N1856

REPORT NUMBER: CAL-93-N09

NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST

CHRYSLER CORPORATION
1993 DODGE RAM 150
PICK-UP

NHTSA NUMBER: MP0304

CALSPAN TEST NUMBER : 8058-5

January 19.1993

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FINAL REPORT

PREPARED FOR:

U. S. Department of Transportation
National Highway Traffic Safety Administration
Office of Market Incentives
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16. *Abstract*

A frontal load cell barrier test of a 1993 Dodge Ram 150 Pick-Up was performed at Calspan Advanced Technology Center crash test facility in Buffalo , New York on January 19, 1993.

The impact velocity was 56.6. kph and the temperature at the barrier face was - 2 deg. C. The maximum post-test vehicle crush was 821 mm. The test vehicle was equipped with a 3-point belt system at each of the front seating positions.

With regard to FMVSS 208 "Occupant Crash Protection" ,injury criteria. both the driver and passenger dummies appear to comply with the maximum head. chest and femur requirements.

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Section 1

PURPOSE AND TEST PROCEDURE

This 56.3 kph frontal barrier impact test is part of the Composite FY 92 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 48.3 kph requirements.

The 56.3 kph frontal barrier impact test was conducted in accordance with the Office of Market Incentives (OMI) Laboratory Indicant Test procedure.

Section 2

SUMMARY OF TEST

A load cell barrier consisting of 36 load cells was impacted by a 1993 Dodge Ram 150 Pick-Up at a velocity of 56.6 kph. The test was performed at the Calspan Corporation Advanced Technology Center on January 19,1993. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The frontal barrier impact event was documented by 1 real-time camera and 16 high-speed cameras. Camera locations and other pertinent camera information can be found in this report.

Two Part 572E, 50th percentile male anthropomorphic test devices (ATDs), were placed in the driver and right-front passenger seating positions according to dummy placement instructions specified in the 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. 150) was used in one previous test (MP5100) . The right-front passenger ATD (Serial No. 245) was used in two previous tests (MP5100 and MP0301). Injury criteria were not exceeded in either of these tests. Certification details, along with instrumentation calibration data, are found in Appendix C and D.

The 83 channels of data were recorded on a P.C. based data acquisition system. Appendix B contains the vehicle, load cell barrier and dummy response data traces. Pos. #1 - Belt Elongation and Pos. #1 - Upper Neck Fz did not record accurately. These channels were removed from this report. Load Cells B3 and B7 sustained an offset. These load cells were not used in the calculation of the load cell sums,

The driver's head struck the steering wheel rim ; the HIC was 433.8 . The maximum chest deceleration over 3 milliseconds was 31.9 g's and the maximum chest deflection was 30.1 mm. Femur loads were -7185.4 newtons on the left femur and -1731.3 newtons on the right femur.

The right front passenger's HIC was 353.6 . Maximum chest deceleration over 3 milliseconds was 36.7 g's and the maximum chest deflection was 29.8 mm . Femur loads were -1194.6 newtons on the left and -1250.3 newtons on the right.

Table 1

GENERAL TEST AND VEHICLE DATA

Vehicle Year/Make/Model/Body Style: 1993 Dodge Ram 150 Pick-Up

NHTSA Test No.: MP0304 VIN.: 1B7HE16X2PS128950

Body Color: White Date of Manufacture: 9/92

Date Received: 12/8/92

Odometer Reading: 58 Km

Engine:	6	Cylinders;	-	C.I.D.;	3.9	Liters;	-	CC
	X	Gas;	-	Diesel;	-	Turbocharged		
	X	Longitudinal;			-	Transverse		
Transmission:	3	Speed;	-	Manual;	X	Automatic;	-	Overdrive
Final Drive:	-	Front Wheel;	X	Rear Wheel;	-	Four Wheel		
Accessories:	-	A/C;	X	P/S;	X	P/B;	-	P/wdo
	-	Tilt Wheel;	-	P/seats;	-	Cruise Control	-	Other

Type of Occupant Restraint: 3 - Point Continuous Belt System

DATA RECORDED FROM VEHICLE'S TIRE PLACARD:

Tire Pressure (at capacity): Front 241 kPa, Rear 283 kPa

Recommended Tire Size: P235/75R15XL

Recommended Cold Tire Pressure: Front 241 kPa, Rear 283 kPa

Tires on Vehicle: P235/75/R15WX4 Manufacturer: Michelin

Number of Occupants:	3	Front;	-	Rear;	-	3rd Seat;	3	TOTAL
Type of Front Seats:	-	Bucket;	X	Bench;	-	Split Bench		
Type of Front Seat Back:	X	Fixed;	-	Adj. with	-	Lever	-	Rot. Knob

Rated Cargo and Luggage Weight (RCLW) A-B = 136 kgs.

GVWR 2812 kgs. GAWR: Front 1270 kgs. Rear 1663 kgs.

Table 1

GENERAL TEST AND VEHICLE DATA (cont'd)

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with maximum fluids) = UDW:

Right Front = 481 kgs. Right Rear = 358 kgs.

Left Front = 522 kgs. Left Rear = 381 kgs.

TOTAL FRONT WEIGHT = 1003 kgs. (58 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 739 kgs. (42 % of Total Vehicle Weight)

TOTAL DELIVERED WEIGHT = 1742 kgs.

CALCULATION FOR TARGET TEST WEIGHT:

UDW = Unloaded Delivered Weight (1742 kgs.)

DSC = Designated Seating Capacity (3)

RCLW = 136 kgs.

Target Test Weight = UDW + RCLW + (2 dummies x 74.4 kgs./ dummy)

Target Test Weight = 2029 kgs.

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 136 KGS CARGO:

Right Front = 513 kgs. Right Rear = 476 kgs.

Left Front = 544 kgs. Left Rear = 494 kgs.

TOTAL FRONT WEIGHT = 1057 kgs. (52 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 970 kgs. (48 % of Total Vehicle Weight)

TOTAL TEST WEIGHT = 2027 kgs.

Weight of ballast secured in vehicle trunk area = 45 kgs.

VEHICLE ATTITUDE (all dimensions in mm):

Delivered Attitude:	RF	813	LF	805	RR	838	LR	838
Test Attitude:	RF	793	LF	791	RR	815	LR	816

Wheel Base: 3334 mm.; C.G. = 1600 mm. rearward of front wheel C/L

Remarks: 106 liters of stoddard solution was placed in the fuel tank.

Table 1

GENERAL TEST AND VEHICLE DATA (cont'd)

POST -IMPACT DATA:

Type of Test: Frontal Barrier Impact Angle: 0 deg.

Date of Test: 1/19/93 Time of Test; 12:20

Ambient Temperature: -2 ° C at impact area

Temperature in Occupant Compartment: 21 ° C

Windshield Molding Temperature: 21 ° C

Required Impact Velocity Range: 55.5 to 57.1 kph

Impact Velocity: primary = 56.6 kph, secondary = 56.6 kph

Distance From Front Bumper to Barrier Face When

Entering Speed Trap: 1321 mm

Exiting Speed Trap: 305 mm

VEHICLE REBOUND AND CRUSH (mm):

Vehicle Length:	Pre-test = R	5550	C_L	5605	L	5550
	Post-test = R	4758	C_L	4784	L	4800
	Crush = R	792	C_L	821	L	750

Distance from front of test vehicle to point of impact:

R 317 C_L 330 L 331

VISIBLE DUMMY CONTACT POINTS:

	Driver	Passenger
Head	Upper Steering Wheel Rim	No Contact
Chest	Steering Wheel Rim	No Contact
Abdomen	Lower Steering Wheel	No Contact
Left Knee	Dashpanel	Lower Dashpanel
Right Knee	Dashpanel	Lower Dashpanel

Table 1

GENERAL TEST AND VEHICLE DATA (cont'd)

	Front		Rear	
	Left	Right	Left	Right
Door Opening	Closed - Oper.	Closed - Oper	-	-

	Front		Rear	
Seat Movement	Left	Right	Left	Right
Seat Back Failure	None	None	-	-
Seat Shift (mm.)	0.0	0.0	-	-

Glazing Damage

Backlight/Windshield: Windshield sustained stress fractures but remained intact.

Other Notable Impact Effects: Steering column dropped.

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 Performance Assessment Data
4. Camera Locations
5. 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.: MP0304 Vehicle: 1993 Dodge Ram 150 Pick-Up

	MAXIMUM HEAD ACCELERATION (g's)			
	X	Y	Z	R
Position #1 - Driver	-58.5	-8.3	29.3	58.7
Position #2 - Passenger	-42.7	-5.5	32.5	53.4

	MAXIMUM CHEST ACCELERATION (g's)			
	X	Y	Z	R*
Position #1 - Driver	-35.5	-8.6	16.1	31.9
Position #2 - Passenger	-36.0	-14.2	-18.6	36.7

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

	MAXIMUM FORCE - FEMUR LOAD (kgs)	
	LEFT FEMUR	RIGHT FEMUR
Position #1 - Driver	-7185.4	-1731.3
Position #2 - Passenger	-1194.6	-1250.3

	MAXIMUM FORCE - SEAT BELT LOADS (kgs)		
	SHOULDER STRAP UPPER BELT LOAD	LAP STRAP RIGHT BELT LOAD	LAP STRAP LEFT BELT LOAD
Position #1 - Driver	5932.7	-	4805.1
Position #2 - Passenger	5882.6	5851.5	-

	HEAD INJURY CRITERIA (HIC)			
	HIC**	t_1 (msec)	t_2 (msec)	Average Acceleration t_1 to t_2
Position #1 - Driver	433.8	61.44	97.32	42.95
Position #2 - Passenger	353.6	85.44	121.32	39.6

** HIC is as defined in FMVSS 208. The maximum time interval from t_1 to t_2 is 36 milliseconds.

Table 3

HYBRID III NECK AND CHEST DATA SHEET

Vehicle Year/Make/Model/Body Style: 1993 Dodge Ram 150 Pick-Up

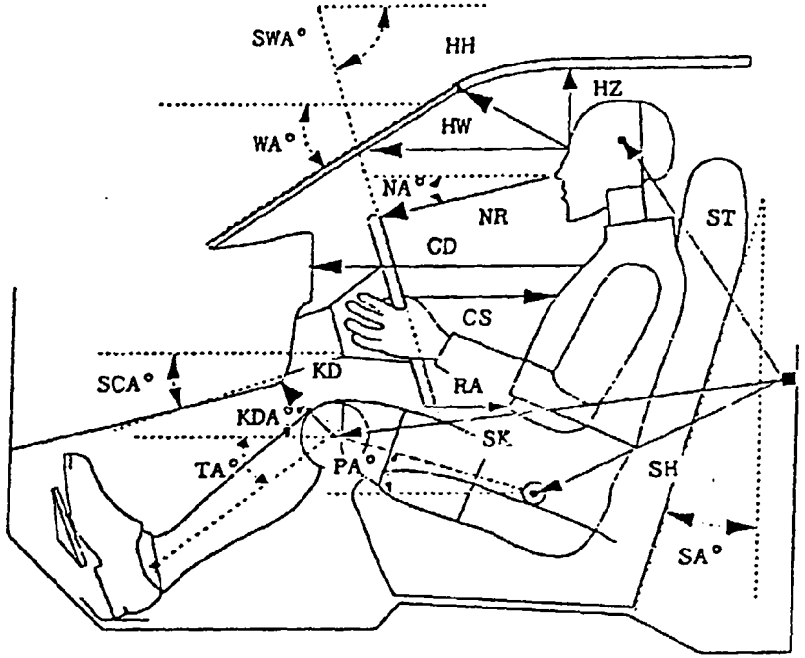
Vehicle NHTSA No.: MP0304 Test Date; 1/19/93

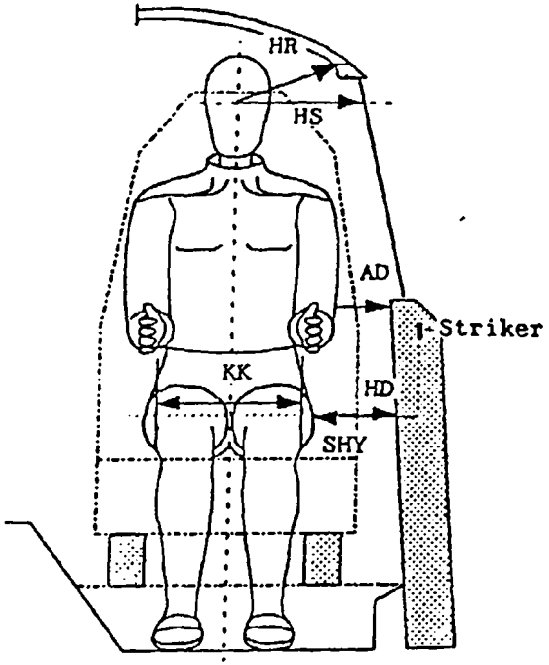
MAXIMUM VALUES	DRIVER DUMMY ID # : 150	PASSENGER DUMMY ID # : 245
Neck Load X (nwt)	1537.5	1577.6
Neck Load Y (nwt)	-162.4	-251.0
Neck Load Z (nwt)	N/A	1455.4
Neck Moment X (nwt-m)	19.0	16.9
Neck Moment Y (nwt-m)	-81.9	73.8
Neck Moment Z (nwt-m)	6.7	11.7
Chest Deflection X (mm.)	29.8	30.1
Time of Max. Occurrence (msec)	86.9	112.2

Note: All values listed must occur during the primary impact event.

Figure 1

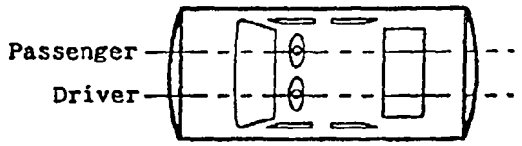
DUMMY MEASUREMENTS FOR FRONT SEAT PASSENGERS





HH - Head to Header
HW - Head to Windshield
HZ - Head to Roof
NR - Nose to Rim
CS - Steering Wheel to Chest
CD - Chest to Dash
RA - Rime to Abdomen
KDL/KDR - Knee to Dash
KDA - Knee to Dash Angle
SH - Striker to H-Point
SK - Striker to Knee
ST - Striker to Head
NA - Nose to Rim Angle
TA - Tibial Angle
PA - Pelvic Angle
SA - Seat Back Angle
SCA - Steering Column Angle
SWA - Steering Wheel Angle.
WA - Windshield Angle
HR - Head to Side Header
HS - Head to Side Window
AD - Arm to Door
HD - H-Point to Door
SHY - Striker to H-Point (Y Dir.)
KK - Knee to Knee

Vertical Longitudinal Planes



Vertical Transverse Plane

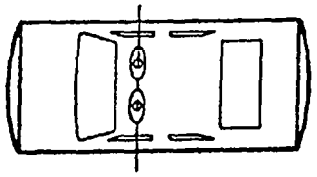


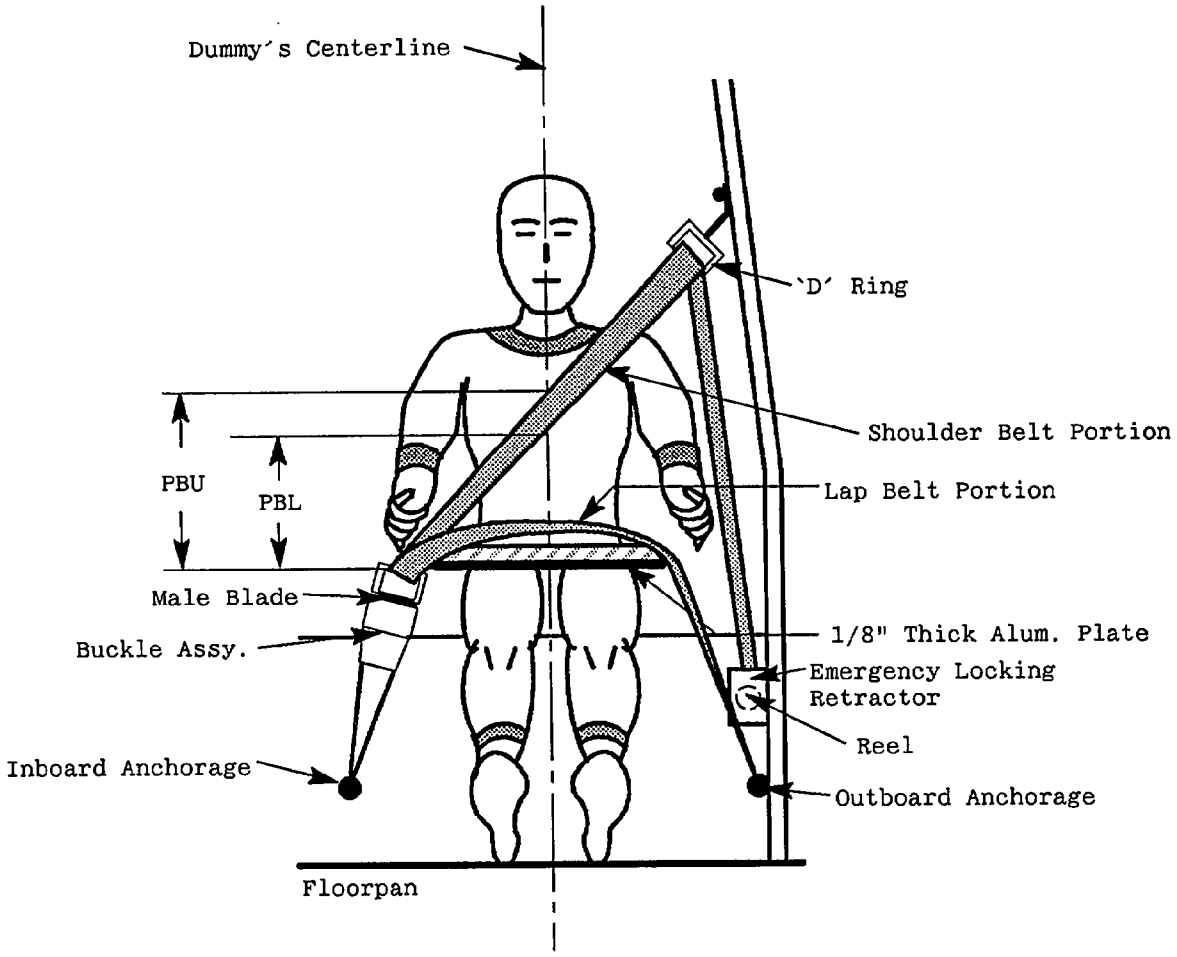
Table 4

FRONT SEAT OCCUPANT MEASUREMENTS

	DRIVER (Serial # 150)		PASSENGER (Serial # 245)	
WA°	47 deg		47 deg	
SWA°	66 deg		N/A	
SCA°	24 deg		N/A	
SA°	Fixed		Fixed	
HZ	235 mm		224 mm	
HH	495 mm		493 mm	
HW	606 mm		599 mm	
HR	219 mm		221 mm	
NR	358 mm	Angle 16 deg	N/A	
CD	578 mm		612 mm	
CS	305 mm		N/A	
RA	169 mm		N/A	
KDL	215 mm	Angle (KDA) 10 deg	283 mm	
KDR	246 mm		284 mm	Angle (KDA) 18 deg
PA°	24 deg		24 deg	
TA°	56 deg		53 deg	
KK	266 mm		250 mm	
ST	650 mm	Angle 65 deg	630 mm	Angle 70 deg
SK	704 mm	Angle 0 deg	668 mm	Angle 0 deg
SH	318 mm	Angle 15 deg	269 mm	Angle 15 deg
SHY	258 mm		255 mm	
HS	225 mm		230 mm	
HD	137 mm		120 mm	
AD	100 mm		90 mm	

Figure 2

SEAT BELT POSITIONING DATA



Front View of Driver Dummy

	DRIVER DUMMY (inches)	PASSENGER DUMMY (inches)
PBU -- Top surface of alum. plate to upper edge	325 mm	332 mm
PBL -- Top surface of alum. plate to belt lower edge	245 mm	248 mm
LAP BELT TENSION	-	-
SHOULDER BELT TENSION	0.9 kgs	0.9 kgs

8058-5

Table 5

SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:	Driver	Passenger
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	2470 mm	2425 mm
Shoulder belt length as measured on Part 572 Dummy.	820 mm	790 mm
Lap belt length as measured on Part 572 Dummy.	920 mm	900 mm
SHOULDER BELT SPOOL-OFF DATA:		
As determined by film analysis.	76 mm	76 mm
As determined mechanically.	80 mm	110 mm
As determined electronically.	121 mm	96 mm
BELT STRETCH DATA:		
Measured electronically between shoulder belt load cell and the "D" ring.	N/A	45.7 mm/M
Measured mechanically.	0 mm/M	0 mm/M

Figure 3

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera Information Shown on Table 4

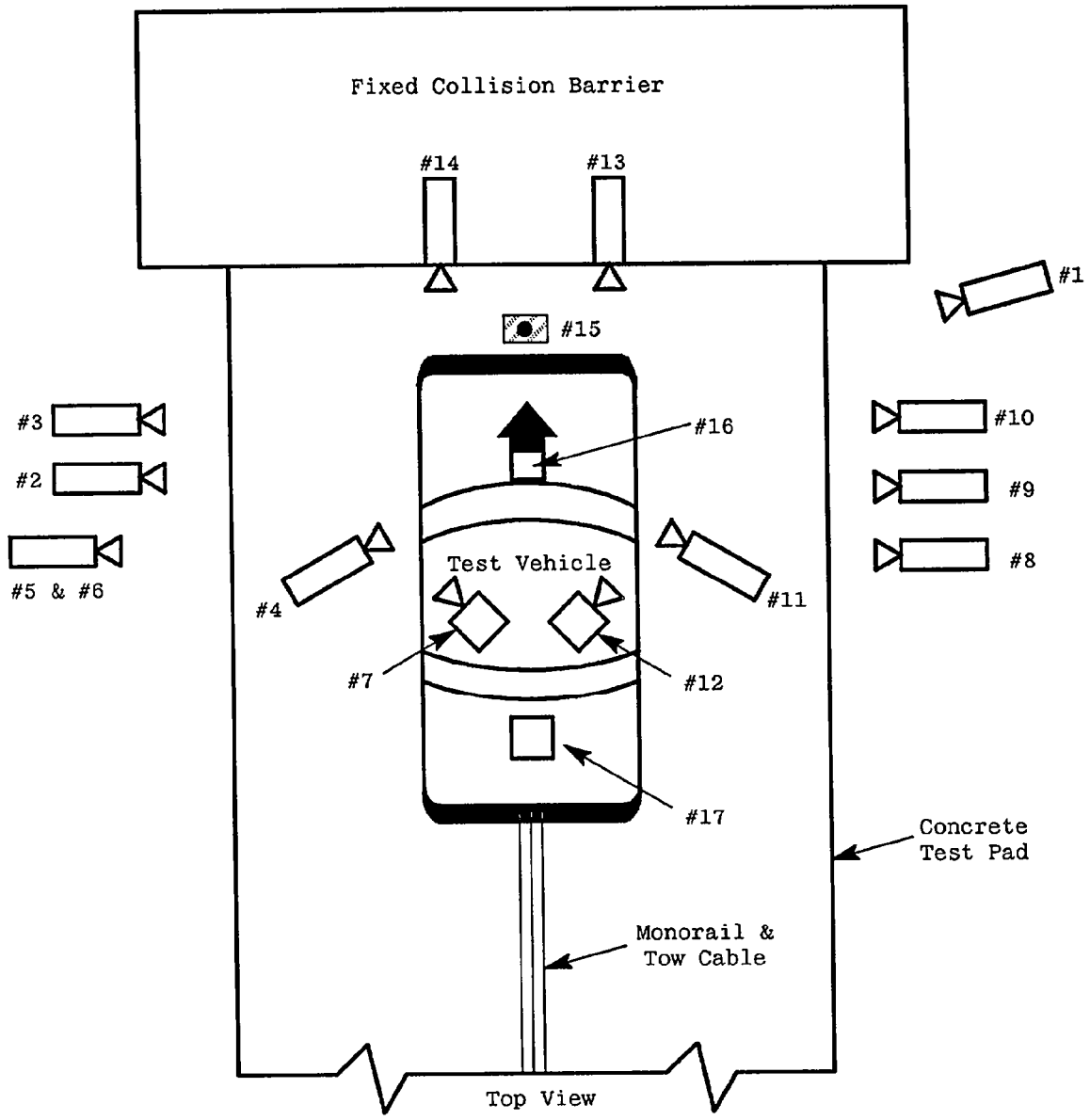


Table 6

HIGH-SPEED CAMERA LOCATIONS

Test No. MP0304 Vehicle: 1993 Dodge Ram 150 Pick-Up

CAMERA NO.	VIEW	CAMERA POSITIONS (MM.)* X	Y	Z	ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	6985	1701	1067	-2	6415	13	550
3	Left Side View	8636	1067	1041	-2	8066	25	620
4	Driver and Interior View	3124	2896	1778	-14	2554	13	580
5	Steering Column (Bottom)	7391	1930	1168	-3	6821	25	N.T.
6	Steering Column (Top)	7391	1930	1778	-8	6821	25	770
7	Left Belt	-	-	-	-	-	8	N.T.
8	Overall Right Side	6909	1905	1092	-2	6339	13	560
9	Right Side View	8357	1295	1041	0	7787	25	550
10	Right Passenger View	8636	1930	1448	-2	8066	25	540
11	Passenger and Interior View	3040	2794	1727	-12	-	13	580
12	Right Belt	-	-	-	-	-	8	N.T.
13	Passenger Front View	610	-127	1778	-28	-	13	640.
14	Driver Front View	610	-127	1778	-26	-	13	600
15	Windshield View	0	0	3048	-45	-	13	600
16	Pit View of Engine	0	0	-3048	90	-	13	630
17	Pit View of Fuel Tank	0	3432	-3048	90	-	13	790

*X = film plane to monorail centerline

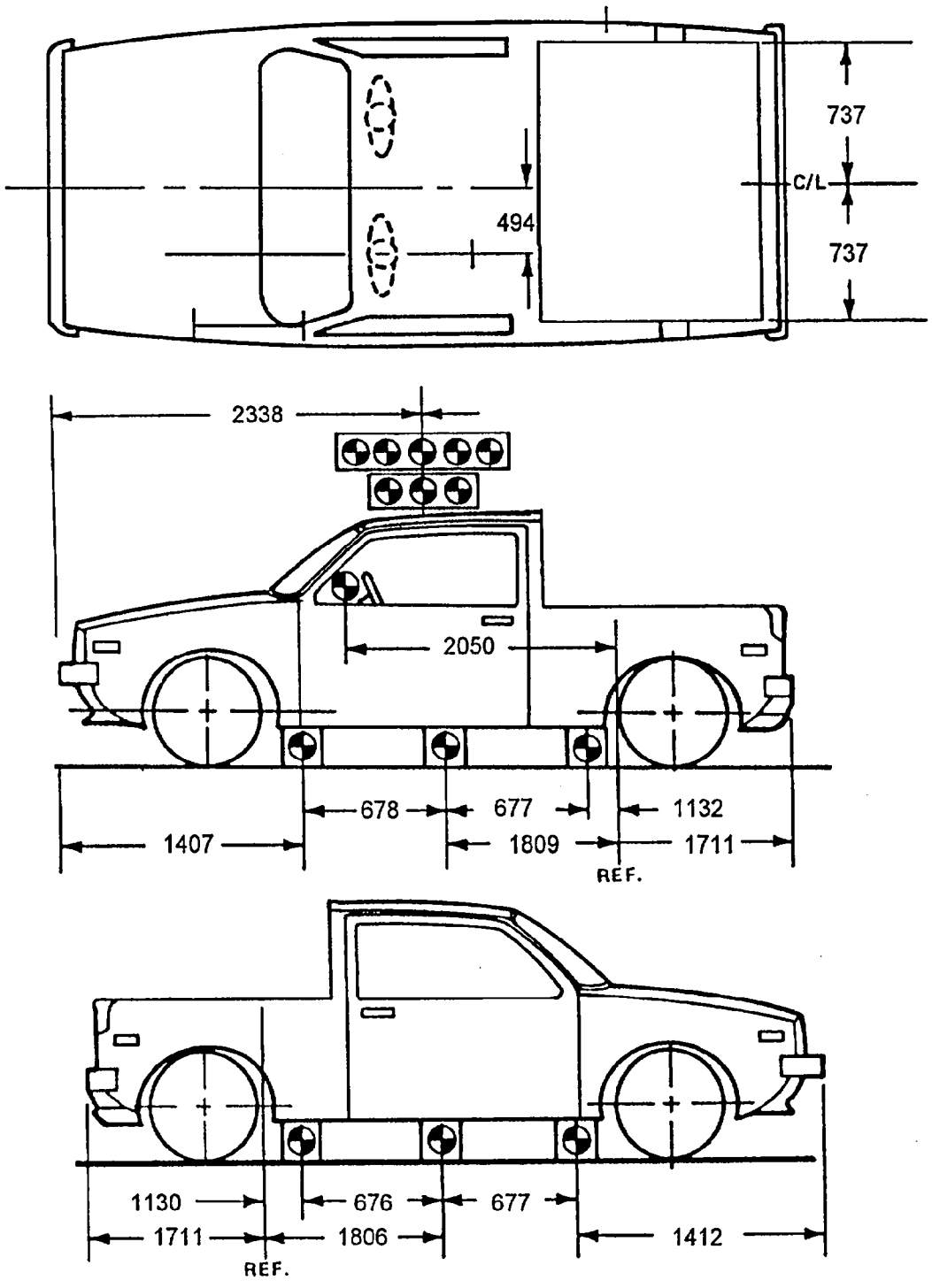
Y = film plane to impact location

Z = film plane to ground

** = referenced to horizontal plane

N.T. indicates that timing did not recorded for this particular camera

Figure 4
VEHICLE TARGET LOCATIONS

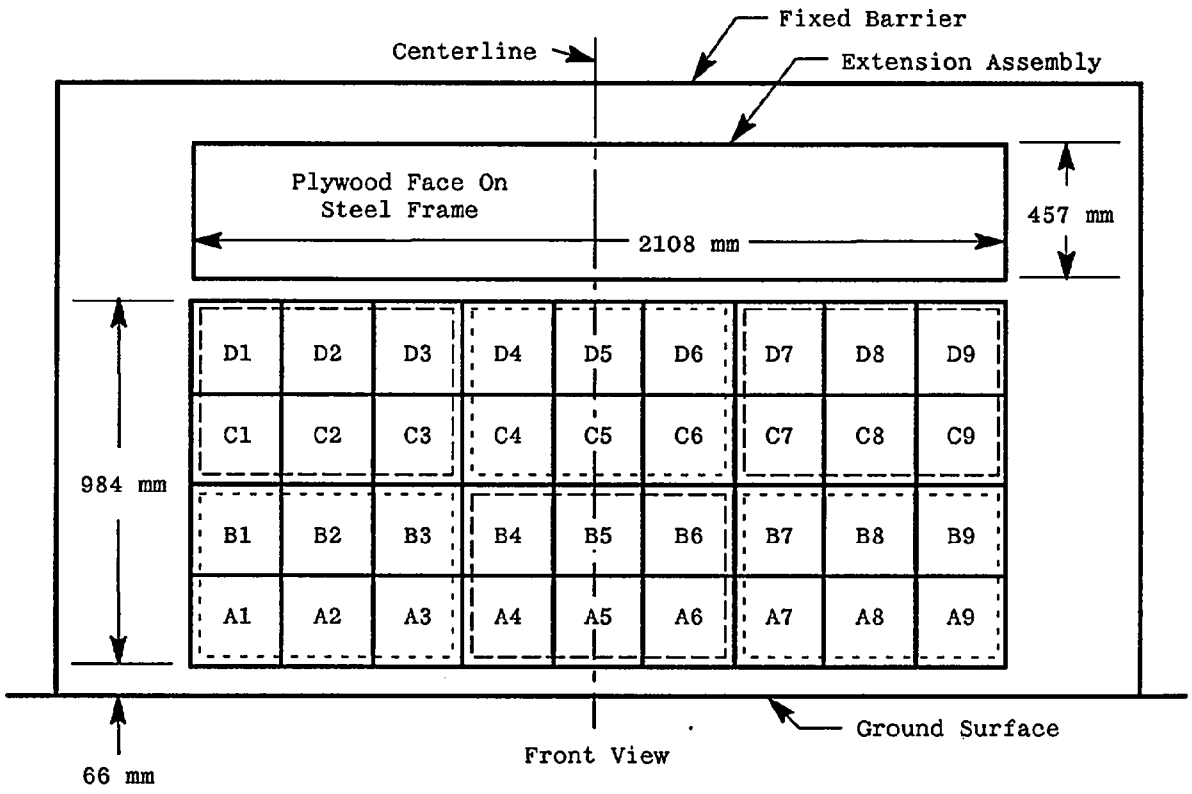


DIMENSIONS ARE IN MILLIMETERS

Figure 5

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

The following data is presented in Appendix B:

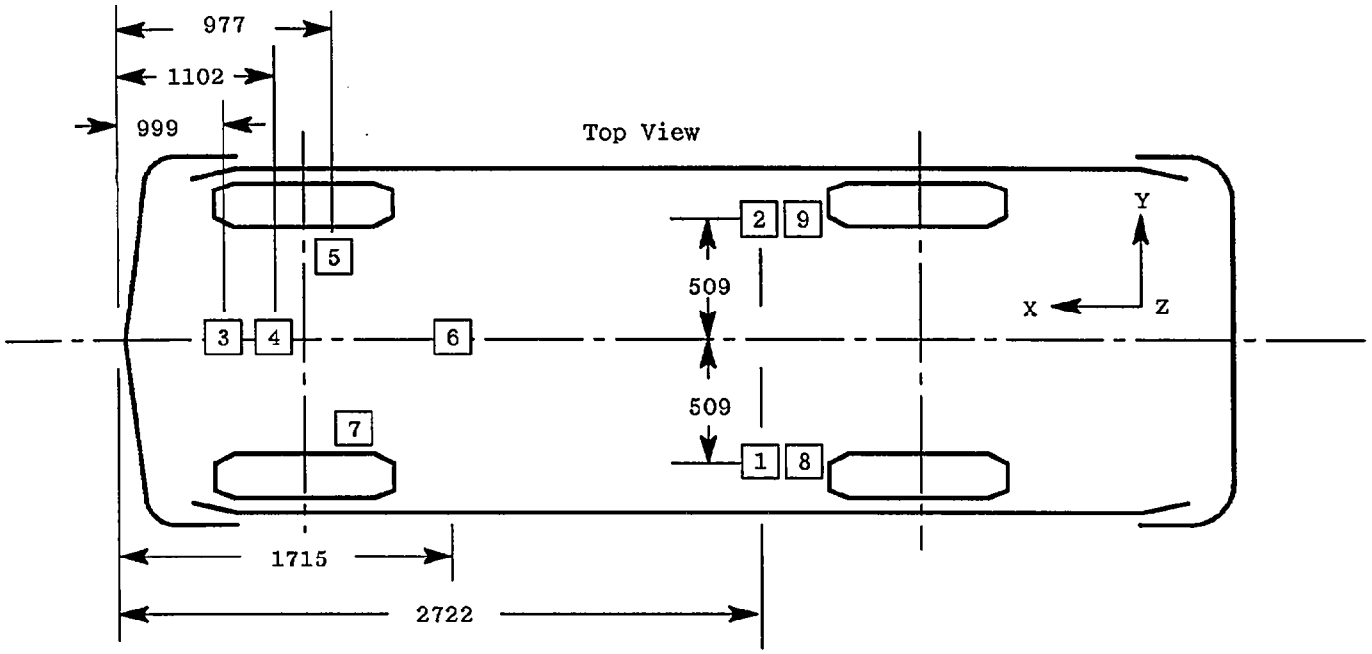
(1) Data from 36 individual load cells

(2) Total or Sum of 36 individual load cells

(3) Data from 6 Groupings shown above (6 cells/group)

Figure 6

VEHICLE ACCELEROMETER LOCATIONS



All dimensions are in millimeters

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

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

Figure 7

TEST VEHICLE MEASUREMENTS

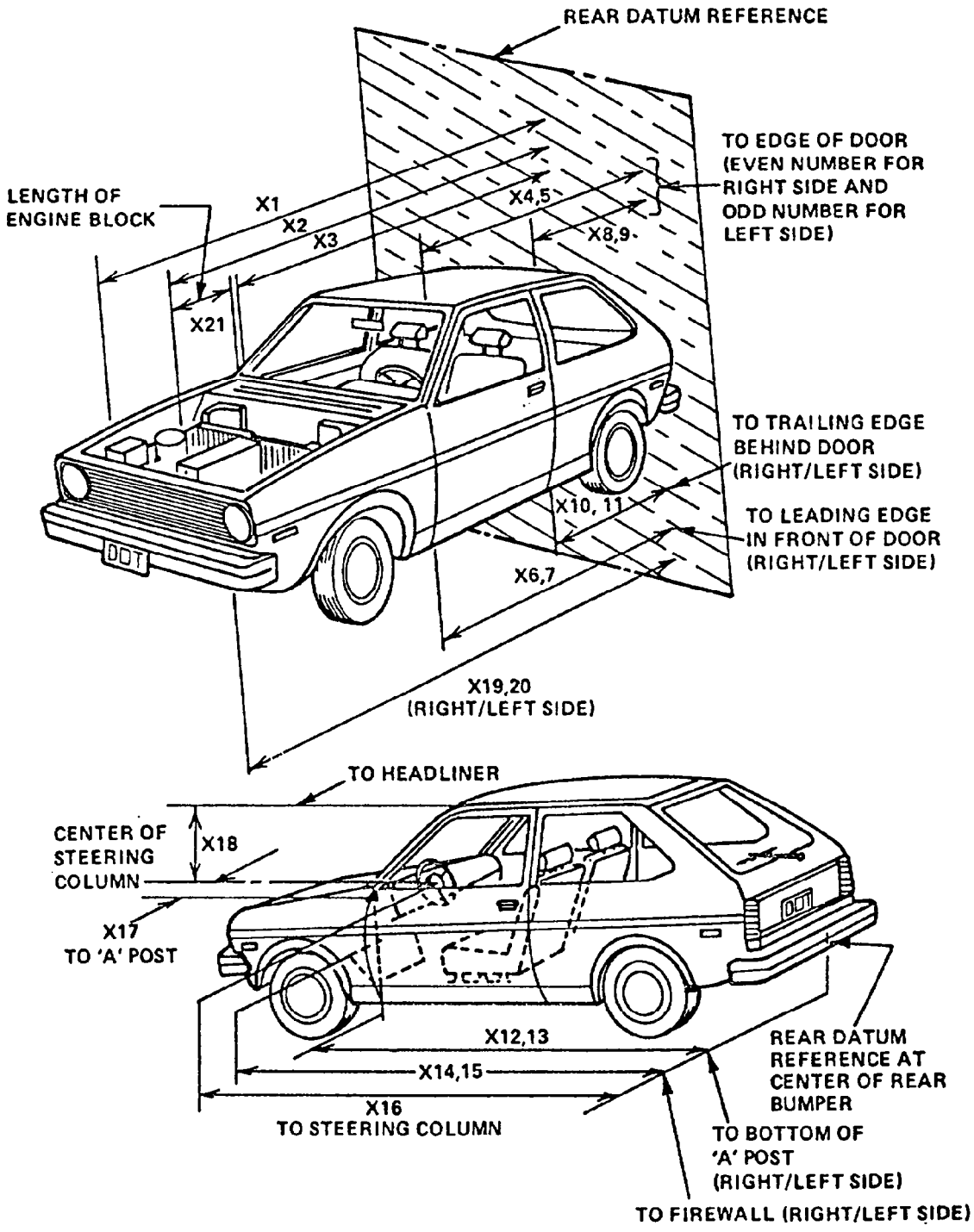


Table 7

VEHICLE MEASUREMENTS

No.		All Dimensions in mm		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	5606	4784	821
X2	Rear Surface of Vehicle to Front of Engine	4810	4520	290
X3	Rear Surface of Vehicle to Firewall	4250	4160	90
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	3920	3895	25
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	3932	3786	146
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	3936	3840	96
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	3940	3835	105
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	2894	2845	49
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	2900	2775	125
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	2893	2865	28
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	2899	2806	93
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	3936	3900	36
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	3940	3856	84
X14	Rear Surface of Vehicle to Firewall, Right Side	4245	4150	95
X15	Rear Surface of Vehicle to Firewall, Left Side	4260	4098	162
X16	Rear Surface of Vehicle to Steering Column	3585	3410	175
X17	Center of Steering Column to "A" Post	395	320	75
X18	Center of Steering Column to Headliner	475	685	-210
X19	Rear Surface of Vehicle to Right Side of Front Bumper	5550	4758	792
X20	Rear Surface of Vehicle to Left Side of Front Bumper	5550	4800	750
X21	Length of Engine Block	510	510	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	3850	3770	80
CD	Rear Surface of Vehicle to Center of Dash Panel	3820	3680	140
LD	Rear Surface of Vehicle to Left Side of Dash Panel	3840	3670	170

Table 8

ACCIDENT INVESTIGATION DIVISION DATA

FOR 56.3 KPH FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: 1993 Dodge Ram 150 Pick-Up

Vehicle NHTSA No.: MP0304 VIN: 1B7FHE16X2PS128950

Model Year: 1993 Build Date: 9/92 Test Date: 1/19/93

Vehicle Size Category: Full Size Pick-Up Test Weight: 2027 Kgs

Vehicle Wheelbase: 1600 mm; Front Overhang: 1467 mm; Overall Width: N/A mm

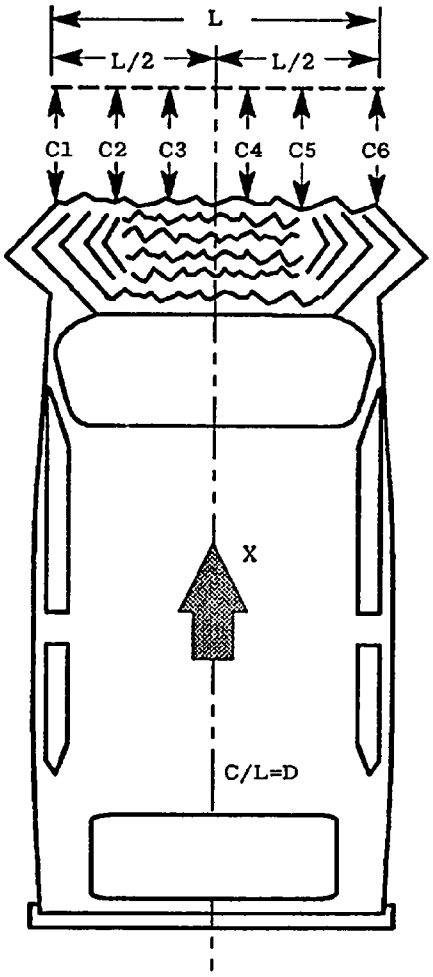
Collision Deformation Classification (CDC) Code: 12FDEW3

Crush Depth Dimensions:

C1=	730	mm
C2=	776	mm
C3=	833	mm
C4=	820	mm
C5=	803	mm
C6=	780	mm

Midpoint of Damage: D = Vehicle Centerline (Longitud.)

Length of Damaged Region: L= 1920 mm



Appendix A

PHOTOGRAPHS

PHOTOGRAPHS

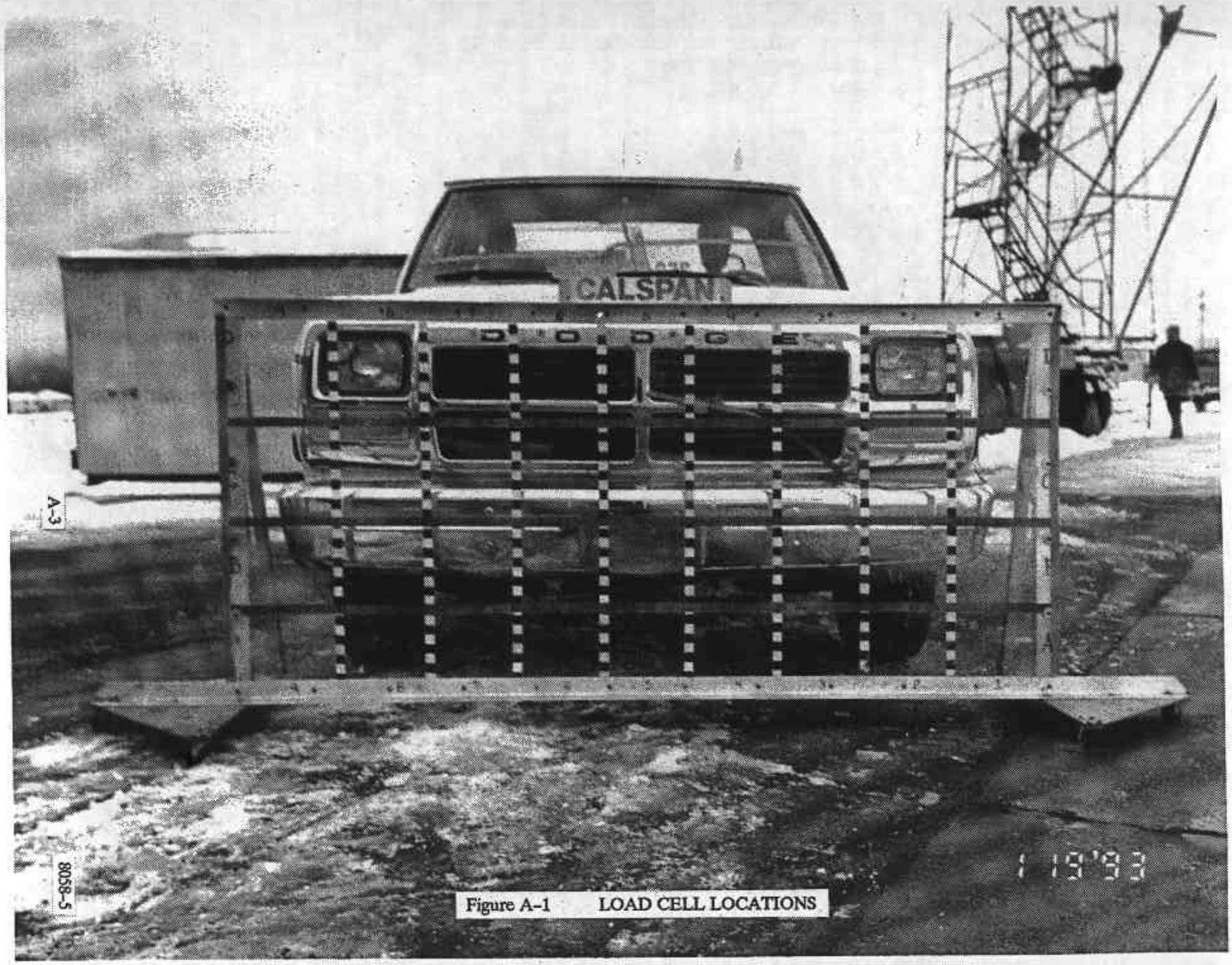


Figure A-1 LOAD CELL LOCATIONS

Figure A-2 PRE-TEST FRONT VIEW

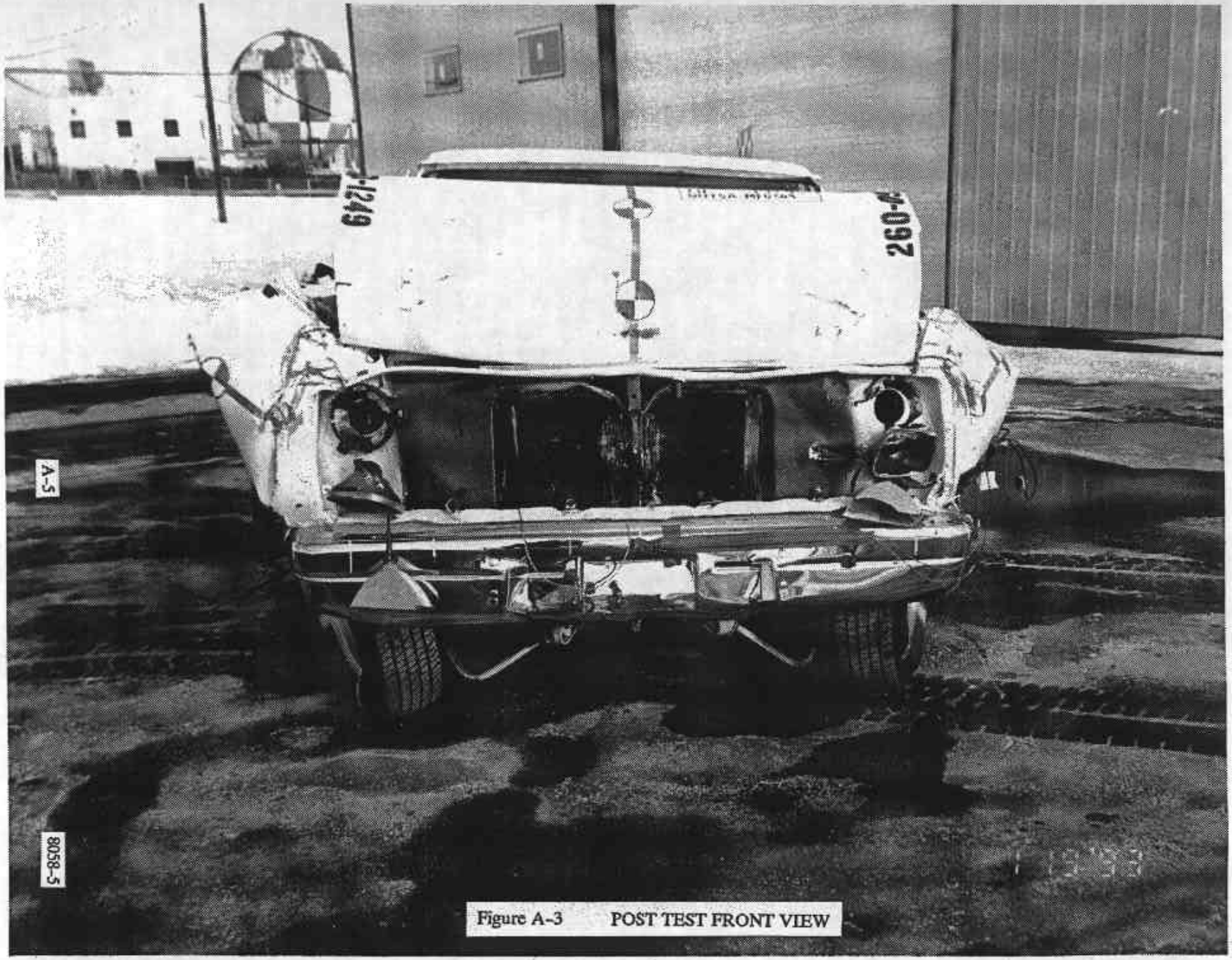


Figure A-3 POST TEST FRONT VIEW

Figure A-4 PRE-TEST LEFT SIDE VIEW

Figure A–5 POST TEST LEFT SIDE VIEW

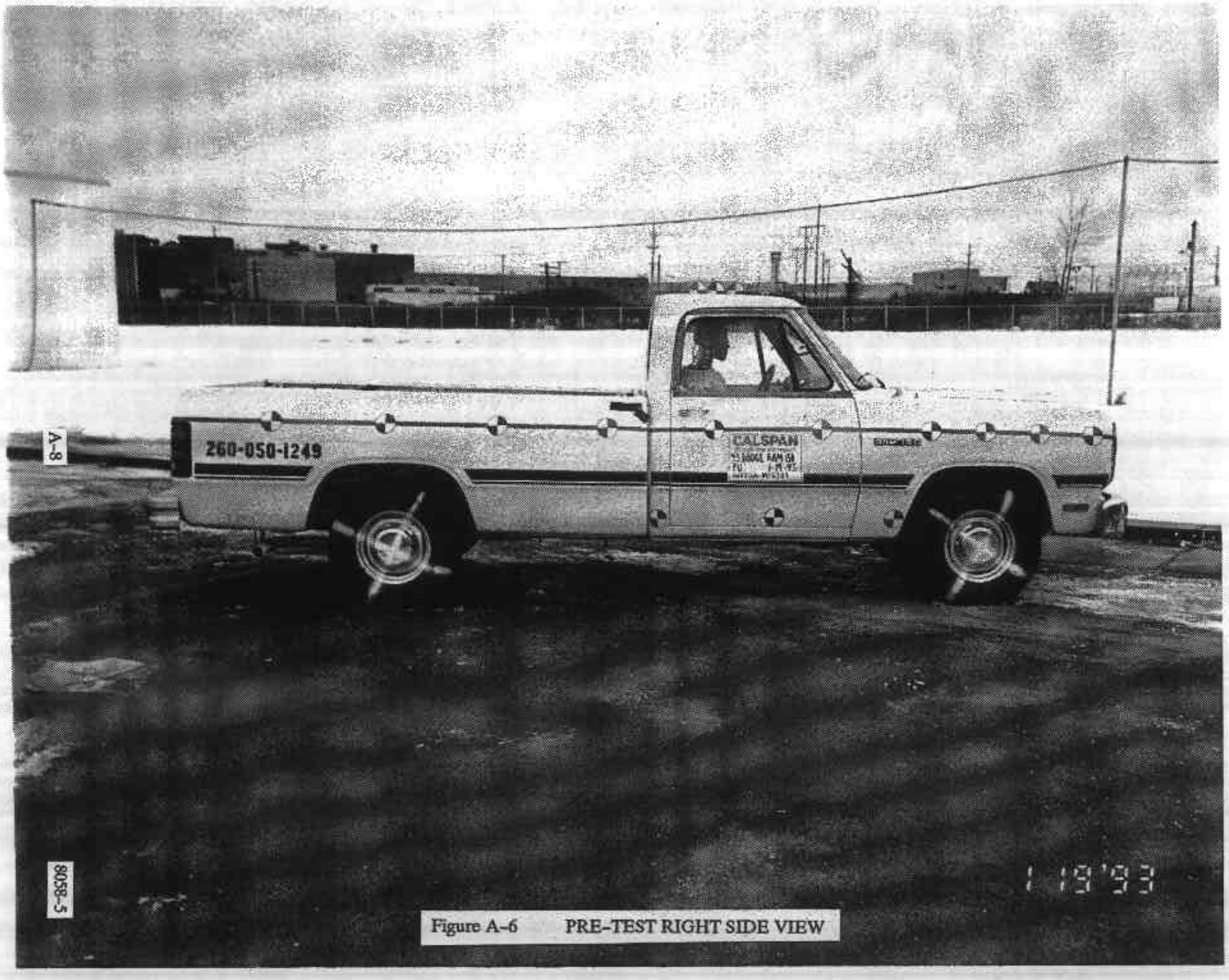


Figure A-6 PRE-TEST RIGHT SIDE VIEW

Figure A-7 POST-TEST RIGHT SIDE VIEW

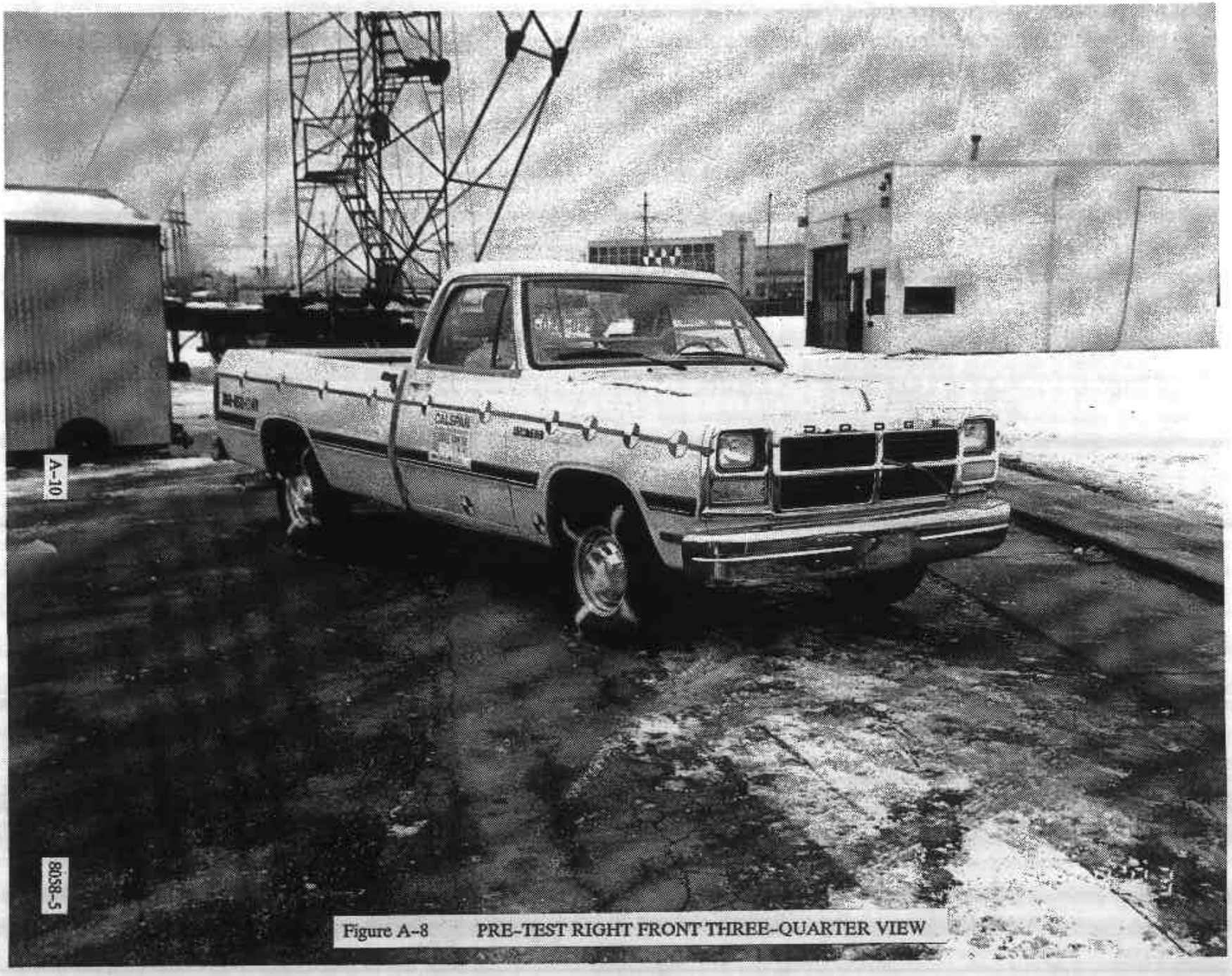


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Figure A-8 PRE-TEST RIGHT FRONT THREE-QUARTER VIEW

