

REPORT NUMBER: CAL-91-N03

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

**GENERAL MOTORS CORPORATION
1991 CHEVROLET S-10 BLAZER
4-DOOR MULTI-PURPOSE VEHICLE**

NHTSA NUMBER: MM0101

CALSPAN TEST NUMBER: 7862-3

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December 6, 1990



FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
Office of Market Incentives
400 Seventh Street, S.W.
Room No. 5313 (NRM-20)
Washington, DC 20590

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16. Abstract A frontal load cell barrier test of a 1991 Chevrolet S-10 Blazer 4-Door MPV was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on December 6, 1990. The impact speed was 35.0 mph and the ambient temperature at the barrier face at the time of impact was 37°F. The maximum post-test vehicle crush was 20.6 inches. The test vehicle was equipped with a 3-point continuous belt system at each of the front outboard seating positions. With regard to FMVSS 208 "Occupant Crash Protection," injury criteria, both the driver and passenger dummies appeared to exceed the maximum Head Injury Criteria. The driver dummy also appeared to exceed the maximum chest resultant and maximum left femur load.					
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TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	PURPOSE AND TEST PROCEDURE	1-1
2	SUMMARY OF FRONTAL BARRIER IMPACT TEST	2-1
3	OCCUPANT AND VEHICLE INFORMATION	3-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA	B-1
APPENDIX C	PART 572 E DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION TESTS	C-1
APPENDIX D	DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION	D-1
APPENDIX E	VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS	E-1

LIST OF FIGURES

<u>Figure No.</u>		<u>Page No.</u>
1	Part 572 Dummy In-Vehicle Position	3-4
2	Occupant Clearance Dimensions	3-5
3	Seat Belt Positioning Data	3-6
4	Driver Dummy to Steering Column/Wheel Dimensions	3-8
5	Camera Positions for Frontal Impacts	3-9
6	Vehicle Target Locations	3-11
7	Load Cell Locations on Fixed Barrier	3-12
8	Vehicle Accelerometer Locations	3-13
9	Test Vehicle Measurements	3-14
10	Dummy Configuration Dimensions	C-3

LIST OF TABLES

<u>Table No.</u>		<u>Page No.</u>
1	General Test and Vehicle Data	2-2
2	Dummy Injury Criteria Values	3-2
3	Hybrid III Neck and Chest Data Sheet	3-3
4	Seat Belt Performance Assessment Test Data	3-7
5	High Speed Camera Locations	3-10
6	Vehicle Measurements	3-15

Section I
PURPOSE AND TEST PROCEDURE

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

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

Section 2

SUMMARY OF TEST NUMBER MM0101

A load cell barrier consisting of 36 load cells was impacted by a 1991 Chevrolet S-10 Blazer 4-Door MPV at a velocity of 35.0 mph. The test was performed at the Calspan Corporation Advanced Technology center on December 6, 1990. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Both ATDs were fully instrumented with head and chest triaxial accelerometers and right/left femur load cells. Seat belt load cells were also on the driver's and passenger's lap and shoulder belts to measure dummy torso and pelvic section loading. The driver ATD (Serial No. 45) was used in two previous tests (MM0100 and MM0300). The passenger ATD (Serial No. 150) was also used in test MM0300. The Injury Criteria Values were not exceeded during these tests. Certification data, along with instrumentation calibration data, can be found in Appendices C and D.

The 83 channels of data were recorded on six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces. Accelerometers #8 and #9 were installed in the x-direction.

The driver's HIC was 1026.2. The maximum chest deceleration over 3 milliseconds was 70.5 g's along with a maximum chest deflection of 1.5 inches. The femur loads were 2626.0 and 1908.6 pounds for the left femur and right femur, respectively.

The right front passenger's HIC was 1825.9 and maximum chest deceleration over 3 milliseconds was 51.1 g's coupled with a chest deflection of 1.4 inches. The maximum left femur load was 592.8 pounds and the right maximum femur load was 514.7 pounds.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1991 Chevrolet S-10 Blazer 4-Door MPV

NHTSA No.: MM0101 VIN.: 1GNDT13Z4M2154074

Body Color: Sky Blue Date Of Manufacture: April 1990

Engine: 6 Cylinders; - C.I.D.; 4.3 Liters; - CC
X Gas; - Diesel; - Turbocharged
X Longitudinal; - Transverse

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

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

Date Received: 11/4/90 Odometer Reading: 101

X A/C; X P/S; X P/B; - P/wdo.; X Tilt Wheel
- P/seats; - Cruise Control

Type of Occupant Restraint: 3-point continuous belt restraint.

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 35 psi, Rear 35 psi

Recommended Tire Size: P205/75R15

Recommended Cold Tire Pressure: Front 35 psi, Rear 35 psi

Tires on Vehicle: P205/75R15; Manufacturer: Uniroyal

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

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

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

Rated Cargo and Luggage

Weight (RCLW) A-B = 300 lbs.

GVWR 5100 lbs. GAWR: Front 2400 lbs. Rear 2900 lbs.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

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

Right Front = 1040 lbs. Right Rear = 880 lbs.
 Left Front = 1050 lbs. Left Rear = 850 lbs.
 TOTAL FRONT WEIGHT = 2090 lbs. (55 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1730 lbs. (45 % of Total Vehicle Weight)
 TOTAL DELIVERY WEIGHT = 3820 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (3820 lbs.)
 RCLW = 300 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 167 lbs./dummy)
 Target Test Weight = 4454 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 296 POUNDS CARGO:

Right Front = 1070 lbs. Right Rear = 1160 lbs.
 Left Front = 1080 lbs. Left Rear = 1140 lbs.
 TOTAL FRONT WEIGHT = 2150 lbs. (48 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 2300 lbs. (52 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 4450 lbs.
 Weight of ballast secured in vehicle trunk area = 300 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 33.1 LF 33.3 RR 32.0 LR 32.0
 Test Attitude: RF 32.9 LF 33.1 RR 30.6 LR 31.1
 Wheel Base: 107.5 in.; C.G. = 55.6 in. rearward of front wheel C/L
 Remarks: 18.2 gallons of stoddard solution was placed in the fuel tank.

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0°
 Date of Test: 12-6-90 Time of Test: 12:40
 Ambient Temperature: 37 °F at impact area
 Temperature in Occupant Compartment: 70 °F
 Windshield Molding Temperature: 70 °F
 Required Impact Velocity Range: 34.5 to 35.5 mph
 Impact Velocity: primary = 35.0 mph, secondary = 35.1 mph
 Distance From Front Bumper to Barrier Face When
 Entering Speed Trap: 52 inches
 Exiting Speed Trap: 12 inches

VEHICLE REBOUND AND CRUSH (inches):

Vehicle Length: Pre-test = R 175.6 C 177.5 L 175.0
 Post-test = R 156.5 C 156.9 L 156.0
 Crush = R 19.1 C 20.6 L 19.0

Distance from front of test vehicle to point of impact:

R 8.0 C 8.6 L 9.2

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Upper Steering Wheel Rim</u>	<u>Glove Box Door and Right Knee</u>
Chest	<u>No Contact</u>	<u>No Contact</u>
Abdomen	<u>Lower Steering Wheel Rim</u>	<u>No Contact</u>
Left Knee	<u>Dash Panel</u>	<u>Glove Box Door</u>
Right Knee	<u>Dash Panel</u>	<u>Glove Box Door</u>

Table 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
	<u>Tools</u> <u>Required</u>	<u>Tools</u> <u>Required</u>	<u>Tools</u> <u>Required</u>	<u>Tools</u> <u>Required</u>
Door Opening				

<u>Seat Movement</u>	<u>Front</u>		<u>Rear</u>	
	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
	<u>None</u>	<u>None</u>	<u>-</u>	<u>-</u>
Seat Back Failure	<u>None</u>	<u>None</u>	<u>-</u>	<u>-</u>
Seat Shift (in.)	<u>~1.0"</u>	<u>None</u>	<u>-</u>	<u>-</u>
	<u>Forward</u>			

Glazing Damage

Backlight/Windshield The windshield sustained major stress fractures,
but remained intact.

Other Notable Impact Effects: None

Section 3
OMI FINAL DATA

Occupant and Vehicle Information

I. OMI DATA

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

II. OVR DATA

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

Table 2
DUMMY INJURY CRITERIA VALUES

NHTSA No.: MM0101 Vehicle: 1991 Chevrolet S-10 Blazer 4-Door MPV

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-120.8	28.2	-60.9	133.0
Position #2 - Passenger	-275.7	-32.9	76.7	286.2

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-77.0	11.6	26.2	70.5
Position #2 - Passenger	-47.7	15.8	23.5	51.1

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

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Position #1 - Driver	2626.0	1908.6
Position #2 - Passenger	592.8	514.7

	MAXIMUM FORCE - SEAT BELT LOADS (lbs.)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	2550.7	-	1489.1
Position #2 - Passenger	1677.1	2200.0	-

	HEAD INJURY CRITERIA (HIC)			
	HIC	t ₁ (SEC)	t ₂ (SEC)	Average Acceleration t ₁ TO t ₂
Position #1 - Driver	1026.2	.05784	.09372	60.61
Position #2 - Passenger	1825.9	.10152	.10380	229.84

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

Table 3
HYBRID III NECK AND CHEST DATA SHEET

Vehicle Year/Make/Model/Body Style: 1991 Chevrolet S-10 Blazer 4-Door MPV

Vehicle NHTSA No.: MM0101 Test Date: December 6, 1990

MAXIMUM VALUES	DRIVER DUMMY ID # <u>45</u>	PASSENGER DUMMY ID # <u>150</u>
Neck Load X	625.4	1124.0
Neck Load Y	1734.2	457.9
Neck Load Z	2965.1	1108.4
Neck Moment X	888.8	-219.5
Neck Moment Y	-1434.5	908.3
Neck Moment Z	-210.4	-559.0
Chest Deflection X (in.)	1.5	1.4
Time of Max. Occurance	73.0 msec	71.9 msec

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

Figure 1

PART 572 DUMMY IN-VEHICLE POSITION

Test No.: MMO101 Vehicle: 1991 Chevrolet S-10 Blazer 4-Door MPV

SEAT TYPE:

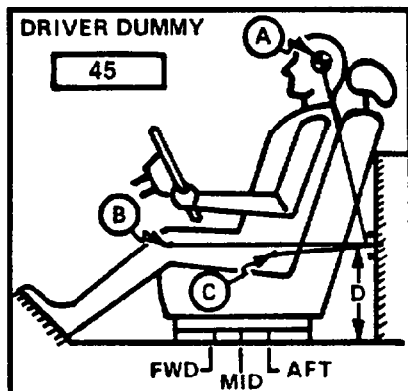
 Bench
 X Bucket
 Split Bench

ADJUSTER TYPE:

 X Manual
 Power

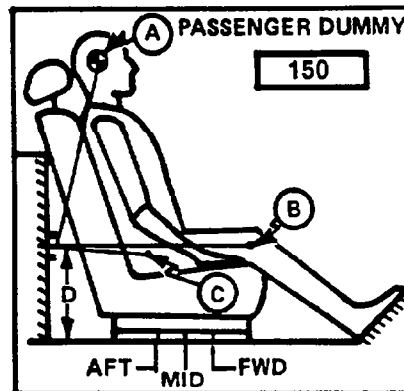
BUCKET SEAT BACK TYPE:

 Fixed
 X Adjustable Reclining



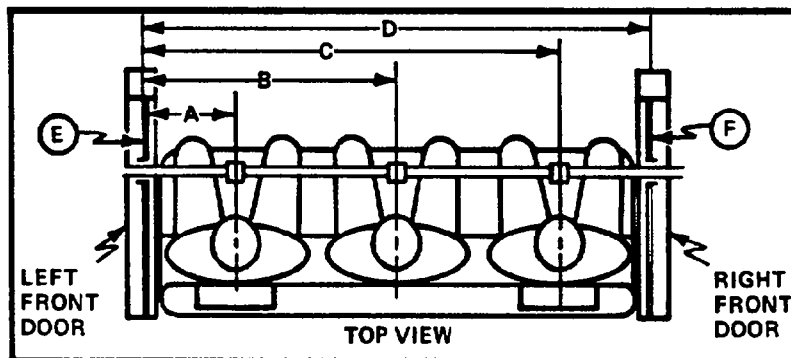
MEASUREMENT LOCATION

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



A = 22.2 in. 28 Degrees
 B = 28.3 in. 95 Degrees
 C = 14.6 in. 118 Degrees
 D = 17.7 in.

A = 22.5 in. 25 Degrees
 B = 28.7 in. 98 Degrees
 C = 14.3 in. 118 Degrees
 D = 17.7 in.



S/N 45

DUMMY ID

150

A = Left Door to Driver Centerline 12.8 in.
 B = Left Door to Center Passenger Centerline in.
 C = Left Door to Right Passenger Centerline 39.4 in.
 D = Left Door to Right Door 52.5 in.
 E,F = Window Glass Height (Right and Left Must Be Equal) 11.0 in.

Figure 2

OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	15.5	15.1
HW	19.8	19.9
CD	21.0	21.6
CS	10.3	—
KDL	5.0	5.9
KDR	5.5	5.7
SA	See Note	See Note
TA	19°	18°
HSW	16.7	—

HH = Head to Windshield Header

HW = Head to Windshield

HSW = Head to Steering Wheel

CD = Chest to Dash

CS = Chest to Steering Wheel

KD(L/R) = Knee to Dash (Left/Right)

SA = Seat Back Angle

TA = Torso Angle

HA = Head Target to "A" Pillar

HR = Head to Side Roof

HS = Head to Side Window

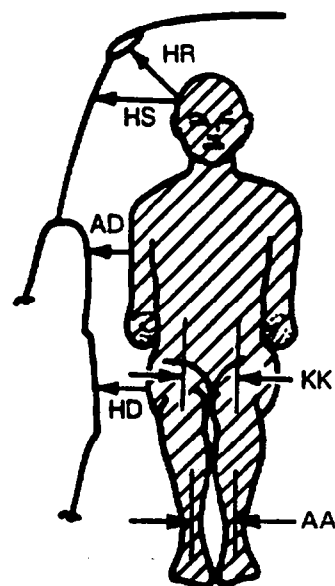
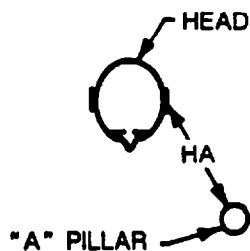
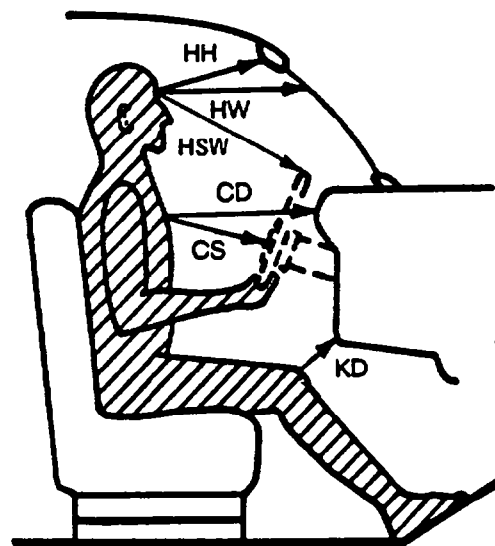
AD = Arm to Door

HD = Hip to Door

KK = Knee to Knee

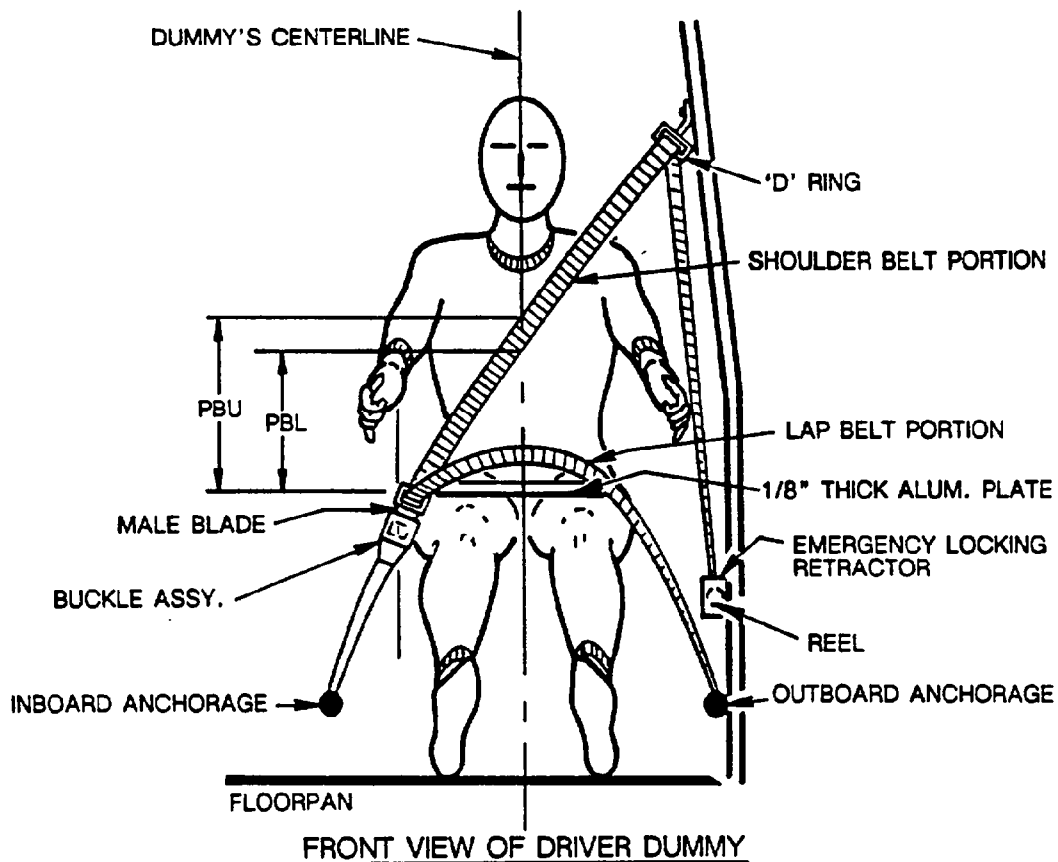
AA = Ankle to Ankle

	DRIVER	PASSENGER
HR	7.5	7.9
HS	9.7	10.1
AD	3.8	4.1
HD	5.9	5.5
KK	8.0	6.5
HA	19.5	19.0
AA	9.0	5.2



Note: Seat back angle was set according to manufacturer's specifications.

Figure 3
SEAT BELT POSITIONING DATA



	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	13.1	13.0
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	9.6	9.5
<u>LAP BELT TENSION</u>	2.0 lbs	2.0 lbs.
<u>SHOULDER BELT TENSION</u>	-	-

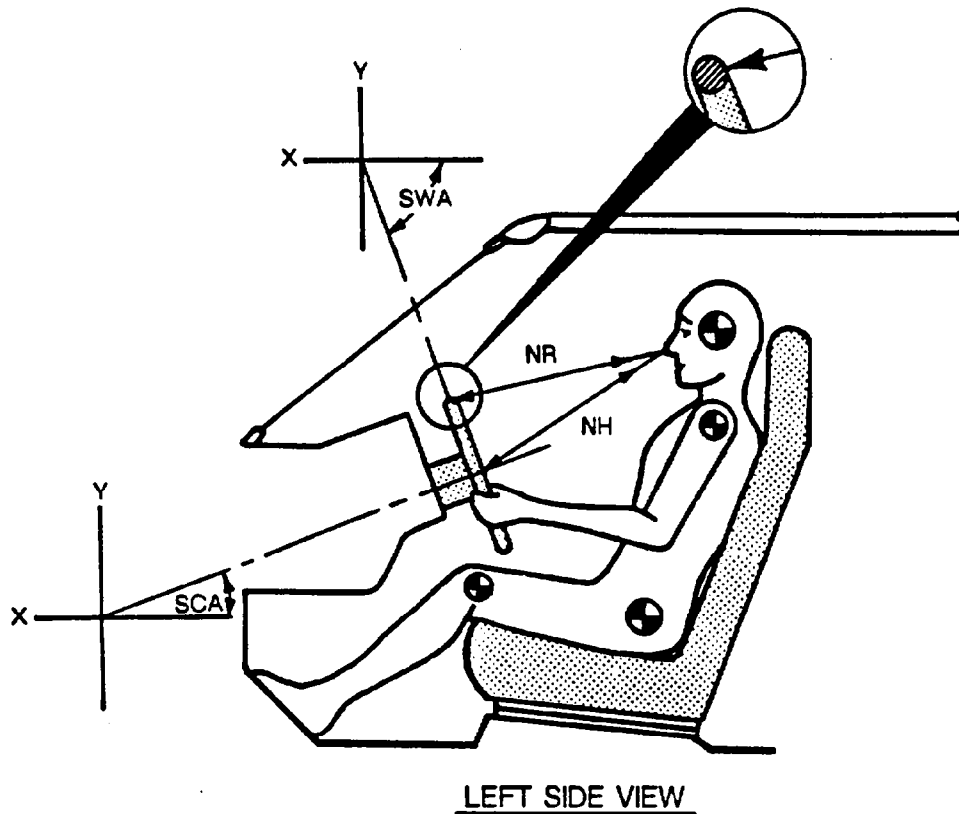
Table 4

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

<u>BELT LENGTH DATA:</u>	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>89.0"</u>	<u>90.3"</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>31.8"</u>	<u>32.5"</u>
Lap belt length as measured on Part 572 Dummy.	<u>26.0"</u>	<u>26.0"</u>
<u>SHOULDER BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>1.5"</u>	<u>1.5"</u>
As determined mechanically.	<u>1.4"</u>	<u>1.1"</u>
As determined electronically.	<u>3.2"</u>	<u>3.1"</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>.64 in/ft</u>	<u>.72 in/ft</u>
Measured mechanically	<u>0.0 in/ft</u>	<u>0.0 in/ft</u>
<u>LAP BELT SPOOL-OUT DATA</u>		
As determined mechanically	<u>1.5"</u>	<u>N/A</u>

Figure 4

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSY. REFERENCE DIMENSIONS



		MEASUREMENTS	
<u>NR</u>	-- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	13.8	Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	14.3	Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	21.0	Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	-69.0	Degrees

Figure 5
CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

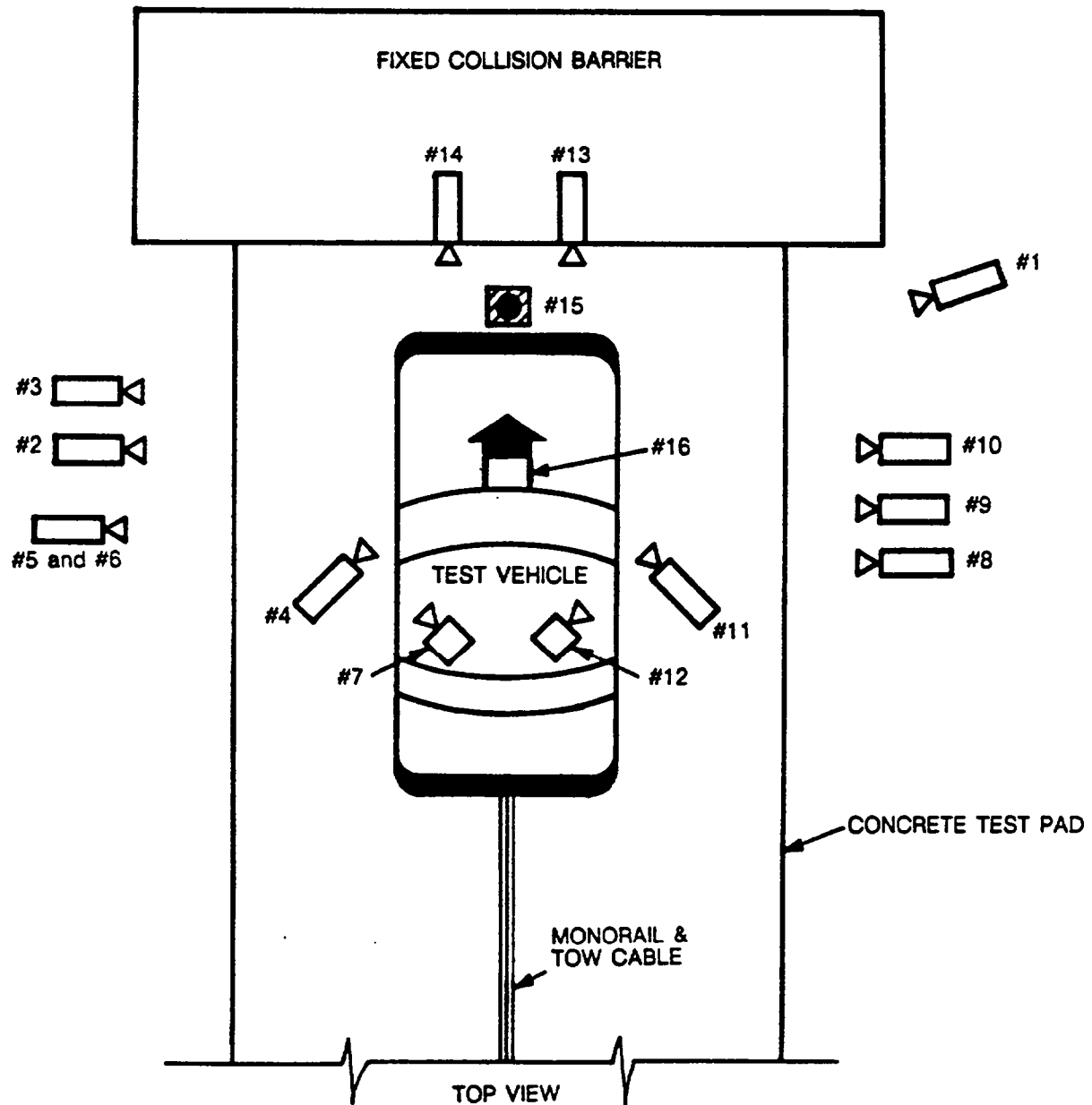


Table 5

HIGH-SPEED CAMERA LOCATIONS

Test No. MM0101 Vehicle: 1991 Chevrolet S-10 Blazer 4-Door MPV

CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	218	47	41	-4	201.1	13	550
3	Left Side View	301	23	41	-3	284.1	25	545
4	Driver and Interior View	109	92	74	-15	92.1	13	580
5	Steering Column (Bottom)	265	62	47	-2	248.1	25	560
6	Steering Column (Top)	265	62	70	-8	248.1	25	585
7	Left Belt	-	-	-	-	-	8	575
8	Overall Right Side	225	74	42	-1	208.1	13	800
9	Right Side View	286	54	41	-1	269.1	25	****
10	Right Passenger View	284	72	59	-2	267.1	35	675
11	Passenger and Interior View	102	99	72	-16	85.1	25	***
12	Right Belt	-	-	-	-	-	8	485
13	Passenger Front View	24	-5	73	-37	-	13	***
14	Driver Front View	24	-5	73	-37	-	13	540
15	Windshield View	0	0	126	-45	-	13	555
16	Pit View of Engine	0	32	-120	90	-	13	840

*X = film plane to monorail centerline *** = Timing marks not present on film

Y = film plane to impact location **** = Film could not be processed

Z = film plan to ground

** = referenced to horizontal plane

Figure 6
VEHICLE TARGET LOCATIONS

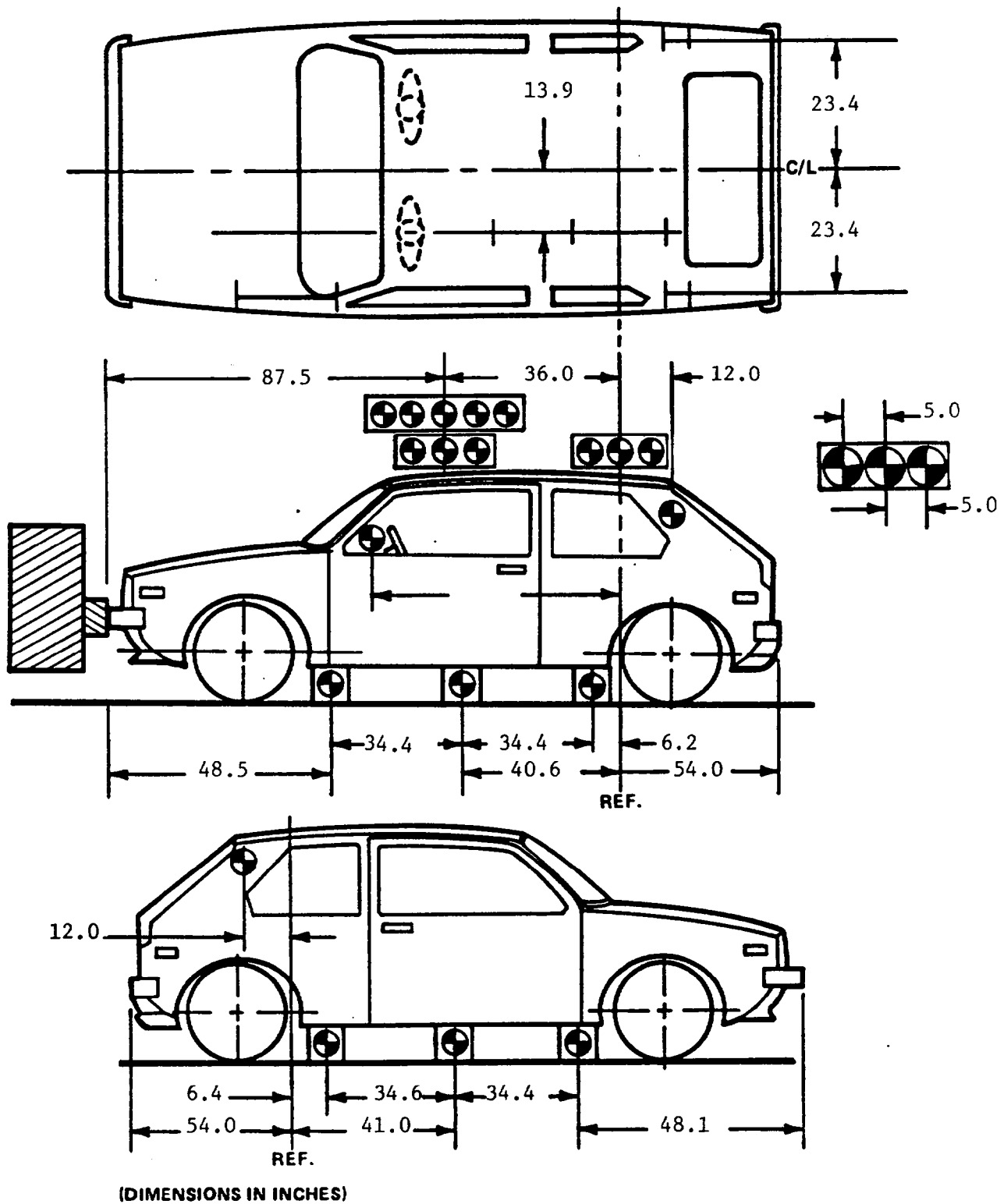
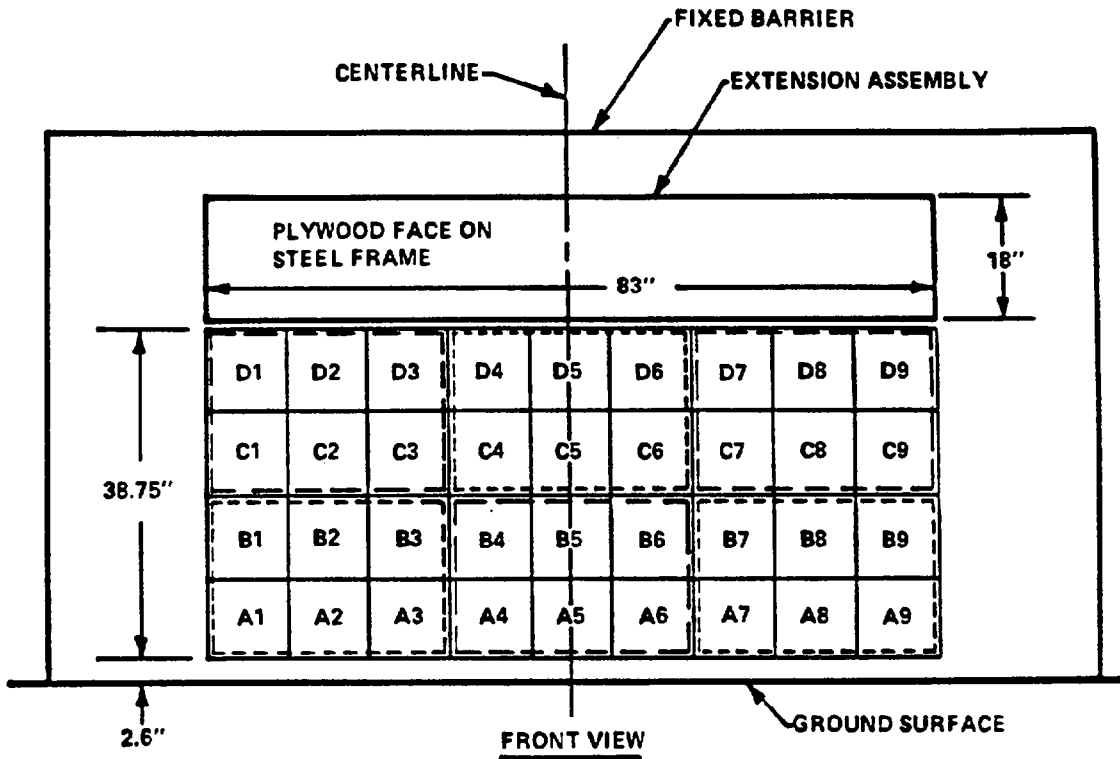


Figure 7

LOAD CELL LOCATIONS ON FIXED BARRIER

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



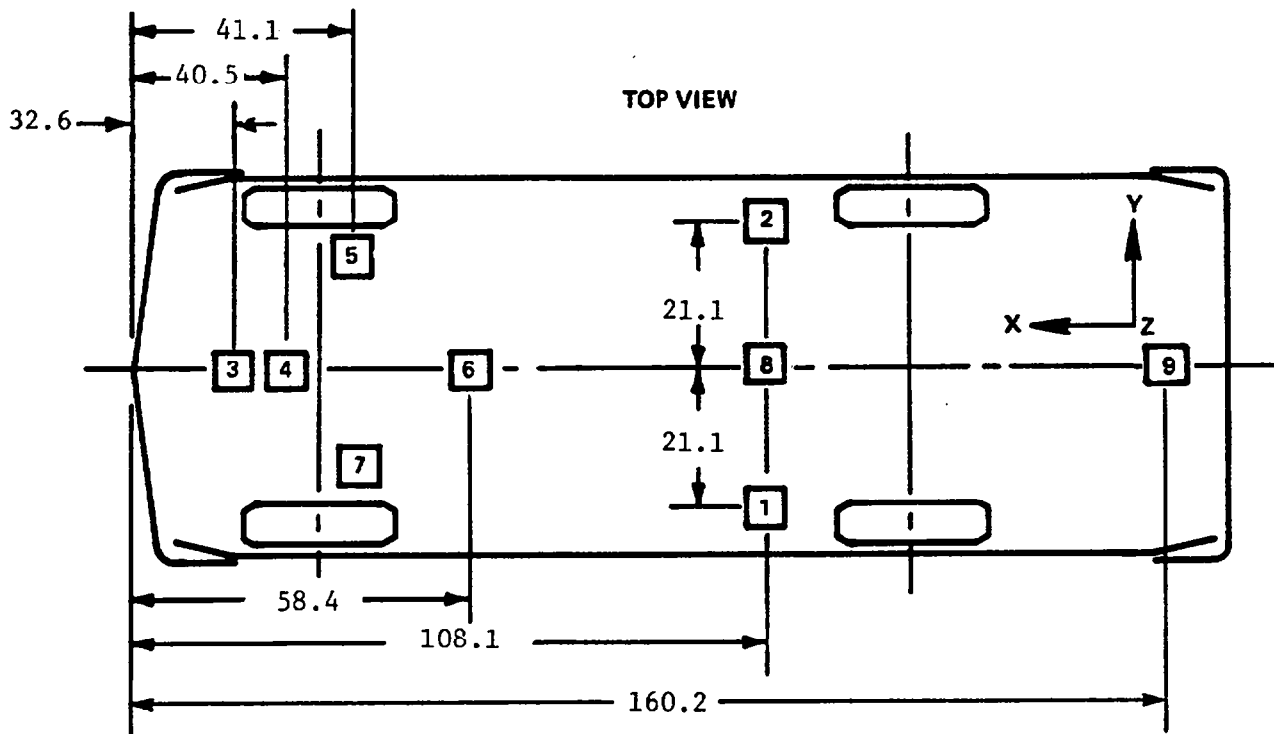
6 GROUPS OF 6 LOAD CELLS EACH

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

The following data is presented in Appendix B:

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

Figure 8
VEHICLE ACCELEROMETER LOCATIONS



(All Measurements in Inches)

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	Center Rear Seat Crossmember	X		
9	Rear Trunk Centerline	X		

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

Figure 9
TEST VEHICLE MEASUREMENTS

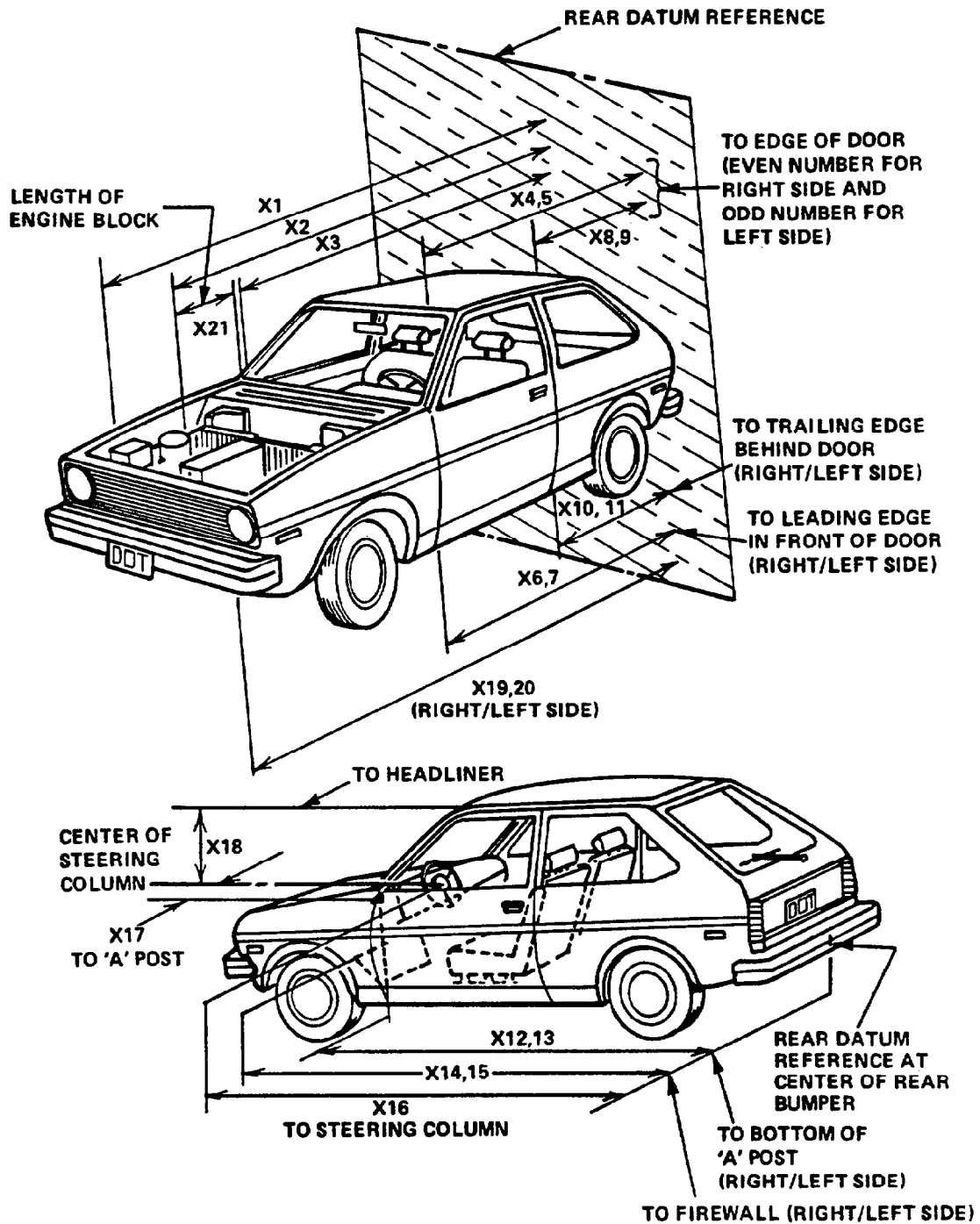


Table 6

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	177.5	156.9	20.6
X2	Rear Surface of Vehicle to Front of Engine	157.7	148.9	8.8
X3	Rear Surface of Vehicle to Firewall	134.5	131.4	3.1
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	125.3	125.0	0.3
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	125.3	126.7	-1.4
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	124.4	125.0	-0.6
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	124.0	125.5	-1.5
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	82.1	82.3	-0.2
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	82.0	83.3	-1.3
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	81.3	82.2	-0.9
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	81.0	82.7	-1.7
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	123.9	124.8	-0.9
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	124.1	125.5	-1.4
X14	Rear Surface of Vehicle to Firewall, Right Side	134.7	134.7	0.0
X15	Rear Surface of Vehicle to Firewall, Left Side	135.2	133.5	1.7
X16	Rear Surface of Vehicle to Steering Column	105.9	108.3	-2.4
X17	Center of Steering Column to "A" Post	14.1	11.9	2.2
X18	Center of Steering Column to Headliner	17.9	20.1	-2.2
X19	Rear Surface of Vehicle to Right Side of Front Bumper	175.6	156.5	19.1
X20	Rear Surface of Vehicle to Left Side of Front Bumper	175.0	156.0	19.0
X21	Length of Engine Block	21.0	21.0	0.0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	116.4	115.2	1.2
CD	Rear Surface of Vehicle to Center of Dash Panel	117.9	114.0	3.9
LD	Rear Surface of Vehicle to Left Side of Dash Panel.	116.3	117.3	-1.0

Appendix A

PHOTOGRAPHS

PHOTOGRAPHS

<u>Figure</u>	<u>Title</u>	<u>Page</u>
A-1	LOAD CELL LOCATIONS	A-3
A-2	PRE-TEST FRONT VIEW	A-4
A-3	POST TEST FRONT VIEW	A-5
A-4	PRE-TEST LEFT SIDE VIEW	A-6
A-5	POST TEST LEFT SIDE VIEW	A-7
A-6	PRE-TEST RIGHT SIDE VIEW	A-8
A-7	POST-TEST RIGHT SIDE VIEW	A-9
A-8	PRE-TEST RIGHT FRONT THREE-QUARTER VIEW	A-10
A-9	POST-TEST RIGHT FRONT THREE-QUARTER VIEW	A-11
A-10	PRE-TEST LEFT REAR THREE-QUARTER VIEW	A-12
A-11	POST-TEST LEFT REAR THREE-QUARTER VIEW	A-13
A-12	PRE-TEST WINDSHIELD VIEW	A-14
A-13	POST-TEST WINDSHIELD VIEW	A-15
A-14	PRE-TEST ENGINE COMPARTMENT VIEW	A-16
A-15	FUEL CAP VIEW	A-17
A-16	PRE-TEST FRONT UNDERBODY VIEW	A-18
A-17	POST-TEST FRONT UNDERBODY VIEW	A-19
A-18	PRE-TEST FRONT SIDE UNDERBODY VIEW	A-20
A-19	POST-TEST FRONT SIDE UNDERBODY VIEW	A-21
A-20	PRE-TEST REAR UNDERBODY VIEW	A-22
A-21	POST-TEST REAR UNDERBODY VIEW	A-23
A-22	PRE-TEST DRIVER POSITION VIEW	A-24
A-23	POST-TEST DRIVER POSITION VIEW	A-25
A-24	PRE-TEST PASSENGER POSITION VIEW	A-26
A-25	POST-TEST PASSENGER POSITION VIEW	A-27
A-26	PRE-TEST DRIVER AND INTERIOR VIEW	A-28
A-27	POST-TEST DRIVER AND INTERIOR VIEW	A-29
A-28	PRE-TEST PASSENGER AND INTERIOR VIEW	A-30
A-29	POST-TEST PASSENGER AND INTERIOR VIEW	A-31
A-30	PRE-TEST DRIVER HEAD LOCATION	A-32
A-31	PRE-TEST PASSENGER HEAD LOCATION	A-33
A-32	IMPACT VIEW	A-34

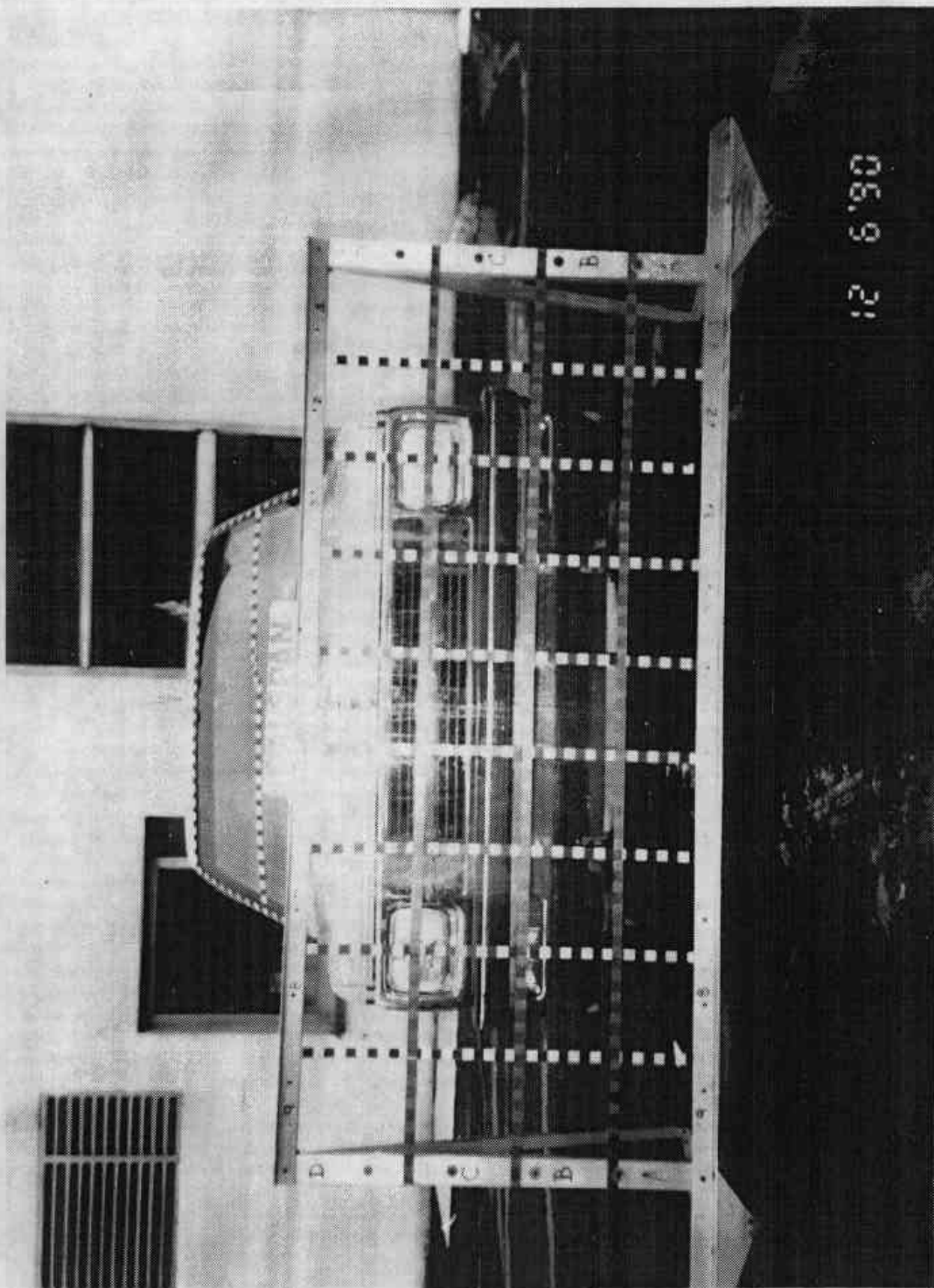


Figure A-1 LOAD CELL LOCATIONS

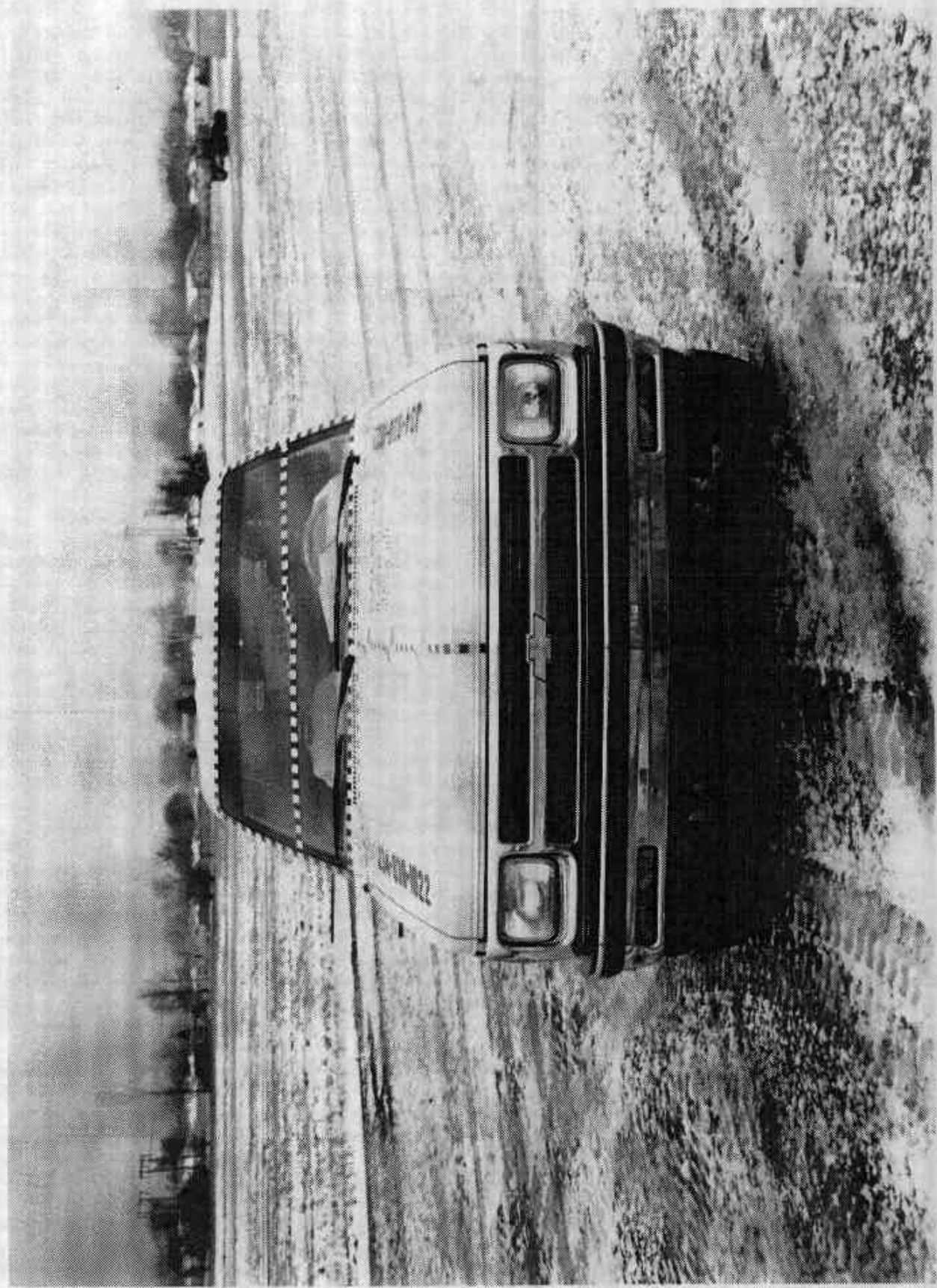


Figure A-2 PRE-TEST FRONT VIEW

A-4

7862-3

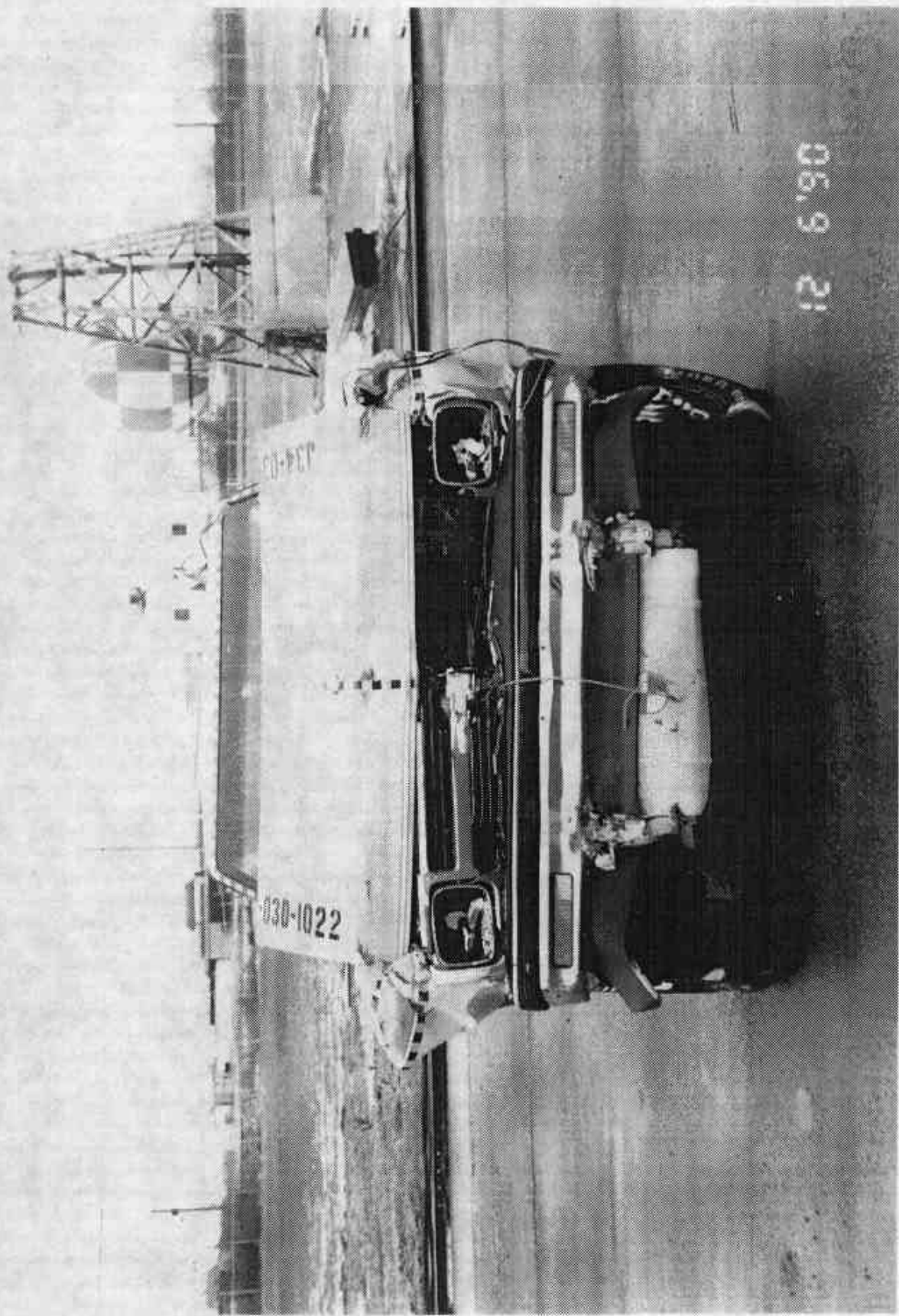


Figure A-3 POST TEST FRONT VIEW

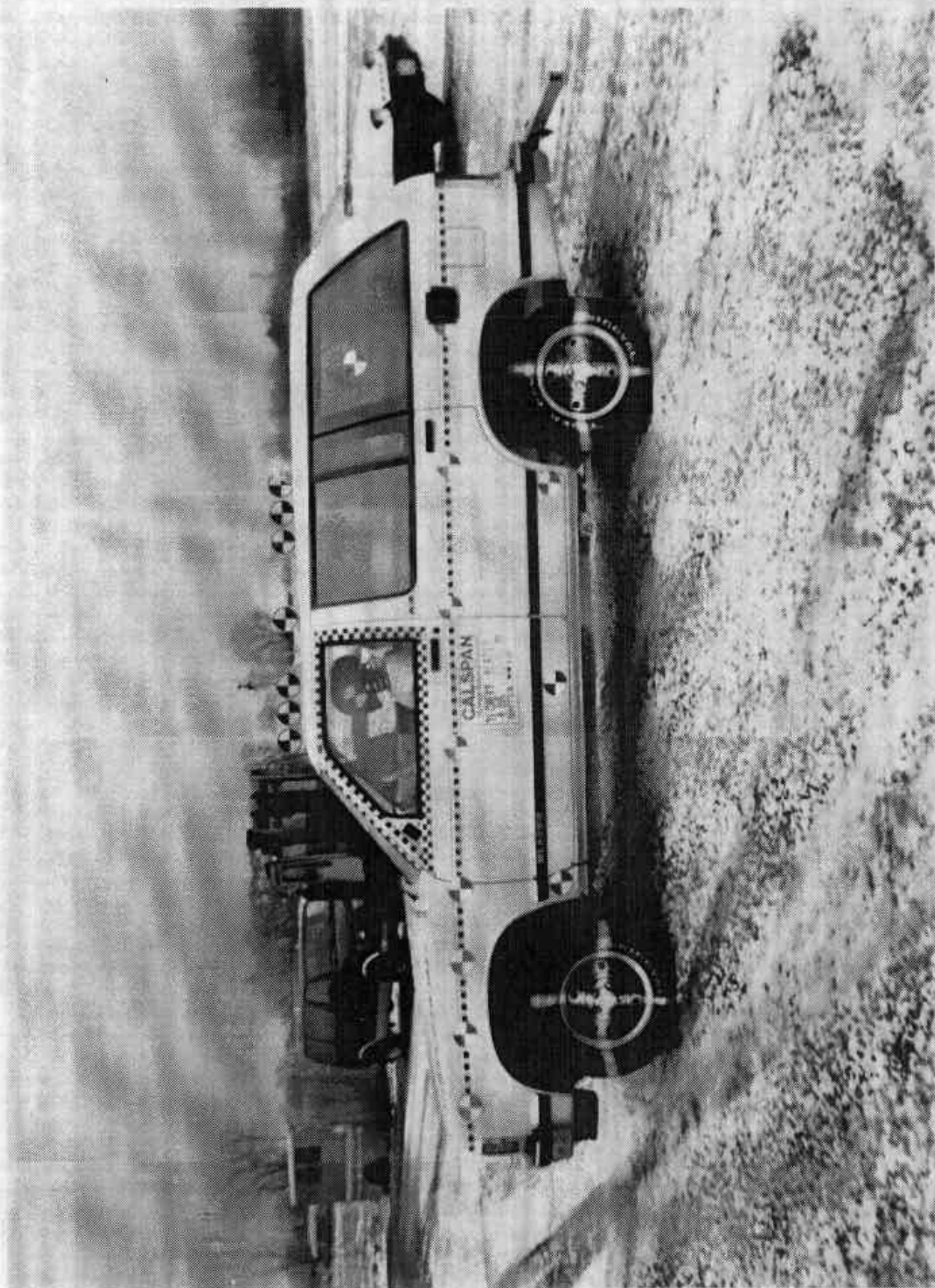
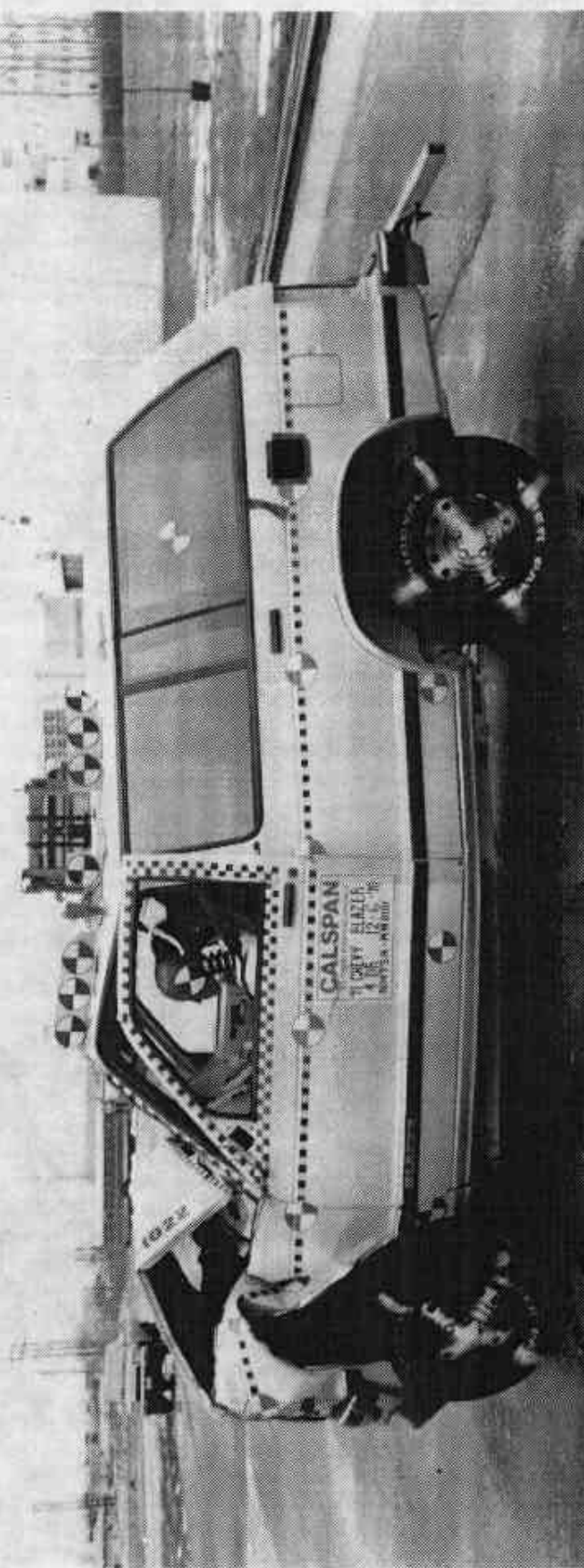


