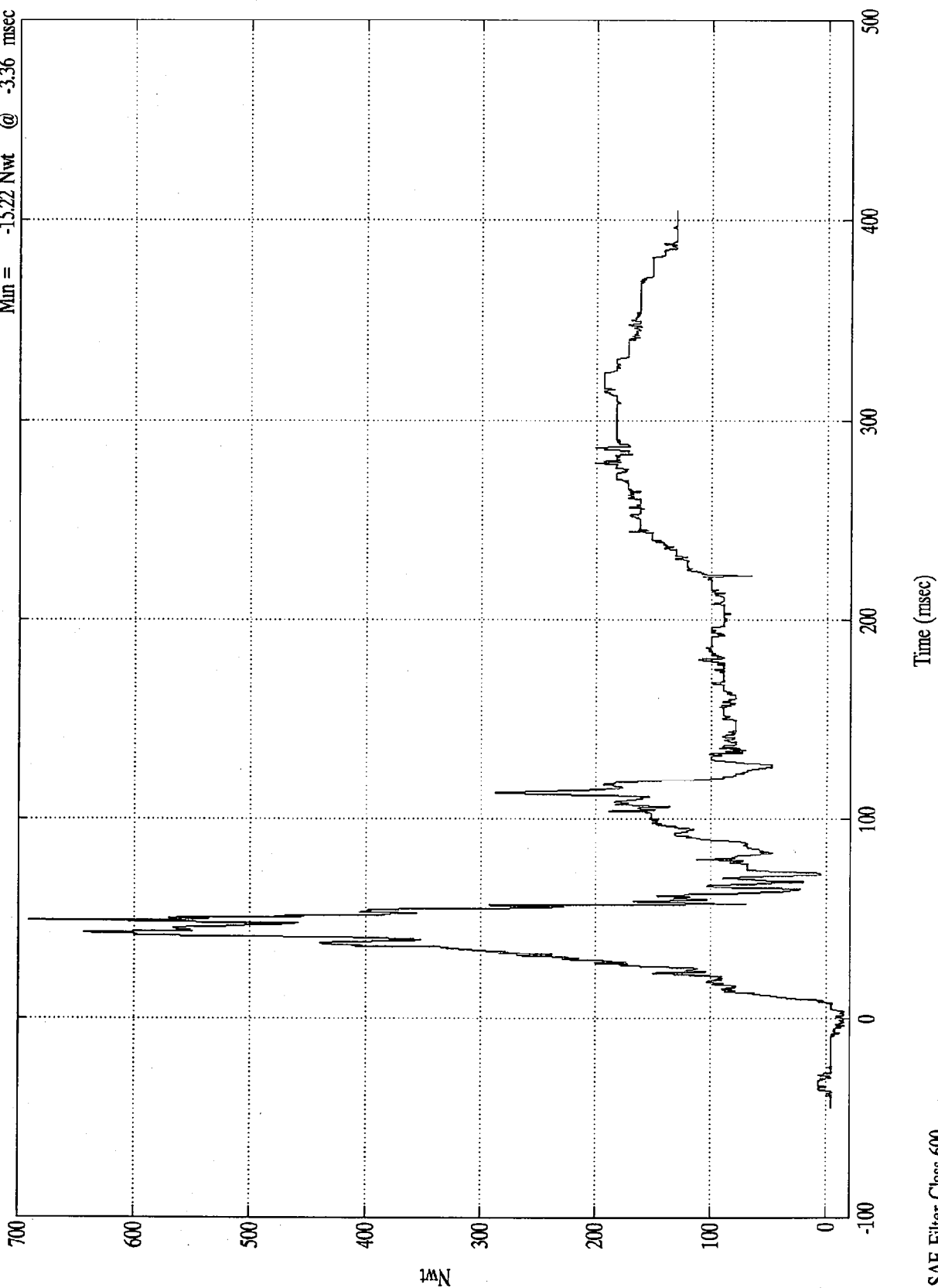
813-14

SAE Filter Class 600

NCAP TEST #14 - 1997 VOLVO 960

P1 Lt Lower Tibia Fx

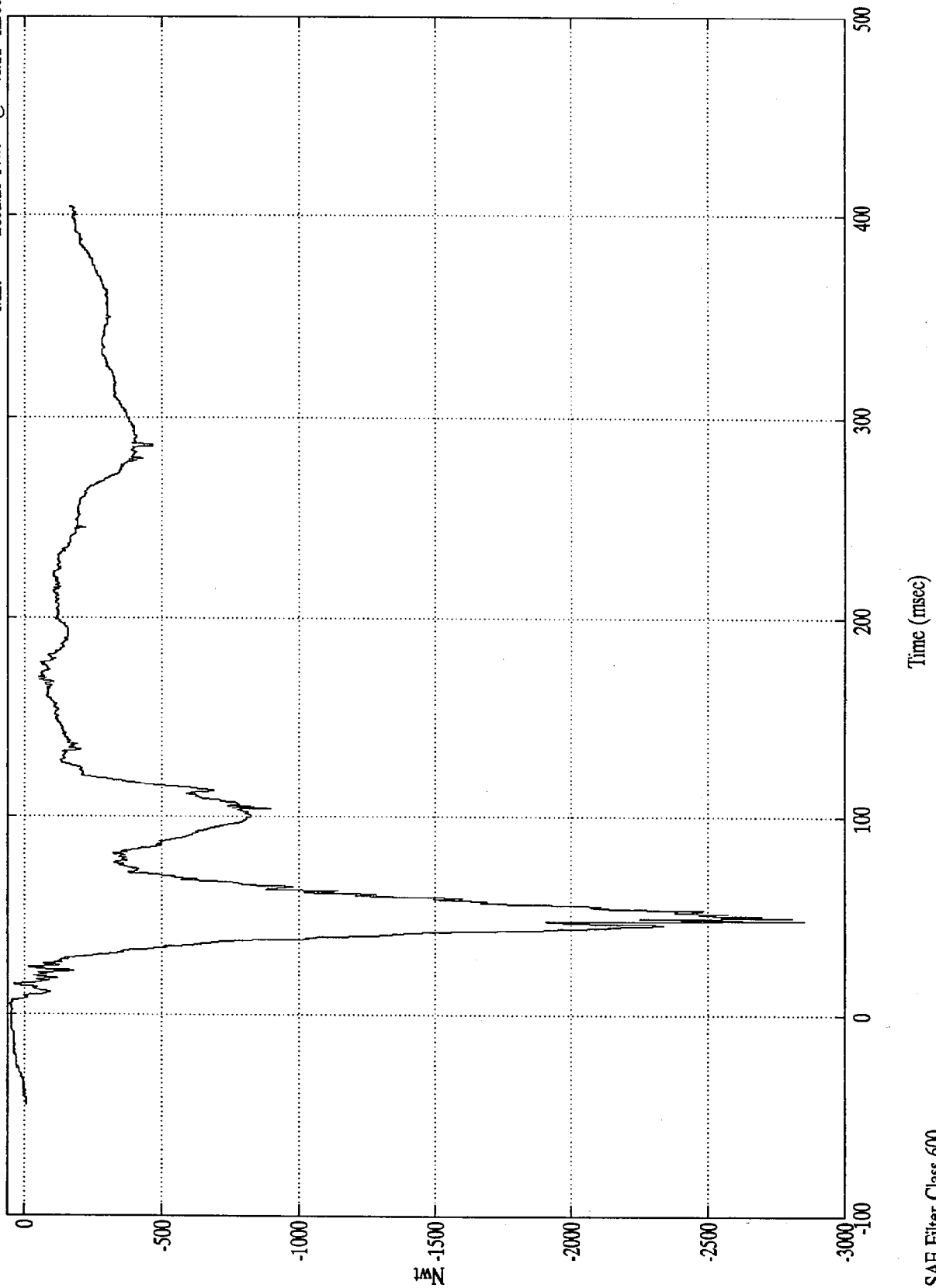
Max = 691.03 Nwt @ 48.95 msec
Min = -15.22 Nwt @ -3.36 msec



NCAP TEST #14 - 1997 VOLVO 960

P1 Lt Lower Tibia Fz

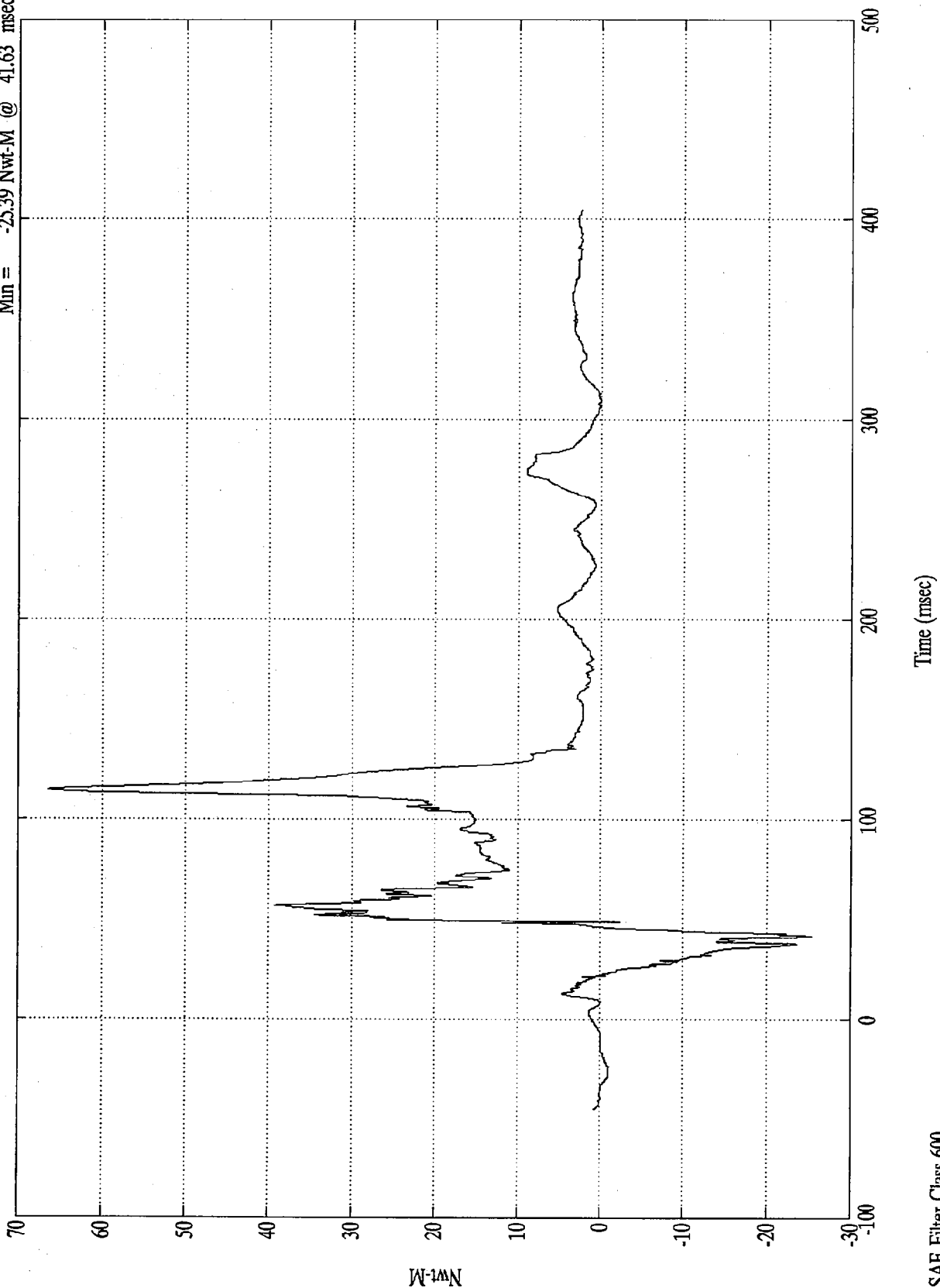
Max = 54.62 Nwt @ 5.39 msec
Min = -2852.25 Nwt @ 48.11 msec



SAE Filter Class 600

P1 Lt Lower Tibia My

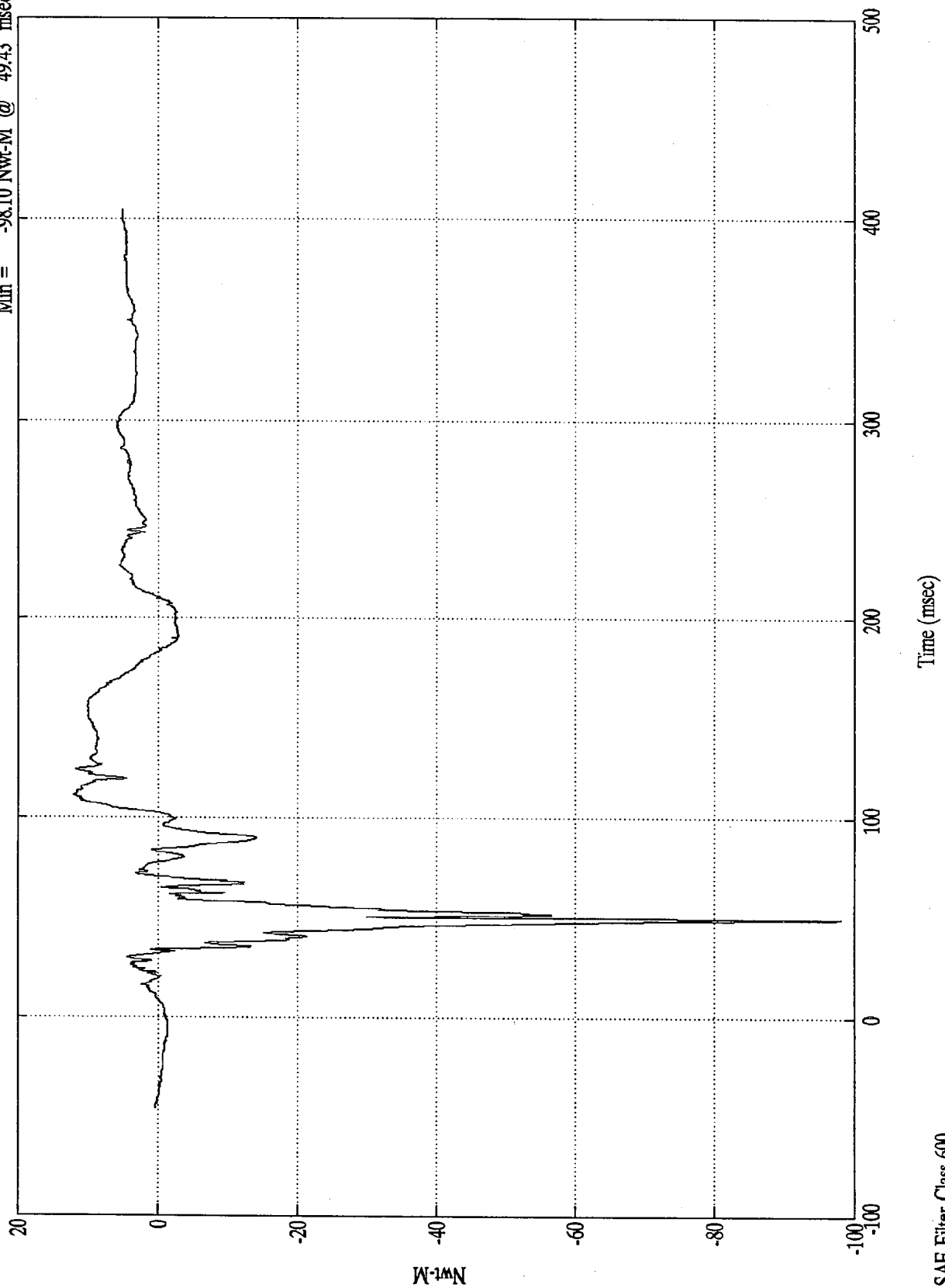
Max = 66.42 Nwt-M @ 114.60 msec
Min = -25.39 Nwt-M @ 41.63 msec



NCAP TEST #14 - 1997 VOLVO 960

Pl Rt Upper Tibia Mx

Max = 12.08 Nwt-M @ 110.88 msec
Min = -98.10 Nwt-M @ 49.43 msec

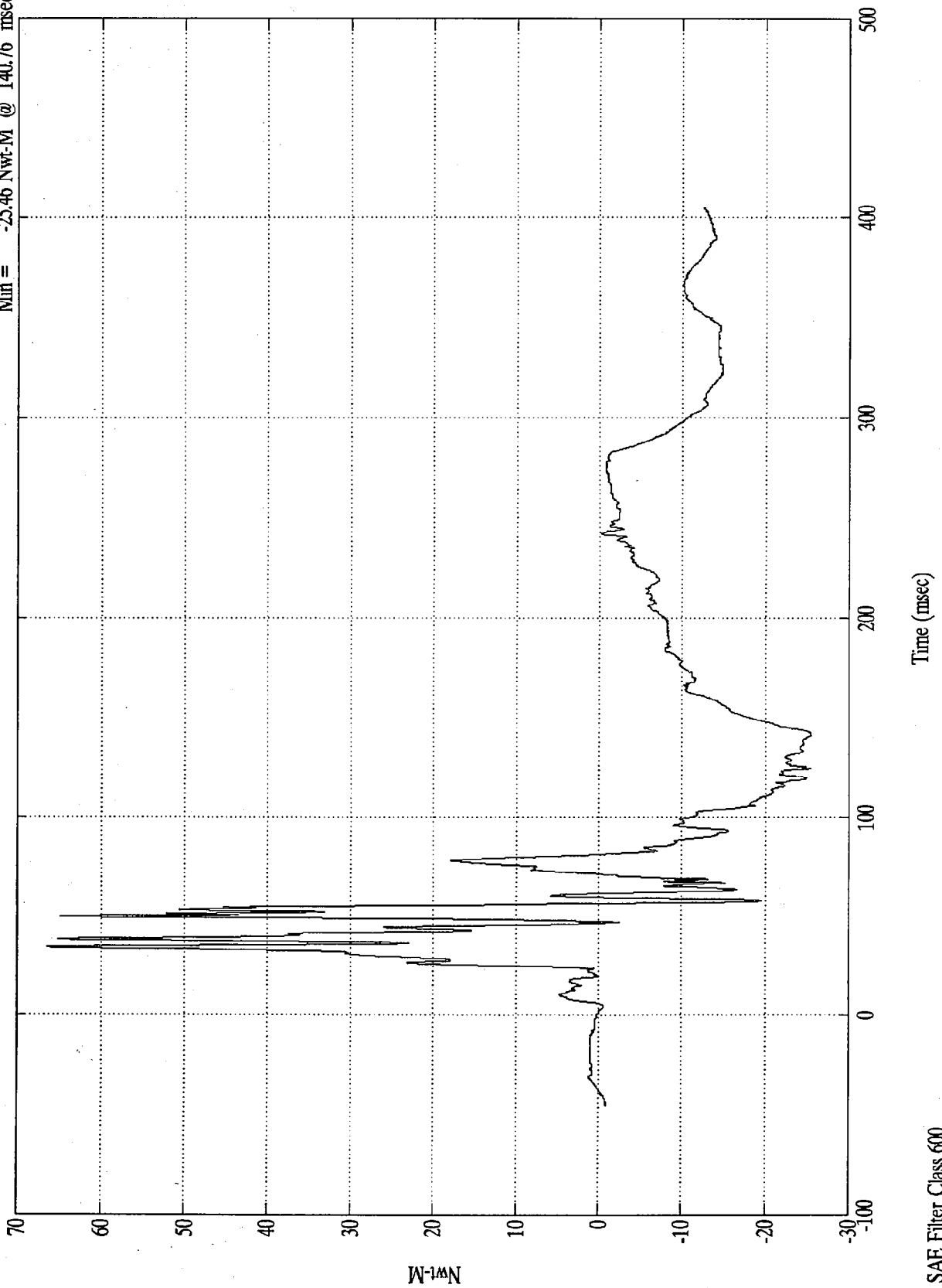


SAE Filter Class 600

NCAP TEST #14 - 1997 VOLVO 960

P1 Rt Upper Tibia My

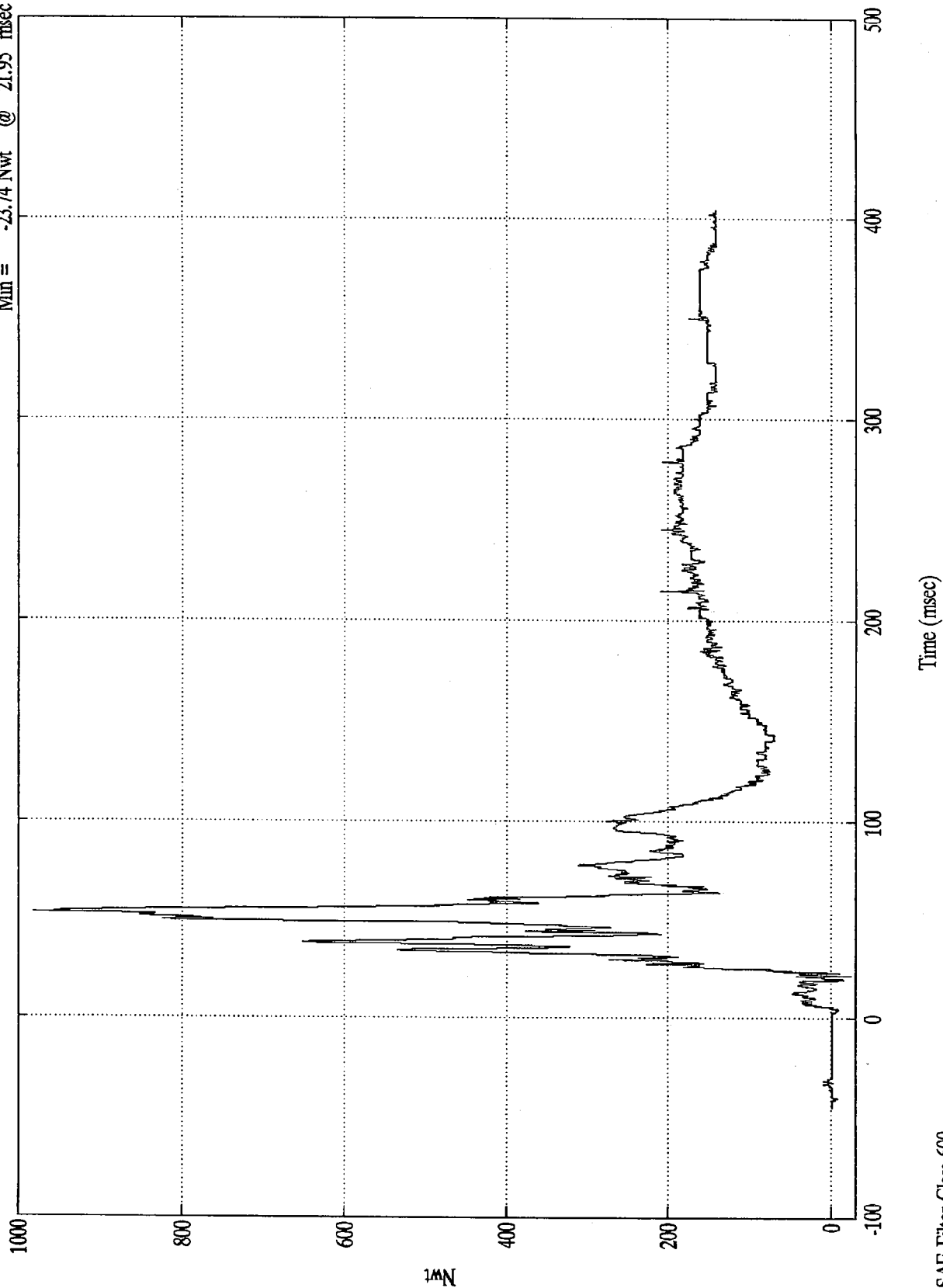
Max = 66.38 Nwt-M @ 34.31 msec
Min = -25.46 Nwt-M @ 140.76 msec



NCAP TEST #14 - 1997 VOLVO 960

P1 Rt Lower Tibia Fx

Max = 981.47 Nwt @ 53.27 msec
Min = -23.74 Nwt @ 21.95 msec

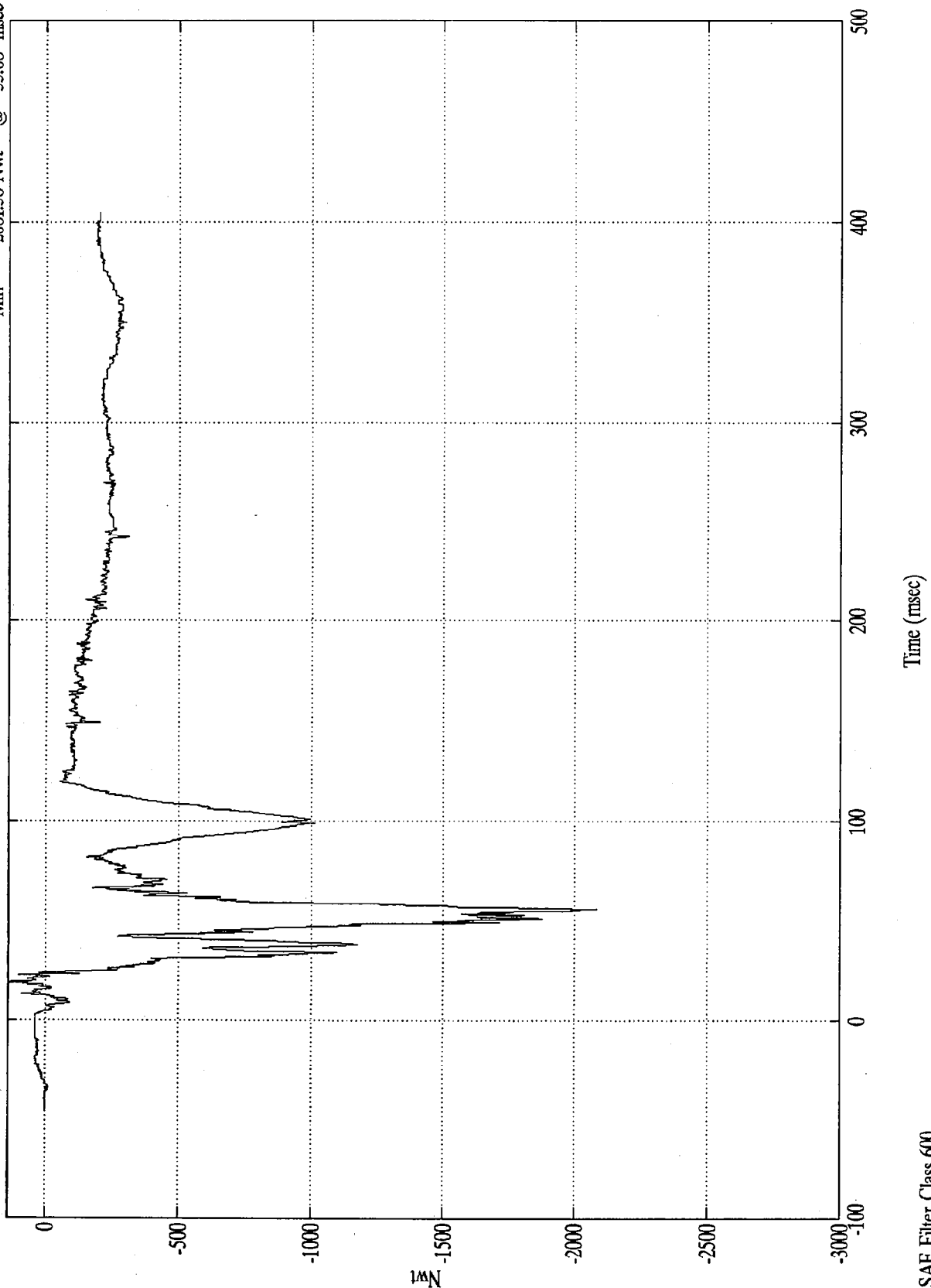


SAE Filter Class 600

NCAP TEST #14 - 1997 VOLVO 960

P1 Rt Lower Tibia Fz

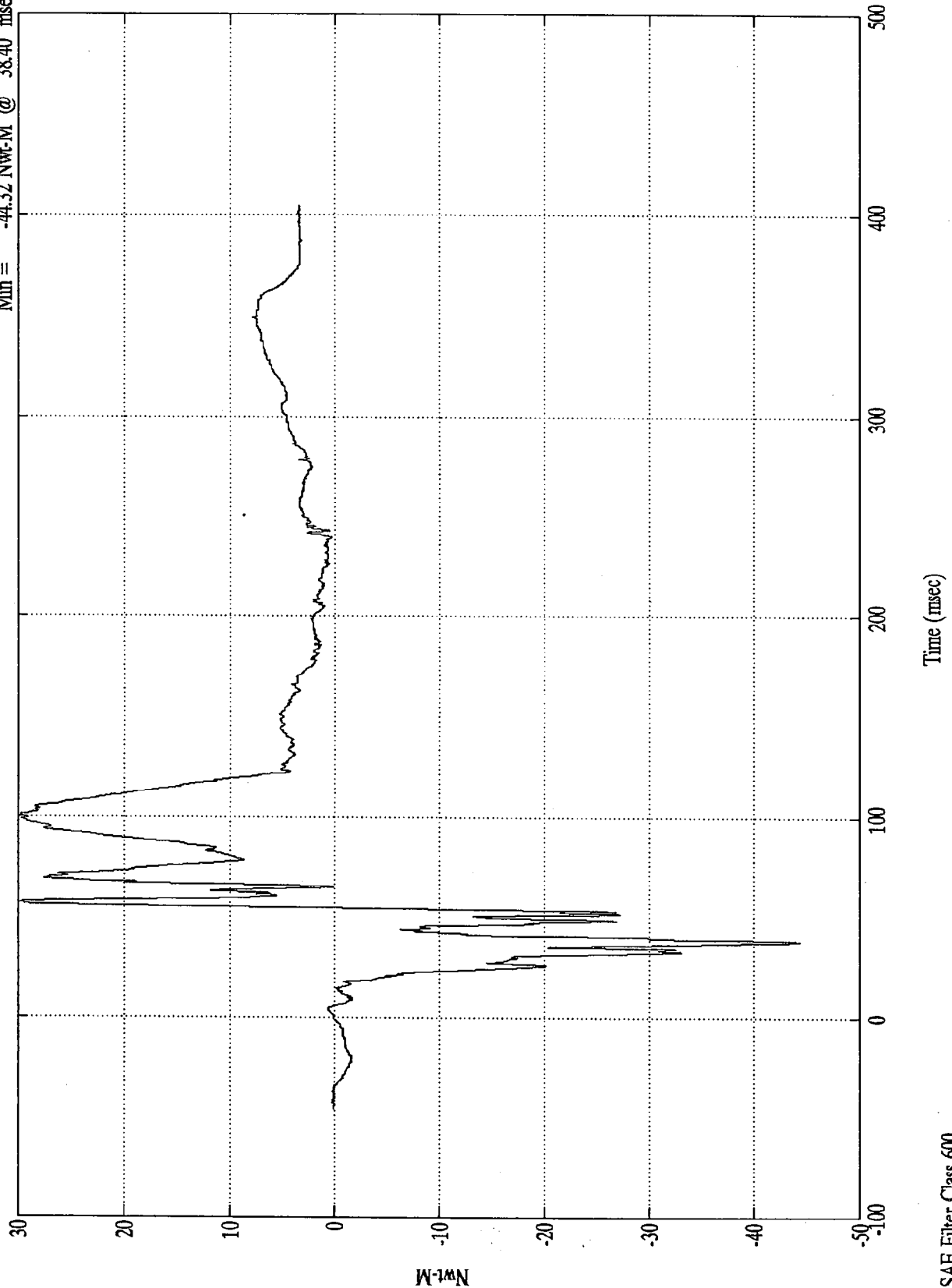
Max = 133.34 Nwt @ 19.19 msec
Min = -2081.58 Nwt @ 55.68 msec



NCAP TEST #14 - 1997 VOLVO 960

P1 Rt Lower Tibia My

Max = 29.85 Nwt-M @ 100.91 msec
Min = -44.32 Nwt-M @ 38.40 msec

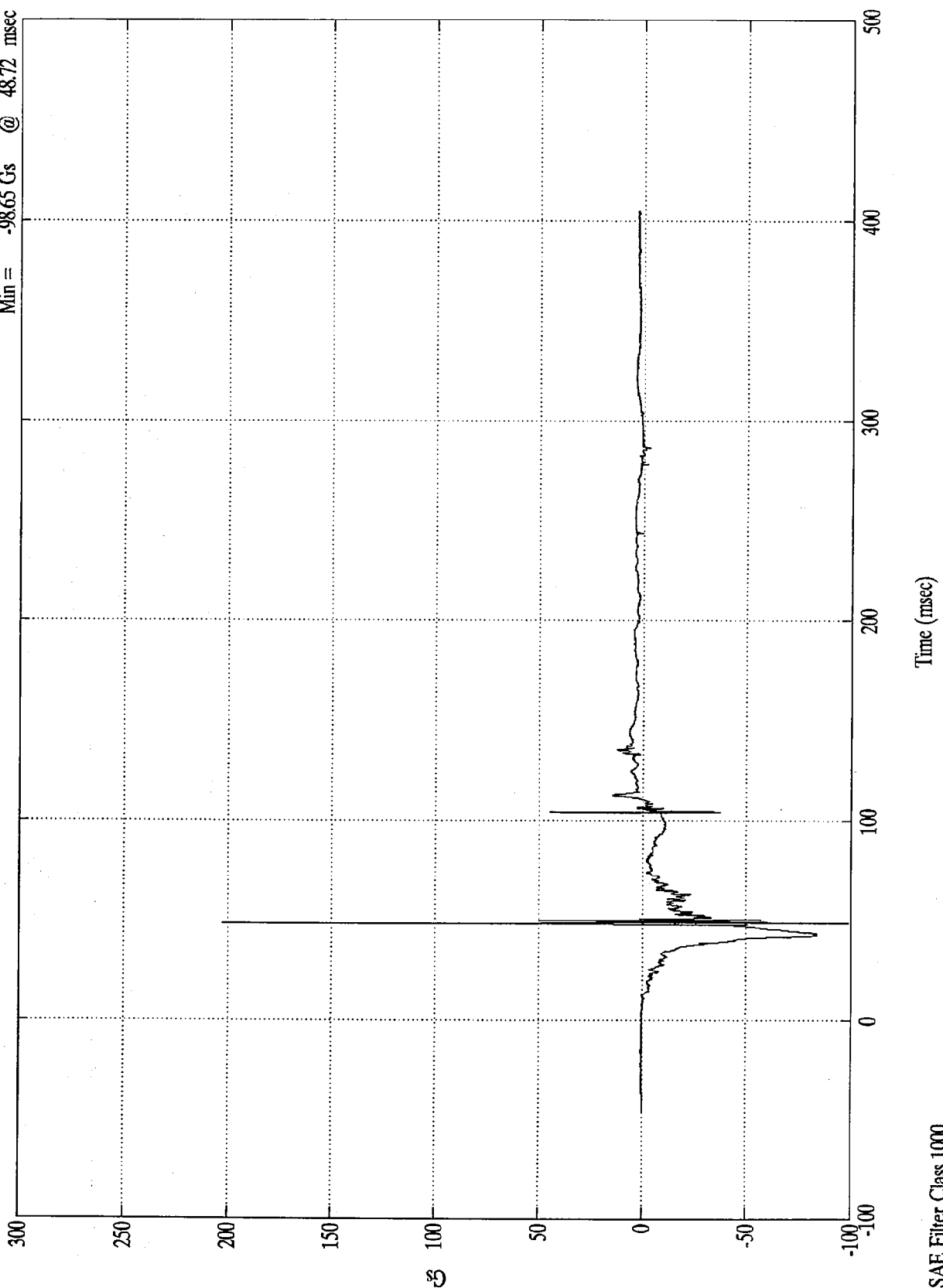


SAE Filter Class 600

NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Left Foot Z

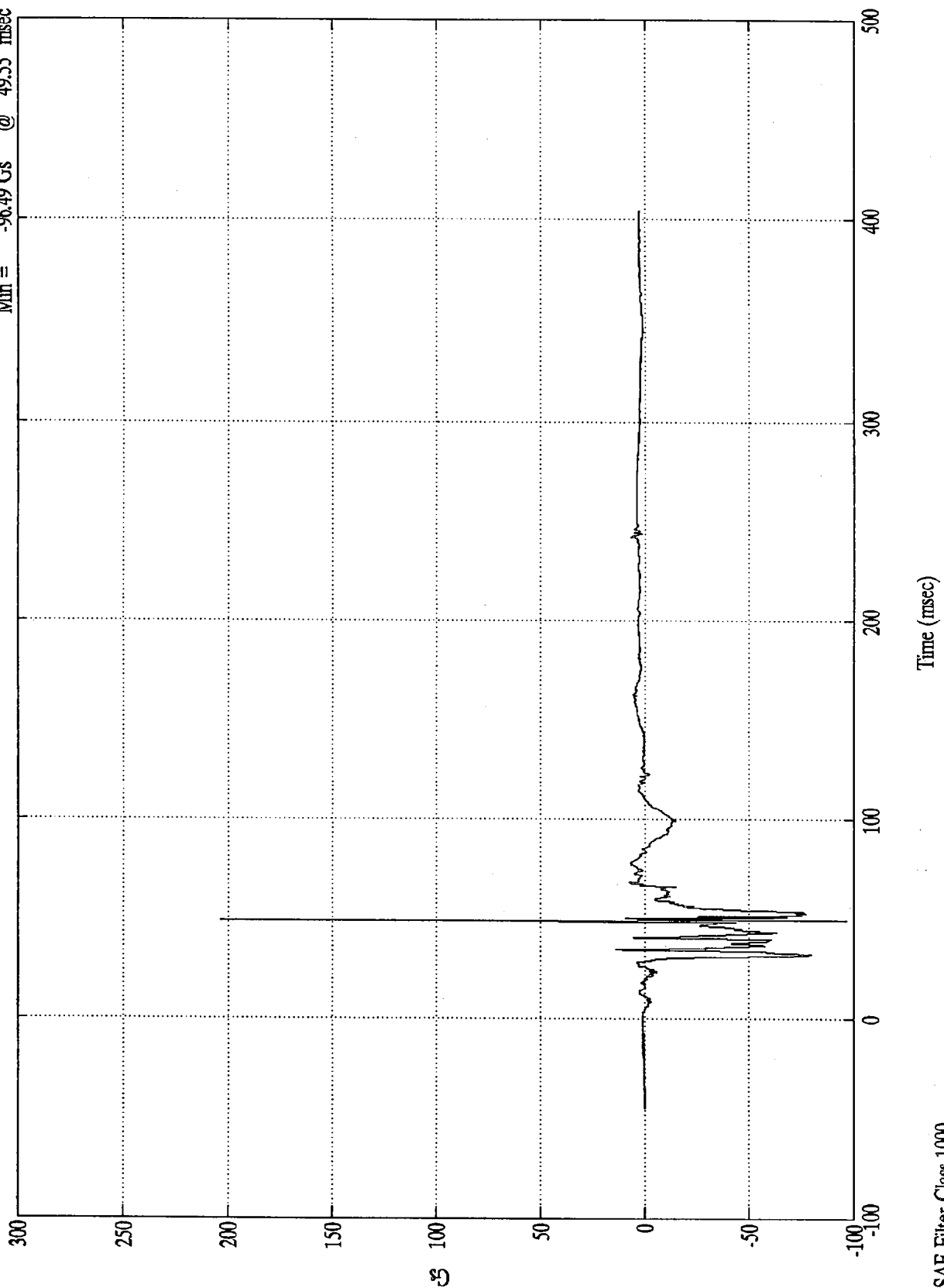
Max = 202.56 Gs @ 48.24 msec
Min = -98.65 Gs @ 48.72 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Right Foot Z

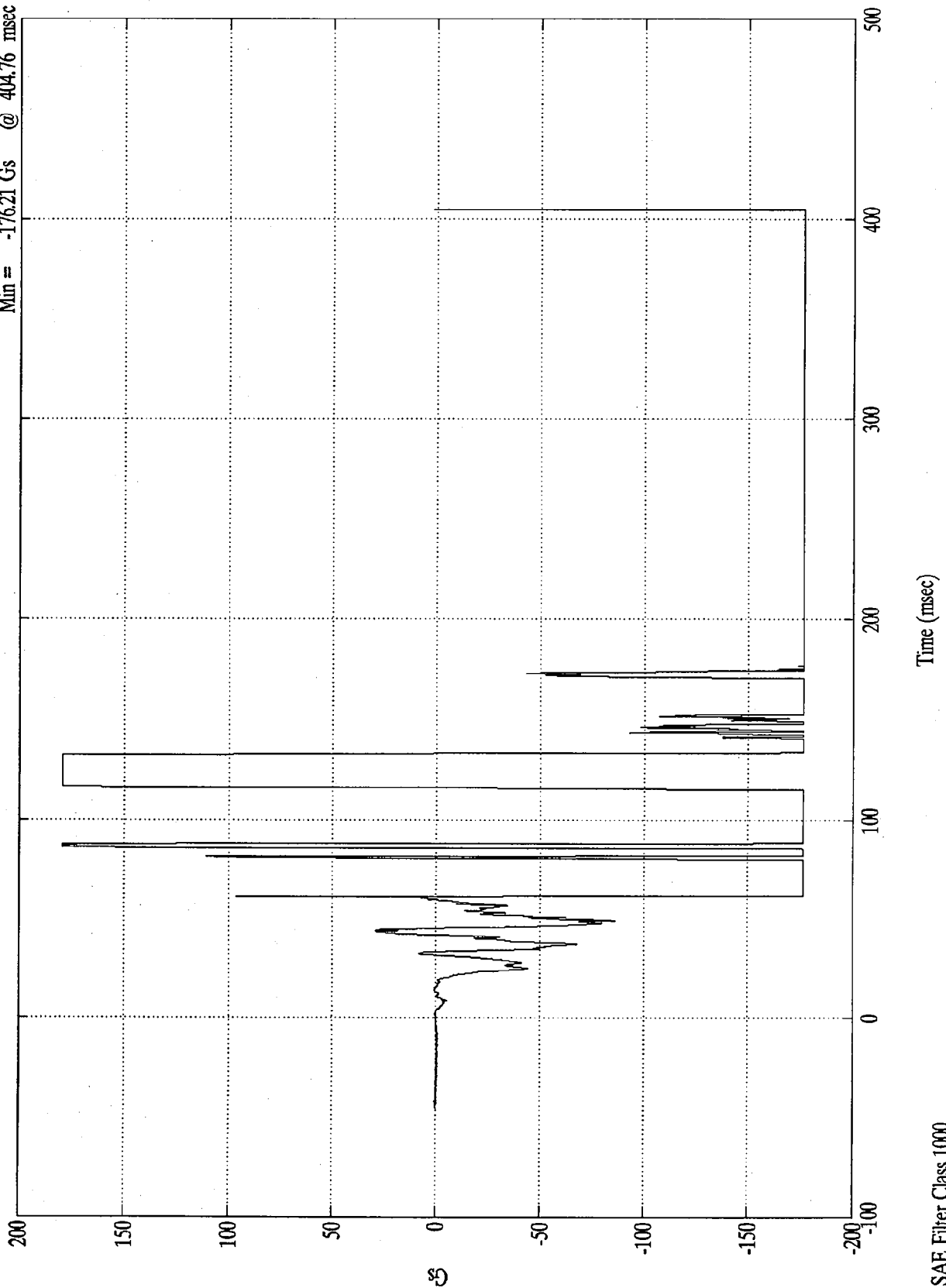
Max = 203.37 Gs @ 49.07 msec
Min = -96.49 Gs @ 49.55 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Right Foot X

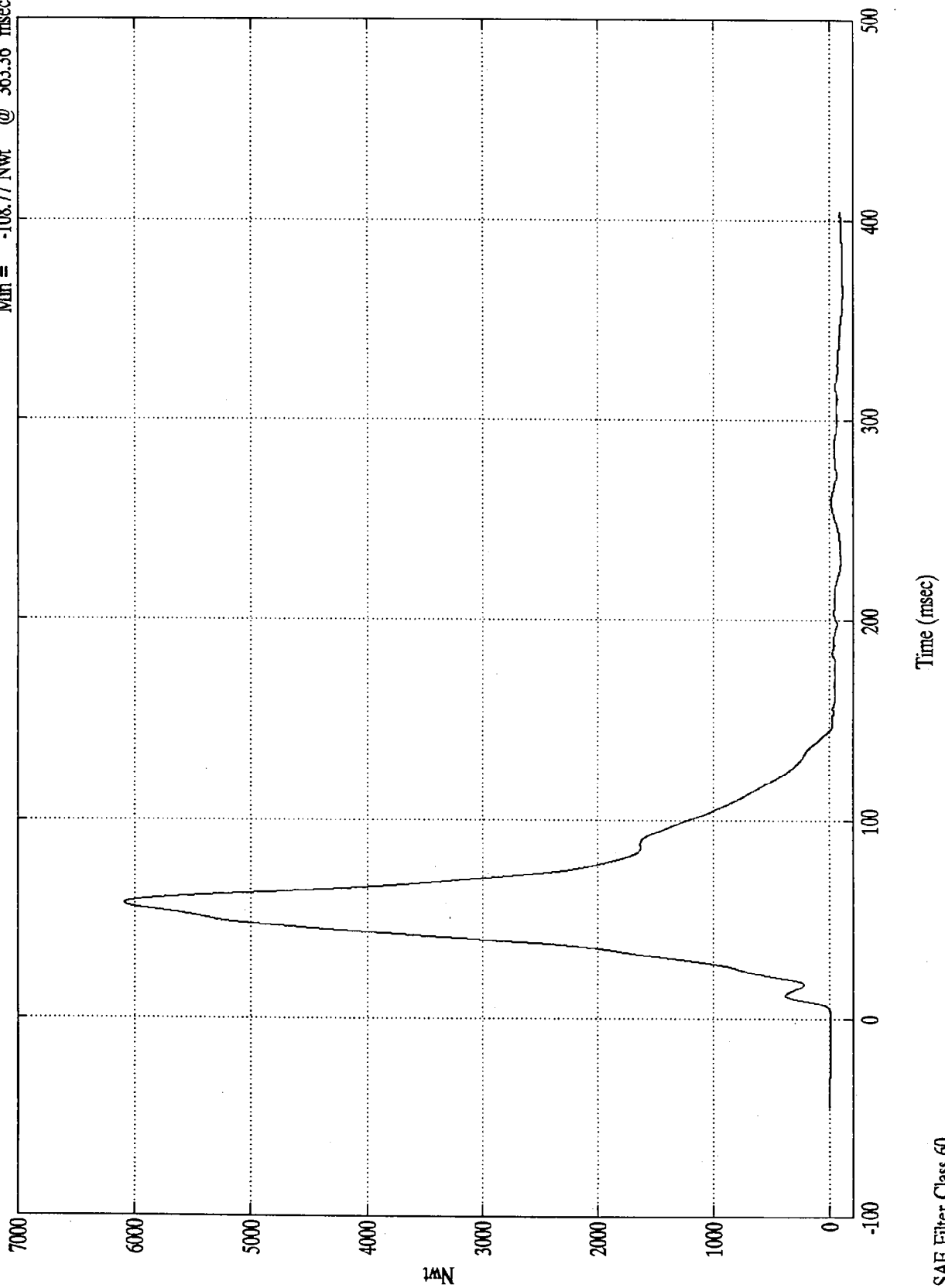
Max = 179.38 Gs @ 132.36 msec
Min = -176.21 Gs @ 404.76 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Left Belt Load

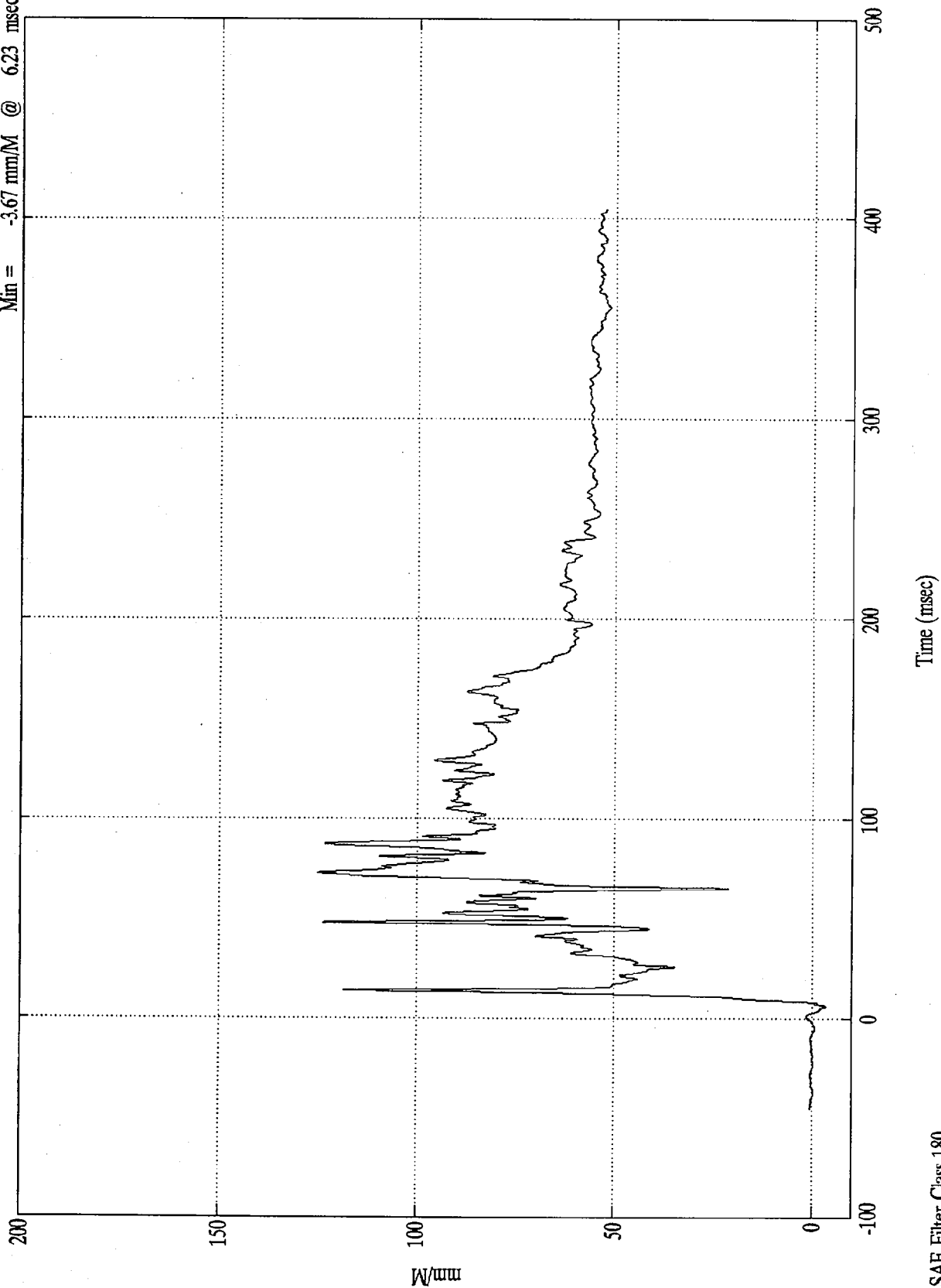
Max = 6090.89 Nwt @ 57.72 msec
Min = -108.77 Nwt @ 363.36 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 1 Belt Elongation

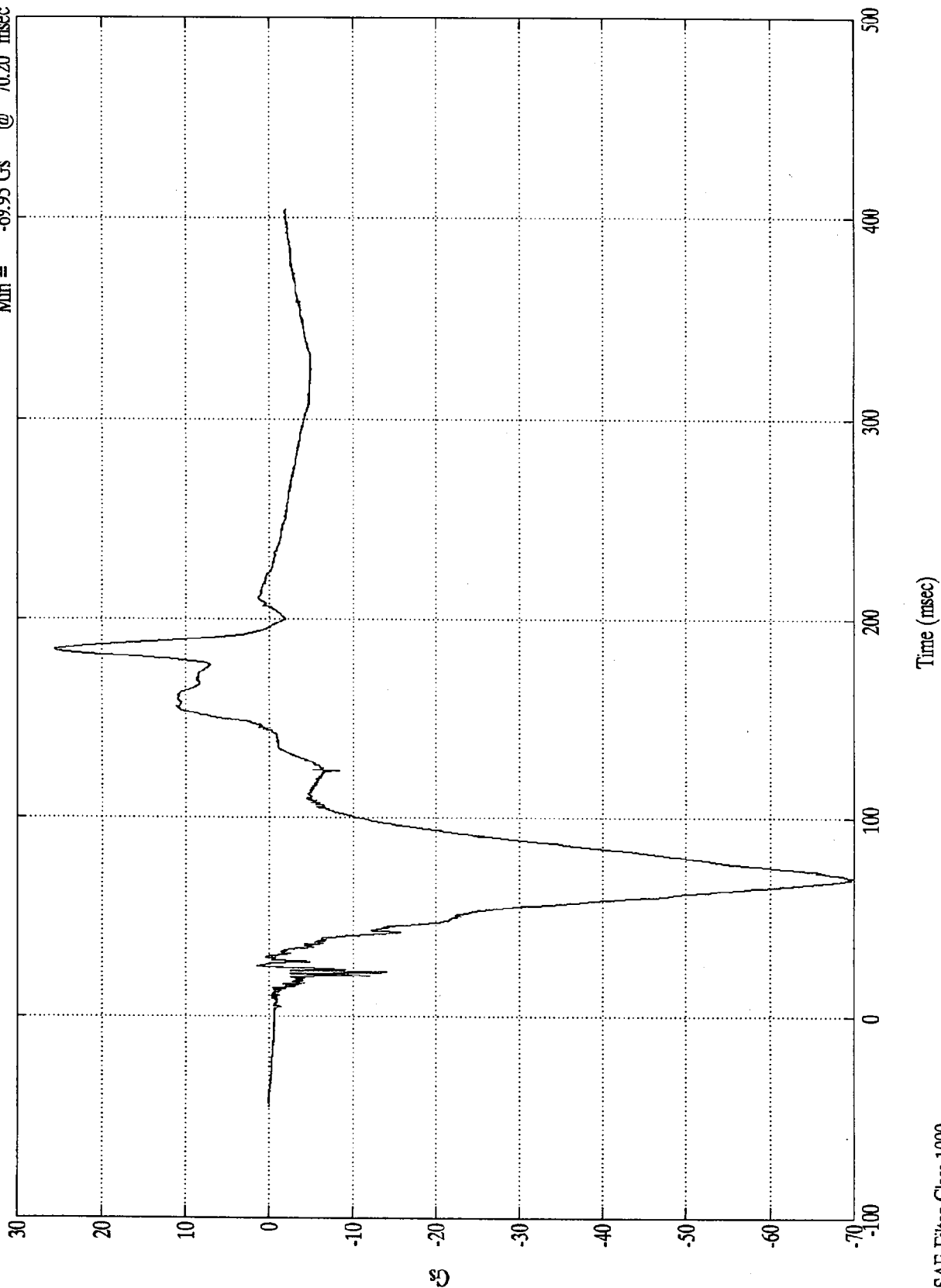
Max = 125.05 mm/M @ 73.20 msec
Min = -3.67 mm/M @ 6.23 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Head X

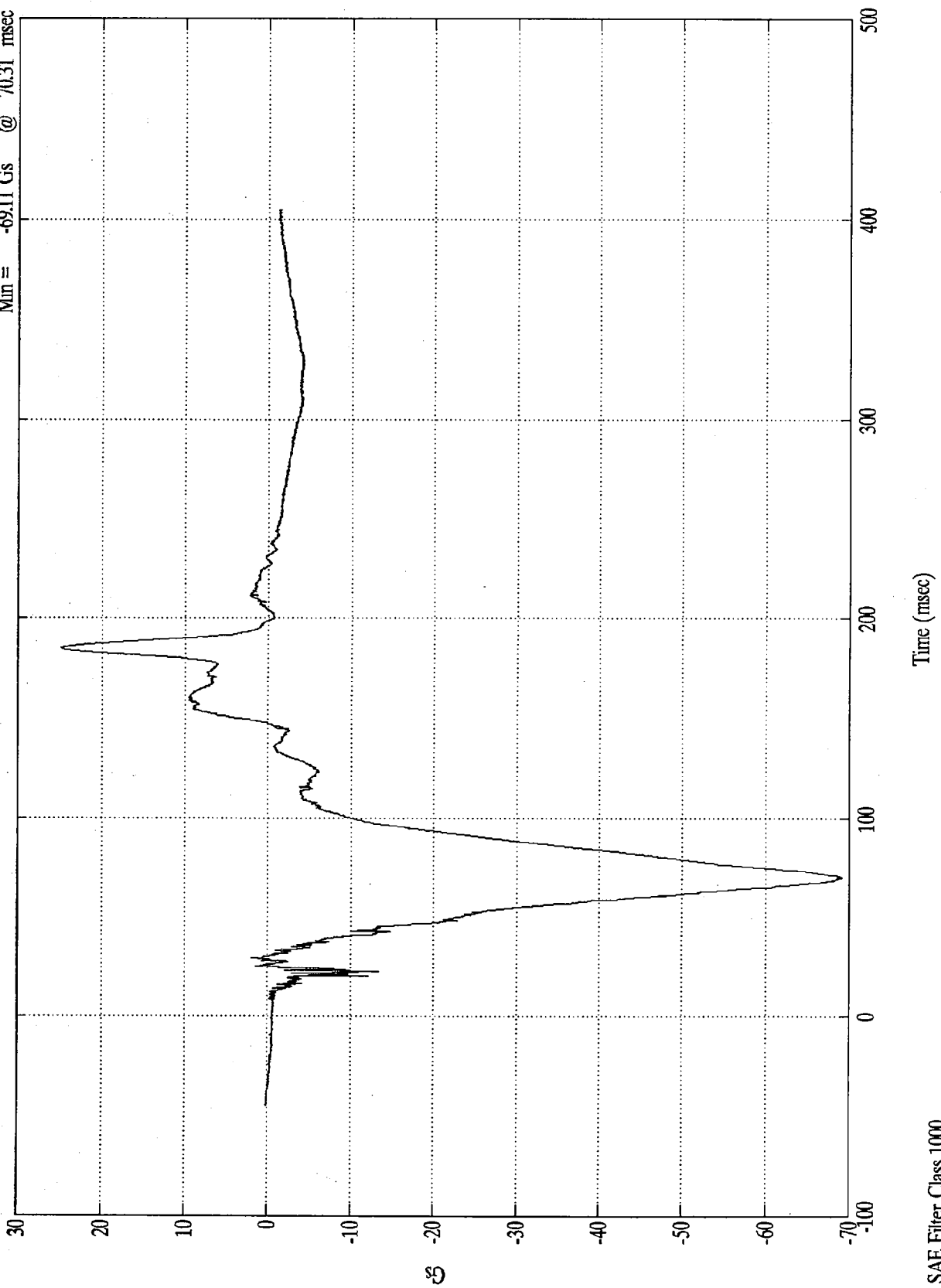
Max = 25.57 Gs @ 184.91 msec
Min = -69.95 Gs @ 70.20 msec



NCAP TEST #14 - 1997 VOLVO 960

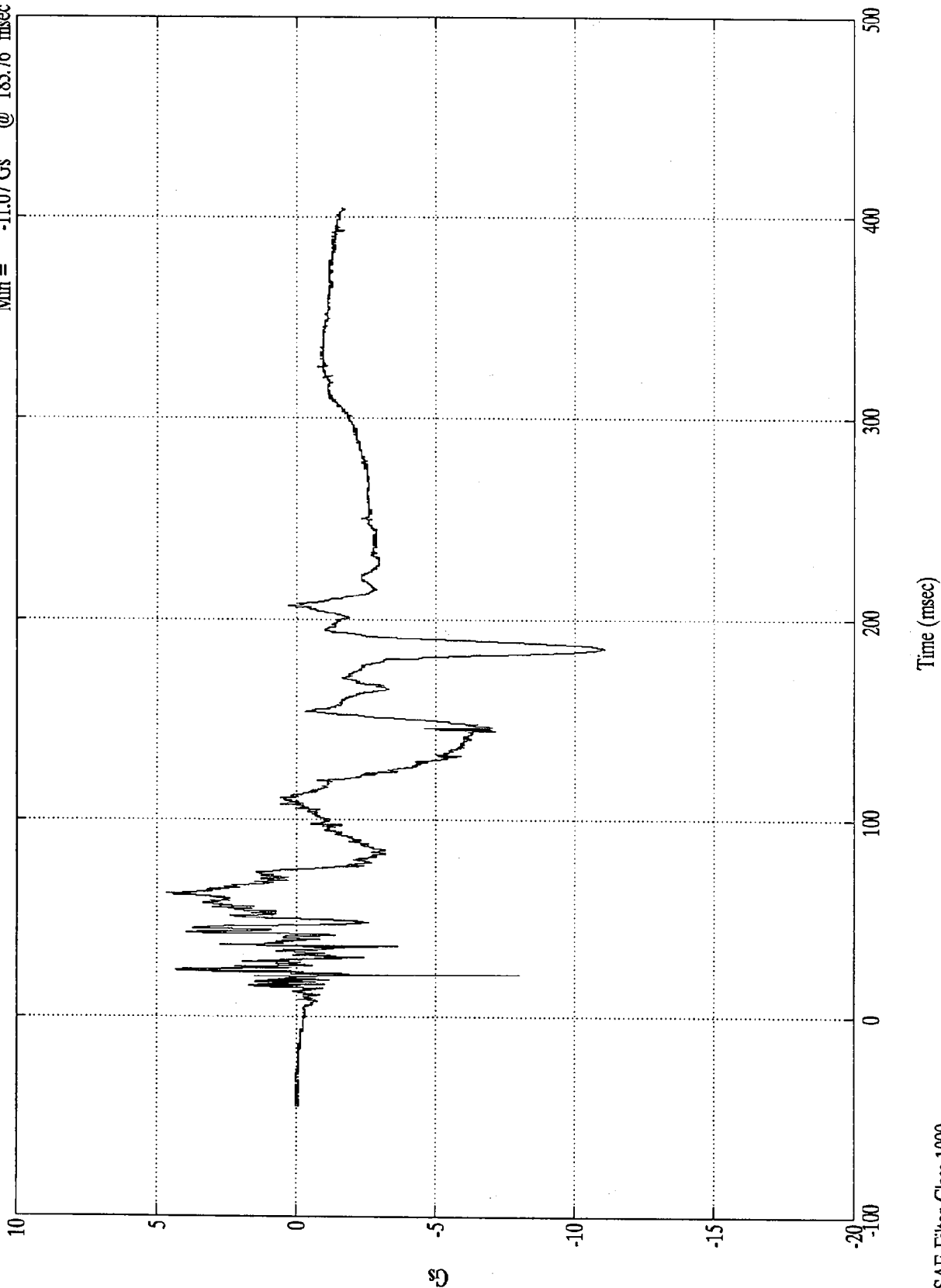
Pos. 2 Head X(R)

Max = 24.82 Gs @ 185.04 msec
Min = -69.11 Gs @ 70.31 msec



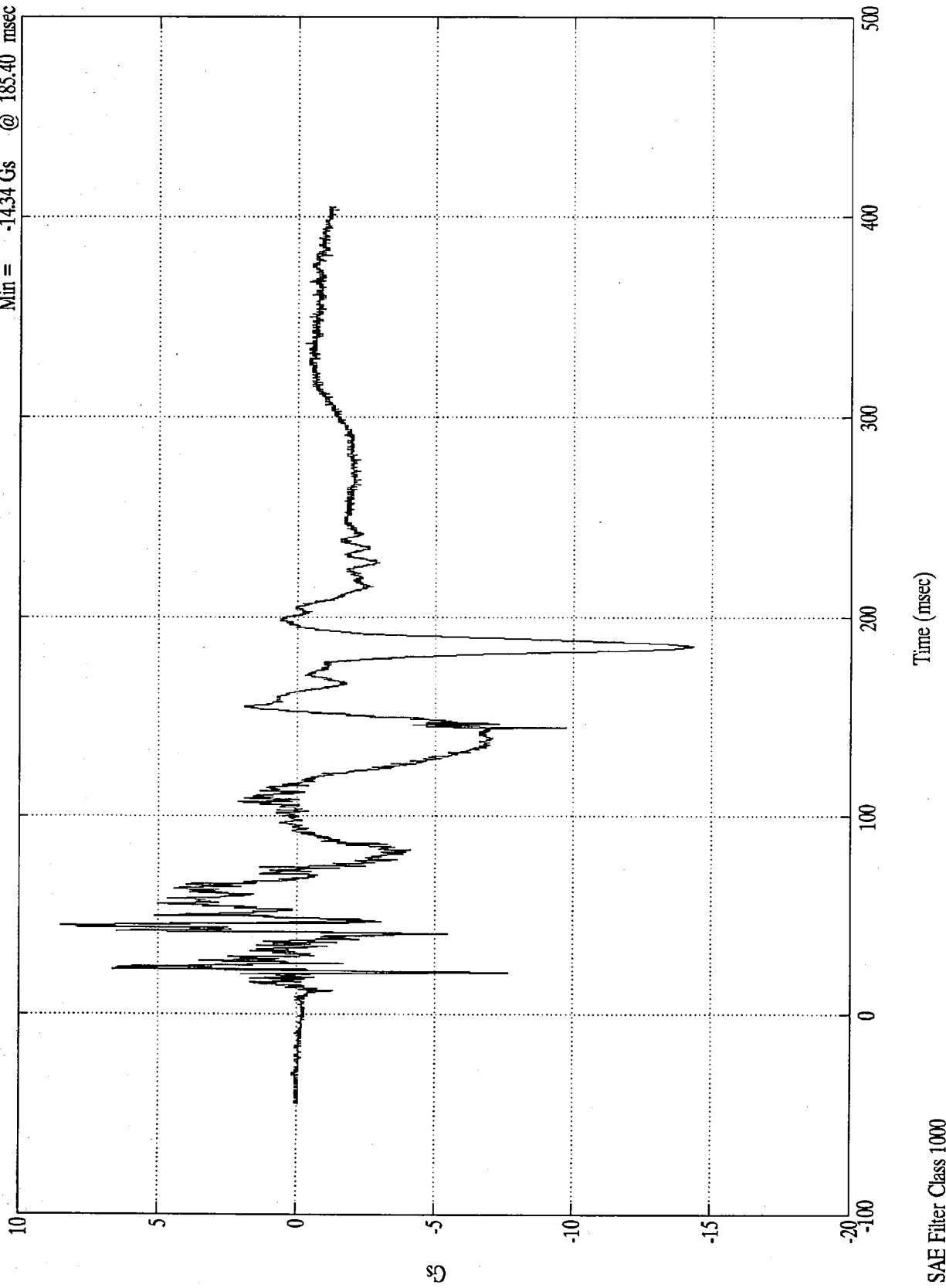
Pos. 2 Head Y

Max = 4.67 Gs @ 62.15 msec
Min = -11.07 Gs @ 185.76 msec



Pos. 2 Head Y(R)

