

CALSPAN REPORT NUMBER: 8102-6

MOVING BARRIER REAR IMPACT TEST
FOR FUEL SYSTEM INTEGRITY

FORD MOTOR COMPANY
1993 FORD MUSTANG LX
2-DOOR SEDAN

CALSPAN TEST NUMBER: Y47-060-1292

JUNE 4, 1993

CALSPAN CORPORATION
ADVANCED TECHNOLOGY CENTER
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FINAL REPORT

PREPARED FOR:

U.S. DEPARTMENT OF TRANSPORTATION
RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION
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TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. 8102-6		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Moving Barrier Rear Impact Test of a 1993 Ford Mustang LX 2-Door Sedan				5. Report Date June 4, 1993	
				6. Performing Organization Code CAL	
7. Author(s) Michael J. Kilgallon, Project Engineer Walter E. Levan, Program Manager				8. Performing Organization Report No. 8102-6	
9. Performing Organization Name and Address Calspan Corporation Advanced Technology Center P.O. Box 400 Buffalo, New York 14225				10. Work Unit No. Y47-060-1292	
				11. Contract or Grant No. DTRS57-90-C-00104	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Research and Special Programs Administration Volpe National Transportation Systems Center Kendall Square, Cambridge, MA 02142				13. Type of Report and Period Covered Final Report June-July 1993	
				14. Sponsoring Agency Code DOT/NHTSA/NRD	
15. Supplementary Notes					
16. Abstract A Moving Barrier Rear Impact test of a 1993 Ford Mustang 2-Door Sedan was performed at the Calspan Corporation Advanced Technology Center Crash Test Facility on June 4, 1993. The MDB impact velocity was 52.2 mph and the ambient temperature at the time of impact was 69°F. The test vehicle leaked excessive fuel after impact.					
17. Key Words Rear Barrier Test				18. Distribution Statement Copies of this report are available from: National Highway Traffic Safety Admin. Technical Reference Division Docket Section, Room 5108 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	

Form DOT F1700.7 (8-69)

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Section 1

PURPOSE AND TEST PROCEDURE

This 52.2 mph rear moving barrier impact test is part of a test program conducted for the National Highway Traffic Safety Administration (NHTSA) by Calspan Advanced Technology Center under contract No. DTRS57-90-C-00104.

The purpose of this test was to generate vehicle and occupant data with regard to the test vehicle, a 1993 Ford Mustang LX. This test was conducted using the requirements found in the OVSC Laboratory Test Procedure No. TP-301-00, dated April 26, 1989.

Section 2

SUMMARY OF TEST

A rear moving barrier impacted a 1993 Ford Mustang LX 2-Door Sedan at a velocity of 52.2 mph. The barrier was a moving deformable barrier. The MDB was offset such that 80% of the struck vehicle was engaged by the barrier face. The test was performed at the Calspan Advanced Technology Center on June 4, 1993. Pre- and Post-test photographs can be found in Appendix A of this report.

The test was documented by one real time camera and 5 high-speed cameras. Camera locations and other pertinent data can be found in Figure 6 and Table 4.

The test vehicle contained two Hybrid III 50th percentile male anthropomorphic test devices (ATDs) in the driver and right front passenger positions. Both ATDs were restrained with the vehicles 3-point restraint system. Both ATDs were instrumented with head and chest accelerometers, chest potentiometers, left/right femur load cells, neck transducers and tibial transducers. The ATDs were placed in the vehicle following the dummy placement instructions specified in the Laboratory Indicant Test Procedure.

The 56 channels of data were recorded on a P.C. based data acquisition system. Appendix B contains the vehicle and dummy response data traces.

The following channels on the passenger dummy did not record accurately:

Chest Deflection

Left Upper Tibia Mx

Left Lower Tibia Mx

The data plots for these channels were deleted from this report. A seat back displacement gage was mounted on the driver seat. This gage was attached 22.5 inches up from the seat back rotation axis. An accelerometer was also mounted on the driver's seat head rest post approximately 26.0 inches up from the seat back rotation axis.

The drivers HIC was 1109.0. The maximum chest deceleration over 3 milliseconds was 97.6 gs. The left femur load was 311.8 pounds and the right femur load was 157.1 pounds.

The right-front passenger sustained a HIC value of 1238.4. The maximum chest deceleration over 3 milliseconds was 108.8 gs. The left femur load was 435.8 pounds and 413.4 pounds on the right femur.

The test vehicle leaked excessive fuel after impact. More than 2 gallons of Stoddard solution leaked after impact.

Section 3
VEHICLE AND TEST INFORMATION

Figure 1
GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 1993 Ford Mustang LX 2-Door Sedan
NHTSA No.: 1292; VIN: 1FACP40M4PF121081; Color: Blue
Engine Data: 4 cylinders; - CID; 2.3 Liters; - cc
Placement: X Longitudinal or In-Line; - Transverse or Lateral
Transmission Data: 5 speeds; X Manual; - Automatic; X Overdrive
Final Drive: X Rear Wheel Drive; - Front Wheel Drive; - Four Wheel Drive
Major Options: - A/C; X Pwr. Strg.; X Pwr. Brakes
- Power Windows; - Pwr. Door Locks
Odometer Reading 98.5 miles
Selling Dealer: Advantage Ford
& Address 100 Niagara St. Tonawanda, NY 14150

DATA FROM VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Ford Motor Company
Date of Manufacture: 10/92
GVWR: 3847 lbs.; GAWR: 1956 lbs. FRONT; 1911 lbs. REAR

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load: 35 psi FRONT
35 psi REAR
Recommended Tire Size: P195/75R14 Load Range: 1400
Recommended Cold Tire Pressure: 35 psi FRONT; 35 psi REAR
Size of Tires on Test Vehicle: P195/75R14; Manufacturer: Firestone
Vehicle Capacity Data:

Type of Front Seats: - Bench; X Bucket; - Split Bench
Number of Occupants: 2 Front; 2 Rear; 4 Total
Vehicle Capacity Weight (VCW) = 700 lbs.
No. of Occupants x 150 lbs. = 600 lbs.
Rated Cargo/Luggage Weight (RCLW) = 100 lbs. (Difference)

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

Right Front = 770 lbs. Right Rear = 570 lbs.
Left Front = 810 lbs. Left Rear = 570 lbs.
TOTAL FRONT = 1580 lbs. TOTAL REAR = 1140 lbs.
% of Total Vehicle Weight = 58 % of Total Weight = 42 %
TOTAL DELIVERED WEIGHT = 2720 lbs.

TRE
P195/25
R14

Figure 1

GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)

153

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 296 POUNDS OF CARGO

Right Front = 930 lbs. Right Rear = 700
Left Front = 1040 lbs. Left Rear = 710 lbs.
TOTAL FRONT = 1940 lbs. ~~840 kg~~ TOTAL REAR = 1410 lbs. ~~840 kg~~
% of Total Weight = 58 % % of Total Weight = 42 %
TOTAL TEST WEIGHT = 3350 lbs. 1520 kg
Weight of Ballast Secured in Vehicle Trunk Area = 0 lbs.

WEIGHT OF MOVING DEFORMABLE BARRIER:

Right Front = 820 lbs. Right Rear = 640 lbs.
Left Front = 950 lbs. Left Rear = 520 lbs.
TOTAL FRONT = 1770 lbs. TOTAL REAR = 1160 lbs.
% of Total Weight = 60 % % of Total Weight = 40 %
TOTAL TEST WEIGHT = 2930 lbs.