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

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

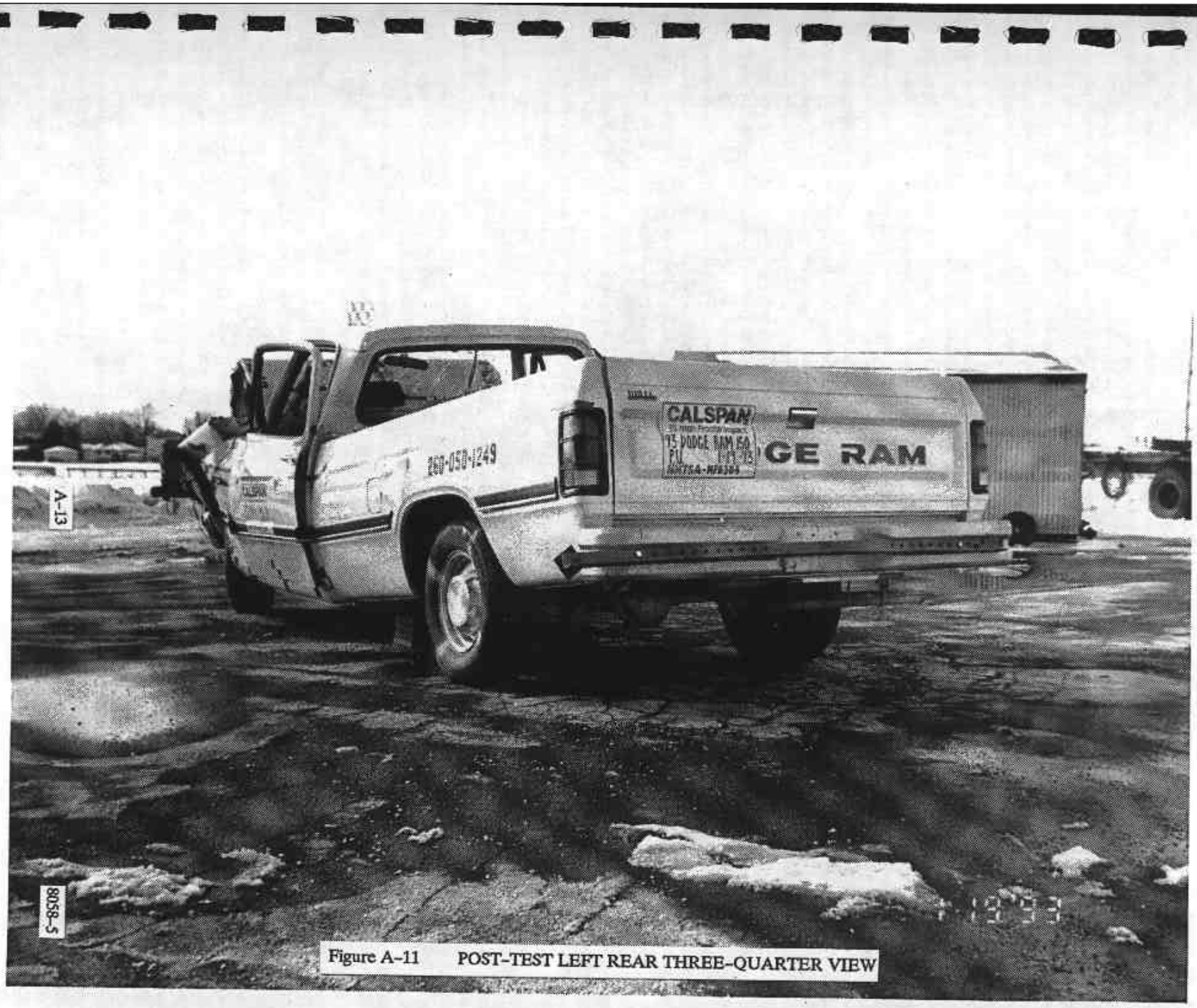

Figure A–11 POST-TEST LEFT REAR THREE-QUARTER VIEW

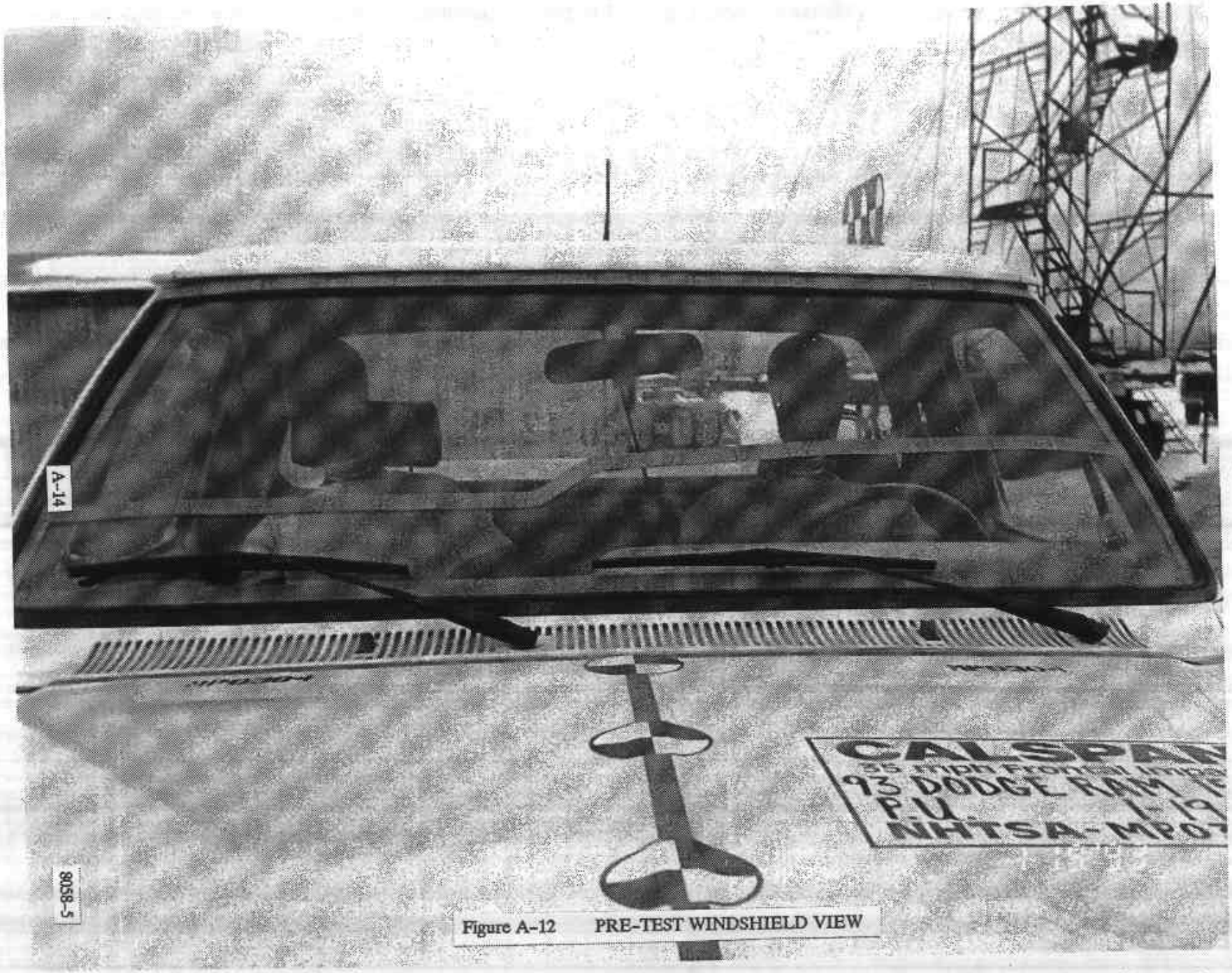

Figure A-12 PRE-TEST WINDSHIELD VIEW

Figure A-13 POST-TEST WINDSHIELD VIEW

8058-S

Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

Figure A-15 FUEL CAP VIEW

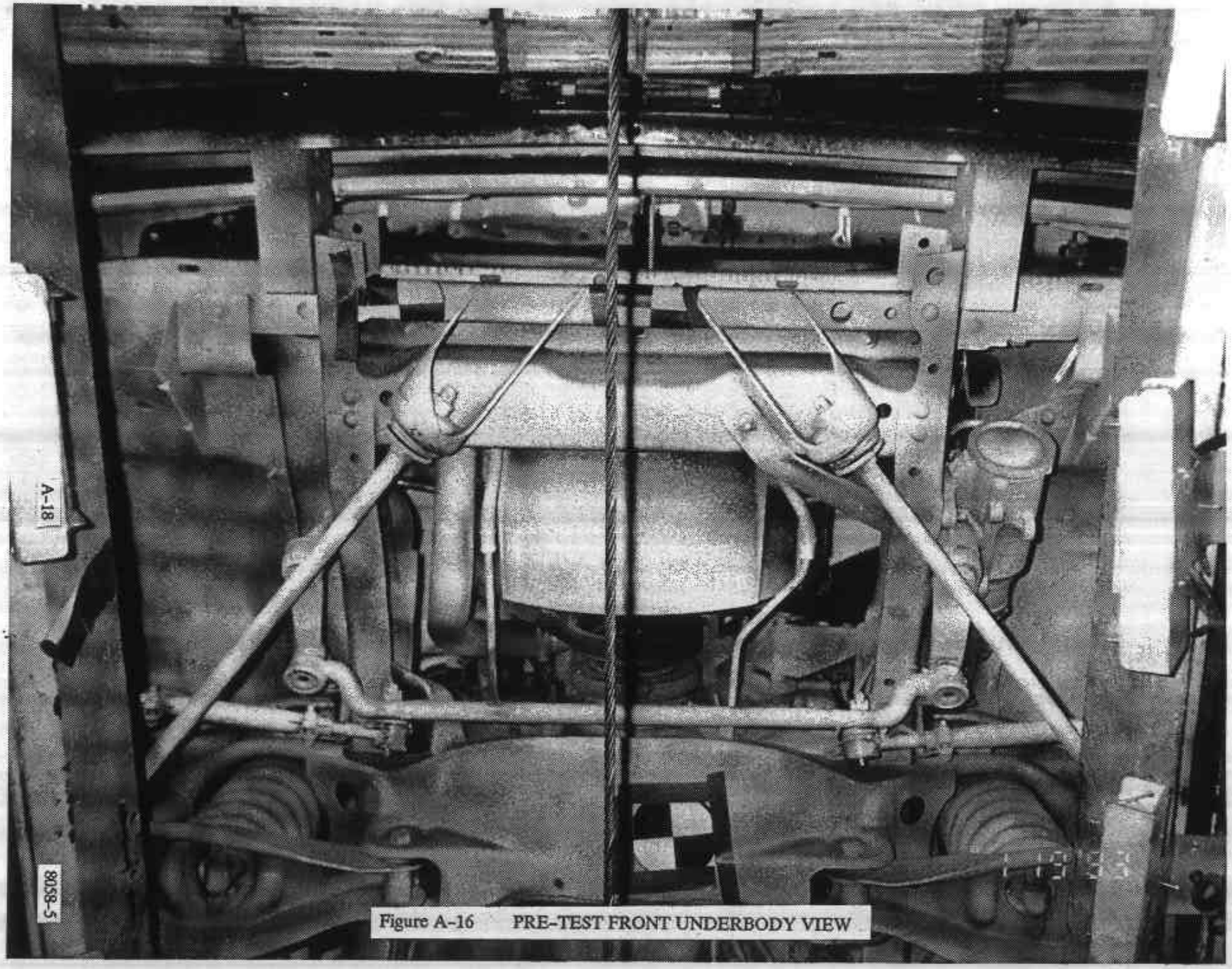

Figure A-16 PRE-TEST FRONT UNDERBODY VIEW

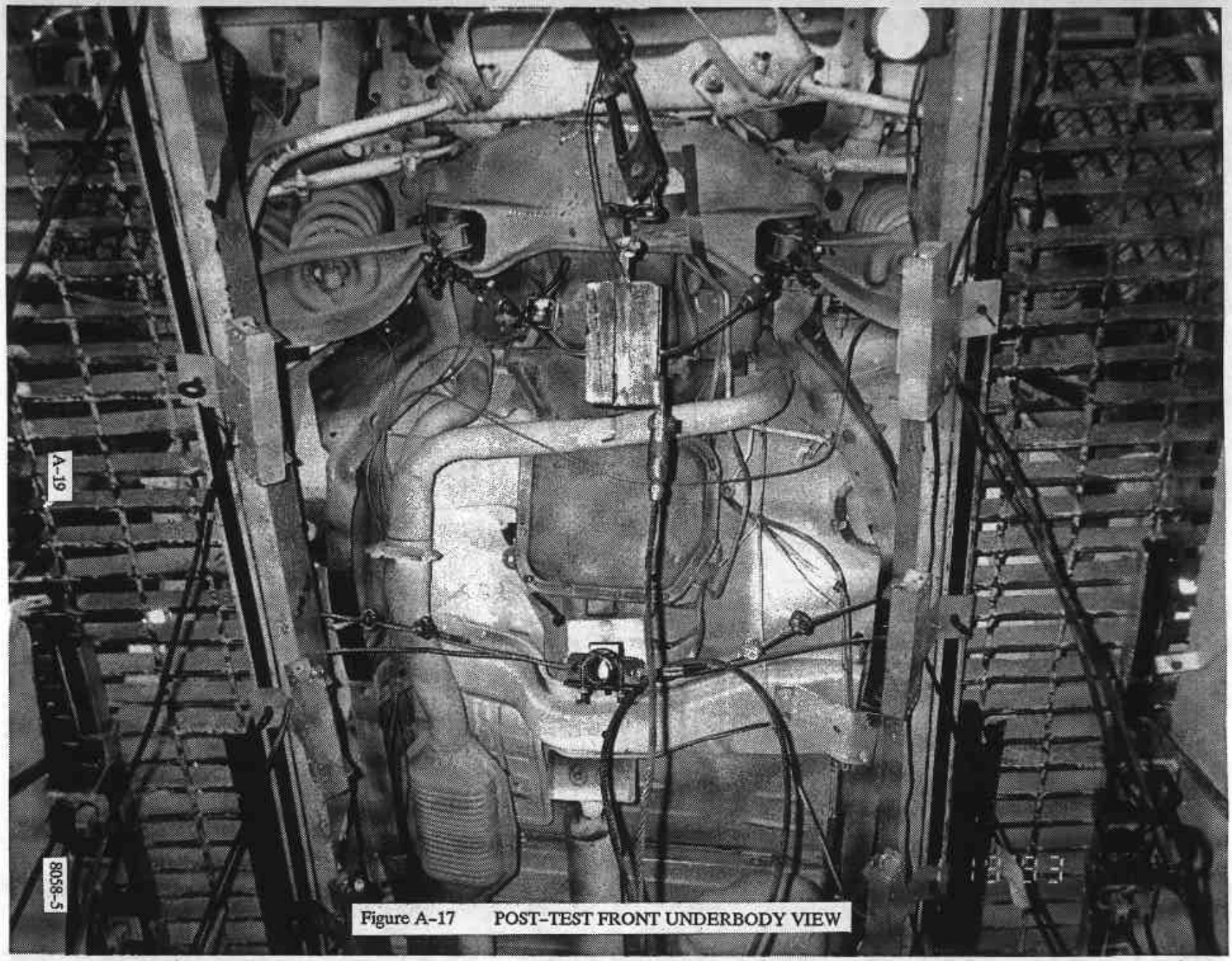

Figure A–17 POST–TEST FRONT UNDERBODY VIEW

8058–5

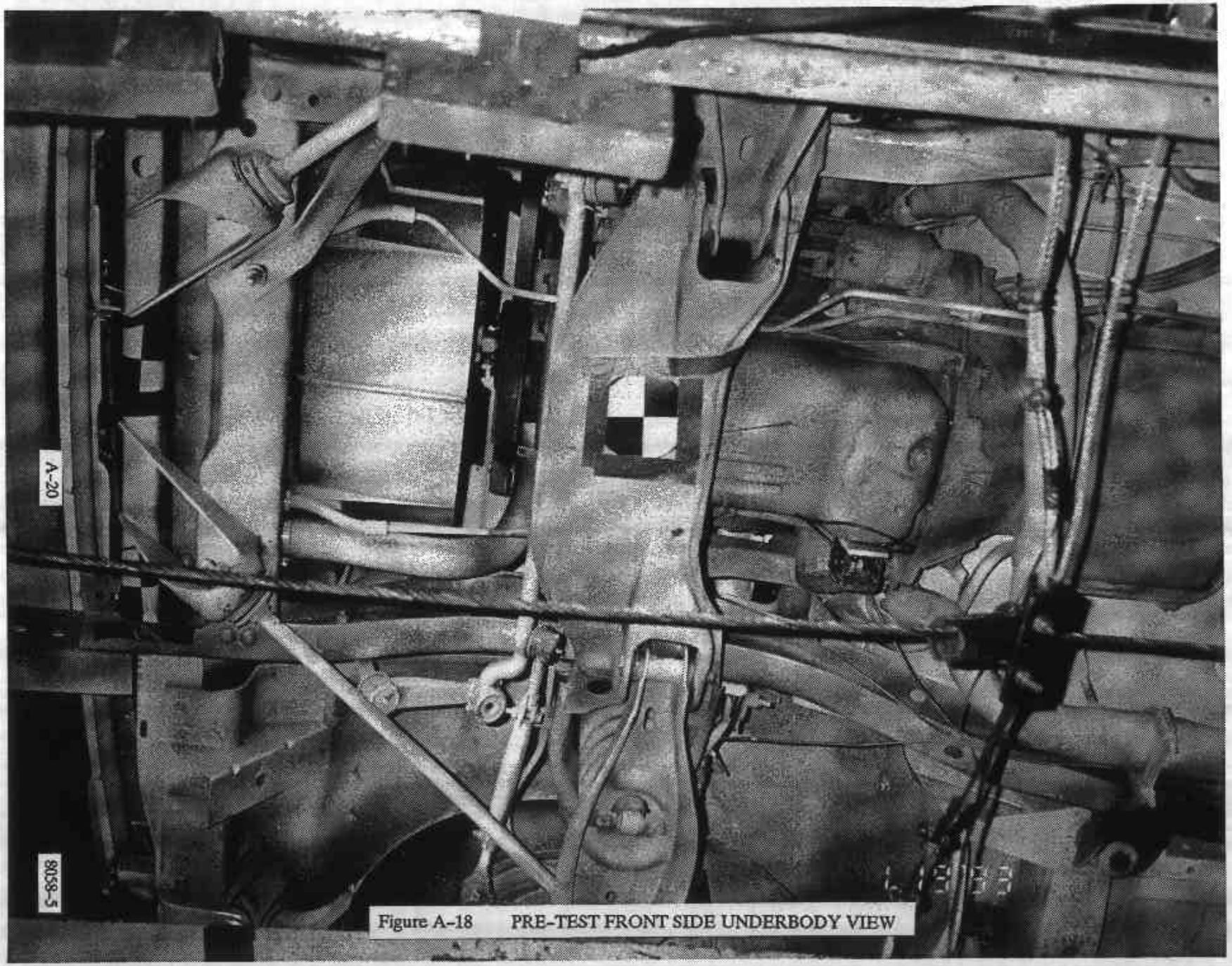

Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW

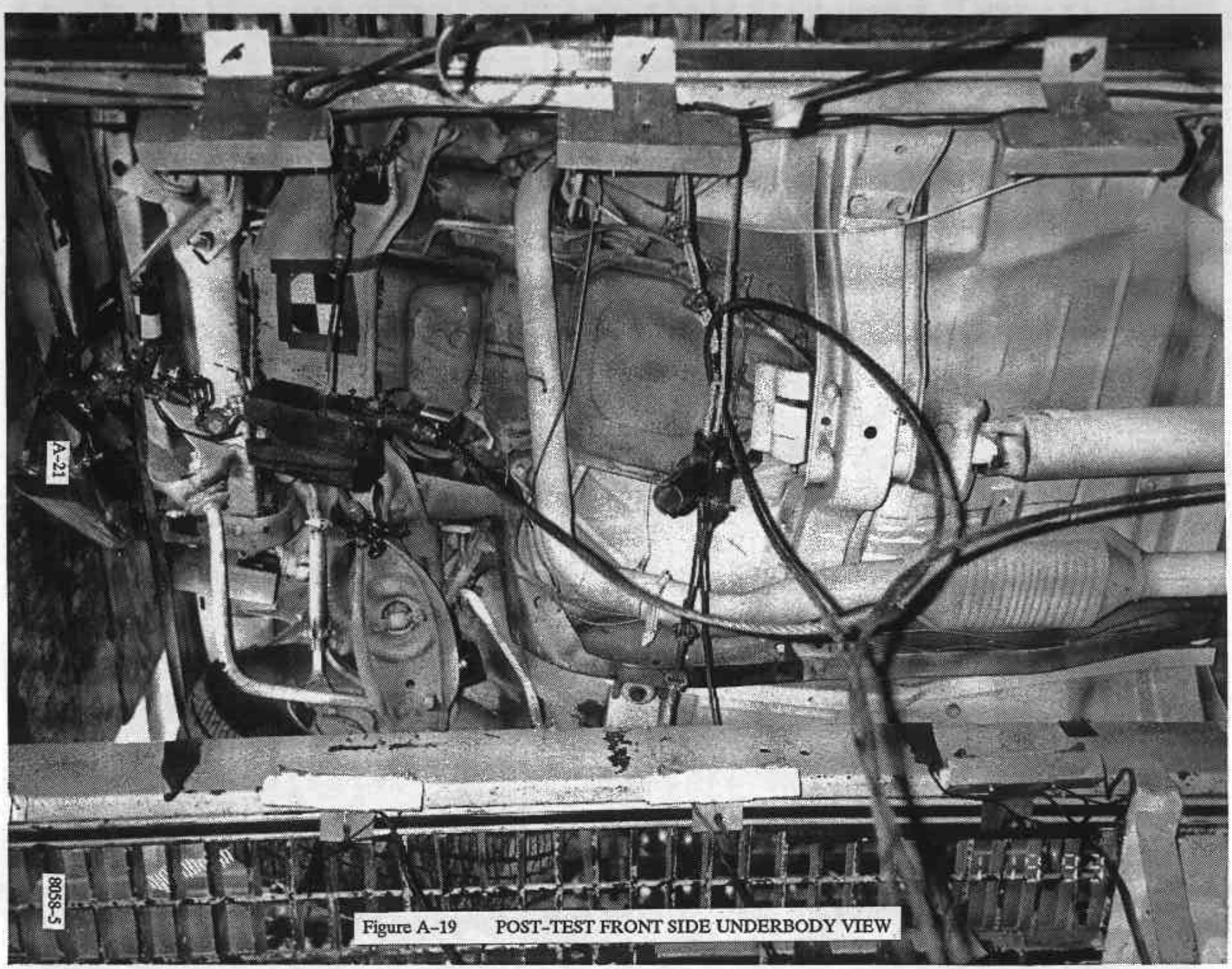

Figure A–19 POST-TEST FRONT SIDE UNDERBODY VIEW

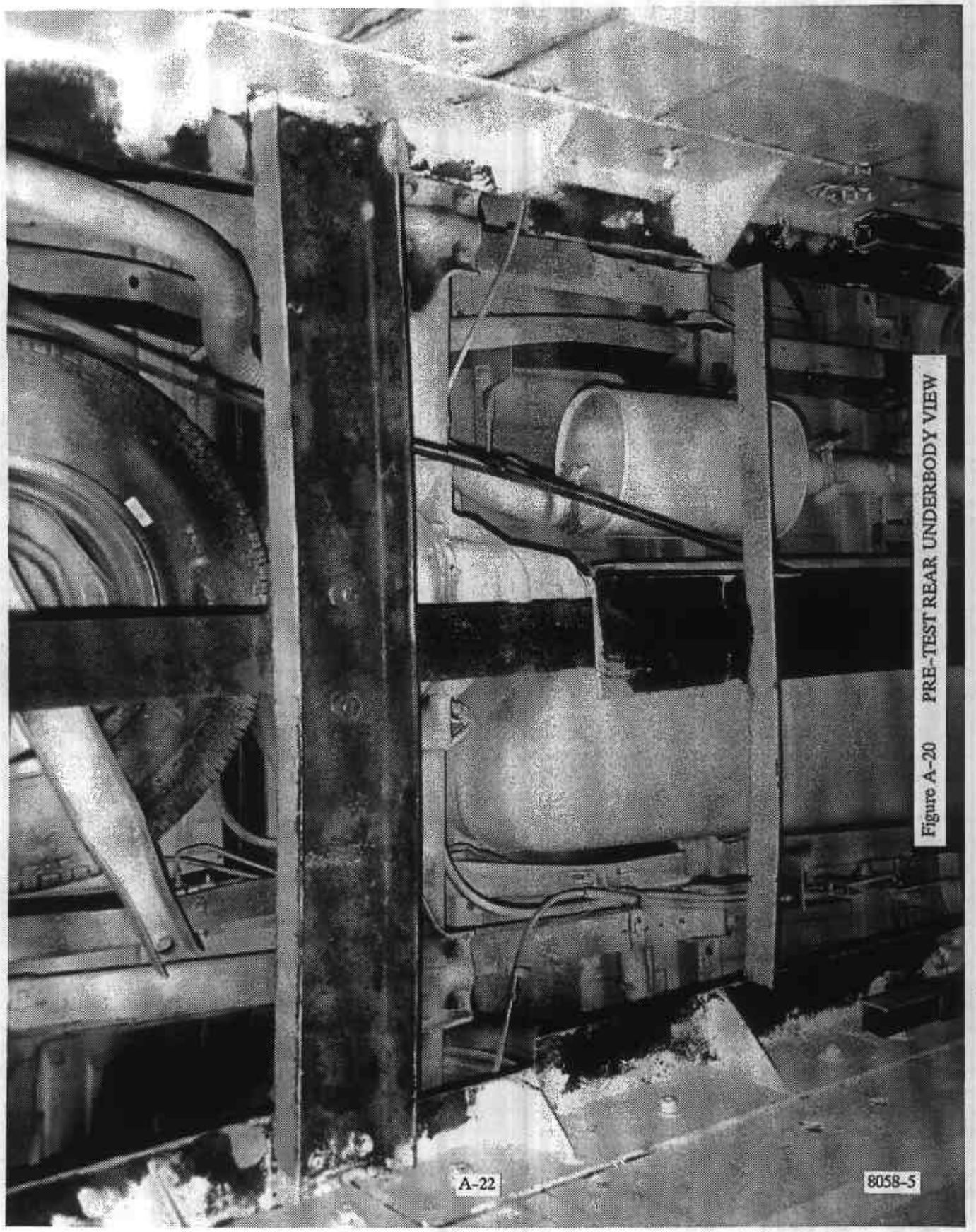

Figure A-20 PRE-TEST REAR UNDERBODY VIEW

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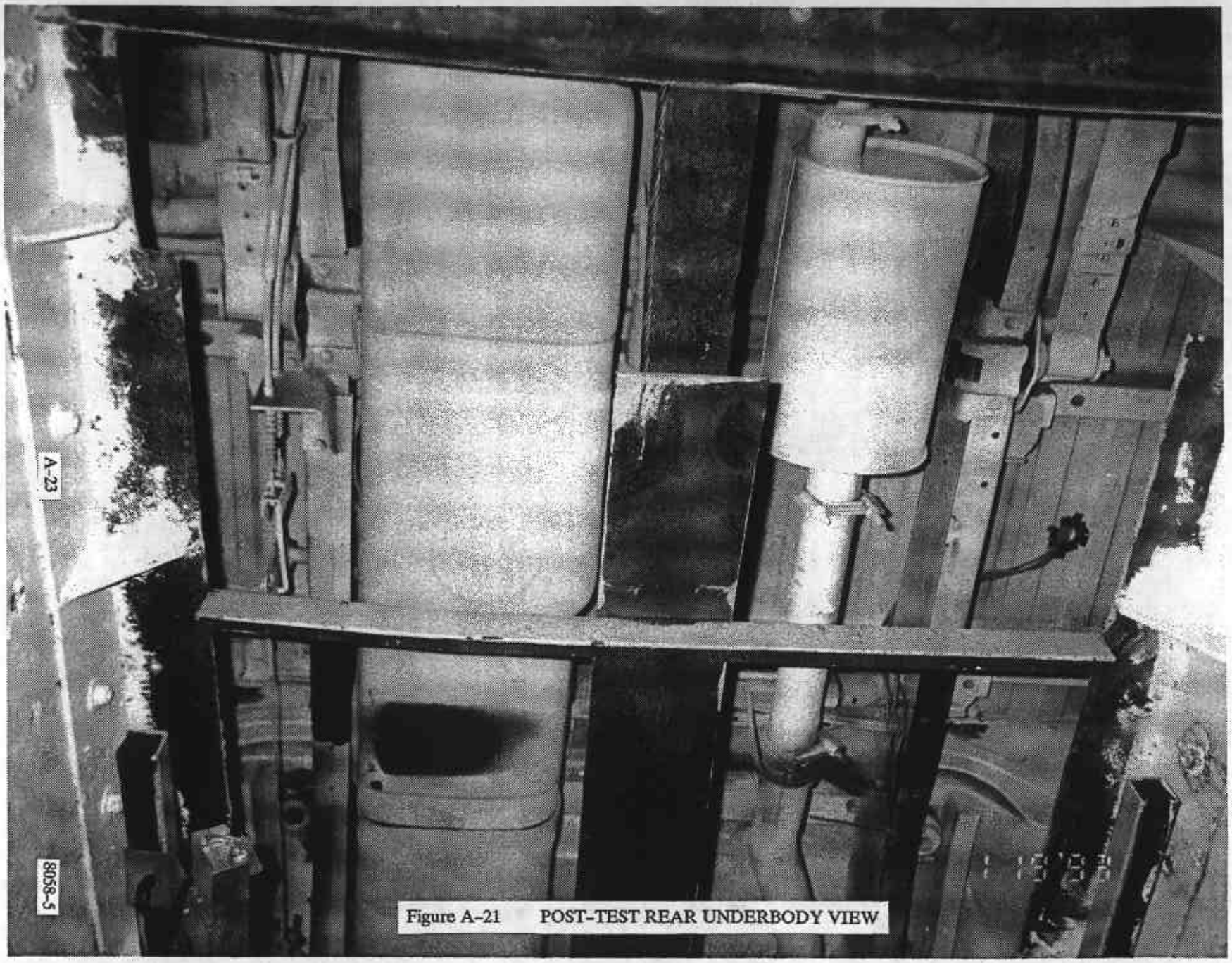


Figure A-21 POST-TEST REAR UNDERBODY VIEW

Figure A–22 PRE-TEST DRIVER POSITION VIEW

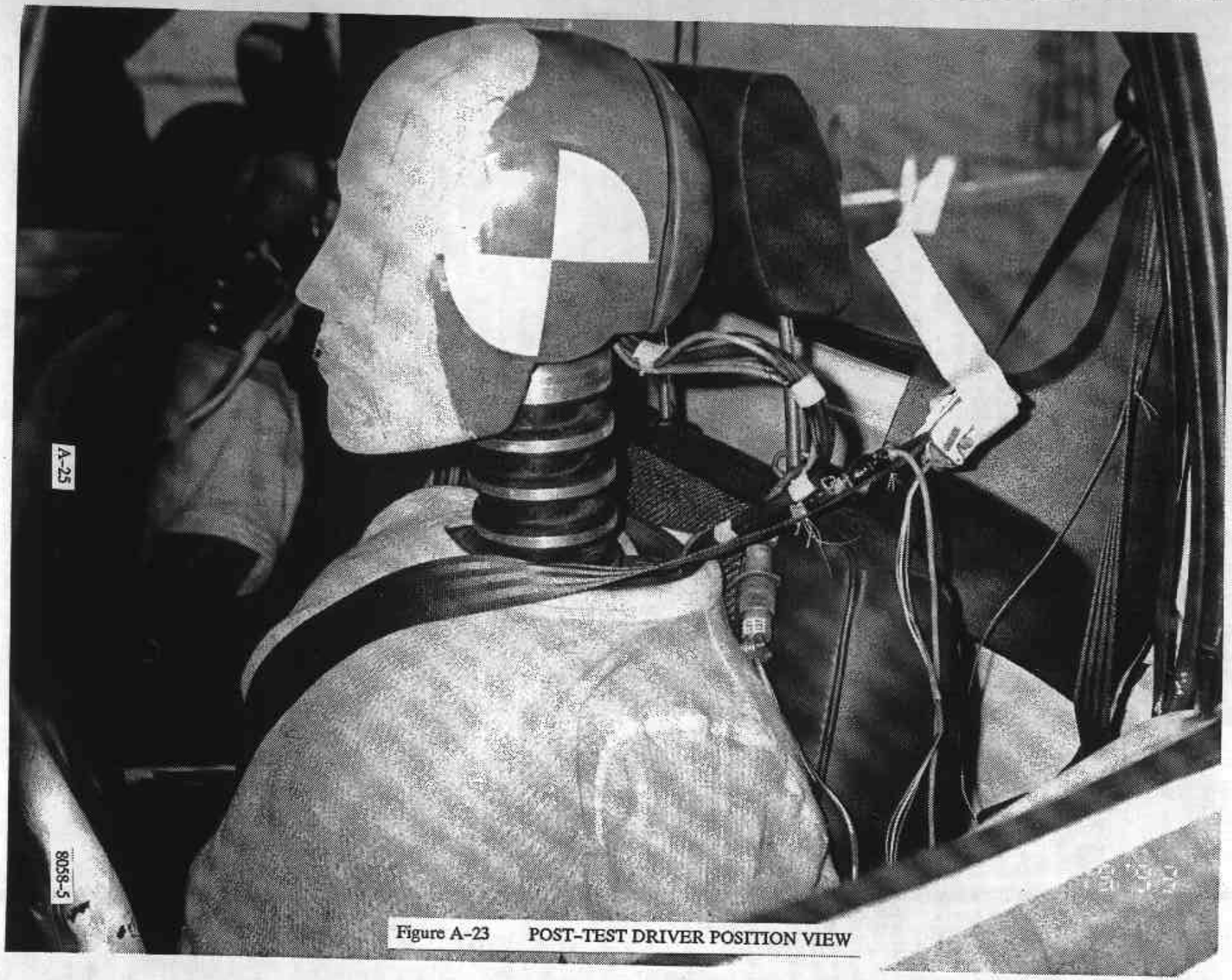


Figure A-23 POST-TEST DRIVER POSITION VIEW

Figure A-24 PRE-TEST PASSENGER POSITION VIEW

Figure A-25 POST-TEST PASSENGER POSITION VIEW

Figure A-26 PRE-TEST DRIVER AND INTERIOR VIEW

8058-5

Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW

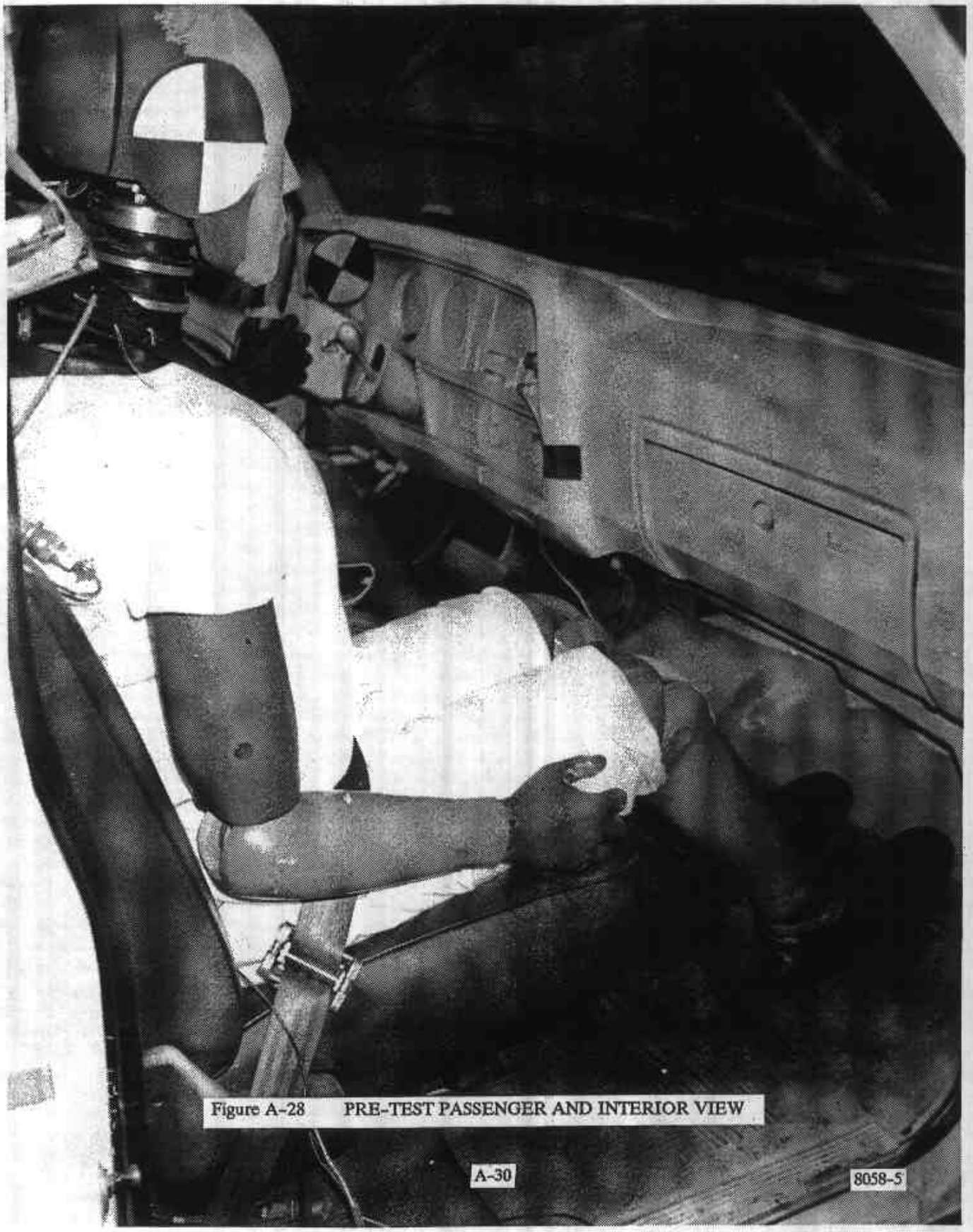


Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW

8058-5

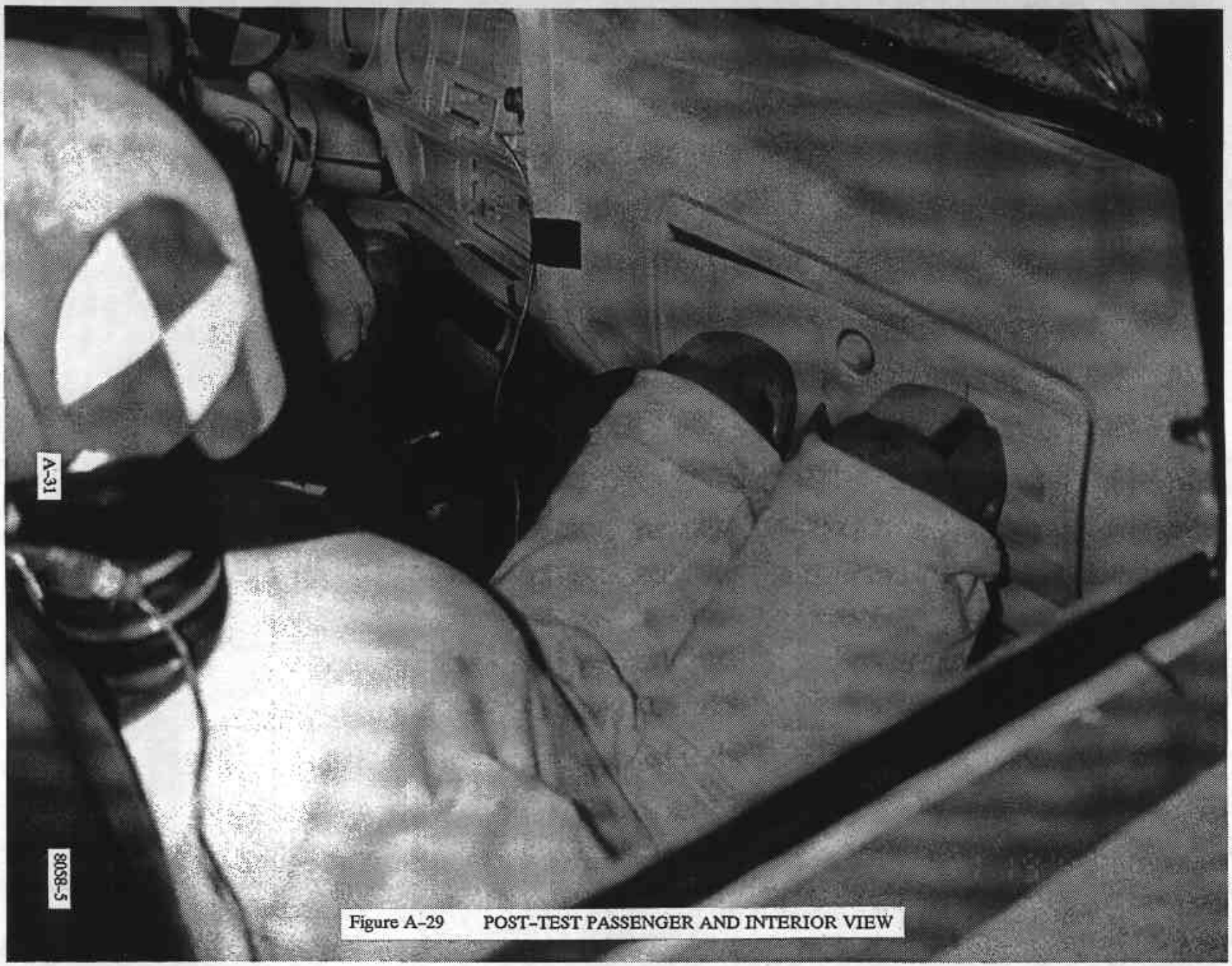


Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW

Figure A–30 PRE-TEST DRIVER HEAD LOCATION

(Photo is not available for this test)

Figure A-31 PRE-TEST PASSENGER HEAD LOCATION

(Photo is not available for this test)

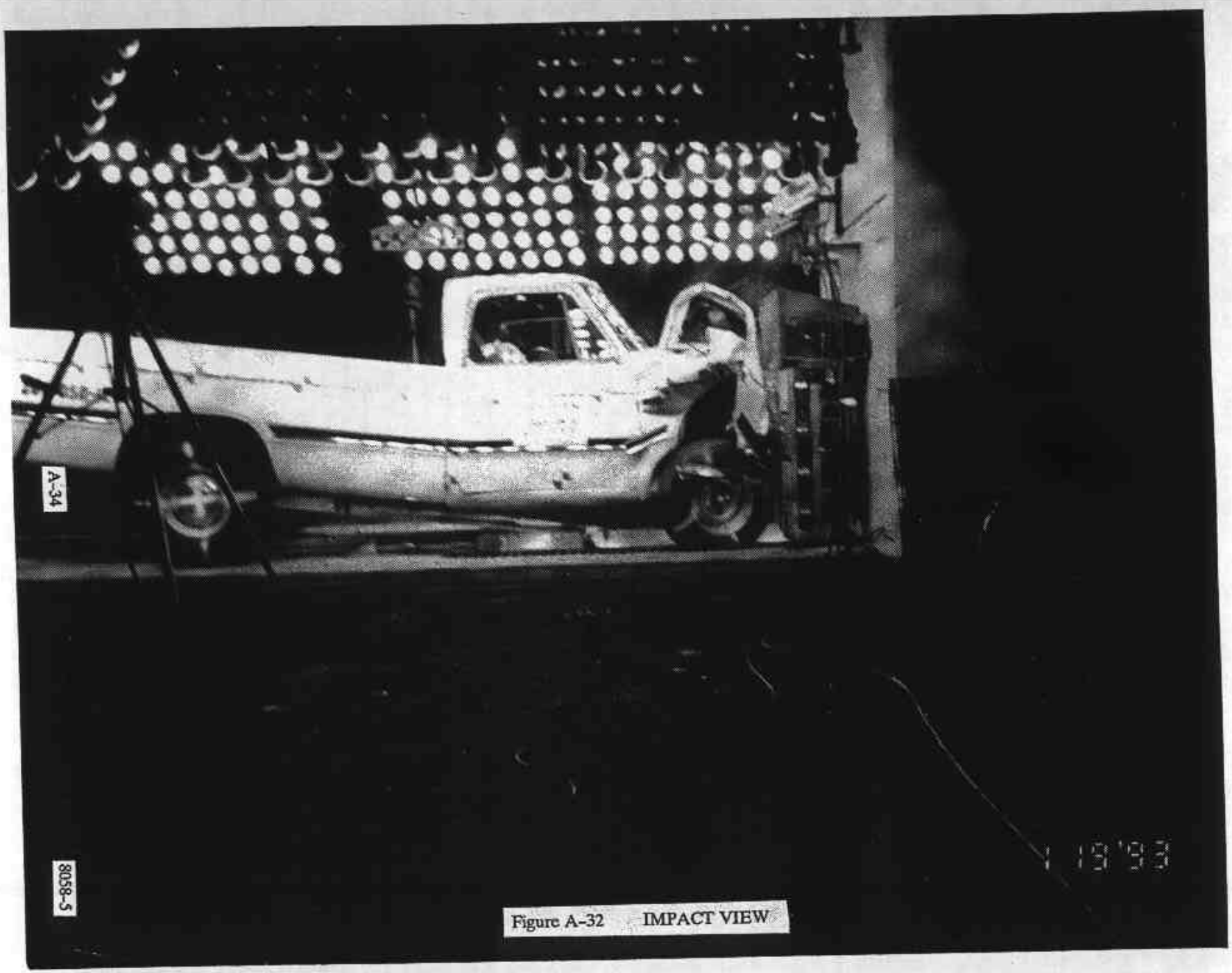


Figure A-32 IMPACT VIEW

Appendix B

VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA

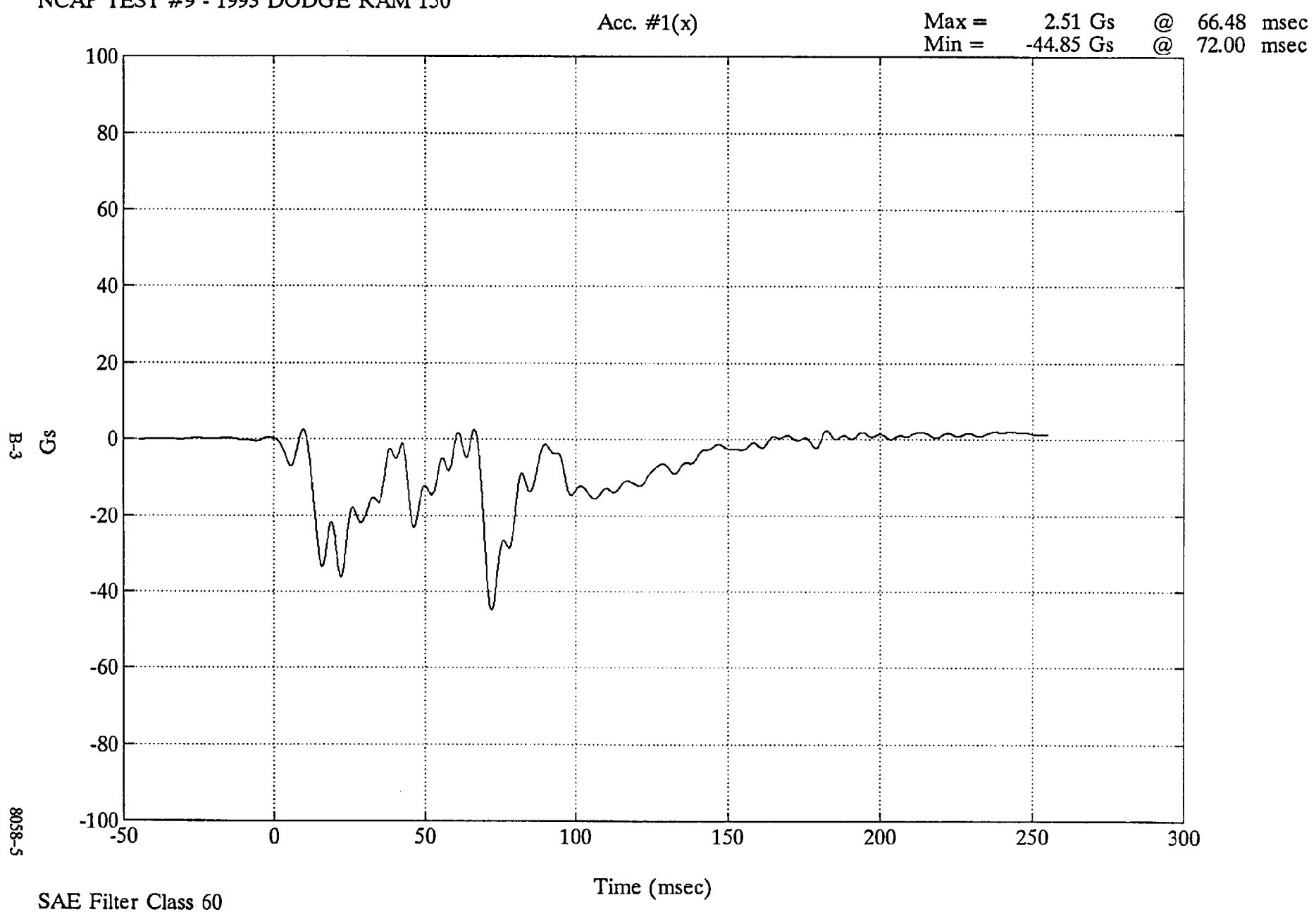
TEST NO. MP0304

VEHICLE DATA

FILTER CHANNEL CLASS

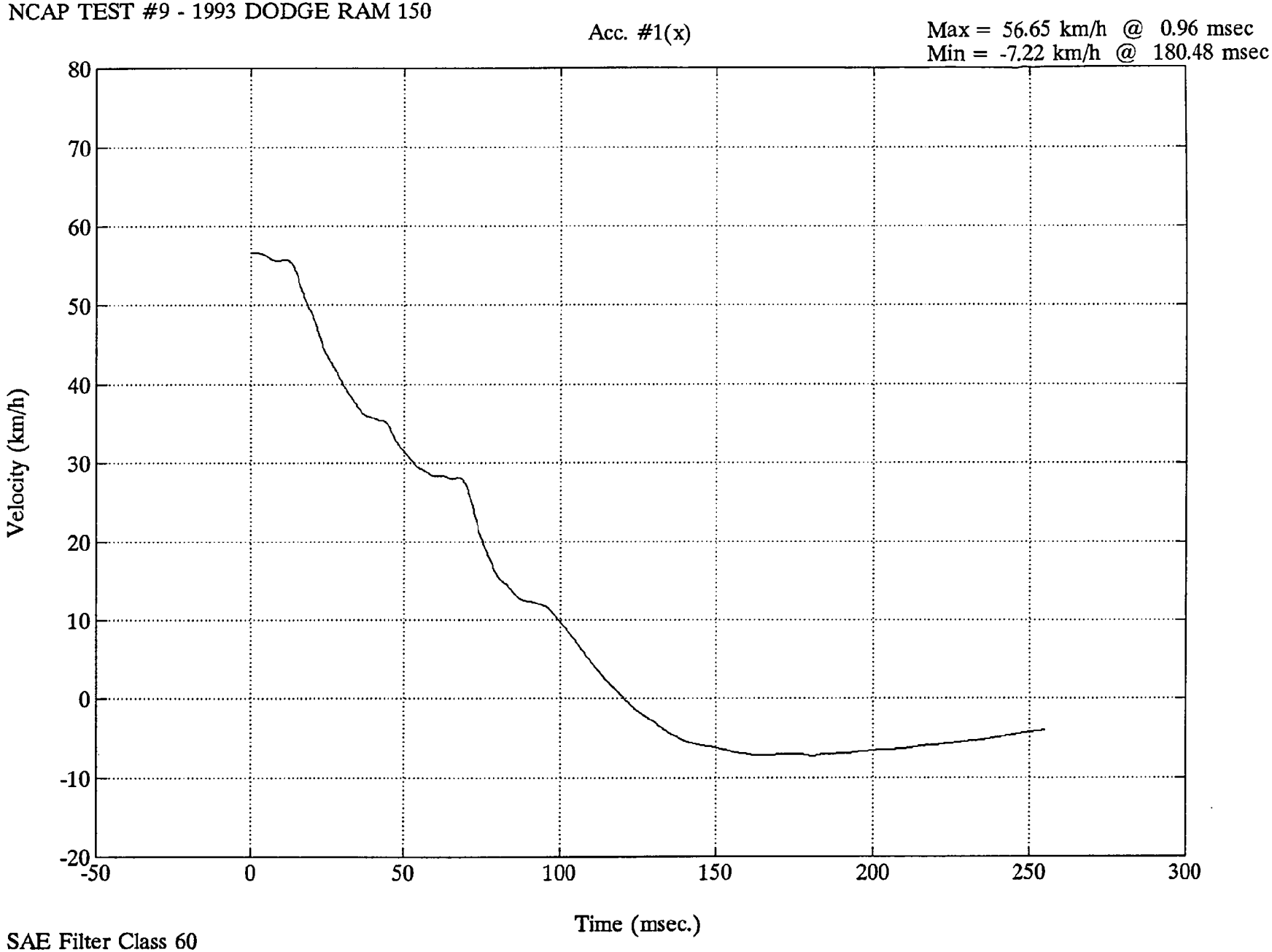
60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

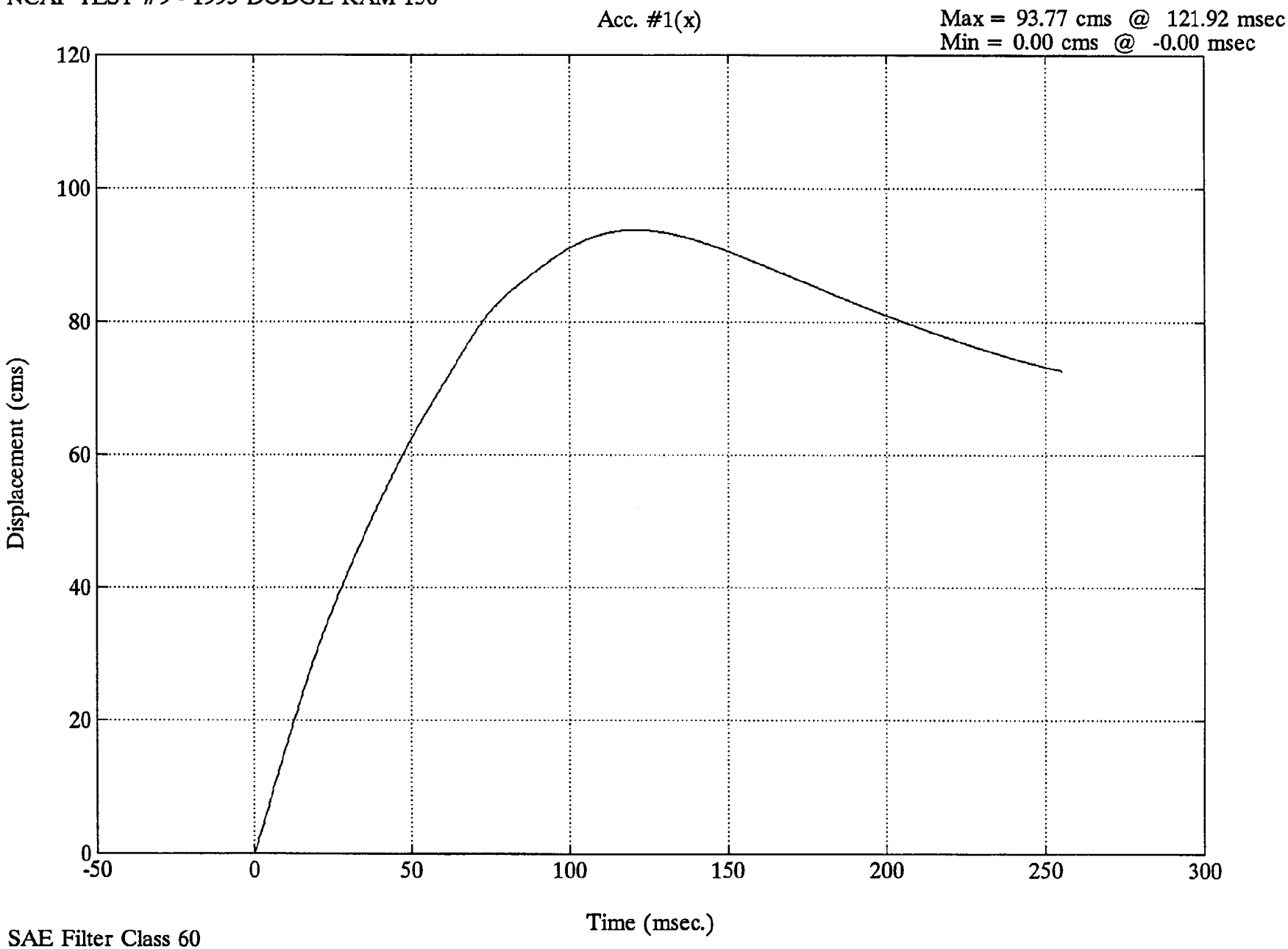
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

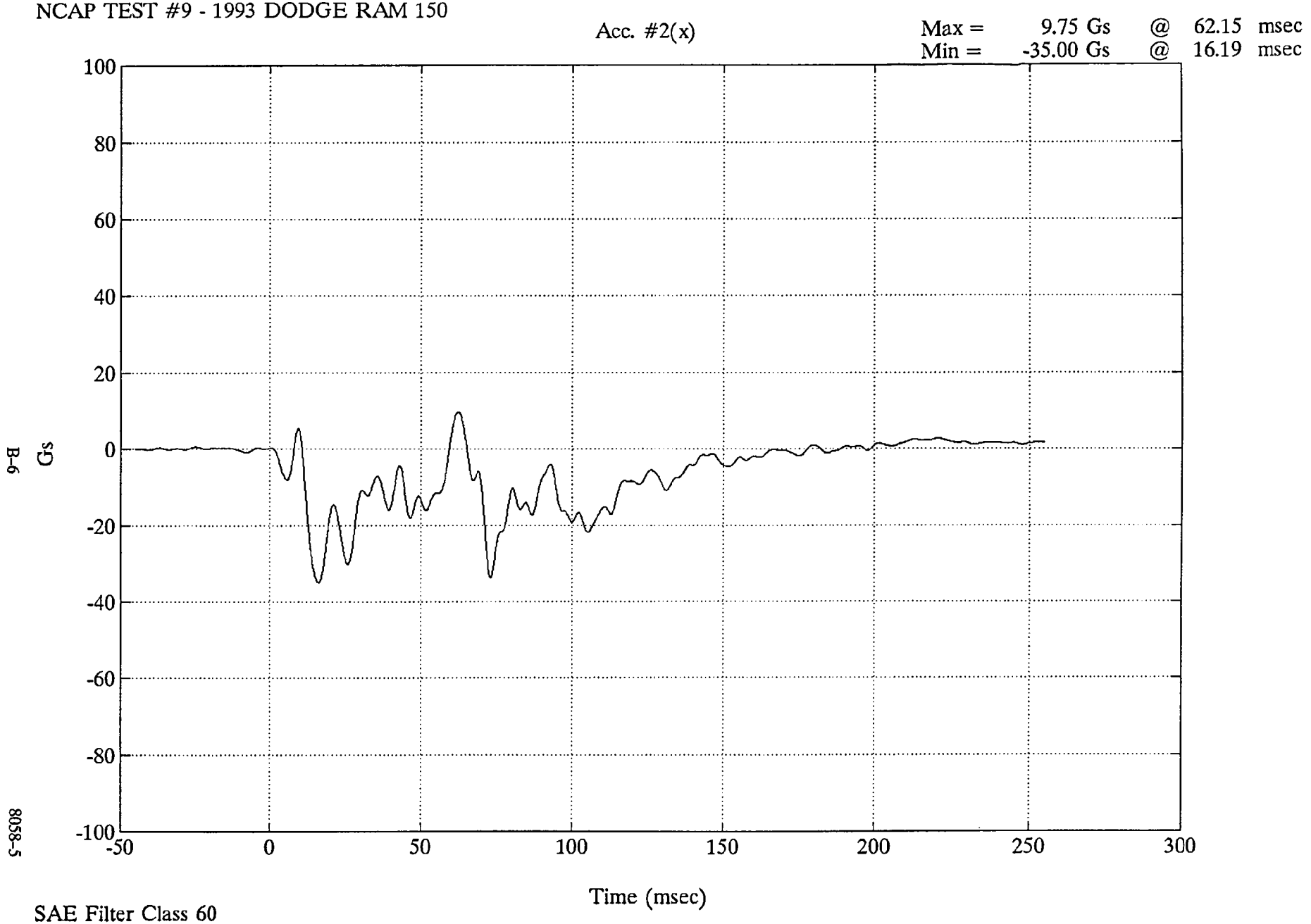
8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



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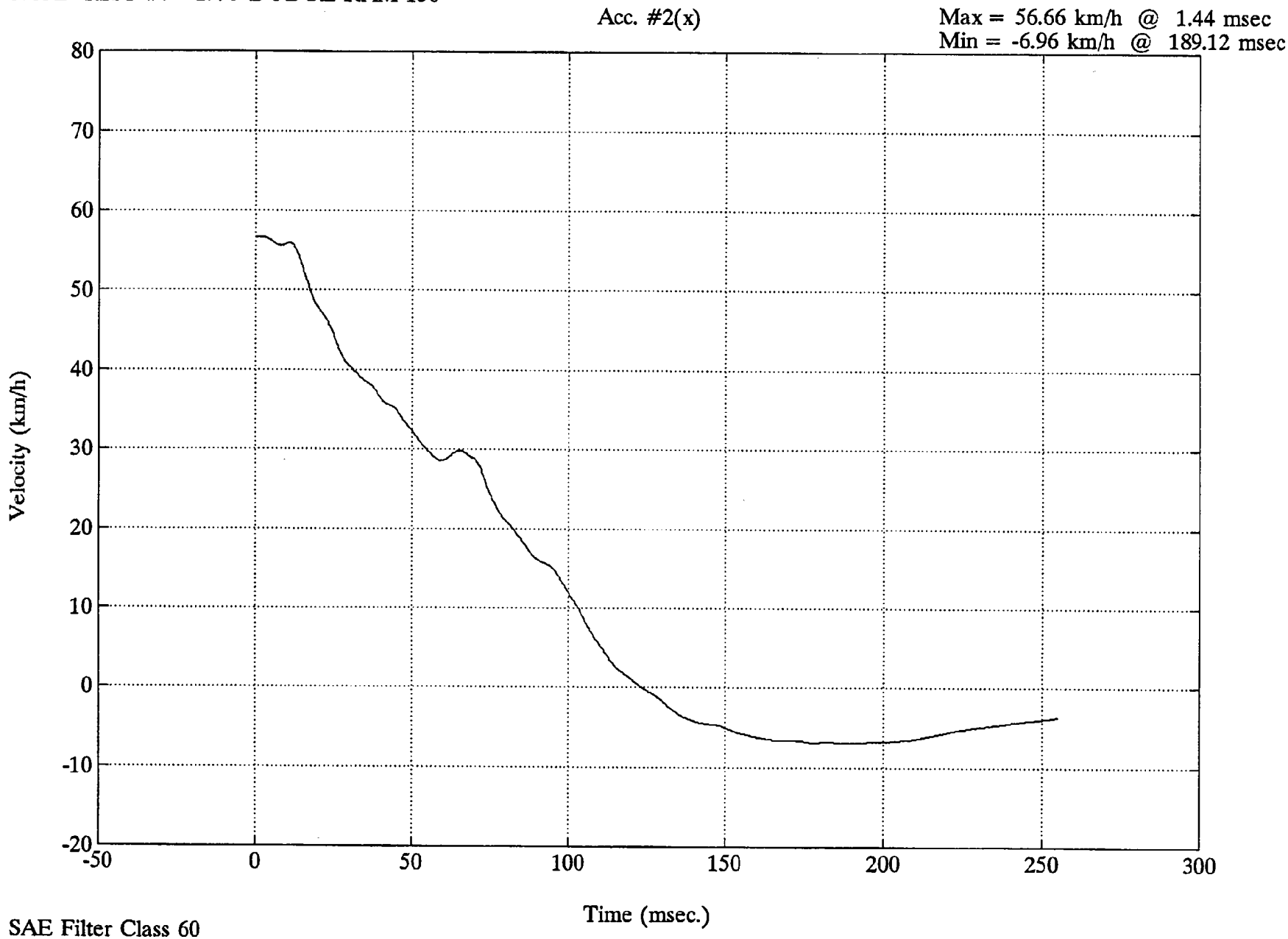
8058-5

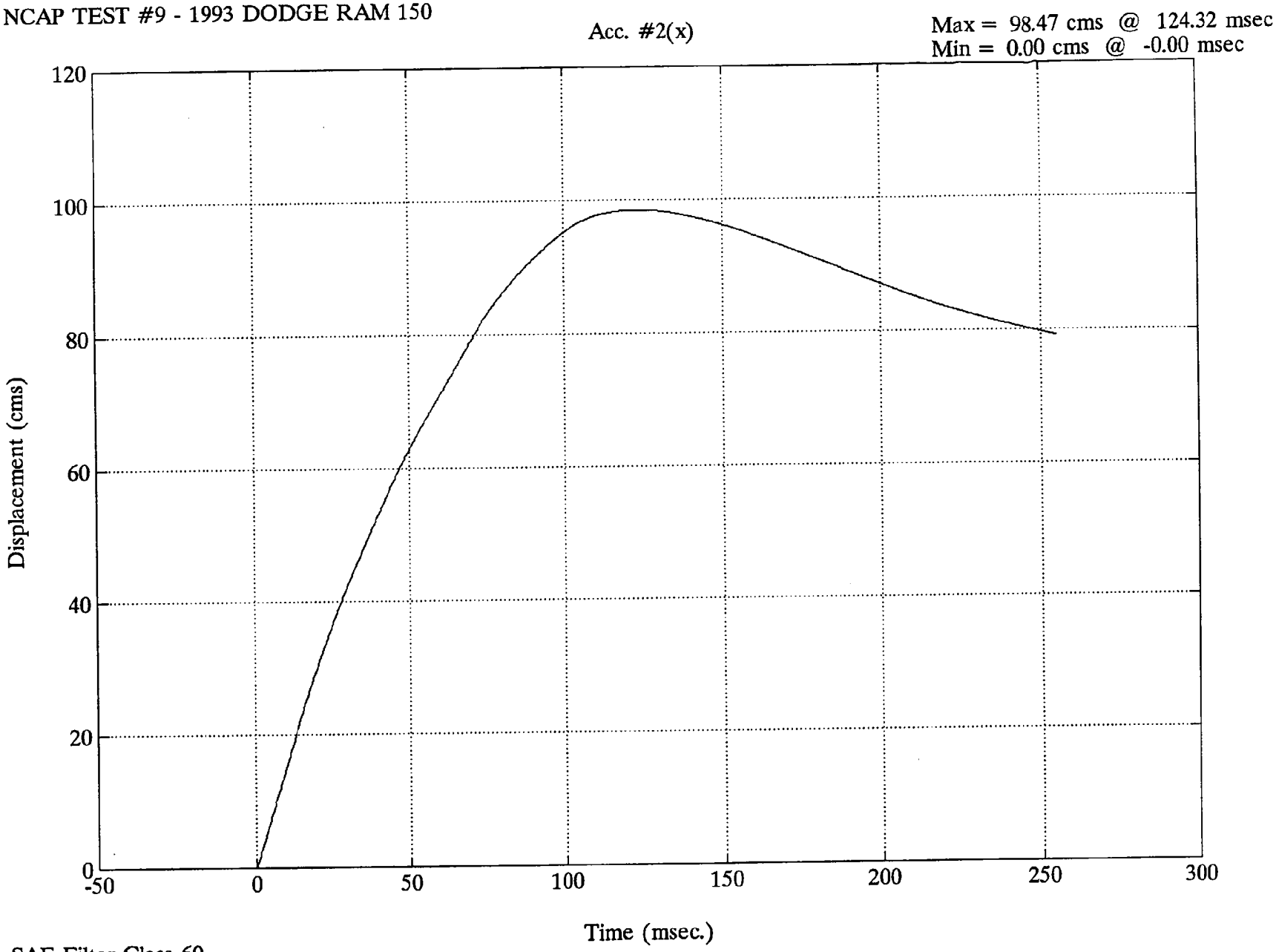
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

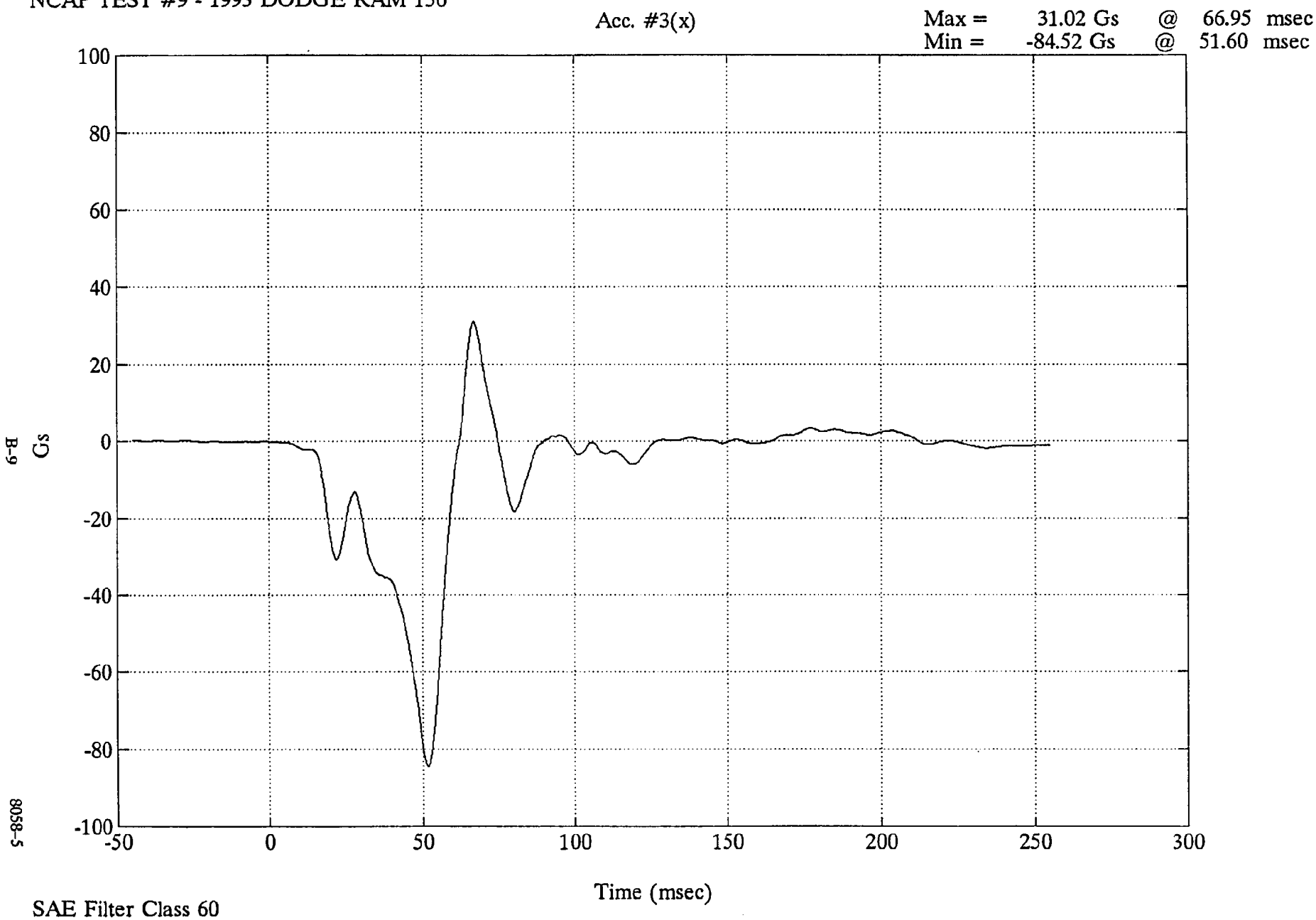
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

8058-5

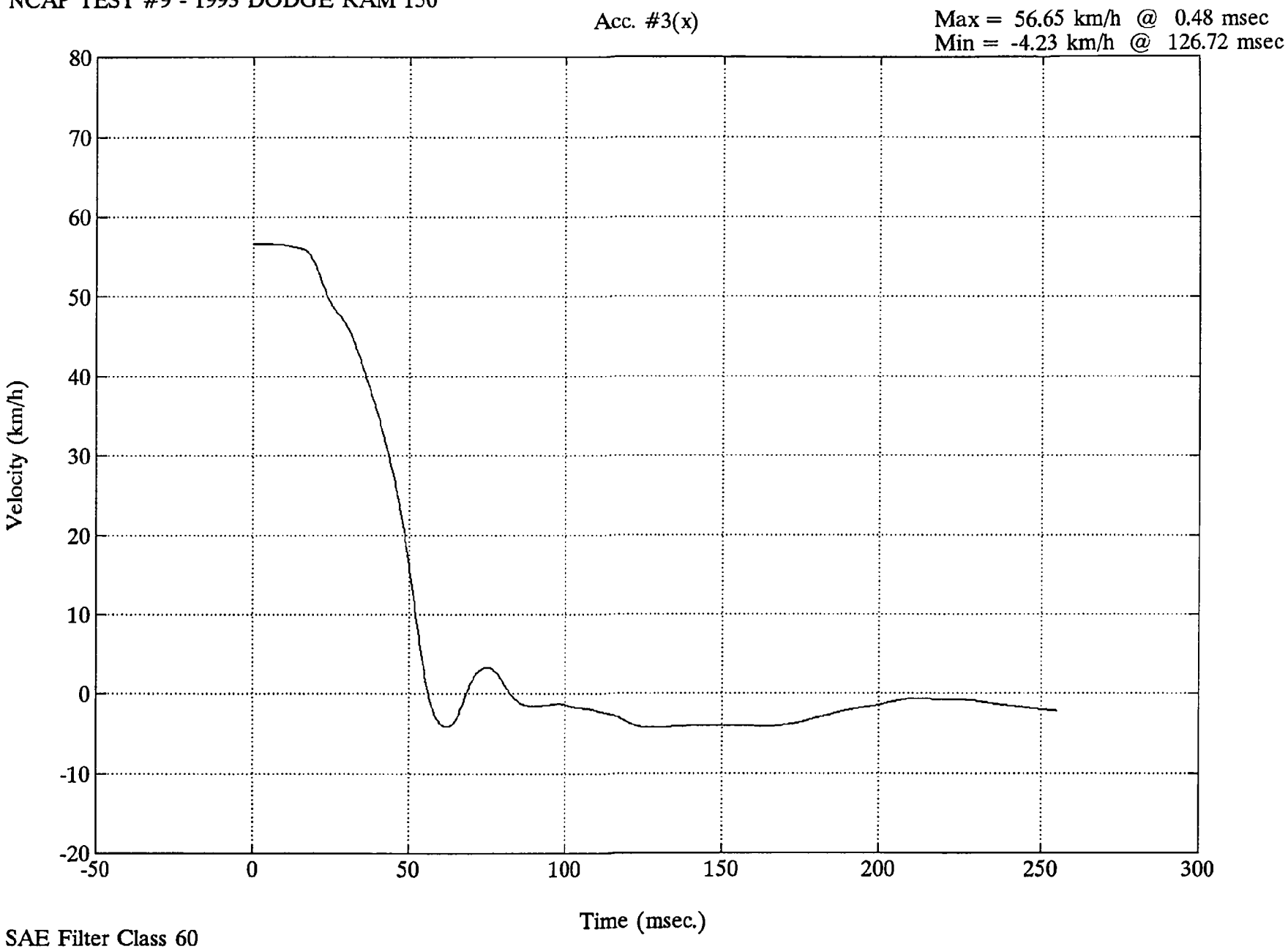
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

8058-5

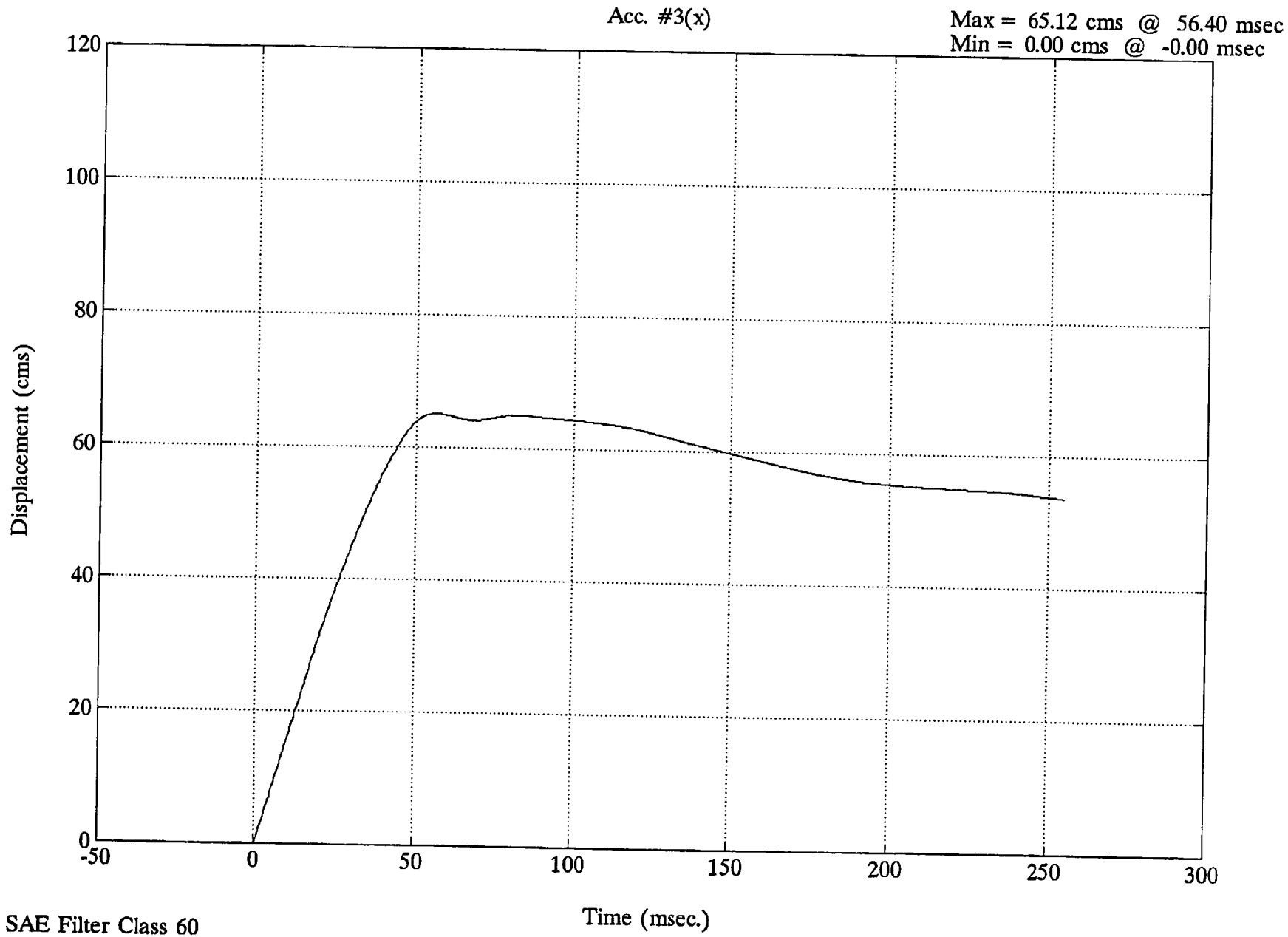
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