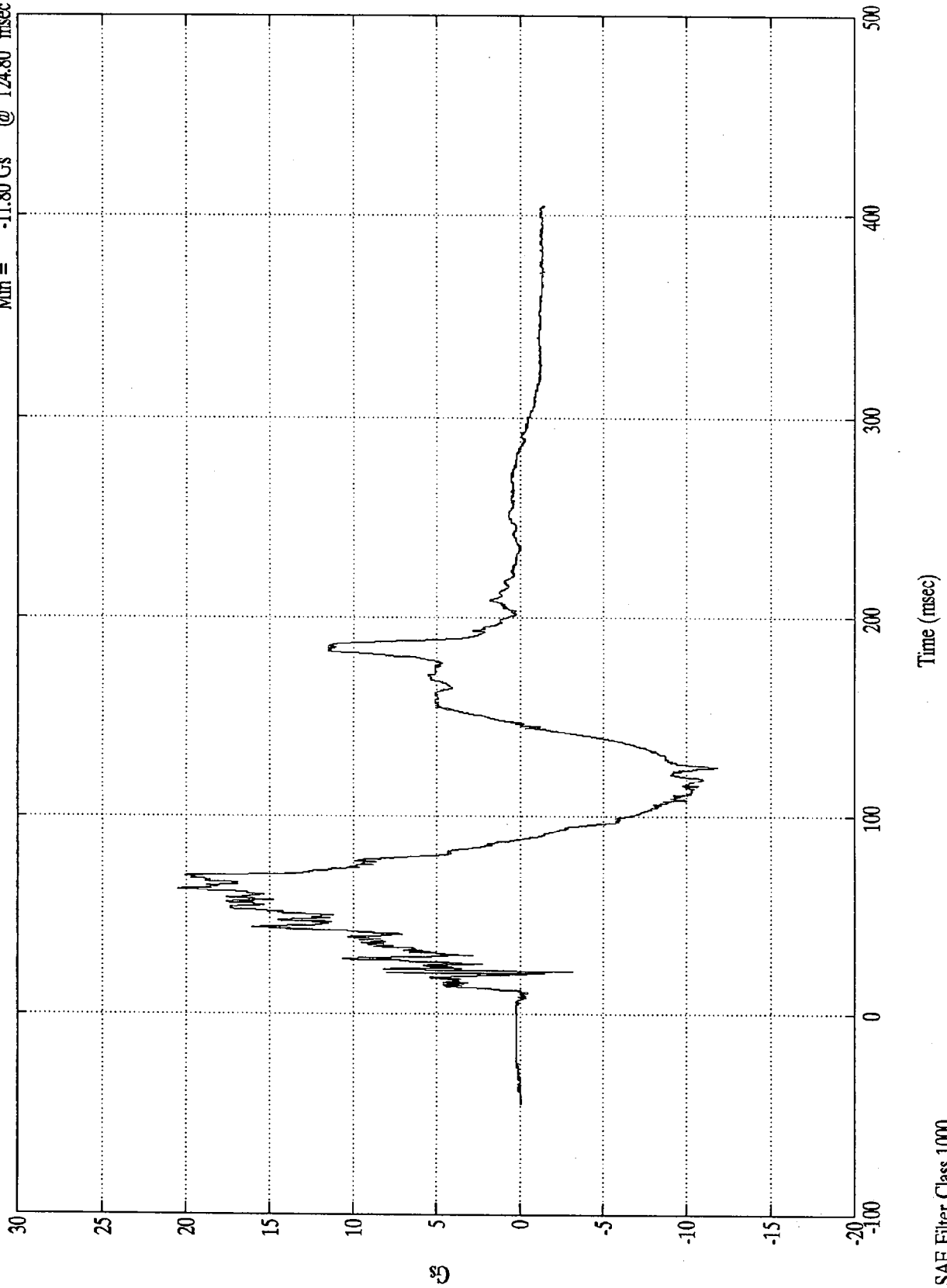
Max = 8.48 Gs @ 45.24 msec
Min = -14.34 Gs @ 185.40 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Head Z

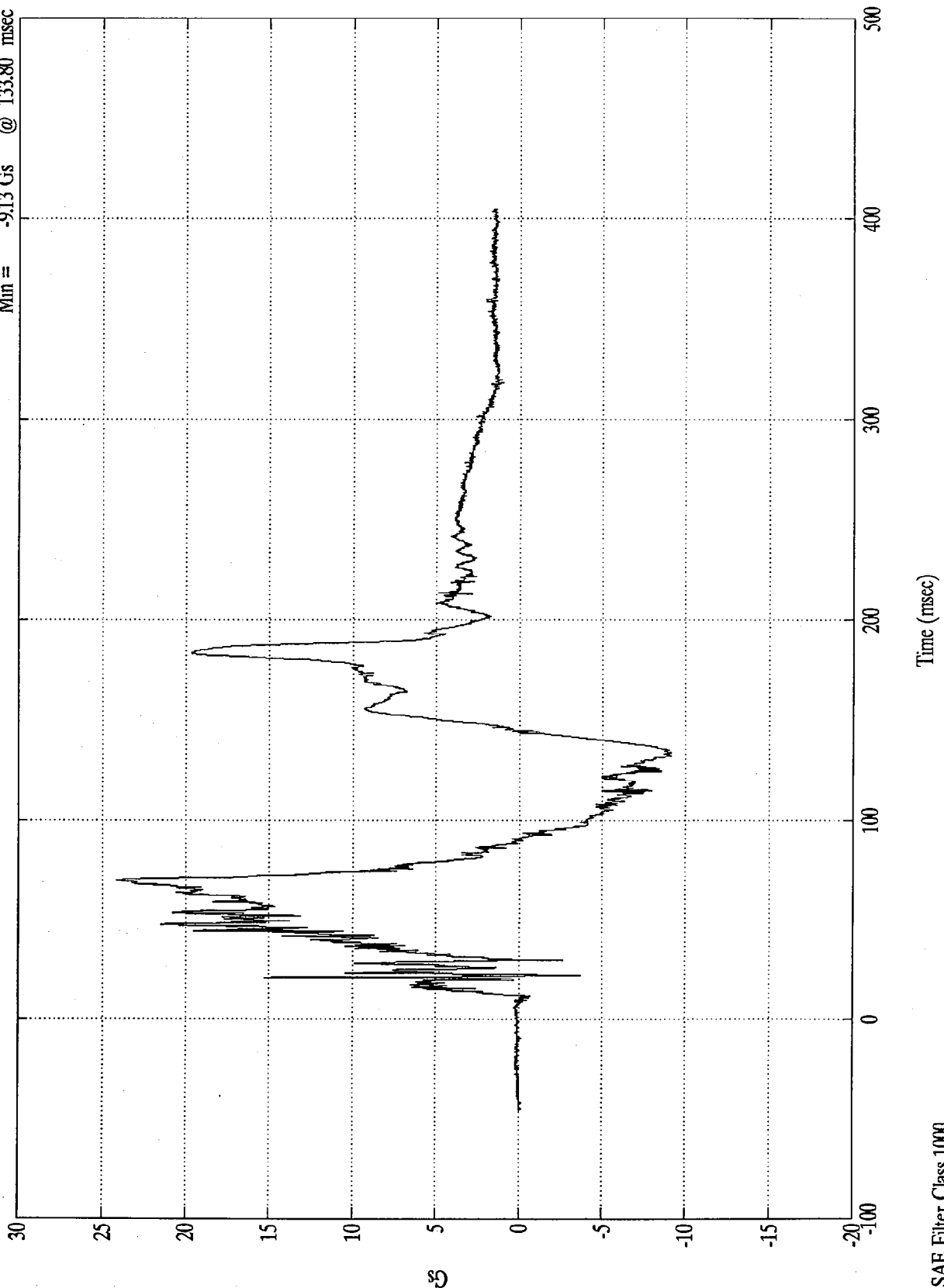
Max = 20.52 Gs @ 63.00 msec
Min = -11.80 Gs @ 124.80 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Head Z(R)

Max = 24.14 Gs @ 69.36 msec
Min = -9.13 Gs @ 133.80 msec



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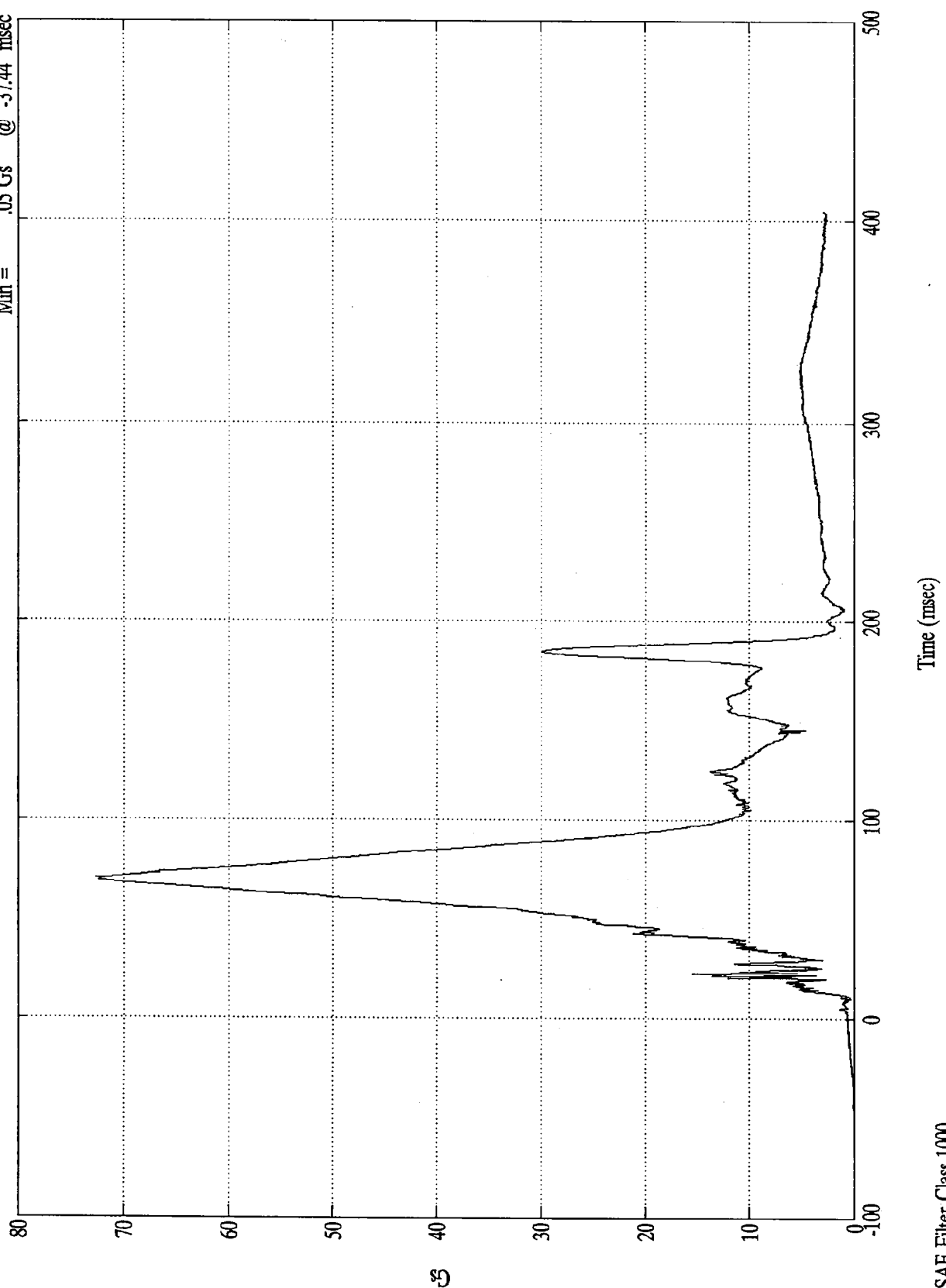
8313-14

SAE Filter Class 1000

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Head Resultant

Max = 72.64 Gs @ 70.08 msec
Min = .05 Gs @ -37.44 msec

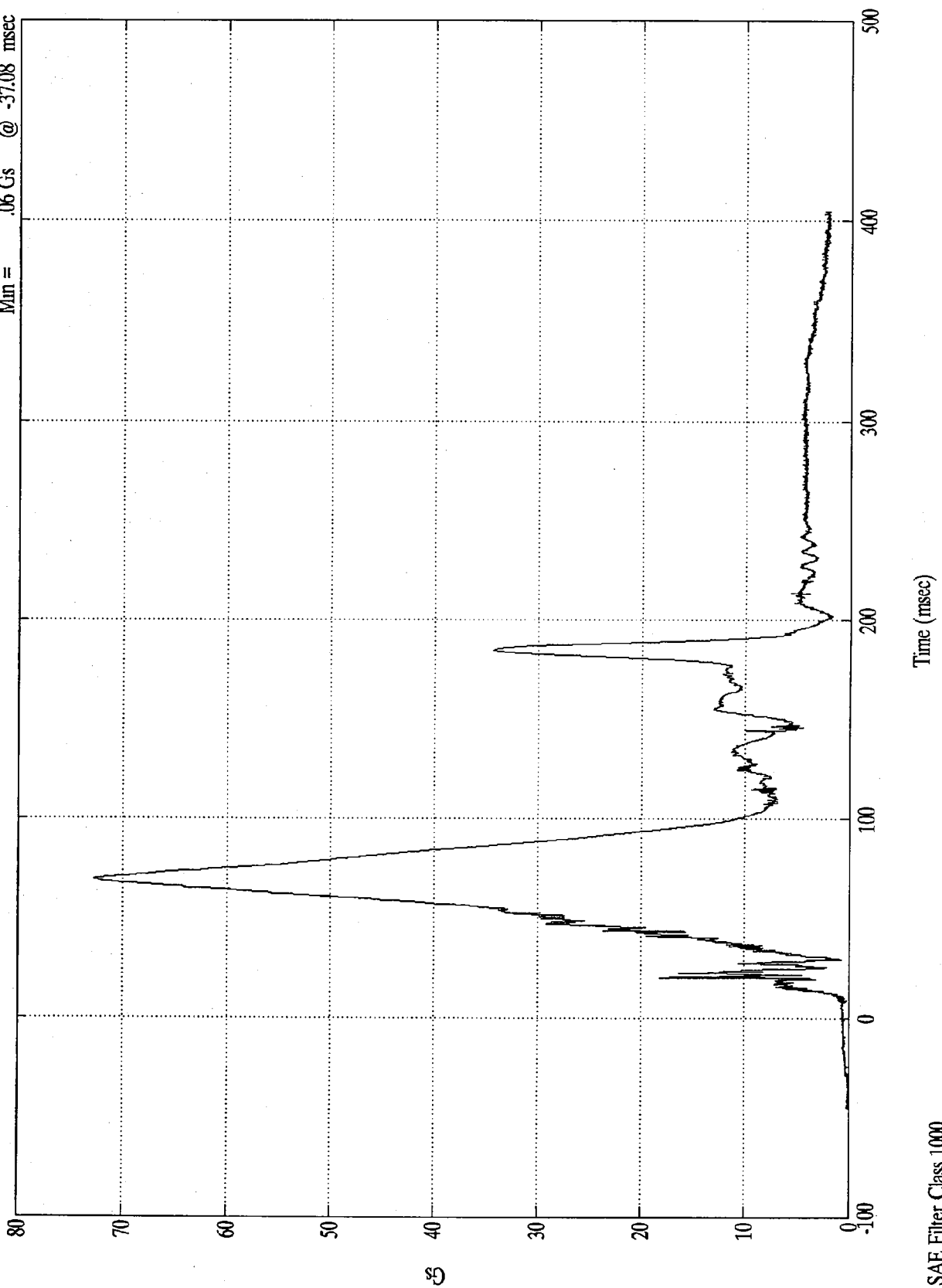


SAE Filter Class 1000

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Head Resultant(RR)

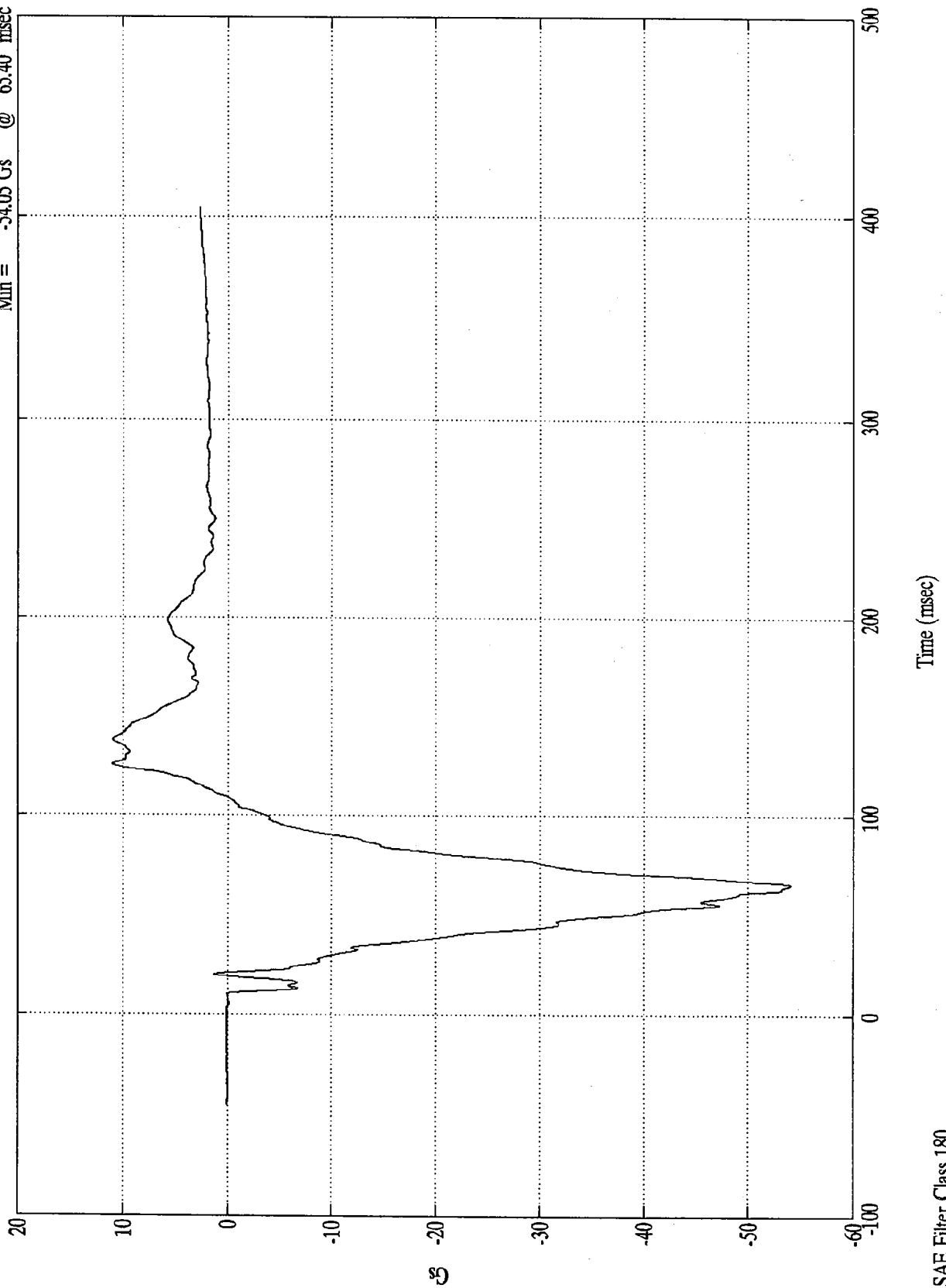
Max = 72.80 Gs @ 69.95 msec
Min = .06 Gs @ -37.08 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Chest X

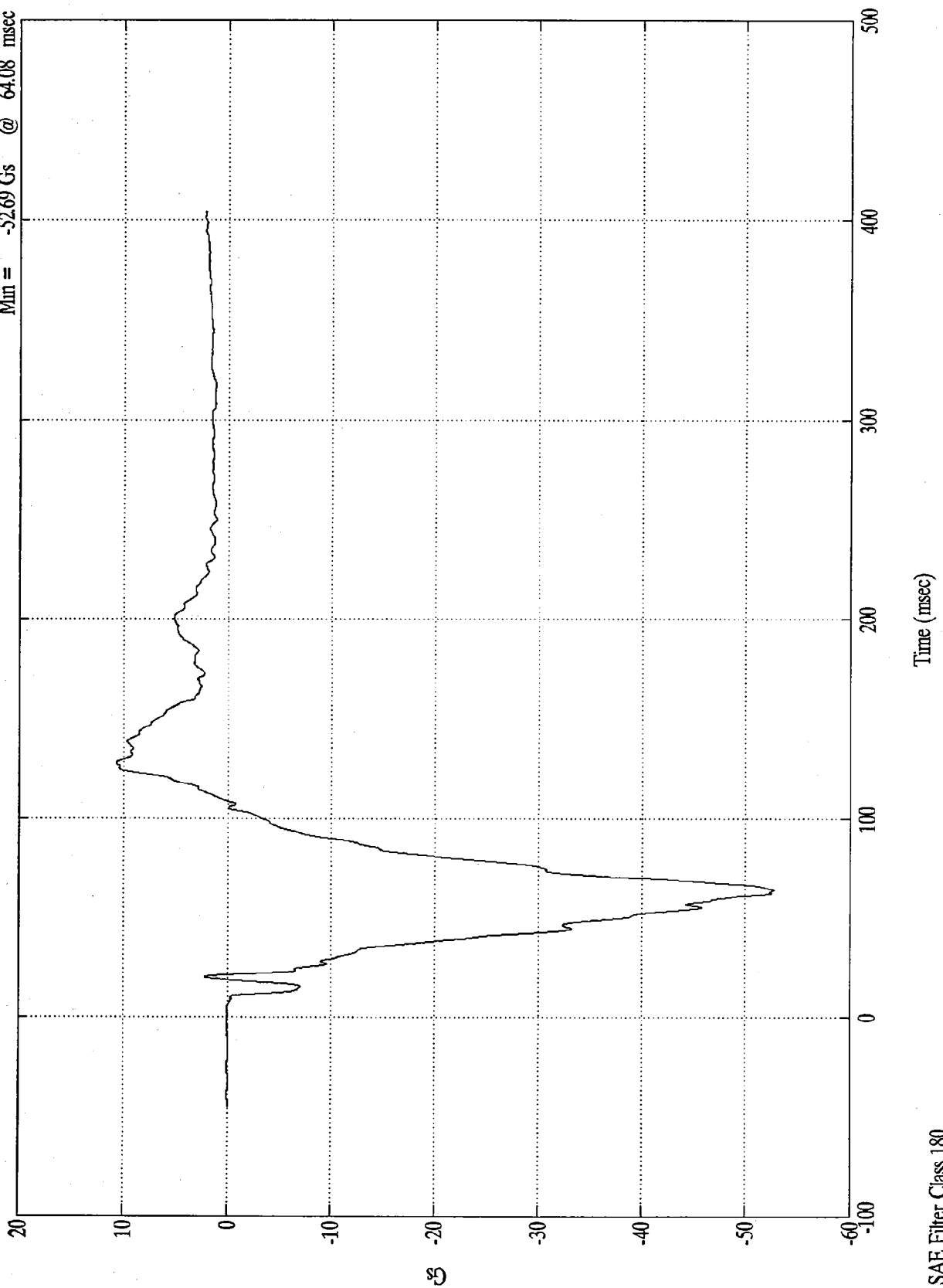
Max = 11.03 Gs @ 125.76 msec
Min = -54.05 Gs @ 65.40 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Chest X(R)

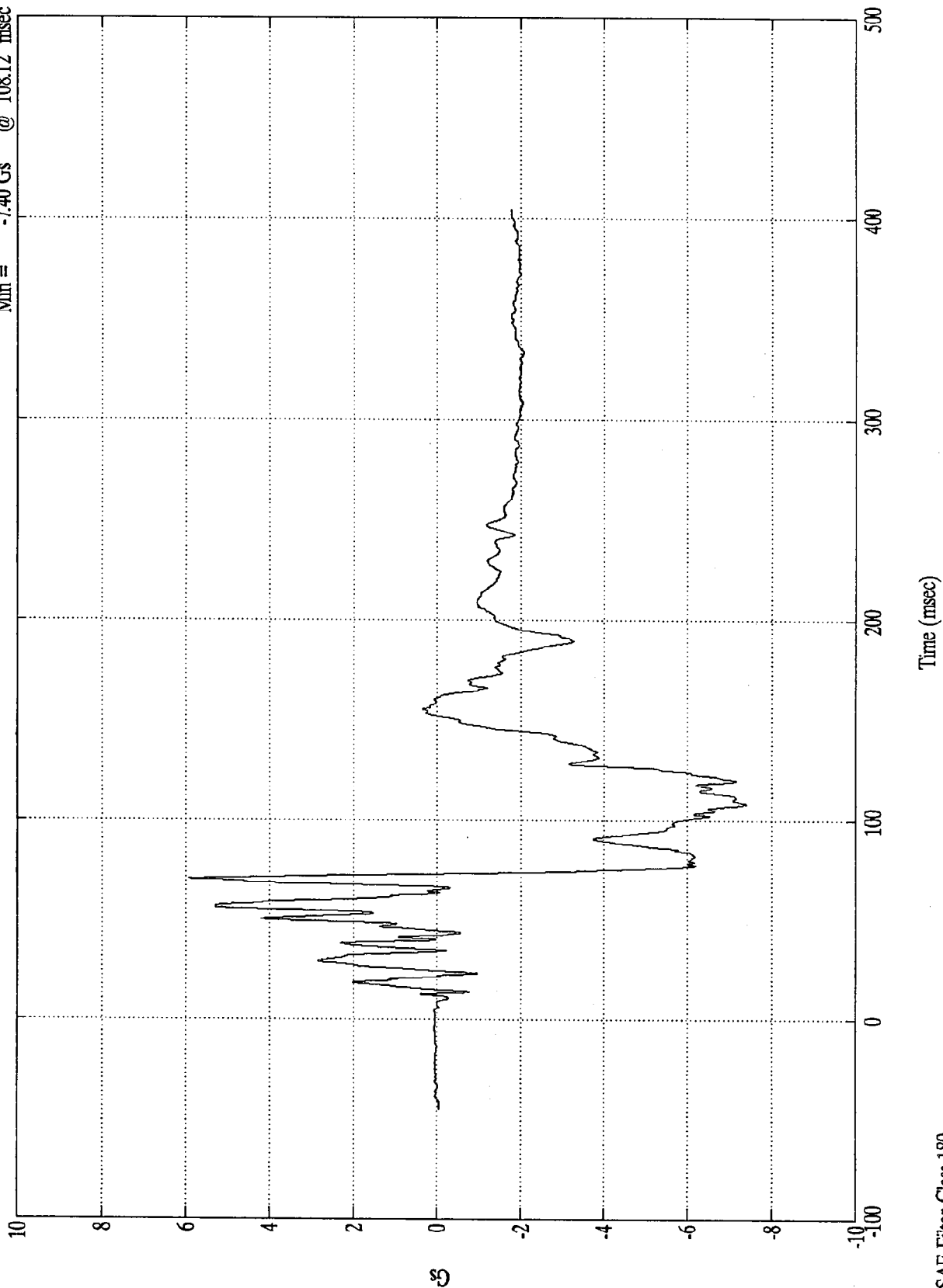
Max = 10.71 Gs @ 127.68 msec
Min = -52.69 Gs @ 64.08 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Chest Y

Max = 5.92 Gs @ 70.68 msec
Min = -7.40 Gs @ 108.12 msec



B-60

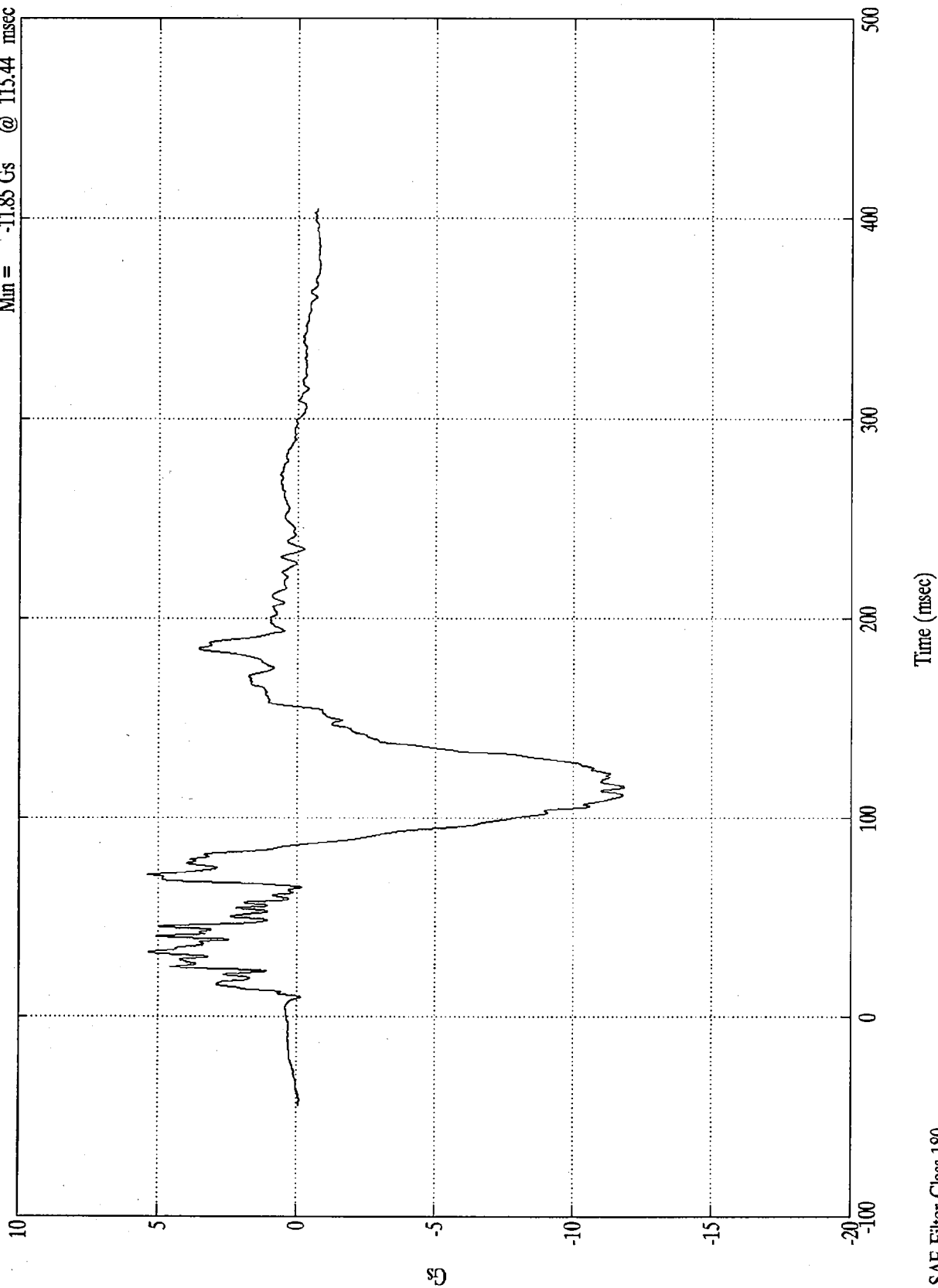
8313-14

SAE Filter Class 180

NCAP TEST #14 - 1997 VOLVO 960

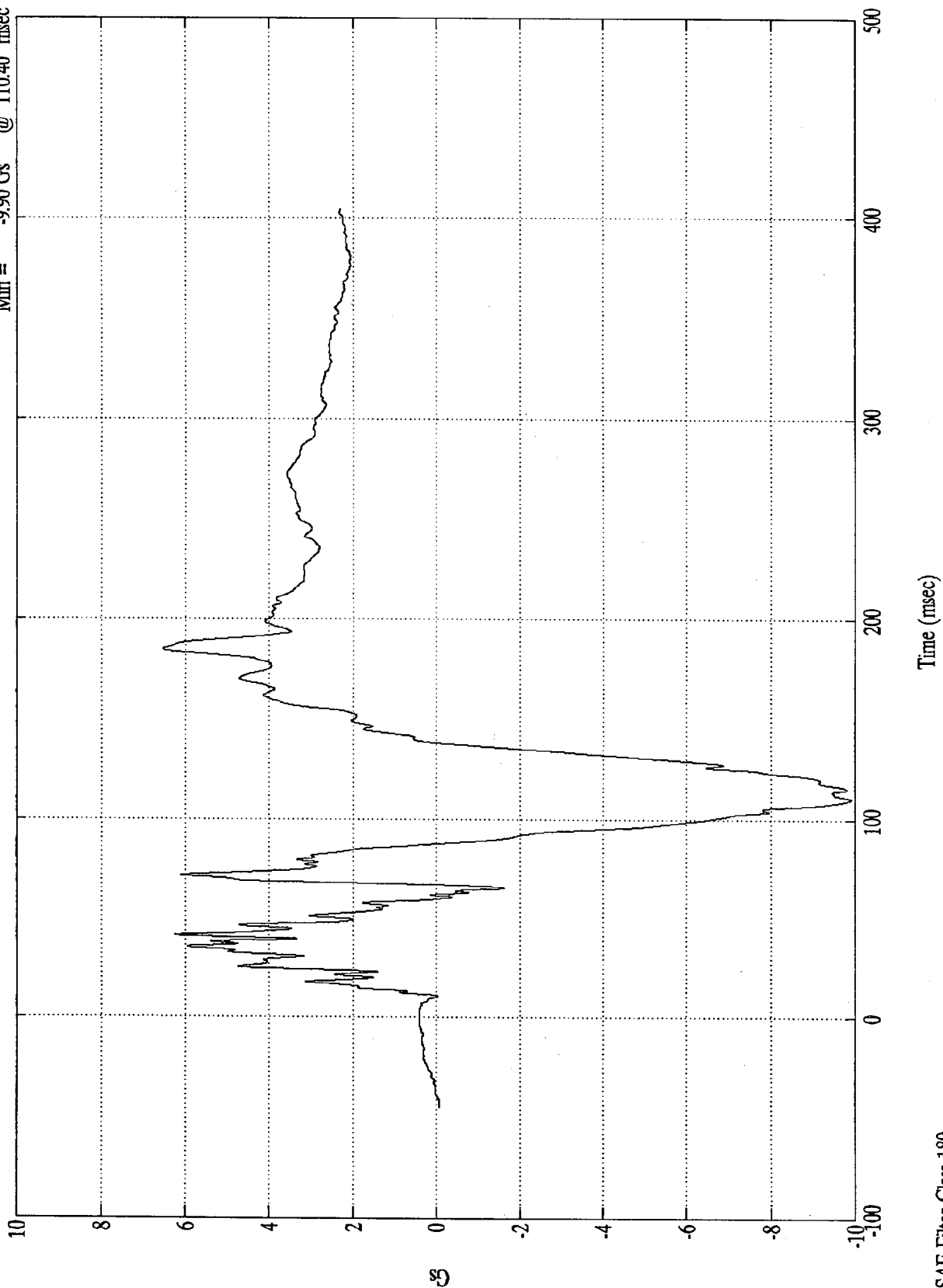
Pos. 2 Chest Y(R)

Max = 5.40 Gs @ 71.40 msec
Min = -11.85 Gs @ 115.44 msec



NCAP TEST #14 - 1997 VOLVO 960

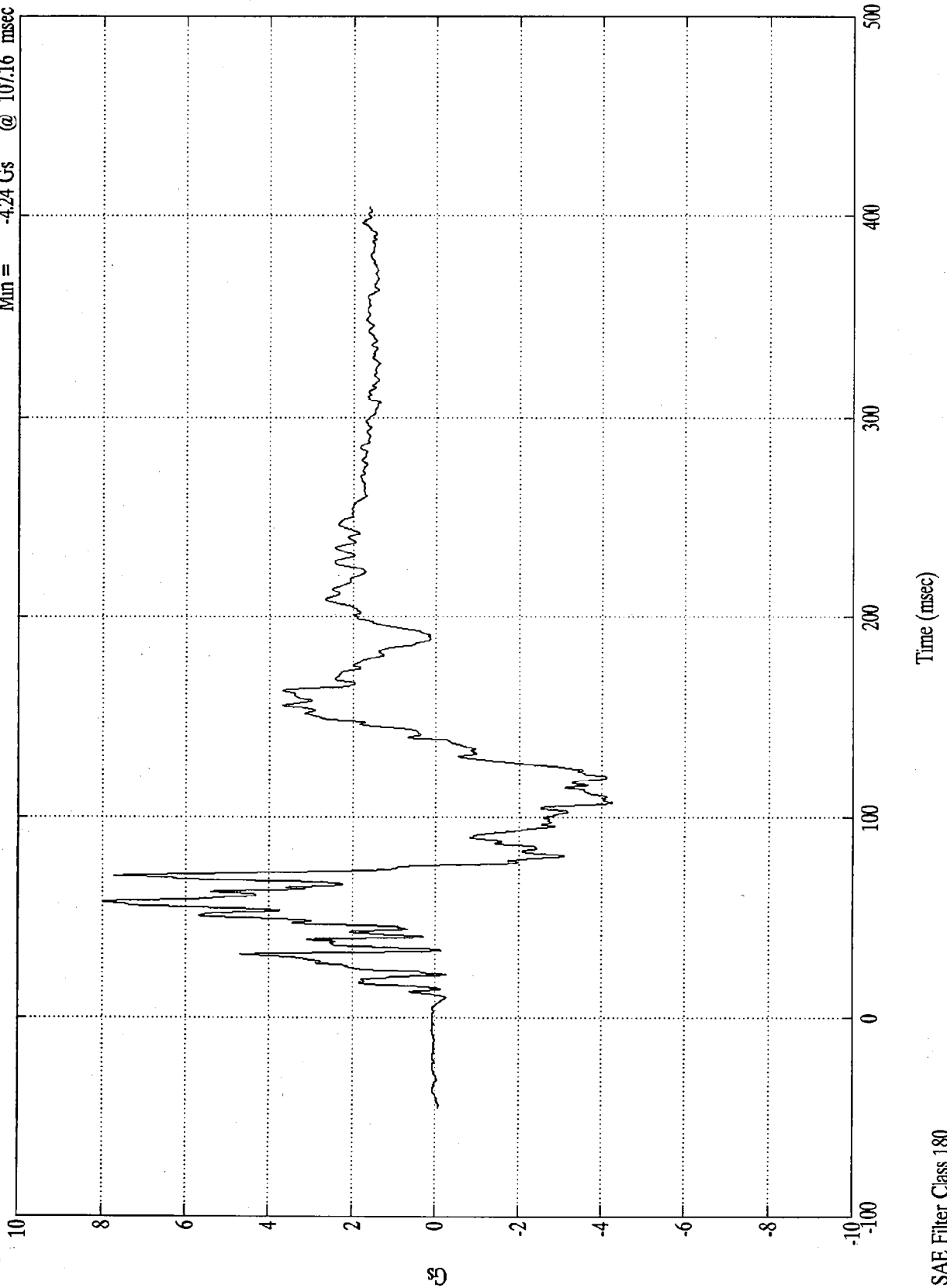
Pos. 2 Chest Z
Max = 6.54 Gs @ 185.40 msec
Min = -9.90 Gs @ 110.40 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Chest Z(R)

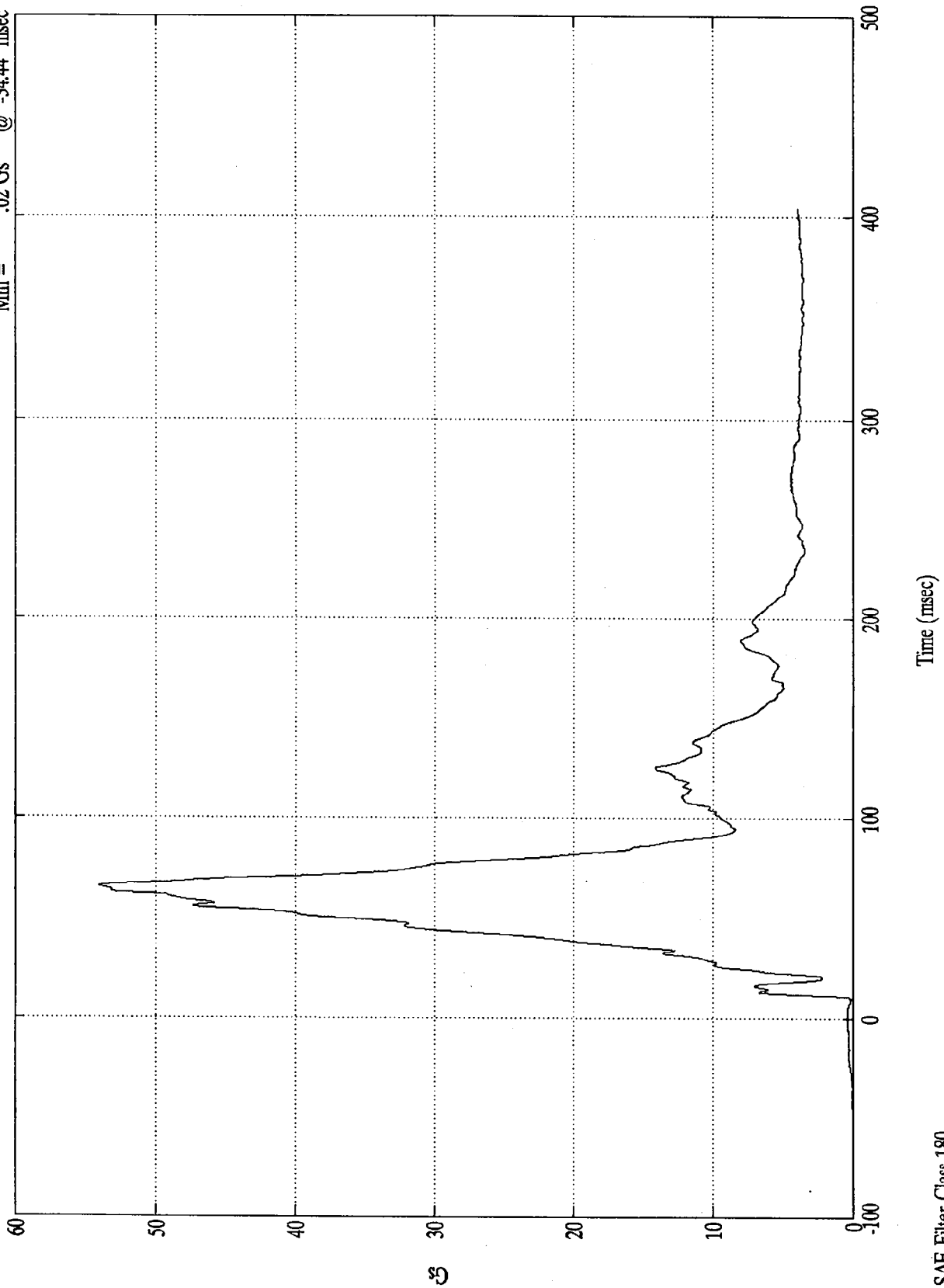
Max = 7.97 Gs @ 57.36 msec
Min = -4.24 Gs @ 107.16 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Chest Resultant

Max = 54.08 Gs @ 65.40 msec
Min = .02 Gs @ -34.44 msec

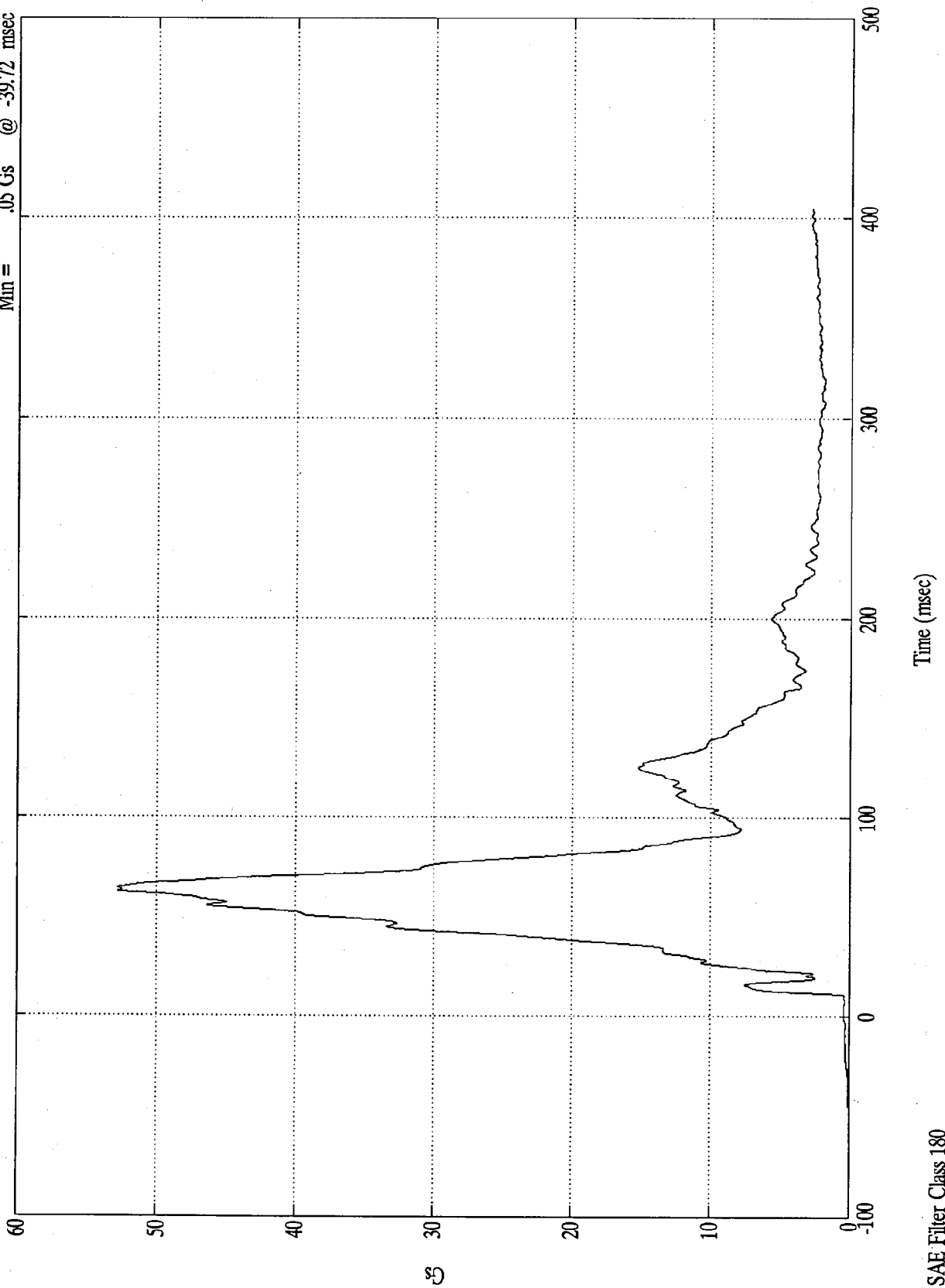


SAE Filter Class 180

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Chest Res(RR)

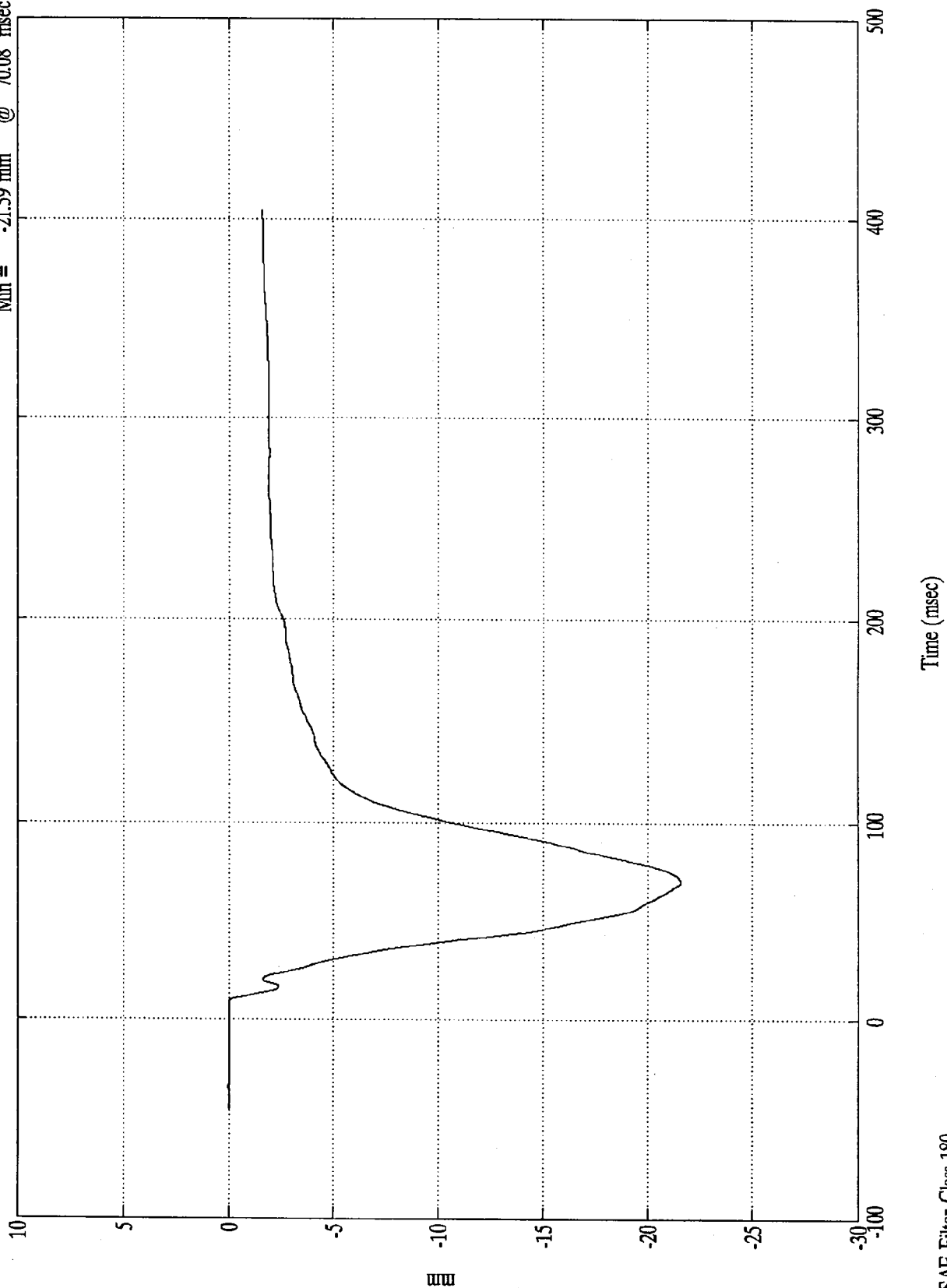
Max = 52.79 Gs @ 64.19 msec
Min = .05 Gs @ -39.72 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Chest Disp.

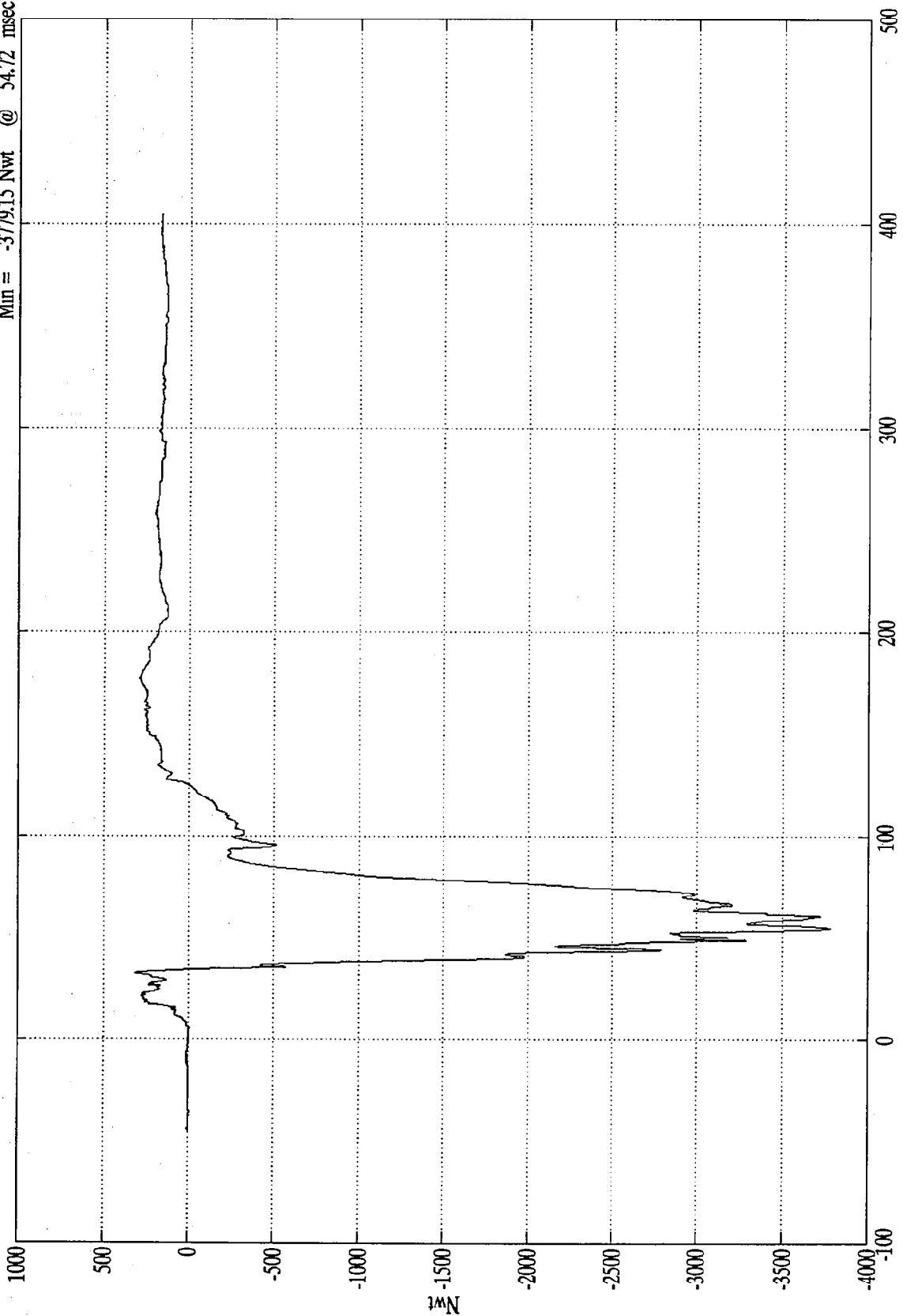
Max = .03 mm @ -34.20 msec
Min = -21.59 mm @ 70.08 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Left Femur

Max = 316.86 Nwt @ 32.63 msec
Min = -3779.15 Nwt @ 54.72 msec



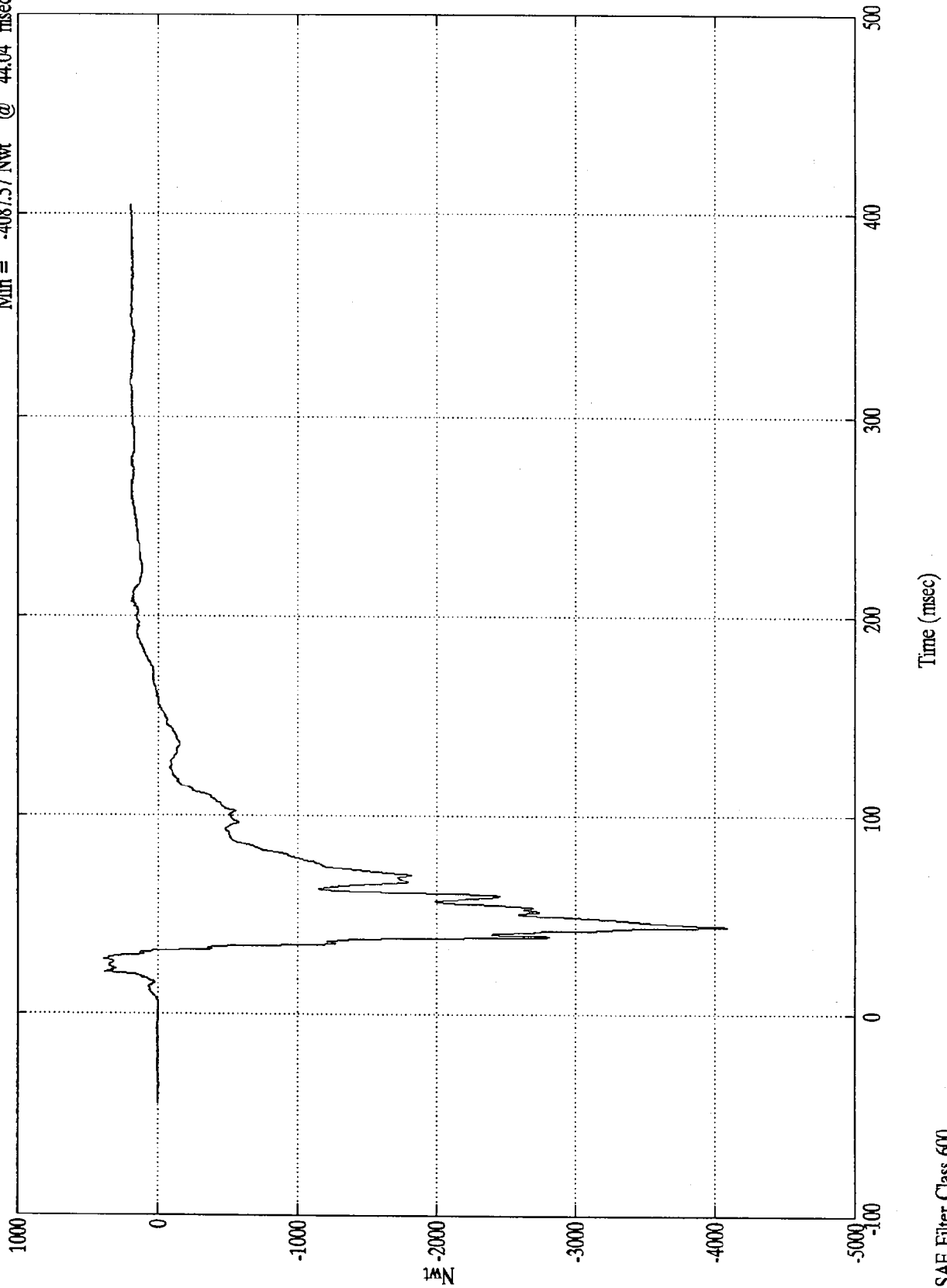
Time (msec)

SAE Filter Class 600

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Right Femur

Max = 393.14 Nwt @ 27.84 msec
Min = -4087.57 Nwt @ 44.04 msec

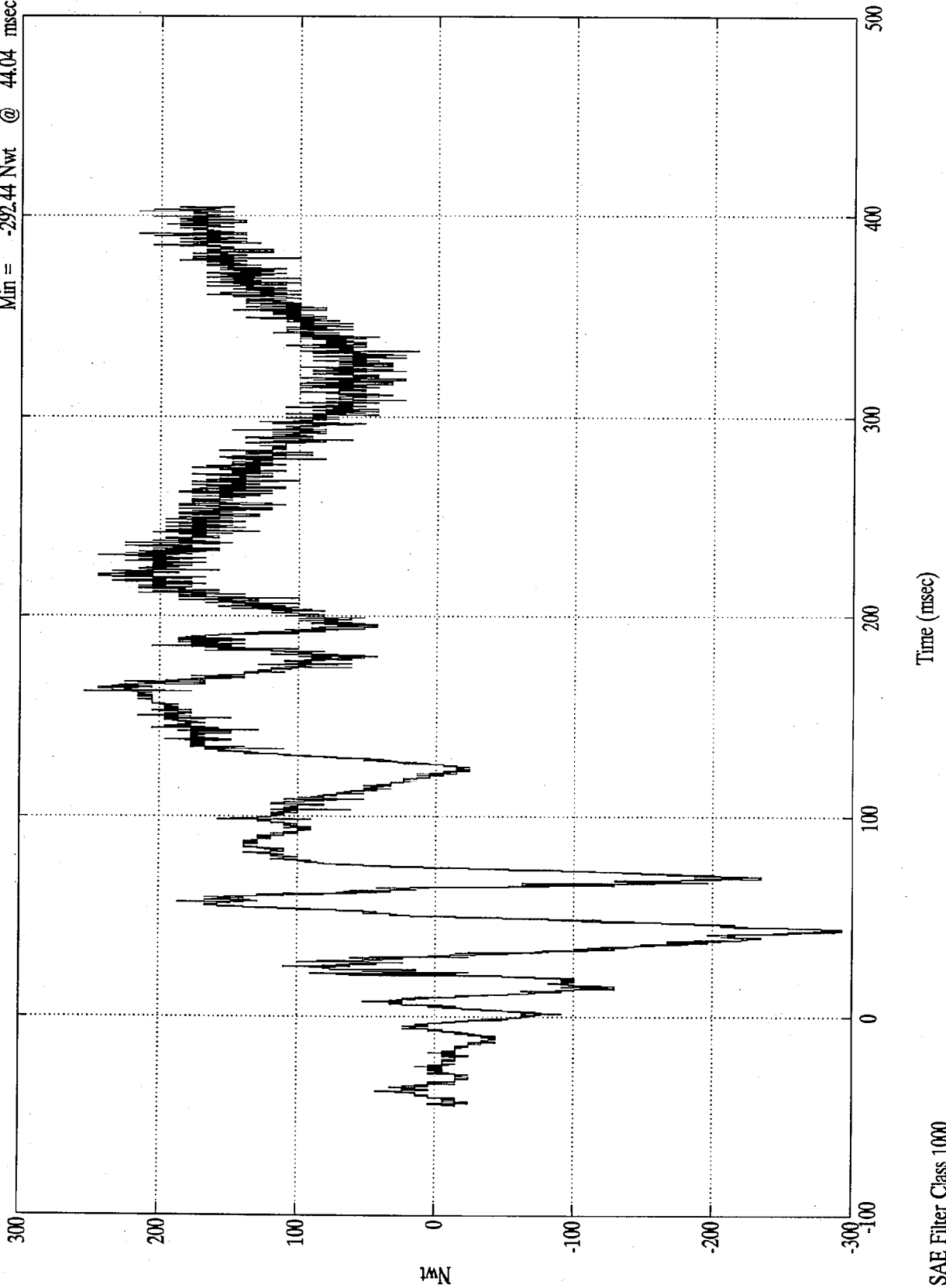


SAE Filter Class 600

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Upper Neck Fx

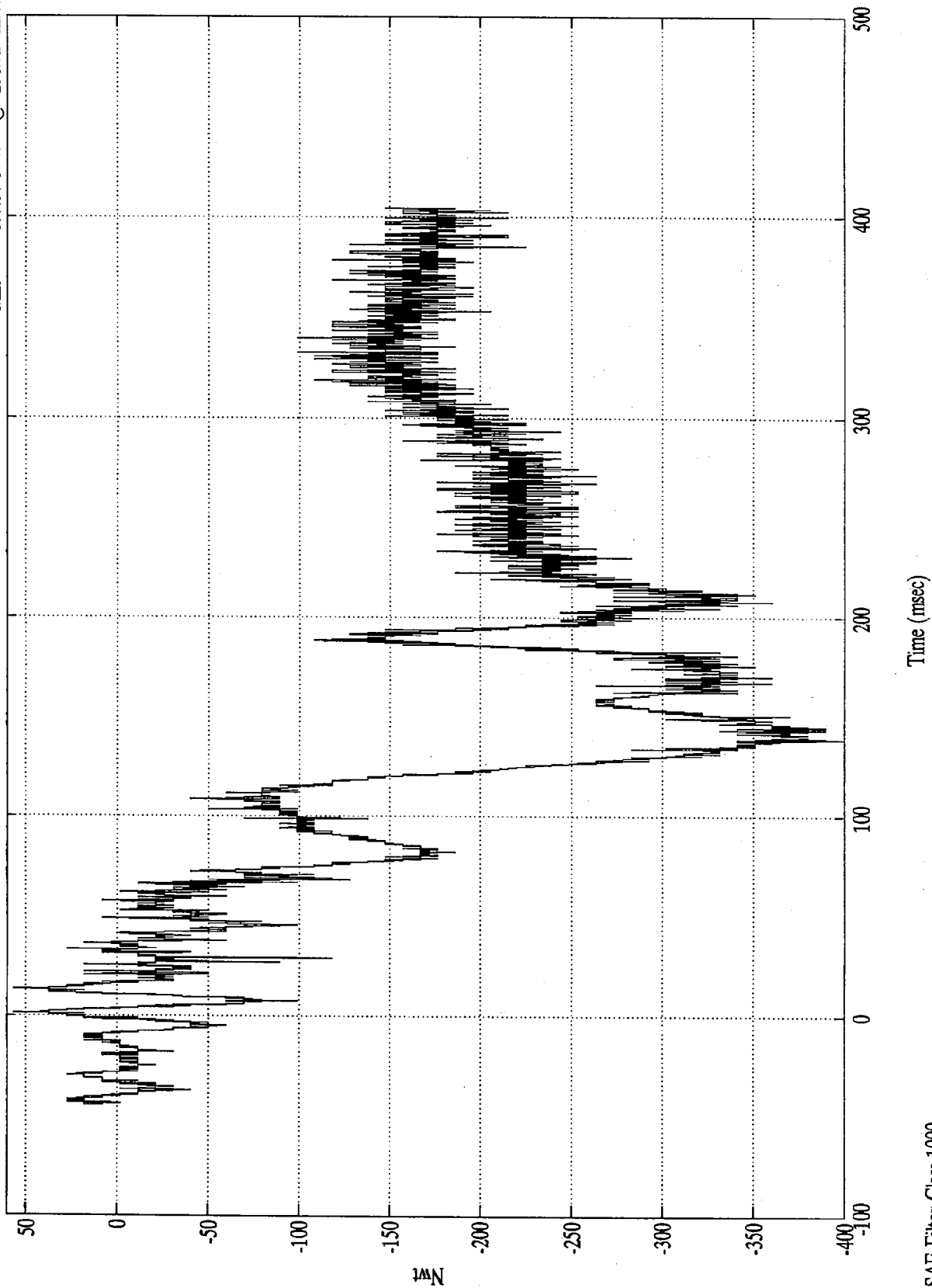
Max = 253.65 Nwt @ 162.24 msec
Min = -292.44 Nwt @ 44.04 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Upper Neck Fy