VEHICLE ATTITUDE (all dimensions in inches):

AS DELIVERED: RF 27.5 LF 27.5 RR 28.3 LR 28.2
AS TESTED: RF 26.4 LF 26.2 RR 27.4 LR 26.8
Vehicle's Wheel Base: 100.5 in. 670.6 mm 665.5 696.0 680.1
Location of Vehicle's C.G.: 42.2 inches rearward of front wheel center

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual = 15.4 gallons
Usable Capacity Figure Furnished by COTR = 15.4 gallons
Test Volume Range (92 to 94% of Usable Capacity) = 14.2 to 14.5 gallons
ACTUAL TEST VOLUME = 14.3 gallons (with entire fuel system filled)
Test Fluid Type: Stoddard Solution; Spec. Grav. 0.764
Kinematic Viscosity = 0.96 centistokes; Color = purple

DETAILS OF FUEL SYSTEM:

14.3 gallons of stoddard solution was placed in the fuel tank

Figure 2
POST-TEST IMPACT DATA
SUMMARY OF RESULTS

TYPE OF TEST:

Type of Test: Rear Impact Impact Angle: 0°
Test Date: June 4, 1993 Time: 15:25 Temperature: 69°F
Vehicle NHTSA No.: Y47-060-1292

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

Trap No. 1 = 52.2 mph; Trap No. 2 = - 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 = 166.5; C/L = 179.6; Left = 166.6
Post-Test Right = 147.8; C/L = 153.8; Left = 155.5
Crush Right = 18.7; C/L = 25.8; Left = 11.1
AVERAGE = 18.5 inches

DOOR OPENING:

	Left	Right
Front	<u>closed-nonoperable</u>	<u>closed-nonoperable</u>
Rear	<u>N/A</u>	<u>N/A</u>

SEAT MOVEMENT:

	Seat Back Failure	Seat Shift
Front	<u>failed</u>	<u>seat shifted rearward</u>
Rear	<u>failed</u>	<u>seat shifted rearward</u>

Figure 2
POST-TEST IMPACT DATA
SUMMARY OF RESULTS (cont'd)

CONTACT PTS.:

	<u>Driver</u>	<u>Passenger</u>
Head	<u>Rear of head contacted headrest</u>	<u>Rear of head contacted headrest</u>
Chest	<u>No Contact</u>	<u>No Contact</u>
Abdomen	<u>No Contact</u>	<u>No Contact</u>
Left Knee	<u>No Contact</u>	<u>No Contact</u>
Right Knee	<u>No Contact</u>	<u>No Contact</u>

STODDARD SPILLAGE: Stoddard leaked at a high rate from the left, right and center rear area of fuel tank. Stoddard solvent also evident around fuel filler cap.

GLAZING DAMAGE: The rear window glass broke and the rear side glass broke.

OTHER NOTABLE IMPACT FEATURES: Driver and left front passenger seat back failed. Trunk pushed in and lid opened. Rear seat back frame support pushed forward close to front seat backs. Right rear side of roof deformed between "B" and "C" pillars. Left and right sill floor sills deformed between "A" and "B" pillars. Right rear coil spring detached from vehicle during impact event. "B" pillars and both doors pushed forward rendering them inoperable

Table 1

DUMMY INJURY CRITERIA VALUESNHTSA No.: Y47-060-1292 Vehicle: 1993 Ford Mustang LX 2-Door Sedan

	MAXIMUM ACCELERATION (g's)							
	HEAD				CHEST			
	X	Y	Z	R	X	Y	Z	R*
Dummy (1)	71.7	-14.8	98.8	101.2	104.8	-18.5	17.6	97.6
Dummy (2)	94.5	-57.6	69.9	114.6	130.3	26.0	15.0	108.8

	MAXIMUM FORCE - FEMUR LOAD (lbs.)	
	LEFT FEMUR	RIGHT FEMUR
Dummy (1)	311.8	157.1
Dummy (2)	435.8	413.4

	HEAD INJURY CRITERIA**			
	HIC	36 millisecond Maximum		Avg. Acc. (g) t ₁ TO t ₂
		t ₁ (SEC)	t ₂ (SEC)	
Dummy (1)	1109.0	89.4	123.12	64.1
Dummy (2)	1238.4	80.4	109.92	70.6

*Defined as exceeding 0.003 sec. duration

**As defined in FMVSS No. 208

Table 2
HYBRID III NECK AND CHEST DATA SHEET

Vehicle Year/Make/Model/Body Style: 1993 Ford Mustang LX 2-Door Sedan

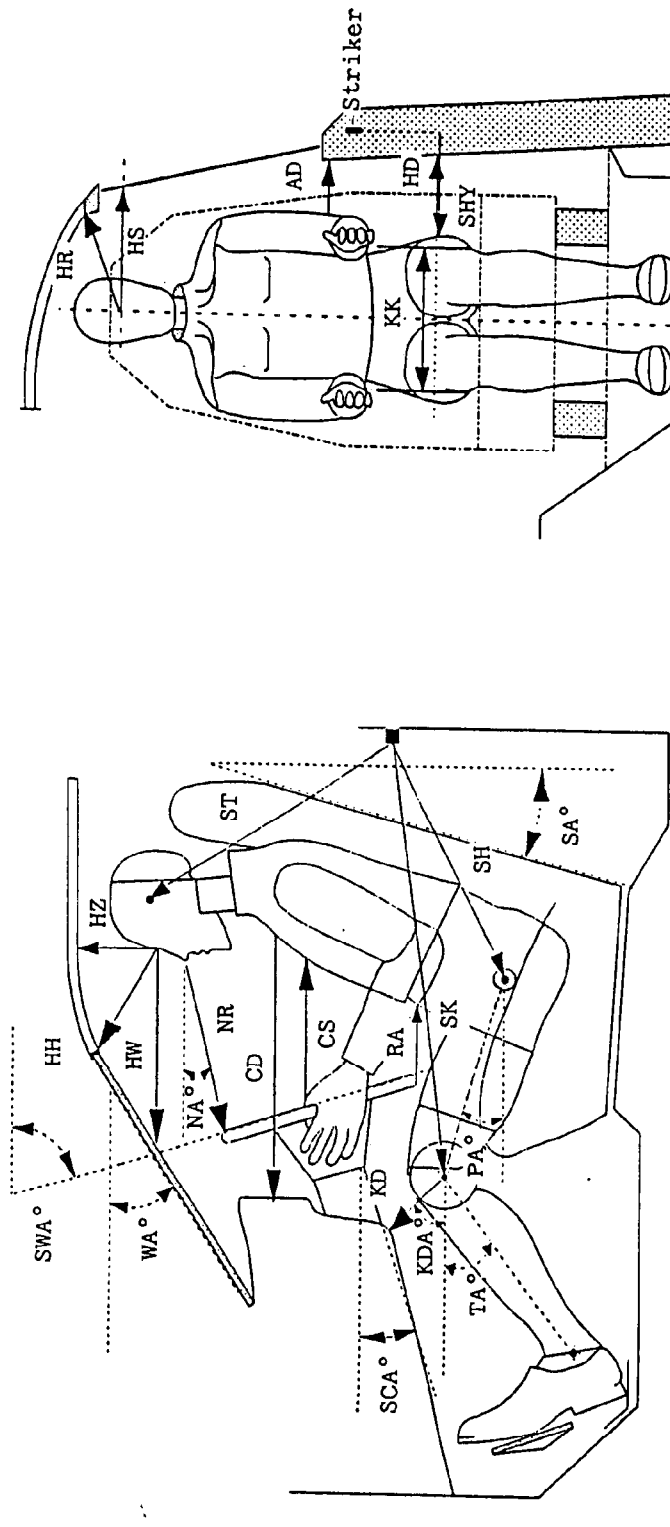
Vehicle NHTSA No.: Y47-060-1292 Test Date: June 4, 1993

