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

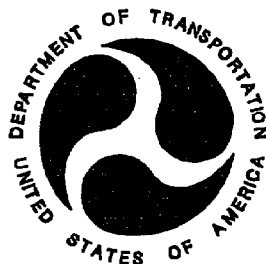
VOLVO GOTHENBURG SWEDEN
1994 Volvo 940
4-door sedan

NHTSA NUMBER: CR5900

CALSPAN TEST NUMBER: 8183-1

March 8, 1994

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FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
ENFORCEMENT
Office of Vehicle Safety Compliance
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		8. Performing Organization Report No. 8183-1	
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		15. Supplementary Notes	
16. Abstract A 30 mph vehicle safety compliance test was conducted on a 1994 Volvo 940 4-door sedan. This test was performed at the Calspan Advanced Technology Center in Buffalo, New York on March 8, 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" The test mode was perpendicular (0°) and the impact velocity was 29.6 mph. The ambient temperature at the impact face was 70 °F. The subject test vehicle appears to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial) and 301. <u>Type of Restraint System:</u> The test vehicle was equipped with a driver airbag and a passenger airbag restraint system.			
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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 Volvo 940 4-door sedan, 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.

Section 2

SUMMARY OF TEST NUMBER CR5900

A frontal barrier was impacted by a 1994 Volvo 940 4-door sedan at a velocity of 29.6 mph. The test was performed at the Calspan Corporation Advanced Technology Center on March 8, 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.

One Part 572E, 50th percentile male anthropomorphic test device (ATD), was placed in the driver seating position. One Part 572B, 50th percentile male ATD was placed in the right-front passenger seating position. The ATD's were placed in the vehicle following the dummy placement instructions specified in the OVSC Laboratory Test Procedure TP-208-09.

The driver ATD was fully instrumented with head and chest three axis (X,Y,Z) accelerometers, left/right femur load cells, upper neck force and moment transducers, and chest displacement potentiometer. The passenger ATD contained head and chest three axis (X,Y,Z) accelerometers and left/right femur load cells. These ATDs had been certified prior to the test.

The 30 channels of data were recorded on a P.C. based data acquisition system. Appendix B contains the vehicle and dummy response data traces.

The driver's HIC was 123. The maximum chest deceleration over 3 milliseconds was 45.5 g's with -1.5 inches of deflection. The maximum force on the driver's left femur was -1712.2 pounds and -1259.3 pounds on the right femur.

The right front passenger's HIC was 484. The maximum chest deceleration over 3 milliseconds was 56.1 g's. Loads of -1803.7 and -1743.9 pounds were recorded on the left and right femurs respectively.

Table 1

CRASH TEST SUMMARY

Vehicle NHTSA No. :	<u>CR5900</u>	Test Mode :	<u>30 mph Frontal Barrier</u>
Test Date :	<u>March 8, 1994</u>	Time:	<u>11:30</u> Temperature : <u>70</u> °F
Vehicle Make/Model/Body Style : <u>1994 Volvo 940 4-door sedan</u>			
Vehicle Test Weight :	<u>3725</u>	lbs	
Vehicle/Barrier Impact Angle :	<u>0</u>	°	
Impact Velocity :	<u>29.6</u>	mph	
Maximum Static Crush :	<u>17.6</u>	inches	
Vehicle Rebound :	<u>10.3</u>	inches	
<u>DUMMIES:</u>	<u>DRIVER</u>	<u>PASSENGER</u>	
Type :	<u>Part 572E</u>	<u>Part 572B</u>	
Restraint System :	<u>airbag</u>	<u>airbag</u>	
Number of Data Channels :	<u>30</u>		
Number of Cameras :	<u>1</u>	Real Time	
	<u>14</u>	High Speed	
<u>DOOR OPENING DATA :</u>	<u>Closed/Operable</u>	- Left Front	
	<u>Closed/Operable</u>	- Right Front	
Front Seat(s) Data :	<u>DRIVER</u>	<u>PASSENGER</u>	
Seat Track Failure :	<u>None</u>	<u>None</u>	
		Inches of shift	
Seat Back Failure :	<u>0.0</u>	<u>0.0</u>	
<u>VISIBLE DUMMY CONTACT POINTS :</u>	<u>DRIVER</u>	<u>PASSENGER</u>	
Head :	Face with airbag, top of head with sunvisor, rear of head with headrest.	Face with airbag, rear of head with "B" pillar, forehead & top of head with sunvisor.	
Abdomen :	Lower steering wheel rim	Airbag	
Chest	Airbag	Airbag	
Knees	Lower dash	Lower dash	

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATATEST VEHICLE INFORMATION :

Year/Make/Model/Body Style : 1994 Volvo 940 4-door sedan
 NHTSA No. : CR5900 ; VIN: YV1JS8319R1158405 ; Color : White
 Engine Data: 4 cylinders; - CID; 2.3 Liters; - cc
 Placement : X Longitudinal or In-Line; - Transverse of Lateral
 Transmission Data : 4 speeds; - Manual; X Automatic; X Overdrive
 Final Drive : X Rear Wheel Drive; - Front Wheel Drive; - Four Wheel Drive
 Major Options : X A/C; X Pwr.Strg.; X Pwr. Brakes
X Pwr. Windows; X Pwr. Door Locks; - Tilt Wheel
 Date Received : 2/1/94 ; Odometer Reading 317 miles
 Selling Dealer : KEELER VOLVO
 & Address: 347 New Karner Road Route 155 Colonie, N.Y. 12205

DATA FROM TIRE VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by : VOLVO GOTHENBURG SWEDEN, INC.
 Date of Manufacture October, 1993
 GVWR : 4150 lbs.; GAWR: 2040 lbs. FRONT; 2180 lbs. REAR

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load : 36 psi FRONT
36 psi REAR
 Recommended Tire Size : 185/65 R15
 * Recommended Cold Tire Pressure : 36 psi FRONT; 36 psi REAR
 Size of Tires on Test Vehicle: 185/65 R15 ; Manufacturer: Goodyear
 Vehicle Capacity Data :
 Type of Front Seats: - Bench; X Bucket; - Split Bench
 Number of Occupants: 2 Front; 3 Rear; 5 Total
 Vehicle Capacity Weight (VCW) = 930 lbs.
 No. of Occupants x 150 lbs. = 750 lbs.
 Rated Cargo/Luggage Weight (RCLW) = 180

*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	=	860	lbs.	Right Rear	=	730	lbs.
Left Front	=	920	lbs.	Left Rear	=	720	lbs.
TOTAL FRONT	=	1,780	lbs.	TOTAL REAR	=	1,450	lbs.
TOTAL DELIVERED WEIGHT =				3,230 lbs.			

% of Total Front of Vehicle Weight = 55.1 % of Total Rear Weight = 44.9 %

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT :

Total Delivered Weight	=	3,230	lbs.
Rated Cargo/Luggage Weight (RCLW)	=	180	lbs.
Weight of p.572 dummies,167 & 164 each	=	331	lbs.
TARGET TEST WEIGHT	=	3,741	lbs.

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 164 POUNDS OF CARGO WEIGHT:

Right Front	=	880	lbs.	Right Rear	=	940	lbs.
Left Front	=	970	lbs.	Left Rear	=	935	lbs.
TOTAL FRONT	=	1,850	lbs.	TOTAL REAR	=	1,875	lbs.
TOTAL TEST WEIGHT =				3,725 lbs.			

% of Total Front Weight = 49.7 % % of Total Rear Weight = 50.3 %

Weight of Ballast Secured in Vehicle Trunk Area = 0 lbs.

Vehicle Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimension in inches) :

AS DELIVERED :	RF	<u>27.6</u>	LF	<u>27.1</u>	RR	<u>27.1</u>	LR	<u>26.9</u>
FULLY LOADED :	RF	<u>26.5</u>	LF	<u>26.4</u>	RR	<u>24.1</u>	LR	<u>24.0</u>
AS TESTED :	RF	<u>27.0</u>	LF	<u>26.7</u>	RR	<u>25.4</u>	LR	<u>25.3</u>
Vehicle's Wheel Base : <u>109.8</u> in.								

Location of Vehicle's C.G. : 55.3 inches rearward of front wheel center.

FUEL SYSTEM DATA :

Fuel System Capacity From Owner's Manual	=	19.8	gallons
Usable Capacity Figure Furnished by COTR	=	19.8	gallons
Test Volume Range (92 to 94% of Usable Capacity)	=	18.2	to 18.6 gallons
ACTUAL TEST VOLUME=		18.4	gallons (with entire fuel system filled)

Table 3

POST IMPACT DATATYPE OF TEST:

Type of Test : Frontal Barrier Impact Angle : 0°
 Test Date : March 8, 1994 Time: 11:30 Temperature: 70 °F
 Vehicle NHTSA No. : CR5900
 Required Impact Velocity Range : 28.9 to 29.9 mph

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

Trap No. 1 = 29.6 mph; Trap No. 2 = 29.6 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 = 187.5 ; C/L = 190.7 ; Left = 188.2
 Post-Test Right = 172.5 ; C/L = 173.1 ; Left = 172.7
 Crush Right = 15.0 ; C/L = 17.6 ; Left = 15.5
 AVERAGE = 16.0 inches

VEHICLE REBOUND: (From rigid barrier only.)

Distance from front of test vehicle to impact point :

Right = 9.9 ; C/L = 10.3 ; Left = 10.8
 AVERAGE = 10.3 inches

DOOR OPENING:

	Left	Right
Front	Closed/Operable	Closed/Operable
Rear	N/A	N/A

SEAT MOVEMENT:

	Seat Back Failure	Seat Shift
Front	None	0.0
Rear	N/A	N/A

Table 3

POST IMPACT (cont.)

GLAZING DAMAGE :

Windshield cracked near passenger airbag.

OTHER NOTABLE IMPACT FEATURES :

None

Section 3

OCCUPANT AND VEHICLE DATA

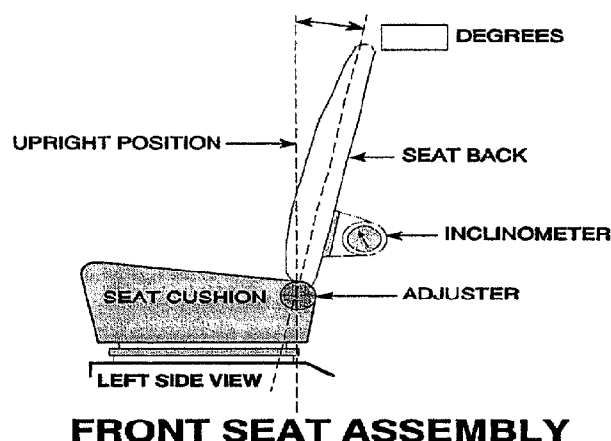
Figure 1

TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 1994 Vehicle Model: Volvo 940 Body Style : 4-door sedan

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 : 16 deg.

Measurement instructions : Press a bar against centerline of seat back, with vehicle attitude at zero degrees. Seat back angle set at 16 deg. from vertical position.

Seat back angle for passenger's seat : 16 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. There are 7 locking positions before and after mid locking position.

Positioning of the passenger's seat (if applicable) : Same as driver seating position.

3. Fuel Tank Capacity Data

A. "Usable Capacity" of the standard equipment fuel tank is 19.8 gallons

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

4. Steering Column Position :

Steering column is not adjustable.

5. Other:

Lumbar support in off position for driver and passenger seats. Driver seat in lowest position.

Figure 2

PART 572 DUMMY IN-VEHICLE POSITION

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS

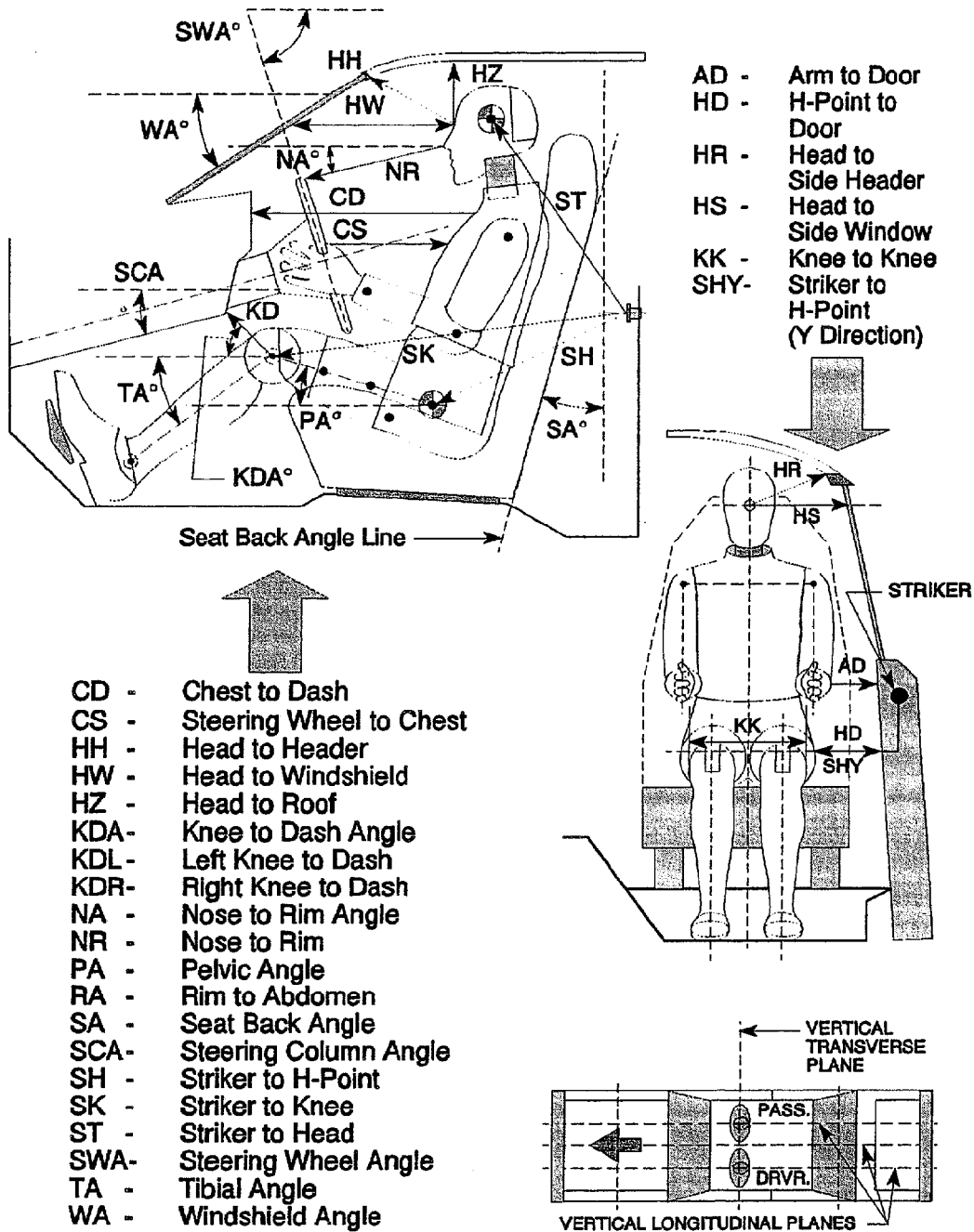


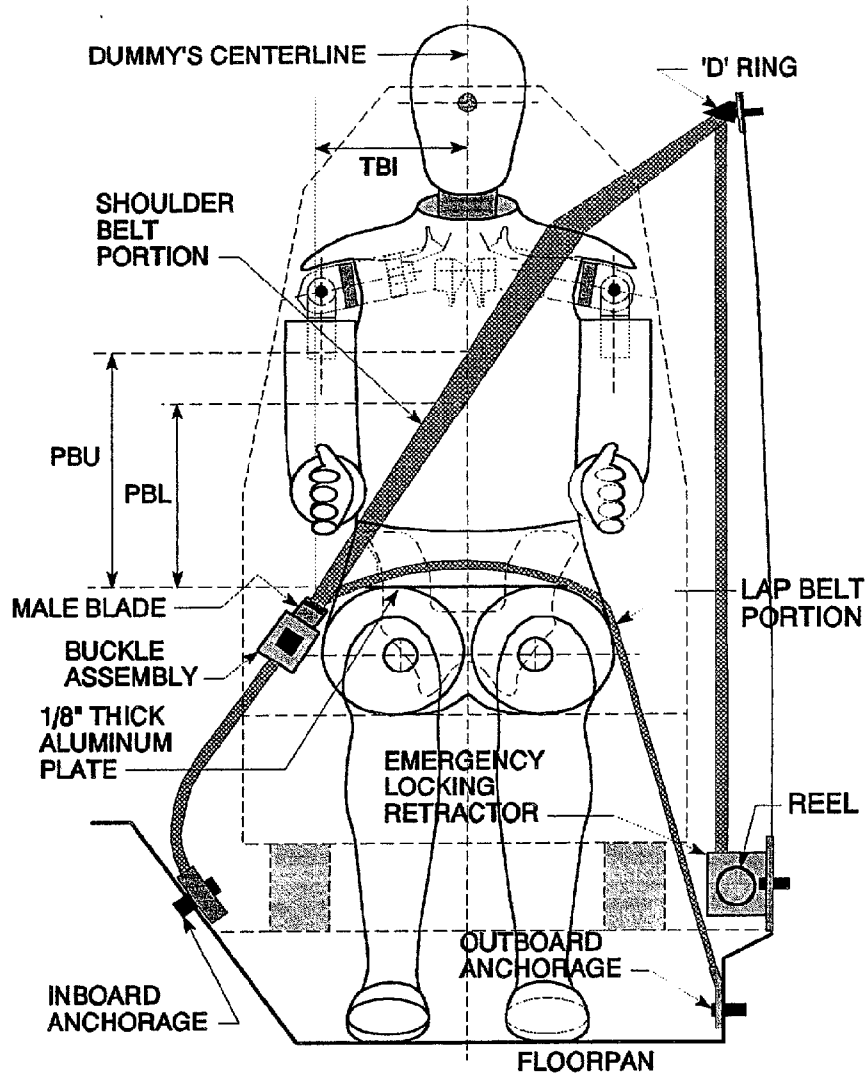
Table 4

FRONT SEAT OCCUPANT MEASUREMENTS

	DRIVER (Serial #342)	PASS. (Serial #1020)
WA°	33 deg.	-
SWA°	66 deg.	-
SCA°	24 deg.	-
SA°	16 deg.	16 deg.
HZ	8.2	6.2
HH	15.1	16.4
HW	22.6	22.2
HR	9.1	5.9 (to handle)
NR	14.4 Angle 10 deg.	-
CD	21.1	23.5
CS	11.1	-
RA	7.0	-
KDL	6.7 Angle (KDA) 30 deg.	7.6
KDR	6.3	7.7 Angle (KDA) 24 deg.
PA°	23 deg.	N/A
TA°	33 deg.	27 deg.
KK	10.8	11.8
ST	21.1 Angle 13 deg.	21.1 Angle 8 deg.
SK	23.5 Angle 94 deg.	22.8 Angle 96 deg.
SH	8.8 Angle 127 deg.	8.8 Angle 128 deg.
SHY	9.1	9.0
HS	15.3	12.0
HD	6.0	5.8
AD	4.8	4.3

Figure 3

SEAT BELT POSITIONING DATA



FRONT VIEW OF DUMMY

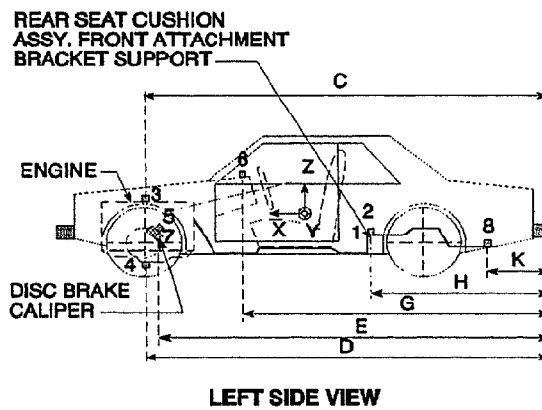
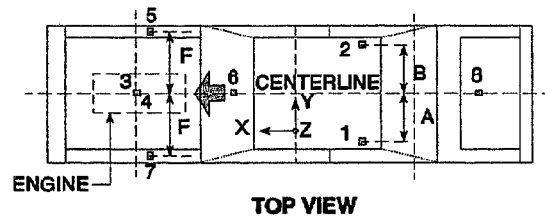
	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	*	*
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	*	*
<u>TBI</u> -- Distance from torso centerline to buckle	*	*

* - Vehicle equipped with air bags, seat belts not used for this test.

Figure 4

VEHICLE ACCELEROMETER LOCATIONS

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			na

*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	21.0	21.0
B	21.0	21.0
C	159.3	155.8
D	148.9	147.1
E	Right = 151.1 Left = 151.0	Right = 148.6 Left = 150.7
F	Right = -24.3 Left = 23.9	Right = 24.3 Left = 23.8
G	118.0	118.5
H	72.5	72.3
K	11.8	11.8

LOCATION NO.	DESCRIPTION	MAXIMUM VALUE			
		Pos.	msec.	Neg.	msec.
1	Rear Seat X-Member @ Left Side	3.4	114.7	-31.8	24.6
2	Rear Seat X-Member @ Right Side	3.3	114.5	-34.5	25.1
3	Top of Engine Block	6.1	77.8	-86.4	46.8
4	Bottom of Engine	10.2	103.6	-67.9	47.0
5	Disc Brake Caliper @ Right Side	10.6	108.6	-55.8	27.7
6	Instrument Panel	23.8	37.2	-57.7	68.9
7	Disc Brake Caliper @ Left Side	13.9	56.9	-53.9	28.7
8	Trunk	6.8	121.4	-27.2	35.5

Figure 5

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information shown on Table 5.

CAMERA POSITIONS FOR FRONTAL IMPACTS

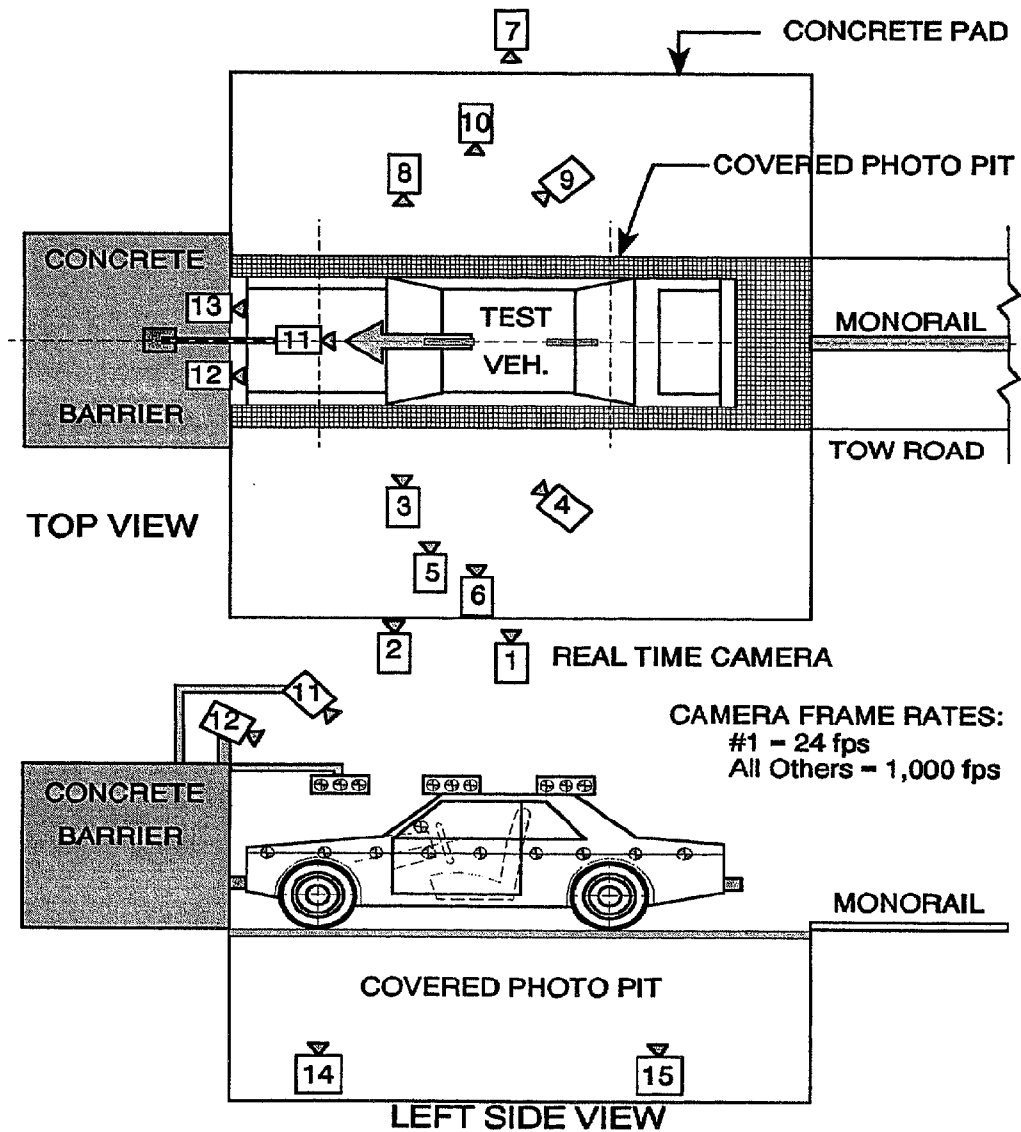


Table 6

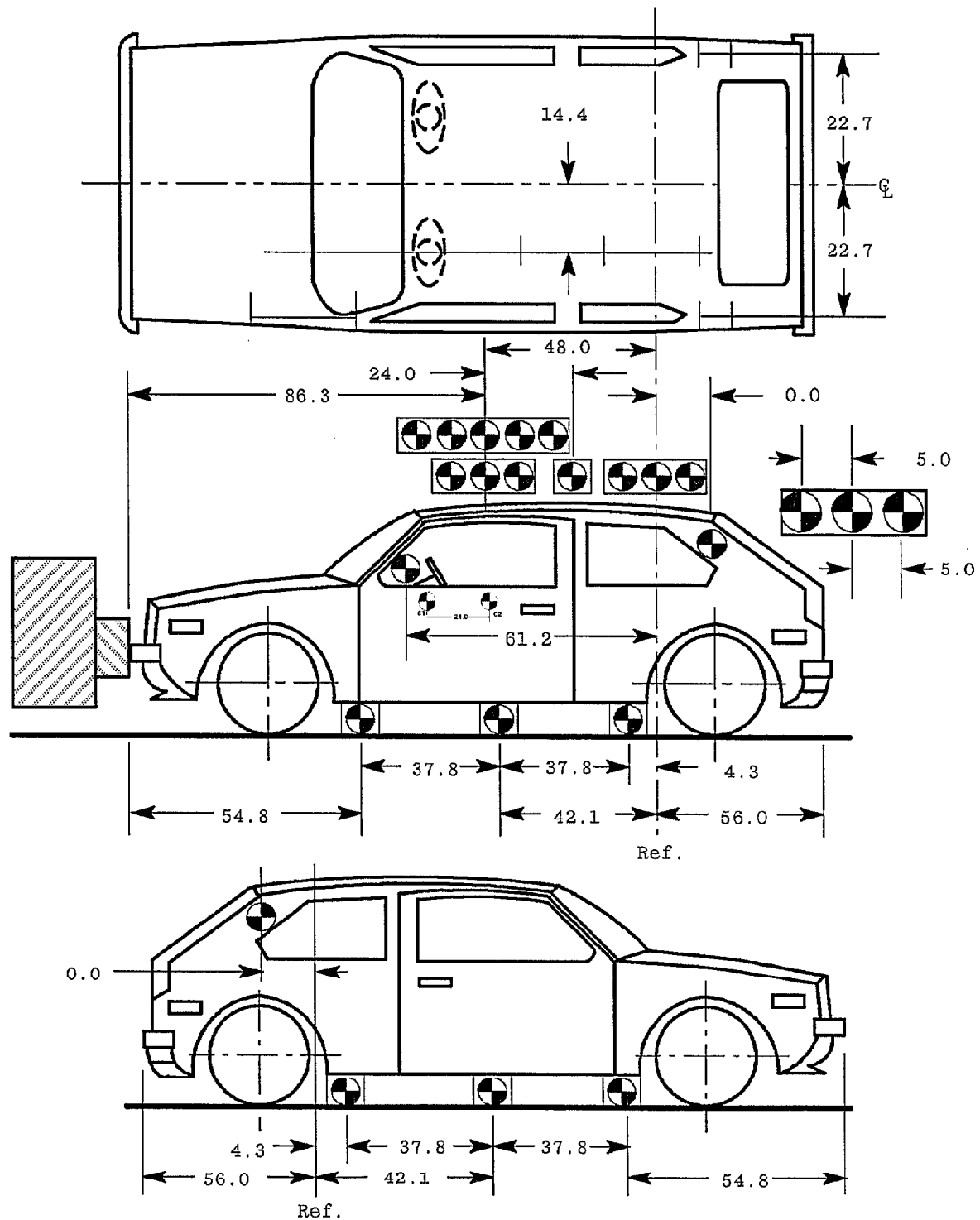
HIGH-SPEED CAMERA LOCATIONS

Test No. CR5900 Vehicle: 1994 Volvo 940 4-door sedan

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	239	76	41	-4	221.6	13	102
3	Left Side View	320	51	41	-3	302.6	25	100
4	Driver and Interior View	106	109	72	-22	-	13	102
5	Steering Column (Bottom)	276	88	46	-5	258.6	25	101
6	Steering Column (Top)	276	88	70	-9	258.6	25	100
7	Overall Right Side	252	84	42	-3	234.6	13	-
8	Right Side View	324	68	41	-3	306.6	25	850
9	Right Passenger View	306	83	55	-3	288.6	35	100
10	Passenger and Interior View	110	113	74	-22	-	13	930
11	Passenger Front View	22	19	76	-43	-	13	102
12	Driver Front View	22	19	76	-43	-	13	102
13	Windshield View	0	0	127	-60	-	13	110
14	Pit View of Engine	0	38	-86	90	-	13	680
15	Pit View of Fuel Tank	0	132	-86	90	-	13	710

*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



(Dimensions in inches)

TEST VEHICLE MEASUREMENTS



Table 7

VEHICLE MEASUREMENTS

No.		All Dimensions in inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	190.7	173.1	17.6
X2	Rear Surface of Vehicle to Front of Engine	159.2	158.5	0.7
X3	Rear Surface of Vehicle to Firewall	138.6	138.5	0.1
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	128.7	128.9	-0.2
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	128.8	128.3	0.5
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	129.0	128.9	0.1
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	128.5	128.5	0.0
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	88.4	88.4	0.0
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	88.4	88.2	0.2
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	88.9	88.9	0.0
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	88.6	88.6	0.0
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	132.9	132.9	0.0
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	132.7	132.7	0.0
X14	Rear Surface of Vehicle to Firewall, Right Side	140.0	140.1	-0.1
X15	Rear Surface of Vehicle to Firewall, Left Side	139.5	140.1	-0.6
X16	Rear Surface of Vehicle to Steering Column	109.9	n/a	n/a
X17	Center of Steering Column to "A" Post	16.3	n/a	n/a
X18	Center of Steering Column to Headliner	16.9	n/a	n/a
X19	Rear Surface of Vehicle to Right Side of Front Bumper	188.2	172.5	15.7
X20	Rear Surface of Vehicle to Left Side of Front Bumper	187.5	172.7	14.8
X21	Length of Engine Block	18.0	18.0	0.0

Section 4

SUMMARY OF RESULTS OF FMVSS NOS. 208, 212, 219 AND 301-75

- "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. 301-75

Table 8

DUMMY INJURY CRITERIA VALUESNHTSA No. : CR5900 Vehicle : 1994 Volvo 940 4-door sedan

	MAXIMUM ACCELERATION (g's)								
	HEAD				CHEST				
	X	Y	Z	R	X	Y	Z	R*	Displacement
Dummy (1)	-35.0	-14.2	11.0	35.3	-46.2	-3.1	13.0	45.5	-1.5 in.
Dummy (2)	-75.3	-13.8	46.1	83.8	-56.1	-10.7	25.4	56.1	n/a

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Dummy (1)	-1712.2	-1259.3
Dummy (2)	-1803.7	-1743.9

	HEAD INJURY CRITERIA**			
	HIC	36 millisecond Maximum		Avg. Acc (g)
		t ₁ (msec)	t ₂ (msec)	t ₁ TO t ₂
Dummy (1)	122.73	63.000	98.880	25.92
Dummy (2)	483.54	60.720	74.040	66.68

* Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

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 driver and passenger "B" pillars.

The label states, " The manufacturer's recommended schedule is to replace airbags ten (10) years after date of manufacture".

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 lower 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. :	CR5900
Make/Model :	1994 Volvo 940 4-door sedan
Date of Comfort/Convenience Check :	March 7, 1994
Technician Performing Check :	D.J.T.
GVWR :	4150 lbs.

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 - NO X

(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 N/A NO N/A
 - b. The latch plate is released from the buckle. YES N/A NO N/A
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 0.4 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. | 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 X NO -
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 X NO -
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 N/A NO N/A

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 X NO -
2. The remaining two seat belt parts are accessible under normal conditions.
- YES X NO -

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 1.0 inch trim along the top and sides.

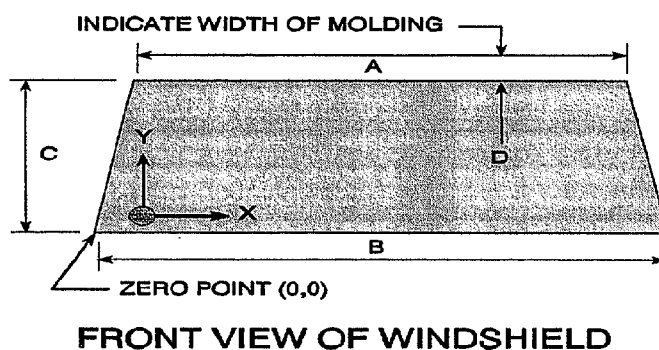
FMVSS 212 REQUIREMENTS :

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	82.55	82.55	100.0
LEFT SIDE	82.55	82.55	100.0
TOTAL	165.1	165.1	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=50.0

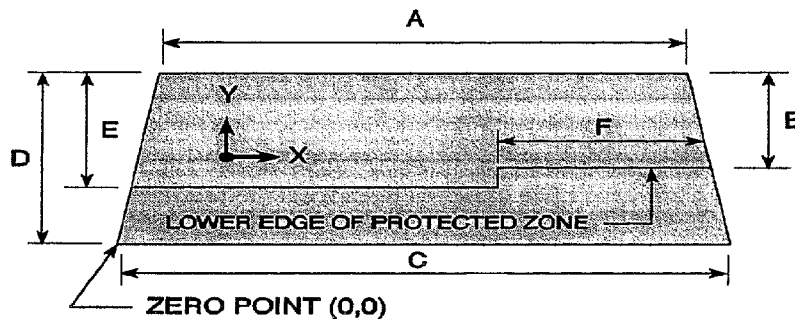
B=16.4

C=61.9

D=26.6

E=16.5

F=24.5



FRONT VIEW OF WINDSHIELD

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

(Show location of penetration on above sketch)

No failure

COORDINATES		
	X	Y
1		
2		
3		
4		

Table 13

FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

FMVSS NO. 301

TEST VEHICLE NHTSA NO. : CR5900 TEST DATE : March 8, 1994Vehicle Mfr./Make/Model : 1994 Volvo 940 4-door sedan

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 0 ° 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 :

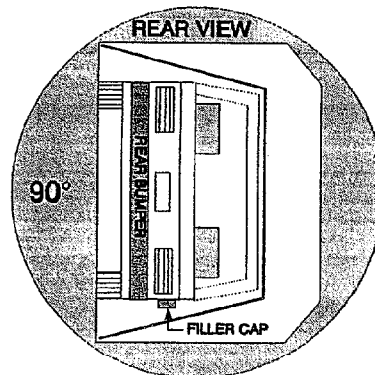
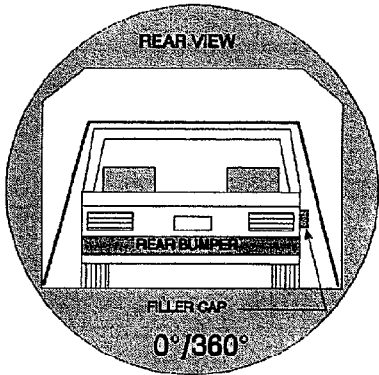
None

Table 14

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE :
0-90 Deg.

Vehicle NHTSA ID No. :
CR5900

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD :

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	2	minutes	01	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	7	minutes	01	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.

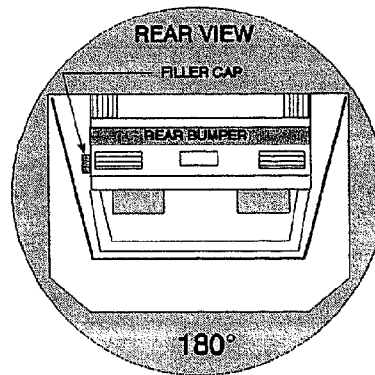
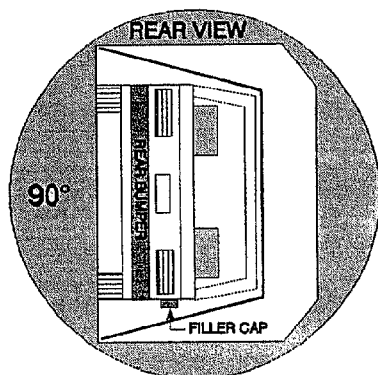
IV. SOLVENT SPILLAGE LOCATION(S) :

None

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

TEST PHASE :
90-180 Deg.

Vehicle NHTSA ID No. :
CR5900



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD :

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	<u>1</u>	minutes	<u>55</u>	seconds
FMVSS 301 Position Hold Time +	<u>5</u>	minutes	<u>00</u>	seconds
TOTAL	<u>6</u>	minutes	<u>55</u>	seconds
Next whole minute interval	<u>7</u>	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.

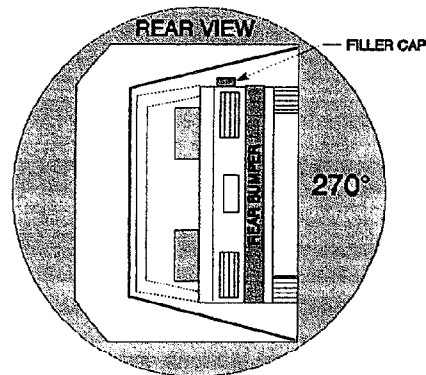
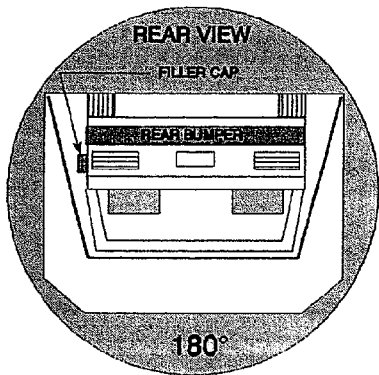
IV. SOLVENT SPILLAGE LOCATION(S) :

None

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

TEST PHASE :
180-270 Deg.