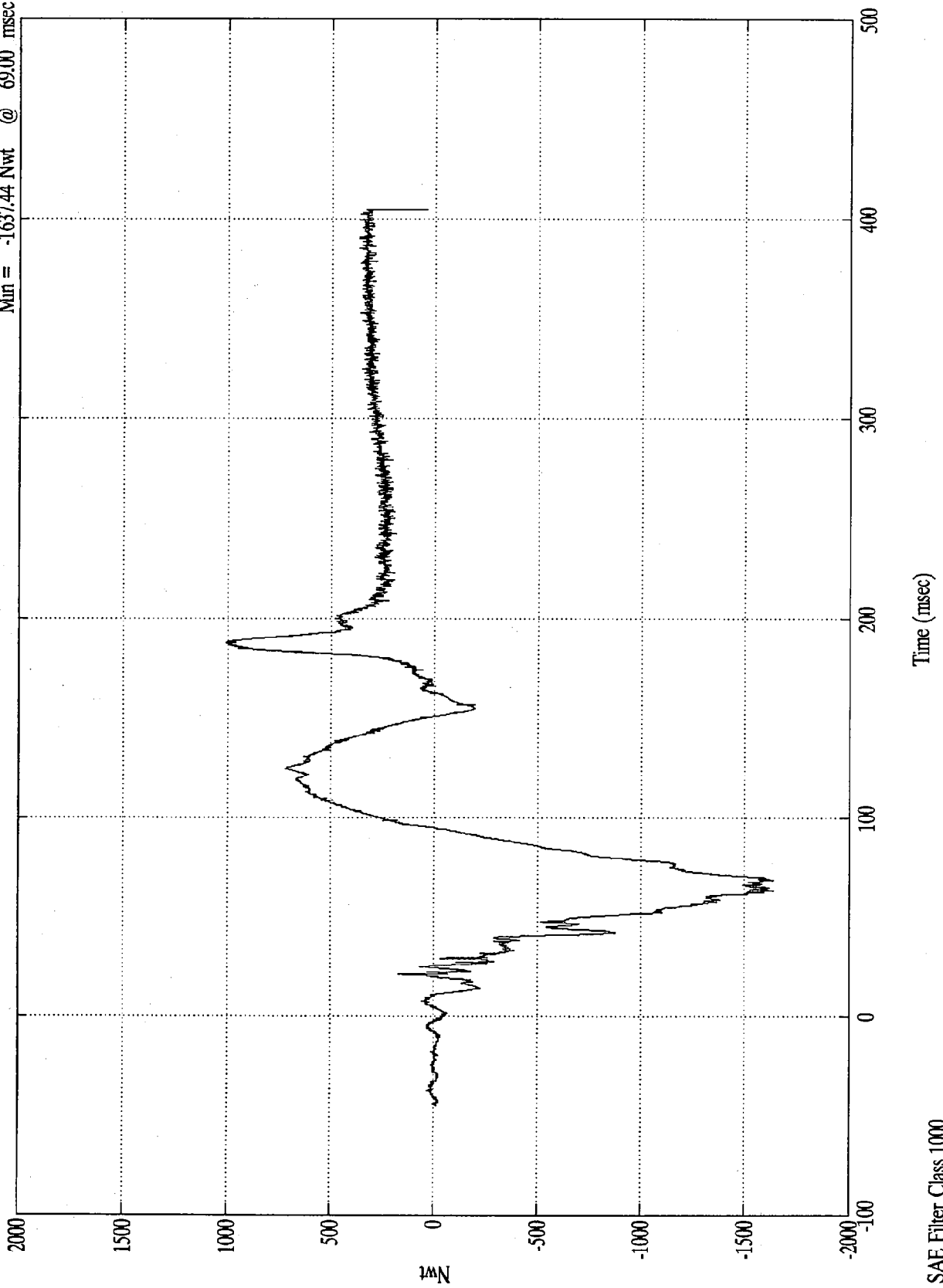
Max = 56.47 Nwt @ 13.79 msec
Min = -399.37 Nwt @ 138.72 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Upper Neck Fz

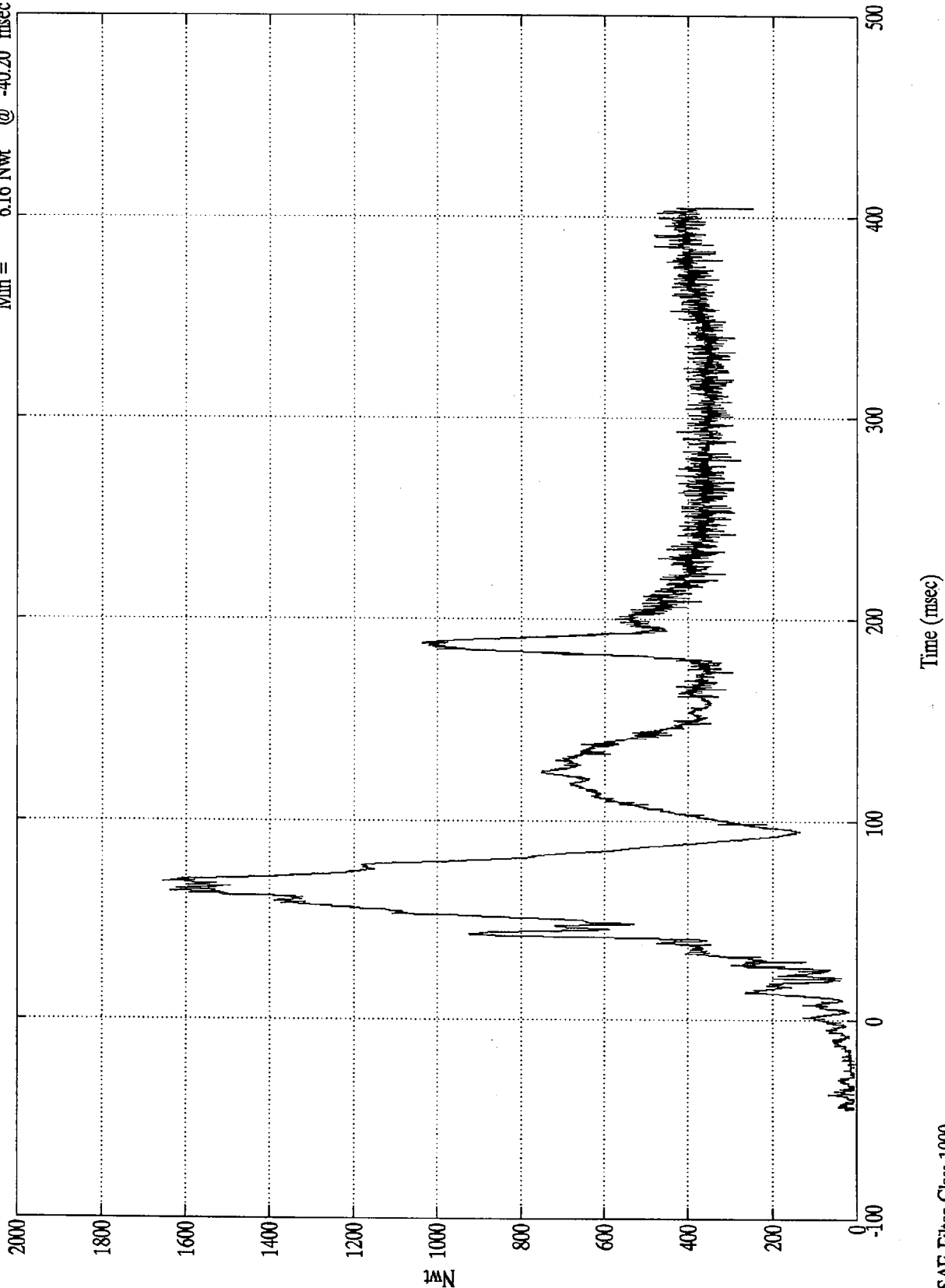
Max = 1005.79 Nwt @ 188.52 msec
Min = -1637.44 Nwt @ 69.00 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Neck Force Res.

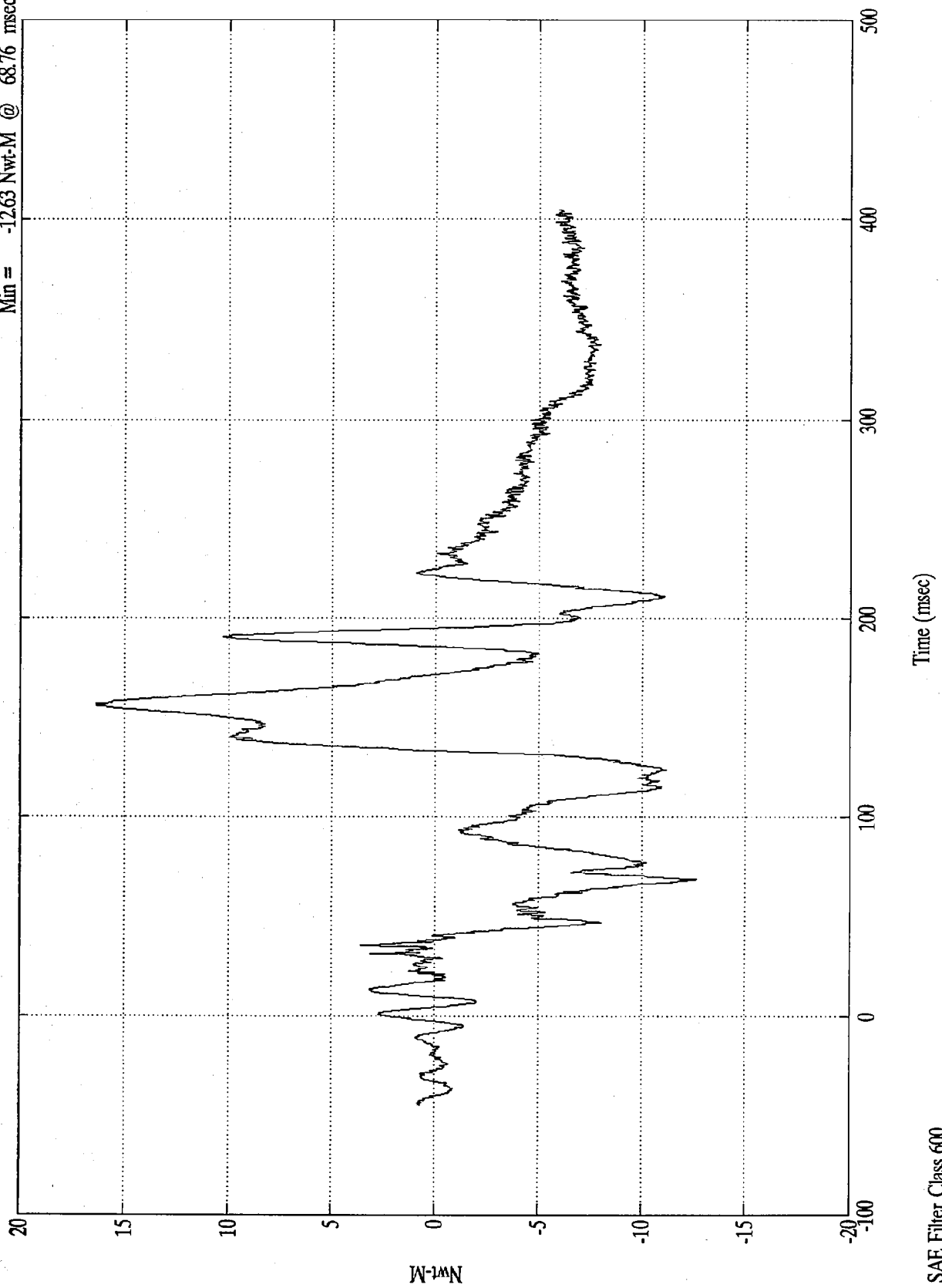
Max = 1655.68 Nwt @ 69.00 msec
Min = 6.16 Nwt @ -40.20 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Upper Neck Mx

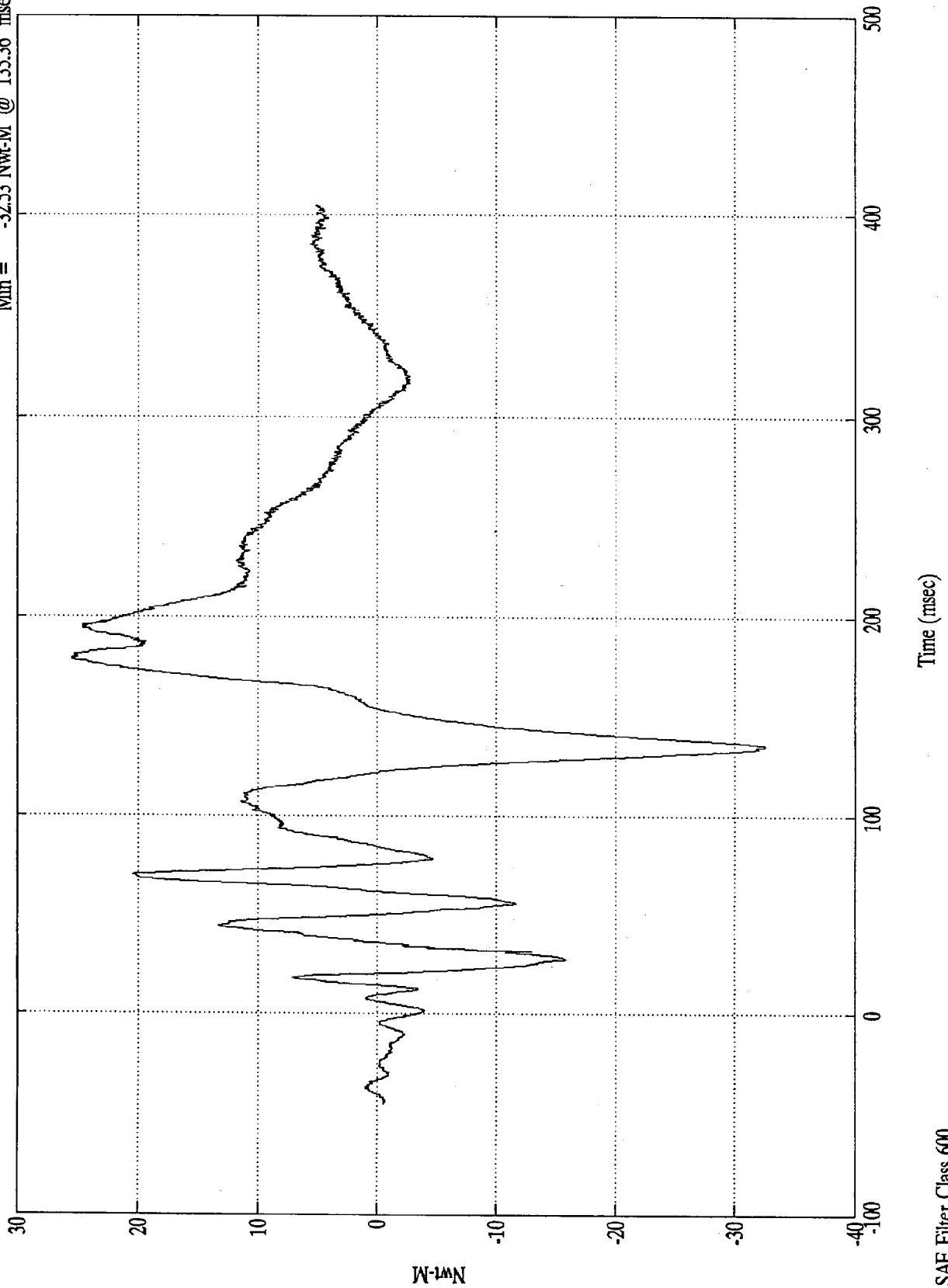
Max = 16.39 Nwt-M @ 156.72 msec
Min = -12.63 Nwt-M @ 68.76 msec



NCAP TEST #14 - 1997 VOLVO 960

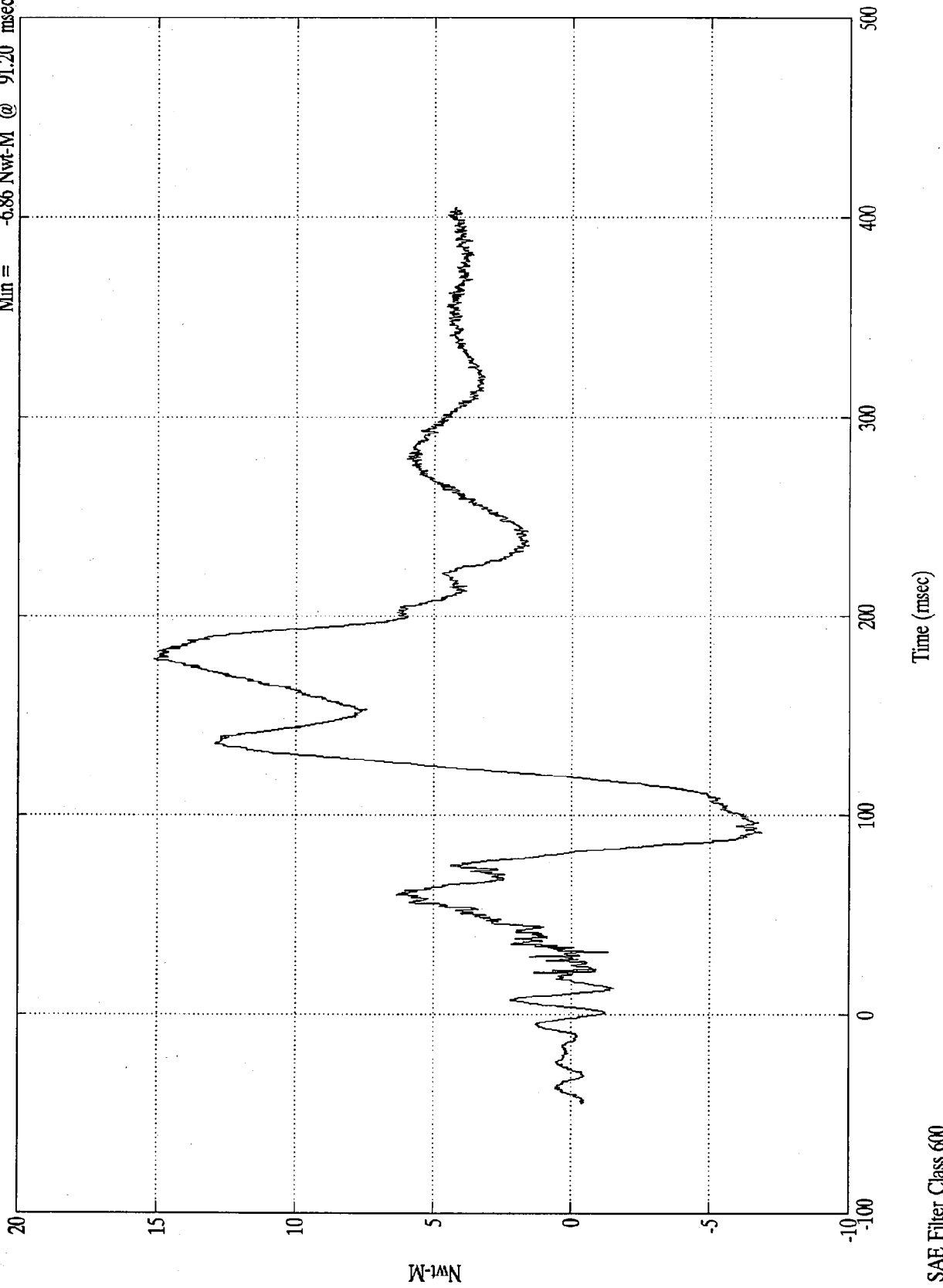
Pos. 2 Upper Neck My

Max = 25.47 Nwt-M @ 179.27 msec
Min = -32.53 Nwt-M @ 135.36 msec



Pos. 2 Upper Neck Mz

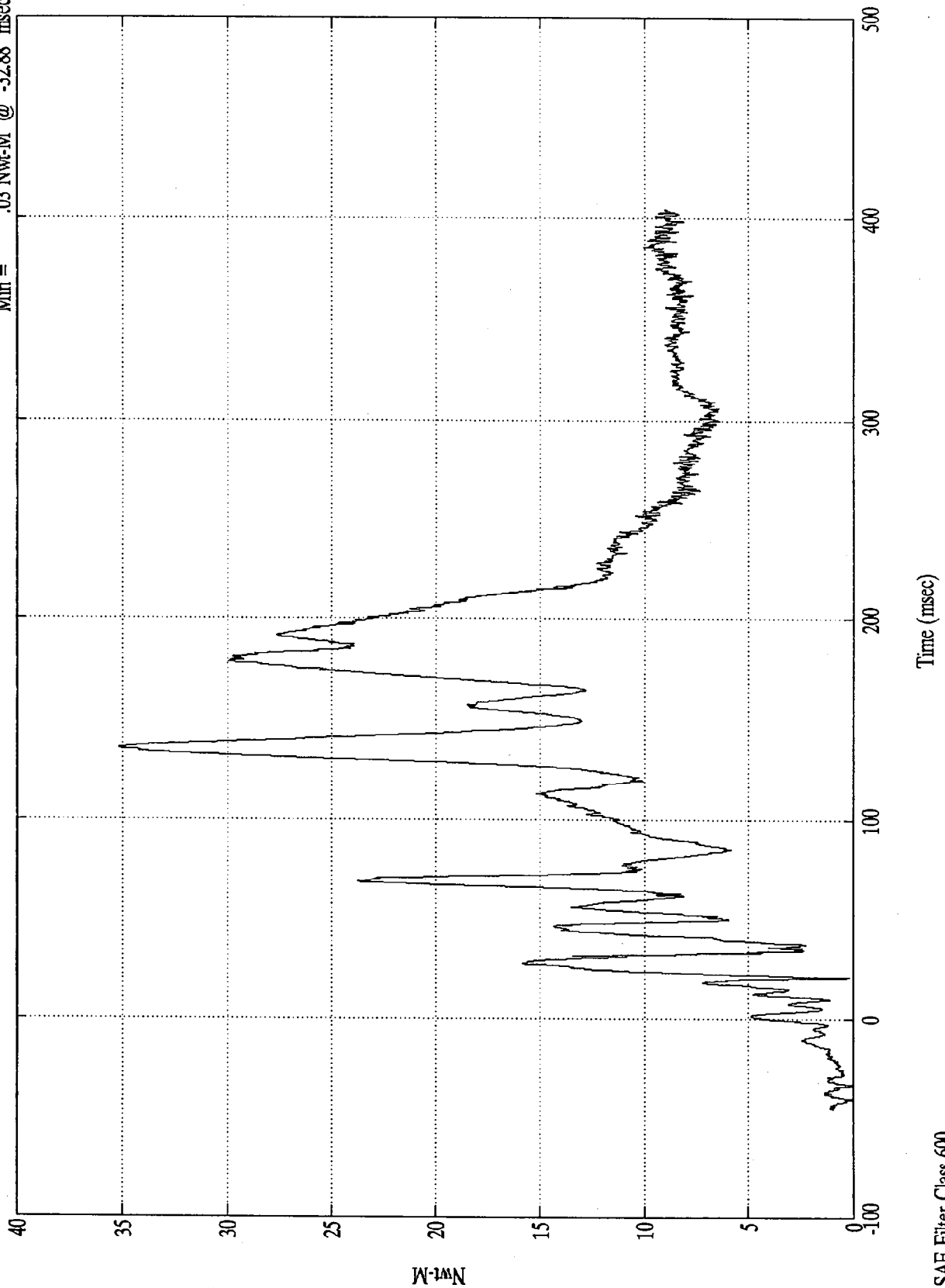
Max = 15.13 Nwt-M @ 178.44 msec
Min = -6.86 Nwt-M @ 91.20 msec



NCAP TEST #14 - 1997 VOLVO 960

Max = 35.19 Nwt-M @ 135.47 msec
Min = .03 Nwt-M @ -32.88 msec

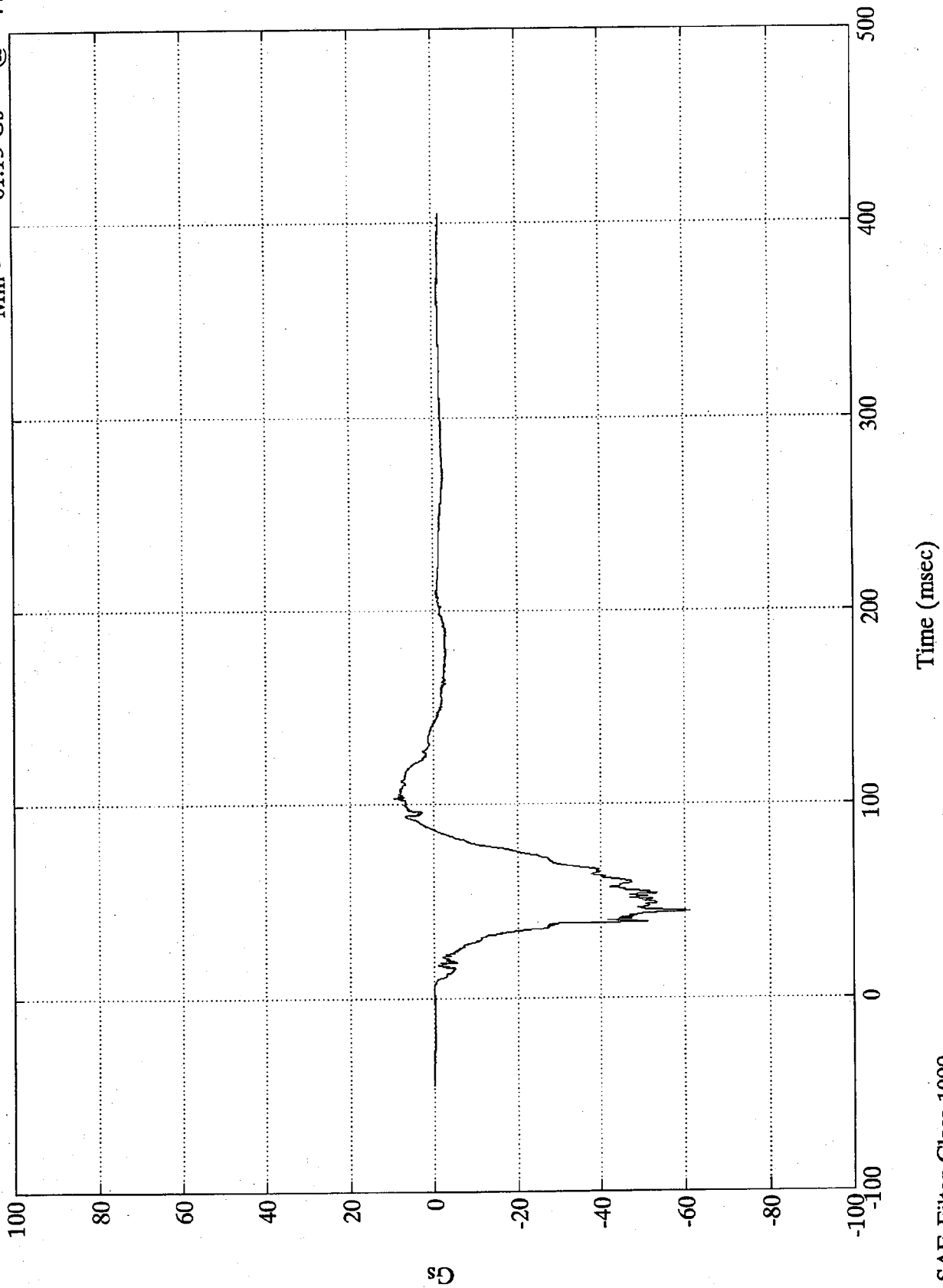
Pos. 2 Neck Moment Res.



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Pelvic (X)

Max = 9.40 Gs @ 103.44 msec
Min = -61.13 Gs @ 44.39 msec



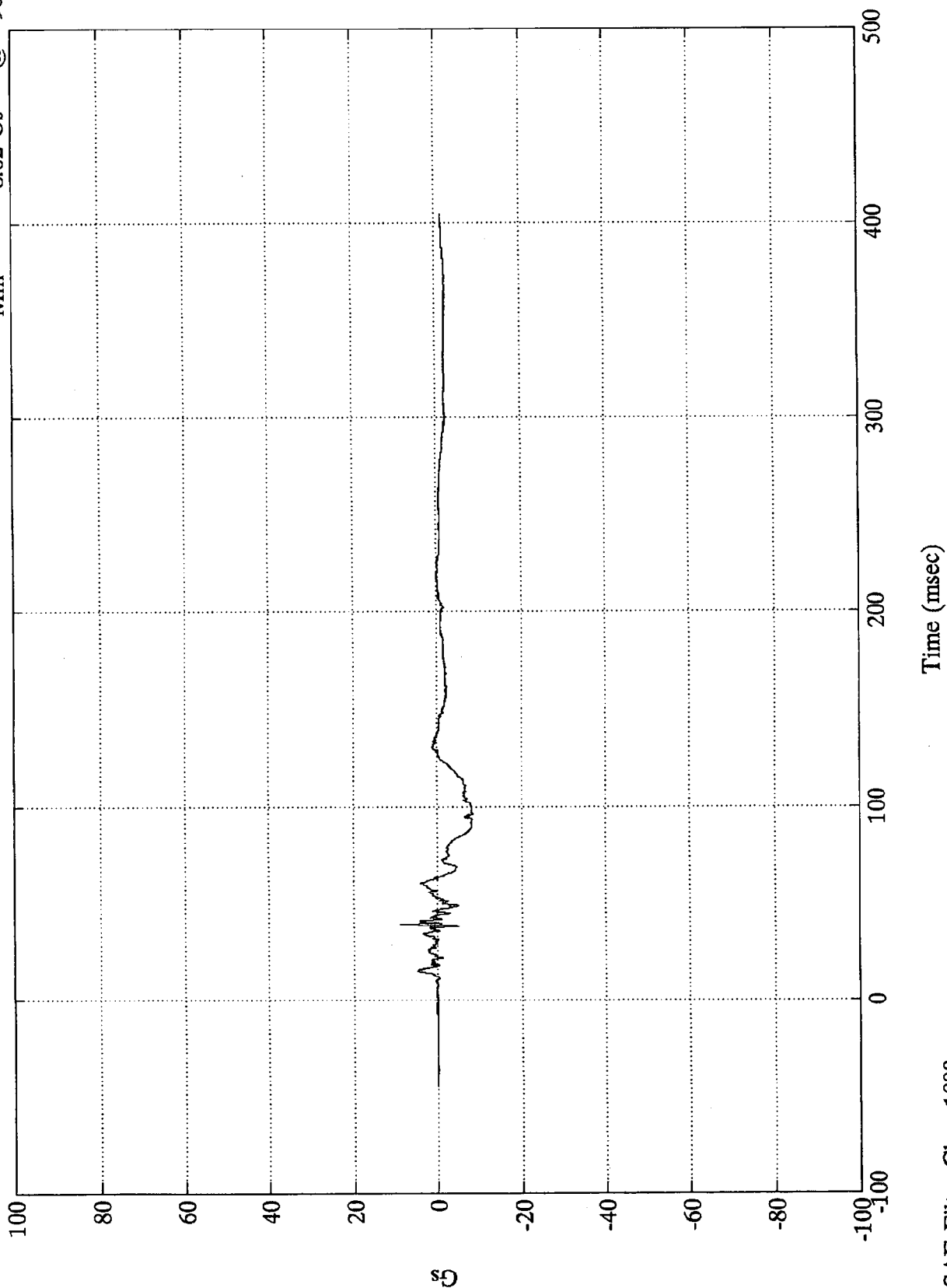
SAE Filter Class 1000

Gs

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Pelvic (Y)

Max =	8.83 Gs	@	39.84 msec
Min =	-8.62 Gs	@	96.60 msec

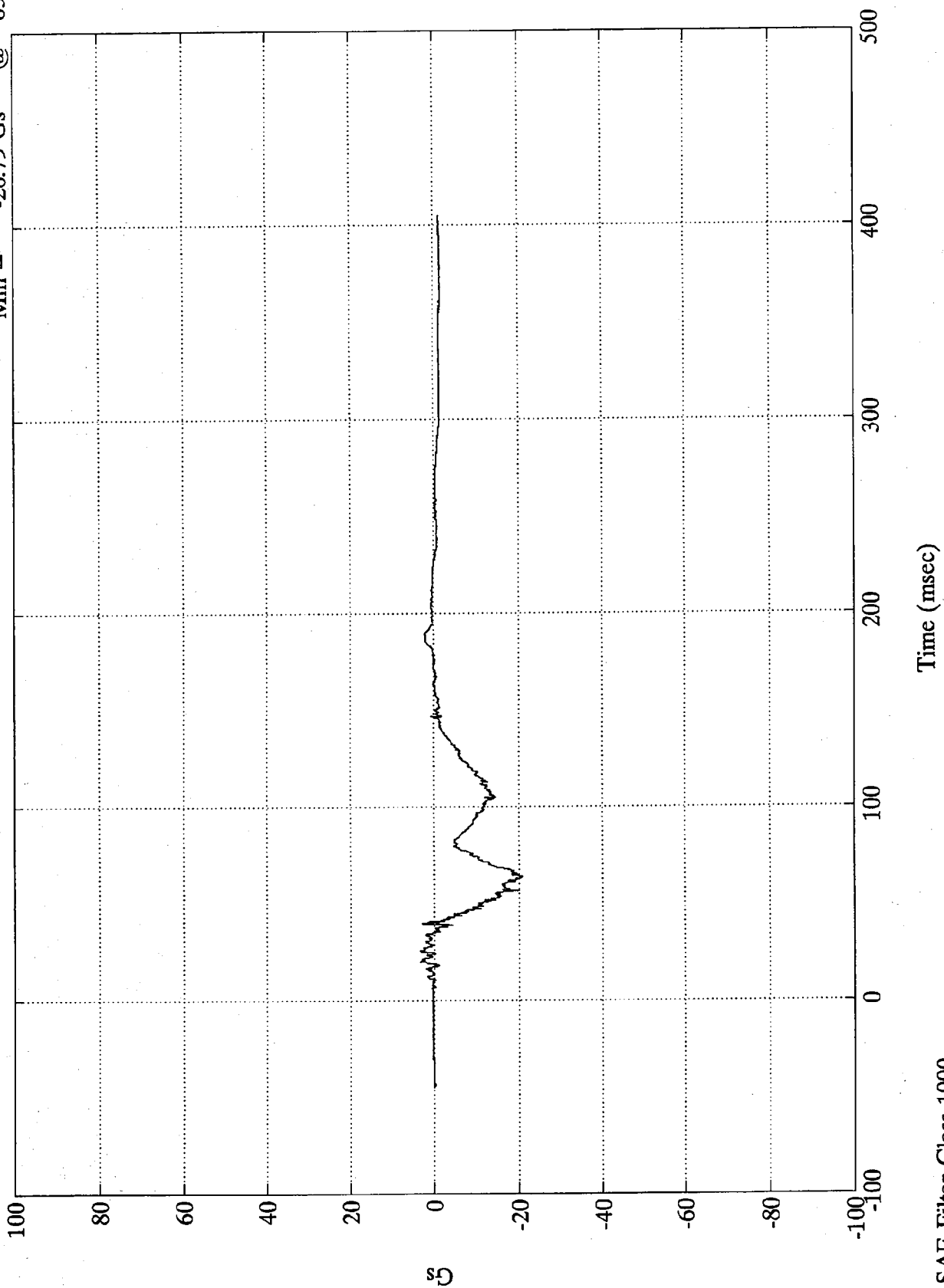


SAE Filter Class 1000

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Pelvic (Z)

Max = 3.41 Gs @ 25.68 msec
Min = -20.79 Gs @ 63.95 msec



5G

B-79

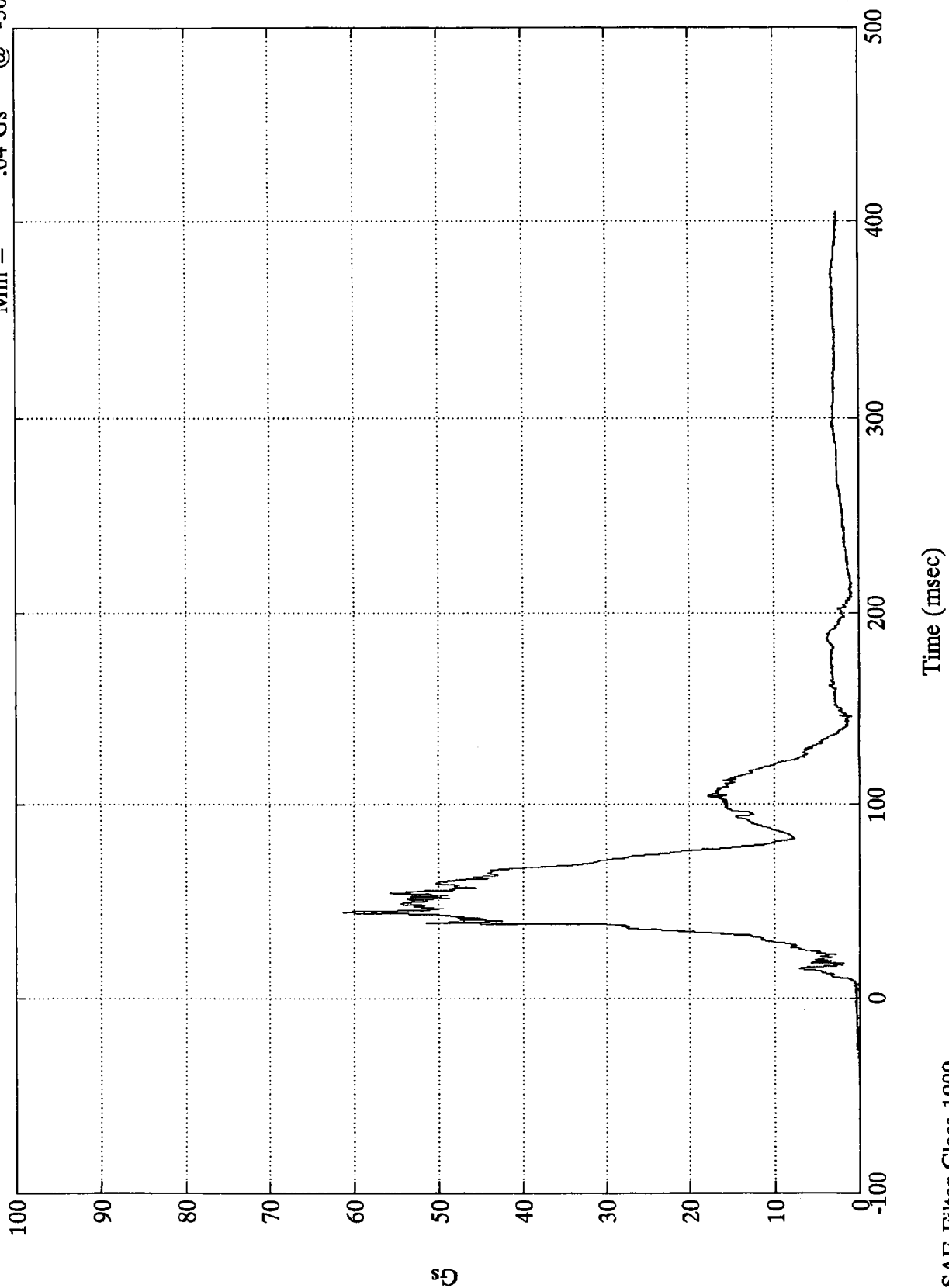
8313-14

SAE Filter Class 1000

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Pelvic (R)

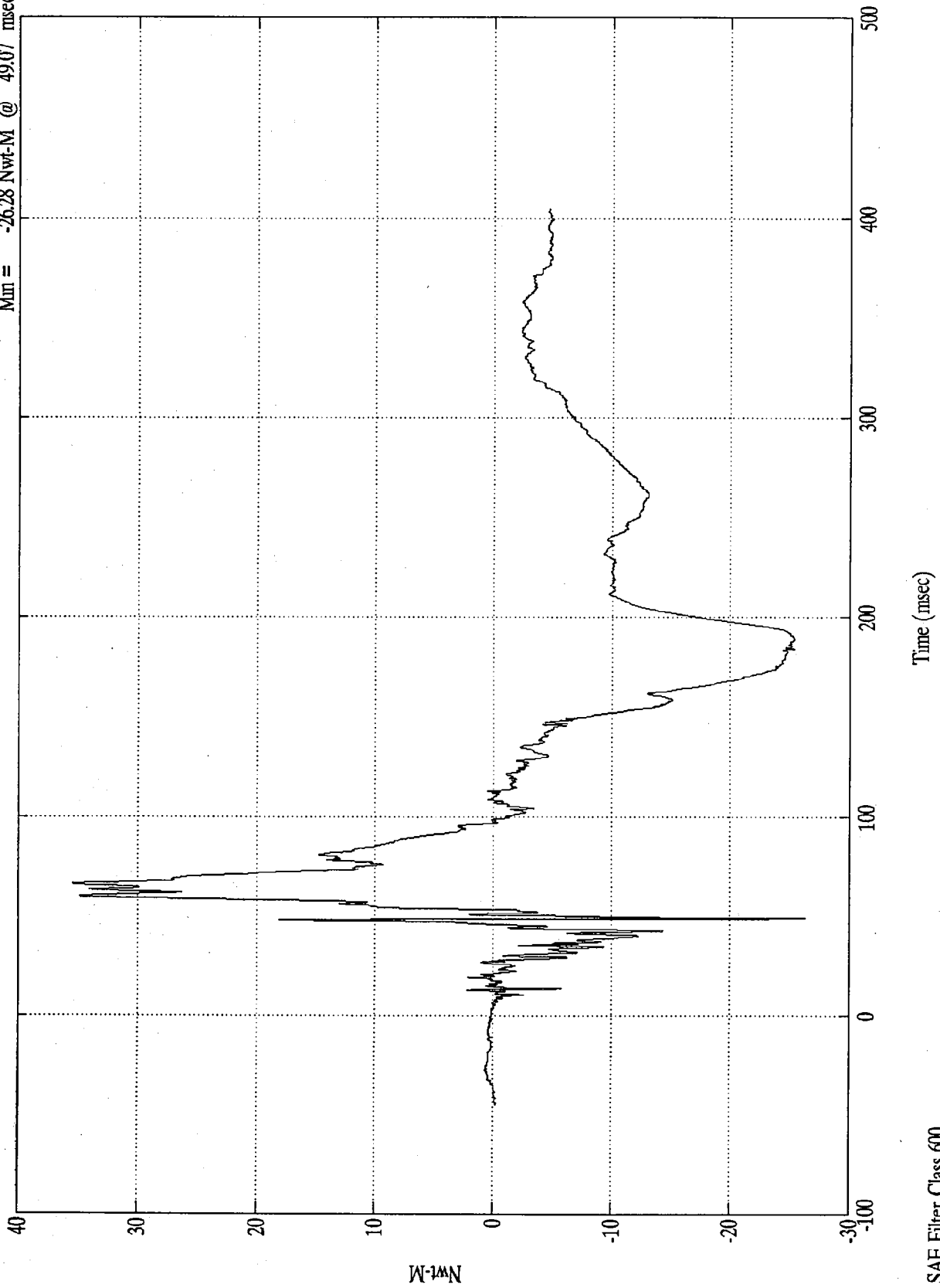
Max = 61.36 Gs @ 44.39 msec
Min = .04 Gs @ -30.72 msec



SAE Filter Class 1000

Pos. 2 Lt Upper Tibia Mx

Max = 35.46 Nwt-M @ 65.87 msec
Min = -26.28 Nwt-M @ 49.07 msec



Nwt-M

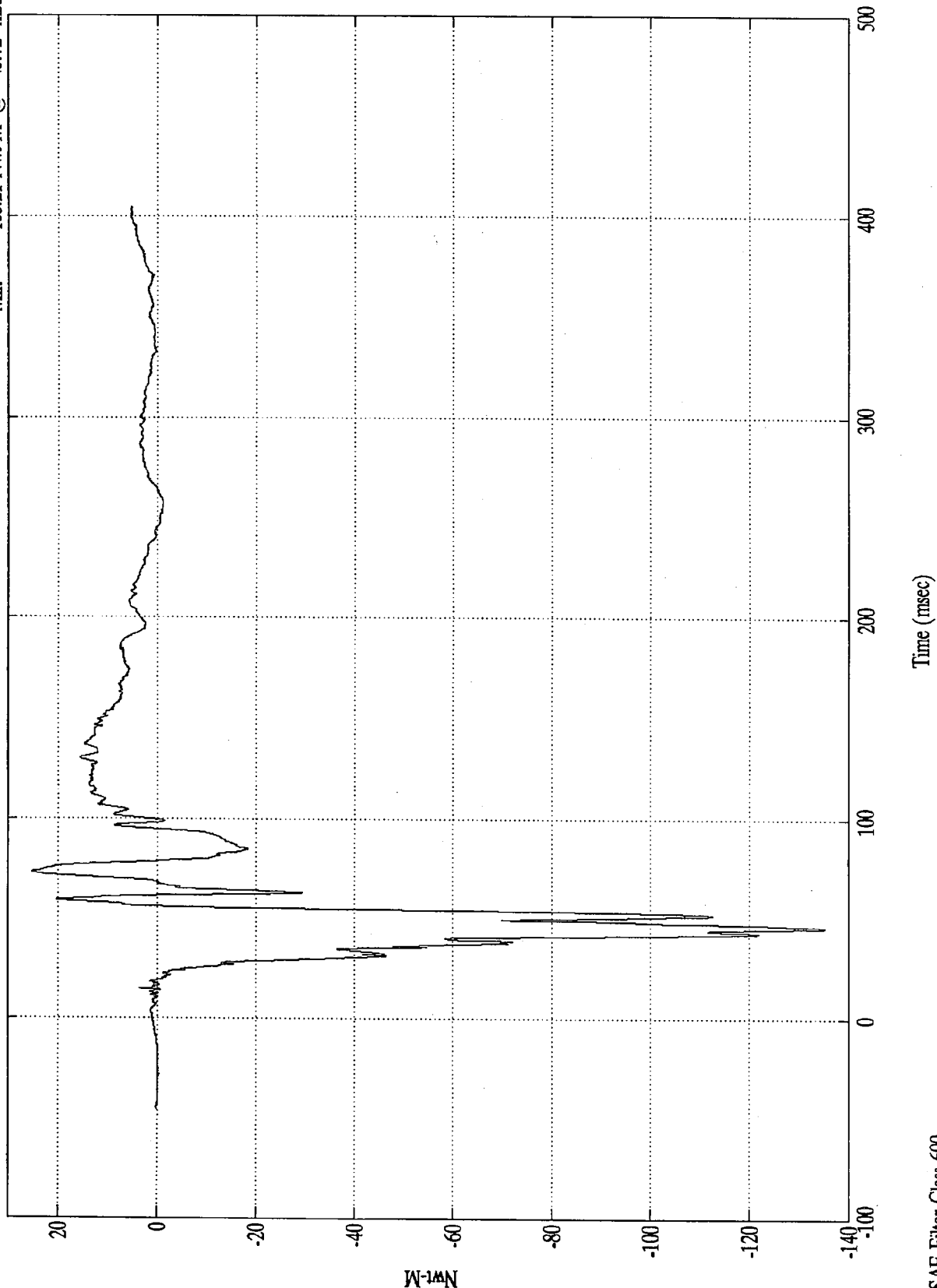
Time (msec)

SAE Filter Class 600

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Lt Upper Tibia My

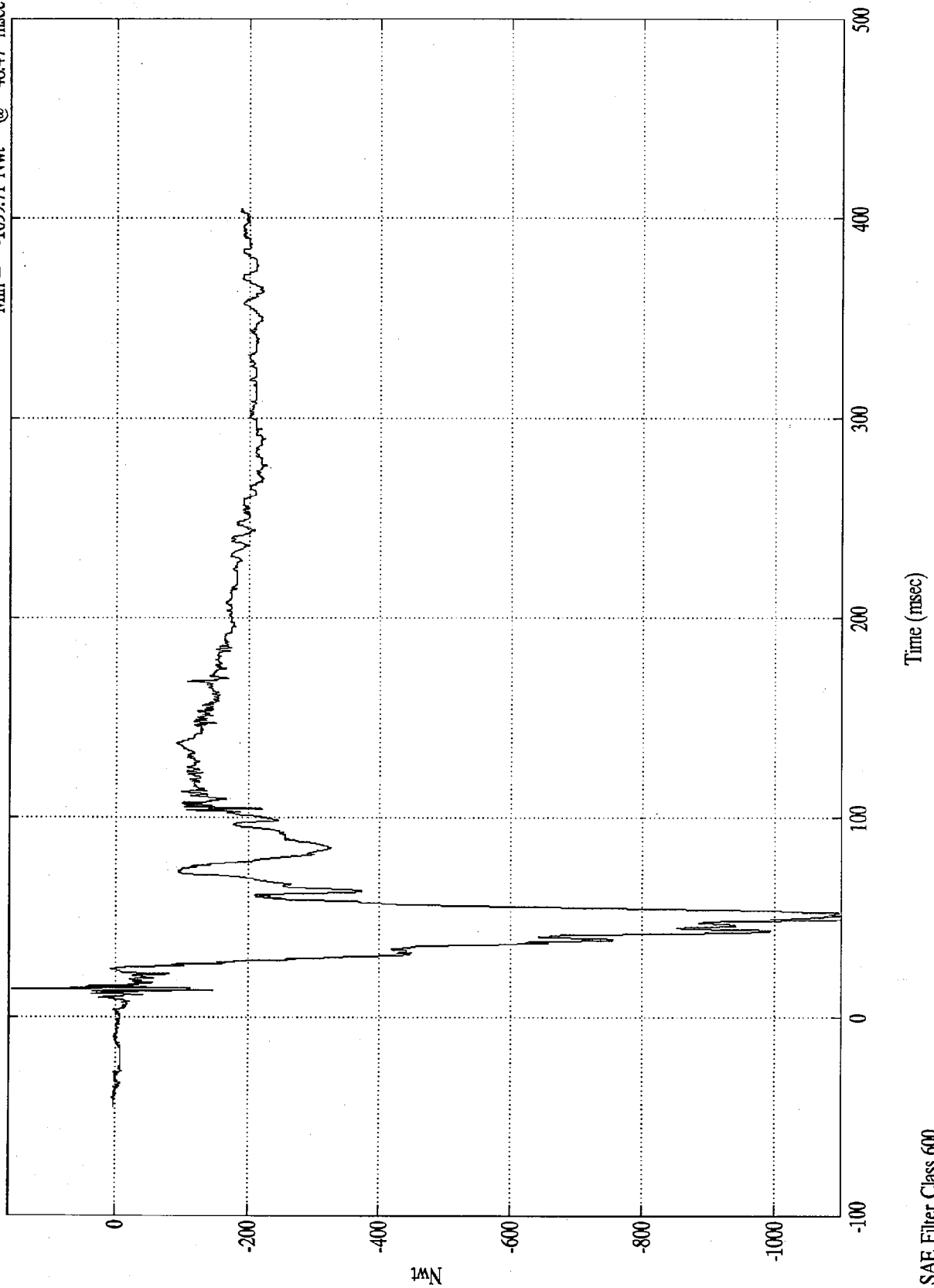
Max = 25.24 Nwt-M @ 73.55 msec
Min = -135.21 Nwt-M @ 45.72 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Lt Lower Tibia Fx

Max = 155.98 Nwt @ 13.91 msec
Min = -1099.71 Nwt @ 48.47 msec



1MN

B-83

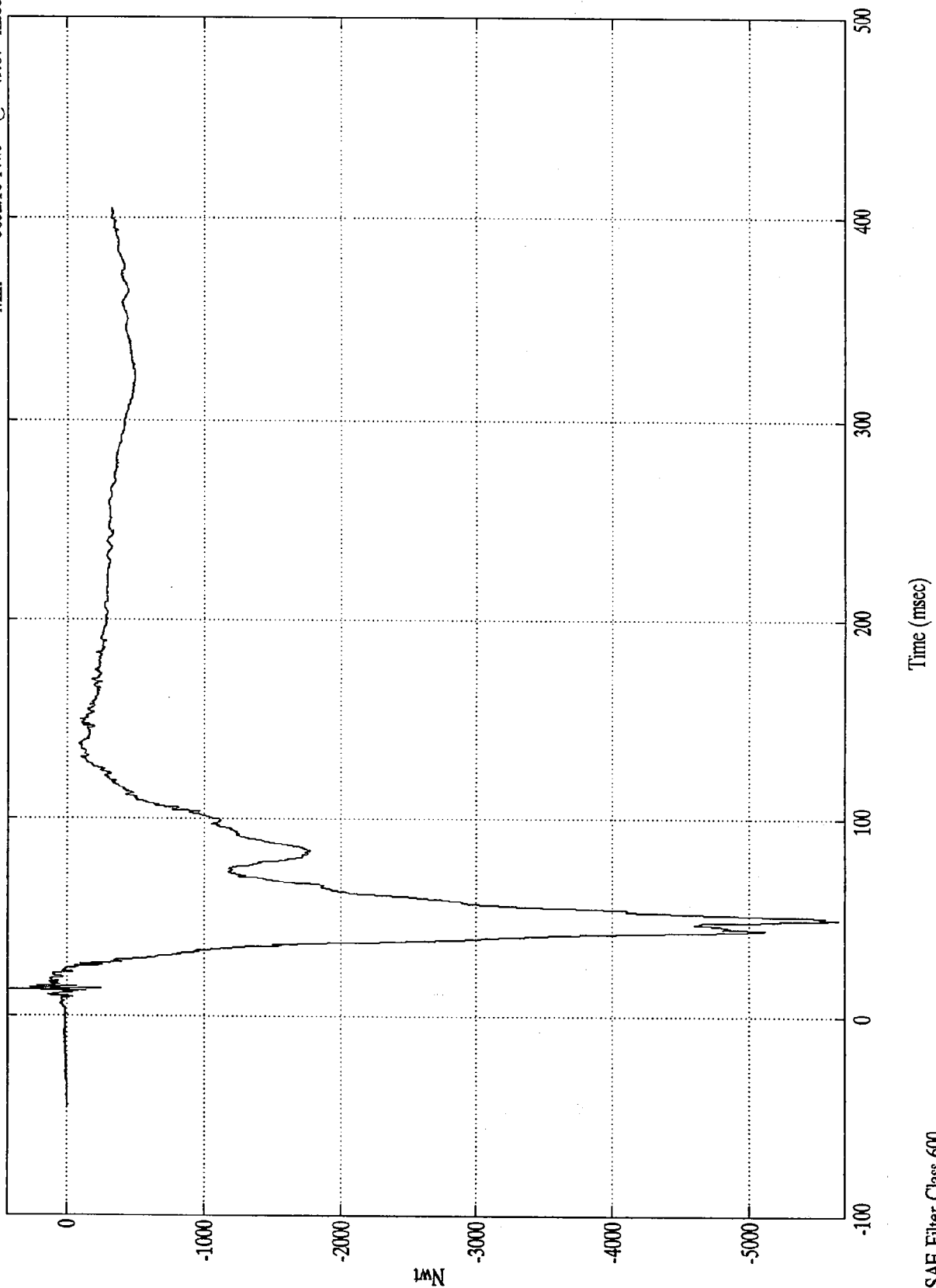
SAE Filter Class 600

8313-14

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Lt Lower Tibia Fz

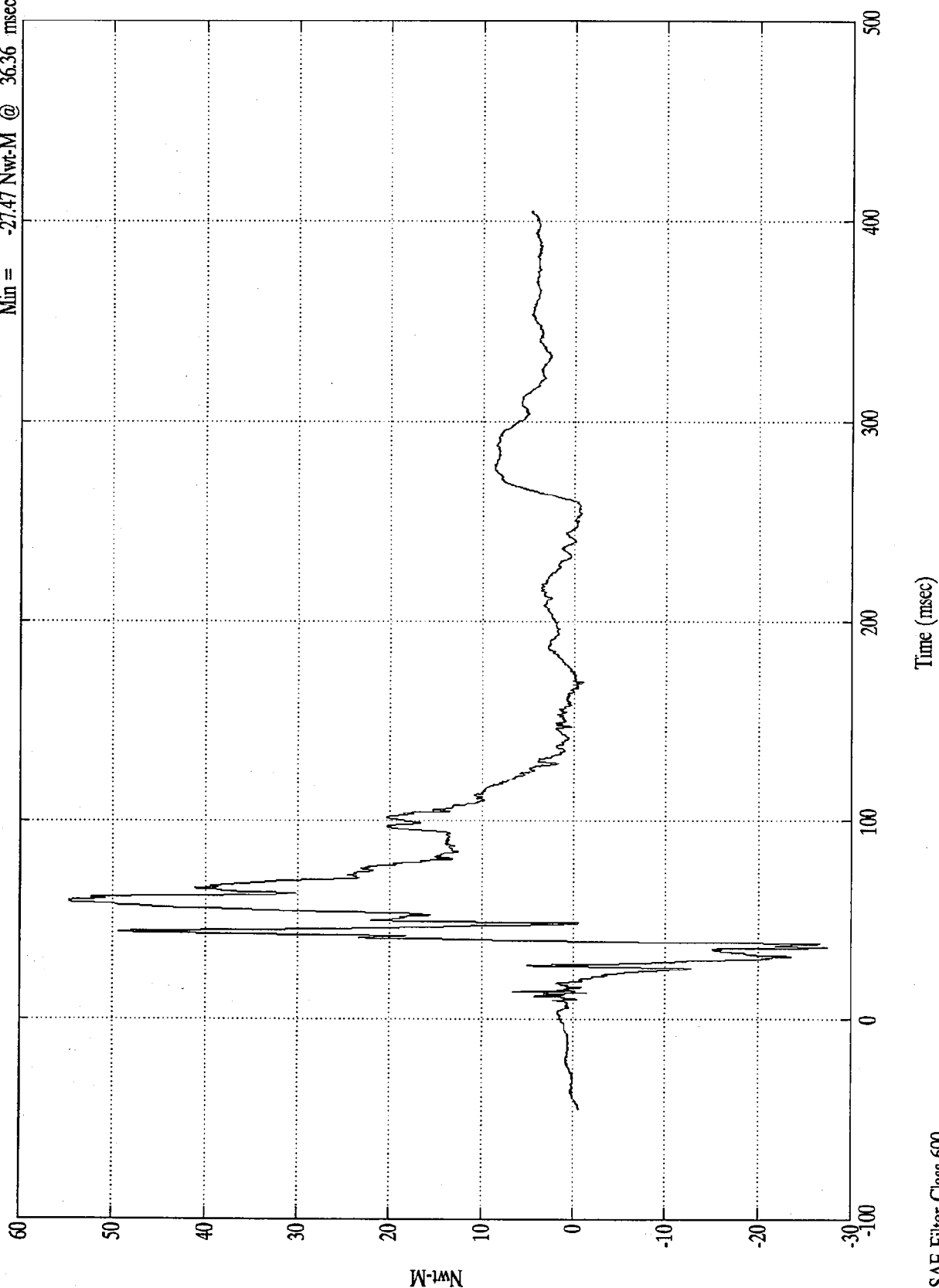
Max = 420.05 Nwt @ 13.31 msec
Min = -5652.10 Nwt @ 49.07 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Lt Lower Tibia My

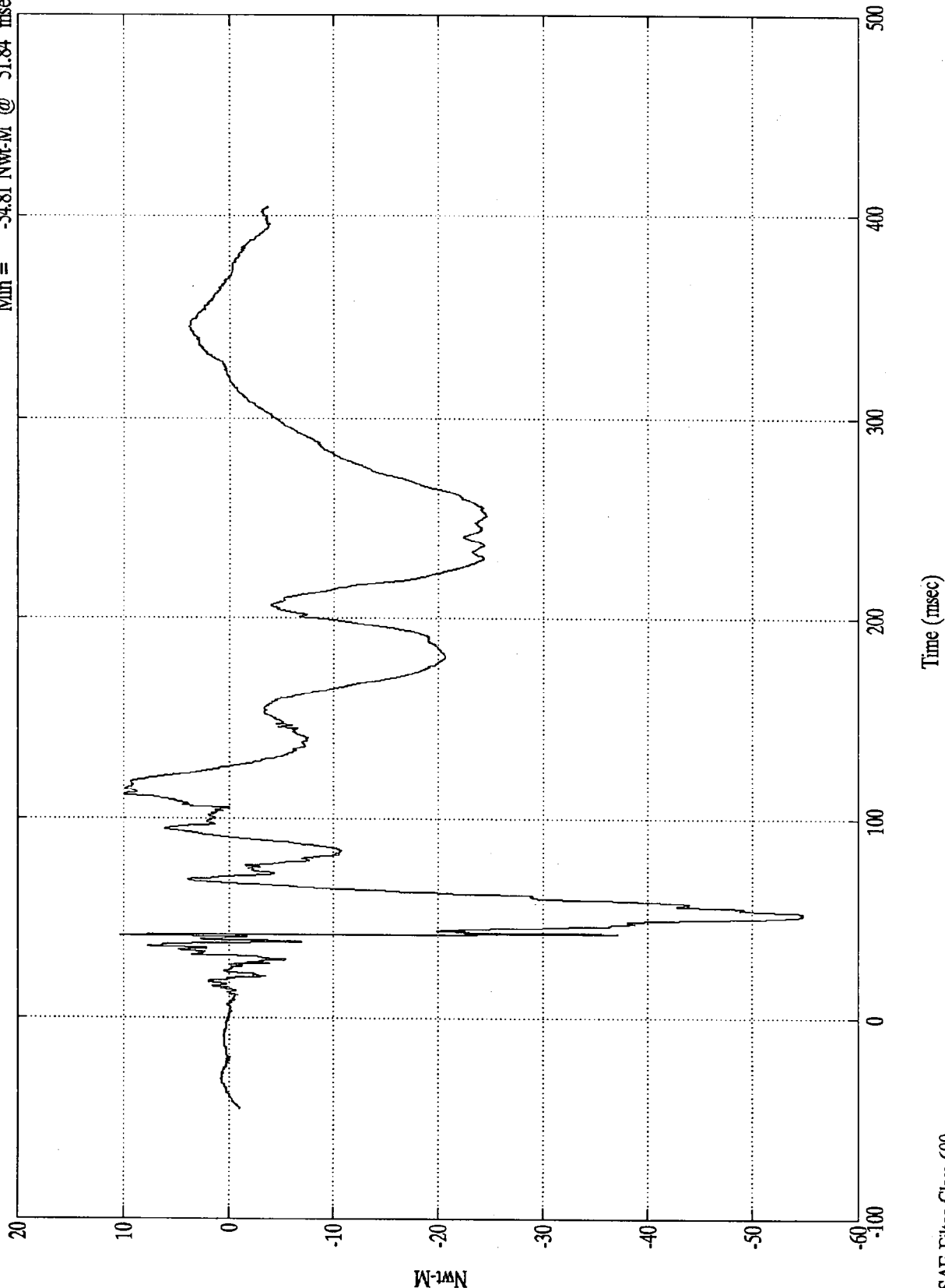
Max = 54.77 Nwt-M @ 59.04 msec
Min = -27.47 Nwt-M @ 36.36 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos 2 Rt Upper Tibia Mx