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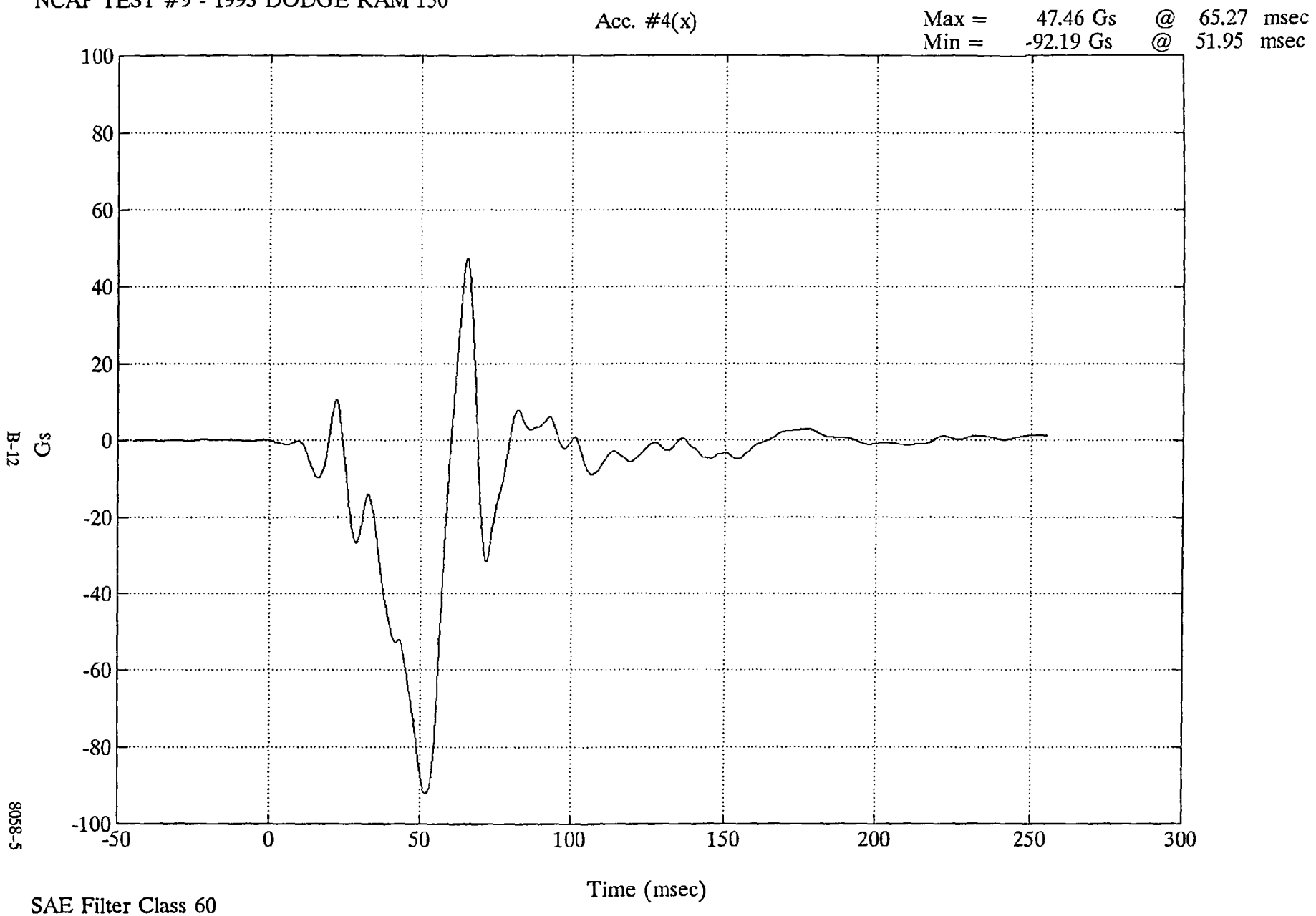
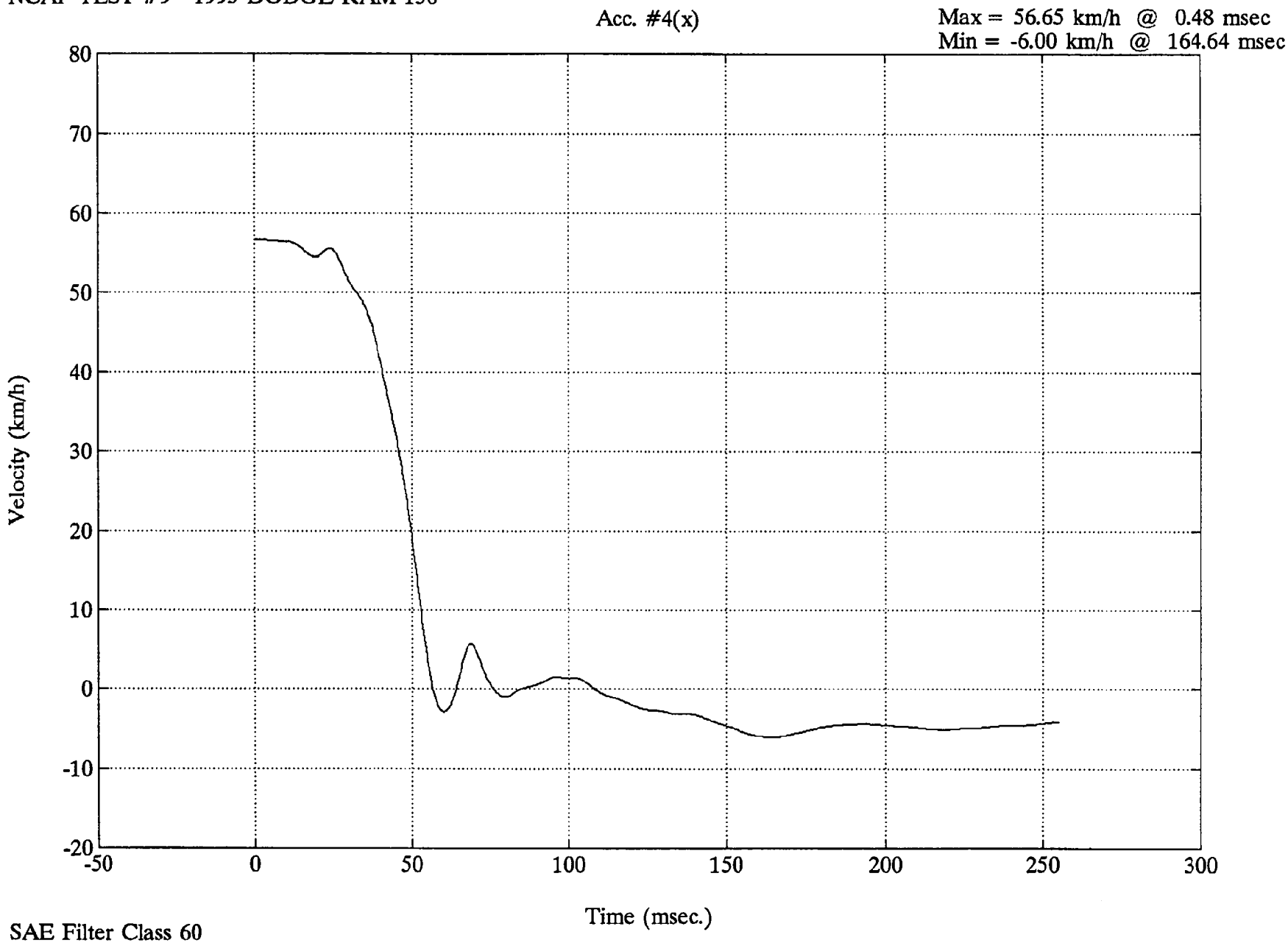
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

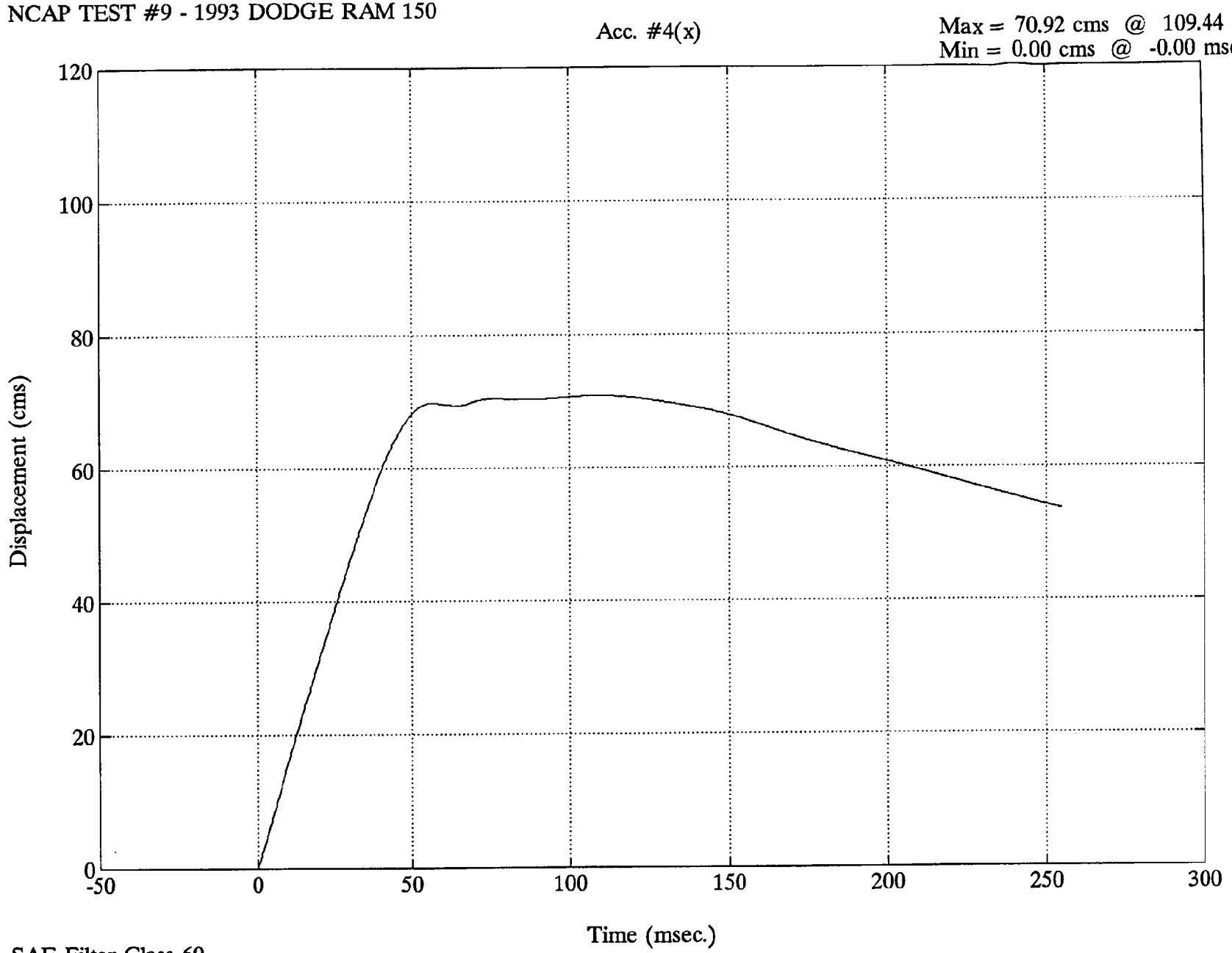
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

8058-5

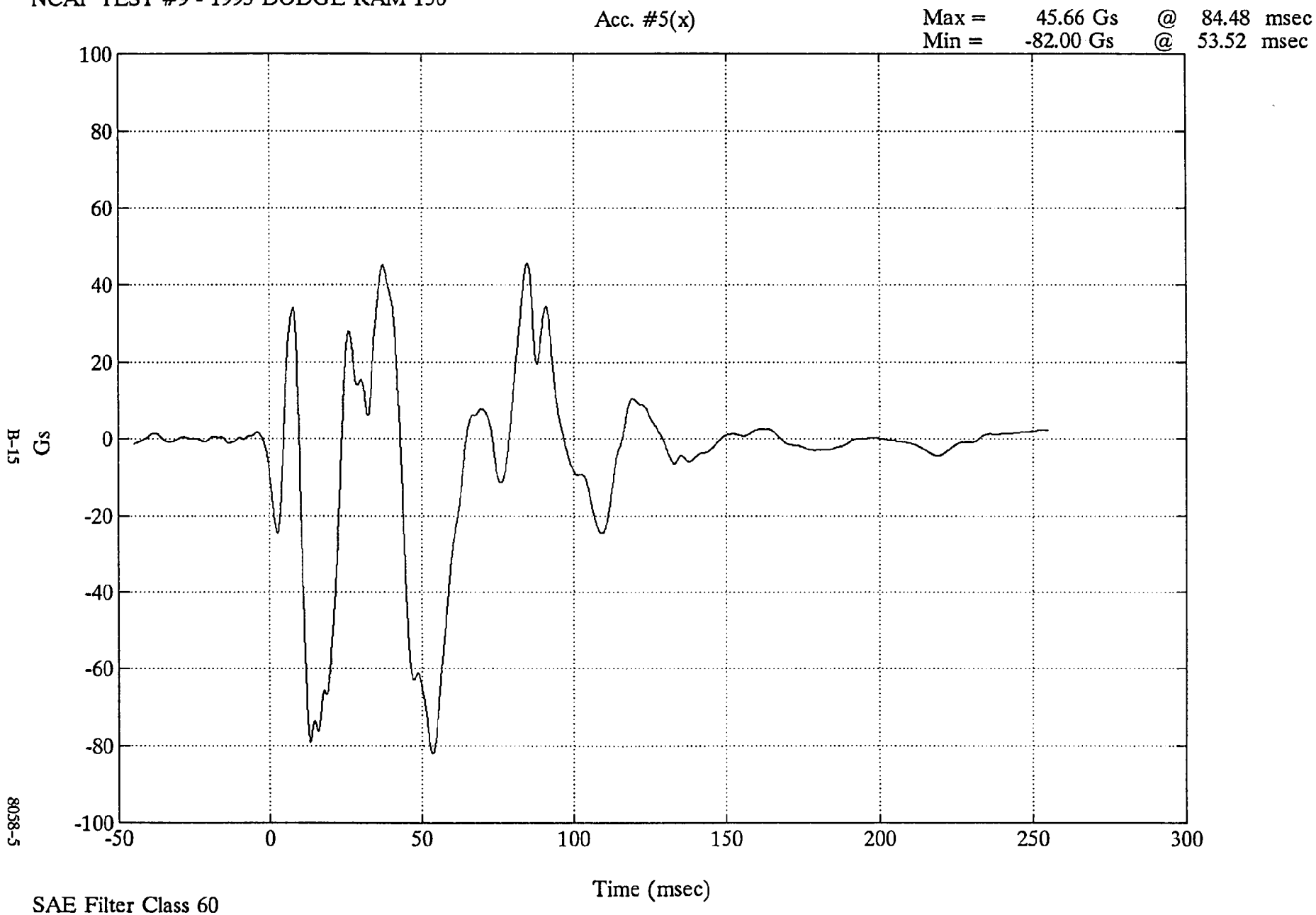
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

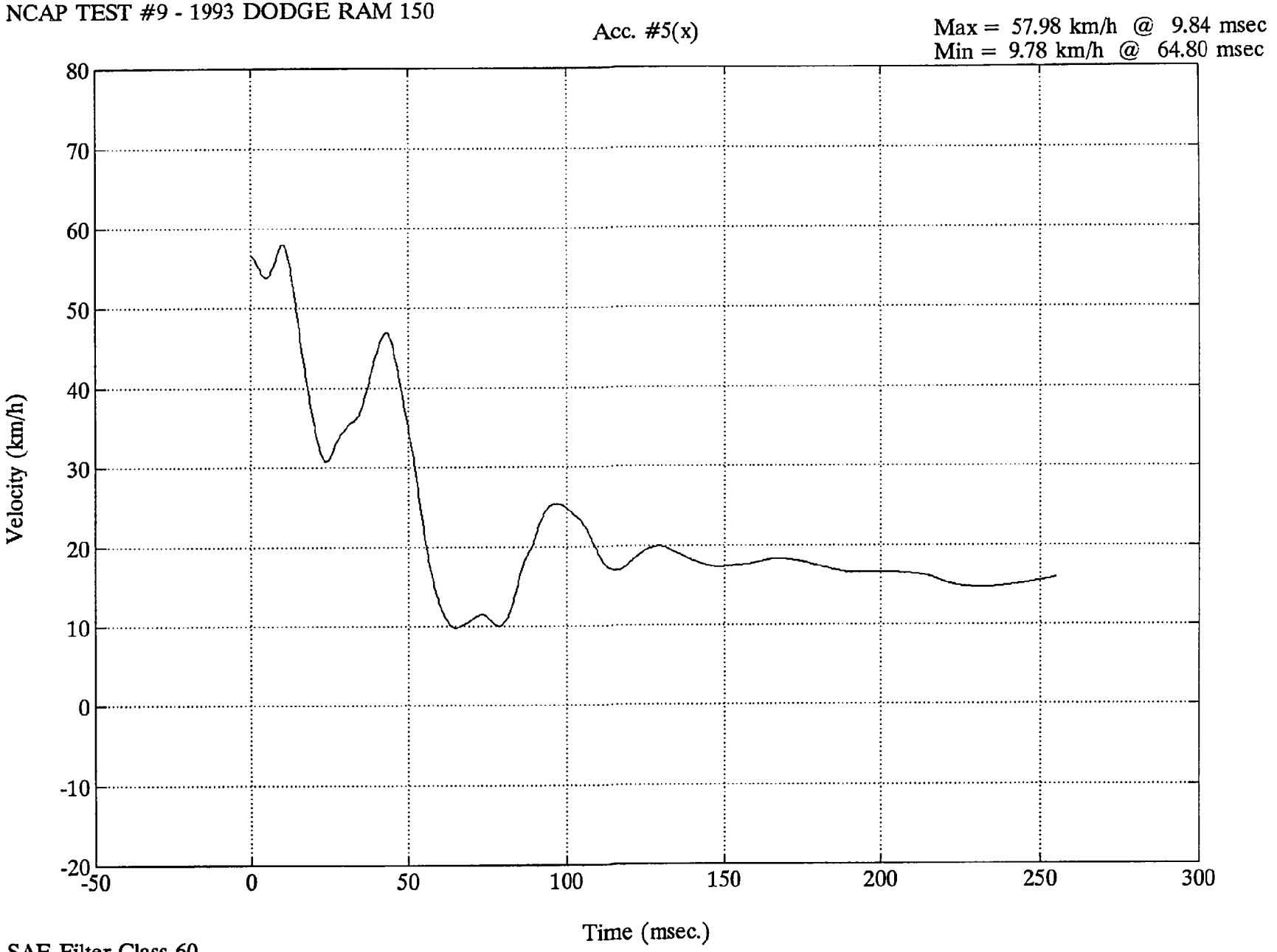
8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



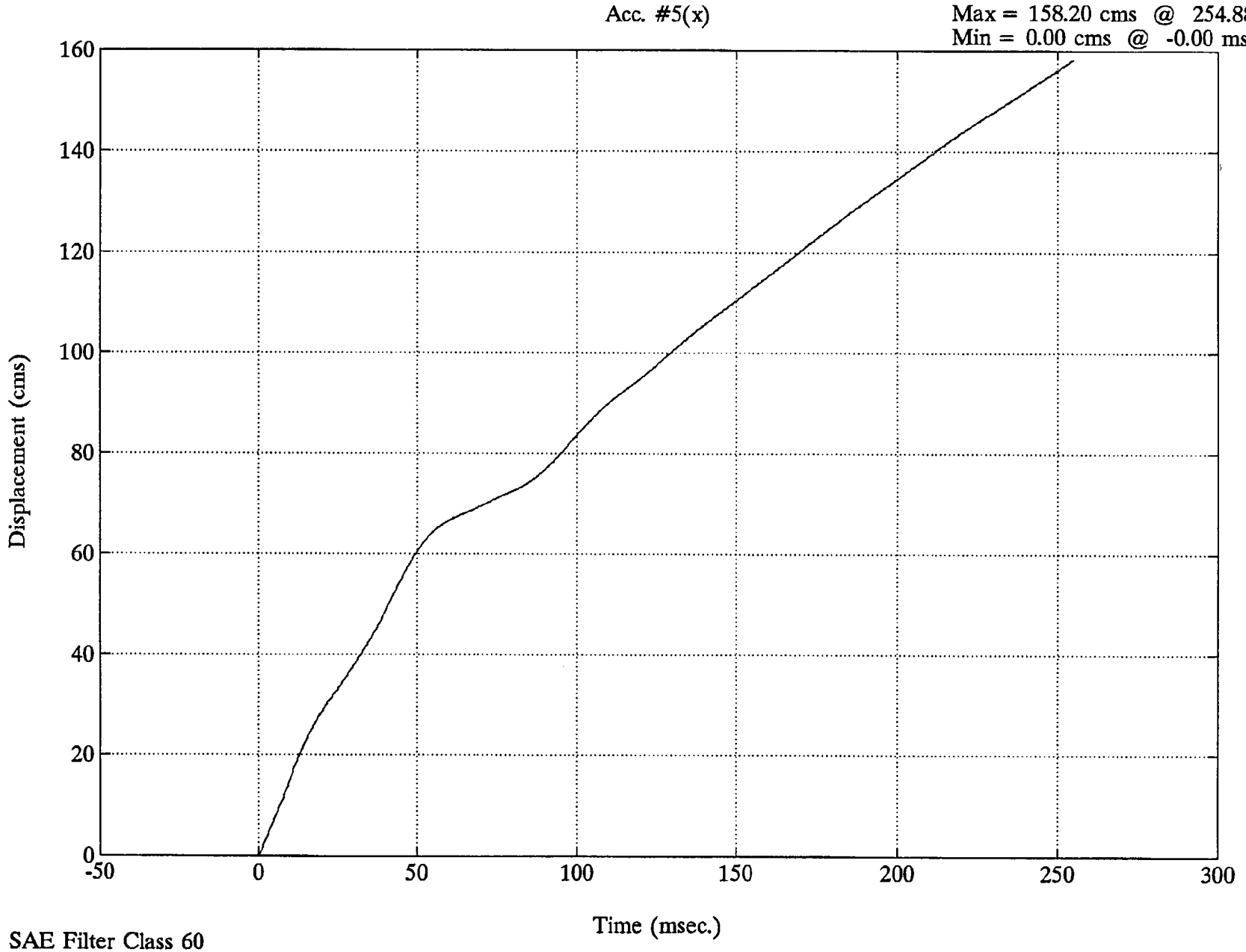
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

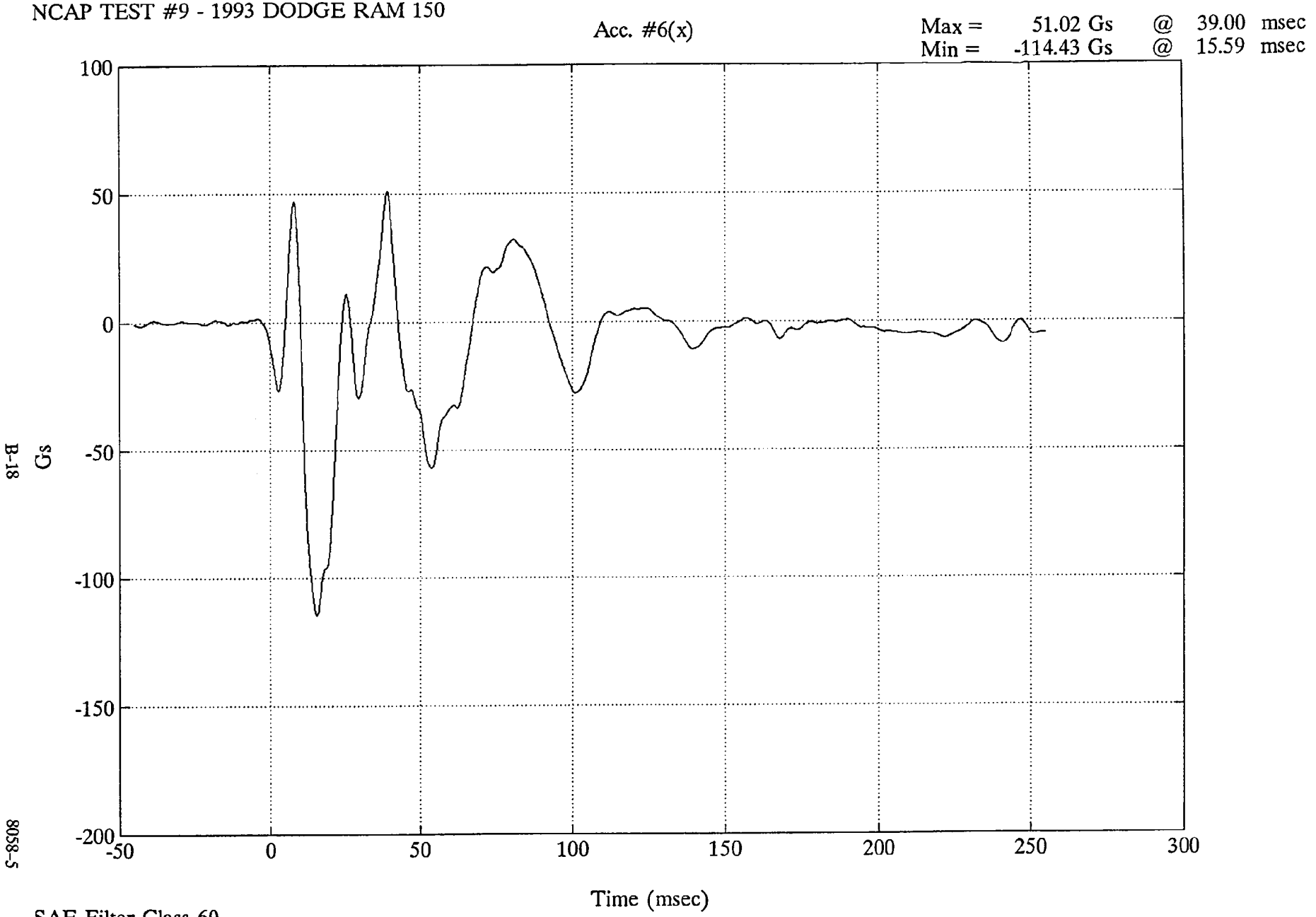
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

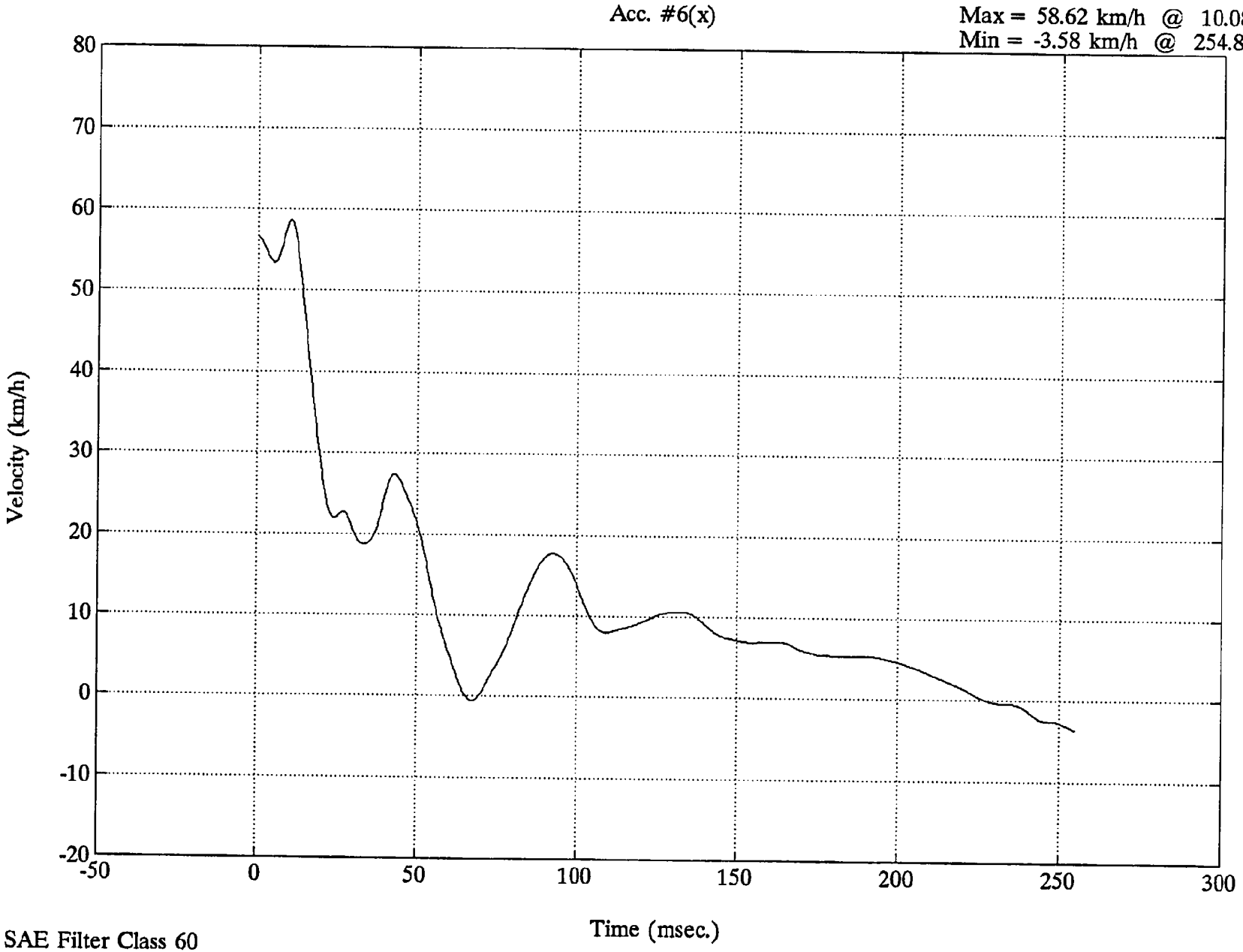
8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

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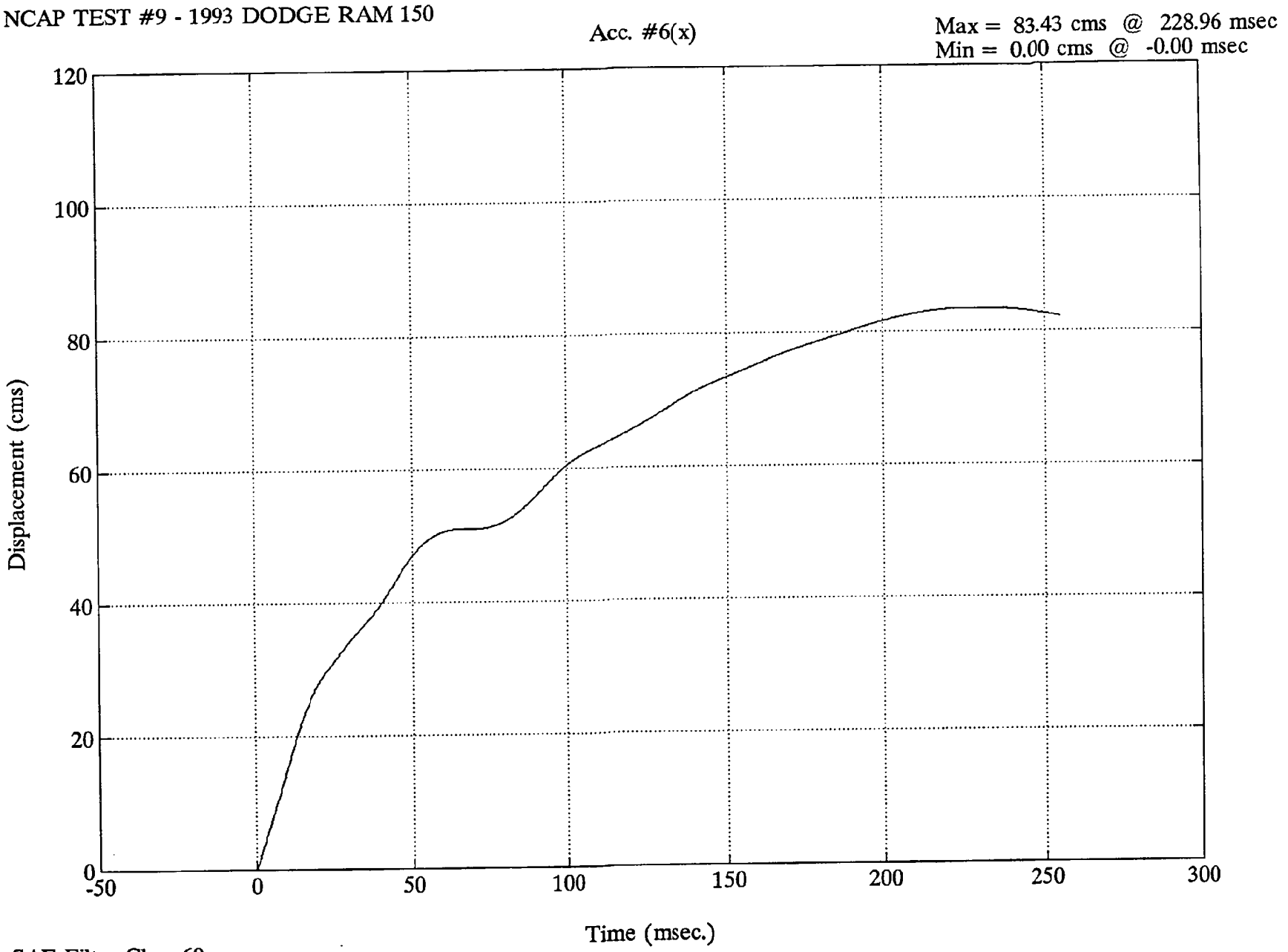
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

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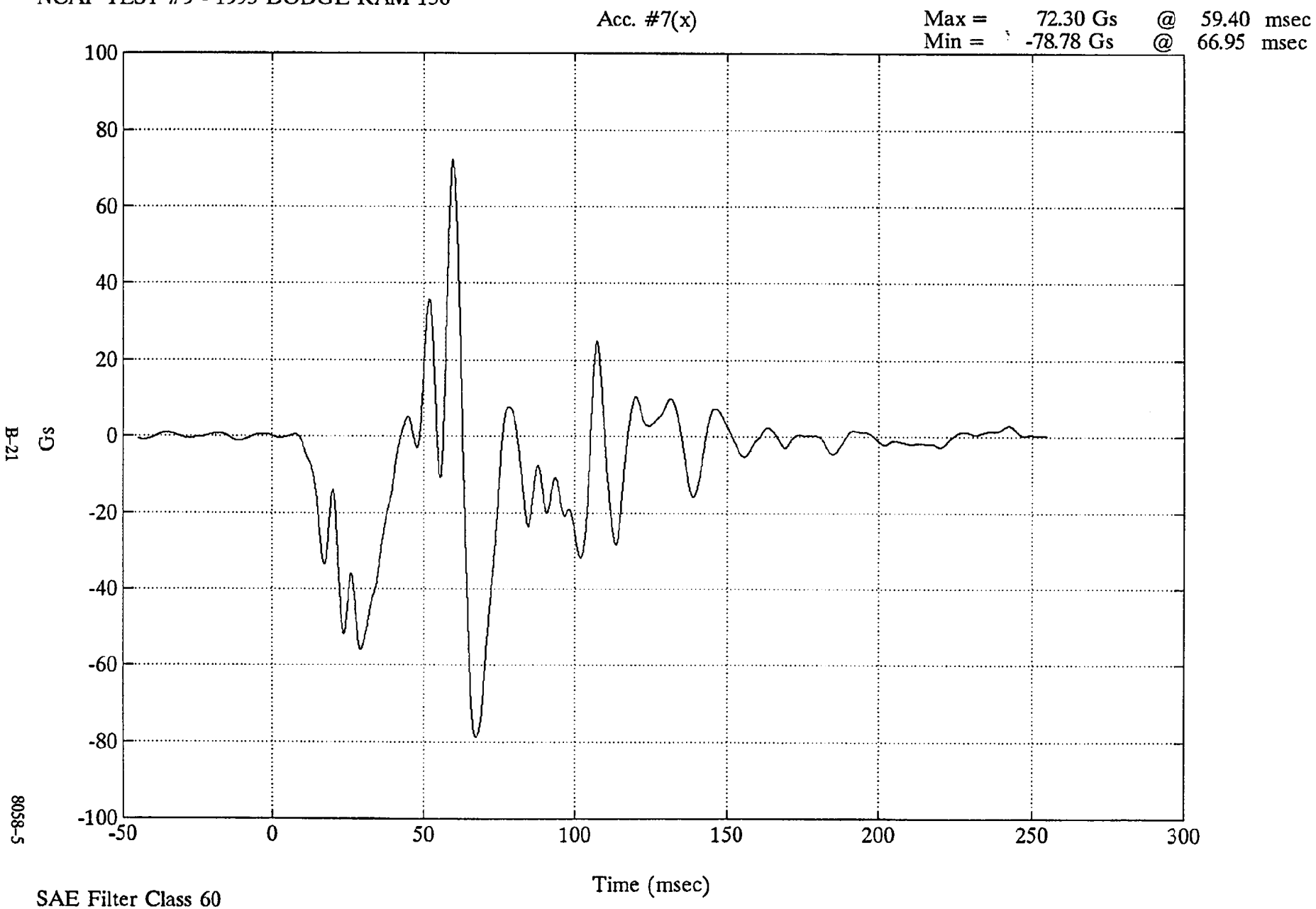
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

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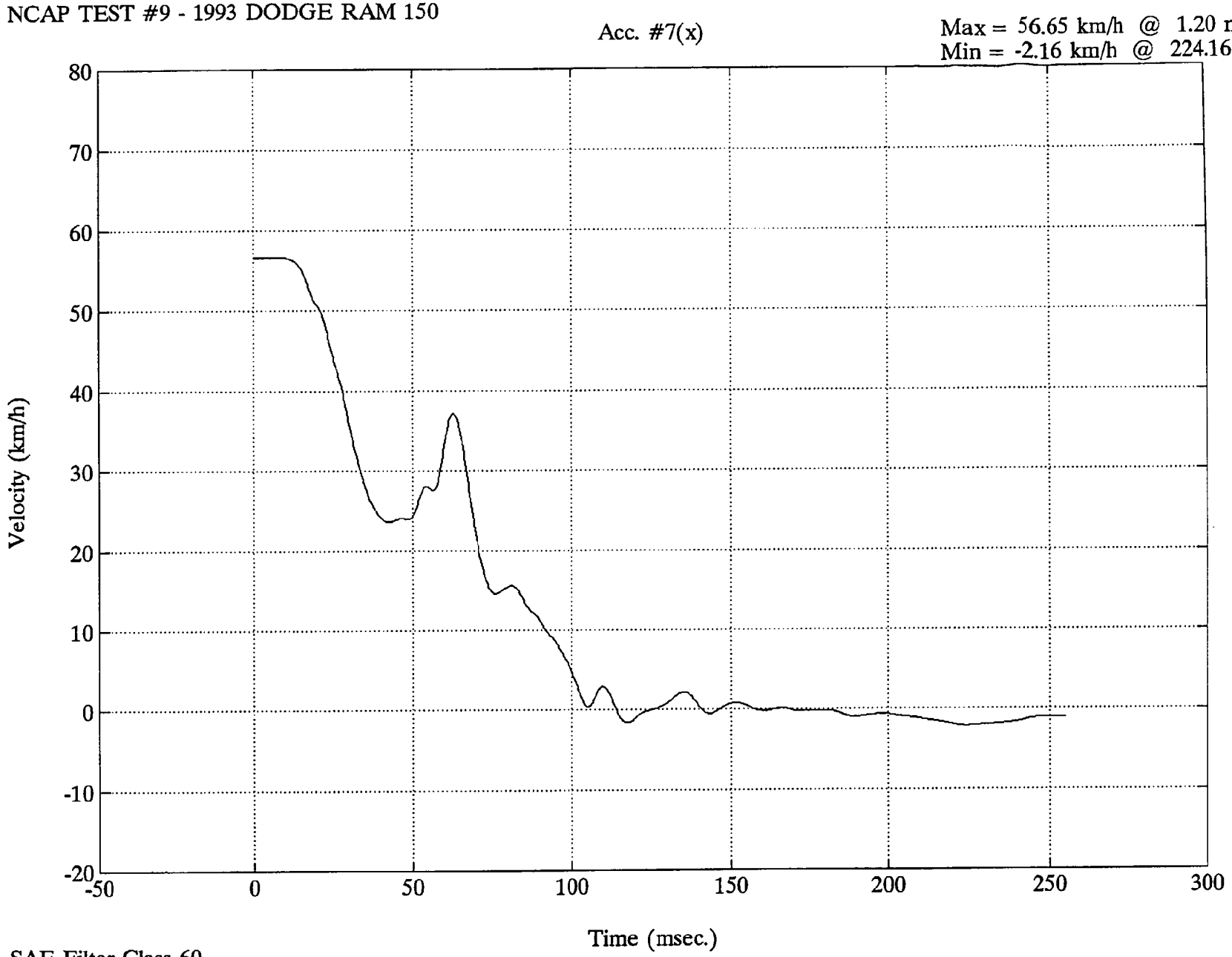
8058-5

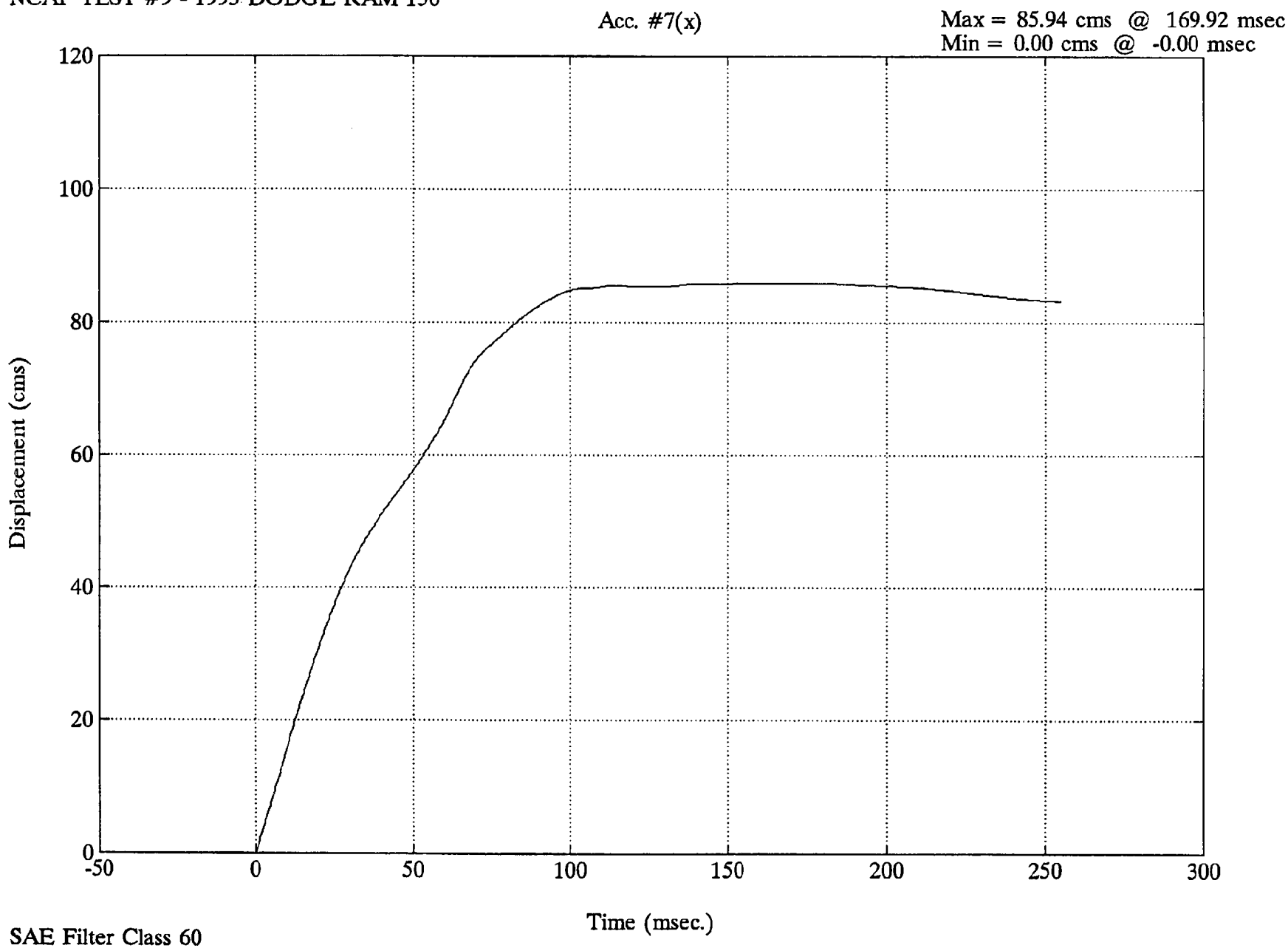
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

8058-5

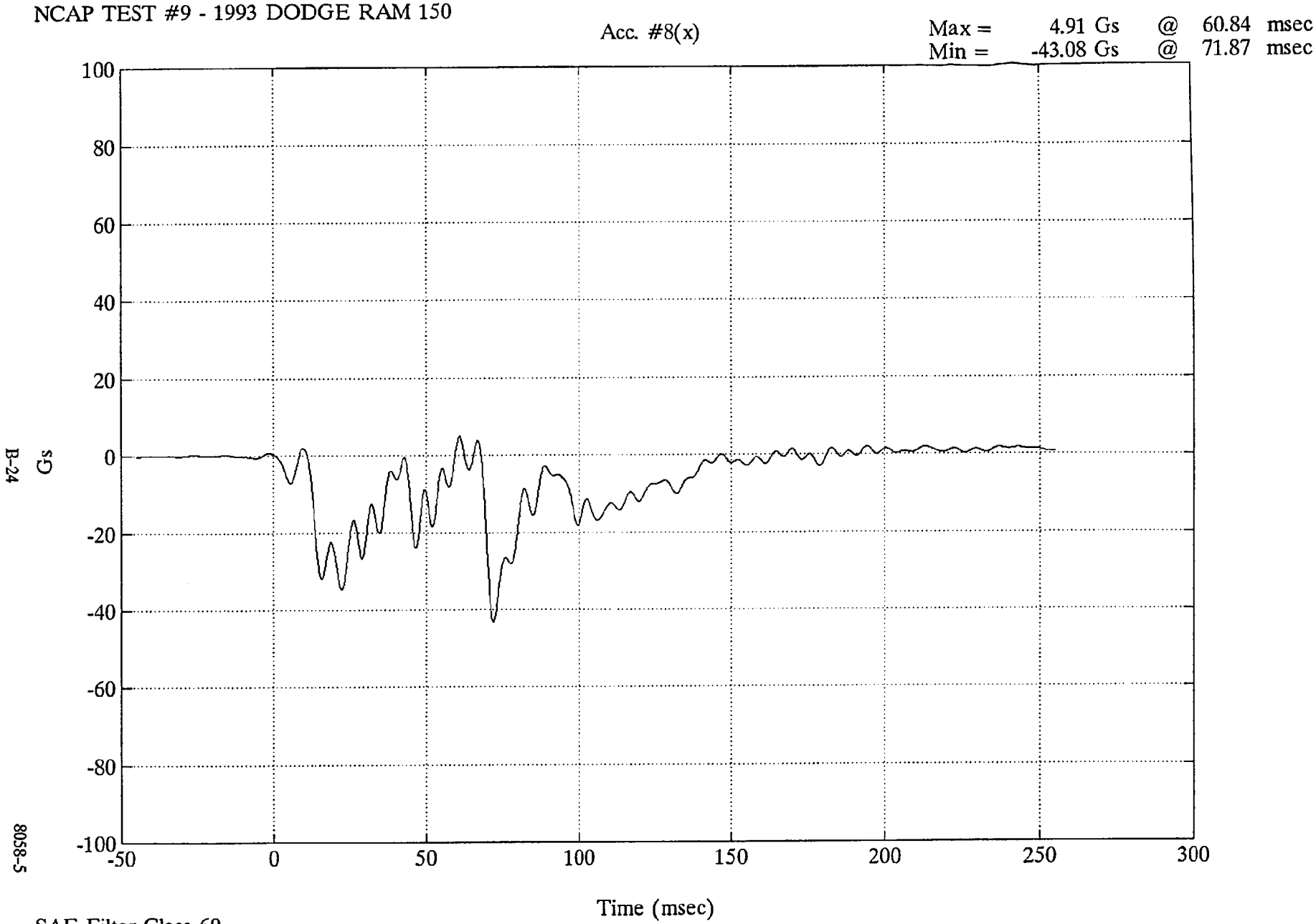
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



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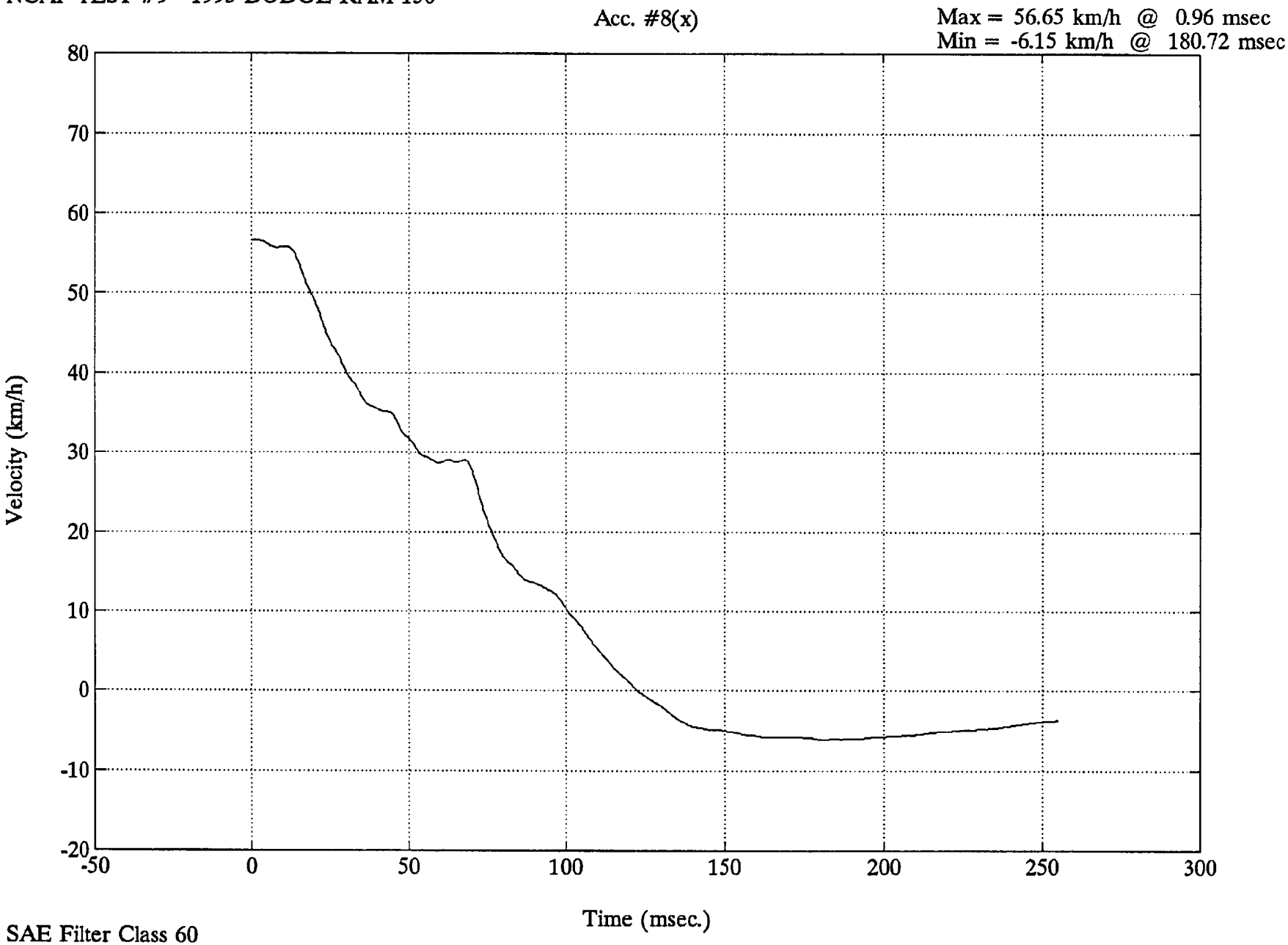
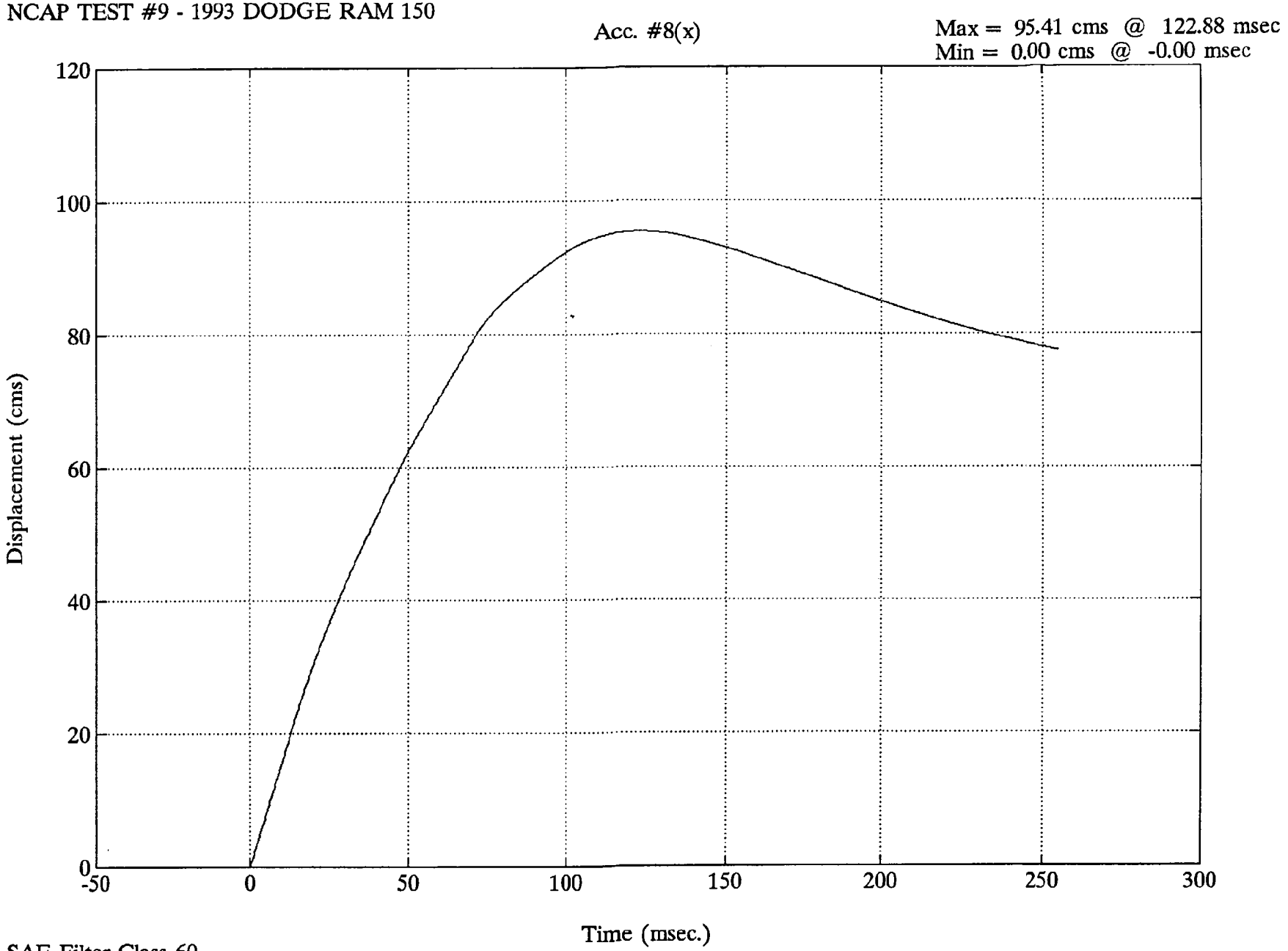


SAE Filter Class 60

8058-5

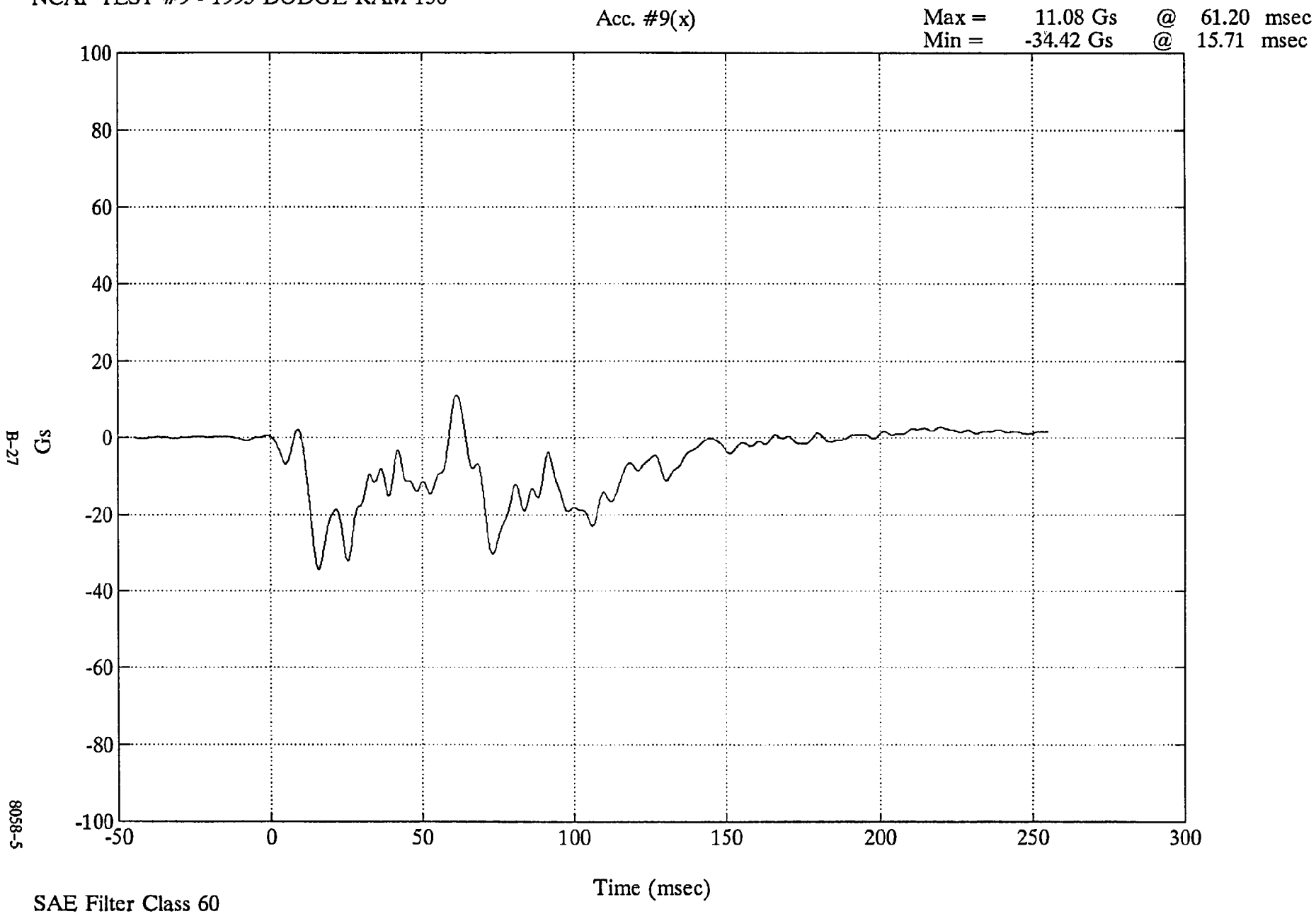
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

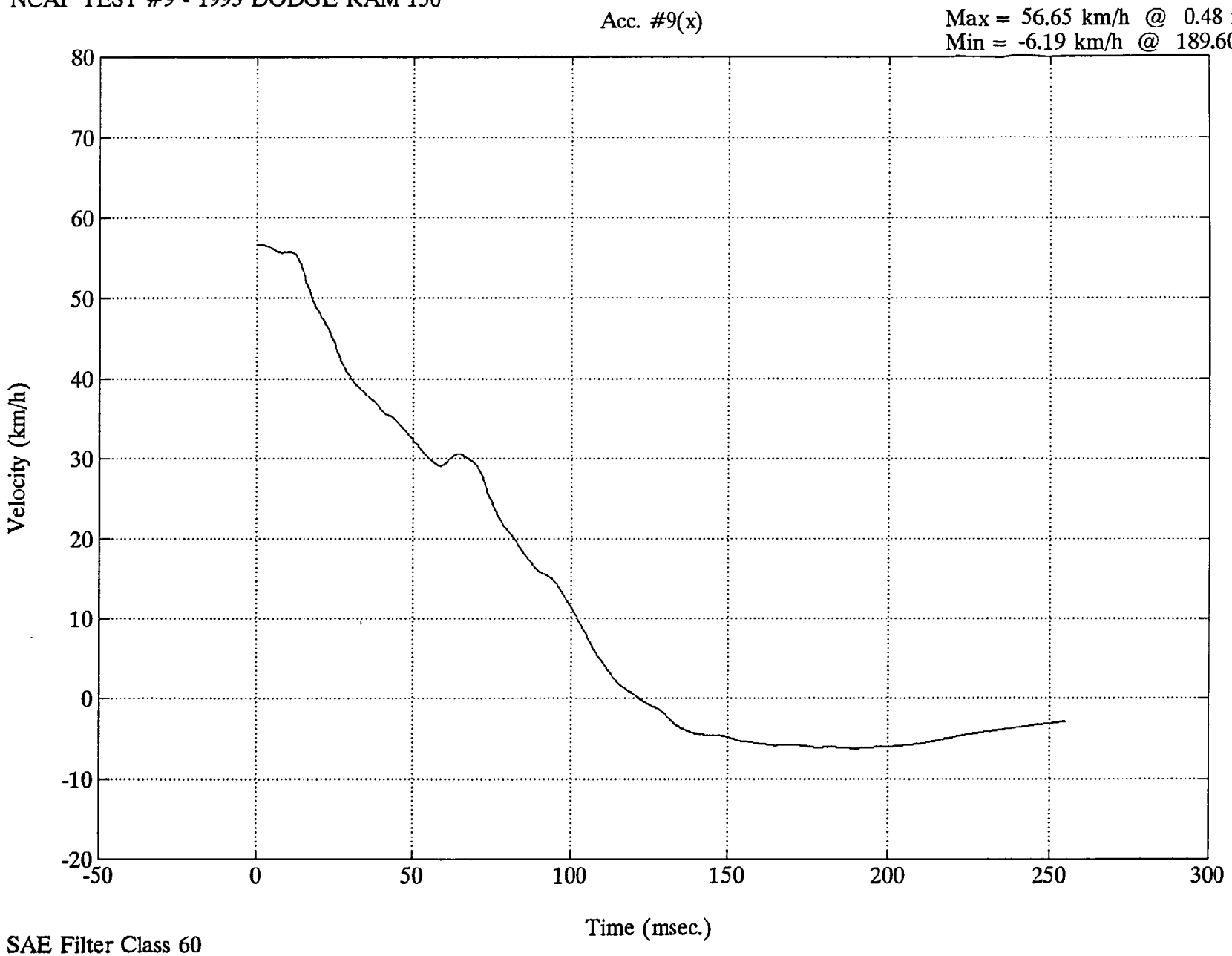
8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

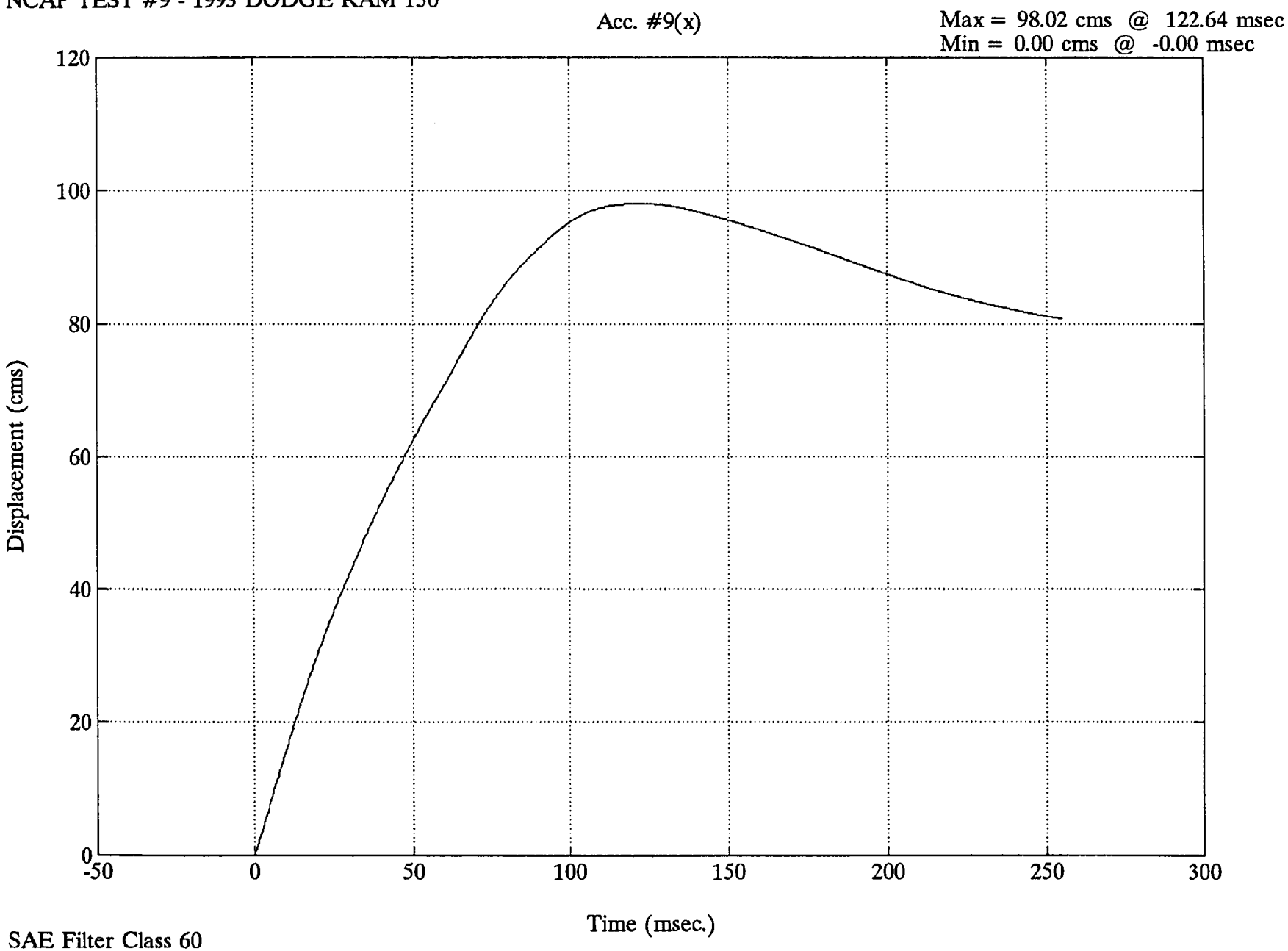
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