Vehicle NHTSA ID No. :
CR5900



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD :

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	1	minutes	50	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	6	minutes	50	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.

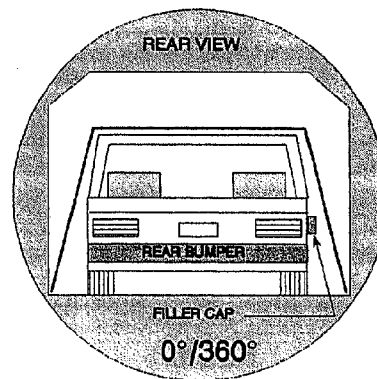
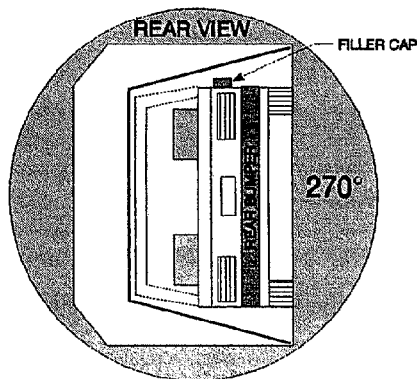
IV. SOLVENT SPILLAGE LOCATION(S) :

None

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

TEST PHASE :
270-360 Deg.

Vehicle NHTSA ID No. :
CR5900



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD :

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	<u>2</u>	minutes	<u>05</u>	seconds
FMVSS 301 Position Hold Time +	<u>5</u>	minutes	<u>00</u>	seconds
TOTAL	<u>7</u>	minutes	<u>05</u>	seconds
Next whole minute interval	<u>8</u>	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 15
POST TEST AIR BAG DATA

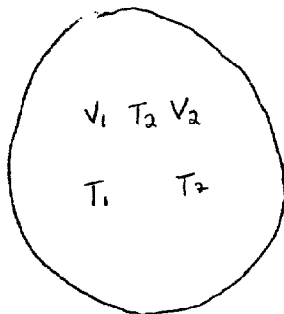
NHTSA No. : CR5900; Test Date: March 8, 1994; Technician: D. J. Travale

Vehicle Model Year/Make/Model: 1994 Volvo 940

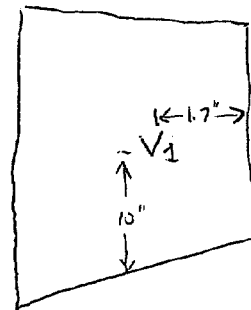
A.	No. of vent holes:	<u>2</u>	-Driver	<u>1</u>	-Passenger
B.	Size of vent holes: (In. ²)	<u>0.785</u>	-Driver	<u>3.46</u>	-Passenger
C.	Total vent area: (In. ²)	<u>1.57</u>	-Driver	<u>3.46</u>	-Passenger
D.	Deflated air bag length and width dimensions or, if round, diameter. (In inches)				
	Driver:	<u>-</u>	-Length;	<u>-</u>	-Width;
		<u>22.0</u>	-Height;	<u>13.0</u>	-Width;
	Passenger:			<u>20.0</u>	-Depth
E.	Is the air bag tethered?				
	Driver:	<u>X</u>	-Yes;	<u>-</u>	-No; If yes, record length of tether- <u>3-11 inch tethers.</u>
	Passenger:	<u>-</u>	-Yes;	<u>X</u>	-No; If yes, record length of tether- <u>-</u>

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.

(NOT TO SCALE). V_n = Vent hole n; T_n = Tether n



Driver



Passenger

Right Side View

tethe
redF.

Record part numbers and manufacturer name of the air bag and gas generator.

Driver: SVENSKE AIR BAG No. 0921, Gas generator - TEMIC GG6-40

Passenger: SVENSKE AIR BAG No. 0228, Gas generator - TEMIC RG1-245

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
TEST VEHICLE NONCOMPLIANCE NOTICE

NHTSA Contract Lab : Calspan Advanced Technology Center

Lab Project Manager & Telephone No. : Walter E. Levan (716) 632 - 7500

Date of Test : March 8, 1994 Vehicle NHTSA No. : CR5900

Vehicle Manufacturer : VOLVO GOTHENBURG SWEDEN, INC.

Model Year : 1994 VIN : YV1JS8319R1158405

Model : 940 Body Style: 4-door sedan Build Date : October, 1993

Dummy Stabilized Temperature at Time of Test : 69 F (Spec. = 69 - 72 °F)

Impact Velocity : 29.6 mph; Time of Test : 11:30

Type of Automatic Restraint System :

Driver : airbag

Passenger : airbag

Failure Details :

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

Appendix A
PHOTOGRAPHS

LIST OF PHOTOGRAPHS

<u>Figure</u>	<u>Photograph Title</u>	<u>Page No.</u>
A-1	PRE-TEST FRONT VIEW	A-3
A-2	POST-TEST FRONT VIEW	A-4
A-3	PRE-TEST LEFT SIDE VIEW	A-5
A-4	POST-TEST LEFT SIDE VIEW	A-6
A-5	PRE-TEST RIGHT SIDE VIEW	A-7
A-6	POST-TEST RIGHT SIDE VIEW	A-8
A-7	PRE-TEST FRONT UNDERBODY VIEW	A-9
A-8	POST-TEST FRONT UNDERBODY VIEW	A-10
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A-11	PRE-TEST PASSENGER SIDE VIEW	A-13
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A-13	PRE-TEST UNDERBODY STEERING SHAFT	A-15
A-14	POST-TEST UNDERBODY STEERING SHAFT	A-16
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A-24	POST-TEST DRIVER HEAD CONTACT	A-25



Figure A-1 PRE-TEST FRONT VIEW

8183-1

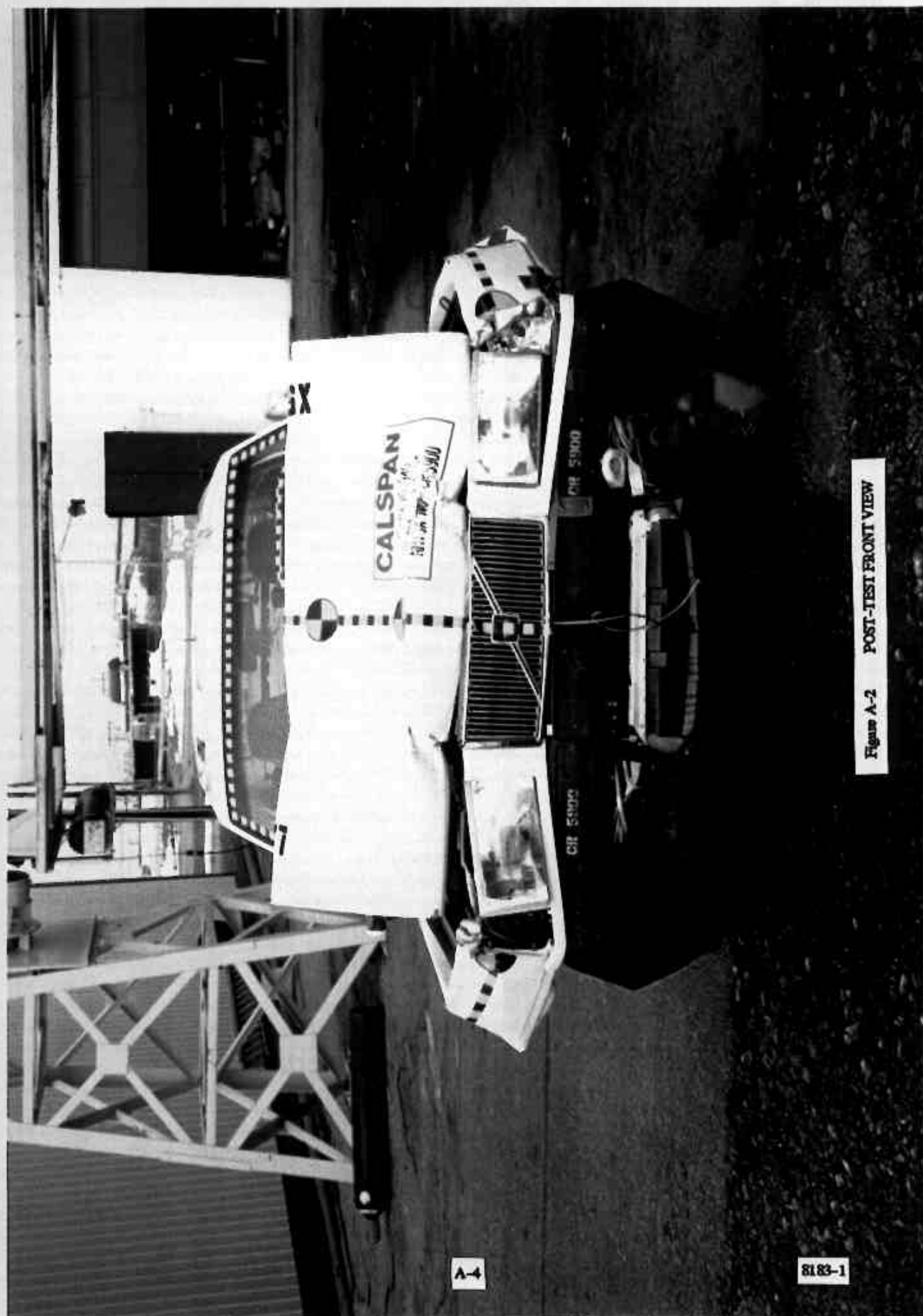


Figure A-2 POST-TEST FRONT VIEW

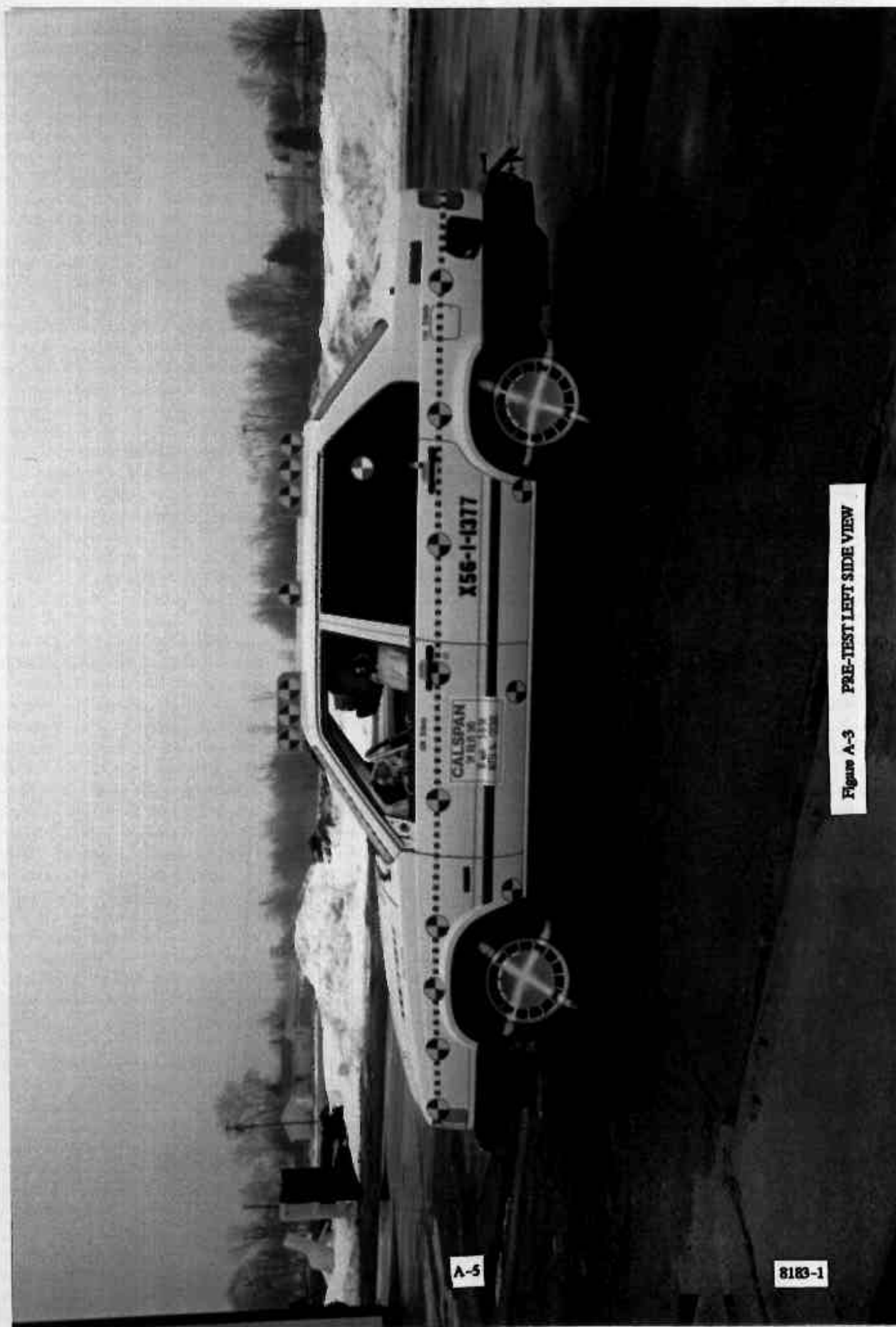


Figure A-3 PRE-TEST LEFT SIDE VIEW

A-5

8183-1



Figure A-4 POST-TEST LEFT SIDE VIEW



Figure A-5 PRE-TEST RIGHT SIDE VIEW

A-7

8183-1

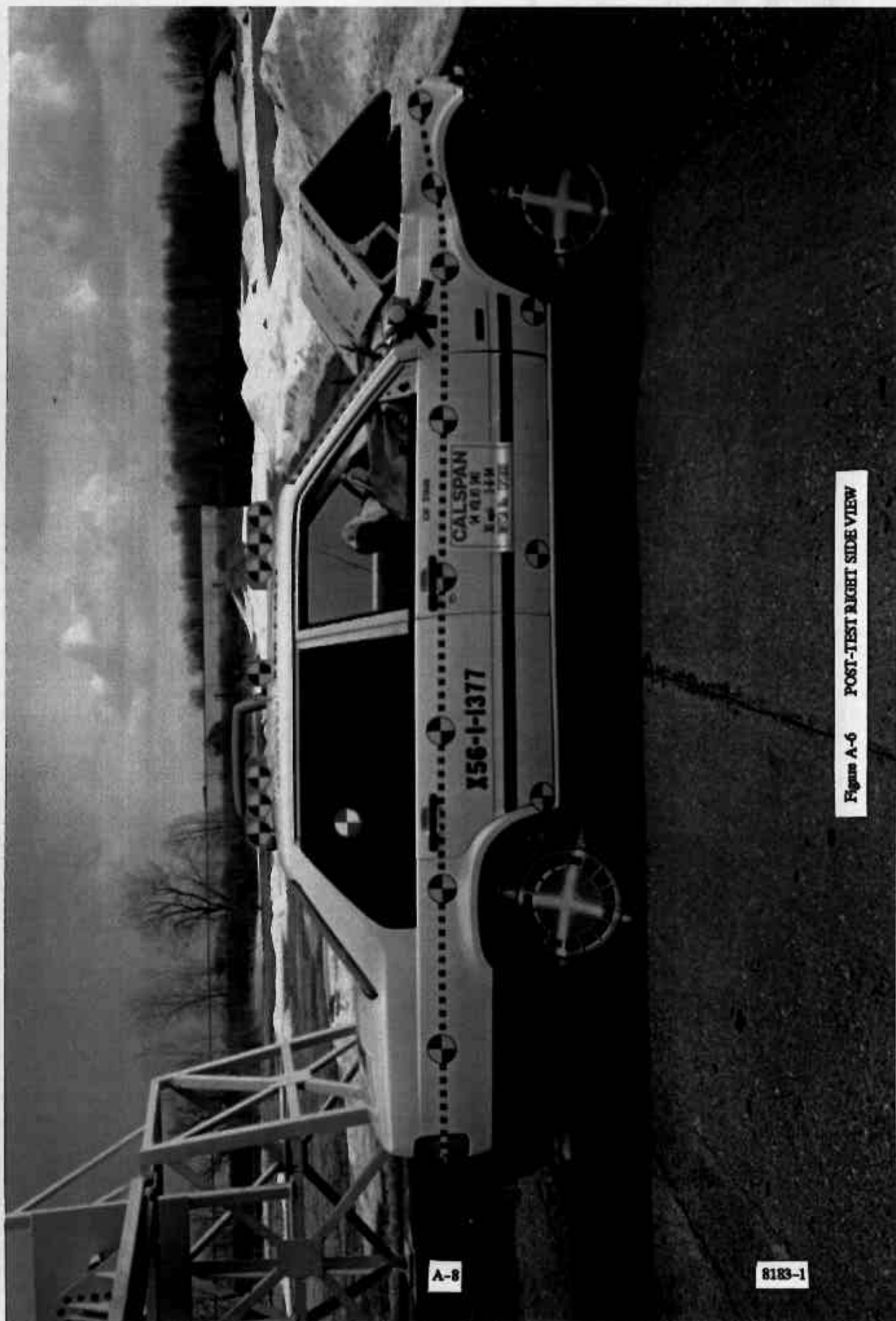


Figure A-6 POST-TEST RIGHT SIDE VIEW

A-8

8183-1

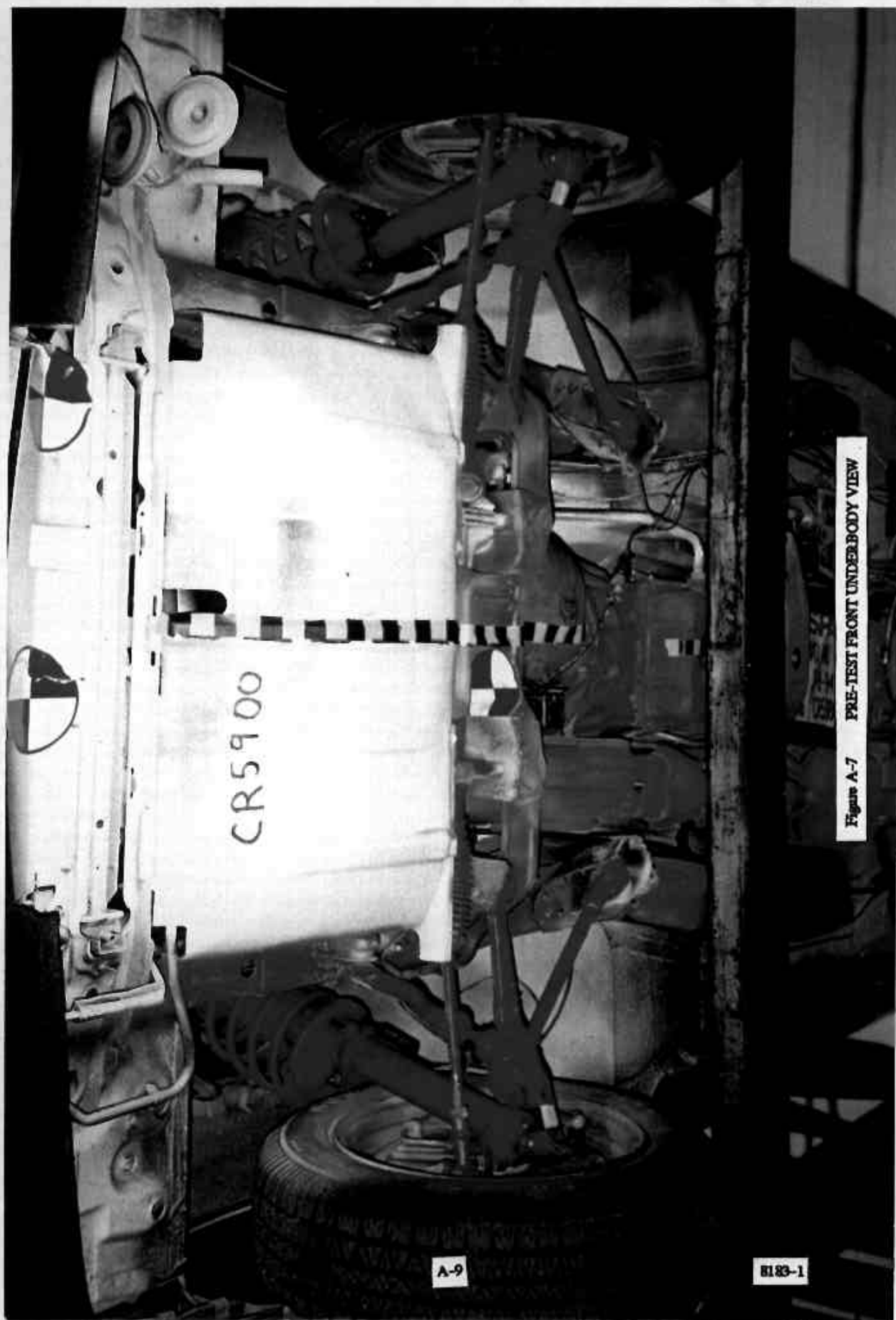


Figure A-7 PRE-TEST FRONT UNDERBODY VIEW

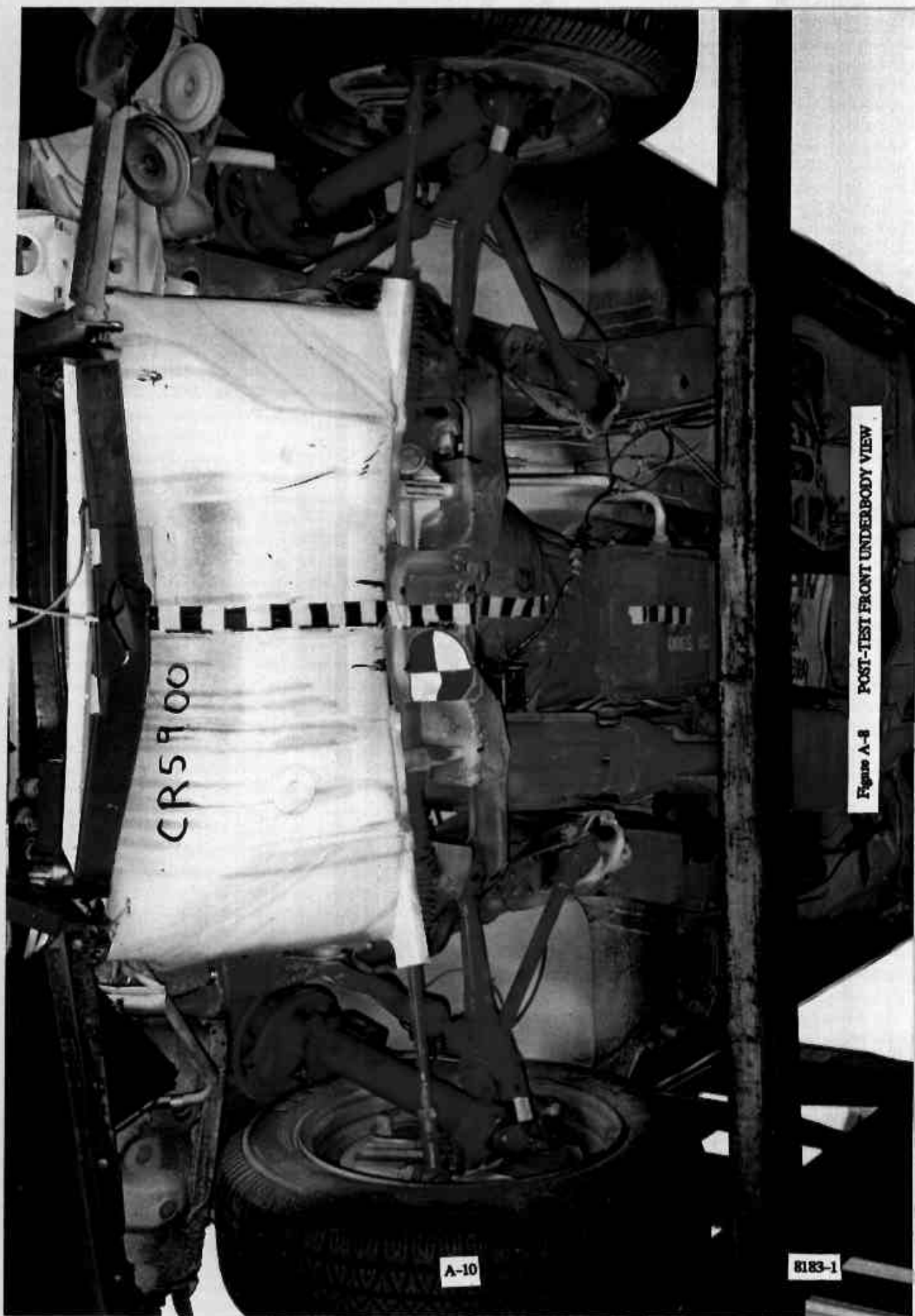


Figure A-8 POST-TEST FRONT UNDERBODY VIEW



Figure A-9 PRE-TEST DRIVER SIDE VIEW

A-11

8183-1





Figure A-11 PRE-TEST PASSENGER SIDE VIEW

A-13

8183-1

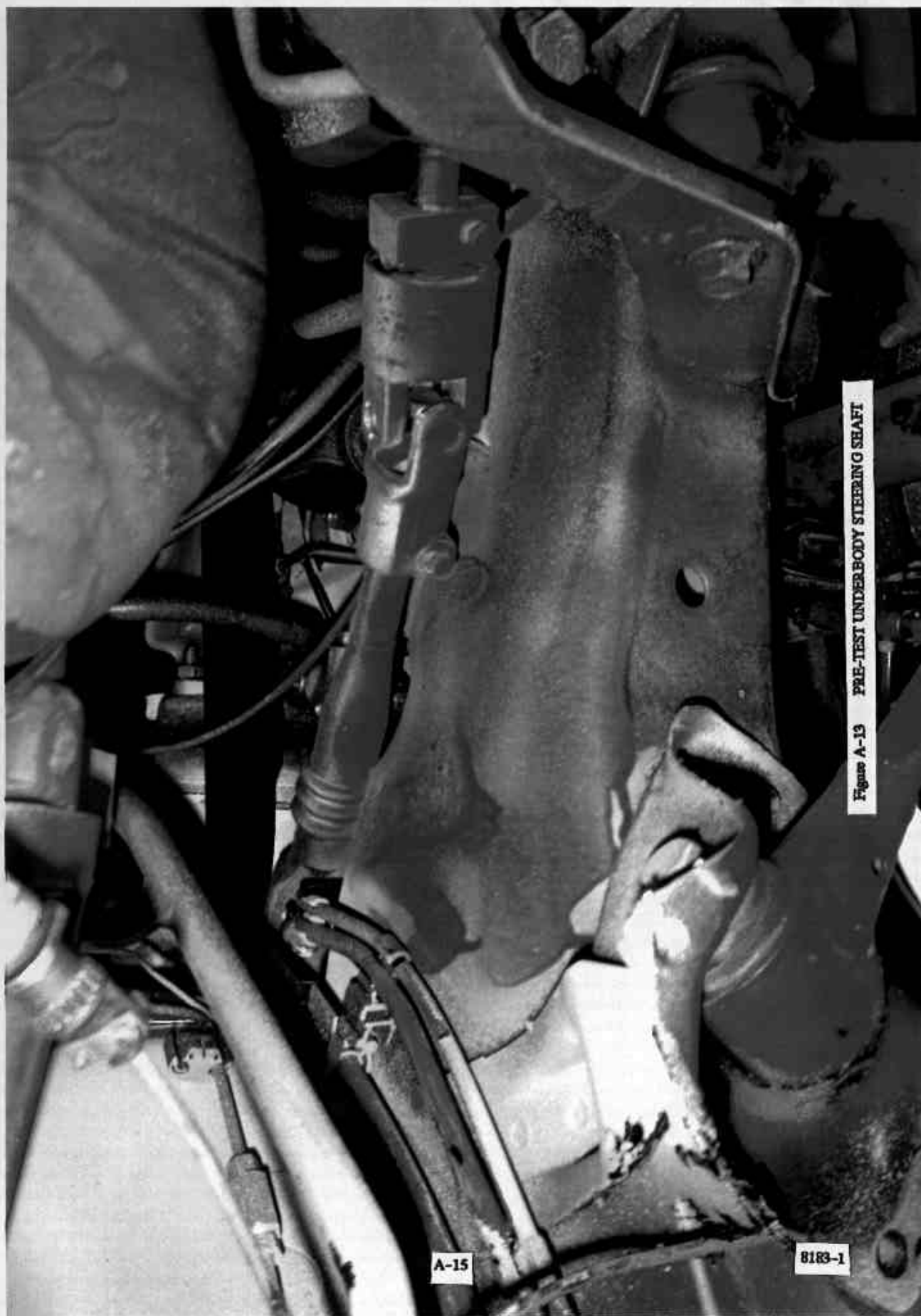


Figure A-12 POST-TEST PASSENGER SIDE VIEW

A-14

8183-1

Figure A-13 PRE-TEST UNDERBODY STEERING SHAFT



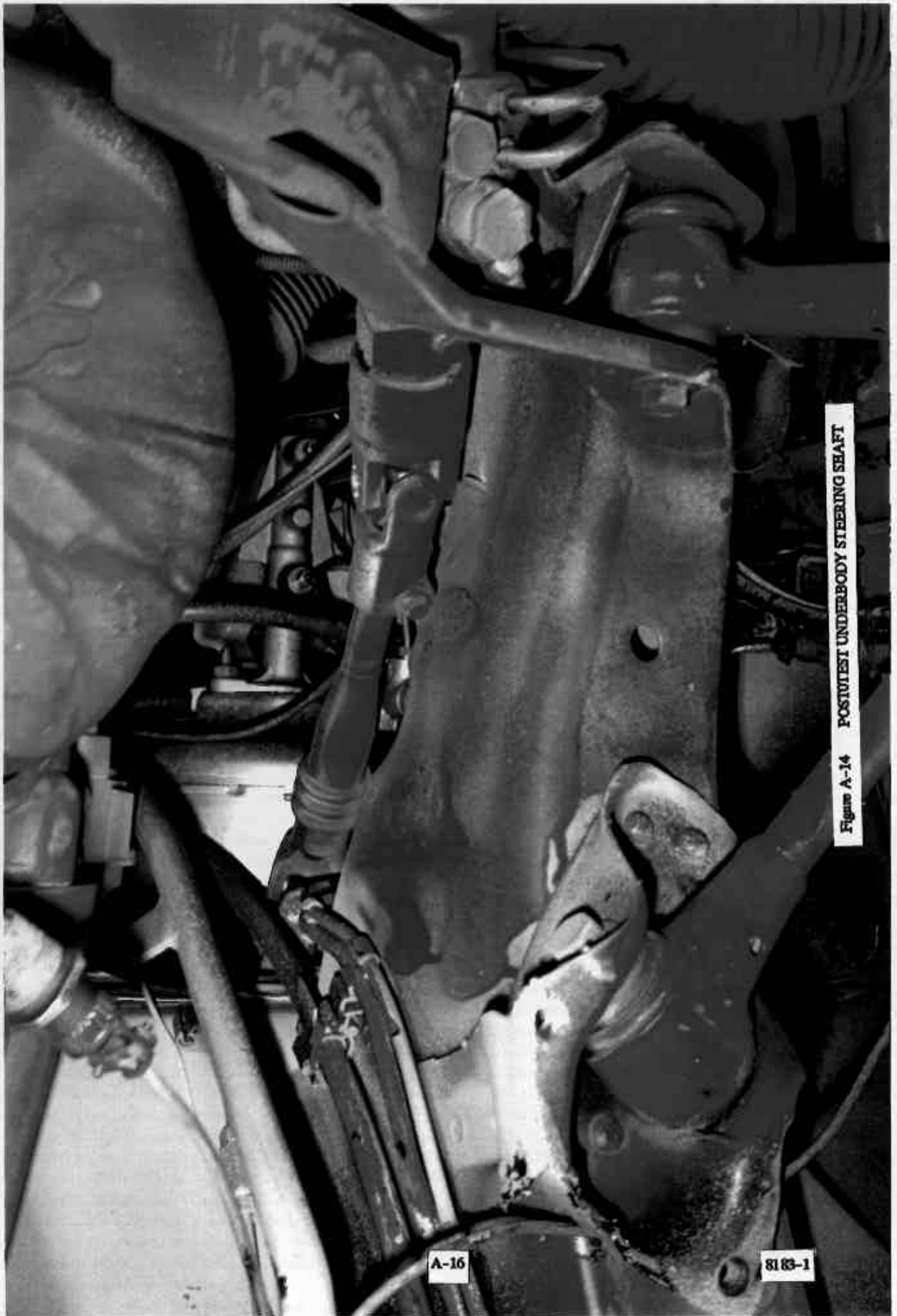


Figure A-14 POSTTEST UNDERBODY STEERING SHAFT

A-16

8183-1

Figure A-15 PRE-TEST STEERING COLUMN/FIREWALL INSIDE VIEW (NOT AVAILABLE)

Figure A-16 POST-TEST STEERING COLUMN/FIREWALL INSIDE VIEW (NOT AVAILABLE)



Figure A-17 POST-TEST DRIVER KNEE BOLSTER

A-19

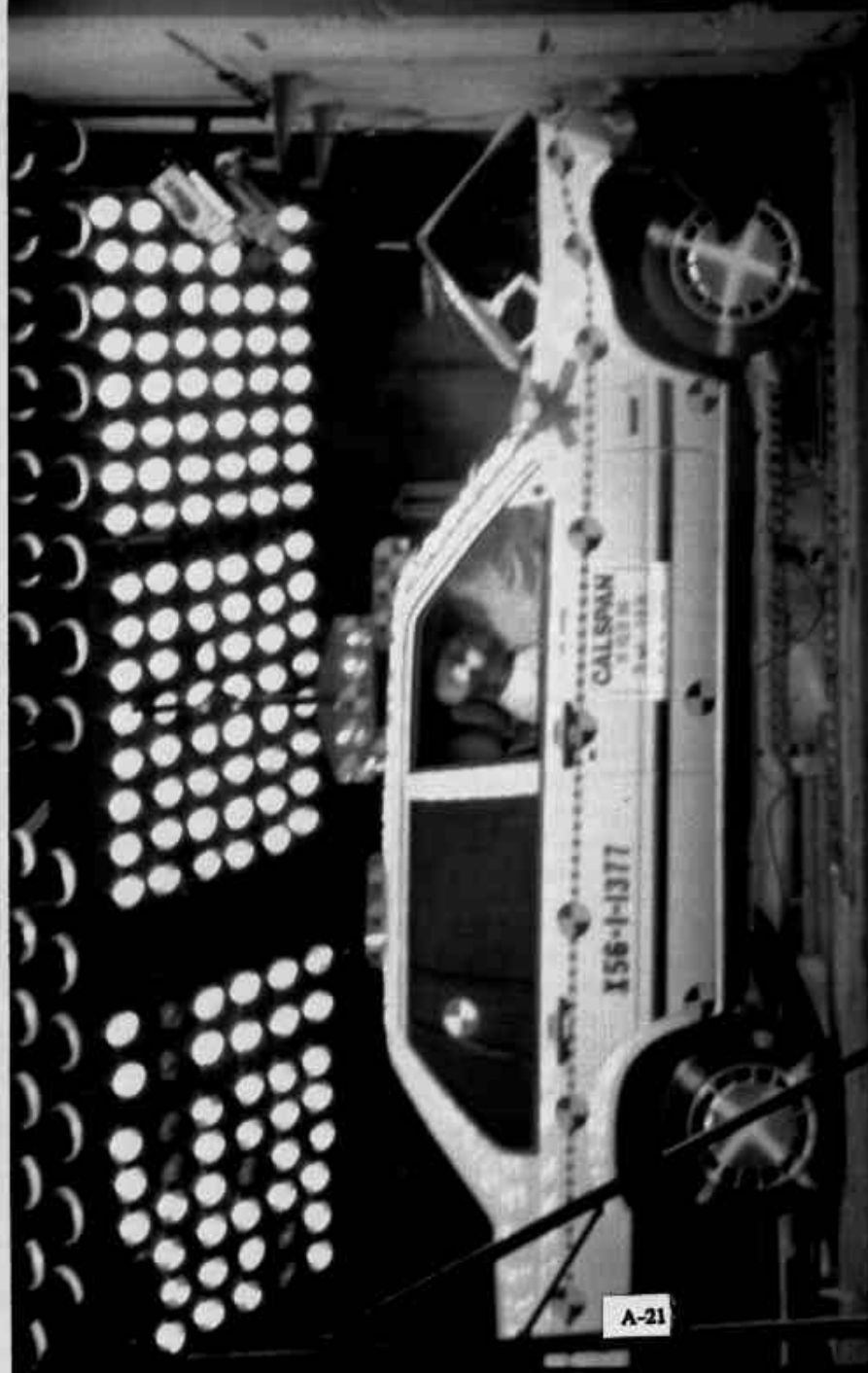
8183-1



Figure A-18 POST-TEST PASSENGER KNEE BOLSTER

A-20

8183-1



A-21

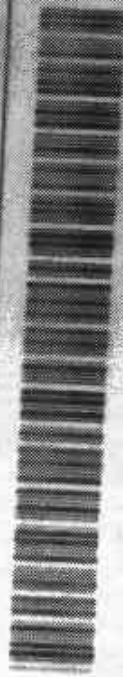
8183-1

Figure A-19 VEHICLE IMPACT

MFD. BY VOLVO GOTENBURG SWEDEN
DATE: 10/93 GVWR: 4150 GAWR FRONT: 2040 GAWR REAR: 2180 LB

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY, BUMPER AND THEFT PROTECTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE

VIN: YV1J8319R1158405 PASS CAR



VOLVO

3514038

Figure A-20 CERTIFICATION PLACARD

VEHICLE CAPACITY OCCUPANTS COLD TIRE PRESSURE
 WEIGHT FRT RRT TOTAL REAR
 MAX 0930 LB 2 3 5 36 36 PSI
 LOAD

RECOMMENDED FOR FUEL ECONOMY

OPTIMAL PRESSURE
 TIRE SIZE 185/65R15 2 1 3 28 28 PSI

IF TIRES ARE HOT FROM DRIVING ADD 4 PSI LOADS TO TIRE PRESSURE

155R15 0000 2000 2000 4.0 PSI

SEE OWNERS MANUAL FOR ADDITIONAL INFORMATION

VOLVO

Figure A-21 TIRE PLACARD

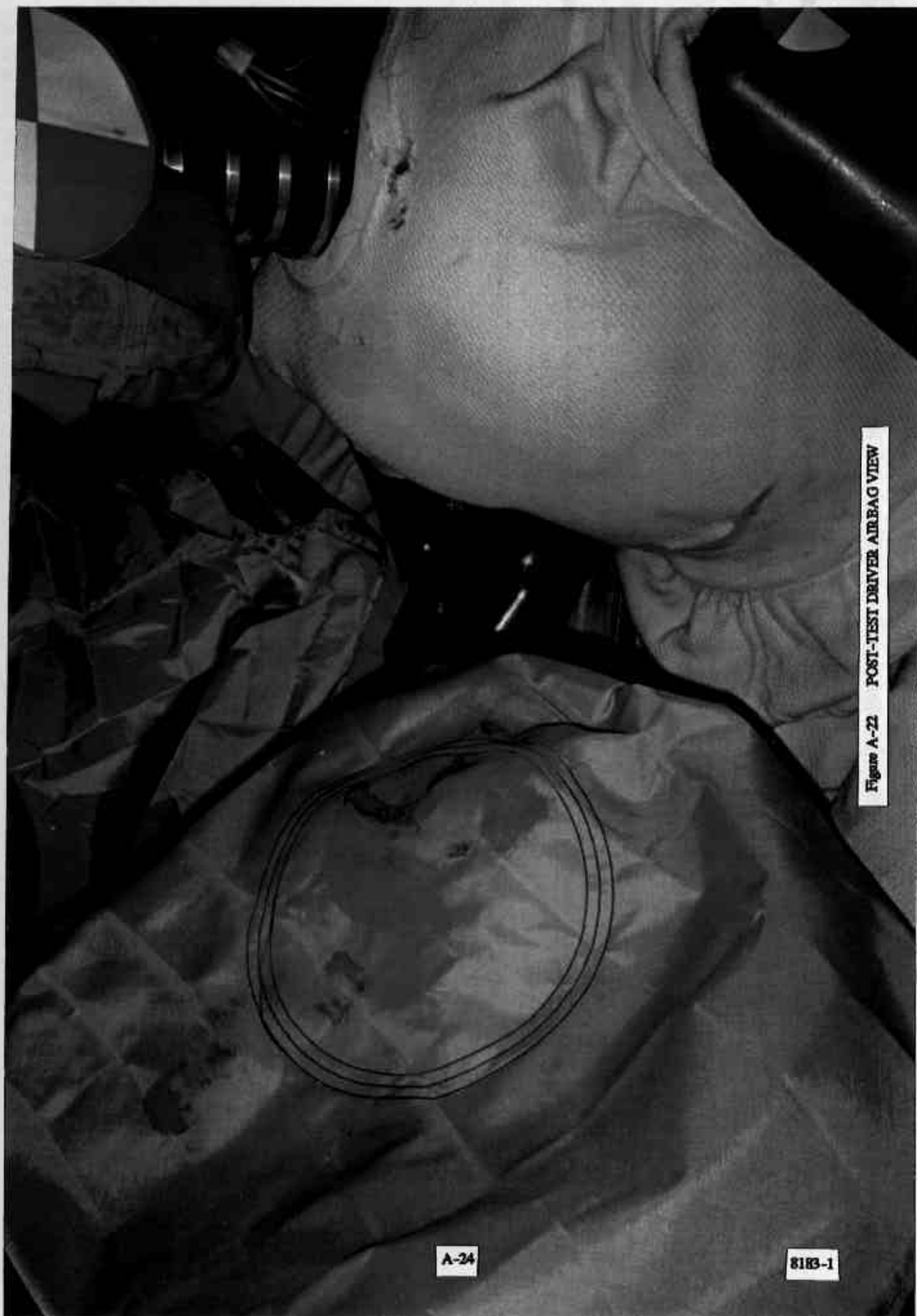


Figure A-22 POST-TEST DRIVER AIRBAG VIEW

A-24

8183-1

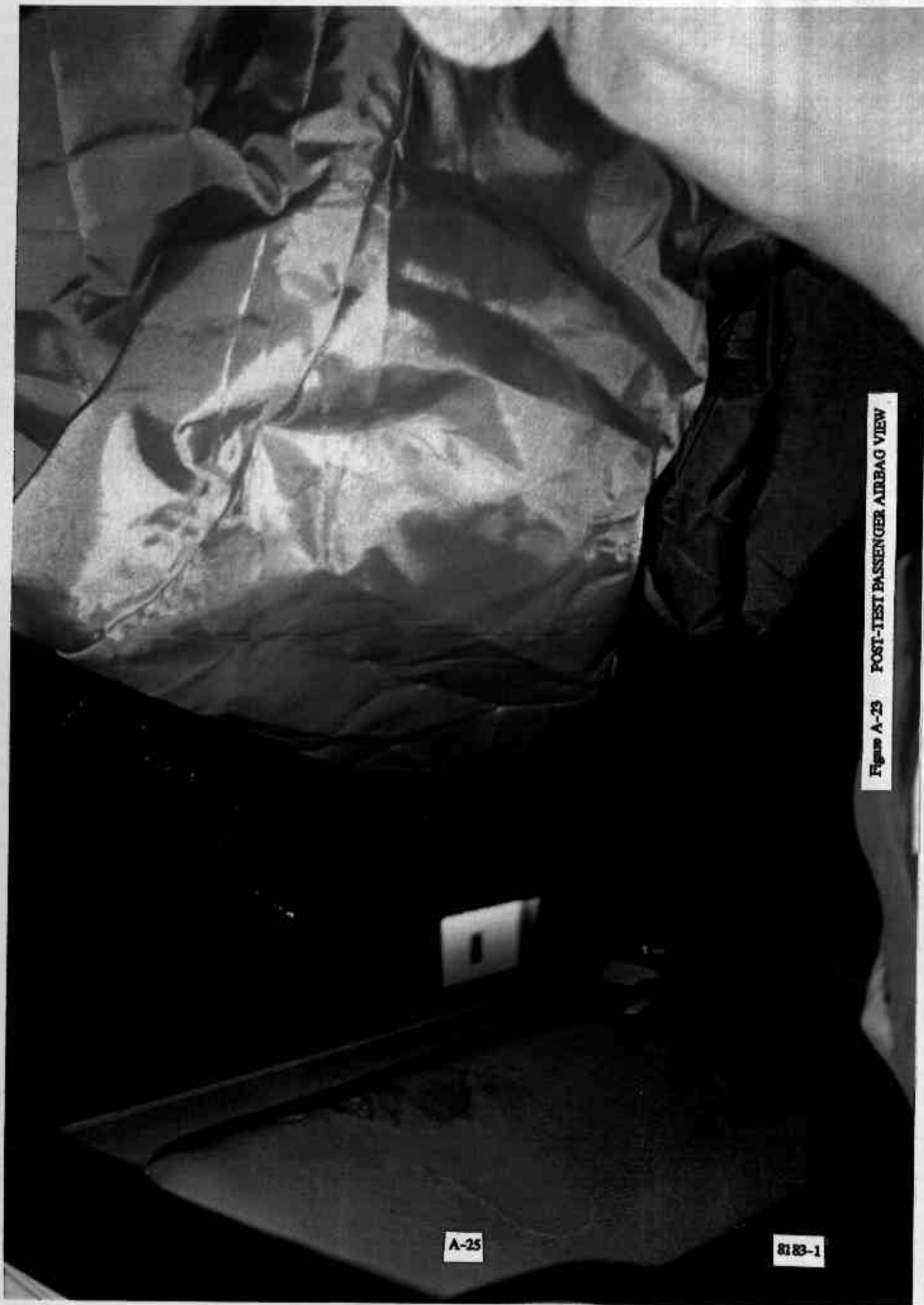


Figure A-23 POST-TEST PASSENGER AIRBAG VIEW

A-25

8183-1

Figure A-24 POST-TEST DRIVER HEAD CONTACT

A-26

8183-1

Appendix B

VEHICLE AND DUMMY RESPONSE DATA

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

TEST NO. CR5900

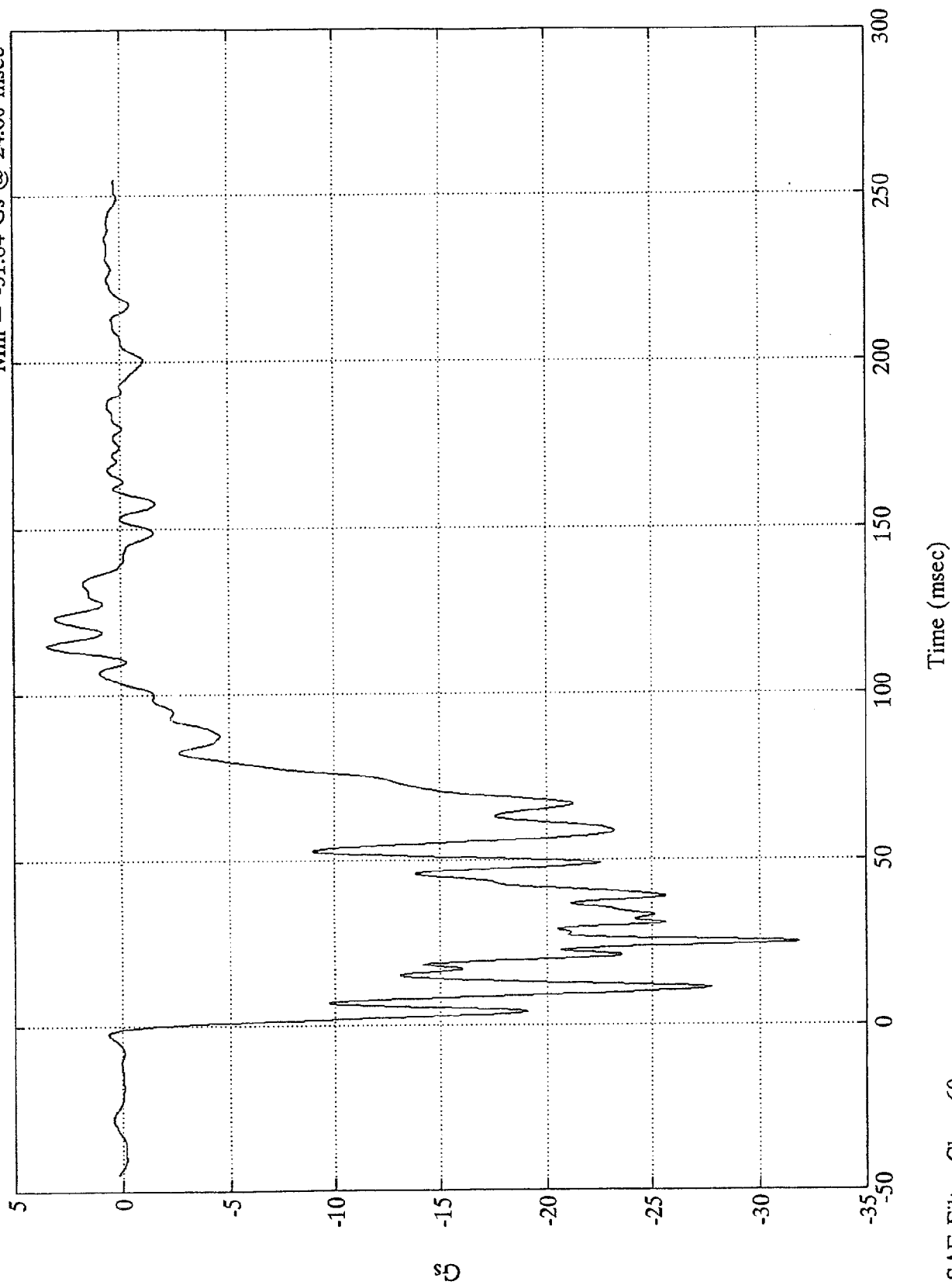
VEHICLE

SAE FILTER CHANNEL CLASS

60

Max = 3.39 Gs @ 114.72 msec
Min = -31.84 Gs @ 24.60 msec

L. Rear Crossmember X

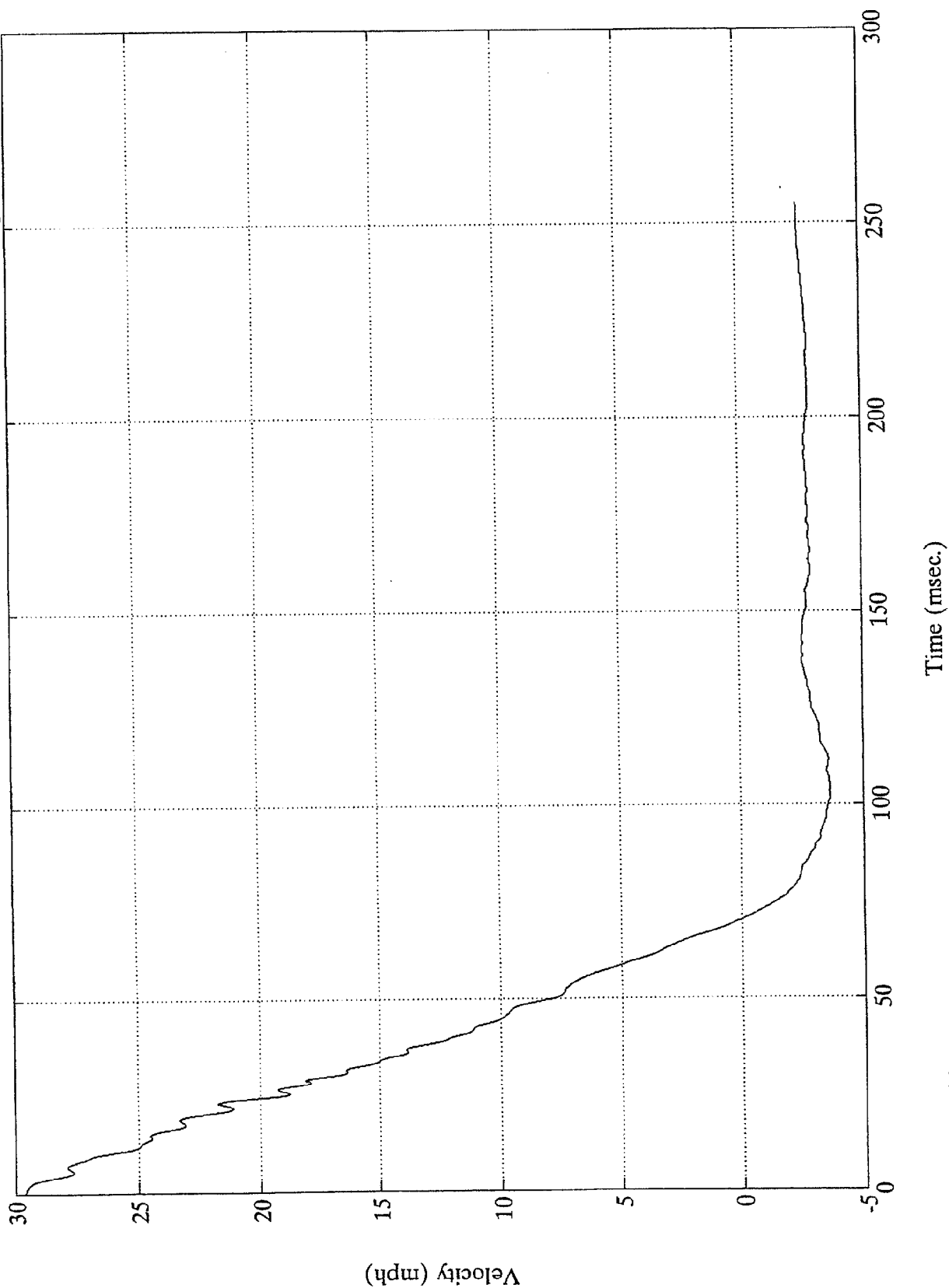


SAE Filter Class 60

NHTSA 208 TEST #10 - 1994 Volvo 940

L. Rear Crossmember X

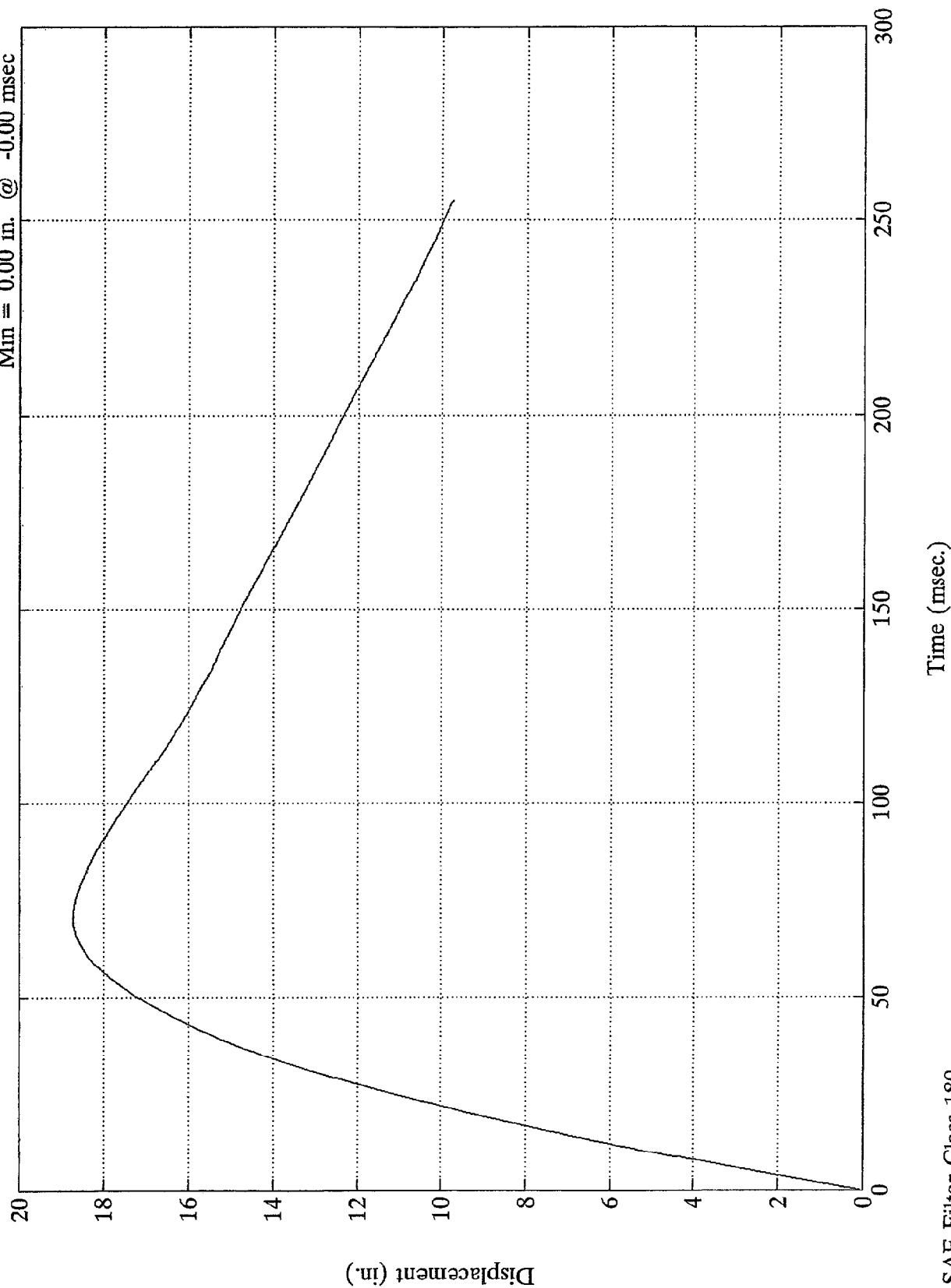
Max = 29.60 mph @ 0.48 msec
Min = -3.63 mph @ 102.00 msec



