

REPORT NUMBERS: 208-CAL-92-11
212-CAL-92-11
301-CAL-92-11

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

CHRYSLER CORPORATION
1992 JEEP CHEROKEE 4X4
4-DOOR MPV

NHTSA NUMBER: CN0307

CALSPAN TEST NUMBER: 7979-3
FEBRUARY 12, 1992

CALSPAN CORPORATION
ADVANCED TECHNOLOGY CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225



FINAL REPORT

PREPARED FOR:

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

*Rec'd
3/19/92*

This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-90-C-01003. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

Prepared: David J. Travale
David J. Travale, Project Engineer

Approved: Walter E. Levan
Walter E. Levan, Program Manager
Transportation Sciences Center

FINAL REPORT ACCEPTED BY:

Charles K. Case
Contracting Office's Technical Representative
(COTR), NHTSA, Office of Vehicle Safety Compliance

6/25/92
Date of Report Acceptance

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. 208-CAL-92-11 212-CAL-92-11 301-CAL-92-11		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Final Report of FMVSS Nos. 208, 212, 219 (Partial) and 301 Compliance Testing of a 1992 Jeep Cherokee Sport 4x4 4-door MPV				5. Report Date February 12, 1992	
				6. Performing Organization Code CAL	
7. Author(s) David J. Travale, Project Engineer Walter E. Levan, Program Manager				8. Performing Organization Report No. 7979-3	
9. Performing Organization Name and Address Calspan Advanced Technology Center P.O. Box 400 Buffalo, New York 14225				10. Work Unit No. 204-3-1157	
				11. Contract or Grant No. DTNH22-90-C-01003	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance (NEF-30) 400 Seventh St., S.W., Rm. 6115, Washington, DC 20590				13. Type of Report and Period Covered Final Report February-March 1992	
				14. Sponsoring Agency Code DOT/NHTSA/NEF/OVSC	
15. Supplementary Notes					
16. Abstract A 30 mph vehicle safety compliance test was conducted a 1992 Jeep Cherokee Sport 4x4 4-door MPV. This test was performed at the Calspan Advanced Technology Center in Buffalo, New York on February 12, 1992. The purpose of this test was to determine compliance with the performance requirements of the following Federal Motor Vehicle Safety Standards: 1. FMVSS No. 208, "Occupant Crash Protection" 2. FMVSS No. 212, "Windshield Mounting" 3. FMVSS No. 219 (partial), "Windshield Zone Intrusion" 4. FMVSS No. 301, "Fuel System Integrity" The test mode was perpendicular (0°) and the impact velocity was 29.6 mph. The ambient temperature at the impact face was 20°F. The subject test vehicle appears to comply with the requirements of FMVSS Nos. 208, 212, 219 (partial) and 301. <u>Type of Restraint System:</u> The test vehicle was equipped with both a driver and right front passenger manual 3-point seat belt restraint.					
17. Key Words 30 mph Vehicle Safety Compliance Testing FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Mounting" FMVSS 219, "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity" Frontal Impact			18. Distribution Statement <u>Copies of this report are available from:</u> Technical Reference Division National Highway Traffic Safety Admin. Nassif Building, Room 5108 (NAD-52) 400 Seventh St., S.W., Washington, DC 20590		
19. Security Classif. (of this report) UNCLASSIFIED		20. Security Classif. (of this page) UNCLASSIFIED		21. No. of Pages	
				22. Price	

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
4	SUMMARY OF RESULTS FOR: FMVSS 208, "Occupant Crash Protection" FMVSS 212, "Windshield Mounting" FMVSS 219 (Partial), "Windshield Zone Intrusion" FMVSS 301, "Fuel System Integrity"	4-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	VEHICLE AND DUMMY RESPONSE DATA	B-1
APPENDIX C	VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS	C-1

LIST OF FIGURES

<u>Figure No.</u>		<u>Page No.</u>
1	TEST VEHICLE INFORMATION	3-2
2	PART 572 DUMMY IN-VEHICLE POSITION	3-3
3	OCCUPANT CLEARANCE DIMENSIONS	3-4
4	DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY REFERENCE DIMENSIONS	3-5
5	SEAT BELT POSITIONING DATA	3-6
6	VEHICLE ACCELEROMETER LOCATIONS	3-7
7	CAMERA POSITIONS FOR FRONTAL IMPACTS	3-9
8	VEHICLE TARGET LOCATIONS	3-11
9	TEST VEHICLE MEASUREMENTS	3-12
10	FMVSS NO. 212 - "WINDSHIELD MOUNTING" DATA SHEET	4-12
11	FMVSS NO. 219 (PARTIAL) - "WINDSHIELD ZONE INTRUSION" DATA SHEET	4-13

LIST OF TABLES

<u>Table No.</u>		<u>Page No.</u>
1	Crash Test Summary	2-2
2	General Test and Vehicle Parameter Data	2-3
3	Post-Impact Data	2-5
4	Vehicle Accelerometer Locations and Data Summary	3-8
5	High Speed Camera Locations	3-10
6	Vehicle Measurements	3-13
7	Dummy Injury Criteria Values	4-2
8	FMVSS No. 208 - Seat Belt Warning System check	4-3
9	FMVSS No. 208 - Labeling and Driver's Manual Information	4-4
10	FMVSS No. 208 - Readiness Indicator	4-5
11	FMVSS No. 208 - Comfort and Convenience Test Summary	4-6
12	FMVSS No. 301 - "Fuel System Integrity" Post-Impact Test Data	4-14
13	FMVSS No. 301 - Static Rollover Data Sheet	4-15
14	Test Vehicle Noncompliance Notice	4-19

Section 1

PURPOSE AND TEST PROCEDURE

This 30 mph frontal barrier impact test is part of the Federal Motor Vehicle Safety Standard (FMVSS) 208, 212, 219 (partial) and 301 compliance test program conducted for the National Highway Traffic Safety Administration (NHTSA) by Calspan Advanced Technology Center under Contract No. DTNH22-90-C-01003. The purpose of this test was to determine if the subject vehicle, a 1992 Jeep Cherokee Sport 4x4 4-door MPV, meets the performance requirements of FMVSS 208, "Occupant Crash Protection"; FMVSS No. 212, "Windshield Mounting"; FMVSS No. 219 (partial), "Windshield Zone Intrusion"; and FMVSS No. 301, "Fuel System Integrity". This compliance test was conducted using the requirements found in the OVSC Laboratory Test Procedure No. TP-208-08, dated September 8, 1989.

Section 2

SUMMARY OF TEST NUMBER CN0307

A frontal barrier was impacted by a 1992 Jeep Cherokee Sport 4x4 4-door MPV at a velocity of 29.6 mph. The test was performed at the Calspan Corporation Advanced Technology Center on February 12, 1992. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

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

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

Both ATDs were fully instrumented with head and chest triaxial accelerometers, chest displacement potentiometers and left/right femur load cells. These ATDs had been certified prior to the test.

The 25 channels of data were recorded on three 14-channel FM tape recorders. Appendix B contains the vehicle and dummy response data traces.

The driver's HIC was 696. The maximum chest deceleration over 3 milliseconds was 49.8 g's with 1.3 inches of deflection. The maximum force on the driver's left femur was 935 pounds and 1081 pounds on the right femur.

The right front passenger's HIC was 404. The maximum chest deceleration over 3 milliseconds was 46.6 g's with 1.2 inches of deflection. Loads of 660 and 1140 pounds were recorded on the left and right femurs respectively.

Table 1

CRASH TEST SUMMARY

Vehicle NHTSA No.: CN0307 Test Mode: 30 mph Frontal Barrier

Test Date: February 12, 1992 Time: 13:35 Temperature: 20 F°

Vehicle Make/Model/Body Style: 1992 Jeep Cherokee Sport 4x4 4-door MPV

Vehicle Test Weight: 3960 lbs.

Vehicle/Barrier Impact Angle: 0°

Impact Velocity: 29.6 mph

Maximum Static Crush: 16.3 inches

Vehicle Rebound: 5.1 inches

DUMMIES:

DRIVER

PASSENGER

Type: Part 572E Part 572E

Restraint System: 3-point manual 3-point manual seat belt
seat belt

Number of Data Channels: 25

Number of Cameras: 1 Real Time

14 High Speed

DOOR OPENING DATA: Closed - Left Front

Closed - Right Front

Front Seat(s) Data: DRIVER PASSENGER

Seat Track Failure: None None

inches of shift

Seat Back Failure: 0.0 0.0

Table 1

CRASH TEST SUMMARY (cont.)

<u>VISIBLE DUMMY CONTACT POINTS:</u>	<u>DRIVER</u>	<u>PASSENGER</u>
Head:	Face with top of steering wheel rim. Chin with top of steering column. Rear of head with headrest	Rear of head with headrest chin with chest
Abdomen:	Lower steering wheel rim	-
Chest:	-	-
Knees:	Lower dash	Lower dash

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATATEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 1992 Jeep Cherokee Sport 4x4 4-Door MPV
 NHTSA No.: CN0307; VIN: 1J4FJ88S6NL155633; Color: Black
 Engine Data: 6 cylinders; - CID; 4 Liters; - cc
 Placement: - Longitudinal or In-Line; - Transverse or Lateral
 Transmission Data: - speeds; - Manual; ✓ Automatic; ✓ Overdrive
 Final Drive: - Rear Wheel Drive; - Front Wheel Drive; ✓ Four Wheel Drive
 Major Options: ✓ A/C; ✓ Pwr.Strg.; ✓ Pwr.Brakes
- Pwr.Windows; - Pwr.Door Locks; ✓ Tilt Wheel
 Date Received: 1/31/92; Odometer Reading 22 miles
 Selling Dealer: Hall's Jeep-Eagle
 & Address 6179 South Transit Road, Lockport, NY 14094

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Chrysler Corporation
 Date of Manufacture: 10-91
 GVWR: 4900 lbs.; GAWR: 2500 lbs. FRONT; 2606 lbs. REAR

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load: 44 psi FRONT
44 psi REAR

Recommended Tire Size: P195/75R-15

*Recommended Cold Tire Pressure: 33 psi FRONT; 33 psi REAR

Size of Tires on Test Vehicle: P225/75R-15; Manufacturer: Goodyear

Vehicle Capacity Data:

Type of Front Seats: - Bench; ✓ Bucket; - Split Bench
 Number of Occupants: 2 Front; 3 Rear; 5 Total
 Vehicle Capacity Weight (VCW) = - lbs.
 No. of Occupants x 150 lbs. = - lbs.
 Rated Cargo/Luggage Weight (RCLW) = **300 lbs. (Difference)

*Tires set to this pressure for test

**Cargo capacity used for MPV.

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (WITH MAXIMUM FLUIDS) = UDW:

Right Front = 940 lbs. Right Rear = 720 lbs.
 Left Front = 950 lbs. Left Rear = 730 lbs.
 TOTAL FRONT = 1890 lbs. TOTAL REAR = 1450 lbs.
 % of Total Vehicle Weight = 56.6 % of Total Weight = 43.4 %
 TOTAL DELIVERED WEIGHT = 3340 lbs.

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight = 3340 lbs.
 Rated Cargo/Luggage Weight (RCLW) = 300 lbs.
 Weight of 2 P.572E Dummies @ 167 ea. = 334 lbs.
 TARGET TEST WEIGHT = 3974 lbs. (sum)

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 286 POUNDS OF CARGO WEIGHT:

Right Front = 990 lbs. Right Rear = 980 lbs.
 Left Front = 1020 lbs. Left Rear = 970 lbs.
 TOTAL FRONT = 2010 lbs. TOTAL REAR = 1950 lbs.
 % of Total Weight = 50.8 % % of Total Weight = 49.2 %
 TOTAL TEST WEIGHT = 3960 lbs.
 Weight of Ballast Secured in Vehicle Trunk Area = 225 lbs.
 Vehicle Components Removed for Weight Reduction: None

VEHICLE ATTITUDE (all dimensions in inches):

AS DELIVERED: RF 31.5" LF 31.5" RR 31.2" LR 31.1"
 FULLY LOADED: RF 31.0" LF 31.0" RR 30.7" LR 30.6"
 AS TESTED: RF 31.5" LF 31.5" RR 29.8" LR 29.8"
 Vehicle's Wheel Base: 101.4 in.
 Location of Vehicle's C.G.: 49.9 inches rearward of front wheel center

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual = 20.2 gallons
 Usable Capacity Figure Furnished by COTR = 20.0 gallons
 Test Volume Range (92 to 94% of Usable Capacity) = 18.4 to 18.8 gallons
 ACTUAL TEST VOLUME = 18.6 gallons (with entire fuel system filled)

Table 3
POST IMPACT DATA

TYPE OF TEST:

Type of Test: Frontal Barrier Impact Angle: 0°
 Test Date: February 12, 1992 Time: 13:35 Temperature: 20°F
 Vehicle NHTSA No.: CN0307
 Required Impact Velocity Range: 28.9 to 29.9 mph

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

Trap No. 1 = 29.6 mph; Trap No. 2 = 29.6 mph
 Distance from vehicle to barrier: (1) entering trap = 52 inches
 (2) exiting trap = 12 inches

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

Vehicle Length:

Pre-Test Right = 164.3; C/L = 165.7; Left = 164.3
 Post-Test Right = 148.7; C/L = 149.4; Left = 148.6
 Crush Right = 15.6; C/L = 16.3; Left = 15.7
 AVERAGE = 15.9 inches

VEHICLE REBOUND: (From rigid barrier only.)

Distance from front of test vehicle to impact point:
 Right = 4.8; C/L = 5.1; Left = 5.5
 AVERAGE = 5.1 inches

DOOR OPENING:

	Left	Right
Front	<u>Closed</u>	<u>Closed</u>
Rear	<u>Closed</u>	<u>Closed</u>

SEAT MOVEMENT:

	Seat Back Failure	Seat Shift
Front	<u>None</u>	<u>None</u>
Rear	<u>N/A</u>	<u>N/A</u>

Table 3

POST IMPACT DATA (cont.)

GLAZING DAMAGE: Windshield cranked. Lower right corner of windshield separated
from mounting.

OTHER NOTABLE IMPACT FEATURES: None

Section 3
OCCUPANT AND VEHICLE DATA

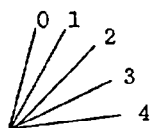
Figure 1

TEST VEHICLE INFORMATION

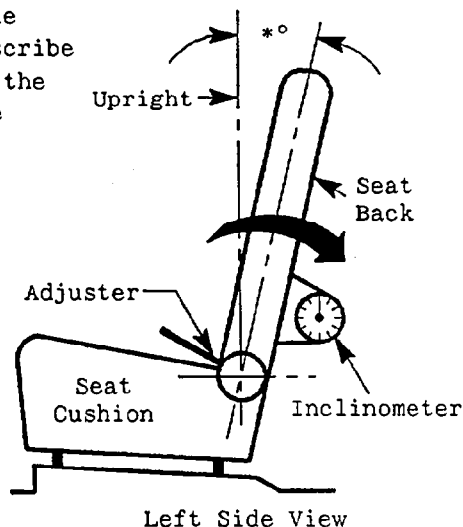
VEHICLE IDENTIFICATION:

Model Year: 1992 Vehicle Model: Cherokee Body Style: 4-Door MPV

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



*Seat back set in 4 notch rearward from full upright on specified by manufacturer. Head rests fully up. No vertical seat adjustment



Seat back angle for driver's seat: *

Measurement instructions: Place seat in 4th detent from full upright

Seat back angle for passenger's seat: *

Measurement instructions: Same as driver

2. Seat Fore and Aft Positioning

Provide instructions for positioning the driver and front outboard passenger seat(s) in the center of fore and aft travel. For example, provide information to locate the detent in which the seat track is to be locked.

Positioning of the driver's seat: Seat was placed in 7th detent (mid-position) from a total of 13 total detents

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

3. Fuel Tank Capacity Data

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

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

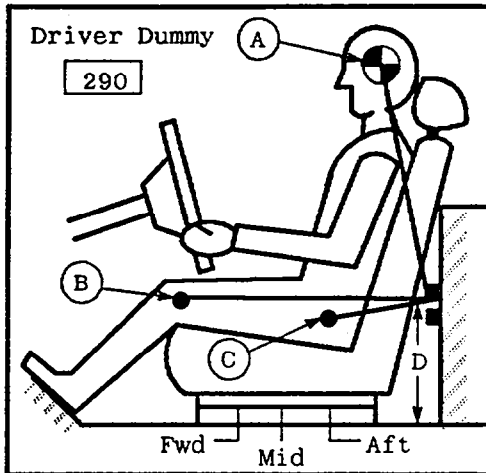
Additional Instructions: Note: owner's manual states 20.2 gallons as fuel tank capacity. Information from COTR is 20.0 gallons.

Figure 2

PART 572 DUMMY IN-VEHICLE POSITION

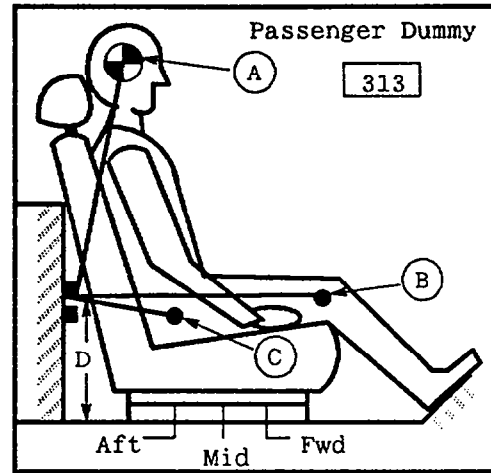
Test No.: CN0307 Vehicle: 1992 Jeep Cherokee Sport 4x4 4-Door MPV

<u>SEAT TYPE:</u>	<u>ADJUSTER TYPE:</u>	<u>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

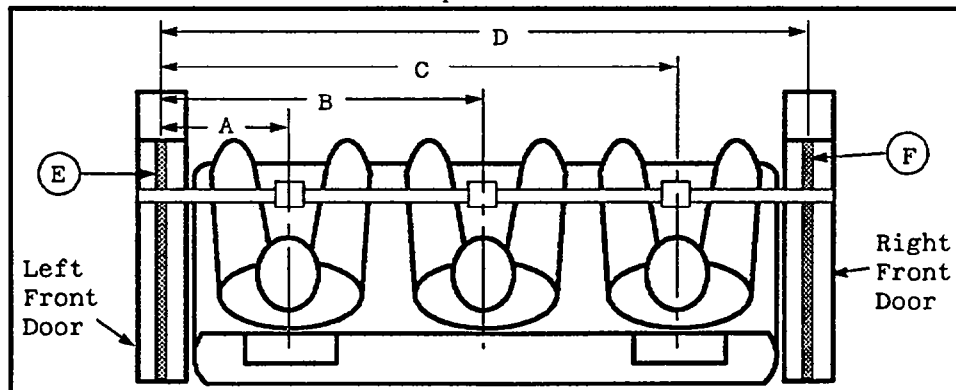
- A - Head Target
- B - Knee Joint
- C - Approximate 'H' Point
- D - Sill to Reference Point



A = 20.8 in. 10 Degrees
 B = 23.5 in. 95 Degrees
 C = 8.8 in. 125 Degrees
 D = 14.5 in.

A = 21.4 in. 10 Degrees
 B = 23.7 in. 96 Degrees
 C = 8.5 in. 126 Degrees
 D = 14.5 in.

Top View



S/N 290

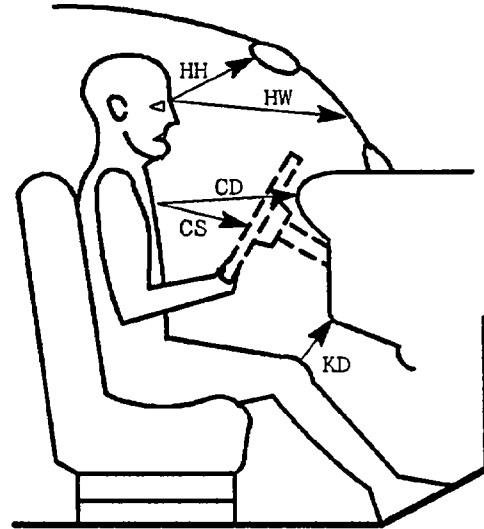
DUMMY ID

S/N 313

A = Left Door to Driver Centerline	<u>13.0</u> in.
B = Left Door to Center Passenger Centerline	<u>-</u> in.
C = Left Door to Right Passenger Centerline	<u>41.9</u> in.
D = Left Door to Right Door	<u>55.2</u> in.
E, F = Window Glass Height (Right and Left Must Be Equal)	<u>11.0</u> in.

Figure 3
OCCUPANT CLEARANCE DIMENSIONS
(Dimensions in inches)

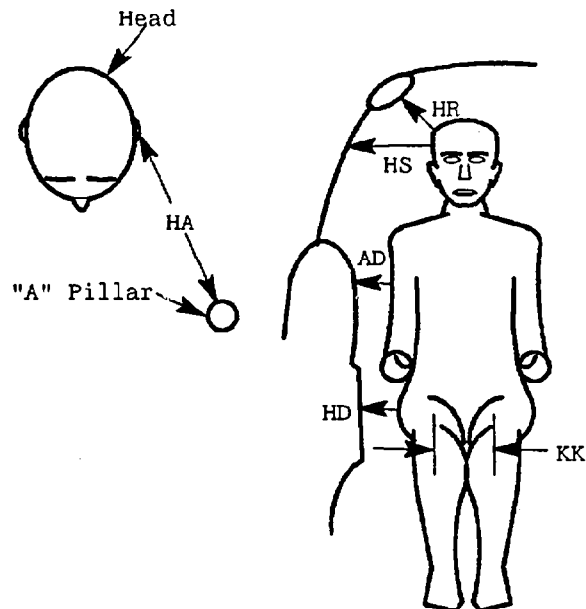
	DRIVER	PASSENGER
HH	16.3	16.1
HW	20.7	20.8
CD	21.0	21.2
CS	11.3	-
KDL	4.0	4.7
KDR	3.8	4.8
SA	See Note	See Note
PA	24	24



HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD(L/R) = Knee to Dash (Left/Right)
 SA = Seat Back Angle
 PA = Pelvic 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

H-Point Location		Relative to Target	Pas-senger	Relative to Target
	Driver			
To sill	6.75	-0.4	6.85	+0.25
To Striker	8.0	0.0	7.8	-0.2

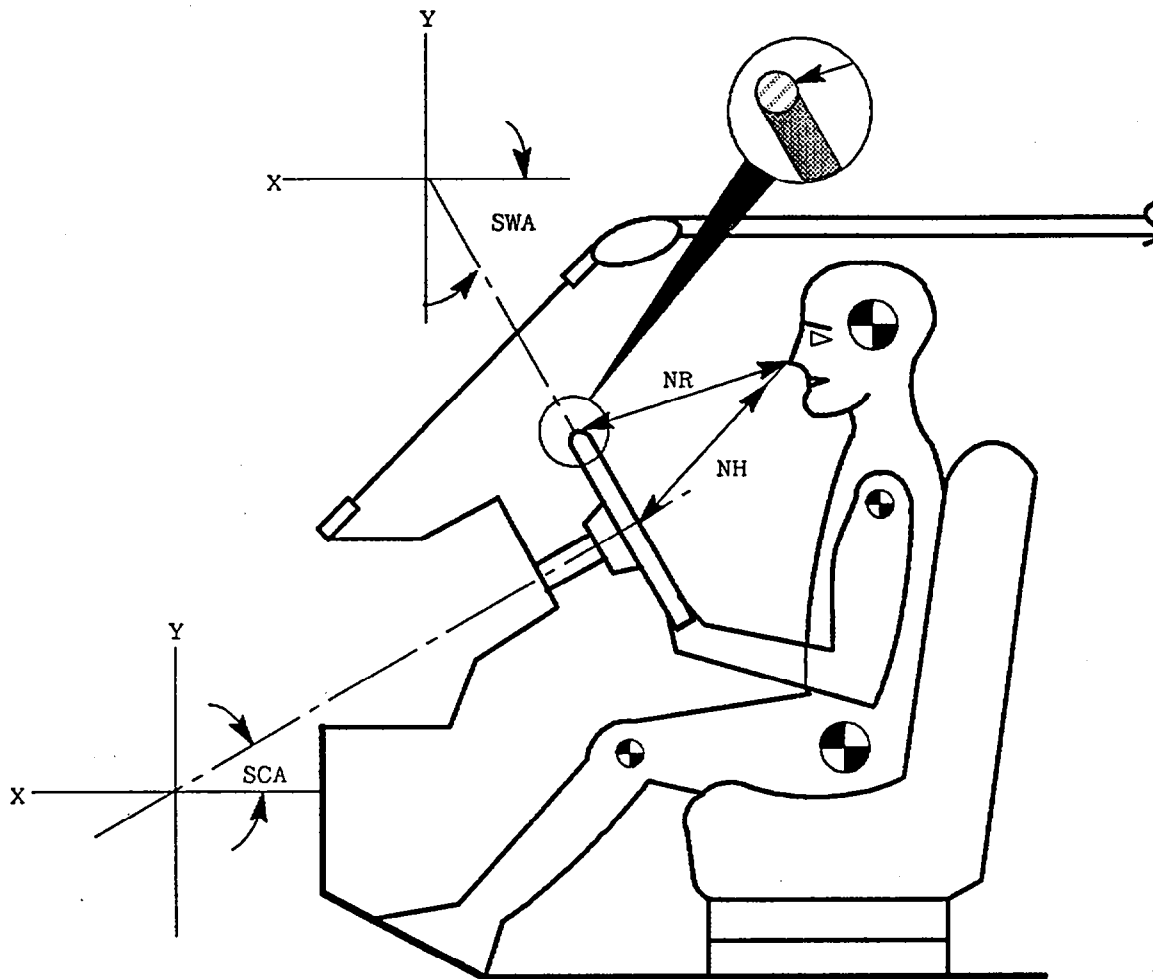
	DRIVER	PASSENGER
HR	7.8	3.2
HS	10.0	10.4
AD	3.5	3.6
HD	5.9	6.0
KK	8.3	8.3
HA	20.0	20.1



Note: Seat angle was positioned as specified by the manufacturer.

Figure 4

DRIVER DUMMY TO STEERING COLUMN/WHEEL ASSEMBLY REFERENCE DIMENSIONS

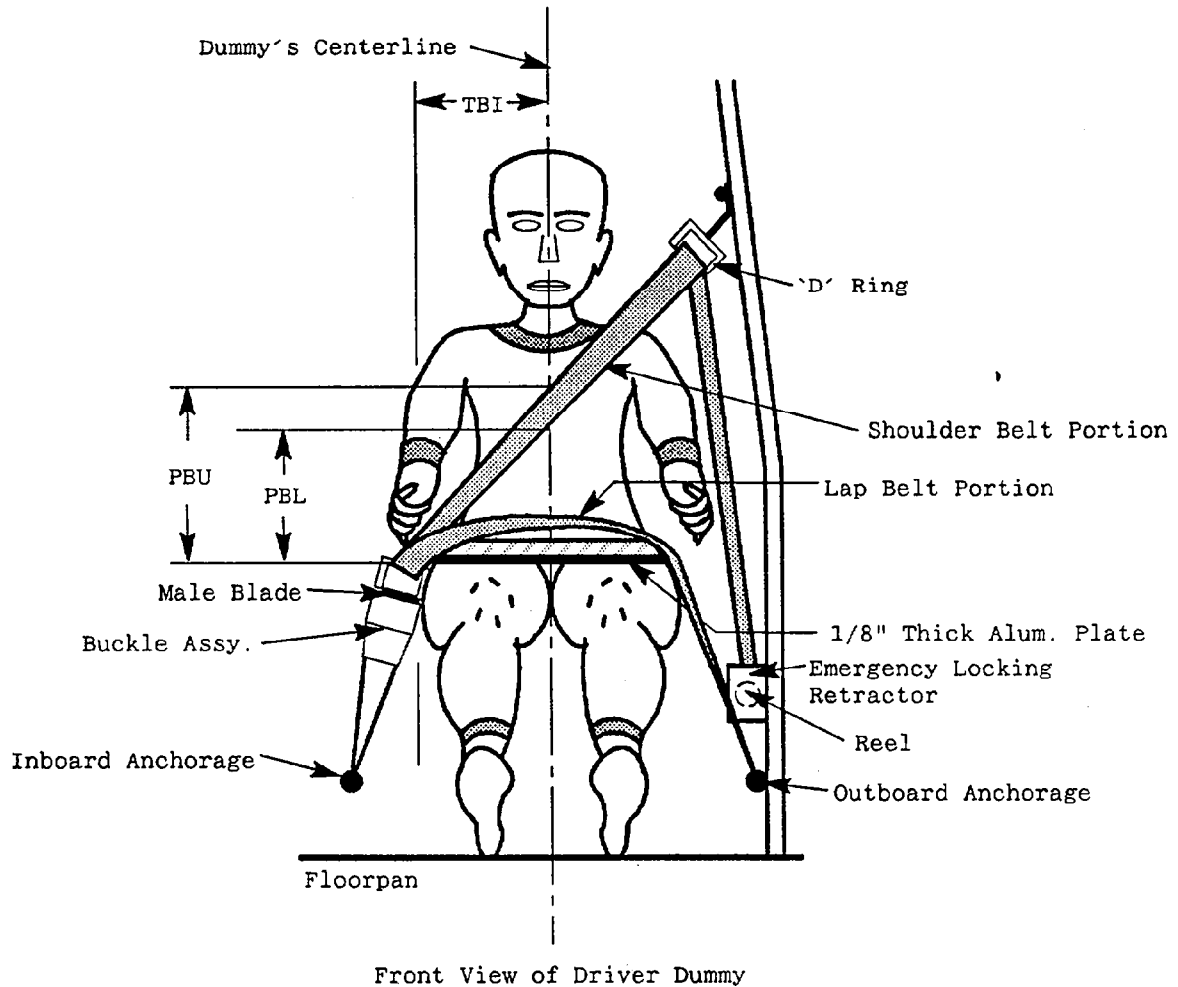


Left Side View

MEASUREMENTS		
<u>NR</u>	-- Distance from tip of dummy's nose to Top Rear surface of steering wheel rim	14.3 Inches
<u>NH</u>	-- Distance from tip of dummy's nose to center of steering wheel hub	15.8 Inches
<u>SCA</u>	-- Angle of steering column relative to the horizontal X axis	23.5* Degrees
<u>SWA</u>	-- Angle of steering wheel relative to the horizontal X axis	66.5 Degrees

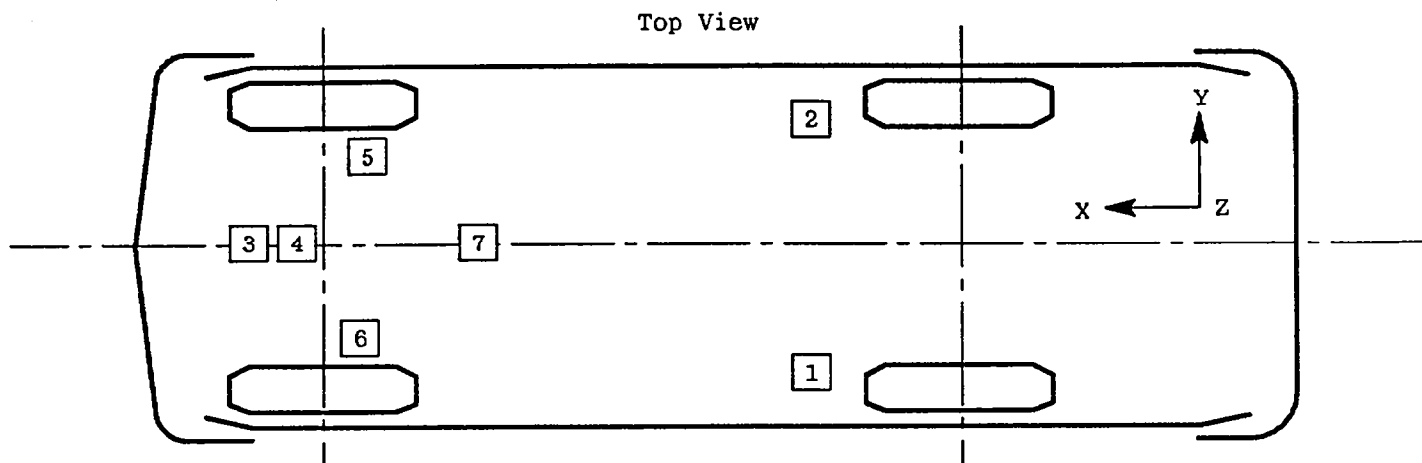
*Steering column set in second notch up from lowest position per manufacturer instructions.

Figure 5
SEAT BELT POSITIONING DATA



	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
<u>PBU</u> -- Top surface of alum. plate to upper edge	13.5	13.4
<u>PBL</u> -- Top surface of alum. plate to belt lower edge	10.3	10.4
<u>TBI</u> -- Distance from torso centerline to buckle	8.5	8.4

Figure 6
VEHICLE ACCELEROMETER LOCATIONS



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	Left Disc Brake Caliper	X		
7	Instrument Panel	X		

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

Table 4
VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION		X*	Y*	Z*	POSITIVE DIRECTION**		NEGATIVE DIRECTION**	
						MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
1	REAR SEAT X-MEMBER AT LEFT SIDE	PRE:	48.2	11.3	24.0				
		POST:	48.2	11.3	23.2				
	LONGITUDINAL ACCELERATION					60	46	-69	49
2	REAR SEAT X-MEMBER AT RIGHT SIDE	PRE:	48.2	-11.3	23.8				
		POST:	48.2	-11.3	23.2				
	LONGITUDINAL ACCELERATION					36	63	-113	64
3	TOP OF ENGINE BLOCK	PRE:	130.5	-1.0	39.4				
		POST:	123.6	-1.0	39.9				
	LONGITUDINAL ACCELERATION					85	31	-160	26
4	BOTTOM OF ENGINE	PRE:	129.7	-6.3	15.0				
		POST:	125.1	-6.3	15.5				
	LONGITUDINAL ACCELERATION					126	31	-180	29
5	BRAKE CALIPER AT RIGHT SIDE	PRE:	135.0	-20.8	15.5				
		POST:	131.9	-20.8	14.1				
	LONGITUDINAL ACCELERATION					21	49	-82	31
6	BRAKE CALIPER AT LEFT SIDE	PRE:	135.0	20.8	15.8				
		POST:	130.7	20.8	14.2				
	LONGITUDINAL ACCELERATION					43	52	-101	30
7	DASH PANEL	PRE:	105.1	-1.5	41.4				
		POST:	105.0	-1.5	40.2				
	LONGITUDINAL ACCELERATION					72	66	-115	48

** *X + Forward from rear bumper Y + Left from vehicle centerline Z + Up from ground	LONGITUDINAL: LATERAL: VERTICAL:	<u>POSITIVE</u> FORWARD LEFTWARD UPWARD	<u>NEGATIVE</u> REARWARD RIGHTWARD DOWNWARD
--	---	---	---

DISTANCE MEASUREMENTS IN INCHES

Figure 7
CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 5.