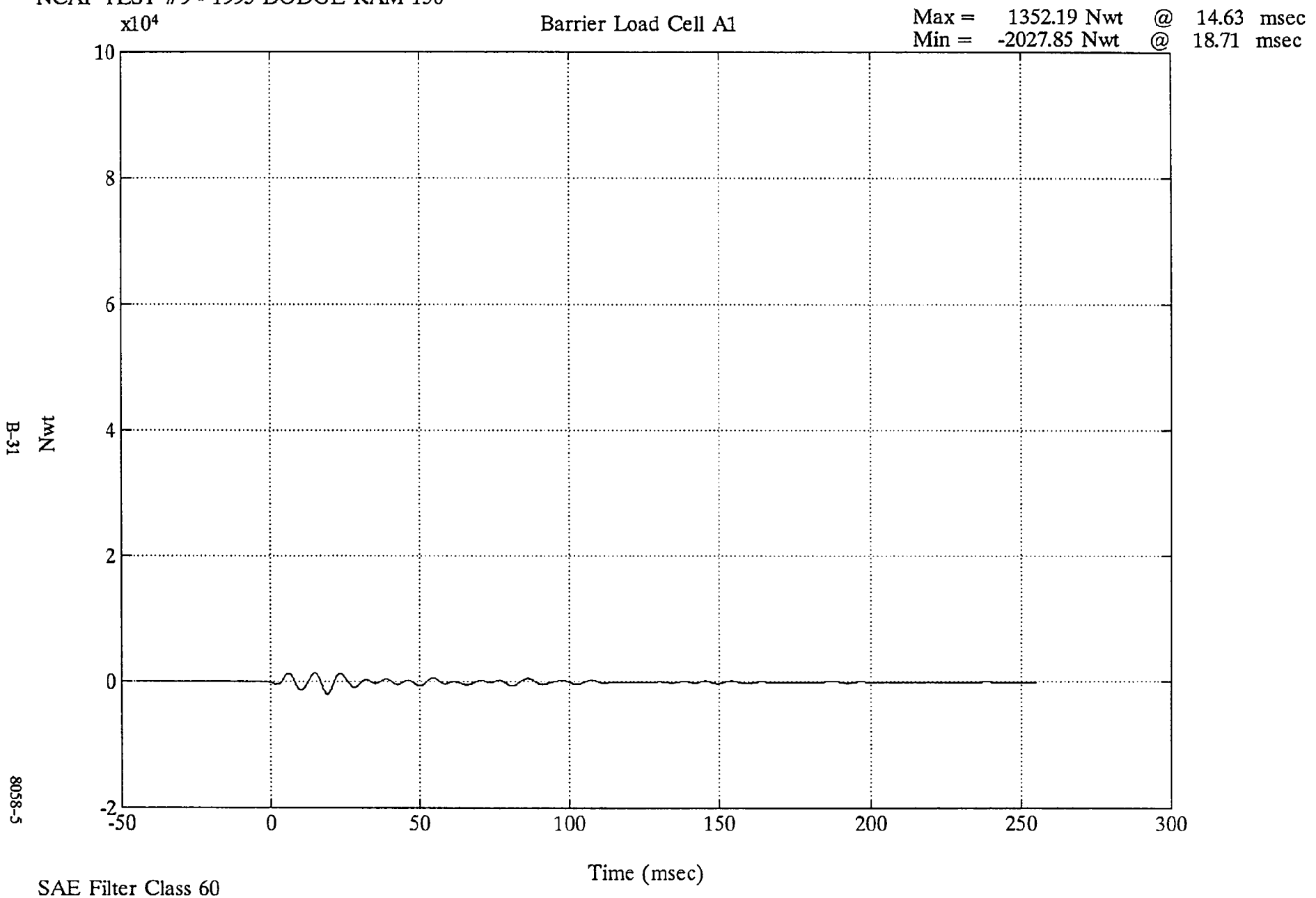
TEST NO. MP0304

LOAD CELL BARRIER DATA

FILTER CHANNEL CLASS

60

NCAP TEST #9 - 1993 DODGE RAM 150

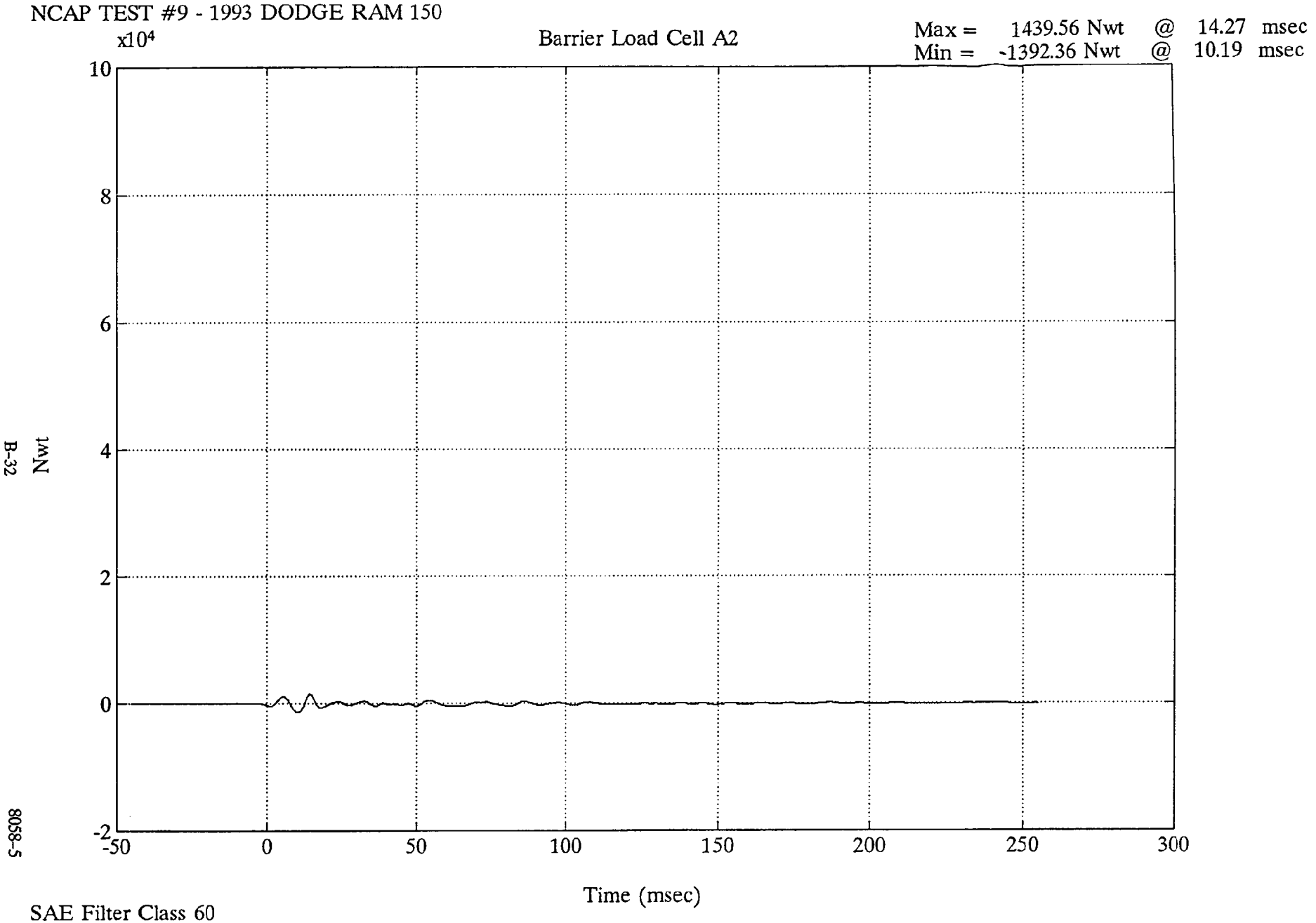


SAE Filter Class 60

B-31

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150

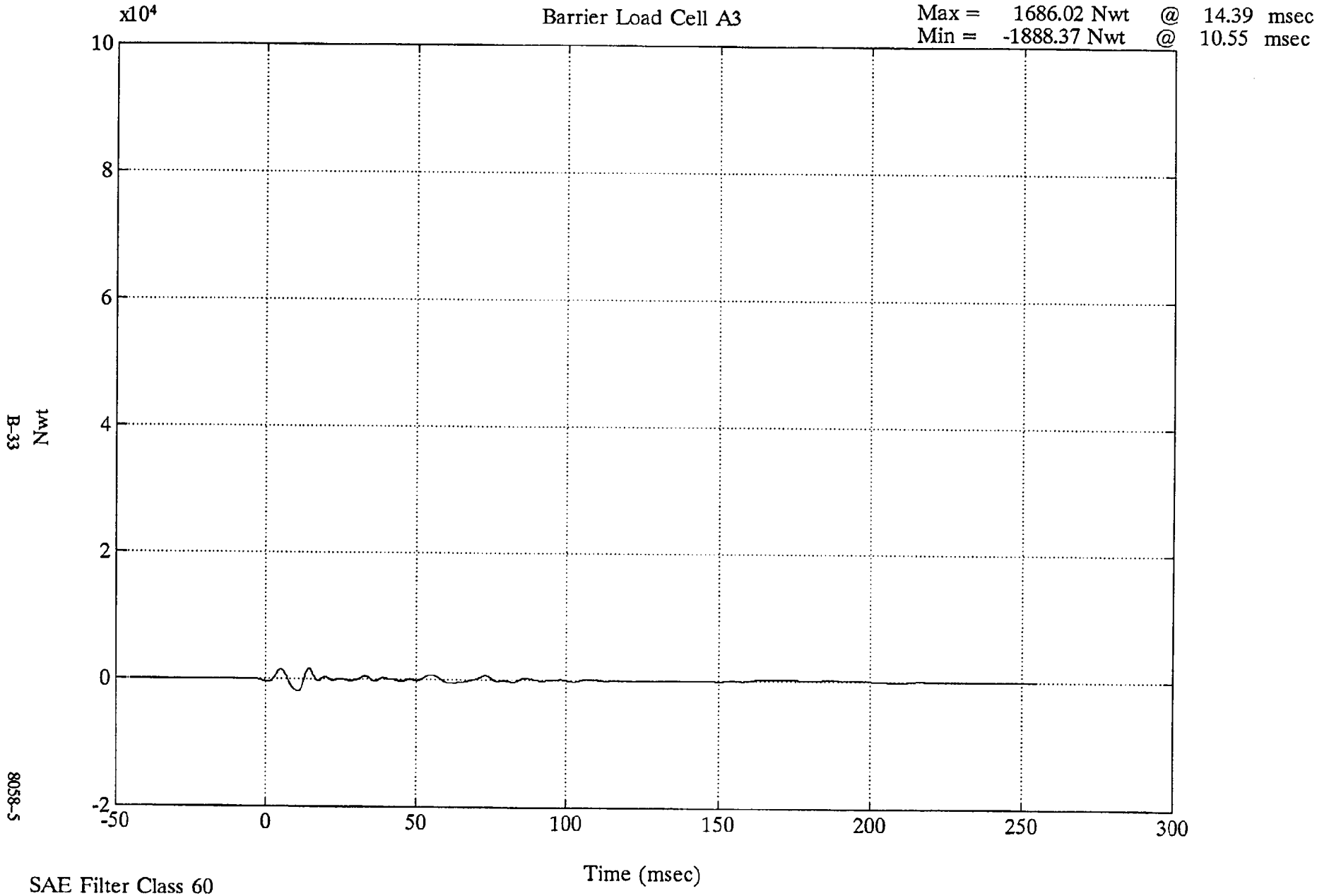


SAE Filter Class 60

B-32

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150

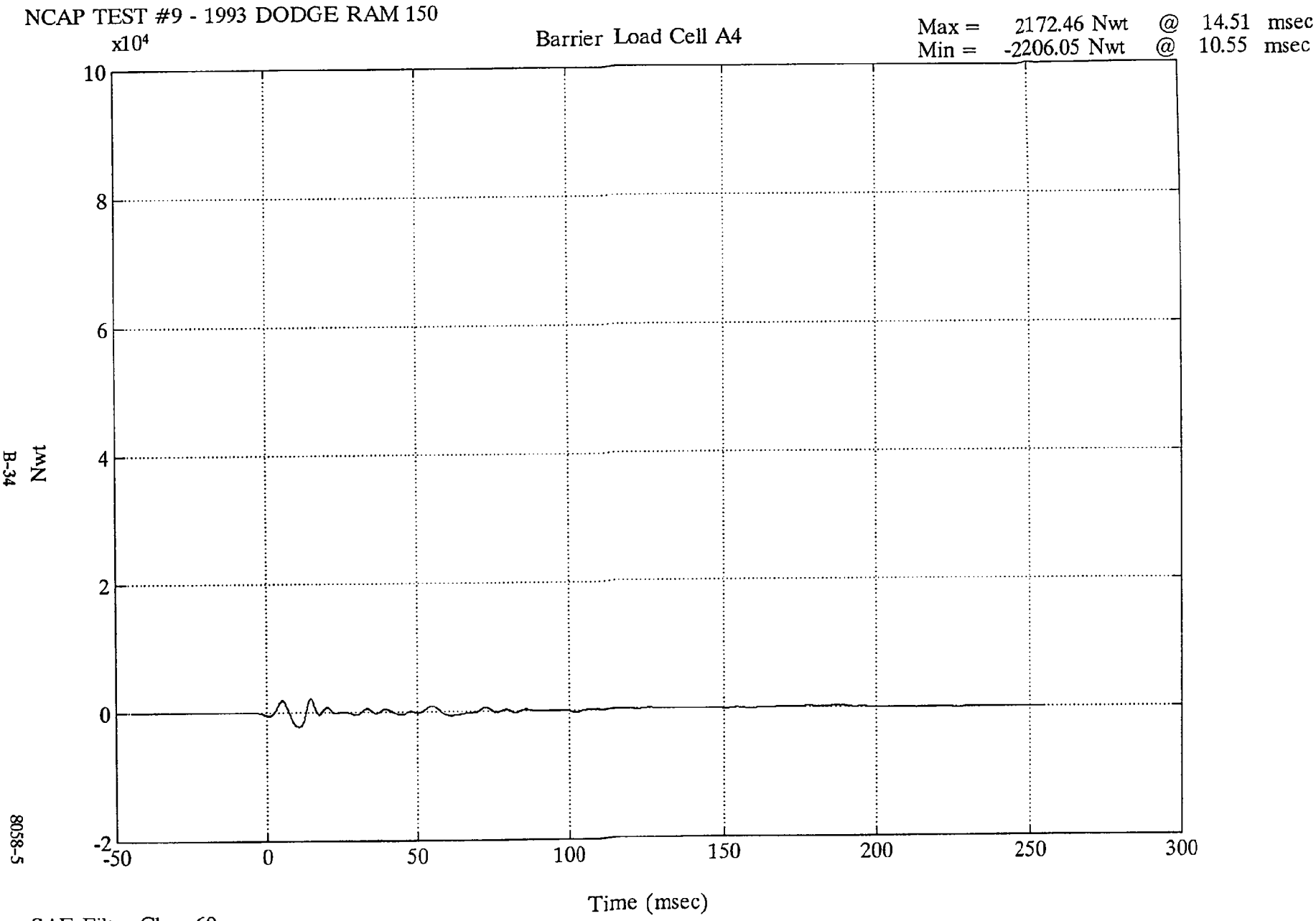


SAE Filter Class 60

B-33

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



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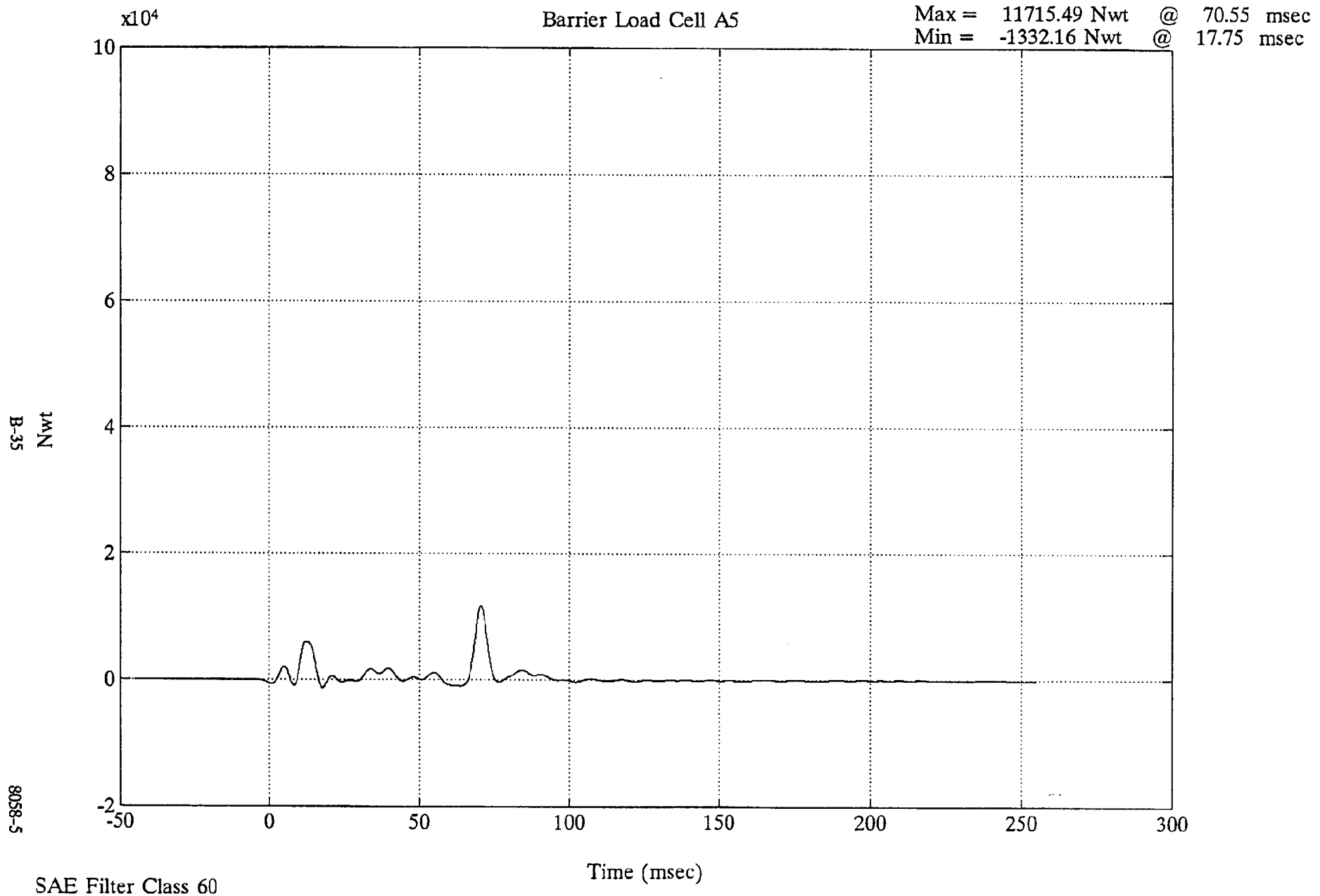
NCAP TEST #9 - 1993 DODGE RAM 150



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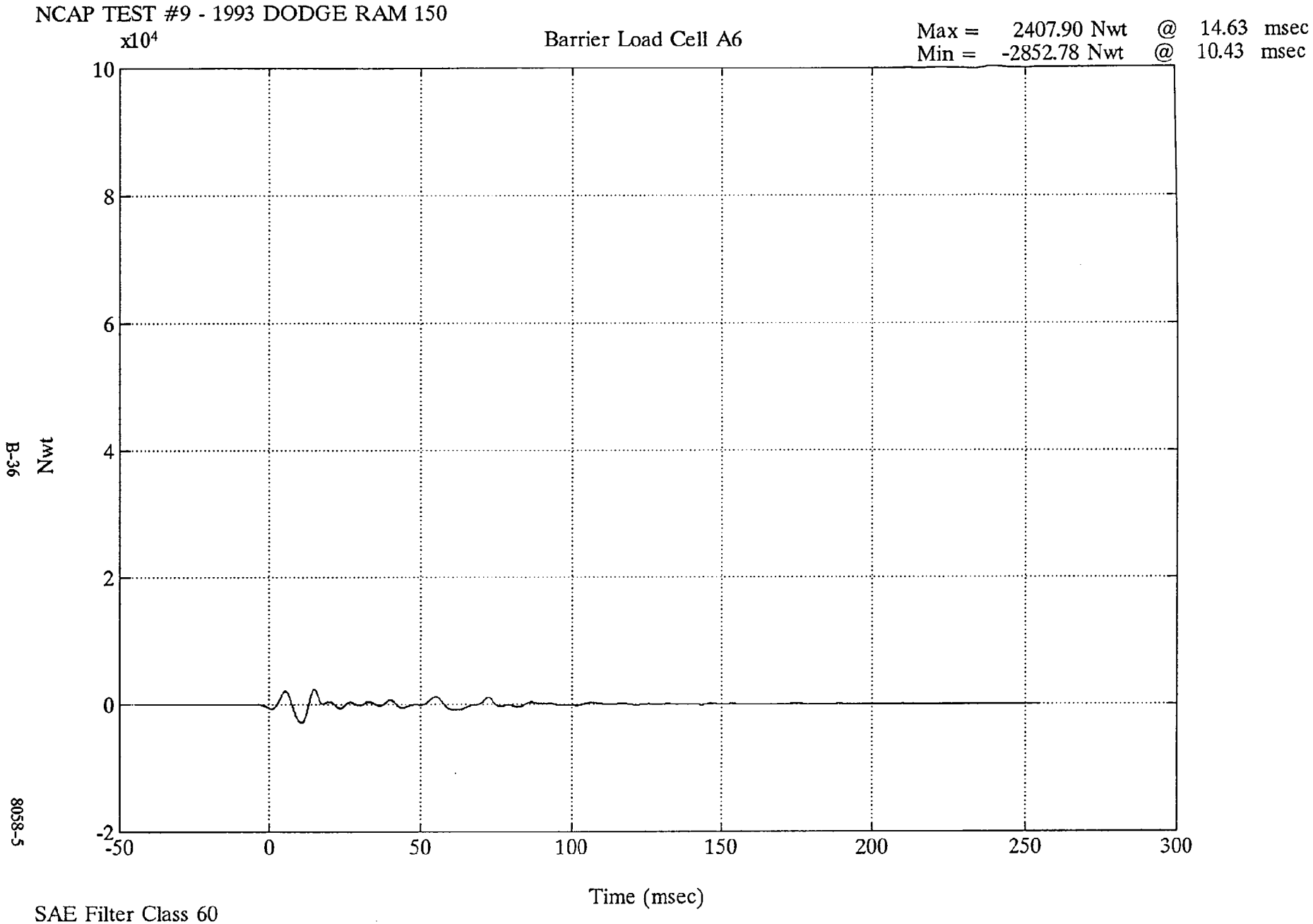
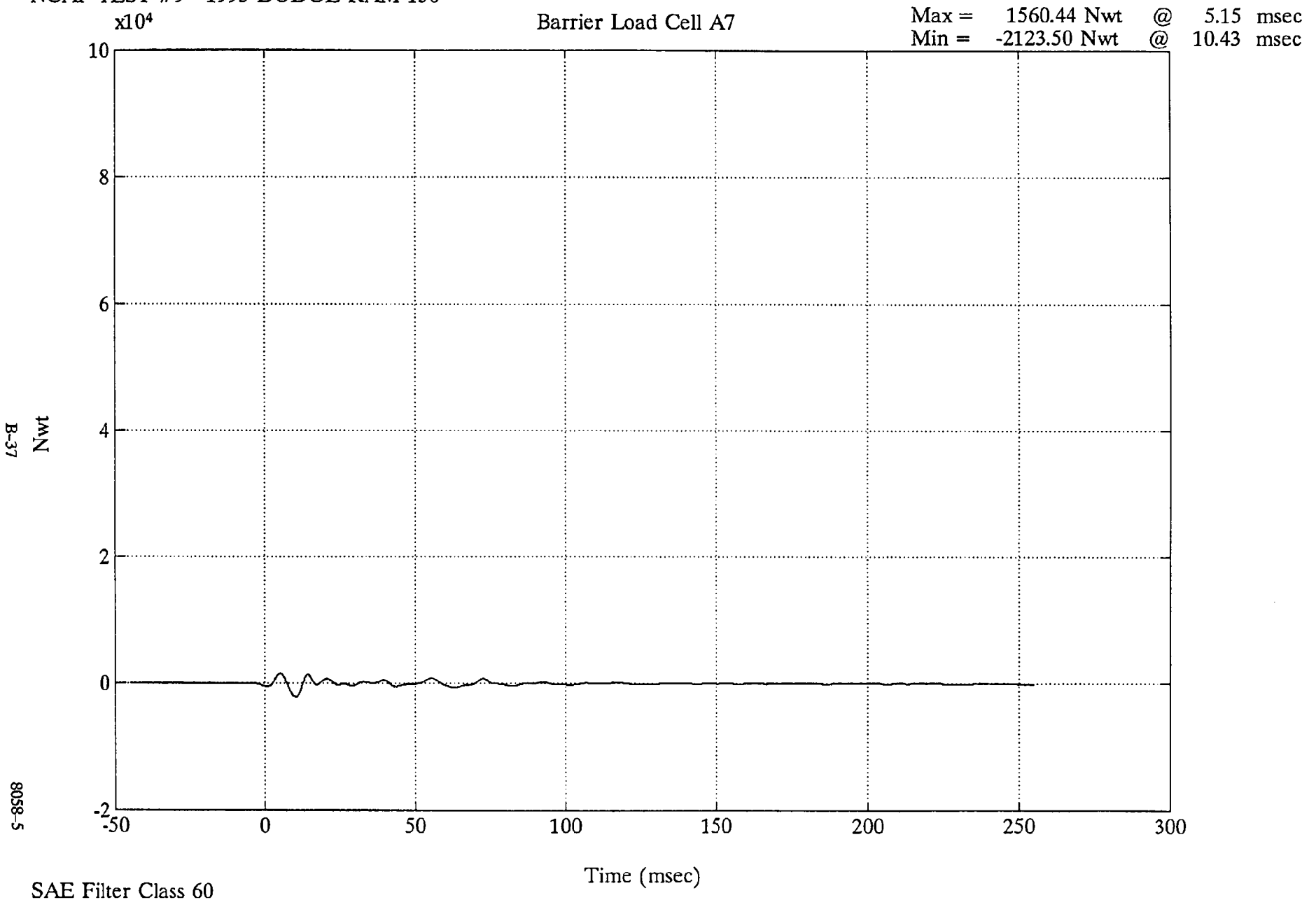


SAE Filter Class 60

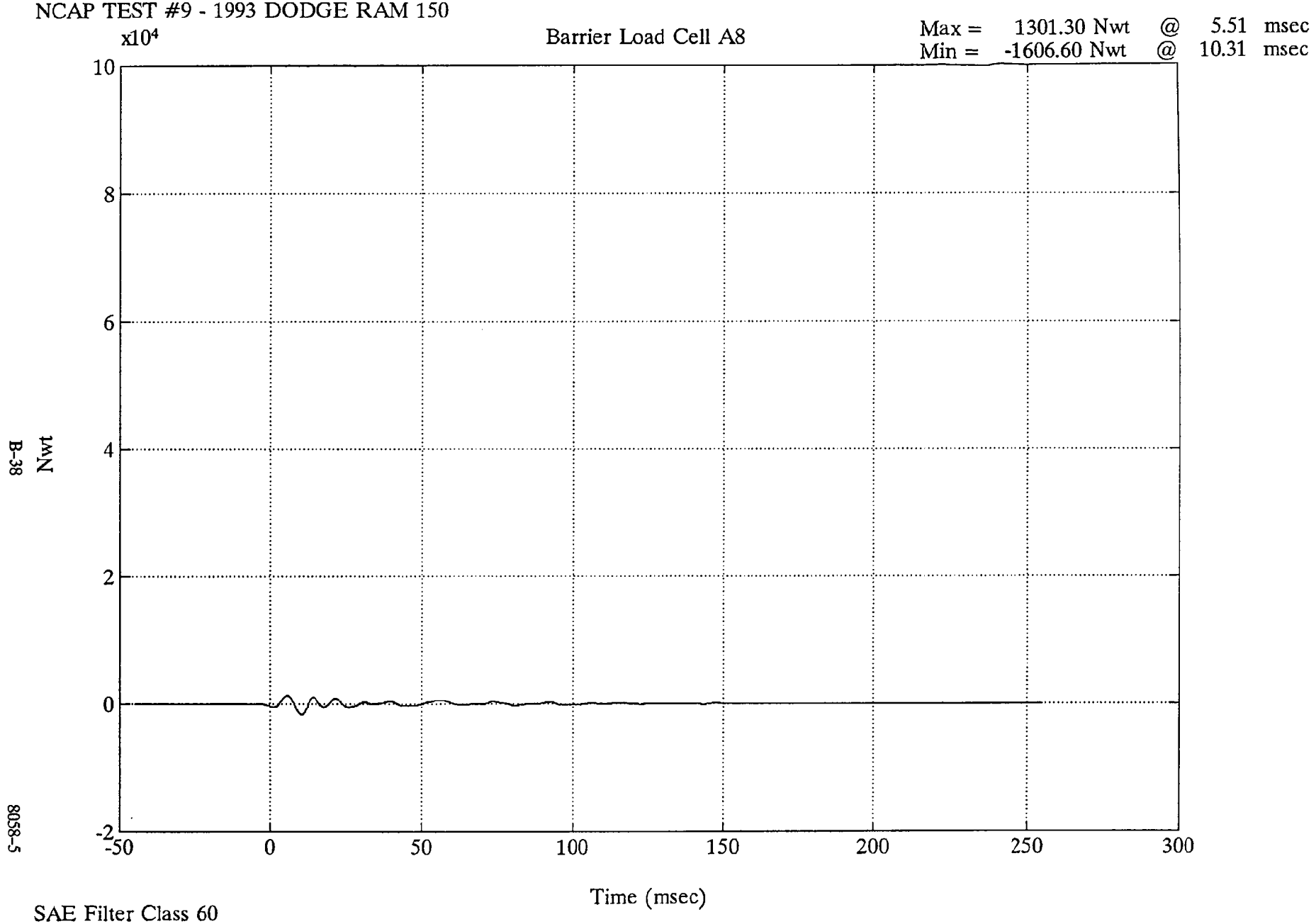
8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

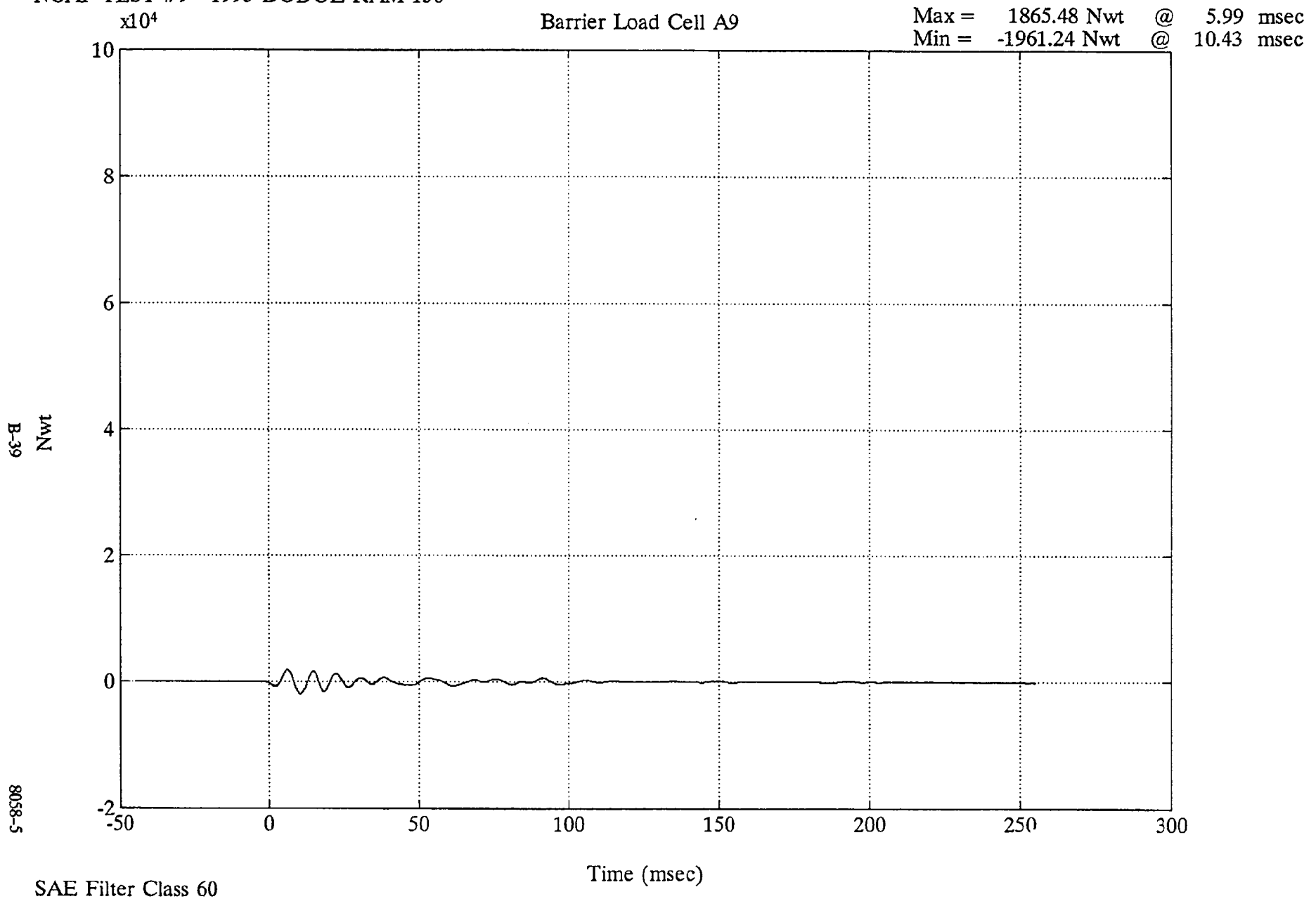
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150

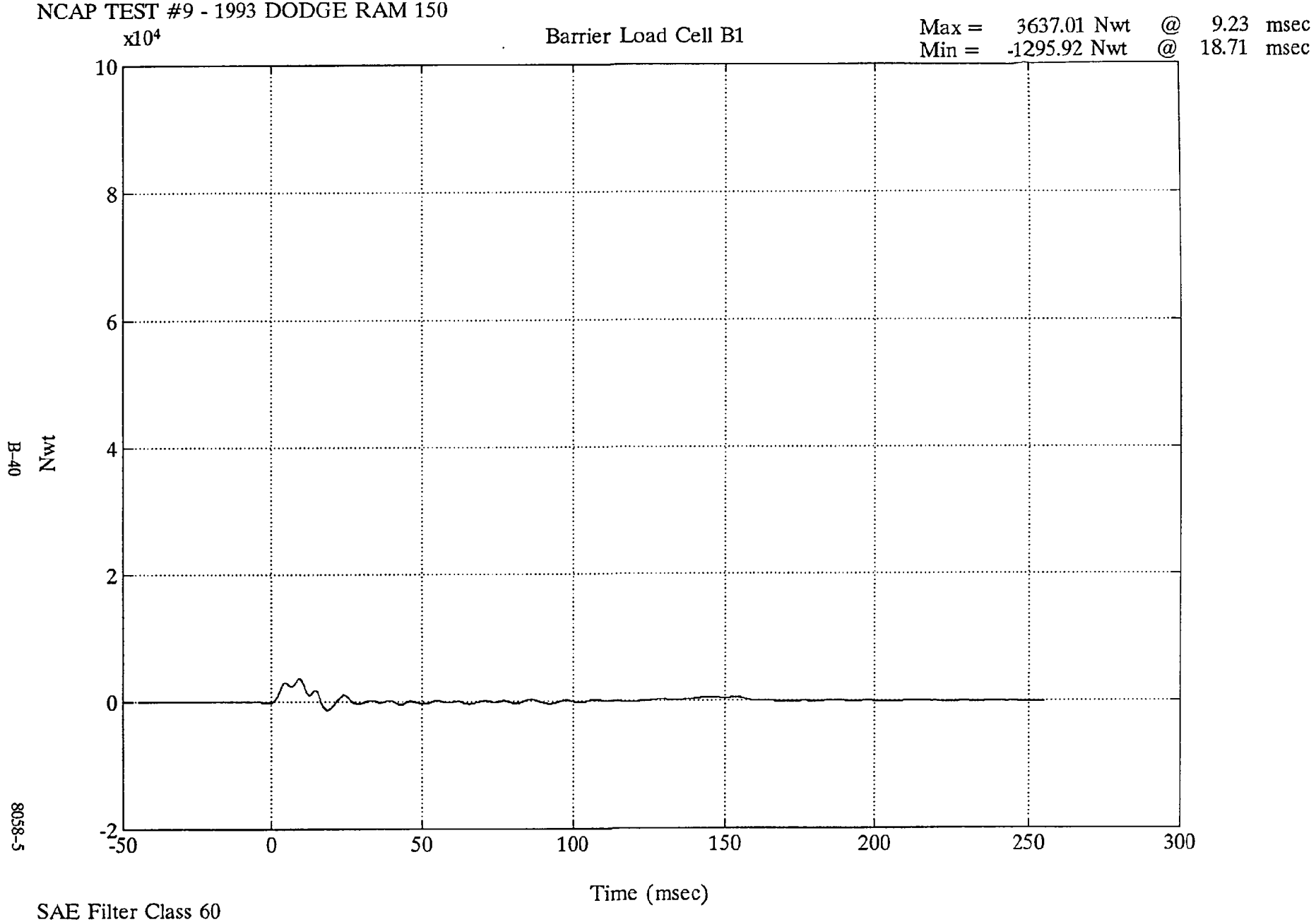


SAE Filter Class 60

B-39

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150

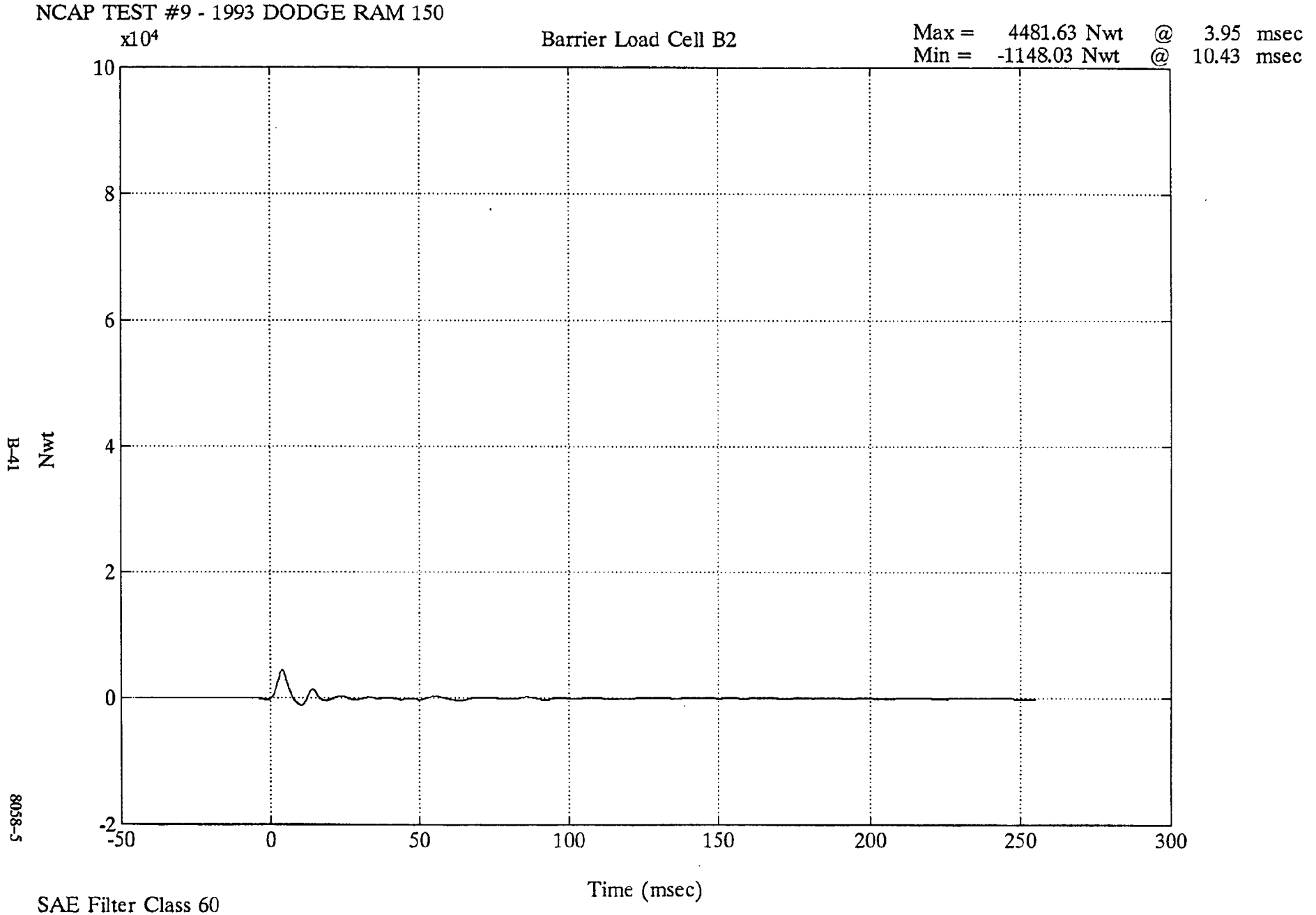


SAE Filter Class 60

B-40

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

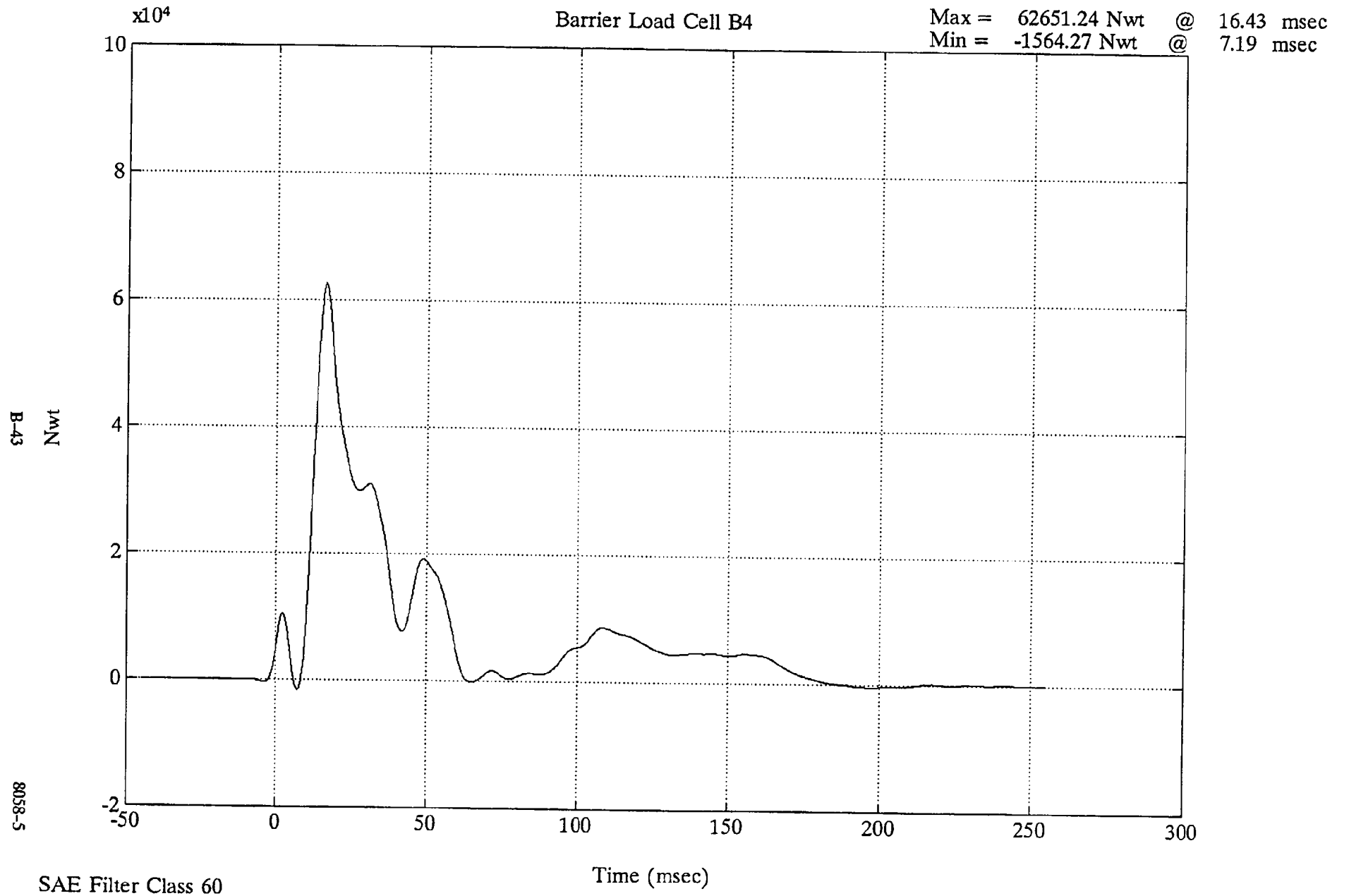
8058-5

NCAP TEST #9 - 1993 DODGE RAM 150

SAE Filter Class 60

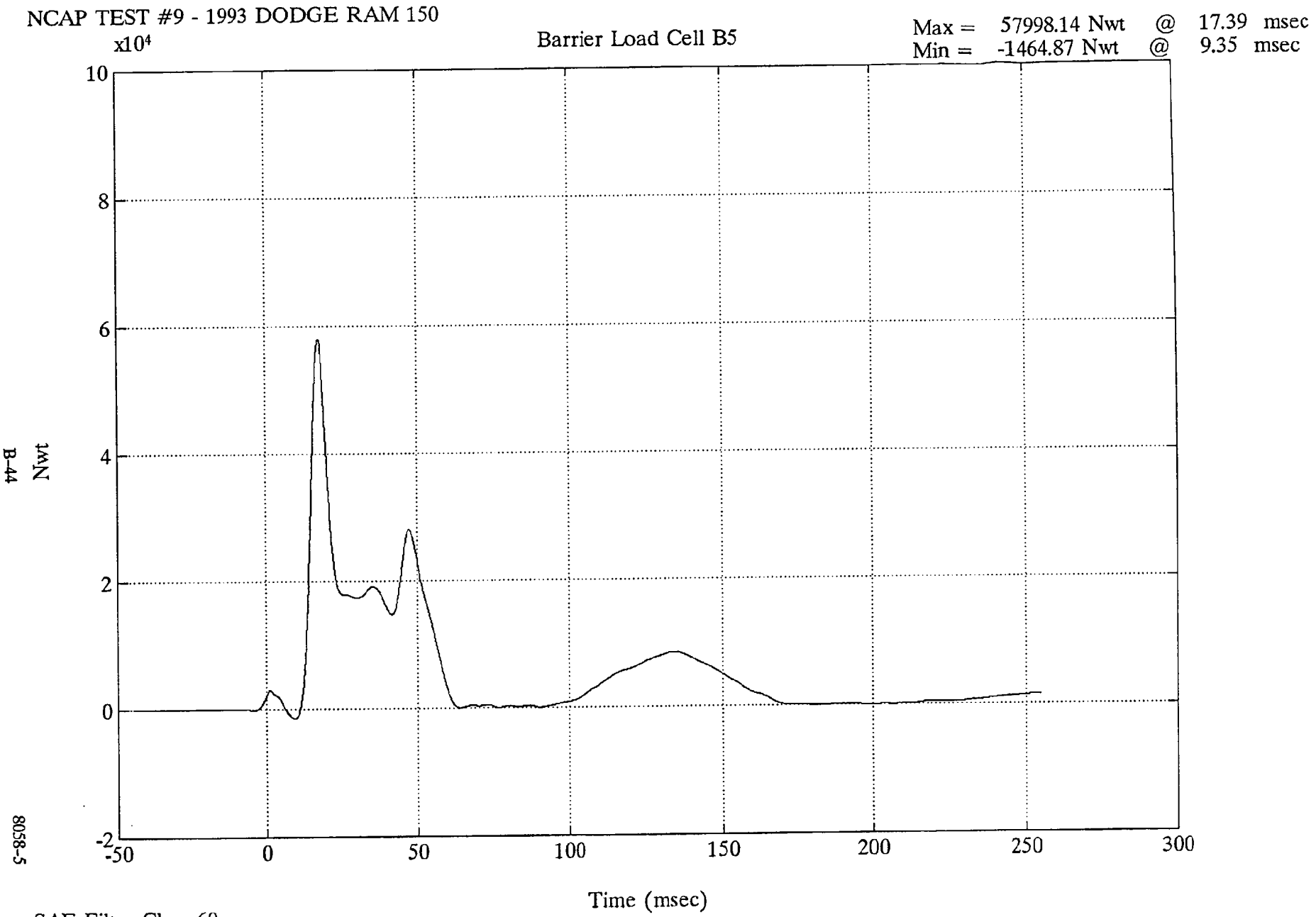
8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



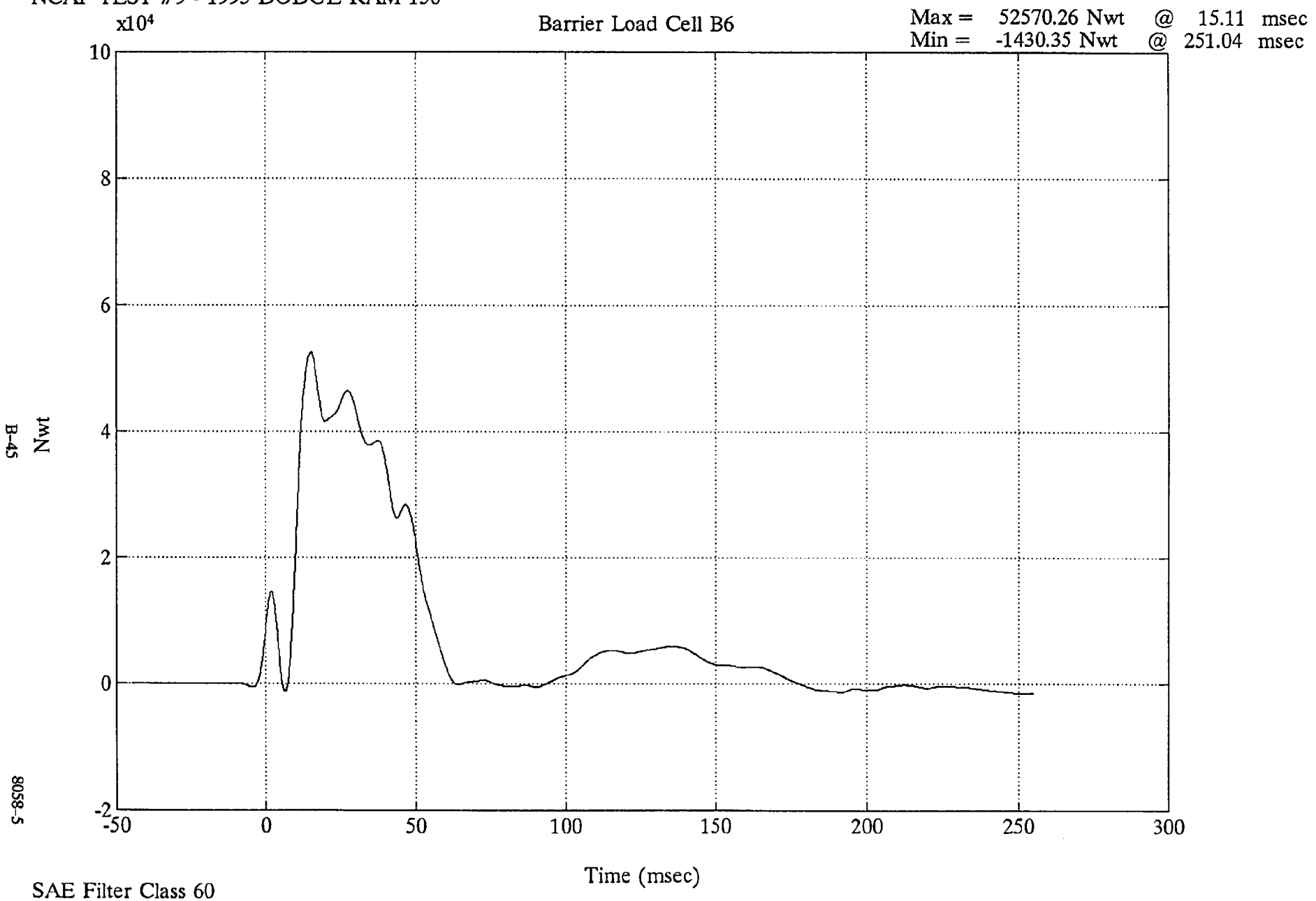
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150

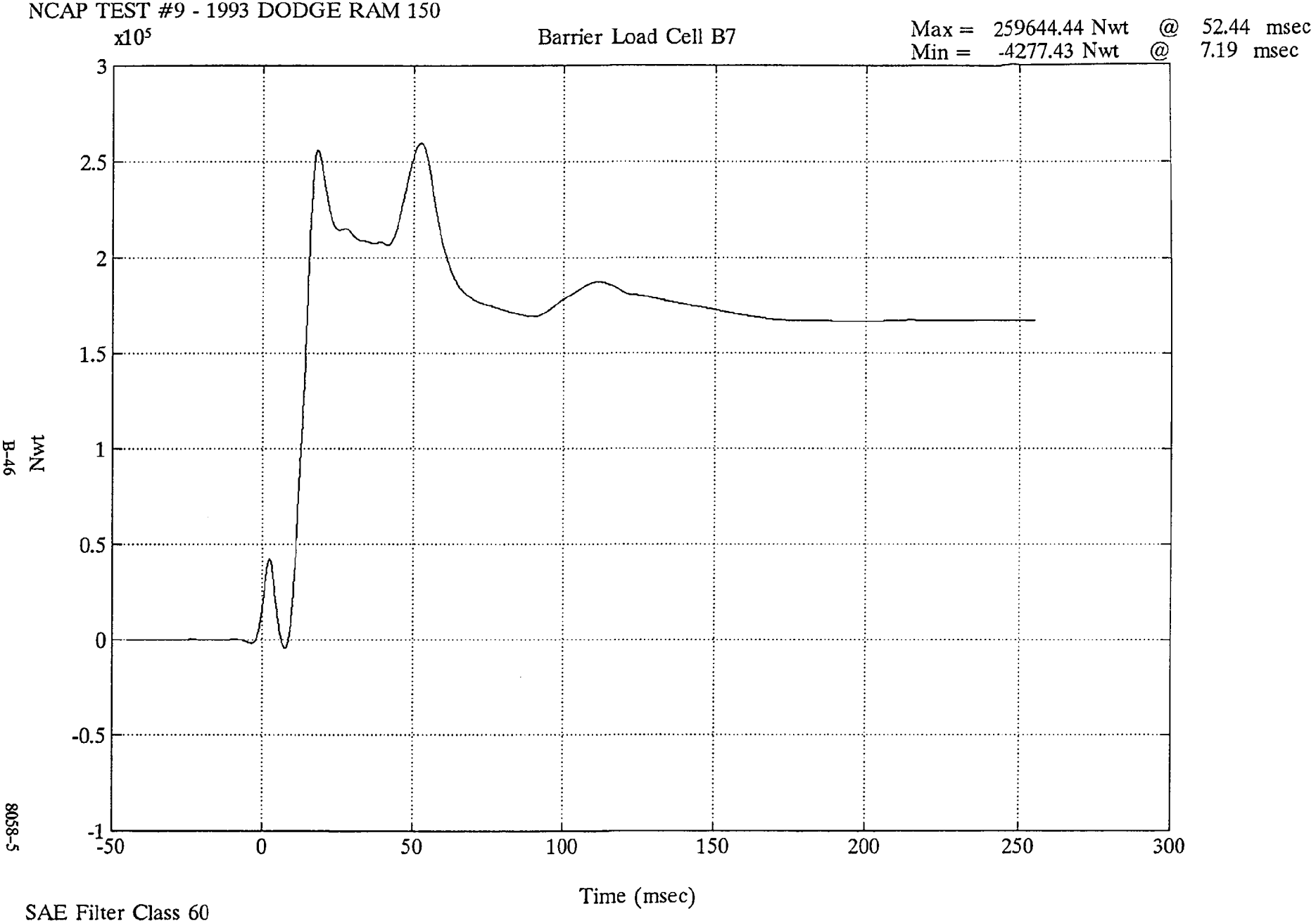


SAE Filter Class 60

B-45

8058-5

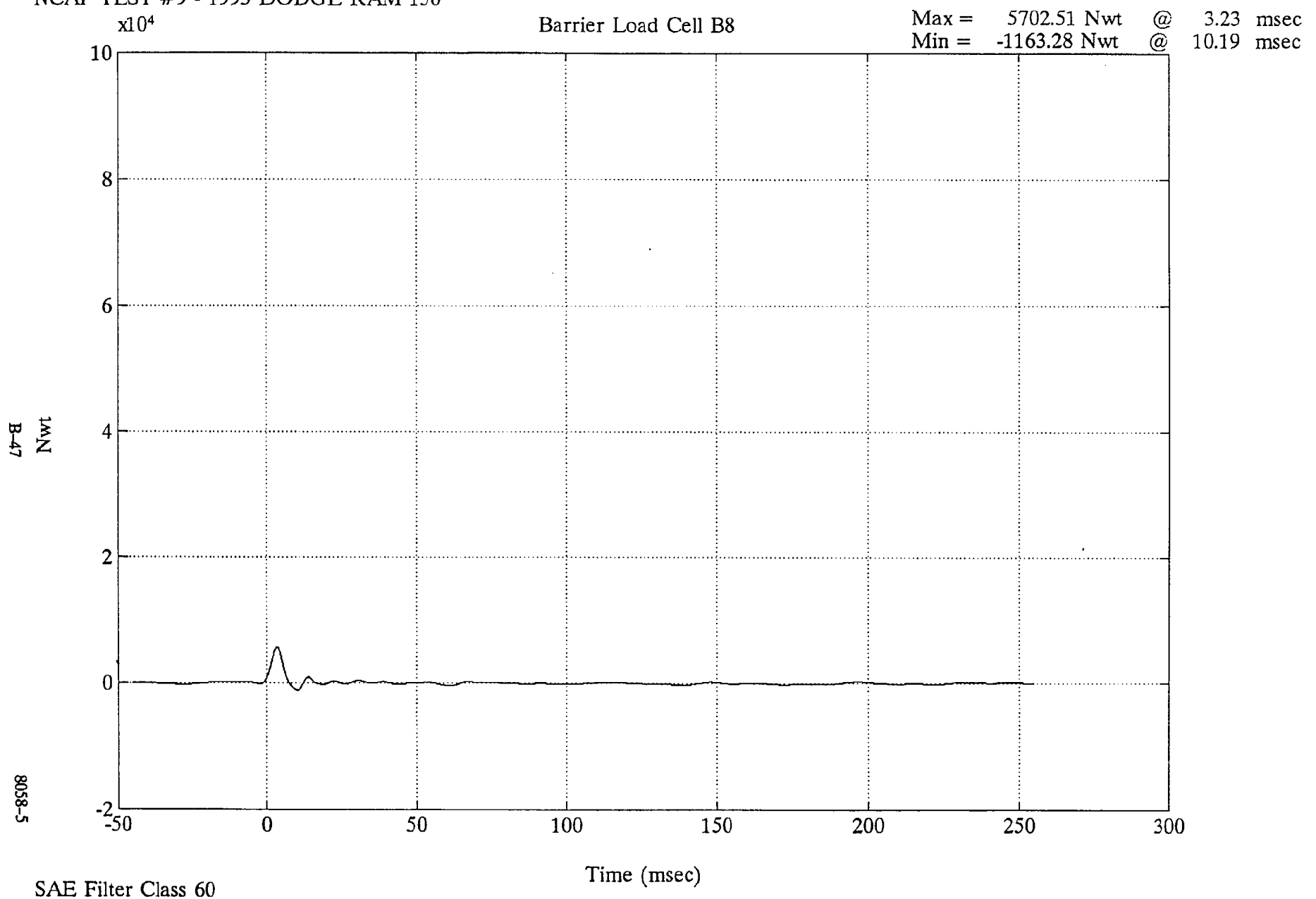
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

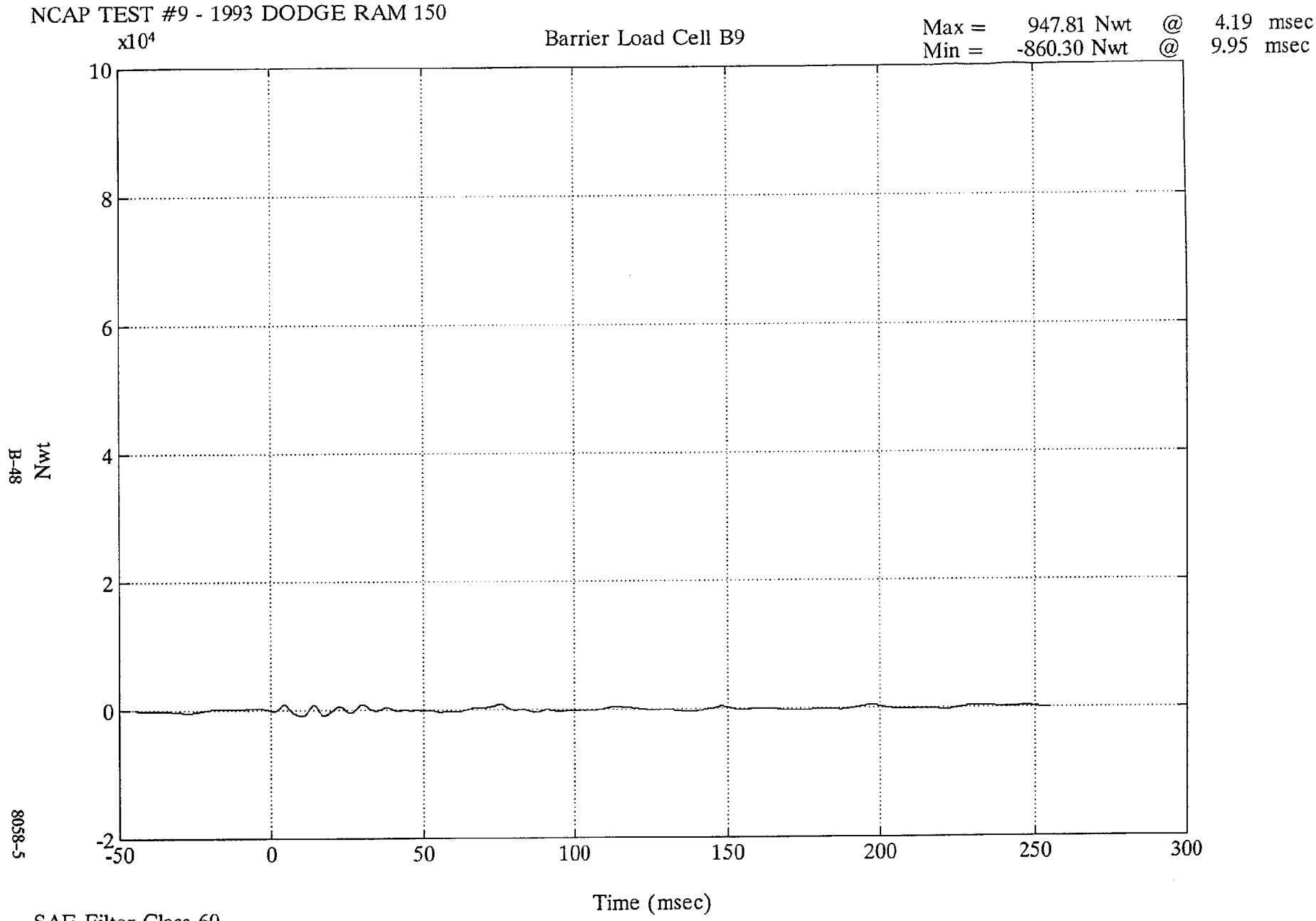
8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



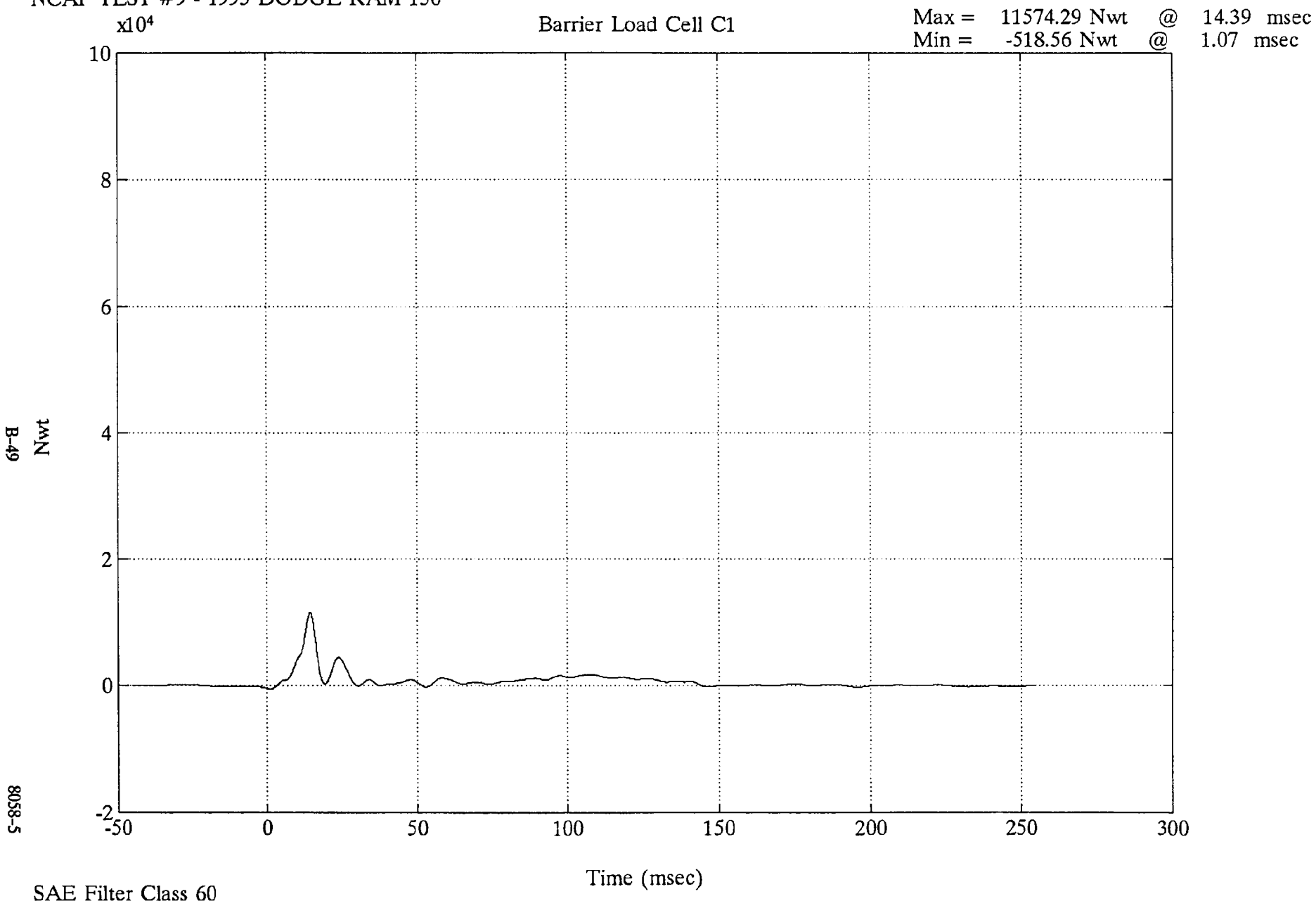
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150