Figure A-4 PRE-TEST LEFT SIDE VIEW

A-6

7802-3



12 8'90

Figure A-5 POST TEST LEFT SIDE VIEW

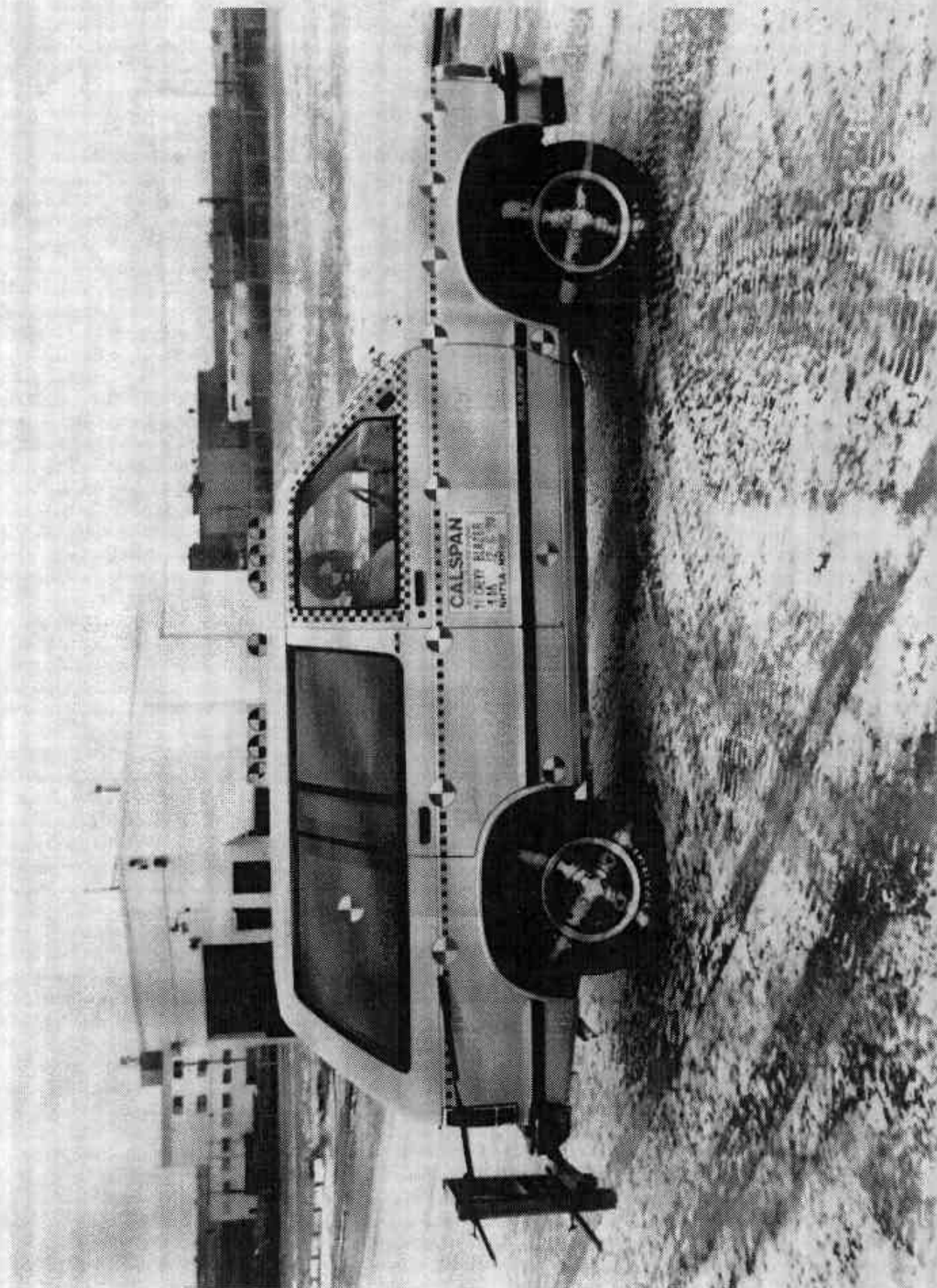


FIGURE A-6 PRE-TEST RIGHT SIDE VIEW

A-6

7862-3

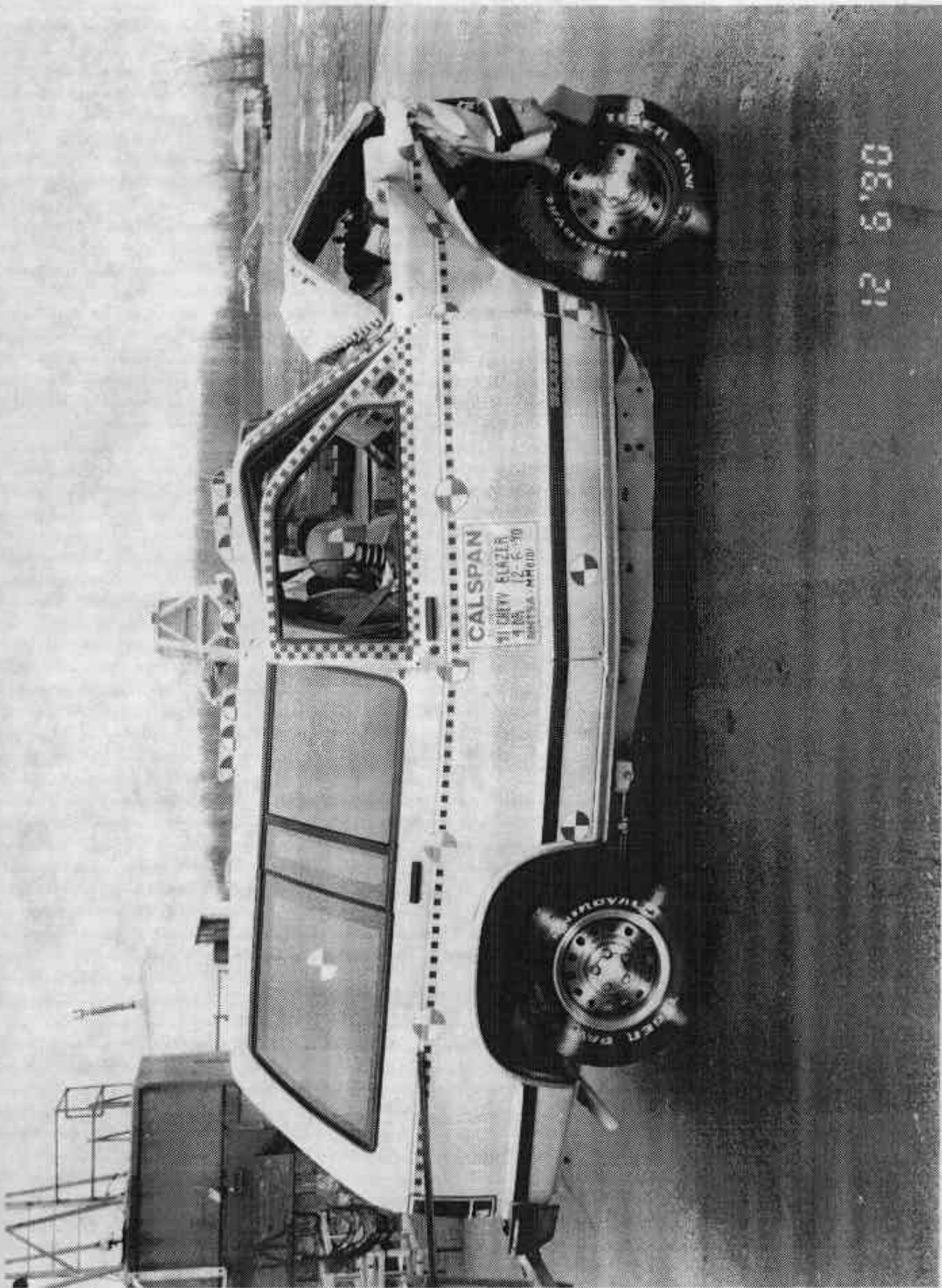


Figure A-7 POST-TEST RIGHT SIDE VIEW

A-9

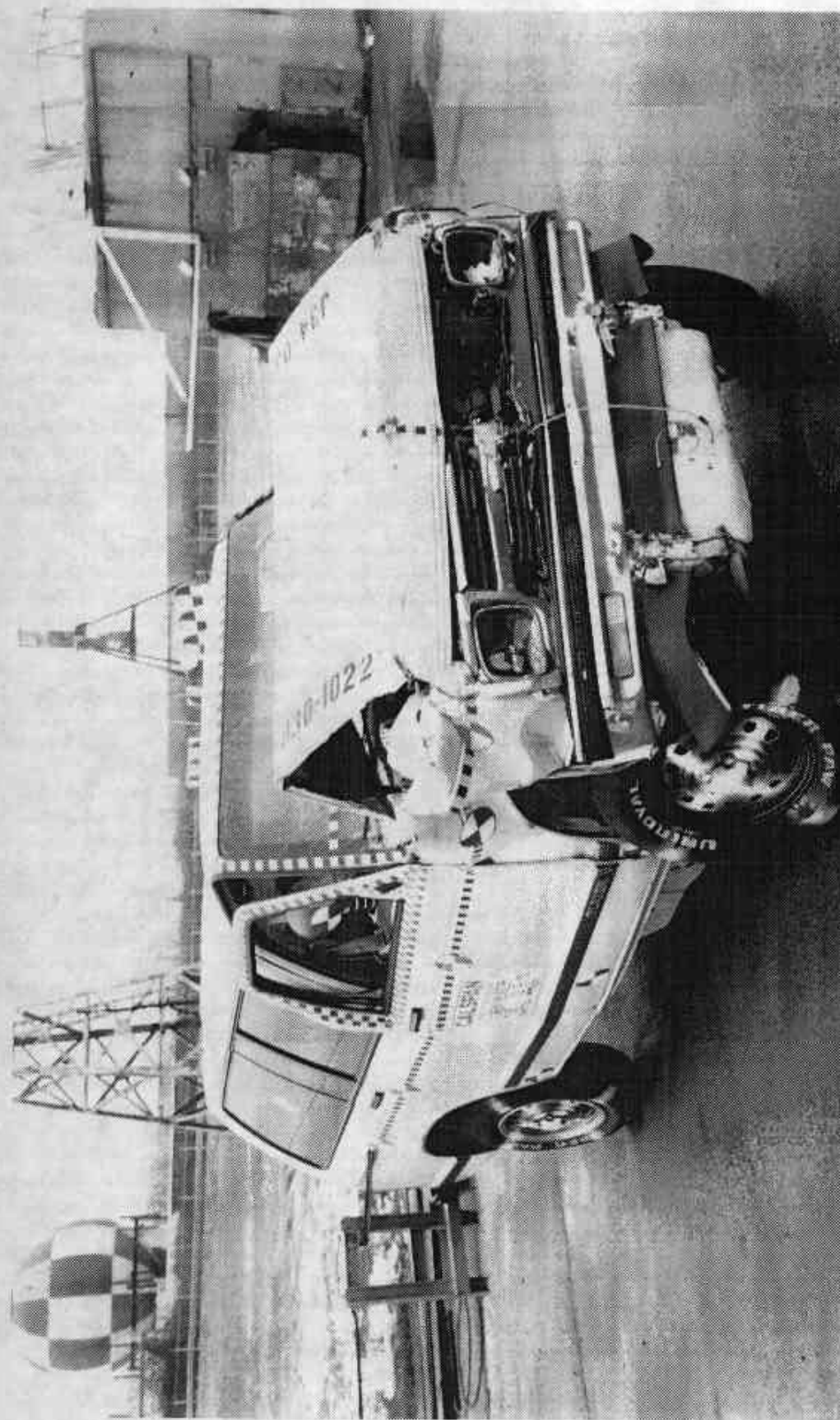
7862-3



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

A-10

7862-3



06.9 21

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

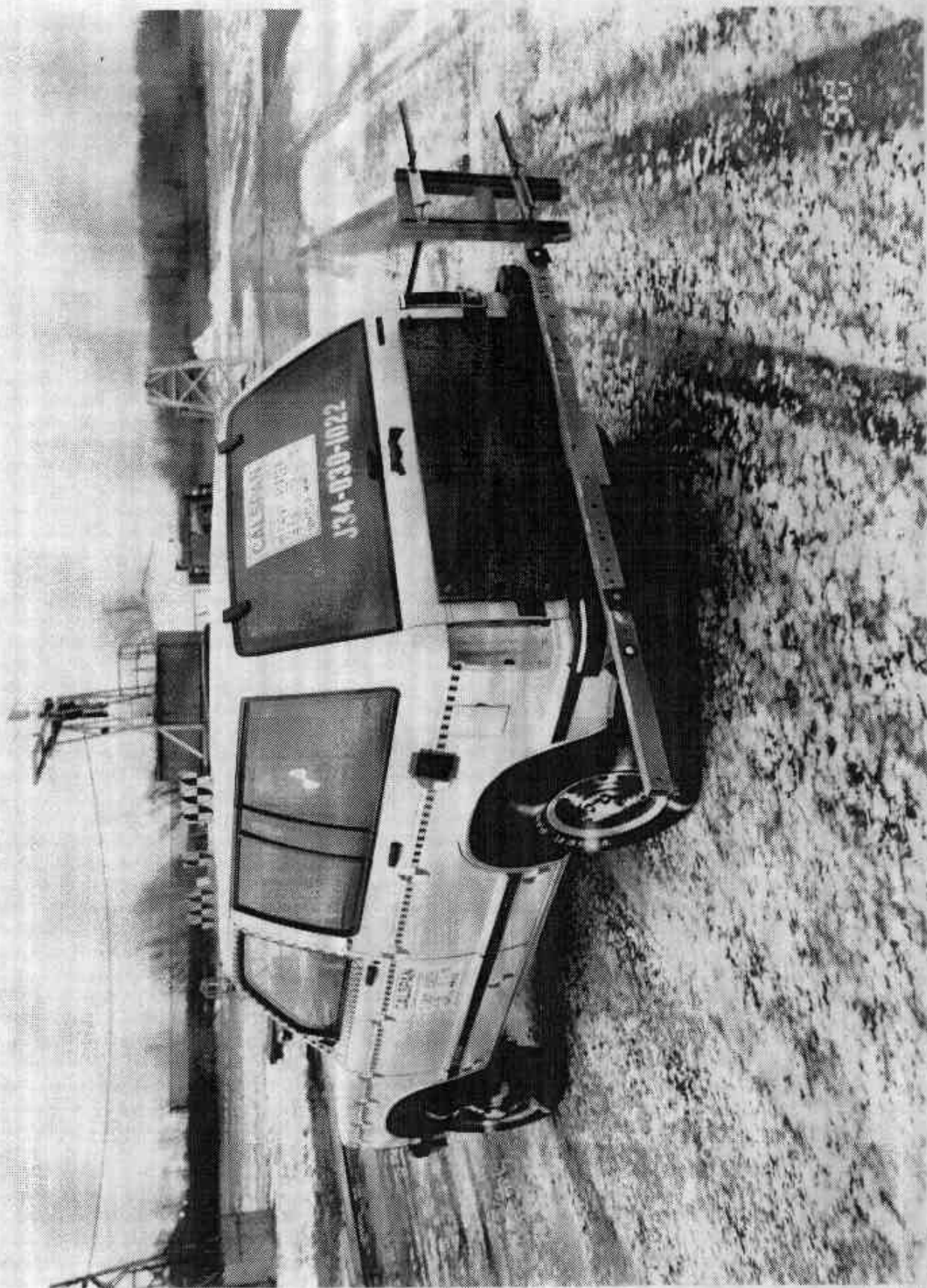


Figure A-10 PRE-TEST LEFT REAR THREE-QUARTER VIEW



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

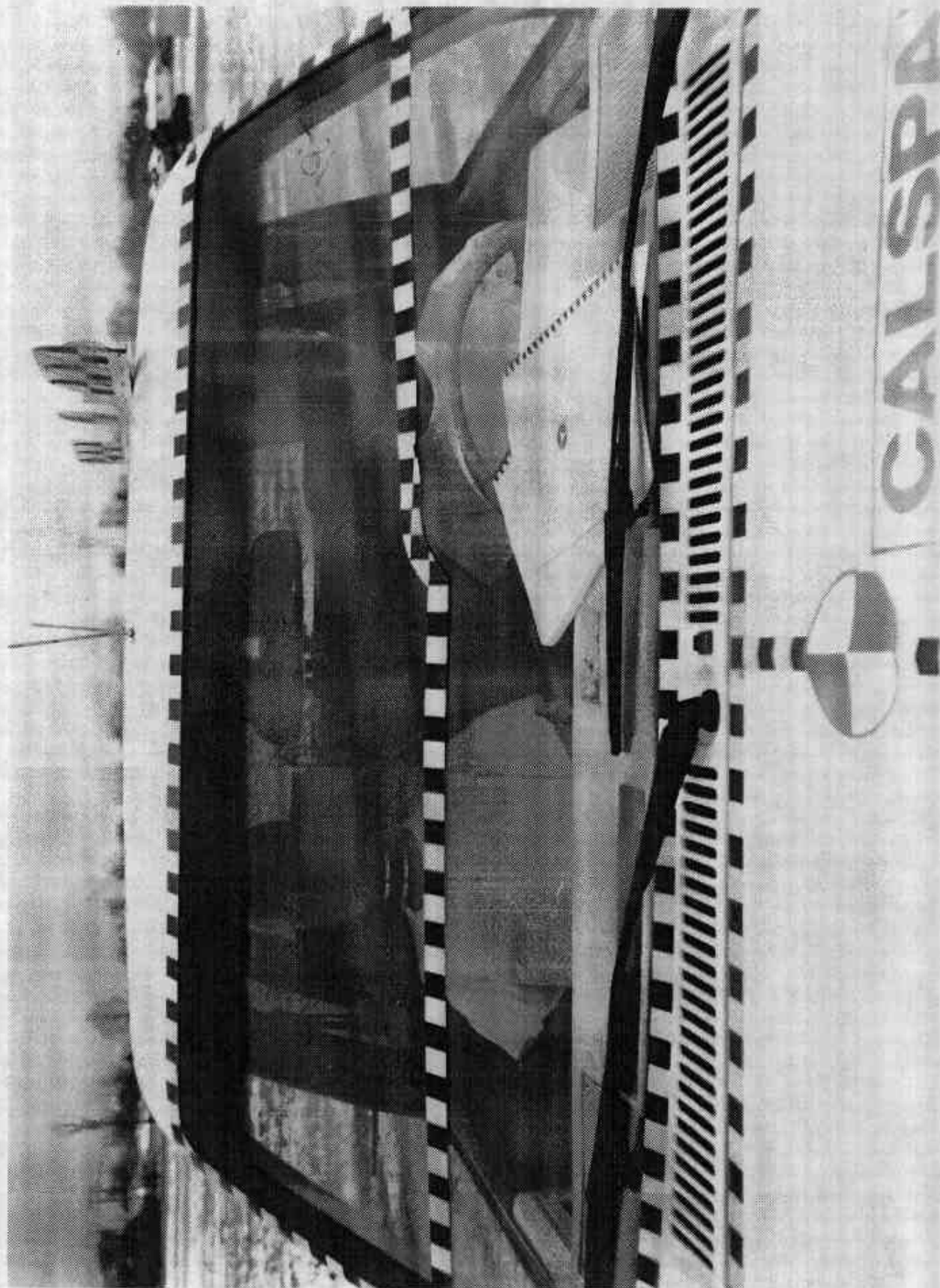


FIGURE A-12 PRE-TEST WINDSHIELD VIEW

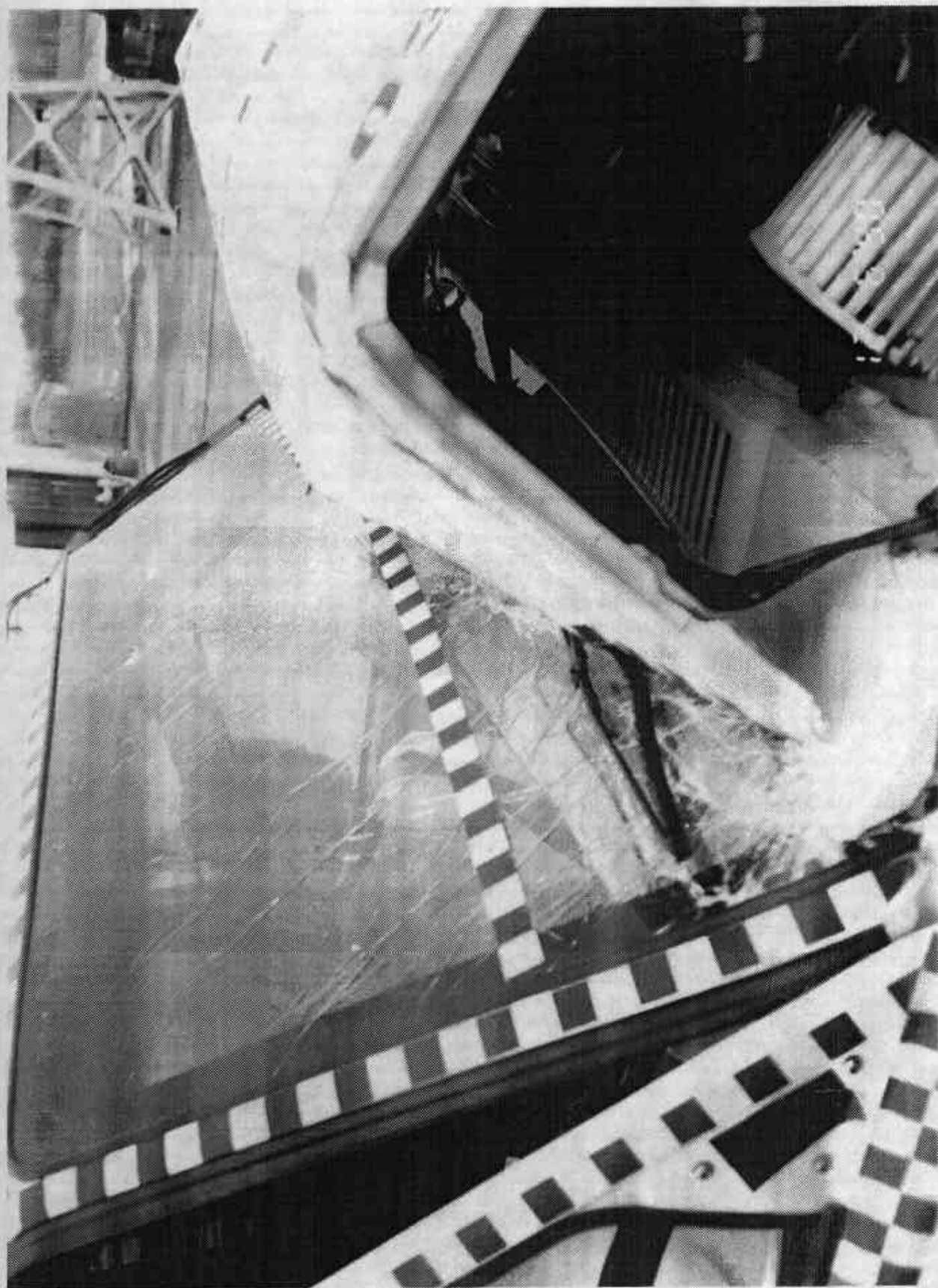


Figure A-13 POST-TEST WINDSHIELD VIEW

A-15

7862-3

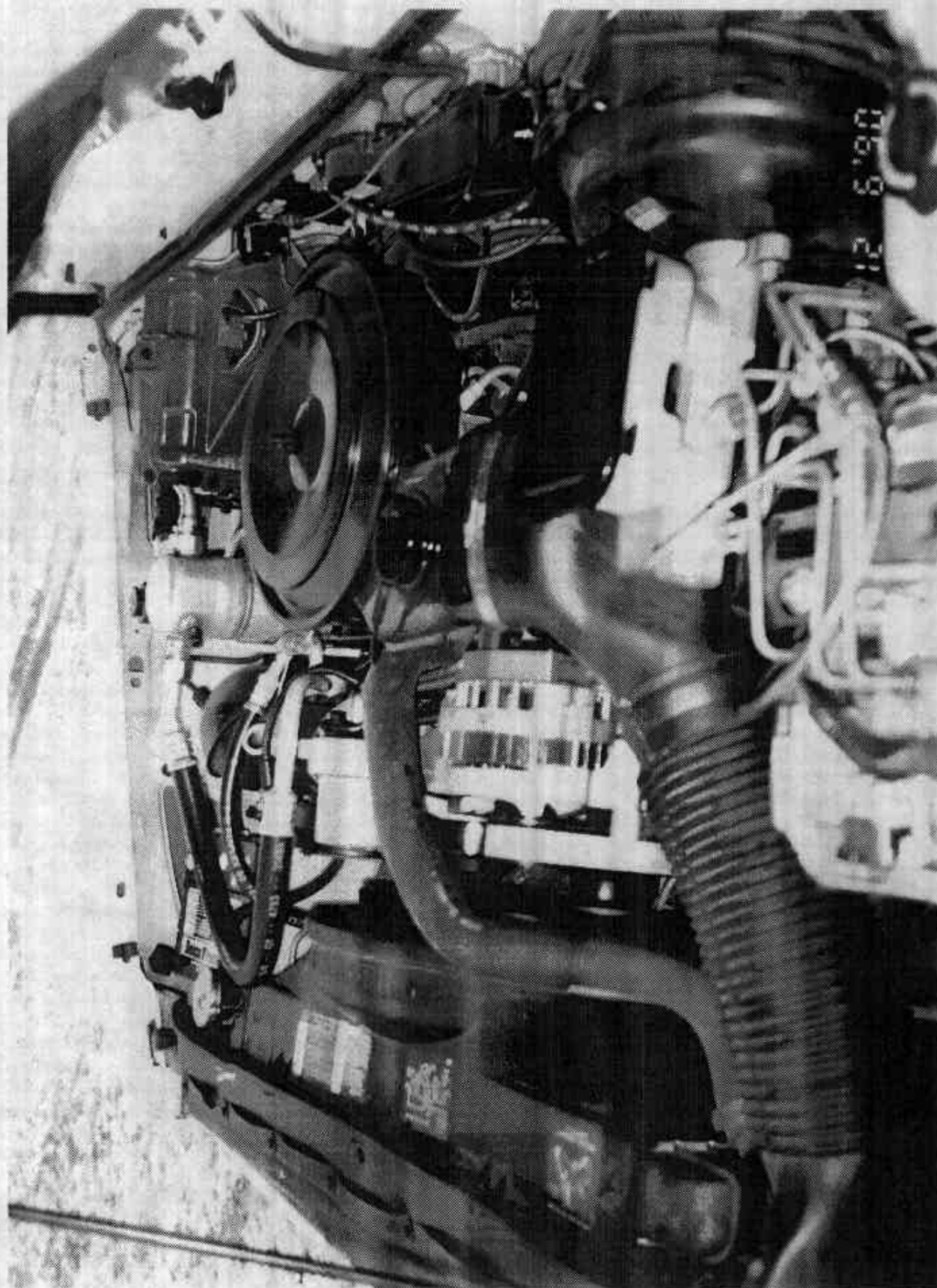


FIGURE A-14 PRE-TEST ENGINE COMPARTMENT VIEW

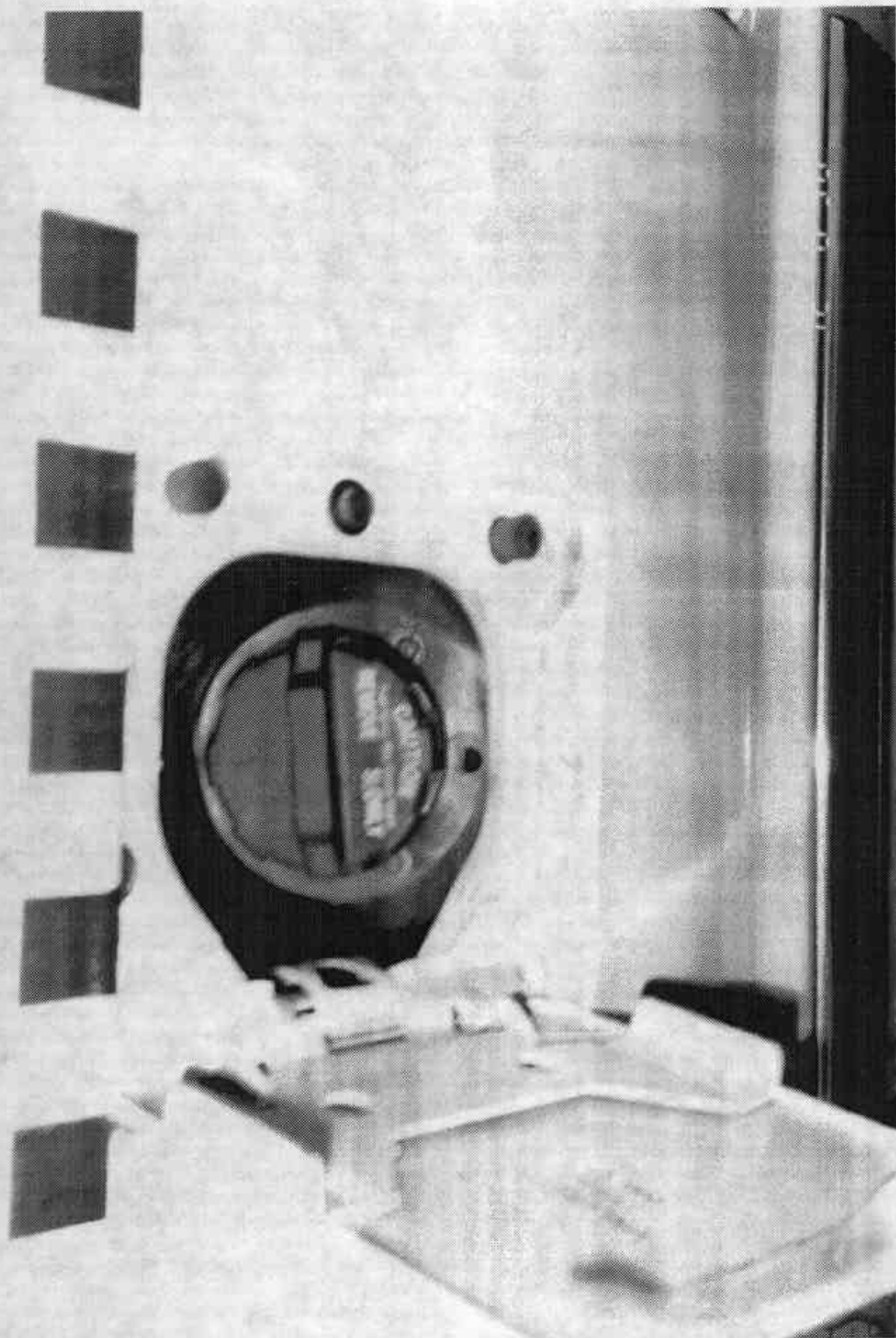


FIGURE A-15 FUEL CAP VIEW

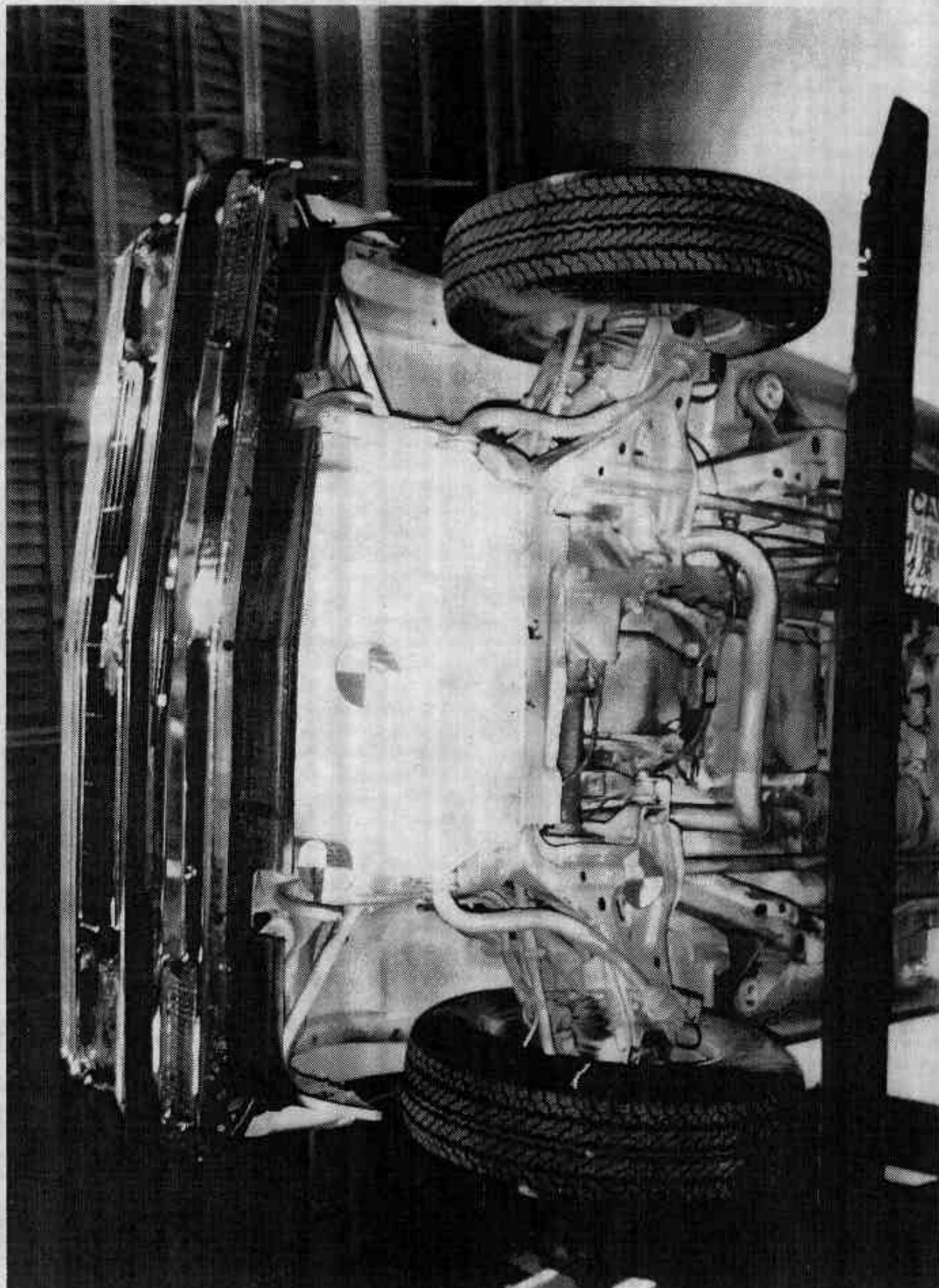


FIGURE A-16 PRE-TEST FRONT UNDERBODY VIEW

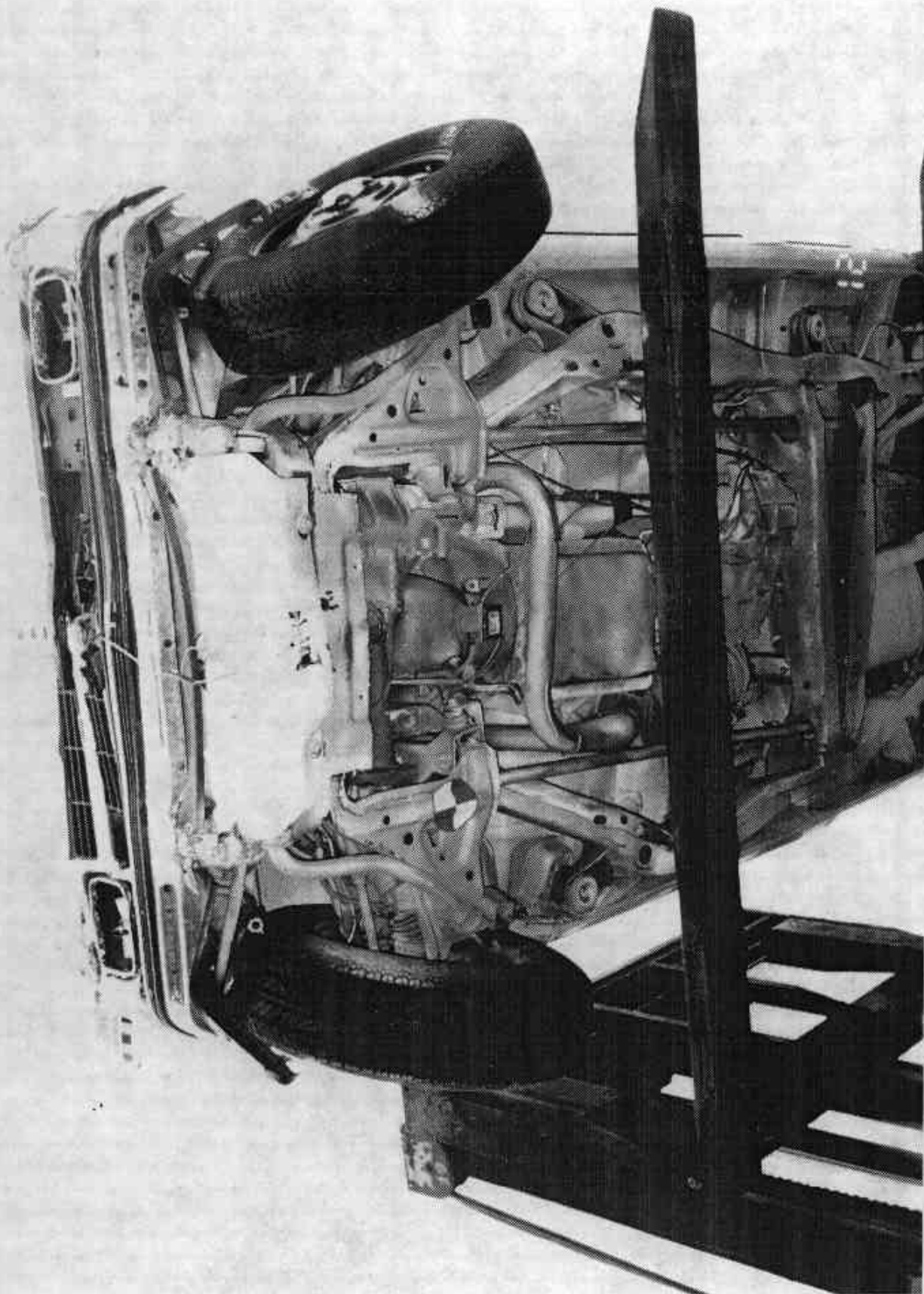
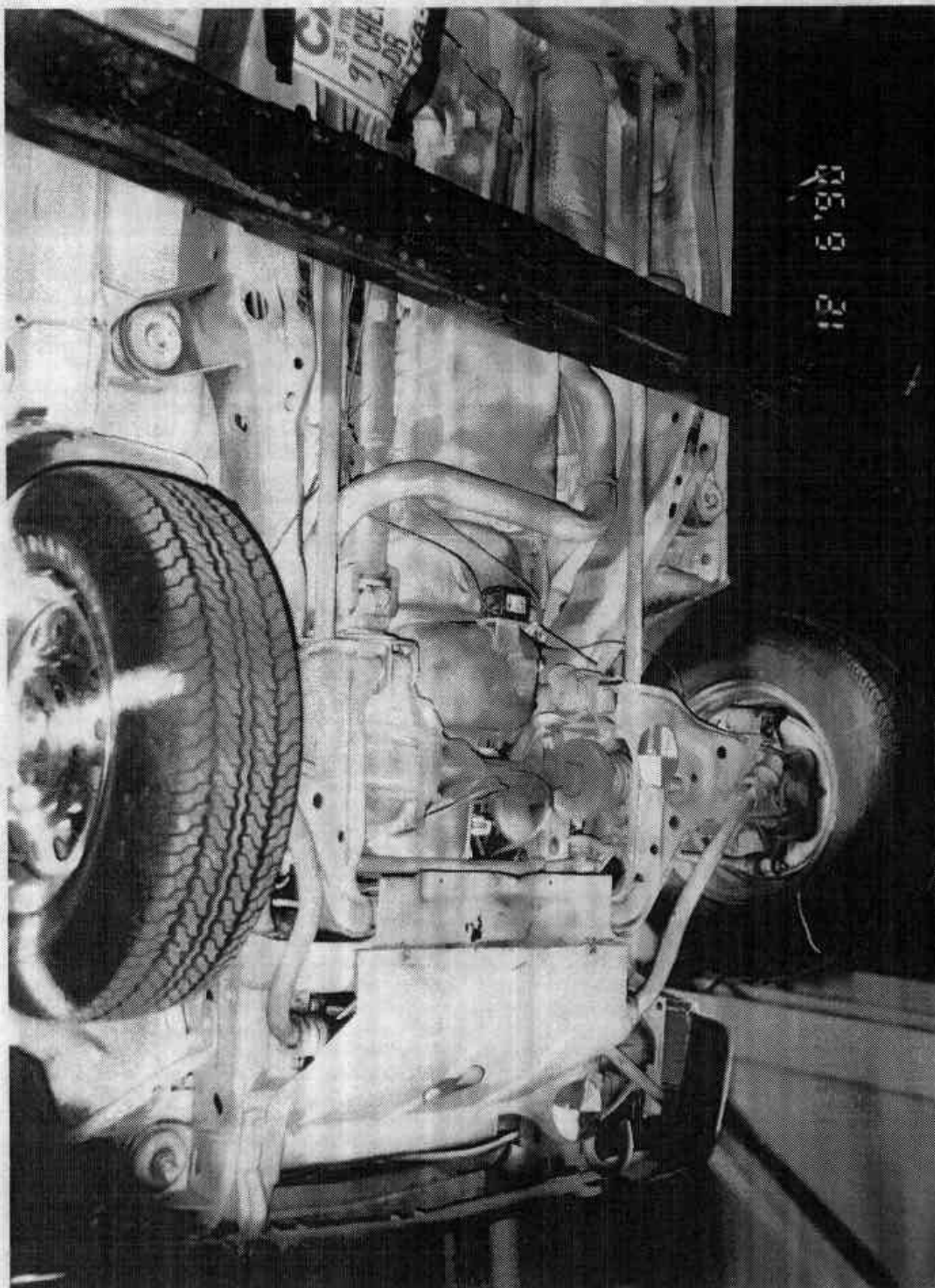


Figure A-17 POST-TEST FRONT UNDERBODY VIEW



12 6'90

FIGURE A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW

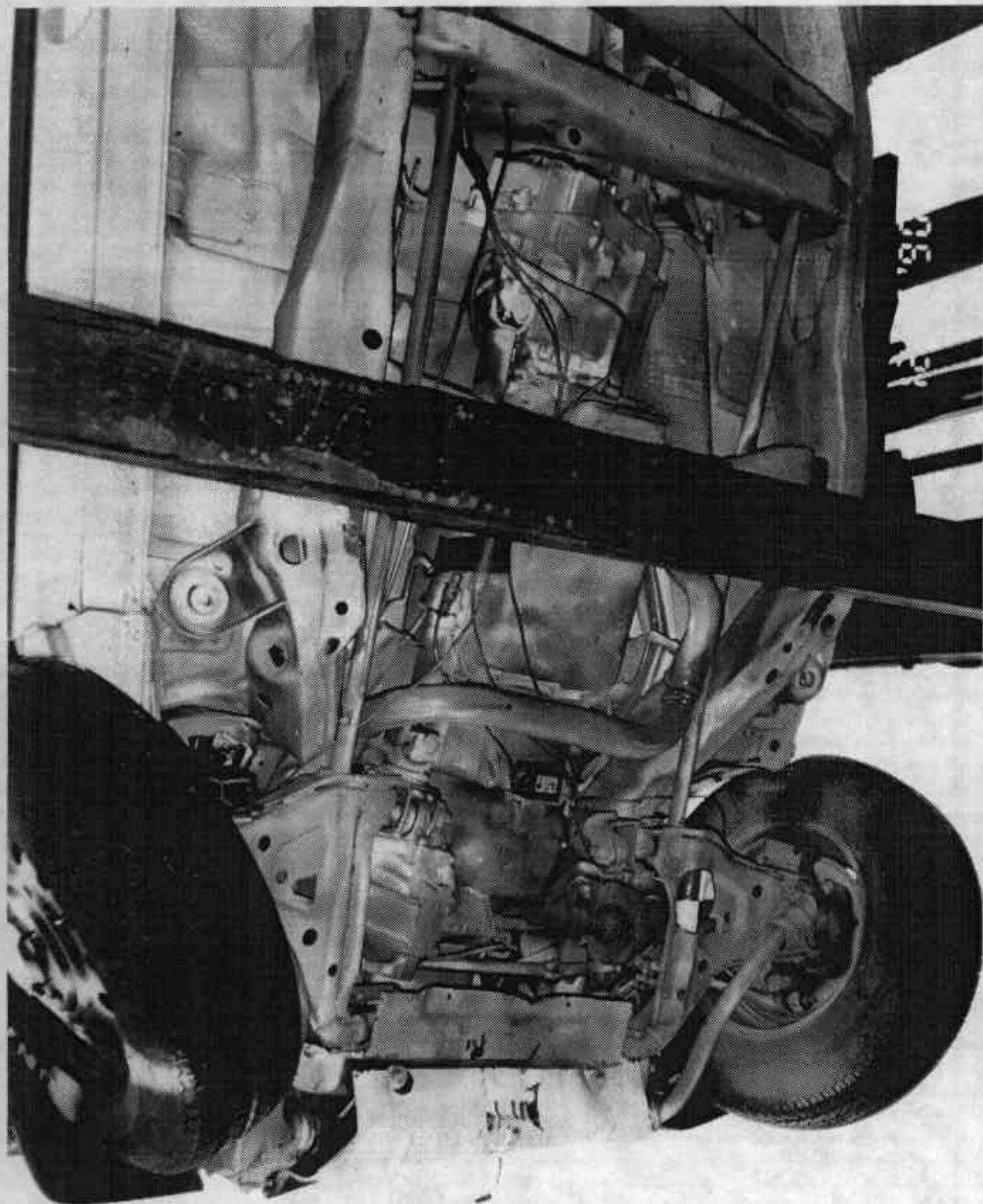


Figure A-19 POST-TEST FRONT SIDE UNDERBODY VIEW

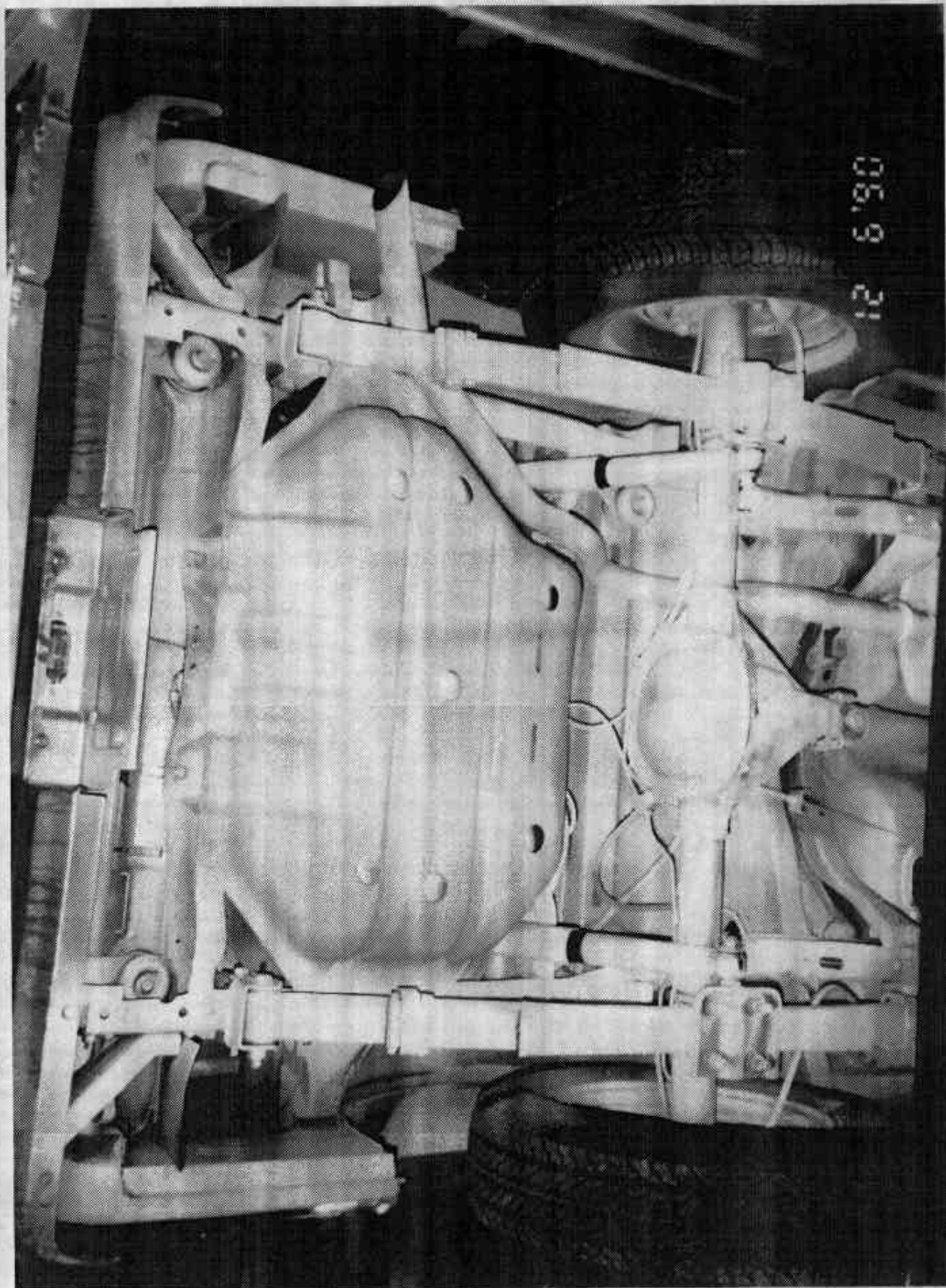


FIGURE A-20 PRE-TEST REAR UNDERBODY VIEW

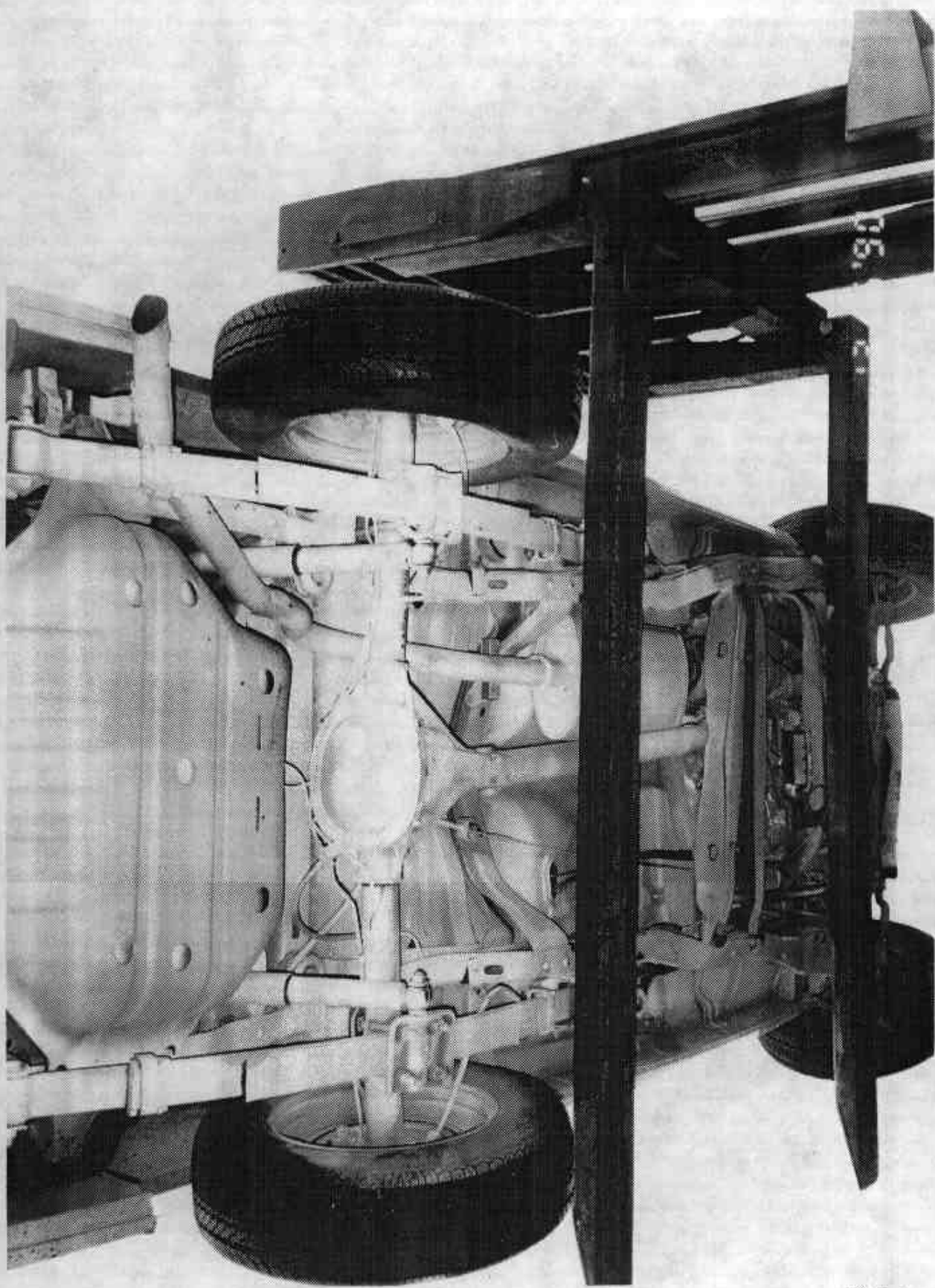


FIGURE A-21 POST-TEST REAR UNDERBODY VIEW



Figure A-22 PRE-TEST DRIVER POSITION VIEW



Figure A-23 POST-TEST DRIVER POSITION VIEW



Figure A-24 PRE-TEST PASSENGER POSITION VIEW

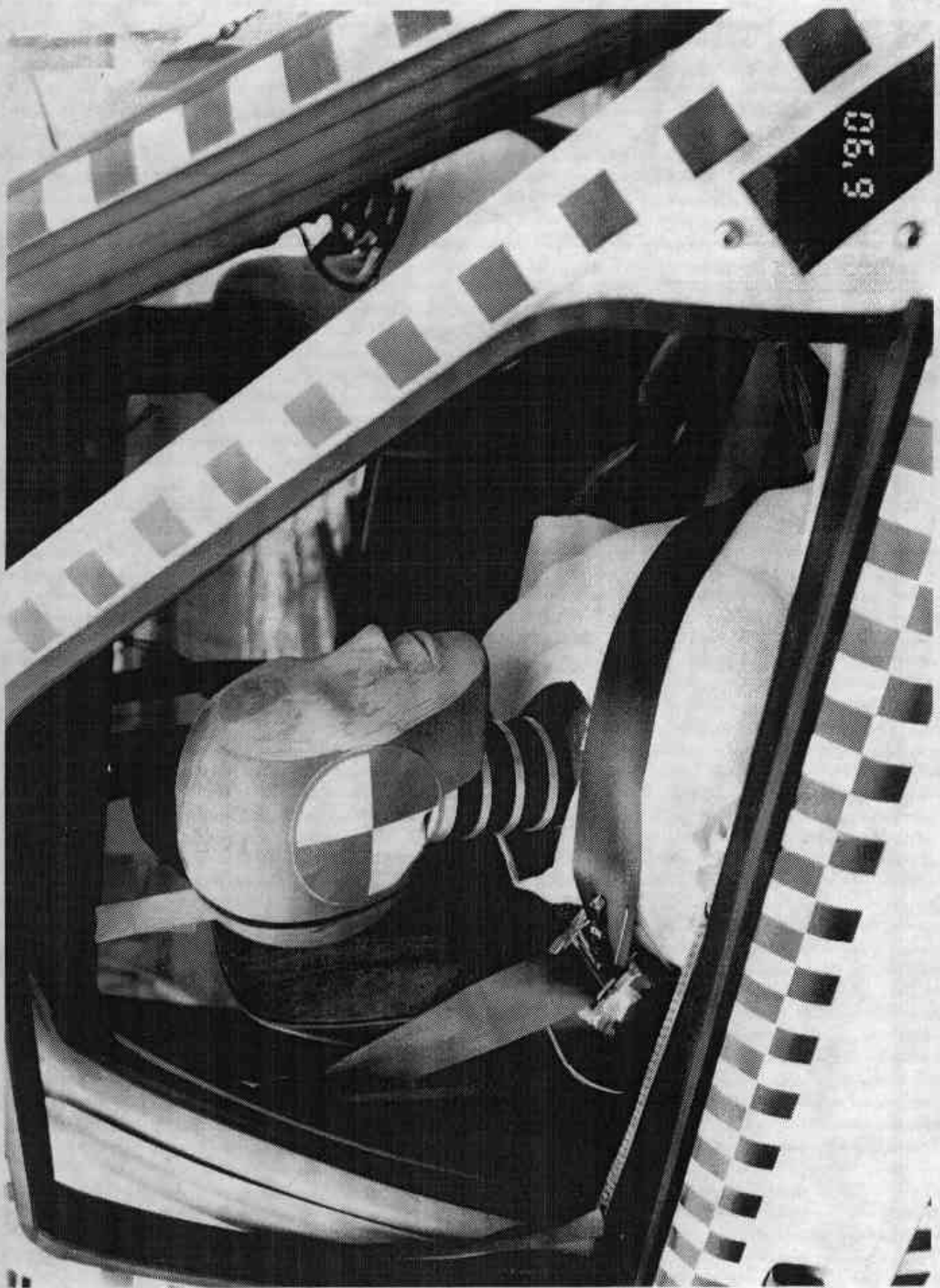


Figure A-25 POST-TEST PASSENGER POSITION VIEW

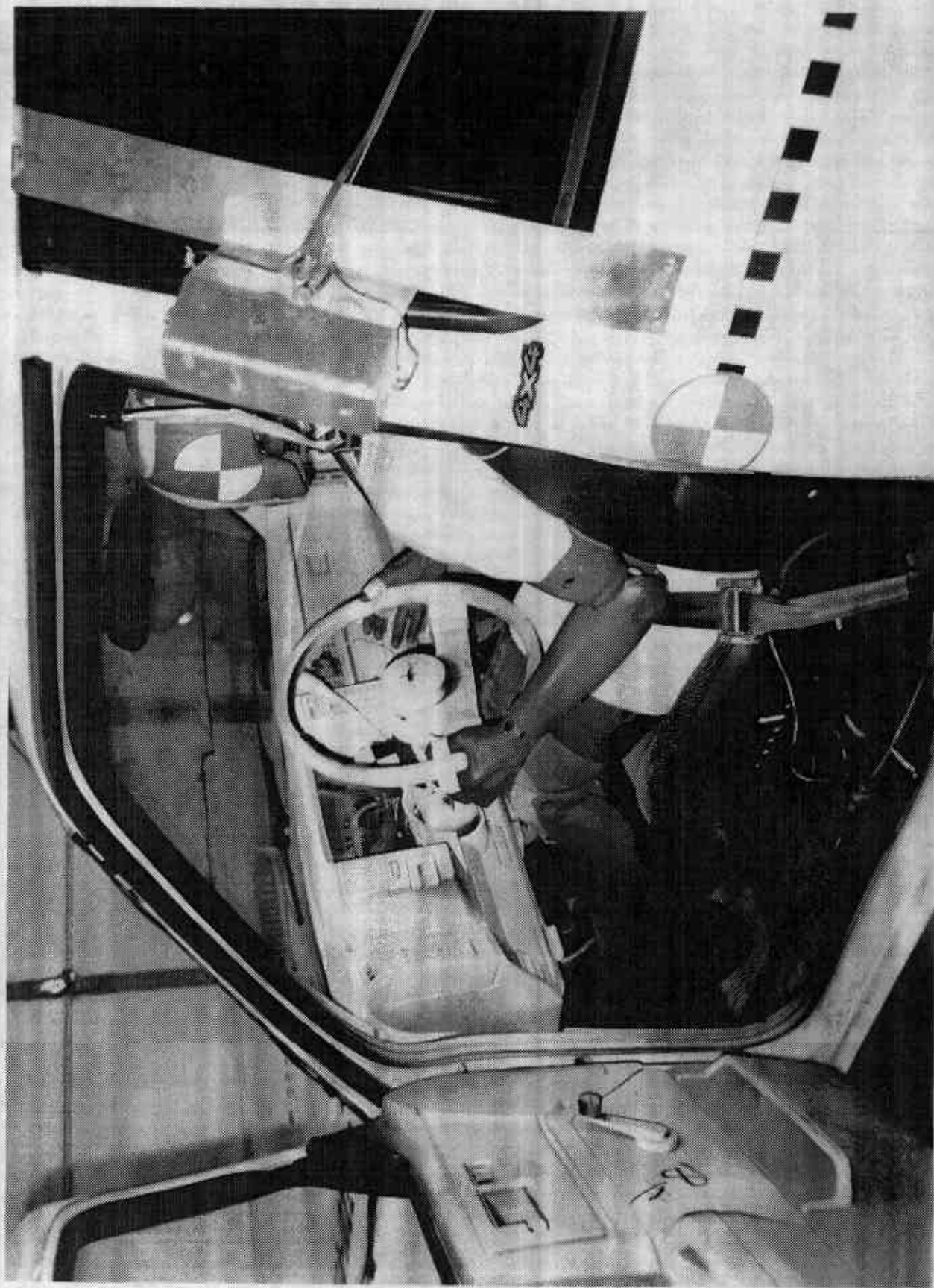


FIGURE A-26 PRE-TEST DRIVER AND INTERIOR VIEW

A-28

7862-3

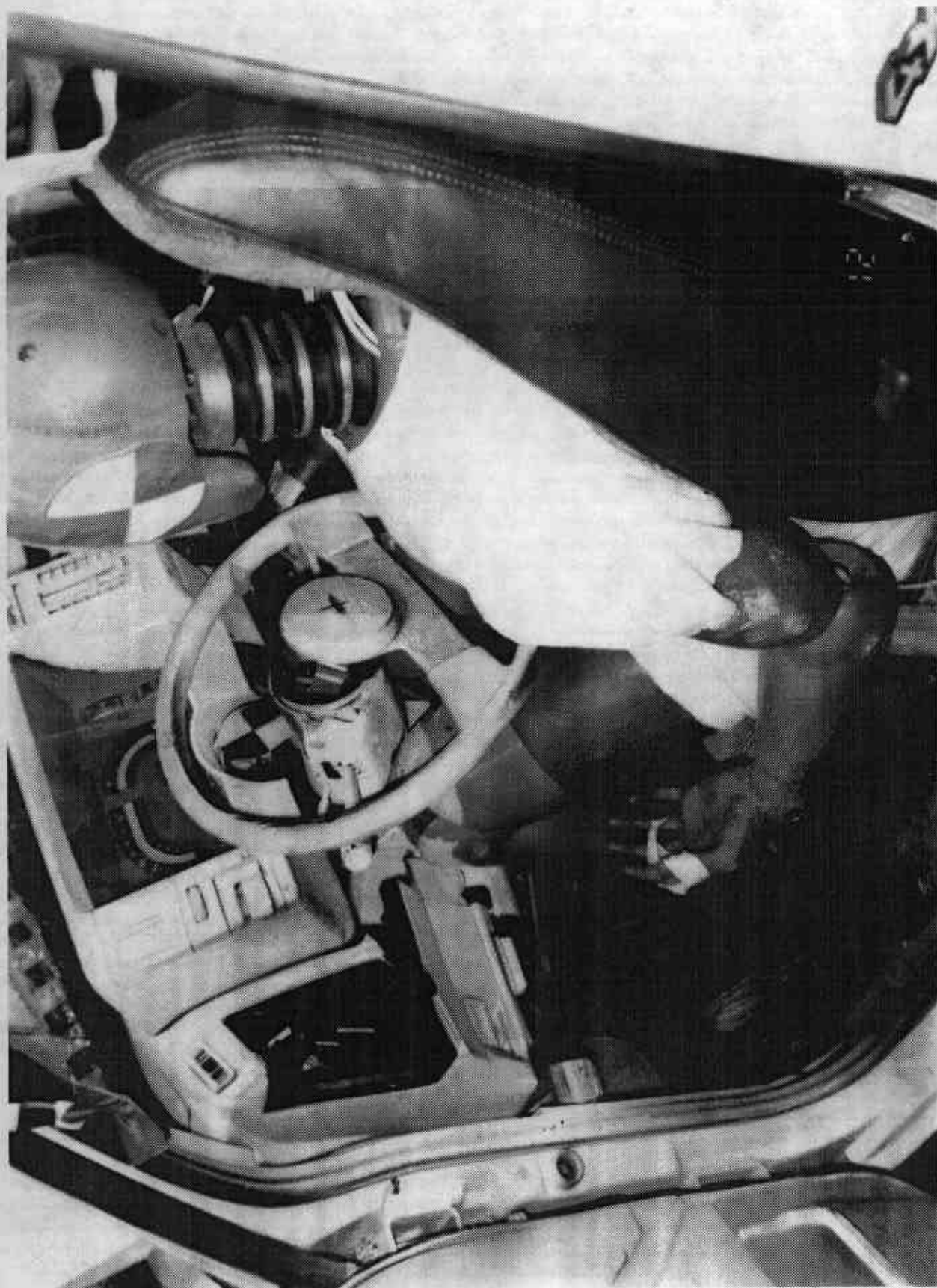


FIGURE A-27 POST-TEST DRIVER AND INTERIOR VIEW



Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW

A-30

7862-3

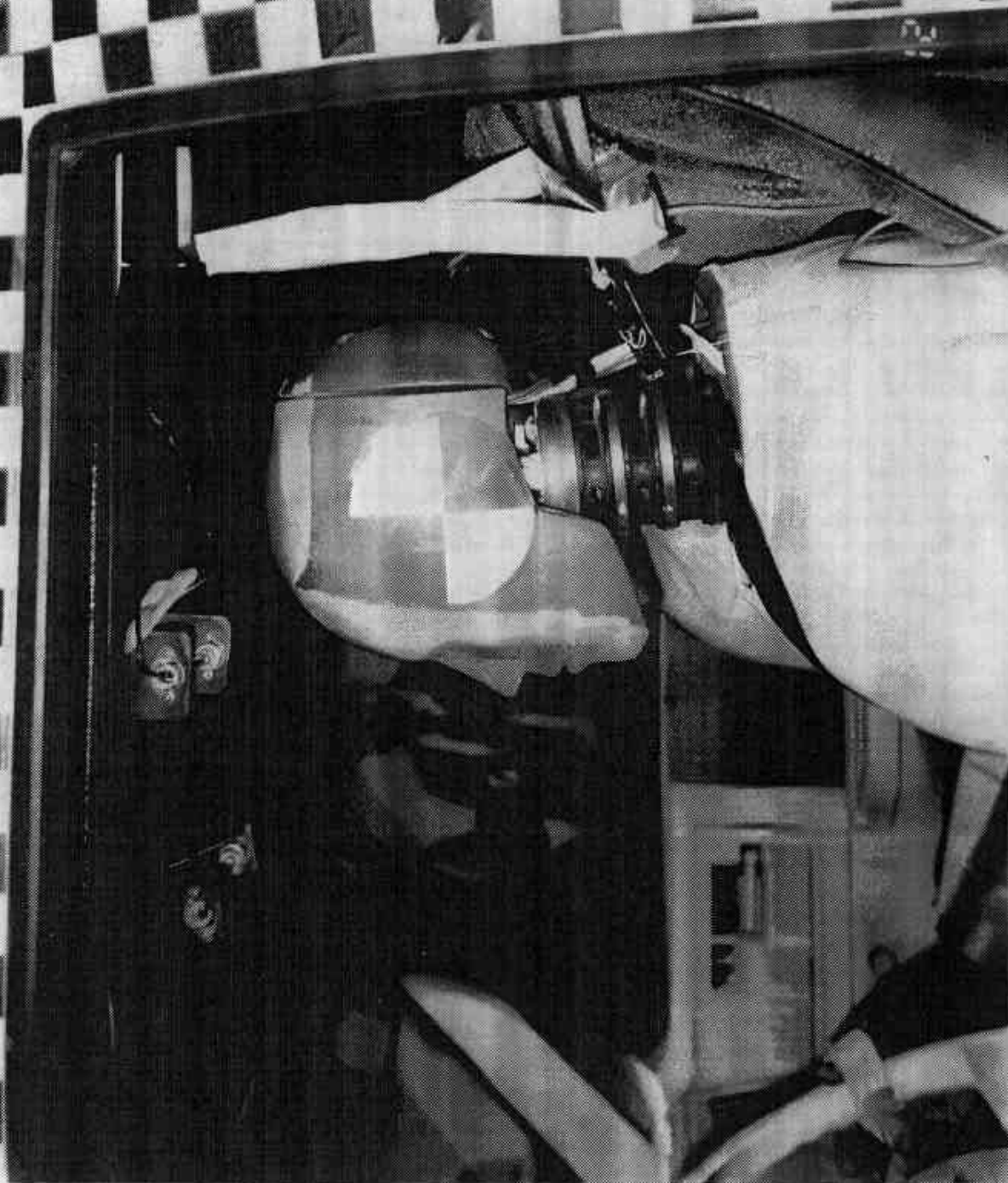


Figure A-28 POST-TEST PASSENGER AND INTERIOR VIEW

A-31

7862-3

FIGURE A-30 PRE-TEST DRIVER HEAD LOCATION



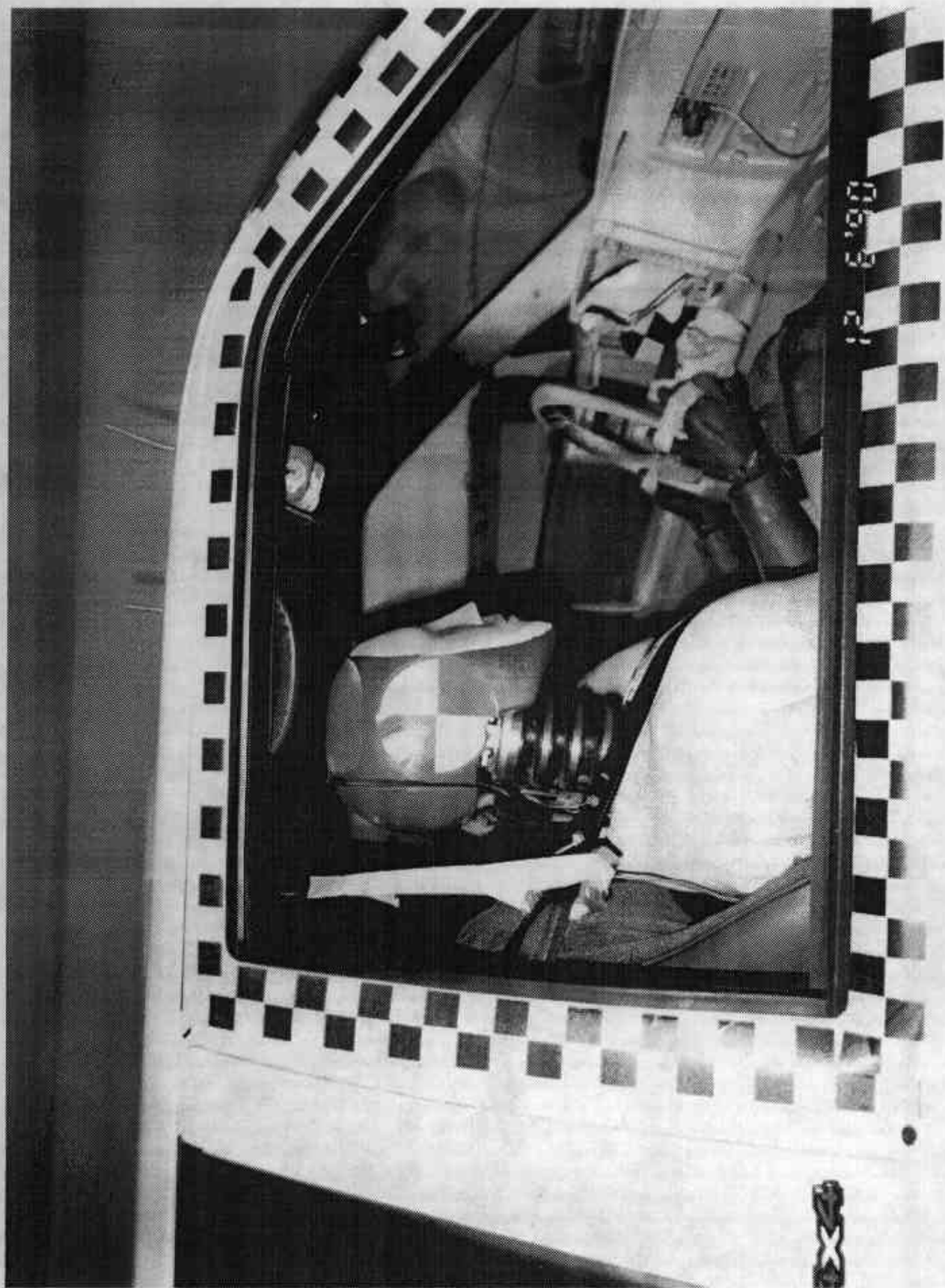
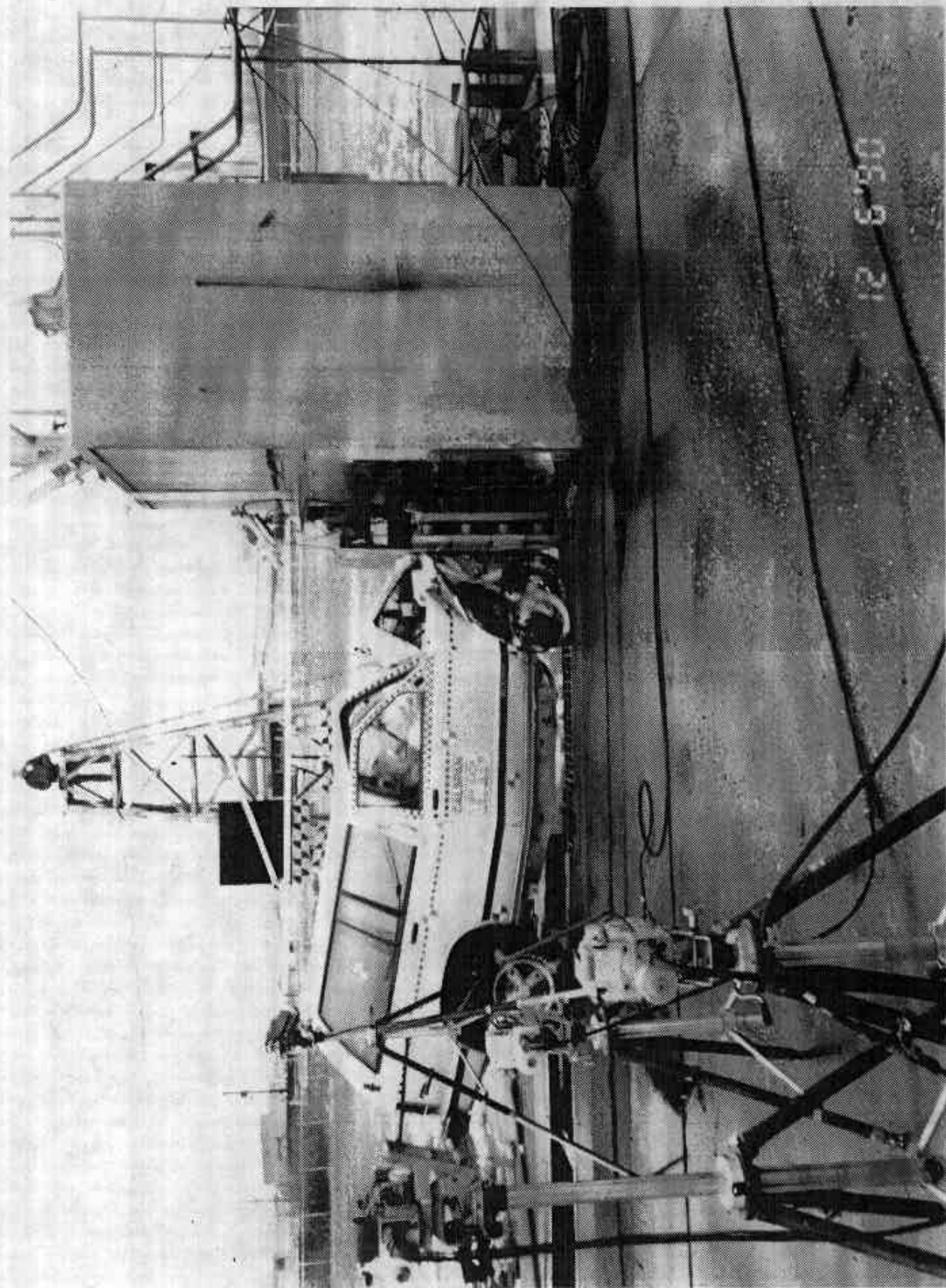


Figure A-31 PRE-TEST PASSENGER HEAD LOCATION

A-33

7862-3



A-34

7862-3

Figure A-32 IMPACT VIEW

06.9 21

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST NO. MM0101

VEHICLE DATA

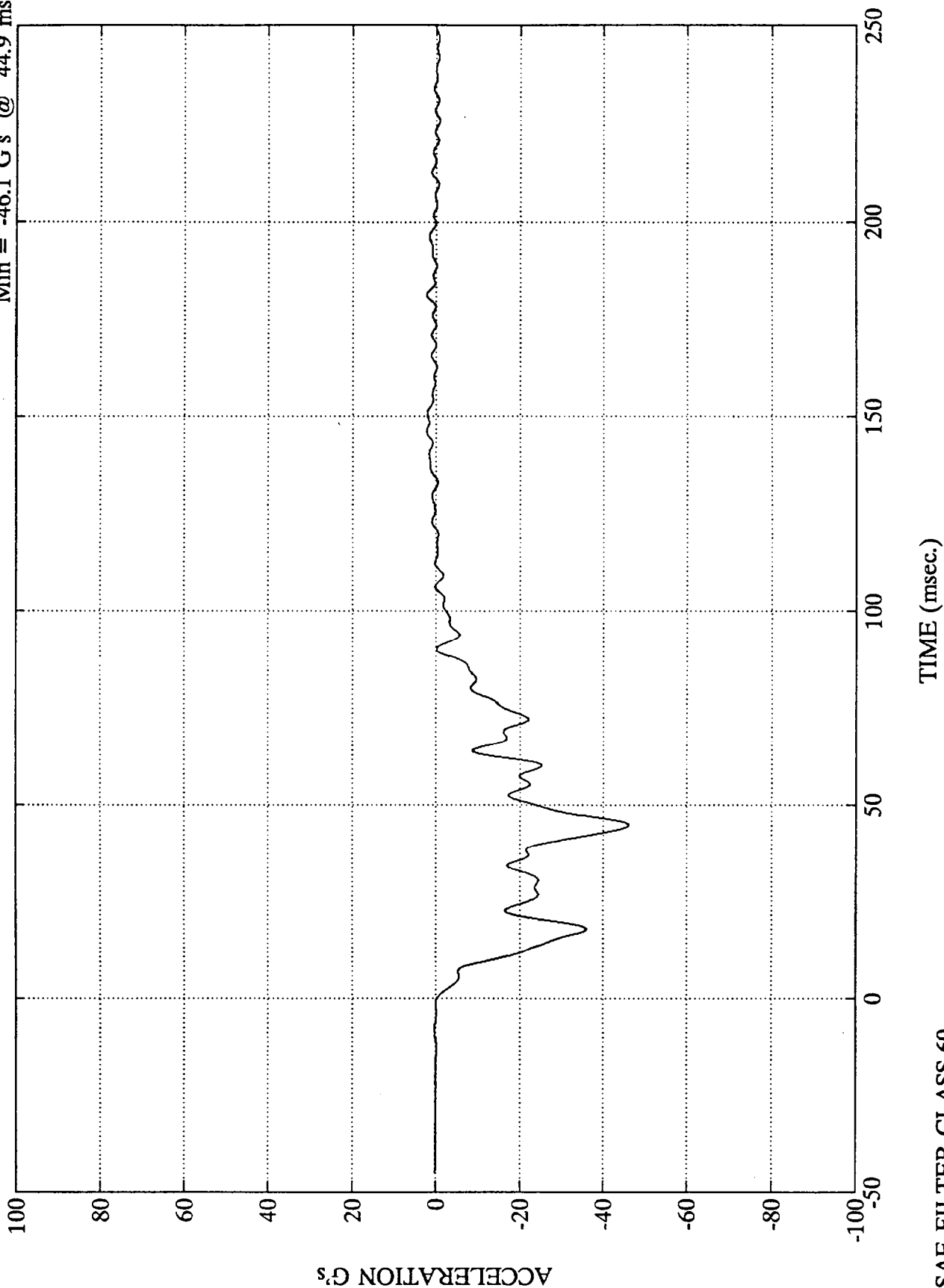
FILTER CHANNEL CLASS

60

Test 1022

ACCELEROMETER #1(X)

Max = 2.3 G's @ 146.0 msec
Min = -46.1 G's @ 44.9 msec

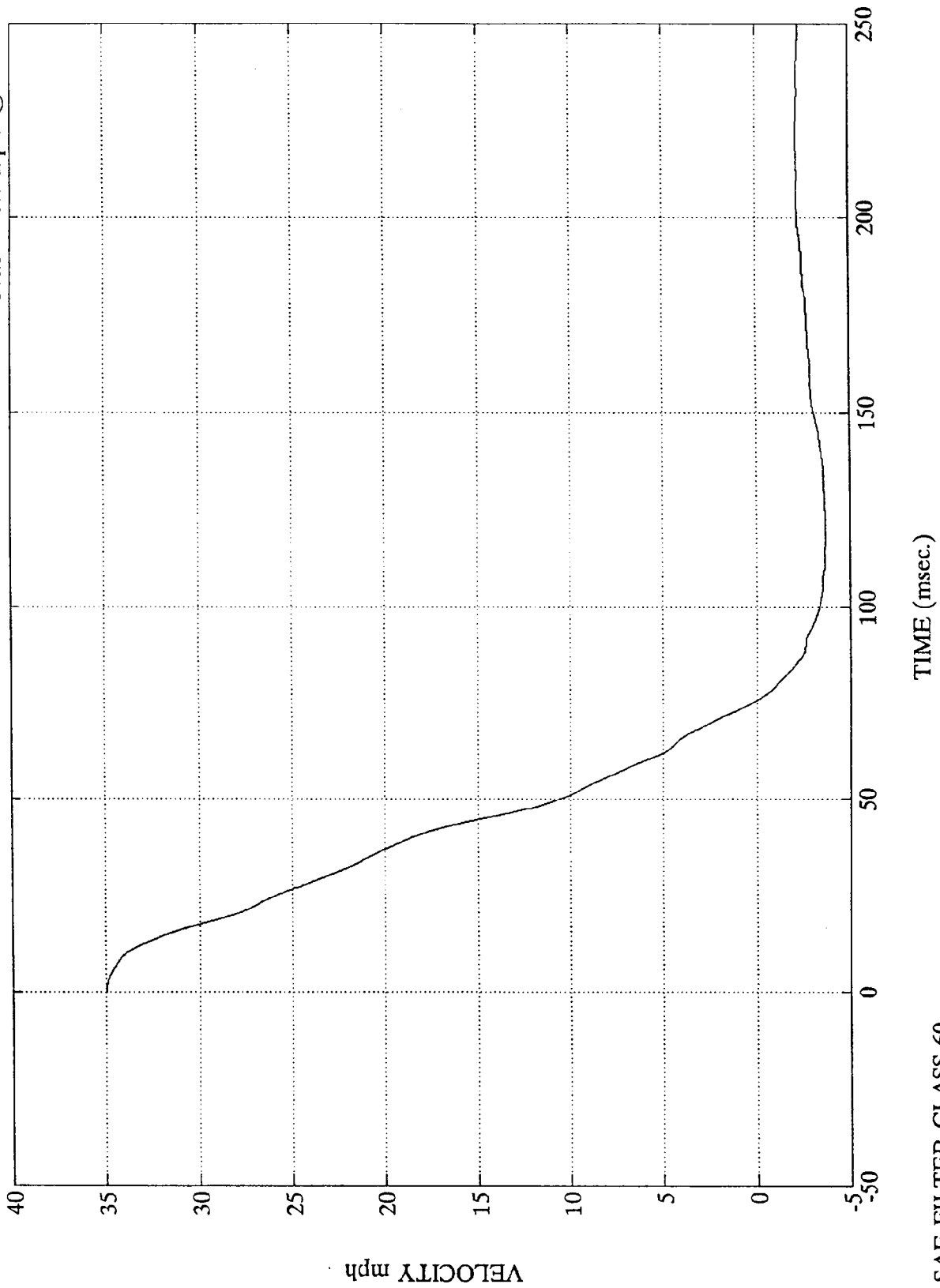


SAE FILTER CLASS 60

Max = 35.0 mph @ 0.5 msec
Min = -3.7 mph @ 121.4 msec

ACCELEROMETER #1(X)

Test 1022

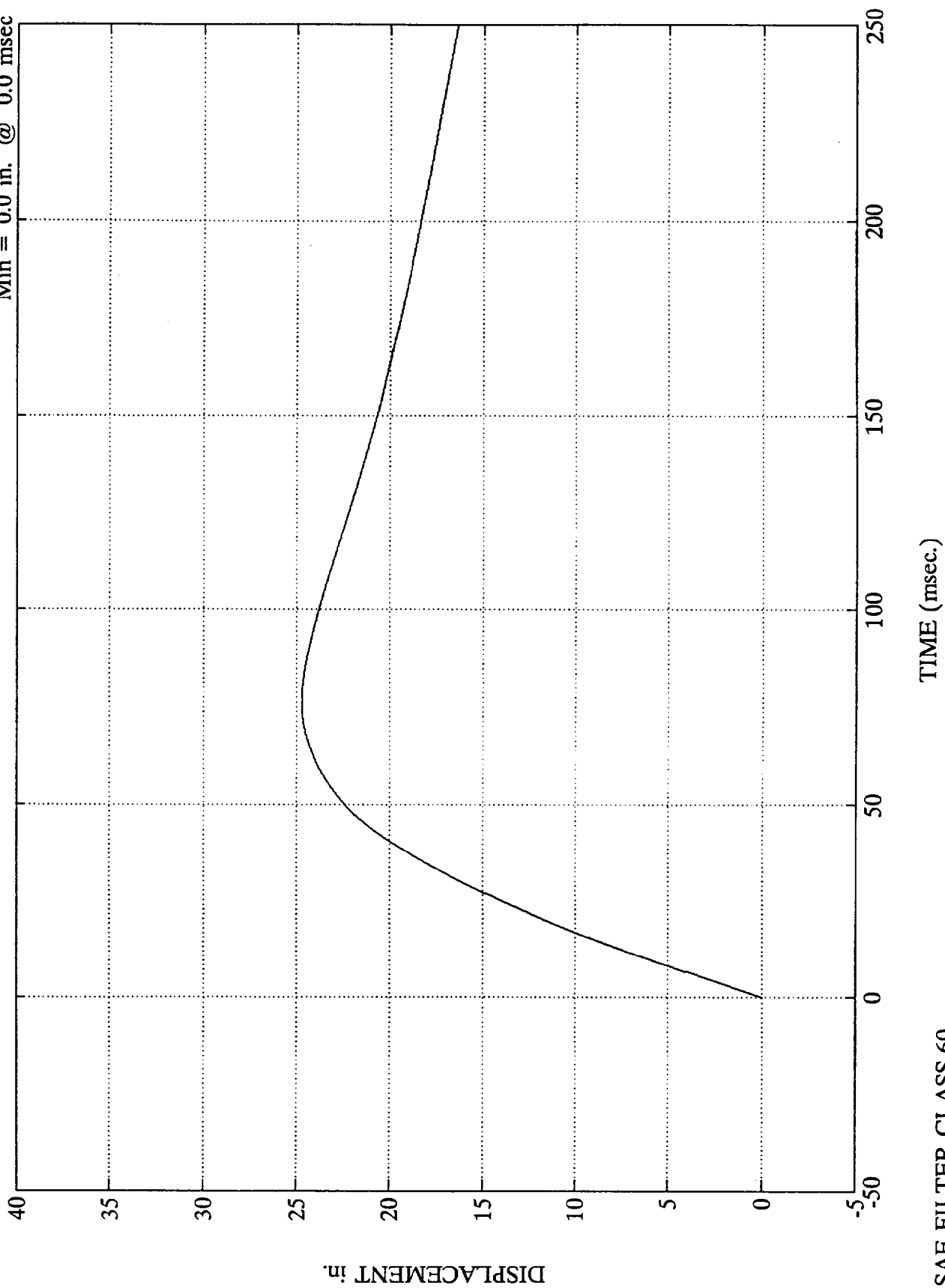


SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #1(X)

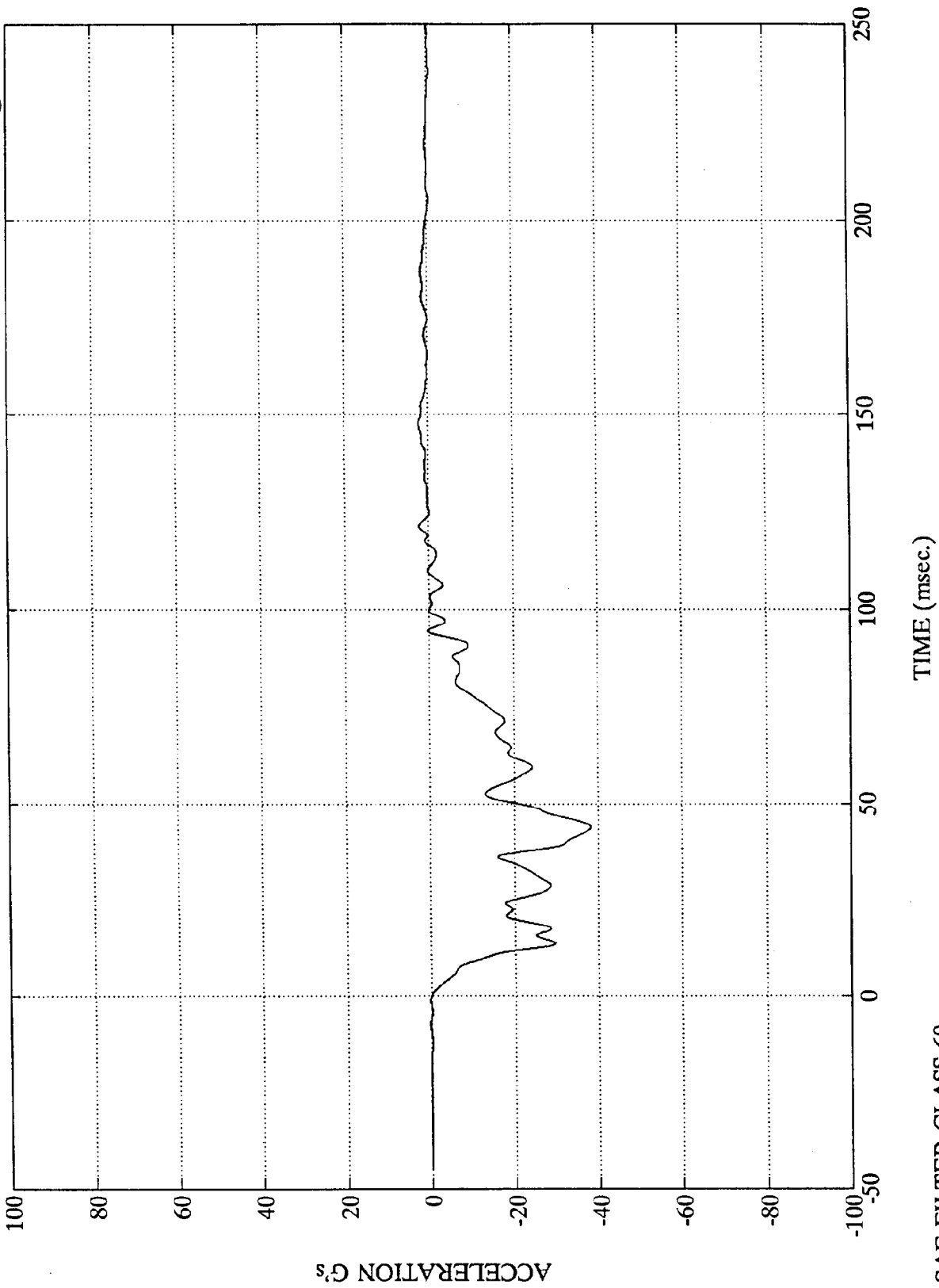
Max = 24.7 in. @ 77.5 msec
Min = 0.0 in. @ 0.0 msec



Test 1022

ACCELEROMETER #2(X)

Max = 2.3 G's @ 147.4 msec
Min = -38.3 G's @ 44.2 msec

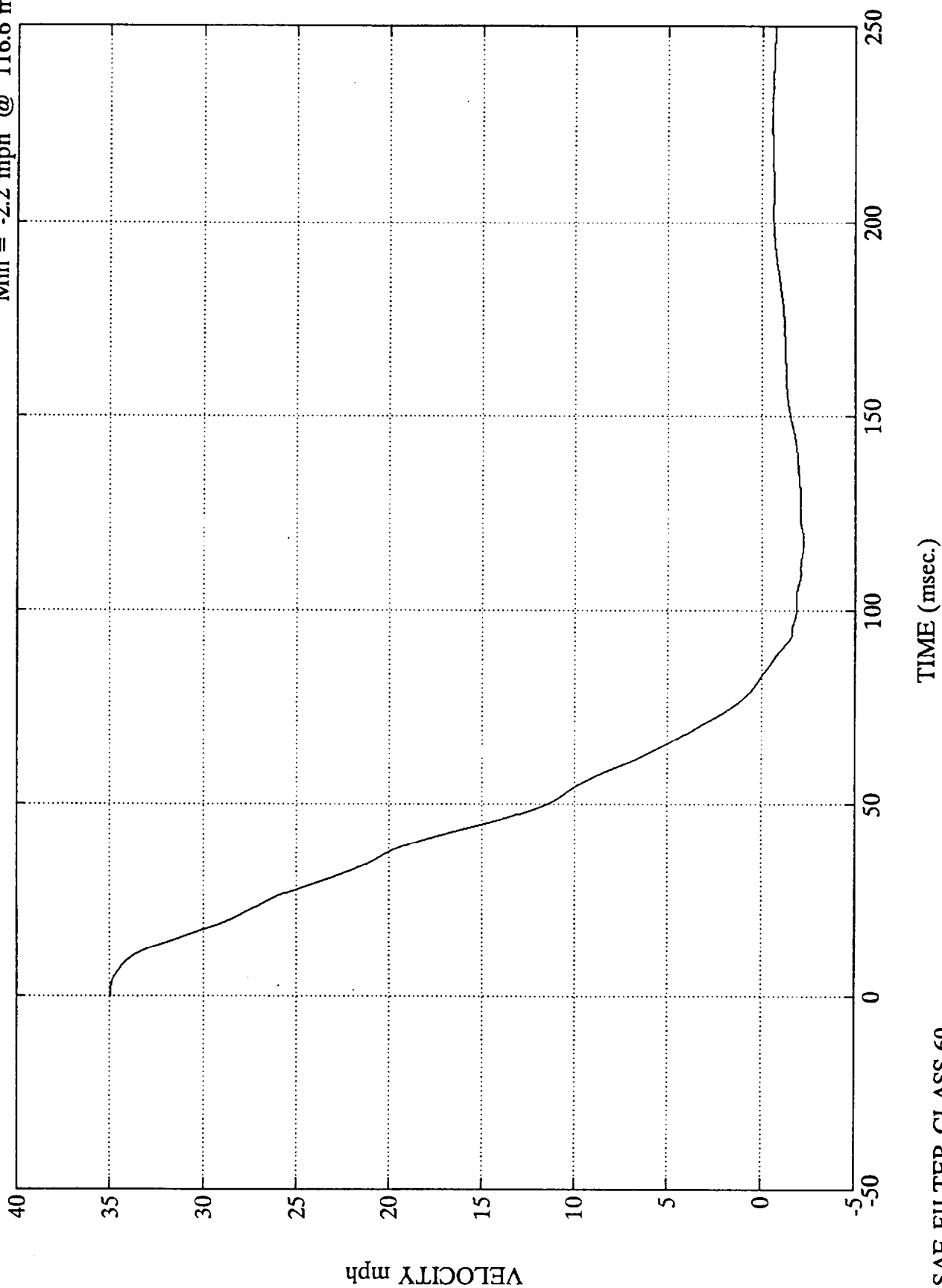


SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #2(X)