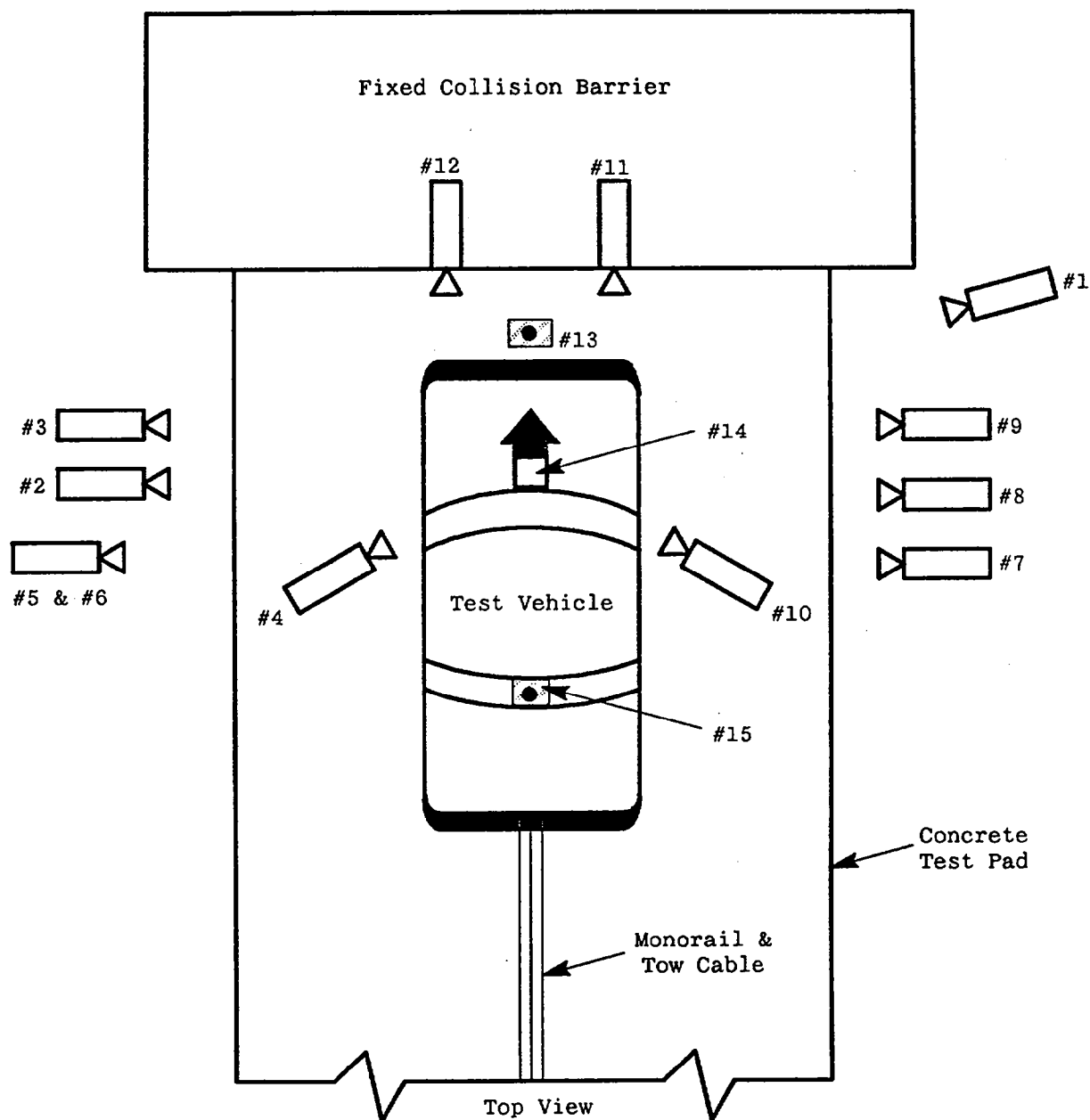


Table 5

HIGH-SPEED CAMERA LOCATIONS

Test No. CN0307		Vehicle: 1992 Jeep Cherokee Sport 4x4 4-Door Sedan						
CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
		X	Y	Z				
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	225	64	42	-2	207.4	13	555
3	Left Side View	307	44	41	-2	289.4	25	570
4	Driver and Interior View	111	97	63	-11	-	13	N.T.
5	Steering Column (Bottom)	276	79	46	-3	258.4	25	510
6	Steering Column (Top)	276	79	70	-8	258.4	25	500
7	Overall Right Side	234	68	42	-1	216.4	13	595
8	Right Side view	288	49	41	-2	270.4	25	590
9	Right Passenger View	311	62	55	-2	293.4	13	585
10	Passenger and Interior View	115	90	65	-12	-	13	505
11	Passenger Front View	22	19	74	-43	-	13	590
12	Driver Front View	22	19	74	-41	-	13	500
13	Windshield View	0	0	130	-55	-	25	500
14	Pit View of Engine	0	32	-86	90	-	13	765
15	Pit View of Fuel Tank	0	96	-86	90	-	13	890

*X = film plane to monorail centerline

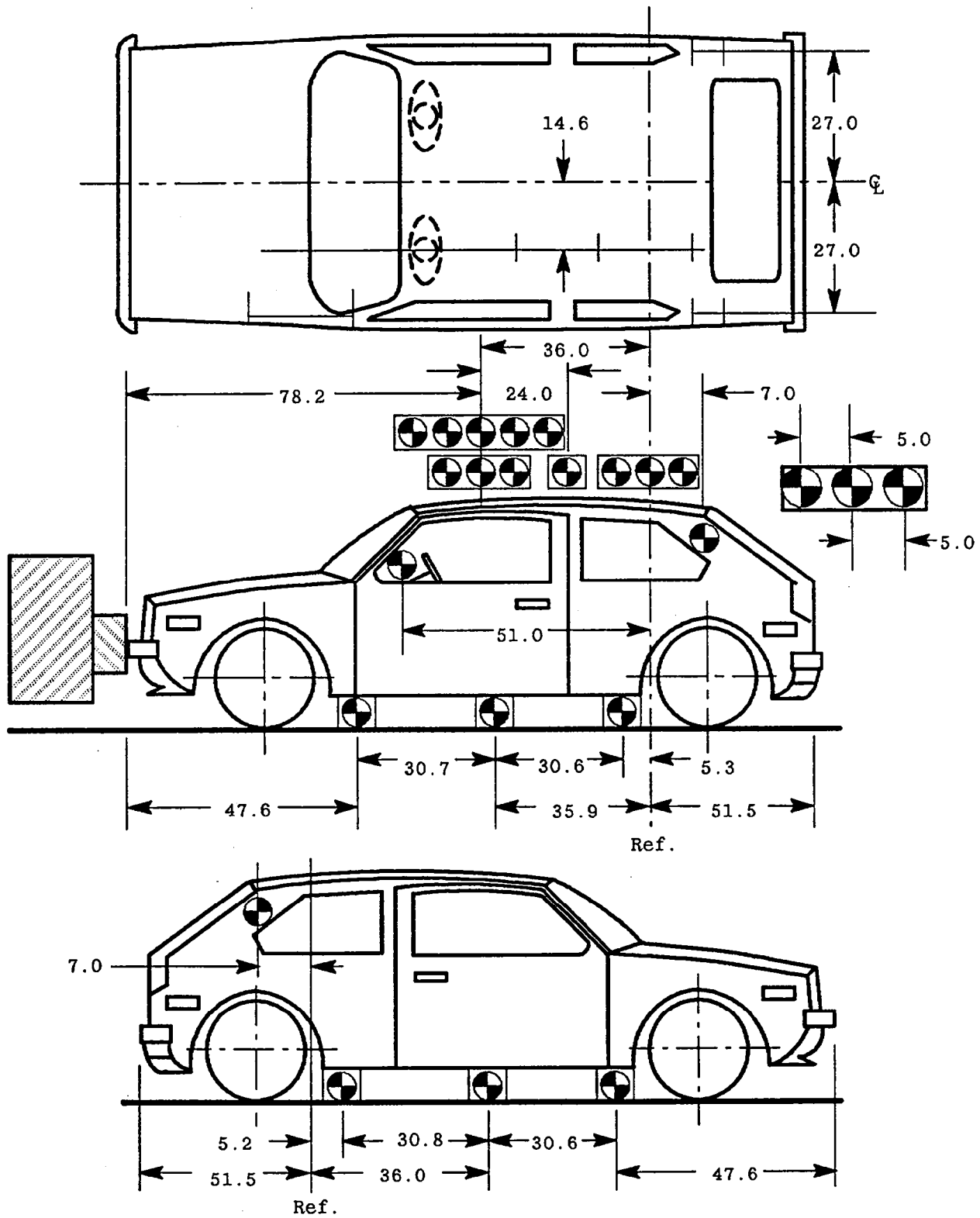
Y = film plane to impact location

Z = film plane to ground

** = referenced to horizontal plane

N.T. = NO Timing

Figure 8
VEHICLE TARGET LOCATIONS



(Dimensions in inches)

Figure 9

TEST VEHICLE MEASUREMENTS

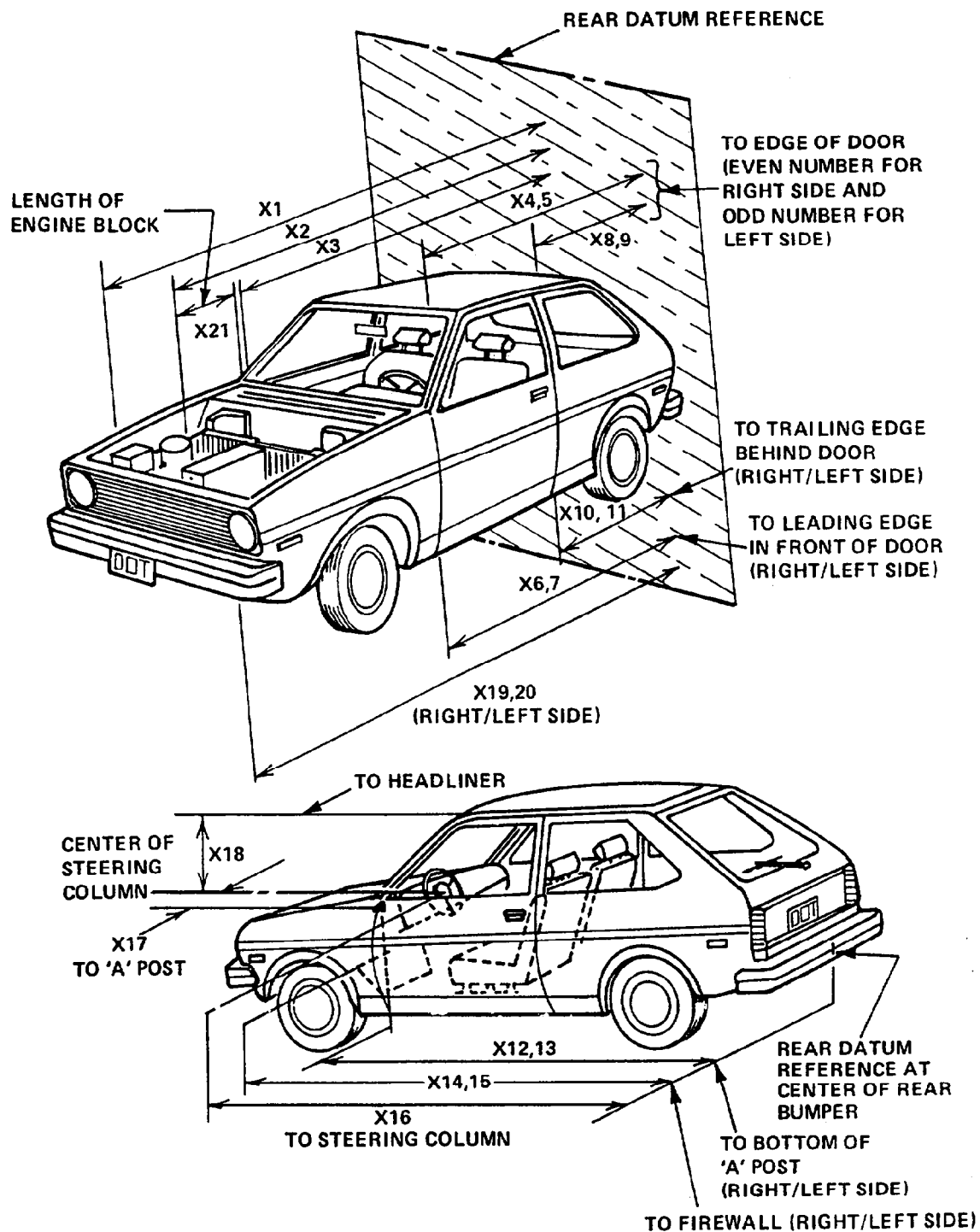


Table 6

VEHICLE MEASUREMENTS

No.		All Dimensions in Inches		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	165.7	149.4	16.3
X2	Rear Surface of Vehicle to Front of Engine	151.7	144.0	7.7
X3	Rear Surface of Vehicle to Firewall	122.2	119.2	3.0
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	111.5	111.2	0.3
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	111.6	110.9	0.7
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	112.9	112.4	0.5
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	113.4	112.0	1.4
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	74.6	74.8	-0.2
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	74.6	74.3	0.3
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	74.5	73.8	0.7
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	74.9	73.8	1.1
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	113.2	112.5	0.7
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	113.5	112.5	1.0
X14	Rear Surface of Vehicle to Firewall, Right Side	121.6	120.0	1.6
X15	Rear Surface of Vehicle to Firewall, Left Side	121.8	120.5	1.3
X16	Rear Surface of Vehicle to Steering Column	96.8	95.3	1.5
X17	Center of Steering Column to "A" Post	15.4	15.2	0.2
X18	Center of Steering Column to Headliner	16.8	18.5	-1.7
X19	Rear Surface of Vehicle to Right Side of Front Bumper	164.3	148.7	15.6
X20	Rear Surface of Vehicle to Left Side of Front Bumper	164.3	148.6	15.7
X21	Length of Engine Block	29.5	29.5	0.0

Section 4

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

- "Occupant Crash Protection," FMVSS No. 208 Data
- "Windshield Mounting," FMVSS No. 212 Data
- "Windshield Zone Intrusion," FMVSS No. 219 (Partial) Data
- "Fuel System Integrity," FMVSS No. 301-75

Table 7

DUMMY INJURY CRITERIA VALUESNHTSA No.: CN0307 Vehicle: 1992 Jeep Cherokee Sport 4x4 4-Door MPV

	MAXIMUM ACCELERATION (g's)							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
Dummy (1)	-122	11	-36	124	-51	-9	-22	49.8
Dummy (2)	-39	8	-44	49	-44	7	-18	46.6

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Dummy (1)	935	1081
Dummy (2)	660	1140

	HEAD INJURY CRITERIA**			
	HIC	36 millisecond Maximum		Avg. Acc. (g) t ₁ TO t ₂
		t ₁ (msec)	t ₂ (msec)	
Dummy (1)	695.97	57.480	93.360	51.89
Dummy (2)	404.01	53.640	89.520	41.75

*Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

Table 8

FMVSS NO. 208 - SEAT BELT WARNING SYSTEM CHECK

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

Log time duration of audible warning signal = 6.0 sec.

Log time duration of reminder light operation = 6.0 sec.

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

Log time duration of audible warning signal = - sec.

(audible warning should not operate)

Log time duration of reminder light operation = 6.0 sec.

Note wording of visual warning:

Fasten Seat Belt -

Fasten Belt -

Symbol 101-80 X

Table 9

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

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

Describe location: Vehicle not equipped with crash deployed occupant protection system

The manufacturers recommended schedule is to replace ____ or repair ____ this system:

- a. by ____ month, ____ year
- b. by ____ miles
- c. or after a time interval of ____ months or ____ years.

Were appropriate instructions concerning maintenance and/or replacement of this system provided? YES N/A NO N/A

Was a description of the functional operation of the system provided? YES N/A NO N/A

Is there a reference to the instructions and description of the system on the label? YES N/A NO N/A

Was an owner's manual provided? YES N/A NO N/A

Did the owner's manual contain appropriate information concerning maintenance and/or replacement and a description of the functional operation of the systems? YES P/A NO N/A

Table 10

FMVSS NO. 208 - READINESS INDICATOR

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

Is the system totally mechanical?

YES X NO -

Describe the location of the readiness indicator:

Not applicable

Is the readiness indicator clearly visible to the driver?

YES N/A NO N/A

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

YES N/A NO N/A

Table 11

FMVSS NO. 208 - COMFORT AND CONVENIENCE TEST SUMMARY

Test Vehicle NHTSA No.:	<u>CN0307</u>
Make/Model:	<u>Jeep Cherokee</u>
Date of Comfort/Convenience Check:	<u>2/10/92</u>
Technician Performing Check:	<u>VMP</u>
GVWR:	<u>4900 lbs</u>

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

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

1. Automatic seat belts YES - NO X

If yes, go to requirements D1, D2 and D3

2. Manual seat belts* YES X NO -

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

YES - NO X

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

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

STOP

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

Table 11 (cont.)

D1

CONVENIENCE HOOKS

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

YES X NO -

Check the option which applies to this test vehicle:

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

YES X NO -

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

YES X NO -

D2

WEBBING TENSION - RELIEVING DEVICE

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

YES - NO X

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

YES N/A NO N/A

(If NO, provide explanation.)

Check the option which applies to this test vehicle:

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

YES N/A NO N/A

(If NO, provide explanation.)

Table 11 (cont.)

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

(If NO, provide explanation.)

D3

BELT CONTACT FORCE

1. Do not measure the belt contact force if the manual or automatic seat belt assemblies in this vehicle incorporate a webbing tension relieving device. Does the vehicle incorporate a tension relieving device?
- YES - NO X
2. Seats are adjusted according to instructions in Appendix B.
- YES X NO -
3. The test dummies are positioned according to dummy position placement instructions in Appendix B and Appendix C.
- YES X NO -
4. Close the vehicle's adjacent door, pull either 12 inches of belt webbing or the maximum available amount of belt webbing, whichever is less, from the retractor and then release it, allowing the belt webbing to return to the dummy's chest, then fasten the latch. Locate the point where the centerline of the upper torso belt webbing crosses the midsagittal line on the dummy's chest. At that point, pull the belt webbing out 3 inches from the dummy's chest and release until it is within one inch from the dummy's chest. Measure the contact force exerted by the belt webbing on the dummy's chest. The contact force is 0.6 pounds. Contact the COTR if the contact force exceeds 0.7 pounds.

Table 11 (cont.)

D4

LATCHPLATE ACCESSIBILITY

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

D5

RETRACTION

1. Seats and seat backs are adjusted according to instructions in Appendix B "General Test Conditions" in TP-208-8.
YES X NO -
2. Use anthropomorphic test dummies whose arms have been removed and position the dummies in the front outboard designated seating positions according to instructions in Appendix B and restrain the dummies, using the belt systems for the positions being tested.
YES X NO -
3. Outboard armrests which are capable of being stowed on vehicle seats shall be placed in their stowed positions.
YES N/A NO N/A
4. Check the option which applies to this test vehicle:
 - a. The torso and lap belt webbing of the seat belt system automatically retract to a stowed position when the adjacent vehicle door is in an open position and the seat belt latch plate is released.
YES X NO -

Table 11 (cont.)

- b. The torso and lap belt webbing of the seat belt system automatically retract when the seat belt latch plate is released.

YES X NO -

5. With the webbing and hardware in the stowed position, close the door to assure that the webbing and hardware are prevented from being pinched.

YES X NO -

6. If this test vehicle has an open body (without doors) and has a belt system with a tension-relieving device, check to assure that the belt system fully retracts when the tension-relief device is manually deactivated.

YES N/A NO N/A

D6

ACCESSIBILITY

The requirements for accessibility do not apply to:

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

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

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

YES X NO -

2. The remaining two seat belt parts are accessible under normal conditions.

YES X NO -

Table 11 (cont.)

3. The buckle and latchplate do not pass through the guides or conduits provided and fall behind the seat when the following events occur in order:

a. The belt is completely retracted or, if the belt is nonretractable, the belt is unattached.

YES - NO X

b. The seat is moved to any position to which it is designed to be adjusted.

YES - NO X

c. The seat back, if foldable, is folded forward as far as possible and then moved backward into positions.

YES - NO X

4. Is the inboard receptacle end of the seat belt assembly which is installed in the outboard designated seating position accessible with the center arm rest in any position to which it can be adjusted without moving the armrest?

YES N/A NO N/A

D7

LATCH MECHANISM

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

1. Whose components are accessible to a seated occupant in both the stowed and operational positions.

YES X NO -

2. That releases both the upper torso restraint and the lap belt simultaneously, if the assembly has a lap belt and an upper torso restraint that require unlatching for release of the occupant.

YES X NO -

3. That releases at a single point by a push button action.

YES X NO -

Win

Figure 10

FMVSS NO. 212 - "WINDSHIELD MOUNTING" DATA SHEET

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

Windshield is bonded in place with 0.8" metal trim covering the entire windshield periphery

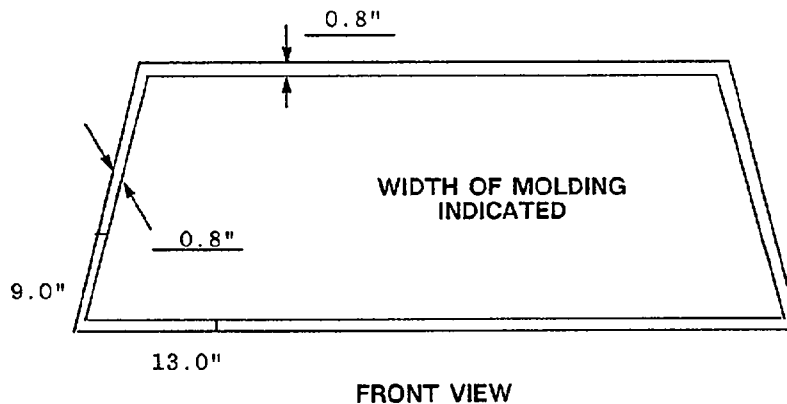
FMVSS 212 REQUIREMENTS:

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

FMVSS 212 TEST DATA:

	WINDSHIELD PERIPHERY		PERCENT RETENTION
	PRE-TEST (in.)	POST-TEST (in.)	
RIGHT SIDE	80.4	58.4	73%
LEFT SIDE	80.4	80.4	100%
TOTAL	160.8	138.8	86%

AREA OF RETENTION FAILURE:



FAILURE DETAILS:

Windshield separated from mounting at the lower right hand corner for a total of 22.0 linear inches.

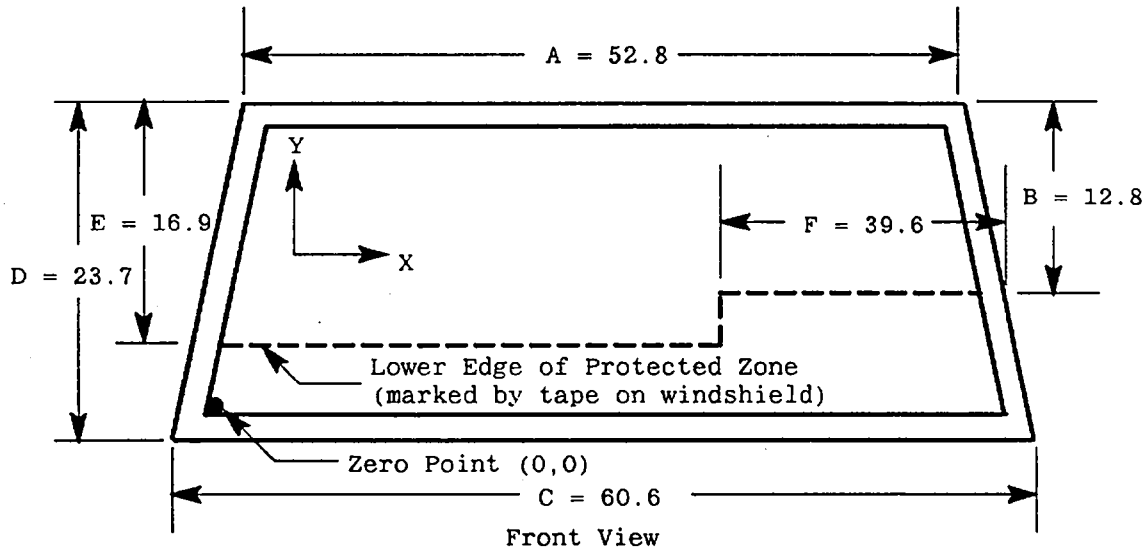
Figure 11

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

PROTECTED ZONE LOWER EDGE REQUIREMENT:

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

FMVSS 219 TEST DATA: (Dimensions in inches.)



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

(Show location of penetration on above sketch)

None

	COORDINATES	
	X	Y
1.		
2.		
3.		
4.		

Table 12
FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

FMVSS NO. 301

TEST VEHICLE NHTSA NO.:

C	N	0	3	0	7
---	---	---	---	---	---

TEST DATE: February 12, 1992

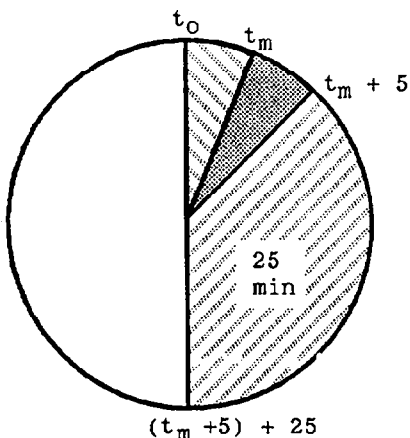
Vehicle Mfgr./Make/Model: 1992 Jeep Cherokee Sport 4x4 4-Door MPV

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

TEST VEHICLE IMPACT TYPE:

- ☒ Frontal (30 mph)
- ☐ Oblique (30 mph) with _____° barrier face first contacting _____
(driver/passenger) side
- ☐ Rear Moving Barrier (30 mph)
- ☐ Lateral Moving Barrier (20 mph)

FUEL SPILLAGE MEASUREMENT:



1. From impact until vehicle motion ceases
2. For 5 minute period after vehicle motion ceases
3. For next 25 minutes

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

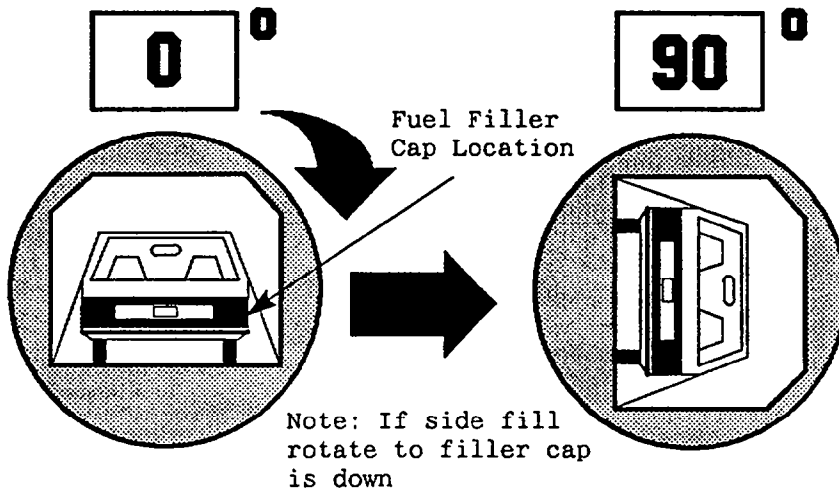
SOLVENT SPILLAGE DETAILS:

None

Table 13
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE:

Vehicle NHTSA ID No.:



CN0307

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 10 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 00 seconds

TOTAL 7 minutes 10 seconds

Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

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

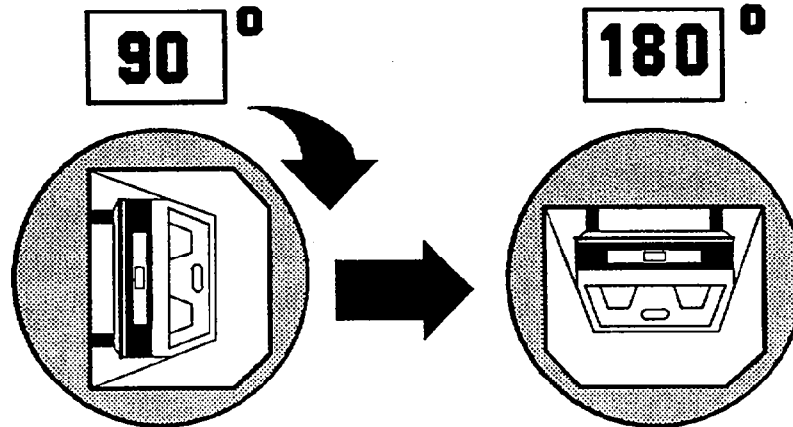
IV. SOLVENT SPILLAGE LOCATION(S):

None

Table 13
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE:

Vehicle NHTSA ID No.:



CN0307

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	<u>1</u> minutes <u>59</u> seconds
FMVSS 301 Position Hold Time +	<u>5</u> minutes <u>00</u> seconds
TOTAL	<u>6</u> minutes <u>59</u> seconds
Next whole minute interval	<u>7</u> minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	N/A
---	---	---	-----

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

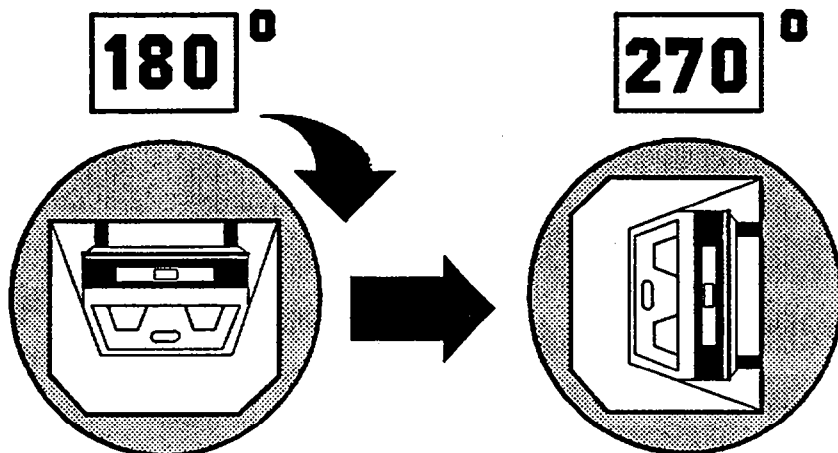
IV. SOLVENT SPILLAGE LOCATION(S):

None

Table 13
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE:

Vehicle NHTSA ID No.:



CN0307

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 2 minutes 15 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 00 seconds

TOTAL 7 minutes 15 seconds

Next whole minute interval 8 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

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

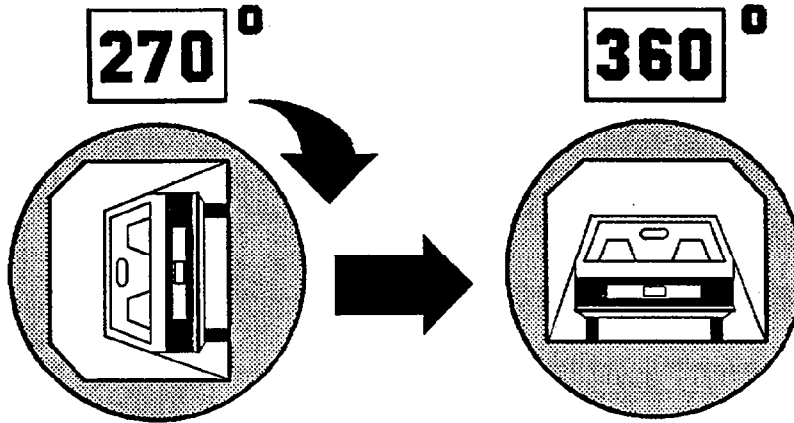
IV. SOLVENT SPILLAGE LOCATION(S):

None

Table 13
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE:

Vehicle NHTSA ID No.:



CN0307

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	1	minutes	57	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	6	minutes	57	seconds
Next whole minute interval	7	minutes		

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	N/A
---	---	---	-----

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

IV. SOLVENT SPILLAGE LOCATION(S):

None

Table 14

TEST VEHICLE NONCOMPLIANCE NOTICE

NHTSA Contract Lab: Calspan Advanced Technology Center

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

Date of Test: February 12, 1992 Vehicle NHTSA No.: CN0307

Vehicle Manufacturer: Chrysler Corporation

Model Year: 1992 VIN: 1J4FJ88S6NL155633

Model: Jeep Cherokee Body Style: 4-door MPV Build Date: 10-91

Dummy Stabilized Temperature at Time of Test: 70 °F (Spec. = 62-72°F)

Impact Velocity: 29.6 mph Time of Test: 13:35

Type of Automatic Restraint System: Driver and right front passenger
3-point manual seat belt restraints.

Failure Details:

Vehicles as tested appears to comply with the requirements of FMVSS

Nos. 208, 212, 219 (Partial), and 301.

Appendix A

PHOTOGRAPHS

LIST OF PHOTOGRAPHS

<u>Figure</u>	<u>Photograph Title</u>	<u>Page No.</u>
Figure A-1	PRE-TEST FRONT VIEW	A-3
Figure A-2	POST-TEST FRONT VIEW	A-4
Figure A-3	PRE-TEST LEFT SIDE VIEW	A-5
Figure A-4	POST-TEST LEFT SIDE VIEW	A-6
Figure A-5	PRE-TEST RIGHT SIDE VIEW	A-7
Figure A-6	POST-TEST RIGHT SIDE VIEW	A-8
Figure A-7	PRE-TEST RIGHT FRONT THREE-QUARTER VIEW	A-9
Figure A-8	POST-TEST RIGHT FRONT THREE-QUARTER VIEW	A-10
Figure A-9	PRE-TEST LEFT REAR THREE-QUARTER VIEW	A-11
Figure A-10	POST-TEST LEFT REAR THREE-QUARTER VIEW	A-12
Figure A-11	POST-TEST TOP VIEW	A-13
Figure A-12	PRE-TEST WINDSHIELD VIEW	A-14
Figure A-13	POST-TEST WINDSHIELD VIEW	A-15
Figure A-14	PRE-TEST ENGINE COMPARTMENT VIEW	A-16
Figure A-15	POST-TEST ENGINE COMPARTMENT VIEW	A-17
Figure A-16	PRE-TEST FUEL FILLER CAP PHOTO	A-18
Figure A-17	POST-TEST FUEL FILLER CAP PHOTO	A-19
Figure A-18	PRE-TEST FRONT UNDERBODY VIEW	A-20
Figure A-19	POST-TEST FRONT UNDERBODY VIEW	A-21
Figure A-20	PRE-TEST FRONT SIDE UNDERBODY VIEW	A-22
Figure A-21	POST-TEST FRONT SIDE UNDERBODY VIEW	A-23
Figure A-22	PRE-TEST REAR UNDERBODY VIEW	A-24
Figure A-23	POST-TEST REAR UNDERBODY VIEW	A-25
Figure A-24	CERTIFICATION LABEL AND TIRE PLACARD	A-26
Figure A-25	PRE-TEST DRIVER DUMMY POSITION	A-27
Figure A-26	POST-TEST DRIVER DUMMY POSITION	A-28
Figure A-27	PRE-TEST PASSENGER DUMMY POSITION	A-29
Figure A-28	POST-TEST PASSENGER DUMMY POSITION	A-30
Figure A-29	PRE-TEST DRIVER DUMMY AND INTERIOR VIEW	A-31
Figure A-30	POST-TEST DRIVER DUMMY AND INTERIOR VIEW	A-32
Figure A-31	PRE-TEST PASSENGER DUMMY AND INTERIOR VIEW	A-33
Figure A-32	POST-TEST PASSENGER DUMMY AND INTERIOR VIEW	A-34
Figure A-33	VEHICLE IMPACT	A-35
Figure A-34	BALLAST IN REAR SEATING AREA	A-36
Figure A-35	POST-TEST STEERING WHEEL CLOSEUP	A-37
Figure A-36	WINDSHIELD SEPARATION FROM MOUNTING AT LOWER RIGHT SIDE	A-38

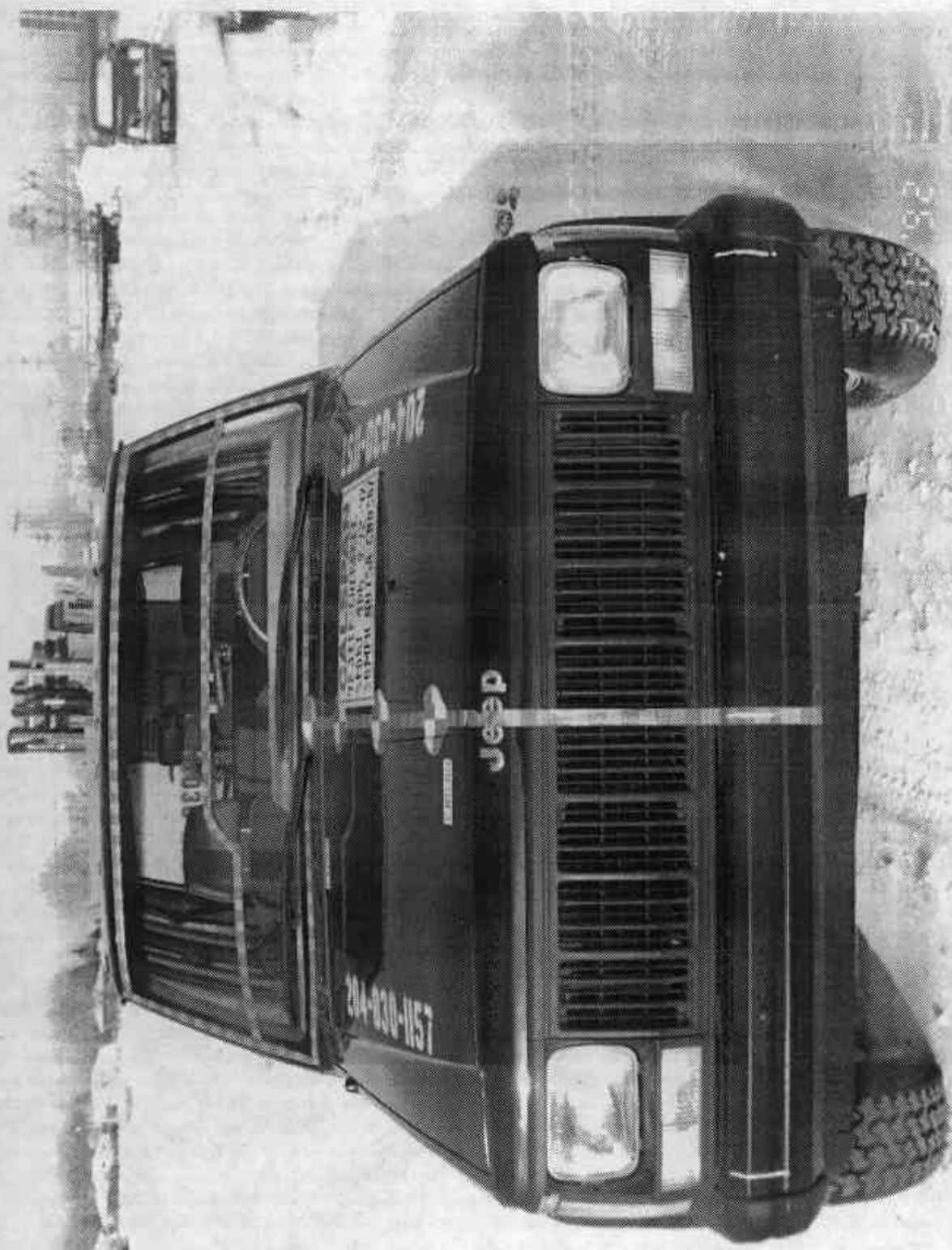


Figure A-1 PRE-TEST FRONT VIEW

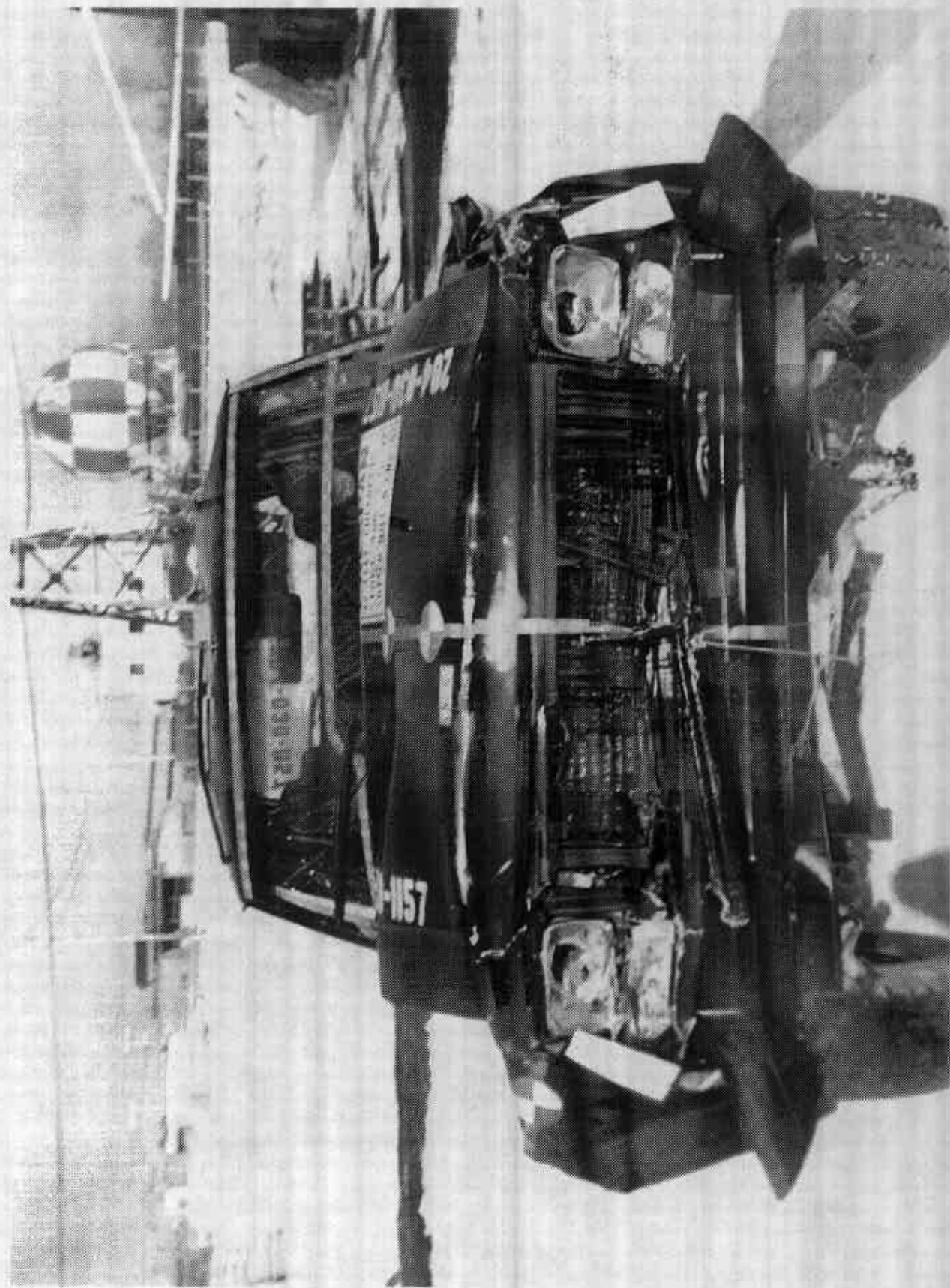


Figure A-2 POST-TEST FRONT VIEW

A-4

7979-3

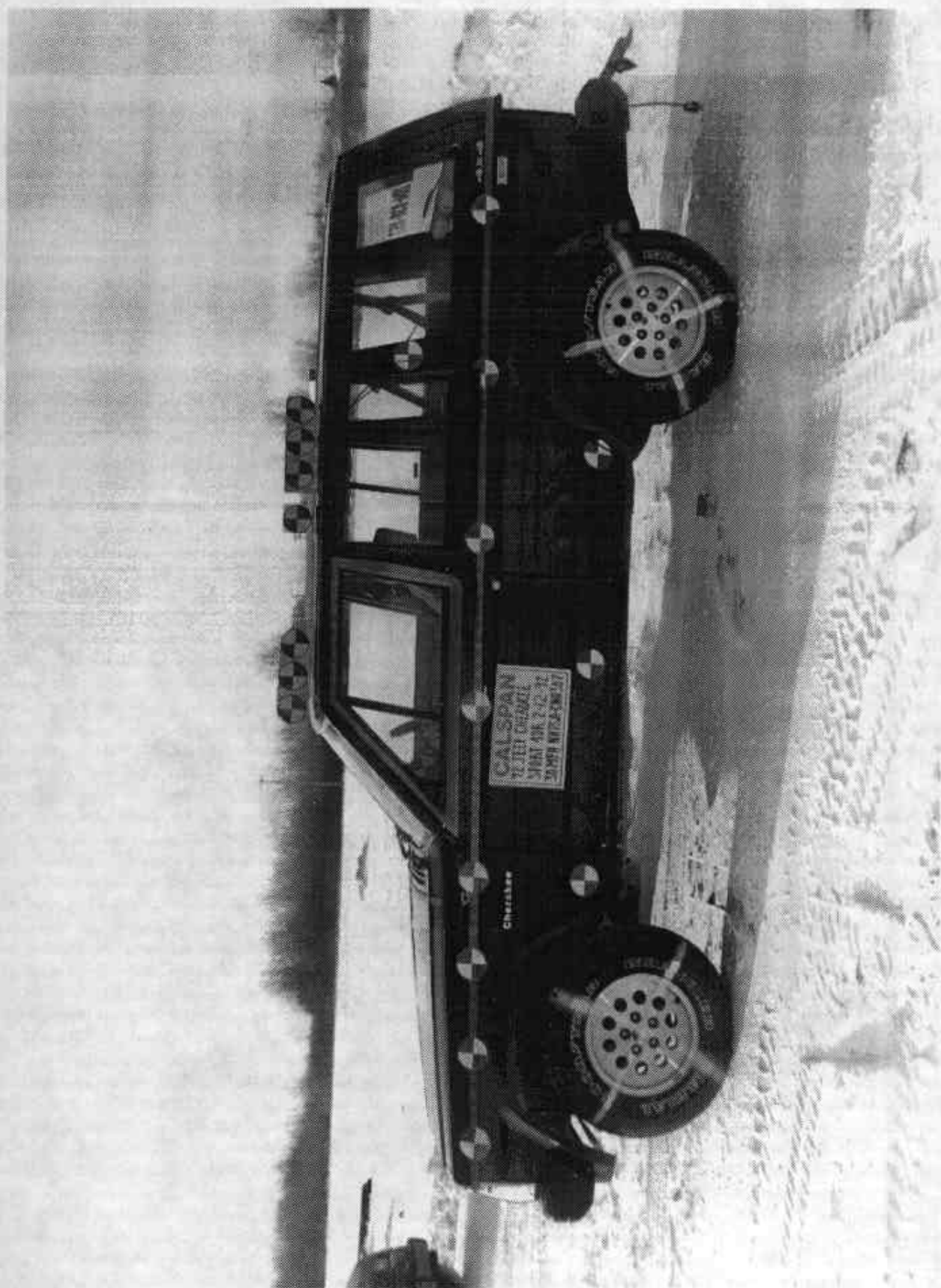
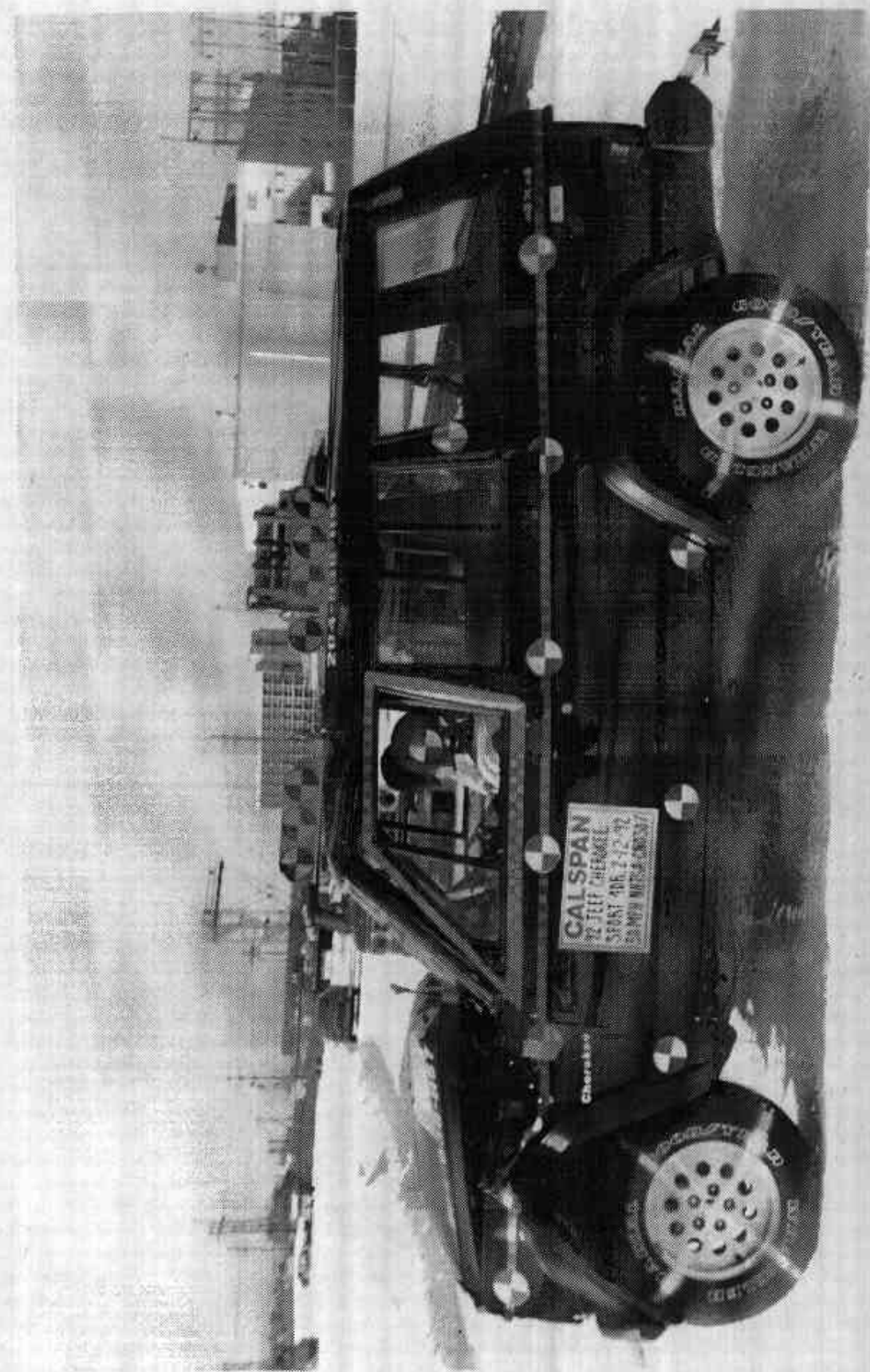