MAXIMUM VALUES	DRIVER DUMMY ID # <u>45</u>	PASSENGER DUMMY ID # <u>150</u>
Neck Load X (lbs)	339.7	-352.3
Neck Load Y (lbs)	-82.4	136.0
Neck Load Z (lbs)	878.9	806.1
Neck Moment X (ft-lbs)	18.7	-23.0
Neck Moment Y (ft-lbs)	-125.8	119.0
Neck Moment Z (ft-lbs)	-5.1	23.2
Chest Deflection X (in.)	-0.7	N/A
Time of Max. Occurance (msec)	96.2	N/A

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

Figure 3

DUMMY MEASUREMENTS FOR FRONT SEAT PASSENGERS



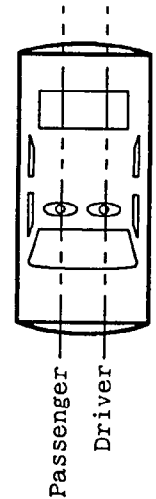
HH - Head to Header
 HW - Head to Windshield
 HZ - Head to Roof
 NR - Nose to Rim
 CS - Chest to Dash
 RA - Rime to Abdomen
 KDL/KDR - Knee to Dash
 KDA - Knee to Dash Angle
 SH - Striker to H-Point

SK - Striker to Knee
 ST - Striker to Head
 NA - Nose to Rim Angle
 TA - Tibial Angle
 PA - Pelvic Angle
 SCA - 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



Passenger

Driver

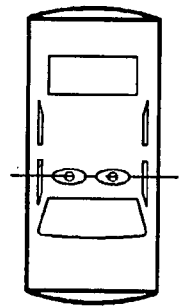


Table 3

FRONT SEAT OCCUPANT MEASUREMENTS

(all dimensions in inches unless otherwise specified)

	DRIVER (Serial #45)	PASS (Serial #150)
WA°	33°	-
SWA°	-24°	-
SCA°	66°	-
SA°	3rd detent	3rd detent
HZ	7.3	7.2
HH	12.3	12.0
HW	20.0	20.0
HR	7.9	7.9
NR	14.6 Angle (NA) 10°	-
CD	19.8	20.7
CS	10.7	-
RA	6.7	-
KDL	5.6 Angle (KDA) 17°	7.5
KDR	5.8	7.6 Angle (KDA) 25°
PA°	25°	25°
TA°	45°	42°
KK	11.5	7.5
ST	25.8 Angle 42°	25.0 Angle 42°
SK	35.9 Angle 92°	35.8 Angle 91°
SH	22.1 Angle 107°	21.4 Angle 104°
SHY	9.0	8.7
HS	8.5	8.8
HD	7.4	6.6
AD	4.1	3.8

Figure 4
VEHICLE TARGET LOCATIONS

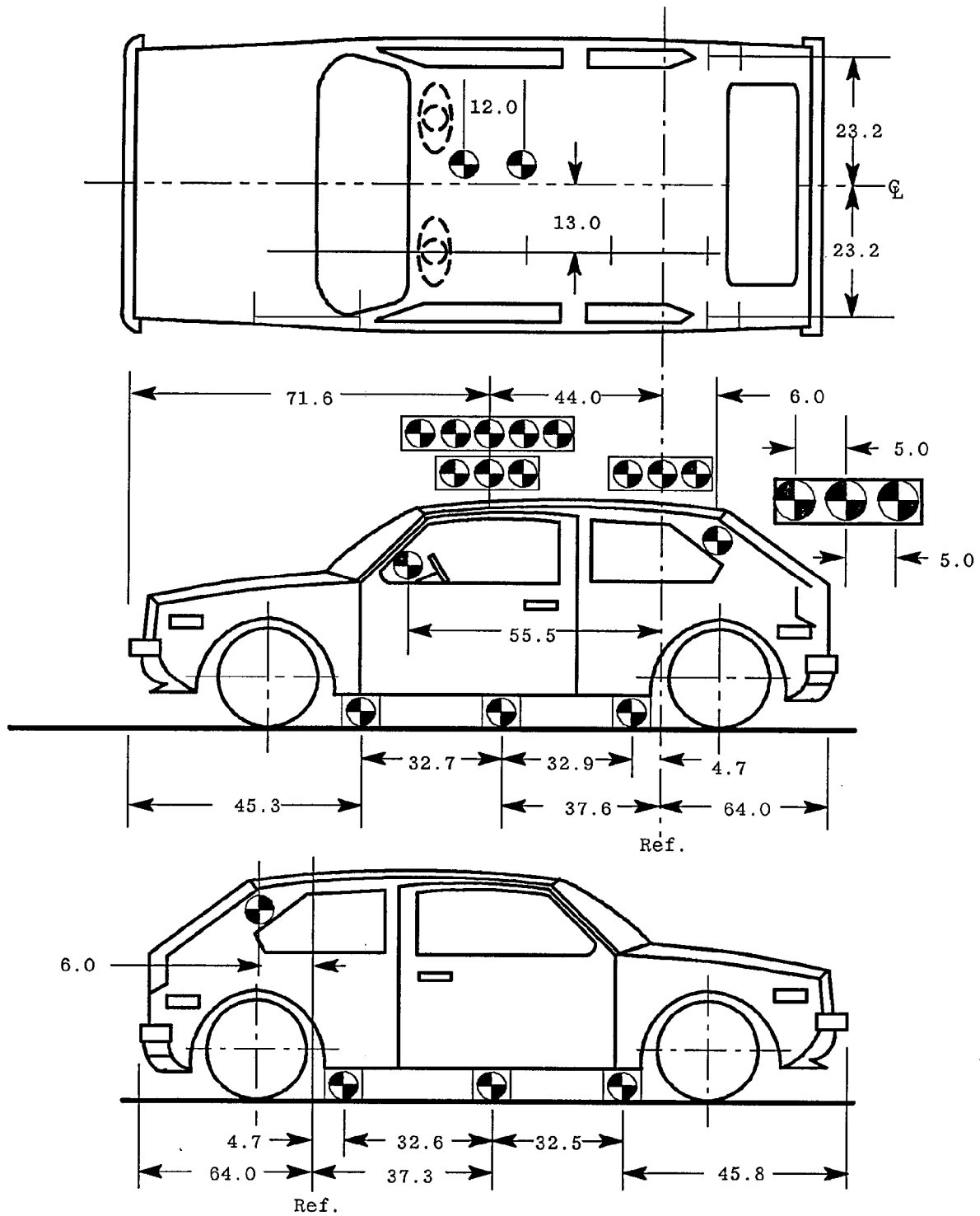
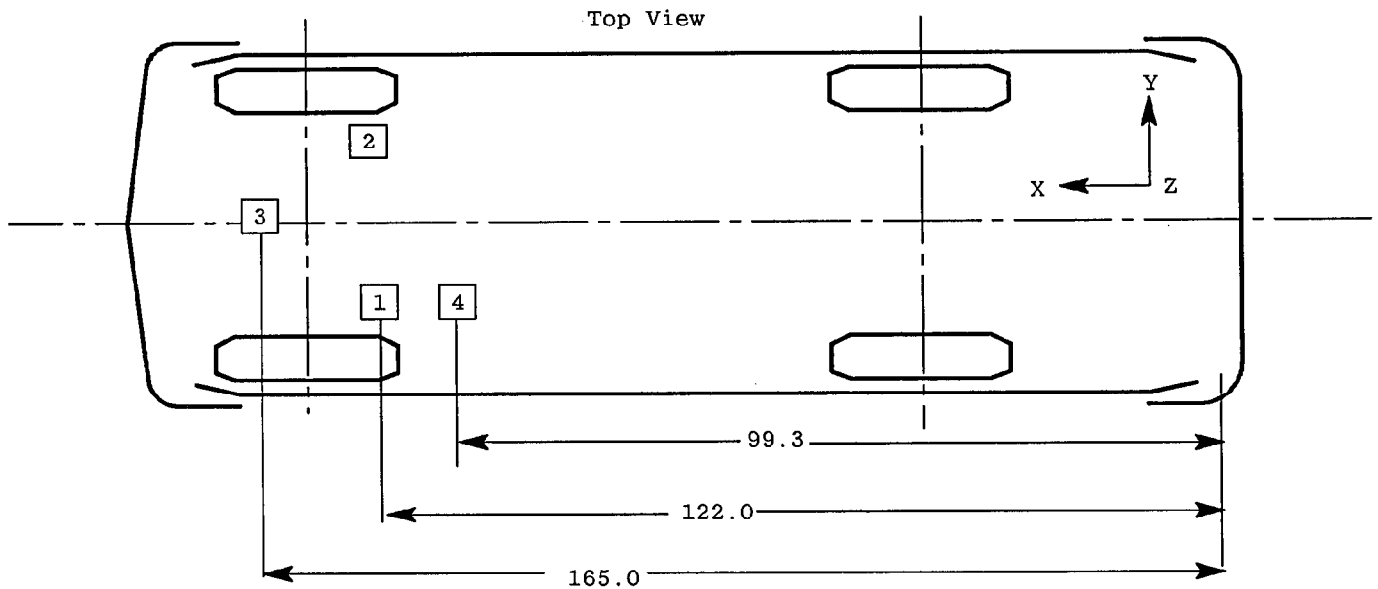