SAE Filter Class 180

L. Rear Crossmember X

Max = 18.71 in. @ 71.76 msec
Min = 0.00 in. @ -0.00 msec

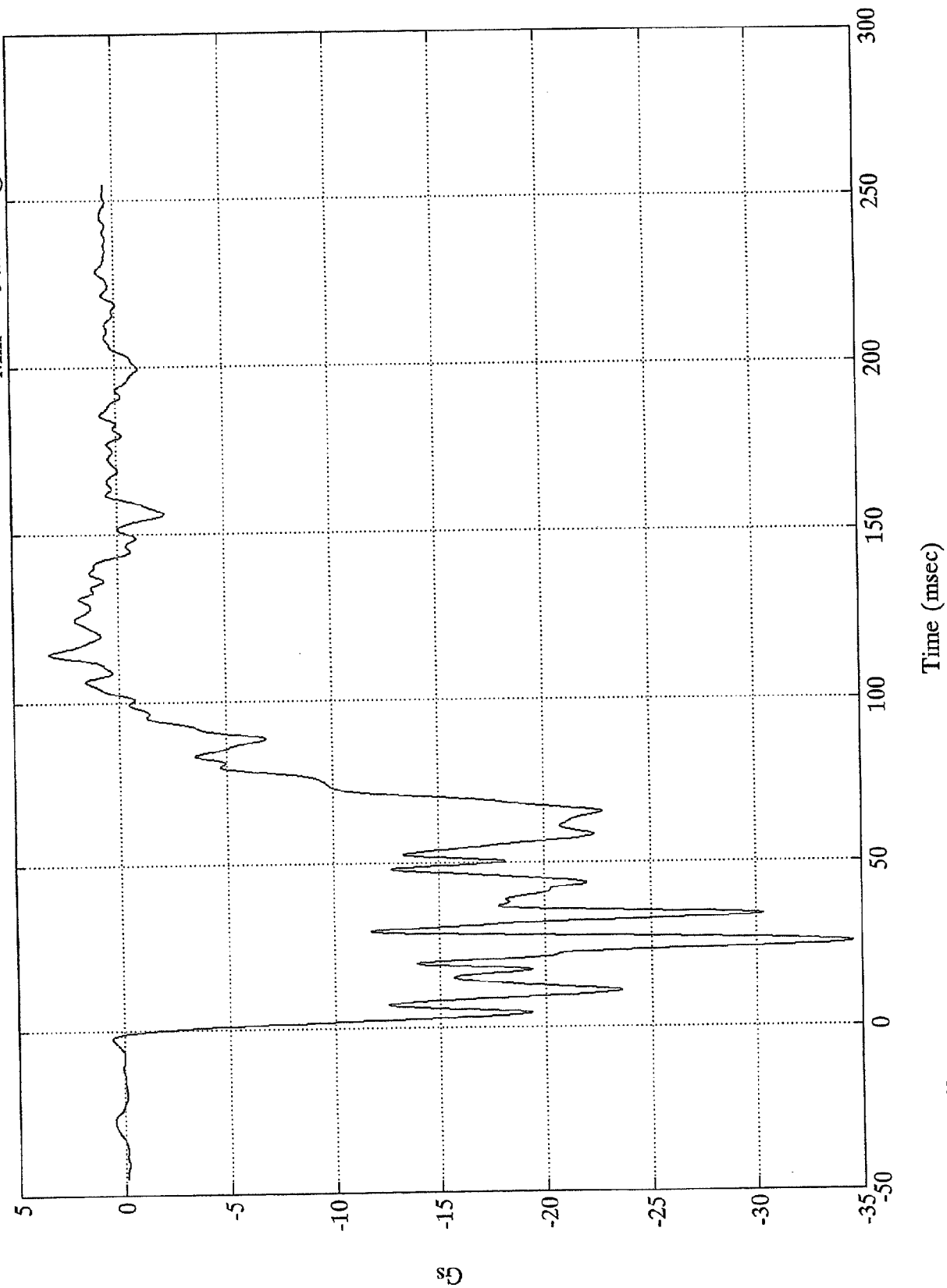


NHTSA 208 TEST #10 - 1994 Volvo 940

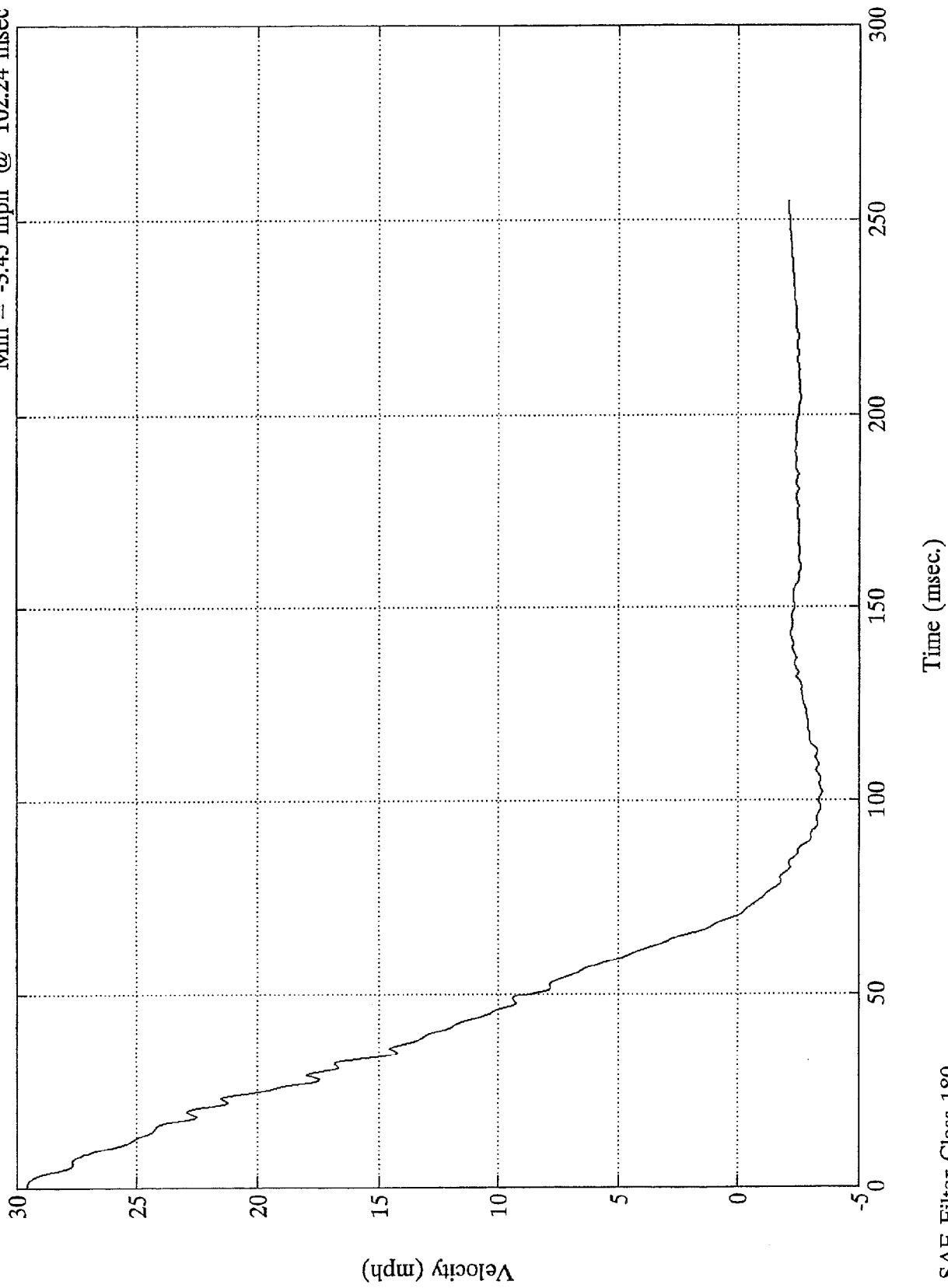
Max = 3.30 Gs @ 114.48 msec

Min = -34.53 Gs @ 25.08 msec

R. Rear Crossmember X



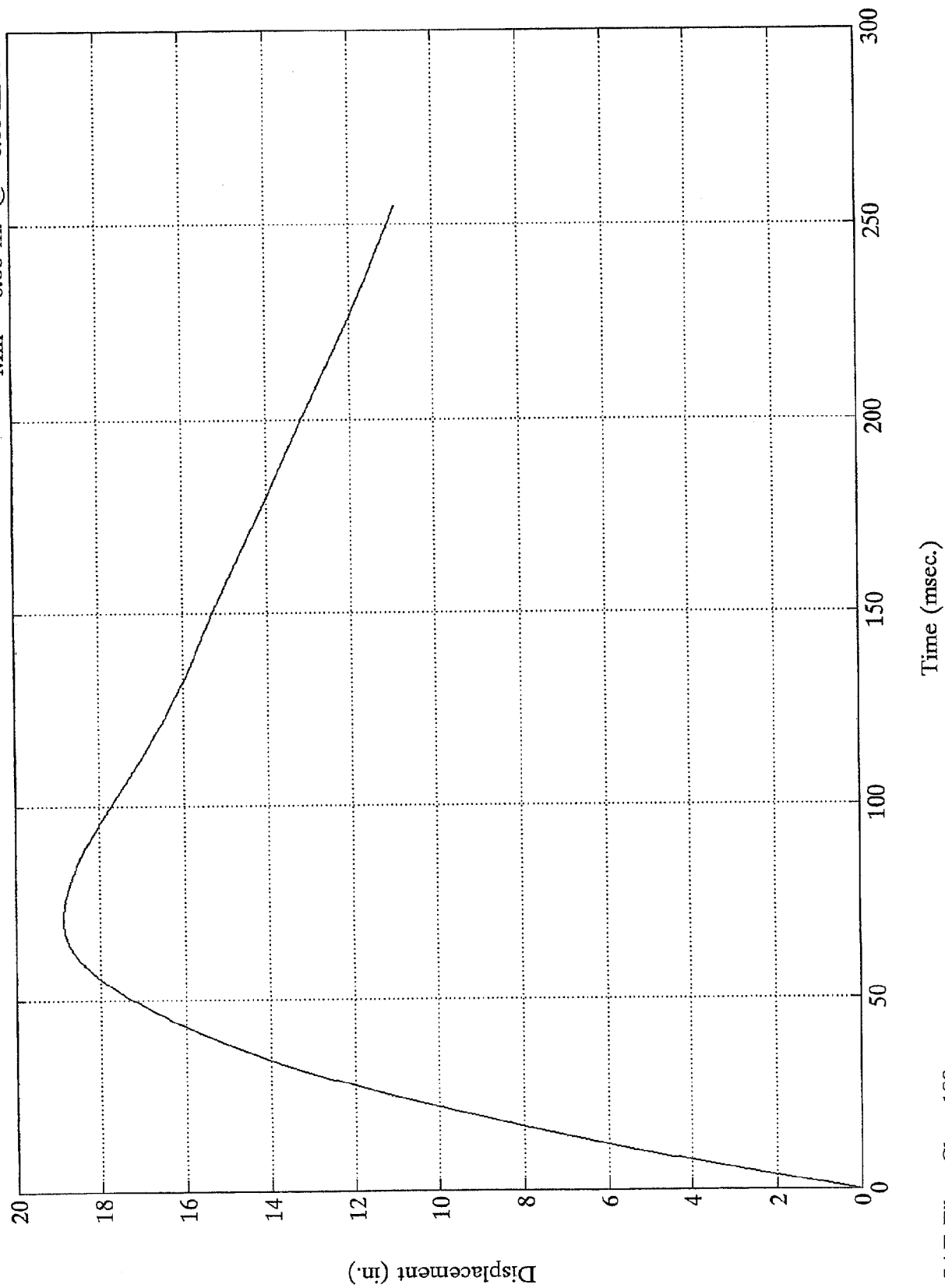
SAE Filter Class 60



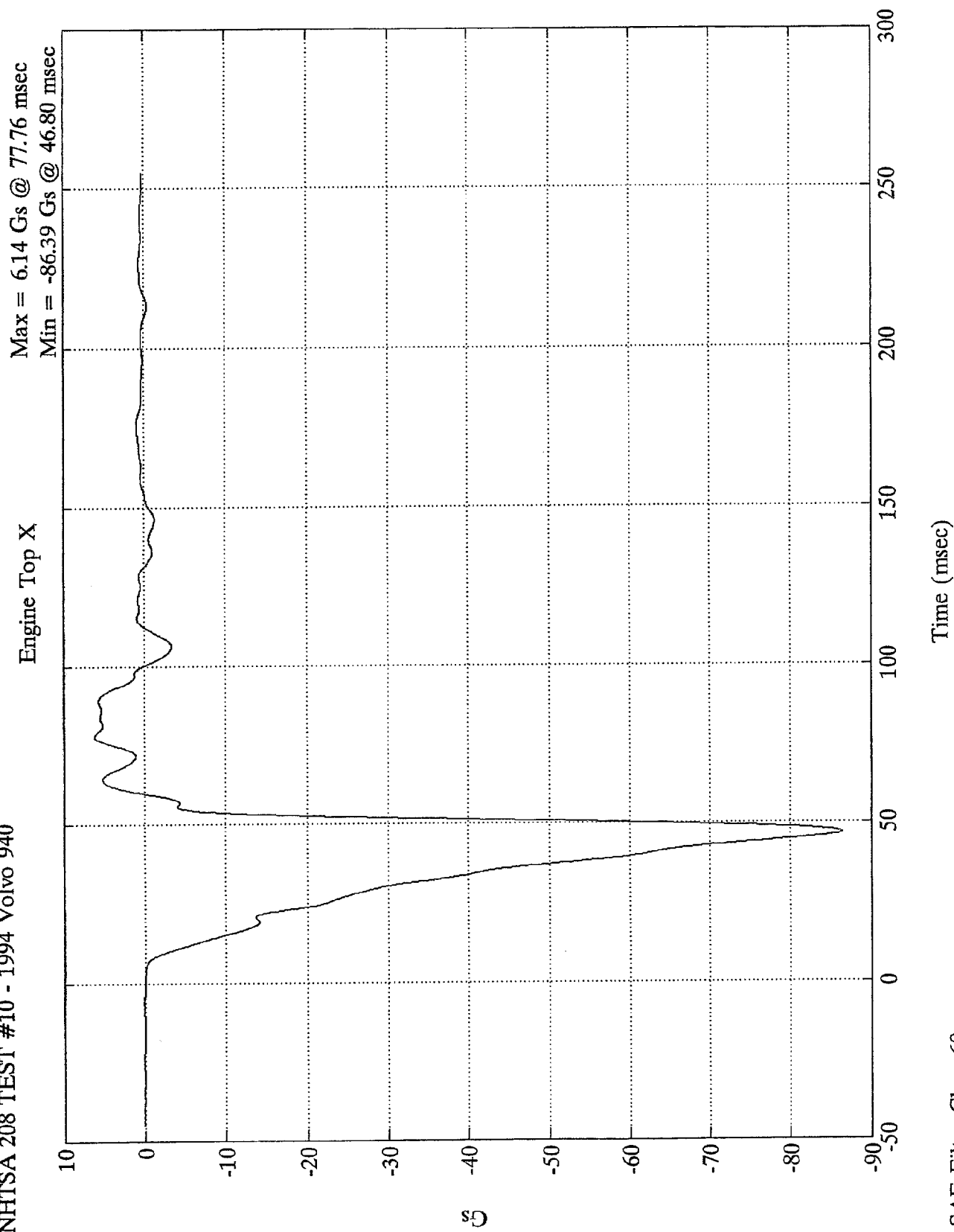
NHTSA 208 TEST #10 - 1994 Volvo 940

Max = 18.87 in. @ 71.76 msec
Min = 0.00 in. @ -0.00 msec

R. Rear Crossmember X



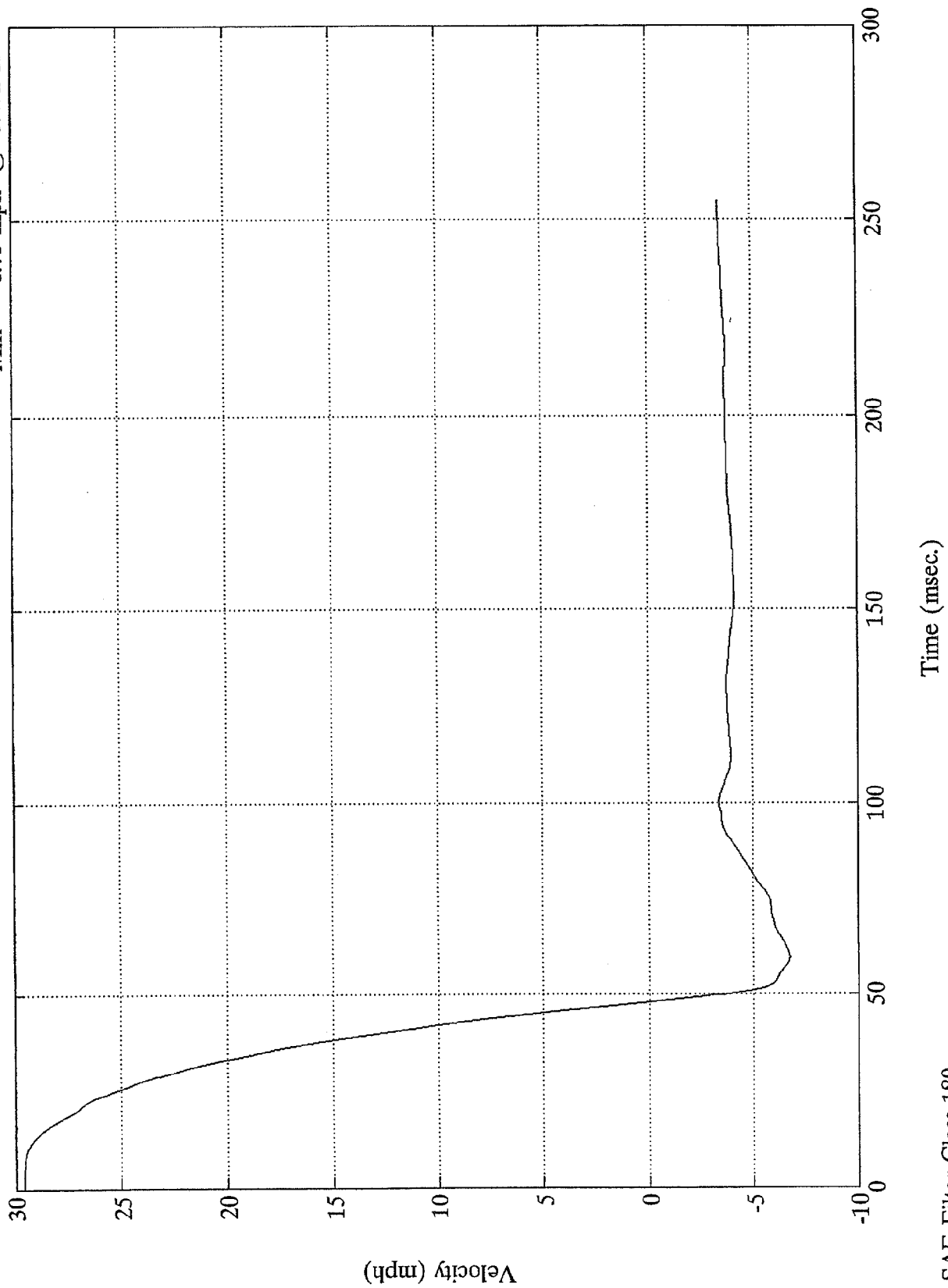
SAE Filter Class 180



NHTSA 208 TEST #10 - 1994 Volvo 940

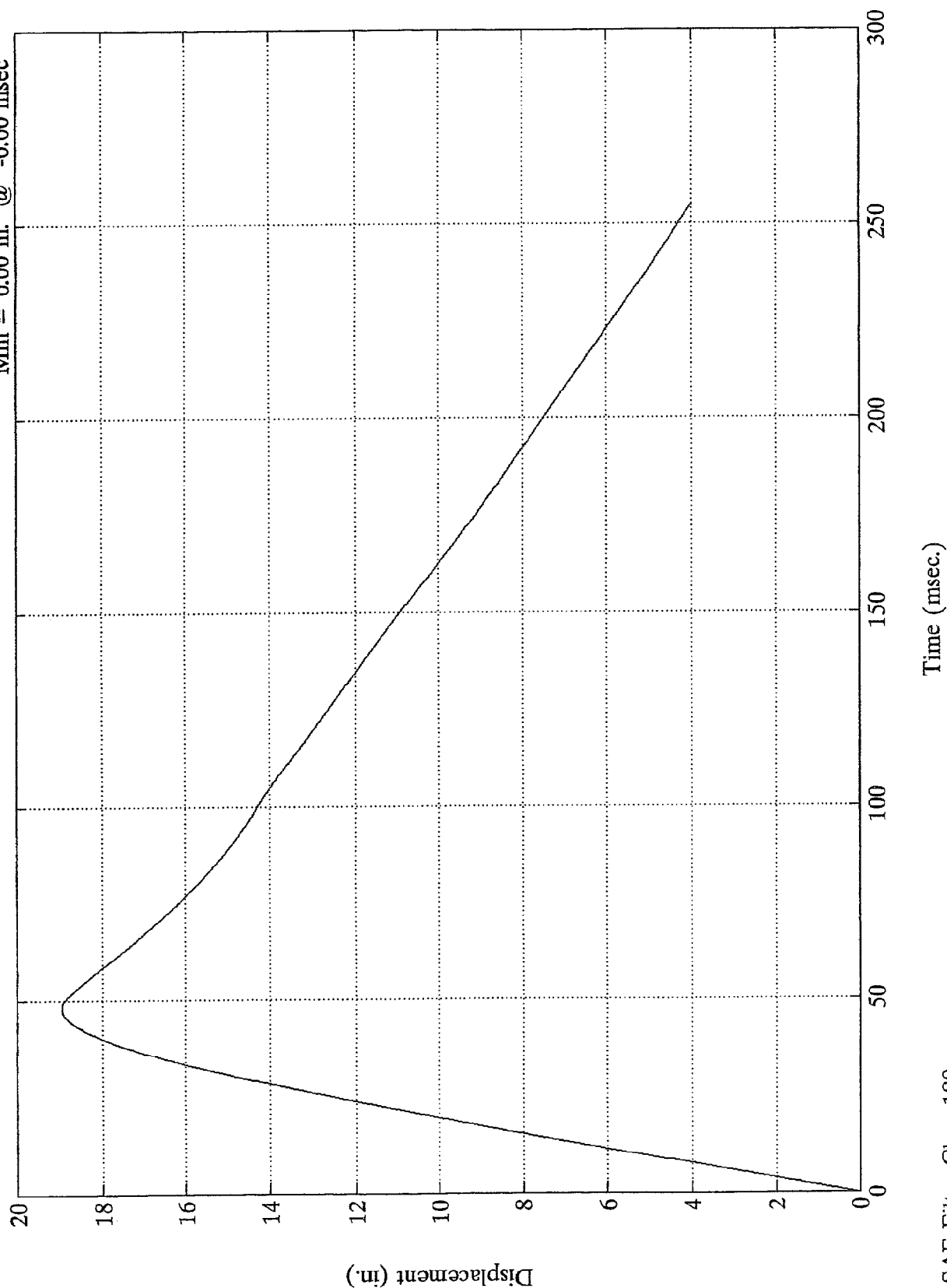
Engine Top X

Max = 29.60 mph @ 2.64 msec
Min = -6.75 mph @ 59.52 msec



SAE Filter Class 180

Max = 18.96 in. @ 48.24 msec
Min = 0.00 in. @ -0.00 msec

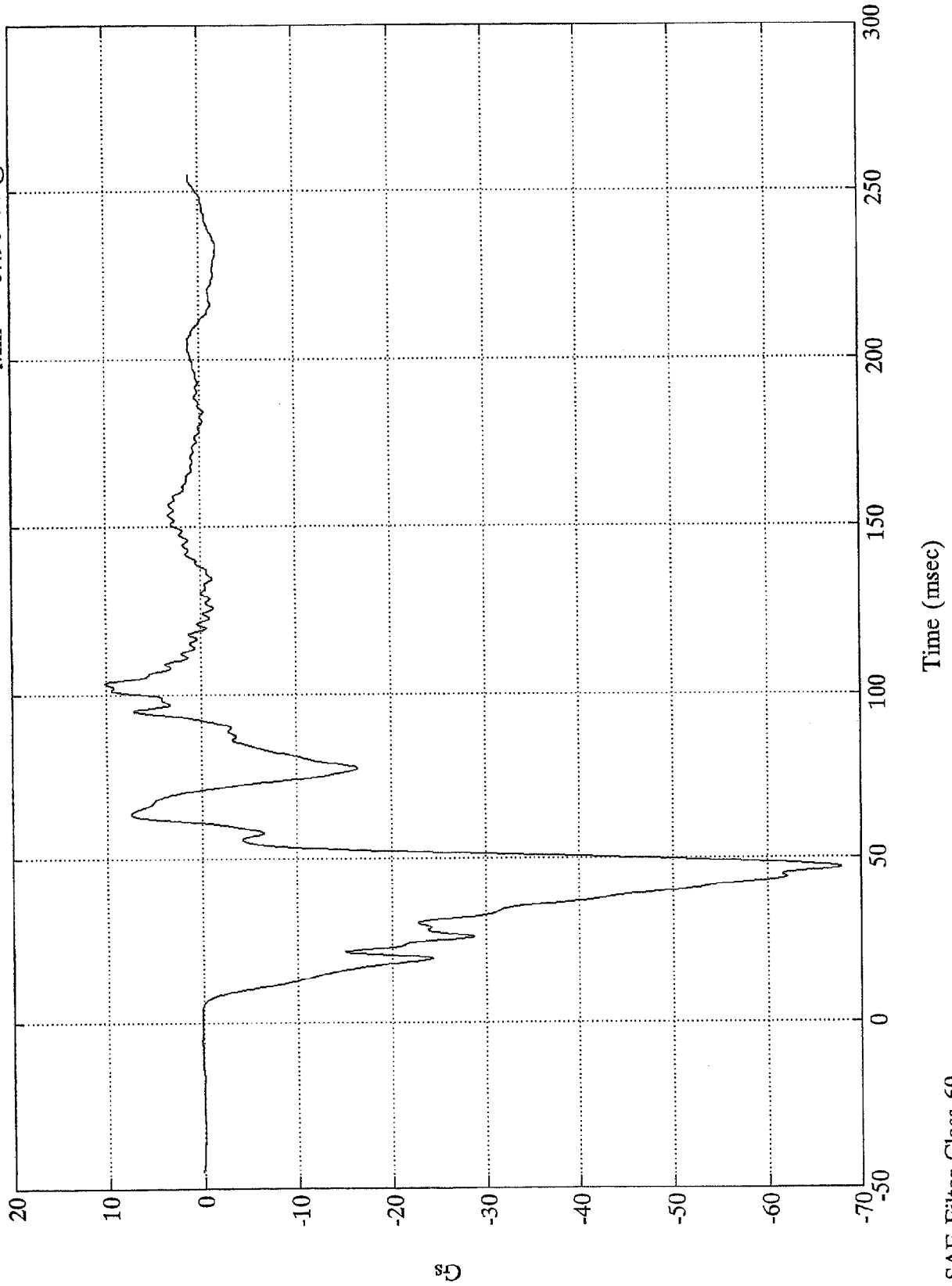


SAE Filter Class 180

NHTSA 208 TEST #10 - 1994 Volvo 940

Engine Bottom X

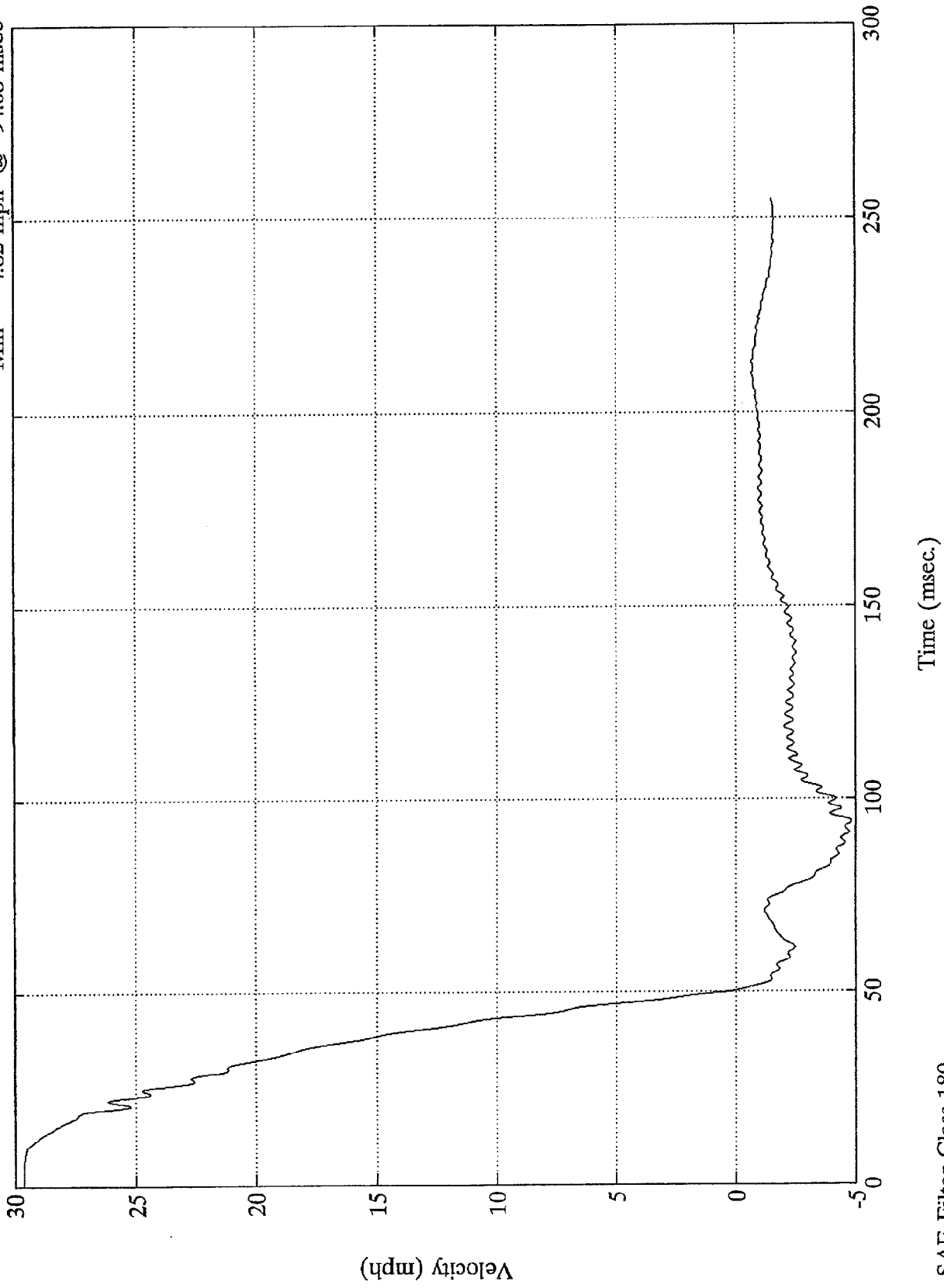
Max = 10.17 Gs @ 103.56 msec
Min = -67.90 Gs @ 47.04 msec



SAE Filter Class 60

Engine Bottom X

Max = 29.60 mph @ 3.84 msec
Min = -4.82 mph @ 94.08 msec



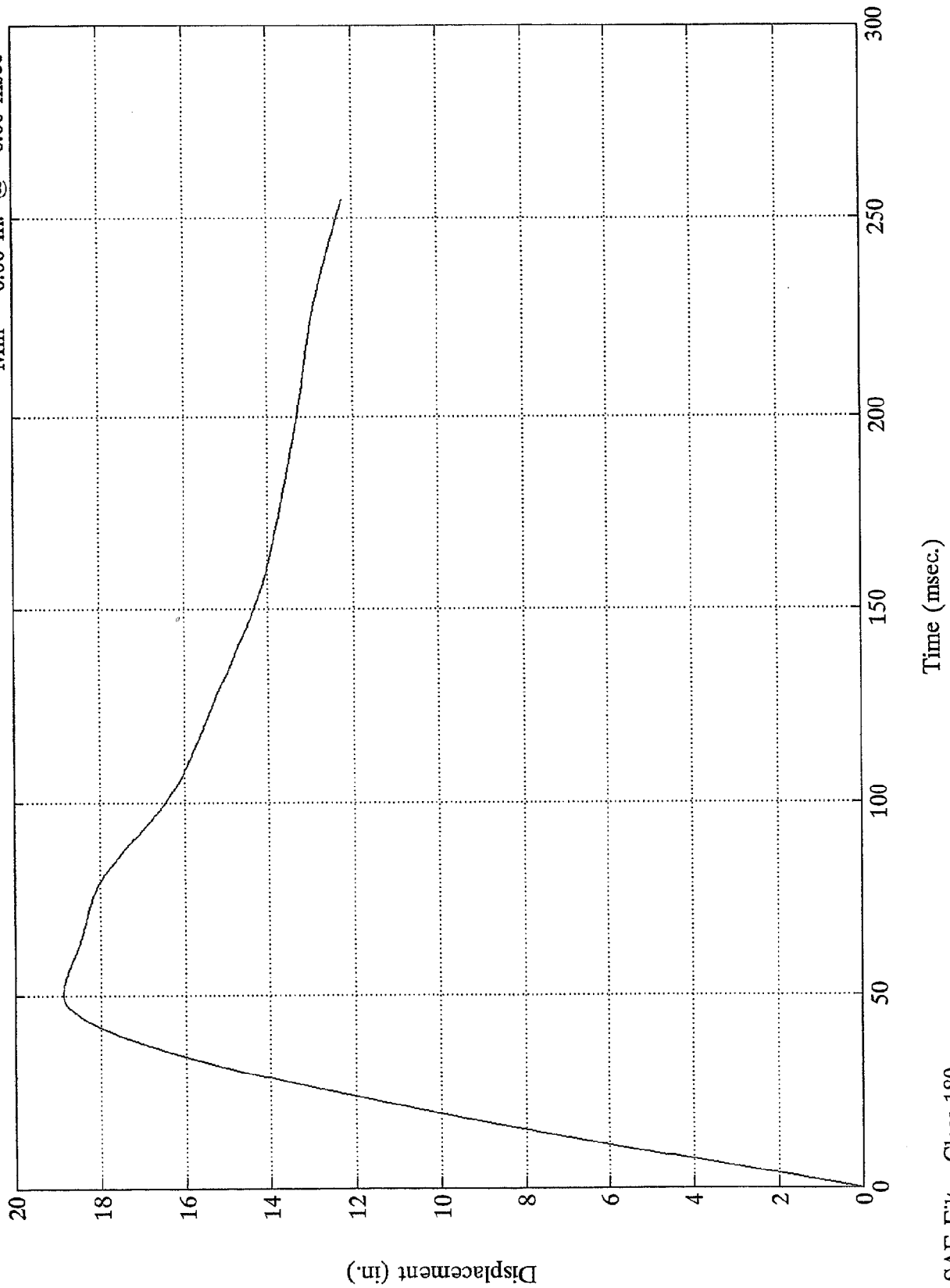
SAE Filter Class 180

NHTSA 208 TEST #10 - 1994 Volvo 940

Engine Bottom X

Max = 18.86 in. @ 51.36 msec

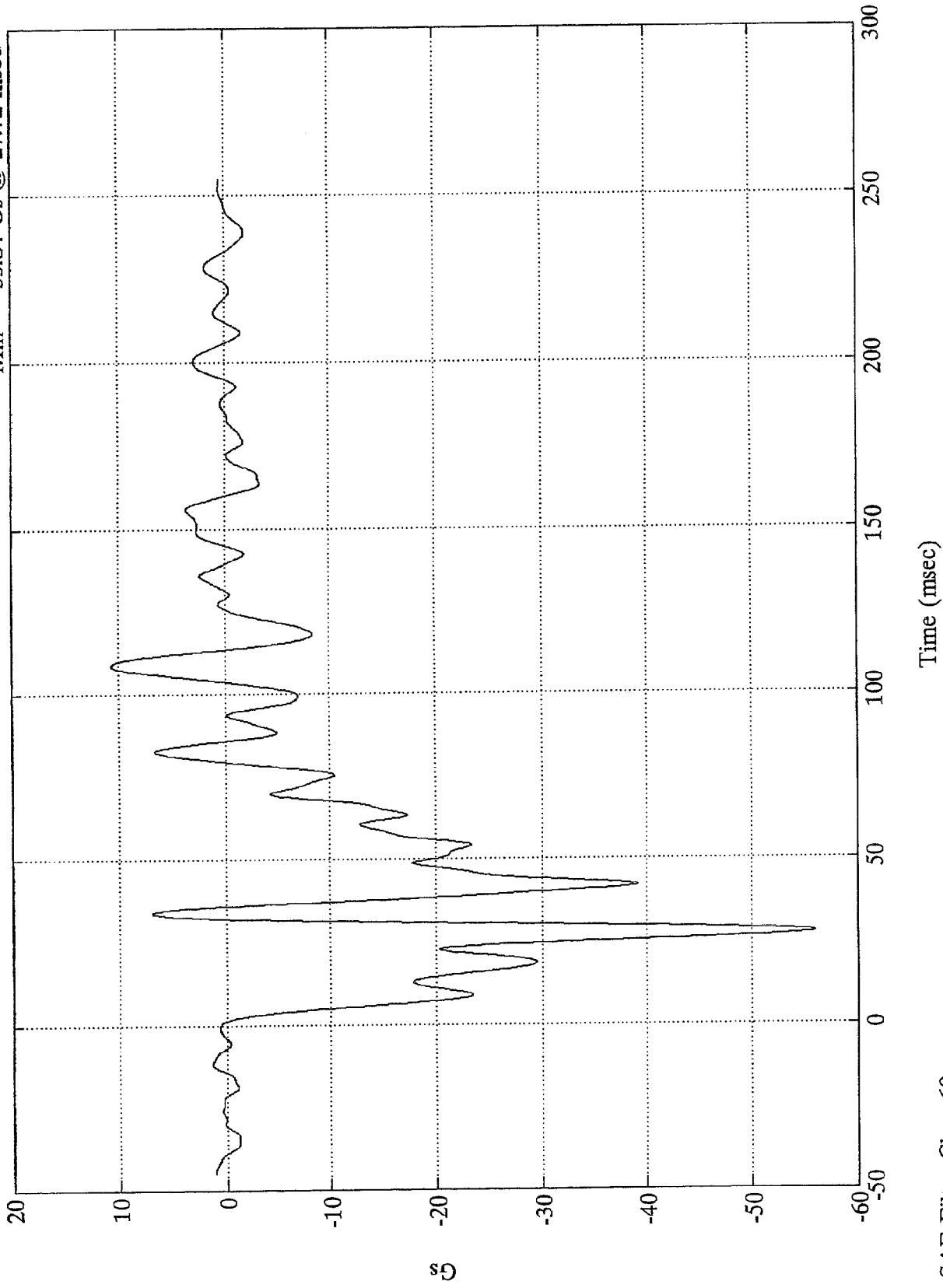
Min = 0.00 in. @ -0.00 msec



SAE Filter Class 180

R. Brake Caliper X

Max = 10.65 Gs @ 108.60 msec
Min = -55.84 Gs @ 27.72 msec

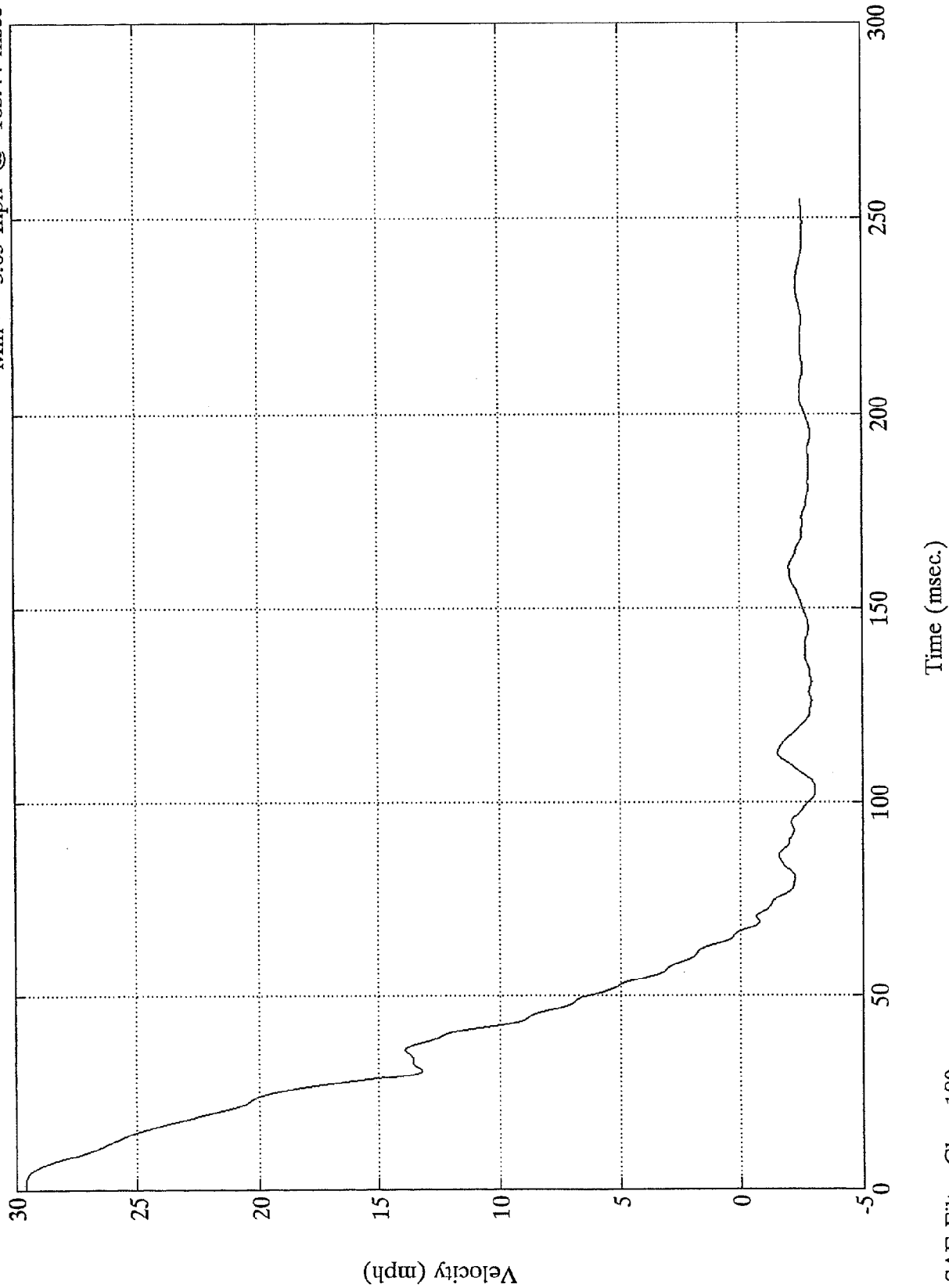


SAE Filter Class 60

NHTSA 208 TEST #10 - 1994 Volvo 940

R. Brake Caliper X

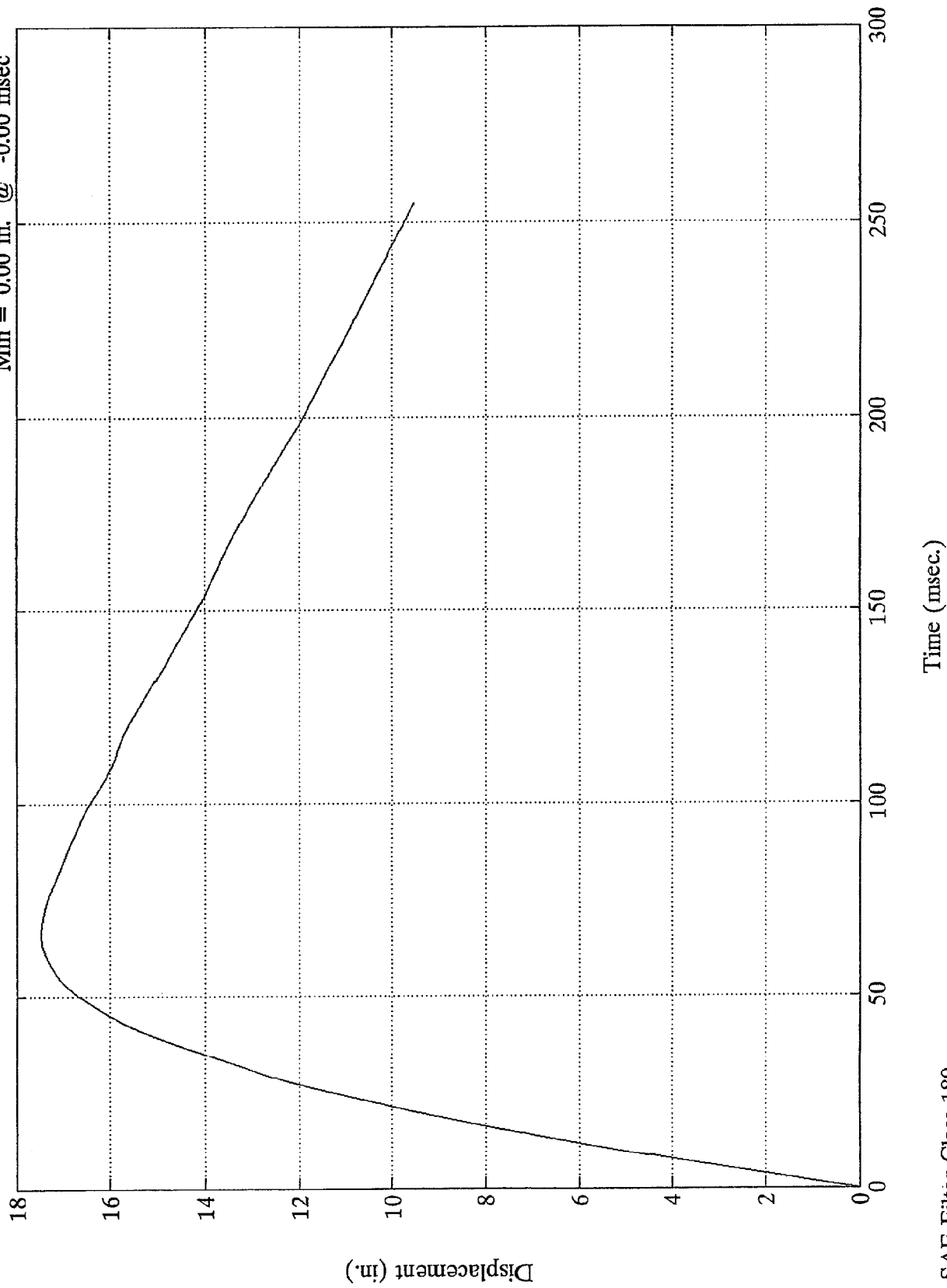
Max = 29.61 mph @ 2.40 msec
Min = -3.05 mph @ 103.44 msec