Figure A-3 PRE-TEST LEFT SIDE VIEW



A-6

7970-3

Photo A-4 POST-TEST LEFT SIDE VIEW

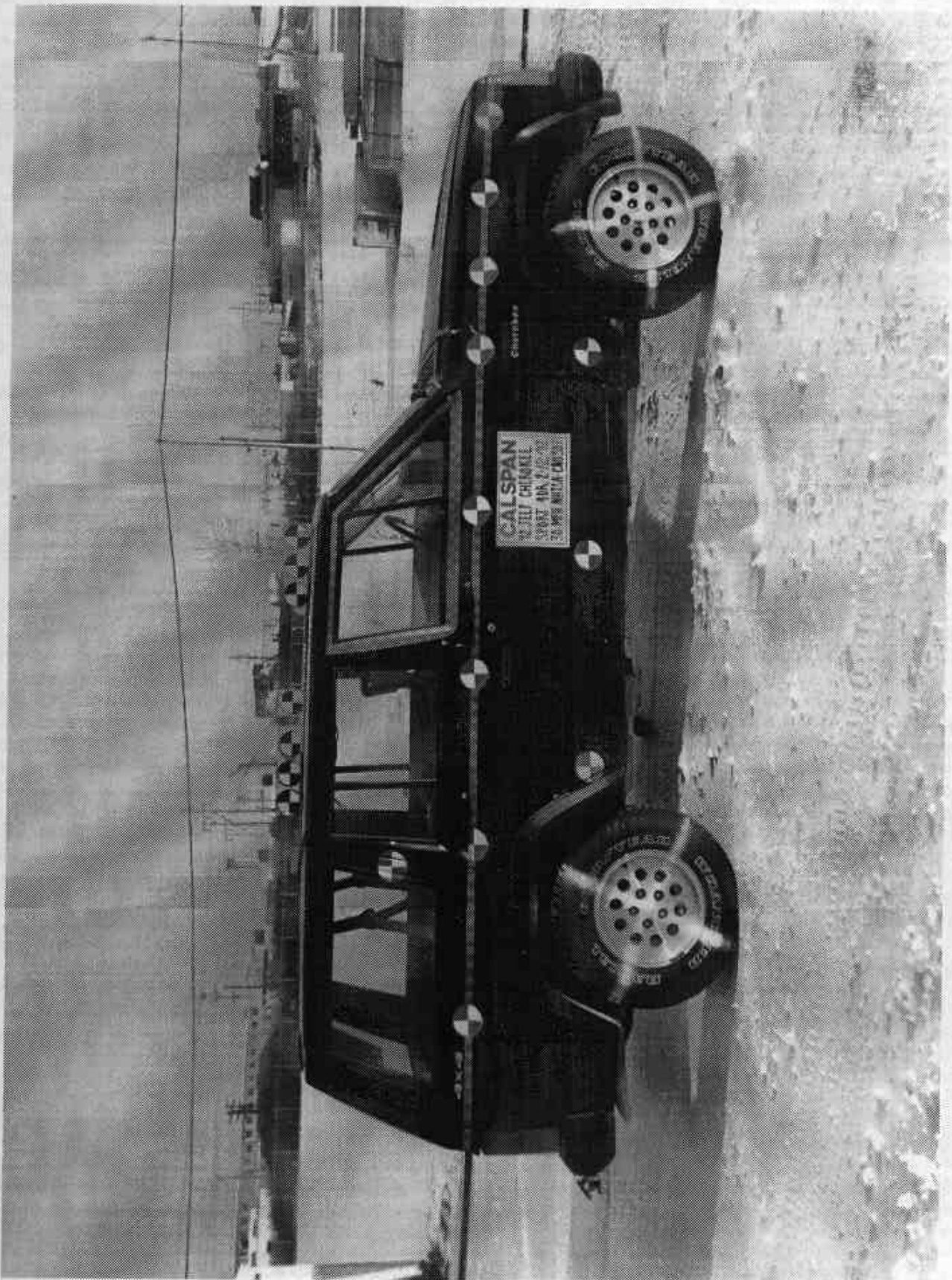


Figure A-5 PRE-TEST RIGHT SIDE VIEW

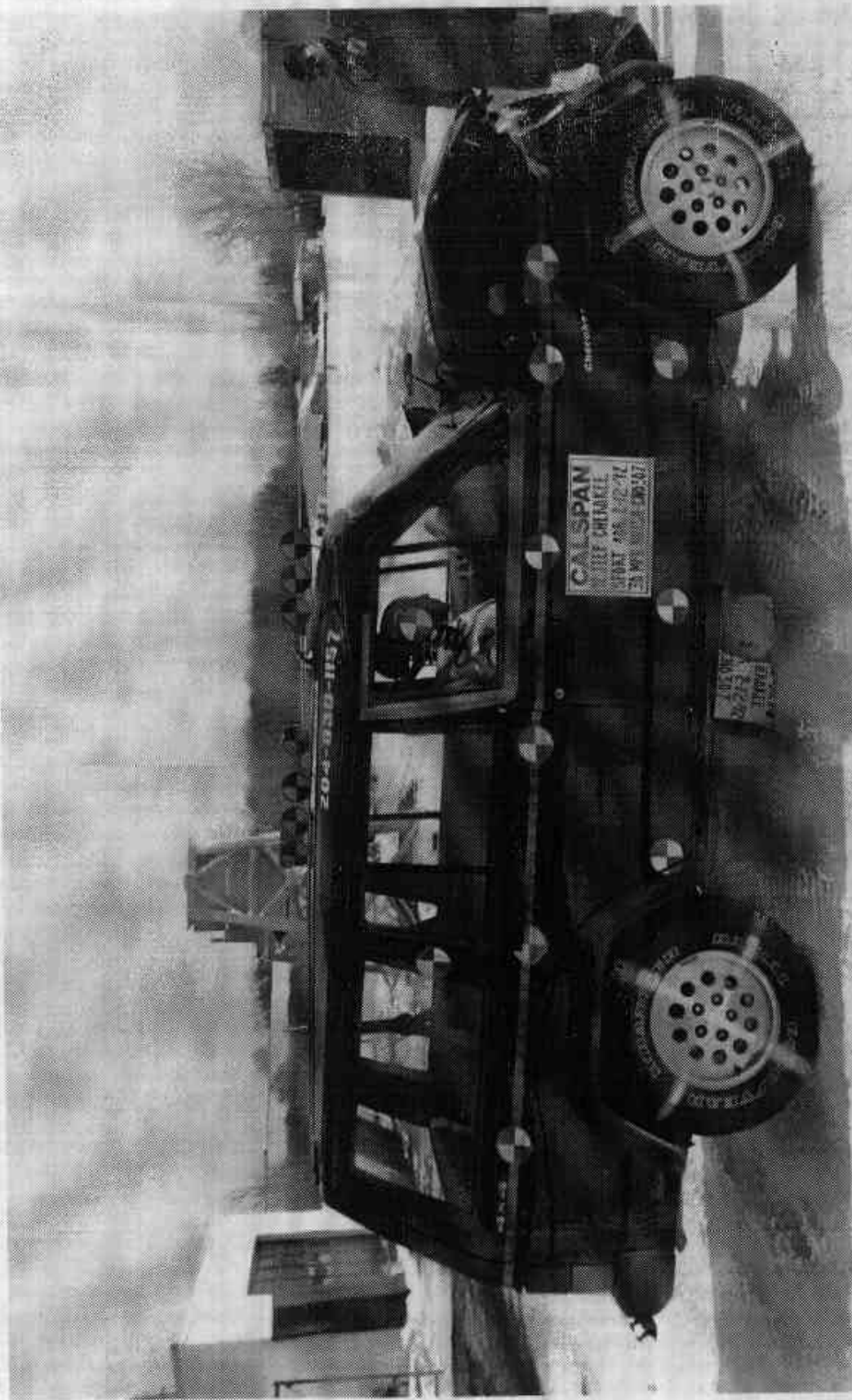


Figure A-8 POST TEST RIGHT SIDE VIEW



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

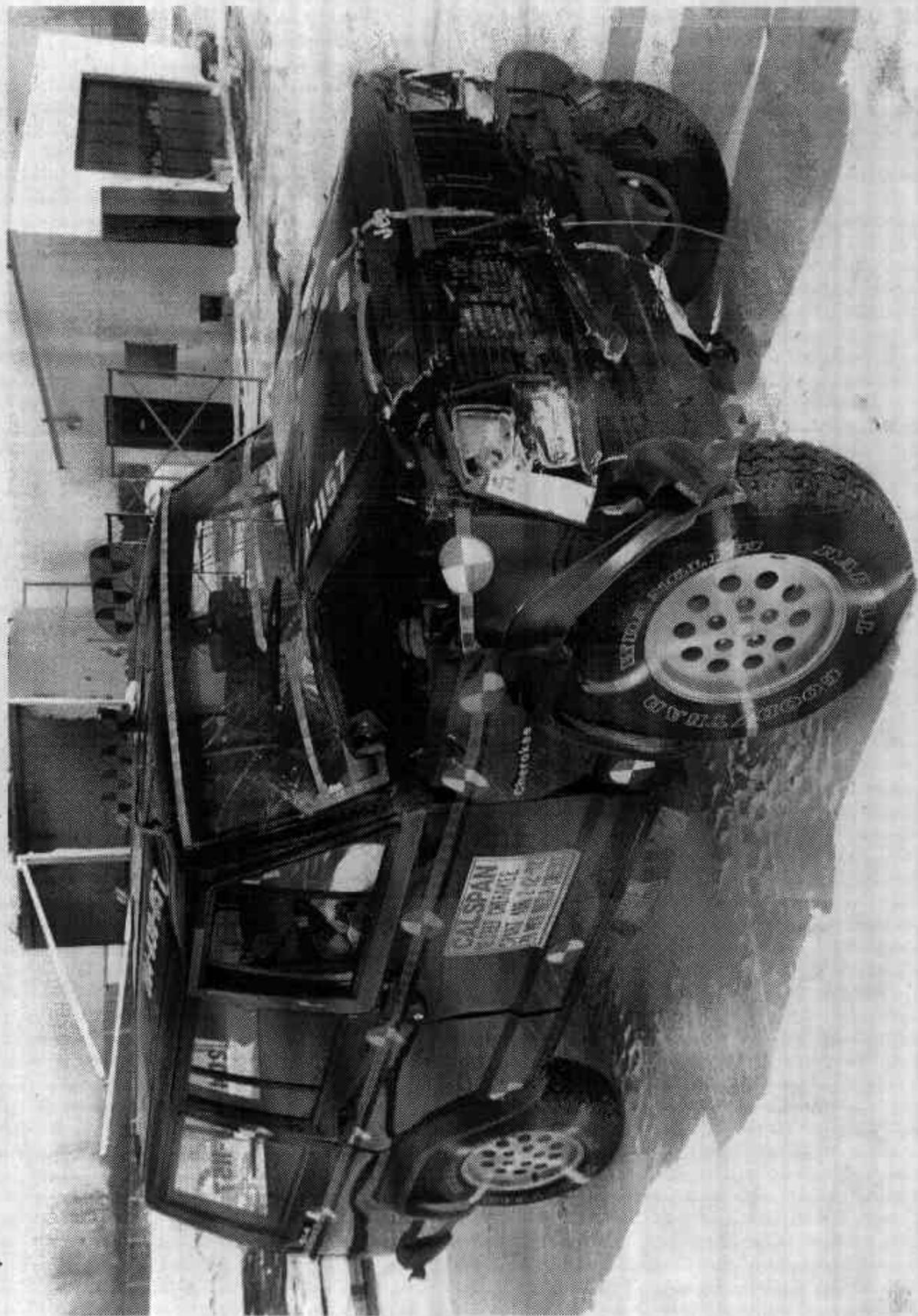


Figure A-8 POST-TEST RIGHT FRONT THREE-QUARTER VIEW

A-10

7879-3



Figure A-3 PRE-TEST LEFT REAR THREE-QUARTER VIEW



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

A-12

7979-3



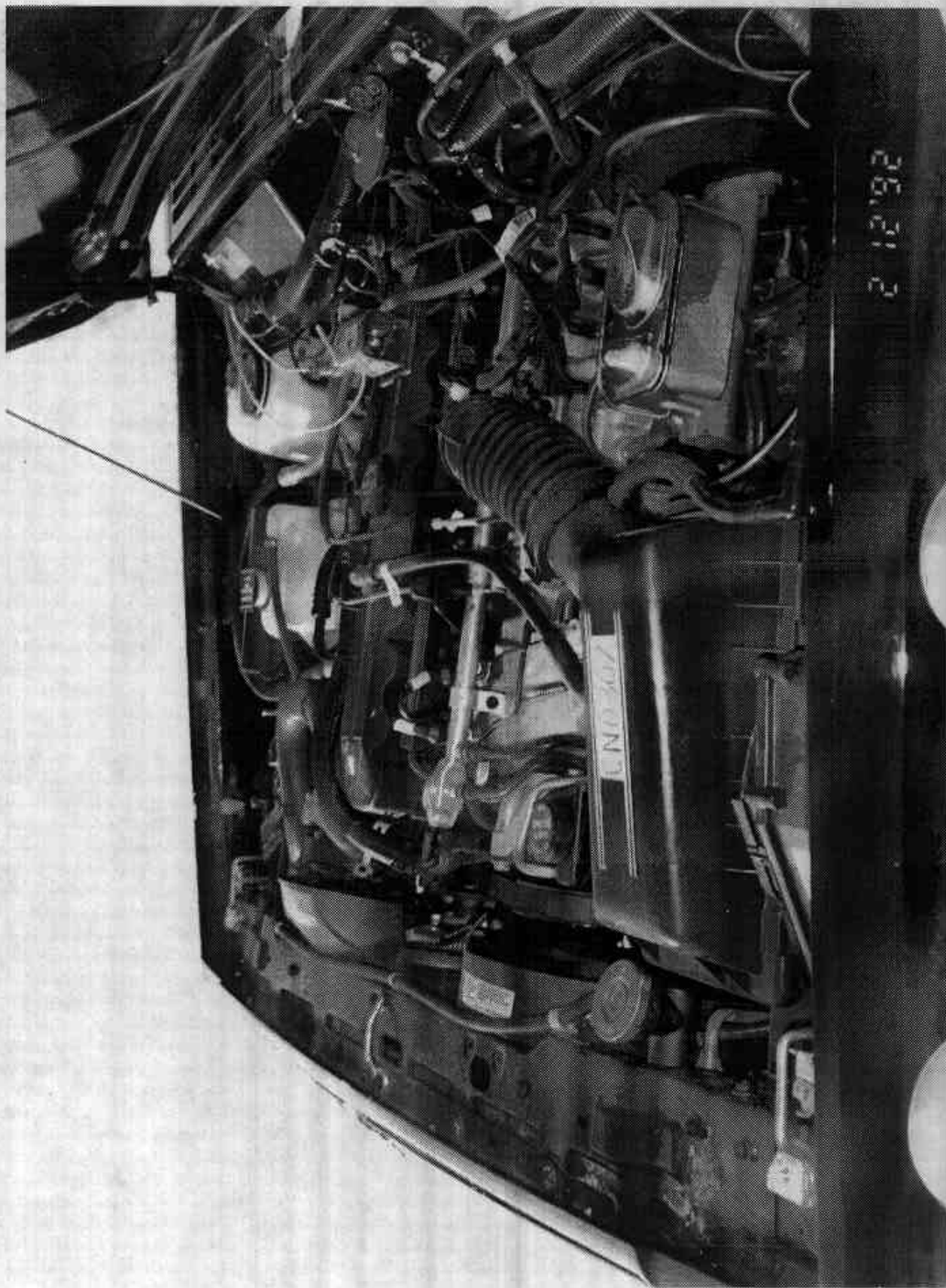
Figure A-11 POST-TEST TOP VIEW



Figure A-12 PRE-TEST WINDSHIELD VIEW



Figure A-13 POST-TEST WINDSHIELD VIEW



2 12'92

Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

A-16

7979-3

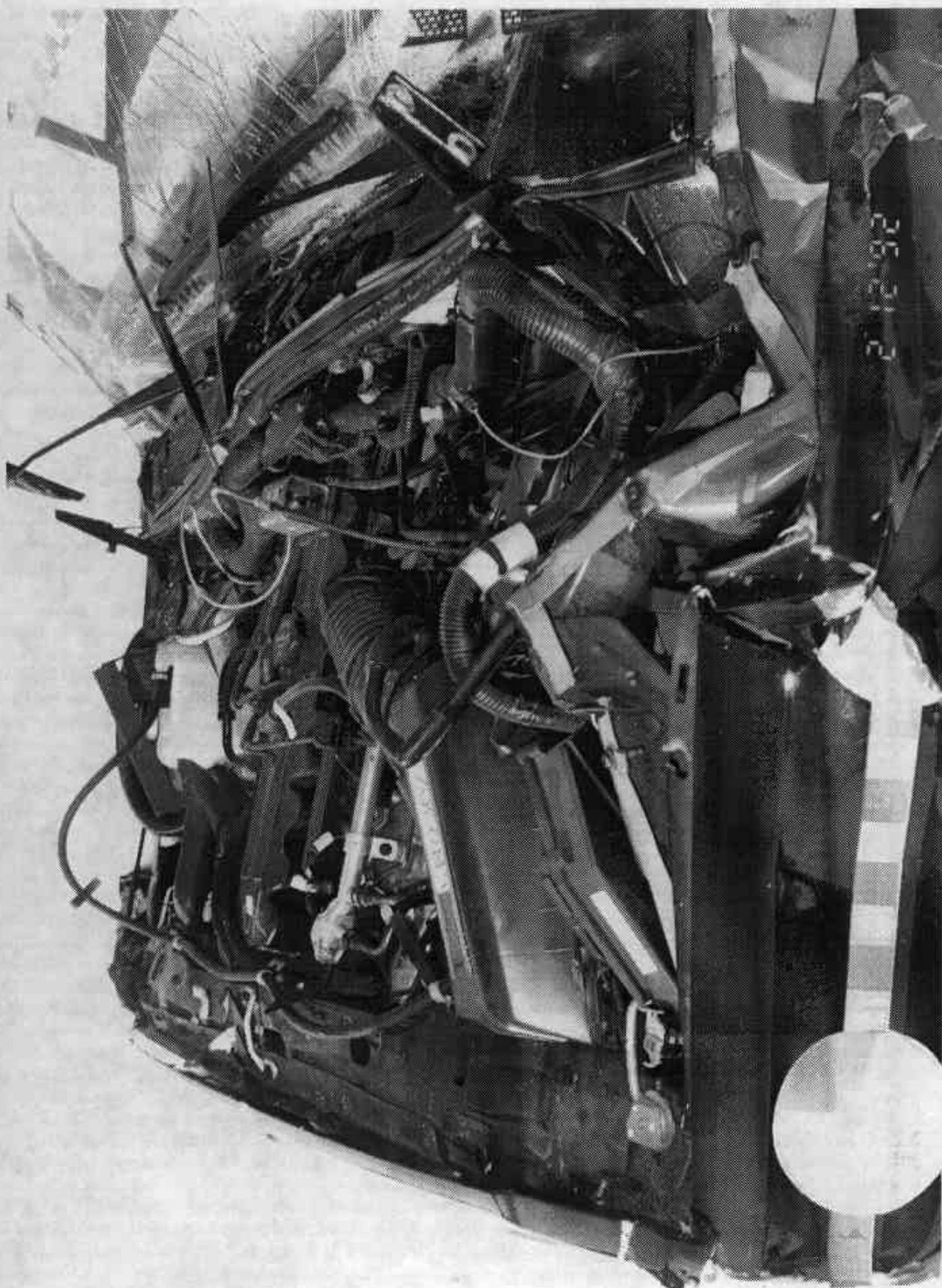


Figure A-15 POST-TEST ENGINE COMPARTMENT VIEW

A-17

7979-3

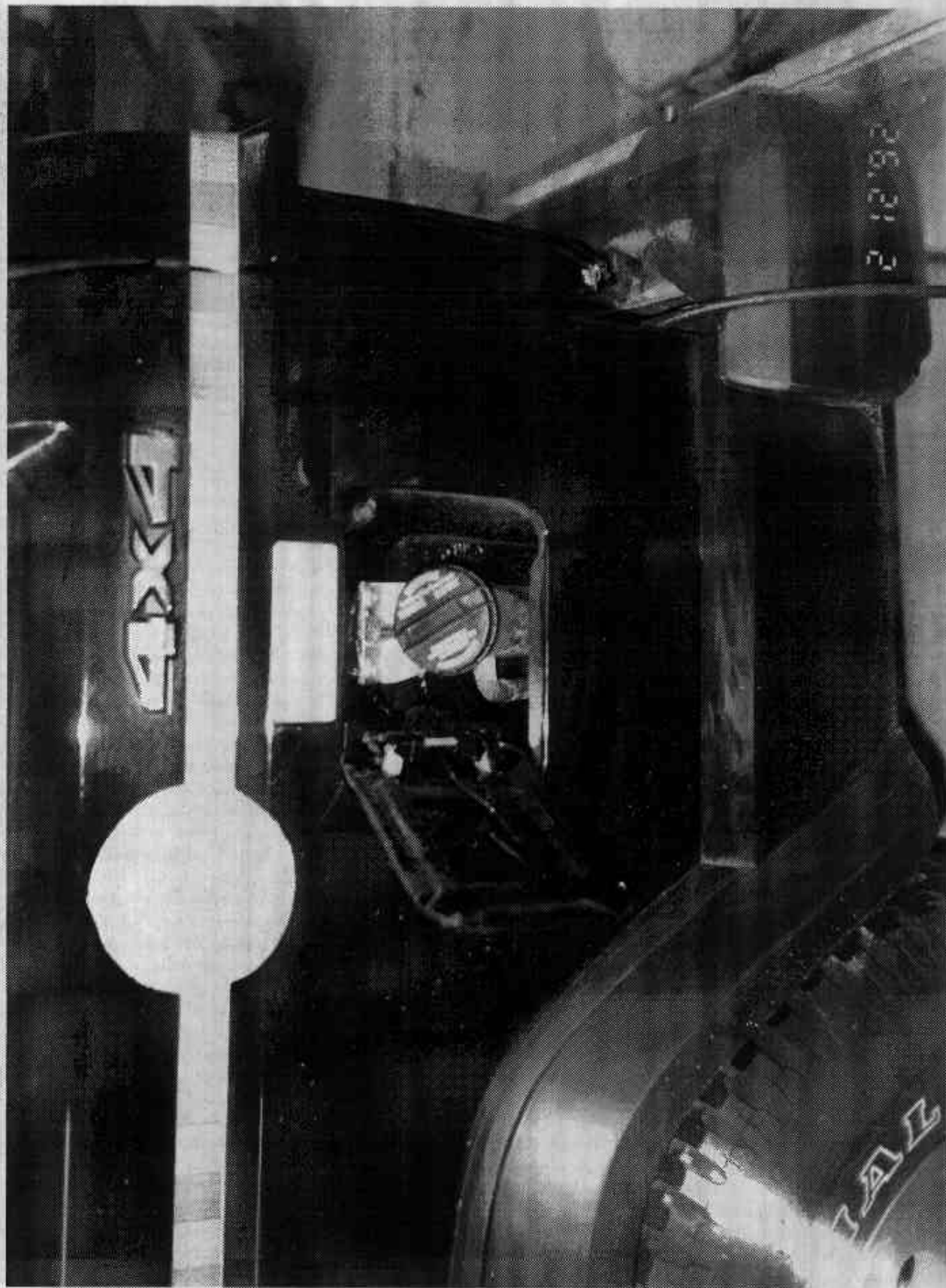


Figure A-16 PRE-TEST FUEL FILLER CAP PHOTO

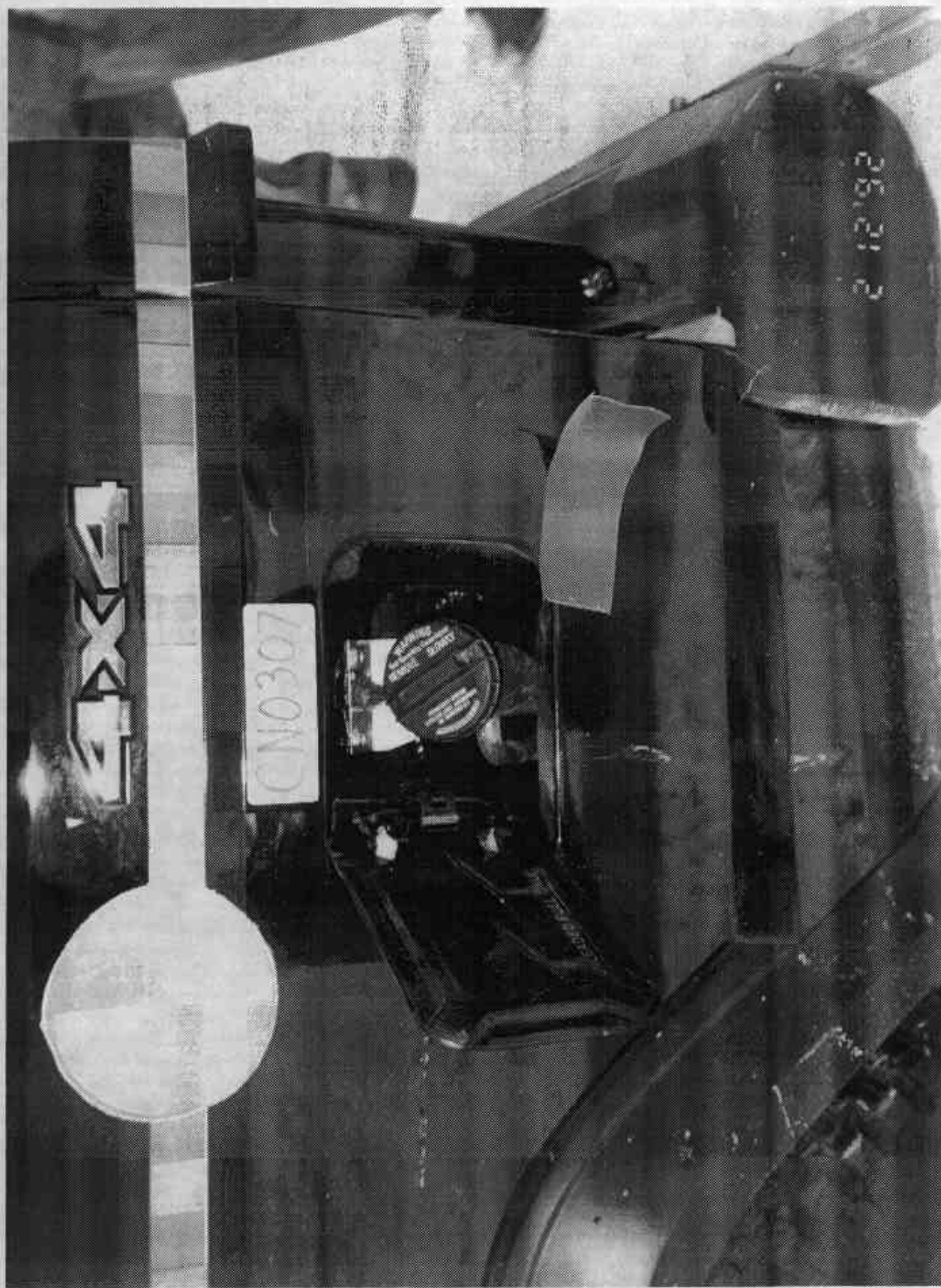


Figure A-17. POST-TEST FUEL FILLER CAP PHOTO

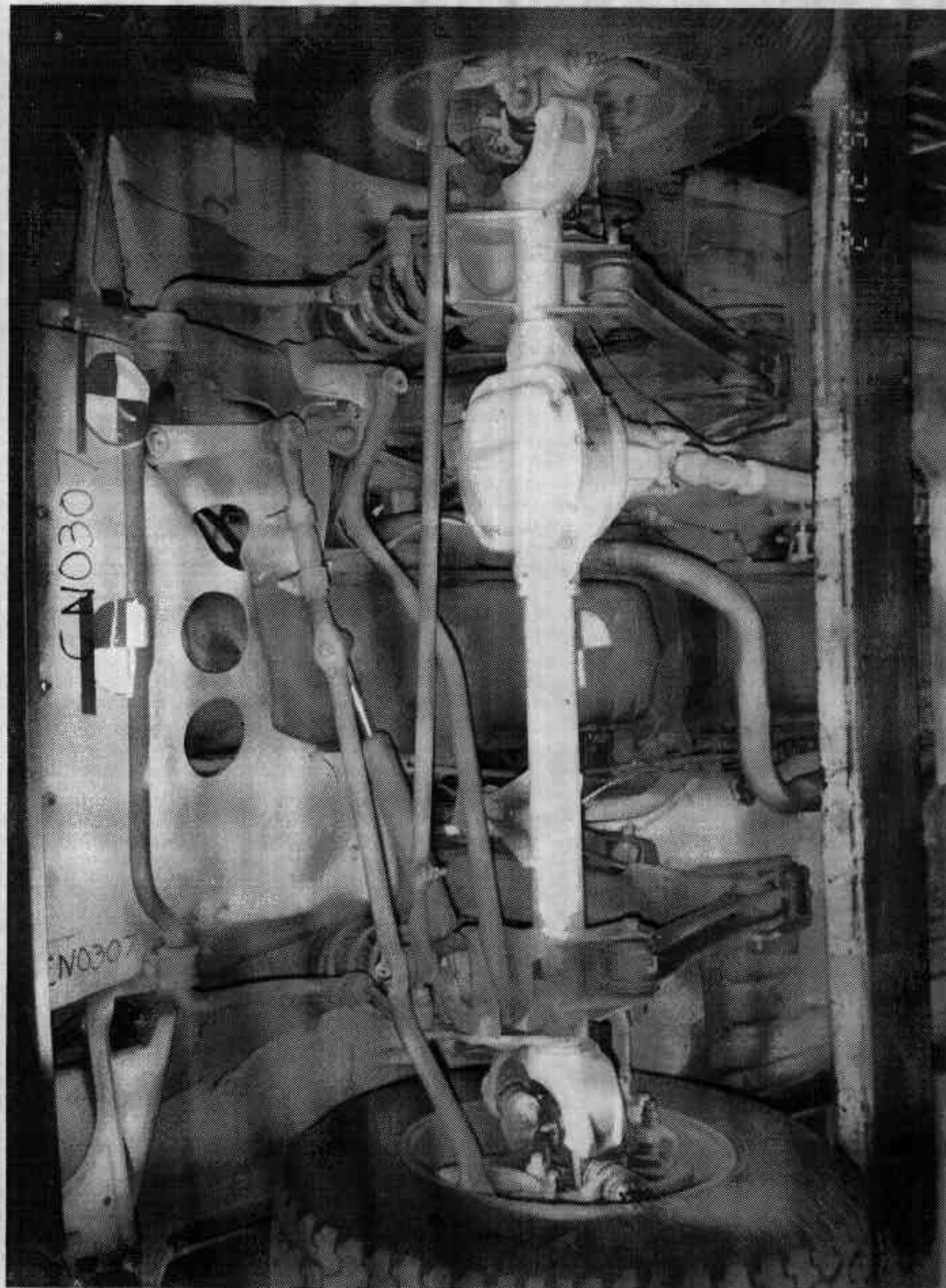


Figure A-18 PRE-TEST FRONT UNDERBODY VIEW

A-20

7979-2

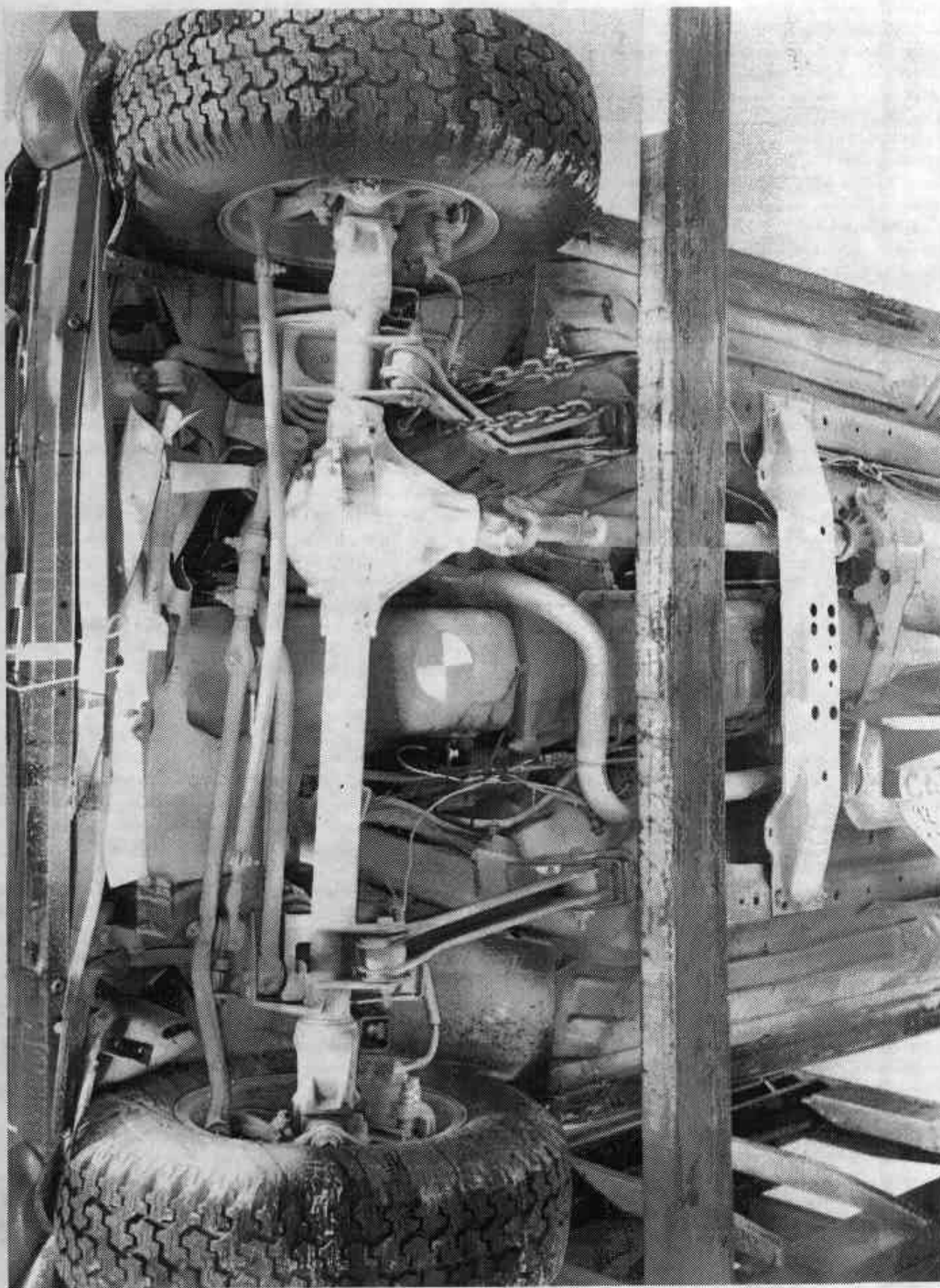


Figure A-19 POST-TEST FRONT UNDERBODY VIEW

A-21

7979-3

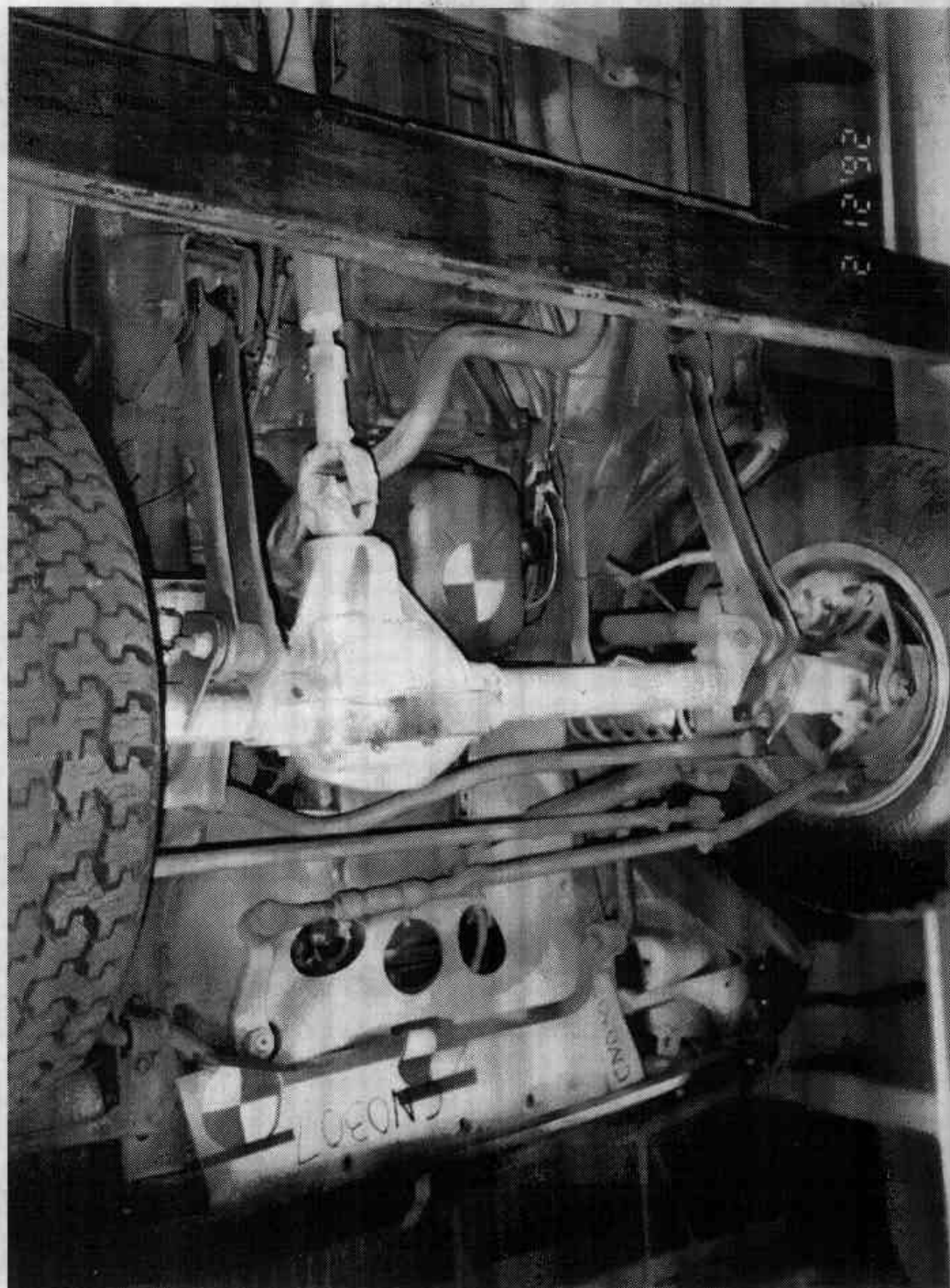