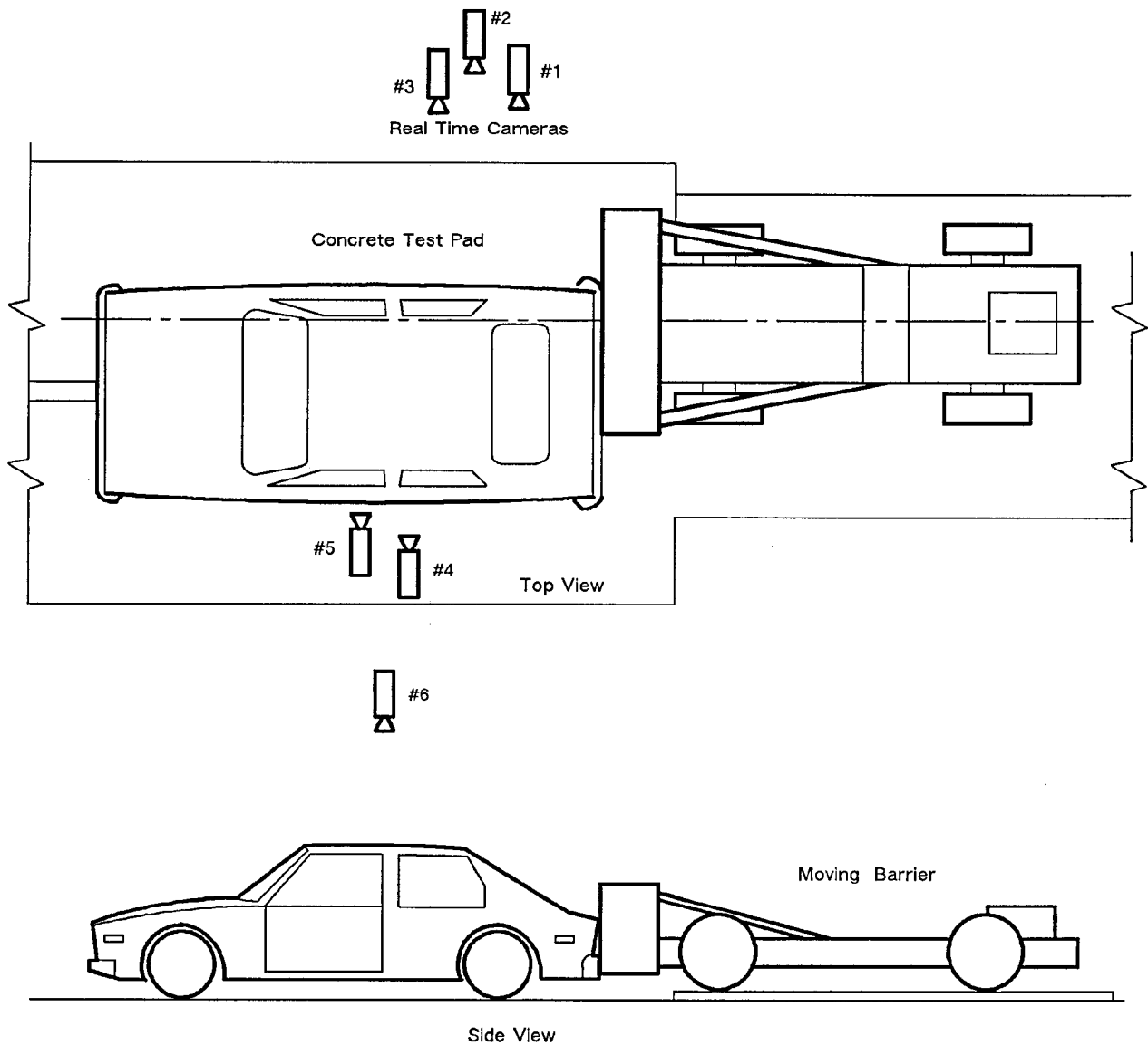
Figure 5
VEHICLE ACCELEROMETER LOCATIONS



ACCELEROMETER NUMBER*	ACCELEROMETER LOCATION	DIRECTION		
		X	Y	Z
1	Left Seat	✓		
2	Right Seat	✓		
3	Engine Top	✓		
4	Left Front Seat	✓		