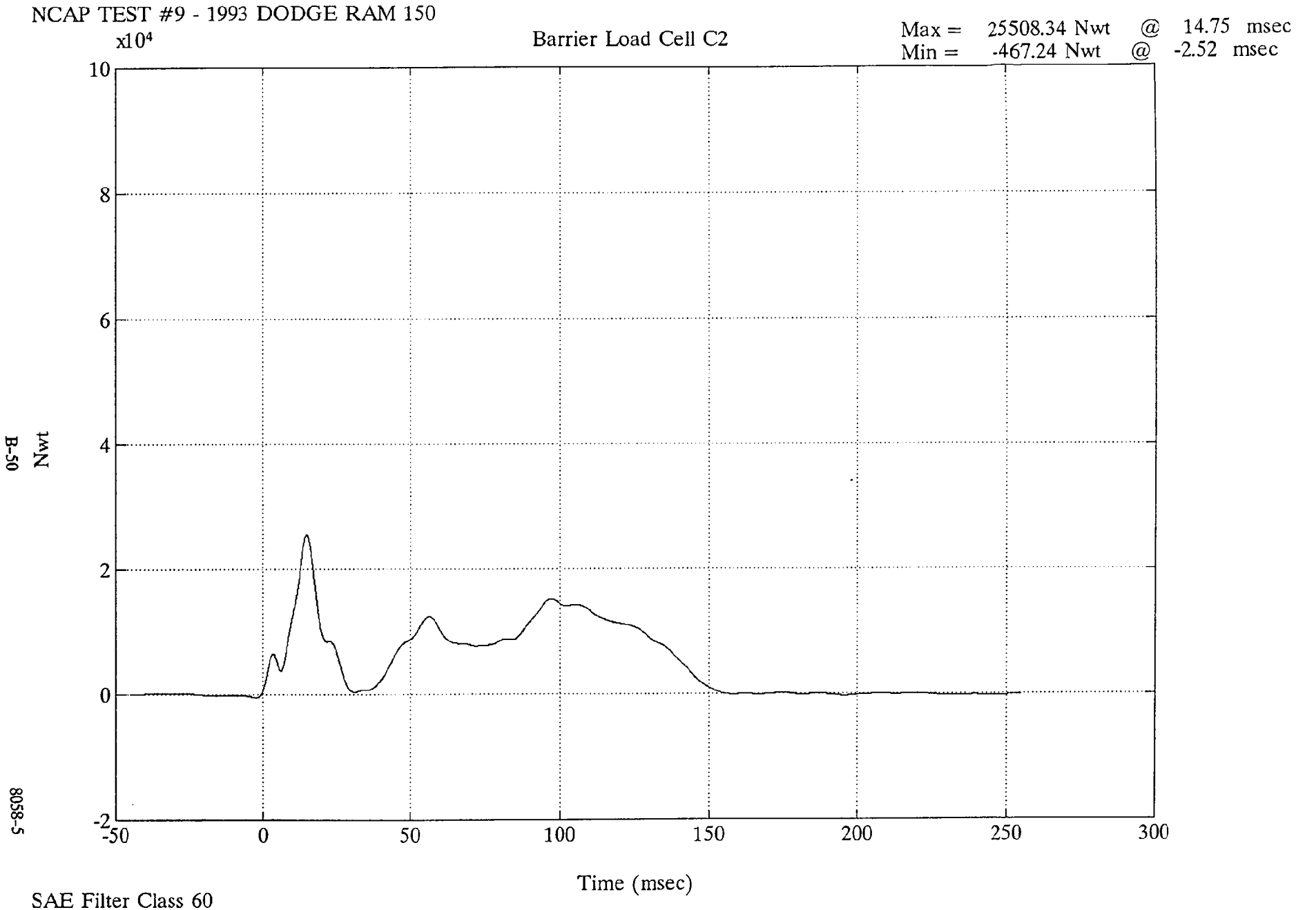


SAE Filter Class 60

B-49

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150

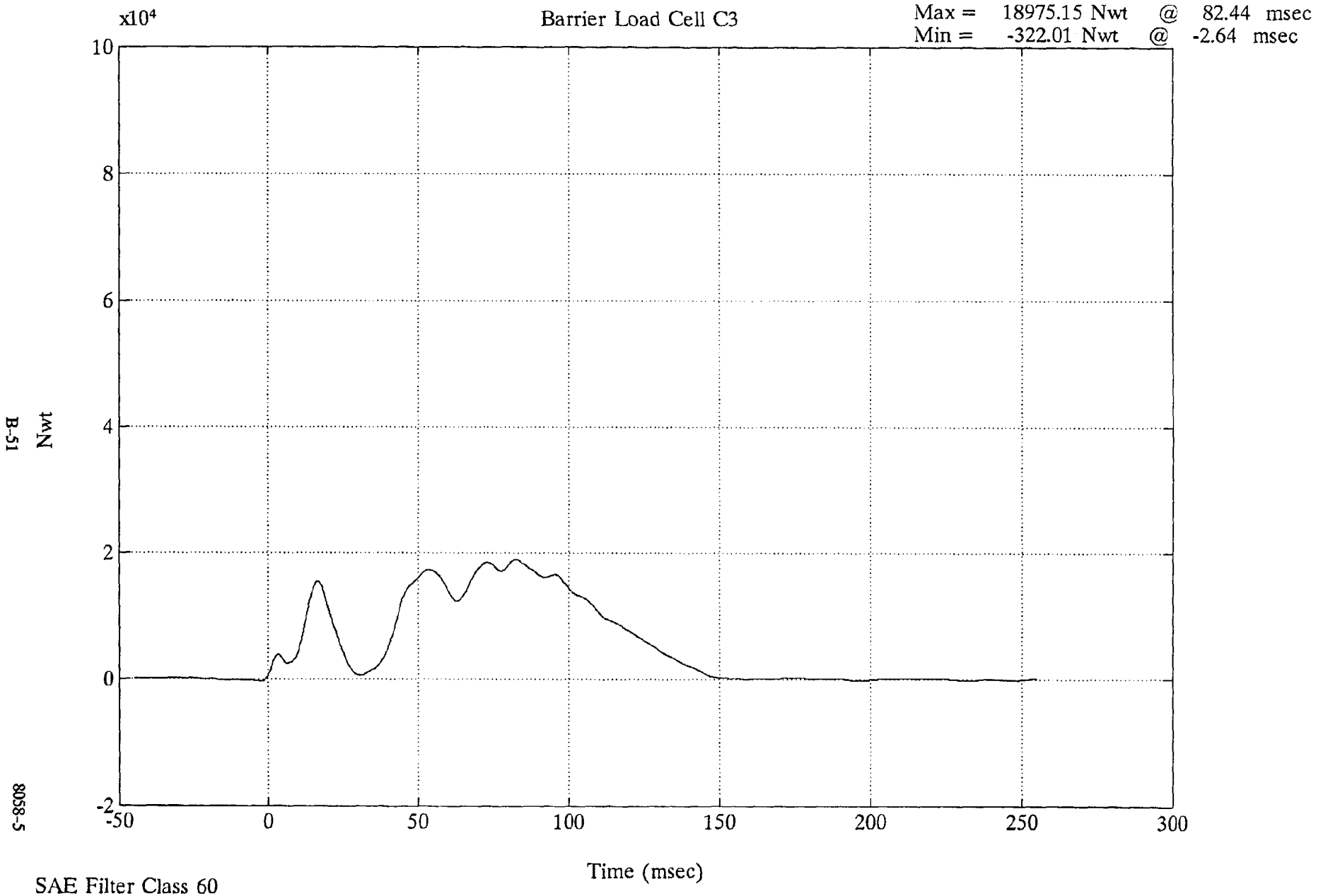


B-50

8058-5

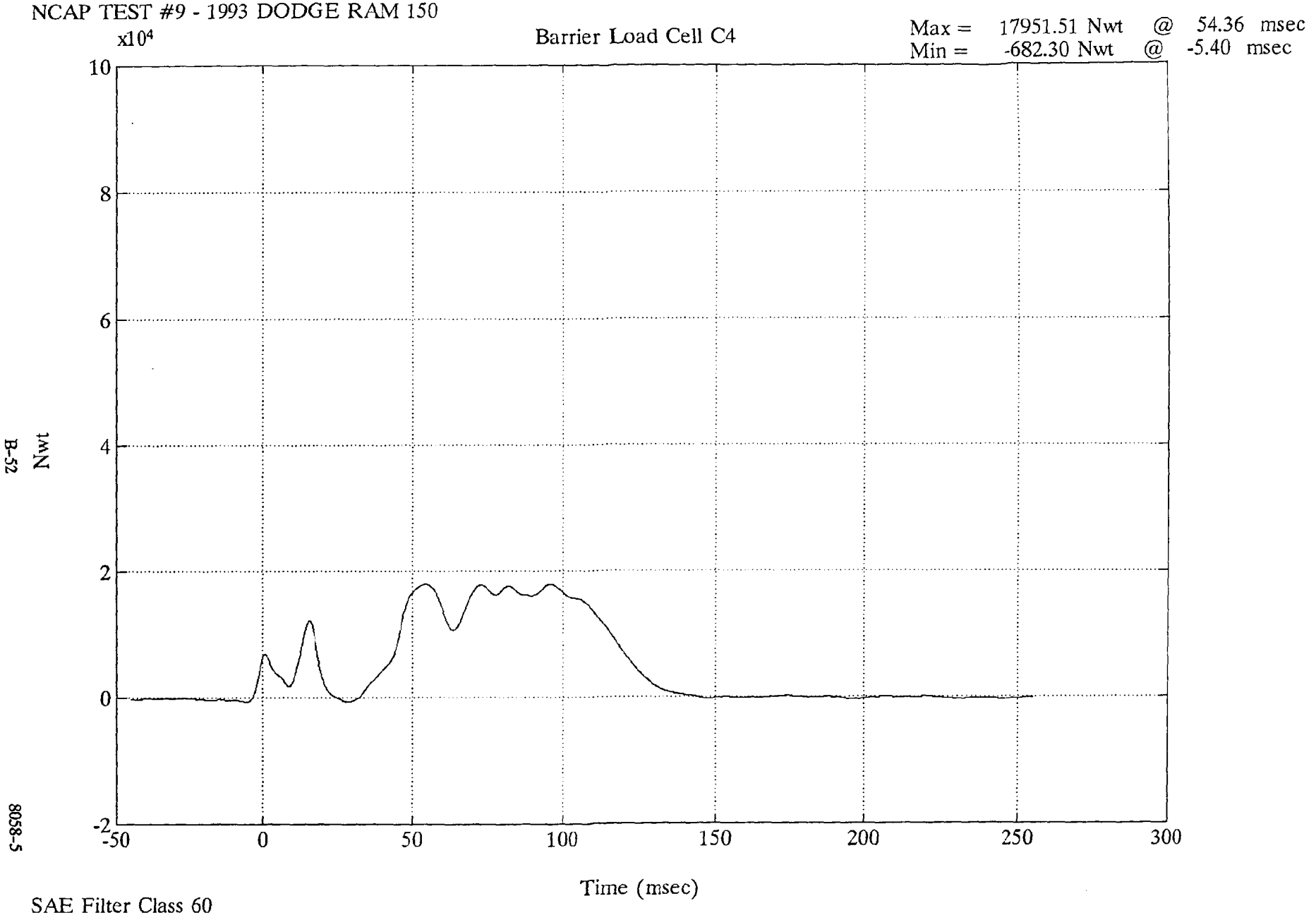
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150

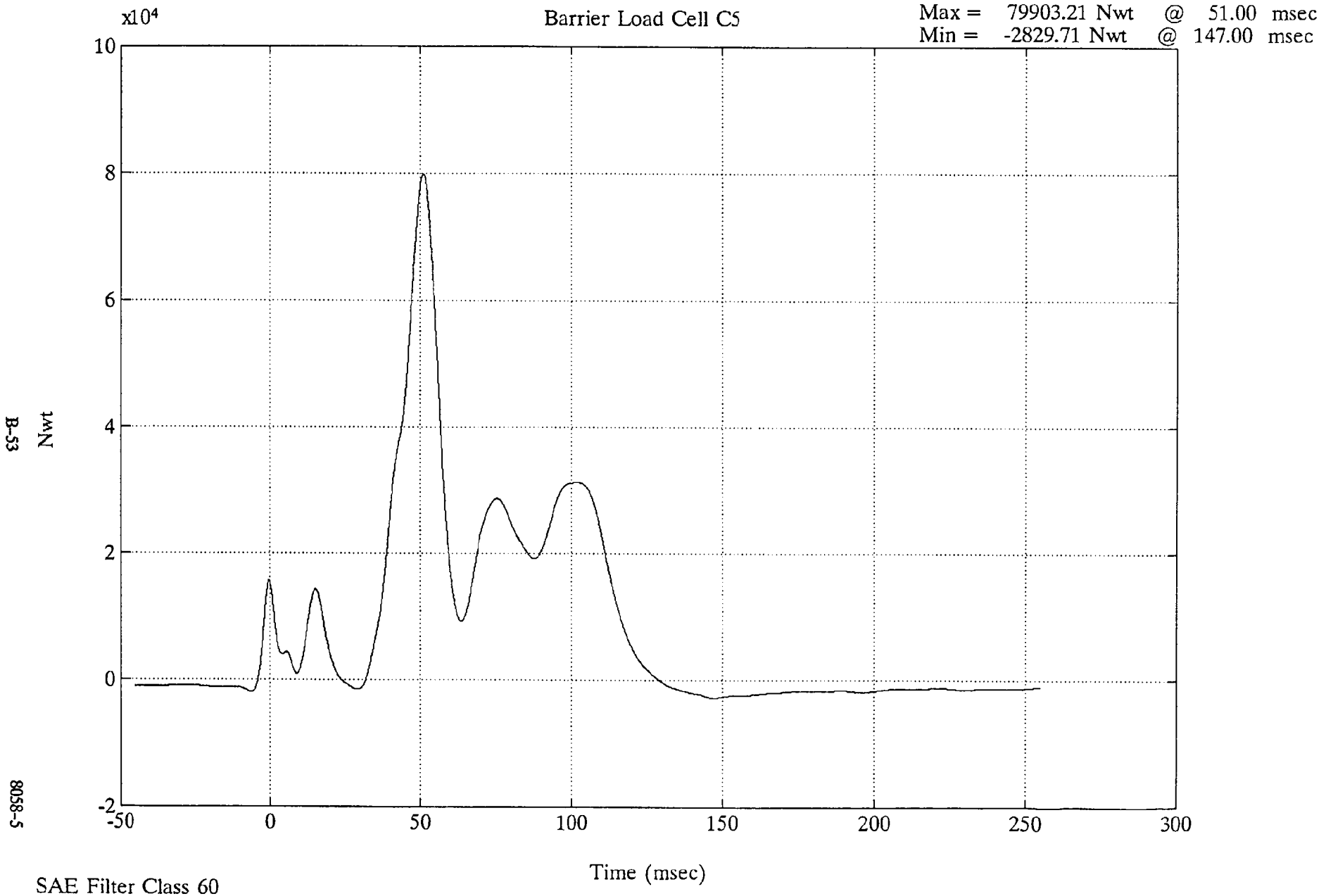


B-52

8058-5

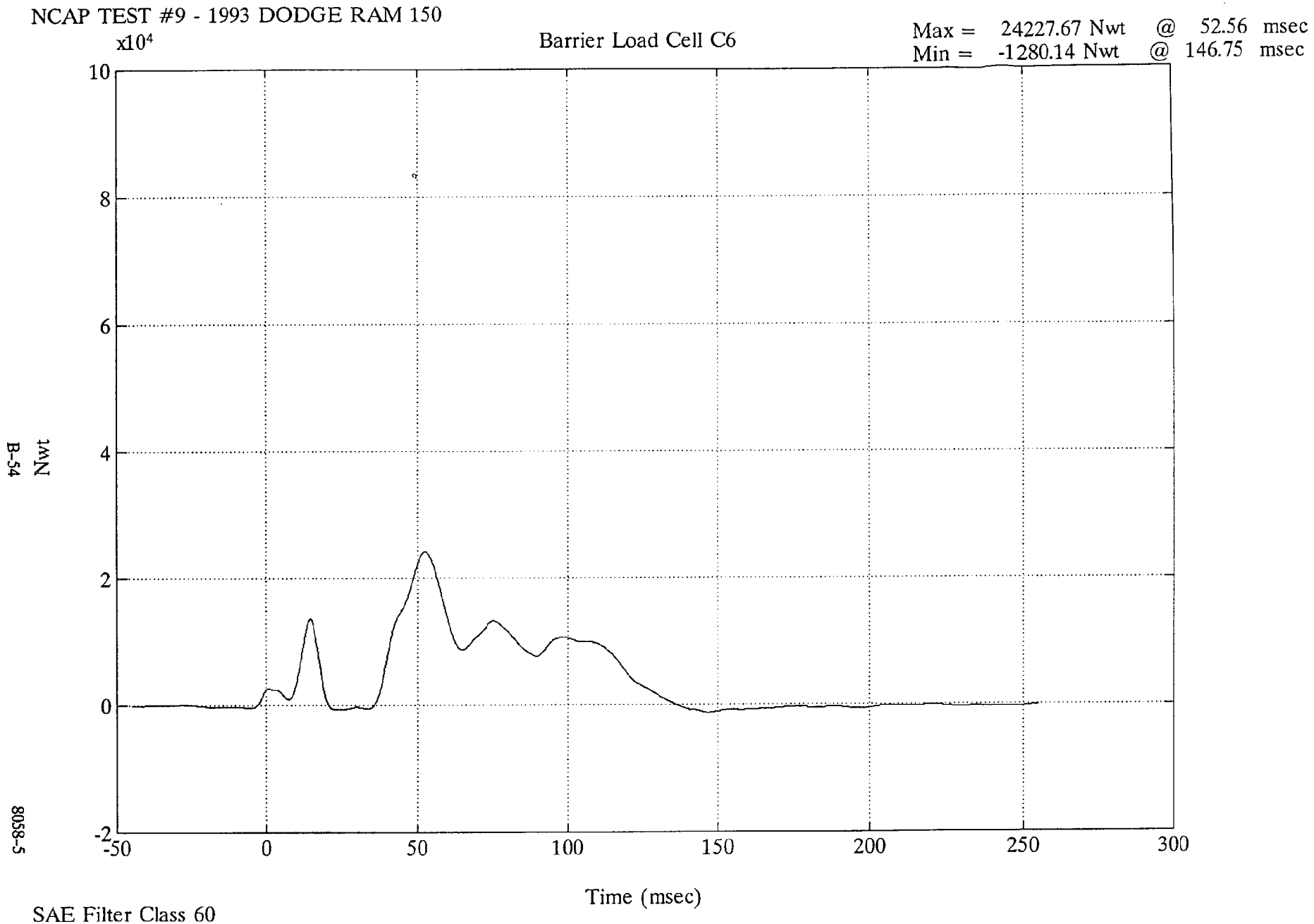
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150

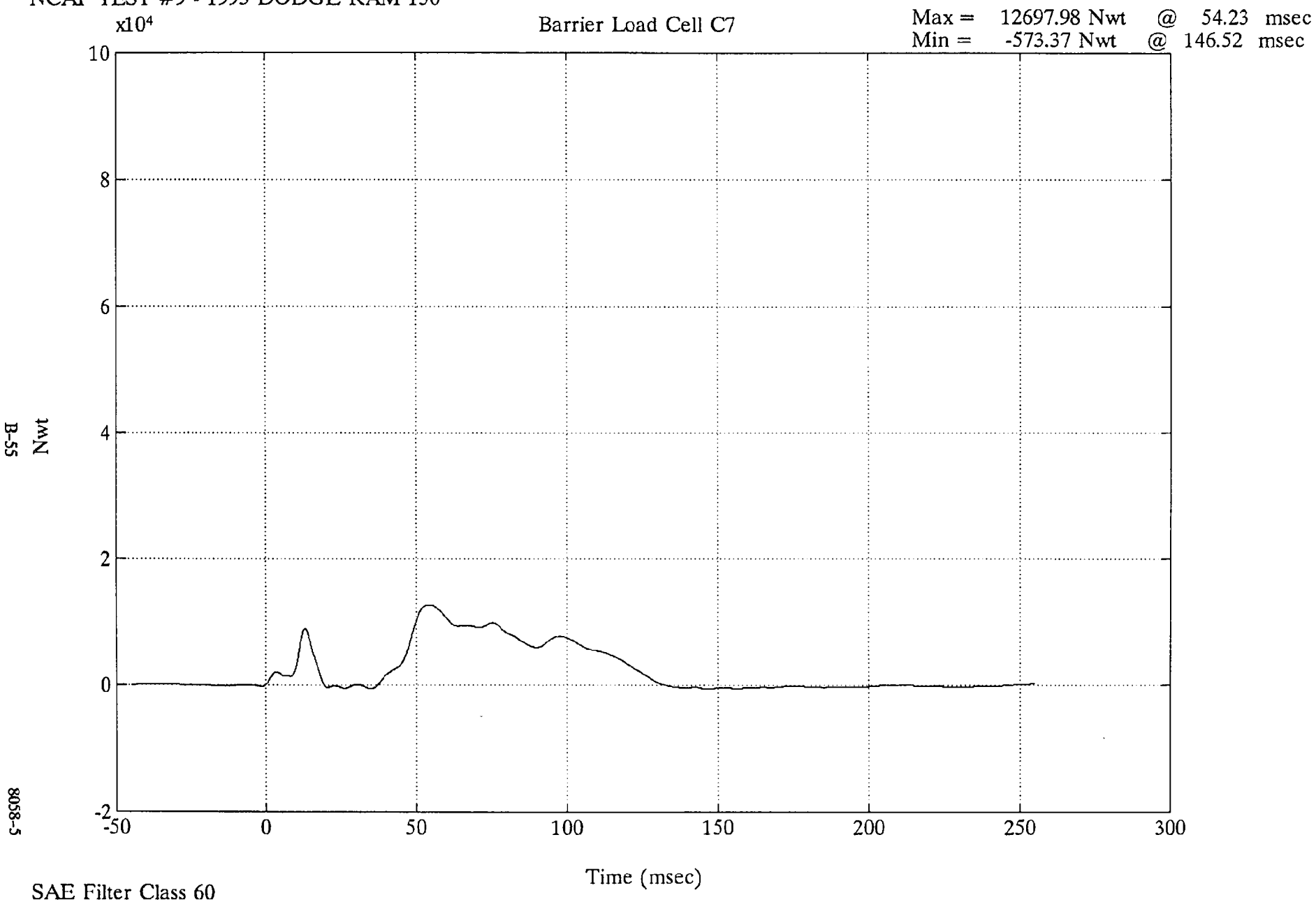


B-54

8058-5

SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150

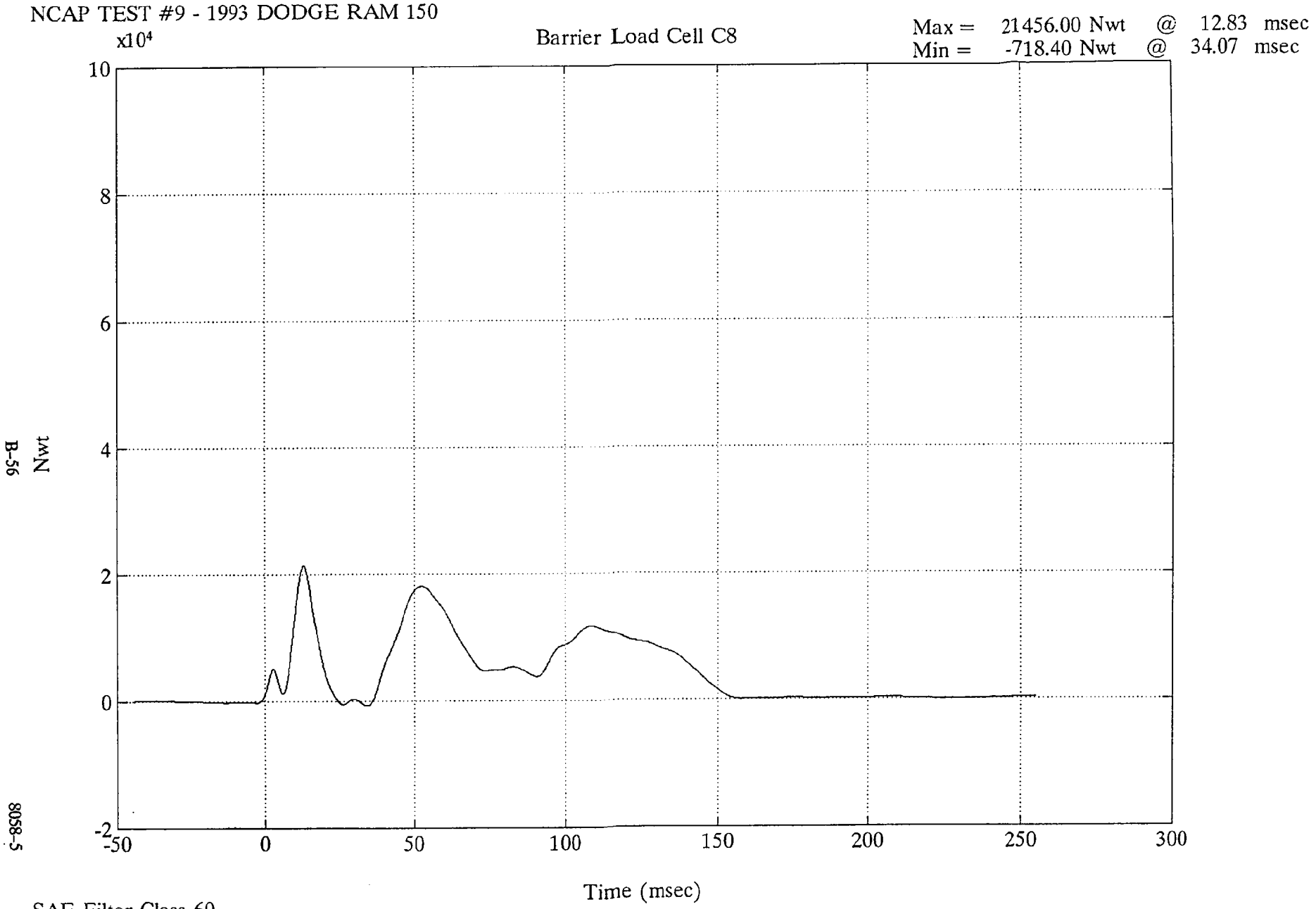


B-55

8058-5

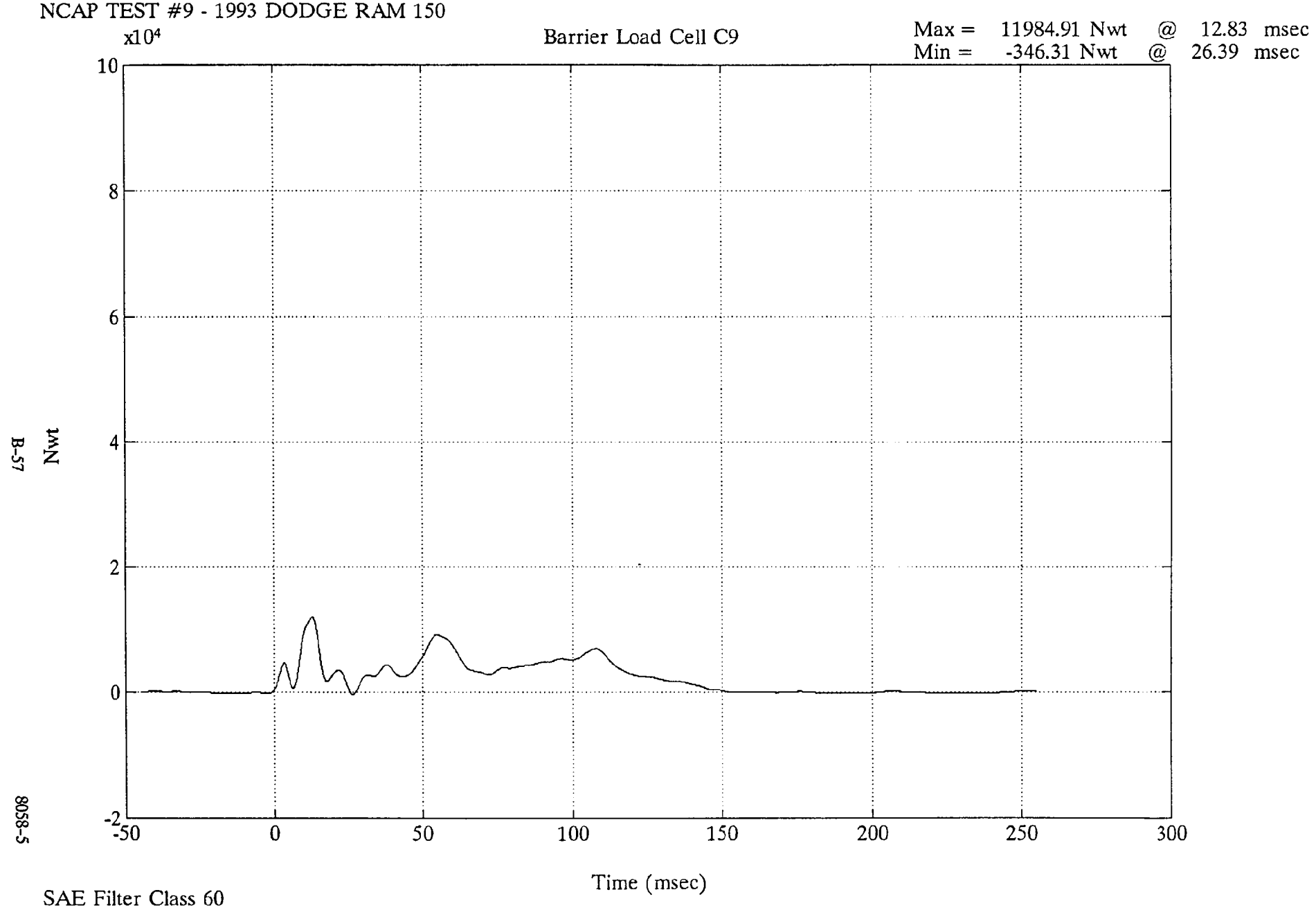
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150

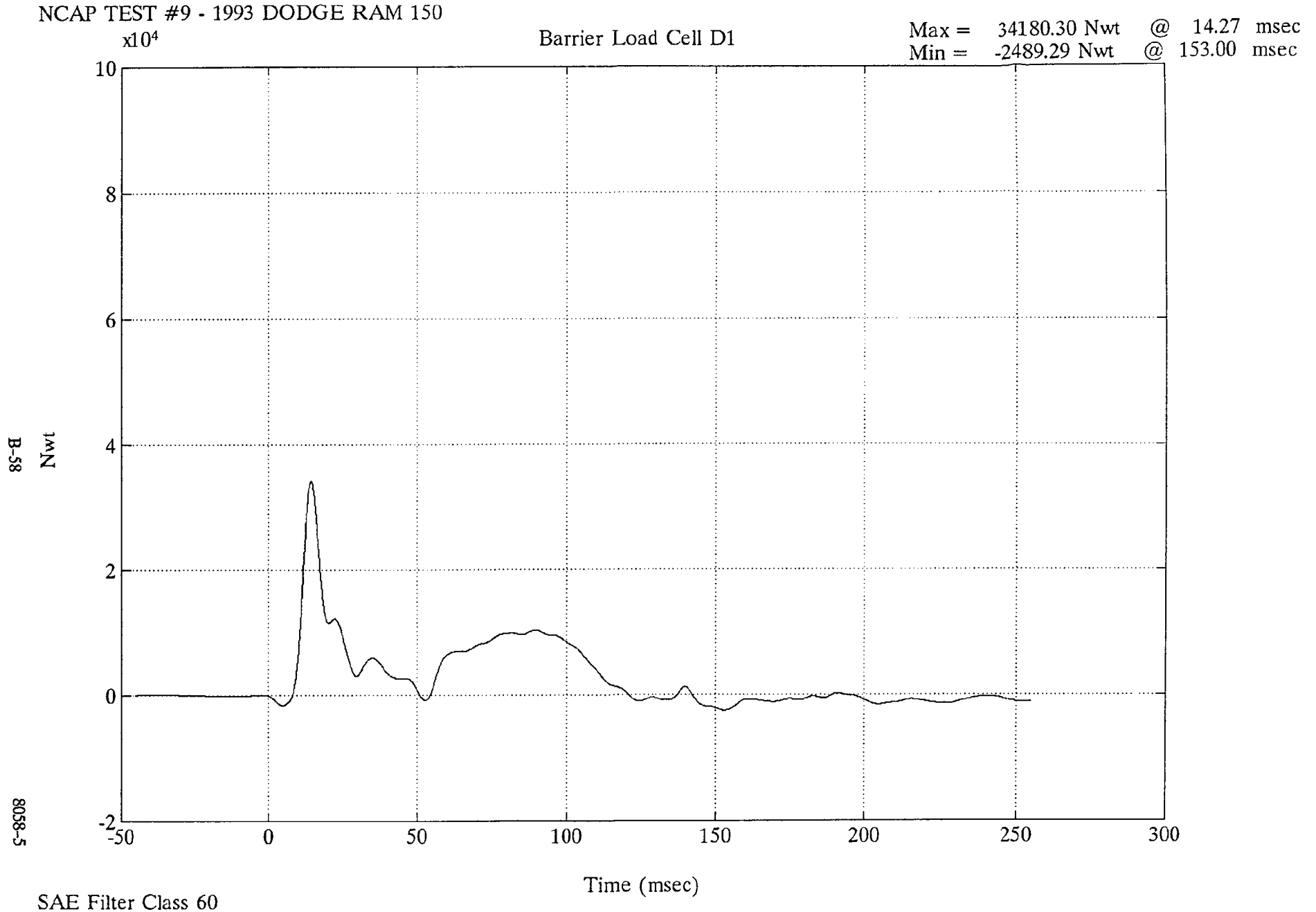


SAE Filter Class 60

B-57

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150

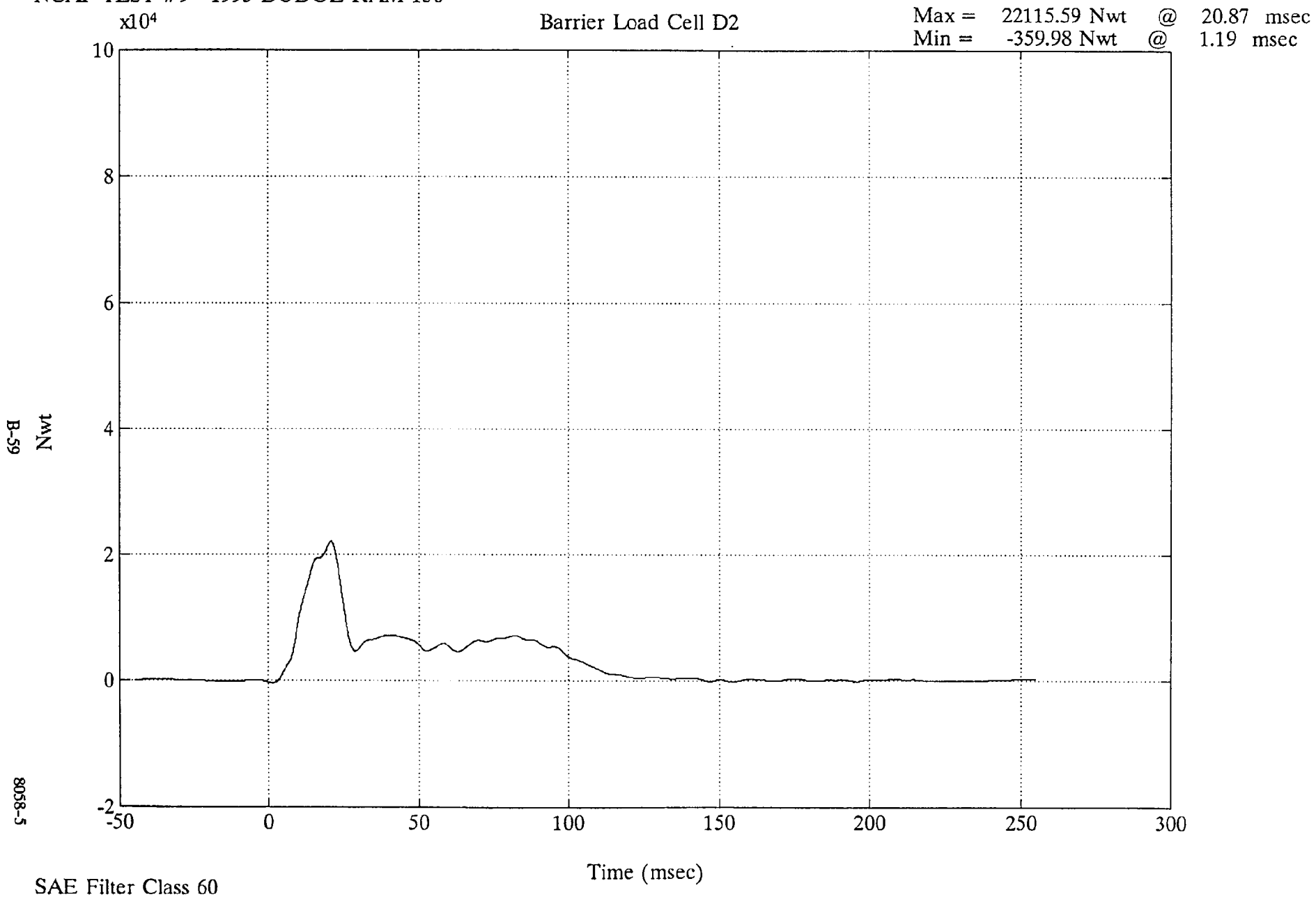


SAE Filter Class 60

B-58

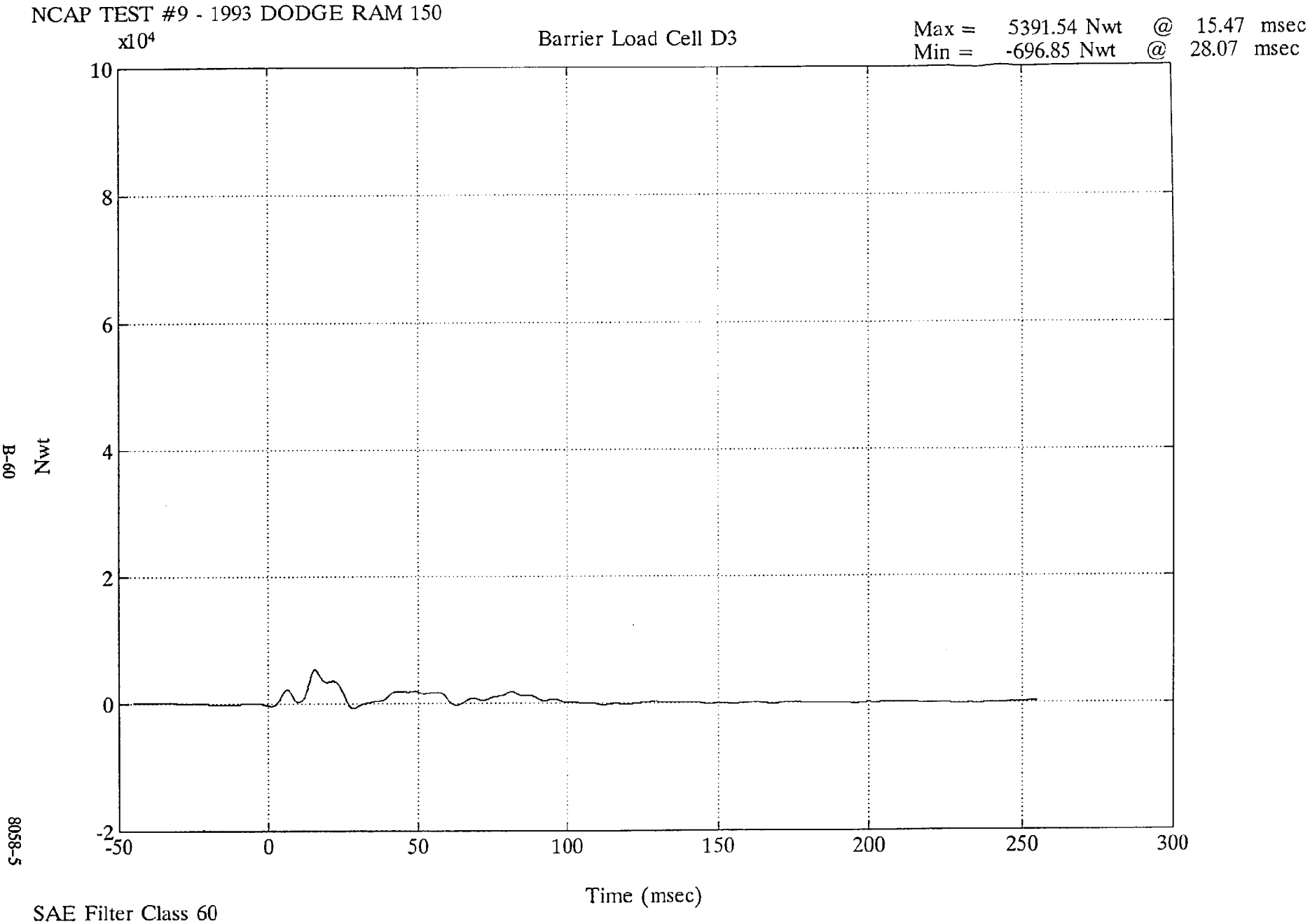
8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150

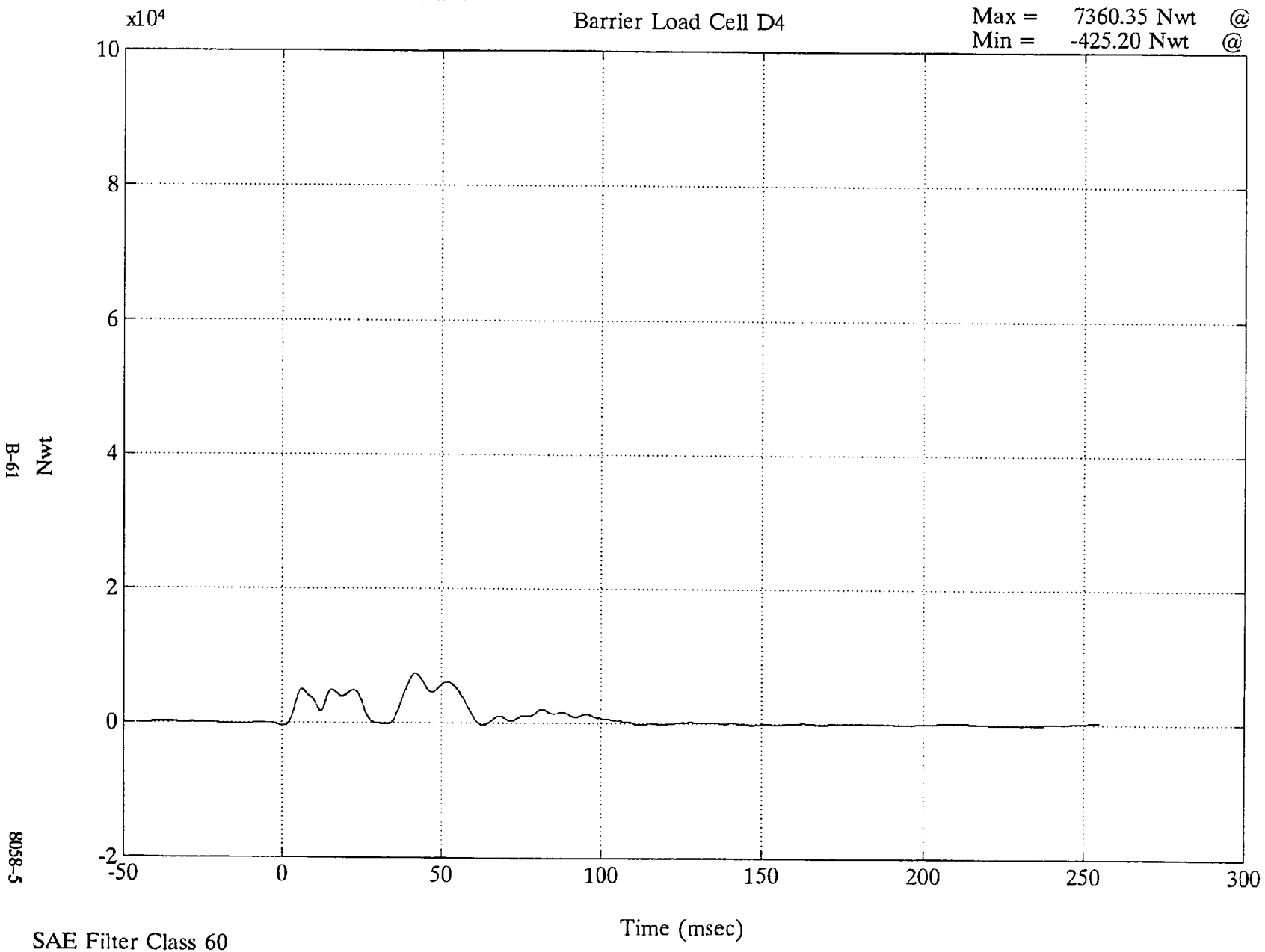


SAE Filter Class 60

B-60

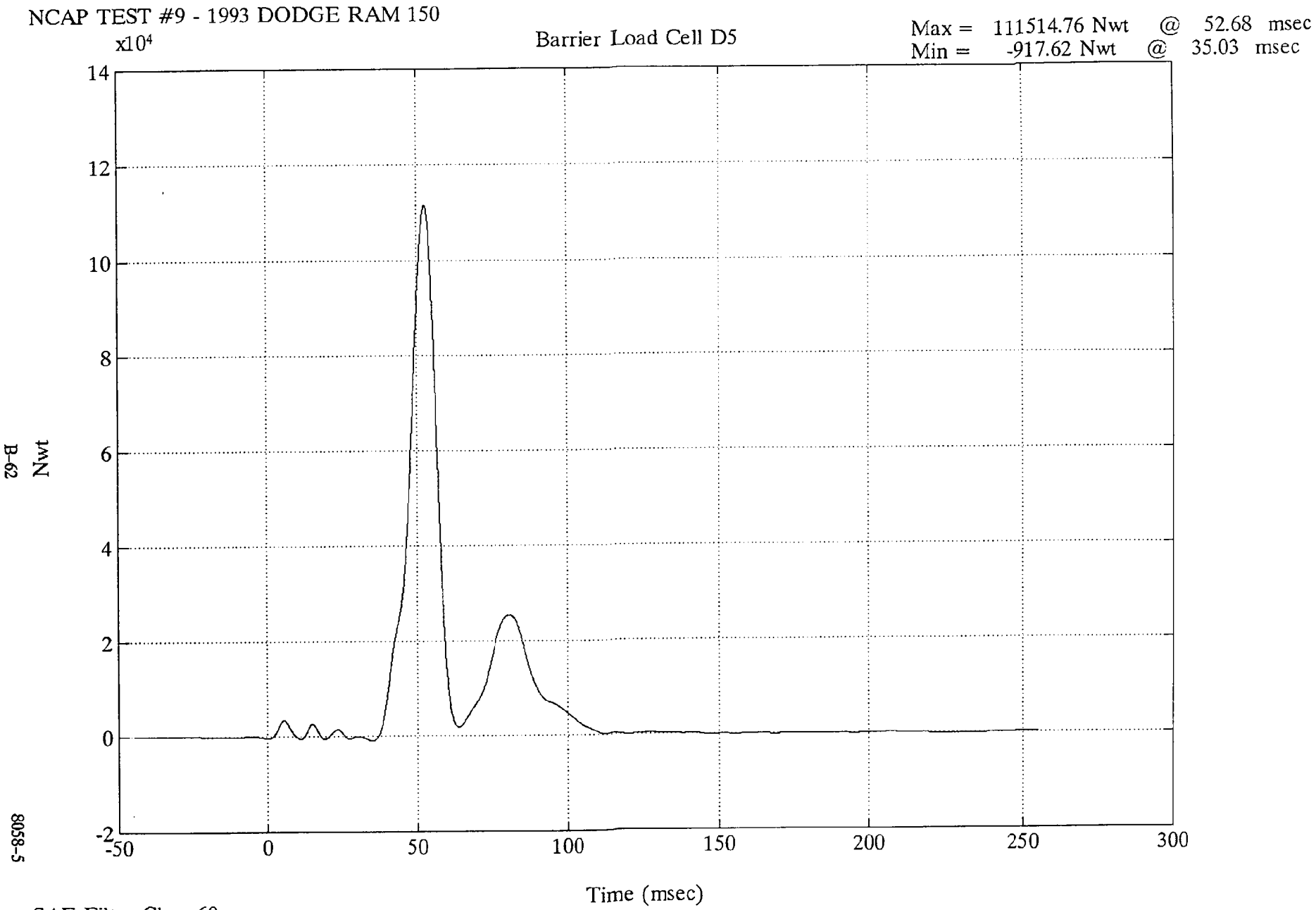
8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



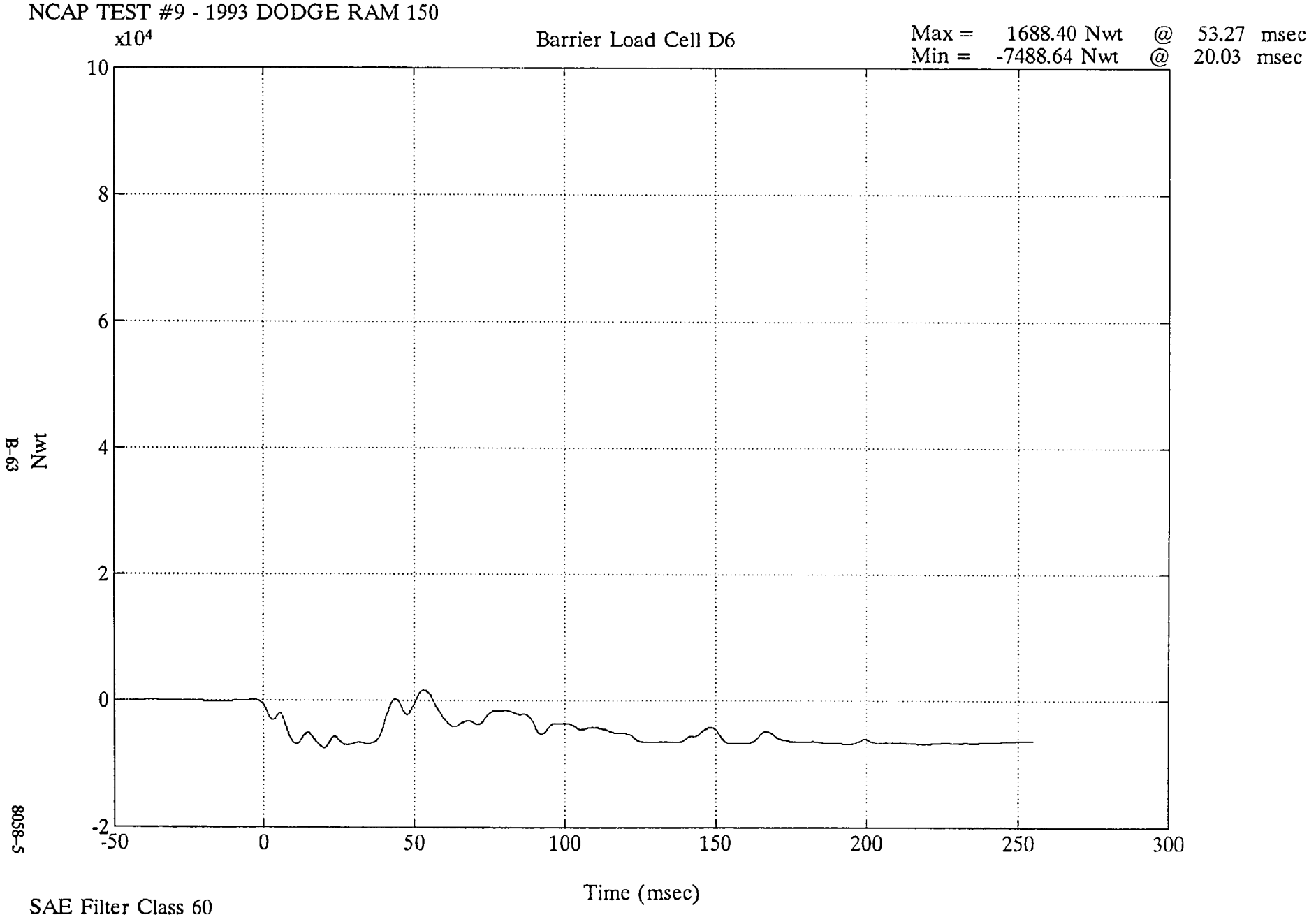
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



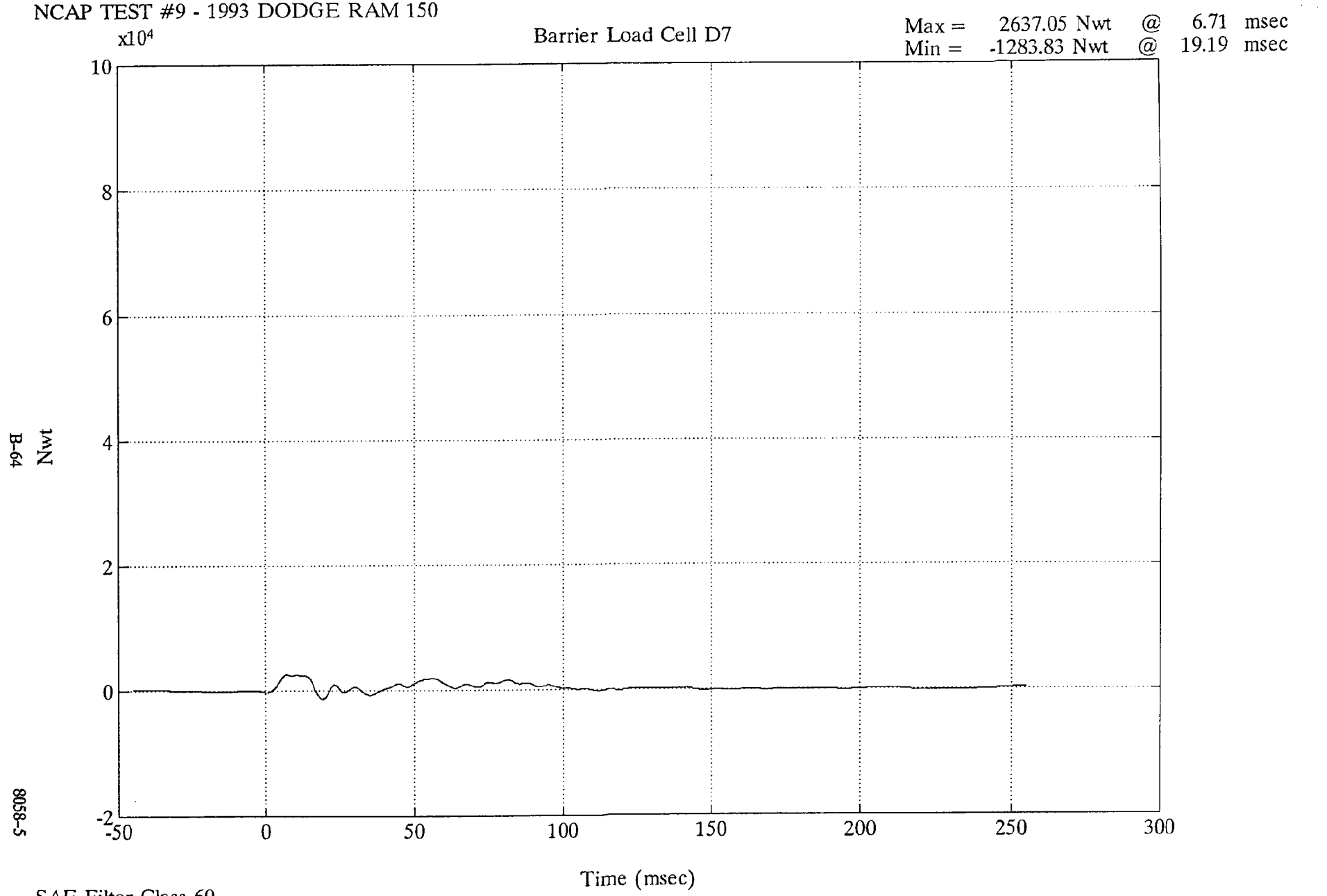
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150

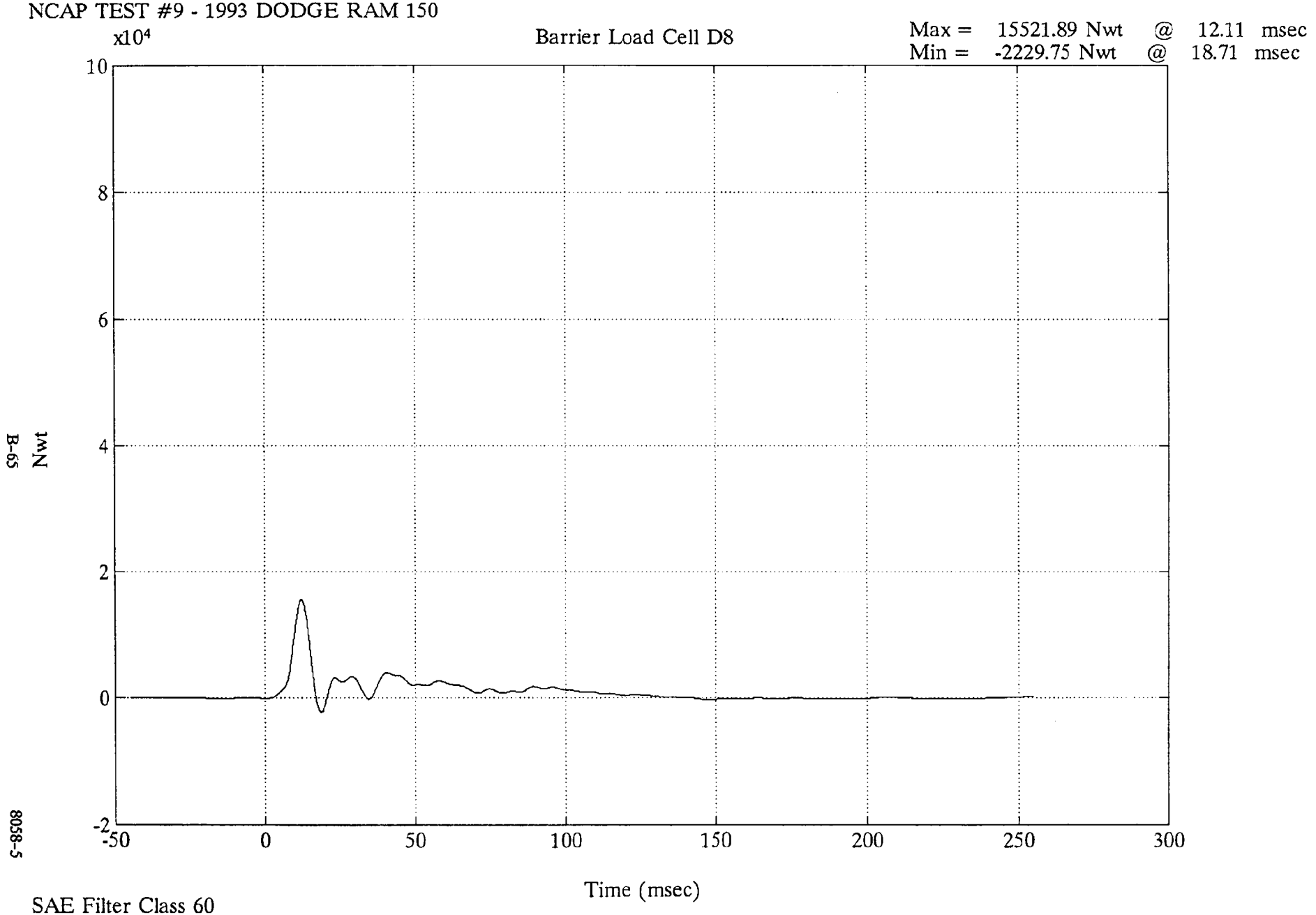


B-64

8058-5

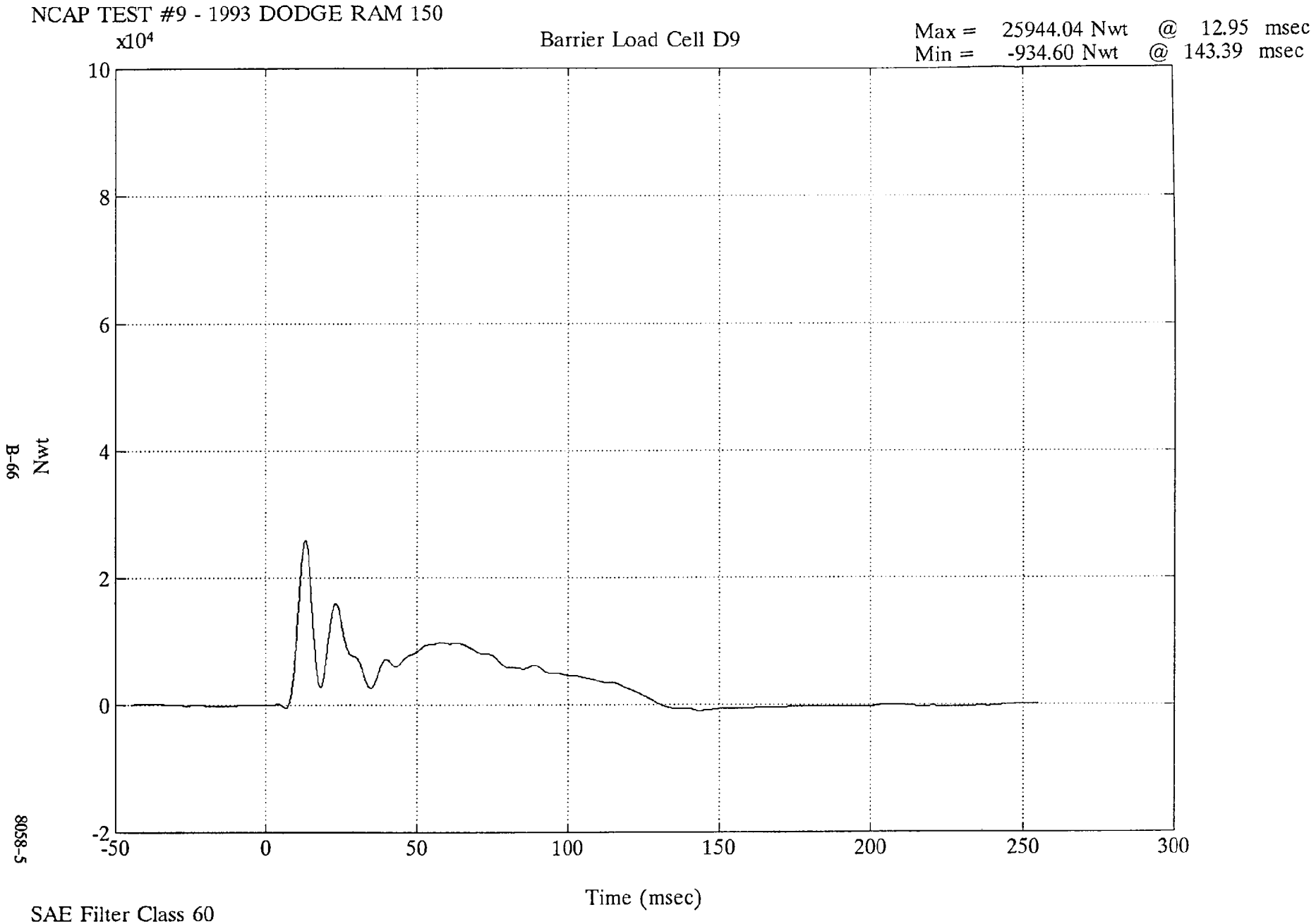
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



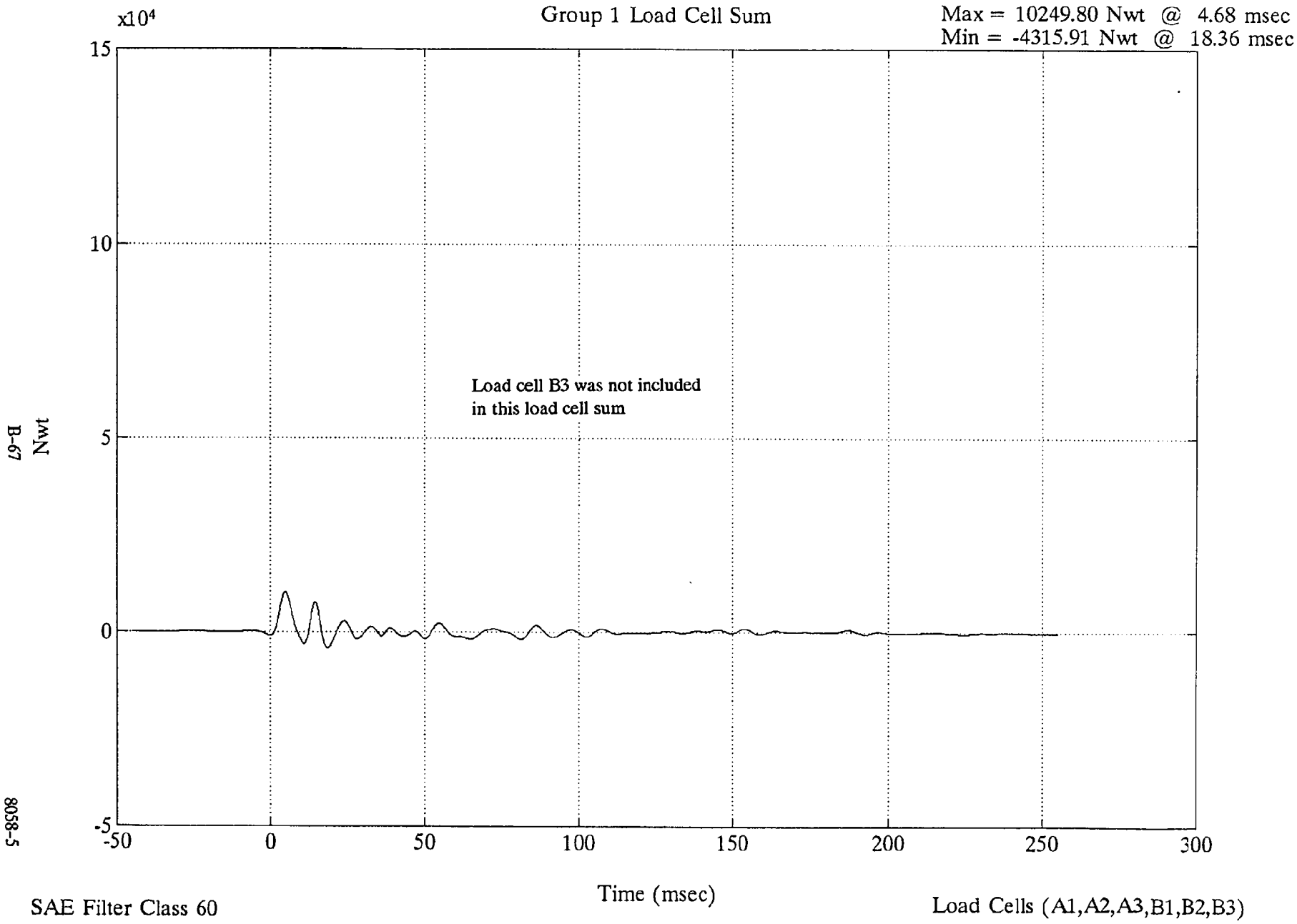
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

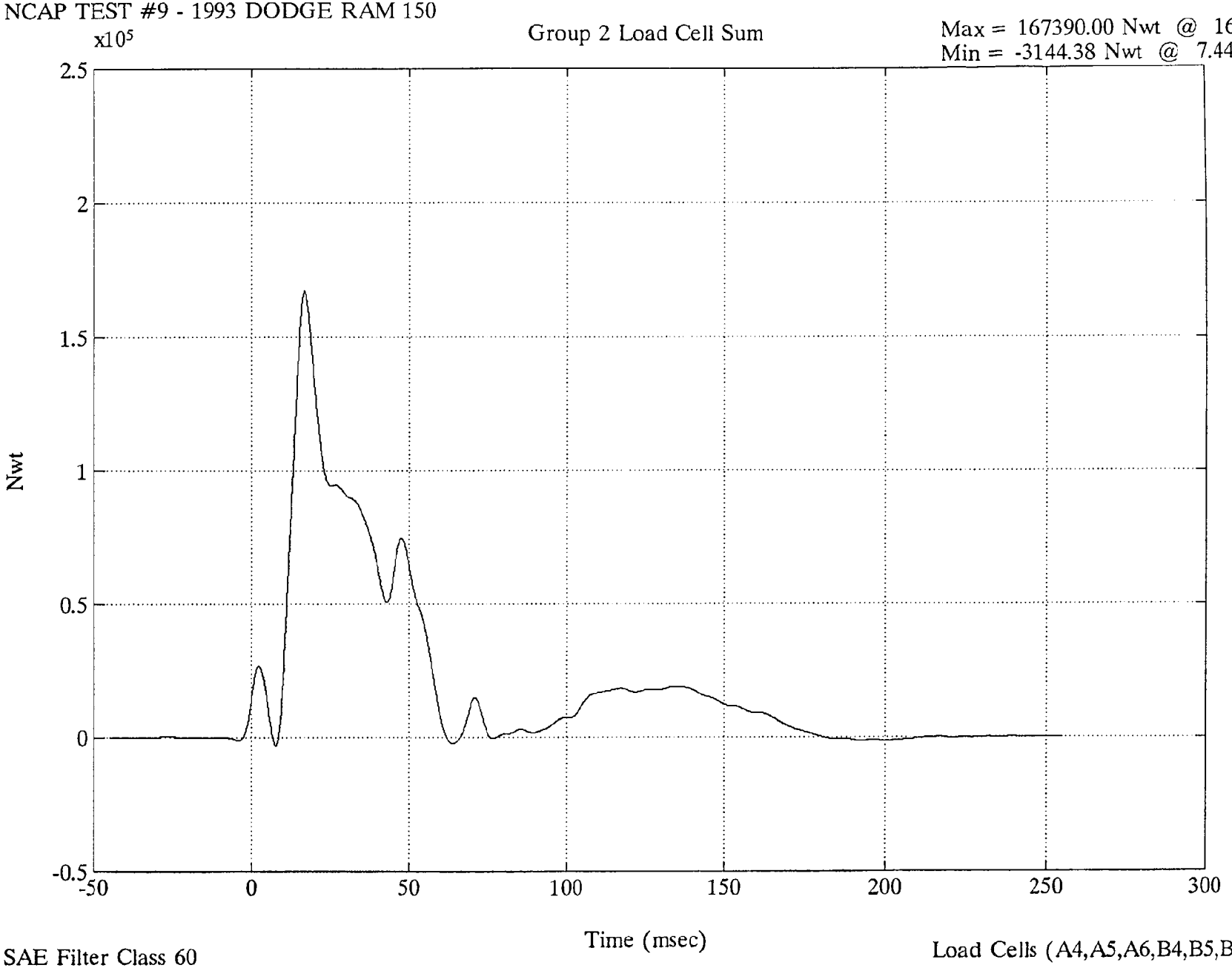
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