Max = 10.38 Nwt-M @ 41.63 msec
Min = -54.81 Nwt-M @ 51.84 msec



W-1wN

B-86

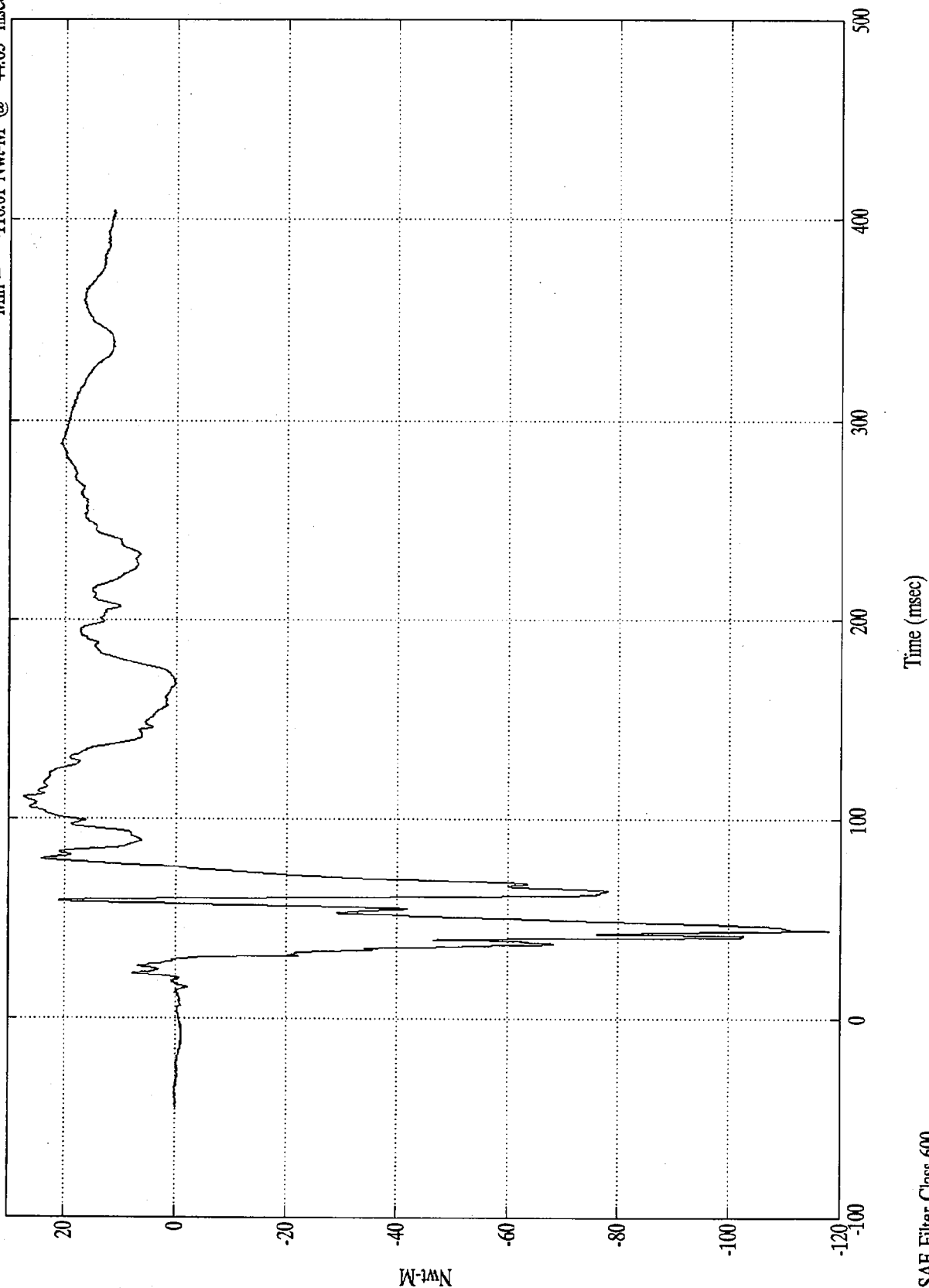
SAE Filter Class 600

8313-14

NCAP TEST #14 - 1997 VOLVO 960

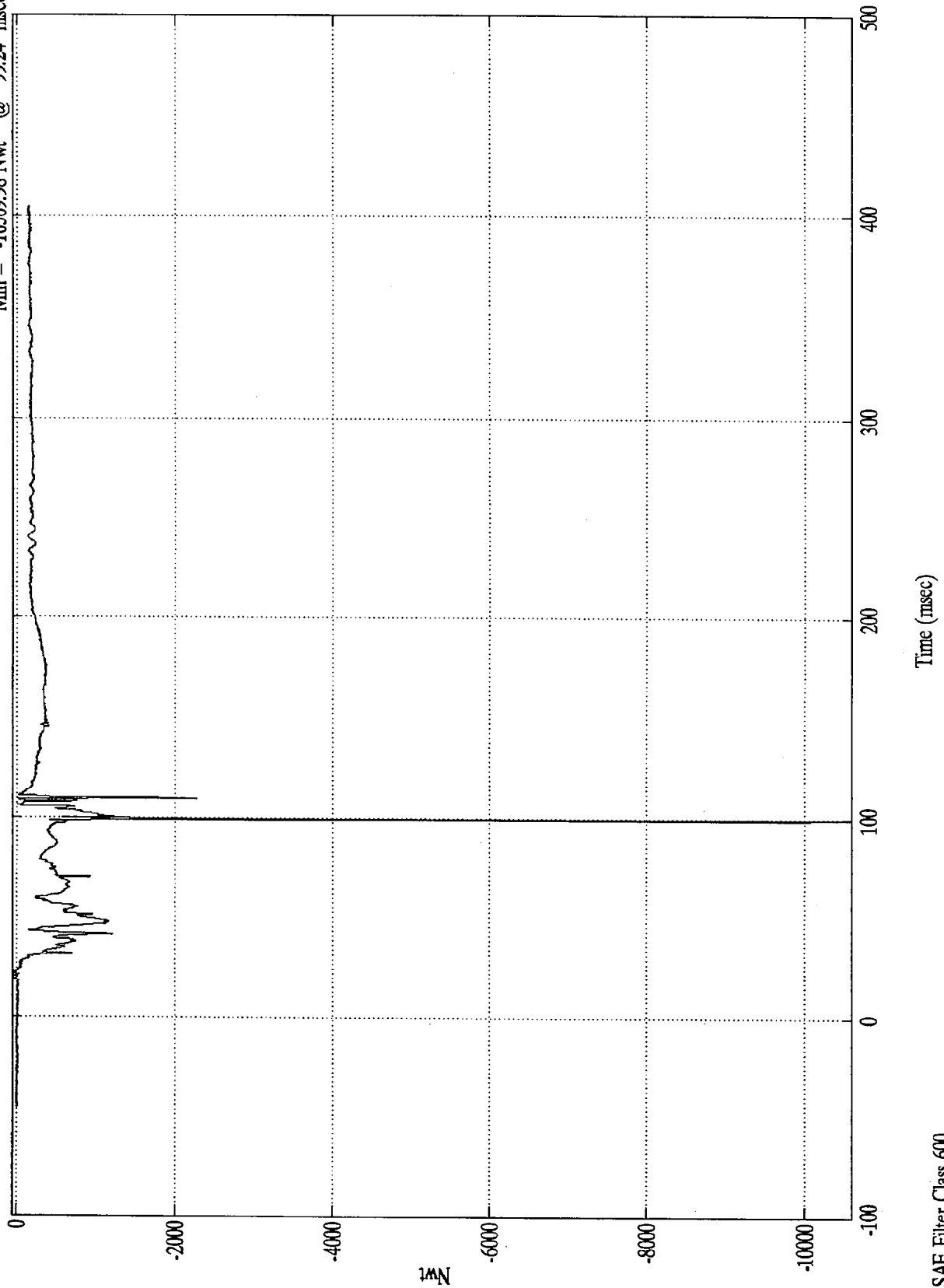
Pos. 2 Rt Upper Tibia My

Max = 27.28 Nwt-M @ 110.64 msec
Min = -118.01 Nwt-M @ 44.63 msec



NCAP TEST #14 - 1997 VOLVO 960

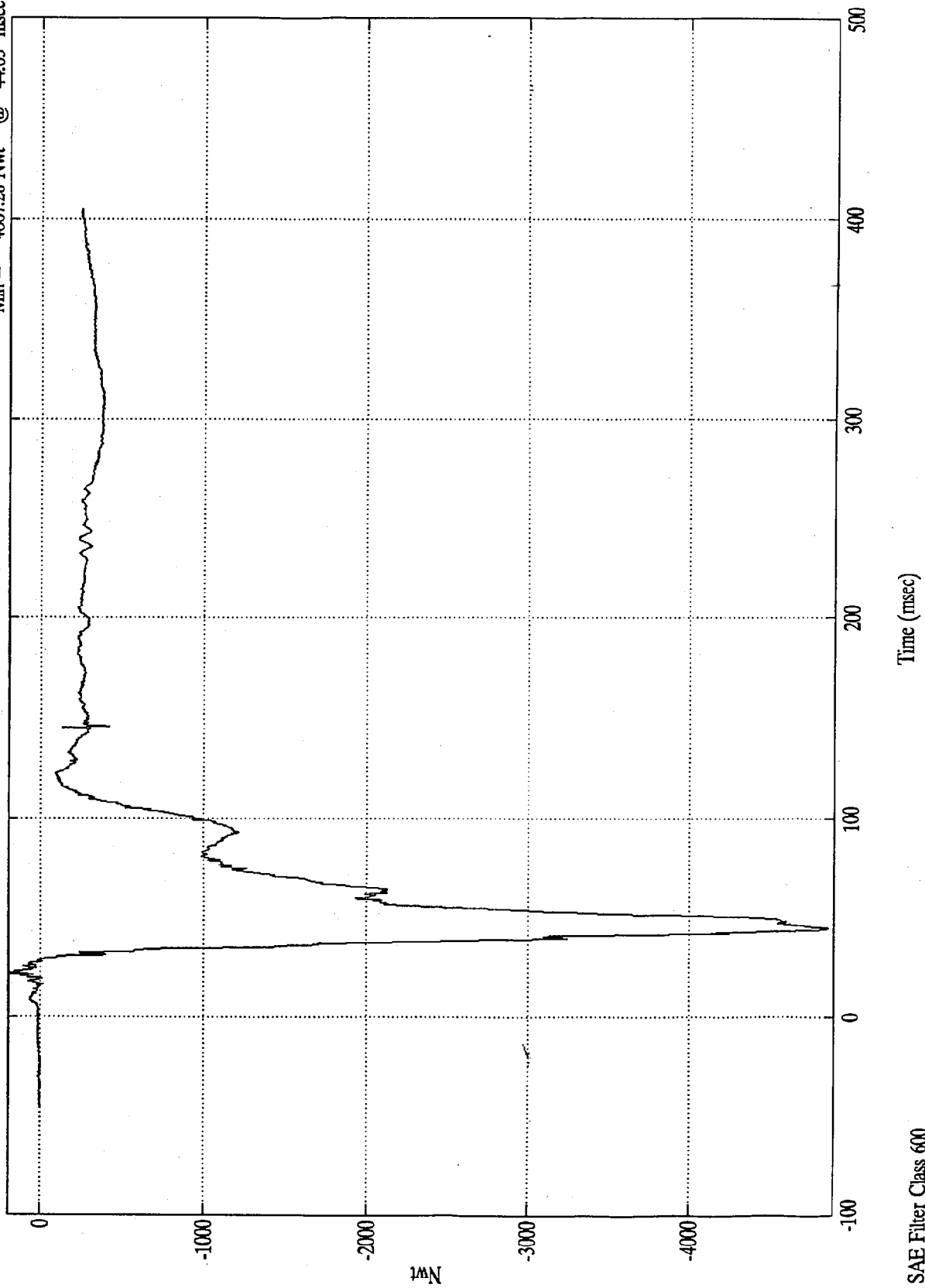
Pos. 2 Rt Lower Tibia Fx
Max = 41.67 Nwt @ 20.76 msec
Min = -10569.98 Nwt @ 99.24 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Rt Lower Tibia Fz

Max = 184.76 Nwt @ 21.59 msec
Min = -4867.20 Nwt @ 44.63 msec



1wN

B-89

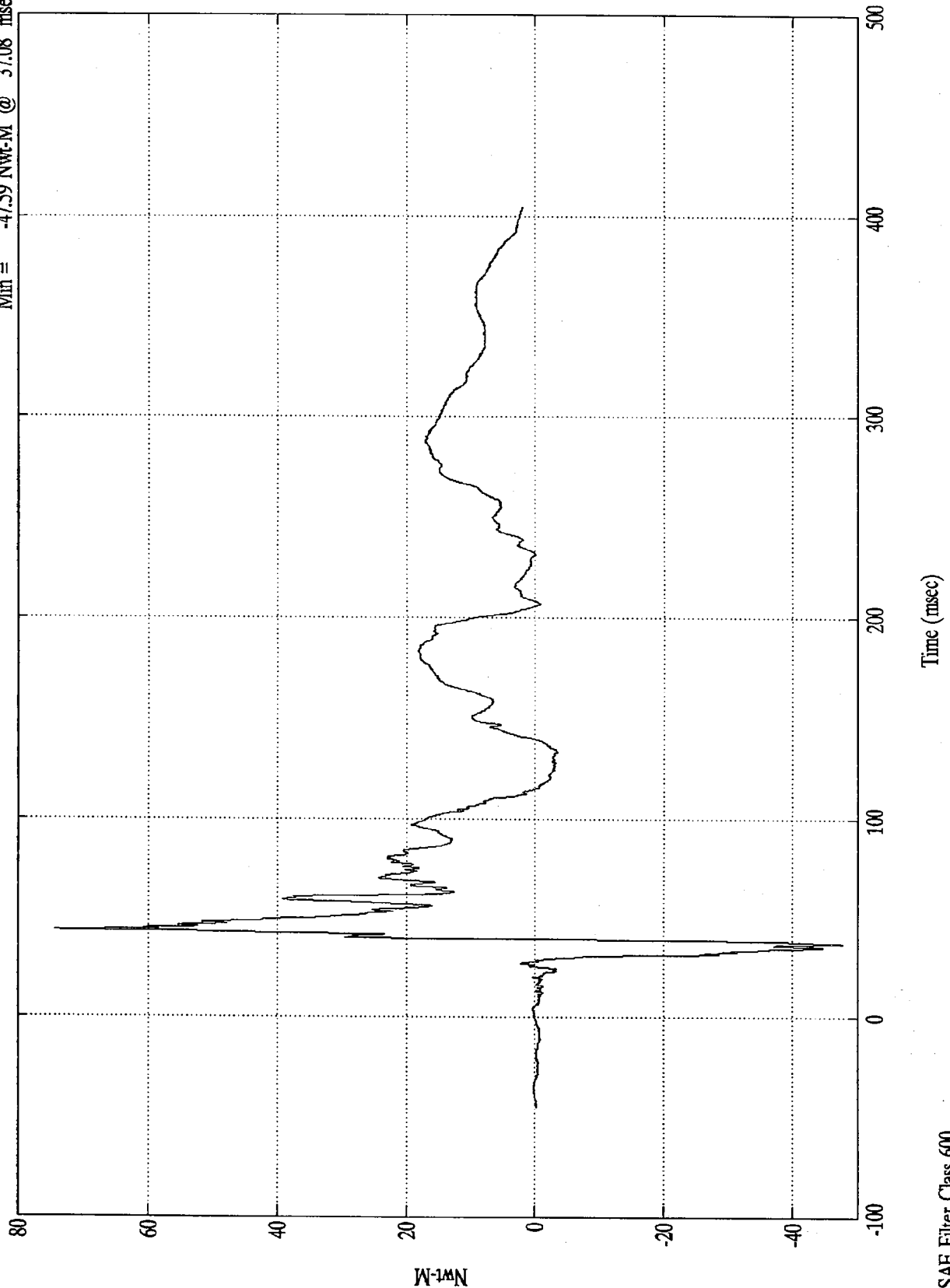
8313-14

SAE Filter Class 600

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Rt Lower Tibia My

Max = 74.40 Nwt-M @ 43.31 msec
Min = -47.59 Nwt-M @ 37.08 msec



W-14N

B-90

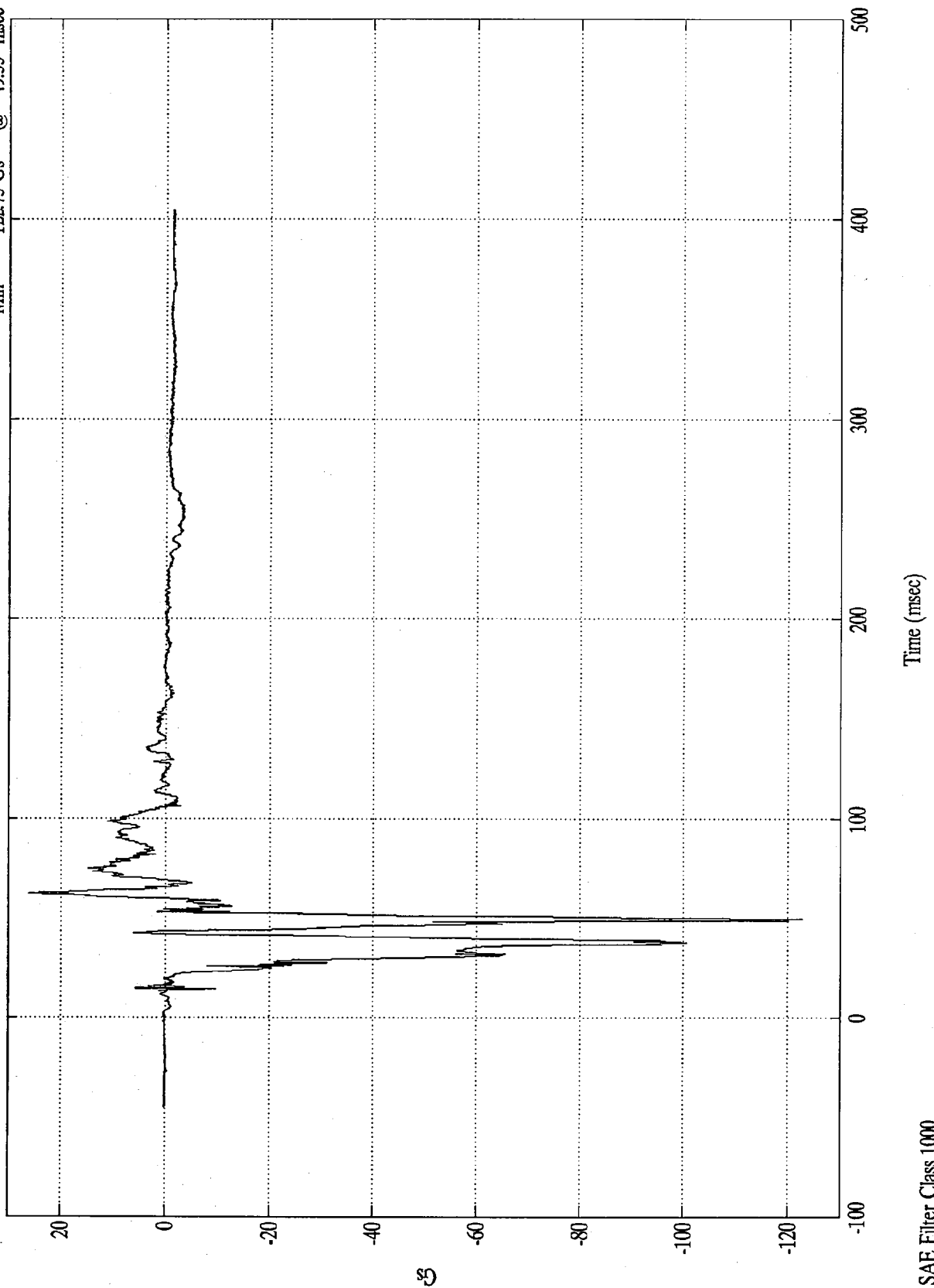
SAE Filter Class 600

8313-14

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Left Foot X

Max = 26.08 Gs @ 62.40 msec
Min = -122.75 Gs @ 49.55 msec



89

B-91

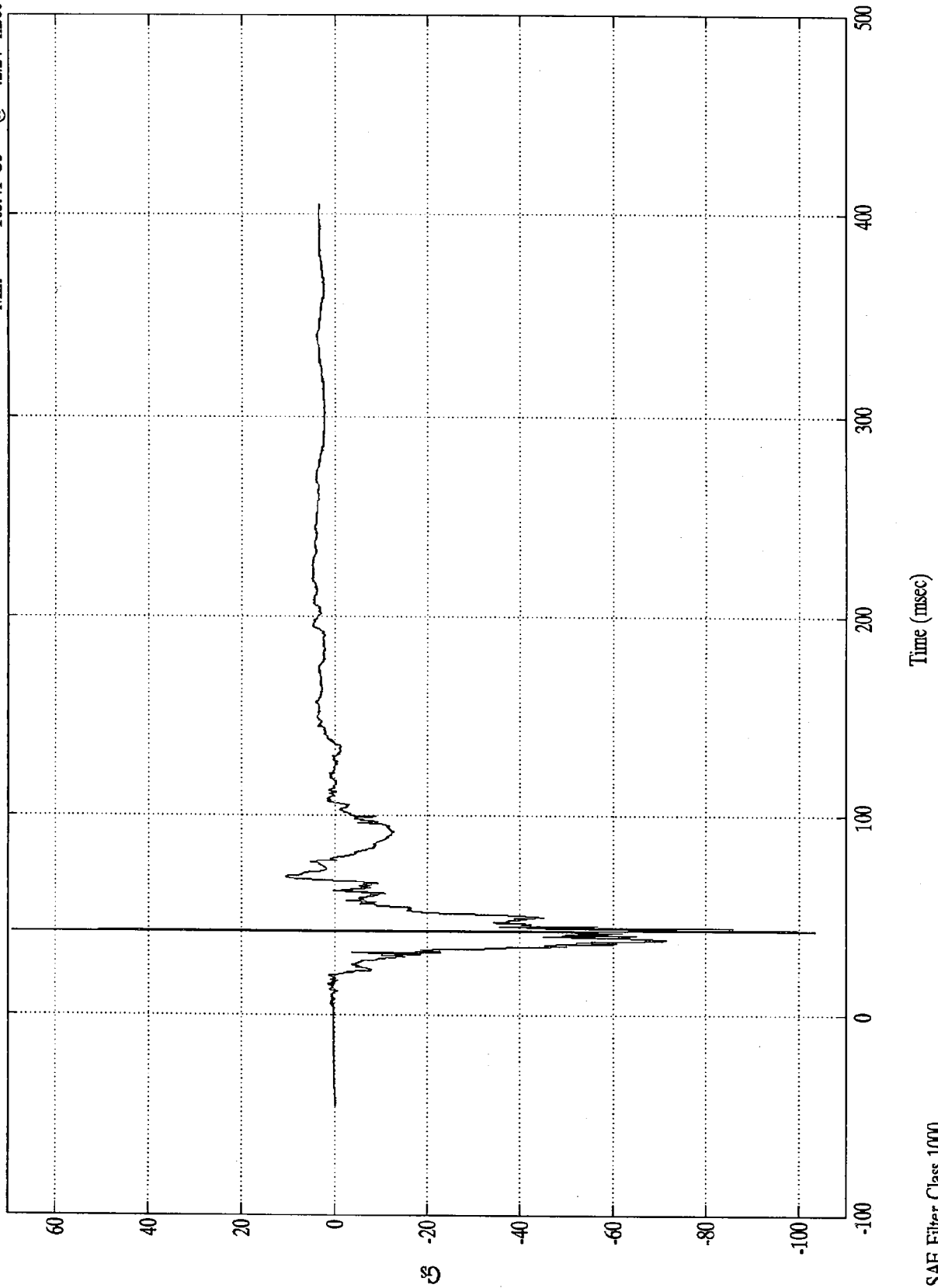
8313-14

SAE Filter Class 1000

NCAP TEST #14 - 1997 VOLVO 960

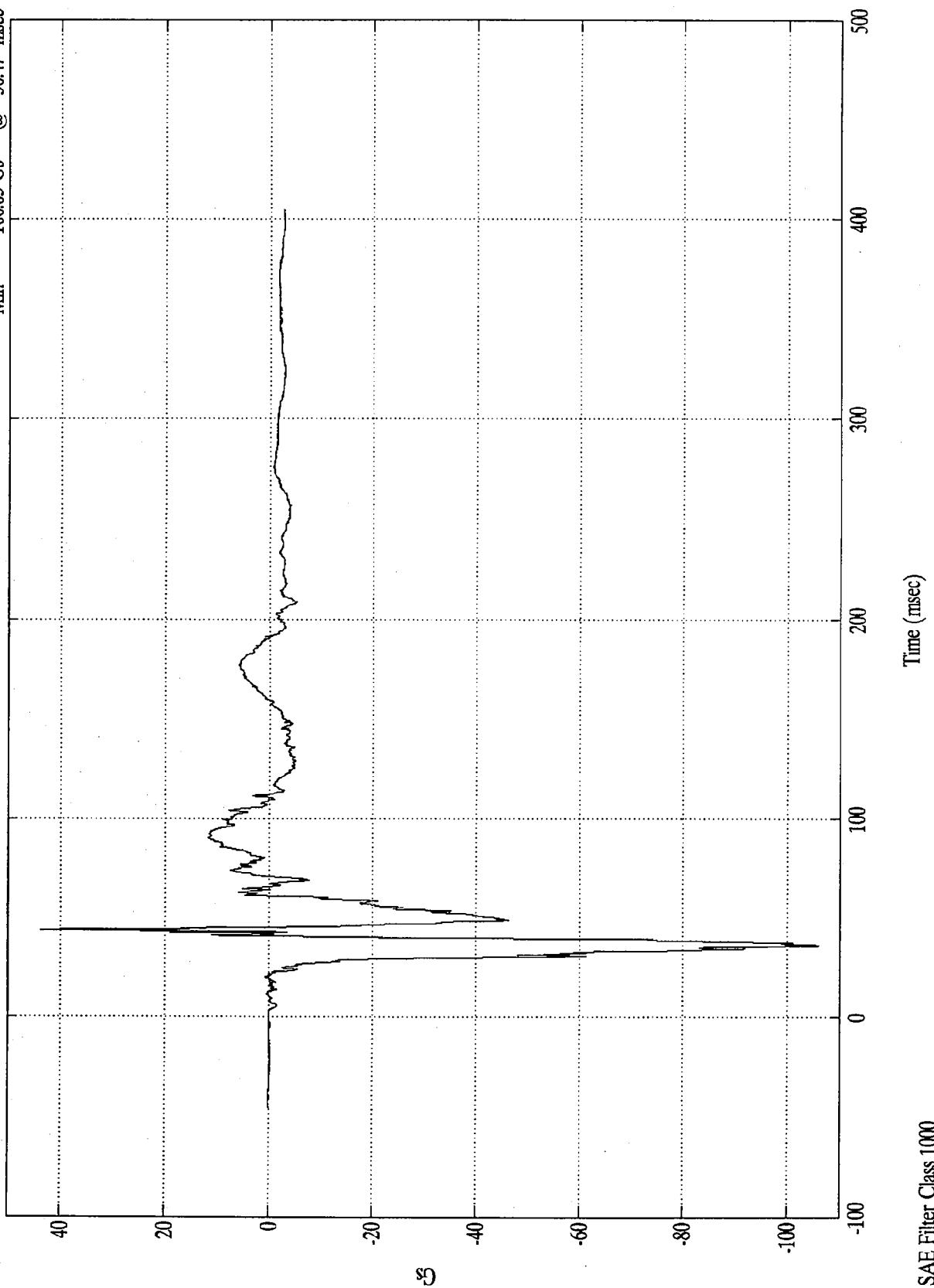
Pos. 2 Right Foot Z

Max = 69.22 Gs @ 41.76 msec
Min = -103.41 Gs @ 42.24 msec



Pos. 2 Right Foot X

Max = 43.80 Gs @ 44.04 msec
Min = -106.03 Gs @ 36.47 msec

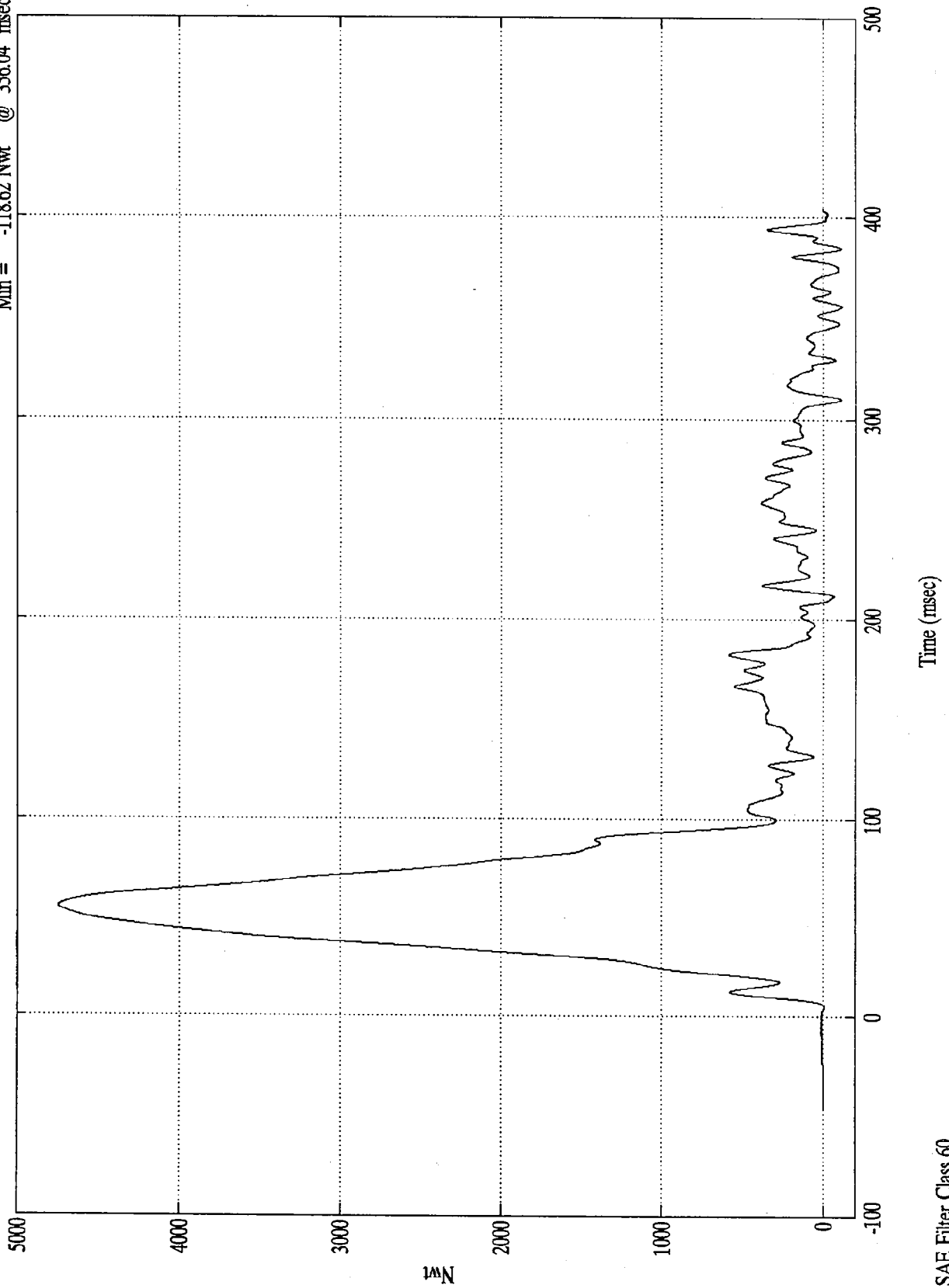


§

NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Right Belt Load

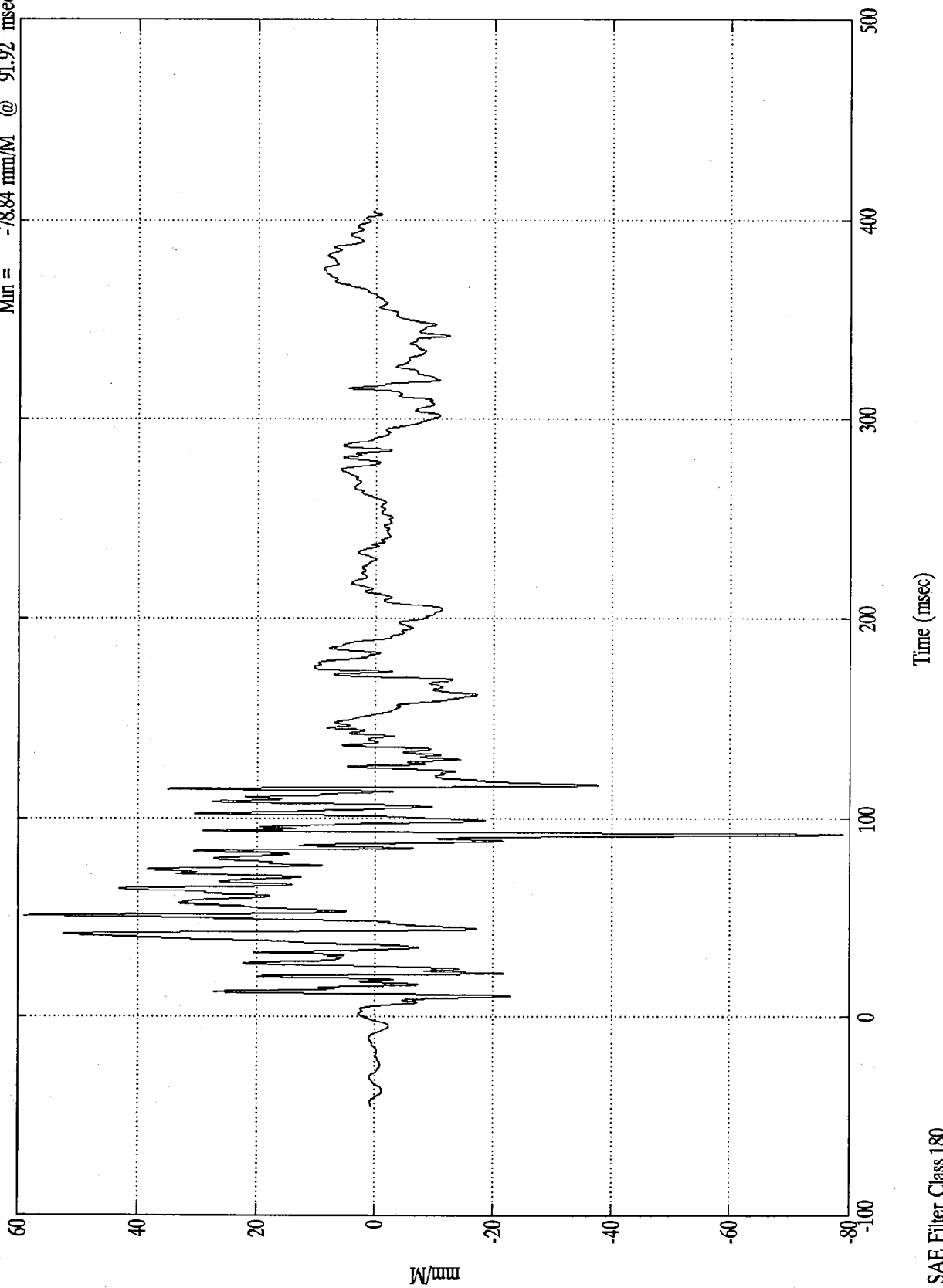
Max = 4745.58 Nwt @ 54.47 msec
Min = -118.62 Nwt @ 356.04 msec



NCAP TEST #14 - 1997 VOLVO 960

Pos. 2 Belt Elongation

Max = 59.14 mm/M @ 50.76 msec
Min = -78.84 mm/M @ 91.92 msec



NHTSA TEST NO. MV5900

VEHICLE DATA

Acceleration

Velocity

Displacement

FILTER CHANNEL CLASS

60

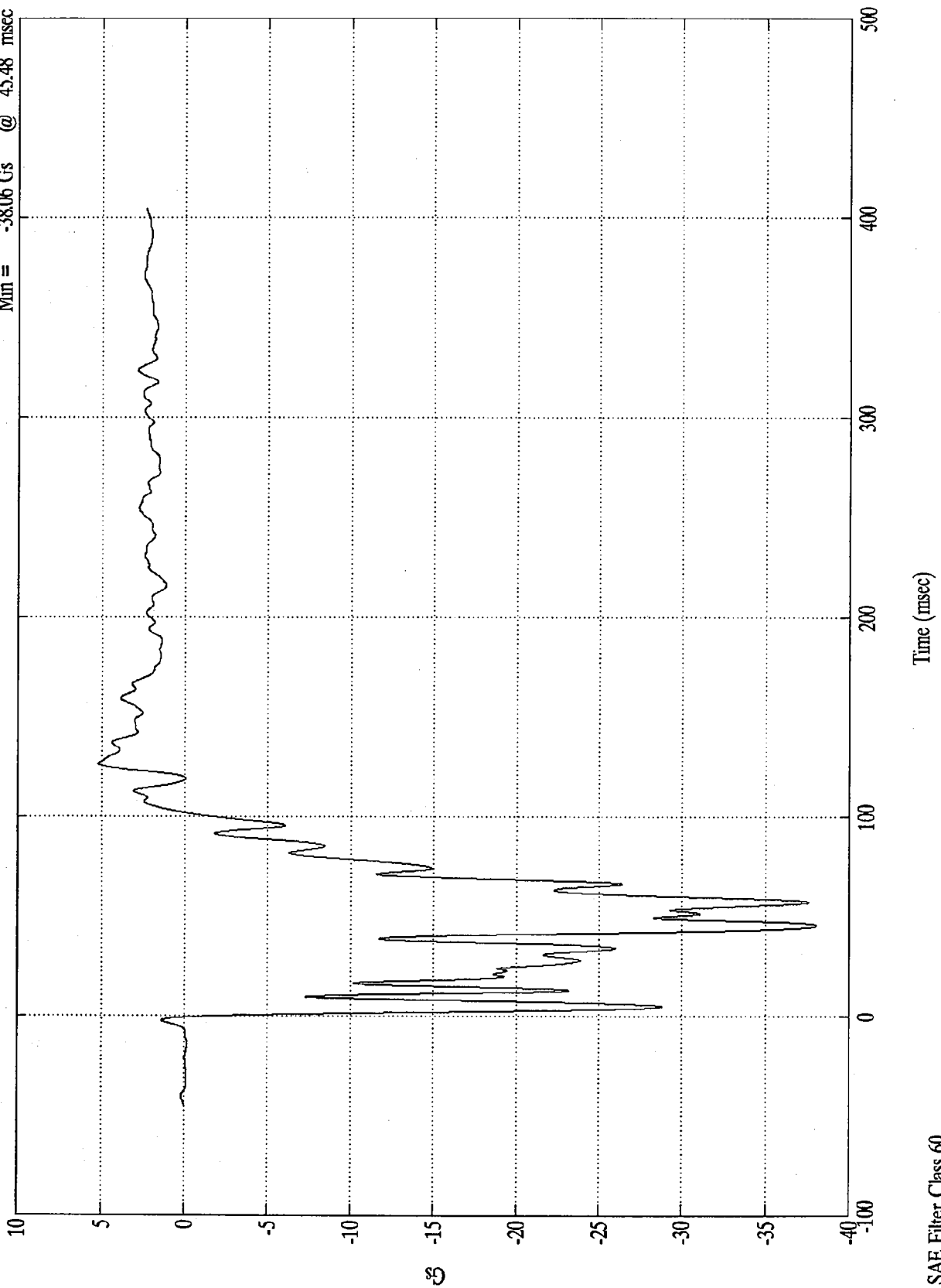
180

180

NCAP TEST #14 - 1997 VOLVO 960

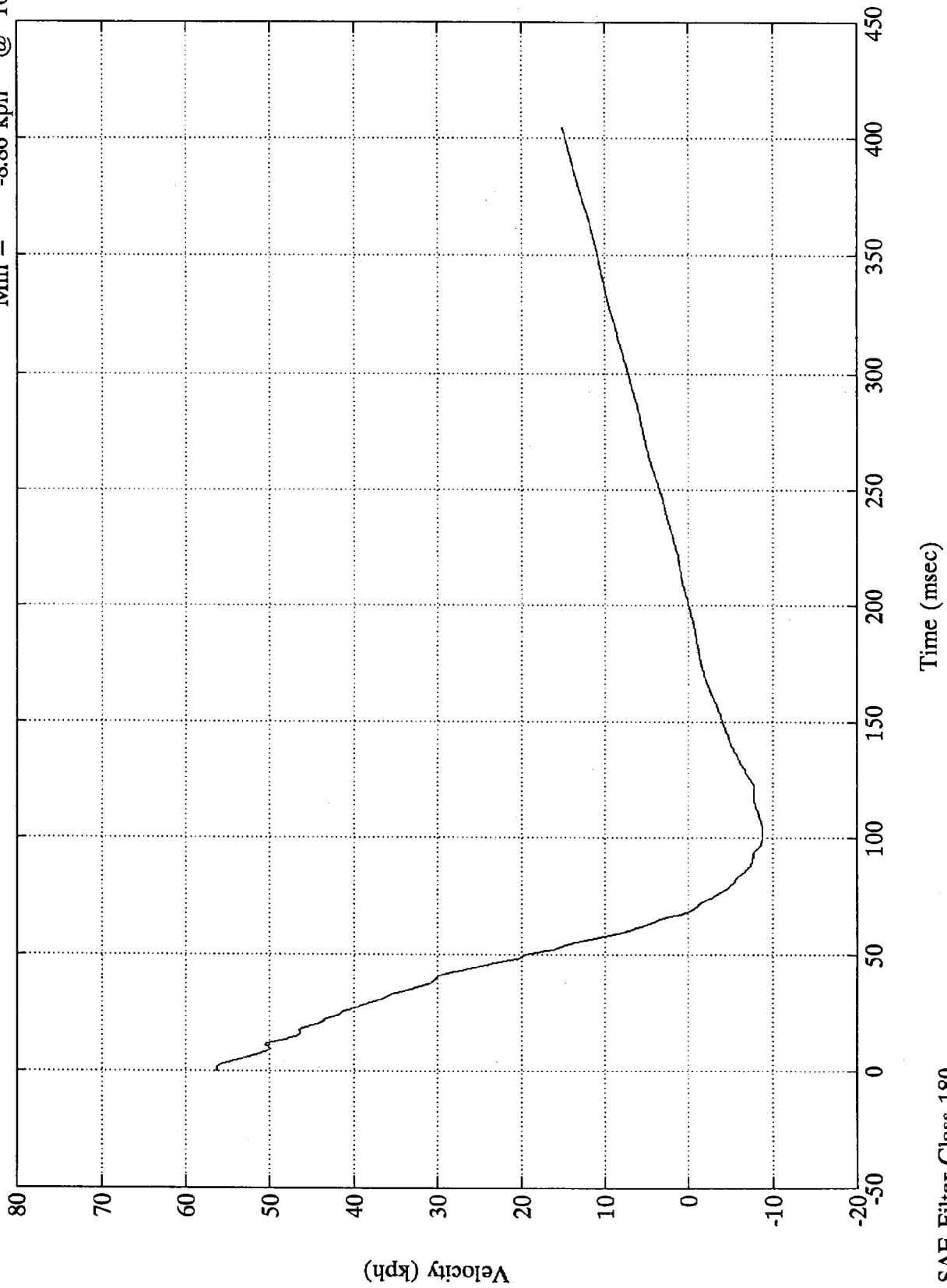
Max = 5.17 Gs @ 126.59 msec
Min = -38.06 Gs @ 45.48 msec

Acc. #1(x)



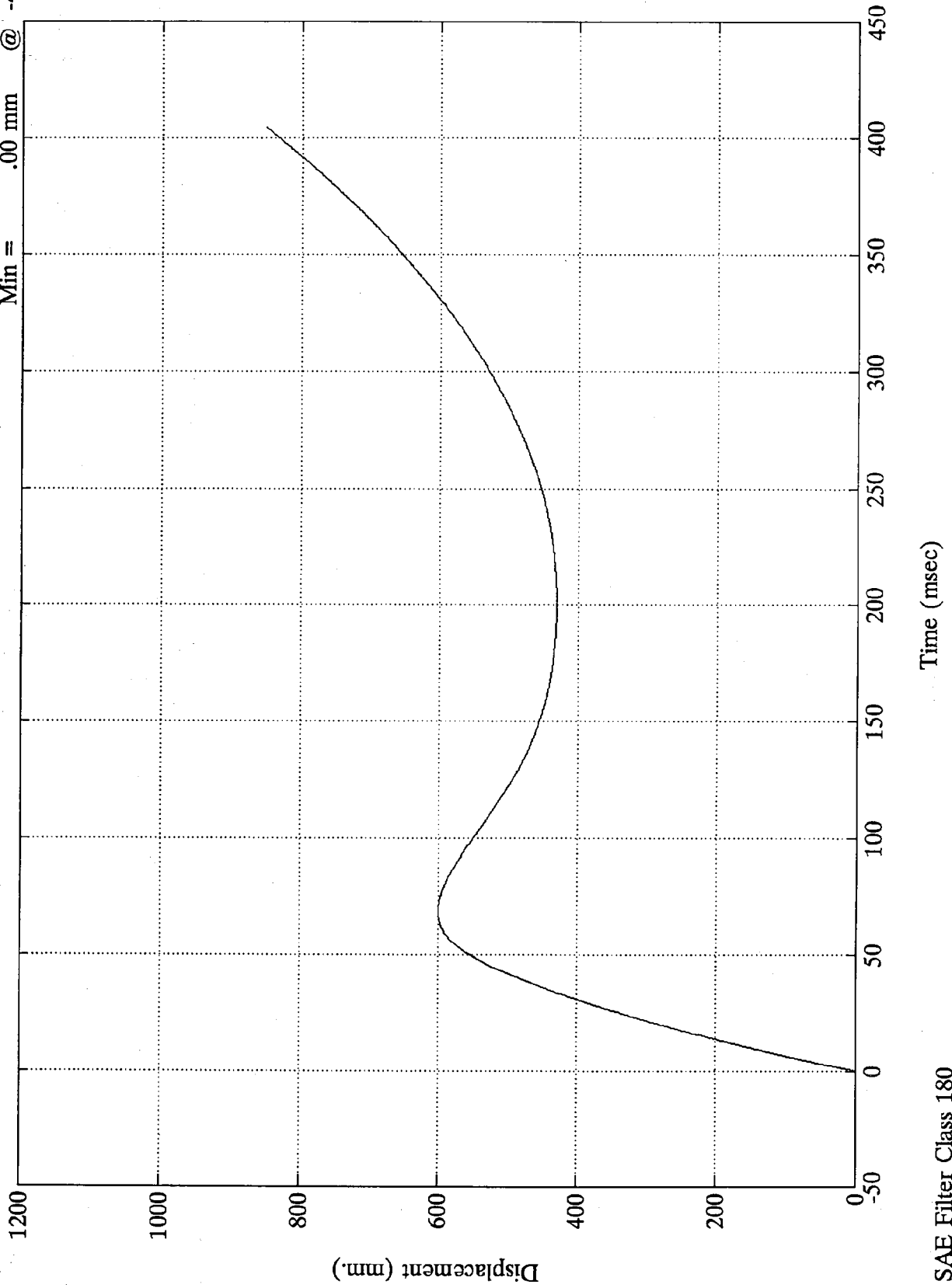
NCAP TEST #14 - 1997 VOLVO 960

Acc. #1(x) Max = 56.35 kph @ 1.07 msec
Min = -8.86 kph @ 102.24 msec



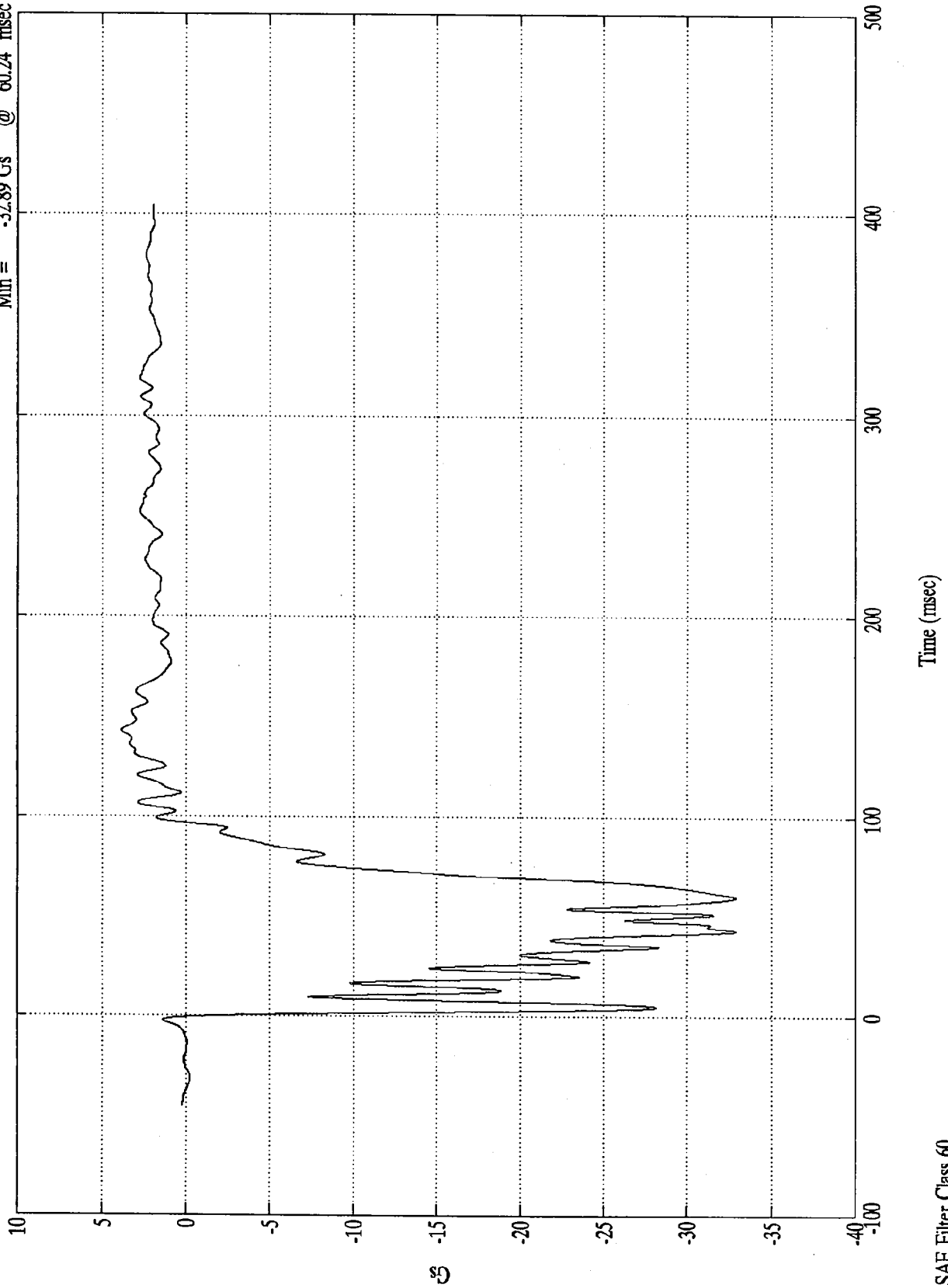
NCAP TEST #14 - 1997 VOLVO 960

Acc. #1(x)
Max = 853.17 mm @ 404.88 msec
Min = .00 mm @ -44.88 msec



NCAP TEST #14 - 1997 VOLVO 960

Acc. #2(x) Max = 3.83 Gs @ 142.32 msec
Min = -32.89 Gs @ 60.24 msec



B-100

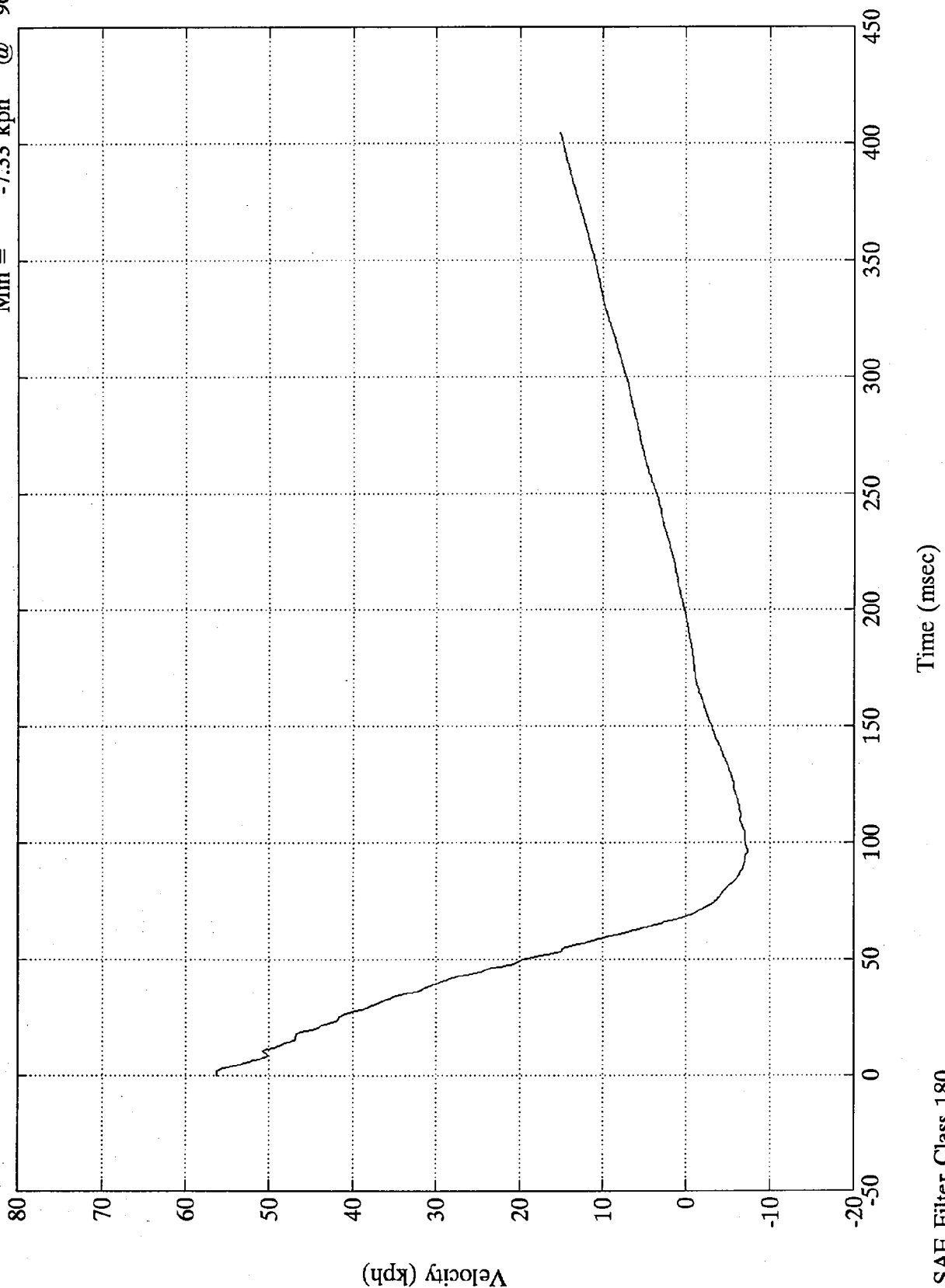
8313-14

SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

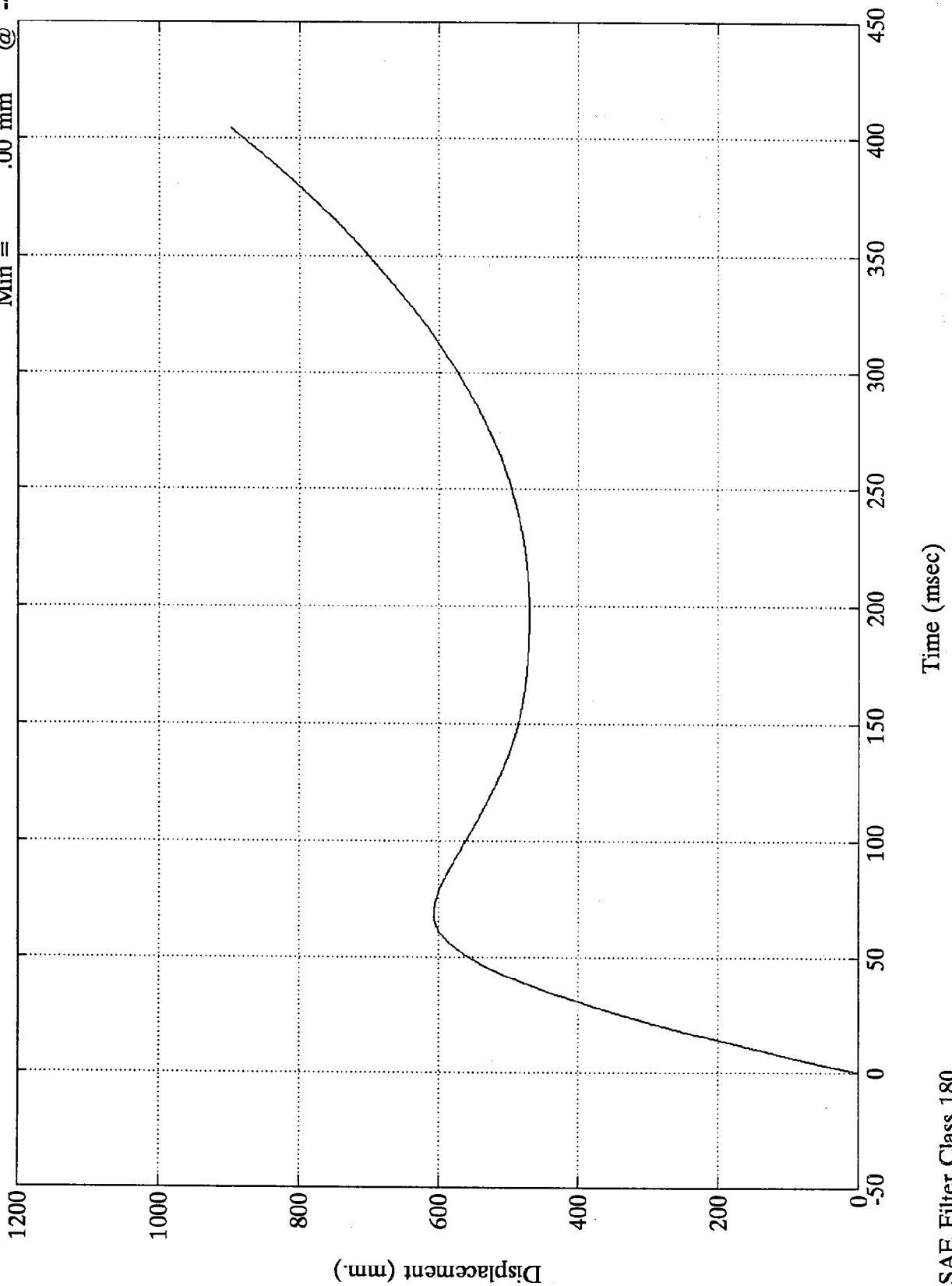
Max = 56.35 kph @ 1.07 msec
Min = -7.33 kph @ 96.11 msec

Acc. #2(x)



NCAP TEST #14 - 1997 VOLVO 960

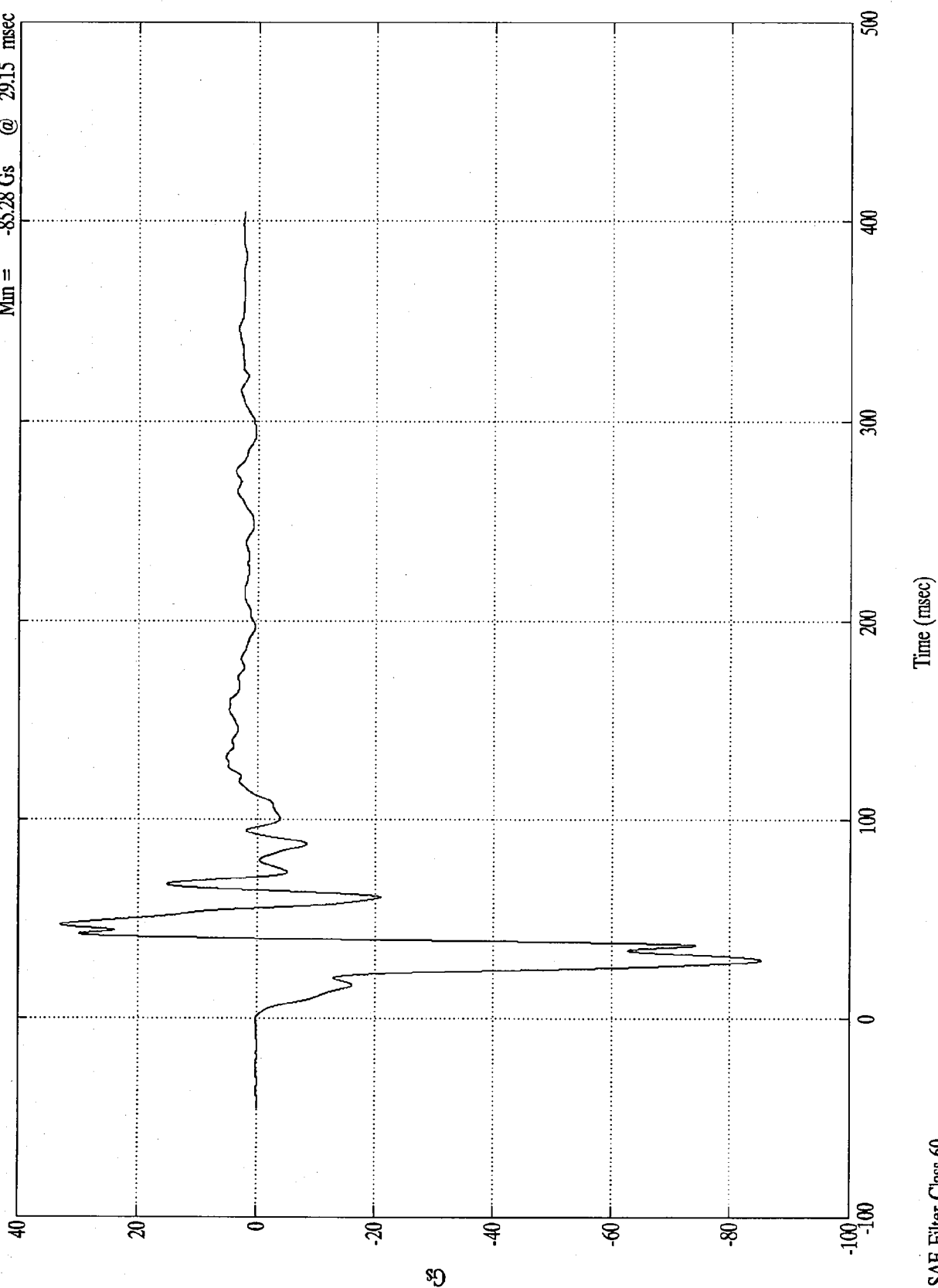
Acc. #2(x) Max = 900.35 mm @ 404.88 msec
Min = .00 mm @ -44.88 msec



NCAP TEST #14 - 1997 VOLVO 960

Acc. #4(x)