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

Figure 6
CAMERA POSITIONS FOR FRONTAL IMPACTS



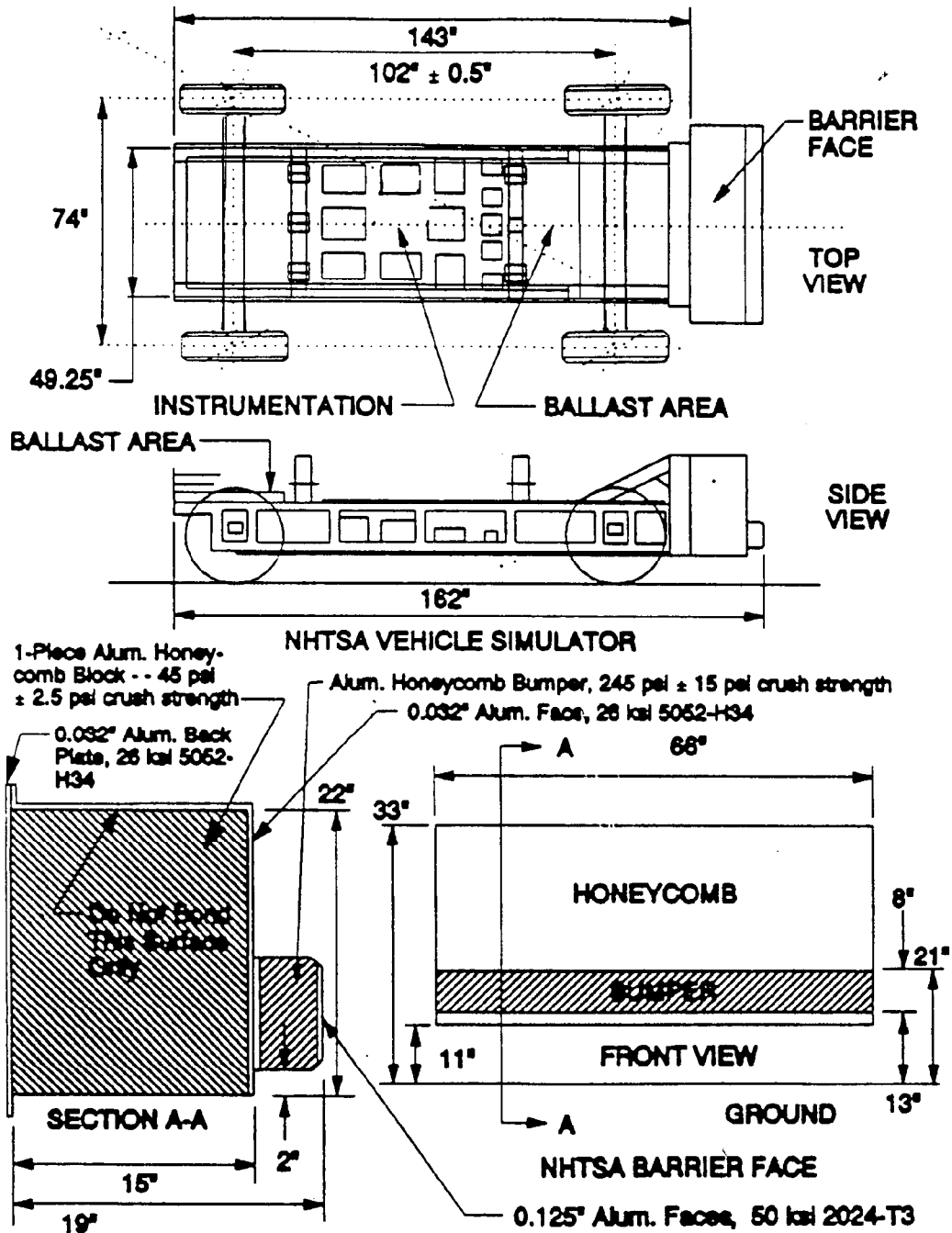
Note: The impact barrier overlapped the impact vehicle by 80%.
Camera information is shown in table 4.

Table 4
HIGH-SPEED CAMERA LOCATIONS

Test No. Y47-6-1292		Vehicle: 1993 Ford Mustang LX 2-Door Sedan					
CAMERA NO.	VIEW	CAMERA POSITIONS (in)*			ANGLE** (deg)	LENS (mm)	SPEED (fps)
		X	Y	Z			
1	Real-Time	-	-	-	-	-	24
2	Right Side View	333	76	43	0	13	600
3	Right Closeup View	386	50	41	-1	25	750
4	Left Side View	-327	54	42	0	13	550
5	Left Closeup View	-398	33	41	-2	25	760
6	Overhead View	-17	42	386	-90	13	580

*X = film plane to monorail centerline
 Y = film plane to impact location
 Z = film plan to ground
 ** = referenced to horizontal plane

Figure 7
MOVING DEFORMABLE BARRIER



Section 4

SUMMARY OF RESULTS FOR FUEL SYSTEM INTEGRITY

Figure 8

"FUEL SYSTEM INTEGRITY POST-TEST IMPACT." DATA SHEET

TEST VEHICLE NHTSA NO.: Y47-6-1292 TEST DATE: June 4, 1993

Vehicle Mfr./Make/Model: 1993 Ford Mustang LX 2-Door Sedan

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

.....

TEST VEHICLE IMPACT TYPE: - Frontal (30 mph)
- Oblique (30 mph) with -° barrier face first
 contacting -
 (driver/passenger) side
X 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
>>1	1 oz.
>>5 oz	5 oz.
>>1 oz/min	1 oz./1 min.

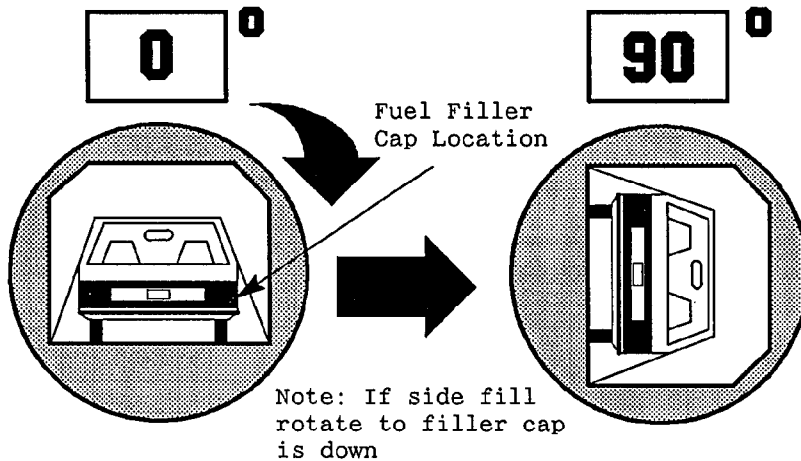
SOLVENT SPILLAGE DETAILS: Test vehicle leaked approximately 2 gallons of solvent after impact.

Figure 9
"STATIC ROLLOVER DATA"

TEST PHASE:

Vehicle NHTSA ID No.:

Y47-060-1202



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	<u>3</u> minutes <u>00</u> seconds
FMVSS 301 Position Hold Time +	<u>5</u> minutes <u>00</u> seconds
TOTAL	<u>8</u> minutes <u>00</u> seconds
Next whole minute interval	<u>8</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:

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

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

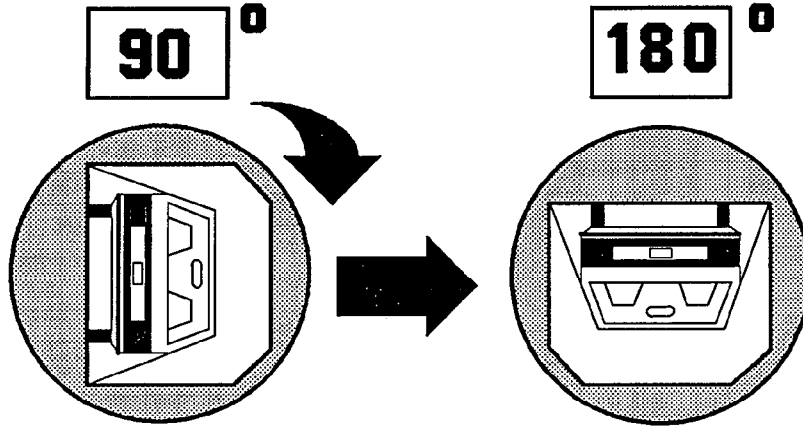
IV. SOLVENT SPILLAGE LOCATION(S):

Rollover test was not conducted.

Figure 9
 "STATIC ROLLOVER DATA" (cont.)

TEST PHASE:

Vehicle NHTSA ID No.:



Y47-060-1292

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time _____ 3 _____ minutes _____ 00 _____ seconds
 (Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + _____ 5 _____ minutes _____ 00 _____ seconds

TOTAL _____ 8 _____ minutes _____ 00 _____ 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:

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

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

IV. SOLVENT SPILLAGE LOCATION(S):

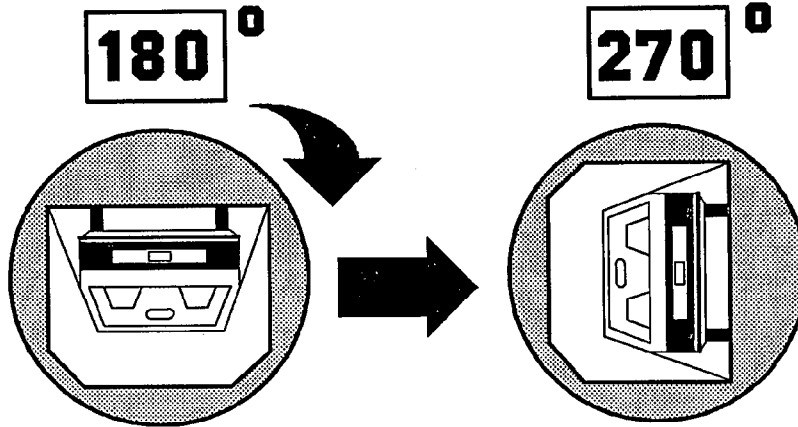
Rollover test was not conducted.