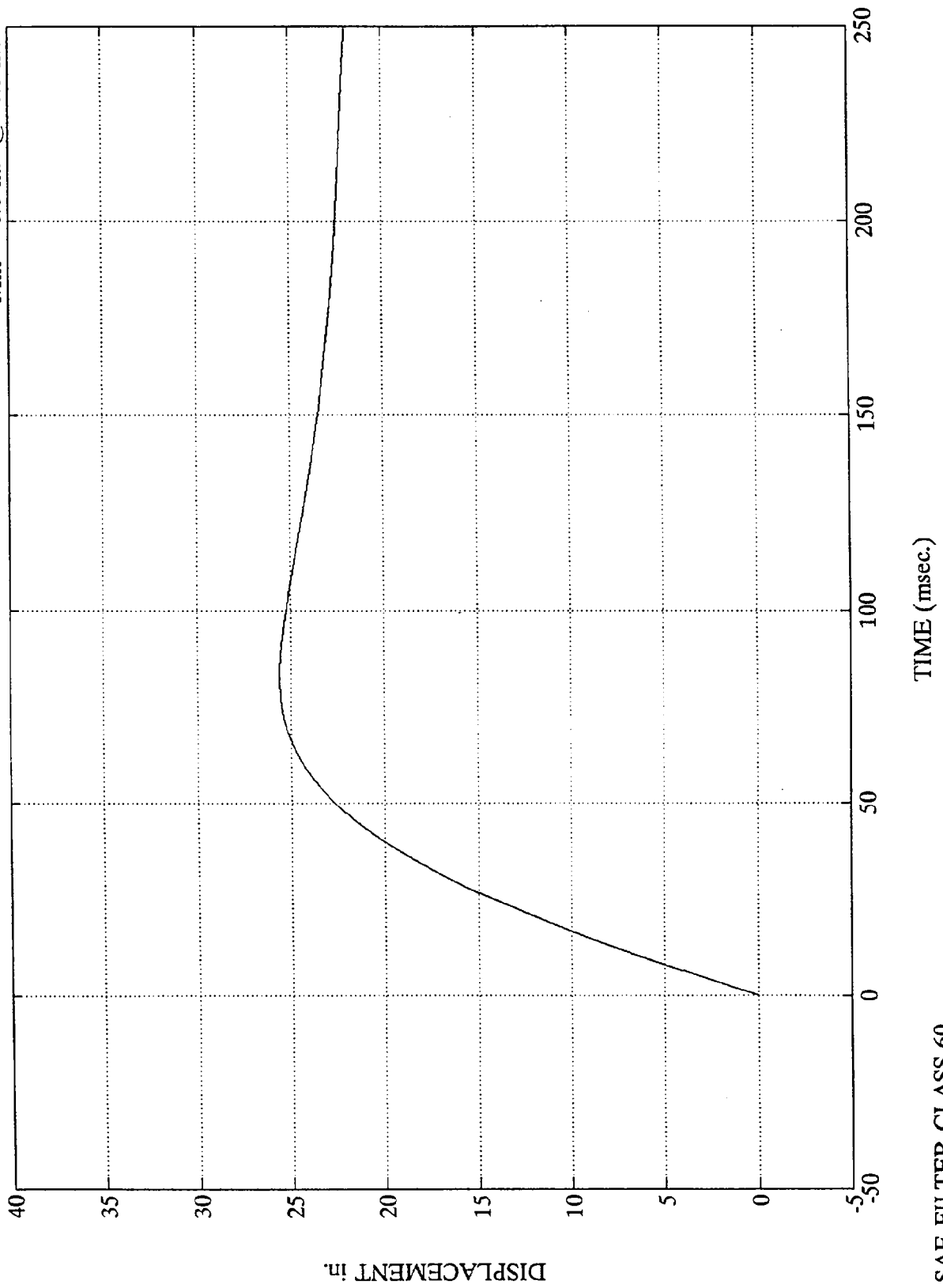
Max = 35.0 mph @ 0.7 msec
Min = -2.2 mph @ 116.6 msec



Test 1022

Max = 25.6 in. @ 84.7 msec
Min = 0.0 in. @ 0.0 msec

ACCELEROMETER #2(X)

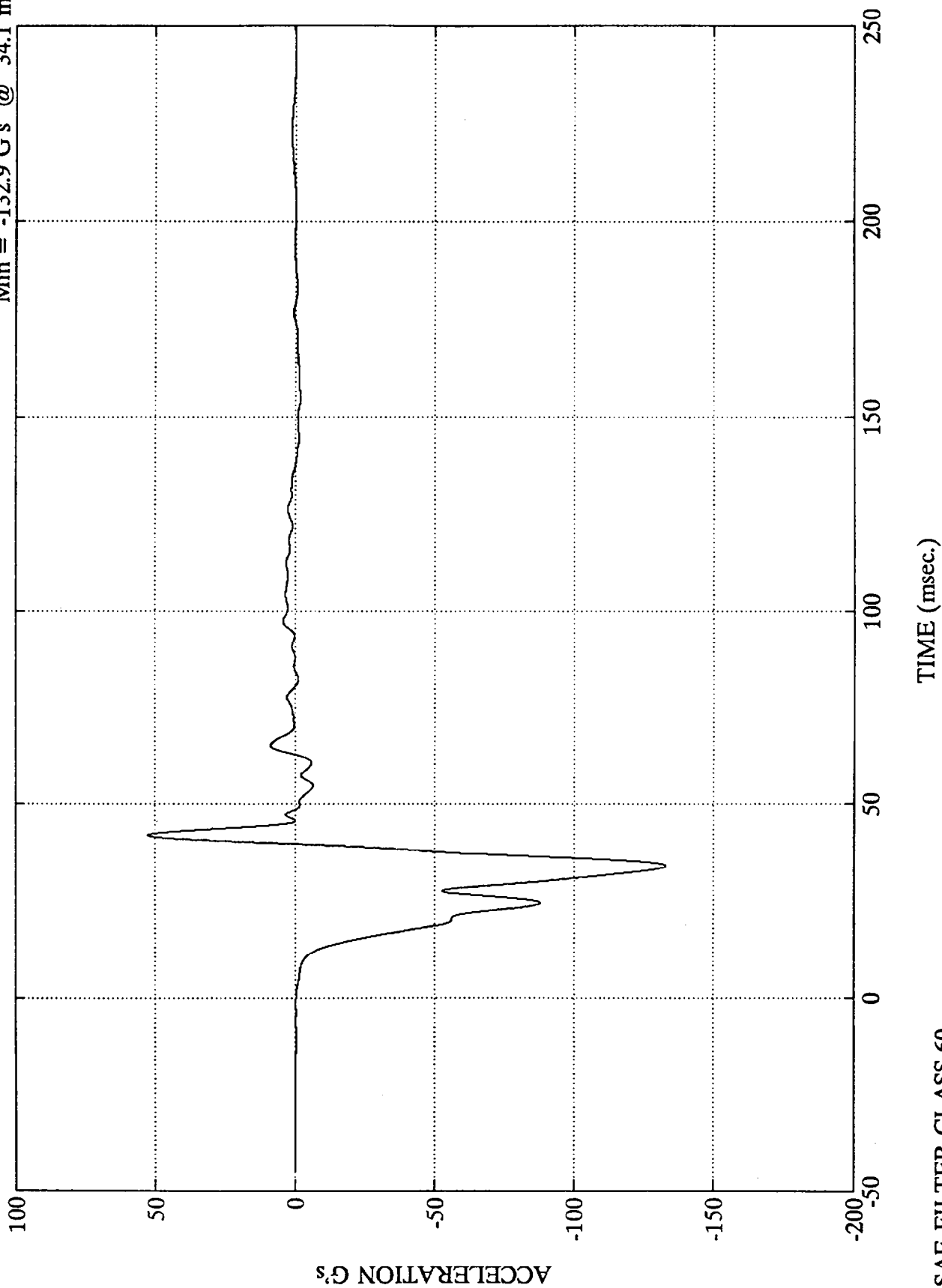


SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #3(X)

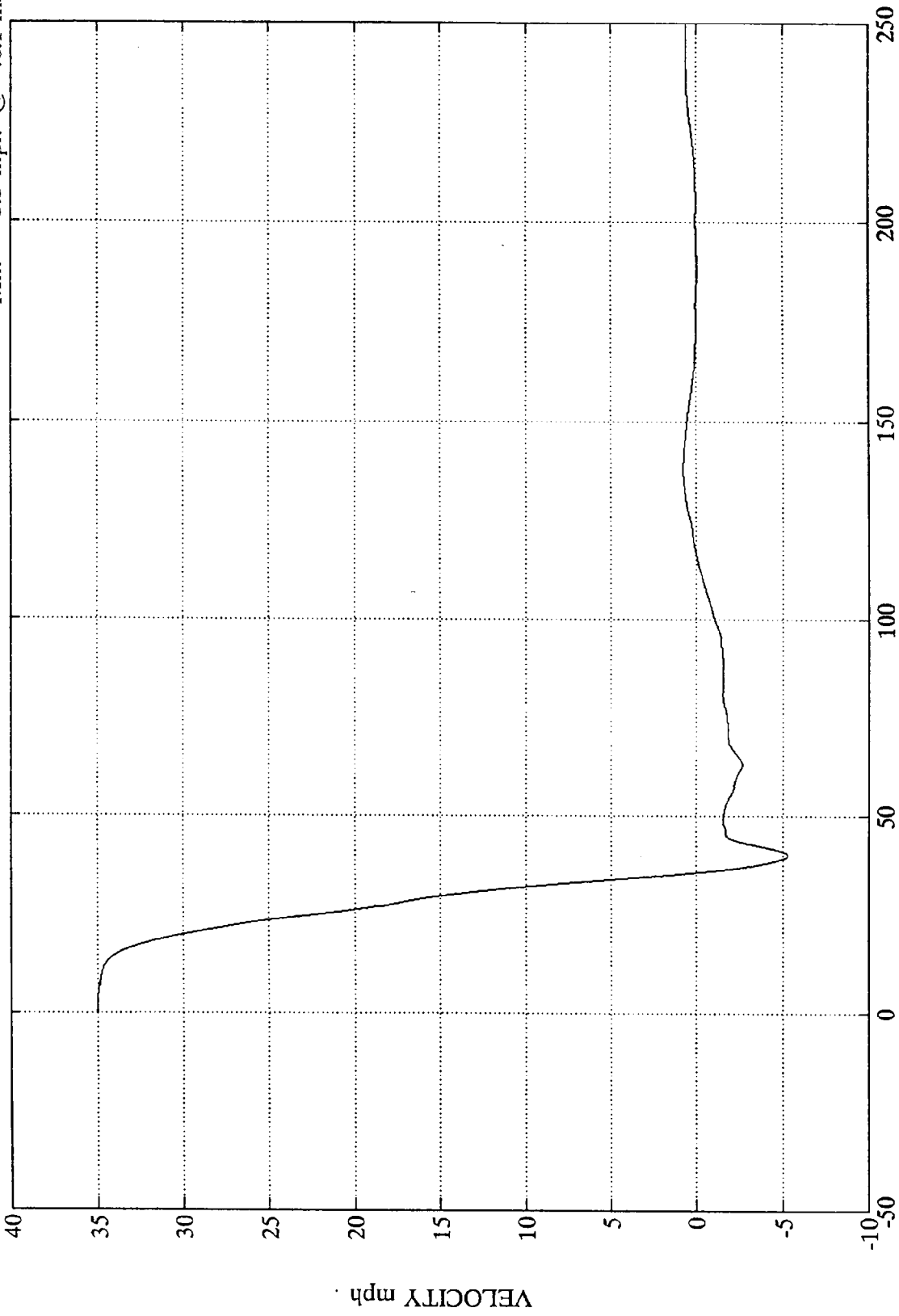
Max = 52.6 G's @ 42.1 msec
Min = -132.9 G's @ 34.1 msec



Test 1022

ACCELEROMETER #3(X)

Max = 35.0 mph @ 1.0 msec
Min = -5.3 mph @ 40.1 msec



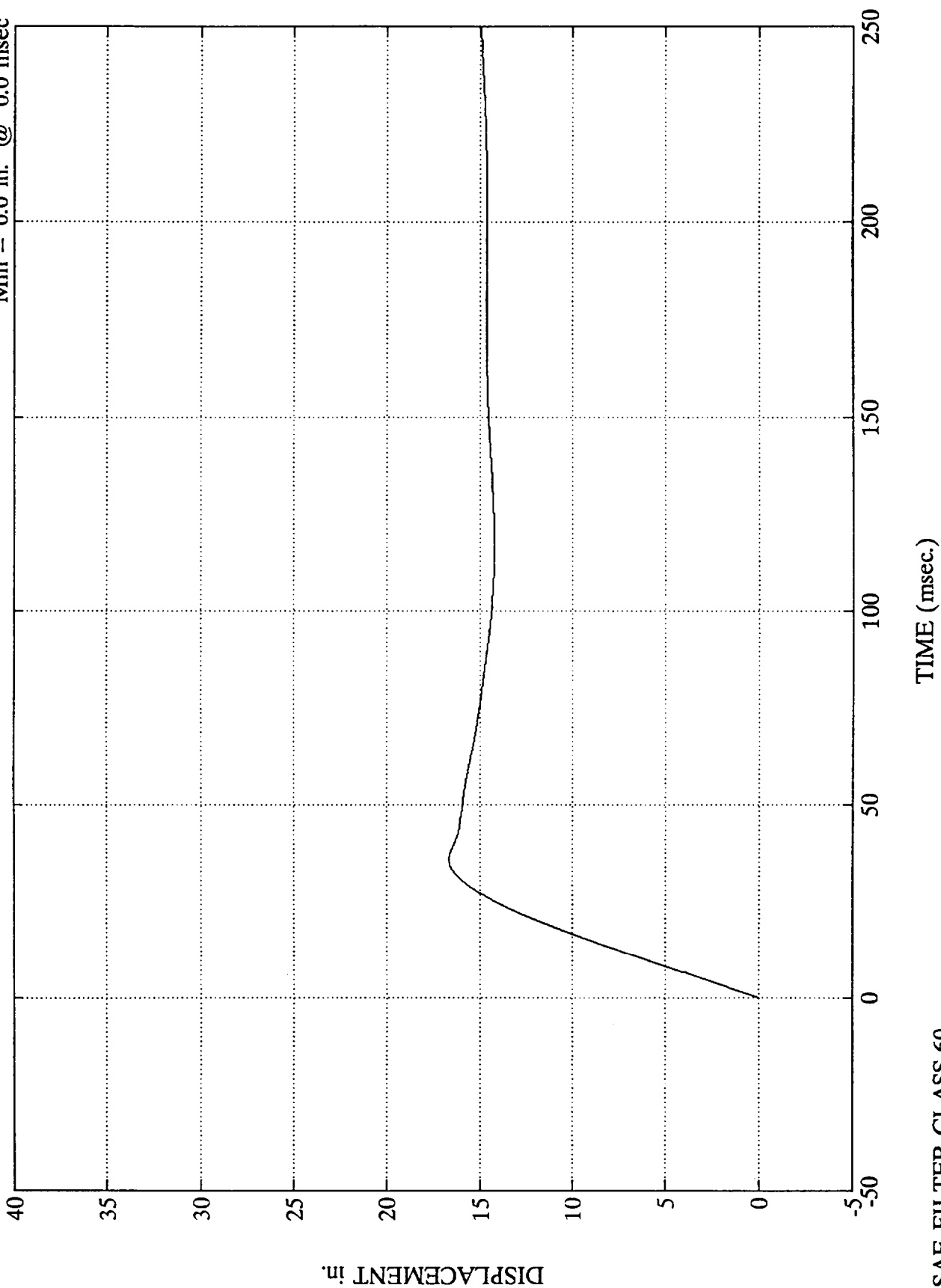
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #3(X)

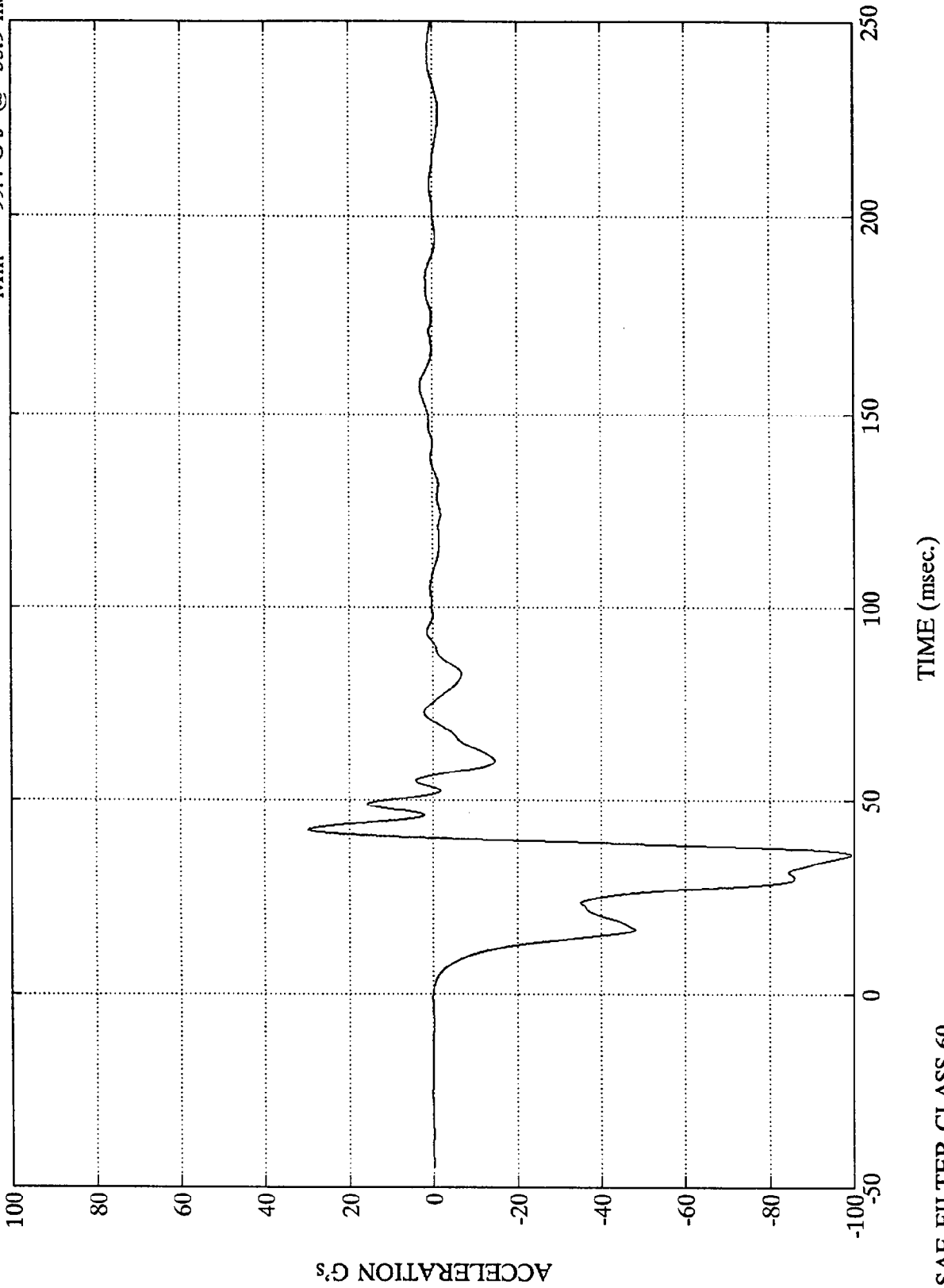
Max = 16.6 in. @ 36.0 msec
Min = 0.0 in. @ 0.0 msec



SAE FILTER CLASS 60

Test 1022
Max = 29.7 G's @ 42.2 msec
Min = -99.4 G's @ 35.9 msec

ACCELEROMETER #4(X)

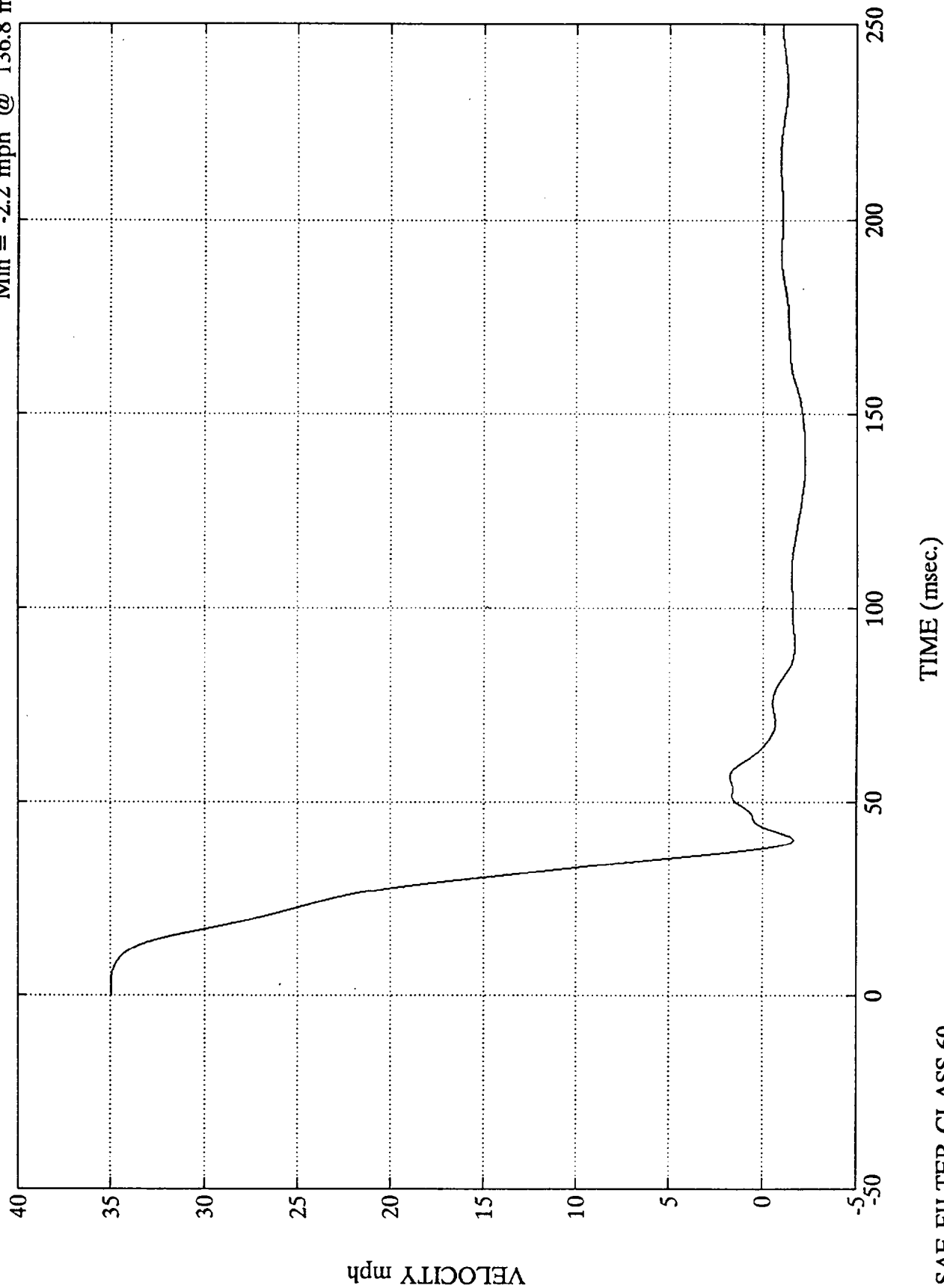


SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #4(X)

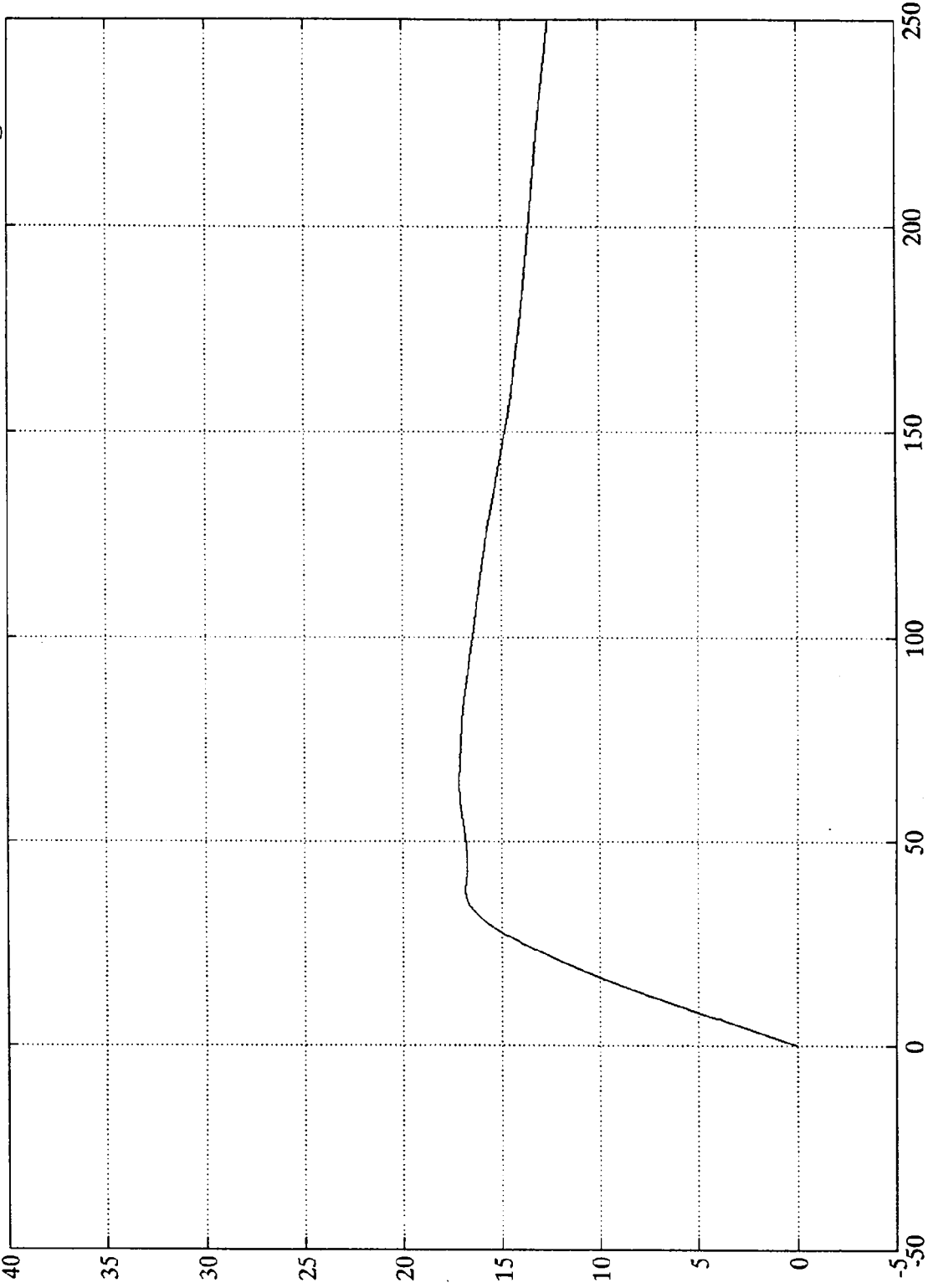
Max = 35.0 mph @ 2.4 msec
Min = -2.2 mph @ 136.8 msec



Test 1022

ACCELEROMETER #4(X)

Max = 17.1 in. @ 66.5 msec
Min = 0.0 in. @ 0.0 msec



TIME (msec.)

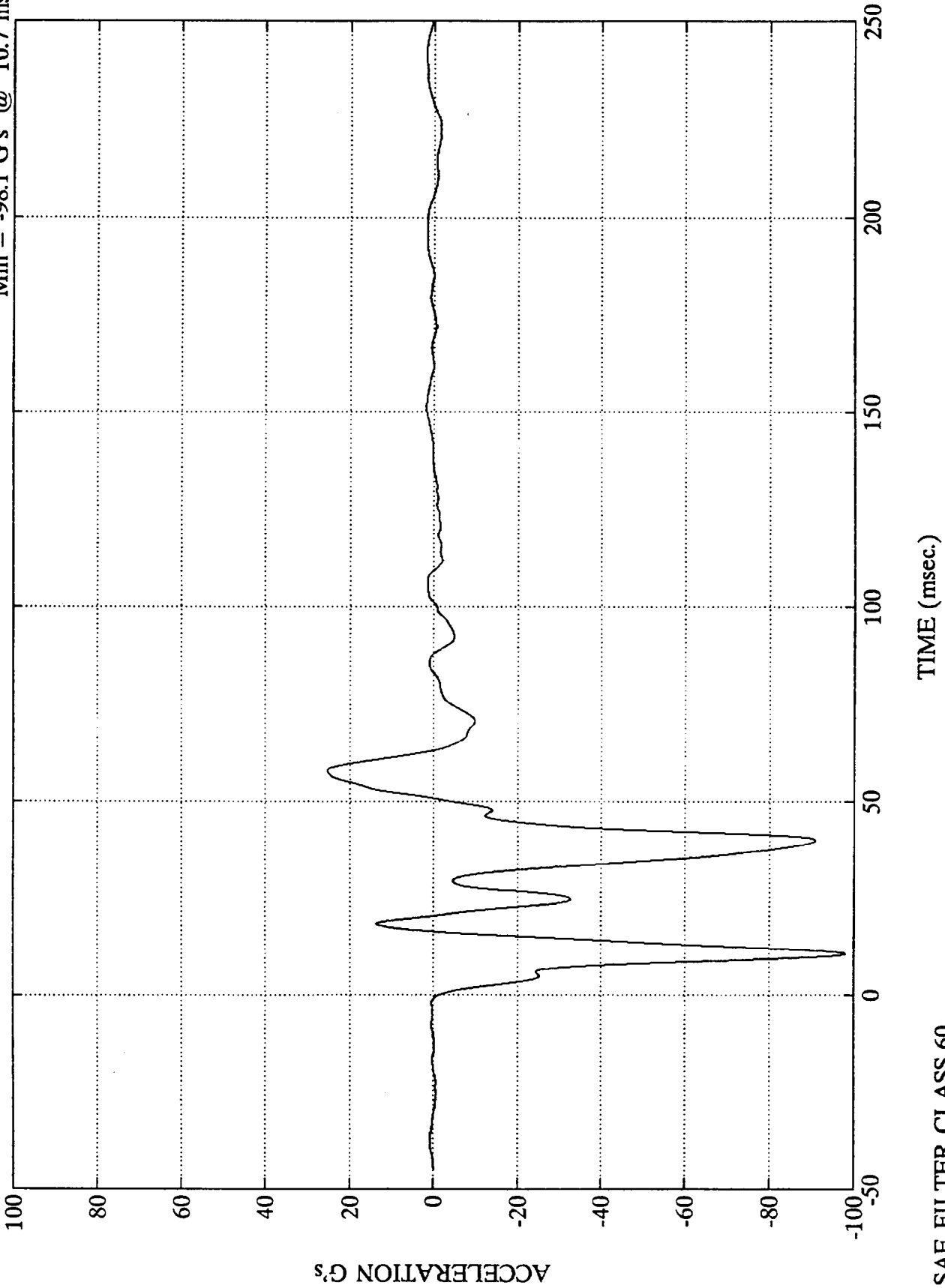
SAE FILTER CLASS 60

DISPLACEMENT in.

Test 1022

ACCELEROMETER #5(X)

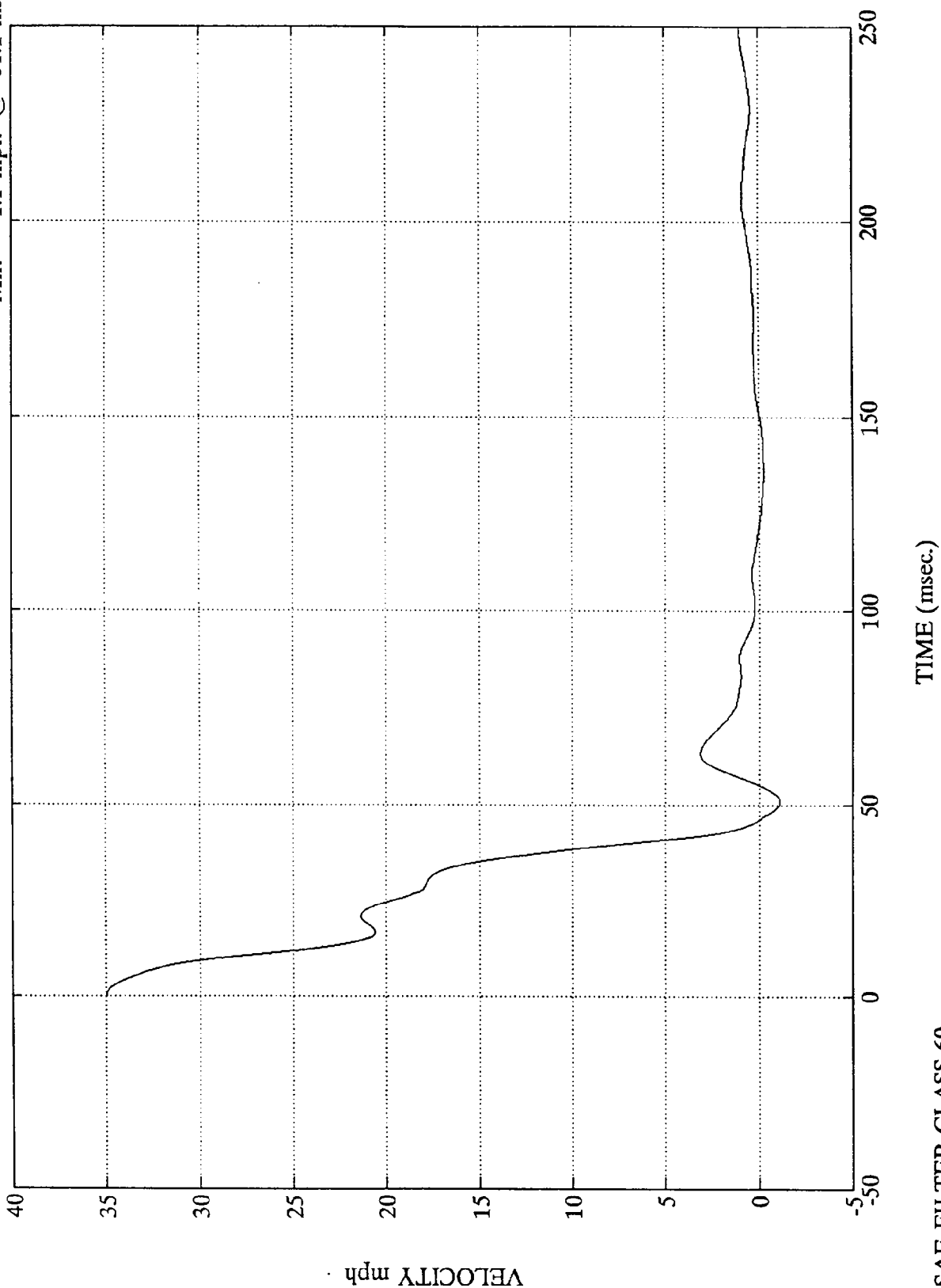
Max = 25.3 G's @ 58.0 msec
Min = -98.1 G's @ 10.7 msec



Test 1022

ACCELEROMETER #5(X)

Max = 35.0 mph @ 0.0 msec
Min = -1.1 mph @ 51.1 msec

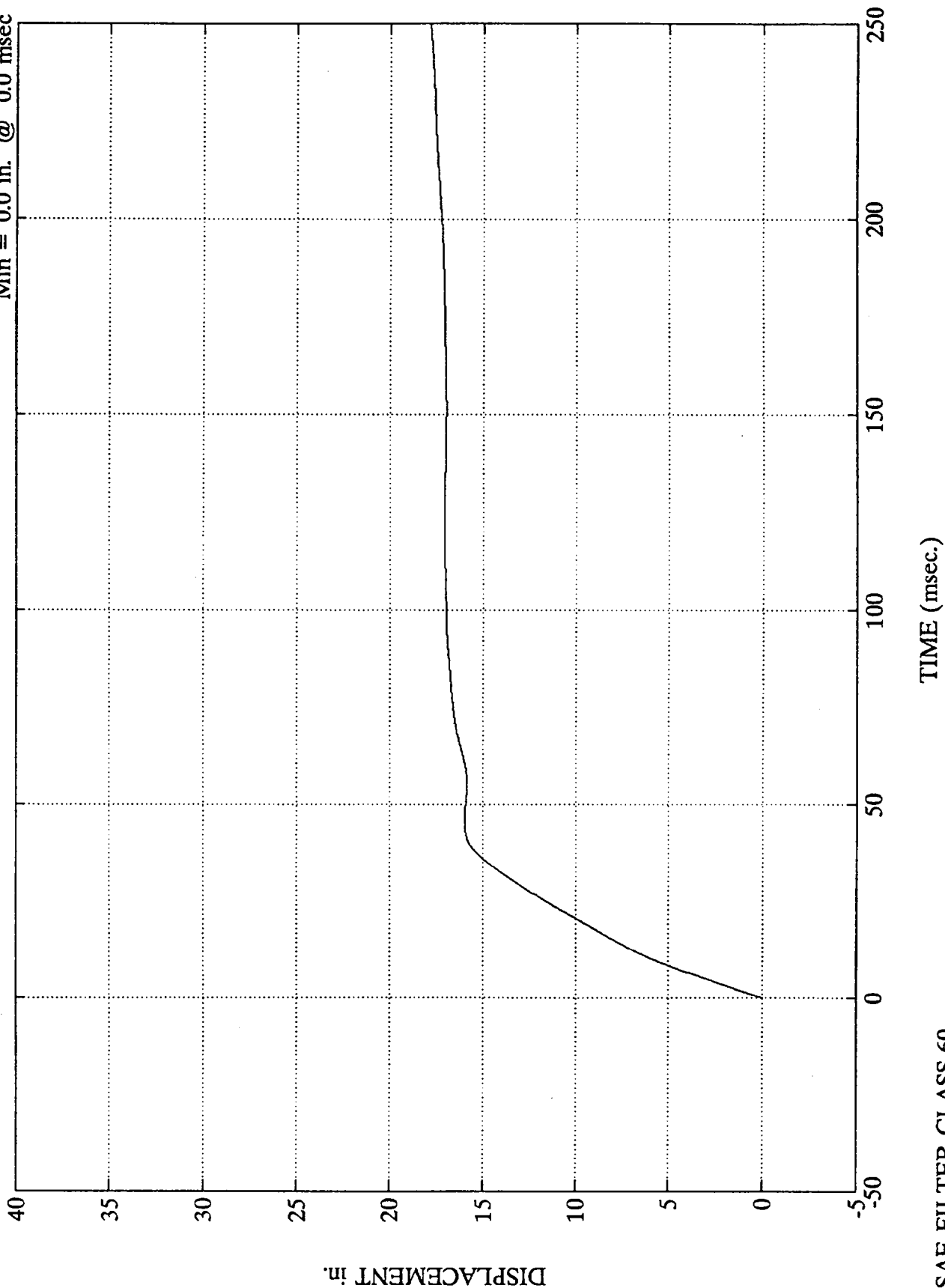


SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #5(X)

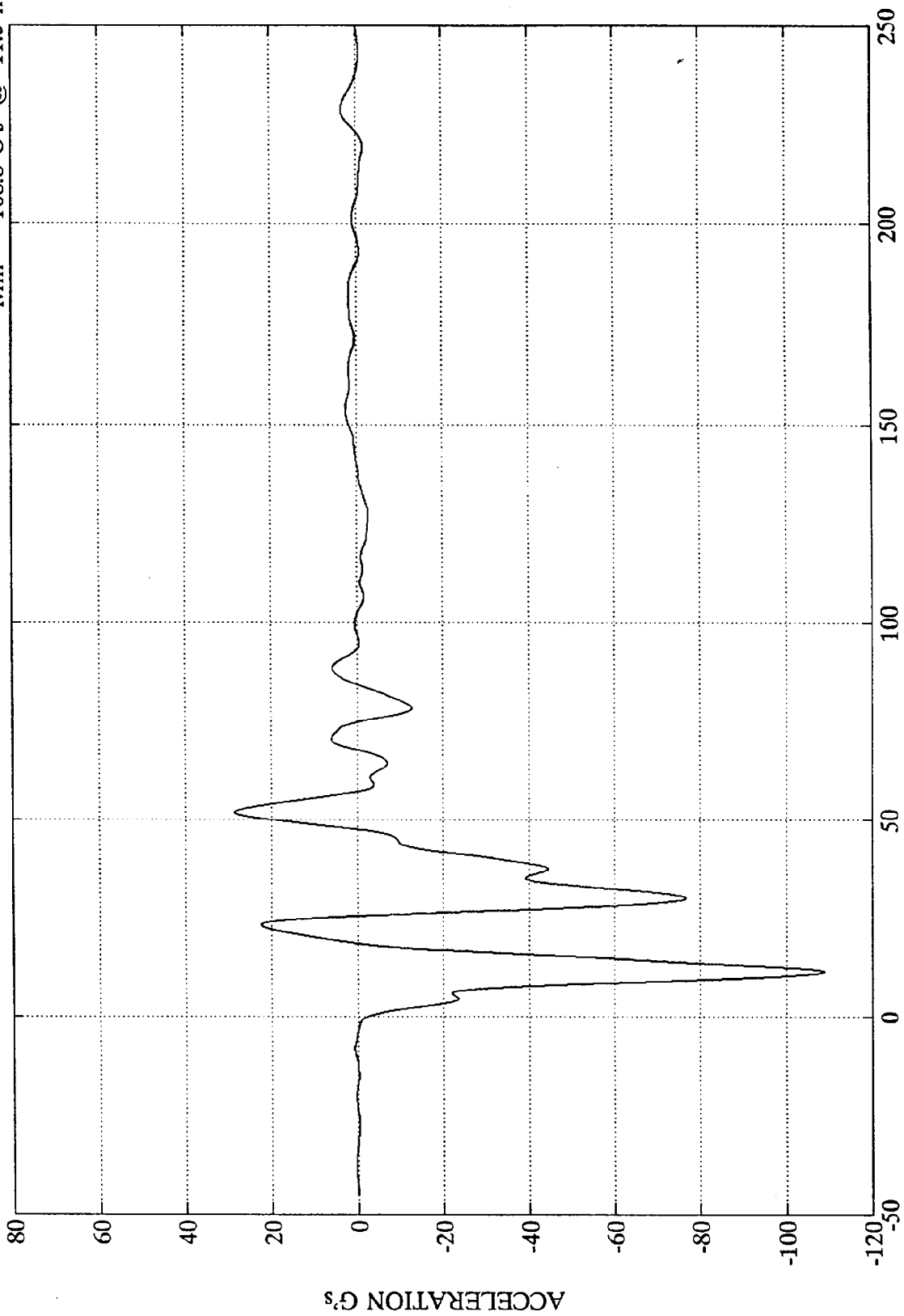
Max = 18.0 in. @ 254.9 msec
Min = 0.0 in. @ 0.0 msec



SAE FILTER CLASS 60

Test 1022
Max = 28.6 G's @ 52.1 msec
Min = -108.8 G's @ 11.5 msec

ACCELEROMETER #6(X)



TIME (msec.)

SAE FILTER CLASS 60

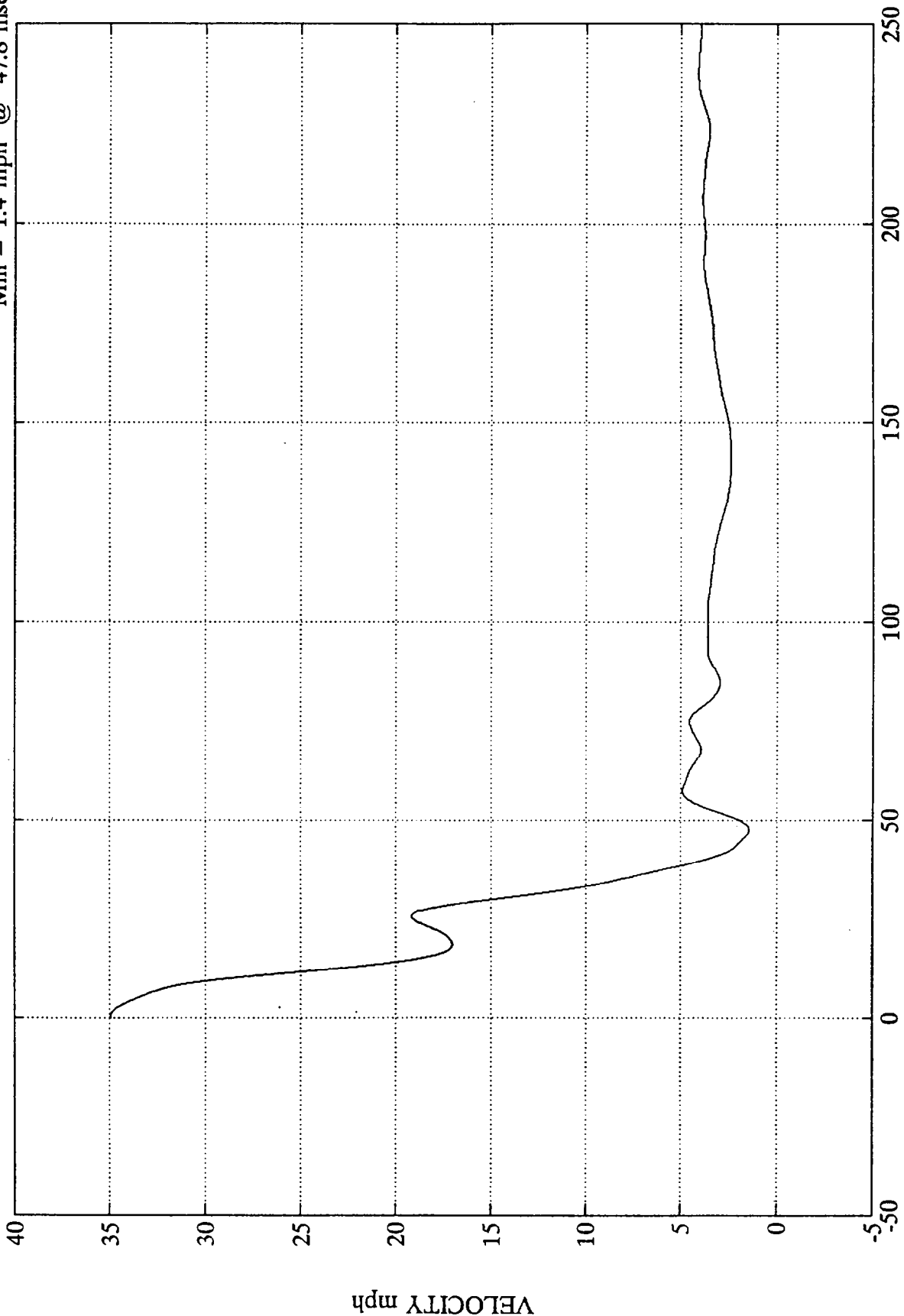
Test 1022

ACCELERATION G's

Test 1022

ACCELEROMETER #6(X)

Max = 35.0 mph @ 0.0 msec
Min = 1.4 mph @ 47.8 msec



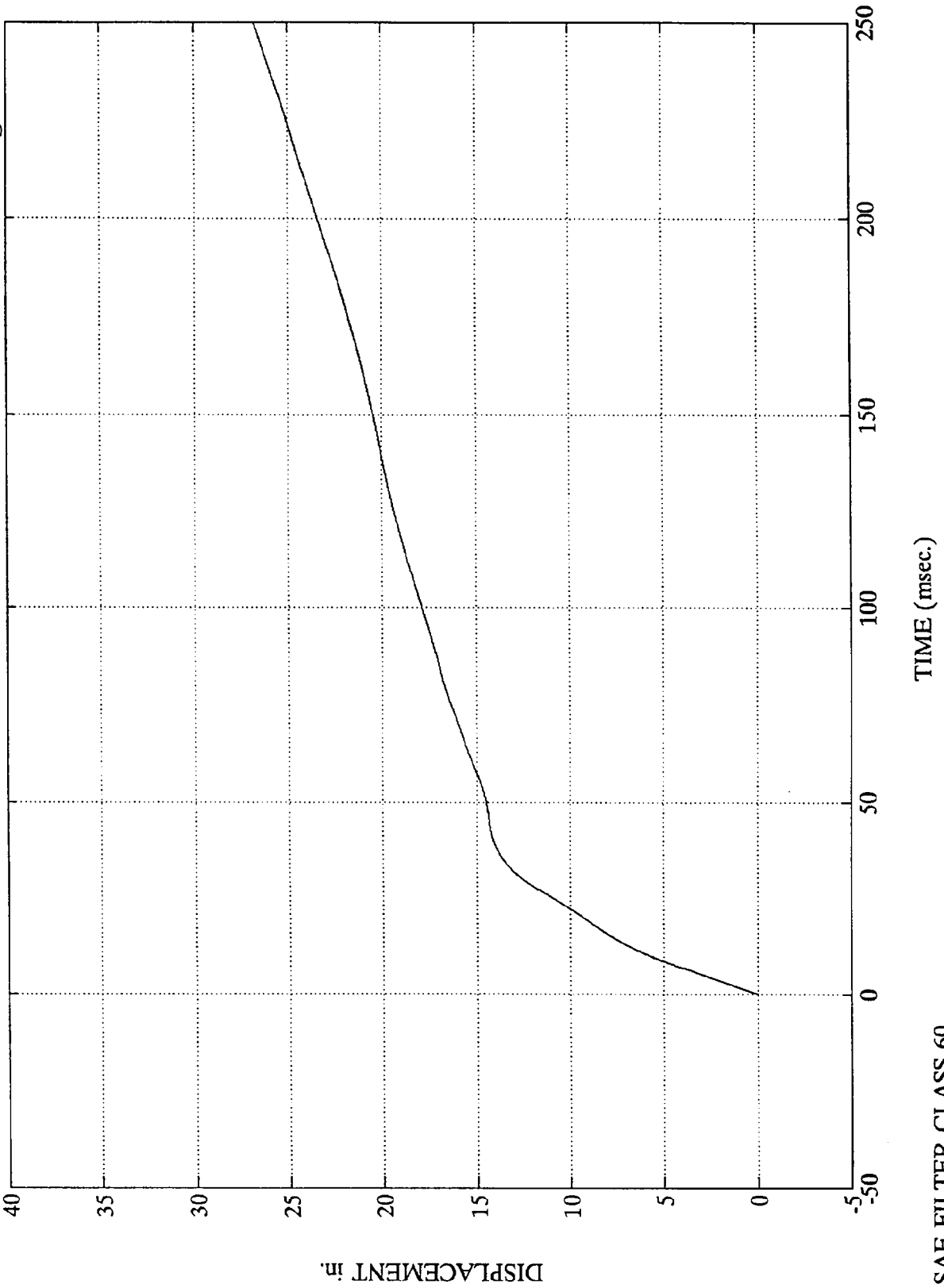
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #6(X)

Max = 27.2 in. @ 254.9 msec
Min = 0.0 in. @ 0.0 msec



SAE FILTER CLASS 60

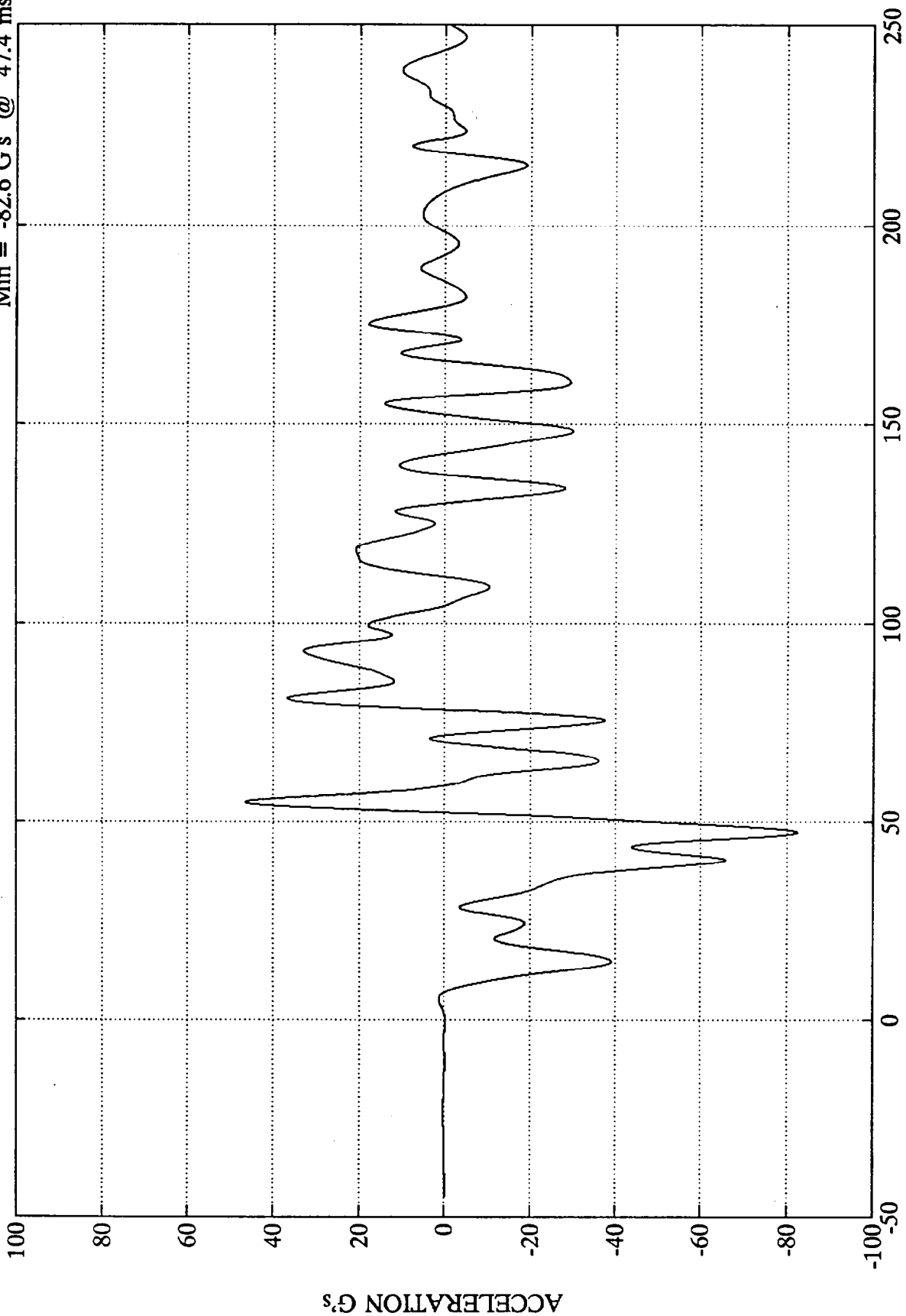
B-20

7862-3

Test 1022

ACCELEROMETER #7(X)

Max = 46.6 G's @ 55.0 msec
Min = -82.6 G's @ 47.4 msec



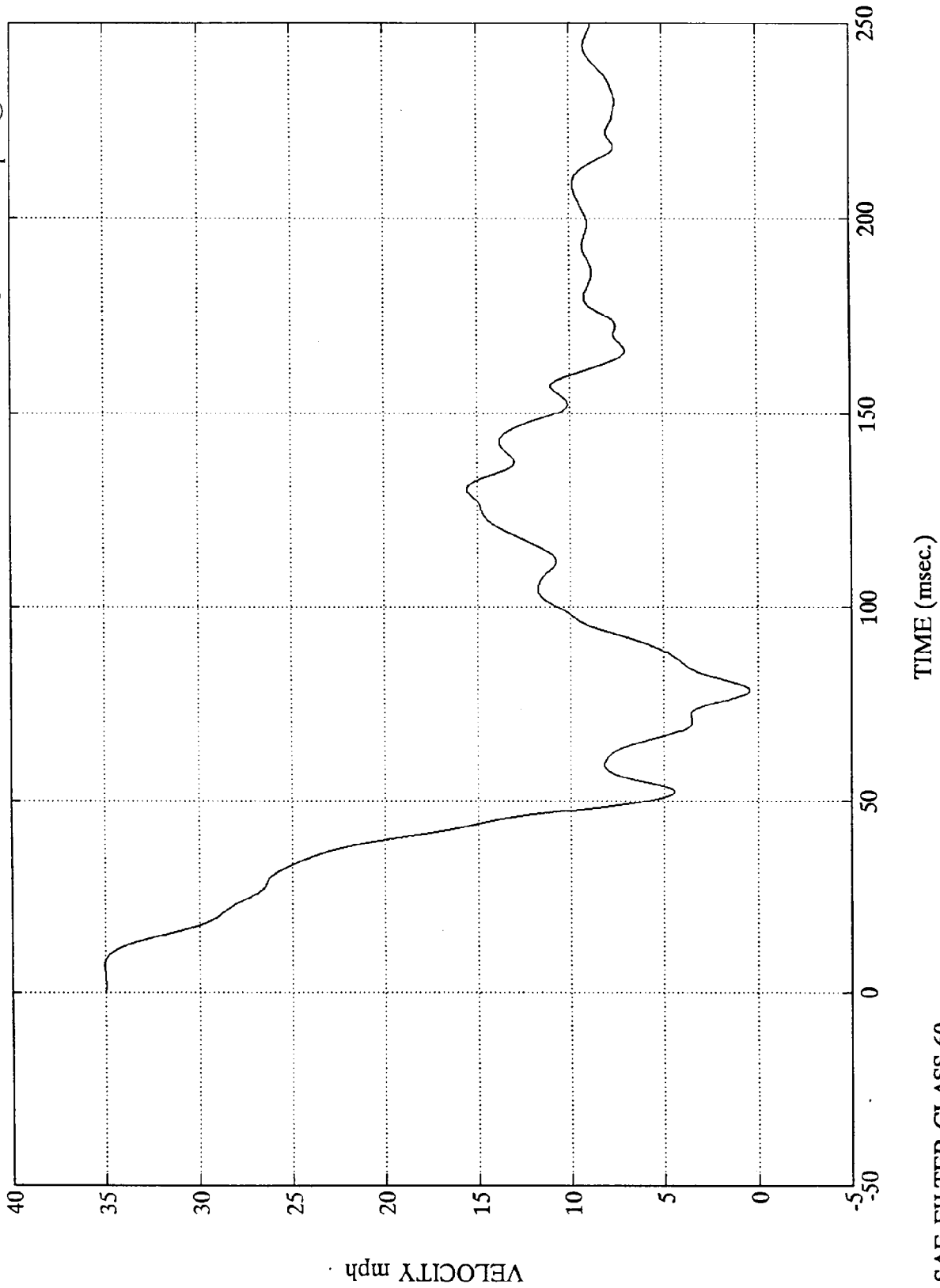
TIME (msec.)

SAE FILTER CLASS 60

Max = 35.1 mph @ 7.4 msec
Min = 0.4 mph @ 78.5 msec

ACCELEROMETER #7(X)

Test 1022



SAE FILTER CLASS 60

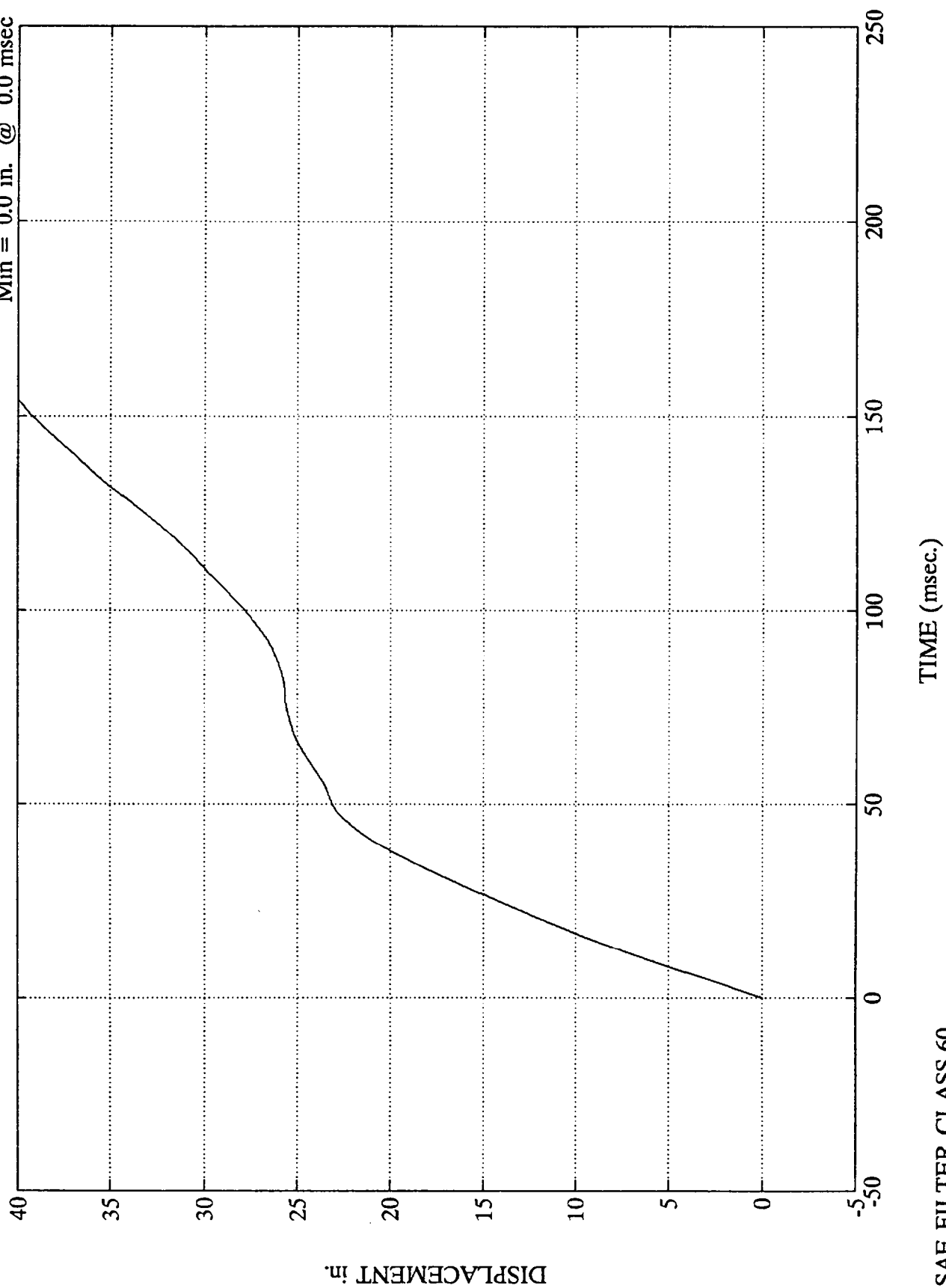
7862-3

B-22

Test 1022

ACCELEROMETER #7(X)

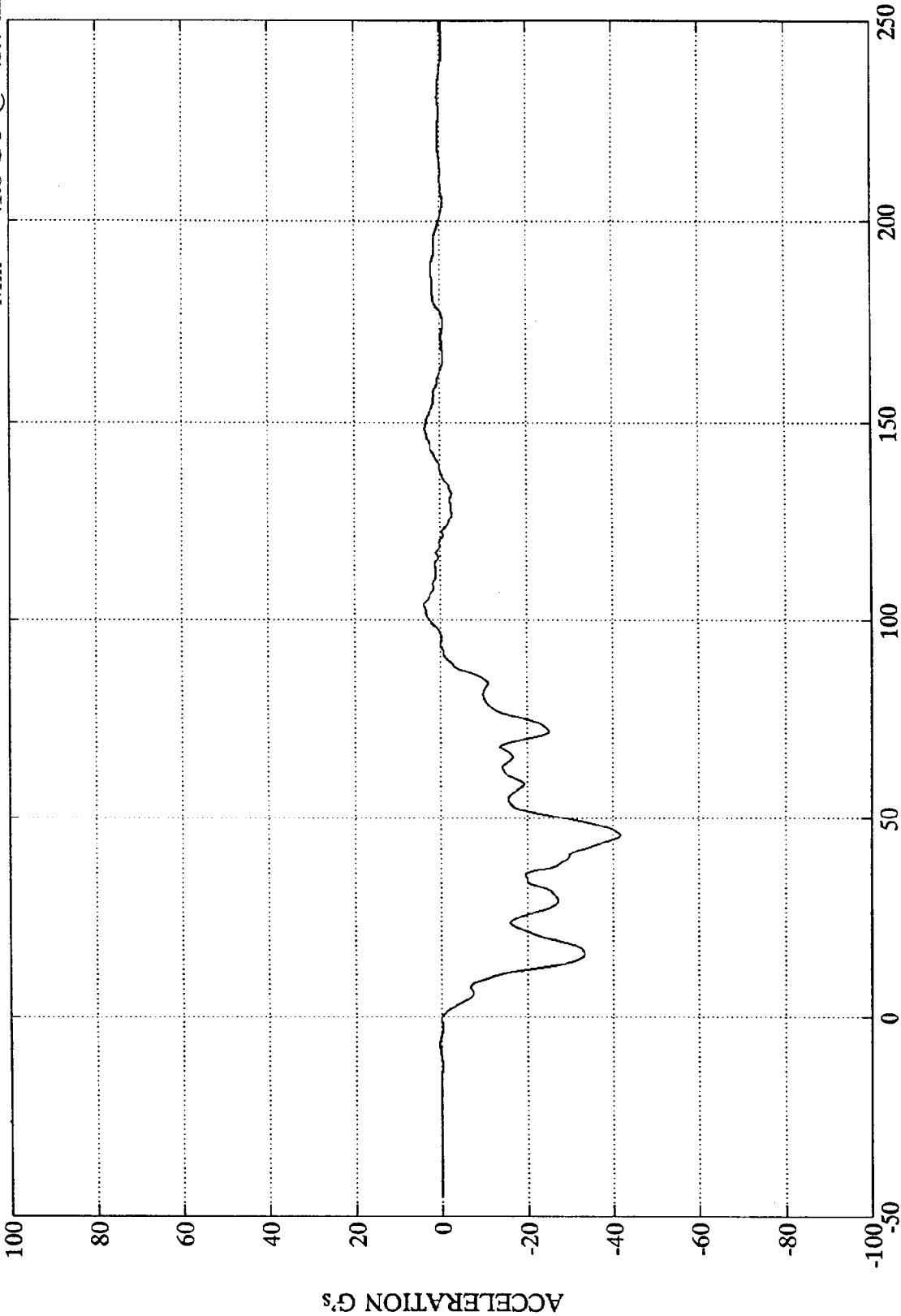
Max = 55.4 in. @ 254.9 msec
Min = 0.0 in. @ 0.0 msec



Test 1022

ACCELEROMETER #8(X)

Max = 3.8 G's @ 104.2 msec
Min = -41.8 G's @ 45.7 msec



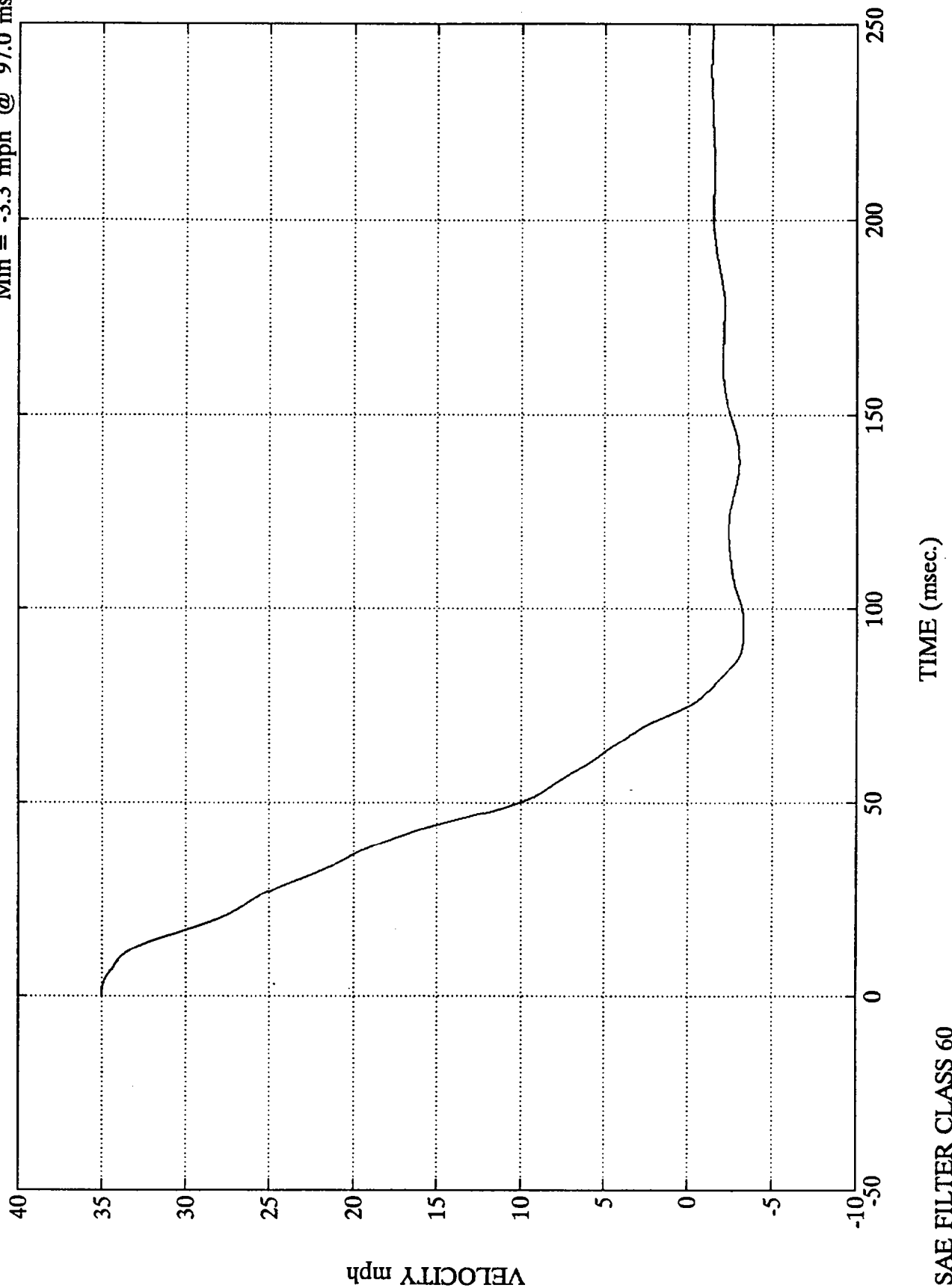
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #8(X)

Max = 35.0 mph @ 0.7 msec
Min = -3.3 mph @ 97.0 msec

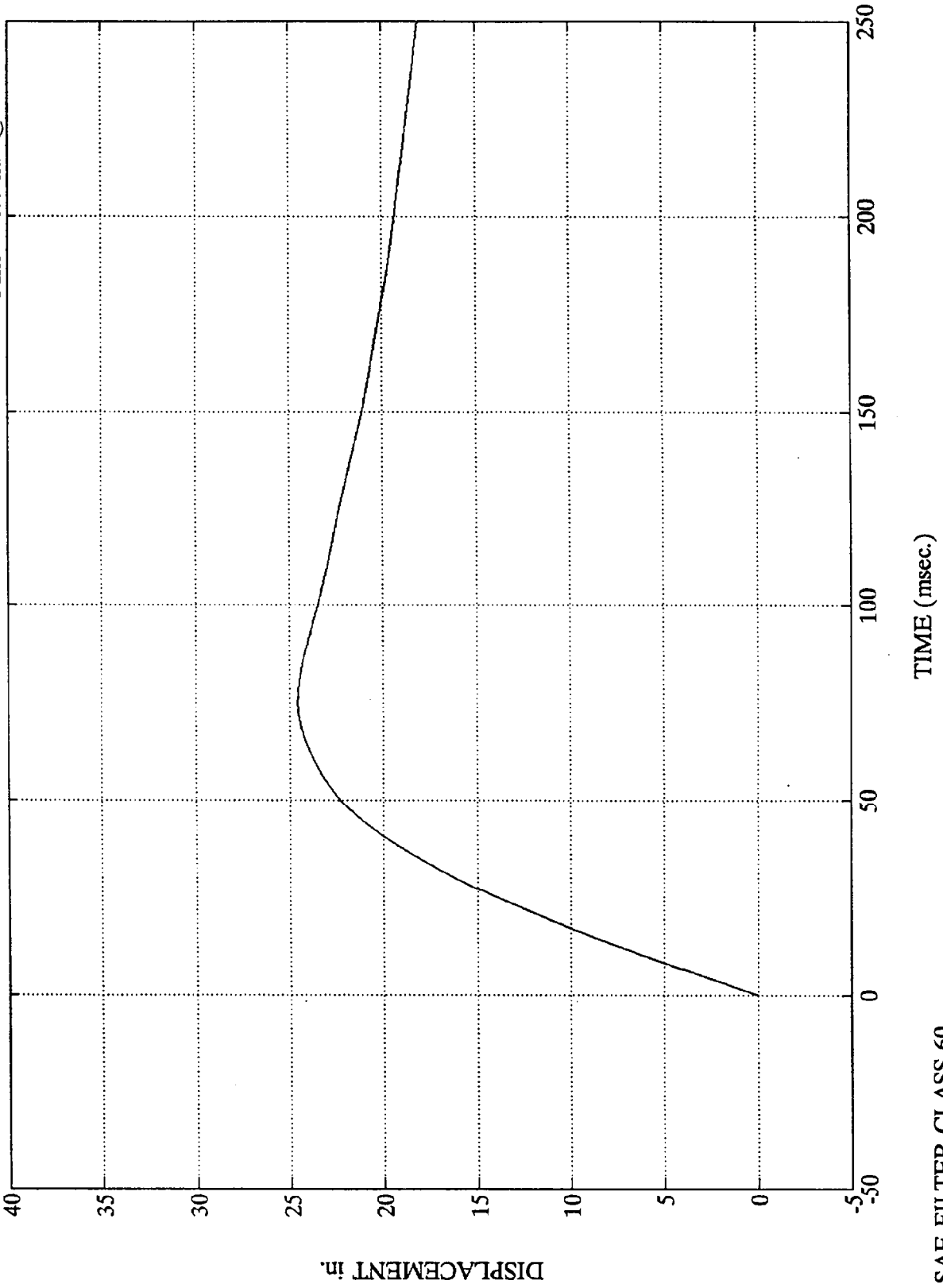


SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #8(X)

Max = 24.6 in. @ 75.8 msec
Min = 0.0 in. @ 0.0 msec

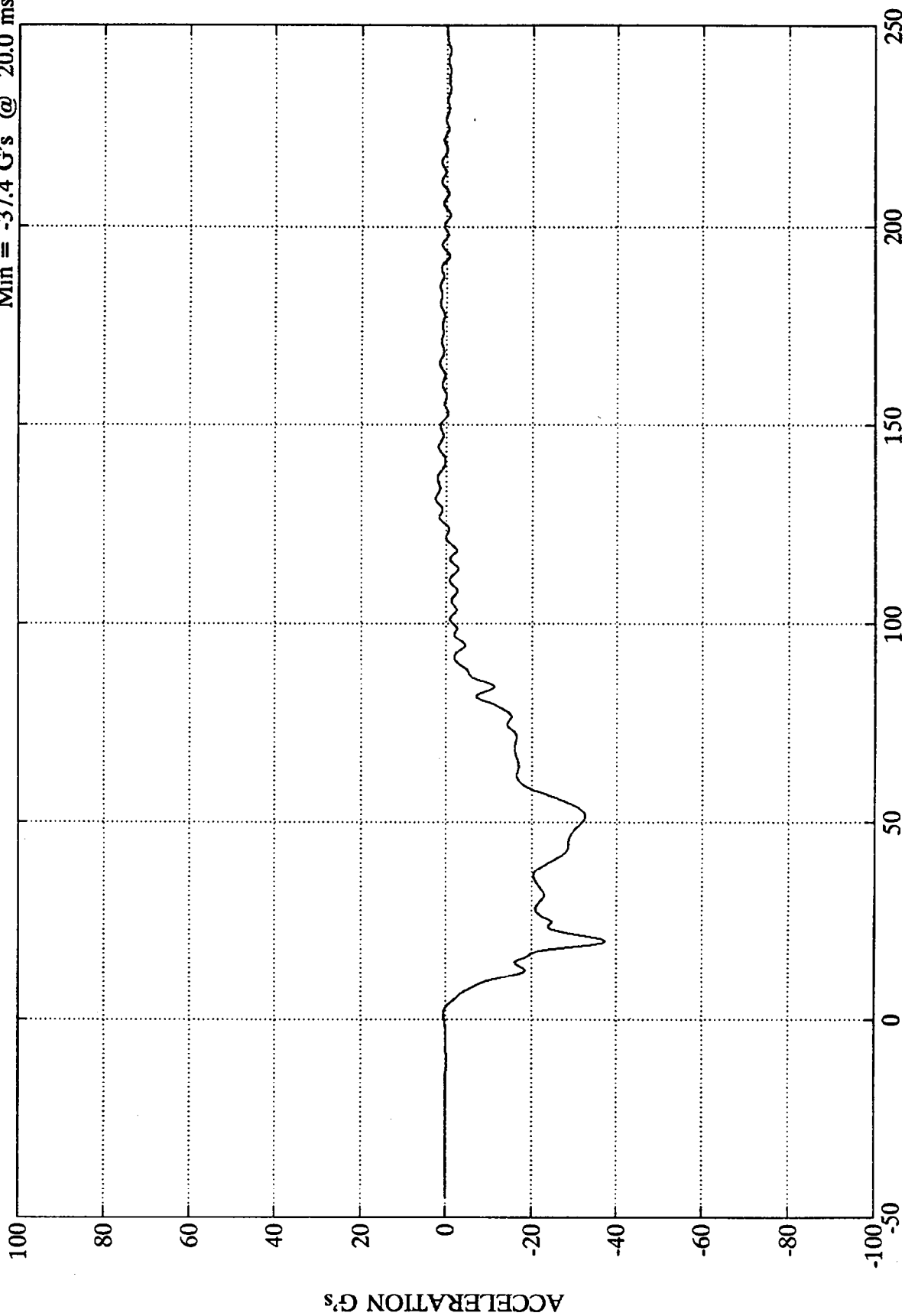


SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #9(X)

