

REPORT NUMBER: CAL-91-N02

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

**CHRYSLER CORPORATION
1991 DODGE SHADOW
4-DOOR HATCHBACK**

NHTSA NUMBER: MM0300

CALSPAN TEST NUMBER: 7862-2

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November 27, 1990



FINAL REPORT

PREPARED FOR:

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Office of Market Incentives
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16. Abstract A frontal load cell barrier test of a 1991 Dodge Shadow 4-Door Hatchback was performed at Calspan Advanced Technology Center crash test facility in Buffalo, New York on November 27, 1990. The impact speed was 35.2 mph and the ambient temperature at the barrier face at the time of impact was 66°F. The maximum post-test vehicle crush was 28.2 inches. The test vehicle was equipped with a 3-point belt system at each of the front outboard seating positions. The vehicle was also equipped with a driver side airbag as a supplemental restraint device. With regard to FMVSS 208 "Occupant Crash Protection," injury criteria, both the driver and passenger dummies appear to satisfy the head, chest, and femur requirements.					
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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 MM0300

A load cell barrier consisting of 36 load cells was impacted by a 1991 Dodge Shadow 4-Door Hatchback at a velocity of 35.2 mph. The test was performed at the Calspan Corporation Advanced Technology center on November 27, 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 one previous test (MM0100) and the Injury Criteria Values were not exceeded in that test. The passenger ATD (Serial No. 150) was certified prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C and D.

The 83 channels of data were recorded on six 14-channel FM tape recorders. Appendix B contains the vehicle, load cell barrier and dummy response data traces. Accelerometer Pack #2 (x), located on the right rear seat crossmember, contains questionable data. Accelerometer Pack #3 (x), located on the top of engine block, sustained a cut wire after approximately 98 milliseconds after impact. Accelerometer Pack #6 (x) located on the instrument panel, also contains questionable data. Accelerometers 8 and 9 were installed in the x-direction.

The driver's HIC was 503.3. The maximum chest deceleration over 3 milliseconds was 41.6 g's along with a maximum chest deflection of 1.4 inches. The femur loads were 1234.0 and 738.9 pounds for the left femur and right femur, respectively.

The right front passenger's HIC was 456.6 and maximum chest deceleration over 3 milliseconds was 38.9 g's coupled with a chest deflection of 1.2 inches. The maximum left femur load was 647.2 pounds and the right maximum femur load was 780.8 pounds.

Table 1
GENERAL TEST AND VEHICLE PARAMETER DATA

Vehicle Year/Make/Model/Body Style: 1991 Dodge Shadow 4-Door Hatchback
NHTSA No.: MM0300 VIN.: 1B3XP28D1MN561430
Body Color: Blue Date Of Manufacture: October 1990
Engine: 4 Cylinders; - C.I.D.; 2.2 Liters; - CC
X Gas; - Diesel; - Turbocharged
- Longitudinal; X Transverse
Transmission: 3 Speed; - Manual; X Automatic; - Overdrive
Final Drive: X Front Wheel; - Rear Wheel; - Four Wheel
Date Received: 11/1/90 Odometer Reading: 20
- A/C; X P/S; X P/B; - P/wdo.; - Tilt Wheel
- P/seats; - Cruise Control
Type of Occupant Restraint: 3-point continuous belt system with a driver
side airbag

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 32 psi, Rear 32 psi
Recommended Tire Size: P185/70R14
Recommended Cold Tire Pressure: Front 32 psi, Rear 32 psi
Tires on Vehicle: P185/70R14; Manufacturer: Goodyear
Number of Occupants: 2 Front; 3 Rear; - 3rd Seat; 5 TOTAL
Type of Front Seats: X Bucket; - Bench; - Split Bench
Type of Front Seat Back: - Fixed X Adj. With X Lever - Rot. Knob
Vehicle Capacity Weight (VCW) = 865 lbs. (A)
No. of Occupants x 150 lbs. = 750 lbs. (B)
Rated Cargo and Luggage
Weight (RCLW) A-B = 115 lbs.
GVWR 3624 lbs. GAWR: Front 1962 lbs. Rear 1712 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 = 790 lbs. Right Rear = 520 lbs.
 Left Front = 900 lbs. Left Rear = 520 lbs.
 TOTAL FRONT WEIGHT = 1690 lbs. (62 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1040 lbs. (38 % of Total Vehicle Weight)
 TOTAL DELIVERY WEIGHT = 2730 lbs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (2730 lbs.)
 VCW = Vehicle Capacity Weight (865 lbs.)
 DSC = Designated Seating Capacity (5)
 RCLW = VCW - 150 (DSC) = 115 lbs.
 Target Test Weight = UDW + RCLW + (2 dummies x 167 lbs./dummy)
 Target Test Weight = 3179 lbs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 116 POUNDS CARGO:

Right Front = 870 lbs. Right Rear = 730 lbs.
 Left Front = 910 lbs. Left Rear = 650 lbs.
 TOTAL FRONT WEIGHT = 1780 lbs. (56 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1380 lbs. (44 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 3160* lbs.
 Weight of ballast secured in vehicle trunk area = - lbs.

VEHICLE ATTITUDE (all dimensions in inches):

Delivered Attitude: RF 26.6 LF 26.0 RR 26.6 LR 26.2
 Test Attitude: RF 26.1 LF 25.7 RR 24.8 LR 24.2
 Wheel Base: 97.2 in.; C.G. = 42.4 in. rearward of front wheel C/L
 Remarks: 12.7 gallons of stoddard solution was placed in the fuel tank.

*Rear bumper and both tail lights were removed along with a battery pack to attain target test weight.

Table 1
GENERAL TEST AND VEHICLE PARAMETER DATA (cont'd)

POST-IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0°
 Date of Test: 11-27-90 Time of Test: 12:20
 Ambient Temperature: 66 °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 = 35.2 mph, secondary = 35.2 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	<u>168.1</u>	C _L	<u>172.2</u>	L	<u>168.0</u>
	Post-test	= R	<u>142.4</u>	C _L	<u>144.0</u>	L	<u>145.1</u>
	Crush	= R	<u>25.7</u>	C _L	<u>28.2</u>	L	<u>22.9</u>

Distance from front of test vehicle to point of impact:

R 24.9 C_L 24.6 L 25.3

VISIBLE DUMMY CONTACT POINTS:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Air Bag</u>	<u>No Contact</u>
Chest	<u>Air Bag</u>	<u>No Contact</u>
Abdomen	<u>No Contact</u>	<u>No Contact</u>
Left Knee	<u>Dash Panel</u>	<u>Glove Box</u>
Right Knee	<u>Dash Panel</u>	<u>Glove Box</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 Required</u>	<u>Tools Required</u>	<u>Operable</u>	<u>Operable</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				
Seat Shift (in.)	<u>0.7"</u>	<u>0.7"</u>	<u>-</u>	<u>-</u>
	<u>Forward</u>	<u>Forward</u>		

Glazing Damage

Backlight/Windshield The windshield sustained 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.: MM0300 Vehicle: 1991 Dodge Shadow 4-Door Hatchback

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-54.5	15.5	19.1	57.7
Position #2 - Passenger	-30.2	-10.0	46.8	56.1

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-43.5	7.8	-15.3	41.6
Position #2 - Passenger	-38.6	-19.9	-9.6	38.9

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	1234.0	738.9
Position #2 - Passenger	647.2	780.8

	MAXIMUM FORCE - SEAT BELT LOADS (lbs.)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	898.7	-	1165.4
Position #2 - Passenger	1529.8	1071.9	-

	HEAD INJURY CRITERIA (HIC)			
	HIC	t ₁ (SEC)	t ₂ (SEC)	Average Acceleration t ₁ TO t ₂
Position #1 - Driver	503.3	.05244	.08256	48.9
Position #2 - Passenger	456.6	.08100	.11888	43.8

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 Dodge Shadow 4-Door Hatchback

Vehicle NHTSA No.: MM0300 Test Date: November 27, 1990

MAXIMUM VALUES	DRIVER DUMMY ID # <u>45</u>	PASSENGER DUMMY ID # <u>150</u>
Neck Load X	-162.4	272.7
Neck Load Y	-53.7	-53.5
Neck Load Z	-9936.3	374.4
Neck Moment X	-89.3	166.8
Neck Moment Y	575.9	654.4
Neck Moment Z	-249.6	-462.8
Chest Deflection X (in.)	1.4	1.2
Time of Max. Occurance	67.8	76.0

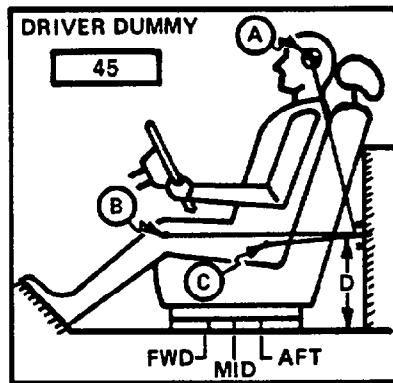
NOTE: All values listed must be occurring during primary impact event.

Figure 1

PART 572 DUMMY IN-VEHICLE POSITION

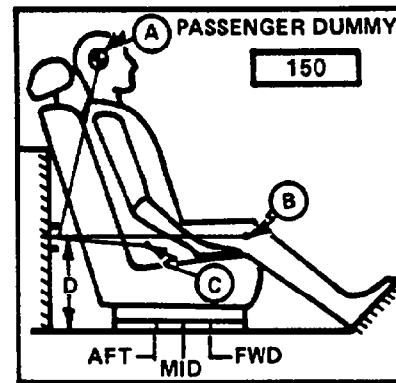
Test No.: MM0300 Vehicle: 1991 Dodge Shadow 4-Door Hatchback

<u>SEAT TYPE:</u>	<u>ADJUSTER TYPE:</u>	<u>BUCKET SEAT BACK TYPE:</u>
<u>-</u> Bench	<u>X</u> Manual	<u>-</u> Fixed
<u>X</u> Bucket	<u>-</u> Power	<u>X</u> Adjustable Reclining
<u>-</u> Split Bench		



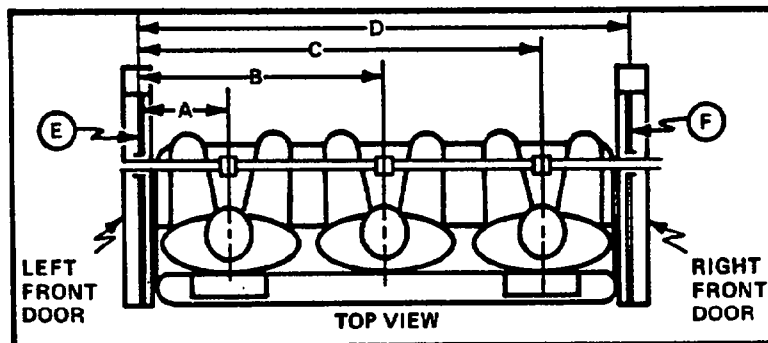
MEASUREMENT
LOCATION

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



A = 20.2 in. 16 Degrees
 B = 24.5 in. 95 Degrees
 C = 10.5 in. 125 Degrees
 D = 15.1 in.

A = 20.2 in. 15 Degrees
 B = 24.9 in. 95 Degrees
 C = 10.7 in. 125 Degrees
 D = 15.1 in.



DUMMY ID

<u>45</u>	<u>150</u>
A = Left Door to Driver Centerline	<u>13.1</u> in.
B = Left Door to Center Passenger Centerline	<u>-</u> in.
C = Left Door to Right Passenger Centerline	<u>39.2</u> in.
D = Left Door to Right Door	<u>52.0</u> in.
E, F = Window Glass Height (Right and Left Must Be Equal)	<u>11.0</u> in.

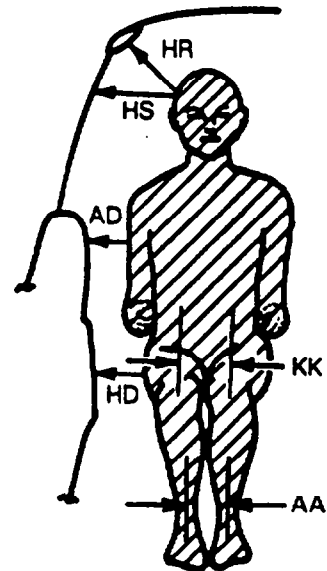
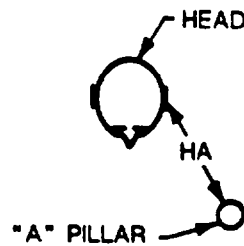
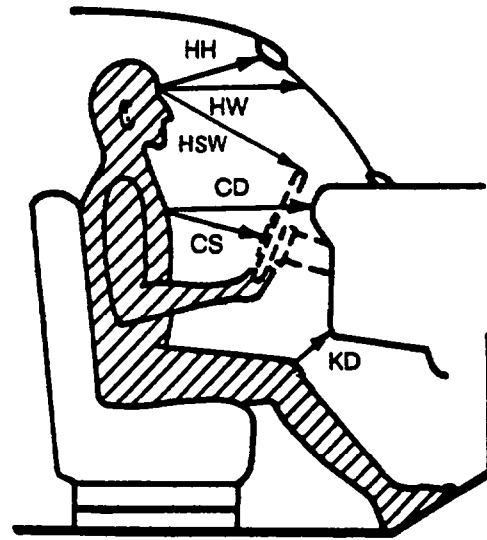
Figure 2
OCCUPANT CLEARANCE DIMENSIONS

	DRIVER	PASSENGER
HH	11.4	11.7
HW	17.7	17.4
CD	18.3	19.6
CS	9.0	—
KDL	3.7	4.3
KDR	4.5	4.2
SA	See Note	See Note
TA	20°	20°
HSW	14.0	—

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

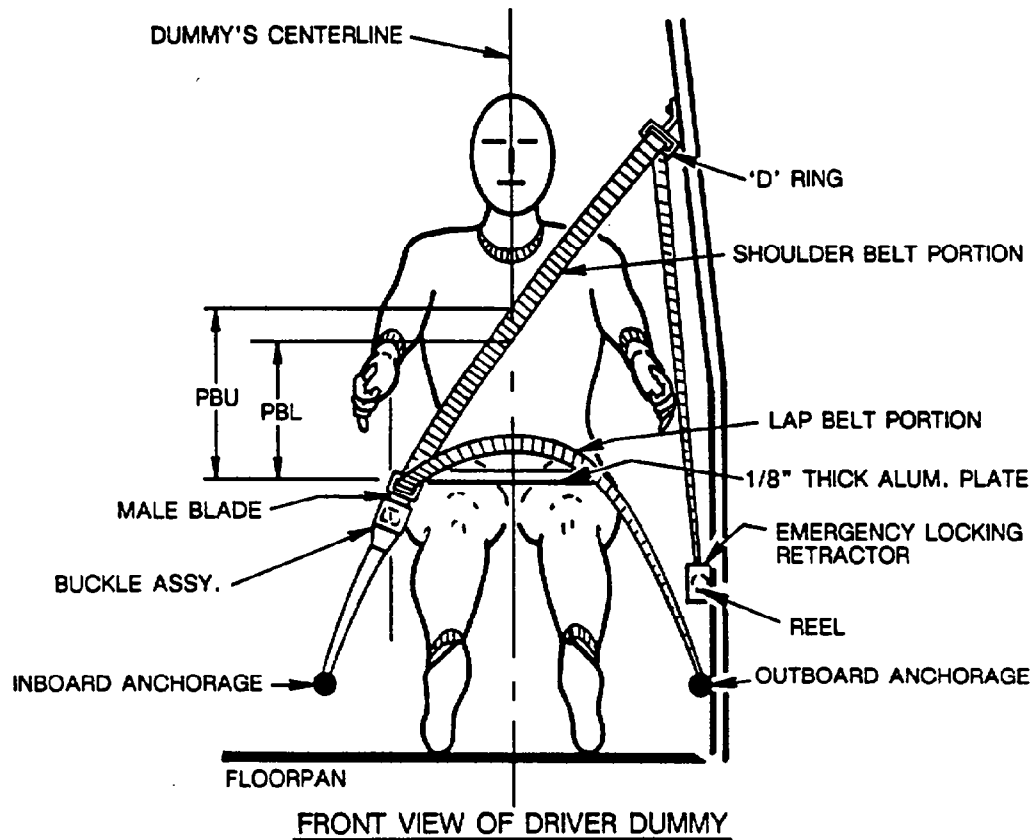
HA = Head Target to "A" Pillar
HR = Head to Side Roof
HS = Head to Side Window
AD = Arm to Door
HD = Hip to Door
KK = Knee to Knee
AA = Ankle to Ankle

	DRIVER	PASSENGER
HR	6.4	6.3
HS	9.7	9.8
AD	4.3	4.1
HD	6.5	6.2
KK	10.5	7.8
HA	16.9	17.3
AA	10.0	6.9



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

Figure 3
SEAT BELT POSITIONING DATA

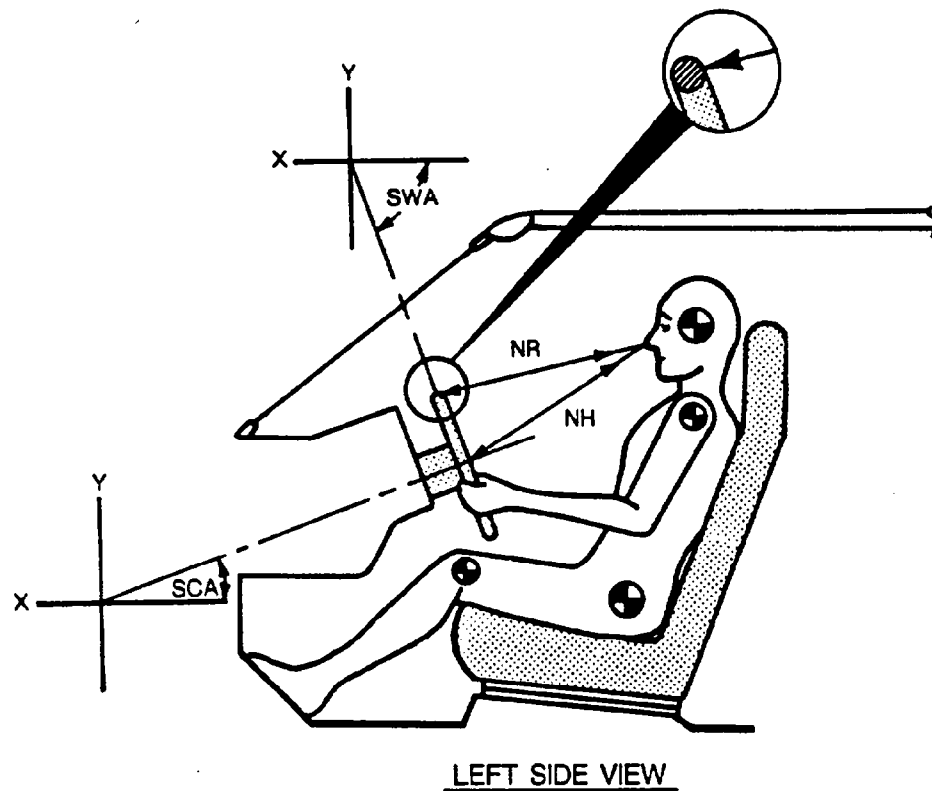


	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	12.3	13.5
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	9.5	10.5
<u>LAP BELT TENSION</u>	2.0 lbs	2.0 lbs.
<u>SHOULDER BELT TENSION</u>	—	—

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>84.5"</u>	<u>85.0"</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>34.0"</u>	<u>34.0"</u>
Lap belt length as measured on Part 572 Dummy.	<u>31.5"</u>	<u>32.0"</u>
<u>SHOULDER BELT SPOOL-OFF DATA:</u>		
As determined by film analysis.	<u>2.0"</u>	<u>N/A</u>
As determined mechanically.	<u>1.8"</u>	<u>2.2"</u>
As determined electronically.	<u>2.1"</u>	<u>2.8"</u>
<u>BELT STRETCH DATA:</u>		
Measured electronically between shoulder belt load cell and the "D" ring.	<u>.31 in/ft</u>	<u>.71 in/ft</u>
Measured mechanically	<u>0.0 in/ft</u>	<u>0.0 in/ft</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	12.6	Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering column hub	13.2	Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	25	Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	-65	Degrees

Figure 5
CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

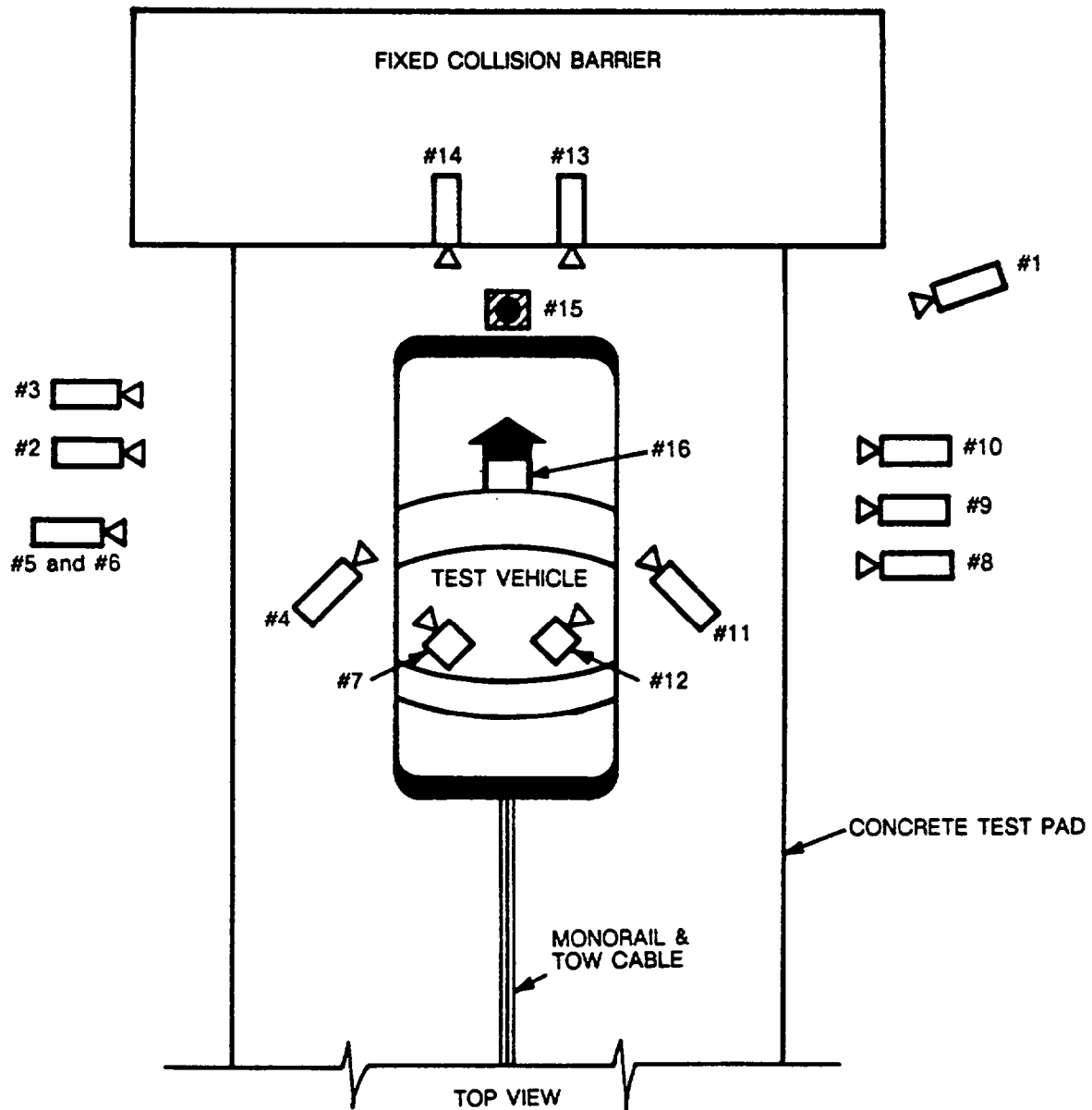


Table 5

HIGH-SPEED CAMERA LOCATIONS

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	217	55	41	-4	201.2	13	540
3	Left Side View	297	32	41	-4	281.2	25	540
4	Driver and Interior View	108	101	74	-18	92.2	13	600
5	Steering Column (Bottom)	264	71	46	-3	248.2	25	560
6	Steering Column (Top)	264	71	70	-9	248.2	25	605
7	Left Belt	-	-	-	-	-	8	***
8	Overall Right Side	225	71	42	-3	209.2	13	785
9	Right Side View	289	52	41	-2	273.2	25	****
10	Right Passenger View	292	76	58	-4	276.2	35	700
11	Passenger and Interior View	97	100	70	-23	81.2	25	1130
12	Right Belt	-	-	-	-	-	8	****
13	Passenger Front View	24	-5	73	-36	-	13	***
14	Driver Front View	24	-5	73	-36	-	13	***
15	Windshield View	0	0	126	-45	-	13	560
16	Pit View of Engine	0	32	-120	90	-	13	875

*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 plane to ground

** = referenced to horizontal plane

Technical drawings of a vehicle for a crash test, showing dimensions in inches.

Top View:

- Overall width: 87.3
- Distance from centerline (C/L) to the front of the vehicle: 21.7
- Distance from centerline (C/L) to the rear of the vehicle: 21.7
- Distance from the front of the vehicle to the centerline: 12.8

Side View:

- Overall length: 87.3
- Distance from the front of the vehicle to the center of the rear wheel: 54.9
- Distance from the front of the vehicle to the center of the front wheel: 36.0
- Distance from the front of the vehicle to the center of the rear wheel: 9.0
- Distance from the front of the vehicle to the center of the front wheel: 56.3
- Distance from the front of the vehicle to the center of the rear wheel: 31.4
- Distance from the front of the vehicle to the center of the rear wheel: 31.4
- Distance from the front of the vehicle to the center of the rear wheel: 4.2
- Distance from the front of the vehicle to the center of the rear wheel: 35.6
- Distance from the front of the vehicle to the center of the rear wheel: 48.9
- Reference point (REF.) is located at the front of the vehicle.

Rear View:

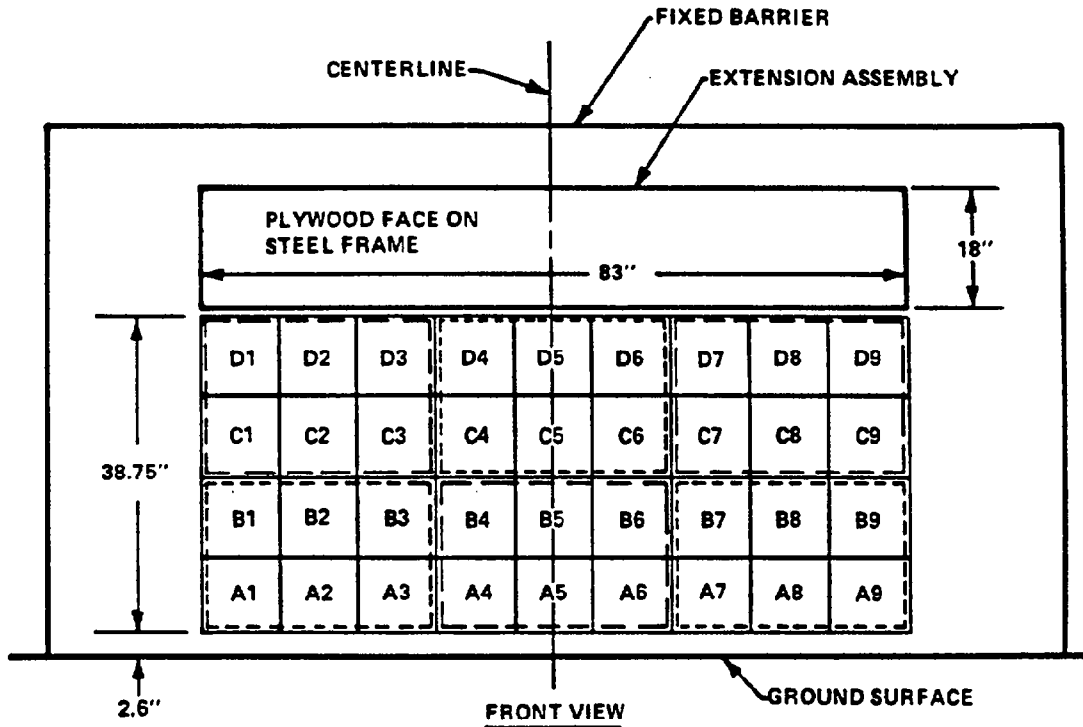
- Overall width: 87.3
- Distance from the centerline (C/L) to the front of the vehicle: 21.7
- Distance from the centerline (C/L) to the rear of the vehicle: 21.7
- Distance from the front of the vehicle to the centerline: 12.8

7862-2

Figure 7

LOAD CELL LOCATIONS ON FIXED BARRIER

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



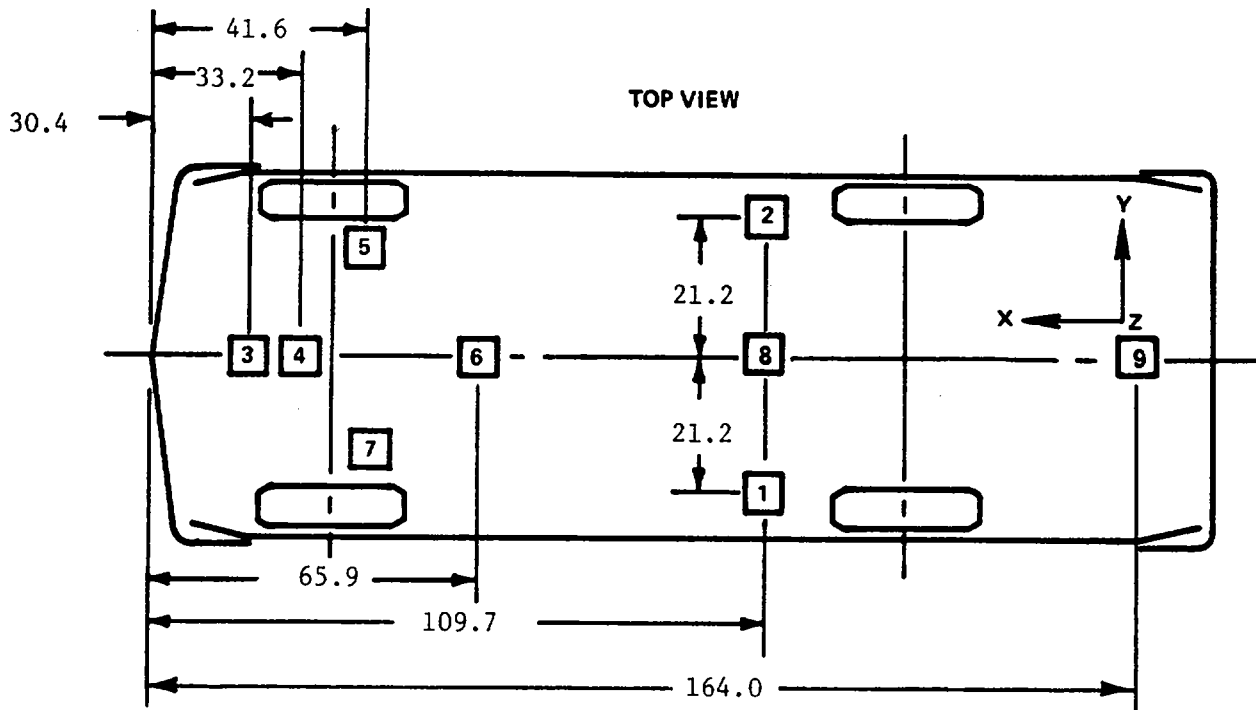
6 GROUPS OF 6 LOAD CELLS EACH

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

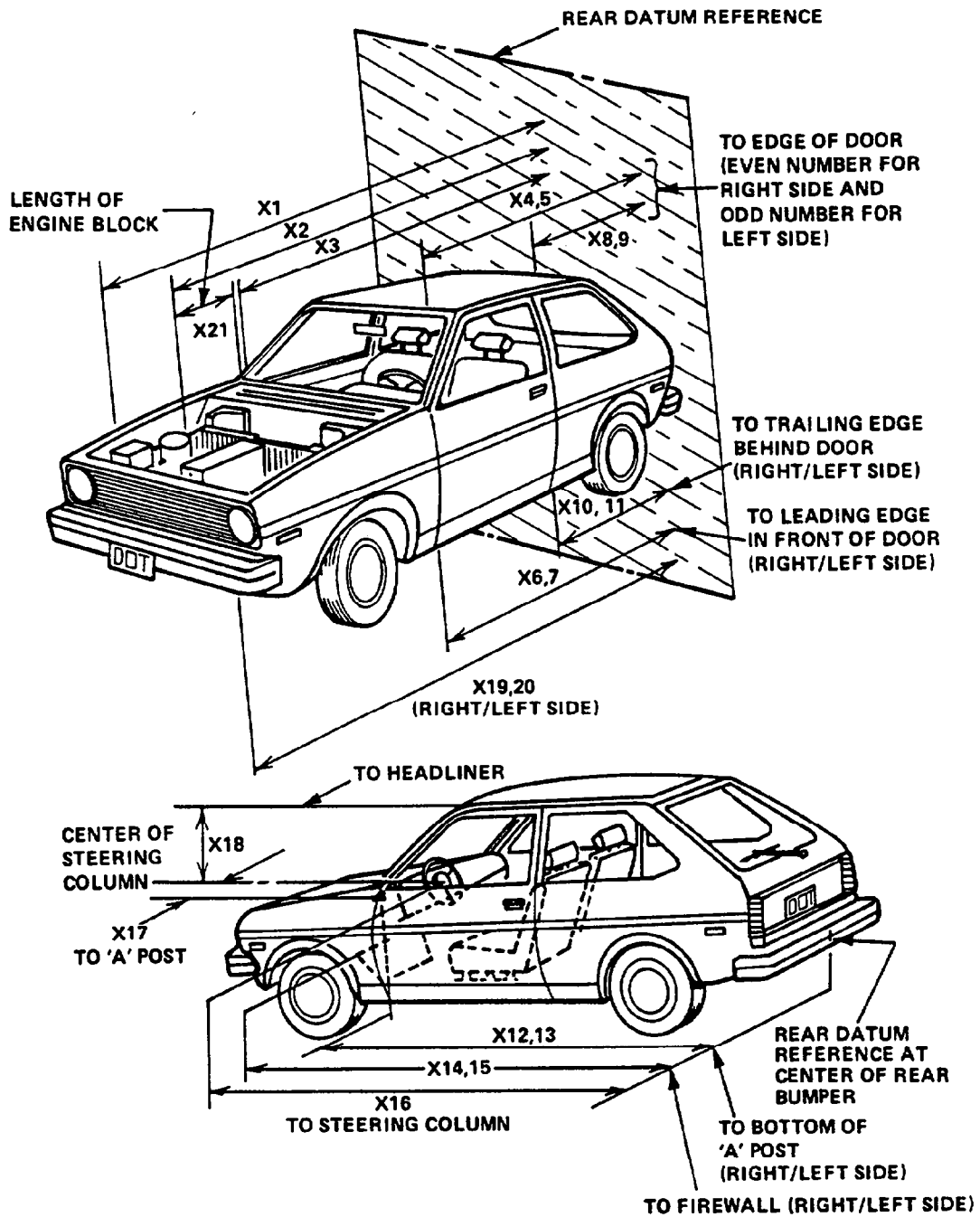


Table 6
VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	172.2	144.0	28.2
X2	Rear Surface of Vehicle to Front of Engine	148.5	137.1	11.4
X3	Rear Surface of Vehicle to Firewall	126.5	116.6	9.9
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	112.7	111.7	1.0
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	112.9	111.4	1.5
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	112.9	111.2	1.7
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	112.6	110.7	1.9
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	72.1	71.1	1.0
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	71.4	70.5	0.9
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	74.6	73.1	1.5
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	74.4	72.5	1.9
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	112.9	110.8	2.1
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	112.2	110.7	1.5
X14	Rear Surface of Vehicle to Firewall, Right Side	126.2	111.1	15.1
X15	Rear Surface of Vehicle to Firewall, Left Side	126.4	112.8	13.6
X16	Rear Surface of Vehicle to Steering Column	94.6	89.3	5.3
X17	Center of Steering Column to "A" Post	15.1	16.2	-1.1
X18	Center of Steering Column to Headliner	16.5	15.3	1.2
X19	Rear Surface of Vehicle to Right Side of Front Bumper	168.1	142.4	25.7
X20	Rear Surface of Vehicle to Left Side of Front Bumper	168.0	145.1	22.9
X21	Length of Engine Block	20.5	20.5	0.0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	103.9	103.5	0.4
CD	Rear Surface of Vehicle to Center of Dash Panel	105.8	103.1	2.7
LD	Rear Surface of Vehicle to Left Side of Dash Panel	104.6	103.1	1.5

Appendix A

PHOTOGRAPHS

PHOTOGRAPHS

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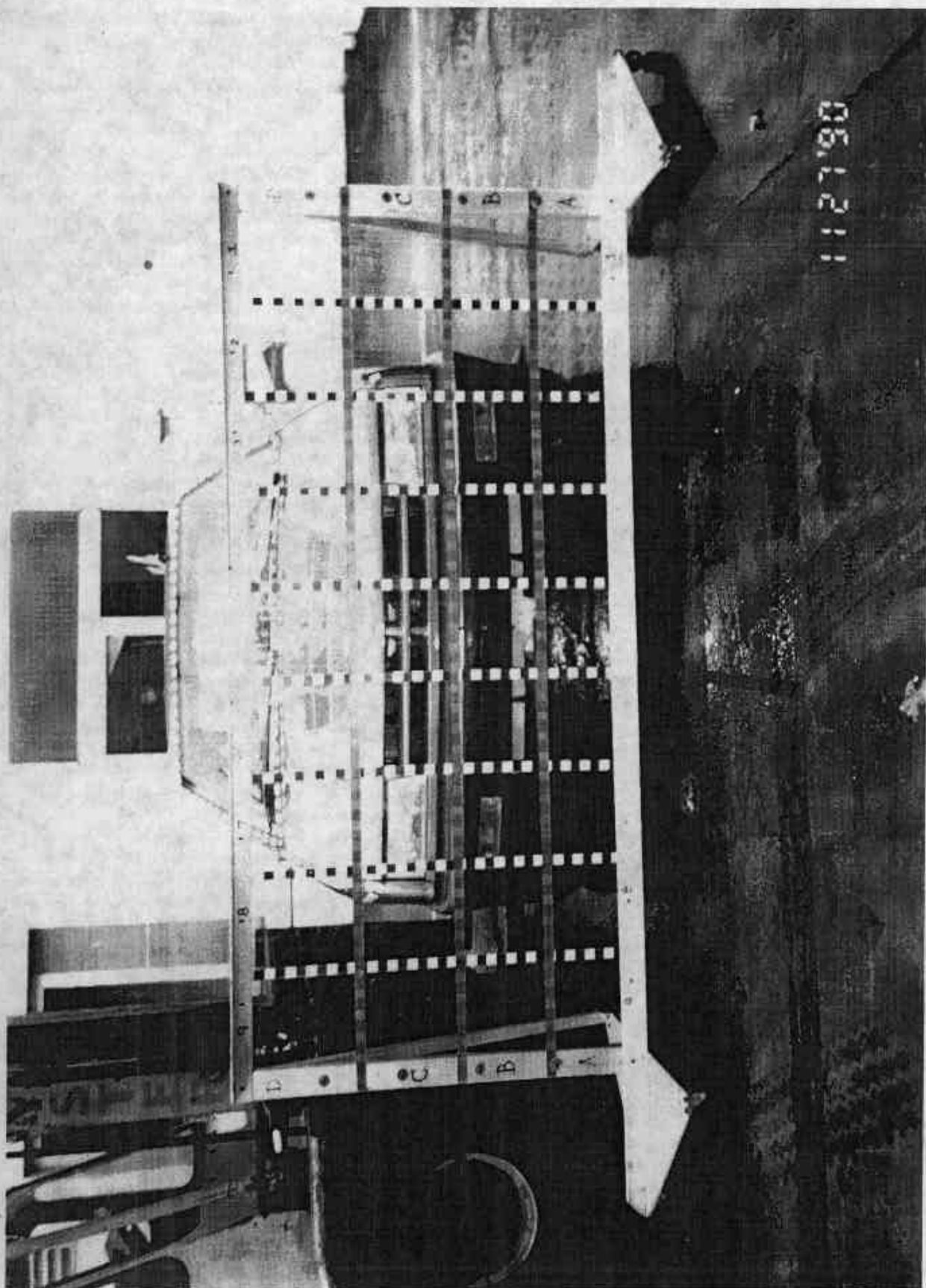
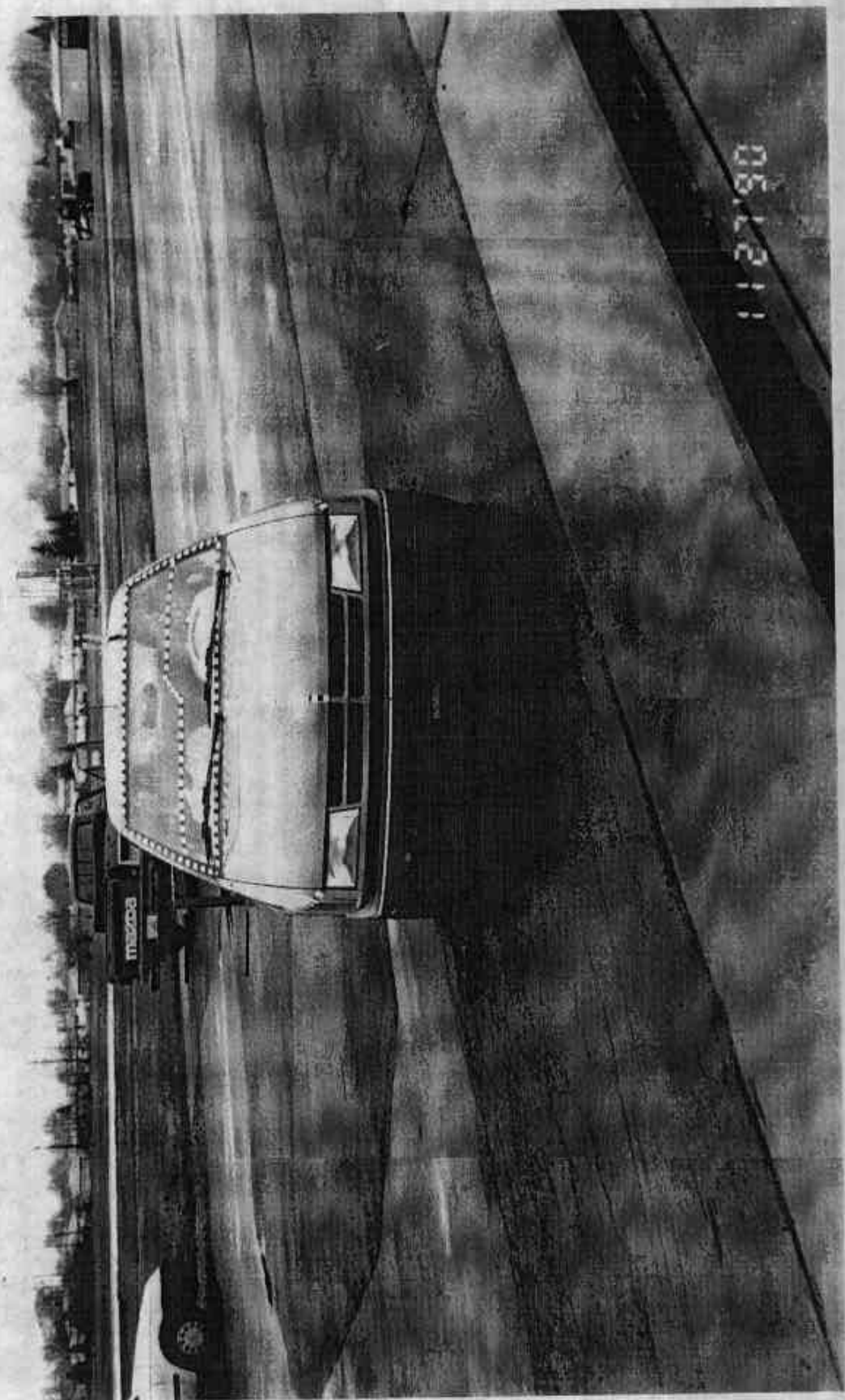


Figure A-1 LOAD CELL LOCATIONS



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112790

Figure A-2 PRE-TEST FRONT VIEW

A-4

7862-2

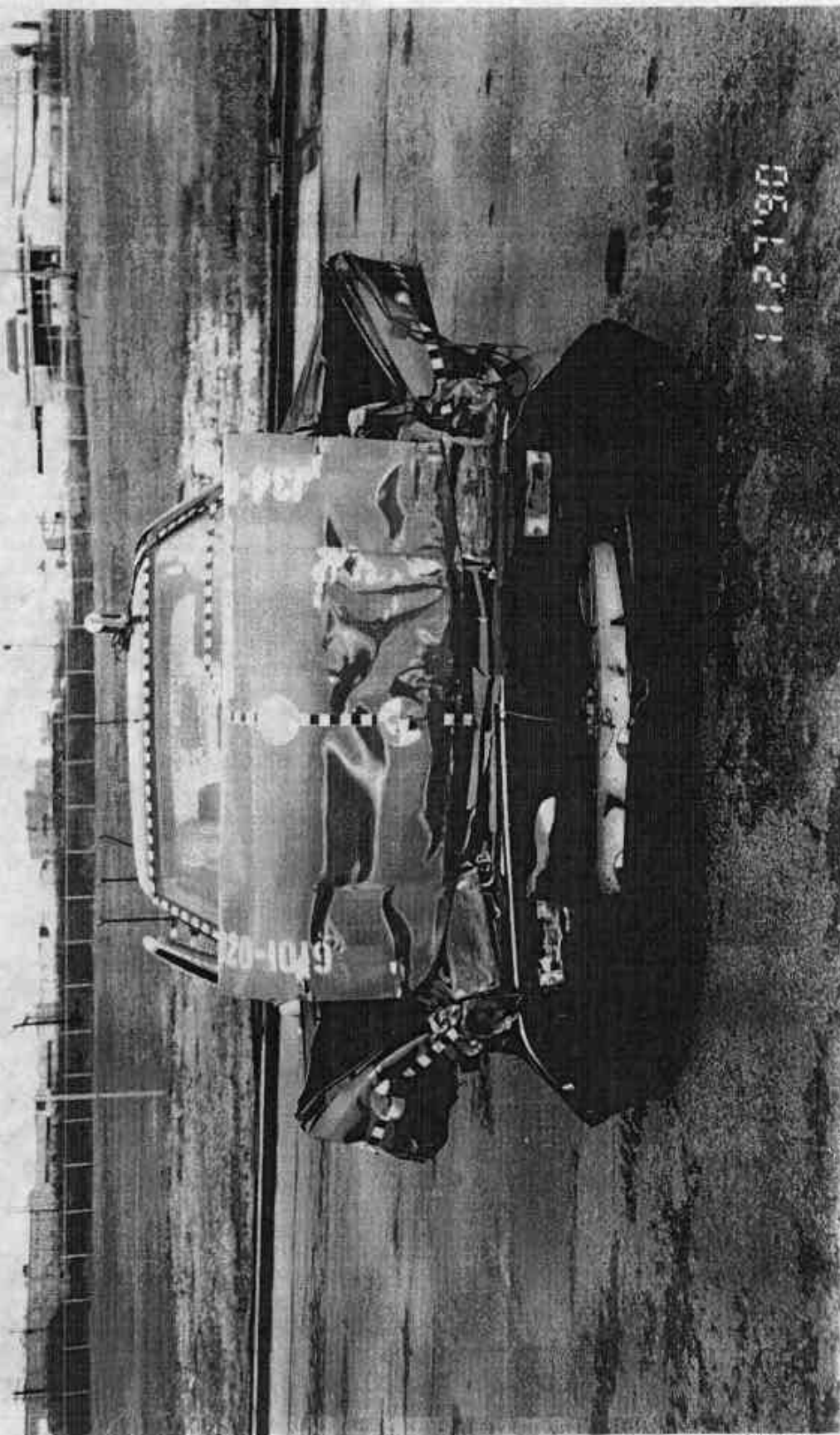


Figure A-3 POST TEST FRONT VIEW

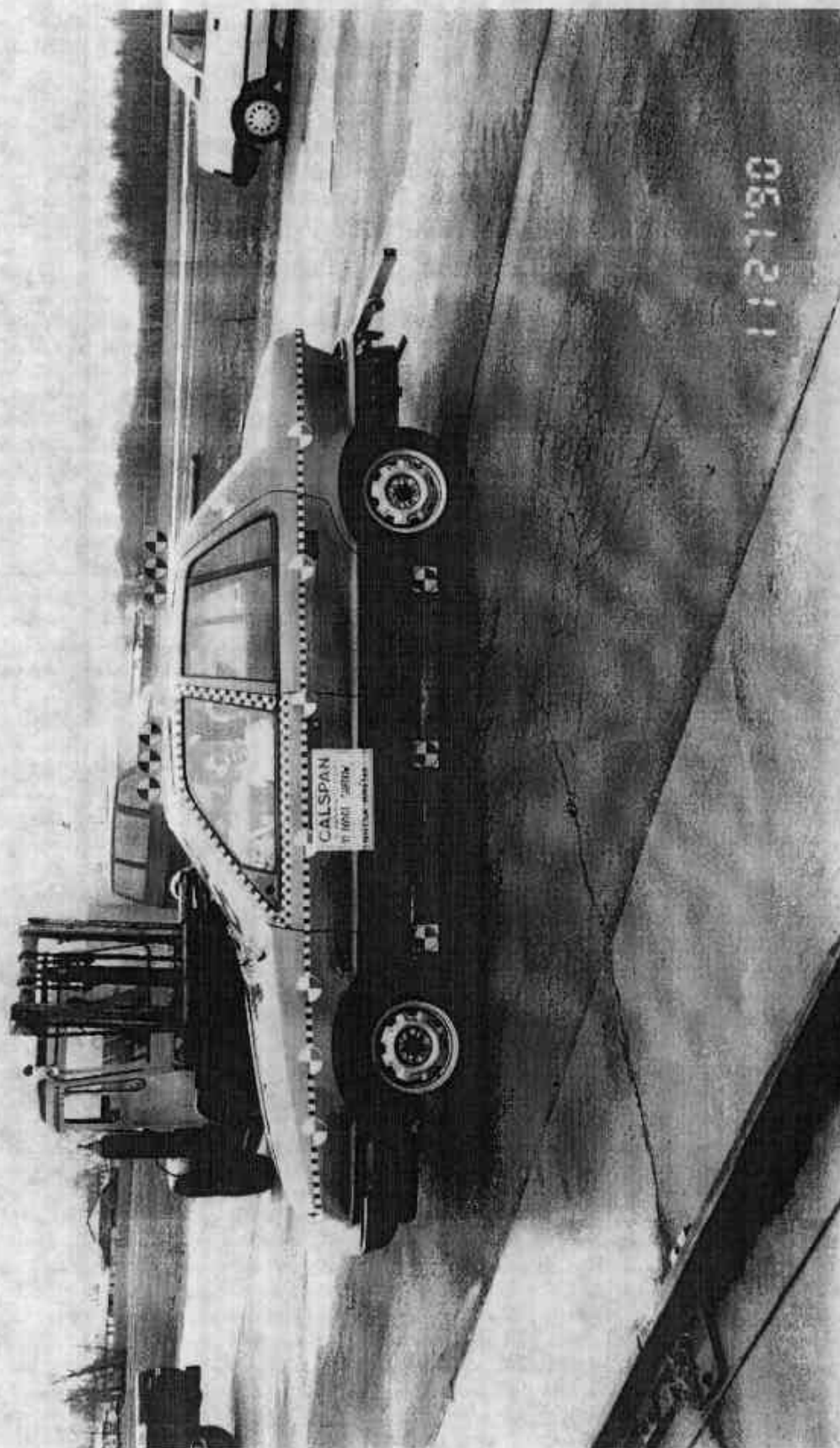


Figure A-4 PRE-TEST LEFT SIDE VIEW

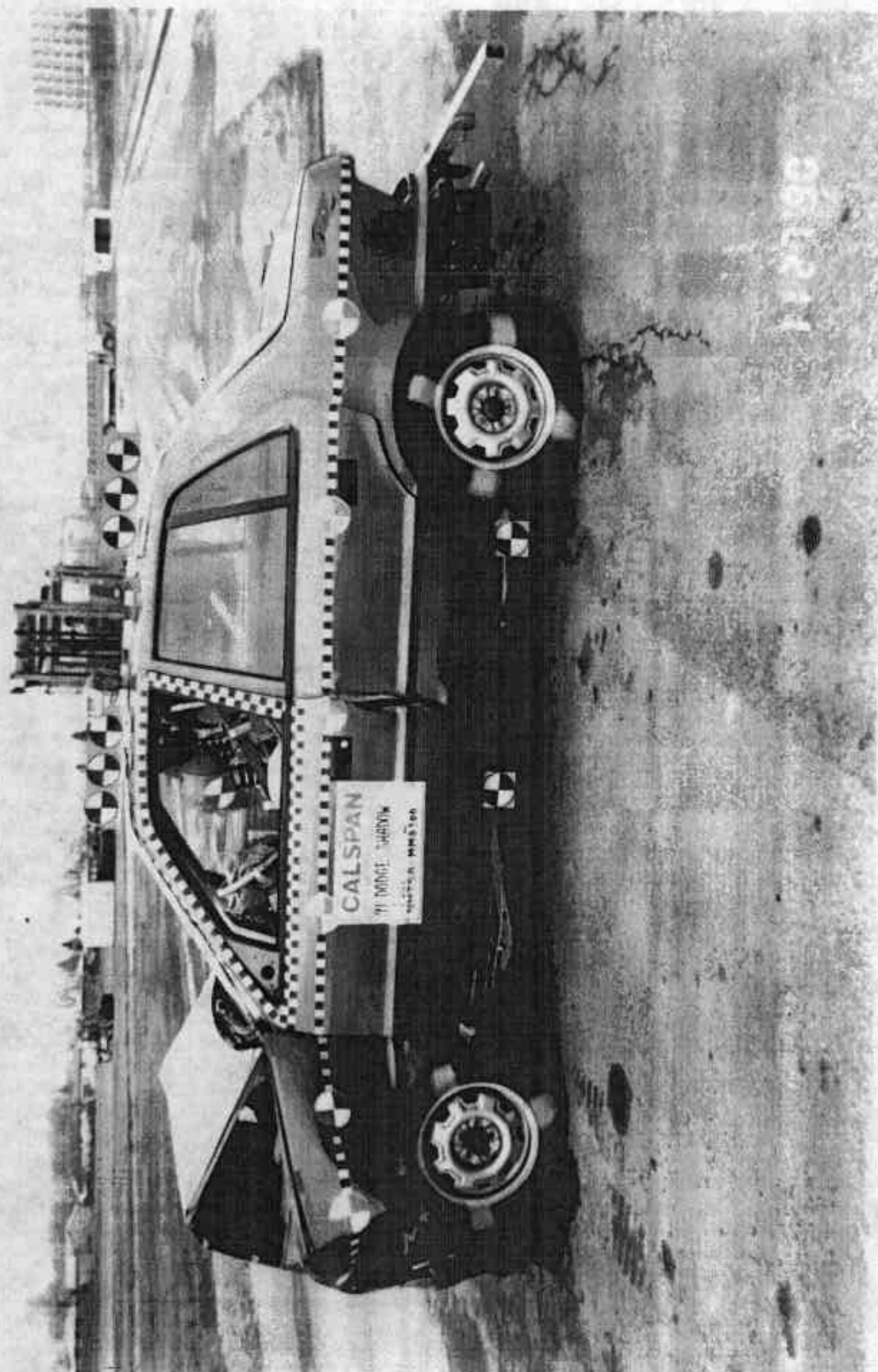
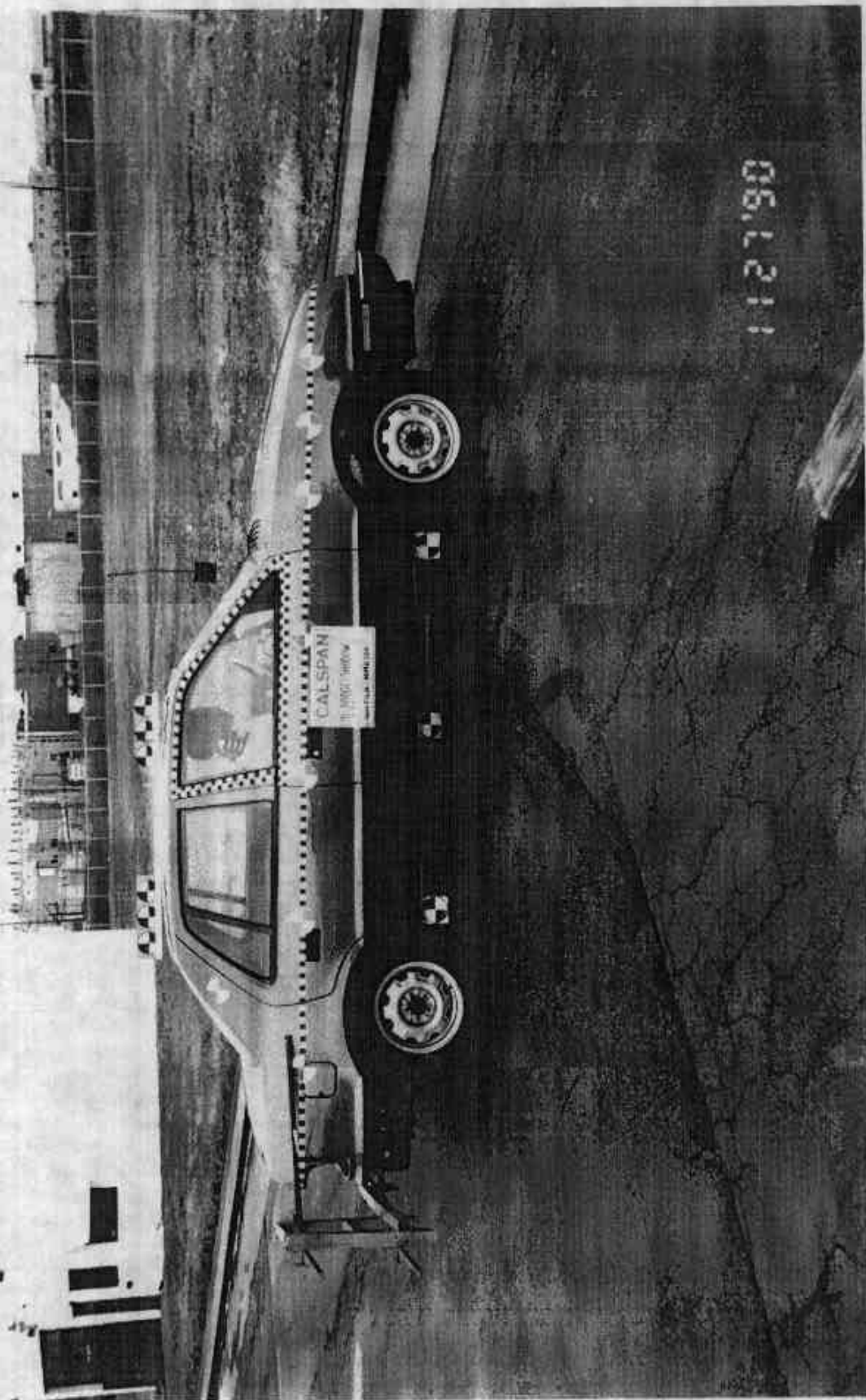


