

V2120

REPORT NUMBER: 208-CAL-94-19
212-CAL-94-19
213-CAL-94-54
301-CAL-94-19

**VEHICLE SAFETY COMPLIANCE TESTING FOR OCCUPANT CRASH PROTECTION
WINDSHIELD MOUNTING, WINDSHIELD ZONE INTRUSION (PARTIAL),
BUILT-IN CHILD RESTRAINT SYSTEM
AND FUEL SYSTEM INTEGRITY**

GENERAL MOTORS CORPORATION
1994 Chevrolet Lumina
MPV

NHTSA NUMBER: CR0111

CALSPAN TEST NUMBER: 8221-3

August 11, 1994

CALSPAN CORPORATION
ADVANCED TECHNOLOGY CENTER
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FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
ENFORCEMENT
Office of Vehicle Safety Compliance
400 Seventh Street, S. W.
Room No. 6115 (NEF-30)
Washington, DC 20590

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11/2/95

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. 208-CAL-94-19 212-CAL-94-19 213-CAL-95-54 301-CAL-94-19		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Final Report of FMVSS 208, 212, 213, 219 (Partial), and 301 Compliance testing of a 1994 Chevrolet Lumina MPV NHTSA No. CR0111				5. Report Date August 11, 1994	
				6. Performing Organization Code CAL	
7. Author(s) Reginald E. Evans, Project Engineer David J. Travale Program Manager				8. Performing Organization Report No. 8221-3	
9. Performing Organization Name and Address Calspan Advanced Technology Center P.O. Box 400 Buffalo, New York 14225				10. Work Unit No. X65-3-1441	
				11. Contract or Grant No. DTNH22-93-D-11089	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance (NEF-30) 400 Seventh St., S.W., Rm. 6115, Washington, D.C. 20590				13. Type of Report and Period Covered Final - August 1994	
				14. Sponsoring Agency Code NEF-30	
15. Supplementary Notes					
16. Abstract A 30 mph vehicle safety compliance test was conducted on a 1994 Chevrolet Lumina MPV. This test was performed at the Calspan Advanced Technology Center in Buffalo, New York on August 11, 1994. The purpose of this test was to determine compliance with the performance requirements of the following Federal Motor Vehicle Safety Standards: 1. FMVSS No. 208, "Occupant Crash Protection" 2. FMVSS No. 212, "Windshield Mounting" 3. FMVSS No. 219 (partial), "Windshield Zone Intrusion" 4. FMVSS No. 301, "Fuel System Integrity" 5. FMVSS No. 213, "Child Restraint Systems" The test mode was perpendicular (0°) and the impact velocity was 29.5 mph. The ambient temperature at the impact face was 67.3 °F. The subject test vehicle appears to comply with the requirements of FMVSS Nos. 208, 212, 213, 219 (partial) and 301. <u>Type of Restraint System:</u> The test vehicle was equipped with a driver air bag, and driver/passenger 3 pt. belt restraints. The driver air bag was the only restraint system used for its designated seating position. The right front passenger was restrained using the manual 3 pt. seat belt restraint. The vehicle was also equipped with integrated child restraints located in the mid passenger seating positions which were used to perform the FMVSS 213 test. The mid passenger seats used two Part 572 three year-old dummies.					
17. Key Words Compliance Testing Safety Engineering FMVSS 208			18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division ; Mail Code: NAD-52 400 Seventh, S.W., Room 5108, Washington, D.C. 20590 Telephone No. (202) 366-4946 Attn: Robert Hornickle		
19. Security Classif. (of this report) UNCLASSIFIED		20. Security Classif. (of this page) UNCLASSIFIED		21. No. of Pages 283 pgs.	
22. Price					

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Section 1

PURPOSE AND TEST PROCEDURE

This 30 mph frontal barrier impact test is part of the Federal Motor Vehicle Safety Standard (FMVSS) 208, 212, 219 (partial) and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by Calspan Advanced Technology Center under Contract No. DTNH22-93-D-11089. The purpose of this test was to determine if the subject vehicle, a 1994 Chevrolet Lumina MPV, meets the performance requirements of FMVSS 208, "Occupant Crash Protection"; FMVSS No. 212, "Windshield Mounting"; FMVSS No. 219 (partial), "Windshield Zone Intrusion"; and FMVSS No. 301, "Fuel System Integrity". This compliance test was conducted using the requirements found in the OVSC Laboratory Test Procedure No. TP-208-09, dated March 15, 1993. In addition, a FMVSS 213 "Child Restraint System" test was performed on the mid outboard integrated child restraints.

Section 2

SUMMARY OF TEST NUMBER CR0111

A frontal barrier was impacted by a 1994 Chevrolet Lumina MPV at a velocity of 29.5 mph. The test was performed at the Calspan Corporation Advanced Technology Center on August 11, 1994. Pre- and Post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by one real-time camera and 14 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the OVSC Laboratory Test Procedure. In addition, a FMVSS 213 test was performed using two part 572 three year old dummies placed in the mid-passenger seating position rearward of the front seat passengers. To film three-year old ATD's, the vehicle's mid-location windows were removed to locate high-speed cameras on each side.

Both 50th percentile male ATDs were fully instrumented with head and chest three axis (x, y, and z) accelerometers, chest displacement potentiometers and left/right femur load cells. These ATDs had been certified prior to the test.

The 56 channels of data were recorded on a P.C. based data acquisition system. Appendix B contains the vehicle and dummy response data traces. Engine bottom X accelerometer sustained a cut wire at approximately 50 milliseconds. The left mid passenger dummy head Z contained questionable data. The full duration HIC calculation was done by taking the resultant of the left mid passenger dummy's head X and head Y and the right mid passenger dummy's head Z.

The driver's HIC was 149.13. The maximum chest deceleration over 3 milliseconds was 46.987 g's with -1.5 inches of deflection. The maximum force on the driver's left femur was -1899.3 pounds and -2017.2 pounds on the right femur.

The right front passenger's HIC was 481.61. The maximum chest deceleration over 3 milliseconds was 38.149 g's with -1.3 inches of deflection. Loads of -782.6 and -371.3 pounds were recorded on the left and right femurs respectively.

The left mid position ATD had a full duration HIC of 455 and chest g's of 31.9. The right mid position ATD had a full duration HIC of 435 and chest g's of 32.8. The FMVSS 213 test and calibration information can be found in Appendix E, F, and G.

Table 1

CRASH TEST SUMMARY

Vehicle NHTSA No. :	CR0111	Test Mode :	30 mph Frontal Barrier
Test Date :	August 11, 1994	Time:	13:55 Temperature : 67.3 °F
Vehicle Make/Model/Body Style :	1994 Chevrolet Lumina MPV		
Vehicle Test Weight :	4467	lbs	
Vehicle/Barrier Impact Angle :	0	°	
Impact Velocity :	29.5	mph	
Maximum Static Crush :	17.6	inches	
Vehicle Rebound :	7.7	inches	
<u>DUMMIES:</u>	<u>DRIVER</u>	<u>PASSENGER</u>	
Type :	Part 572E	Part 572E	
Restraint System :	Air bag/3 point belt	3 point belt	
Number of Data Channels :	56		
Number of Cameras :	1	Real Time	
	14	High Speed	
<u>DOOR OPENING DATA :</u>	Closed-operable	- Left Front	
	Closed-operable	- Right Front	
Front Seat(s) Data :	<u>DRIVER</u>	<u>PASSENGER</u>	
Seat Track Failure :	None	None	
	Inches of shift		
Seat Back Failure :	0.0	0.0	
<u>VISIBLE DUMMY CONTACT POINTS :</u>	<u>DRIVER</u>	<u>PASSENGER</u>	
Head :	Face with air bag.	Chin with chest. Rear of head with headrest.	
Abdomen :	Lower steering wheel rim.	No contact.	
Chest	Air bag.	No contact.	
Knees	Lower dash.	Glove box door.	

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATATEST VEHICLE INFORMATION :

Year/Make/Model/Body Style : 1994 Chevrolet Lumina MPV

NHTSA No. : CR0111 ; VIN: 1GNDU06L1RT126054 ; Color : Garnet Red

Engine Data: 6 cylinders; - CID; 3.8 Liters; - cc

Placement : - Longitudinal or In-Line; X Transverse of Lateral

Transmission Data : 4 speeds; - Manual; X Automatic; X Overdrive

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

Major Options : X A/C; X Pwr.Strg.; X Pwr. Brakes
X Pwr. Windows; X Pwr. Door Locks; X Tilt Wheel

Date Received : 3-31-94 ; Odometer Reading 140.4 miles

Selling Dealer : CHEVROLET - EASTERN REGION

& Address: PO BOX 9015 WAYNE, PA. 19087

DATA FROM TIRE VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by : GENERAL MOTORS CORPORATION

Date of Manufacture January, 1994

GVWR : 5126 lbs.; GAWR: 2642 lbs. FRONT; 2568 lbs. REAR

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load : 35 psi FRONT
35 psi REAR

Recommended Tire Size : P205/70R 15

* Recommended Cold Tire Pressure : 35 psi FRONT; 35 psi REAR

Size of Tires on Test Vehicle: P205/70R 15 ; Manufacturer: GENERAL

Vehicle Capacity Data :

Type of Front Seats:	<u>-</u> Bench;	<u>X</u> Bucket;	<u>-</u> Split Bench
Number of Occupants:	<u>2</u> Front;	<u>5</u> Rear;	<u>7</u> Total
Vehicle Capacity Weight (VCW)	=	<u>1236</u>	lbs.
No. of Occupants x 150 lbs.	=	<u>1,050</u>	lbs.
Rated Cargo/Luggage Weight (RCLW)	=	<u>186</u>	

*Tire pressure used for test

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with maximum fluids)= UDW:

Right Front	=	1120	lbs.	Right Rear	=	800	lbs.
Left Front	=	1190	lbs.	Left Rear	=	780	lbs.
TOTAL FRONT	=	2,310	lbs.	TOTAL REAR	=	1,580	lbs.

TOTAL DELIVERED WEIGHT = 3,890.0 lbs.

% of Total Front of Vehicle Weight = 59.4 % of Total Rear Weight = 40.6 %

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT :

Total Delivered Weight	=	3,890	lbs.
Rated Cargo/Luggage Weight (RCLW)	=	186	lbs.
Weight of 2 p.572 Dummies @ 167 each plus 2 three yr.old dummies @ 35 each	=	404	lbs.
TARGET TEST WEIGHT	=	4,480	lbs.

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 173 POUNDS OF CARGO WEIGHT:

Right Front	=	1196	lbs.	Right Rear	=	1048	lbs.
Left Front	=	1200	lbs.	Left Rear	=	1023	lbs.
TOTAL FRONT	=	2,396	lbs.	TOTAL REAR	=	2,071	lbs.

TOTAL TEST WEIGHT = 4,467.0 lbs.

% of Total Front Weight = 53.6 % % of Total Rear Weight = 46.4 %

Weight of Ballast Secured in Vehicle Trunk Area = 225 lbs.

Vehicle Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimension in inches) :

AS DELIVERED :	RF	29.9	LF	29.8	RR	27.6	LR	27.3
FULLY LOADED :	RF	29.0	LF	29.3	RR	25.7	LR	25.5
AS TESTED :	RF	29.0	LF	29.0	RR	25.7	LR	25.7

Vehicle's Wheel Base : 109.8 in.

Location of Vehicle's C.G. : 50.9 inches rearward of front wheel center.

FUEL SYSTEM DATA :

Fuel System Capacity From Owner's Manual = 20.0 gallons

Usable Capacity Figure Furnished by COTR = 20.0 gallons

Test Volume Range (92 to 94% of Usable Capacity) = 18.4 to 18.8 gallons

ACTUAL TEST VOLUME = 18.6 gallons (with entire fuel system filled)

Table 3

POST IMPACT DATATYPE OF TEST:

Type of Test : Frontal Barrier Impact Angle : 0°
 Test Date : August 11, 1994 Time: 13:55 Temperature: 67.3 °F
 Vehicle NHTSA No. : CR0111
 Required Impact Velocity Range : 28.9 to 29.9 mph

BARRIER IMPACT VELOCITY: (Speed traps within 5 feet of impact plane.)

Trap No. 1 = 29.5 mph; Trap No. 2 = 29.5 mph
 Distance from vehicle to barrier : (1) entering trap = 52 inches
 (2) exiting trap = 12 inches

VEHICLE STATIC CRUSH: (For frontal and rear impacts only.)

Vehicle Length:

Pre-Test Right = 186.2 ; C/L = 191.8 ; Left = 185.7
 Post-Test Right = 169.7 ; C/L = 172.5 ; Left = 168.7
 Crush Right = 16.5 ; C/L = 19.3 ; Left = 17.0
 AVERAGE = 17.6 inches

VEHICLE REBOUND: (From rigid barrier only.)

Distance from front of test vehicle to impact point :

Right = 7.8 ; C/L = 5.7 ; Left = 9.7
 AVERAGE = 7.7 inches

DOOR OPENING :

	Left	Right
Front	Closed-operable	Closed-operable
Rear	N/A	Closed-operable

SEAT MOVEMENT :

	Seat Back Failure	Seat Shift
Front	None	0.0
Rear	None	0.0

Table 3

POST IMPACT (cont.)

GLAZING DAMAGE :

Minimal cracking near "A" pillar.

OTHER NOTABLE IMPACT FEATURES :

Steering column stroked upward.

Section 3

OCCUPANT AND VEHICLE DATA

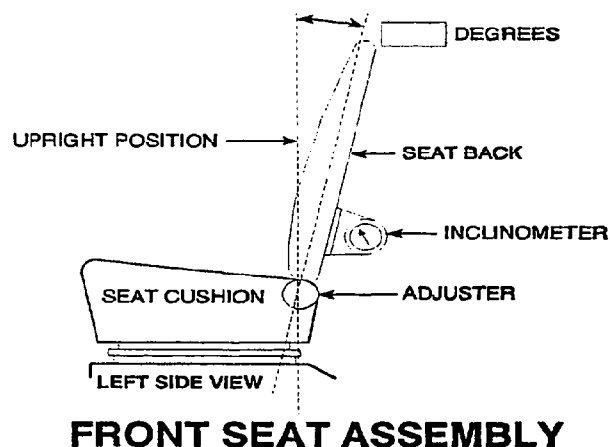
Figure 1

TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 1994 Vehicle Model: Chevrolet Lumina Body Style : minivan

1. Nominal Design Riding Position for adjustable driver and passenger seat backs. Please describe how to position the inclinometer to measure the seat back angle. Include description of the location of the adjustment latch detent, if applicable.



Seat back angle for driver's seat : 24 deg.

Measurement instructions : Cut fabric, locate seat frame at outboard edge of seat back and place inclinometer on metal surface measuring 24 degrees.

Seat back angle for passenger's seat : 24 deg.

Measurement instructions : Same as driver seating position.

2. Seat Fore and Aft Positioning

Positioning of the driver's seat : Seat set at mid-position, 9th detent rearward of forward most (position 1). There are 17 detents total. Seat height adjusted to lowest position.

Positioning of the passenger's seat (if applicable) : Seat set at mid-position, 5th detent rearward of forward most (position 1). There are 9 detents total.

3. Fuel Tank Capacity Data

A. "Usable Capacity" of the standard equipment fuel tank is 20.0 gallons

B. "Usable Capacity" of the optional equipment fuel tank is - gallons

4. Steering Column Position :

Steering column set at mid-position, 3 locking positions up from lower most (position 1).

5. Other:

None

Figure 2

PART 572 DUMMY IN-VEHICLE POSITION

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS

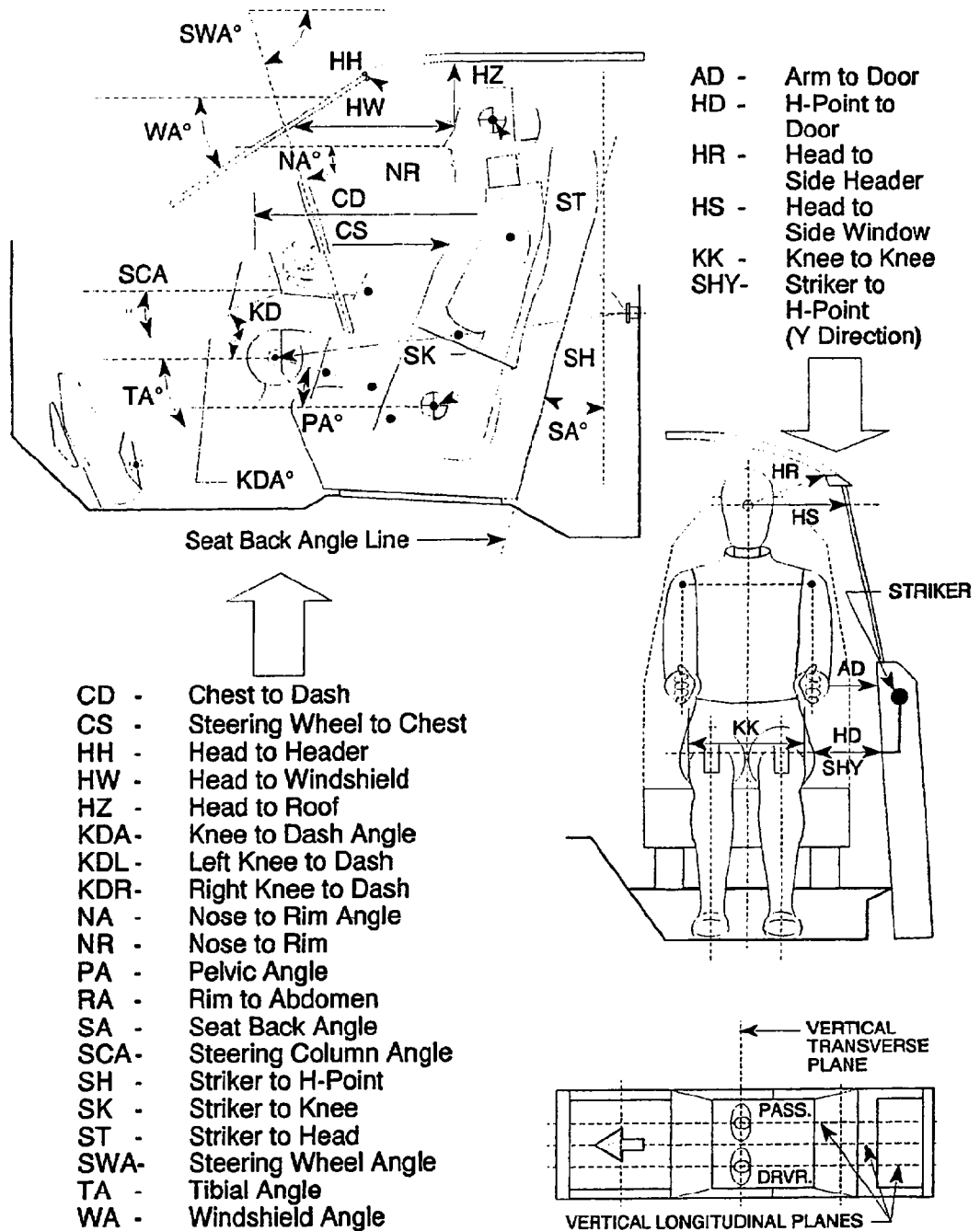


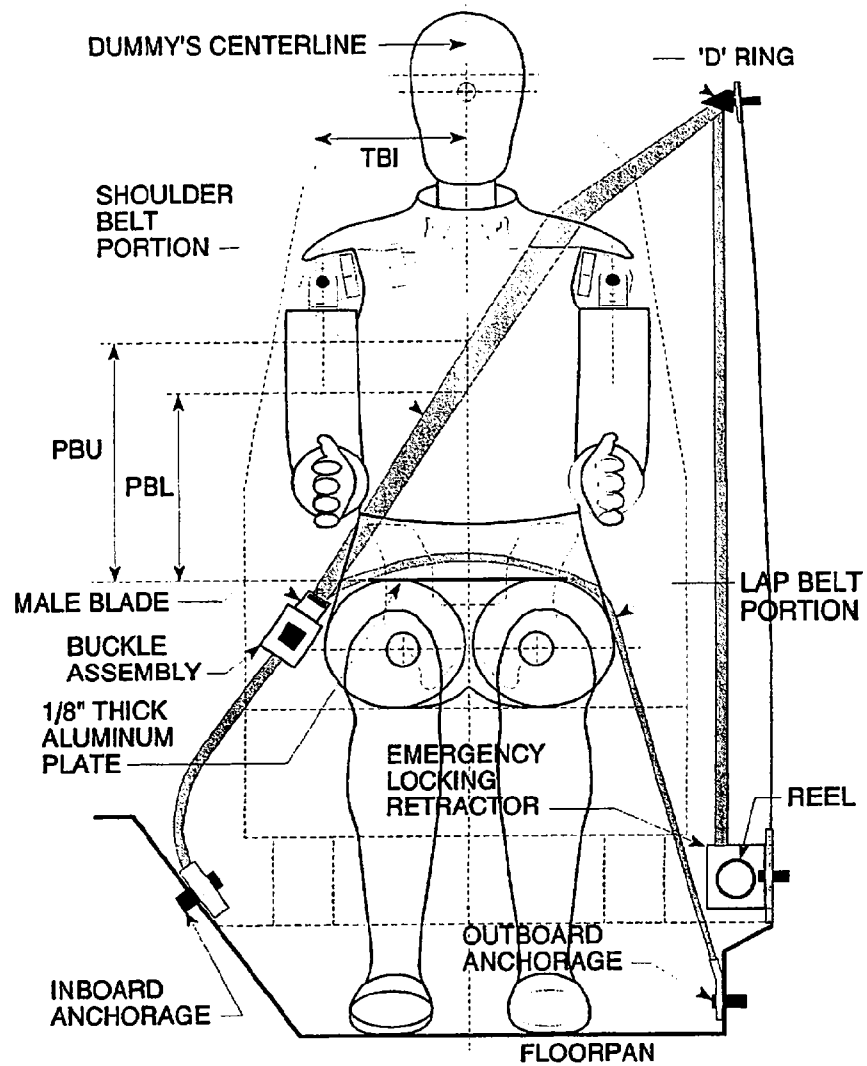
Table 4

FRONT SEAT OCCUPANT MEASUREMENTS

	DRIVER (Serial #342)	PASS. (Serial #341)
WA°	23 deg.	-
SWA°	62.5 deg.	-
SCA°	27.5 deg.	-
SA°	24 deg.	24 deg.
HZ	9.4 in.	8.5 in.
HH	17.6 in.	17.6 in.
HW	34.1 in.	36.8 in.
HR	11.4 in.	9.7 in.
NR	15.2 in. Angle 11 deg.	-
CD	20.4 in.	22.2 in.
CS	11.2 in.	-
RA	6.3 in.	-
KDL	5.7 in. Angle (KDA) 29 deg.	8.2 in.
KDR	6.1 in.	8.1 in. Angle (KDA) 32 deg.
PA°	24 deg.	24 deg.
TA°	50 deg.	52 deg.
KK	10.9 in.	10.4 in.
ST	22.3 in. Angle 11 deg.	22.1 in. Angle 10.0 deg.
SK	26.2 in. Angle 91 deg.	25.0 in. Angle 91 deg.
SH	10.6 in. Angle 111 deg.	9.3 in. Angle 110 deg.
SHY	10.4 in.	9.0 in.
HS	15.5 in.	3.4 in.
HD	4.4 in.	3.3 in.
AD	4.2 in.	13.5 in.

Figure 3

SEAT BELT POSITIONING DATA



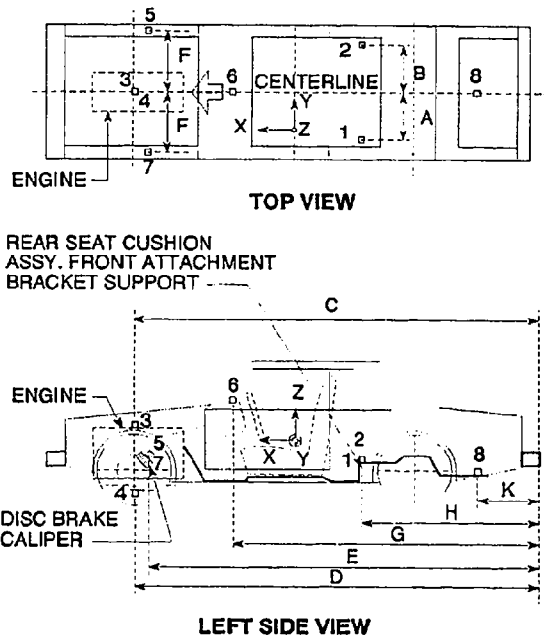
FRONT VIEW OF DUMMY

	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	*	14.0
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	*	10.5
<u>TBI</u> -- Distance from torso centerline to buckle	*	10.4

* Vehicle equipped with air bag, manual seat belt not used for this position.

Figure 4

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY



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

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

Table 5

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

DIMENSION	LENGTH (Inches)	
	PRE-TEST VALUES	POST-TEST VALUES
A	21.2	21.2
B	21.2	21.2
C	160.3	153.9
D	155.3	148.1
E	Right = 154.0 Left = 145.5	Right = 150.0 Left = 142.7
F	23.0	22.5
G	124.8	124.2
H	82.5	82.5
K	11.8	11.8

LOCATION NUMBER	DESCRIPTION	MAXIMUM VALUE (g's)			
		Pos.	msec.	Neg.	msec.
1	Rear Seat X-Member @ Left Side	5.5	20.0	-36.4	41.5
2	Rear Seat X-Member @ Right Side	5.2	180.2	-33.6	36.1
3	Top of Engine Block	157.9	54.5	-155.9	41.5
4	Bottom of Engine	240.5	41.8	-37.3	50.5
5	Disc Brake Caliper @ Right Side	141.8	54.7	-76.0	76.2
6	Instrument Panel	30.2	76.8	-144.4	59.9
7	Disc Brake Caliper @ Left Side	50.3	65.0	-130.3	55.7
8	Trunk	2.3	76.3	-2.4	47.9

CAMERA POSITIONS FOR FRONTAL IMPACTS

CAMERA POSITIONS FOR FRONTAL IMPACTS

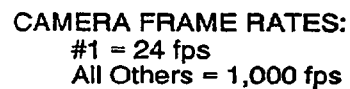


Table 6

HIGH-SPEED CAMERA LOCATIONS

Test No. CR0111 Vehicle: 1994 Chevrolet Lumina MPV

Camera No.	VIEW	CAMERA POSITIONS (In.)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	243	72	41	-3	225.5	13	1005
3	Left Side View	309	54	41	-1	291.5	25	1000
4	Driver and Interior View	110	98	73	-17	-	13	980
5	Steering Column (Bottom)	293	84	46	-2	275.5	25	1000
6	Steering Column (Top)	293	84	70	-8	275.5	25	N.T.
7	Overall Right Side	247	79	42	0	229.5	13	1100
8	Right Side View	305	64	41	-1	287.5	25	960
9	Right Passenger View	355	83	59	-2	337.5	35	N.T.
10	Passenger and Interior View	101	106	74	-16	-	13	1080
11	Passenger Front View	23	20	74	-41	-	8	1000
12	Driver Front View	23	20	73	-38	-	8	1000
13	Windshield View	10	0	127	-59	-	13	1090
14	Pit View of Engine	40	0	-86	90	-	13	695
15	Pit View of Fuel Tank	114	0	-86	90	-	13	650

*X = film plane to monorail centerline

Y = film plane to impact location

Z = film plane to ground

** = referenced to horizontal plane

Figure 6

VEHICLE TARGET LOCATIONS
(All dimensions in inches)

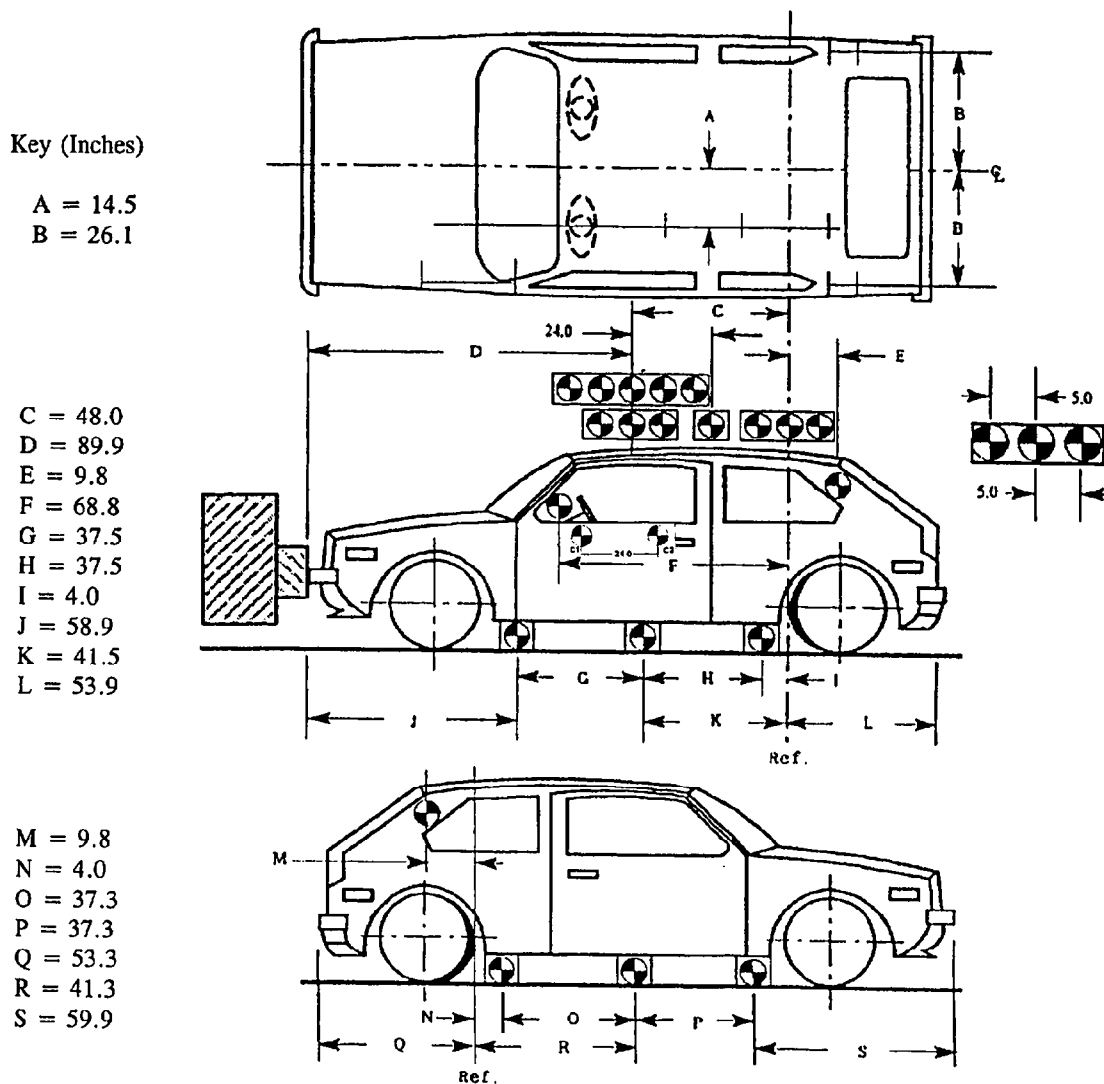


Figure 7

TEST VEHICLE MEASUREMENTS

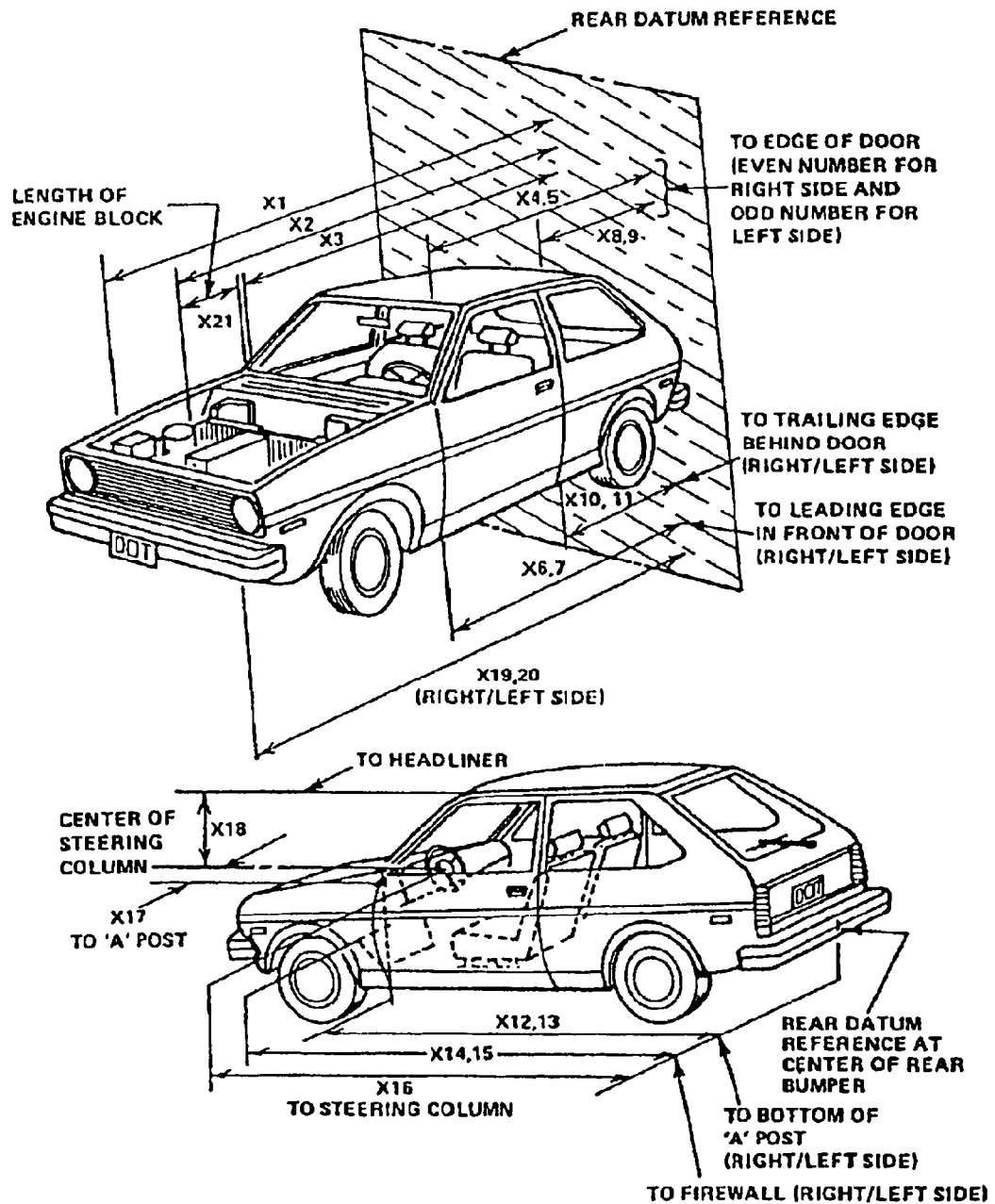


Table 7

VEHICLE MEASUREMENTS

No.		All Dimensions in inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	191.8	172.5	19.3
X2	Rear Surface of Vehicle to Front of Engine	162.5	154.2	8.3
X3	Rear Surface of Vehicle to Firewall	145.5	142.7	2.8
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	132.6	132.5	0.1
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	132.5	132.4	0.1
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	132.5	132.6	-0.1
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	132.9	132.3	0.6
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	90.3	90.3	0.0
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	90.5	90.1	0.4
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	90.5	90.9	-0.4
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	91.2	90.9	0.3
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	131.3	131.5	-0.2
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	131.7	131.2	0.5
X14	Rear Surface of Vehicle to Firewall, Right Side	141.5	139.5	2.0
X15	Rear Surface of Vehicle to Firewall, Left Side	142.5	141.5	1.0
X16	Rear Surface of Vehicle to Steering Column	114.0	117.8	-3.8
X17	Center of Steering Column to "A" Post	17.8	17.5	0.3
X18	Center of Steering Column to Headliner	18.5	16.8	1.7
X19	Rear Surface of Vehicle to Right Side of Front Bumper	156.2	169.7	-13.5
X20	Rear Surface of Vehicle to Left Side of Front Bumper	185.7	168.7	17.0
X21	Length of Engine Block	21.0	21.0	0.0

Section 4

SUMMARY OF RESULTS OF FMVSS NOS. 208, 212, 219 AND 301

- "Occupant Crash Protection," FMVSS No. 208 Data
- "Windshield Mounting," FMVSS No. 212 Data
- "Windshield Zone Intrusion," FMVSS No. 219 (Partial) Data
- "Fuel System Integrity," FMVSS No. 301

Table 8

DUMMY INJURY CRITERIA VALUESNHTSA No. : CR0111 Vehicle : 1994 Chevrolet Lumina MPV

	MAXIMUM ACCELERATION (g's)								
	HEAD				CHEST				
	X	Y	Z	R	X	Y	Z	R*	Displacement
Dummy (1)	-30.7	17.5	-21.0	32.2	-47.5	7.9	13.8	46.987	-1.5
Dummy (2)	-33.8	-4.3	48.5	51.5	-38.7	9.5	11.5	38.149	-1.3

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Dummy (1)	-1899.3	-2017.2
Dummy (2)	-782.6	-371.3

	HEAD INJURY CRITERIA**			
	HIC	36 millisecond Maximum		Avg. Acc (g)
		t ₁ (msec)	t ₂ (msec)	t ₁ TO t ₂
Dummy (1)	149.13	69.720	105.600	28.02
Dummy (2)	481.61	81.720	117.600	44.79

* Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

	3 YEAR OLD DUMMY DATA	
	Full Duration HIC	Chest G's
Left Mid Position	455*	31.9
Right Mid Position	435	32.8

* - estimated, see summary.

Table 9

FMVSS NO. 208 - SEAT BELT WARNING SYSTEM CHECK

With occupant in driver's position, the lap belt in stowed position, and ignition switch placed in "Start/On" position:

Log time duration of audible warning signal = 6 sec.

Log time duration of reminder light operation = 6 sec.

With occupant in driver's position, lap belt in use, and the ignition switch placed in "Start/On" position :

Log time duration of audible warning signal = 0 sec.
(audible warning should not operate)

Log time duration of reminder light operation = 6 sec.

Note wording of visual warning :

Fasten Seat Belt -

Fasten Belt -

Symbol 101 X

Table 10

FMVSS NO. 208 - LABELING AND DRIVER'S MANUAL INFORMATION

Locate label which describes manufacturers maintenance or replacement schedule for crash-deployed occupant protection system.

Describe location :

Label located on inside panel of driver side sunvisor.

The label states, "REGULAR MAINTENANCE OF THE AIR BAG SYSTEM IS NOT REQUIRED. If the air bag readiness light comes on while you are driving, or doesn't come on when you first start your vehicle, see your dealer for service.

Were appropriate instructions concerning maintenance and/or replacement of this system provided ?

YES X NO -

Was a description of the functional operation of the system provided ?

YES X NO -

Is there a reference to the instructions and description of the system on the label ?

YES X NO -

Was an owner's manual provided ?

YES X NO -

Did the owner's manual contain appropriate information concerning maintenance and/or replacement and a description of the functional operation of the system ?

YES X NO -

Table 11

FMVSS NO. 208 - READINESS INDICATOR

An occupant restraint system that deploys in the event of a crash shall have a monitoring system with a readiness indicator. A totally mechanical system is exempt from this requirement.

Is the system totally mechanical ?

YES - NO X

Describe the location of the readiness indicator :

Readiness indicator located at top right of instrument cluster.

Is the readiness indicator clearly visible to the driver ?

YES X NO -

Is a list of the elements in the occupant restraint system, being monitored by the readiness indicator, provided ?

YES X NO -

Table 12

FMVSS NO. 208 - COMFORT AND CONVENIENCE TEST SUMMARY

Test Vehicle NHTSA No. :	CR0111
Make/Model :	1994 Chevrolet Lumina MPV
Date of Comfort/Convenience Check :	August 10, 1994
Technician Performing Check :	R.E.
GVWR :	5126

Seat belt comfort and convenience requirements cover vehicles manufactured on or after September 1, 1986, which have a gross vehicle weight rating of 10,000 pounds or less. Exemptions to this rule are belts installed in a walk-in, van-type vehicle and manual Type 2 belt systems installed in the front outboard seating positions of passenger automobiles. On or after September 1, 1989, the exemption of the type 2 manual seat belts installed in the front outboard seating positions of passenger automobiles will change depending on the states' enactment of mandatory usage laws.

Was vehicle built after or on September 1, 1986, and is it equipped with :

1. Automatic seat belts YES - NO X

If yes, go to requirements D1, D2, and D3

2. Manual seat belts* YES X NO -

- a. The seat belts, other than Type 2 lap/shoulder belts, are located in the front outboard seating positions of a passenger automobile.

YES X NO -

(Go to requirements D3, D4, D5, and D6)

- b. The seat belt system is Type 2 lap/shoulder belt in the front outboard seating positions or the seat belts are located in a walk-in van.

STOP

* If the seat belts are voluntarily installed by the manufacturer they do not have to comply.

Table 12 (cont.)

D1
CONVENIENCE HOOKS

A convenience hook or other device is provided to stow seat belt webbing to facilitate entering or exiting the vehicle.

YES - NO X

Check the option which applies to this test vehicle:

1. A convenience hook or other device automatically releases the webbing when the automatic belt system is operational and remains in the released mode as long as the vehicle's ignition switch is moved to the "on" or "start" position and the vehicle's drivetrain is engaged.

YES N/A NO N/A

2. A convenience hook or other device automatically releases the webbing when the automatic belt system is operational and remains in the released mode as long as the vehicle's ignition switch is moved to the "on" or "start" position and the vehicle's parking brake is in the released mode (non-engaged)

YES N/A NO N/A

D2
WEBBING TENSION - RELIEVING DEVICE

The seat belt assembly installed in the outboard designated seating position has either manual or automatic tension relieving devices permitting the introduction of slack in the webbing of the shoulder belt ("comfort clips" or "window shade" devices).

YES - NO X

Check the owner's manual and determine the maximum amount of slack recommended by the manufacturer in inches. The recommended slack is N/A inches. Introduce this slack into the shoulder belt before testing the vehicle to comply with the requirements of FMVSS 208 S5.1. A warning is included in the owner's manual that introducing slack beyond the amount specified can significantly reduce the effectiveness of the shoulder belt.

YES N/A NO N/A

(If NO, provide explanation.)

Check the option which applies to this test vehicle:

1. This vehicle is equipped with automatic seat belts and the tension relieving device is cancelled each time the adjacent door is opened.

YES N/A NO N/A

(If NO, provide explanation.)

Table 12 (cont.)

- | | | | | | |
|----|---|-----|------------|----|------------|
| 2. | This vehicle is equipped with manual belts, required to meet FMVSS 208 S4.6, and the tension relieving device is cancelled each time one of the following options occurs: | | | | |
| | a. The adjacent door is opened. | YES | <u>N/A</u> | NO | <u>N/A</u> |
| | b. The latch plate is released from the buckle. | YES | <u>N/A</u> | NO | <u>N/A</u> |
| 3. | This is an open-body vehicle, without doors. Does the manual mean to cancel any shoulder belt slack introduced by a tension relieving device to operate properly ? | | | | |
| | | YES | <u>N/A</u> | NO | <u>N/A</u> |

(If NO, provide explanation.)

D3
BELT CONTACT FORCE

- | | | | | | |
|----|--|-----|----------|----|----------|
| 1. | Do not measure the belt contact force if the manual or automatic seat belt assemblies in this vehicle incorporate a webbing tension relieving device. Does the vehicle incorporate a tension relieving device? | YES | <u>-</u> | NO | <u>X</u> |
| 2. | Seat are adjusted according to instructions in Appendix B. | YES | <u>X</u> | NO | <u>-</u> |
| 3. | The test dummies are positioned according to dummy position placement instructions in Appendix B and Appendix C. | YES | <u>X</u> | NO | <u>-</u> |
| 4. | Close the vehicle's adjacent door, pull either 12 inches of belt webbing or the maximum available amount of belt webbing, whichever is less, from the retractor and then release it, allowing the belt webbing to return to the dummy's chest, then fasten the latch. Locate the point where the centerline of the upper torso belt webbing crosses the midsagittal line on the dummy's chest. At that point, pull the belt webbing out 3 inches from the dummy's chest and release until it is within one inch from the dummy's chest. Measure the contact force exerted by the belt webbing on the dummy's chest. The contact force is 0.3 pounds. Contact the COTR if the contact force exceeds 0.7 pounds. | | | | |

Table 12 (cont.)

D4
LATCHPLATE ACCESSIBILITY

- | | | | | | |
|----|--|-----|--------------|----|--------------|
| 1. | Position the test dummy in the driver's seat or passenger's seat in its forward most adjustment position. | YES | <u> X </u> | NO | <u> - </u> |
| 2. | Attach the inboard and outboard reach string. | YES | <u> X </u> | NO | <u> - </u> |
| 3. | Extend each line backward and outboard to generate arcs of the reach envelope of the test dummy's arms. With the latchplate in the normal stowed position, check to assure that the latchplates are within the reach envelope. | YES | <u> X </u> | NO | <u> - </u> |
| 4. | Using the clearance test block, determine if there is sufficient clearance between the vehicle seat and the side of vehicle interior to allow the test block to move unhindered to the latchplate or buckle. | YES | <u> X </u> | NO | <u> - </u> |

D5
RETRACTION

- | | | | | | |
|----|--|-----|--------------|----|--------------|
| 1. | Seats and seat backs are adjusted according to instructions in Appendix B "General Test Conditions" in TP-208-09, dated March 15, 1993. | YES | <u> X </u> | NO | <u> - </u> |
| 2. | Use anthropomorphic test dummies whose arms have been removed and position the dummies in the front outboard designated seating positions according to instructions in Appendix B and restrain the dummies, using the belt systems for the positions being tested. | YES | <u> X </u> | NO | <u> - </u> |
| 3. | Outboard armrests which are capable of being stowed on vehicle seats shall be placed in their stowed positions. | YES | <u> X </u> | NO | <u> - </u> |
| 4. | Check the option which applies to this test vehicle: | | | | |
| | a. The torso and lap belt webbing of the seat belt system automatically retract to a stowed position when the adjacent vehicle door is in an open position and the seat belt latch plate is released. | YES | <u> X </u> | NO | <u> - </u> |

Table 12 (cont.)

b. The torso and lap belt webbing of the seat belt system automatically retract when the seat belt latchplate is released.		YES	<u>X</u>	NO	<u>-</u>
5.	With the webbing and hardware in the stowed position, close the door to assure that the webbing and hardware are prevented from being pinched.	YES	<u>X</u>	NO	<u>-</u>
6.	If this test vehicle has an open body (without doors) and has a belt system with a tension-relieving device, check to assure that the belt system fully retracts when the tension-relief device is manually deactivated.	YES	<u>N/A</u>	NO	<u>N/A</u>

D6
ACCESSIBILITY

The requirements for accessibility do not apply to:

1. Seats whose seat cushions are removable so that the seat back serves a function other than seating;
2. Seats which are removable;
3. Seats which are movable so that the space formerly occupied by the seat can be used for a secondary function.

If the seats in this vehicle are different than the criteria above, then determine if:

1. Each manual seat belt assembly whose webbing is designed to pass through the seat cushion or between the seat cushion and seat back has one of the following three parts (the seat belt latchplate, the buckle, or the seat belt webbing) on top of or above the seat cushion under normal conditions (i.e., conditions other than when belt hardware is intentionally pushed behind the seat by a vehicle occupant).

YES	<u>N/A</u>	NO	<u>N/A</u>
-----	------------	----	------------
2. The remaining two seat belt parts are accessible under normal conditions.

YES	<u>N/A</u>	NO	<u>N/A</u>
-----	------------	----	------------

Table 12 (cont.)

- | | | | | |
|----|--|-----|----------|-------------|
| 3. | The buckle and latchplate pass through the guides or conduits provided and do not fall behind the seat when the following events occur in order: | | | |
| | a. The belt is completely retracted or, if the belt is non-retractable, the belt is unattached. | YES | <u>X</u> | NO <u>-</u> |
| | b. The seat is moved to any position to which it is designed to be adjusted. | YES | <u>X</u> | NO <u>-</u> |
| | c. The seat back, if foldable, is folded forward as far as possible and then moved backward into positions. | YES | <u>X</u> | NO <u>-</u> |
| 4. | Is the inboard receptacle end of the seat belt assembly which is installed in the outboard designated seating position accessible with the center arm rest in any position to which it can be adjusted without moving the armrest? | YES | <u>X</u> | NO <u>-</u> |

D7
LATCH MECHANISM

A seat belt assembly installed in a passenger car, except an automatic belt assembly, shall have a latch mechanism:

- | | | | | |
|----|--|-----|----------|-------------|
| 1. | Whose components are accessible to a seated occupant in both the stowed and operational positions. | YES | <u>X</u> | NO <u>-</u> |
| 2. | That releases both the upper torso restraint and the lap belt simultaneously, if the assembly has a lap belt and an upper torso restraint that require unlatching for release of the occupant. | YES | <u>X</u> | NO <u>-</u> |
| 3. | That releases at a single point by a push button action. | YES | <u>X</u> | NO <u>-</u> |

Figure 8

FMVSS NO. 212 - "WINDSHIELD MOUNTING" DATA SHEET

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

The windshield is bonded in place with 0.7 inch rubber molding along top and 0.4 inch molding along sides. Bottom of windshield is covered with a plastic shroud.

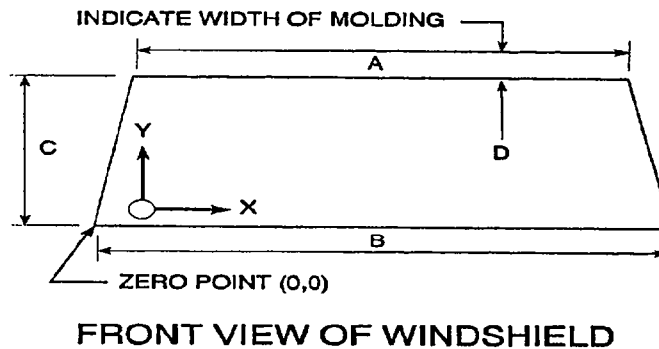
FMVSS 212 REQUIREMENTS :

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

FMVSS 212 TEST DATA :

	WINDSHIELD PERIPHERY		PERCENT RETENTION
	PRE - TEST (in.)	POST - TEST (in.)	
RIGHT SIDE	99.35	99.35	100.0
LEFT SIDE	99.35	99.35	100.0
TOTAL	198.7	198.7	100.0

AREA OF RETENTION FAILURE:



FAILURE DETAILS :

None

Figure 9

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

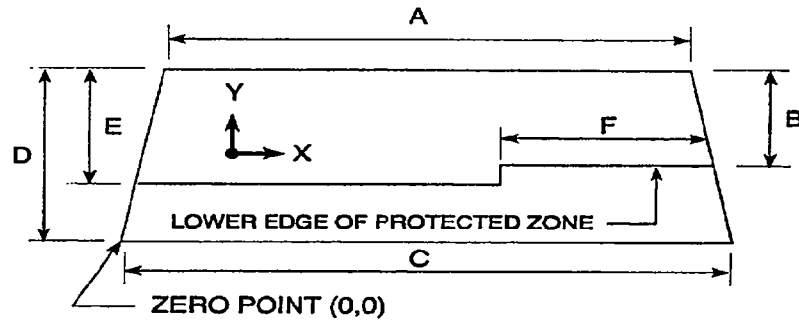
PROTECTED ZONE LOWER EDGE REQUIREMENT :

The lower edge of the protected zone is determined by placing a 6.5" dia. 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, and 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 inches.)

KEY:

A = 54.4
B = 27.3
C = 59.3
D = 42.5
E = 27.8
F = 17.0



FRONT VIEW OF WINDSHIELD

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

(Show location of penetration on above sketch)

None

COORDINATES		
	X	Y
1		
2		
3		
4		

Table 13

FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

FMVSS NO. 301

TEST VEHICLE NHTSA NO. : CR0111 TEST DATE : August 11, 1994Vehicle Mfgr./Make/Model : 1994 Chevrolet Lumina minivan

Test vehicle fuel tank filled to 92% to 94% of manufacturer's "usable" capacity and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

TEST VEHICLE IMPACT TYPE : X Frontal (30 mph)
- Oblique (30 mph) with - ° barrier face first
 contacting -
 (driver/passenger) side
- Rear Moving Barrier (30 mph)
- Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT:

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

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

SOLVENT SPILLAGE DETAILS :

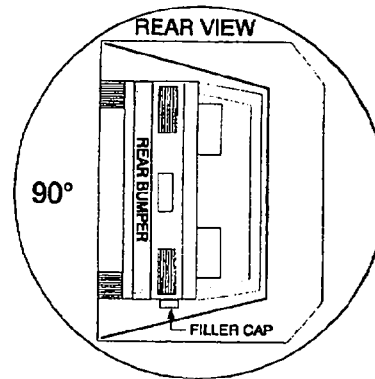
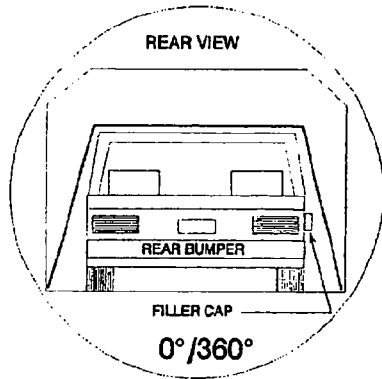
None

Table 14

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE :
0-90 Deg.

Vehicle NHTSA ID No. :
CR0111

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD :

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	1	minutes	33	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	6	minutes	33	seconds
Next whole minute interval	7	minutes		

II. FMVSS 301 REQUIREMENTS :

(1) Time Period

First 5 minutes 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.

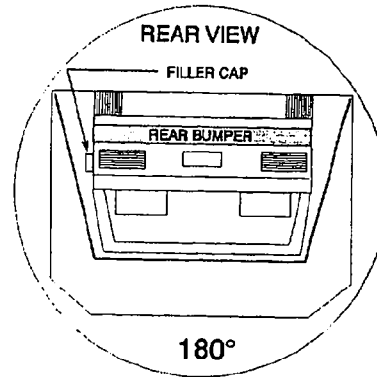
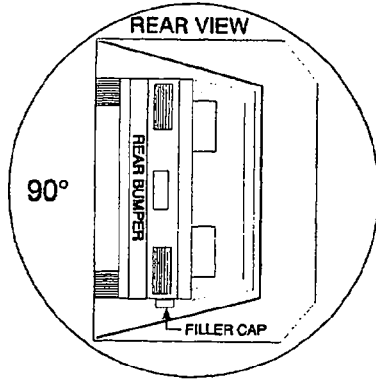
IV. SOLVENT SPILLAGE LOCATION(S) :

None

Table 14
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE :
90-180 Deg.

Vehicle NHTSA ID No. :
CR0111



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD :

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

2 minutes 00 seconds

FMVSS 301 Position Hold Time +

5 minutes 00 seconds

TOTAL

7 minutes 00 seconds

Next whole minute interval

8 minutes

II. FMVSS 301 REQUIREMENTS :

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE :

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

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

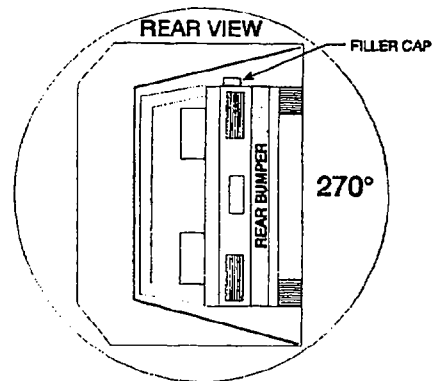
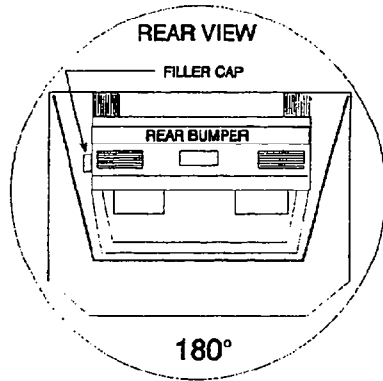
IV. SOLVENT SPILLAGE LOCATION(S) :

None

Table 14
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE :
180-270 Deg.

Vehicle NHTSA ID No. :
CR0111



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD :

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	2	minutes	20	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	7	minutes	20	seconds
Next whole minute interval	8	minutes		

II. FMVSS 301 REQUIREMENTS :

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE :

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

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

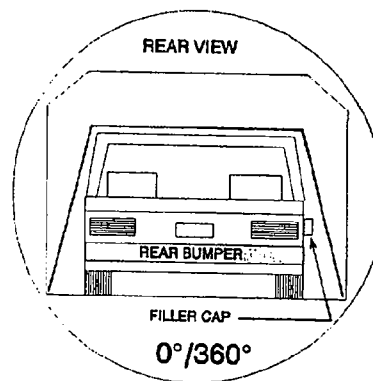
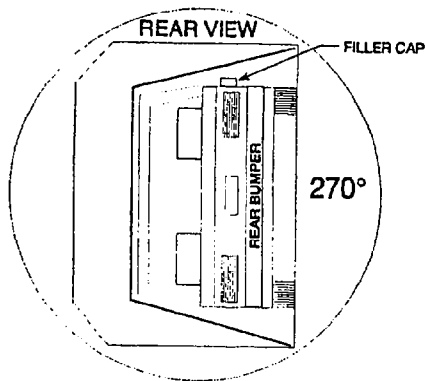
IV. SOLVENT SPILLAGE LOCATION(S) :

None

Table 14
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE :
270-360 Deg.

Vehicle NHTSA ID No. :
CR0111



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD :

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

1 minutes 47 seconds

FMVSS 301 Position Hold Time +

5 minutes 00 seconds

TOTAL

6 minutes 47 seconds

Next whole minute interval

7 minutes

II. FMVSS 301 REQUIREMENTS :

(1) Time Period

First 5 minutes 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

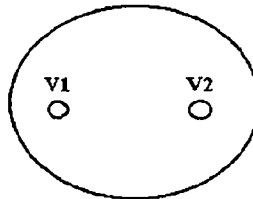
Table 15

POST TEST AIR BAG DATANHTSA No. : CR0111; Test Date: August 11, 1994; Technician: R.E.Vehicle Model Year/Make/Model: 1994 Chevrolet Lumina minivan

- A. No. of vent holes: 2 -Driver N/A -Passenger
- B. Size of vent holes: (In.²) 0.7 -Driver N/A -Passenger
- C. Total vent area: (In.²) 1.4 -Driver N/A -Passenger
- D. Deflated air bag length and width dimensions or, if round, diameter. (In inches)
- Driver: - -Length; - -Width; 27.5 -Diameter
- Passenger: N/A -Height; N/A -Width; N/A -Depth
- E. Is the air bag tethered?
- Driver: - -Yes; X -No; If yes, record length of tether- N/A
- Passenger: N/A -Yes; N/A -No; If yes, record length of tether- N/A

Sketch the air bag showing the location of the vent holes, how the bag is tethered, and where the bag is tethered. Also describe how the tethers are attached to the bag and the steering wheel.

(Note: Not to scale; V_n = Vent hole_n, T_n = Tether_n).

DRIVER AIRBAG (front view)

- F. Record part numbers and manufacturer name of the air bag and gas generator.
- Driver: Air bag: PUT1176020 / TBQ332812395.
- Generator: GBU DZ1 15 ABN / JUA DZM 5Y CQZ
- G. Cut out a 6 inch by 6 inch swatch of the bag material and at least one tether from each bag, mark the vehicle's NHTSA number on the swatch, and send these parts to the COTR with the test report.

Table 16

ACCIDENT INVESTIGATION DIVISION DATA

VEHICLE YEAR/MAKE/MODEL/BODY STYLE: 1994 Chevrolet Lumina minivan

VEHICLE NHTSA NO. : CR0111 VIN NO. : 1GNDU06L1RT126054

WHEELBASE: 109.8 in. BUILD DATE: January, 1994 TEST DATE: August 11, 1994

VEH SIZE CATEGORY: minivan TEST WEIGHT: 4467 lbs.

FRONT OVERHANG: -- OVERALL WIDTH: 74.6 in.

COLLISION DEFORMATION (CDC) CODE: 12FDEW2

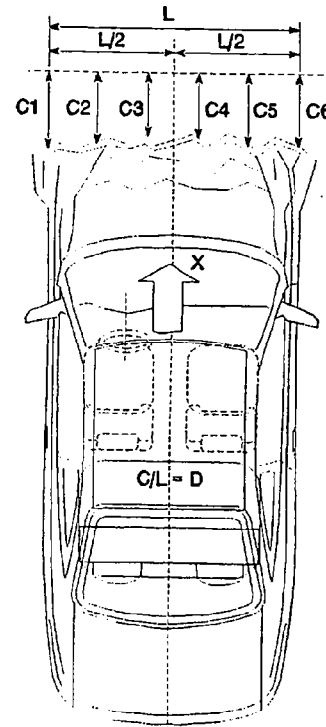
IMPACT MODE: Frontal Barrier

CRUSH DEPTH DIMENSIONS: (Inches)

C1 = <u>17.2</u>	C4 = <u>18.8</u>
C2 = <u>18.2</u>	C5 = <u>17.8</u>
C3 = <u>19.1</u>	C6 = <u>15.9</u>

MIDPOINT OF DAMAGE: D =
(Vehicle Longitudinal Centerline) 29.9 in.

LENGTH OF DAMAGE
REGION: L = 59.8 in.



Remarks: None

Table 17
TEST VEHICLE NONCOMPLIANCE NOTICE

NHTSA Contract Lab : Calspan Advanced Technology Center
Lab Project Manager & Telephone No. : David J. Travale (716) 632 - 7500
Date of Test : August 11, 1994 Vehicle NHTSA No. : CR0111
Vehicle Manufacturer : GENERAL MOTORS CORPORATION
Model Year : 1994 VIN : 1GNDU06L1RT126054
Model : Lumina Body Style: minivan Build Date : January, 1994
Dummy Stabilized Temperature at Time of Test : 70 °F (Spec. = 69 - 72 °F)
Impact Velocity : 29.5 mph; Time of Test : 13:55
Type of Automatic Restraint System :
Driver : Air bag (Note: 3-point belt not used)
Passenger : 3-point belt

Failure Details :

The vehicle, as tested, appears to meet the requirements of FMVSS Nos. 208, 212, 219 (partial), and 301.

Appendix A
PHOTOGRAPHS

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Figure A-1 PRE-TEST FRONT VIEW