Figure A-20 PRE-TEST FRONT SIDE UNDERBODY VIEW

A-22

7979-3

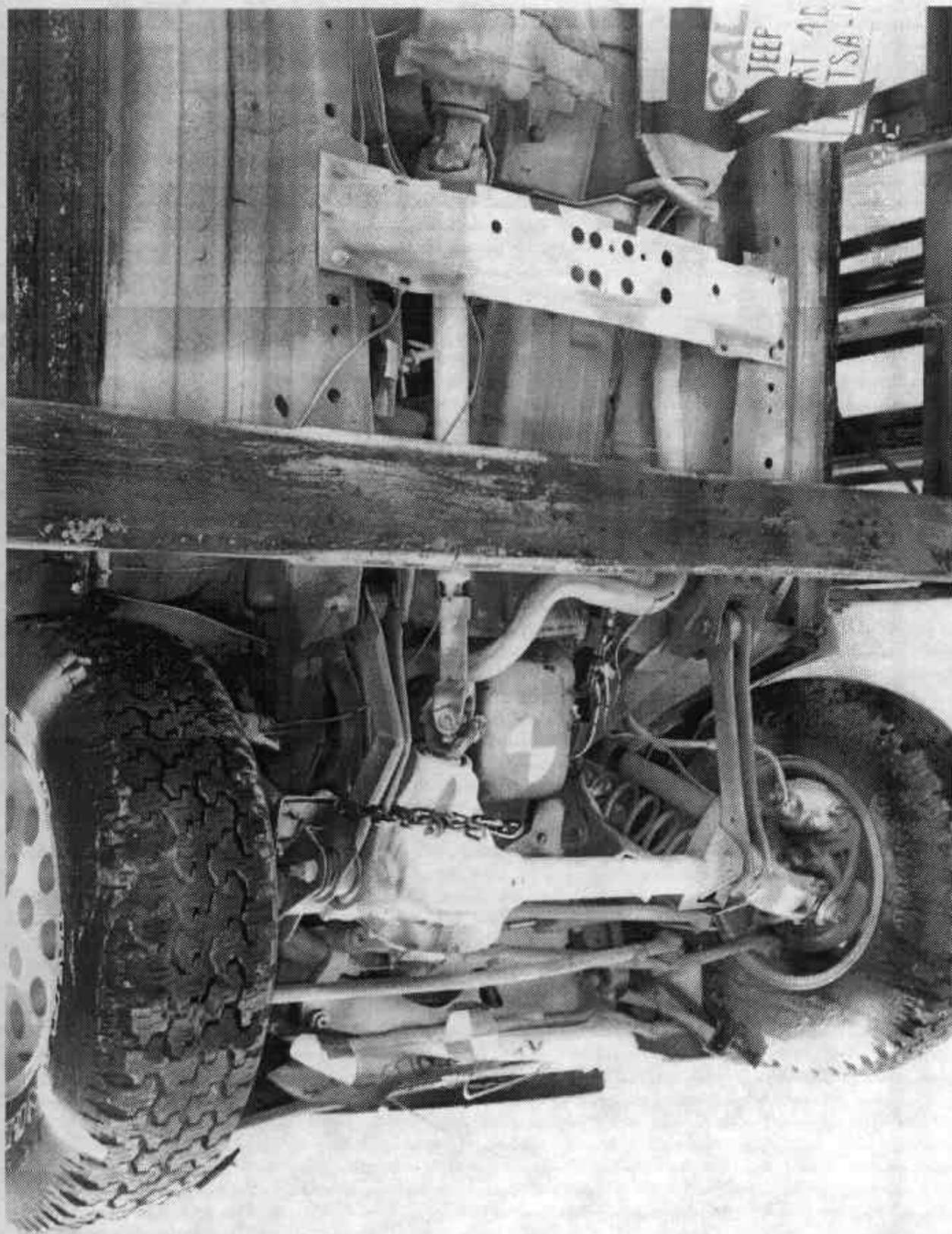


Figure A-21 POST-TEST FRONT SIDE UNDERBODY VIEW

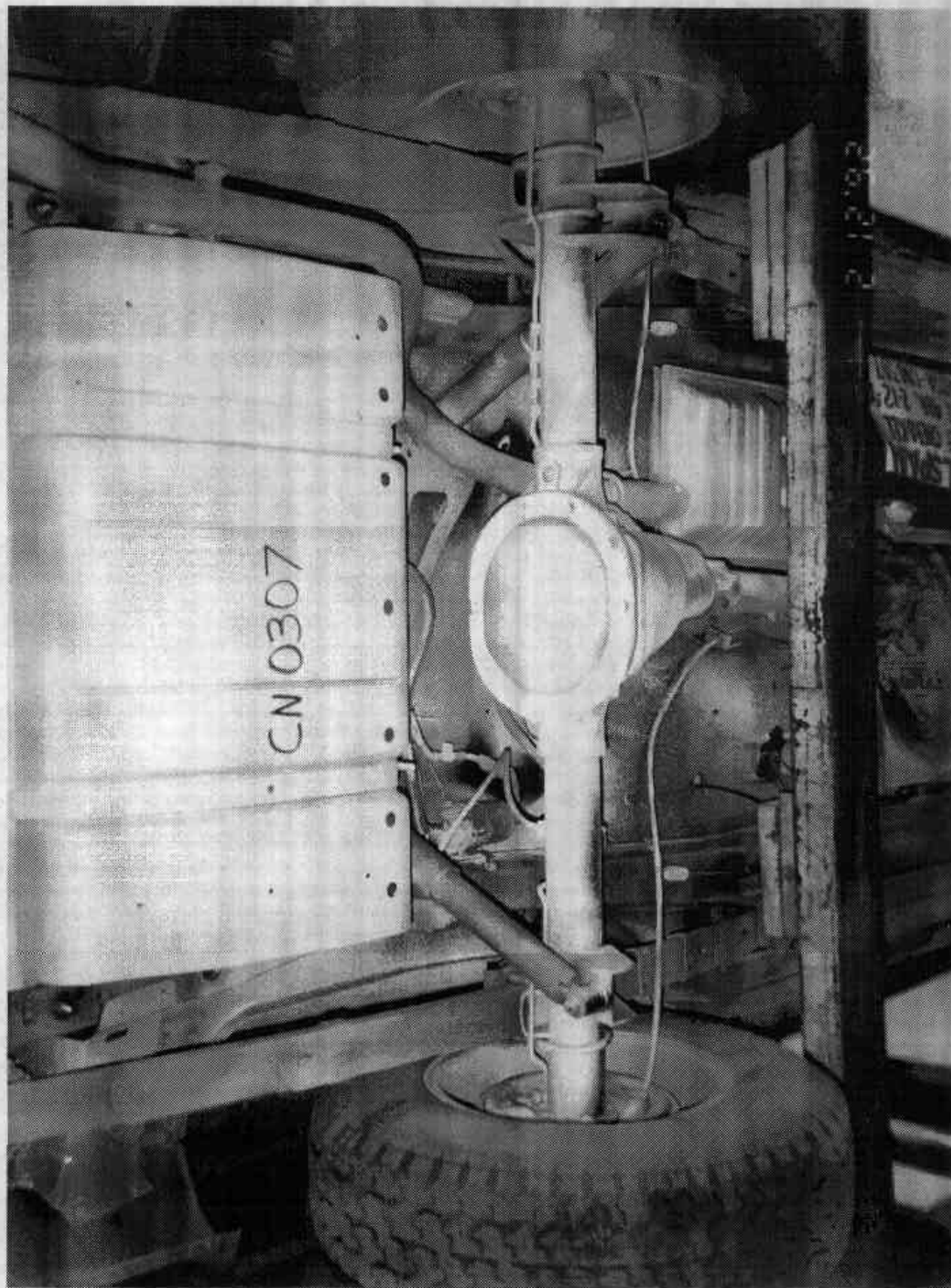


Figure A-22 PRE-TEST REAR UNDERBODY VIEW

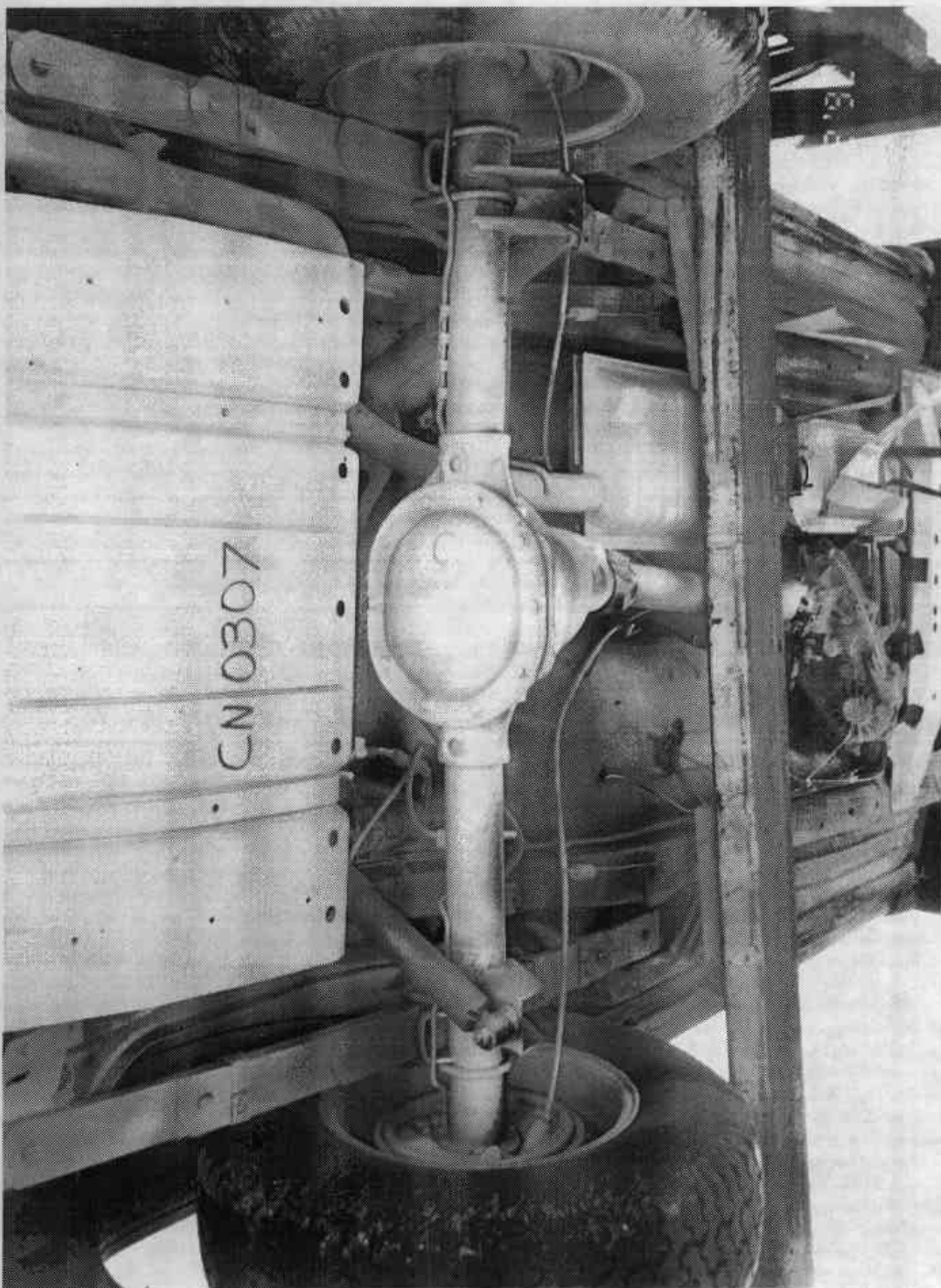


Figure A-23 POST-TEST REAR UNDERBODY VIEW



Figure A-25 PRE-TEST DRIVER DUMMY POSITION



FIGURE A-26 POST-TEST DRIVER DUMMY POSITION

A-26

7979-3

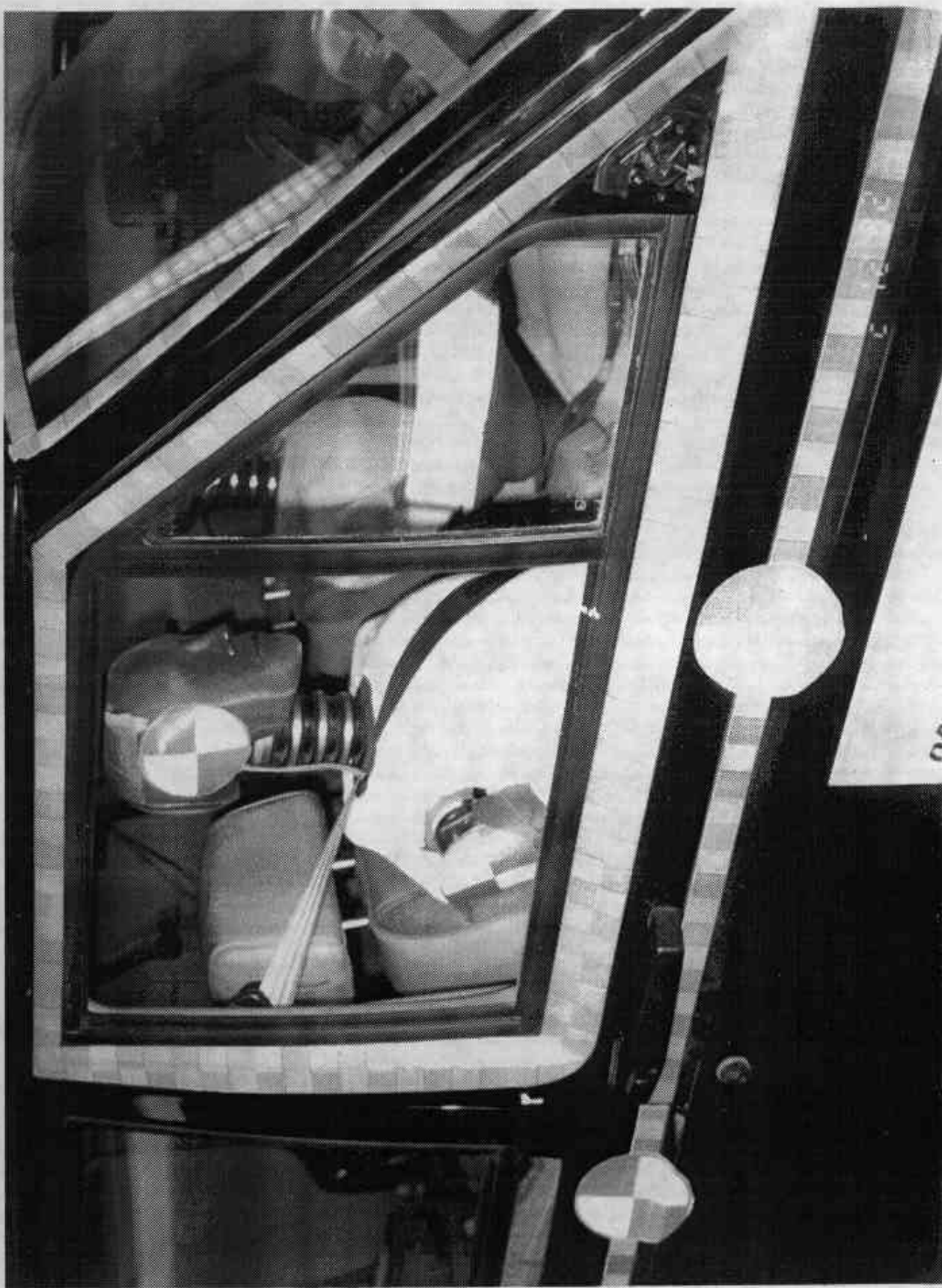


FIGURE A-27 PRE-TEST PASSENGER DUMMY POSITION



Figure A-28 POST-TEST PASSENGER DUMMY POSITION

A-30

7979-3



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



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



FIGURE A-31 PRE-TEST PASSENGER DUMMY AND INTERIOR VIEW



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

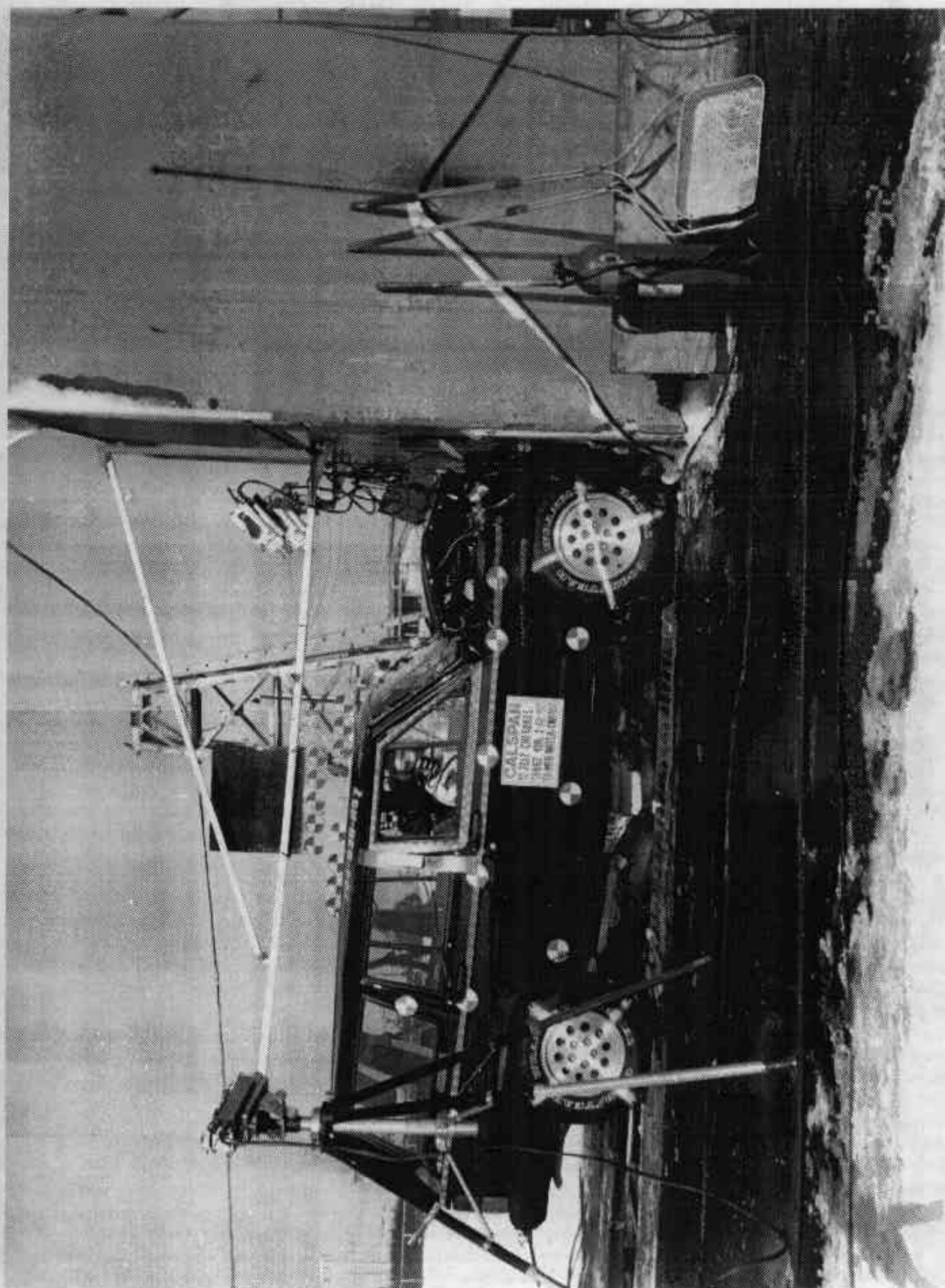


Figure A-33 VEHICLE IMPACT

A-35

7979-3

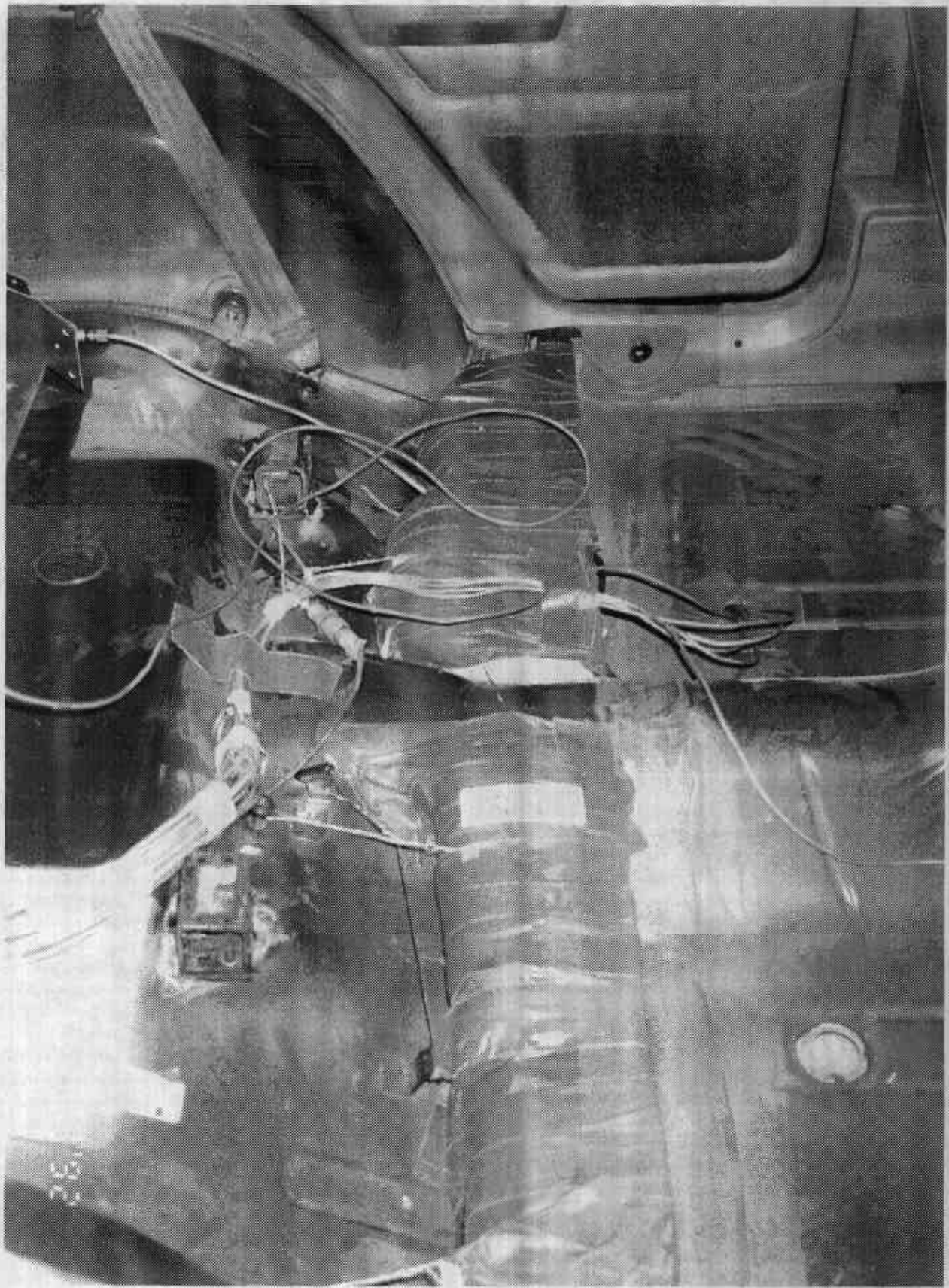


Figure A-34 BALLAST IN REAR SEATING AREA

A-36

7979-3

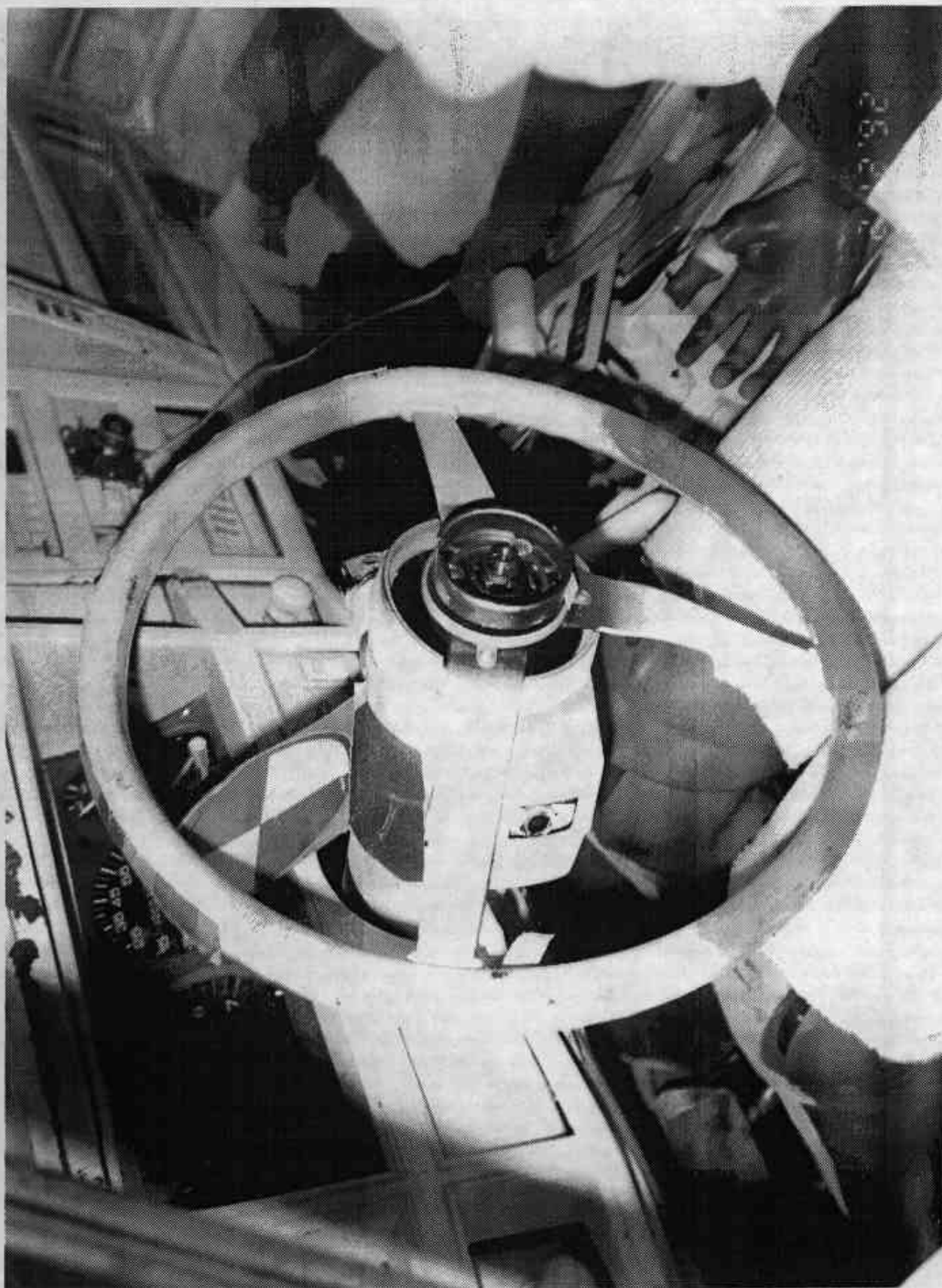


Figure A-35 POST-TEST STEERING WHEEL CLOSEUP

A-37

7979-3



FIGURE A-38. WINDSHIELD SEPARATION FROM MOUNTING AT LOWER RIGHT SIDE

A-38

7979-3

Appendix B

VEHICLE AND DUMMY RESPONSE DATA

Calspan meets and follows
the requirement of SAE J211.