Figure A-5 POST TEST LEFT SIDE VIEW



06.12.11

Figure A-6 PRE-TEST RIGHT SIDE VIEW

A-8

7862-2

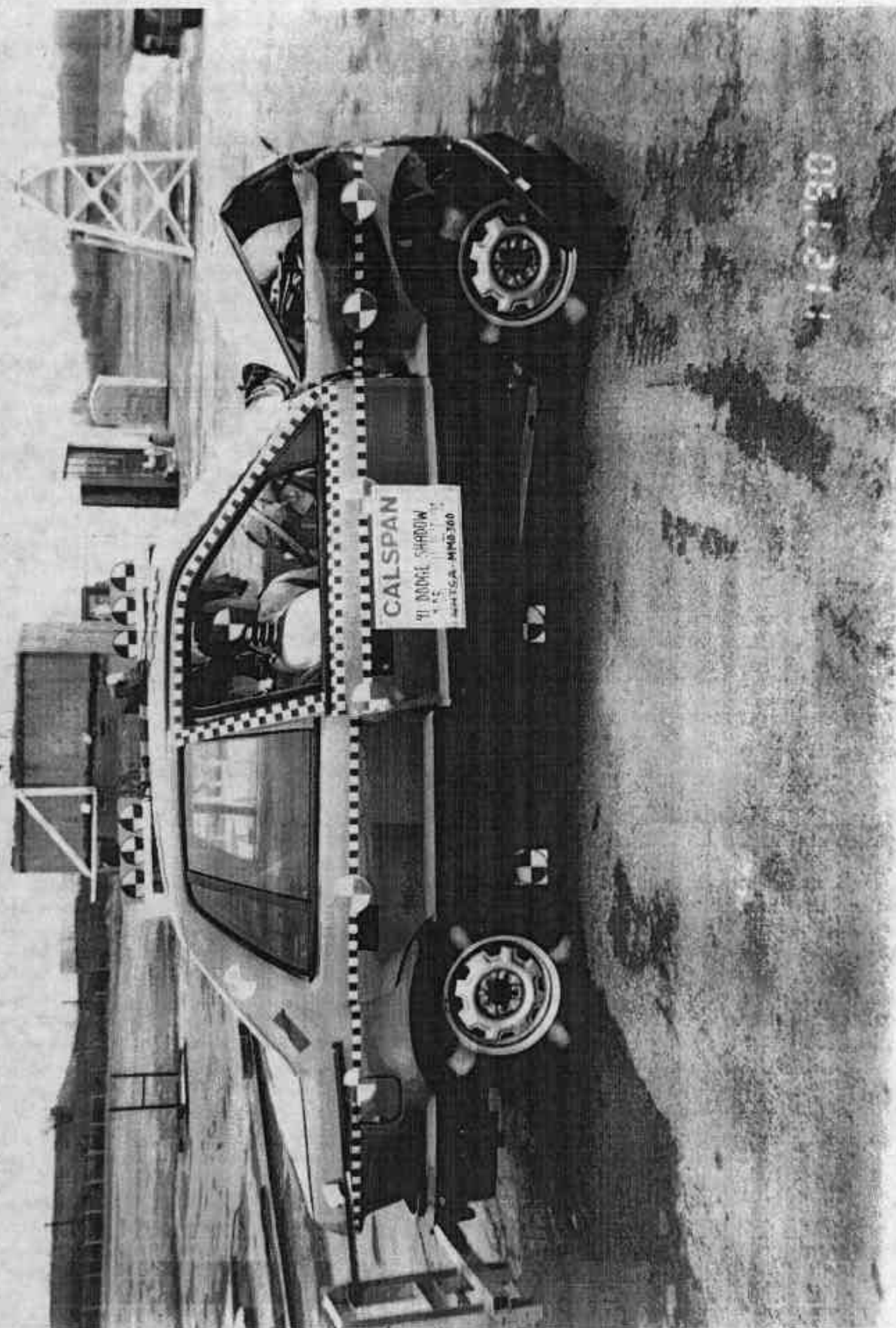


Figure A-7 POST-TEST RIGHT SIDE VIEW

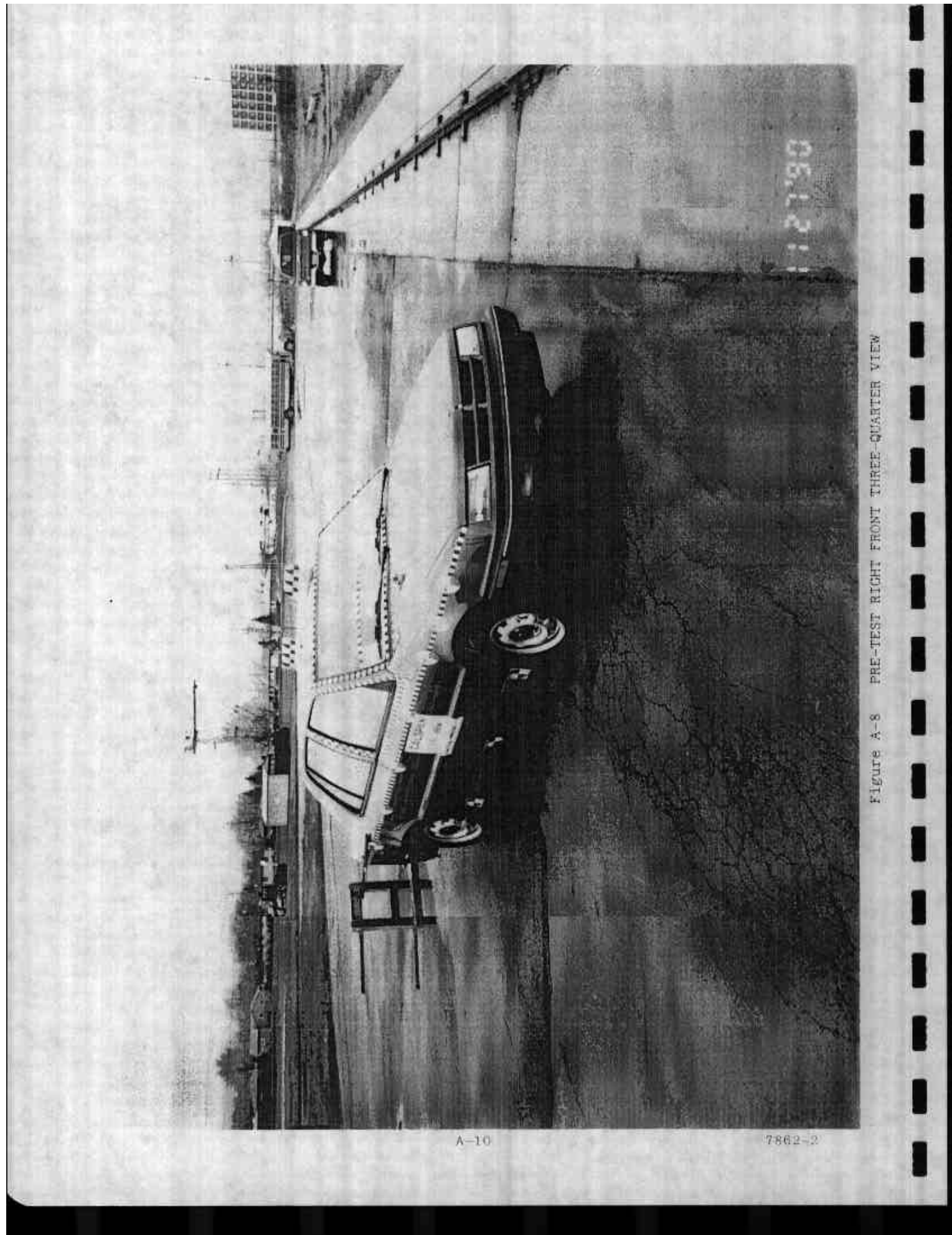


Figure A-8 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

A-10

7862-2

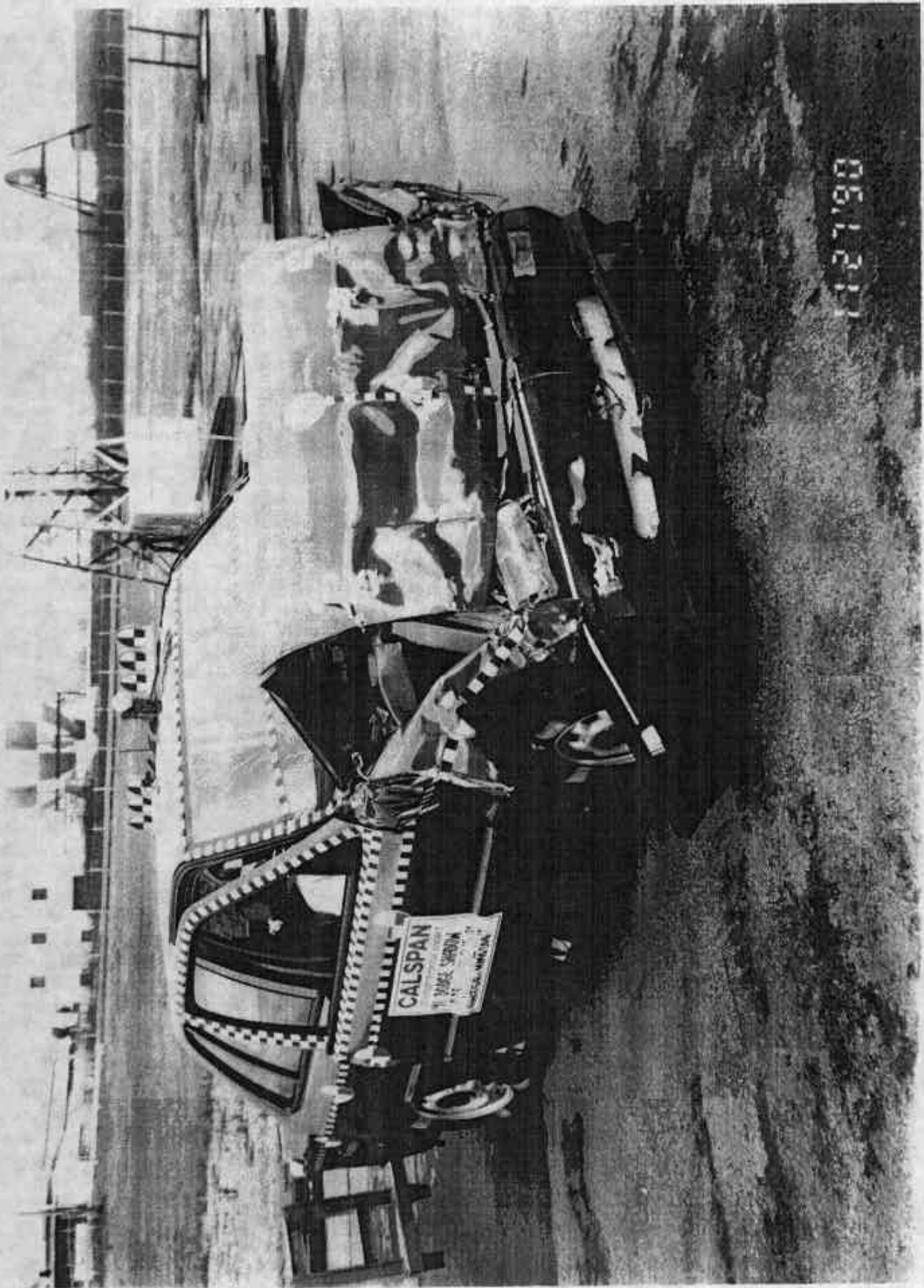


Figure A-9 POST-TEST RIGHT FRONT THREE-QUARTER VIEW



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

A-12

7862-2



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

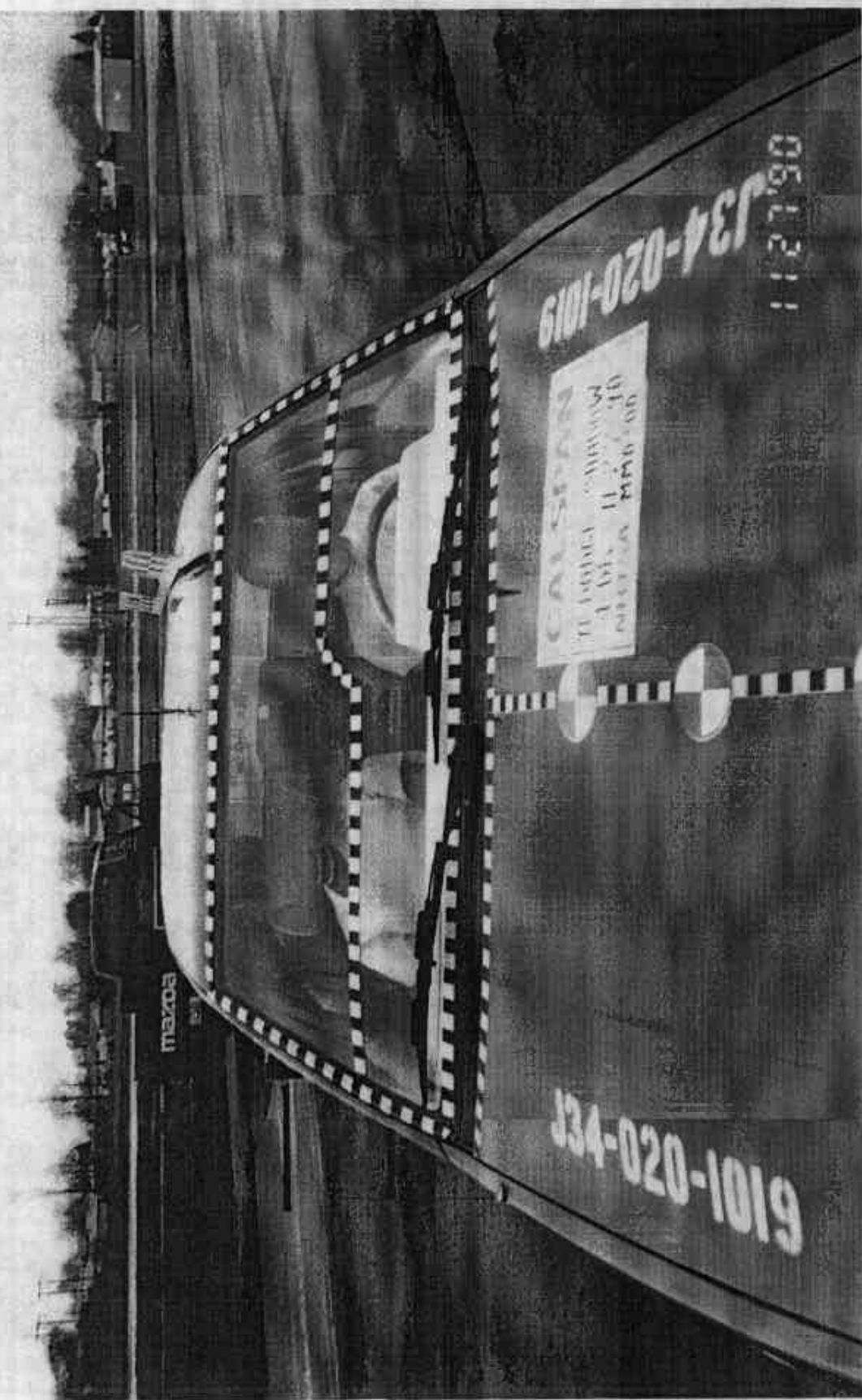


Figure A-12 PRE-TEST WINDSHIELD VIEW

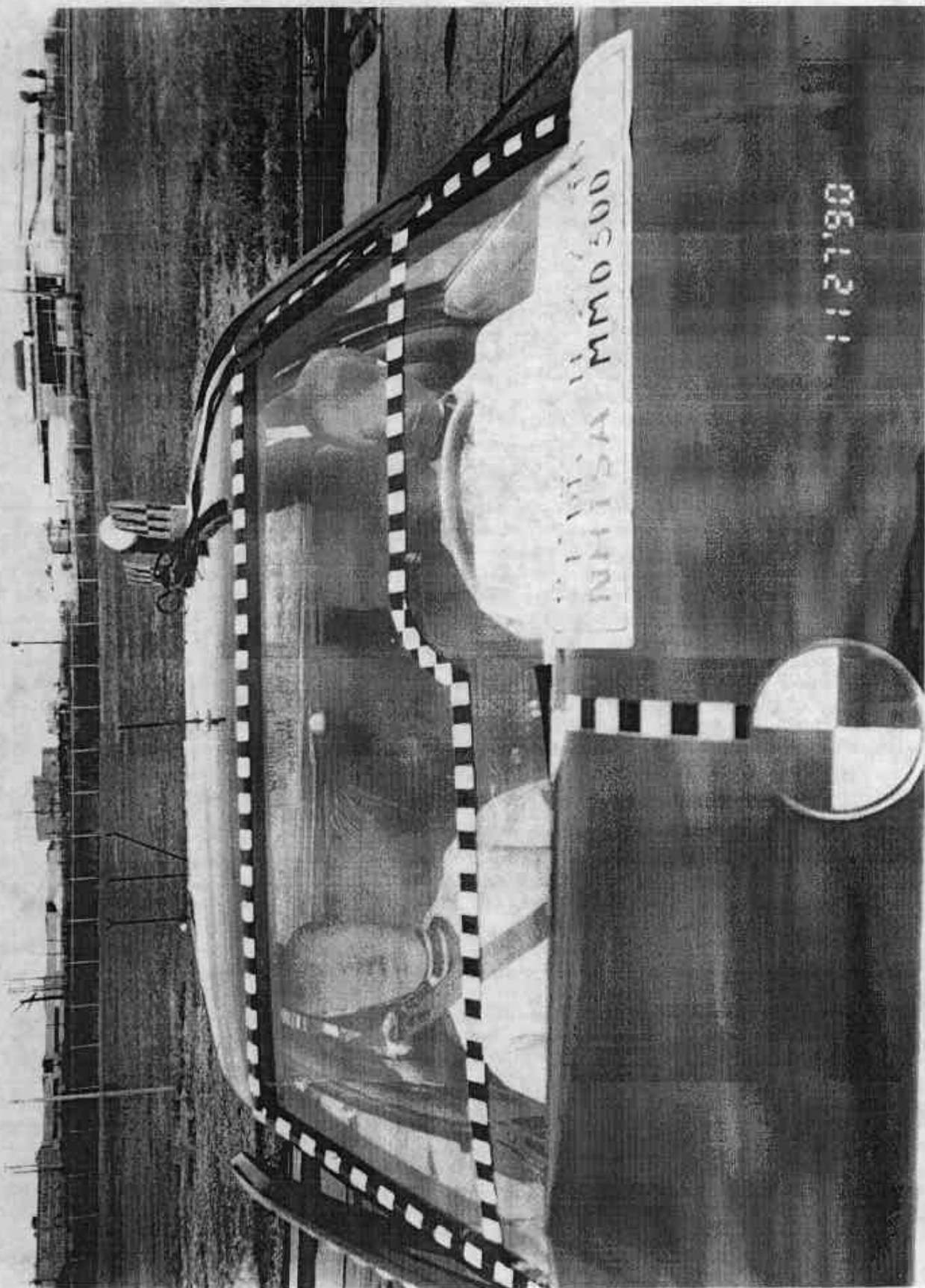


Figure A-13 POST-TEST WINDSHIELD VIEW

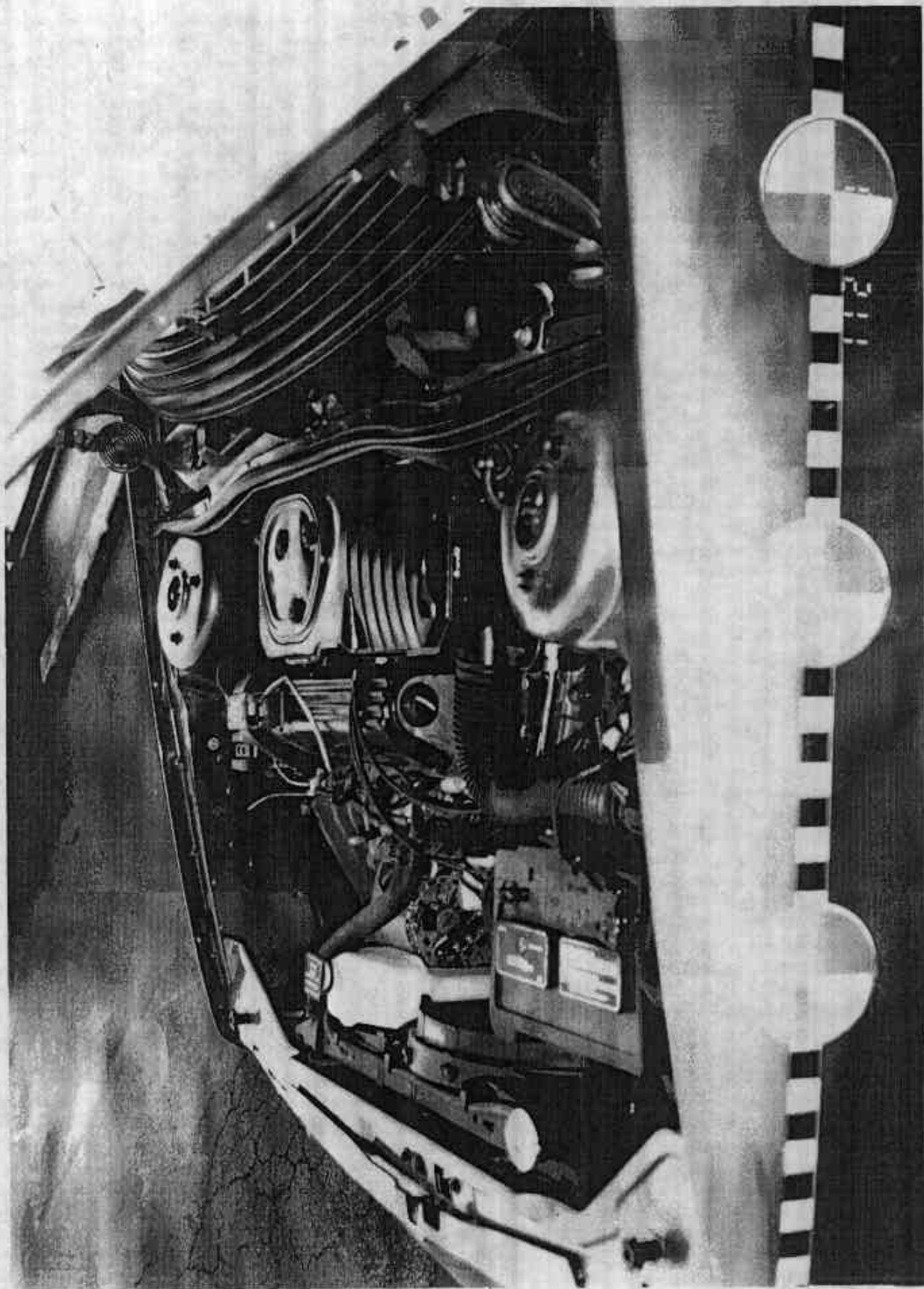


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

A-16

7862-2

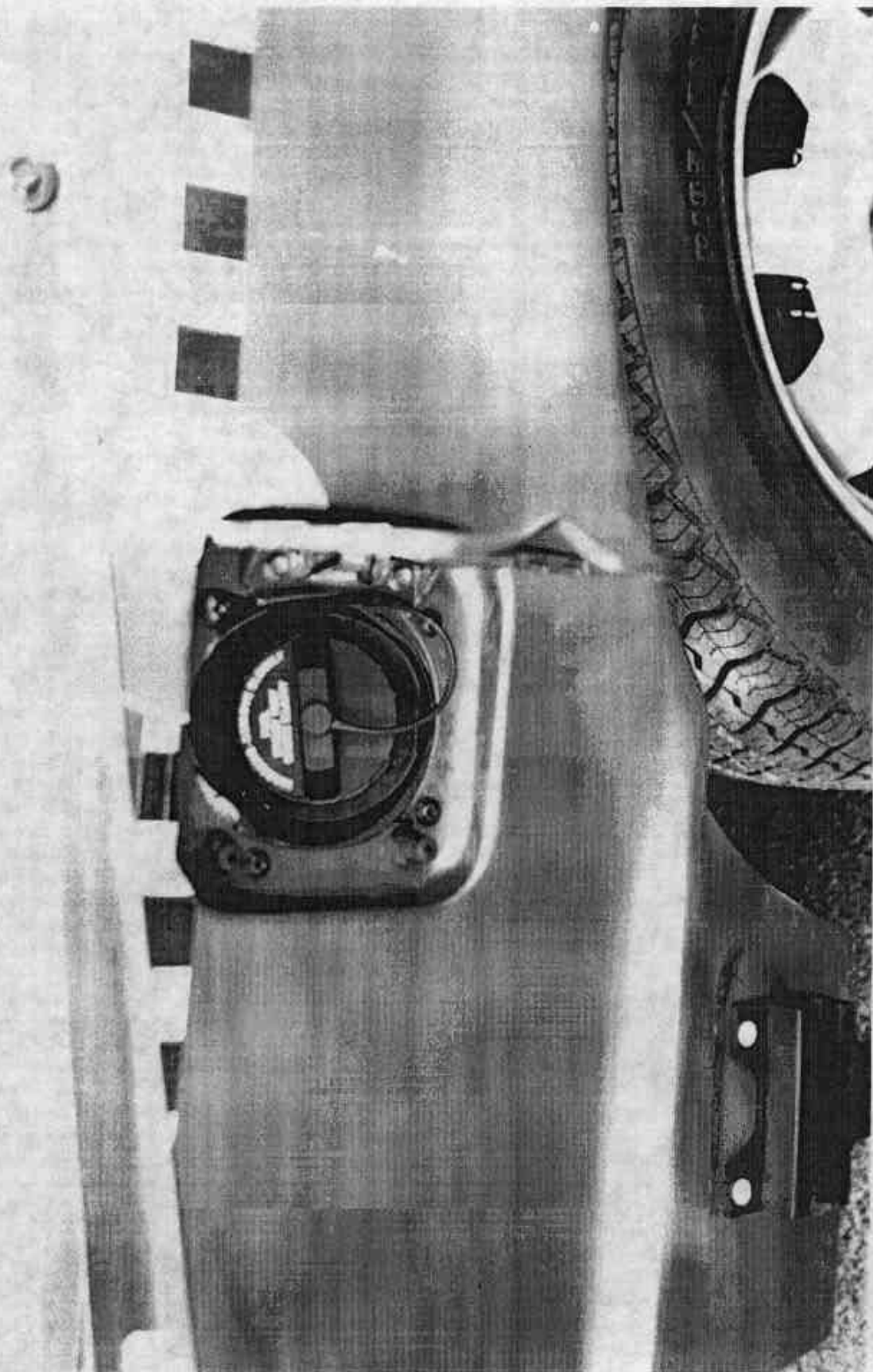


Figure A-15 FUEL CAP VIEW

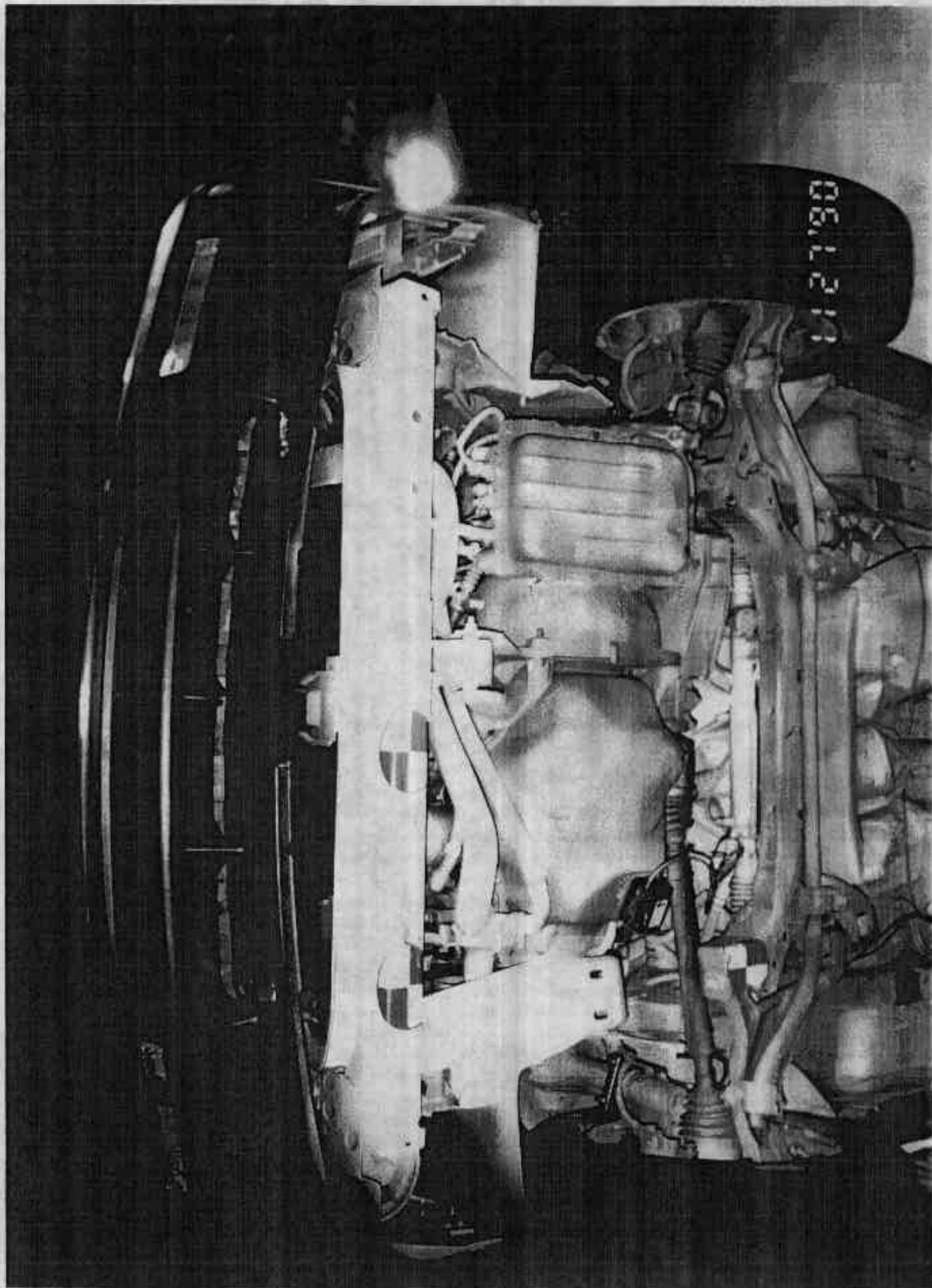


Figure A-16 PRE TEST FRONT UNDERBODY VIEW

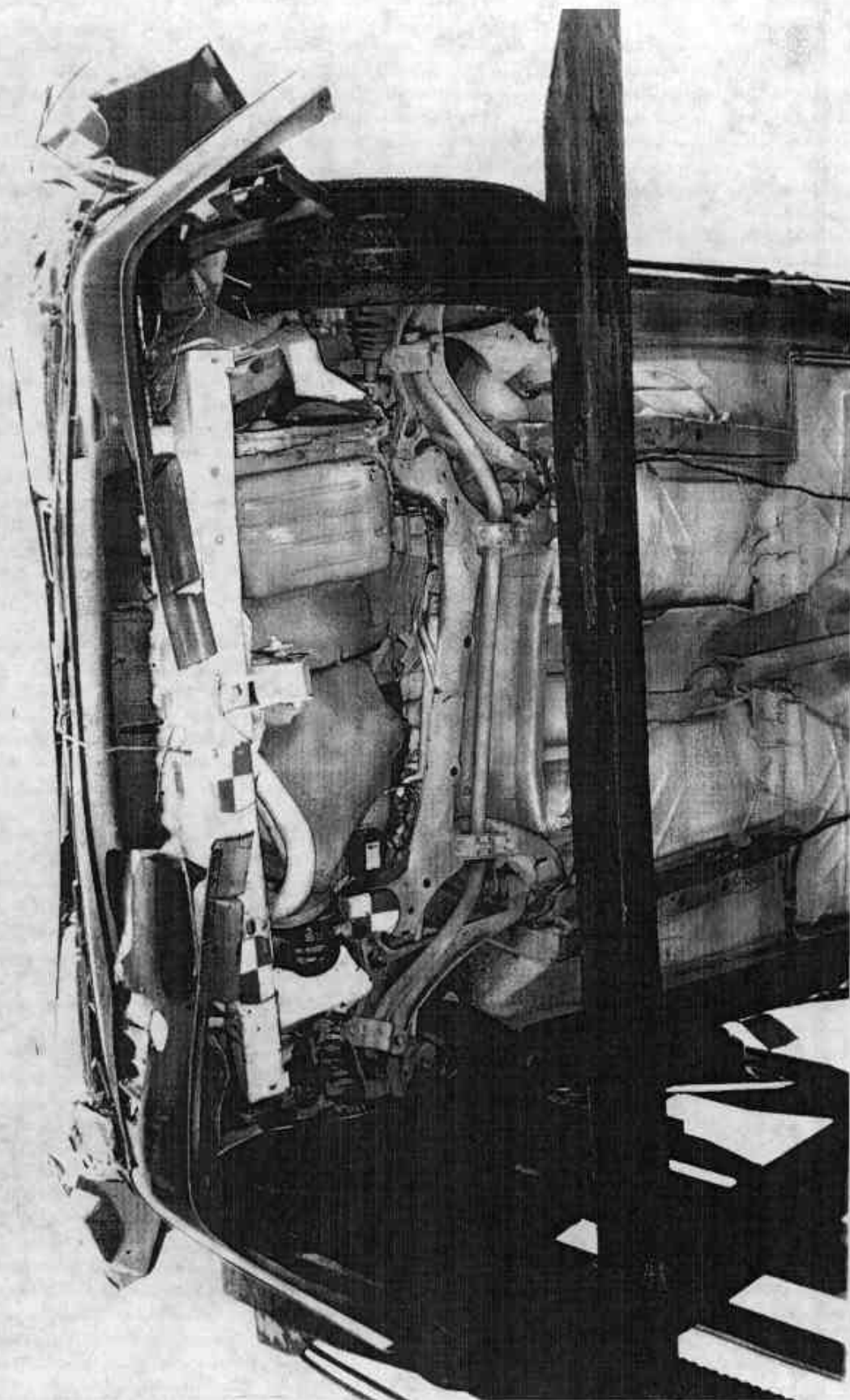
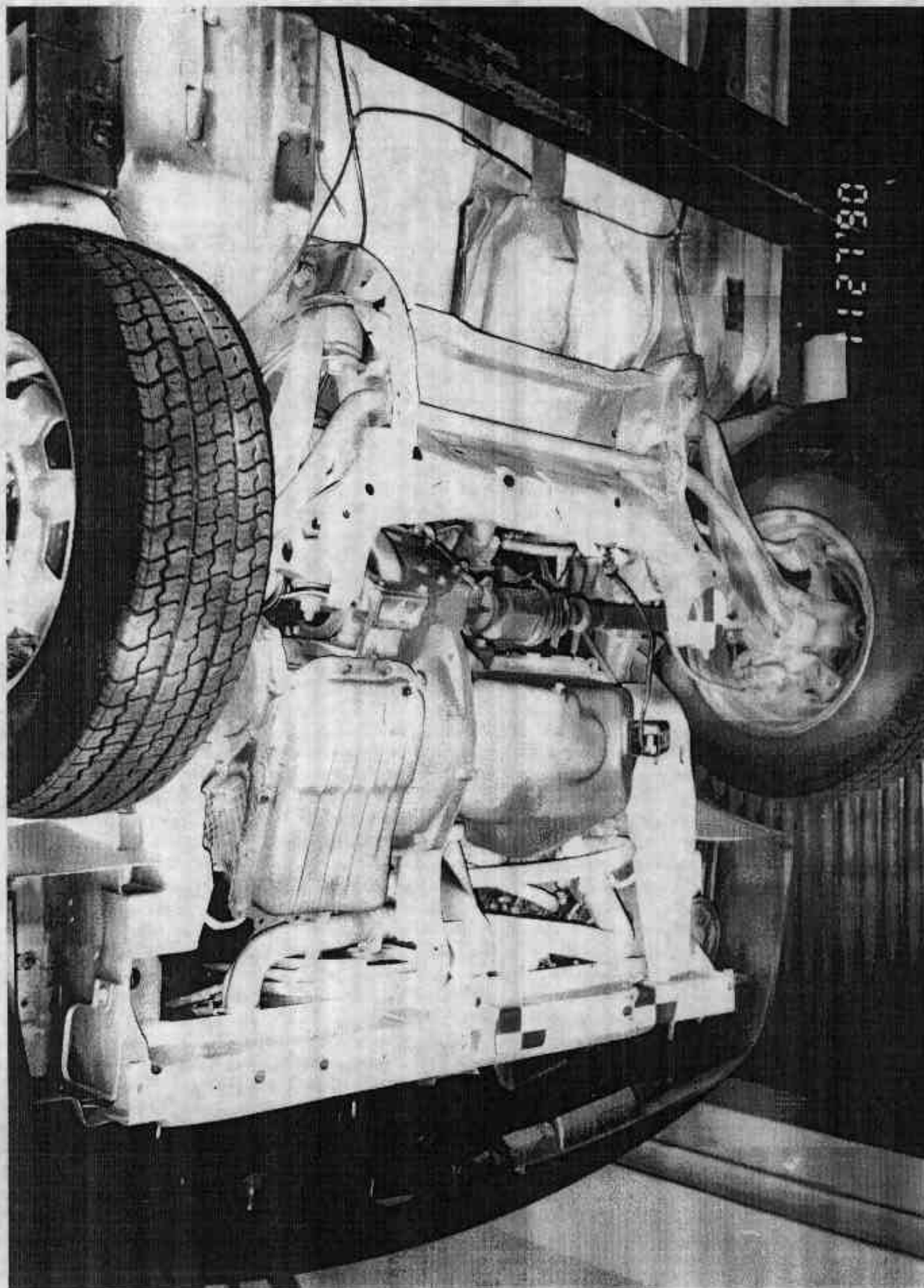


Figure A-17 POST-TEST FRONT UNDERBODY VIEW

A-19

7862-2



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Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW

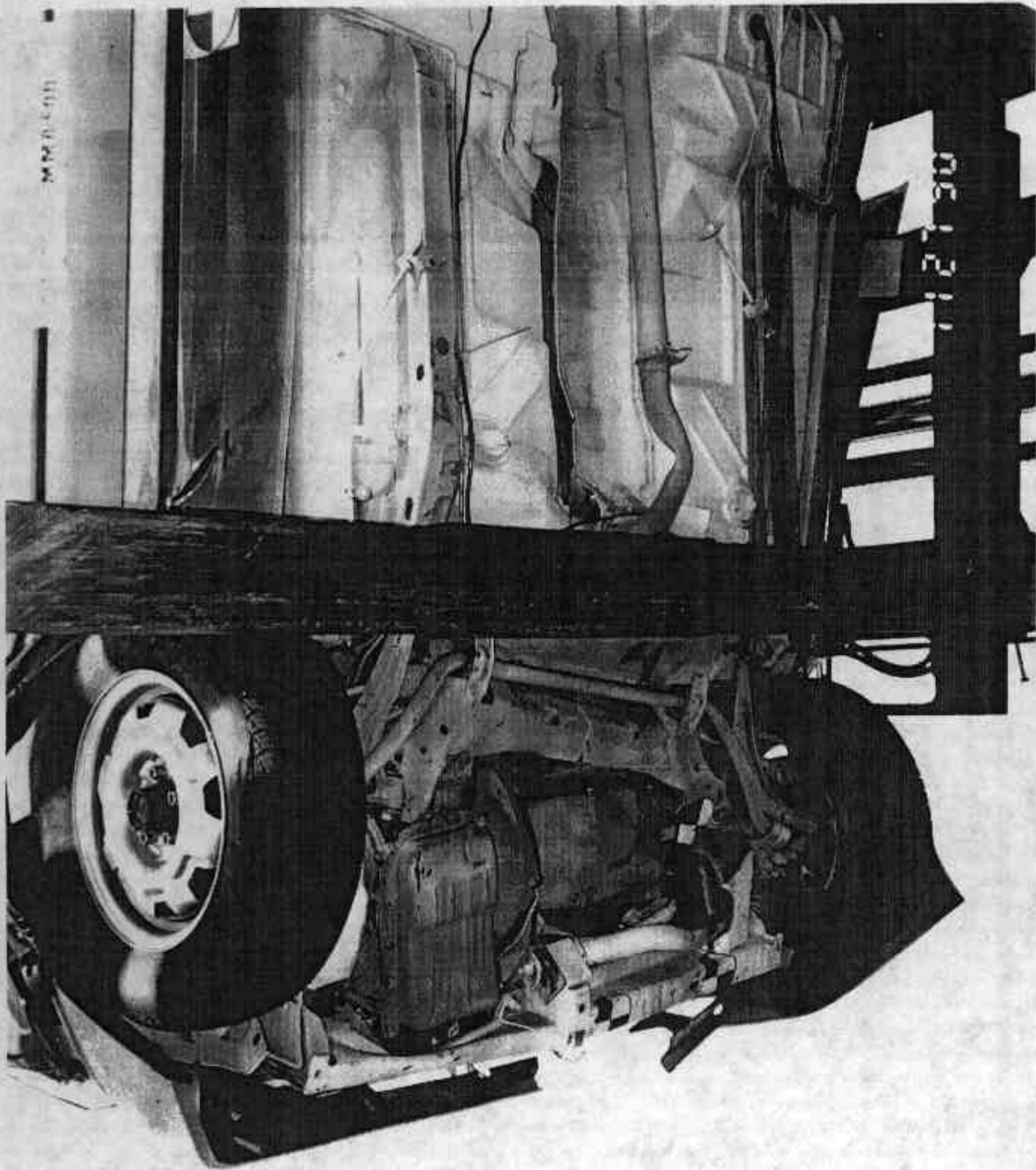
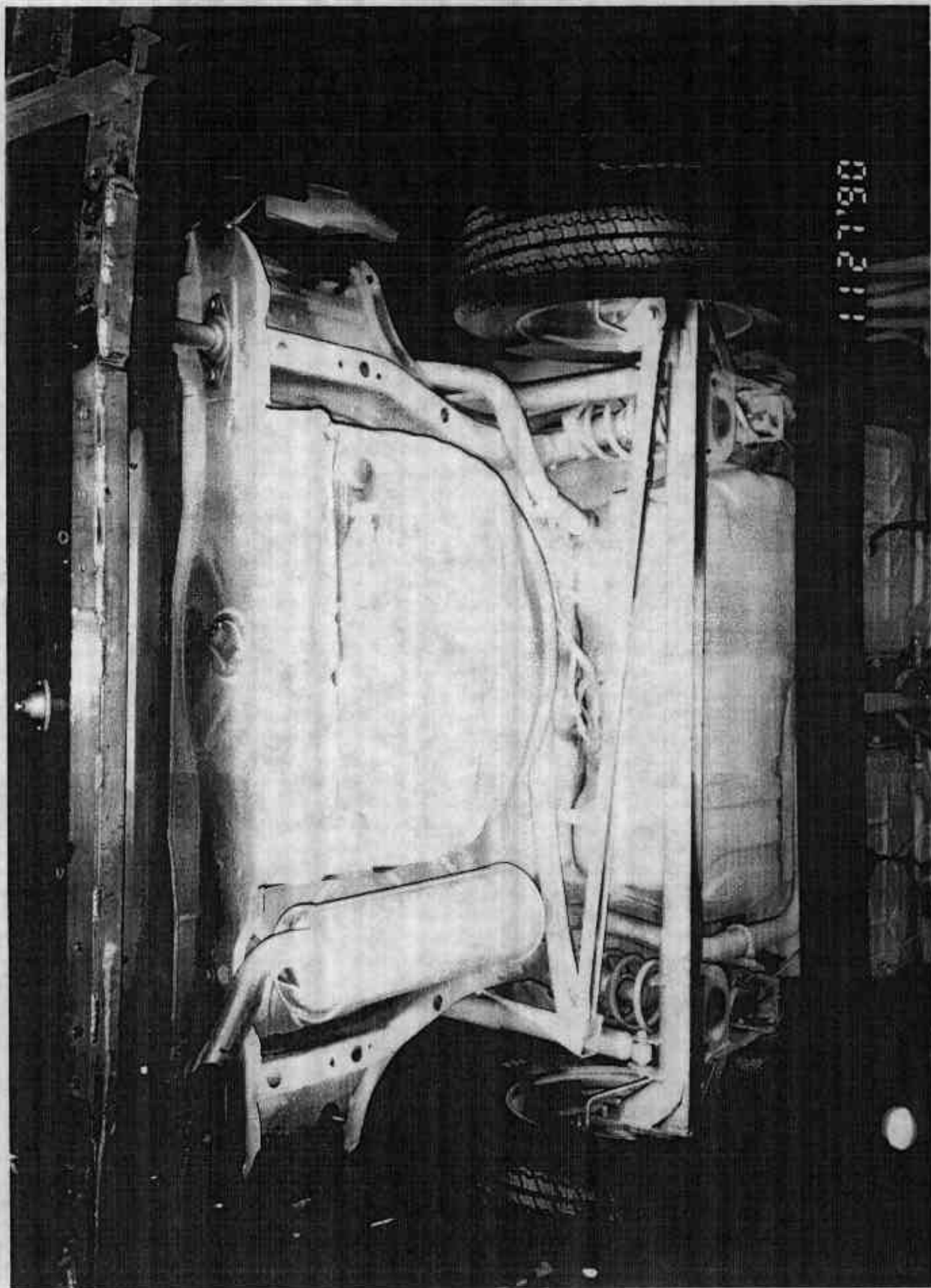


Figure A-19 POST-TEST FRONT SIDE UNDERBODY VIEW



112790

FIGURE A-20 PRE-TEST REAR UNDERBODY VIEW

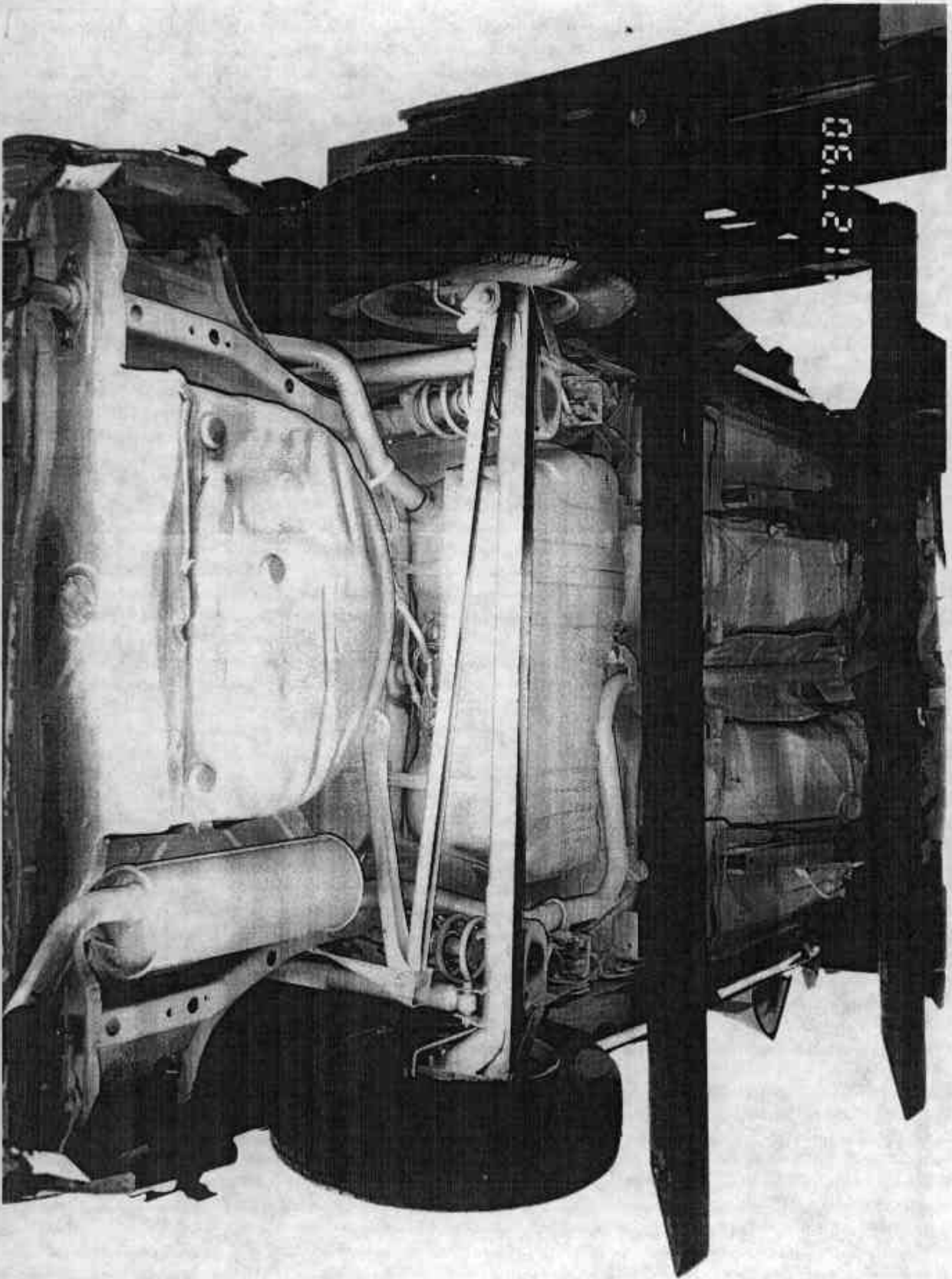


Figure A-21. POST-TEST REAR UNDERBODY VIEW

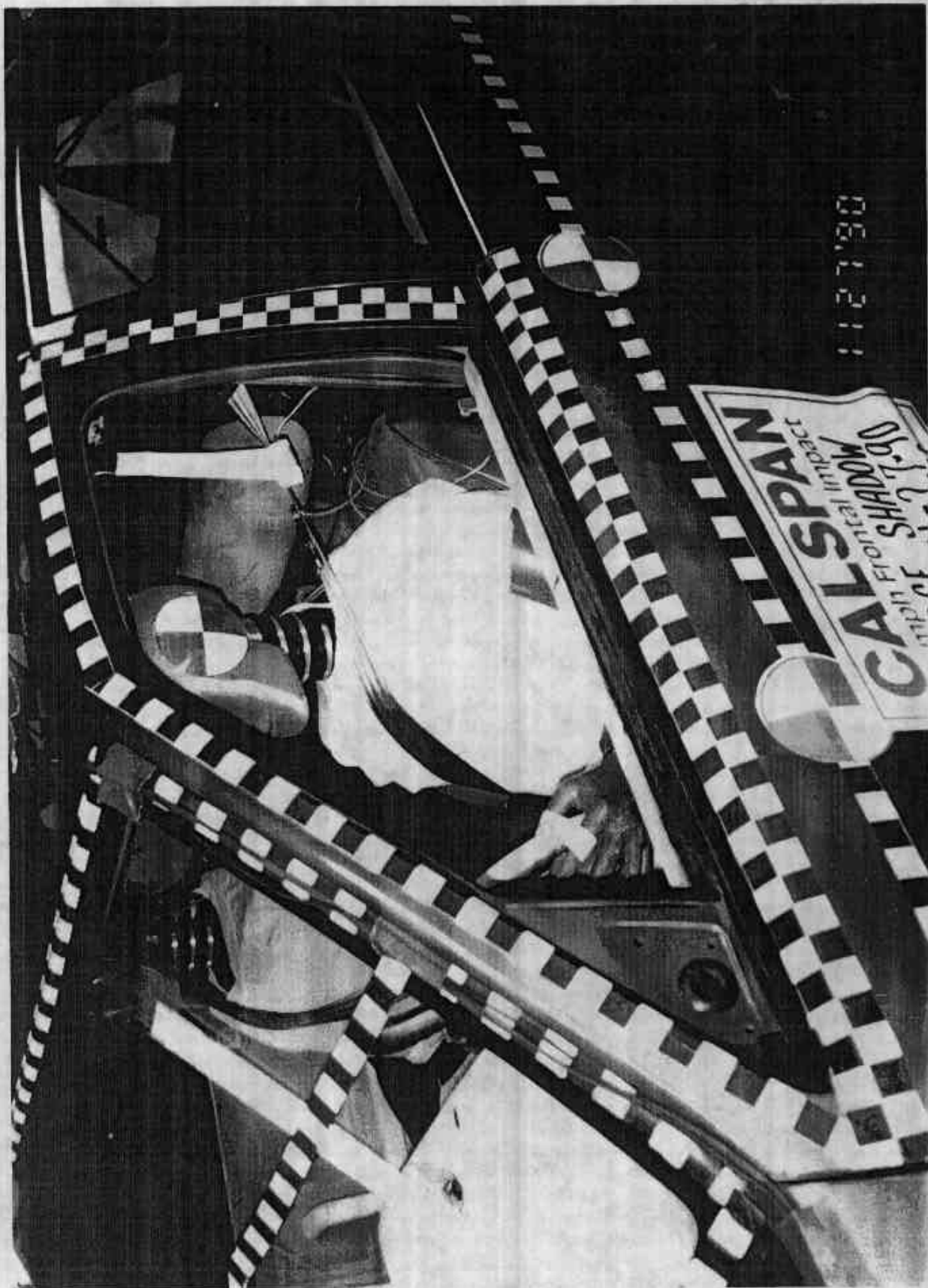


Figure A-22 PRE-TEST DRIVER POSITION VIEW



Figure A-23 POST-TEST DRIVER POSITION VIEW



Figure A-24 PRE-TEST PASSENGER POSITION VIEW

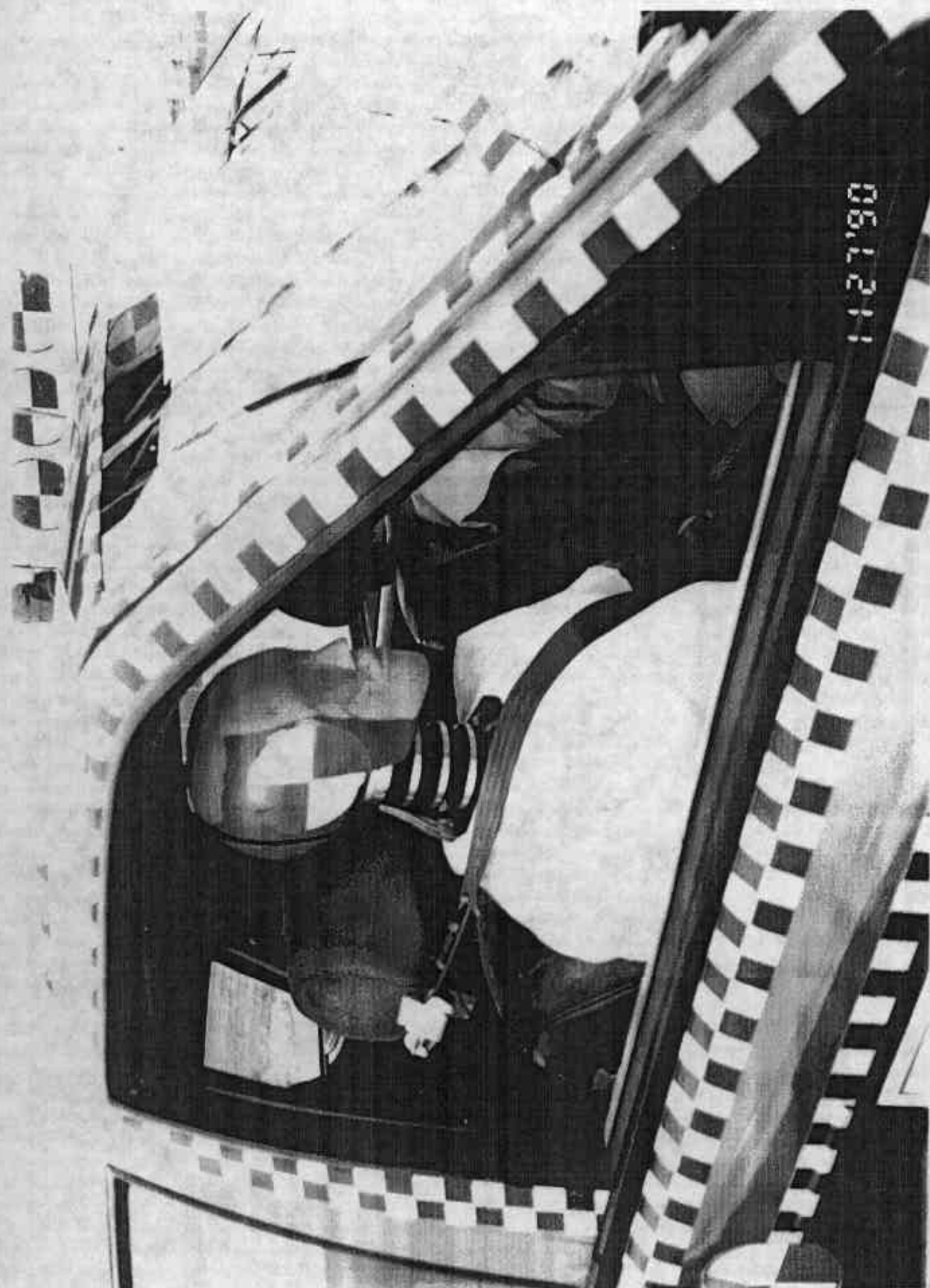


Figure A-25 POST-TEST PASSENGER POSITION VIEW

A-27

7862-2

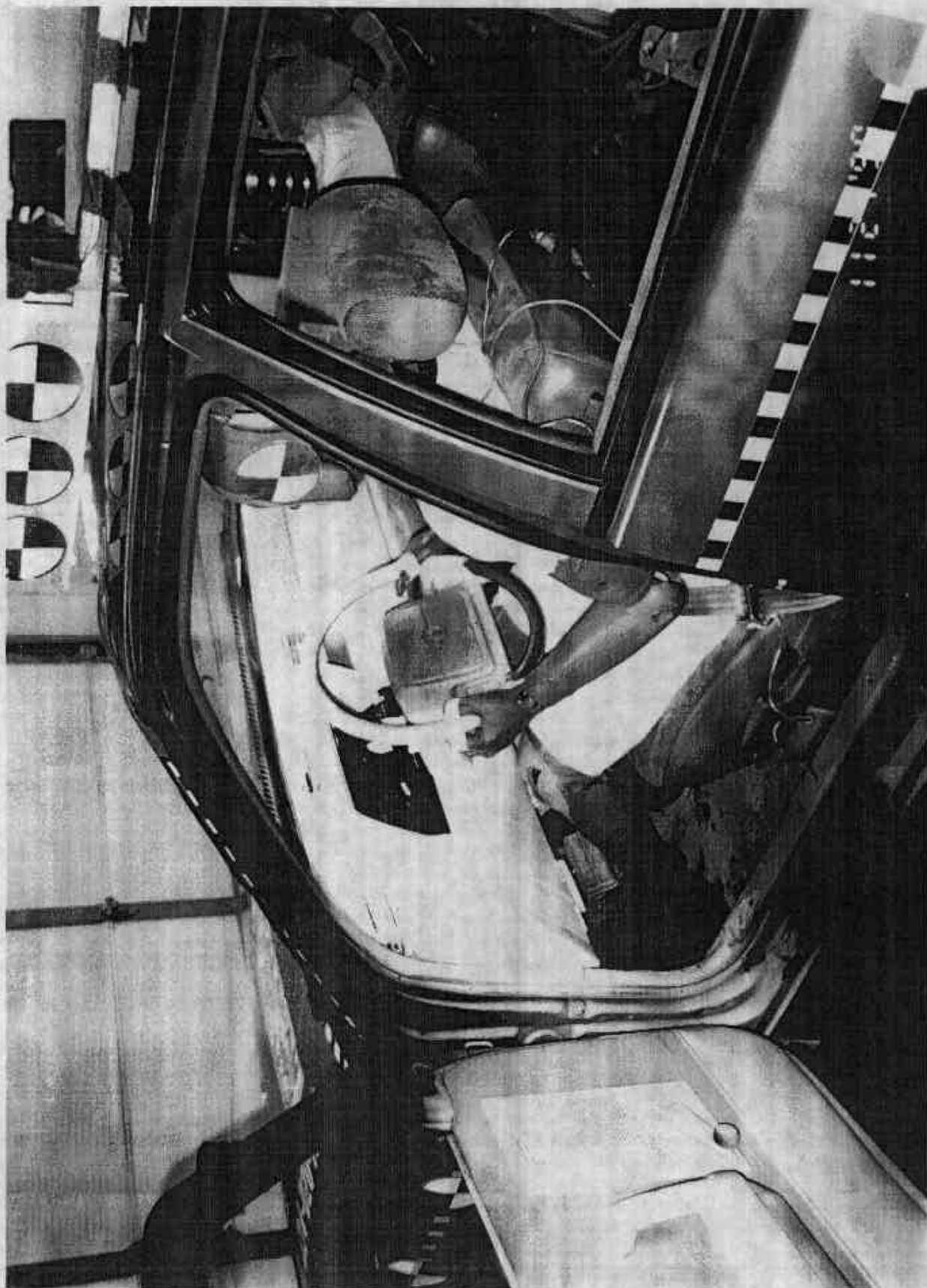
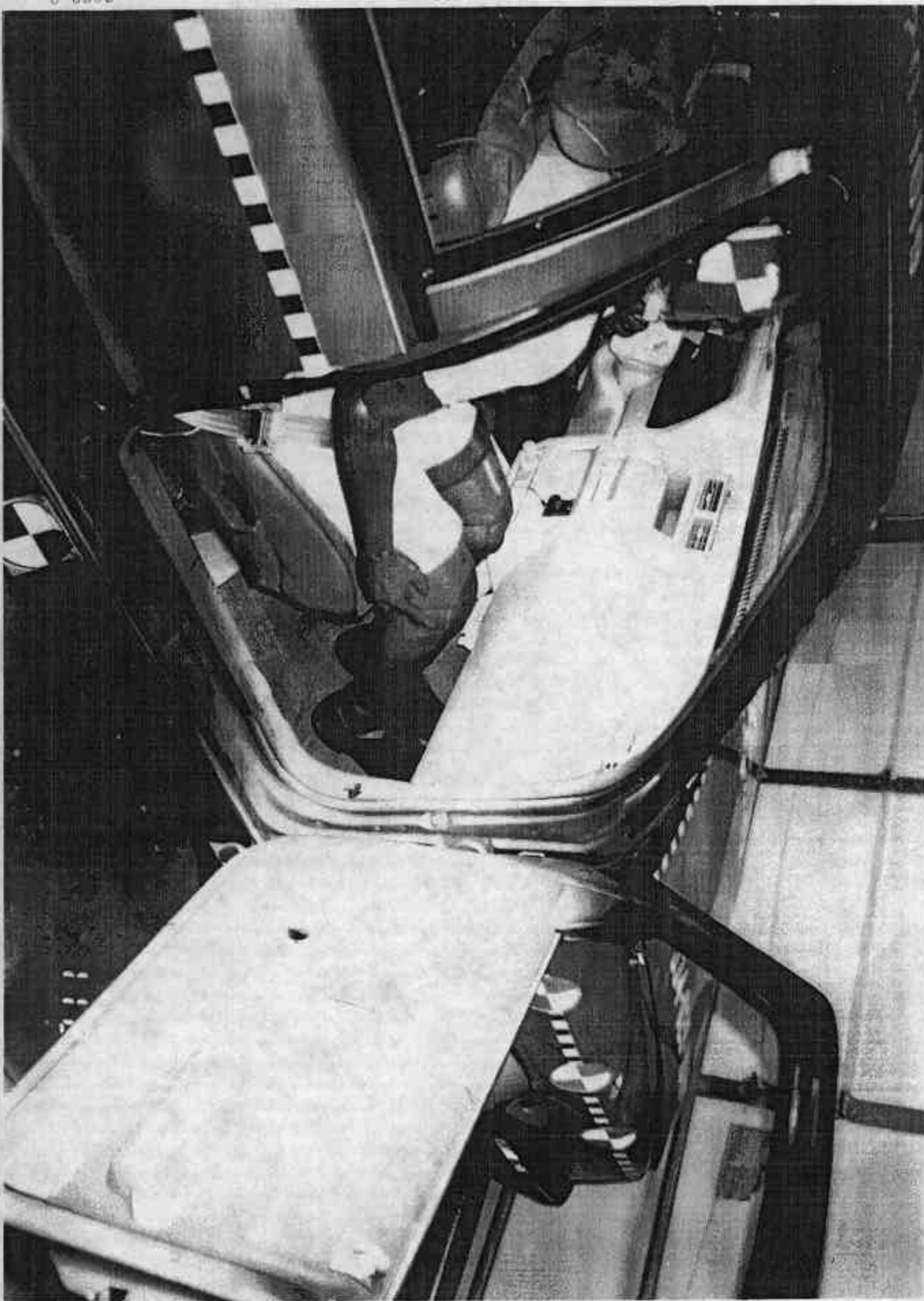


FIGURE A-26 PRE-TEST DRIVER AND INTERIOR VIEW



A-30

7862-2

FIGURE A-28 PRE-TEST PASSENGER AND INTERIOR VIEW



7862-2

A-29

Figure A-27 POST TEST DRIVER AND INTERIOR VIEW



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW



FIGURE A-30 PRE-TEST DRIVER HEAD LOCATION

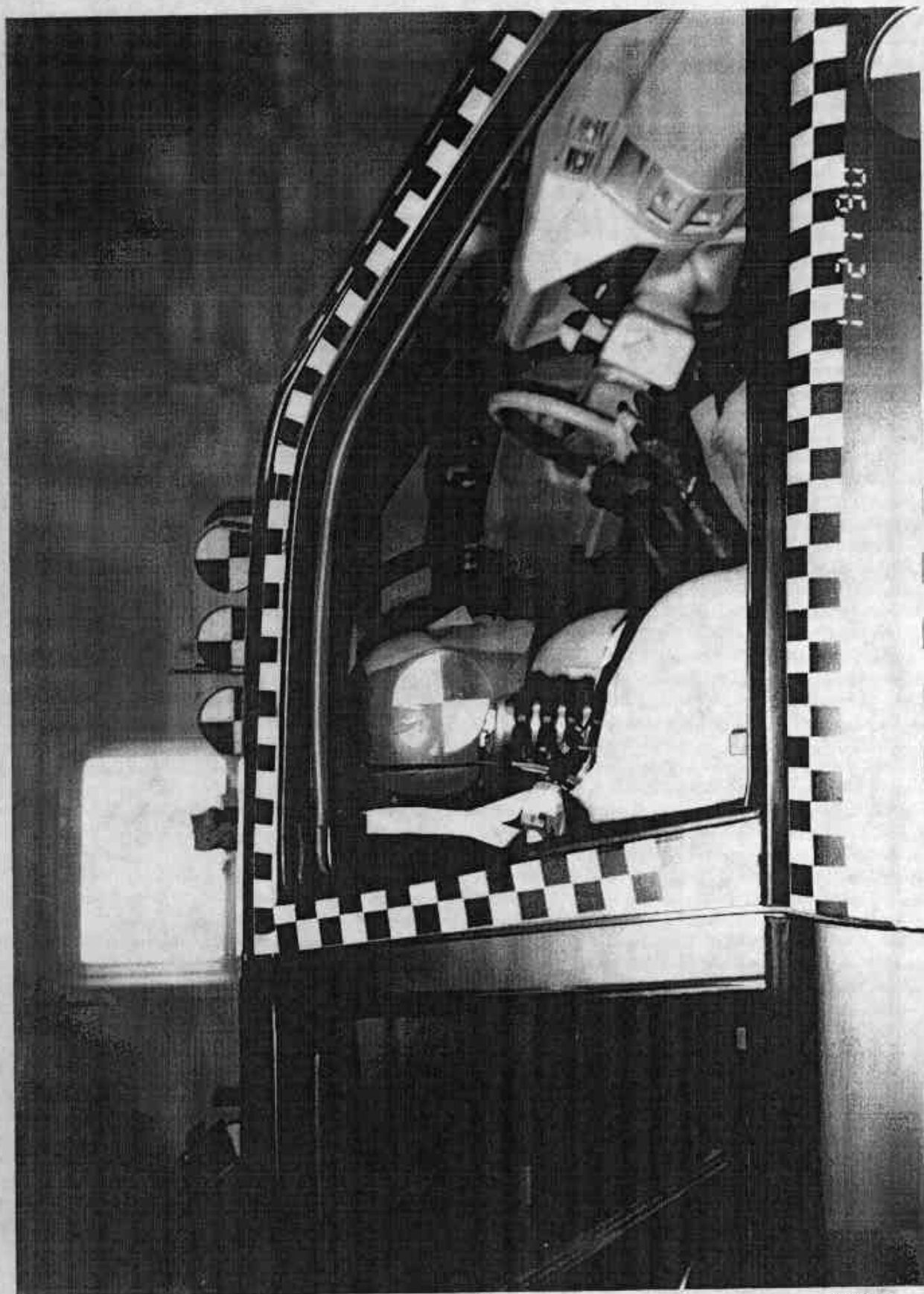


Figure A-31. PRE-TEST PASSENGER HEAD LOCATION

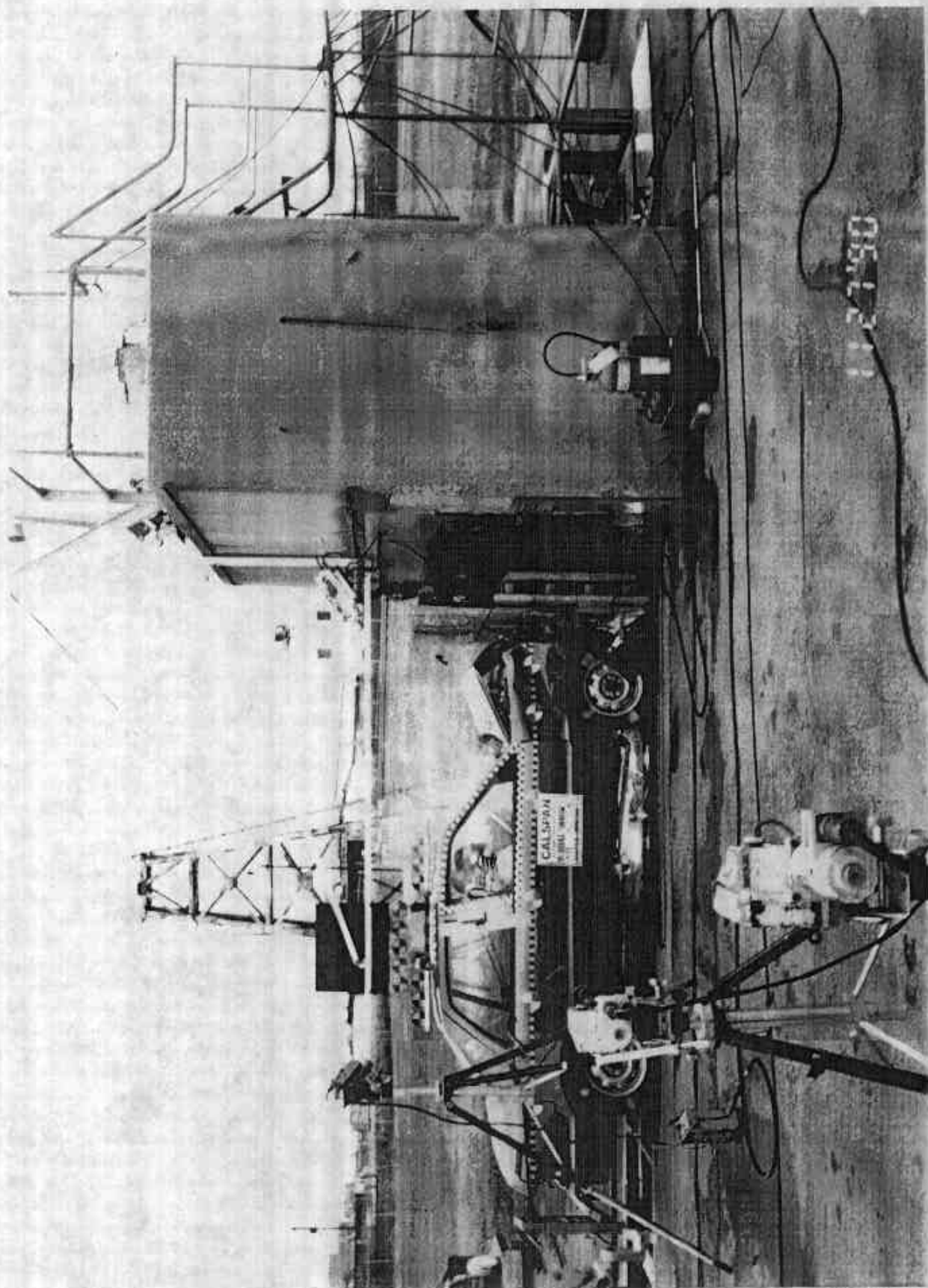


Figure A-32 IMPACT VIEW

Appendix B

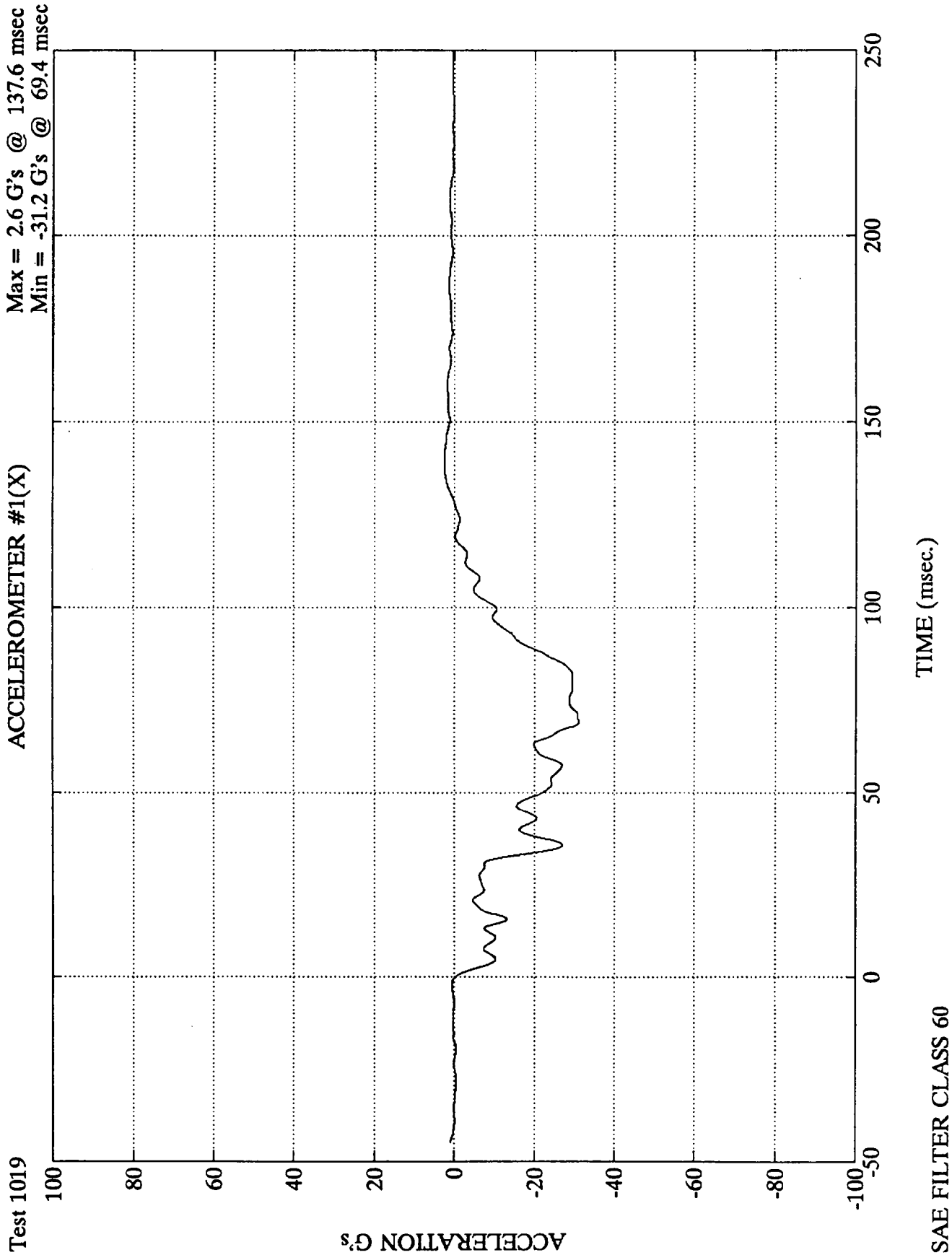
VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

TEST NO. MM0300

VEHICLE DATA

FILTER CHANNEL CLASS

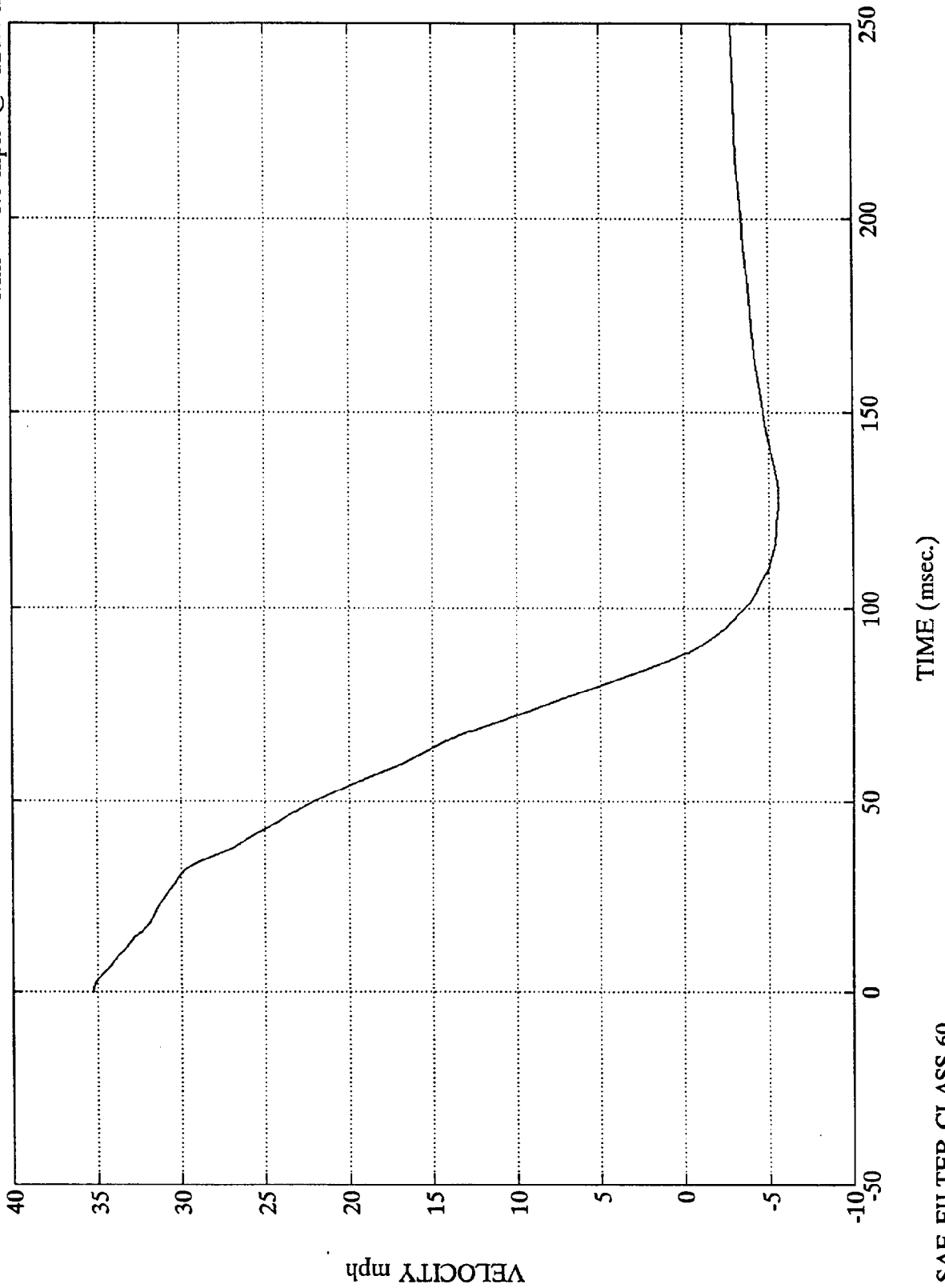
60



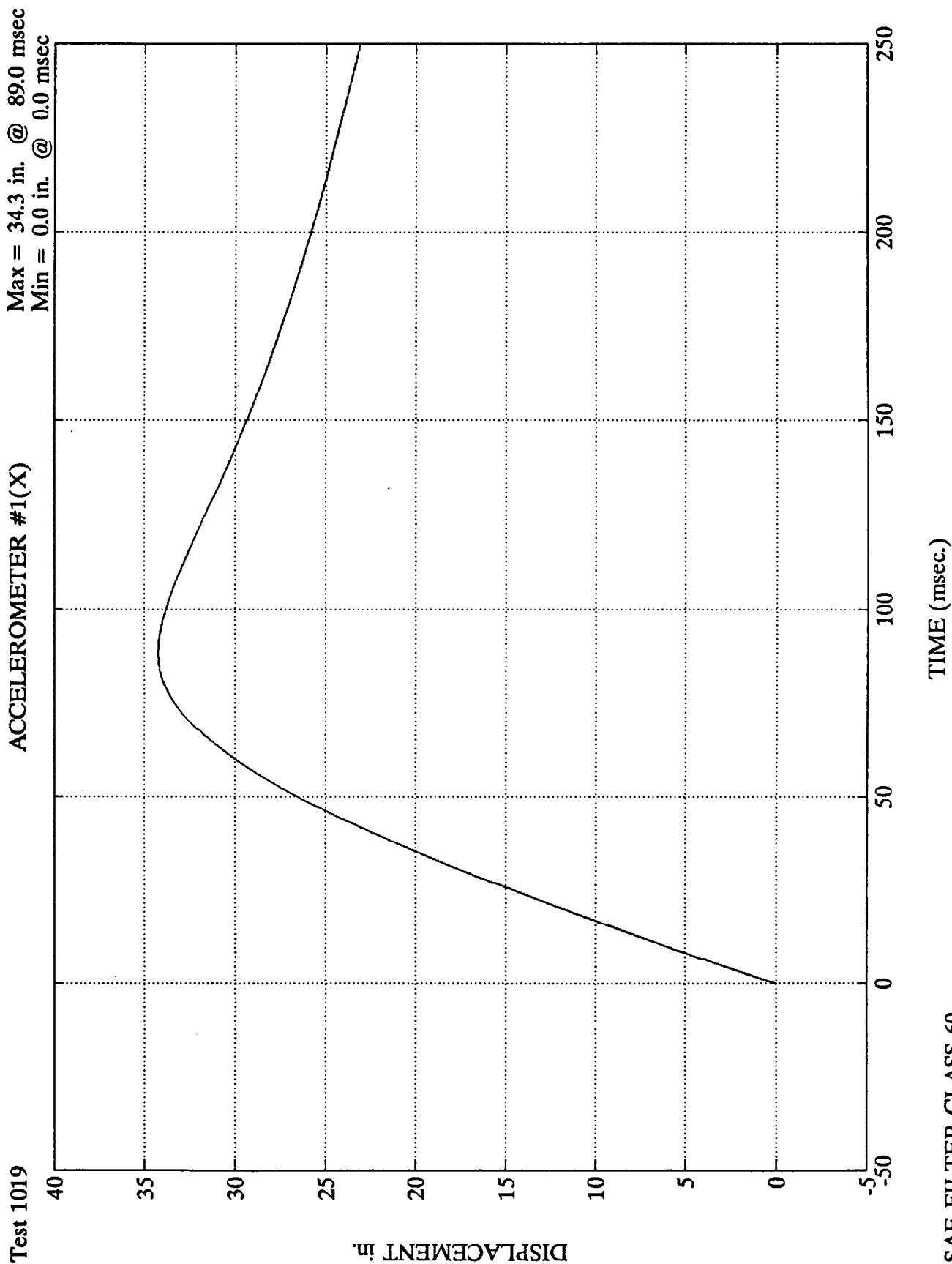
Max = 35.2 mph @ 0.2 msec
Min = -5.6 mph @ 128.4 msec

ACCELEROMETER #1(X)

Test 1019



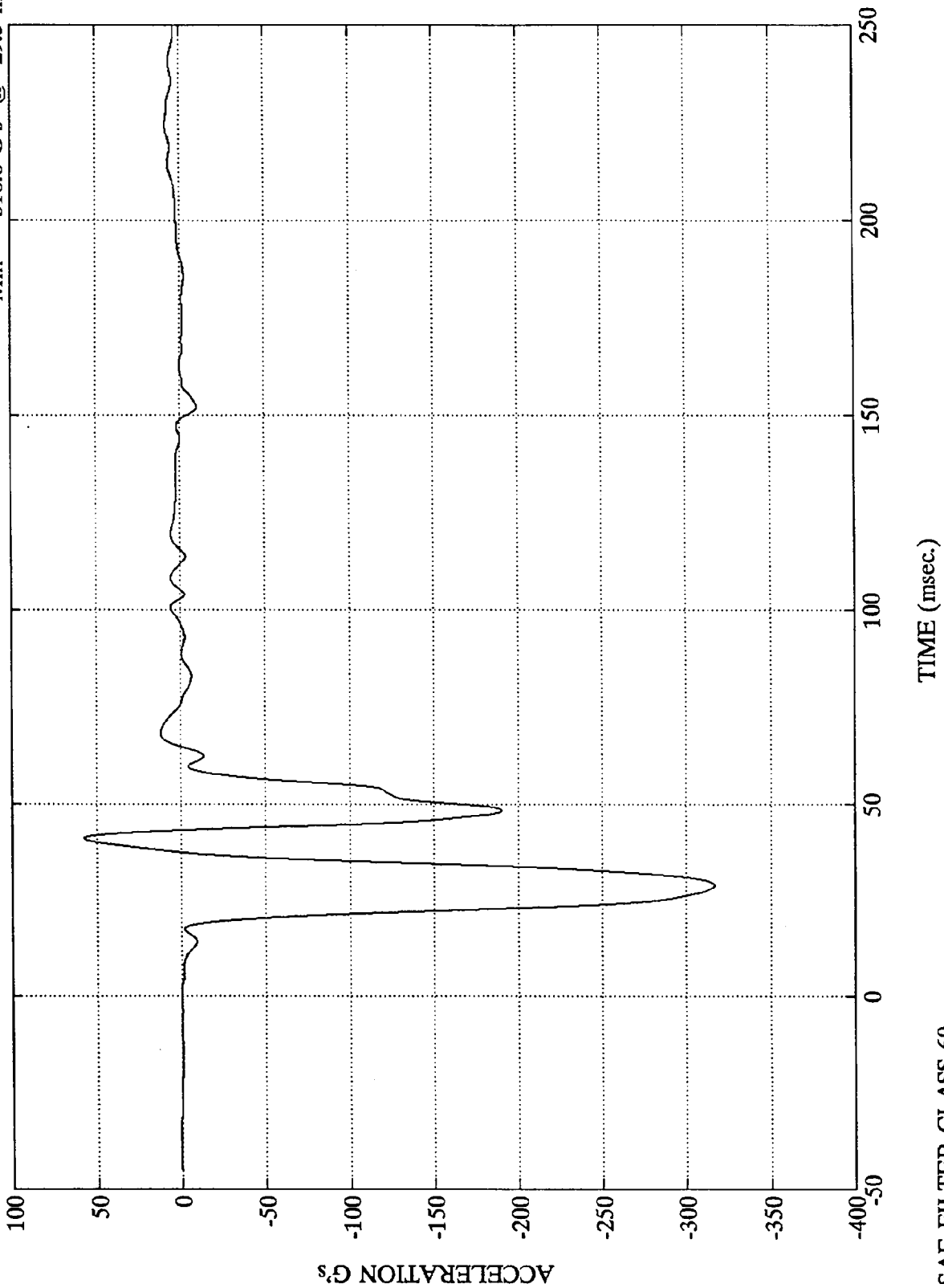
SAE FILTER CLASS 60



Test 1019

ACCELEROMETER #2(X)