Figure 9
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE:

Vehicle NHTSA ID No.:

Y47-060-1292



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time 3 minutes 00 seconds
(Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + 5 minutes 00 seconds

TOTAL 8 minutes 00 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:

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

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

IV. SOLVENT SPILLAGE LOCATION(S):

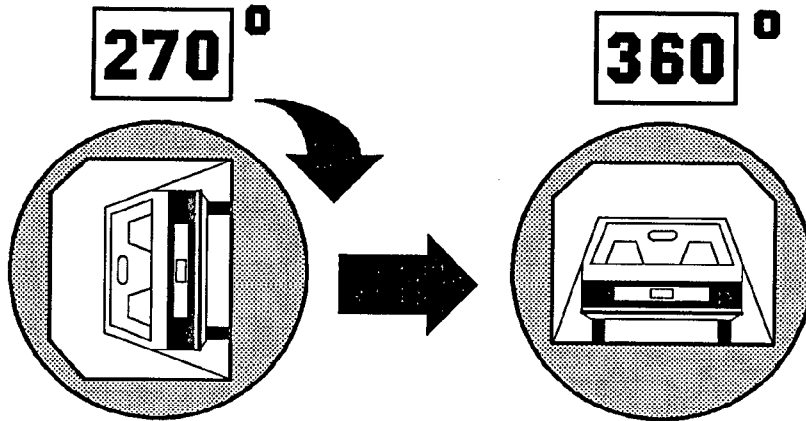
Rollover test was not conducted.

Figure 9
 "STATIC ROLLOVER DATA" (cont.)

TEST PHASE:

Vehicle NHTSA ID No.:

Y47-060-1292



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time _____ 3 _____ minutes _____ 00 _____ seconds
 (Spec. Range = 1 to 3 minutes)

FMVSS 301 Position Hold Time + _____ 5 _____ minutes _____ 00 _____ seconds

TOTAL _____ 8 _____ minutes _____ 00 _____ 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:

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

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

IV. SOLVENT SPILLAGE LOCATION(S):

Rollover test was not conducted.

Appendix A
PHOTOGRAPHS

LIST OF PHOTOGRAPHS

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Figure A-5	POST-TEST LEFT SIDE VIEW	A-7
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Figure A-7	POST-TEST LEFT REAR THREE-QUARTER VIEW	A-9
Figure A-8	PRE-TEST REAR VIEW	A-10
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Figure A-20	POST-TEST STODDARD LEAKAGE VIEW	A-22
Figure A-21	POST-TEST REAR UNDERBODY VIEW	A-23

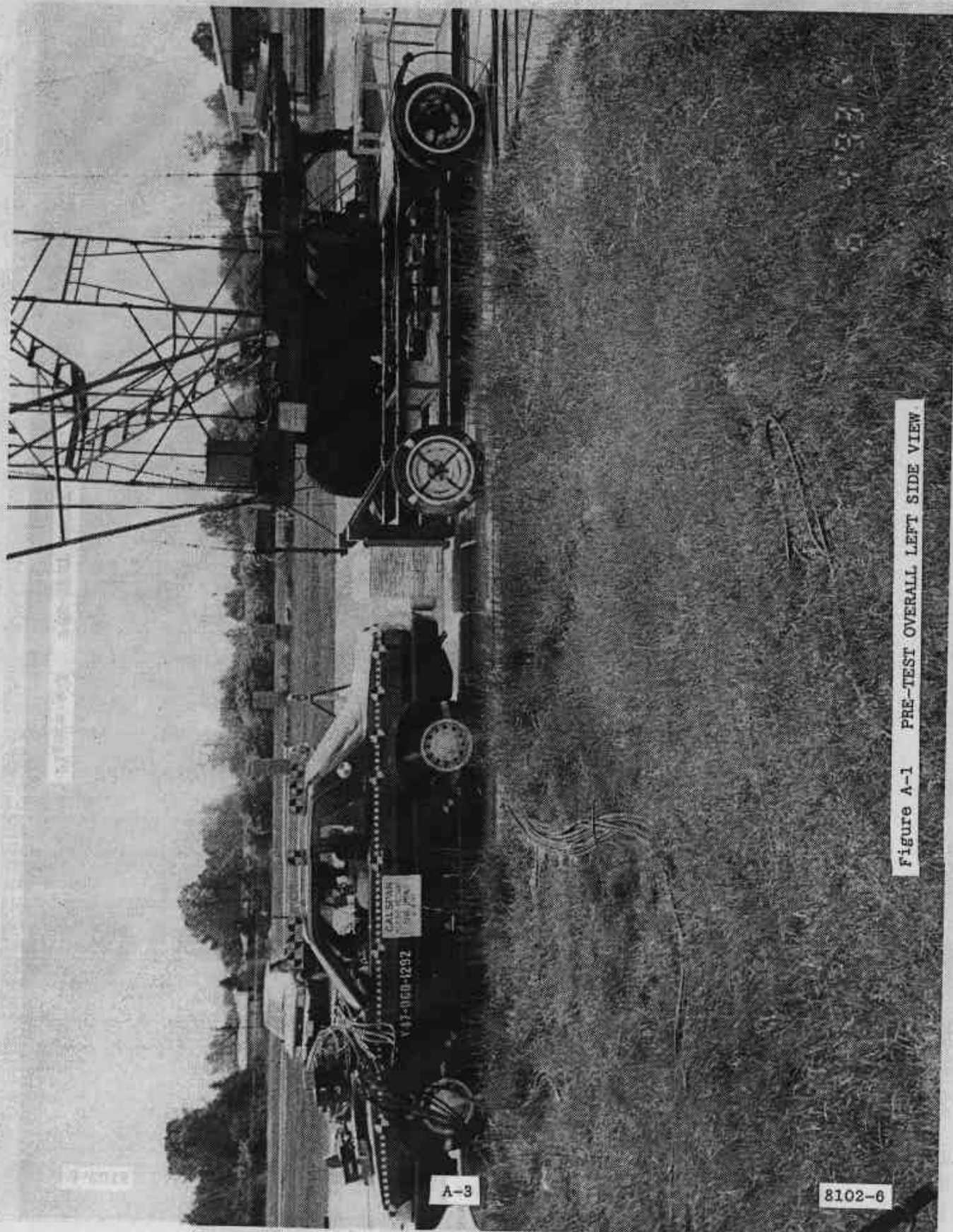
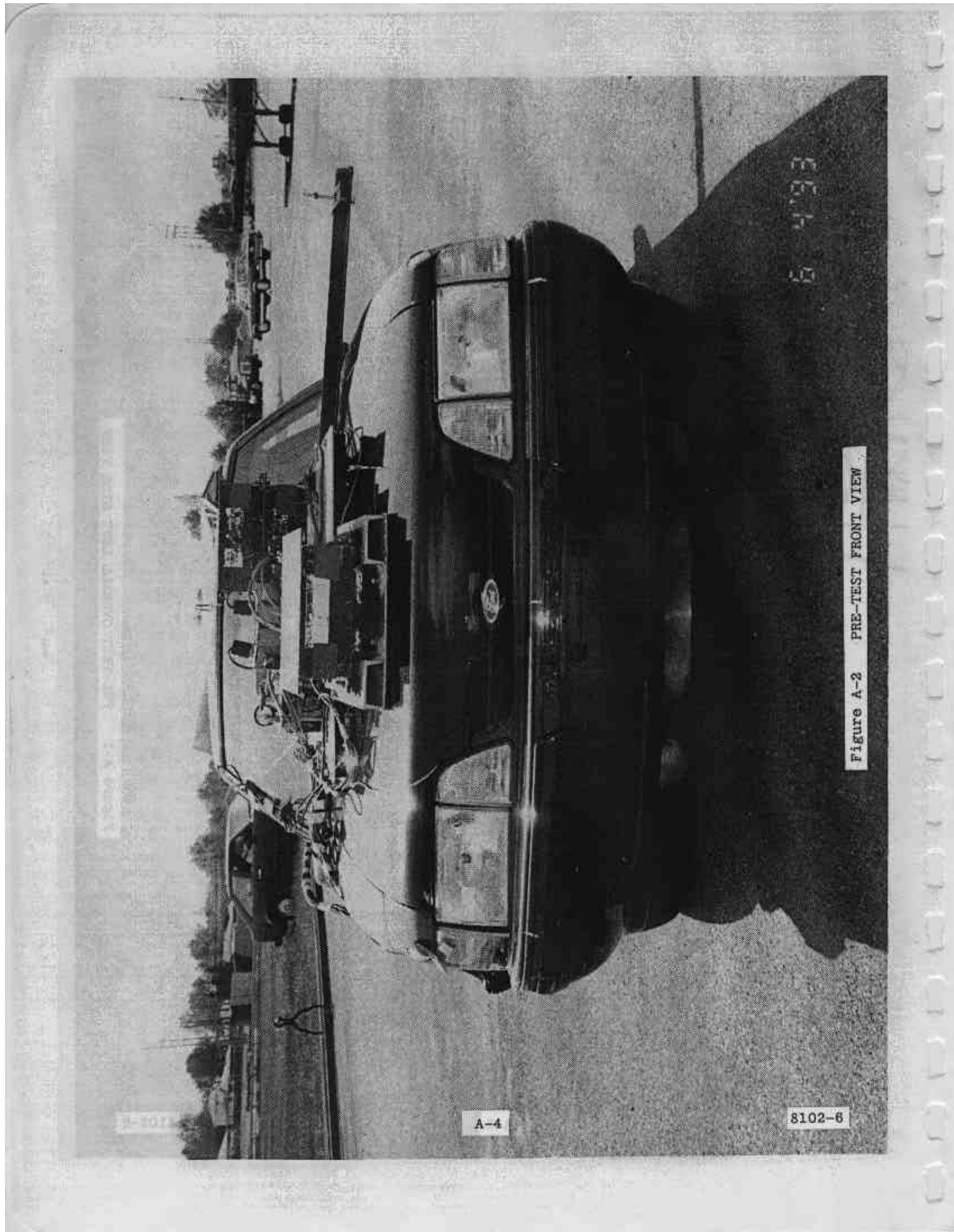