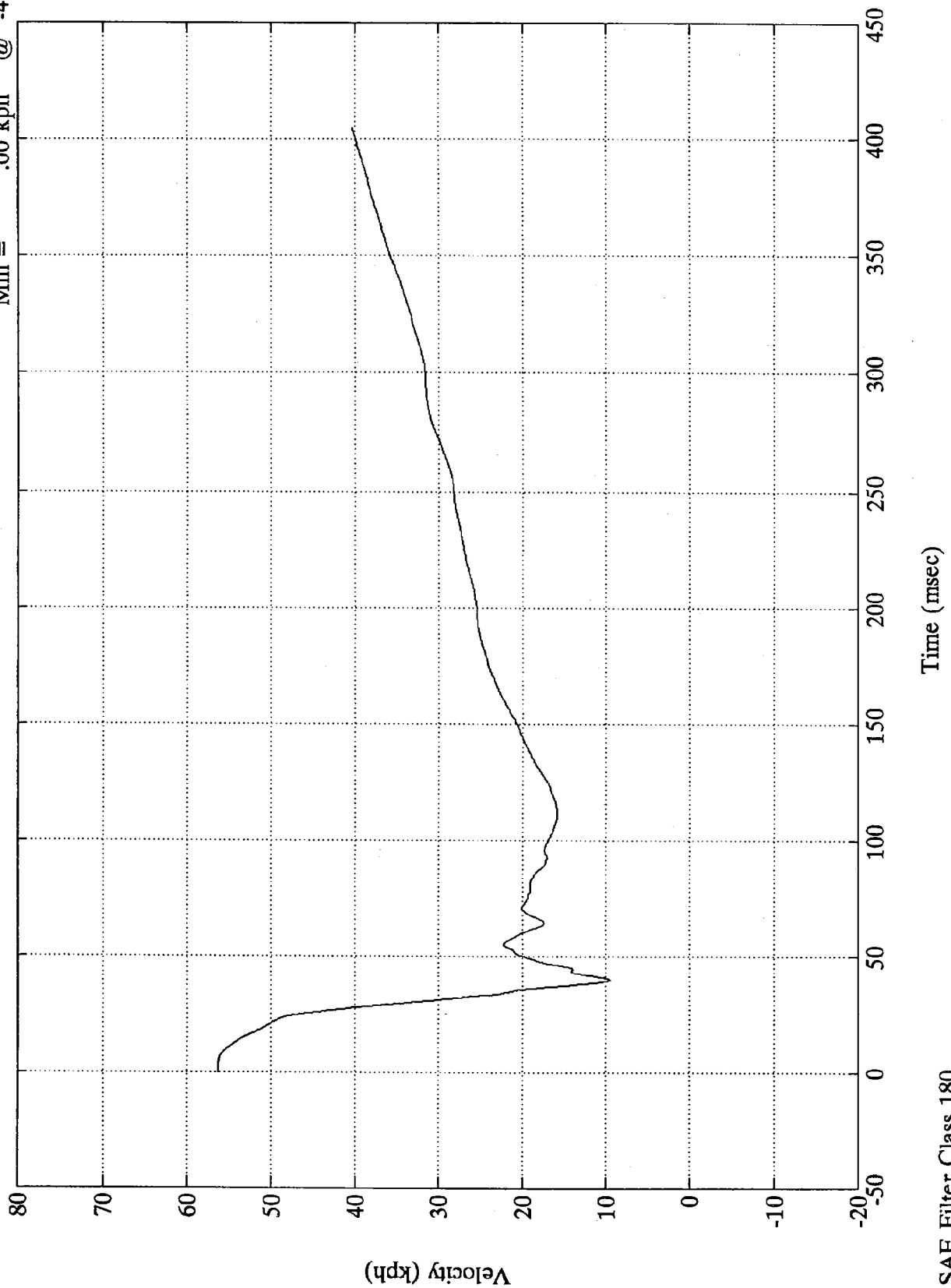
Max = 32.90 Gs @ 46.68 msec
Min = -85.28 Gs @ 29.15 msec



g

NCAP TEST #14 - 1997 VOLVO 960

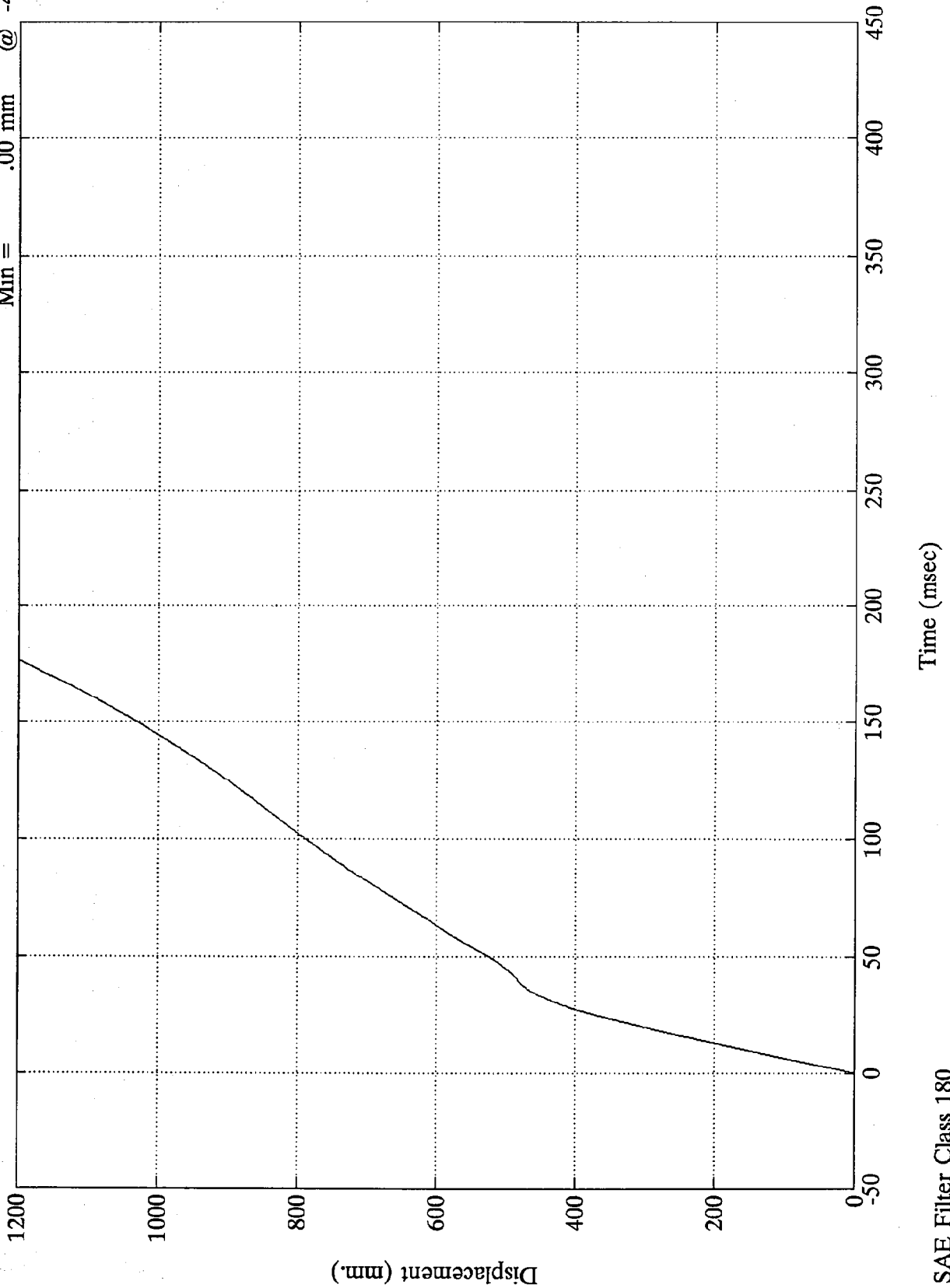
Acc. #4(x) Max = 56.33 kph @ 0.83 msec
Min = .00 kph @ -44.88 msec



NCAP TEST #14 - 1997 VOLVO 960

Acc. #4(x)

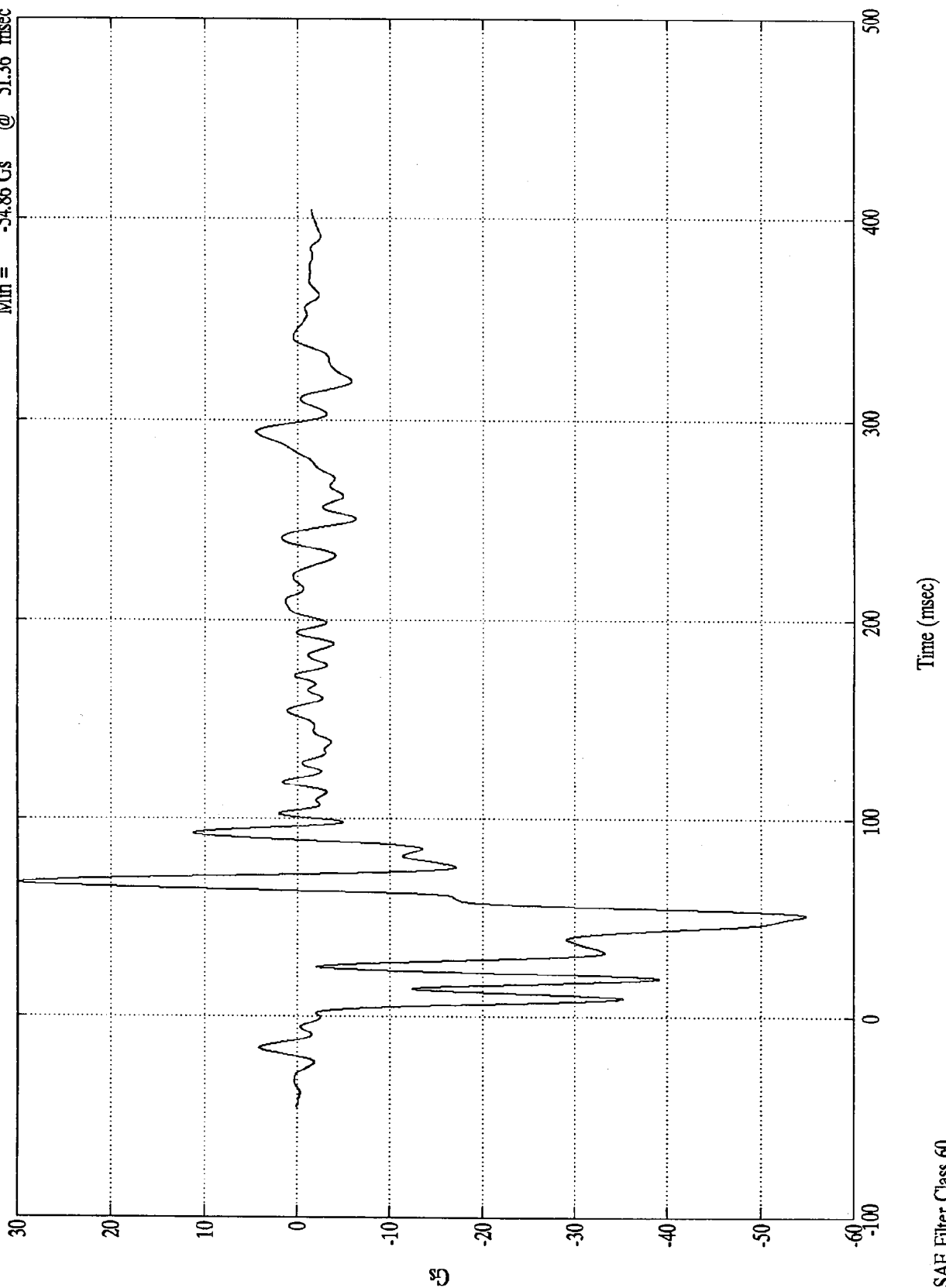
Max = 3198.67 mm @ 404.88 msec
Min = .00 mm @ -44.88 msec



NCAP TEST #14 - 1997 VOLVO 960

Max = 29.92 Gs @ 67.68 msec
Min = -54.86 Gs @ 51.36 msec

Acc. #5(x)



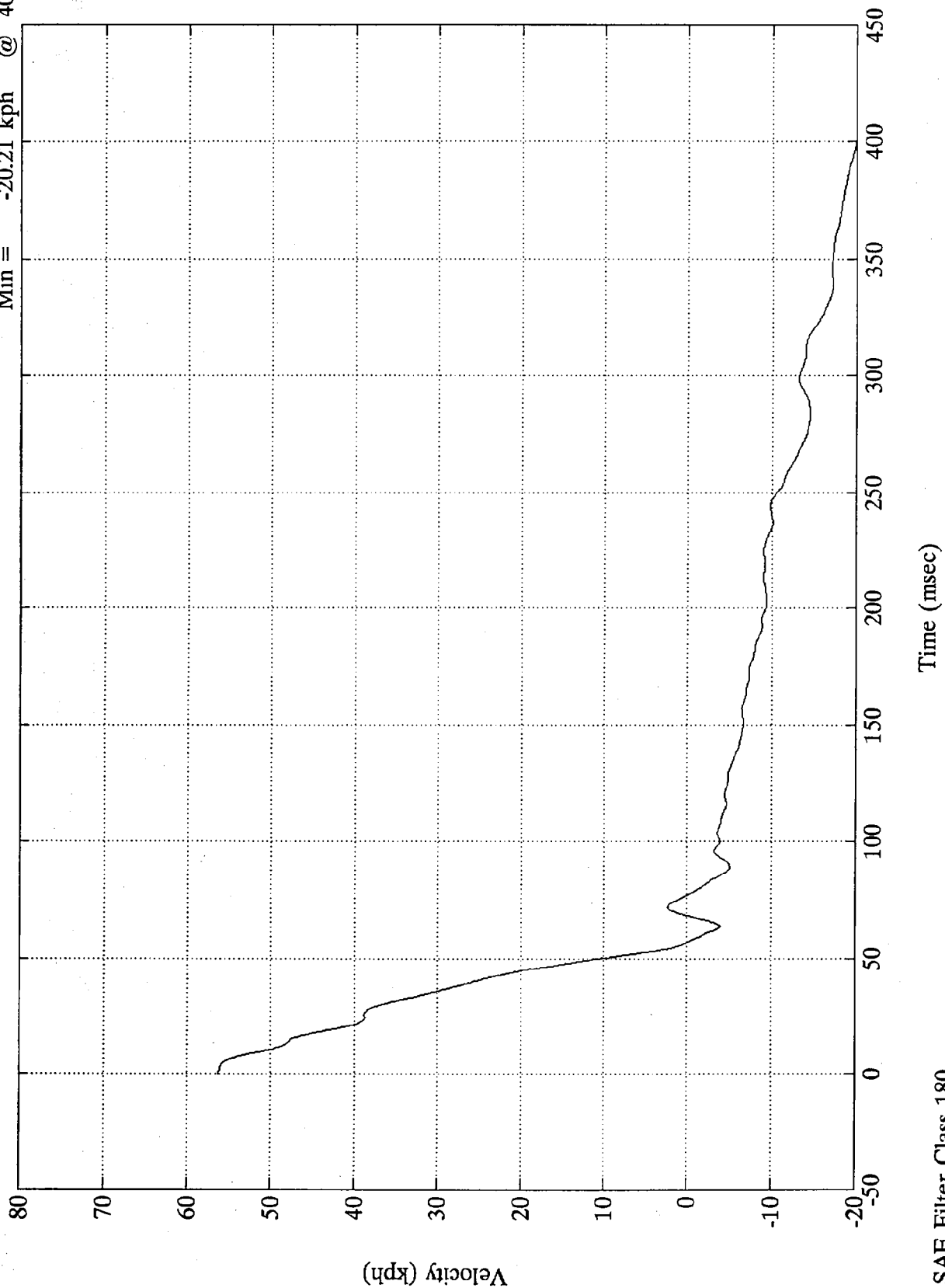
Gs

Time (msec)

SAE Filter Class 60

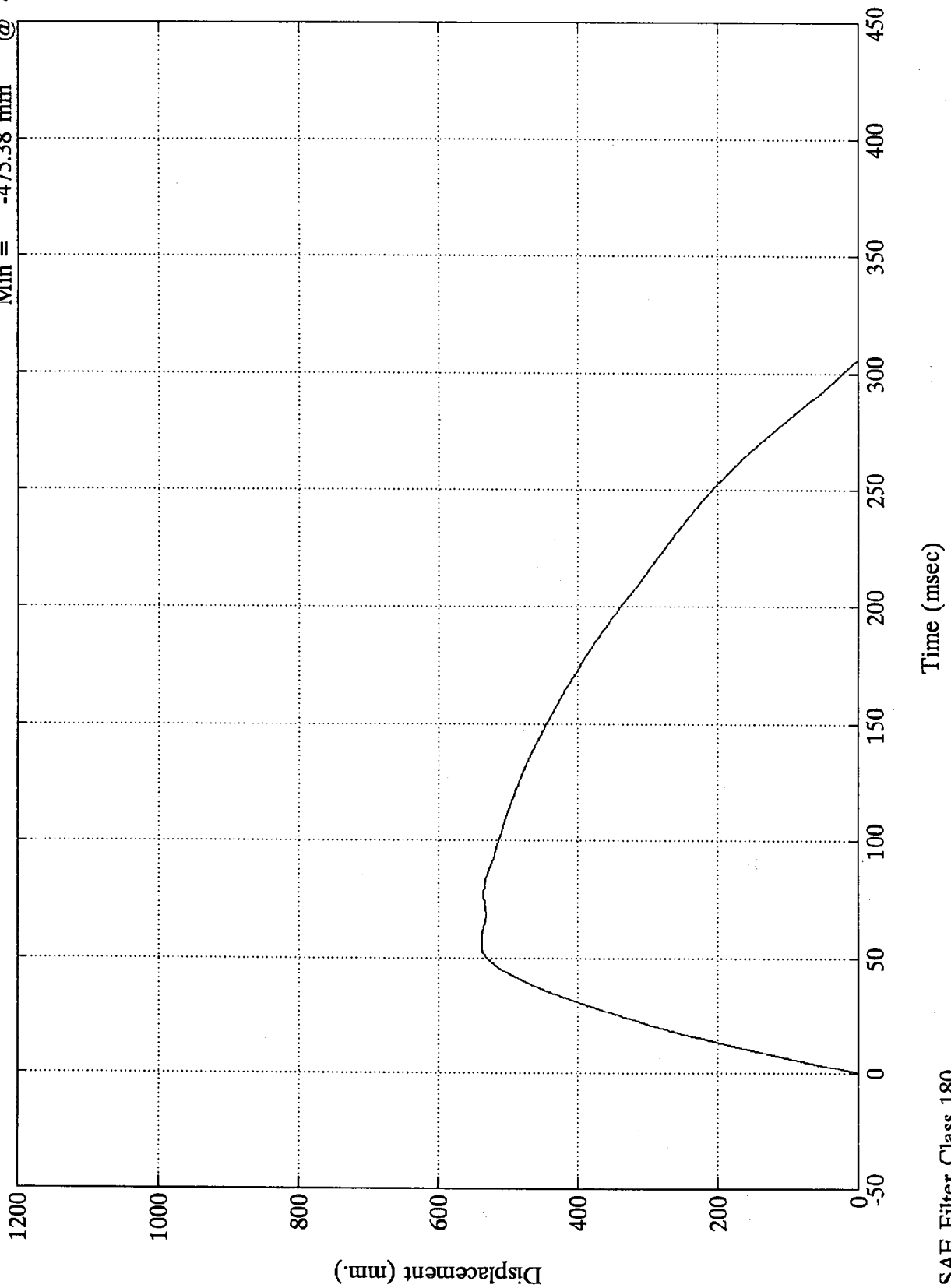
NCAP TEST #14 - 1997 VOLVO 960

Acc. #5(x)
Max = 56.33 kph @ -0.00 msec
Min = -20.21 kph @ 404.88 msec



NCAP TEST #14 - 1997 VOLVO 960

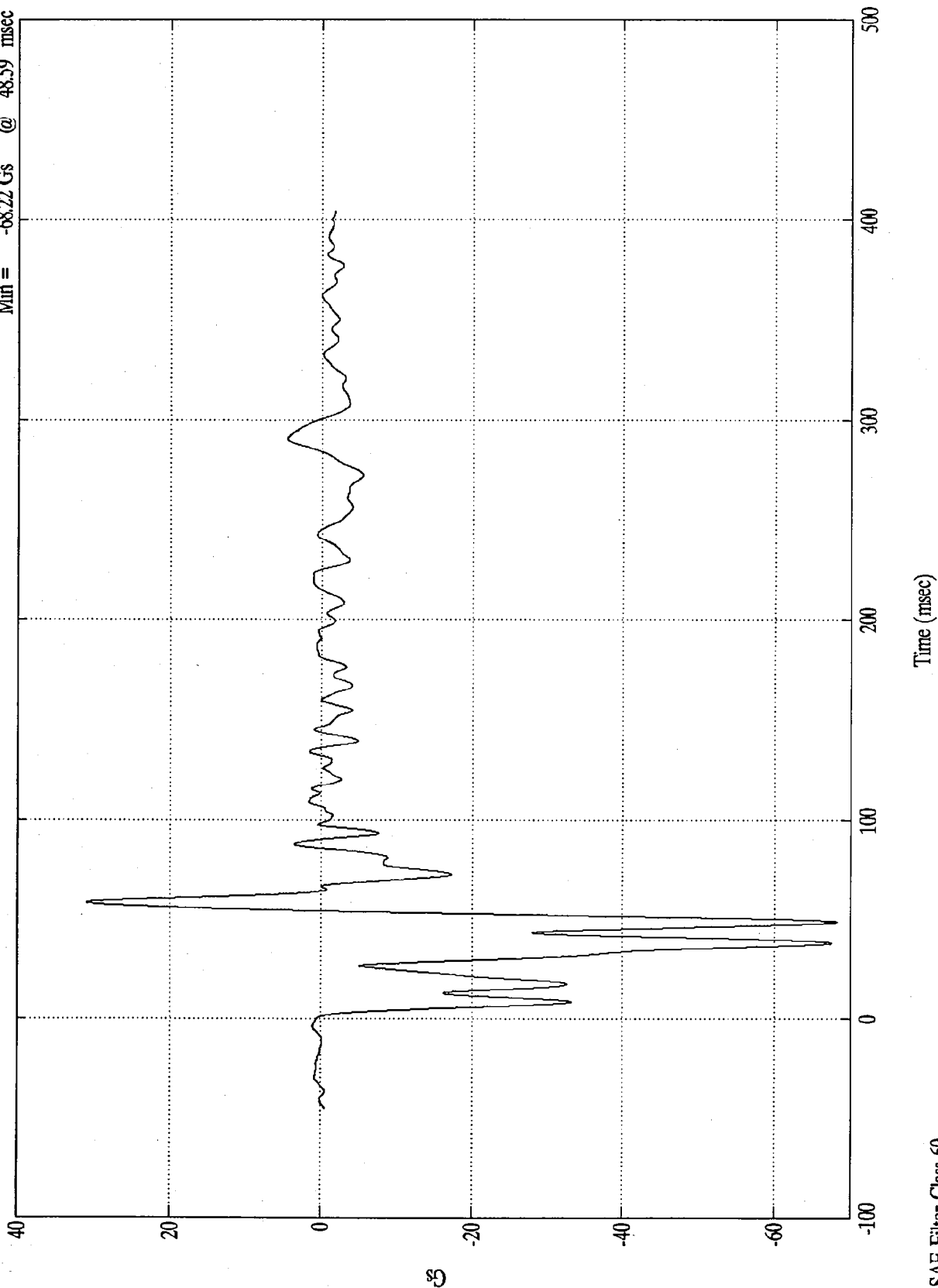
Acc. #5(x)
Max = 538.93 mm @ 56.76 msec
Min = -475.38 mm @ 404.88 msec



NCAP TEST #14 - 1997 VOLVO 960

Acc. #6(x)

Max = 30.91 Gs @ 58.31 msec
Min = -68.22 Gs @ 48.59 msec



Gs

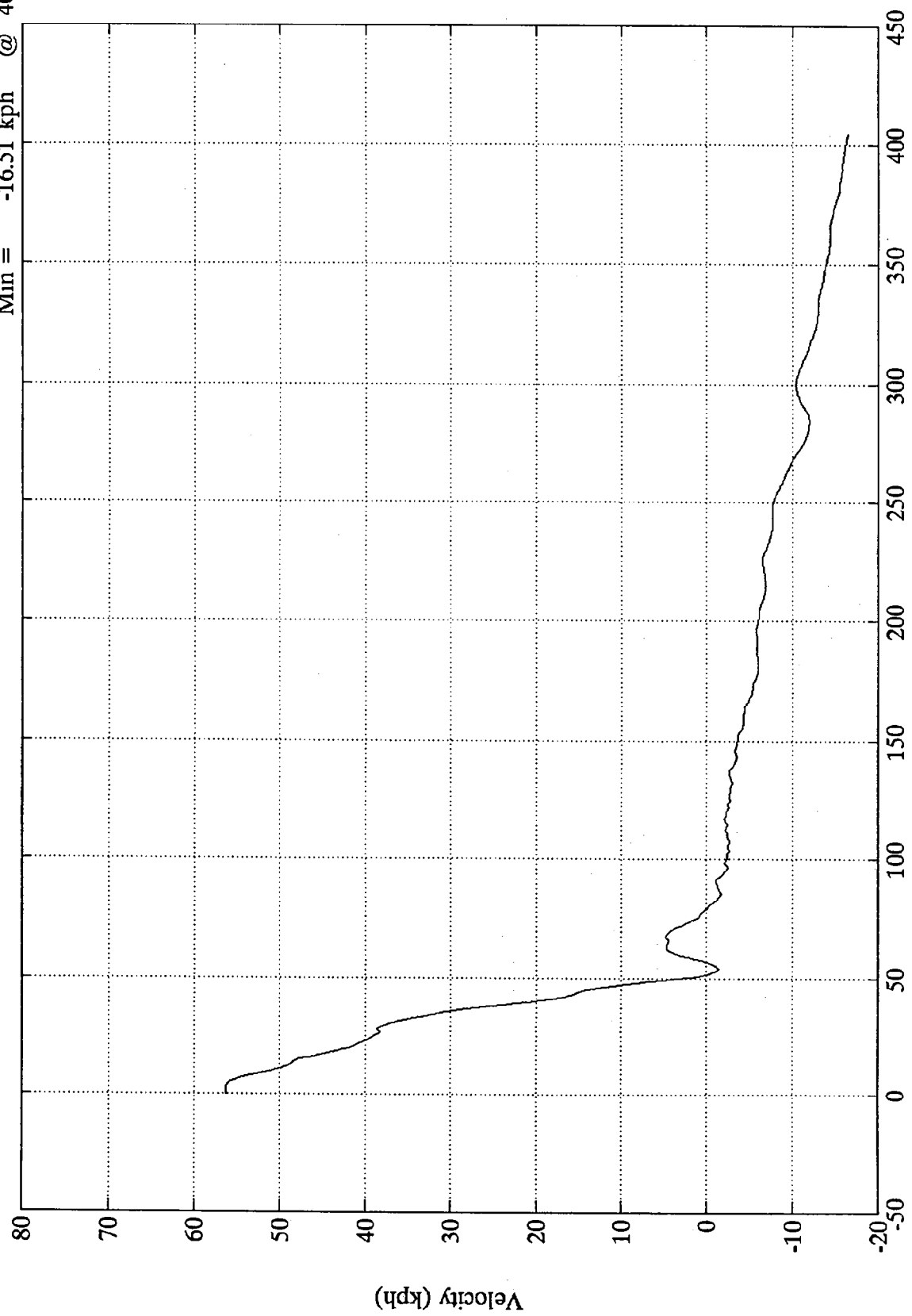
Time (msec)

SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

Max = 56.33 kph @ -0.00 msec
Min = -16.51 kph @ 404.88 msec

Acc. #6(x)



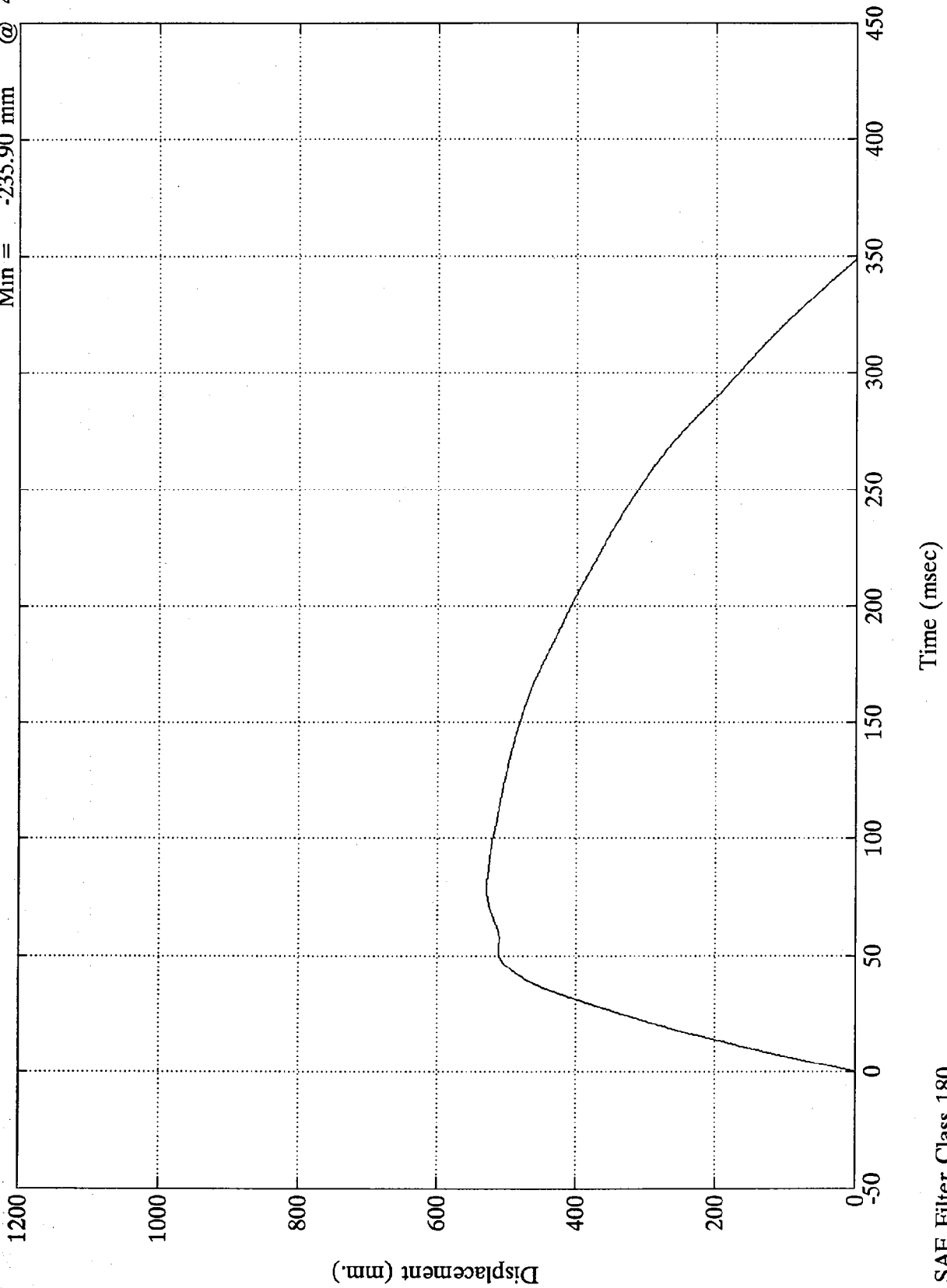
Time (msec)

SAE Filter Class 180

NCAP TEST #14 - 1997 VOLVO 960

Acc. #6(x)

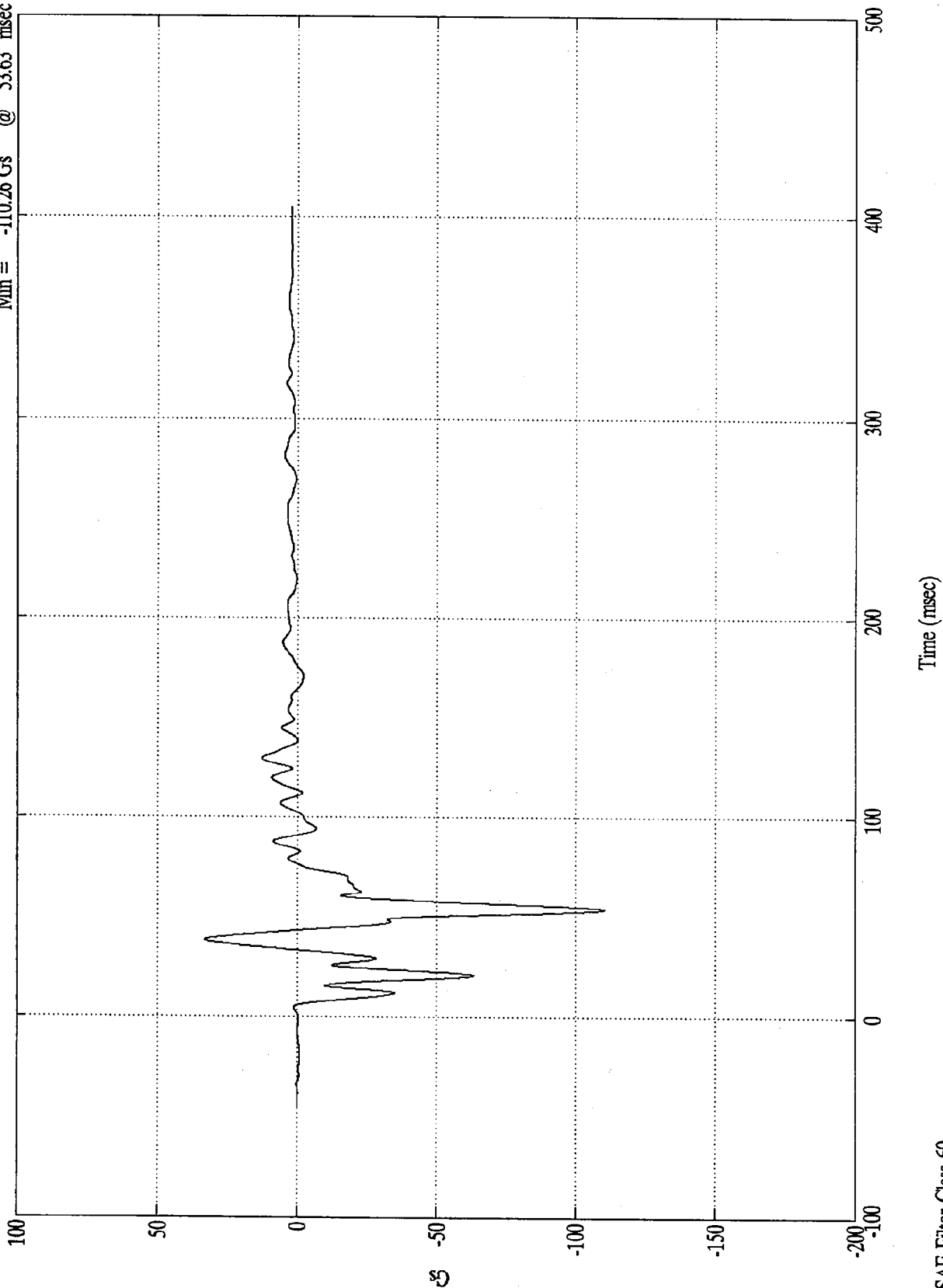
Max = 528.85 mm @ 78.96 msec
Min = -235.90 mm @ 404.88 msec



NCAP TEST #14 - 1997 VOLVO 960

Acc. #7(x)

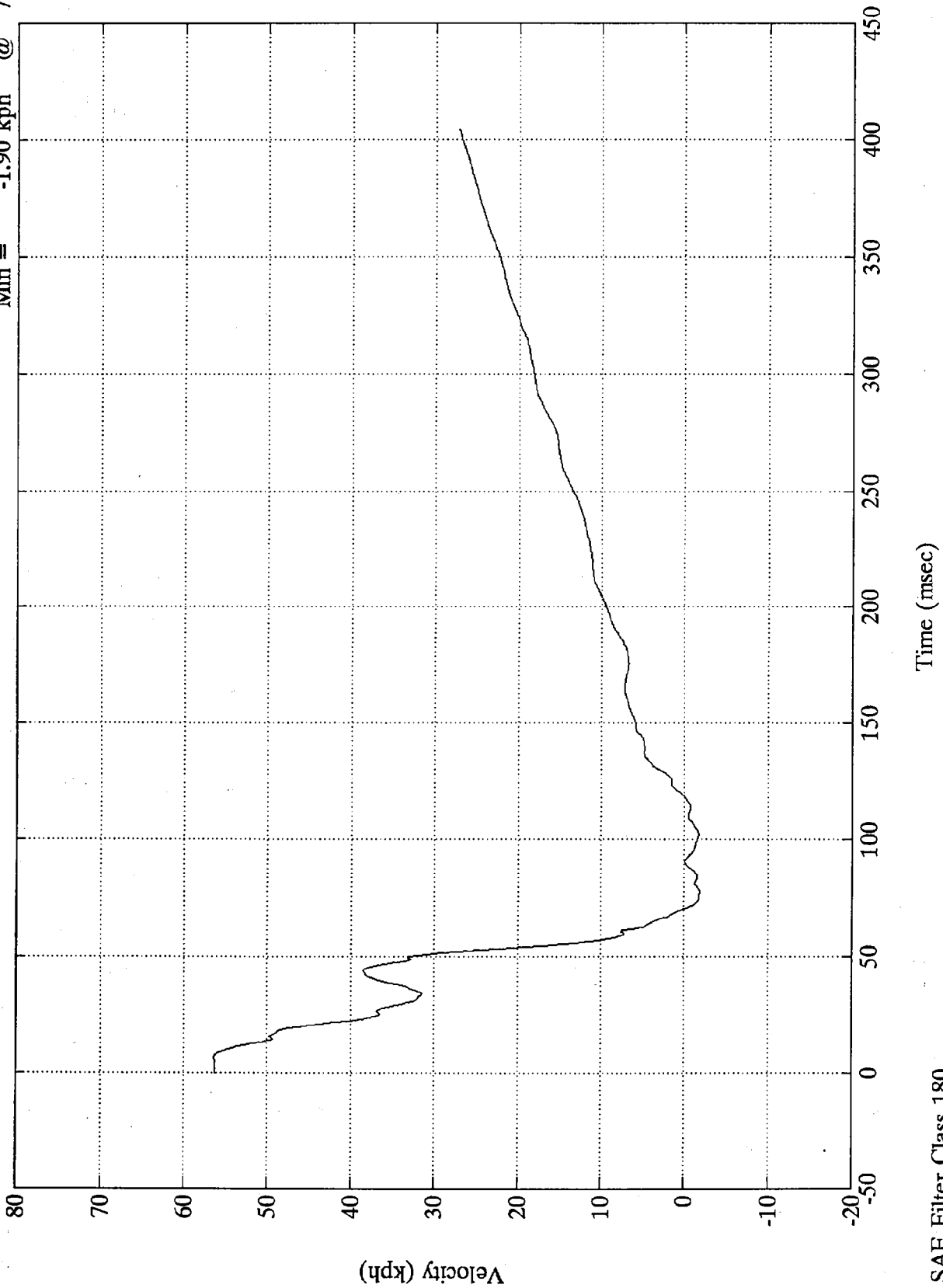
Max = 33.32 Gs @ 38.27 msec
Min = -110.26 Gs @ 53.63 msec



NCAP TEST #14 - 1997 VOLVO 960

Acc. #7(x)

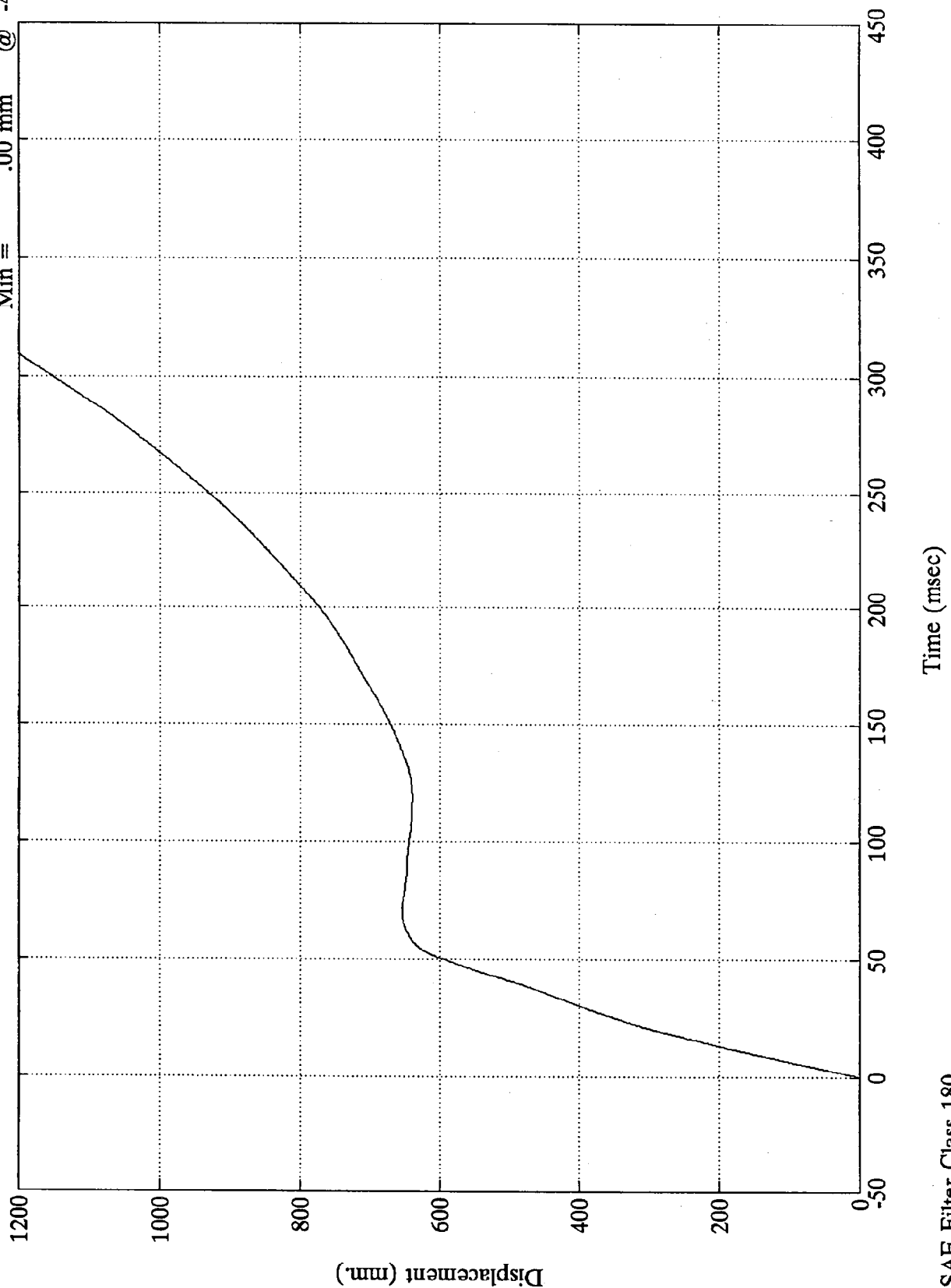
Max = 56.43 kph @ 6.83 msec
Min = -1.90 kph @ 77.39 msec



NCAP TEST #14 - 1997 VOLVO 960

Max = 1812.55 mm @ 404.88 msec
Min = .00 mm @ -44.88 msec

Acc. #7(x)

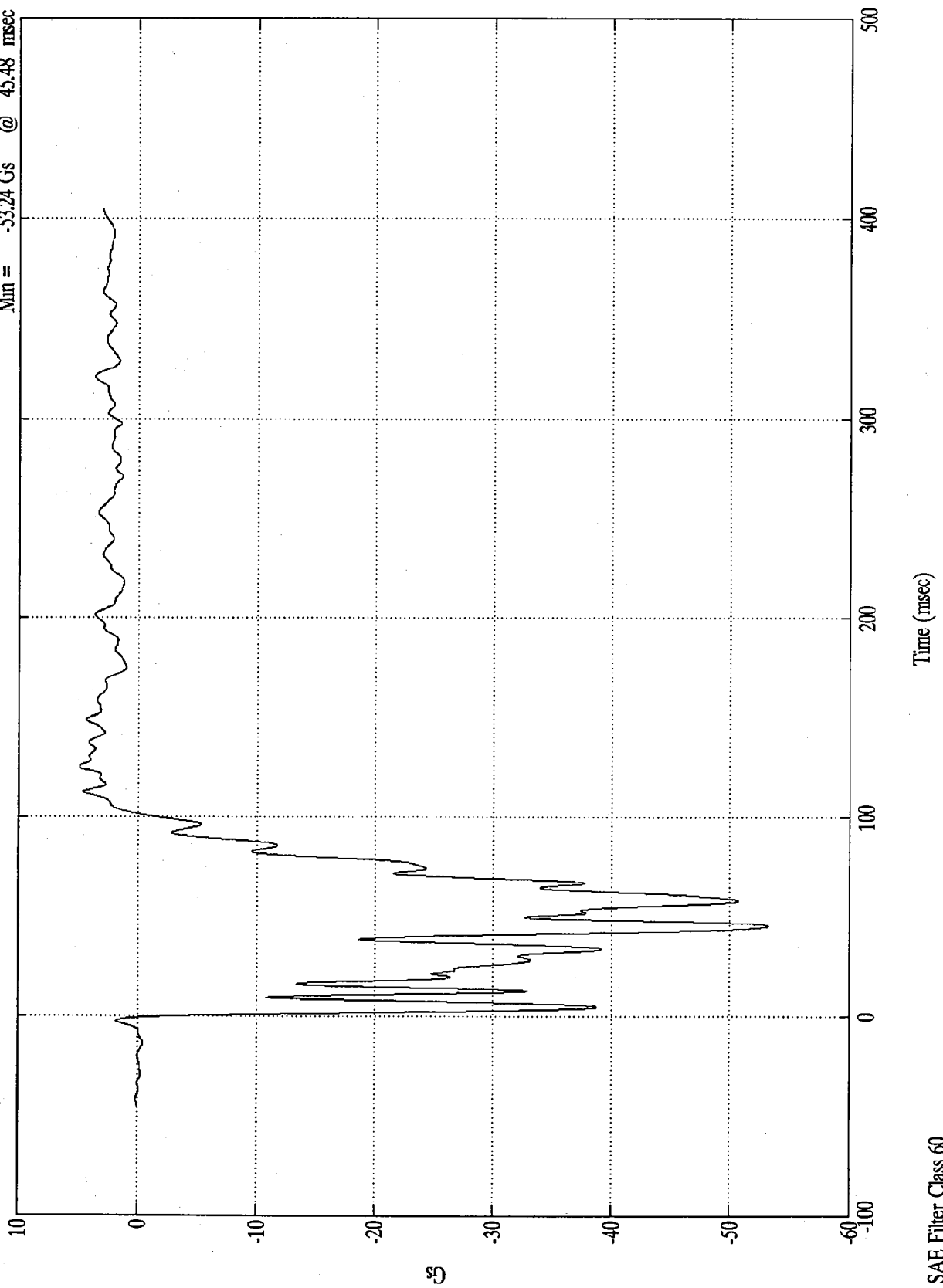


SAE Filter Class 180

NCAP TEST #14 - 1997 VOLVO 960

Acc. #8(x)

Max = 4.95 Gs @ 125.16 msec
Min = -53.24 Gs @ 45.48 msec



89

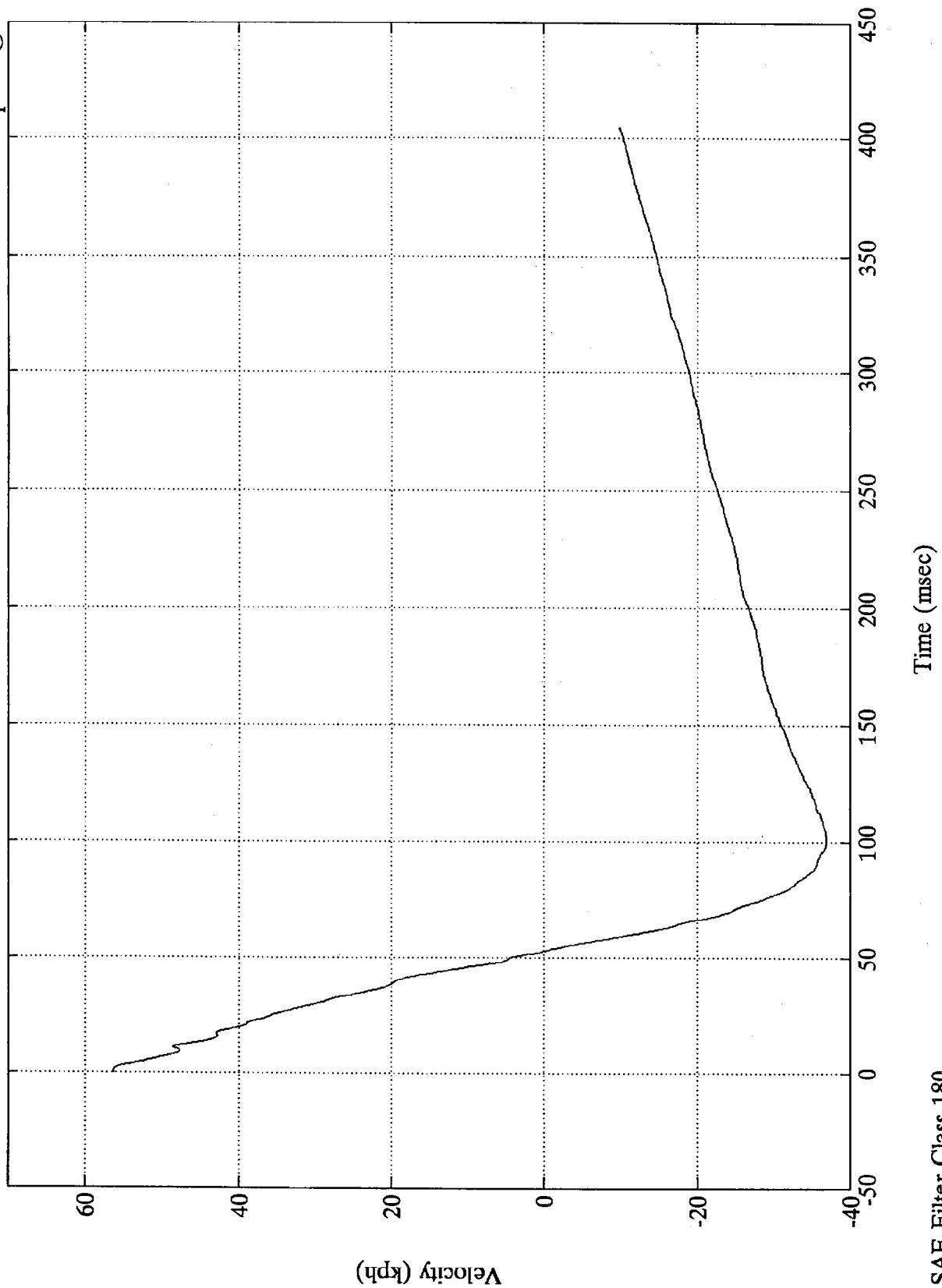
B-115

8313-14

SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

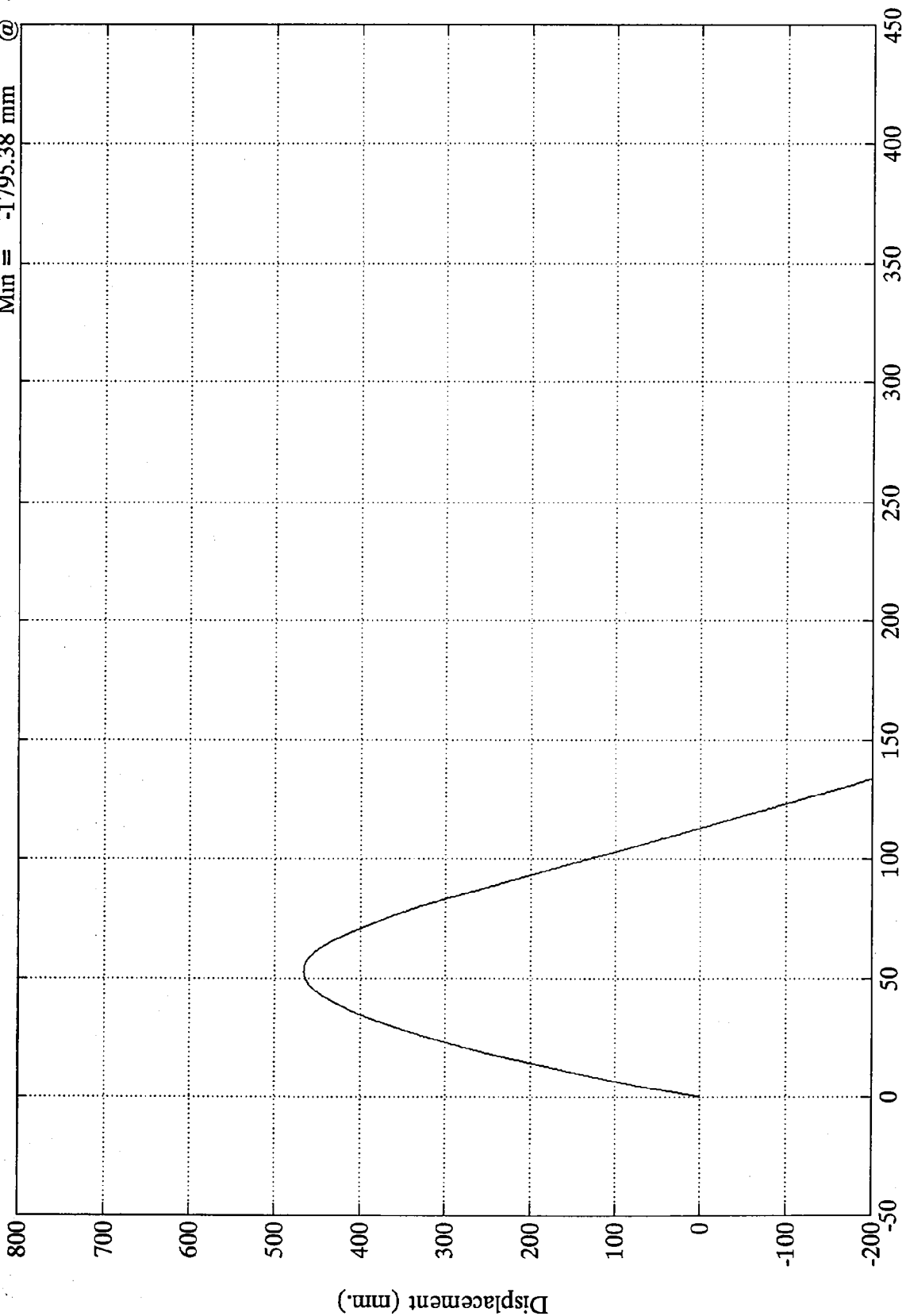
Acc. #8(x) Max = 56.35 kph @ 1.07 msec
Min = -36.93 kph @ 102.24 msec



NCAP TEST #14 - 1997 VOLVO 960

Acc. #8(x)

Max = 466.27 mm @ 52.79 msec
Min = -1795.38 mm @ 404.88 msec

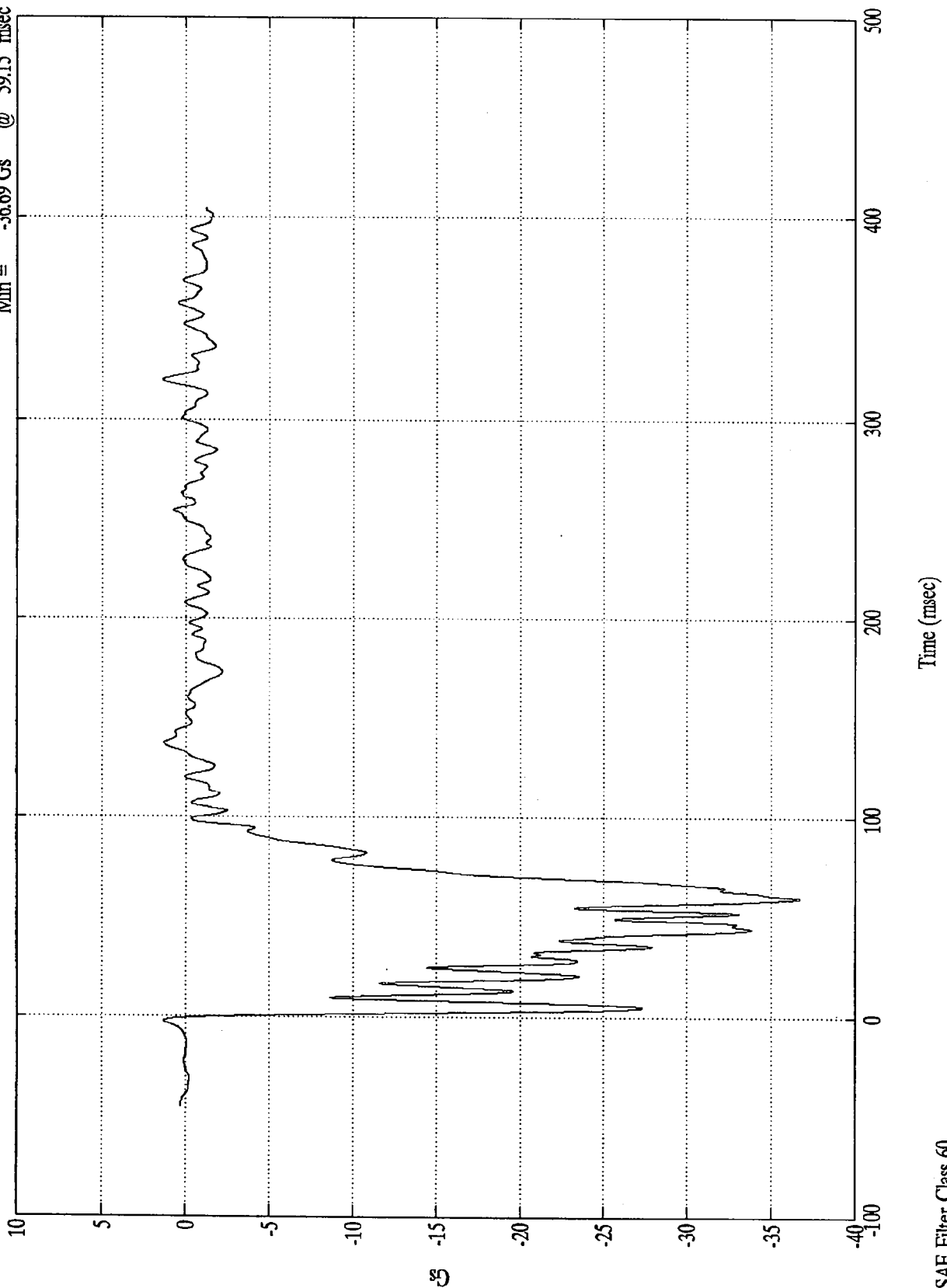


Time (msec)

SAE Filter Class 180

NCAP TEST #14 - 1997 VOLVO 960

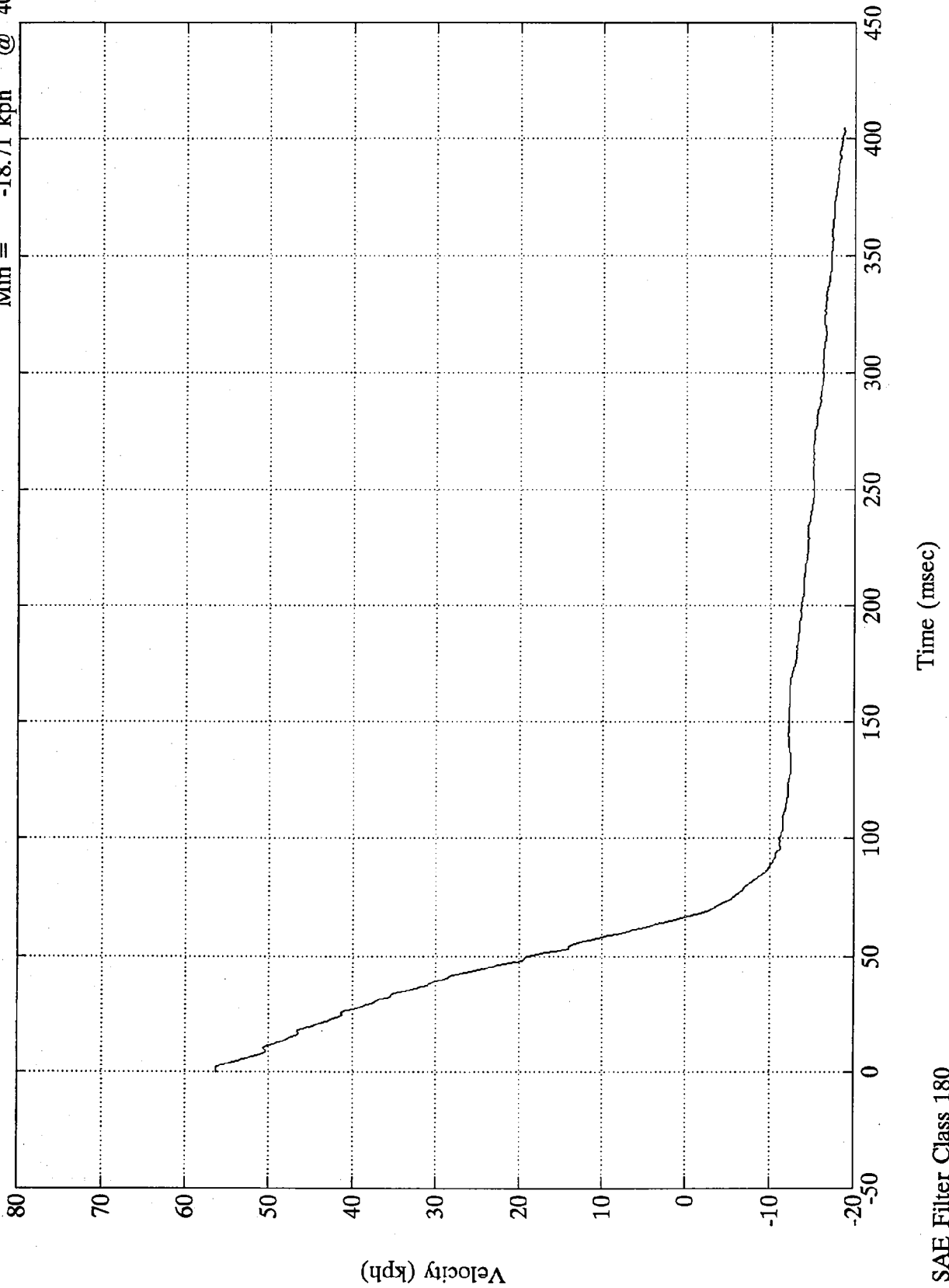
Acc. #9(x)
Max = 1.37 Gs @ 320.04 msec
Min = -36.69 Gs @ 59.15 msec