Max = 2.5 G's @ 131.6 msec
Min = -37.4 G's @ 20.0 msec



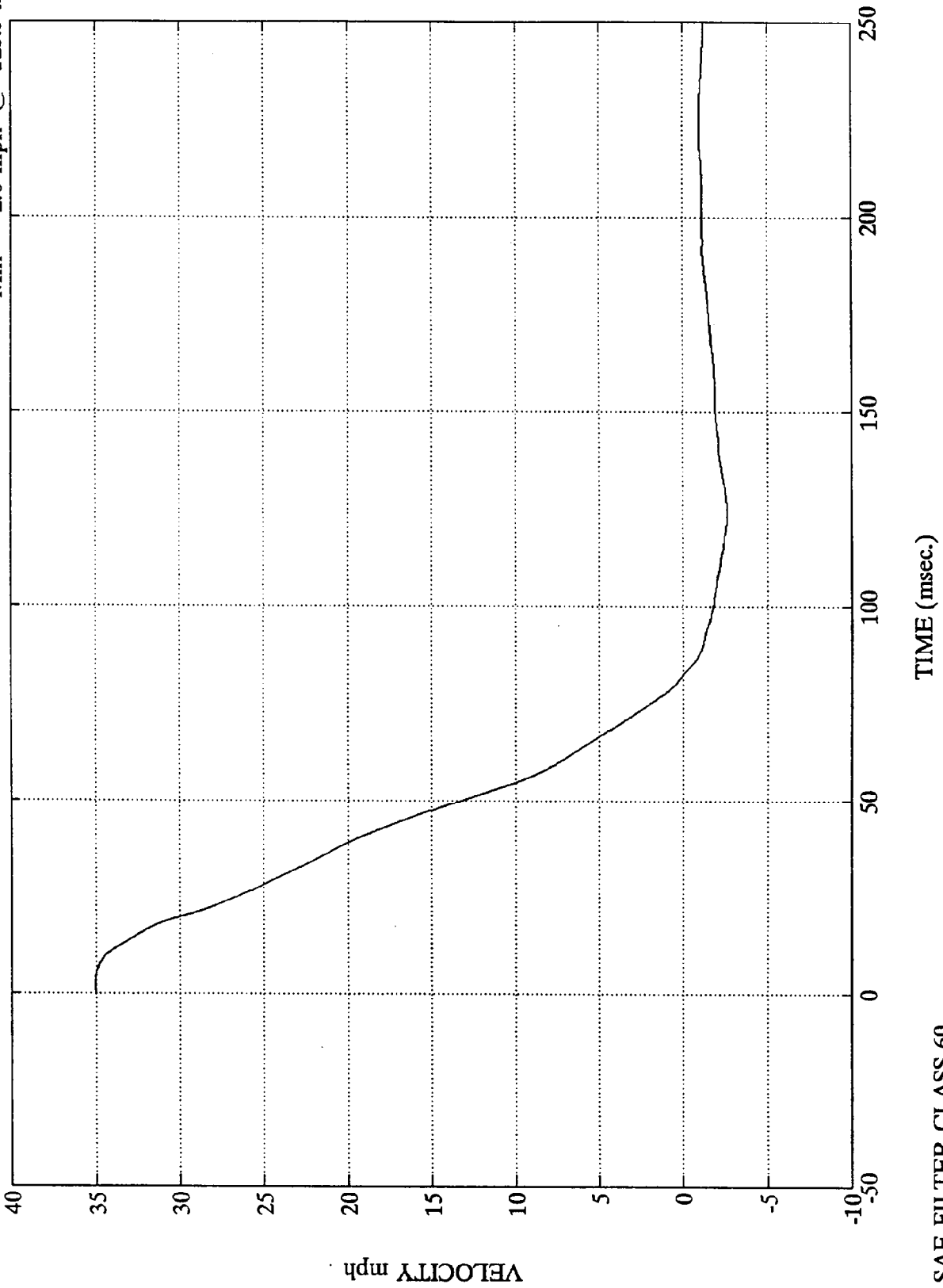
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #9(X)

Max = 35.0 mph @ 3.4 msec
Min = -2.6 mph @ 125.3 msec

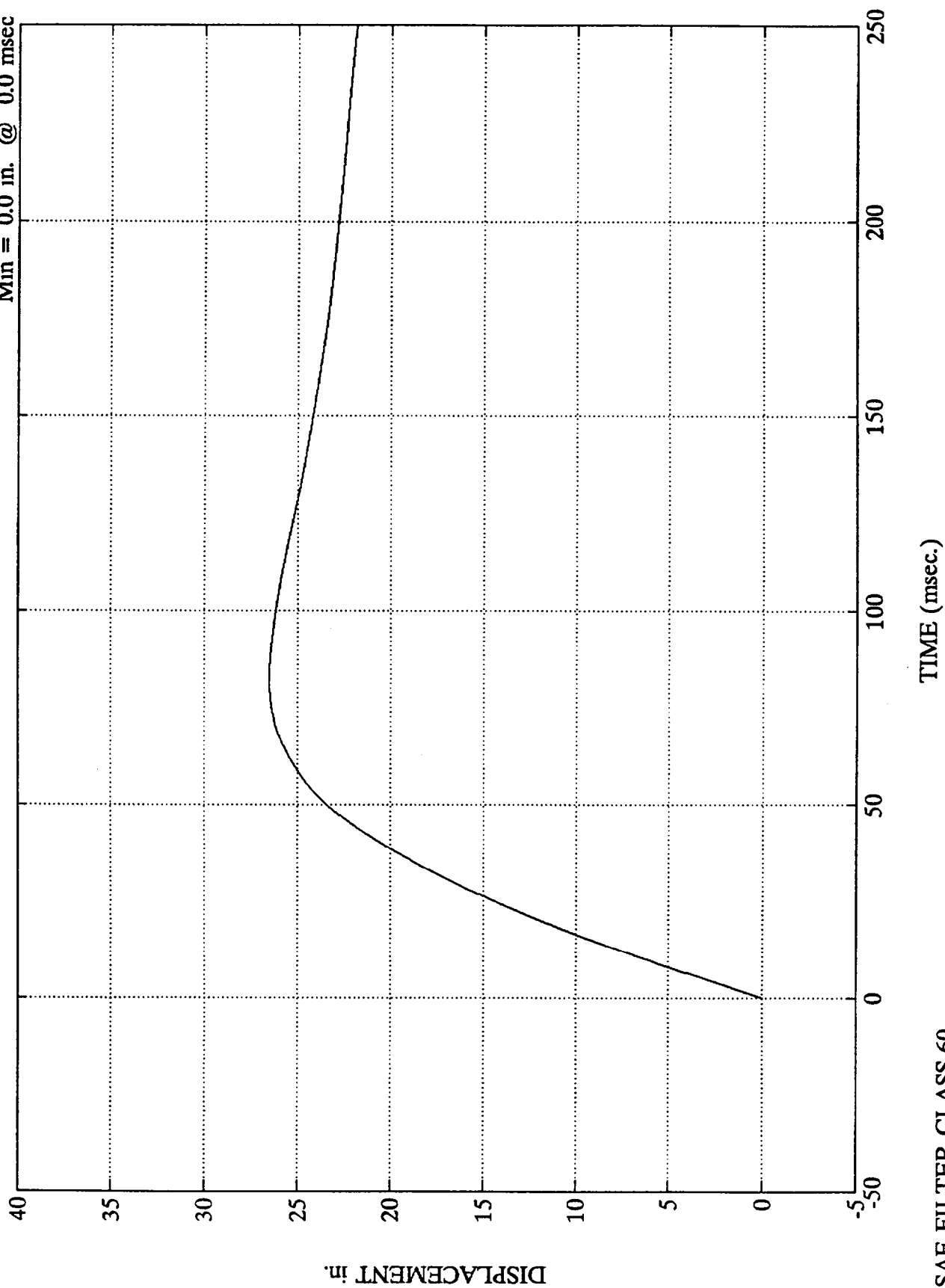


SAE FILTER CLASS 60

Test 1022

ACCELEROMETER #9(X)

Max = 26.5 in. @ 83.8 msec
Min = 0.0 in. @ 0.0 msec



SAE FILTER CLASS 60

TEST NO. MM0101

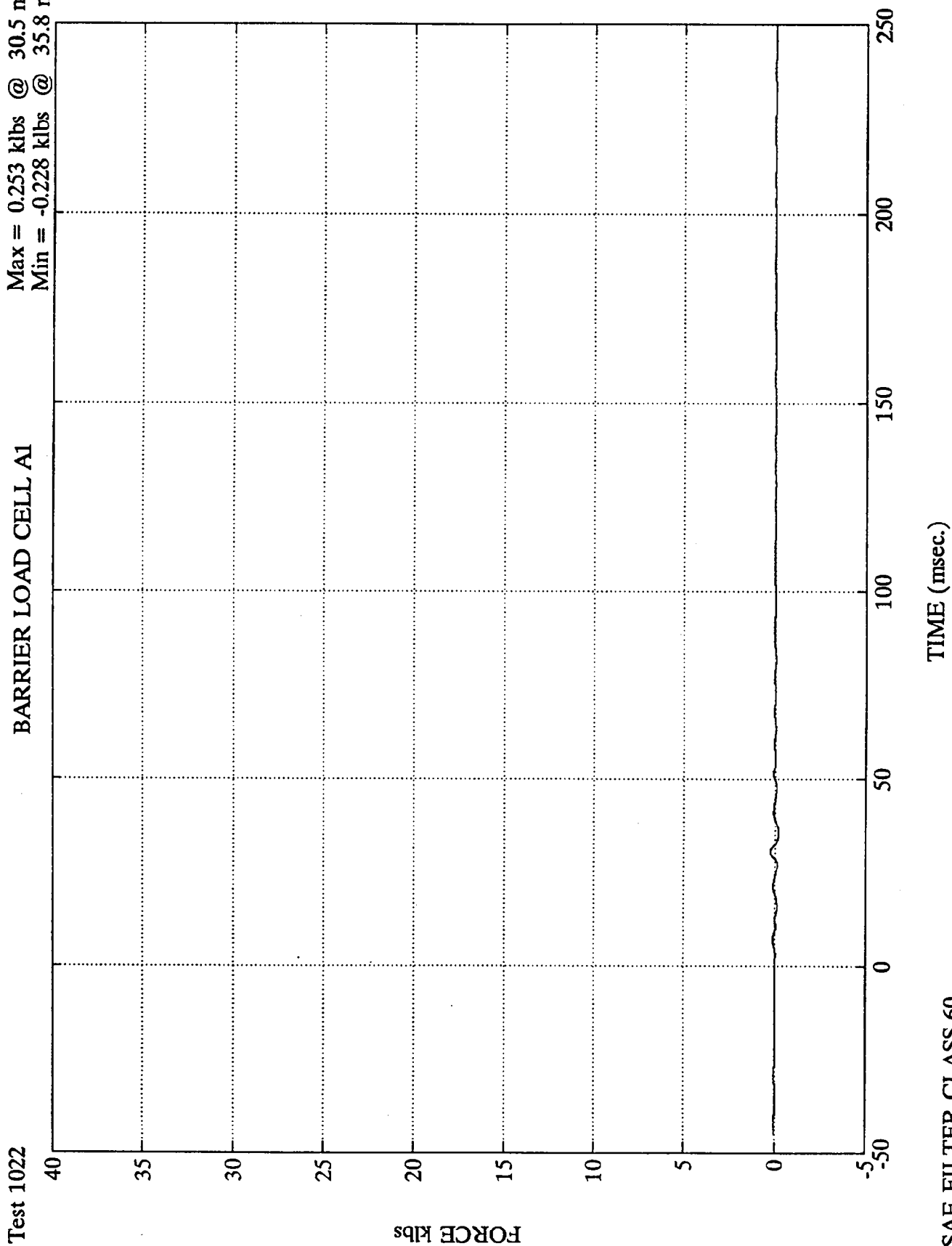
LOAD CELL BARRIER DATA

FILTER CHANNEL CLASS

60

Test 1022
Max = 0.253 klbs @ 30.5 msec
Min = -0.228 klbs @ 35.8 msec

BARRIER LOAD CELL A1

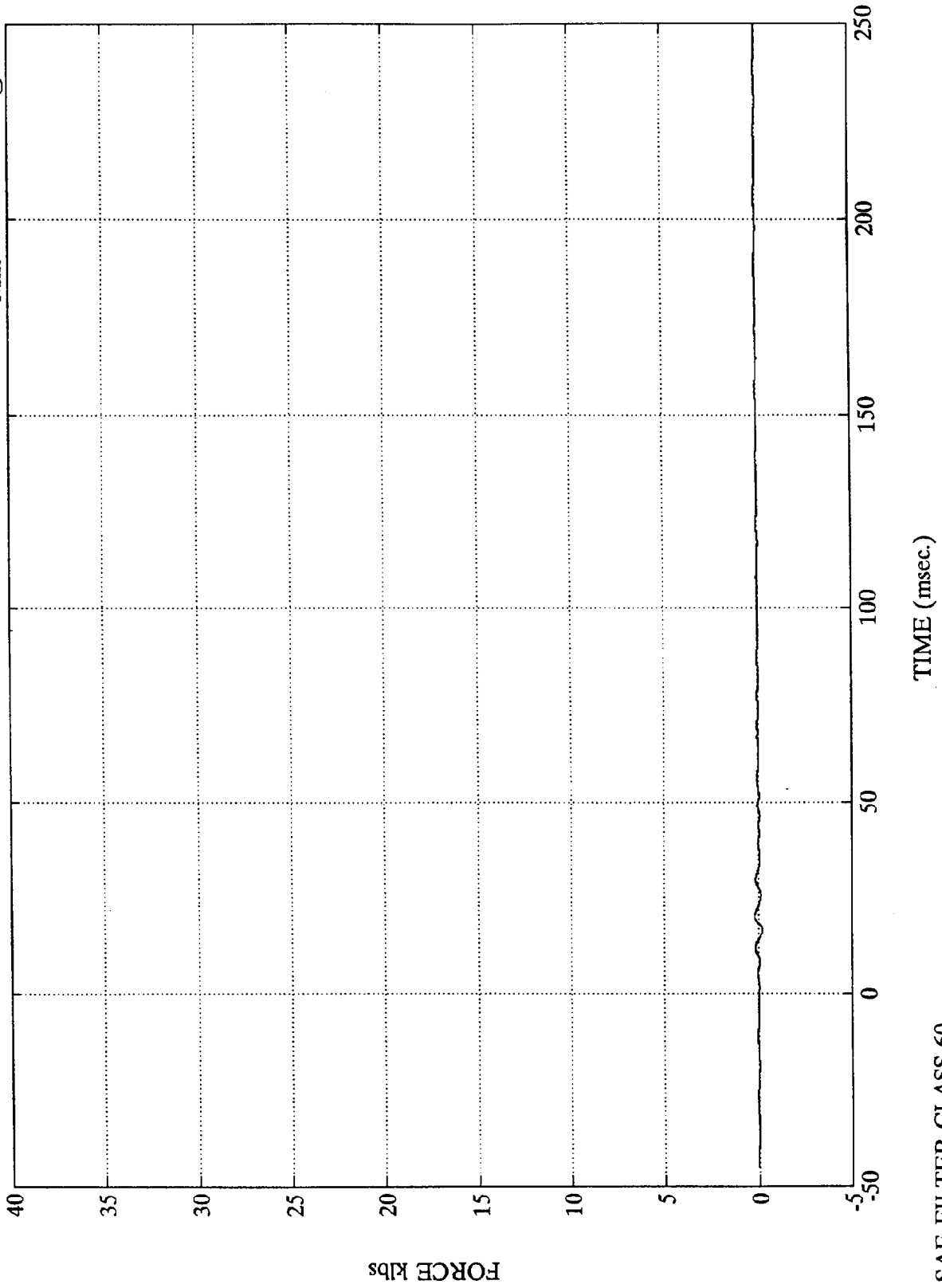


TIME (msec.)

SAE FILTER CLASS 60

Test 1022
Max = 0.189 klbs @ 19.9 msec
Min = -0.233 klbs @ 16.4 msec

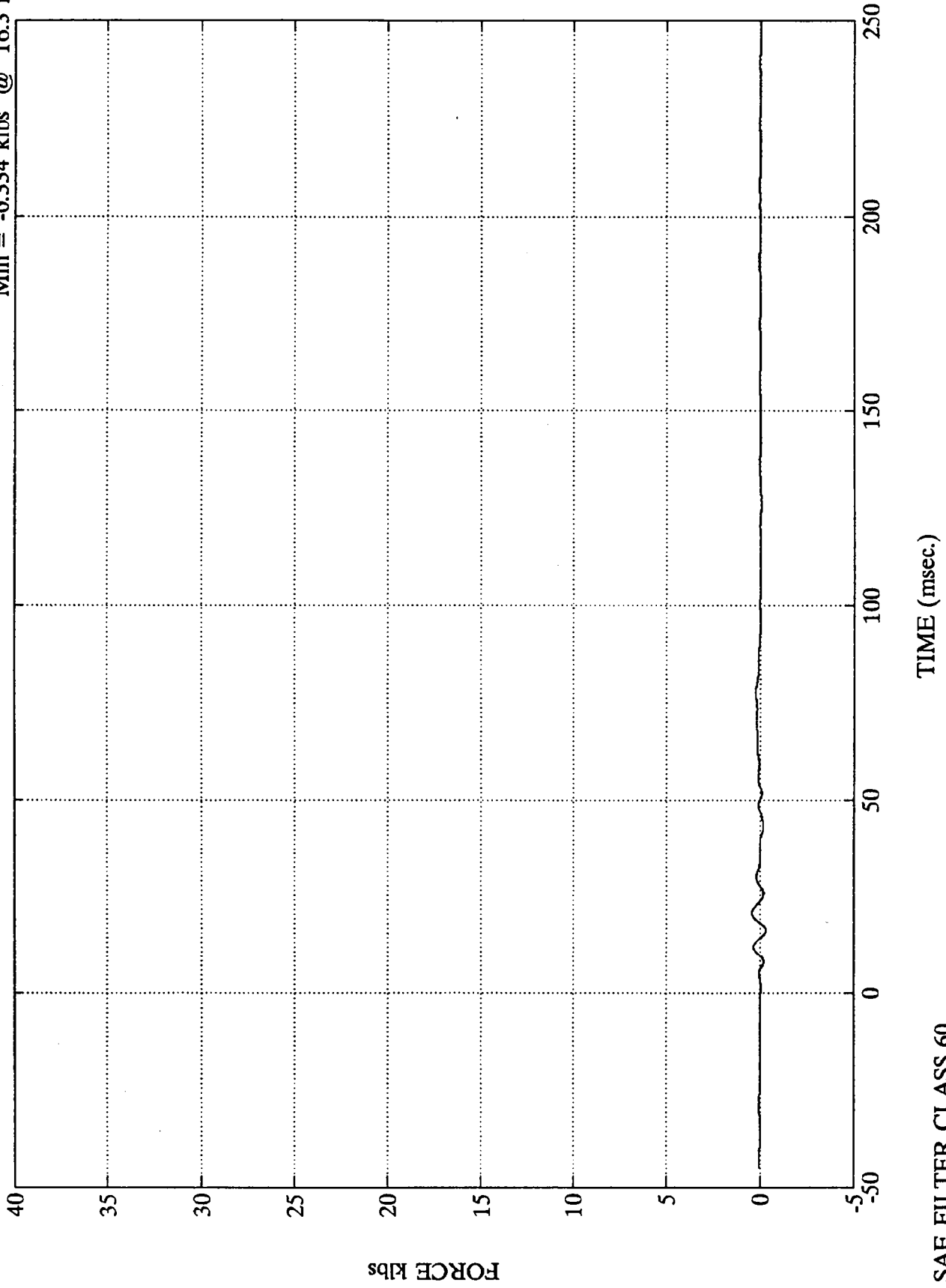
BARRIER LOAD CELL A2



Test 1022

BARRIER LOAD CELL A3

Max = 0.429 klbs @ 20.8 msec
Min = -0.334 klbs @ 16.3 msec

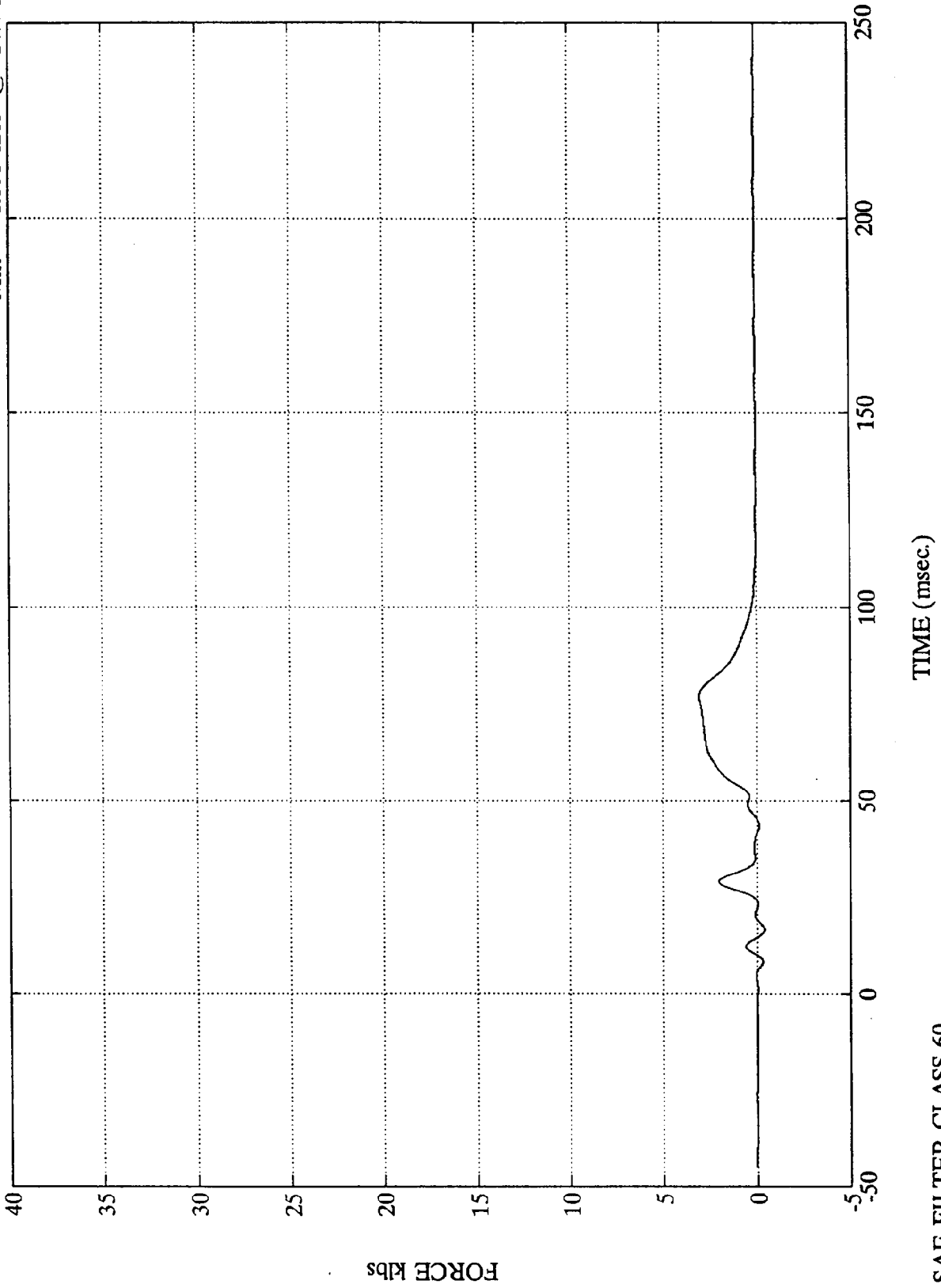


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL A4

Max = 3.058 klbs @ 77.0 msec
Min = -0.393 klbs @ 16.4 msec

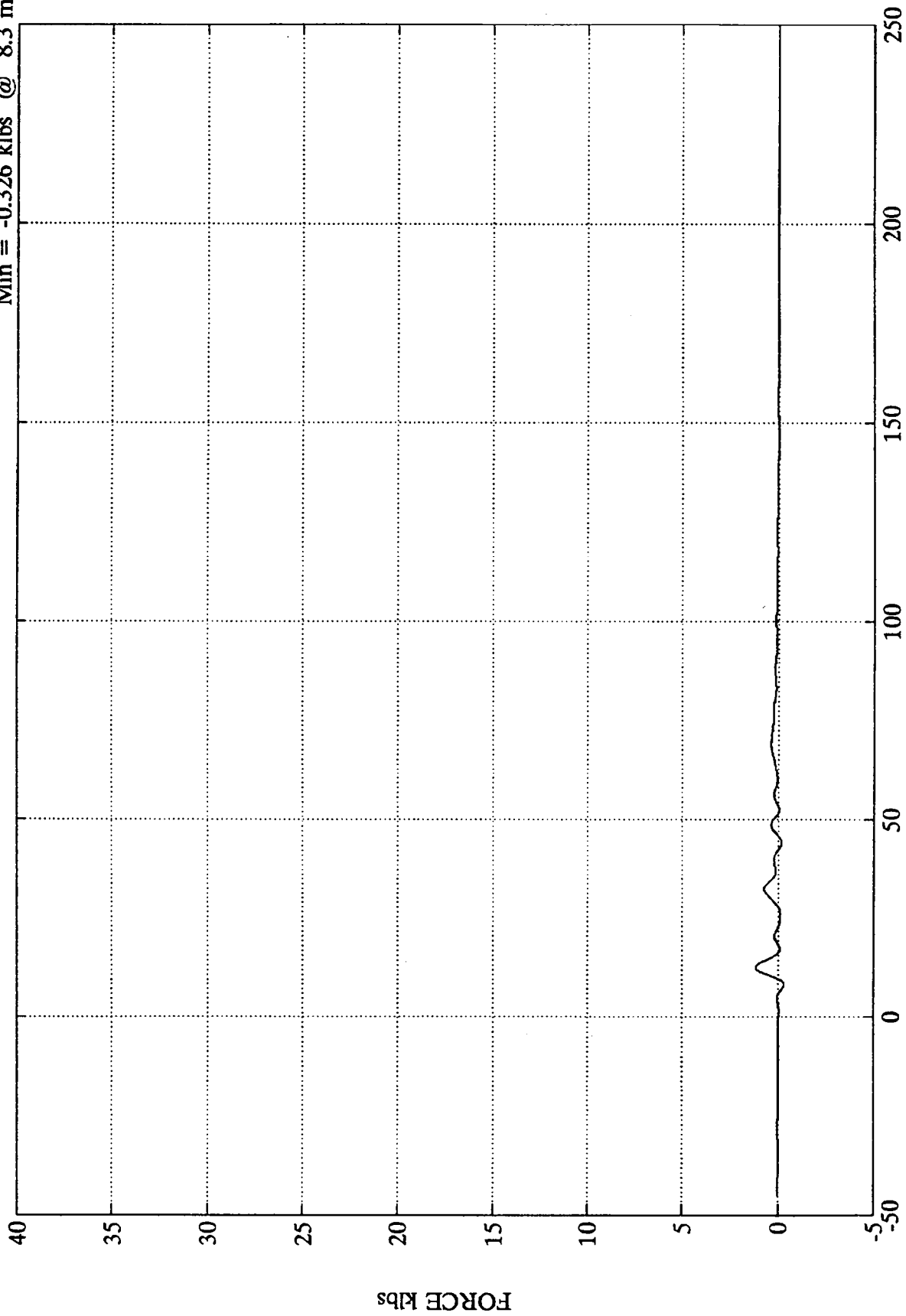


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL A5

Max = 1.170 klbs @ 12.6 msec
Min = -0.326 klbs @ 8.3 msec



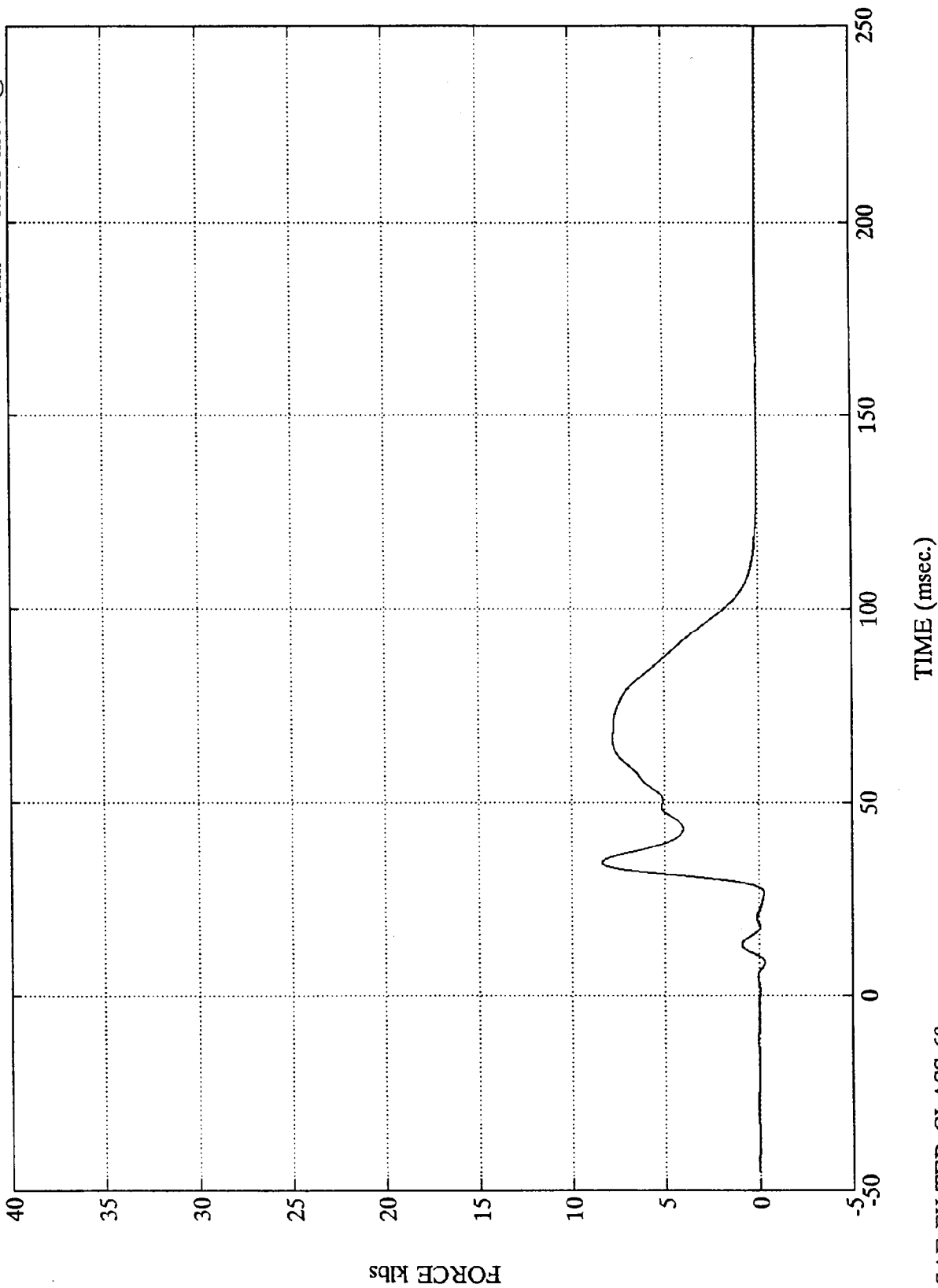
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL A6

Max = 8.386 klbs @ 34.4 msec
Min = -0.313 klbs @ 8.4 msec

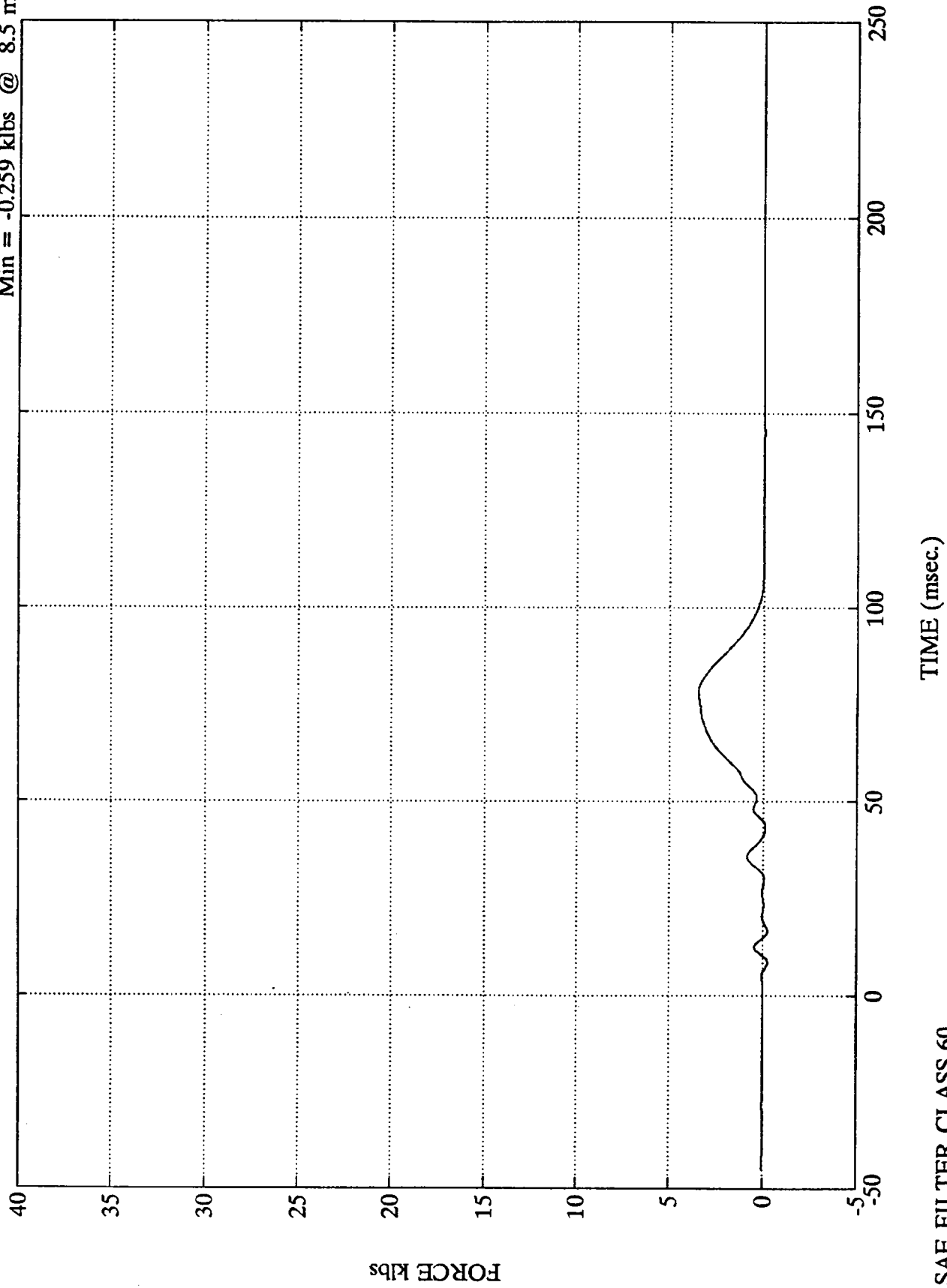


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL A7

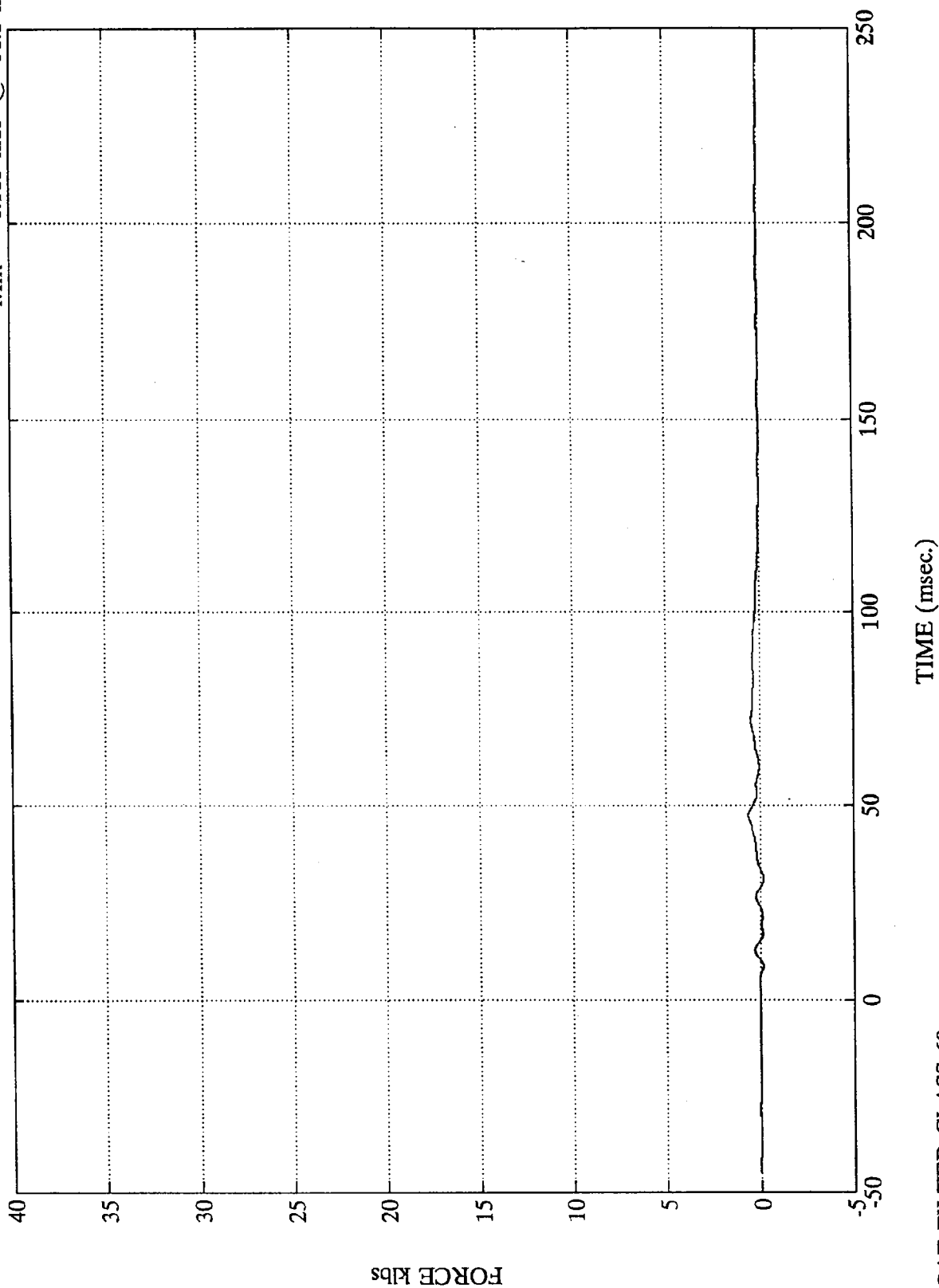
Max = 3.481 klbs @ 78.1 msec
Min = -0.259 klbs @ 8.5 msec



SAE FILTER CLASS 60

Test 1022
BARRIER LOAD CELL A8
Max = 0.631 klbs @ 47.4 msec
Min = -0.185 klbs @ 31.1 msec

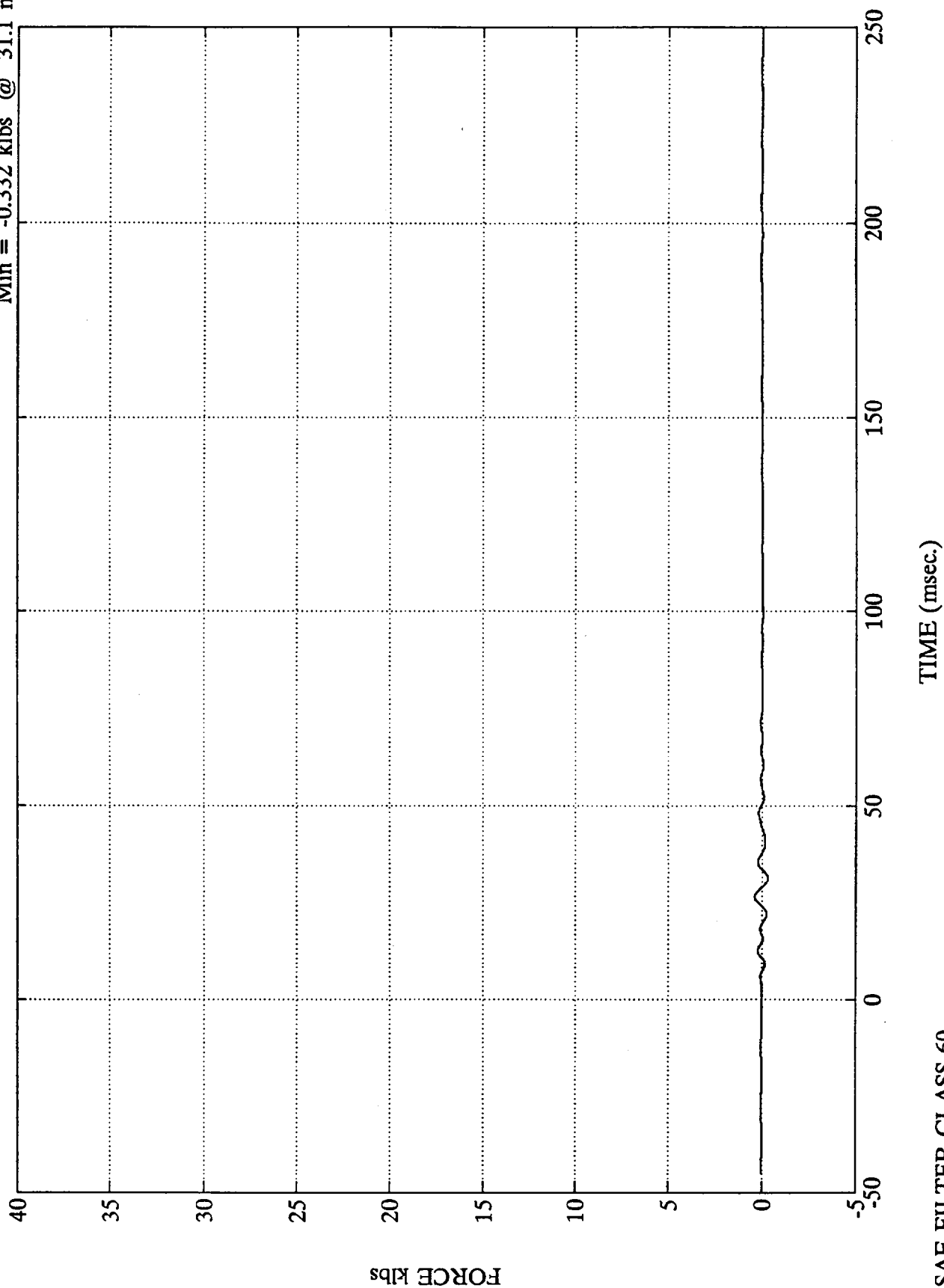
SAE FILTER CLASS 60



Test 1022

BARRIER LOAD CELL A9

Max = 0.372 klbs @ 26.4 msec
Min = -0.332 klbs @ 31.1 msec

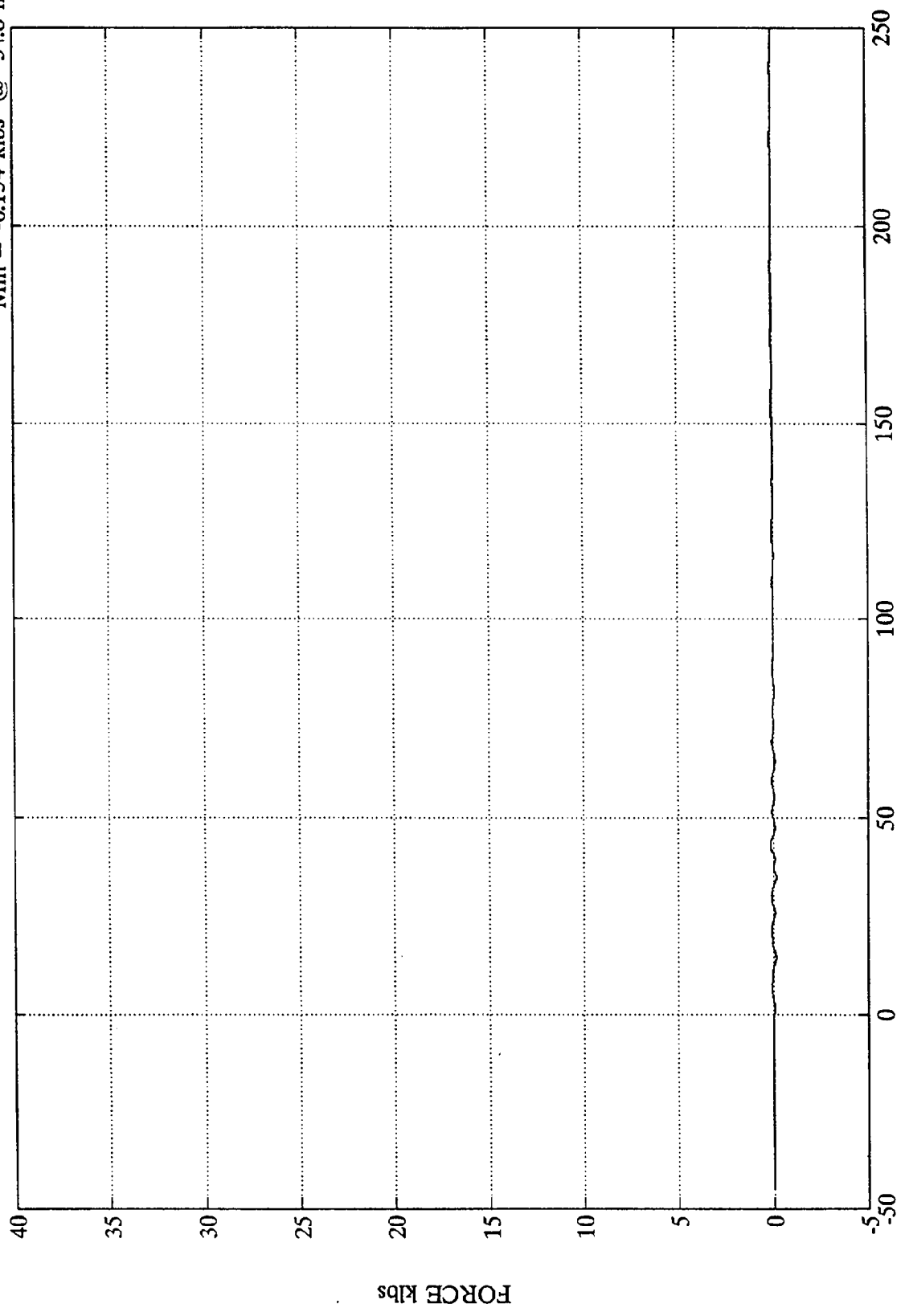


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL B1

Max = 0.164 klbs @ 43.0 msec
Min = -0.154 klbs @ 34.8 msec



TIME (msec.)

SAE FILTER CLASS 60

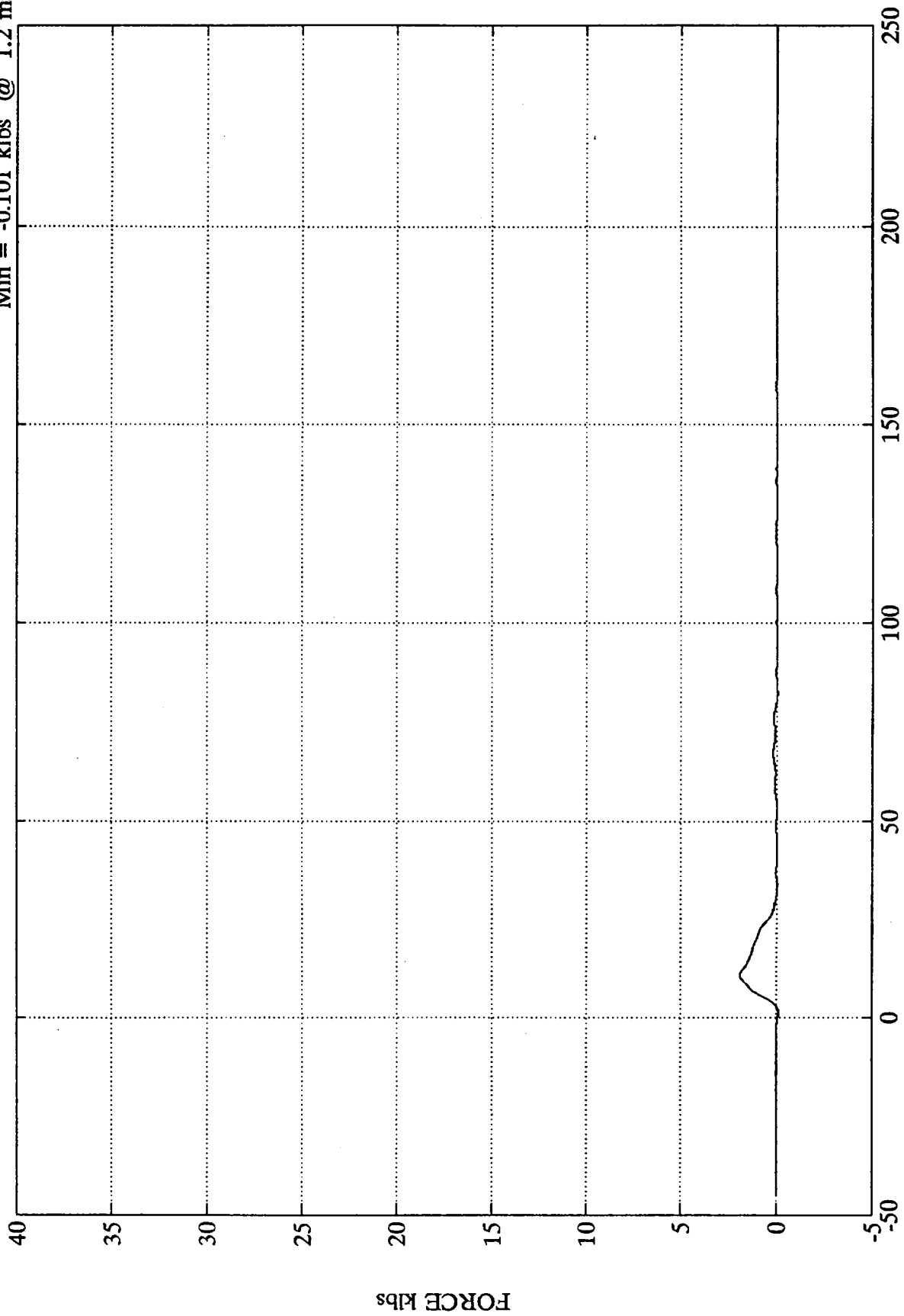
B-40

7862-3

Test 1022

BARRIER LOAD CELL B2

Max = 1.911 klbs @ 10.9 msec
Min = -0.101 klbs @ 1.2 msec



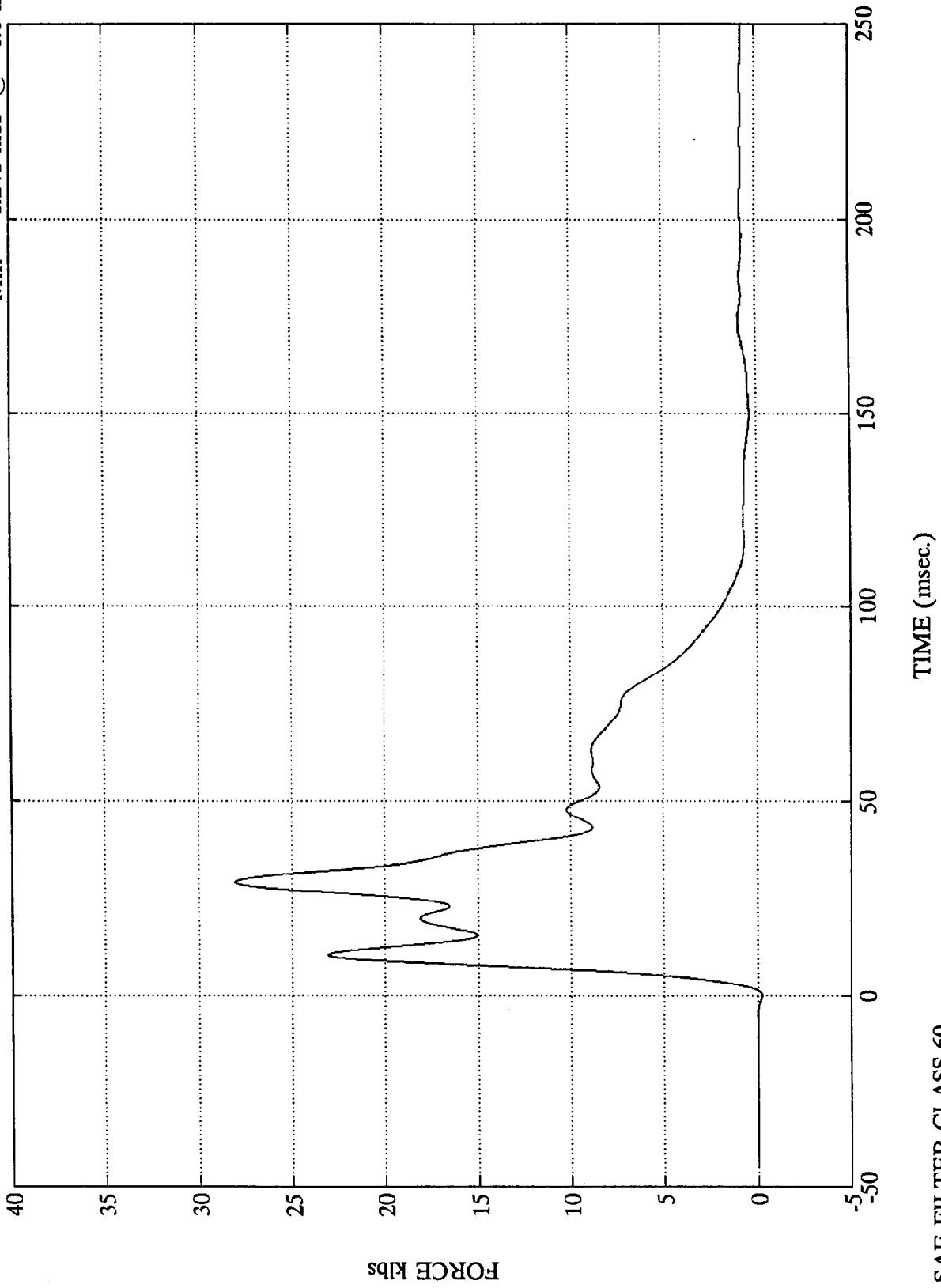
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

Max = 28.086 klbs @ 29.4 msec
Min = -0.248 klbs @ -0.0 msec

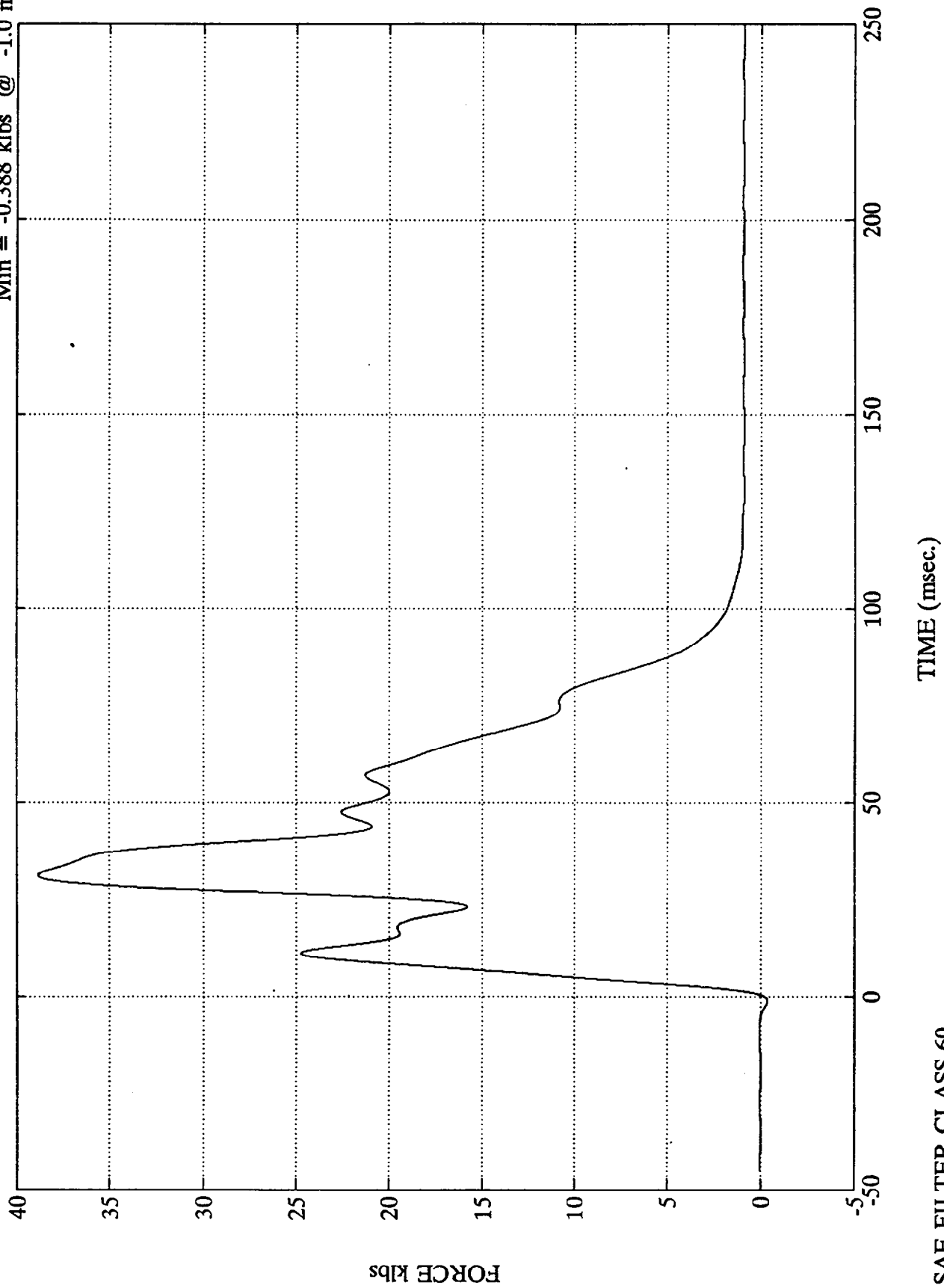
BARRIER LOAD CELL B3



Test 1022

BARRIER LOAD CELL B4

Max = 38.863 klbs @ 31.1 msec
Min = -0.388 klbs @ -1.0 msec

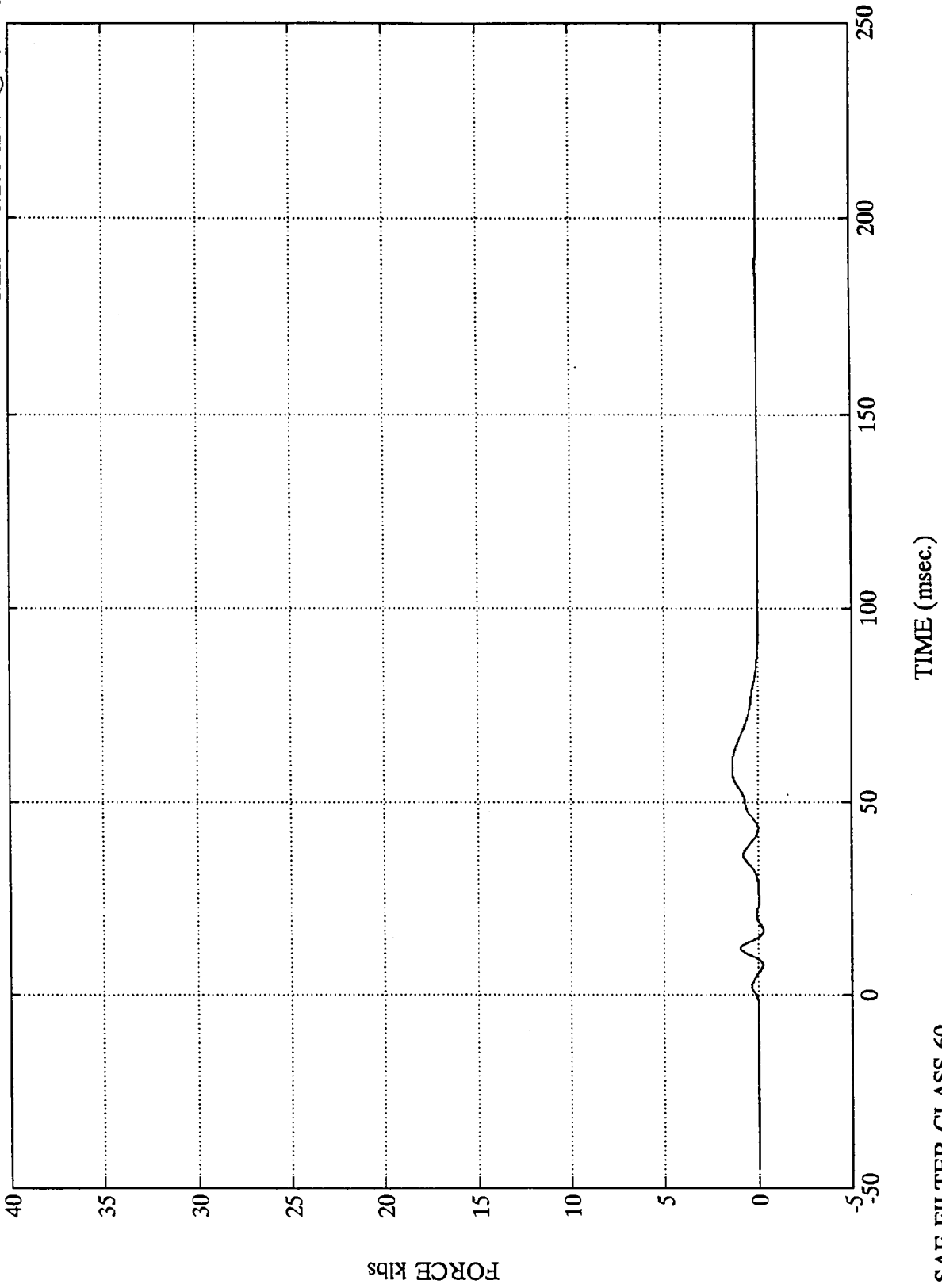


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL B5

Max = 1.354 klbs @ 59.4 msec
Min = -0.278 klbs @ 16.6 msec

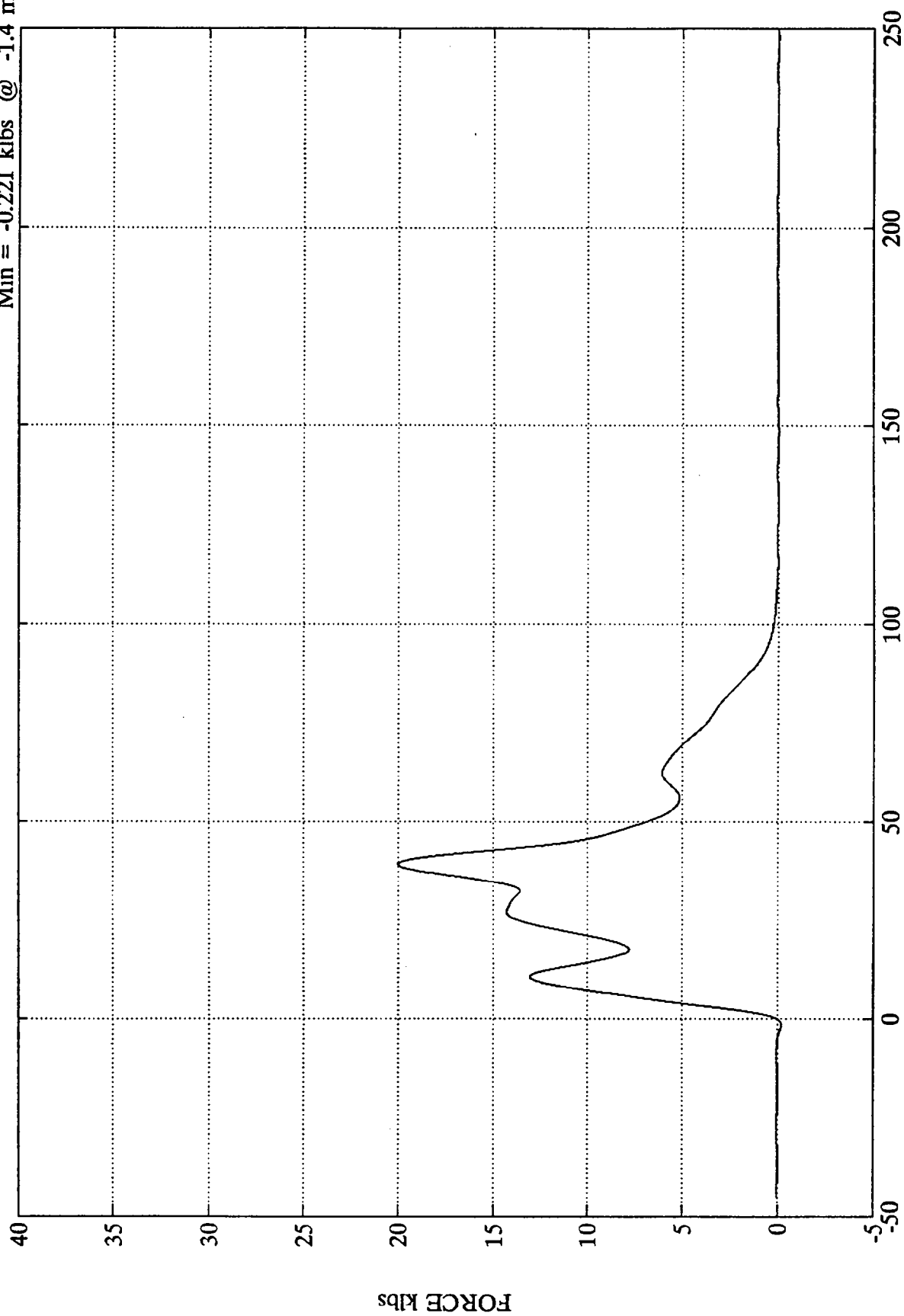


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL B6

Max = 20.053 klbs @ 39.4 msec
Min = -0.221 klbs @ -1.4 msec



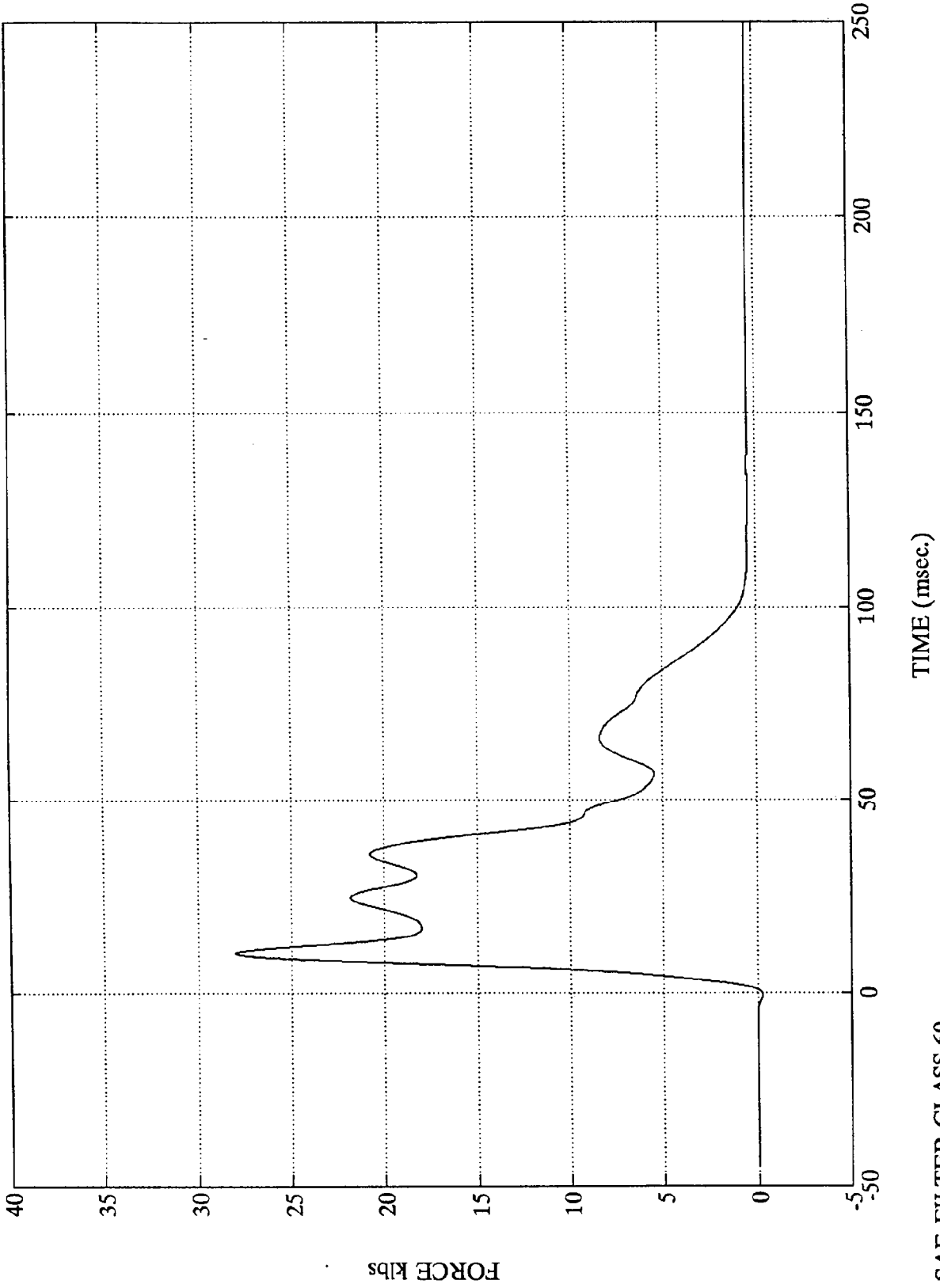
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL B7

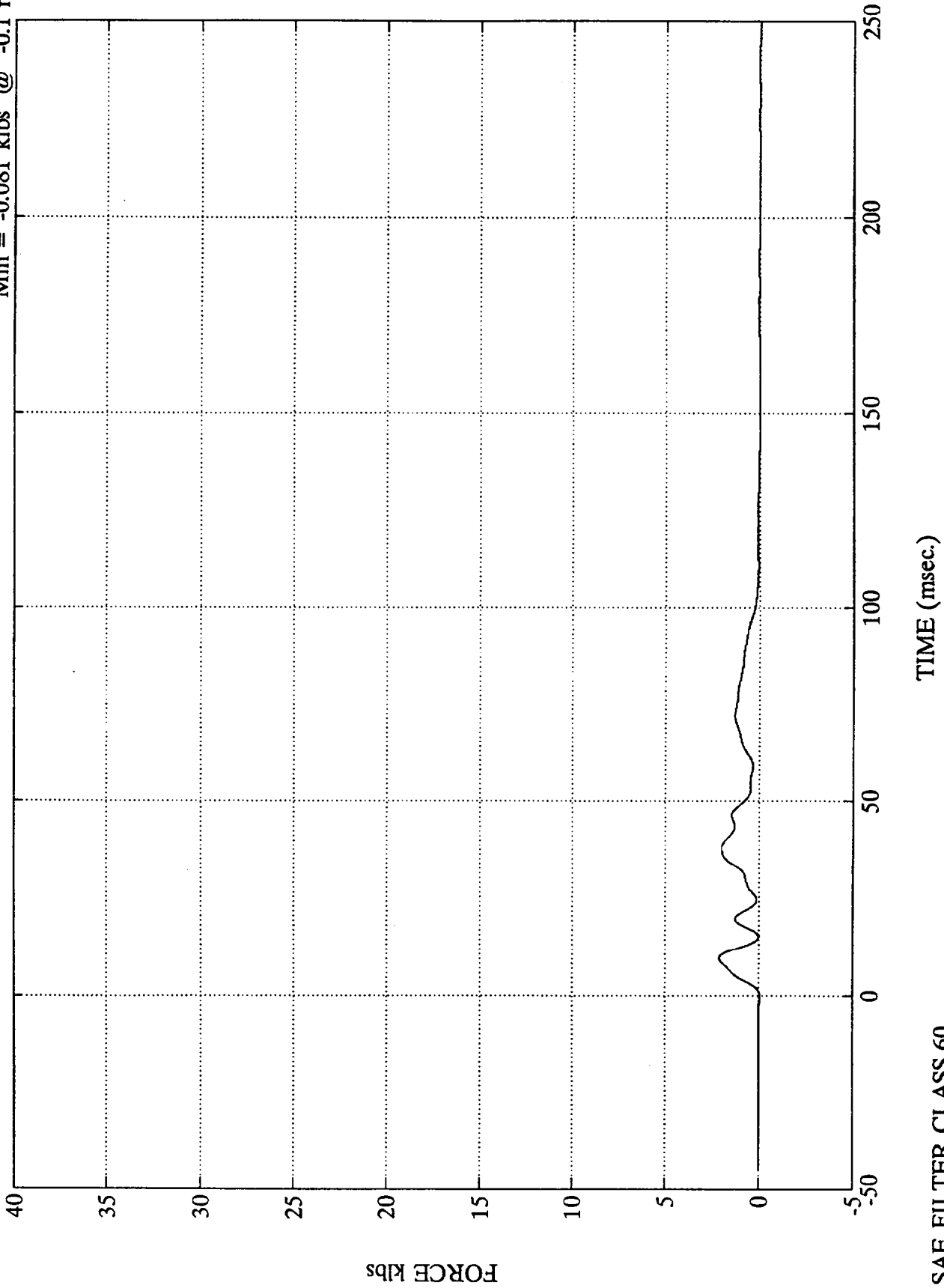
Max = 28.025 klbs @ 10.2 msec
Min = -0.280 klbs @ -0.5 msec



Test 1022

BARRIER LOAD CELL B8

Max = 2.132 klbs @ 9.7 msec
Min = -0.081 klbs @ -0.1 msec

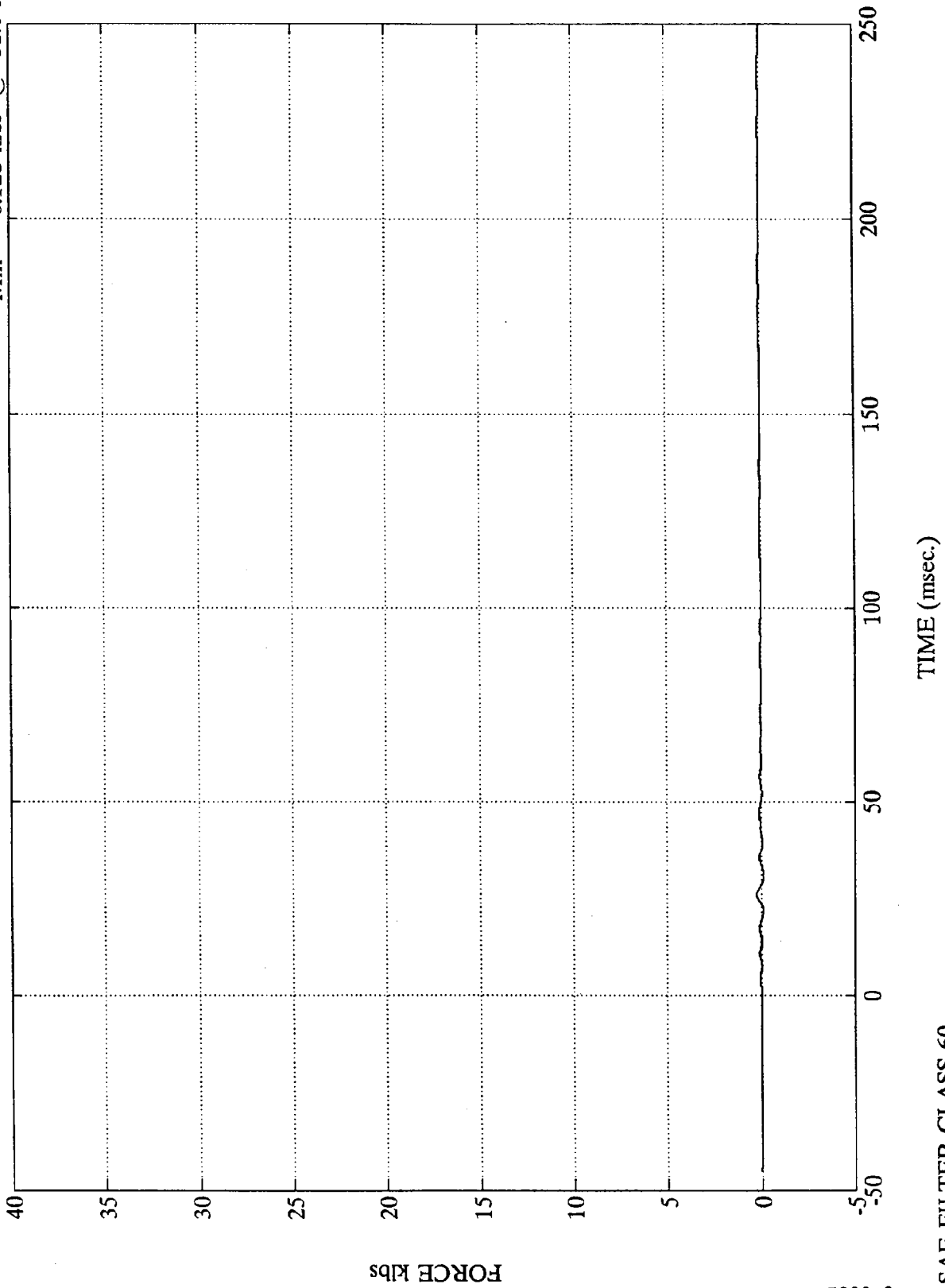


SAE FILTER CLASS 60

Test 1022

Max = 0.231 klbs @ 26.3 msec
Min = -0.128 klbs @ 31.0 msec

BARRIER LOAD CELL B9



SAE FILTER CLASS 60

FORCE klbs

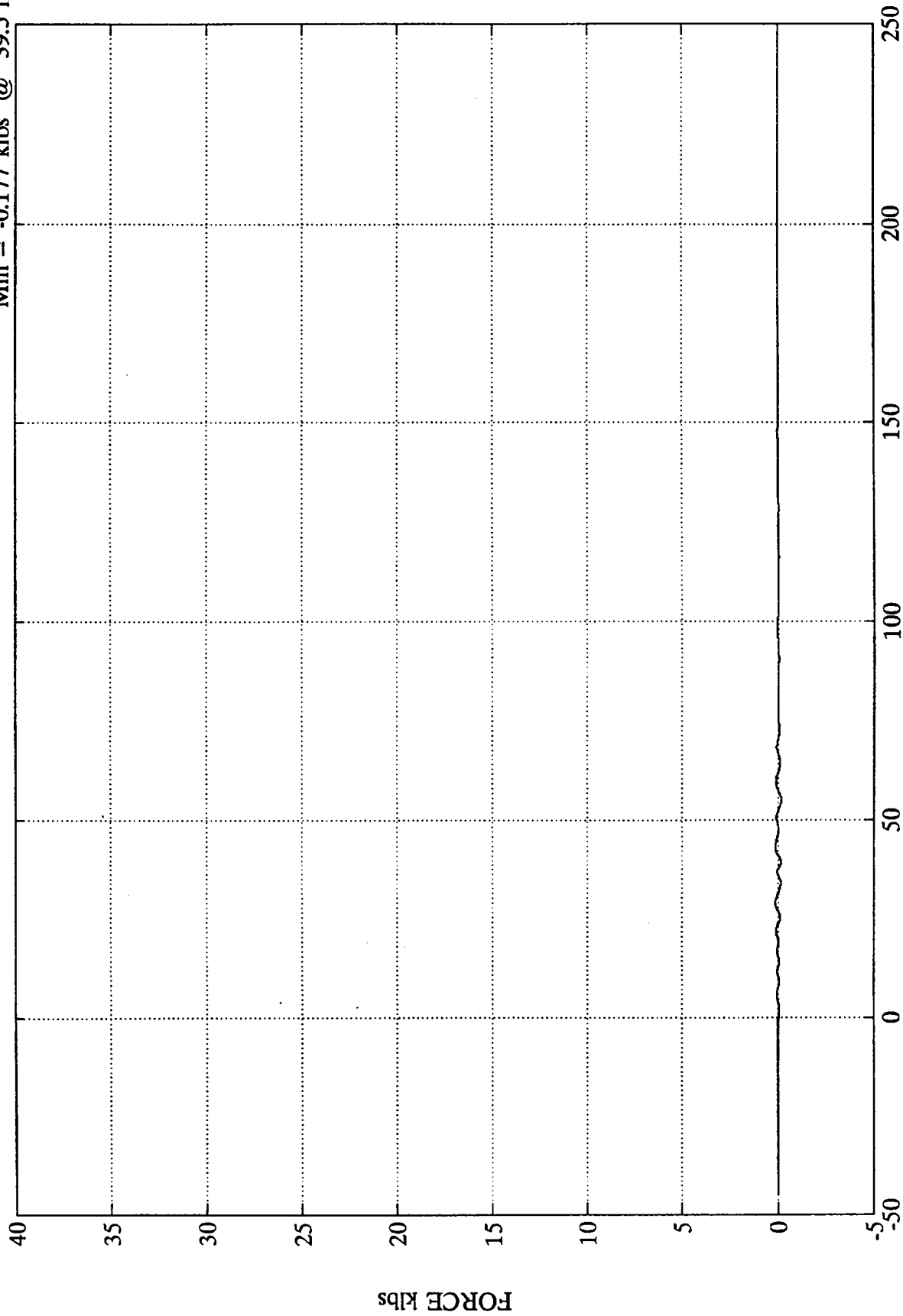
B-48

7862-3

Test 1022

BARRIER LOAD CELL C1

Max = 0.139 klbs @ 28.8 msec
Min = -0.177 klbs @ 39.5 msec



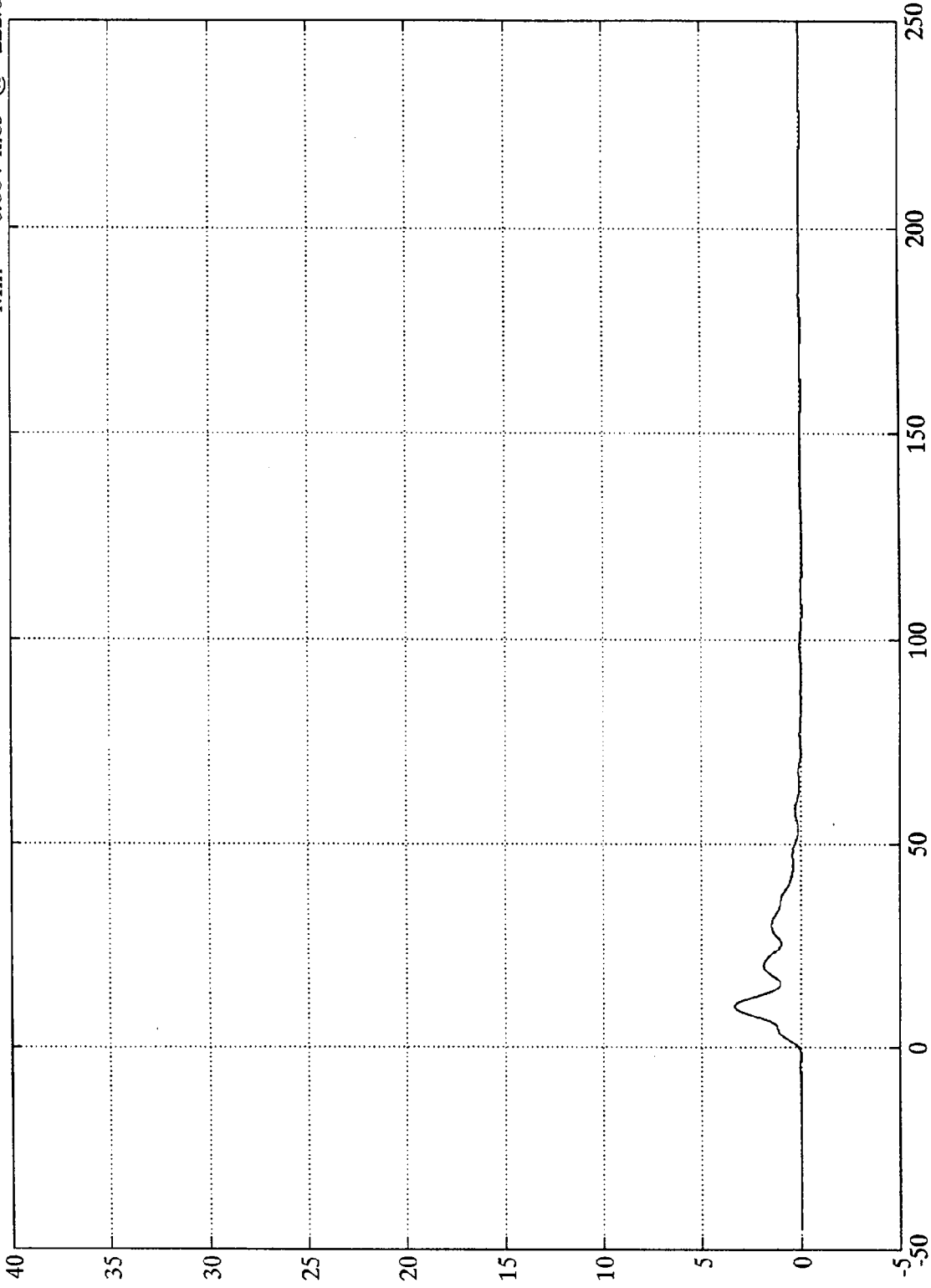
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL C2

Max = 3.349 klbs @ 10.1 msec
Min = -0.064 klbs @ 222.6 msec



TIME (msec.)