TEST NO. CN0307

VEHICLE DATA

SAE FILTER CHANNEL CLASS

60

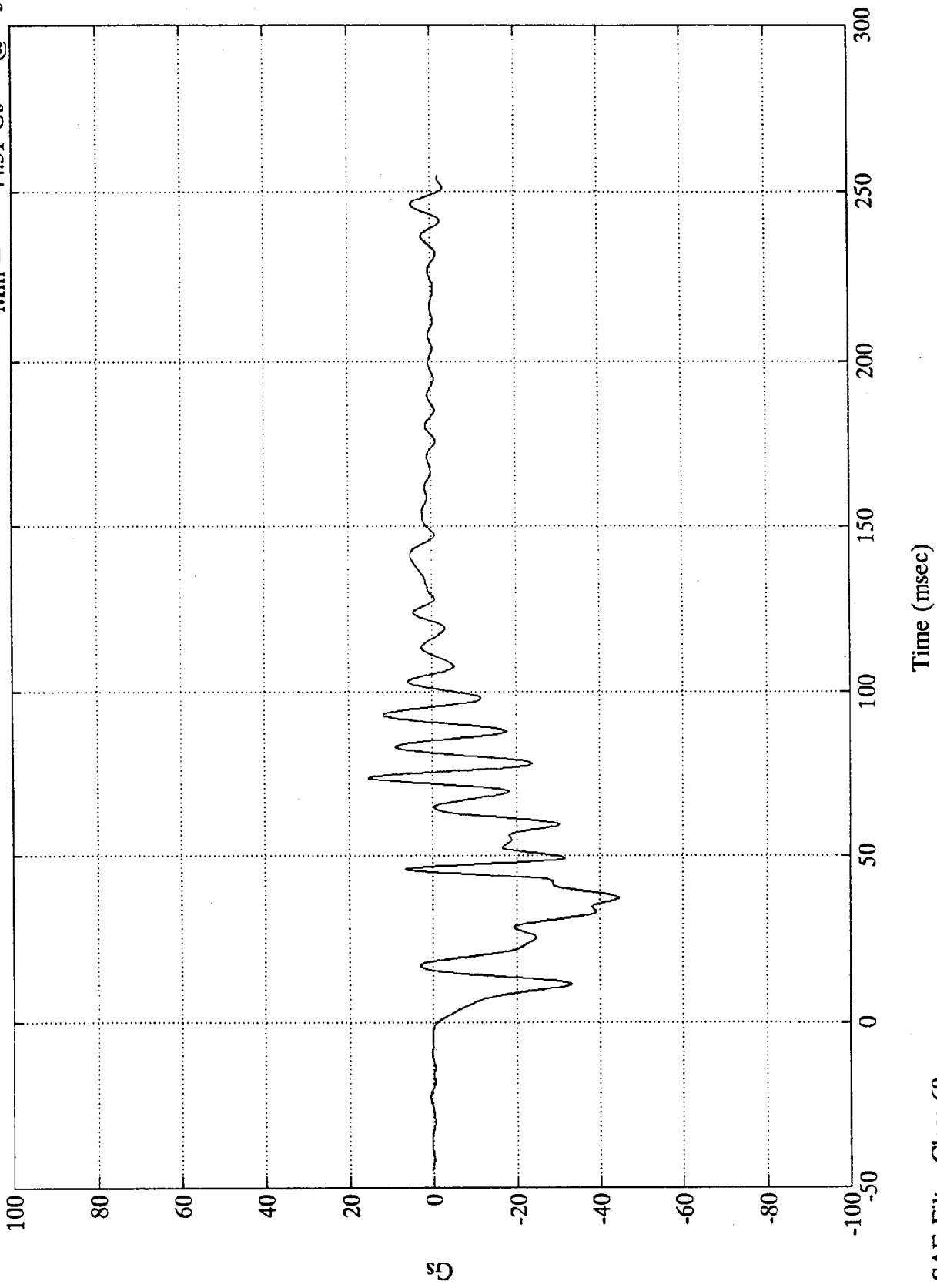
TEST NO. CN0307

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

CN0307

L. Rear X-member X (#1)

Max =	15.23 Gs	@	73.80 msec
Min =	-44.51 Gs	@	36.95 msec



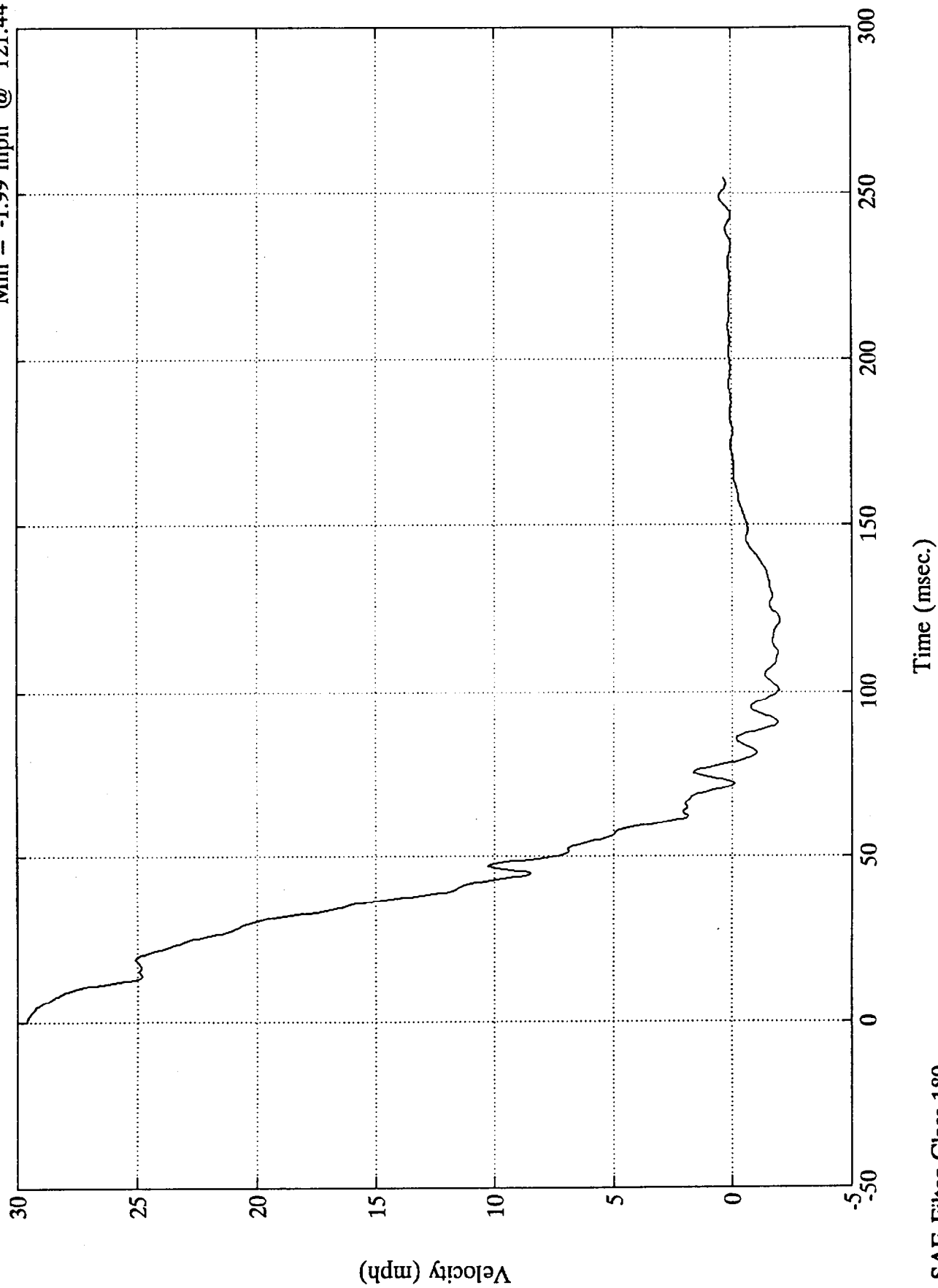
B-4

SAE Filter Class 60

7979-3

Max = 29.60 mph @ 0.48 msec
Min = -1.99 mph @ 121.44 msec

L. Rear X-member X (#1)

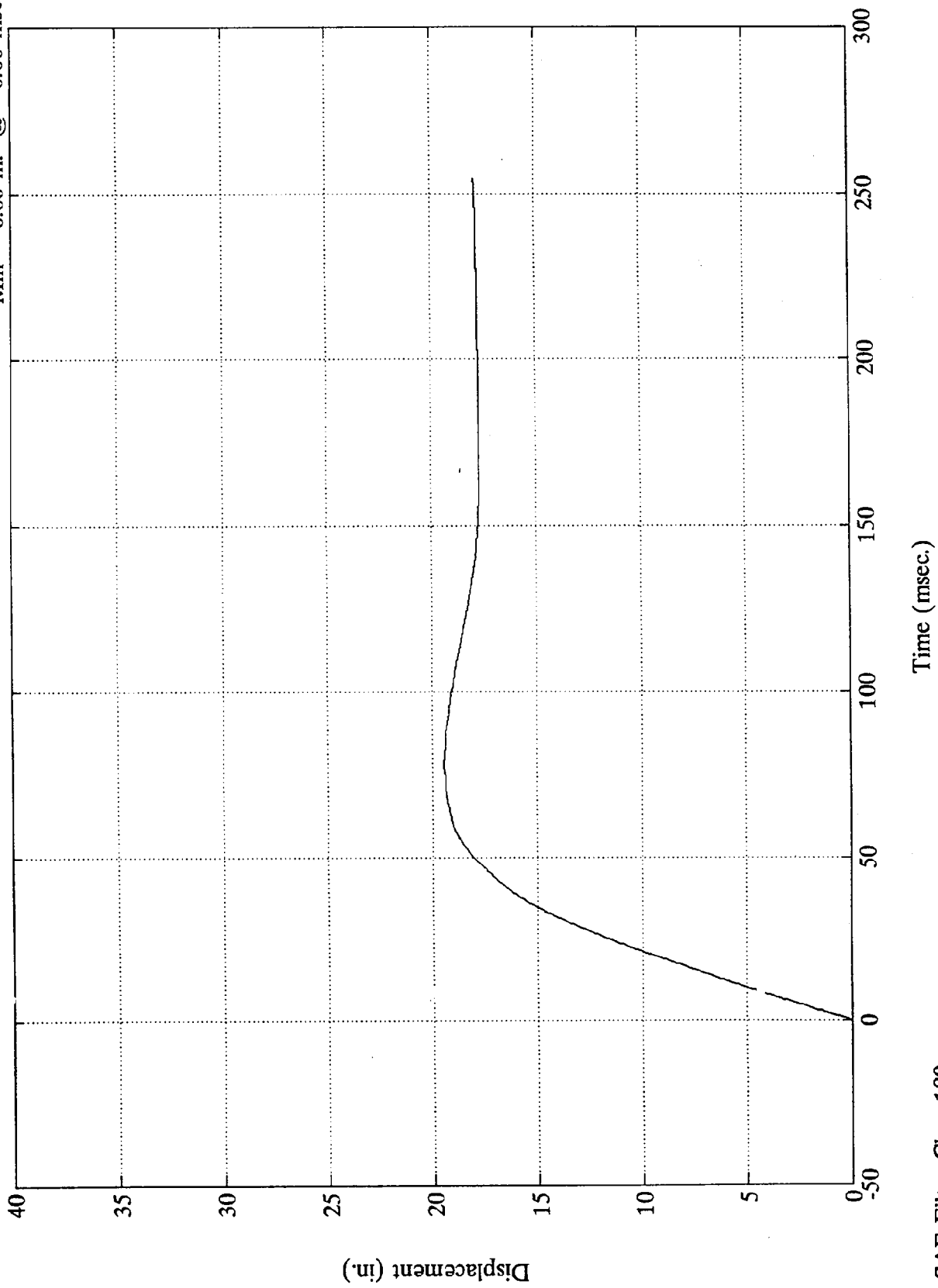


SAE Filter Class 180

CN0307

L. Rear X-member X (#1)

Max = 19.46 in. @ 78.96 msec
Min = 0.00 in. @ -0.00 msec

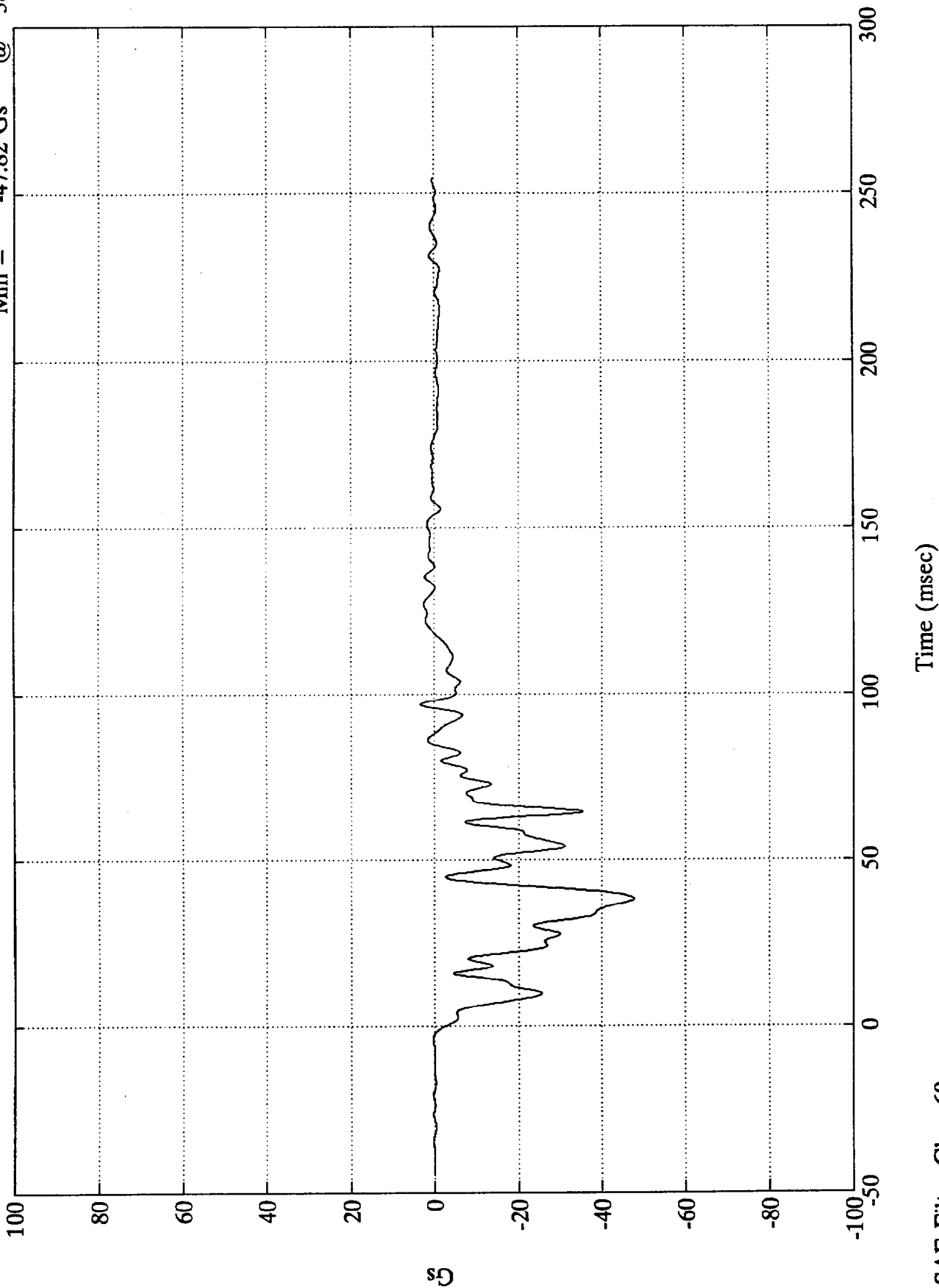


SAE Filter Class 180

R. Rear X-member X (#2)

Max = 3.32 Gs
Min = -47.82 Gs

@ 96.84 msec
@ 38.15 msec

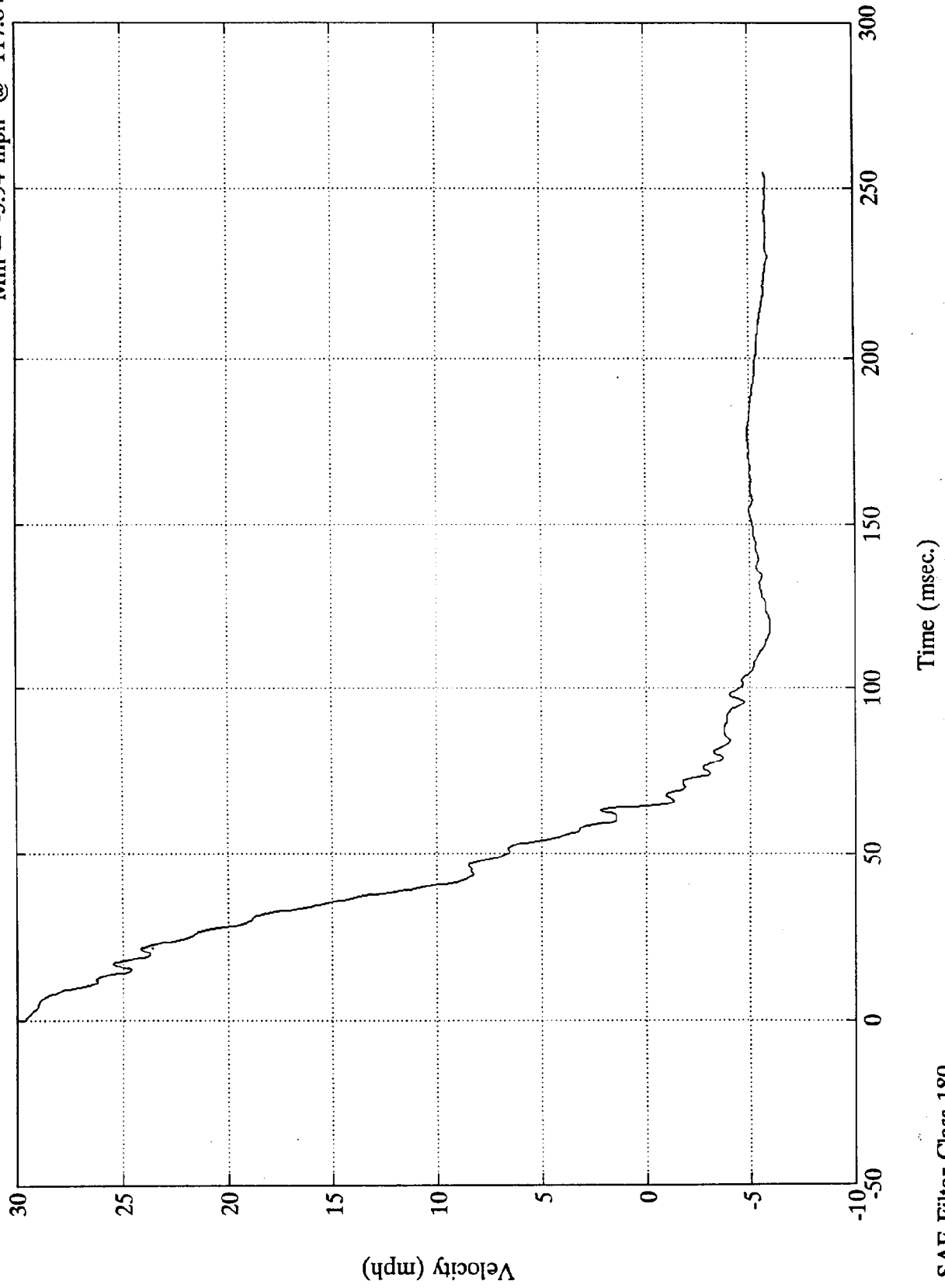


SAE Filter Class 60

CN0307

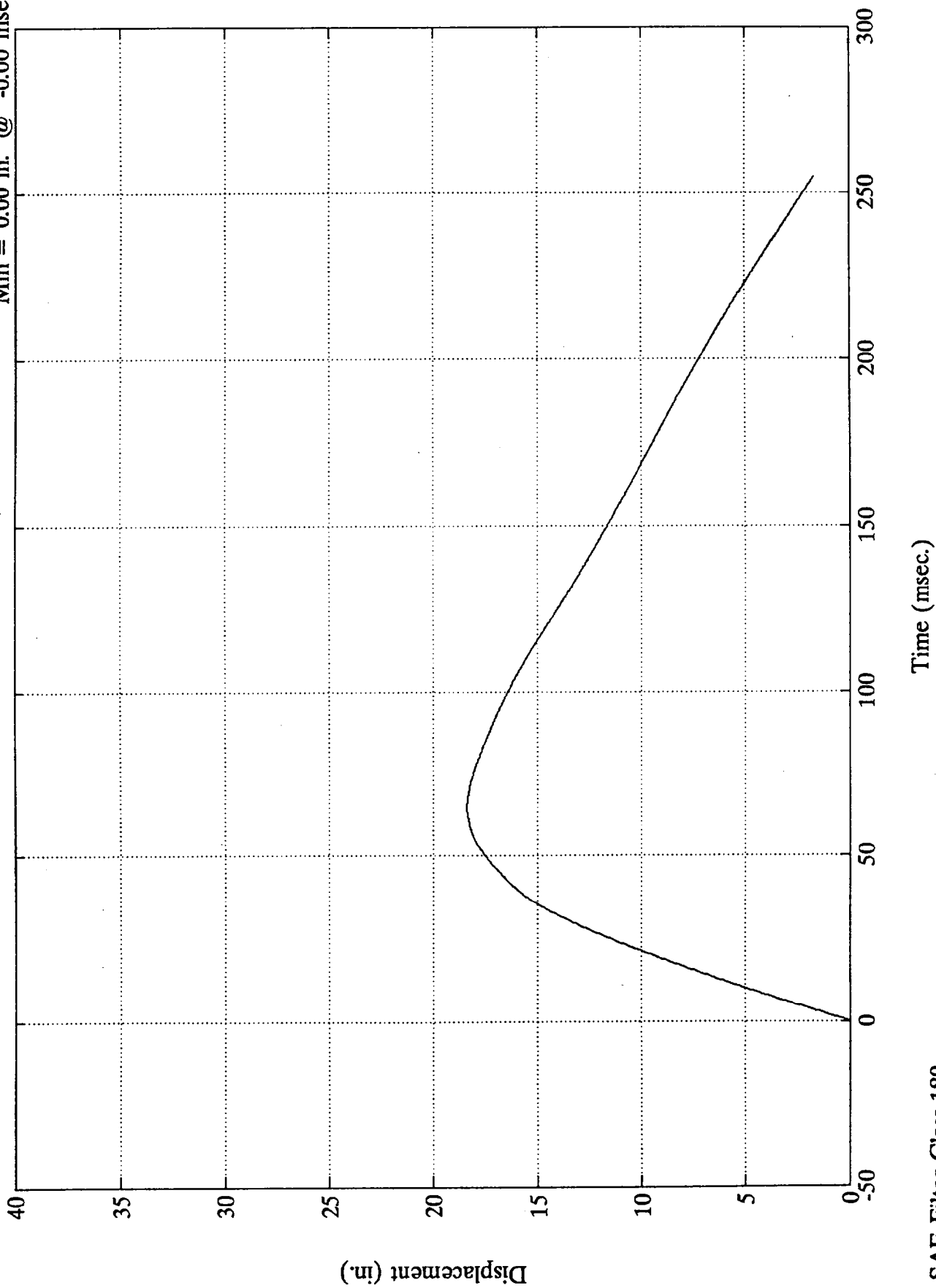
R. Rear X-member X (#2)

Max = 29.60 mph @ -0.00 msec
Min = -5.94 mph @ 117.84 msec



Max = 18.40 in. @ 65.04 msec
Min = 0.00 in. @ -0.00 msec

R. Rear X-member X (#2)

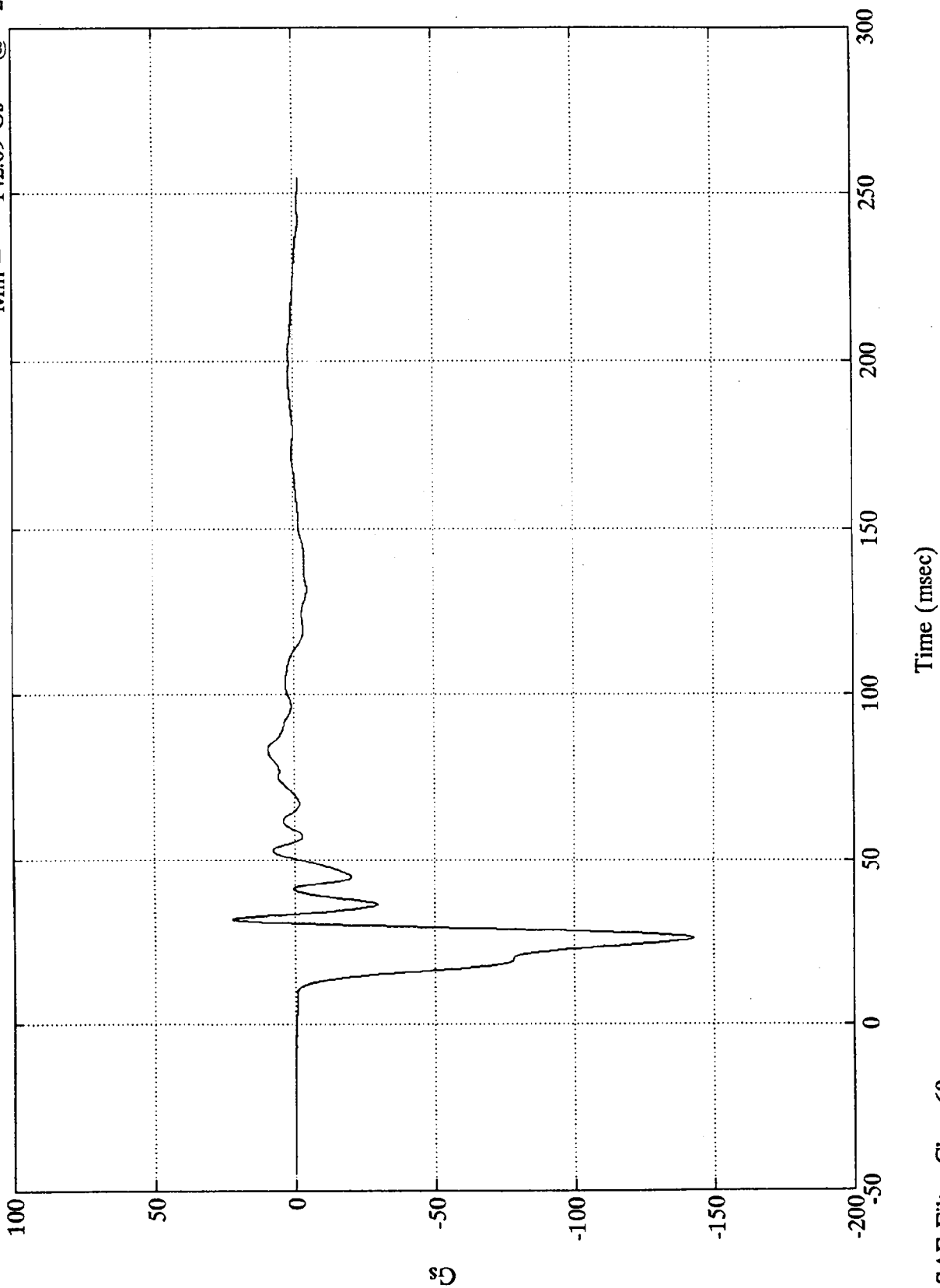


SAE Filter Class 180

CN0307

Engine Top X (#3)

Max = 22.22 Gs @ 31.55 msec
Min = -142.69 Gs @ 25.79 msec

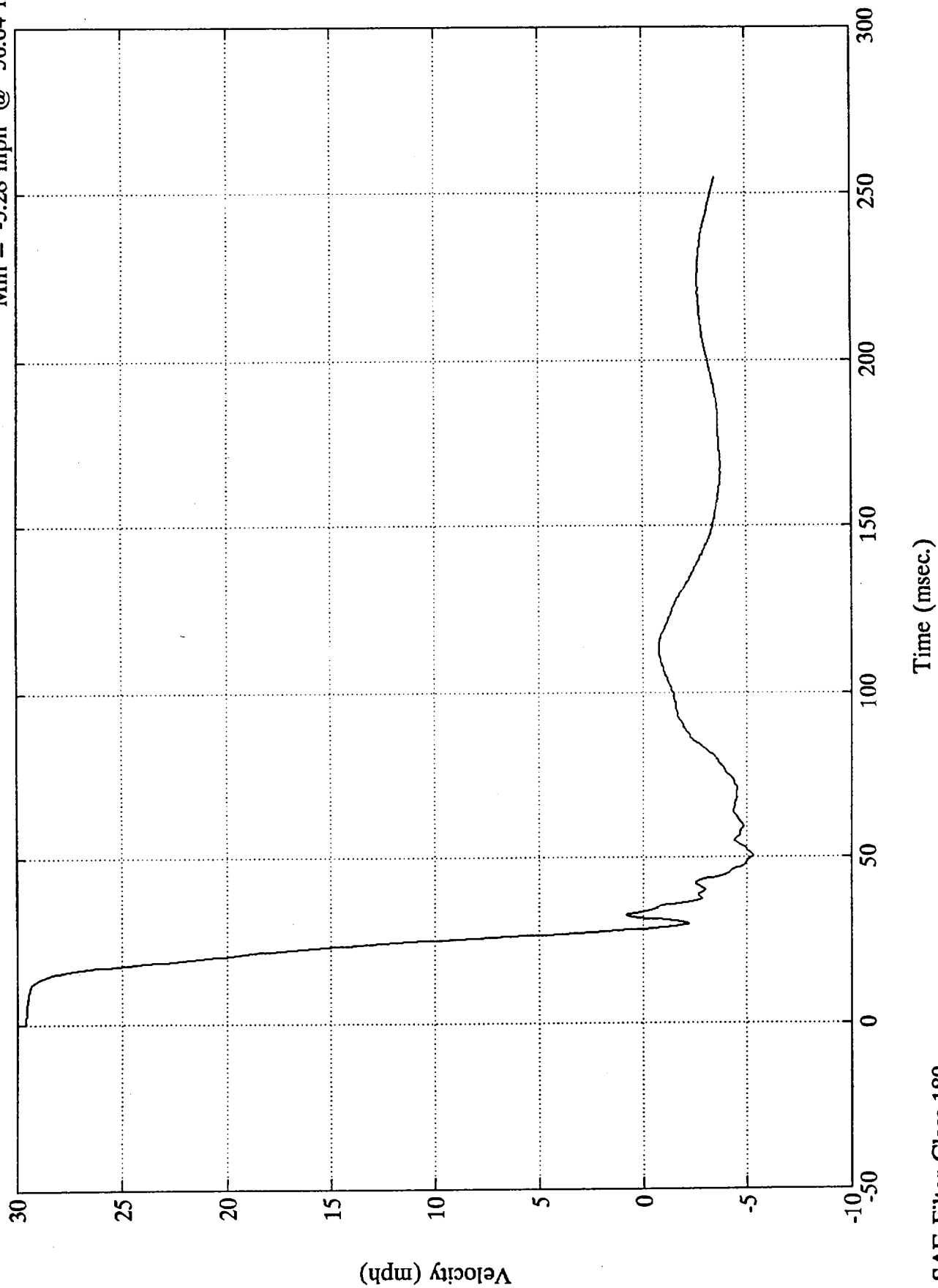


SAE Filter Class 60

CN0307

Engine Top X (#3)

Max = 29.60 mph @ 0.72 msec
Min = -5.28 mph @ 50.64 msec

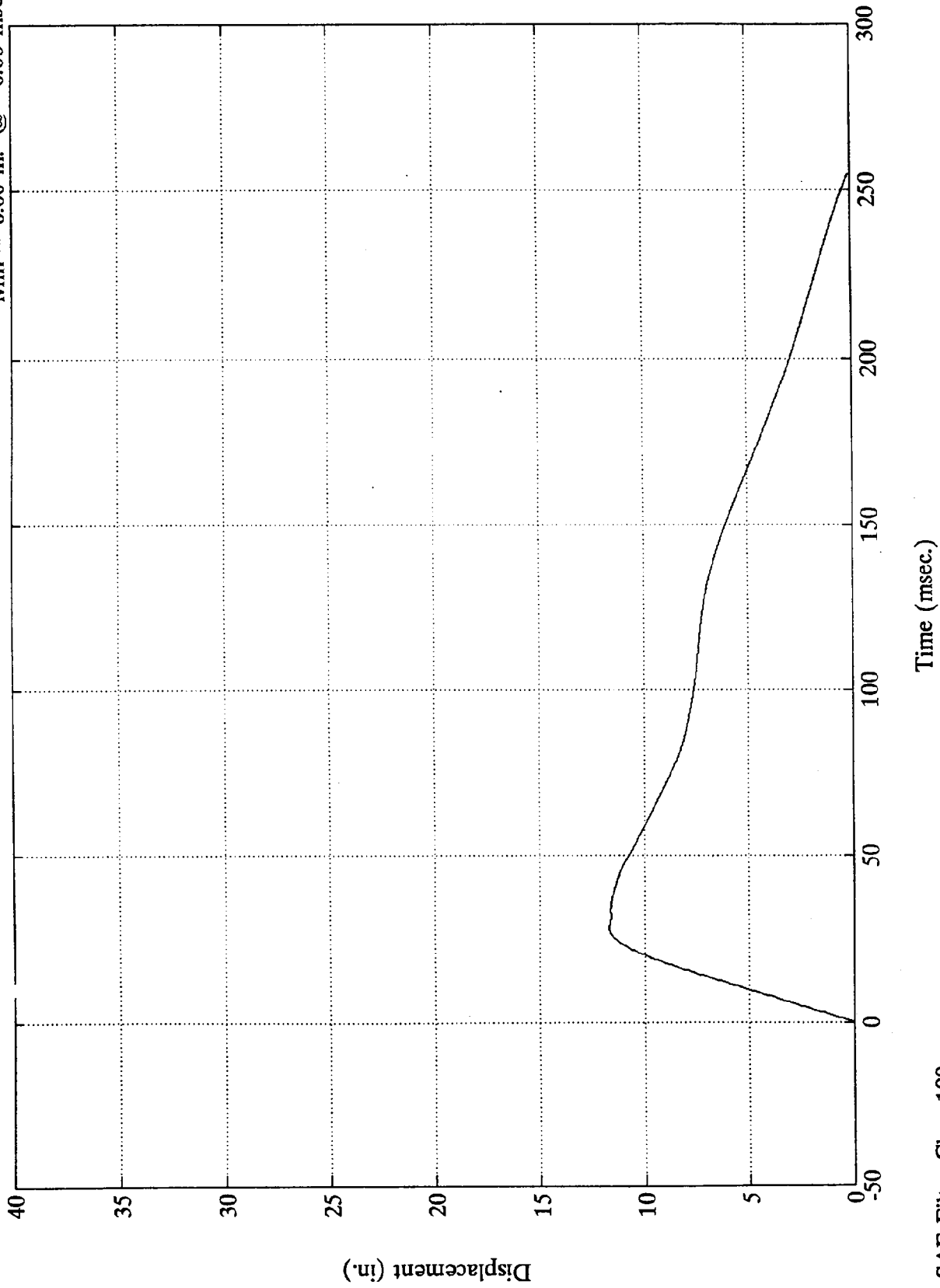


SAE Filter Class 180

CN0307

Engine Top X (#3)

Max = 11.68 in. @ 28.80 msec
Min = 0.00 in. @ -0.00 msec



SAE Filter Class 180

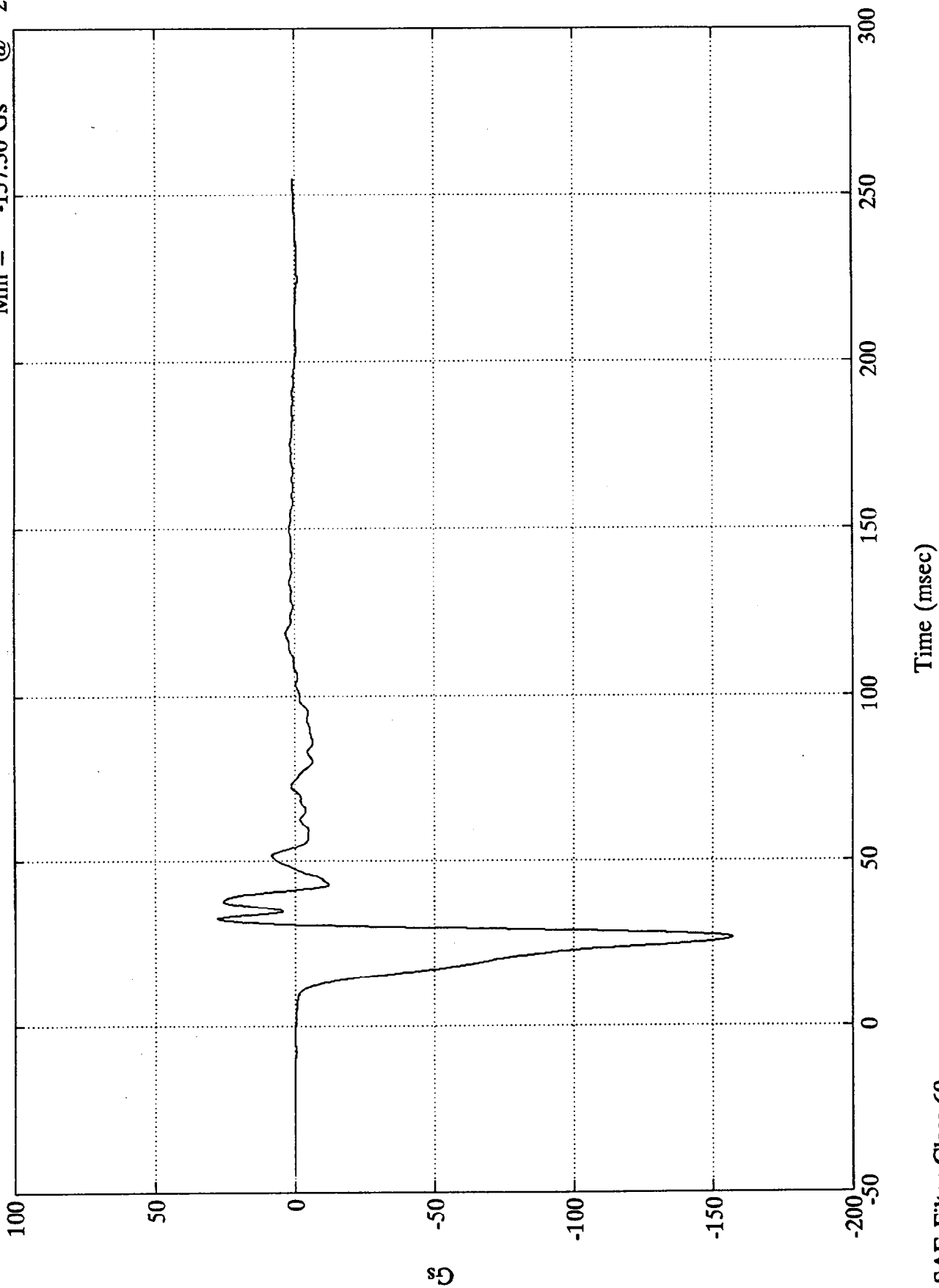
CN0307

B-13

7979-3

Max = 27.51 Gs @ 32.52 msec
Min = -157.30 Gs @ 26.51 msec

Engine Bottom X (#4)

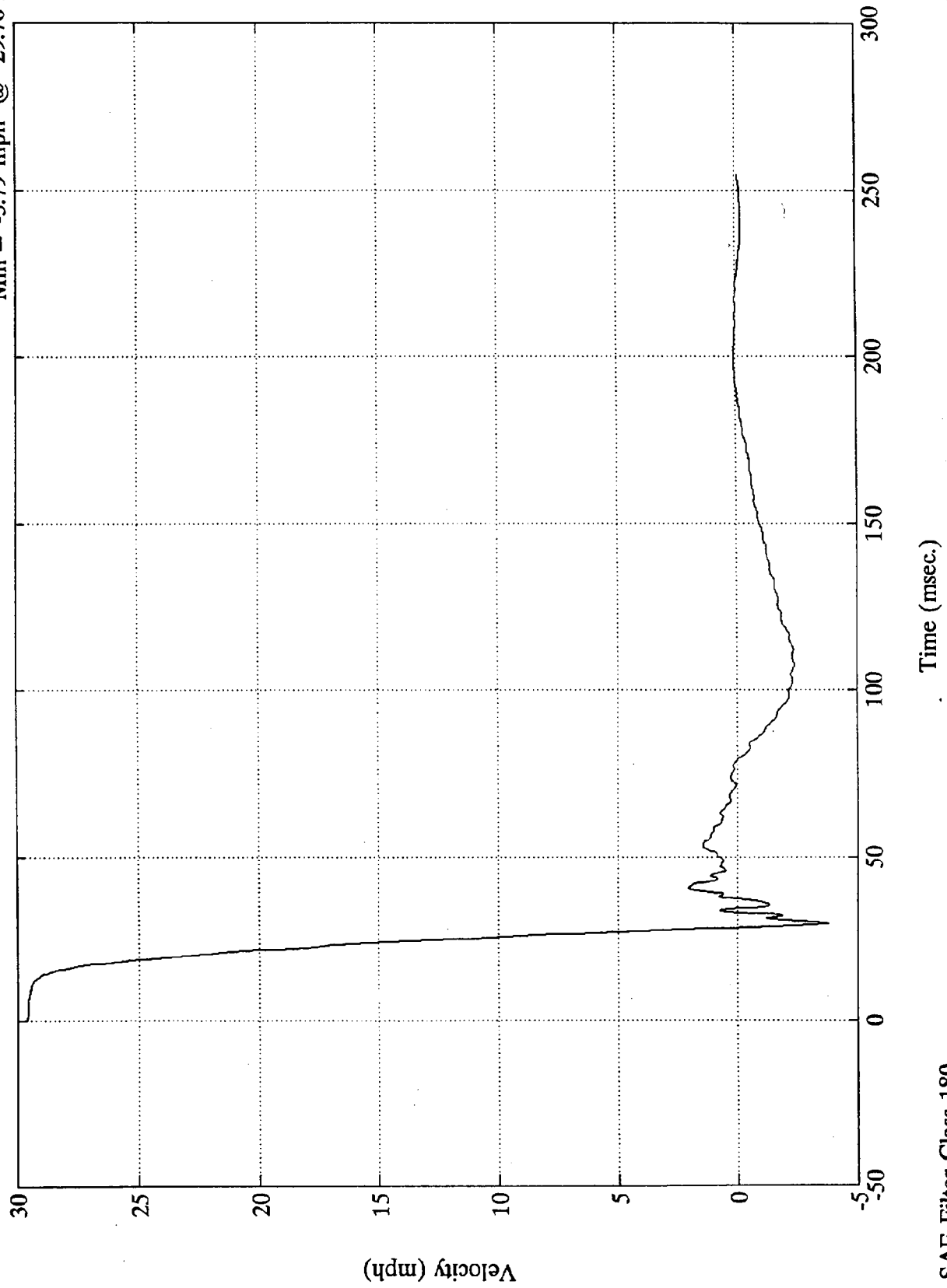


SAE Filter Class 60

CN0307

Engine Bottom X (#4)

Max = 29.60 mph @ 0.96 msec
Min = -3.79 mph @ 29.76 msec



SAE Filter Class 180

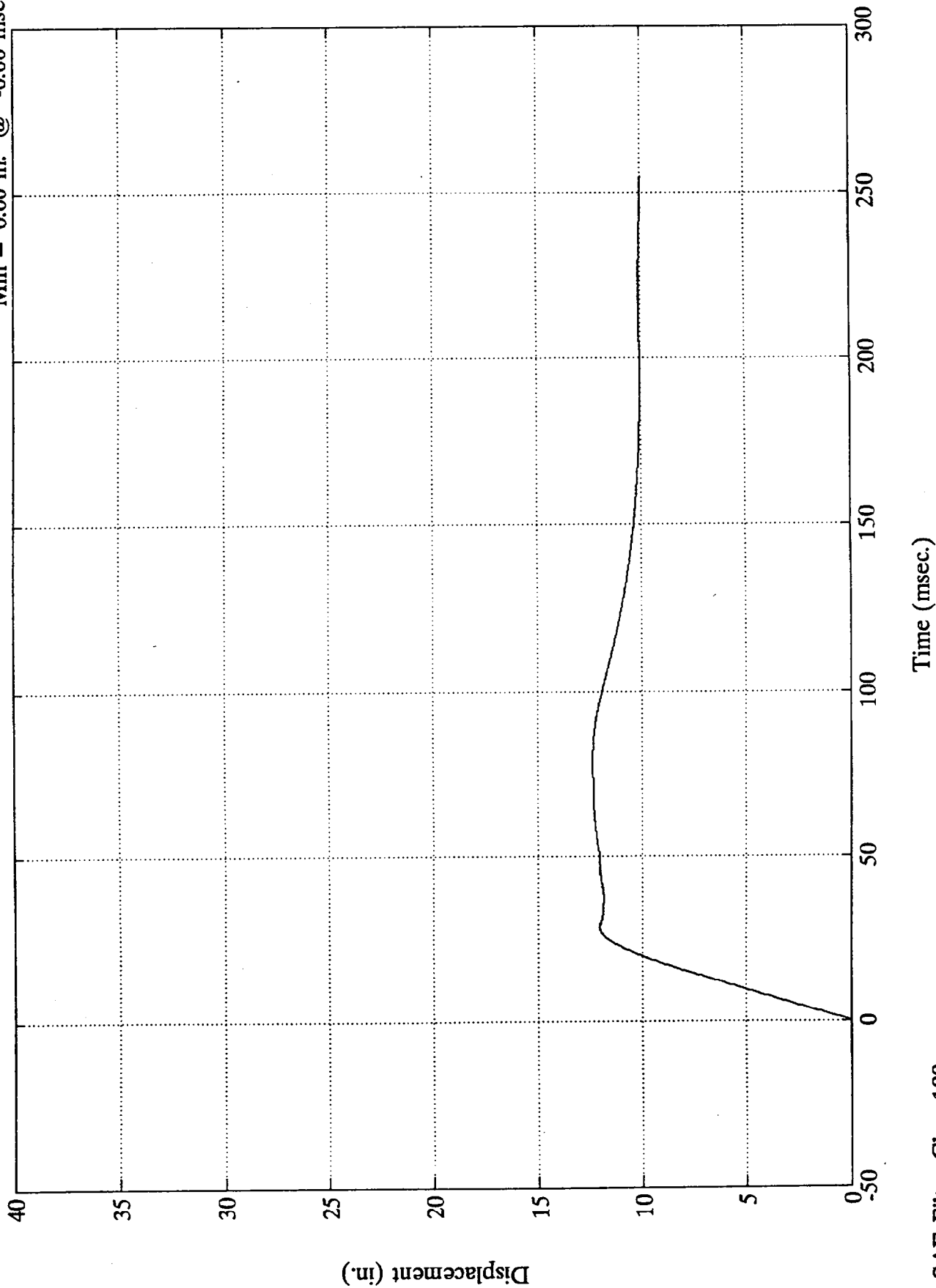
Time (msec.)