SAE Filter Class 180

R, Brake Caliper X

Max = 17.47 in. @ 67.68 msec
Min = 0.00 in. @ -0.00 msec



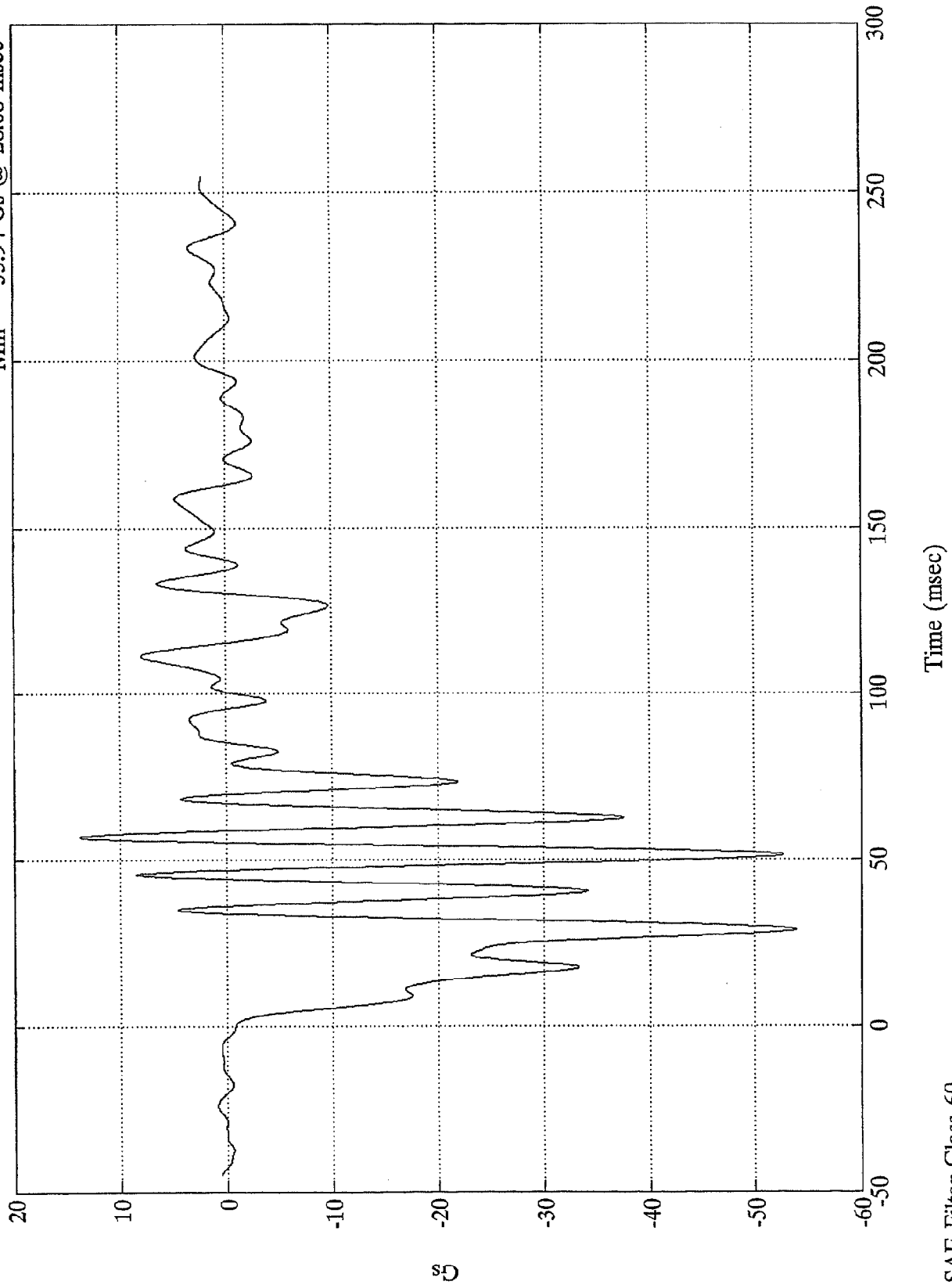
SAE Filter Class 180

NHTSA 208 TEST #10 - 1994 Volvo 940

L. Brake Caliper X

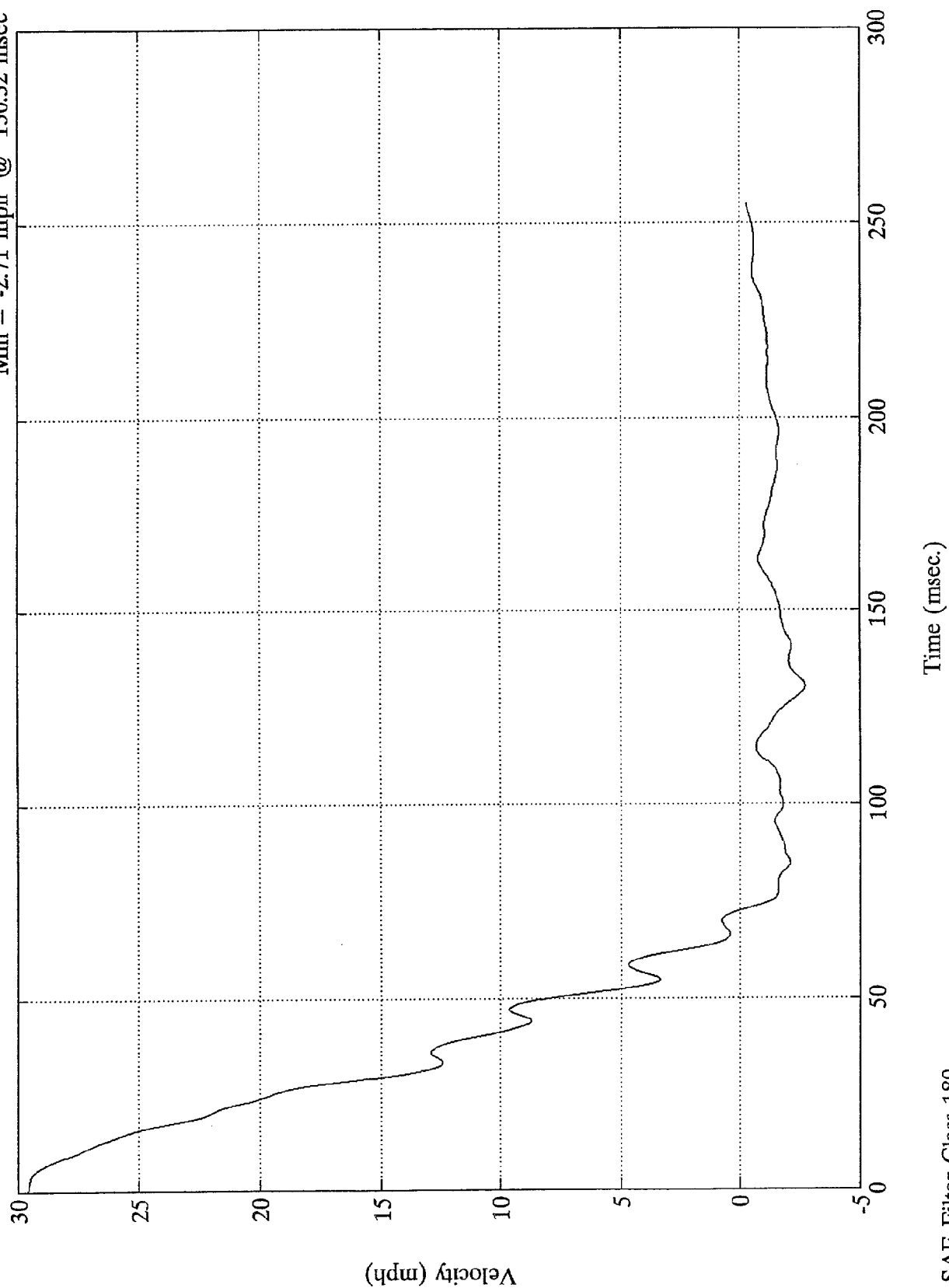
Max = 13.86 Gs @ 56.88 msec

Min = -53.94 Gs @ 28.68 msec



L. Brake Caliper X

Max = 29.60 mph @ 0.24 msec
Min = -2.71 mph @ 130.32 msec



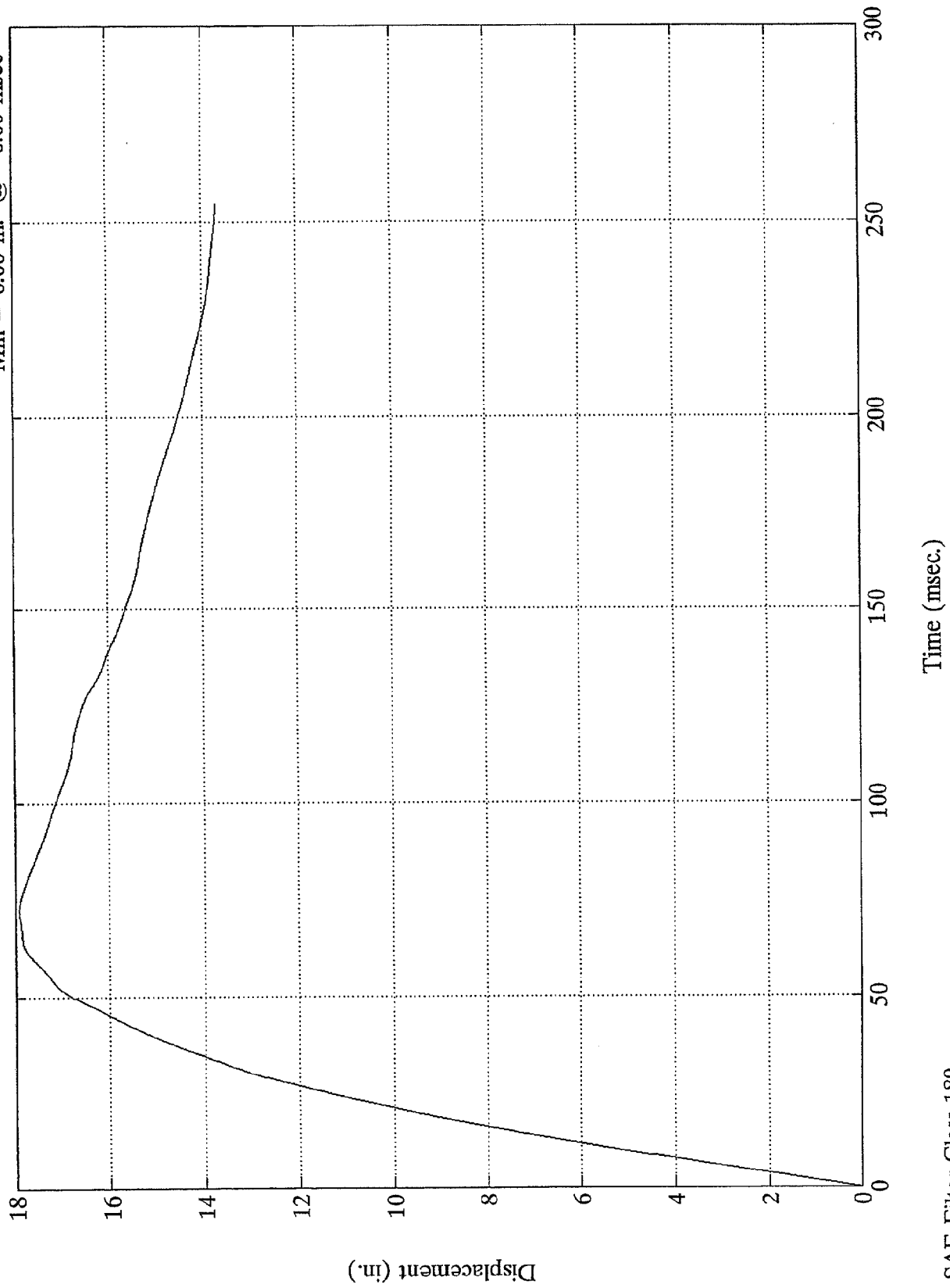
SAE Filter Class 180

NHTSA 208 TEST #10 - 1994 Volvo 940

L. Brake Caliper X

Max = 17.93 in. @ 73.44 msec

Min = 0.00 in. @ -0.00 msec

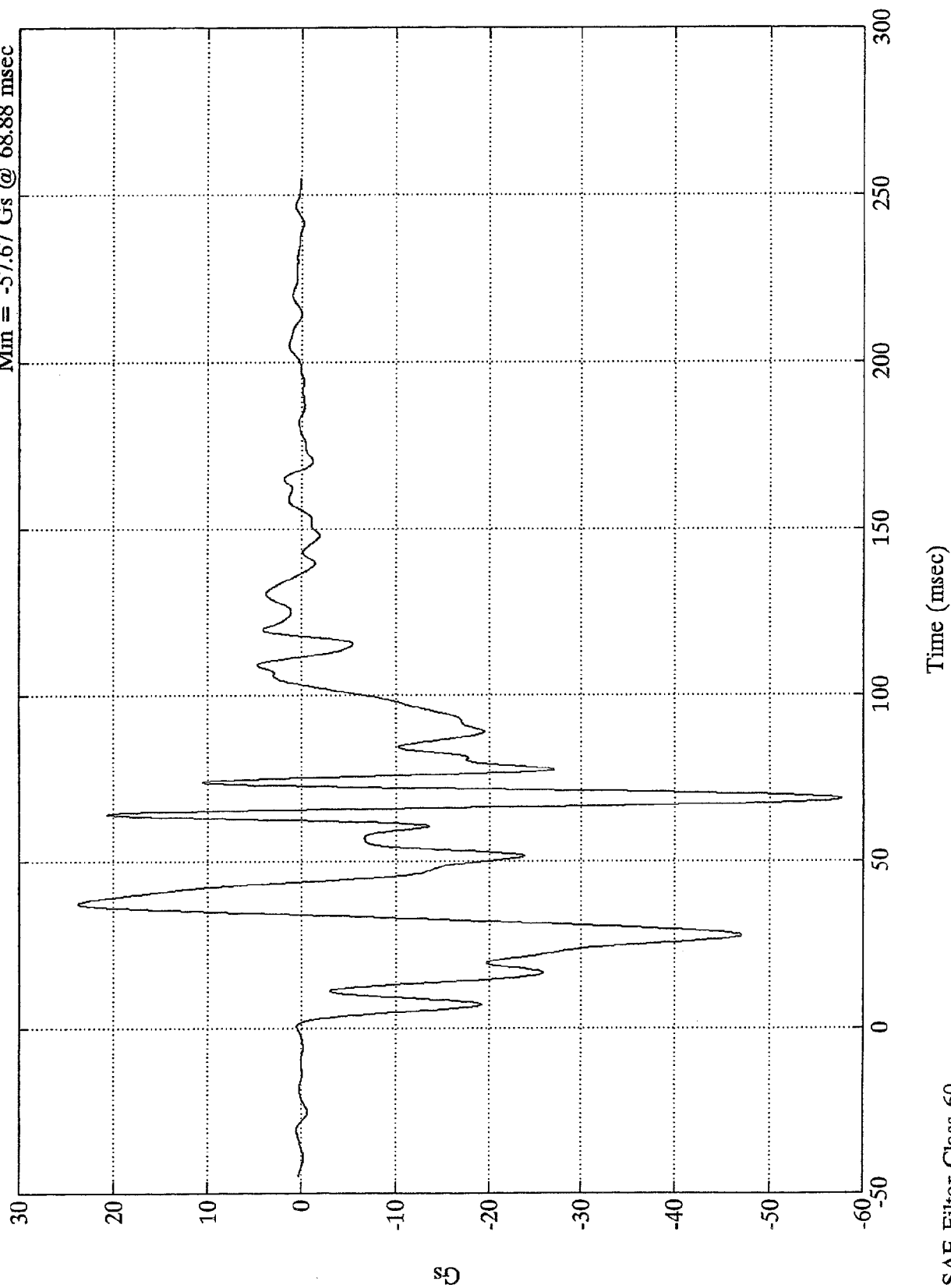


SAE Filter Class 180

Instrument Panel X

Max = 23.78 Gs @ 37.20 msec

Min = -57.67 Gs @ 68.88 msec

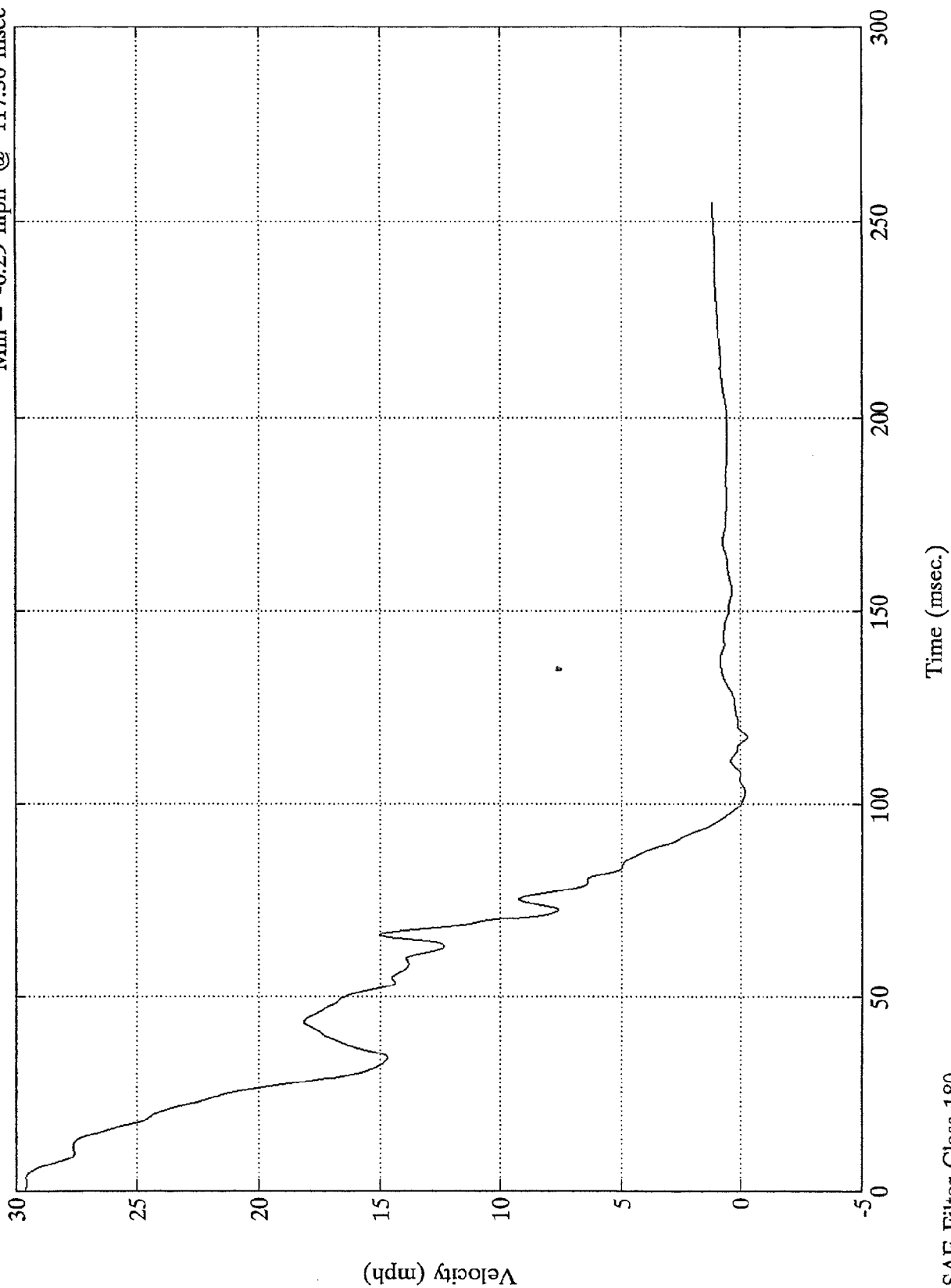


SAE Filter Class 60

NHTSA 208 TEST #10 - 1994 Volvo 940

Instrument Panel X

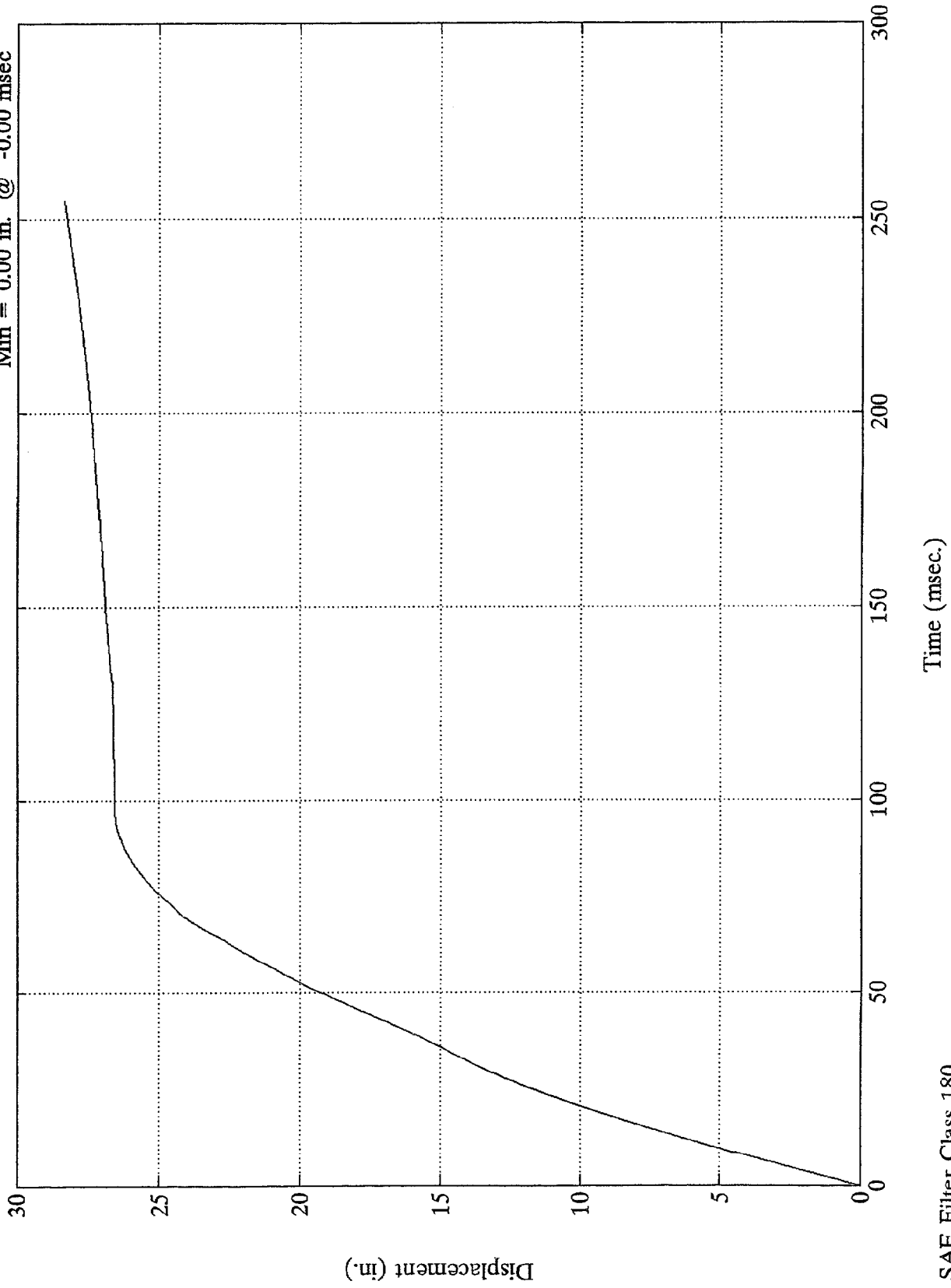
Max = 29.60 mph @ 3.60 msec
Min = -0.29 mph @ 117.36 msec



SAE Filter Class 180

Max = 28.34 in. @ 254.88 msec
Min = 0.00 in. @ -0.00 msec

Instrument Panel X



SAE Filter Class 180

TEST NO. CR5900

DUMMY	SAE FILTER CHANNEL CLASS
Head Accelerations	1000
Chest Accelerations	180
Femur Forces	600

FACILITY: TRACK

TEST DATE: 08 MAR 1994

RUN #: 1377

TEST TIME: 12:16:57

SERIES #: 1

BOARD: A

TITLE: NHTSA 208 TEST #10 - 1994 Volvo 940

CHANNEL NUMBER	DESCRIPTION	ENGR UNIT	MAXIMUM		MINIMUM		FILTER CLASS
			AMP	msec	AMP	msec	
1	Pos. 1 Head X	Gs	4.4	247.0	-35.0	14.2	1000.0
2	Pos. 1 Head Y	Gs	7.7	89.5	-14.2	14.5	1000.0
3	Pos. 1 Head Z	Gs	11.0	14.4	-8.8	16.1	1000.0
4	Pos. 1 Left Femur	lbs	169.7	31.3	-1712.2	48.1	600.0
5	Pos. 1 Chest X	Gs	3.1	254.2	-46.2	75.6	180.0
6	Pos. 1 Chest Y	Gs	2.1	73.6	-3.1	92.3	180.0
7	Pos. 1 Chest Z	Gs	13.0	78.1	-6.5	39.0	180.0
8	Pos. 1 Right Femur	lbs	43.8	133.8	-1259.3	45.8	600.0
9	Pos. 2 Head X	Gs	7.5	106.2	-75.3	65.2	1000.0
10	Pos. 2 Head Y	Gs	12.7	62.8	-13.8	63.6	1000.0
11	Pos. 2 Head Z	Gs	46.1	63.1	-34.7	86.8	1000.0
12	Pos. 2 Left Femur	lbs	74.4	140.5	-1803.7	43.9	600.0
13	Pos. 2 Chest X	Gs	8.2	129.5	-56.1	78.0	180.0
14	Pos. 2 Chest Y	Gs	2.7	136.8	-10.7	87.8	180.0
15	Pos. 2 Chest Z	Gs	25.4	69.0	-10.2	51.7	180.0
16	Pos. 2 Right Femur	lbs	58.9	157.9	-1743.9	48.6	600.0
17	Pos. 1 Head Resultant	Gs	35.3	14.2	.1	-24.7	1000.0
18	Pos. 1 Chest Resultant	Gs	47.8	75.6	.0	-1.7	180.0
19	Pos. 2 Head Resultant	Gs	83.8	64.4	.1	-21.2	1000.0
20	Pos. 2 Chest Resultant	Gs	57.1	79.9	.0	-12.5	180.0

36 ms Fixed Duration HIC SUMMARY: Pos. 1 Head Resultant

hic: 122.73

t1 = 63.000 msec

t2 = 98.880 msec

Average G's Over Hic Duration = 25.92

CLIP SUMMARY: Pos. 1 Chest Resultant

Peak Resultant (3 ms CLIPPED DURATION) = 45.521 G's

Tstart = 74.1600 ms

Tend = 77.2800 ms

CSI = 323.898

36 ms Fixed Duration HIC SUMMARY: Pos. 2 Head Resultant

hic: 483.54

t1 = 60.720 msec

t2 = 74.040 msec

Average G's Over Hic Duration = 66.68

CLIP SUMMARY: Pos. 2 Chest Resultant

Peak Resultant (3 ms CLIPPED DURATION) = 56.129 G's

Tstart = 77.4000 ms

Tend = 80.5200 ms

CSI = 554.423

FACILITY: TRACK

TEST DATE: 08 Mar 1994

RUN #: 1377

TEST TIME: 12:16:57

SERIES #: 1

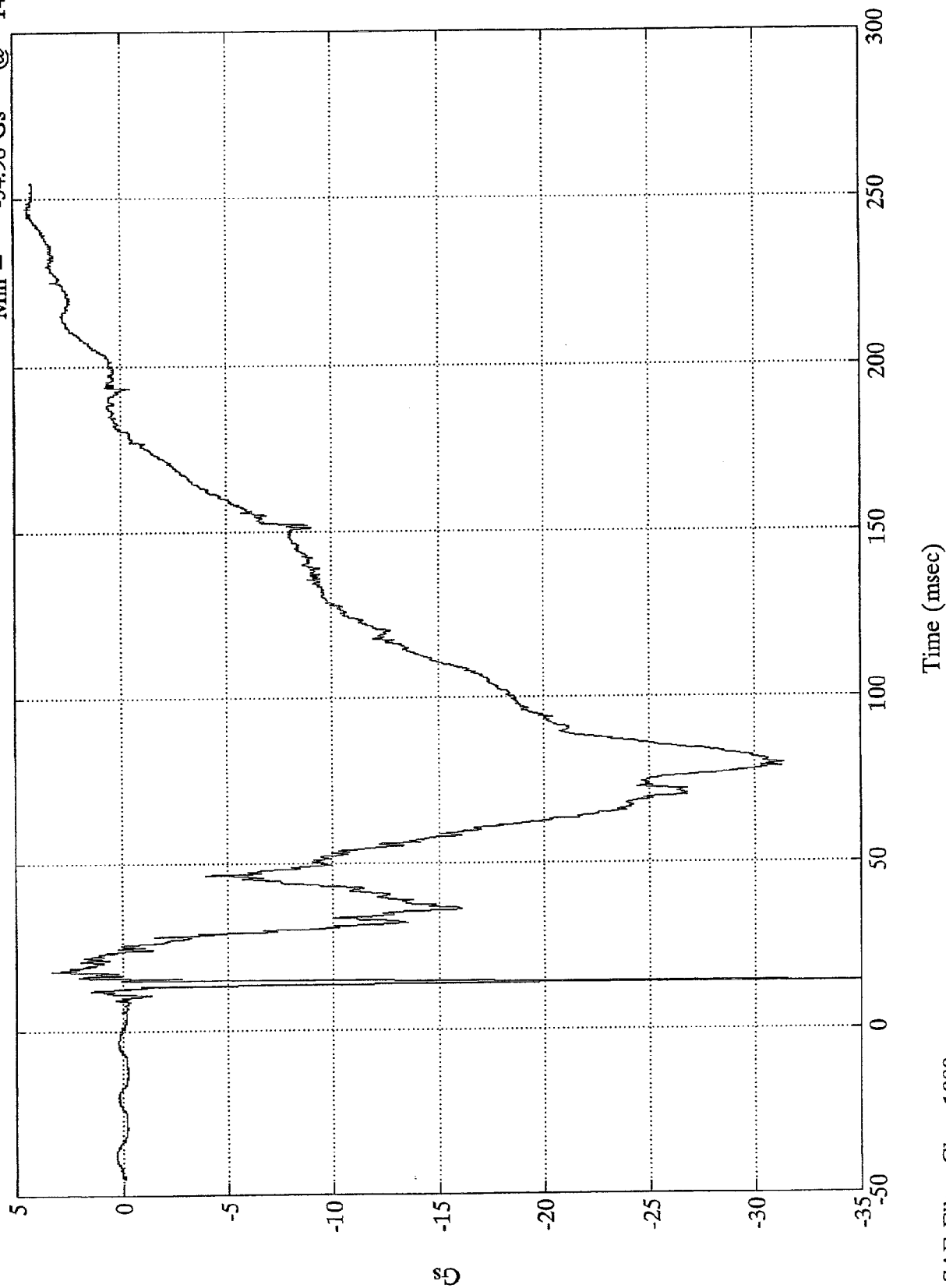
BOARD: B

TITLE: NHTSA 208 TEST #10 - 1994 Volvo 940

CHANNEL NUMBER	DESCRIPTION	ENGR UNIT	MAXIMUM		MINIMUM		FILTER CLASS
			AMP	msec	AMP	msec	
1	Pos.1 Upper Neck Fx	Lbs	67.6	145.4	-237.9	82.7	1000.0
2	Pos.1 Upper Neck Fy	Lbs	25.8	14.8	-22.7	61.4	1000.0
3	Pos.1 Upper Neck Fz	Lbs	99.3	30.8	-45.9	81.5	1000.0
4	Pos.1 Chest Displacement	ins	.0	5.5	-1.5	78.7	60.0
5	Pos.1 Upper Neck Mx	Ftlb	4.3	142.8	-8.8	116.0	600.0
6	Pos.1 Upper Neck My	Ftlb	44.2	46.6	-7.4	198.5	600.0
7	Pos.1 Upper Neck Mz	Ftlb	5.5	145.3	-8.0	85.3	600.0
8	N/A	Gs	6.8	121.4	-27.2	35.5	60.0
9	L. Rear X-member X (#1)	Gs	3.4	114.7	-31.8	24.6	60.0
10	R. Rear X-member X (#2)	Gs	3.3	114.5	-34.5	25.1	60.0
11	Engine Top X (#3)	Gs	6.1	77.8	-86.4	46.8	60.0
12	Engine Bottom X (#4)	Gs	10.2	103.6	-67.9	47.0	60.0
13	R. Brake Caliper X (#5)	Gs	10.6	108.6	-55.8	27.7	60.0
14	L. Brake Caliper X (#6)	Gs	13.9	56.9	-53.9	28.7	60.0
15	Instrument Panel X (#7)	Gs	23.8	37.2	-57.7	68.9	60.0
16	NULL	Gs	.0	254.9	.0	254.9	1000.0
17	Pos.1 Neck Force Res.	Lbs	240.7	82.7	1.1	11.8	1000.0
18	Pos.1 Neck Moment Res.	Ftlb	44.5	46.6	.0	-24.4	600.0
19	NULL	Gs	89.1	46.8	.0	-10.3	60.0
20	NULL	Gs	89.6	28.1	.0	-28.2	60.0

Pos. 1 Head X

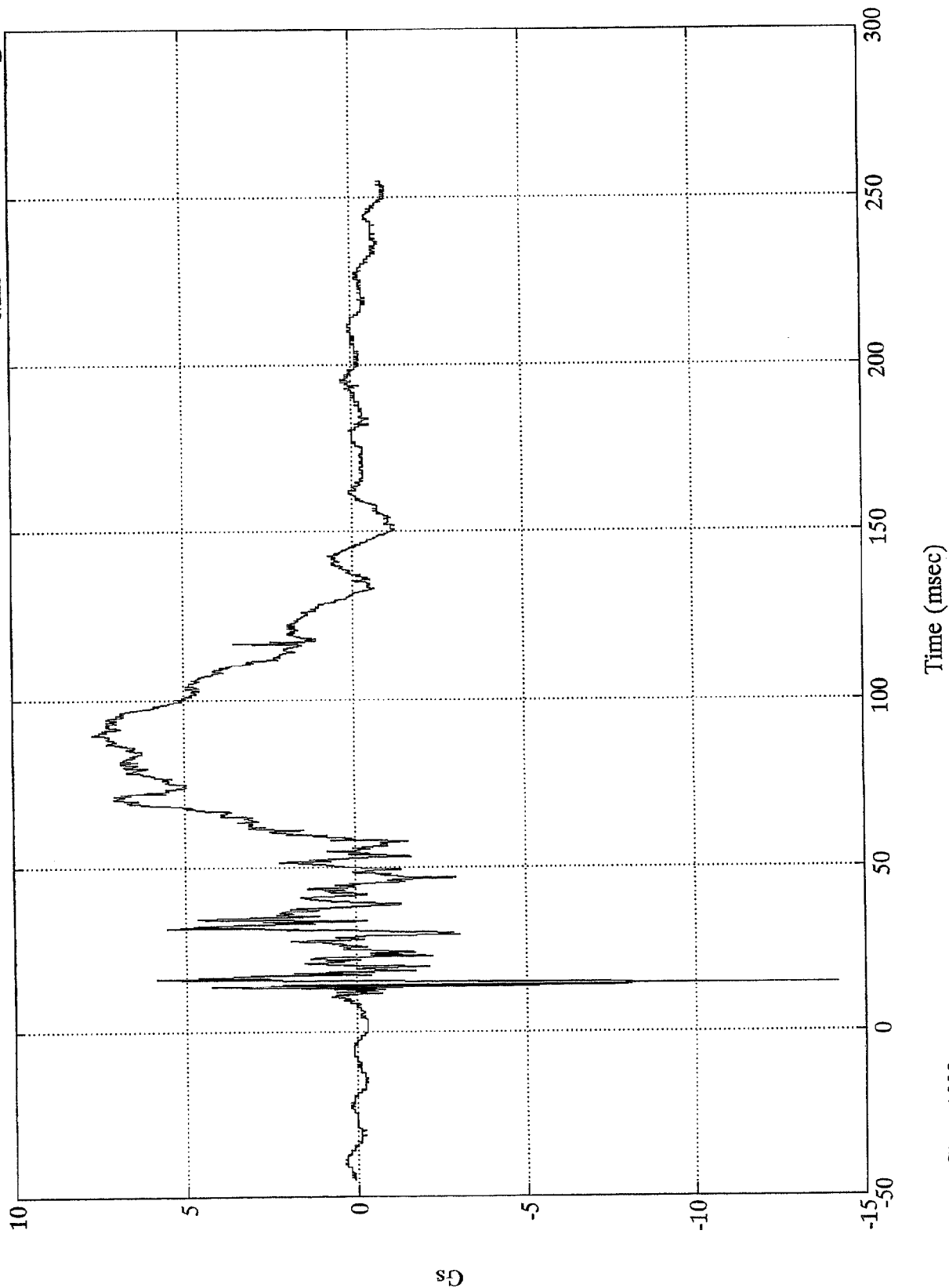
Max = 4.41 Gs @ 246.96 ms
Min = -34.98 Gs @ 14.15 ms



NHTSA 208 TEST #10 - 1994 Volvo 940

Max = 7.68 Gs @ 89.51 msec
Min = -14.20 Gs @ 14.51 msec

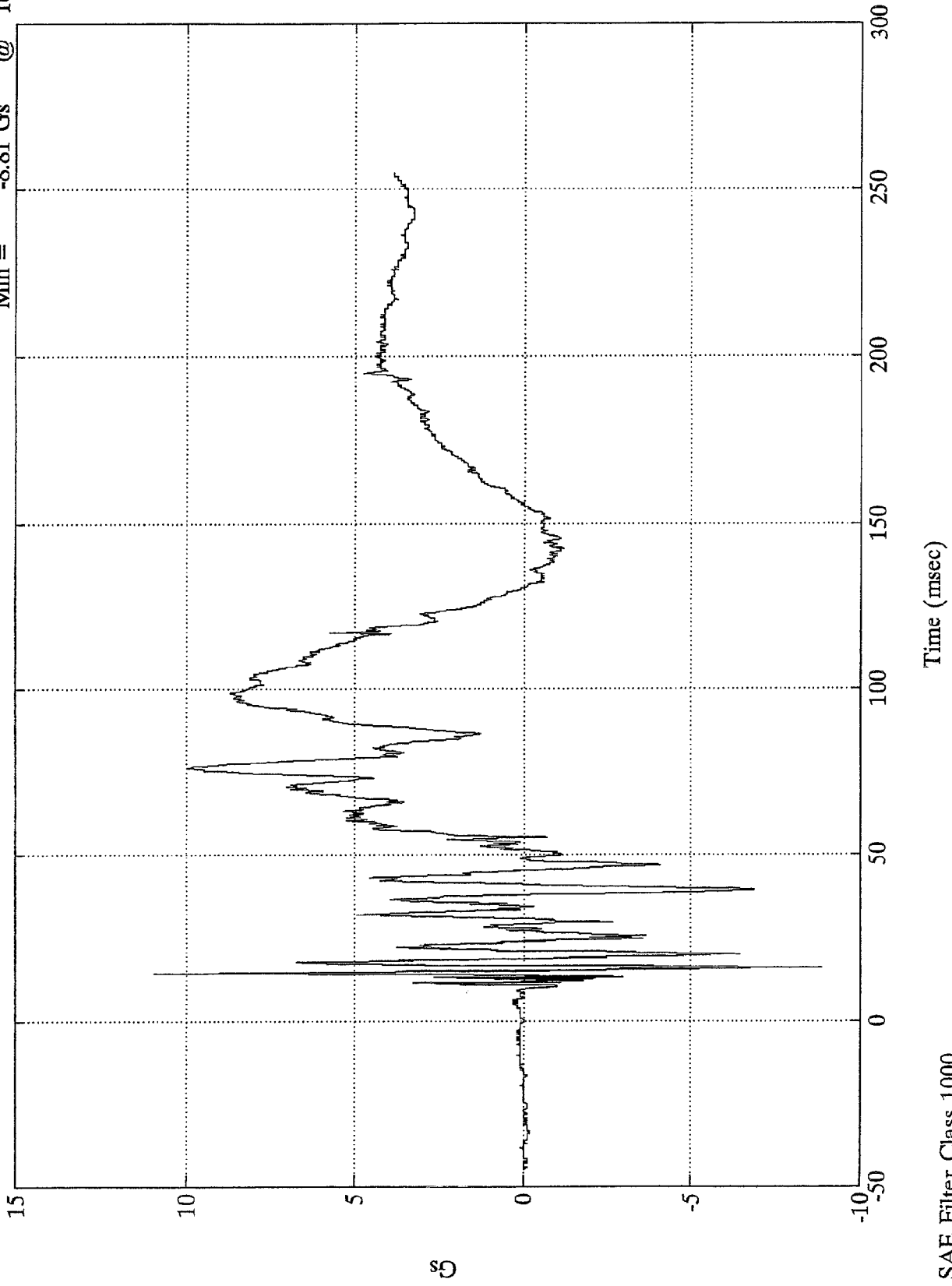
Pos. 1 Head Y



SAE Filter Class 1000

Pos. 1 Head Z

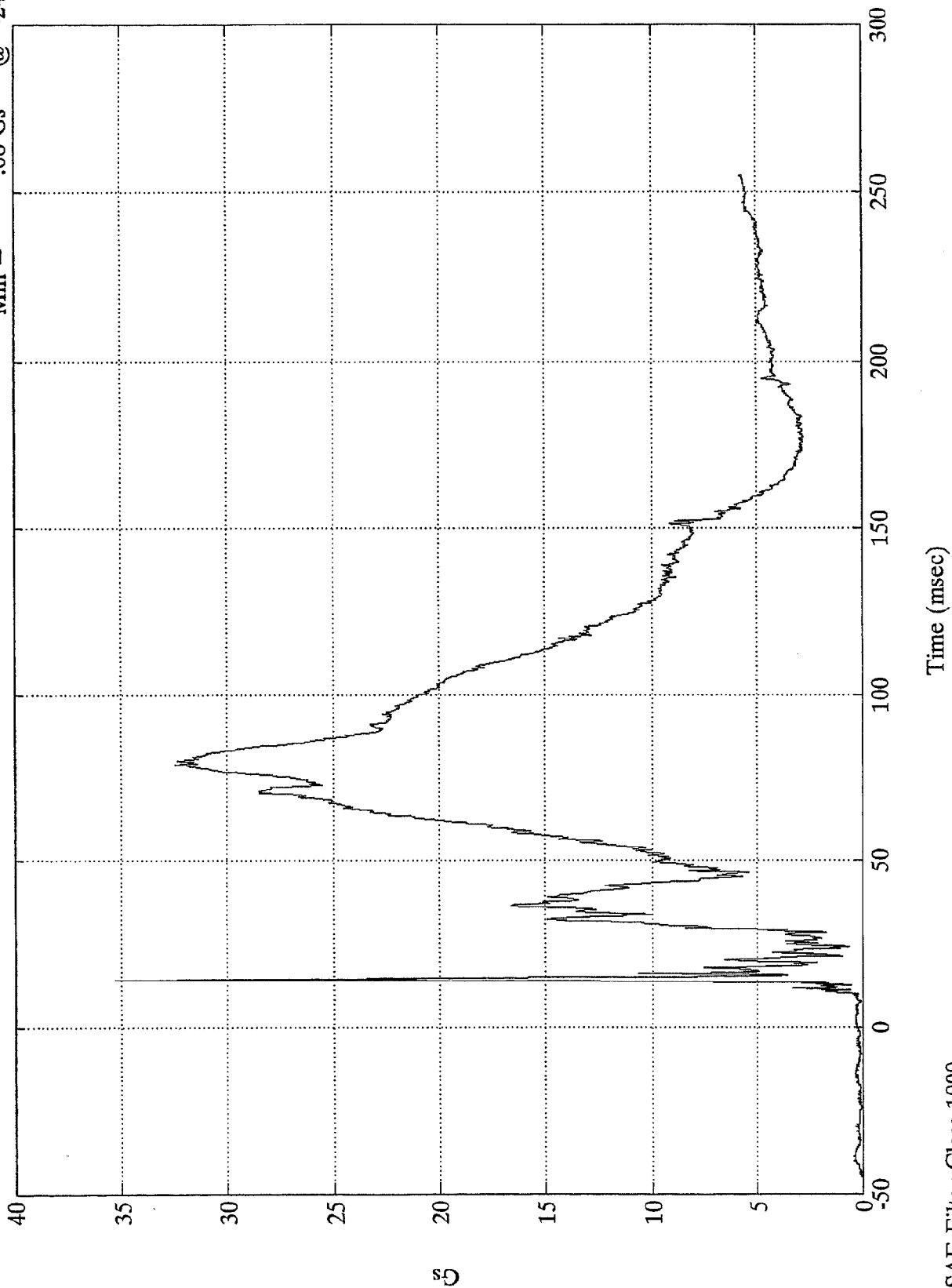
Max = 10.96 Gs @ 14.39 ms
Min = -8.81 Gs @ 16.07 ms



NHTSA 208 TEST #10 - 1994 Volvo 940

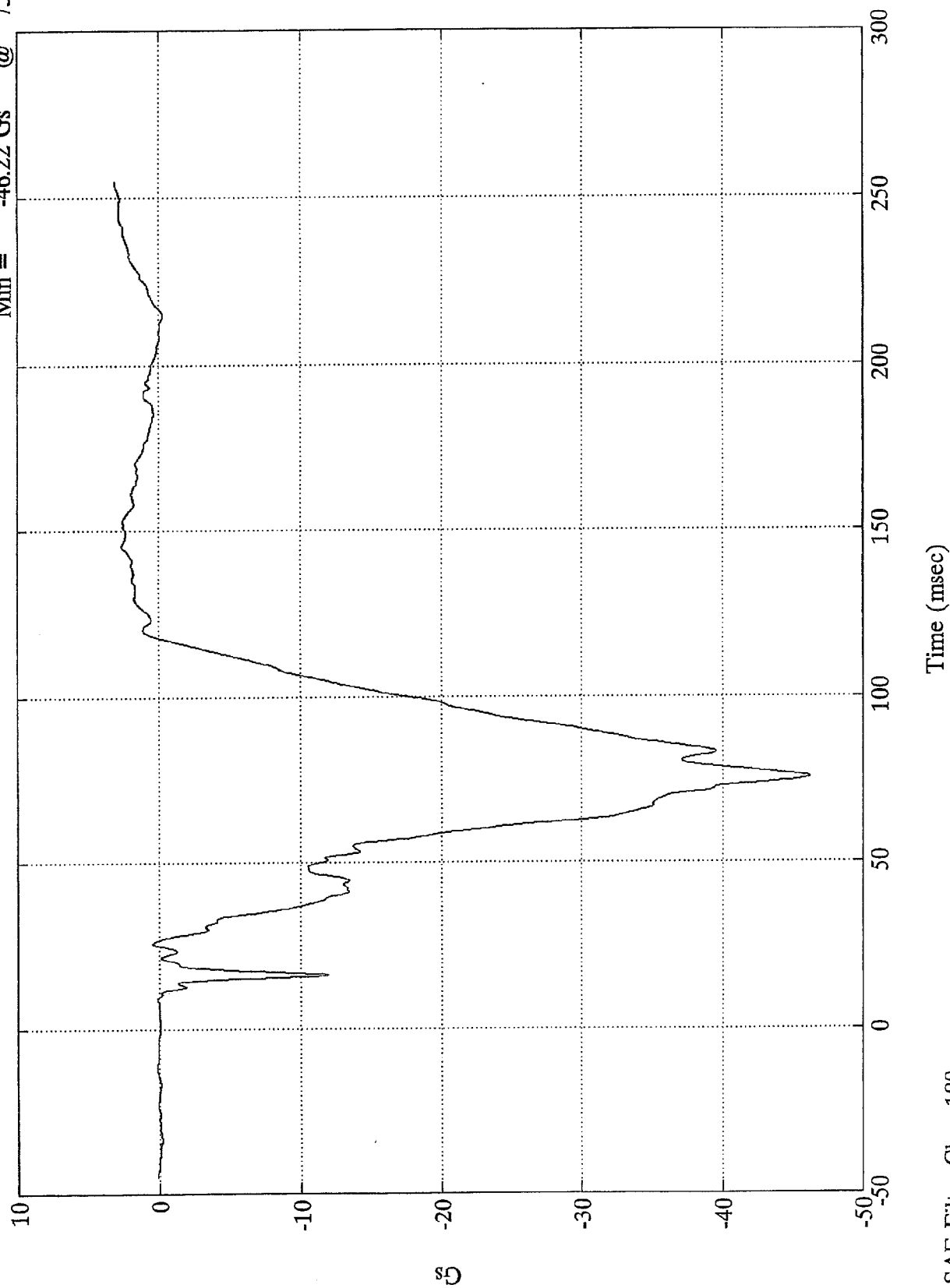
Pos. 1 Head Resultant

Max = 35.29 Gs @ 14.15 msec
Min = .08 Gs @ -24.72 msec



Pos. 1 Chest X

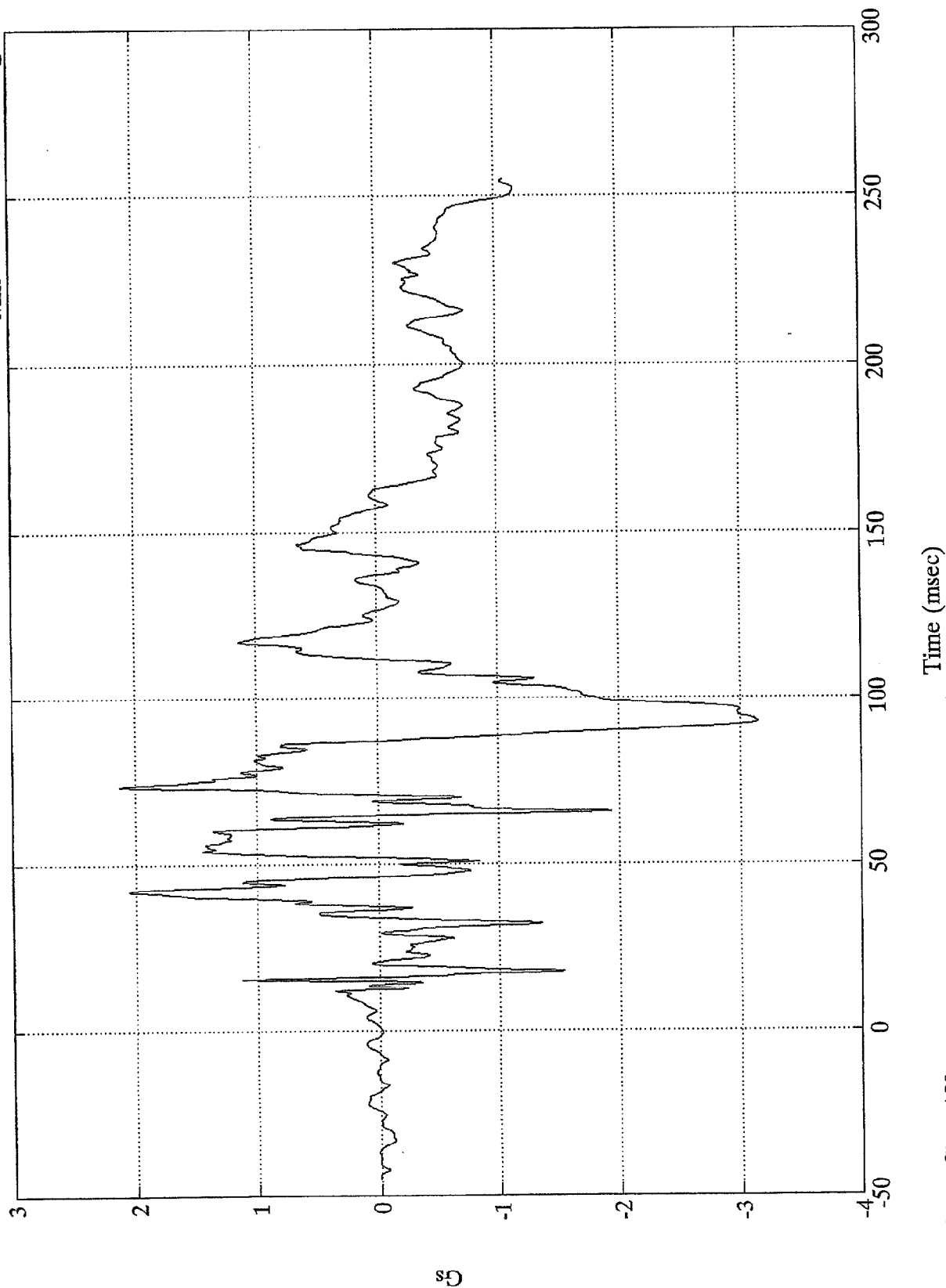
Max = 3.13 Gs @ 254.16 ms
Min = -46.22 Gs @ 75.59 ms