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

NCAP TEST #9 - 1993 DODGE RAM 150

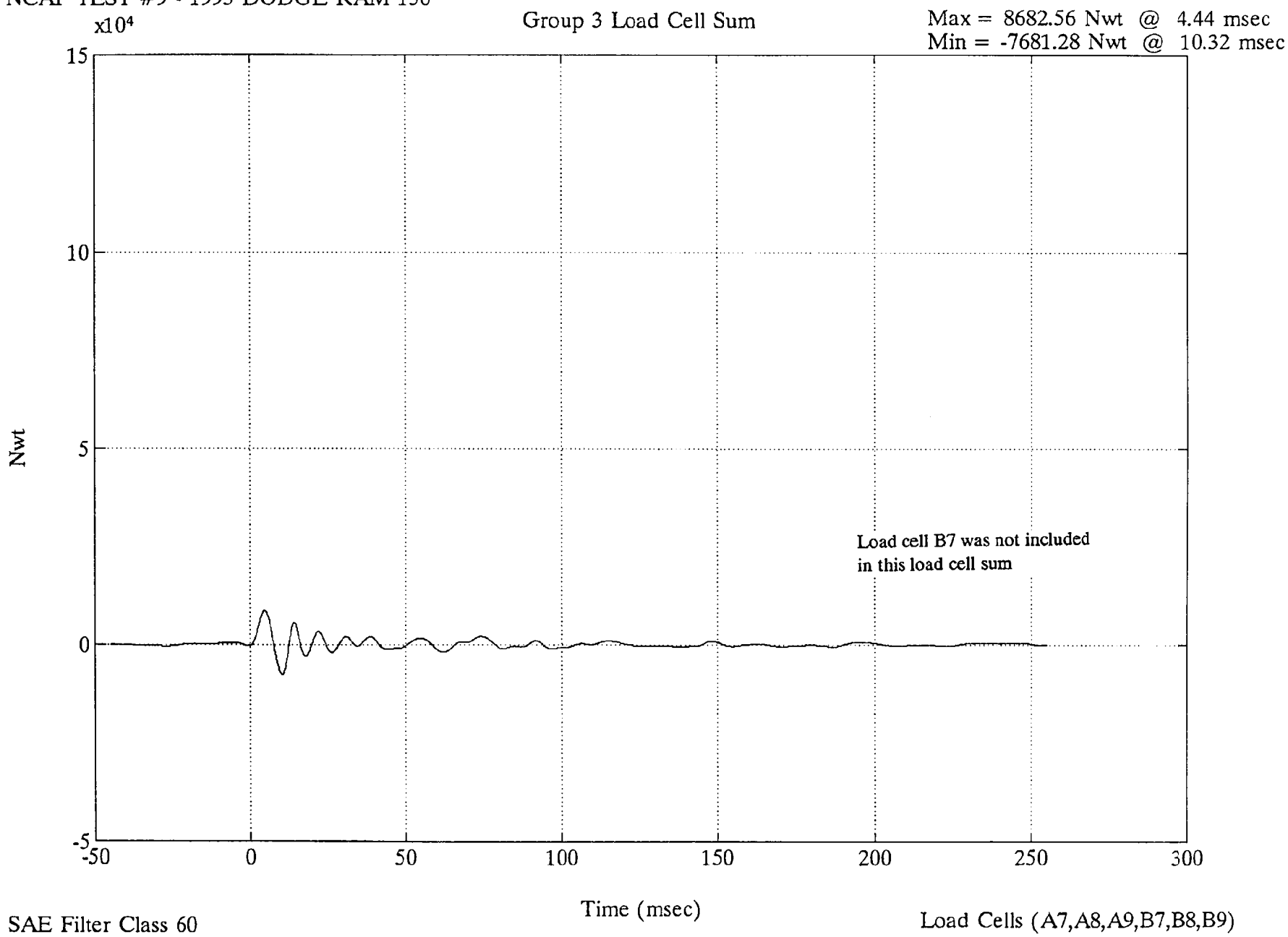


SAE Filter Class 60

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

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



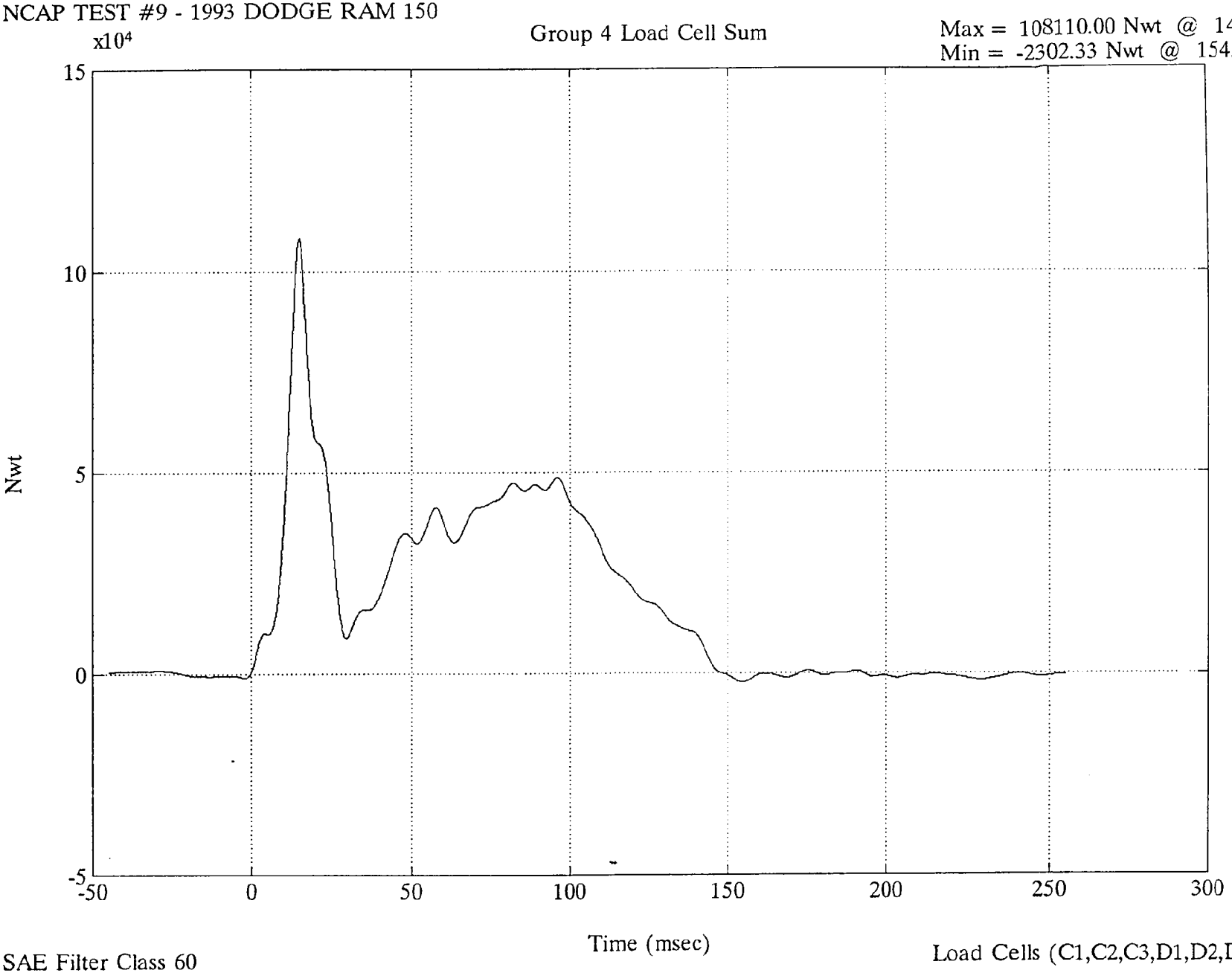
SAE Filter Class 60

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

B-69

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



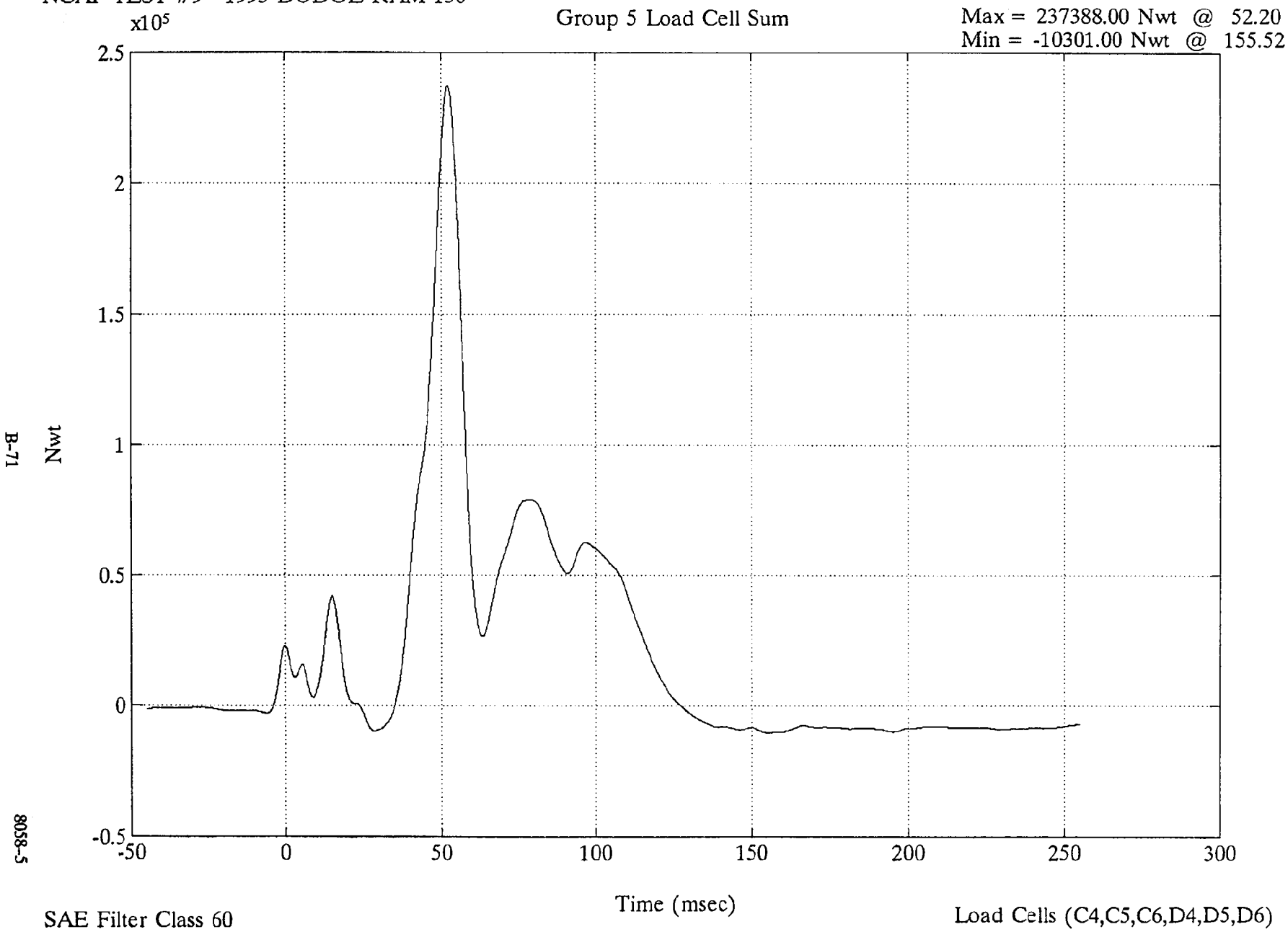
SAE Filter Class 60

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

B-70

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



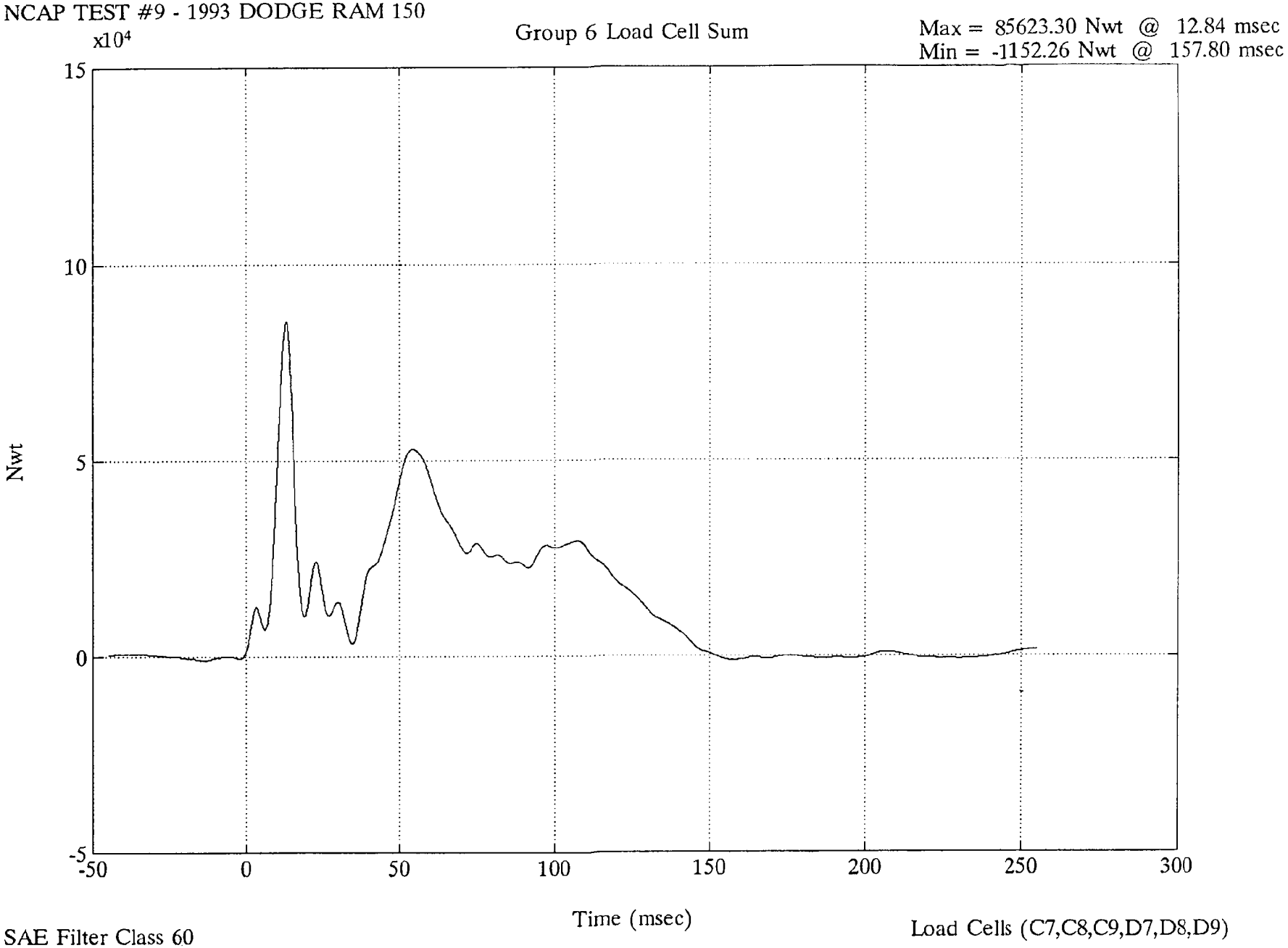
B-71

8058-5

SAE Filter Class 60

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

NCAP TEST #9 - 1993 DODGE RAM 150



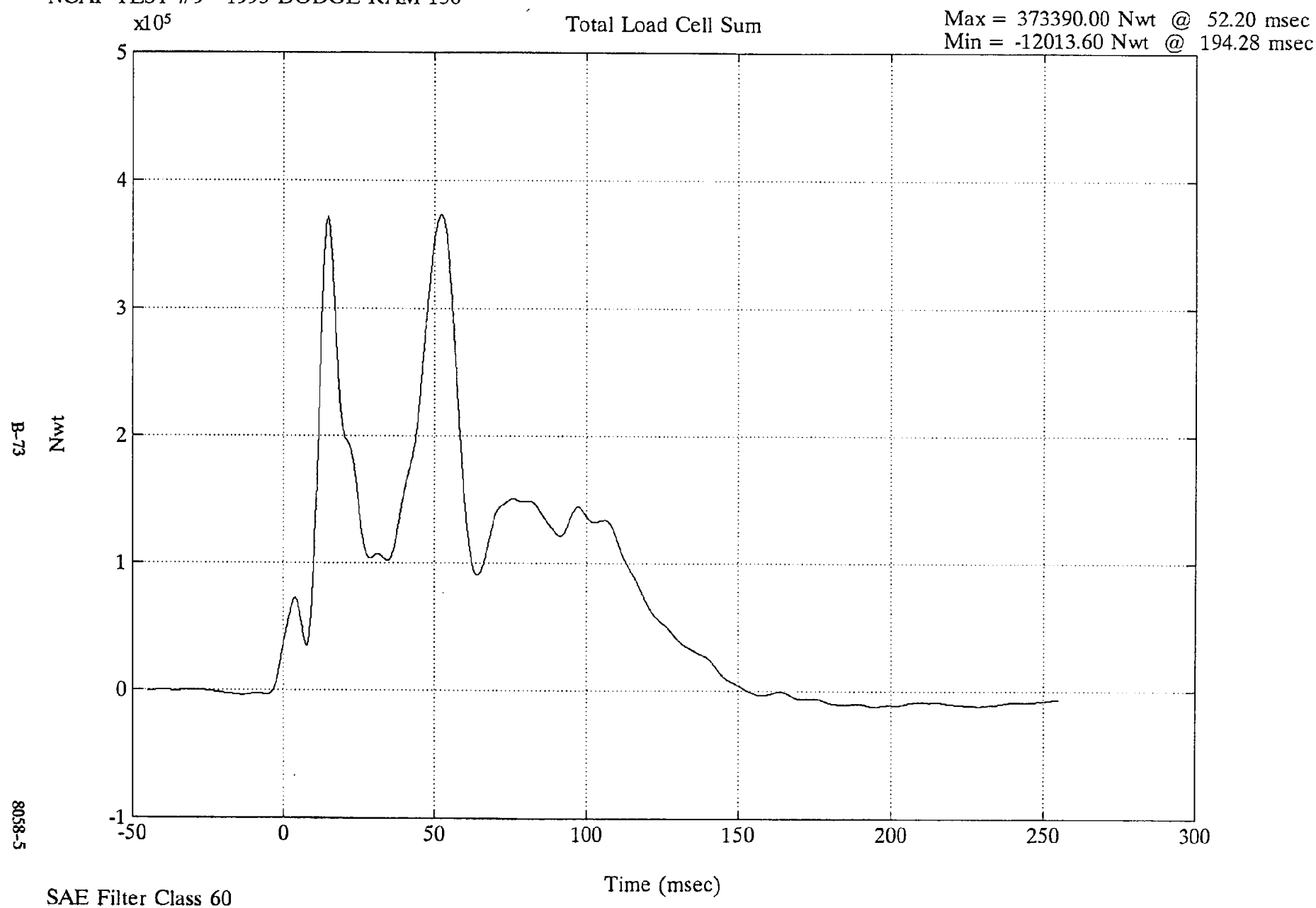
B-72

8058-5

SAE Filter Class 60

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

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

B-73

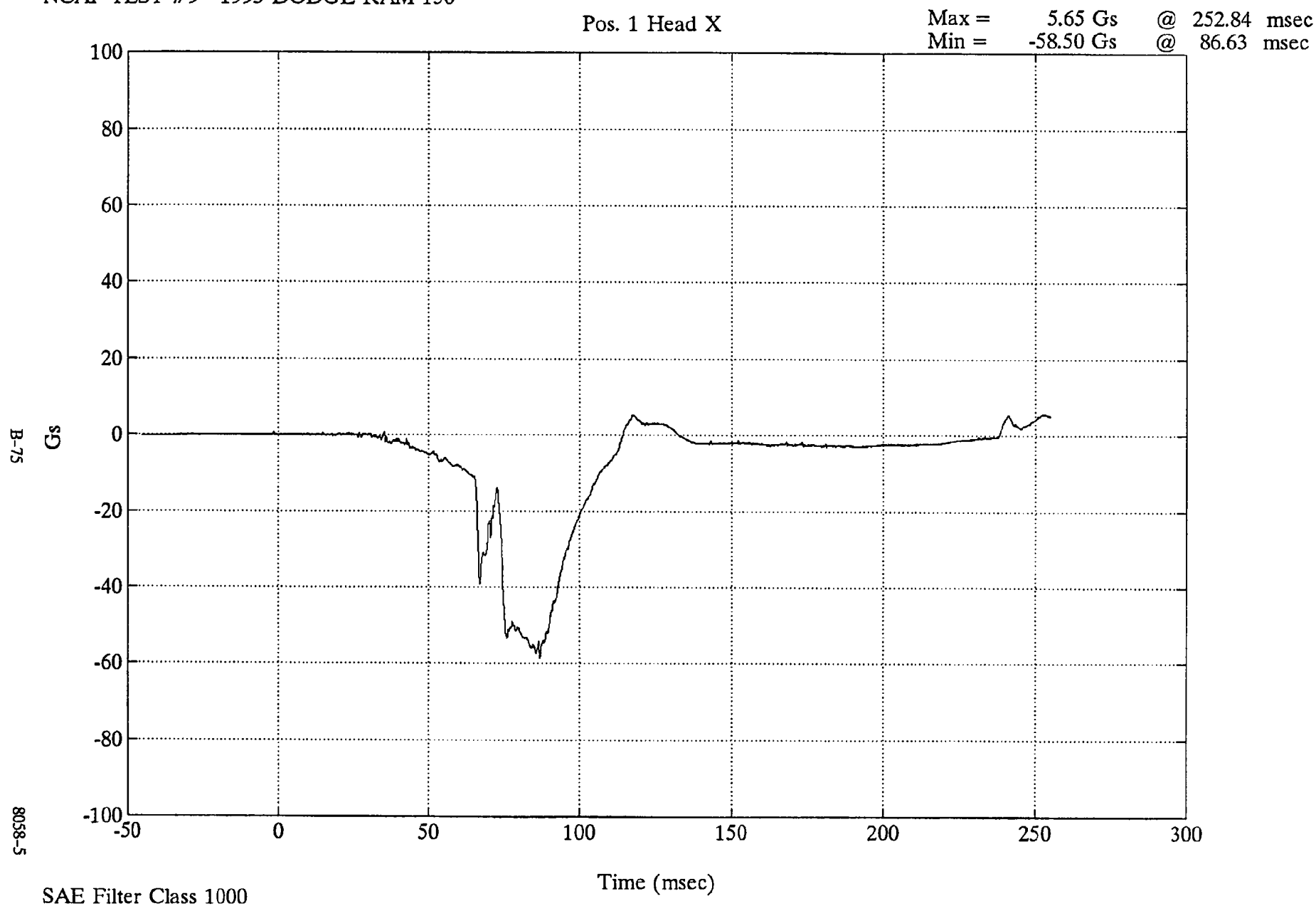
8058-5

TEST NO. MP0304

DUMMY DATA

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

NCAP TEST #9 - 1993 DODGE RAM 150

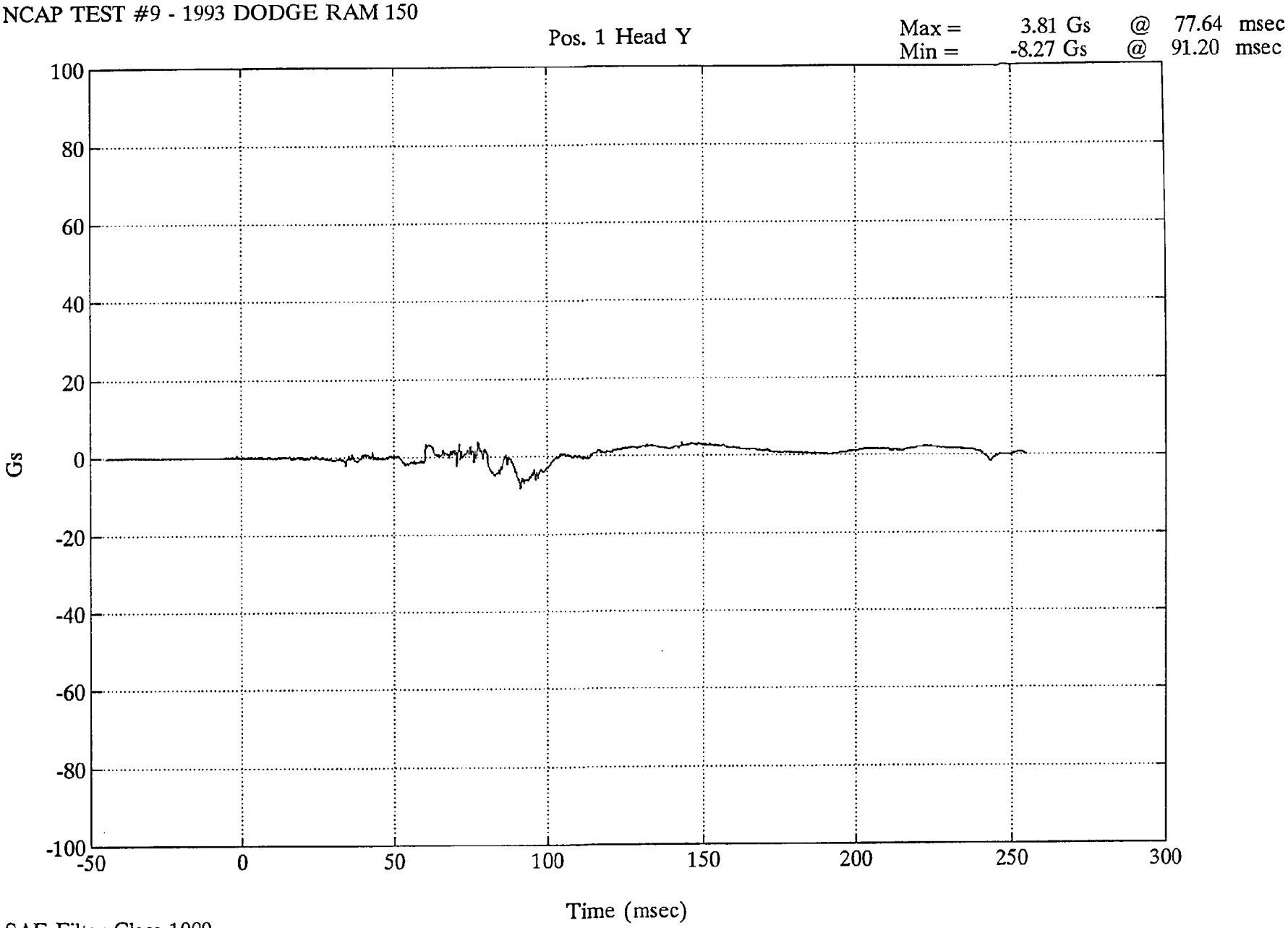


B-75

8058-5

SAE Filter Class 1000

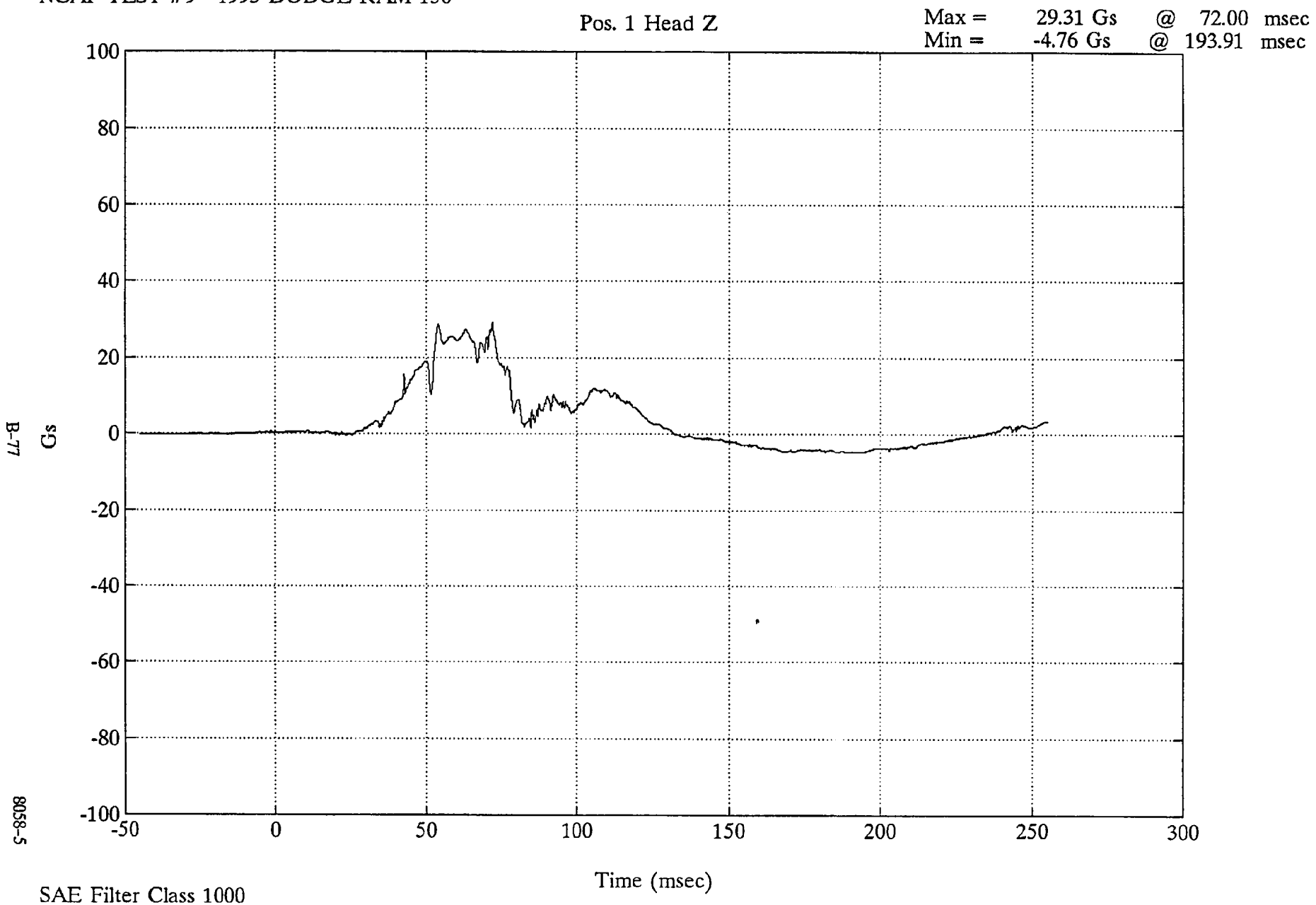
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 1000

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150

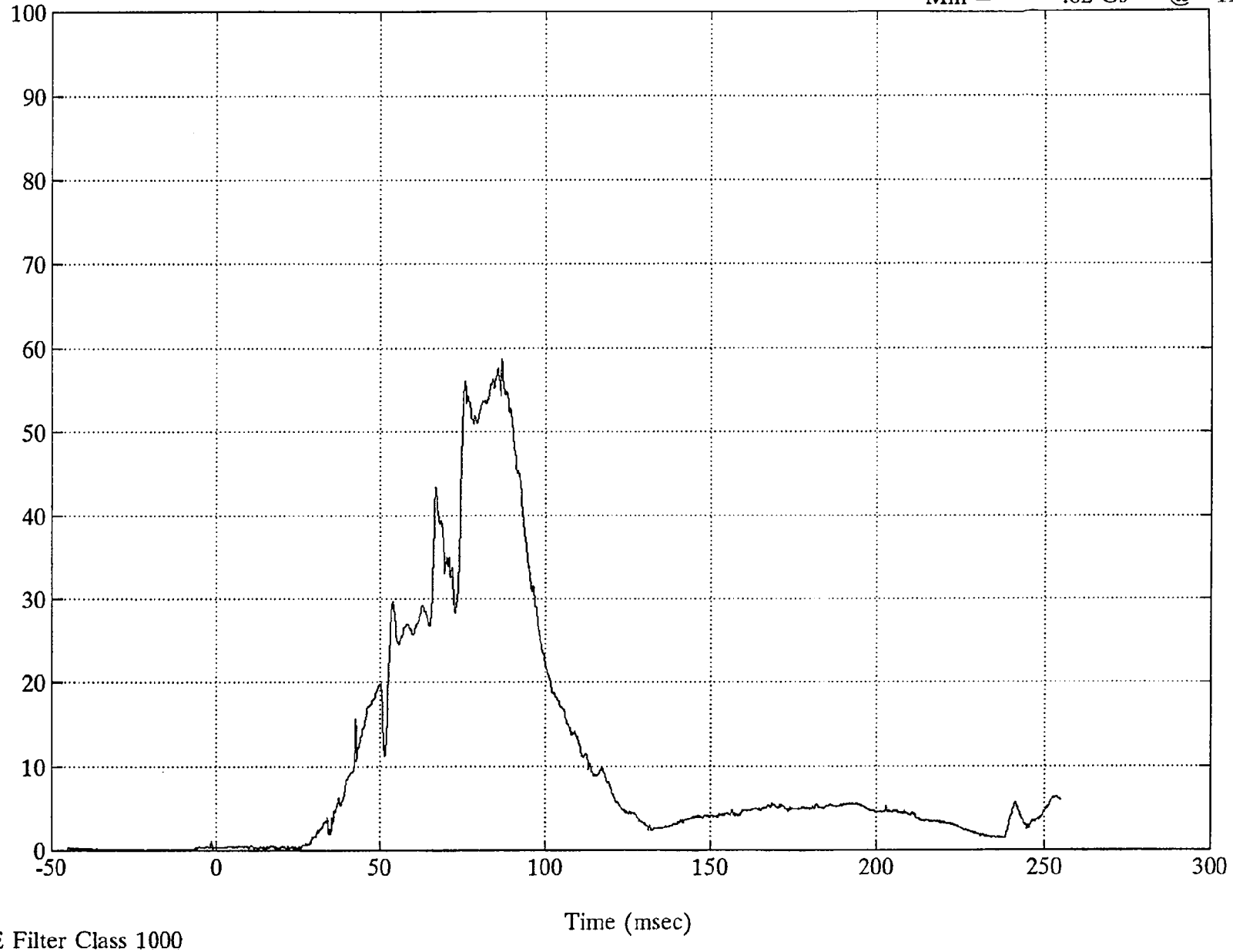


SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150

Pos. 1 Head Resultant

Max = 58.72 Gs @ 86.63 msec
Min = .02 Gs @ 19.43 msec

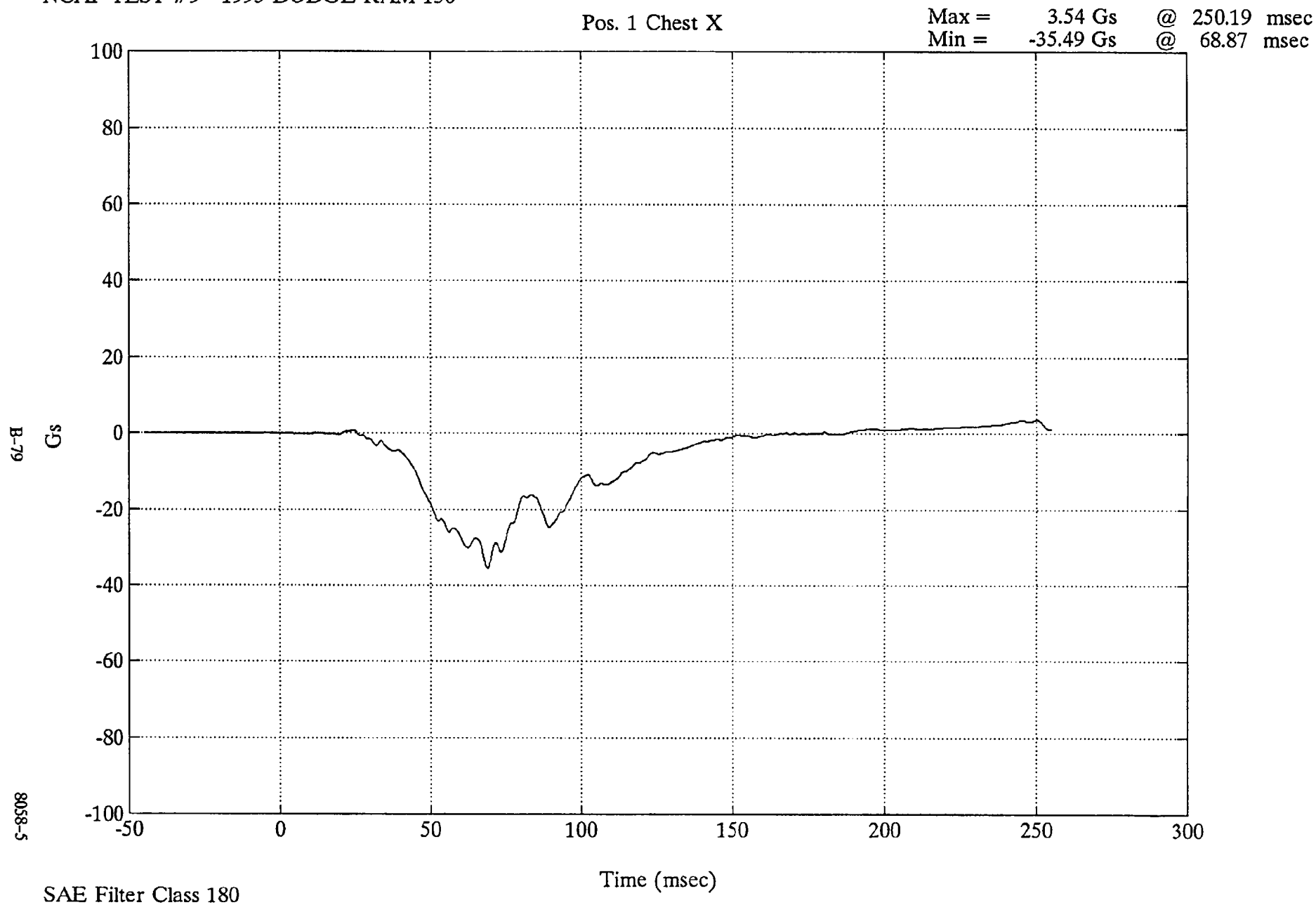


B-78

8058-5

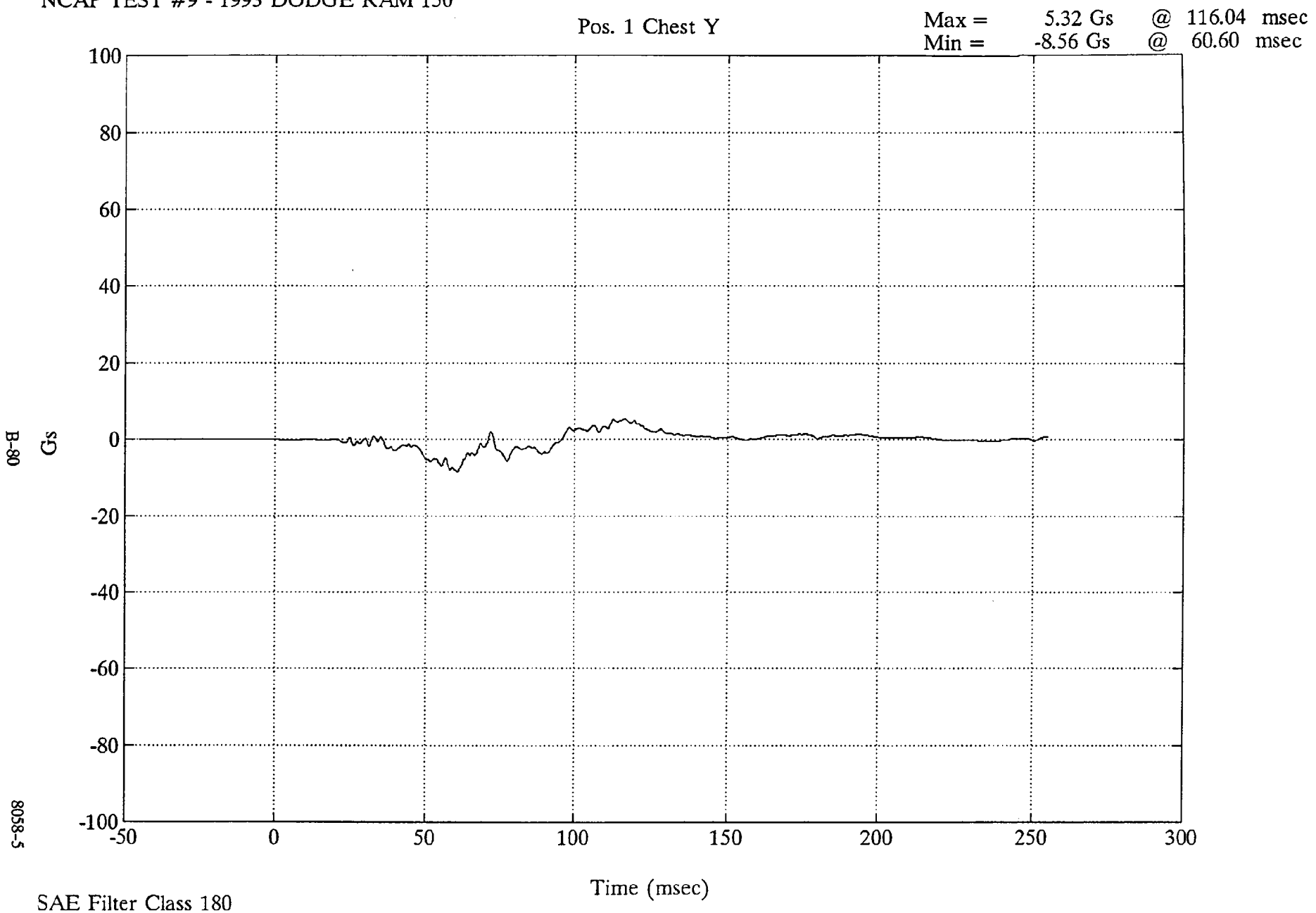
SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150



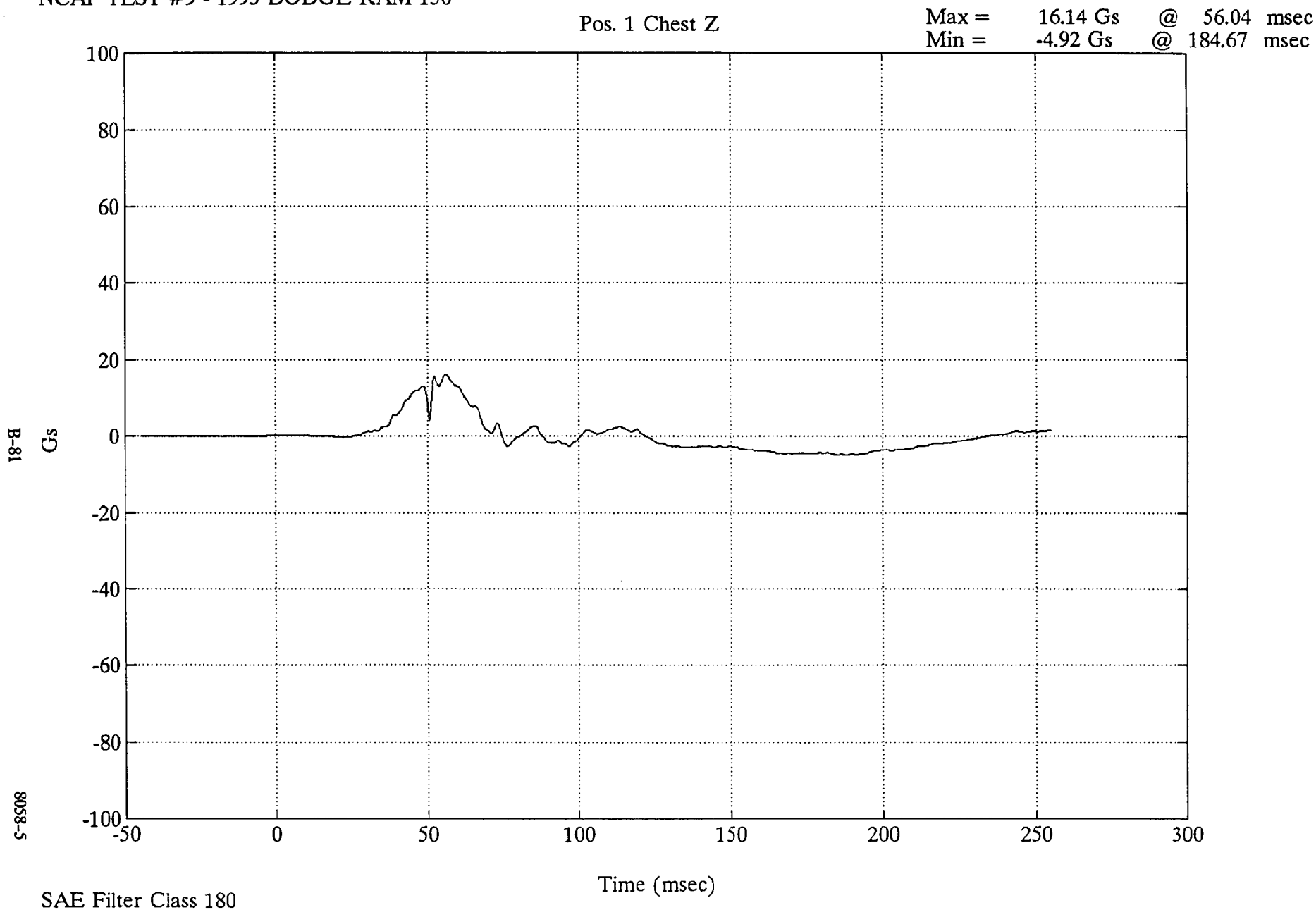
SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150

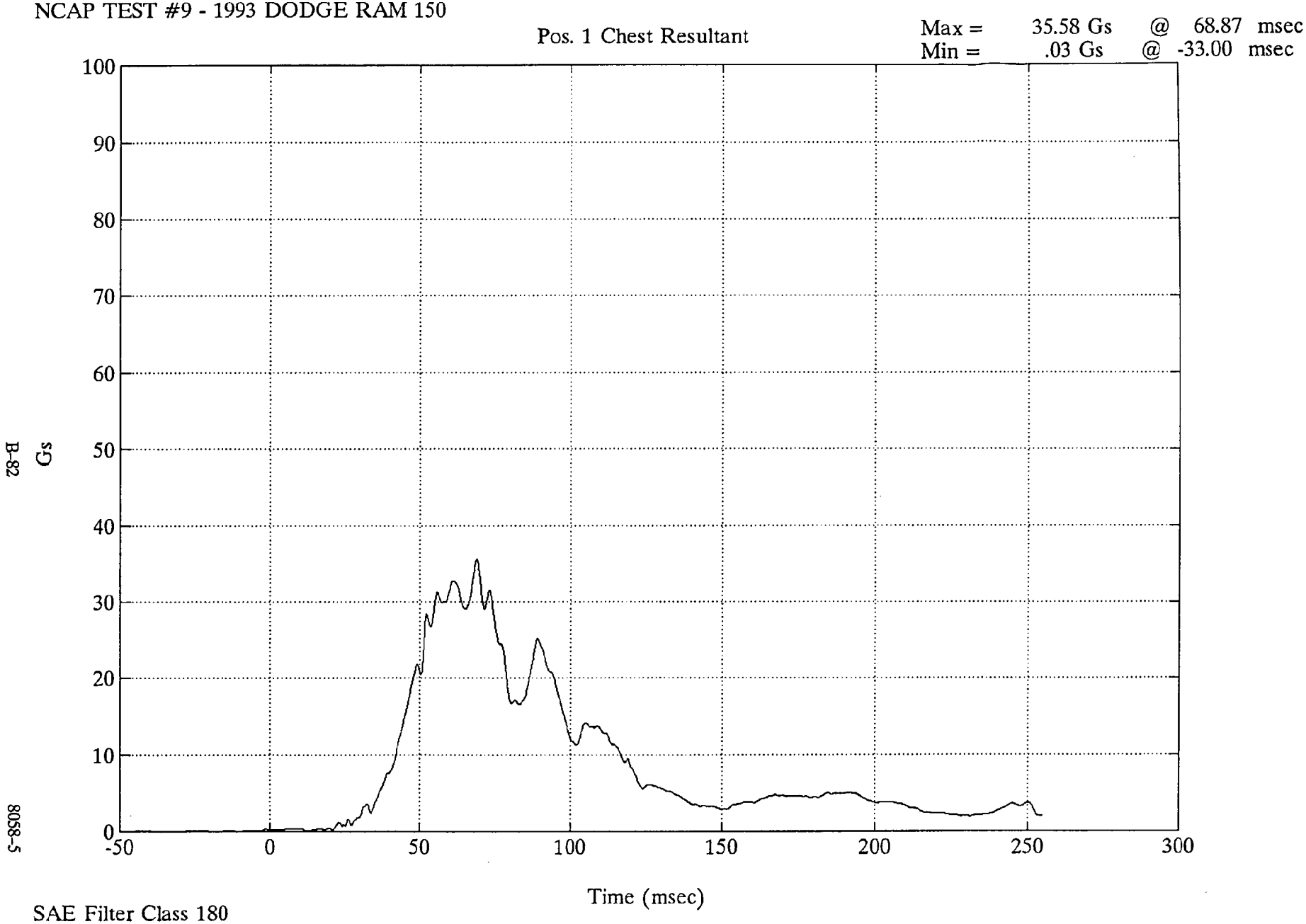


B-81

8058-5

SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150

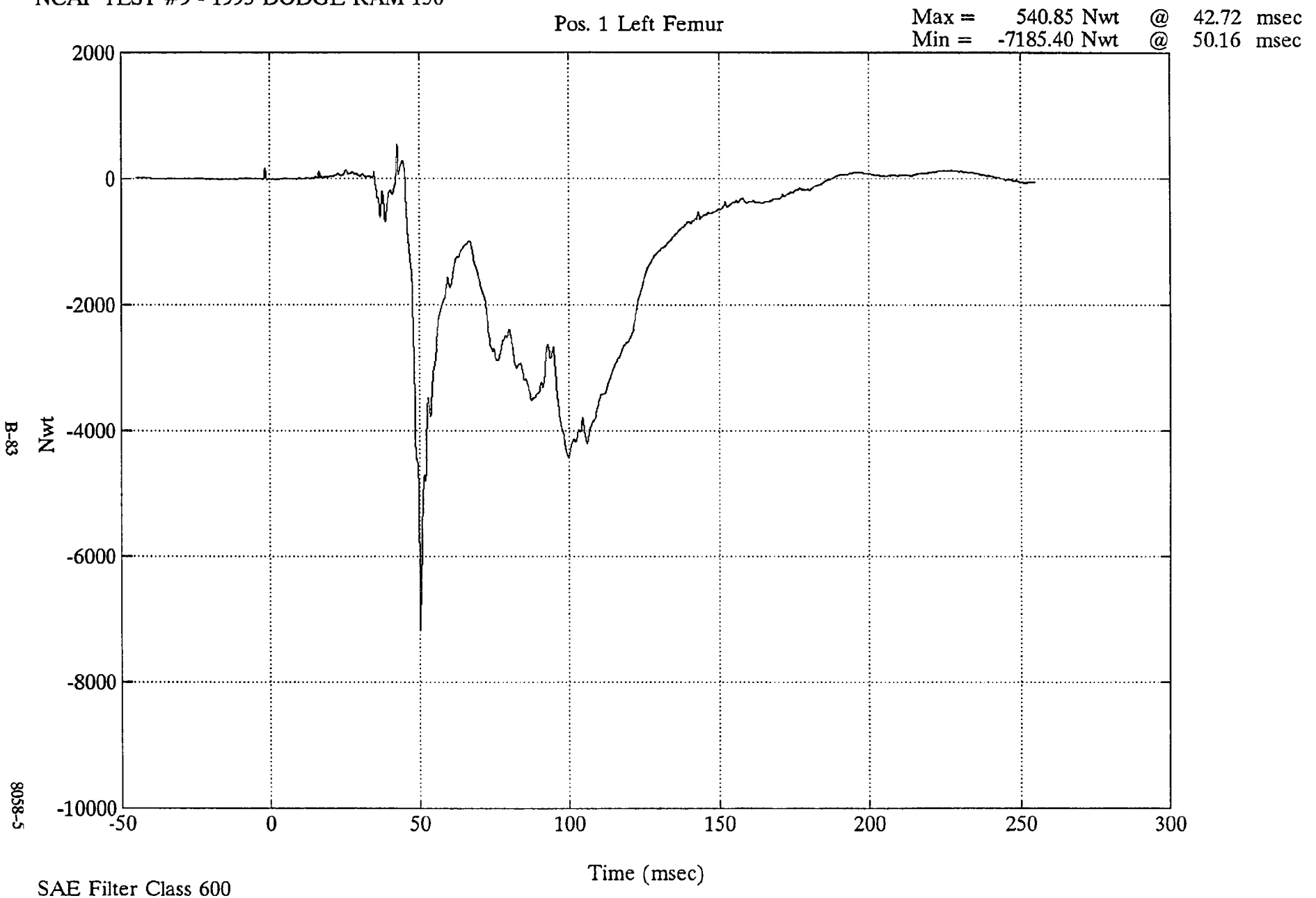


B-82

8058-5

SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150

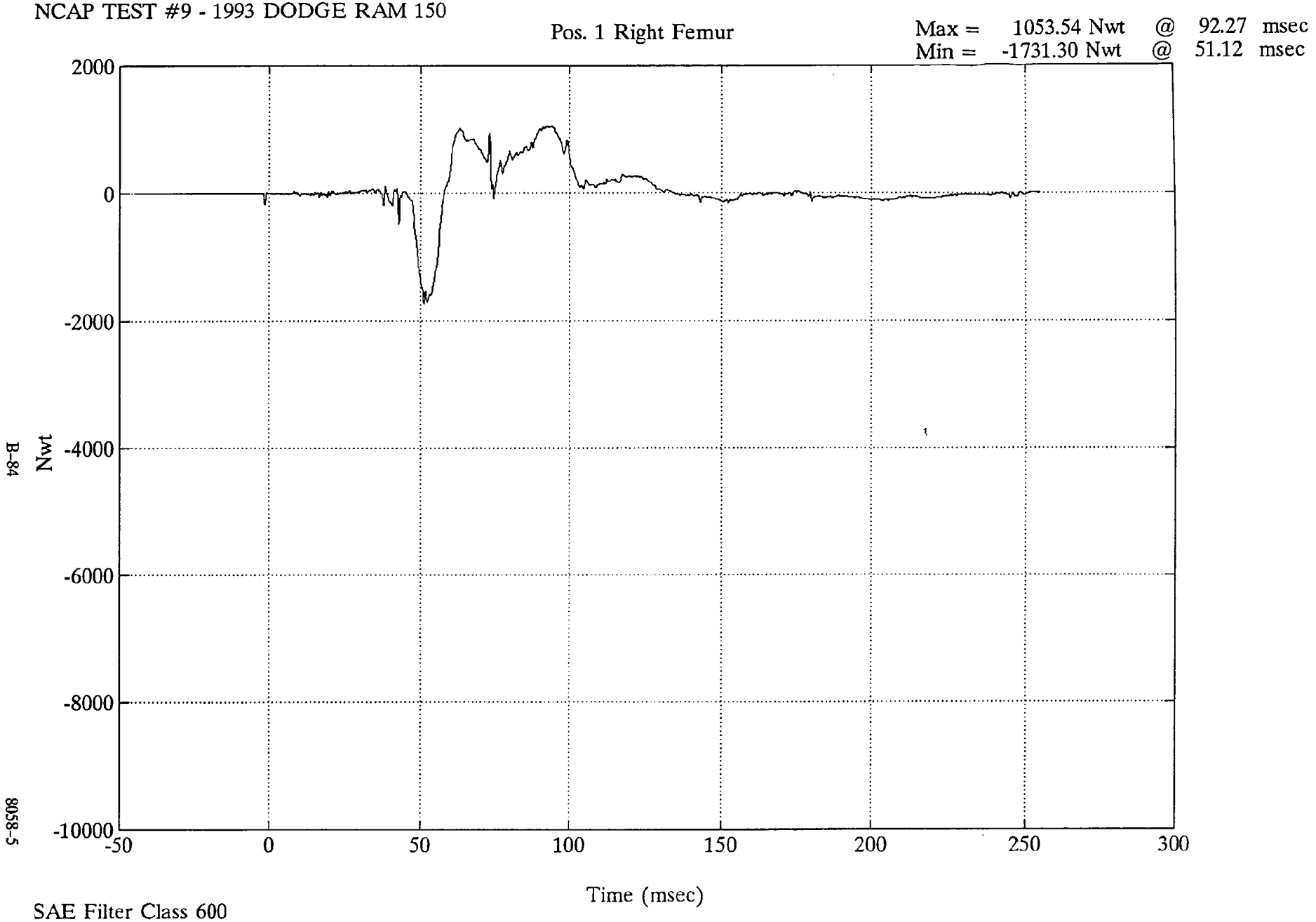


SAE Filter Class 600

B-83

8058-5

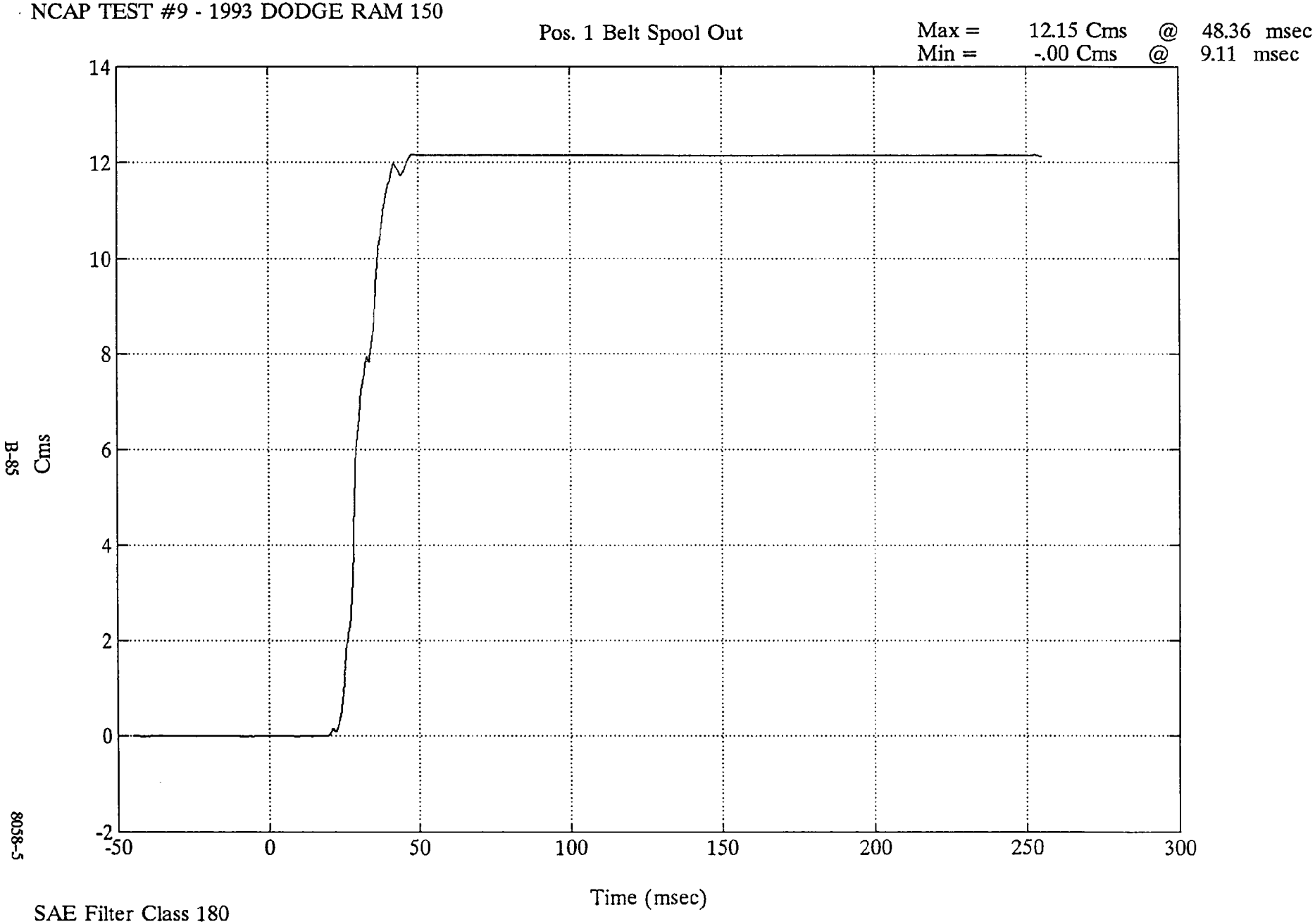
NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 600