Max = 57.6 G's @ 41.4 msec
Min = -316.6 G's @ 29.3 msec

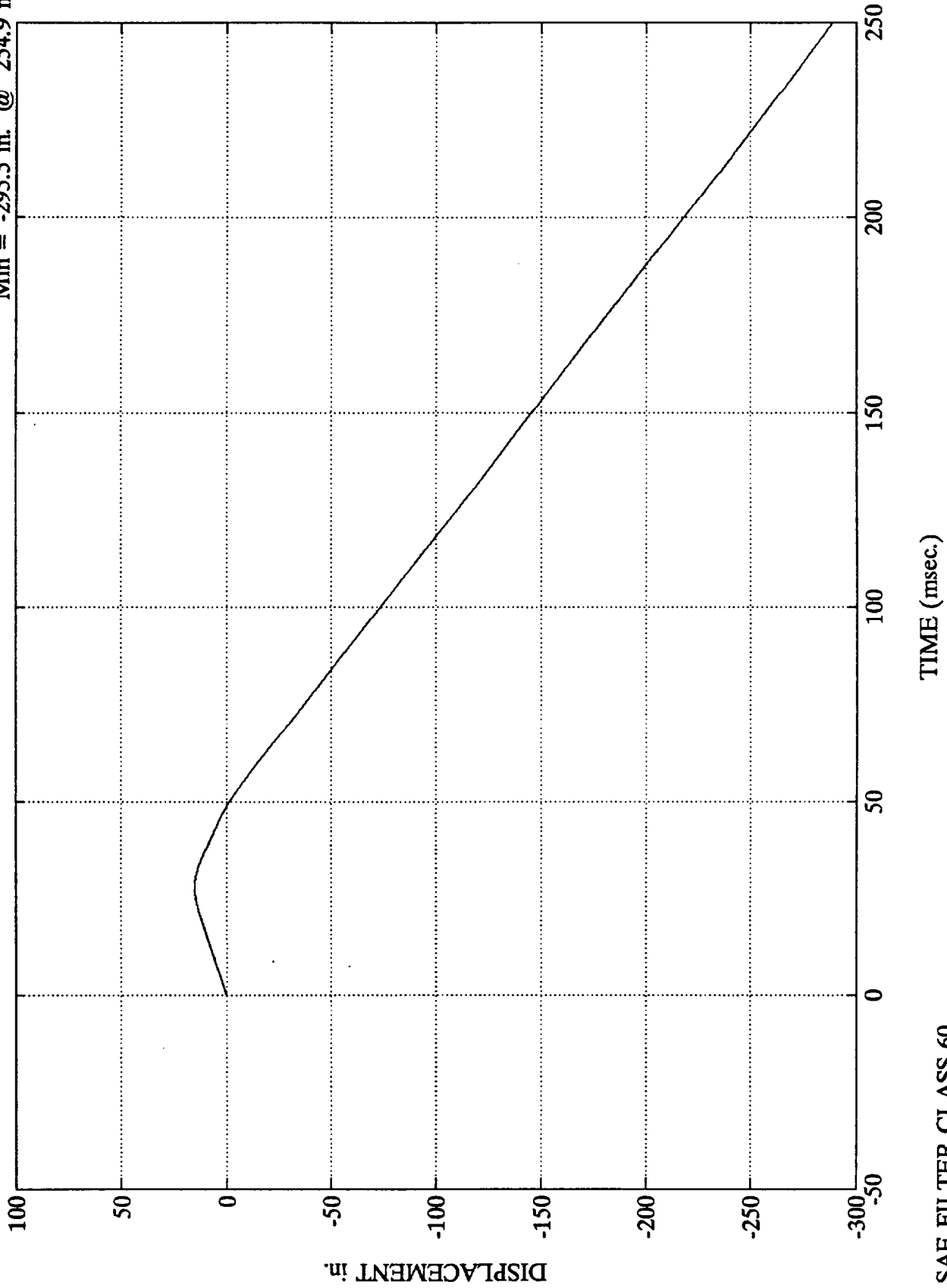


SAE FILTER CLASS 60

Test 1019

ACCELEROMETER #2(X)

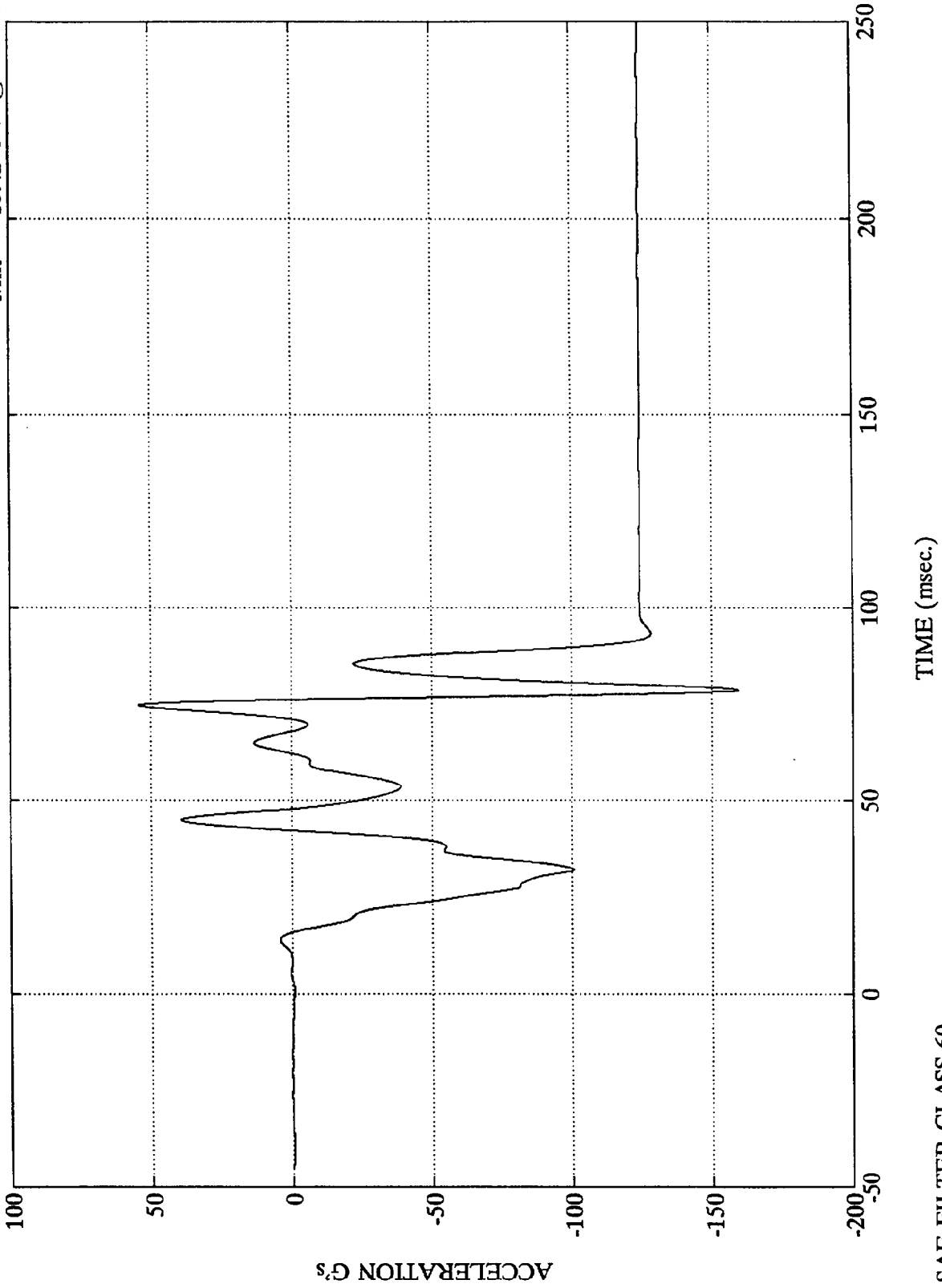
Max = 15.1 in. @ 27.8 msec
Min = -295.5 in. @ 254.9 msec



SAE FILTER CLASS 60

Test 1019
Max = 54.3 G's @ 74.6 msec
Min = -159.2 G's @ 78.6 msec

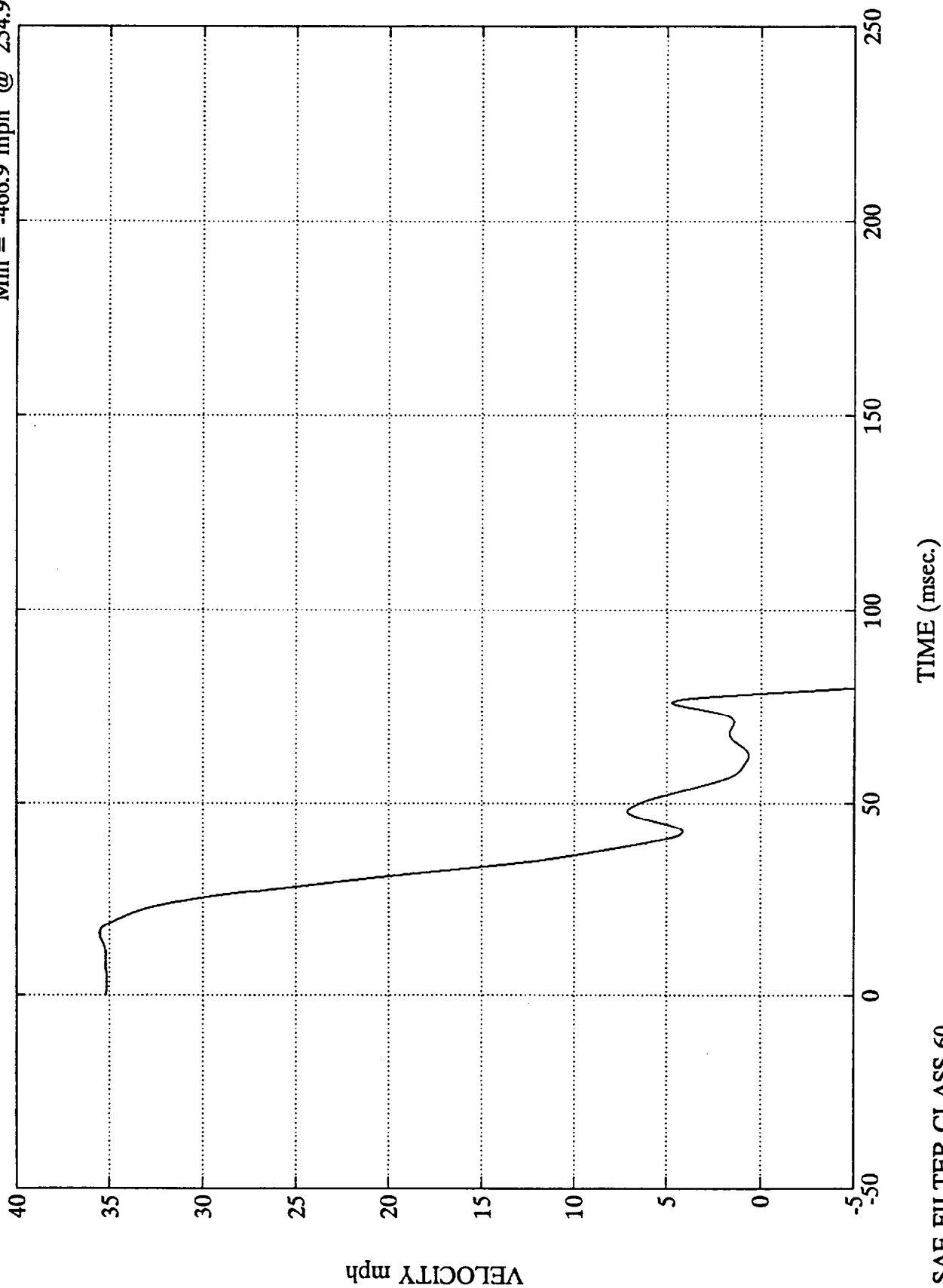
ACCELEROMETER #3(X)



Test 1019

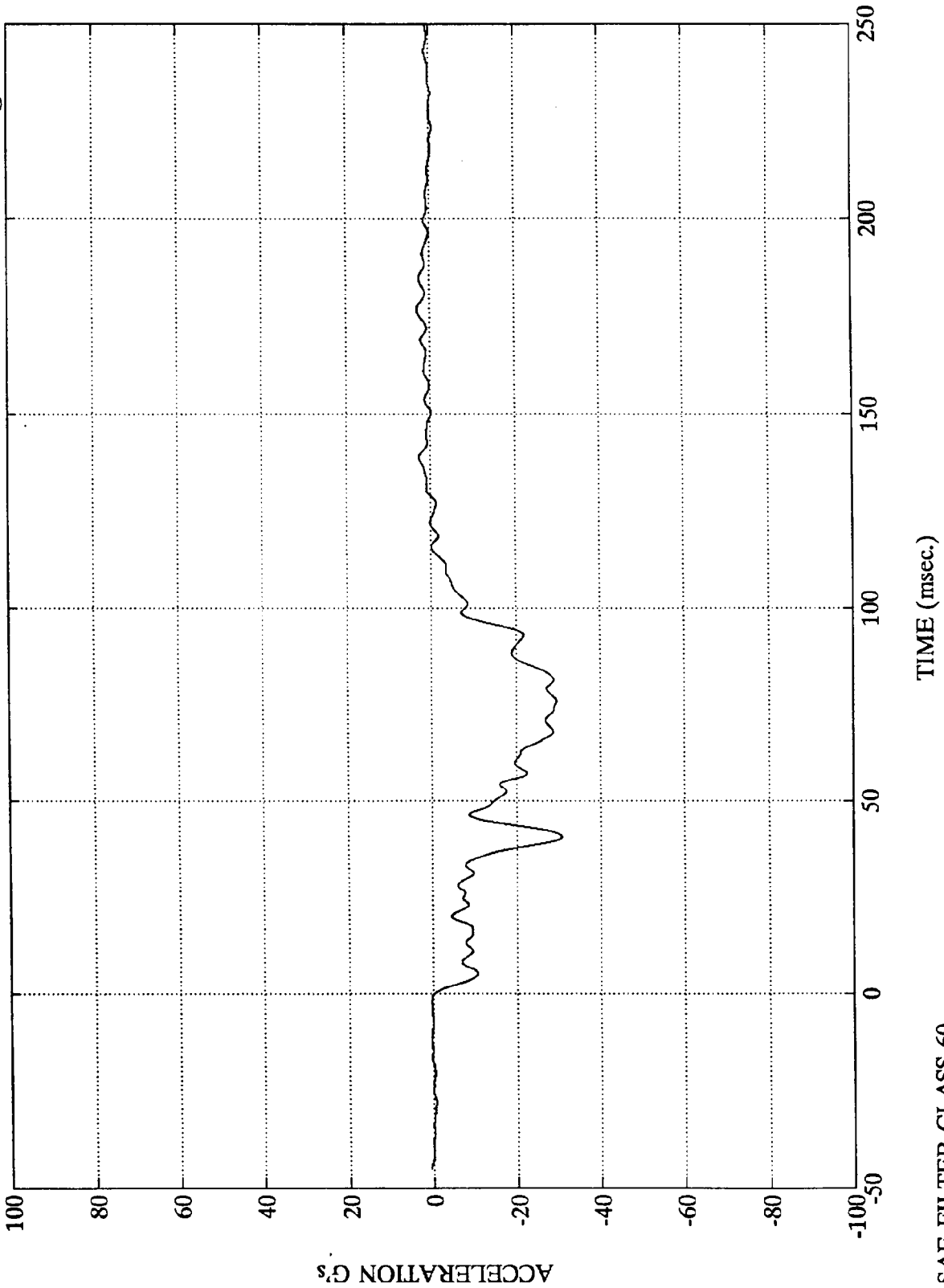
ACCELEROMETER #3(X)

Max = 35.6 mph @ 16.1 msec
Min = -466.9 mph @ 254.9 msec



SAE FILTER CLASS 60

Test 1019
ACCELEROMETER #4(X)
Max = 3.0 G's @ 176.6 msec
Min = -30.8 G's @ 40.9 msec

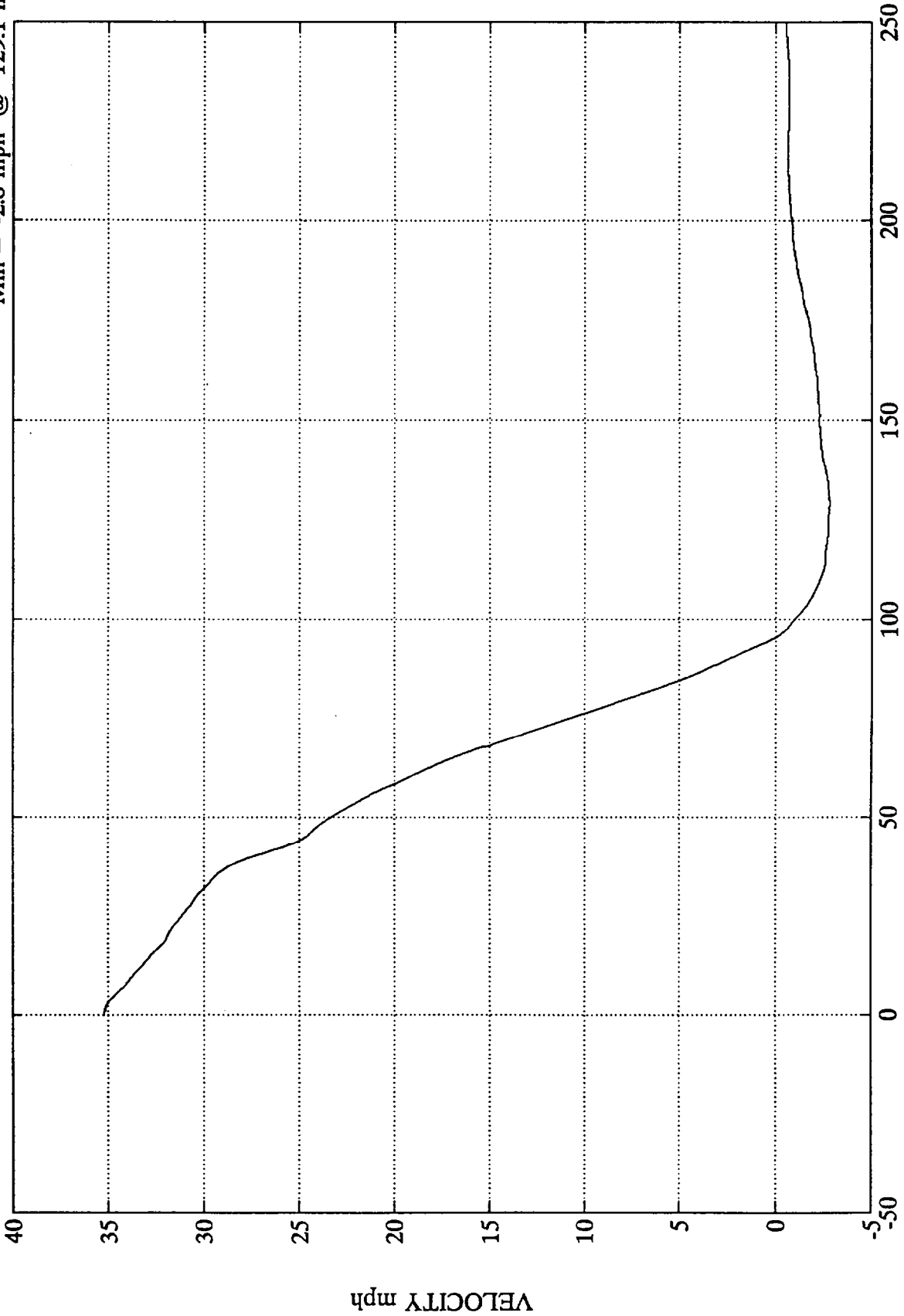


SAE FILTER CLASS 60

Test 1019

ACCELEROMETER #4(X)

Max = 35.2 mph @ 0.5 msec
Min = -2.8 mph @ 129.1 msec

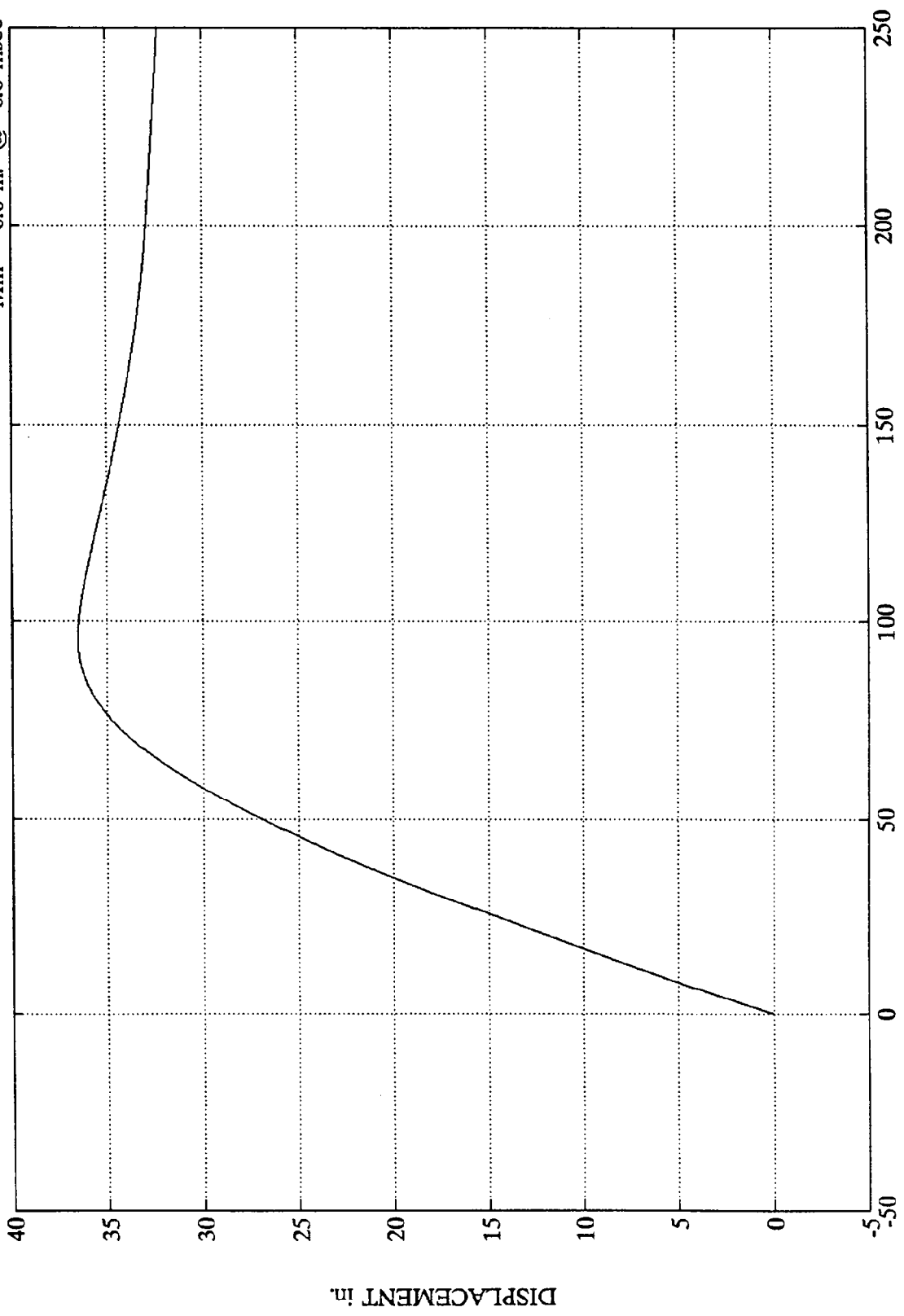


TIME (msec.)

SAE FILTER CLASS 60

Test 1019
Max = 36.5 in. @ 96.2 msec
Min = 0.0 in. @ 0.0 msec

ACCELEROMETER #4(X)



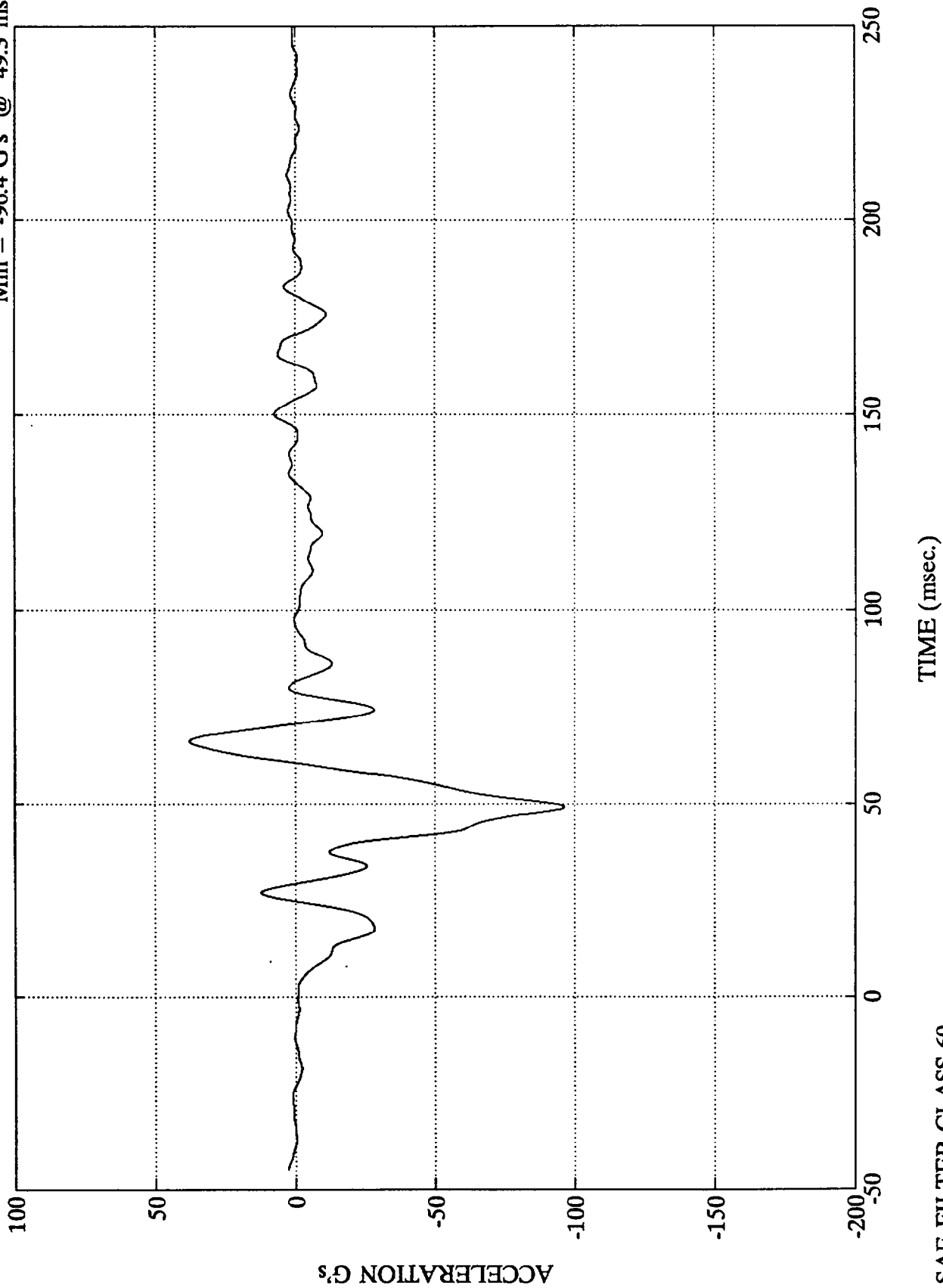
TIME (msec.)

SAE FILTER CLASS 60

Test 1019
Max = 37.8 G's @ 66.2 msec
Min = -96.4 G's @ 49.3 msec

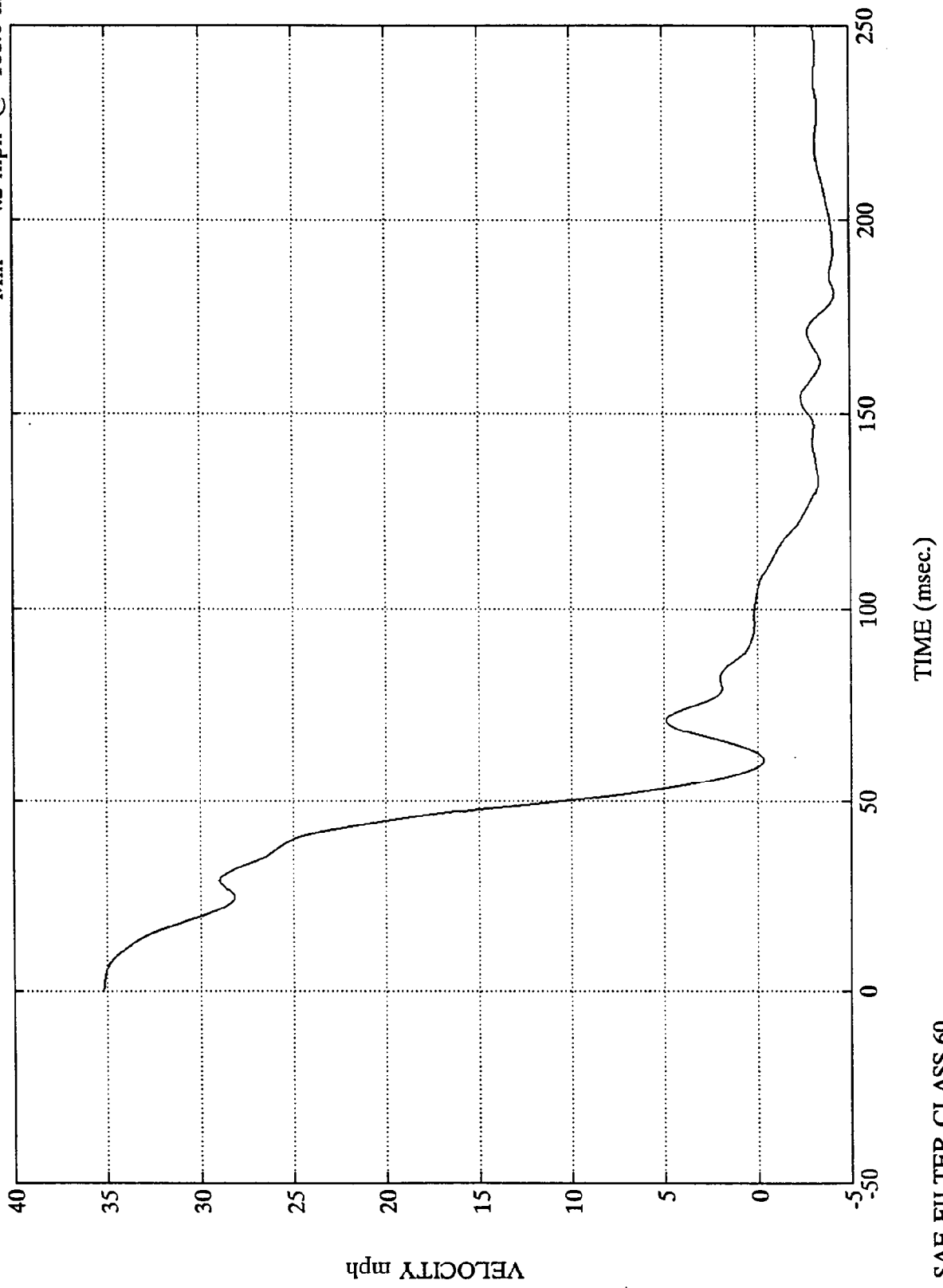
ACCELEROMETER #5(X)

SAE FILTER CLASS 60



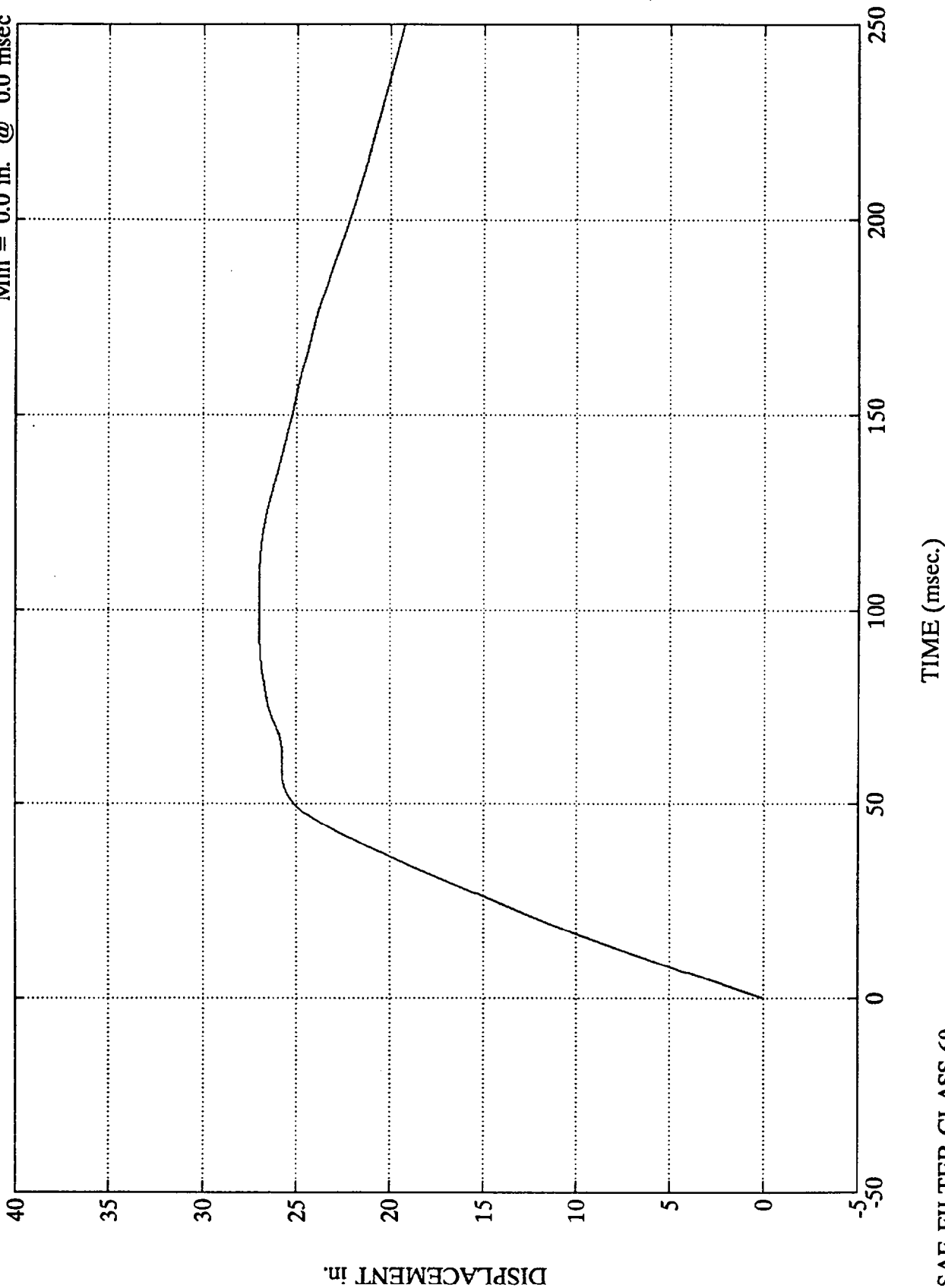
Test 1019
Max = 35.2 mph @ 0.0 msec
Min = -4.2 mph @ 181.0 msec

ACCELEROMETER #5(X)



Test 1019
Max = 27.0 in. @ 108.7 msec
Min = 0.0 in. @ 0.0 msec

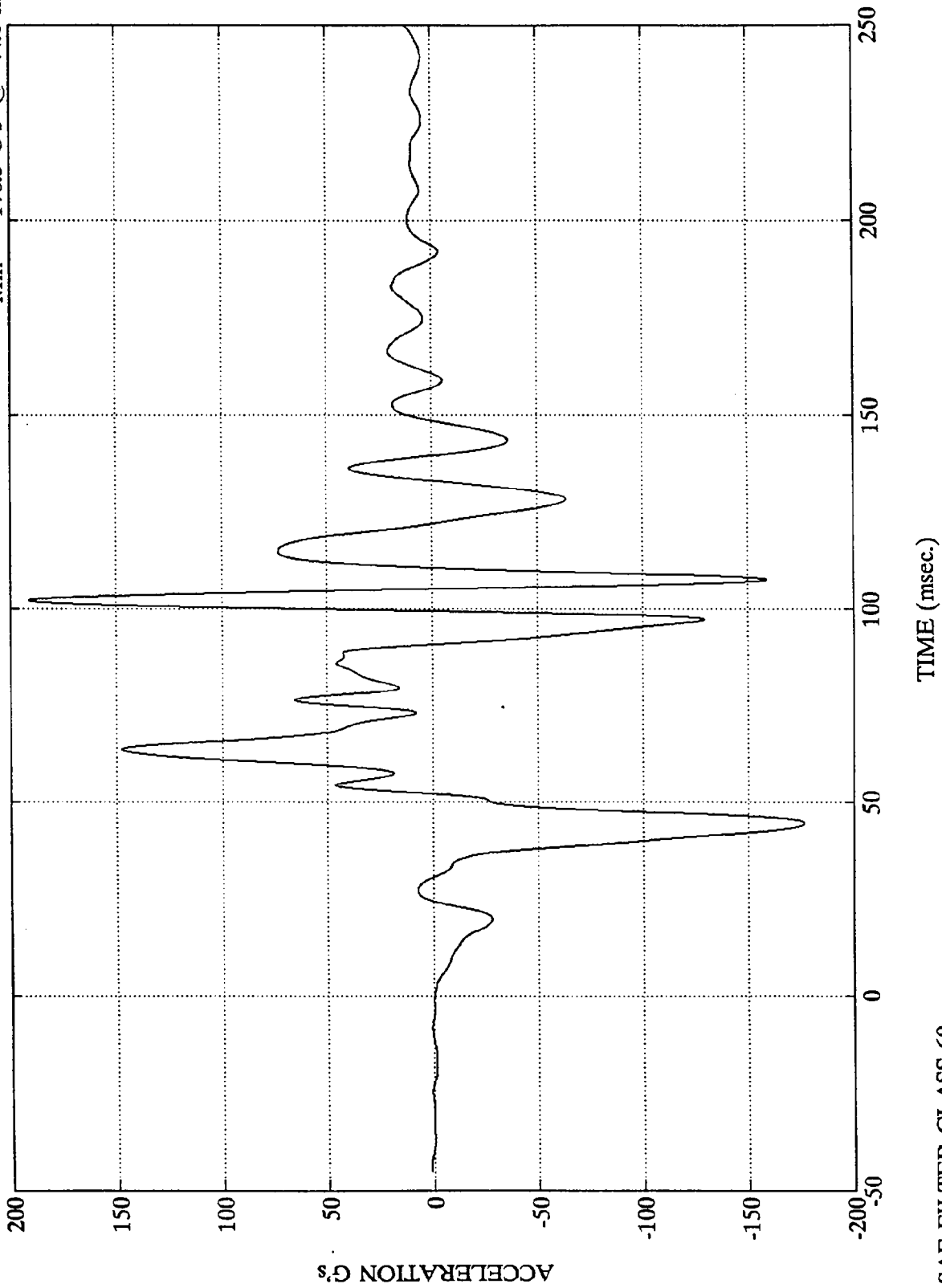
ACCELEROMETER #5(X)



SAE FILTER CLASS 60

Test 1019
Max = 191.4 G's @ 102.2 msec
Min = -176.3 G's @ 44.6 msec

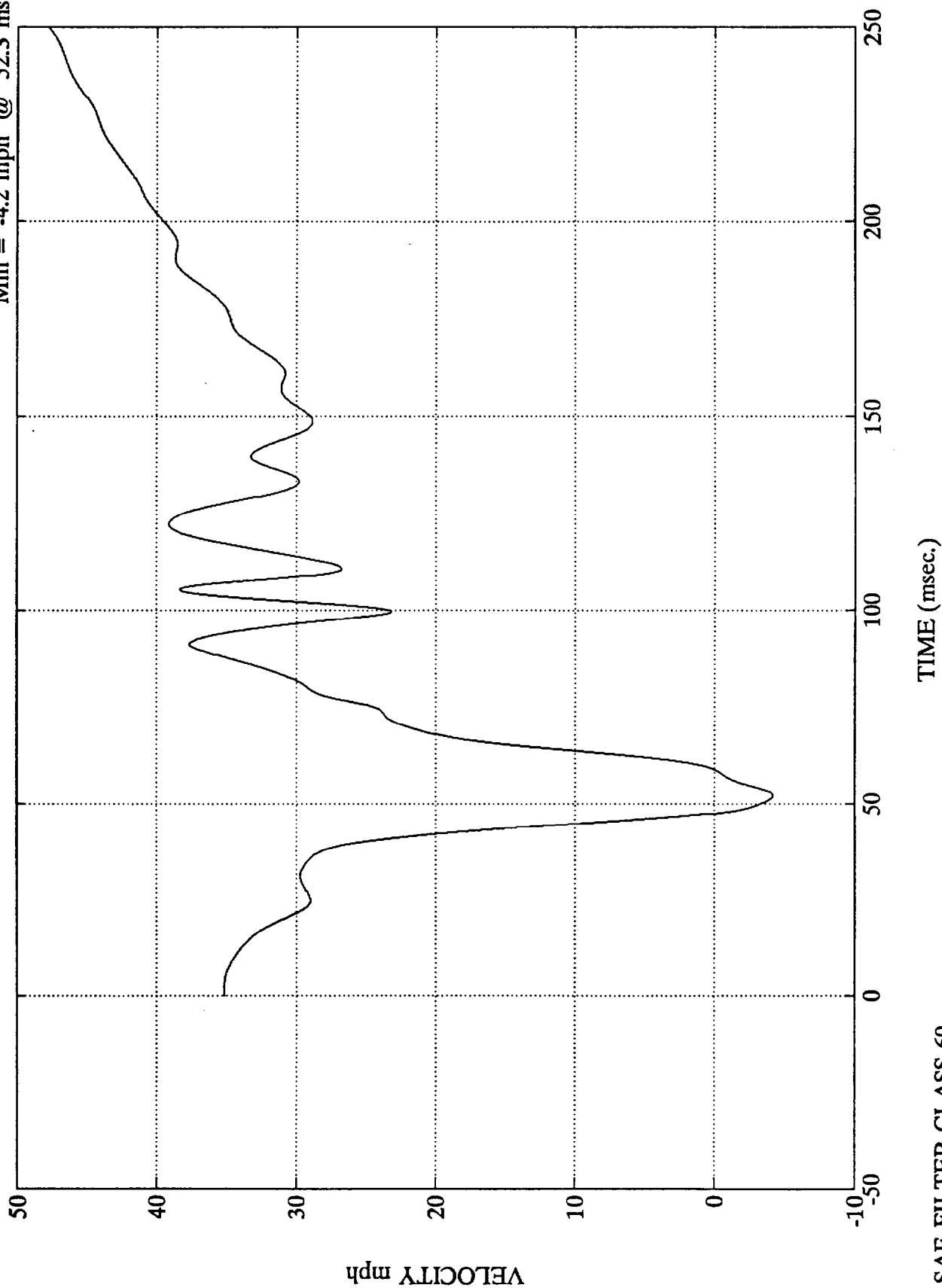
ACCELEROMETER #6(X)



SAE FILTER CLASS 60

Test 1019
Max = 49.5 mph @ 254.9 msec
Min = -4.2 mph @ 52.3 msec

ACCELEROMETER #6(X)



SAE FILTER CLASS 60

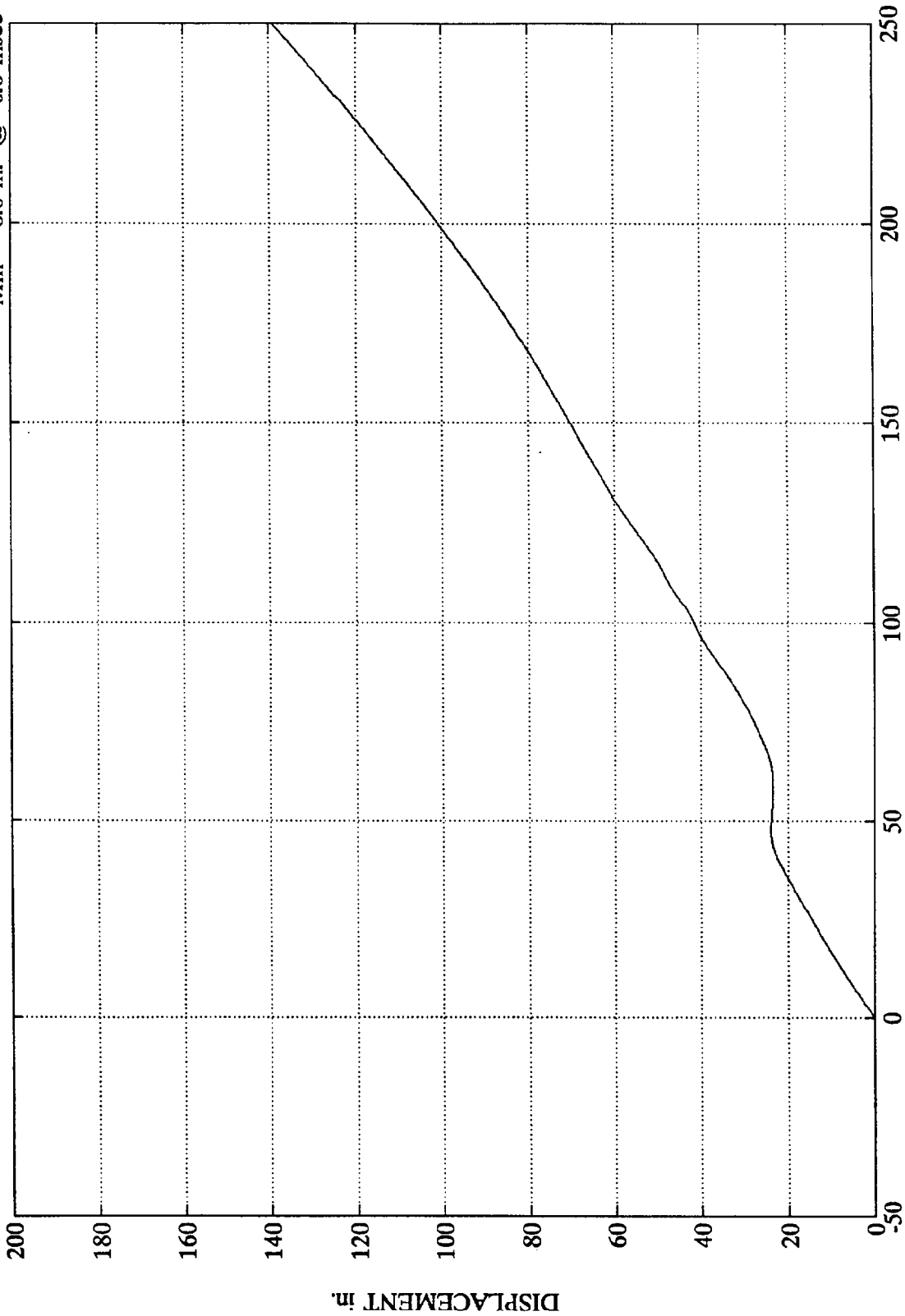
Test 1019

VELOCITY mph

TIME (msec.)

Test 1019
ACCELEROMETER #6(X)
Max = 143.6 in. @ 254.9 msec
Min = 0.0 in. @ 0.0 msec

DISPLACEMENT in.



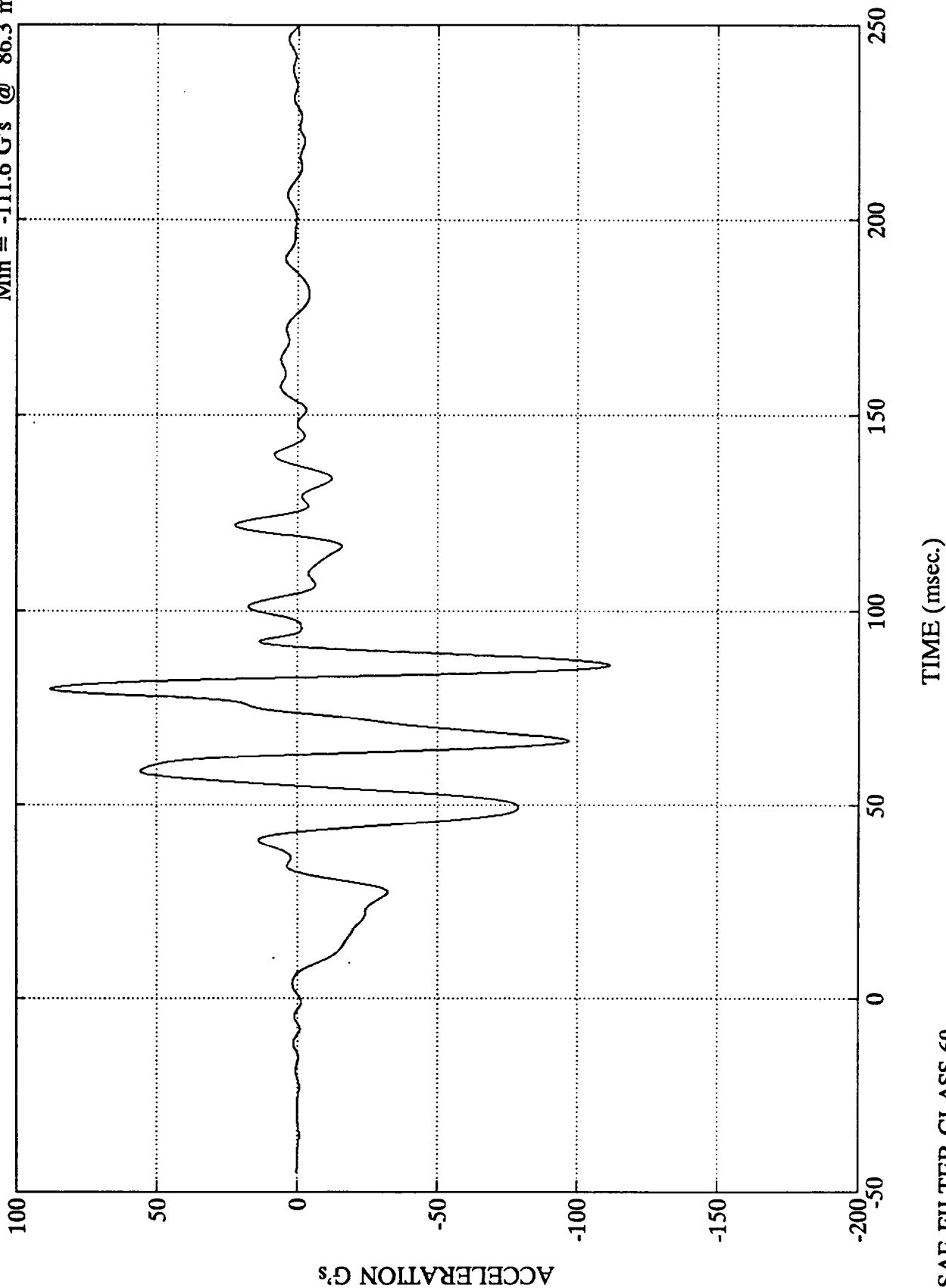
TIME (msec.)

SAE FILTER CLASS 60

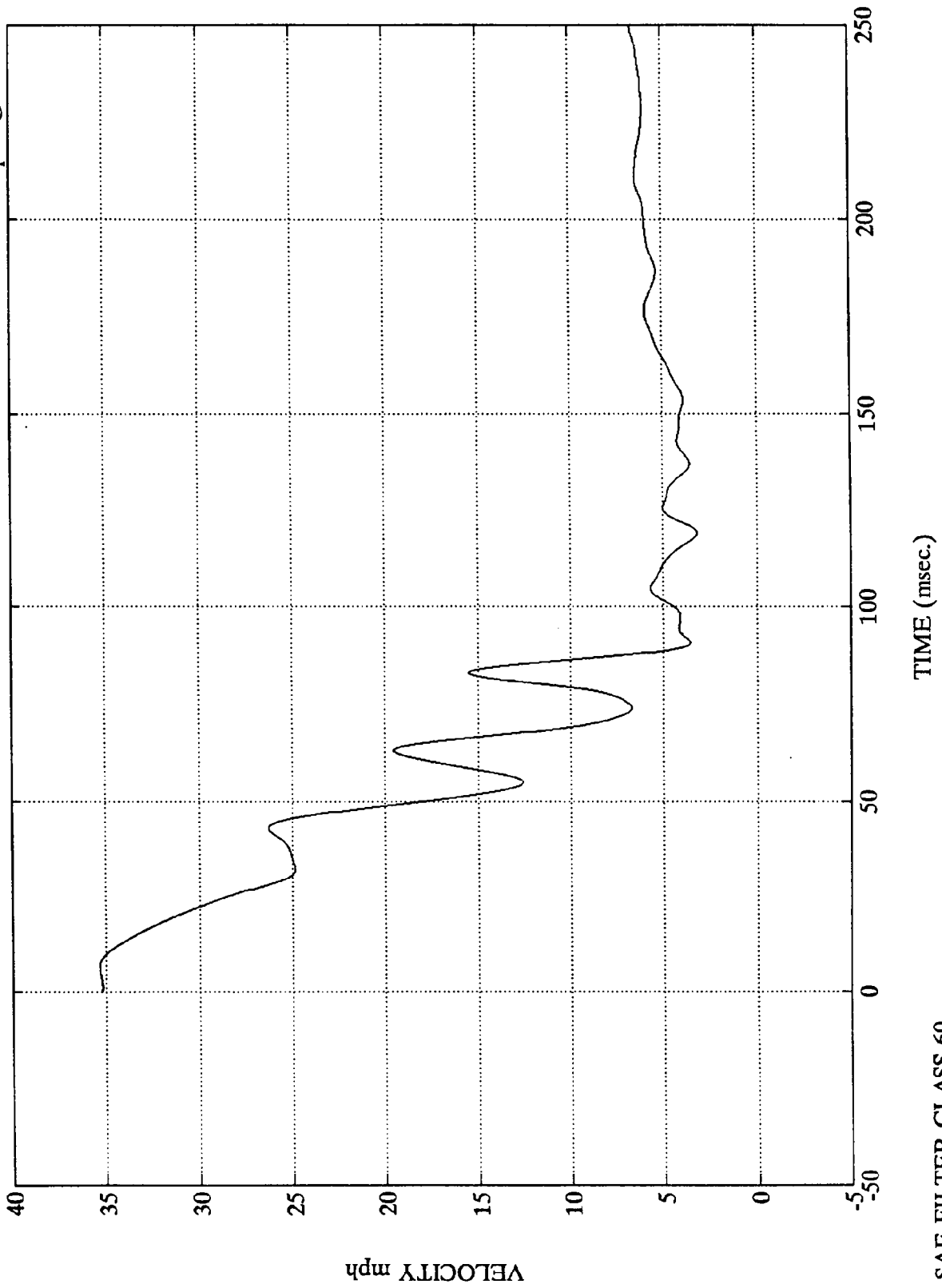
Test 1019
Max = 87.9 G's @ 80.2 msec
Min = -111.6 G's @ 86.3 msec

ACCELEROMETER #7(X)

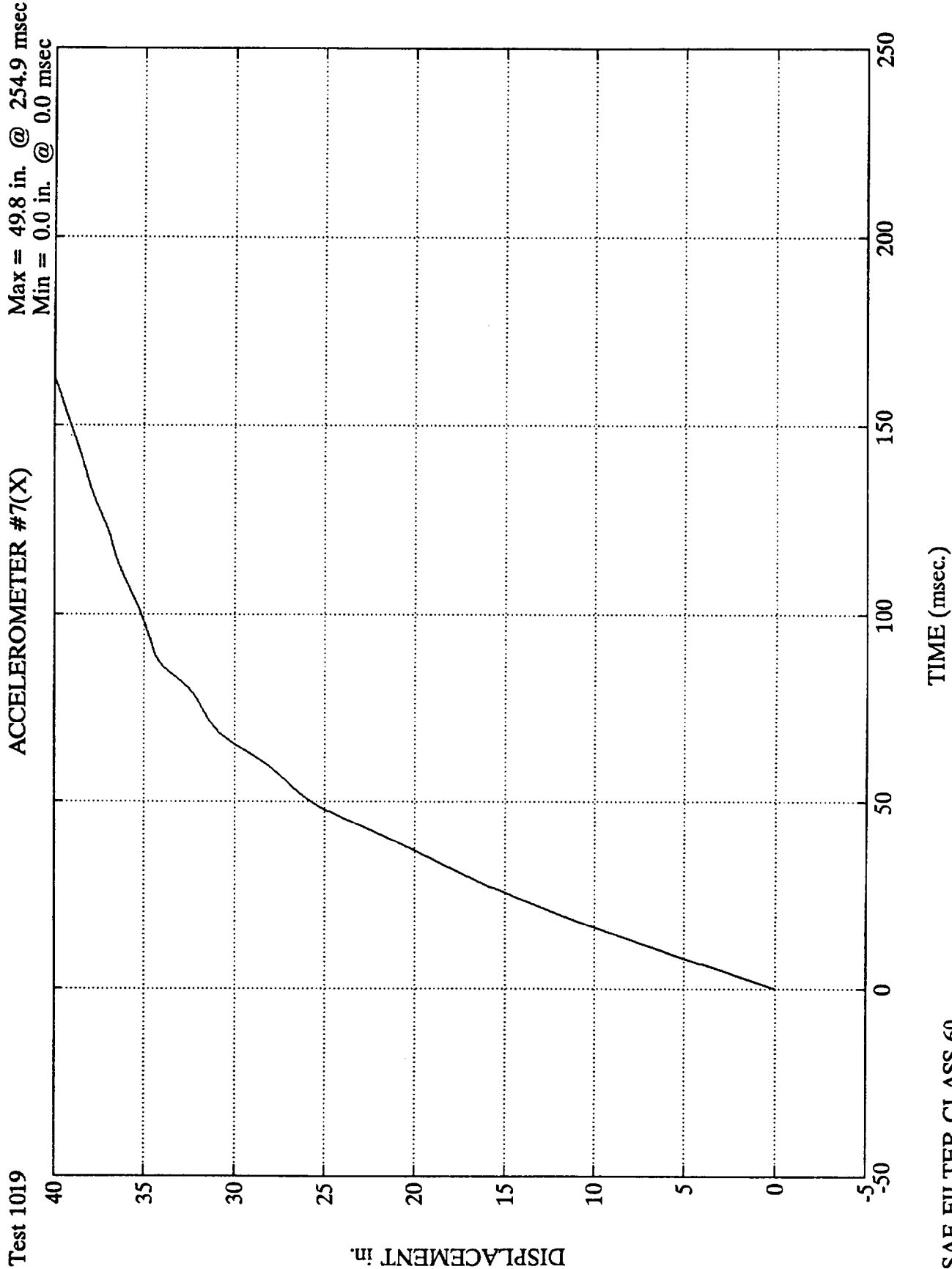
SAE FILTER CLASS 60



Test 1019
ACCELEROMETER #7(X)
Max = 35.3 mph @ 7.0 msec
Min = 3.2 mph @ 119.0 msec



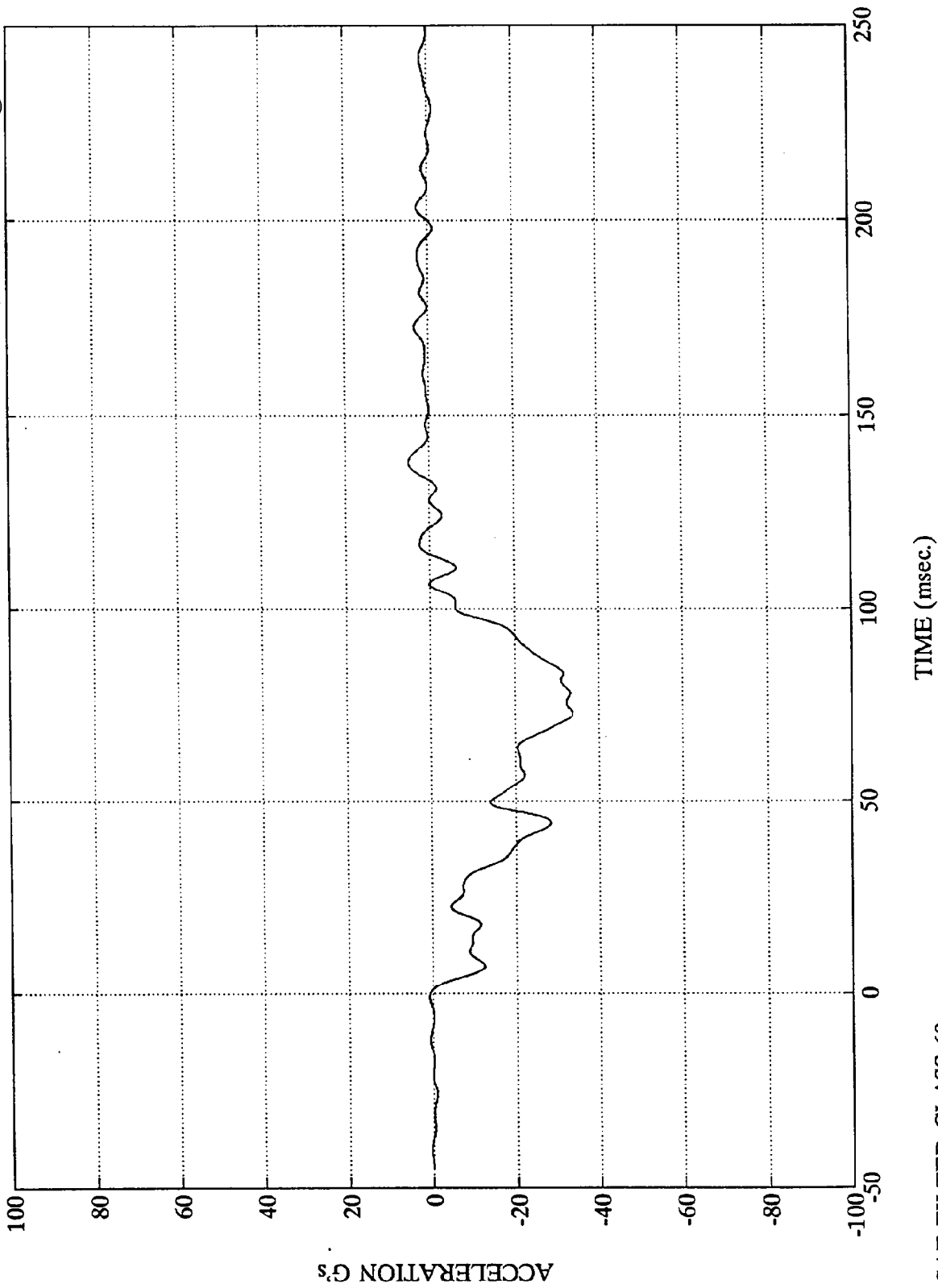
SAE FILTER CLASS 60



Test 1019

ACCELEROMETER #8(X)

Max = 5.0 G's @ 137.8 msec
Min = -33.8 G's @ 72.8 msec

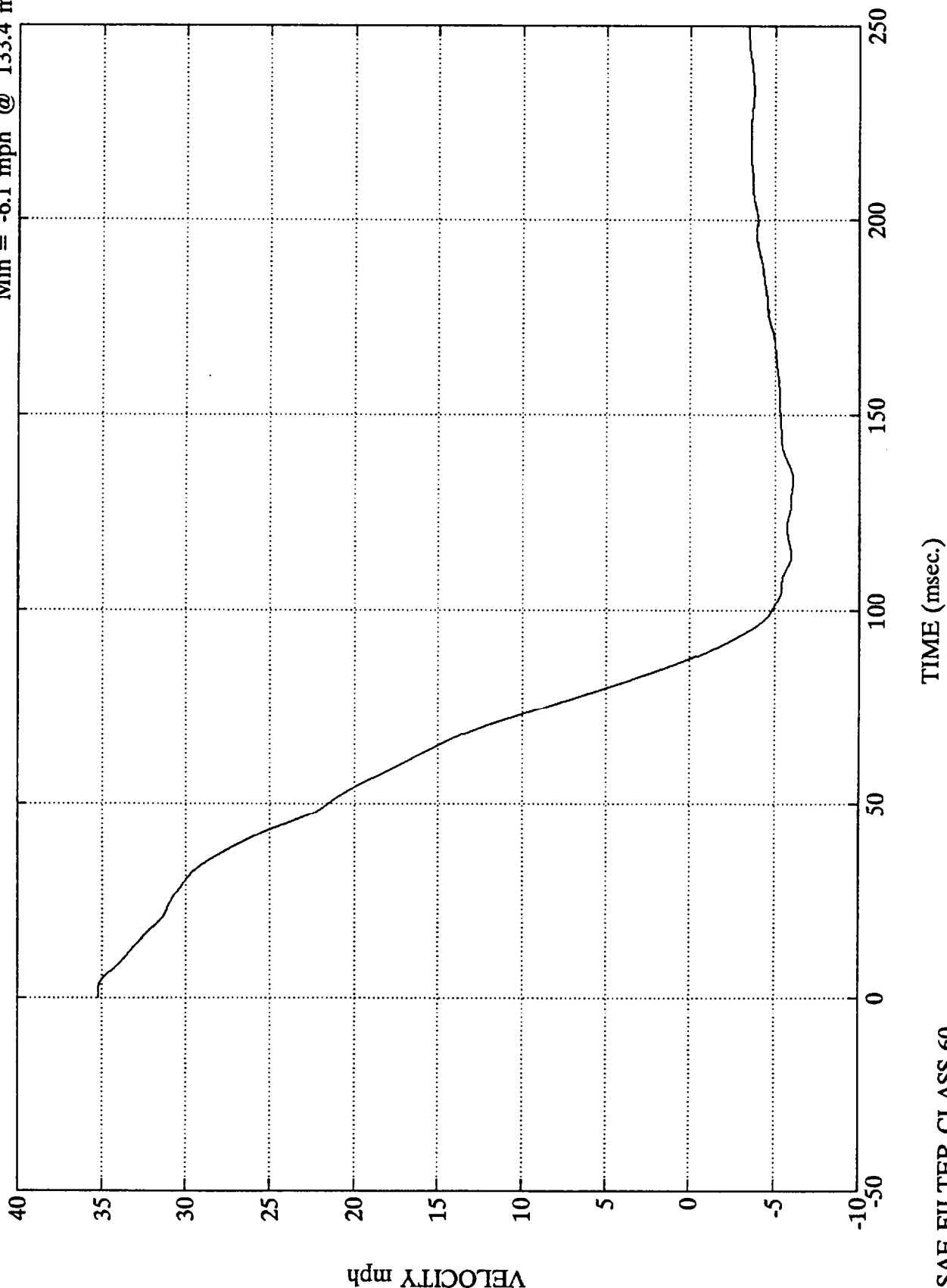


SAE FILTER CLASS 60

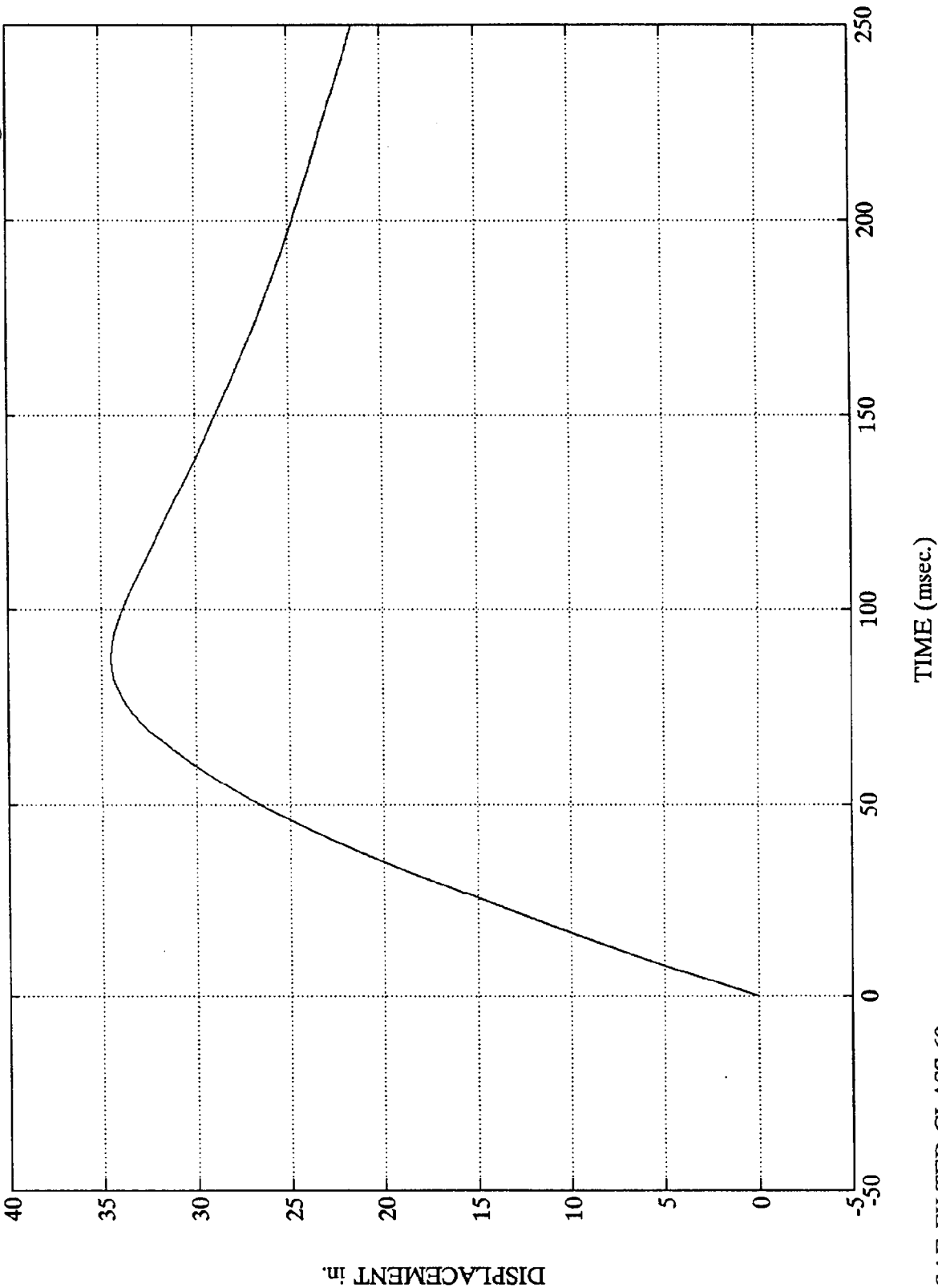
Test 1019

ACCELEROMETER #8(X)

Max = 35.2 mph @ 1.7 msec
Min = -6.1 mph @ 133.4 msec



Test 1019
ACCELEROMETER #8(X)
Max = 34.5 in. @ 88.3 msec
Min = 0.0 in. @ 0.0 msec