SAE Filter Class 180

NHTSA 208 TEST #10 - 1994 Volvo 940

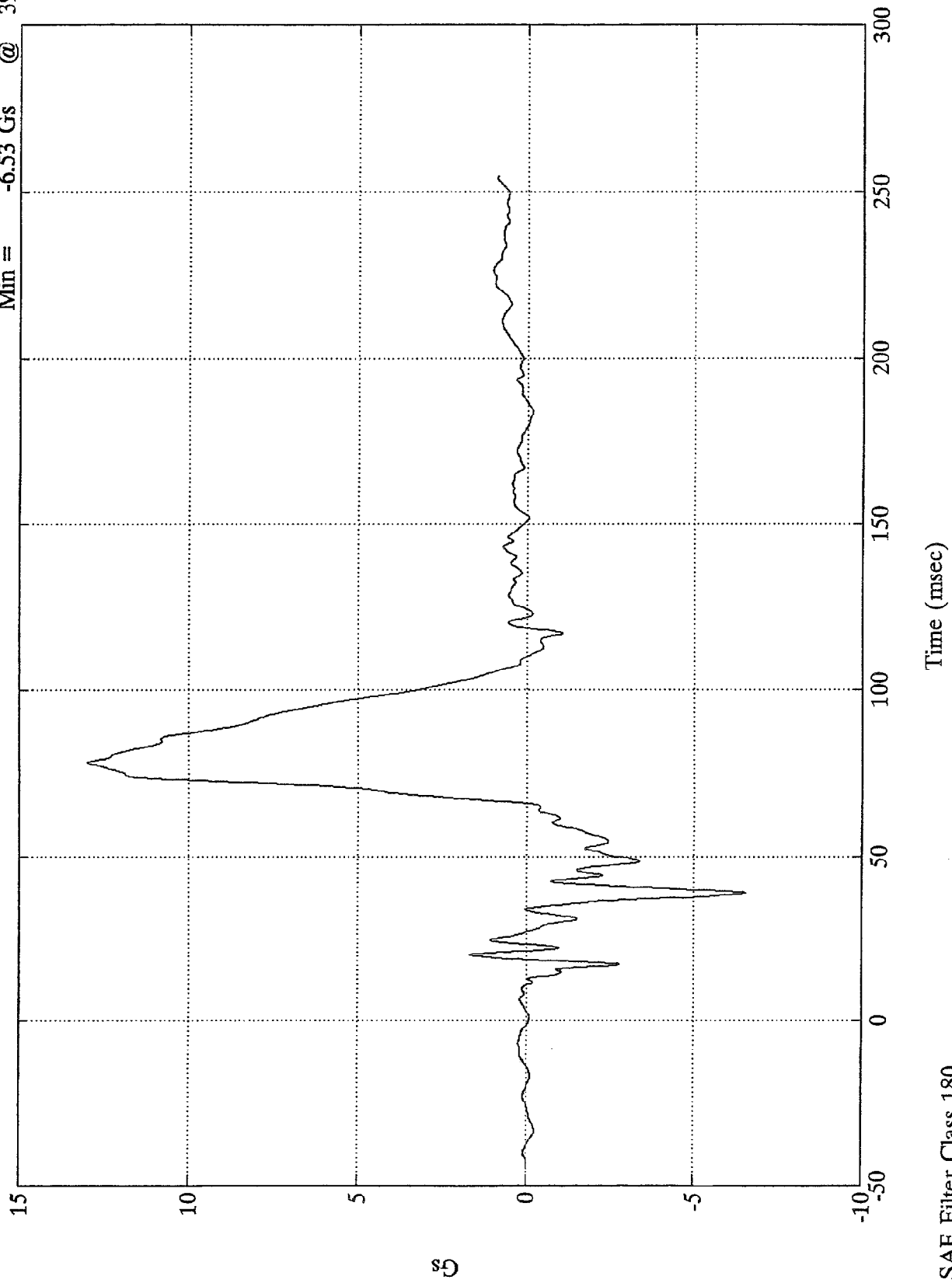
Pos. 1 Chest Y Max = 2.13 Gs @ 73.55 msec
 Min = -3.14 Gs @ 92.27 msec



SAE Filter Class 180

Pos. 1 Chest Z

Max = 12.98 Gs @ 78.12 ms
Min = -6.53 Gs @ 39.00 ms

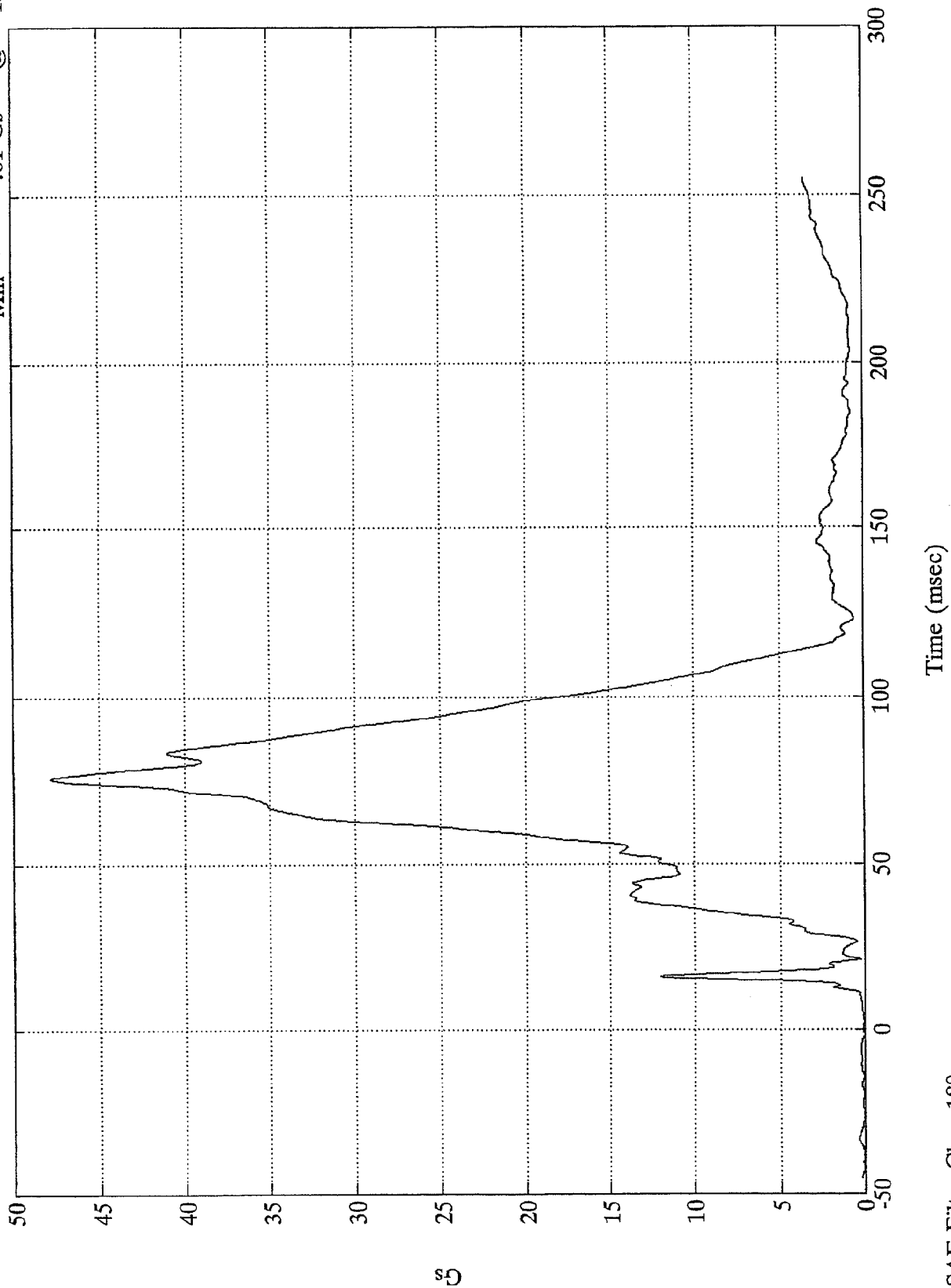


SAE Filter Class 180

NHTSA 208 TEST #10 - 1994 Volvo 940

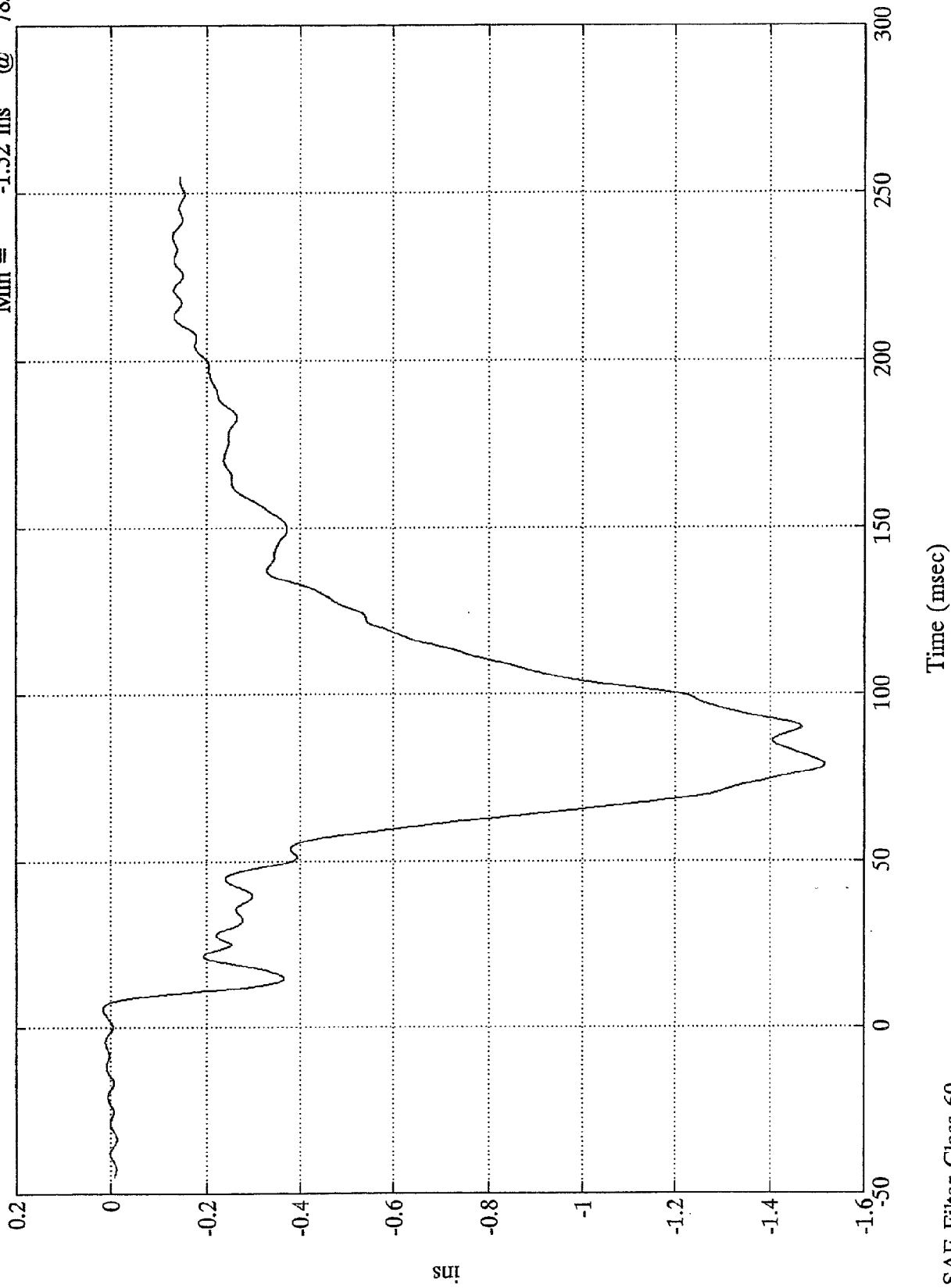
Pos. 1 Chest Resultant

Max = 47.81 Gs @ 75.59 msec
Min = .01 Gs @ -1.68 msec



SAE Filter Class 180

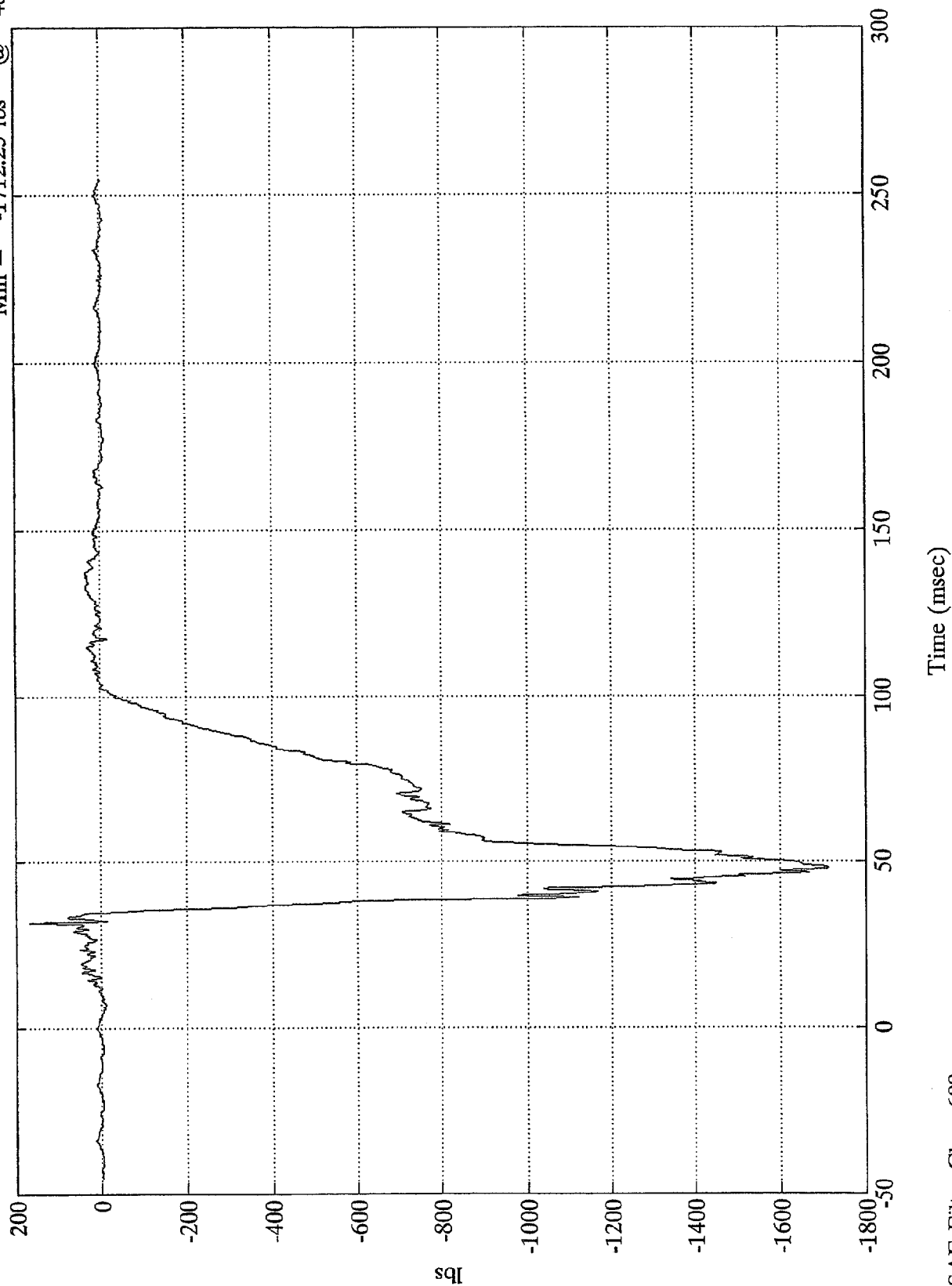
Pos.1 Chest Displacement
 Max = .02 ins @ 5.51 msec
 Min = -1.52 ins @ 78.72 msec



SAE Filter Class 60

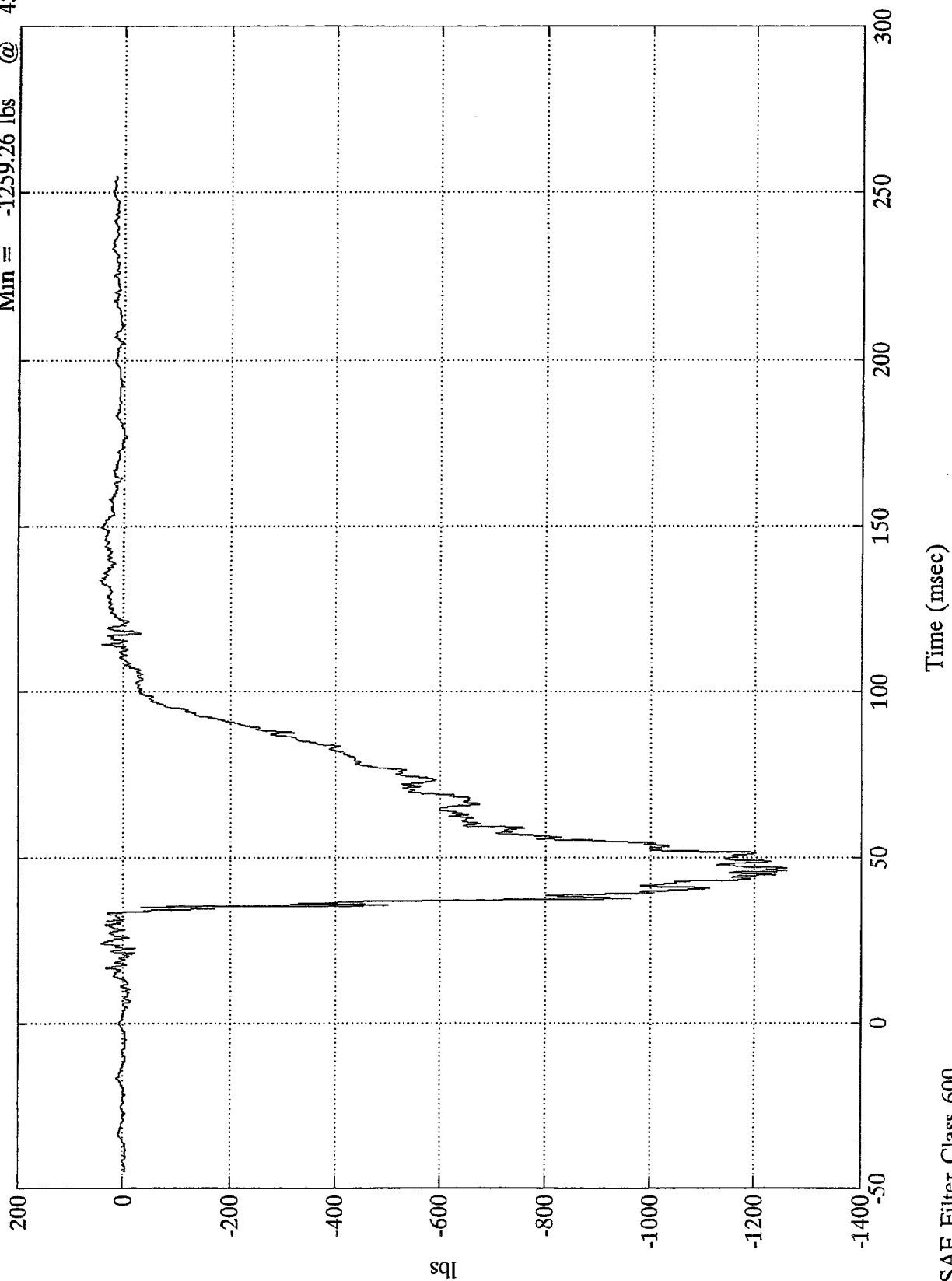
NHTSA 208 TEST #10 - 1994 Volvo 940

Pos. 1 Left Femur
Max = 169.73 lbs @ 31.31 msec
Min = -1712.25 lbs @ 48.11 msec



Pos. 1 Right Femur

Max = 43.76 lbs @ 133.80 ms
Min = -1259.26 lbs @ 45.84 ms

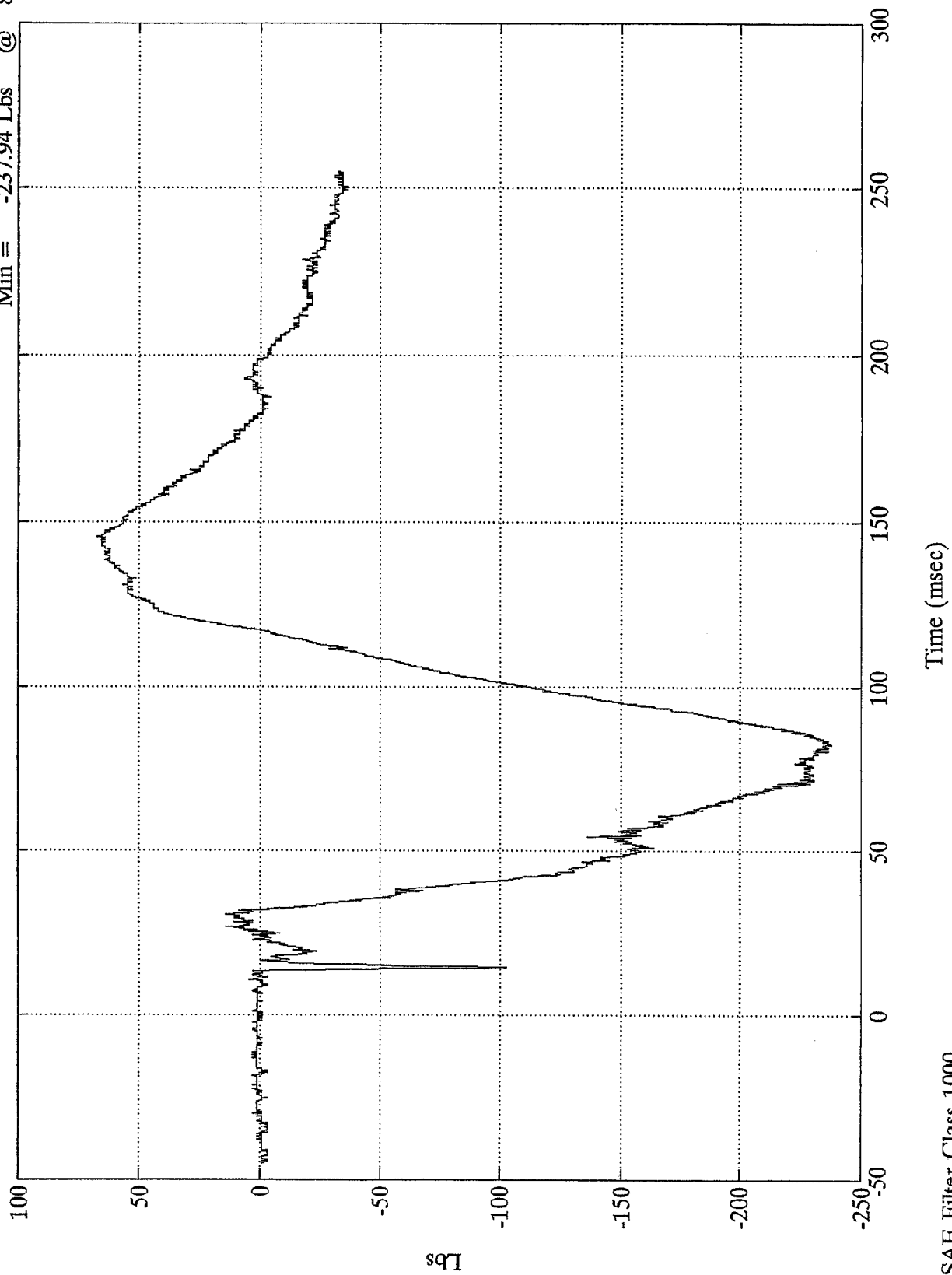


SAE Filter Class 600

NHTSA 208 TEST #10 - 1994 Volvo 940

Pos.1 Upper Neck Fx

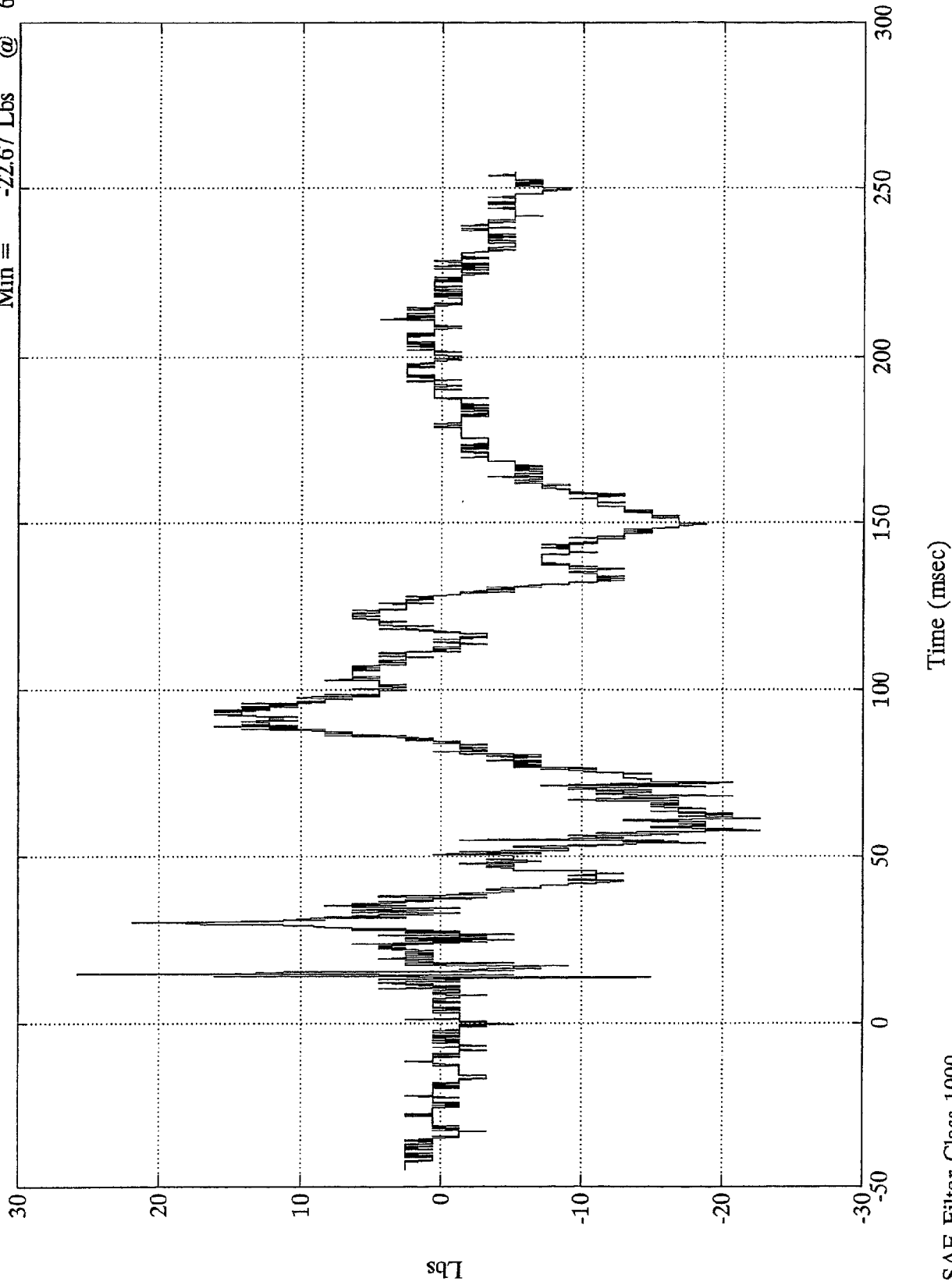
Max = 67.61 Lbs @ 145.44 msec
Min = -237.94 Lbs @ 82.68 msec



SAE Filter Class 1000

Pos.1 Upper Neck Fy

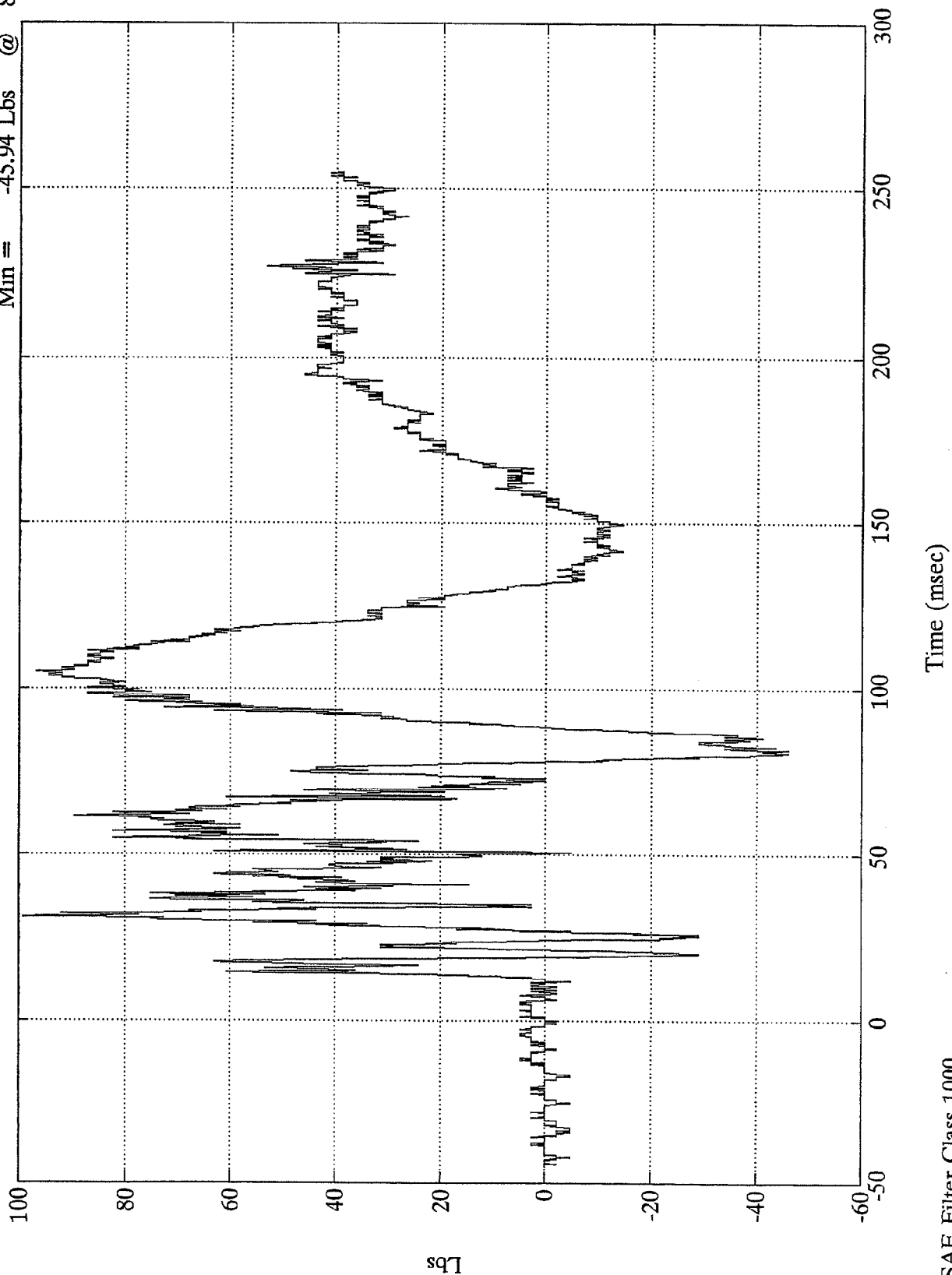
Max = 25.80 Lbs @ 14.75 m
 Min = -22.67 Lbs @ 61.44 ms



NHTSA 208 TEST #10 - 1994 Volvo 940

Pos.1 Upper Neck Fz

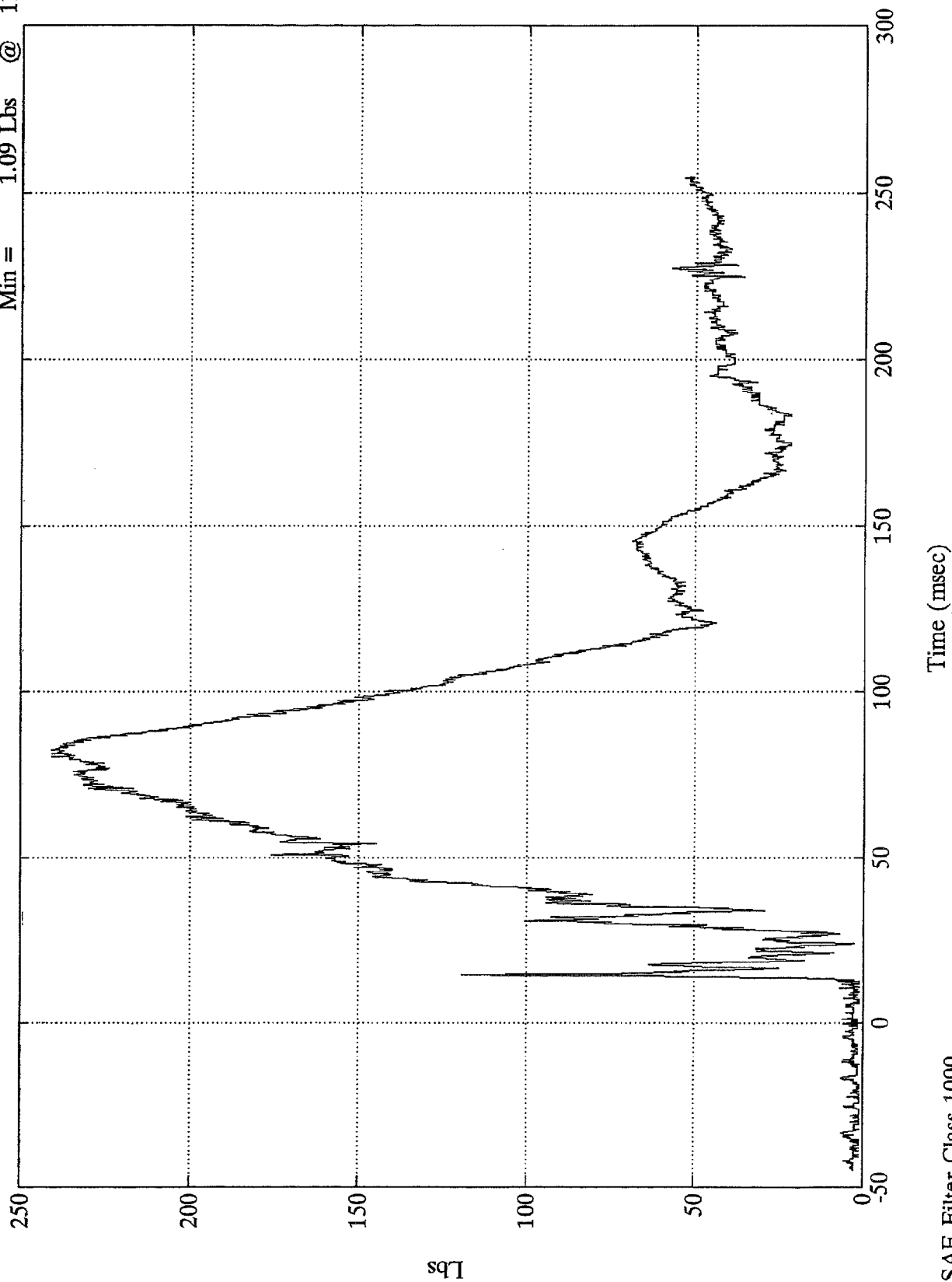
Max = 99.29 Lbs @ 30.84 msec
Min = -45.94 Lbs @ 81.48 msec



SAE Filter Class 1000

Pos.1 Neck Force Res.