Velocity (mph)

CN0307

Engine Bottom X (#4)

Max = 12.35 in. @ 80.88 msec
Min = 0.00 in. @ -0.00 msec



B-15

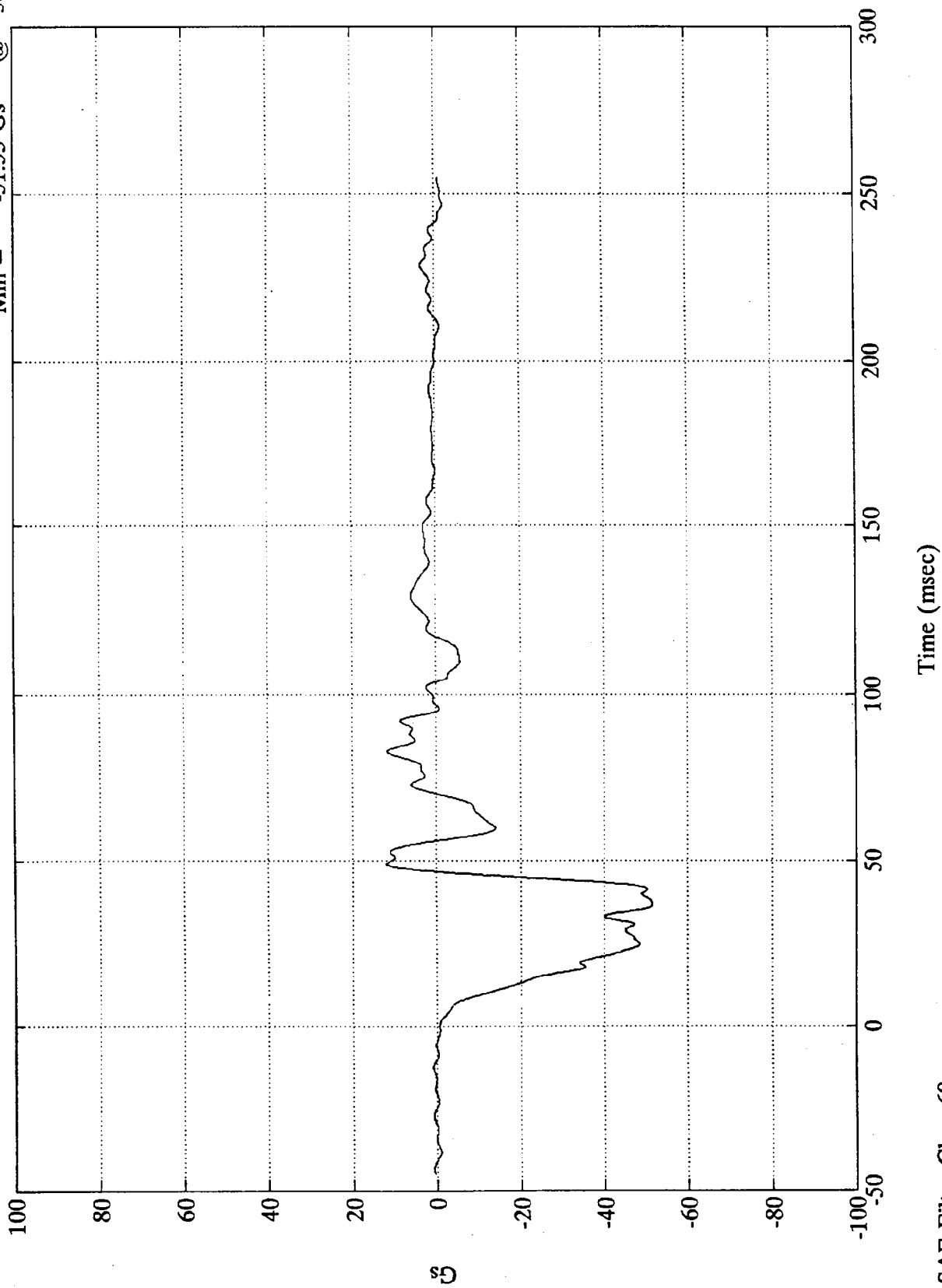
7979-3

SAE Filter Class 180

CN0307

R. Brake Caliper X (#5)

Max = 11.83 Gs @ 48.95 msec
Min = -51.53 Gs @ 36.95 msec



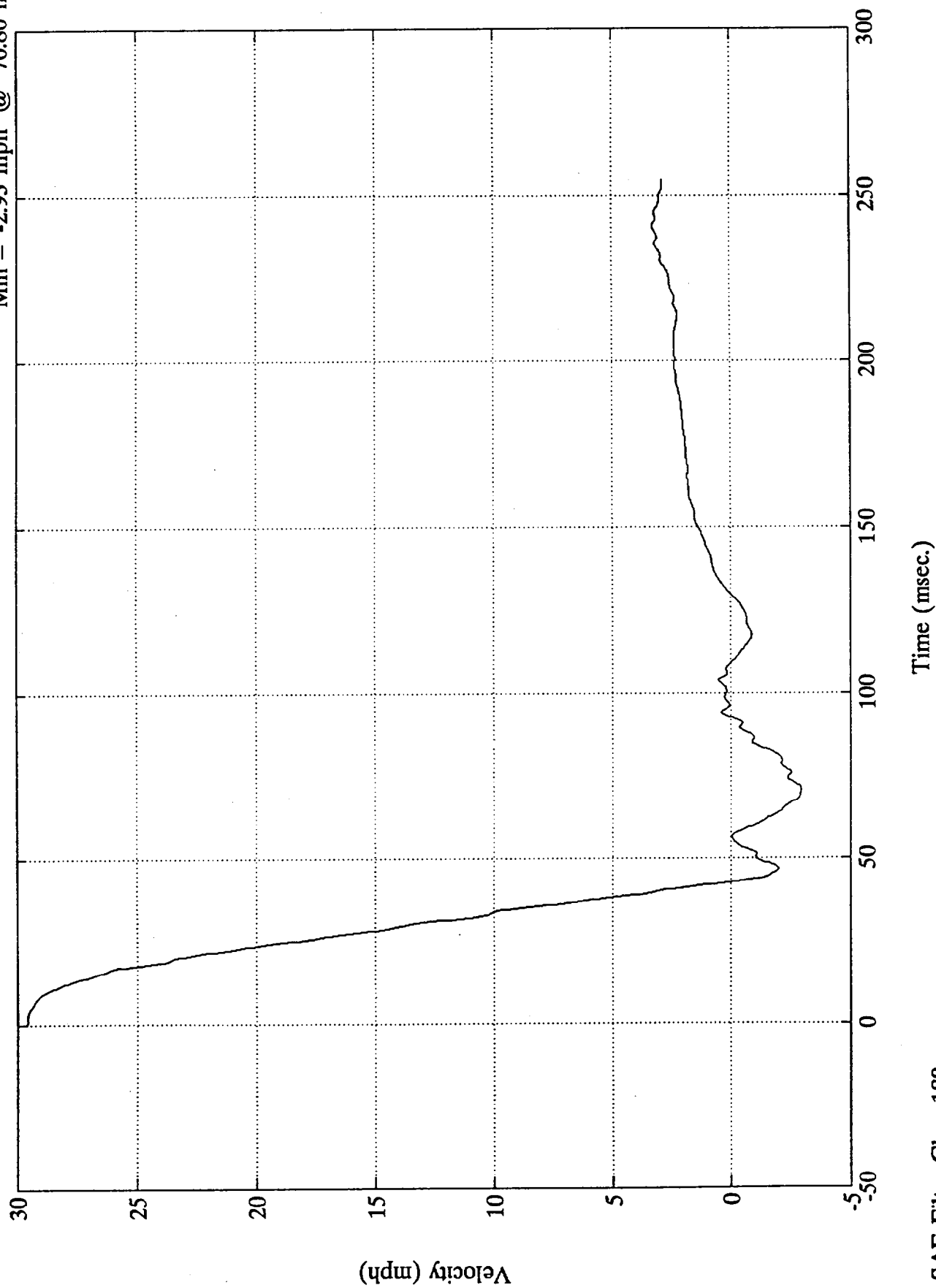
B-16

7979-3

SAE Filter Class 60

Max = 29.60 mph @ 0.24 msec
Min = -2.93 mph @ 70.80 msec

R. Brake Caliper X (#5)

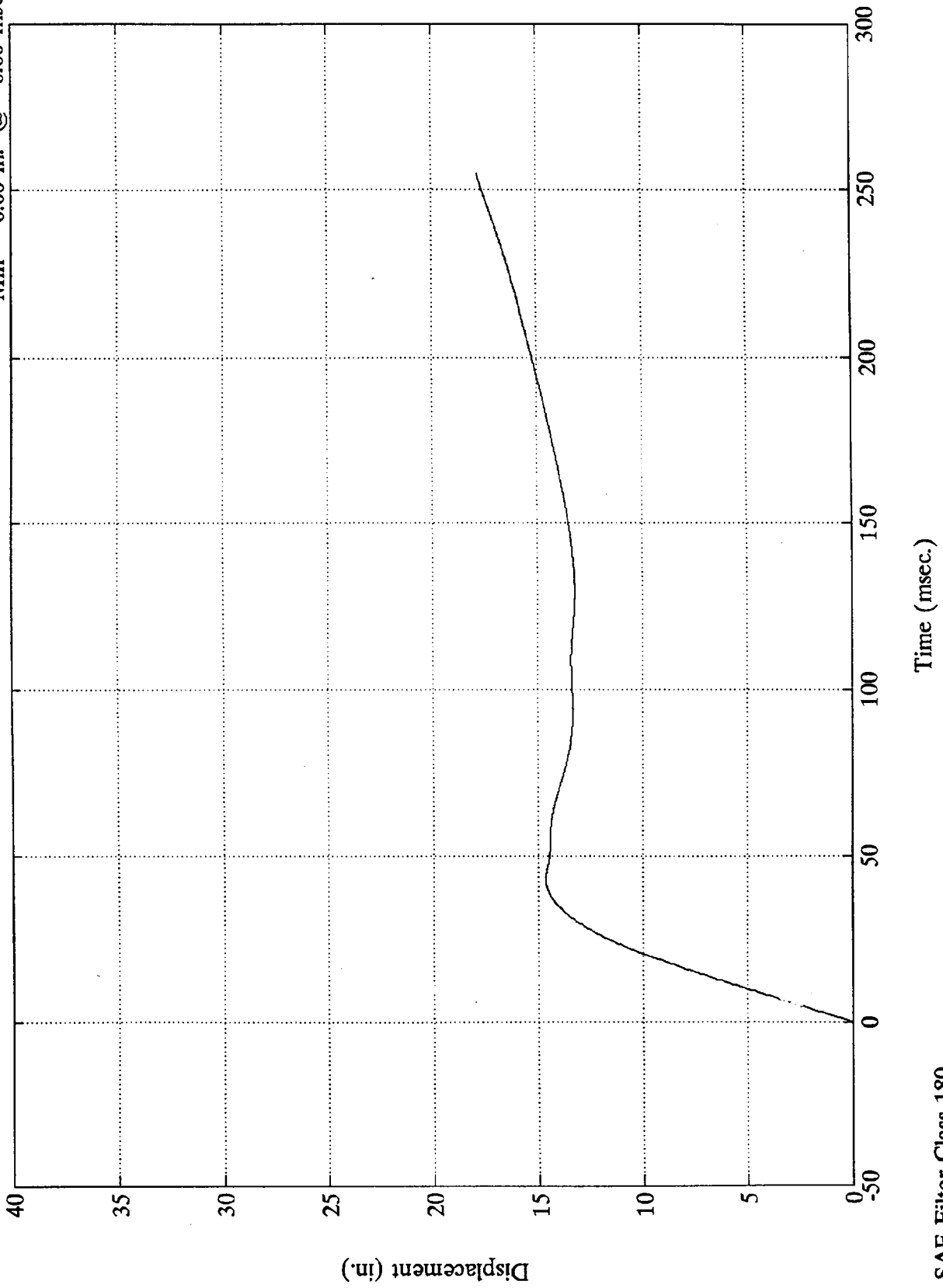


SAE Filter Class 180

CN0307

R. Brake Caliper X (#5)

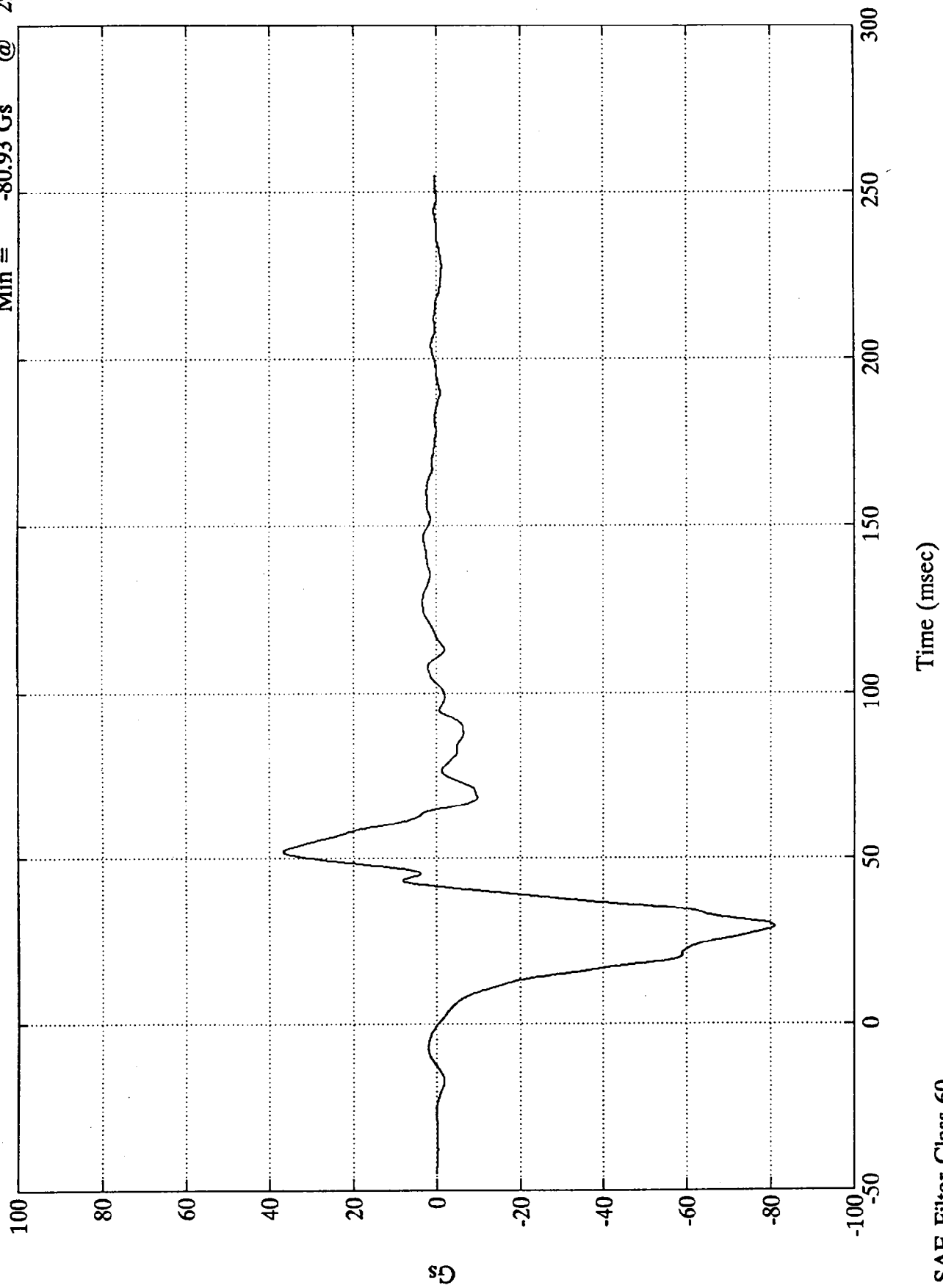
Max = 17.83 in. @ 254.88 msec
Min = 0.00 in. @ -0.00 msec



SAE Filter Class 180

Max = 36.77 Gs @ 51.95 msec
Min = -80.93 Gs @ 29.15 msec

L. Brake Caliper X (#6)

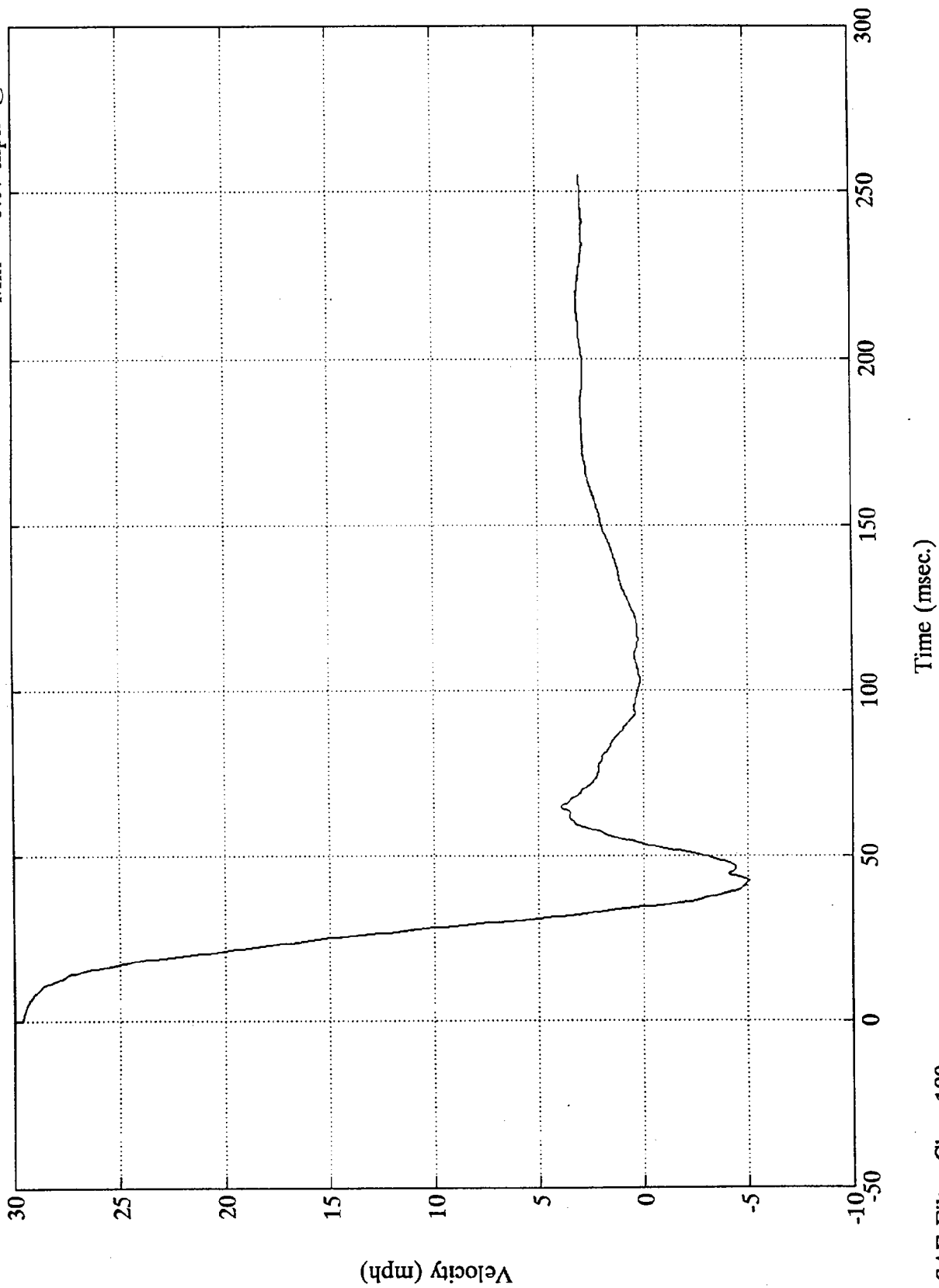


SAE Filter Class 60

CN0307

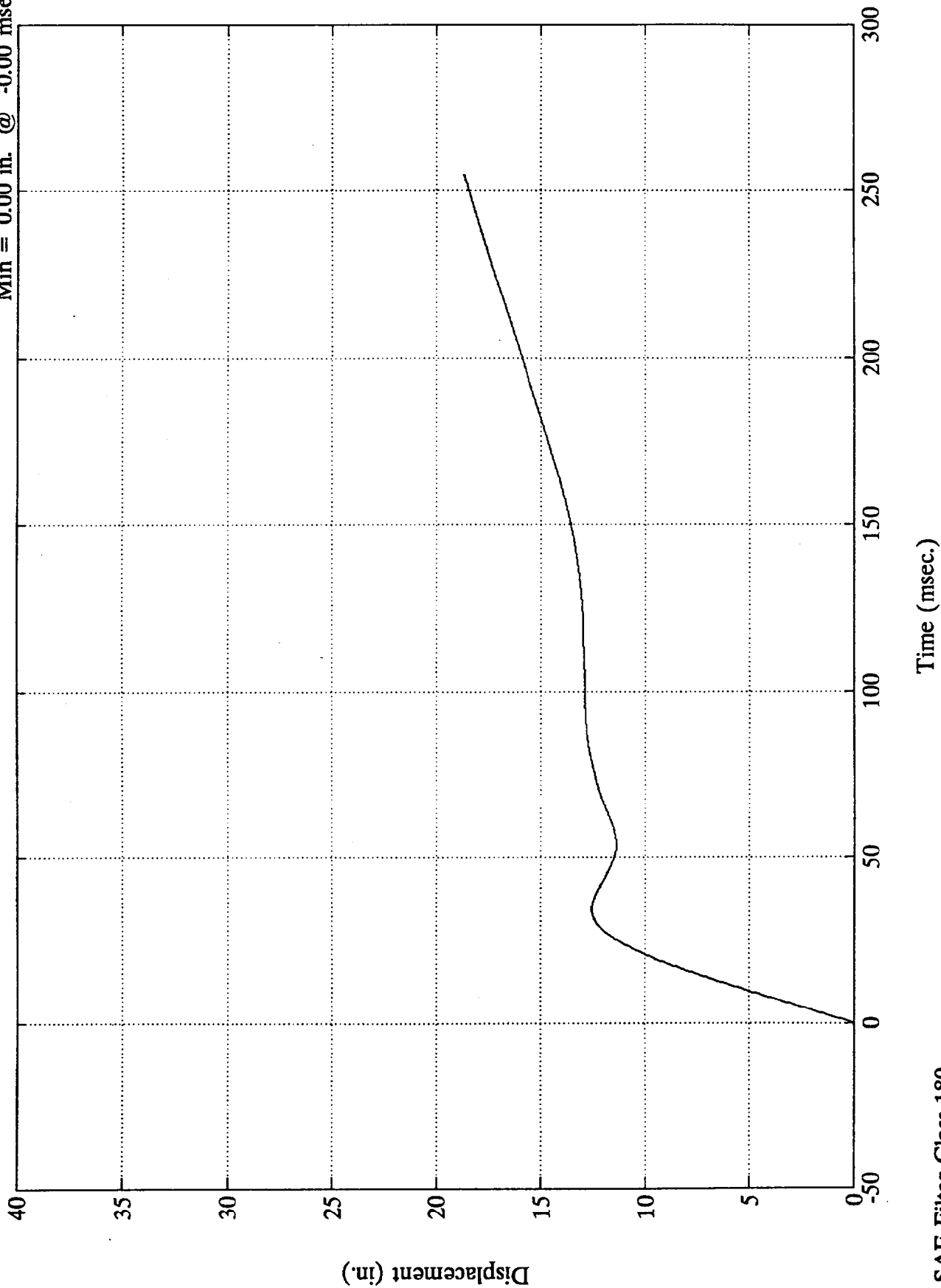
L. Brake Caliper X (#6)

Max = 29.60 mph @ 0.24 msec
Min = -5.07 mph @ 42.24 msec



L. Brake Caliper X (#6)

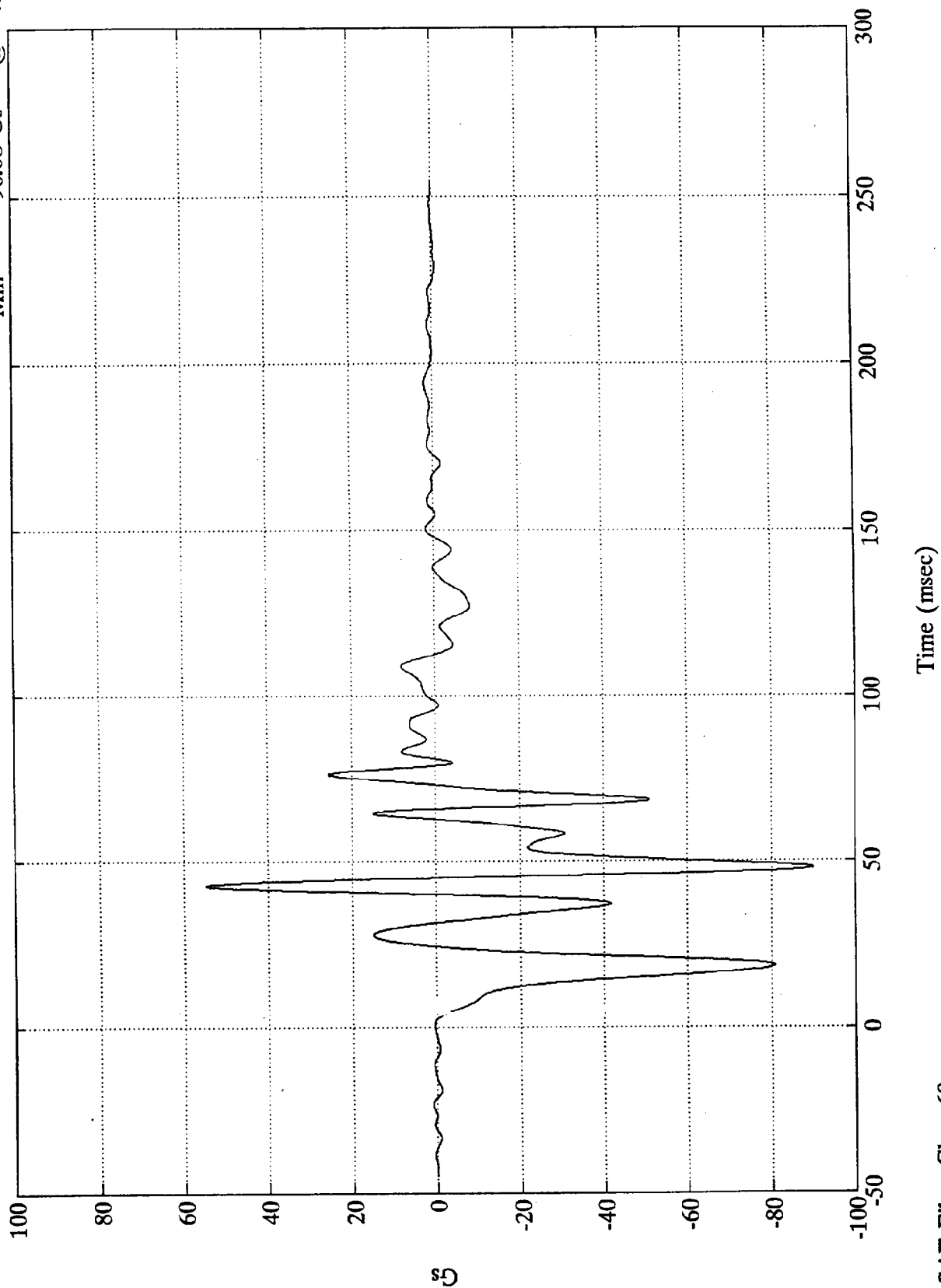
Max = 18.70 in. @ 254.88 msec
 Min = 0.00 in. @ -0.00 msec



CN0307

Instrument Panel X (#7)

Max = 54.68 Gs @ 42.47 msec
Min = -90.08 Gs @ 48.00 msec



B-22

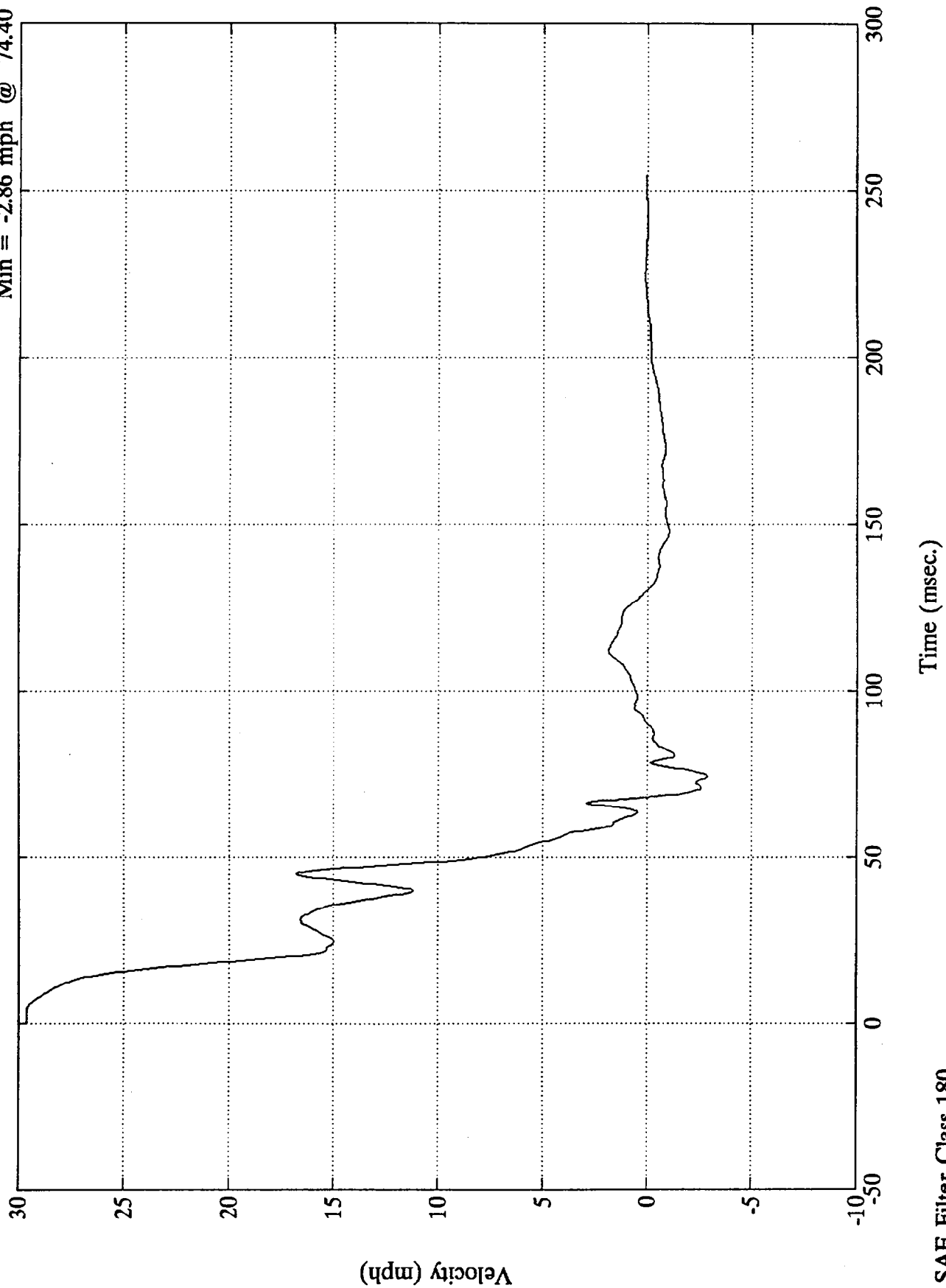
7979-3

SAE Filter Class 60

CN0307

Instrument Panel X (#7)

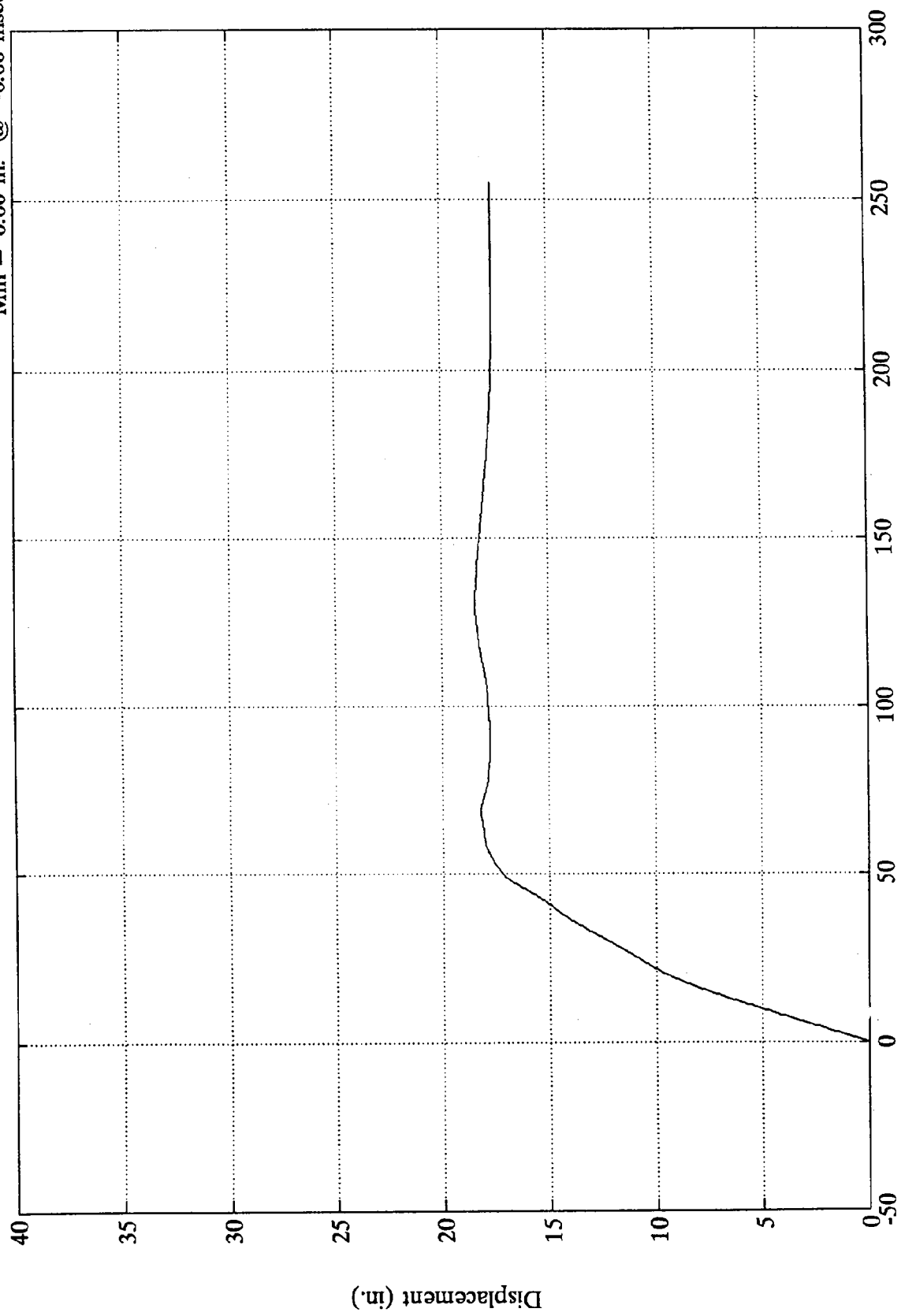
Max = 29.62 mph @ 3.84 msec
Min = -2.86 mph @ 74.40 msec



CN0307

Instrument Panel X (#7)

Max = 18.43 in. @ 132.96 msec
Min = 0.00 in. @ -0.00 msec



B-24

7979-3

SAE Filter Class 180

Time (msec.)

Displacement (in.)

FACILITY: TRACK
RUN #: 1157
SERIES #:

TEST DATE: 12 Feb 1992

TITLE: NHTSA "208" TEST 11 - 1992 JEEP CHEROKEE

Peak Resultant (3 ms CLIPPED DURATION) = 49.765 G's
Tstart = 52.5600 ms
Tend = 55.6800 ms
CSI = 452.024

CLIP SUMMARY: Pos. 2 Chest Resultant

Peak Resultant (3 ms CLIPPED DURATION) = 46.580 G's
Tstart = 52.2000 ms
Tend = 55.3200 ms
CSI = 387.035

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

hic: 695.97
t1 = 57.480 msec
t2 = 93.360 msec
Average G's Over Hic Duration = 51.89

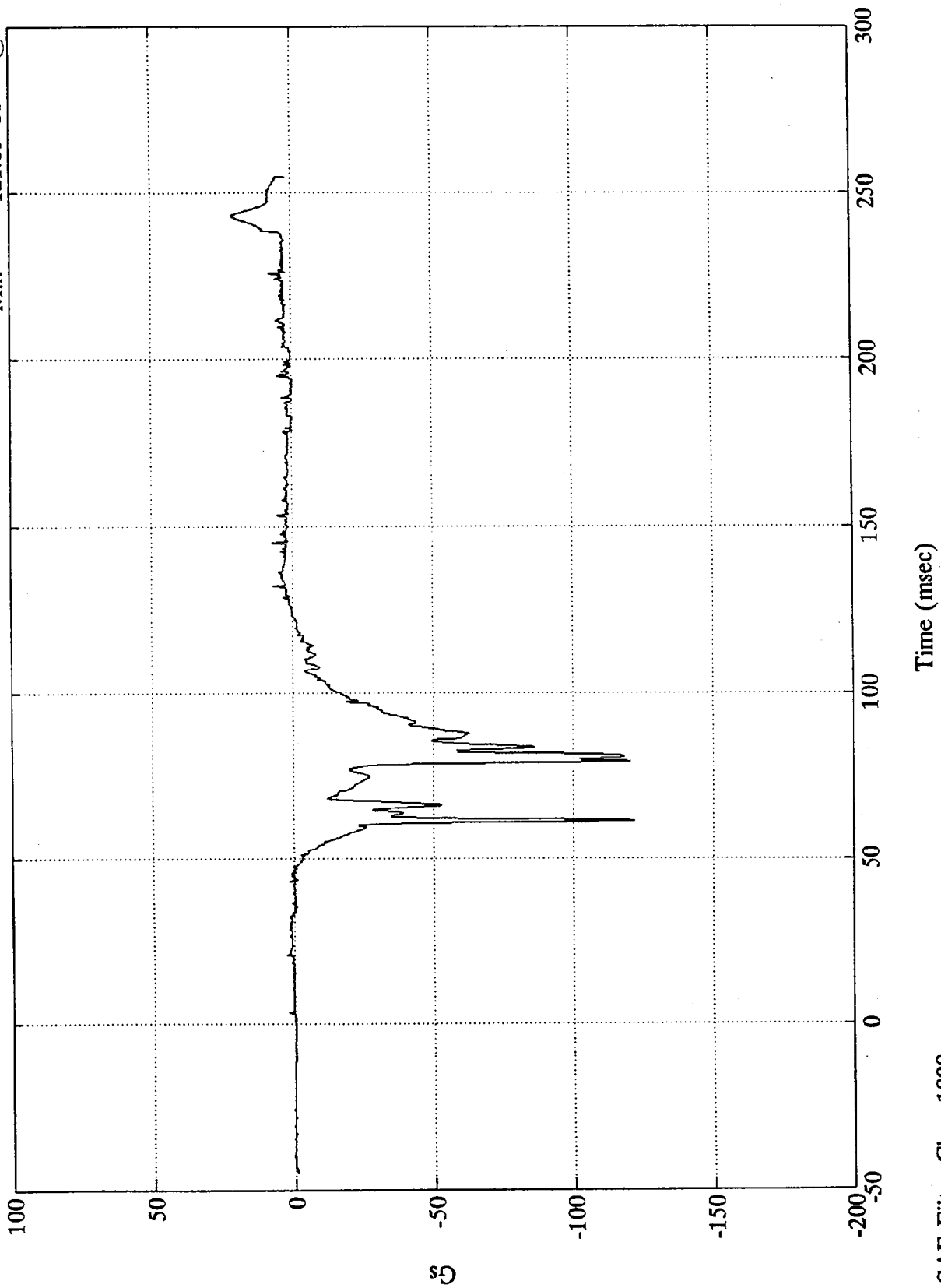
36 ms Fixed Duration HIC SUMMARY: Pos. 2 Head Resultant

hic: 404.01
t1 = 53.640 msec
t2 = 89.520 msec
Average G's Over Hic Duration = 41.75