SAE FILTER CLASS 60

FORCE klbs

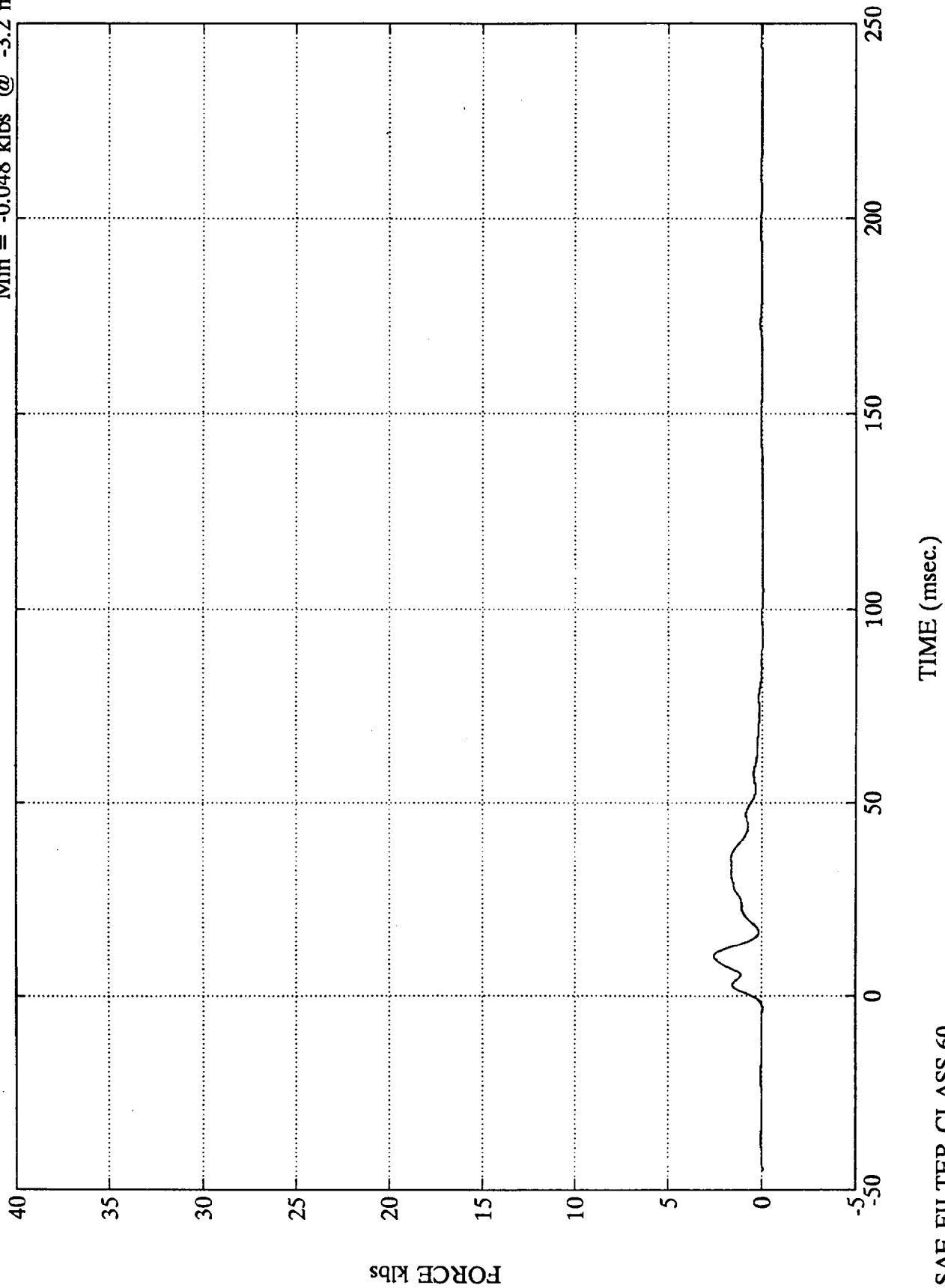
B-50

7862-3

Test 1022

BARRIER LOAD CELL C3

Max = 2.564 klbs @ 10.4 msec
Min = -0.048 klbs @ -3.2 msec



B-51

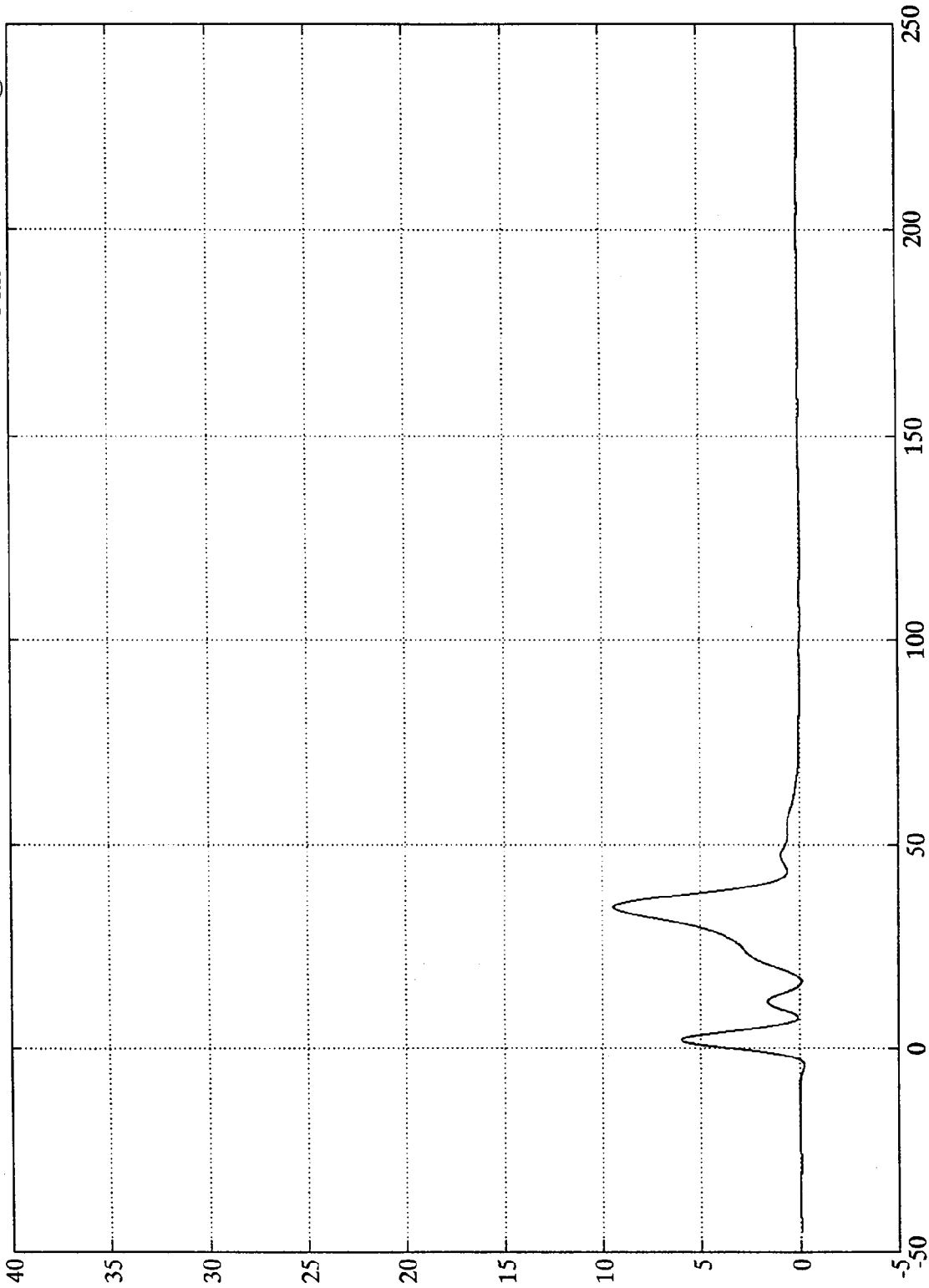
7862-3

SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL C4

Max = 9.434 klbs @ 34.7 msec
Min = -0.226 klbs @ -4.3 msec



TIME (msec.)

SAE FILTER CLASS 60

FORCE klbs

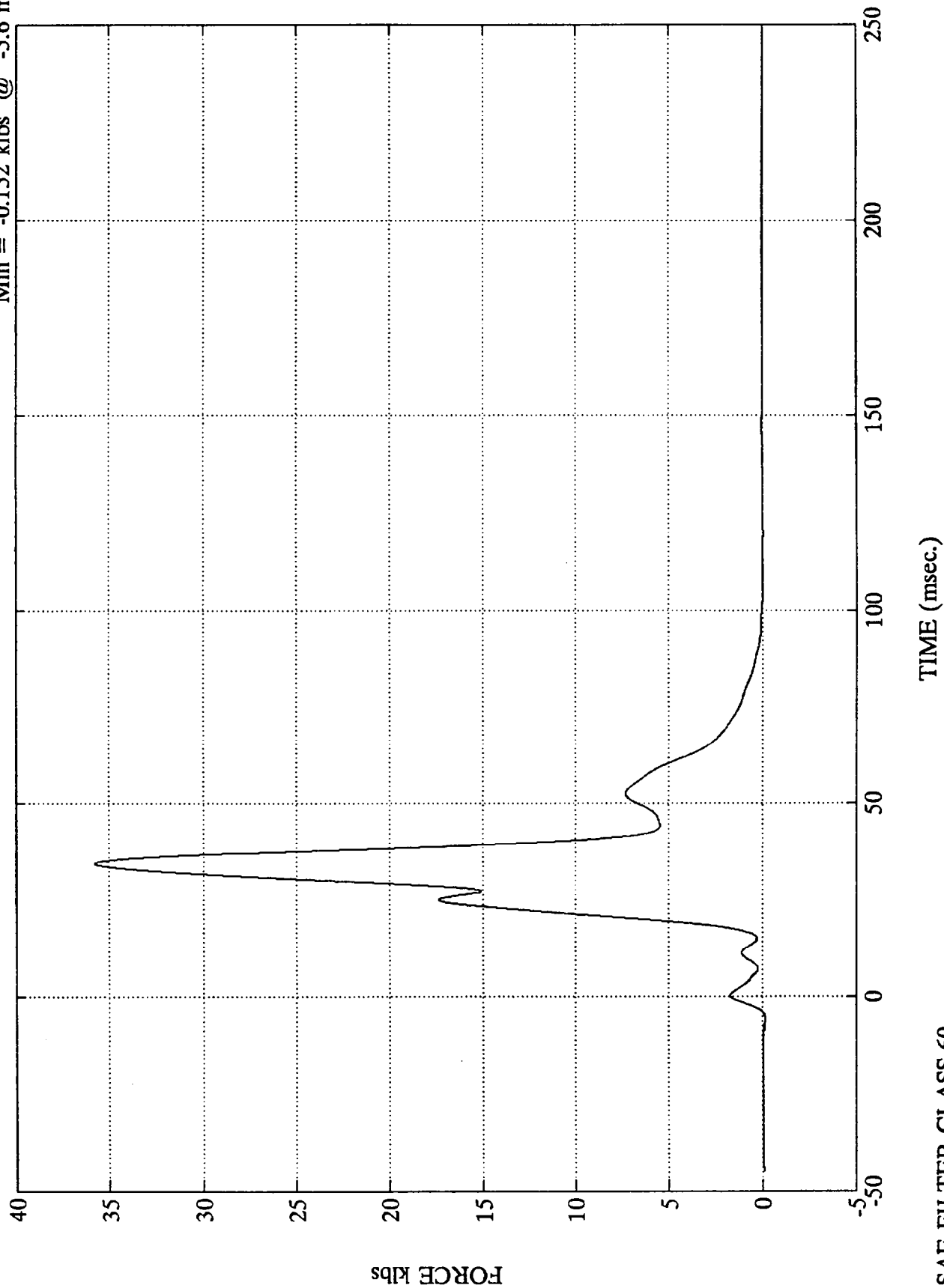
B-52

7862-3

Test 1022

BARRIER LOAD CELL C5

Max = 35.803 klbs @ 34.6 msec
Min = -0.152 klbs @ -5.6 msec

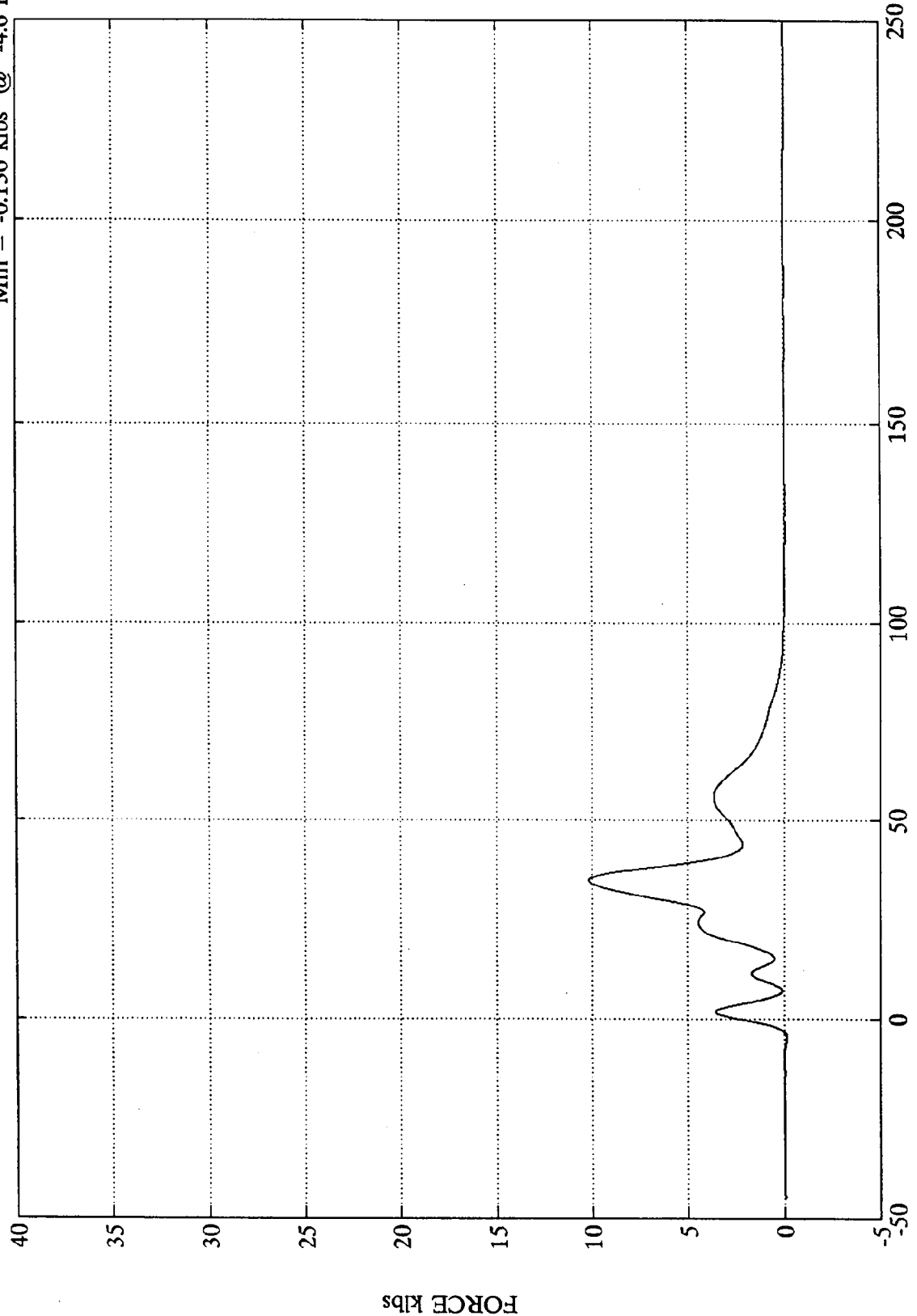


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL C6

Max = 10.204 klbs @ 34.7 msec
Min = -0.136 klbs @ -4.6 msec



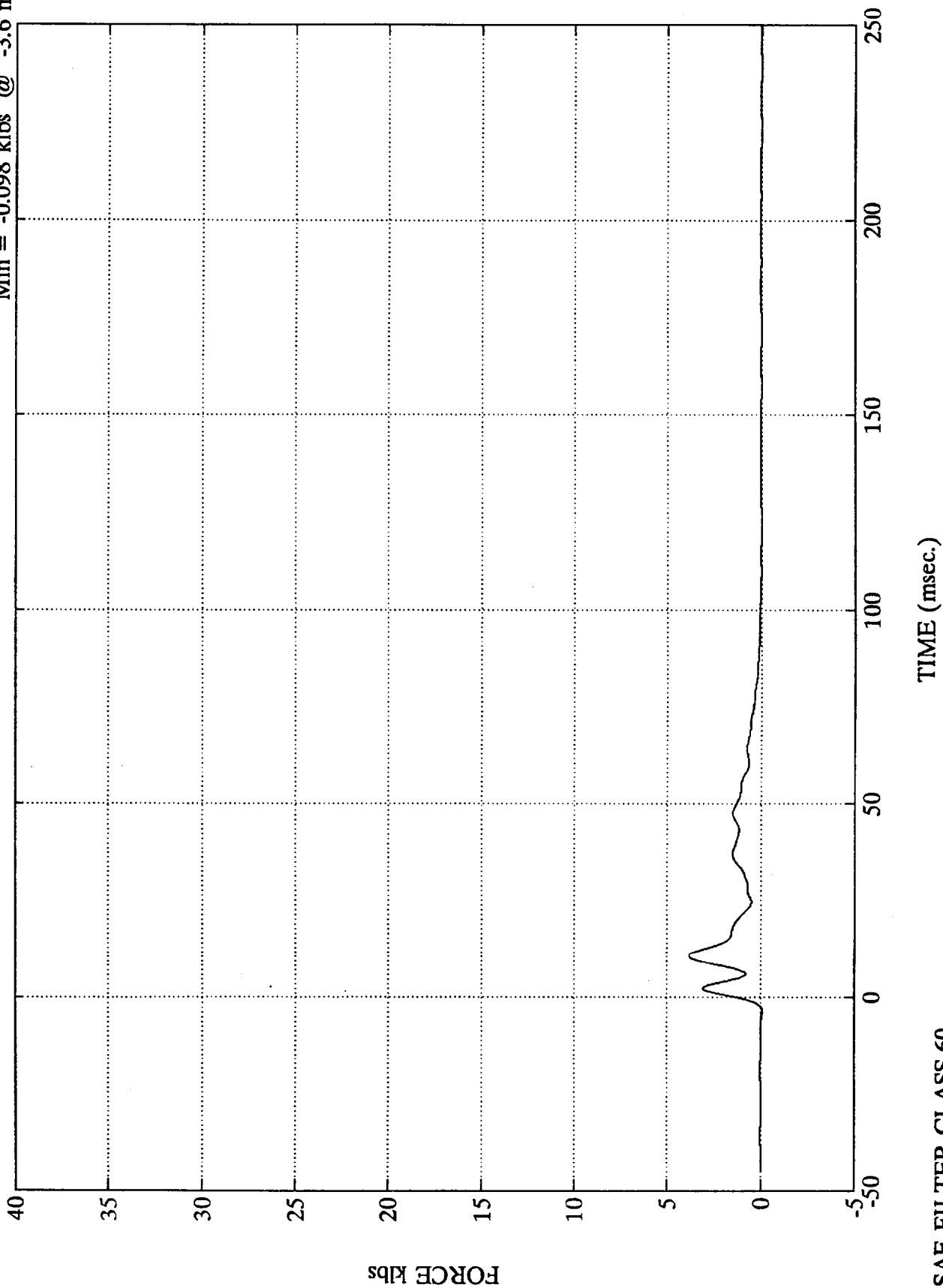
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL C7

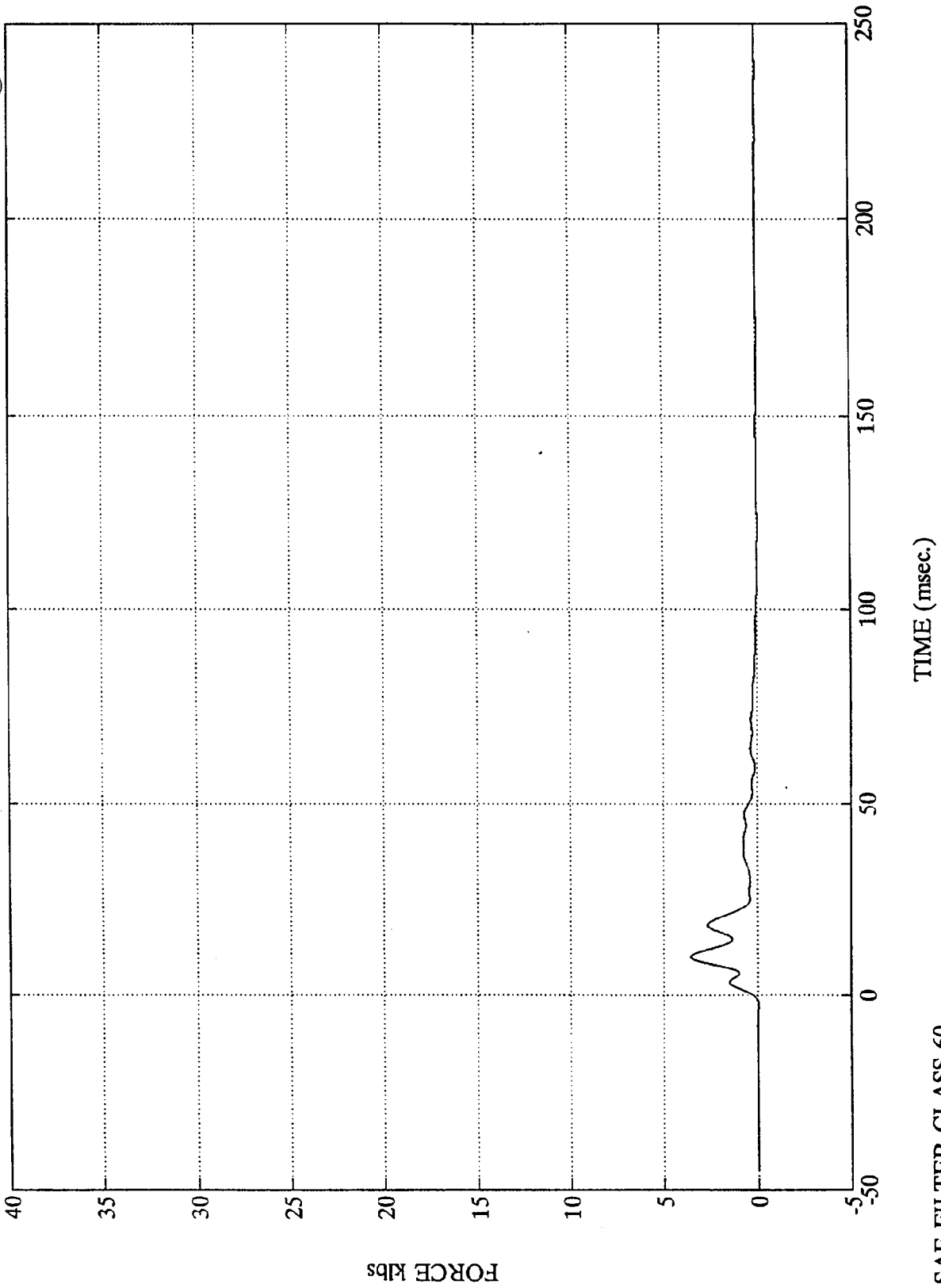
Max = 3.829 klbs @ 10.9 msec
Min = -0.098 klbs @ -3.6 msec



Test 1022

BARRIER LOAD CELL C8

Max = 3.550 klbs @ 10.0 msec
Min = -0.058 klbs @ 171.8 msec

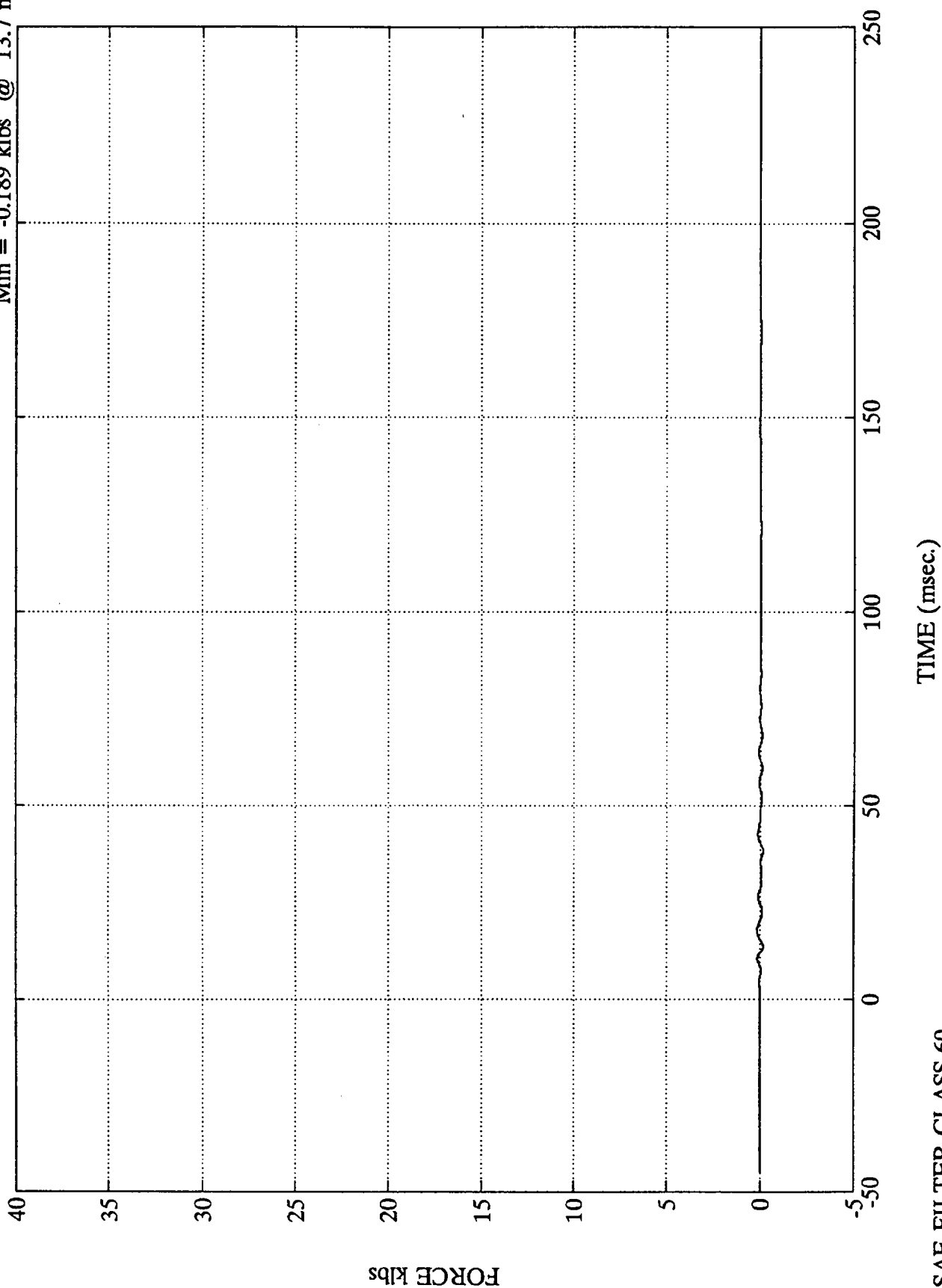


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL C9

Max = 0.133 klbs @ 17.9 msec
Min = -0.189 klbs @ 13.7 msec

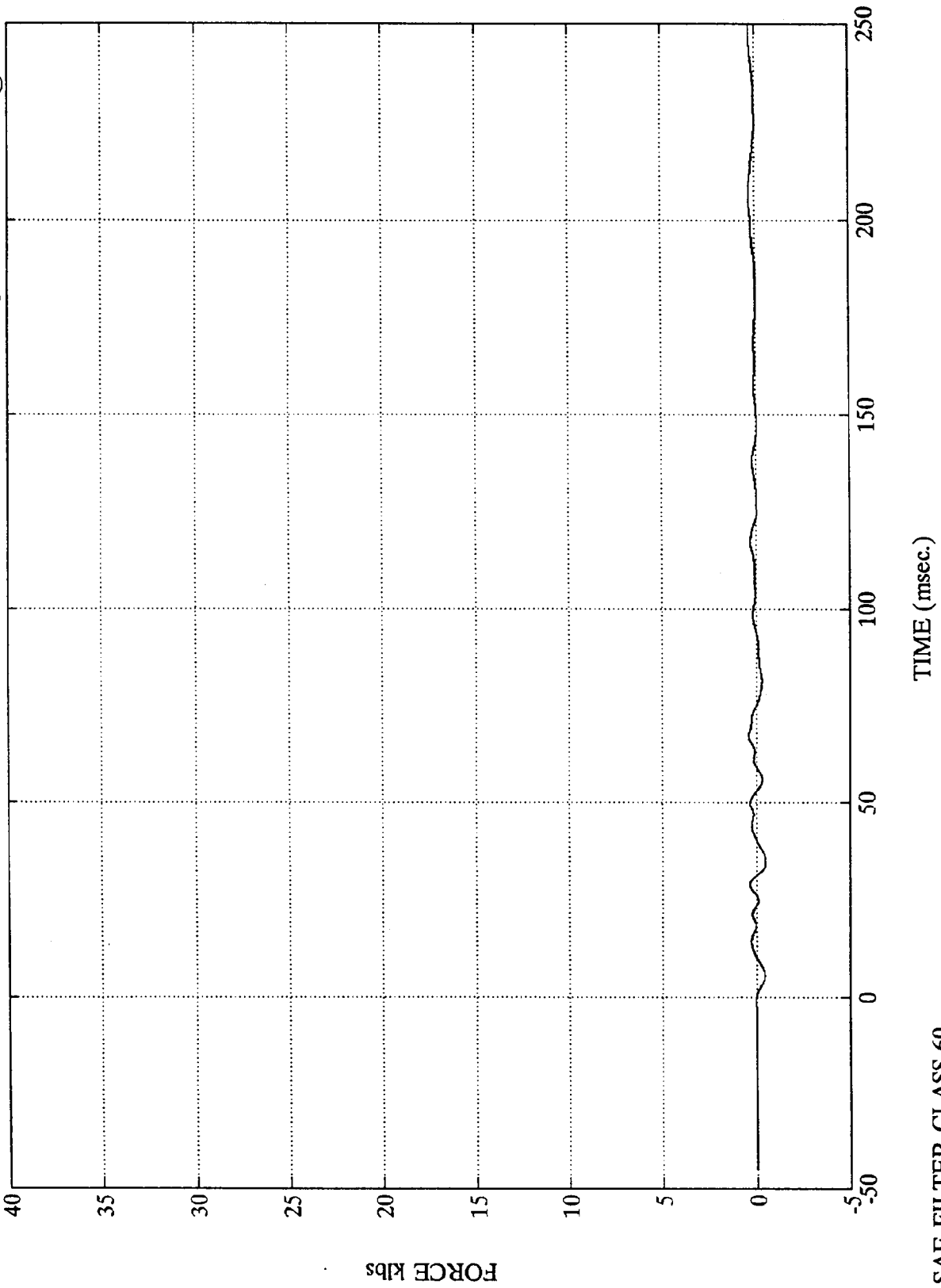


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL D1

Max = 0.401 klbs @ 67.0 msec
Min = -0.486 klbs @ 34.6 msec



B-58

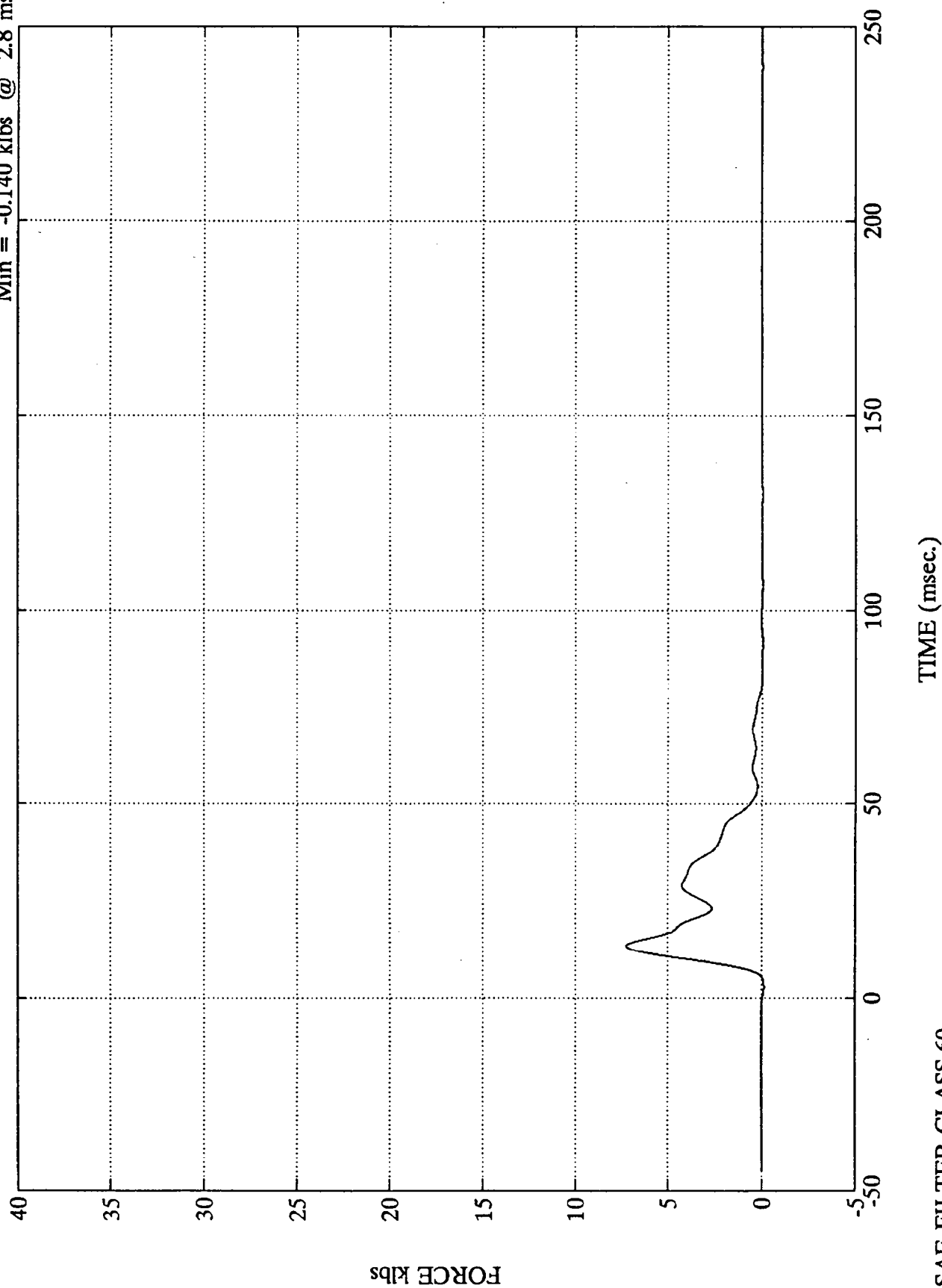
7862-3

SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL D2

Max = 7.268 klbs @ 13.3 msec
Min = -0.140 klbs @ 2.8 msec

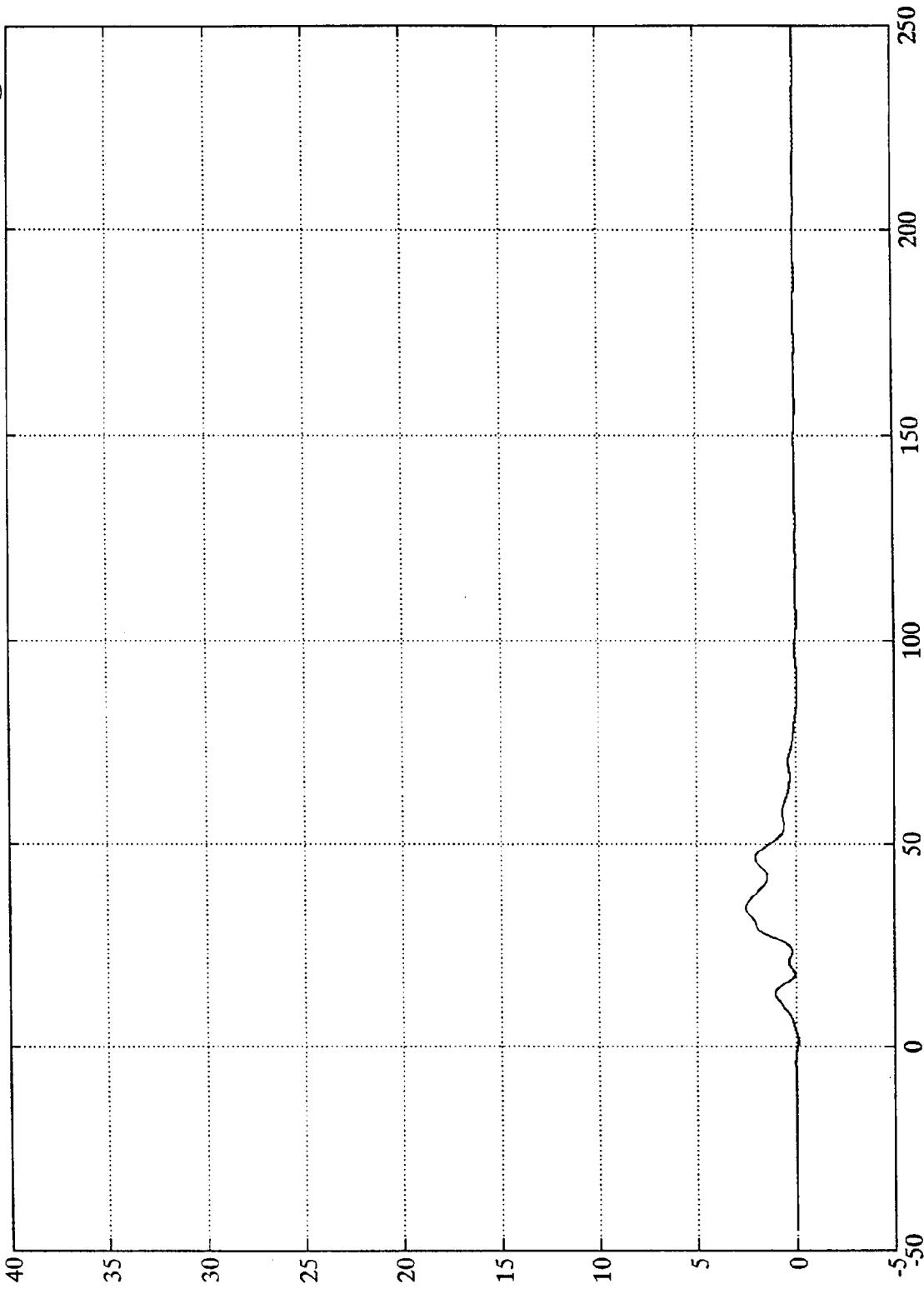


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL D3

Max = 2.554 klbs @ 34.3 msec
Min = -0.106 klbs @ 1.3 msec



TIME (msec.)

SAE FILTER CLASS 60

FORCE klbs

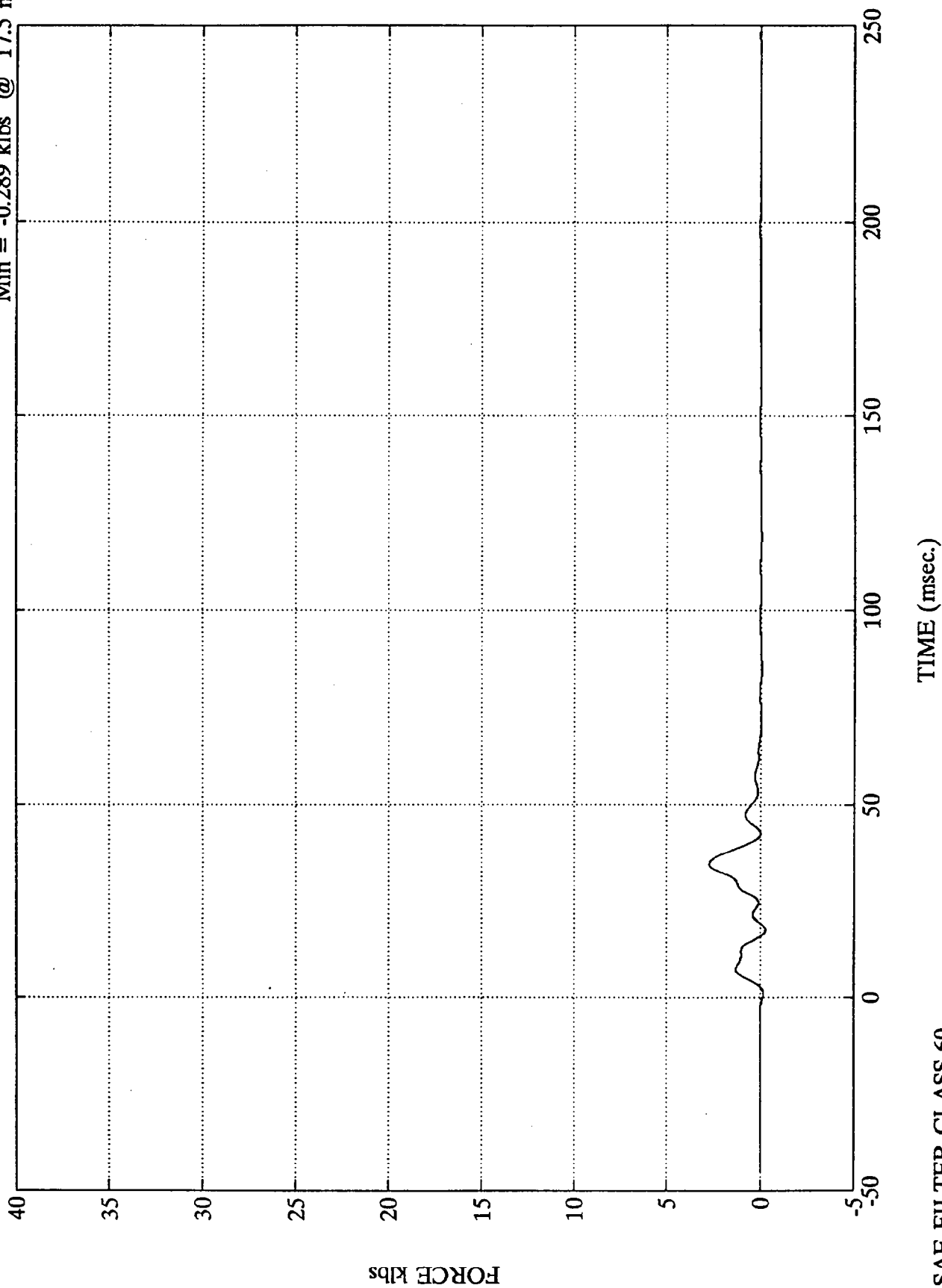
B-60

7862-3

Test 1022

Max = 2.734 klbs @ 34.6 msec
Min = -0.289 klbs @ 17.5 msec

BARRIER LOAD CELL D4

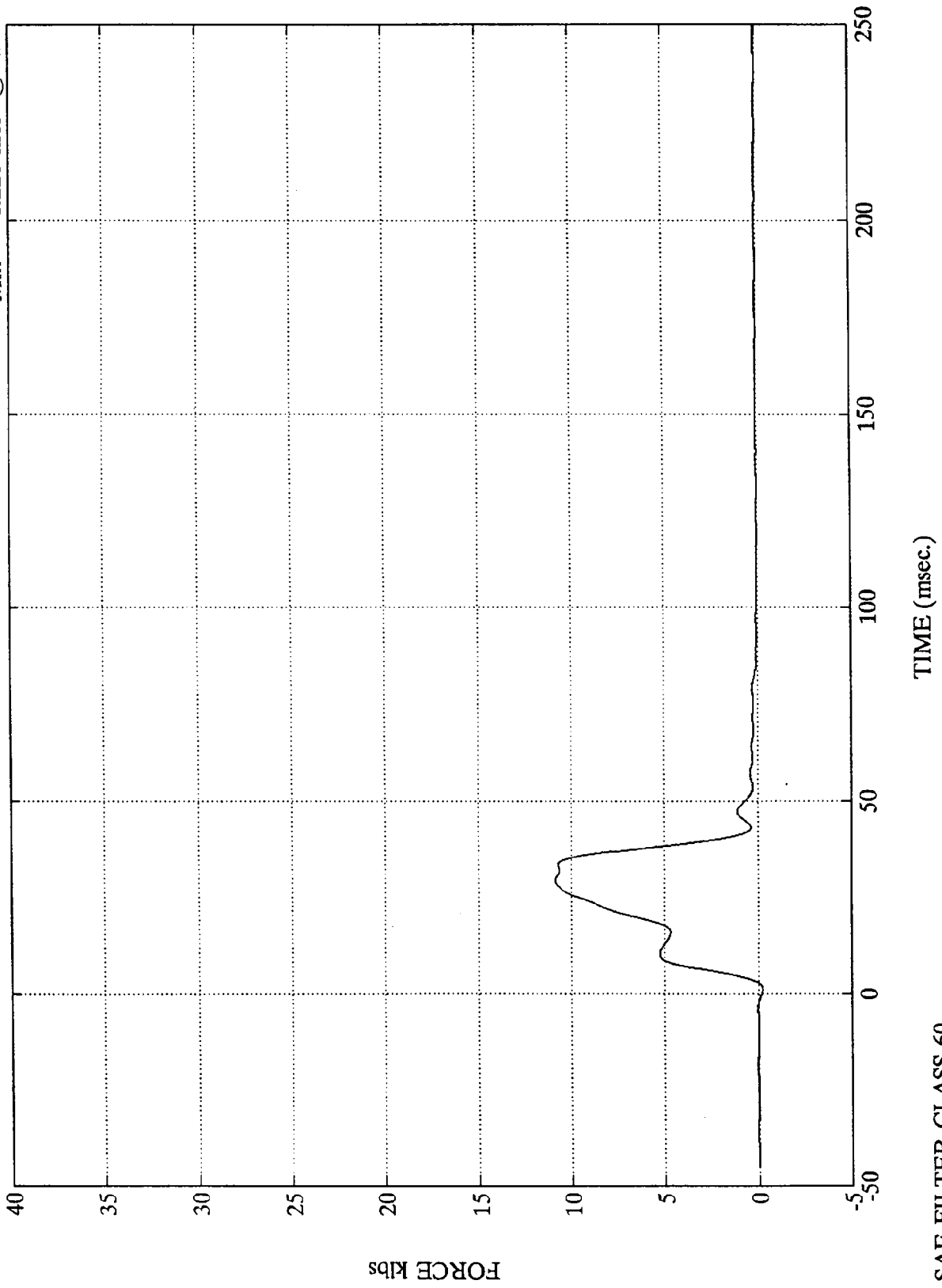


SAE FILTER CLASS 60

Test 1022

BARRIER LOAD CELL D5

Max = 10.881 klbs @ 29.6 msec
Min = -0.226 klbs @ 1.2 msec



B-62

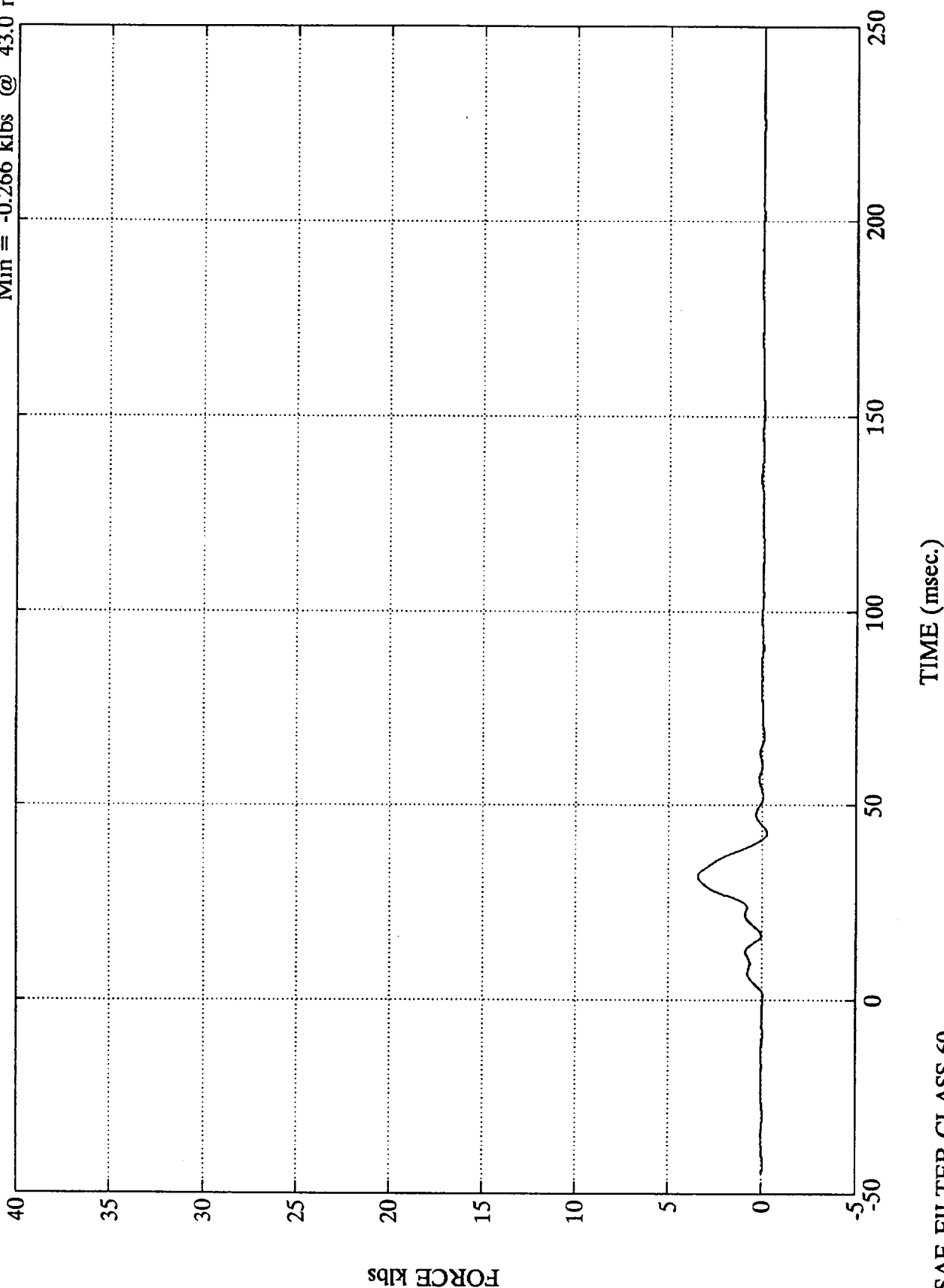
7862-3

SAE FILTER CLASS 60

Test 1022

Max = 3.431 klbs @ 31.8 msec
Min = -0.266 klbs @ 43.0 msec

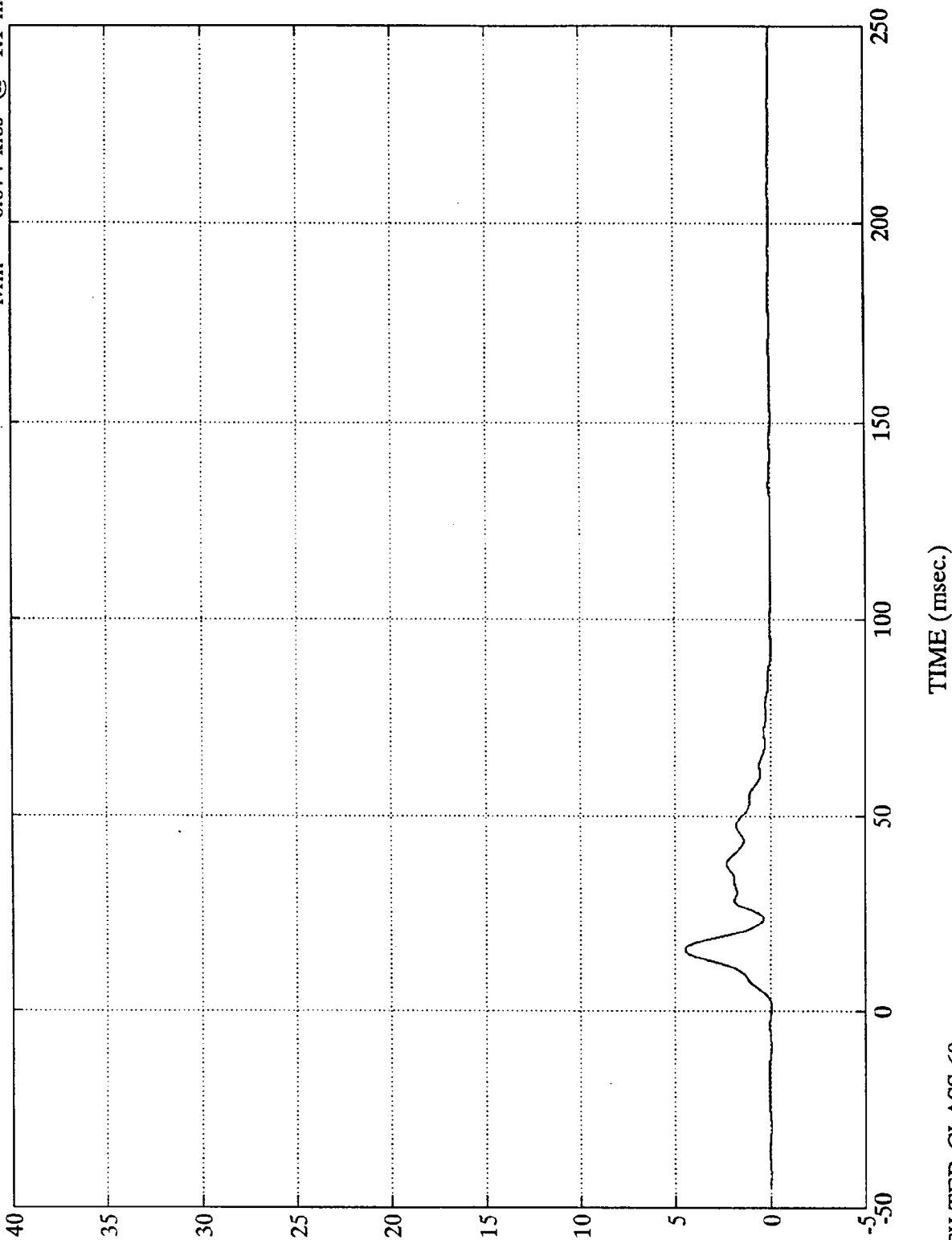
BARRIER LOAD CELL D6



Test 1022

BARRIER LOAD CELL D7

Max = 4.493 klbs @ 15.6 msec
Min = -0.074 klbs @ 1.1 msec



SAE FILTER CLASS 60

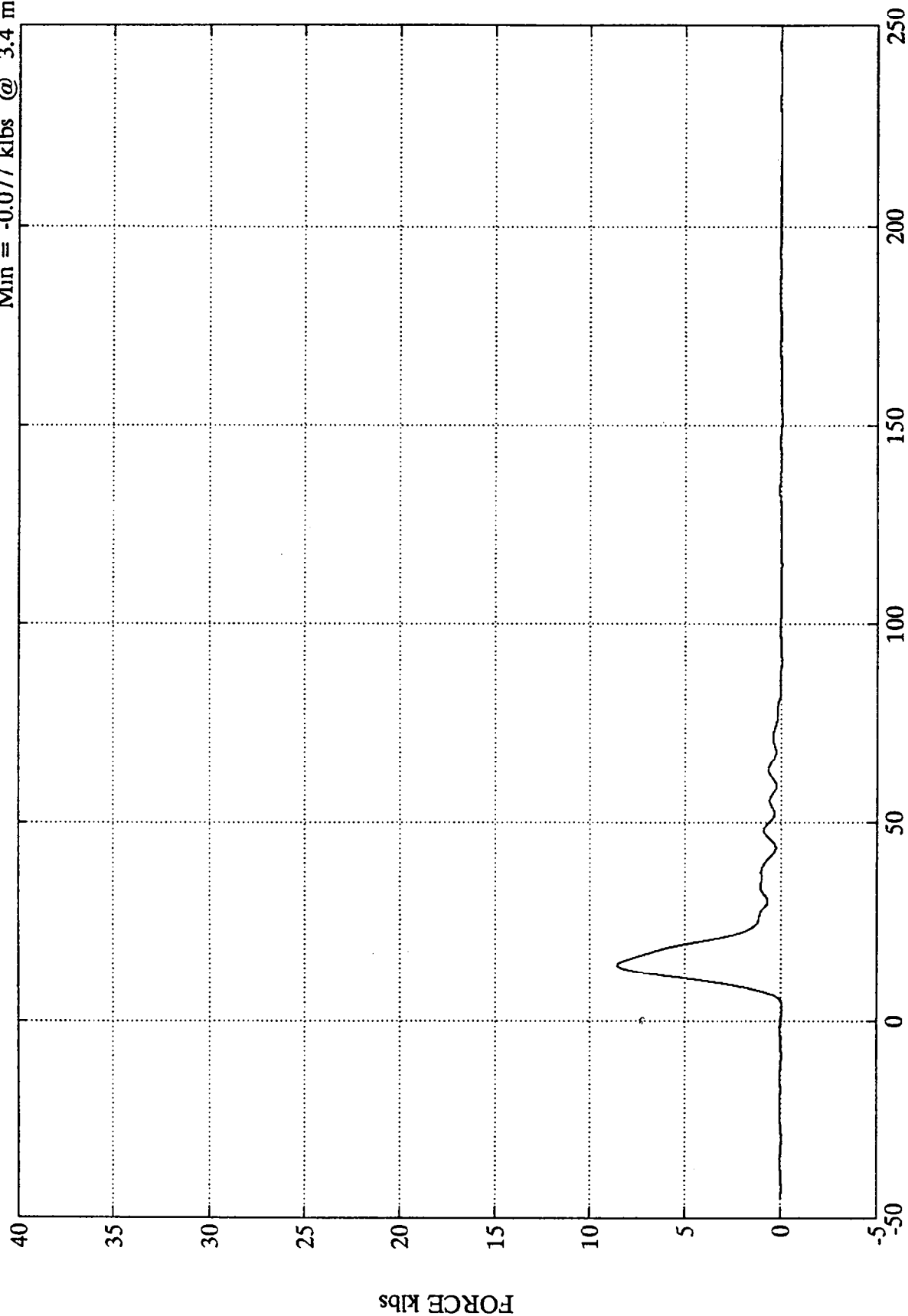
B-64

7862-3

Test 1022

BARRIER LOAD CELL D8

Max = 8.566 klbs @ 13.9 msec
Min = -0.077 klbs @ 3.4 msec



TIME (msec.)

SAE FILTER CLASS 60

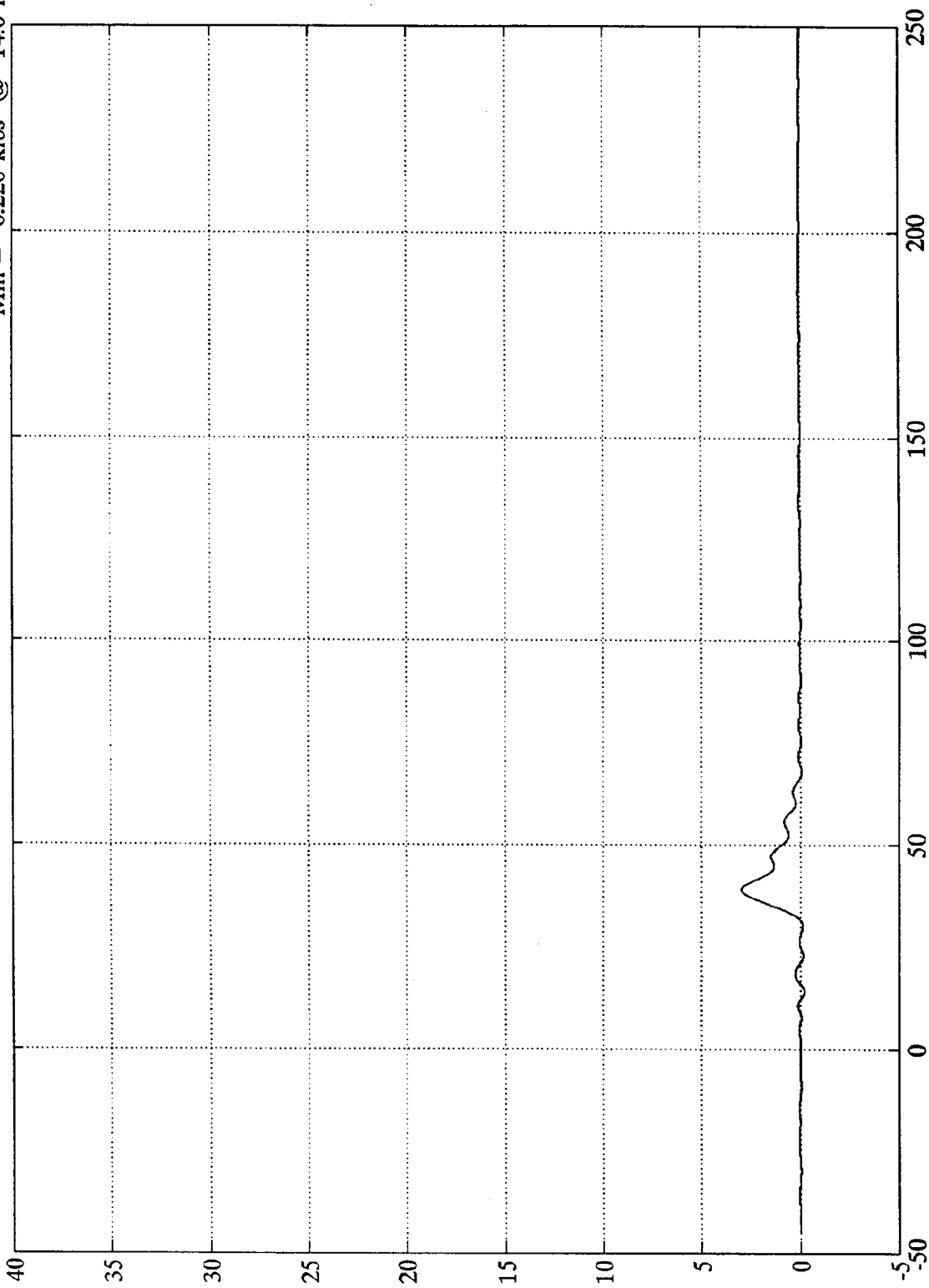
B-65

7862-3

Test 1022

BARRIER LOAD CELL D9

Max = 2.987 klbs @ 39.4 msec
Min = -0.220 klbs @ 14.0 msec



TIME (msec.)