Max = 240.70 Lbs @ 82.68 m
Min = 1.09 Lbs @ 11.75 ms

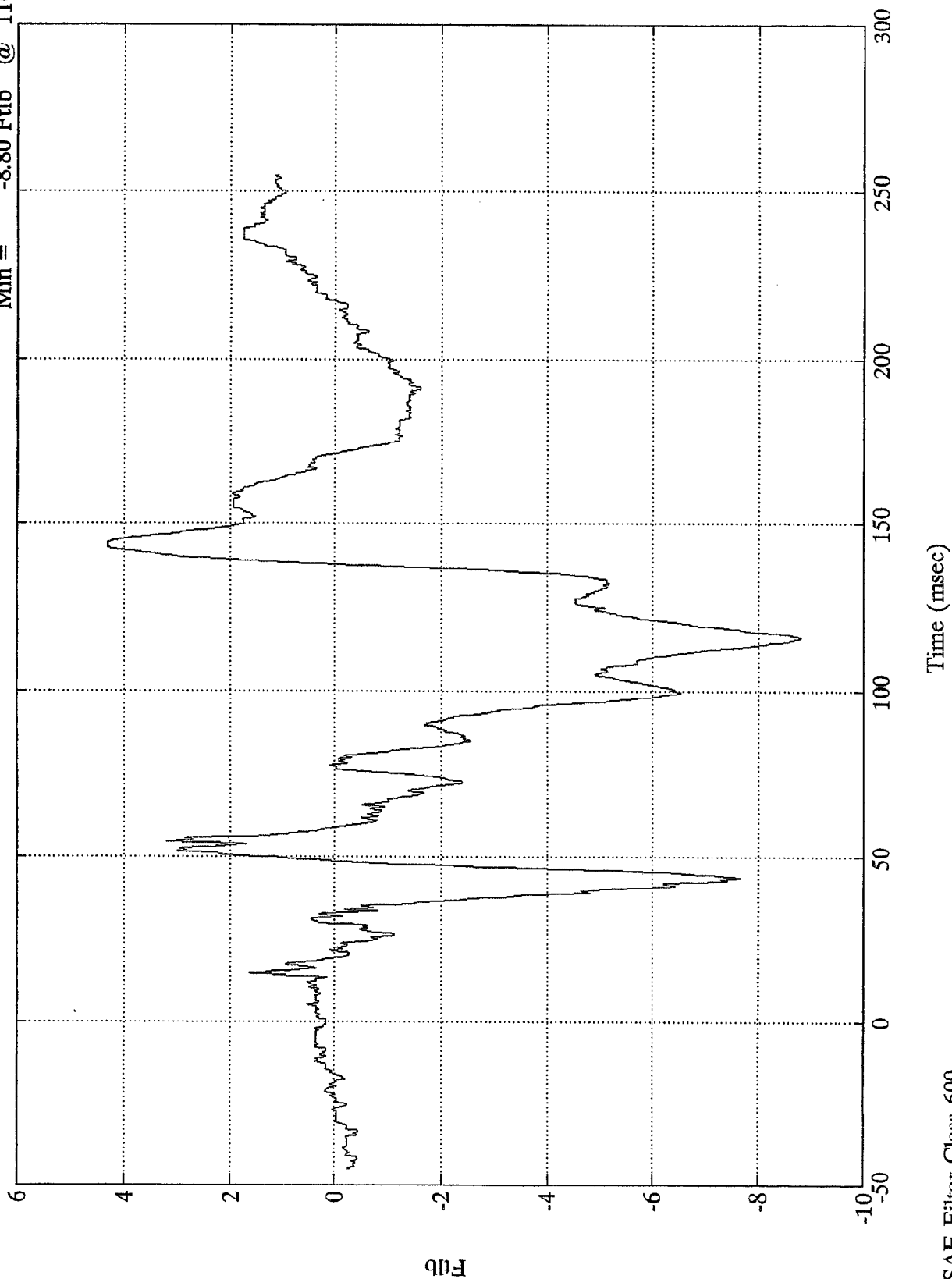


SAE Filter Class 1000

NHTSA 208 TEST #10 - 1994 Volvo 940

Pos.1 Upper Neck Mx

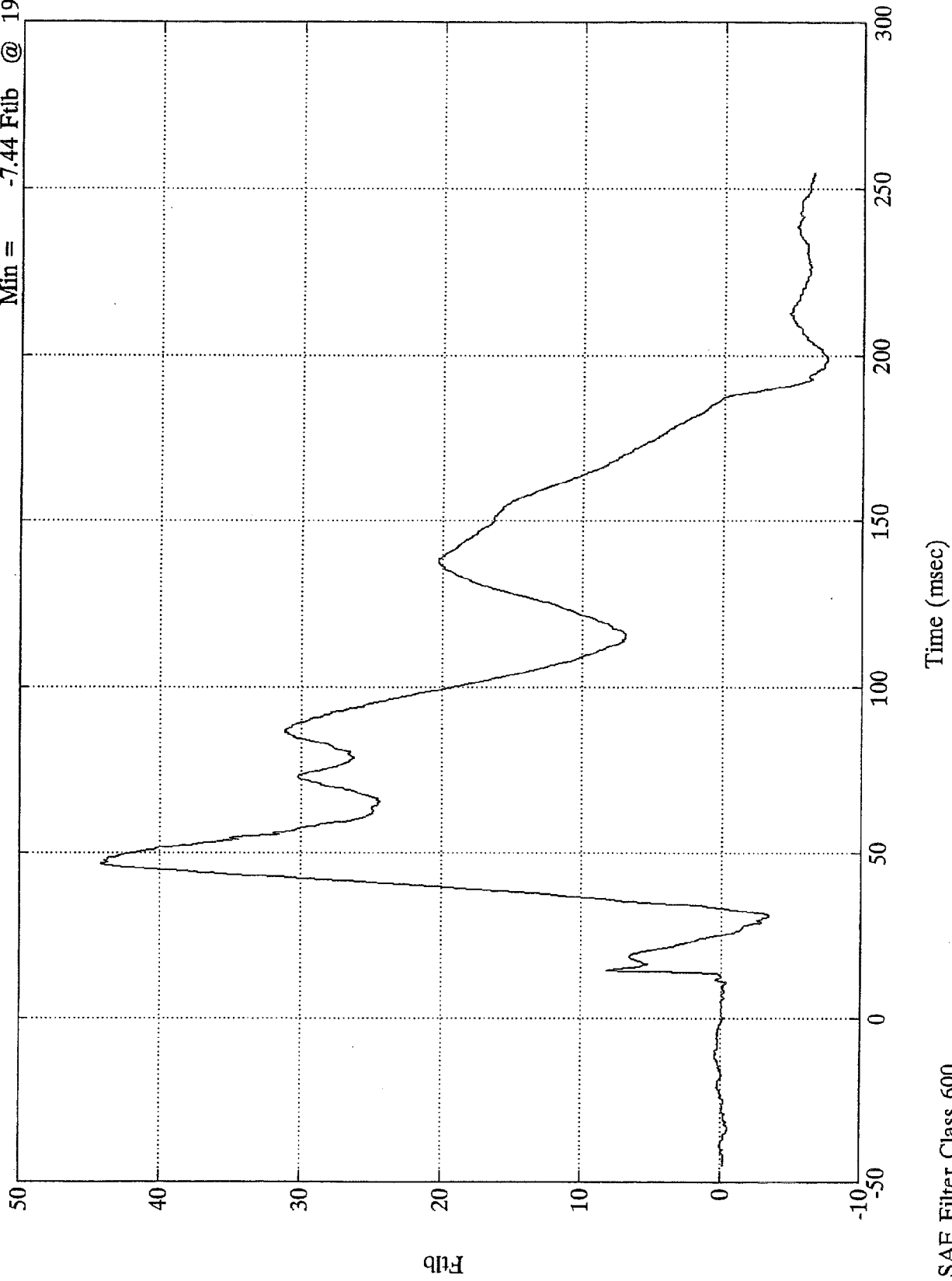
Max = 4.31 Ftlb @ 142.80 msec
Min = -8.80 Ftlb @ 116.04 msec



SAE Filter Class 600

Pos.1 Upper Neck My

Max = 44.25 Ftlb @ 46.56 ms
Min = -7.44 Ftlb @ 198.48 ms

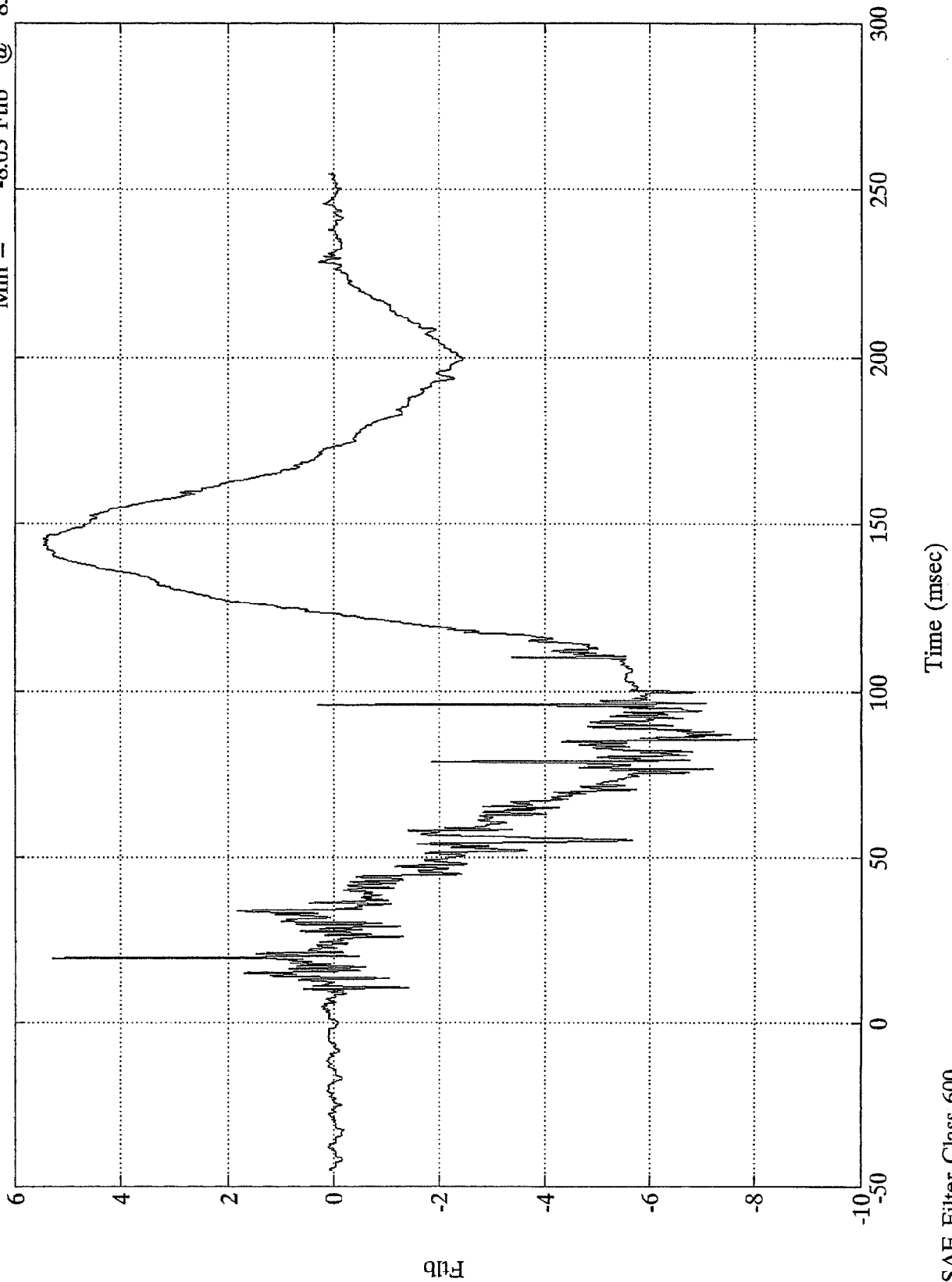


SAE Filter Class 600

NHTSA 208 TEST #10 - 1994 Volvo 940

Pos.1 Upper Neck Mz

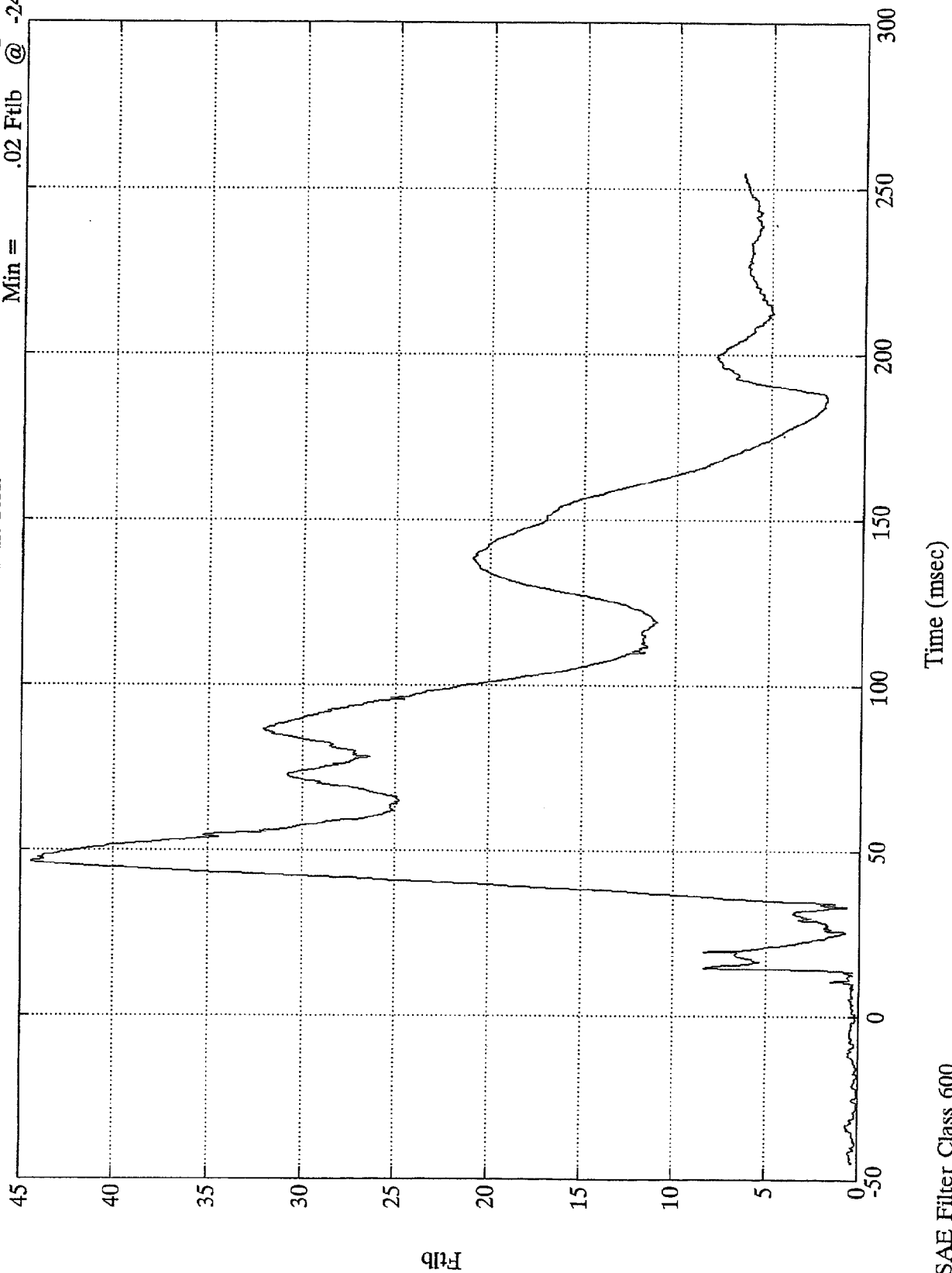
Max = 5.47 Ftlb @ 145.31 msec
Min = -8.03 Ftlb @ 85.31 msec



SAE Filter Class 600

Pos.1 Neck Moment Res.

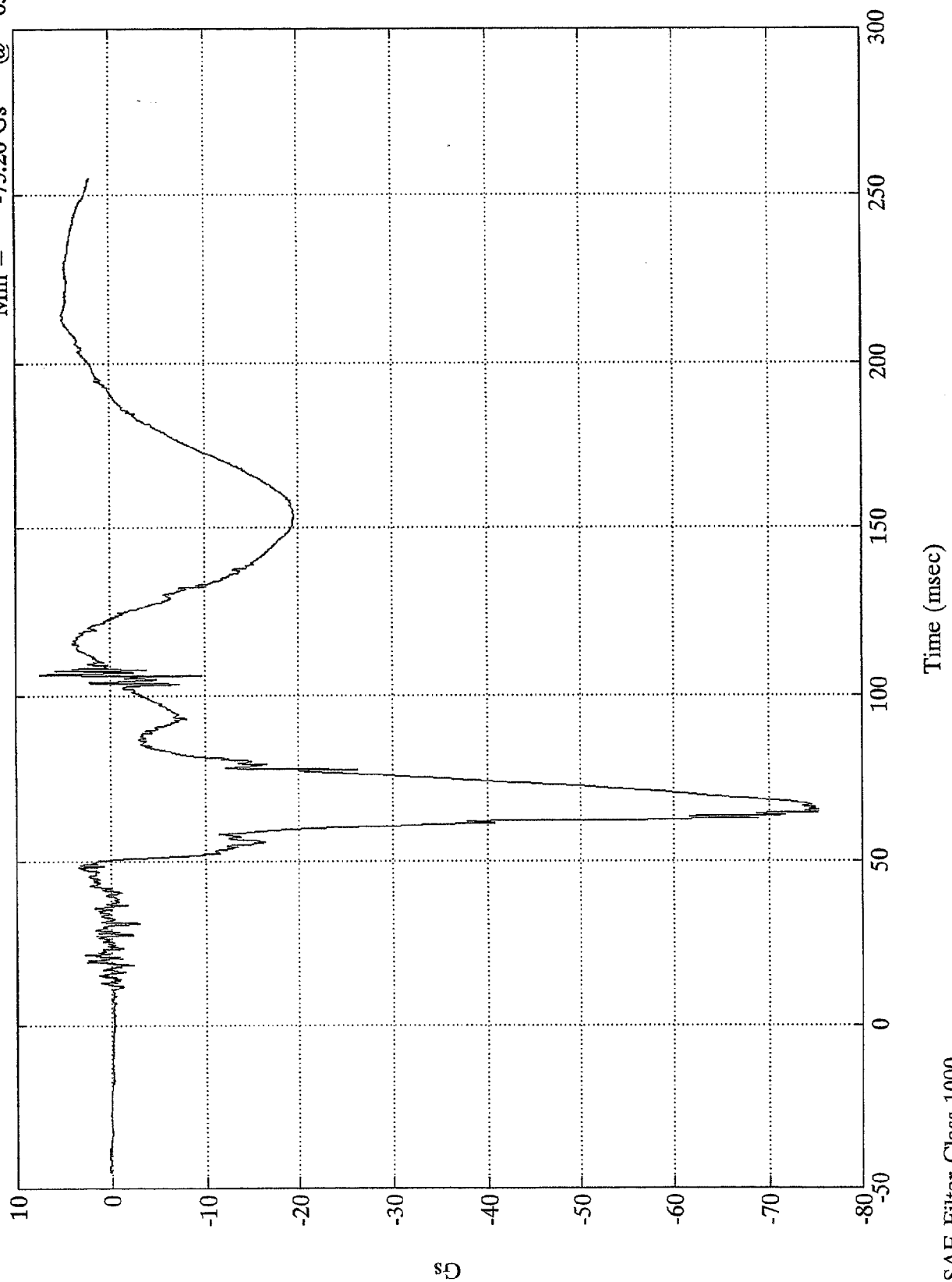
Max = 44.47 Ftlb @ 46.56 m
Min = .02 Ftlb @ -24.36 ms



NHTSA 208 TEST #10 - 1994 Volvo 940

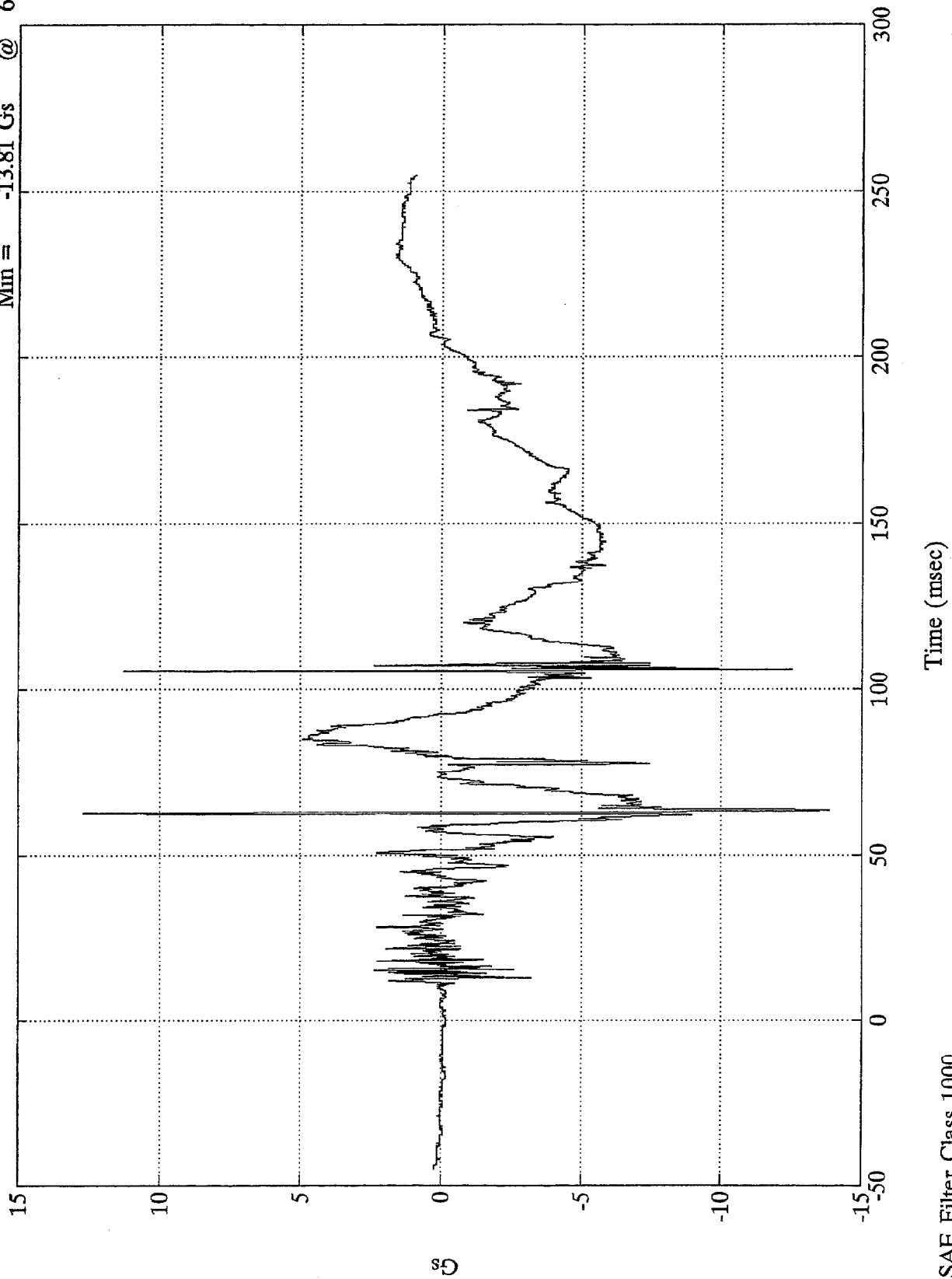
Max = 7.50 Gs @ 106.20 msec
Min = -75.26 Gs @ 65.15 msec

Pos. 2 Head X



Max = 12.68 Gs @ 62.76 m
 Min = -13.81 Gs @ 63.60 ms

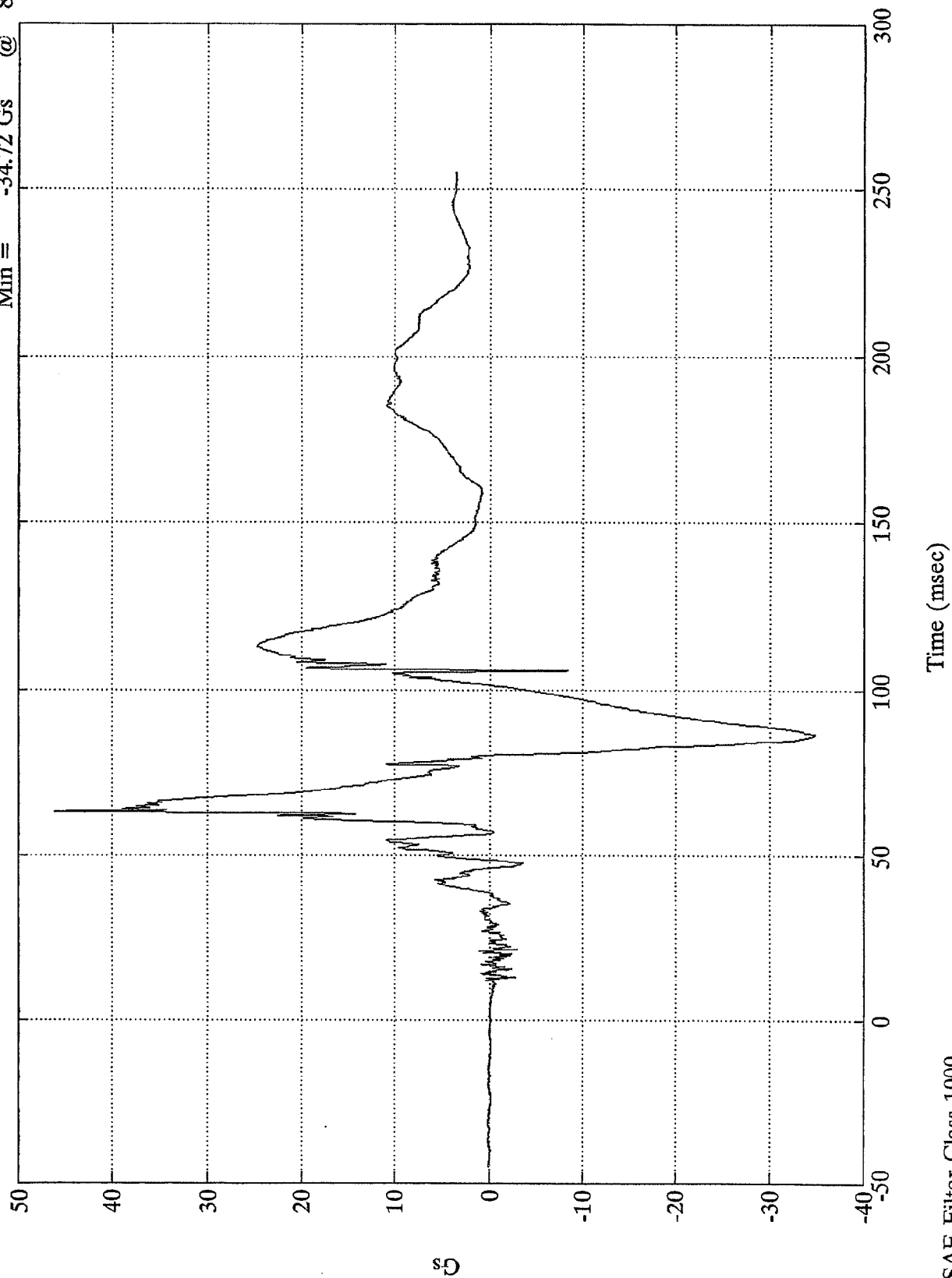
Pos. 2 Head Y



SAE Filter Class 1000

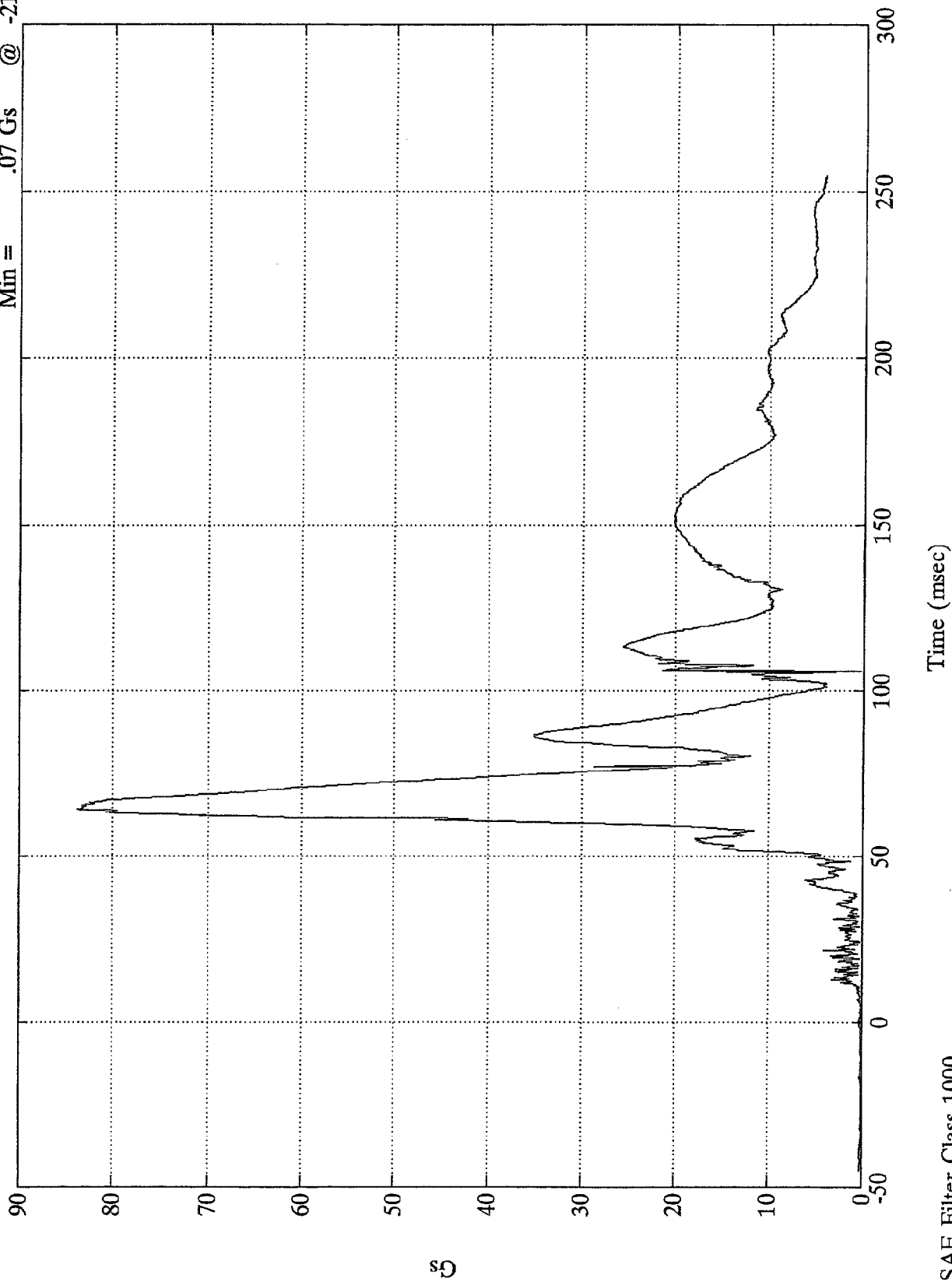
NHTSA 208 TEST #10 - 1994 Volvo 940

Pos. 2 Head Z
Max = 46.06 Gs @ 63.11 msec
Min = -34.72 Gs @ 86.76 msec



Pos. 2 Head Resultant

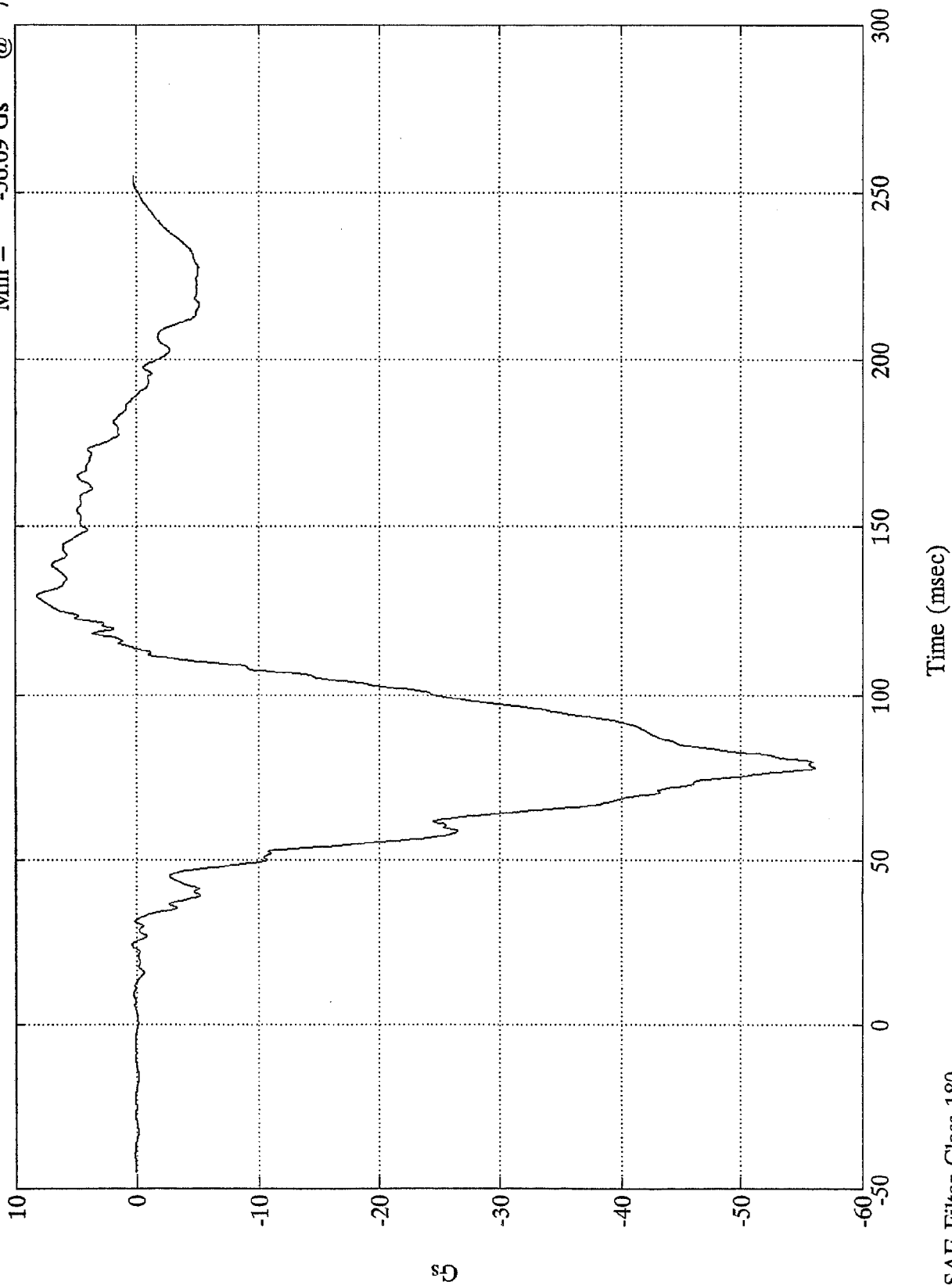
Max = 83.80 Gs @ 64.44 m
Min = .07 Gs @ -21.24 ms