CN0307

Pos. 1 Head X

Max = 20.80 Gs @ 243.12 msec
Min = -121.85 Gs @ 61.44 msec



SAE Filter Class 1000

CN0307

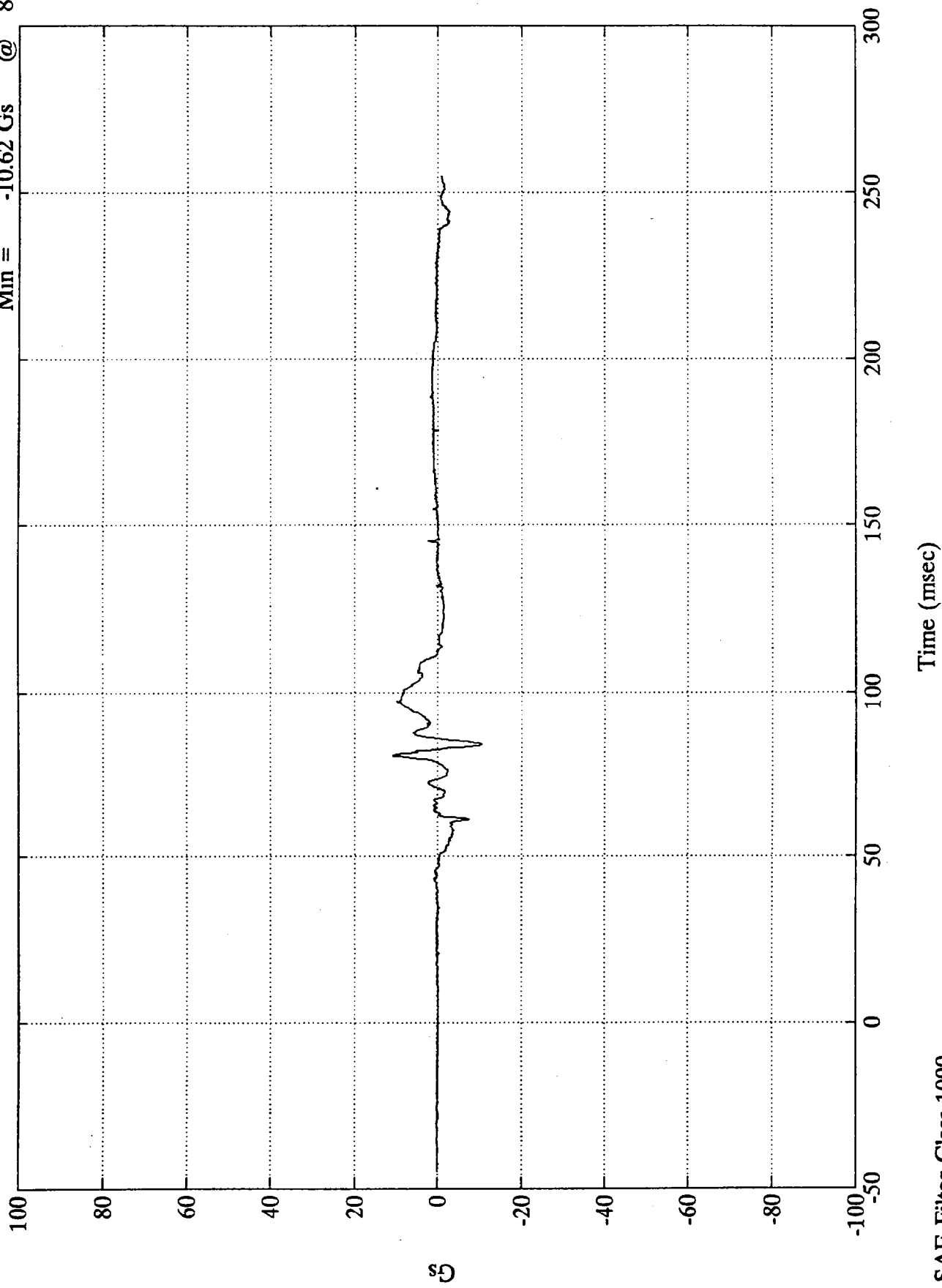
B-27

7979-3

Pos. 1 Head Y

Max = 10.83 Gs
Min = -10.62 Gs

@ 80.88 msec
@ 84.24 msec

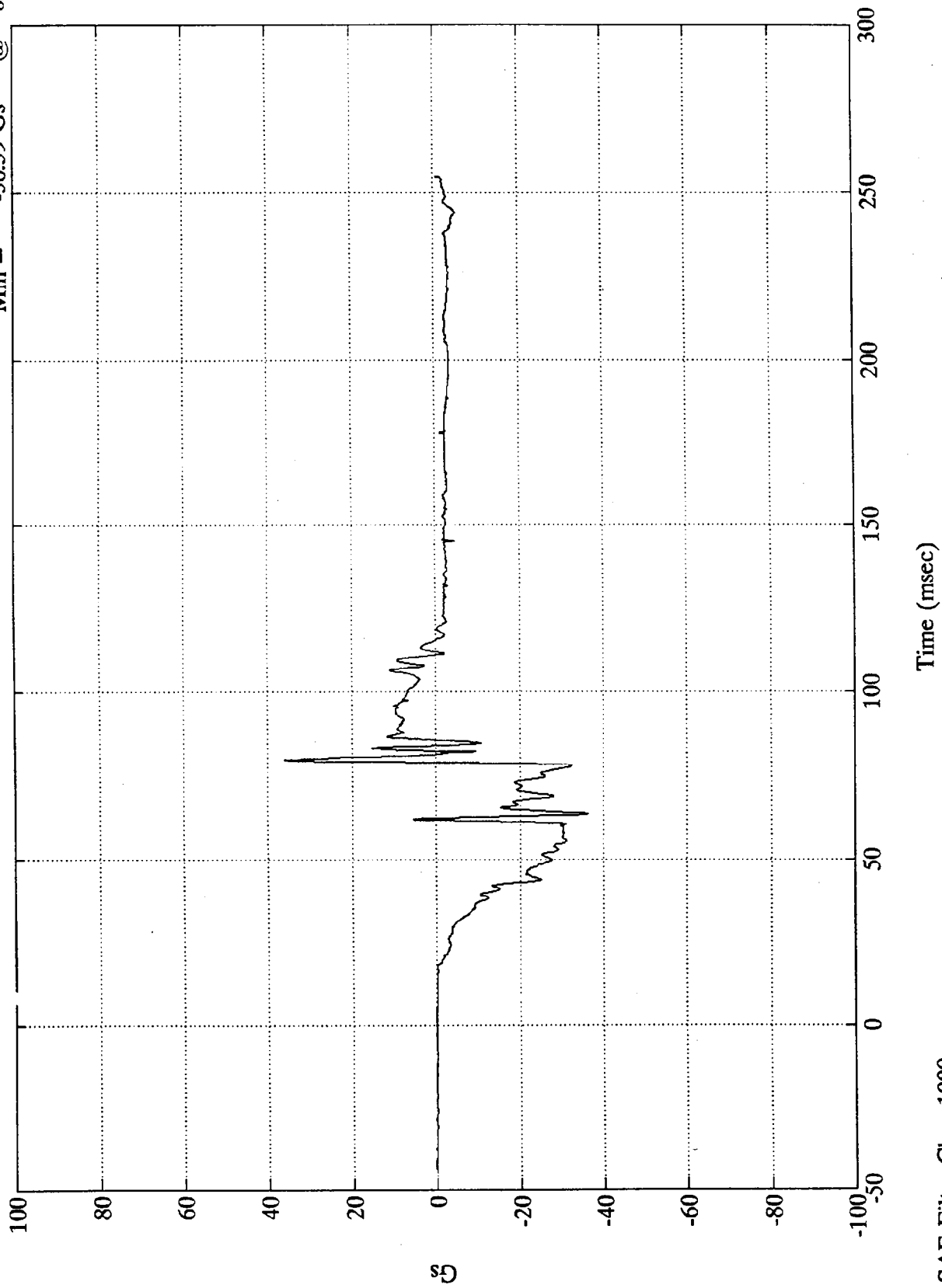


SAE Filter Class 1000

CN0307

Pos. 1 Head Z

Max = 36.07 Gs @ 79.68 msec
Min = -36.39 Gs @ 63.84 msec

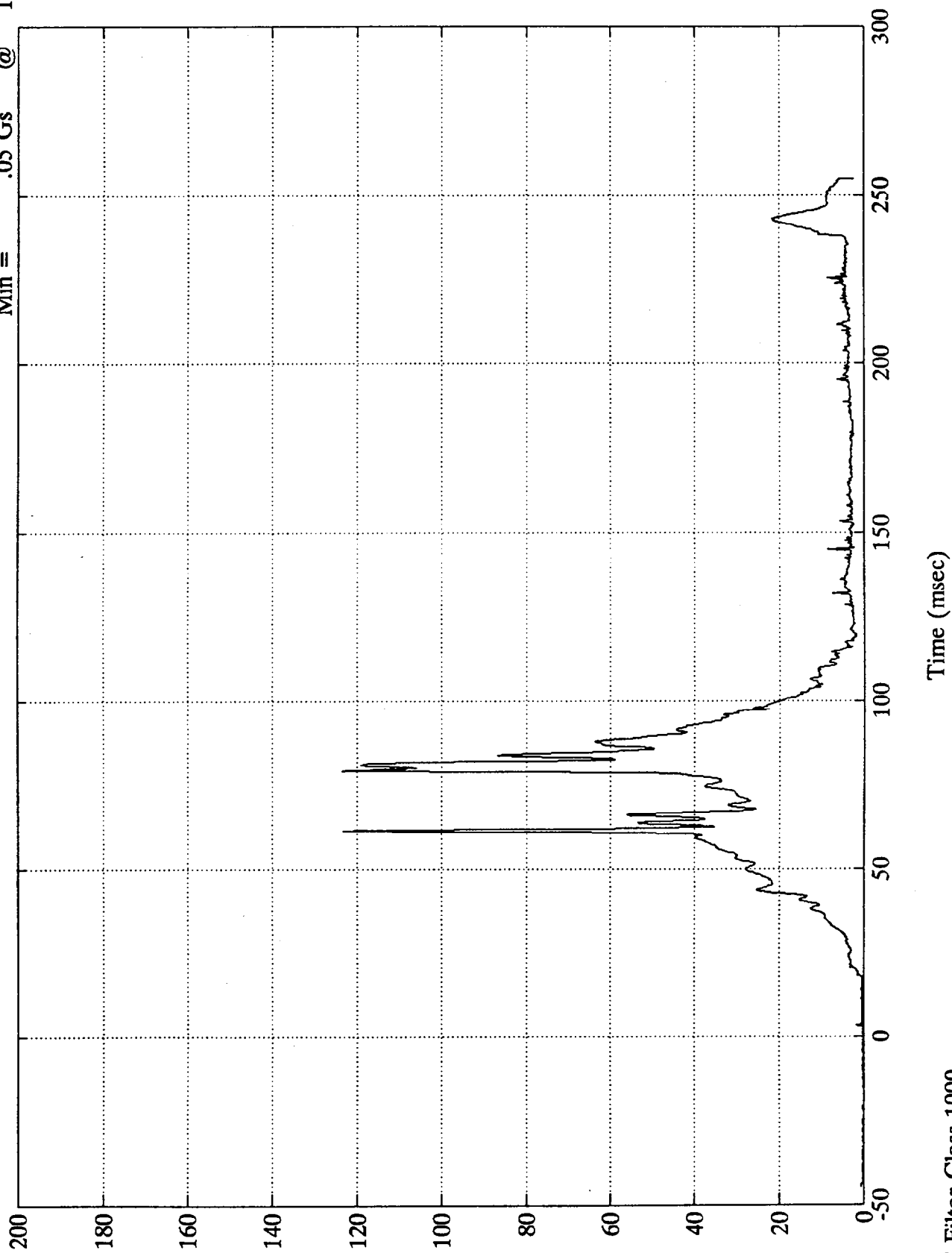


B-28

7979-3

SAE Filter Class 1000

Pos. 1 Head Resultant

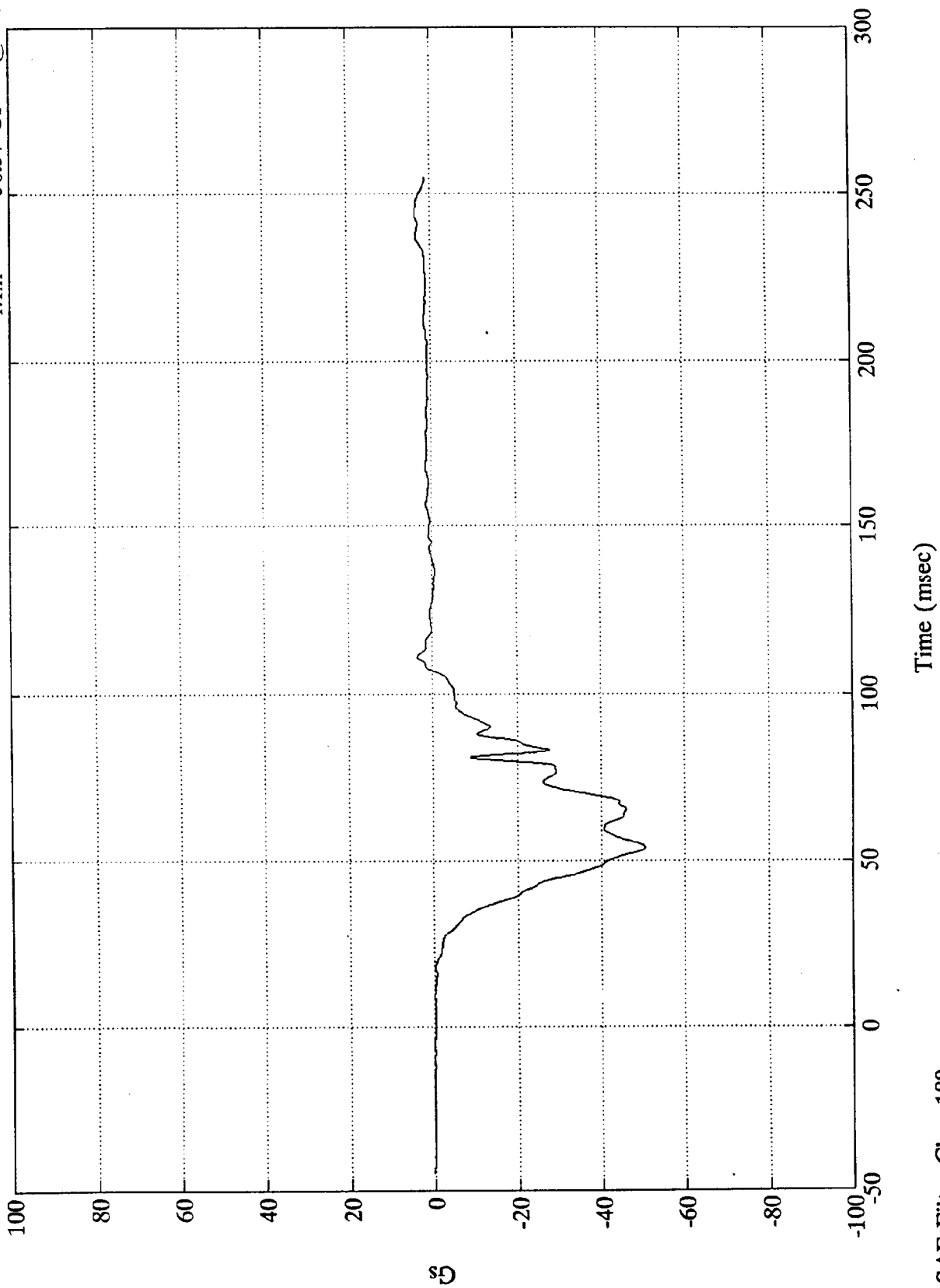
Max = 123.48 Gs @ 79.31 msec
Min = .05 Gs @ 1.31 msec

SAE Filter Class 1000

CN0307

Pos. 1 Chest X

Max = 3.66 Gs @ 111.23 msec
Min = -50.57 Gs @ 54.00 msec



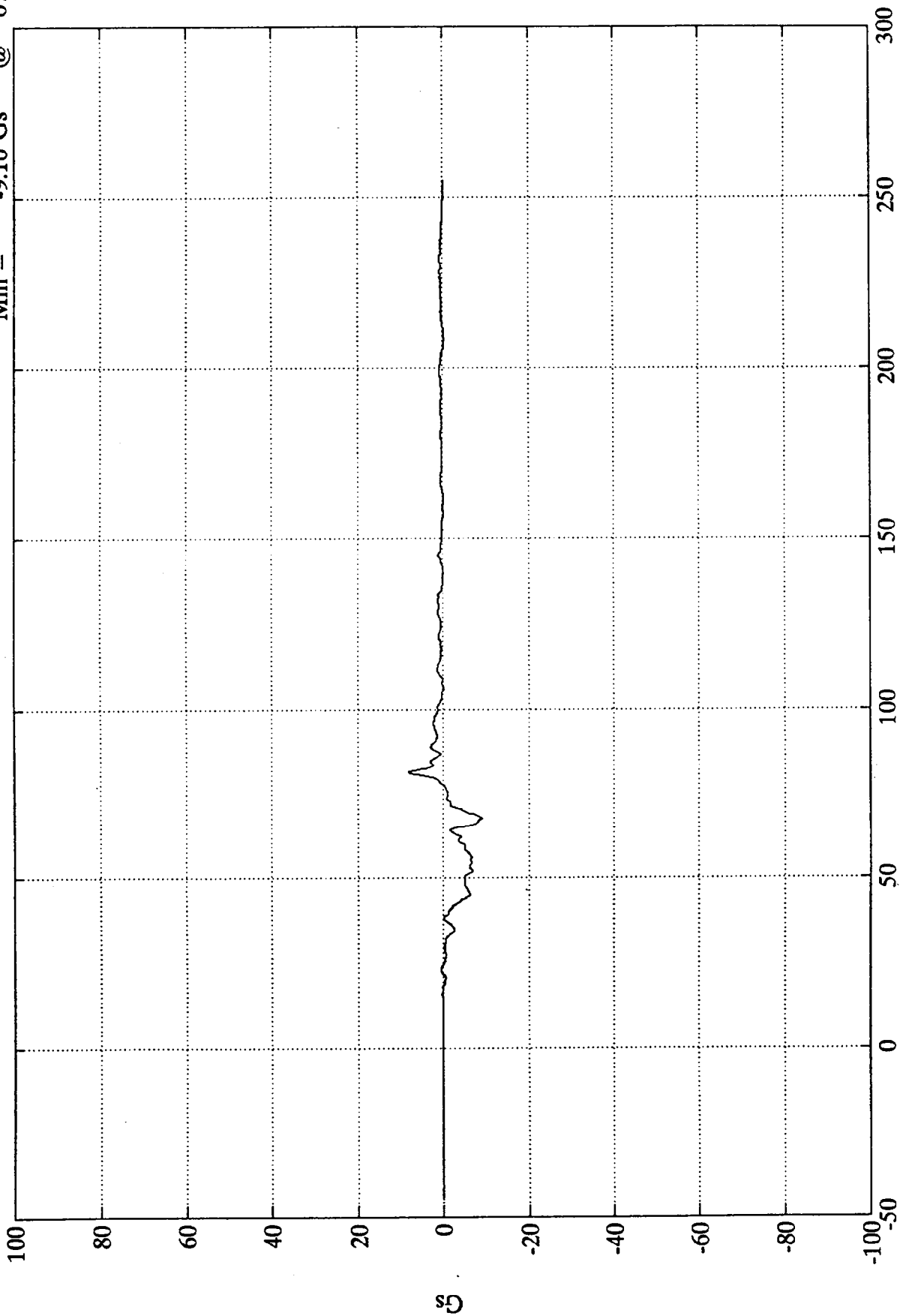
B-30

SAE Filter Class 180

7979-3

Pos. 1 Chest Y

Max = 8.11 Gs @ 81.23 msec
Min = -9.10 Gs @ 67.56 msec

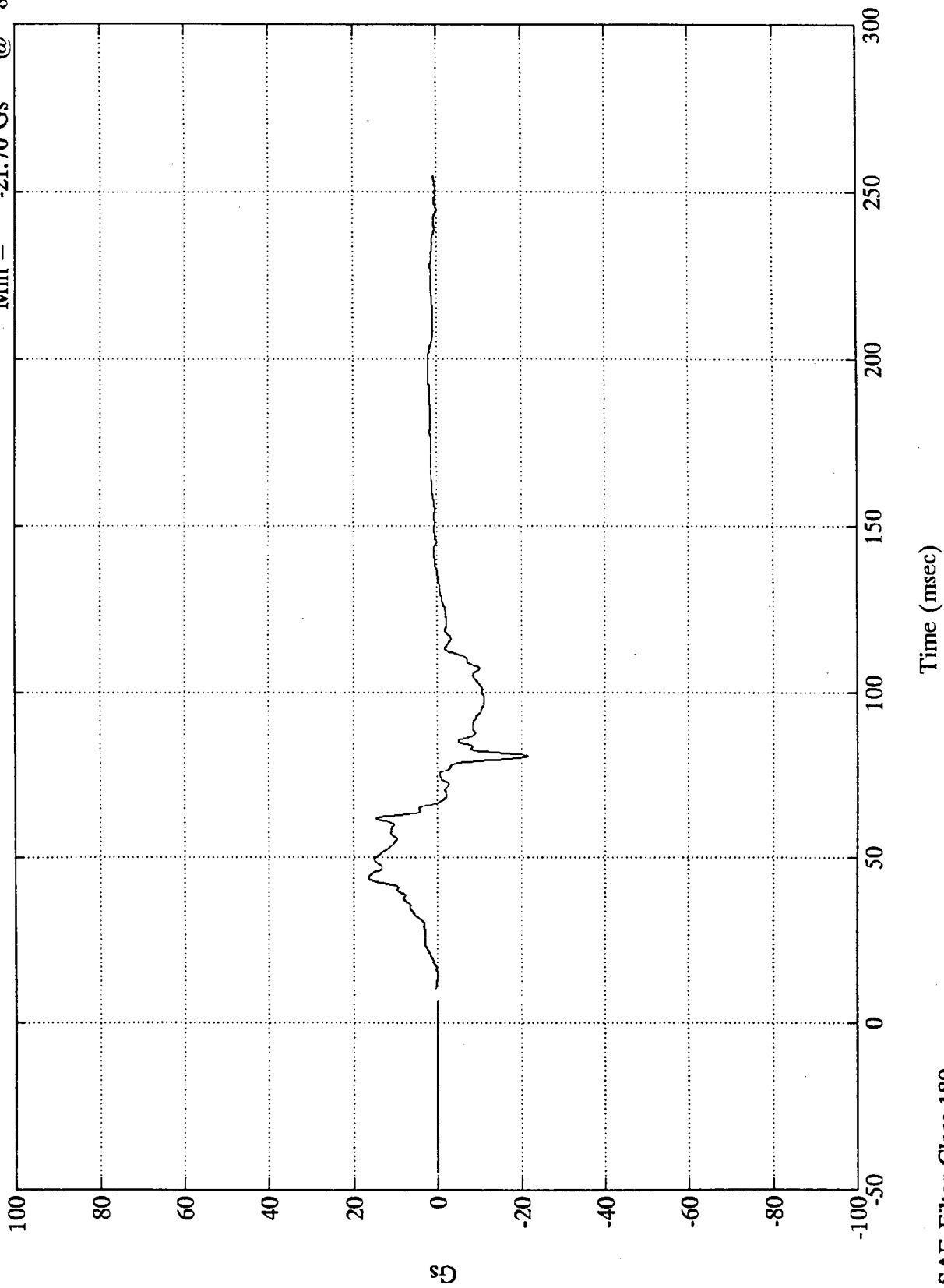


Time (msec)

SAE Filter Class 180

CN0307

Pos. 1 Chest Z
Max = 16.37 Gs @ 43.56 msec
Min = -21.70 Gs @ 80.88 msec



B-32

7979-3

SAE Filter Class 180

Pos. 1 Chest Resultant

Max = 52.06 Gs @ 54.00 msec
Min = .01 Gs @ -28.92 msec



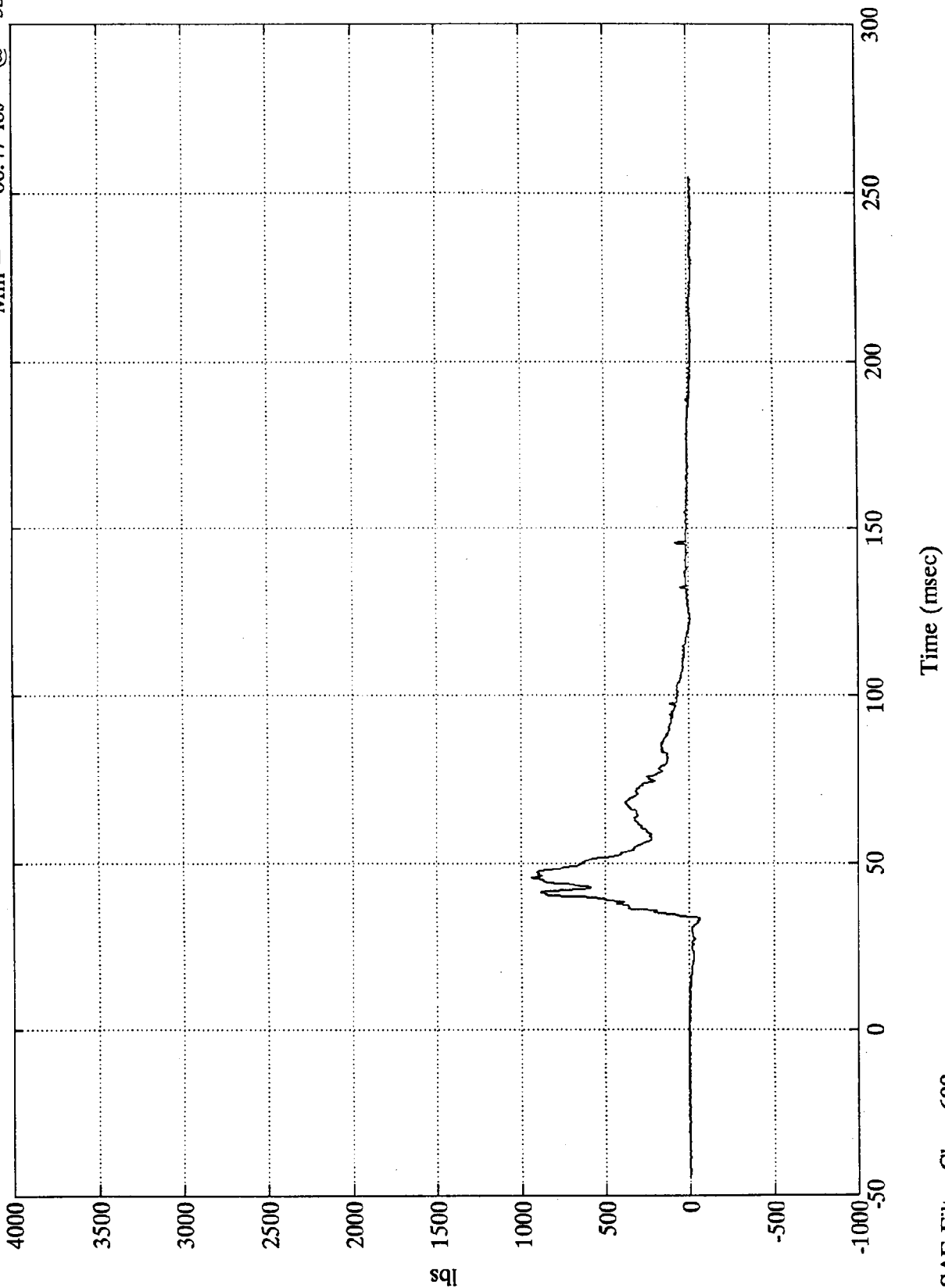
Time (msec)

SAE Filter Class 180

CN0307

Pos. 1 Left Femur

Max = 934.64 lbs @ 45.36 msec
Min = -60.47 lbs @ 33.00 msec



B-34

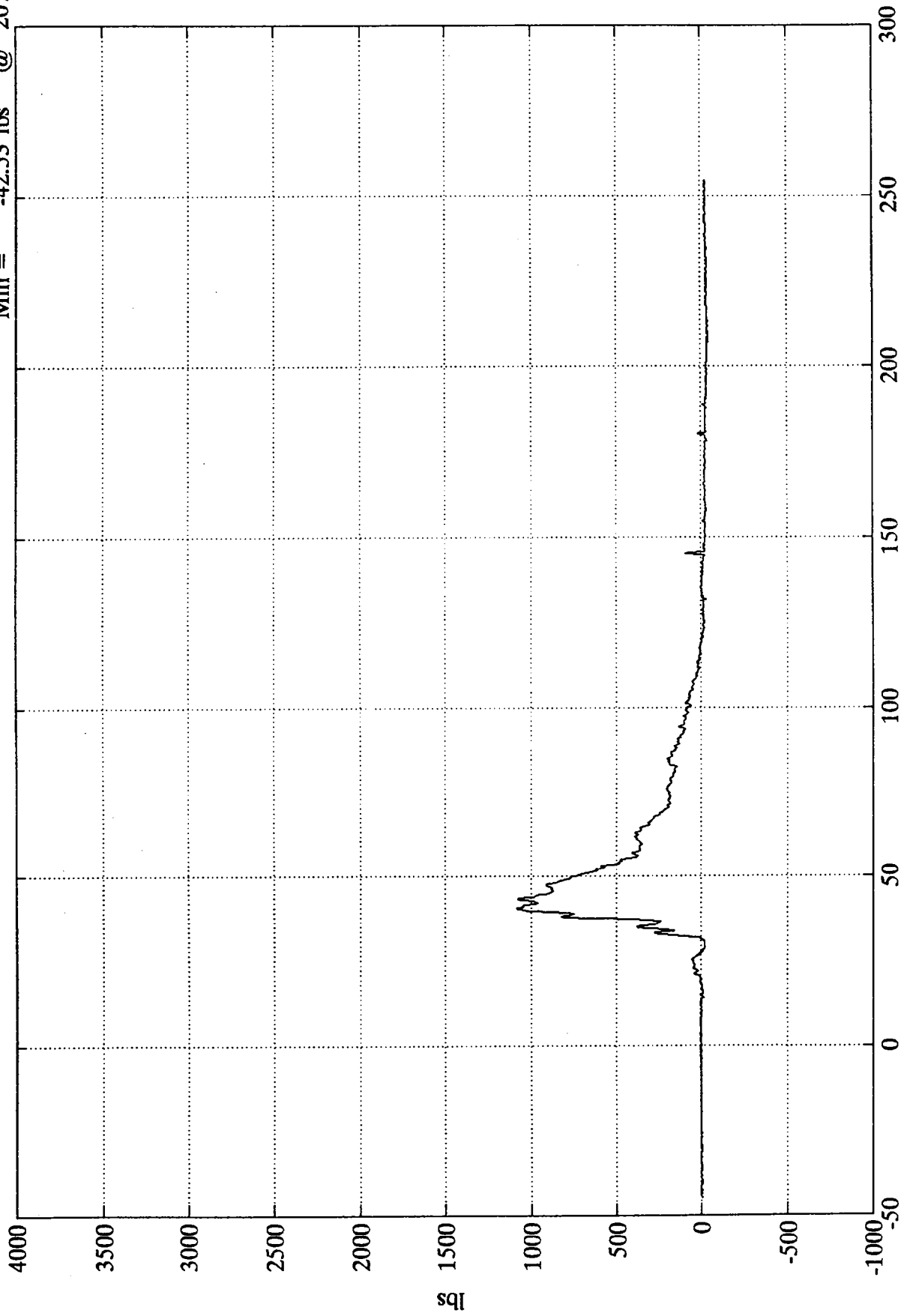
7979-3

SAE Filter Class 600

CN0307

Pos. 1 Right Femur

Max = 1081.15 lbs @ 40.56 msec
Min = -42.53 lbs @ 207.24 msec



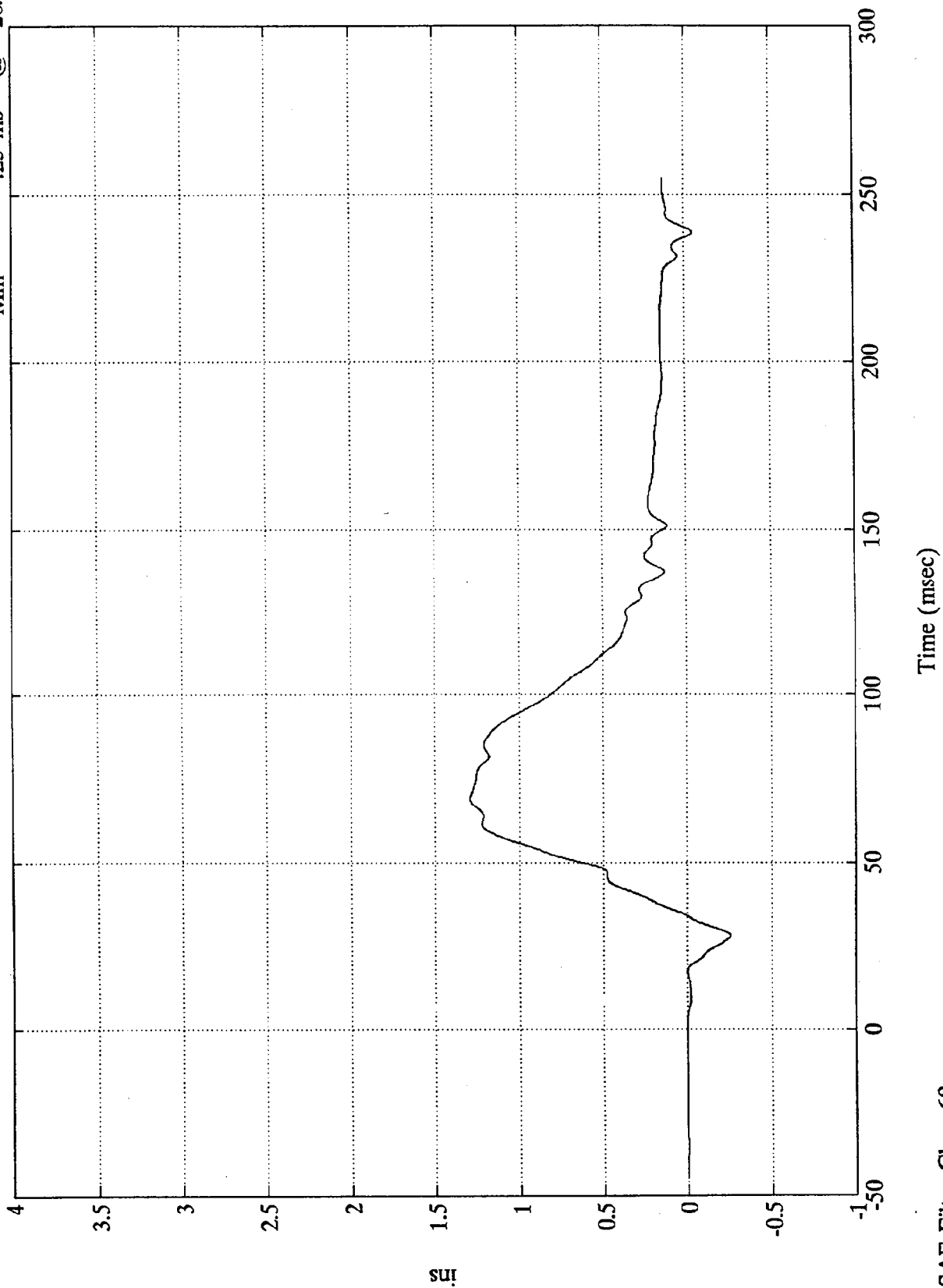
Time (msec)

SAE Filter Class 600

CN0307

Pos 1 Chest Disp.

Max = 1.29 ins @ 68.87 msec
Min = -.25 ins @ 28.20 msec



B-36

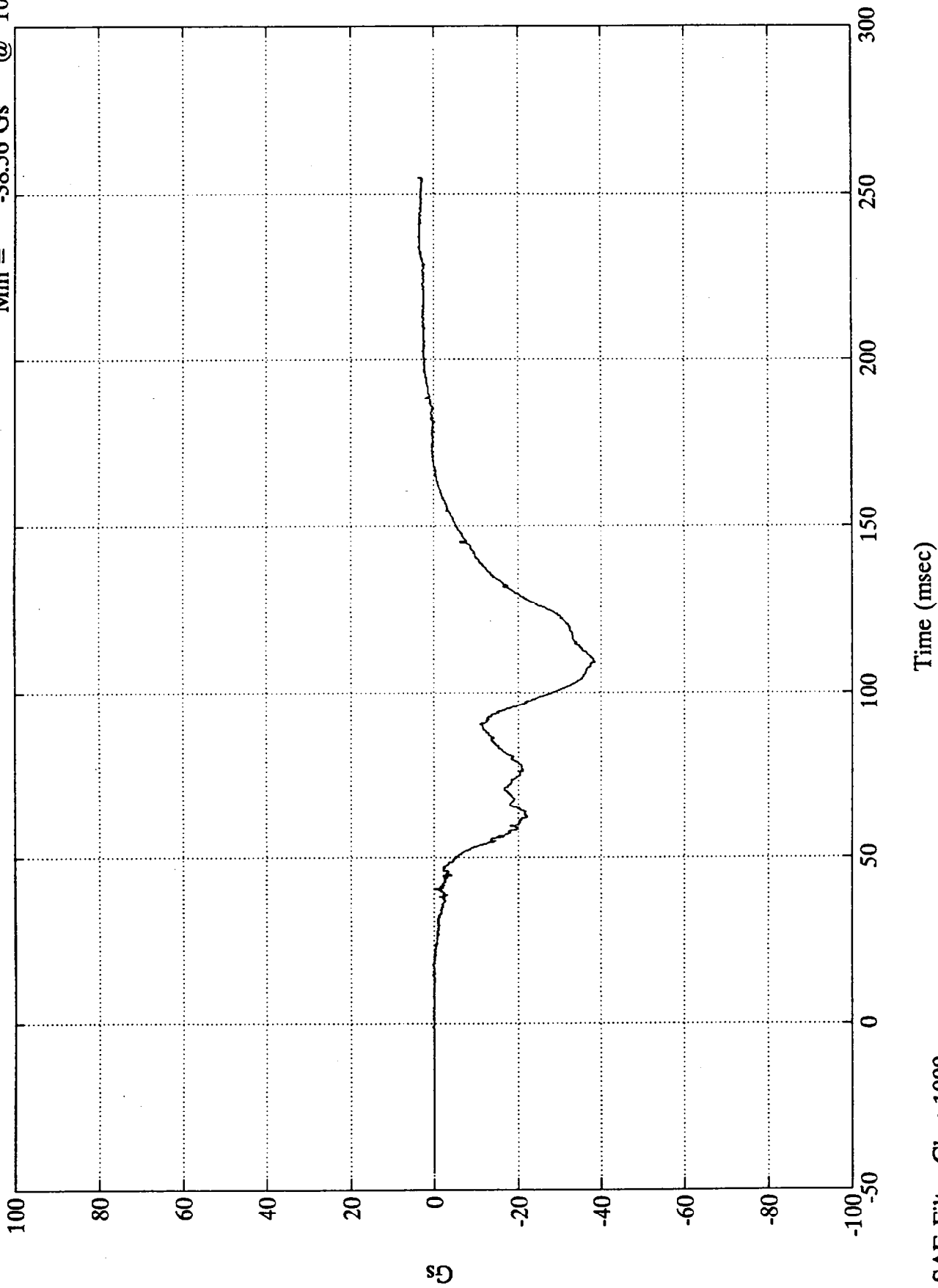
SAE Filter Class 60

7979-3

CN0307

Pos. 2 Head X

Max = 3.57 Gs @ 254.88 msec
Min = -38.56 Gs @ 109.19 msec



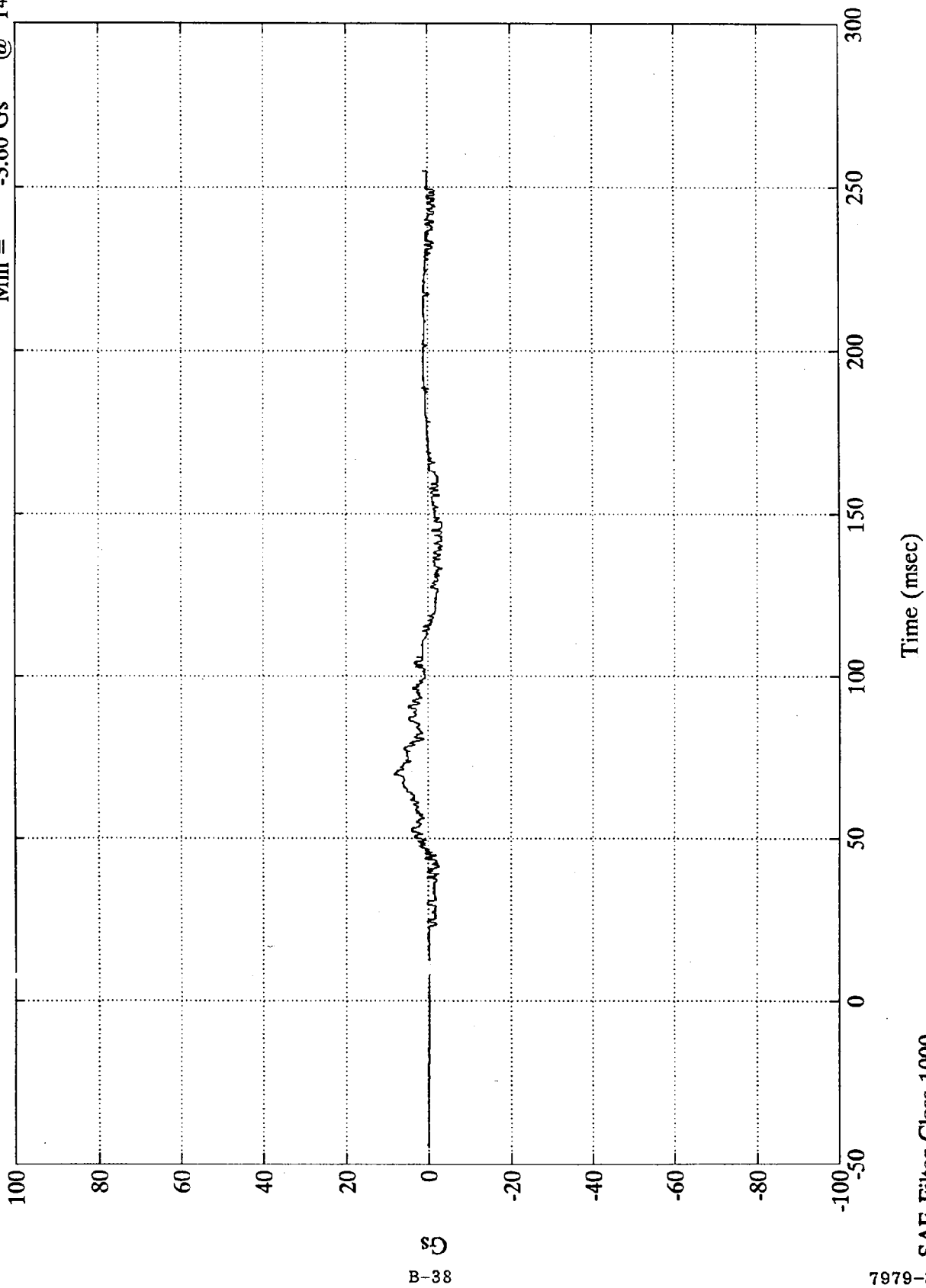
B-37

7979-3 SAE Filter Class 1000

CN0307

Pos. 2 Head Y

Max =	8.22 Gs	@	69.72 msec
Min =	-3.60 Gs	@	142.08 msec



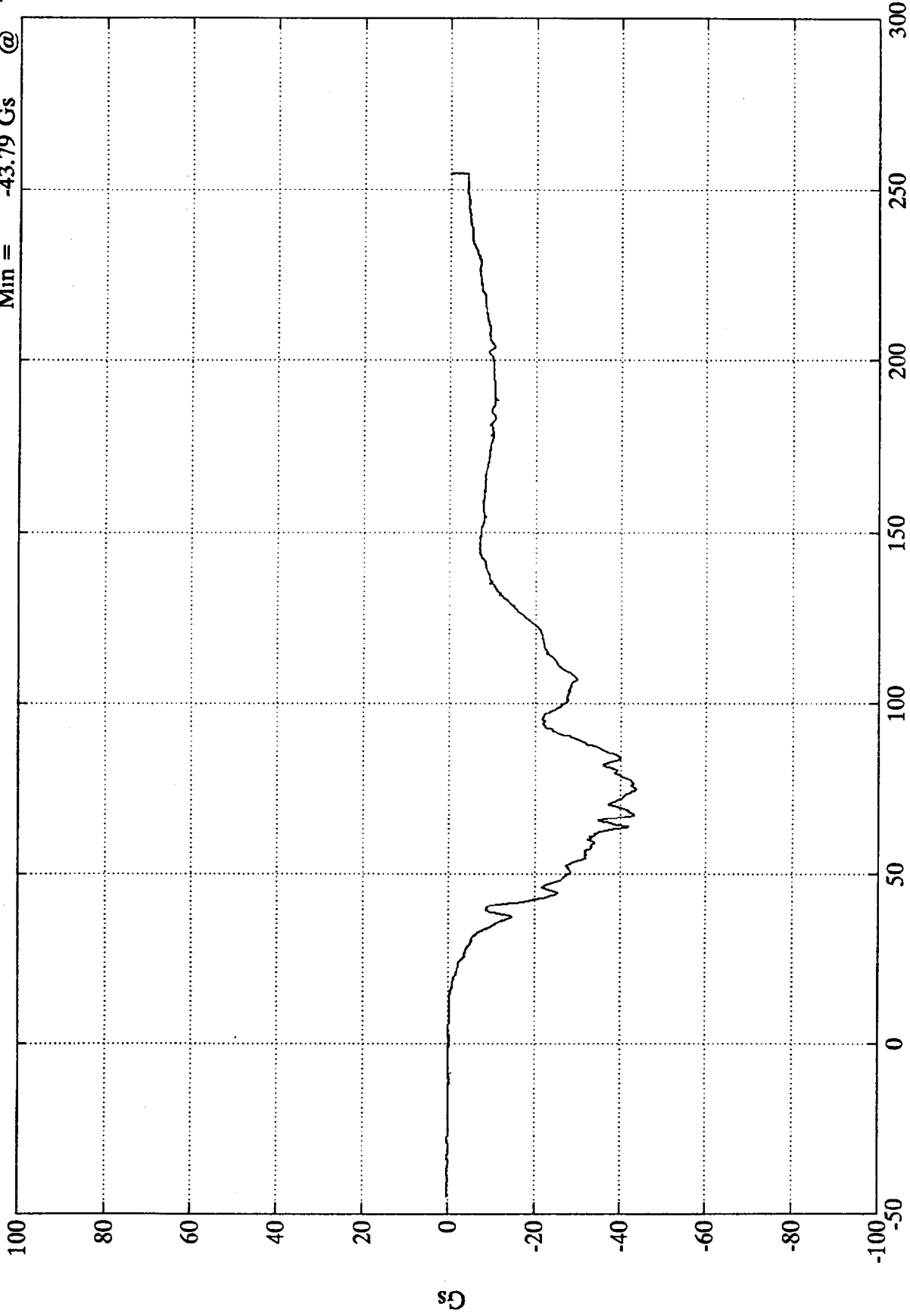
B-38

SAE Filter Class 1000

7979-3

Pos. 2 Head Z

Max = .14 Gs @ -27.48 msec
 Min = -43.79 Gs @ 75.00 msec



B-39

7979-3

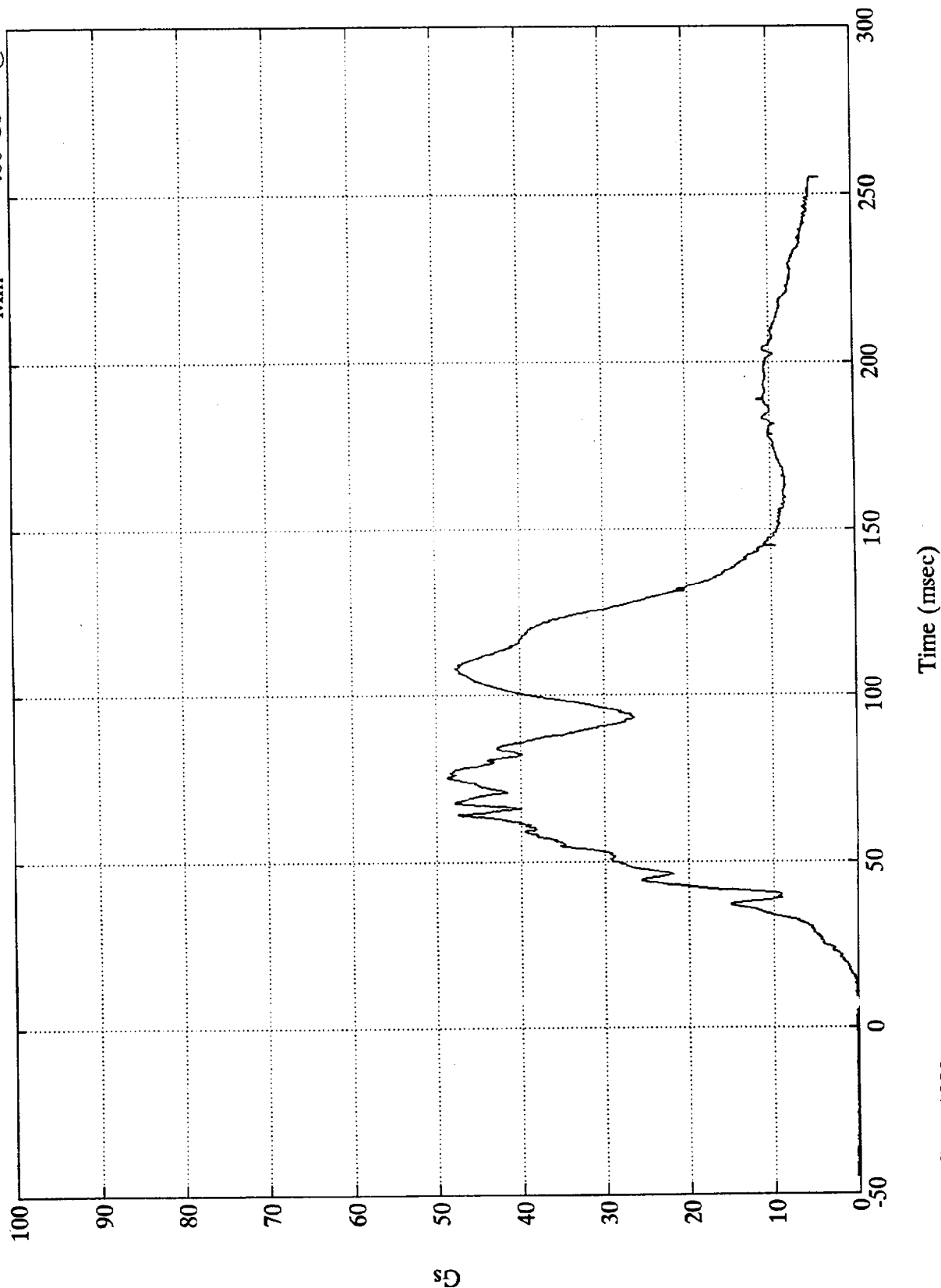
SAE Filter Class 1000

Time (msec)