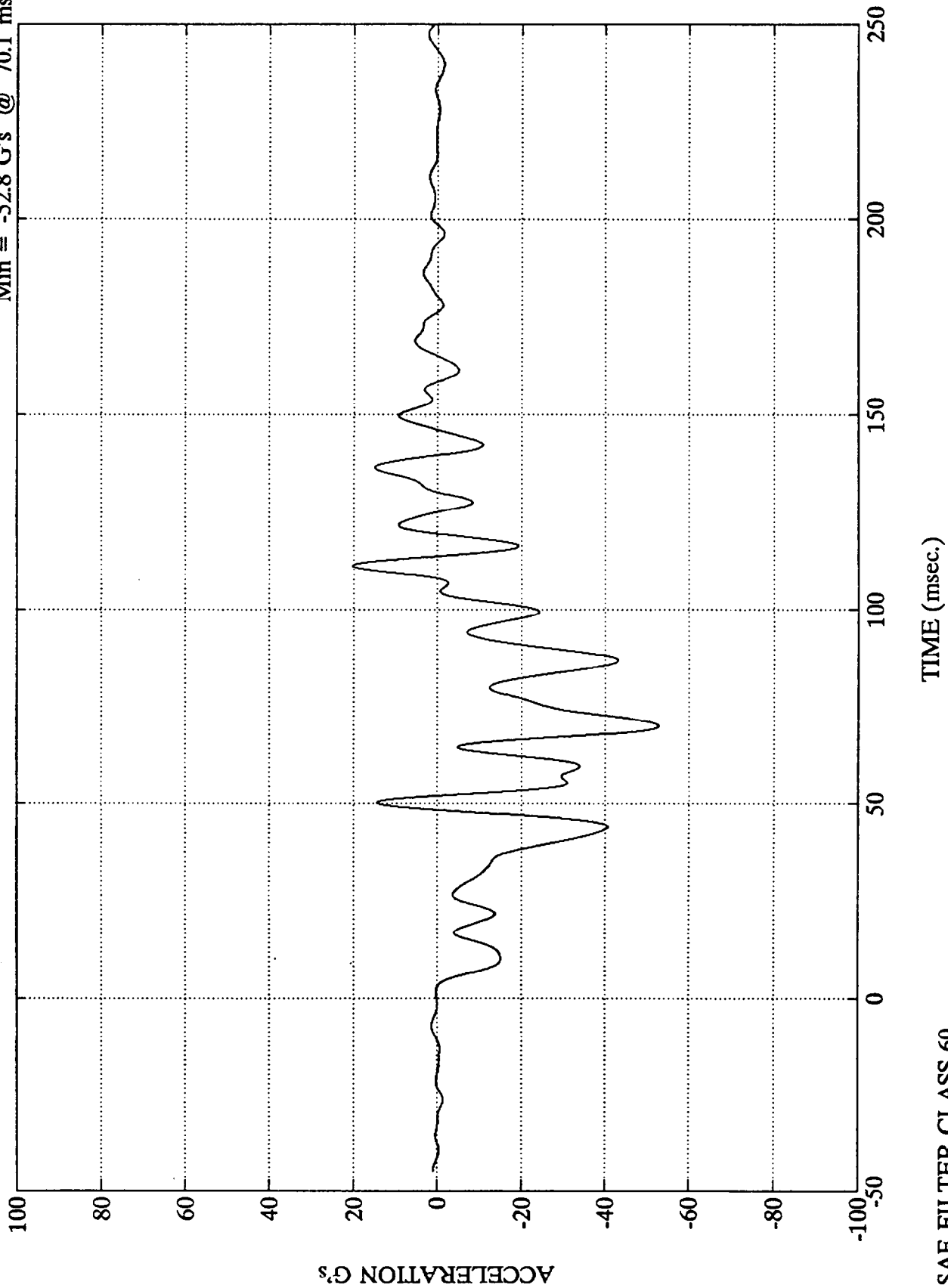


SAE FILTER CLASS 60

Test 1019

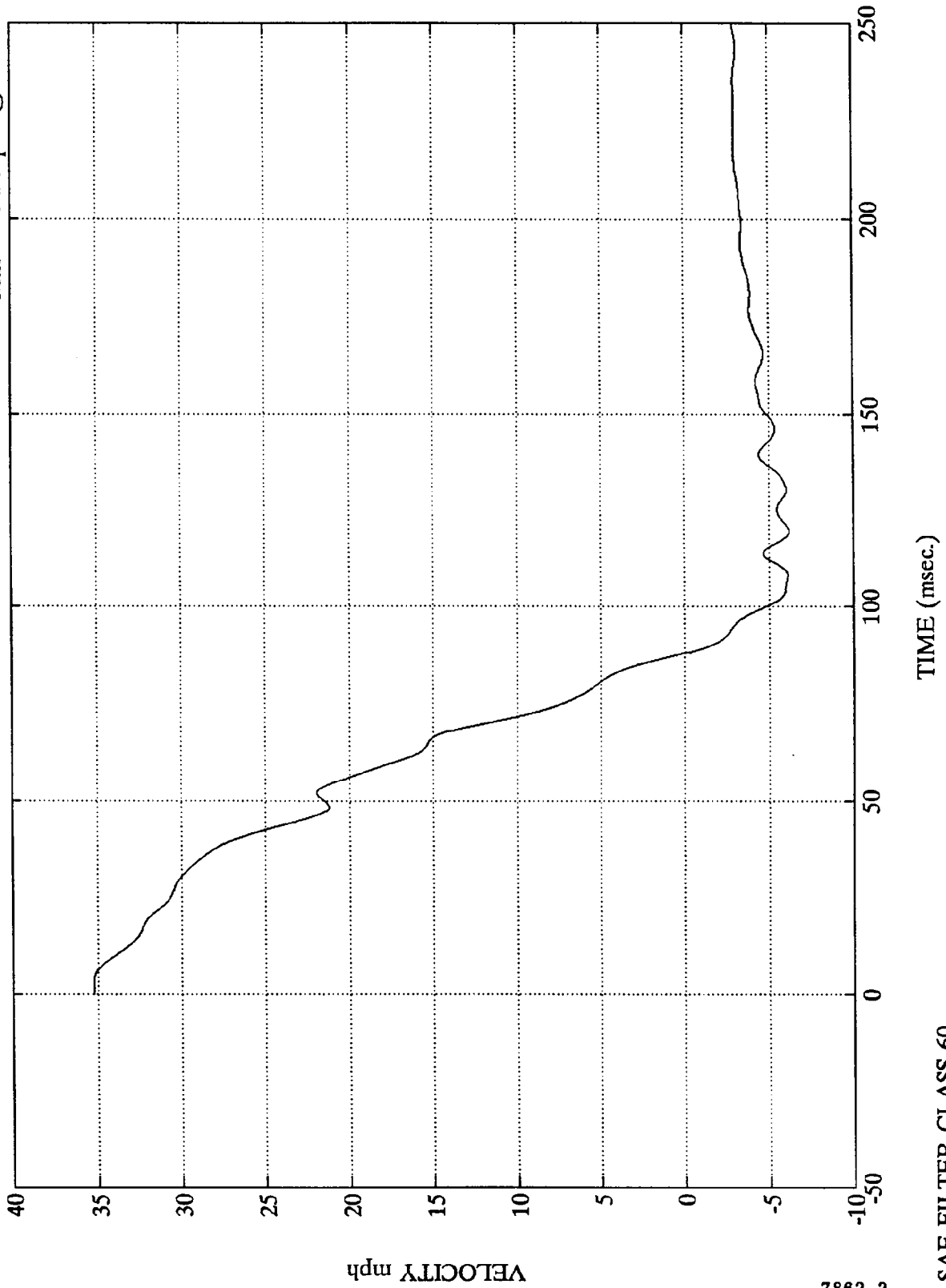
ACCELEROMETER #9(X)

Max = 20.3 G's @ 111.2 msec
Min = -52.8 G's @ 70.1 msec



Test 1019
Max = 35.2 mph @ 3.8 msec
Min = -6.2 mph @ 119.5 msec

ACCELEROMETER #9(X)

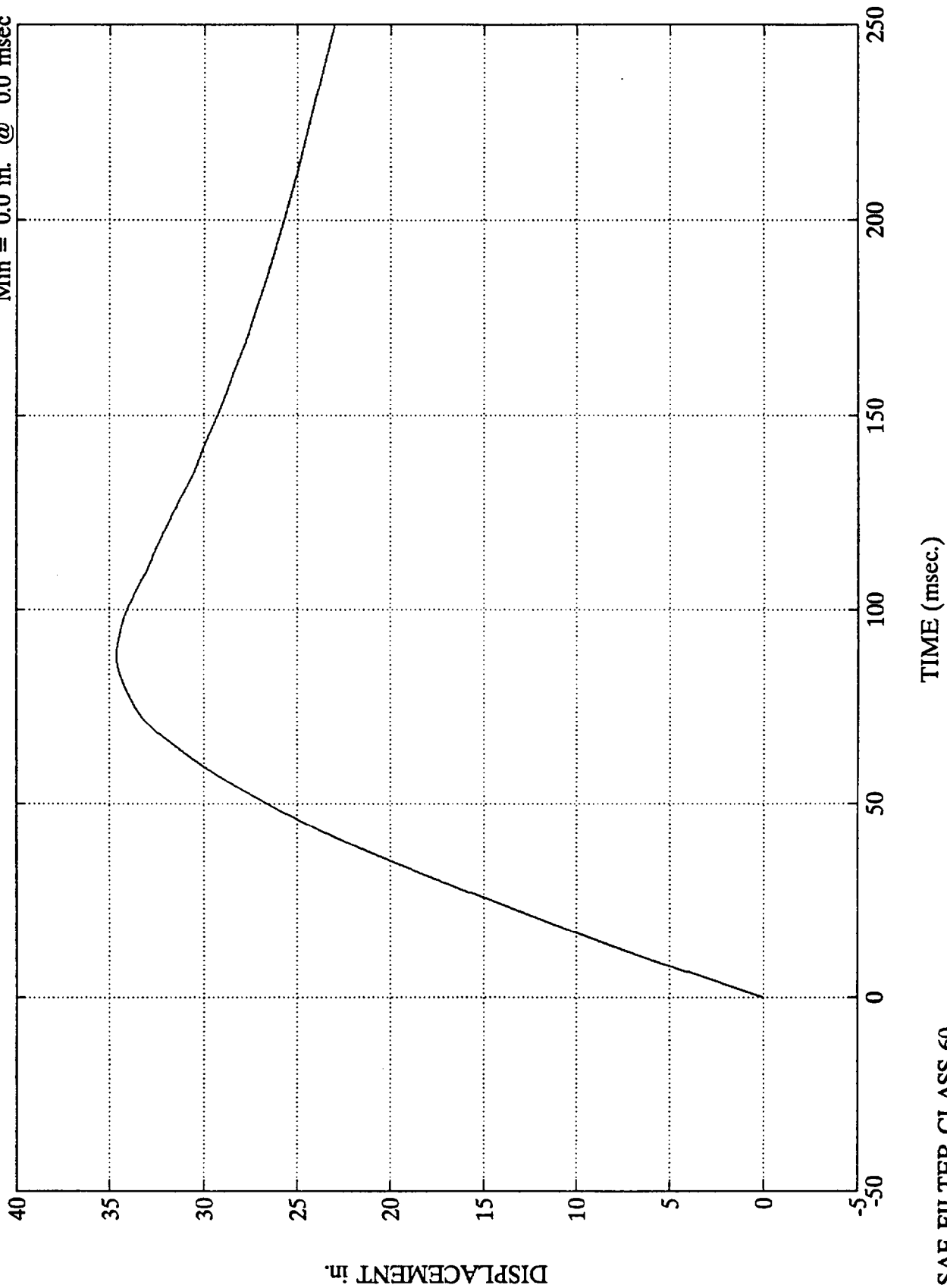


SAE FILTER CLASS 60

Test 1019

ACCELEROMETER #9(X)

Max = 34.6 in. @ 89.3 msec
Min = 0.0 in. @ 0.0 msec



B-27

7862-2

SAE FILTER CLASS 60

TEST NO. MM0300

LOAD CELL BARRIER DATA

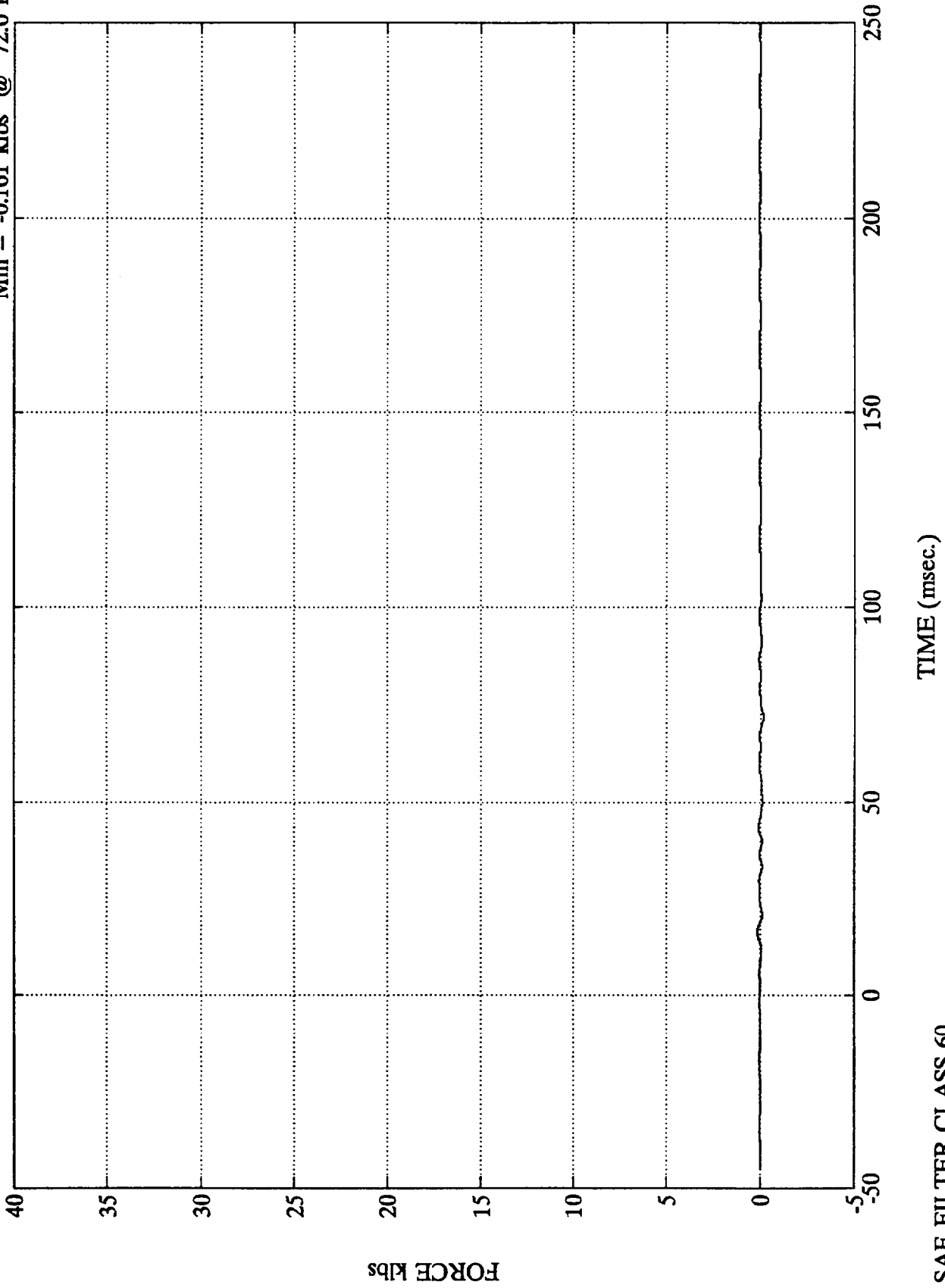
FILTER CHANNEL CLASS

60

Test 1019

BARRIER LOAD CELL A1

Max = 0.149 klbs @ 16.2 msec
Min = -0.161 klbs @ 72.0 msec

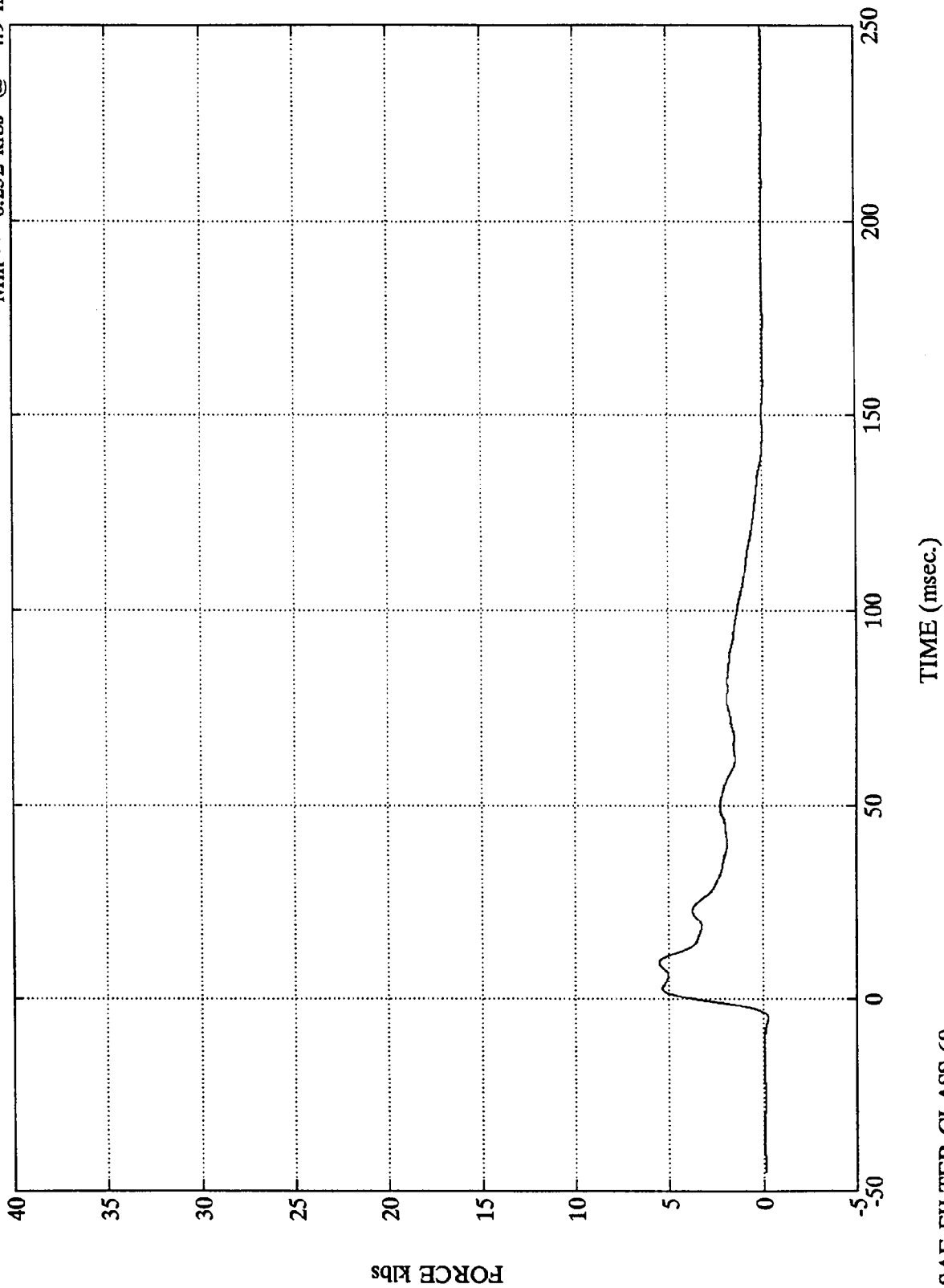


SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL A2

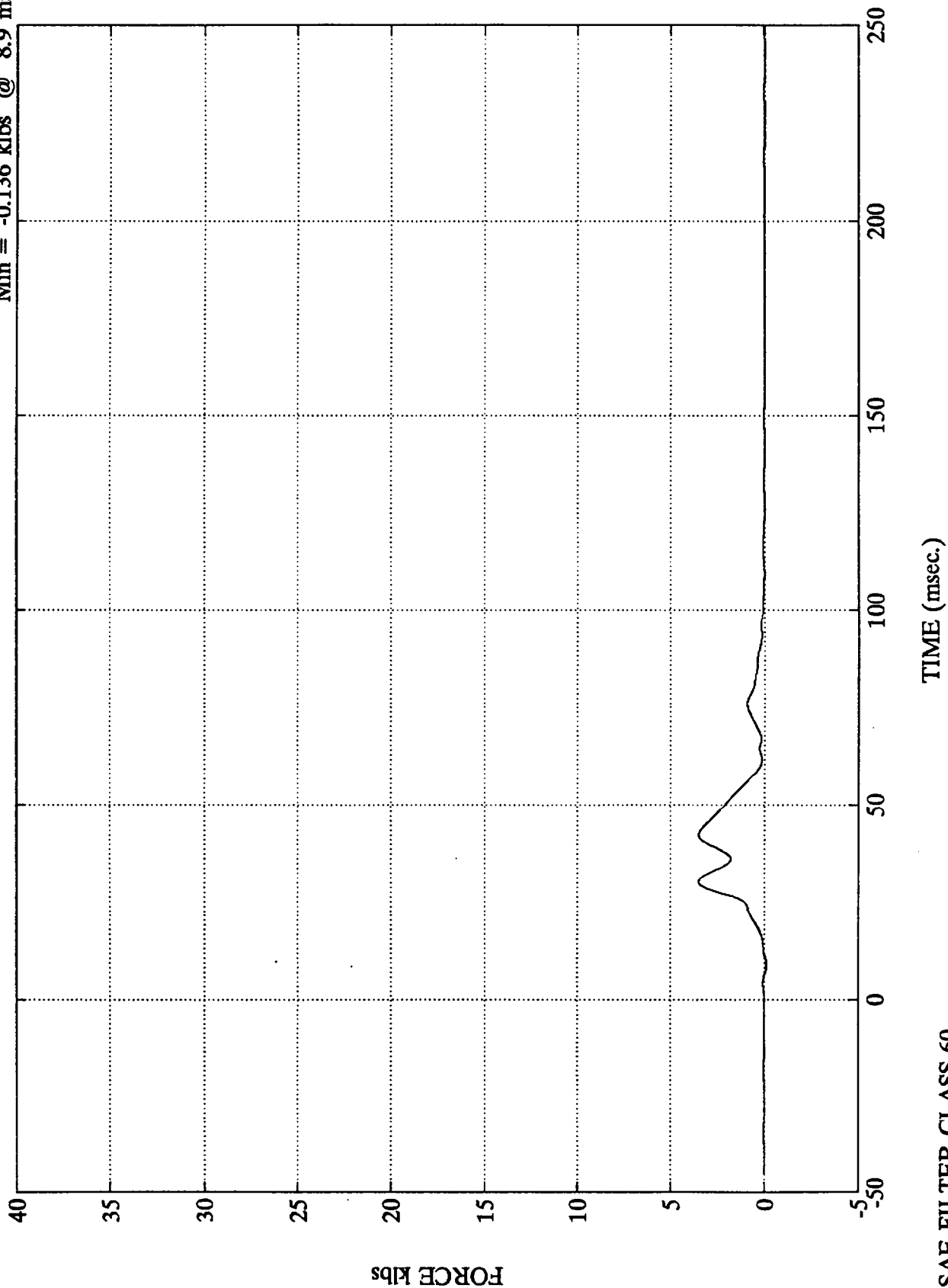
Max = 5.531 klbs @ 9.5 msec
Min = -0.252 klbs @ -4.9 msec



SAE FILTER CLASS 60

Test 1019
Max = 3.502 klbs @ 30.4 msec
Min = -0.136 klbs @ 8.9 msec

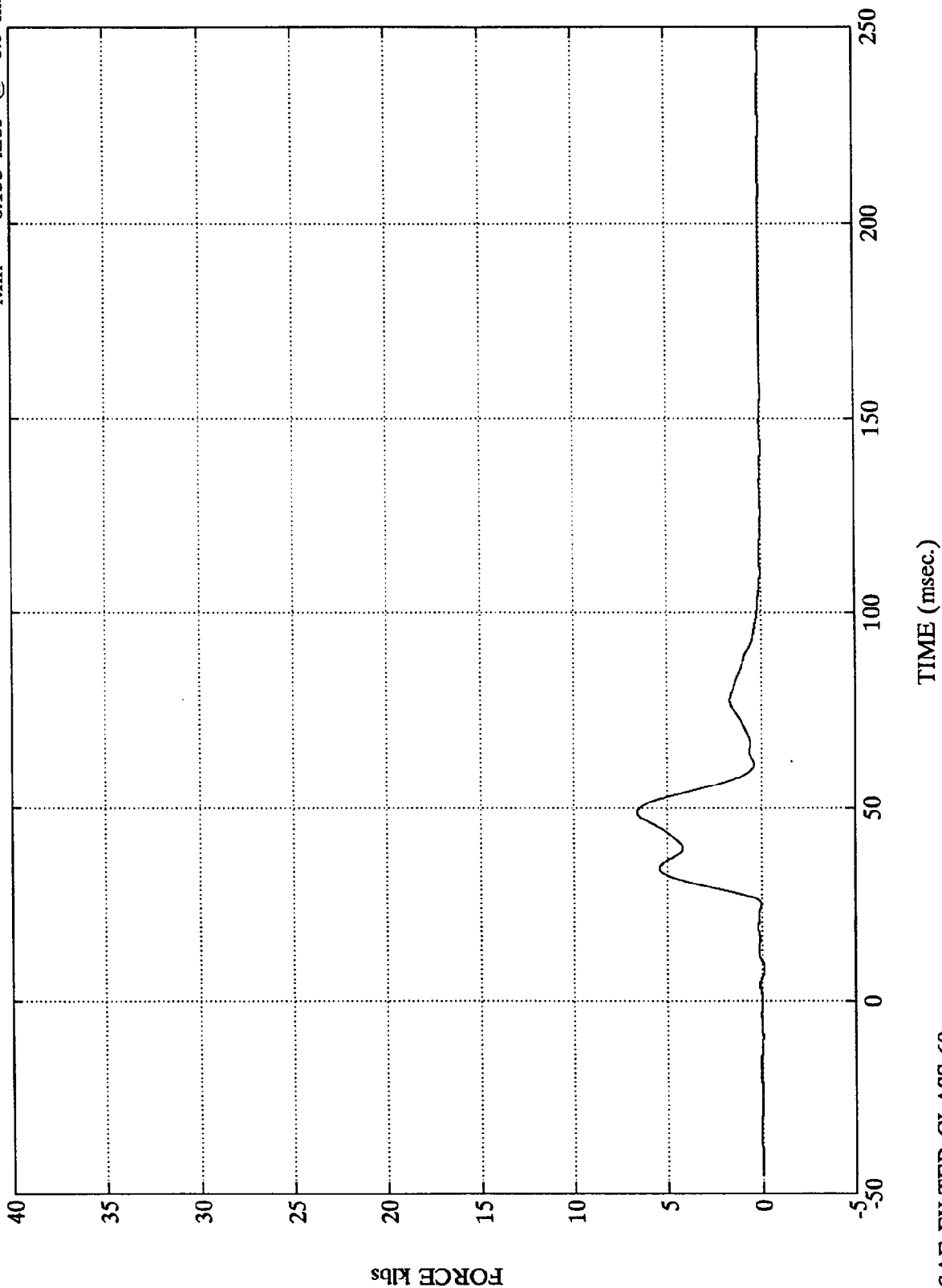
BARRIER LOAD CELL A3



SAE FILTER CLASS 60

Test 1019
Max = 6.657 klbs @ 49.0 msec
Min = -0.133 klbs @ 8.5 msec

BARRIER LOAD CELL A4

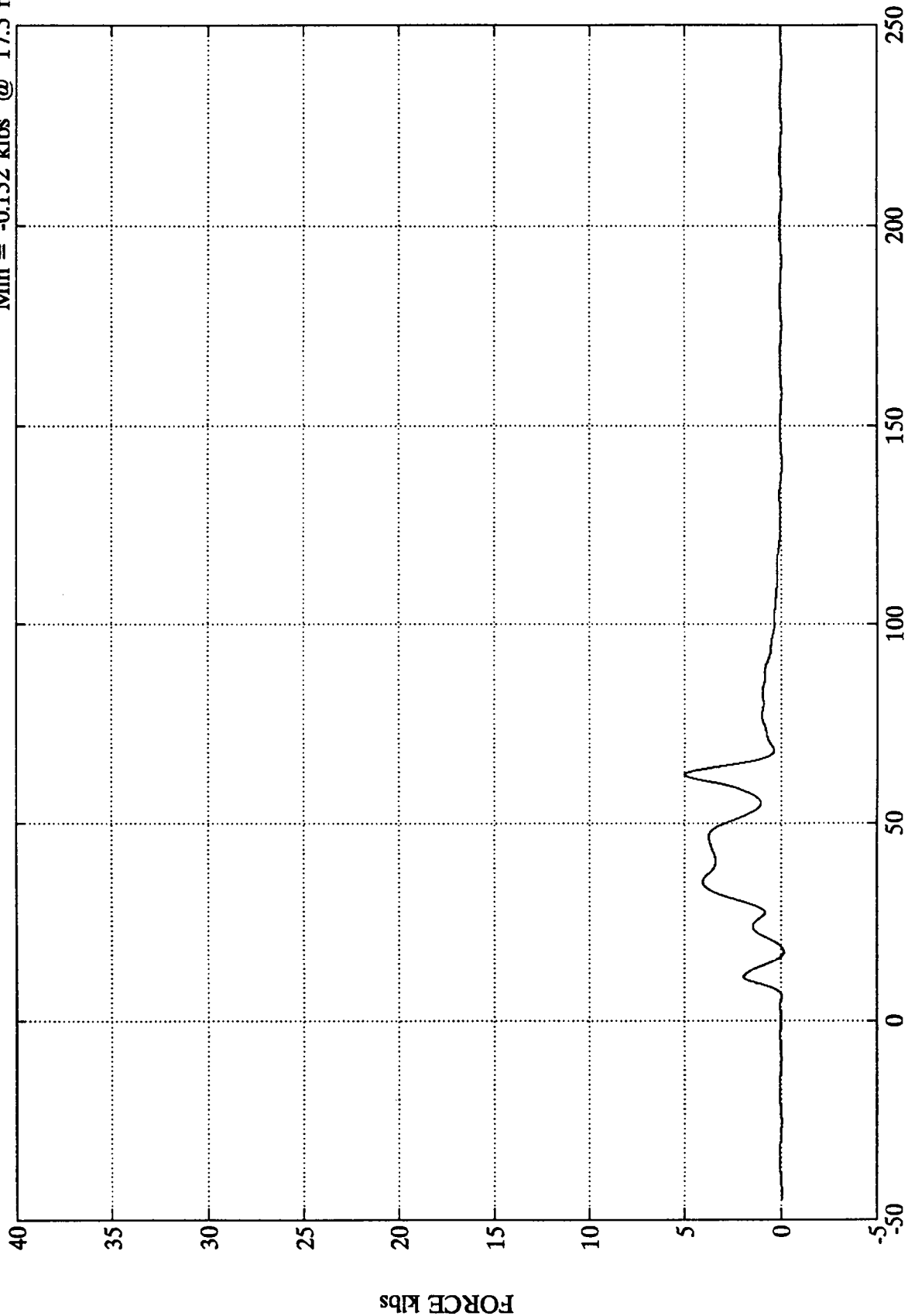


SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL A5

Max = 5.010 klbs @ 62.3 msec
Min = -0.152 klbs @ 17.5 msec



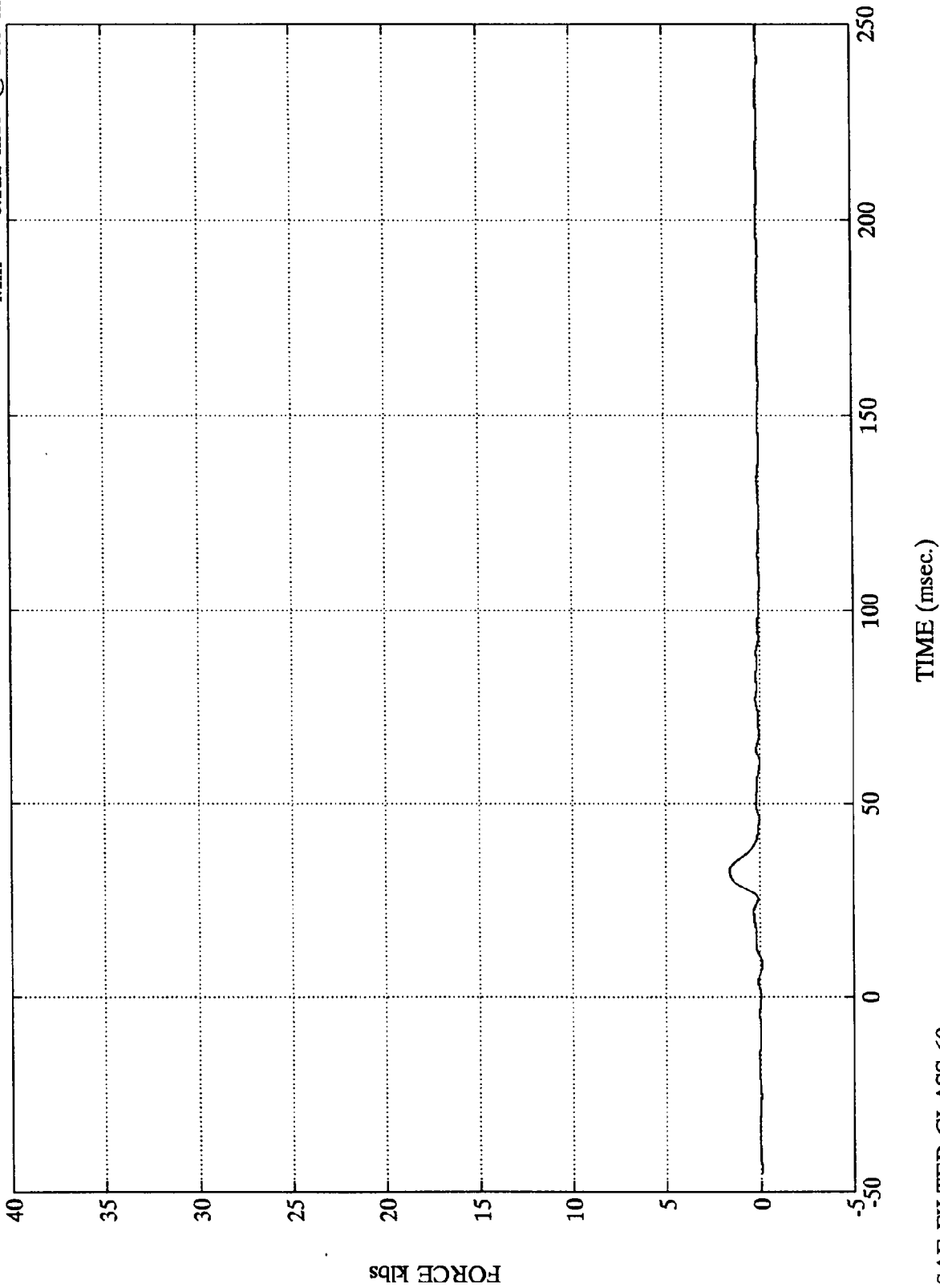
TIME (msec.)

SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL A6

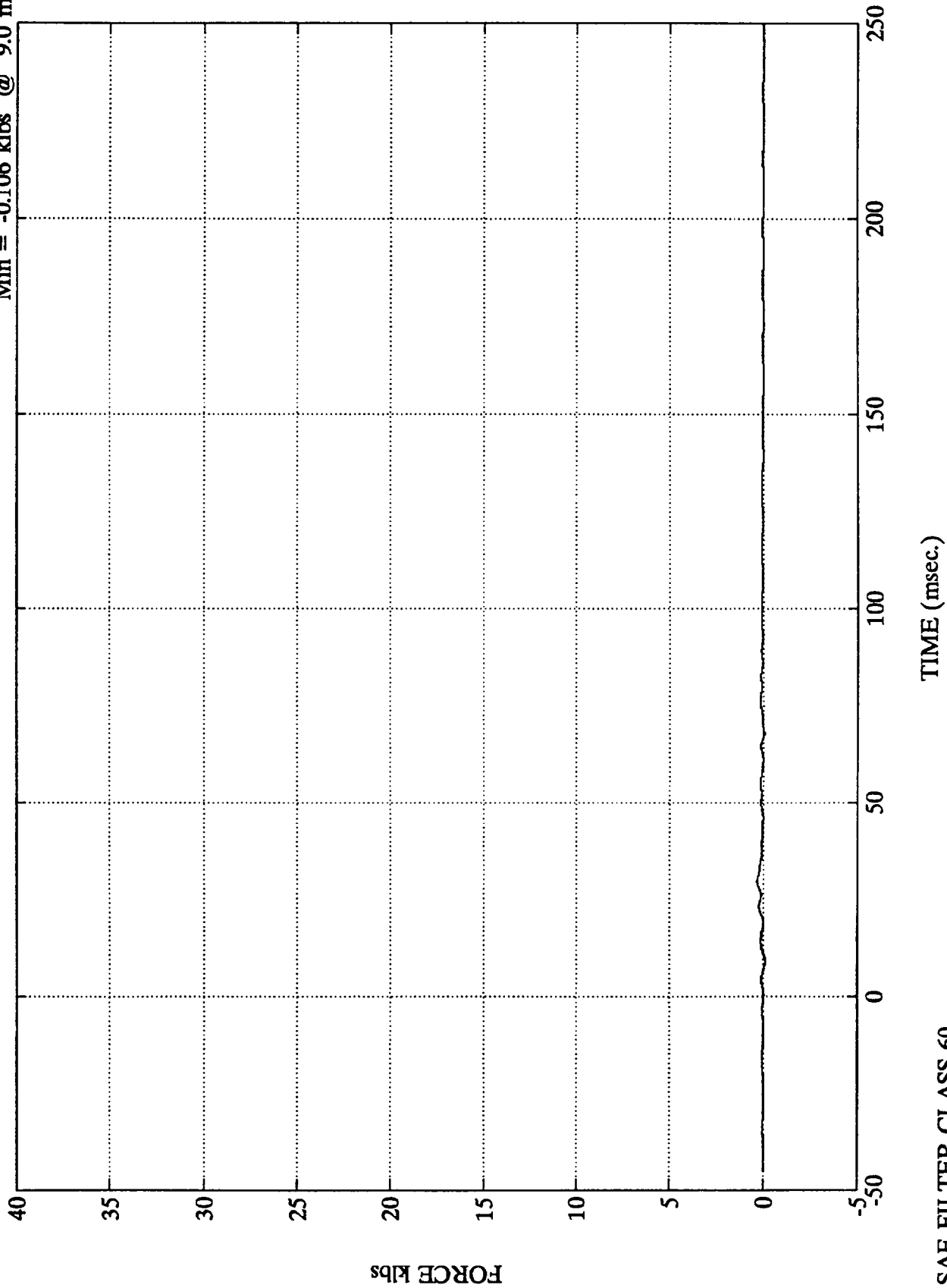
Max = 1.604 klbs @ 32.6 msec
Min = -0.121 klbs @ 8.5 msec



SAE FILTER CLASS 60

Test 1019
Max = 0.317 klbs @ 29.6 msec
Min = -0.106 klbs @ 9.0 msec

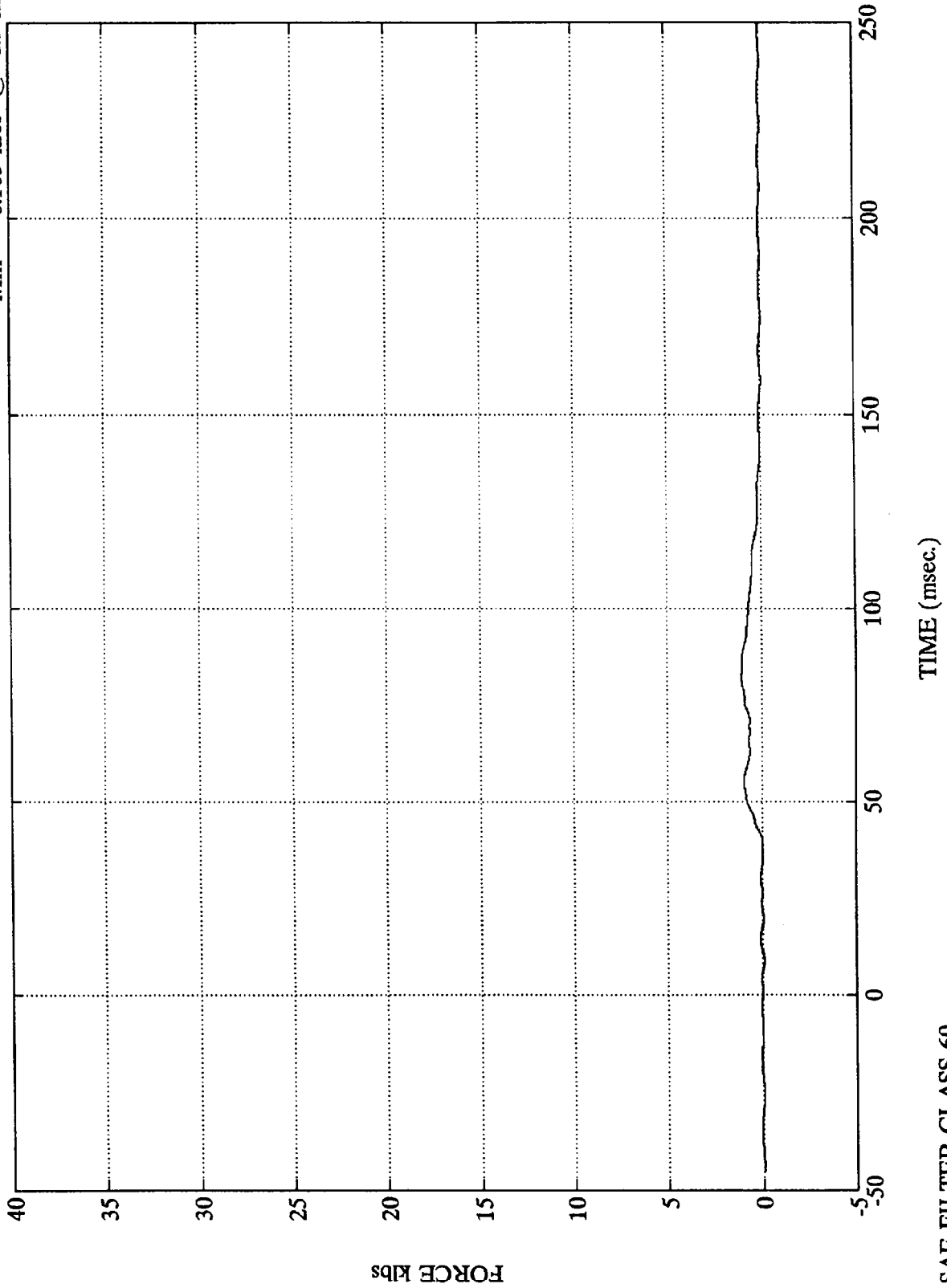
BARRIER LOAD CELL A7



SAE FILTER CLASS 60

Test 1019
Max = 1.082 klbs @ 82.1 msec
Min = -0.103 klbs @ 8.9 msec

BARRIER LOAD CELL A8

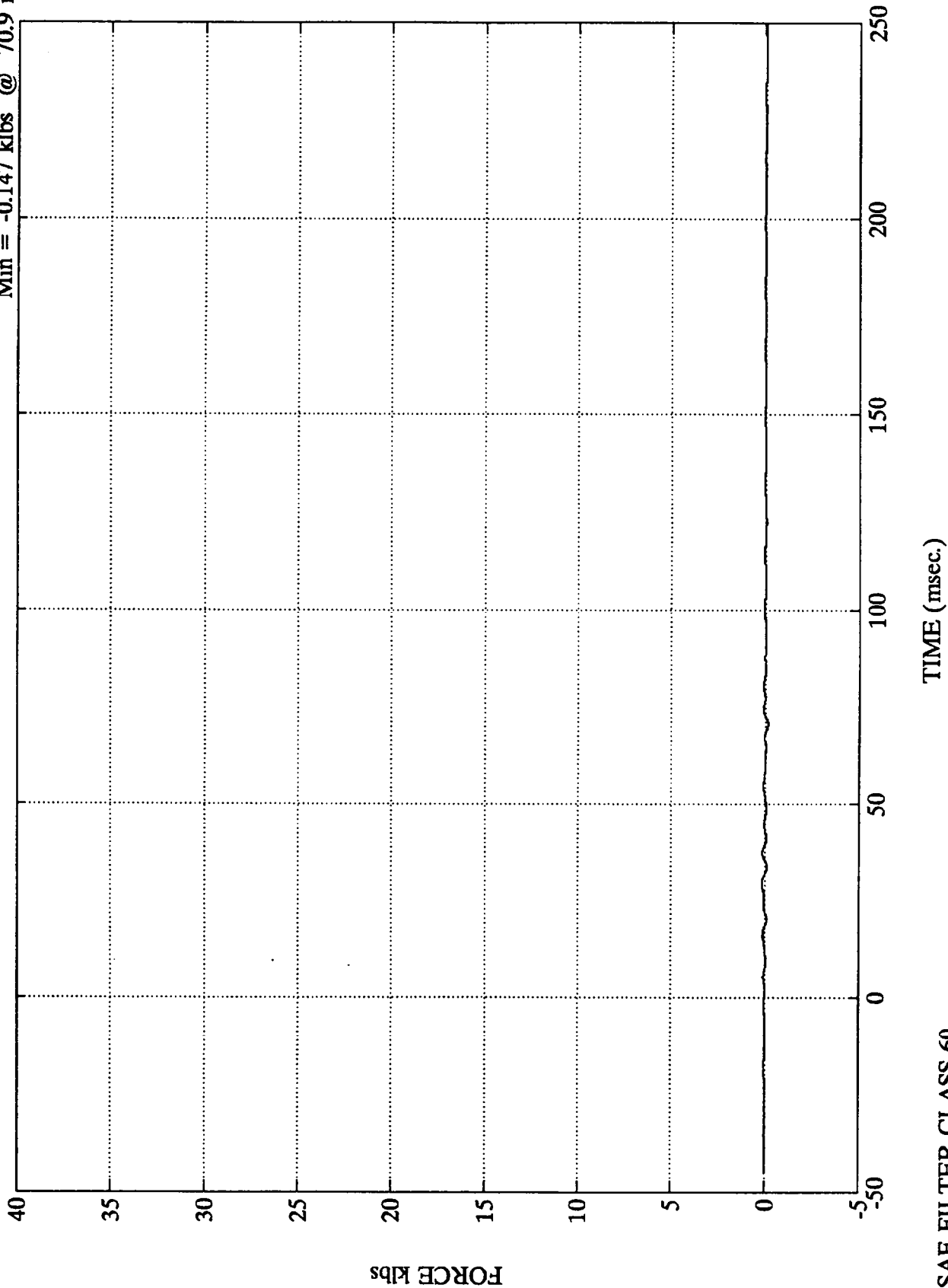


SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL A9

Max = 0.157 klbs @ 29.5 msec
Min = -0.147 klbs @ 70.9 msec

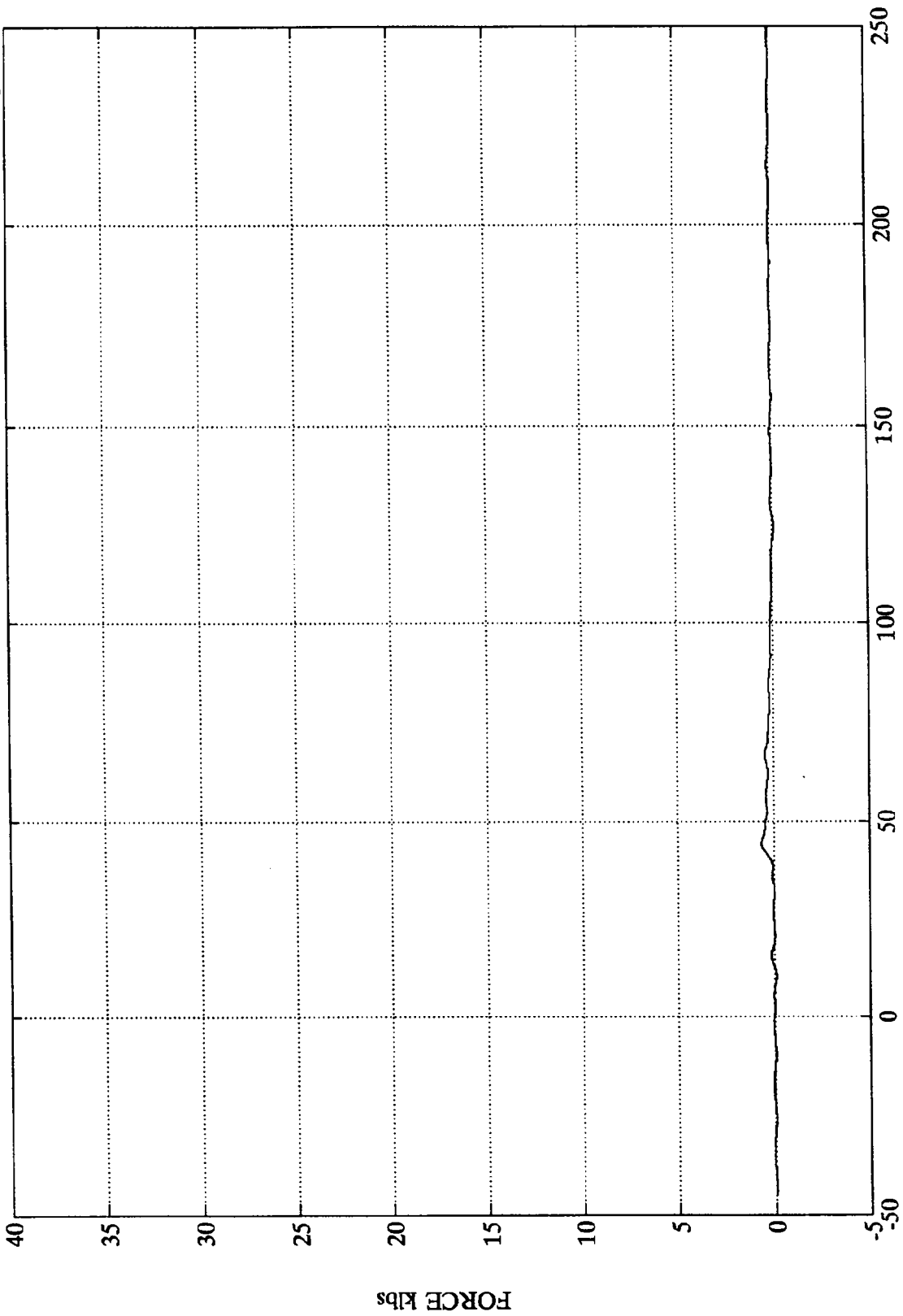


SAE FILTER CLASS 60

Test 1019
BARRIER LOAD CELL B1
Max = 0.633 klbs @ 44.3 msec
Min = -0.103 klbs @ 124.3 msec

SAE FILTER CLASS 60

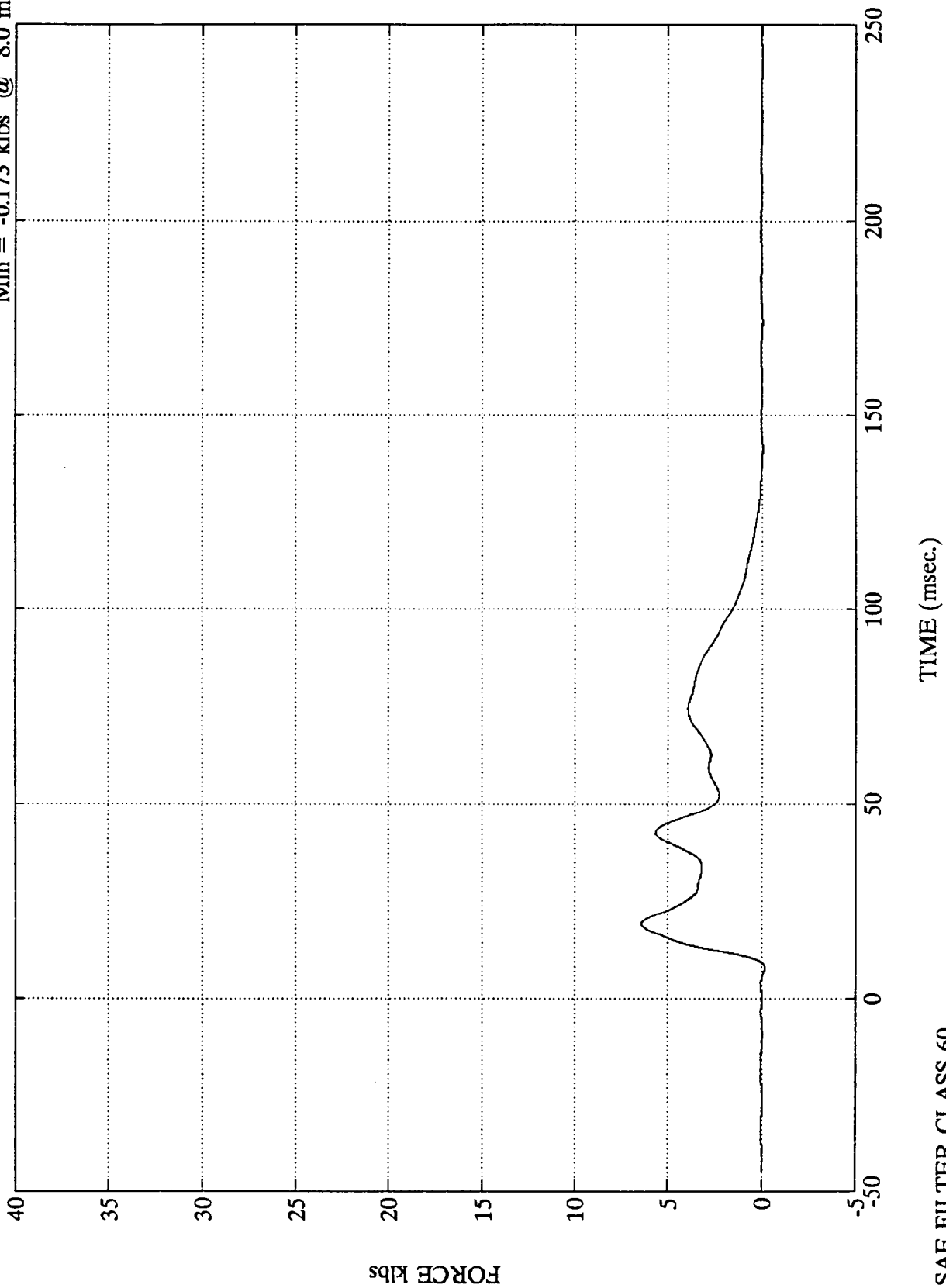
7862-2



Test 1019

BARRIER LOAD CELL B2

Max = 6.439 klbs @ 19.3 msec
Min = -0.173 klbs @ 8.0 msec



B-39

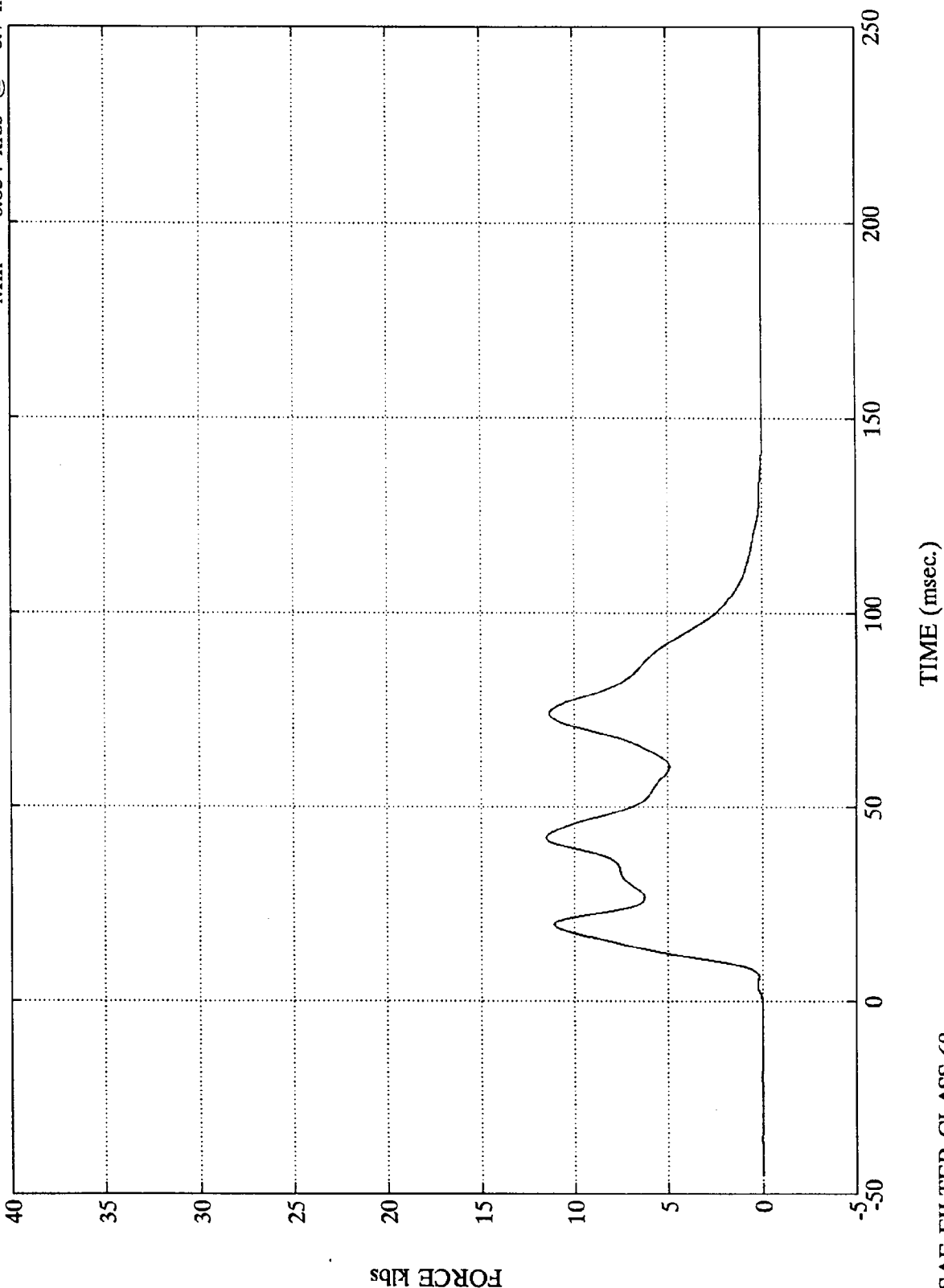
7862-2

SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL B3

Max = 11.516 klbs @ 42.4 msec
Min = -0.034 klbs @ -0.7 msec



B-40

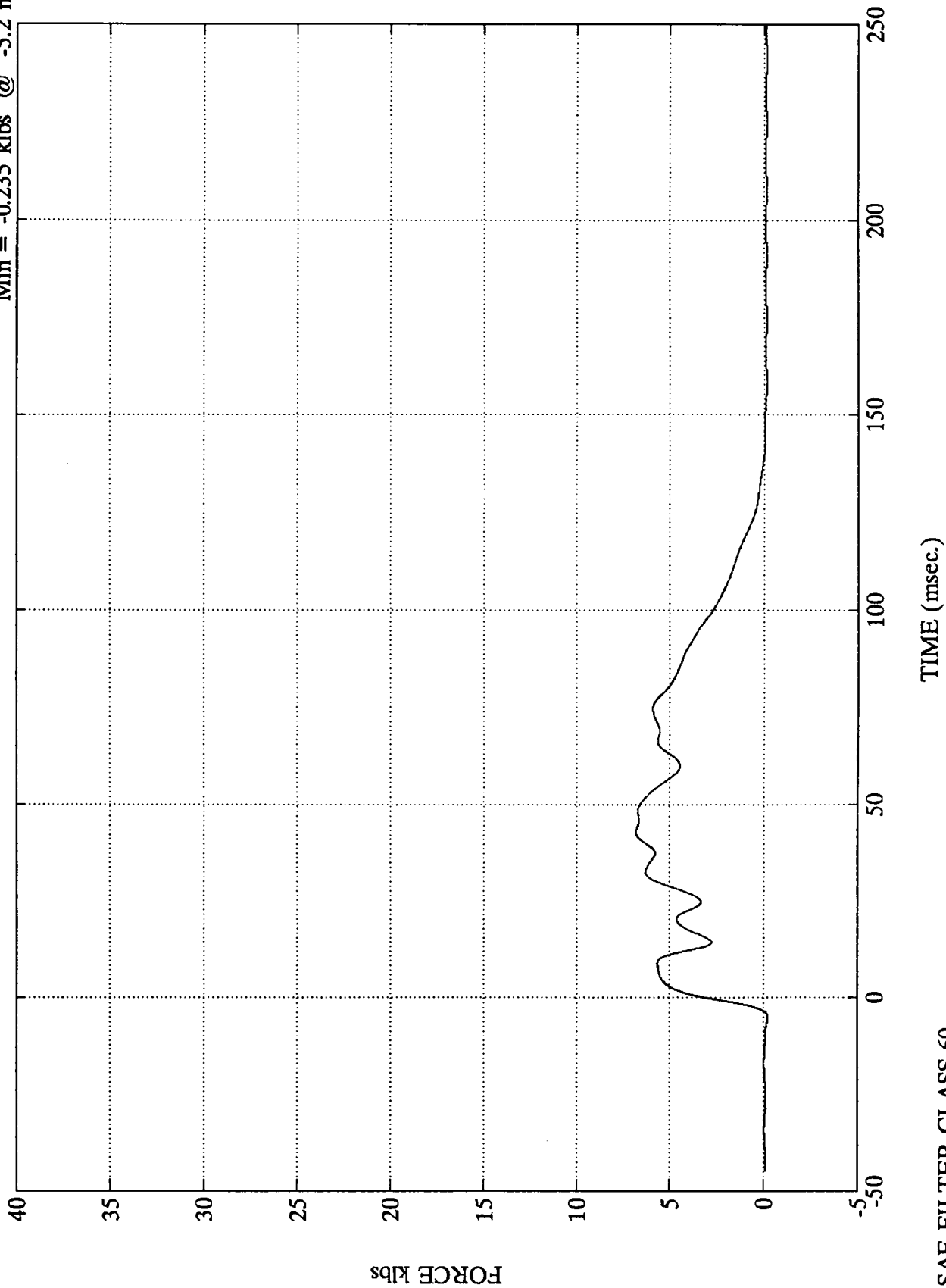
7862-2

SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL B4

Max = 6.838 klbs @ 43.0 msec
Min = -0.235 klbs @ -5.2 msec



B-41

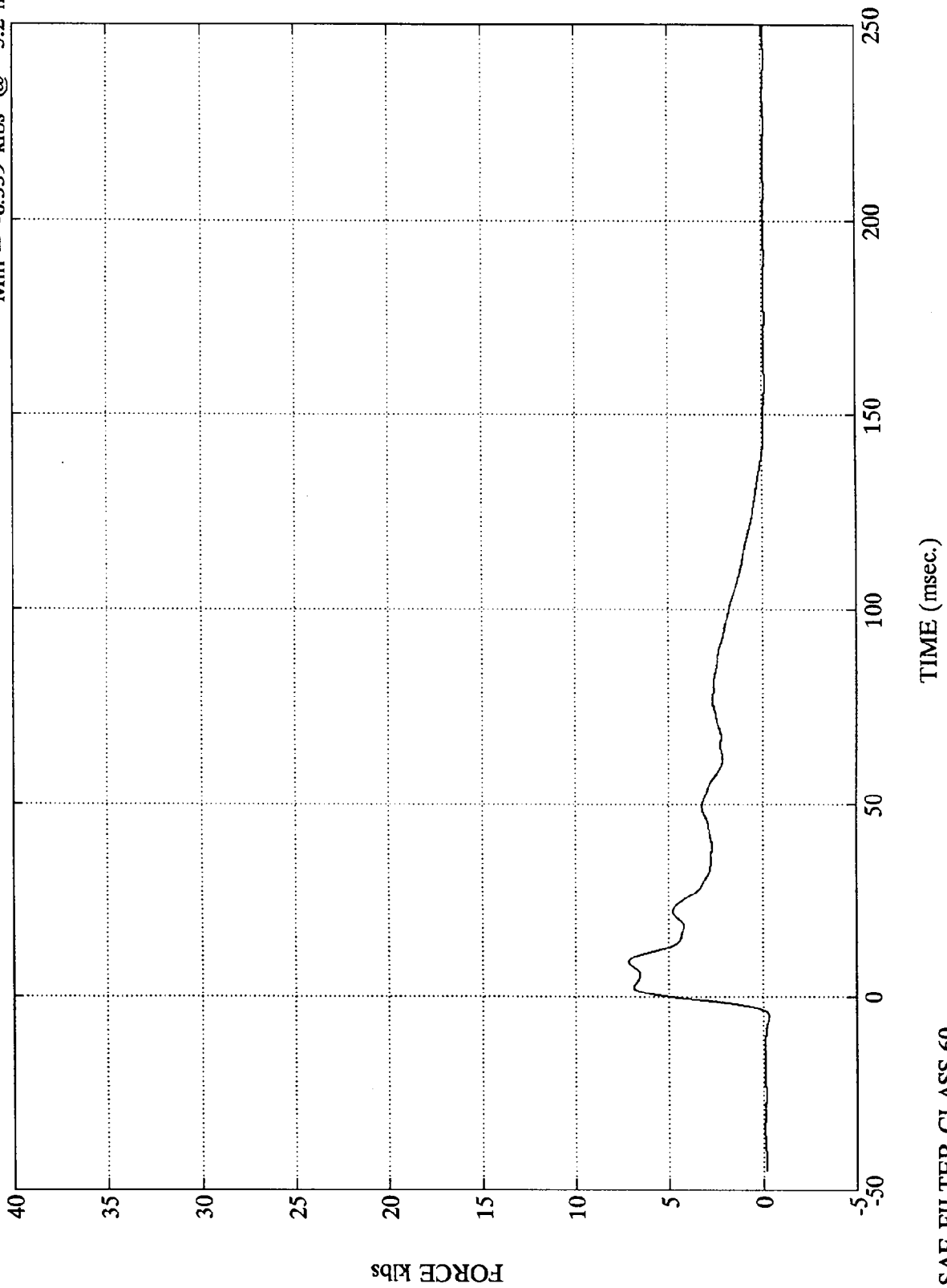
7862-2

SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL B5

Max = 7.170 klbs @ 9.4 msec
Min = -0.339 klbs @ -5.2 msec

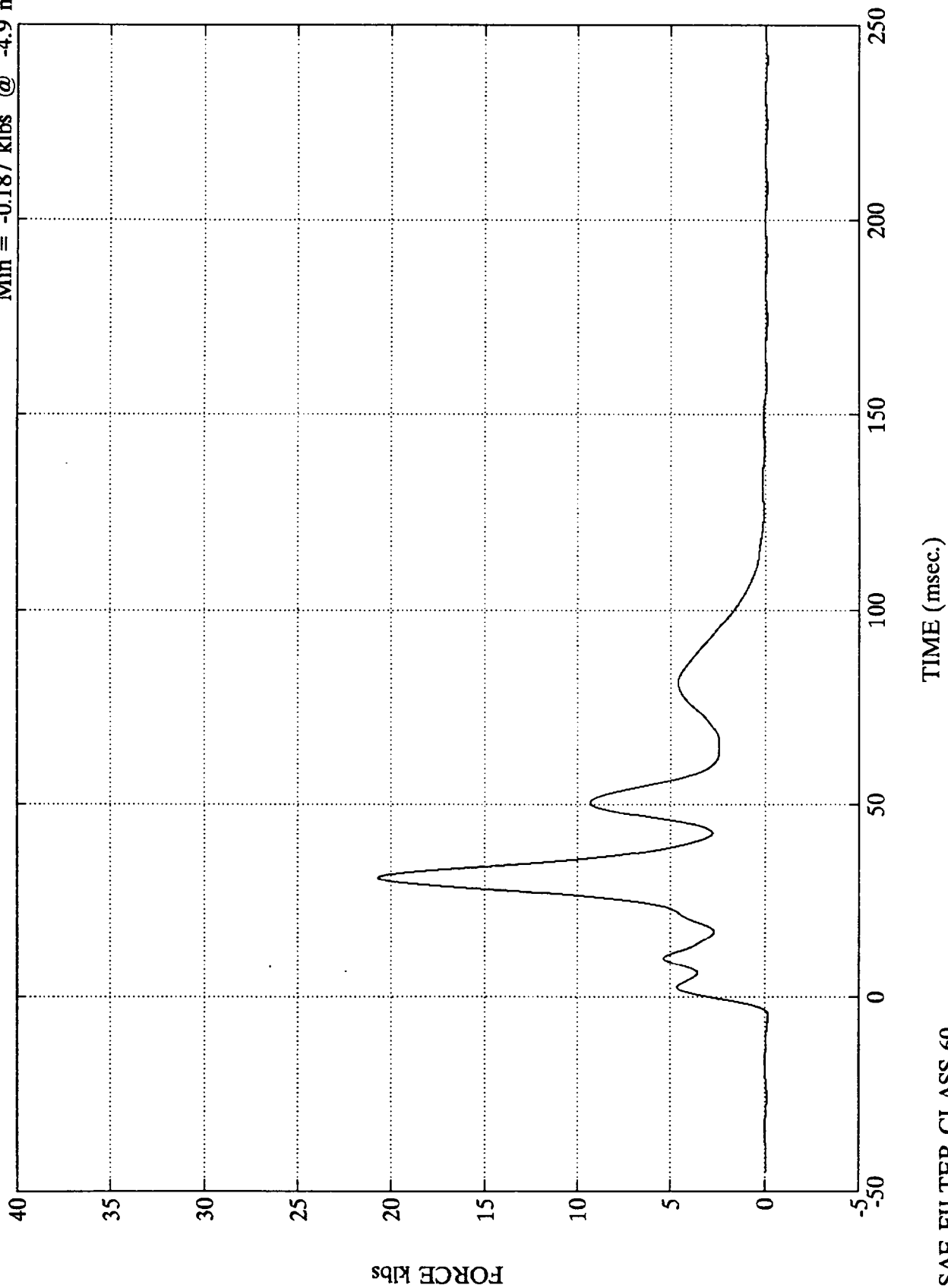


SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL B6

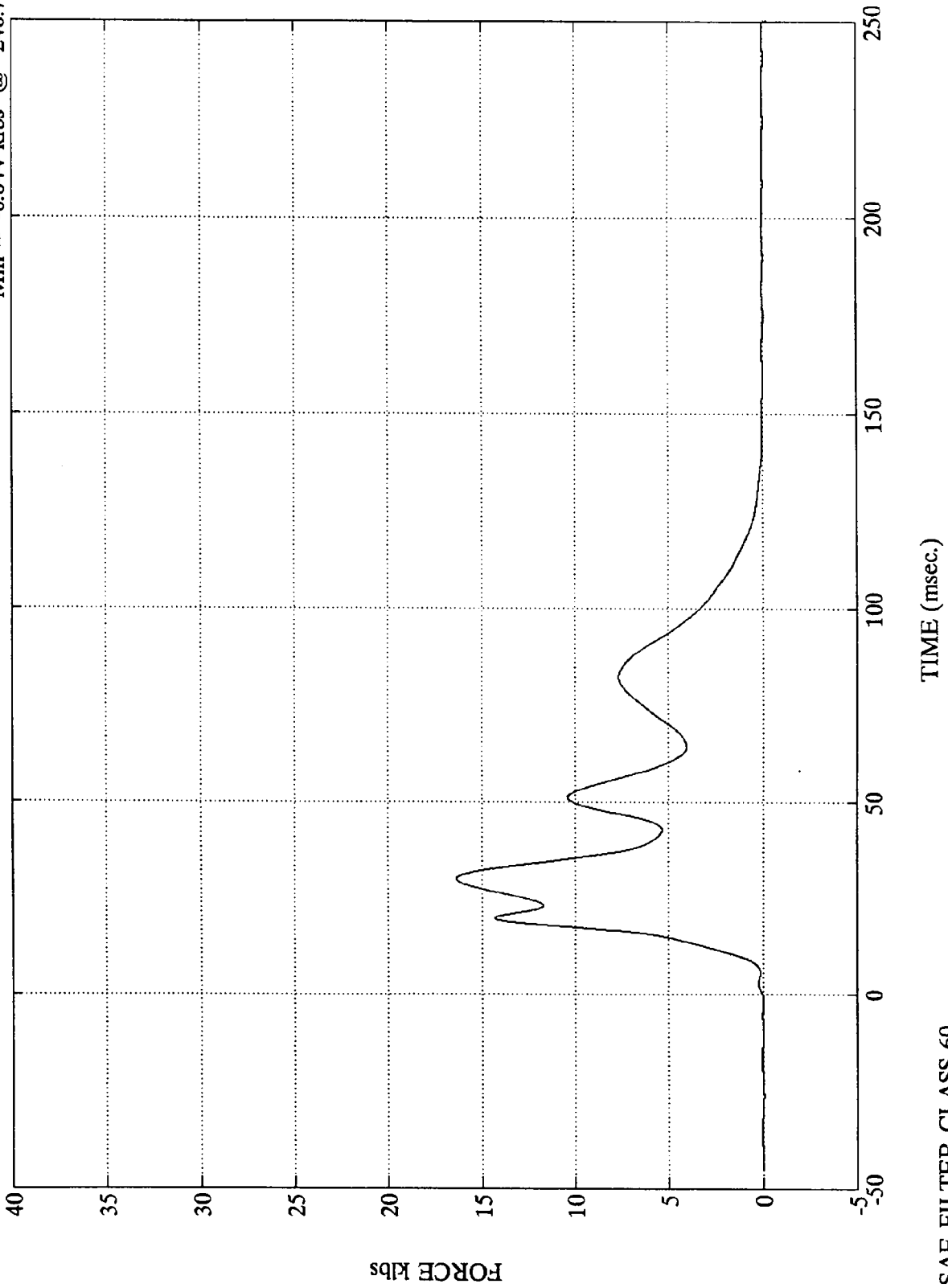
Max = 20.703 klbs @ 31.0 msec
Min = -0.187 klbs @ -4.9 msec



Test 1019

BARRIER LOAD CELL B7

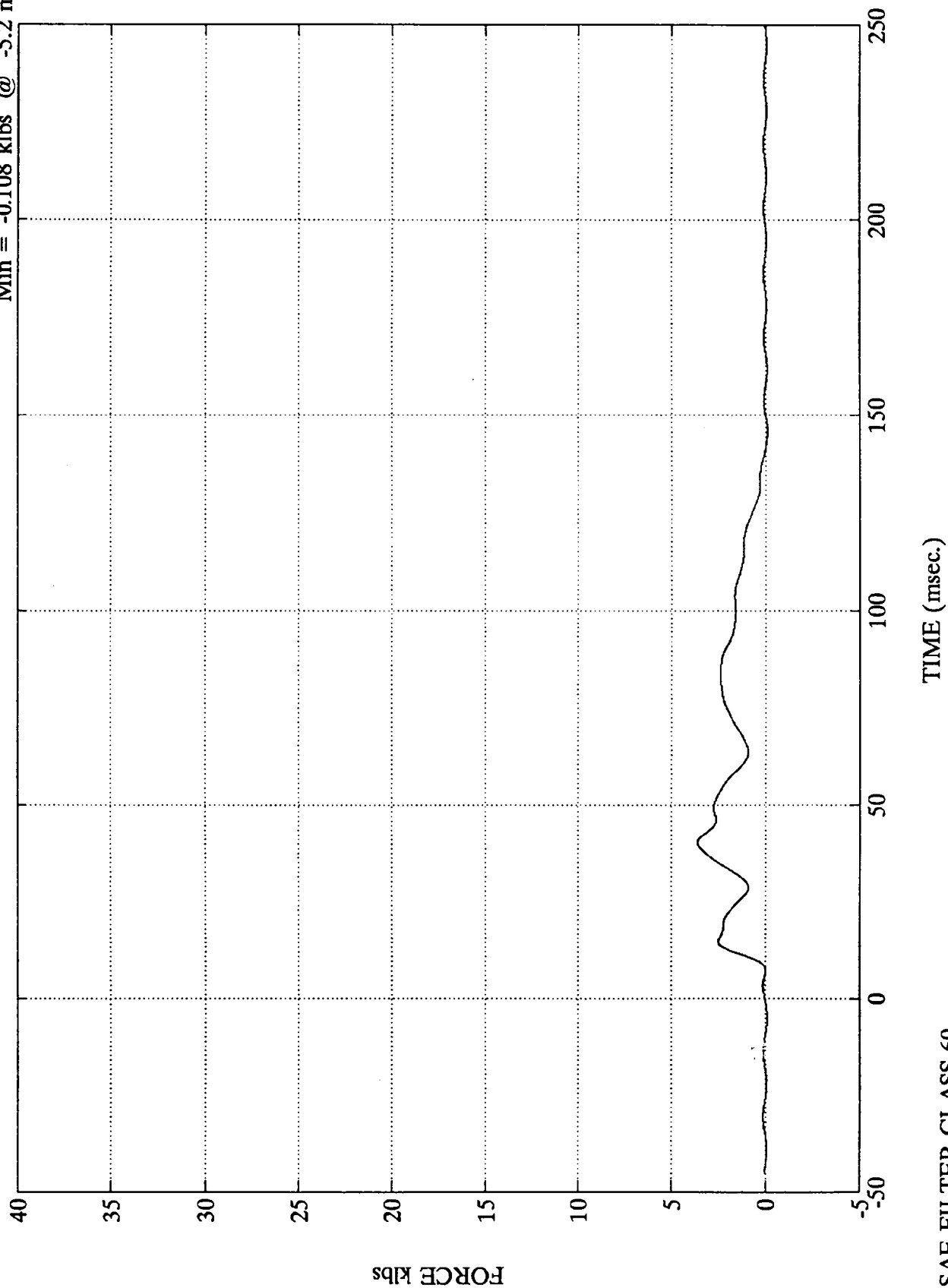
Max = 16.371 klbs @ 30.5 msec
Min = -0.044 klbs @ 240.7 msec