NCAP TEST #14 - 1997 VOLVO 960

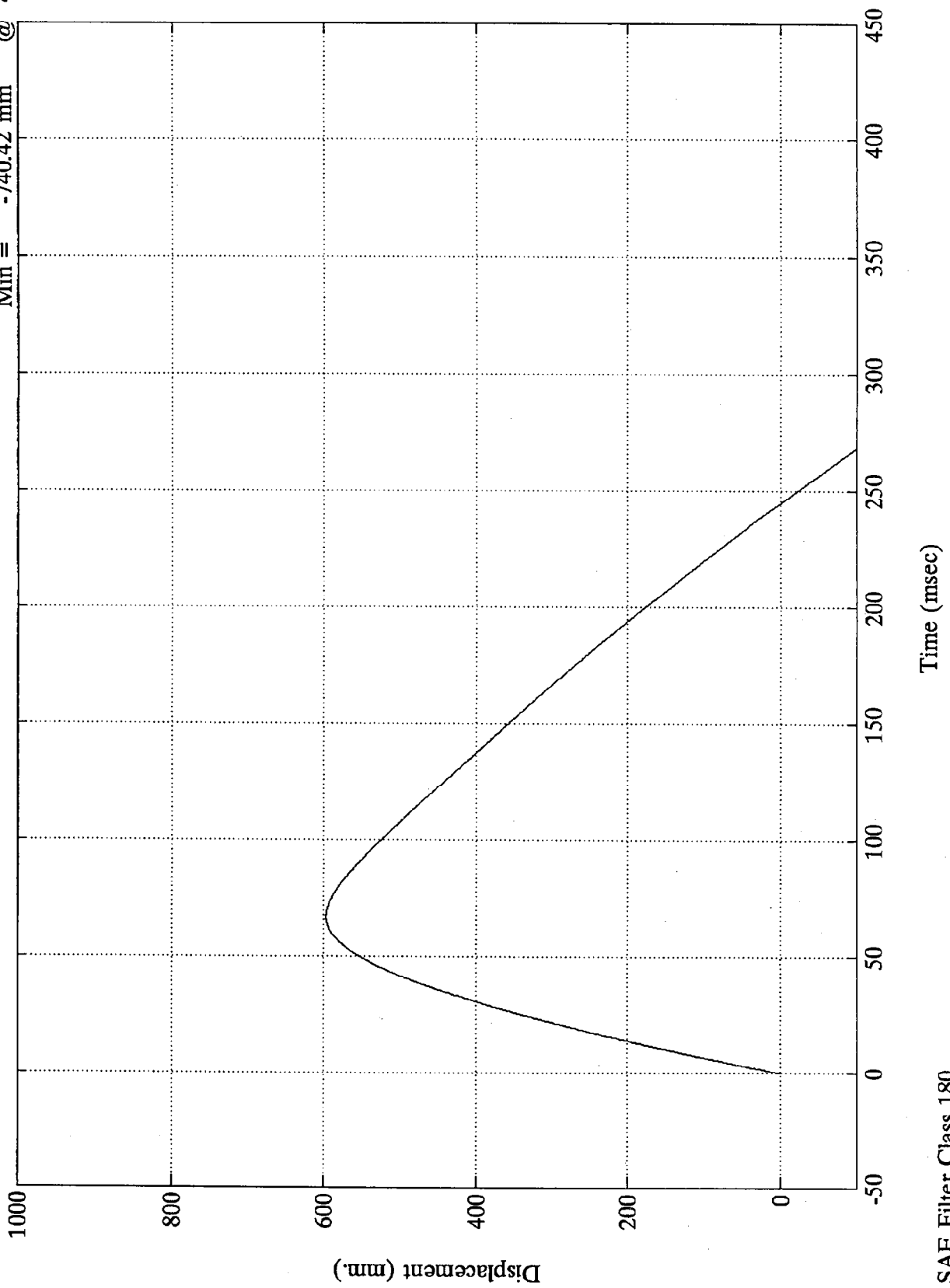
Acc. #9(x)

Max = 56.35 kph @ 1.07 msec
Min = -18.71 kph @ 403.20 msec



NCAP TEST #14 - 1997 VOLVO 960

Acc. #9(x) Max = 597.25 mm @ 66.72 msec
Min = -740.42 mm @ 404.88 msec



NHTSA TEST NO. MV5900

LOAD CELL BARRIER DATA

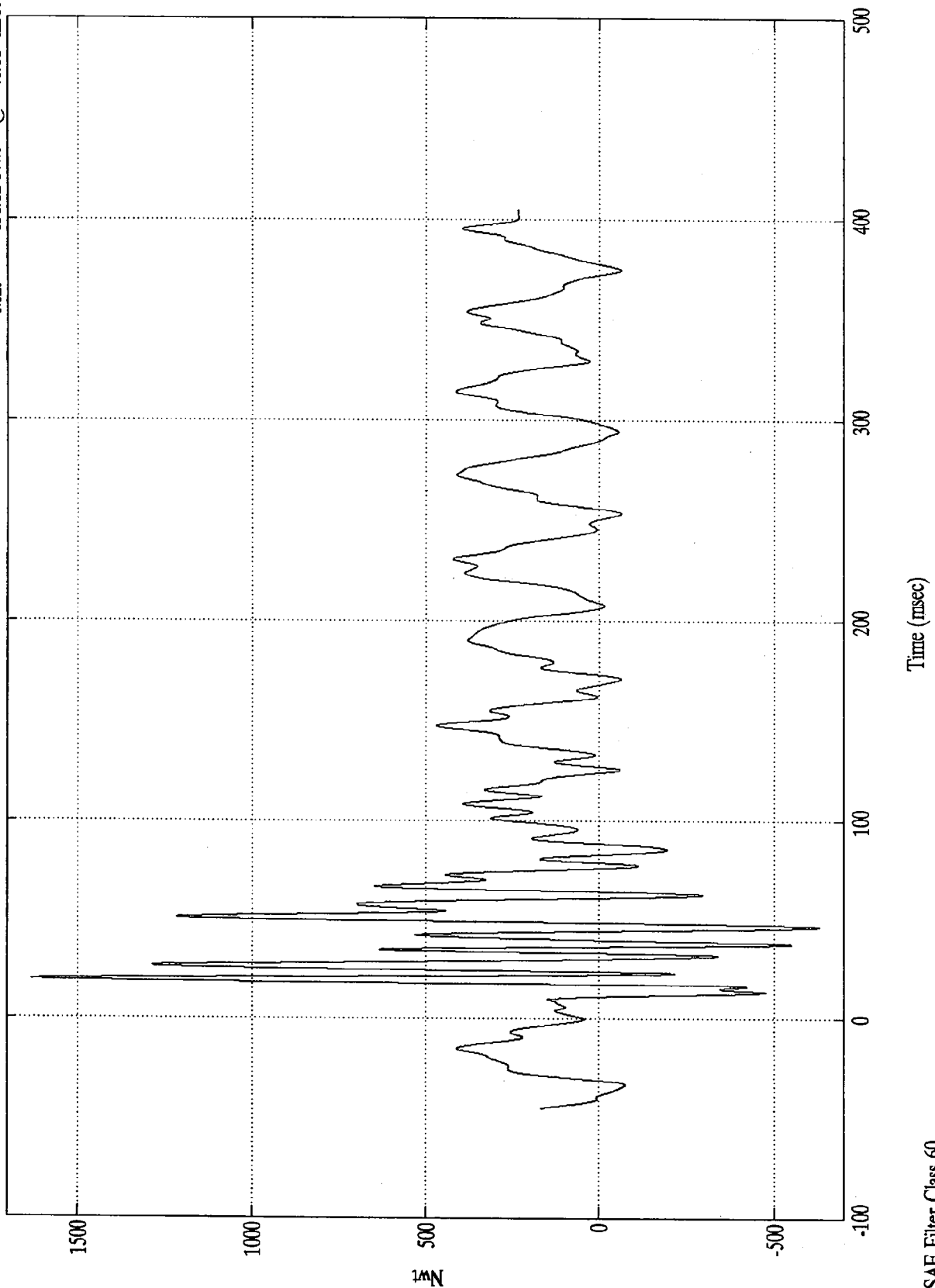
FILTER CHANNEL CLASS

60

NCAP TEST #14 - 1997 VOLVO 960

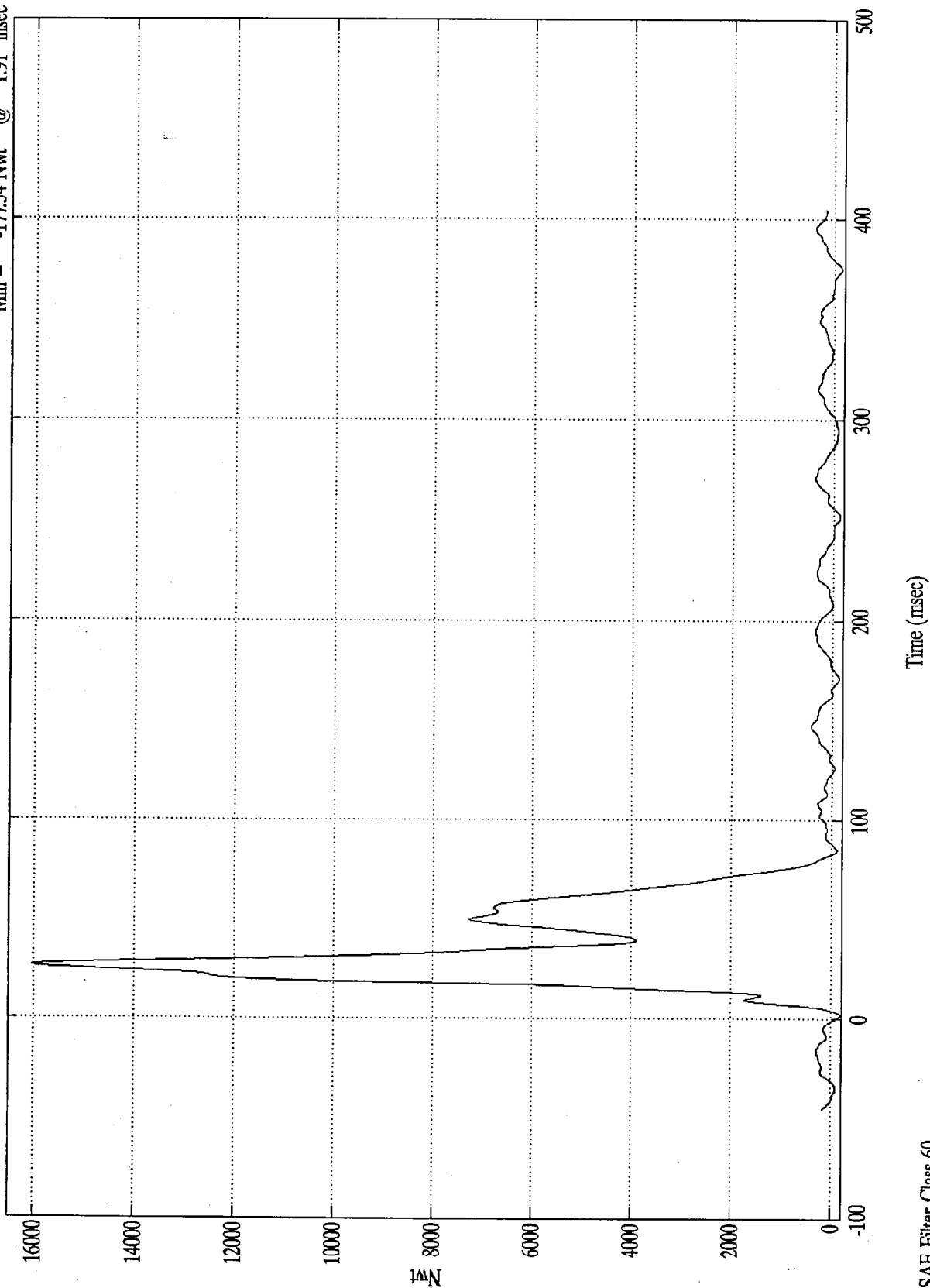
Barrier Load Cell A1

Max = 1629.88 Nwt @ 20.03 msec
Min = -630.82 Nwt @ 46.68 msec



Barrier Load Cell A2

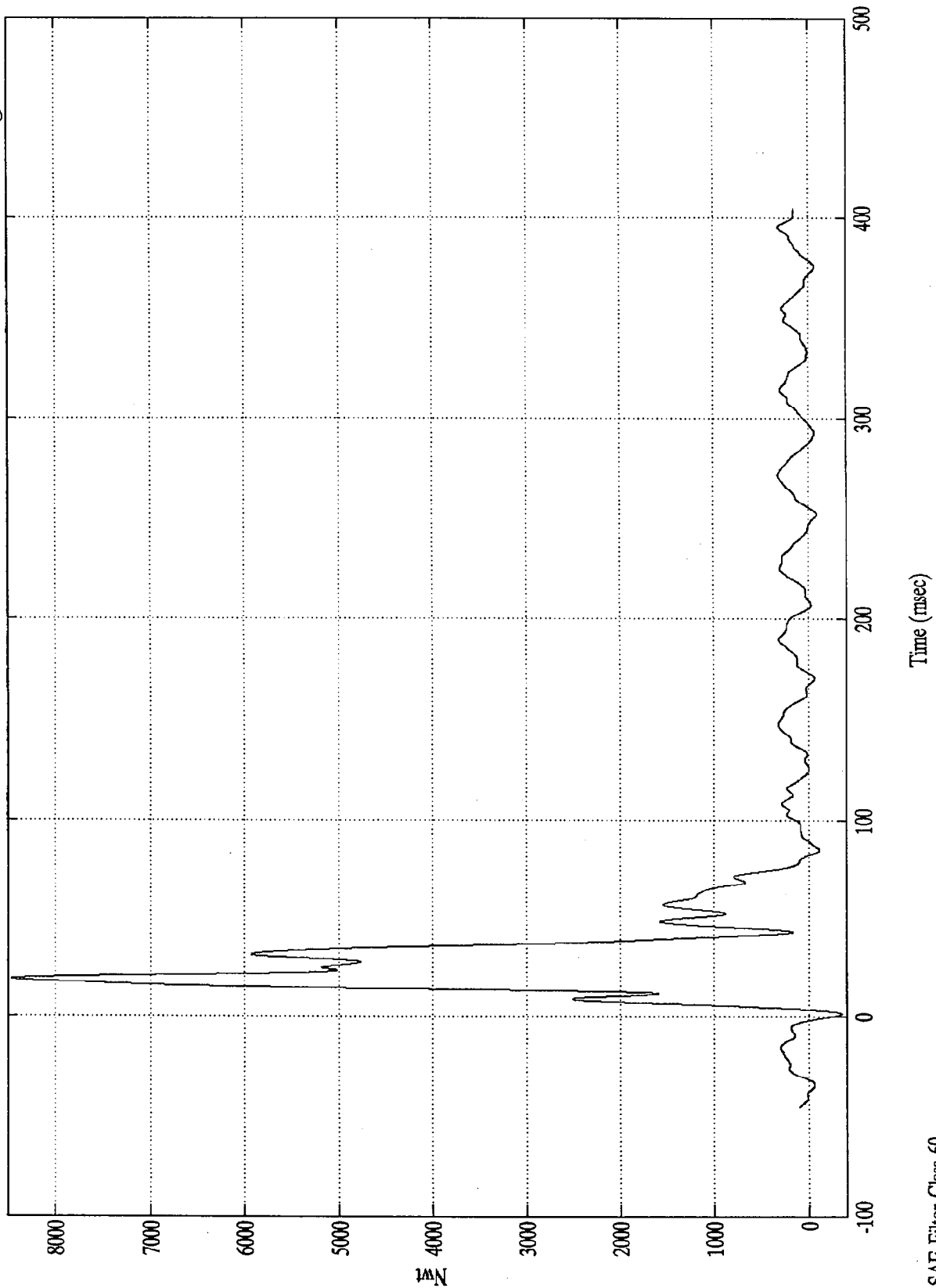
Max = 16041.37 Nwt @ 26.63 msec
Min = -177.54 Nwt @ 1.91 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell A3

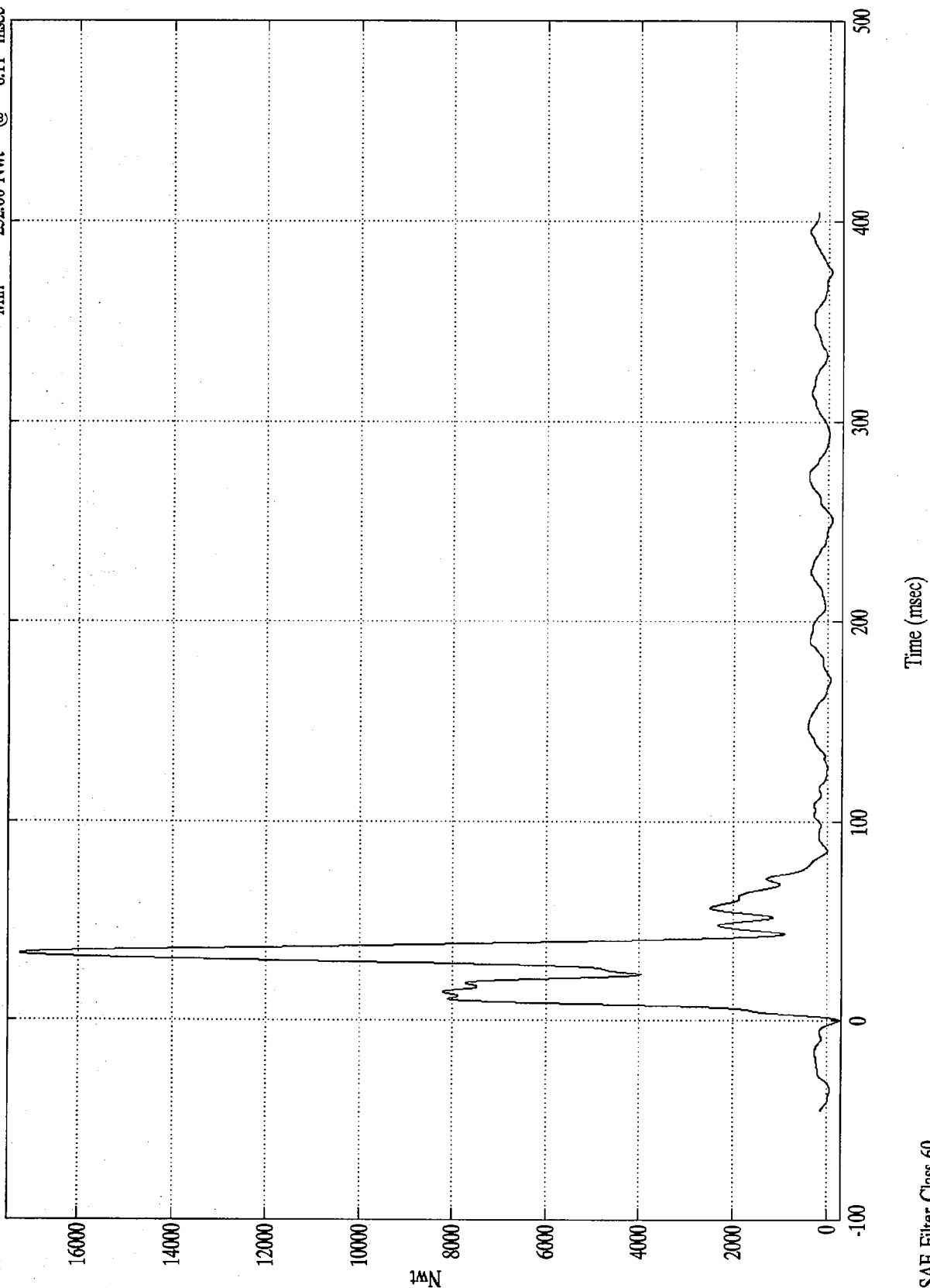
Max = 8471.22 Nwt @ 18.71 msec
Min = -344.69 Nwt @ 1.55 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell A4

Max = 17233.82 Nwt @ 33.47 msec
Min = -252.60 Nwt @ 0.11 msec

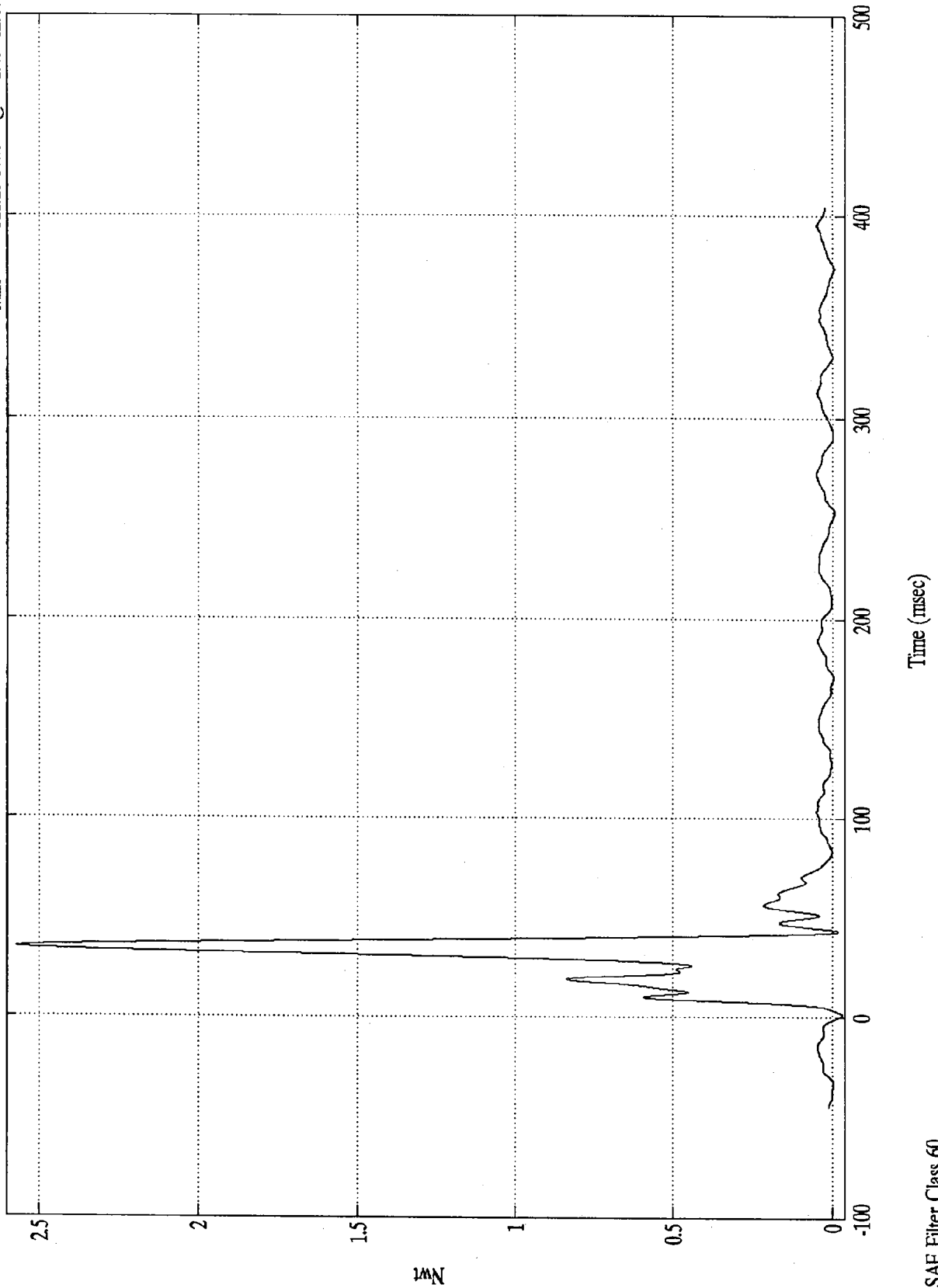


NCAP TEST #14 - 1997 VOLVO 960

$\times 10^4$

Barrier Load Cell A5

Max = 25712.33 Nwt @ 35.27 msec
Min = -321.23 Nwt @ 1.43 msec



Nwt

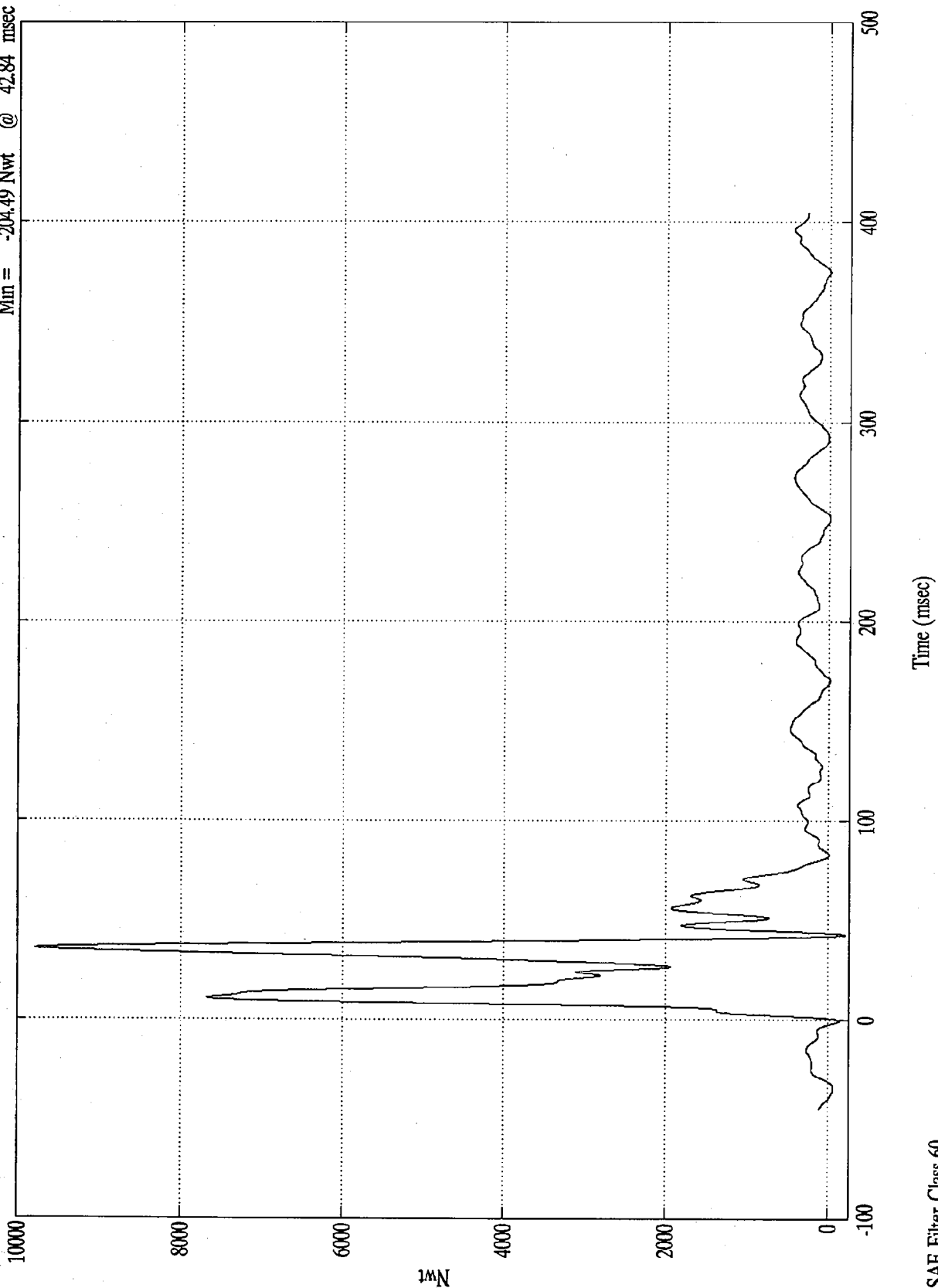
Time (msec)

SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell A6

Max = 9782.56 Nwt @ 36.00 msec
Min = -204.49 Nwt @ 42.84 msec



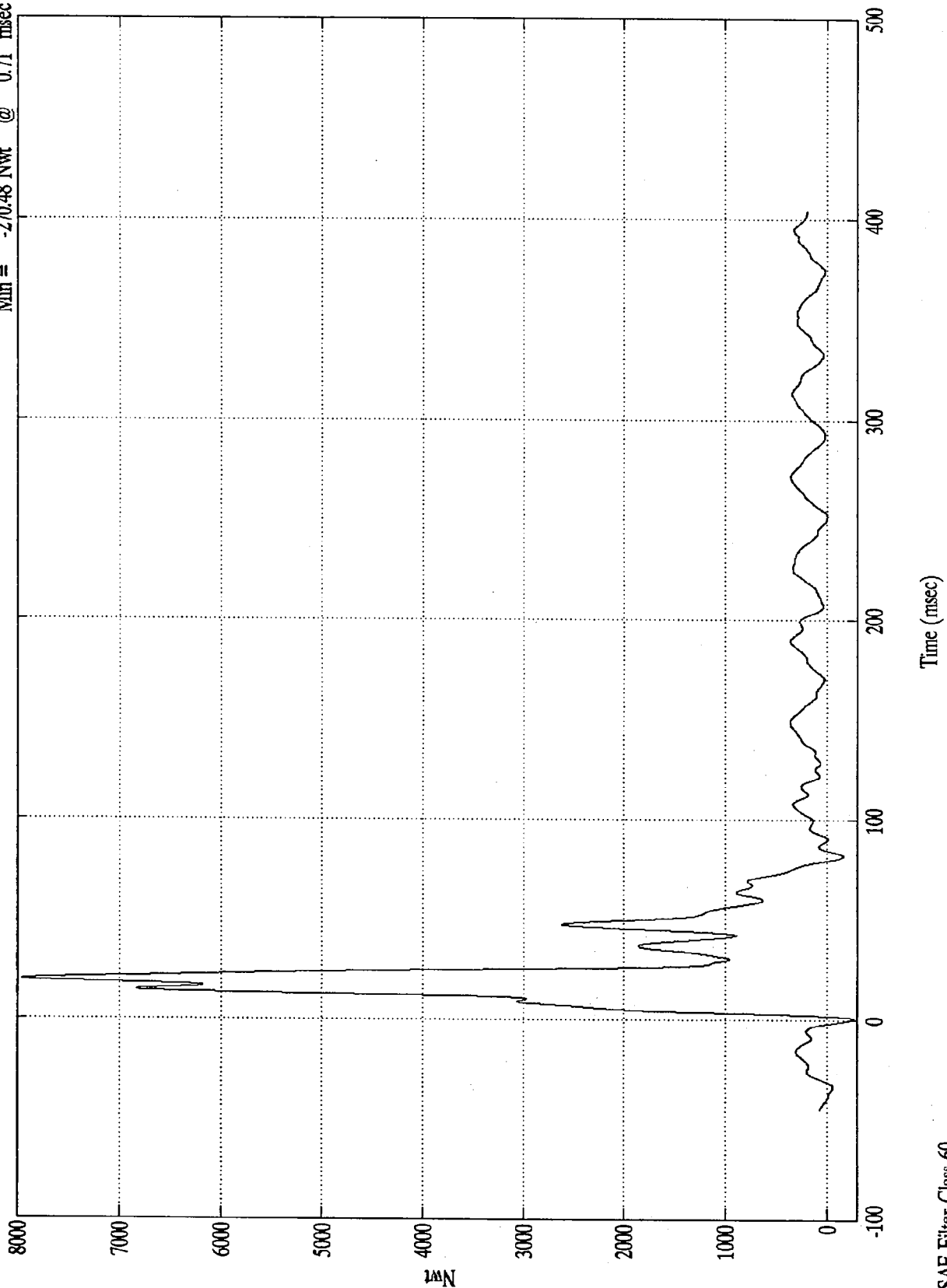
1Nwt

SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell A7

Max = 7952.00 Nwt @ 20.15 msec
Min = -270.48 Nwt @ 0.71 msec



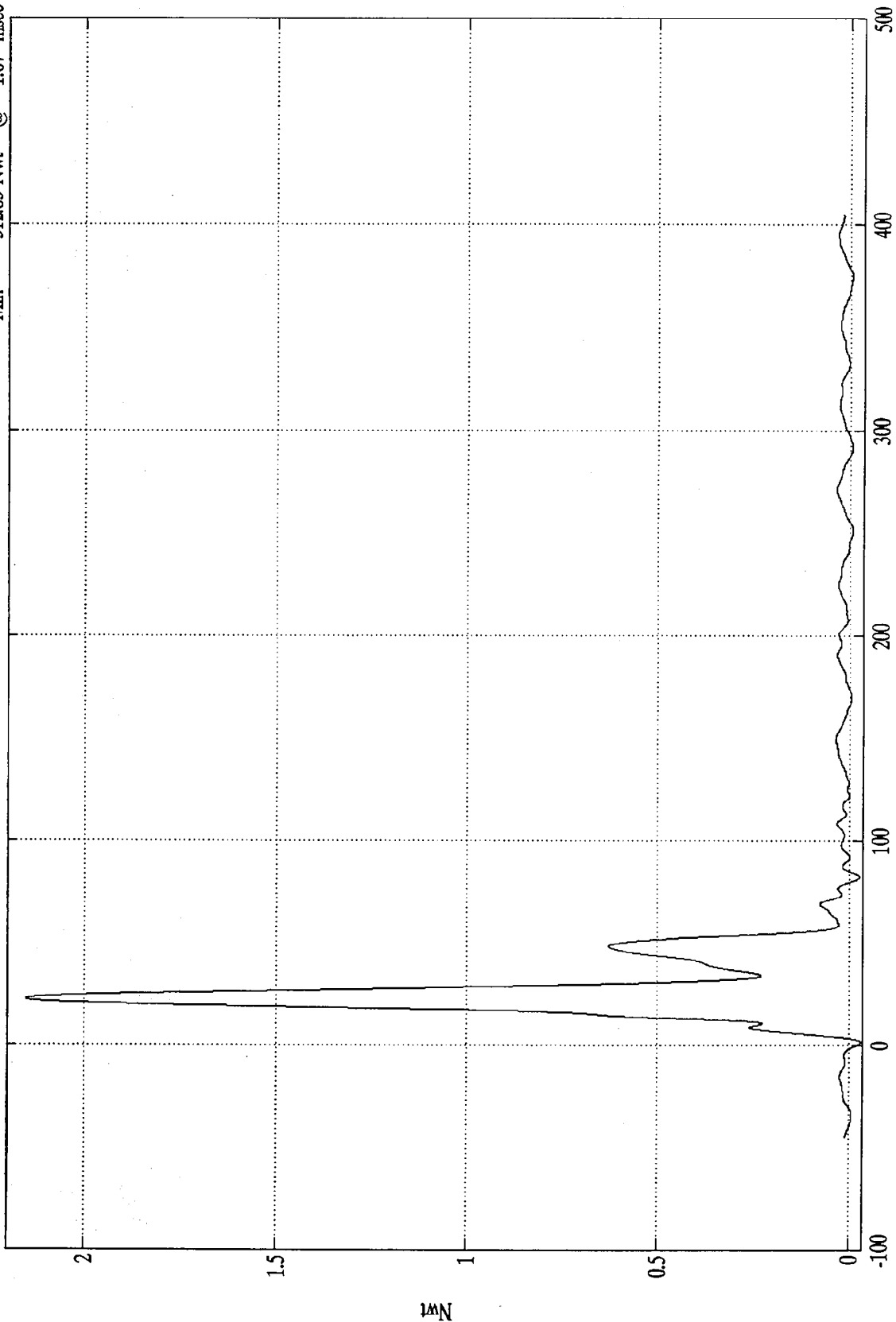
SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

$\times 10^4$

Barrier Load Cell A8

Max = 21504.71 Nwt @ 22.56 msec
Min = -312.83 Nwt @ 1.67 msec



Time (msec)

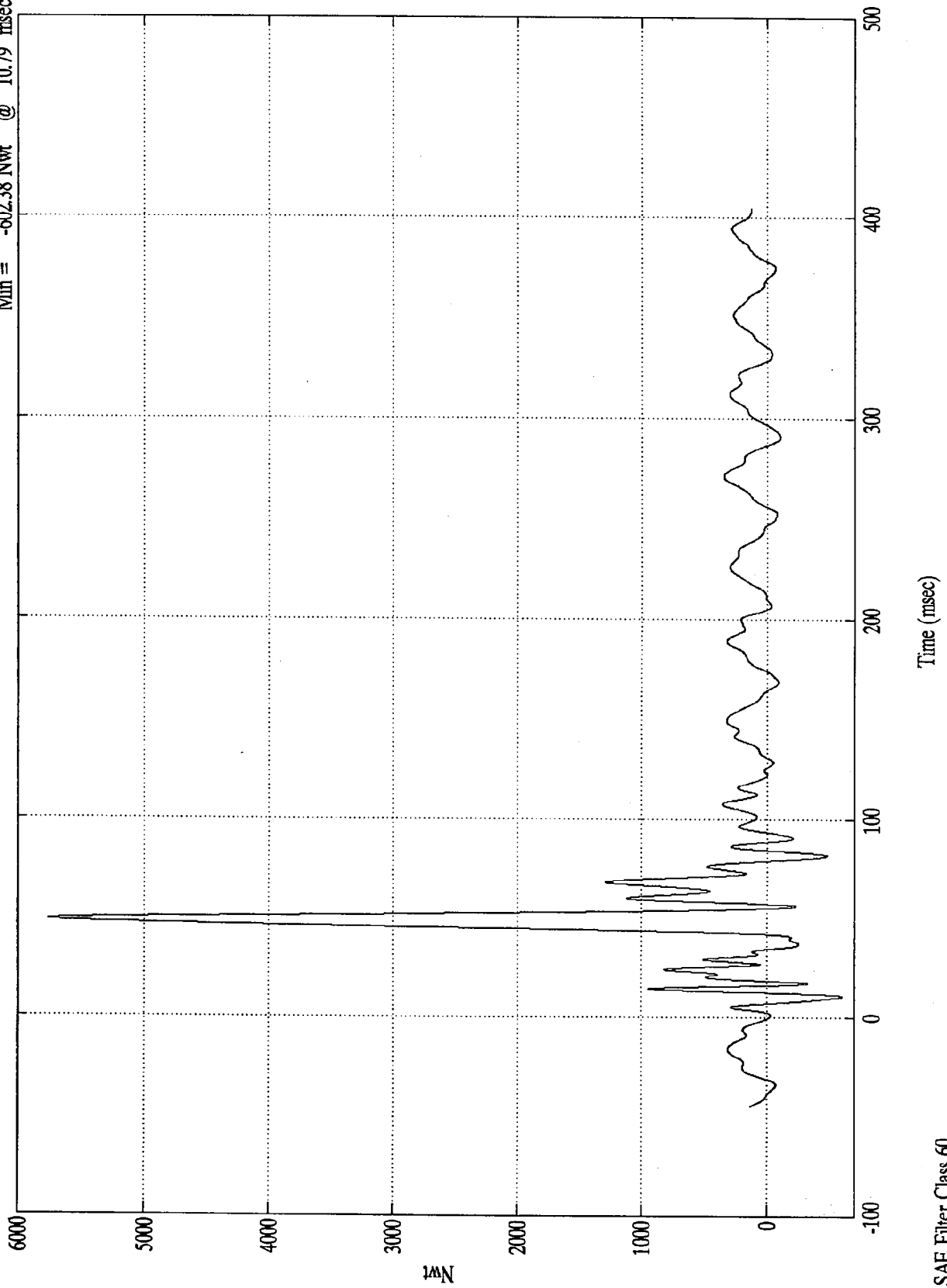
SAE Filter Class 60

Nwt

NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell A9

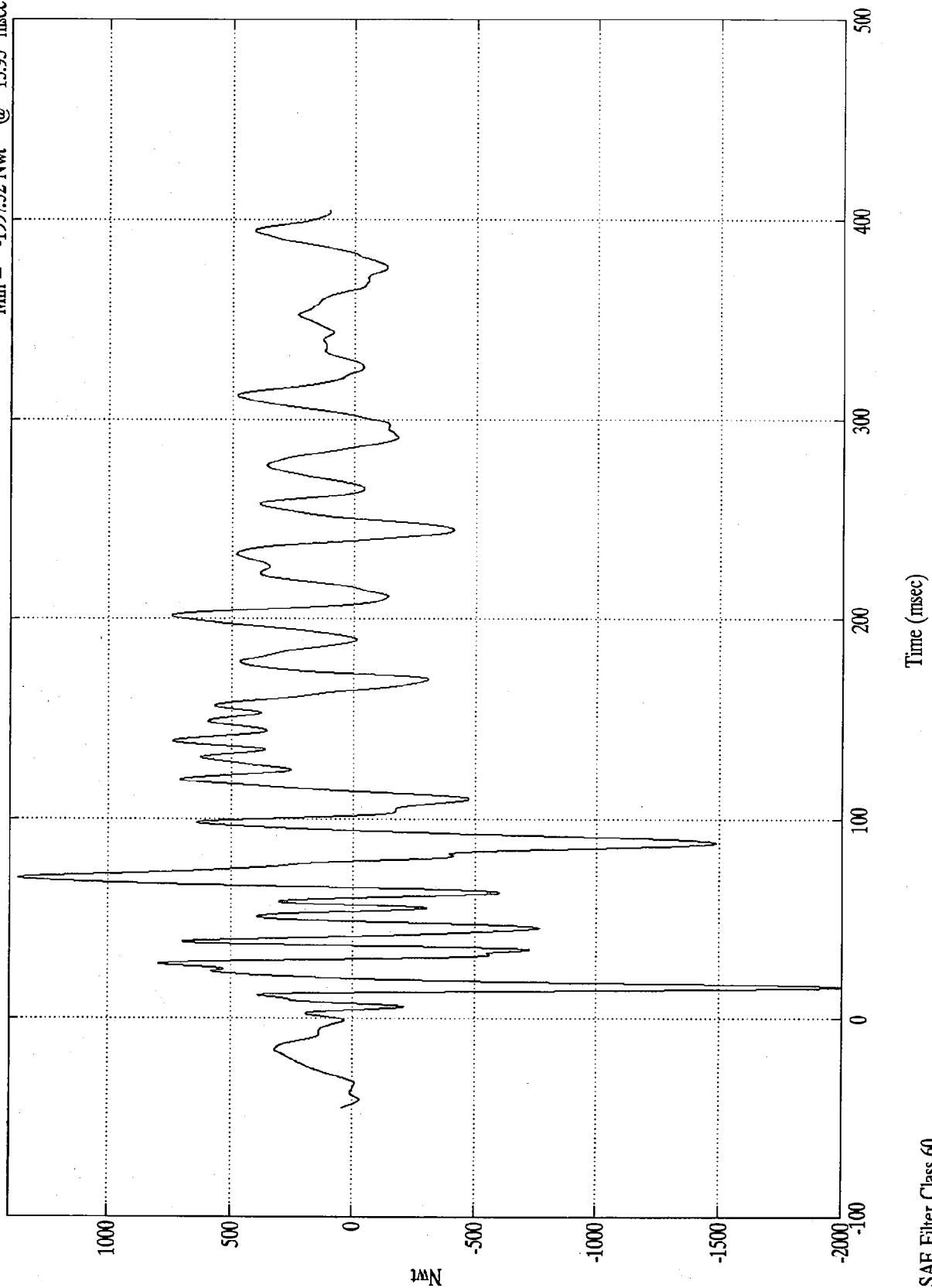
Max = 5762.99 Nwt @ 48.95 msec
Min = -602.38 Nwt @ 10.79 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell B1

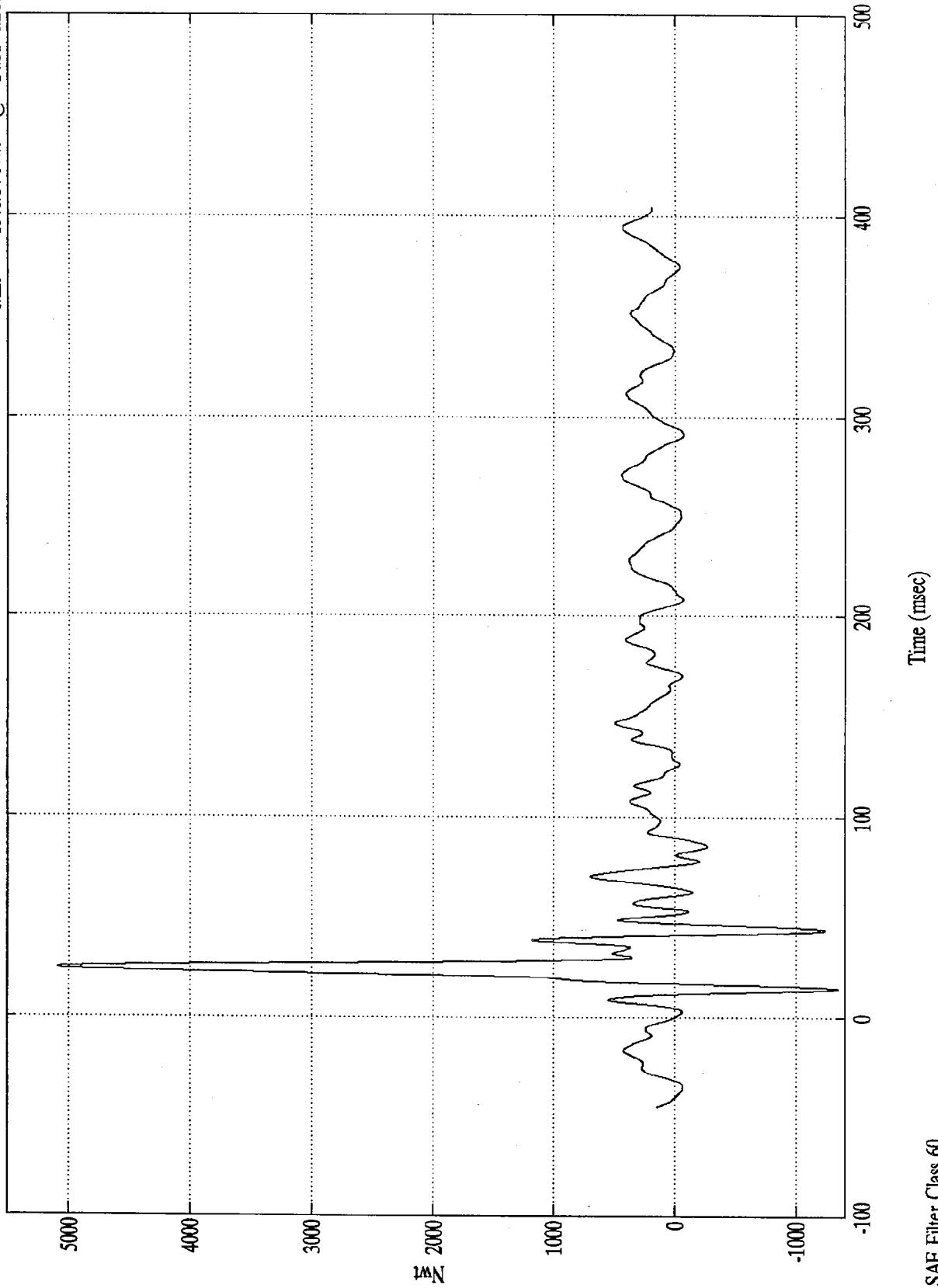
Max = 1364.70 Nwt @ 70.44 msec
Min = -1997.52 Nwt @ 15.95 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell B2

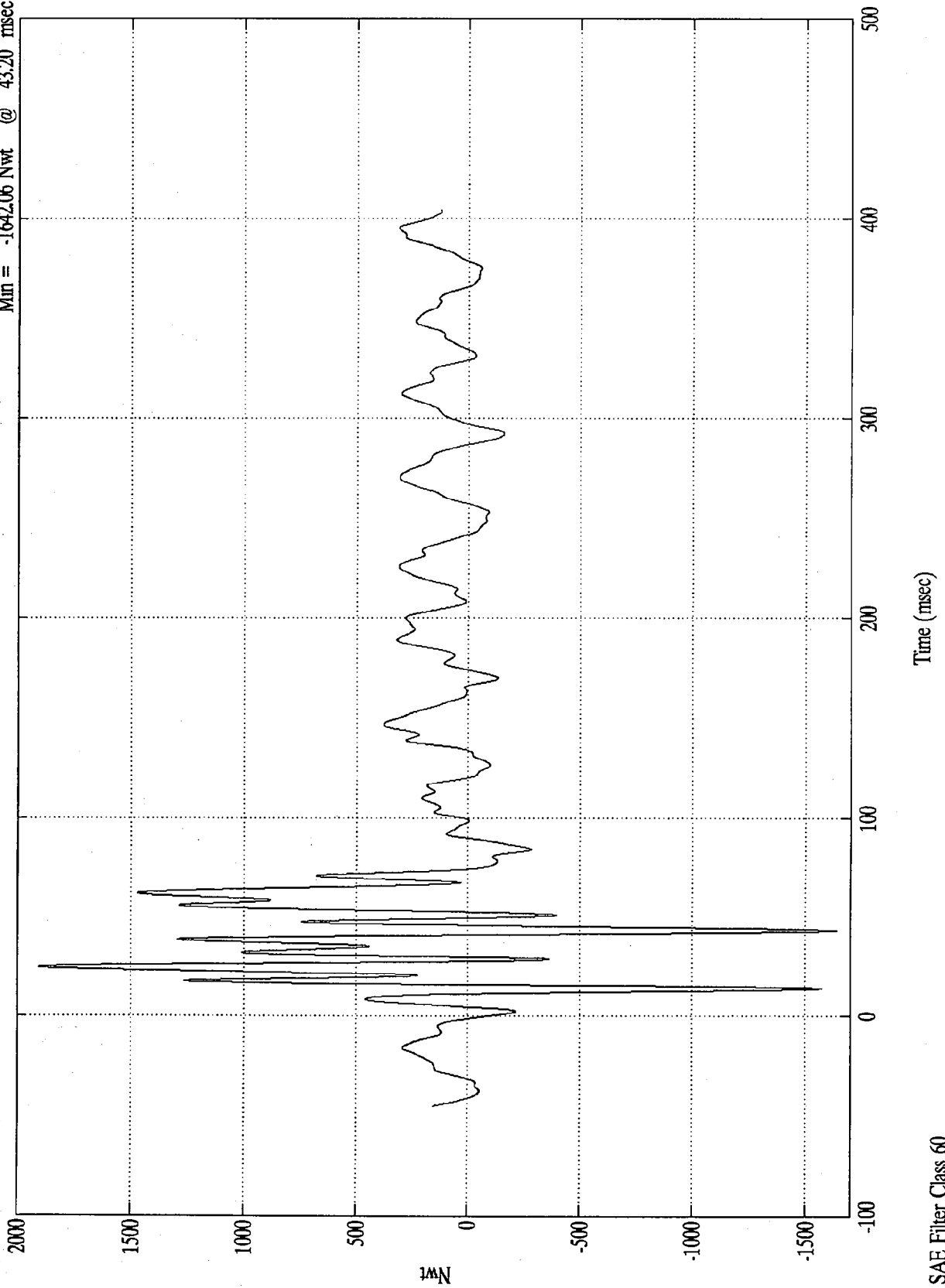
Max = 5090.86 Nwt @ 24.71 msec
Min = -1346.84 Nwt @ 14.51 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell B3

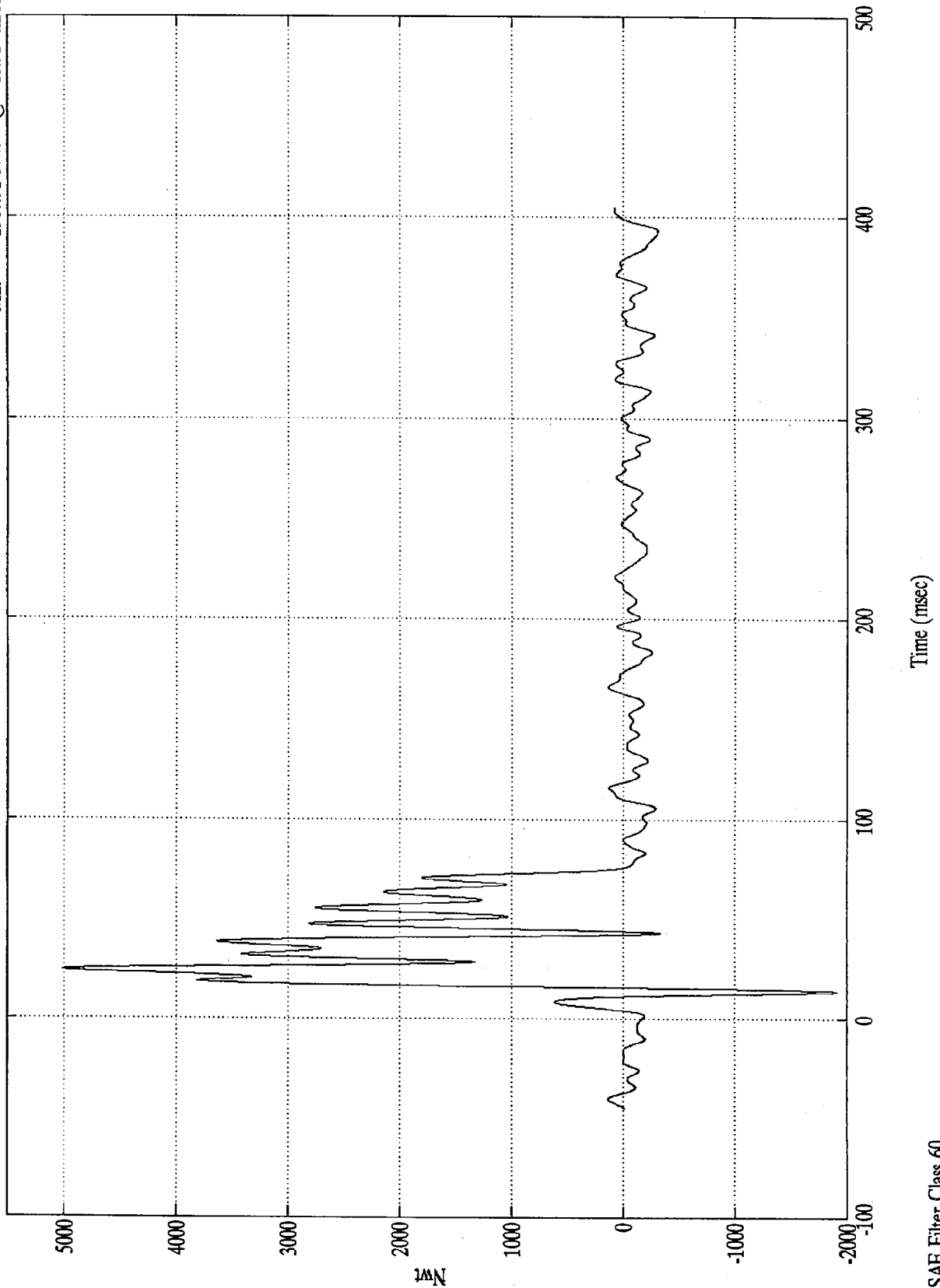
Max = 1906.12 Nwt @ 24.83 msec
Min = -1642.06 Nwt @ 43.20 msec



NCAP TEST #14 - 1997 VOLVO 960

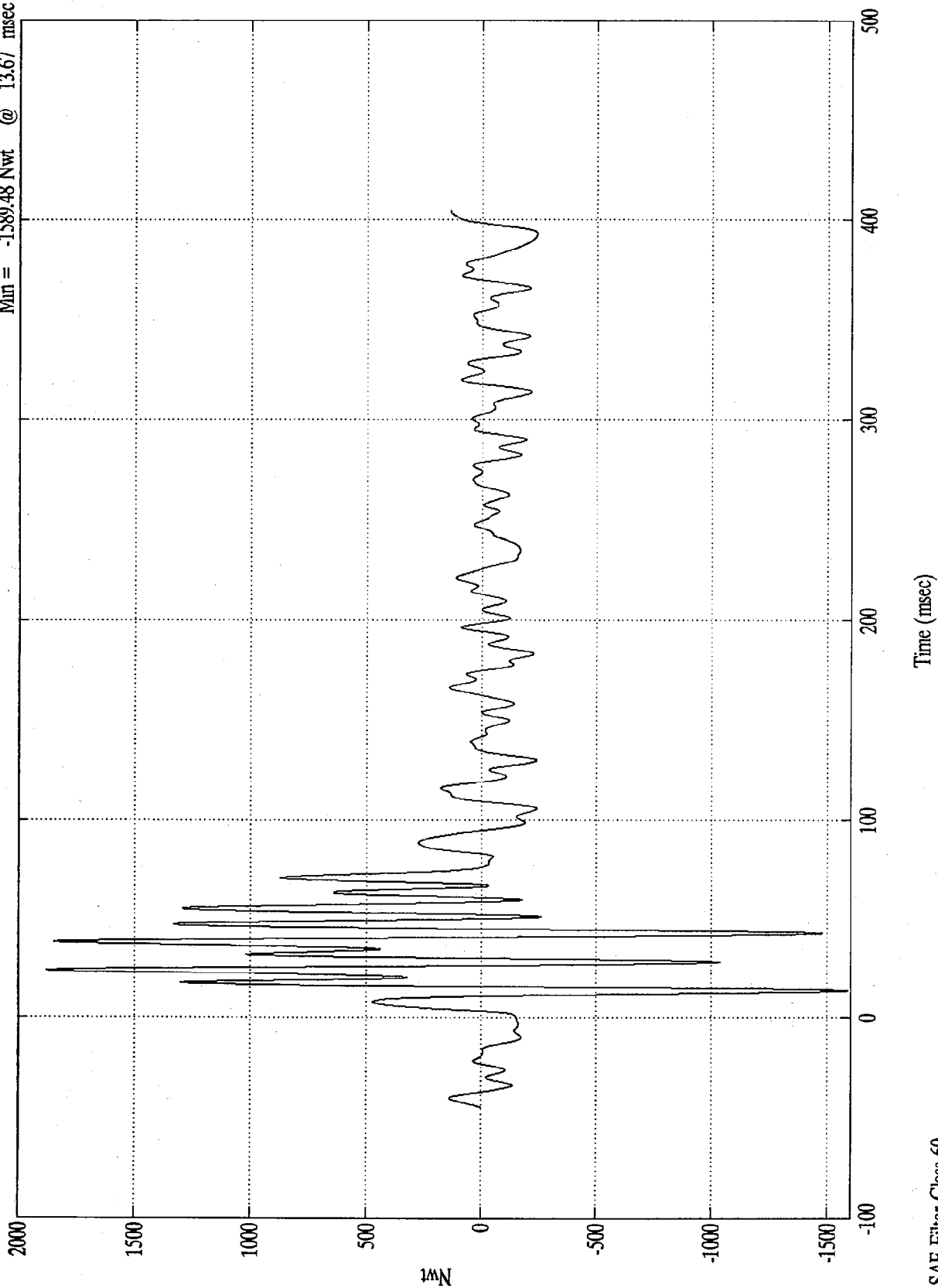
Barrier Load Cell B4

Max = 5014.81 Nwt @ 24.71 msec
Min = -1907.91 Nwt @ 13.91 msec



Barrier Load Cell B5

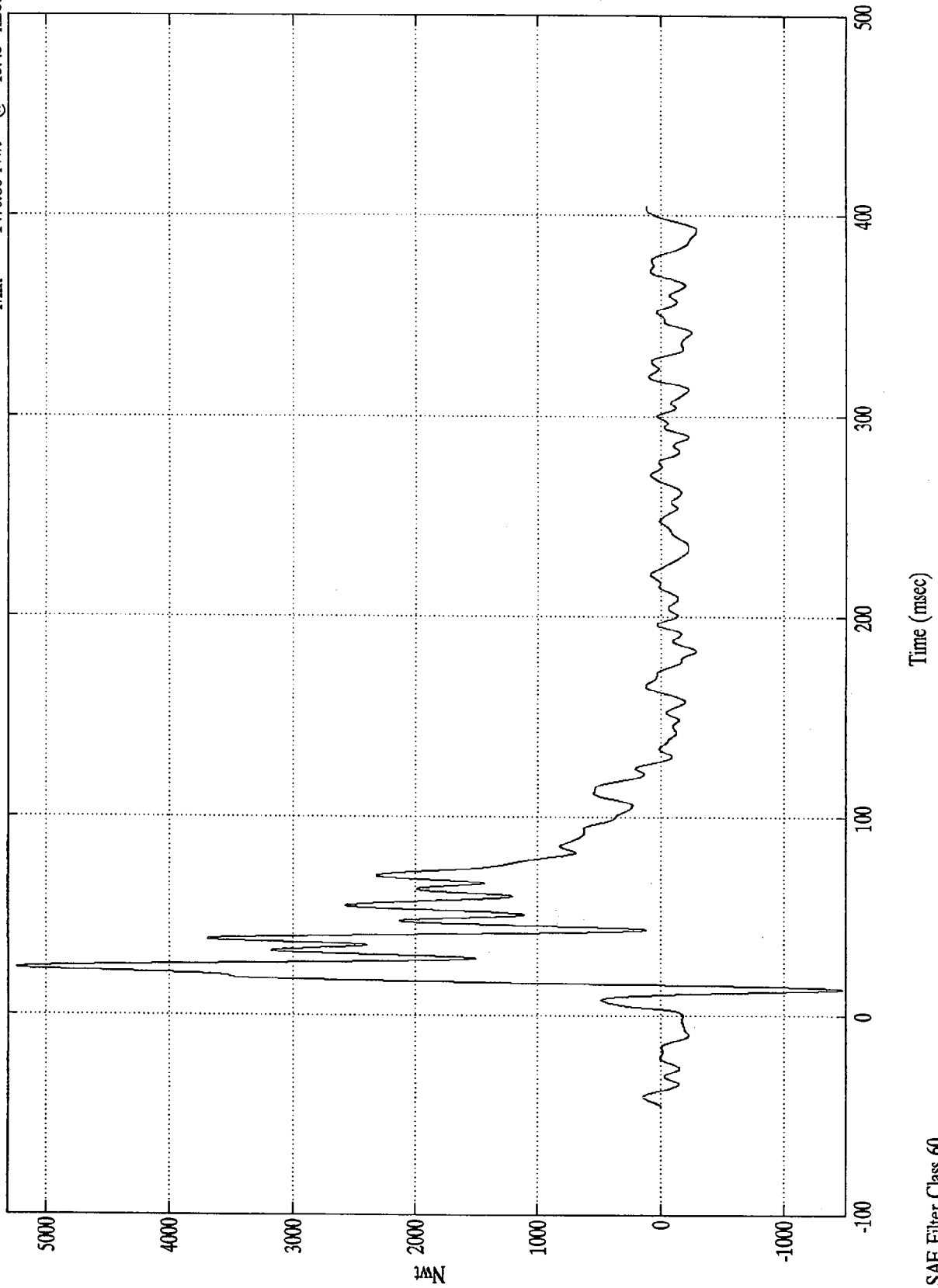
Max = 1878.95 Nwt @ 24.59 msec
Min = -1589.48 Nwt @ 13.67 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell B6

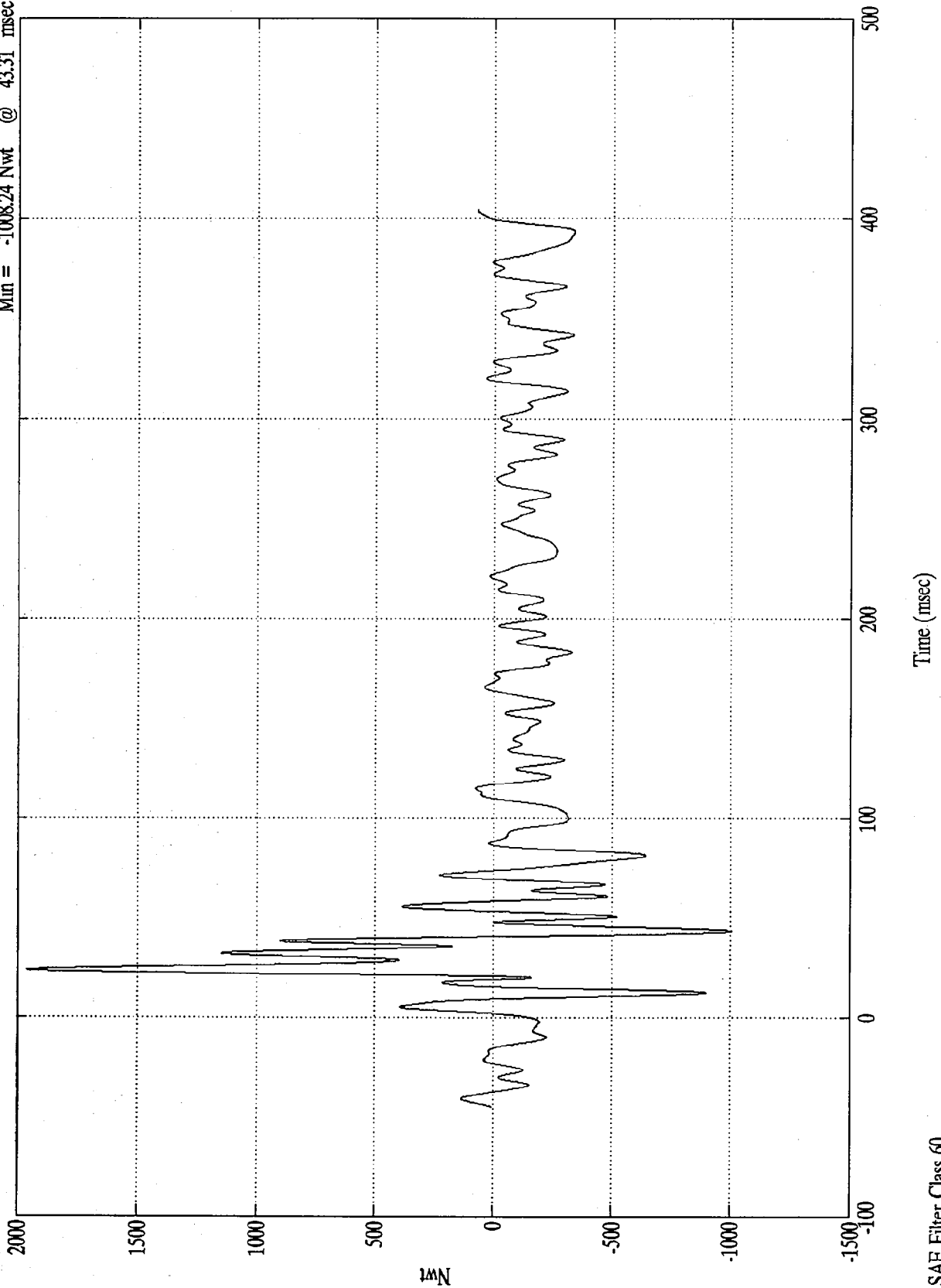
Max = 5232.92 Nwt @ 24.00 msec
Min = -1470.86 Nwt @ 13.43 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell B7