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



B-85

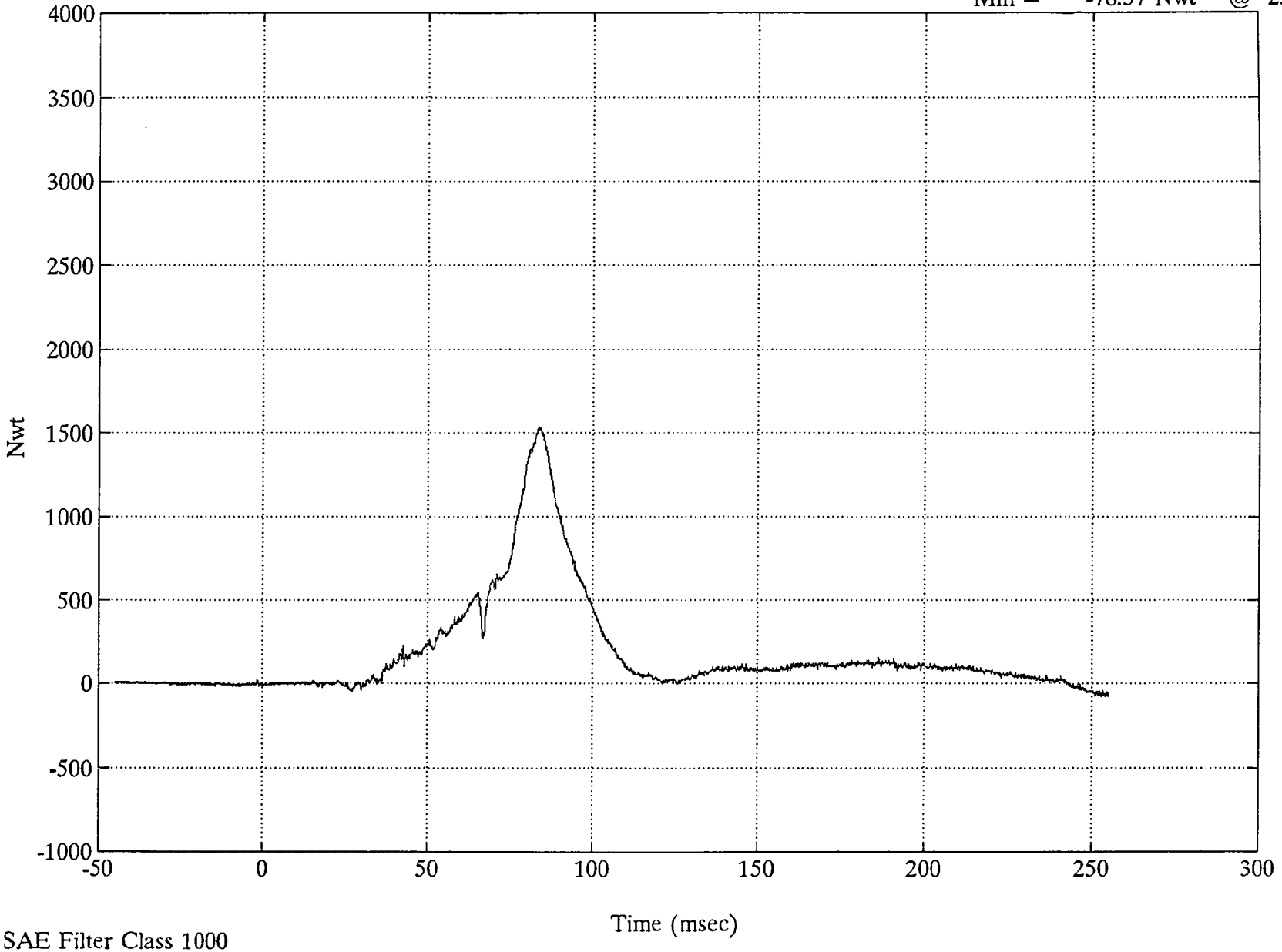
8058-5

SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150

Pos. 1 Upper Neck Fx

Max = 1537.51 Nwt @ 83.52 msec
Min = -78.37 Nwt @ 254.88 msec

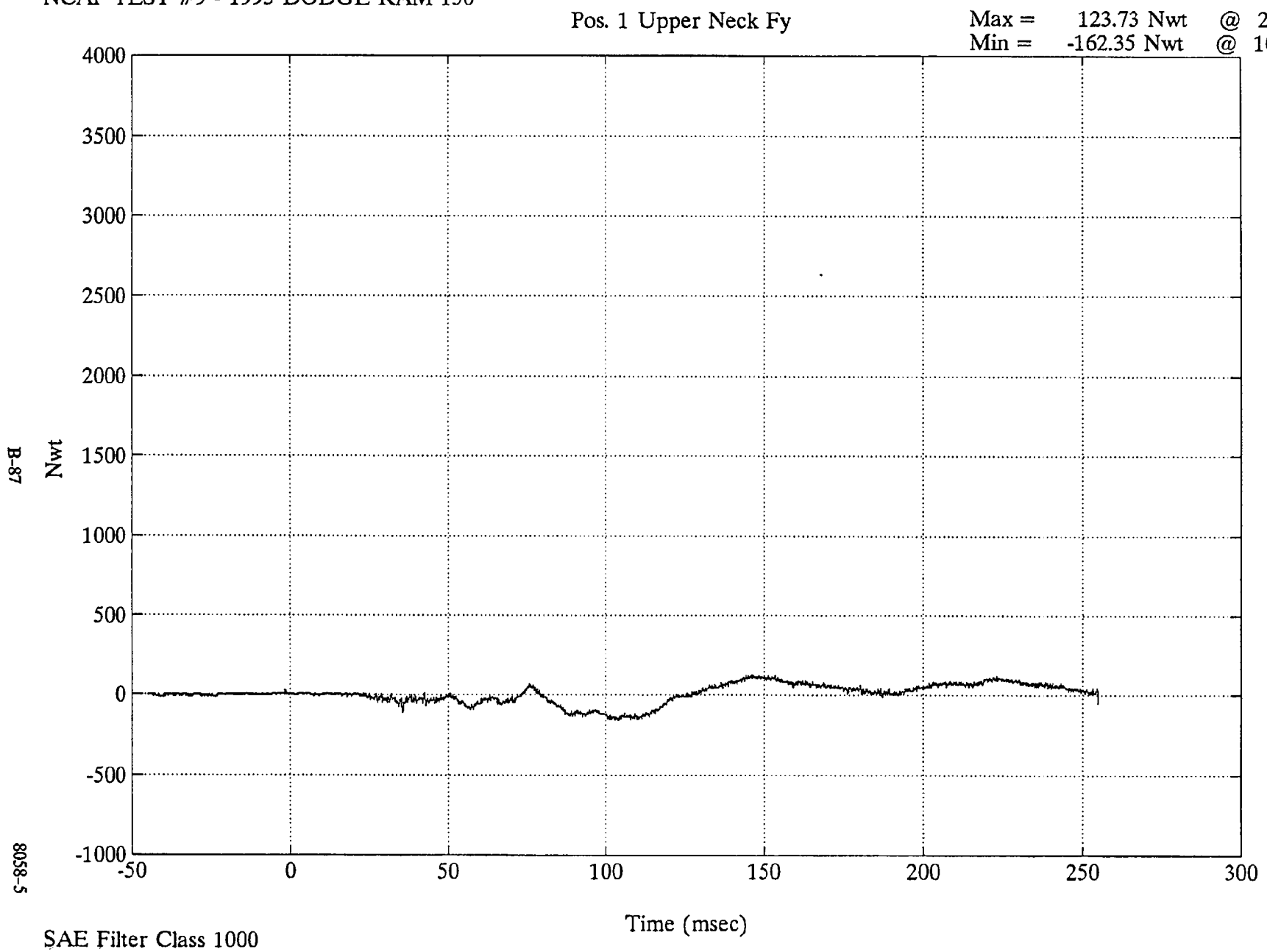


B-86

8058-5

SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150



B-87

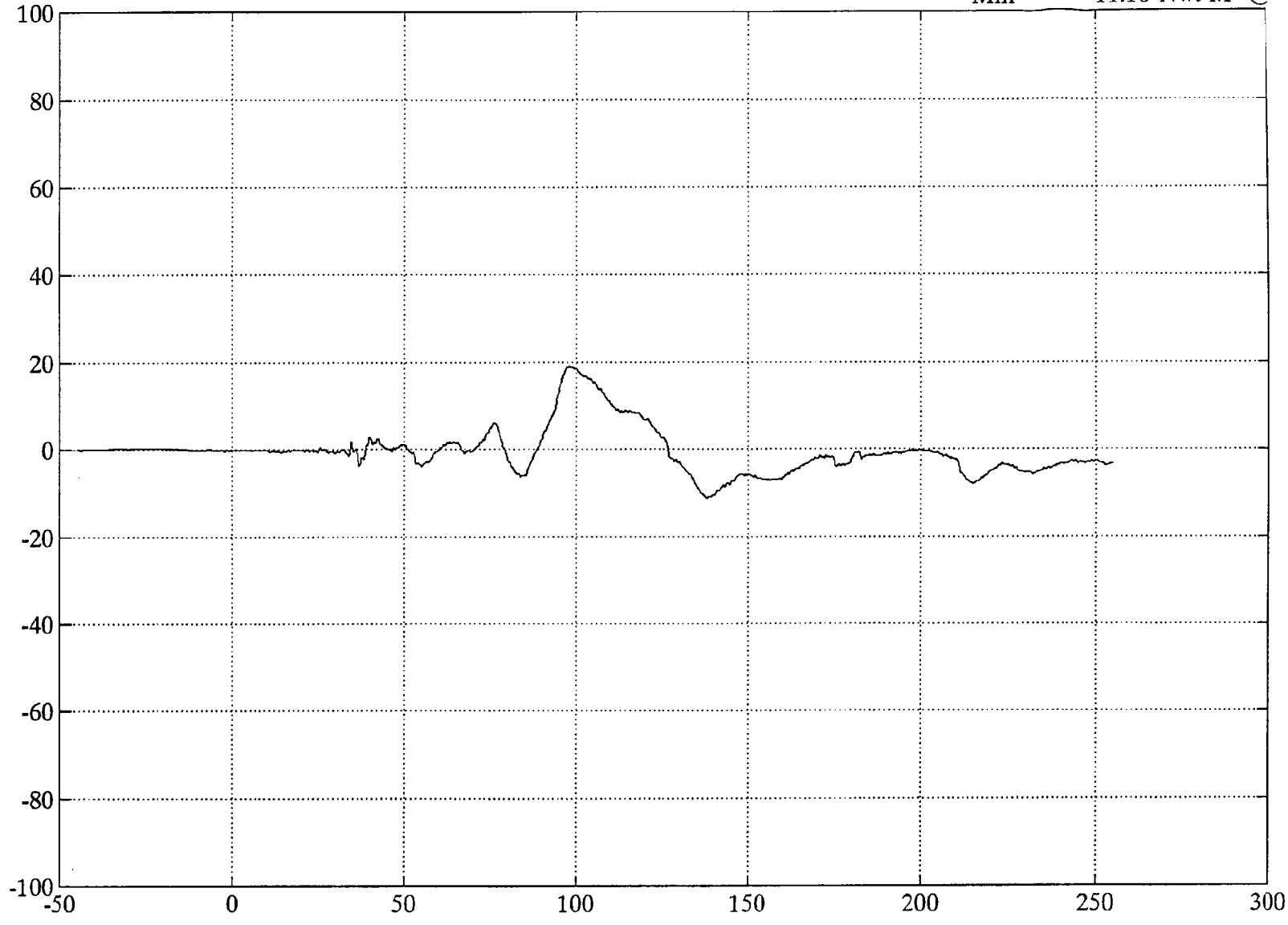
8058-5

SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150

Pos. 1 Upper Neck Mx

Max = 18.95 Nwt-M @ 97.80 msec
Min = -11.16 Nwt-M @ 138.12 msec

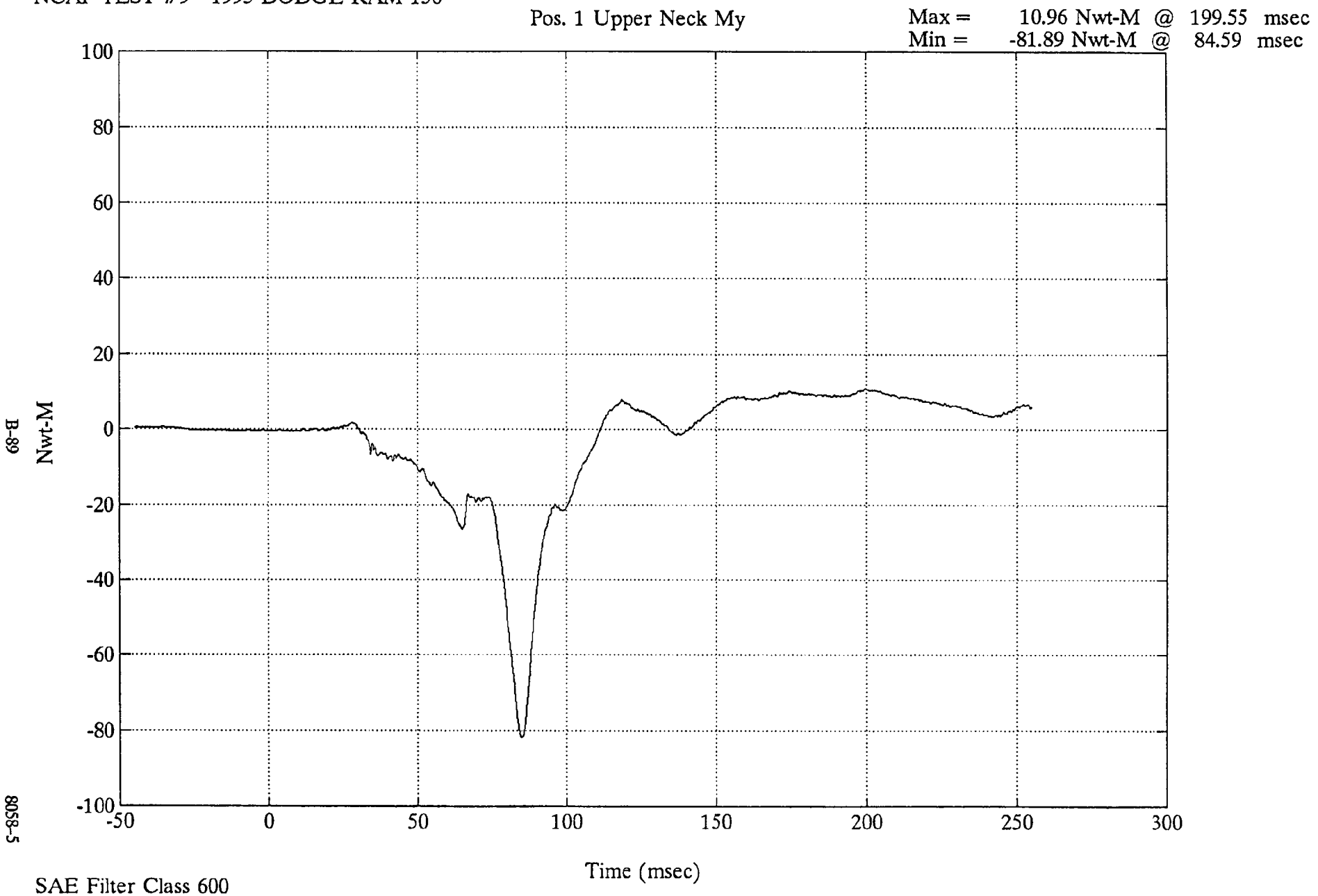


B-88

8058-5

SAE Filter Class 600

NCAP TEST #9 - 1993 DODGE RAM 150

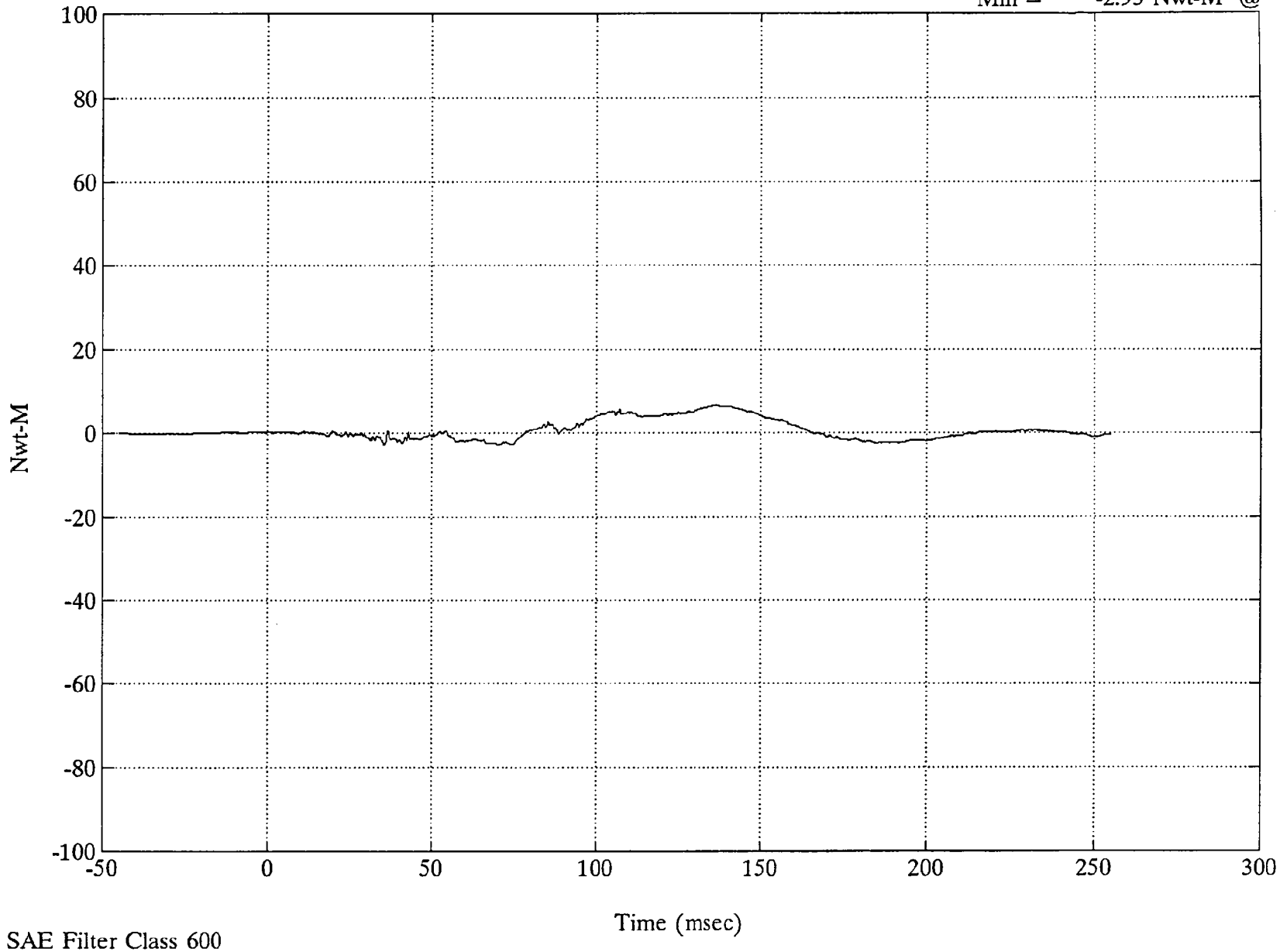


SAE Filter Class 600

NCAP TEST #9 - 1993 DODGE RAM 150

Pos. 1 Upper Neck Mz

Max = 6.66 Nwt-M @ 136.32 msec
Min = -2.93 Nwt-M @ 35.15 msec

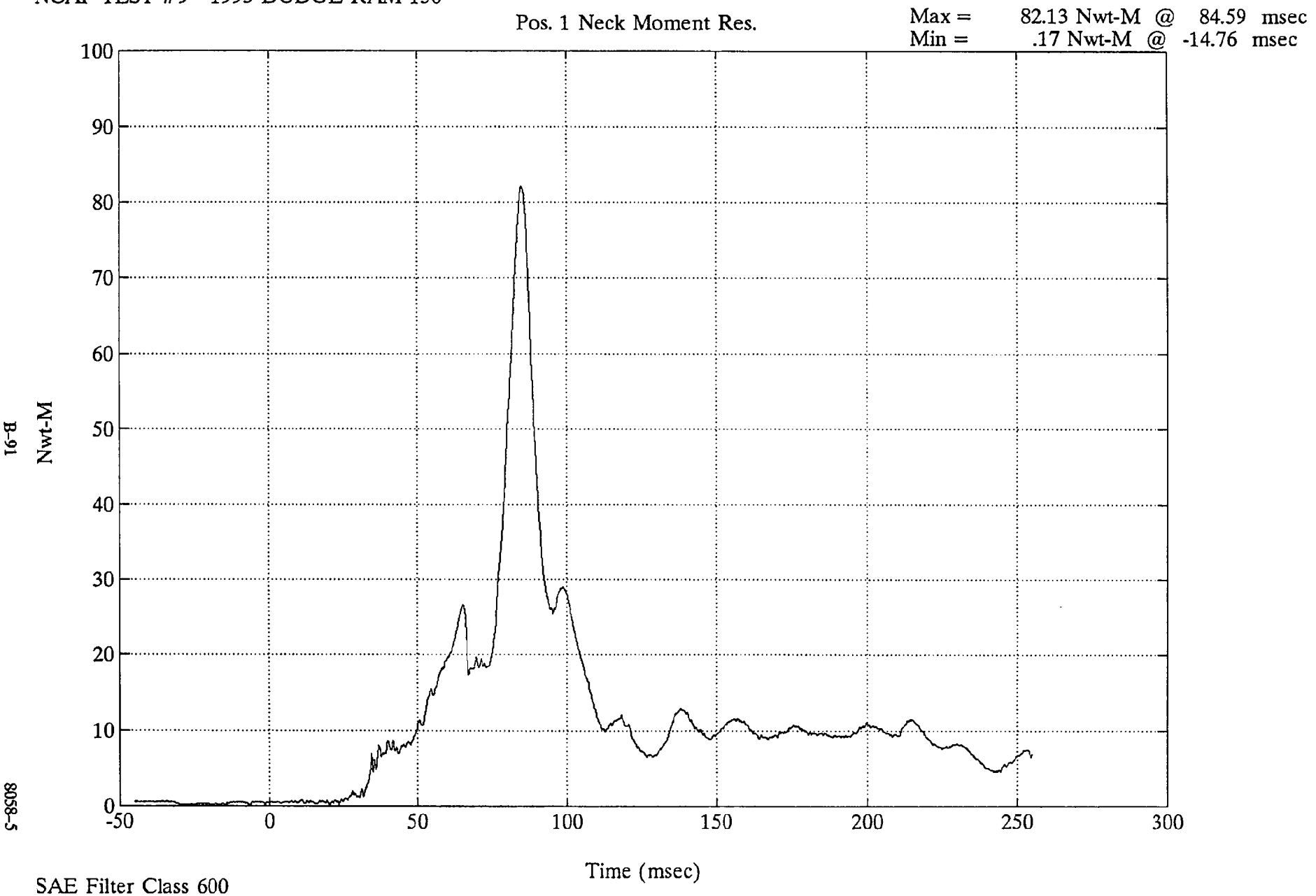


SAE Filter Class 600

B-90

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150

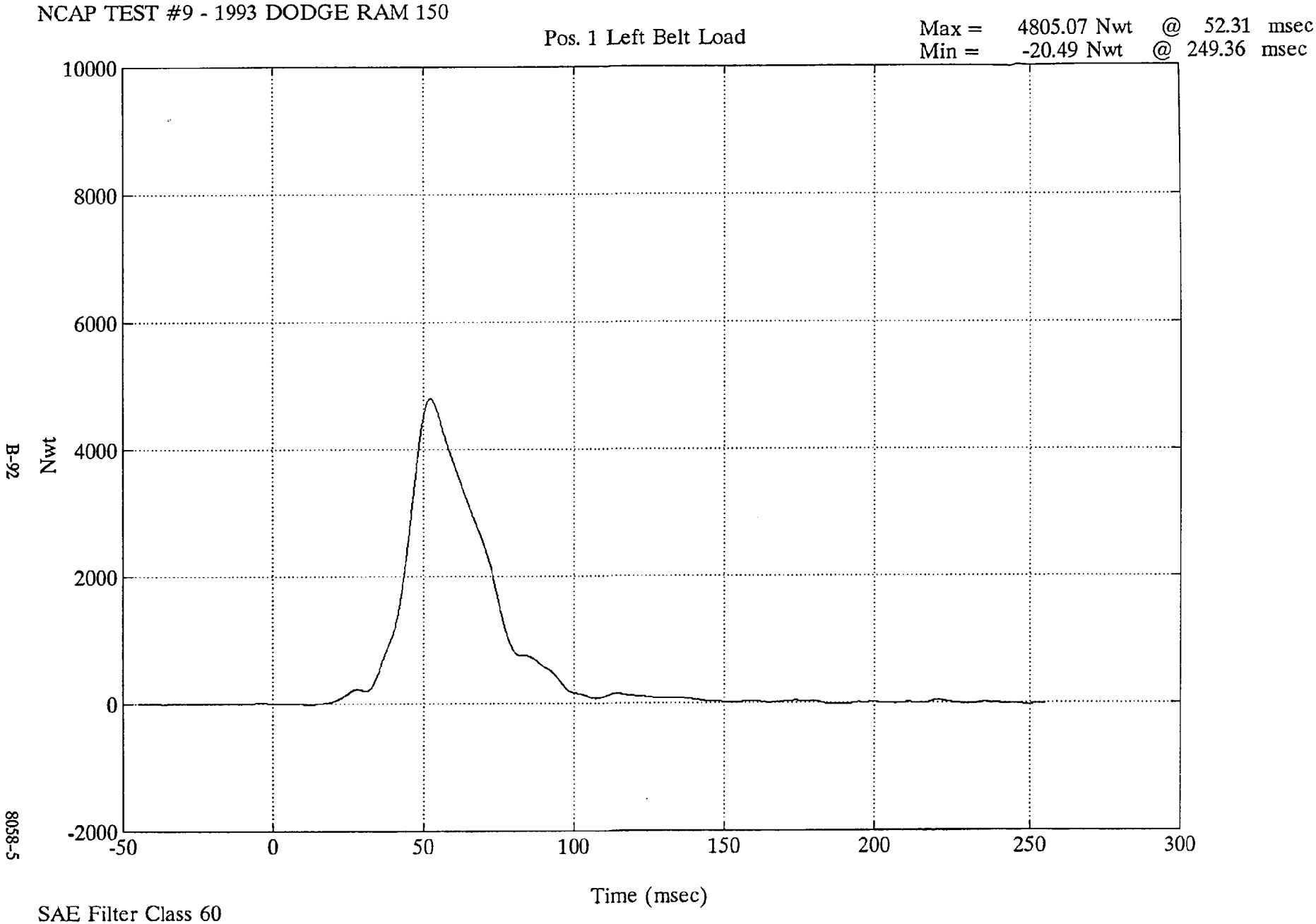


SAE Filter Class 600

B-91

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150

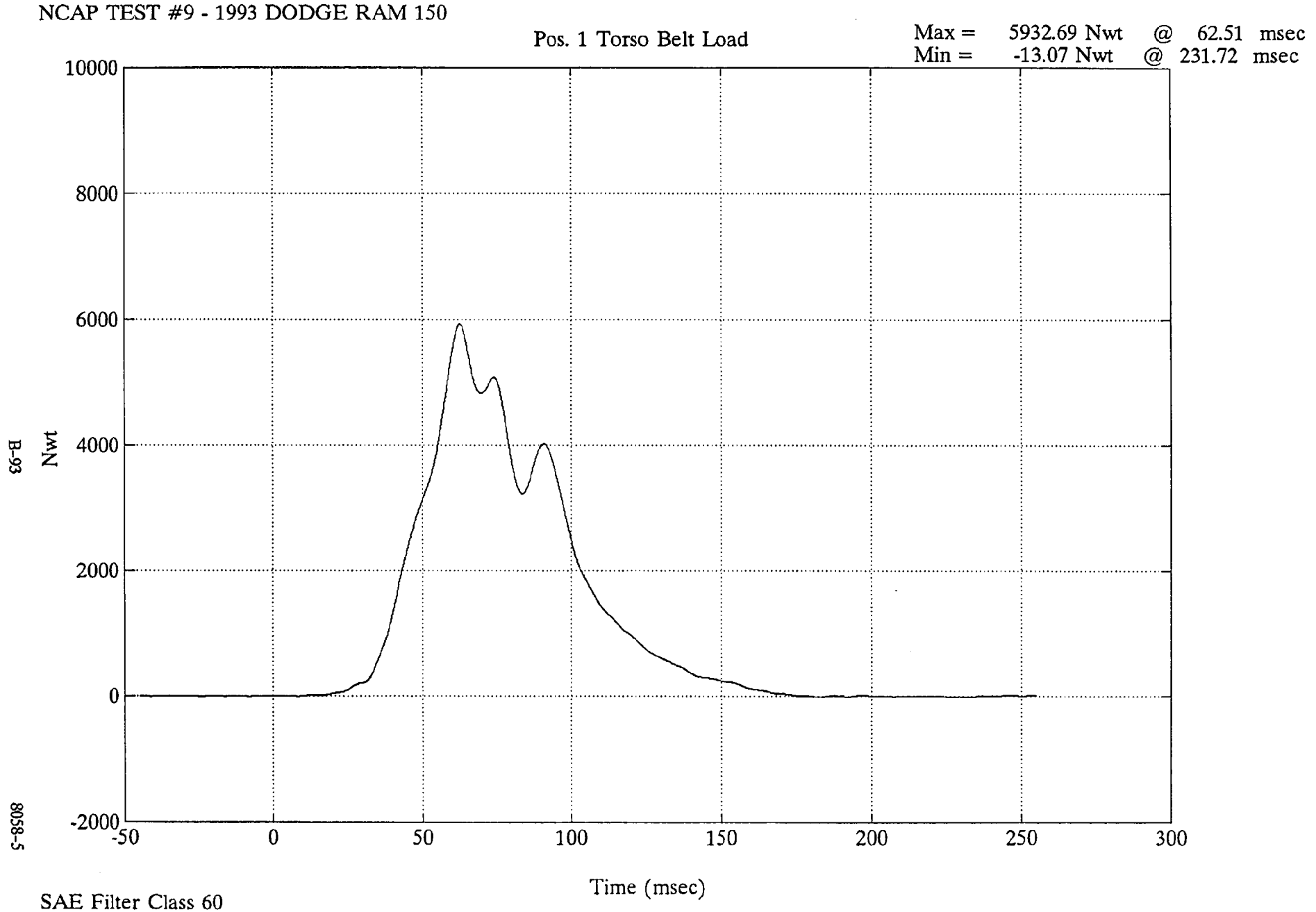


B-92

8058-5

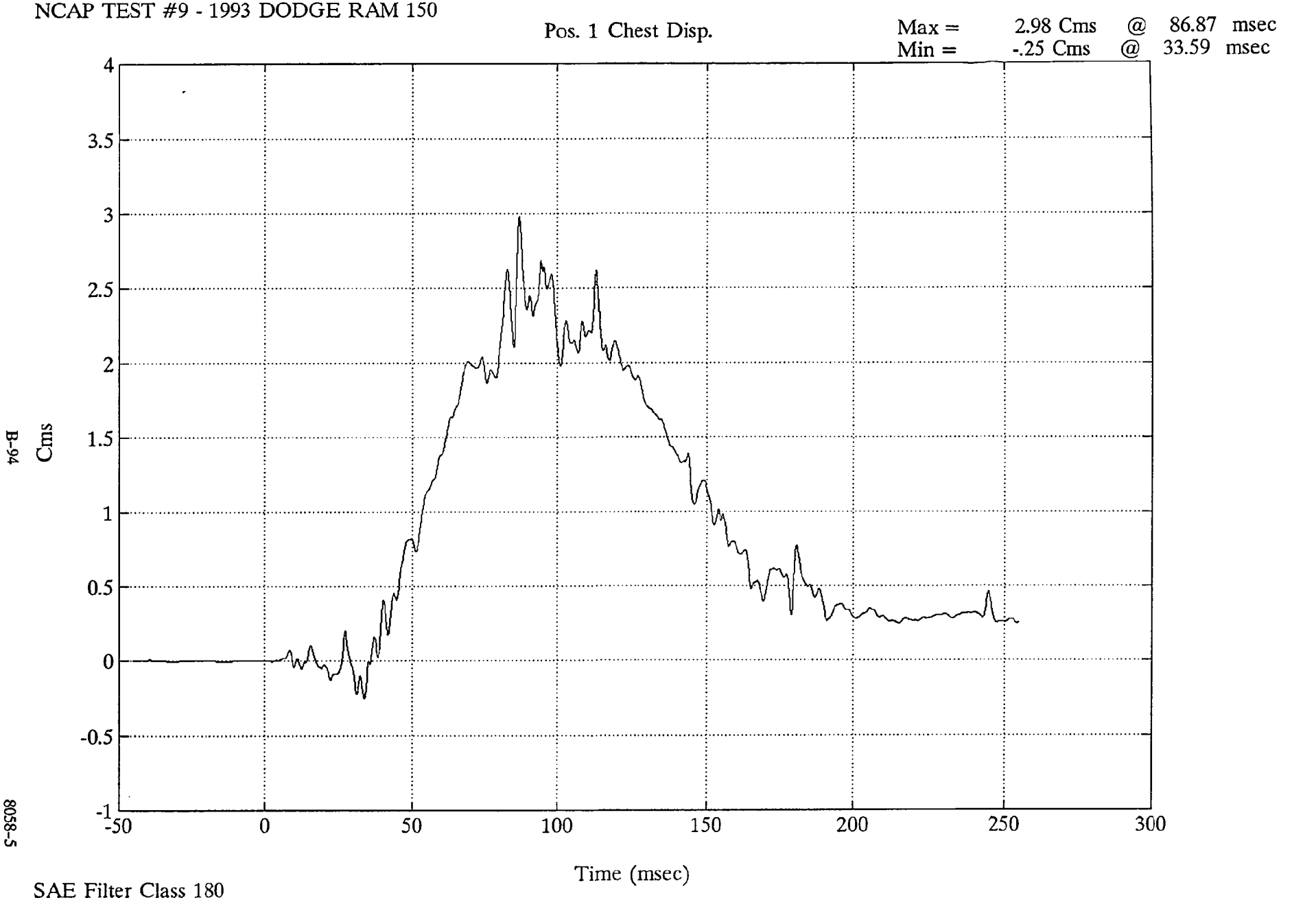
SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150



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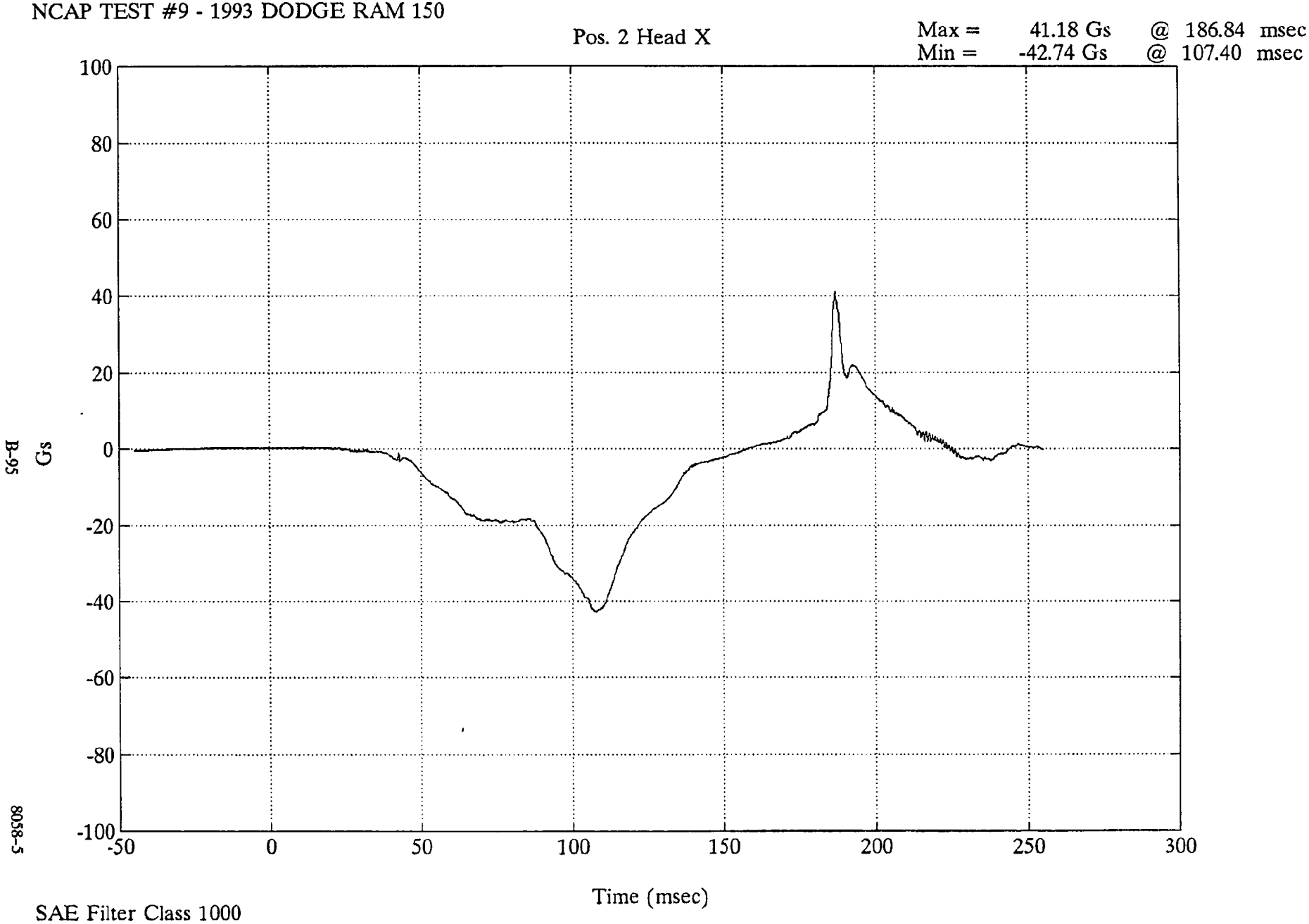
8058-5

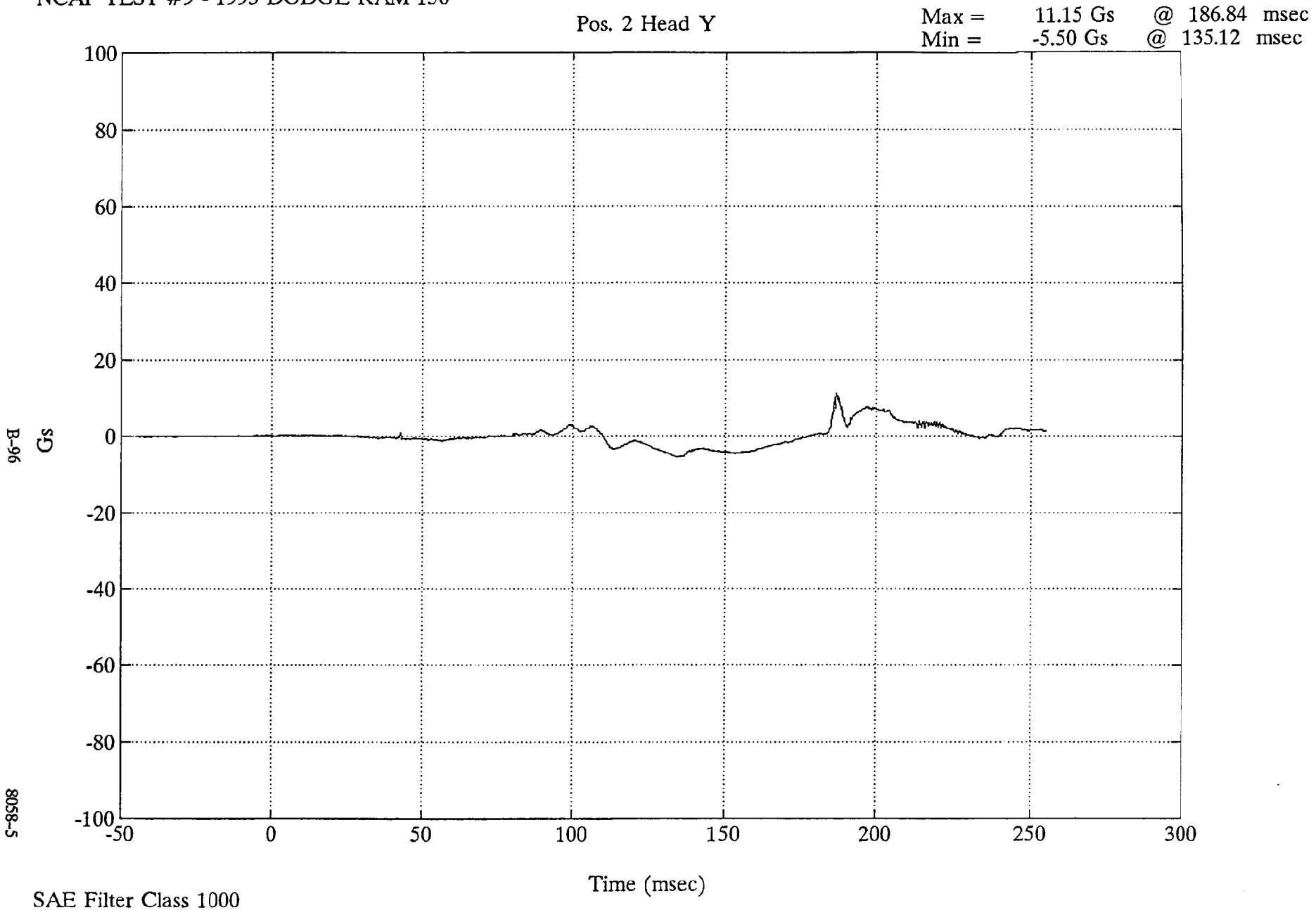
SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150

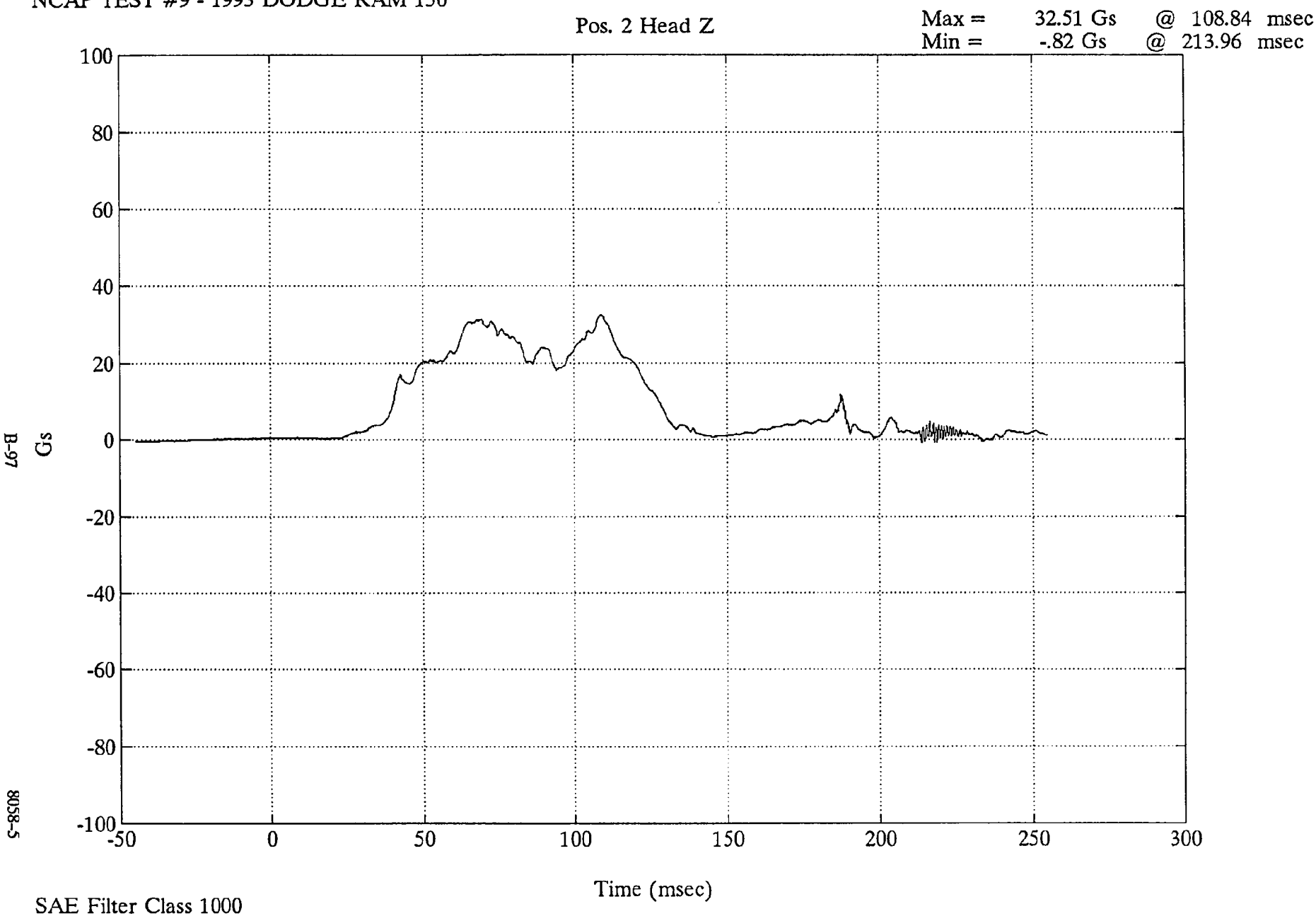


B-96

8058-5

SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150

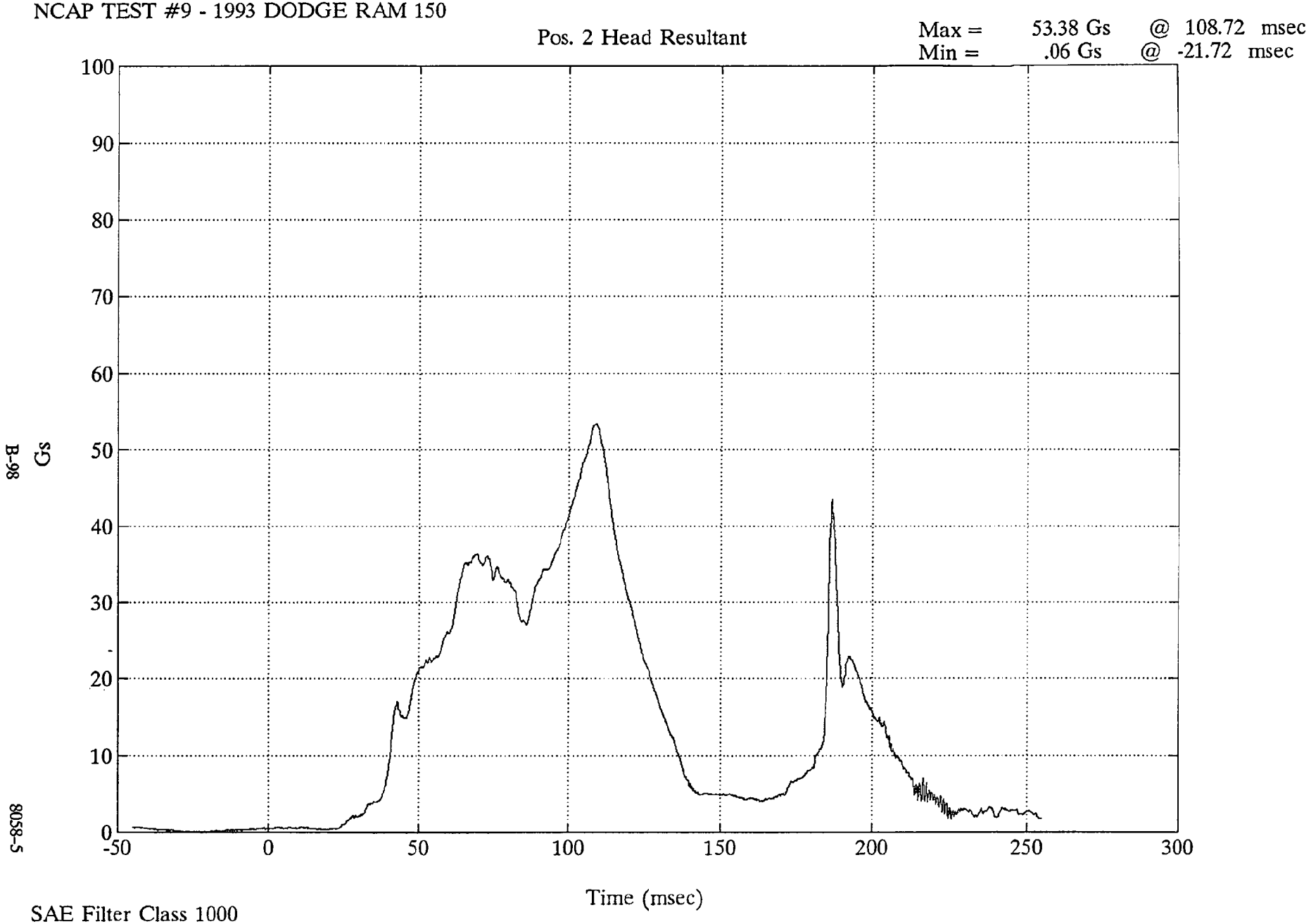


B-97

8058-5

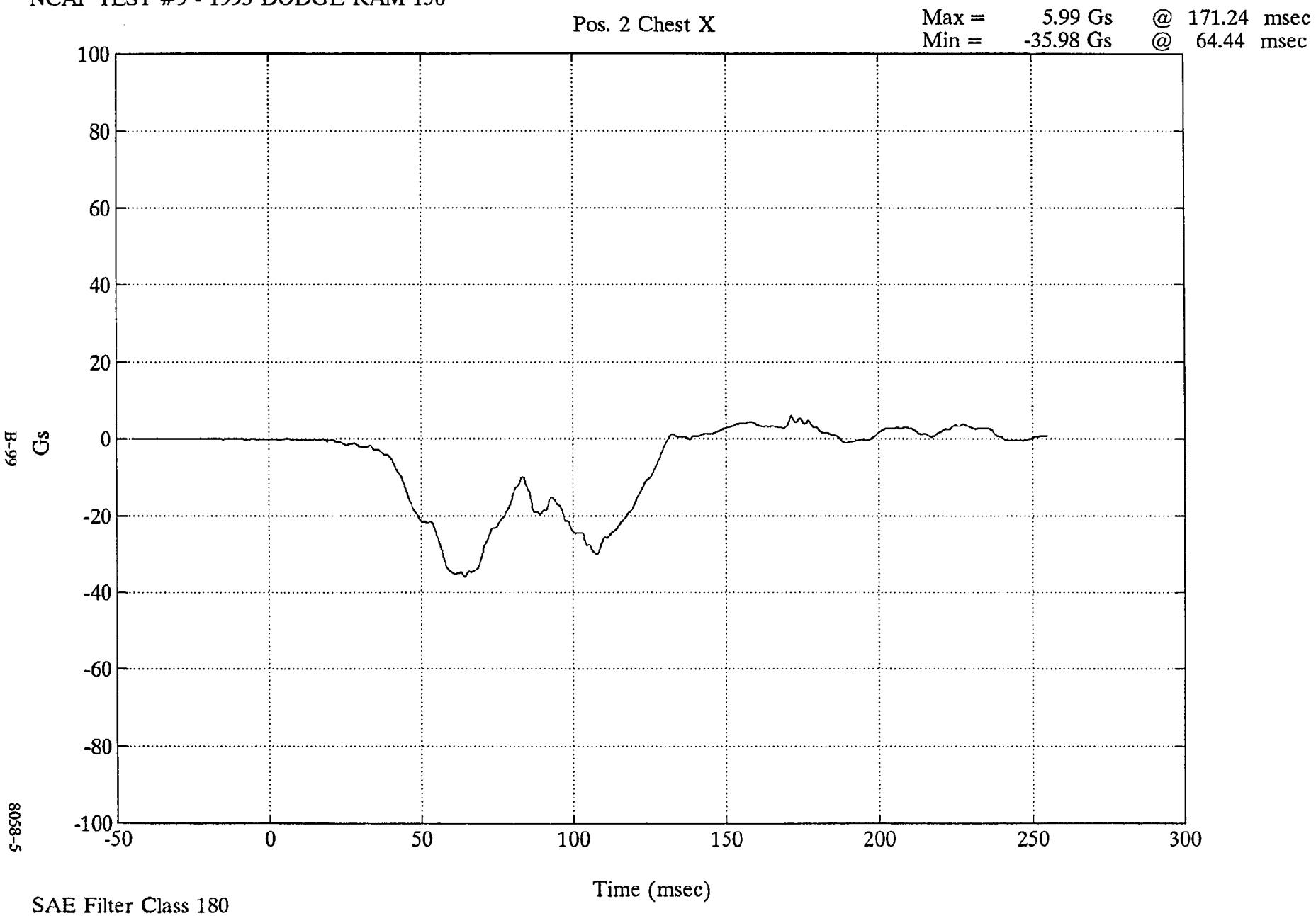
SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150



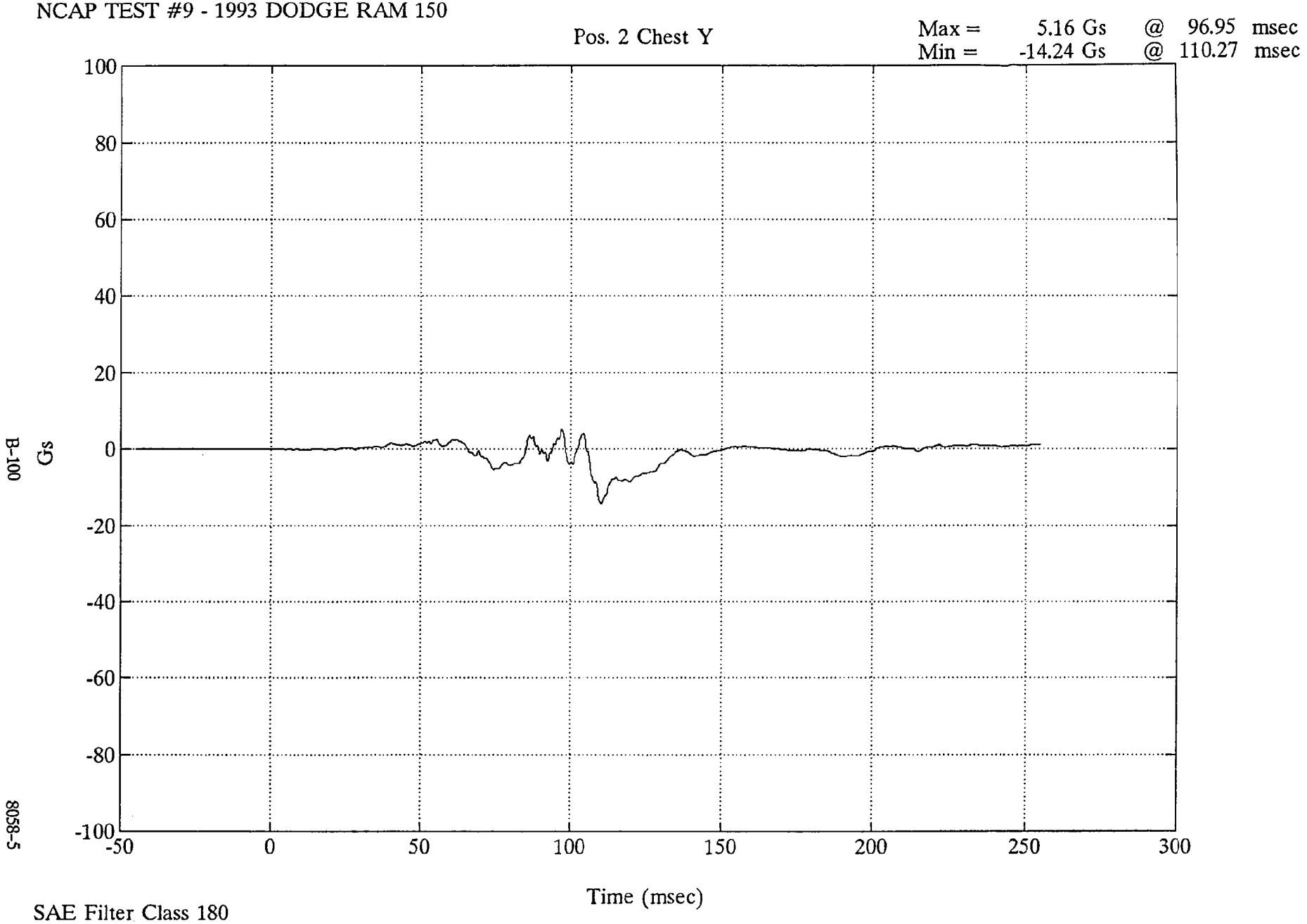
SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150



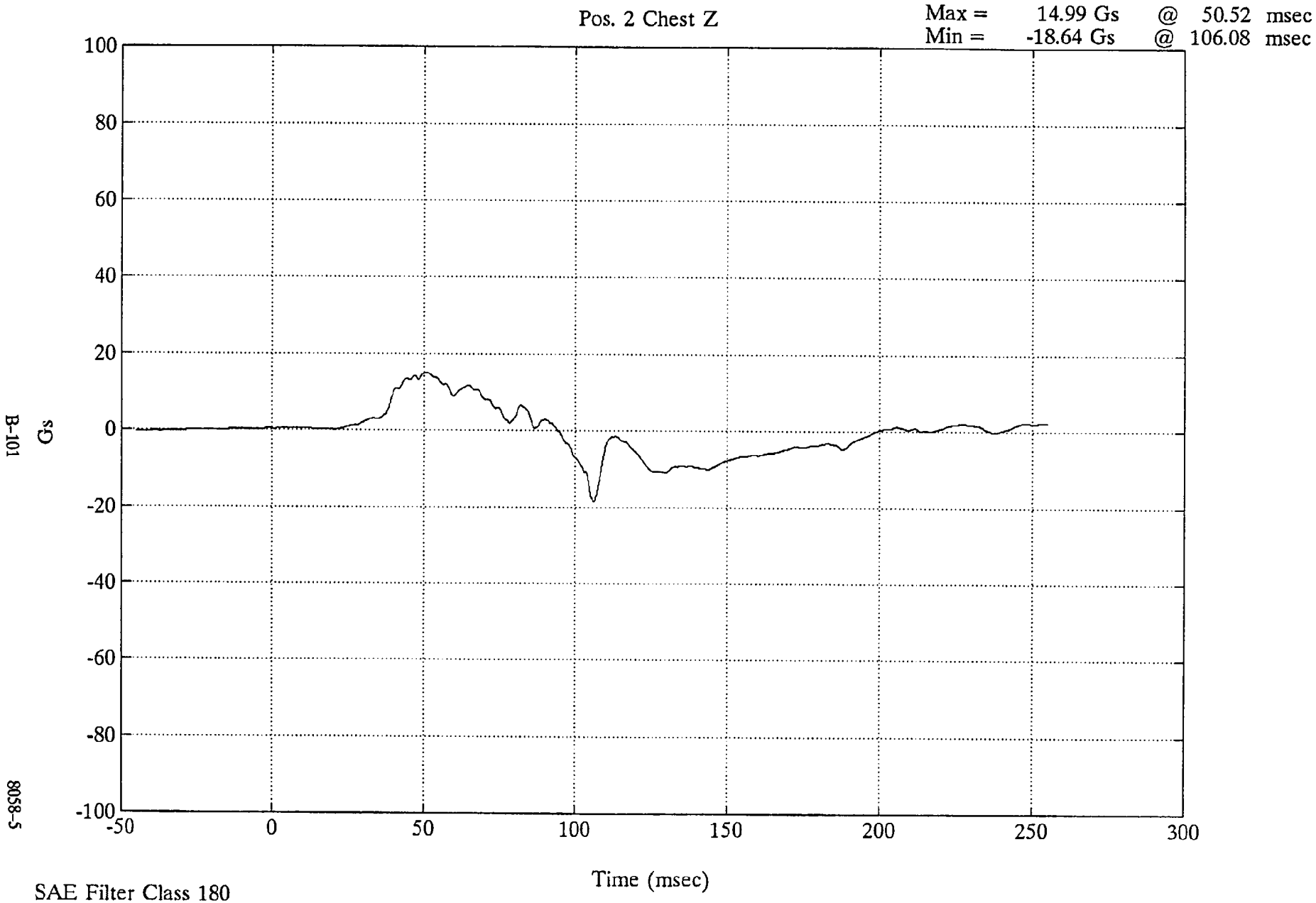
SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150



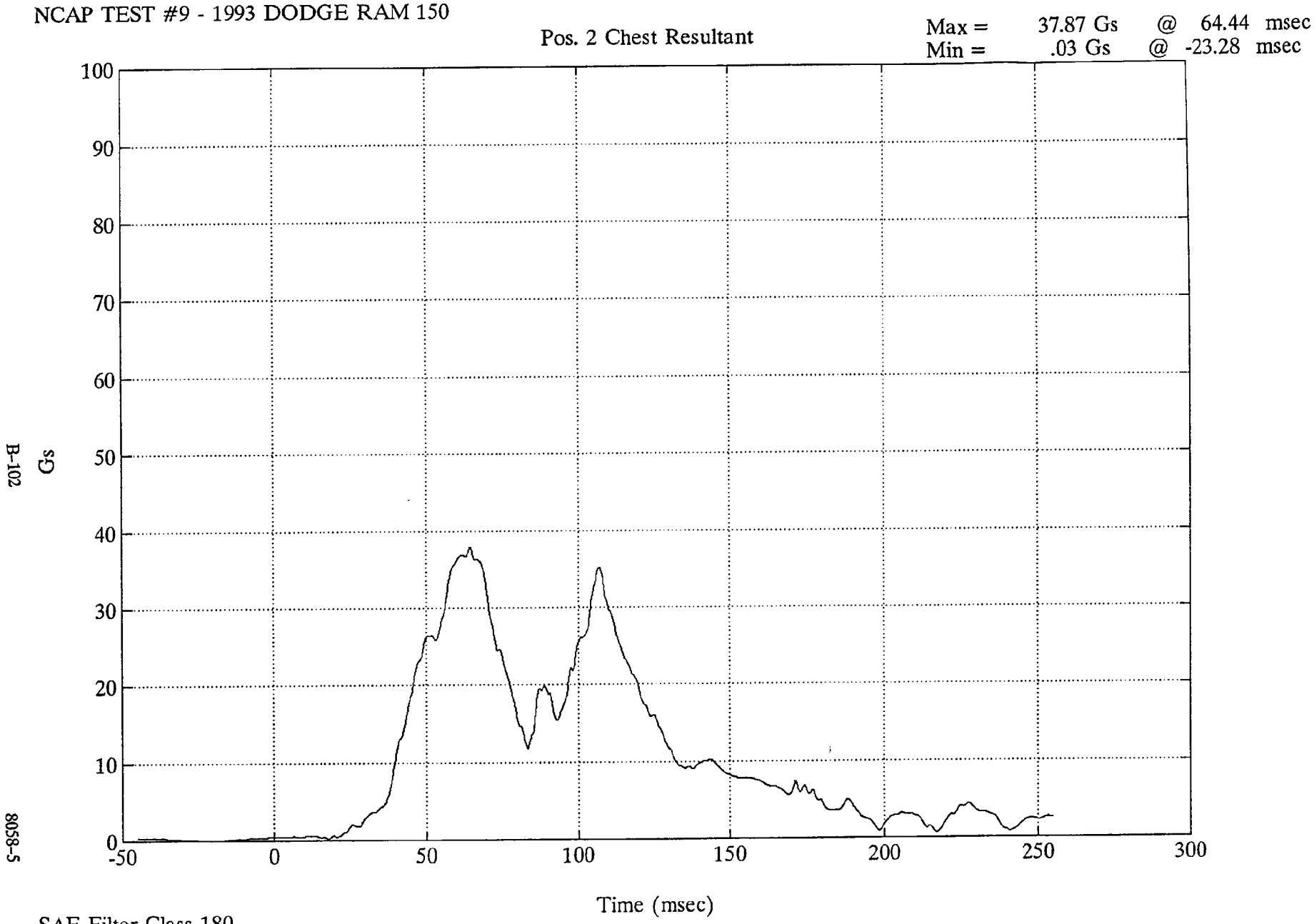
SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150



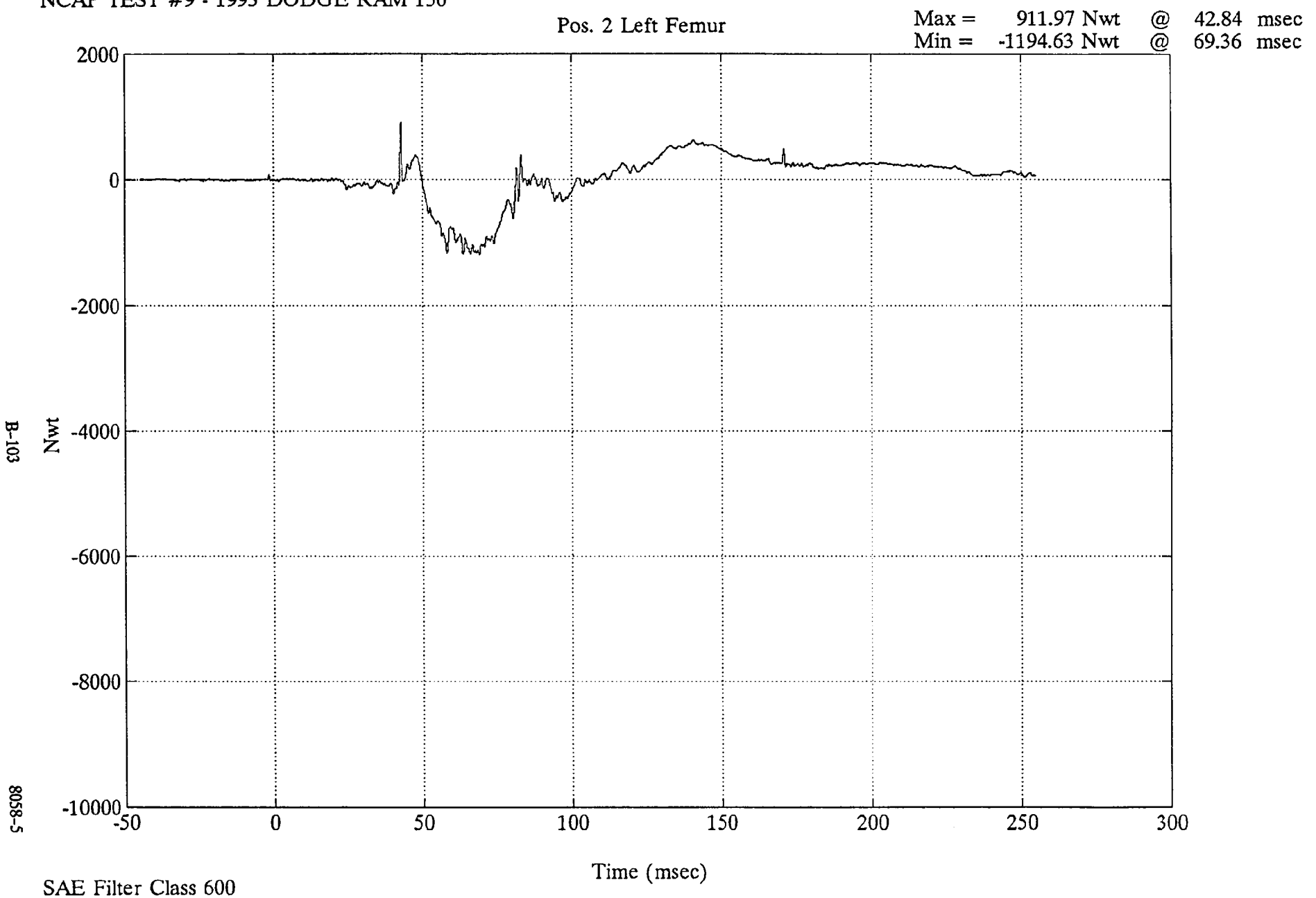
SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150



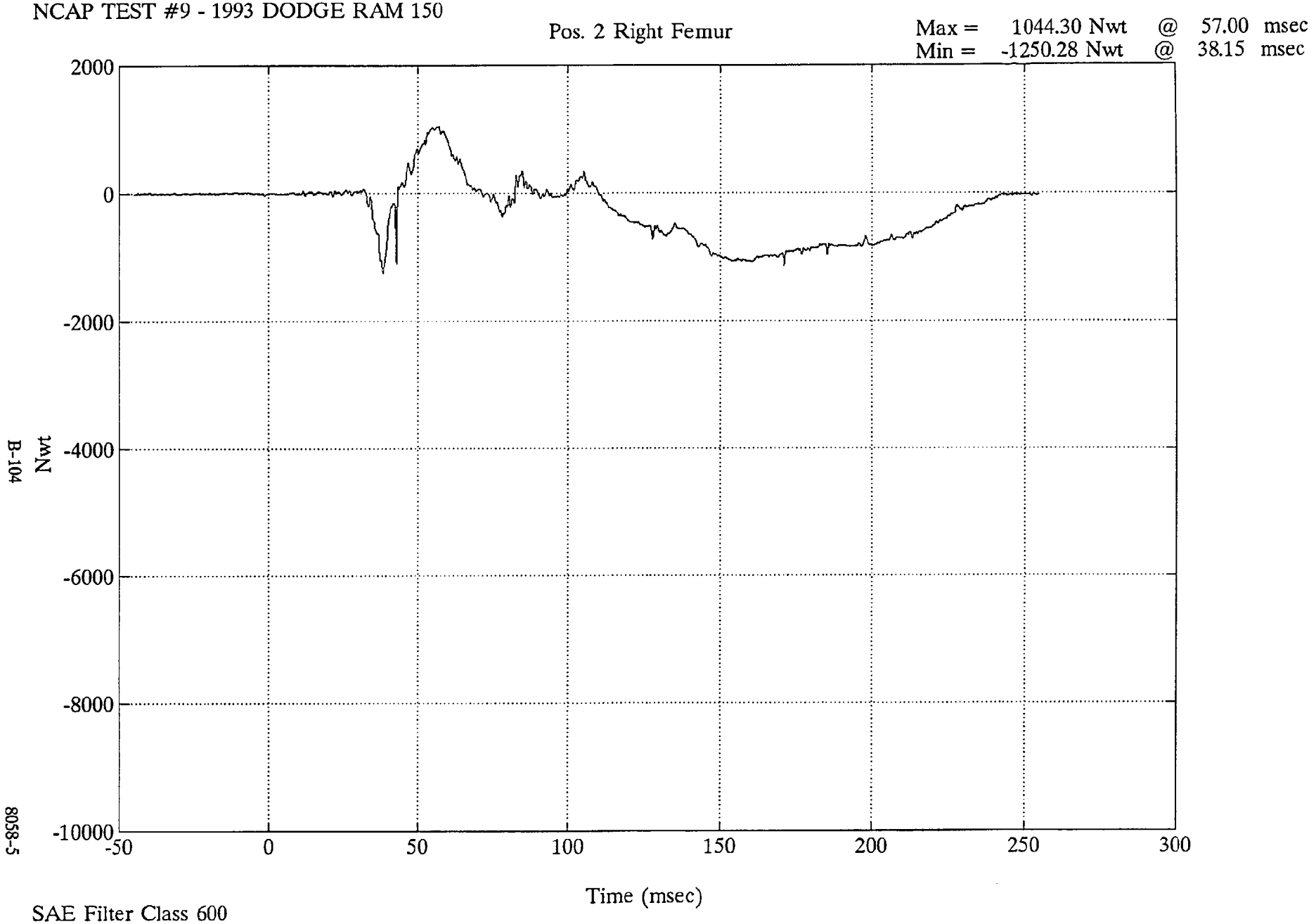
SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150



SAE Filter Class 600

NCAP TEST #9 - 1993 DODGE RAM 150



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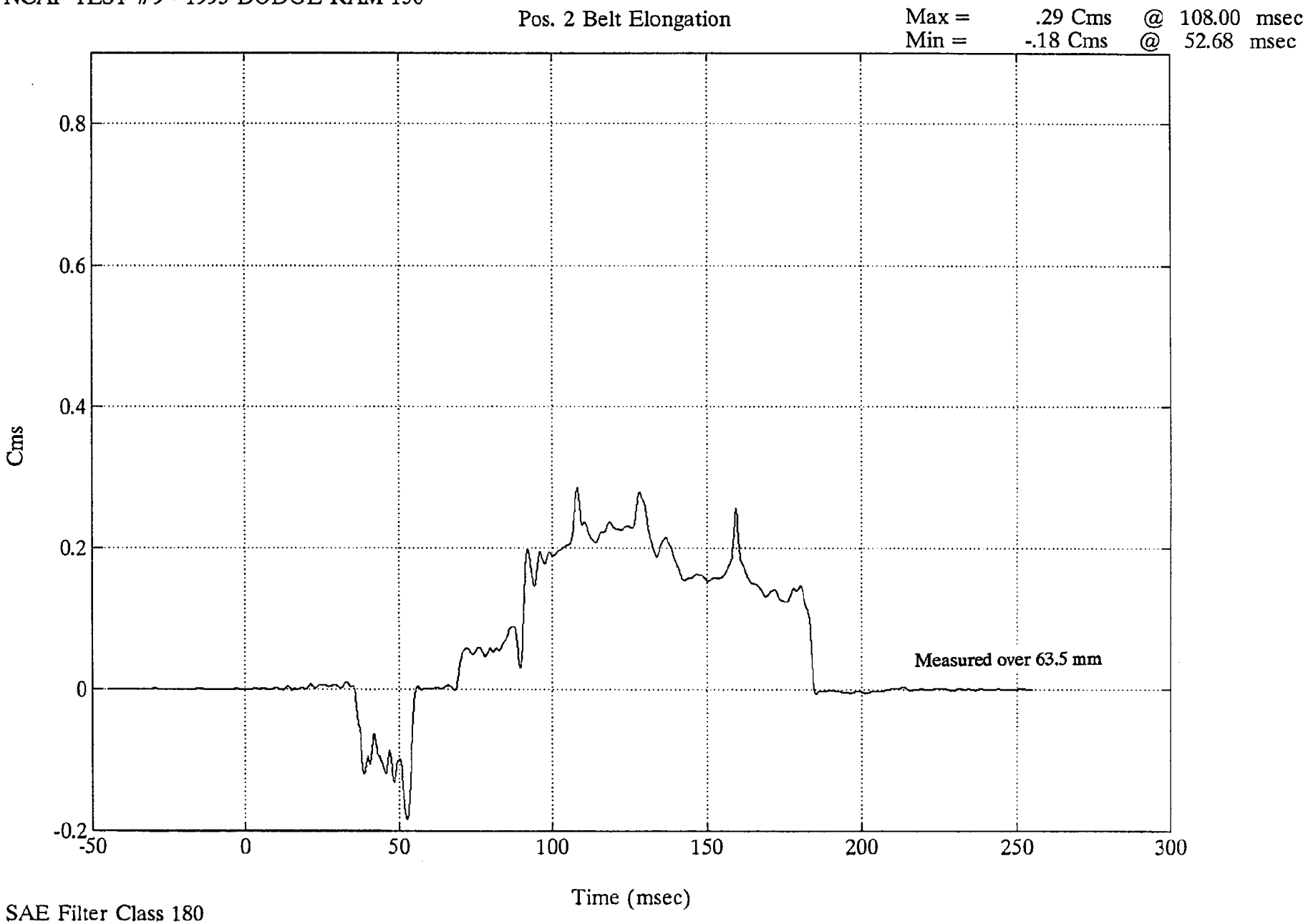
SAE Filter Class 600