SAE FILTER CLASS 60

FORCE klbs

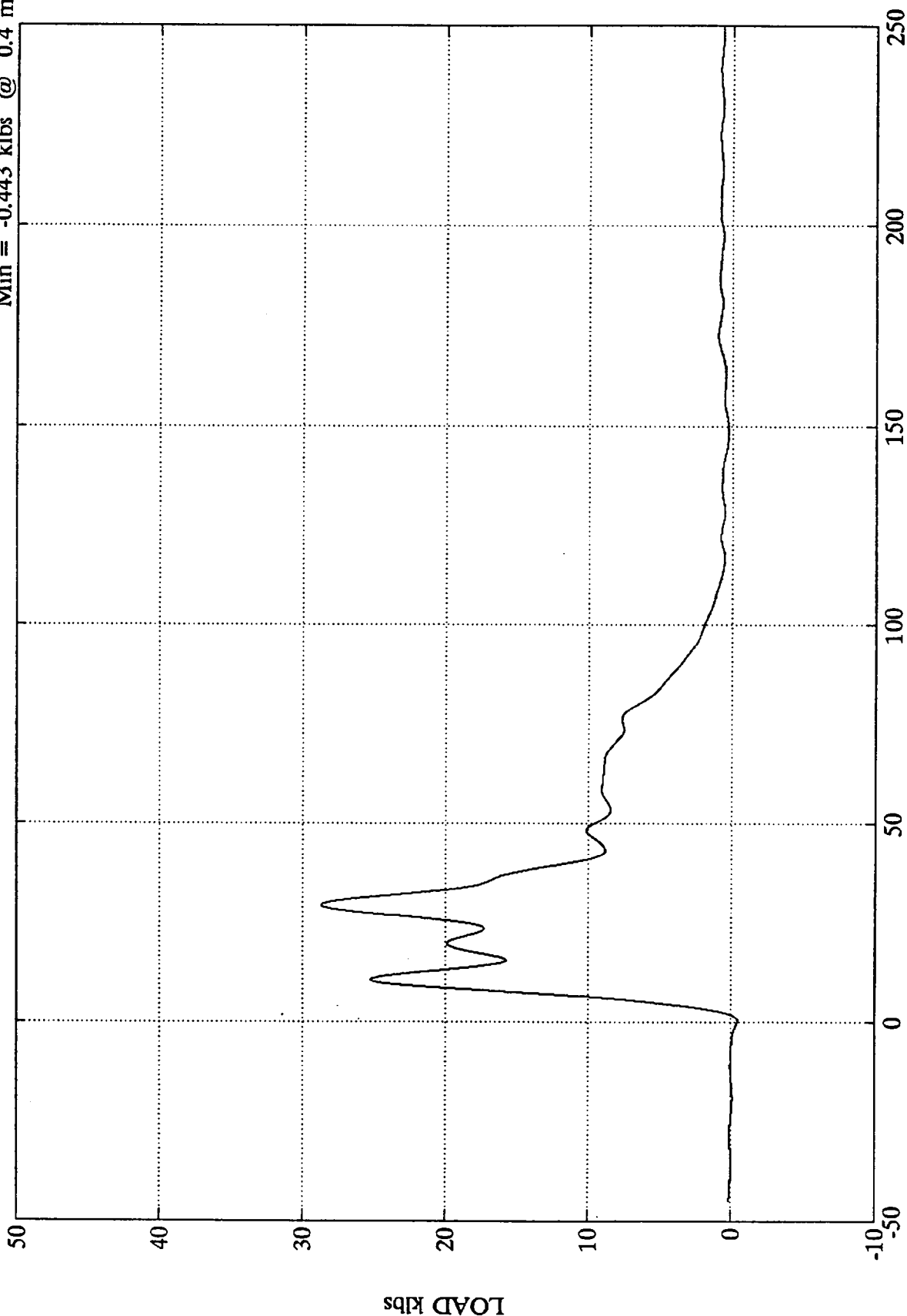
B-66

7862-3

Test 1022

GROUP 1 LOAD CELL SUM

Max = 28.719 klbs @ 29.5 msec
Min = -0.443 klbs @ 0.4 msec



TIME (msec)

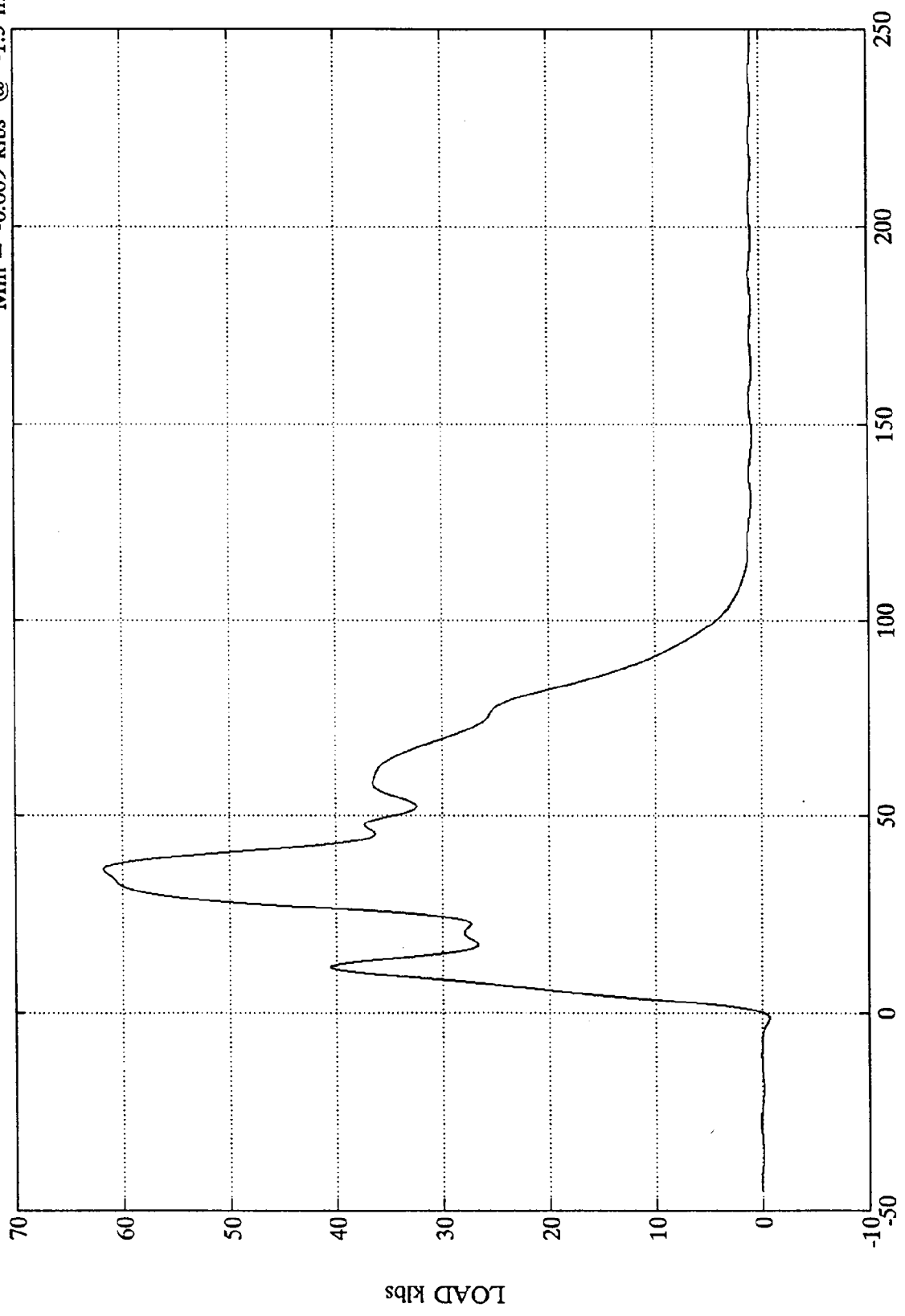
Load Cells (A1,A2,A3,B1,B2,B3)

SAE Filter Class 60

Test 1022

Max = 61.758 klbs @ 36.2 msec
Min = -0.669 klbs @ -1.3 msec

GROUP 2 LOAD CELL SUM



TIME (msec)

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

SAE Filter Class 60

LOAD klbs

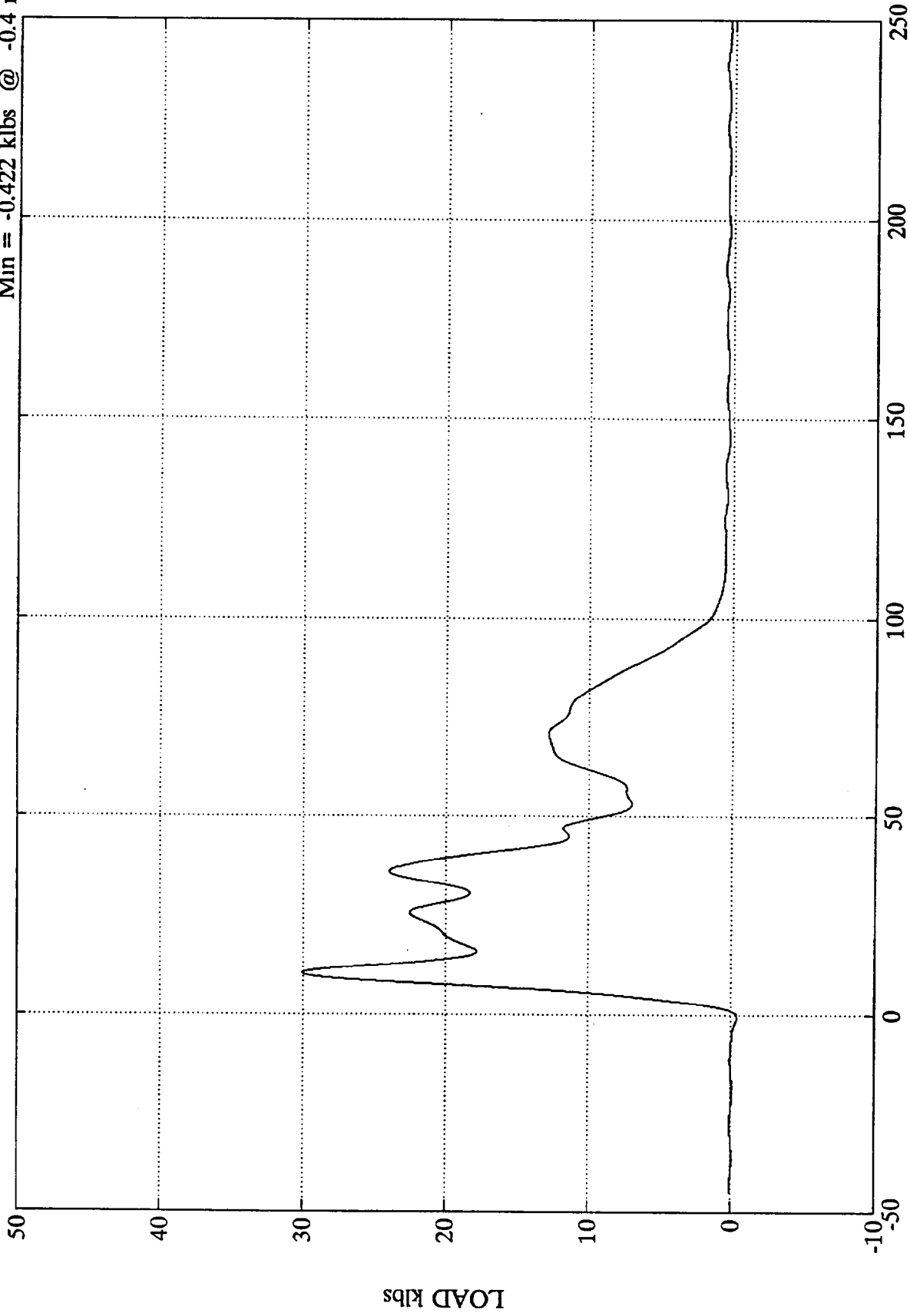
B-68

7862-3

Test 1022

GROUP 3 LOAD CELL SUM

Max = 30.064 klbs @ 10.3 msec
Min = -0.422 klbs @ -0.4 msec



TIME (msec)

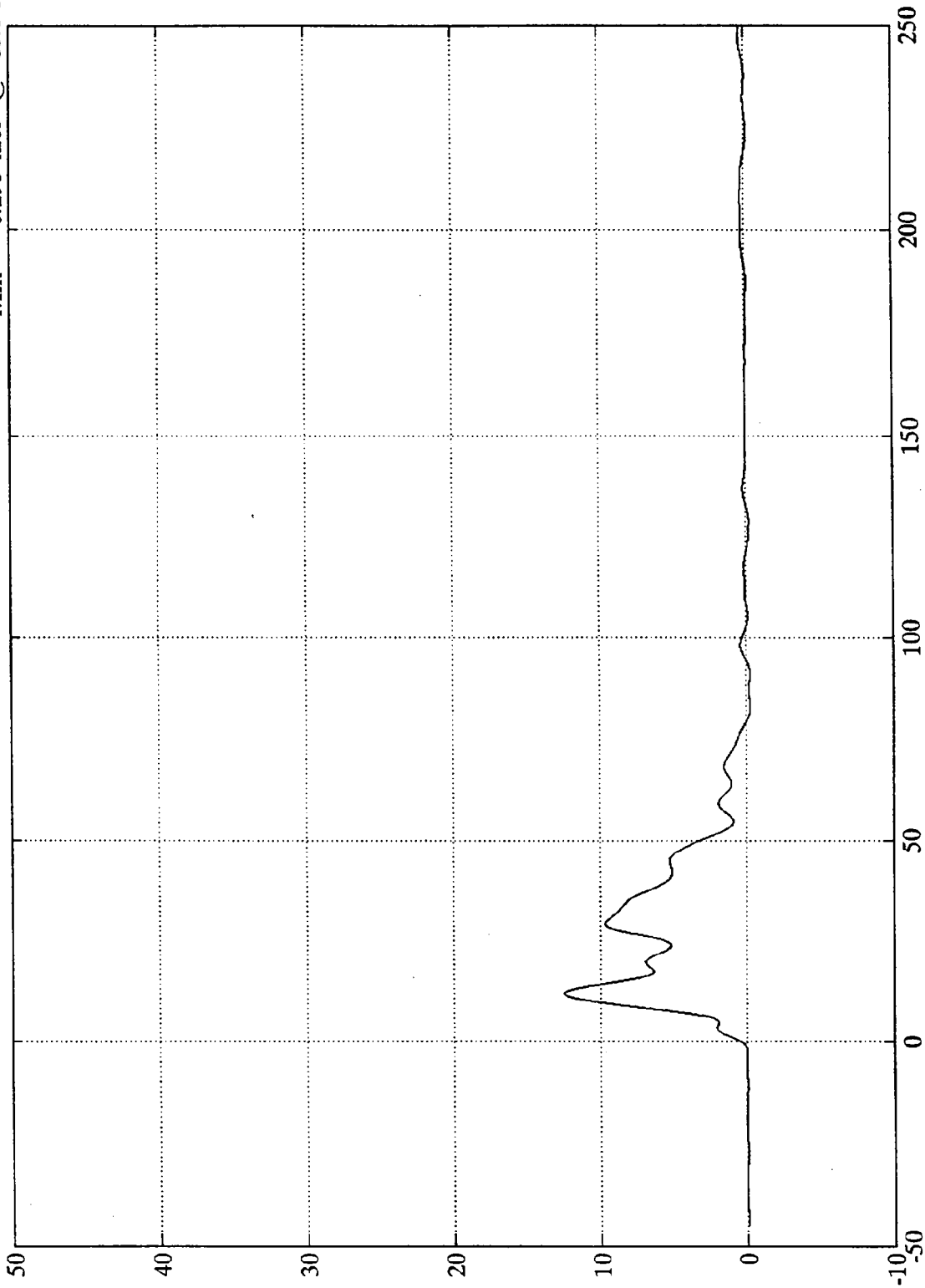
SAE Filter Class 60

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

Test 1022

GROUP 4 LOAD CELL SUM

Max = 12.470 klbs @ 11.9 msec
Min = -0.293 klbs @ 83.0 msec



SAE Filter Class 60

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

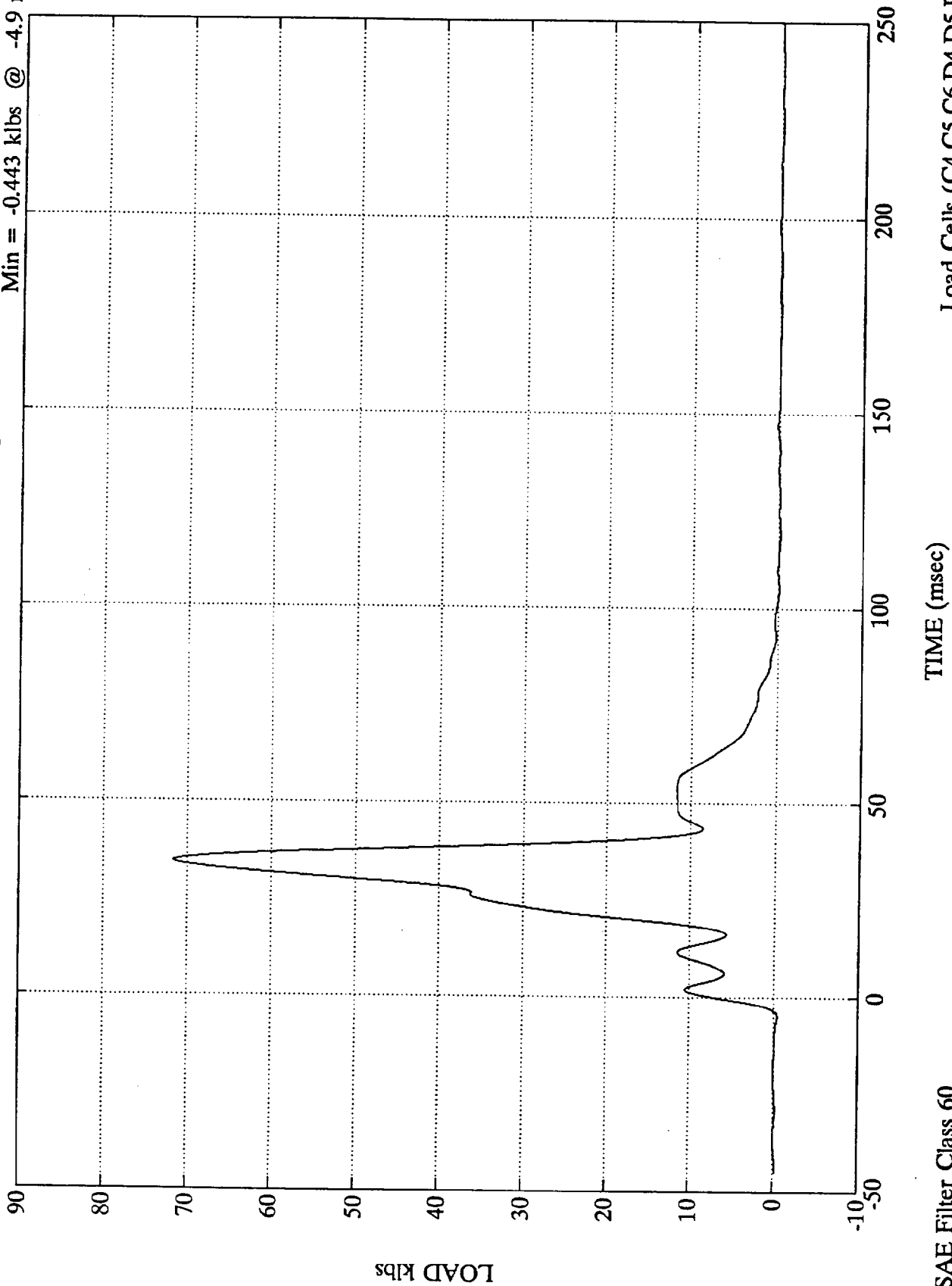
B-70

7862-3

Test 1022

GROUP 5 LOAD CELL SUM

Max = 71.632 klbs @ 34.4 msec
Min = -0.443 klbs @ -4.9 msec



SAE Filter Class 60

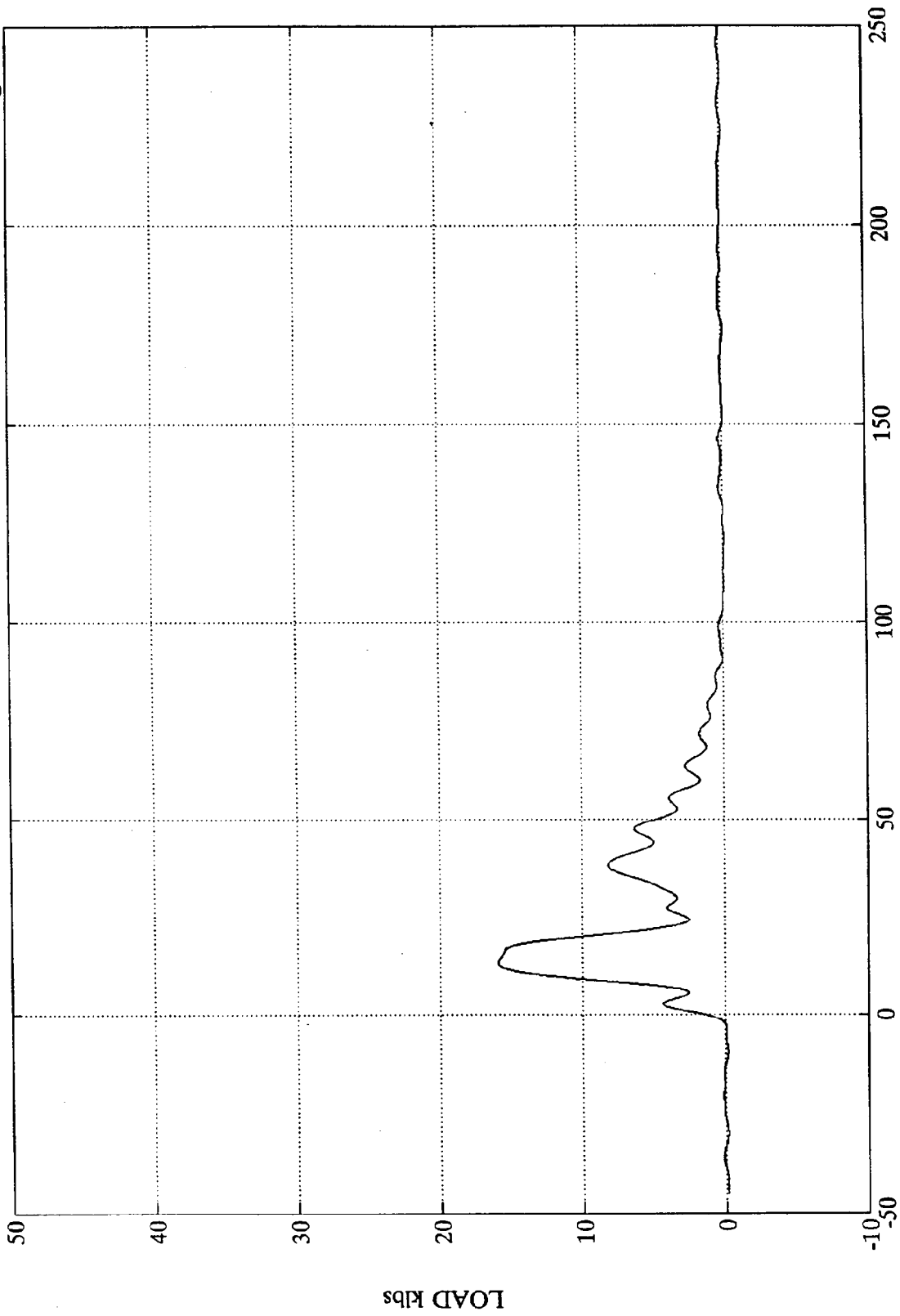
TIME (msec)

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

Max = 15.930 klbs @ 13.1 msec
Min = -0.170 klbs @ -9.4 msec

GROUP 6 LOAD CELL SUM

Test 1022



LOAD klbs

TIME (msec)

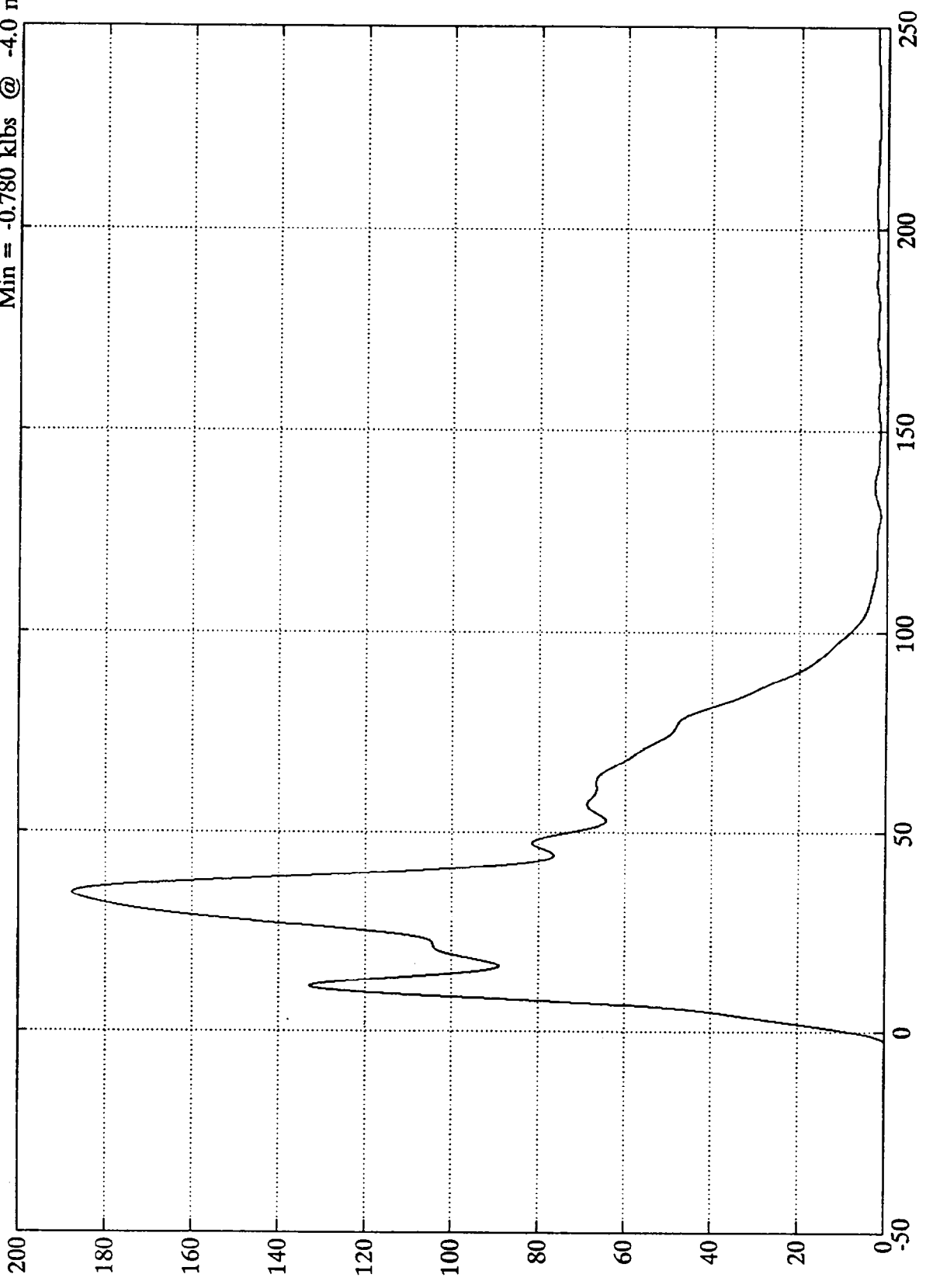
Load Cells (C7,C8,C9,D7,D8,D9)

SAE Filter Class 60

Test 1022

TOTAL LOAD CELL SUM

Max = 187.666 klbs @ 34.7 msec
Min = -0.780 klbs @ -4.0 msec



TIME (msec)

SAE Filter Class 60

TEST NO. MM0101

DUMMY DATA

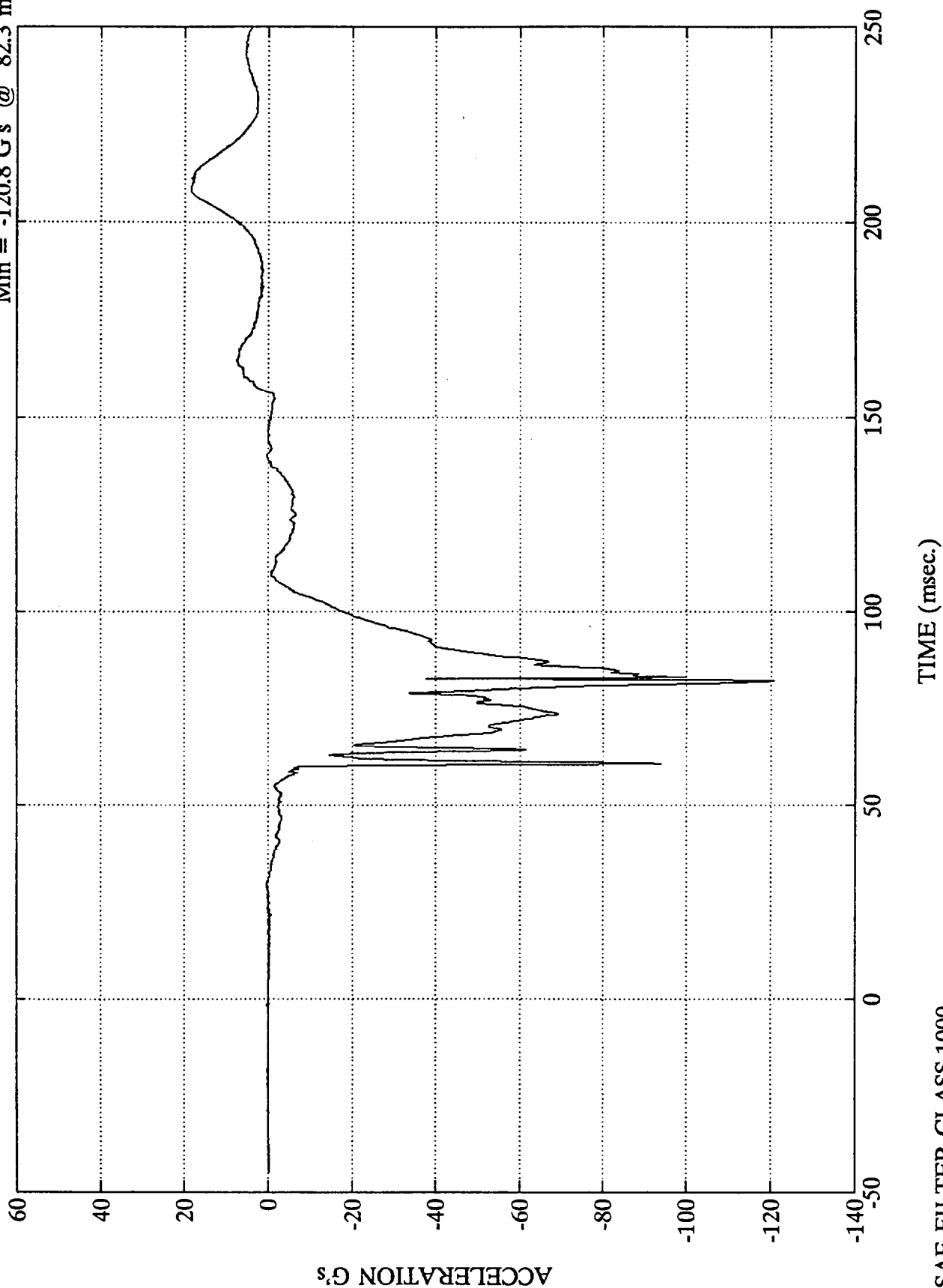
CLASS	FILTER CHANNEL
Head Accelerations	1000
Chest Accelerations	180
Chest Displacements	180
Femur Forces	600
Belt Loads	60
Belt Displacements	60

Test 1022

POS #1 HEAD X

Max = 18.5 G's @ 208.9 msec
Min = -120.8 G's @ 82.3 msec

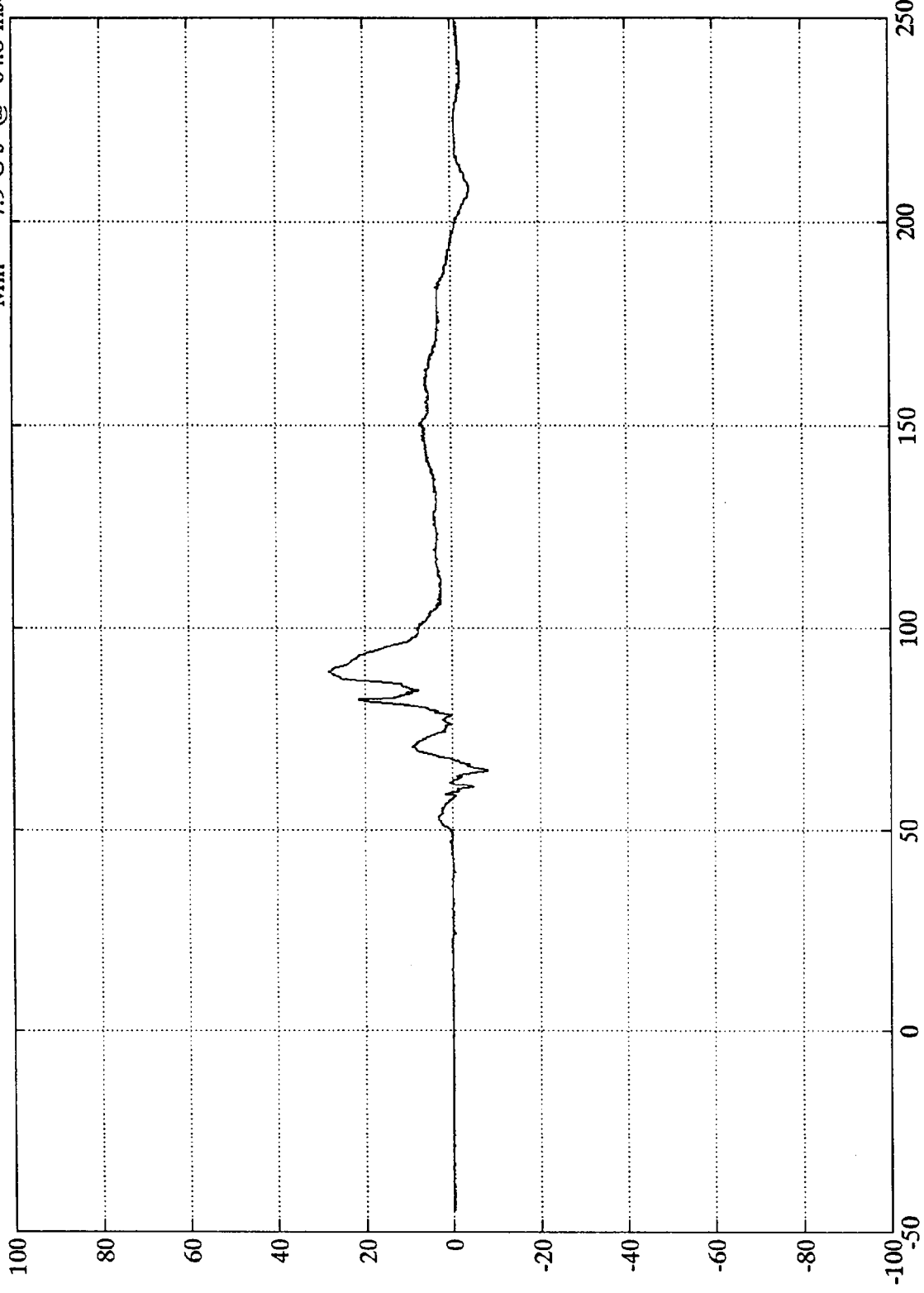
SAE FILTER CLASS 1000



Test 1022

POS #1 HEAD Y

Max = 28.2 G's @ 89.4 msec
Min = -7.9 G's @ 64.8 msec



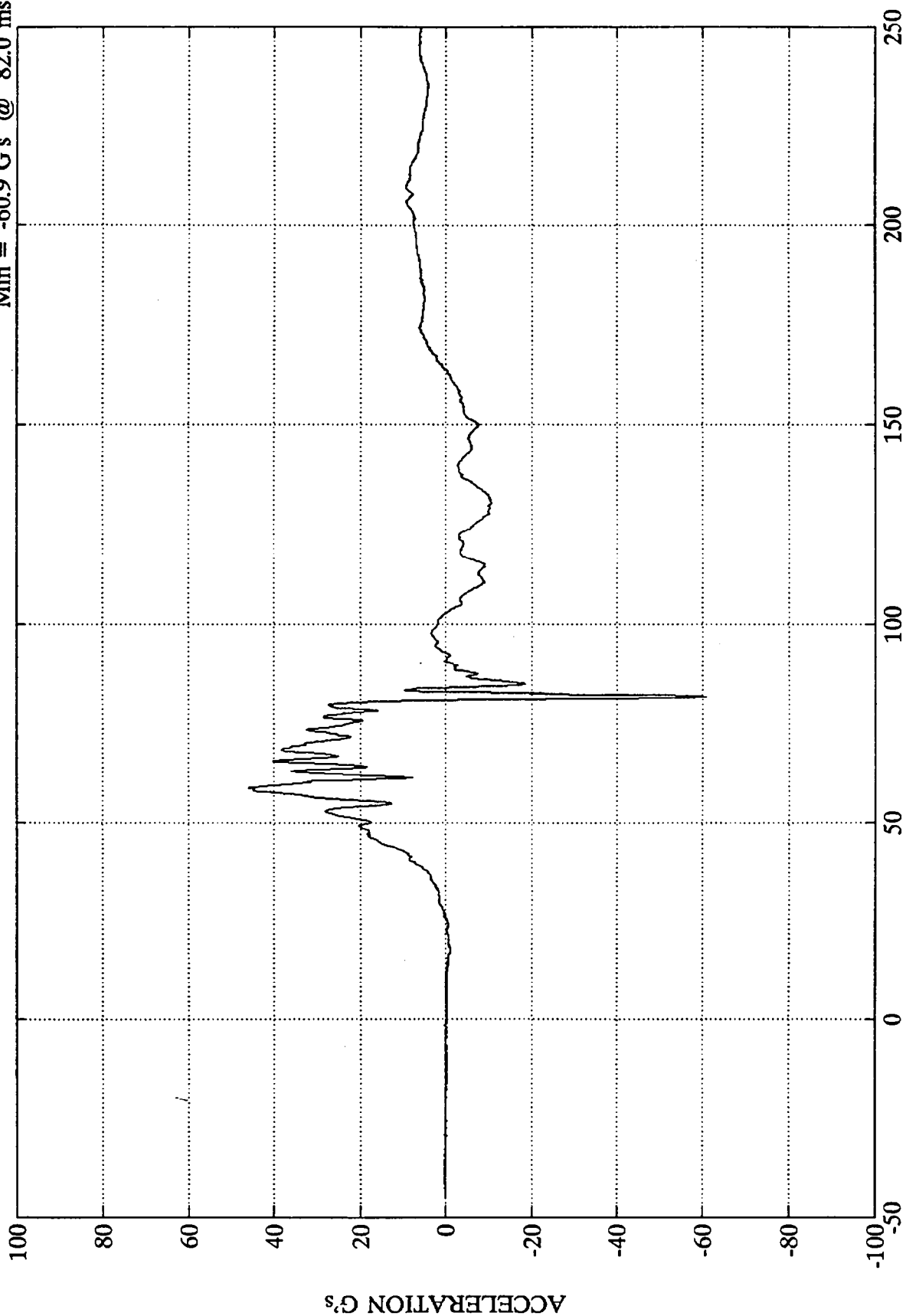
TIME (msec.)

SAE FILTER CLASS 1000

Test 1022

Max = 46.1 G's @ 58.9 msec
Min = -60.9 G's @ 82.0 msec

POS #1 HEAD Z



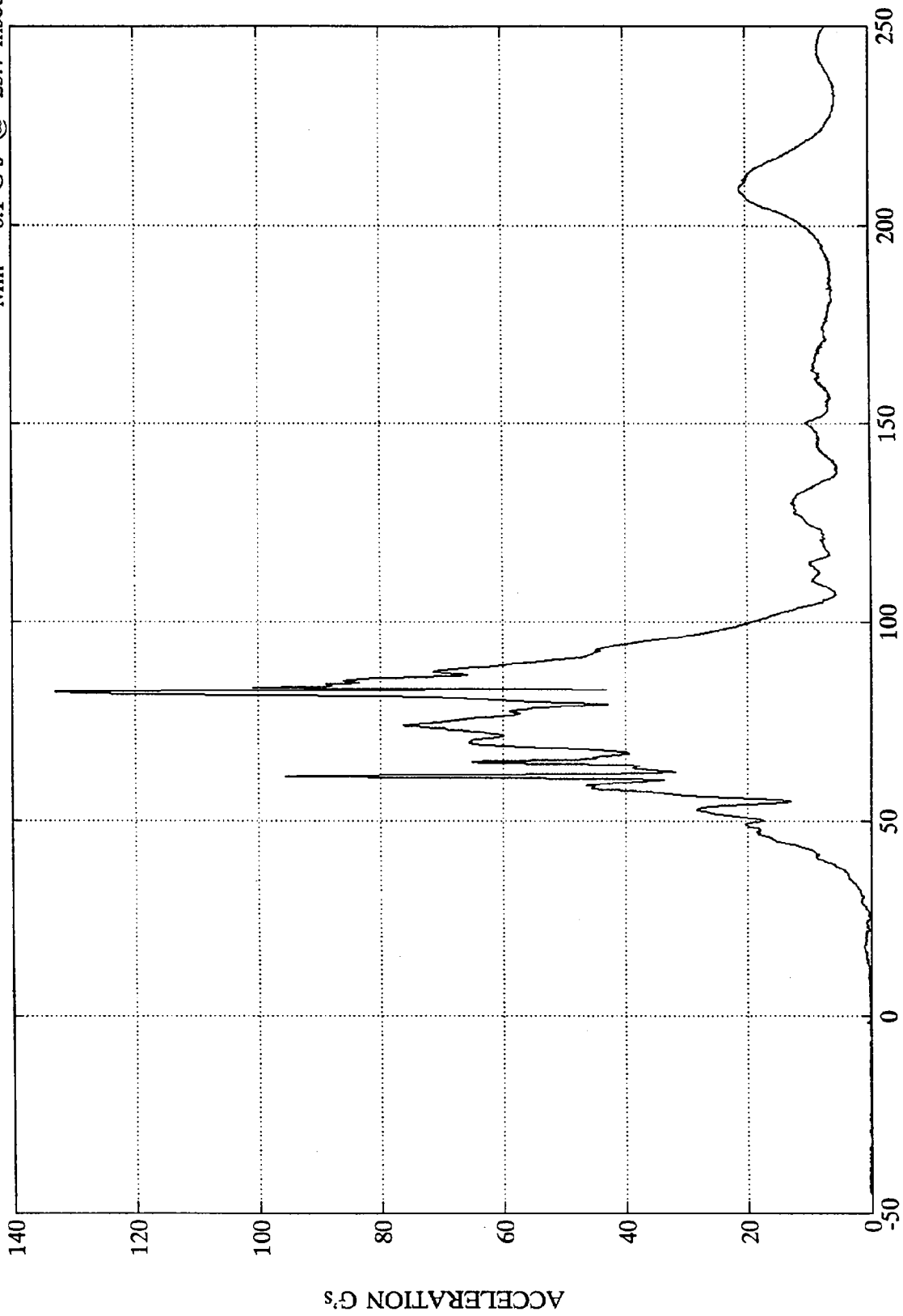
TIME (msec.)

SAE FILTER CLASS 1000

Test 1022

Max = 133.0 G's @ 82.3 msec
Min = 0.1 G's @ 25.7 msec

POS #1 HEAD RESULTANT



TIME (msec.)

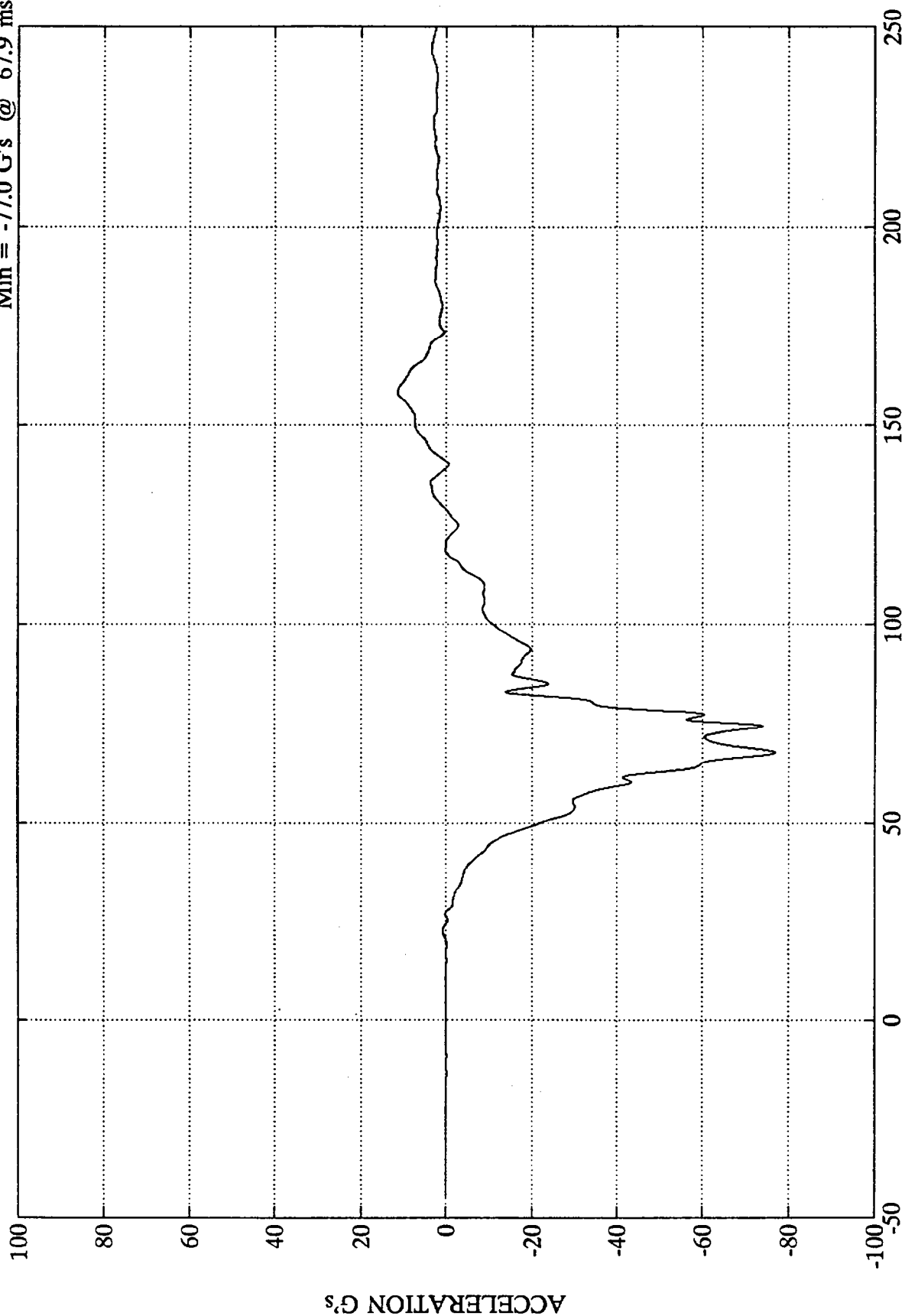
SAE FILTER CLASS 1000

Test 1022

POS #1 CHEST X

Max = 11.5 G's @ 158.0 msec
Min = -77.0 G's @ 67.9 msec

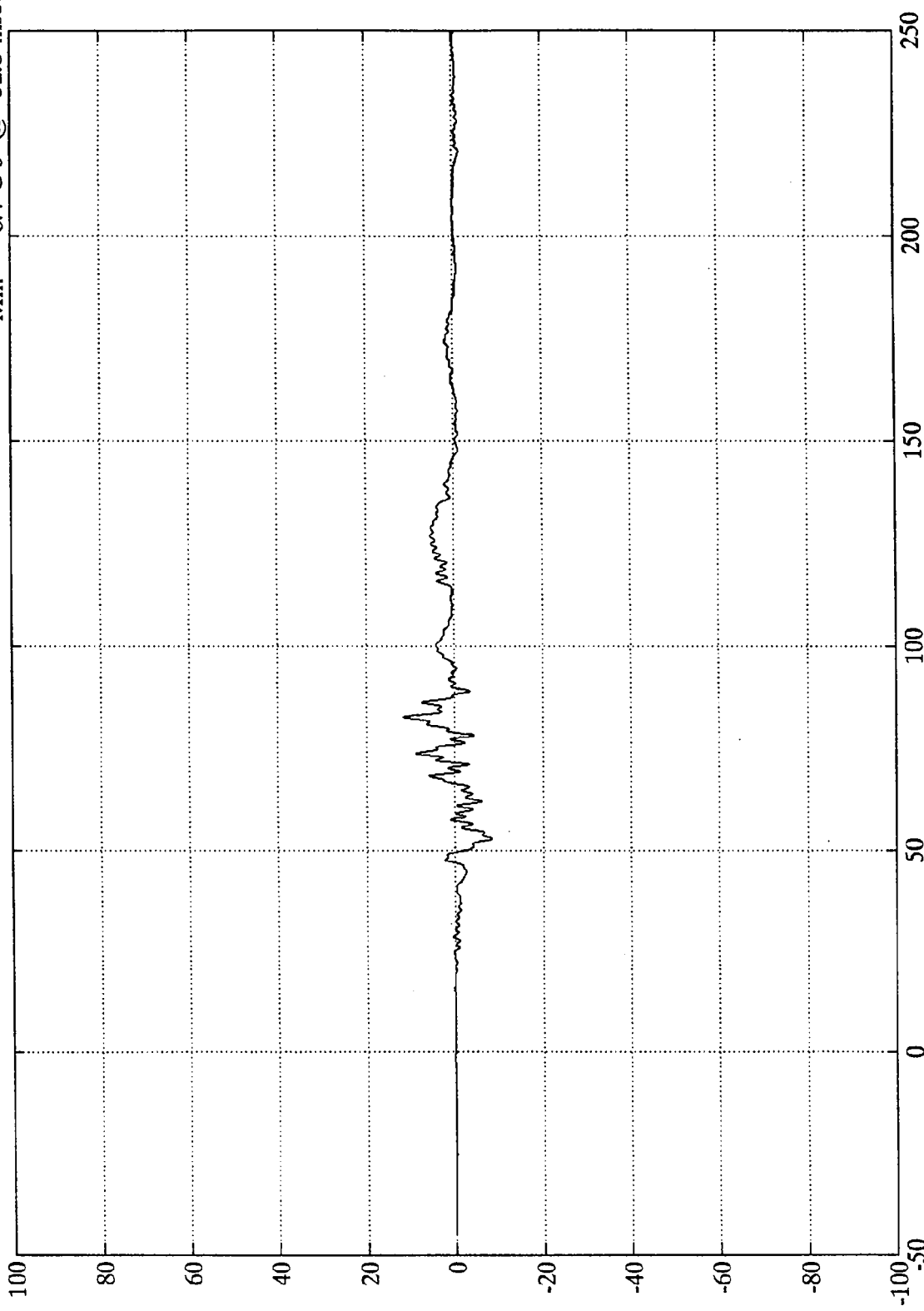
SAE FILTER CLASS 180



Test 1022

POS #1 CHEST Y

Max = 11.6 G's @ 82.3 msec
Min = -8.4 G's @ 52.8 msec



SAE FILTER CLASS 180

B-80

7862-3

Test 1022

Max = 26.2 G's @ 57.2 msec
Min = -18.0 G's @ 83.2 msec

POS #1 CHEST Z

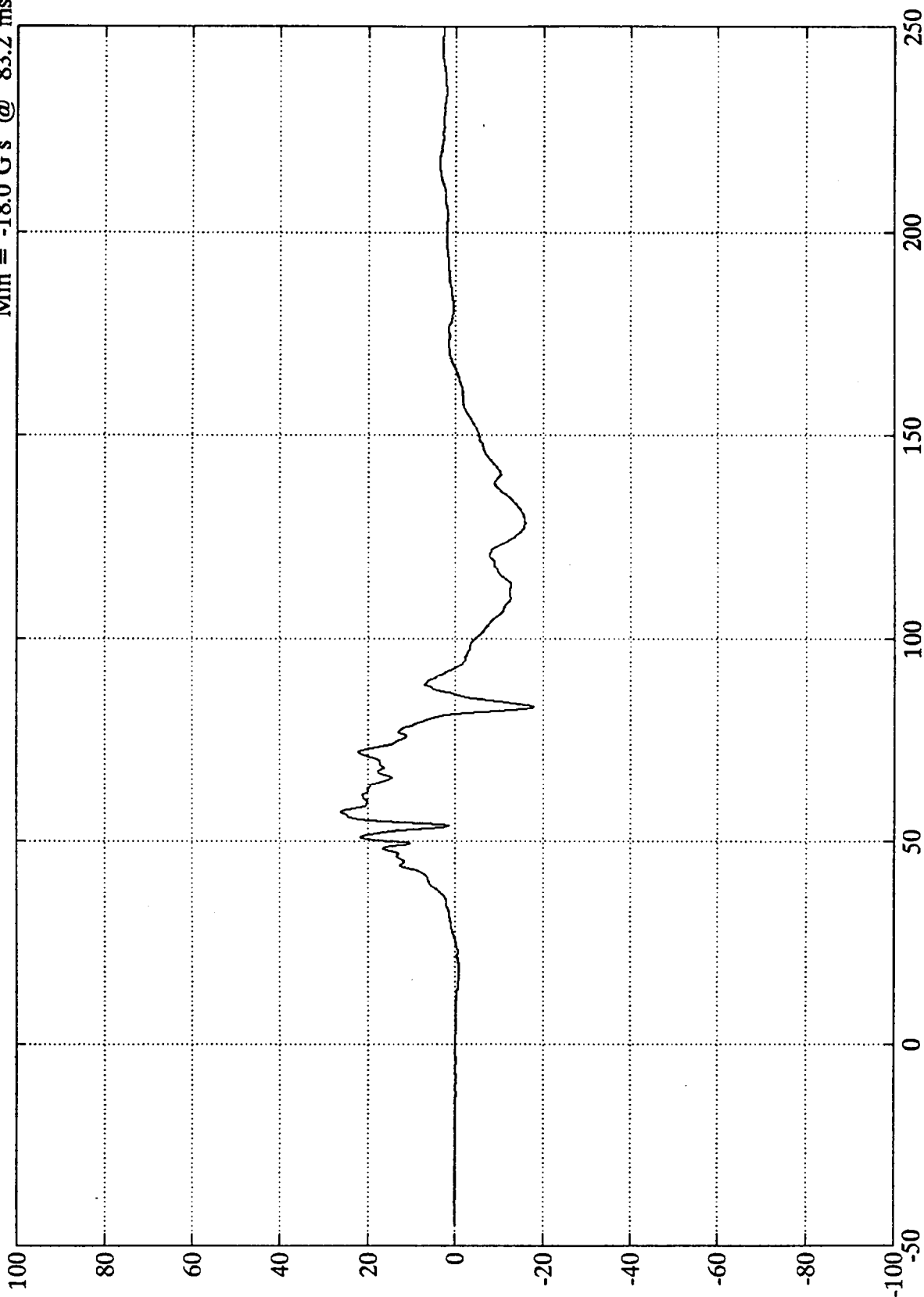
ACCELERATION G's

B-81

7862-3

TIME (msec.)

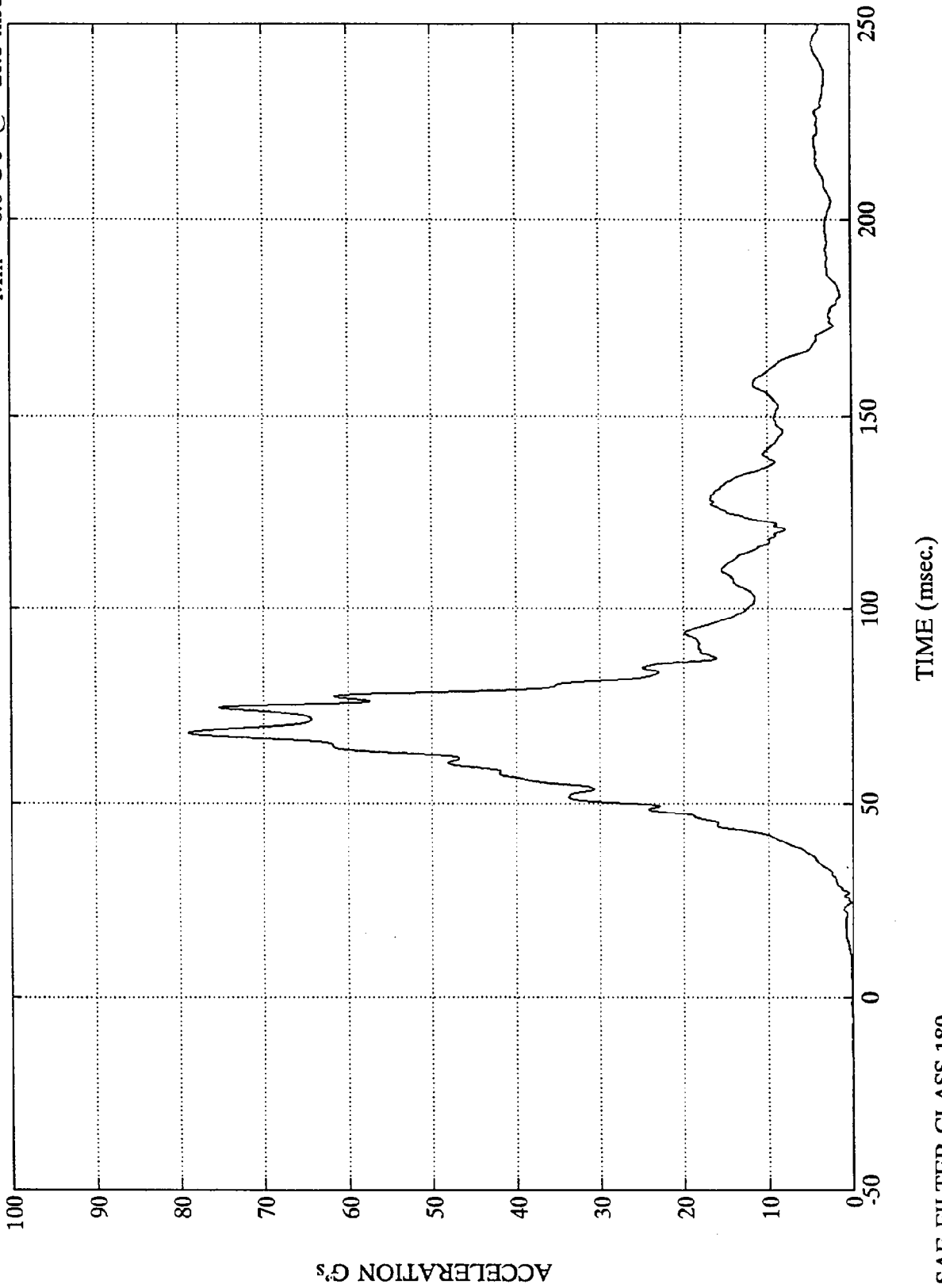
SAE FILTER CLASS 180



Test 1022

Max = 79.0 G's @ 67.9 msec
Min = 0.0 G's @ -26.8 msec

POS #1 CHEST RESULTANT

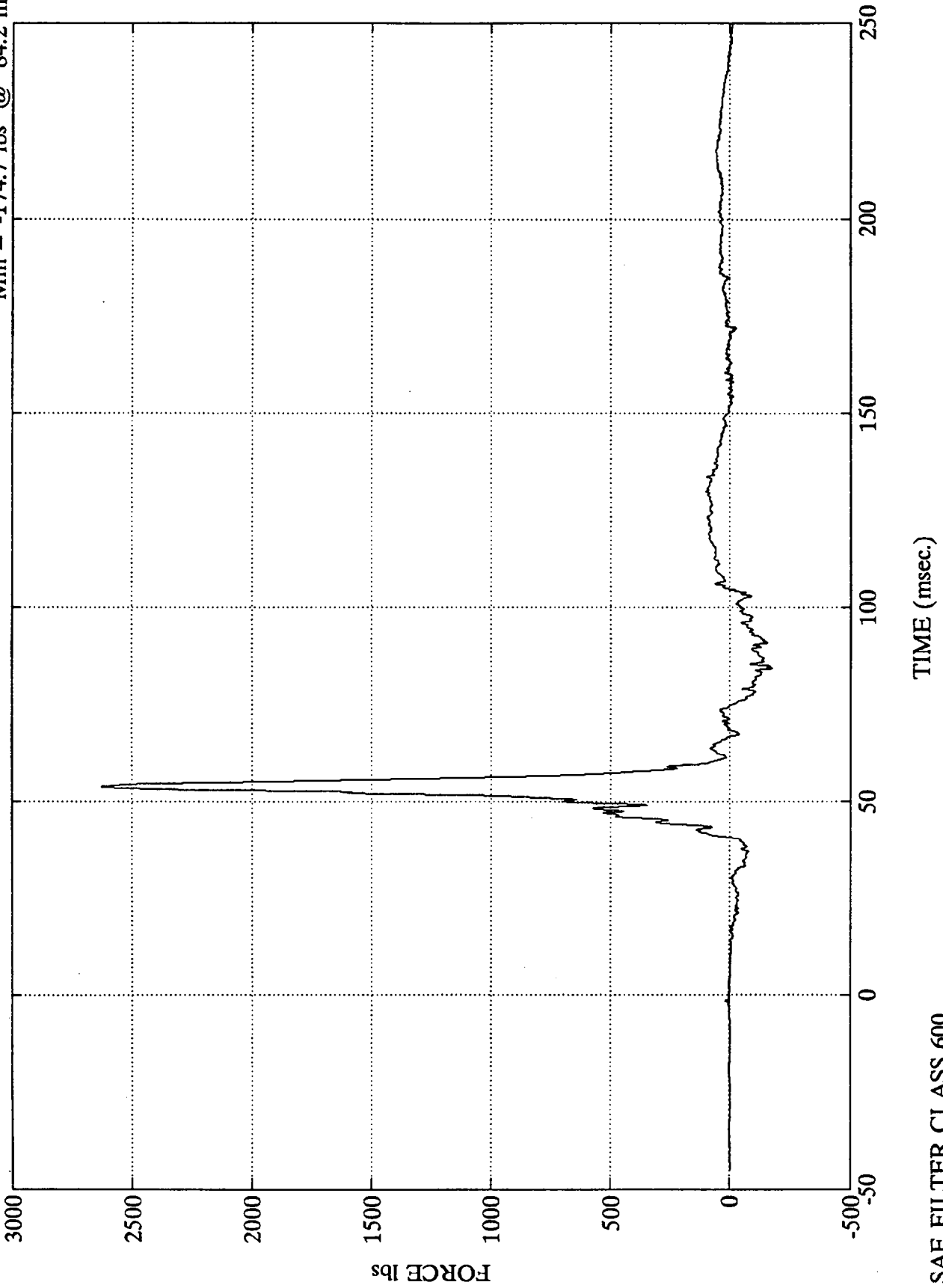


SAE FILTER CLASS 180

Test 1022

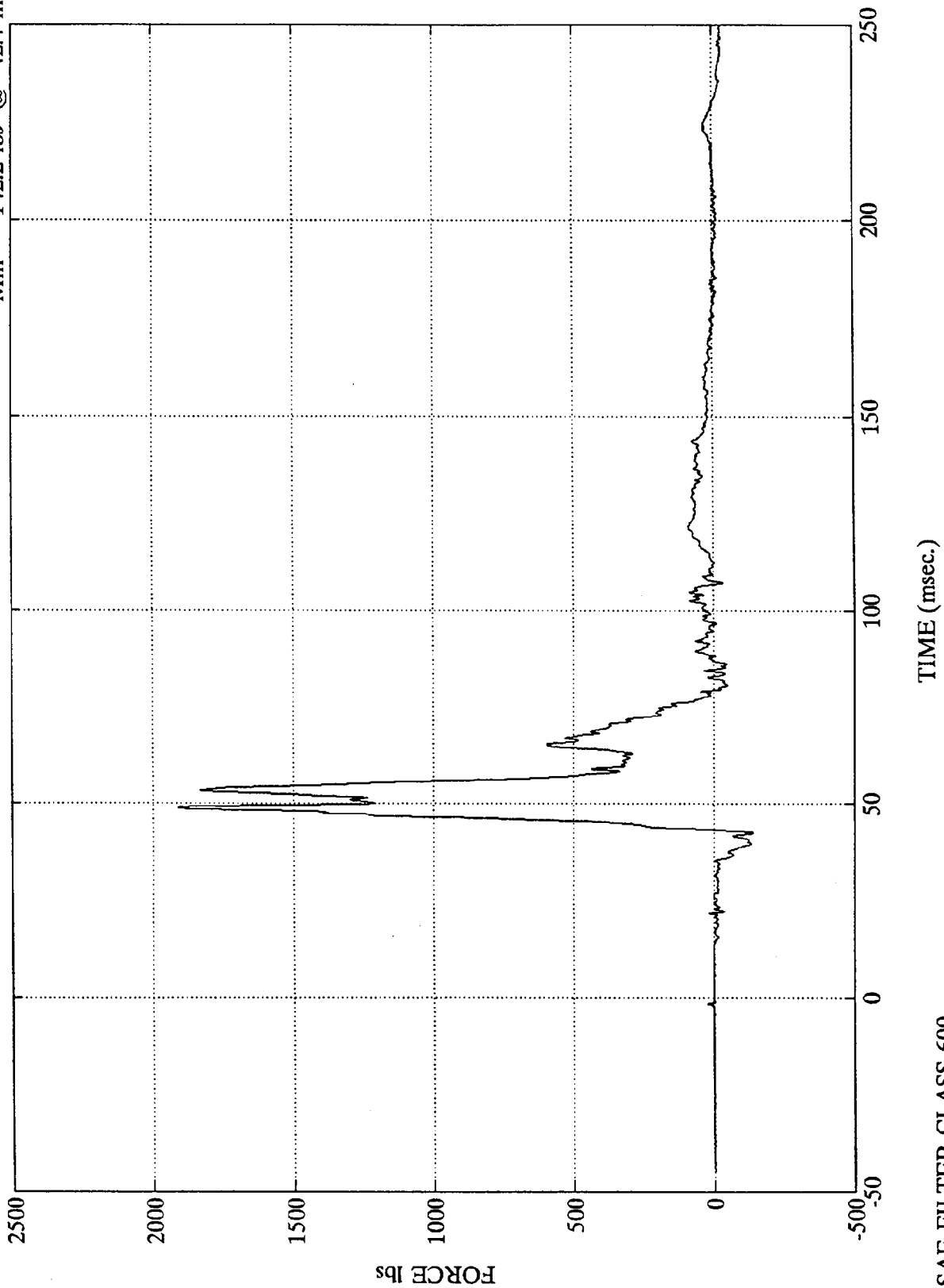
POS #1 LEFT FEMUR

Max = 2626.0 lbs @ 53.8 msec
Min = -174.7 lbs @ 84.2 msec



Test 1022
Max = 1908.6 lbs @ 49.1 msec
Min = -142.2 lbs @ 42.4 msec

POS #1 RIGHT FEMUR

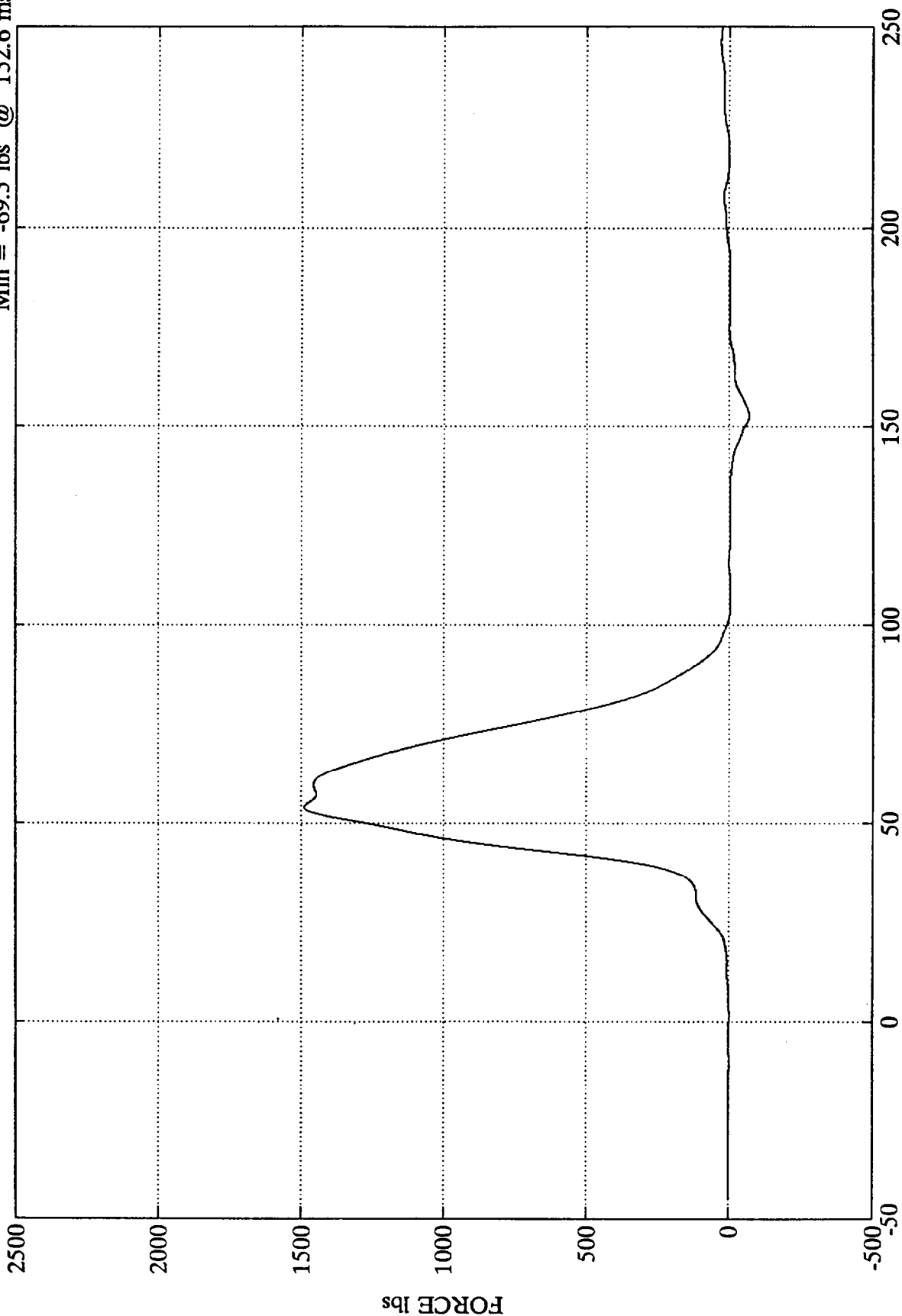


SAE FILTER CLASS 600

Test 1022

Max = 1489.1 lbs @ 54.0 msec
Min = -69.5 lbs @ 152.6 msec

POS #1 LAP BELT



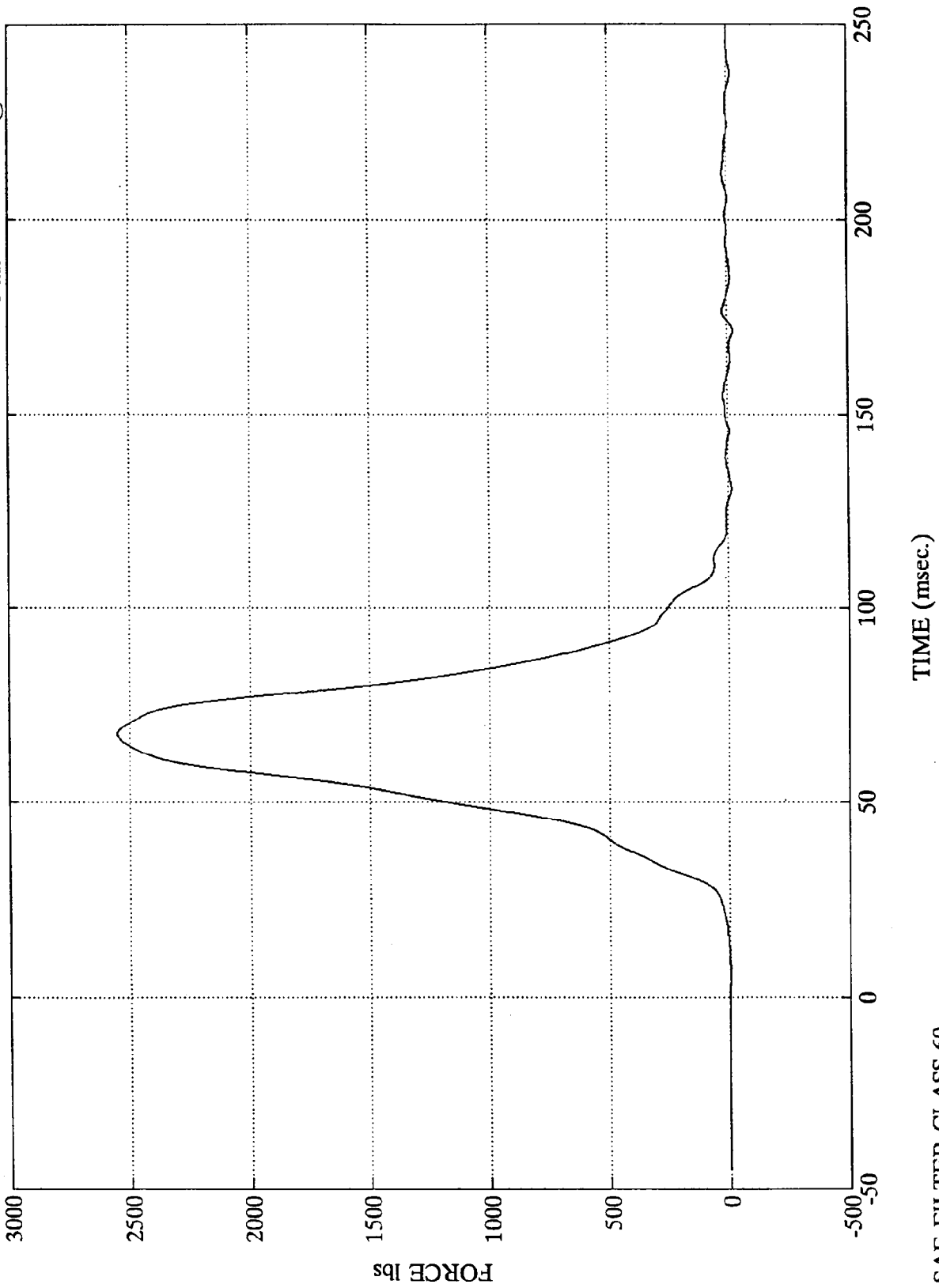
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

POS #1 TORSO BELT

Max = 2550.7 lbs @ 67.7 msec
Min = -21.3 lbs @ 171.7 msec



B-86

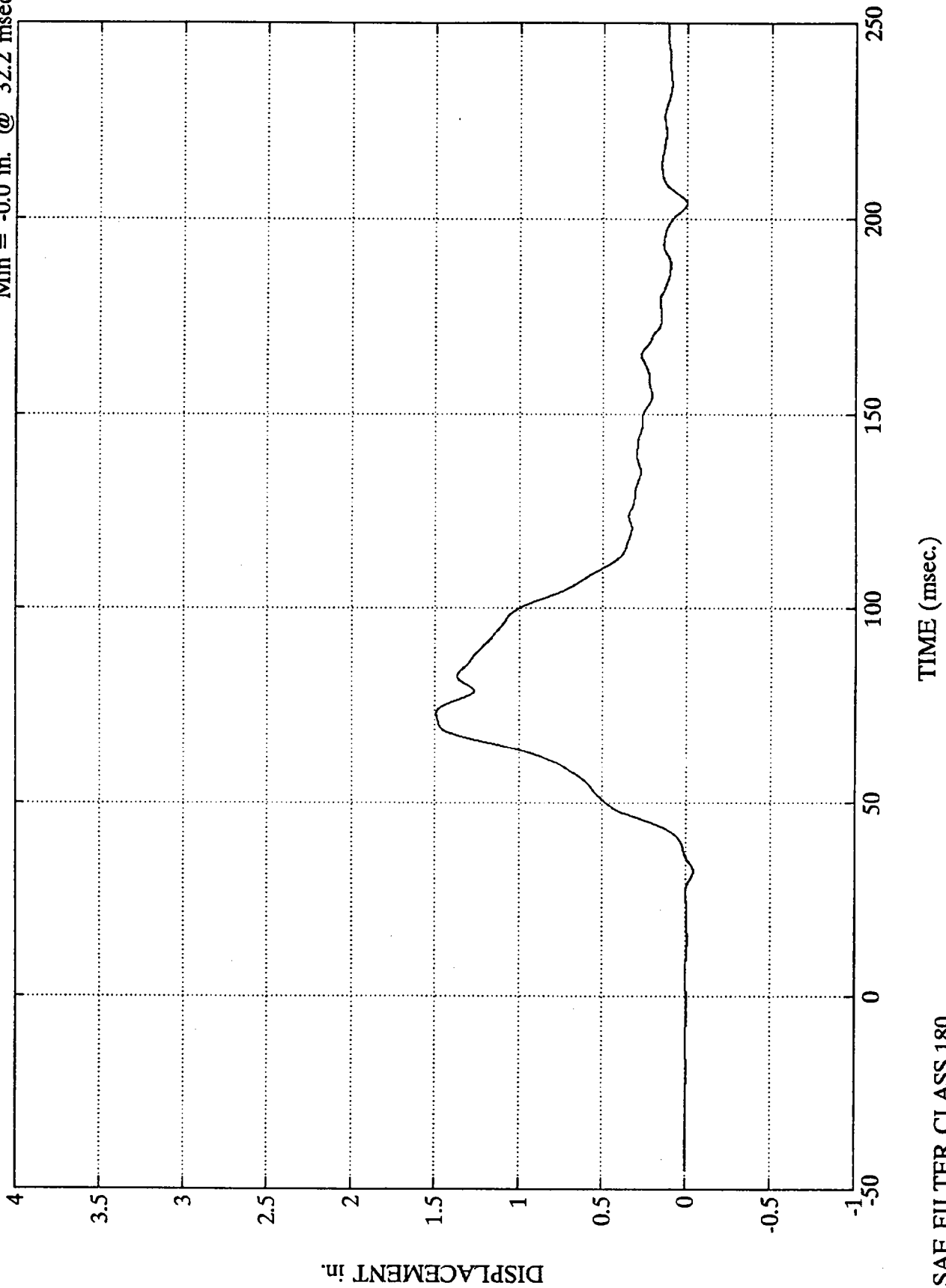
7862-3

SAE FILTER CLASS 60

Test 1022

POS #1 CHEST DISPLACEMENT

Max = 1.5 in. @ 73.0 msec
Min = -0.0 in. @ 32.2 msec



B-87

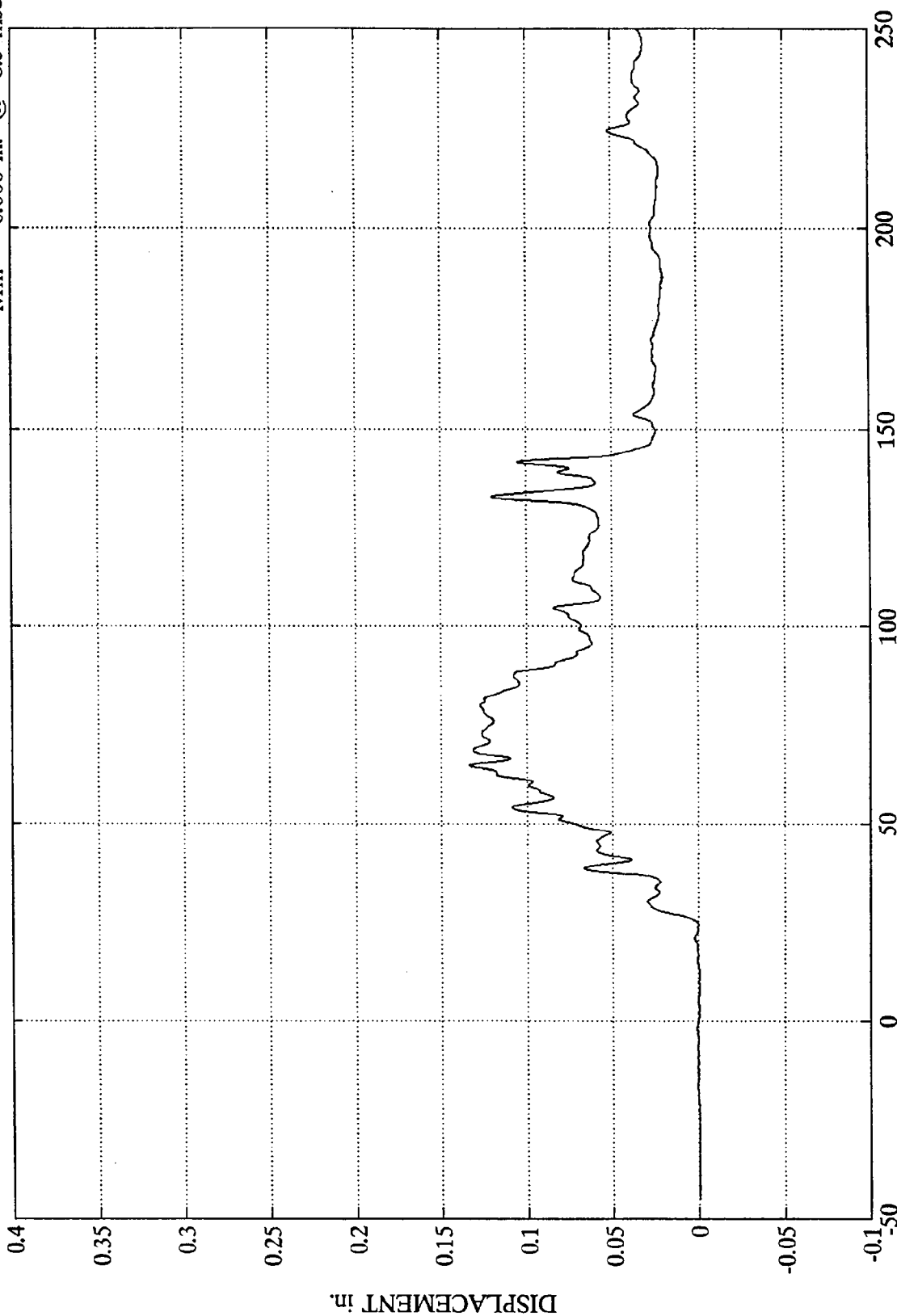
7862-3

SAE FILTER CLASS 180

Test 1022

POS #1 BELT ELONGATION

Max = 0.134 in. @ 64.7 msec
Min = -0.000 in. @ 8.5 msec



TIME (msec.)

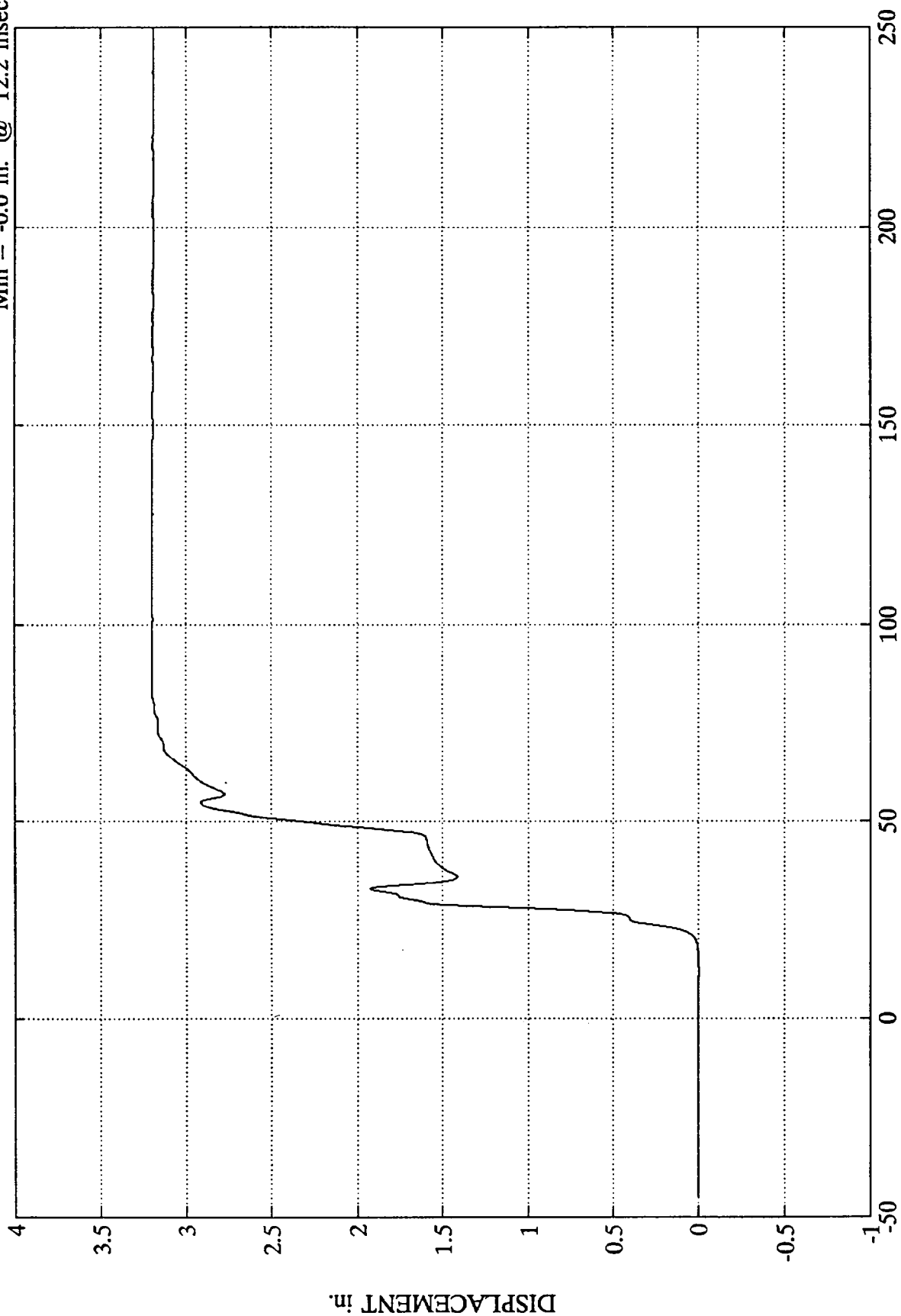
Measured over
2.5 inches

SAE FILTER CLASS 60

Test 1022

POS #1 BELT SPOOL OUT

Max = 3.2 in. @ 88.4 msec
Min = -0.0 in. @ 12.2 msec



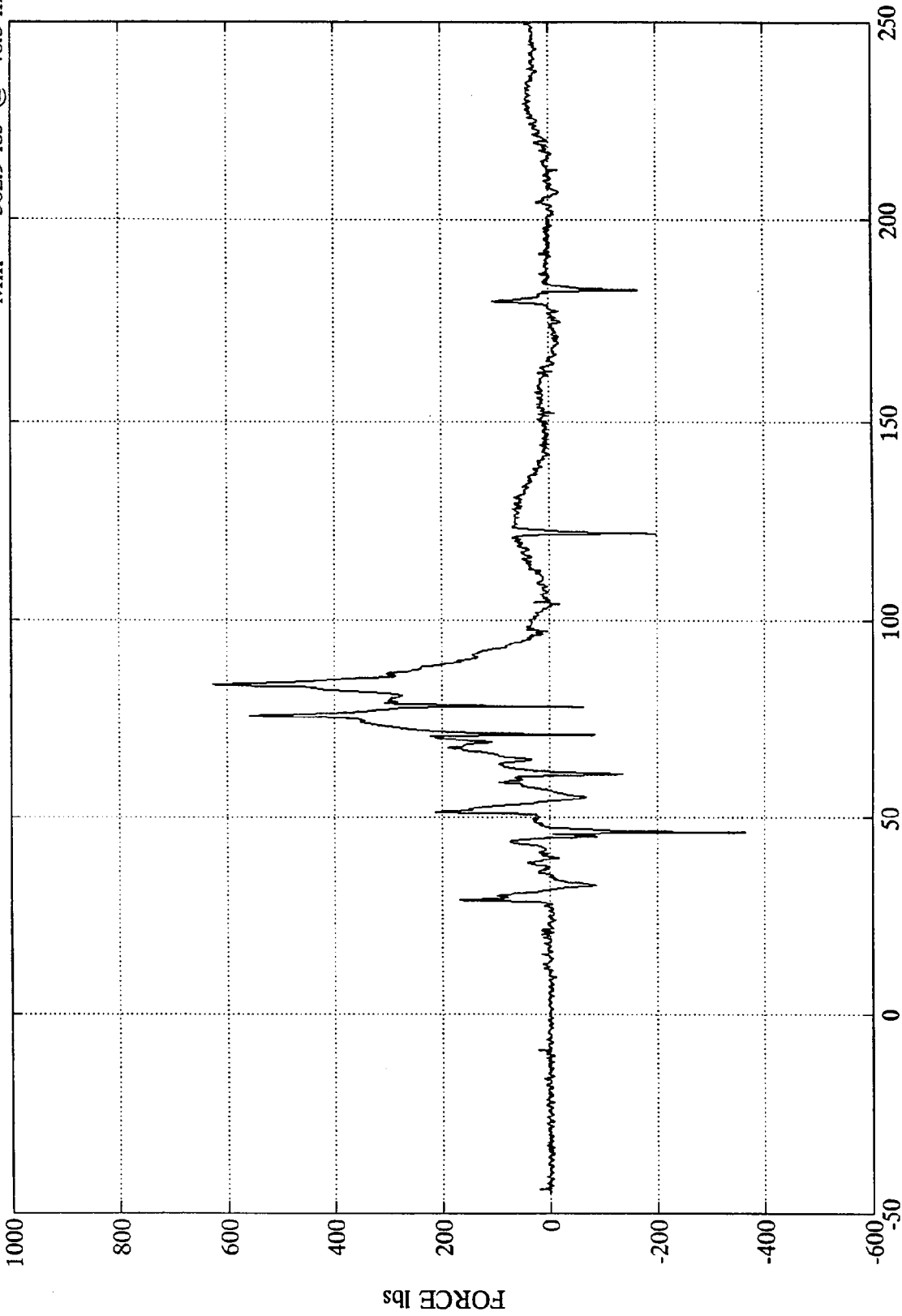
TIME (msec.)