Max = 1962.61 Nwt @ 24.00 msec
Min = -1008.24 Nwt @ 43.31 msec



Nwt

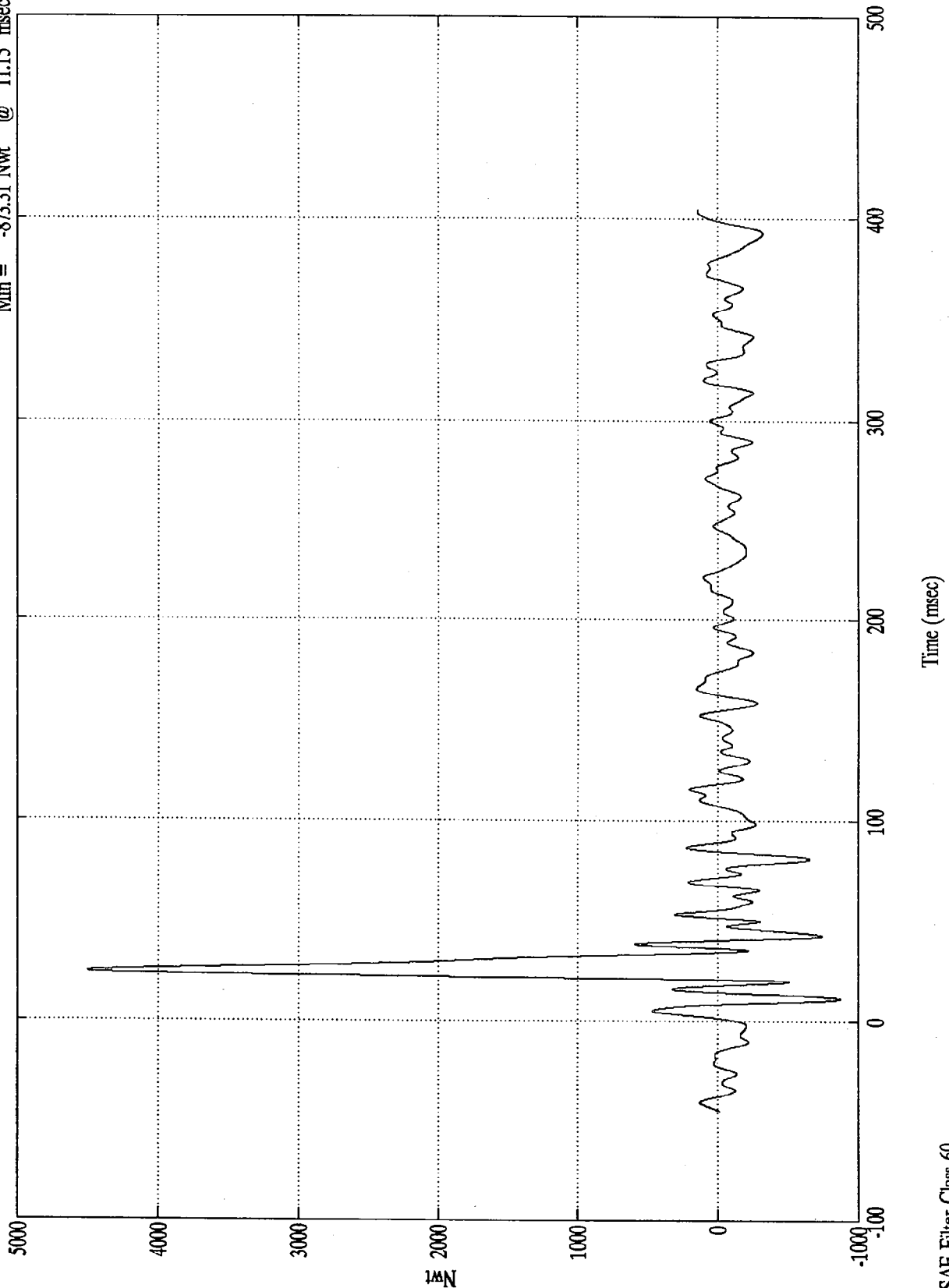
Time (msec)

SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell B8

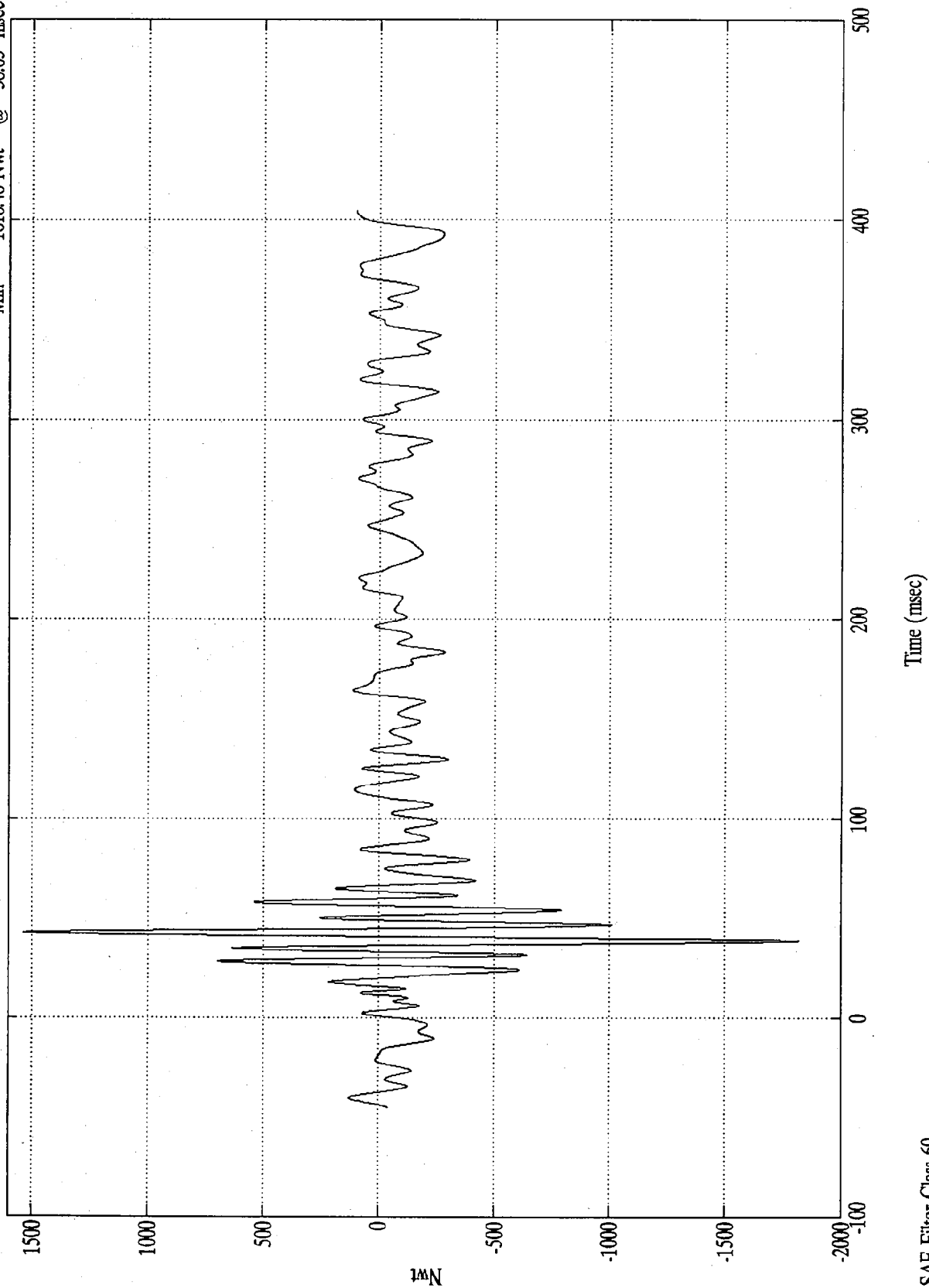
Max = 4506.34 Nwt @ 24.59 msec
Min = -873.31 Nwt @ 11.15 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell C1

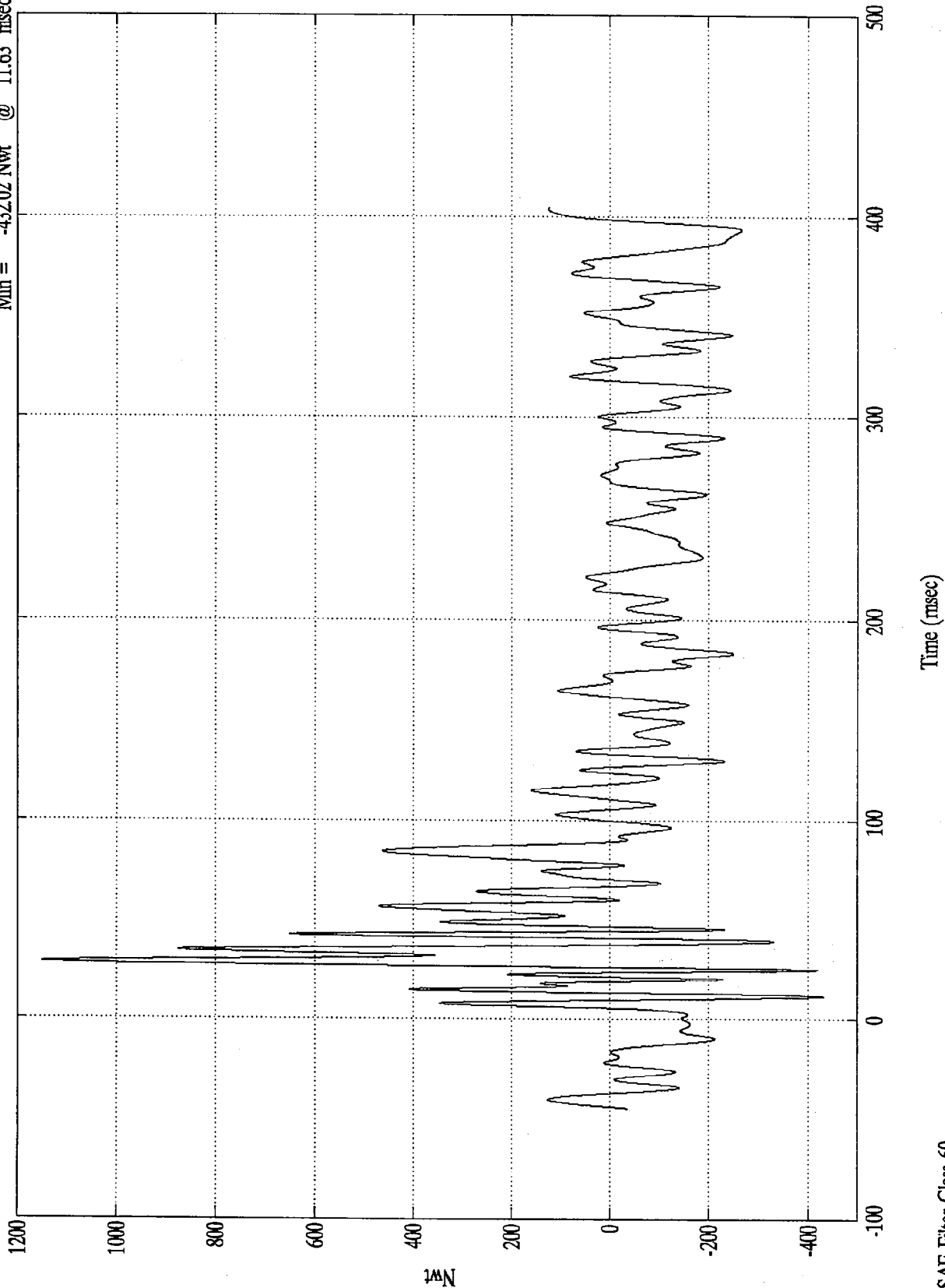
Max = 1537.24 Nwt @ 42.60 msec
Min = -1818.48 Nwt @ 38.63 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell C2

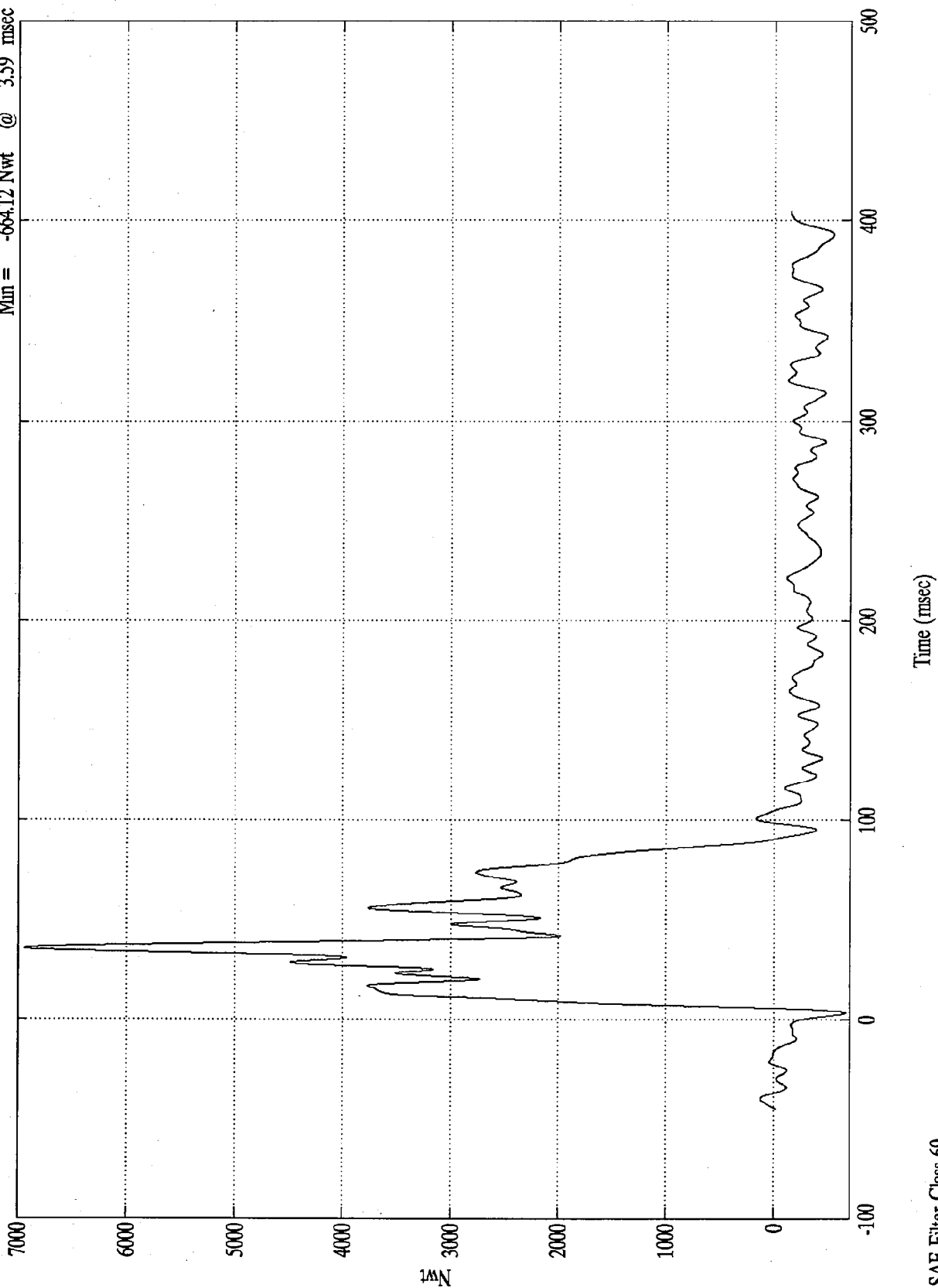
Max = 1150.05 Nwt @ 29.03 msec
Min = -432.02 Nwt @ 11.63 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell C3

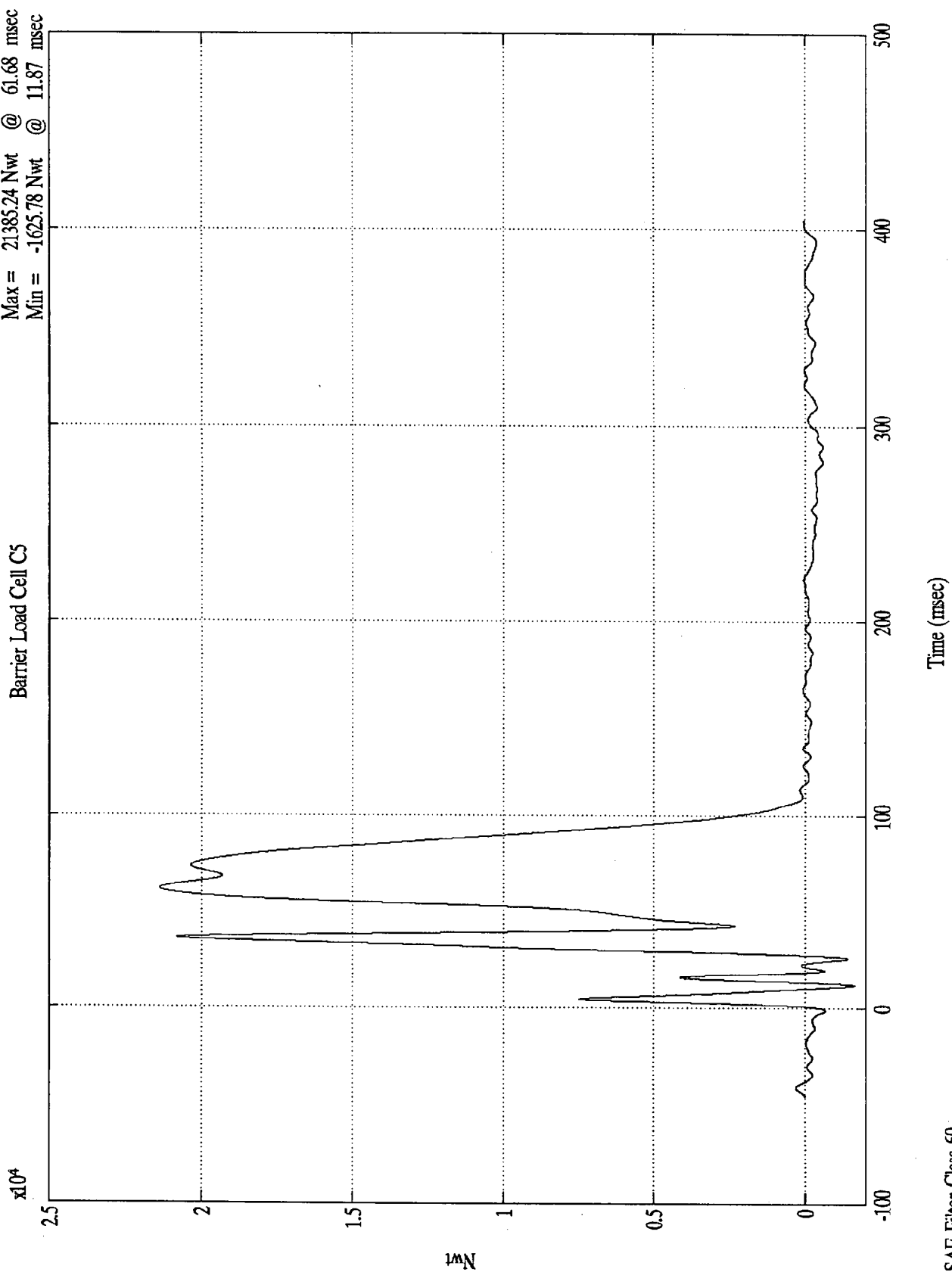
Max = 6938.94 Nwt @ 36.12 msec
Min = -664.12 Nwt @ 3.59 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell C5

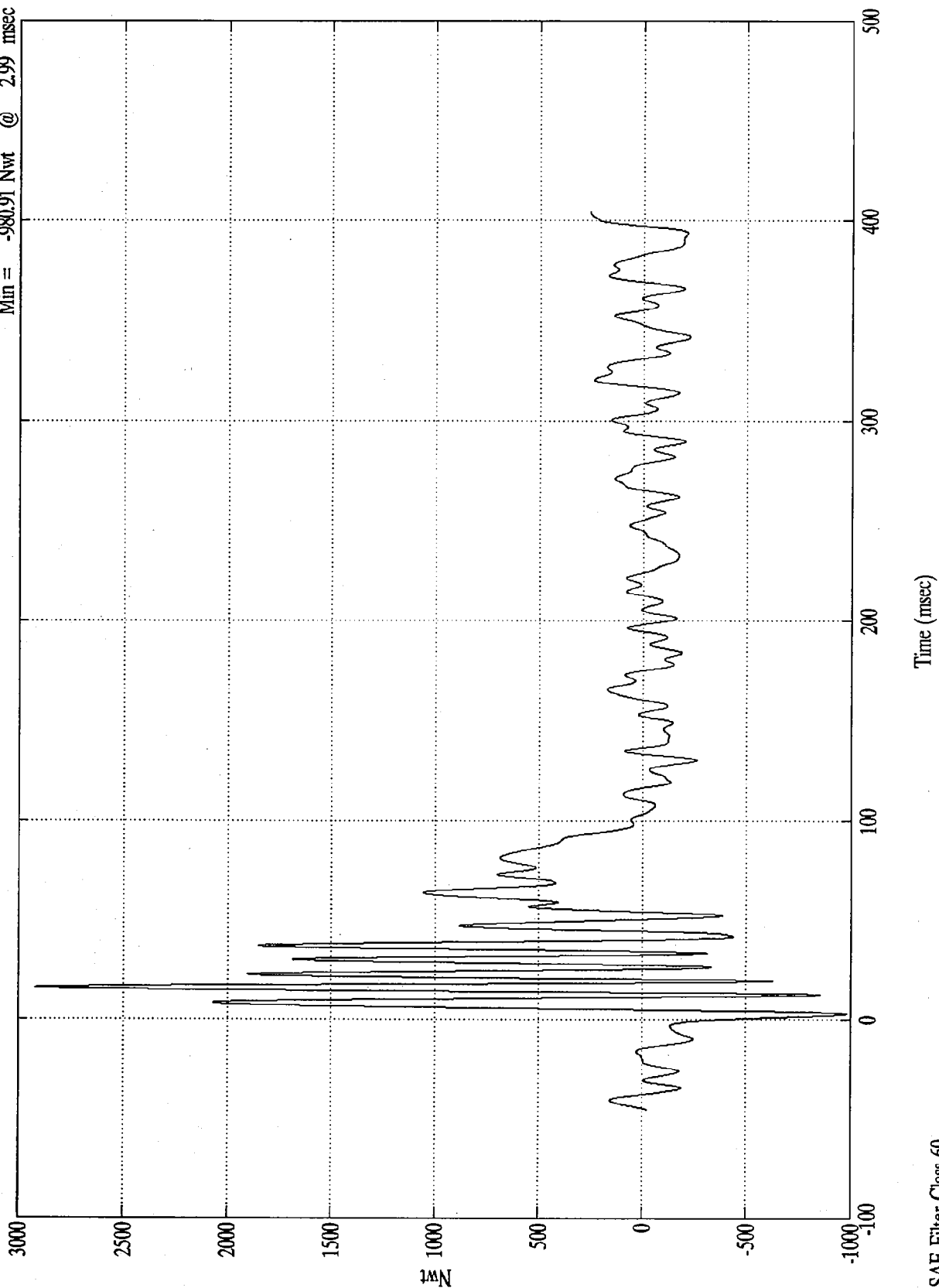
Max = 21385.24 Nwt @ 61.68 msec
Min = -1625.78 Nwt @ 11.87 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell C6

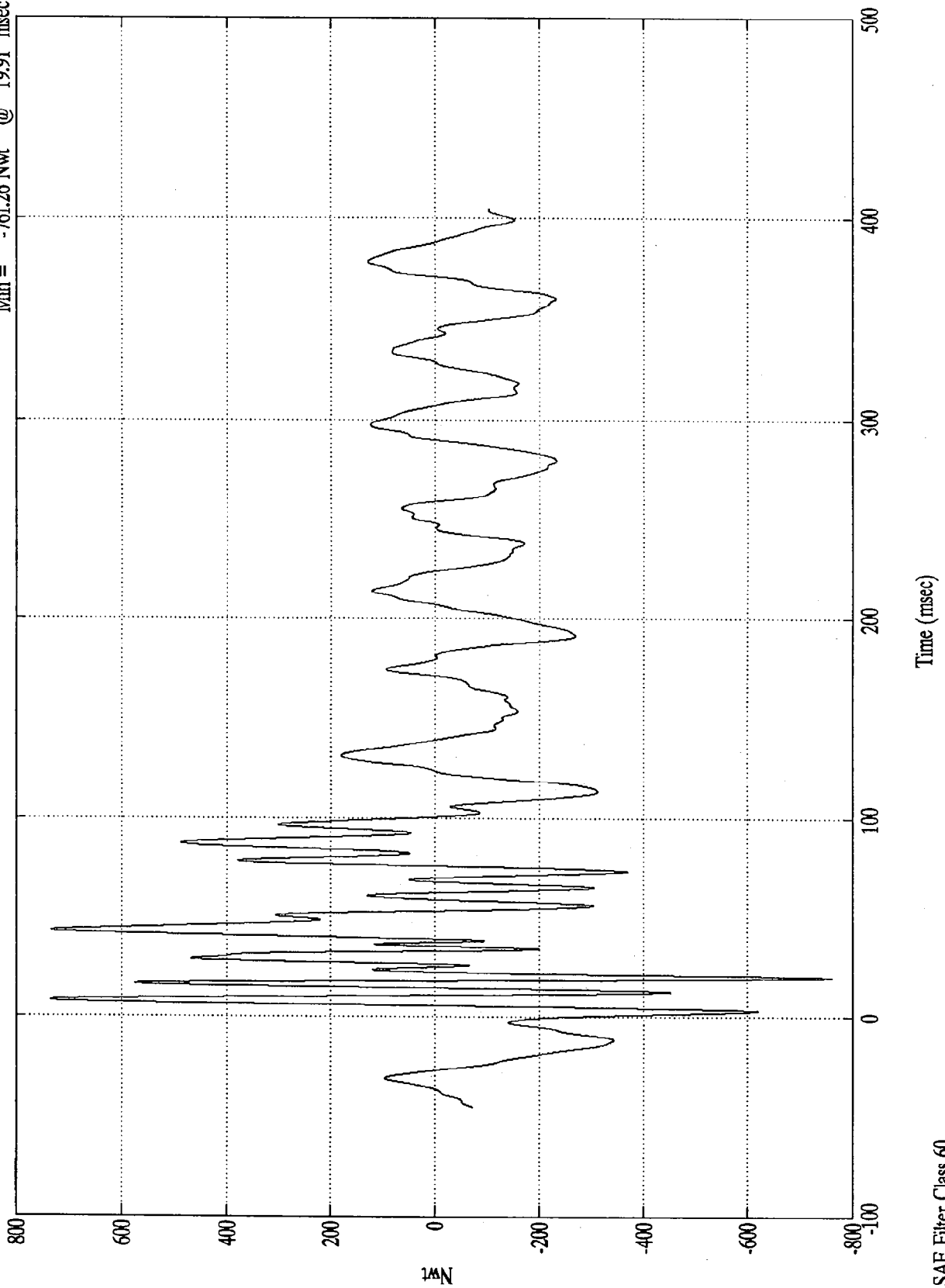
Max = 2922.17 Nwt @ 15.95 msec
Min = -980.91 Nwt @ 2.99 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell C8

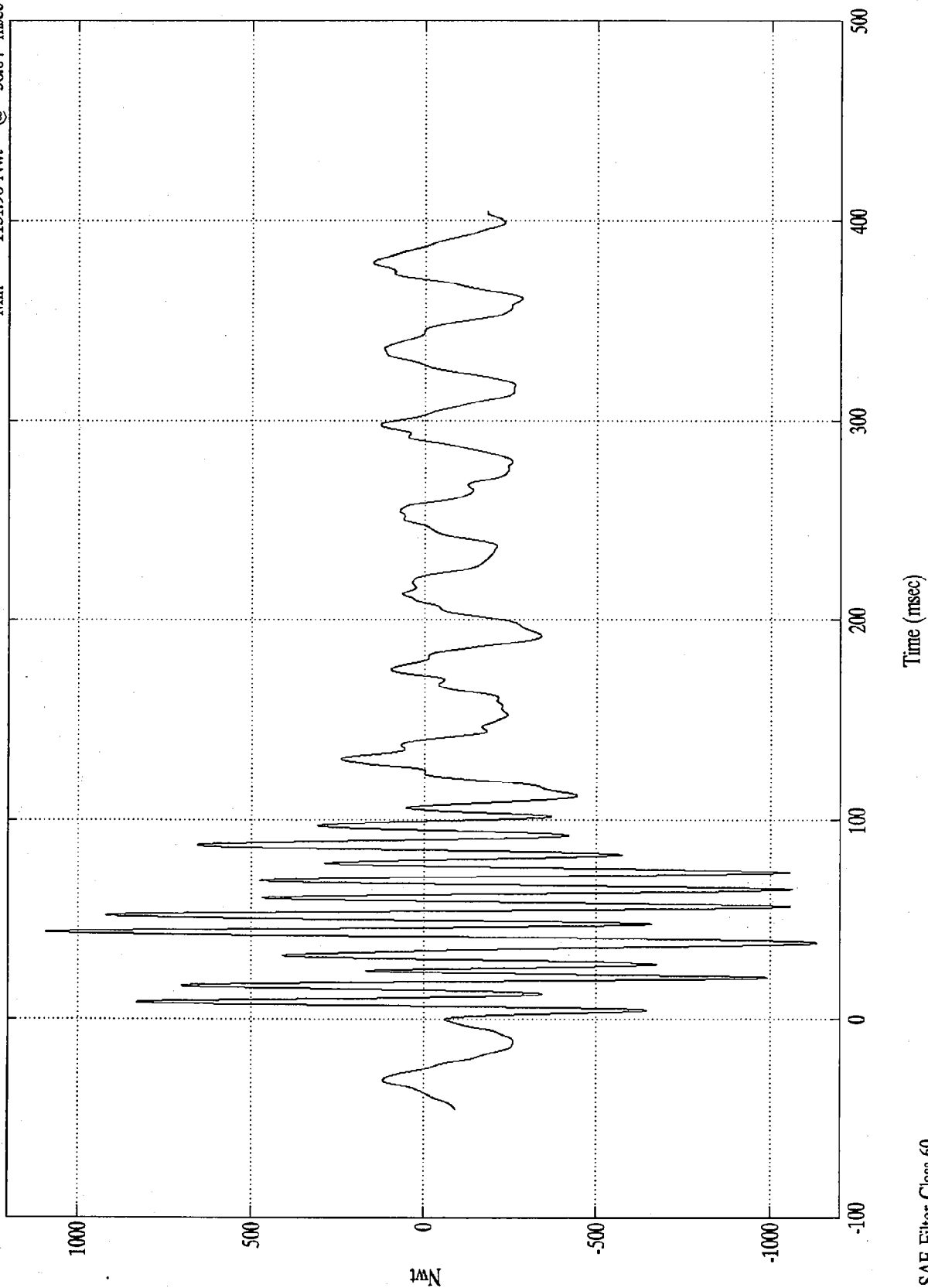
Max = 735.24 Nwt @ 8.27 msec
Min = -761.26 Nwt @ 19.91 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell C9

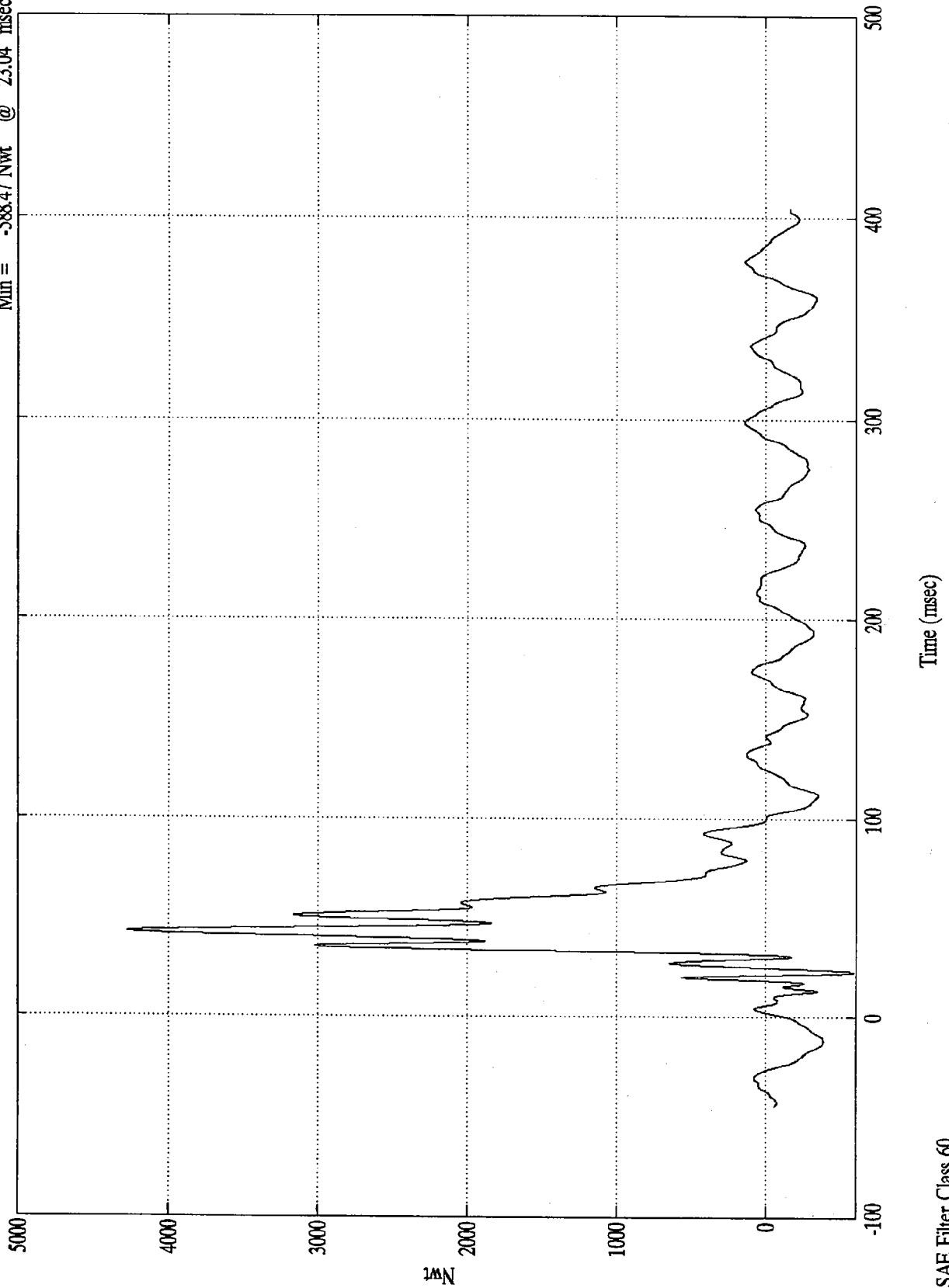
Max = 1090.27 Nwt @ 43.20 msec
Min = -1131.98 Nwt @ 38.04 msec



NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell D1

Max = 4275.89 Nwt @ 42.72 msec
Min = -588.47 Nwt @ 23.04 msec

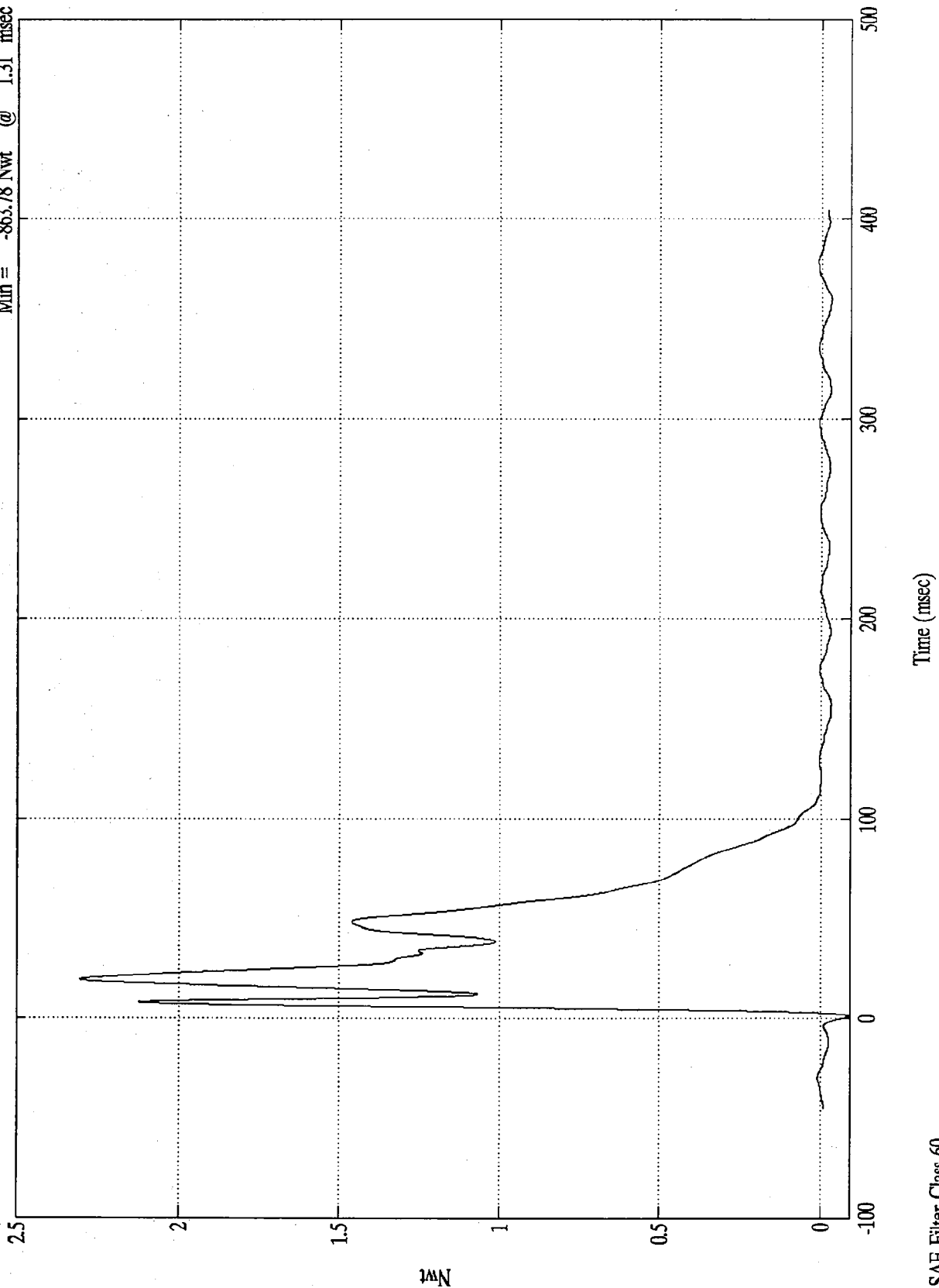


NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell D2

Max = 23053.18 Nwt @ 19.43 msec
Min = -863.78 Nwt @ 1.31 msec

$\times 10^4$



Nwt

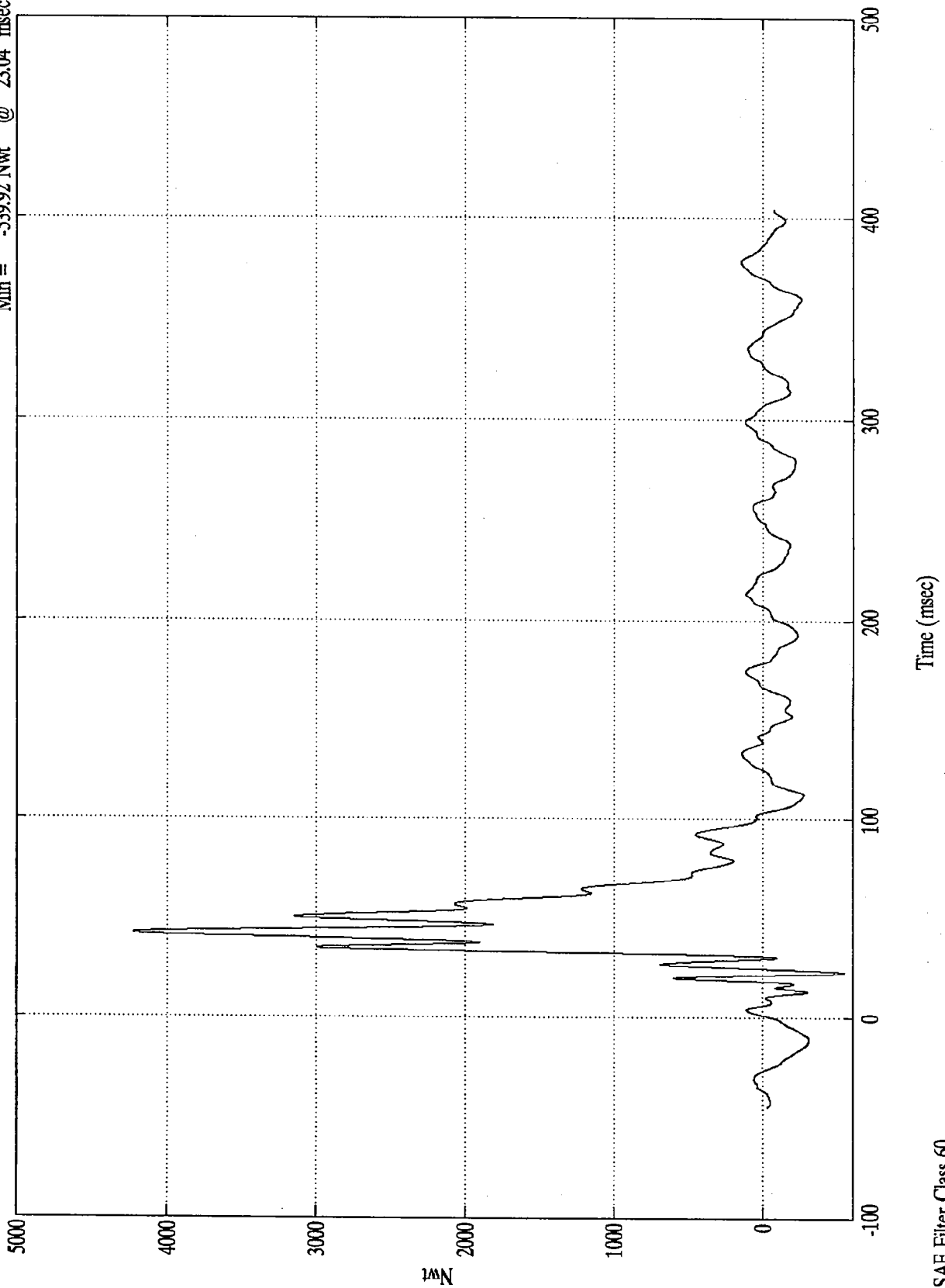
Time (msec)

SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell D3

Max = 4225.28 Nwt @ 42.60 msec
Min = -539.92 Nwt @ 23.04 msec

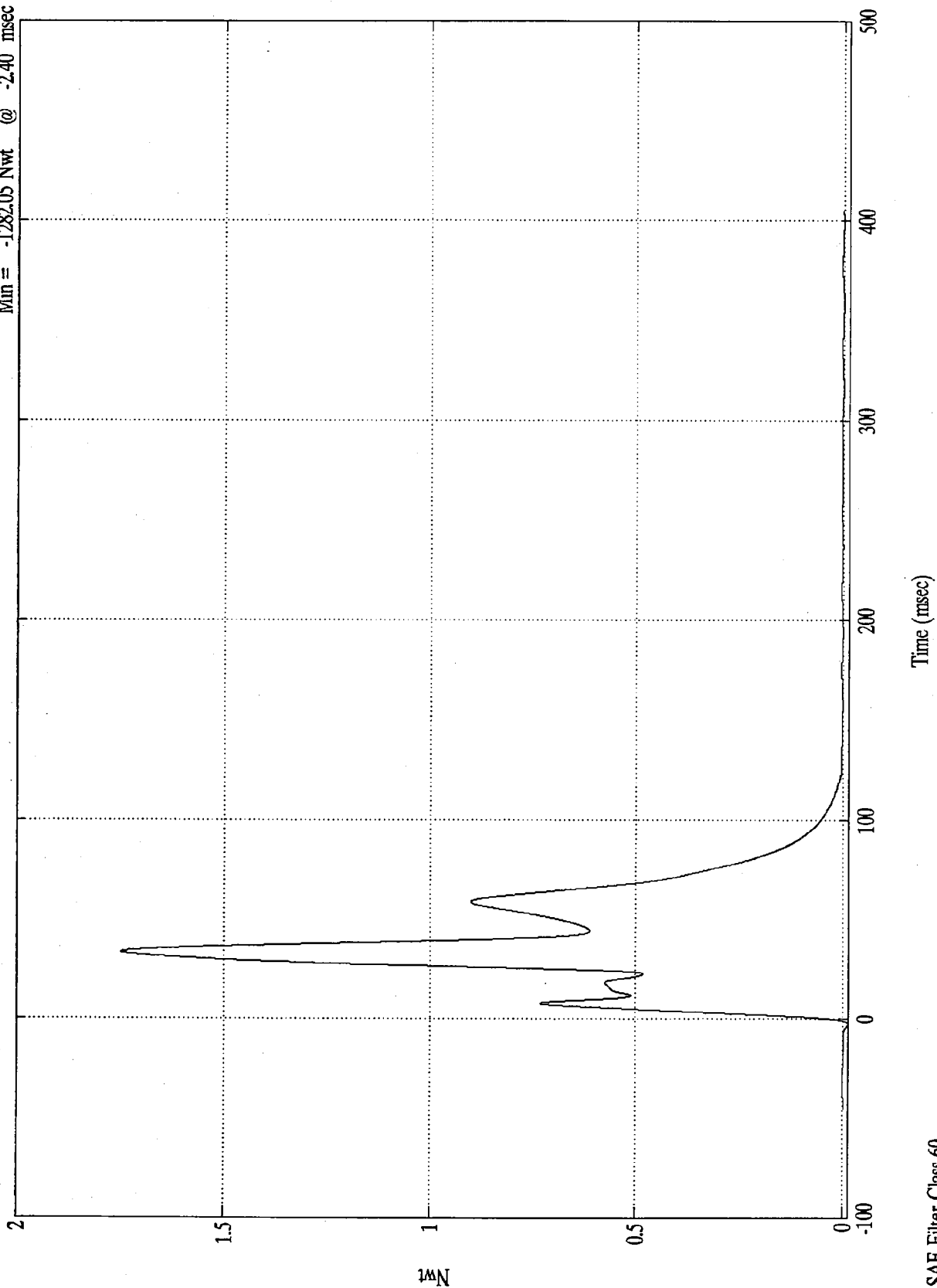


NCAP TEST #14 - 1997 VOLVO 960

$\times 10^5$

Barrier Load Cell D4

Max = 175031.76 Nwt @ 33.59 msec
Min = -1282.05 Nwt @ -2.40 msec

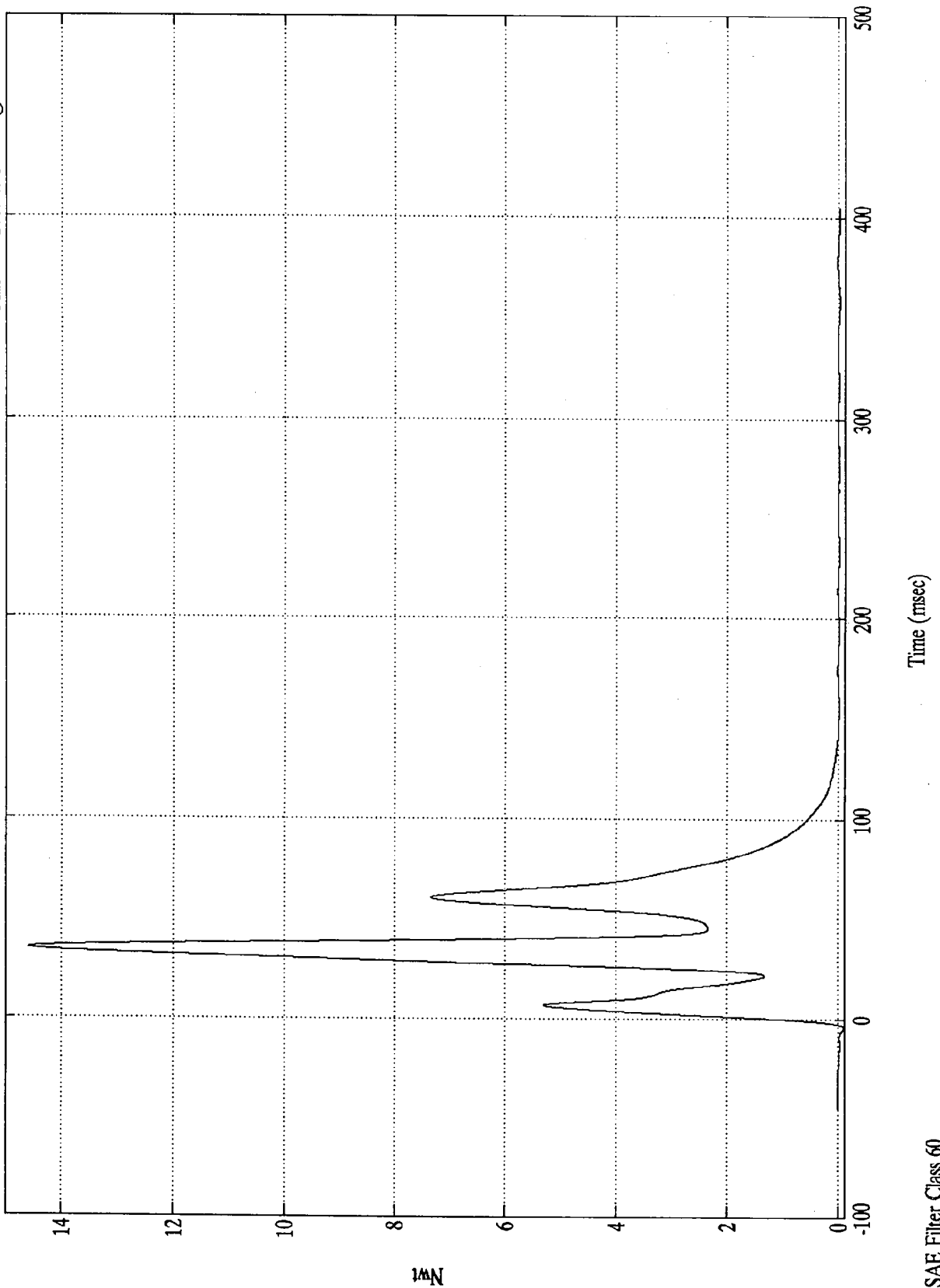


NCAP TEST #14 - 1997 VOLVO 960

$\times 10^4$

Barrier Load Cell D5

Max = 145907.29 Nwt @ 35.15 msec
Min = -1067.45 Nwt @ -3.84 msec



Nwt

Time (msec)

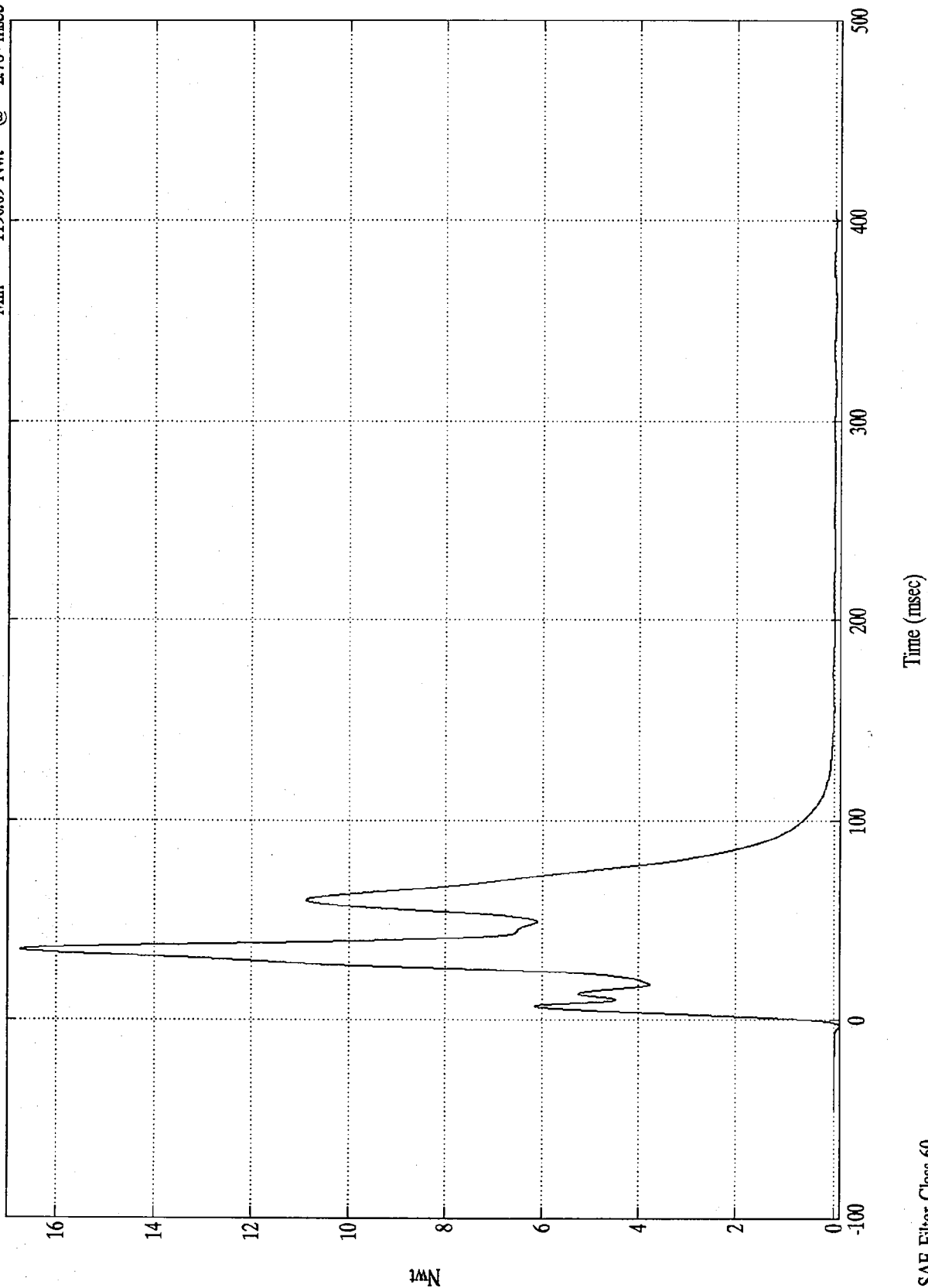
SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

$\times 10^4$

Barrier Load Cell D6

Max = 167402.45 Nwt @ 35.27 msec
Min = -1196.09 Nwt @ -2.76 msec

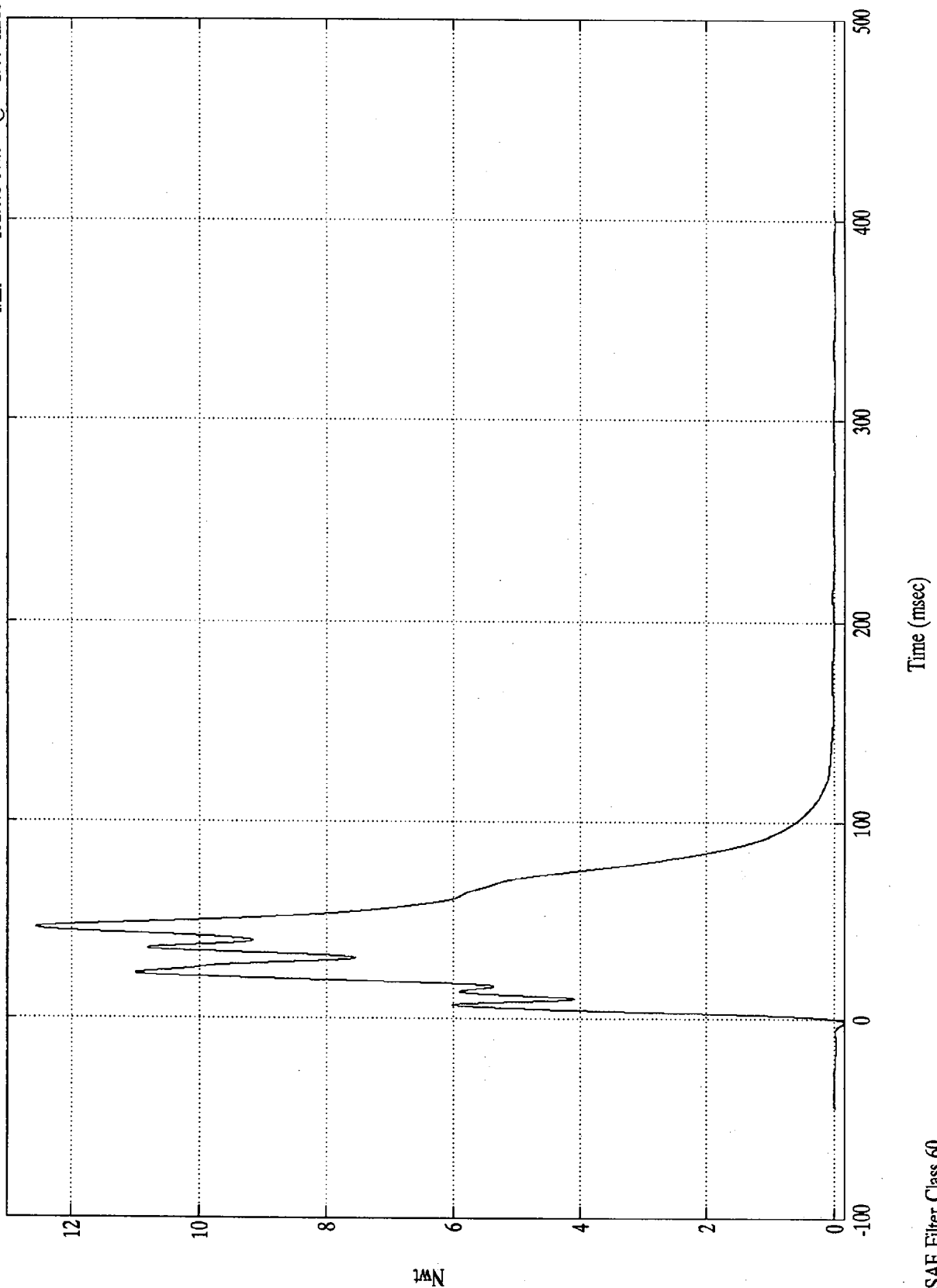


NCAP TEST #14 - 1997 VOLVO 960

$\times 10^4$

Barrier Load Cell D7

Max = 125598.39 Nwt @ 46.31 msec
Min = -1529.73 Nwt @ -1.44 msec

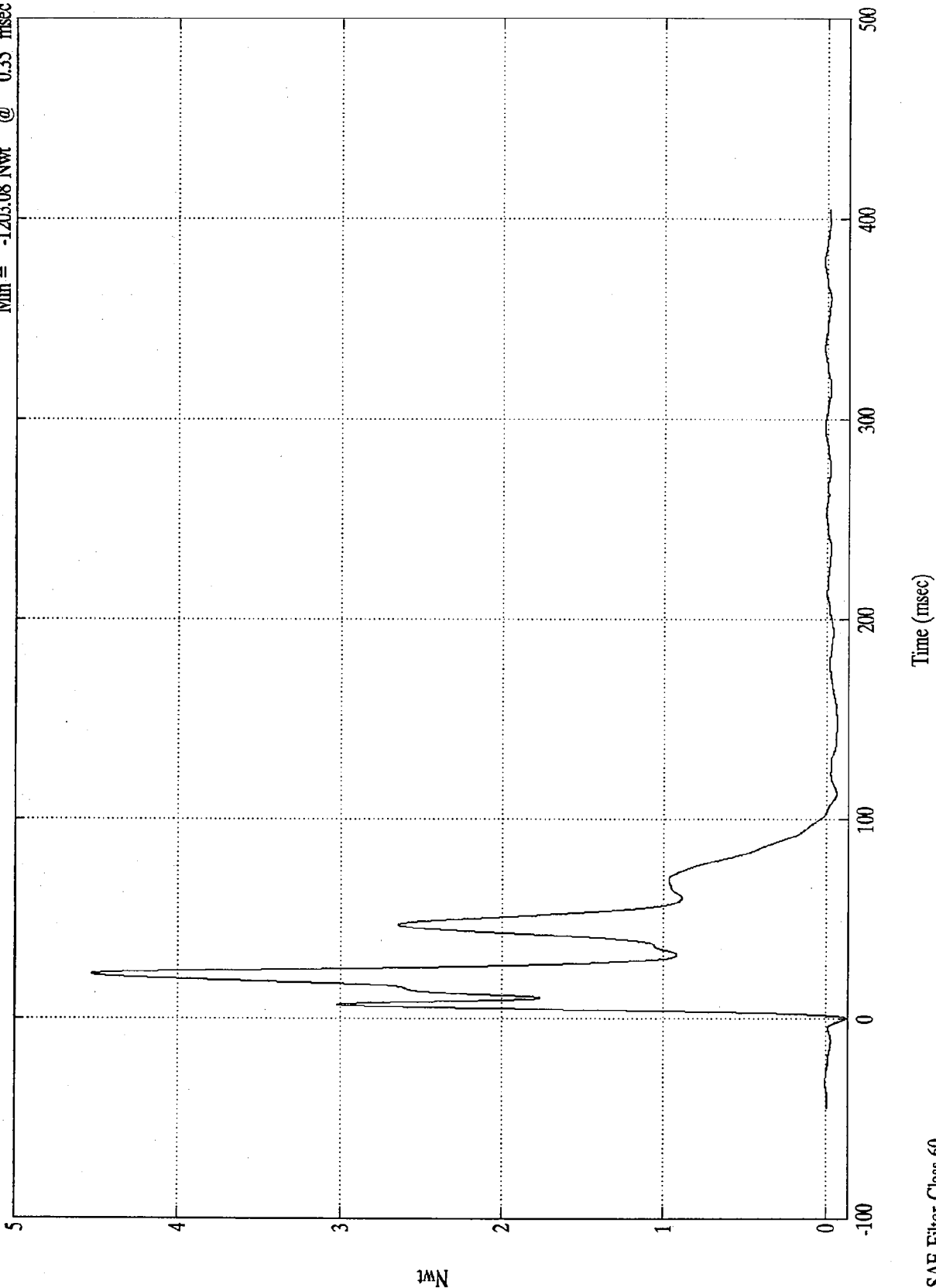


NCAP TEST #14 - 1997 VOLVO 960

$\times 10^4$

Barrier Load Cell D8

Max = 45309.07 Nwt @ 22.43 msec
Min = -1203.08 Nwt @ 0.35 msec



Nwt

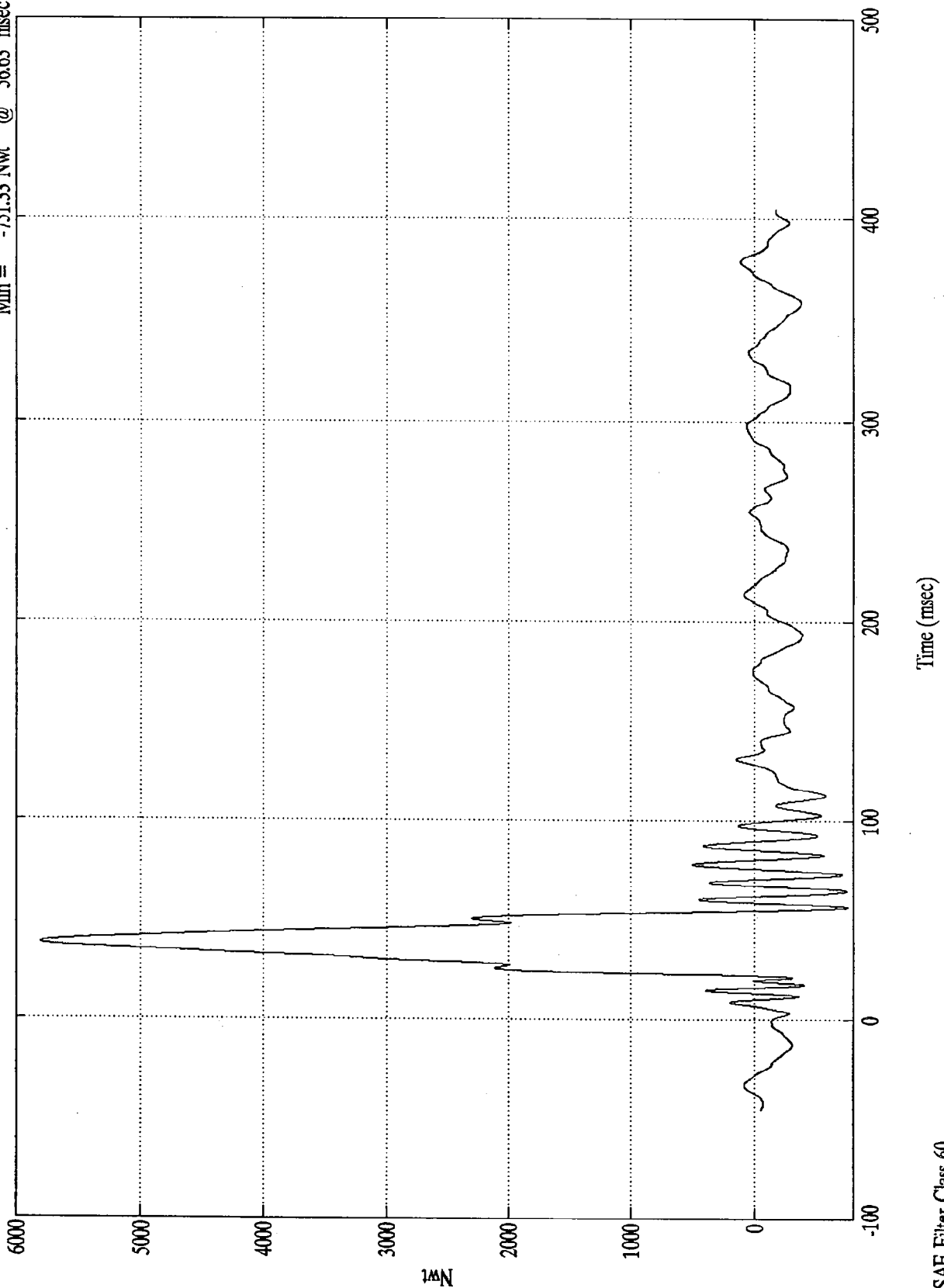
Time (msec)

SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

Barrier Load Cell D9

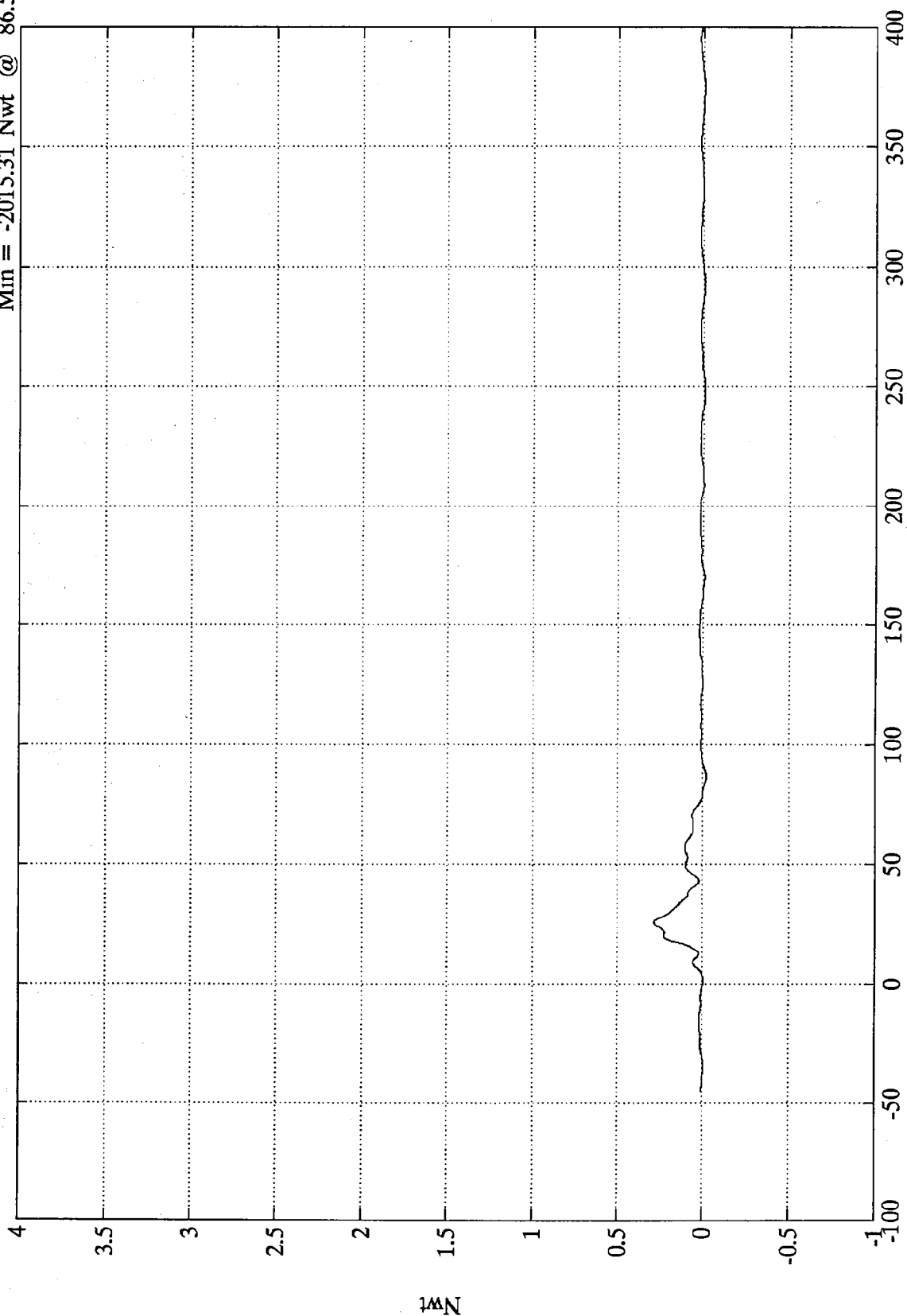
Max = 5801.68 Nwt @ 38.04 msec
Min = -751.33 Nwt @ 56.63 msec



NCAP TEST #14 - 1997 VOLVO 960

Group 1 Load Cell Sum

Max = 28466.23 Nwt @ 25.68 msec
Min = -2015.31 Nwt @ 86.52 msec



Time (msec)

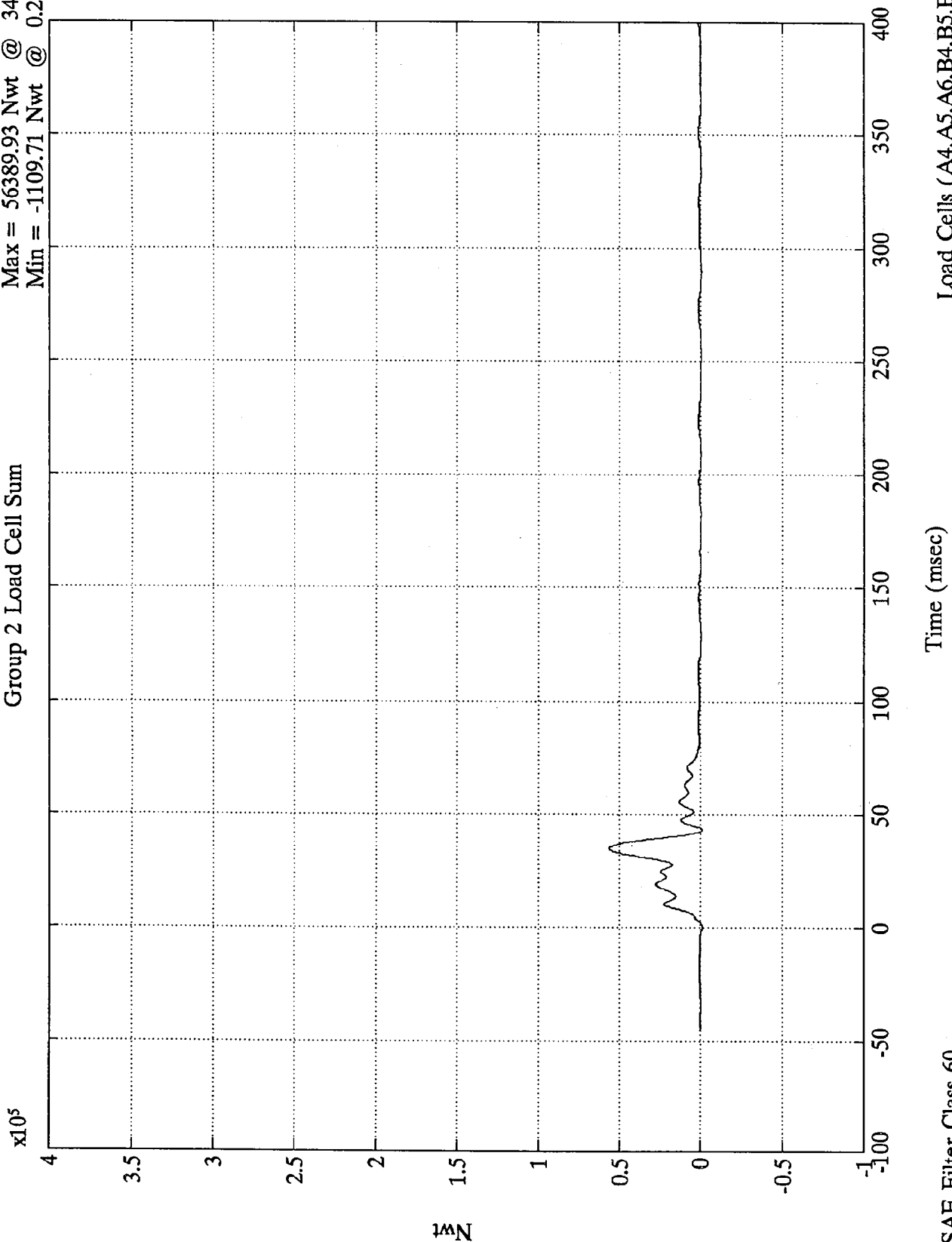
SAE Filter Class 60

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

NCAP TEST #14 - 1997 VOLVO 960

Group 2 Load Cell Sum

Max = 56389.93 Nwt @ 34.68 msec
Min = -1109.71 Nwt @ 0.24 msec



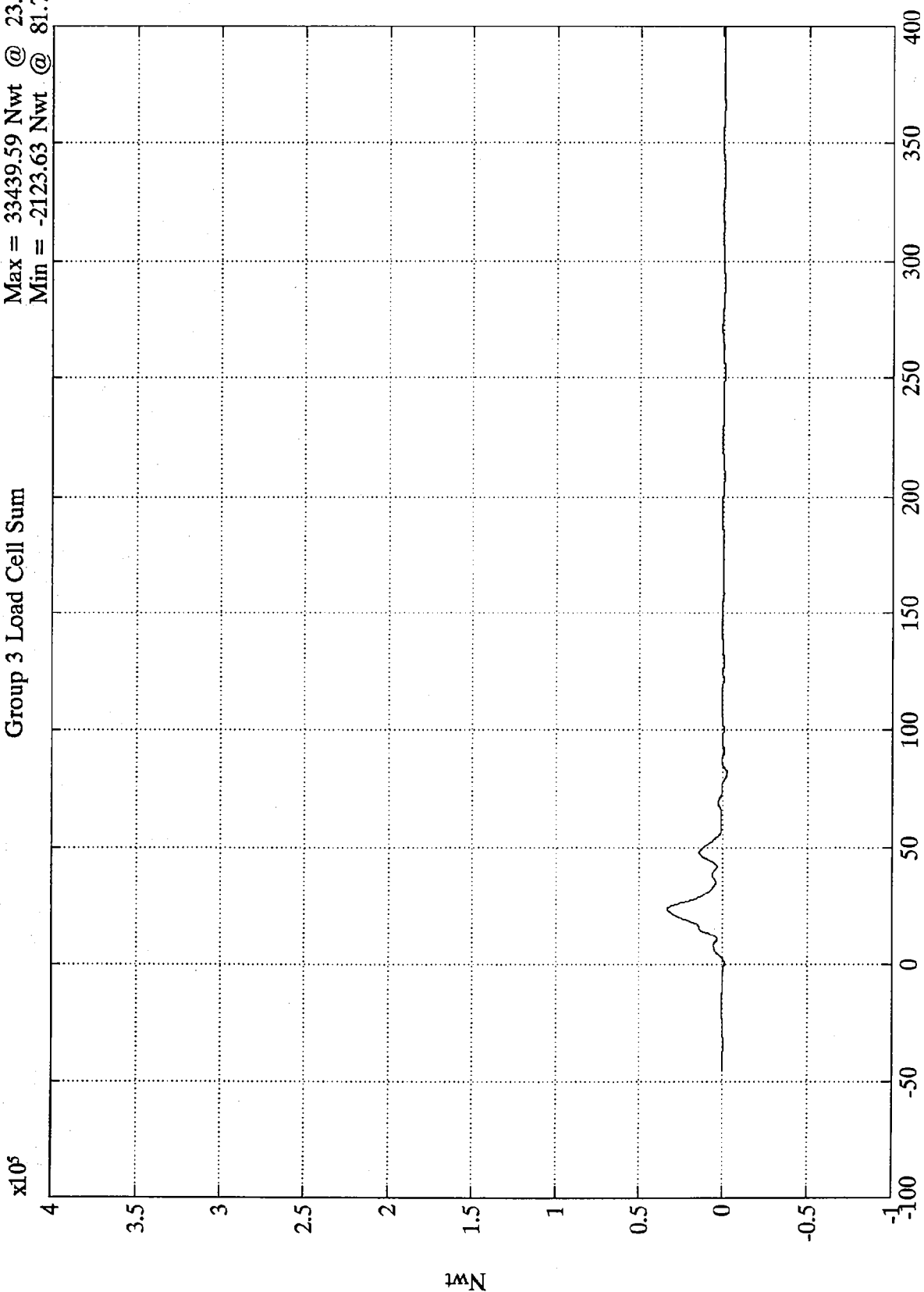
Load Cells (A4,A5,A6,B4,B5,B6)

Time (msec)

SAE Filter Class 60

NCAP TEST #14 - 1997 VOLVO 960

Group 3 Load Cell Sum
Max = 33439.59 Nwt @ 23.64 msec
Min = -2123.63 Nwt @ 81.72 msec



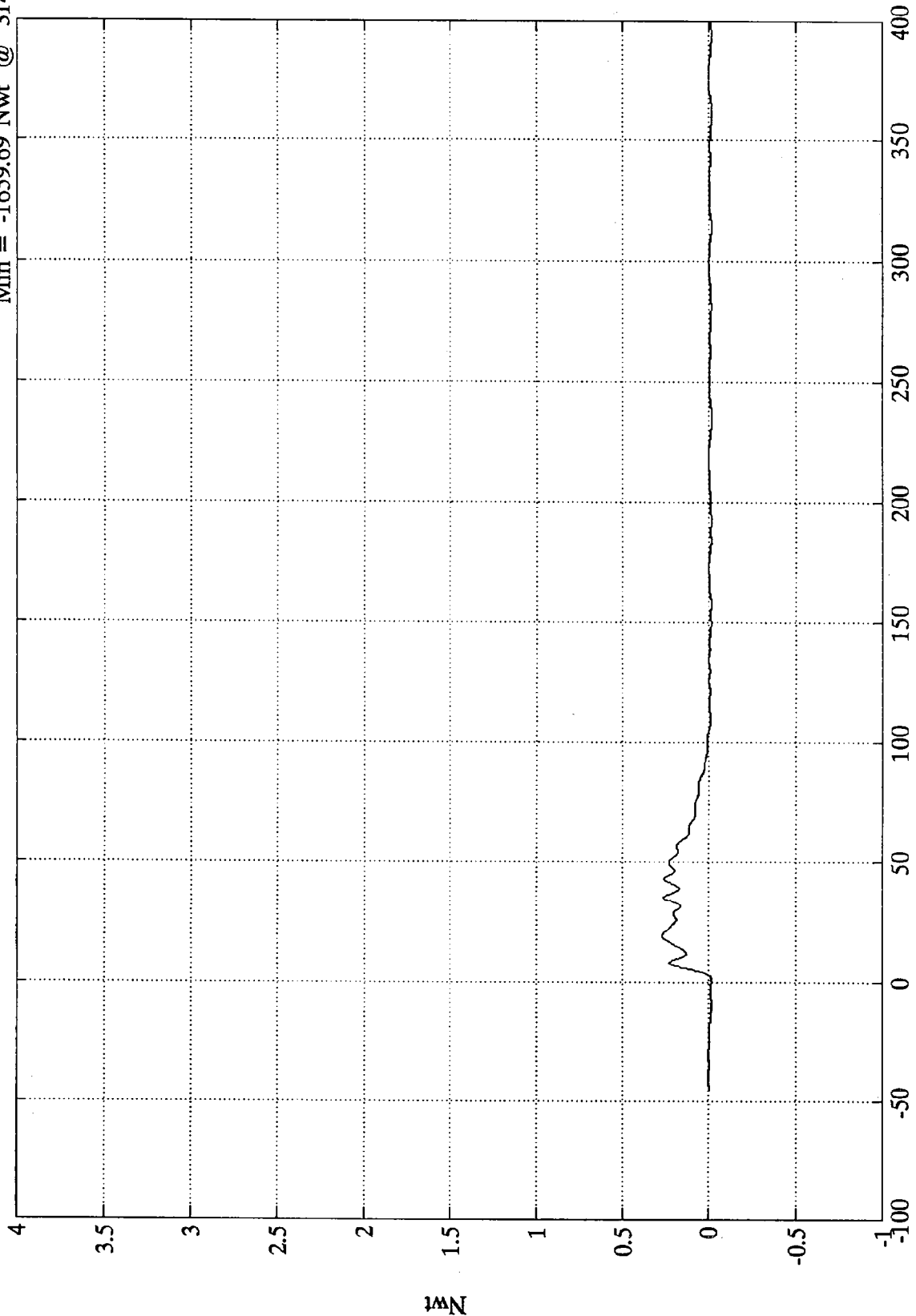
SAE Filter Class 60
Load Cells (A7,A8,A9,B7,B8)

NCAP TEST #14 - 1997 VOLVO 960

Max = 26981.79 Nwt @ 19.32 msec
 Min = -1659.69 Nwt @ 314.04 msec

Group 4 Load Cell Sum

x10⁵



Time (msec)

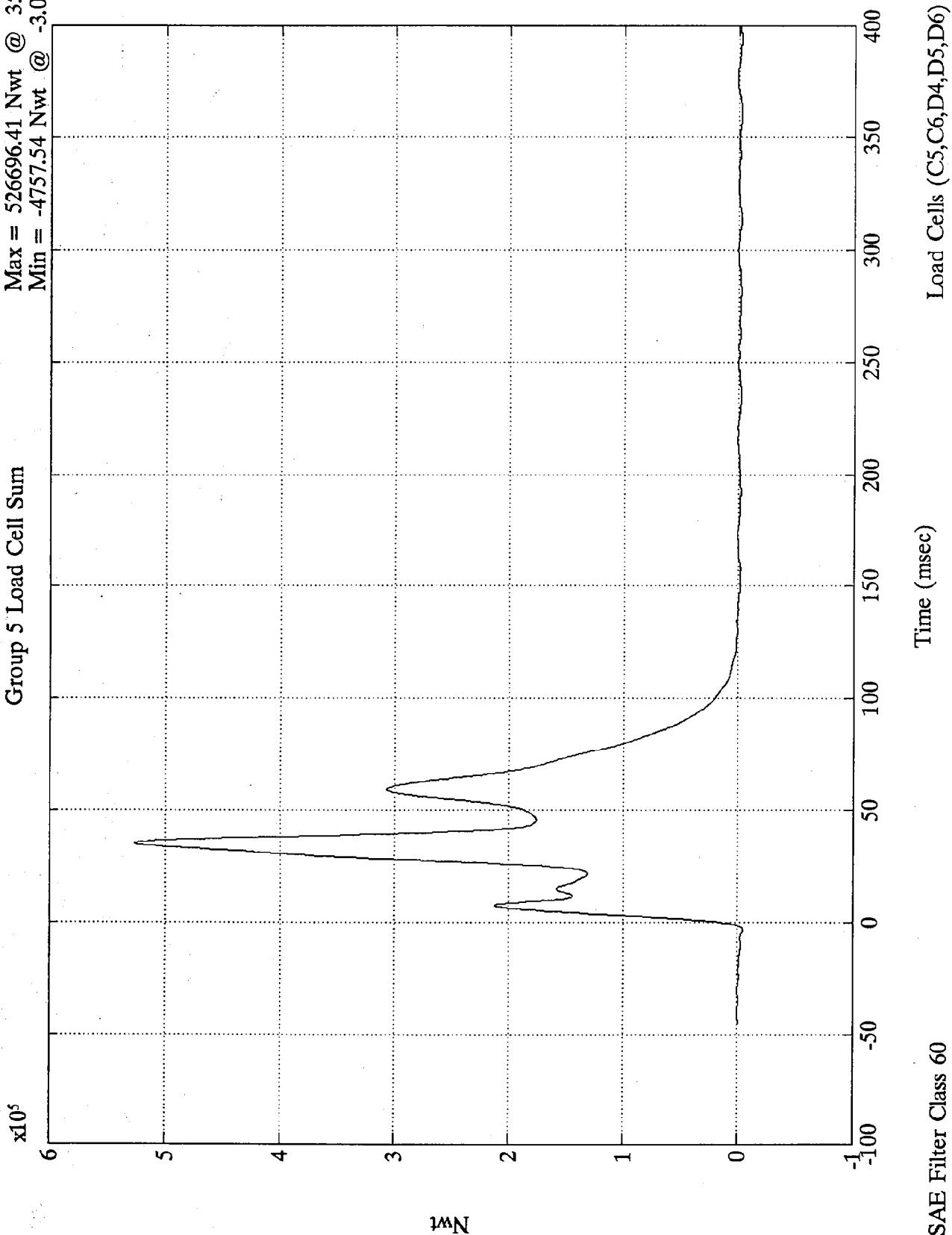
SAE Filter Class 60

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

NCAP TEST #14 - 1997 VOLVO 960

Group 5 Load Cell Sum

Max = 526696.41 Nwt @ 35.04 msec
Min = -4757.54 Nwt @ -3.00 msec



Nwt

Time (msec)

SAE Filter Class 60

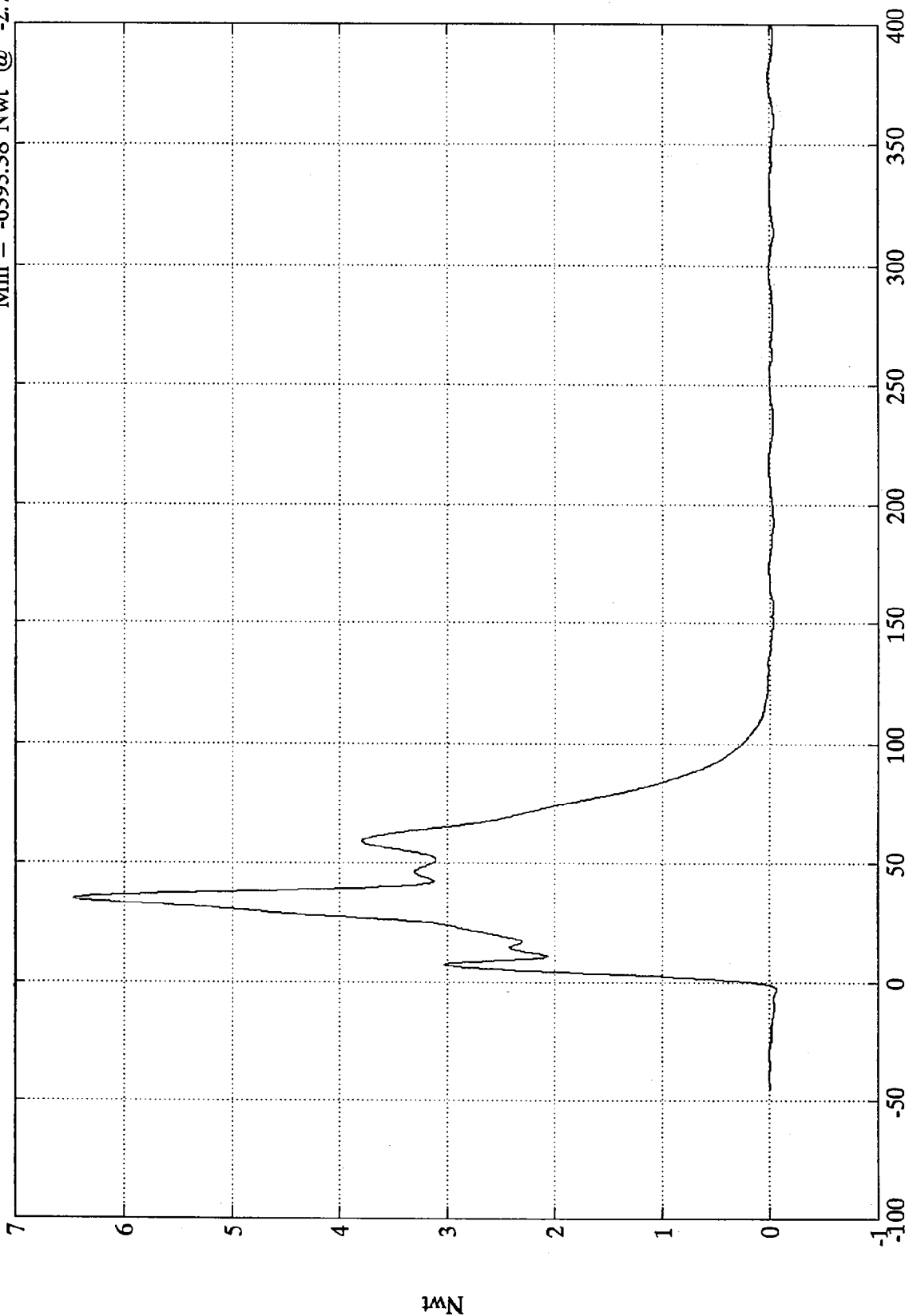
Load Cells (C5,C6,D4,D5,D6)

NCAP TEST #14 - 1997 VOLVO 960

$\times 10^5$

Group 6 Load Cell Sum

Max = 646772.33 Nwt @ 35.28 msec
Min = -6393.38 Nwt @ -2.76 msec



Time (msec)

SAE Filter Class 60

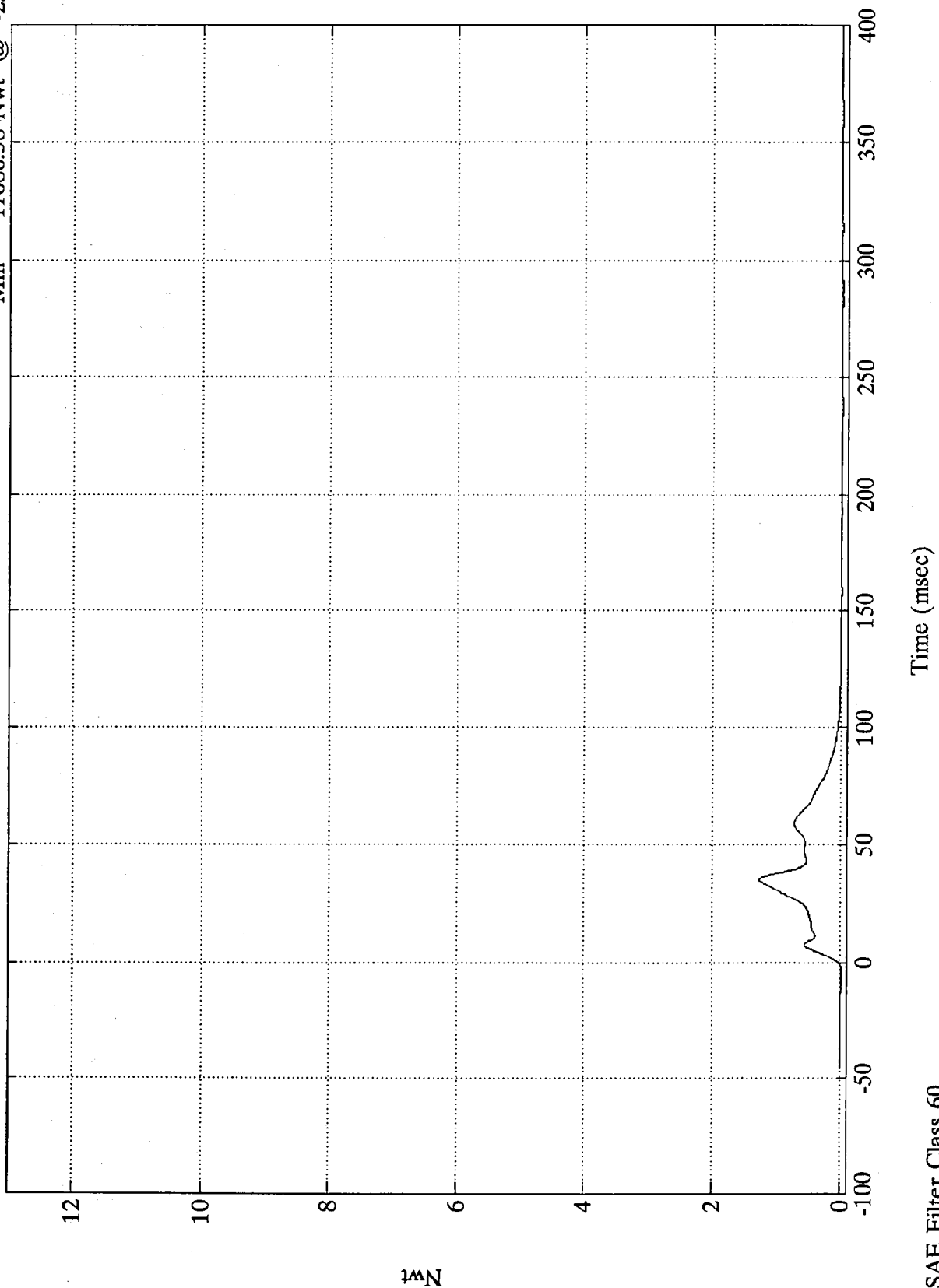
Load Cells (C8,C9,D7,D8,D9)

NCAP TEST #14 - 1997 VOLVO 960

$\times 10^6$

Total Load Cell Sum

Max = 1270989.86 Nwt @ 35.04 msec
Min = -11686.58 Nwt @ -2.64 msec



Nwt

SAE Filter Class 60

Appendix C

PART 572B/E DUMMY CONFIGURATION

AND PERFORMANCE VERIFICATION DATA SHEETS

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

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

Dummy serial numbers and certification dates are:

<u>Position No./Location</u>	<u>Serial No.</u>	<u>Completion Date</u>
#1/Driver	150	9/17/96
#2/Right Front Passenger	064	9/20/96

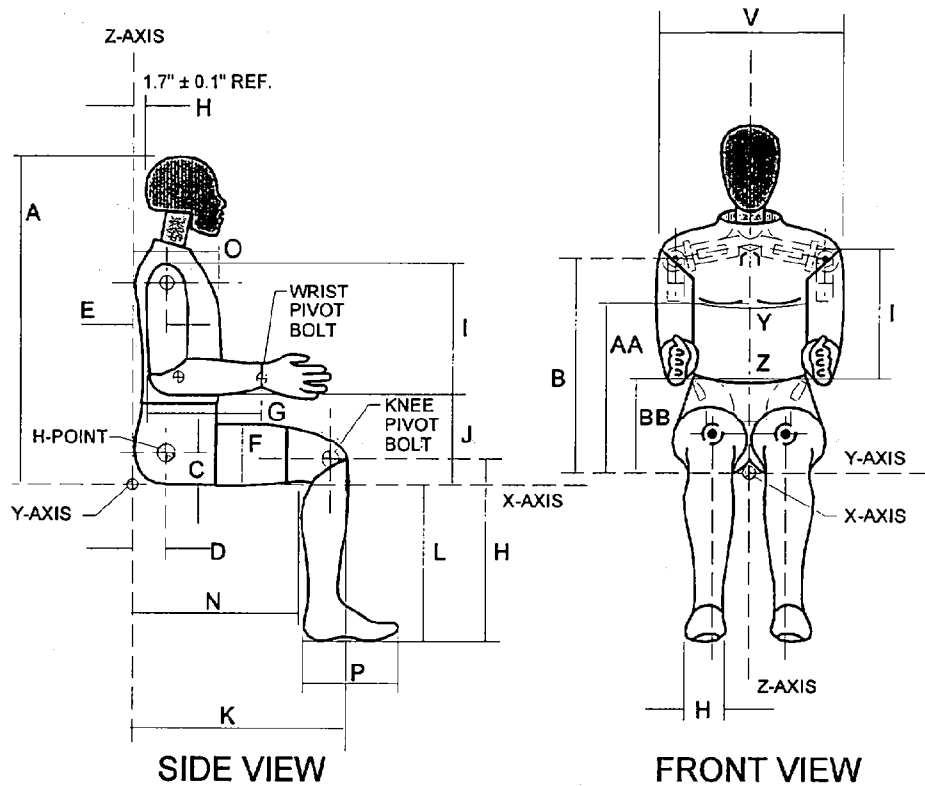
Electronic Test Equipment

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 14

DUMMY CONFIGURATION DIMENSIONS

EXTERNAL DIMENSIONS
SPECIFICATIONS



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

CALSPAN CORPORATION

Transportation Sciences Center

PART 572E HEAD DROP TEST

Dummy Serial Number 150
Calspan Sequential Test Number 1
Date 9/17/96
Workfile

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	55
Peak Resultant Acceleration	225-275 G's	255.5
Peak Lateral Acceleration	15 G's Max	14.8
Is Acceleration Curve Unimodal?	YES	Yes

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION

Transportation Sciences Center

PART 572E
NECK FLEXION TESTDummy Serial Number 150
Calspan Sequential Test Number 1
Date 9/16/96
Workfile

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	45
Impact Velocity		22.60 - 23.40 Ft/s	23.2
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	23.66
	20 ms	17.60 - 22.60 G's	19.89
	30 ms	12.50 - 18.50 G's	16.24
Max Pendulum G's Above 30 ms		29 G's Max	16.24
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	35.88
D Plane Rotation	Max	64 - 78 Deg	68.08
	Time	57 - 64 ms	62.25
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	66.09
	Time	47 - 58 ms	49.88
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	121.13
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	99.00

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION

Transportation Sciences Center

PART 572E
NECK EXTENSION TEST

Dummy Serial Number 150
Calspan Sequential Test Number 1
Date 9/16/96
Workfile

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	45
Impact Velocity		19.50 - 20.30 Ft/s	19.70
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	17.63
	20 ms	14.00 - 19.00 G's	15.68
	30 ms	11.00 - 16.00 G's	13.81
Max Pendulum G's Above 30 ms		22 G's Max	13.81
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	38.63
D Plane Rotation	Max	81 - 106 Deg	92.29
	Time	72 - 82 ms	78.13
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs	43.80
	Time	65 - 79 ms	71.75
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	155.50
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	140.13

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION
Transportation Sciences Center

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 150
Calspan Sequential Test Number 1
Date 9/17/96
Workfile

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70
Relative Humidity	10% - 70%	53
Pendulum Velocity	21.6 - 22.4 Ft/s	22.00
Maximum Deflection	2.50 - 2.86 in	2.69
Maximum Resistive Force	1160 - 1325 Lbs	1260.42
Internal Hysteresis	69 - 85 %	70.99

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION
Transportation Sciences Center

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 150
Calspan Sequential Test Number 1
Date 9/16/96
Workfile

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	55
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 -1300 Lbs	1147
RIGHT KNEE		
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	55
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 -1300 Lbs	1144

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION
Transportation Sciences Center

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 150
Calspan Sequential Test Number 1
Date 9/17/96

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			52
Location for Chest Circumference	AA	16.9 - 17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.7 in	9.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	39.2
Waist Circumference	Z	32.9 - 34.1 in	34.0
Chest Depth	O	8.4 - 9.0 in	8.4
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Total Sitting Height	A	34.6 - 35.0 in	34.8
Thigh Clearance	F	5.5 - 6.1 in	5.7
Buttock Knee Length	K	22.8 - 23.8 in	23.4
Buttock Popliteal Length	N	17.8 - 18.8 in	18.5
Popliteal Height	L	16.9 - 17.9 in	17.8
Knee Pivot Height	M	19.1 - 19.7 in	19.6
Foot Length	P	9.9 - 10.5 in	10.1
Foot Breadth	W	3.6 - 4.2 in	3.8
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.7
Shoulder Breadth	V	16.6 - 17.2 in	16.9
Shoulder Pivot Height	B	19.9 - 20.5 in	20.2
Elbow Rest Height	J	7.5 - 8.3 in	8.1
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.2
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.5

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION
Transportation Sciences Center

PART 572E
HEAD DROP TEST

Dummy Serial Number 064
Calspan Sequential Test Number 1
Date 9/19/96
Workfile

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	45
Peak Resultant Acceleration	225-275 G's	271.2
Peak Lateral Acceleration	15 G's Max	2.0
Is Acceleration Curve Unimodal?	YES	Yes

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION

Transportation Sciences Center

PART 572E
NECK FLEXION TEST

Dummy Serial Number 064
Calspan Sequential Test Number 1
Date 9/20/96
Workfile

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	45
Impact Velocity		22.60 - 23.40 Ft/s	23.20
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	22.62
	20 ms	17.60 - 22.60 G's	19.31
	30 ms	12.50 - 18.50 G's	15.03
Max Pendulum G's Above 30 ms		29 G's Max	15.03
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	41.38
D Plane Rotation	Max	64 - 78 Deg	64.29
	Time	57 - 64 ms	60.88
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	70.32
	Time	47 - 58 ms	53.63
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	114.88
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	102.00

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION
Transportation Sciences Center

PART 572E
NECK EXTENSION TEST

Dummy Serial Number 064
Calspan Sequential Test Number 1
Date 9/20/96
Workfile

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	45
Impact Velocity		19.50 - 20.30 Ft/s	23.20
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	17.44
	20 ms	14.00 - 19.00 G's	16.07
	30 ms	11.00 - 16.00 G's	12.88
Max Pendulum G's Above 30 ms		22 G's Max	12.88
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	41.00
D Plane Rotation	Max	81 - 106 Deg	89.88
	Time	72 - 82 ms	77.50
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs	-39.94
	Time	65 - 79 ms	71.75
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	154.38
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	146.00

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION

Transportation Sciences Center

PART 572E THORAX IMPACT TEST

Dummy Serial Number 064
Calspan Sequential Test Number 1
Date 9/20/96
Workfile

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70
Relative Humidity	10% - 70%	45
Pendulum Velocity	21.6 - 22.4 Ft/s	22.00
Maximum Deflection	2.50 - 2.86 in	2.51
Maximum Resistive Force	1160 - 1325 Lbs	1280.37
Internal Hysteresis	69 - 85 %	72.5

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION

Transportation Sciences Center

PART 572E KNEE IMPACT TEST

Dummy Serial Number 064
Calspan Sequential Test Number 1
Date 9/19/96
Workfile

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	45
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 -1300 Lbs	1169
RIGHT KNEE		
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	45
Probe Velocity	6.8 - 7.0 Ft/s	7.00
Peak Knee Impact Force	1060 -1300 Lbs	1154

Remarks:

Laboratory Technician: B. Swiecicki

CALSPAN CORPORATION

Transportation Sciences Center

PART 572E

EXTERNAL DIMENSIONS

Dummy Serial Number 064
Calspan Sequential Test Number 1
Date 9/19/96

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			45
Location for Chest Circumference	AA	16.9 - 17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.7 in	9.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	38.8
Waist Circumference	Z	32.9 - 34.1 in	33.3
Chest Depth	O	8.4 - 9.0 in	8.6
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Total Sitting Height	A	34.6 - 35.0 in	34.8
Thigh Clearance	F	5.5 - 6.1 in	6.0
Buttock Knee Length	K	22.8 - 23.8 in	23.6
Buttock Popliteal Length	N	17.8 - 18.8 in	18.4
Popliteal Height	L	16.9 - 17.9 in	17.3
Knee Pivot Height	M	19.1 - 19.7 in	19.4
Foot Length	P	9.9 - 10.5 in	10.1
Foot Breadth	W	3.6 - 4.2 in	3.8
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.6
Shoulder Breadth	V	16.6 - 17.2 in	16.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.4
Elbow Rest Height	J	7.5 - 8.3 in	8.0
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.3
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.6

Remarks:

Laboratory Technician: B. Swiecicki

Appendix D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY

(6 Month Calibration Minimum)

DRIVER DUMMY (S/N 150)	Serial #	Manufacturer	Calibration	
			Last	Next
Head				
X	ADL98	ENDEVCO	9/96	3/97
Y	AE8K0	ENDEVCO	9/96	3/97
Z	ADMB6	ENDEVCO	9/96	3/97
Chest				
X	A26A	ENDEVCO	9/96	3/97
Y	A27A	ENDEVCO	9/96	3/97
Z	A51A	ENDEVCO	9/96	3/97
Right Femur Load Cell	951	GSE	7/96	1/97
Left Femur Load Cell	952	GSE	7/96	1/97
Neck Load Cell	269	DENTON	8/96	2/97
X	269	DENTON	8/96	2/97
Y	269	DENTON	8/96	2/97
Z	269	DENTON	8/96	2/97
Neck Moment	269	DENTON	8/96	2/97
X	269	DENTON	8/96	2/97
Y	269	DENTON	8/96	2/97
Z	269	DENTON	8/96	2/97
Chest Deflection Gauge	150	HUMANOID	9/96	3/97
Hybrid III Use Only				
Lap Belt Load Cells	706	LEBOW	9/96	3/97
Shoulder Belt Load Cells	N/A	LEBOW	-	-
Spool-Out Potentiometer	N/A	MAGNETEK	-	-
Belt Stretch Transducer	E6	CALSPAN	7/96	1/97

INSTRUMENT CALIBRATION FOR DRIVER DUMMY

(6 Month Calibration Minimum)

DRIVER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head				
X (R)	AP1A0	ENDEVCO	7/96	1/97
Y (R)	AC8F6	ENDEVCO	9/96	3/97
Z (R)	ACCW0	ENDEVCO	9/96	3/97
Chest				
X (R)	AHRC9	ENDEVCO	9/96	3/97
Y (R)	AC7W8	ENDEVCO	9/96	3/97
Z (R)	ACC06	ENDEVCO	9/96	3/97
Pelvic				
X	AL6N5	ENDEVCO	9/96	3/97
Y	AL6R7	ENDEVCO	9/96	3/97
Z	A12C	ENDEVCO	9/96	3/97
Left Upper Tibia	Mx	DENTON	9/96	3/97
Left Upper Tibia	My	DENTON	9/96	3/97
Left Lower Tibia	Fy	DENTON	9/96	3/97
Left Lower Tibia	Fz	DENTON	9/96	3/97
Left Lower Tibia	Mx	DENTON	9/96	3/97
Right Upper Tibia	Mx	DENTON	9/96	3/97
Right Upper Tibia	My	DENTON	9/96	3/97
Right Lower Tibia	Fy	DENTON	9/96	3/97
Right Lower Tibia	Fz	DENTON	9/96	3/97
Right Lower Tibia	Mx	DENTON	9/96	3/97

INSTRUMENT CALIBRATION FOR DRIVER DUMMY

(6 Month Calibration Minimum)

DRIVER DUMMY	Serial #	Manufacture	Calibration	
			Last	Next
Left Foot Rear X	AA35	ENDEVCO	10/96	4/97
Left Foot Rear Z	BC45	ENDEVCO	10/96	4/97
Right Foot Rear X	AEWK1	ENDEVCO	8/96	2/97
Right Foot Rear Z	AKD92	ENDEVCO	10/96	4/97

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY

(6 Month Calibration Minimum)

PASSENGER DUMMY (S/N 064)	Serial #	Manufacturer	Calibration	
			Last	Next
Head				
X	AH5M9	ENDEVCO	9/96	3/97
Y	AGHF5	ENDEVCO	9/96	3/97
Z	AL6K2	ENDEVCO	9/96	3/97
Chest				
X	A33A	ENDEVCO	8/96	2/97
Y	FB32L	ENDEVCO	8/96	2/97
Z	AD395	ENDEVCO	8/96	2/97
Right Femur Load Cell	231	GSE	7/96	1/97
Left Femur Load Cell	232	GSE	7/96	1/97
Neck Load Cell				
X	076	DENTON	9/96	3/97
Y	076	DENTON	9/96	3/97
Z	076	DENTON	9/96	3/97
Neck Moment				
X	076	DENTON	9/96	3/97
Y	076	DENTON	9/96	3/97
Z	076	DENTON	9/96	3/97
Chest Deflection Gauge	064	HUMANOID	8/96	2/97
Hybrid III Use Only				
Lap Belt Load Cells	635	LEBOW	9/96	3/97
Shoulder Belt Load Cells	N/A	LEBOW	-	-
Spool-Out Potentiometer	N/A	MAGNETEK	-	-
Belt Stretch Transducer	E7	CALSPAN	7/96	1/97

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY

(6 Month Calibration Minimum)

PASSENGER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head				
X (R)	APBF4	ENDEVCO	9/96	3/97
Y (R)	APBD7	ENDEVCO	9/96	3/97
Z (R)	AN967	ENDEVCO	7/96	1/97
Chest				
X (R)	APA30	ENDEVCO	7/96	1/97
Y (R)	AP1B5	ENDEVCO	8/96	2/97
Z (R)	AP057	ENDEVCO	8/96	2/97
Pelvic				
X	AF480	ENDEVCO	9/96	3/97
Y	AL508	ENDEVCO	9/96	3/97
Z	AF5C1	ENDEVCO	9/96	3/97
Left Upper Tibia				
Mx	015	DENTON	9/96	3/97
Left Upper Tibia				
My	015	DENTON	9/96	3/97
Left Lower Tibia				
Fy	011	DENTON	9/96	3/97
Left Lower Tibia				
Fz	011	DENTON	9/96	3/97
Left Lower Tibia				
Mx	011	DENTON	9/96	3/97
Right Upper Tibia				
Mx	016	DENTON	9/96	3/97
Right Upper Tibia				
My	016	DENTON	9/96	3/97
Right Lower Tibia				
Fy	012	DENTON	9/96	3/97
Right Lower Tibia				
Fz	012	DENTON	9/96	3/97
Right Lower Tibia				
Mx	012	DENTON	9/96	3/97

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY

(6 Month Calibration Minimum)

PASSENGER DUMMY	Serial #	Manufacture	Calibration	
			Last	Next
Left Foot Rear X	AY03	ENDEVCO	6/96	12/96
Left Foot Rear Z	BA98	ENDEVCO	10/96	4/97
Right Foot Rear X	AN25	ENDEVCO	10/96	4/97
Right Foot Rear Z	AY60	ENDEVCO	10/96	4/97

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS

(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration	
			Last	Next
Left Seat Rear Crossmember	X83	ICS	10/96	4/97
Right Rear Seat Crossmember	Y89	ICS	11/96	5/97
Top of Engine	X26	ICS	11/96	5/97
Bottom of Engine	X78	ICS	7/96	1/97
Left Disc Brake Caliper	A70	CEC	9/96	3/97
Right Disc Brake Caliper	A86	CEC	9/96	3/97
Instrument Panel	A129	CEC	11/96	5/97
Left Seat Rear Crossmember (R)	Y17	ICS	11/96	5/97
Right Seat Rear Crossmember (R)	X84	ICS	11/96	5/97

Appendix E

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

Seat belts

Seat belts

Always fasten the seat belts before you drive or ride.

Two lights above the rear view mirror will be illuminated for 4-8 seconds after the starting (ignition) key is turned to the driving position. A chime will sound at the same time if the driver has not fastened his seat belt. The rear seats are provided with self-retracting inertia reel belts. The front seats are provided with single roller belts with tensioners.

To buckle:

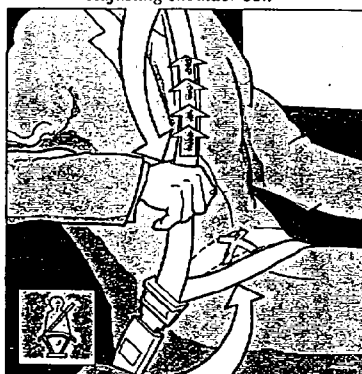
Pull the belt out far enough to insert the latch plate into the receptacle (buckle for rear seats) until a distinct snapping sound is heard. The seat belt retractor is normally "unlocked" and you can move freely, provided that the shoulder belt is not pulled out too far. The retractor will lock up as follows:

- if the belt is pulled out rapidly
- during braking and acceleration
- if the vehicle is leaning excessively
- when driving in turns

For the seat belt to provide maximum protection in the event of an accident, it must be worn correctly. When wearing the seat belt remember:

- The belt should not be twisted or turned.
- The lap belt must be positioned low on the hips (not pressing against the abdomen).
- The shoulder section of the front seat

Adjusting shoulder belt



Lap portion of the belt should sit low

belts adjust automatically to the driver's height.

Make sure that the shoulder belt is rolled up into its retractor and that the shoulder and lap belts are taut.

Before exiting the car, check that the seat belt retracts fully after being unbuckled.

If necessary, guide the belt back into the retractor slot.

NOTE: Legislation in your state or province may mandate seat belt usage.

WARNING! Any device used to induce slack into the shoulder belt portion of the three-point belt system will have a detrimental effect on the amount of protection available to you in the event of a collision. The seat back should not be tilted too far back. The shoulder belt must be taut in order to function properly.

Spool-out

To make child seat installation easier, each seat belt buckle (except for the driver's belt) is equipped with a locking mechanism to help keep the lap section of the seat belt taut. Please refer to page 1:11 for more information on this function.

Seat belts



Center head restraint

The center head restraint can be adjusted according to the passenger's height. The restraint should be carefully adjusted to support the occupant's head.

The head restraint can be raised by pulling straight up or lowered by grasping the restraint, pulling it slightly forward and pushing down.



During pregnancy

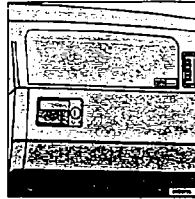
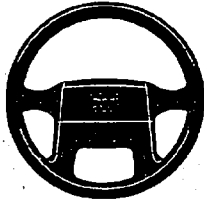
Pregnant women should always wear seat belts. Remember that the belt should always be positioned in such a way as to avoid any possible pressure on the abdomen. The lap portion of the belt should be located low, as shown in the above illustration.

WARNING! Never use a seat belt for more than one occupant. Never wear the shoulder portion of the belt under the arm, behind the back or otherwise out of position. Such use could cause injury in event of accident. As the seat belts lose much of their strength when exposed to violent stretching, they should be replaced after any collision, even though they may appear to be undamaged. Never repair the belt on your own; have this done by an authorized Volvo retailer only.

NOTE:

Legislation in your state or province may mandate seat belt usage.

Volvo SRS



Passenger side SRS hatch

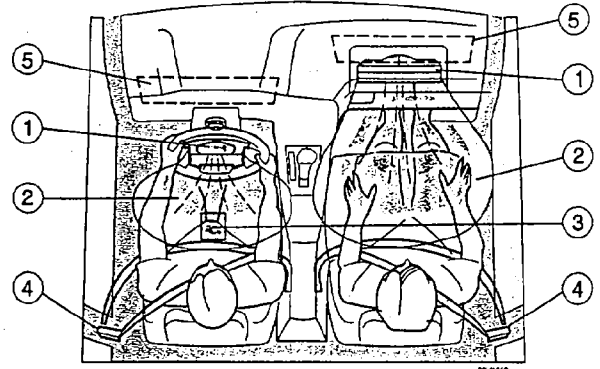
As an enhancement to the three-point seat belt system, your Volvo is equipped with a Supplemental Restraint System (SRS). The Volvo SRS consists of airbags (2) and knee bolsters (5) on both the driver's and passenger's sides and seat belt tensioners in both front door pillars (4). The system is designed to supplement the protection provided by the three-point seat belt system.

The SRS system is indicated by the "SRS" embossed on the steering wheel pad and above the glove compartment, the knee bolsters beneath the steering column and the glove compartment and decals on both sun visors and on the far right side of the dash.

The airbags are folded and located in the center of the steering wheel and above the glove compartment. They are designed to deploy during certain frontal or front-angular collisions, impacts, or decelerations, depending on the crash severity, angle, speed and object impacted. The airbags may also deploy in certain non-frontal collisions where rapid deceleration occurs. Both airbags and seat belt tensioners will deploy, even if the passenger seat is not occupied.

WARNING!

As its name implies, SRS is designed to be a SUPPLEMENT to - not a replacement for - the three-point belt system. For maximum protection, wear seat belts at all times. Be aware that no system can prevent all possible injuries that may occur in an accident.



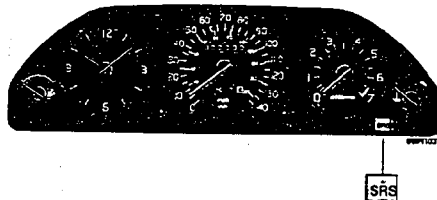
The airbag system includes gas generators (1) surrounded by the airbags (2) and front seat belt tensioners for both of the front seats (4). To deploy the system, the sensor (3) activates the gas generators causing the airbags to be inflated with nitrogen gas. As the movement of the seats' occupants compresses the airbags, some of the gas is expelled at a controlled rate to provide better cushioning. Both seat belt tensioners also deploy, minimizing any seat belt slack.

The entire process, including inflation and deflation of the airbags, takes approximately two-tenths of a second.

WARNING!

When installing any optional equipment make sure that the SRS system is not damaged. Do not attempt to service any component of the SRS yourself. Attempting to do so may result in serious personal injury. If a problem arises, take your car to the nearest authorized Volvo Retailer for inspection as soon as possible.

Volvo SRS



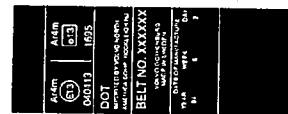
A self-diagnostic system incorporated in the sensor monitors the SRS. This system does not, however, monitor the SIPS airbags. If a fault is detected, the "SRS" warning light will illuminate. The light is included in the warning/indicator light cluster in the instrument panel. Normally, the SRS warning lamp should light up when the ignition is switched on and should go out after 10 seconds or when the engine is started. Check that this light is functioning properly every time the car is started.

The following items are monitored by the self-diagnostic system:

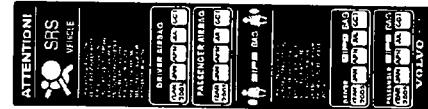
- Sensor unit
- Cable harness
- Gas generator ignitors

WARNING! Never drive an SRS equipped car with your hands on the steering wheel pad/airbag housing. No objects, accessory equipment or stickers may be placed on, attached to or installed near the SRS cover in the center of the steering wheel, the SRS cover above the glove compartment or the area affected by airbag deployment.

If the SRS warning light stays on after the engine has started or if it comes on while you are driving, drive the car to the nearest authorized Volvo retailer for inspection as soon as possible.



The above is a sample of the label found on all seat belts equipped with tensioners, located on the front seat belts near the lower anchorage point.



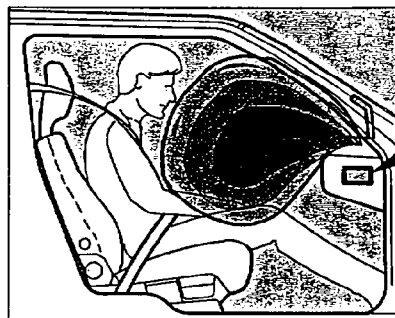
The above is a sample of the decals which can be found on both front door pillars.

There is no maintenance to perform on the SRS yourself. The only periodic maintenance recommended on the SRS is that the air bag modules and front seat belts (including tensioners) should be replaced approximately every ten years and that the other components in the system (wiring, connectors, etc.) should also be inspected at this time. The SRS decal on your car shows the month and year servicing is due. This service must be performed by an authorized Volvo retailer. Should you have any questions about the SRS system, please contact your authorized Volvo Retailer or Volvo Customer Support:

In the U.S.A.:
Volvo Cars of North America
Customer Support
P.O. Box 914
Rockleigh, New Jersey 07647-0914
800-458-1552

In Canada:
Volvo Canada Ltd.
175 Gordon Baker Road
Willowdale, Ontario M2H 2N7
800-663-8255

Volvo SRS



Passenger side air bag

CAUTION
TO AVOID SERIOUS INJURY:
FOR MAXIMUM SAFETY PROTECTION IN ALL TYPES OF CRASHES, YOU MUST ALWAYS WEAR YOUR SAFETY BELT.
DO NOT INSTALL REARWARD-FACING CHILD SEATS IN ANY FRONT PASSENGER SEAT POSITION.
DO NOT SIT OR LEAN UNNECESSARILY CLOSE TO THE AIR BAG.
DO NOT PLACE ANY OBJECTS OVER THE AIR BAG OR BETWEEN THE AIR BAG AND YOURSELF.
SEE THE OWNER'S MANUAL FOR FURTHER INFORMATION AND EXPLANATIONS.
VOLVO

SRS texts on inside of both sun visors

**AIR BAG
SEE OTHER SIDE**

SRS texts on outside of both sun visors

WARNING
* ALL OCCUPANTS MUST WEAR SEATBELTS PROPERLY. * SEATBELTS MUST BE WORN AND CHILDREN MUST NOT BE SEATED IN THE FRONT SEAT.
* DO NOT INSTALL ANY LOOSE CHILD SEAT OR CHILD BOOSTER SEAT IN THE FRONT SEAT.
* Do not use child seats or child booster cushions/backrests in the front passenger's seat. We also recommend that children who have outgrown these devices sit in the rear seat with the seat belt properly fastened.
VOLVO

SRS text at far right of instrument panel

WARNING! Do not use child safety seats or child booster cushions/backrests in the front passenger's seat. We also recommend that children who have outgrown these devices sit in the rear seat with the seat belt properly fastened.

NOTE: Deployment of SRS components occurs only one time during an accident. In a collision where deployment occurs, the air bags and seat belt tensioners activate. Some noise occurs and a small amount of powder is released. The release of the powder may appear as smoke-like matter. This is a normal characteristic and does not indicate fire.

WARNING!

- Occupants in the front passenger's seat must never sit on the edge of the seat, sit leaning toward the instrument panel or otherwise sit out of position. The occupant's back must be as upright as comfort allows and be against the seat back with the seat belt properly fastened.
- Feet must be on the floor, e.g. not on the dash, seat or out of the window.
- Children must never be allowed to stand in front of the passenger seat.
- No objects or accessory equipment, e.g. dash covers, may be placed on, attached to or installed near the SRS hatch (the area above the glove compartment) or the area affected by air bag deployment (see illustration).
- There should be no loose articles, e.g. coffee cups, on the floor, seat or dash area.
- Never try to open the SRS cover on the steering wheel or the passenger side SRS hatch. This should only be done by an authorized Volvo service technician.
- Failure to follow these instructions can result in injury to the vehicle occupants in an accident.

Volvo SRS

NOTE: The information on this page does not pertain to the Side Impact protection System airbags.

When are the airbags deployed?

The SRS system is designed to deploy during certain frontal or front-angular collisions, impacts, or decelerations, depending on the crash severity, angle, speed and object impacted. The SRS sensor is designed to react to both the impact of the collision and the inertial forces generated by it and to determine if the intensity of the collision is sufficient for the airbags to be deployed.

WARNING! The SRS is designed to help prevent serious injury. Deployment occurs very quickly and with considerable force. During normal deployment and depending on variables such as seating position, one may experience abrasions, bruises, swellings, or other injuries as a result of airbag(s) deployment.

If the airbags have been deployed, we recommend the following:

- Have the car towed to an authorized Volvo retailer. Even if it can be driven after an accident we do not recommend driving the car with deployed airbags.
- Have an authorized Volvo retailer replace the SRS system components.
- Use only new, Genuine Volvo Parts when replacing SRS components (airbags, seat belts, tensioners, etc.).

When are the airbags NOT deployed?

Not all frontal collisions activate the SRS system. If the collision involves a non-rigid object (e.g., a snow drift or bush), or a rigid, fixed object at a low speed, the SRS system will not necessarily deploy. Airbags do not normally deploy in a side impact collision, in a collision from the rear or in a rollover situation. The amount of damage to the bodywork does not reliably indicate if the airbags should have deployed or not.

Seat belts - the heart of the Volvo safety system

The heart of the Volvo safety system is the **three-point seat belt!** In order for the SRS system to provide the protection intended, seat belts must be worn at all times by everyone in the car. The SRS system is a supplement to the seat belts.

WARNING! If your car has been subjected to flood conditions (e.g. soaked carpeting/standing water on the floor of the vehicle) or if your car has become flood-damaged in any way, do not attempt to start the vehicle or put the key in the ignition before disconnecting the battery (see below). This may cause airbag deployment which could result in personal injury. Have the car towed to an authorized Volvo retailer for repairs.

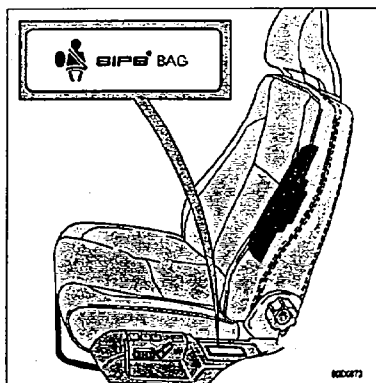
Automatic transmission only:

Before attempting to tow the car, use the following procedure to override the shiftlock system to move the gear selector to the neutral position.

- Disconnect the battery
- Wait at least one minute
- Insert the key in the ignition and turn it to position 1
- Press firmly on the shiftlock override button (located near the base of the gear selector).
- While holding the override button down, move the gear selector from the park position.

WARNING! Never drive with the airbags deployed. The fact that they hang out can impair the steering of your car. Other safety systems can also be damaged. The smoke and dust formed when the airbags are deployed can cause skin and eye irritation in the event of prolonged exposure.

Volvo Side Impact Protection System (SIPS) airbag

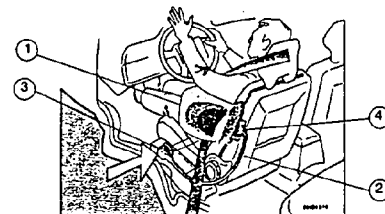


SIPS airbag (front seats only)

As an enhancement to the structural Side Impact Protection System built into your car, your car is also equipped with Side Impact Protection System (SIPS) airbags. The SIPS airbag system consists of airbag modules built into the sides of both front seat backrests (1), cables (2) from these modules to the mechanical sensor units (3) and gas generators (4). The SIPS airbag system is designed to help increase occupant protection in the event of certain side impact collisions. The SIPS airbags are designed to deploy only during certain side-impact collisions, depending on the crash severity, angle, speed and point of

WARNING!

- The SIPS airbag system is a supplement to the Side Impact Protection System and the three-point seat belt system. It is not designed to deploy during collisions from the front or rear of the car or in rollover situations.
- Only Volvo approved seat covers may be used. The use of non-approved aftermarket seat covers may impede SIPS airbag deployment.
- No objects, accessory equipment or stickers may be placed on, attached to or installed near the SIPS airbag system or in the area affected by SIPS airbag deployment (see illustration to the right above).
- Never try to open or repair any components of the SIPS airbag system. This should only be done by an authorized Volvo service technician.
- For best protection from the SIPS airbag system, both front seat occupants should sit in an upright position with the seat belt properly fastened.



1 - Airbag, 2 - cable, 3 - sensor unit, 4 - gas generator

impact. The airbags are not designed to deploy in all side impact situations.

NOTE: SIPS airbag deployment (one airbag) occurs only on the side of the vehicle affected by the impact.

* A SIPS airbag warning decal is located at the end of the instrument panel on the driver's side of the car.

Seat belt maintenance

Check periodically that the anchor bolts are secure and that the belts are in good condition. Use water and a mild detergent for cleaning. Check seat belt mechanism function as follows: Attach the seat belt and pull rapidly on the strap.

Volvo Concern for Safety

Safety is the cornerstone for Volvo. Our concern dates back to 1927 when the first Volvo rolled off the production line. Three-point seat belts, safety cages, and energy-absorbing impact zones were designed into Volvo cars long before it was fashionable or required by government regulation. We will not compromise our commitment to safety. We continue to seek out new safety features and to refine those already in our cars. You can help. We would appreciate hearing your suggestions about improving automobile safety. We also want to know if you ever have a safety concern with your car. Call us in the U.S. at: 800-458-1552 or in Canada at: 800-663-8255.

Occupant safety

How safely you drive doesn't depend on how old you are but rather on:

- how well you see
- your ability to concentrate
- how quickly you make decisions under stress to avoid an accident.

The tips listed below are suggestions to help you cope with the ever changing traffic environment.

- Never drink and drive.
- If you are taking any medication, consult your physician about its potential effects on your driving abilities.
- Take a driver-retraining course
- Have your eyes checked regularly
- Keep your windshield and headlamps clean.
- Replace wiper blades when they start to leave streaks.
- Take into account the traffic, road, and weather conditions, particularly with regard to stopping distance.

Reporting Safety Defects in the U.S.

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Volvo Cars of North America. If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your retailer, or Volvo Cars of North America. To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in Washington, D.C. area) or write to: NHTSA, U.S. Department of Transportation, Washington D.C. 20590. You can also obtain other information about motor vehicle safety from the Hotline.

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