Test 1019

BARRIER LOAD CELL B8

Max = 3.620 klbs @ 40.3 msec
Min = -0.108 klbs @ -5.2 msec



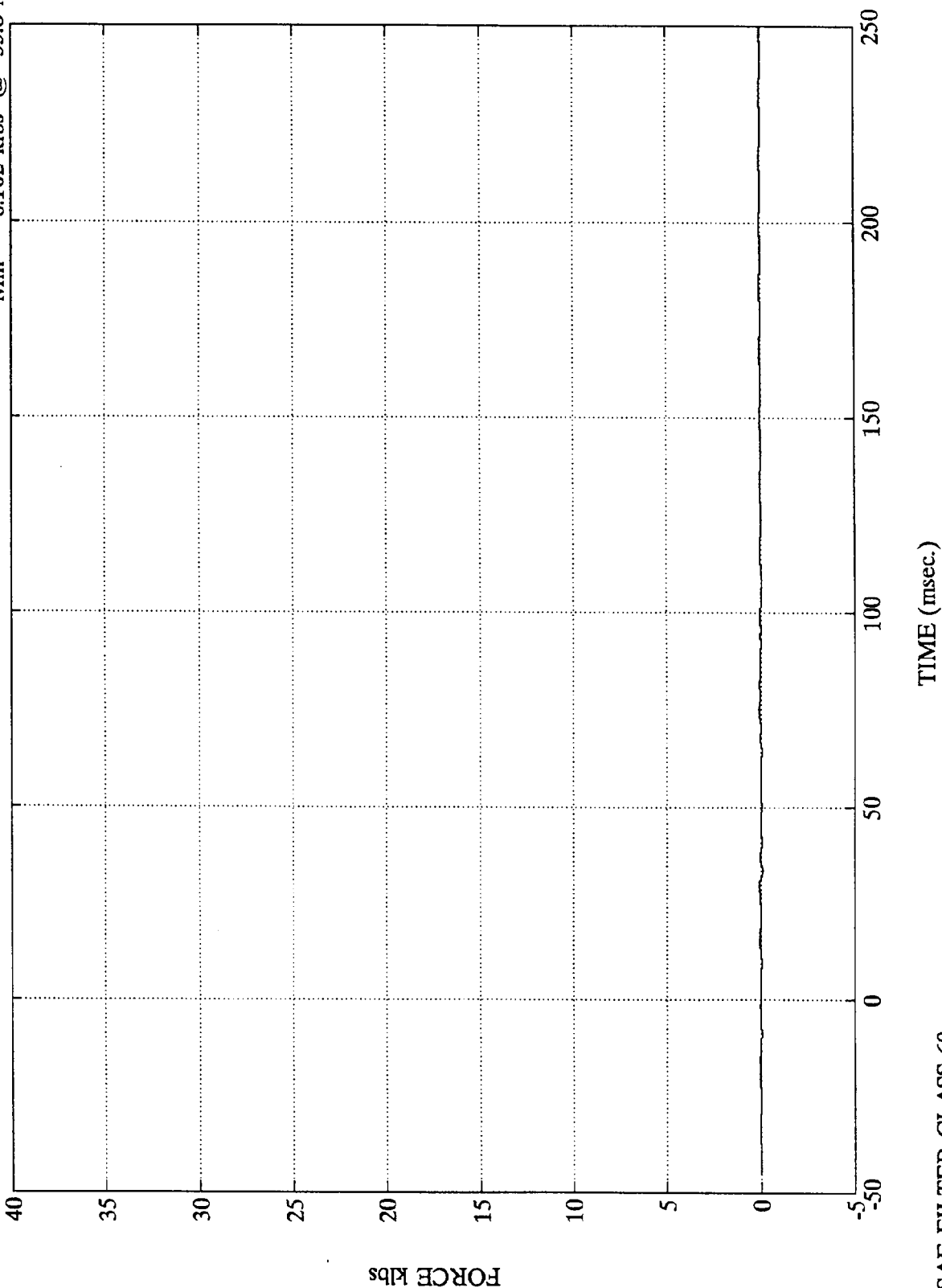
B-45

7862-2

SAE FILTER CLASS 60

Test 1019
Max = 0.115 klbs @ 75.0 msec
Min = -0.102 klbs @ 33.8 msec

BARRIER LOAD CELL B9

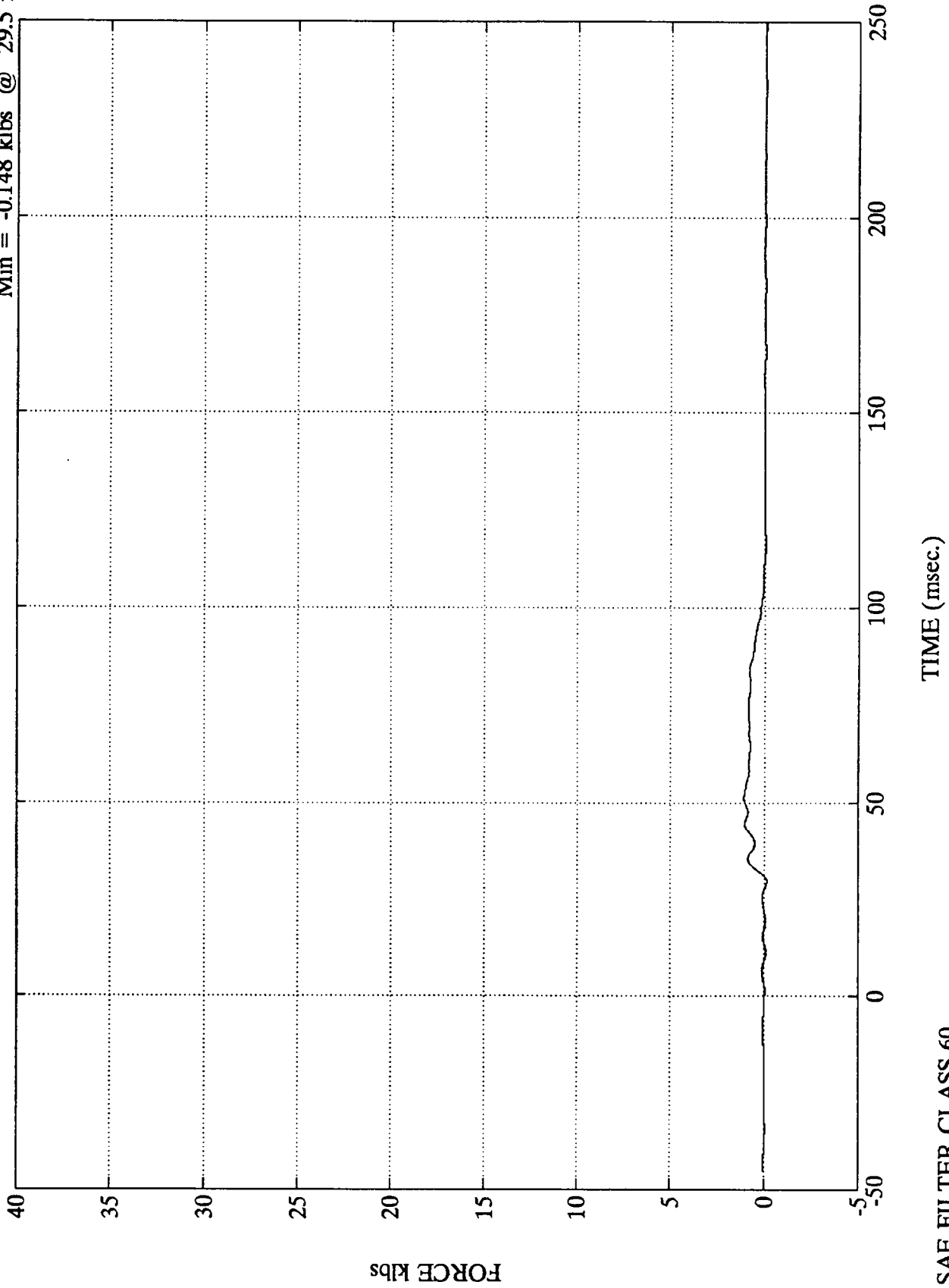


SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL C1

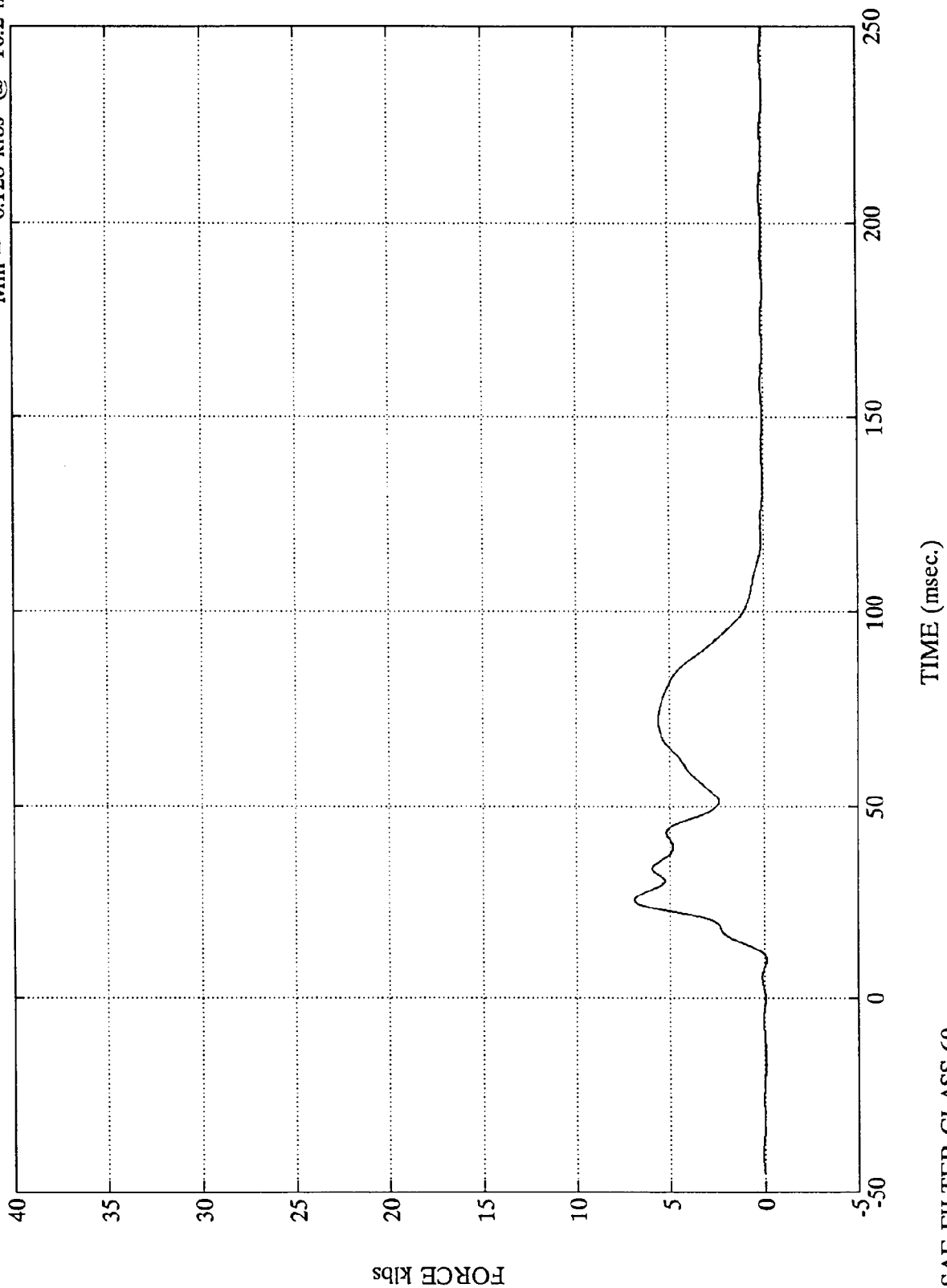
Max = 1.077 klbs @ 51.4 msec
Min = -0.148 klbs @ 29.5 msec



SAE FILTER CLASS 60

Test 1019
Max = 6.917 klbs @ 26.0 msec
Min = -0.128 klbs @ 10.2 msec

BARRIER LOAD CELL C2

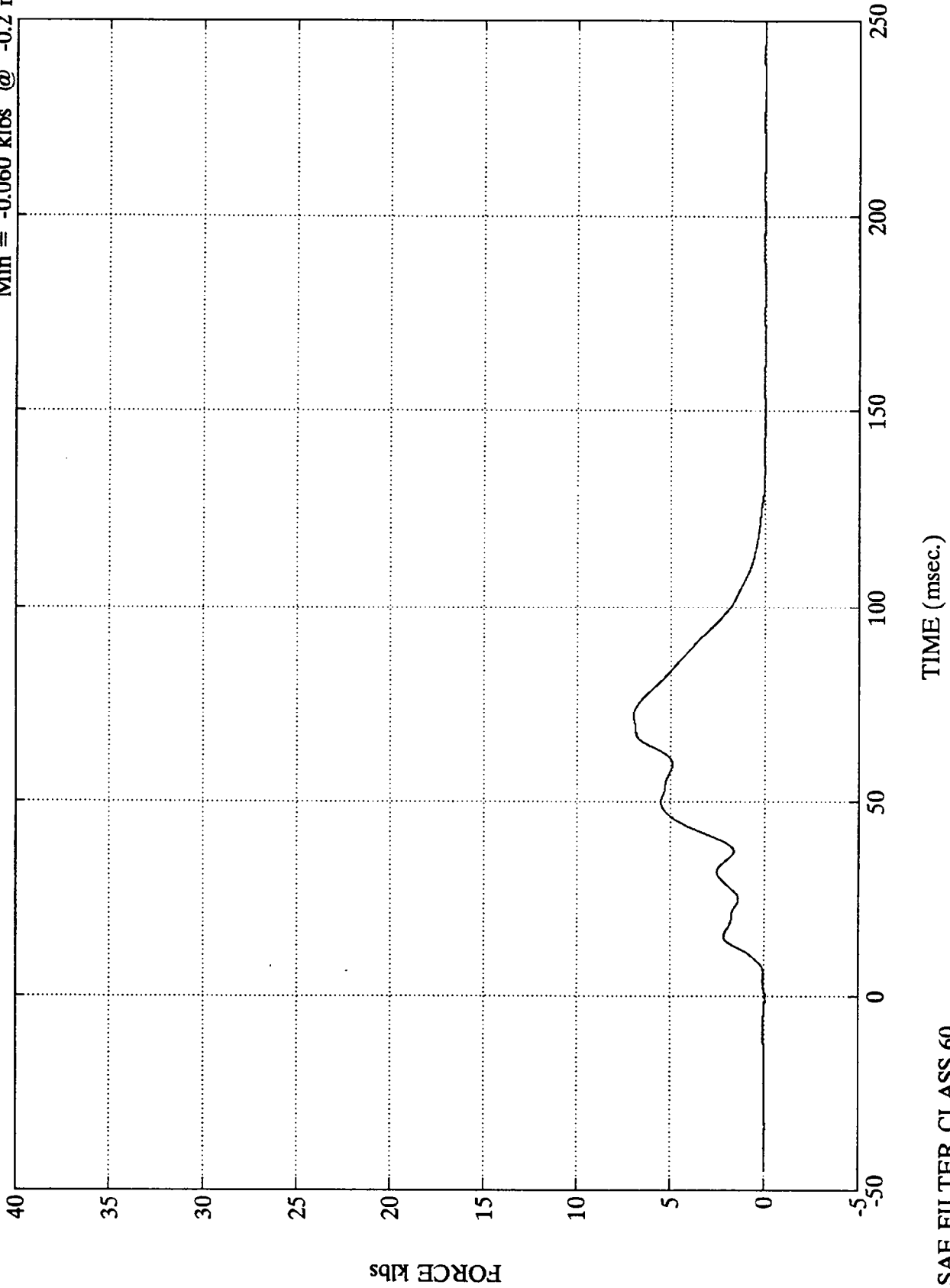


SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL C3

Max = 6.983 klbs @ 72.0 msec
Min = -0.060 klbs @ -0.2 msec



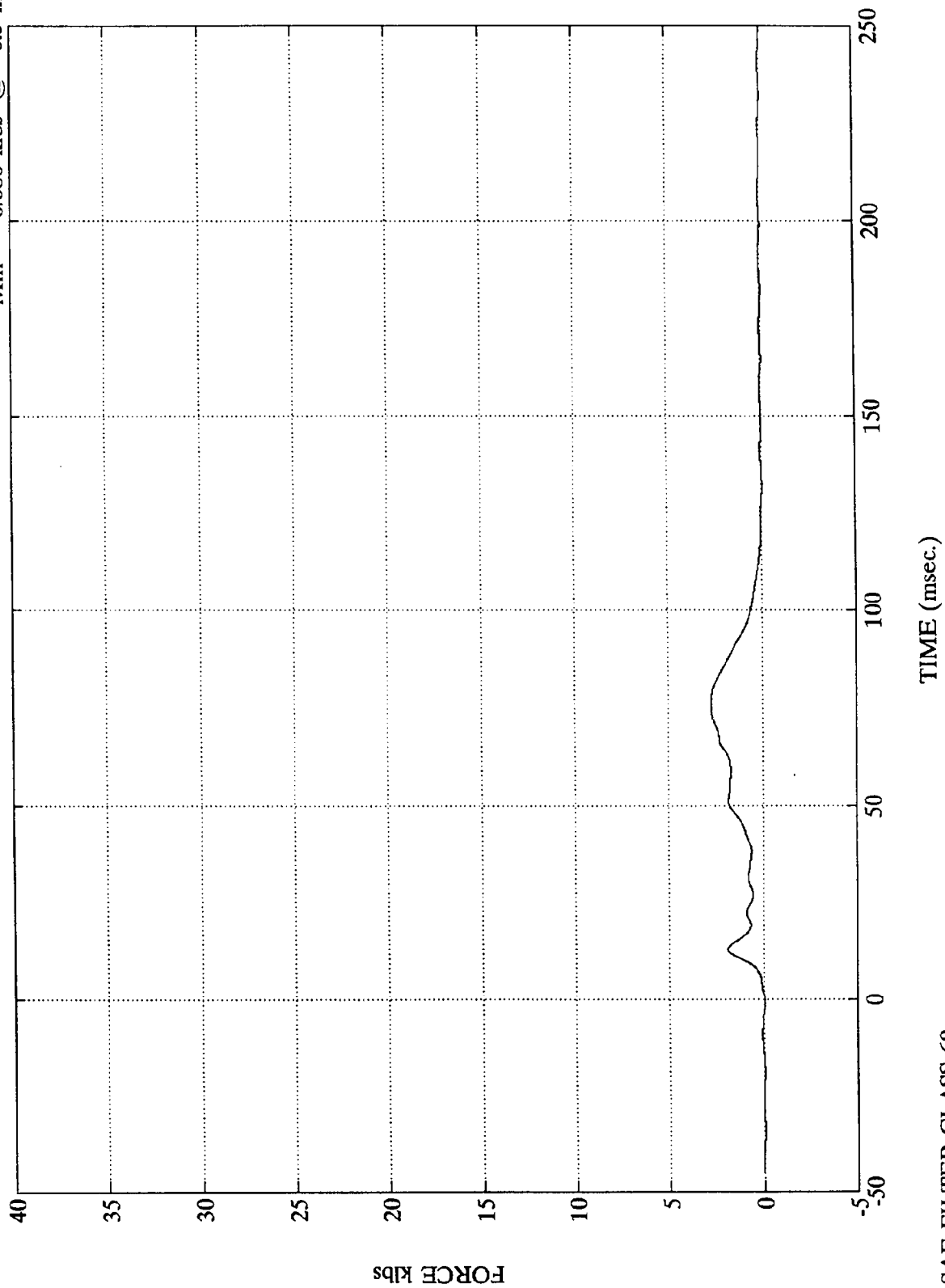
B-49

7862-2

SAE FILTER CLASS 60

Test 1019
Max = 2.705 klbs @ 74.8 msec
Min = -0.080 klbs @ -0.5 msec

BARRIER LOAD CELL C4

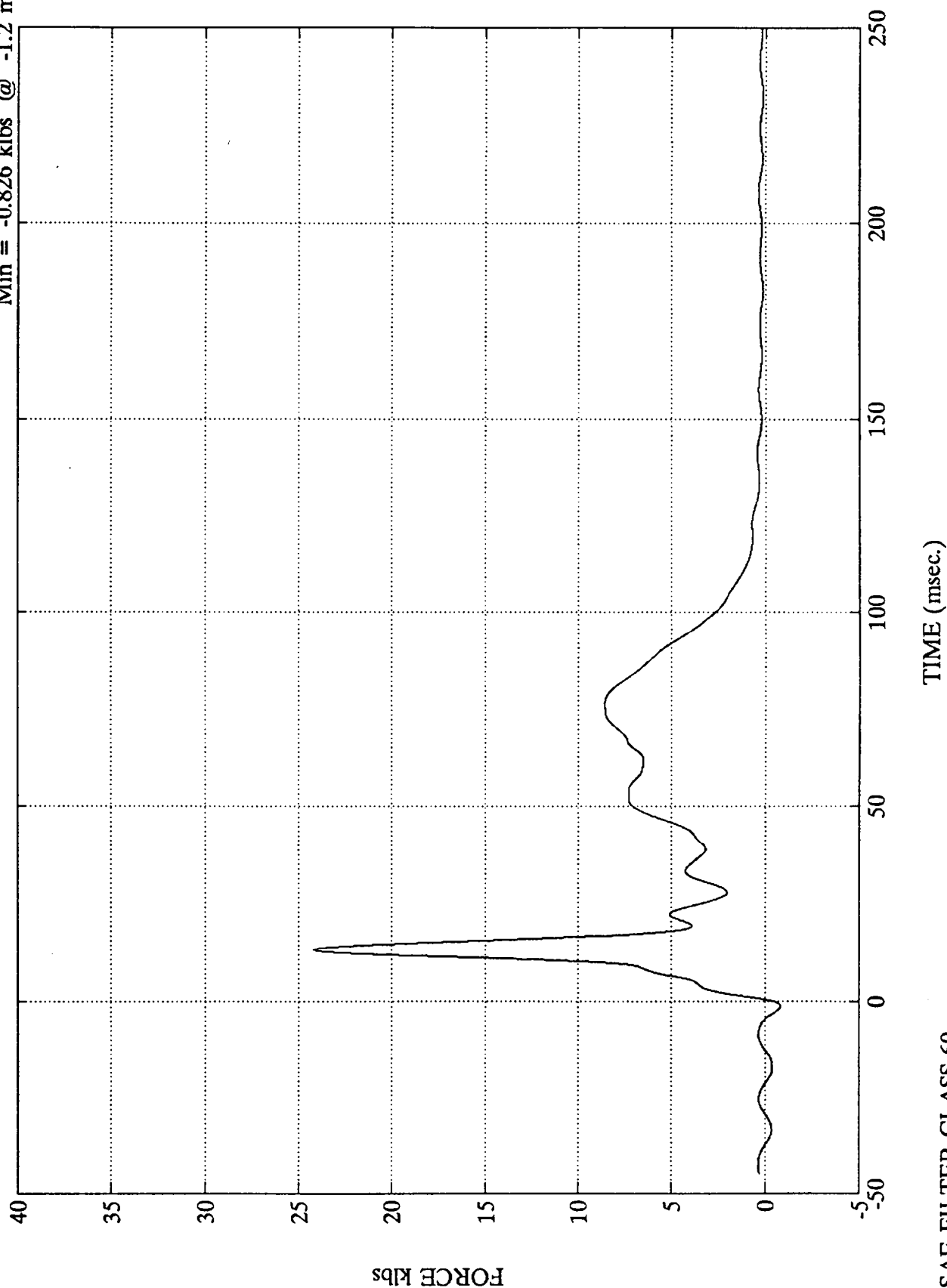


SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL C5

Max = 24.189 klbs @ 13.2 msec
Min = -0.826 klbs @ -1.2 msec



B-51

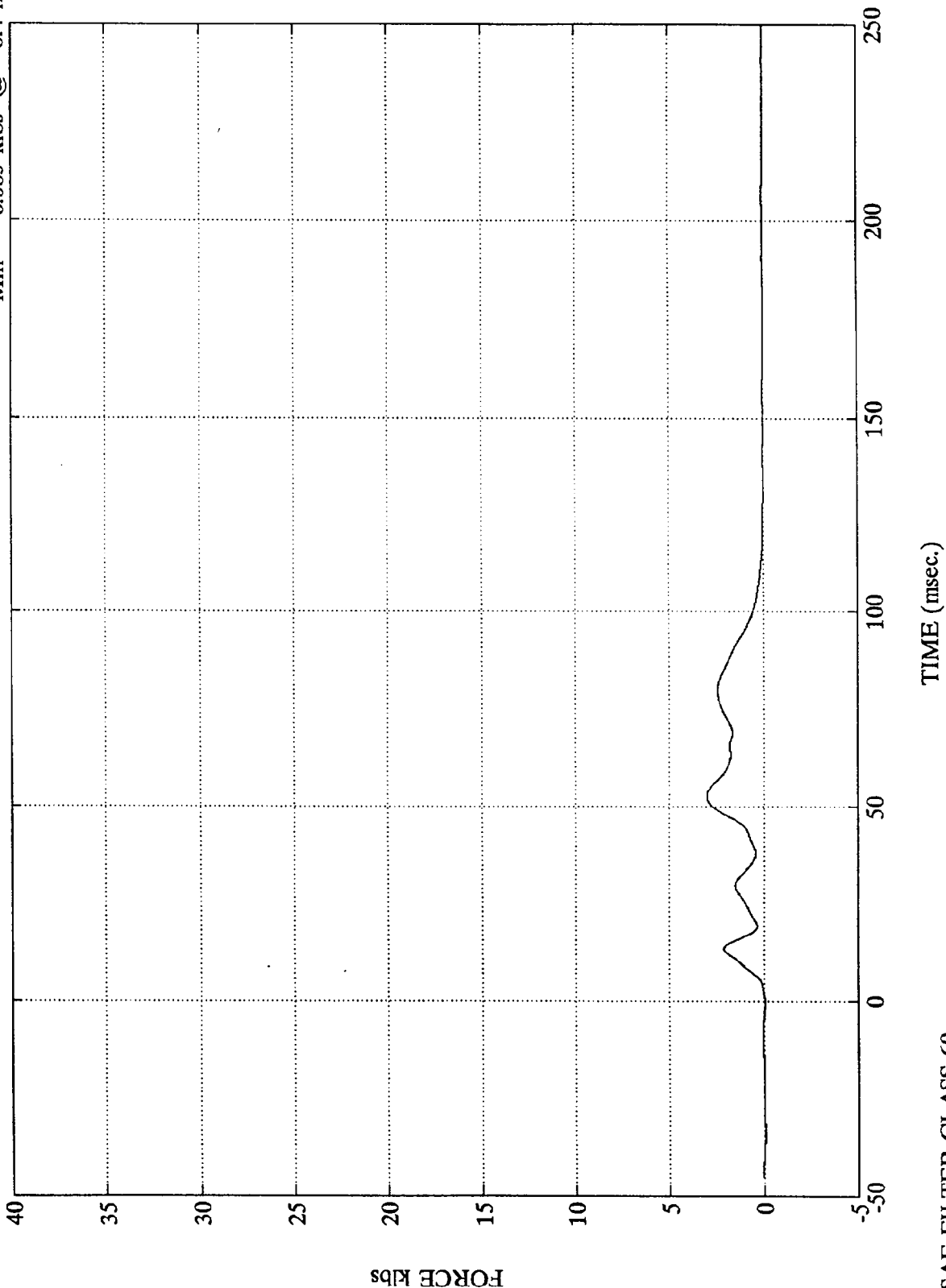
7862-2

SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL C6

Max = 3.034 klbs @ 52.8 msec
Min = -0.065 klbs @ -0.4 msec

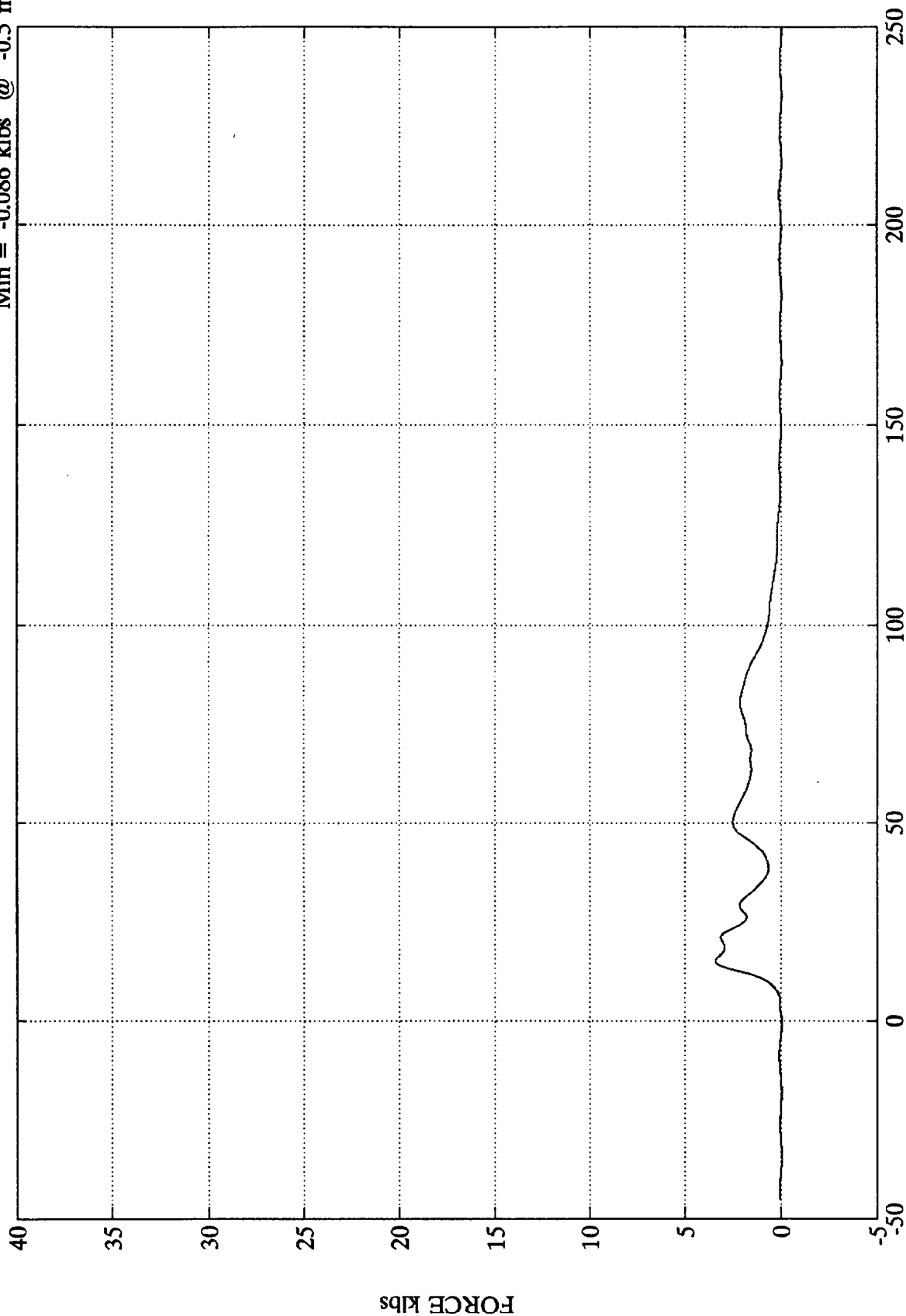


SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL C7

Max = 3.434 klbs @ 14.9 msec
Min = -0.086 klbs @ -0.5 msec

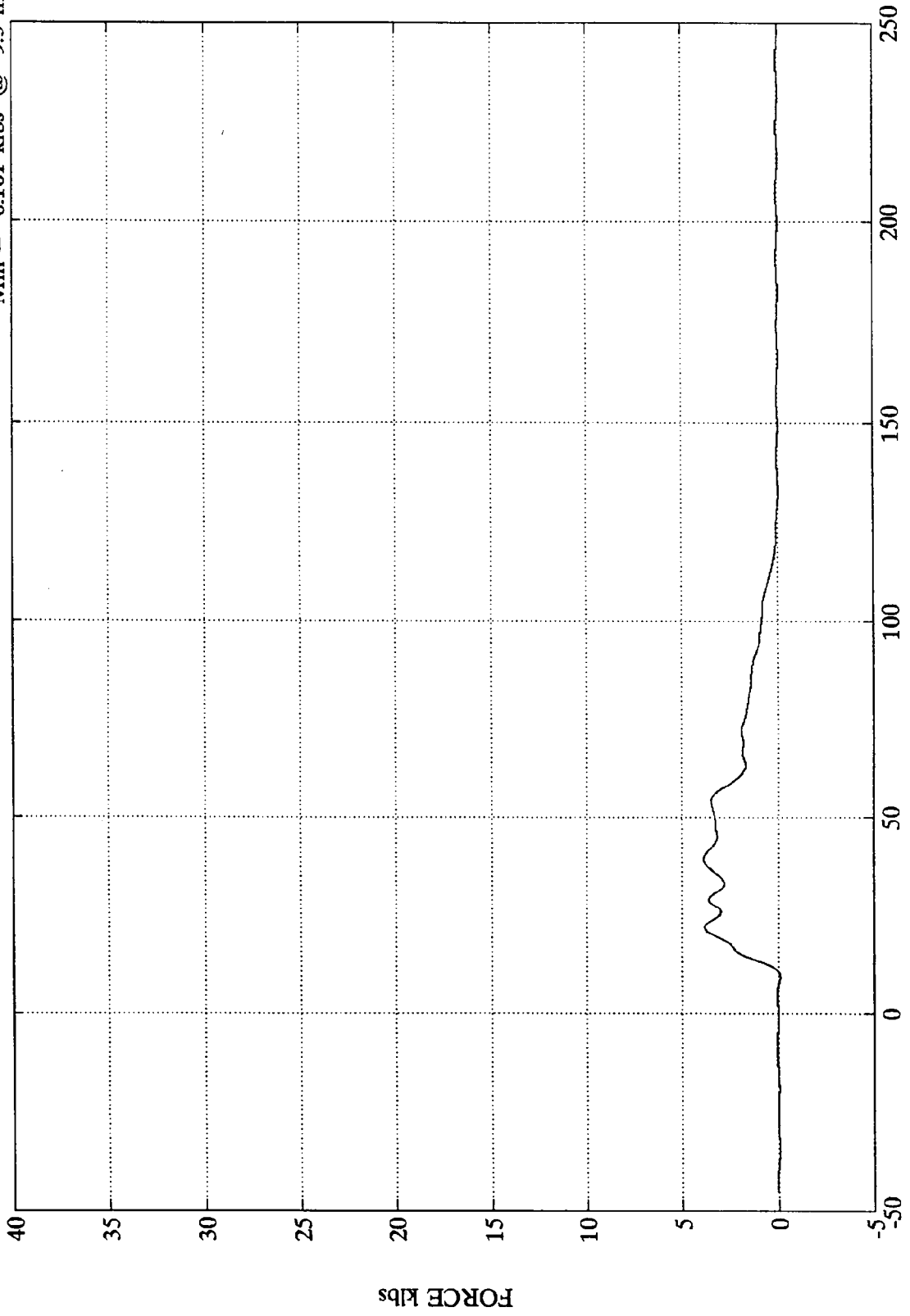


TIME (msec.)

SAE FILTER CLASS 60

Test 1019
Max = 3.901 klbs @ 39.5 msec
Min = -0.101 klbs @ 9.5 msec

BARRIER LOAD CELL C8



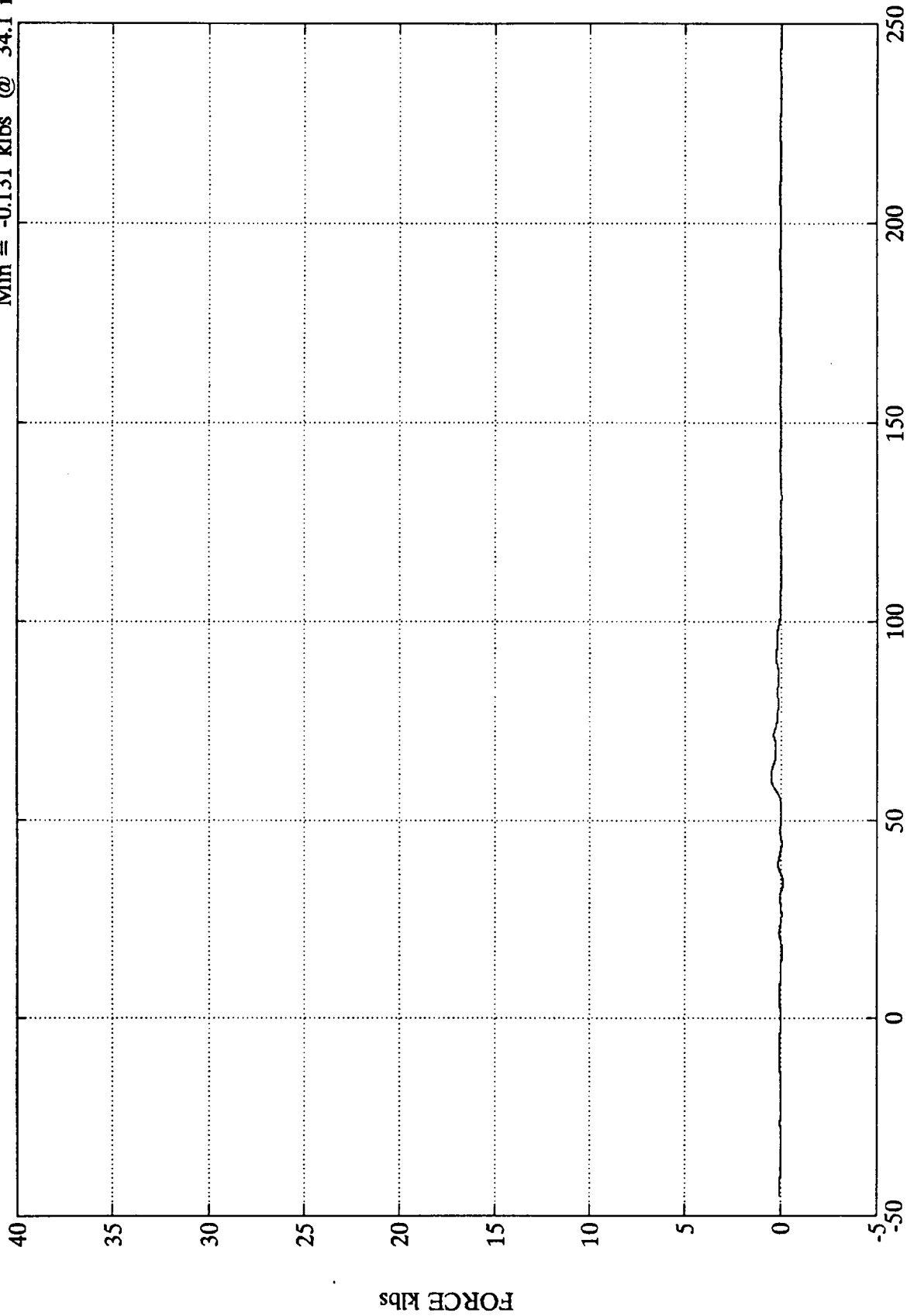
TIME (msec.)

SAE FILTER CLASS 60

Test 1019
Max = 0.494 klbs @ 60.7 msec
Min = -0.131 klbs @ 34.1 msec

BARRIER LOAD CELL C9

Test 1019

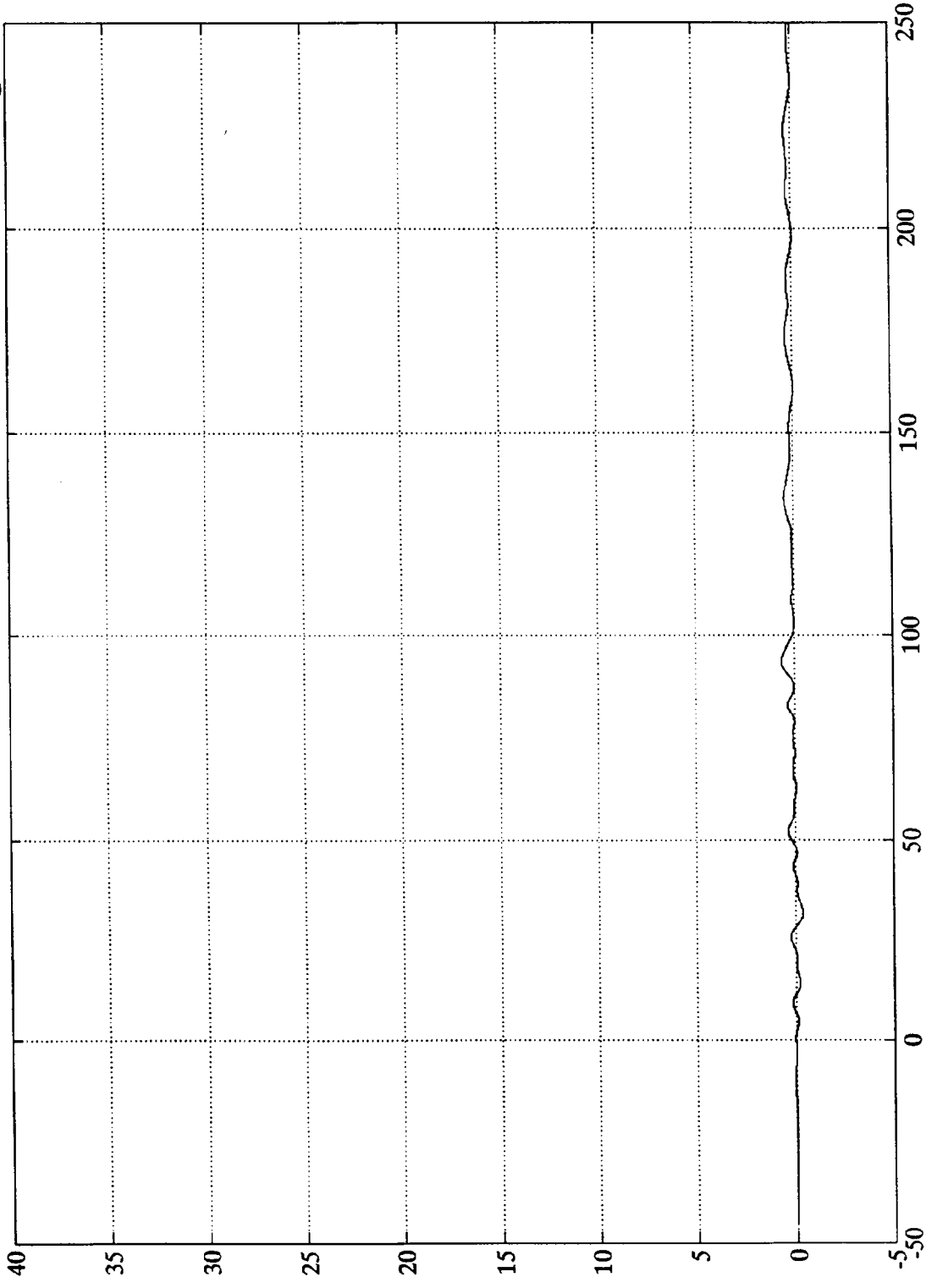


TIME (msec.)

SAE FILTER CLASS 60

Test 1019
Max = 0.664 klbs @ 93.7 msec
Min = -0.374 klbs @ 32.0 msec

BARRIER LOAD CELL D1



TIME (msec.)

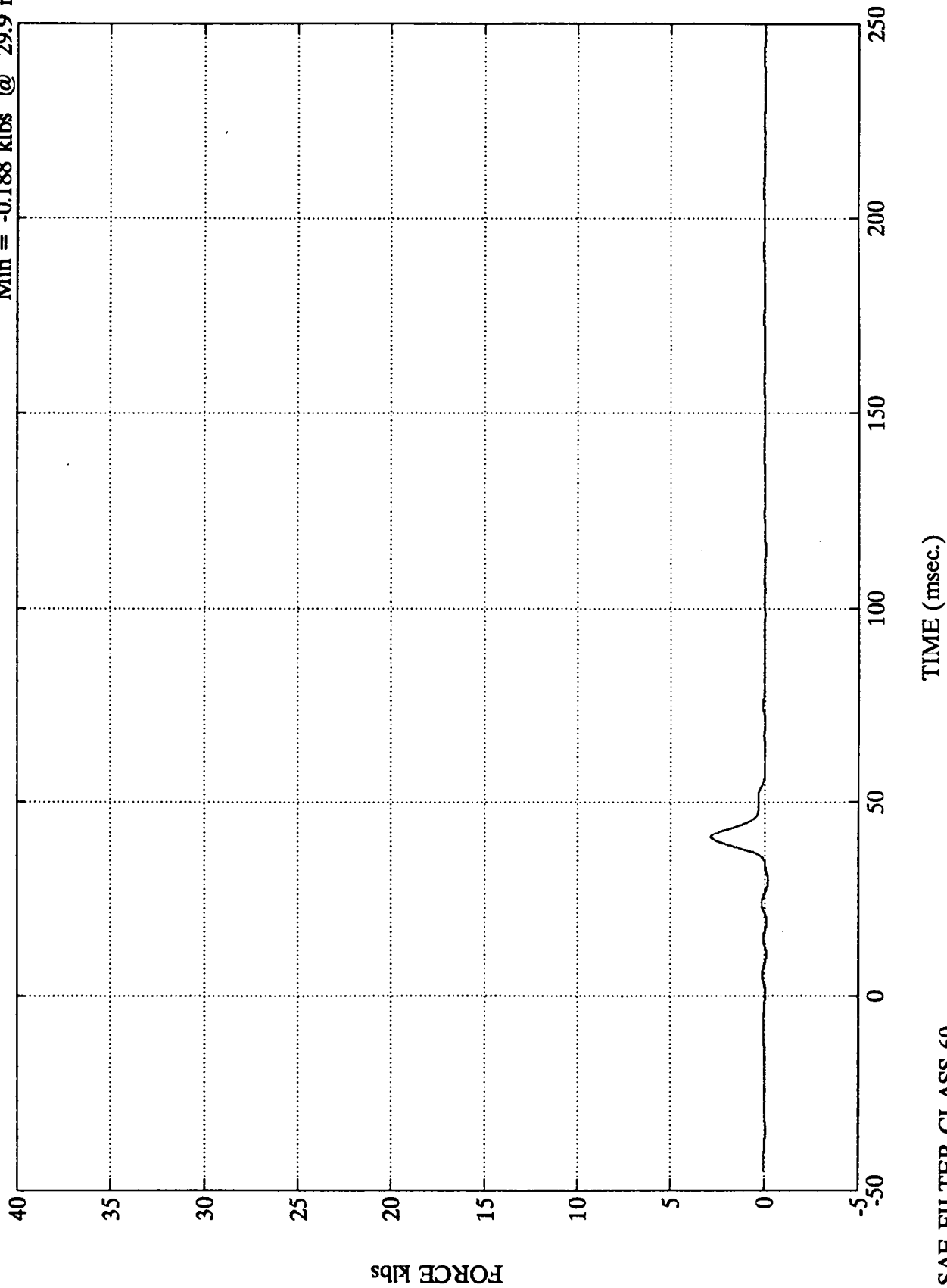
SAE FILTER CLASS 60

FORCE klbs

Test 1019

BARRIER LOAD CELL D2

Max = 2.841 klbs @ 41.0 msec
Min = -0.188 klbs @ 29.9 msec

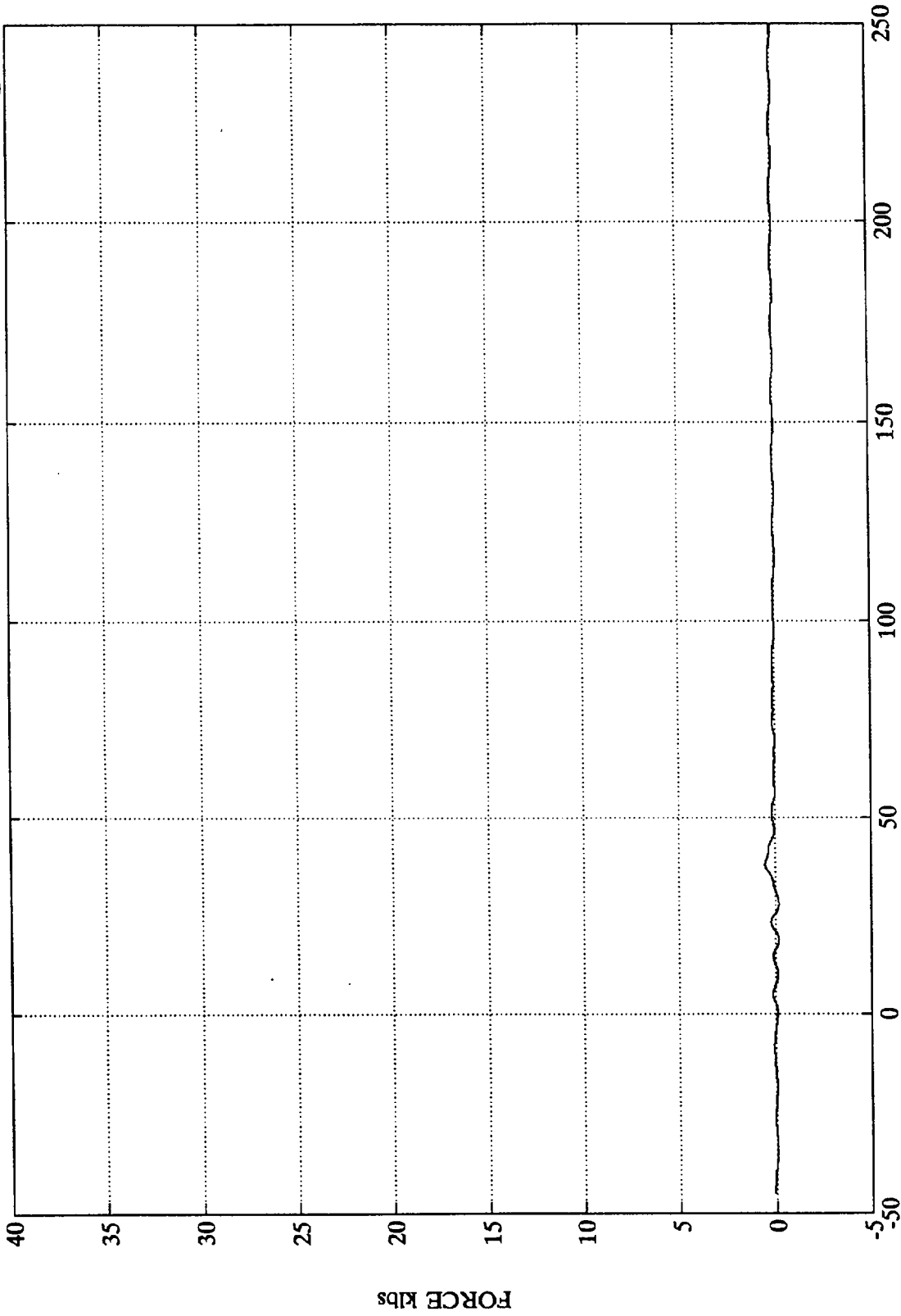


SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL D3

Max = 0.519 klbs @ 38.2 msec
Min = -0.190 klbs @ 28.1 msec



TIME (msec.)

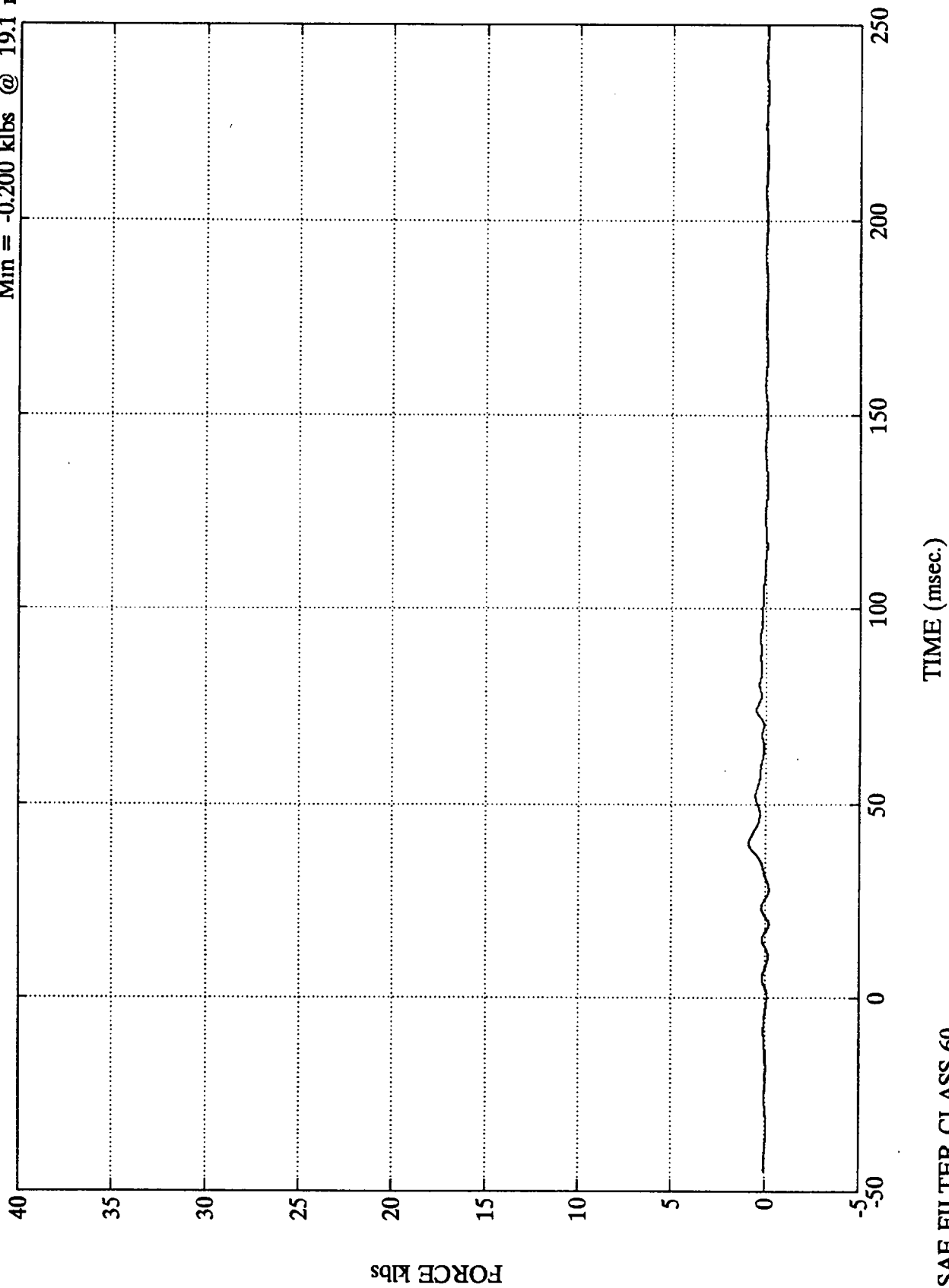
SAE FILTER CLASS 60

FORCE klbs

Test 1019

BARRIER LOAD CELL D4

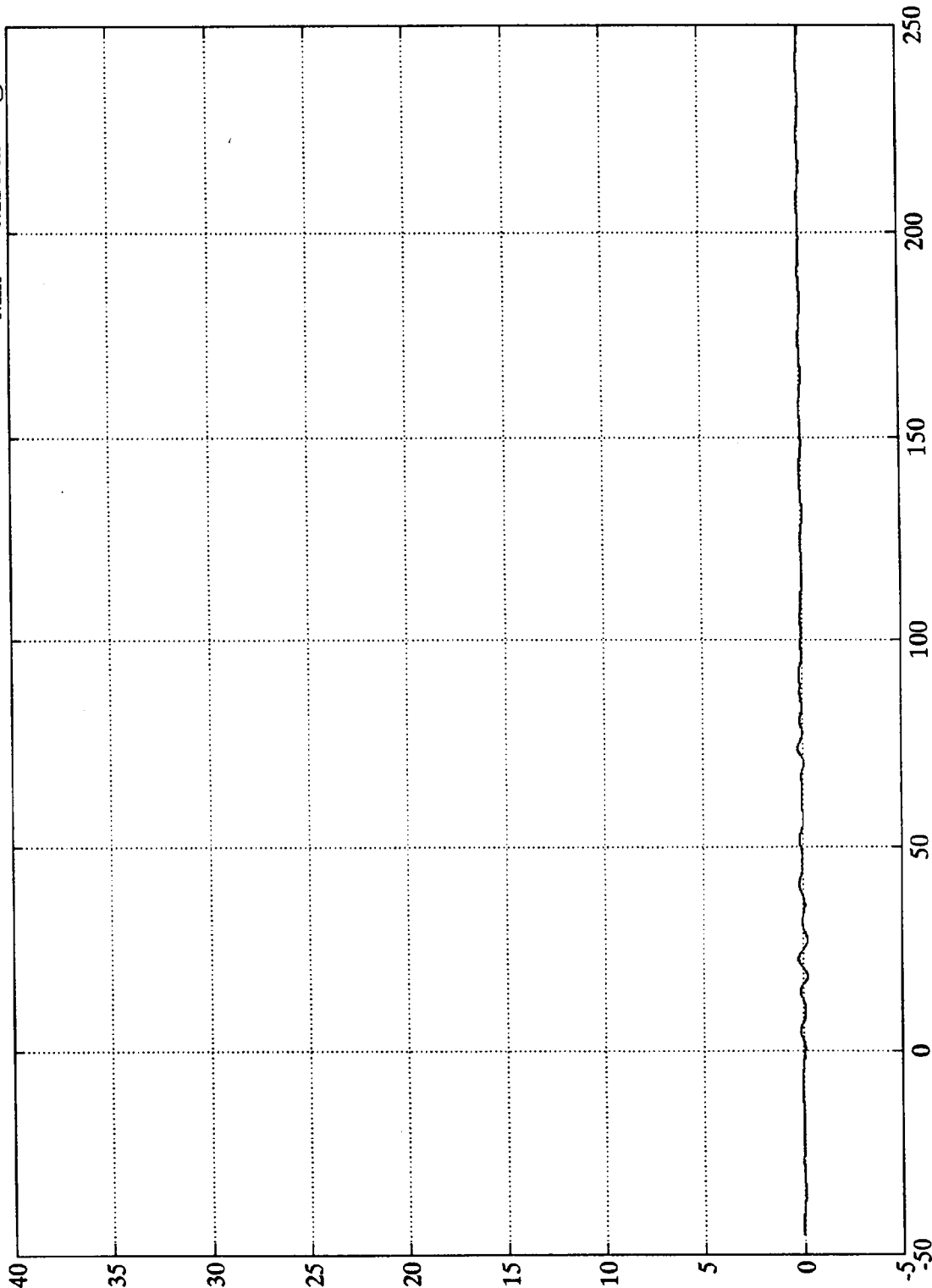
Max = 0.884 klbs @ 40.0 msec
Min = -0.200 klbs @ 19.1 msec



Test 1019

BARRIER LOAD CELL D5

Max = 0.232 klbs @ 73.9 msec
Min = -0.218 klbs @ 27.4 msec



TIME (msec.)

SAE FILTER CLASS 60

FORCE klbs

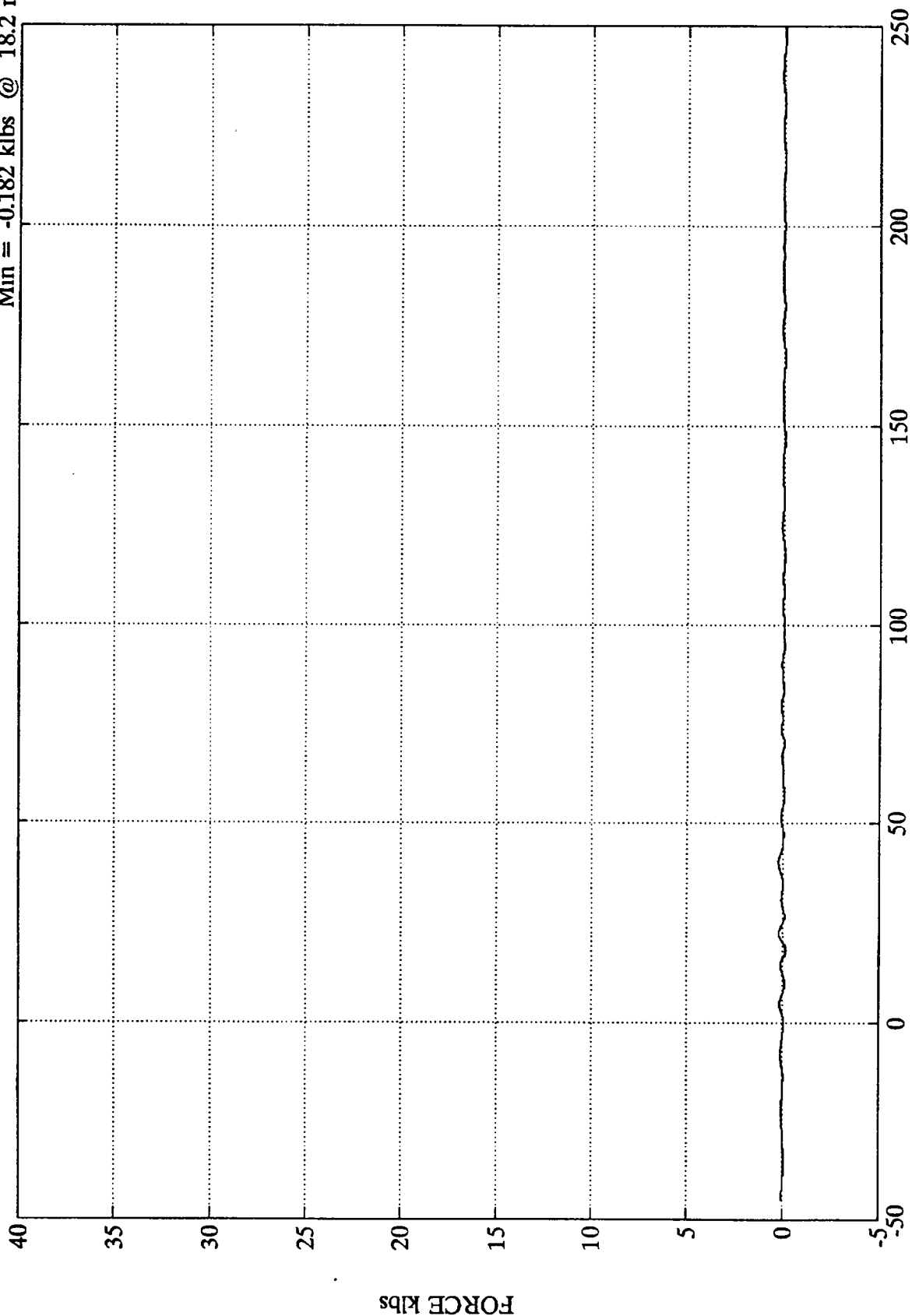
B-60

7862-2

Test 1019

BARRIER LOAD CELL D6

Max = 0.220 klbs @ 40.2 msec
Min = -0.182 klbs @ 18.2 msec



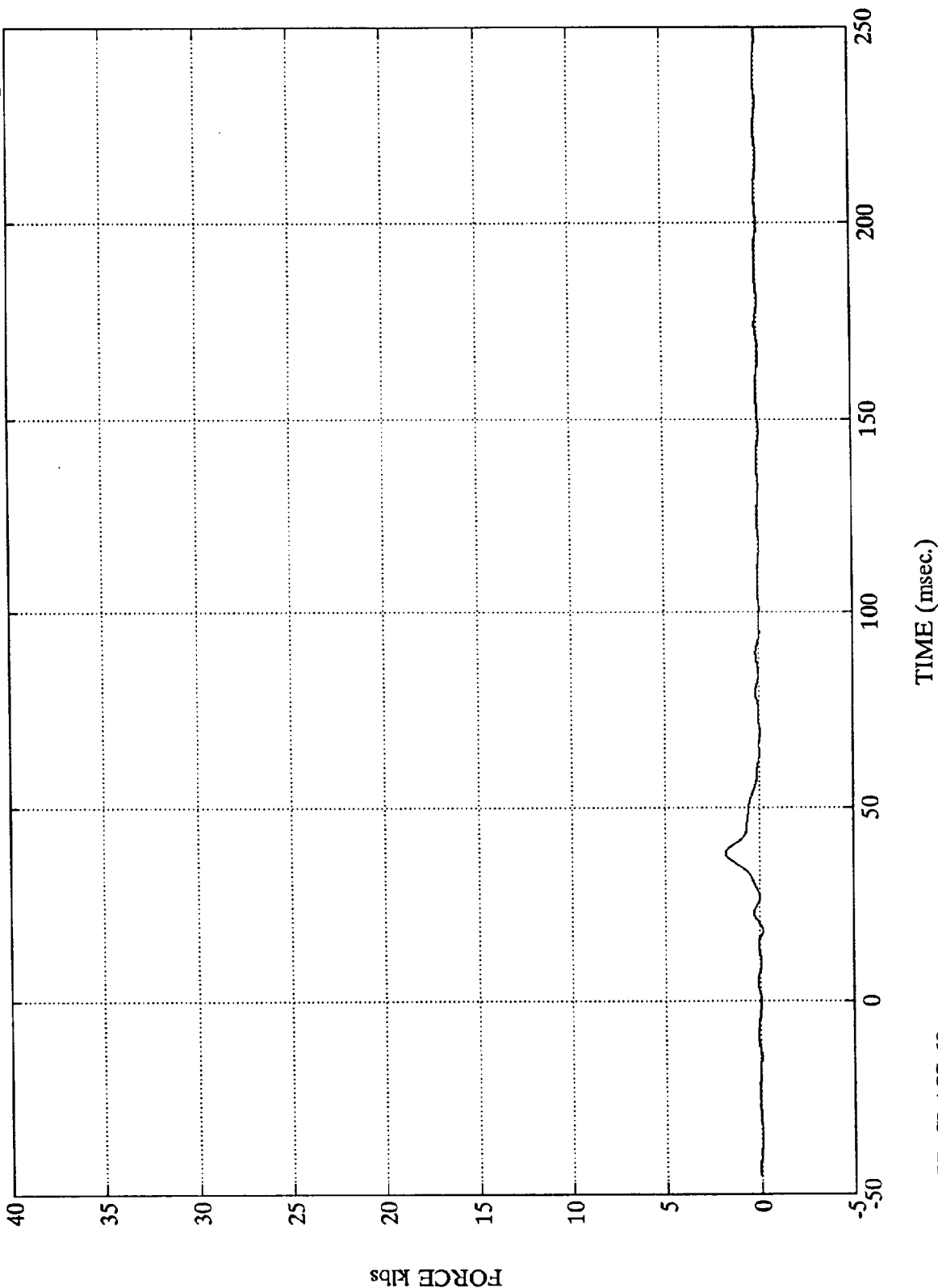
TIME (msec.)

SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL D7

Max = 1.811 klbs @ 38.3 msec
Min = -0.155 klbs @ 18.1 msec

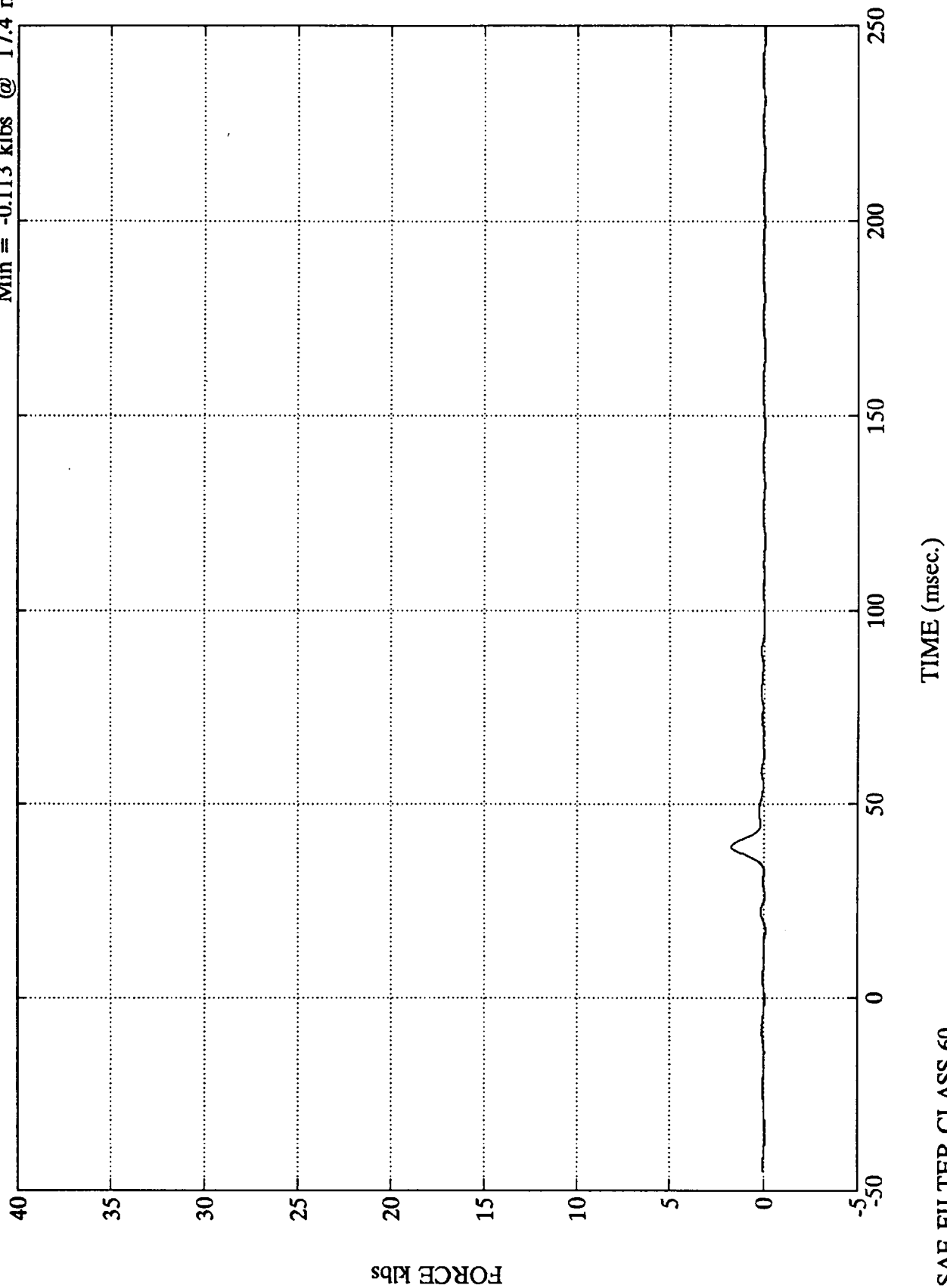


SAE FILTER CLASS 60

Test 1019

BARRIER LOAD CELL D8

Max = 1.732 klbs @ 39.0 msec
Min = -0.113 klbs @ 17.4 msec

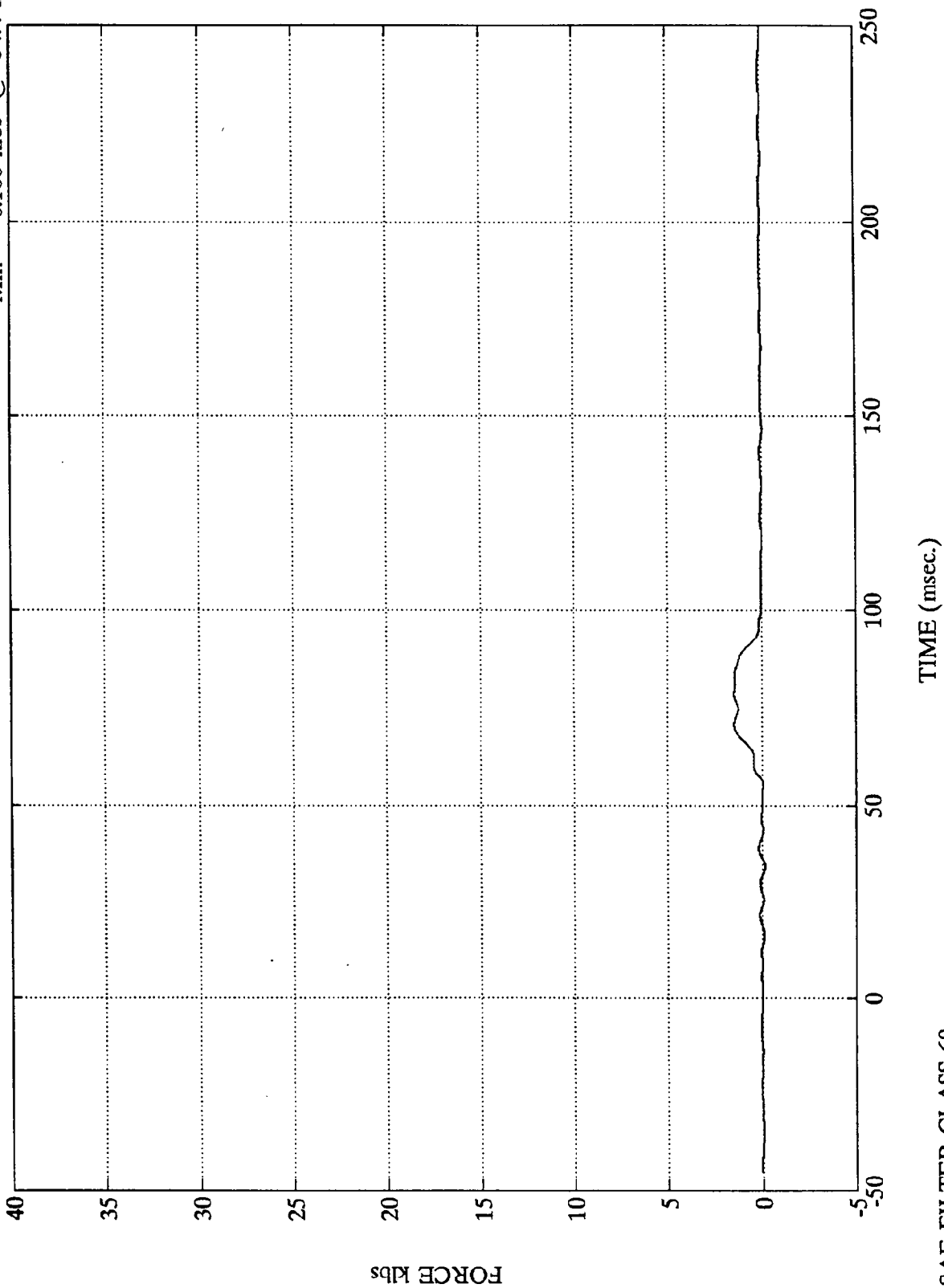


SAE FILTER CLASS 60

Test 1019

Max = 1.483 klbs @ 78.5 msec
Min = -0.166 klbs @ 34.4 msec

BARRIER LOAD CELL D9



B-64

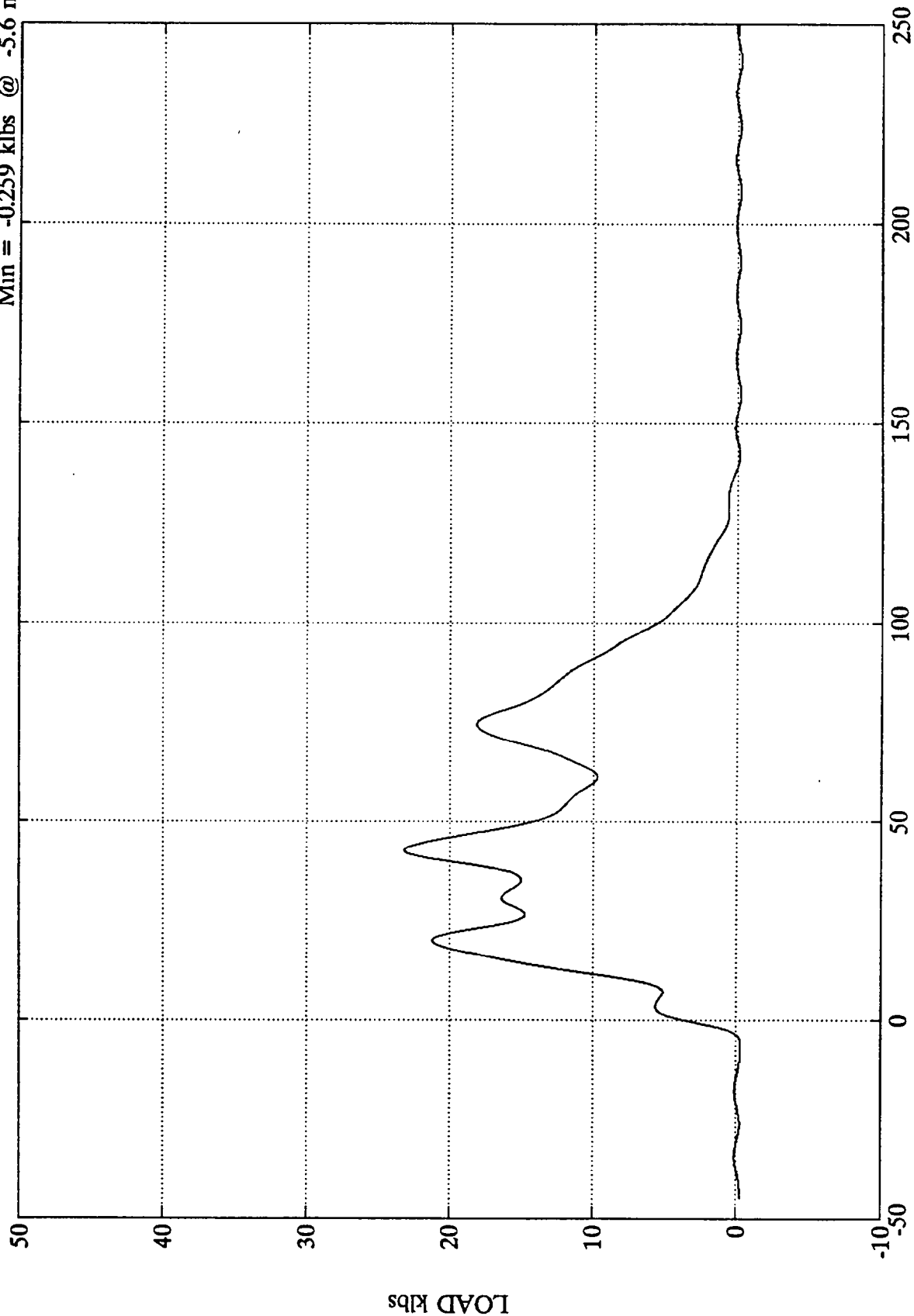
7862-2

SAE FILTER CLASS 60

Test 1019

GROUP 1 LOAD CELL SUM

Max = 23.213 klbs @ 42.7 msec
Min = -0.259 klbs @ -5.6 msec



TIME (msec)

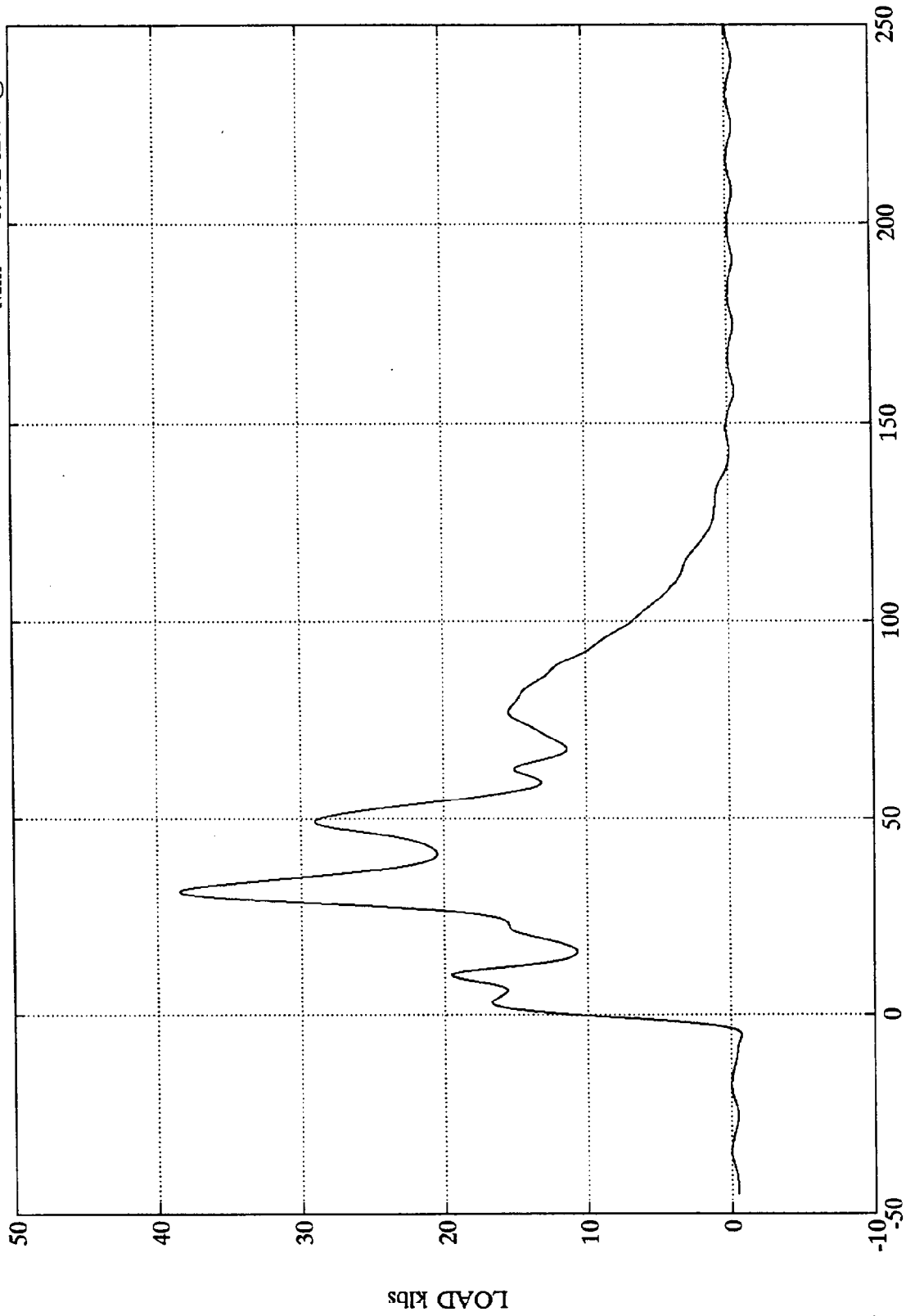
SAE Filter Class 60

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

Test 1019

Max = 38.492 klbs @ 31.7 msec
Min = -0.732 klbs @ -5.3 msec

GROUP 2 LOAD CELL SUM

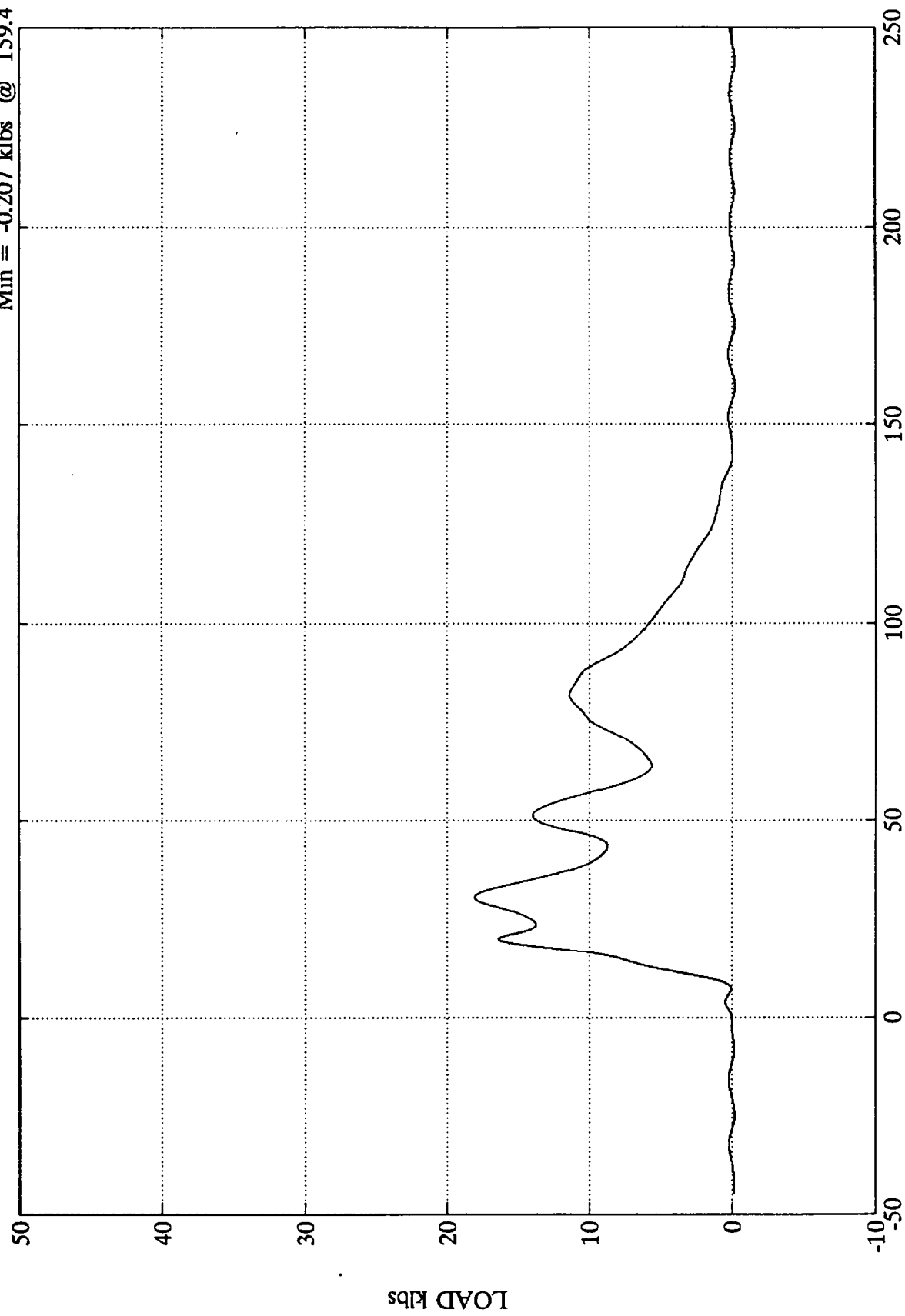


Load Cells (A4,A5,A6,B4,B5,B6)

SAE Filter Class 60

Test 1019
Max = 18.072 klbs @ 30.5 msec
Min = -0.207 klbs @ 159.4 msec

GROUP 3 LOAD CELL SUM



TIME (msec)

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

SAE Filter Class 60

Test 1019

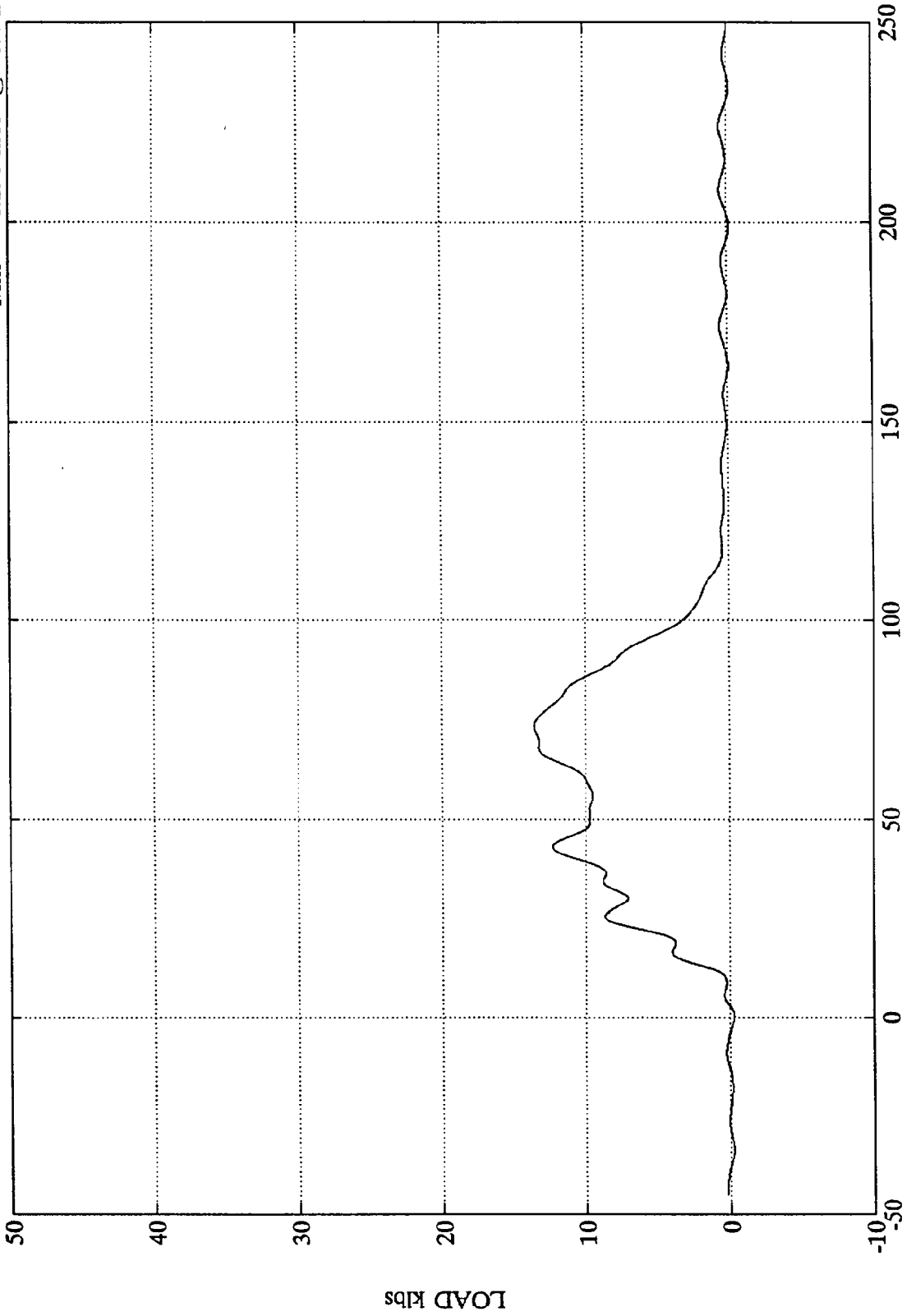
LOAD klbs
B-67

7862-2

Test 1019

GROUP 4 LOAD CELL SUM

Max = 13.582 klbs @ 73.4 msec
Min = -0.296 klbs @ 0.4 msec



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

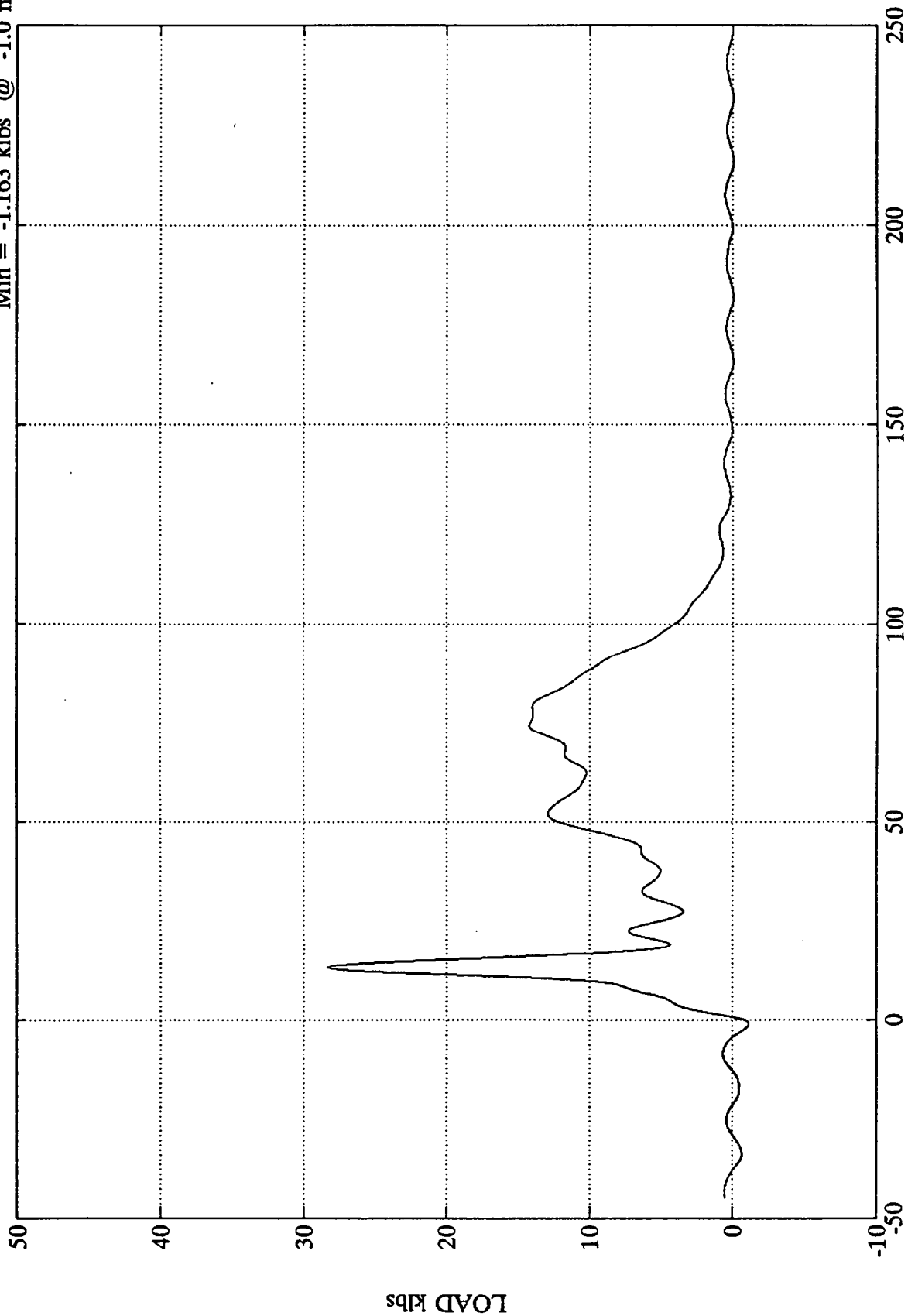
TIME (msec)

SAE Filter Class 60

Test 1019

GROUP 5 LOAD CELL SUM

Max = 28.337 klbs @ 13.2 msec
Min = -1.163 klbs @ -1.0 msec



TIME (msec)

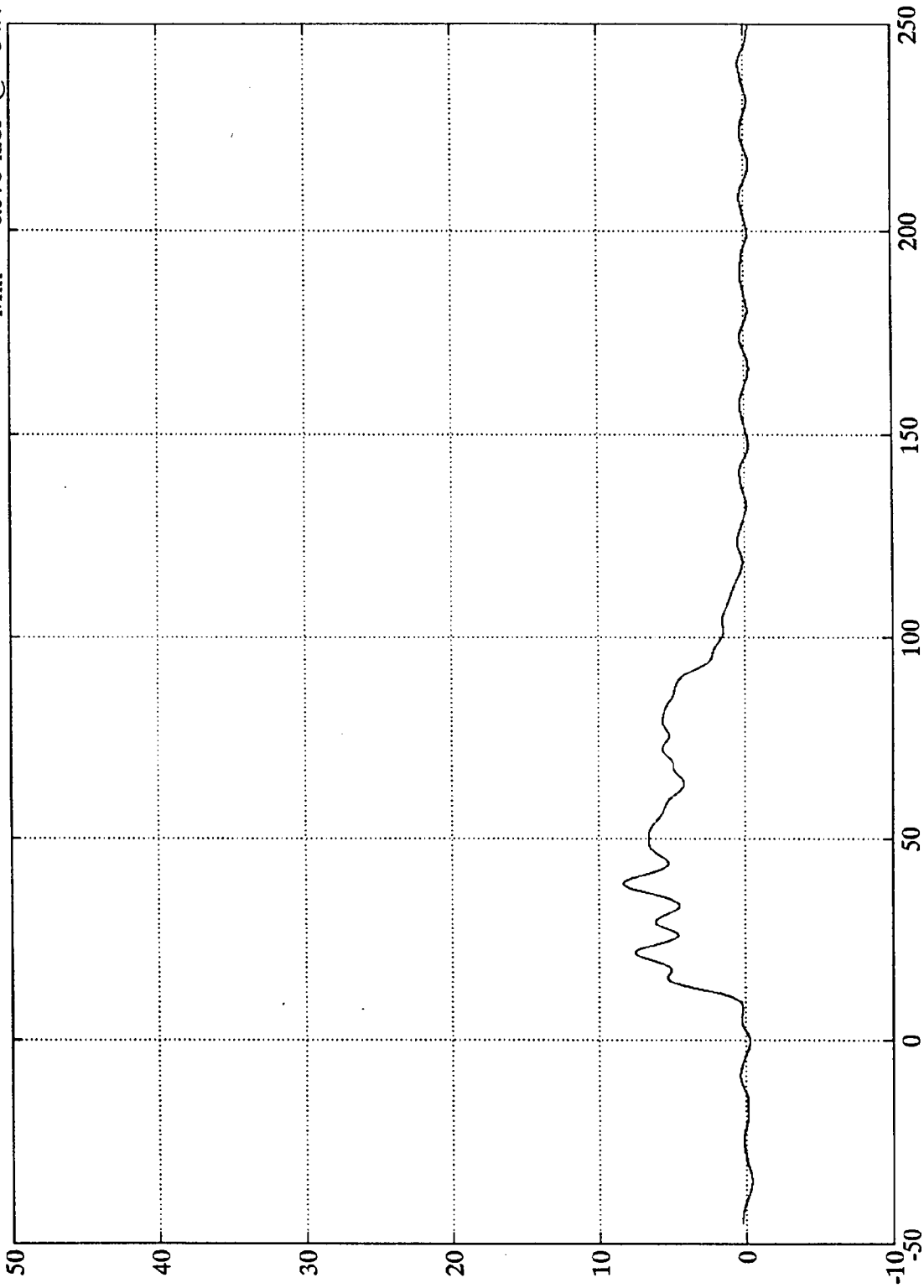
Load Cells (C4,C5,C6,D4,D5,D6)

SAE Filter Class 60

Test 1019

Max = 8.334 klbs @ 39.0 msec
Min = -0.376 klbs @ -34.4 msec

GROUP 6 LOAD CELL SUM



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

TIME (msec)

SAE Filter Class 60

LOAD klbs

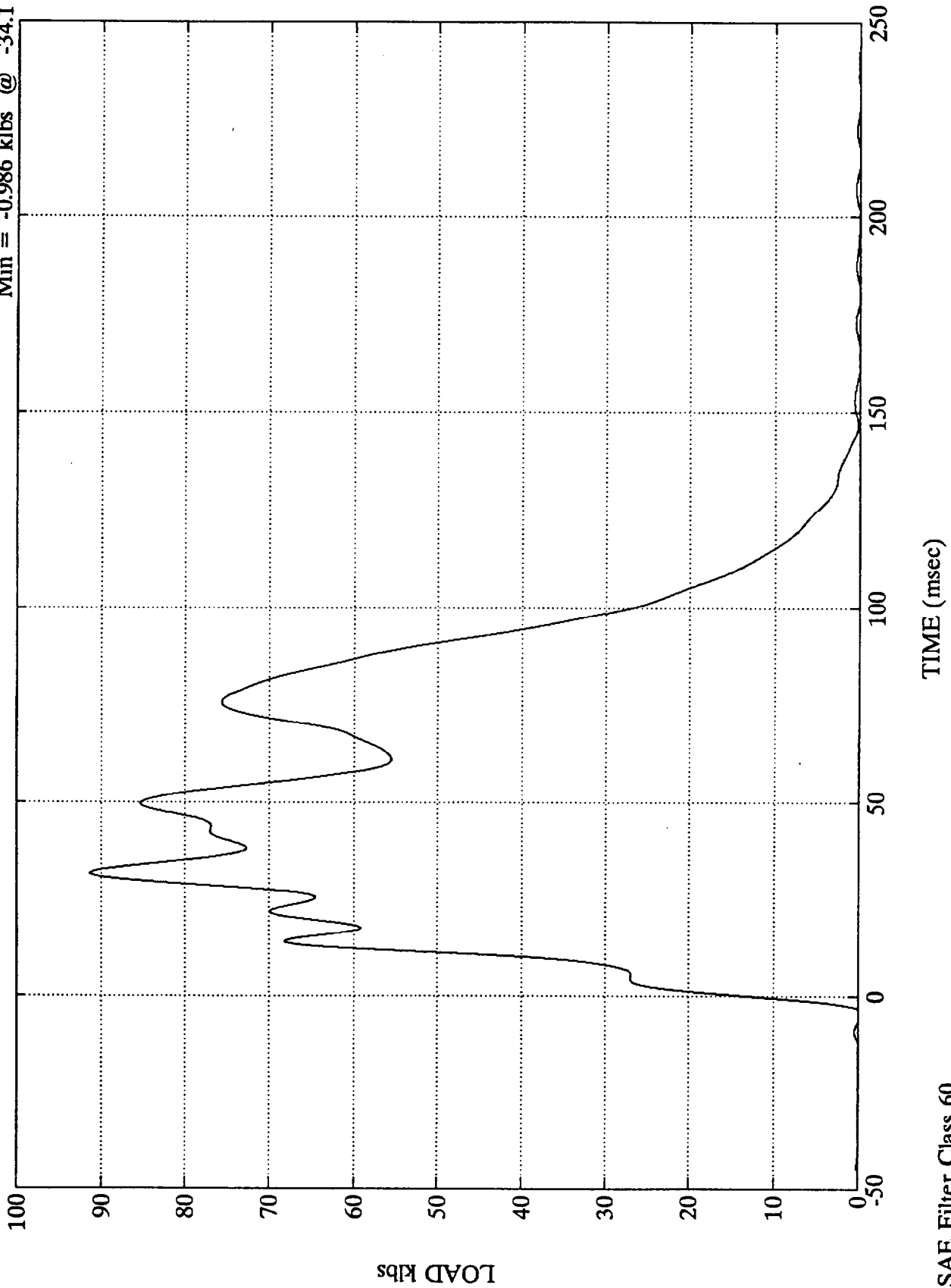
B-70

7862-2

Test 1019

TOTAL LOAD CELL SUM

Max = 91.244 klbs @ 31.4 msec
Min = -0.986 klbs @ -34.1 msec



B-71

7862-2

SAE Filter Class 60

TEST NO. MM0300

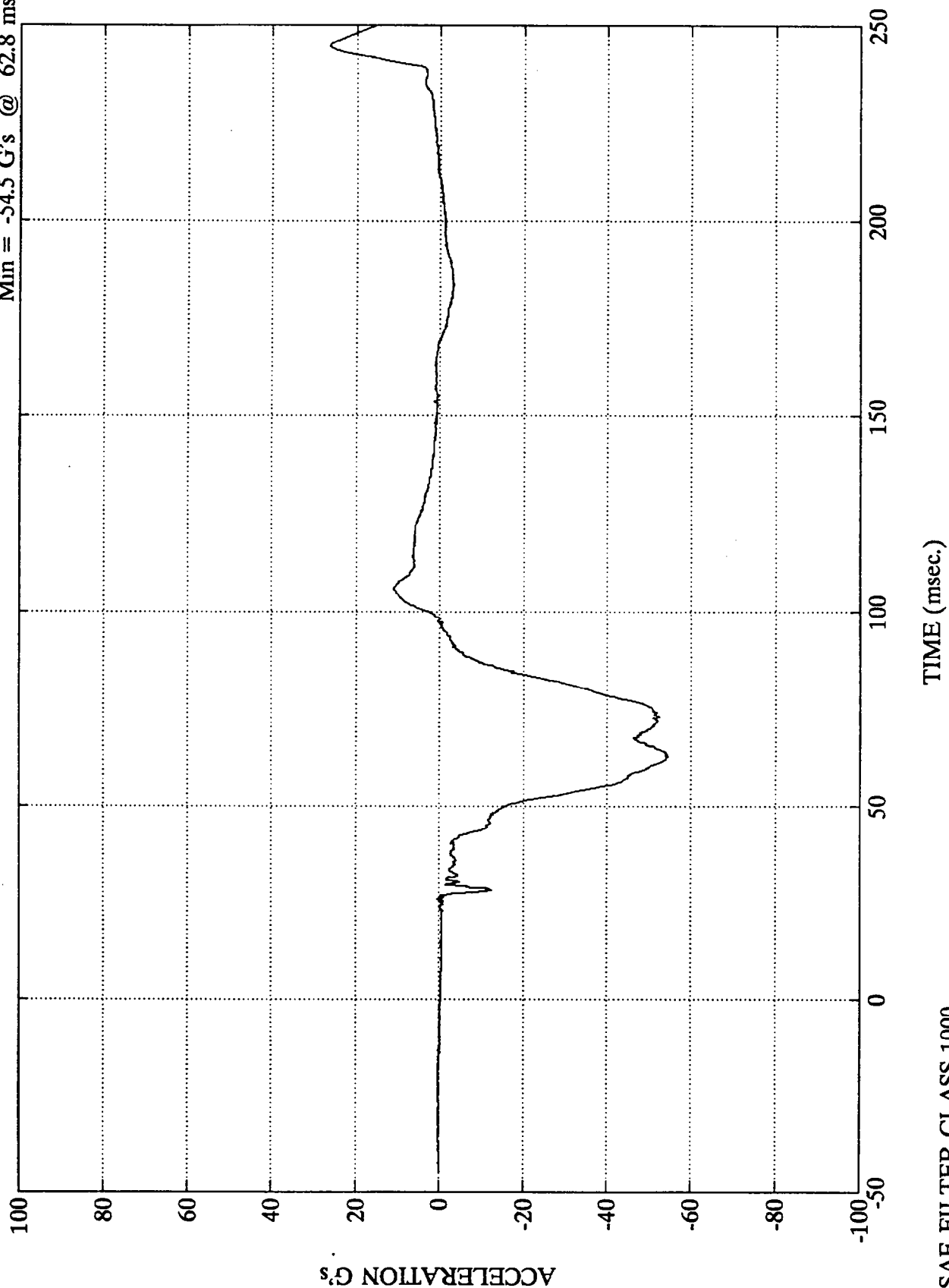
DUMMY DATA

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

Test 1019
Max = 26.4 G's @ 244.9 msec
Min = -54.5 G's @ 62.8 msec

POS #1 HEAD X

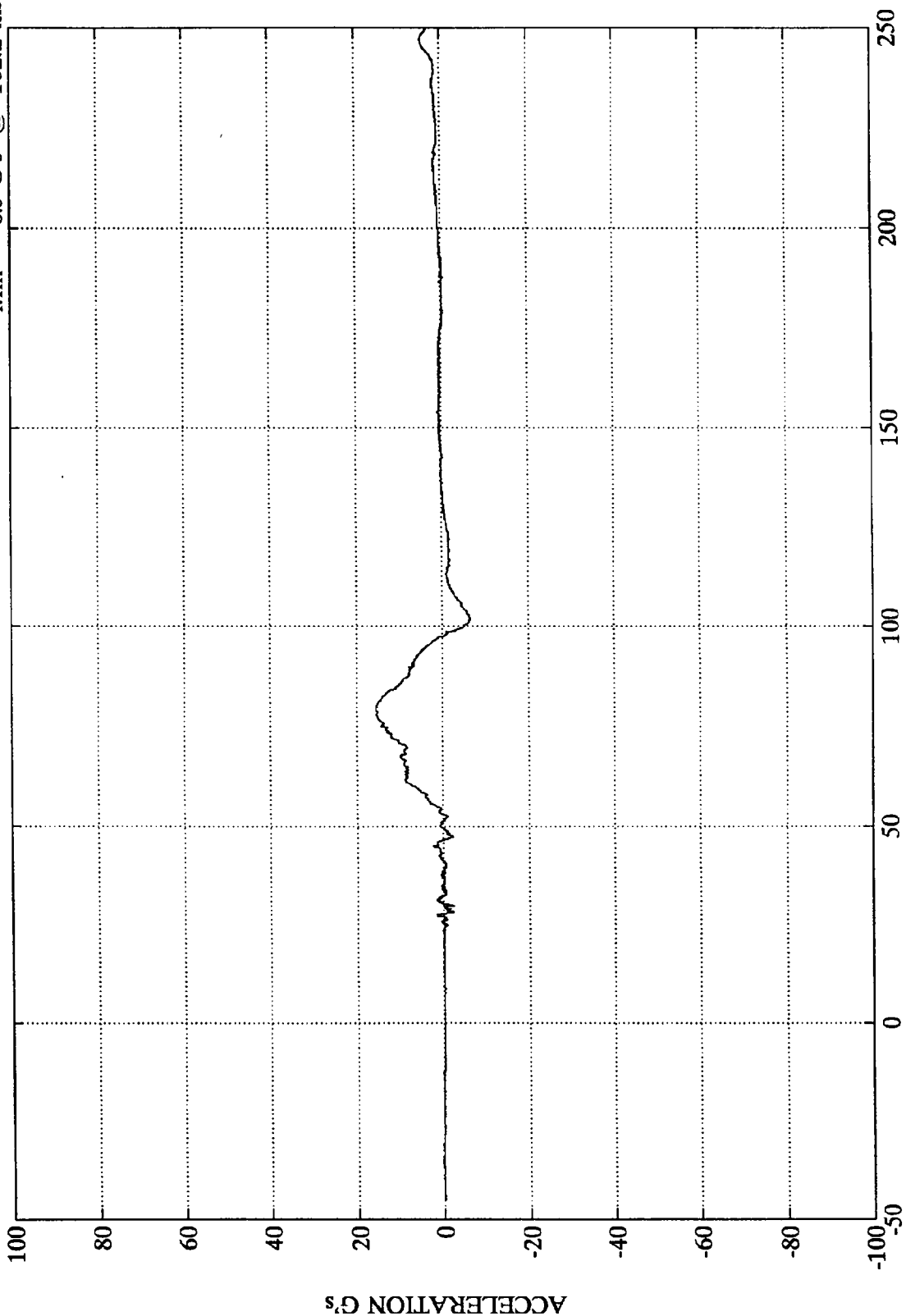
SAE FILTER CLASS 1000



Test 1019

POS #1 HEAD Y

Max = 15.5 G's @ 80.4 msec
Min = -6.5 G's @ 102.2 msec



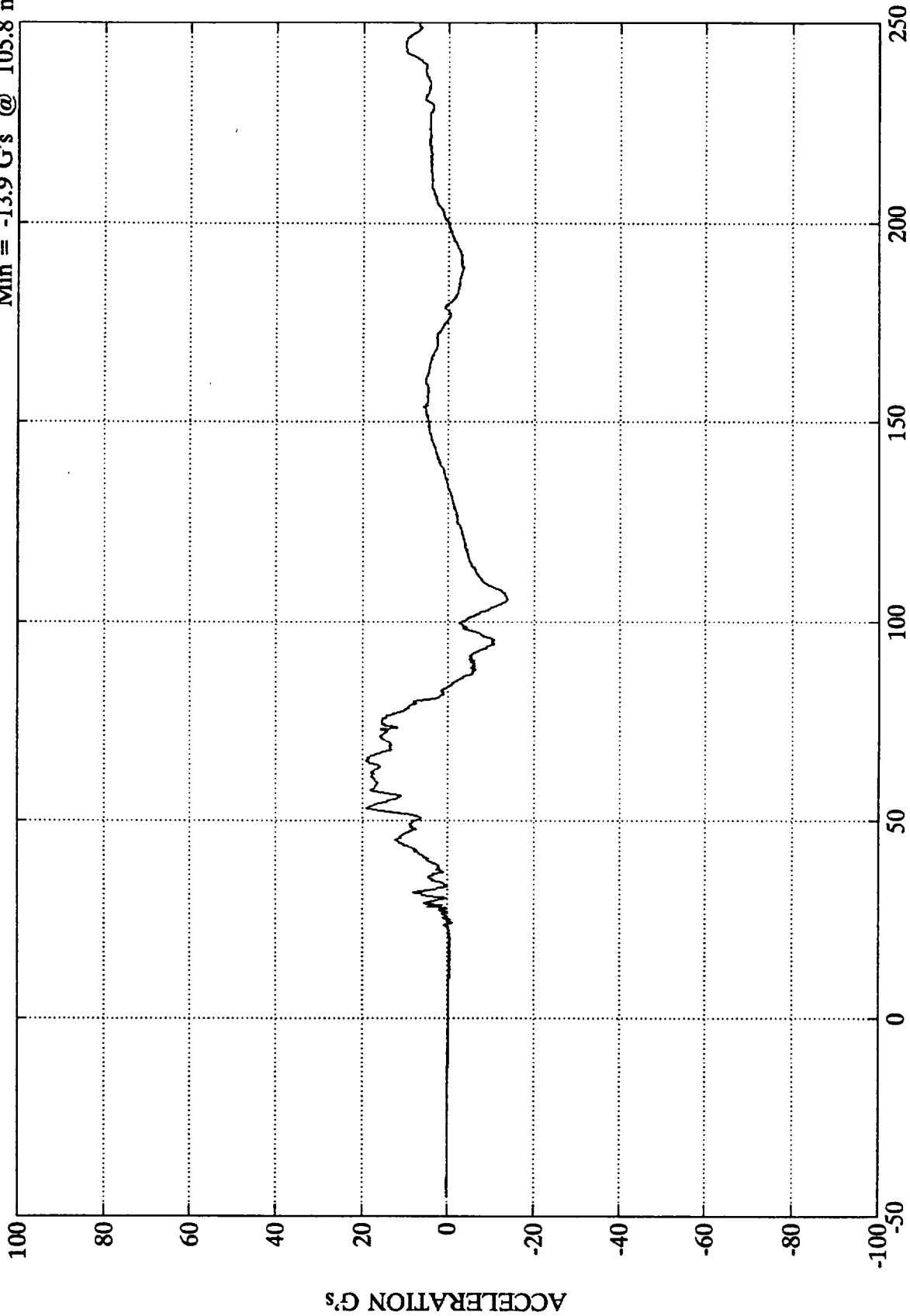
TIME (msec.)

SAE FILTER CLASS 1000

Test 1019

POS #1 HEAD Z

Max = 19.1 G's @ 65.0 msec
Min = -13.9 G's @ 105.8 msec

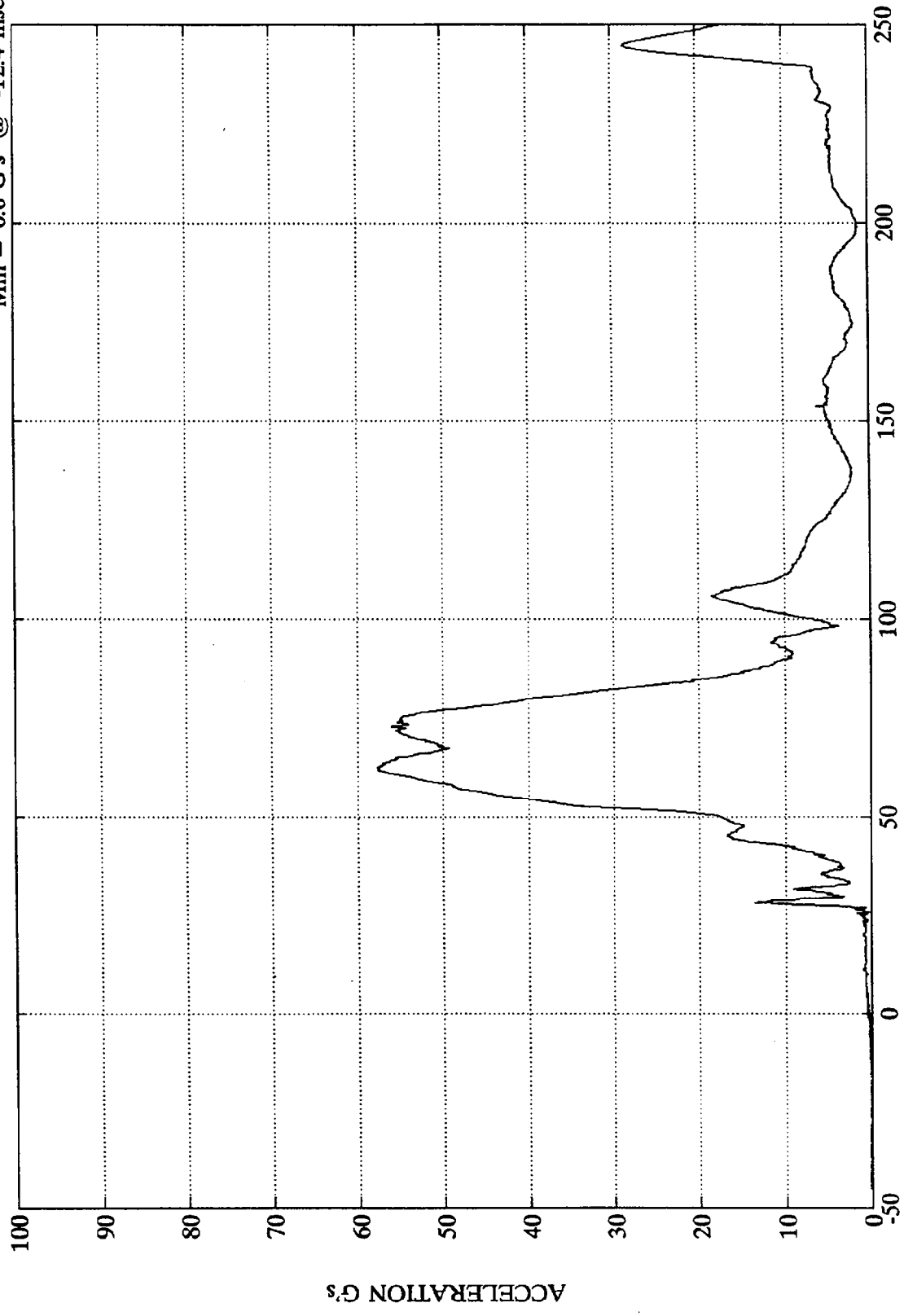


TIME (msec.)

SAE FILTER CLASS 1000

Test 1019
Max = 57.7 G's @ 62.8 msec
Min = 0.0 G's @ -12.4 msec

POS #1 HEAD RESULTANT



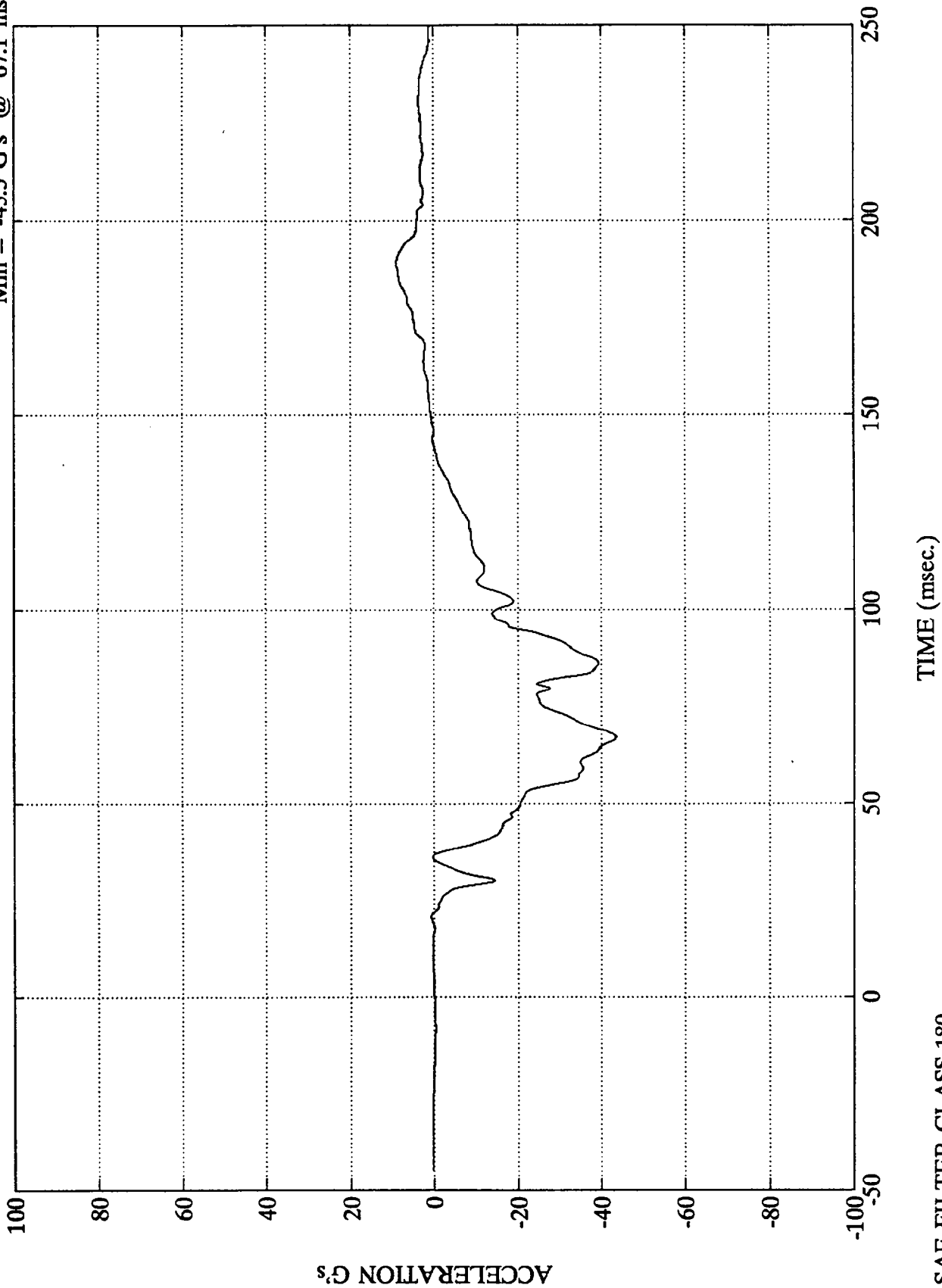
TIME (msec.)

SAE FILTER CLASS 1000

Test 1019

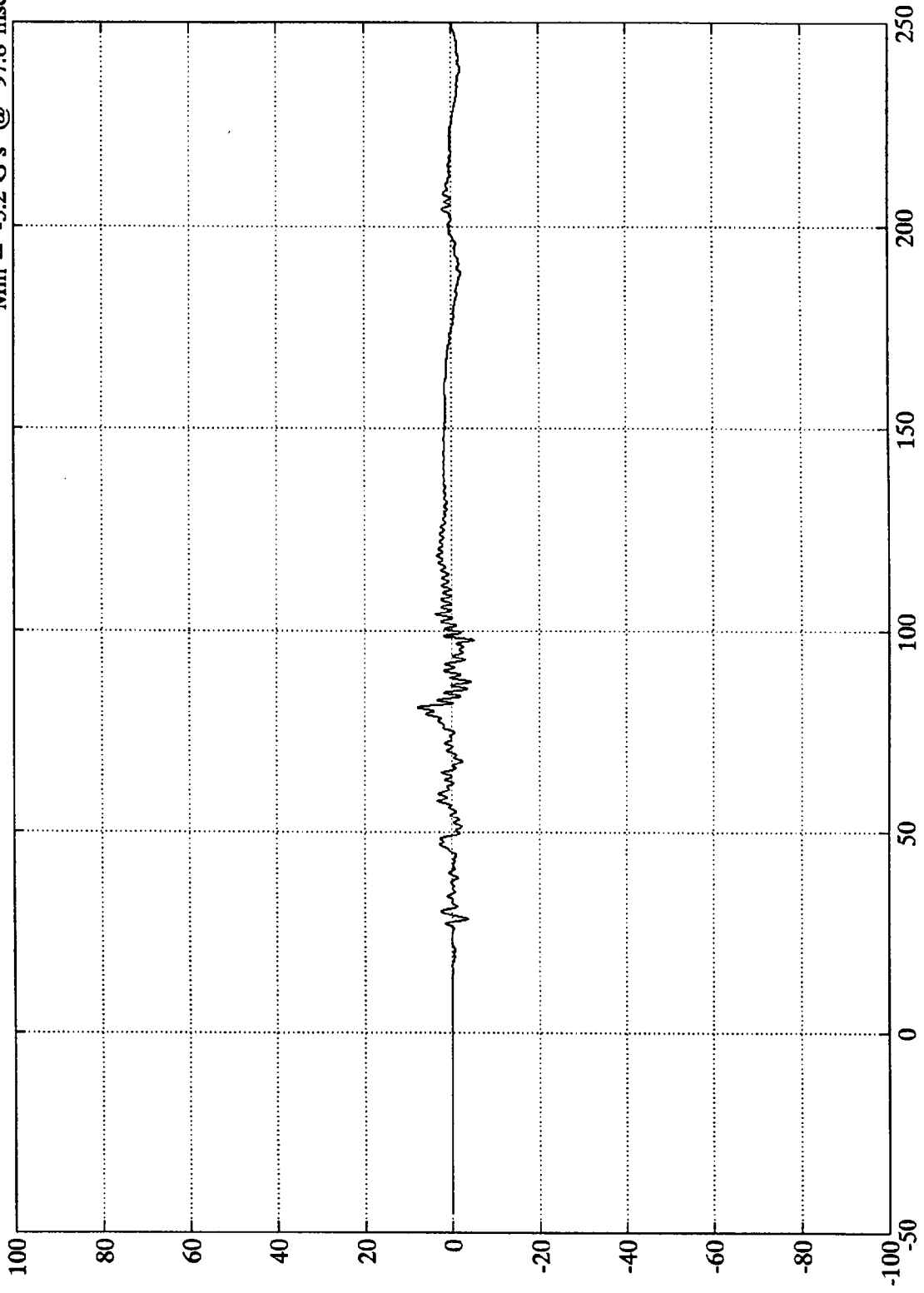
POS #1 CHEST X

Max = 9.1 G's @ 188.8 msec
Min = -43.5 G's @ 67.1 msec



Test 1019
Max = 7.8 G's @ 81.1 msec
Min = -5.2 G's @ 97.8 msec

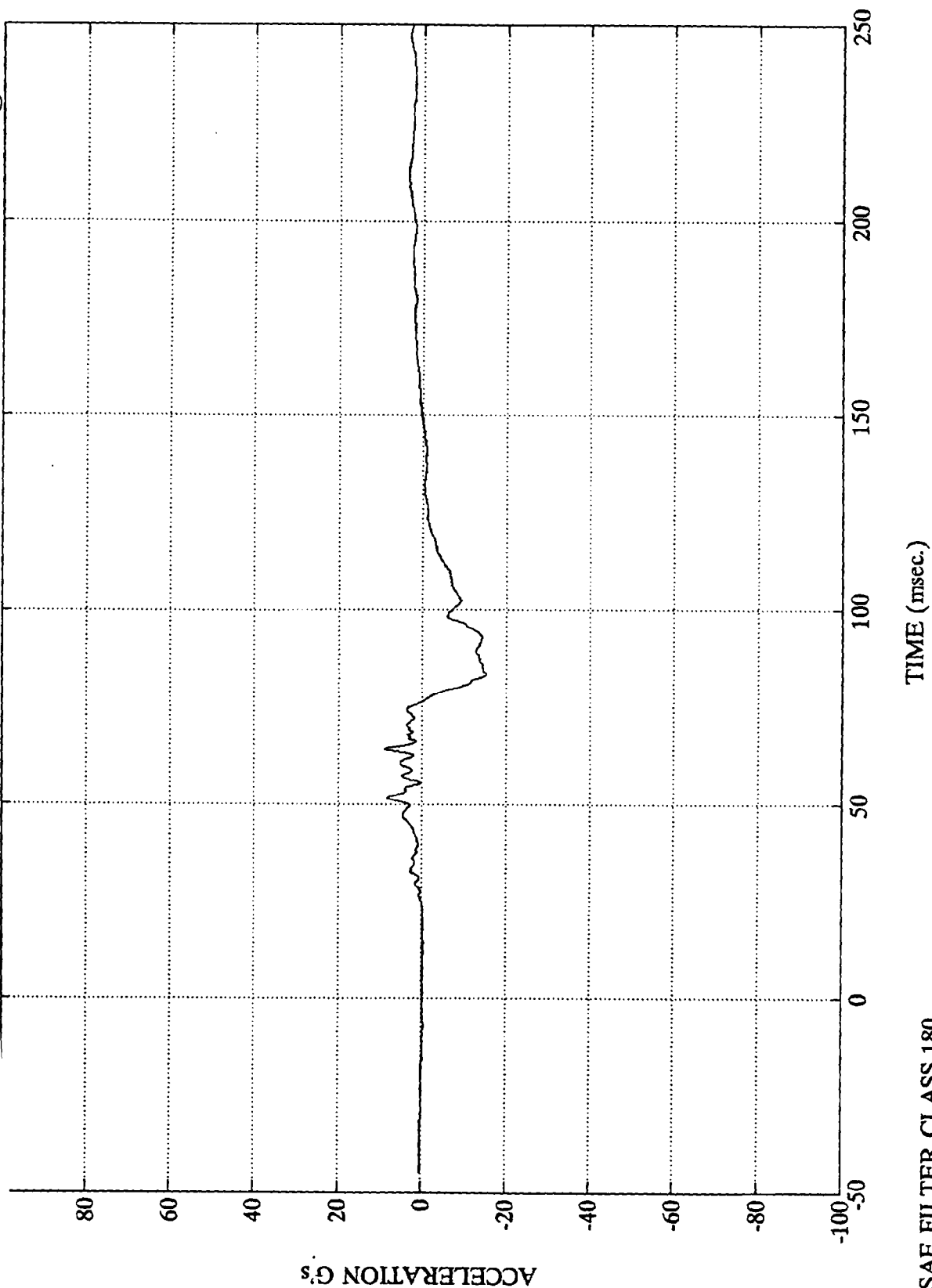
POS #1 CHEST Y



SAE FILTER CLASS 180

Max = 9.0 G's @ 64.3 msec
Min = -15.3 G's @ 83.6 msec

SAE FILTER CLASS 180



ACCELERATION G's

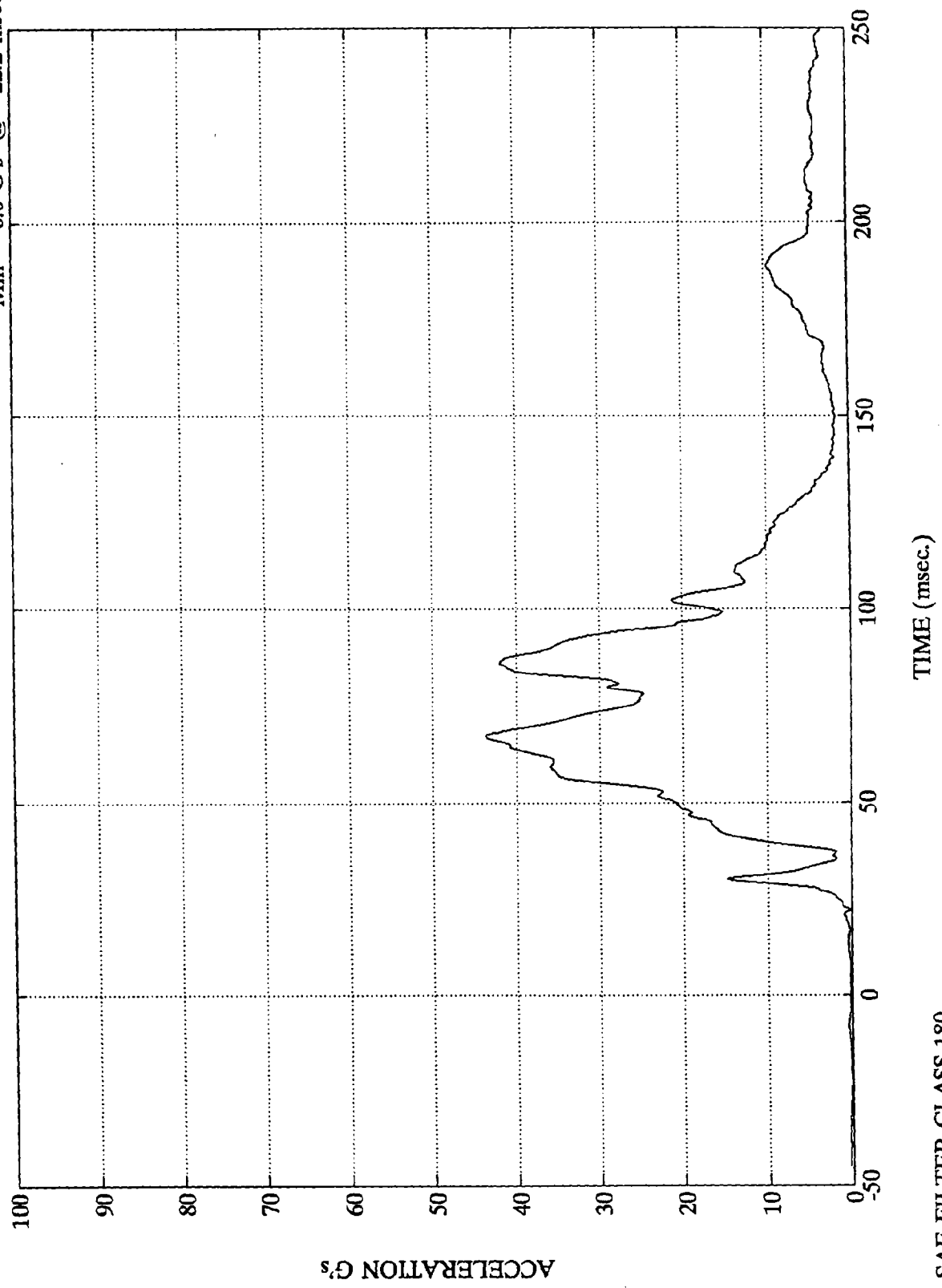
SAE FILTER CLASS 180

TIME (msec.)

Test 1019
Max = 43.6 G's @ 67.1 msec
Min = 0.0 G's @ -22.2 msec

POS #1 CHEST RESULTANT

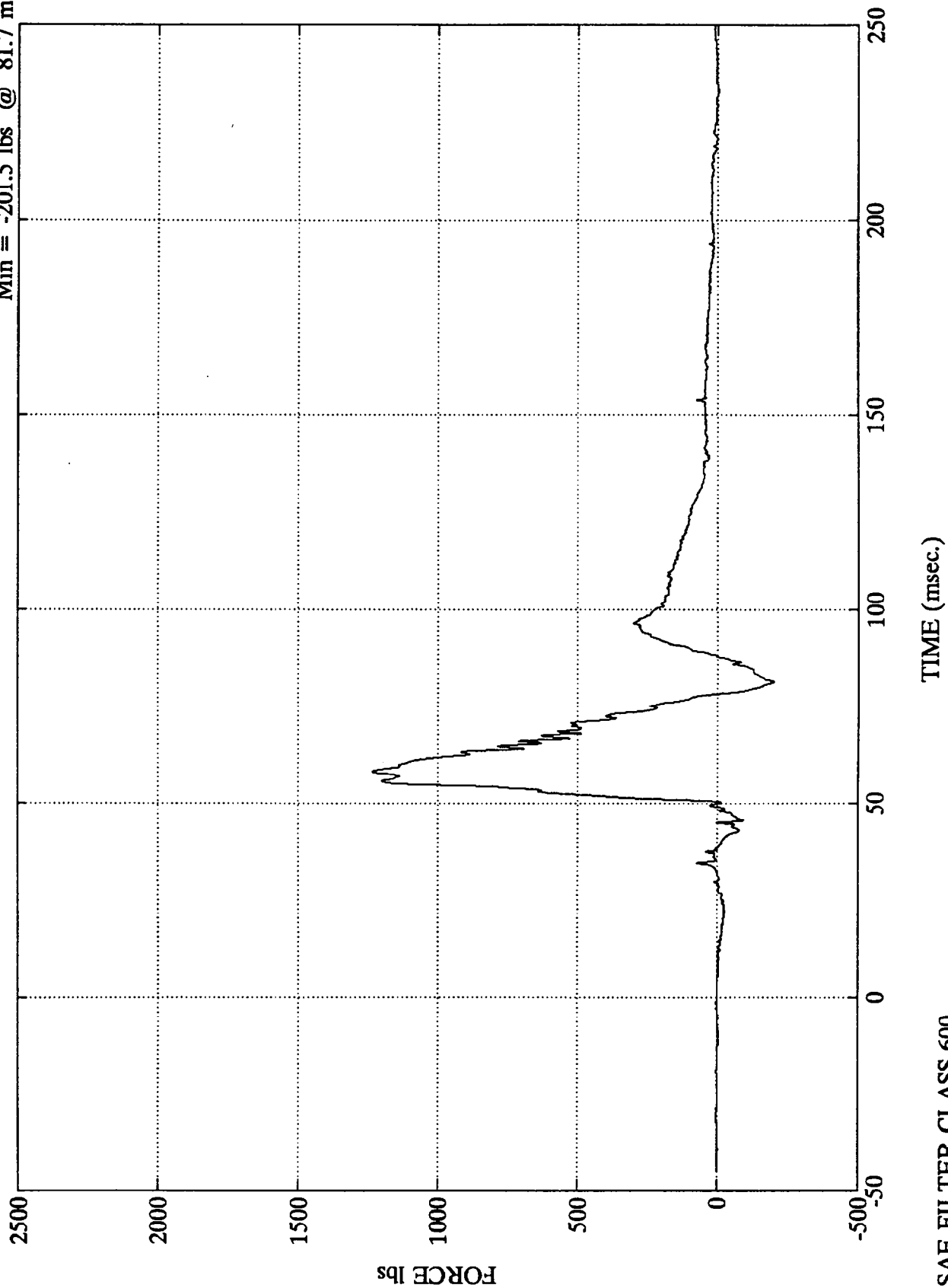
SAE FILTER CLASS 180



Test 1019

Max = 1234.0 lbs @ 58.3 msec
Min = -201.5 lbs @ 81.7 msec

POS #1 LEFT FEMUR

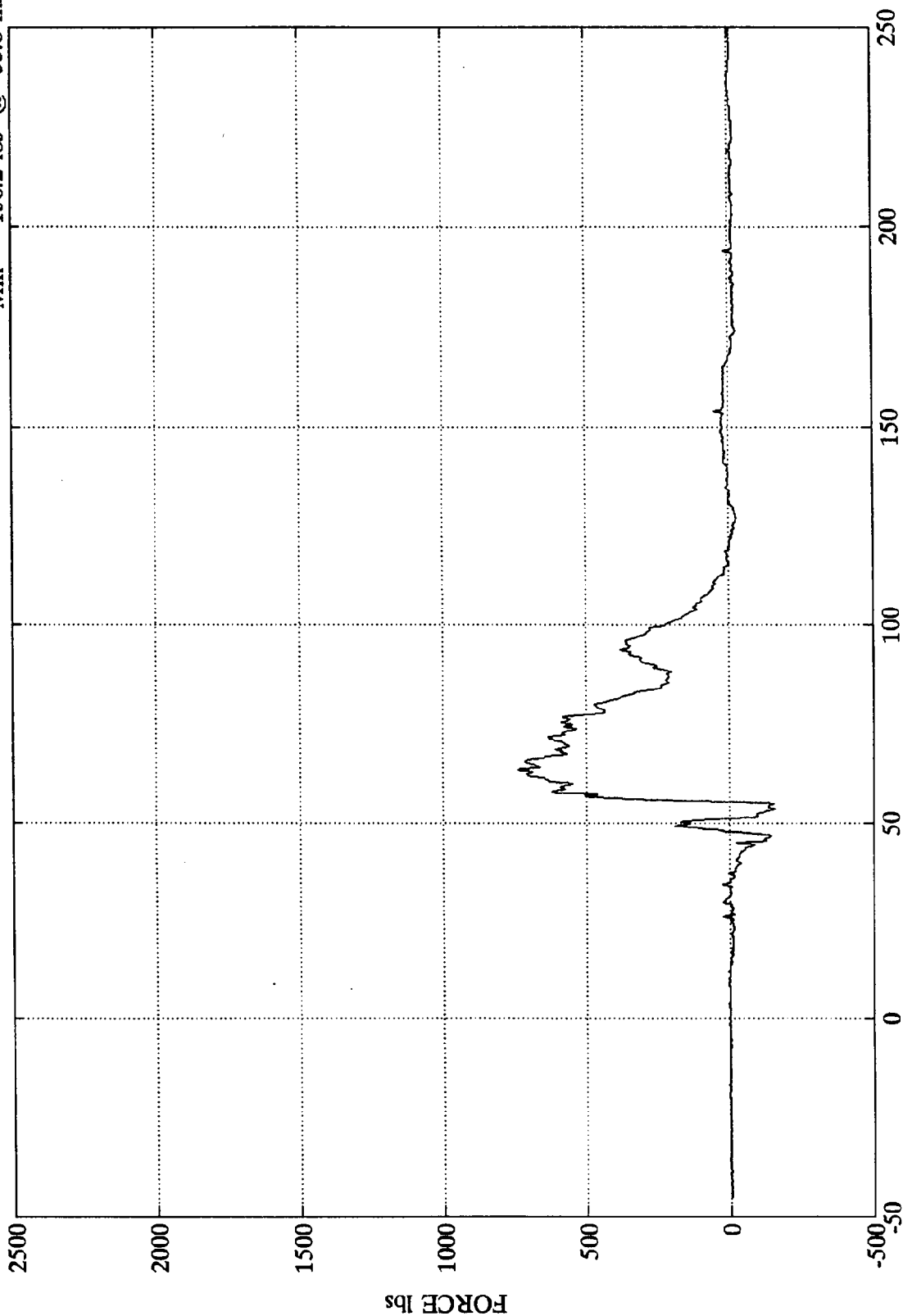


SAE FILTER CLASS 600

Test 1019
Max = 738.9 lbs @ 63.7 msec
Min = -156.2 lbs @ 53.8 msec

POS #1 RIGHT FEMUR

2500



TIME (msec.)