SAE FILTER CLASS 60

Test 1022

POS #1 UPPER NECK FORCE(X)

Max = 625.4 lbs @ 83.8 msec
Min = -362.9 lbs @ 46.3 msec



B-90
FORCE lbs

TIME (msec.)

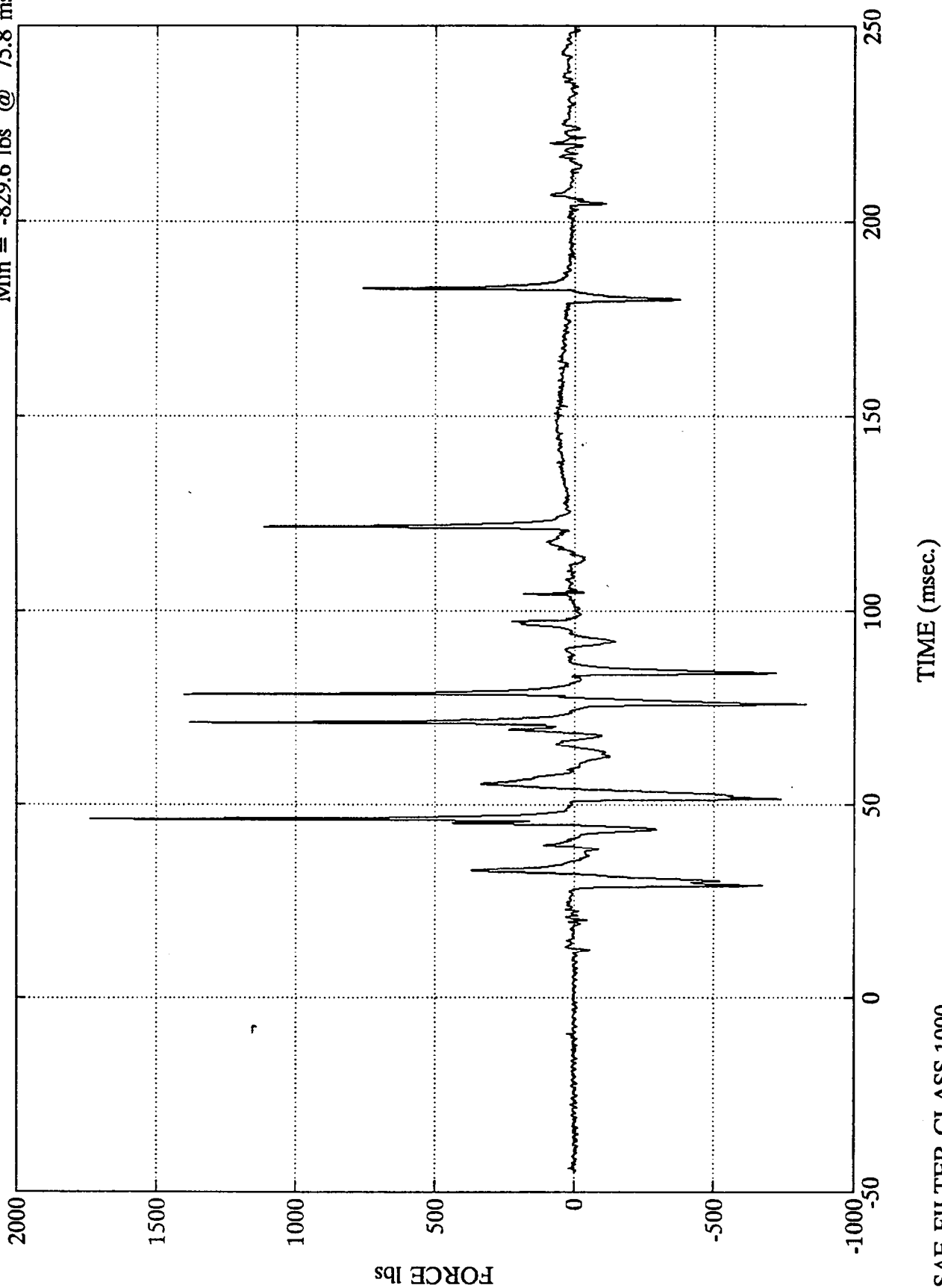
SAE FILTER CLASS 1000

7862-3

Test 1022

POS #1 UPPER NECK FORCE(Y)

Max = 1734.2 lbs @ 46.3 msec
Min = -829.6 lbs @ 75.8 msec



B-91

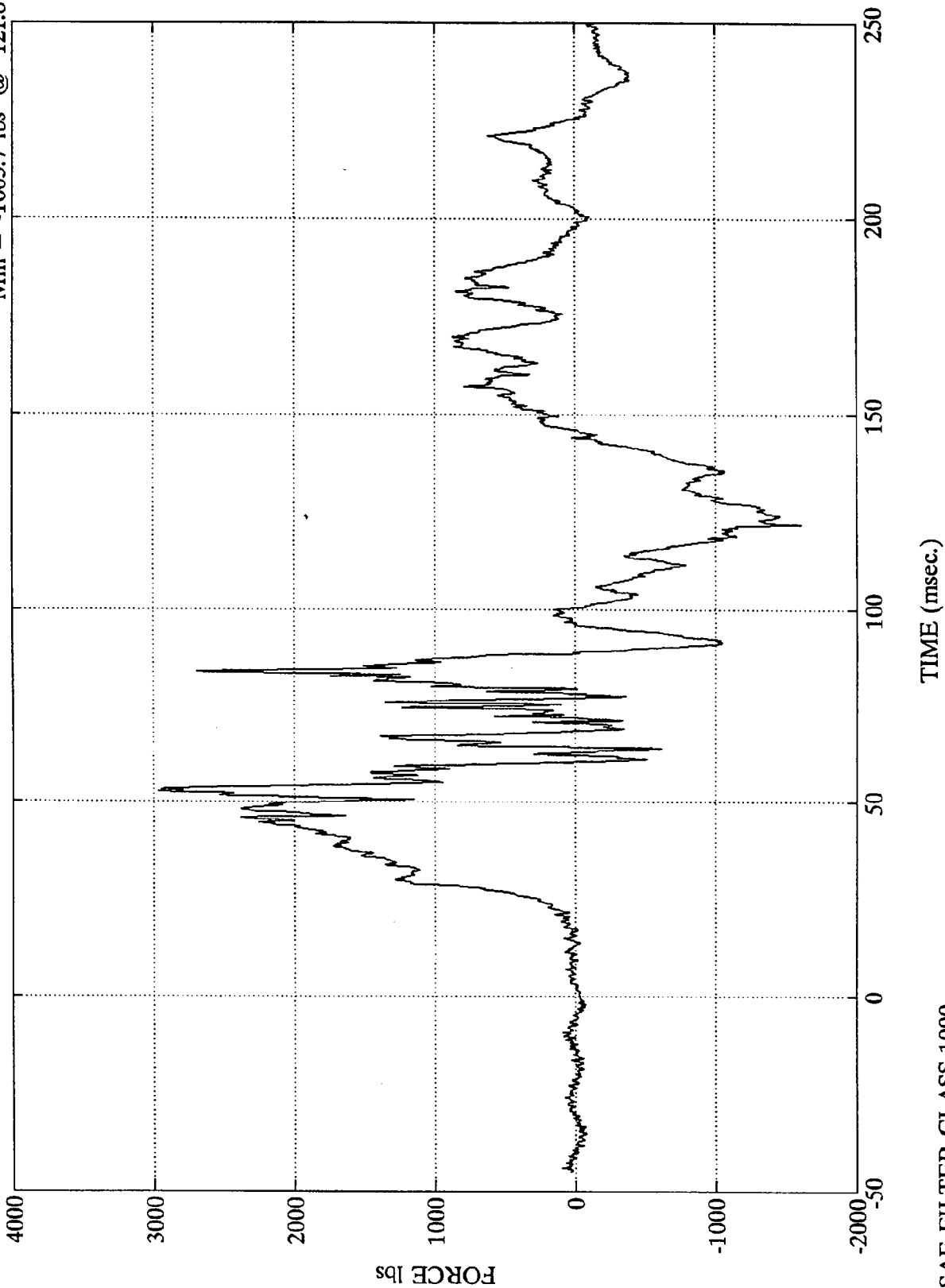
7862-3

SAE FILTER CLASS 1000

Test 1022

POS #1 UPPER NECK FORCE(Z)

Max = 2965.1 lbs @ 52.7 msec
Min = -1603.7 lbs @ 121.8 msec



B-92

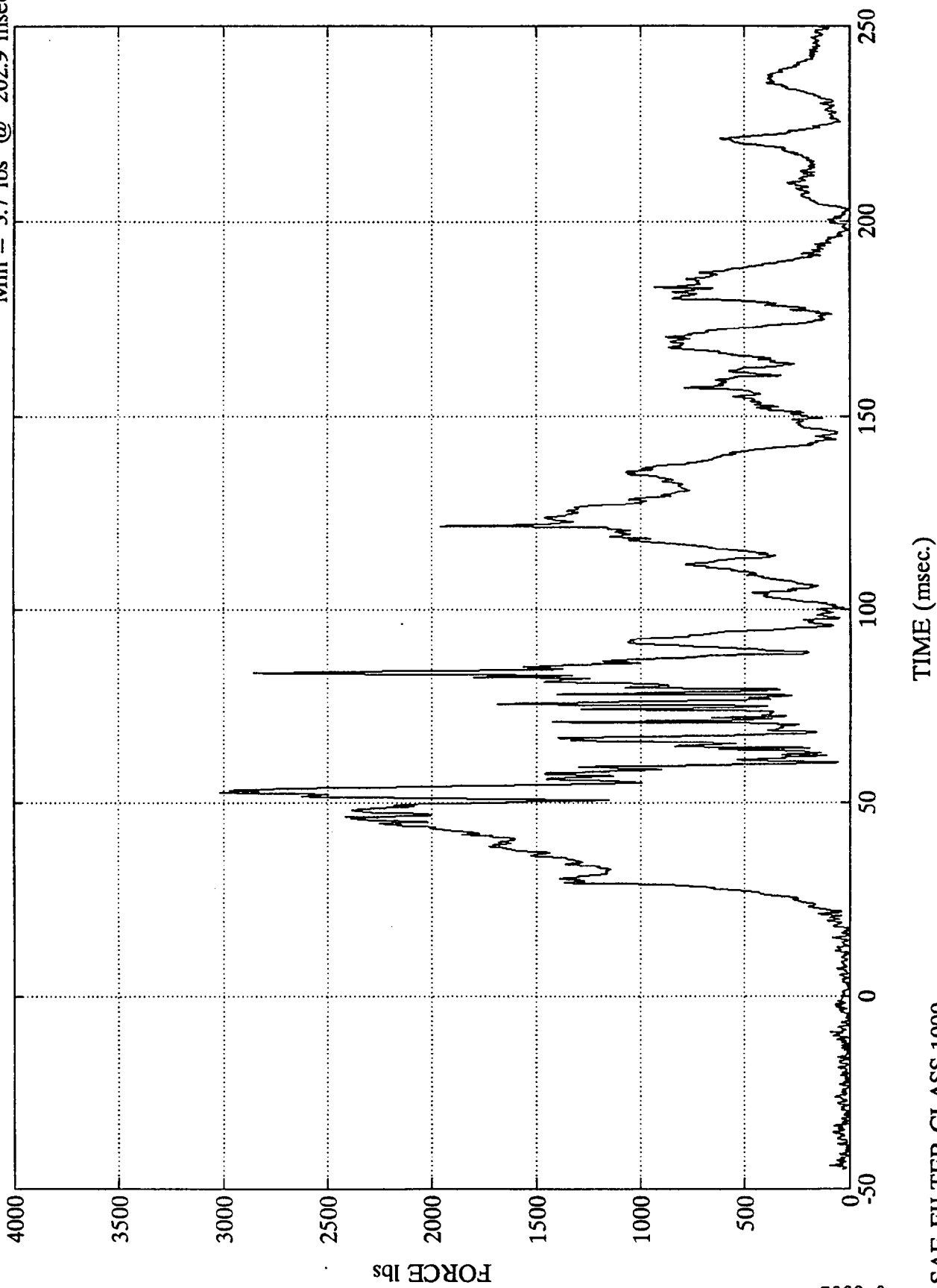
7862-3

SAE FILTER CLASS 1000

Test 1022

POS #1 NECK FORCE RESULTANT

Max = 3015.8 lbs @ 52.7 msec
Min = 3.7 lbs @ 202.9 msec



B-93

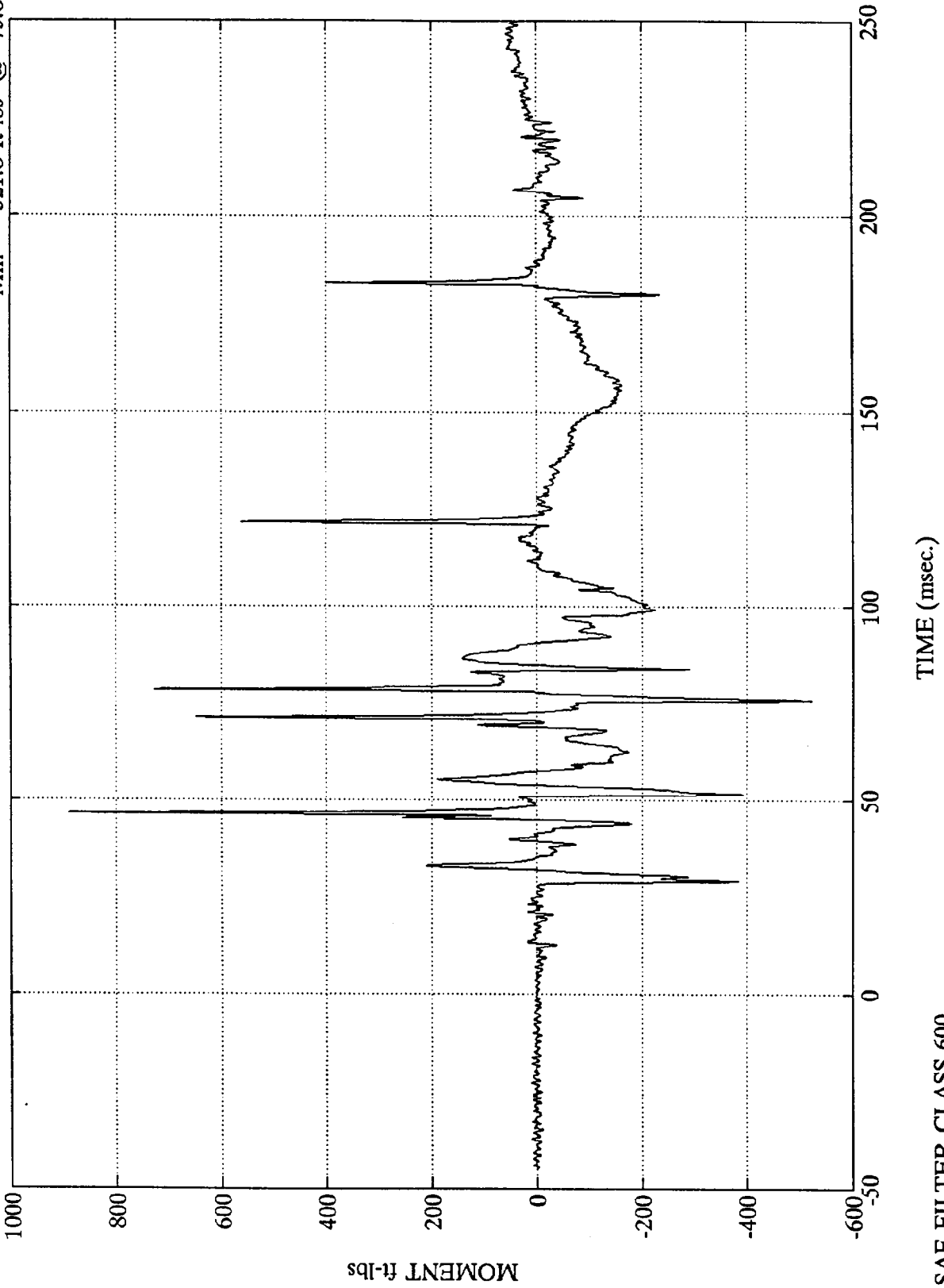
7862-3

SAE FILTER CLASS 1000

Test 1022

POS #1 UPPER NECK MOMENT(X)

Max = 888.8 ft-lbs @ 46.3 msec
Min = -521.8 ft-lbs @ 75.8 msec



B-94

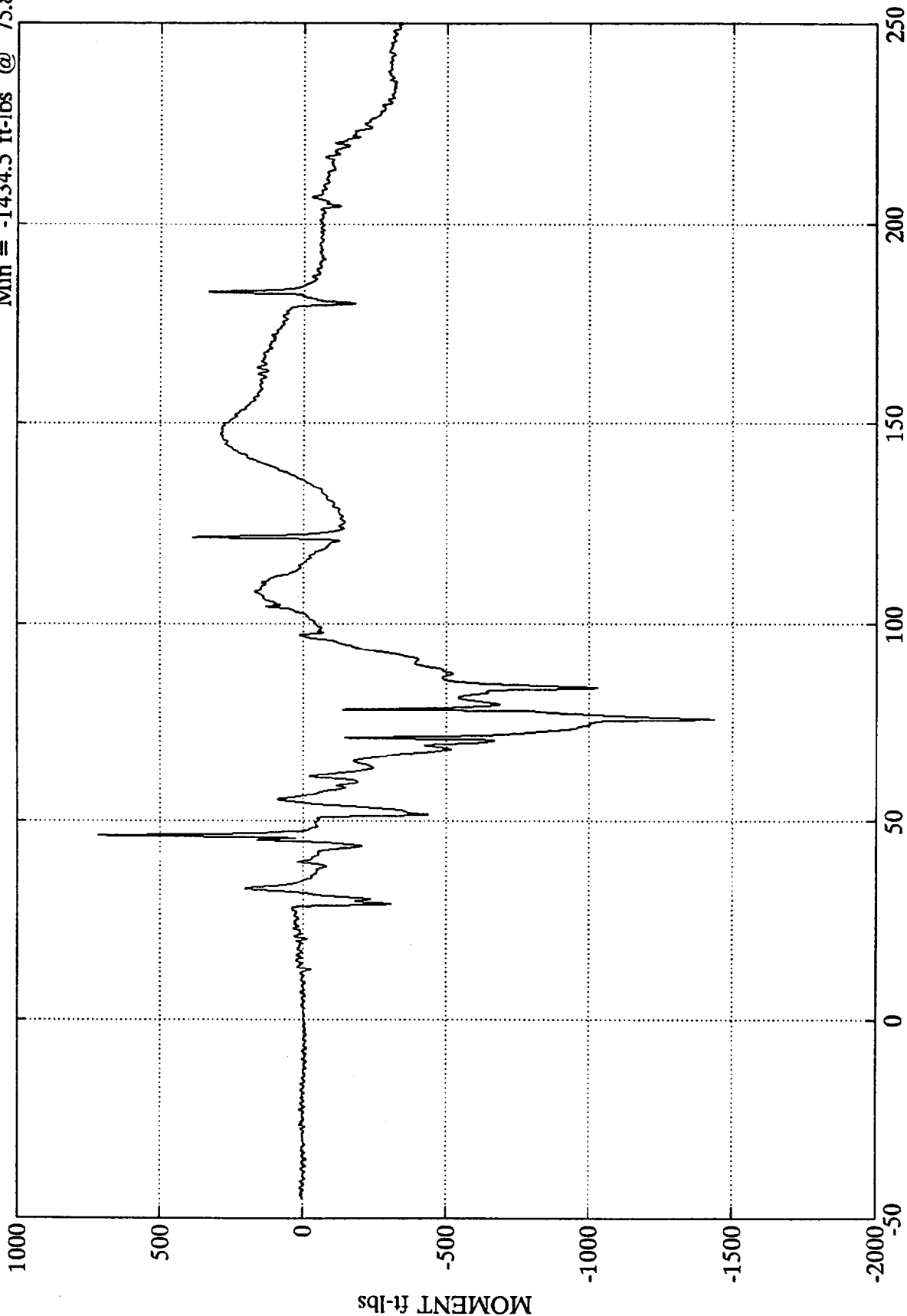
7862-3

SAE FILTER CLASS 600

Test 1022

POS #1 UPPER NECK MOMENT(Y)

Max = 720.1 ft-lbs @ 46.3 msec
Min = -1434.5 ft-lbs @ 75.8 msec



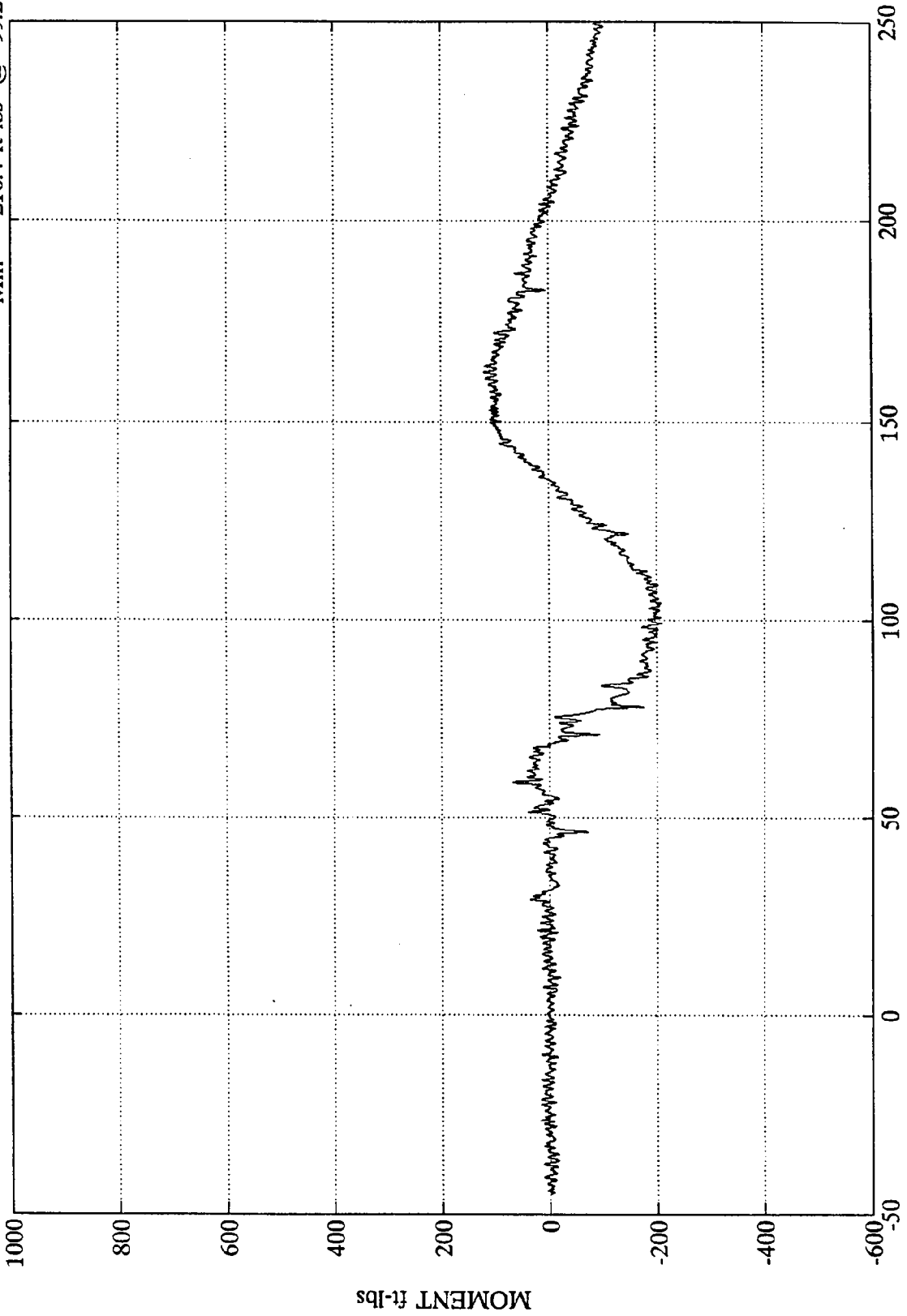
TIME (msec.)

SAE FILTER CLASS 600

Test 1022

POS #1 UPPER NECK MOMENT(Z)

Max = 119.0 ft-lbs @ 162.2 msec
Min = -210.4 ft-lbs @ 99.2 msec



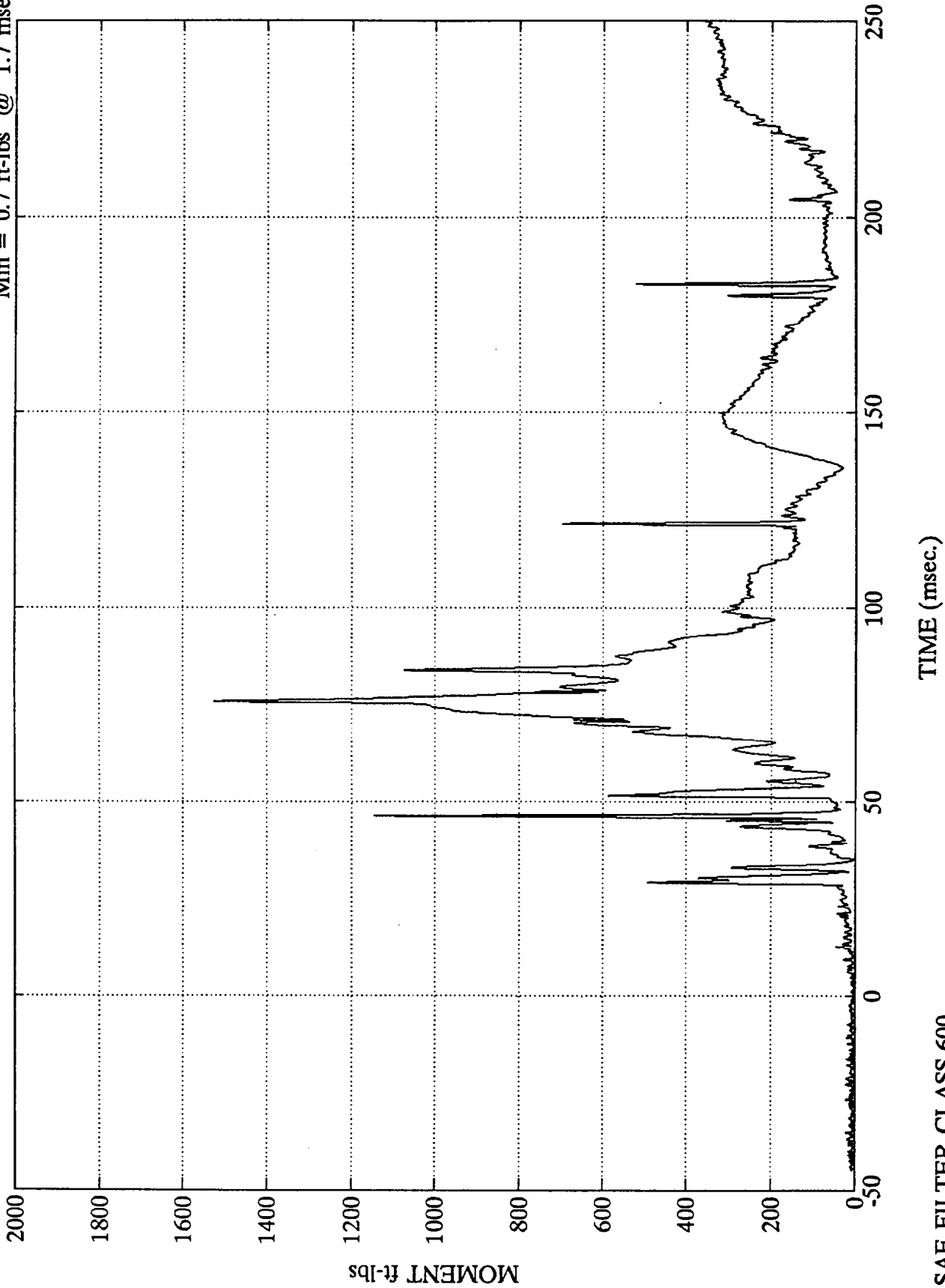
TIME (msec.)

SAE FILTER CLASS 600

Test 1022

POS #1 NECK MOMENT RESULTANT

Max = 1526.6 ft-lbs @ 75.8 msec
Min = 0.7 ft-lbs @ 1.7 msec

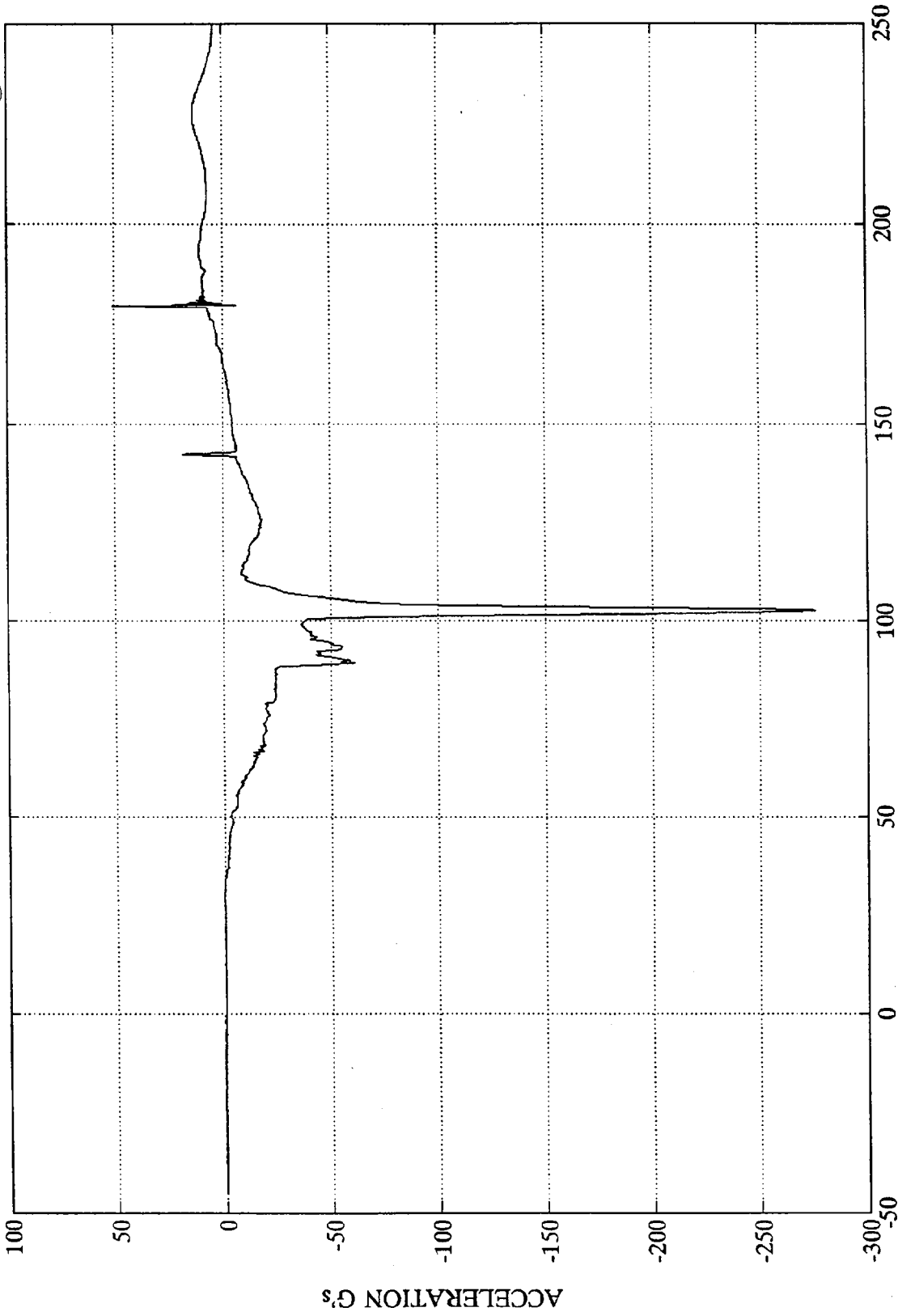


SAE FILTER CLASS 600

Test 1022

POS #2 HEAD X

Max = 50.7 G's @ 179.2 msec
Min = -275.7 G's @ 102.8 msec



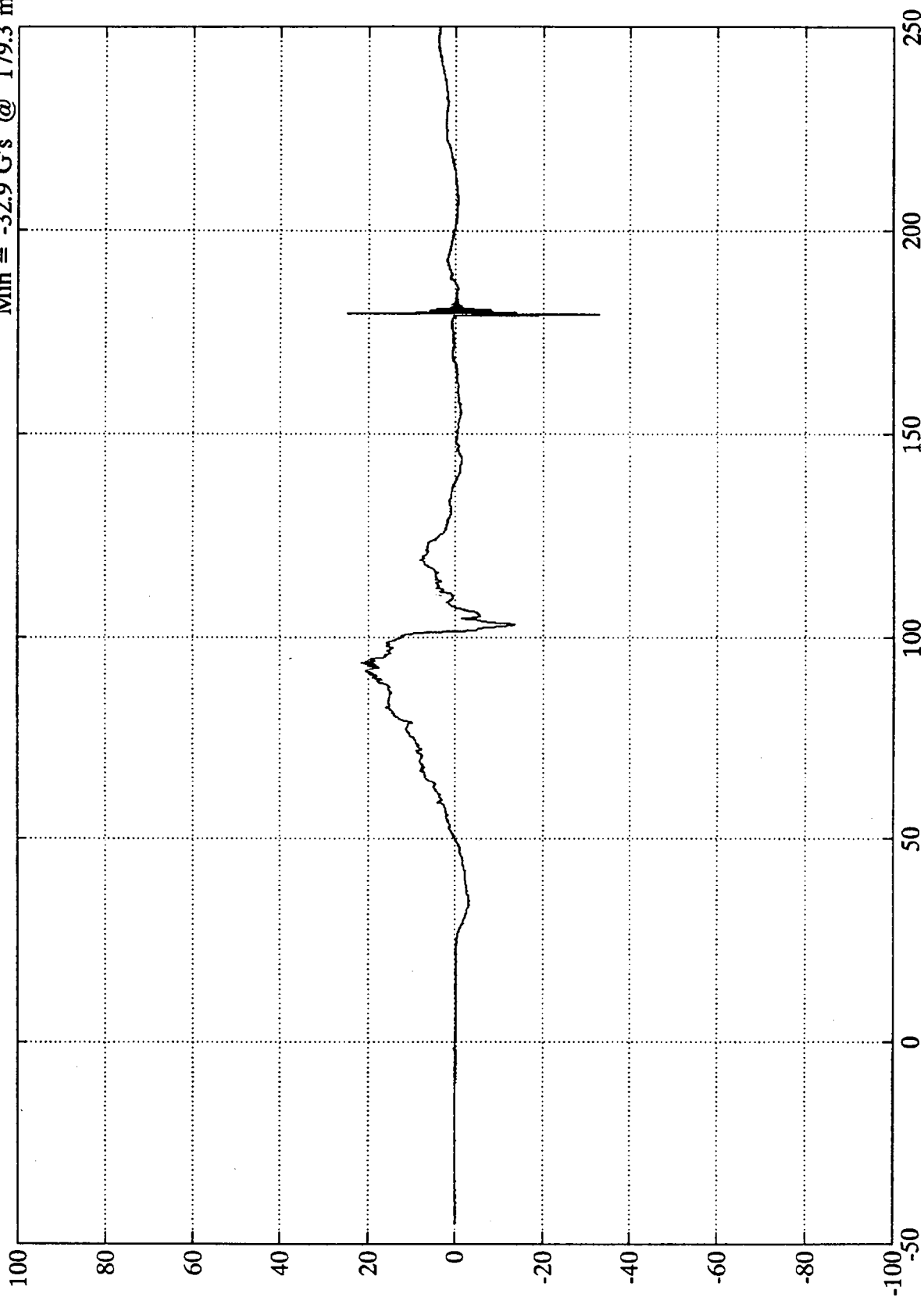
TIME (msec.)

SAE FILTER CLASS 1000

Test 1022

POS #2 HEAD Y

Max = 24.8 G's @ 179.5 msec
Min = -32.9 G's @ 179.3 msec



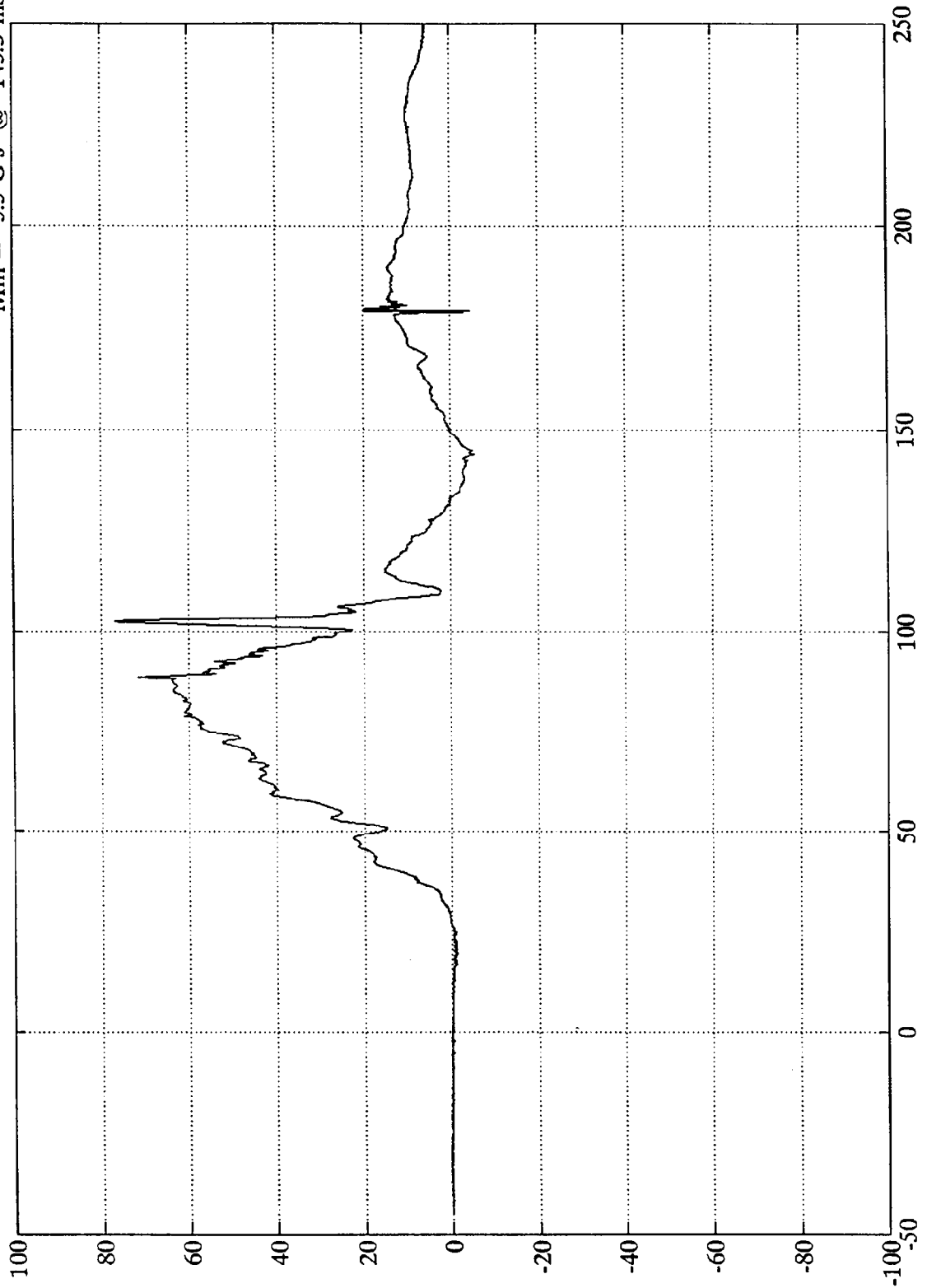
TIME (msec.)

SAE FILTER CLASS 1000

Max = 76.7 G's @ 102.7 msec
Min = -5.5 G's @ 143.5 msec

POS #2 HEAD Z

Test 1022



TIME (msec.)

SAE FILTER CLASS 1000

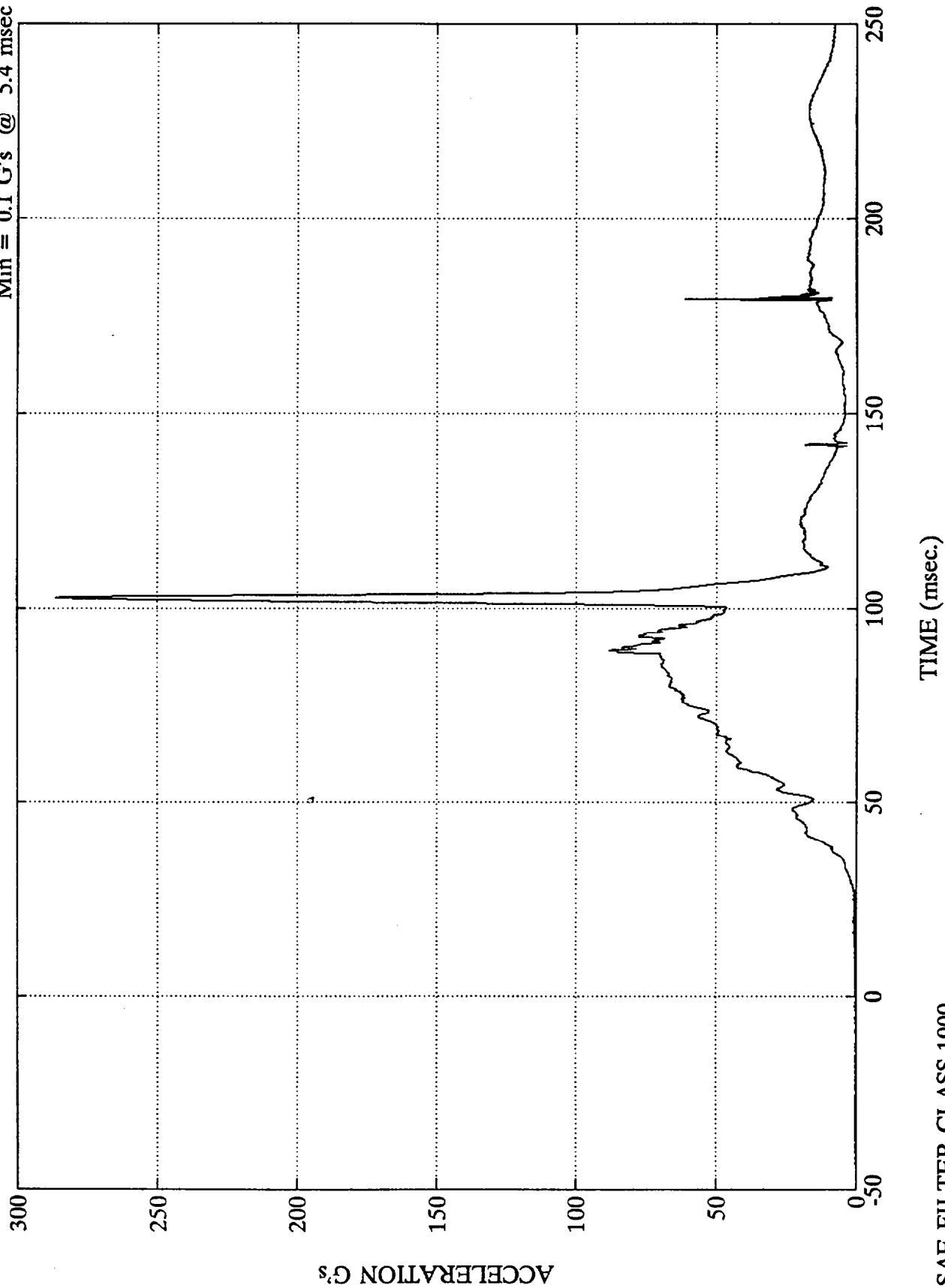
B-100
ACCELERATION G's

7862-3

Test 1022

POS #2 HEAD RESULTANT

Max = 286.2 G's @ 102.8 msec
Min = 0.1 G's @ 5.4 msec

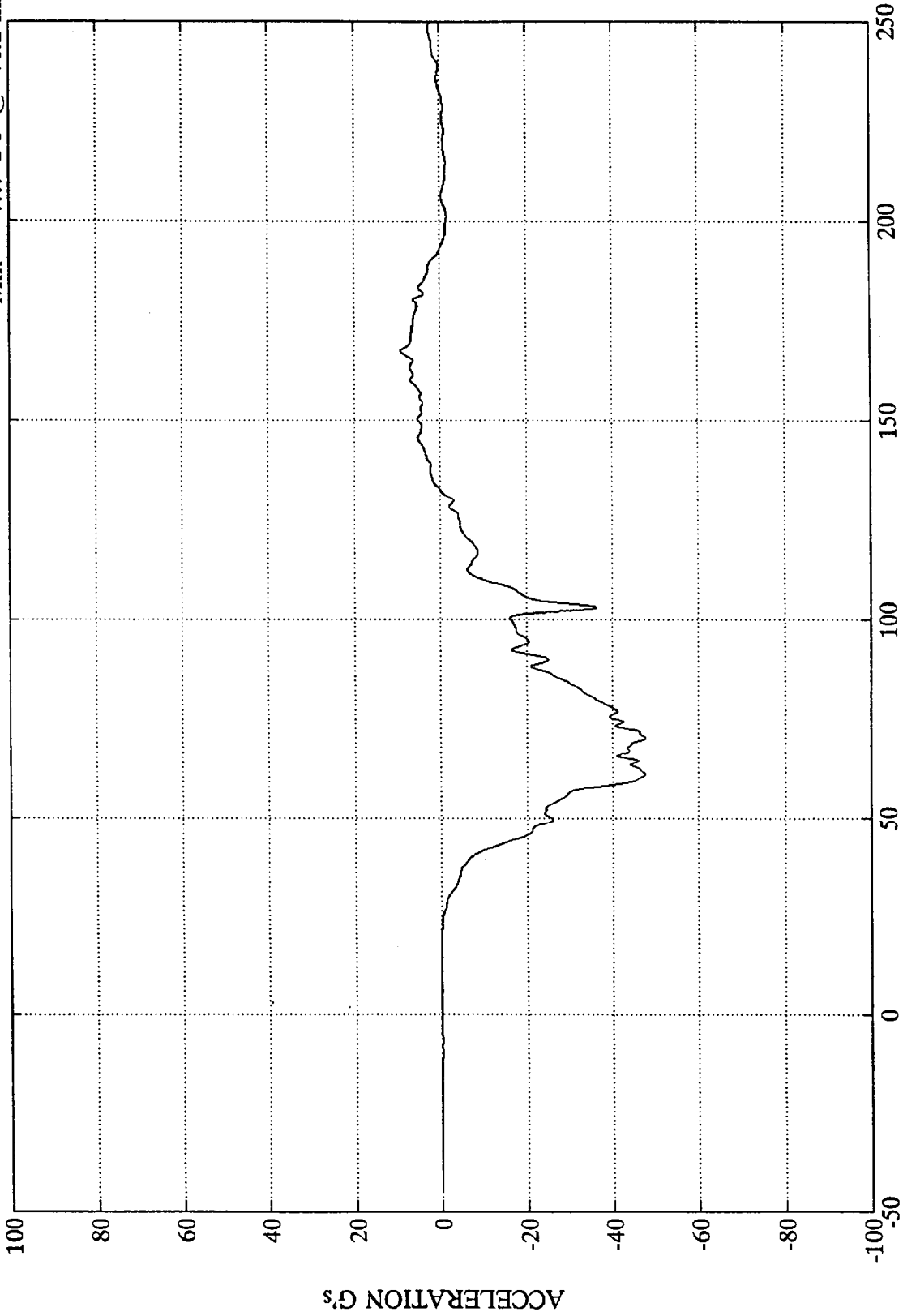


SAE FILTER CLASS 1000

Test 1022

POS #2 CHEST X

Max = 9.2 G's @ 167.3 msec
Min = -47.7 G's @ 70.2 msec



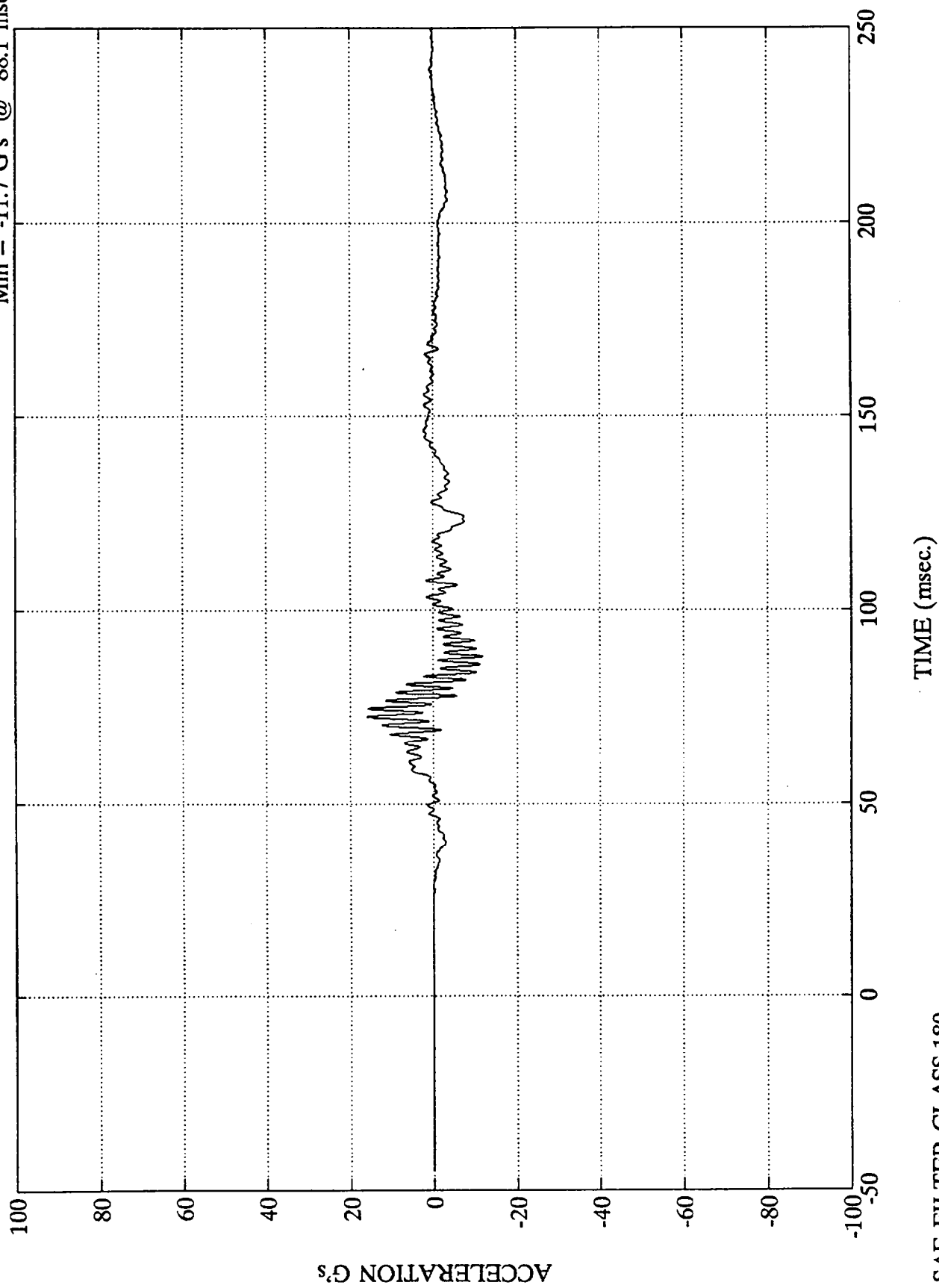
TIME (msec.)

SAE FILTER CLASS 180

Test 1022

POS #2 CHEST Y

Max = 15.8 G's @ 72.5 msec
Min = -11.7 G's @ 88.1 msec



B-103

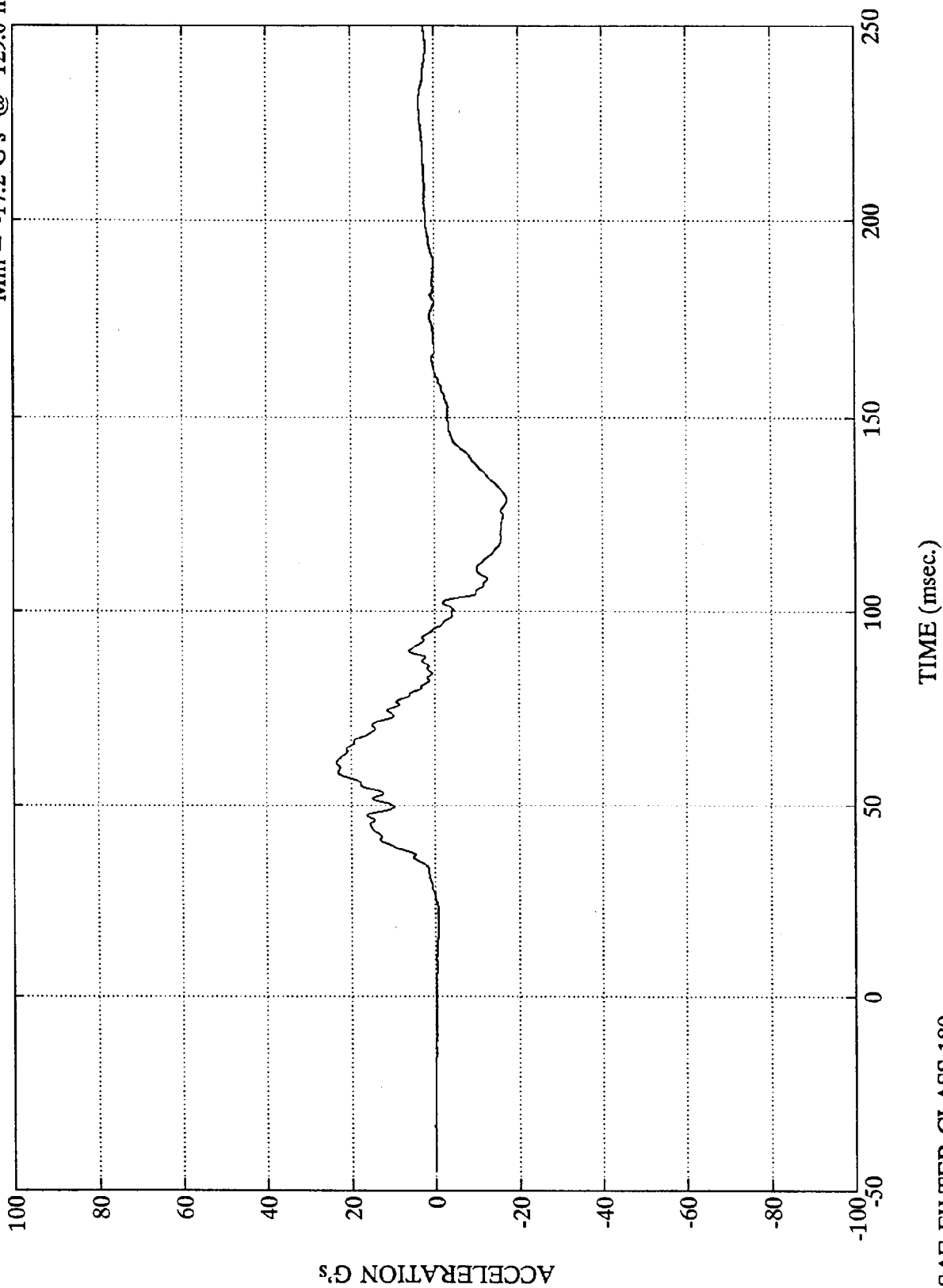
7862-3

SAE FILTER CLASS 180

Test 1022

Max = 23.5 G's @ 60.8 msec
Min = -17.2 G's @ 129.0 msec

POS #2 CHEST Z

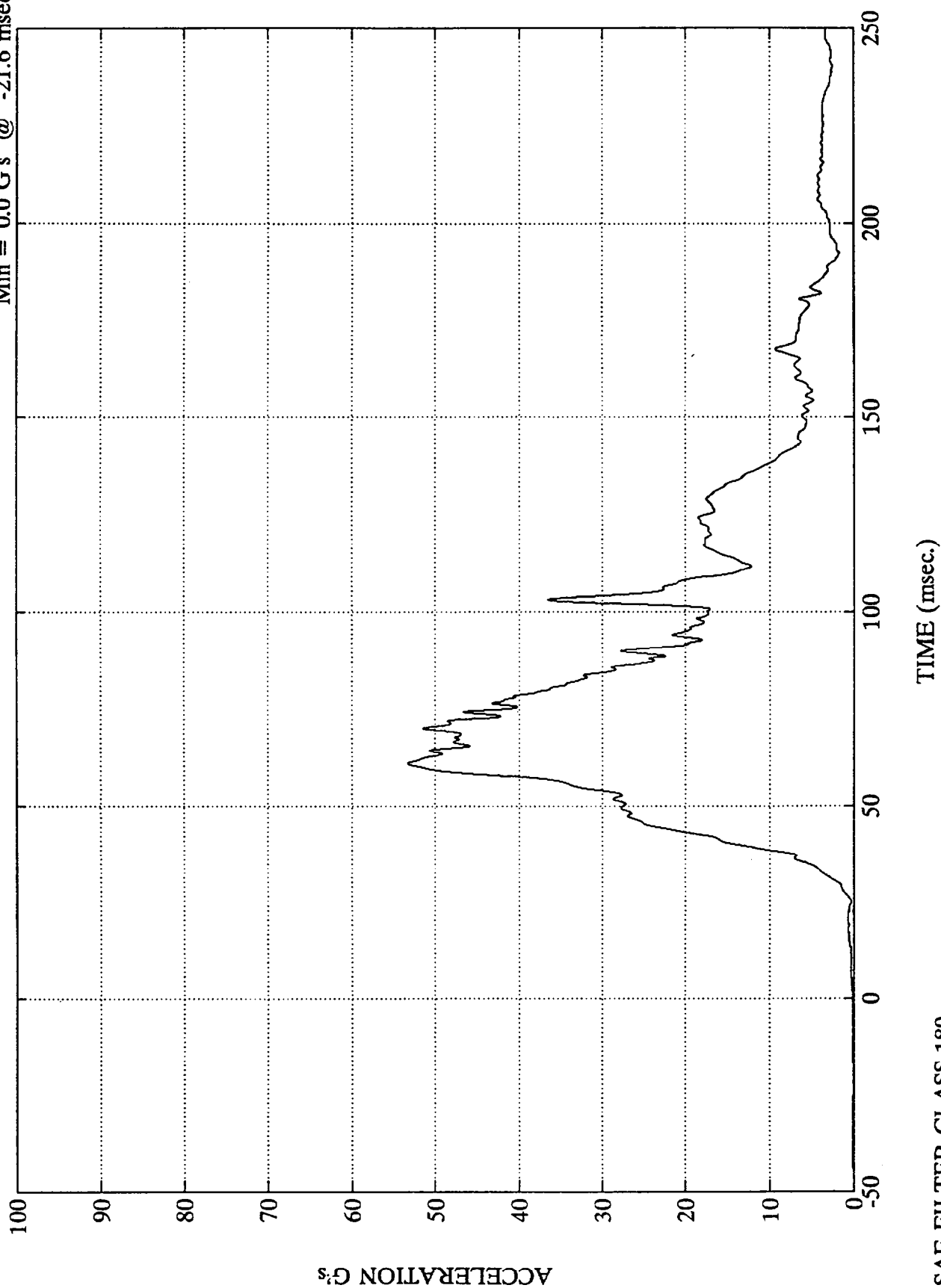


SAE FILTER CLASS 180

Test 1022

POS #2 CHEST RESULTANT

Max = 53.3 G's @ 61.1 msec
Min = 0.0 G's @ -21.6 msec



ACCELERATION G's

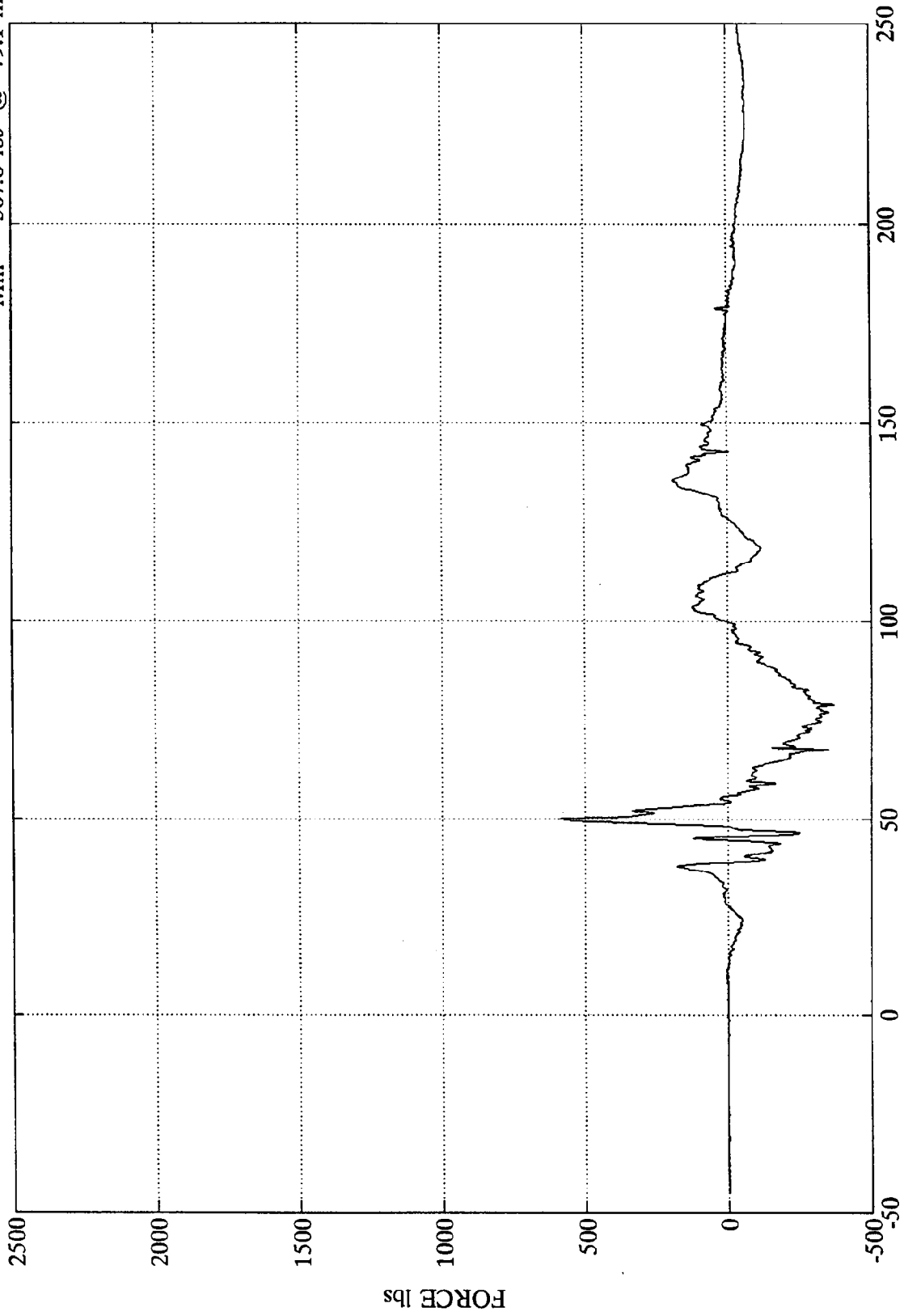
TIME (msec.)

SAE FILTER CLASS 180

Test 1022

Max = 592.9 lbs @ 50.2 msec
Min = -367.6 lbs @ 79.1 msec

POS #2 LEFT FEMUR



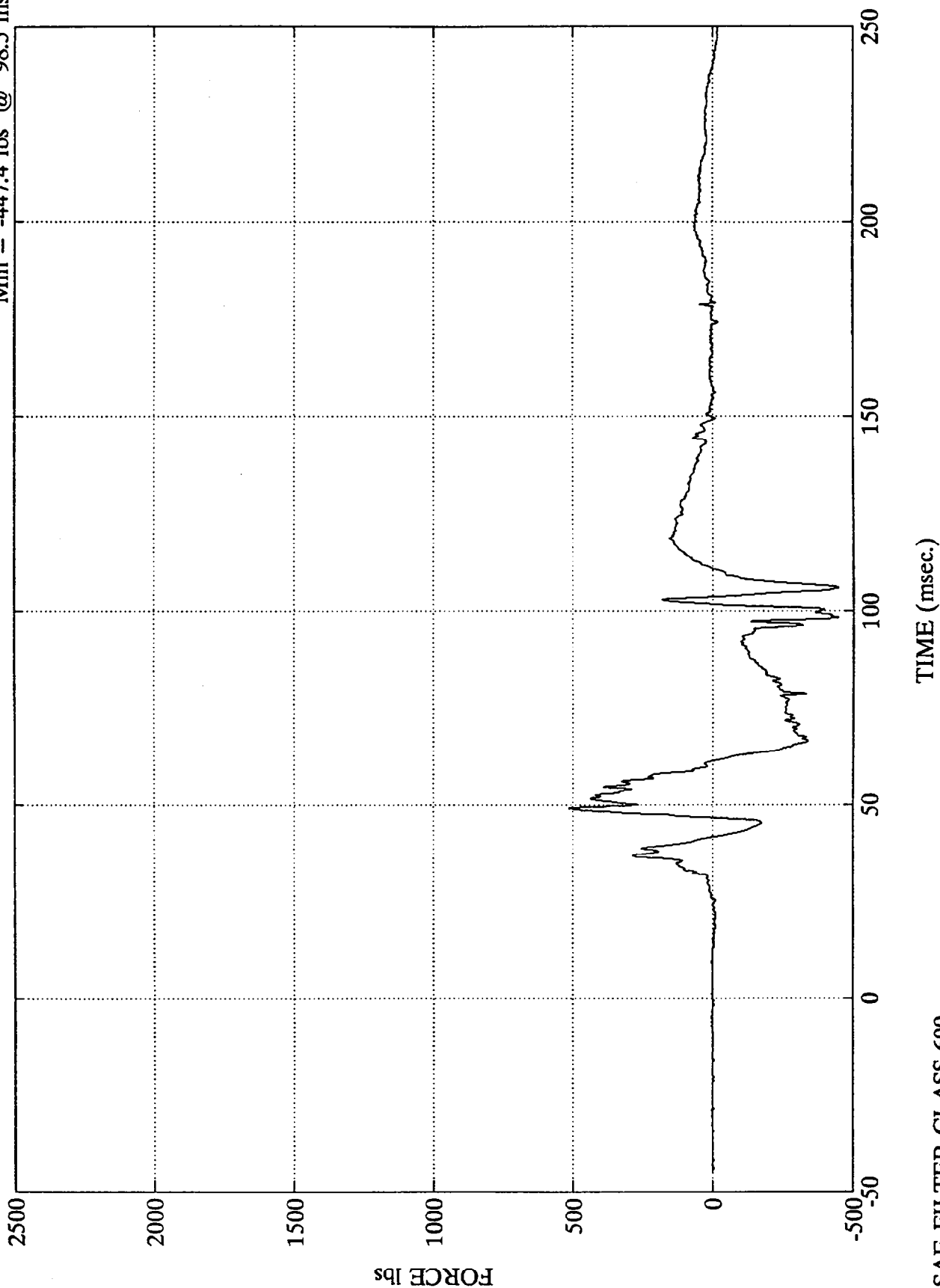
TIME (msec.)

SAE FILTER CLASS 600

Test 1022

POS #2 RIGHT FEMUR

Max = 514.7 lbs @ 49.2 msec
Min = -447.4 lbs @ 98.5 msec

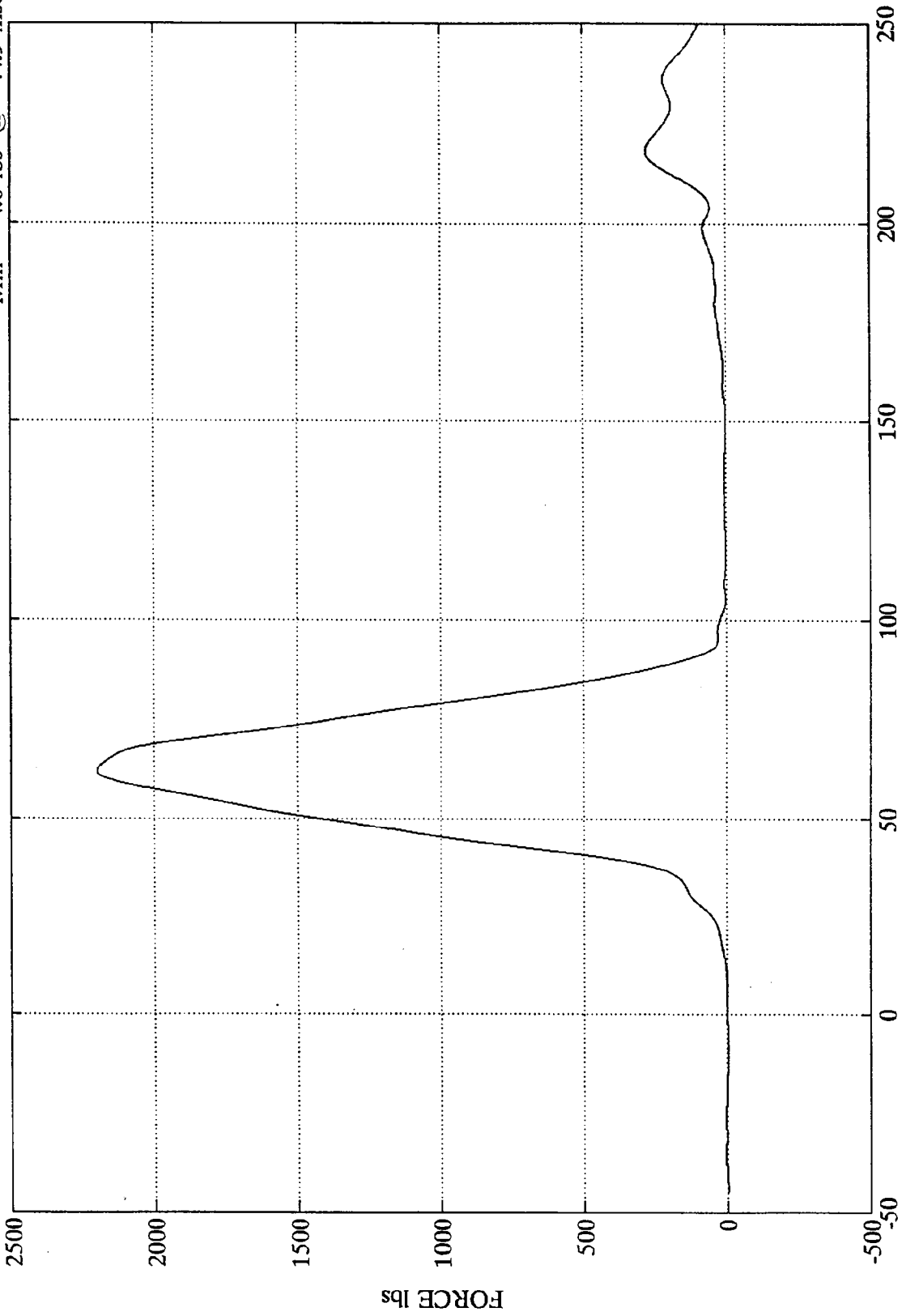


SAE FILTER CLASS 600

Test 1022

Max = 2200.0 lbs @ 61.9 msec
Min = -4.0 lbs @ -44.9 msec

POS #2 LAP BELT



TIME (msec.)

SAE FILTER CLASS 60

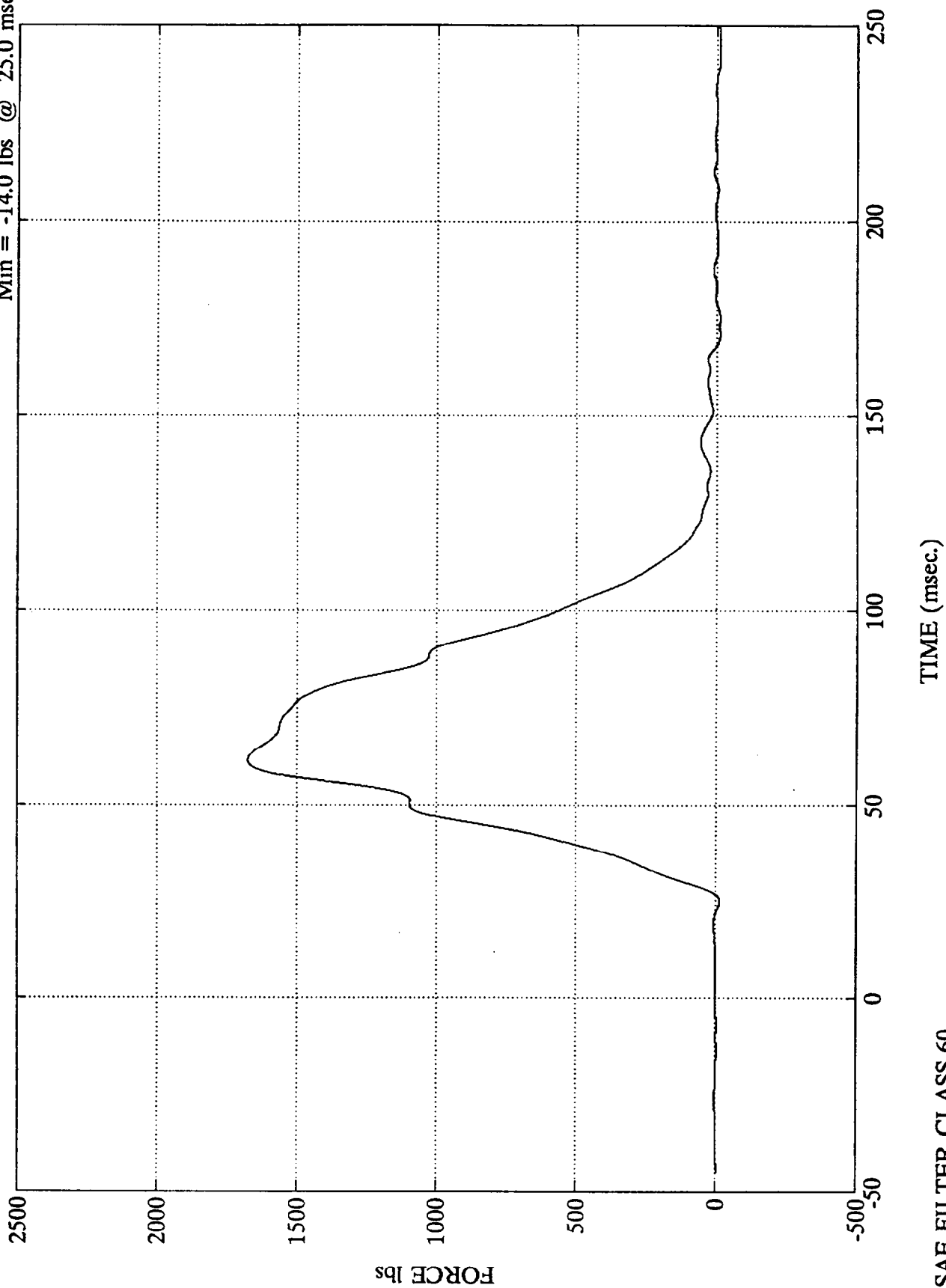
B-108
FORCE lbs

7862-3

Test 1022

POS #2 TORSO BELT

Max = 1677.1 lbs @ 61.7 msec
Min = -14.0 lbs @ 25.0 msec



B-109
FORCE lbs

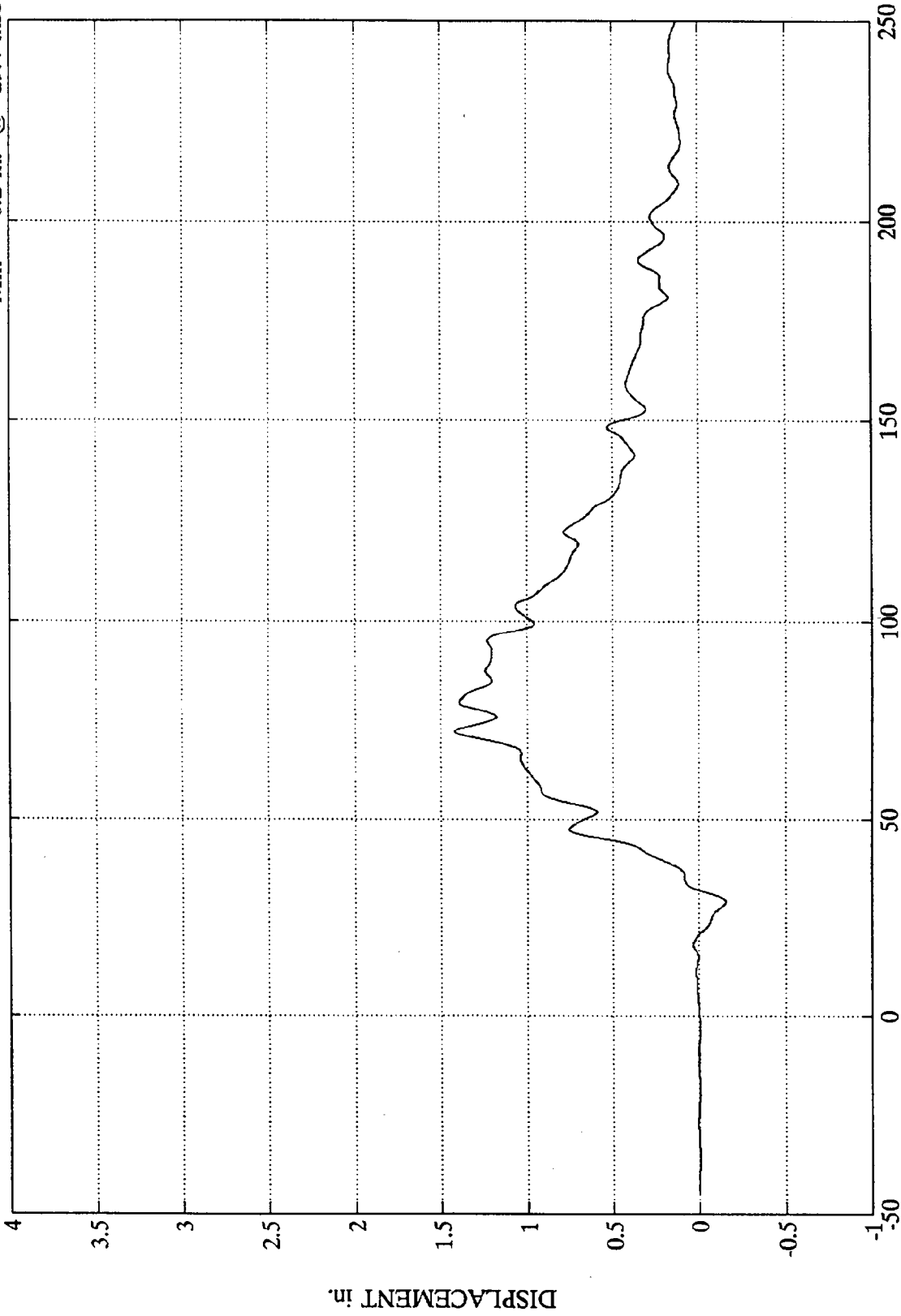
7862-3

SAE FILTER CLASS 60

Test 1022

POS #2 CHEST DISPLACEMENT

Max = 1.4 in. @ 71.9 msec
Min = -0.2 in. @ 29.4 msec



TIME (msec.)