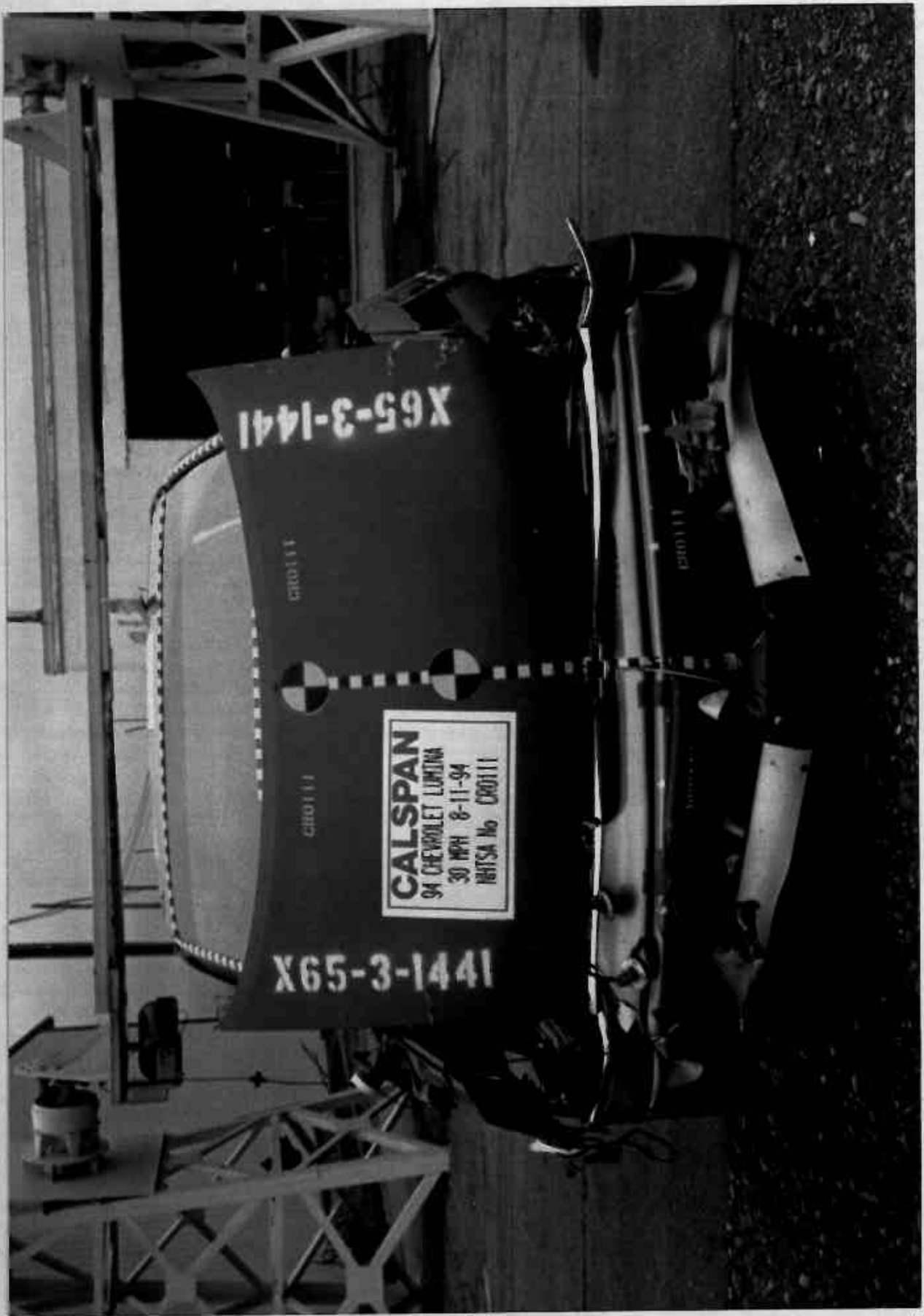


Figure A-2 POST-TEST FRONT VIEW

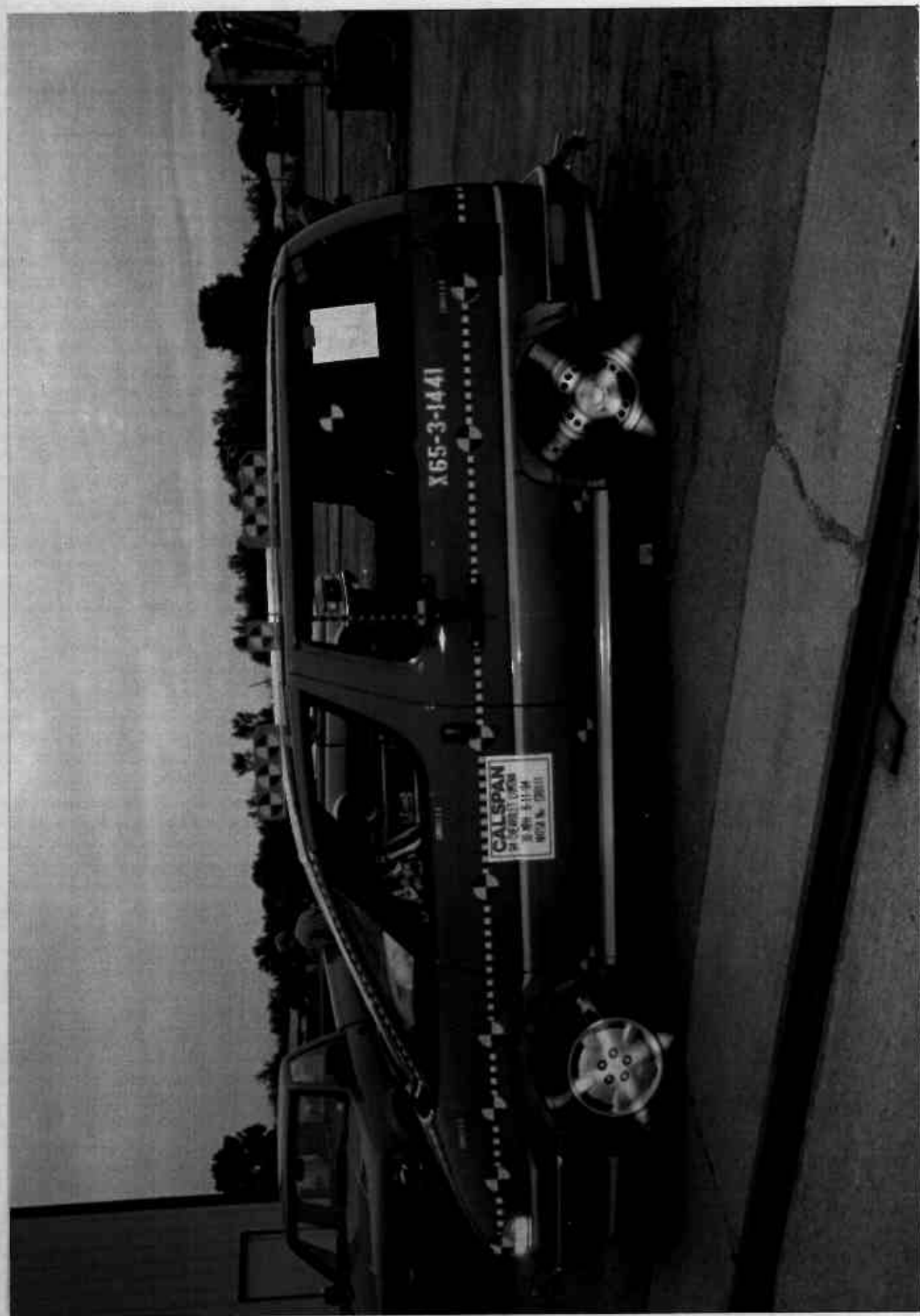


Figure A-3 PRE-TEST LEFT SIDE VIEW

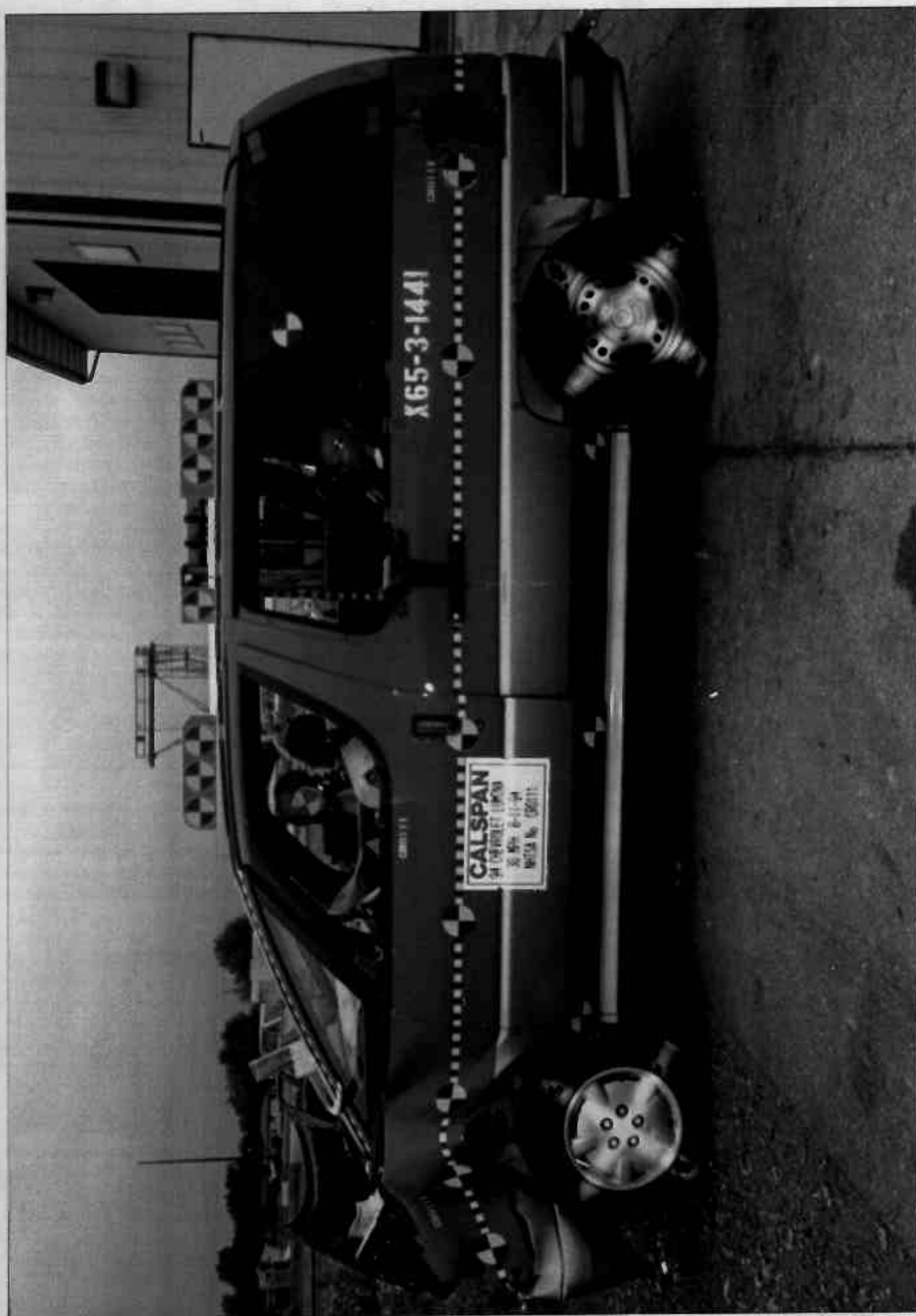


Figure A-4 POST-TEST LEFT SIDE VIEW



Figure A-5 PRE-TEST RIGHT SIDE VIEW

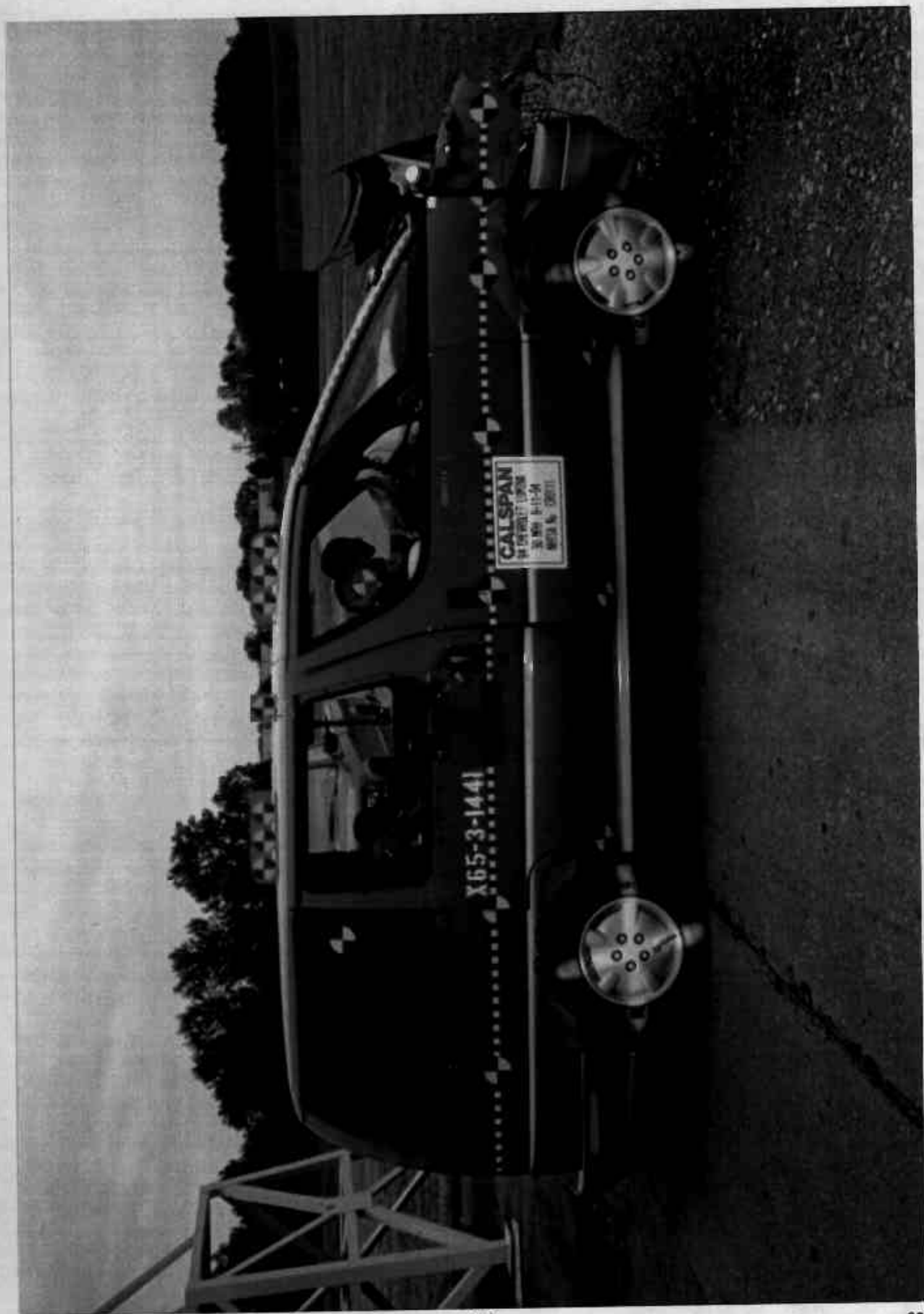


Figure A-6 POST-TEST RIGHT SIDE VIEW

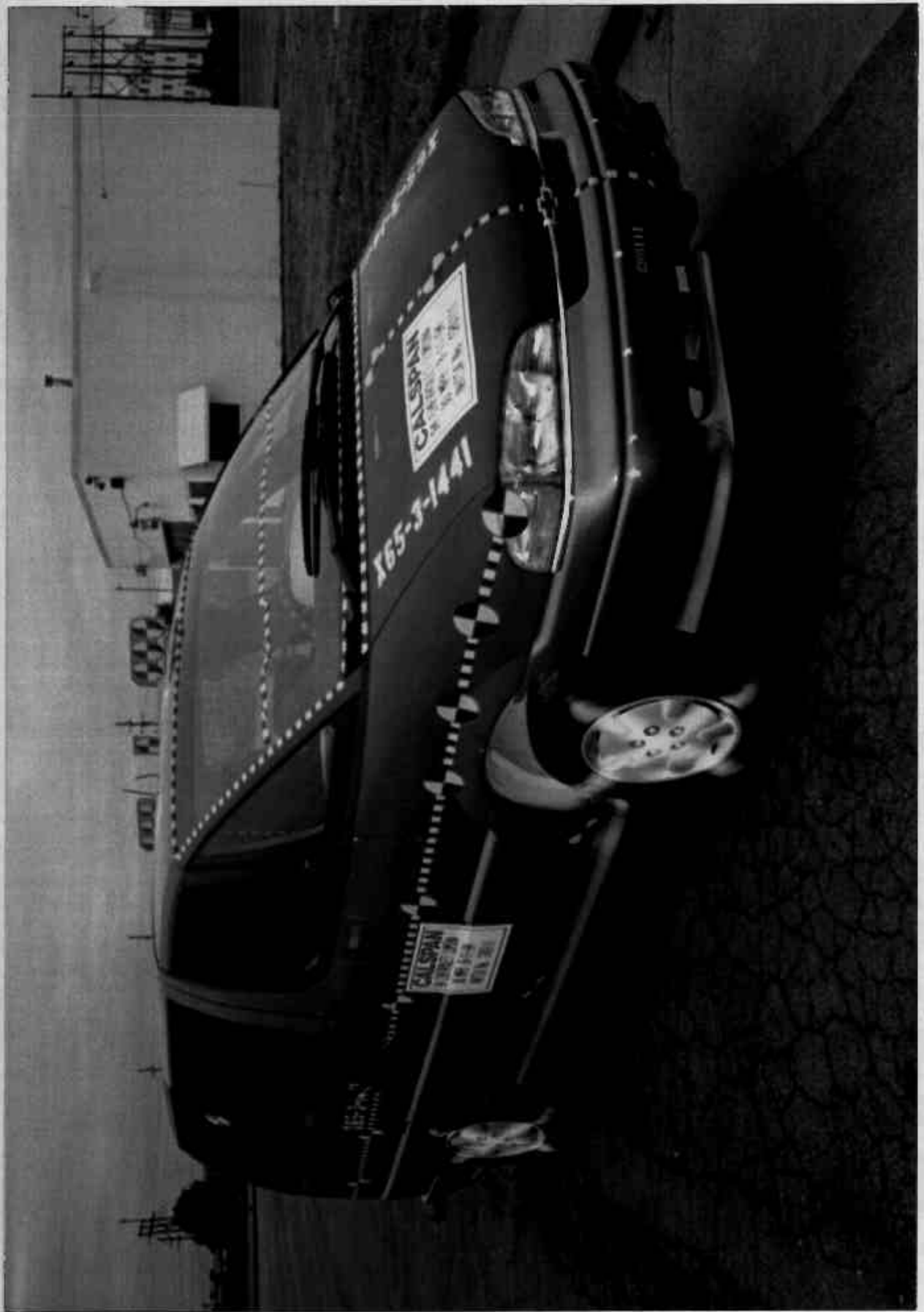


Figure A-7 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW



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



Figure A-9 PRE-TEST LEFT REAR THREE-QUARTER VIEW



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

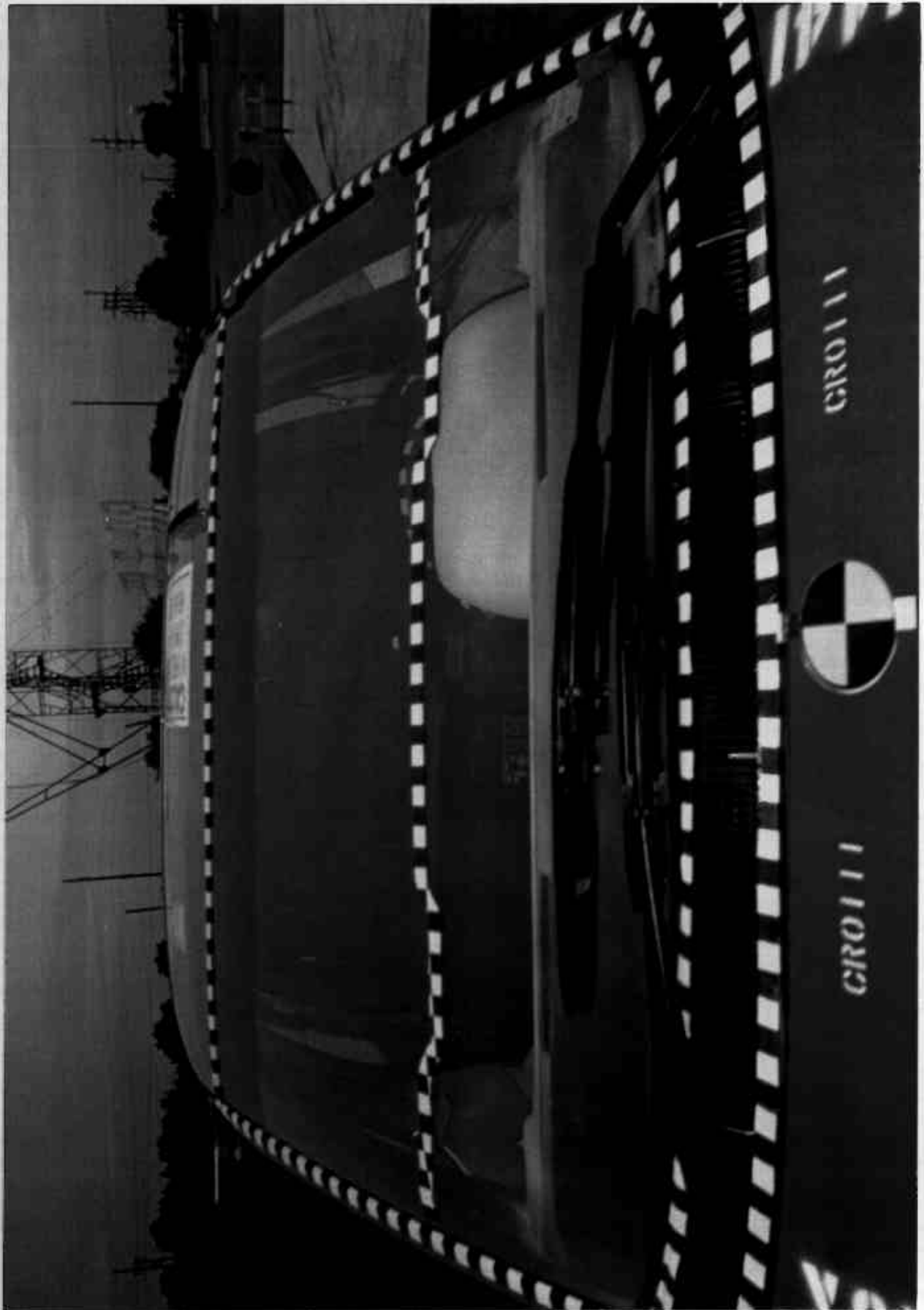


Figure A-11 PRE-TEST WINDSHIELD VIEW

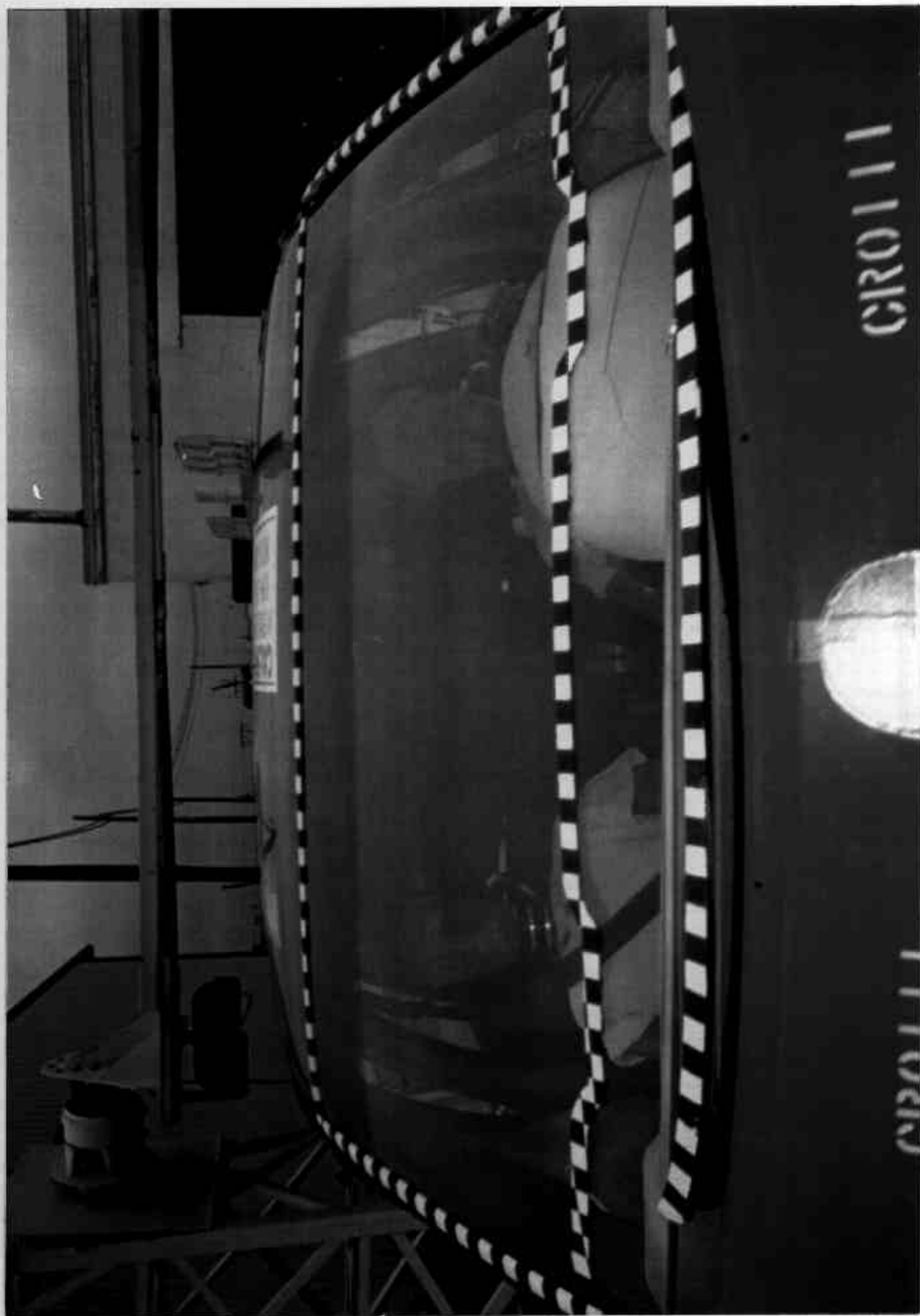


Figure A-12 POST-TEST WINDSHIELD VIEW



Figure A-13 PRE-TEST ENGINE COMPARTMENT VIEW

PHOTOGRAPH NOT AVAILABLE



Figure A-15 PRE-TEST FUEL FILLER CAP



Figure A-16 POST-TEST FUEL FILLER CAP

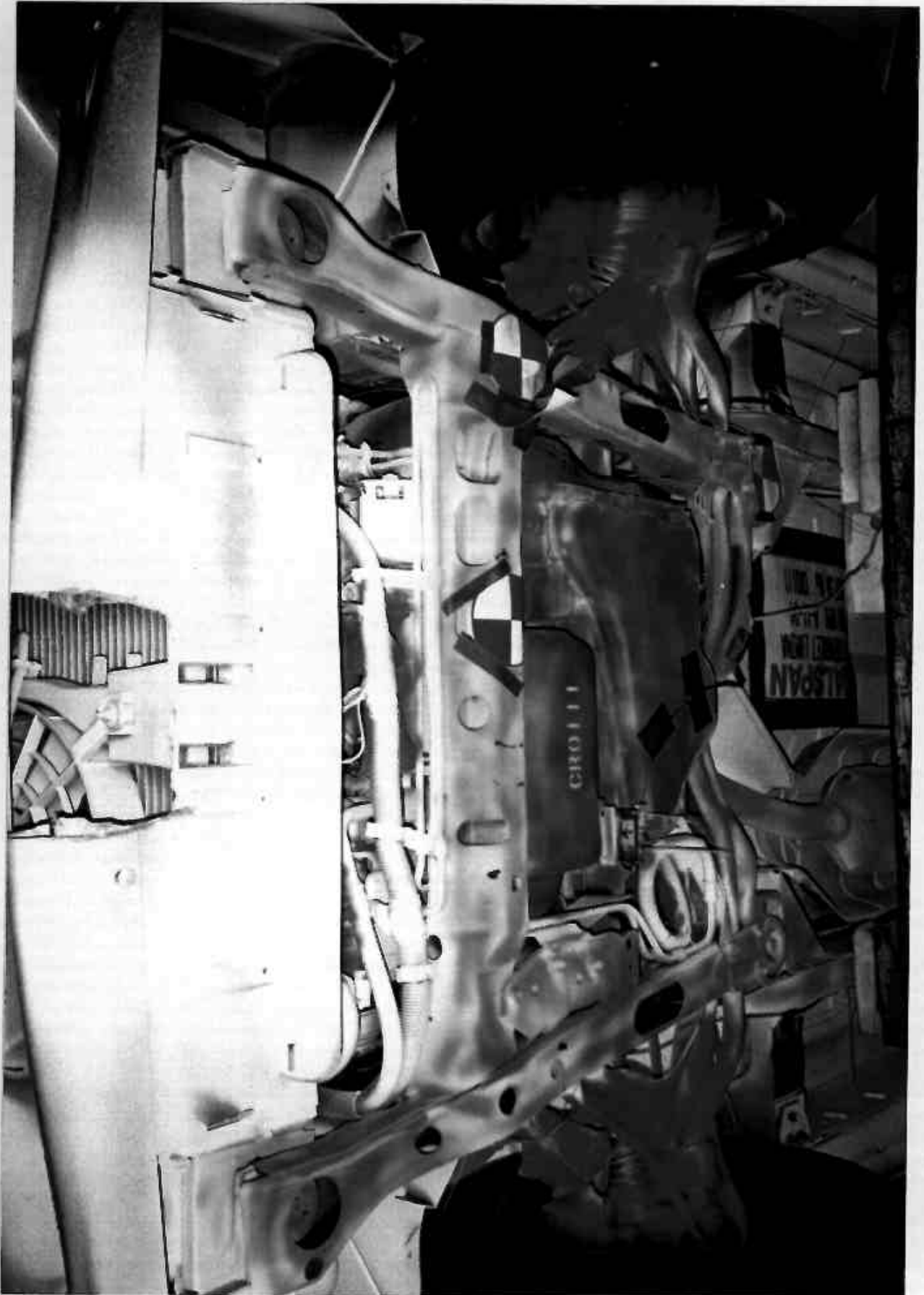


Figure A-17 PRE-TEST FRONT UNDERBODY VIEW

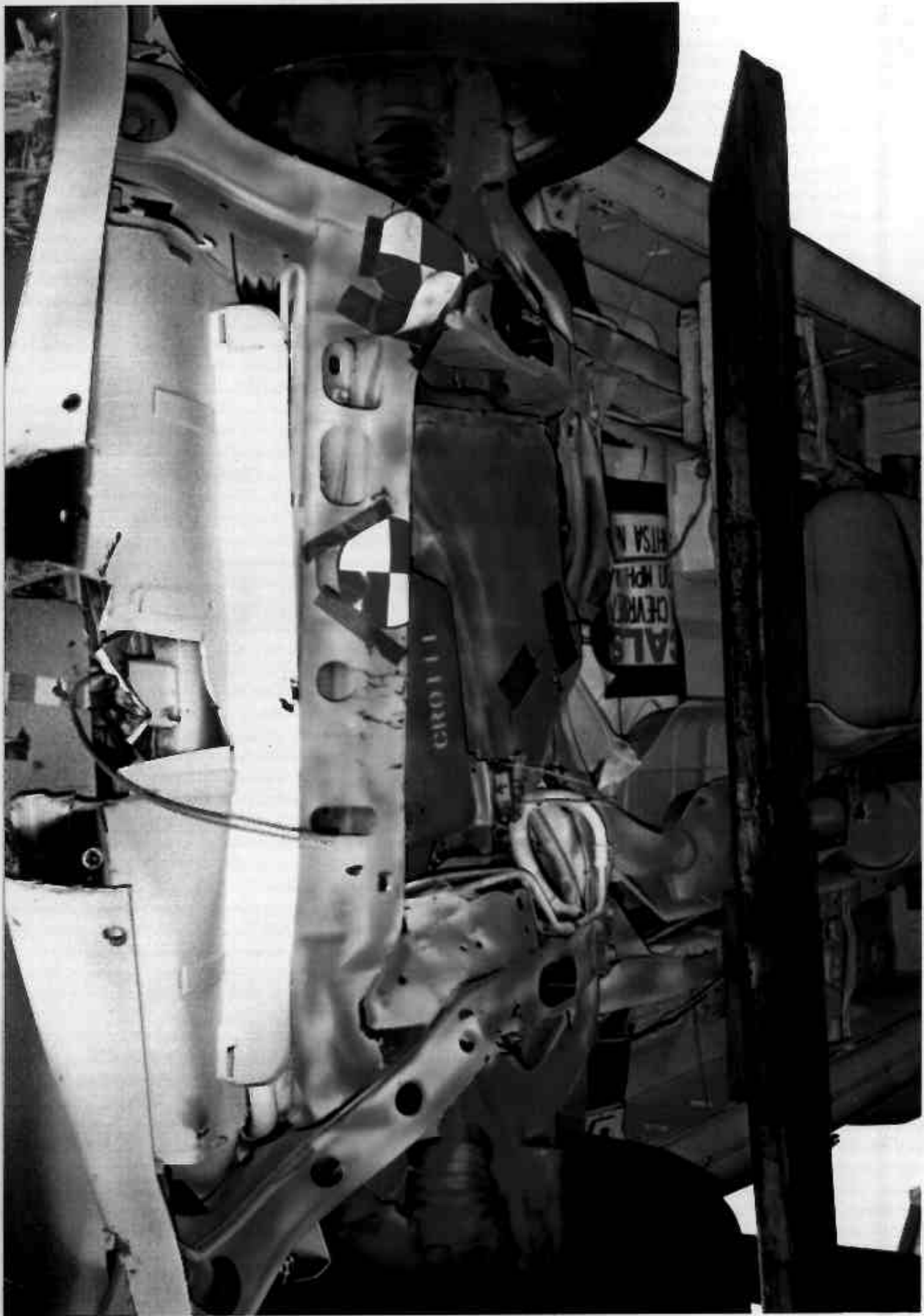


Figure A-18 POST-TEST FRONT UNDERBODY VIEW

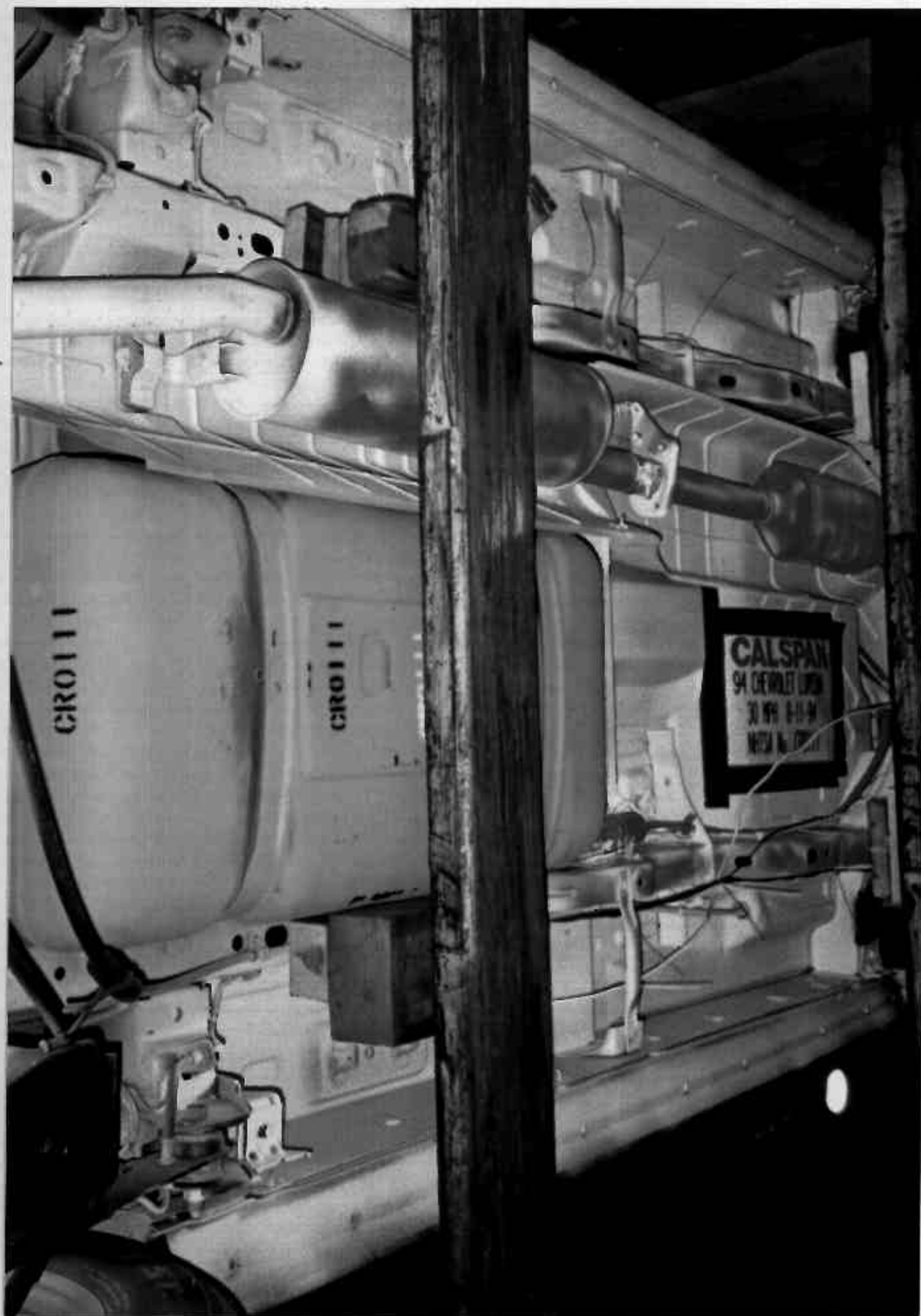


Figure A-19 PRE-TEST REAR UNDERBODY VIEW

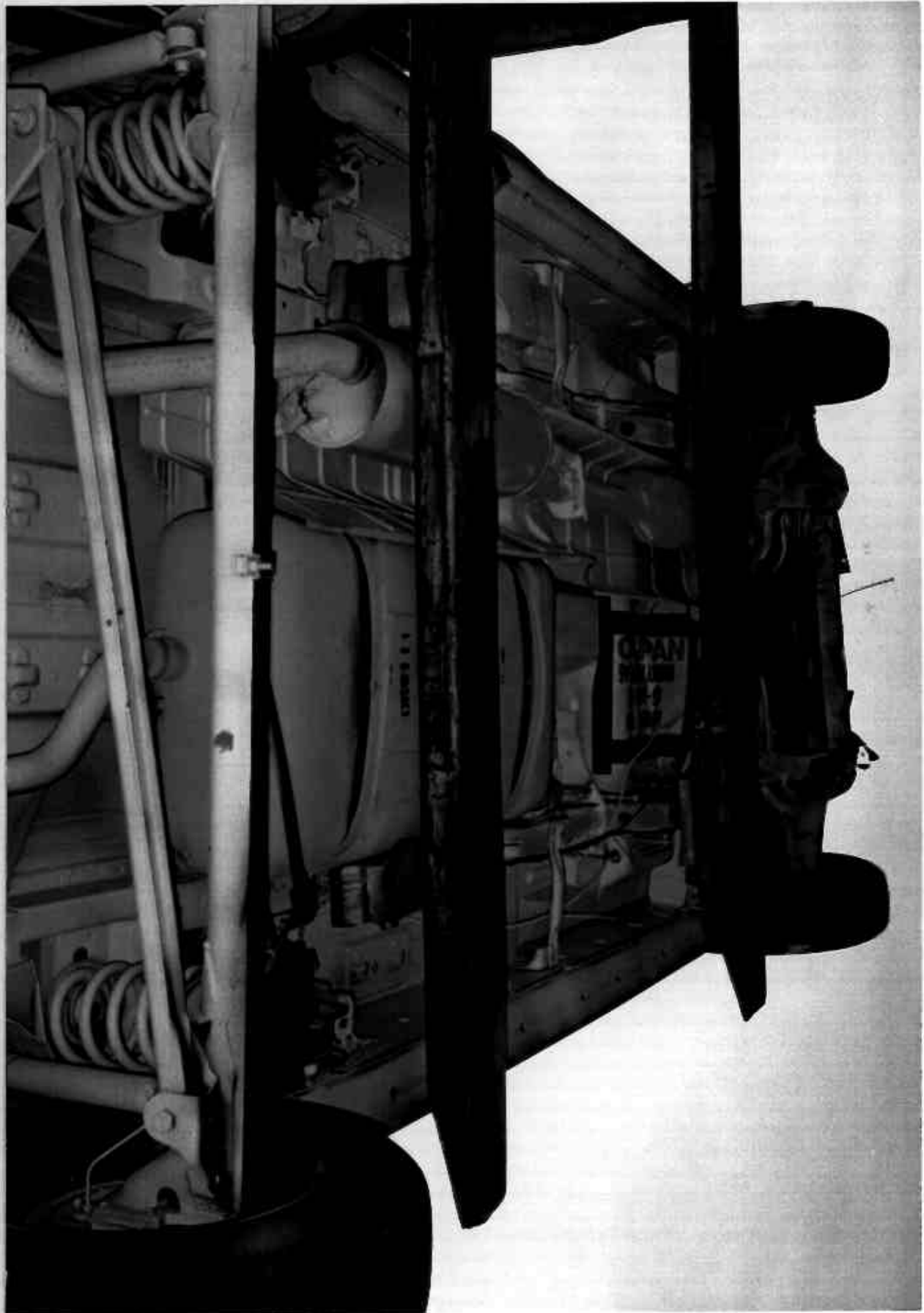


Figure A-20 POST-TEST REAR UNDERBODY VIEW



Figure A-21 PRE-TEST DRIVER SIDE VIEW
A-23

8221-3



Figure A-22 POST-TEST DRIVER SIDE VIEW
A-24

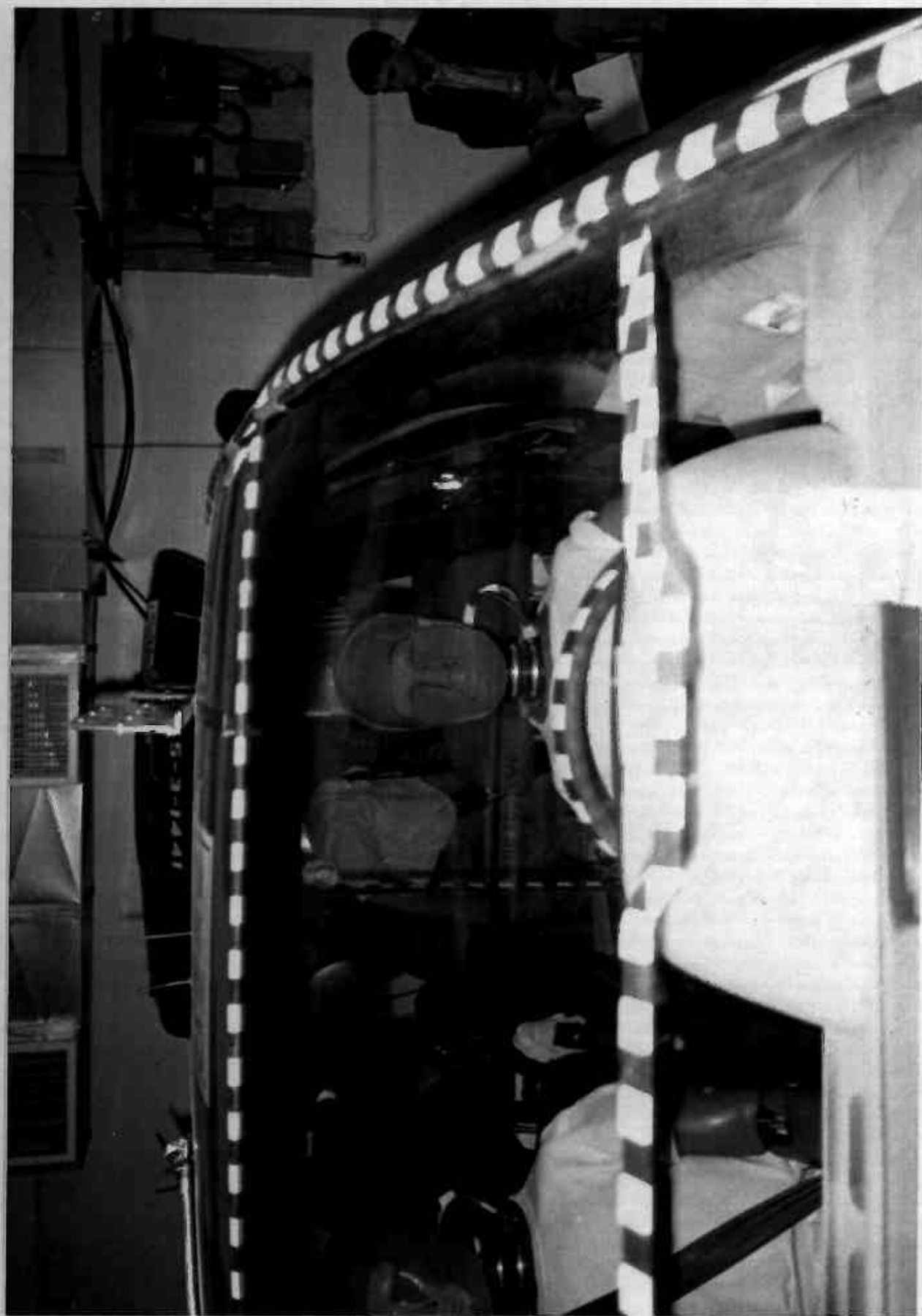


Figure A-23 PRE-TEST DRIVER FRONT VIEW



Figure A-24 POST-TEST DRIVER FRONT VIEW



Figure A-25 PRE-TEST DRIVER DUMMY AND INTERIOR VIEW
A-27

8221-3



Figure A-26 POST-TEST DRIVER DUMMY AND INTERIOR VIEW
A-28



Figure A-27 PRE-TEST PASSENGER SIDE VIEW

A-29

8221-3



Figure A-28 POST-TEST PASSENGER SIDE VIEW
A-30

8221-3

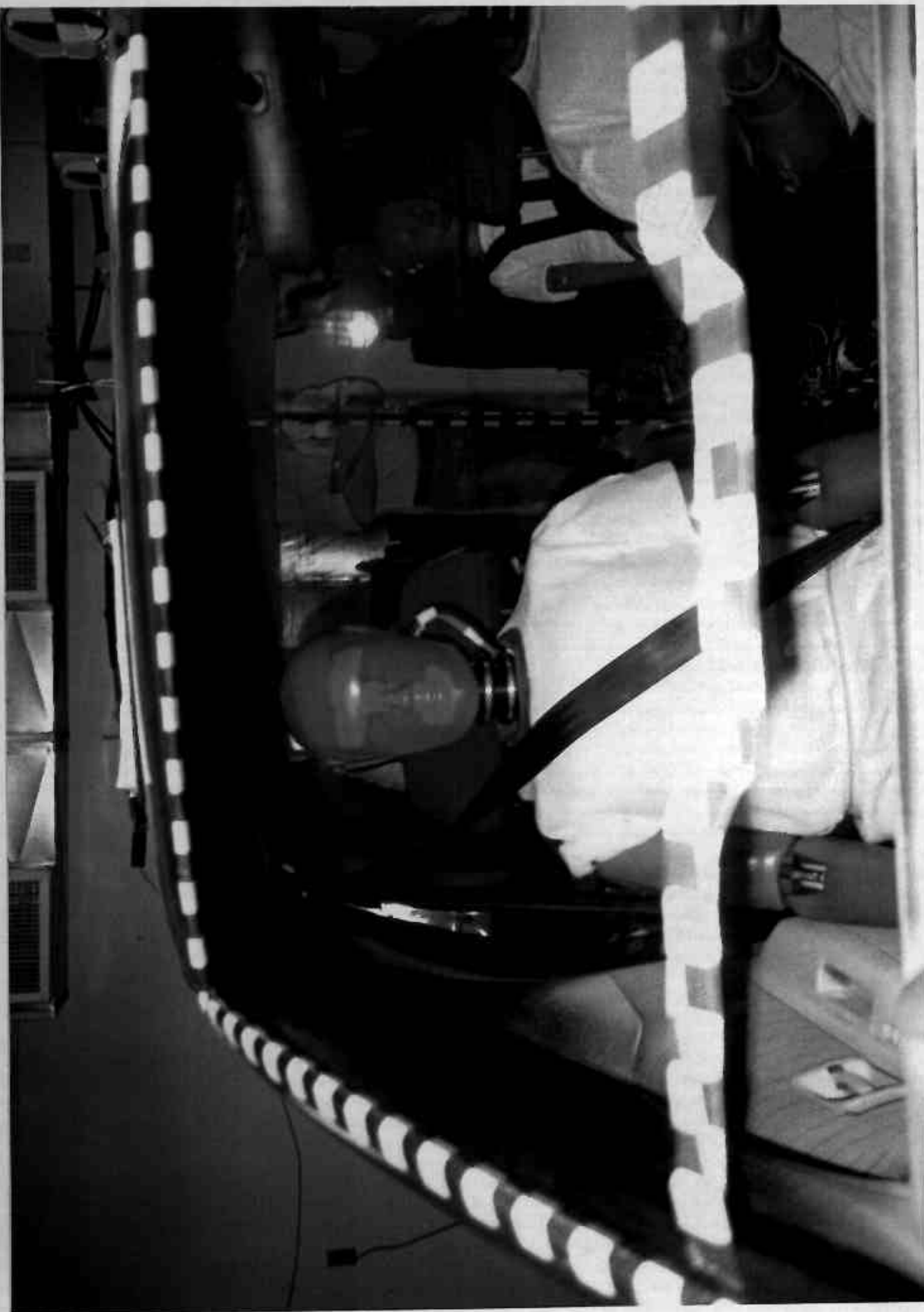


Figure A-29 PRE-TEST PASSENGER FRONT VIEW

Figure A-30 POST-TEST PASSENGER FRONT VIEW





Figure A-31 PRE-TEST PASSENGER DUMMY AND INTERIOR VIEW
A-33



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

A-34

8221-3



Figure A-33 PRE-TEST UNDERBODY STEERING SHAFT



Figure A-34 POST-TEST UNDERBODY STEERING SHAFT

PHOTOGRAPH NOT AVAILABLE

PHOTOGRAPH NOT AVAILABLE

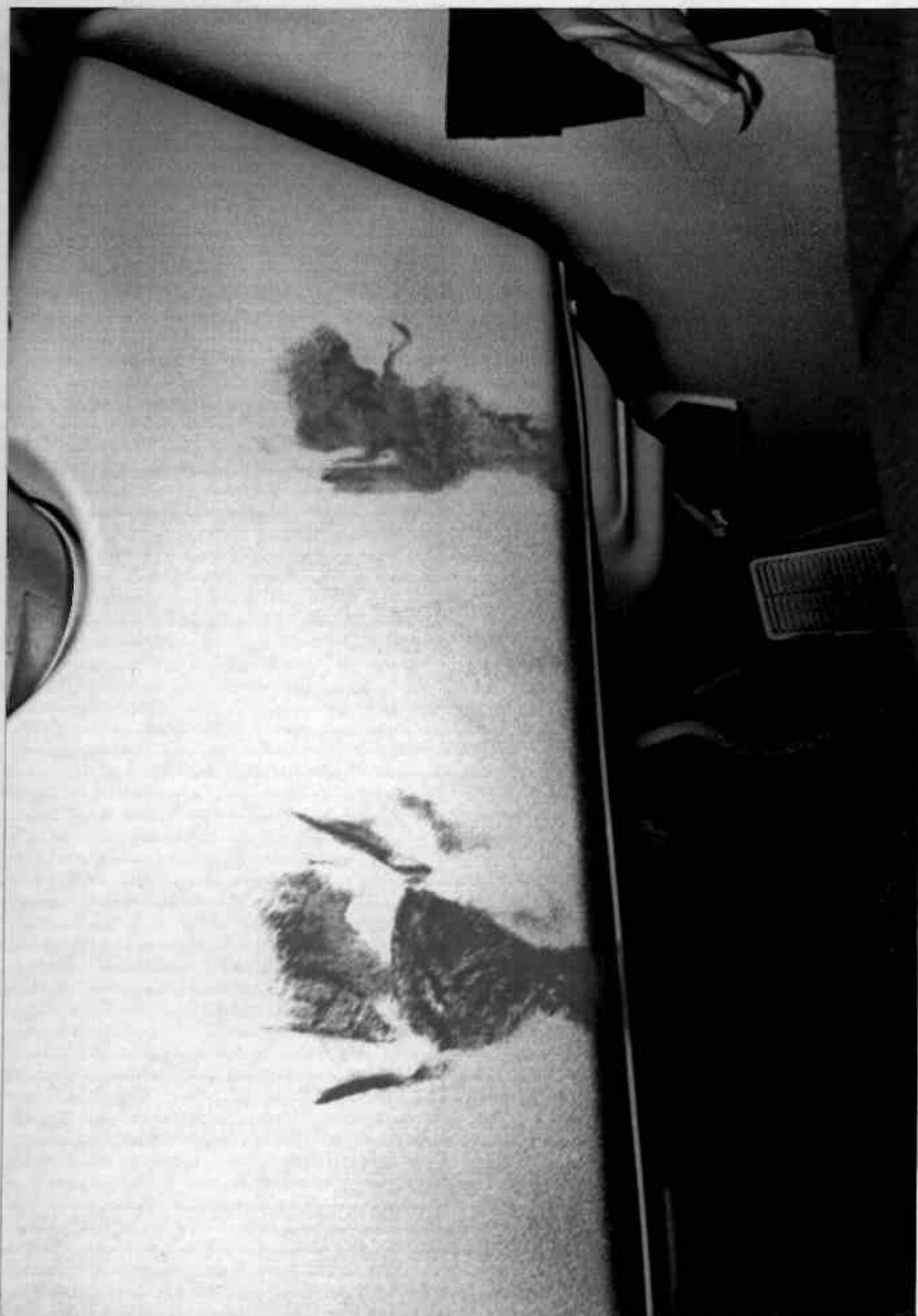


Figure A-37 POST-TEST DRIVER KNEE BOLSTER



Figure A-38 POST-TEST PASSENGER KNEE BOLSTER

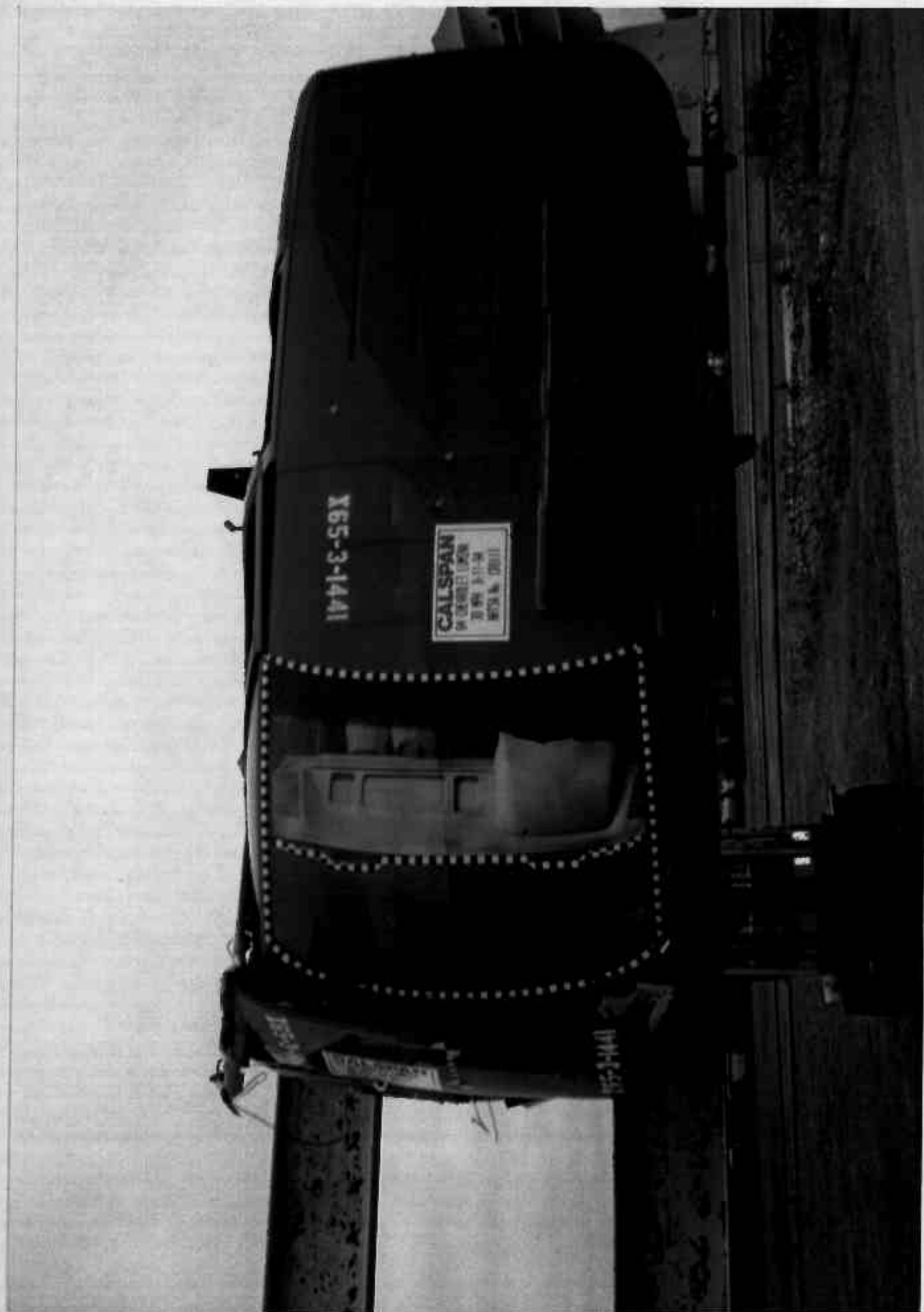


Figure A-39 POST-TEST VEHICLE TOP VIEW

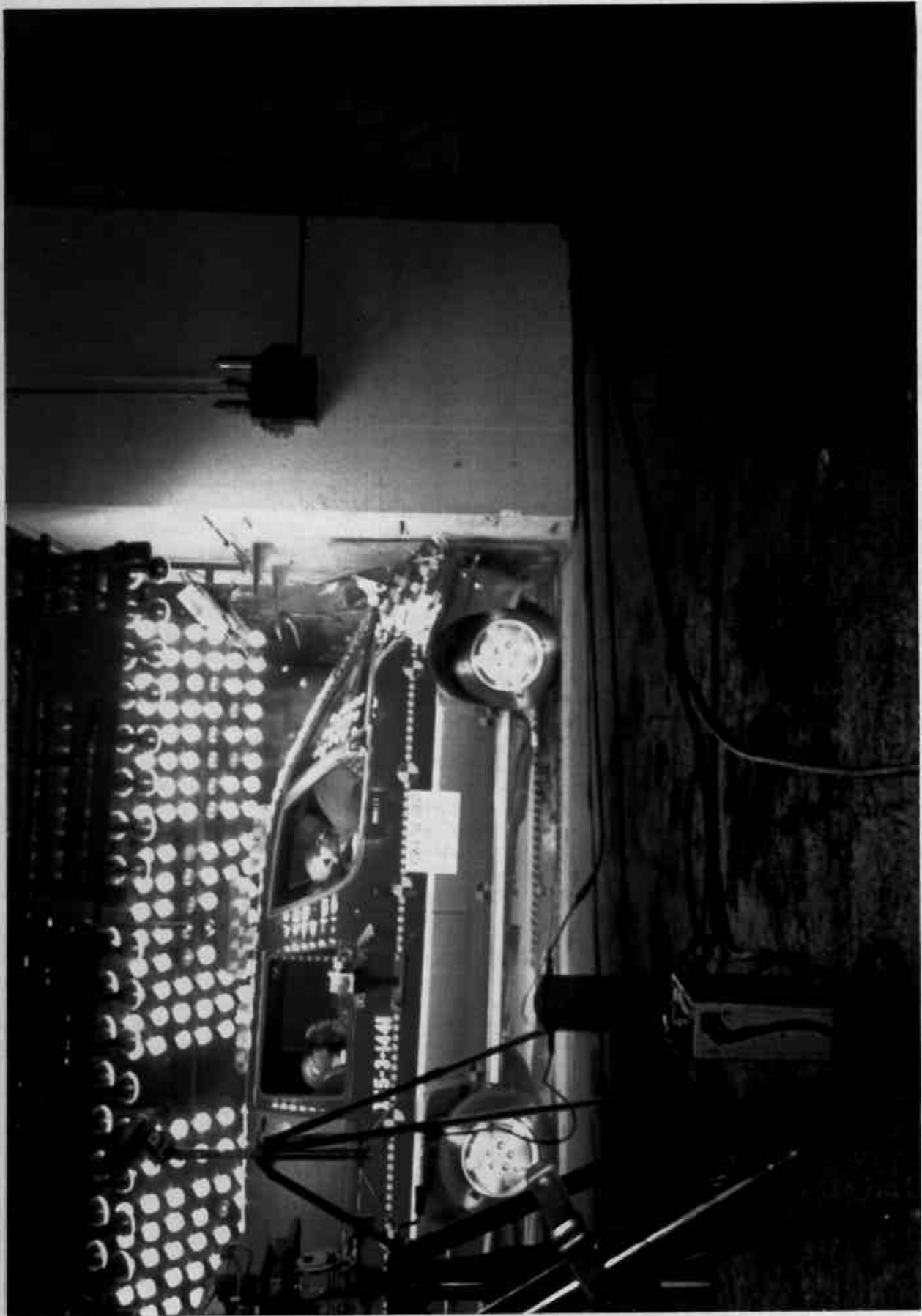


Figure A-40 VEHICLE IMPACT



Figure A-41 - 42 CERTIFICATION/TIRE PLACARD



Figure A-43 POST-TEST DRIVER AIRBAG VIEW

PHOTOGRAPH NOT AVAILABLE



Figure A-45 POST-TEST DRIVER KNEE CONTACT



Figure A-46 POST-TEST DRIVER ABDOMEN CONTACT
A-48

Appendix B

VEHICLE AND DUMMY RESPONSE DATA

(Part 572E 50th percentile ATD's only)

NOTE : Data trace scales are automatically scaled at the
request of the COTR. Use caution when
reviewing data.

TEST NO. CR0111

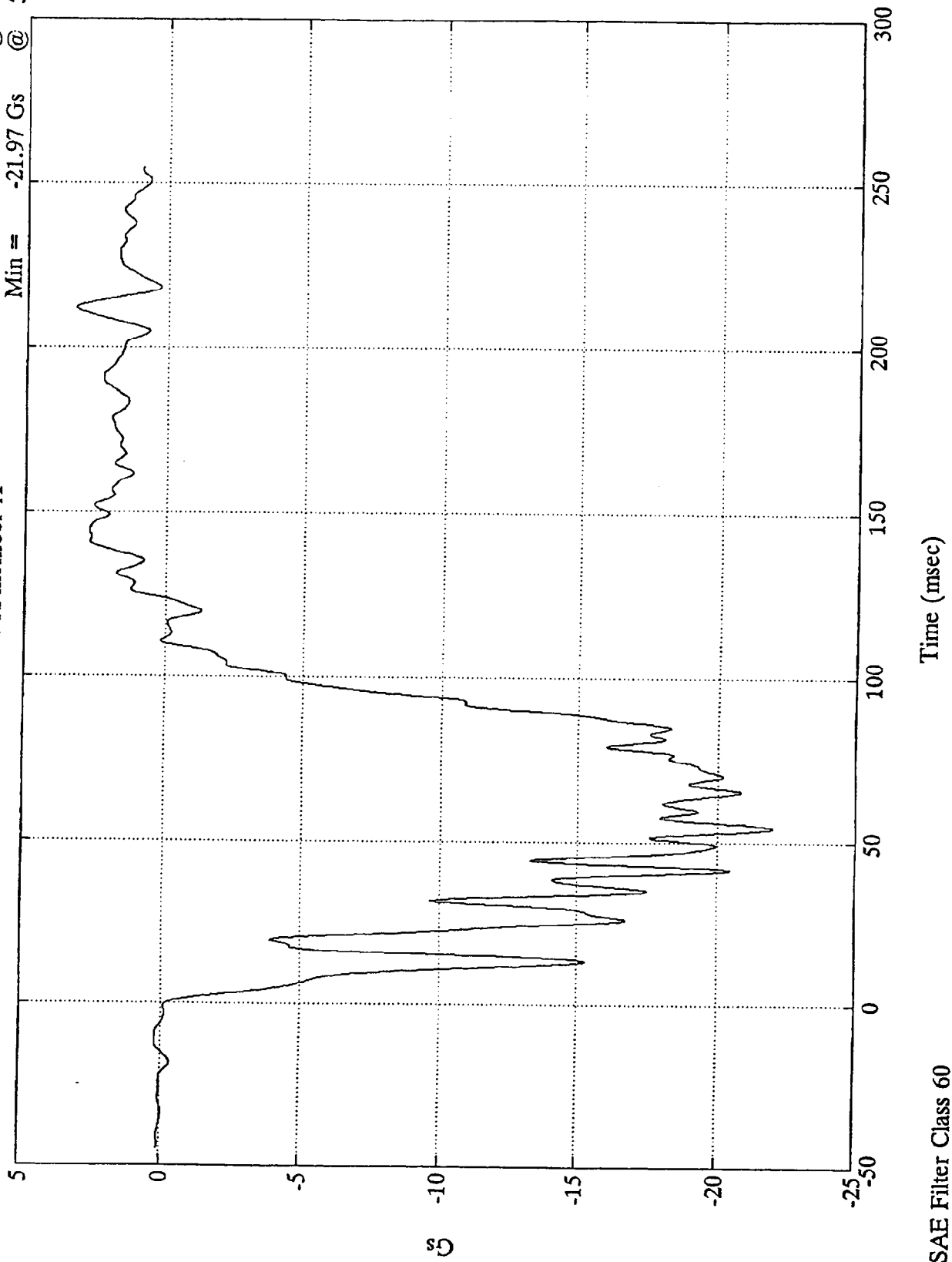
VEHICLE

SAE FILTER CHANNEL CLASS

60

NHTSA 208 TEST - 1994 Chevrolet Lumina

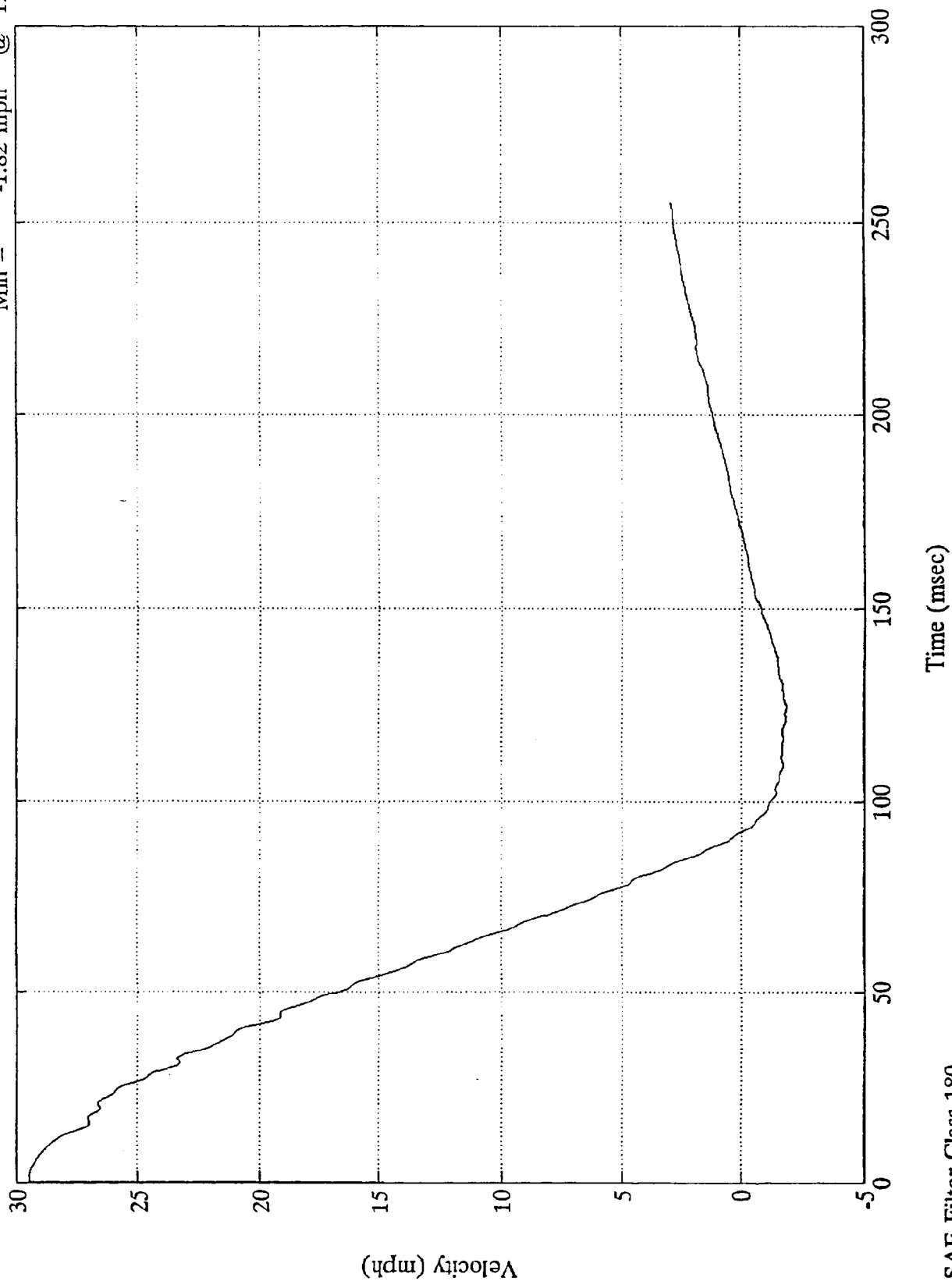
L. Rear X-member X
Max = 3.26 Gs @ 212.04 msec
Min = -21.97 Gs @ 54.47 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

L. Rear X-member X

Max = 29.50 mph @ 0.11 msec
Min = -1.82 mph @ 124.56 msec

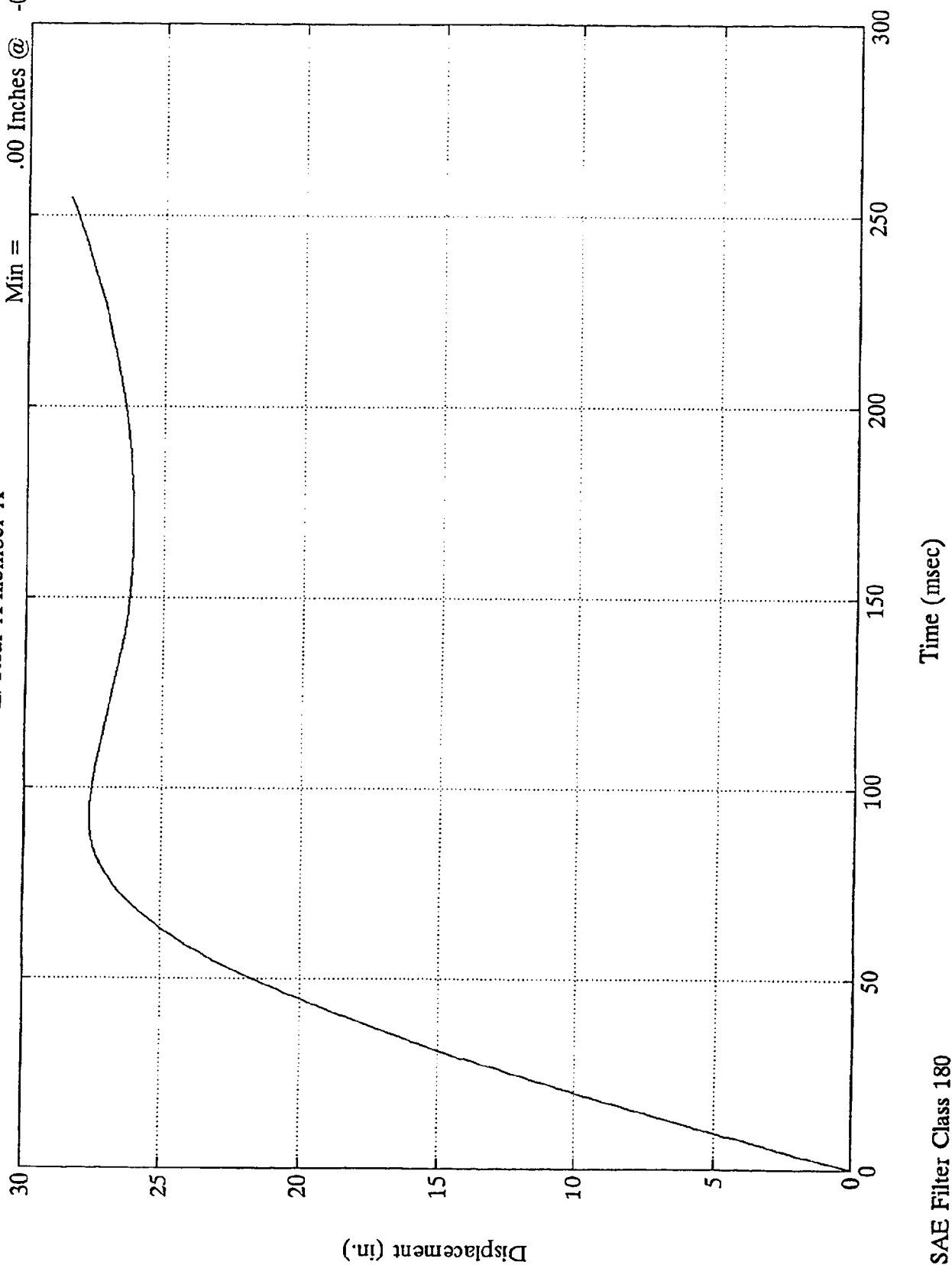


SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 28.49 Inches @ 254.88 msec
Min = .00 Inches @ -0.00 msec

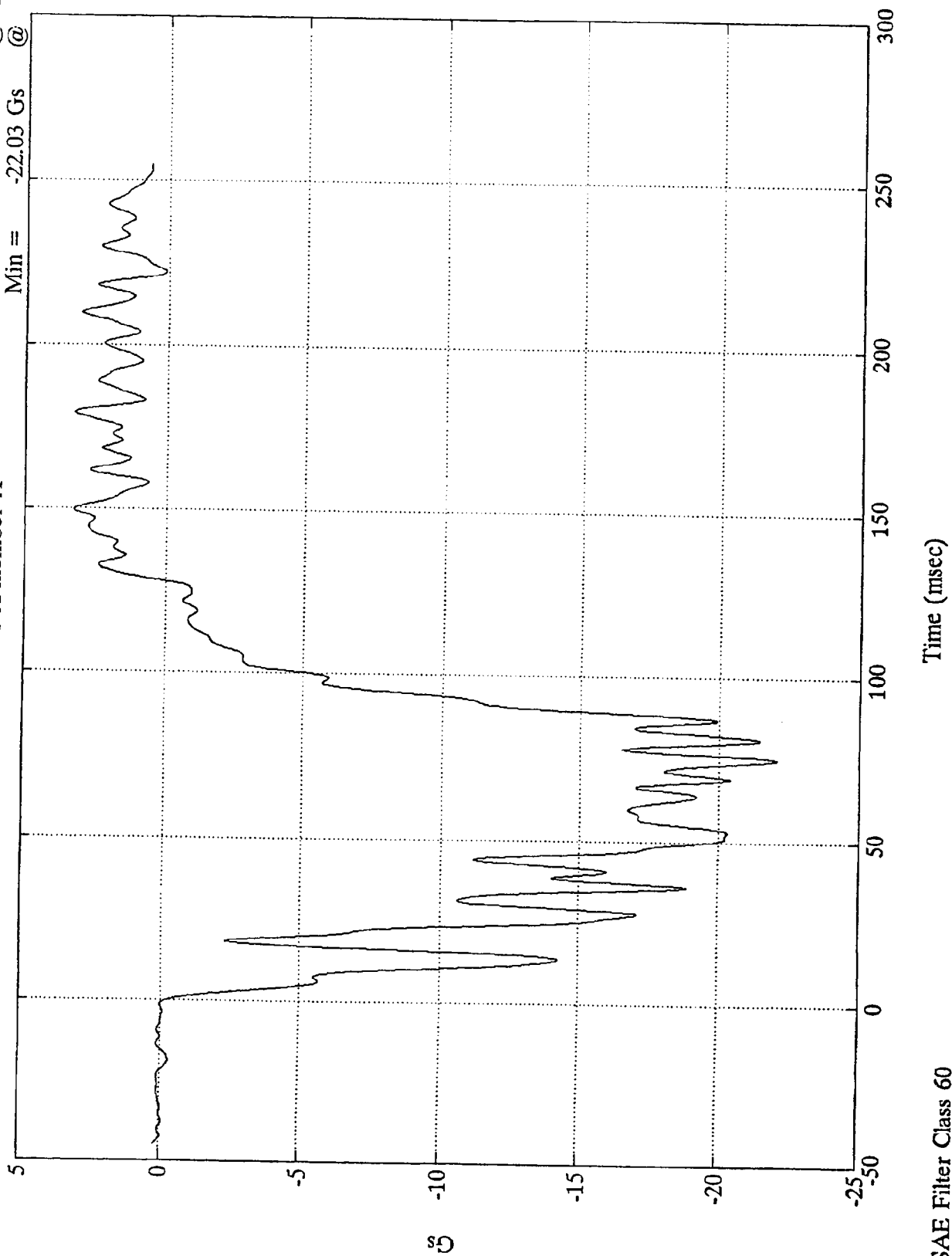
L. Rear X-member X



SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

R. Rear X-member X Max = 3.24 Gs @ 149.76 msec
Min = -22.03 Gs @ 75.23 msec

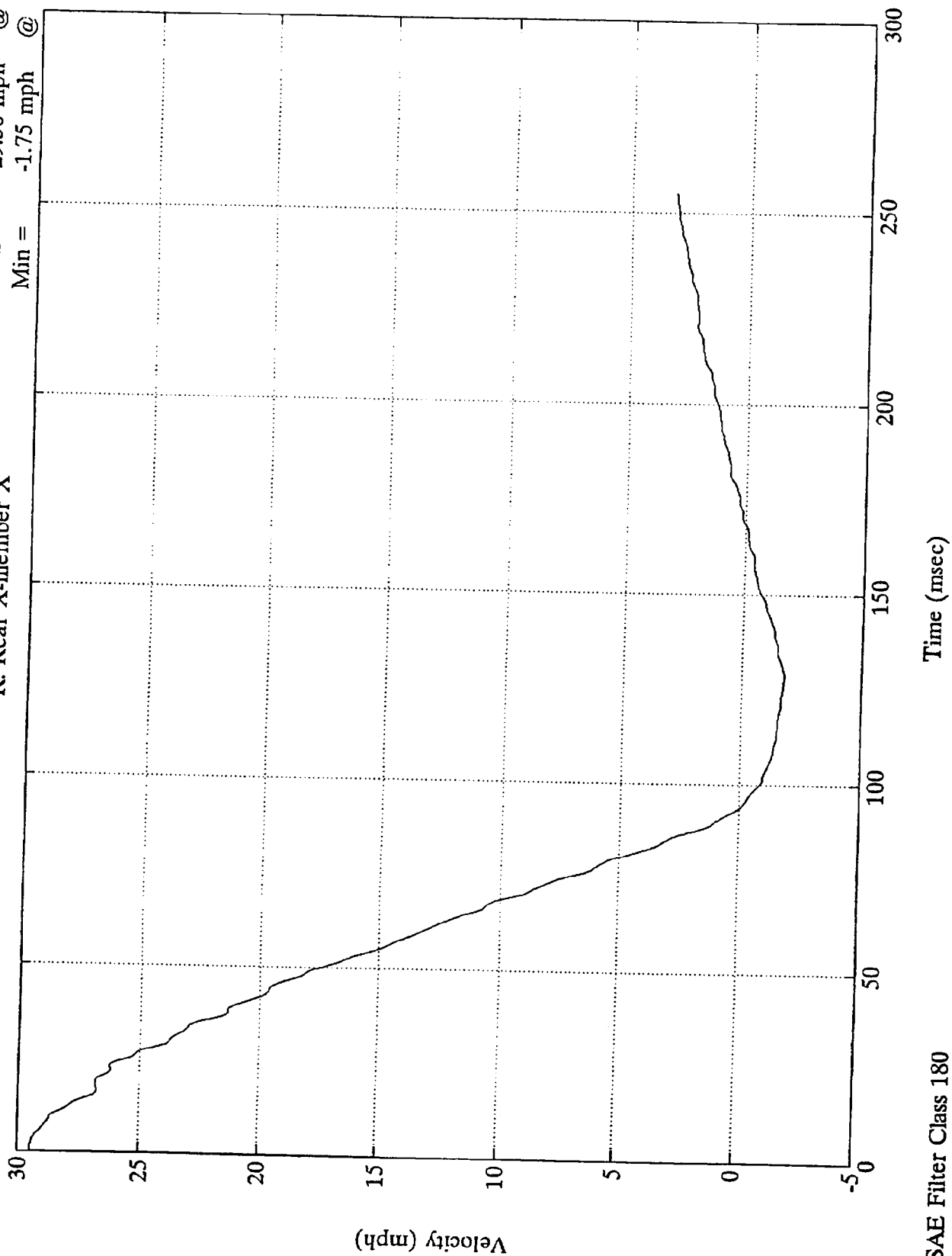


SAE Filter Class 60

NHTSA 208 TEST - 1994 Chevrolet Lumina

R. Rear X-member X

Max = 29.50 mph @ 0.11 msec
Min = -1.75 mph @ 128.15 msec

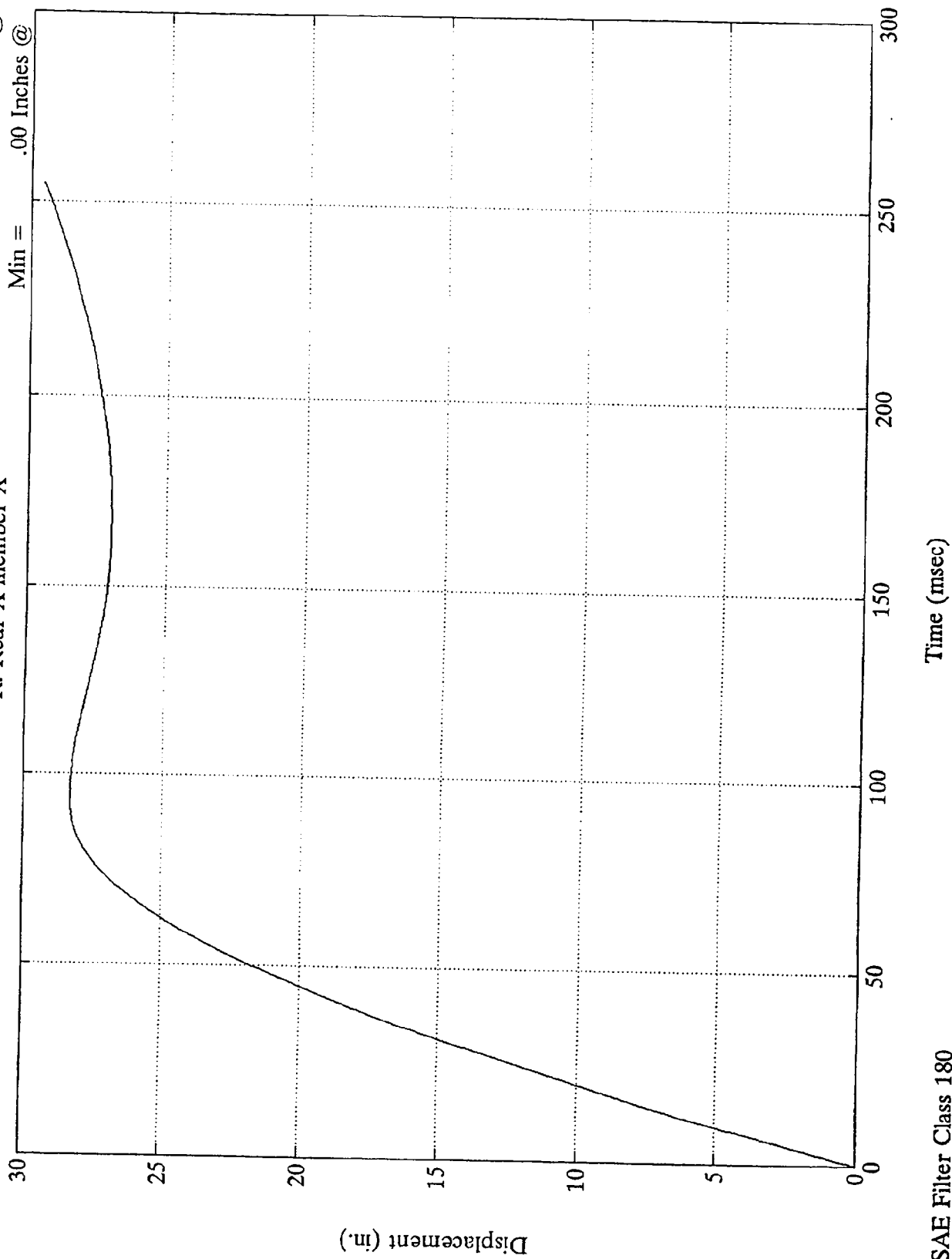


SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

R. Rear X-member X

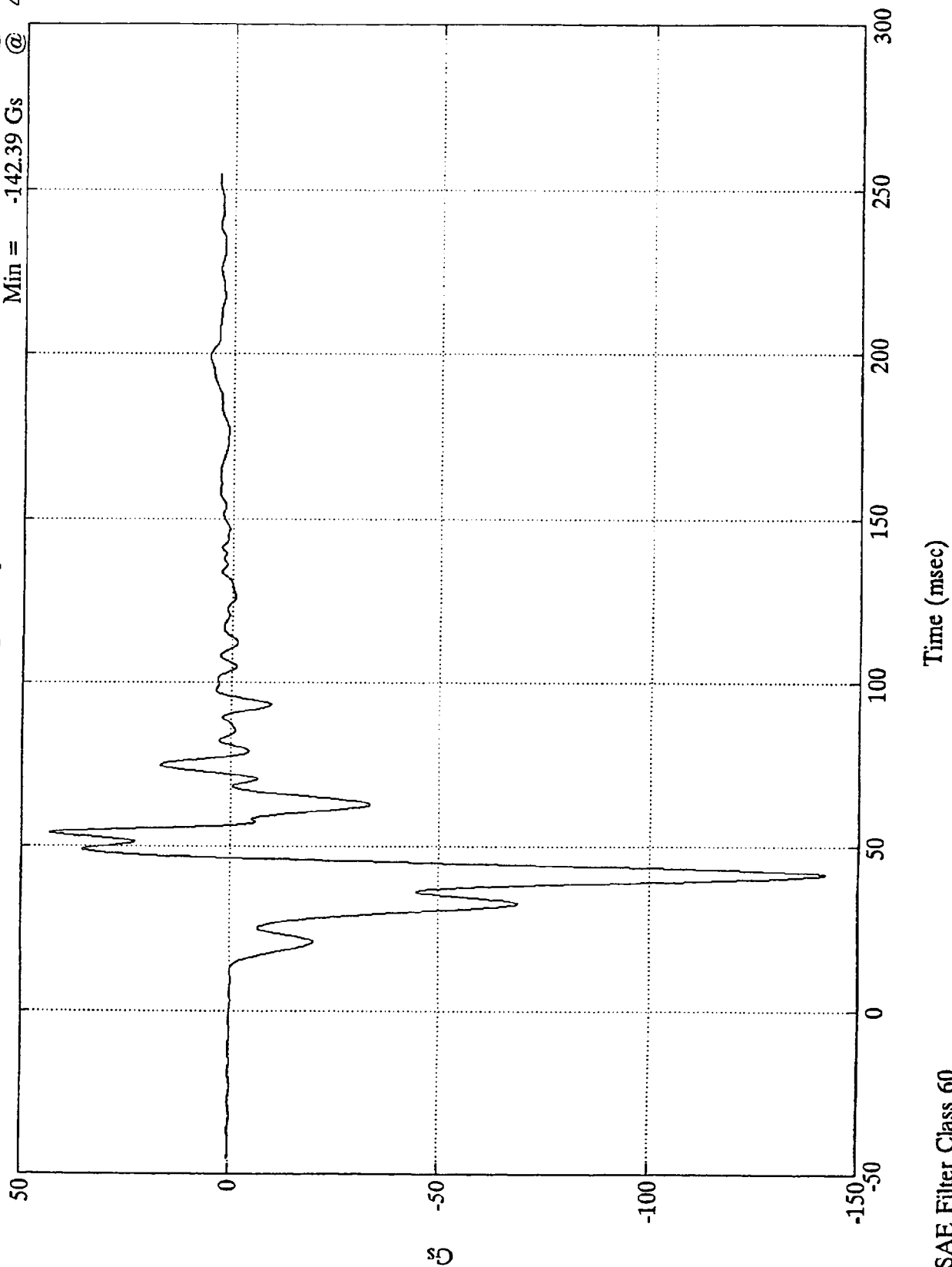
Max = 29.53 Inches @ 254.88 msec
Min = .00 Inches @ -0.00 msec



SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

Engine Top X
Max = 43.38 Gs @ 54.11 msec
Min = -142.39 Gs @ 41.28 msec

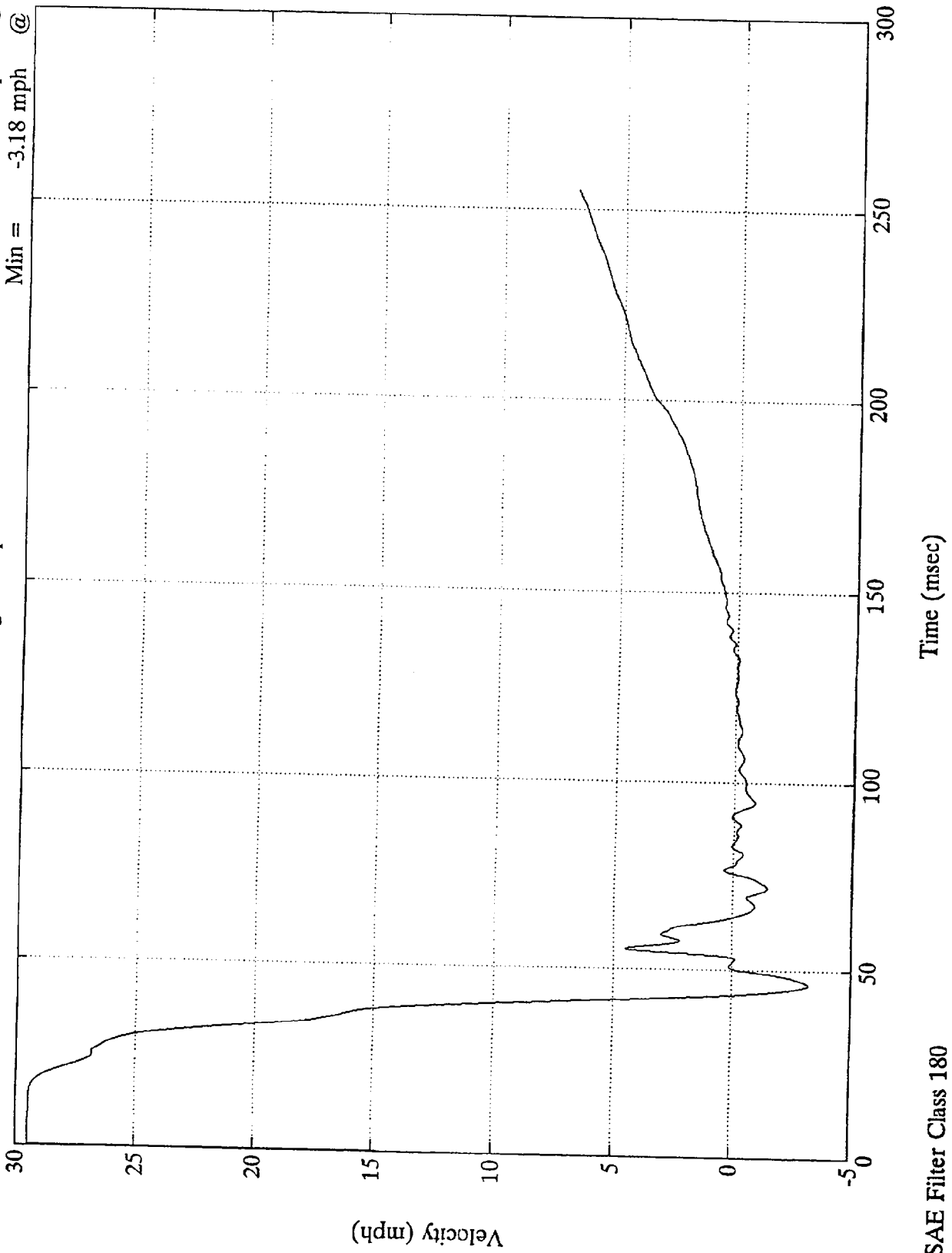


SAE Filter Class 60

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 29.50 mph @ 0.35 msec
Min = -3.18 mph @ 46.08 msec

Engine Top X

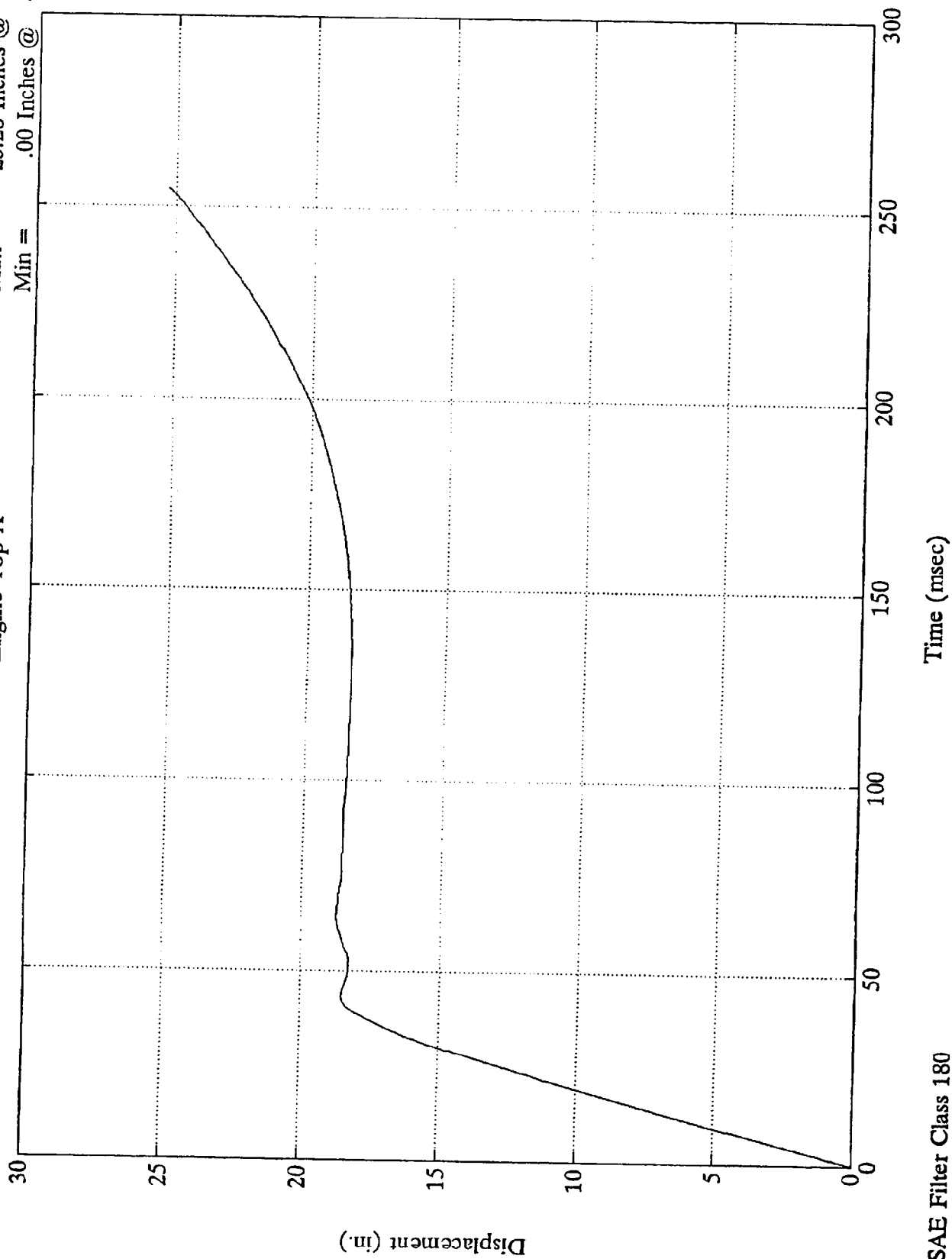


SAE Filter Class 180

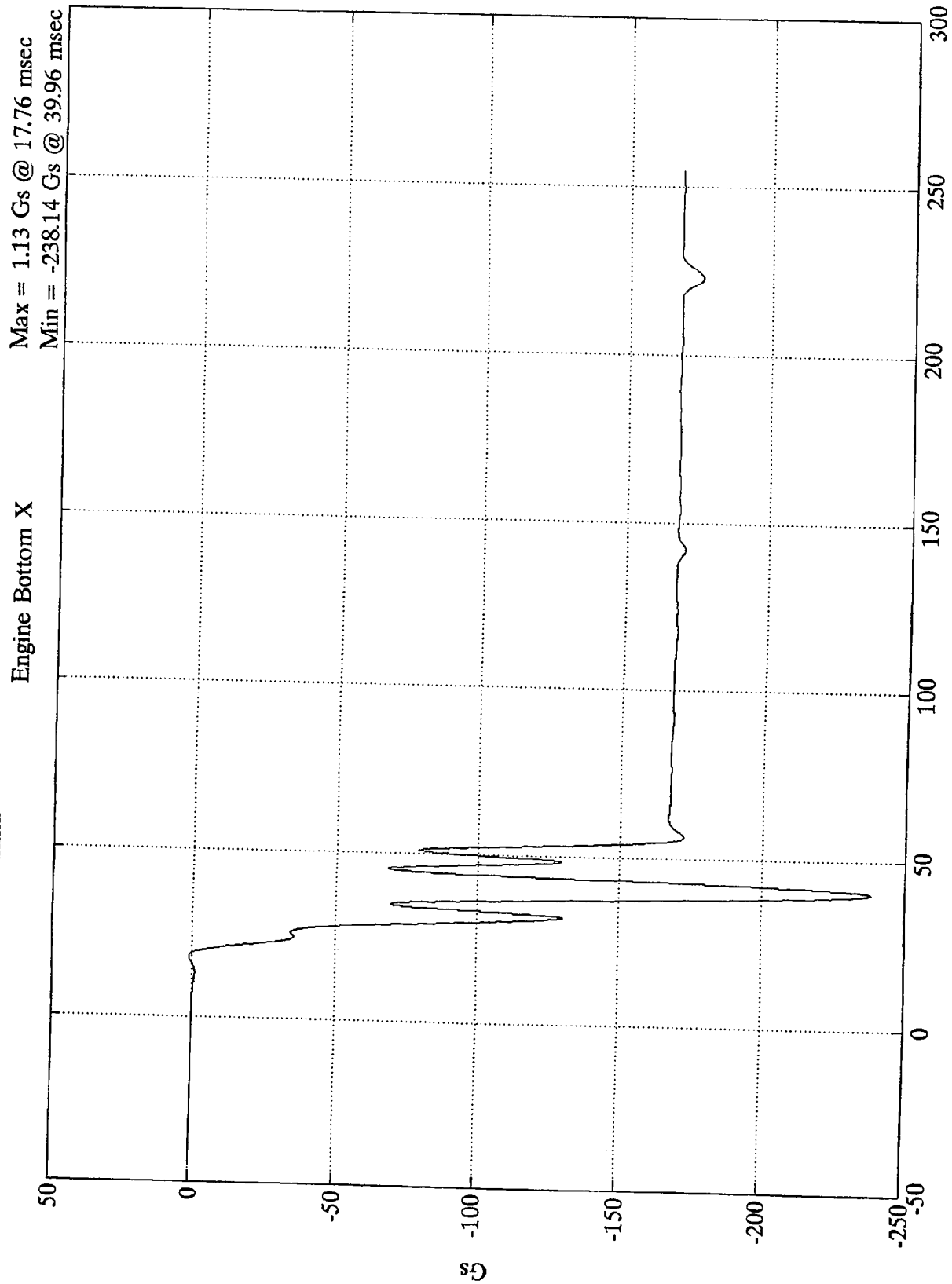
NHTSA 208 TEST - 1994 Chevrolet Lumina

Engine Top X

Max = 25.26 Inches @ 254.88 msec
Min = .00 Inches @ -0.00 msec



FMVSS 208 TEST - 1994 Chevrolet Lumina

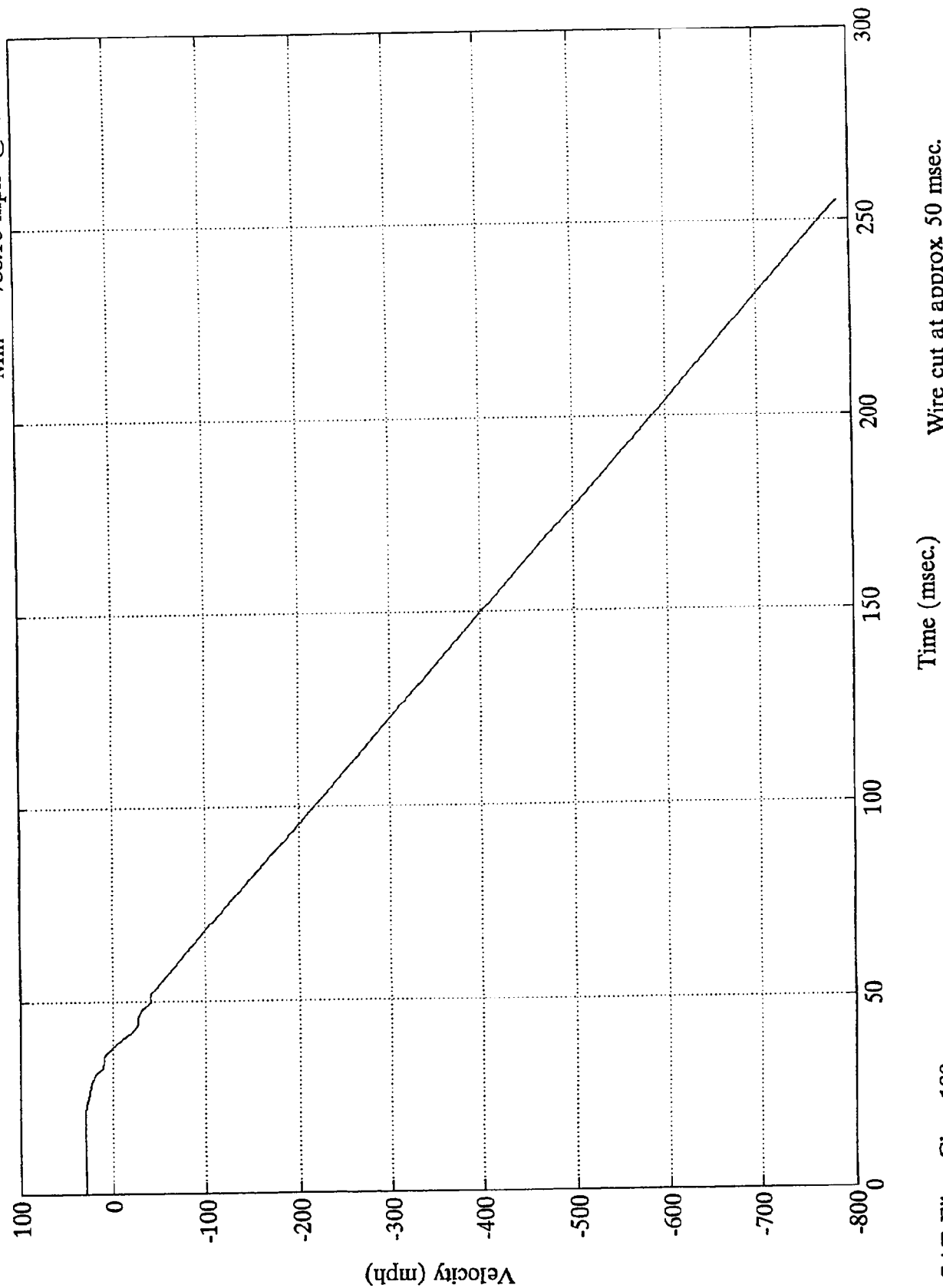


SAE Filter Class 60

FMVSS 208 TEST - 1994 Chevrolet Lumina

Engine Bottom X

Max = 29.50 mph @ 7.20 msec
Min = -788.18 mph @ 254.88 msec



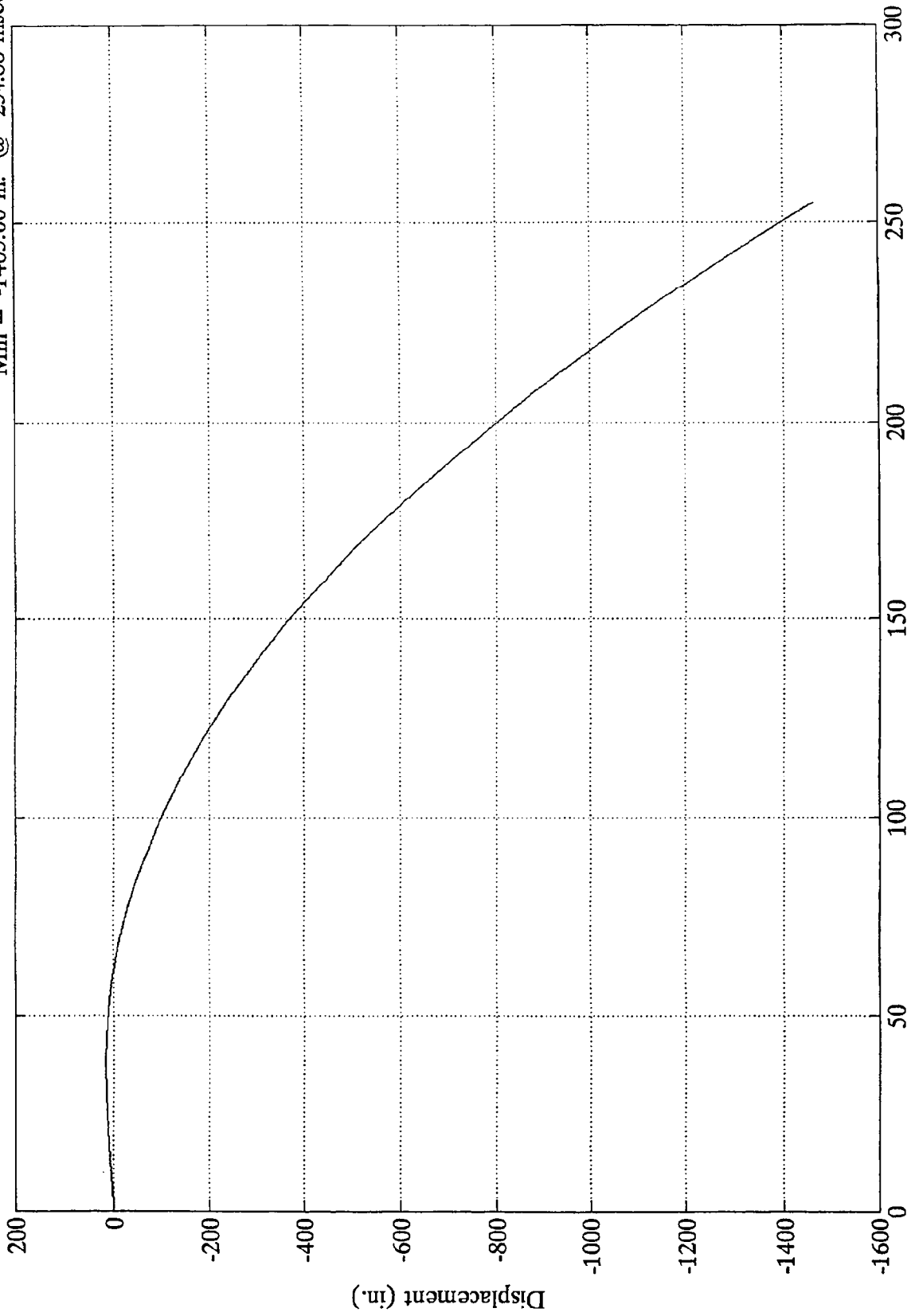
SAE Filter Class 180

Wire cut at approx 50 msec.

FMVSS 208 TEST - 1994 Chevrolet Lumina

Engine Bottom X

Max = 16.61 in. @ 38.40 msec
Min = -1465.00 in. @ 254.88 msec



Wire cut at approx 50 msec.

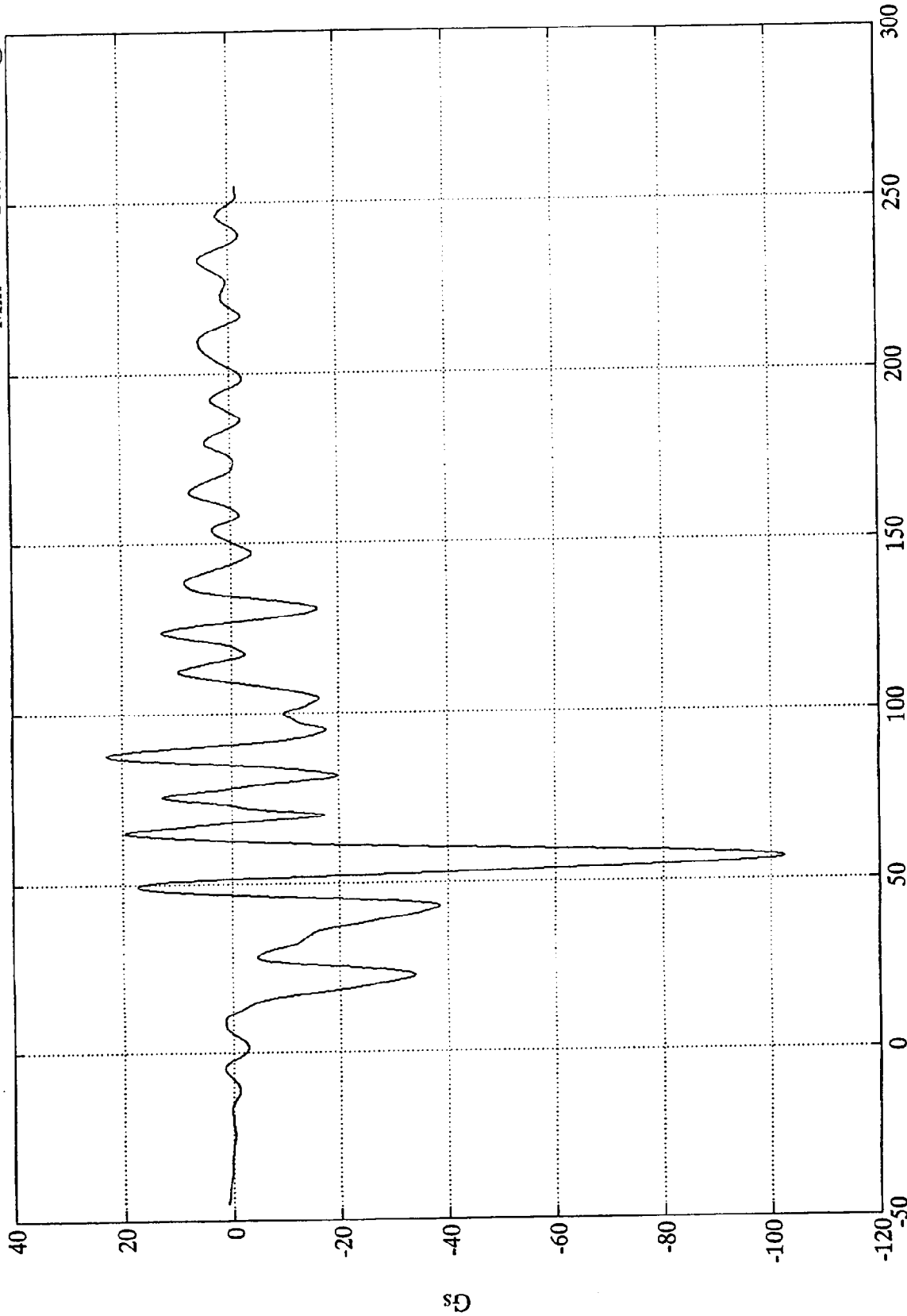
Time (msec.)

SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

L. Brake Caliper X

Max = 22.87 Gs @ 87.72 msec
Min = -102.51 Gs @ 56.40 msec



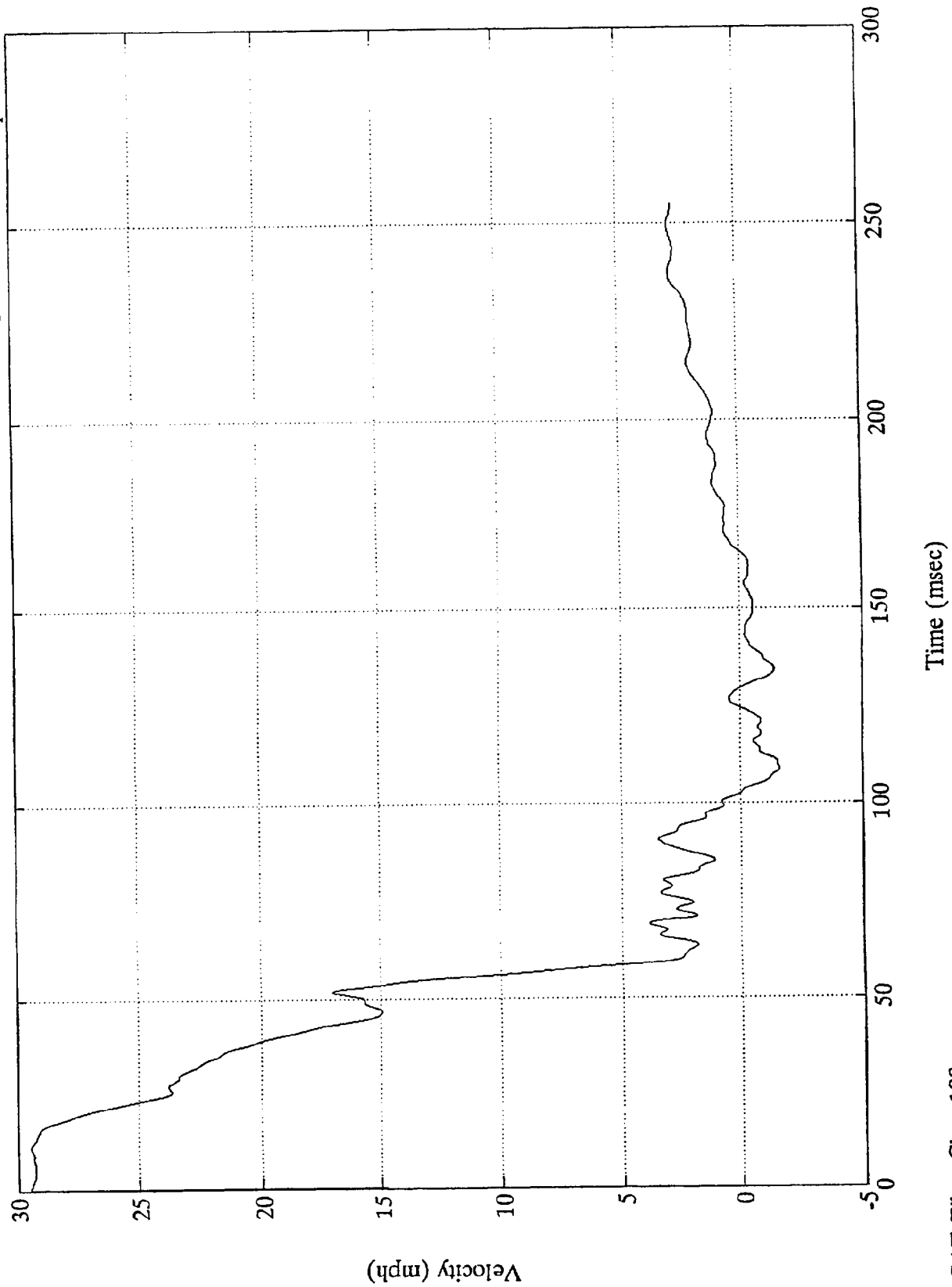
Time (msec)

SAE Filter Class 60

NHTSA 208 TEST - 1994 Chevrolet Lumina

L. Brake Caliper X

Max = 29.49 mph @ 0.11 msec
Min = -1.60 mph @ 108.84 msec

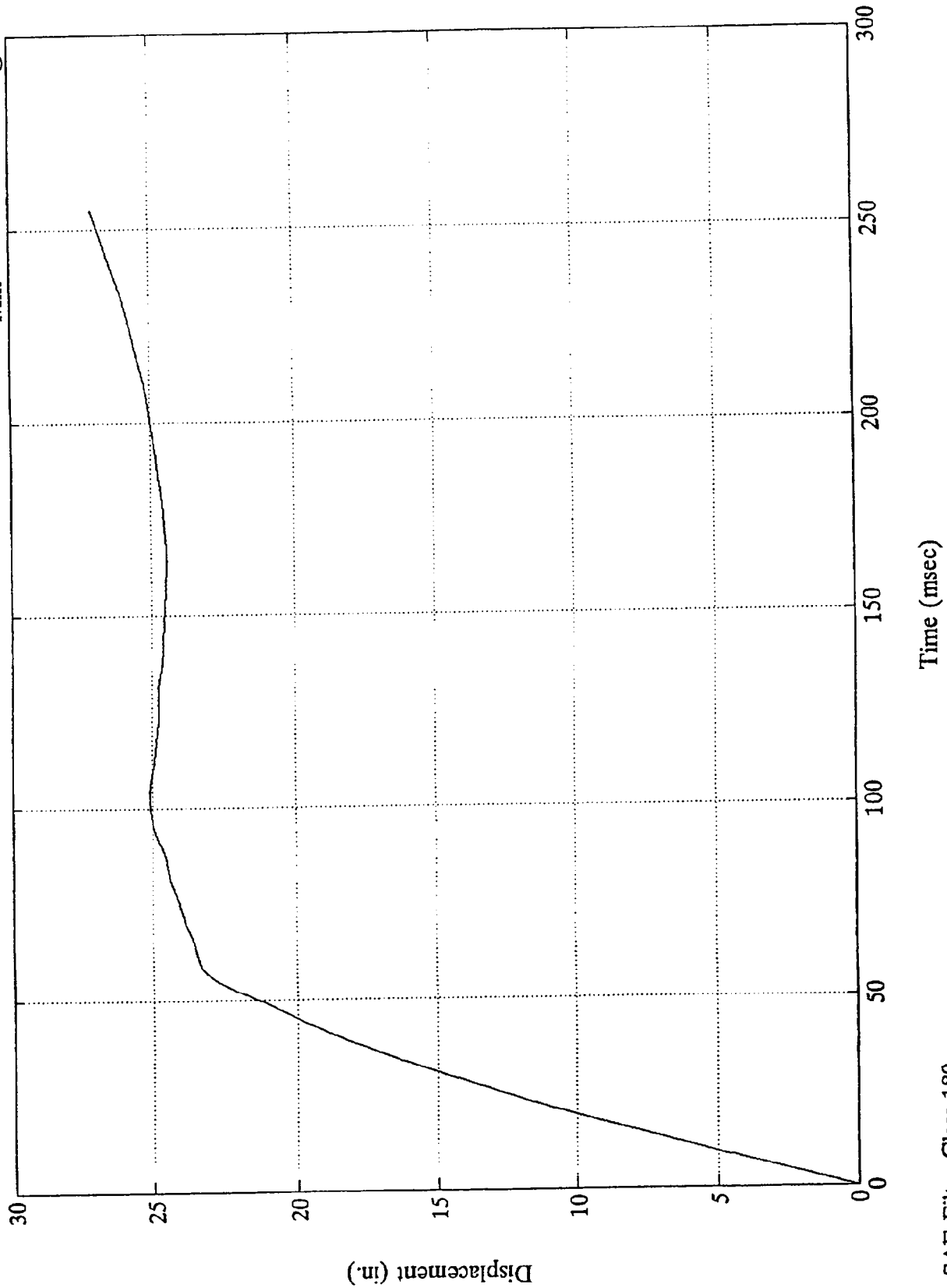


SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

L. Brake Caliper X

Max = 27.08 Inches @ 254.88 msec
Min = .00 Inches @ -0.00 msec

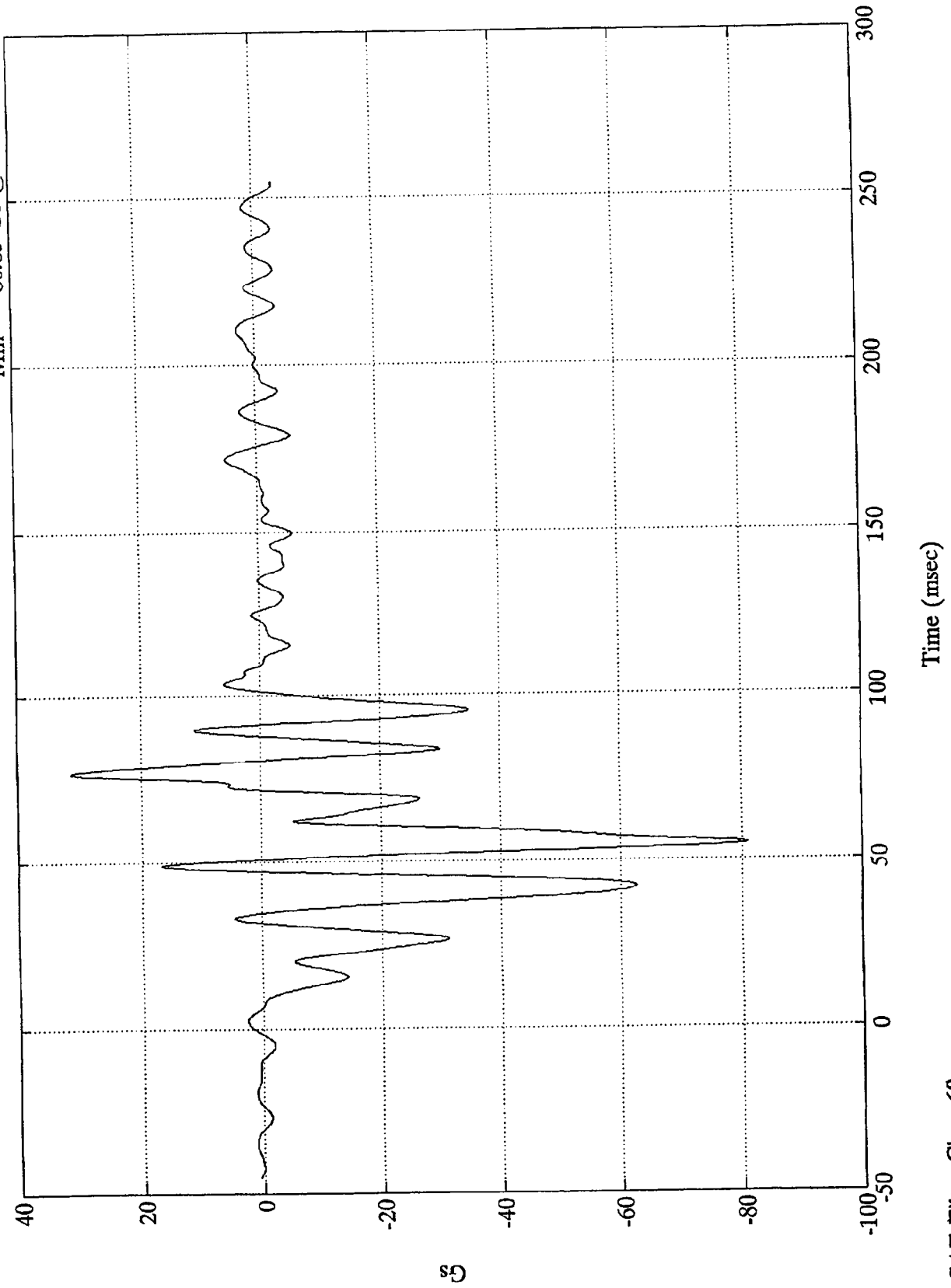


SAE Filter Class 180

FMVSS 208 TEST - 1994 Chevrolet Lumina

R. Brake Caliper X

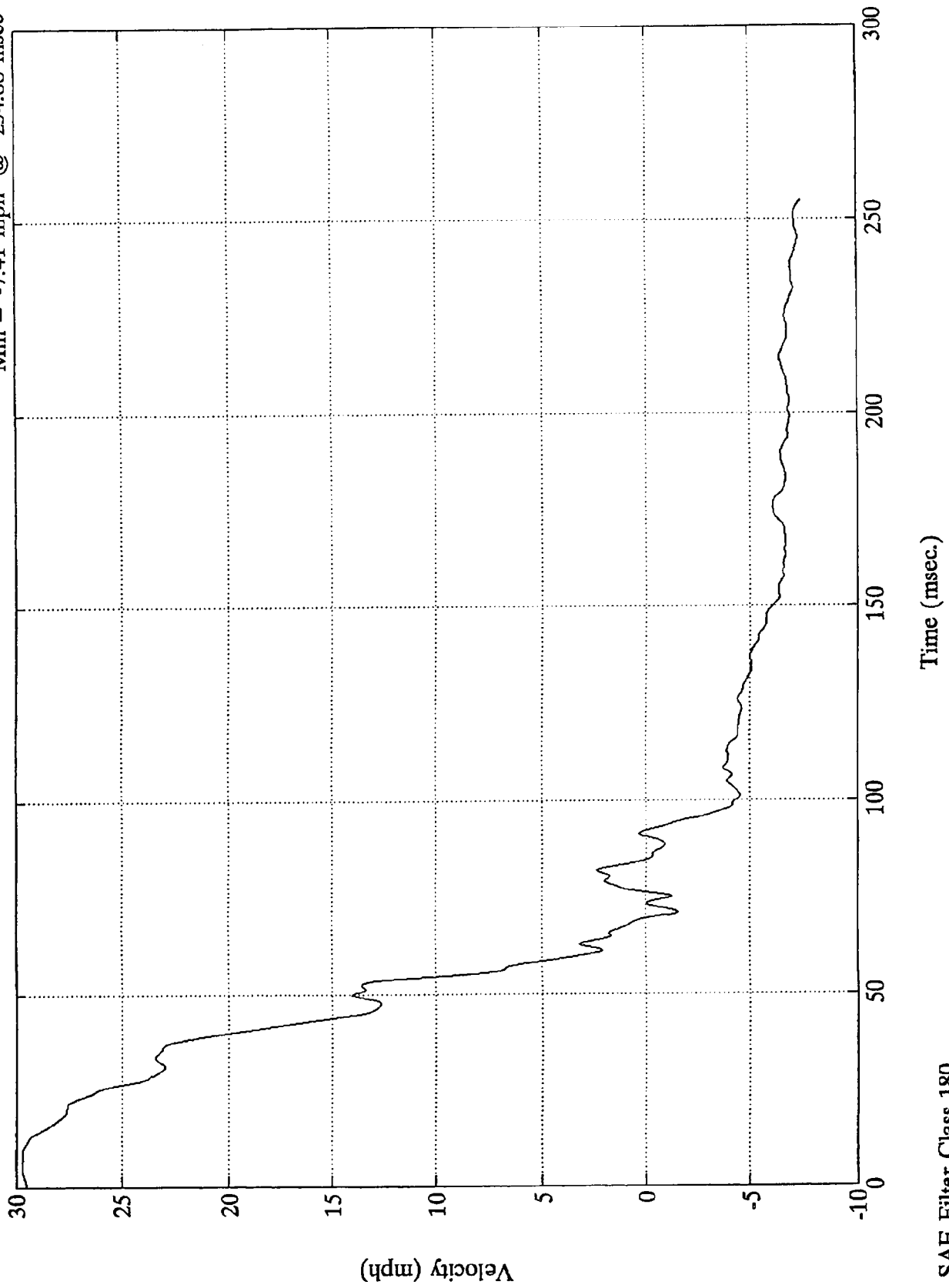
Max = 31.35 Gs @ 76.80 msec
Min = -80.83 Gs @ 55.08 msec



SAE Filter Class 60

FMVSS 208 TEST - 1994 Chevrolet Lumina

R. Brake Caliper X
Max = 29.74 mph @ 6.00 msec
Min = -7.41 mph @ 254.88 msec

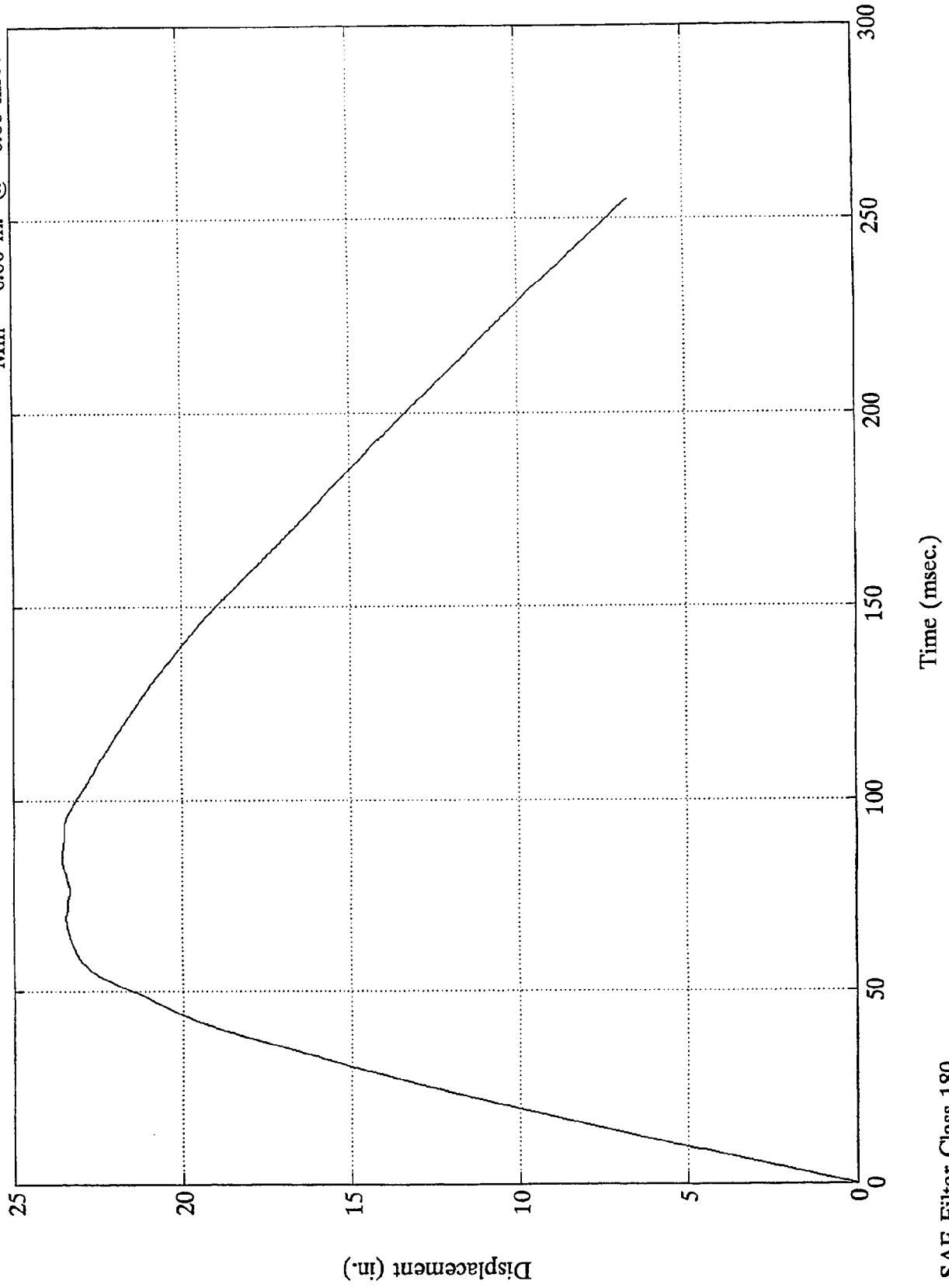


SAE Filter Class 180

FMVSS 208 TEST - 1994 Chevrolet Lumina

R. Brake Caliper X

Max = 23.55 in. @ 85.68 msec
Min = 0.00 in. @ -0.00 msec

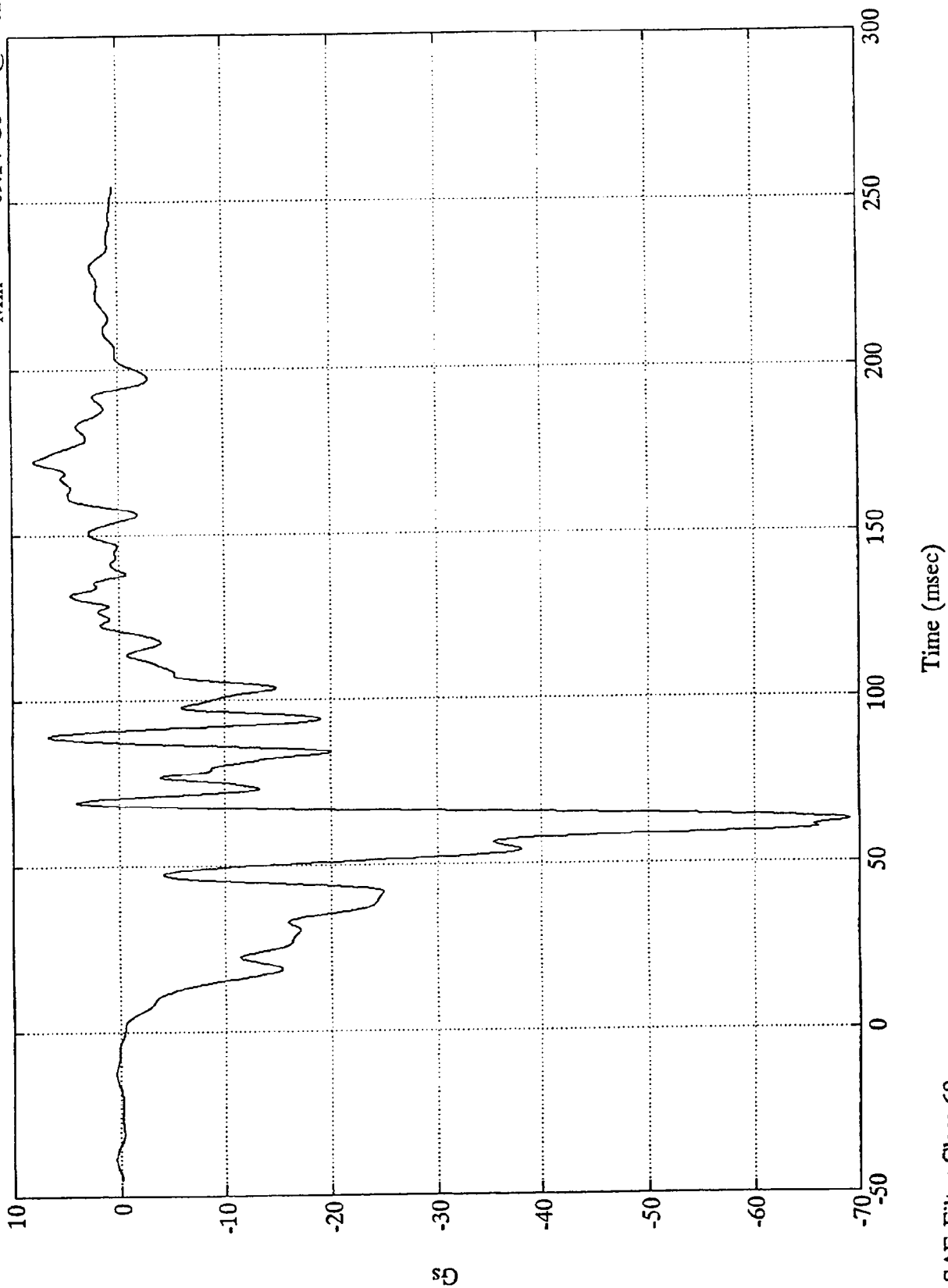


SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 8.00 Gs @ 172.56 msec
Min = -69.14 Gs @ 62.64 msec

Instrument Panel X

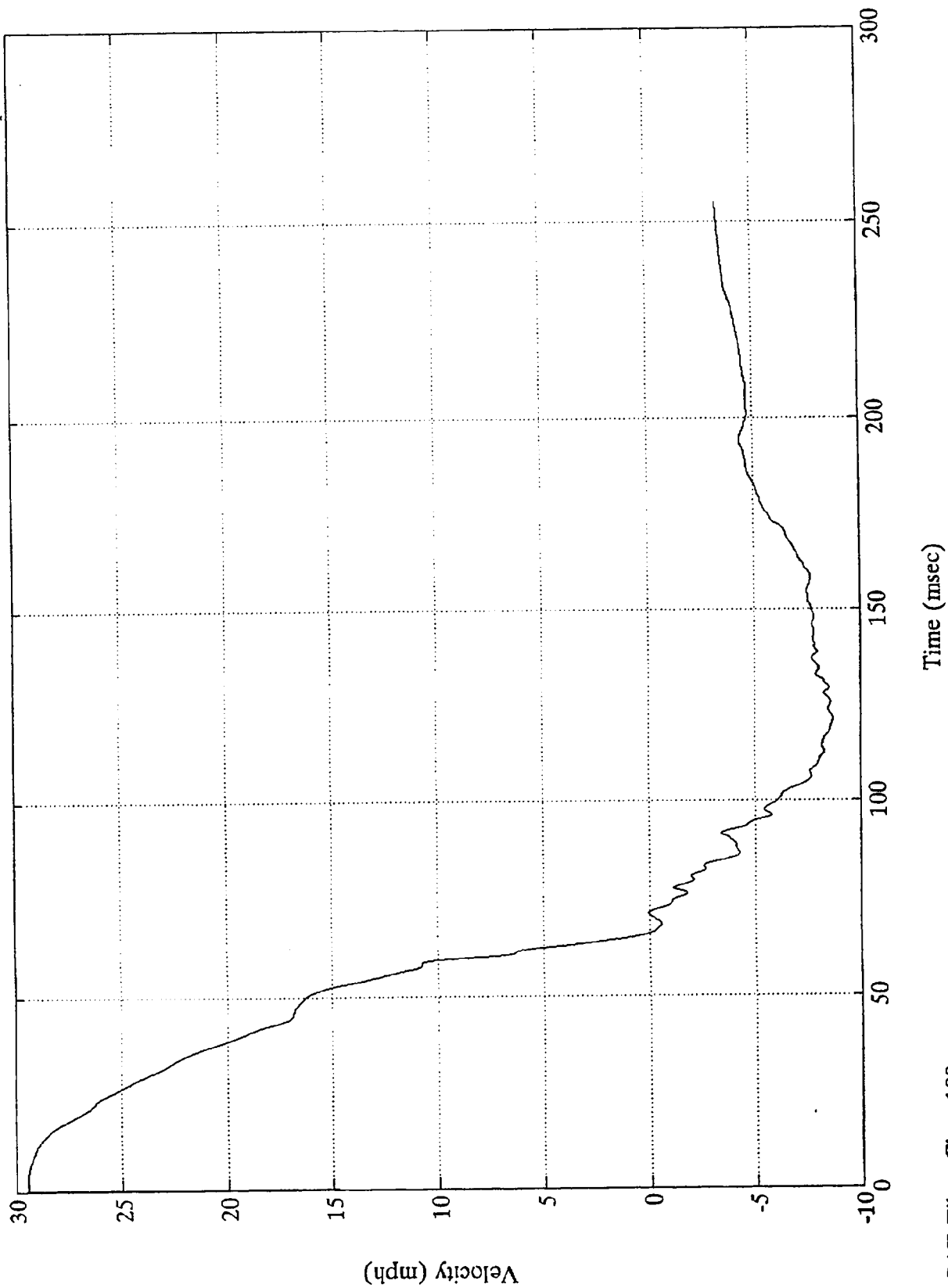


SAE Filter Class 60

NHTSA 208 TEST - 1994 Chevrolet Lumina

Instrument Panel X

Max = 29.50 mph @ 0.11 msec
Min = -8.65 mph @ 121.20 msec

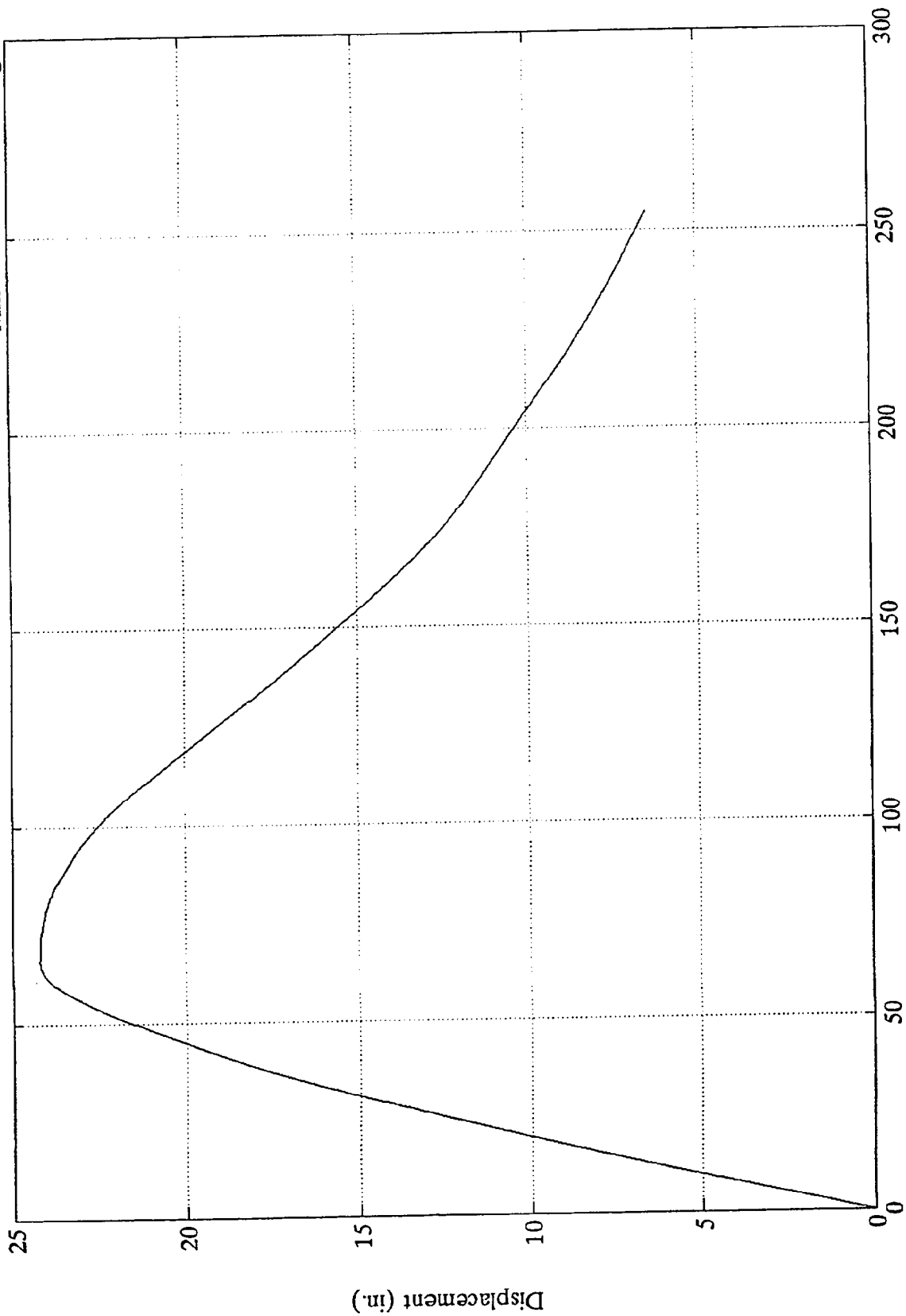


SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 24.21 Inches @ 65.99 msec
Min = .00 Inches @ -0.00 msec

Instrument Panel X



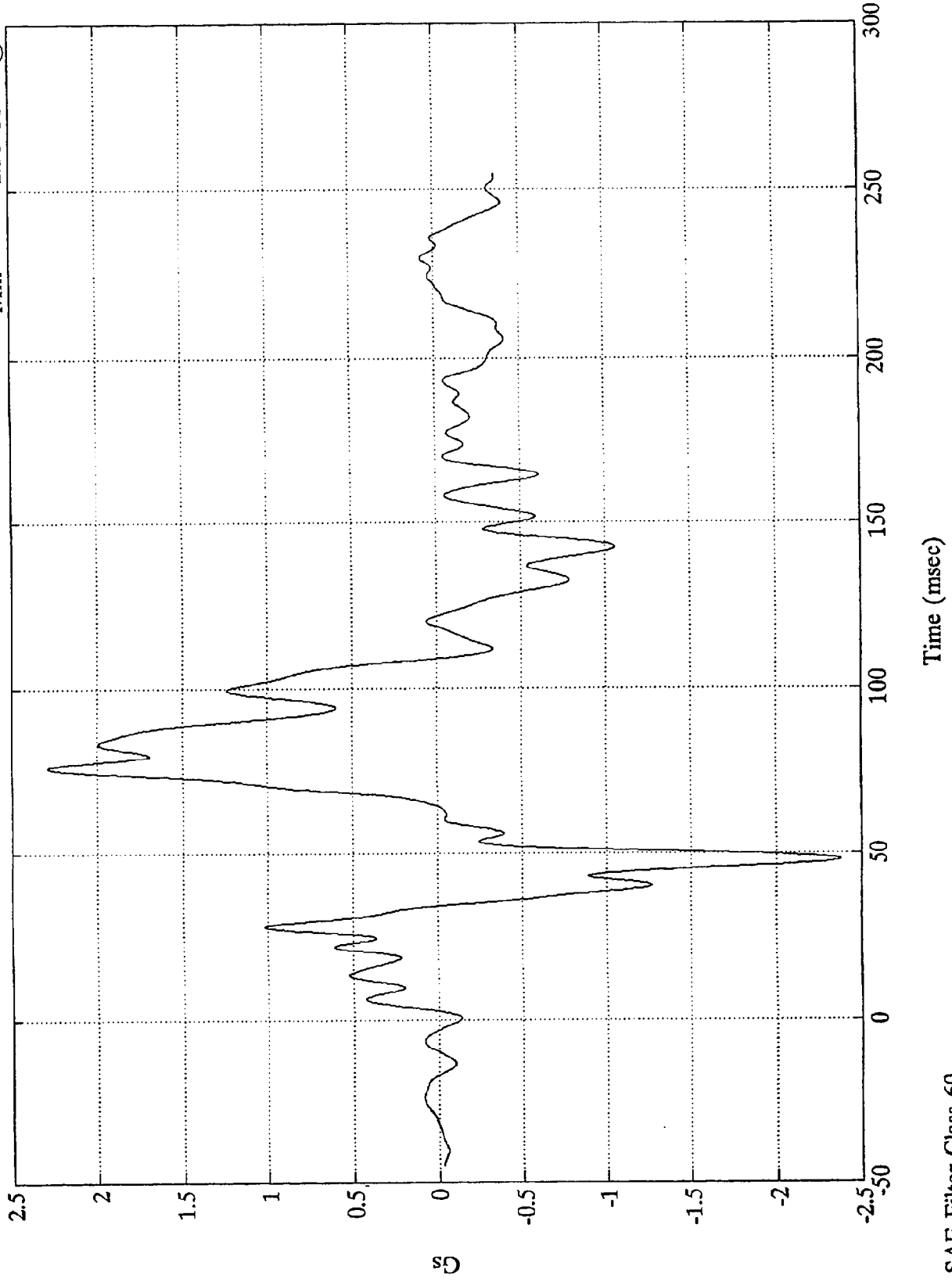
Time (msec)

SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 2.29 Gs @ 76.31 msec
Min = -2.38 Gs @ 47.88 msec

Trunk Z



SAE Filter Class 60

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = .87 mph @ 108.60 msec
Min = -.28 mph @ 65.03 msec

Trunk Z

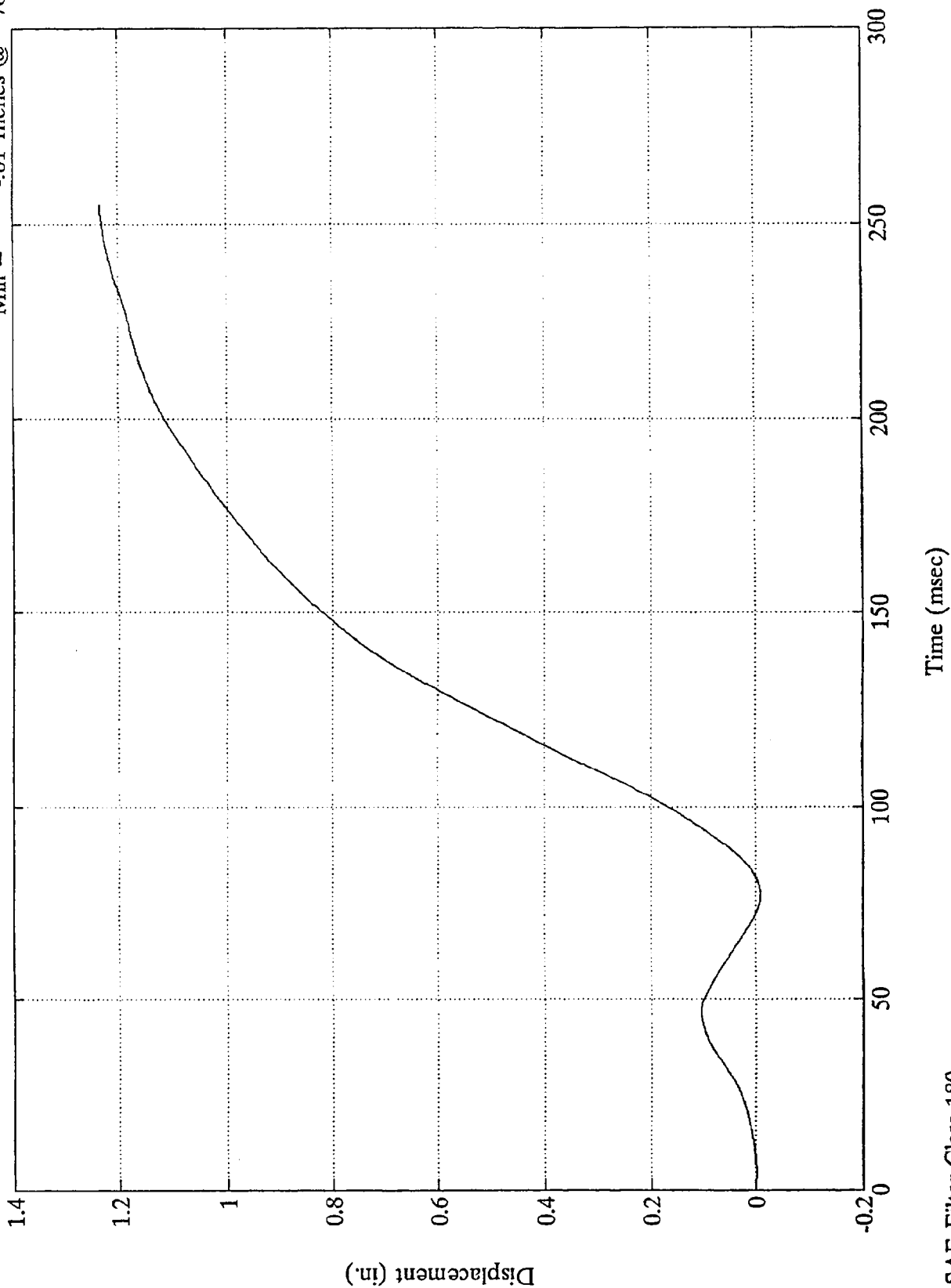


SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

Trunk Z

Max = 1.23 Inches @ 254.88 msec
Min = -.01 Inches @ 76.68 msec



SAE Filter Class 180

TEST NO. CR0111

DUMMY	SAE FILTER CHANNEL CLASS
Head Accelerations	1000
Chest Accelerations	180
Femur Forces	600
Neck Forces	1000
Neck Moments	600
Chest Displacements	180
Pelvic Accelerations	1000

FACILITY: TRACK TEST DATE: 11 Aug 1994
 RUN #: 1441 TEST TIME: 13:55:49
 SERIES #: 16 BOARD: A

TITLE: NHTSA 208 TEST #3 - 1994 Chevrolet Lumina

CHANNEL NUMBER	DESCRIPTION	ENGR UNIT	MAXIMUM		MINIMUM		FILTER CLASS
			AMP	msec	AMP	msec	
1	Pos. 1 Head X	Gs	4.2	243.4	-30.7	79.9	1000.0
2	Pos. 1 Head Y	Gs	17.5	100.7	-3.6	30.6	1000.0
3	Pos. 1 Head Z	Gs	6.3	154.1	-21.0	104.3	1000.0
4	Pos. 1 Left Femur	lbs	62.6	30.7	-1899.3	54.2	600.0
5	Pos. 1 Chest X	Gs	6.8	218.5	-47.5	95.0	1000.0
6	Pos. 1 Chest Y	Gs	7.9	60.4	-2.5	115.6	1000.0
7	Pos. 1 Chest Z	Gs	13.8	98.8	-12.5	60.4	1000.0
8	Pos. 1 Right Femur	lbs	52.7	30.7	-2017.2	61.6	600.0
9	Pos. 2 Head X	Gs	31.9	206.8	-33.8	119.4	1000.0
10	Pos. 2 Head Y	Gs	4.0	164.0	-4.3	116.8	1000.0
11	Pos. 2 Head Z	Gs	48.5	96.6	-4.8	30.6	1000.0
12	Pos. 2 Left Femur	lbs	91.5	58.9	-782.6	76.1	600.0
13	Pos. 2 Chest X	Gs	5.0	254.2	-38.7	84.4	1000.0
14	Pos. 2 Chest Y	Gs	9.5	81.5	-6.0	114.8	1000.0
15	Pos. 2 Chest Z	Gs	11.5	91.7	-6.8	114.8	1000.0
16	Pos. 2 Right Femur	lbs	93.2	30.7	-371.3	74.0	600.0
17	Pos. 1 Head Resultant	Gs	32.2	99.5	.0	-8.3	1000.0
18	Pos. 1 Chest Resultant	Gs	48.9	95.0	.0	-28.4	180.0
19	Pos. 2 Head Resultant	Gs	51.5	96.4	.1	-19.2	1000.0
20	Pos. 2 Chest Resultant	Gs	39.4	84.5	.0	-11.4	180.0

HIC SUMMARY: Pos. 1 Head Resultant

hic: 149.13
 t1 = 69.720 msec
 t2 = 105.600 msec
 Average G's Over Hic Duration = 28.02

HIC SUMMARY: Pos. 2 Head Resultant

hic: 481.61
 t1 = 81.720 msec
 t2 = 117.600 msec
 Average G's Over Hic Duration = 44.79

CLIP SUMMARY: Pos. 1 Chest Resultant

Peak Resultant (3 ms CLIPPED DURATION) = 46.987 G's
 Tstart = 93.6000 ms
 Tend = 96.7200 ms
 CSI = 329.176

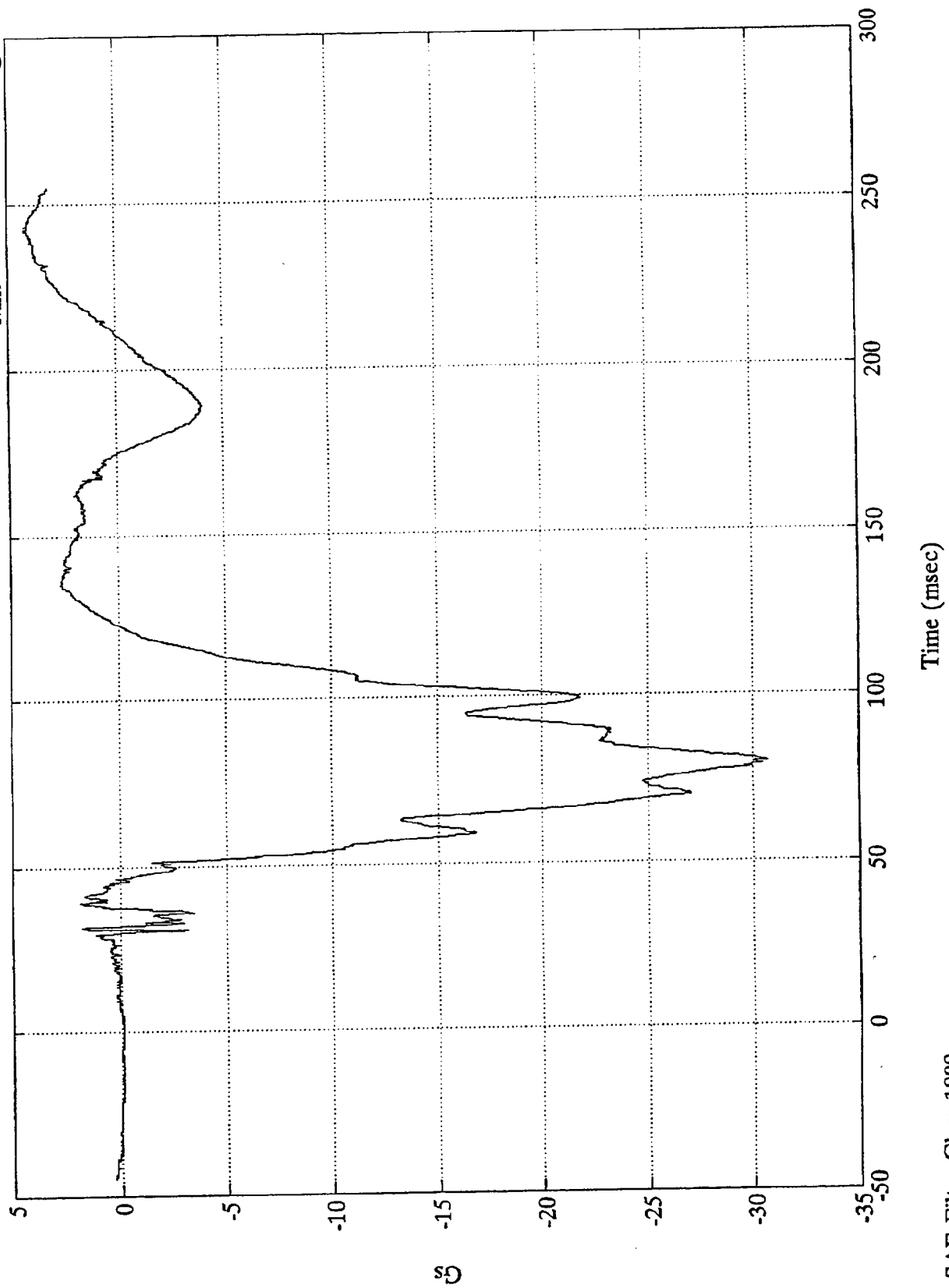
CLIP SUMMARY: Pos. 2 Chest Resultant

Peak Resultant (3 ms CLIPPED DURATION) = 38.149 G's
 Tstart = 94.0800 ms
 Tend = 97.2000 ms
 CSI = 302.298