SAE FILTER CLASS 600

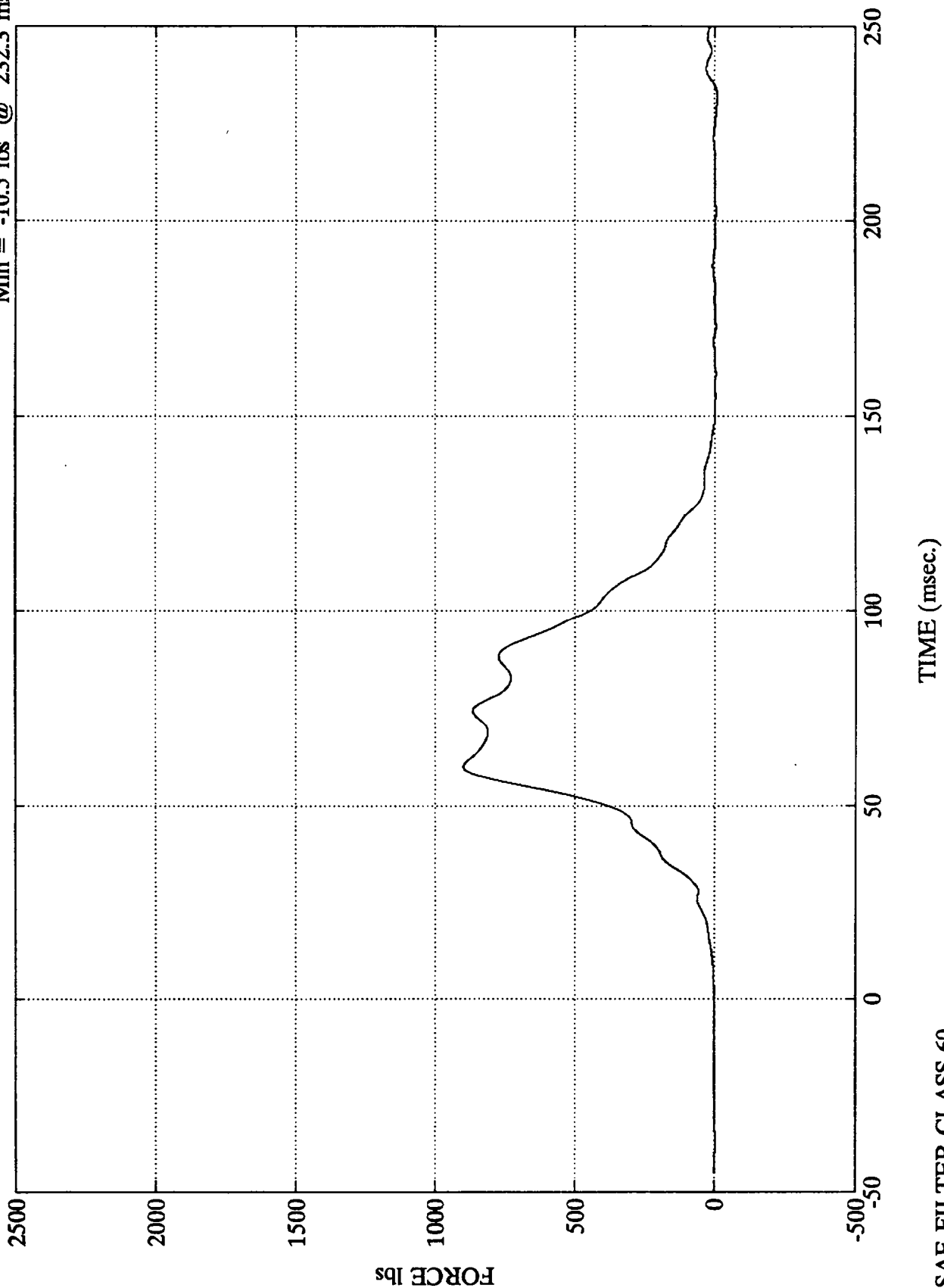
FORCE lbs

B-82

7862-2

Test 1019
Max = 898.7 lbs @ 60.2 msec
Min = -10.5 lbs @ 232.3 msec

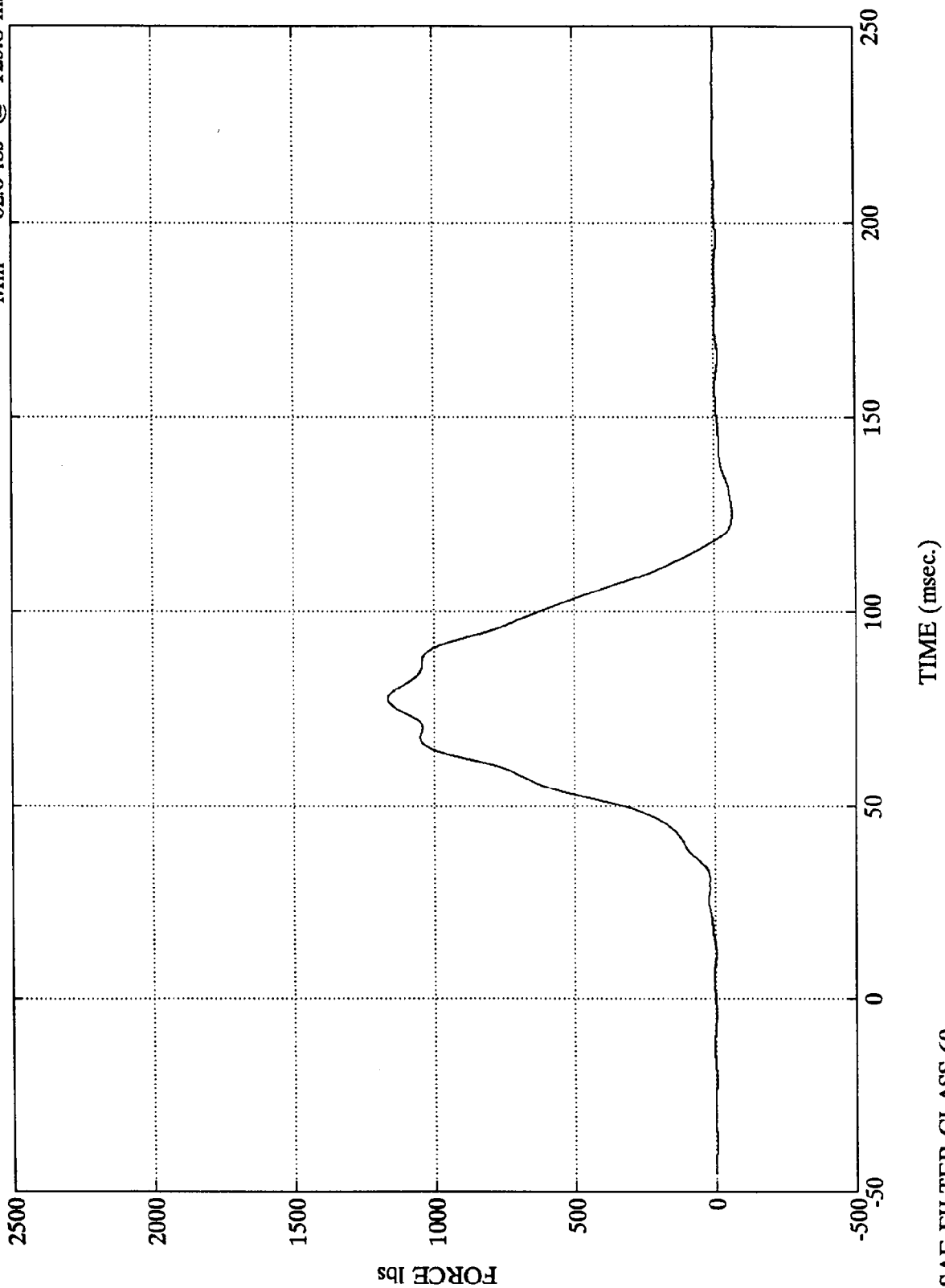
POS #1 TORSO BELT



Max = 1165.4 lbs @ 77.5 msec
Min = -62.6 lbs @ 125.8 msec

POS #1 LAP BELT

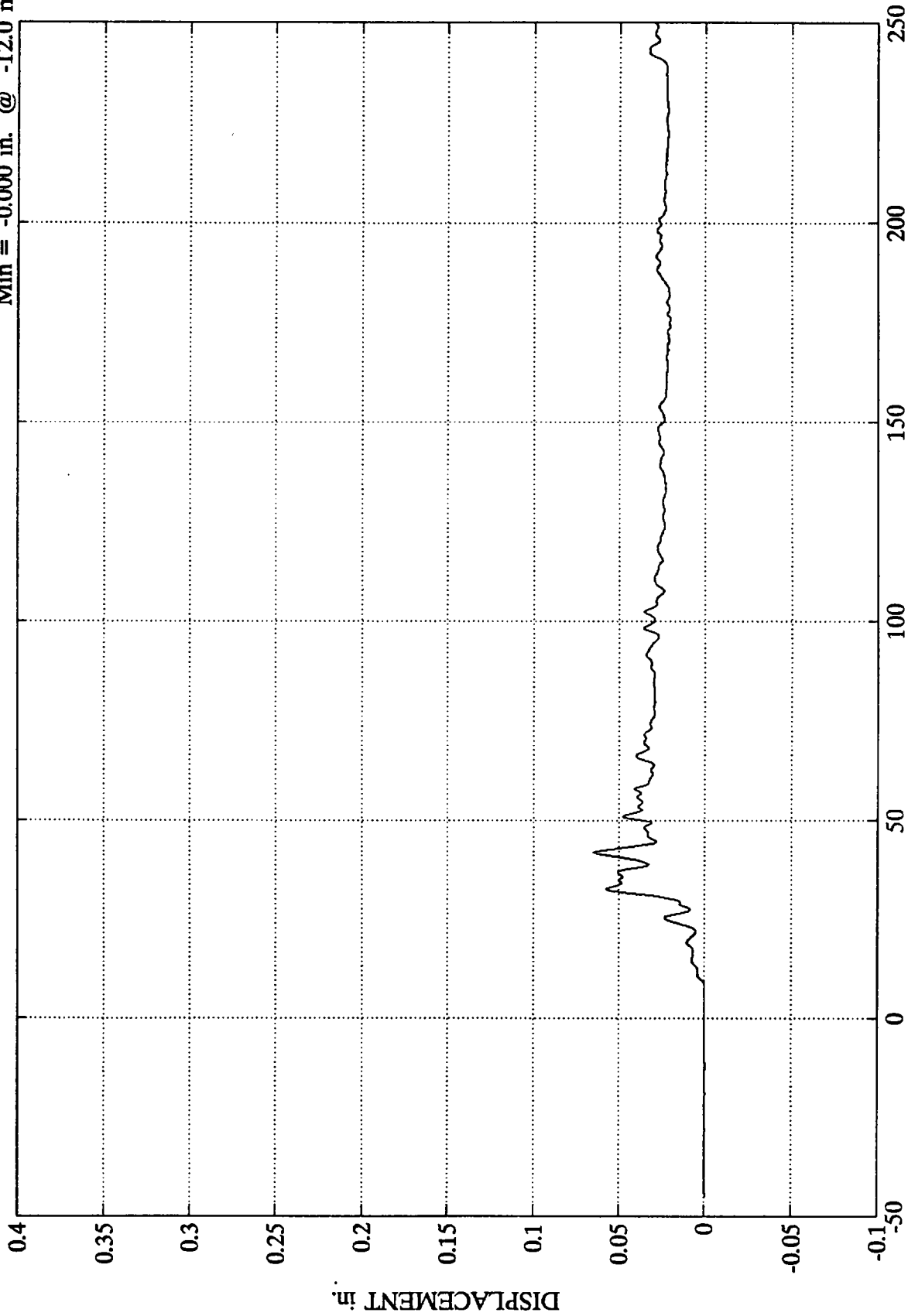
Test 1019



Test 1019

POS #1 BELT ELONGATION

Max = 0.065 in. @ 42.0 msec
Min = -0.000 in. @ -12.0 msec



B-85

7862-2

Measured over
2.5 inches

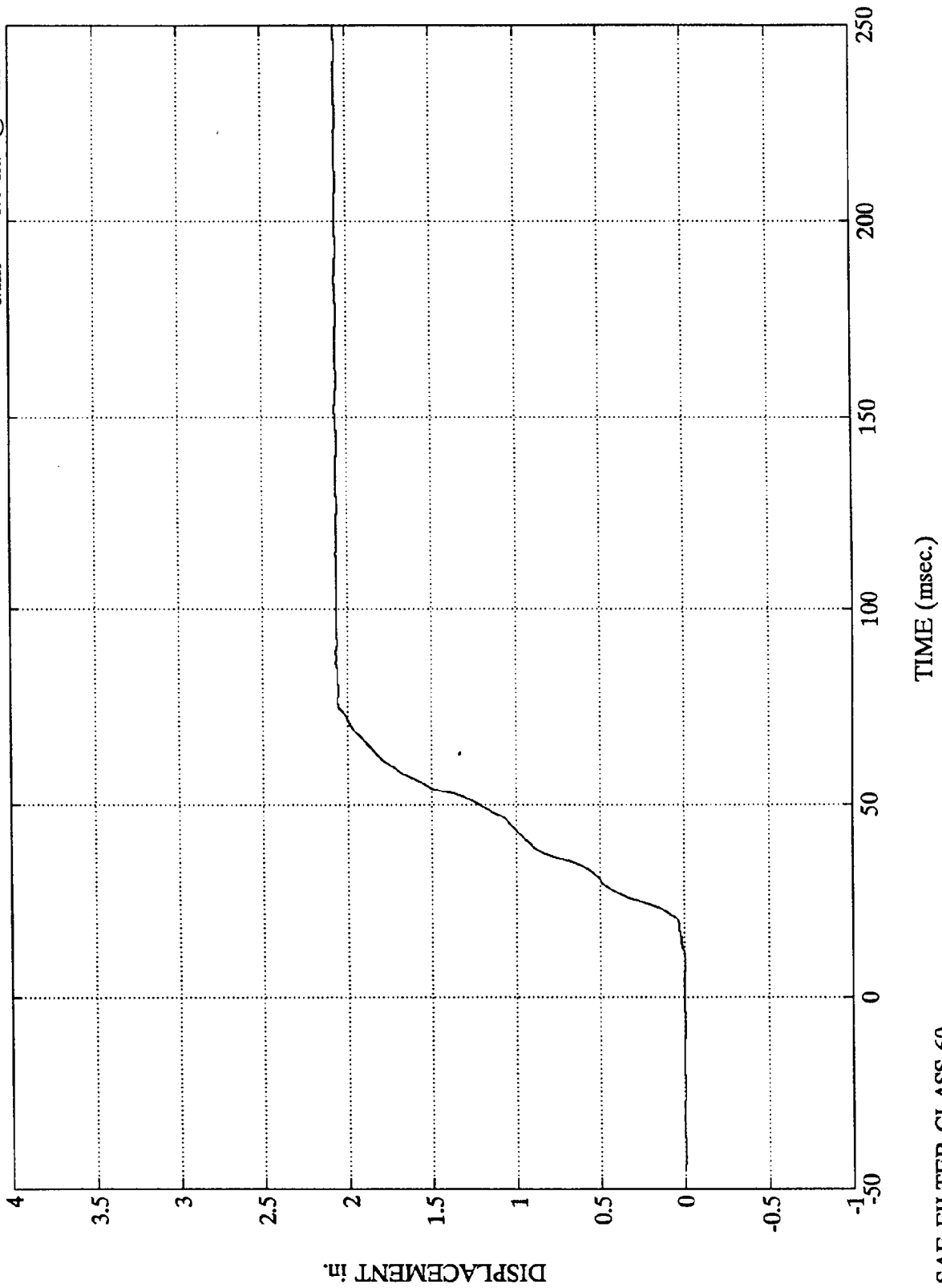
TIME (msec.)

SAE FILTER CLASS 60

Test 1019

Max = 2.1 in. @ 89.2 msec
Min = -0.0 in. @ -22.8 msec

POS #1 BELT SPOOL OUT

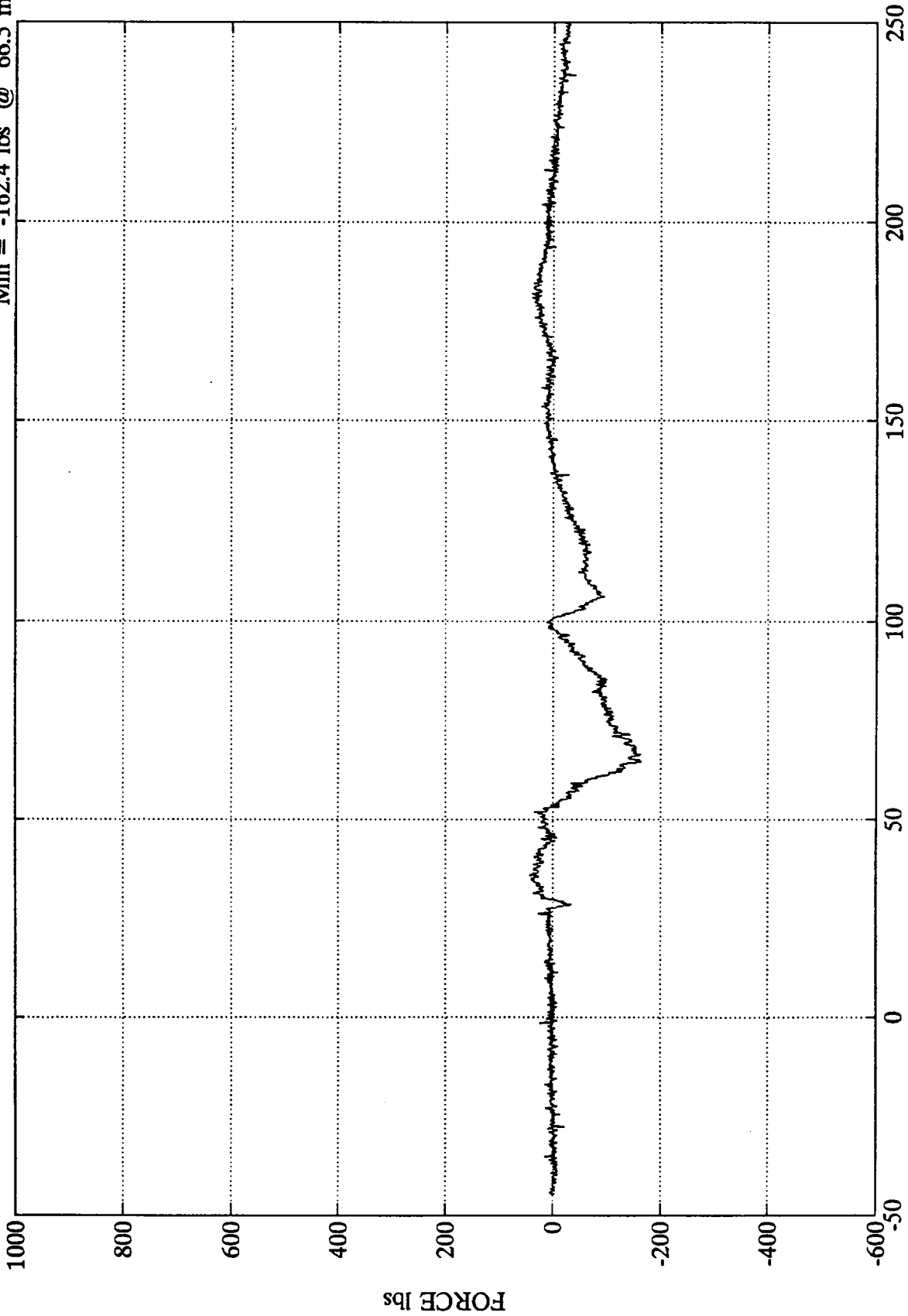


SAE FILTER CLASS 60

Test 1019

POS #1 UPPER NECK FORCE(X)

Max = 42.2 lbs @ 35.8 msec
Min = -162.4 lbs @ 66.5 msec



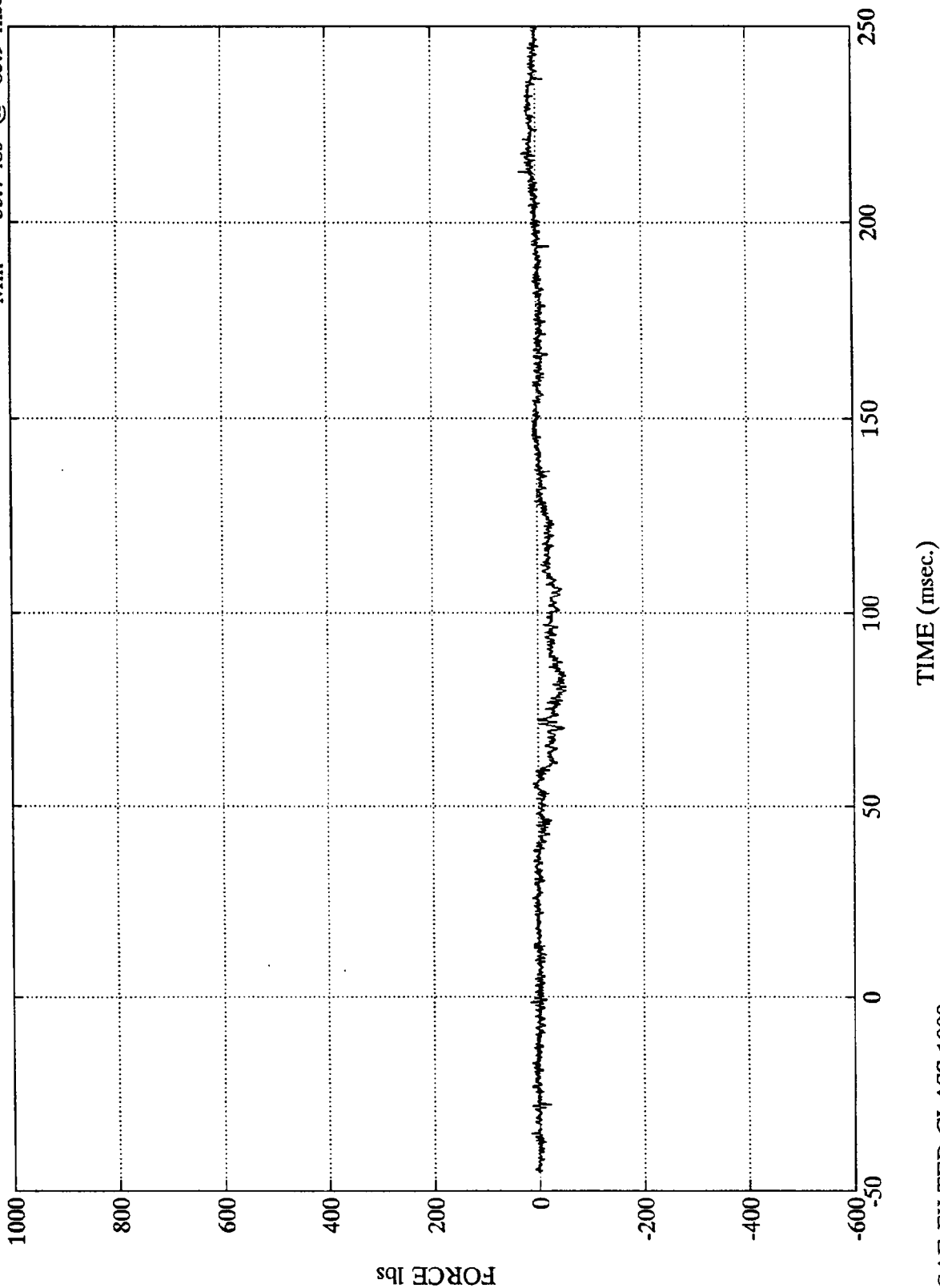
TIME (msec.)

SAE FILTER CLASS 1000

Test 1019

POS #1 UPPER NECK FORCE(Y)

Max = 30.7 lbs @ 213.0 msec
Min = -53.7 lbs @ 83.9 msec

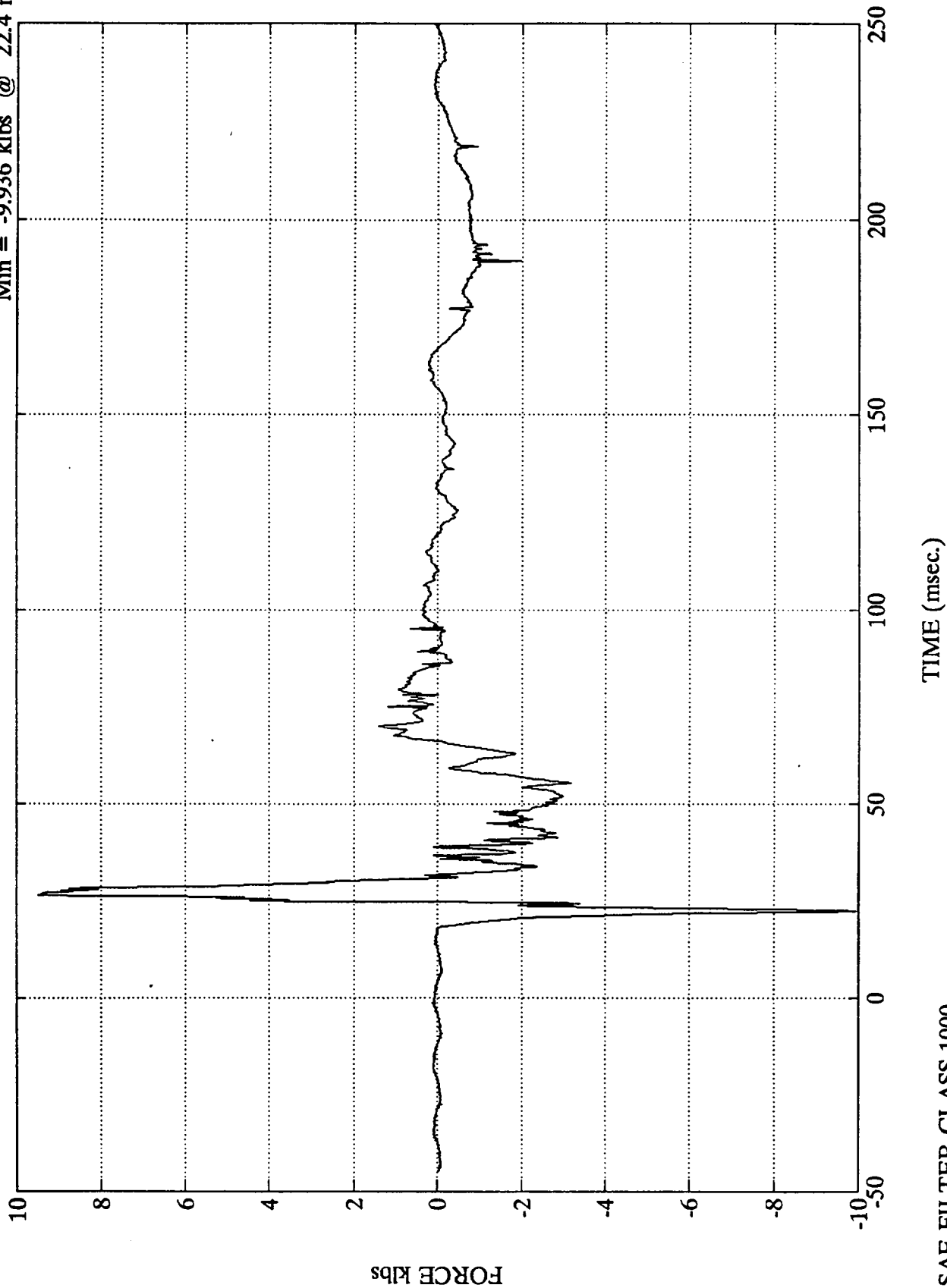


SAE FILTER CLASS 1000

Test 1019

POS #1 UPPER NECK FORCE(Z)

Max = 9.480 klbs @ 26.5 msec
Min = -9.936 klbs @ 22.4 msec

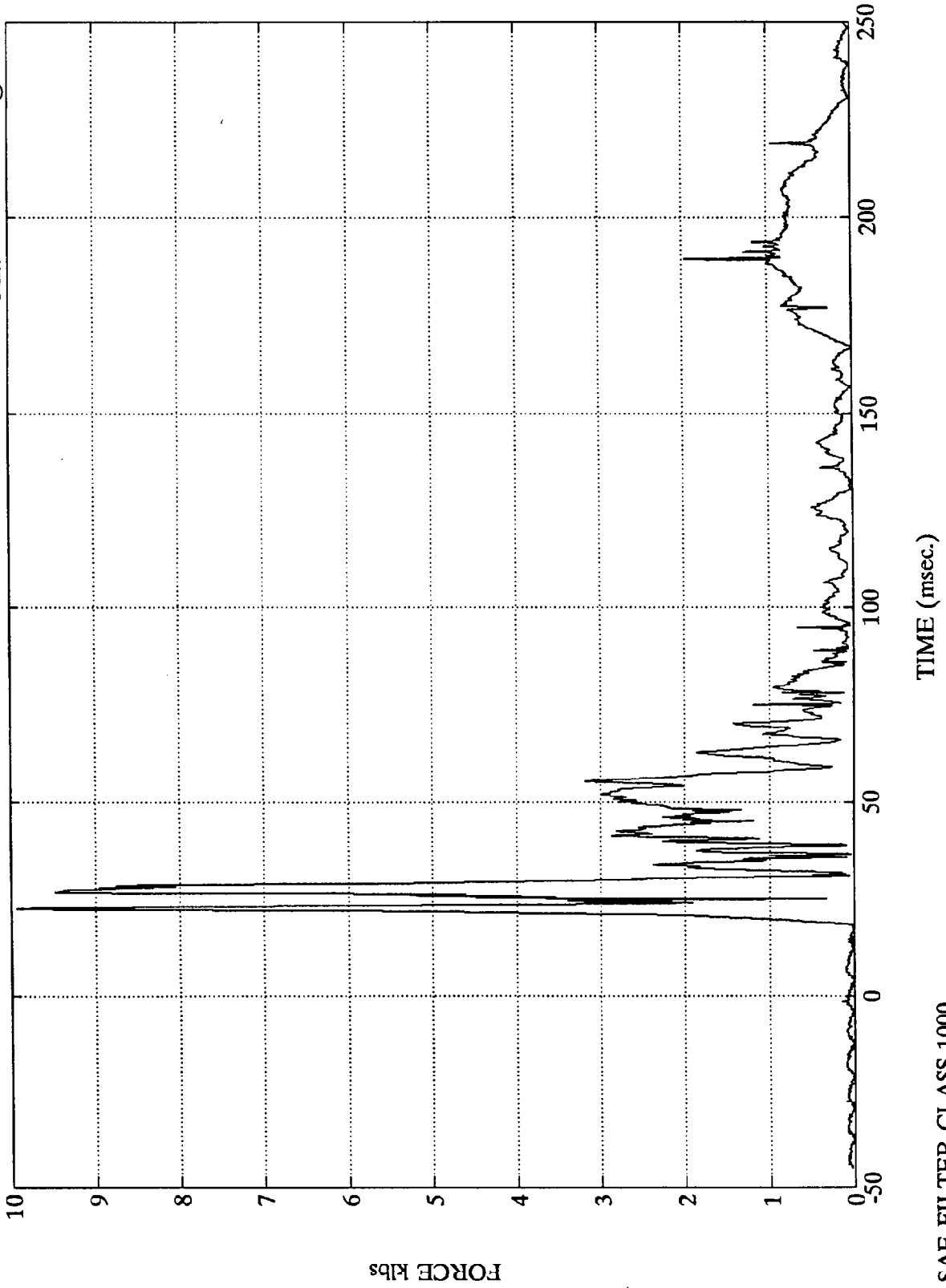


SAE FILTER CLASS 1000

Test 1019

POS #1 NECK FORCE RESULTANT

Max = 9.936 klbs @ 22.4 msec
Min = 0.002 klbs @ -20.6 msec



SAE FILTER CLASS 1000

Test 1019
Max = 85.7 ft-lbs @ 92.6 msec
Min = -89.3 ft-lbs @ 64.9 msec

POS #1 UPPER NECK MOMENT(X)

1000

800

600

400

200

0

-200

-400

-600

MOMENT ft-lbs

250

200

150

100

50

0

-50

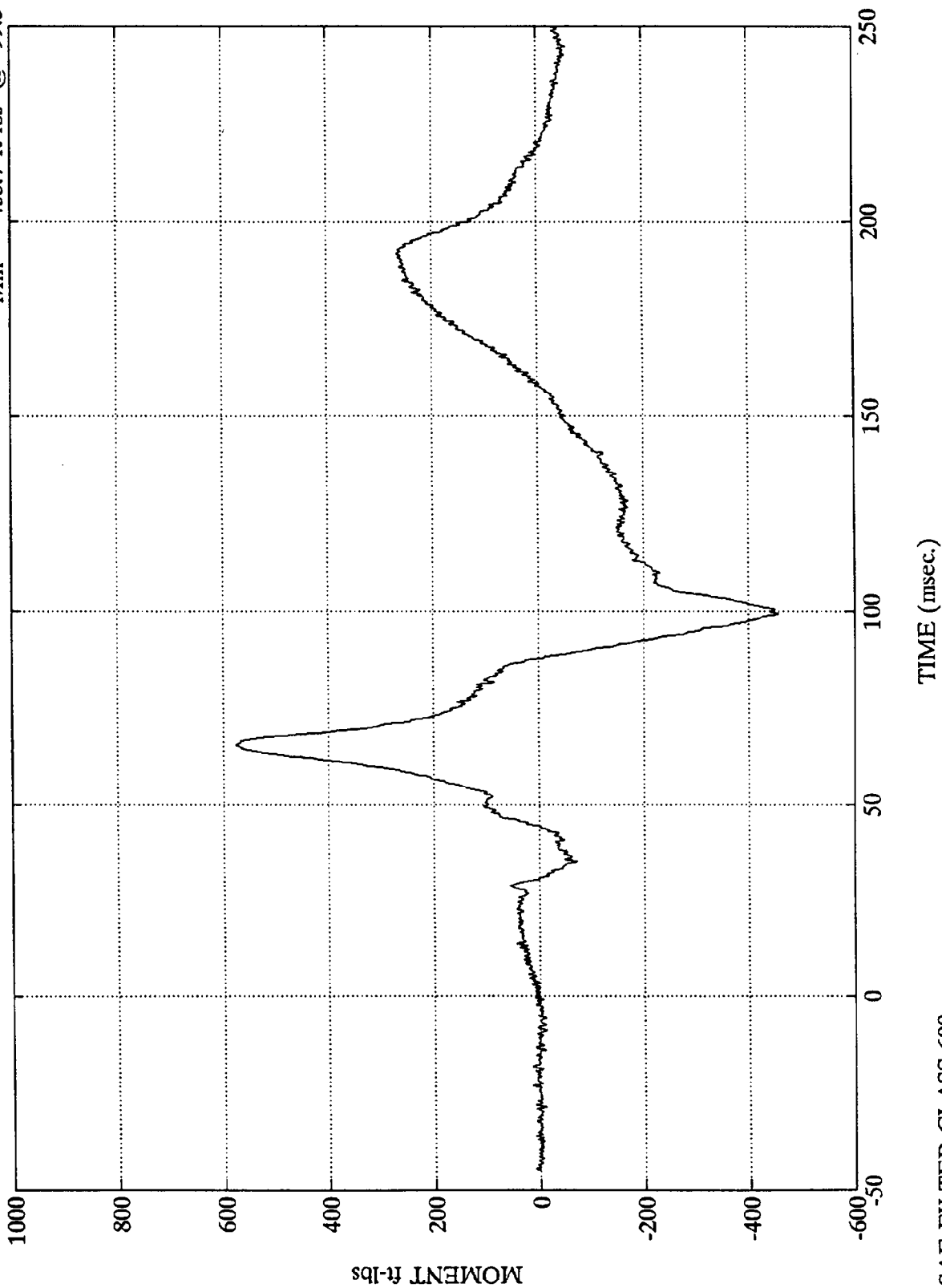
TIME (msec.)

SAE FILTER CLASS 600

Test 1019

POS #1 UPPER NECK MOMENT(Y)

Max = 575.9 ft-lbs @ 65.8 msec
Min = -455.7 ft-lbs @ 99.5 msec

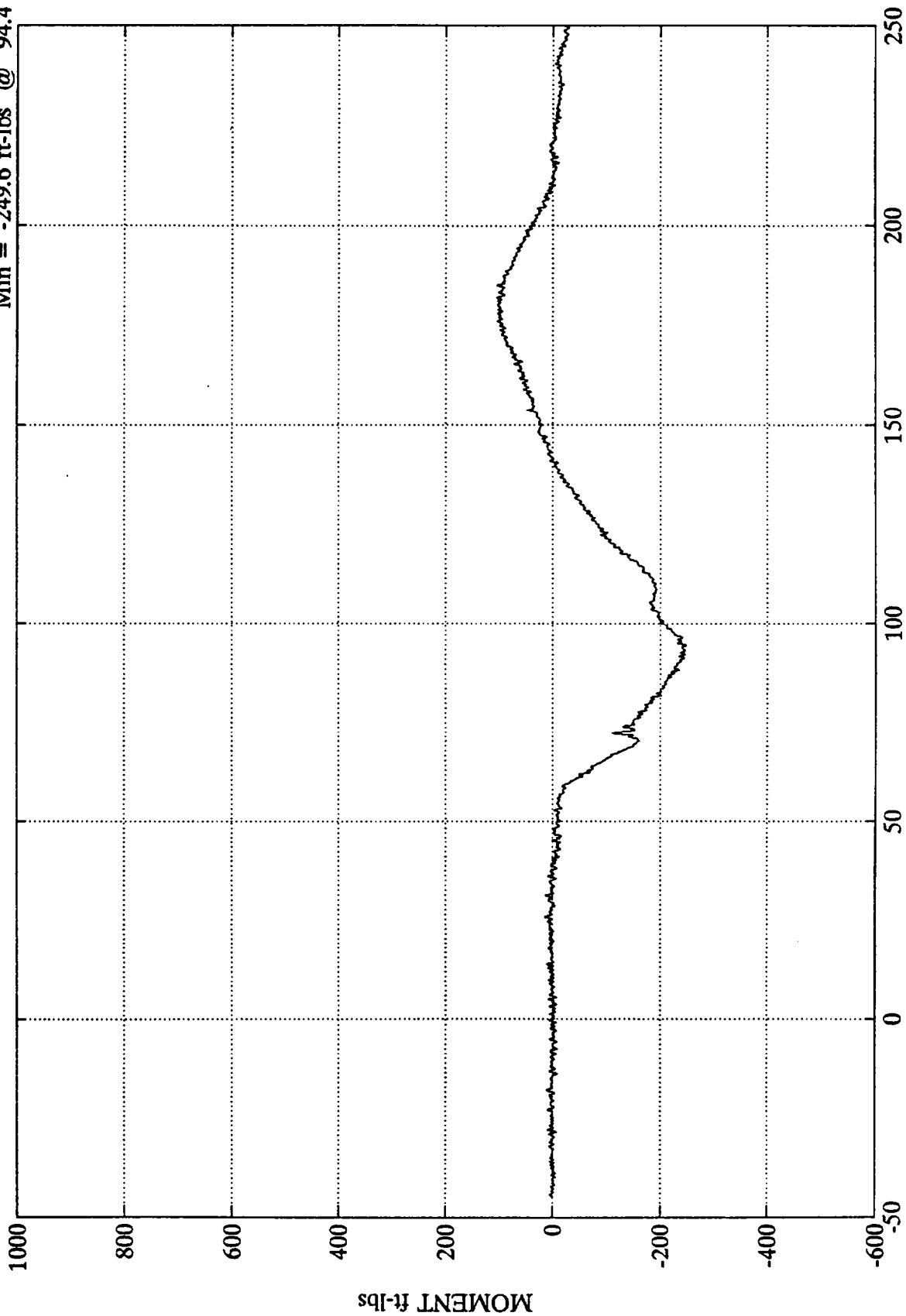


SAE FILTER CLASS 600

Test 1019

POS #1 UPPER NECK MOMENT(Z)

Max = 105.9 ft-lbs @ 184.9 msec
Min = -249.6 ft-lbs @ 94.4 msec

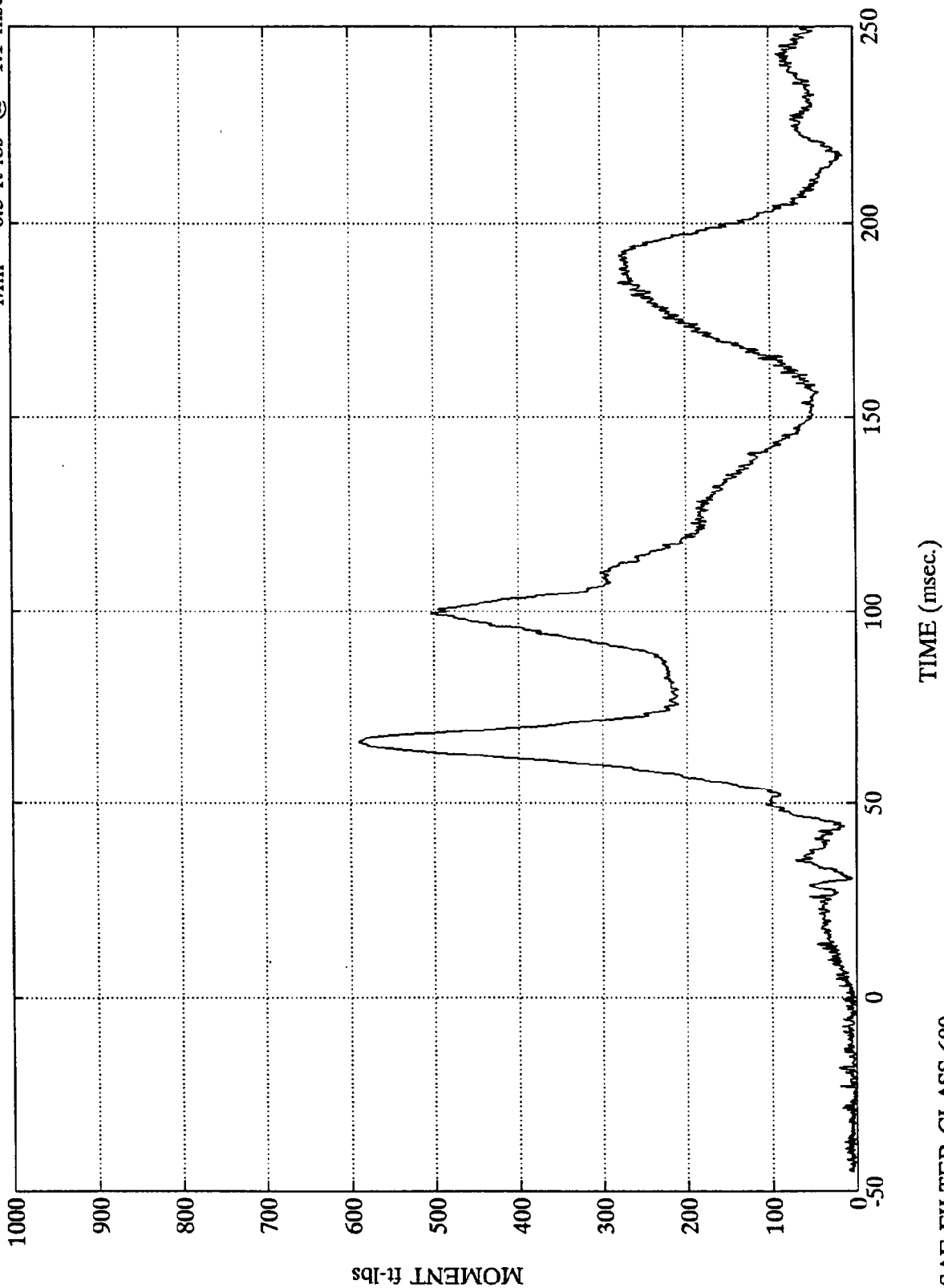


TIME (msec.)

SAE FILTER CLASS 600

Test 1019
Max = 590.2 ft-lbs @ 65.8 msec
Min = 0.5 ft-lbs @ -1.1 msec

POS #1 NECK MOMENT RESULTANT

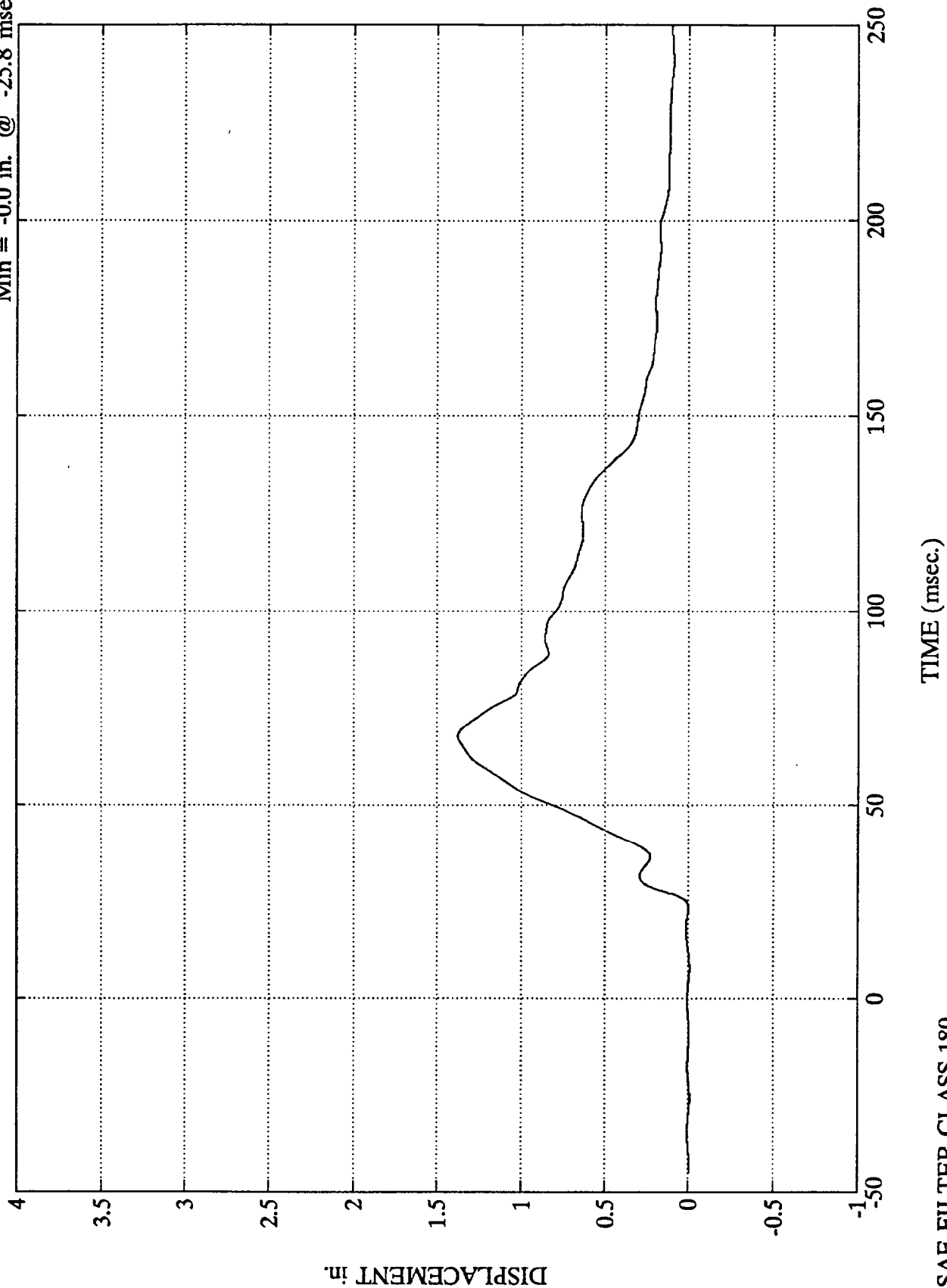


SAE FILTER CLASS 600

Test 1019

POS #1 CHEST DISPLACEMENT

Max = 1.4 in. @ 67.8 msec
Min = -0.0 in. @ -25.8 msec



B-95

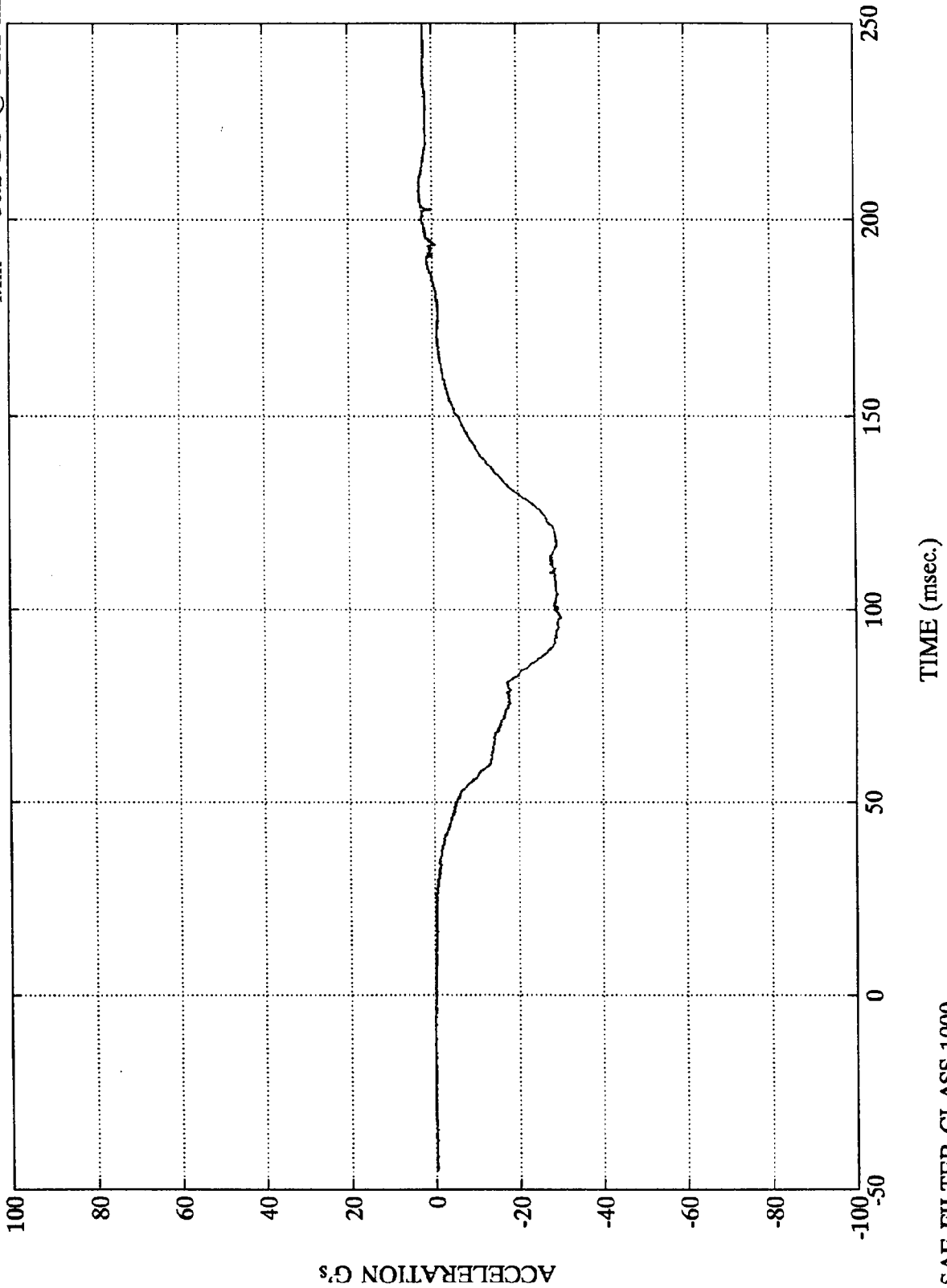
7862-2

SAE FILTER CLASS 180

Test 1019

POS #2 HEAD X

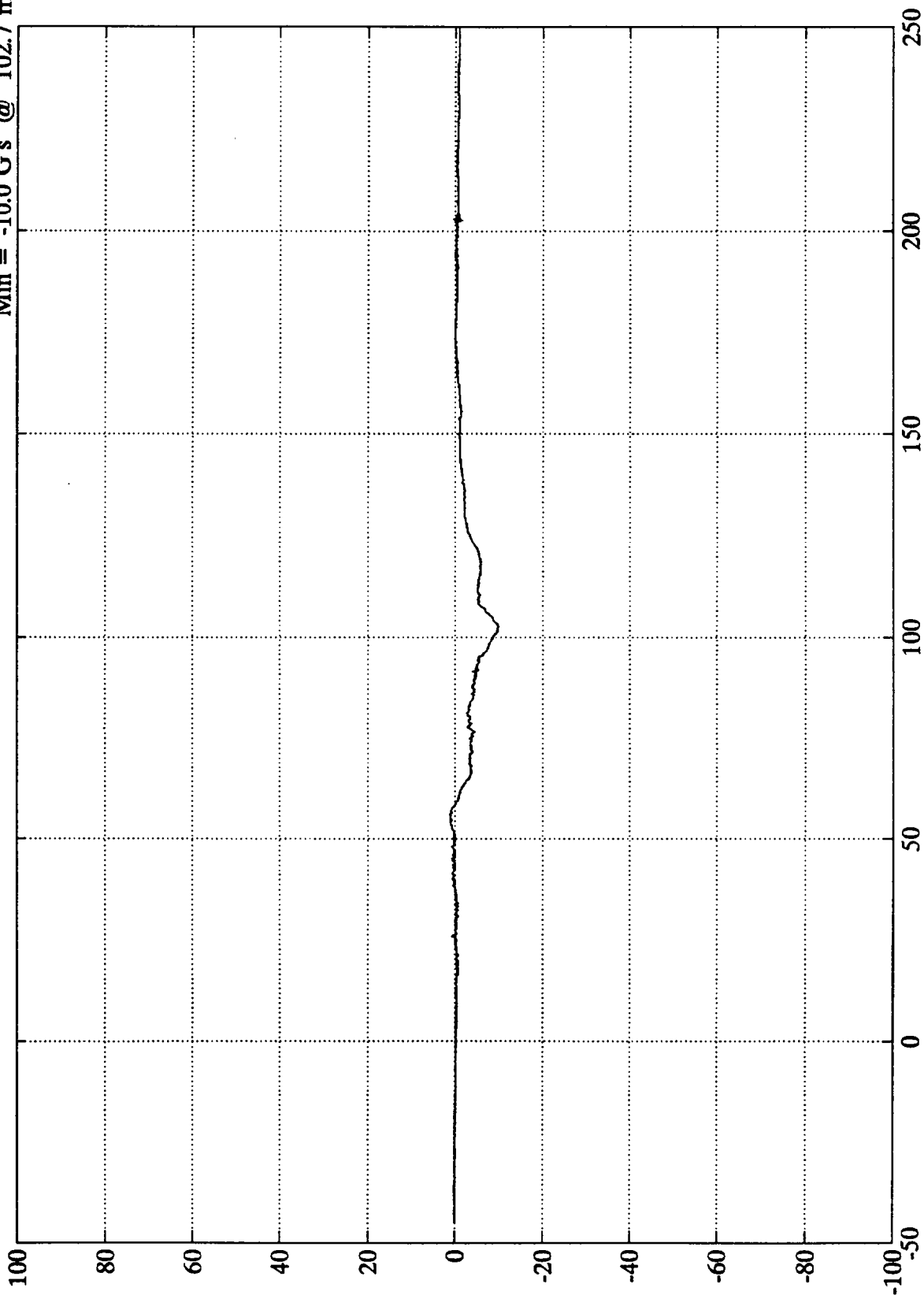
Max = 5.2 G's @ 254.9 msec
Min = -30.2 G's @ 98.2 msec



SAE FILTER CLASS 1000

Test 1019
Max = 1.2 G's @ 56.0 msec
Min = -10.0 G's @ 102.7 msec

POS #2 HEAD Y



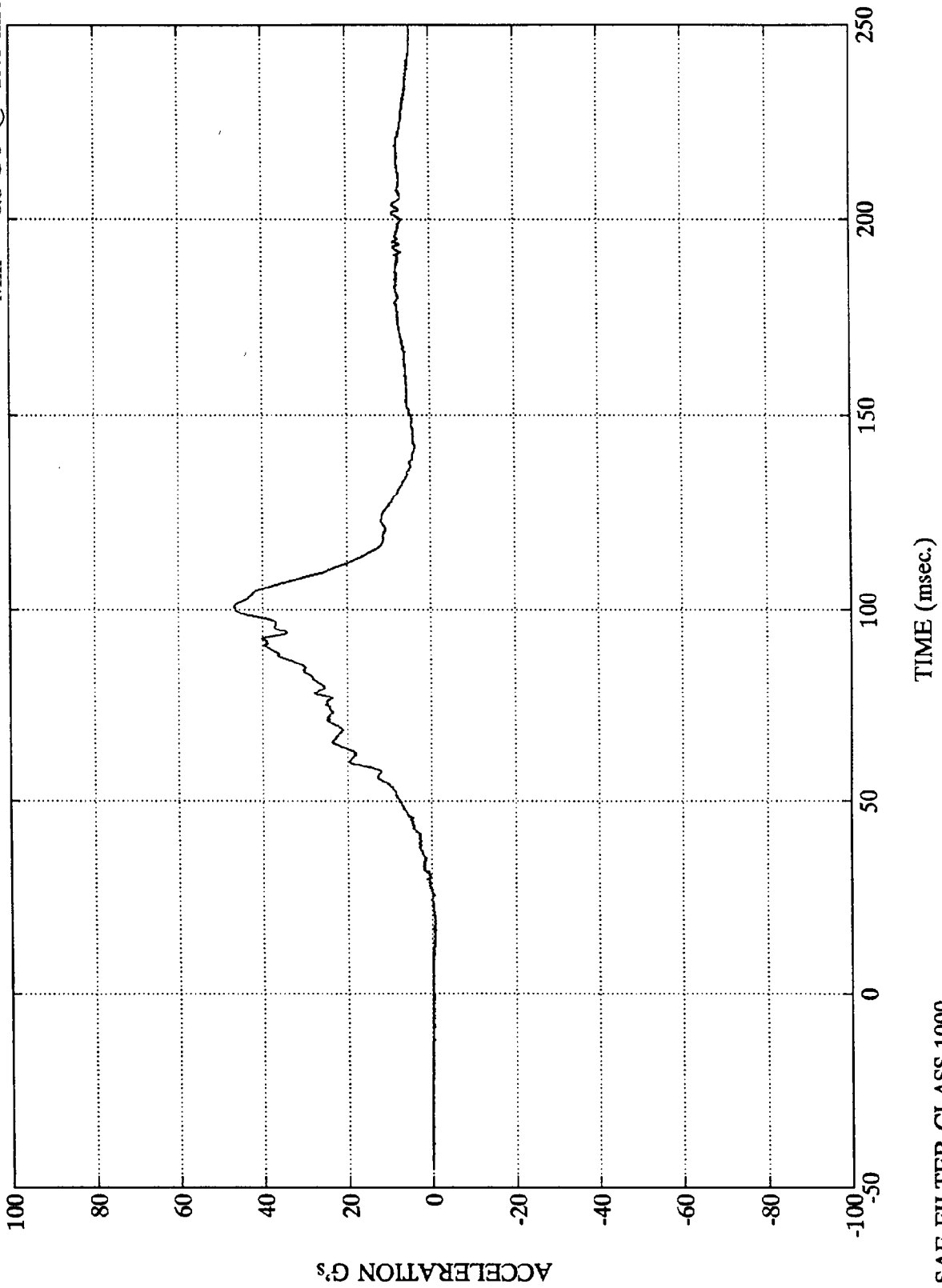
TIME (msec.)

SAE FILTER CLASS 1000

Test 1019

POS #2 HEAD Z

Max = 46.8 G's @ 101.2 msec
Min = -0.8 G's @ 19.0 msec

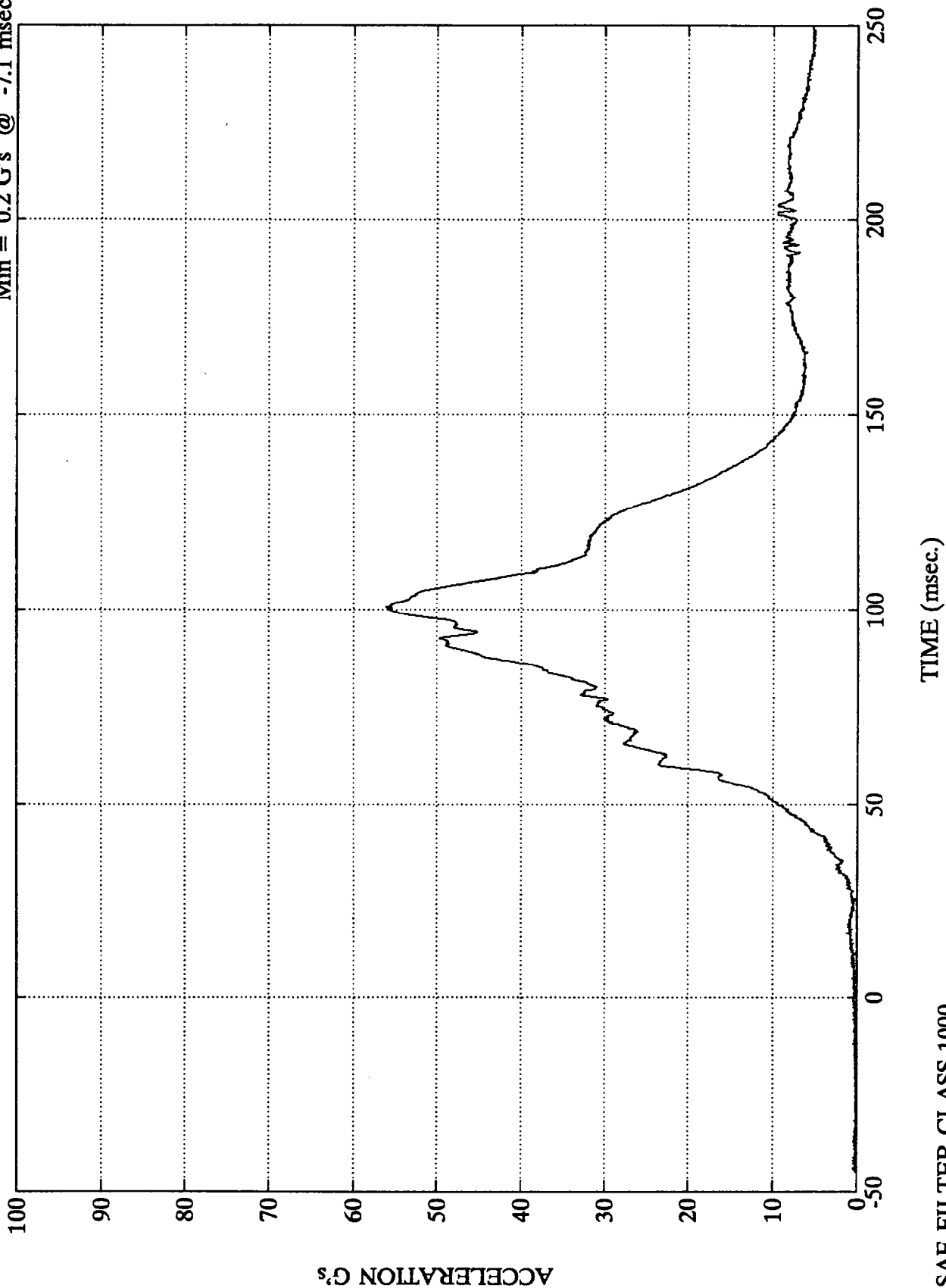


SAE FILTER CLASS 1000

Test 1019
Max = 56.1 G's @ 100.8 msec
Min = 0.2 G's @ -7.1 msec

POS #2 HEAD RESULTANT

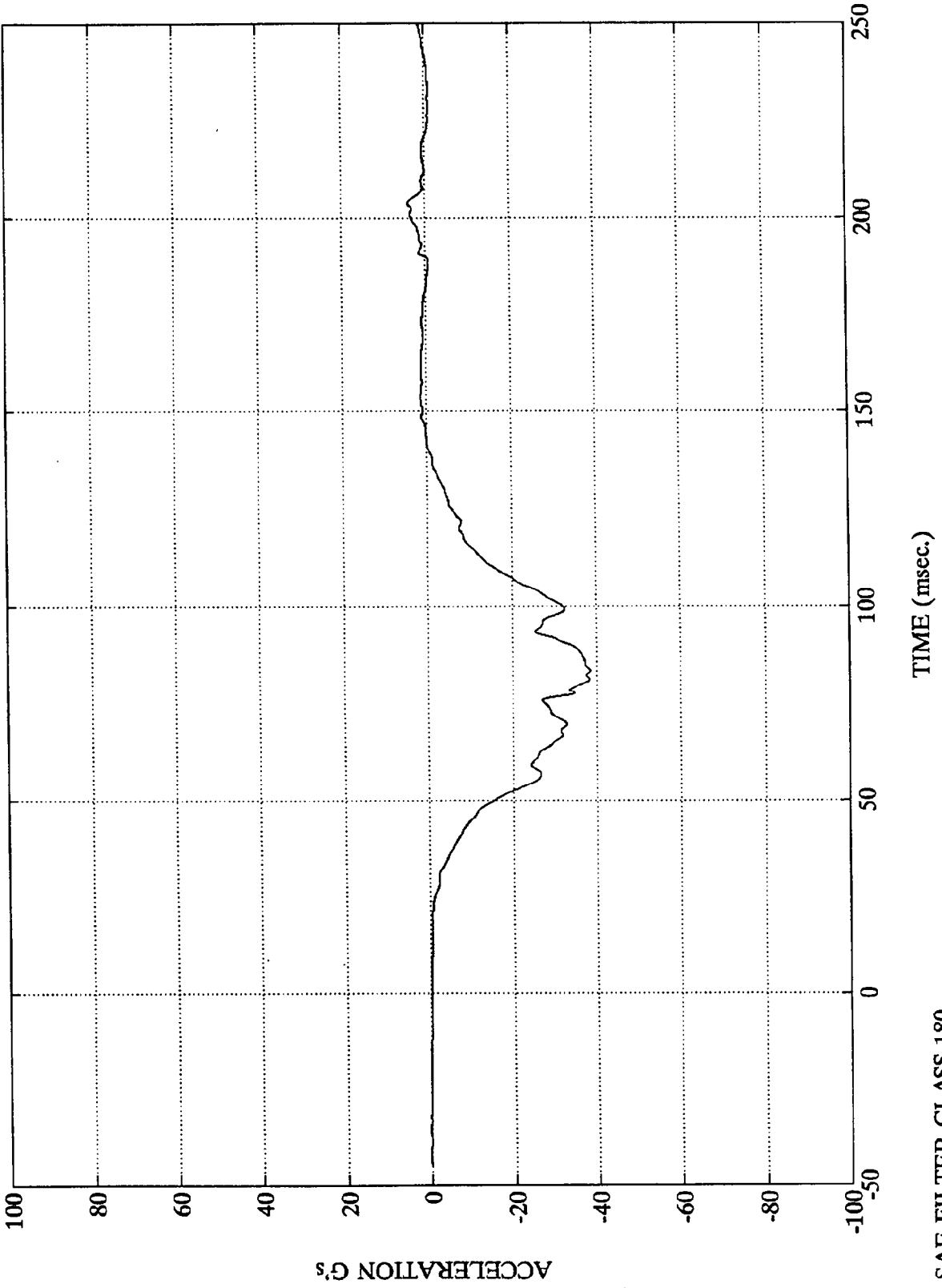
SAE FILTER CLASS 1000



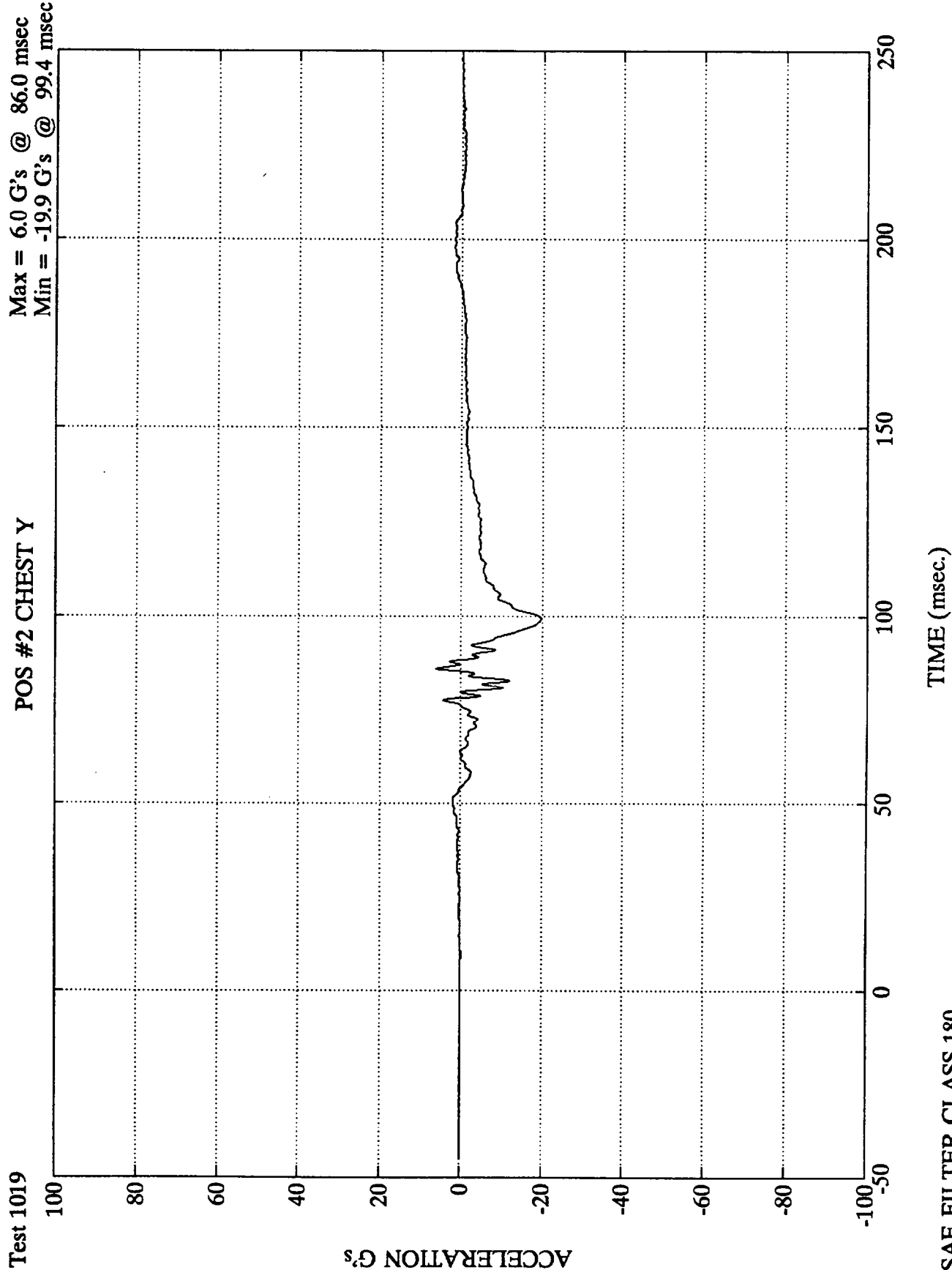
Test 1019

POS #2 CHEST X

Max = 4.1 G's @ 203.8 msec
Min = -38.6 G's @ 83.6 msec



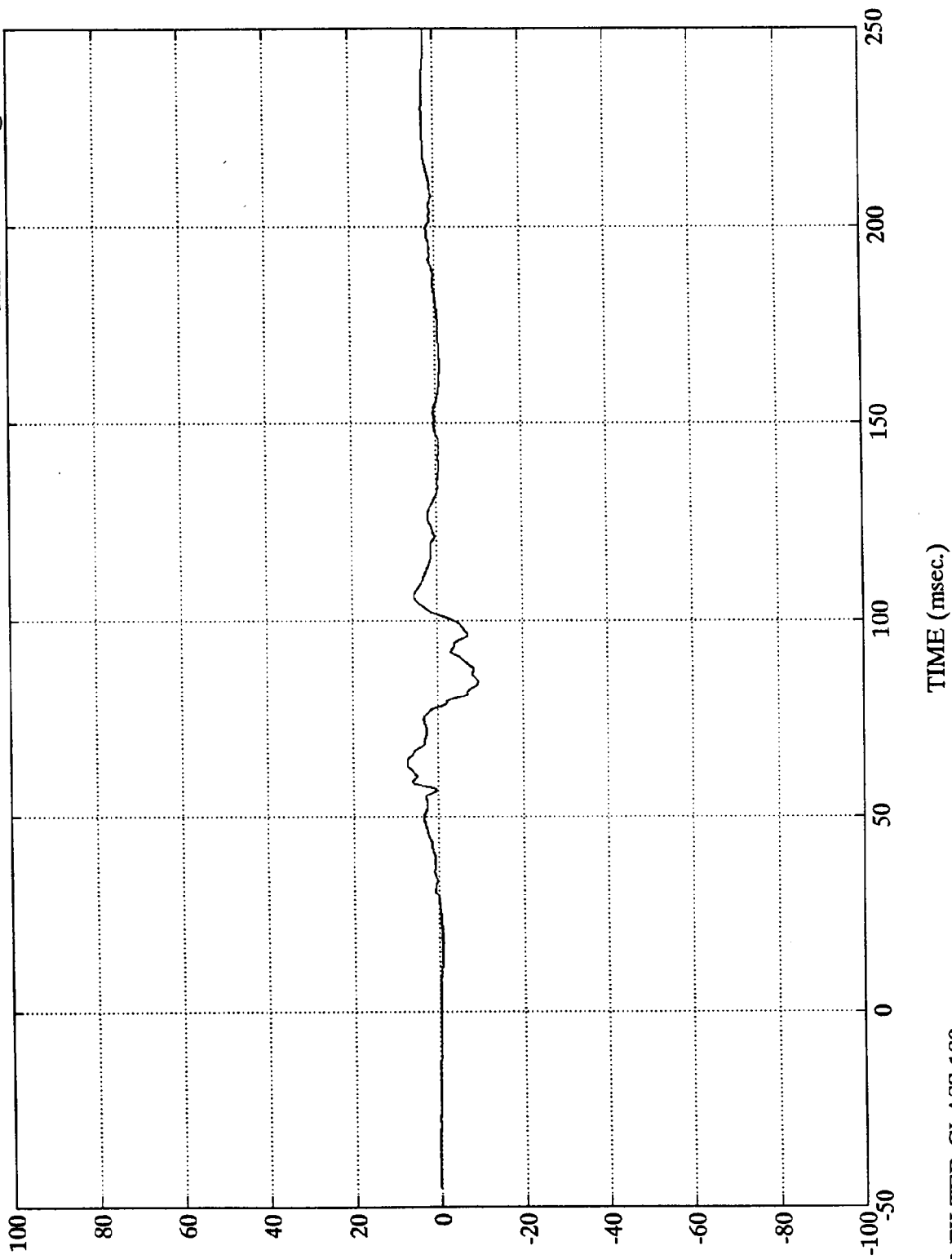
SAE FILTER CLASS 180



Test 1019

POS #2 CHEST Z

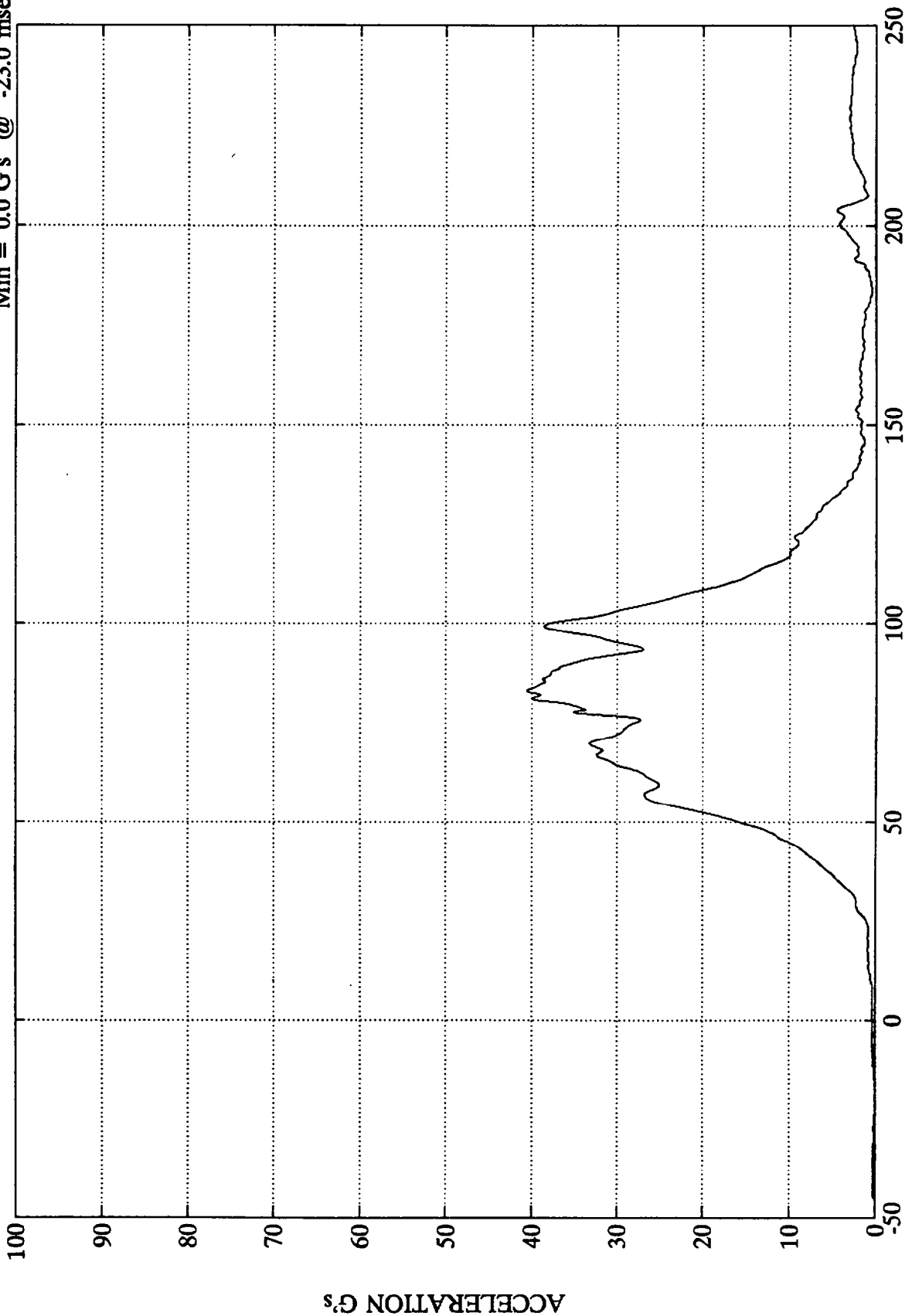
Max = 7.2 G's @ 64.2 msec
Min = -9.6 G's @ 84.7 msec



SAE FILTER CLASS 180

Test 1019
Max = 40.5 G's @ 83.2 msec
Min = 0.0 G's @ -23.0 msec

POS #2 CHEST RESULTANT



TIME (msec.)