SAE FILTER CLASS 180

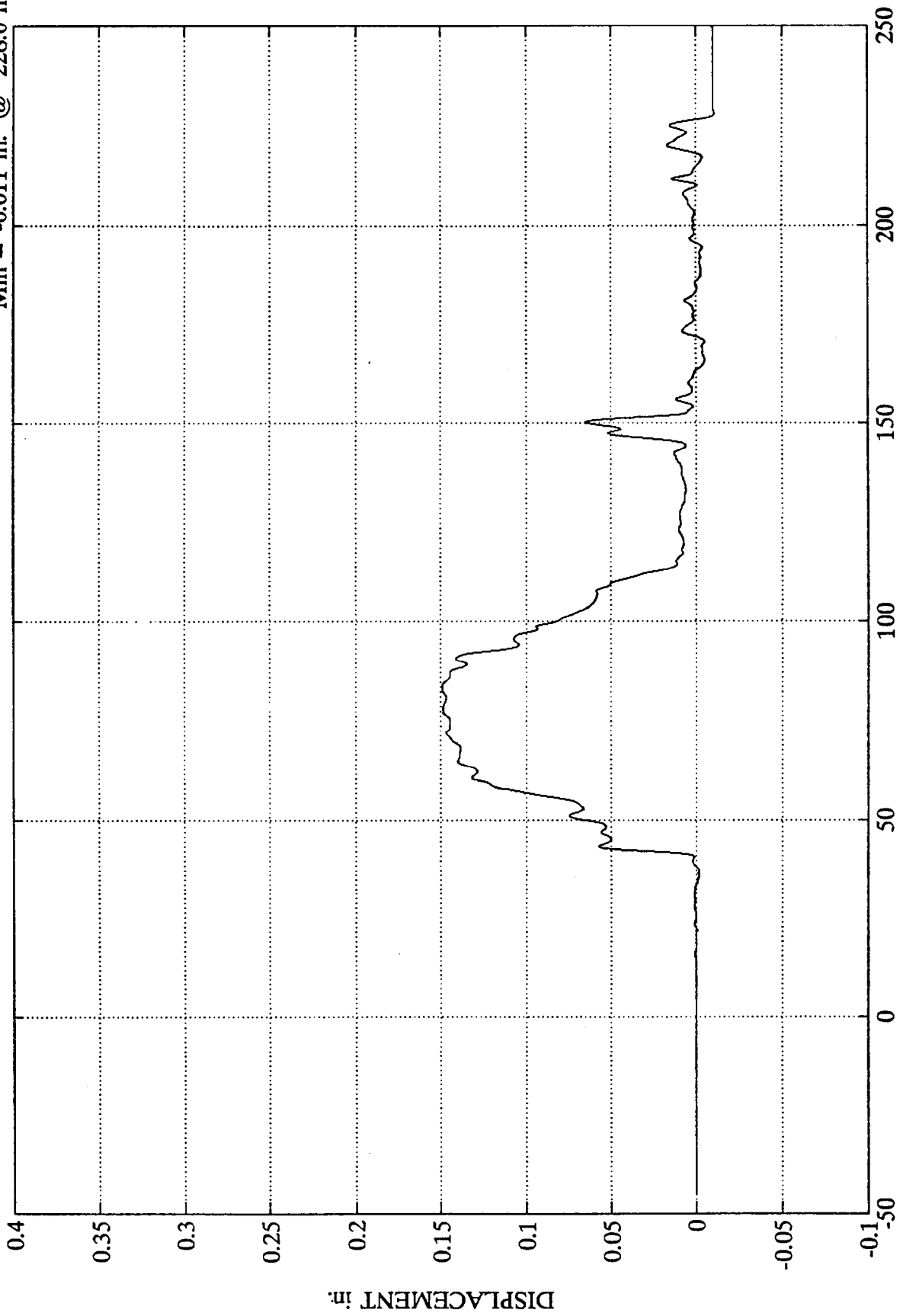
B-110

7862-3

Test 1022

POS #2 BELT ELONGATION

Max = 0.149 in. @ 84.0 msec
Min = -0.011 in. @ 228.0 msec



B-111

7862-3

TIME (msec.)

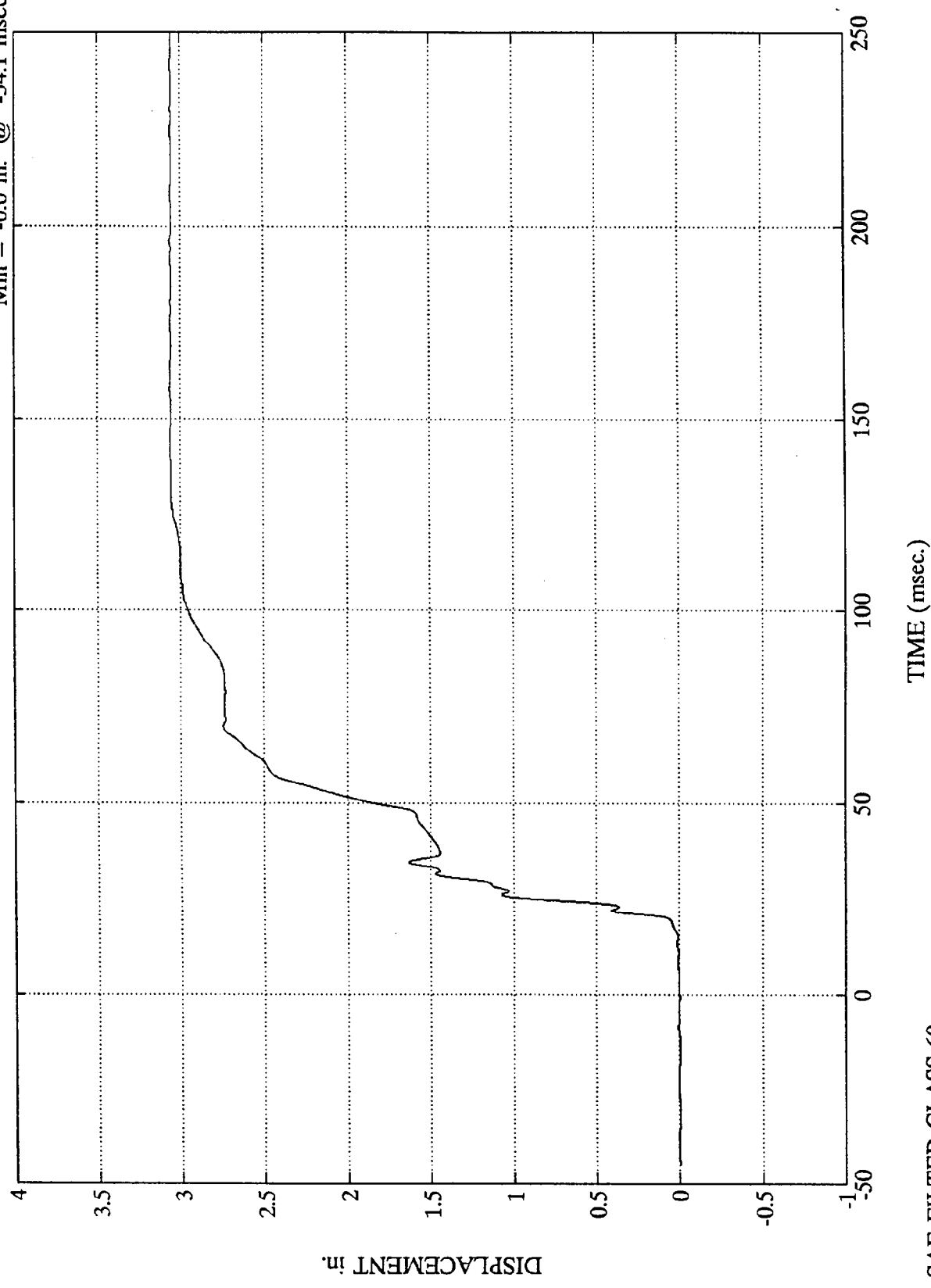
Measured over
2.5 inches

SAE FILTER CLASS 60

Test 1022

POS #2 BELT SPOOL OUT

Max = 3.1 in. @ 196.1 msec
Min = -0.0 in. @ -34.1 msec



SAE FILTER CLASS 60

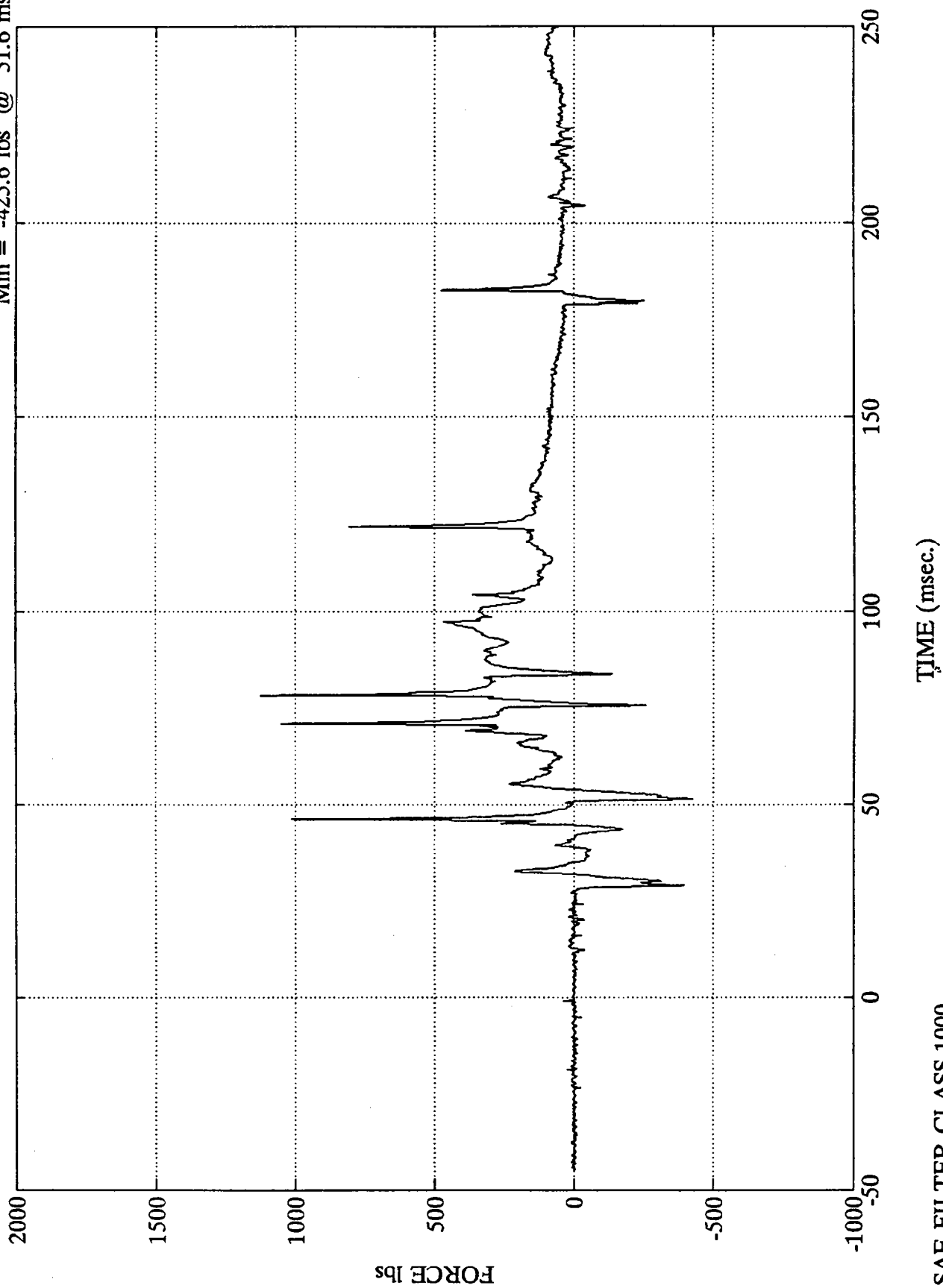
B-112

7862-3

Test 1022

Max = 1124.0 lbs @ 78.4 msec
Min = -425.6 lbs @ 51.6 msec

POS #2 UPPER NECK FORCE(X)

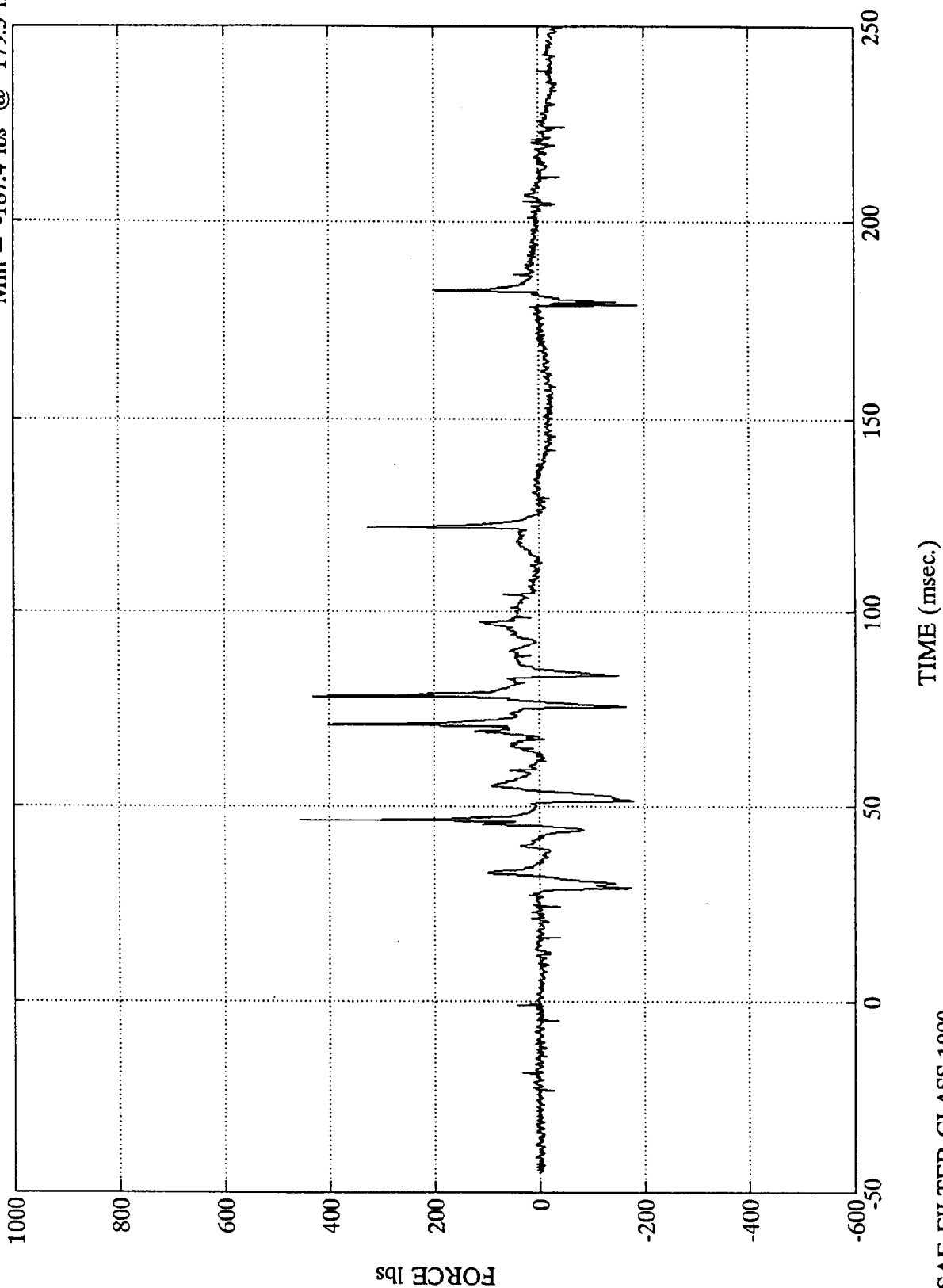


SAE FILTER CLASS 1000

Test 1022

POS #2 UPPER NECK FORCE(Y)

Max = 457.9 lbs @ 46.3 msec
Min = -187.4 lbs @ 179.3 msec

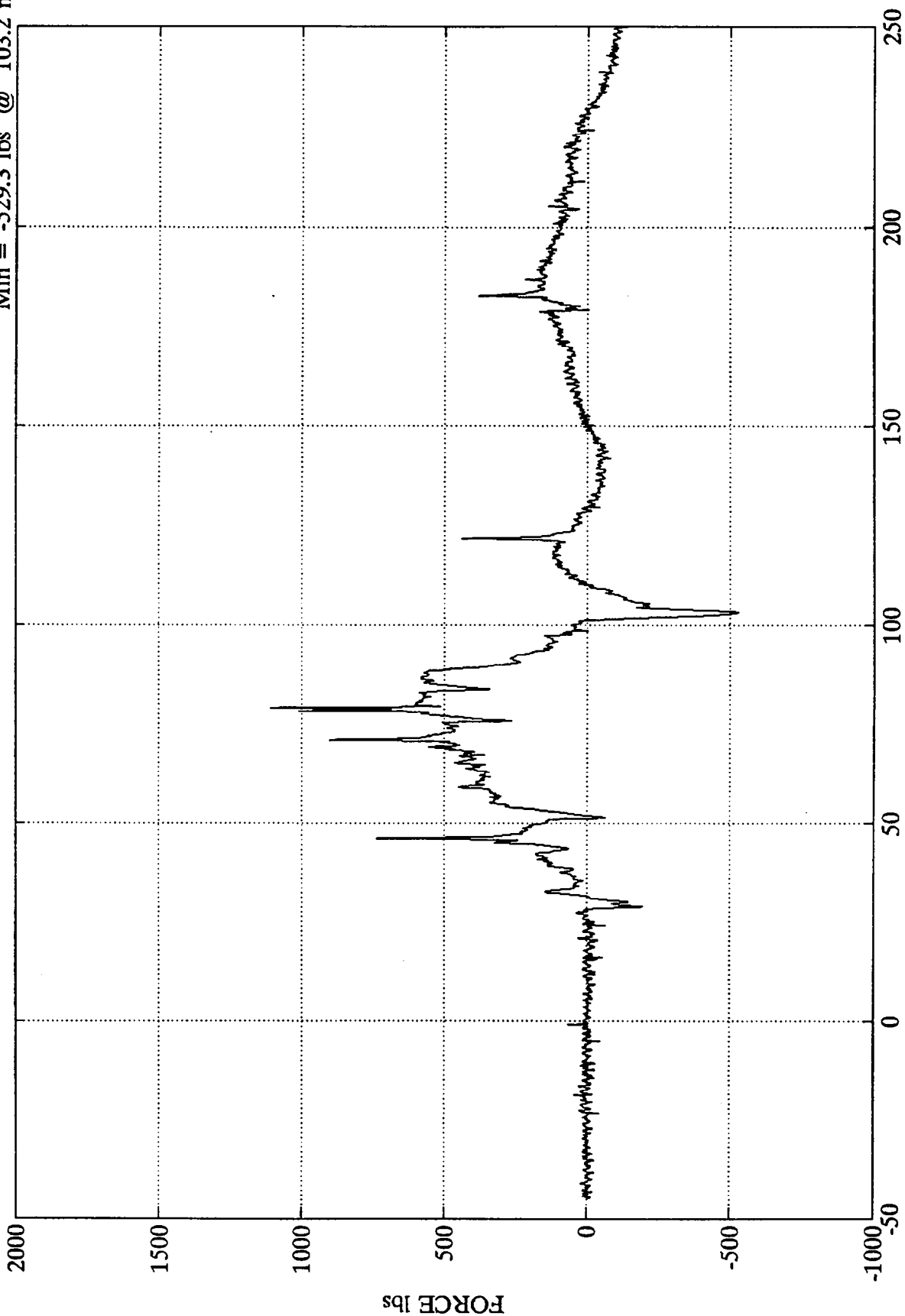


SAE FILTER CLASS 1000

Test 1022

Max = 1108.4 lbs @ 79.1 msec
Min = -529.3 lbs @ 103.2 msec

POS #2 UPPER NECK FORCE(Z)



TIME (msec.)

SAE FILTER CLASS 1000

Test 1022

FORCE lbs

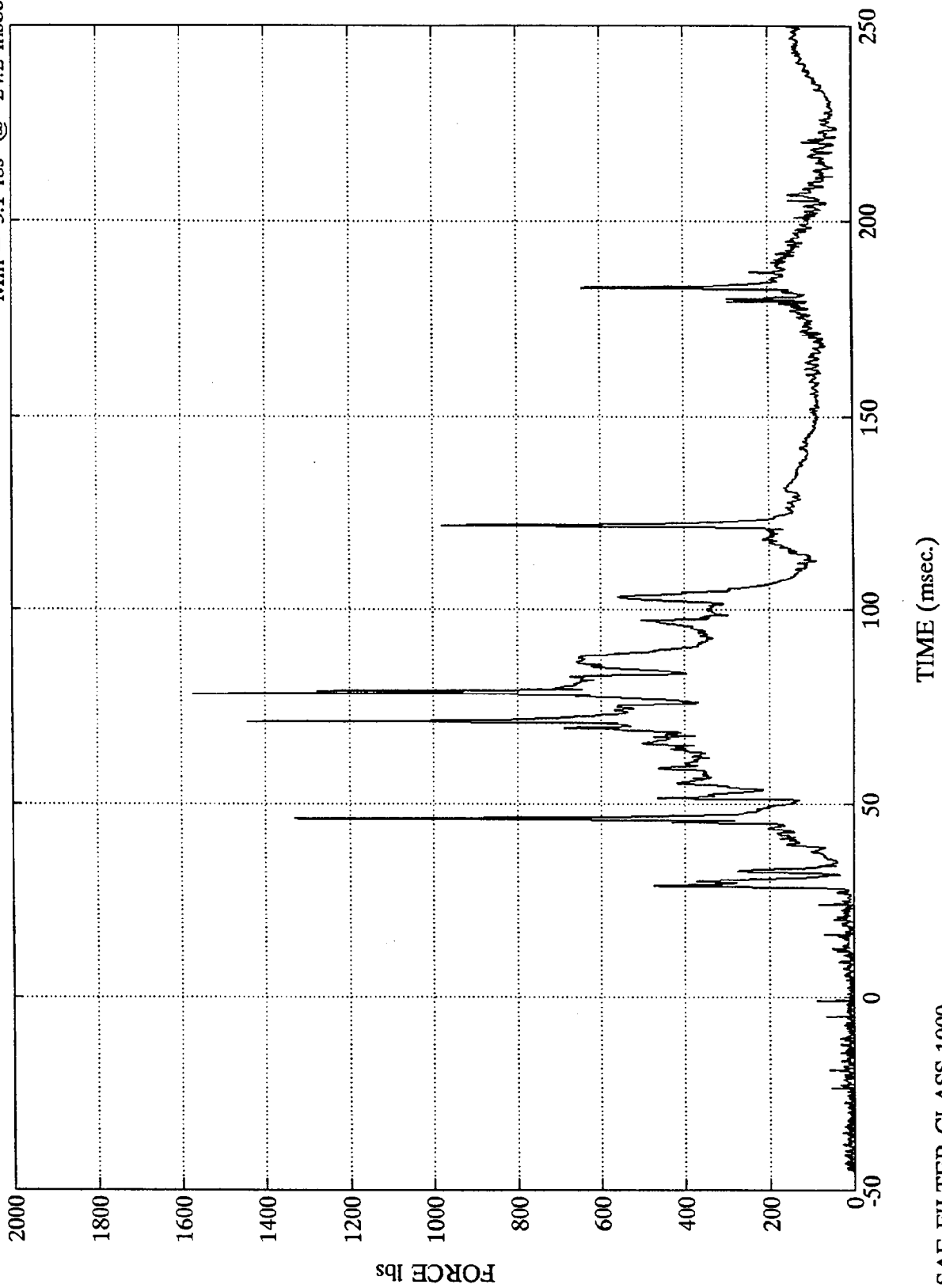
B-115

7862-3

Test 1022

POS #2 NECK FORCE RESULTANT

Max = 1573.0 lbs @ 78.4 msec
Min = 3.1 lbs @ 24.2 msec



B-116

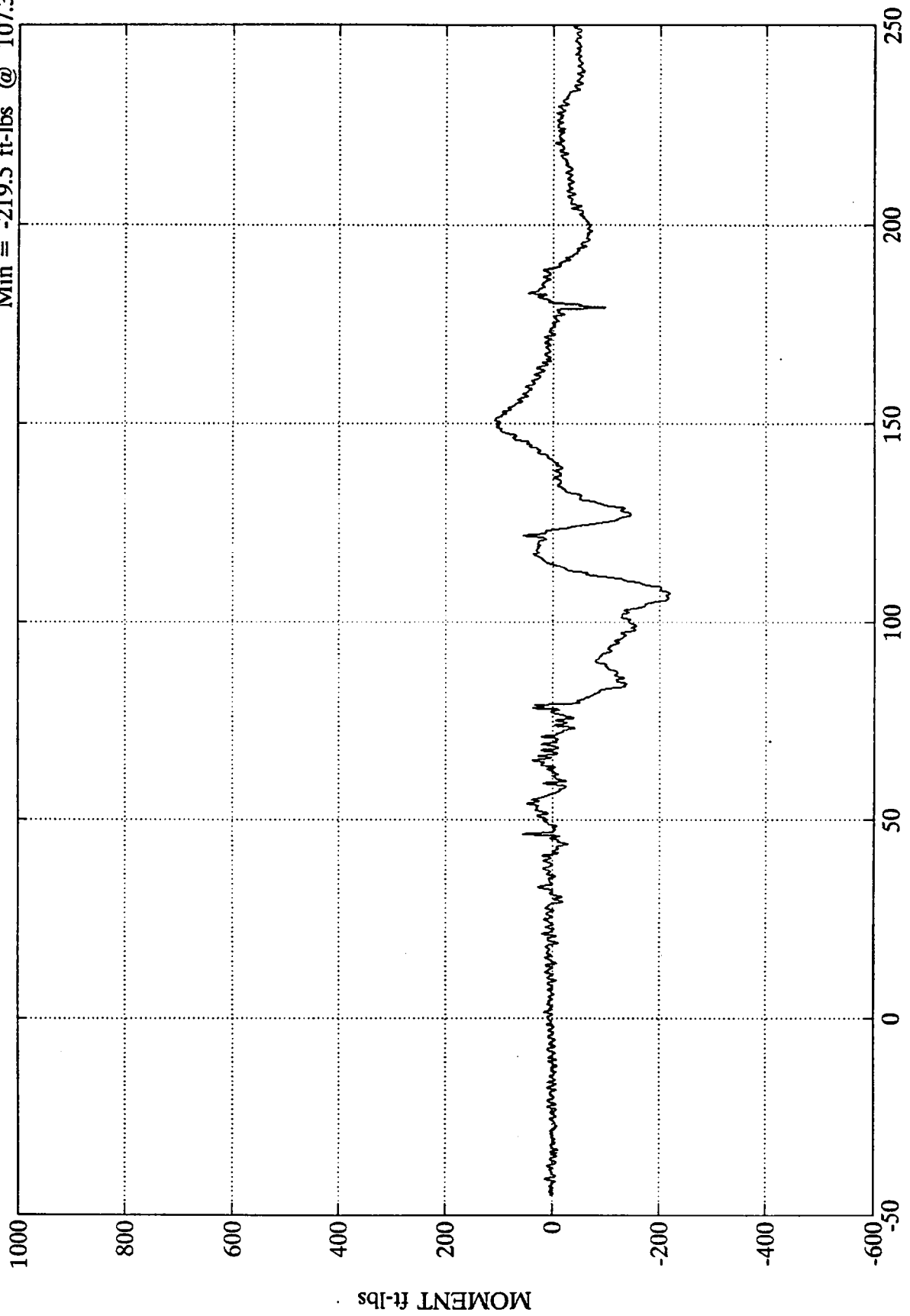
7862-3

SAE FILTER CLASS 1000

Test 1022

POS #2 UPPER NECK MOMENT(X)

Max = 108.6 ft-lbs @ 150.7 msec
Min = -219.5 ft-lbs @ 107.3 msec



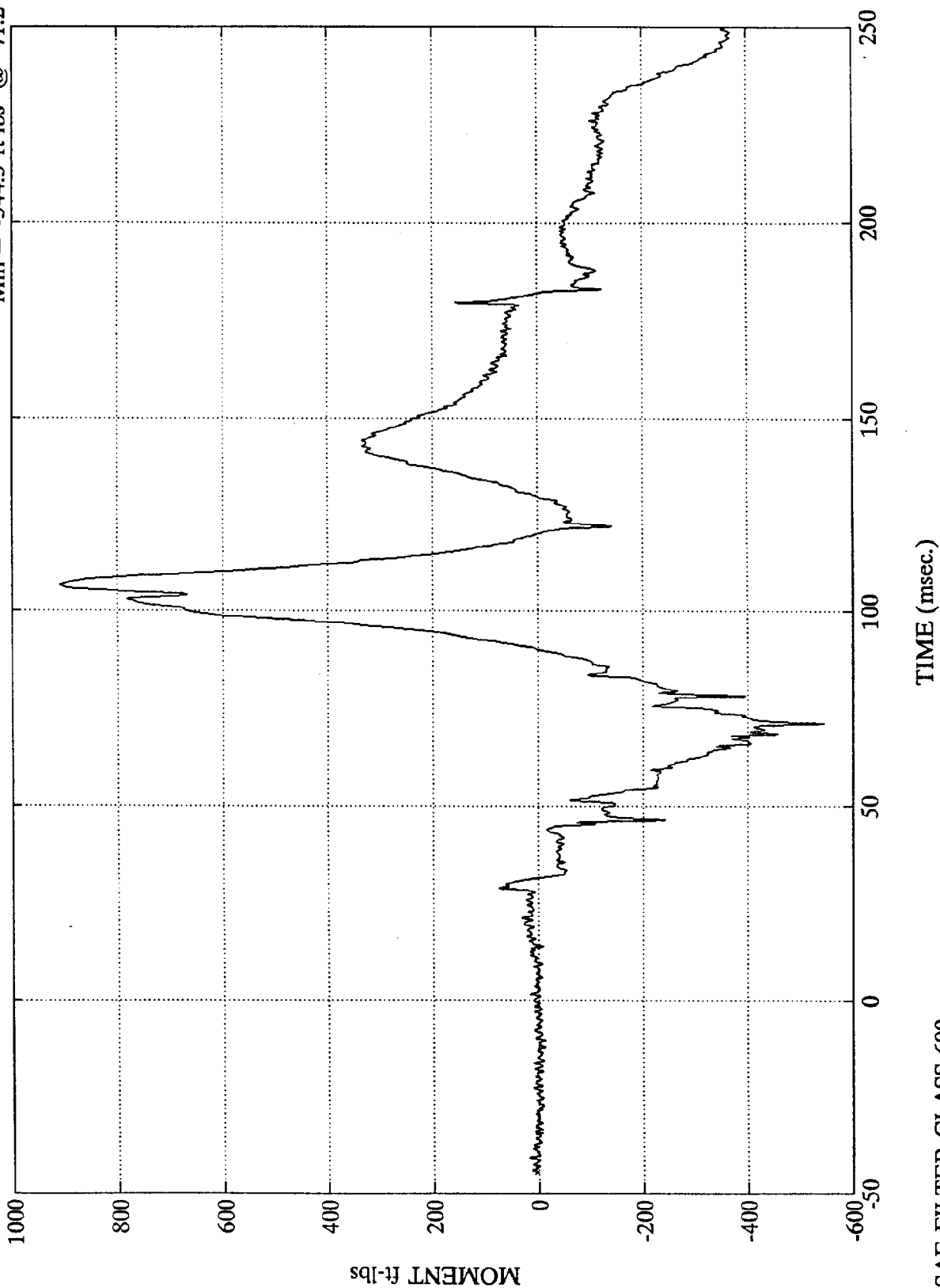
TIME (msec.)

SAE FILTER CLASS 600

Test 1022

Max = 908.3 ft-lbs @ 106.6 msec
Min = -544.3 ft-lbs @ 71.2 msec

POS #2 UPPER NECK MOMENT(Y)

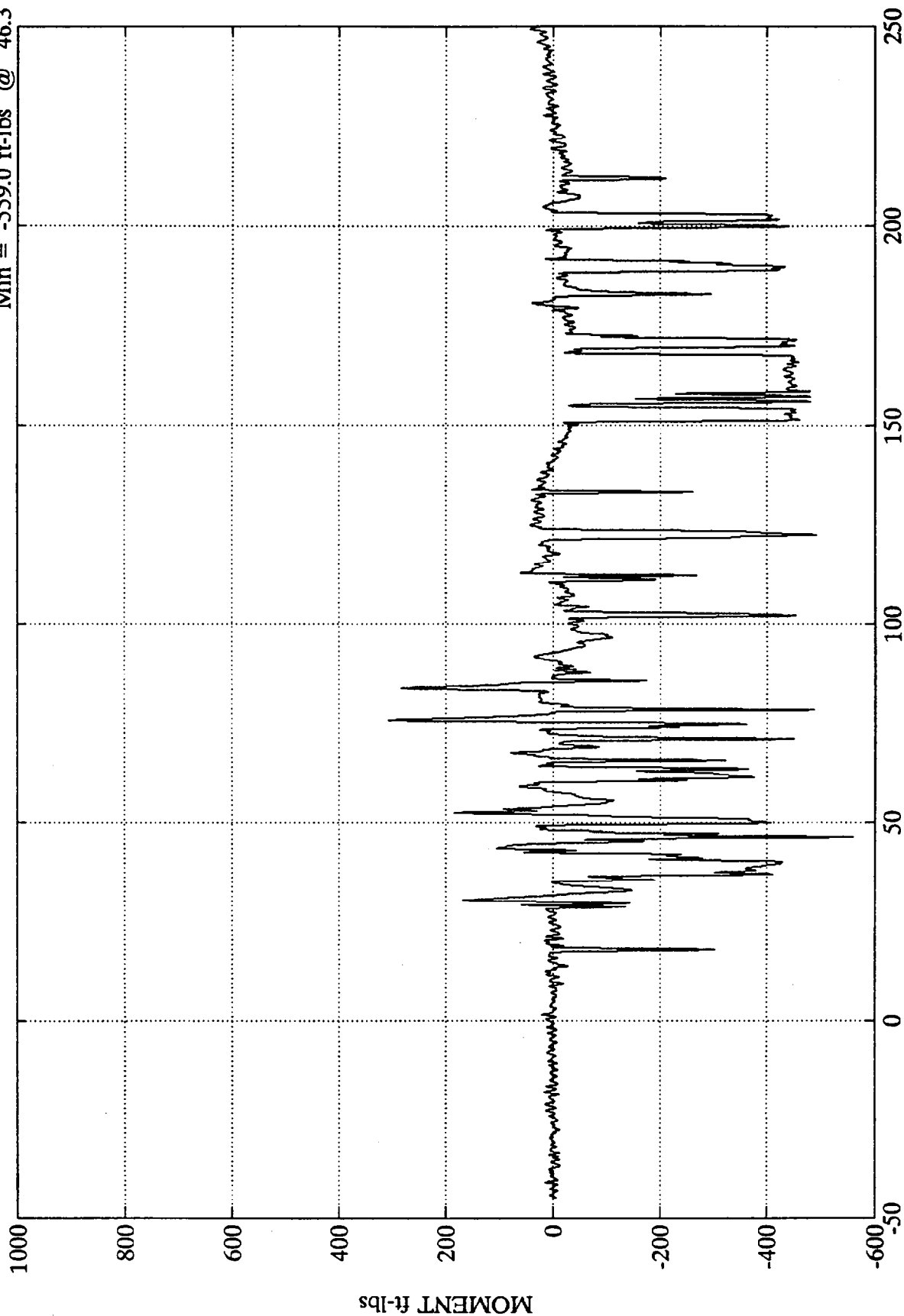


SAE FILTER CLASS 600

Test 1022

Max = 306.7 ft-lbs @ 75.8 msec
Min = -559.0 ft-lbs @ 46.3 msec

POS #2 UPPER NECK MOMENT(Z)

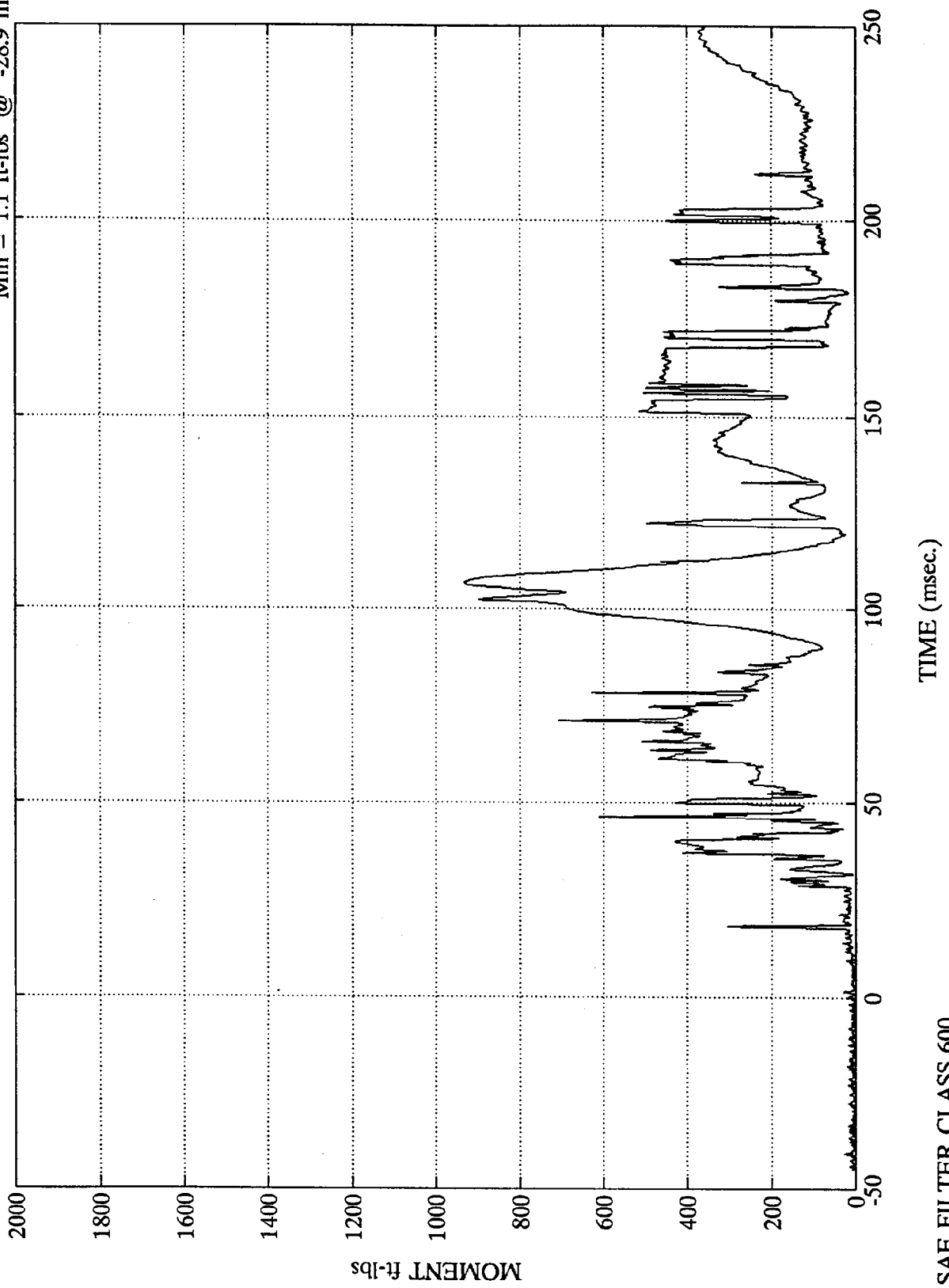


TIME (msec.)

SAE FILTER CLASS 600

Test 1022
Max = 933.2 ft-lbs @ 106.6 msec
Min = 1.1 ft-lbs @ -28.9 msec

POS #2 NECK MOMENT RESULTANT



SAE FILTER CLASS 600

Appendix C

**PART 572 B/E DUMMY CONFIGURATION
AND PERFORMANCE VERIFICATION DATA SHEETS**

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

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

Dummy serial numbers and certification dates are:

<u>Serial No.</u>	<u>Completion Date</u>
45	10-22-90
150	11-13-90

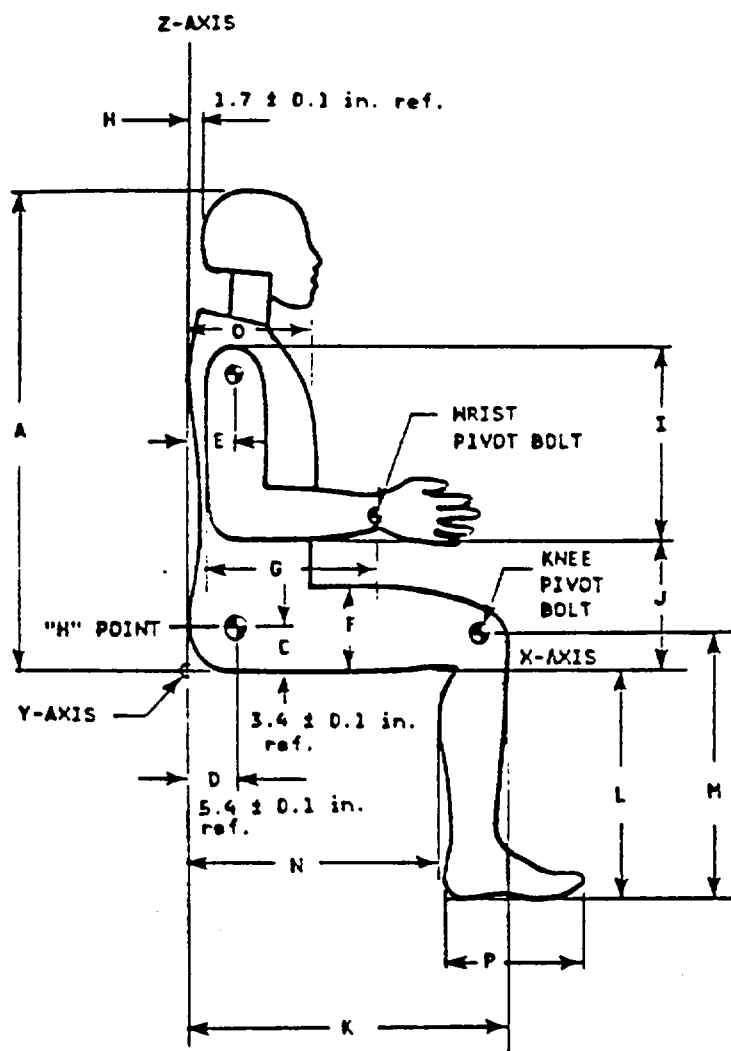
Electronic Test Equipment

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

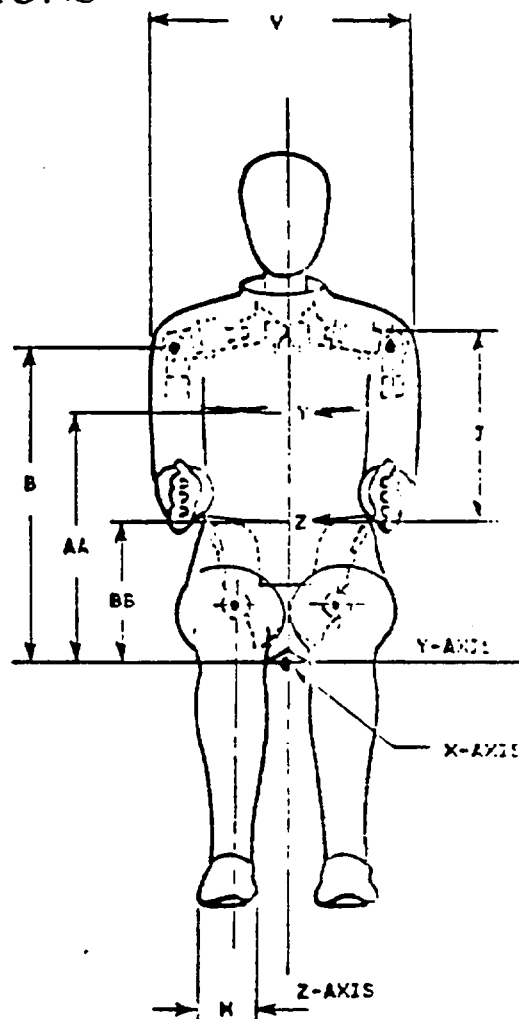
Figure 10

DUMMY CONFIGURATION DIMENSIONS

EXTERNAL DIMENSIONS
SETUP SPECIFICATIONS



SIDE VIEW



FRONT VIEW

NOTE: FIGURE IS REFERENCED TO
THE ERECT SEATED POSITION.
THE CURVED LUMBAR DOES NOT ALLOW
THE BYBRID III TO BE POSITIONED
IN A PERFECT ERECT ATTITUDE.

HYBRID III EXTERNAL DIMENSIONS
S/N 45 HUMANOID

DUMMY SERIAL NO. 45

DATE: 10-22-90

TEMPERATURE		70 DEG. F
RELATIVE HUMIDITY		50 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)	16.9-17.1 IN	17.0 IN
LOCATION FOR WAIST CIRCUMFERENCE (BB)	8.9-9.1 IN	8.9 IN
CHEST CIRCUMFERENCE (Y)	38.2-39.4 IN	38.6 IN
WAIST CIRCUMFERENCE (Z)	32.1-34.1 IN	33.3 IN
CHEST DEPTH (O)	8.4-9.0 IN	8.7 IN
H-POINT HEIGHT (C)	3.3-3.5 IN	3.3 IN
H-POINT FROM SEAT BACK (D)	5.3-5.5 IN	5.3 IN
SKULL CAP TO BACKLINE (H)	1.6-1.8 IN	1.6 IN
TOTAL SITTING HEIGHT (A)	34.6-35.0 IN	34.9 IN
THIGH CLEARANCE (F)	5.5-6.1 IN	5.7 IN
BUTTOCK KNEE LENGTH (K)	22.8-23.8 IN	23.2 IN
BUTTOCK POPLITAL LENGTH (N)	17.8-18.8 IN	17.3 IN
POPLITEAL LENGTH (L)	16.9-17.9 IN	17.5 IN
KNEE PIVOT HEIGHT (M)	19.1-19.7 IN	19.3 IN
FOOT LENGTH (P)	9.9-10.5 IN	10.3 IN
FOOT BREADTH (W)	3.6-4.2 IN	4.0 IN
SHOULDER PIVOT FROM BACKLINE (E)	3.3-3.7 IN	3.6 IN
SHOULDER BREADTH (V)	16.6-17.2 IN	16.9 IN
SHOULDER PIVOT HEIGHT (B)	19.9-20.5 IN	20.0 IN
ELBOW REST HEIGHT (J)	7.5-8.3 IN	7.9 IN
SHOULDER-ELBOW LENGTH (I)	13.0-13.6 IN	13.3 IN
BACK OF ELBOW TO WRIST PIVOT (G)	11.4-12.0 IN	11.9 IN

DUMMY MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKIEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 10-30-90

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN 45 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	71 DEG. F
RELATIVE HUMIDITY		10% - 70%	35 %
IMPACT VELOCITY		19.50 - 20.30 FPS	20.1 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.83 G
	20 MS	14.00 - 19.00 G	16.62 G
	30 MS	11.00 - 16.00 G	14.02 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	14.02 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	44.63 MS
D PLANE	MAX	81 - 106 DEG.	105.56 DEG.
ROTATION	TIME	72 - 82 MS	74.88 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-59.0/-39.0 FT.-LBS.	-57.77 FT.-LBS.
	TIME	65 - 79 MS	70.25 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	151.63 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	131.5 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK FLEXION TEST
HYBRID III

DATE : 10-30-90

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN 45 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	70 DEG. F
RELATIVE HUMIDITY		10% - 70%	34 %
IMPACT VELOCITY		22.6 - 23.4 FPS	22.9 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	23.54 G
	20 MS	17.60 - 22.60 G	21.58 G
	30 MS	12.50 - 18.50 G	16.04 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	16.04 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	39.88 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	77.58 DEG.
	TIME	57 - 64 MS	58.5 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.-LBS.	75.55 FT.-LBS.
	TIME	47 - 58 MS	53.88 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	115.88 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	101.88 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 10-22-90

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN 45

H.S. THORAX

CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	69 - 72 DEG. F	70 DEG. F
RELATIVE HUMIDITY	10% - 70%	47 %
PENDULUM VELOCITY	21.6 - 22.4 FT/SEC	21.6 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 INCHES	2.54 INCHES
MAXIMUM RESISTIVE FORCE	1080 - 1245 POUNDS	1229 POUNDS
INTERNAL HYSTERESIS	69% - 85%	69.7 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 10-29-90

KNEE : LEFT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN 45 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	33 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1073 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN _____IVAN MINKEWICZ_____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 10-29-90

KNEE : RIGHT

CALSPAN SEQUENTIAL NUMBER 1

HY3 SN 45 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	33 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1161 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN _____ IVAN MINKEWICZ _____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
HEAD DROP TEST
HYBRID III

DATE : 10-25-90

CALSPAN SEQUENTIAL NUMBER 1 HY3 SN 45 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	43 %
PEAK RESULTANT ACCELERATION	225 - 275 G	239.9 G
PEAK LATERAL ACCELERATION	15 G MAX	2.0 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 45

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CS75	10-90	4-91
HY LATERAL--	ENDEVCO	CY89	9-90	3-91
HZ VERTICAL--	ENDEVCO	CE76	10-90	4-91
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A147	10-90	4-91
CY LATERAL--	ENDEVCO	CJ54	10-90	4-91
CZ VERTICAL--	CEC	A148	10-90	4-91
3. FEMUR LOAD CELLS				
LEFT SIDE	GSE	311	9-90	3-91
RIGHT SIDE	GSE	312	9-90	3-91
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A160	11-90	5-91
2. TEST PROBE ACCELEROMETER--	CEC	A161	11-90	5-91
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	8-90	2-91
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	8-90	2-91
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	8-90	2-91

HYBRID III EXTERNAL DIMENSIONS S/N 150 HUMANOID		
DUMMY SERIAL NO. 150		DATE: 11-13-90
TEMPERATURE		70 DEG. F
RELATIVE HUMIDITY		50 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)	16.9-17.1 IN	17.1 IN
LOCATION FOR WAIST CIRCUMFERENCE (BB)	8.9-9.1 IN	9.0 IN
CHEST CIRCUMFERENCE (Y)	38.2-39.4 IN	38.9 IN
WAIST CIRCUMFERENCE (Z)	32.1-34.1 IN	33.3 IN
CHEST DEPTH (O)	8.4-9.0 IN	8.7 IN
H-POINT HEIGHT (C)	3.3-3.5 IN	3.4 IN
H-POINT FROM SEAT BACK (D)	5.3-5.5 IN	5.5 IN
SKULL CAP TO BACKLINE (H)	1.6-1.8 IN	1.6 IN
TOTAL SITTING HEIGHT (A)	34.6-35.0 IN	34.8 IN
THIGH CLEARANCE (F)	5.5-6.1 IN	5.8 IN
BUTTOCK KNEE LENGTH (K)	22.8-23.8 IN	23.2 IN
BUTTOCK POPLITAL LENGTH (N)	17.8-18.8 IN	18.4 IN
POPLITEAL LENGTH (L)	16.9-17.9 IN	17.6 IN
KNEE PIVOT HEIGHT (M)	19.1-19.7 IN	19.4 IN
FOOT LENGTH (P)	9.9-10.5 IN	10.1 IN
FOOT BREADTH (W)	3.6-4.2 IN	4.0 IN
SHOULDER PIVOT FROM BACKLINE (E)	3.3-3.7 IN	3.5 IN
SHOULDER BREADTH (V)	16.6-17.2 IN	16.8 IN
SHOULDER PIVOT HEIGHT (B)	19.9-20.5 IN	20.3 IN
ELBOW REST HEIGHT (J)	7.5-8.3 IN	8.1 IN
SHOULDER-ELBOW LENGTH (I)	13.0-13.6 IN	13.5 IN
BACK OF ELBOW TO WRIST PIVOT (G)	11.4-12.0 IN	11.8 IN
DUMMY MEETS SPECIFICATIONS TECHNICIAN <u>IVAN MINKEWICZ</u>		

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK EXTENSION TEST
HYBRID III

DATE : 11-15-90

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN 150 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	69 DEG. F
RELATIVE HUMIDITY		10% - 70%	37 %
IMPACT VELOCITY		19.50 - 20.30 FPS	20.1 FPS
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.61 G
	20 MS	14.00 - 19.00 G	17.66 G
	30 MS	11.00 - 16.00 G	14.8 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	14.8 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	43.0 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	95.53 DEG.
	TIME	72 - 82 MS	75.0 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-59.0/-39.0 FT.-LBS.	-50.51 FT.-LBS.
	TIME	65 - 79 MS	69.75 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	154.88 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	128.75 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKIEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
NECK FLEXION TEST
HYBRID III

DATE : 11-15-90

6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN 150 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		69 - 72 DEG. F	69 DEG. F
RELATIVE HUMIDITY		10% - 70%	36 %
IMPACT VELOCITY		22.6 - 23.4 FPS	22.6 FPS
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	23.59 G
	20 MS	17.60 - 22.60 G	21.73 G
	30 MS	12.50 - 18.50 G	17.21 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	17.21 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	37.88 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	74.63 DEG.
	TIME	57 - 64 MS	58.38 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	65 - 80 FT.-LBS.	69.62 FT.-LBS.
	TIME	47 - 58 MS	50.88 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	119.13 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	98.88 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
THORAX IMPACT TEST
HYBRID III

DATE : 11-14-90

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN 150 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	69 - 72 DEG. F	69 DEG. F
RELATIVE HUMIDITY	10% - 70%	29 %
PENDULUM VELOCITY	21.6 - 22.4 FT/SEC	21.6 FT/SEC
MAXIMUM DEFLECTION	2.50 - 2.86 INCHES	2.51 INCHES
MAXIMUM RESISTIVE FORCE	1080 - 1245 POUNDS	1228 POUNDS
INTERNAL HYSTERESIS	69% - 85%	73.2 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN ____IVAN MINKEWICZ____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 11-15-90

KNEE : LEFT

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN 150 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	71 DEG. F
RELATIVE HUMIDITY	10% - 70%	38 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1163 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN _____IVAN MINKEWICZ_____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
KNEE IMPACT TEST
HYBRID III

DATE : 11-15-90

KNEE : RIGHT

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN 150 KNEE 11LB. CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	71 DEG. F
RELATIVE HUMIDITY	10% - 70%	38 %
PROBE VELOCITY	6.8 - 7.0 FT/SEC	7.0 FT/SEC
PEAK KNEE IMPACT FORCE	996 - 1566 LBS.	1088 LBS.
PROBE WEIGHT	11 LBS.	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN ____IVAN MINKEWICZ____

CALSPAN CORPORATION
TRANSPORTATION RESEARCH DEPARTMENT
HEAD DROP TEST
HYBRID III

DATE : 11-14-90

CALSPAN SEQUENTIAL NUMBER 2

HY3 SN 150 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	68 - 78 DEG. F	70 DEG. F
RELATIVE HUMIDITY	10% - 70%	31 %
PEAK RESULTANT ACCELERATION	225 - 275 G	239.3 G
PEAK LATERAL ACCELERATION	15 G MAX	10.3 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY ID NUMBER 150

DUMMY INSTRUMENT--	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER--				
HX LONGITUDINAL--	ENDEVCO	CL60	10-90	4-91
HY LATERAL--	ENDEVCO	GD54	10-90	4-91
HZ VERTICAL--	ENDEVCO	CK11	10-90	4-91
2. CHEST ACCELEROMETER--				
CX LONGITUDINAL--	CEC	A145	10-90	4-91
CY LATERAL--	ENDEVCO	FL04	10-90	4-91
CZ VERTICAL--	CEC	A149	10-90	4-91
3. FEMUR LOAD CELLS				
LEFT SIDE	GSE	548	9-90	3-91
RIGHT SIDE	GSE	549	9-90	3-91
CALIBRATION LABORATORY INSTRUMENTS--				
1. PENDULUM ACC.--	CEC	A160	11-90	5-91
2. TEST PROBE ACCELEROMETER--	CEC	A161	11-90	5-91
3. LUMBAR FLEXION TEST PUSH FORCE GAUGE--	TRANS- DUCER INC	20051	8-90	2-91
4. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	BLH	72952	8-90	2-91
5. ABDOMINAL COMPRESS. TEST FORCE GAUGE--	CIC	567-11	8-90	2-91

Appendix D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY
(6 Month Calibration Minimum)

DRIVER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head X Y Z	CS75	ENDEVCO	10-90	4-91
	CY89	ENDEVCO	9-90	3-91
	CE76	ENDEVCO	10-90	4-91
Chest X Y Z	A147	CEC	10-90	4-91
	CJ54	ENDEVCO	10-90	4-91
	A148	CEC	10-90	4-91
Right Femur Load Cell	311	GSE	9-90	3-91
Left Femur Load Cell	312	GSE	9-90	3-91
Neck Load Cell X Y Z	269	DENTON	10-90	4-91
	269	DENTON	10-90	4-91
	269	DENTON	10-90	4-91
Neck Moment X Y Z	269	DENTON	10-90	4-91
	269	DENTON	10-90	4-91
	269	DENTON	10-90	4-91
Chest Deflection Gauge Hybrid III Use Only	84892-15	HUMANIOD	10-90	4-91
Lap Belt Load Cells	123	Lebow	9-90	3-91
Shoulder Belt Load Cells	127	Lebow	9-90	3-91
Spool-Out Potentiometer	52	SERVONIC INST.	10-90	4-91
Belt Stretch Transducer	E1	CALSPAN	10-90	4-91

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY
(6 Month Calibration Minimum)

PASSENGER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head X Y Z	CL60	ENDEVCO	10-90	4-91
	CD54	ENDEVCO	10-90	4-91
	CK11	ENDEVCO	10-90	4-91
Chest X Y Z	A145	CEC	10-90	4-91
	FL04	ENDEVCO	10-90	4-91
	A149	CEC	10-90	4-91
Right Femur Load Cell	548	GSE	9-90	3-91
Left Femur Load Cell	549	GSE	9-90	4-91
Neck Load Cell X Y Z	076	DENTON	10-90	4-91
	076	DENTON	10-90	4-91
	076	DENTON	10-90	4-91
Neck Moment X Y Z	076	DENTON	10-90	4-91
	076	DENTON	10-90	4-91
	076	DENTON	10-90	4-91
Chest Deflection Gauge Hybrid III Use Only	150	HUMANOID	10-90	4-91
Lap Belt Load Cells	133	LEBOW	9-90	3-91
Shoulder Belt Load Cells	135	LEBOW	9-90	3-91
Spool-Out Potentiometer	42	SERVONIC INST.	10-90	4-91
Belt Stretch Transducer	E3	CALSPAN	10-90	4-91

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS
(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration	
			Last	Next
Left Seat Rear Crossmember	A155	CEC	9-90	3-91
Right Rear Seat Crossmember	A156	CEC	9-90	3-91
Top of Engine	A115	CEC	9-90	3-91
Bottom of Engine	A29	CEC	7-90	1-91
Left Disc Brake Caliper	A84	CEC	9-90	3-91
Right Disc Brake Caliper	A101	CEC	9-90	3-91
Instrument Panel	A75	CEC	9-90	3-91
Center Rear Crossmember Z	A157	CEC	9-90	3-91
Vehicle Rear Z	A164	CEC	9-90	3-91

Appendix E

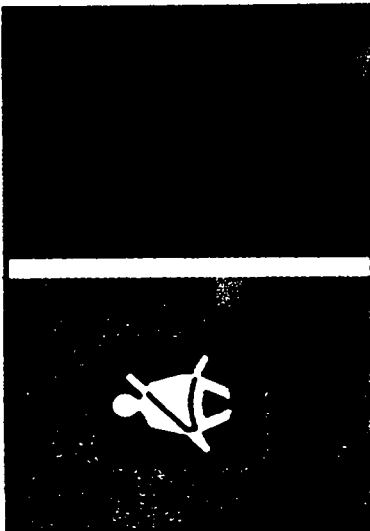
VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

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

A: You may be an excellent driver, but if there is an accident, you and your passengers can be hurt. Just because you are a good driver does not protect you from things beyond your control or from bad drivers.

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

Safety belts are for everyone.



K0823

■ **Safety Belt** **Reminder Light**

When the key is turned to RUN or START, a light and a buzzer will come on for about eight seconds to remind people to fasten their safety belts. Unless the driver's safety belt is buckled, a buzzer will also sound.

■ **How to Wear Safety Belts Properly**

Adults

This part is only for people of adult size. If children will be riding in your vehicle, see the section after this one, called "Children."

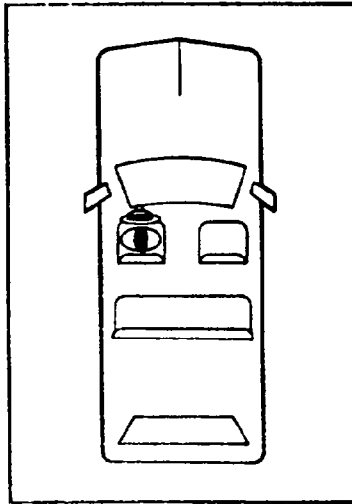
CAUTION



First, you'll want to know which restraint systems your vehicle has. We'll start with the front seats.

3-11 . . .

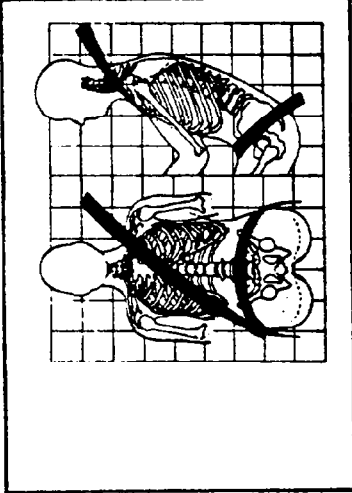
Seats & Safety Belts



K0324

Driver's Position

The driver has a lap-shoulder belt.



K0325

Lap-Shoulder Belt

Here's how to wear it properly.

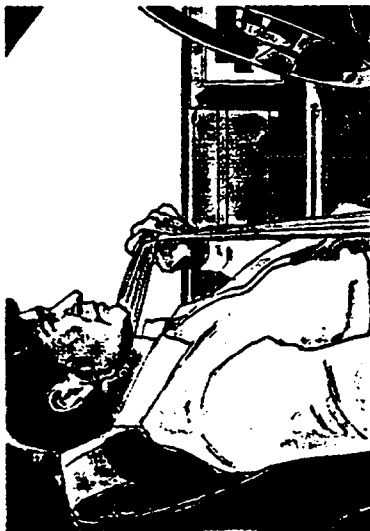
1. First, of course, close and lock your door. Then, adjust the seat. To see how, see "Seats" in this section so you can sit up straight.



K0326

2. Pick up the latch plate, and pull the belt across you (don't let it get twisted).
3. Push the latch plate into the buckle until it "clicks."

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



K0327

If the shoulder belt is too tight, try this:

- Pull out the belt at least 5 inches (130 mm).



K0328

- Let it go back all the way.



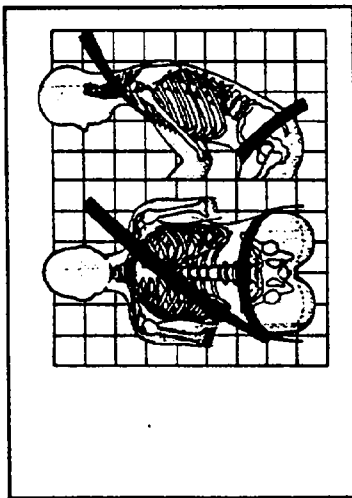
K0329

- You can add a small amount of slack. The system works like a window shade. To add a little slack, pull down on the shoulder belt — but no more than 1 inch (25 mm) — to make it not so tight.

If it's now too loose, pull it out as you did before and start again.

If you move around in the vehicle and your shoulder belt becomes loose, be sure to make it tight again.

Seats & Safety Belts



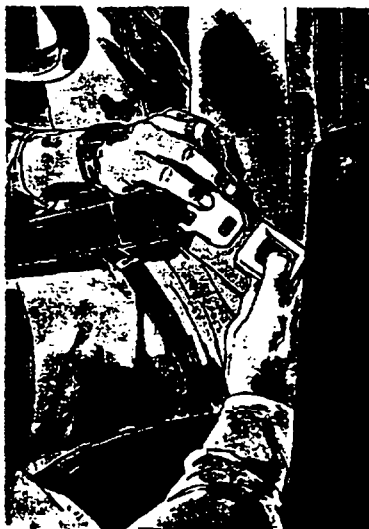
K0330

The lap part of the belt should be low. It needs to be snug below the hips, just touching the tops of the thighs. That applies belt force to the pelvic bones in a crash. And it means you'd be less likely to slide under the lap belt. If you slide under it, the belt would apply force to the abdomen. That could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

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

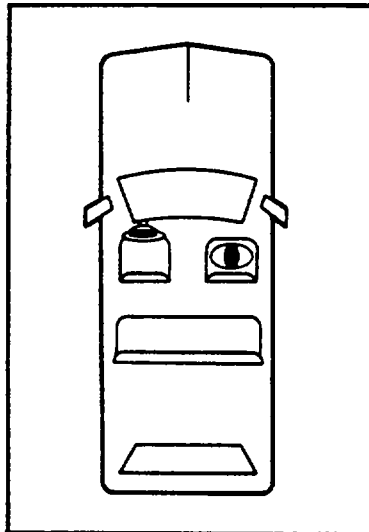
CAUTION

 You can be seriously hurt if your shoulder belt is too loose. In a crash you would move forward too much, and that could significantly increase injury. The shoulder belt should fit against your body. Don't allow more than 1 inch (25 mm) of slack.



K0332

- To unlatch the belt, just push the button on the buckle.
 - When you unbuckle it, the belt should go back out of the way.
- Before you close the door, be sure the belt is out of the way. If you slam the door on it, you can damage both the belt and your vehicle's interior.

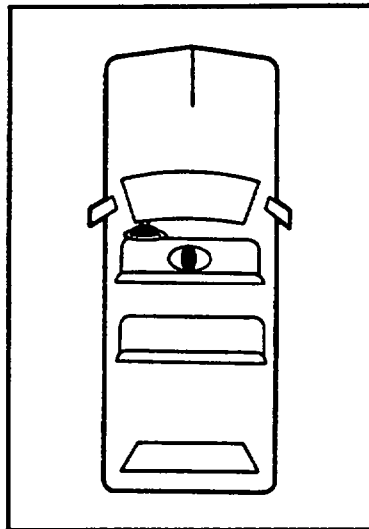


K0333

Right Front Passenger's Position Lap-Shoulder Belt

The right front passenger's position has a lap-shoulder belt. To see how to make it work, please see "Lap-Shoulder Belt" in this section. Also, if this lap-shoulder belt is pulled all the way out, it switches to a locking mode. See "Child Restraints" in this section.

Adjust the seat so you can sit up straight. To see how, see "Seats" in this section.



K0391

Center Front Passenger's Position (BENCH SEAT — FOUR DOOR MODELS)

The center seat on the bench seat has a lap belt with no retractor.

Seats & Safety Belts



K0335

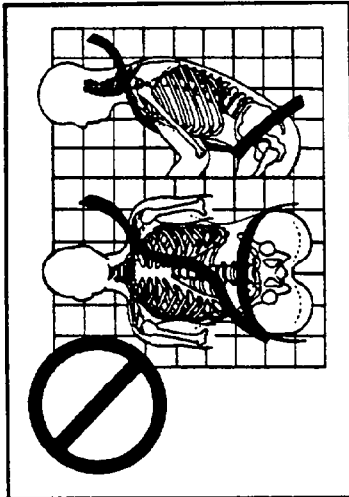
Lap Belt

To make the belt longer, tilt the latch plate a little and pull it. If the belt is not long enough, see "Safety Belt Extender" later in this section.



K0336

To make it shorter, pull the belt like this. It is buckled, positioned, and released the same way as a lap-shoulder belt. When buckling, make sure the buckle faces upward or outward to allow quick release.



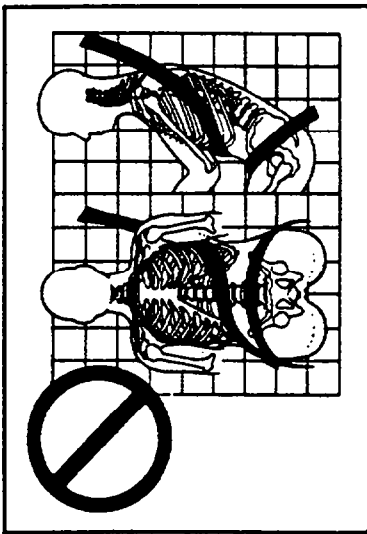
K0337

Q: What's Wrong With This?

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

CAUTION

 You can be seriously hurt if your shoulder belt is too loose. In a crash you would move forward too much, and that could significantly increase injury. The shoulder belt should fit against your body. Don't allow more than 1 inch (25 mm) of slack.



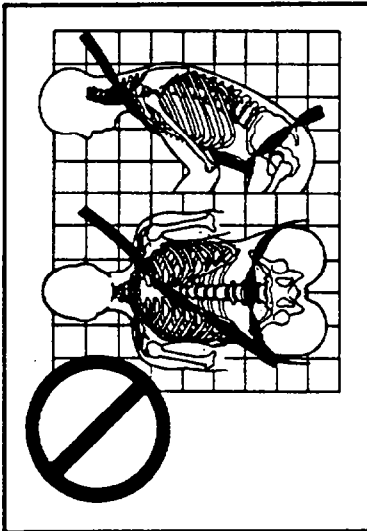
K0338

Q: What's Wrong With This?

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

CAUTION

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



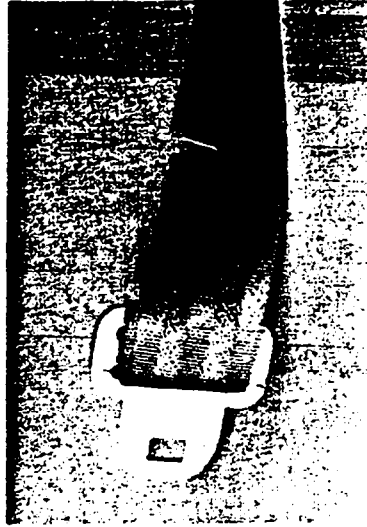
K0339

Q: What's Wrong With This?

A: The belt is twisted across the person's body.

CAUTION

 You can be seriously injured by twisted belts. In a crash, you wouldn't have the full width of the belt to take impact forces. The twisted belt against your body could injure you. If a belt is twisted, make it straight (or ask your dealer to do that) so it can work properly.



K0340

Q: What's Wrong With This?

A: The belt is torn.

CAUTION

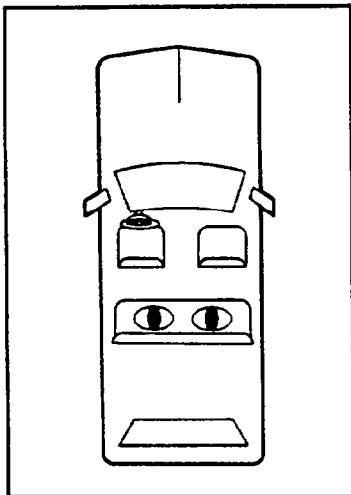
 Torn or frayed belts may not protect you in a crash. They can rip apart under impact forces. If a belt is torn or frayed, get a new one right away.

Seats & Safety Belts

Rear Safety Belts

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

- People who aren't belted can be thrown out of the vehicle in a crash.
- And, they can strike others in the vehicle who are belted.



Rear Passengers' Position (Two Door Models)

Lap-Shoulder Belt

These positions lap-shoulder belts. Here's how to wear them properly.

1. Adjust the seat so you can sit up straight. To see how, see "Seats" in this section.



2. Pick up the latch plate, and pull the belt across you until it stops.
3. Then tilt the latch plate if you need to and keep on pulling until you can buckle it.



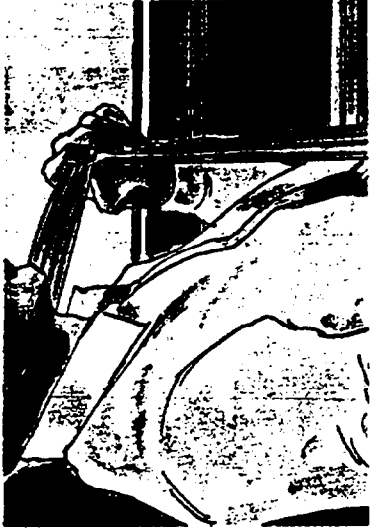
K0386

4. Push the latch plate into the buckle until it "clicks." Make sure the buckle faces up or out to allow quick release.
If the belt isn't long enough, see "Safety Belt Extender" at the end of this section.



K0387

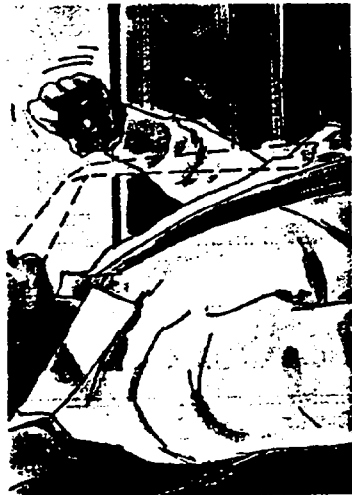
5. Pull upward on the shoulder belt to cinch the lap belt.



K0343

- If the shoulder belt is too tight, try this:
- Pull out the belt at least 5 inches (130 mm).

Seats & Safety Belts



K0344

- Let it go back all the way.

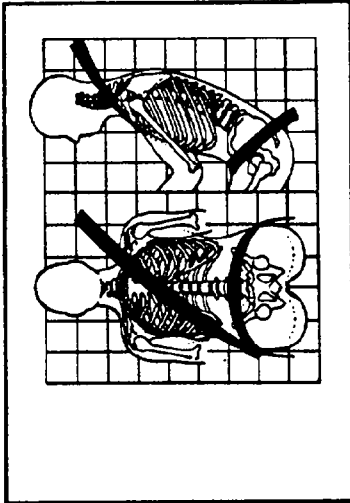


K0345

- You can add a small amount of slack. The system works like a window shade. To add a little slack, pull down on the shoulder belt — but no more than 1 inch (25 mm) — to make it not so tight.

If it's now too loose, pull it out as you did before and start again.

If you move around in the vehicle and your shoulder belt becomes loose, be sure to make it tight again.



K0346

The lap part of the belt should be low. It needs to be snug below the hips, just touching the tops of the thighs. That applies belt force to the pelvic bones in a crash. And it means you'd be less likely to slide under the lap belt. If you slide under it, the belt would apply force to the abdomen. That could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

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



K0347

If the belt is fully extended and cannot be retracted, press down on the lever on the retractor cover to make it retract.

CAUTION

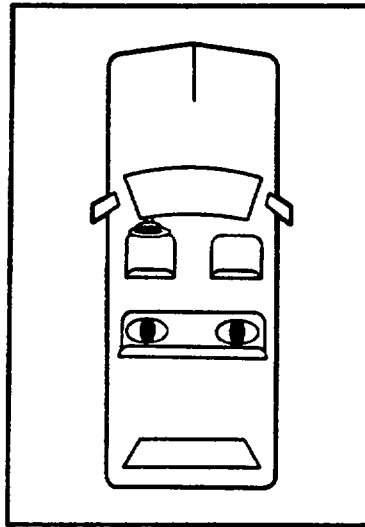
 You can be seriously hurt if your shoulder belt is too loose. In a crash you would move forward too much, and that could significantly increase injury. The shoulder belt should fit against your body. Don't allow more than 1 inch (25 mm) of slack.



K0346

- To unlatch the belt, just push the button on the buckle.
- When you unbuckle it, the belt should go back out of the way.

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



K0349

Rear Outside Passengers' Positions (Four Door Models)

Lap-Shoulder Belt

The positions next to the windows have lap-shoulder belts.

Seats & Safety Belts



K0350

The belts should be worn like this.



K0351

• Pick up the latch plate.



K0352

• Pull the lap-shoulder belt across you until you can buckle it.



K0353

- Push the latch plate into the buckle until it clicks.
If the belt is not long enough, see "Safety Belt Extender" at the end of this section.
The lap part of the belt should be low. It needs to be snug below the hips, just touching the top of the thighs.



K0354

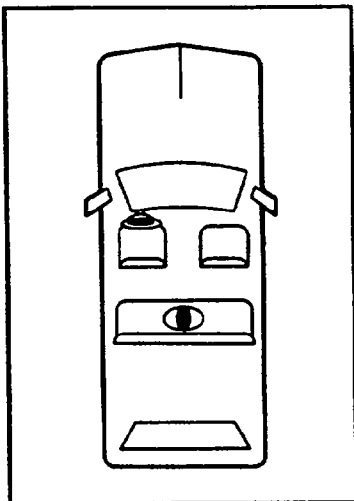
To make it snug, pull up on the shoulder belt, like this.
This applies belt force to the pelvic bones. And it means you'd be less likely to slide under the lap belt in a crash. If you slide under it, the belt can apply force at the abdomen. That can cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take high belt forces.
The belt locks only if there's a sudden stop or a crash. If the lap-shoulder belt is pulled all the way out, it switches to a locking mode. See "Child Restraints" in this section.



K0355

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

Seats & Safety Belts



K0392

Rear Center Position (Four Door Models)

The center seat on the bench seat has a lap belt with no retractor.



K0356

Lap Belt

To make the belt longer, tilt the latch plate a little and pull it. If the belt is not long enough, see "Safety Belt Extender" later in this section.



K0357

To make it shorter, pull the belt like this. Wear this lap belt, and release it, just like the lap part of the driver's belt. See "Driver's Position" in this section. When you buckle up, make sure the buckle faces upward or outward so you could release it quickly if you ever had to.