CN0307

Pos. 2 Head Resultant

Max = 48.67 Gs @ 75.00 msec
Min = .06 Gs @ -19.56 msec



B-40

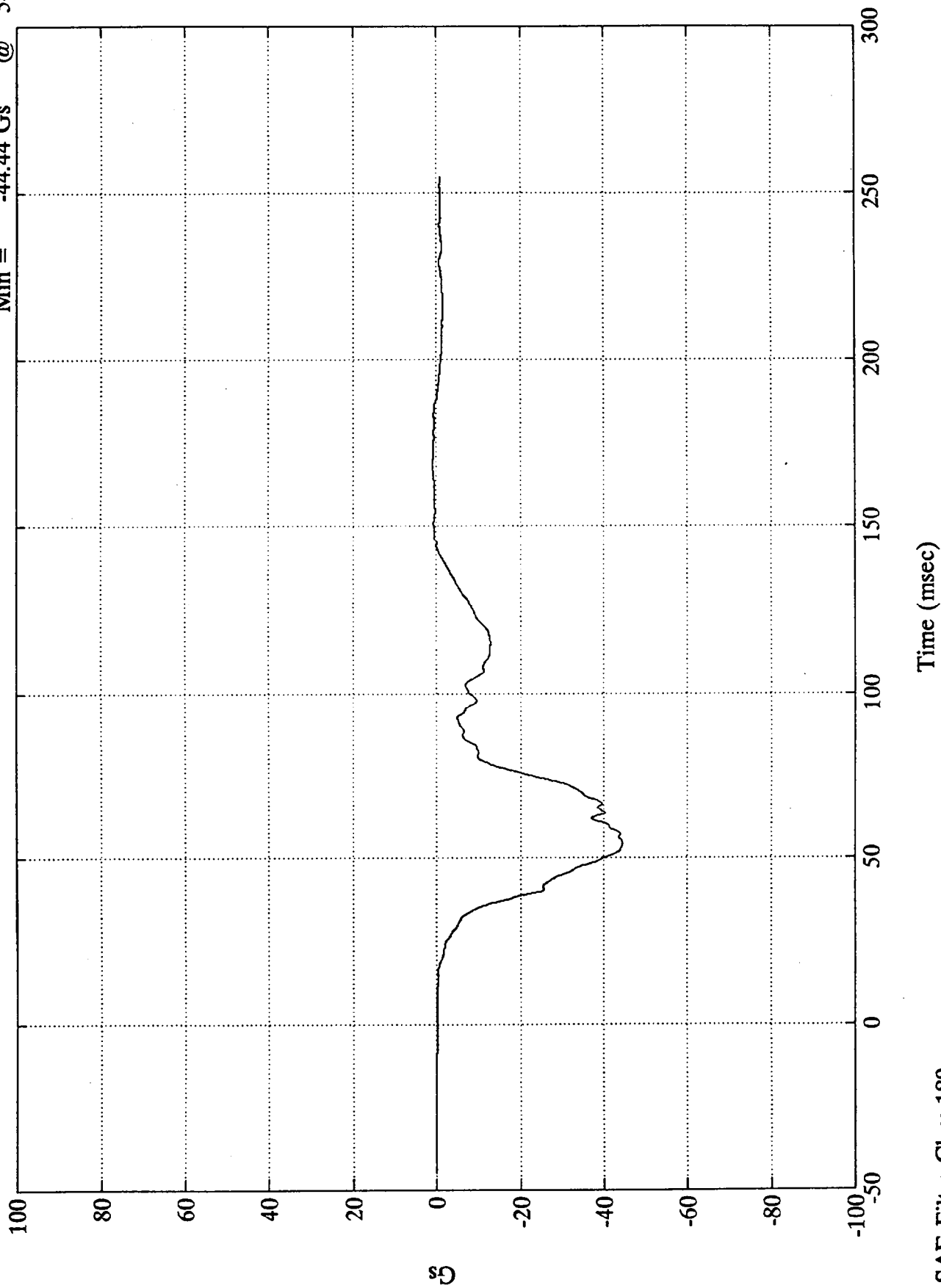
7979-3

SAE Filter Class 1000

CN0307

Pos. 2 Chest X

Max = .86 Gs @ 168.36 msec
Min = -44.44 Gs @ 54.11 msec



B-41

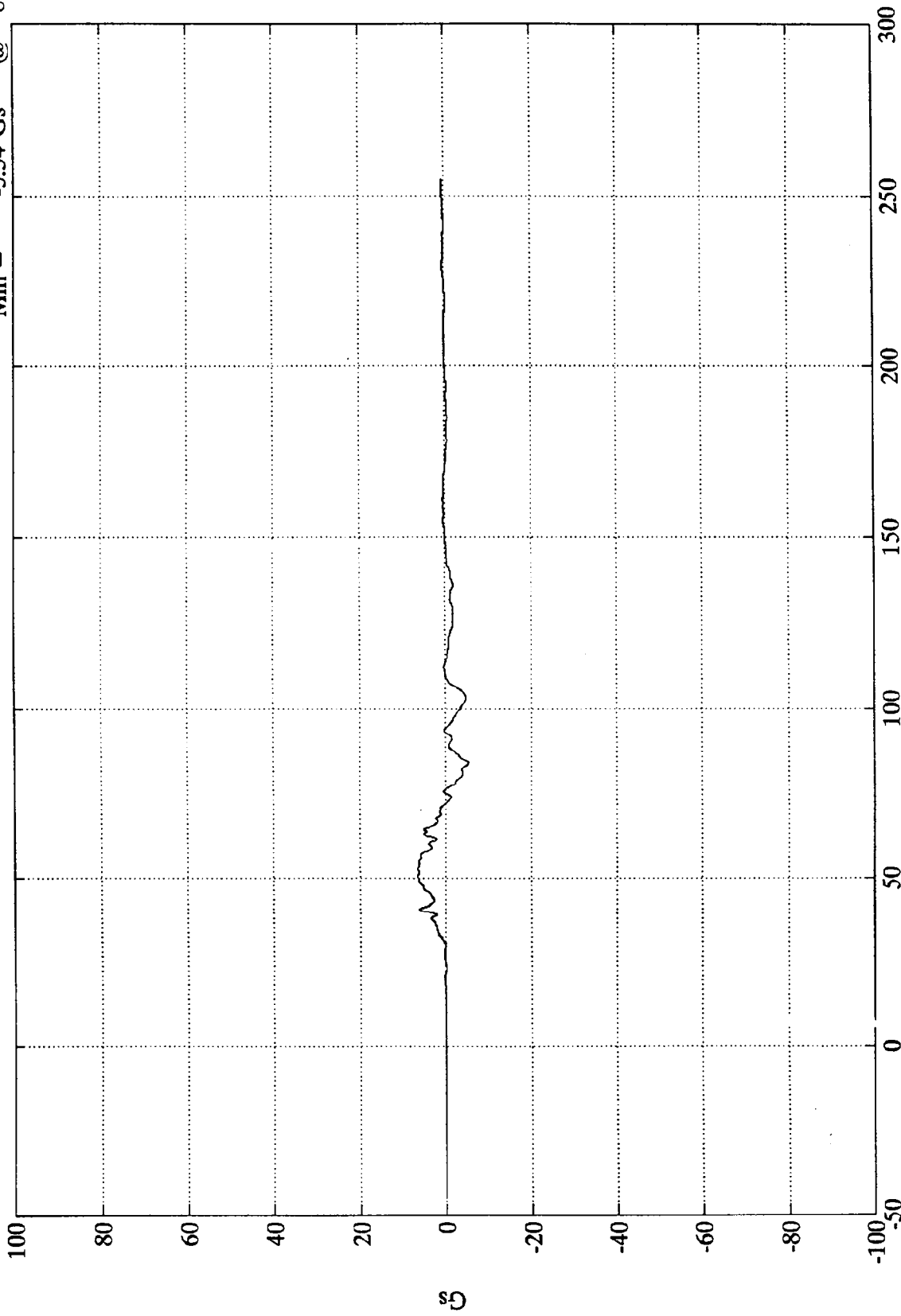
7979-3

SAE Filter Class 180

CN0307

Pos. 2 Chest Y

Max = 6.52 Gs @ 50.76 msec
Min = -5.34 Gs @ 84.12 msec



B-42

7979-3

Time (msec)

SAE Filter Class 180

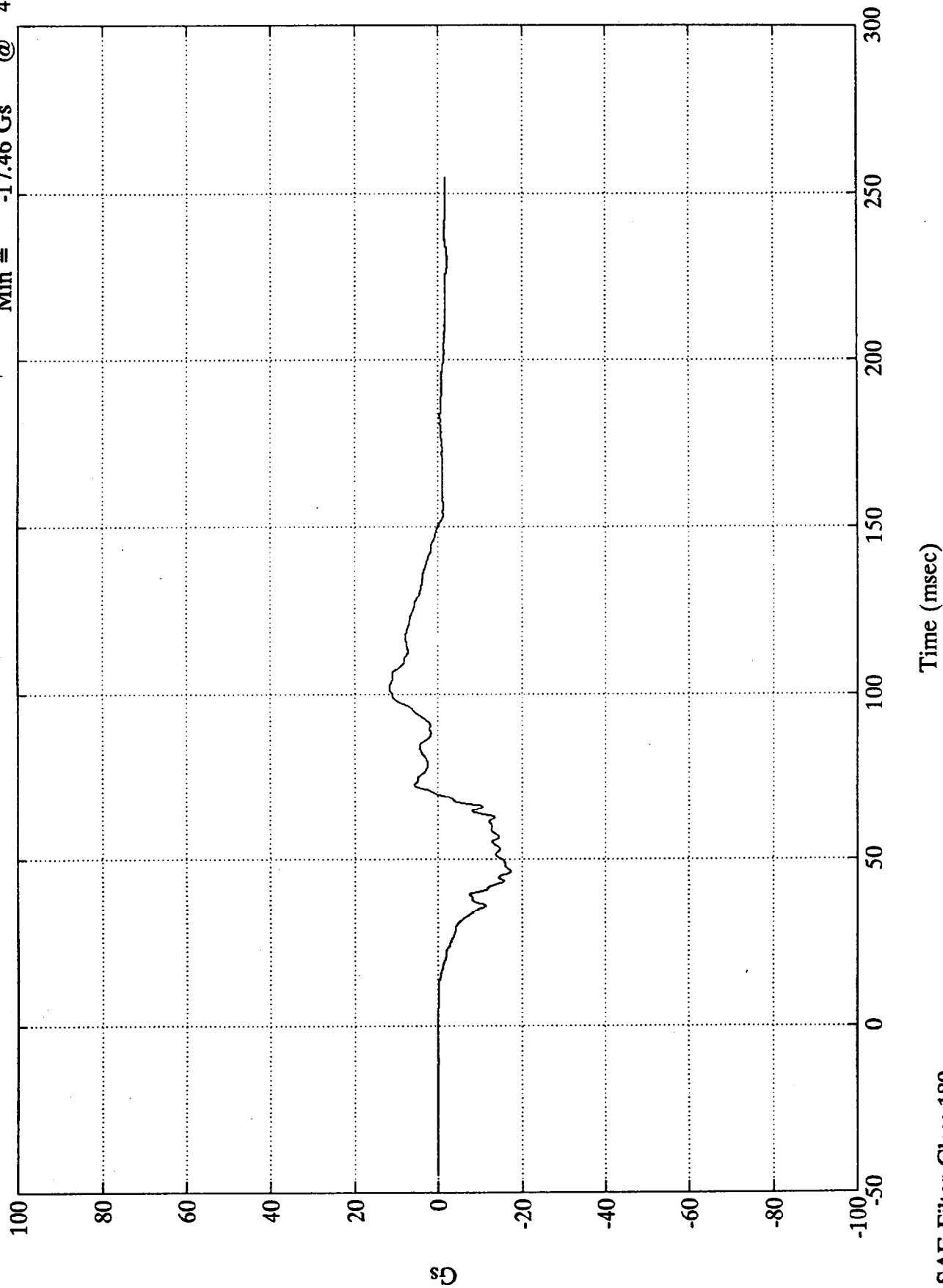
CN0307

Pos. 2 Chest Z

Max =
Min =

11.67 Gs
-17.46 Gs

@ 101.87 msec
@ 46.31 msec



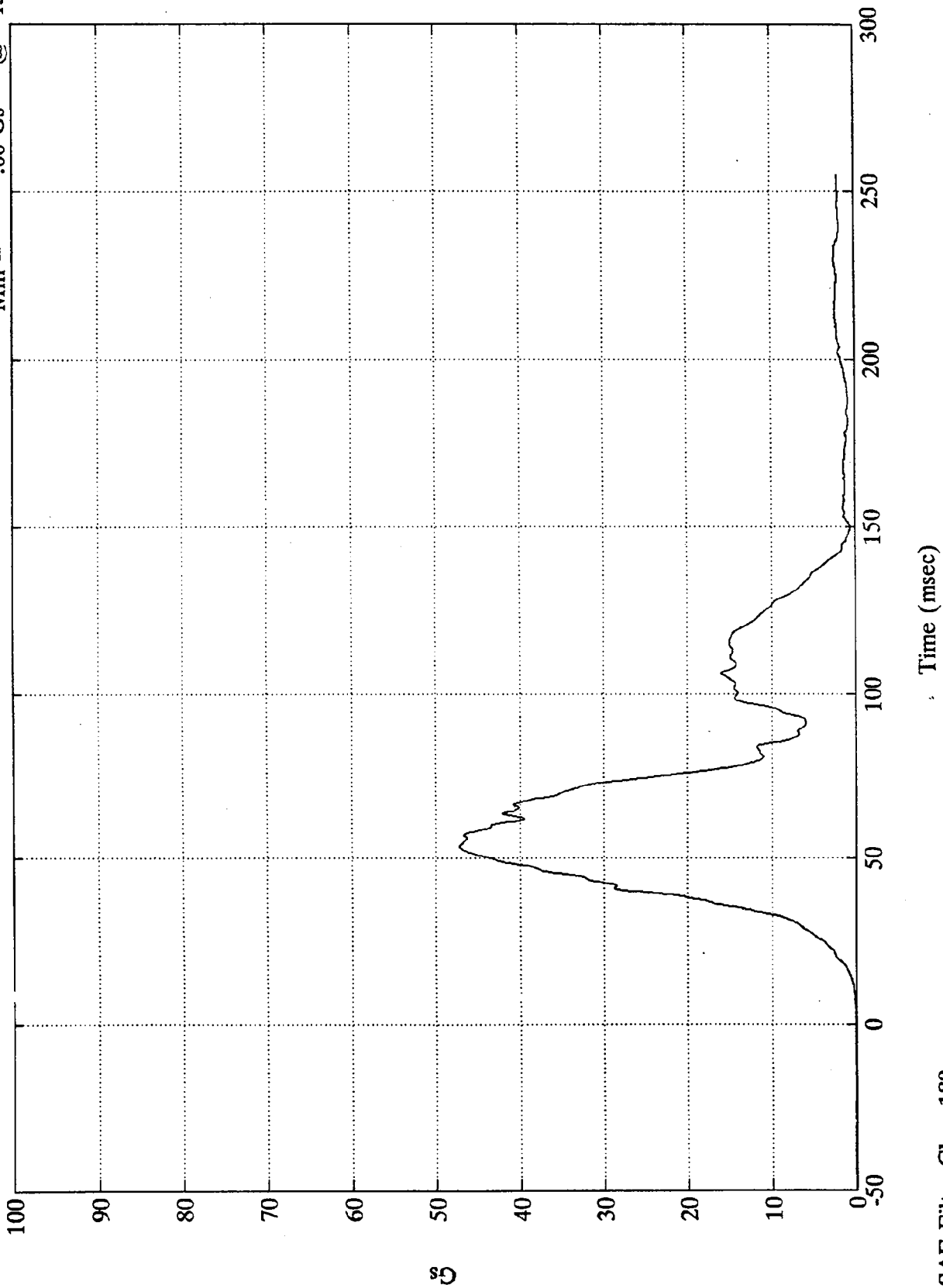
B-43

7979-3

SAE Filter Class 180

CN0307

Pos. 2 Chest Resultant
Max = 47.16 Gs @ 53.52 msec
Min = .00 Gs @ -15.96 msec



B-44

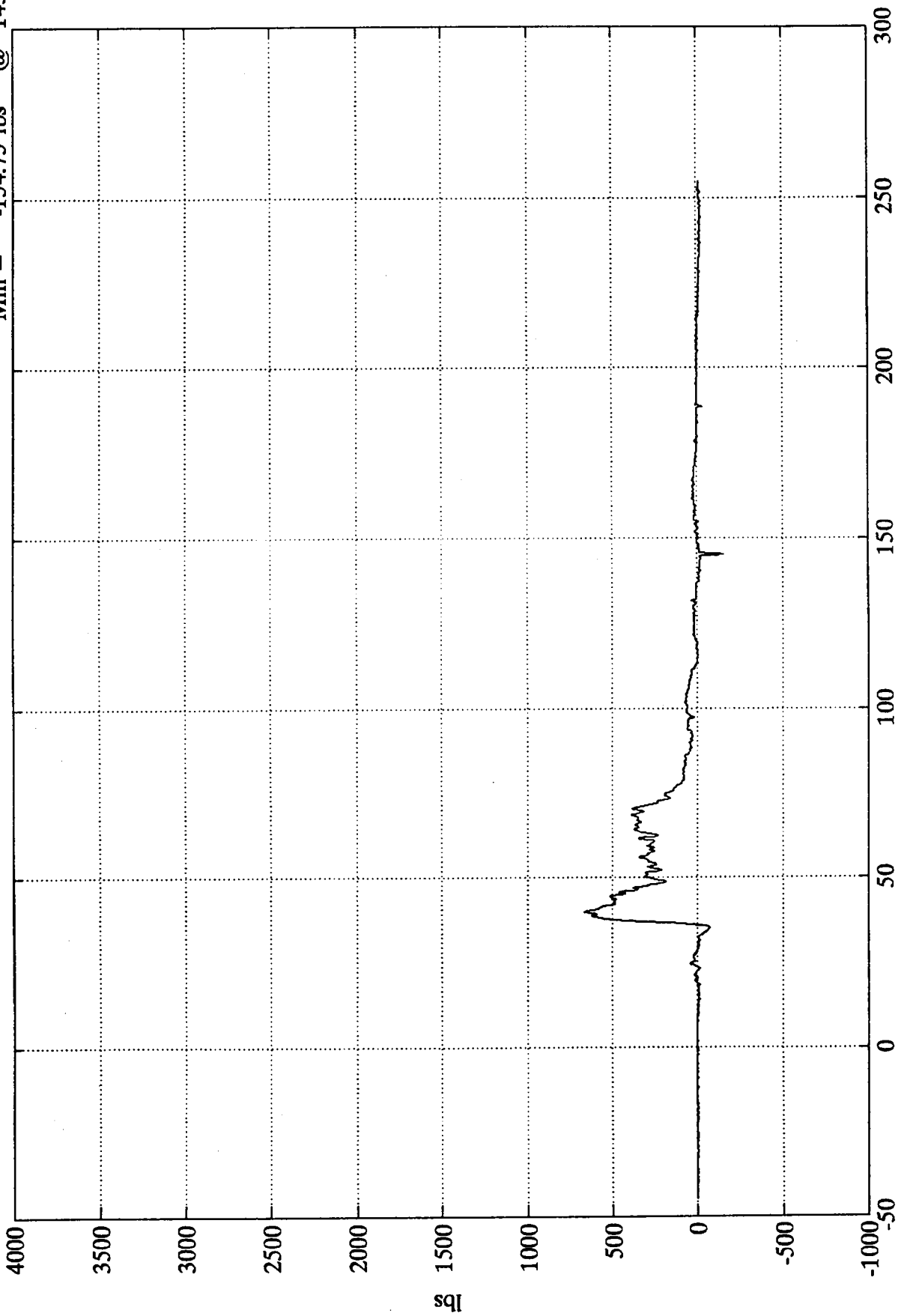
7979-3

SAE Filter Class 180

CN0307

Pos. 2 Left Femur

Max = 660.27 lbs @ 39.95 msec
Min = -154.75 lbs @ 145.31 msec



B-45

7979-3

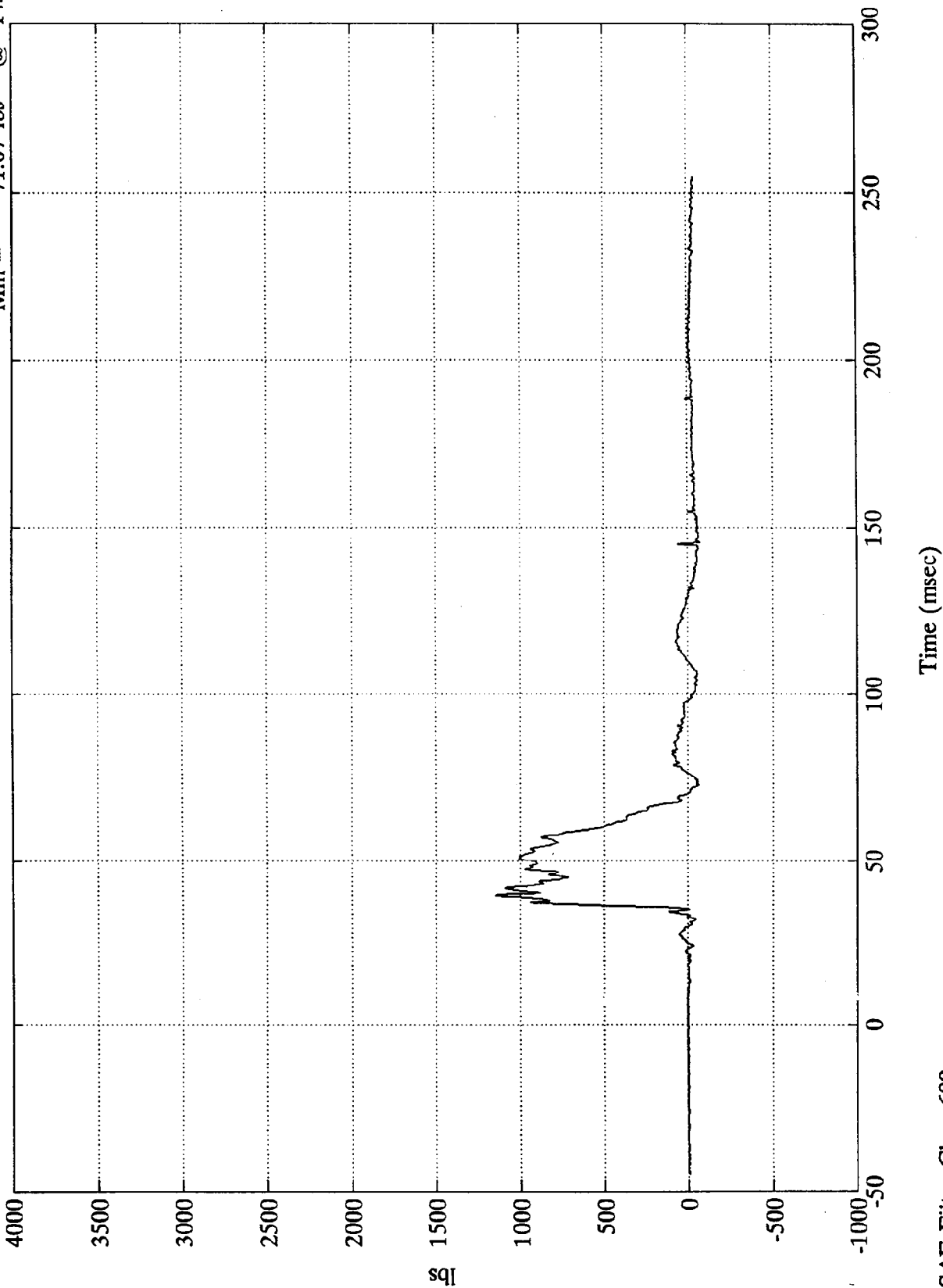
SAE Filter Class 600

Time (msec)

CN0307

Pos. 2 Right Femur

Max = 1140.25 lbs @ 39.36 msec
Min = -71.07 lbs @ 145.80 msec



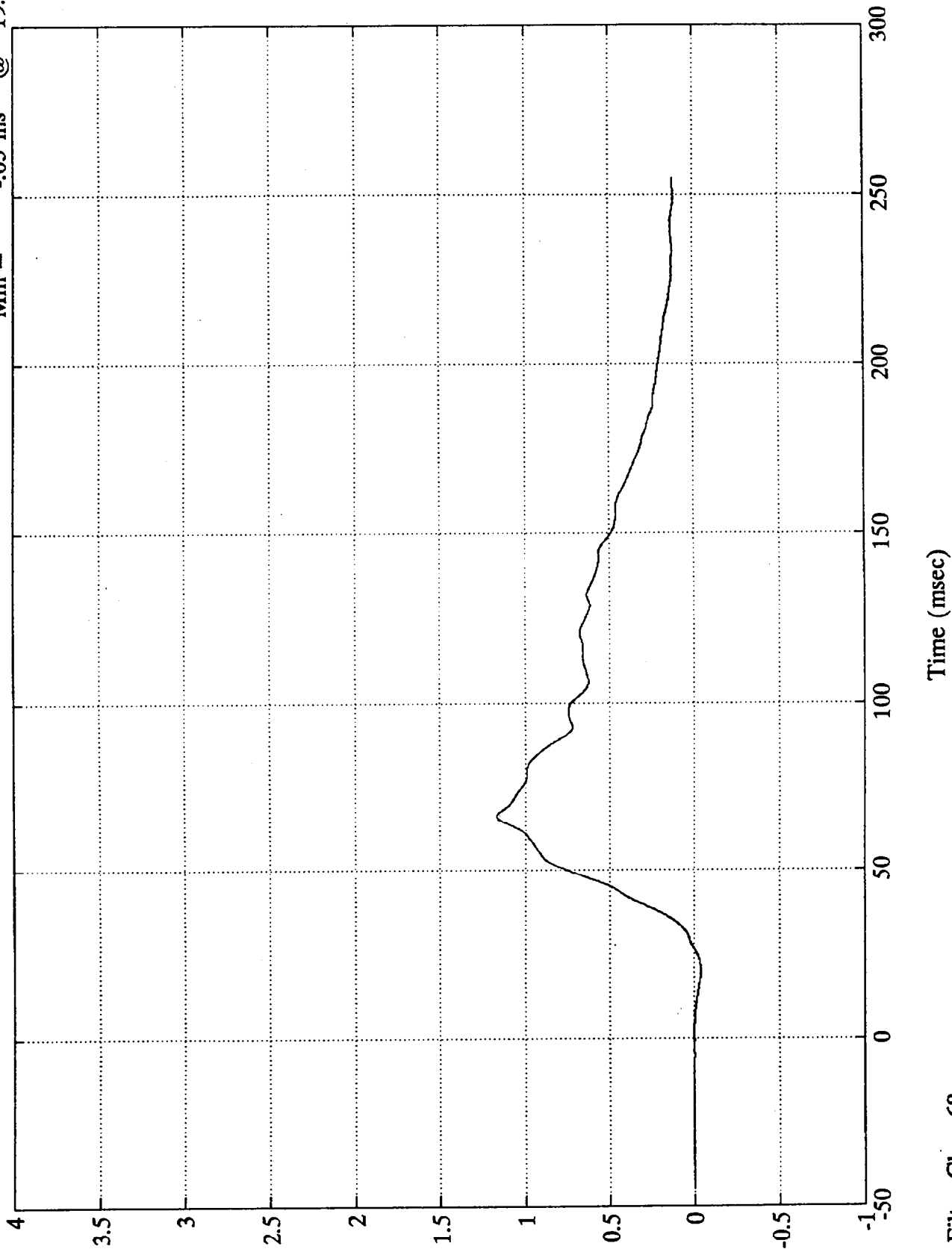
CN0307

B-47
sui

7979-3

Pos 2 Chest Disp.

Max = 1.16 ins @ 66.11 msec
Min = -.03 ins @ 19.31 msec



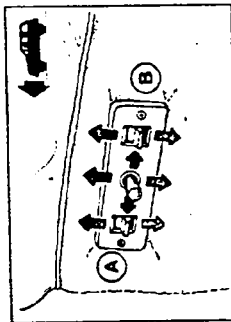
SAE Filter Class 60

Appendix C

VEHICLE OWNERS MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

Six-Way Power Seats

A control is mounted on the outboard side of each power seat.



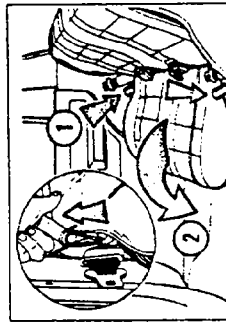
- To raise/lower seat: Move center control upward or downward.
- To move seat forward/rearward: Move center control forward/rearward.
- To tilt front of seat upward/downward: Move control (A) upward or downward.
- To tilt rear of seat upward/downward: Move control (B) upward/downward.

CAUTION! Don't put anything under a power seat. It may cause damage to the seat controls.

Fold-Down Rear Seat

To expand cargo area:

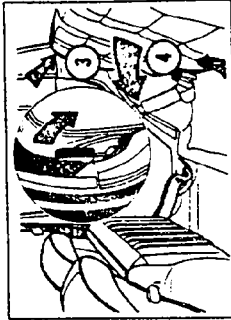
1. Pull either side loop;
2. Pivot seat cushion forward;



3. Release the lock at either side of seatback;

4. Fold the seatback flat.

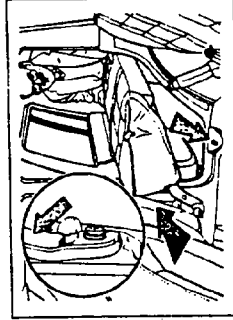
To carry passengers, place the seatback in the upright position and latch it securely. Fold the seat cushion into place and be sure seat belts are placed where they can be used.



Rear Seat Cushion Removal

To lengthen the cargo area:

- Pull the passenger-side loop to release the cushion.
- Pull up on pivot release lever and remove cushion from pivot.
- Carefully pull cushion toward you until pin is removed from pivot on driver's side.
- Remove cushion.
- Reverse the procedure to replace the cushion.



Occupant Restraints

One of the most important safety features in your vehicle is the restraint system. This system includes the front and rear seat belts. Your seat belts can also be used to hold infant and child restraint systems if you will be carrying children too small for adult-size belts.

Please pay close attention to the information in this section. It tells you how to use your restraint system properly to keep you and your passengers as safe as possible.

WARNING! In a collision you and your passengers can suffer much greater injuries if you are not properly buckled up. You can strike parts of the inside of the vehicle or other passengers, or you can be thrown out of the vehicle. Always be sure you and others in your vehicle are buckled up properly.

Buckle up even though you are an excellent driver. Even on short trips. Someone else on the road may be a poor driver and cause a collision which involves you. And this can happen far from home or on your own street.

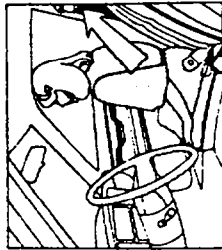
Research has shown that seat belts save lives. And they can reduce the seriousness of injuries in a collision. Some of the worst injuries happen when people are thrown from the vehicle. Seat belts provide protection against that, and they reduce the risk of injury caused by striking the inside of the vehicle. Everyone in a motor vehicle needs to be buckled up all the time.

Unibelts

The outboard front and rear seats of your vehicle have combination lap/shoulder belts, or unbelted. The retractor is designed to lock during very sudden stops or impacts. The retractors will also lock if the belt webbing is jerked or pulled rapidly. This feature allows the shoulder part of the belt to move freely with you under normal conditions. But in a collision, the belt will lock and reduce the risk of your striking the inside of the vehicle or being thrown out.

Seat Belt Operating Instructions

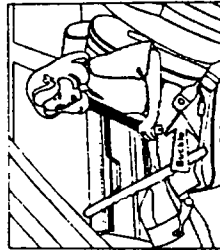
1. Enter the vehicle and close the door. Sit back and adjust the seat.



2. The latch plate of the belt is above the back of your seat. Grasp the latch plate and pull out the belt. Slide the latch plate up the webbing as far as necessary to make the belt go around your lap.



3. When the belt is long enough to fit, insert the latch plate into the buckle until you hear a "click."



WARNING! A belt buckled into the wrong buckle will not protect you properly. The lap portion could ride too high on your body, possibly causing internal injuries. Always buckle your belt into the buckle nearest you.

WARNING!

- A belt that is too loose will not protect you as well. In a sudden stop you could move too far forward, increasing the possibility of injury. Wear your safety belt snugly.
- A shoulder belt worn under your arm is very dangerous. Your body could fall into the inside surfaces of the vehicle in a crash, increasing head and neck injury. And a belt worn under the arm is very likely to break your ribs. Ribs aren't as strong as shoulder bones. Wear the belt over your shoulder so that your strongest bones will take the force in a collision.



4. Position the lap belt across your thighs, below your abdomen. If you need the lap portion tighter, pull up a bit on the shoulder part, as shown. A snug belt reduces the risk of sliding under the belt in a collision.

WARNING! A lap belt worn too high can increase the risk of internal injury in a collision. The belt forces won't be at the strong hip and pelvic bones, but across your abdomen. Always wear the lap part of your safety belt as low as possible, and keep it snug.



5. Position the shoulder belt on your chest so that it is comfortable and not resting on your neck. The retractor will withdraw any slack in the belt.

WARNING! A twisted belt can't do its job as well. In a collision it could even cut into you. Be sure your belt is not twisted. If your belt can't be untwisted, take it to your dealer and have it fixed.

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

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

WARNING! A frayed or torn belt could rip apart in a collision. It could leave you with no protection. Inspect your belts periodically, checking for cuts, frays, and loose parts. If you have been in a collision, have the belts checked, even though they may not show signs of damage. Have any damaged belt replaced.

Rear Center Lap Belts

Rear center seating positions have a lap belt only.

To fasten a lap belt, slip the latch plate into the buckle.

To lengthen the lap belt, tilt the latch plate and pull. To shorten the belt, pull the loose end of the webbing.

Wear the lap belt snug against the hips. Sit back and erect in the seat, then adjust the belt as tightly as is comfortable.

WARNING! A lap belt worn too loose or too high is dangerous.

A belt worn too loose can allow you to slip down and under the belt in a collision.

A belt that is too high will apply crash forces to the abdomen, not to the stronger hip bones.

In either case, the risk of internal injuries is greater. Wear a lap belt low and snug.

WARNING! Belting two people into one seat belt can lead to greater injury. People belted together can crash into one another in an accident, hurting one another badly. Never use a belt for more than one person, no matter what their size.

Seat Belts and Pregnant Women

We recommend that pregnant women use seat belts throughout their pregnancies. Keeping the mother safe is the best way to keep the baby safe.

Pregnant women should wear the lap part of the belt across the thighs and as snug against the hips as possible. Keep the belt low so that it does not come across the abdomen. That way the strong bones of the hips will take the force if there is a collision.

Seat Belt Extender

If a seat belt is too short, even when fully extended, your dealer can provide you with a seat belt extender. This extender should be used only if the existing belt is not long enough.

When it is not required, remove the extender and stow it.