Figure A-1 PRE-TEST OVERALL LEFT SIDE VIEW

A-3

8102-6



FORD CREDIT

8102-6

A-4

8102-6

Figure A-2 PRE-TEST FRONT VIEW

8 4 93



Figure A-3 POST-TEST FRONT VIEW





Figure A-5 POST-TEST LEFT SIDE VIEW

A-7

8102-6



Figure A-6 PRE-TEST LEFT REAR THREE-QUARTER VIEW

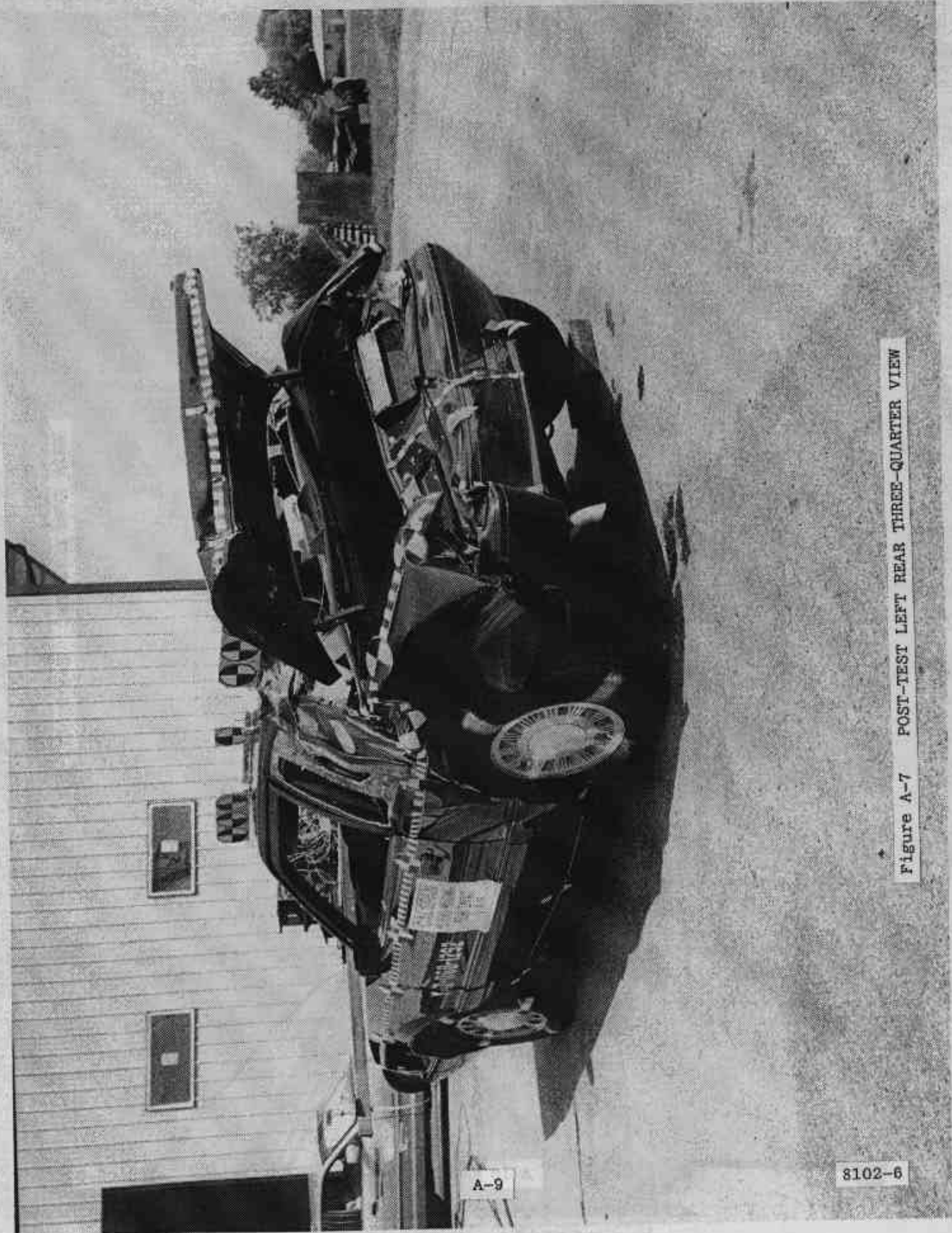