NHTSA 208 TEST - Chevrolet Lumina

Pos. 1 Head X

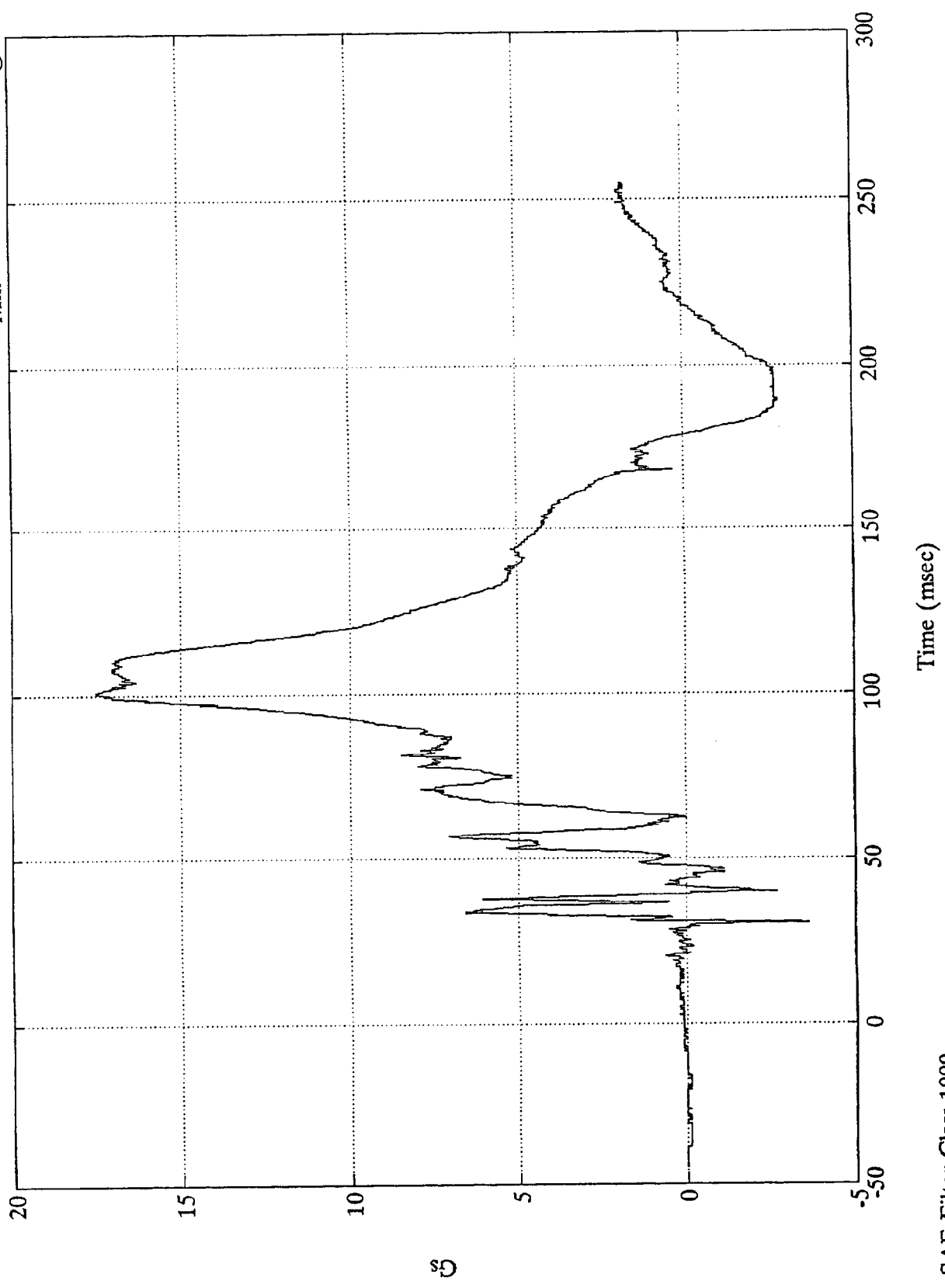
Max = 4.19 Gs @ 243.36 msec
Min = -30.68 Gs @ 79.91 msec



NHTSA 208 TEST - Chevrolet Lumina

Max = 17.53 Gs @ 100.68 msec
Min = -3.61 Gs @ 30.60 msec

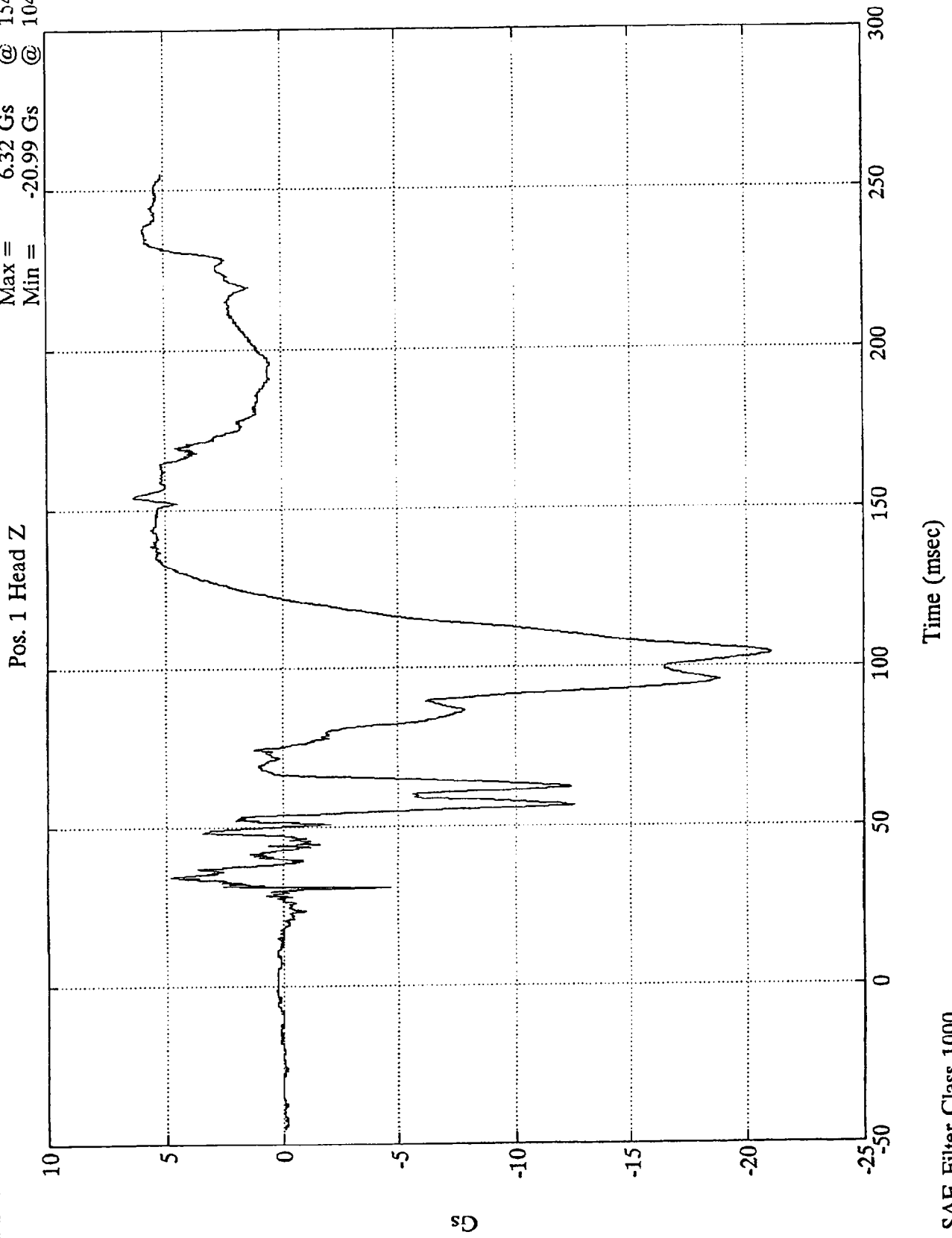
Pos. 1 Head Y



SAE Filter Class 1000

NHTSA 208 TEST - Chevrolet Lumina

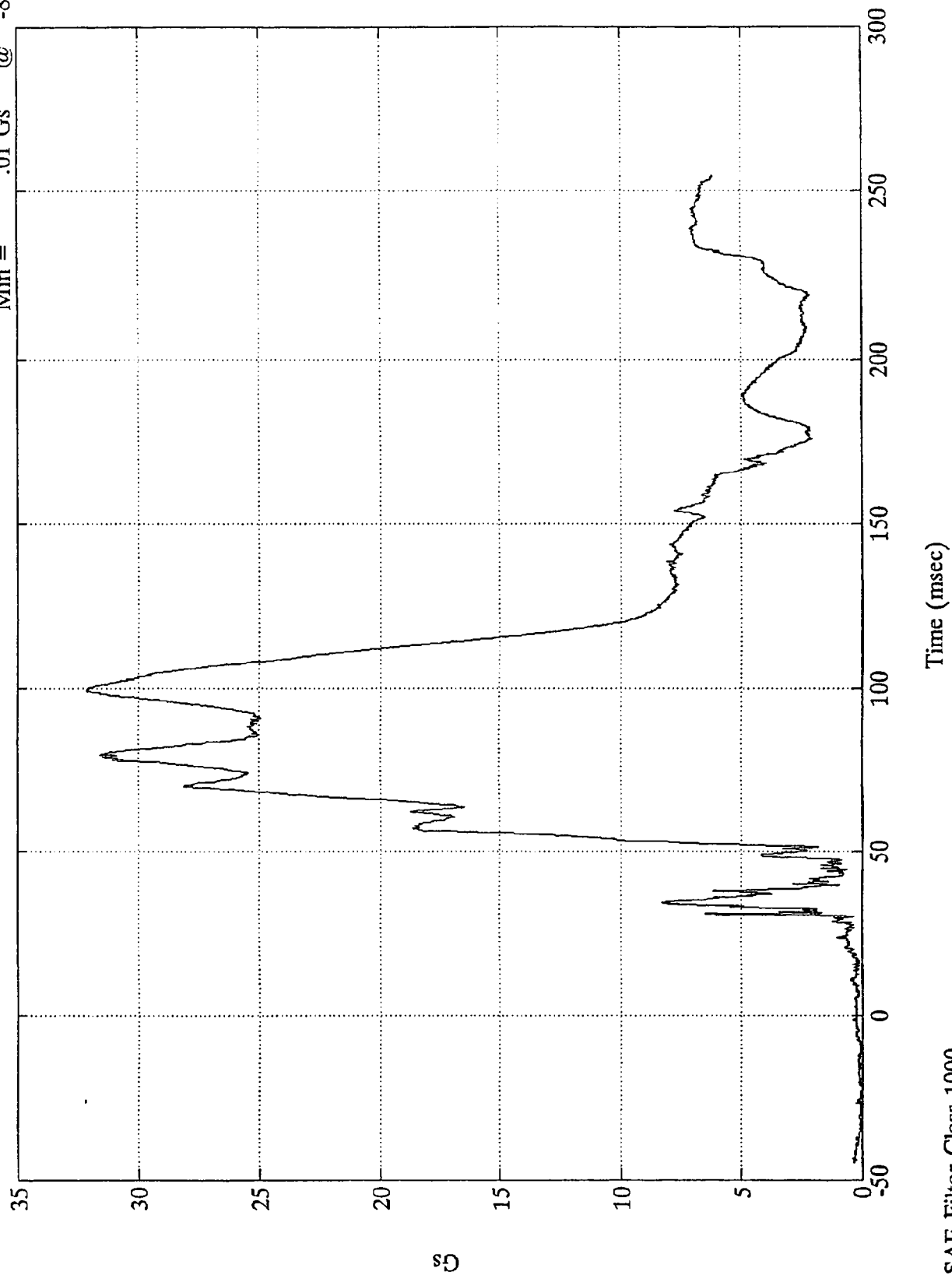
Max = 6.32 Gs @ 154.08 msec
Min = -20.99 Gs @ 104.27 msec



Gs

NHTSA 208 TEST - Chevrolet Lumina

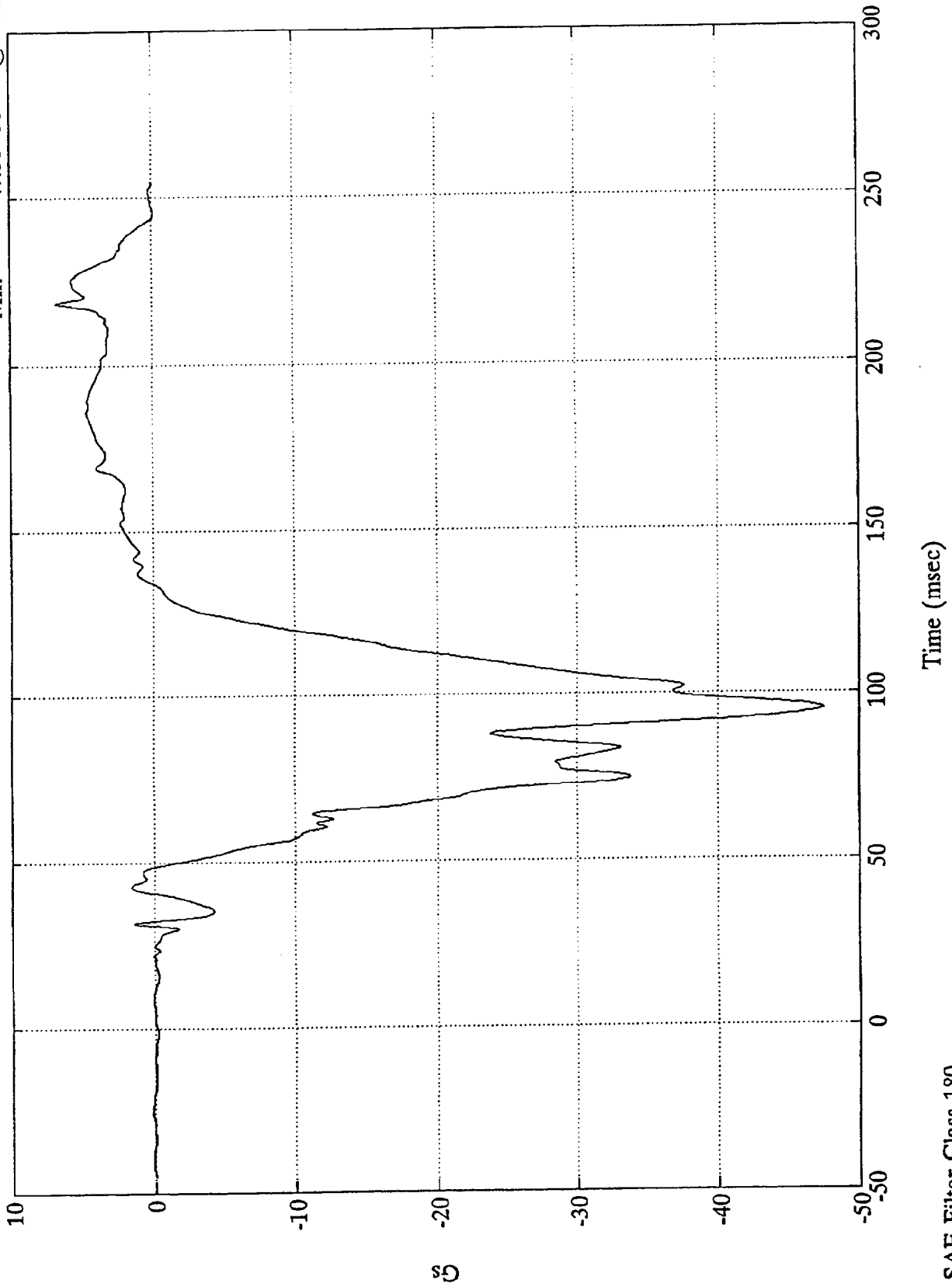
Pos. 1 Head Resultant
 Max = 32.16 Gs @ 99.48 msec
 Min = .01 Gs @ -8.28 msec



SAE Filter Class 1000

NHTSA 208 TEST - Chevrolet Lumina

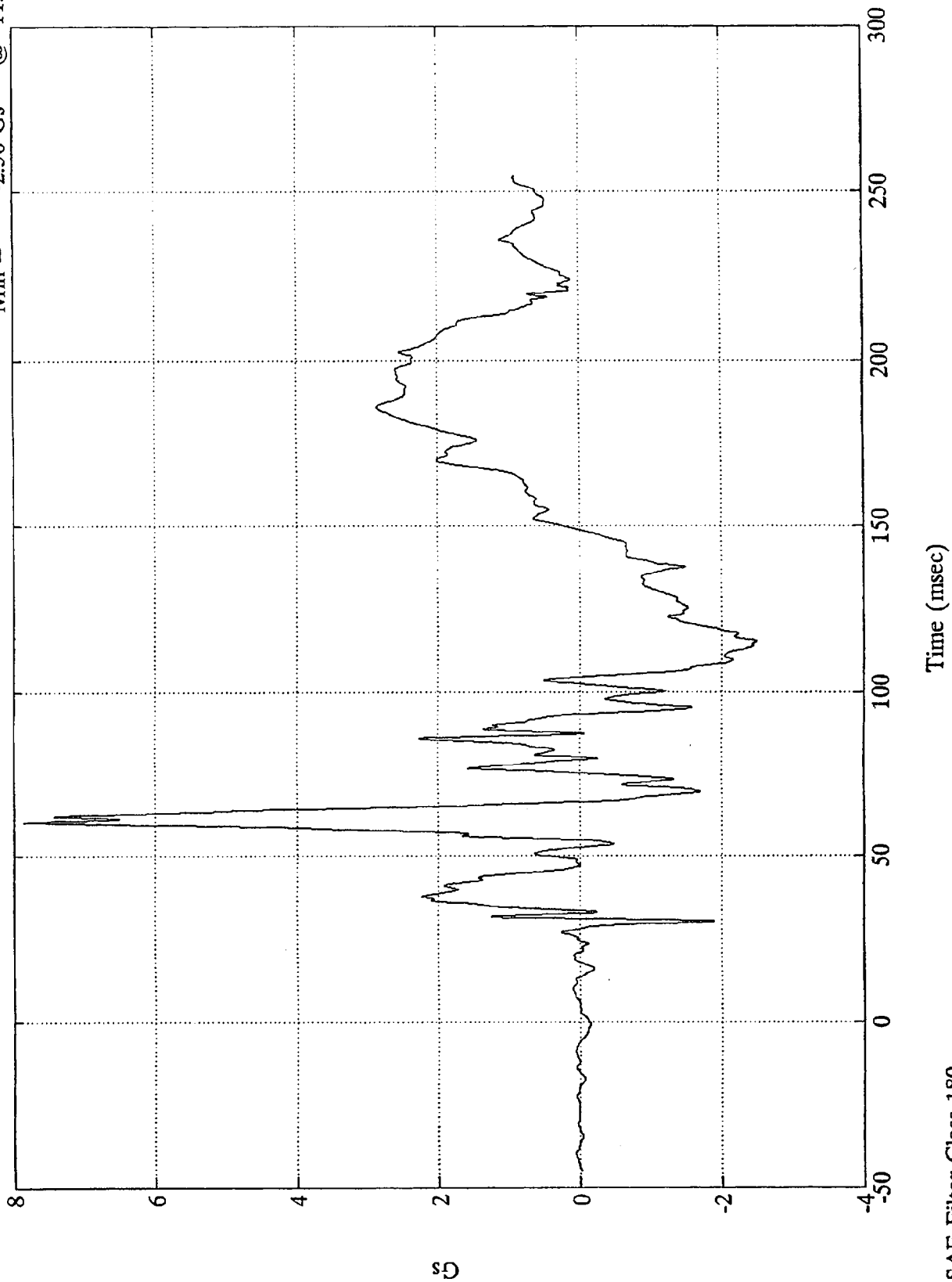
Pos. 1 Chest X
Max = 6.81 Gs @ 218.52 msec
Min = -47.53 Gs @ 95.04 msec



SAE Filter Class 180

NHTSA 208 TEST - Chevrolet Lumina

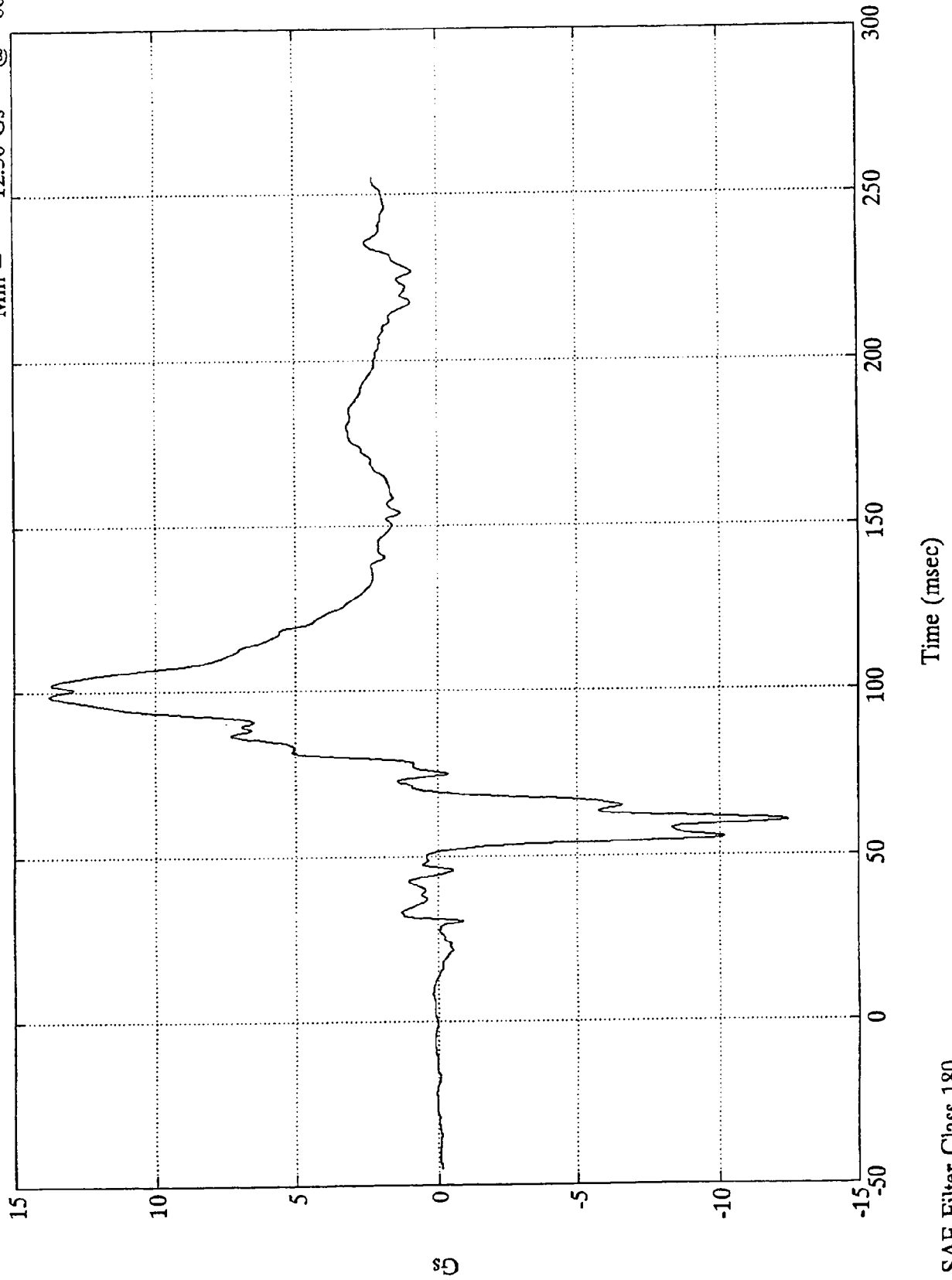
Pos. 1 Chest Y
 Max = 7.86 Gs @ 60.36 msec
 Min = -2.50 Gs @ 115.56 msec



SAE Filter Class 180

NHTSA 208 TEST - Chevrolet Lumina

Pos. 1 Chest Z
Max = 13.78 Gs @ 98.76 msec
Min = -12.50 Gs @ 60.36 msec

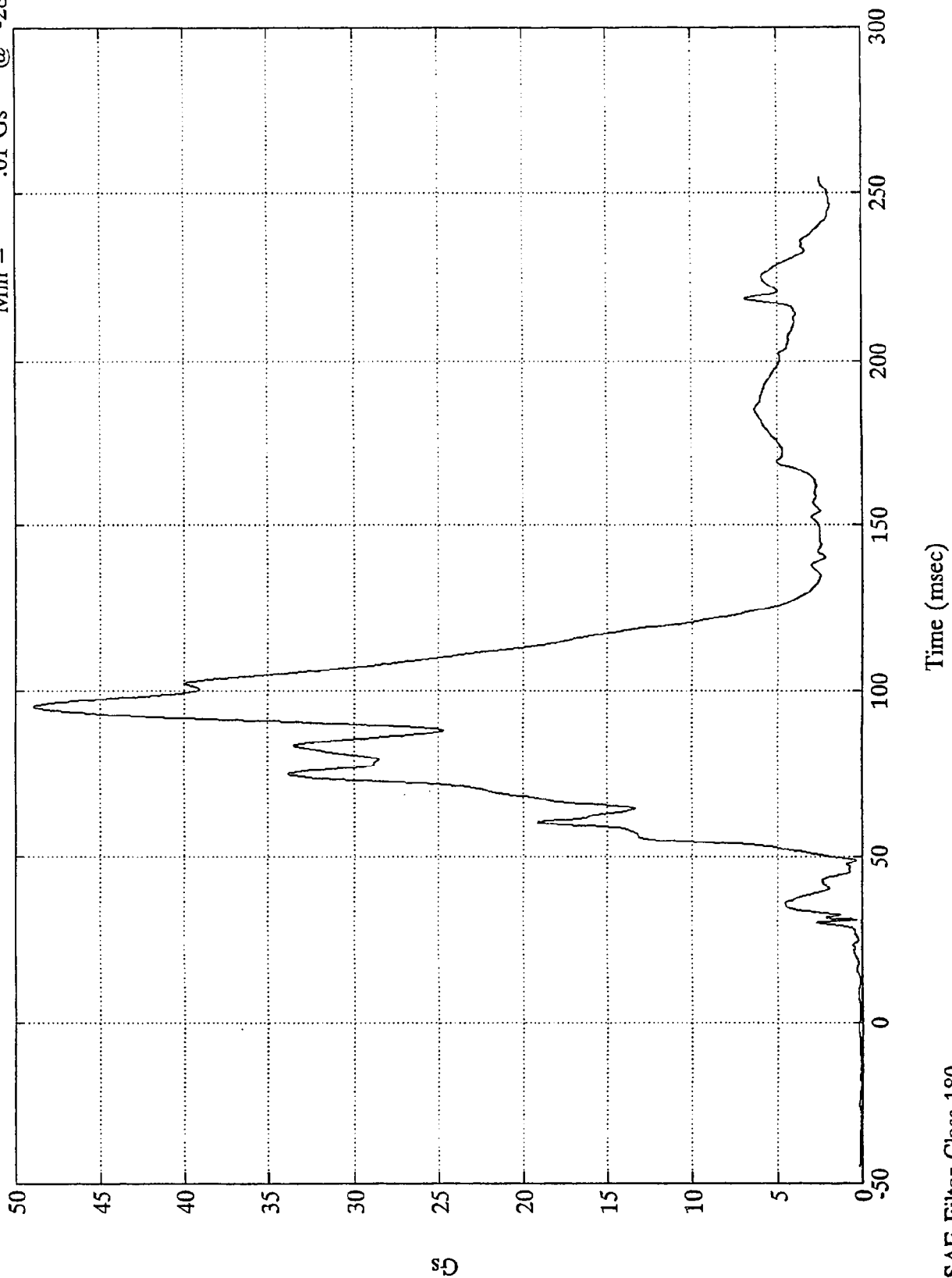


SAE Filter Class 180

NHTSA 208 TEST - Chevrolet Lumina

Pos. 1 Chest Resultant

Max = 48.95 Gs @ 95.04 msec
Min = .01 Gs @ -28.44 msec

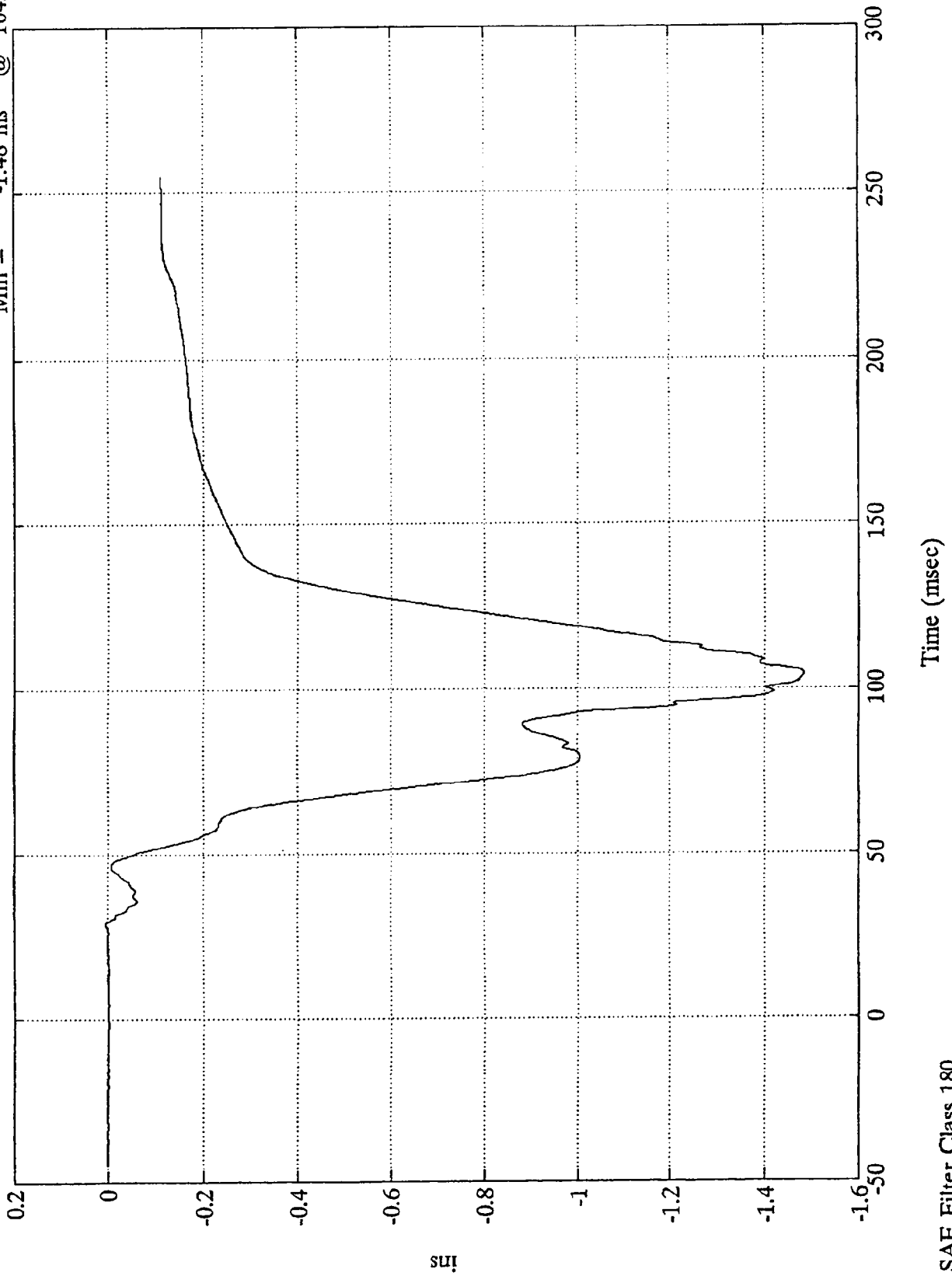


SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos.1 Chest Displacement

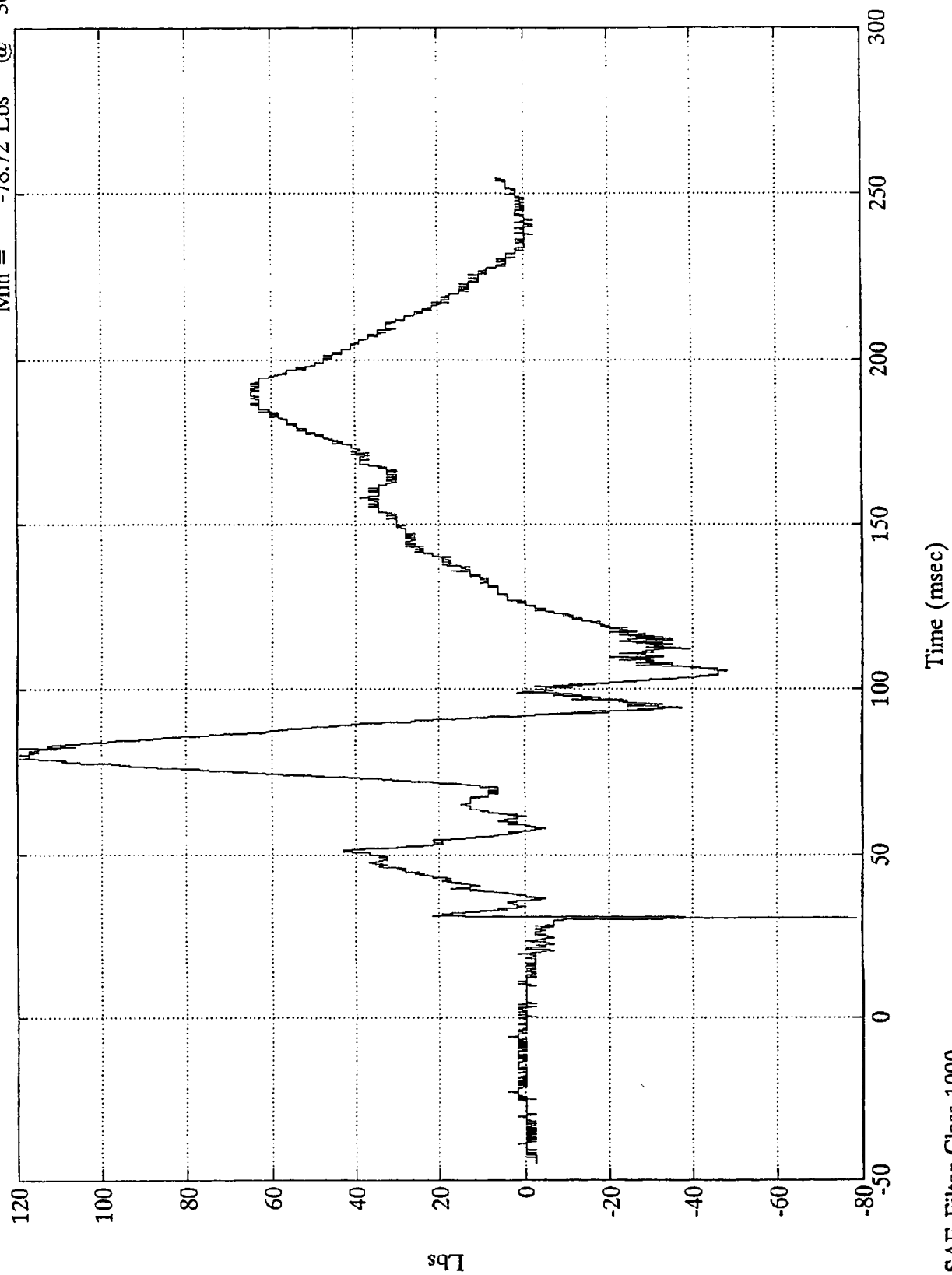
Max = .01 ins @ 28.79 msec
Min = -1.48 ins @ 104.52 msec



SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

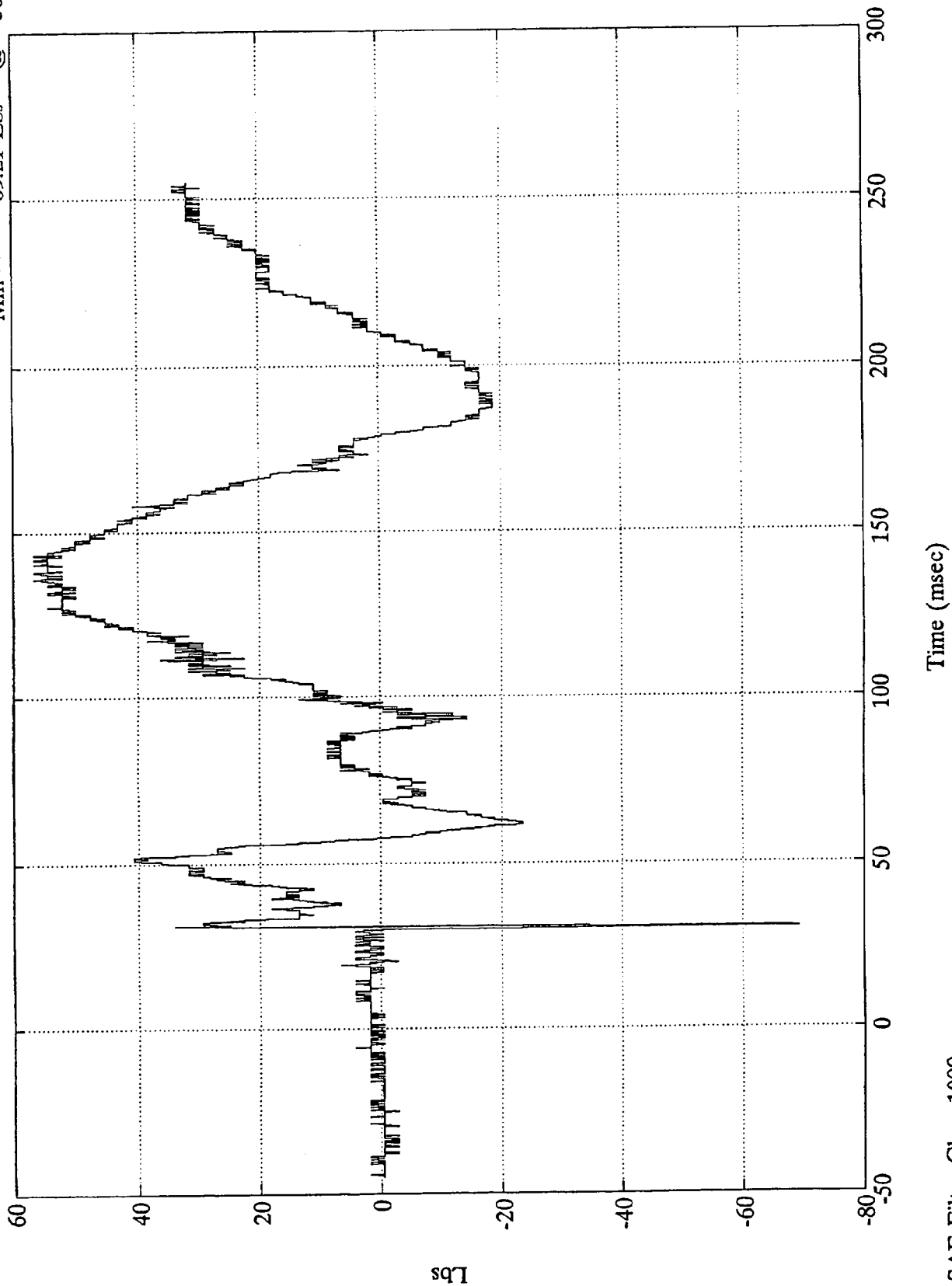
Pos.1 Upper Neck Fx
Max = 119.26 Lbs @ 82.32 msec
Min = -78.72 Lbs @ 30.60 msec



SAE Filter Class 1000

NHTSA 208 TEST - 1994 Chevrolet Lumina

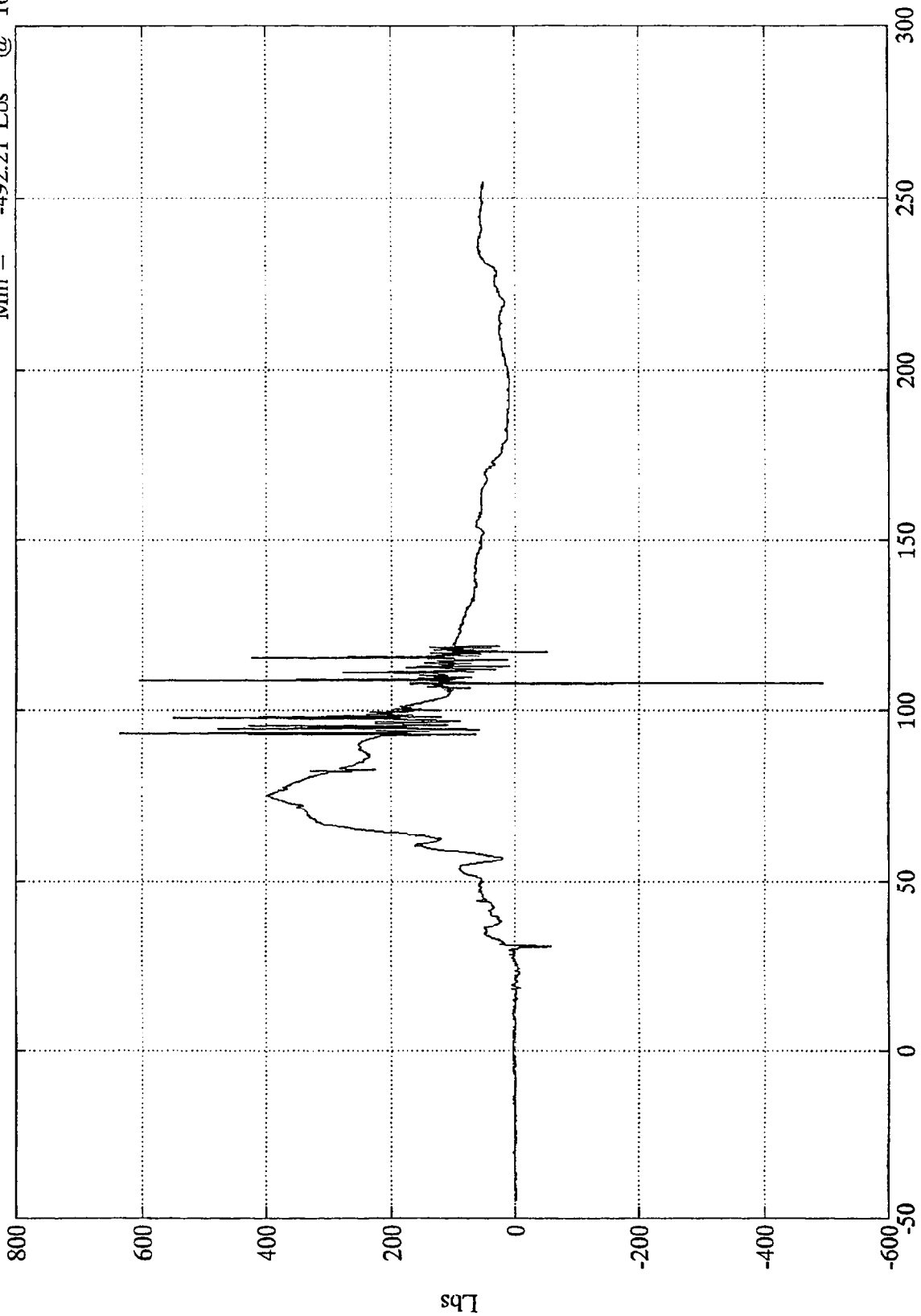
Pos.1 Upper Neck Fy
Max = 56.81 Lbs @ 143.39 msec
Min = -69.21 Lbs @ 30.60 msec



SAE Filter Class 1000

NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos.1 Upper Neck Fz
Max = 635.89 Lbs @ 93.00 msec
Min = -492.21 Lbs @ 108.00 msec



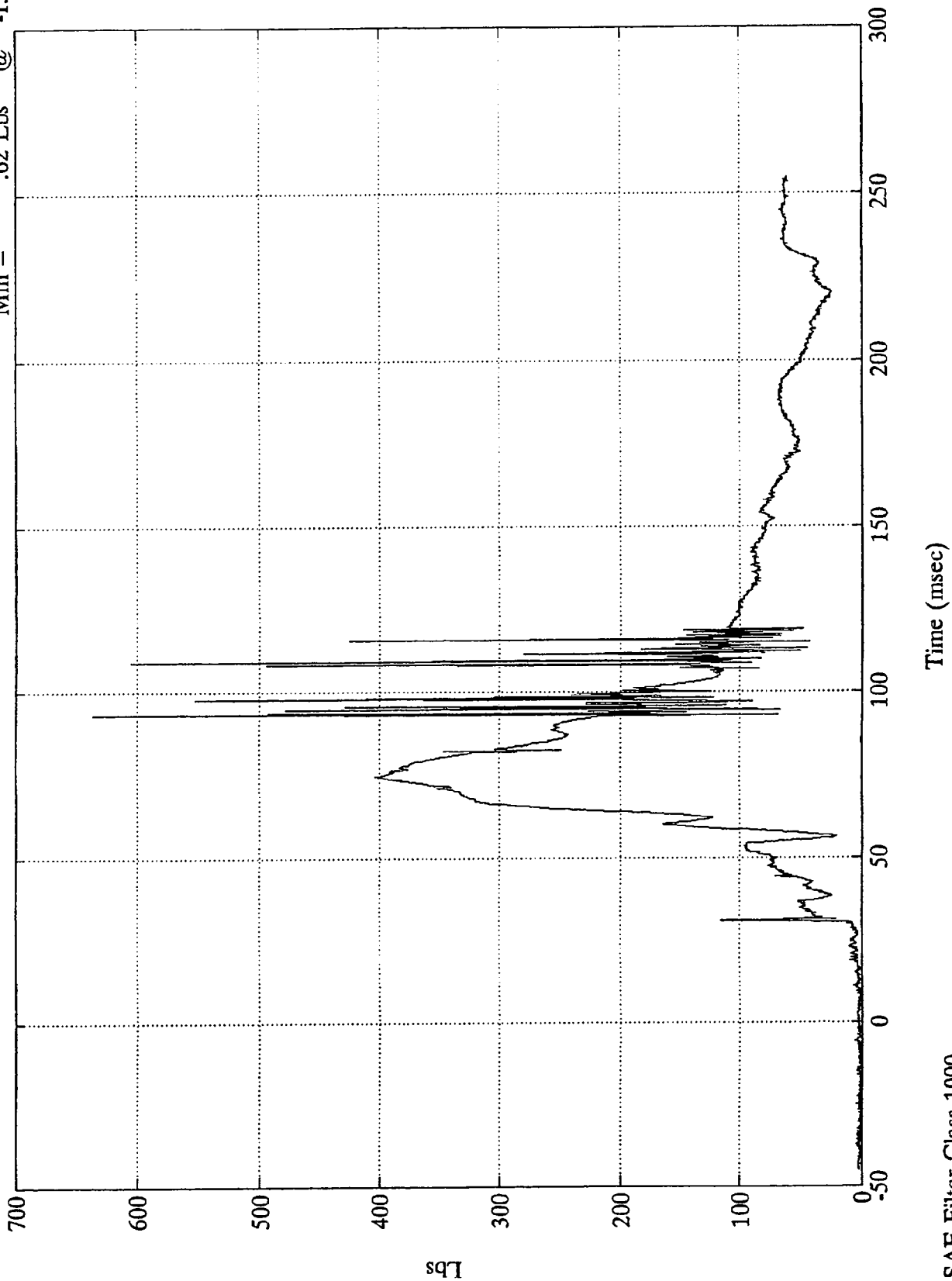
Time (msec) Noise in Channel

SAE Filter Class 1000

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 636.03 Lbs @ 93.00 msec
Min = .62 Lbs @ -1.68 msec

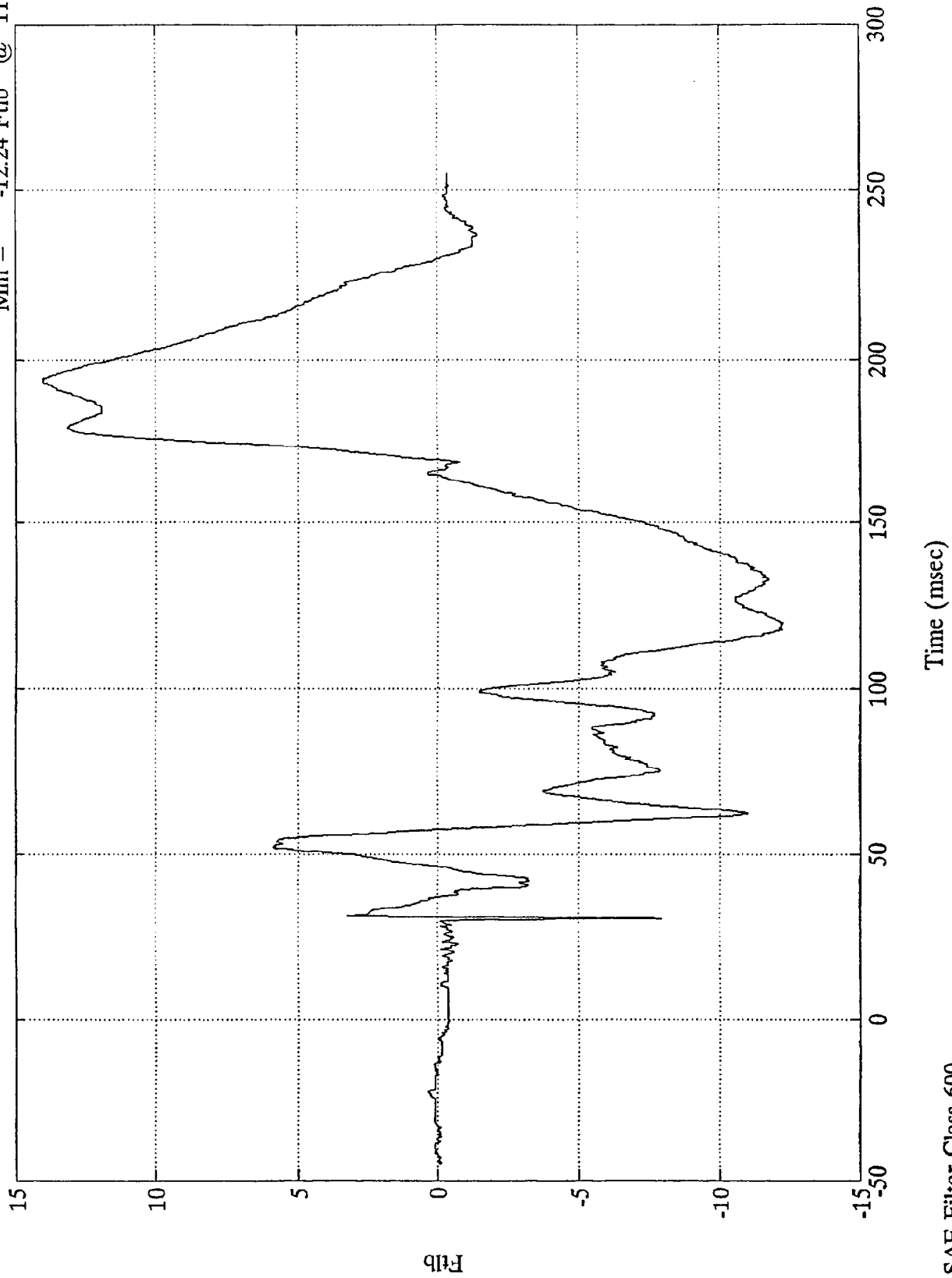
Pos.1 Neck Force Res.



SAE Filter Class 1000

NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos.1 Upper Neck Mx
Max = 14.02 Ftlb @ 193.20 msec
Min = -12.24 Ftlb @ 119.88 msec

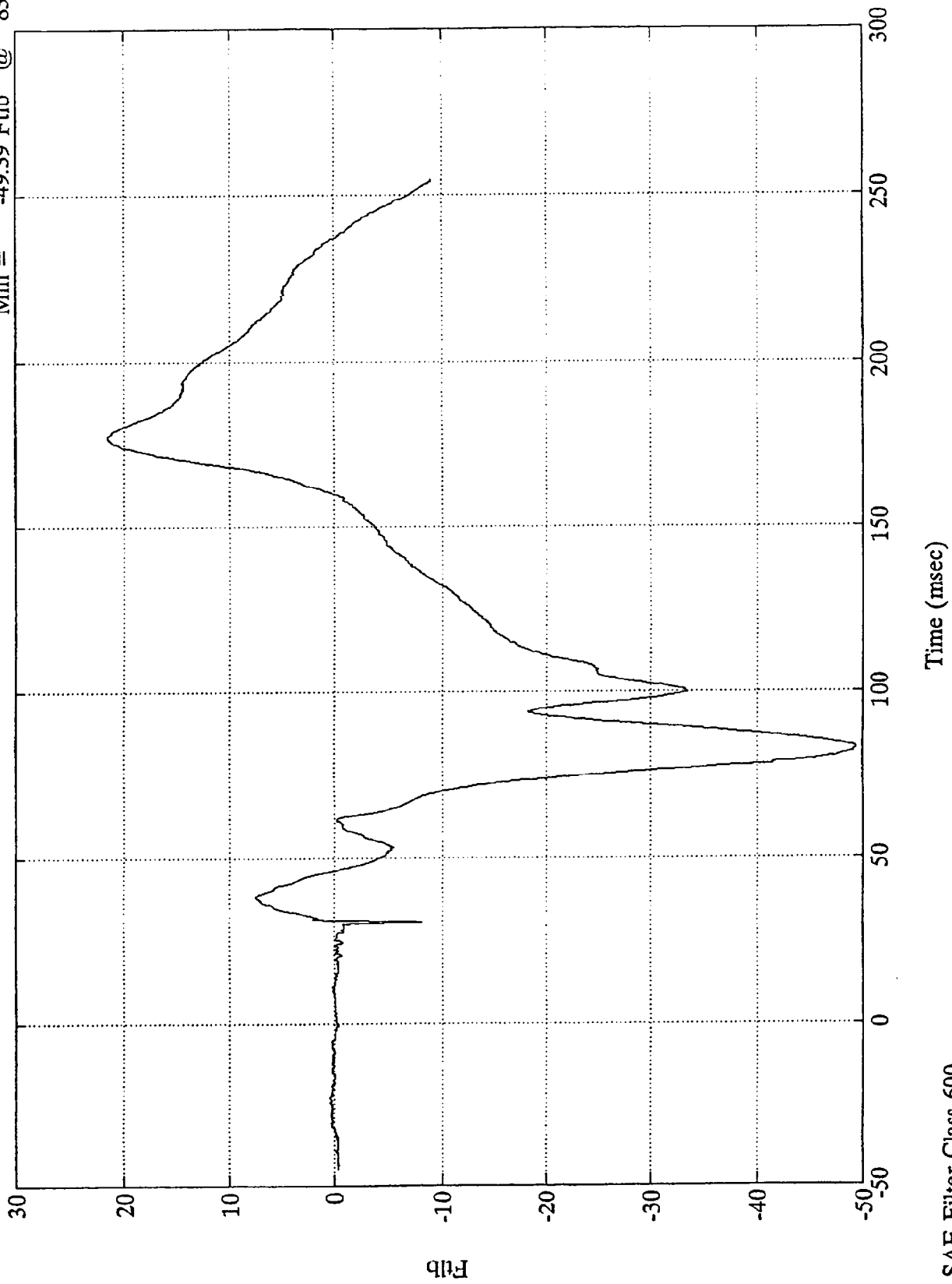


SAE Filter Class 600

NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos.1 Upper Neck My

Max = 21.56 Ftlb @ 177.60 msec
Min = -49.39 Ftlb @ 83.16 msec

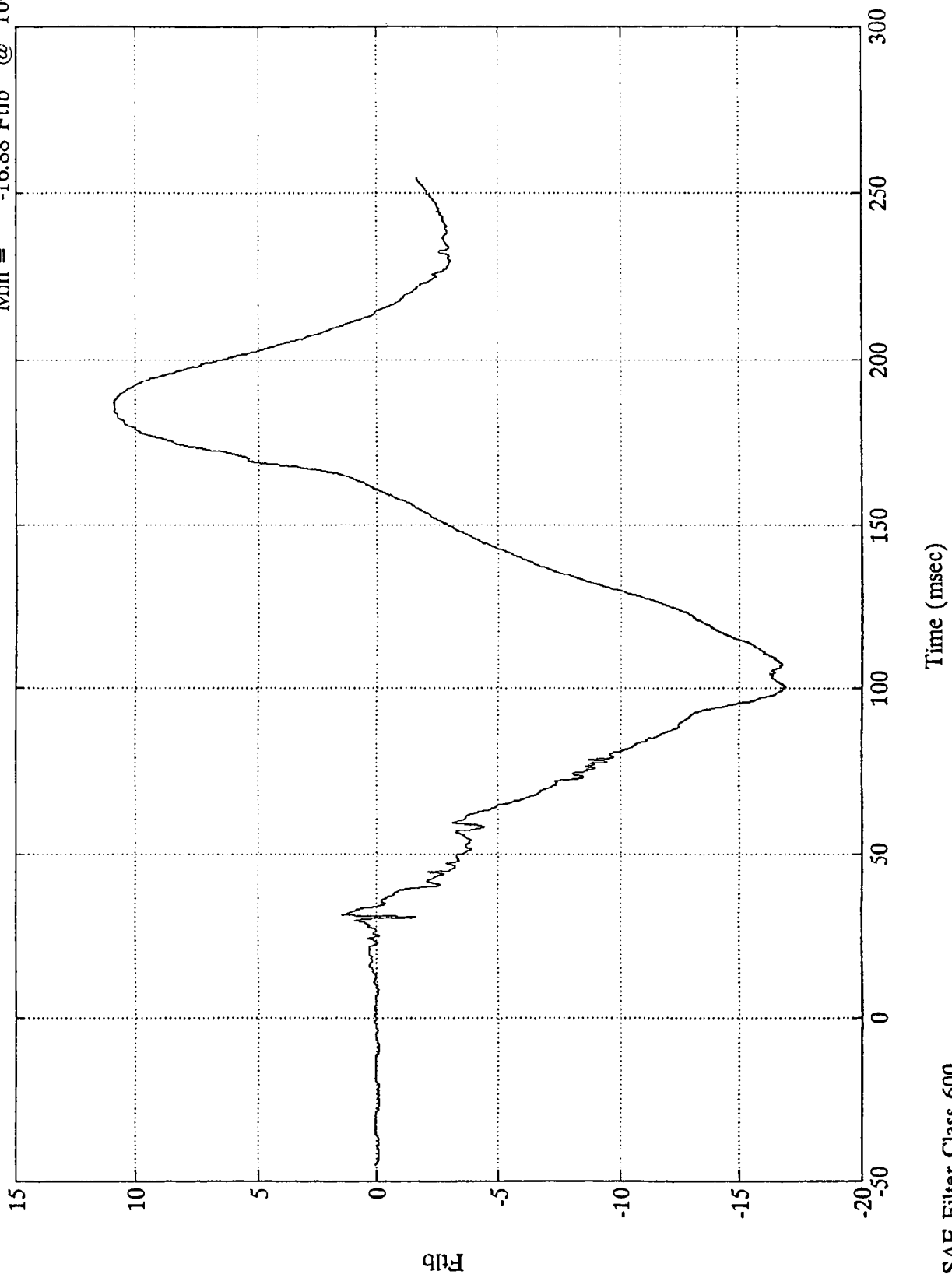


SAE Filter Class 600

NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos.1 Upper Neck Mz

Max = 10.91 Ftlb @ 186.84 msec
Min = -16.88 Ftlb @ 100.32 msec

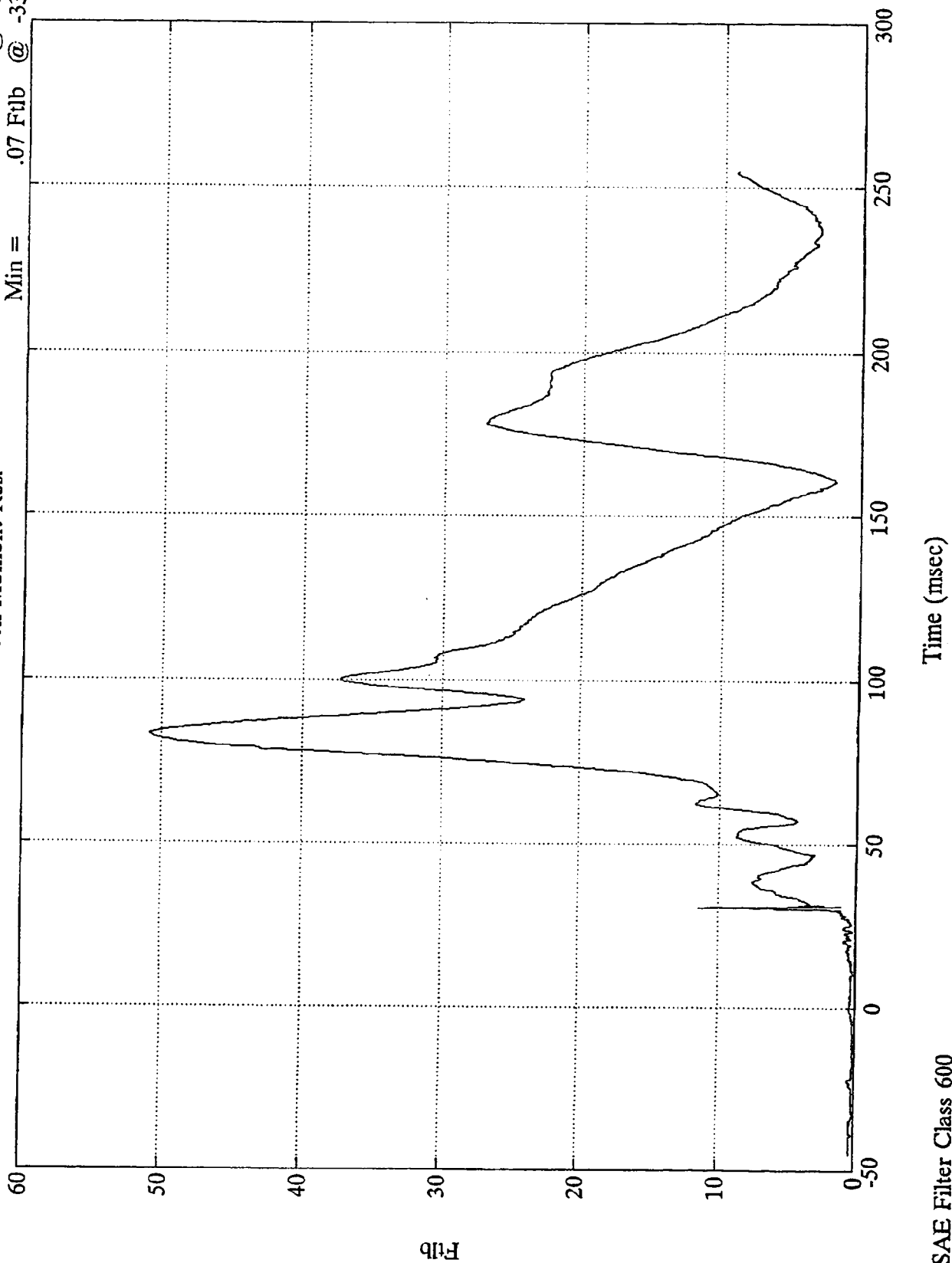


SAE Filter Class 600

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 50.88 Ftlb @ 83.16 msec
Min = .07 Ftlb @ -33.00 msec

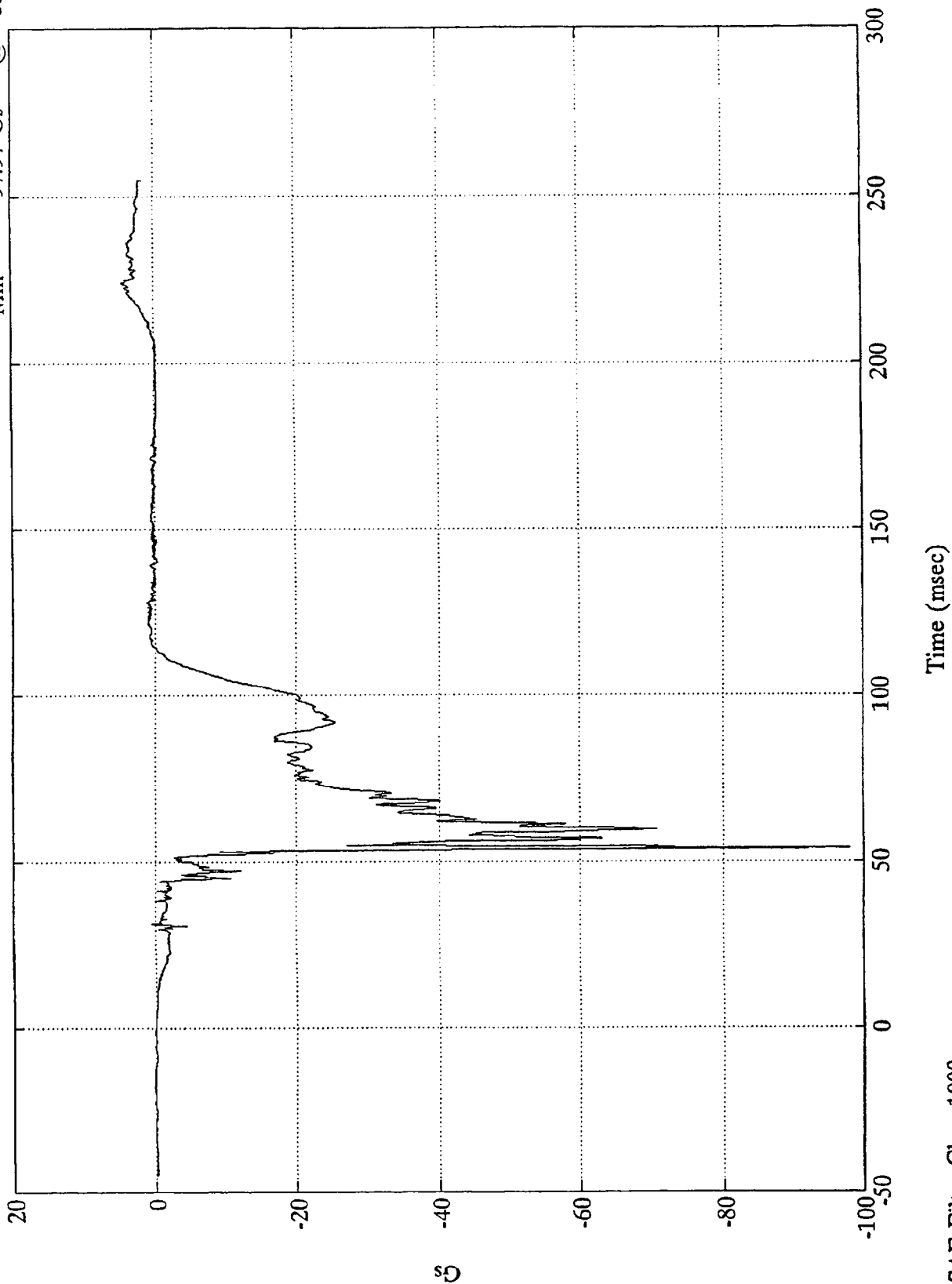
Pos.1 Neck Moment Res.