SAE FILTER CLASS 180

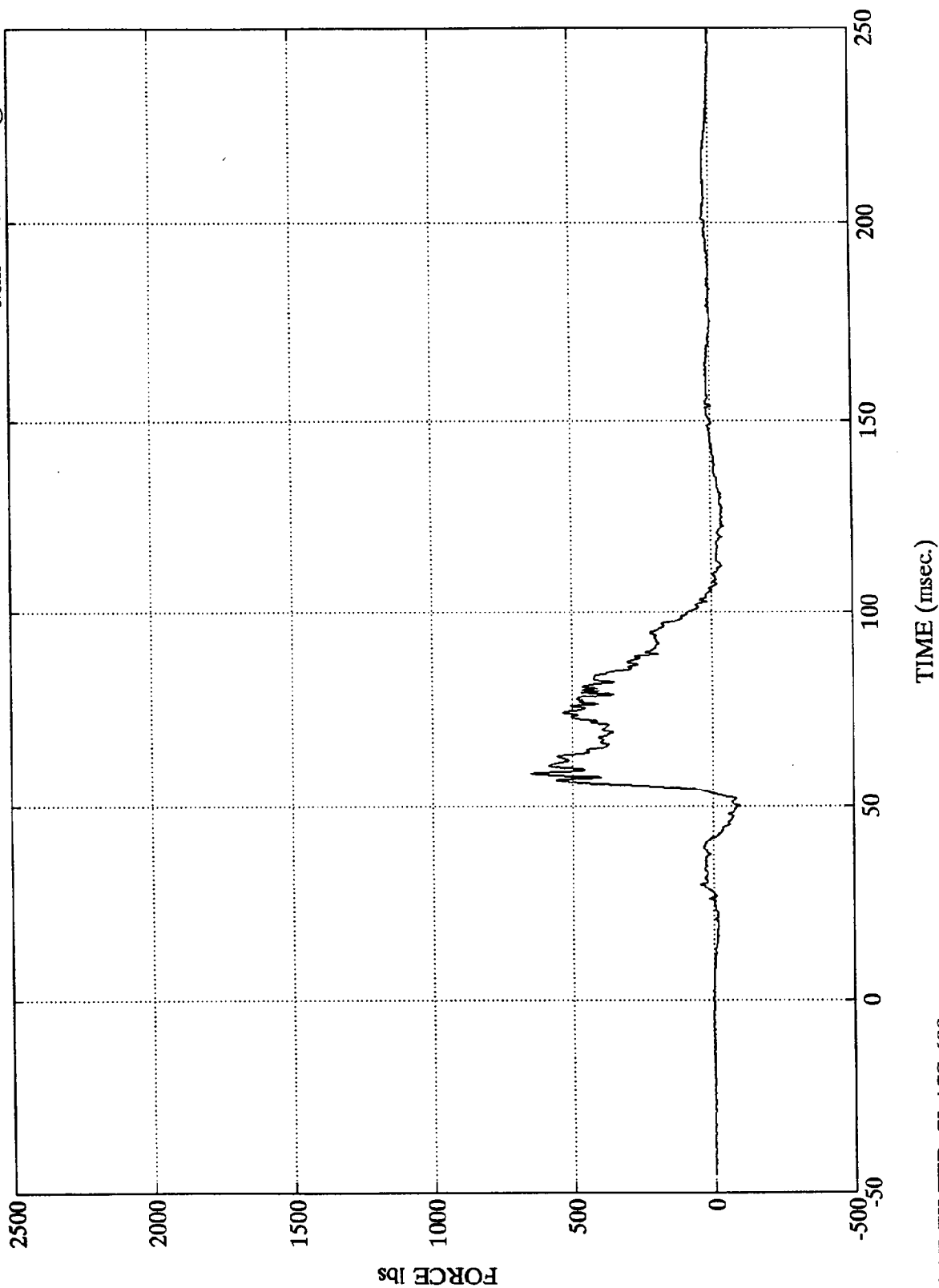
Test 1019

ACCELERATION G's

Max = 647.2 lbs @ 58.7 msec
Min = -93.3 lbs @ 50.2 msec

POS #2 LEFT FEMUR

Test 1019

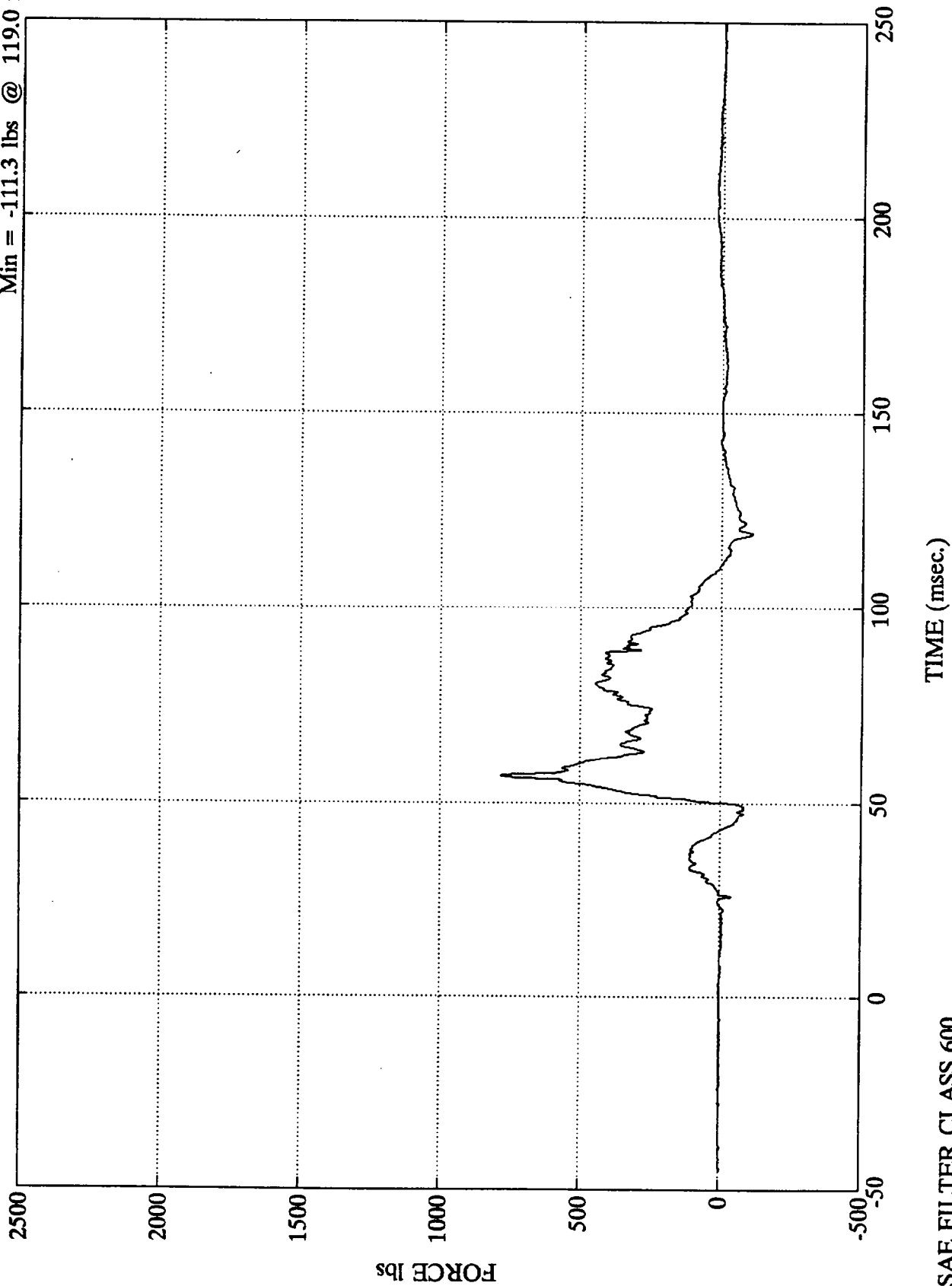


SAE FILTER CLASS 600

Test 1019

POS #2 RIGHT FEMUR

Max = 780.8 lbs @ 56.9 msec
Min = -111.3 lbs @ 119.0 msec



B-105

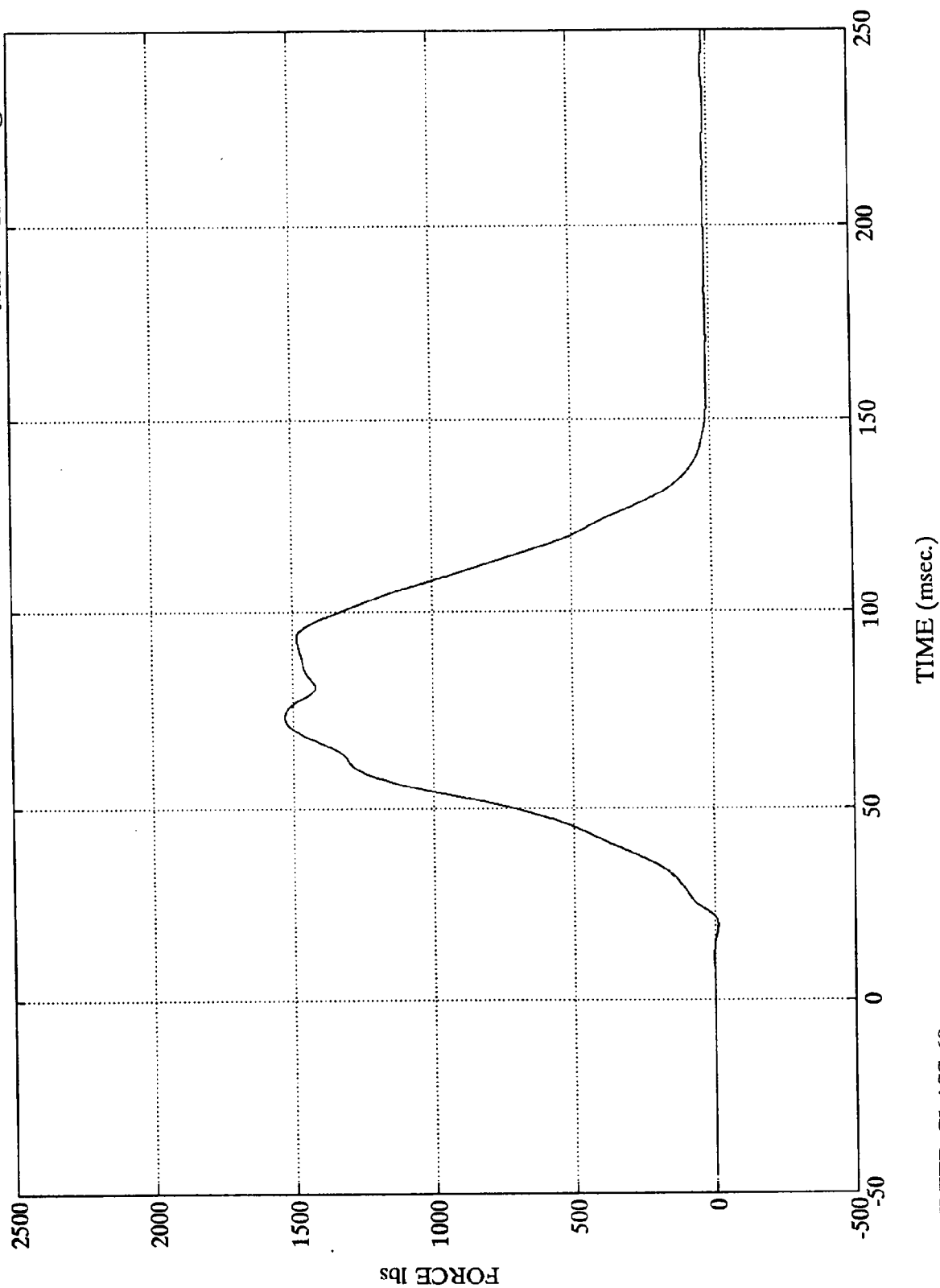
7862-2

SAE FILTER CLASS 600

Max = 1529.8 lbs @ 73.6 msec
Min = -11.6 lbs @ 19.4 msec

POS #2 TORSO BELT

Test 1019

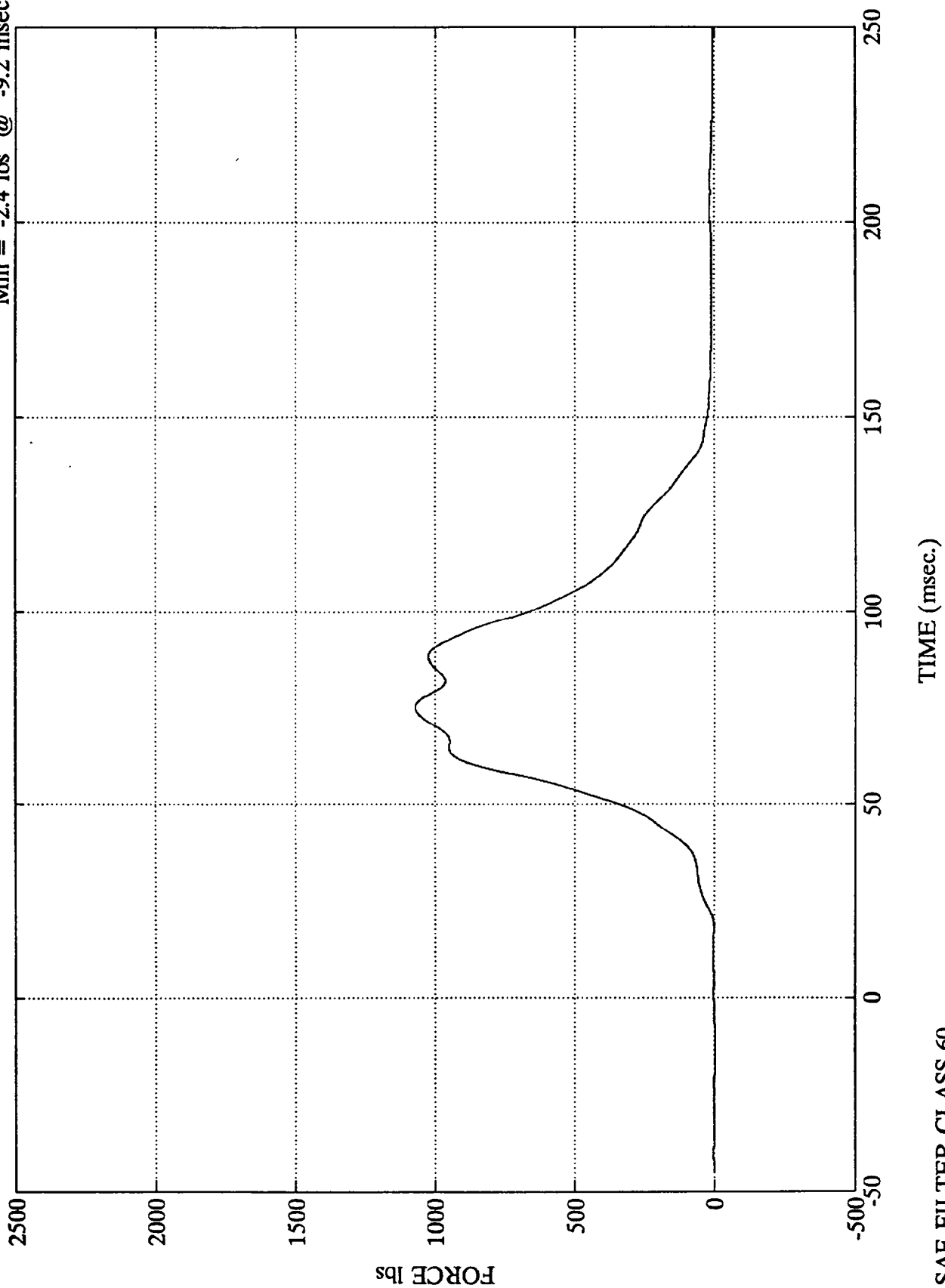


SAE FILTER CLASS 60

Test 1019

POS #2 LAP BELT

Max = 1071.9 lbs @ 75.5 msec
Min = -2.4 lbs @ -9.2 msec



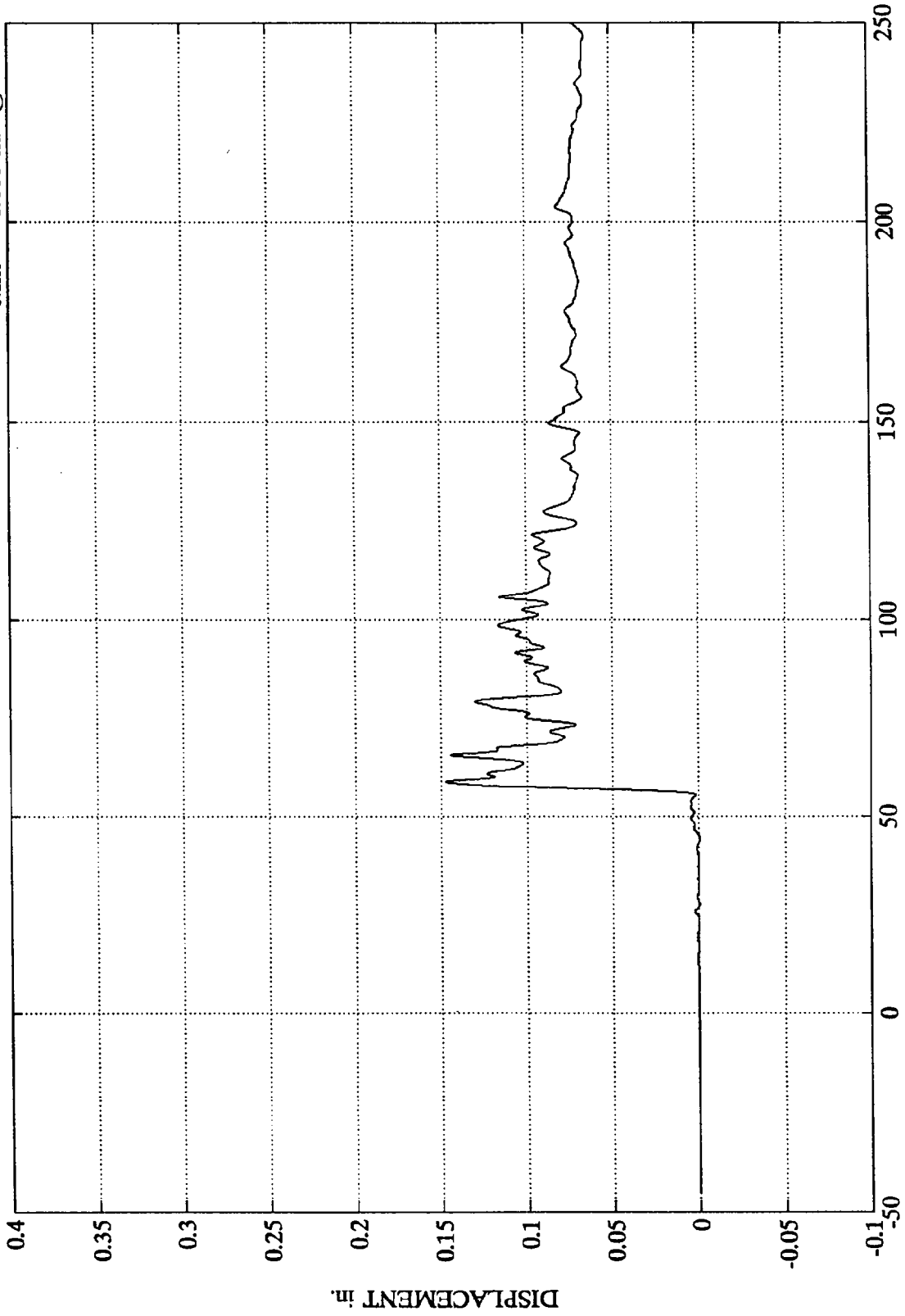
B-107

7862-2

SAE FILTER CLASS 60

Test 1019
Max = 0.147 in. @ 59.2 msec
Min = -0.000 in. @ 44.4 msec

POS #2 BELT ELONGATION



Measured over
2.5 inches

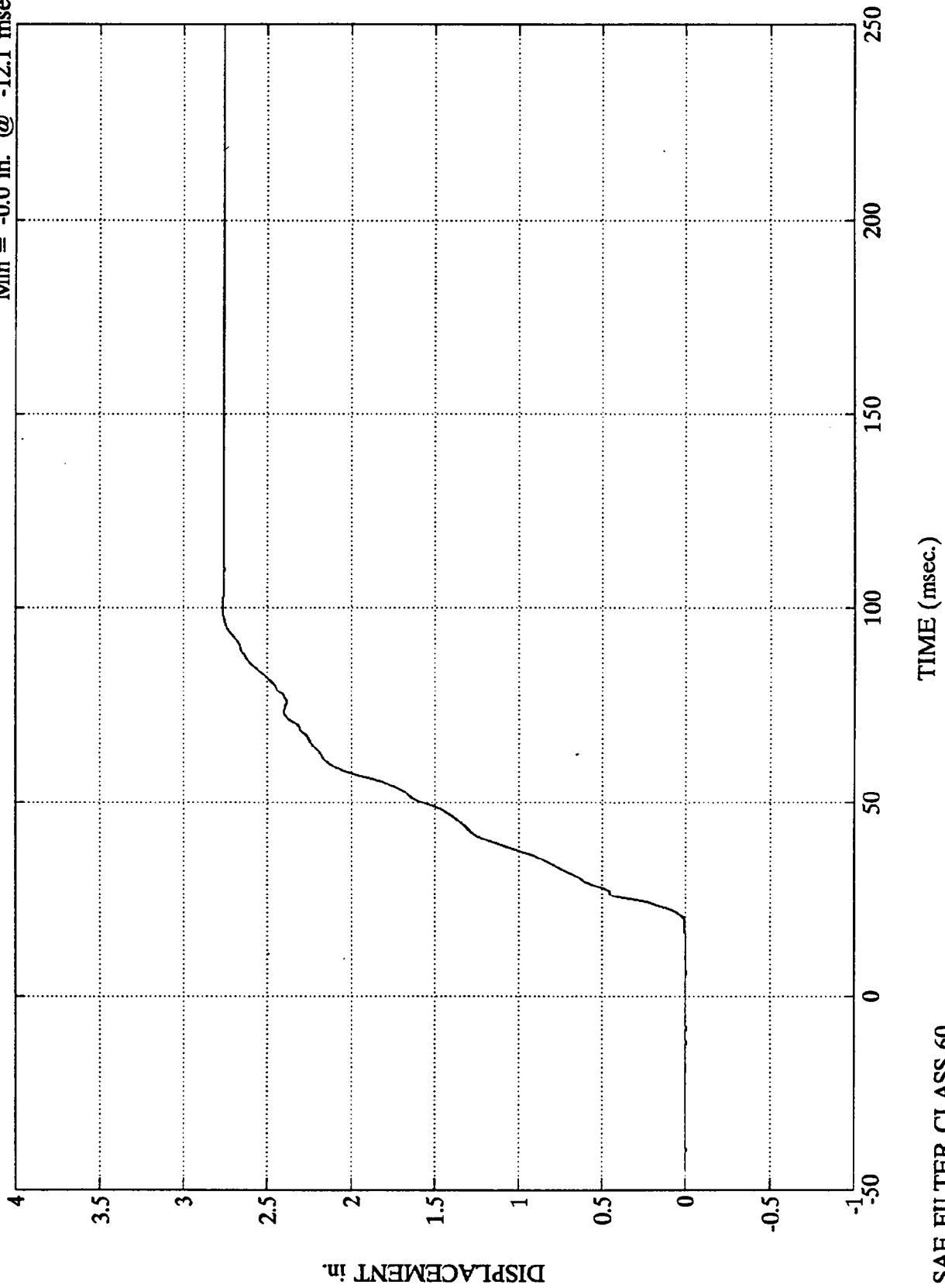
TIME (msec.)

SAE FILTER CLASS 60

Test 1019

POS #2 BELT SPOOL OUT

Max = 2.8 in. @ 98.8 msec
Min = -0.0 in. @ -12.1 msec

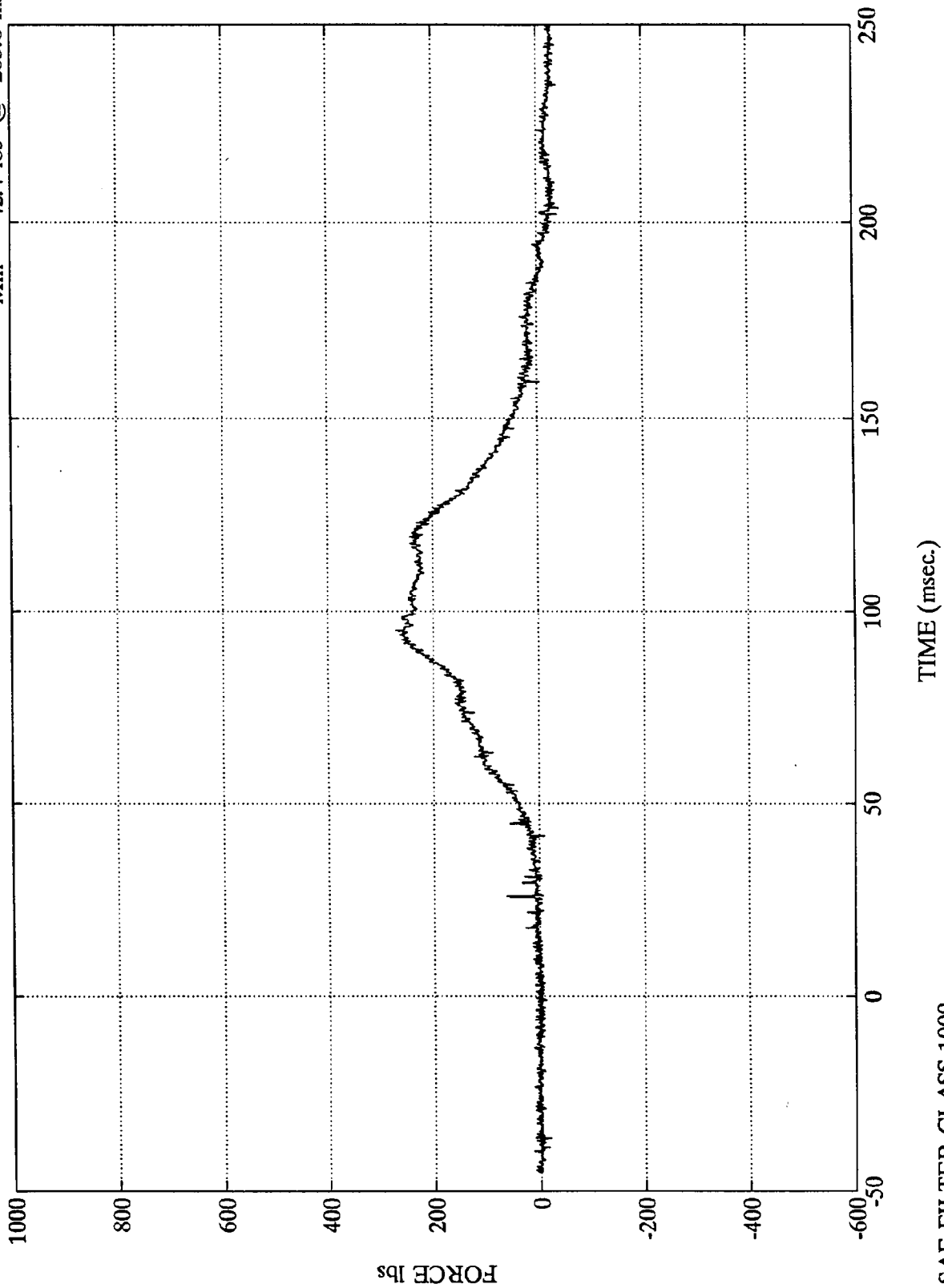


SAE FILTER CLASS 60

Test 1019

Max = 272.7 lbs @ 94.9 msec
Min = -42.4 lbs @ 203.6 msec

POS #2 UPPER NECK FORCE(X)

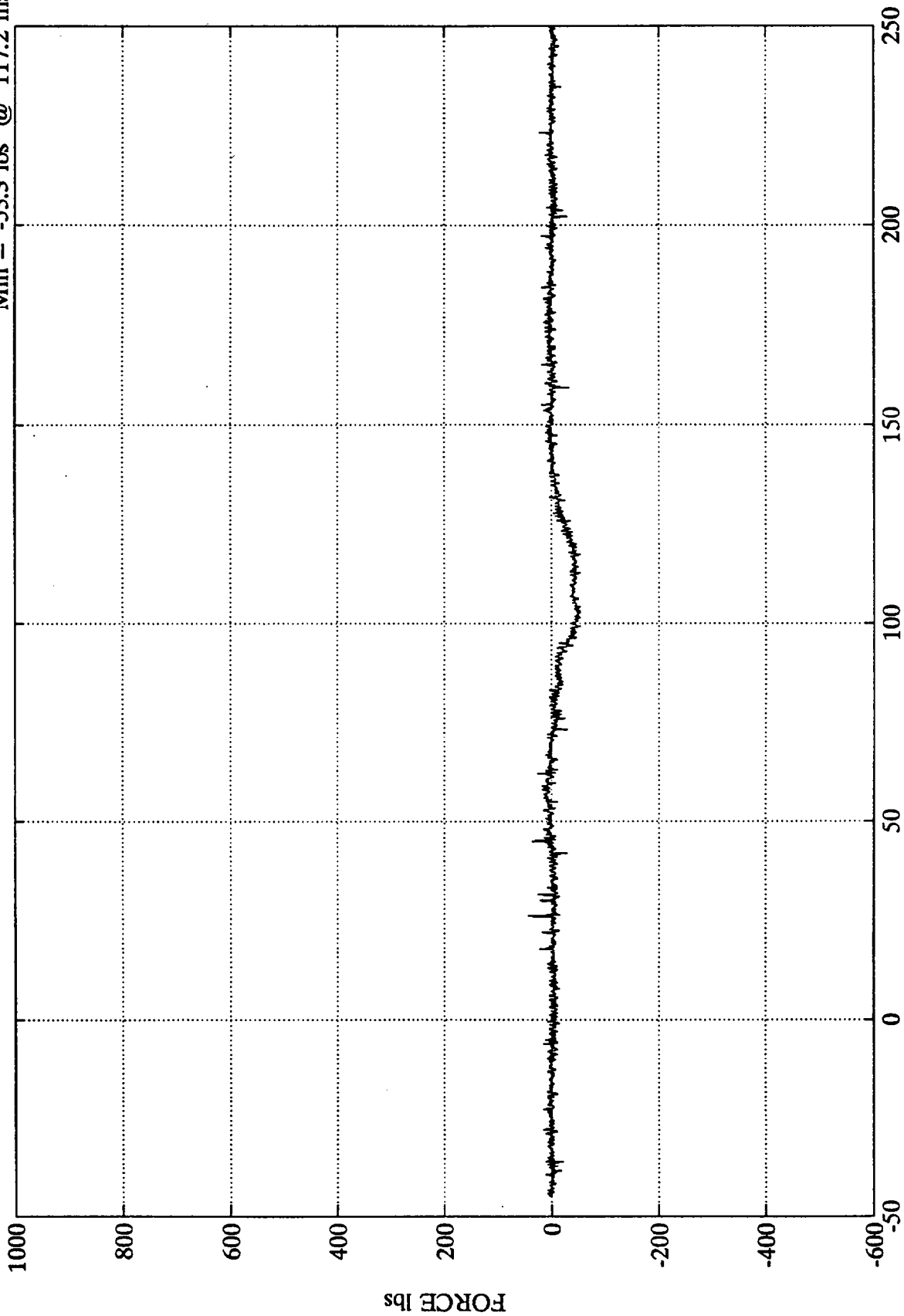


SAE FILTER CLASS 1000

Test 1019

POS #2 UPPER NECK FORCE(Y)

Max = 42.7 lbs @ 25.9 msec
Min = -53.3 lbs @ 117.2 msec



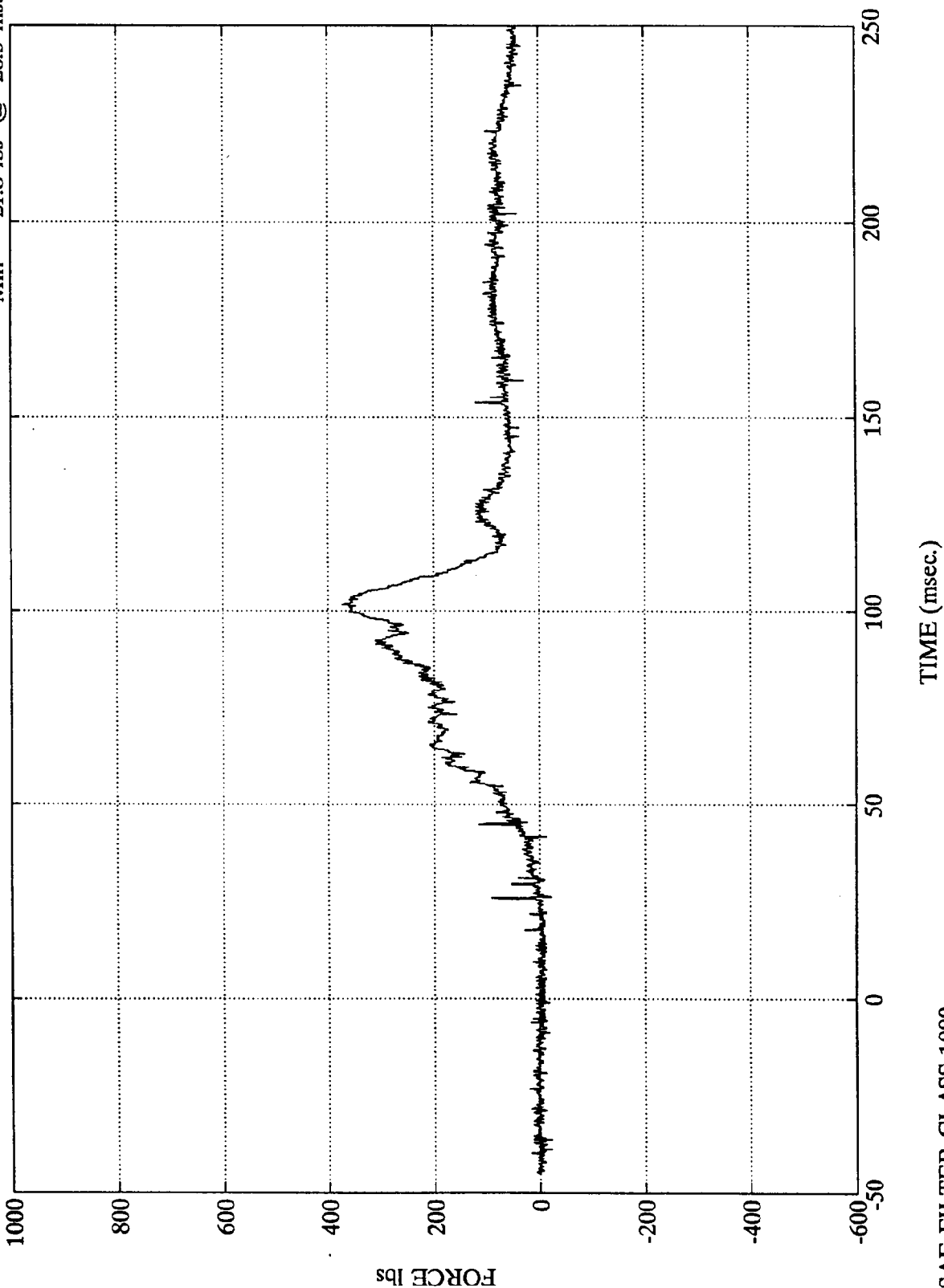
TIME (msec.)

SAE FILTER CLASS 1000

Test 1019

POS #2 UPPER NECK FORCE(Z)

Max = 374.4 lbs @ 101.9 msec
Min = -21.8 lbs @ 26.3 msec



FORCE lbs

B-112

7862-2

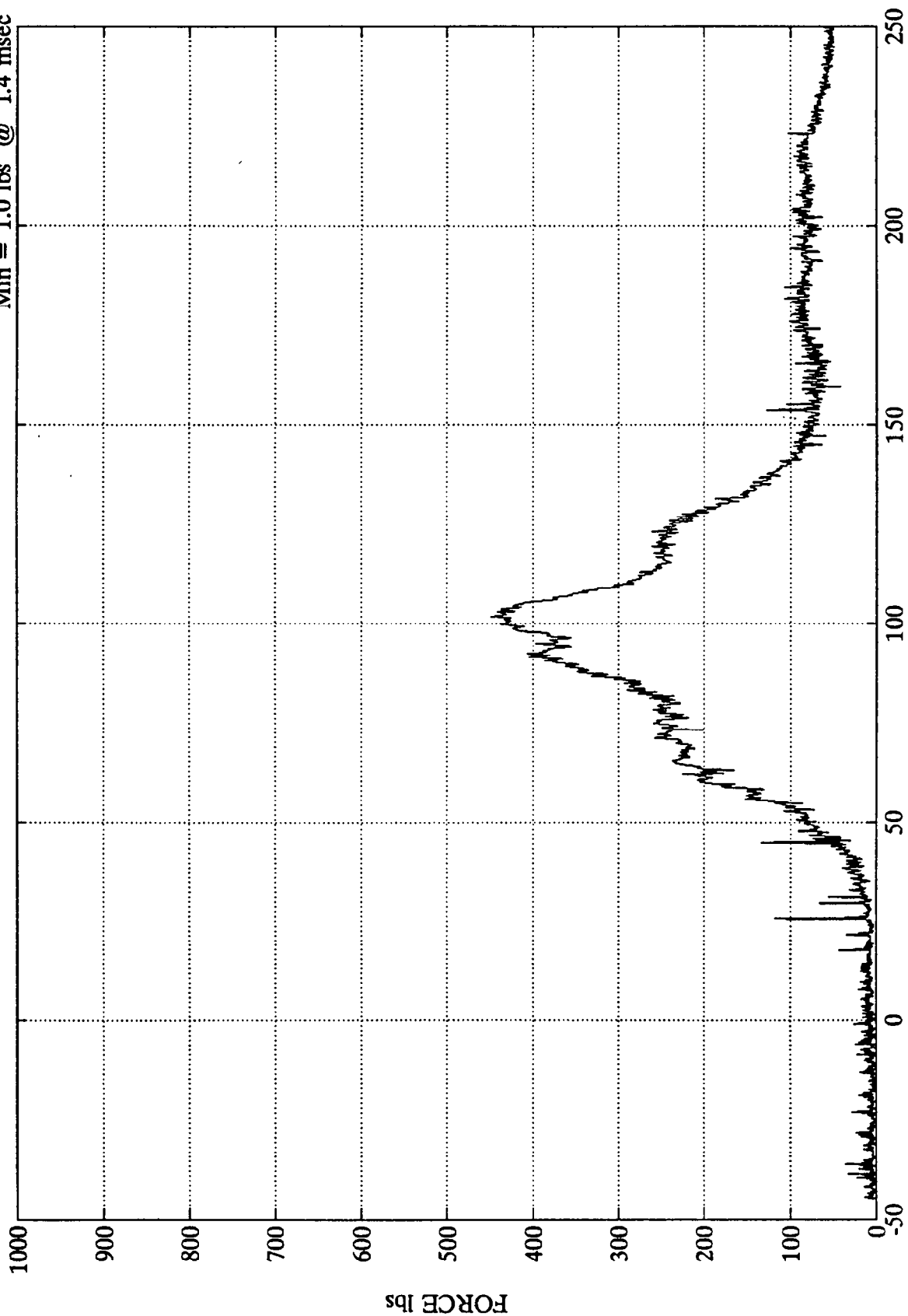
SAE FILTER CLASS 1000

TIME (msec.)

Test 1019

POS #2 NECK FORCE RESULTANT

Max = 448.6 lbs @ 101.9 msec
Min = 1.0 lbs @ 1.4 msec



TIME (msec.)

SAE FILTER CLASS 1000

FORCE lbs

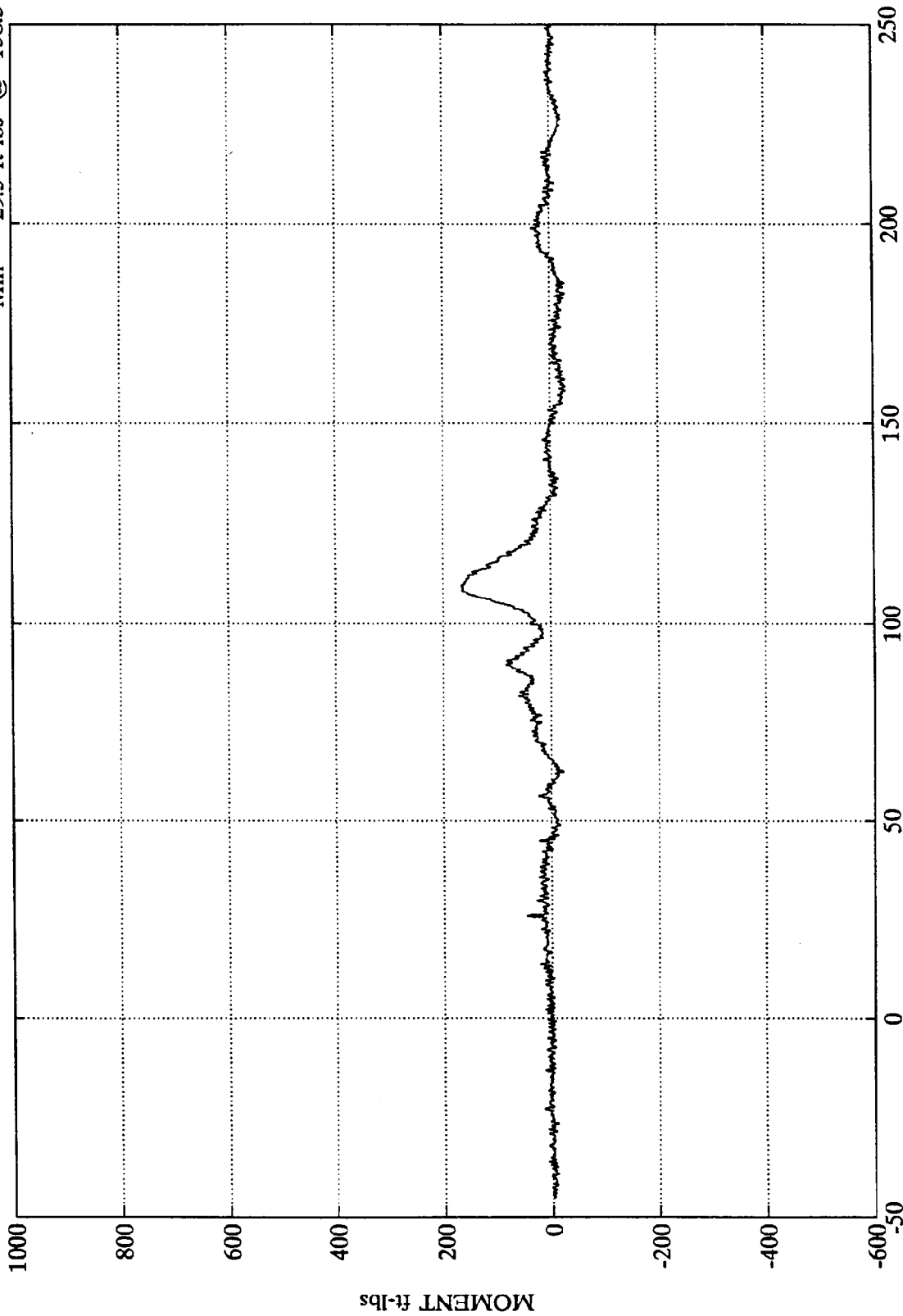
B-113

7862-2

Test 1019
Max = 166.8 ft-lbs @ 109.8 msec
Min = -29.5 ft-lbs @ 158.3 msec

POS #2 UPPER NECK MOMENT(X)

1000



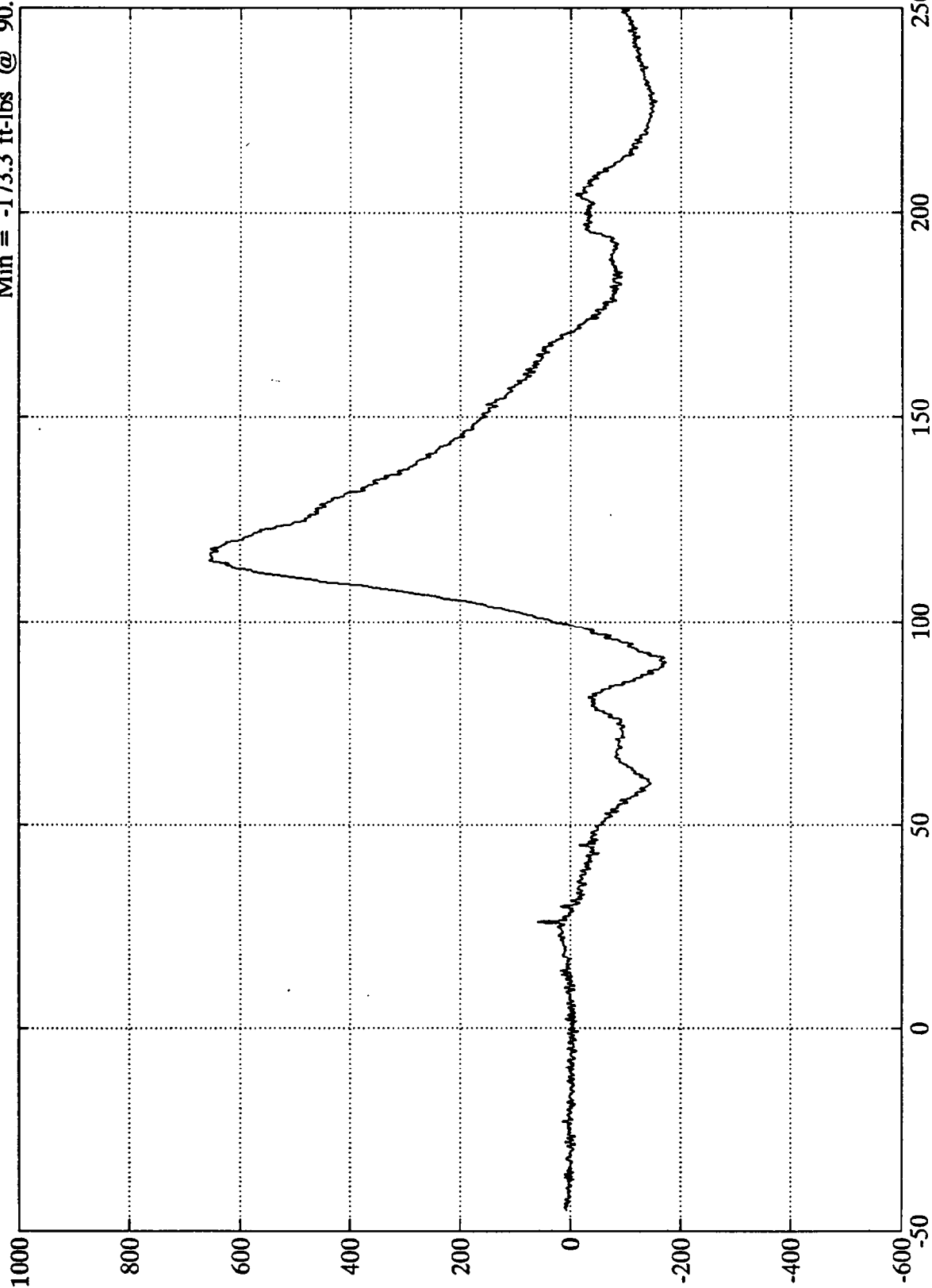
TIME (msec.)

SAE FILTER CLASS 600

Test 1019
Max = 654.4 ft-lbs @ 115.1 msec
Min = -173.3 ft-lbs @ 90.0 msec

POS #2 UPPER NECK MOMENT(Y)

1000

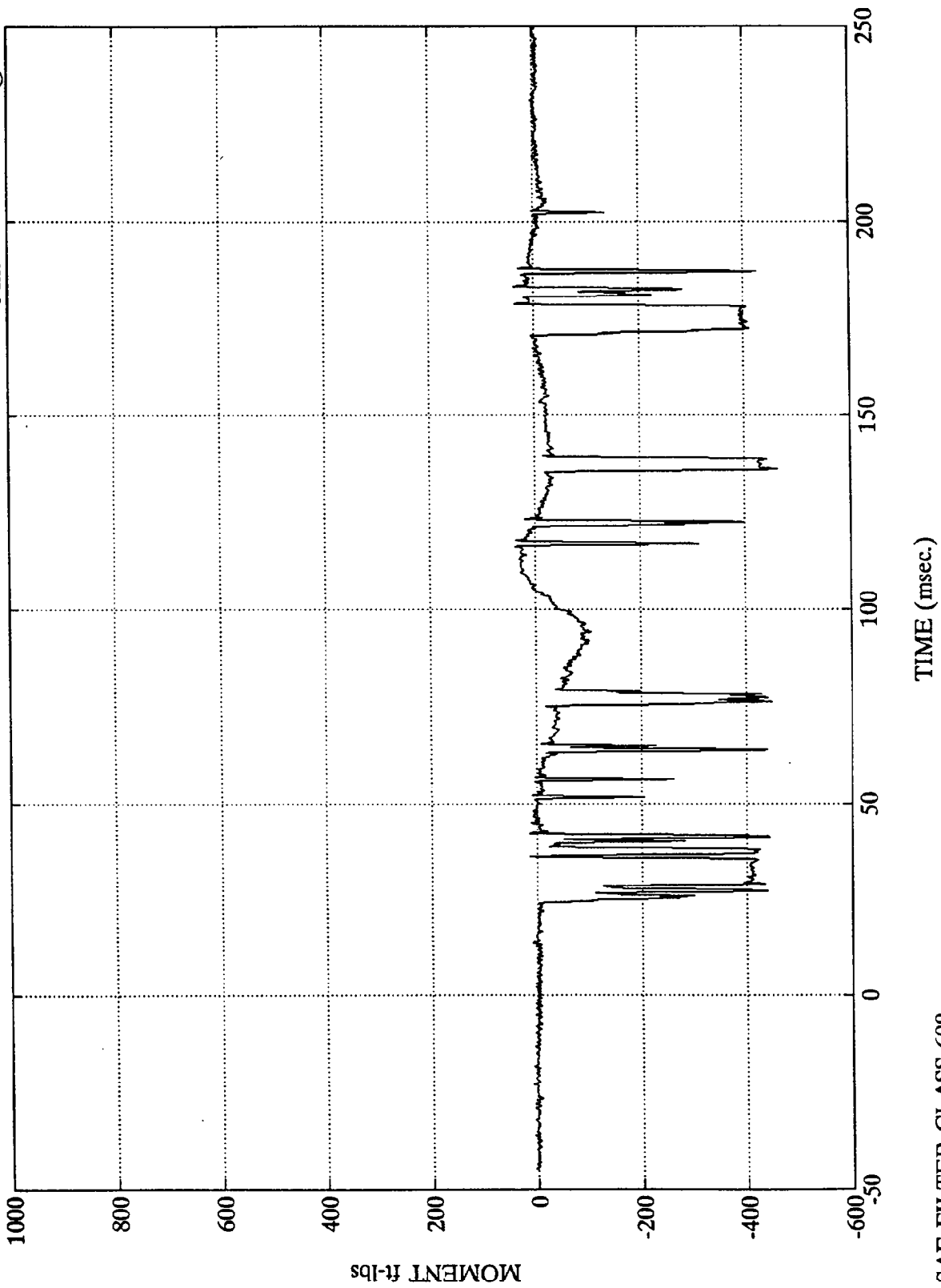


TIME (msec.)

SAE FILTER CLASS 600

Test 1019
Max = 36.7 ft-lbs @ 183.5 msec
Min = -462.8 ft-lbs @ 136.2 msec

POS #2 UPPER NECK MOMENT(Z)

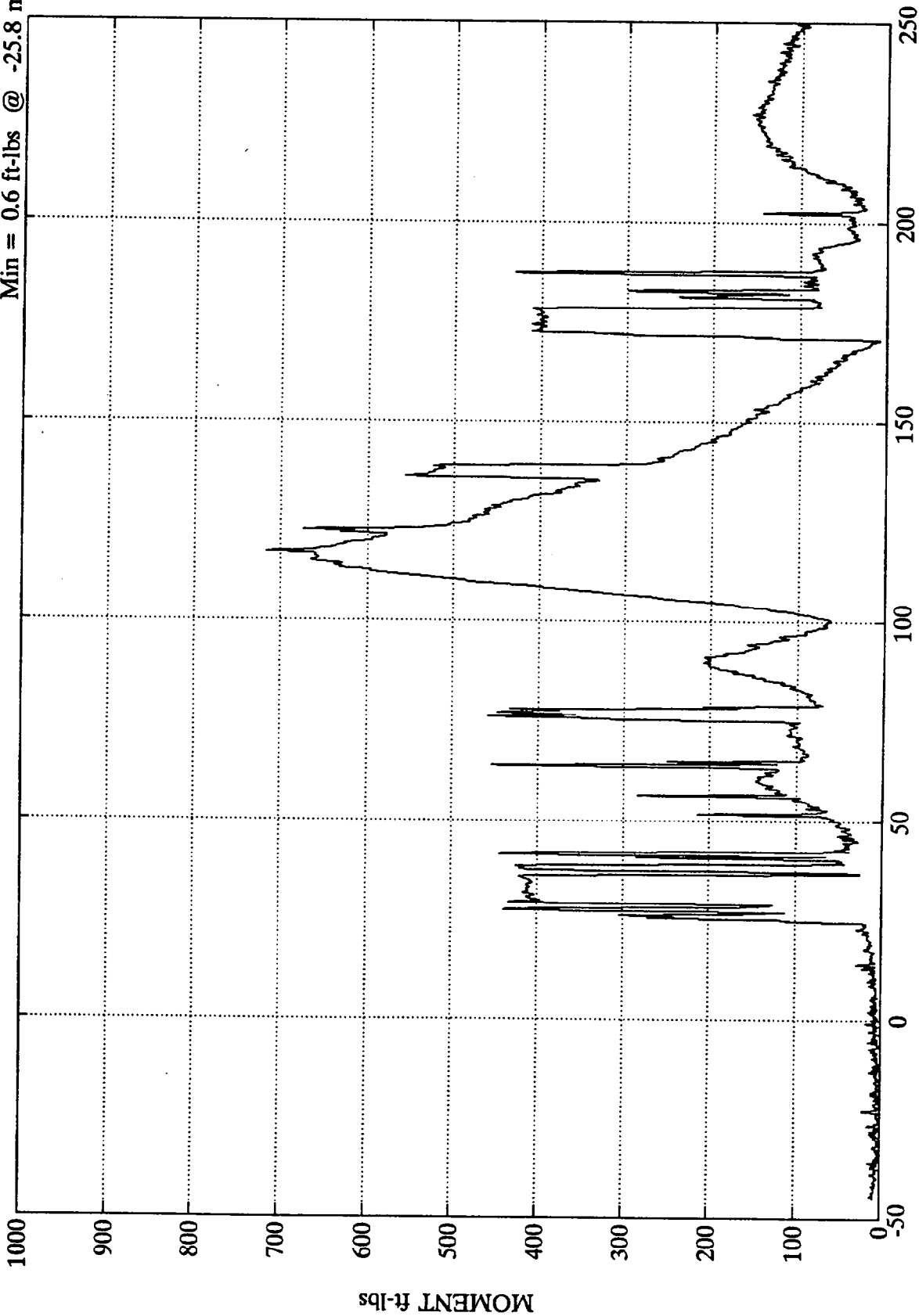


SAE FILTER CLASS 600

Test 1019

POS #2 NECK MOMENT RESULTANT

Max = 717.3 ft-lbs @ 117.1 msec
Min = 0.6 ft-lbs @ -25.8 msec



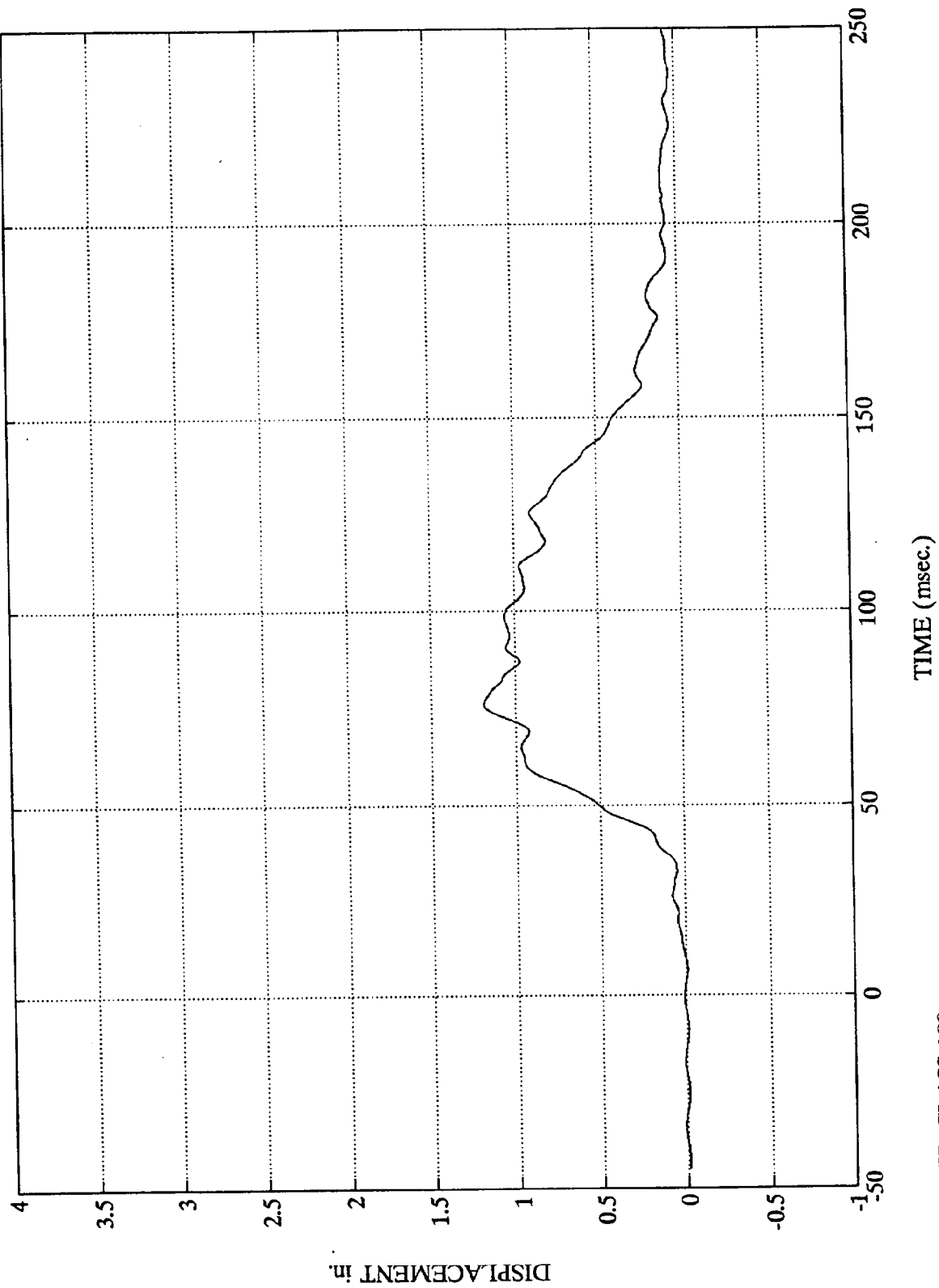
TIME (msec.)

SAE FILTER CLASS 600

Test 1019

Max = 1.2 in. @ 76.0 msec
Min = -0.0 in. @ -25.3 msec

POS #2 CHEST DISPLACEMENT



SAE FILTER CLASS 180

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:

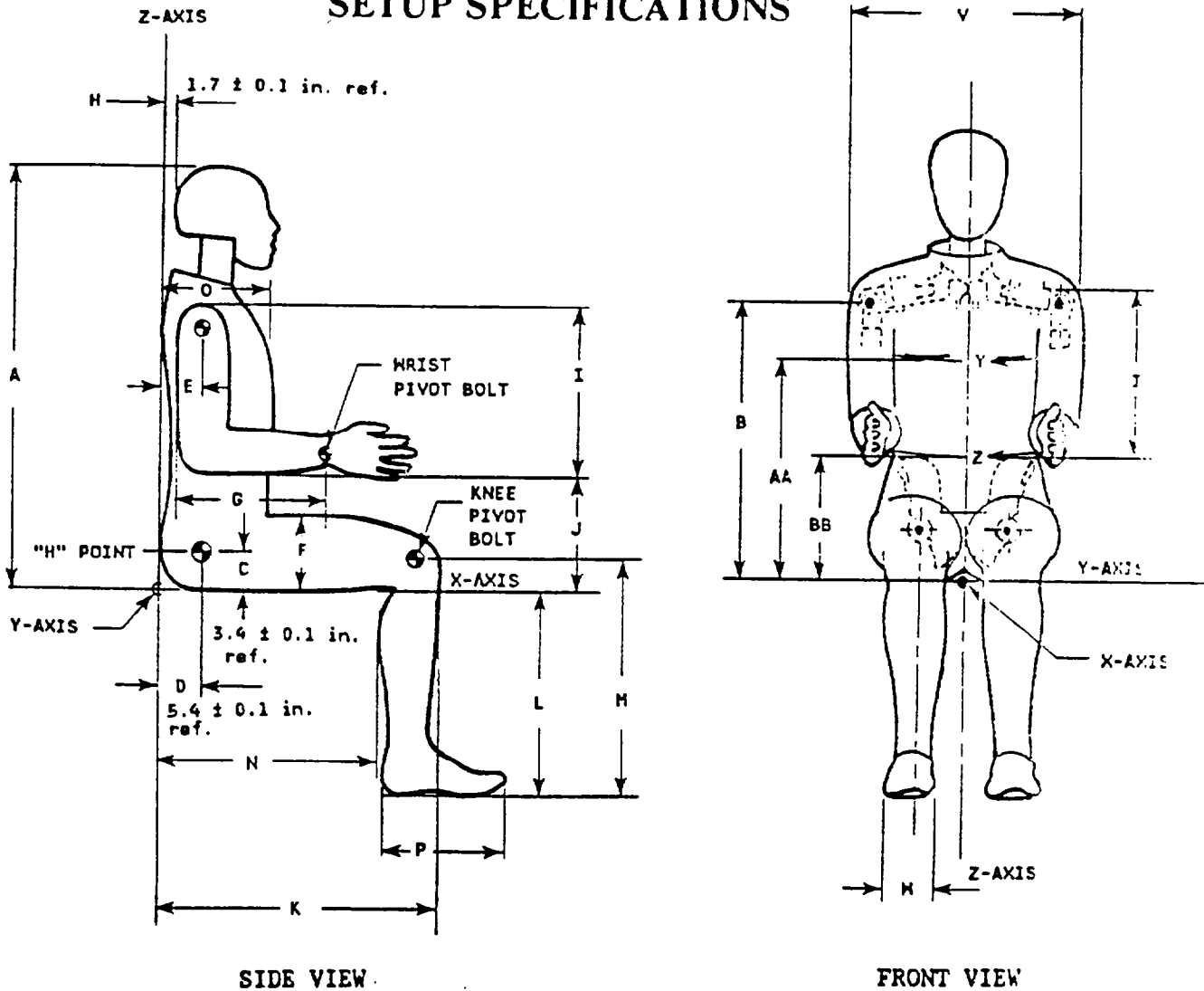
<u>Serial No.</u>	<u>Completion Date</u>
45	10-22-90
150	11-14-90

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 Indicant Testing Final Report No. 6525-V-1.

Figure 10
DUMMY CONFIGURATION DIMENSIONS

EXTERNAL DIMENSIONS SETUP SPECIFICATIONS



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
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____

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	MAX	64 - 78 DEG.	77.58 DEG.
ROTATION	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
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
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	
	SPECIFICATION	TEST RESULTS
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 : 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

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____

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	5-90	11-90
2. TEST PROBE ACCELEROMETER--	CEC	A161	5-90	11-90
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 IVAN MINKIEWICZ

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____

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	MAX	64 - 78 DEG.	74.63 DEG.
ROTATION	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
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 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 : 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
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_____

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	5-90	11-90
2. TEST PROBE ACCELEROMETER--	CEC	A161	5-90	11-90
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	CL60	ENDEVCO	10-90	4-91
Y	CD54	ENDEVCO	10-90	4-91
Z	CK11	ENDEVCO	10-90	4-91
Chest X	A145	CEC	10-90	4-91
Y	FL04	ENDEVCO	10-90	4-91
Z	A149	CEC	10-90	4-91
Right Femur Load Cell	548	GSE	9-90	3-91
Left Femur Load Cell	549	GSE	9-90	3-91
Neck Load Cell X	076	DENTON	10-90	4-91
Y	076	DENTON	10-90	4-91
Z	076	DENTON	10-90	4-91
Neck Moment X	076	DENTON	10-90	4-91
Y	076	DENTON	10-90	4-91
Z	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

INSTRUMENT CALIBRATION FOR LABORATORY INSTRUMENTS
(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration Last	Calibration Next
Neck Bending Pendulum Accel.	A160	CEC	5-90	11-90
Neck Bending Rotary Potentiometer	None	BOURNS	8-90	2-91
Neck Bending Femur Probe Accel.	A160	CEC	5-90	11-90
Chest/Thorax Probe Accel.	A161	CEC	5-90	11-90
Lumbar Flexion Force Gauge	20051	TRANSDUCER INC.	8-90	2-91

Appendix E

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

OCCUPANT RESTRAINTS

Seat Belts

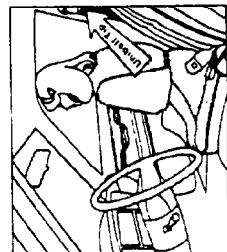
Always use the seat belts. The chance of a serious injury is greatly reduced when the belts are properly used.

Seat belts provide protection against being thrown from the vehicle as well as reducing the risk of an injury caused by striking the interior of the vehicle.

Unibelts

The "UNIBELT", or single continuous-belt restraint system, incorporates an inertia sensitive belt webbing retractor which is designed to lock (i.e., prevent belt travel) *only during very sudden stops or impacts*. This feature allows the shoulder belt to move freely with the wearer under normal conditions. *The retractor will not lock by jerking or pulling the webbing rapidly by hand.*

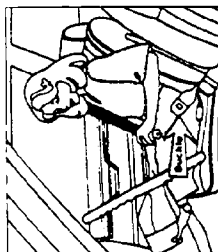
UNIBELT OPERATING INSTRUCTIONS



1. Enter the vehicle and close the door. Sit back and erect and adjust the seat. Note the latch plate of the unbelt in its stowed position.



2. Grasp the latch plate and slide it up the webbing as far as necessary to go around your lap as you pull out the webbing.



3. As you pull the webbing across your lap and over your shoulder, move the latch plate toward the buckle.

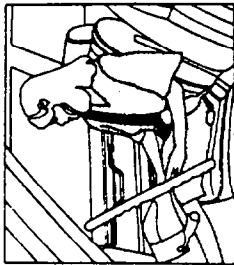
Insert the latch plate into the buckle until a "click" is heard.

Do not wear the shoulder belt under your arm or otherwise out of position. Such use could increase the chance and/or severity of injury in a collision.



4. Position the lap belt with the upper edge of the belt drawn across the thighs and snug against the hips. Slack will automatically be removed due to tension created by the retractor. If a snug fit in the lap belt portion is desired, pull up on the shoulder belt as shown. *A snug belt reduces the risk of sliding under the belt in a collision.*

5. Position the shoulder belt on your chest so that it is comfortable and not resting on your neck. Any slack in the belt will be withdrawn automatically by the retractor.



5

6. To release the belt, push the red button marked "Press" on the buckle. The belt will automatically retract to its stowed position.

If needed, slide the latch plate down the webbing to allow the belt to fully retract.



6

DRIVER SUPPLEMENTAL RESTRAINT SYSTEM - AIRBAG (if so equipped)

This vehicle is equipped with a supplemental airbag restraint system for the driver. The seat belt continues to be the primary restraint and should be worn whenever the vehicle is in motion. It is important to wear the seat belt because it helps to provide protection in collisions for which the airbag is not designed to deploy, either because of low impact speed or non-frontal direction of impact (such as lateral, rollover or rear impacts). The seat belt also helps to position the driver for higher-speed frontal collisions in which the airbag does deploy. The steering wheel mounted airbag, lower instrument panel knee bolster and seat belt work together as a system to provide protection for the driver.

Service and general information labels about the airbag system can be found on the driver's sun visor, glove box door and in the engine compartment. Instructions on how to properly dispose of deployed airbags or airbag equipped vehicles can be obtained from your Chrysler Motors dealer.

The supplemental restraint system consists of the following items:

- impact sensors
- system diagnostic unit
- "AIRBAG" readiness lamp
- airbag module/inflator unit
- unique steering column and wheel
- interconnecting wiring
- instrument panel knee bolster

When the impact sensors located in the front of the car and in the passenger compartment detect a front end collision warranting airbag deployment, their internal switches complete an electrical circuit that actuates the inflator unit in the airbag module. This starts the process of generating a large quantity of non-toxic nitrogen gas which inflates the airbag. As the airbag inflates from its folded, stored position behind the steering wheel hub trim cover, the trim cover separates along seams and folds back out of the way to allow the airbag to inflate to its full size. The airbag fully inflates in about 50 milliseconds, about half the time it takes to blink your eye. It then begins to deflate by venting the non-toxic nitrogen gas through holes in the rear of the airbag so it will not interfere with controlling the car, and within a short amount of time, the airbag is almost entirely deflated.

Should A Deployment Occur

The airbag system is designed to deploy when the impact sensors detect a moderate to severe frontal collision, and then immediately deflate.

NOTE: A frontal collision that does not warrant airbag protection will not activate the system. This does not indicate something is wrong with the airbag system.

Should you experience a frontal collision which deploys the airbag, any or all of the following events may occur.

The nylon airbag material may under certain conditions cause abrasions and/or skin reddening to the driver as the airbag deploys and unfolds itself from its stored position. The abrasions are similar in nature to friction type rope burns or those experienced by sliding along a carpet or gymnasium floor. They are not caused by contact with chemicals, are not permanent and normally heal quickly. However, if significant healing has not occurred within a few days, or in the unlikely event that blistering occurs, seek the immediate advice of a personal physician.

As the airbag deflates from its fully inflated condition, some degree of smoke-like particles may be observed. The particles are a normal by-product of the process which generates the non-toxic nitrogen gas used for airbag inflation. These airborne particles may cause irritation of the skin, eyes, nose, or throat. Should skin or eye irritation occur, rinse the area with cool water. For nose or throat irritation, move to fresh air. If irritation continues, seek the advice of a personal physician.

Within a few seconds, the particles will begin to settle out and dissipate. As they do, the residue will settle on the interior surfaces of the vehicle. Avoid prolonged contact with this residue as it could irritate the skin and/or eyes. Should any irritation occur, rinse the skin or eyes with cool water. If the irritation continues, seek the advice of a personal physician. Should the residue come in contact with clothing, follow the garment manufacturer's instructions for cleaning.

If the vehicle is safely driveable following the airbag deployment, the deployed airbag can be tucked back inside the opening in the steering wheel hub

trim cover to make driving the vehicle somewhat easier. The airbag once deployed, will not re-deploy to provide occupant protection in a subsequent collision, and should be replaced by an authorized dealer as soon as possible.

Readiness Indicator

The diagnostic unit monitors the electrical portions of the airbag system components listed above, continuously whenever the ignition switch is in the "start" or "run" position. When the ignition switch is first turned on, the diagnostic unit will light the "AIRBAG" lamp in the instrument cluster for a period of 6 to 8 seconds and then turn the lamp off. This indicates the airbag system is ready to deploy for your protection in the event of an impact.

NOTE: *Should the "AIRBAG" lamp not come on at all, remain lit or light either momentarily or continuously while driving, a malfunction in one or more of the monitored components may have occurred and prompt service is required.*

Important Maintenance

To assure that the airbag will be ready to deploy in a collision, have the system serviced promptly by an authorized dealer if any of the following indications of a possible system malfunction occurs:

- the "AIRBAG" lamp does not light for 6 to 8 seconds when the ignition switch is first turned on;
- the "AIRBAG" lamp remains lit after the ignition switch is first turned on;
- the "AIRBAG" lamp flickers during the 6 to 8 second period when the ignition switch is first turned on;
- the "AIRBAG" lamp flickers or lights and remains lit while operating the vehicle.

WARNING! Failure to have the airbag system properly serviced by an authorized dealer should one of the above conditions exist may lead to possible injury in the event of an accident.

Aside from the maintenance required in response to the above "AIRBAG" lamp conditions, an inspection of the mechanical and electrical components of the system is included in the regular maintenance service recommended for every 3 years or 30,000 miles. (See SECTION 4 - MAINTENANCE.)

System Precautions

WARNING! Modification to the airbag system components or wiring, including the addition of any kind of badges or stickers to the steering wheel hub trim-cover or modifications to the front bumper or vehicle body structure, can adversely affect system performance and lead to possible injury.

Make sure the fuse access panel, located in the left lower portion of the knee bolster is in place before driving the vehicle, and do not mount or locate any aftermarket equipment on or behind the knee bolster. This is important to provide proper knee impact protection in the event of a collision.

Do not attempt to repair any component of the airbag system yourself. You can be injured if you are too close to the steering wheel hub and the air bag inflates. Be sure to tell anyone who works on your vehicle that it is equipped with an airbag.

Seat Belts — Convertible Models

WARNING! The convertible top does not provide the structural protection that a reinforced metal top does, and the fabric top cannot be expected to prevent the ejection of the occupants of a vehicle in the event of certain types of collisions. Therefore, it is imperative that all occupants wear their restraint systems at all times when riding in a convertible. Studies have shown that it is generally far safer to remain inside a vehicle during a collision, than to be ejected from the vehicle.

Rear Center Seat Lap Belt — Coupe and Sedan models

The lap belt should be worn with the upper edge of the belt drawn across the thighs and snug against the hips. To reduce the risk of sliding under the belt in a collision, it should be adjusted as tight as comfort will allow, *while sitting back and erect in the seat*.

The lap belt is lengthened by tilting the latch plate relative to the webbing and pulling. To shorten the belt, pull the loose end of the webbing.

Never use the same lap belt on more than one person at a time.

Use of Seat Belts During Pregnancy

Chrysler Motors recommends that pregnant women use the available seat belts. This will reduce the likelihood of injury to both the woman and the unborn child. The lap belt should be worn across the thighs and as snug against the hips as possible, *but not across the waist*.

Seat Belt Extender

If the seat belt is too short, even when fully extended, a seat belt extender can be purchased from your dealer.