NHTSA 208 TEST #10 - 1994 Volvo 940

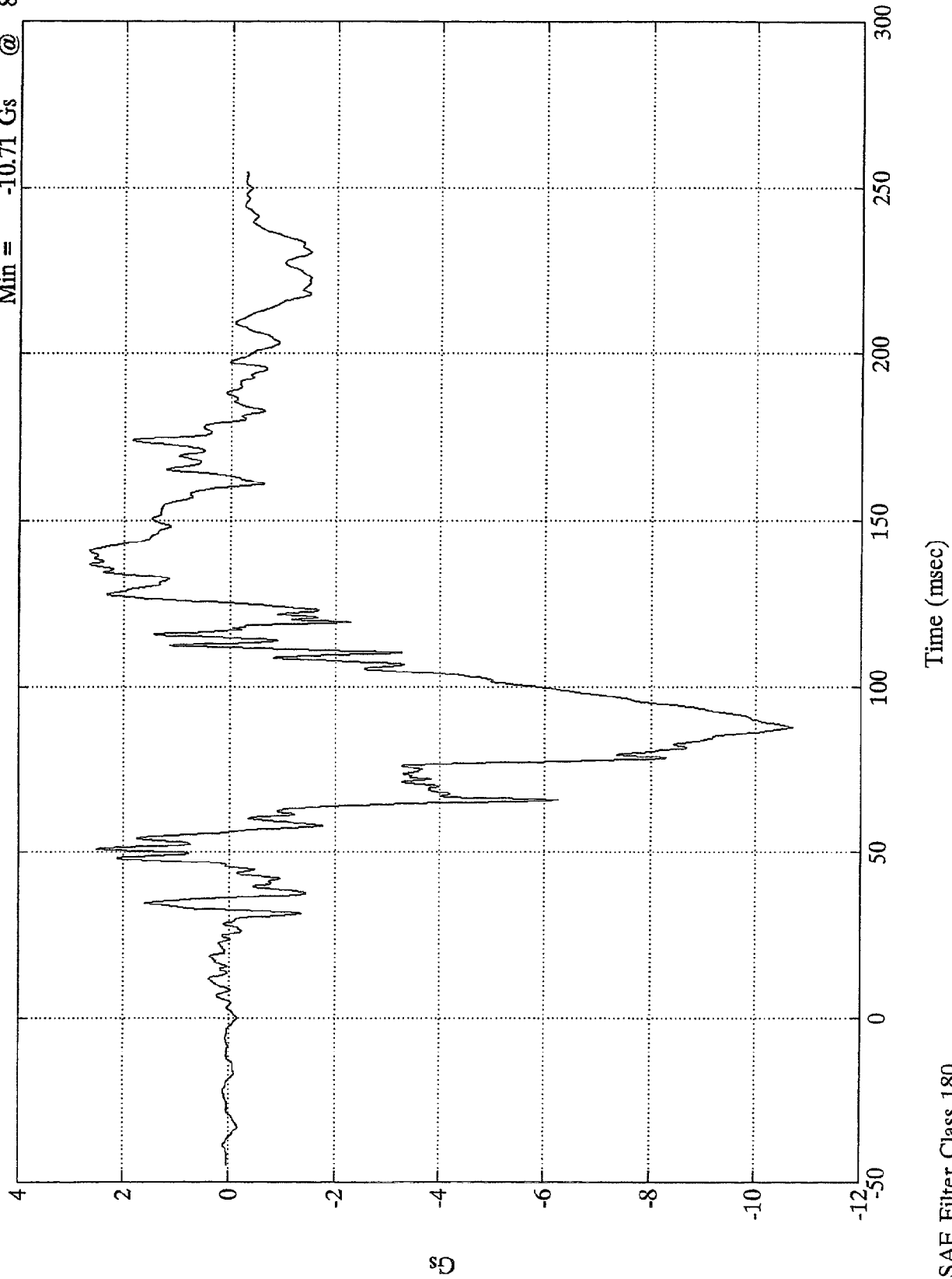
Pos. 2 Chest X

Max = 8.21 Gs @ 129.48 msec
Min = -56.09 Gs @ 78.00 msec



SAE Filter Class 180

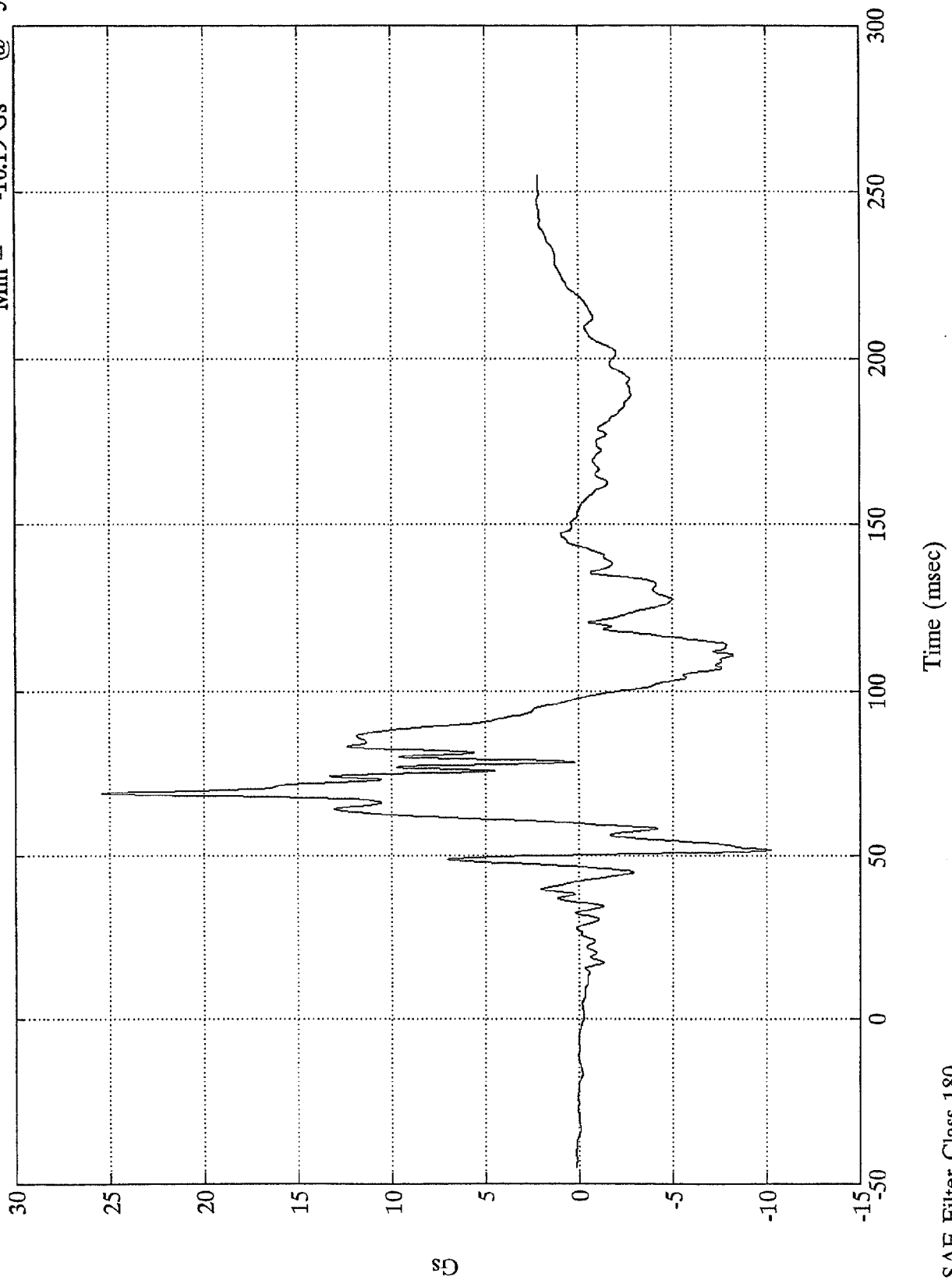
Pos. 2 Chest Y
Max = 2.66 Gs @ 136.80 m
Min = -10.71 Gs @ 87.83 ms



NHTSA 208 TEST #10 - 1994 Volvo 940

Pos. 2 Chest Z

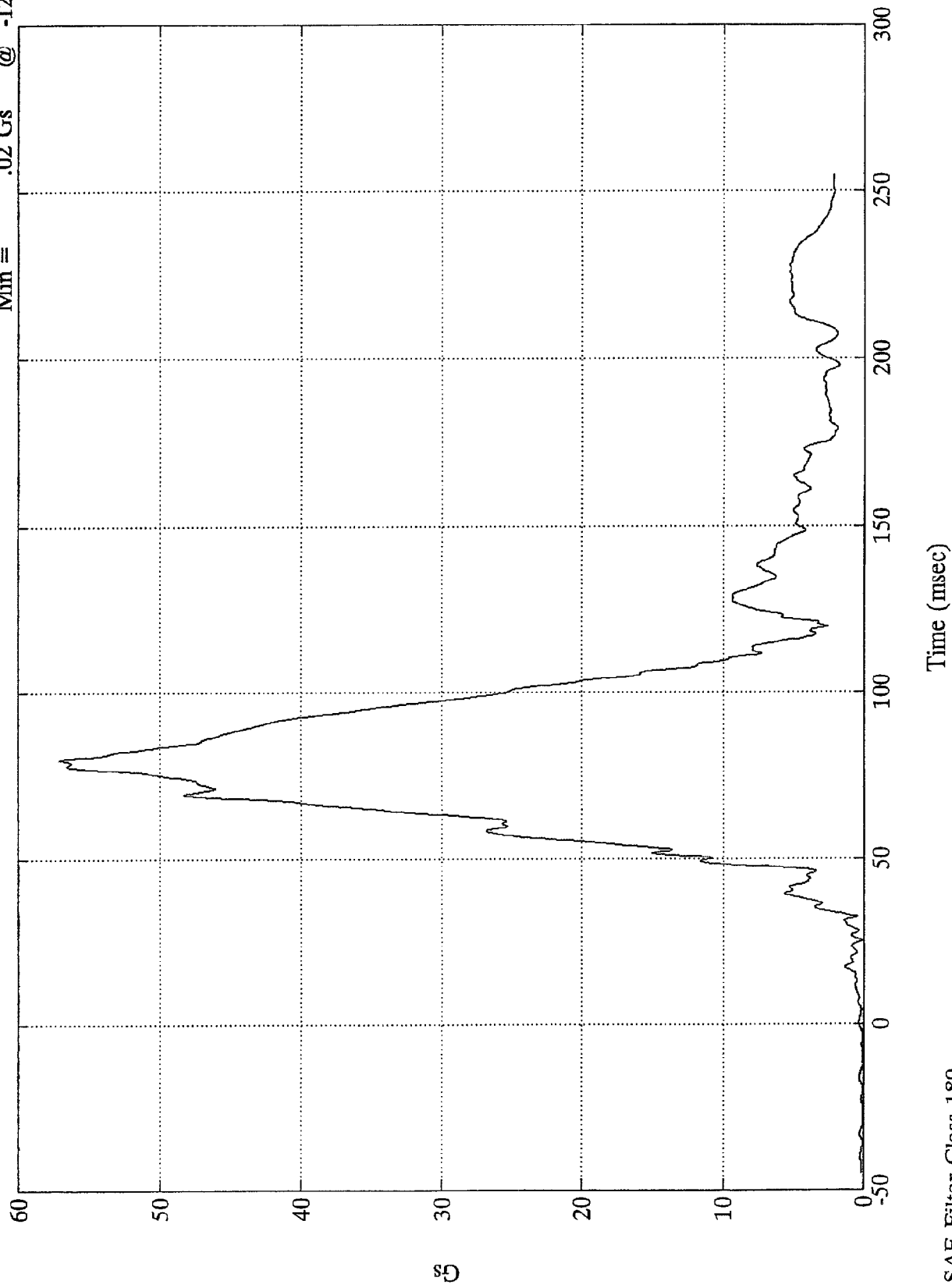
Max = 25.43 Gs @ 69.00 msec
Min = -10.19 Gs @ 51.72 msec



SAE Filter Class 180

Pos, 2 Chest Resultant

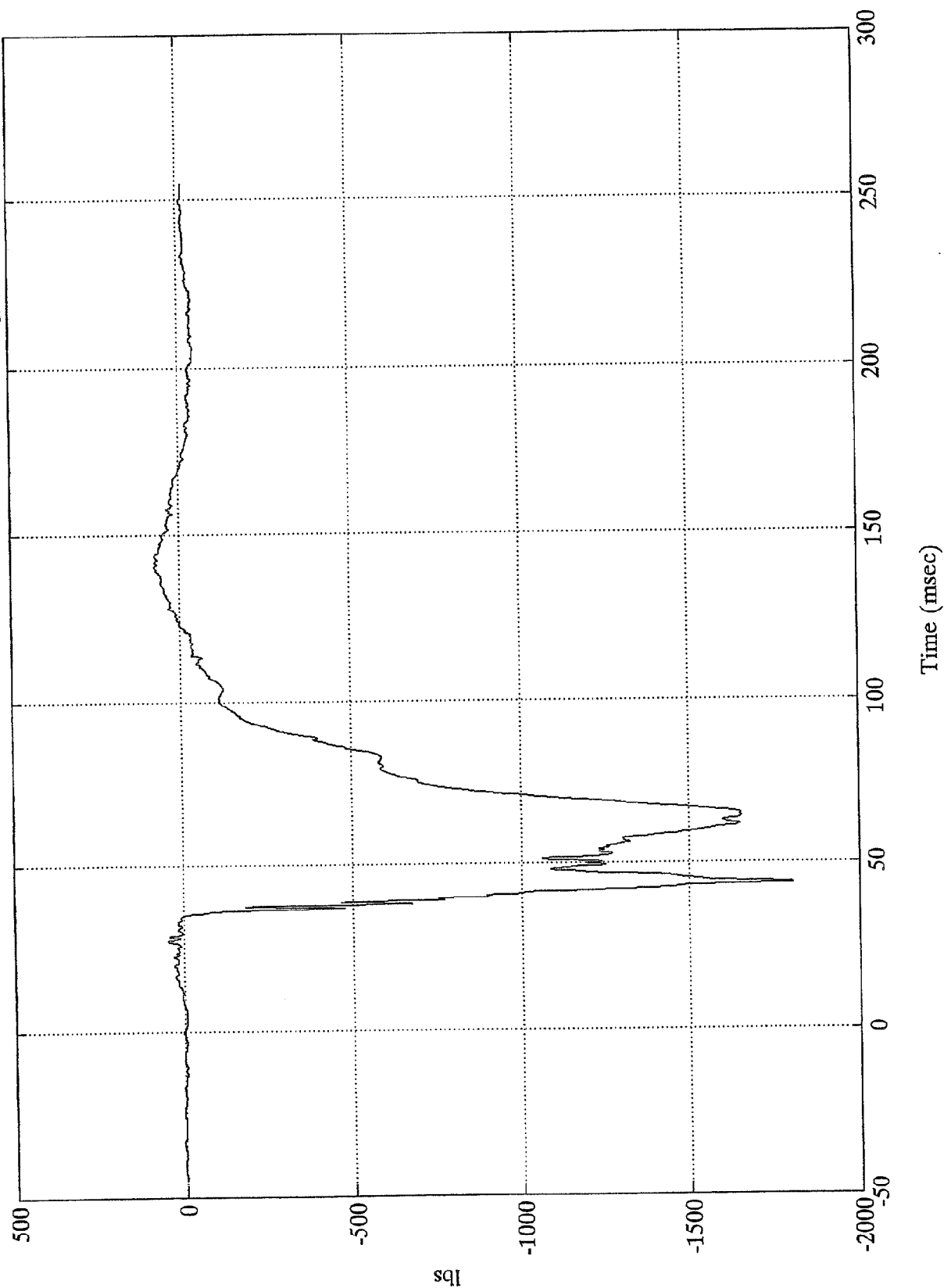
Max = 57.12 Gs @ 79.91 ms
Min = .02 Gs @ -12.48 ms



NHTSA 208 TEST #10 - 1994 Volvo 940

Pos. 2 Left Femur

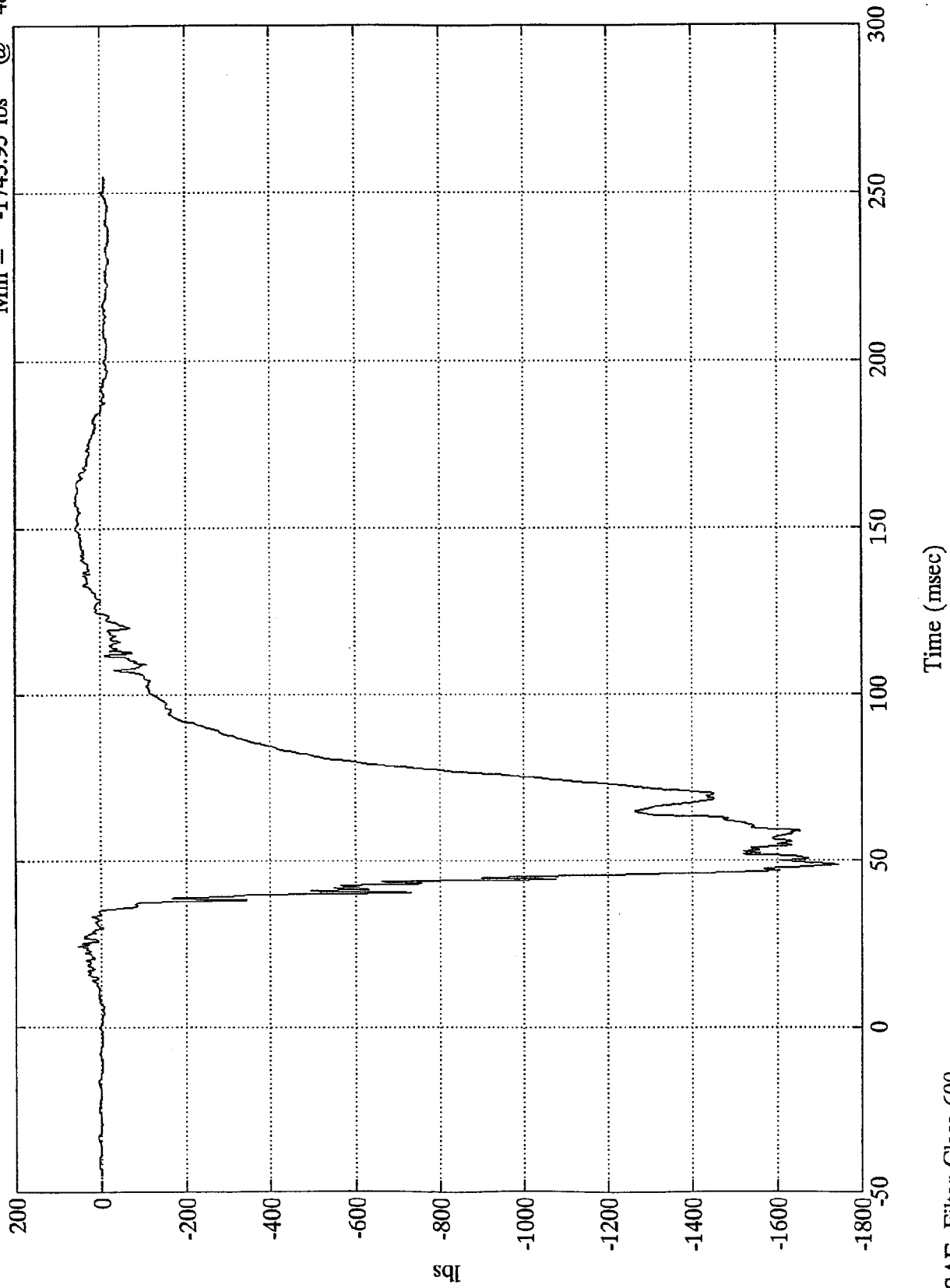
Max = 74.41 lbs @ 140.52 msec
Min = -1803.66 lbs @ 43.91 msec



SAE Filter Class 600

Pos. 2 Right Femur

Max = 58.88 lbs @ 157.91 msec
Min = -1743.95 lbs @ 48.59 msec



SAE Filter Class 600

Appendix C

VEHICLE OWNERS MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

Despite our strongest recommendations, and your best intentions, not wearing a seat belt is like believing "it'll never happen to me!". Volvo urges you and all adult occupants of your car to wear seat belts and ensure that children are properly restrained, using an infant, car or booster seat determined by age, weight and height.

Fact: In every state and province, some type of child-restraint legislation has been passed. Additionally, most states have already made it mandatory for occupants of a car to use seatbelts.

So, urging you to "buckle up" is not just our recommendation - legislation in your state or province may mandate seat belt usage. The few seconds it takes to buckle up may one day allow you to say, "It's a good thing I was wearing my seat belt".

Occupant safety

Seat belts	3:2
Volvo SRS	3:4
Child safety	3:8
Occupant safety	3:11
Reporting Safety Defects	3:11

SEATBELTS

3:1

Seat belts

Seat belts

Always fasten the seat belts before you drive or ride.

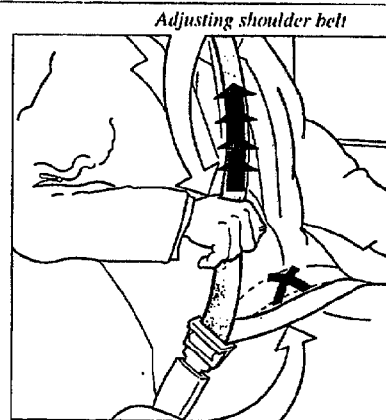
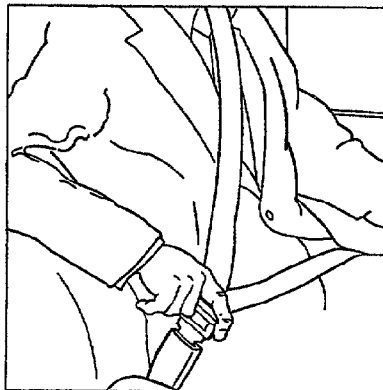
Two lights will be illuminated for 4-8 seconds after the starting (ignition) key is turned to the driving position. One light is located in the instrument panel and one in the console between the front seats.

A chime will sound at the same time if the driver has not fastened his seat belt. The rear seats are provided with self-retracting inertia-reel belts. The front seats are provided with single roller belts with tensioners.

To buckle:

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

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



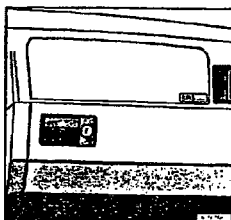
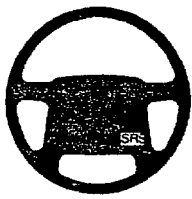
Lap portion of the belt should sit low

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

- the belt should not be twisted or turned
- the lap belt must be positioned low on the hips (not pressing against the abdomen). Make sure that the shoulder belt is rolled up into its retractor and that the shoulder and lap belts are taut.

Before exiting the car, check that the seat belt retracts fully after being unbuckled. If necessary, guide the belt back into the retractor slot.

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



Passenger side SRS airbag

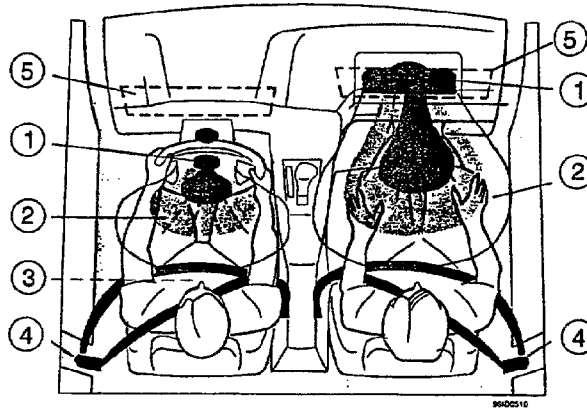
As an enhancement to the three-point seat belt system, your Volvo is equipped with a Supplemental Restraint System (SRS). The Volvo SRS consists of an airbag (2) and knee bolster (5) on both the driver's and passenger's sides and seat belt tensioners in both front door pillars (4). The system is designed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

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

The airbags are folded and located in the center of the steering wheel and above the glove compartment. They are released only during certain frontal or front-angular collisions, depending on the crash severity, angle, speed and object impacted. Both air bags and seat belt tensioners will deploy, even if the passenger seat is not occupied.

WARNING!

As its name implies, SRS is designed to be a SUPPLEMENT to - not a replacement for - the three-point belt system. The airbag is designed not to be released in the event of a side or rear-end collision, or during a rollover situation. For maximum protection, wear seat belts at all times. Be aware that no system can prevent all possible injuries that may occur in an accident.



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

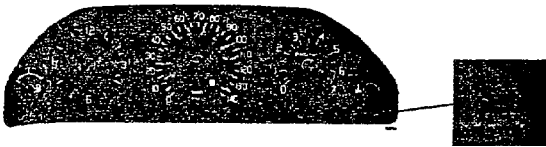
The entire process, including inflation and deflation of the airbags, takes approximately two-tenths of a second.

WARNING!

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

3:4

Volvo SRS



A self-diagnostic system incorporated in the sensor monitors the SRS. If a fault is detected, the "SRS" warning light will illuminate. The light is included in the warning/indicator light cluster in the instrument panel. Normally, the SRS warning lamp should light up when the ignition is switched on and should go out after 10 seconds or when the engine is started. Check that this light is functioning properly every time the car is started.

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

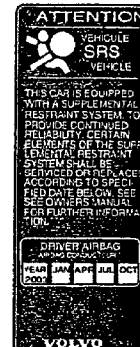
- Sensor unit
- Cable harness
- Gas generator ignitor

WARNING! Never drive an SRS equipped car with your hands on the steering wheel pad / airbag housing.

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



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



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

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

Should you have any questions about the SRS system, please contact your authorized Volvo Dealer or the Consumer Affairs Department:

In the U.S.A.:
Volvo Cars of North America
One Volvo Drive,
Rockleigh, New Jersey 07647
800-458-1552

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

WARNING

This car is equipped with a full frontal Supplemental Restraint System with AIRBAGS in front of the driver and front passenger.

- ALL OCCUPANTS MUST BE PROPERLY RESTRAINED. ADULTS USING SEAT BELTS AND CHILDREN USING CHILD RESTRAINT SYSTEMS.

- DO NOT INSTALL AND USE ANY CHILD RESTRAINTS IN THE FRONT SEAT.

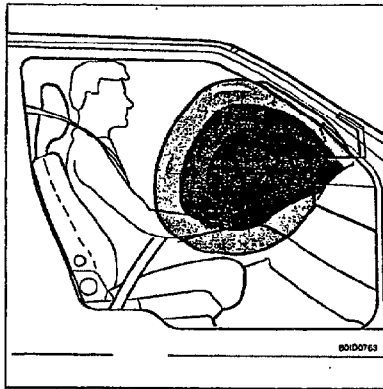
We also recommend that children who have outgrown child restraint systems sit in the rear seat with the seat belt properly fastened. The safest place in the car for children is in the rear seat.

FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN INJURY TO THE VEHICLE OCCUPANTS IN AN ACCIDENT.

For further information, see owner's manual.

VOLVO

SRS text at far right of instrument panel



Passenger side air bag

WARNING

This vehicle is equipped with a Supplemental Restraint System (SRS), which includes driver's and front passenger's airbags.

- ALL OCCUPANTS MUST BE PROPERLY RESTRAINED. ADULTS USING SEAT BELTS AND CHILDREN USING CHILD RESTRAINT SYSTEMS.

- DO NOT INSTALL AND USE ANY CHILD RESTRAINTS IN THE FRONT SEAT.

We also recommend that children who have outgrown child restraint systems sit in the rear seat with the seatbelt properly fastened. The safest place in the car for children is in the rear seat.

FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN INJURY TO THE VEHICLE OCCUPANTS IN AN ACCIDENT.

For further information, see owner's manual.

VOLVO

SRS texts on inside of both sun visors

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

NOTE: Deployment of SRS components occurs only one time during an accident. In a collision where deployment occurs, both air bags and seat belt tensioners activate. Some noise occurs and a small amount of powder is released. This powder is not harmful and does not indicate fire.

WARNING! (Passenger side air bag)

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

3:6

When are the airbags deployed ?

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

NOTE: The SRS system activates only once in a collision.

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

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

When are the airbags NOT deployed ?

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

Can the airbags deploy accidentally ?

The entire SRS system is constructed so that the airbags only inflate in certain collision situations. The SRS system has its own diagnostic unit which continuously monitors and inspects the system.

Make a habit of checking the SRS system warning light when starting and driving the car. Normally, this light will come on when the ignition is switched on and should go out after approximately 10 seconds or

when the engine is started. If this light should stay on or come on while you are driving, drive the car to an authorized Volvo dealer for inspection as soon as possible.

Seat belts - the heart of the Volvo safety system

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

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

Automatic transmission only:

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

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

3:7

APPENDIX D
CHECKLISTS

NHTSA No. CR5900
Date: 3-7-94
Vehicle: Volvo 940

CALSPAN FMVSS 208 ELECTRICAL TECHNICIAN CHECKLIST

- o All accelerometers calibrated within 6 months, have not been used for more than four FMVSS 208 tests without recalibration, or been used in an ATD which failed 208 without recalibration.
- o Dummy's have passed pre-test calibration.
- o Dummies attached to amplifier boxes and also grounded.
- o Data umbilicals attached to vehicle.
- o Event trigger switch functional.
- o Data recording system functional.
- o Data channels functional.
- o Pre-test zero and DLR levels acceptable and recorded.
- o Post-test zero and DLR levels recorded.

✓
✓
✓
✓
✓
✓
✓
✓

Signed: D. White

Table B-12

NHTSA No. CR5900
 Date: 3/8/94
 Vehicle: 1994 Volvo 940

CALSPAN FMVSS 208 TRACK MANAGER CHECKLIST

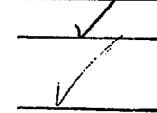
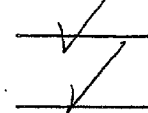
- | | | |
|---|------|-----------|
| o Obtain vehicle test weight. | 3775 | <u>MS</u> |
| o Set console pull force limit. | | <u>MS</u> |
| o Set abort system window. | | <u>MS</u> |
| o Set abort system pressures. | | <u>MS</u> |
| o Verify dummies are grounded, sprayed with static elimination spray, and vehicle battery drained and disconnected. | | <u>MS</u> |
| o Perform onboard light check. | | <u>MS</u> |
| o Start tow system engines. | | <u>MS</u> |
| o Tow system feedback is acceptable. | | <u>MS</u> |
| o Velocity trap system check acceptable. | | <u>MS</u> |
| o Tension tow cable. | | <u>MS</u> |
| o Send track personnel to ready positions. | | <u>MS</u> |
| o Receive final OK from all personnel. | | <u>MS</u> |
| o Energize onboard lights and notify barrier personnel to light barrier. | | <u>MS</u> |
| o Run test. | | <u>MS</u> |

**CALSPAN
H-POINT MACHINE PLACEMENT CHECKLIST
FOR PART 572 E - HYBRID III DUMMY**

Place a piece of muslin cloth over seat area.

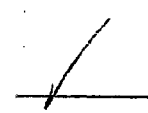
DRIVER

PASSENGER

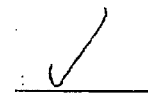


Place H-Point machine in center of seat.

If vehicle is a bench seat, then the center is aligned with the center of the steering column. For the passenger seat, the center is found by placing the machine the same distance outboard from the vehicle centerline as for the driver seat. If the seat is a bucket, place the H-point machine on the seat centerline.

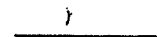


Attach leg assemblies. T-bar parallel to ground and perpendicular to vehicle centerline. T-bar set at 15.8, legs set at 16.3 for 50th percentile.

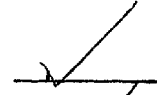
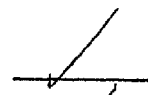


Position right driver's foot on undepressed accelerator pedal. Insert pin in right foot to ensure angle is not less than 87 degrees. Sole on pedal and heel as far forward as possible. Left knee is place same distance from H-point machine centerline as right knee.

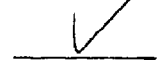
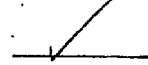
Passenger - position knees 10 inches apart. Place feet as far forward as possible.



Apply lower leg and thigh weights.



Tilt back pan forward. Pull T-bar forward then release to allow machine to slide back into seat.



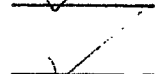
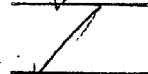
Apply a 22 pound rearward load at the intersection of hip angle and T-bar. Apply load twice.



Return back plane to seat back.



Prevent H-point machine from sliding forward for the rest of the procedure



**HYBRID MACHINE PLACEMENT CHECKLIST
FOR PART 572 E - HYBRID III DUMMY**

	<u>DRIVER</u>	<u>PASSENGER</u>
Move back plane forward and rock 3 times over a 10 degree arc.	<u>✓</u>	<u>✓</u>
Lift each leg and allow it to fall into place. Make sure seat pan in level (i.e. no roll) and return back pan to seat back.	<u>✓</u>	<u>✓</u>
Apply force to the back pan to either: 1. Increase hip angle 3 degrees. 2. a maximum of 15 pounds.	<u>✓</u>	<u>✓</u>

Record the following:

Hip Point X (fore/aft of striker)	<u>2.7</u>	<u>6.8</u>
Y (above/below striker) to sill	<u>6.5</u>	<u>6.5</u>
Y (minus 0.25 inch) *	<u>6.75</u>	<u>6.75</u>

* - According to SAE procedures, the target H-point should be the X location above (+/- 0.5 inch) and 0.25 inches below the Y location (+/- 0.5 inch).

Y below Striker	<u>3.0</u>	<u>3.4</u>
Y below Striker - .025	<u>2.75</u>	<u>3.15</u>

Signed: [Signature] Date: 2/4/94

Table B-5
CALSPAN VEHICLE PREPARATION CHECKLIST
Pre-Test, Engineer

TEST TYPE 208
VEHICLE YEAR, MAKE AND MODEL 94 Volvo 940
VIN No. _____
NHTSA No. CR5920

Date &
INITIALS

1. Seat tracks set in mid position, seat back angle set, steering column position set, seats in lowest position, and lumbar support off. All data recorded in test report.
2. Centerline of each front seat marked. Place H-point machine in each front outboard seat following H-point machine checklist if Part 572E ATDs are used.
3. Adjustable seat belt anchorages positioned per mfg. inst.
4. All dsp have at minimum type I seat belt.
5. All outboard dsp have type II seat belt.
6. Seat belts adjust to fit required ATDs with seat in full forward or rear position.
7. Perform air bag, seat belt warning system, and belt comfort and convenience tests and record in test report.
8. Measure windshield for FMVSS 212, and 219 and record in test report.
9. Measure accelerometer locations and record if applicable.
10. Weigh vehicle with all equipment and ATD weight. Test weight is target weight (-10,-20 lbs.). Record in test report with ballast added or vehicle components removed to achieve test weight.

✓ DJ7

DJ7

n/a

DJ7

DJ7

DJ7

DJ7

DJ7

DJ7

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DJ7

Signed: [Signature] Date: 3/8/94

Table B-1
CALSPAN FMVSS 208 FRONT IMPACT TEST CHECKLIST
Project Engineer

NHTSA No. CP-5400
Test No.: _____
Vehicle: _____

Date: 3/8/94

- o Transport dummies to the temperature-controlled, preparation building at the start of the track. Day before test. DF-7
- o Transport vehicle to the temperature-controlled, enclosed barrier building. Take pre-test still photographs of vehicle. DF-7
- o Set up high-speed movie cameras, time-zero flash lamps and computer trigger switch. DF
- o Record location of high-speed movie cameras. DF
- o Check speed trap location. DF
- o Set up ground positions for electrical trip switches. DF
- o Locate camera start switch pad and engine kill switch pad. DF
- o Test individual cameras for operation; load film. DF-7
- o Move the vehicle to the temperature-controlled building at the start of the track. DF
- o Attach tow cable, abort cable and guide. Align vehicle on approach lane guiderail at proper location. DF
- o Position dummies as specified in Laboratory Test Procedure TP-208-09 and record the measurements. DF
- o Monitor ambient and vehicle windshield molding temperature. 70' DF
- o Attach instrumentation umbilical cables to vehicle. DF
- o Record ride attitude. DF
- o Record ATD positions in test report and chalk ATDs DF-7

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- o Record the ambient temperature as the vehicle begins to move towards the barrier.
- o Document post-test condition of the vehicle exterior, vehicle interior and dummies with a real-time movie camera.
- o Collect Stoddard solvent leakage (if any) immediately after impact. Document leakage with real-time motion picture coverage and a stop watch.
- o Record post-test condition of vehicle and ATDs.
- o Take post-test still photos of vehicle (except underside) and ATDs.
- o Record visually apparent dummy contact locations.
- o Check windshield for FMVSS 212 and record in test report.
- o Check windshield for FMVSS 219 zone intrusion and record in test report.
- o Perform static rollover test for FMVSS 301 ~~only if "quick look" dummy data appear to have satisfied FMVSS 208 occupant injury criteria.~~ Collect and photographically document possible Stoddard solvent spillage.
- o Take still photographs of the vehicle underside.
- o Fill in air bag data sheet.
- o Record seat movement, if any.
- o Document any other noteworthy observation(s) in test report.
- o Photograph the velocity counter.
- o Perform post-test functional DLR check.
- o Process all data gathered on computer.

Signature: _____

Date: _____

Table B-8
Calspan
Part 572B - Hybrid II
DUMMY PLACEMENT CHECKLIST

	Driver	<u>Passenger</u>
<u>Initial Placement</u>		
Place driver dummy's knees 14.5 inches apart with left outer surface 5.9" from mid-sagital plane.	_____	
Right foot on accelerator pedal.	_____	
Left foot on toeboard, heel on floorpan. If vehicle has a footrest that does not elevate foot, place foot on footrest. If feet do not reach toeboard place feet perpendicular to leg.	_____	
Place passenger knees 11.75" apart, feet on toeboard, heels on floorpan.		_____ ✓
For vehicles with bench seat, driver is placed in centerline with steering wheel, passenger is placed same distance from vehicle centerline as driver.	_____	_____ w/h
<u>Final Placement</u>		
Lift dummy so buttocks no longer contact seat.	_____	_____ ✓
Apply a rearward force of 50 pounds 6.5" above bottom of buttocks.	_____	_____ ✓
Slowly lower dummy to seat cushion. Remove force as necessary to lower dummy.	_____	_____ ✓
Apply 10-15 pounds of force to lower torso. Rock dummy side to side 14-16 degrees from vertical for 3 to 4 repetitions.	_____	_____ ✓
Maintain 10-15 pound rearward force on lower torso. Push upper torso against seatback center with a 50 pound force 18" above buttocks.	_____	_____ ✓

**Part 572B - Hybrid II
DUMMY PLACEMENT CHECKLIST**

	<u>Driver</u>	<u>Passenger</u>
<u>Manual Belt Placement</u>		
Place belt around dummy and fasten latch.	<u>N/A</u>	<u>N/A</u>
Cycle belt retractors 4 times.	<u> </u>	<u> </u>
Apply 2-4 pounds of tension to belt near retractor and measure. Torso and lap belts should lay flat.	<u> </u>	<u> </u>
<u>Automatic Belt Placement</u>		
Close doors and allow vehicle system to position belt on dummy. Torso belt should lay flat on shoulder. If not contact OVSC COTR.	<u> </u>	<u> </u>
<u>Arm and Leg Placement</u>		
Fully outstretch driver arm. Push each arm rearward until palm center contacts outer steering wheel rim. Tape thumb of each hand with 1/4 inch wide masking tape. Max 1" overlap.	<u> </u>	<u> </u>
Fully outstretch driver arm. Push each arm rearward until upper arm contacts seatback. Lower forearm until palm contacts outer thigh and little finger contacts seat cushion.	<u> </u>	<u> </u>
Dummy feet and legs may be repositioned.	<u> </u>	<u> </u>

Vehicle: 94 Volvo 940

NHTSA No. CR 5900

Calspan
Part 572E - Hybrid III
DUMMY PLACEMENT CHECKLIST

CR5900

	<u>Driver</u>	<u>Passenger</u>
Place dummy knees 10.6 inches apart as measured from outer knee clevis.	✓	N/A
Right foot on accelerator pedal.	✓	
Left foot on toeboard, heel on floorpan. If vehicle has a footrest that does not elevate foot, place foot on footrest. If feet do not reach toeboard place feet perpendicular to leg.	✓	
For vehicles with bucket seats place dummy mid-sagittal plane along seat centerline.	✓	
For vehicles with bench seat, driver is placed in centerline with steering wheel, passenger is placed same distance from vehicle centerline as driver.	✓	
Place dummy H-point coincides with H-point machine location +/- 0.5 vertically and horizontally (per SAE J826 Apr.80) Note: H-pt machine thigh and legs set at 15.8" and 16.3". Also note vertical target H-pt. 0.25" below H-pt. machine meas.	✓	
Place pelvic angle gauge in pelvis and record angle. Angle must be 22.5 degrees +/- 2.5 degrees.	✓	
Upper torso is centered on seatback. Dummy head is level to within 0.5 degrees.	✓	
<u>Manual Belt Placement</u>		
Place belt around dummy and fasten latch.	N/A	
Cycle belt retractors 4 times.	↓	
Apply 2-4 pounds of tension to belt near retractor and measure. Torso and lap belts should lay flat.	↓	

Part 572E - Hybrid III
DUMMY PLACEMENT CHECKLIST

Driver

Passenger

Automatic Belt Placement

Close doors and allow vehicle system to position belt on dummy. Torso belt should lay flat on shoulder. If not contact OVSC COTR.

11/10

Arm and Leg Placement

Fully outstretch driver arm. Push each arm rearward until palm center contacts outer steering wheel rim. Tape thumb of each hand with 1/4 inch wide masking tape. Max 1" overlap.

✓

Fully outstretch passenger arm. Push each arm rearward until upper arm contacts seatback. Lower forearm until palm contacts outer thigh and little finger contacts seat cushion.

Dummy feet and legs may be repositioned.

✓

Vehicle: 94 Volvo 940

NHTSA No. CR5900

Signed: D. J. T. h

Date: 3/8/94