SAE Filter Class 600

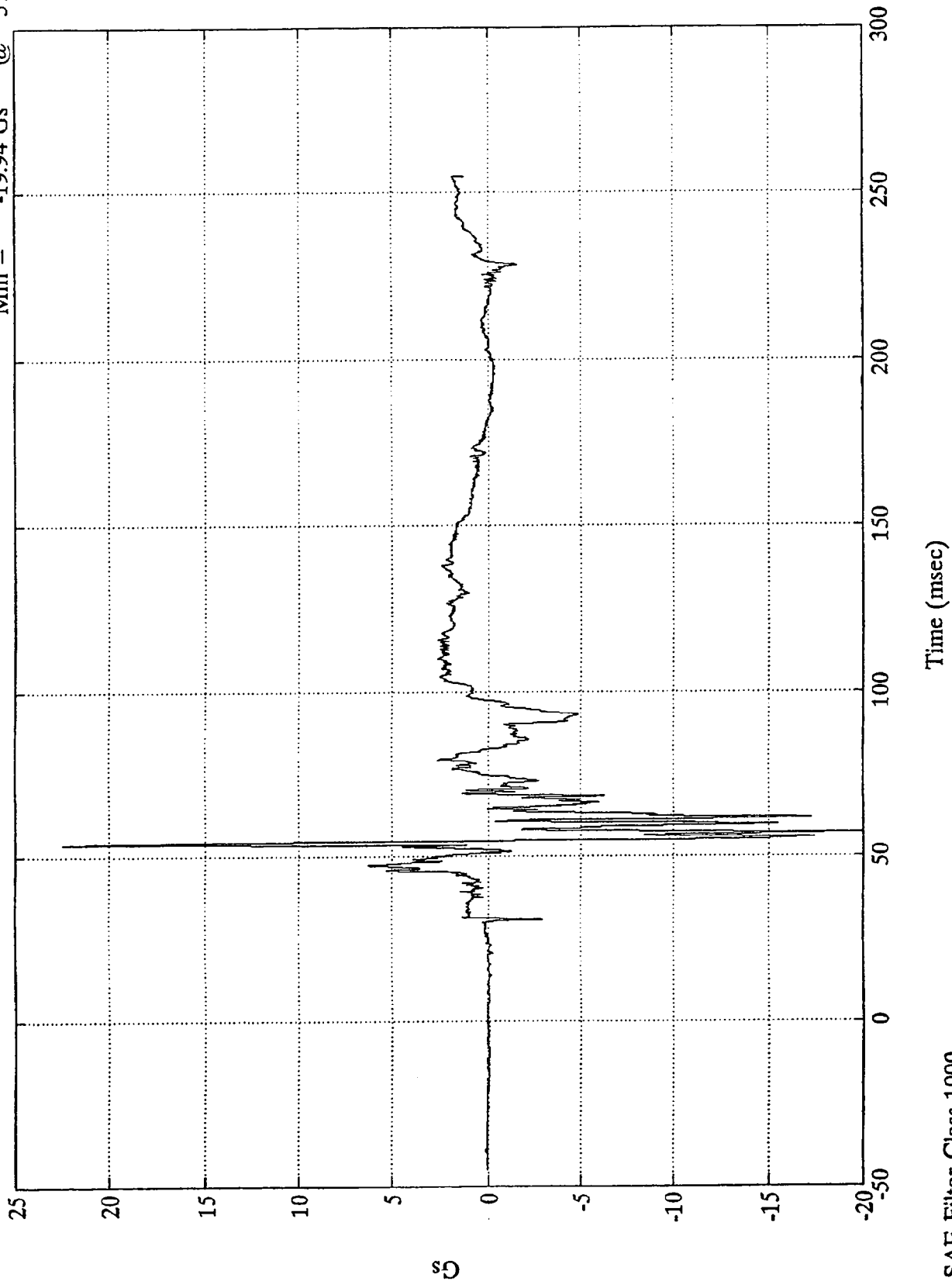
NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos. 1 Pelvic X
Max = 4.55 Gs @ 224.16 msec
Min = -97.97 Gs @ 53.88 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

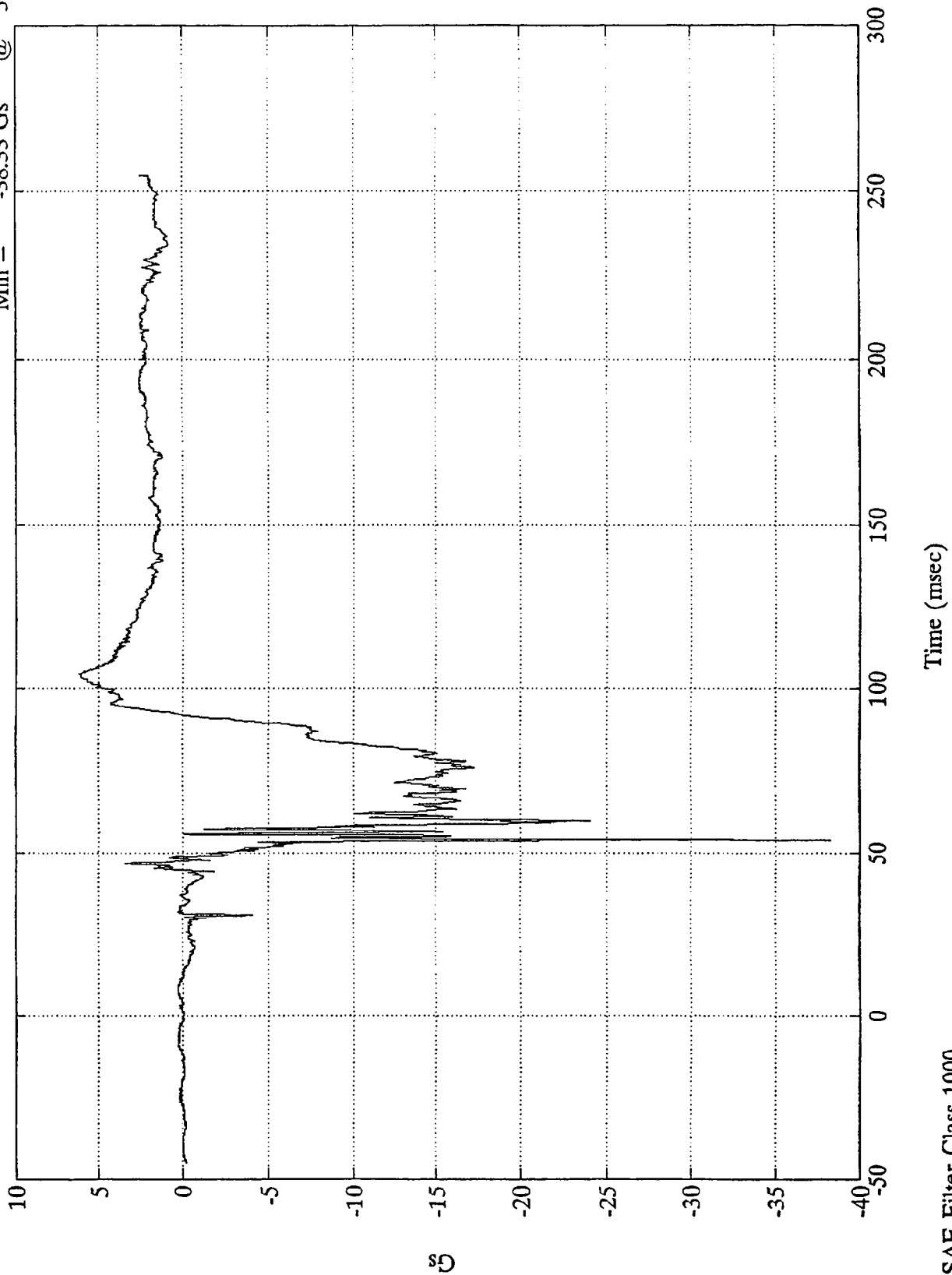
Pos. 1 Pelvic Y
Max = 22.46 Gs @ 53.75 msec
Min = -19.94 Gs @ 57.00 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 6.21 Gs @ 104.16 msec
Min = -38.33 Gs @ 54.11 msec

Pos. 1 Pelvic Z

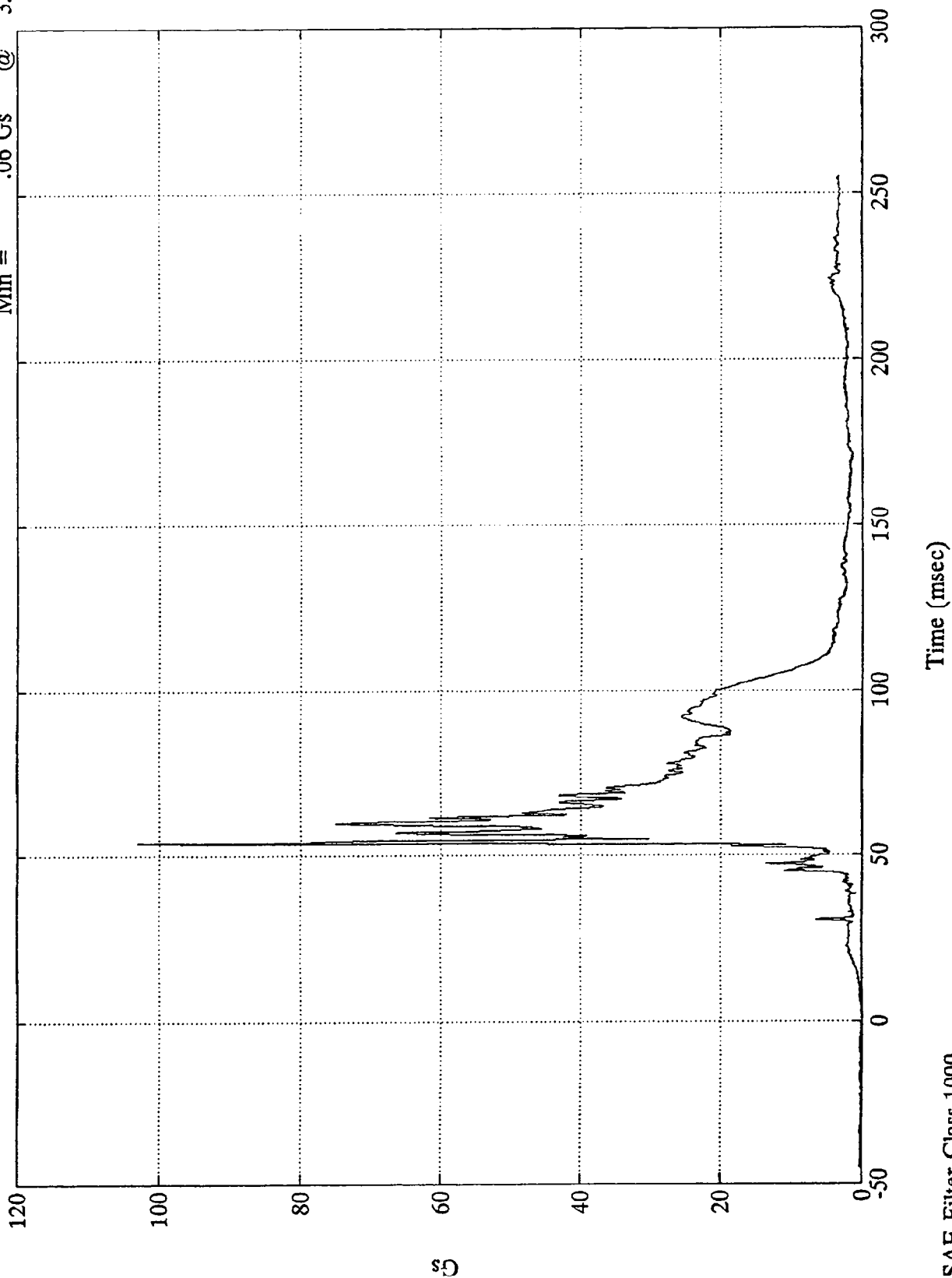


SAE Filter Class 1000

NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos. 1 Pelvic Resultant

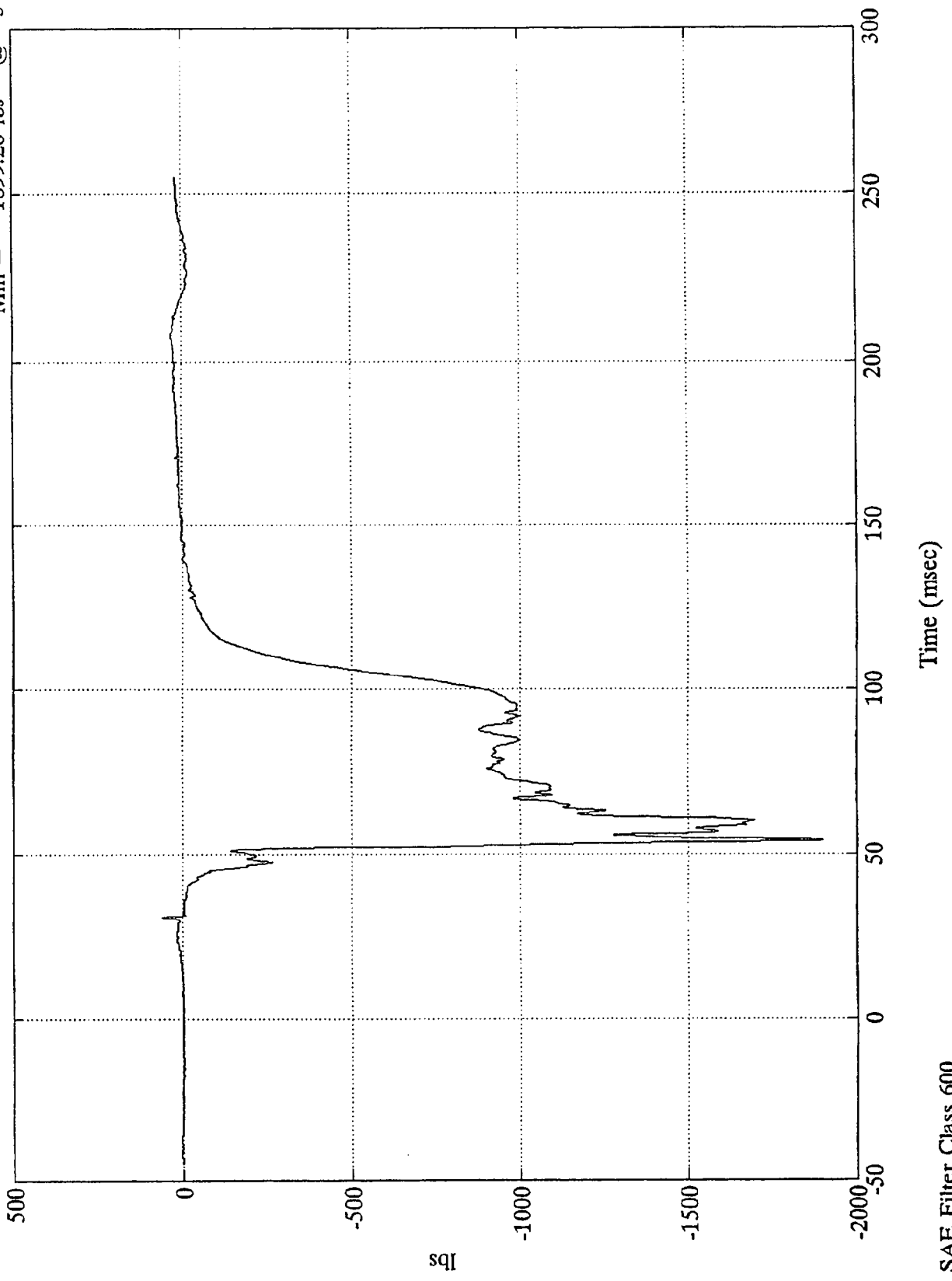
Max = 103.09 Gs @ 53.88 msec
Min = .06 Gs @ 3.83 msec



NHTSA 208 TEST - Chevrolet Lumina

Max = 62.60 lbs @ 30.71 msec
Min = -1899.26 lbs @ 54.23 msec

Pos. 1 Left Femur

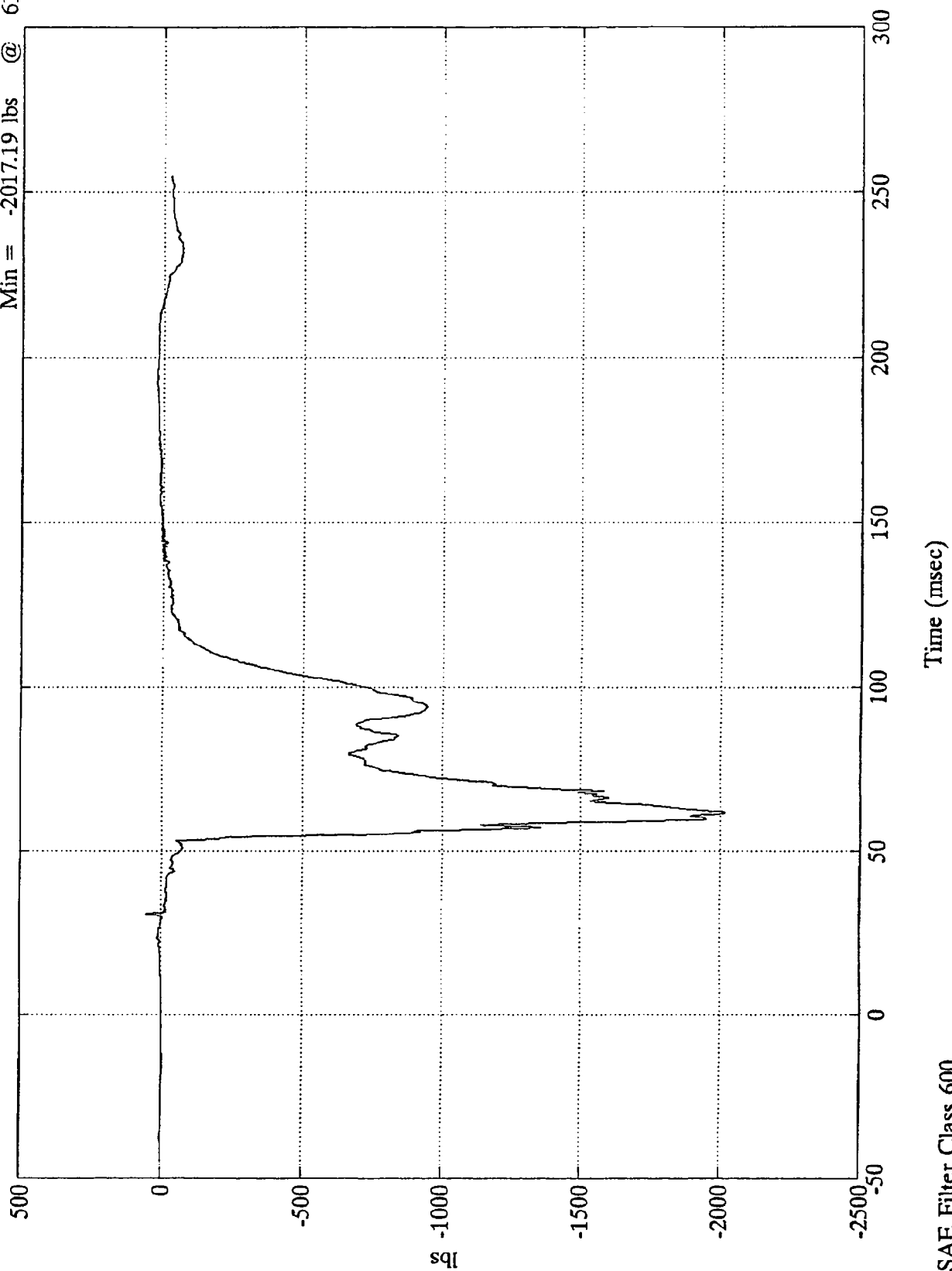


SAE Filter Class 600

NHTSA 208 TEST - Chevrolet Lumina

Pos. 1 Right Femur

Max = 52.74 lbs @ 30.71 msec
Min = -2017.19 lbs @ 61.56 msec

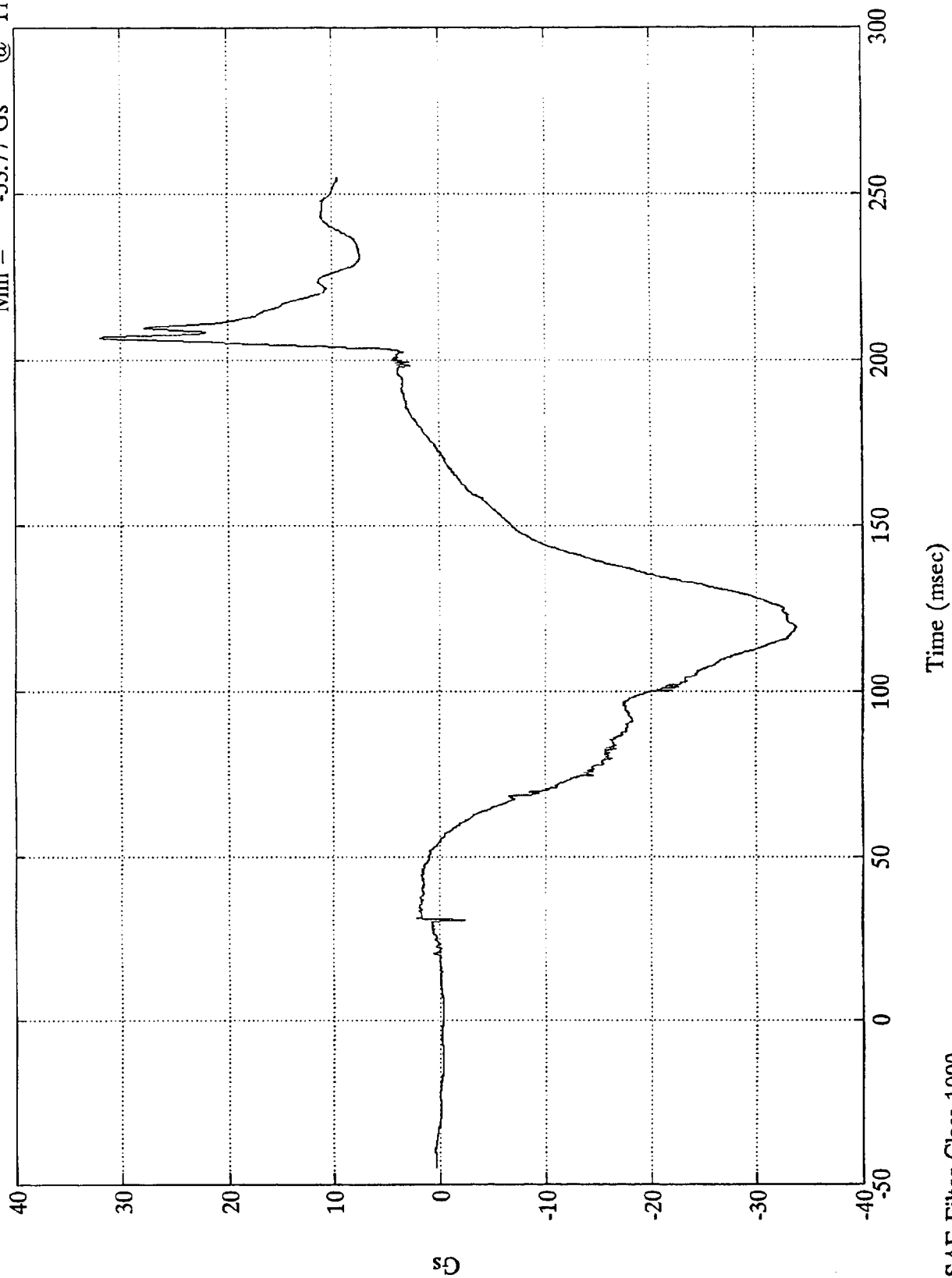


SAE Filter Class 600

NHTSA 208 TEST - Chevrolet Lumina

Pos. 2 Head X

Max = 31.93 Gs @ 206.76 msec
Min = -33.77 Gs @ 119.40 msec

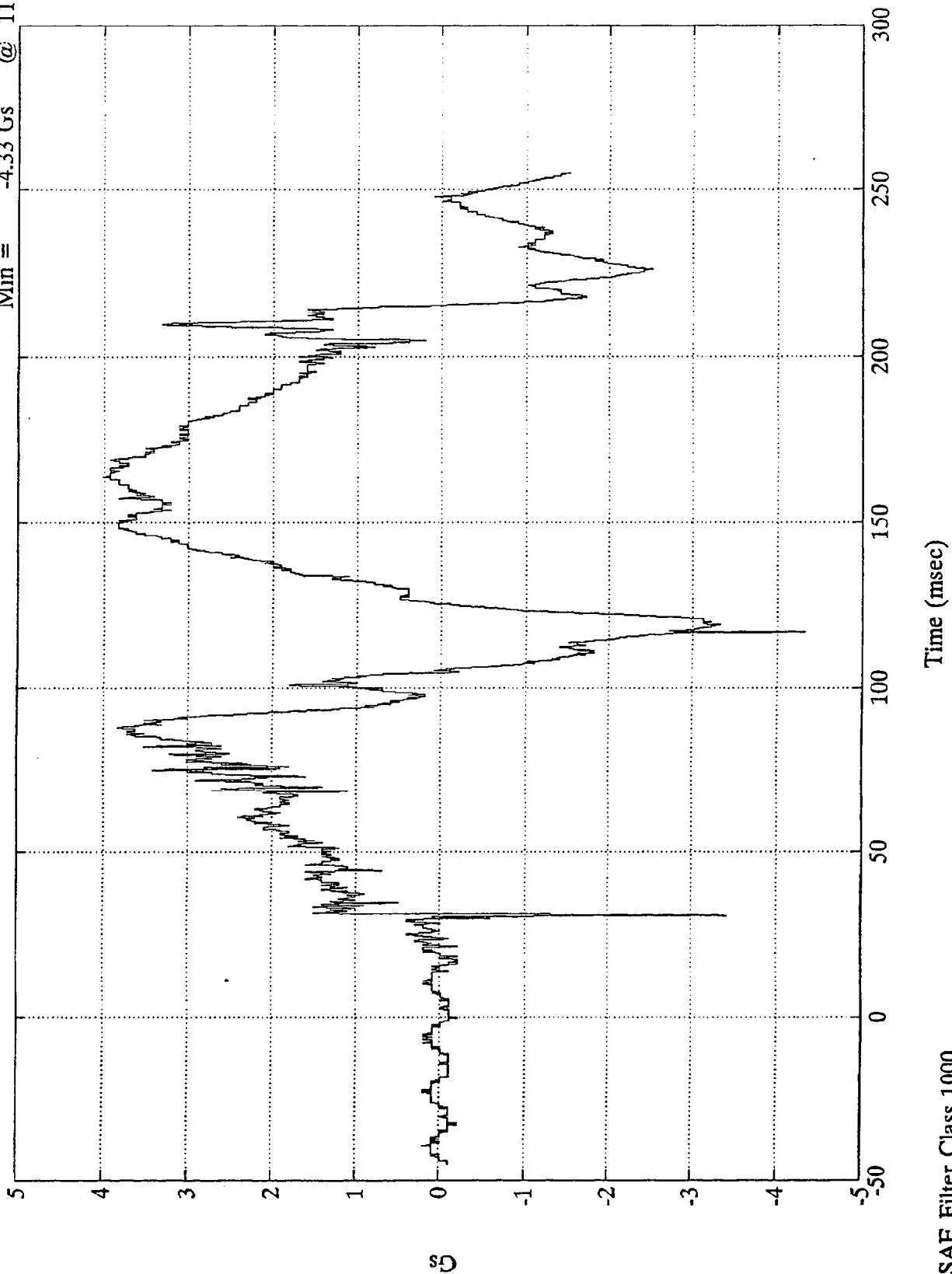


SAE Filter Class 1000

NHTSA 208 TEST - Chevrolet Lumina

Pos. 2 Head Y

Max = 4.01 Gs @ 164.03 msec
Min = -4.33 Gs @ 116.76 msec

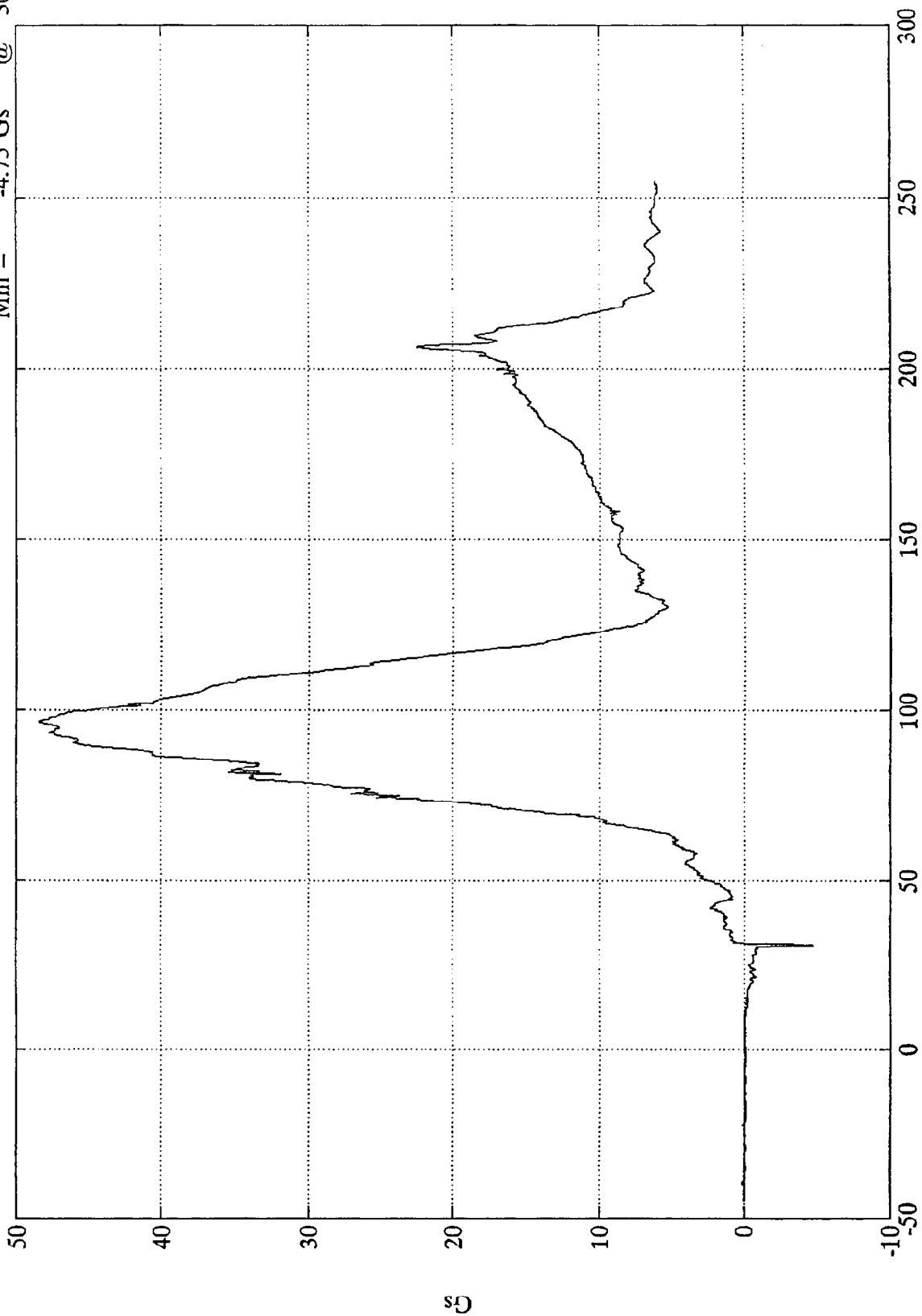


SAE Filter Class 1000

NHTSA 208 TEST - Chevrolet Lumina

Max = 48.48 Gs @ 96.60 msec
Min = -4.75 Gs @ 30.60 msec

Pos. 2 Head Z



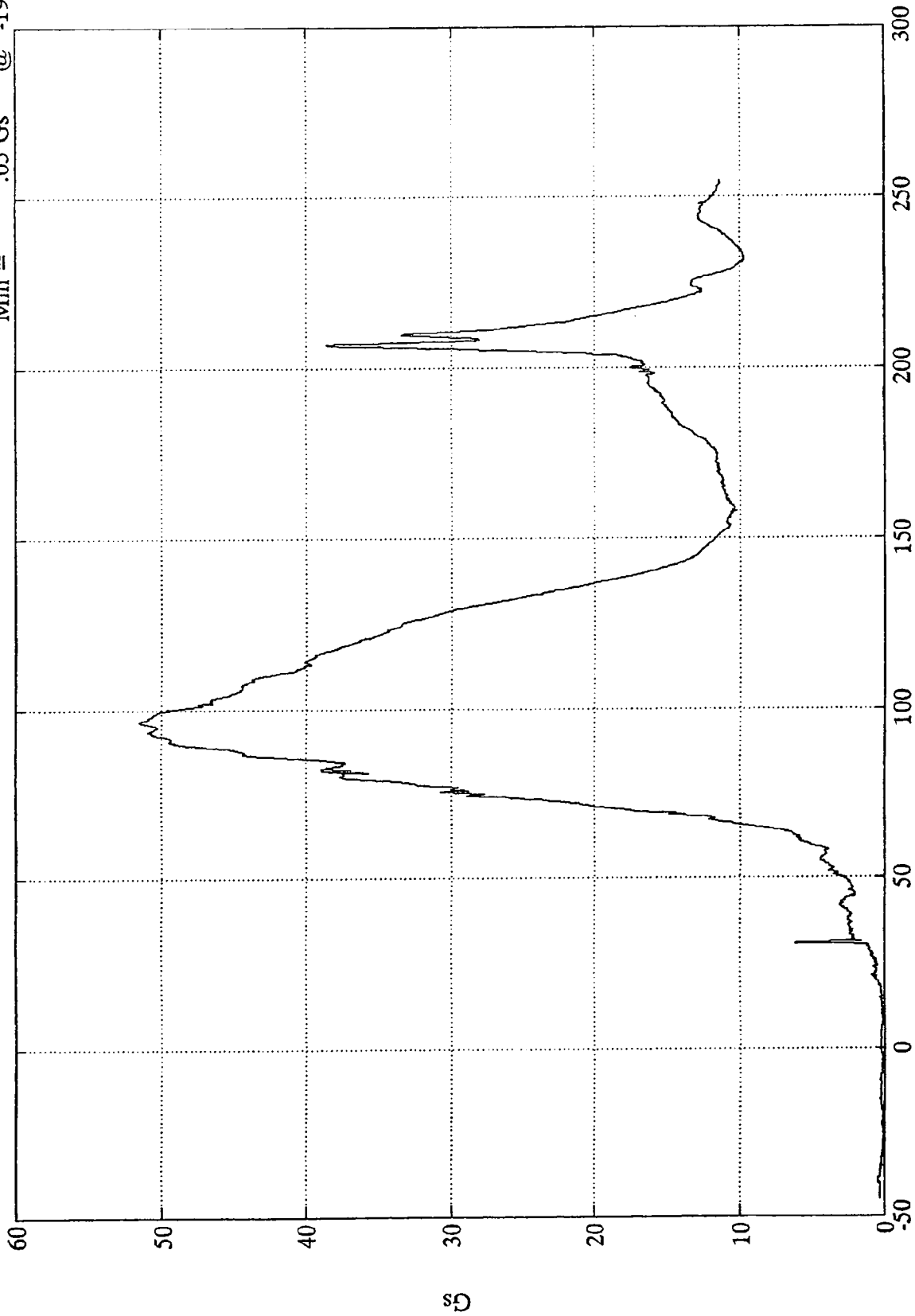
Time (msec)

SAE Filter Class 1000

NHTSA 208 TEST - Chevrolet Lumina

Max = 51.54 Gs @ 96.36 msec
Min = .05 Gs @ -19.20 msec

Pos. 2 Head Resultant

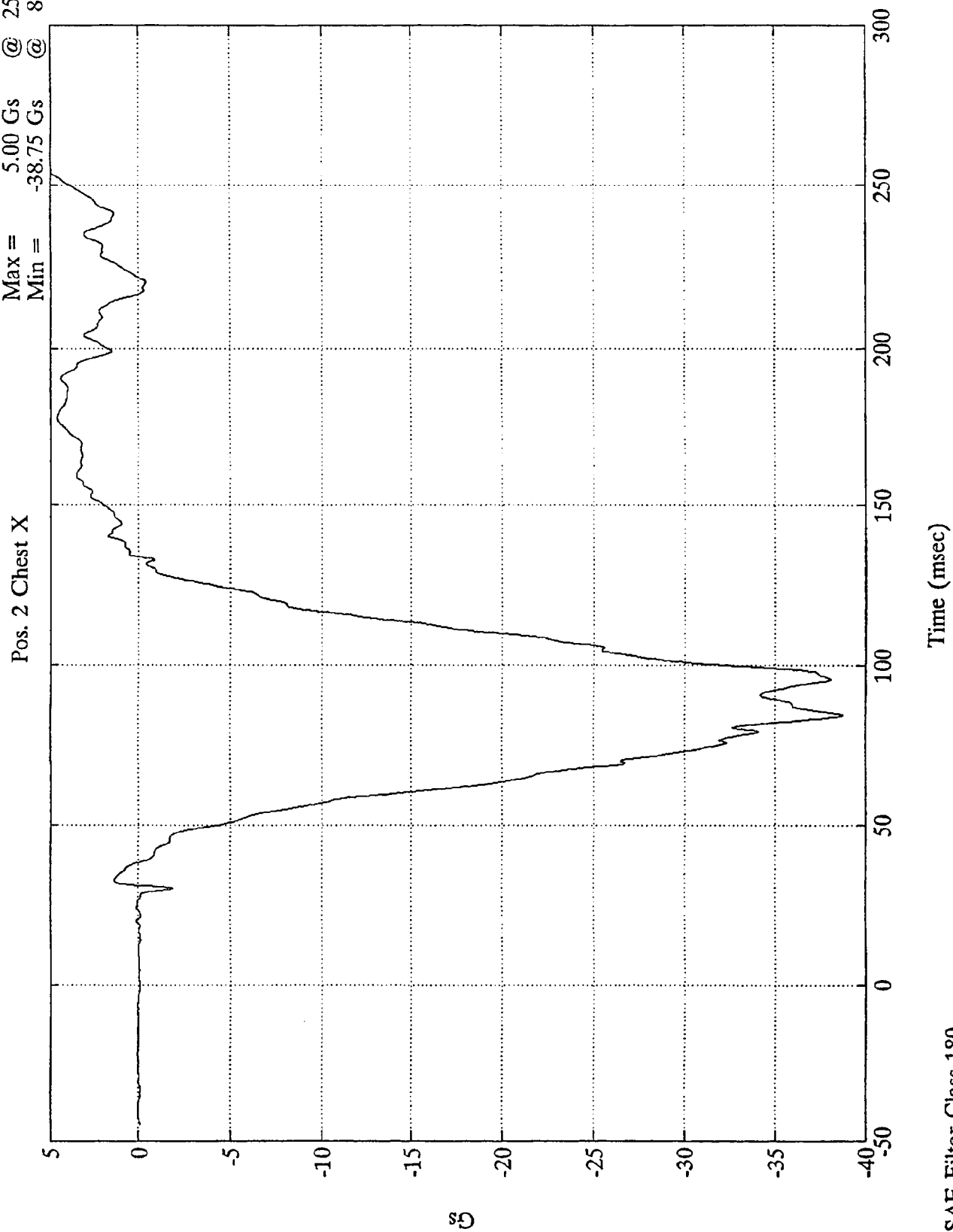


Time (msec)

SAE Filter Class 1000

NHTSA 208 TEST - Chevrolet Lumina

Max = 5.00 Gs @ 254.16 msec
Min = -38.75 Gs @ 84.36 msec



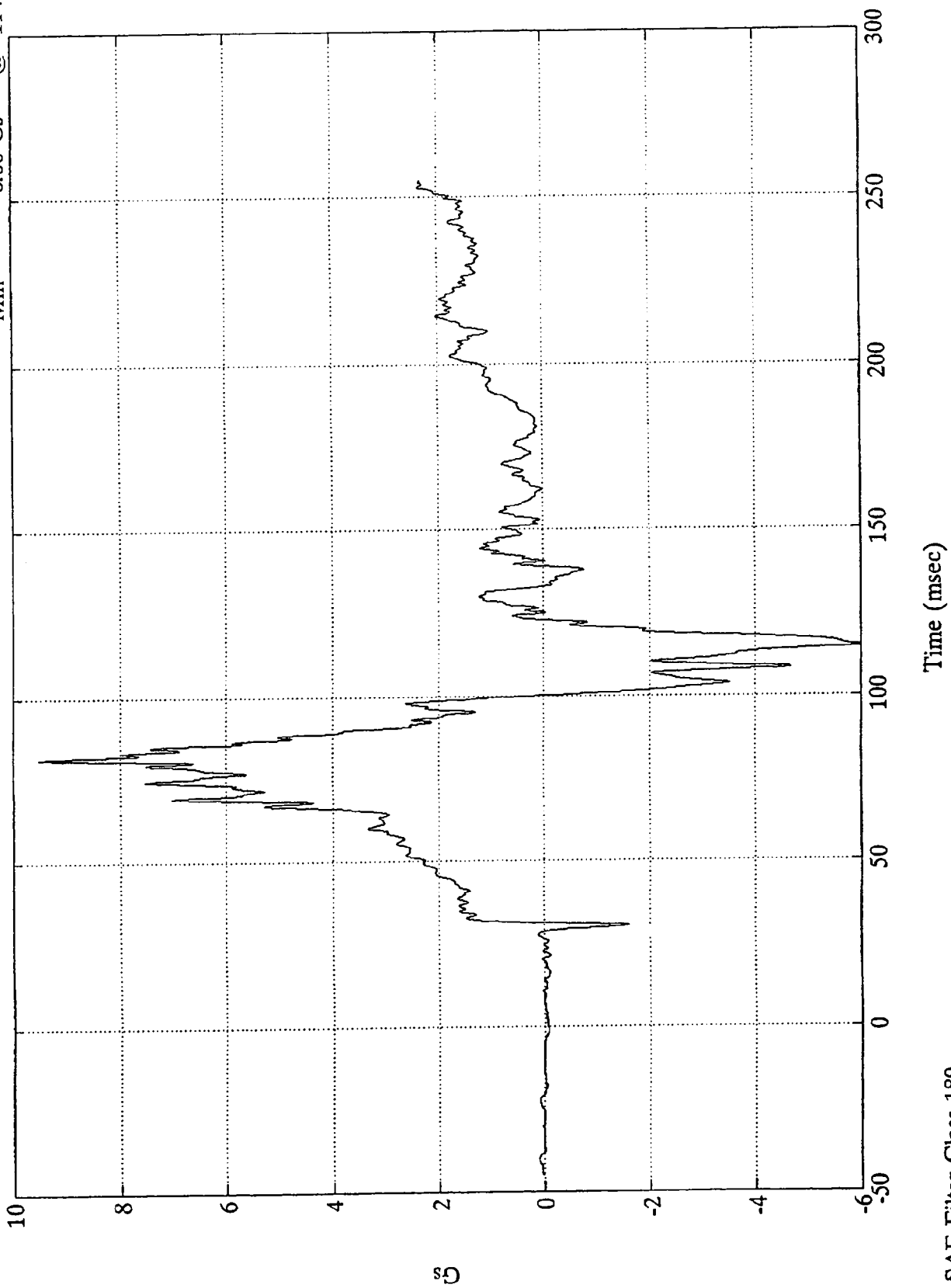
SAE Filter Class 180

Gs

NHTSA 208 TEST - Chevrolet Lumina

Pos. 2 Chest Y

Max = 9.51 Gs @ 81.48 msec
Min = -6.00 Gs @ 114.84 msec

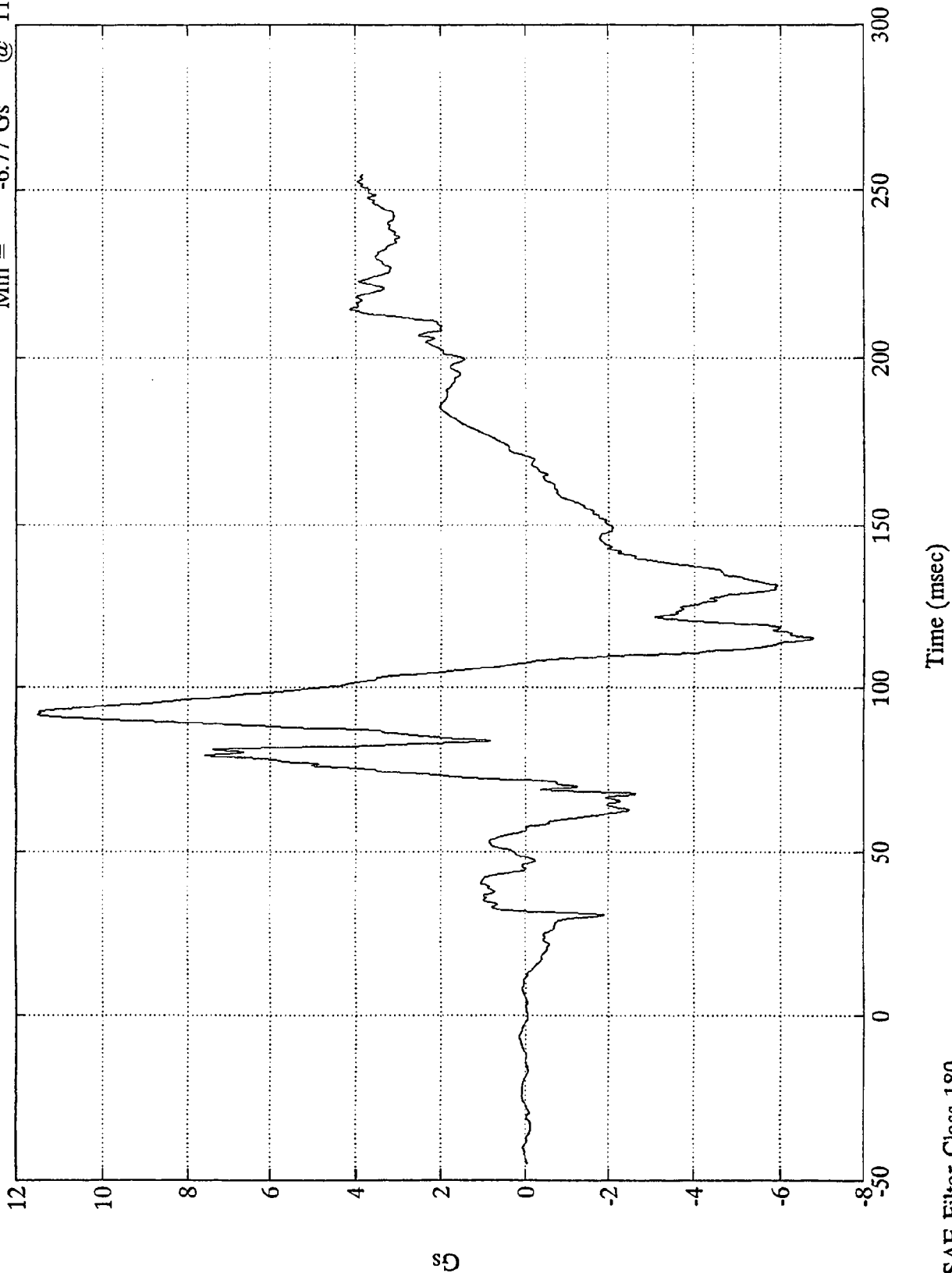


SAE Filter Class 180

NHTSA 208 TEST - Chevrolet Lumina

Max = 11.51 Gs @ 91.68 msec
Min = -6.77 Gs @ 114.84 msec

Pos. 2 Chest Z

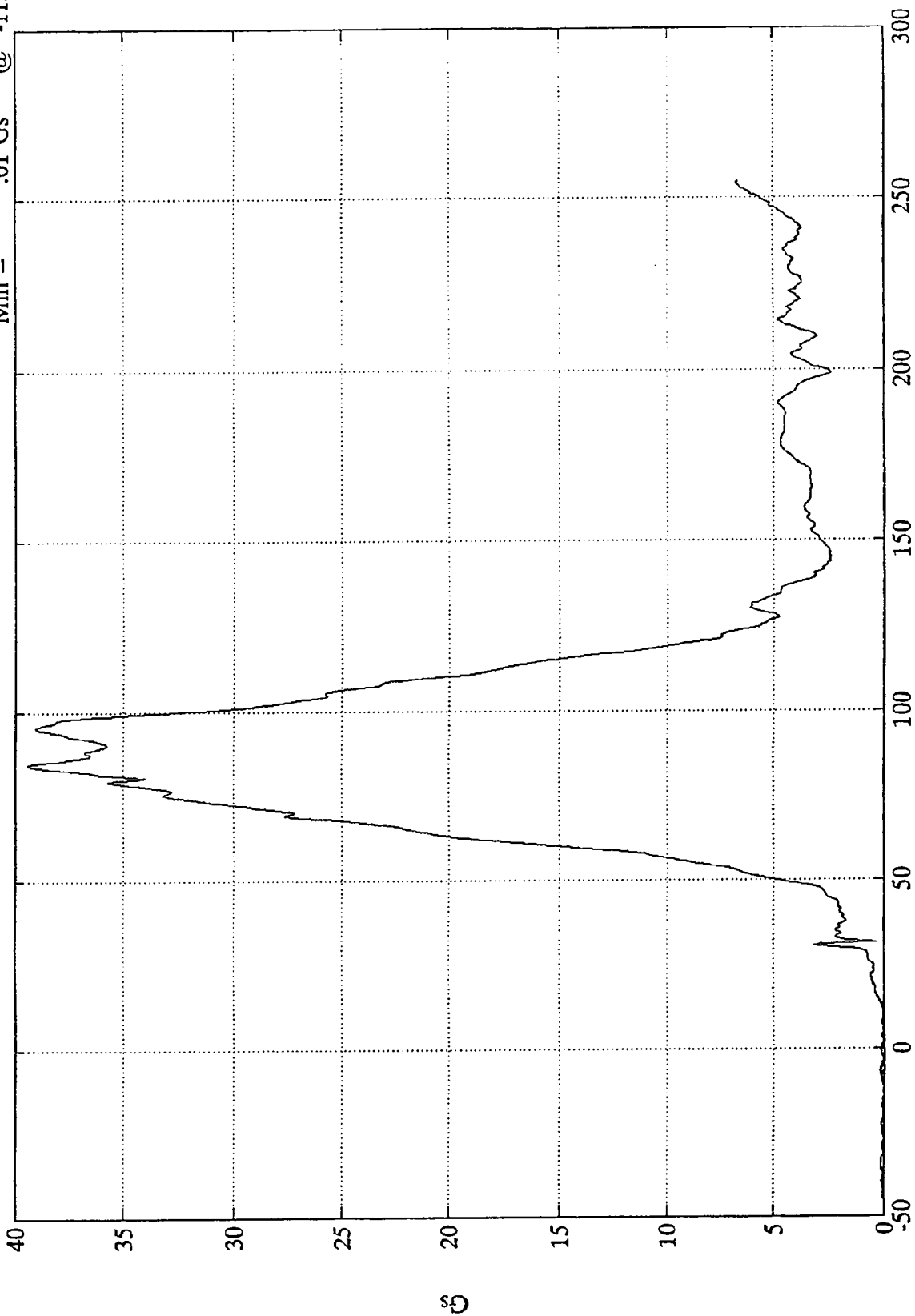


SAE Filter Class 180

NHTSA 208 TEST - Chevrolet Lumina

Max = 39.42 Gs @ 84.48 msec
Min = .01 Gs @ -11.40 msec

Pos. 2 Chest Resultant



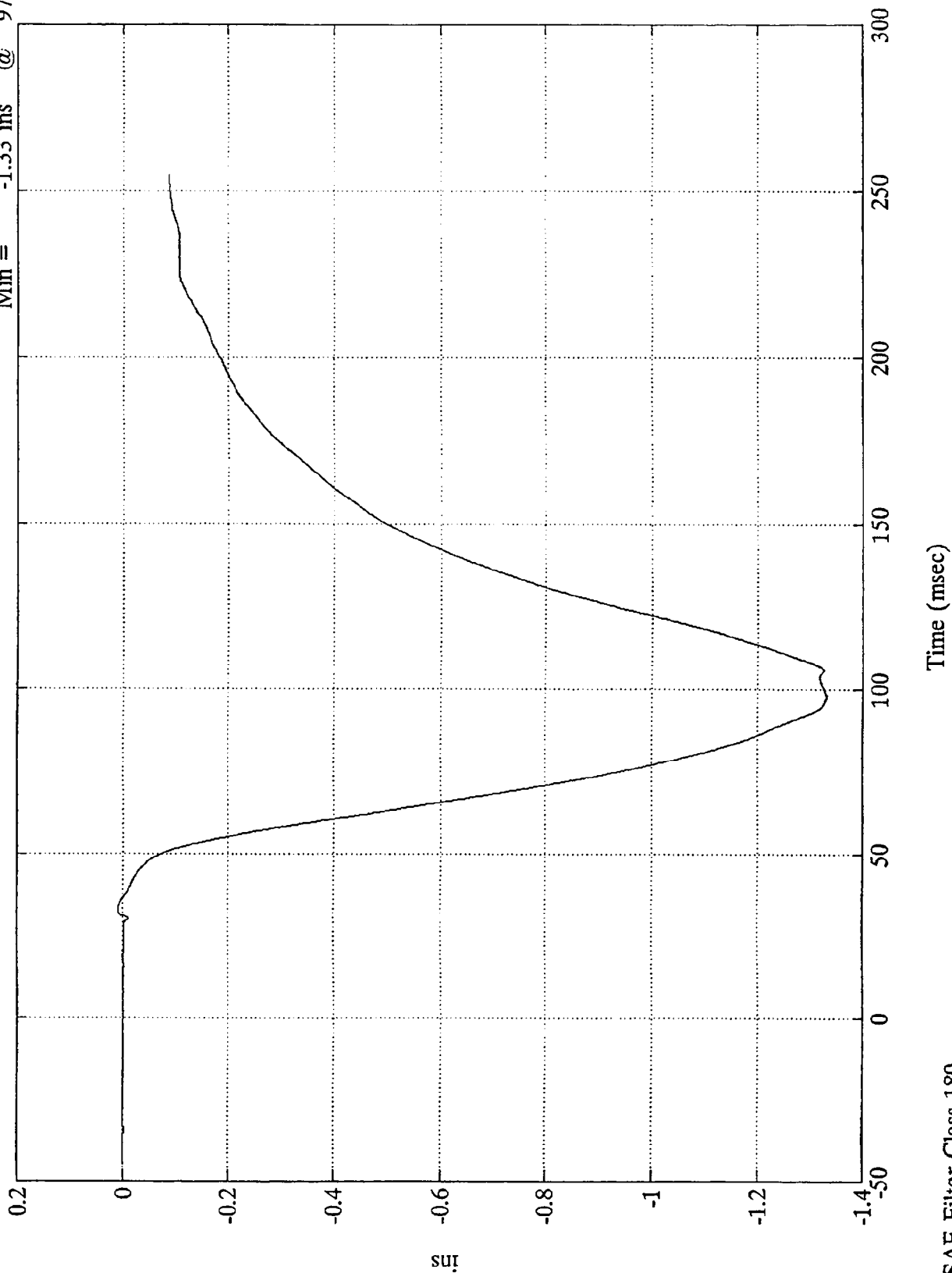
Time (msec)

SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = .01 ins @ 33.72 msec
 Min = -1.33 ins @ 97.68 msec

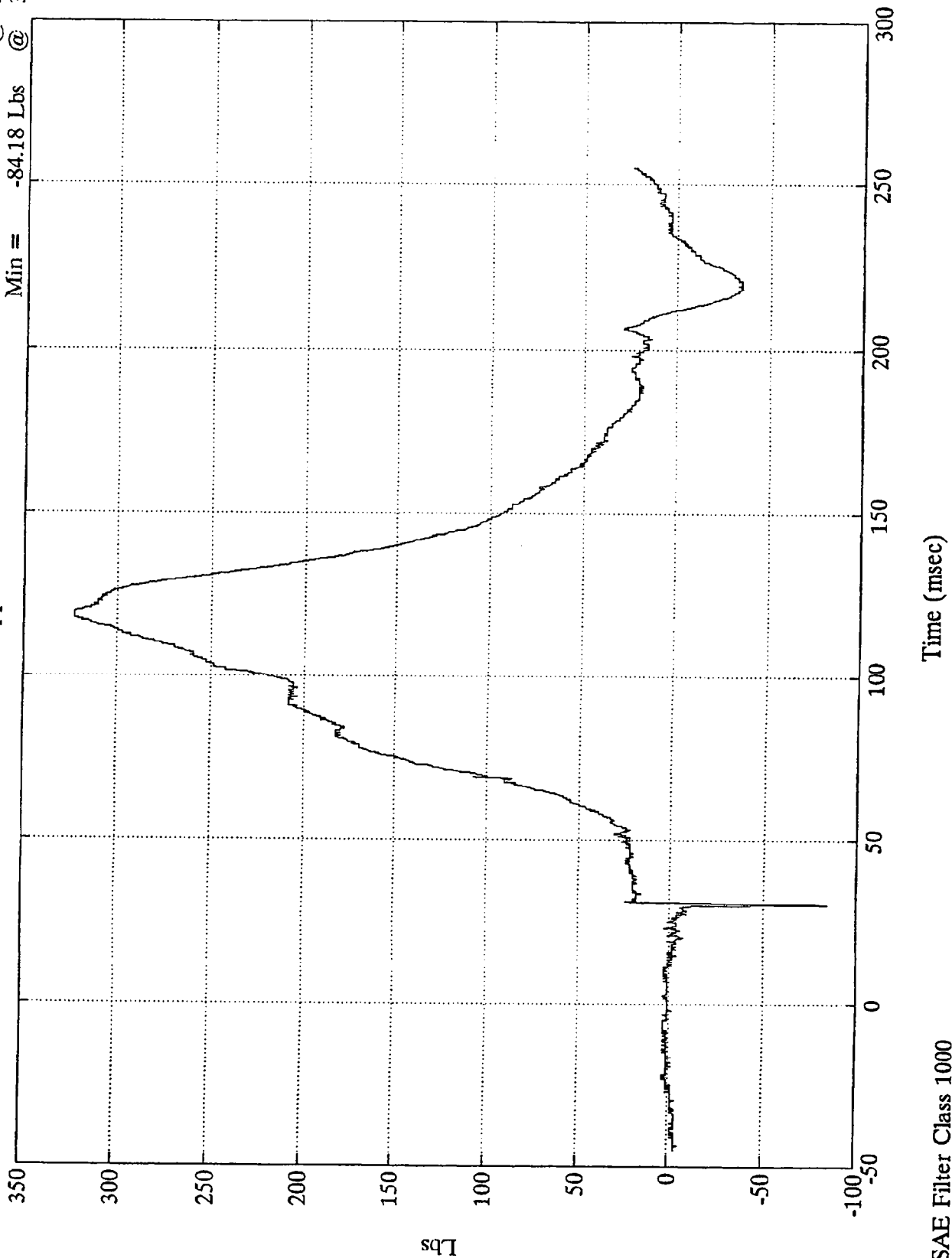
Pos.2 Chest Displacement



SAE Filter Class 180

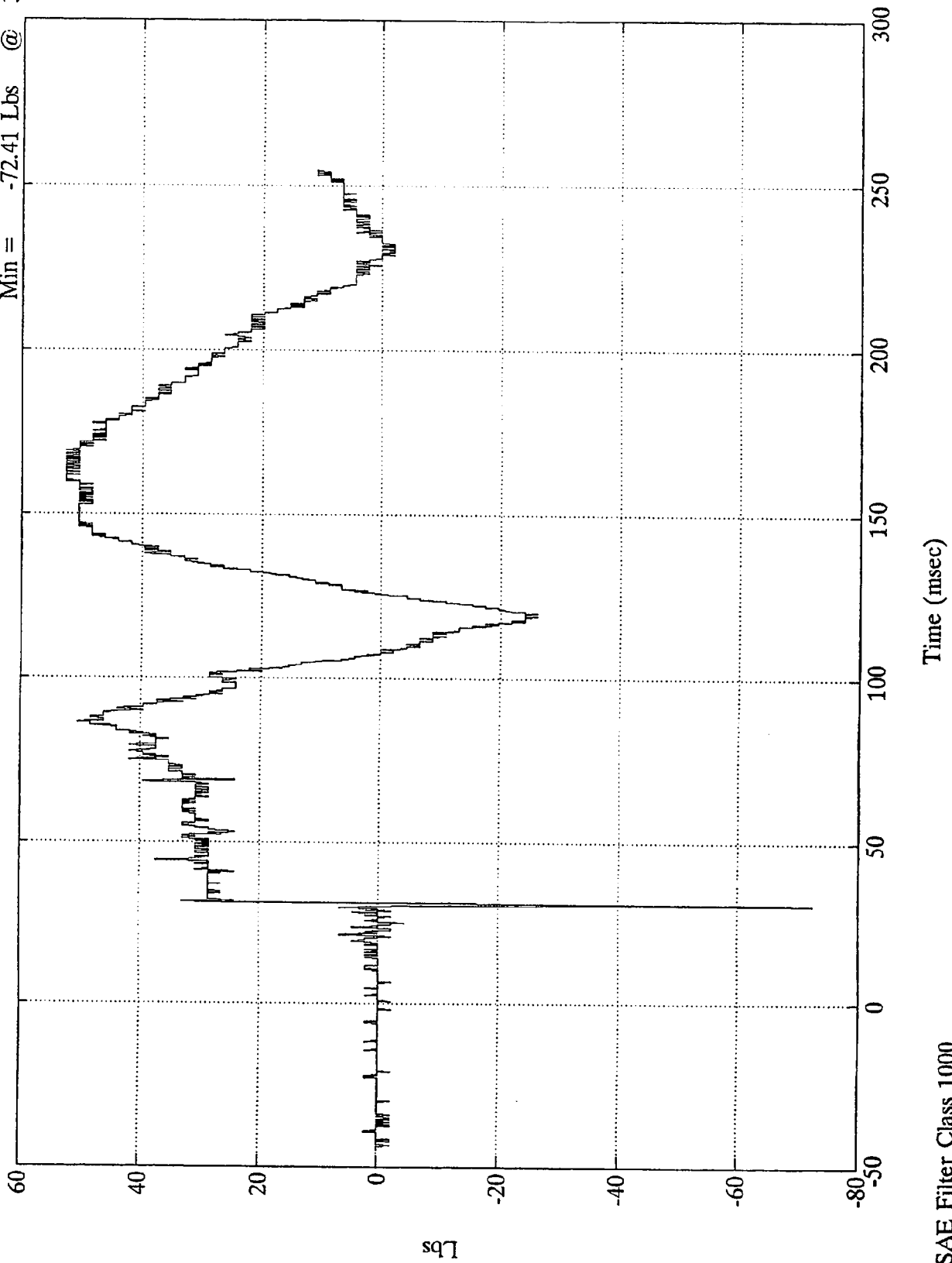
NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos.2 Upper Neck Fx
Max = 323.01 Lbs @ 119.76 msec
Min = -84.18 Lbs @ 30.60 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

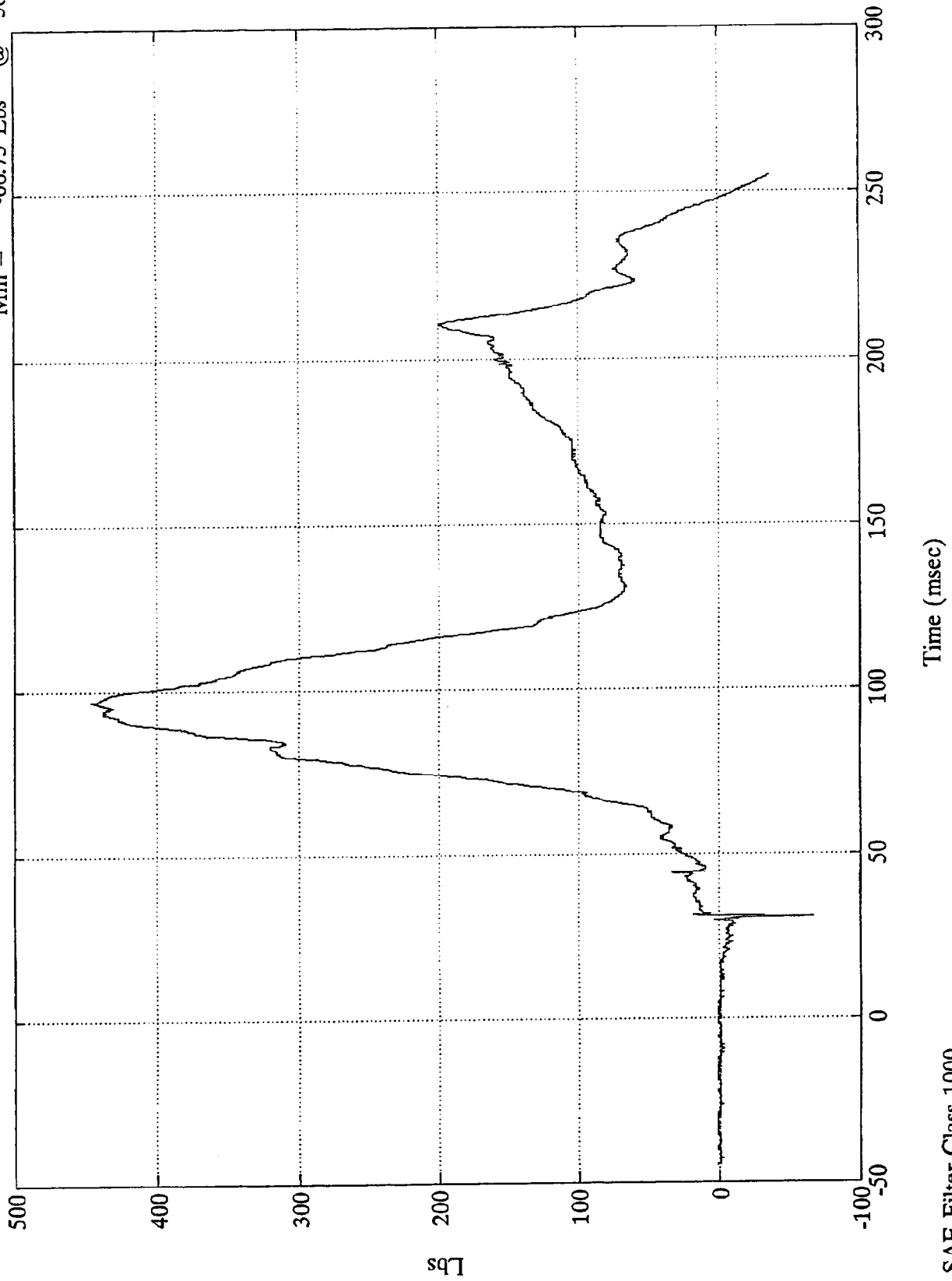
Pos.2 Upper Neck Fy
Max = 52.70 Lbs @ 169.44 msec
Min = -72.41 Lbs @ 30.60 msec



SAE Filter Class 1000

NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos.2 Upper Neck Fz
Max = 446.10 Lbs @ 96.36 msec
Min = -66.75 Lbs @ 30.71 msec

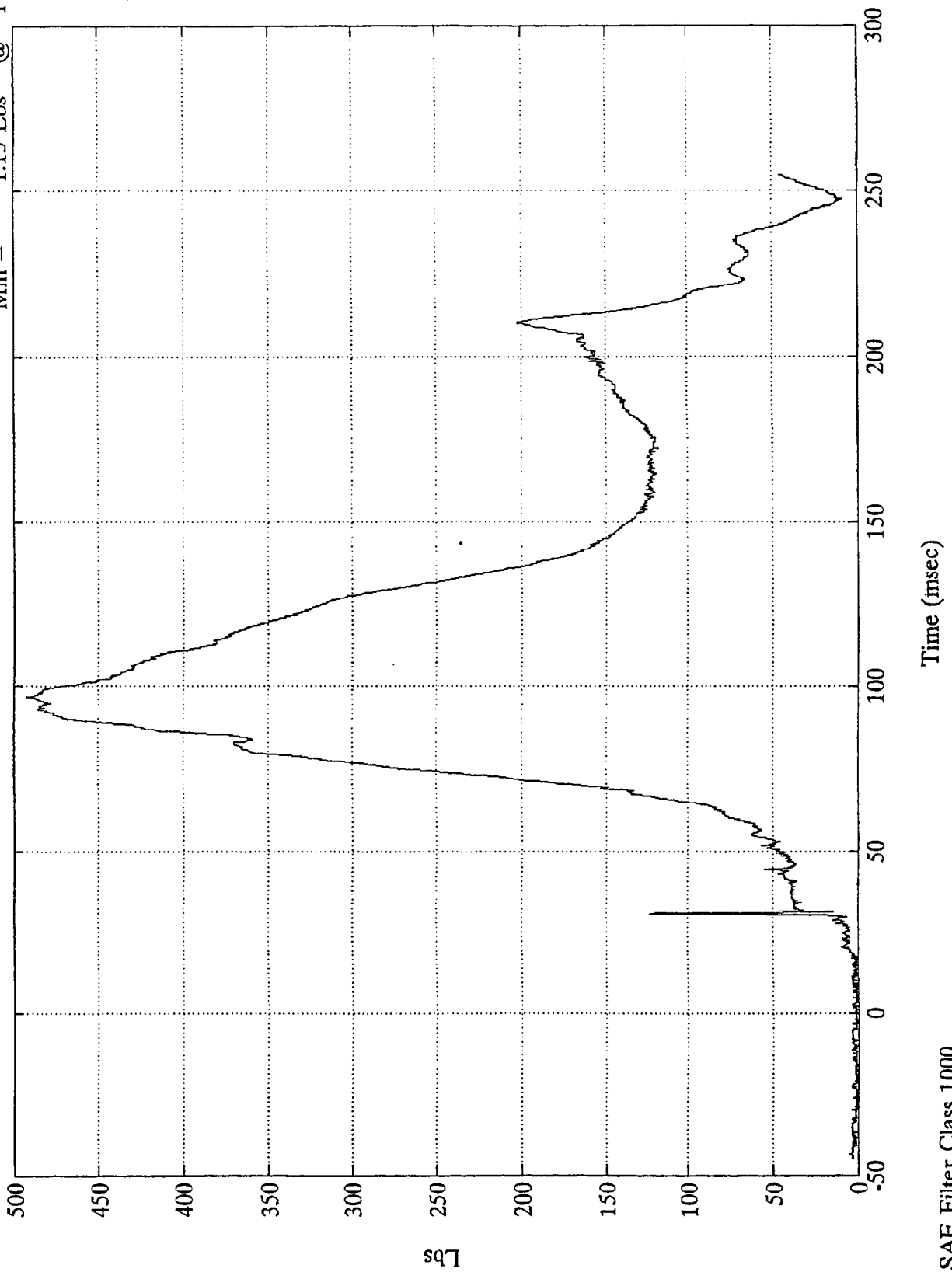


SAE Filter Class 1000

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 492.87 Lbs @ 96.36 msec
Min = 1.15 Lbs @ 17.51 msec

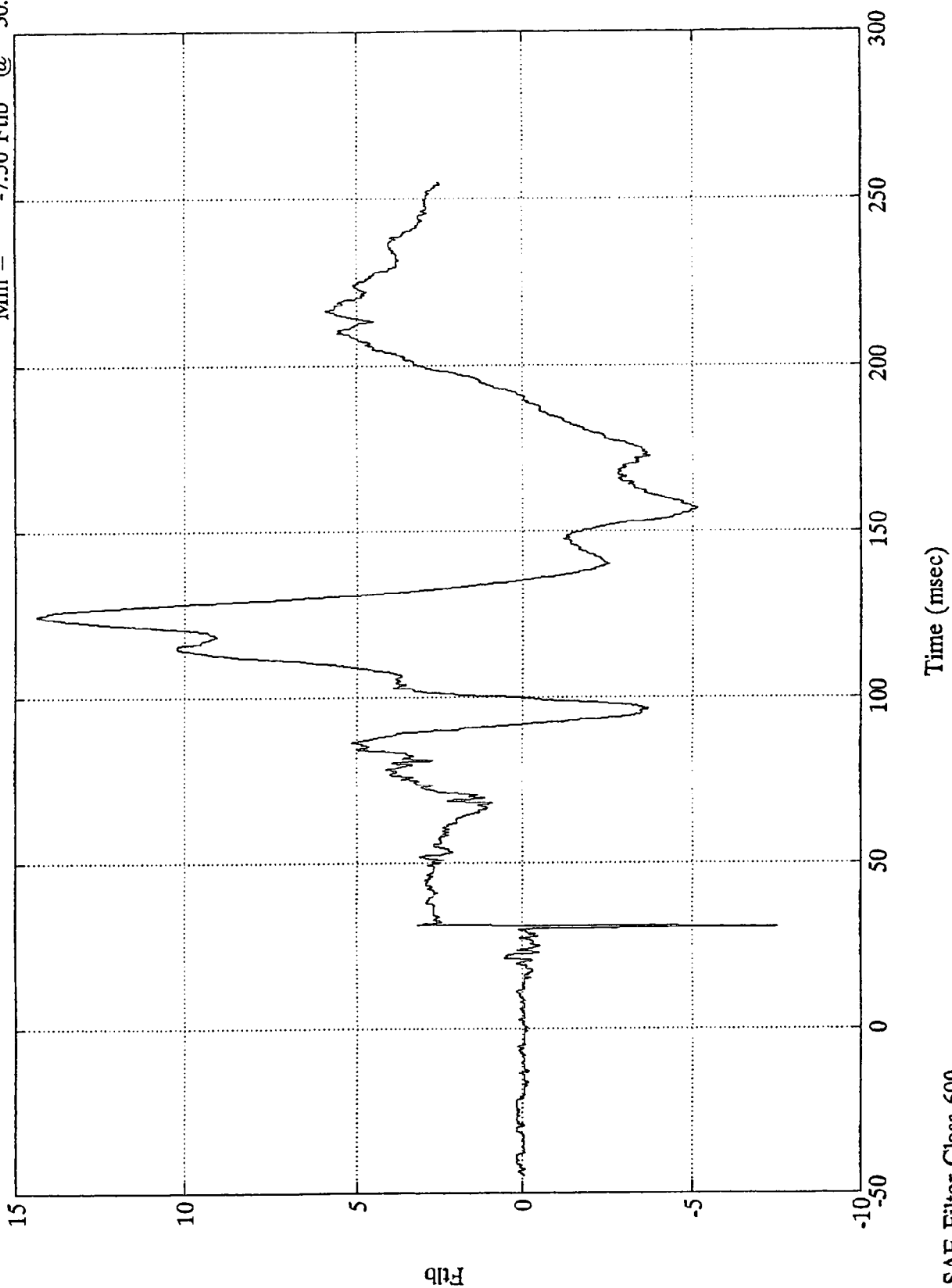
Pos.2 Neck Force Res.