NCAP TEST #9 - 1993 DODGE RAM 150

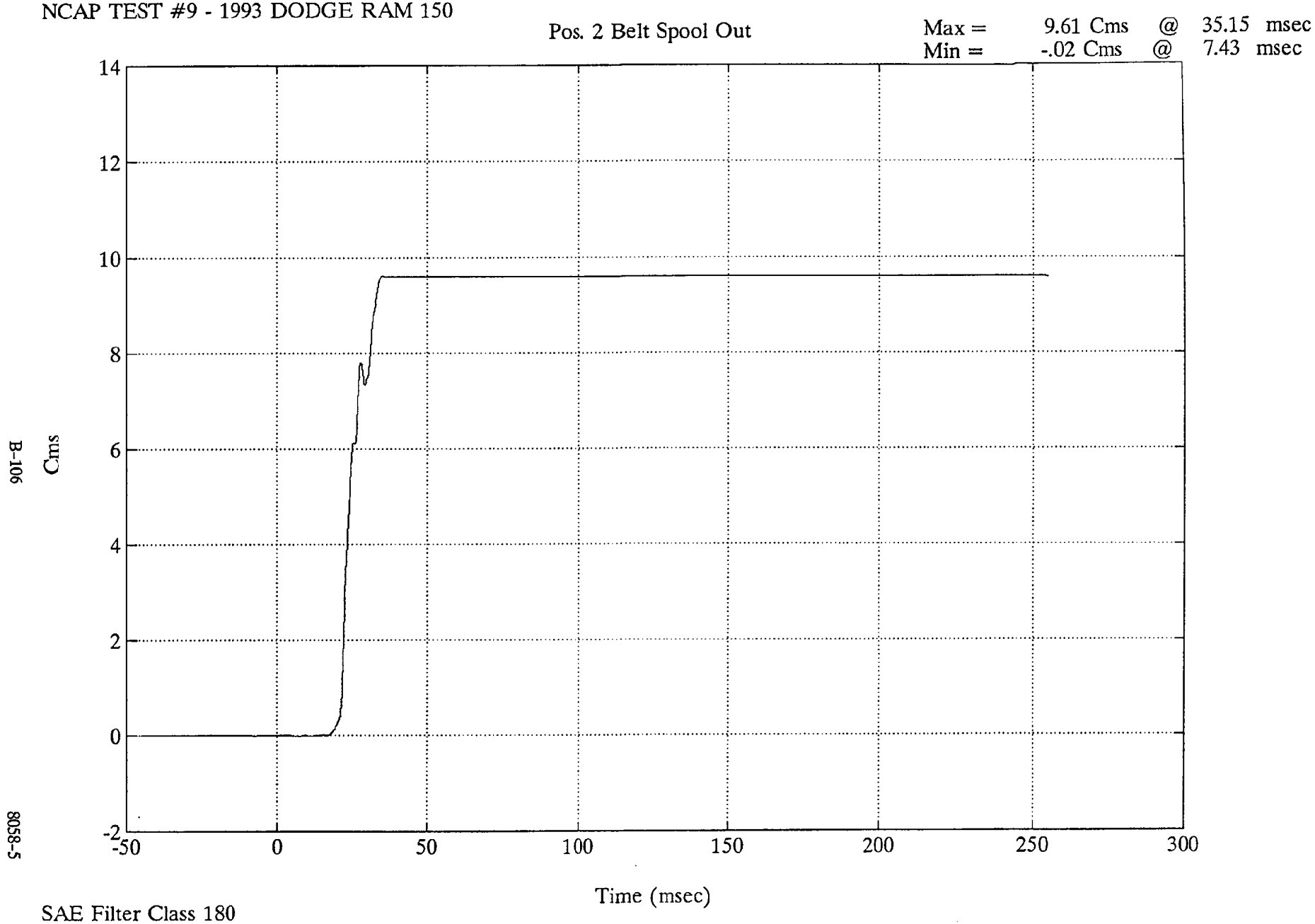


B-105

8058-5

SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150

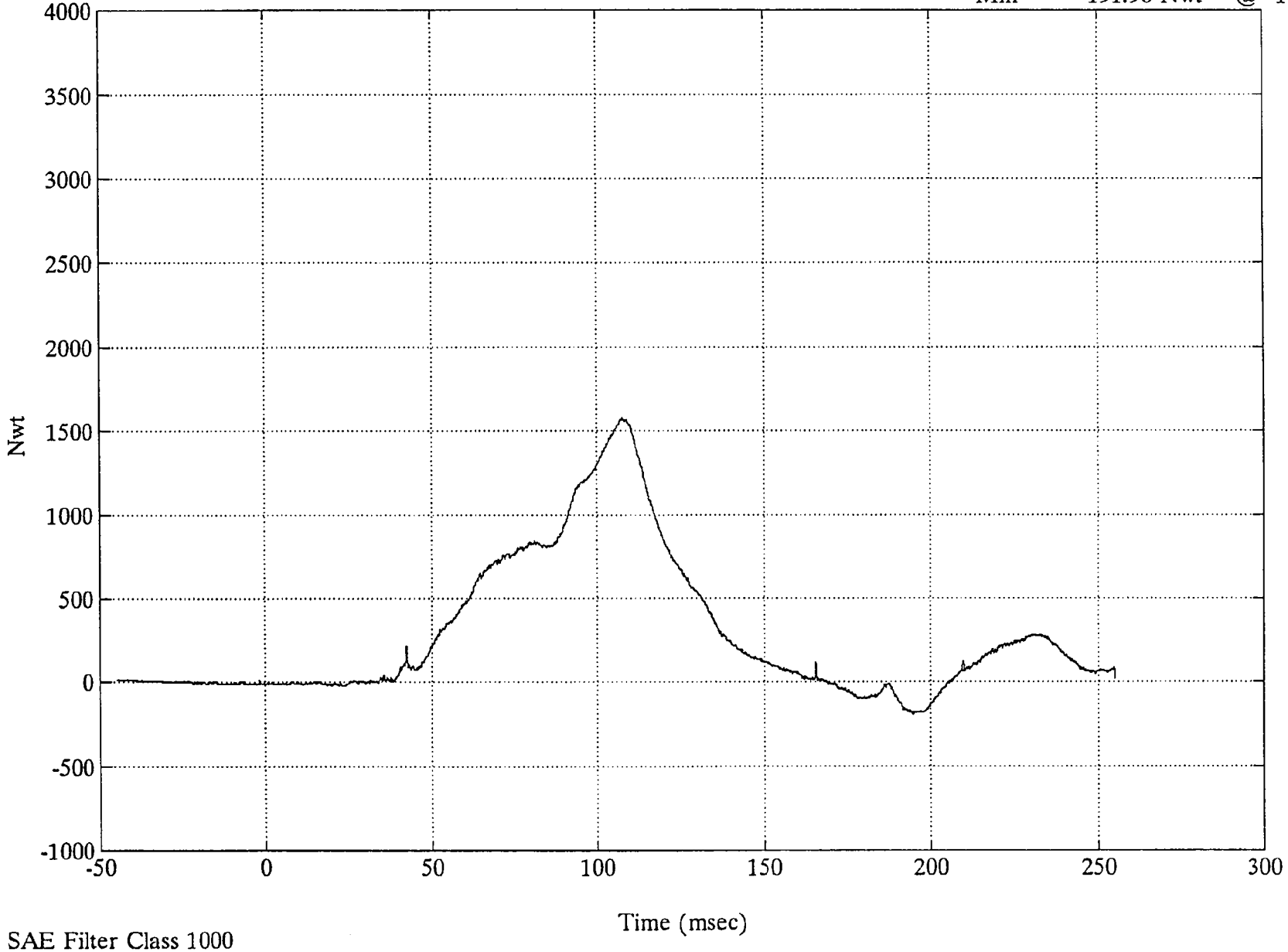


SAE Filter Class 180

NCAP TEST #9 - 1993 DODGE RAM 150

Pos. 2 Upper Neck Fx

Max = 1577.60 Nwt @ 107.64 msec
Min = -191.90 Nwt @ 194.88 msec



B-107

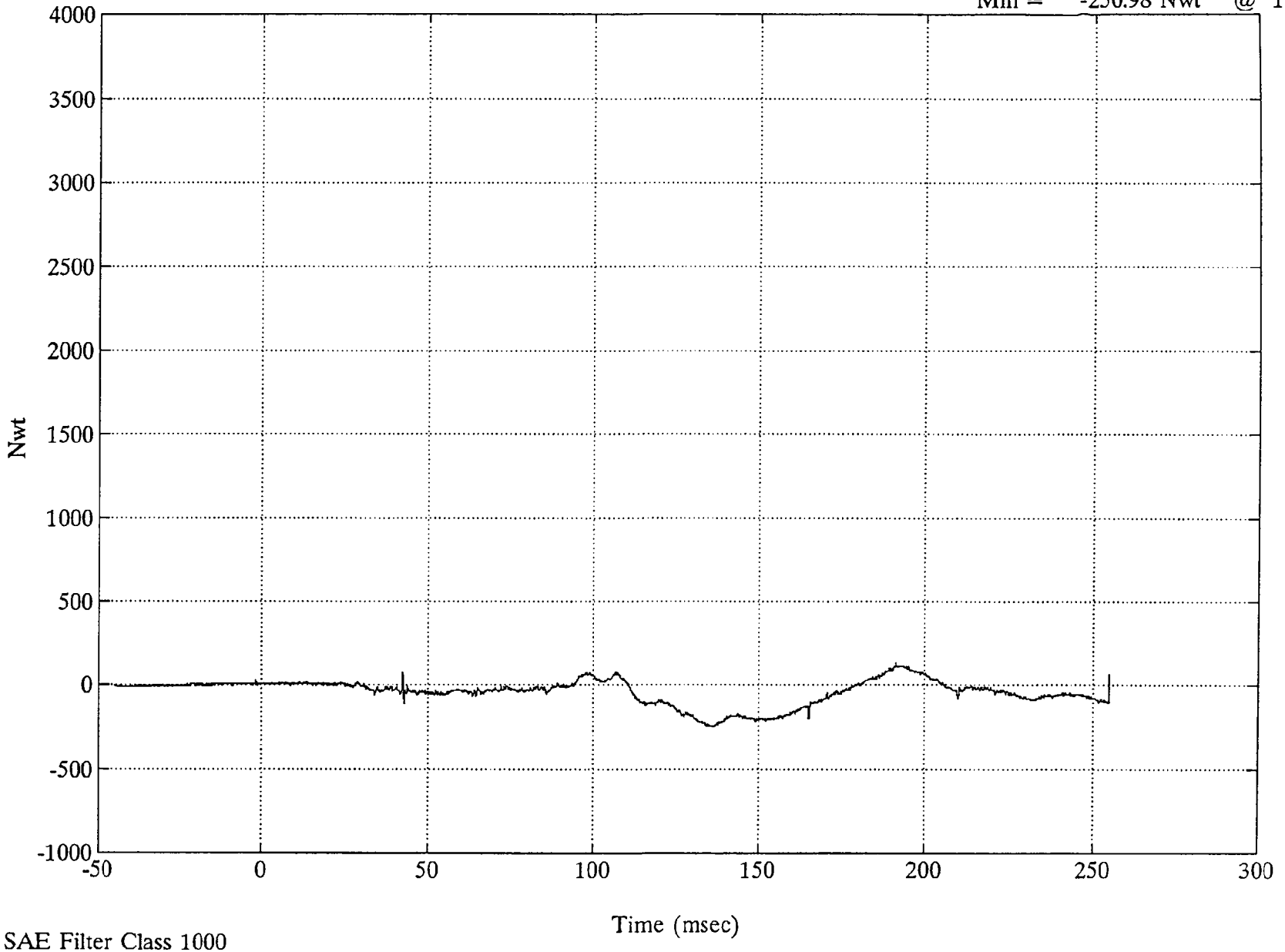
8058-5

SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150

Pos. 2 Upper Neck Fy

Max = 137.72 Nwt @ 191.40 msec
Min = -250.98 Nwt @ 136.44 msec



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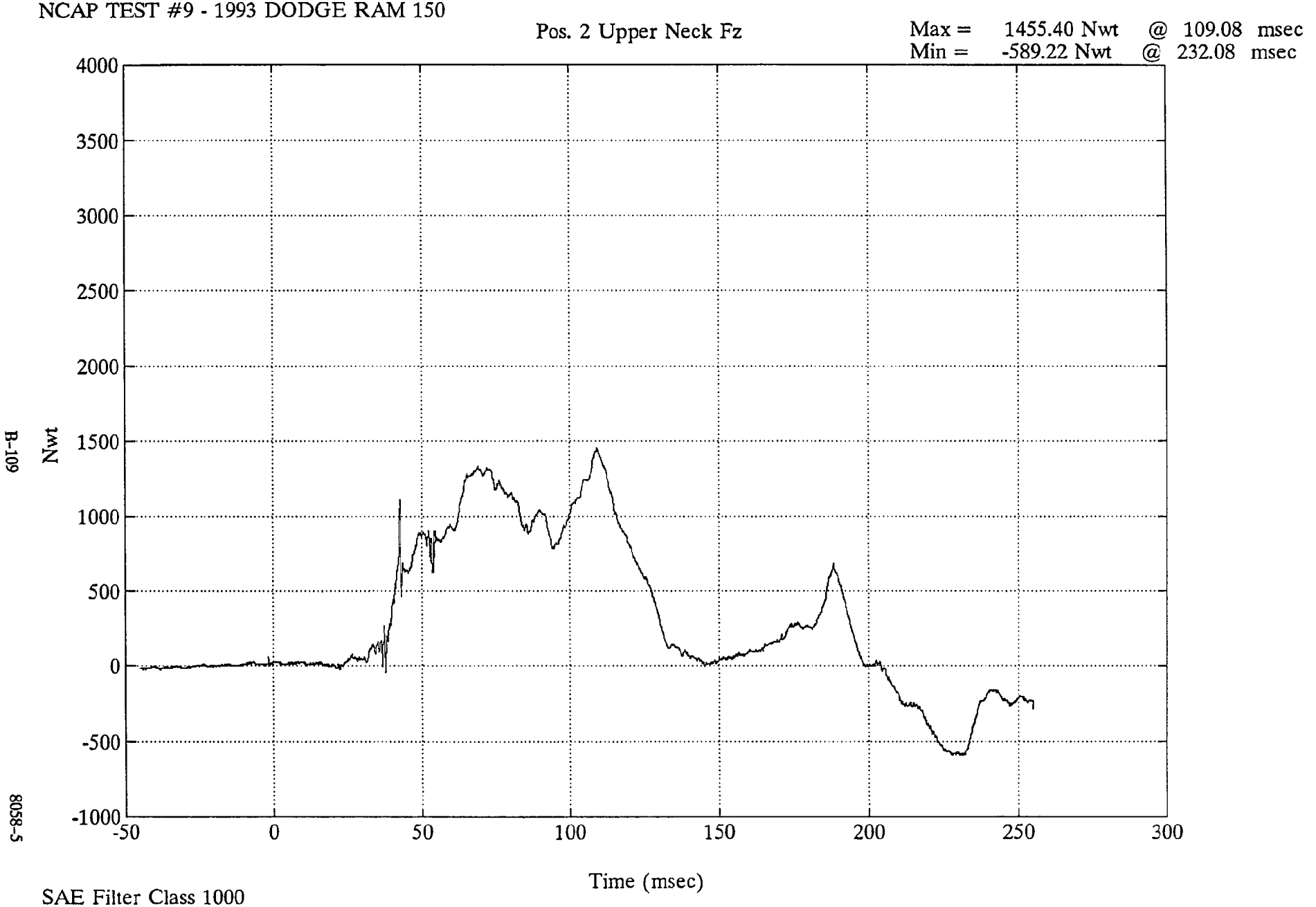
8058-5

SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150

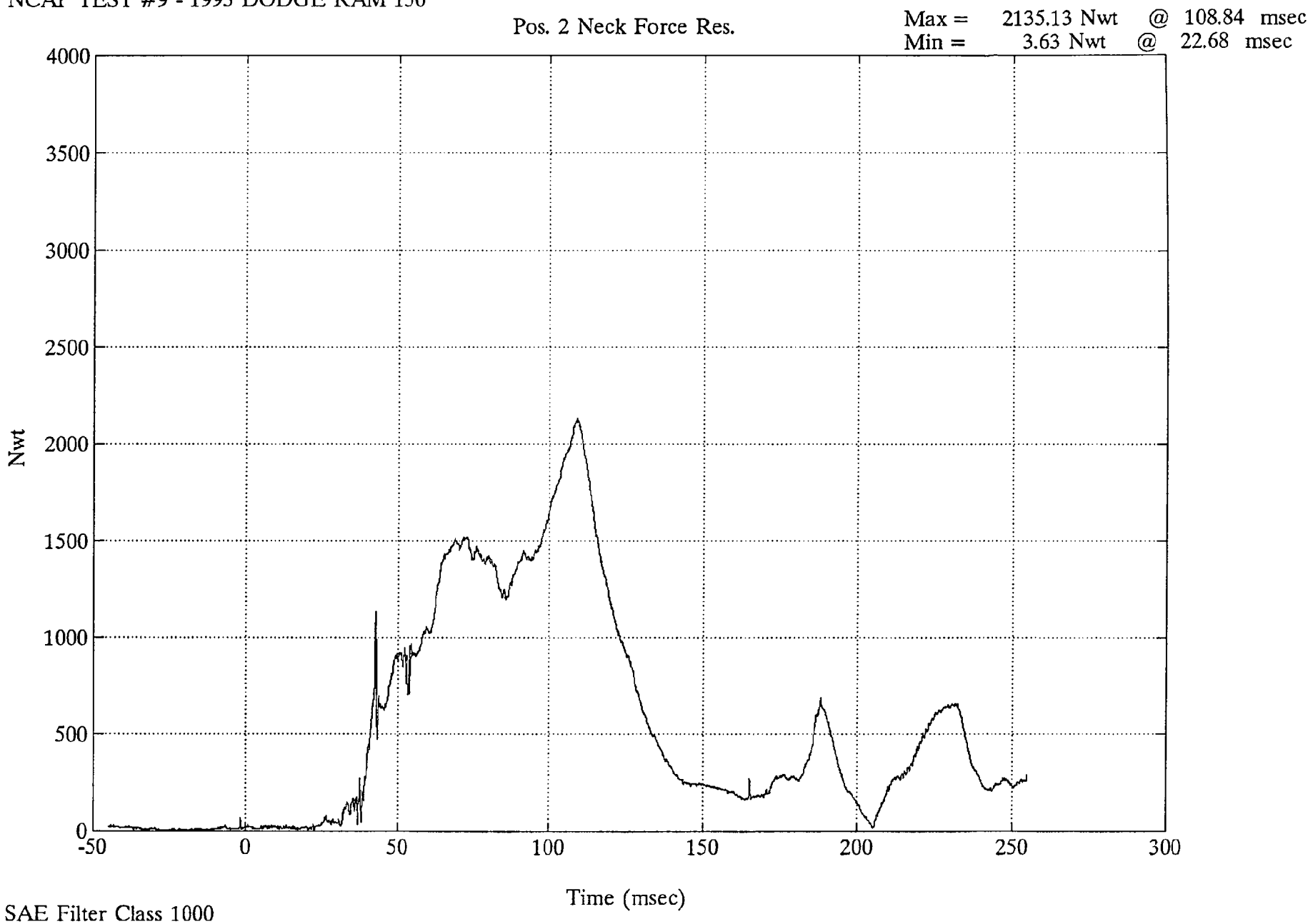


B-109

8058-5

SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150

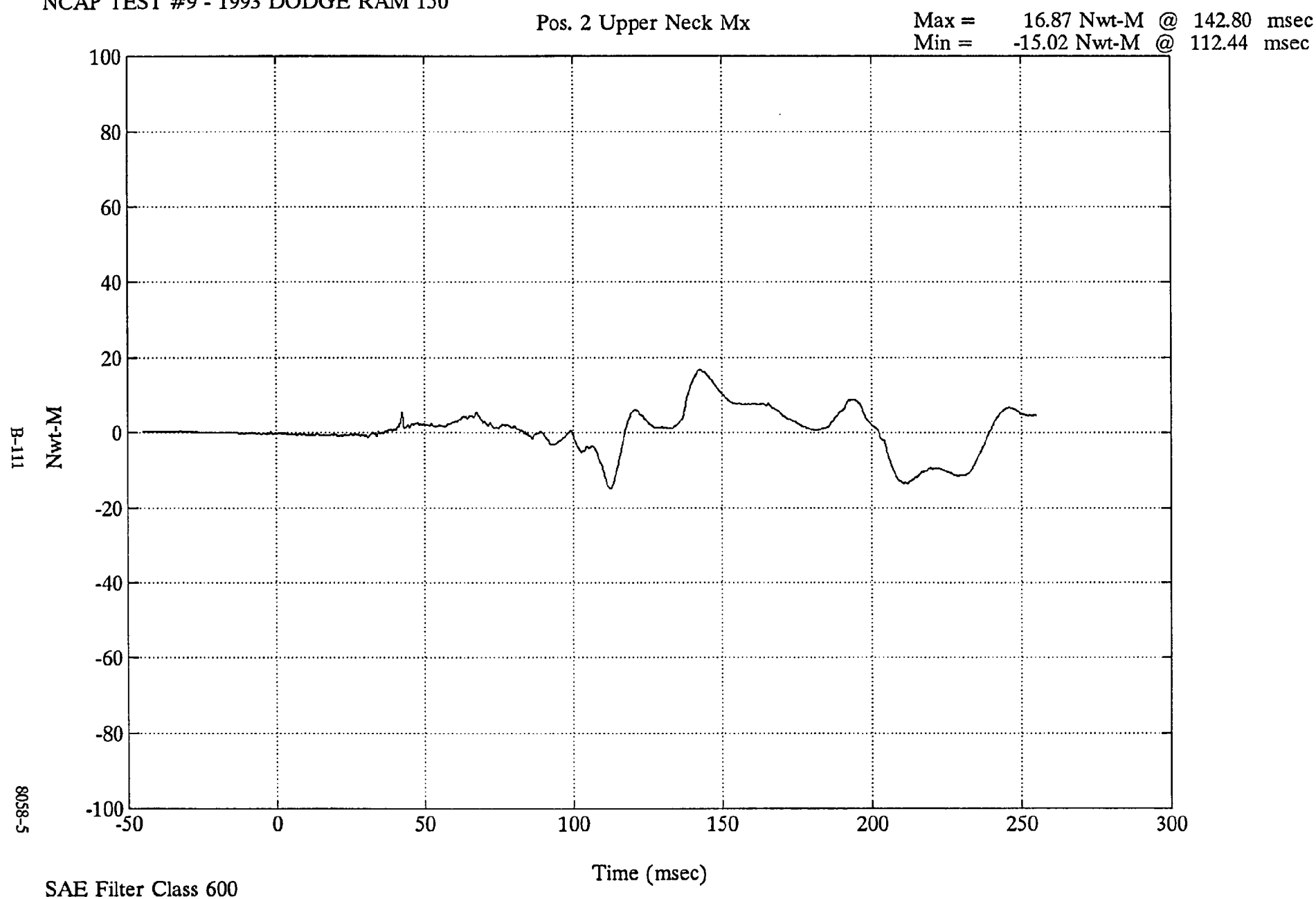


B-110

8058-5

SAE Filter Class 1000

NCAP TEST #9 - 1993 DODGE RAM 150



B-111

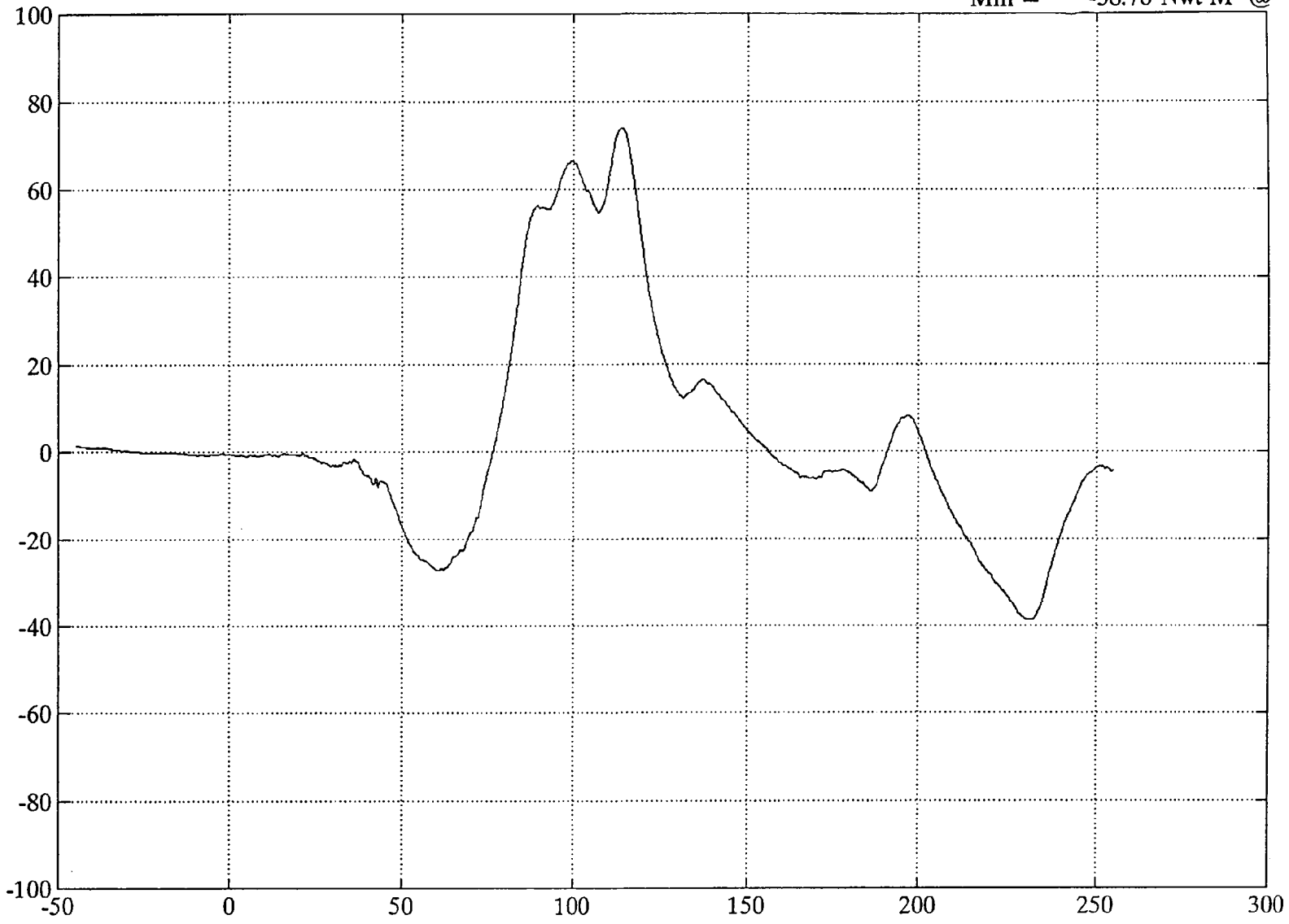
8058-5

SAE Filter Class 600

NCAP TEST #9 - 1993 DODGE RAM 150

Pos. 2 Upper Neck My

Max = 73.76 Nwt-M @ 114.12 msec
Min = -38.76 Nwt-M @ 231.72 msec

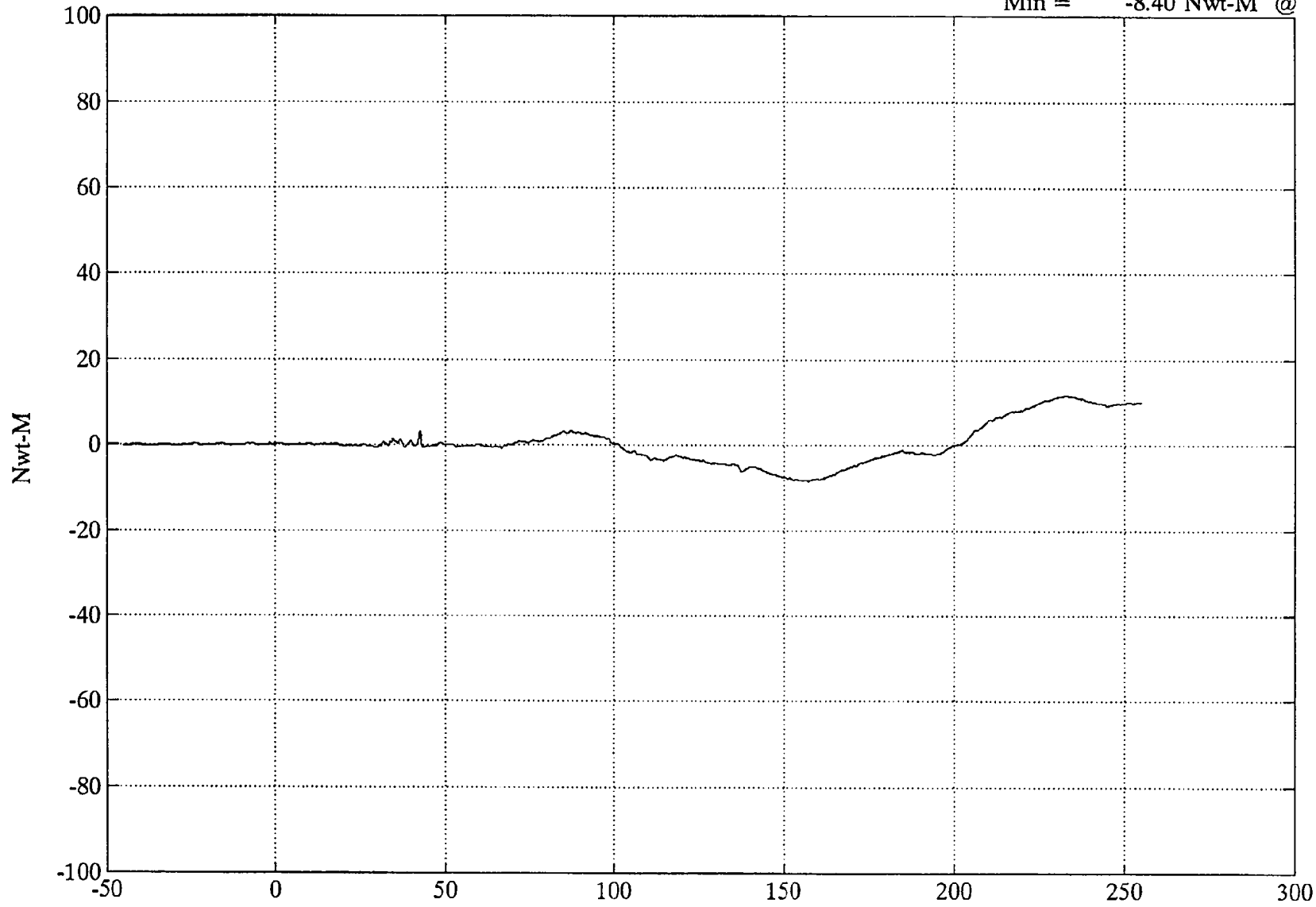


SAE Filter Class 600

NCAP TEST #9 - 1993 DODGE RAM 150

Pos. 2 Upper Neck Mz

Max = 11.67 Nwt-M @ 232.68 msec
Min = -8.40 Nwt-M @ 157.44 msec



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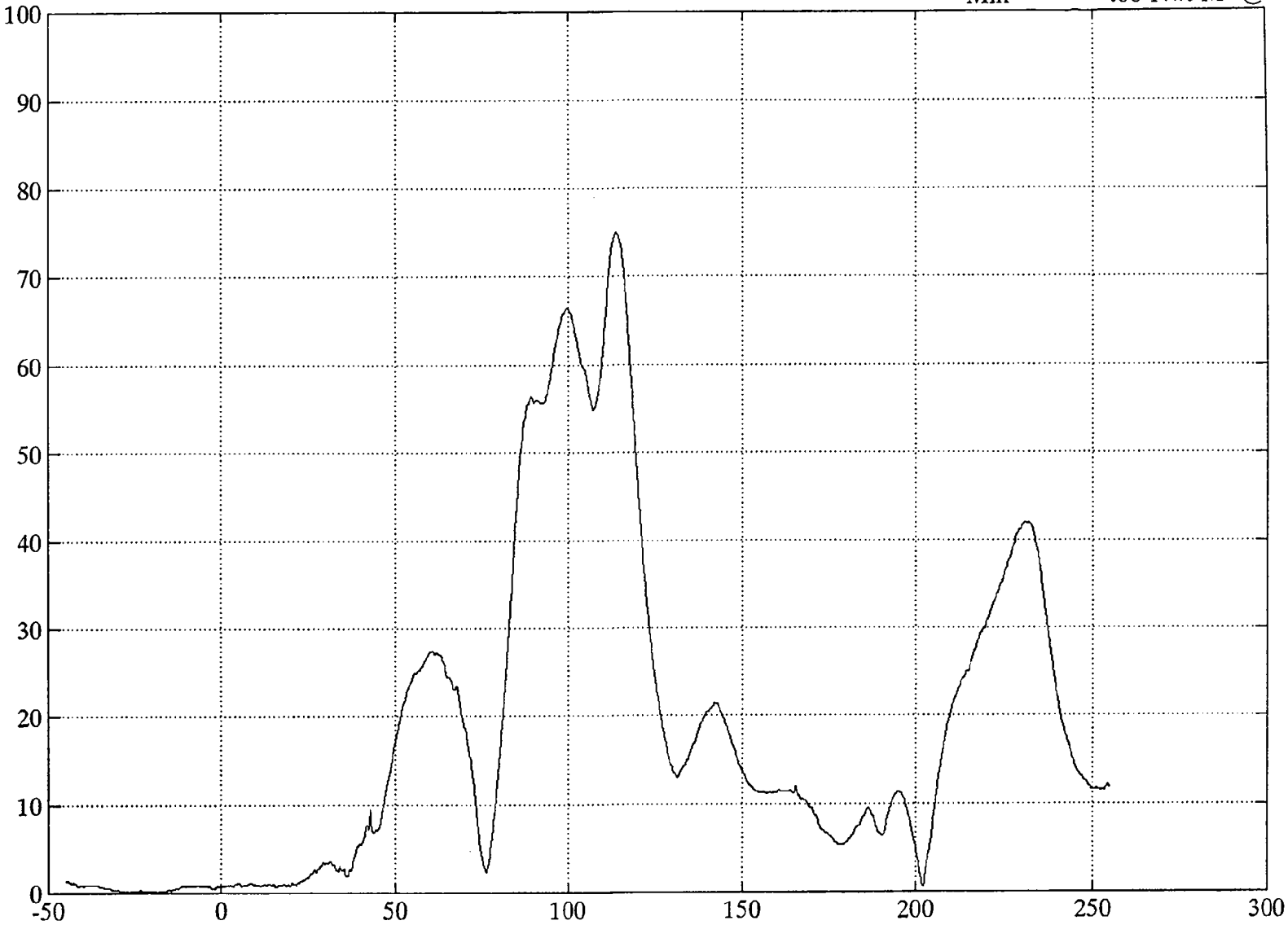
8058-5

SAE Filter Class 600

NCAP TEST #9 - 1993 DODGE RAM 150

Pos. 2 Neck Moment Res.

Max = 74.93 Nwt-M @ 113.52 msec
Min = .06 Nwt-M @ -26.40 msec

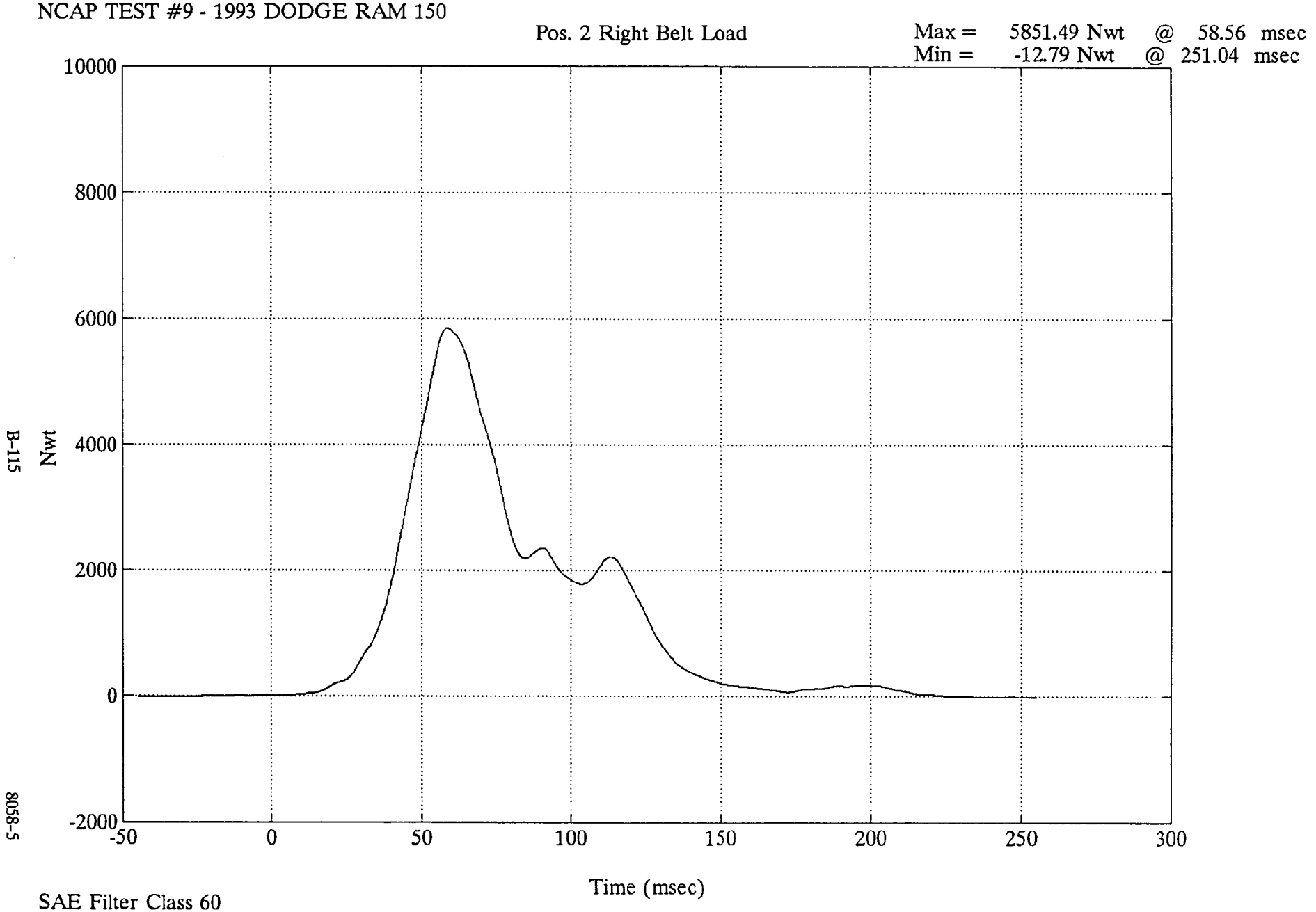


B-114

8058-5

SAE Filter Class 600

NCAP TEST #9 - 1993 DODGE RAM 150



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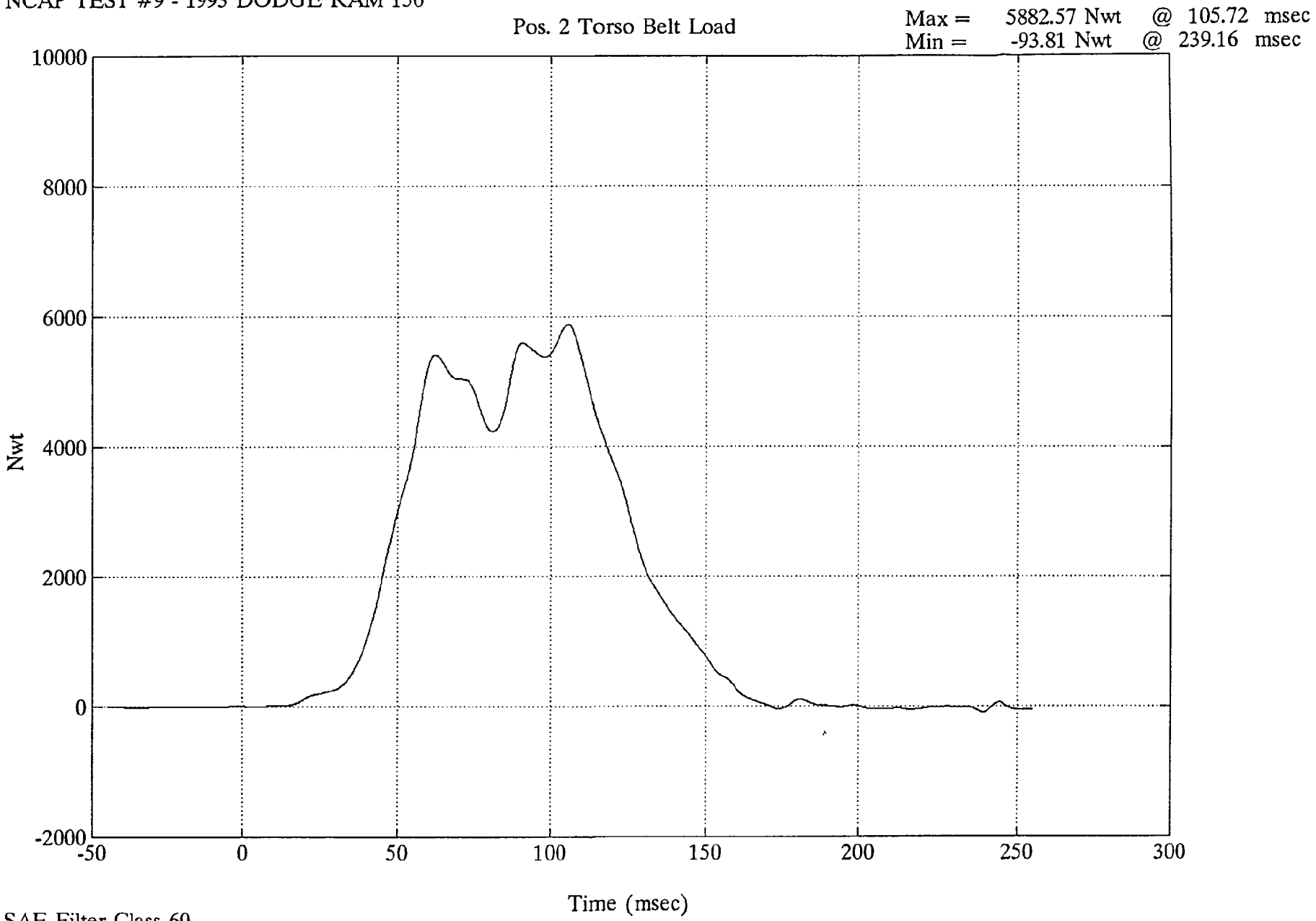
8058-5

SAE Filter Class 60

NCAP TEST #9 - 1993 DODGE RAM 150

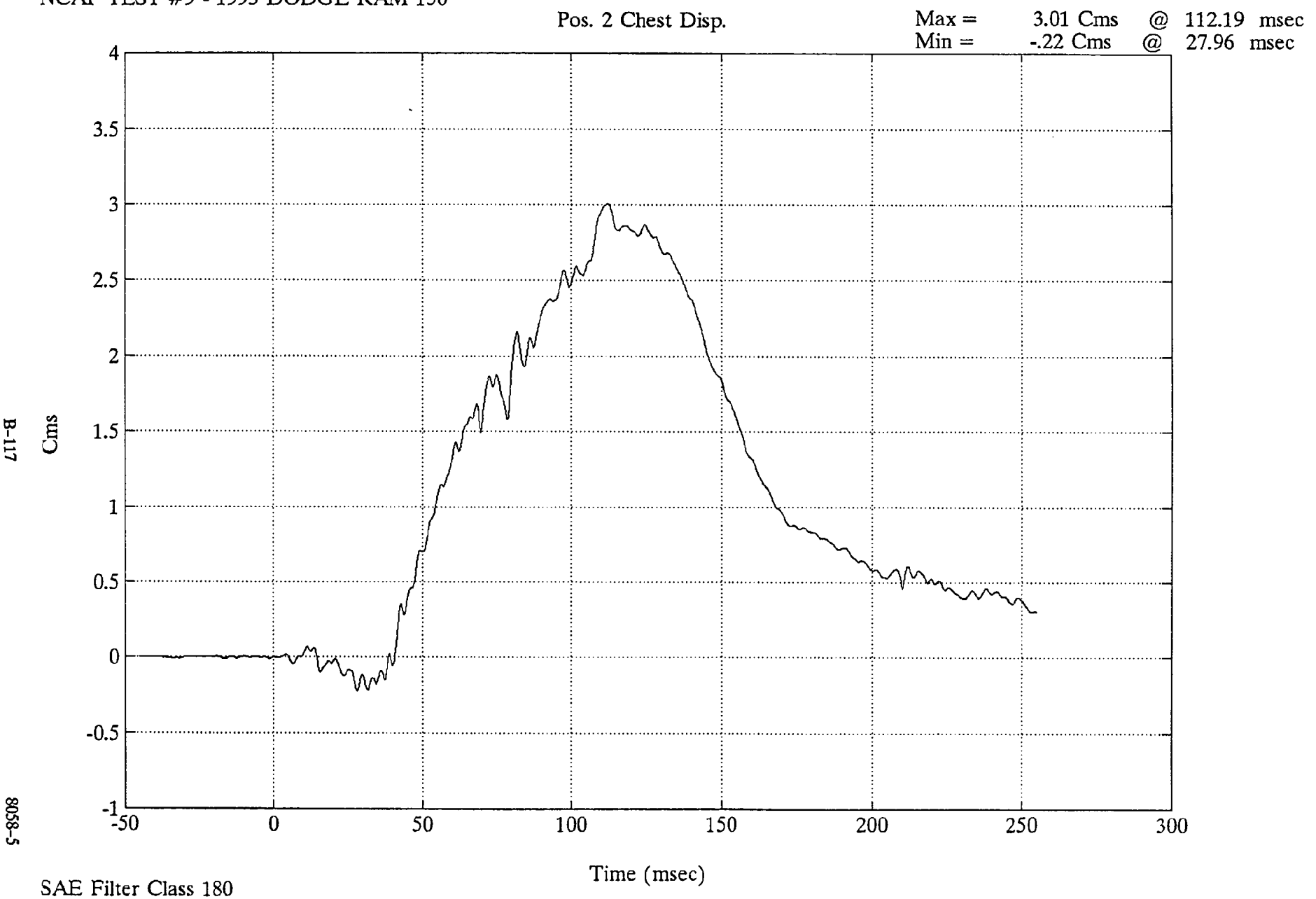


SAE Filter Class 60

B-116

8058-5

NCAP TEST #9 - 1993 DODGE RAM 150



B-117

8058-5

SAE Filter Class 180

Appendix C

PART 572B/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:

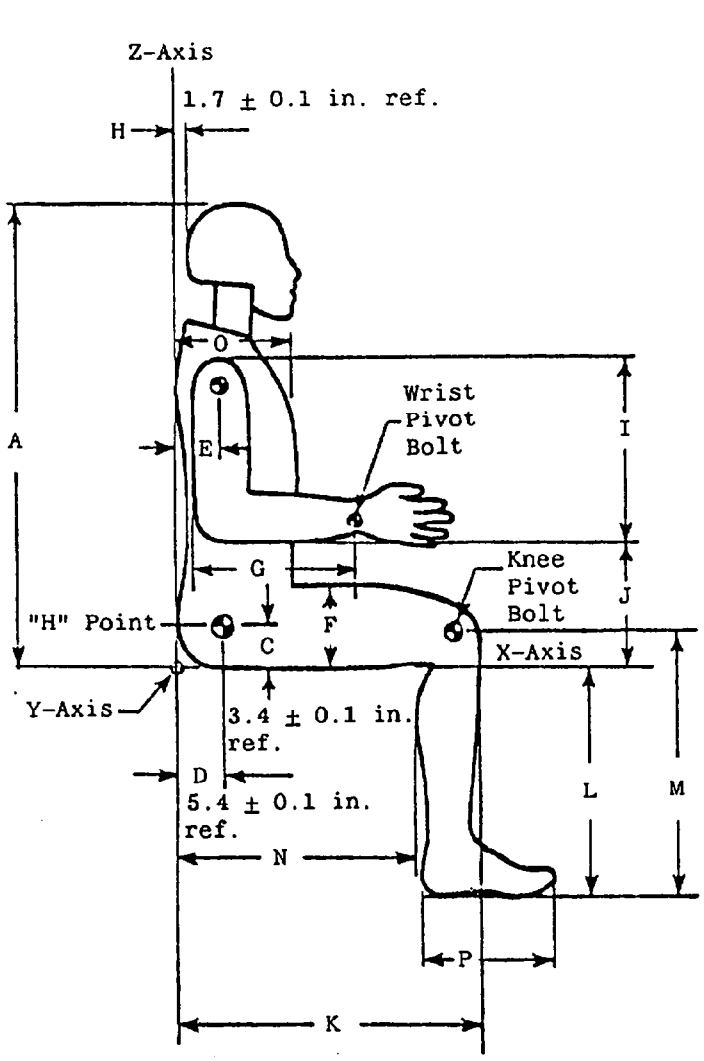
Serial No.	Completion Date
150	10/23/92
245	10/6/92

Electronic Test Equipment

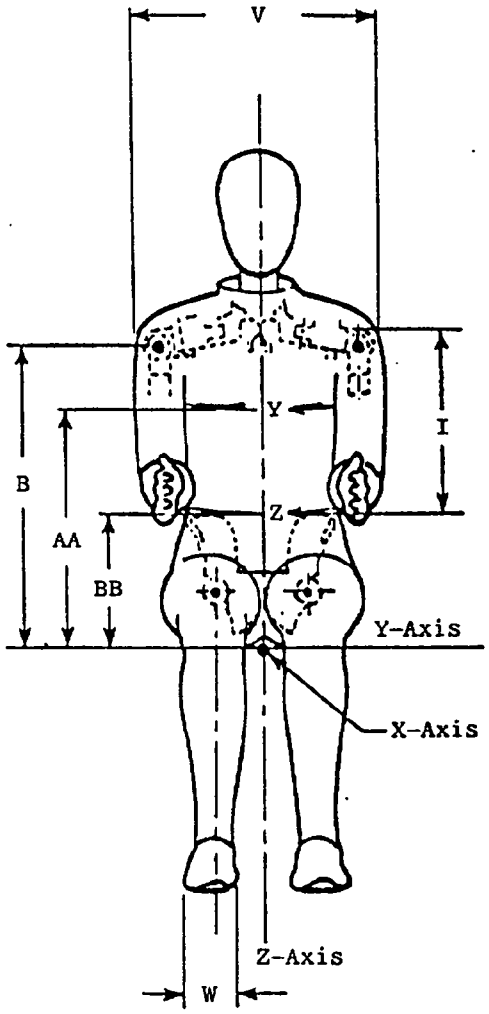
The complement of signal conditioning, recording and display equipment, in conjunction with dummy certification testing, can be found in New Car Assessment and Standards Indicant Testing Final Report No. 6525-V-1.

Figure 8

DUMMY CONFIGURATION DIMENSIONS



Side View



Front View

Note: Figure is referenced to the erect seated position. The curved lumbar does not allow the Hybrid III to be positioned in a perfect erect attitude.

HYBRID III EXTERNAL DIMENSIONS

S/N 150 HUMANOID

DUMMY SERIAL NO. 150 DATE: 10/23/92

TEMPERATURE		20.5 DEG. C
RELATIVE HUMIDITY		40 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)	429-434 mm	431 mm
LOCATION FOR WAIST CIRCUMFERENCE (BB)	226-231 mm	228 mm
CHEST CIRCUMFERENCE (Y)	970-1001 mm	998 mm
WAIST CIRCUMFERENCE (Z)	815-866 mm	863 mm
CHEST DEPTH (O)	213-229 mm	213 mm
H-POINT HEIGHT (C)	84-89 mm	88 mm
H-POINT FROM SEAT BACK (D)	135-140 mm	137 mm
SKULL CAP TO BACKLINE (H)	41-46 mm	43 mm
TOTAL SITTING HEIGHT (A)	879-889 mm	881 mm
THIGH CLEARANCE (F)	140-155 mm	142 mm
BUTTOCK KNEE LENGTH (K)	580-605 mm	591 mm
BUTTOCK POPLITAL LENGTH (N)	452-477 mm	470 mm
POPLITEAL LENGTH (L)	430-455 mm	452 mm
KNEE PIVOT HEIGHT (M)	485-501 mm	500 mm
FOOT LENGTH (P)	252-267 mm	259 mm
FOOT BREADTH (W)	91-107 mm	96 mm
SHOULDER PIVOT FROM BACKLINE (E)	84-94 mm	94 mm
SHOULDER BREADTH (V)	422-437 mm	429 mm
SHOULDER PIVOT HEIGTH (B)	505-521 mm	513 mm
ELBOW REST HEIGHT (J)	190-211 mm	208 mm
SHOULDER-ELBOW LENGTH (I)	330-345 mm	337 mm
BACK OF ELBOW TO WRIST PIVOT (G)	290-305 mm	292 mm

DUMMY MEETS SPECIFICATIONS

TECHNICIAN: IVAN MINKEWICZ

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

HEAD DROP TEST

HYBRID III

DATE : 10/22/92

CALSPAN SEQUENTIAL NUMBER 2 HY3 SN: 150 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	40 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	227 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	10.9 G'S
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

NECK FLEXION TEST

HYBRID III

DATE : 10/22/92 6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2 HY3 SN:150 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5-22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY		10% - 70%	38 %
IMPACT VELOCITY		24.8 - 25.7 KPH	24.9 KPH
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	23.17 G'S
	20 MS	17.60 - 22.60 G'S	21.46 G'S
	30 MS	12.50 - 18.50 G'S	18.46 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	18.46 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	39.75 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	77.89 DEG.
	TIME	57 - 64 MS	59 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88 - 108 N-M	102.6 N-M
	TIME	47 - 58 MS	54.75 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	119.50 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	97.75 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

NECK EXTENSION TEST

HYBRID III

DATE : 10/23/92 6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 2 HY3 SN:150 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5 - 22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY		10% - 70%	40 %
IMPACT VELOCITY		21.4 - 22.3 KPH	22.1 KPH
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	20.69 G'S
	20 MS	14.00 - 19.00 G'S	18.95 G'S
	30 MS	11.00 - 16.00 G'S	15.63 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	15.63 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		38 - 46 MS	41.75 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	101.3 DEG.
	TIME	72 - 82 MS	72 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-80.0/-52.9 N-M	-79.7 N-M
	TIME	65 - 79 MS	67.13 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	149 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	120.25 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

THORAX IMPACT TEST

HYBRID III

DATE : 10/23/92

CALSPAN SEQUENTIAL NUMBER 2 HY3 SN 150 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	20.5 - 22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	40 %
PENDULUM VELOCITY	23.7 - 24.6 KPH	23.7 KPH
MAXIMUM DEFLECTION	64 - 73 mm	64.26 mm
MAXIMUM RESISTIVE FORCE	4804 - 5538 NEWTONS	5511 NEWTONS
INTERNAL HYSTERESIS	69% - 85%	73.2 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 10/22/92 KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 2 HY3 SN: 150 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	40 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	4910 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 10/22/92 KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 2 HY3 SN: 150 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	40 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	4870 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY I.D. NUMBER: 150

A. DUMMY INSTRUMENTS

	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER				
HX LONGITUDINAL	ENDEVCO	A39J	9/92	3/93
HY LATERAL	ENDEVCO	A33F	9/92	3/93
HZ VERTICAL	ENDEVCO	A27F	9/92	3/93
2. CHEST ACCELEROMETER				
CX LONGITUDINAL	ENDEVCO	A73A	7/92	1/92
CY LATERAL	ENDEVCO	EP61	10/92	4/93
CZ VERTICAL	ENDEVCO	A59J	9/92	3/93
3. FEMUR LOAD CELLS				
LEFT SIDE	GSE	951	11/92	5/93
RIGHT SIDE	GSE	952	11/92	5/93

B. CALIBRATION LABORATORY INSTRUMENTS

	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. PENDULUM ACC.	CEC	A160	11/92	5/93
2. TEST PROBE ACCELEROMETER	CEC	A161	11/92	5/93

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

HEAD DROP TEST

HYBRID III

DATE : 8/7/92

CALSPAN SEQUENTIAL NUMBER 1 HY3 SN: 245 HEAD DROP CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20 DEG. C
RELATIVE HUMIDITY	10% - 70%	45 %
PEAK RESULTANT ACCELERATION	225 - 275 G'S	251.1 G'S
PEAK LATERAL ACCELERATION	15 G'S MAX	10.9 G'S
IS ACCELERATION CURVE UNIMODAL?	YES	YES

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

NECK FLEXION TEST

HYBRID III

DATE : 8/26/92 6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1 HY3 SN:245 CAL NECK FLEXION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5-22.2 DEG. C	22 DEG. C
RELATIVE HUMIDITY		10% - 70%	50 %
IMPACT VELOCITY		24.8 - 25.7 KPH	25.2 KPH
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G'S	23.31 G'S
	20 MS	17.60 - 22.60 G'S	22.24 G'S
	30 MS	12.50 - 18.50 G'S	16.7 G'S
MAX PENDULUM G'S ABOVE 30 MS		29 G'S MAX	16.7 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		34 - 42 MS	41.5 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	68.41 DEG.
	TIME	57 - 64 MS	58.38 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88 - 108 N-M	98.8 N-M
	TIME	47 - 58 MS	54.75 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	115.75 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 : 8/27/92 6 AXIS NECK TRANSDUCER

CALSPAN SEQUENTIAL NUMBER 1 HY3 SN:245 CAL NECK EXTENSION

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.5 - 22.2 DEG. C	21 DEG. C
RELATIVE HUMIDITY		10% - 70%	49 %
IMPACT VELOCITY		21.4 - 22.3 KPH	22.0 KPH
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G'S	17.93 G'S
	20 MS	14.00 - 19.00 G'S	18.15 G'S
	30 MS	11.00 - 16.00 G'S	15.98 G'S
MAX PENDULUM G'S ABOVE 30 MS		22 G'S MAX	15.98 G'S
DECELERATION -TIME CURVE DECAY TIME TO 5 G'S		38 - 46 MS	39.19 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	93.55 DEG.
	TIME	72 - 82 MS	72.38 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	-80.0/-52.9 N-M	-73.3 N-M
	TIME	65 - 79 MS	68.3 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	148.25 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	124.5 MS

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

THORAX IMPACT TEST

HYBRID III

DATE : 10/6/92

CALSPAN SEQUENTIAL NUMBER 1 HY3 SN 245 H.S. THORAX CAL

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	20.5 - 22.2 DEG. C	20.5 DEG. C
RELATIVE HUMIDITY	10% - 70%	40 %
PENDULUM VELOCITY	23.7 - 24.6 KPH	23.9 KPH
MAXIMUM DEFLECTION	64 - 73 mm	64.2 mm
MAXIMUM RESISTIVE FORCE	4804 - 5538 NEWTONS	5484 NEWTONS
INTERNAL HYSTERESIS	69% - 85%	76.1 %

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 7/31/92 KNEE: LEFT

CALSPAN SEQUENTIAL NUMBER 1 HY3 SN: 245 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20 DEG. C
RELATIVE HUMIDITY	10% - 70%	46 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	5048 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

CALSPAN CORPORATION

TRANSPORTATION RESEARCH DEPARTMENT

KNEE IMPACT TEST

HYBRID III

DATE : 7/31/92 KNEE: RIGHT

CALSPAN SEQUENTIAL NUMBER 1 HY3 SN: 245 KNEE 4.9 KGS CAL

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20 - 25 DEG. C	20 DEG. C
RELATIVE HUMIDITY	10% - 70%	46 %
PROBE VELOCITY	7.5 - 7.7 KPH	7.68 KPH
PEAK KNEE IMPACT FORCE	4430 - 6965 N	4764 N
PROBE WEIGHT	4.9 KGS	

DUMMY COMPONENT MEETS SPECIFICATIONS

TECHNICIAN IVAN MINKEWICZ

HYBRID III EXTERNAL DIMENSIONS

S/N 245 HUMANOID

DUMMY SERIAL NO. 245 DATE: 10/16/92

TEMPERATURE		20.5 DEG. C
RELATIVE HUMIDITY		52 %
LOCATION FOR CHEST CIRCUMFERENCE (AA)	429-434 mm	431 mm
LOCATION FOR WAIST CIRCUMFERENCE (BB)	226-231 mm	228 mm
CHEST CIRCUMFERENCE (Y)	970-1001 mm	998 mm
WAIST CIRCUMFERENCE (Z)	815-866 mm	863 mm
CHEST DEPTH (O)	213-229 mm	213 mm
H-POINT HEIGHT (C)	84-89 mm	89 mm
H-POINT FROM SEAT BACK (D)	135-140 mm	137 mm
SKULL CAP TO BACKLINE (H)	41-46 mm	43 mm
TOTAL SITTING HEIGHT (A)	879-889 mm	889 mm
THIGH CLEARANCE (F)	140-155 mm	152 mm
BUTTOCK KNEE LENGTH (K)	580-605 mm	596 mm
BUTTOCK POPLITAL LENGTH (N)	452-477 mm	464 mm
POPLITEAL LENGTH (L)	430-455 mm	447 mm
KNEE PIVOT HEIGHT (M)	485-501 mm	487 mm
FOOT LENGTH (P)	252-267 mm	256 mm
FOOT BREADTH (W)	91-107 mm	96 mm
SHOULDER PIVOT FROM BACKLINE (E)	84-94 mm	89 mm
SHOULDER BREADTH (V)	422-437 mm	426 mm
SHOULDER PIVOT HEIGTH (B)	505-521 mm	518 mm
ELBOW REST HEIGHT (J)	190-211 mm	205 mm
SHOULDER-ELBOW LENGTH (I)	330-345 mm	335 mm
BACK OF ELBOW TO WRIST PIVOT (G)	290-305 mm	294 mm

DUMMY MEETS SPECIFICATIONS

TECHNICIAN: IVAN MINKEWICZ

INSTRUMENT CALIBRATION INFORMATION

NHTSA DUMMY I.D. NUMBER: 245

A. DUMMY INSTRUMENTS

	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. HEAD ACCELEROMETER				
HX LONGITUDINAL	ENDEVCO	AC2K4	12/92	6/93
HY LATERAL	ENDEVCO	AC2K3	12/92	6/93
HZ VERTICAL	ENDEVCO	ACSM6	12/92	6/93
2. CHEST ACCELEROMETER				
CX LONGITUDINAL	ENDEVCO	CK11	10/92	4/93
CY LATERAL	ENDEVCO	ER72	10/92	4/93
CZ VERTICAL	ENDEVCO	GD54	10/92	4/93
3. FEMUR LOAD CELLS				
LEFT SIDE	GSE	954	11/92	5/93
RIGHT SIDE	GSE	955	11/92	5/93

B. CALIBRATION LABORATORY INSTRUMENTS

	MFG	SERIAL NUMBER	DATE LAST CALIBRATED	DATE OF NEXT CALIBRATION
1. PENDULUM ACC.	CEC	A160	11/92	5/93
2. TEST PROBE ACCELEROMETER	CEC	A161	11/92	5/93

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	A39J	ENDEVCO	9/92	3/93
Y	A33F	ENDEVCO	9/92	3/93
Z	A27F	ENDEVCO	9/92	3/93
Chest X	A73A	ENDEVCO	7/92	1/93
Y	EP61	ENDEVCO	10/92	4/93
Z	A59J	ENDEVCO	9/92	3/93
Right Femur Load Cell	951	GSE	11/92	5/93
Left Femur Load Cell	952	GSE	11/92	5/93
Neck Load Cell X	269	DENTON	11/92	5/93
Y	269	DENTON	11/92	5/93
Z	269	DENTON	11/92	5/93
Neck Moment X	269	DENTON	11/92	5/93
Y	269	DENTON	11/92	5/93
Z	269	DENTON	11/92	5/93
Chest Deflection Gauge	150	HUMANOID	7/92	1/93
Hybrid III Use Only				
Lap Belt Load Cells	123	LEBOW	11/92	5/93
Shoulder Belt Load Cells	127	LEBOW	11/92	5/93
Spool-Out Potentiometer	52	SERVONIC INST.	11/92	5/93
Belt Stretch Transducer	E1	CALSPAN	11/92	5/93

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY

(6 Month Calibration Minimum)

PASSENGER DUMMY		Serial #	Manufacturer	Calibration	
				Last	Next
Head	X	AC2K4	ENDEVCO	12/92	6/93
	Y	AC2K3	ENDEVCO	12/92	6/93
	Z	AC2M6	ENDEVCO	12/92	6/93
Chest	X	CK11	ENDEVCO	10/92	4/93
	Y	ER72	ENDEVCO	10/92	4/93
	Z	GD54	ENDEVCO	10/92	4/93
Right Femur Load Cell		954	GSE	11/92	5/93
Left Femur Load Cell		955	GSE	11/92	5/93
Neck Load Cell	X	076	DENTON	11/92	5/93
	Y	076	DENTON	11/92	5/93
	Z	076	DENTON	11/92	5/93
Neck Moment	X	076	DENTON	11/92	5/93
	Y	076	DENTON	11/92	5/93
	Z	076	DENTON	11/92	5/93
Chest Deflection Gauge		245	HUMANOID	7/92	1/93
Hybrid III Use Only					
Lap Belt Load Cells		133	LEBOW	11/92	5/93
Shoulder Belt Load Cells		135	LEBOW	11/92	5/93
Spool-Out Potentiometer		42	SERVONIC INST.	11/92	5/93
Belt Stretch Transducer		E2	CALSPAN	11/92	5/93

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS

(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration	
			Last	Next
Left Seat Rear Crossmember	A178	CEC	10/92	4/93
Right Rear Seat Crossmember	A147	CEC	11/92	5/93
Top of Engine	A156	CEC	10/92	4/93
Bottom of Engine	A128	CEC	1/93	7/93
Left Disc Brake Caliper	A69	CEC	1/93	7/93
Right Disc Brake Caliper	A142	CEC	1/93	7/93
Instrument Panel	A183	CEC	10/92	4/93
Center Rear Crossmember	A44	CEC	1/93	7/93
Vehicle Rear Z	A73	CEC	1/93	7/93

Appendix E

VEHICLE OWNER'S MANUAL OCCUPANT RESTRAINT SYSTEM INSTRUCTIONS

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.

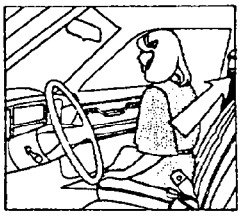
Unibelts

The outboard seats of your vehicle have combination lap/shoulder belts, or unibelts. The retractor is designed to lock during very sudden stops or impacts. 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.

WARNING: *Wearing a seat belt incorrectly is dangerous. Seat belts are designed to go around the large bones of your body. These are the strongest parts of your body and can take the forces of a collision the best. Wearing your belt in the wrong place could make your injuries in a collision much worse. You might suffer internal injuries, or you could even slide out of part of the belt. Follow these instructions to wear your seat belt safely and to keep your passengers safe, too.*

Unibelt Operating Instructions

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

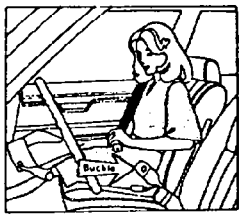


1

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.

2

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



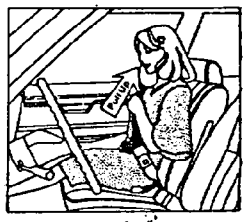
3

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 seat 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 collision, increasing head and neck injury. And a belt worn under the arm can cause internal injuries. 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.*

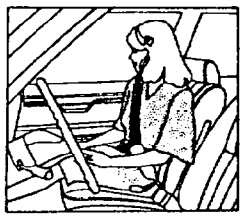
4. Position the lap belt across your thigh, below your abdomen. If you need the lap portion tighter, pull up a bit on the shoulder part, as shown. A snug belt reduces the risk of sliding under the belt in a collision.



4

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 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.



5

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 straight. If you can't straighten a belt in your vehicle, take it to your dealer and have it fixed.*

6. To release the belt, push the red button marked "Press" 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 and leave you with no protection. Inspect the belt system periodically, checking for cuts, frays, or loose parts. Damaged parts must be replaced immediately. Do not disassemble or modify the system. Seat belt assemblies must be replaced after an accident, if they have been damaged (bent retractor, torn webbing, etc.)*

Center Lap Belts
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.

Child Restraint
When we say that everyone in your vehicle needs to be buckled up all the time, we mean babies and children, too.

WARNING: *In a collision, an unrestrained child, even a tiny baby, can become a missile inside the vehicle. The force required to hold even an infant on your lap can become so great that you could not hold the child, no matter how strong you are. The child and others could be badly injured. Any child riding in your vehicle should be in a proper restraint for the child's size.*

Every state in the United States and all Canadian provinces require small children to ride in proper restraint