SAE Filter Class 1000

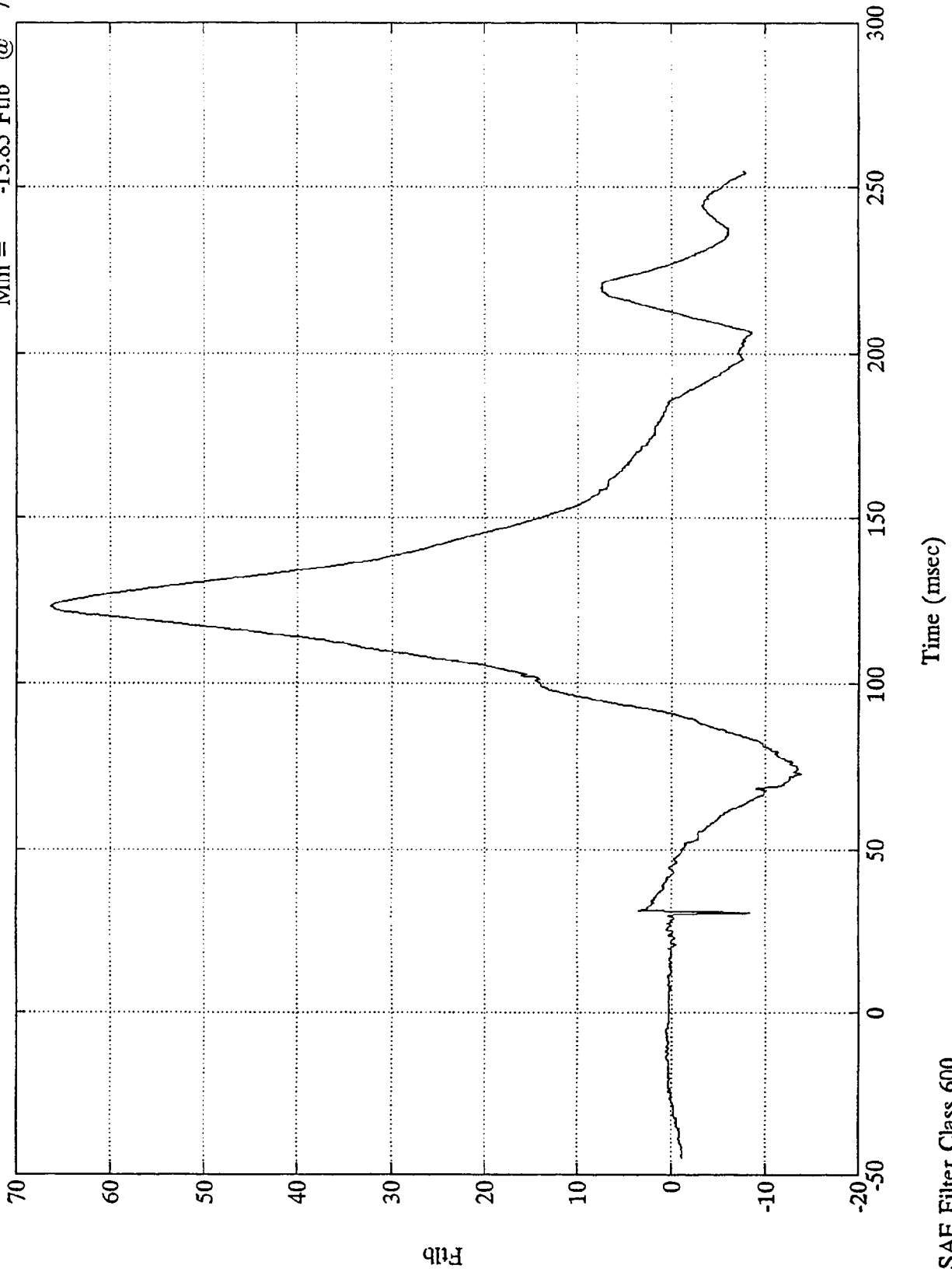
NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos.2 Upper Neck Mx Max = 14.40 Ftlb @ 124.80 msec
Min = -7.50 Ftlb @ 30.71 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

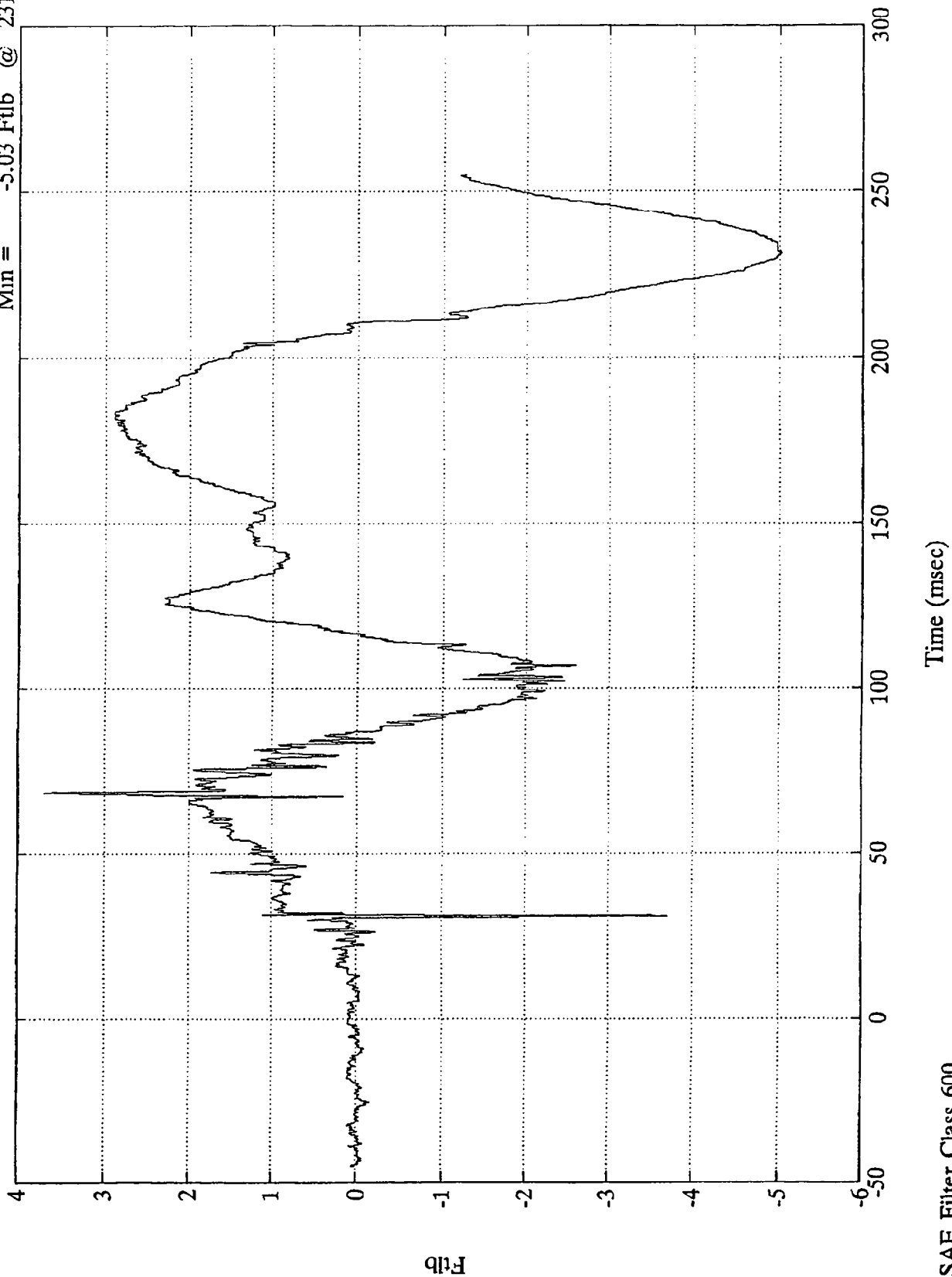
Pos.2 Upper Neck My Max = 66.40 Ftlb @ 123.12 msec
Min = -13.85 Ftlb @ 72.96 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

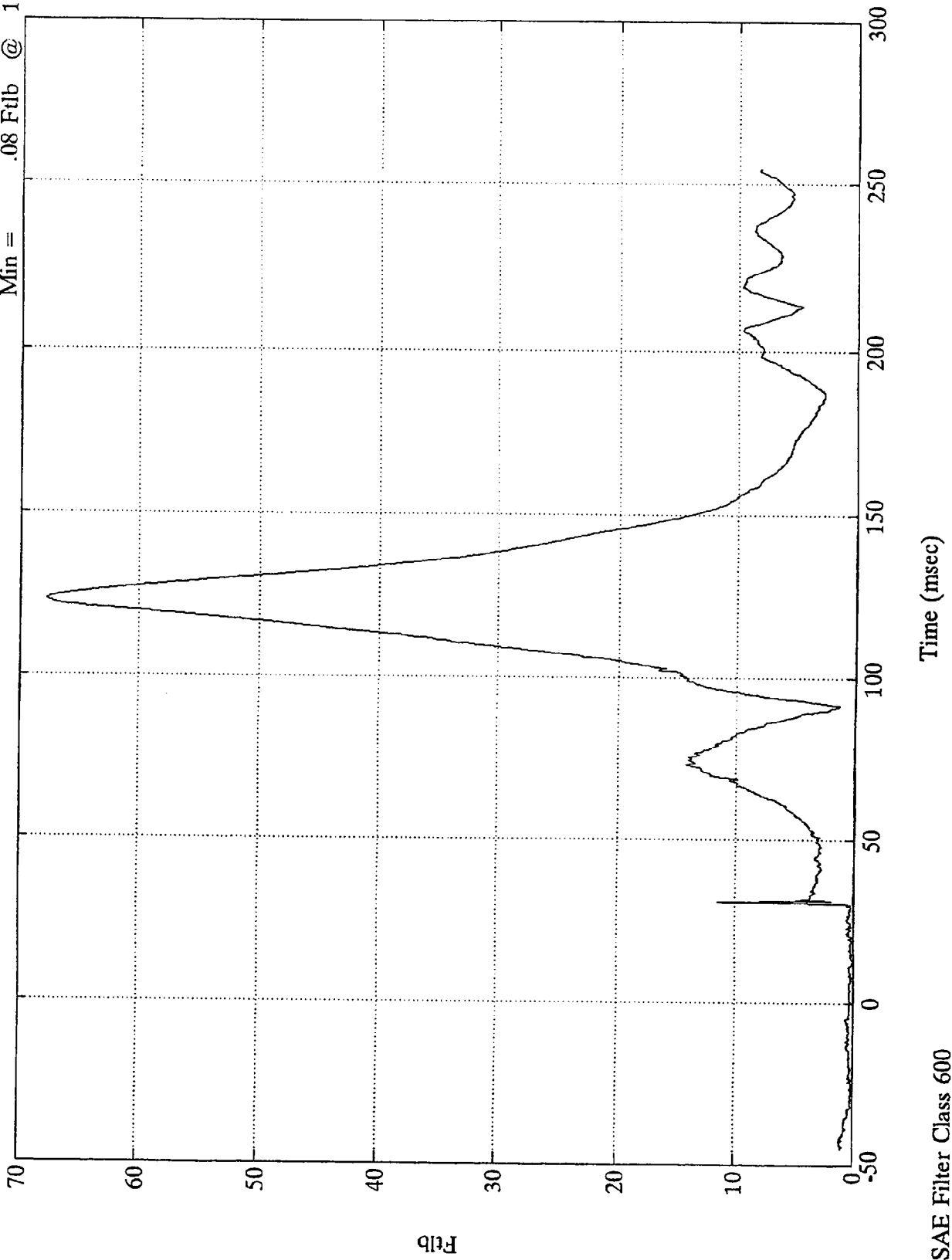
Pos.2 Upper Neck Mz

Max = 3.69 Ftlb @ 68.52 msec
Min = -5.03 Ftlb @ 231.36 msec



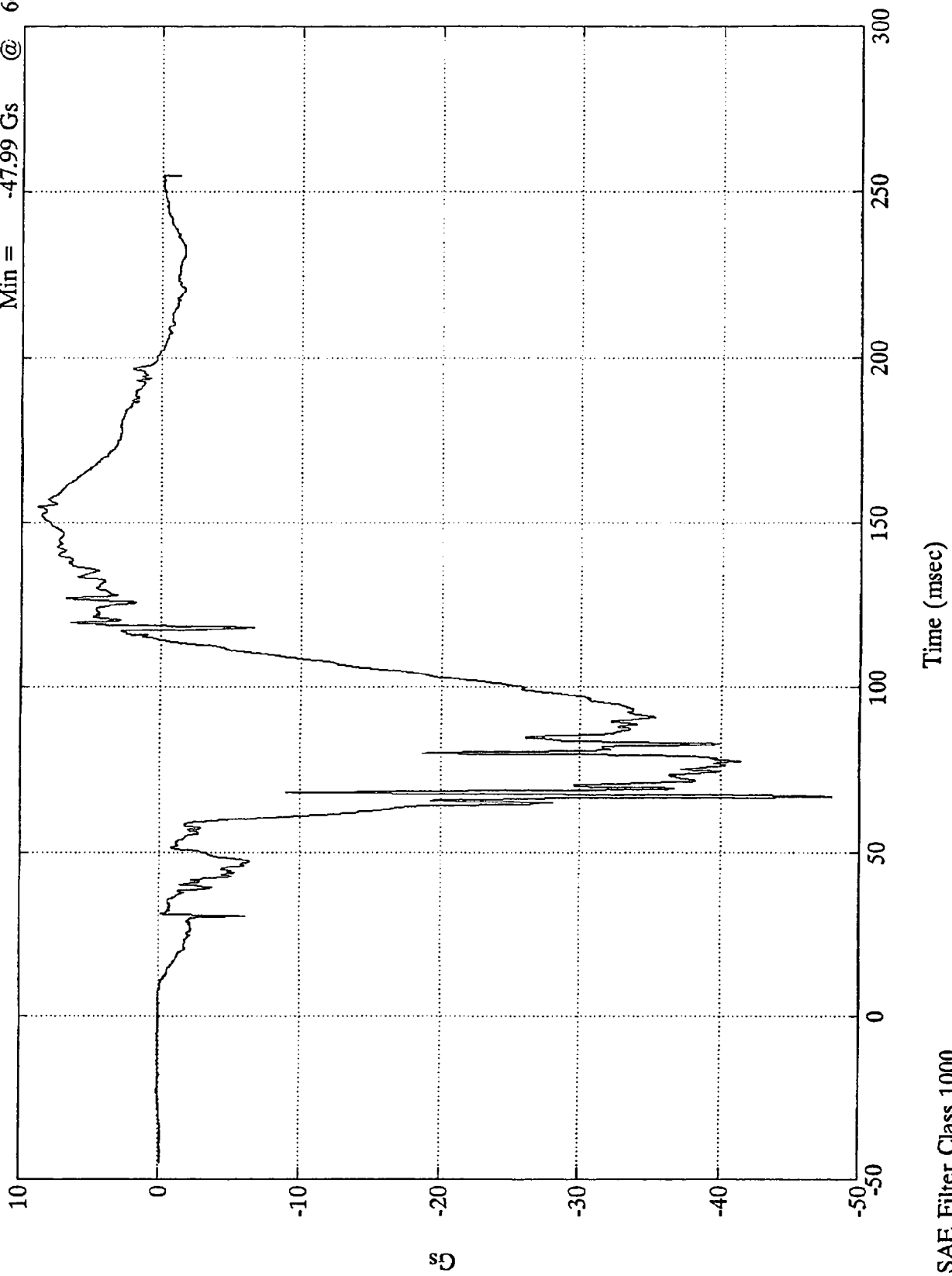
NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos.2 Neck Moment Res. Max = 67.76 Ftlb @ 123.12 msec
Min = .08 Ftlb @ 12.59 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

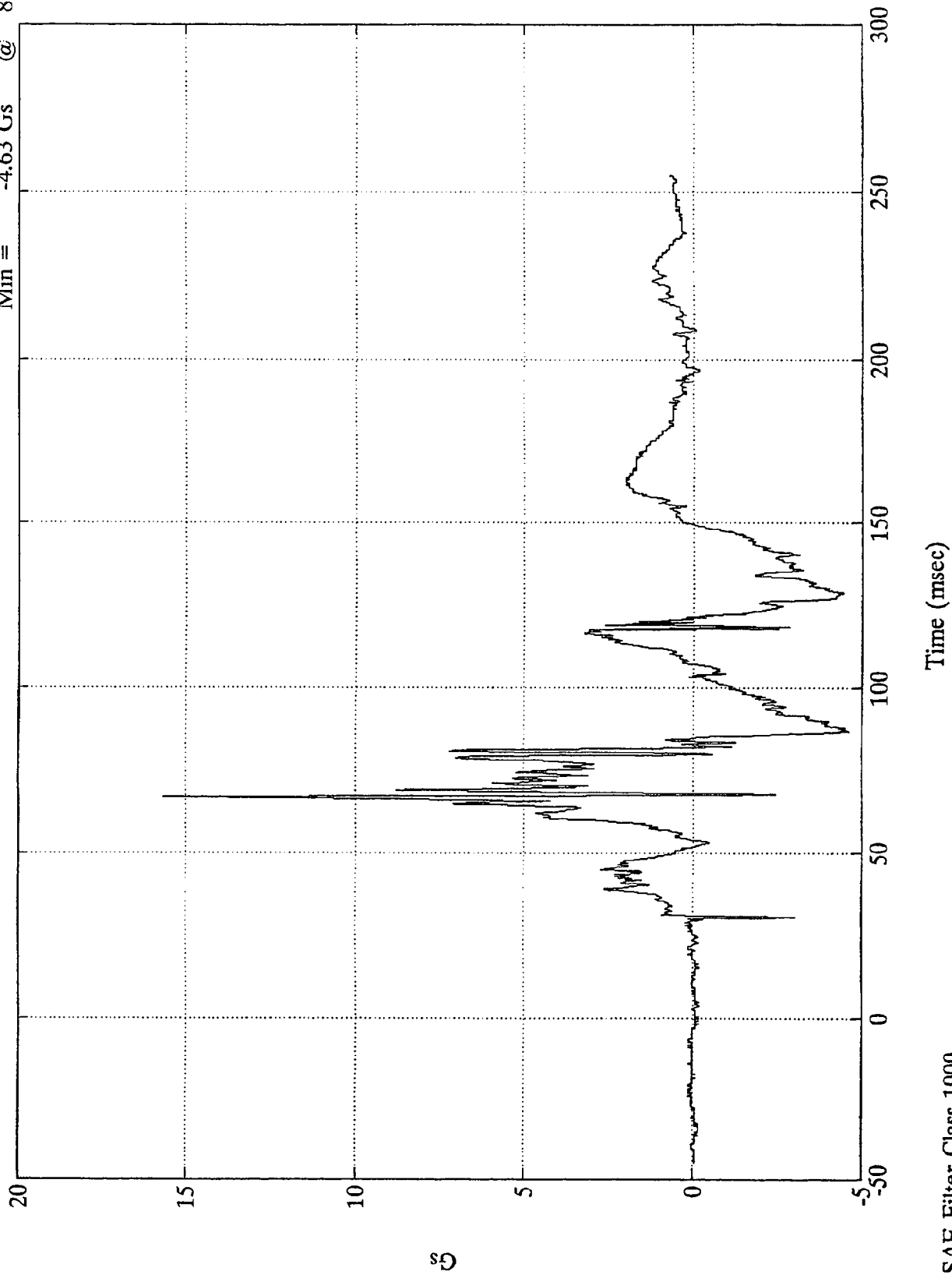
Pos. 2 Pelvic X
Max = 8.87 Gs @ 154.92 msec
Min = -47.99 Gs @ 66.84 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 15.64 Gs @ 66.95 msec
Min = -4.63 Gs @ 87.00 msec

Pos. 2 Pelvic Y



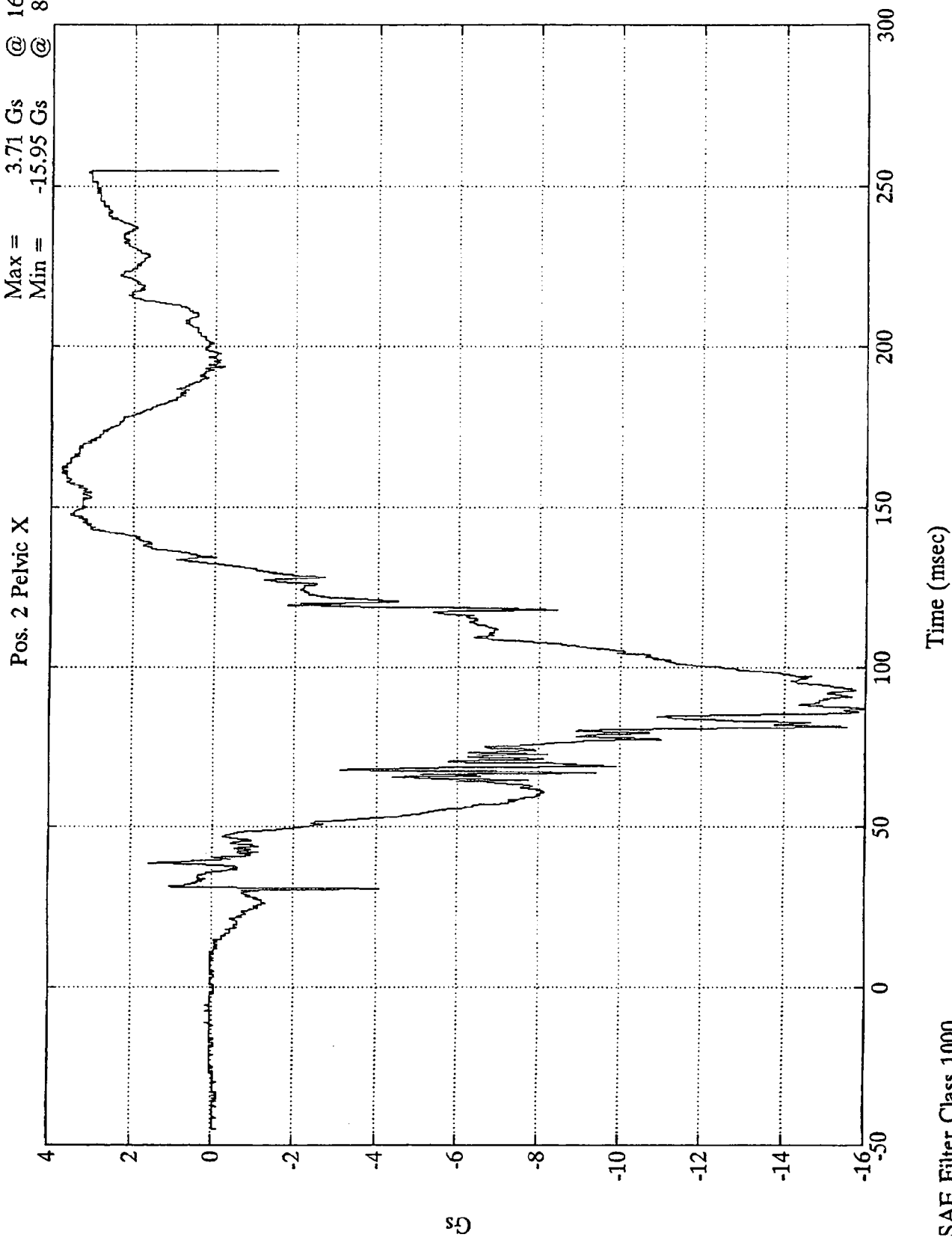
SAE Filter Class 1000

Gs

Time (msec)

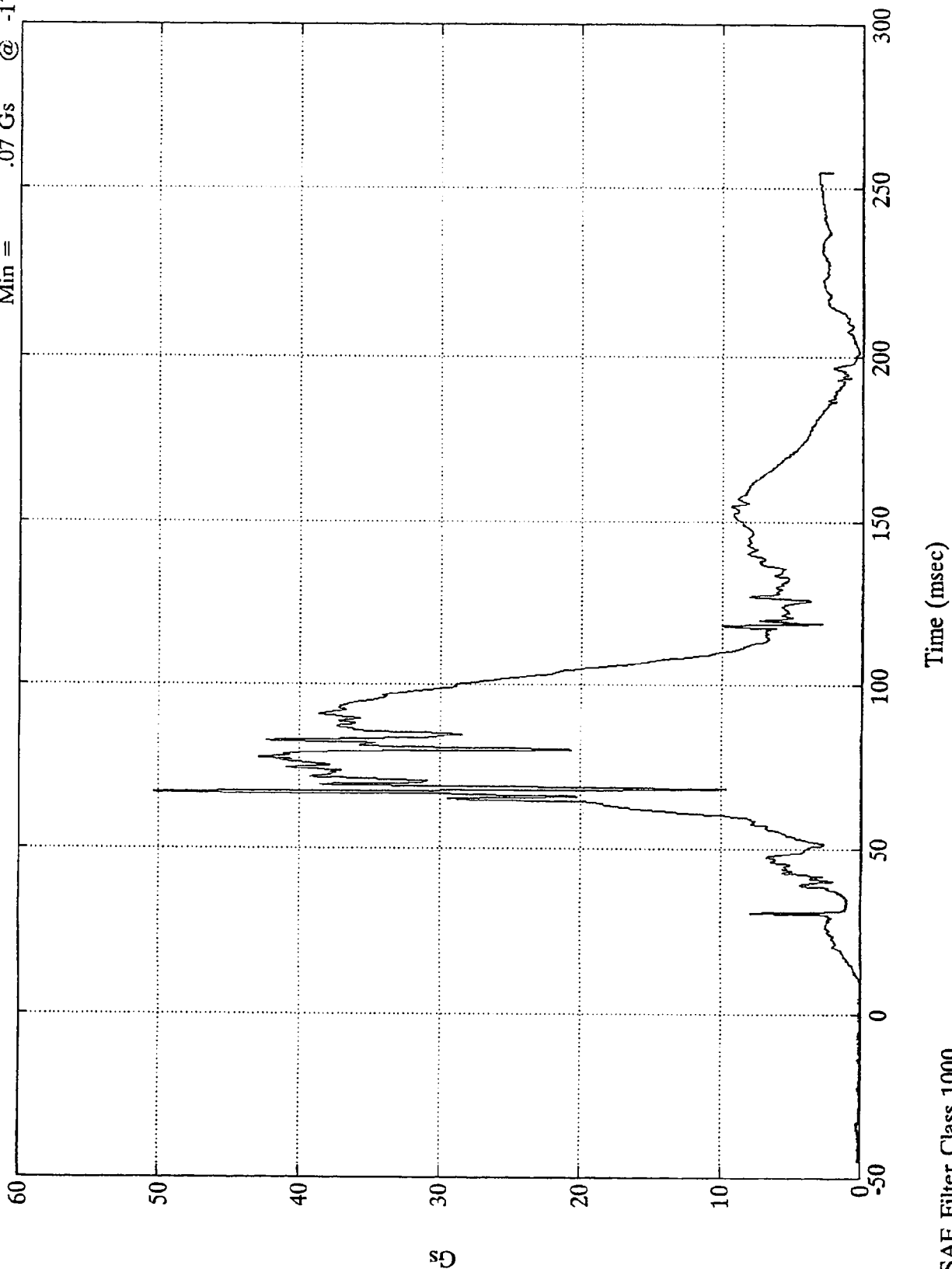
NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 3.71 Gs @ 162.96 msec
Min = -15.95 Gs @ 87.12 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

Pos. 2 Pelvic Resultant Max = 50.35 Gs @ 66.95 msec
 Min = .07 Gs @ -17.88 msec

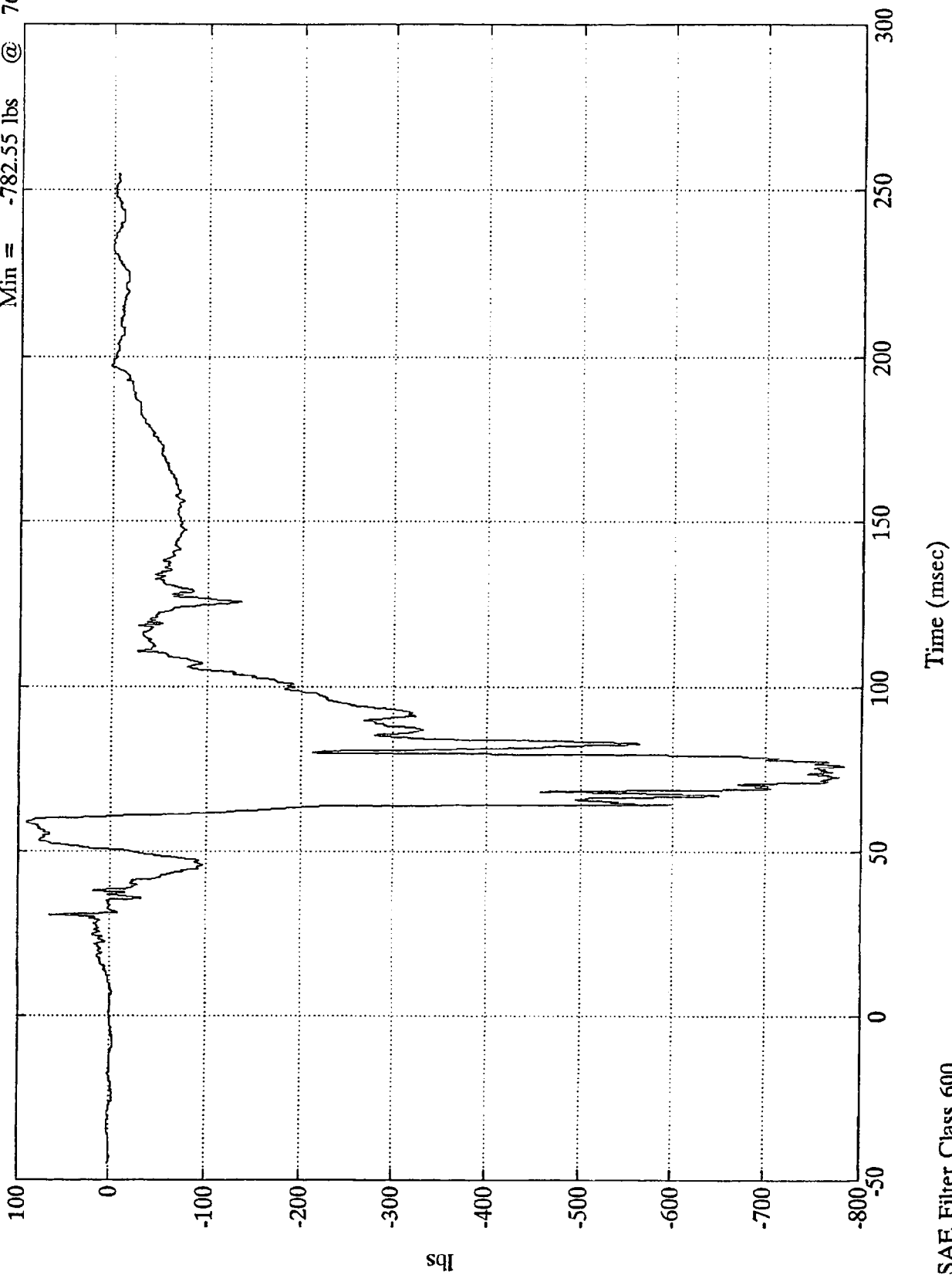


SAE Filter Class 1000

NHTSA 208 TEST - Chevrolet Lumina

Max = 91.47 lbs @ 58.91 msec
 Min = -782.55 lbs @ 76.08 msec

Pos. 2 Left Femur

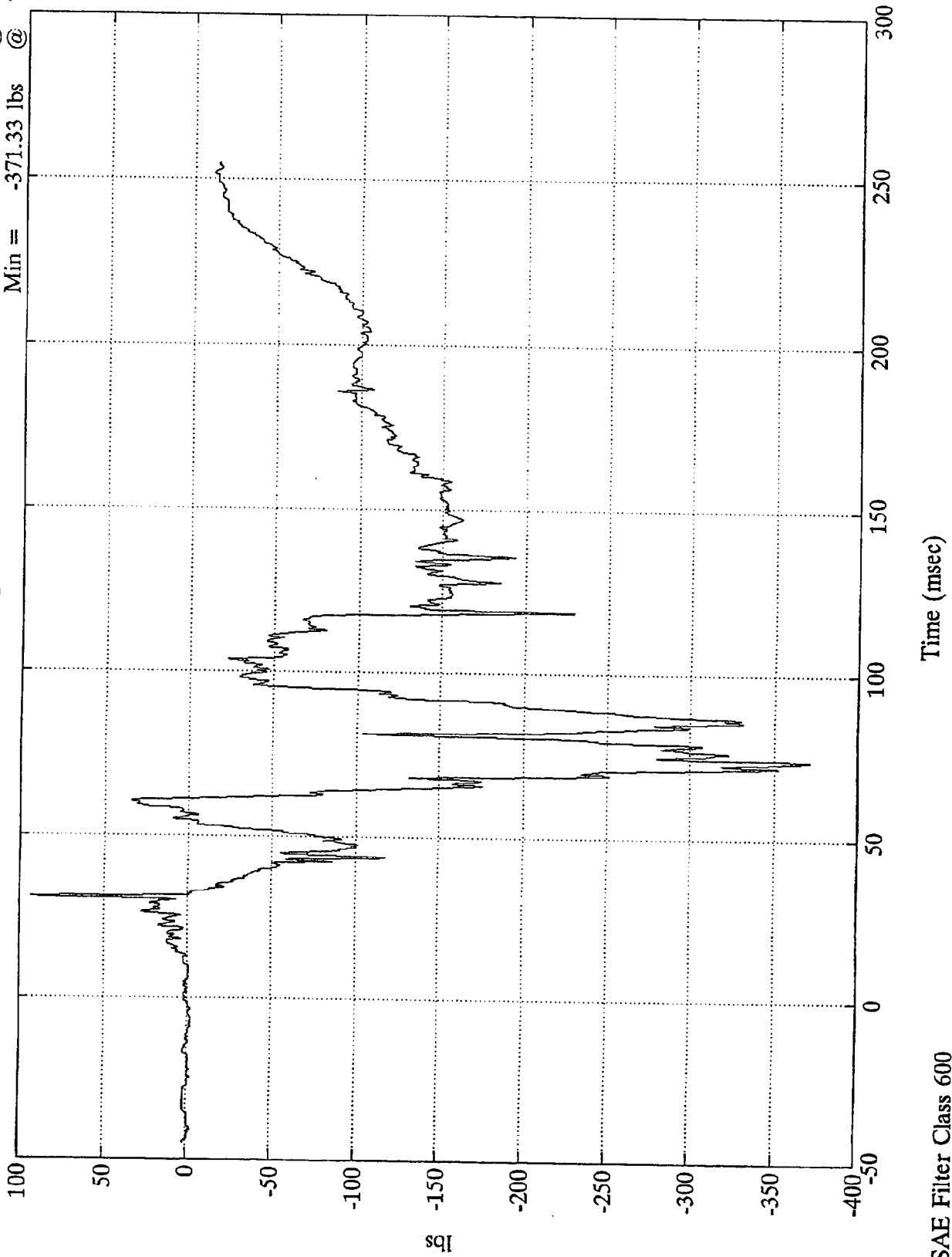


SAE Filter Class 600

NHTSA 208 TEST - Chevrolet Lumina

Pos. 2 Right Femur

Max = 93.16 lbs @ 30.71 msec
 Min = -371.33 lbs @ 74.04 msec



Appendix C

VEHICLE AND DUMMY RESPONSE DATA

(Part 572 3 Year Old ATD's only)

NOTE : Data trace scales are automatically scaled at the
request of the COTR. Use caution when
reviewing data.

FACILITY: TRACK
RUN #: 1441
SERIES #: 16

TEST DATE: 11 Aug 1994
TEST TIME: 13:55:49
BOARD: d

TITLE: NHTSA 208 TEST - 1994 Chevrolet Lumina

CHANNEL NUMBER	DESCRIPTION	ENGR UNIT	MAXIMUM		MINIMUM		FILTER CLASS
			AMP	msec	AMP	msec	
1	RRP Head X	Gs	56.2	195.1	-21.8	111.0	1000.0
2	RRP Head Y	Gs	8.3	104.0	-4.1	30.7	1000.0
3	RRP Head Z	Gs	51.8	95.0	-5.2	30.7	1000.0
4	RRP Chest X	Gs	23.5	198.1	-32.9	59.2	180.0
5	RRP Chest Y	Gs	1.2	69.1	-2.0	100.7	180.0
6	RRP Chest Z	Gs	14.5	209.3	-14.9	67.8	180.0
7	LRP Head X	Gs	54.9	193.9	-25.6	112.1	1000.0
8	LRP Head Y	Gs	5.8	31.2	-15.1	30.8	1000.0
9	LRP Head Z	Gs	81.9	95.2	-13.9	39.1	1000.0
10	LRP Chest X	Gs	15.6	226.3	-32.8	61.0	180.0
11	LRP Chest Y	Gs	1.6	65.9	-2.5	207.1	180.0
12	LRP Chest Z	Gs	12.4	93.4	-13.2	66.1	180.0
17	RRP Head Resultant	Gs	56.3	195.1	.1	-9.1	1000.0
18	RRP Chest Resultant	Gs	34.9	59.2	.1	-30.1	180.0
19	LRP Head Resultant	Gs	82.1	95.2	.1	29.4	1000.0
20	LRP Chest Resultant	Gs	35.2	61.0	.1	-18.2	180.0

Full Duration HIC SUMMARY: RRP Head Resultant

hic: 434.80
t1 = 71.160 msec
t2 = 119.880 msec
Average G's Over Hic Duration = 38.04

** Full Duration HIC SUMMARY: LRP Head Resultant

hic: 454.55
t1 = 71.040 msec
t2 = 124.200 msec
Average G's Over Hic Duration = 37.39

CLIP SUMMARY: RRP Chest Resultant

Peak Resultant (3 ms CLIPPED DURATION) = 32.789 G's
Tstart = 63.7200 ms
Tend = 66.8400 ms
CSI = 223.664

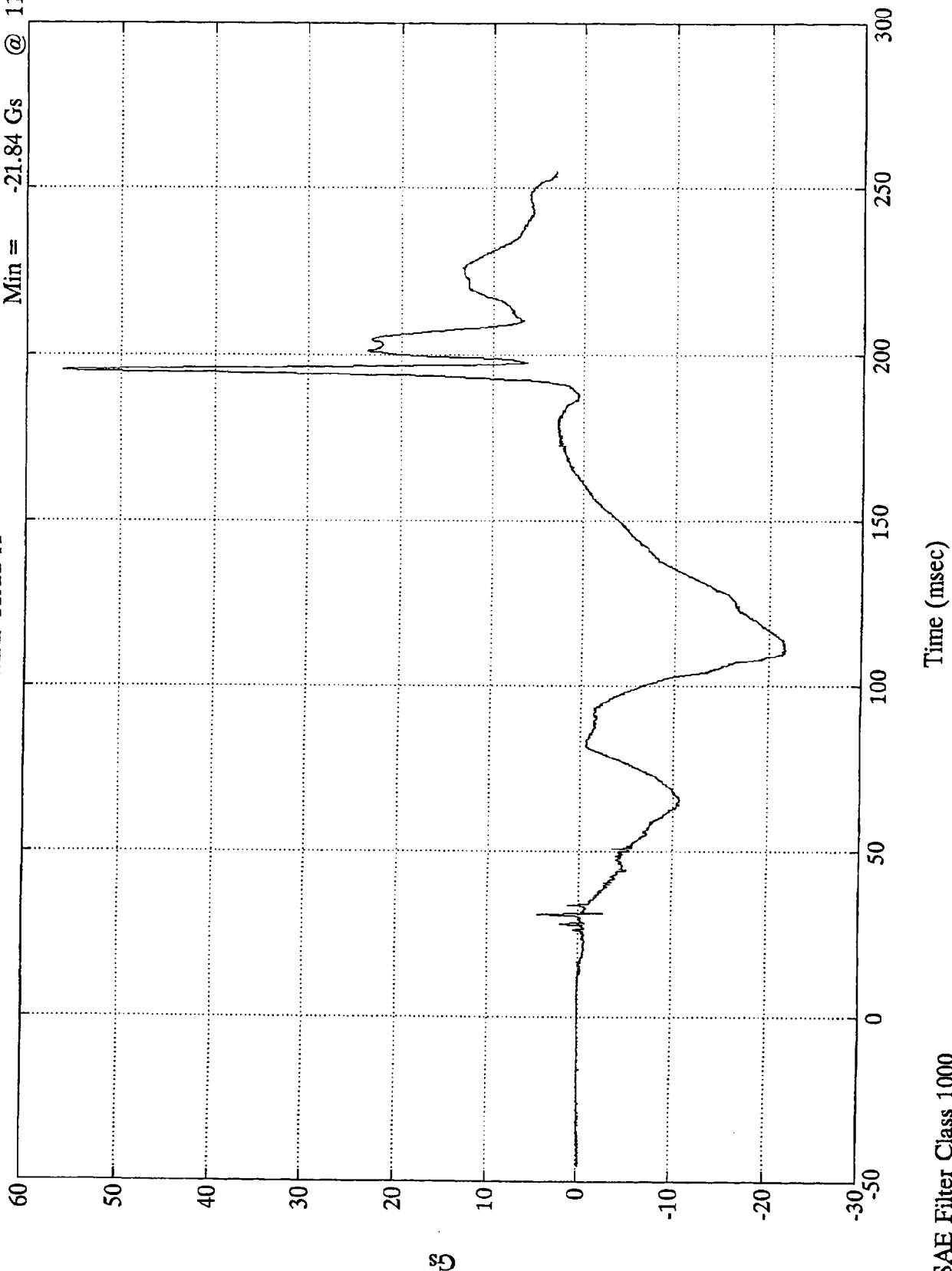
CLIP SUMMARY: LRP Chest Resultant

Peak Resultant (3 ms CLIPPED DURATION) = 31.917 G's
Tstart = 60.0000 ms
Tend = 63.0000 ms
CSI = 225.392

** The HIC calculation is based on the left mid dummy's head X and head Y data, and the right mid dummy's head Z axis data. This was done due to the questionable data occurring on the left mid dummy's head Z axis channel. The COTR was aware of and approved this modification.

NHTSA 208 TEST - 1994 Chevrolet Lumina

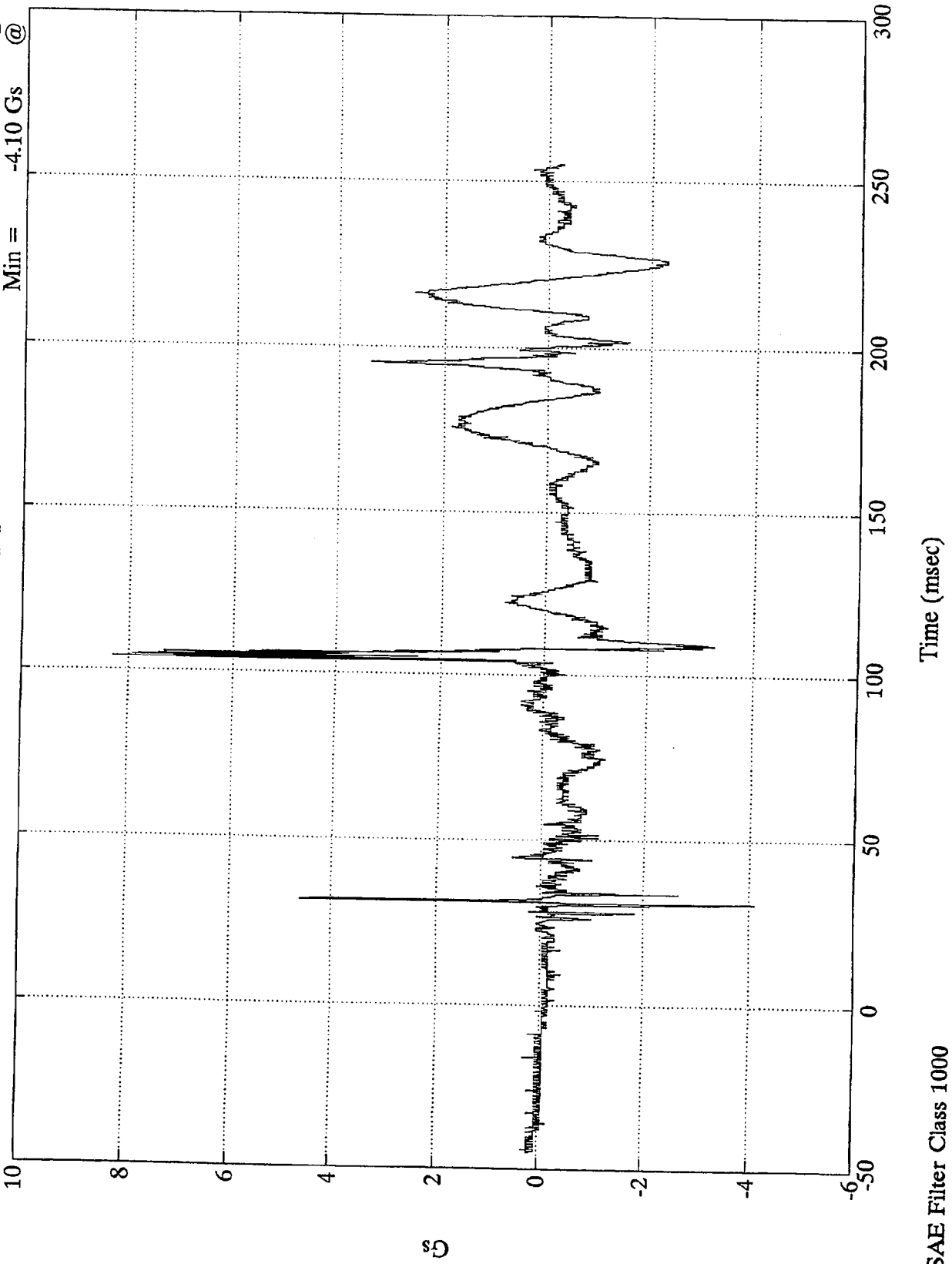
RRP Head X
Max = 56.17 Gs @ 195.12 msec
Min = -21.84 Gs @ 111.00 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 8.28 Gs @ 104.04 msec
Min = -4.10 Gs @ 30.71 msec

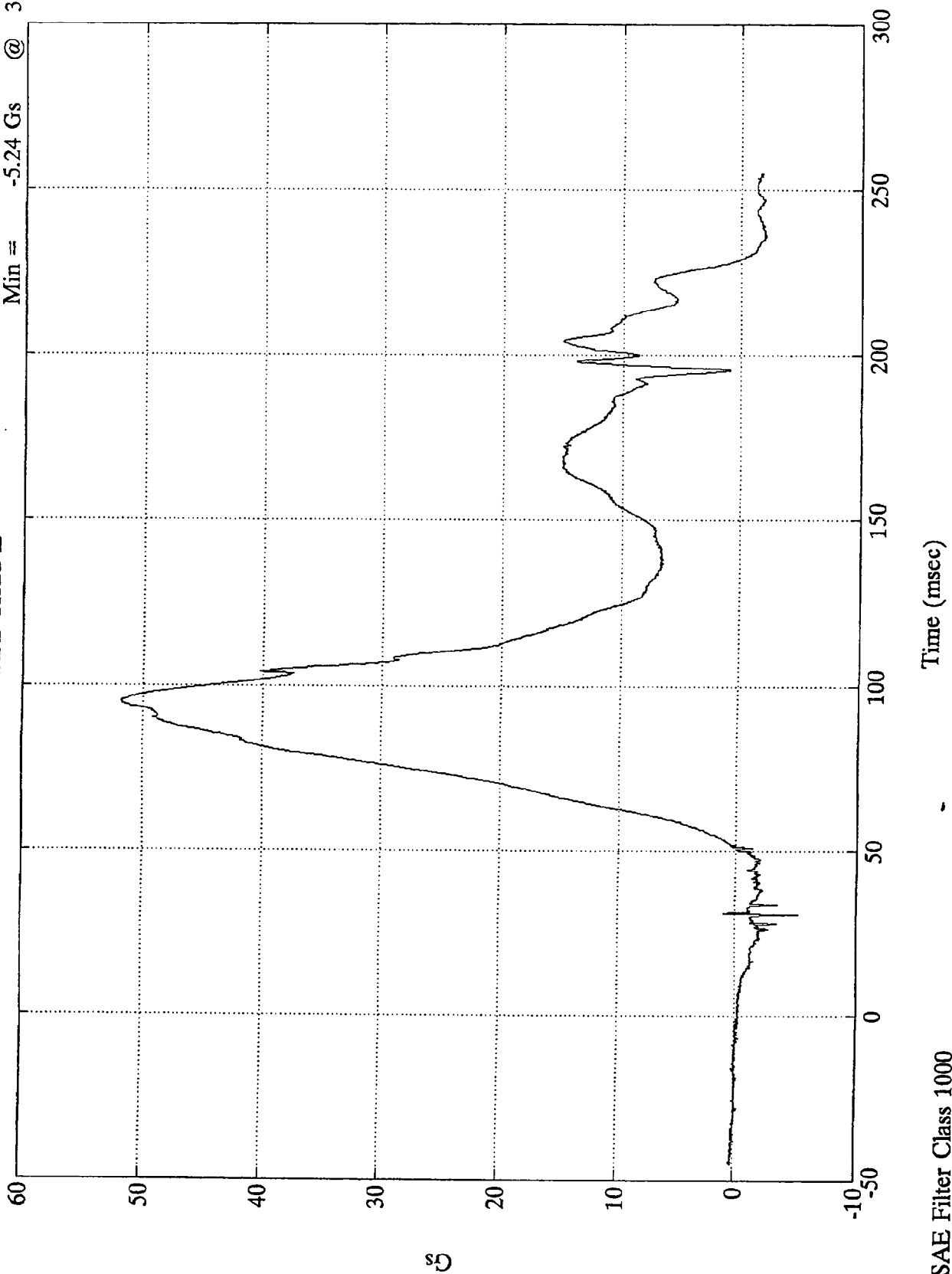
RRP Head Y



NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 51.82 Gs @ 95.04 msec
Min = -5.24 Gs @ 30.71 msec

RRP Head Z

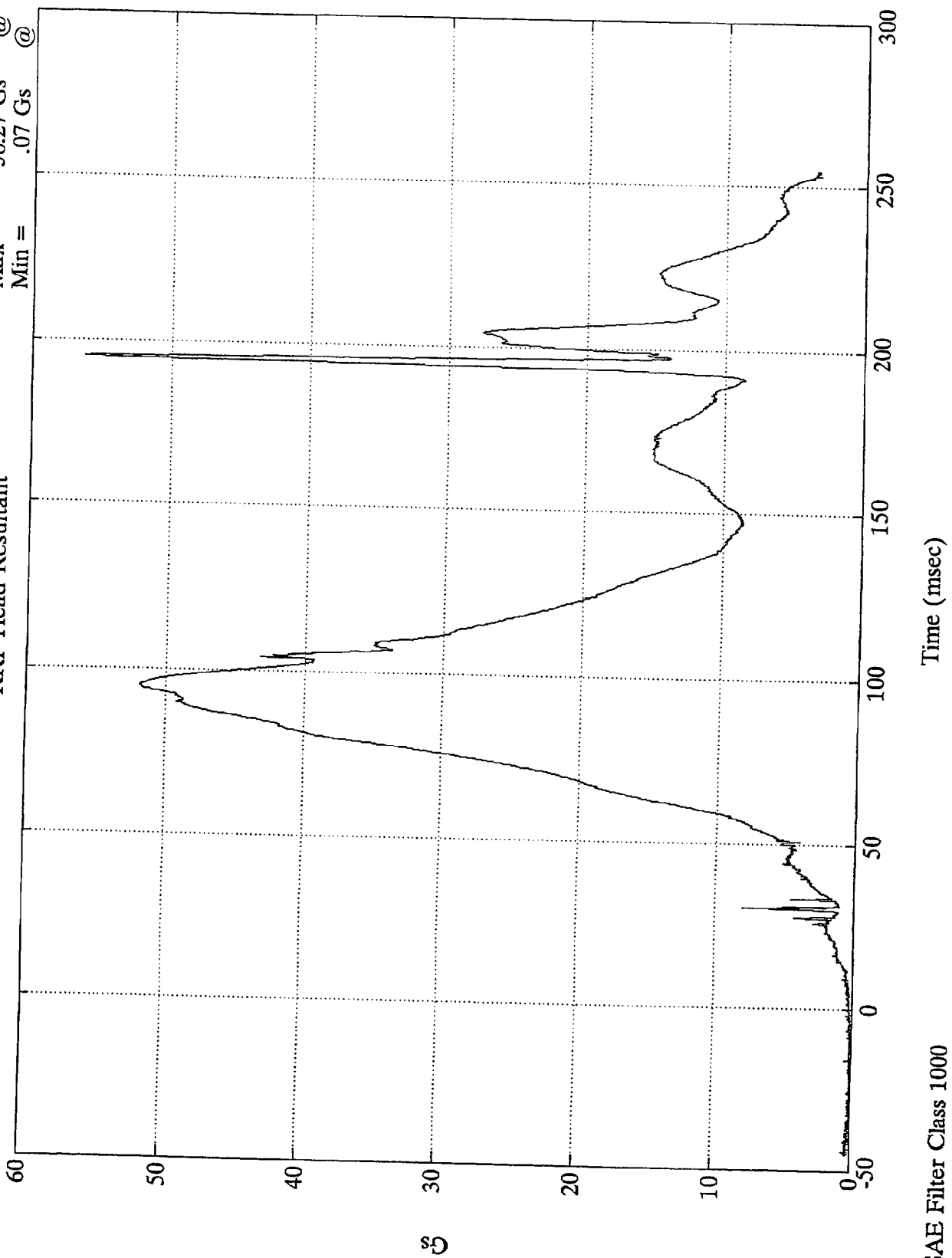


SAE Filter Class 1000

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 56.27 Gs @ 195.12 msec
Min = .07 Gs @ -9.12 msec

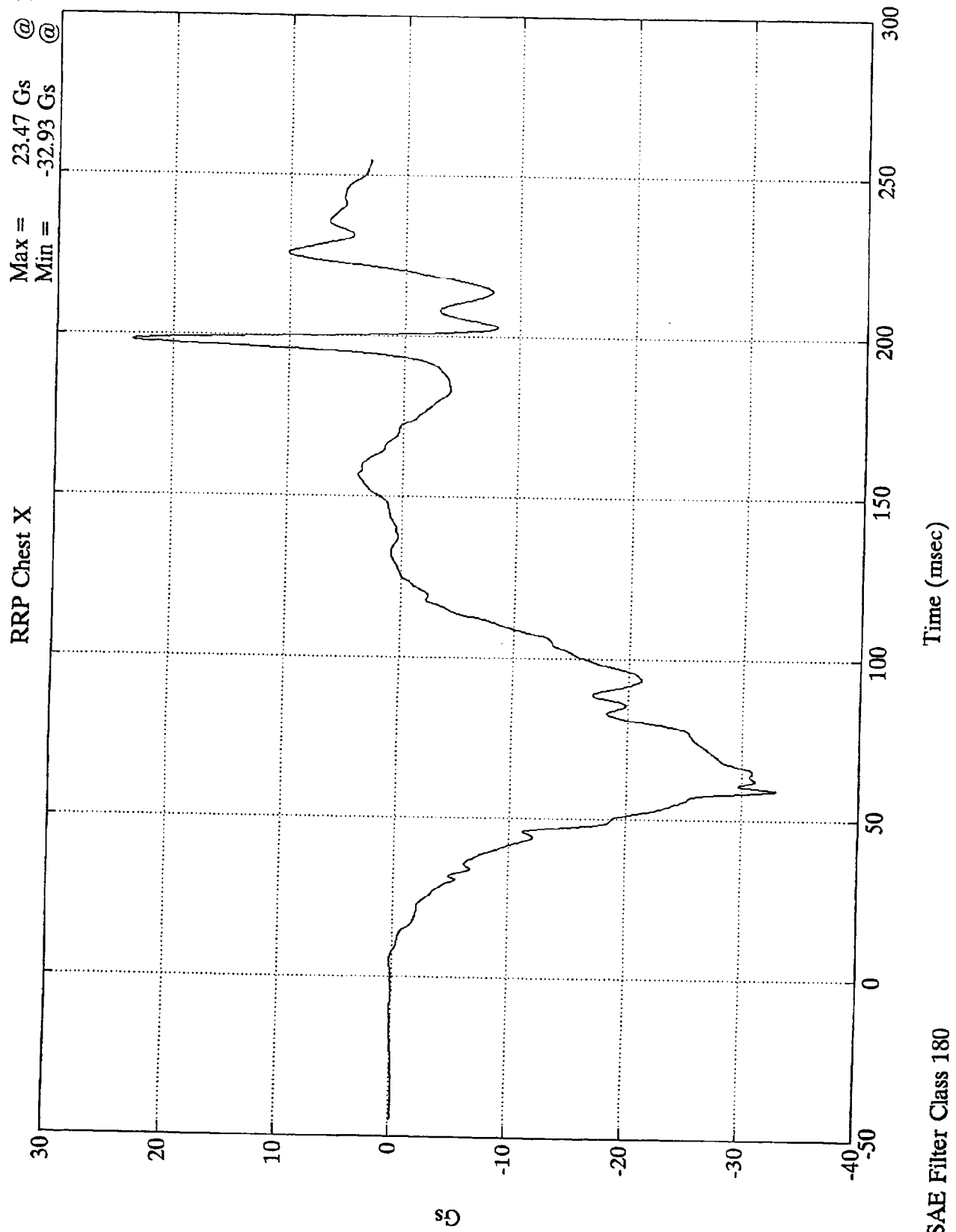
RRP Head Resultant



SAE Filter Class 1000

NHTSA 208 TEST - 1994 Chevrolet Lumina

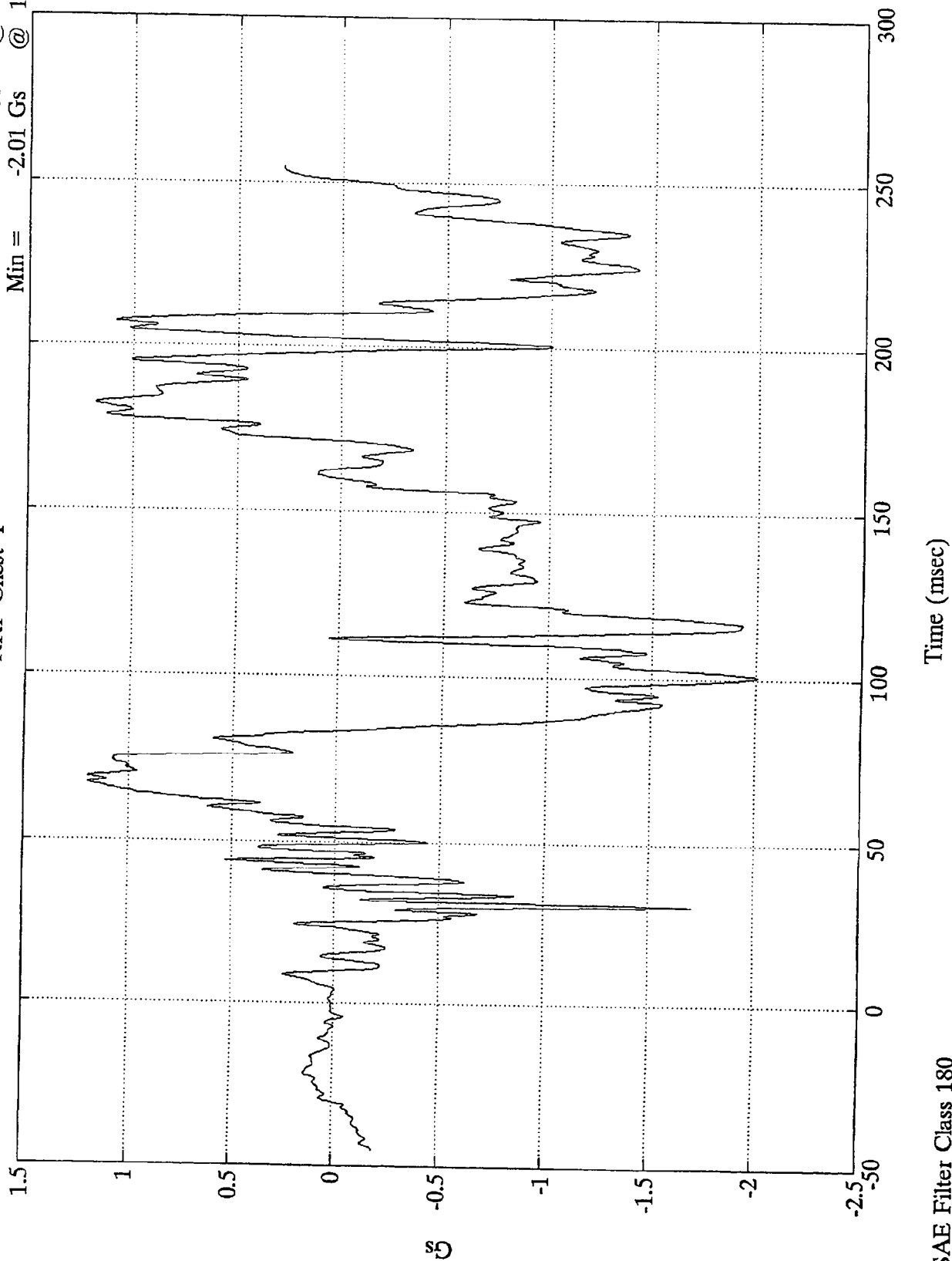
Max = 23.47 Gs @ 198.12 msec
Min = -32.93 Gs @ 59.15 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 1.19 Gs @ 69.12 msec
 Min = -2.01 Gs @ 100.68 msec

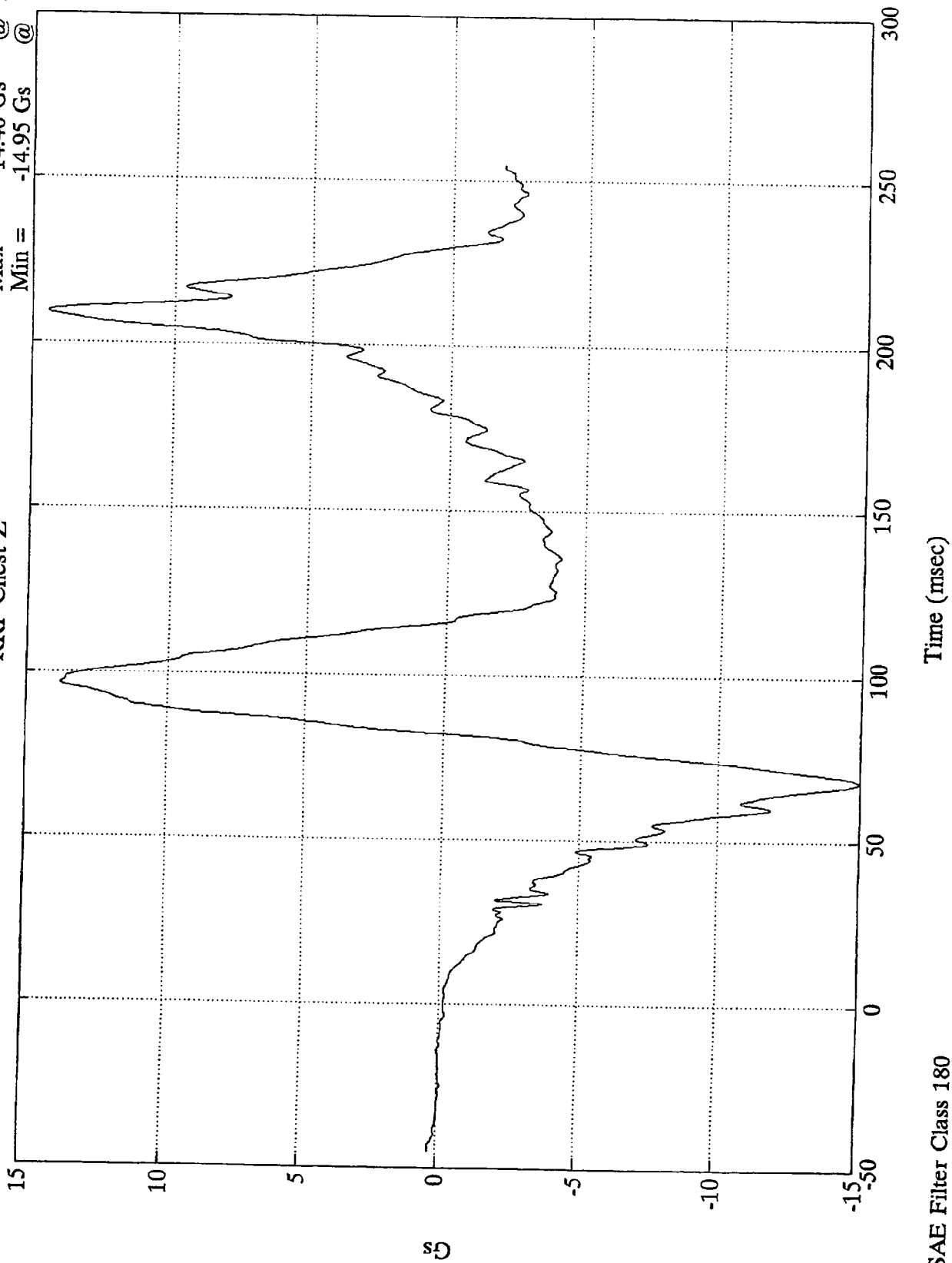
RRP Chest Y



NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 14.46 Gs @ 209.27 msec
Min = -14.95 Gs @ 67.80 msec

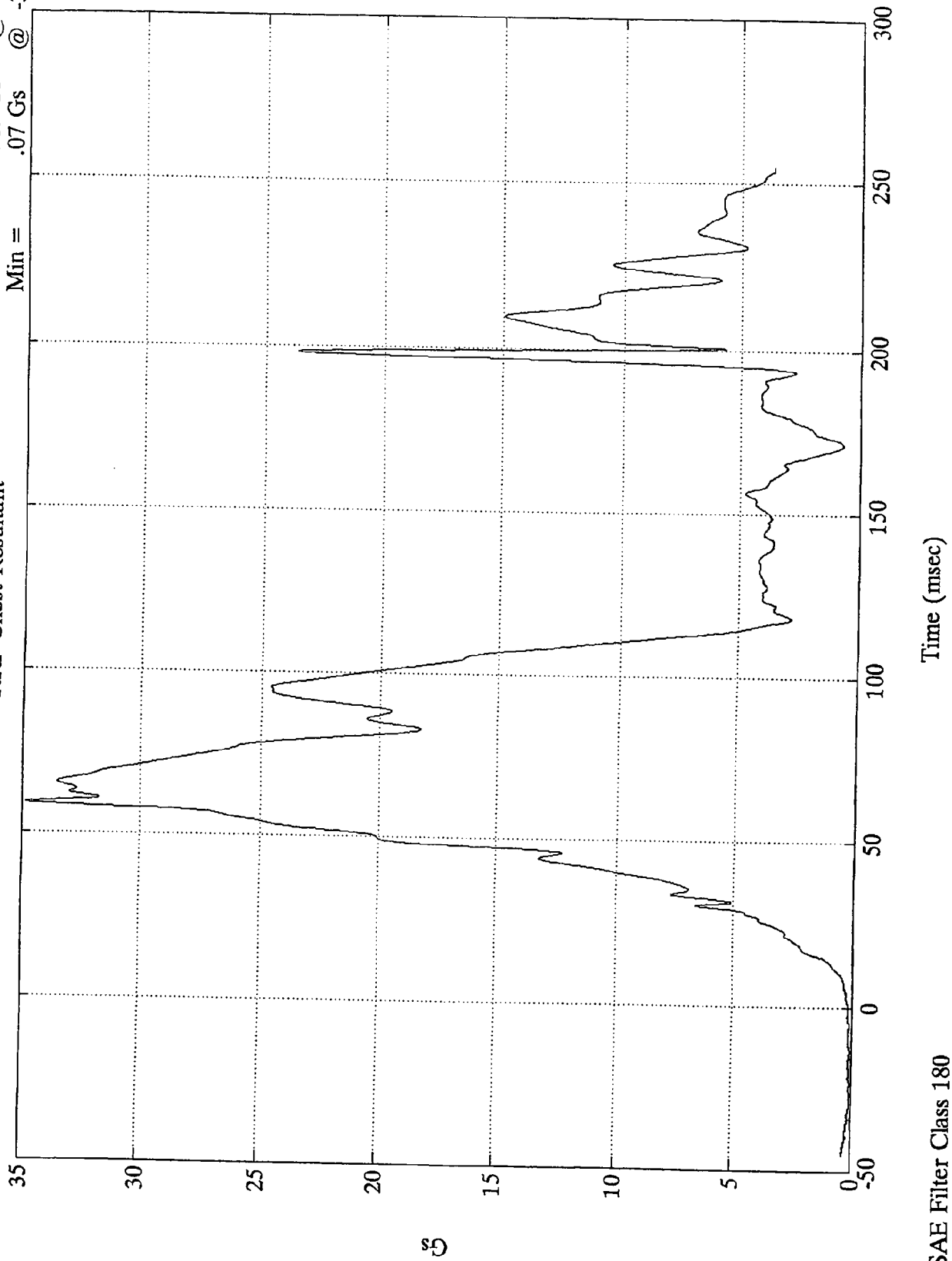
RRP Chest Z



NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 34.89 Gs @ 59.15 msec
Min = .07 Gs @ -30.12 msec

RRP Chest Resultant

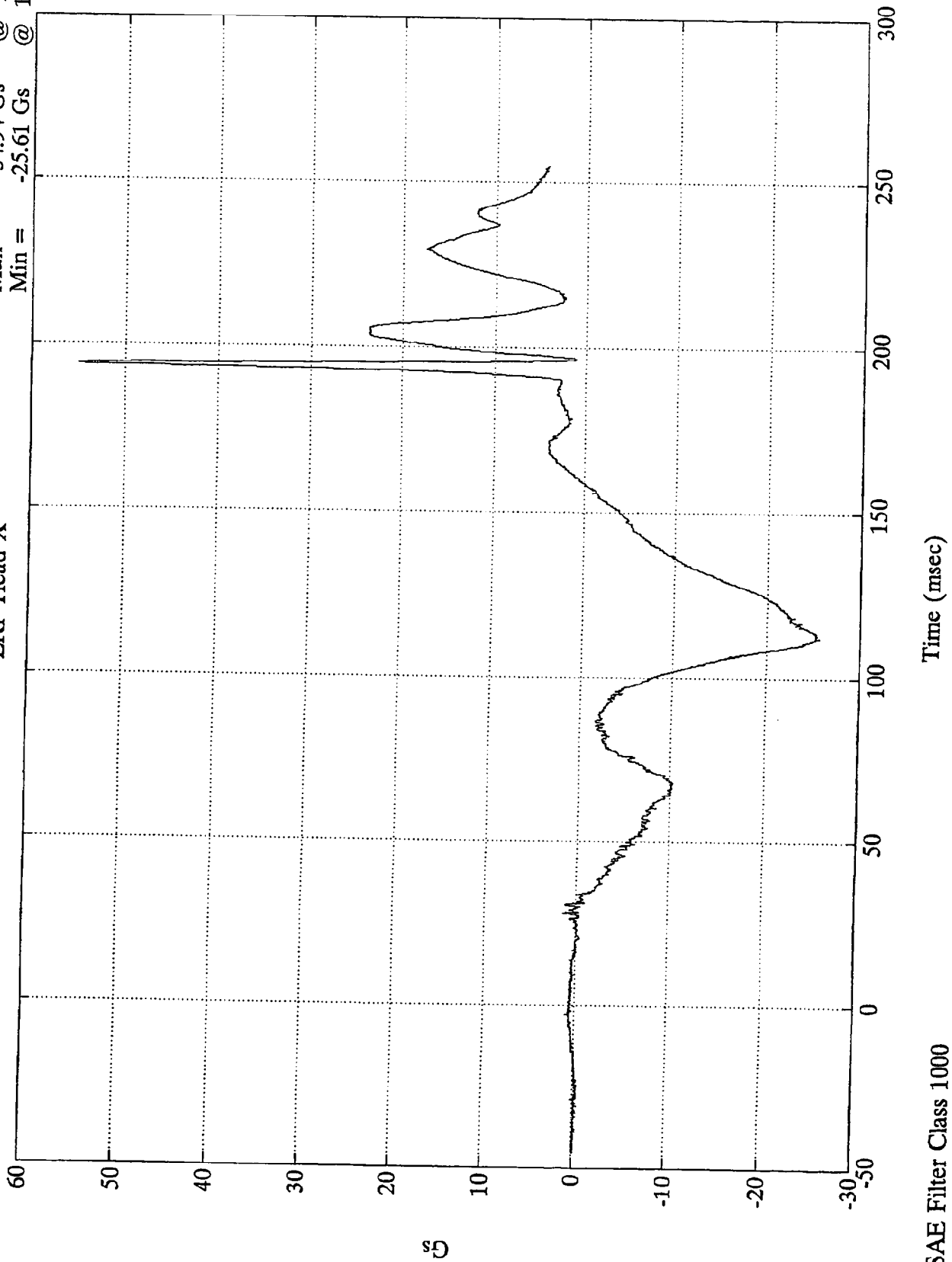


SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 54.94 Gs @ 193.91 msec
Min = -25.61 Gs @ 112.08 msec

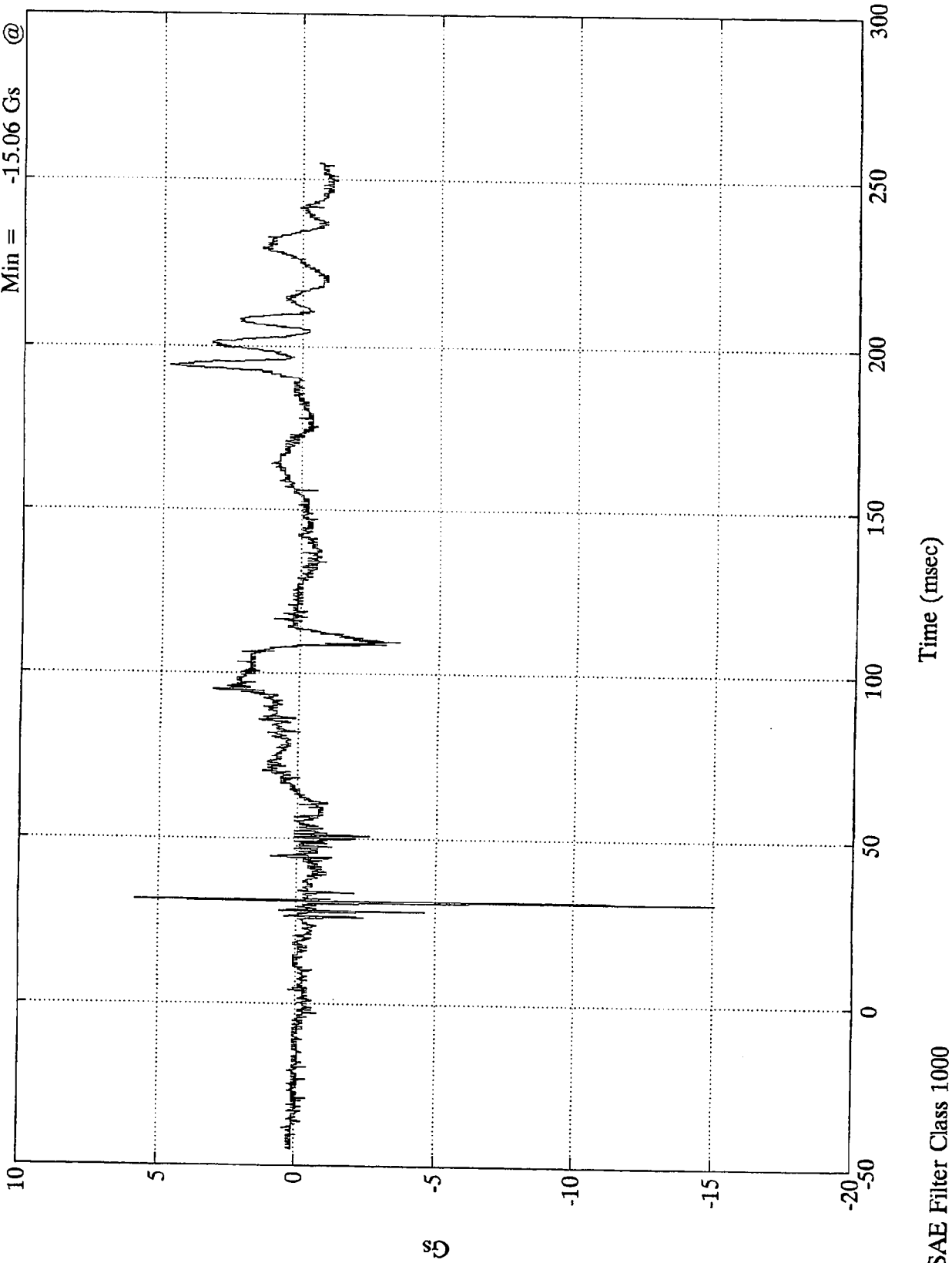
LRP Head X



NHTSA 208 TEST - 1994 Chevrolet Lumina

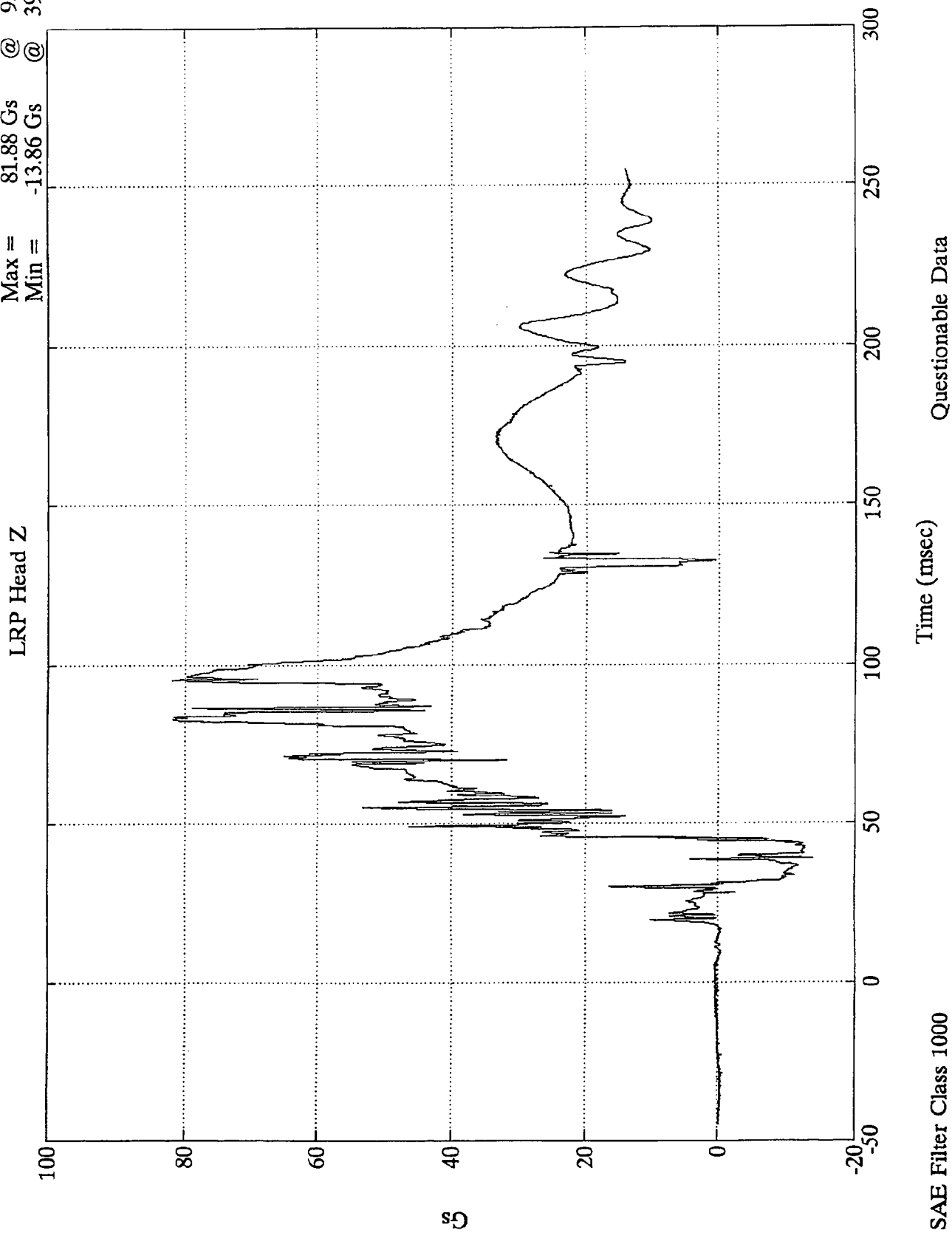
Max = 5.83 Gs @ 31.19 msec
 Min = -15.06 Gs @ 30.84 msec

LRP Head Y



NHTSA 208 TEST - 1994 Chevrolet Lumina

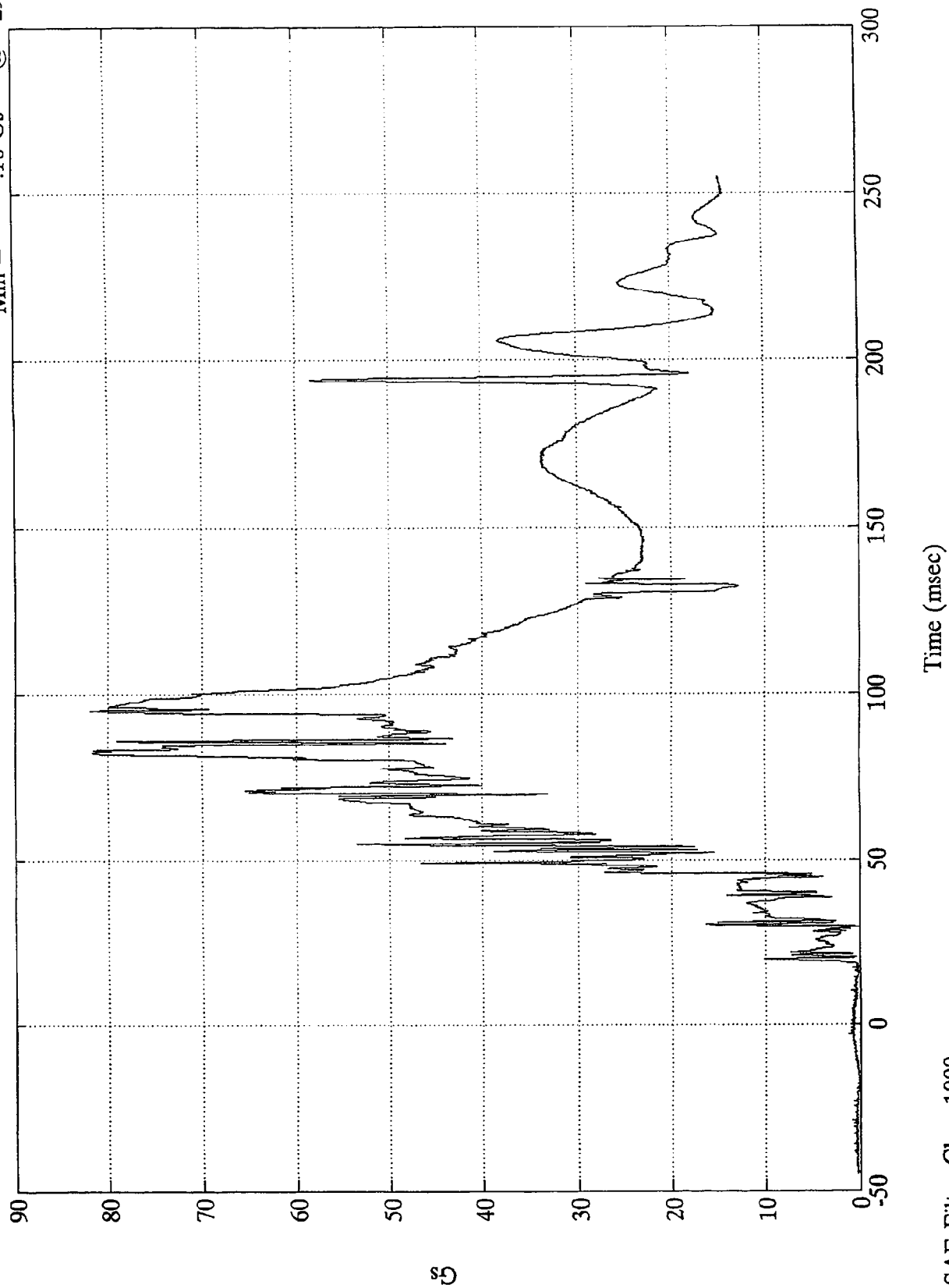
Max = 81.88 Gs @ 95.16 msec
 Min = -13.86 Gs @ 39.11 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 82.05 Gs @ 95.16 msec
Min = .10 Gs @ 29.39 msec

LRP Head Resultant

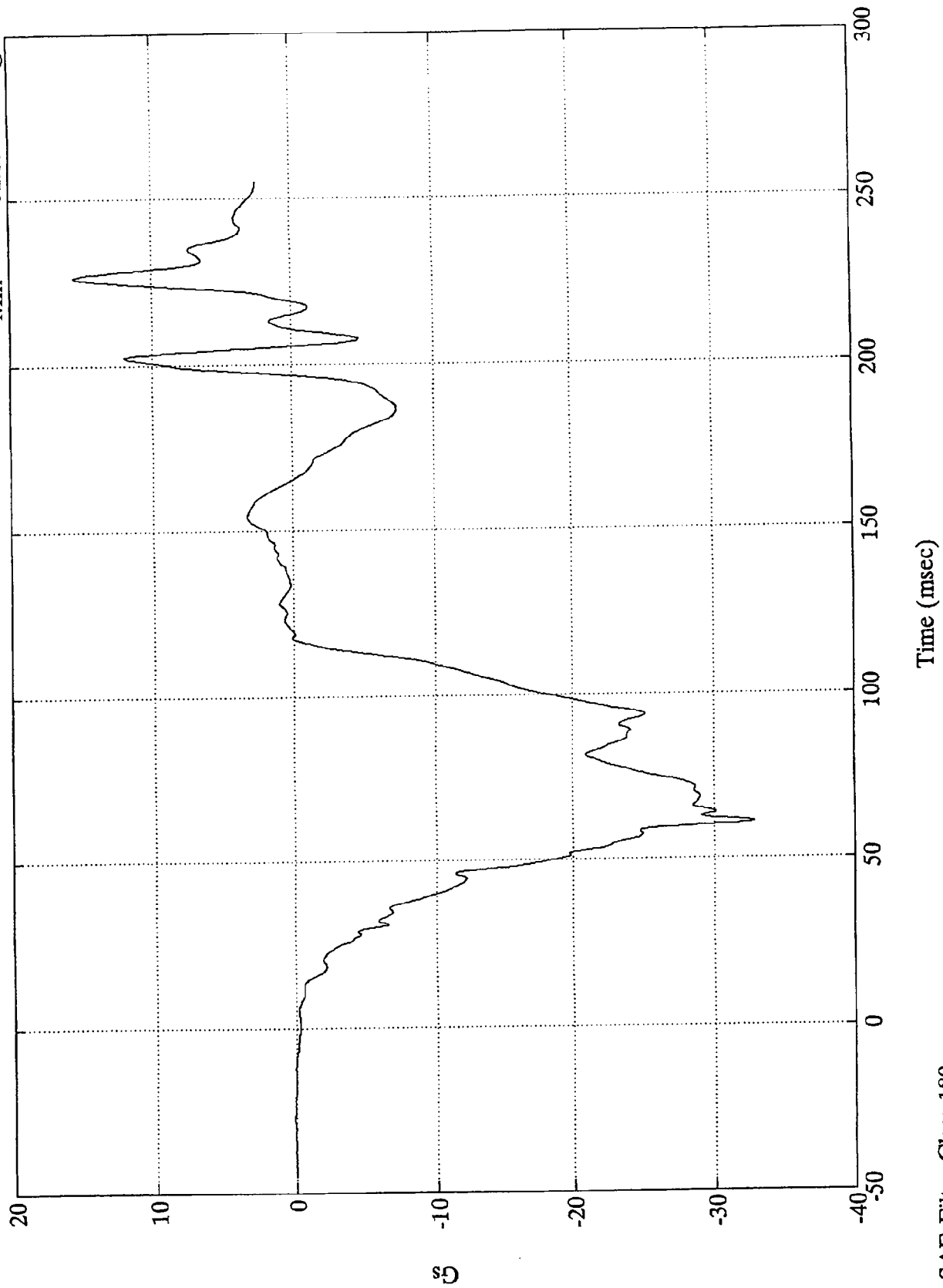


SAE Filter Class 1000

NHTSA 208 TEST - 1994 Chevrolet Lumina

LRP Chest X

Max = 15.60 Gs @ 226.32 msec
Min = -32.83 Gs @ 60.96 msec

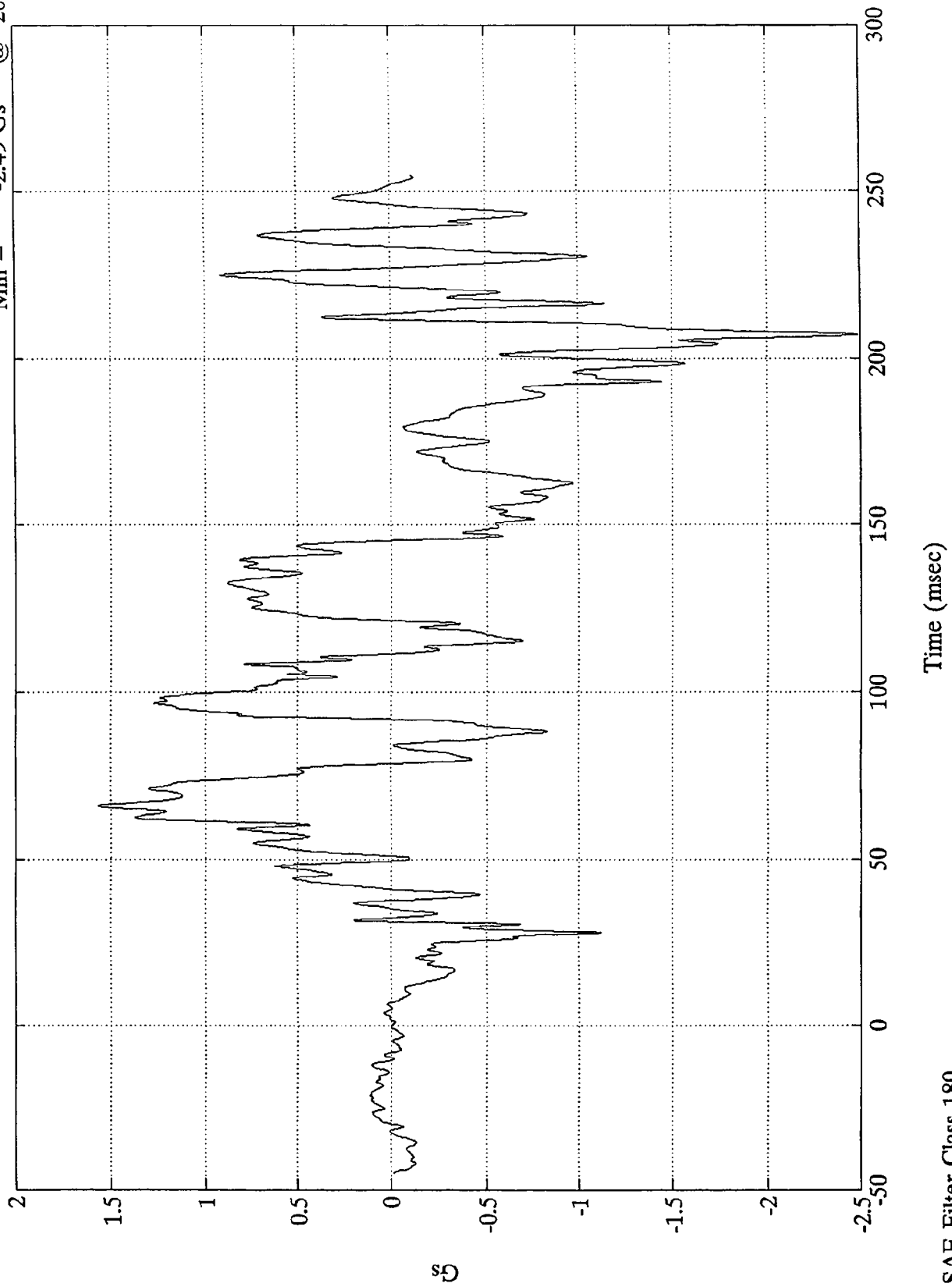


SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 1.57 Gs @ 65.87 msec
 Min = -2.49 Gs @ 207.11 msec

LRP Chest Y

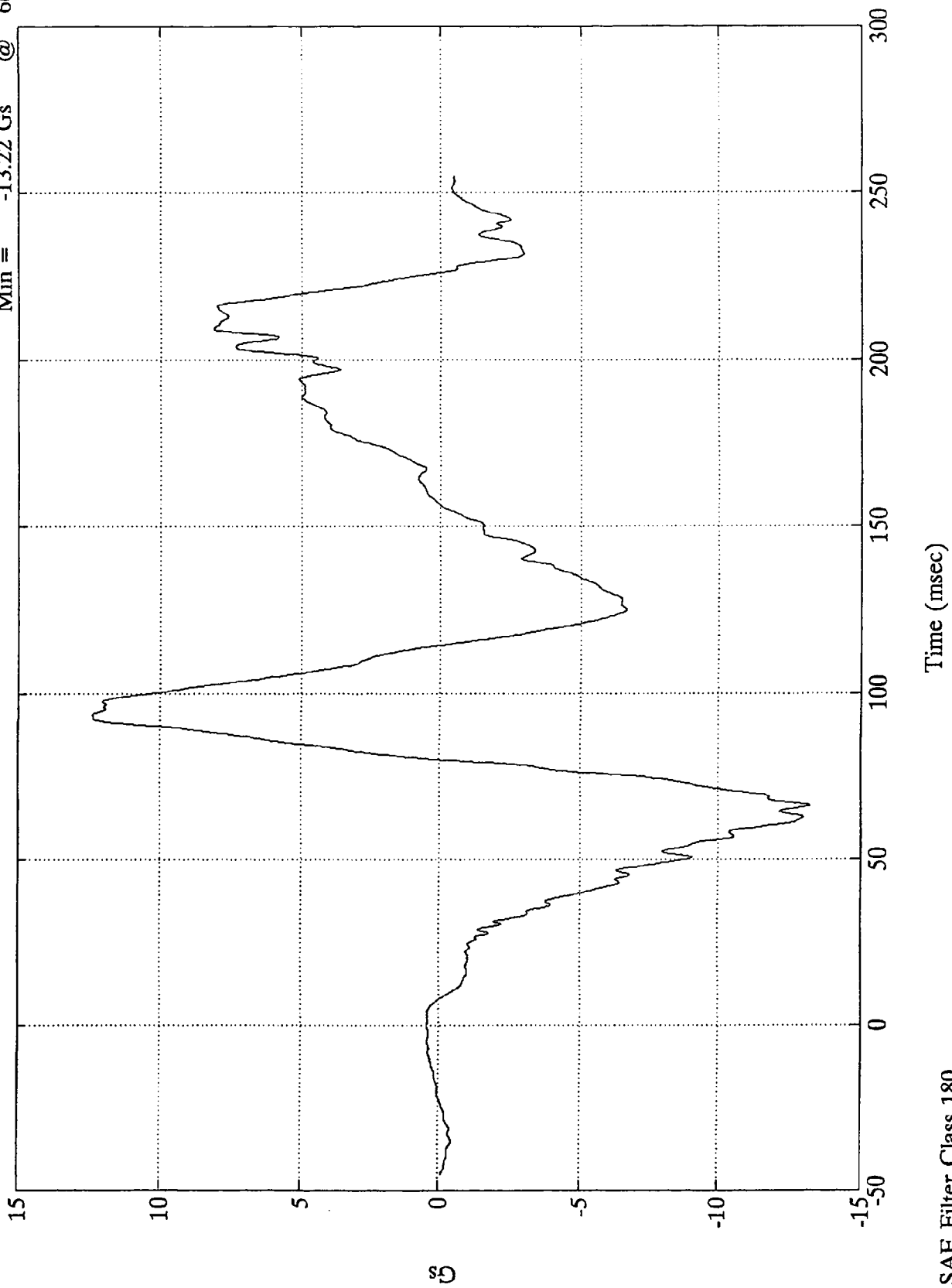


SAE Filter Class 180

NHTSA 208 TEST - 1994 Chevrolet Lumina

LRP Chest Z

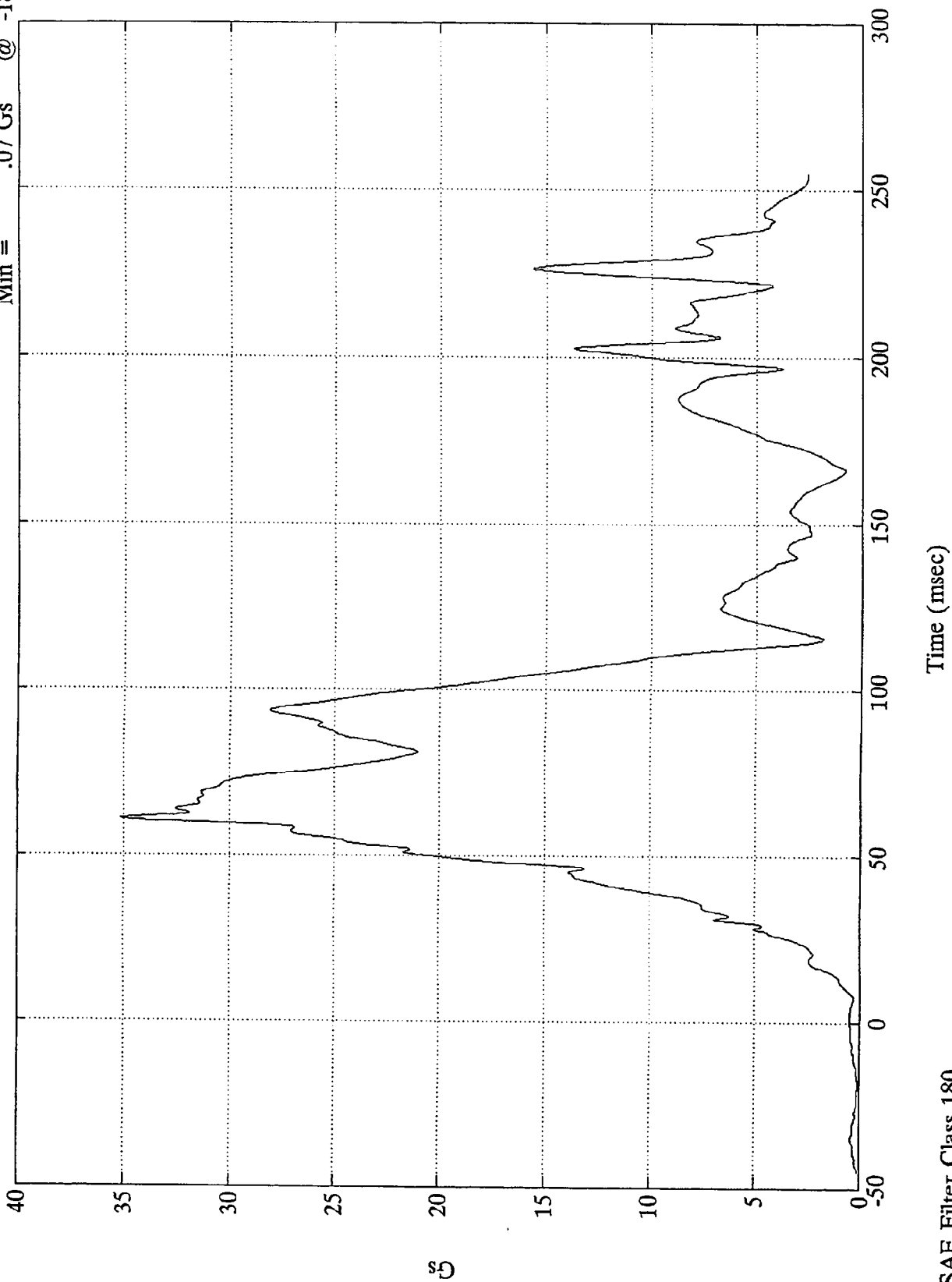
Max = 12.38 Gs @ 93.36 msec
Min = -13.22 Gs @ 66.11 msec



NHTSA 208 TEST - 1994 Chevrolet Lumina

Max = 35.16 Gs @ 60.96 msec
 Min = .07 Gs @ -18.24 msec

LRP Chest Resultant



SAE Filter Class 180

Appendix D

VEHICLE OWNERS MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

safety belts. Even if you're in a vehicle that has air bags, you still have to buckle up to get the most protection. That's true not only in frontal collisions, but especially in side and other collisions.

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

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

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

Safety belts are for everyone.



X1123

Safety Belt Reminder Light

The figure lights up as a reminder to buckle up. When the key is turned to "Run" or "Start," a chime will come on for about eight seconds to remind people to fasten their safety belts, unless the driver's safety belt is already buckled. The safety belt light will also come on and stay on until the driver's belt is buckled.

How To Wear Safety Belts Properly

Adults

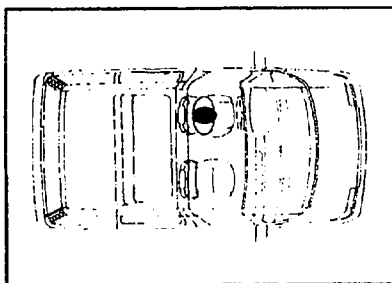
This section is only for people of adult size.

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

First, you'll want to know which restraint systems your vehicle has.

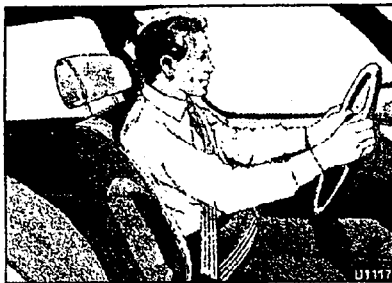
We'll start with the driver position.

Seats & Restraint Systems



Driver Position

This section describes the driver's restraint system.



U1177

Lap-Shoulder Belt

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

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



3. Pick up the latch plate and pull the belt across you. Don't let it get twisted.
4. Push the latch plate into the buckle until it clicks.

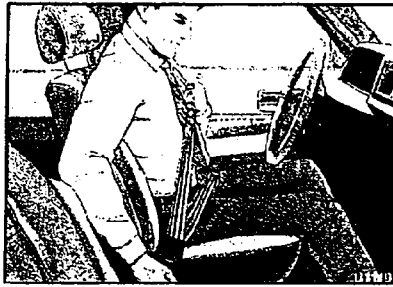


If the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle the belt.

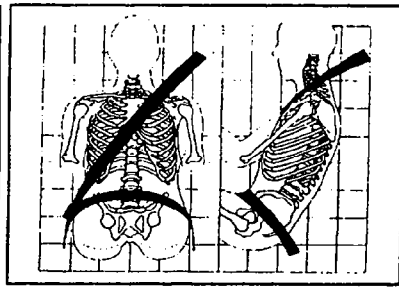
Pull up on the latch plate to make sure it is secure.

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

Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.



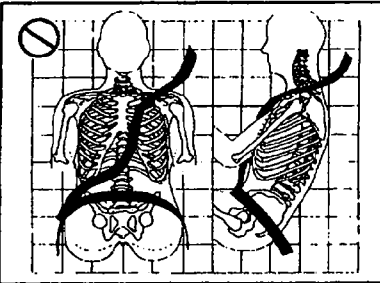
5. To make the lap part tight, pull down on the buckle end of the belt as you pull up on the shoulder belt.



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

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

Seats & Restraint Systems



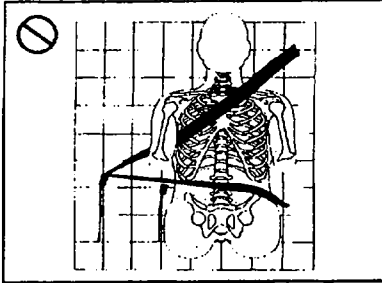
Lap-Shoulder Belt (CONT.)

Q: What's wrong with this?

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

CAUTION:

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

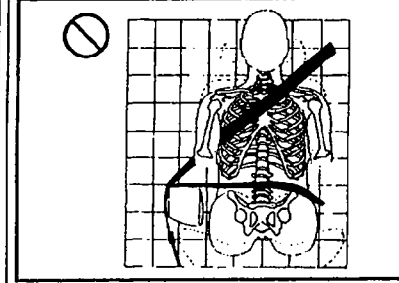


Q: What's wrong with this?

A: The belt is buckled in the wrong place.

CAUTION:

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

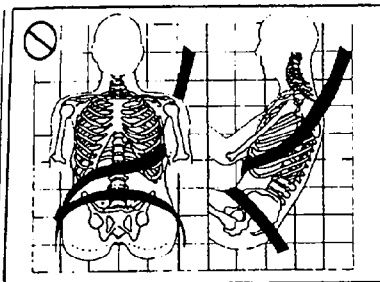


Q: What's wrong with this?

A: The belt is over an armrest.

CAUTION:

You can be seriously injured if your belt goes over an armrest like this. The belt would be much too high. In a crash, you can slide under the belt. The belt force would then be applied at the abdomen, not at the pelvic bones, and that could cause serious or fatal injuries. Be sure the belt goes under the armrests.

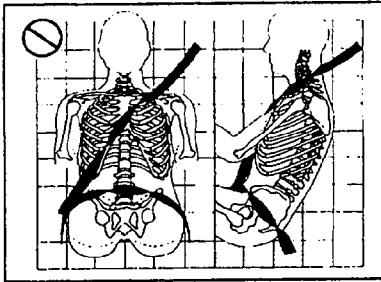


Q: What's wrong with this?

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

⚠ CAUTION:

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



Q: What's wrong with this?

A: The belt is twisted across the body.

⚠ CAUTION:

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



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

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

Seats & Restraint Systems

■ *Supplemental Inflatable Restraint System (Air Bag)*

This section explains the driver's Supplemental Inflatable Restraint (SIR) system, commonly referred to as an air bag. Here are the most important things to know:

⚠ CAUTION:

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

⚠ CAUTION:

Air bags inflate with great force, faster than the blink of an eye. If you're too close to an inflating air bag, it could seriously injure you. Safety belts help keep you in position for an air bag inflation in a crash. Always wear your safety belt, even with an air bag, and the driver should sit as far back as possible while still maintaining control of the vehicle.

⚠ CAUTION:

When an air bag inflates, there is dust in the air. This dust could cause breathing problems for people with a history of asthma or other breathing trouble. To avoid this, everyone in the vehicle should get out as soon as it is safe to do so. If you have breathing problems but can't get out of the vehicle after an air bag inflates, then get fresh air by opening a window or door.

⚠ CAUTION:

Don't put anything on, or attach anything to, the driver's air bag. Also, don't put anything (such as pets or objects) between the driver and the driver air bag. If something is between an occupant and an air bag, it could affect the air bag, or, worse, it could cause injury.

AIR BAG



Air Bag Readiness Light

There is an air bag readiness light on the instrument panel, which shows "AIR BAG" on it. The system checks for electrical malfunctions, and the light tells you if there is a problem.

You will see this light flash for a few seconds when you turn your ignition to "ON". Then the light should go out, which means the system is ready.

Remember, if the air bag readiness light doesn't come on when you start your vehicle, or stays on, or comes on when you are driving, your air bag system may not work properly. Have your vehicle serviced right away.

How The Air Bag System Works

Where is the air bag?

The driver's air bag is in the middle of the steering wheel.

When is an air bag expected to inflate?

The air bag is designed to inflate in moderate to severe frontal or near-frontal crashes. The air bag will only inflate if the velocity of the impact is above the designed threshold level. When impacting straight into a wall that does not move or deform, the threshold level for most GM vehicles is between 9 and 15 mph (14 and 23 km/h). However, this velocity threshold depends on the vehicle design

and may be several miles-per-hour faster or slower. In addition, this threshold velocity will be considerably higher if the vehicle strikes an object such as a parked car which will move and deform on impact. The air bag is also not designed to inflate in rollovers, side impacts, or rear impacts where the inflation would provide no occupant protection benefit.

In any particular crash, the determination of whether the air bag should have inflated cannot be based solely on the level of damage on the vehicle(s). Inflation is determined by the angle of the impact and the vehicle's deceleration, of which vehicle damage is only one indication. Repair cost is not a good indicator of whether an air bag should have deployed.

What makes an air bag inflate?

In a frontal impact of sufficient severity, the air bag sensing system detects that the vehicle is suddenly stopping as a result of a crash. The sensing system triggers a chemical reaction of the sodium azide sealed in the inflator. The reaction produces nitrogen gas, which inflates the cloth bag. The inflator, cloth bag, and

Seats & Restraint Systems

How The Air Bag System Works (CONT.)

related hardware are all part of the air bag inflator module packed inside the steering wheel.

How does an air bag restrain?

In moderate to severe frontal or near-frontal collisions, even belted occupants can contact the steering wheel. The air bag supplements the protection provided by safety belts. Air bags distribute the force of the impact more evenly over the occupant's upper body, stopping the occupant more gradually. But air bags would not provide protection in many types of collisions, including rollovers and rear and side impacts, primarily because an occupant's motion is not toward the air bag. Air bags should never be regarded as anything more than a supplement to safety belt protection in moderate to severe frontal and near-frontal collisions.

What will you see after an air bag inflation?

After the air bag has inflated, it will then quickly deflate. This occurs so quickly that some people may not even realize that the air bag inflated. Some components of the air bag module in the steering wheel hub may be hot for a short time, but the portion of the bag that comes into contact with you will not be hot to the touch. There will be small amounts of smoke and dust coming from vents in the deflated air bag. The air bag will not impede the driver's vision or ability to steer the vehicle, nor will it hinder the occupants from exiting the vehicle.

- The air bag is designed to inflate only once. After it inflates, you'll need some new parts for your air bag system. If you don't get them, the air bag system won't be there to help protect you in another crash. A new system will include the air bag module and possibly other parts. The service manual has information about the need to replace other parts.
- Your vehicle is equipped with a diagnostic module, which records information about the air bag system if the air bag deploys during a crash. The module records information about the readiness of the system, which sensors activated the deployment, and whether the driver's safety belt was in use.
- Let only qualified technicians work on your air bag system. Improper service can mean that your air bag system won't work properly. See your dealer for service.

NOTICE:

If you damage the cover for the driver's air bag, it may not work properly. You may have to replace the air bag on the steering wheel. Do not open or break the air bag cover.

Is the smoke from an air bag inflation harmful?

The particles emitted during air bag inflation are not harmful to most people. Some people with respiratory ailments may experience difficulty breathing if they stay in the vehicle with the windows closed after air bag inflation. So, if your air bag inflates, you and any passengers should exit the vehicle if and when it is safe to do so. If you or your passengers can't get out of the vehicle, try to get fresh air by opening a window, turning on the fan, or opening a door.

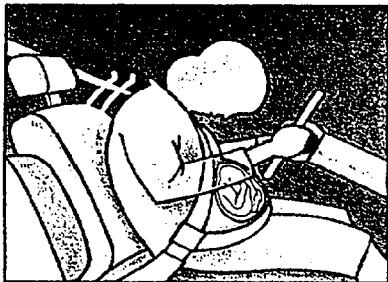
Servicing Your Air Bag-Equipped Chevrolet

The air bag affects how your Chevrolet should be serviced. There are parts of the air bag system in several places around your vehicle. You don't want the system to inflate while someone is working on your vehicle. Your Chevrolet dealer and the 1994 Service Manual have information about servicing your vehicle and the air bag system. The air bag system does not need regular maintenance.

⚠ CAUTION:

For up to 2 minutes after the ignition key is turned off and the battery is disconnected, an air bag can still inflate during improper service. You can be injured if you are close to an air bag when it inflates. Avoid wires wrapped with yellow tape, or yellow connectors. They are probably part of the air bag system. Be sure to follow proper service procedures, and make sure the person performing work for you is qualified to do so.

Seats & Restraint Systems

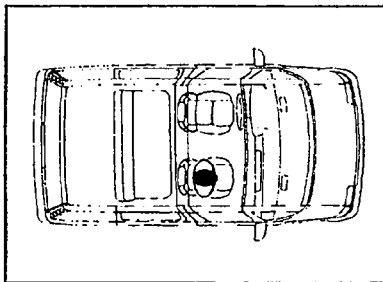


■ Safety Belt Use During Pregnancy

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

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

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



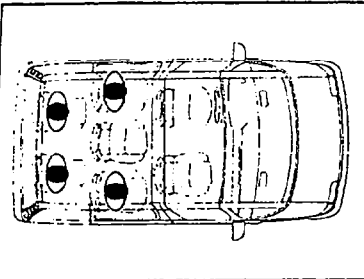
■ Right Front Passenger Position

The right front right passenger's safety belt works the same way as the driver's safety belt. See "Driver Position," earlier in this part.

■ Rear Seat Passengers

It's very important for rear seat passengers to buckle up! Accident statistics show that unbelted people in the rear seat are hurt more often in crashes than those who are wearing safety belts.

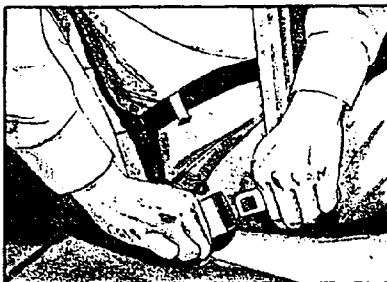
Rear passengers who aren't safety belted can be thrown out of the vehicle in a crash. And they can strike others in the vehicle who are wearing safety belts.



Rear Seat Outside Passenger Positions

Lap-Shoulder Belt

The positions next to the windows have lap-shoulder belts. Here's how to wear one properly.



1. Pick up the latch plate and pull the belt across you. Don't let it get twisted.
2. Push the latch plate into the buckle until it clicks.



If the belt stops before it reaches the buckle, tilt the latch plate and keep pulling until you can buckle it.

Pull up on the latch plate to make sure it is secure.

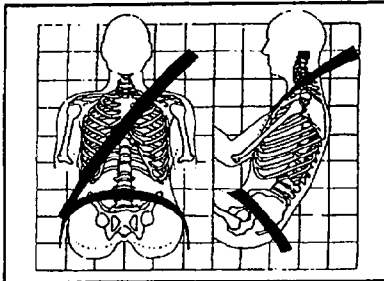
If the belt is not long enough, see "Safety Belt Extender" at the end of this section. Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.

Seats & Restraint Systems



Lap-Shoulder Belt (CONT.)

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

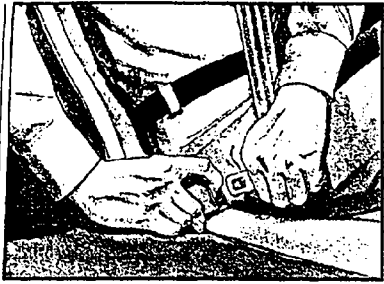


The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even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

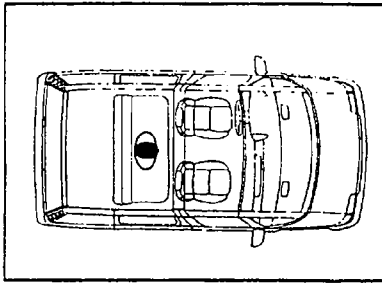
The safety belt locks if there's a sudden stop or a crash.

CAUTION:

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

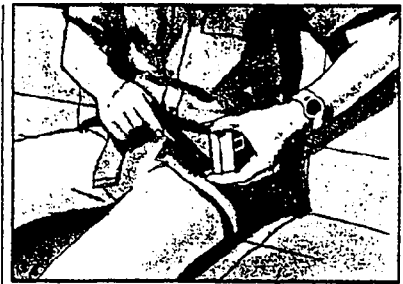


- To unlatch the belt, just push the button on the buckle.



■ *Center Passenger Position (Bench Seat)*

If your vehicle has a rear bench seat, someone can sit in the center position.



Lap Belt

When you sit in the center position of the bench seat, you have a lap safety belt, which has no retractor.

To make the belt longer, tilt the latch plate and pull it along the belt.

Seats & Restraint Systems

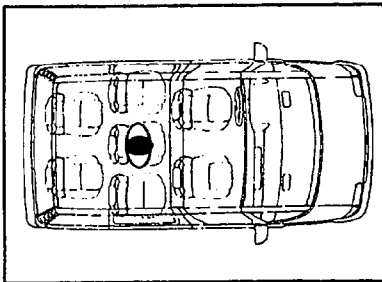


■ *Center Passenger Position (Bench Seat)* (CONT.)

To make the belt shorter, pull its free end as shown until the belt is snug.

Buckle, position and release it the same way as the lap part of a lap-shoulder belt. If the belt isn't long enough, see "Safety Belt Extender" at the end of this section.

Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.



■ *Center Passenger Position (Bucket Seat)*

Lap Belt

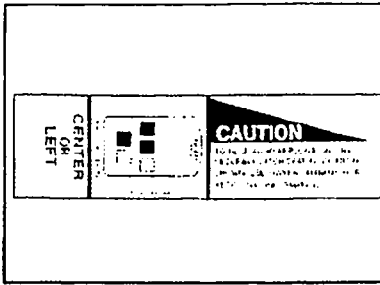
When you sit in the center position bucket seat, you have a lap safety belt which has a retractor.



1. Pick up the latch plate and, in a single motion, pull the belt across you. Don't let it get twisted.
2. Push the latch plate into the buckle until it clicks. If the belt stops before it reaches the buckle, let it go back all the way and start again. Pull up on the latch plate to make sure it is secure.
3. Feed the lap belt into the retractor to tighten it.



4. Position and release it the same way as the lap part of a lap-shoulder belt. If the belt isn't long enough, see "Safety Belt Extender" at the end of this section. Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.



The center position bucket seat is a "Center or Left" type seat. Because it is the only bucket seat with a lap belt, and has a buckle on only one side, there are certain places a "Center or Left" type bucket seat should, and should not, be used. See "Seats" in the Index. If the "Center or Left" bucket seat is used on the left side of the vehicle, the person sitting there should use the lap-shoulder belt. It works the same way as the driver's safety belt. See "Driver Position" in the Index.



■ Children

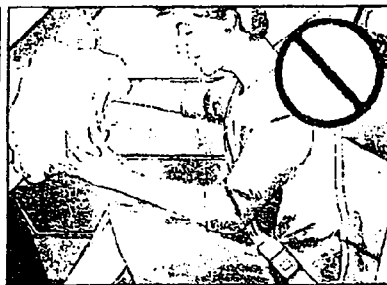
Everyone in a vehicle needs protection! That includes infants and all children smaller than adult size. In fact, the law in every state in the United States and in every Canadian province says children up to some age must be restrained while in a vehicle.

Seats & Restraint Systems

Smaller Children and Babies

⚠ CAUTION:

Smaller children and babies should always be restrained in a child or infant restraint. The instructions for the restraint will say whether it is the right type and size for your child. A very young child's hip bones are so small that a regular belt might not stay low on the hips, as it should. Instead, the belt will likely be over the child's abdomen. In a crash the belt would apply force right on the child's abdomen, which could cause serious or fatal injuries. So, be sure that any child small enough for one is always properly restrained in a child or infant restraint.



⚠ CAUTION:

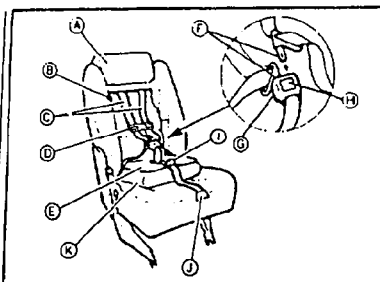
Never hold a baby in your arms while riding in a vehicle. A baby doesn't weigh much -- until a crash. During a crash a baby will become so heavy you can't hold it. For example, in a crash at only 25 mph (40 km/h), a 12-pound (5.5 kg) baby will suddenly become a 240-pound (110 kg) force on your arms. The baby would be almost impossible to hold.

CAUTION: (Continued)



CAUTION: (Continued)

Secure the baby in an infant restraint.



■ Built-In Child Restraint (OPTION)

If you have a rear seat with the optional built-in child restraint, refer to this picture to become familiar with the parts of each child seat and 5-point harness listed below:

- A. Child Head Restraint
- B. Head Restraint Release Strap

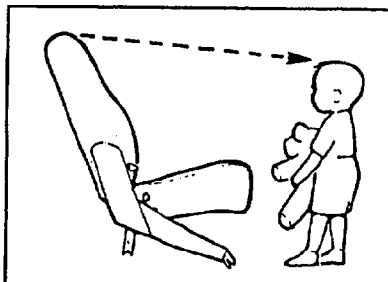
- C. Shoulder Harness Straps
- D. Shoulder Harness Clip
- E. Removable Pad
- F. Seat Belt Latch Plates
- G. Buckle
- H. Seat Belt Buckle Release Button (Red)
- I. Shoulder Harness Release Strap (Black)
- J. Shoulder Harness Adjustment Strap (Grey)
- K. Child Restraint Cushion

This child restraint system conforms to all applicable Federal motor vehicle safety standards.

This child restraint is designed for use only by children who weigh between 20 and 40 pounds (9 and 18 kg) and whose height is 40 inches (102 cm) or less and who are capable of sitting upright alone.

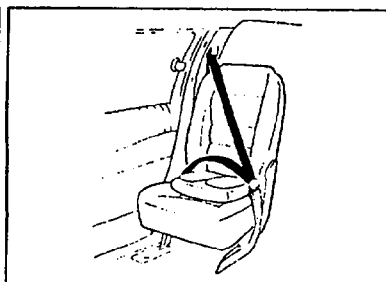
In addition, the child must be one year old or more and at least 28 inches (71 cm) in height. It is important to use an approved, rear-facing infant restraint for a full year to allow the neck and spine to develop enough to support the weight of the child's head in the event of a collision.

Seats & Restraint Systems



■ Built-In Child Restraint (OPTION) (CONT.)

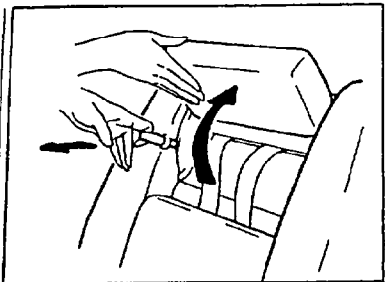
To make sure that the child is tall enough, compare the child's standing height to the top surface of the bucket seat, which is about 29 inches (74 cm) from the floor.



The booster seat can be used by children over 40 pounds (18 kg) or whose shoulders are above the shoulder belt anchorages of the 5-point child restraint harness. The vehicle lap-shoulder belt is used instead of the 5-point harness system. If a child's shoulders are higher than the shoulder belt anchorages while using the 5-point harness, the spine could be injured in a collision.

WARNING! FAILURE TO FOLLOW THE MANUFACTURER'S INSTRUCTIONS ON THE USE OF THIS CHILD RESTRAINT SYSTEM CAN RESULT IN YOUR CHILD STRIKING THE VEHICLE'S INTERIOR DURING A SUDDEN STOP OR CRASH. SNUGLY ADJUST THE BELTS PROVIDED WITH THIS CHILD RESTRAINT AROUND YOUR CHILD.

Just like the other restraint systems in your vehicle, your built-in child restraint needs to be periodically checked and may need to have parts replaced after a crash. See "Checking Your Restraint Systems" and "Replacing Seat and Restraint System Parts after a Crash" in the Index.



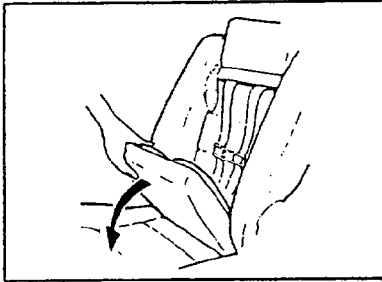
To Use the Built-in Child Restraint

1. Pull the child head restraint release strap and raise the head restraint until you hear the latch click.

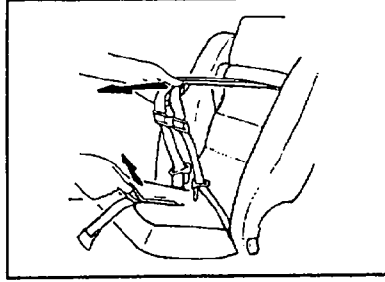


CAUTION:

The child head restraint is not for use by an adult. Use of this head restraint by an adult could result in injury in the event of a collision.

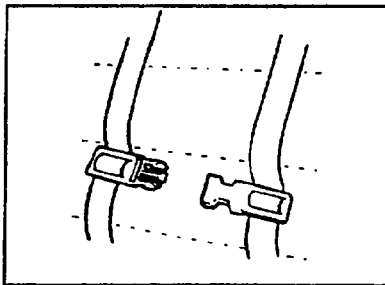


2. Lower the child restraint cushion.



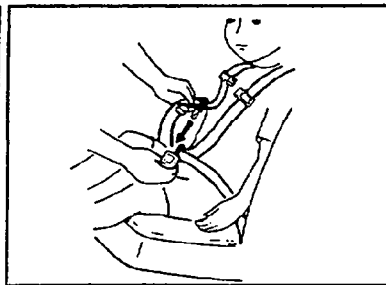
3. Before placing the child in the child restraint, add slack to the shoulder harness. Pull the black shoulder harness release strap firmly. At the same time pull both shoulder harness straps through the slots in the seatback as shown.

Seats & Restraint Systems



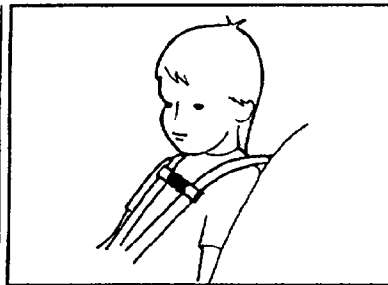
To Use the Built-in Child Restraint (CONT.)

4. Separate the halves of the shoulder harness clip.

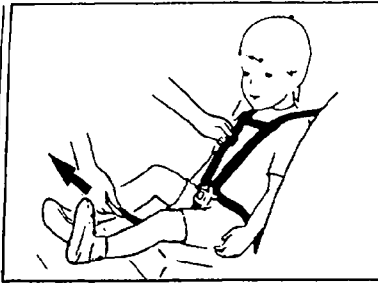


5. Place the child in the child restraint and put a shoulder harness strap over each shoulder. Insert both seat belt latch plates into the buckle and pull up on them to make sure they are firmly latched.

Be sure that the seat buckle is free of foreign objects that may prevent you from properly latching the latch plates. If an object is in the opening, see your Pontiac dealer for service before using the child restraint.

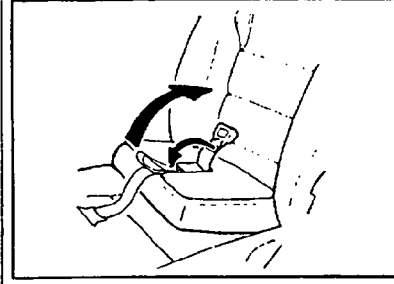


6. Fasten the two halves of the shoulder harness clip together and put it two to three inches (5-8 cm) below the child's chin. The purpose of the clip is to keep the shoulder harness straps positioned correctly on the shoulders.



7. Pull the shoulder harness adjustment strap (grey) firmly until the shoulder harness straps are snug against the child's shoulders.
8. To release the child from the harness, separate the halves of the shoulder harness clip. Then push the red release button in the buckle. Move the shoulder harness straps to the side and remove the child.

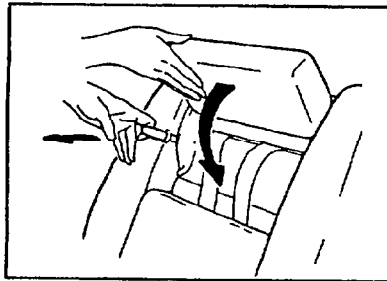
If you expect that the child will sleep while riding, a U-shaped pillow that supports the child's chin may be helpful in providing additional comfort. Such devices may be found in the child restraint section of major toy stores or other stores where children's accessories are sold.



To Store the Built-in Child Restraint

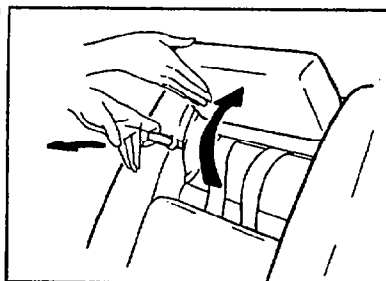
1. Make sure that the crotch strap is held flush to the child restraint cushion with the fastener strip. Also be sure the shoulder harness adjustment strap (grey) is folded up in the seat. This will allow the cushion to fold completely into the seatback. Raise the cushion.

Seats & Restraint Systems



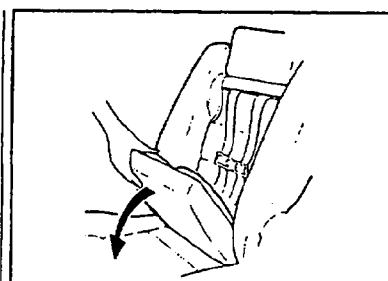
To Store the Built-in Child Restraint (CONT.)

2. Unlatch the child head restraint by pulling the release strap. Lower the head restraint and press it firmly into the seatback until you hear the latch click.



To Use as a Booster Seat

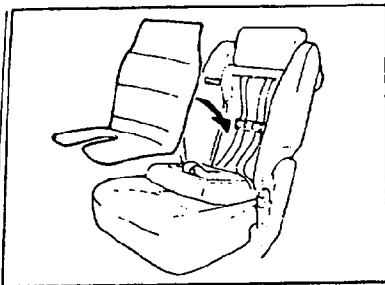
1. Pull the head restraint release strap and raise the head restraint until you hear the latch click.



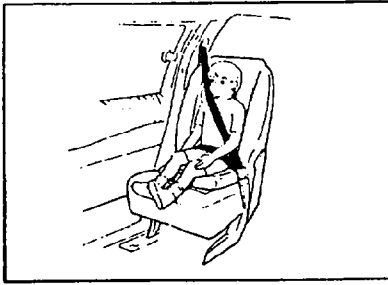
2. Lower the child restraint cushion.

CAUTION:

The child head restraint is not for use by an adult. Use of this head restraint by an adult could result in injury in the event of a collision.



3. Store the 5-point child restraint harness behind the removable pad. The pad is held in place by fastener strips.



4. Place the child on the cushion and fasten the vehicle lap-shoulder belt around the child.
5. To release the child from the vehicle lap-shoulder belt, push the red button on the buckle.

■ Child Restraints

Be sure to follow the instructions for the restraint. You may find these instructions on the restraint itself or in a booklet, or both. These restraints use the belt system in your vehicle, but the child also has to be secured within the restraint to help reduce the chance of personal injury. The instructions that come with the infant or child restraint will show you how to do that.

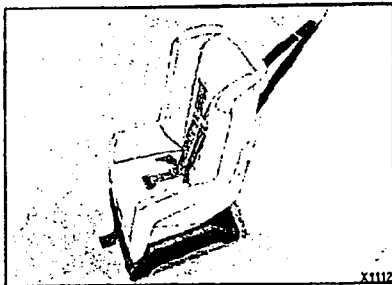
Where to Put the Restraint

Accident statistics show that children are safer if they are restrained in the rear rather than the front seat. We at General Motors therefore recommend that you put your child restraint in the rear seat unless the child is an infant and you're the only adult in the vehicle. In that case, you might want to secure the restraint in the front seat where you can keep an eye on the baby.

Wherever you install it, be sure to secure the child restraint properly.

Keep in mind that an unsecured child restraint can move around in a collision or sudden stop and injure people in the vehicle. Be sure to properly secure any child restraint in your vehicle -- even when no child is in it.

Seats & Restraint Systems



Top Strap

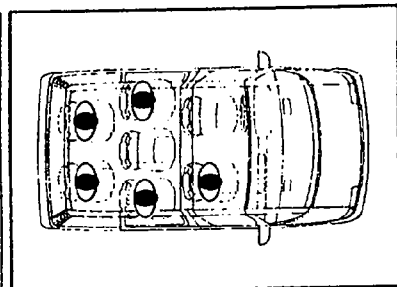
If your child restraint has a top strap, it should be anchored.



If your vehicle has third row seats, anchor brackets for the second row outside positions are located just above the place where the third row lap-shoulder belts meet the floor. There's a vinyl sleeve there; to get to the bracket, push this vinyl sleeve aside slightly. Anchor the top strap to the bracket.

If your vehicle does not have third row seats and belts, or if you need to have an anchor bracket installed for any additional passenger seat position, you can ask your Chevrolet dealer to put it in for you. If you want to install an anchor bracket yourself, your dealer can tell you how to do it.

Once you have the top strap anchored, you'll be ready to secure the child restraint itself.

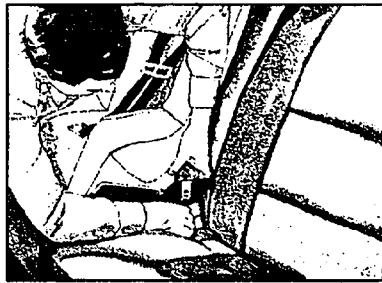


Securing a Child Restraint in an Outside Position

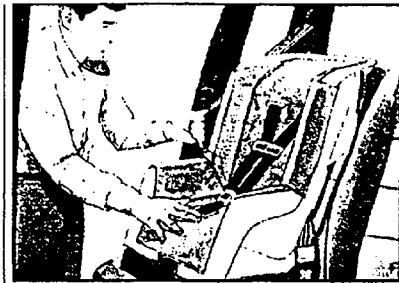
You'll be using the lap-shoulder belt. See the earlier section about the top strap if the child restraint has one.

1. Put the restraint on the seat. Follow the instructions for the child restraint.
2. Secure the child in the child restraint as the instructions say.
3. Pick up the latch plate, and run the lap and shoulder portions of the vehicle's safety belt through or around the restraint. The child restraint instructions will show you how. Tilt the latch plate to adjust the belt if needed.

If the shoulder belt goes in front of the child's face or neck, put it behind the child restraint.

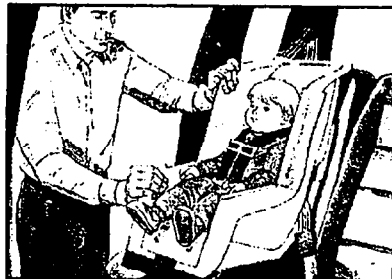


4. Buckle the belt. Make sure the release button is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.



5. To tighten the belt, pull up on the shoulder belt while you push down on the child restraint.

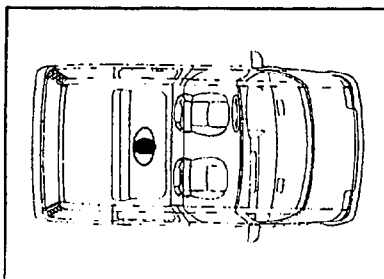
Seats & Restraint Systems



Securing a Child Restraint in an Outside Position (CONT.)

6. Push and pull the child restraint in different directions to be sure it is secure.

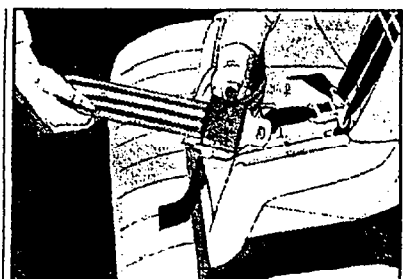
To remove the child restraint, just unbuckle the vehicle's safety belt and let it go back all the way. The safety belt will move freely again and be ready to work for an adult or larger child passenger.



Securing a Child Restraint in the Center Seat Position (Bench Seat)

When you secure a child restraint in a center seating position, you'll be using the lap belt.

If the child restraint has a top strap, see "Top Strap" earlier in this section.



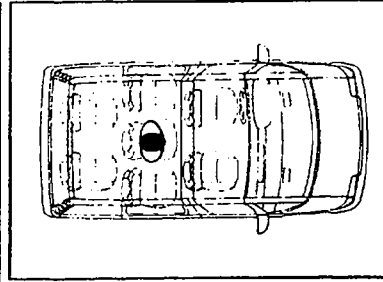
1. Make the belt as long as possible by tilting the latch plate and pulling it along the belt.
2. Put the restraint on the seat. Follow the instructions for the child restraint.
3. Secure the child in the child restraint as the instructions say.
4. Run the vehicle's safety belt through or around the restraint. The child restraint instructions will show you how.



5. Buckle the belt. Make sure the release button is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.
6. To tighten the belt, pull its free end while you push down on the child restraint.

7. Push and pull the child restraint in different directions to be sure it is secure. If the child restraint isn't secure, turn the latch plate over and buckle it again. Then see if it is secure. If it isn't, secure the restraint in a different place in the vehicle and contact the child restraint maker for their advice about how to attach the child restraint properly.

To remove the child restraint, just unbuckle the vehicle's safety belt. It will be ready to work for an adult or larger child passenger.



Securing a Child Restraint in the Center Seat Position (Bucket Seat)

You'll be using the lap belt. See the earlier section about the top strap if the child restraint has one.

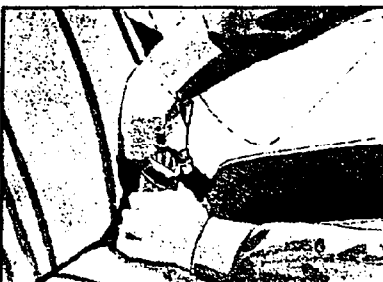
1. Put the restraint on the seat. Follow the instructions for the child restraint.
2. Secure the child in the child restraint as the instructions say.

Seats & Restraint Systems



Securing a Child Restraint in the Center Seat Position (Bucket Seat) (CONT.)

3. Pull the lap belt all the way out without stopping.



4. While holding it out, run the belt through or around the child restraint. The child restraint instructions will show you how.
5. Buckle the belt. Make sure the release button is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.



6. To tighten the belt, feed it back into the retractor while you push down on the child restraint.



7. Push and pull the child restraint in different directions to be sure it is secure.

To remove the child restraint, just unbuckle the vehicle's safety belt and let it go back all the way. The safety belt will move freely again and be ready to work for an adult or larger child passenger.



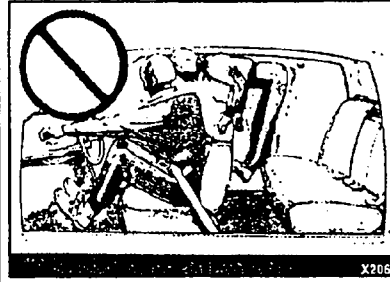
Larger Children

Children who have outgrown child restraints should wear the vehicle's safety belts.

If you have the choice, a child should sit next to a window so the child can wear a lap-shoulder belt and get the additional restraint a shoulder belt can provide.

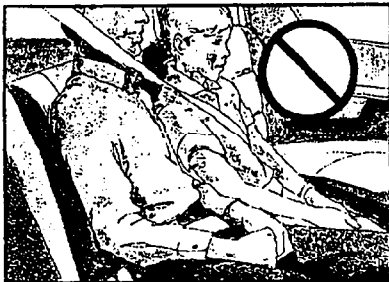
Accident statistics show that children are safer if they are restrained in the rear seat. But they need to use the safety belts properly.

- Children who aren't buckled up can be thrown out in a crash.



- Children who aren't buckled up can strike other people who are.

Seats & Restraint Systems



Larger Children (CONT.)

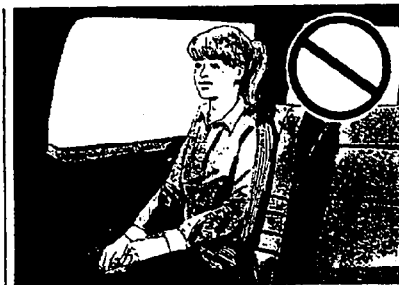
CAUTION:

Never do this.

Here two children are wearing the same belt. The belt can't properly spread the impact forces. In a crash, the two children can be crushed together and seriously injured. A belt must be used by only one person at a time.

Q: What if a child is wearing a lap-shoulder belt, but the child is so small that the shoulder belt is very close to the child's face or neck?

A: Move the child toward the center of the vehicle, but be sure that the shoulder belt still is on the child's shoulder, so that in a crash the child's upper body would have the restraint that belts provide. If the child is so small that the shoulder belt is still very close to the child's face or neck, you might want to place the child in a seat that has a lap belt, if your vehicle has one.



CAUTION:

Never do this.

Here a child is sitting in a seat that has a lap-shoulder belt, but the shoulder part is behind the child. If the child wears the belt in this way, in a crash the child might slide under the belt. The belt's force would then be applied right on the child's abdomen. That could cause serious or fatal injuries.

Wherever the child sits, the lap portion of the belt should be worn low and snug on the hips, just touching the child's thighs.

This applies belt force to the child's pelvic bones in a crash.

■ **Safety Belt Extender**

If the vehicle's safety belt will fasten around you, you should use it.

But if a safety belt isn't long enough to fasten, your dealer will order you an extender. It's free. When you go in to order it, take the heaviest coat you will wear, so the extender will be long enough for you. The extender will be just for you, and just for the seat in your vehicle that you choose. Don't let someone else use it, and use it only for the seat it is made to fit. To wear it, just attach it to the regular safety belt.

■ **Checking Your Restraint Systems**

Now and then, make sure all your belts, buckles, latch plates, retractors, anchorages and reminder systems are working properly.

If your vehicle has a built-in child restraint, also periodically make sure the child head restraint, harness straps, latch plates, buckle, clip and anchorages are working properly. Look for any other loose or damaged restraint system parts. If you see anything that might keep a restraint system from doing its job, have it repaired.

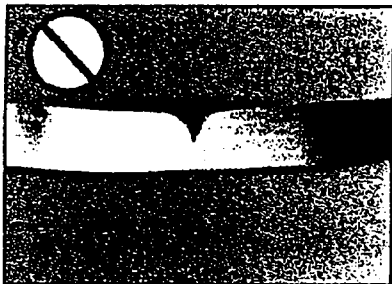
■ **Replacing Seat and Restraint System Parts After a Crash**

If you've had a crash, do you need new safety belts or built-in child restraint parts?

After a very minor collision, nothing may be necessary. But if the safety belts or built-in child restraint harness straps were stretched, as they would if worn during a more severe crash, then you need new safety belts or harness straps.

If safety belts or built-in child restraint harness straps are cut or damaged, replace them. Collision damage also may mean you will need to have safety belt, built-in child restraint or seat parts repaired or replaced. New parts and repairs may be necessary even if the safety belt or built-in child restraint wasn't being used at the time of the collision.

Seats & Restraint Systems



■ **Replacing Seat and Restraint System Parts After a Crash (CONT.)**

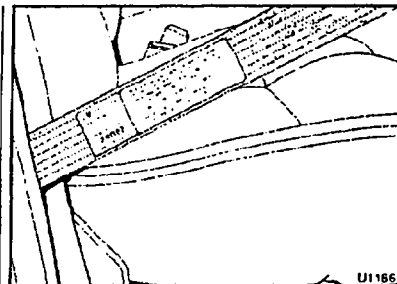
Q: What's wrong with this?

A: The belt is torn.

Torn or frayed belts may not protect you in a crash. They can rip apart under impact forces. If a belt is torn or frayed, get a new one right away.

If your vehicle has the built-in child restraint, torn or frayed harness straps can rip apart under impact forces just like torn or frayed safety belts can. They may not protect a child in a crash. If a harness strap is torn or frayed, get a new harness right away.

Before replacing any safety belt, see your dealer for the correct part number. You'll need the model year and model number for your vehicle. The model year is on your title and registration. And you can find the model number on the Certification/Tire label of your vehicle. See "Certification/Tire Label" in the Index.



The model number on the replacement belt must be listed on the safety belt you want to replace.

Pull the shoulder belt all the way out to see this label.

Appendix E

BUILT-IN CHILD RESTRAINT SYSTEM TESTS - FMVSS NO. 213

General Motors Corporation
Chevrolet Motor Division
Built-In Child Restraint

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Child Restraint Systems Tests - FMVSS 213 General Motors Corporation Chevrolet Motor Division, Built-In Child Restraint		5. Report Date September 1994	6. Performing Organization Code
7. Author(s) Robert F. Hathaway		8. Performing Organization Report No.	
9. Performing Organization Name and Address Calspan Advanced Technology Center 4455 Genesee Street Buffalo, New York 14225		10. Work Unit No.	11. Contract or Grant No. DTNH22-93-D-11089
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh, S.W. Washington, D.C. 20590		13. Type of Report and Period Covered Final Report	
14. Sponsoring Agency Code			
15. Supplementary Notes Reviewed by : <u>Robert F. Hathaway</u> Program Manager Approved by : <u>David Roberts</u> Head, Safety Research Section Transportation Sciences Center			
16. Abstract This report contains the results of tests performed in accordance with FMVSS 213, Child Restraint Systems, on the General Motors Corporation, Chevrolet Motor Division, Built-In Child Restraint. The child restraint appears to comply with all the requirements of FMVSS 213. Final determination of compliance is made by the National Highway Traffic Safety Administration.			
17. Key Words FMVSS 213 Child Restraint Systems Compliance Testing		18. Distribution Statement	
19. Security Classif. (of this report) UNCLASSIFIED	20. Security Classif. (of this page) UNCLASSIFIED	21. No. of Pages	22. Price

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<u>Section</u>		<u>Page No.</u>
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II	INTRODUCTION AND SUMMARY	2-1
III	INSPECTION AND TEST DATA	3-1
APPENDIX A	EQUIPMENT LIST AND CALIBRATION SCHEDULES	A-1
APPENDIX B	PHOTOGRAPHS OF EQUIPMENT	B-1

SECTION I
PURPOSE AND TEST PROCEDURE

Purpose: The purpose of the test was to determine if the production built-in child restraint systems in the 1994 Chevrolet Lumina Minivan met the requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 213, Child Restraint Systems.

Test Procedure: The "Calspan Operating Test Procedure for FMVSS No. 213", submitted to and approved by the Office of Vehicle Safety Compliance, National Highway Traffic Safety Administration, contains the specific procedures used to conduct this test. This procedure shall not be interpreted to be in conflict with any portion of FMVSS No. 213 and amendments in effect as noted in the applicable contract.

SECTION II

INTRODUCTION AND SUMMARY

This report presents all of the FMVSS 213 compliance inspection and test data obtained on the General Motors Corporation, Chevrolet Motor Division, Built-In Child Restraint system. This test was performed in conjunction with a full-scale FMVSS 208 compliance test of a 1994 Chevrolet Lumina minivan. Two production built-in child restraint systems were simultaneously tested in the forward-facing, upright configuration. The results from all inspections and tests indicate that the General Motors Corporation, Chevrolet Motor Division, Built-In Child Restraint complied with all of the requirements of FMVSS 213.

Restraint system inspection and, full-scale dynamic testing were performed by Calspan Advanced Technology Center (ATC). Compliance test data sheets for all tests are found in Section III of this report.

SECTION III

INSPECTION AND TEST DATA

FMVSS 213 - BUILT-IN CHILD RESTRAINT SYSTEMS

Child Restraint System Identification

Manufacturer:

Name General Motors Corporation

Address Chevrolet Motor Division

Model No. Built-In

Group No. N/A

1. Item Code 001-CMD-01-DTUD (1)

Date of Manufacture N/A

Test No. 1441

2. Item Code 001-CMD-02-DTUP (1)

Date of Manufacture N/A

Test No. 1441

3. Item Code _____

Date of Manufacture _____

Test No. _____

4. Item Code _____

Date of Manufacture _____

Test No. _____

5. Item Code _____

Date of Manufacture _____

Test No. _____

6. Item Code _____

Date of Manufacture _____

Test No. _____

Remarks: (1) The Chevrolet Motor Division, Built-In Child Restraint(s) is comprised of two separate units which are built into individual bucket-style seats, the units will be differentiated by the addition of a "D" or a "P" (for Driver's side or Passenger's side) to the end of the item code.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Labeling
(FMVSS 213, S5.5)

Date of Test 7/15/94 Item Code 001-CMD-01-DTUD
001-CAS-01-DTUP

Pass / Fail

S5.5.4

(a) Each built-in child restraint system other than a factory-installed built-in restraint shall be permanently labeled with the information specified in S5.5 (a) through (k). The information specified in S5.5 (a) through (j) shall be visible when the system is activated for use.

N/A (1)

(b) Each factory-installed built-in child restraint shall be permanently labeled with the information specified in S5.5.5 (f) through (j), so that the information is visible when the restraint is activated for use. The information shall also be included in the vehicle owner's manual.

Pass (2)

S5.5.5 The information specified in paragraphs (a) through (k) of this section that is required by S5.5.4 shall be stated in English and lettered in letters and numbers that are not smaller than 10-point type and are on a contrasting background.

N/A

The following information is included:

- (a) The model name or number of the system.
- (b) The manufacturer's name. A distributor's or dealer's name may be used instead if the distributor or dealer assumes all responsibility for all duties and liabilities imposed on the manufacturer with respect to the system by the National Traffic and Motor Vehicle Safety Act, as amended.

N/A

N/A

Remarks:

- (1) These restraints are factory-installed built-in units.
- (2) Labels may be seen in photographs presented in Appendix B.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Labeling (cont'd)

- (c) The statement: "Manufactured in _____," inserting the month and year of manufacture. N/A
- (d) The place of manufacture (city and State, or foreign country). However, if the manufacturer uses the name of the distributor or dealer, then it shall state the location (city and State, or foreign country) of the principle offices of the distributor or dealer. N/A
- (e) The statement: "This child restraint system conforms to all applicable Federal Motor Vehicle Safety Standards." N/A
- (f) One of the following statements, inserting the manufacturer's recommendations for the maximum weight and height of children who can safely occupy the system: Pass
- (i) THIS INFANT RESTRAINT IS DESIGNED FOR USE BY CHILDREN WHO WEIGH _____ POUNDS OR LESS AND WHOSE HEIGHT IS _____ INCHES OR LESS ; or
- (ii) THIS CHILD RESTRAINT IS DESIGNED FOR USE ONLY BY CHILDREN WHO WEIGH BETWEEN _____ AND _____ POUNDS AND WHOSE HEIGHT IS _____ INCHES OR LESS AND WHO ARE CAPABLE OF SITTING UPRIGHT ALONE ; or
- (iii) THIS CHILD RESTRAINT IS DESIGNED FOR USE ONLY BY CHILDREN WHO WEIGH BETWEEN _____ AND _____ POUNDS AND ARE BETWEEN _____ AND _____ INCHES IN HEIGHT.
- (g) The statement specified in paragraph (1), and if appropriate, the statement in paragraph (2). Pass
- (1) WARNING! FAILURE TO FOLLOW THE MANUFACTURER'S INSTRUCTIONS ON THE USE OF THIS CHILD RESTRAINT SYSTEM CAN RESULT IN YOUR CHILD STRIKING THE VEHICLE'S INTERIOR DURING A SUDDEN STOP OR CRASH.
- (2) In the case of each built-in child restraint system which is not intended for use in the motor vehicle at certain adjustment positions or under certain circumstances an appropriate statement of the manufacturer's restrictions regarding those positions or circumstances, in capitalized letters.
- DO NOT USE THE _____ ADJUSTMENT POSITION(S) OF THIS CHILD RESTRAINT WHILE THE VEHICLE IS IN MOTION. Pass (3)

Remarks:

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Labeling (cont'd)

- (h) In the case of each built-in child restraint system that has belts designed to restrain children using them, the statement: Pass

SNUGLY ADJUST THE BELTS PROVIDED WITH THIS CHILD RESTRAINT AROUND YOUR CHILD.

- (i) In the case of each built-in child restraint system which can be used in a rear-facing position, the following statement: N/A

PLACE AN INFANT IN A REAR-FACING POSITION IN THIS CHILD RESTRAINT.

- (j) A diagram or diagrams showing the fully activated child restraint system in infant and/or child configurations. Pass (4)

- (k) The following statement, inserting an address and telephone number: N/A

"Child restraints could be recalled for safety reasons. You must register this restraint to be reached in a recall. Send your name, address and the restraint's model number and manufacturing date to *(insert address)* or call *(insert telephone number)*. For recall information, call the U.S. Government's Auto Safety Hotline at 1-800-424-9393 (202-366-0123 in D.C. area)."

Remarks:

(3) The label on the driver's-side restraint and the label on the passenger-side restraint states: " A child over forty pounds can use this seat with the vehicle shoulder and lap belt."

(4) One of the diagrams on the driver's-side restraint and one of the diagrams on the passenger's-side restraint depicts the activated unit with the integral 5 point belt system, the second diagram depicts an activated passenger's-side unit utilizing the vehicle shoulder and lap belt.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Installation Instructions
(FMVSS 213, S5.6)

Date of Test 7/15/94 Item Code 001-CAS-01-DTUD
001-CAS-02-DTUP

Pass / Fail

S5.6.2

(a) Each built-in child restraint system shall be accompanied by printed instructions in the English that provide a step-by-step procedure, including diagrams, for activating the restraint system, positioning a child in the system, adjusting the restraint and, if provided, the restraint harness to fit the child. The instructions for each built-in car bed shall explain that the child should be positioned in the bed in such a way that the child's head is near the center of the vehicle.

Pass

(b) Each motor vehicle equipped with a factory-installed built-in child restraint shall have the information specified in paragraph (a) of this section included in its vehicle owner's manual.

Pass

S5.6.2.1 The instructions shall explain the primary consequences of not following the manufacturer's warnings for proper use of the child restraint system in accordance with S5.5.5 (f) through (i).

Pass

S5.6.2.2 The instructions for each built-in child restraint system, other than a factory-installed restraint, shall include the following statement, inserting an address and telephone number:

N/A (1)

"Child restraints could be recalled for safety reasons. You must register this restraint to be reached in a recall. Send your name, address and the restraint's model number and manufacturing date to *(insert address)* or call *(insert telephone number)*. For recall information, call the U.S. Government's Auto Safety Hotline at 1-800-424-9393 (202-366-0123 in D.C. area)."

Remarks:

(1) These restraint's are factory-installed built-in units.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Installation Instructions (cont'd)

S5.6.2.3 Each built-in child restraint system other than a factory-installed built-in restraint, shall have a location on the restraint for storing the instructions.

N/A (2)

S5.6.3 Each built-in child restraint system, other than a system that has been installed in a vehicle or a factory-installed built-in system that is designed for a specific vehicle model and seating position, shall be accompanied by instructions in English that provide a step-by-step procedure for installing the system in a motor vehicle. The instructions shall specify the types of vehicles and the seating positions into which the restraint can or cannot be installed. The instructions for each car bed shall explain that the car bed should be installed so that the child's head will be near the center of the vehicle.

N/A (2)

Remarks:

(2) These restraints are factory-installed built-in units.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Registration Form
(FMVSS 213, S5.8)

Date of Test 7/15/94 Item Code 001-CMD-01-DTUD
001-CAS-02-DTUP

Pass / Fail

S5.8 Information requirements - registration form.

- (a) Each child restraint system, except a factory-installed built-in restraint system, shall have a registration form attached to any surface of the restraint that contacts the dummy when the dummy is positioned in the system in accordance with S6.1.2 of Standard 213. N/A (1)
- (b) Each form shall:
- (1) Consist of a postcard that is attached at a perforation to an informational card; N/A (1)
- (2) Conform in size, content and format to Figures 9a and 9b of Standard 213; N/A (1)
- (3) Have a thickness of at least 0.007 inches and not more than 0.0095 inches. N/A (1)
- (c) Each postcard shall provide the model name or number and date of manufacture (month, year) of the child restraint system to which the form is attached, shall contain space for the purchaser to record his or her name and mailing address, shall be addressed to the manufacturer, and shall be postage paid. No other information shall appear on the postcard, except identifying information that distinguishes a particular child restraint system from other systems of that model name or number may be preprinted in the shaded area of the postcard, as shown in Figure 9a of Standard 213. N/A (1)

Remarks:

- (1) These restraints are factory-installed built-in units.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Minimum Head Support Surface
(FMVSS 213, S5.2.1)

Date of Test 7/15/94 Item Code 001-CMD-01-DTUD
001-CAS-02-DTUP

S5.2.1.2 The child restraint system is low enough to be exempt
from this requirement.

Yes (1)

(yes, no)

S5.2.1.1

Back Support Height

Maximum Child Weight (lbs.)	Required Minimum Height (in.)	Measured Height (in.)	Pass / Fail
40	22	22 5/8	Pass

Back Support Width

Required Minimum Width (in.)	Measured Width (in.)	Side Wing Depth (in.)	Pass / Fail
8	12 3/8	3 1/2	Pass

Remarks:

(1) These restraints are exempt from this requirement, however Seat Back Height and Width measurements were performed, and are listed for informational purposes only.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Torso Impact Protection
(FMVSS 213, S5.2.2)

Date of Test 7/15/94 Item Code 001-CMD-01-DTUD
001-CAS-02-DTUP

S5.2.2.1

Test	Compliance Requirement	Test Result	Pass / Fail
Back Support Surface	Flat or concave	Flat	Pass
	Area $\geq$ 85 sq. in.	> 85 sq. in.	Pass
Side Support Surface	Flat or concave	Flat	Pass
Max. weight $\geq$ 20 lb.	Area $\geq$ 24 sq. in.	> 24 sq. in.	Pass
Max. weight < 20 lb.	Area $\geq$ 48 sq. in.	N/A	N/A
Forward Restraining Surface			
Horiz. Cross Section	Flat or concave	N/A	N/A
Vertical Longitudinal Cross Section	Flat or convex	N/A	N/A
	Radius of curvature $\geq$ 2 in.	N/A	N/A

S5.2.2.2 Forward Fixed or Movable Surface

<u>Yes / No</u>	<u>Pass / Deferred</u>
<u>No</u>	<u>Pass</u>

Remarks:

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Protrusion Limitation
(FMVSS 213, S5.2.4)

Date of Test 7/15/94 Item Code 001-CMD-01-DTUD
001-CAS-02-DTUP

Test	Compliance Requirement (in.)	Test Result (in.)	Pass / Fail
Height	$\leq 3/8$ in.	$< 3/8$	Pass
Edge Radius	$\geq 1/4$ in.	$> 1/4$	Pass (1)

Remarks:

(1) There are two recessed screw heads, in the area of the shoulder belt slots - however, they are covered with a foam and fabric seat pad.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Dynamic Impact Test Conditions
(FMVSS 213, S6.1)Date of Test 8/11/94Test No. 1441Item Code 001-CMD-01-DTUD

Laboratory Ambient Conditions During Testing

Temperature Range 72 to 72 Degrees FRelative Humidity Range 68 % to 68 %Test Device 1994 Chevrolet Lumina MinivanNominal velocity (mph) 30 (+0, -3)Dummy Used 3 year old toddler S/N:159

Child Restraint System

Location Driver's-sideInstallation mode Forward-facingAdjustment mode Upright - Non-adjustable"Misuse" mode N/A

Test Results

Actual velocity 43.3 ft/s29.5 mph

Vehicle Seat Position

Vertical position N/A (1)Horizontal position N/A (1)Vehicle seat back position 25 deg. (1)

Include pre- and post-test photographs and acceleration-time history plot.

Remarks:

(1) The seat that contains this unit (as well as the seat back) is not adjustable.

The chest strap retainer was positioned approximately 2.5 inches below the dummy's chin as specified in the manufacturer's installation instructions.

Pre- and post-test photographs are presented in Appendix B.

Technician Donald W. HessProgram Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Belt Restraint
(FMVSS 213, S5.4.3)Date of Test 8/11/94Test No. 1441Item Code 001-CMD-01-DTUDPass / FailS5.4.3.1 Snug Fit of BeltsPass

Extra Webbing

Dummy	Each Shoulder Belt (in.)	Each Lap Belt Side (in.)	Crotch Belt (in.)
3 yr. old	12 3/4	(1)	(1)

S5.4.3.2 Direct Restraint BeltsPass

	<u>Yes / No</u>
(1) Belt / dummy contact for restraint	<u>No</u>
(2) Rigid structure behind dummy	<u>Yes</u>
(3) Belt / child restraint slip possible	<u>No</u>

Note : If all "yes", restraint fails.S5.4.3.3 Seating System Belts and / or ShieldsPass

(1) Upper torso	<u>Yes</u>
(2) Lower torso	<u>Yes</u>
(3) Crotch restraint	<u>Yes</u>

S5.4.3.4 Child Harness Belts N/AN/A

(1) Upper torso	<u>N/A</u>
(2) Lower torso	<u>N/A</u>
(3) Prevent standing	<u>N/A</u>

Remarks:

(1) The shoulder and lap belts are a continuous system with both ends of the belt connected through a yoke to a single strap adjustable at the front of the seat. The crotch belt is non-adjustable.

Technician Donald W. HessProgram Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Buckle Release
(FMVSS 213, S5.4.3.5, S6.2)

Date of Test 8/11/94

Test No. 1441

Item Code 001-CMD-01-DTUD

Test	Compliance Requirement	Test Result	Pass / Fail
Buckle Minimum Surface Area	Area $\geq$ 0.6 in. ²	0.68 in. ²	Pass
Pre - Impact Release Force	Force range : 9 to 14 lbs.	Right: 11.1 lbs. Left: 9.5 lbs. (1)	Pass
Buckle Integrity	Not release during test	No Release	Pass
Post - Impact Release Force	Force range : $\leq$ 16 lbs.	Right: 12.4 lbs. Left: 12.4 lbs. (1)	Pass

Remarks:

The buckle is an integral part of the seat and, therefore, the buckle release test was performed on the entire seat assembly.

(1) The buckle is comprised of right and left buckle tangs that do not always release at the same force.

Chest strap retainer opened during dynamic test.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Restraint System Integrity
(FMVSS 213, S5.1.1)Date of Test 8/11/94Test No. 1441Item Code 001-CMD-01-DTUD

Test	Compliance Requirement	Test Result	Pass / Fail
Structural Integrity	No complete separation	None	Pass
	No partial separation with exposed edge radius < 1/4 in.	None	Pass
	No partial separation with protrusions > 3/8 in.	None	Pass
Adjustment Position	No change	No Change	Pass
Back Surface / Seating Surface Angle	Not < 45 degrees	N/A	N/A

Remarks:Technician Donald W. HessProgram Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Injury Criteria
(FMVSS 213, S5.1.2)Date of Test 8/11/94Test No. 1441Item Code 001-CMD-01-DTUD

Test	Compliance Requirement	Test Result	Pass / Fail
Head Injury Criterion	≤ 1000	455	Pass (1)
Chest Injury Criterion	Cumulative duration over 60 g ≤ 3 ms	Clipped Peak g = <u>31.9</u> Duration exceeding 60 g = <u>0.0</u>	Pass

Remarks:

- (1) The HIC calculation is based on the driver's-side dummy's X and Y axis data, and the passenger's-side Z axis data. This was done due to the loss of data on the driver's-side Z axis channel. The wire from the Z axis element of the accelerometer package in the head of the driver's-side dummy was broken during the dynamic test, and therefore Z axis data was not available. The COTR was aware of and approved this modification.

Technician Donald W. HessProgram Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Occupant Excursion
(FMVSS 213, S5.1.3, S5.1.4, S5.2.1.1 (c))

Date of Test 8/11/94

Test No. 1441

Item Code 001-CMD-01-DTUD

Forward-Facing Restraints

Test	Compliance Requirement	Test Result	Pass / Fail
Torso Retention (FMVSS 213, S5.1.3.1)	Retain within system	Retained	Pass
Knee Target Excursion (FMVSS 213, S5.1.3.1)	≤ 36 in.	16.1 in.	Pass (1)
Head - Torso Angle (FMVSS 213, S5.2.1.1 (c))	Rearward change ≤ 45 degrees	< 45 deg.	Pass

Rear-Facing Restraints

Test	Compliance Requirement	Test Result	Pass / Fail
Torso Retention (FMVSS 213, S5.1.3.2)	Retain within system	N/A	N/A
Head Target Excursion (FMVSS 213, S5.1.3.2)	Not beyond restraint's top and forward edge	N/A	N/A
Back Support Angle (FMVSS 213, S5.1.4)	≤ 70 degrees	N/A	N/A
Head - Torso Angle (FMVSS 213 S5.2.1.1 (c))	Rearward change ≤ 45 degrees	N/A	N/A

Remarks:

- (1) Excursion measured from actual pivot point of the seat that contained the built-in restraint.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Dynamic Impact Test Conditions
(FMVSS 213, S6.1)

Date of Test 8/11/94

Test No. 1441

Item Code 001-CMD-02-DTUP

Laboratory Ambient Conditions During Testing

Temperature Range 72 to 72 Degrees F

Relative Humidity Range 68 % to 68 %

Test Device 1994 Chevrolet Lumina Minivan

Nominal velocity (mph) 30 (+0, -3)

Dummy Used 3 year old toddler S/N: 066

Child Restraint System

Location Passenger-side

Installation mode Forward-facing

Adjustment mode Upright

"Misuse" mode N/A

Test Results

Actual velocity 43.3 ft/s

29.5 mph

Vehicle Seat Position

Vertical position N/A (1)

Horizontal position N/A (1)

Vehicle seat back position 25 deg. (1)

Include pre- and post-test photographs and acceleration-time history plot.

Remarks:

(1) The seat that contains this unit (as well as the seat back) is not adjustable.

The chest strap retainer was positioned approximately 2.5 inches below the dummy's chin as specified in the manufacturer's installation instructions.

Pre- and post-test photographs are presented in Appendix B.

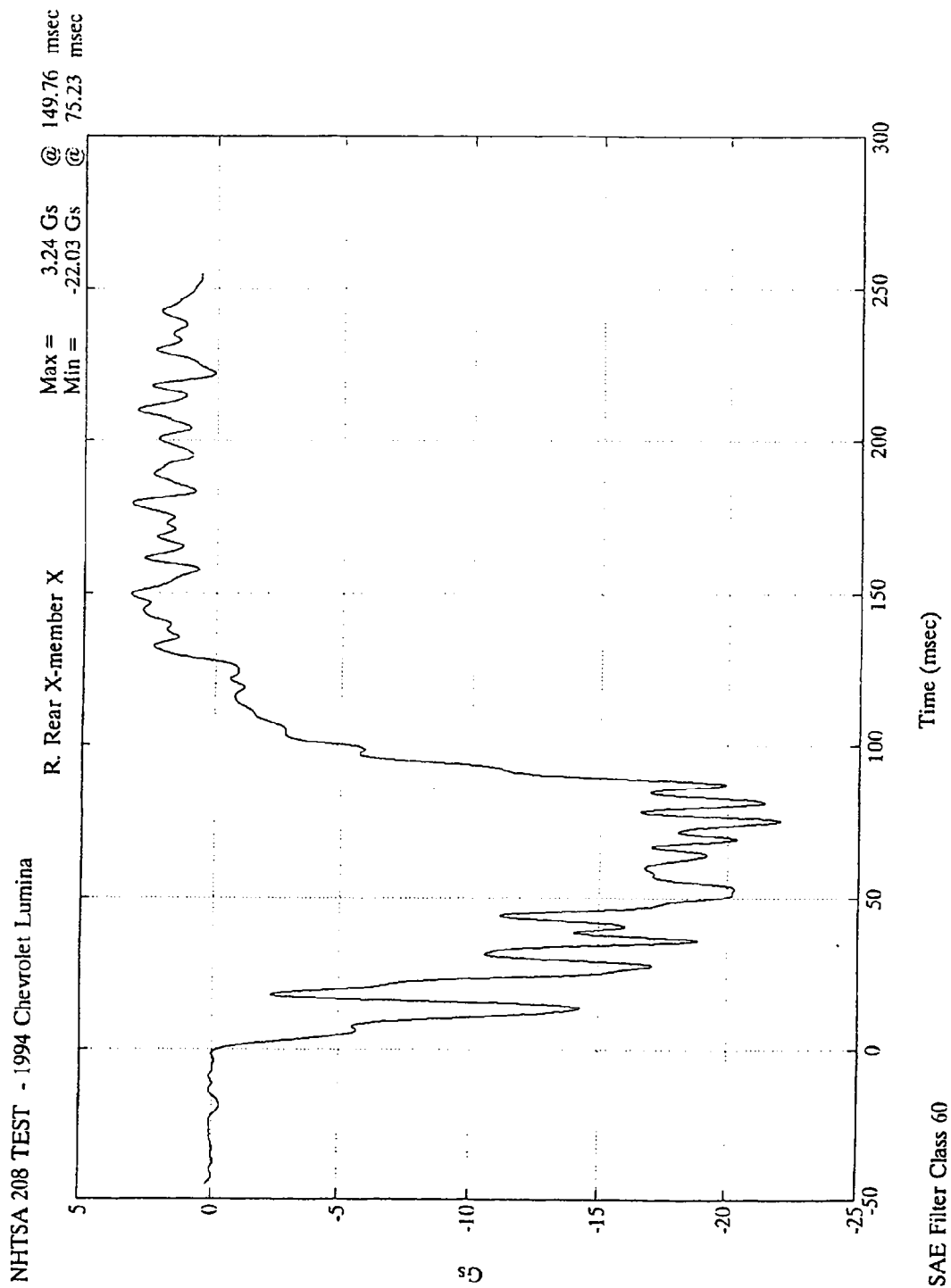
Technician Donald W. Hess

Program Manager Robert F. Hathaway

Date of Test 8/11/94

Test No. 1441

Item Code 001-CMD-02-DTUP



COMPLIANCE TEST DATA: FMVSS 213

Belt Restraint
(FMVSS 213, S5.4.3)Date of Test 8/11/94Test No. 1441Item Code 001-CMD-02-DTUPPass / FailS5.4.3.1 Snug Fit of BeltsPass

Extra Webbing

Dummy	Each Shoulder Belt (in.)	Each Lap Belt Side (in.)	Crotch Belt (in.)
3 yr. old	13	(1)	(1)

S5.4.3.2 Direct Restraint BeltsPass

	Yes / No
(1) Belt / dummy contact for restraint	<u>No</u>
(2) Rigid structure behind dummy	<u>Yes</u>
(3) Belt / child restraint slip possible	<u>No</u>

Note : If all "yes", restraint fails.S5.4.3.3 Seating System Belts and / or ShieldsPass

(1) Upper torso	<u>Yes</u>
(2) Lower torso	<u>Yes</u>
(3) Crotch restraint	<u>Yes</u>

S5.4.3.4 Child Harness Belts N/AN/A

(1) Upper torso	<u>N/A</u>
(2) Lower torso	<u>N/A</u>
(3) Prevent standing	<u>N/A</u>

Remarks:

(1) The shoulder and lap belts are a continuous system with both ends of the belt connected through a yoke to a single strap adjustable at the front of the seat. The crotch belt is non-adjustable.

Technician Donald W. HessProgram Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Buckle Release
(FMVSS 213, S5.4.3.5, S6.2)

Date of Test 8/11/94

Test No. 1441

Item Code 001-CMD-02-DTUP

Test	Compliance Requirement	Test Result	Pass / Fail
Buckle Minimum Surface Area	Area $\geq$ 0.6 in. ²	0.68 in. ²	Pass
Pre - Impact Release Force	Force range : 9 to 14 lbs.	Right: 11.2 lbs. Left: 11.2 lbs.(1)	Pass
Buckle Integrity	Not release during test	No Release	Pass
Post - Impact Release Force	Force range : $\leq$ 16 lbs.	Right: 11.1 lbs. Left: 11.1 lbs.(1)	Pass

Remarks:

The buckle is an integral part of the seat and, therefore, the buckle release test was performed on the entire seat assembly.

- (1) The buckle is comprised of right and left buckle tangs that do not always release at the same force.

The chest strap retainer opened during the dynamic test.

Technician Donald W. Hess

Program Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Restraint System Integrity
(FMVSS 213, S5.1.1)Date of Test 8/11/94Test No. 1441Item Code 001-CMD-02-DTUP

Test	Compliance Requirement	Test Result	Pass / Fail
Structural Integrity	No complete separation	None	Pass
	No partial separation with exposed edge radius < 1/4 in.	None	Pass
	No partial separation with protrusions > 3/8 in.	None	Pass
Adjustment Position	No change	No Change	Pass
Back Surface / Seating Surface Angle	Not < 45 degrees	N/A	N/A

Remarks:Technician Donald W. HessProgram Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Injury Criteria
(FMVSS 213, S5.1.2)Date of Test 8/11/94Test No. 1441Item Code 001-CMD-02-DTUP

Test	Compliance Requirement	Test Result	Pass / Fail
Head Injury Criterion	≤ 1000	435	Pass
Chest Injury Criterion	Cumulative duration over 60 g ≤ 3 ms	Clipped Peak g = <u>32.8</u> Duration exceeding 60 g = <u>0.0</u>	Pass

Remarks:Technician Donald W. HessProgram Manager Robert F. Hathaway

COMPLIANCE TEST DATA: FMVSS 213

Occupant Excursion
(FMVSS 213, S5.1.3, S5.1.4, S5.2.1.1 (c))Date of Test 8/11/94Test No. 1441Item Code 001-CMD-02-DTUP

Forward-Facing Restraints

Test	Compliance Requirement	Test Result	Pass / Fail
Torso Retention (FMVSS 213, S5.1.3.1)	Retain within system	Retained	Pass
Knee Target Excursion (FMVSS 213, S5.1.3.1)	≤ 36 in.	16.1 in.	Pass (1)
Head - Torso Angle (FMVSS 213, S5.2.1.1 (c))	Rearward change ≤ 45 degrees	< 45 deg.	Pass

Rear-Facing Restraints

Test	Compliance Requirement	Test Result	Pass / Fail
Torso Retention (FMVSS 213, S5.1.3.2)	Retain within system	N/A	N/A
Head Target Excursion (FMVSS 213, S5.1.3.2)	Not beyond restraint's top and forward edge	N/A	N/A
Back Support Angle (FMVSS 213, S5.1.4)	≤ 70 degrees	N/A	N/A
Head - Torso Angle (FMVSS 213 S5.2.1.1 (c))	Rearward change ≤ 45 degrees	N/A	N/A

Remarks:

(1) Excursion measured from actual pivot point of the bench seat that contains the built-in restraints.

Technician Donald W. HessProgram Manager Robert F. Hathaway

APPENDIX A
EQUIPMENT LIST AND CALIBRATION SCHEDULES

CERTIFICATION INSTRUMENTATION

<u>Instrument¹</u>	<u>Certification Test</u>	<u>Calibration Date</u>	<u>Due Date</u>
Slide Potentiometer Oceanside Mfg. Co. Model LCP20-50 2.00 inches travel, 10,000 ohms	Neck Pendulum	3/94	9/94
C.G. Head Potentiometer Oceanside Mfg. Co. Model SP221 Serial HNR2 10K, linearity = 1.5%	Neck Pendulum	3/94	9/94
C.G. Pend. Potentiometer Oceanside Mfg. Co. Serial HNR2 10K, linearity = 1.5%	Neck Pendulum	3/94	9/94
Bourns Potentiometer Model 3520S--1-502 5K +/-, linearity = 0.3%	Lumbar Spine Flexion	3/94	9/94
Transducer Inc. Load Cell S/N 20051, 50#	Lumbar Spine Flexion	6/94	12/94
Hewlett Packard 7035B X-Y Recorder +/- .02% Full Scale Accuracy	Lumbar Spine Flexion	6/94	6/95
Hewlett Packard 7045B X-Y Recorder +/- .02% Full Scale Accuracy	Lumbar Spine Flexion	6/94	6/95
Endevco Accelerometers S/N 160 +/- .075% Accuracy CEC 4-202	Neck Pendulum (ATD)	6/94	12/94

CERTIFICATION INSTRUMENTATION (cont'd)

<u>Instrument¹</u>	<u>Certification Test</u>	<u>Calibration Date</u>	<u>Due Date</u>
Endevco Triaxial Accelerometers 7267A			
S/N BH83	Head Impact (ATD)	5/94	11/94
S/N BB21	Chest Impact (ATD)	5/94	11/94
S/N 0025	Head Impact (ATD)	5/94	11/94
S/N BA71	Chest Impact (ATD)	5/94	11/94
Syston/Donner Counter +/- 1 count	Head Impact Chest Impact Neck Pendulum	7/93	7/94
White Box Temp. & Humidity Recorder S/N C7485-RS-009556		5/20/94	11/20/94
Chatillon 20 Pound Gauge +/- 8 oz. Accuracy		5/94	11/94
Chatillon 40 Pound Gauge +/- 1 % Accuracy		5/94	11/94
Force Gauge, Chatillon Model DPTH 250		6/94	12/94
Dillon Force Gauge Model E Serial # 4346 50#		8/93	8/94

¹Pendulum velocity measurements for the Head Impact, Chest Impact and Neck Pendulum tests are measured by a Calspan-designed light beam velocity trap which consists of two .040 inch field stops placed 5.020 inches apart. This system includes General Electric light sources #SL520D6 and Texas Instruments photo diodes.

APPENDIX B

PHOTOGRAPHS OF EQUIPMENT



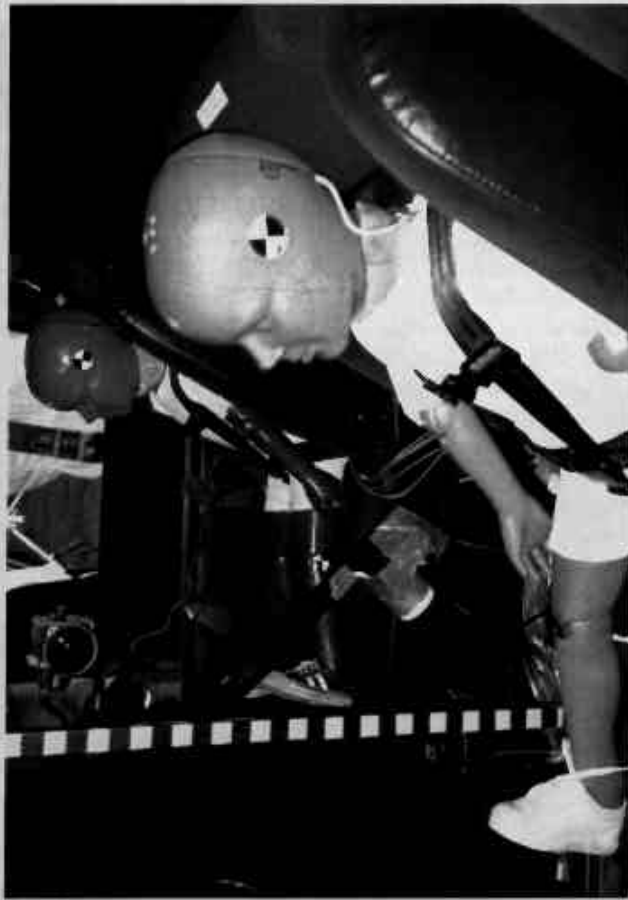
ITEM CODE 001-CMD-01-DTUD
001-CMD-01-DTUP

FULL-SCALE TEST 1441 PRE-TEST



ITEM CODE 001-CMD-01-DTUD
001-CMD-01-DTUP

FULL-SCALE TEST 1441 PRE-TEST



ITEM CODE 001-CMD-01-DTUD

001-CMD-01-DTUP

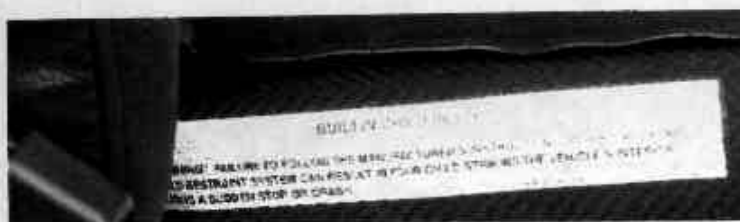
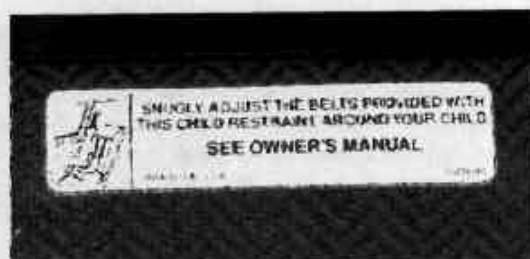
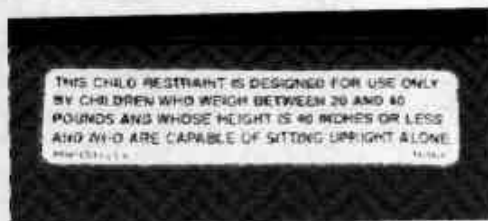
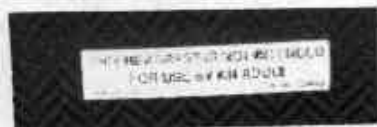
FULL-SCALE TEST 1441

POST-TEST



ITEM CODE 001-CMD-01-DTUD
001-CMD-01-DTUP

FULL-SCALE TEST 1441 POST-TEST



LABELS

ITEM CODES : 001-CMD-01-DTUD

001-CMD-01-DTUP

Note:

The three point belt restraint system shown with the activated unit is for demonstration purposes only. This system was not utilized during this dynamic test.



CONFIGURATION

ITEM CODES : 001-CMD-01-DTUD



Note:

- 1) The three point belt restraint system shown with the activated unit is for demonstration purposes only. This system was not utilized during this dynamic test.
- 2) The activated unit is shown removed from the vehicle.

CONFIGURATION

ITEM CODES : 001-CMD-01-DTUP

Appendix F

Performance Calibration Report for Part 572

Three-Year-Old Child Test Dummy No. 066

Prepared for the United States Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-93-D-11089. This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

REPORT ACCEPTED BY:

Contract Technical Manager
Office of Vehicle Safety Compliance

Acceptance Date

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Performance Calibration Report for Part 572 Three-Year-Old Child Test Dummy No. 066		5. Report Date November 1994	
		6. Performing Organization Report No.	
7. Author(s) Robert F. Hathaway		8. Performing Organization Report No.	
9. Performing Organization Name and Address Calspan Advanced Technology Center 4455 Genesee Street Buffalo, New York 14225		10. Work Unit No.	
		11. Contract or Grant No. DTNH22-93-D-11089	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh, S.W. Washington, D.C. 20590		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code	
15. Supplementary Notes Reviewed by : <u>Robert F. Hathaway</u> Approved by : <u>Edward A. Roberts</u> Program Manager Head, Safety Research Section Transportation Sciences Center			
16. Abstract This report contains results of performance calibration tests performed on a Part 572 three-year-old size child test dummy at the Calspan Advanced Technology Center dummy certification test facility. The following tests were performed: 1. Head Impact Test 2. Chest Impact Test 3. Lumbar Flexion Test 4. Head-Neck Pendulum Test The child test dummy manufactured by Alderson Research Laboratories, Serial No. 066 met the performance calibration requirements of CFR 49 Part 572, Subpart C.			
17. Key Words Part 572, Subpart C - Three-Year-Old Child Dummy FMVSS 213 - Child Restraint Systems		18. Distribution Statement Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 400 Seventh St., SW, Washington, DC 20590	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages	22. Price

FORM DOT F1700.7 (8-69)

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SECTION I

INTRODUCTION AND SUMMARY

This report presents the results obtained during certification tests of a three-year-old size child test dummy that was manufactured in accordance with the requirements of 49 CFR Part 572, Subpart C. The objective of these tests was to demonstrate that the test dummy (Serial No. 066, manufactured by Alderson Research Laboratories) was suitable for use before and after the FMVSS 208/213 compliance full-scale test program. The tests were performed in the Dummy Certification Laboratory of Calspan's Advanced Technology Center using procedures⁽¹⁾ approved by the NHTSA Contract Technical Manager (CTM). These certification test procedures together with photographs of the apparatus for the four required tests (head impact, chest impact, lumbar spine flexion, and head-neck pendulum impact) are presented in Appendix A of this report. These certification tests were performed on this dummy prior to full-scale testing and after the full-scale test program was completed.

Data from these tests demonstrate that each of the dummy components (and their systems), that are required to be certifiable, were in compliance with the specifications of 49 CFR Part 572, Subpart C. All of the original data from each certification test are on file in the Calspan Dummy Certification Laboratory. Typical data traces are presented in Reference (1).

The data sheets presented in this test report were taken directly from TP-213-02 "Laboratory Procedure for Child Restraint System Testing." These data sheets use the word "calibration" when referring to certification procedures. Therefore, these words are used interchangeably in this report.

(1) "Operating Test Procedure for Test Program for FMVSS 213, Child Restraint Systems," Calspan Report No. 6974-V-1, Contract No. DTNH22-81-C-87088, Task Order No. 7.

SECTION II

Table 1

SUMMARY OF HEAD IMPACT TEST CALIBRATION DATA :

PRE-TEST / POST-TEST

CHILD DUMMY I. D. NO. 066

DATE OF CALIBRATION	7/26/94	10/31/94	
ROOM TEMPERATURE (66-78°F)	71	69	
ROOM RELATIVE HUMIDITY (10-70%)	54	46	
TEST MEASUREMENTS :	PRE-TEST DATA	POST-TEST DATA	PART 572 REQMT.
TEST PROBE IMPACT VELOCITY, fps	7.0	7.1	6.86 - 7.14
PEAK HEAD RESULTANT ACCEL., g	117.0	113.9	95 - 118
PEAK HEAD LATERAL ACCEL., g	1.3	0.9	≤7
PULSE Δ TIME @ 50 g, ms	1.75	1.88	1.3 - 2.0

REMARKS:

Technician (s) Ivan Minkewicz

Project Engineer (s) Robert Hathaway

Table 2

SUMMARY OF CHEST IMPACT TEST CALIBRATION DATA :PRE-TEST / POST-TESTCHILD DUMMY I. D. NO. 066

DATE OF CALIBRATION	7/26/94	10/28/94	
ROOM TEMPERATURE (66-78°F)	70	70	
ROOM RELATIVE HUMIDITY (10-70%)	54	43	
TEST MEASUREMENTS :	PRE-TEST DATA	POST-TEST DATA	PART 572 REQMT.
TEST PROBE IMPACT VELOCITY, fps	12.9	12.9	12.87-13.13
PEAK CHEST RESULTANT ACCEL., g	50.2	50.7	50-70
PEAK CHEST LATERAL ACCEL., g	0.8	1.5	≤5
PULSE Δ TIME @ 30 g, ms	4.0	3.88	2.5 - 4.0

REMARKS:

Technician (s) Ivan MinkewiczProject Engineer (s) Robert Hathaway

Table 3

SUMMARY OF LUMBAR FLEXION TEST DATA :

PRE-TEST / POST-TEST

CHILD DUMMY I. D. NO. 066

DATE OF CALIBRATION	8/3/94	10/6/94	
ROOM TEMPERATURE (66-78°F)	70	70	
ROOM RELATIVE HUMIDITY (10-70%)	55	45	
TEST MEASUREMENTS :	PRE-TEST DATA	POST-TEST DATA	PART 572 REQMT.
FORCE @ 40° FLEXION ANGLE, lbs.	45.7	42.3	34 - 47
SPINAL COLUMN ANGLE @ 3 MIN. POST TEST, degrees	1.0	1.0	≤5

REMARKS:

Technician (s) Ivan Minkewicz

Project Engineer (s) Robert Hathaway

Table 4

SUMMARY OF HEAD-NECK PENDULUM TEST DATA :
PRE-TEST / POST-TEST

CHILD DUMMY I. D. NO. 066

DATE OF CALIBRATION		8/5/94	10/27/94	
ROOM TEMPERATURE (66-78°F)		69	69	
ROOM RELATIVE HUMIDITY (10-70%)		50	46	
TEST MEASUREMENTS :		PRE-TEST DATA	POST-TEST DATA	PART 572 REQMT.
PENDULUM IMPACT VELOCITY, fps		17.5	17.5	16 - 18
PEND. MIN./MAX. DECEL. OVER (t ₃ - t ₂), g		28.6	26.0	20 - 34
PEAK HEAD RESULT. ACCEL., g		28.4	26.3	≤ 30
PEND. DECEL. PULSE Δ TIME (t ₂ - t ₁), ms		2.0	2.1	≤ 4
PEND. DECEL. PULSE Δ TIME (t ₃ - t ₂), ms		19.5	21.0	18 - 21
PEND. DECEL. PULSE Δ TIME (t ₄ - t ₃), ms		2.9	3.5	≤ 5
HEAD ZERO POSITION TIME / PEND. REVERSAL TIME, ms		114.7/130.4	114.0/124.0	- / -
HEAD MAX. ROTATION ANGLE, degrees		84.7	80.5	76 - 92
TIME (ms) @ HEAD ROT. ANGLE :	0 deg.	0.0	0.0	-2 - +2
	30 deg.	23.6	24.6	17.3 - 24.7
	60 deg.	36.5	38.3	31.1 - 40.9
	Max.	61.0	62.4	55.0 - 69.0
	60 deg.	86.7	85.0	81.7 - 100.3
	30 deg.	100.8	100.7	97.4 - 118.6
	0 deg.	114.7	114.0	111.2 - 134.8
CHORDAL DISPLACEMENT (in) @ HEAD ROTATION ANGLE OF :	0 deg.	0.0	0.0	-0.8 - +0.8
	30 deg.	2.3	2.4	1.4 - 3.0
	60 deg.	4.4	4.4	3.5 - 5.1
	Max.	6.0	5.9	5.0 - 6.6
	60 deg.	4.4	4.5	3.5 - 5.1
	30 deg.	2.3	2.4	1.4 - 3.0
	0 deg.	0.1	0.1	-0.8 - +0.8

Technician (s) Ivan Minkewicz

Project Engineer (s) Robert Hathaway

SECTION III

INSTRUMENT CALIBRATION

Prior to pre-test certification testing, all test instrumentation was recalibrated in accordance with the requirements and procedures described in TP-213-02 and Section 3.0, Instrumentation Calibration, of the Operating Test Procedure. Table 5 lists all of the applicable test equipment for each of the certification tests and the calibration dates.

Table 5
CERTIFICATION INSTRUMENTATION

<u>Instrument¹</u>	<u>Certification Test</u>	<u>Calibration Date</u>	<u>Due Date</u>
Slide Potentiometer Oceanside Mfg. Co. Model LCP20-50 2.00 inches travel, 10,000 ohms	Neck Pendulum	5/94	11/94
C.G. Head Potentiometer Oceanside Mfg. Co. Model SP221 Serial HNR2 10K, linearity = 1.5%	Neck Pendulum	5/94	11/94
C.G. Pend. Potentiometer Oceanside Mfg. Co. 10K, linearity = 1.5%	Neck Pendulum	5/94	11/94
Bourns Potentiometer Model 3520S--1-502 5K +/-, linearity = 0.3%	Lumbar Spine Flexion	6/94	12/94
Transducer Inc. Load Cell S/N 20051, 50#	Lumbar Spine Flexion	6/94	12/94
Hewlett Packard 7035B X-Y Recorder +/- .02% Full Scale Accuracy	Lumbar Spine Flexion	6/94	6/95
Hewlett Packard 7045B X-Y Recorder +/- .02% Full Scale Accuracy	Lumbar Spine Flexion	6/94	6/95
Endevco Accelerometers S/N 160 +/- .075% Accuracy CEC 4-202	Neck Pendulum (ATD)	6/94	12/94

CERTIFICATION INSTRUMENTATION (cont'd)

<u>Instrument¹</u>	<u>Certification Test</u>	<u>Calibration Date</u>	<u>Due Date</u>
Endevco Triaxial Accelerometers, 7267A :			
S/N BH83	Head Impact (ATD)	5/94	11/94
S/N BB21	Chest Impact (ATD)	5/94	11/94
S/N 0025	Head Impact (ATD)	5/94	11/94
S/N BA71	Chest Impact (ATD)	5/94	11/94
Syston/Donner Counter +/- 1 count	Head Impact Chest Impact Neck Pendulum	7/93	7/94

¹Pendulum velocity measurements for the Head Impact, Chest Impact and Neck Pendulum tests are measured by a Calspan-designed light beam velocity trap which consists of two .040 inch field stops placed 5.020 inches apart. This system includes General Electric light sources #SL520D6 and Texas Instruments photo diodes.

Prior to post-test certification testing, all test instrumentation was recalibrated in accordance with the requirements and procedures described in TP-213-02 and Section 3.0, Instrumentation Calibration, of the Operating Test Procedure. Table 6 lists all of the applicable test equipment for each of the certification tests and the calibration dates.

Table 6
CERTIFICATION INSTRUMENTATION

<u>Instrument²</u>	<u>Certification Test</u>	<u>Calibration Date</u>	<u>Due Date</u>
Slide Potentiometer Oceanside Mfg. Co. Model LCP20-50 2 inches travel, 10,000 ohms	Neck Pendulum	5/94	11/94
C.G. Head Potentiometer Oceanside Mfg. Co. Model SP221, S/N HNR2 10K linearity = 1.5%	Neck Pendulum	5/94	11/94
C.G. Pendulum Potentiometer Oceanside Mfg. Co. Model SP221, S/N HNR1 10K linearity = 1.5%	Neck Pendulum	5/94	11/94
Bourns Potentiometer Model 3520S--1-502 5K +/-, linearity = 0.3%	Lumbar Spine Flexion	6/94	12/94
Transducer Inc. Load Cell S/N 20051, 50#	Lumbar Spine Flexion	6/94	12/94
Hewlett Packard 7035B X-Y Recorder +/- .02% Full Scale Accuracy	Lumbar Spine Flexion	6/94	6/95
Hewlett Packard 7045B X-Y Recorder +/- .02% Full Scale Accuracy	Lumbar Spine Flexion	6/94	6/95
Endevco Accelerometers S/N 160 +/- .075% Accuracy CEC 4-202	Neck Pendulum (ATD)	6/94	12/94

CERTIFICATION INSTRUMENTATION (cont'd)

<u>Instrument²</u>	<u>Certification Test</u>	<u>Calibration Date</u>	<u>Due Date</u>
Endevco Triaxial Accelerometers, 7267A :			
S/N BH83	Head Impact (ATD)	5/94	11/94
S/N BB21	Chest Impact (ATD)	5/94	11/94
S/N 0025	Head Impact (ATD)	5/94	11/94
S/N BA71	Chest Impact (ATD)	5/94	11/94
Syston/Donner Counter +/- 1 count	Head Impact Chest Impact Neck Pendulum	9/94	9/95

²Pendulum velocity measurements for the Head Impact, Chest Impact and Neck Pendulum tests are measured by a Calspan-designed light beam velocity trap which consists of two .040 inch field stops placed 5.020 inches apart. This system includes General Electric light sources #SL520D6 and Texas Instruments photo diodes.

APPENDIX A

CALIBRATION TEST PROCEDURES

1. Head Impact Test

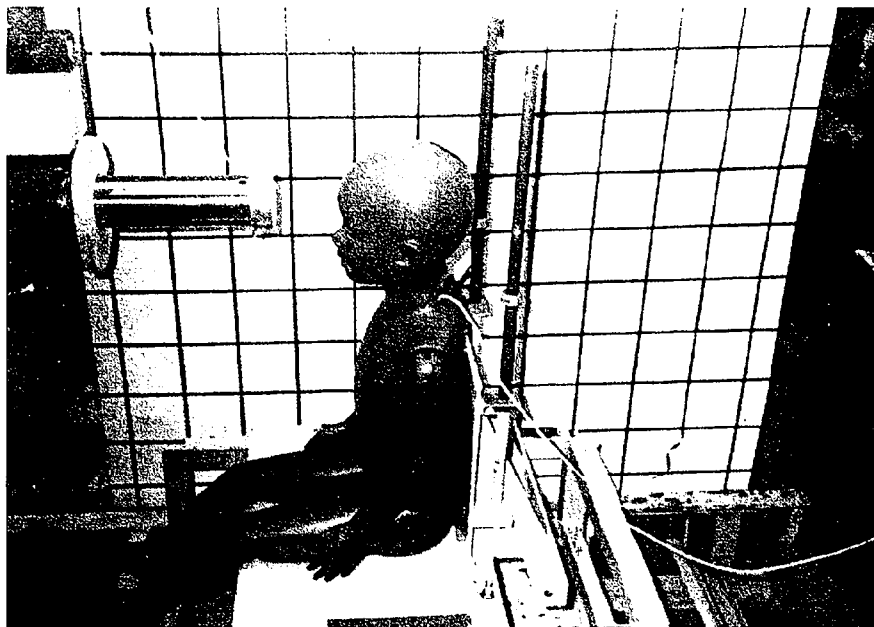
The Calspan linear impactor and the pre-impact position of the three-year-old size ATD are shown in Figure A-1. The impacting steel cylinder conforms dimensionally with the specifications of Part 572.21, Subpart C. Triaxial accelerometers are mounted in the head of the dummy and on the front of the cylinder. Impact velocity is measured by infrared photo reflective sensors located 6 cm apart at the rear of the impact cylinder.

The ATD head impact point is determined by aligning the center of the impact 2.9 inches below the top of the head. The flat front face of the probe is positioned adjacent to the ATD head impact point, and the light beam velocity trap is positioned with the probe interrupter at the second field stop. A dummy back support, 12.4 inches high, is employed in this test. The impactor is then pressurized to a pre-determined setting and fired. The impactor's travel is controlled by ball bearing guides encased in a metal cylinder.

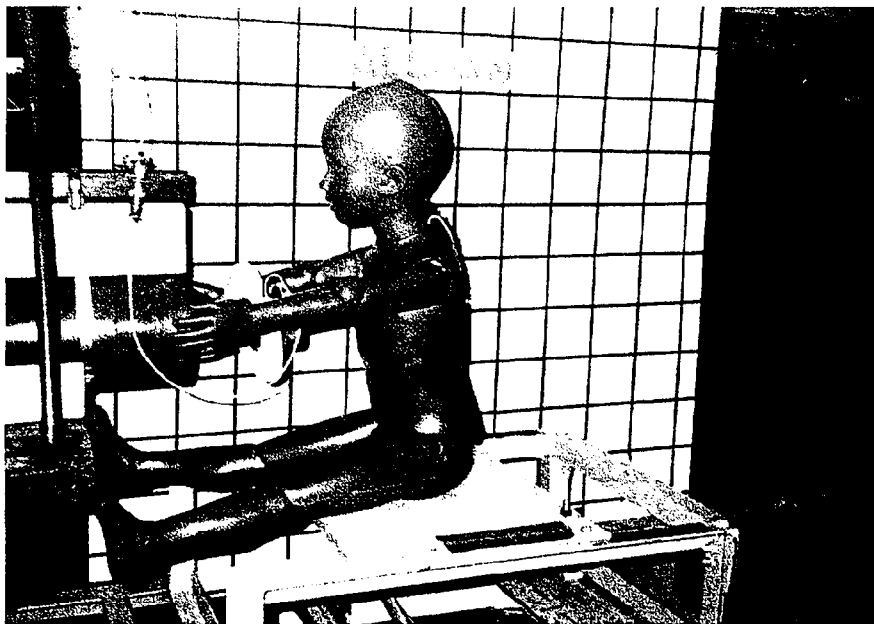
Impactor velocity is immediately available on the EPUT meter and is also recorded electronically for a permanent record. All data is collected on analog tape and played back on brush recordings for quick turnaround data analysis. All head impact data traces are on file at the Calspan Dummy Certification Laboratory.

2. Chest Impact Test

The pre-test chest impact setup is also shown in Figure A-1. The same impactor is used for both head and chest impact certification tests. The chest impact point is determined by seating the ATD against a rigid back surface with the chest skin jacket removed. A measurement is taken from the seating surface to the longitudinal centerline of the bolt attaching the top of the rib cage sternum to the thoracic spine box. The chest skin is then replaced and marked at a position 1.5 inches below the initial measurement.



(a) HEAD IMPACT TEST



(b) CHEST IMPACT TEST

Note: Certifications and dynamic tests were performed with a Type II head, (photos depict a Type I head).

Figure A-1 SETUPS FOR HEAD AND CHEST IMPACT TESTS

The ATD is seated on the teflon seating surface and adjusted to allow the striking mass face surface to be approximately tangent to the most vertical surface of the chest. The accelerator is then pressurized to a pre-determined setting and fired.

Data is collected in the same manner as the head impact test. All data traces are on file at Calspan's Dummy Certification Laboratory.

3. Lumbar Spine Flexion Test

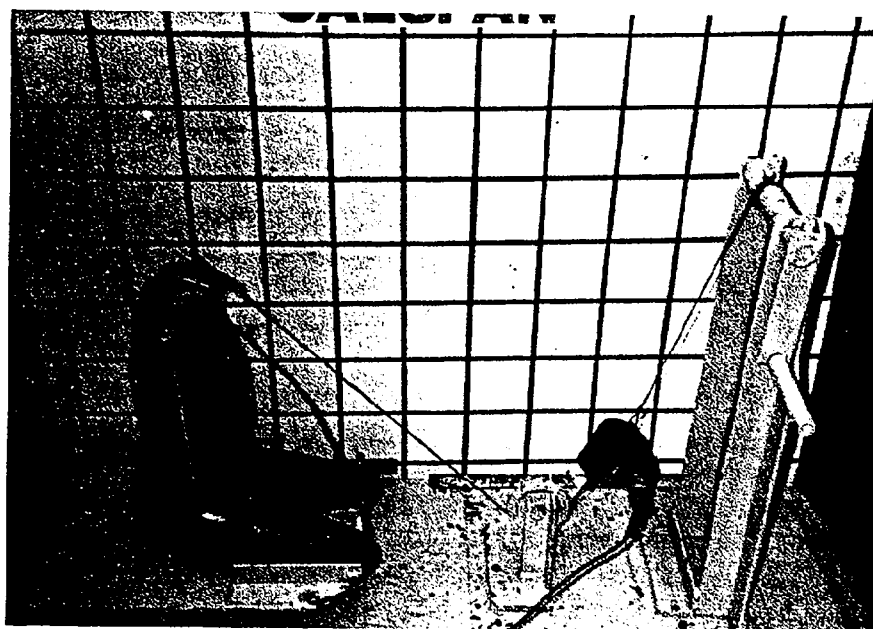
The lumbar spine flexion test apparatus is shown in Figure A-2. The pulley is positioned so that the applied force is perpendicular to the thoracic spine box when the lumbar spine reaches 40 degrees of flexion.

The ATD lower torso and upper legs are bolted to the seating surface after the neck has been replaced with a cylindrical aluminum adapter. A pull force is applied to the ATD neck adapter, through a load cell, at a continuously monitored deflection rate of between 0.5 and 1.5 degrees per second by cranking the cable through the pulley systems until 40 degrees of flexion is reached. This flexion angle is maintained for 10 seconds, the cable is cut to rapidly release the force, and the torso return angle is recorded after 3 minutes.

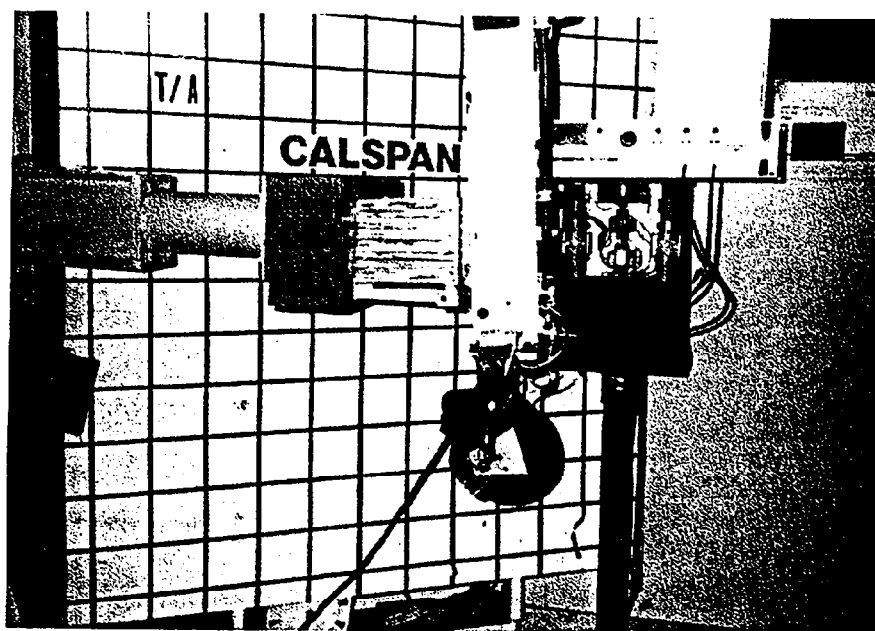
Rotation vs. time and flexion angle vs. force are plotted concurrently. The force required to flex the torso forward to a 40 deg. angle is recorded. Torso return angle is indicated on the flexion angle plot by a straight line through the ordinate. These plots are on file at Calspan's Dummy Certification Laboratory.

4. Neck Pendulum Test

The pendulum impact test apparatus used for neck certification tests is shown in Figure A-2. The inertial and dimensional properties of the rigid pendulum conform to the requirements of Part 572, Subpart C, and TP-213-02, Appendix No. 1.



(a) LUMBAR SPINE FLEXION TEST



(b) NECK PENDULUM TEST

Note: Certifications and dynamic tests were performed with a Type II head, (photos depict a Type I head).

Figure A-2 SETUPS FOR LUMBAR SPINE FLEXION AND NECK PENDULUM TESTS

The ATD head and neck are mounted on the bottom of the pendulum as required (Calspan performs all neck certification tests with the appropriate ATD head attached), and the pendulum is raised and released from a pre-determined height required to achieve the desired impact velocity. The pendulum is decelerated by a block of aluminum honeycomb. Velocity is measured by means of the light beam velocity trap. The light beam interrupter is located a known distance below the center of the pendulum accelerometer in order to preclude any interference between the interrupter and the honeycomb. The velocity trap reading is corrected for this distance so the recorded velocity is that of the center of the accelerometer.

The three potentiometers, mounted on the right side of the head, are arranged to measure the linear and angular geometric components required for computation of the chordal displacements and head rotation angles. The voltage outputs of these three potentiometers are processed by the analog circuitry depicted in Figure A-3 which provides complete time histories of chordal displacement and head rotation angle. These time histories are plotted simultaneously on a brush recorder, along with a common timing trace, thus allowing for accurate correlation between chordal displacement, head rotation angle and time. These brush records are on file at Calspan's Dummy Certification Laboratory.

An electronic time zero switching device is attached to the pendulum/honeycomb contact point on the pendulum. Time zero is electronically recorded at the time of pendulum/honeycomb contact and pendulum reversal time is recorded at the end of the pendulum/honeycomb contact. These times are also plotted on a brush record concurrent with the chordal displacement and head rotation angle. This brush record allows for immediate determination of pendulum reversal time to head zero position time.

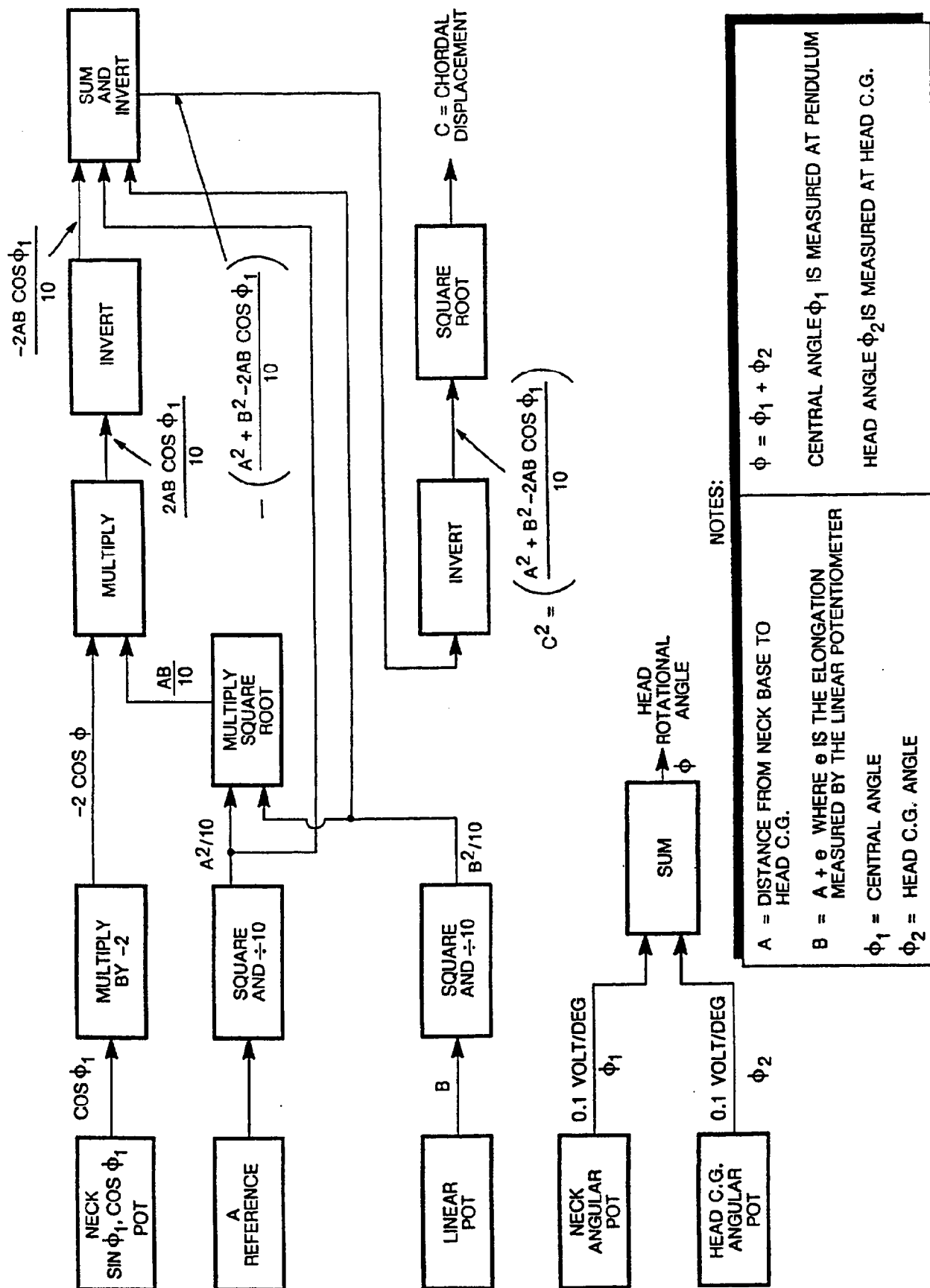


Figure A-3 NECK COMPONENT TEST CIRCUIT

Appendix G

Performance Calibration Report for Part 572

Three-Year-Old Child Test Dummy No. 159

Prepared for the United States Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-93-D-11089. This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

REPORT ACCEPTED BY:

Contract Technical Manager
Office of Vehicle Safety Compliance

Acceptance Date

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Performance Calibration Report for Part 572 Three-Year-Old Child Test Dummy No. 159		5. Report Date November 1994	
		6. Performing Organization Report No.	
7. Author(s) Robert F. Hathaway		8. Performing Organization Report No.	
9. Performing Organization Name and Address Calspan Advanced Technology Center 4455 Genesee Street Buffalo, New York 14225		10. Work Unit No.	
		11. Contract or Grant No. DTNH22-93-D-11089	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh, S.W. Washington, D.C. 20590		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code	
15. Supplementary Notes Reviewed by : <i>Robert F. Hathaway</i> Approved by : <i>Michael Roberts</i> Program Manager Head, Safety Research Section Transportation Sciences Center			
16. Abstract This report contains results of performance calibration tests performed on a Part 572 three-year-old size child test dummy at the Calspan Advanced Technology Center dummy certification test facility. The following tests were performed: 1. Head Impact Test 2. Chest Impact Test 3. Lumbar Flexion Test 4. Head-Neck Pendulum Test The child test dummy manufactured by First Technology Safety Systems, Serial No. 159 met the performance calibration requirements of CFR 49 Part 572, Subpart C.			
17. Key Words Part 572, Subpart C - Three-Year-Old Child Dummy FMVSS 213 - Child Restraint Systems		18. Distribution Statement Copies of this report are available from: Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 400 Seventh St., SW, Washington, DC 20590	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages	22. Price

FORM DOT F1700.7 (8-69)

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SECTION I

INTRODUCTION AND SUMMARY

This report presents the results obtained during certification tests of a three-year-old size child test dummy that was manufactured in accordance with the requirements of 49 CFR Part 572, Subpart C. The objective of these tests was to demonstrate that the test dummy (Serial No. 159, manufactured by First Technology Safety Systems) was suitable for use before and after the FMVSS 208/213 compliance full-scale test program. The tests were performed in the Dummy Certification Laboratory of Calspan's Advanced Technology Center using procedures⁽¹⁾ approved by the NHTSA Contract Technical Manager (CTM). These certification test procedures together with photographs of the apparatus for the four required tests (head impact, chest impact, lumbar spine flexion, and head-neck pendulum impact) are presented in Appendix A of this report. These certification tests were performed on this dummy prior to full-scale testing and after the full-scale test program was completed.

Data from these tests demonstrate that each of the dummy components (and their systems), that are required to be certifiable, were in compliance with the specifications of 49 CFR Part 572, Subpart C. All of the original data from each certification test are on file in the Calspan Dummy Certification Laboratory. Typical data traces are presented in Reference (1).

The data sheets presented in this test report were taken directly from TP-213-02 "Laboratory Procedure for Child Restraint System Testing." These data sheets use the word "calibration" when referring to certification procedures. Therefore, these words are used interchangeably in this report.

(1) "Operating Test Procedure for Test Program for FMVSS 213, Child Restraint Systems," Calspan Report No. 6974-V-1, Contract No. DTNH22-81-C-87088, Task Order No. 7.

SECTION II

Table 1

SUMMARY OF HEAD IMPACT TEST CALIBRATION DATA :

PRE-TEST / POST-TEST

CHILD DUMMY I. D. NO. 159

DATE OF CALIBRATION	7/26/94	10/31/94	
ROOM TEMPERATURE (66-78°F)	71	69	
ROOM RELATIVE HUMIDITY (10-70%)	53	46	
TEST MEASUREMENTS :	PRE-TEST DATA	POST-TEST DATA	PART 572 REQMT.
TEST PROBE IMPACT VELOCITY, fps	6.9	7.0	6.86 - 7.14
PEAK HEAD RESULTANT ACCEL., g	112.4	113.1	95 - 118
PEAK HEAD LATERAL ACCEL., g	3.9	3.5	≤7
PULSE Δ TIME @ 50 g, ms	1.75	1.75	1.3 - 2.0

REMARKS:

Technician (s) Ivan Minkewicz

Project Engineer (s) Robert Hathaway

Table 2

SUMMARY OF CHEST IMPACT TEST CALIBRATION DATA :PRE-TEST / POST-TESTCHILD DUMMY I. D. NO. 159

DATE OF CALIBRATION	7/26/94	10/28/94	
ROOM TEMPERATURE (66-78°F)	71	70	
ROOM RELATIVE HUMIDITY (10-70%)	53	43	
TEST MEASUREMENTS :	PRE-TEST DATA	POST-TEST DATA	PART 572 REQMT.
TEST PROBE IMPACT VELOCITY, fps	12.9	12.9	12.87-13.13
PEAK CHEST RESULTANT ACCEL., g	67.9	68.6	50-70
PEAK CHEST LATERAL ACCEL., g	2.1	2.7	≤5
PULSE Δ TIME @ 30 g, ms	3.8	3.5	2.5 - 4.0

REMARKS:

Technician (s) Ivan MinkewiczProject Engineer (s) Robert Hathaway

Table 3

SUMMARY OF LUMBAR FLEXION TEST DATA :

PRE-TEST / POST-TEST

CHILD DUMMY I. D. NO. 159

DATE OF CALIBRATION

8/3/94

10/7/94

ROOM TEMPERATURE (66-78°F)

70

70

ROOM RELATIVE HUMIDITY (10-70%)

55

46

TEST MEASUREMENTS :

**PRE-TEST
DATA**

**POST-TEST
DATA**

**PART 572
REQMT.**

FORCE @ 40° FLEXION ANGLE, lbs.

39.9

41.2

34 - 47

SPINAL COLUMN ANGLE @ 3 MIN.
POST TEST, degrees

1.0

0.8

≤5

REMARKS:

Technician (s) Ivan Minkewicz

Project Engineer (s) Robert Hathaway

Table 4

SUMMARY OF HEAD-NECK PENDULUM TEST DATA :
PRE-TEST / POST-TEST

CHILD DUMMY I. D. NO. 159

DATE OF CALIBRATION		8/5/94	10/27/94	
ROOM TEMPERATURE (66-78°F)		69	69	
ROOM RELATIVE HUMIDITY (10-70%)		49	45	
TEST MEASUREMENTS :		PRE-TEST DATA	POST-TEST DATA	PART 572 REQMT.
PENDULUM IMPACT VELOCITY, fps		17.4	17.1	16 - 18
PEND. MIN./MAX. DECEL. OVER (t ₃ - t ₂), g		28.3	26.5	20 - 34
PEAK HEAD RESULT. ACCEL., g		29.3	26.9	≤ 30
PEND. DECEL. PULSE Δ TIME (t ₂ - t ₁), ms		2.0	2.2	≤ 4
PEND. DECEL. PULSE Δ TIME (t ₃ - t ₂), ms		19.6	20.3	18 - 21
PEND. DECEL. PULSE Δ TIME (t ₄ - t ₃), ms		2.5	3.0	≤ 5
HEAD ZERO POSITION TIME / PEND. REVERSAL TIME, ms		115.7/151.6	116.3/124.0	- / -
HEAD MAX. ROTATION ANGLE, degrees		83.8	81.4	76 - 92
TIME (ms) @ HEAD ROT. ANGLE :	0 deg.	0.0	0.0	-2 - +2
	30 deg.	23.7	24.6	17.3 - 24.7
	60 deg.	36.2	38.8	31.1 - 40.9
	Max.	62.8	64.7	55.0 - 69.0
	60 deg.	86.4	86.3	81.7 - 100.3
	30 deg.	101.2	102.4	97.4 - 118.6
	0 deg.	115.7	116.3	111.2 - 134.8
CHORDAL DISPLACEMENT (in) @ HEAD ROTATION ANGLE OF :	0 deg.	0.0	0.0	-0.8 - +0.8
	30 deg.	2.4	2.4	1.4 - 3.0
	60 deg.	4.3	4.4	3.5 - 5.1
	Max.	6.0	5.9	5.0 - 6.6
	60 deg.	4.5	4.6	3.5 - 5.1
	30 deg.	2.4	2.5	1.4 - 3.0
	0 deg.	0.1	0.1	-0.8 - +0.8

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SECTION III

INSTRUMENT CALIBRATION

Prior to pre-test certification testing, all test instrumentation was recalibrated in accordance with the requirements and procedures described in TP-213-02 and Section 3.0, Instrumentation Calibration, of the Operating Test Procedure. Table 5 lists all of the applicable test equipment for each of the certification tests and the calibration dates.

Table 5
CERTIFICATION INSTRUMENTATION

<u>Instrument¹</u>	<u>Certification Test</u>	<u>Calibration Date</u>	<u>Due Date</u>
Slide Potentiometer Oceanside Mfg. Co. Model LCP20-50 2.00 inches travel, 10,000 ohms	Neck Pendulum	5/94	11/94
C.G. Head Potentiometer Oceanside Mfg. Co. Model SP221 Serial HNR2 10K, linearity = 1.5%	Neck Pendulum	5/94	11/94
C.G. Pend. Potentiometer Oceanside Mfg. Co. 10K, linearity = 1.5%	Neck Pendulum	5/94	11/94
Bourns Potentiometer Model 3520S--1-502 5K +/-, linearity = 0.3%	Lumbar Spine Flexion	6/94	12/94
Transducer Inc. Load Cell S/N 20051, 50#	Lumbar Spine Flexion	6/94	12/94
Hewlett Packard 7035B X-Y Recorder +/- .02% Full Scale Accuracy	Lumbar Spine Flexion	6/94	6/95
Hewlett Packard 7045B X-Y Recorder +/- .02% Full Scale Accuracy	Lumbar Spine Flexion	6/94	6/95
Endevco Accelerometers S/N 160 +/- .075% Accuracy CEC 4-202	Neck Pendulum (ATD)	6/94	12/94

CERTIFICATION INSTRUMENTATION (cont'd)

<u>Instrument¹</u>	<u>Certification Test</u>	<u>Calibration Date</u>	<u>Due Date</u>
Endevco Triaxial Accelerometers, 7267A :			
S/N BH83	Head Impact (ATD)	5/94	11/94
S/N BB21	Chest Impact (ATD)	5/94	11/94
S/N 0025	Head Impact (ATD)	5/94	11/94
S/N BA71	Chest Impact (ATD)	5/94	11/94
Systron/Donner Counter +/- 1 count	Head Impact Chest Impact Neck Pendulum	7/93	7/94

¹Pendulum velocity measurements for the Head Impact, Chest Impact and Neck Pendulum tests are measured by a Calspan-designed light beam velocity trap which consists of two .040 inch field stops placed 5.020 inches apart. This system includes General Electric light sources #SL520D6 and Texas Instruments photo diodes.

Prior to post-test certification testing, all test instrumentation was recalibrated in accordance with the requirements and procedures described in TP-213-02 and Section 3.0, Instrumentation Calibration, of the Operating Test Procedure. Table 6 lists all of the applicable test equipment for each of the certification tests and the calibration dates.

Table 6
CERTIFICATION INSTRUMENTATION

<u>Instrument²</u>	<u>Certification Test</u>	<u>Calibration Date</u>	<u>Due Date</u>
Slide Potentiometer Oceanside Mfg. Co. Model LCP20-50 2 inches travel, 10,000 ohms	Neck Pendulum	5/94	11/94
C.G. Head Potentiometer Oceanside Mfg. Co. Model SP221, S/N HNR2 10K linearity = 1.5%	Neck Pendulum	5/94	11/94
C.G. Pendulum Potentiometer Oceanside Mfg. Co. Model SP221, S/N HNR1 10K linearity = 1.5%	Neck Pendulum	5/94	11/94
Bourns Potentiometer Model 3520S--1-502 5K +/-, linearity = 0.3%	Lumbar Spine Flexion	6/94	12/94
Transducer Inc. Load Cell S/N 20051, 50#	Lumbar Spine Flexion	6/94	12/94
Hewlett Packard 7035B X-Y Recorder +/- .02% Full Scale Accuracy	Lumbar Spine Flexion	6/94	6/95
Hewlett Packard 7045B X-Y Recorder +/- .02% Full Scale Accuracy	Lumbar Spine Flexion	6/94	6/95
Endevco Accelerometers S/N 160 +/- .075% Accuracy CEC 4-202	Neck Pendulum (ATD)	6/94	12/94

CERTIFICATION INSTRUMENTATION (cont'd)

<u>Instrument²</u>	<u>Certification Test</u>	<u>Calibration Date</u>	<u>Due Date</u>
Endevco Triaxial Accelerometers, 7267A :			
S/N BH83	Head Impact (ATD)	5/94	11/94
S/N BB21	Chest Impact (ATD)	5/94	11/94
S/N 0025	Head Impact (ATD)	5/94	11/94
S/N BA71	Chest Impact (ATD)	5/94	11/94
Syston/Donner Counter +/- 1 count	Head Impact Chest Impact Neck Pendulum	9/94	9/95

²Pendulum velocity measurements for the Head Impact, Chest Impact and Neck Pendulum tests are measured by a Calspan-designed light beam velocity trap which consists of two .040 inch field stops placed 5.020 inches apart. This system includes General Electric light sources #SL520D6 and Texas Instruments photo diodes.

APPENDIX A

CALIBRATION TEST PROCEDURES

1. Head Impact Test

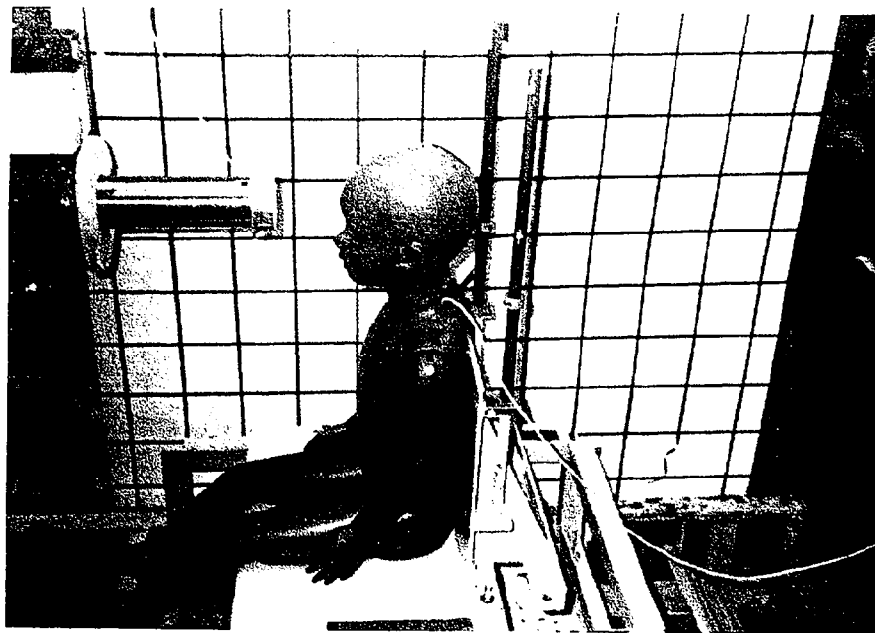
The Calspan linear impactor and the pre-impact position of the three-year-old size ATD are shown in Figure A-1. The impacting steel cylinder conforms dimensionally with the specifications of Part 572.21, Subpart C. Triaxial accelerometers are mounted in the head of the dummy and on the front of the cylinder. Impact velocity is measured by infrared photo reflective sensors located 6 cm apart at the rear of the impact cylinder.

The ATD head impact point is determined by aligning the center of the impact 2.9 inches below the top of the head. The flat front face of the probe is positioned adjacent to the ATD head impact point, and the light beam velocity trap is positioned with the probe interrupter at the second field stop. A dummy back support, 12.4 inches high, is employed in this test. The impactor is then pressurized to a pre-determined setting and fired. The impactor's travel is controlled by ball bearing guides encased in a metal cylinder.

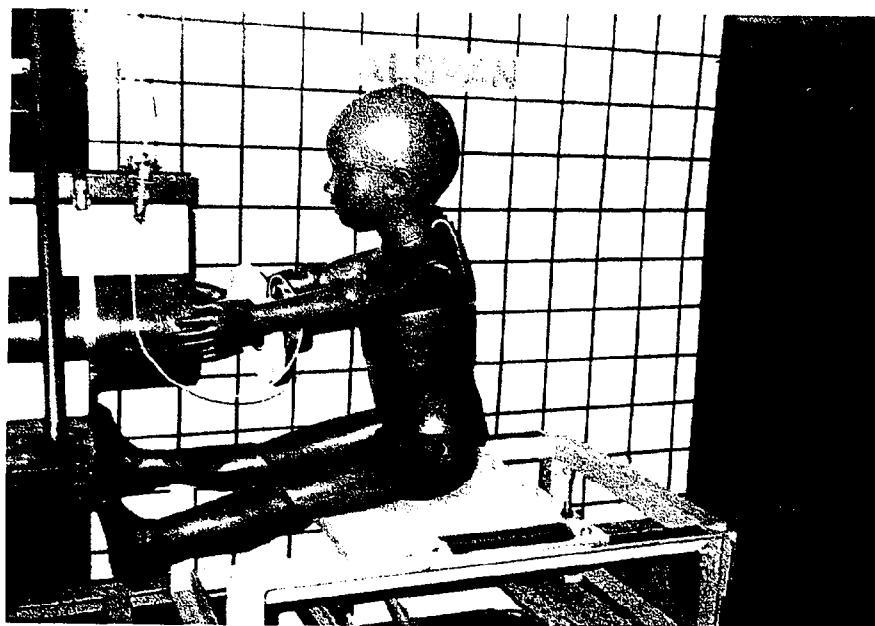
Impactor velocity is immediately available on the EPUT meter and is also recorded electronically for a permanent record. All data is collected on analog tape and played back on brush recordings for quick turnaround data analysis. All head impact data traces are on file at the Calspan Dummy Certification Laboratory.

2. Chest Impact Test

The pre-test chest impact setup is also shown in Figure A-1. The same impactor is used for both head and chest impact certification tests. The chest impact point is determined by seating the ATD against a rigid back surface with the chest skin jacket removed. A measurement is taken from the seating surface to the longitudinal centerline of the bolt attaching the top of the rib cage sternum to the thoracic spine box. The chest skin is then replaced and marked at a position 1.5 inches below the initial measurement.



(a) HEAD IMPACT TEST



(b) CHEST IMPACT TEST

Note: Certifications and dynamic tests were performed with a Type II head, (photos depict a Type I head).

Figure A-1 SETUPS FOR HEAD AND CHEST IMPACT TESTS

The ATD is seated on the teflon seating surface and adjusted to allow the striking mass face surface to be approximately tangent to the most vertical surface of the chest. The accelerator is then pressurized to a pre-determined setting and fired.

Data is collected in the same manner as the head impact test. All data traces are on file at Calspan's Dummy Certification Laboratory.

3. Lumbar Spine Flexion Test

The lumbar spine flexion test apparatus is shown in Figure A-2. The pulley is positioned so that the applied force is perpendicular to the thoracic spine box when the lumbar spine reaches 40 degrees of flexion.

The ATD lower torso and upper legs are bolted to the seating surface after the neck has been replaced with a cylindrical aluminum adapter. A pull force is applied to the ATD neck adapter, through a load cell, at a continuously monitored deflection rate of between 0.5 and 1.5 degrees per second by cranking the cable through the pulley systems until 40 degrees of flexion is reached. This flexion angle is maintained for 10 seconds, the cable is cut to rapidly release the force, and the torso return angle is recorded after 3 minutes.

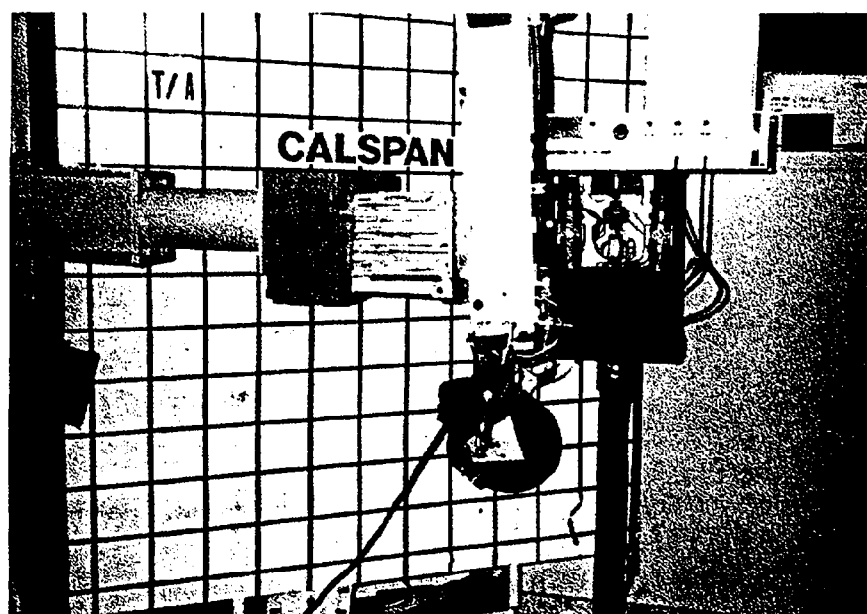
Rotation vs. time and flexion angle vs. force are plotted concurrently. The force required to flex the torso forward to a 40 deg. angle is recorded. Torso return angle is indicated on the flexion angle plot by a straight line through the ordinate. These plots are on file at Calspan's Dummy Certification Laboratory.

4. Neck Pendulum Test

The pendulum impact test apparatus used for neck certification tests is shown in Figure A-2. The inertial and dimensional properties of the rigid pendulum conform to the requirements of Part 572, Subpart C, and TP-213-02, Appendix No. 1.



(a) LUMBAR SPINE FLEXION TEST



(b) NECK PENDULUM TEST

Note: Certifications and dynamic tests were performed with a Type II head, (photos depict a Type I head).

Figure A-2 SETUPS FOR LUMBAR SPINE FLEXION AND NECK PENDULUM TESTS

The ATD head and neck are mounted on the bottom of the pendulum as required (Calspan performs all neck certification tests with the appropriate ATD head attached), and the pendulum is raised and released from a pre-determined height required to achieve the desired impact velocity. The pendulum is decelerated by a block of aluminum honeycomb. Velocity is measured by means of the light beam velocity trap. The light beam interrupter is located a known distance below the center of the pendulum accelerometer in order to preclude any interference between the interrupter and the honeycomb. The velocity trap reading is corrected for this distance so the recorded velocity is that of the center of the accelerometer.

The three potentiometers, mounted on the right side of the head, are arranged to measure the linear and angular geometric components required for computation of the chordal displacements and head rotation angles. The voltage outputs of these three potentiometers are processed by the analog circuitry depicted in Figure A-3 which provides complete time histories of chordal displacement and head rotation angle. These time histories are plotted simultaneously on a brush recorder, along with a common timing trace, thus allowing for accurate correlation between chordal displacement, head rotation angle and time. These brush records are on file at Calspan's Dummy Certification Laboratory.

An electronic time zero switching device is attached to the pendulum/honeycomb contact point on the pendulum. Time zero is electronically recorded at the time of pendulum/honeycomb contact and pendulum reversal time is recorded at the end of the pendulum/honeycomb contact. These times are also plotted on a brush record concurrent with the chordal displacement and head rotation angle. This brush record allows for immediate determination of pendulum reversal time to head zero position time.