Figure A-7 POST-TEST LEFT REAR THREE-QUARTER VIEW

8102-6

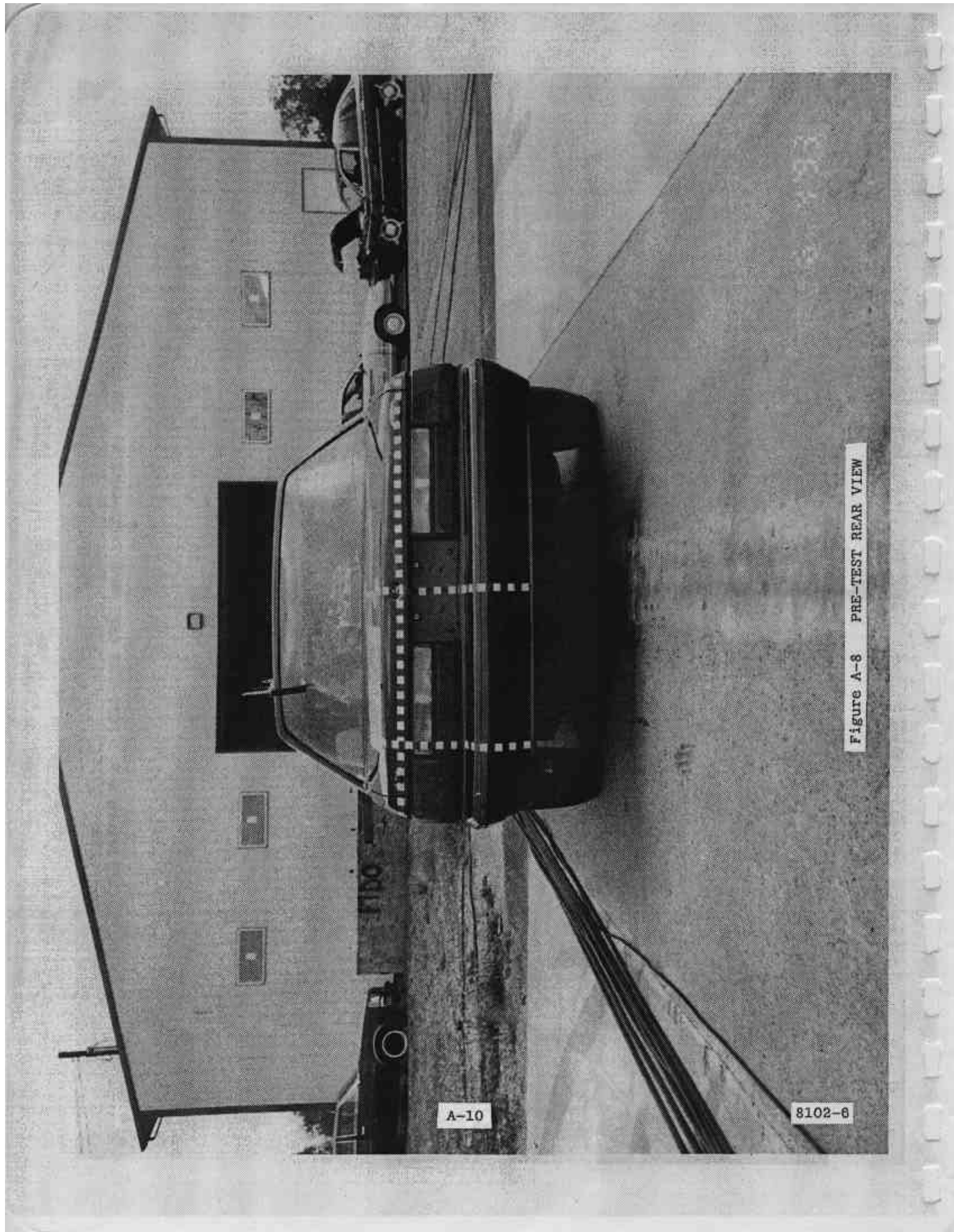


Figure A-8 PRE-TEST REAR VIEW

A-10

8102-8

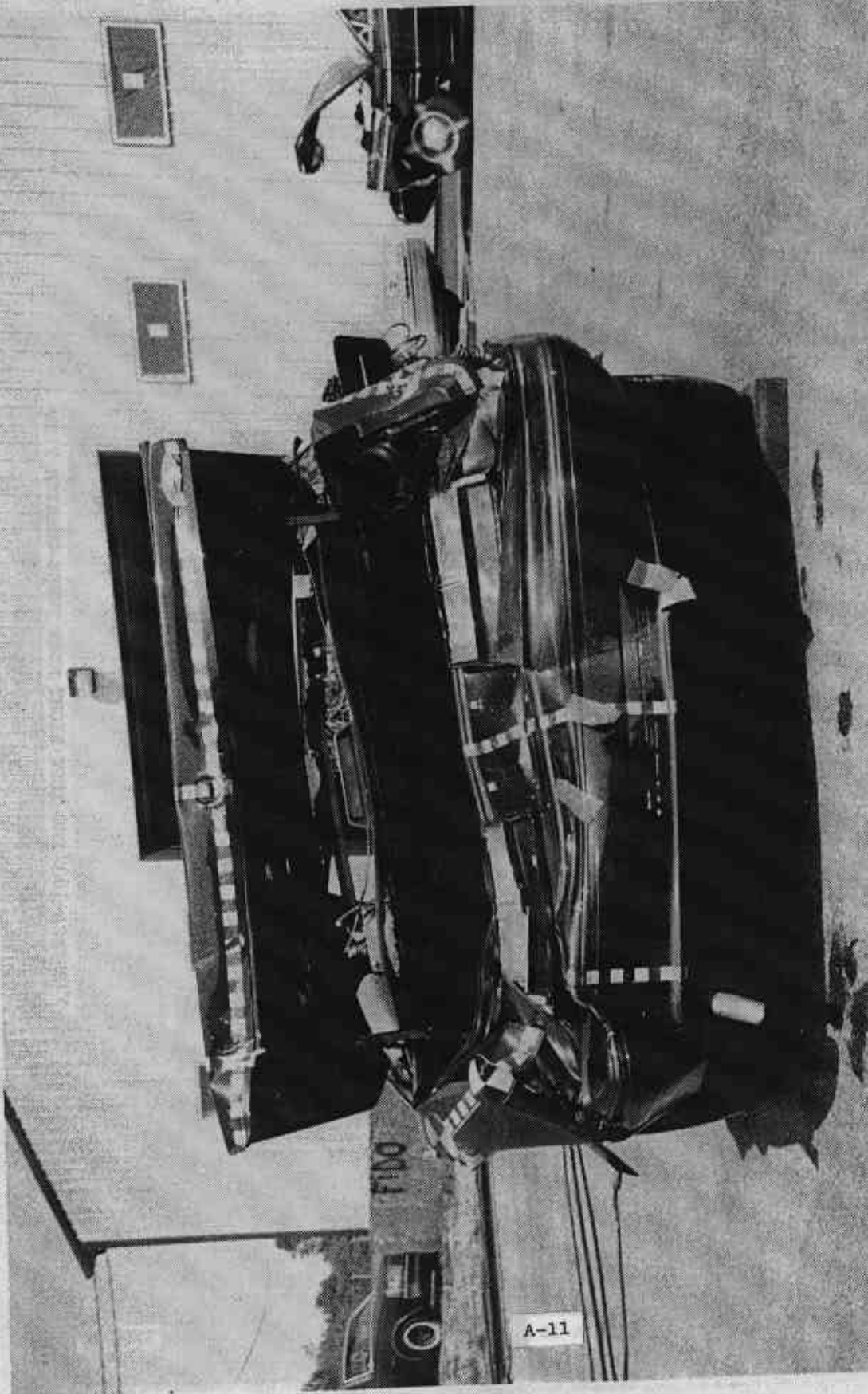


Figure A-9 POST-TEST REAR VIEW

A-11

8102-6



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

A-12

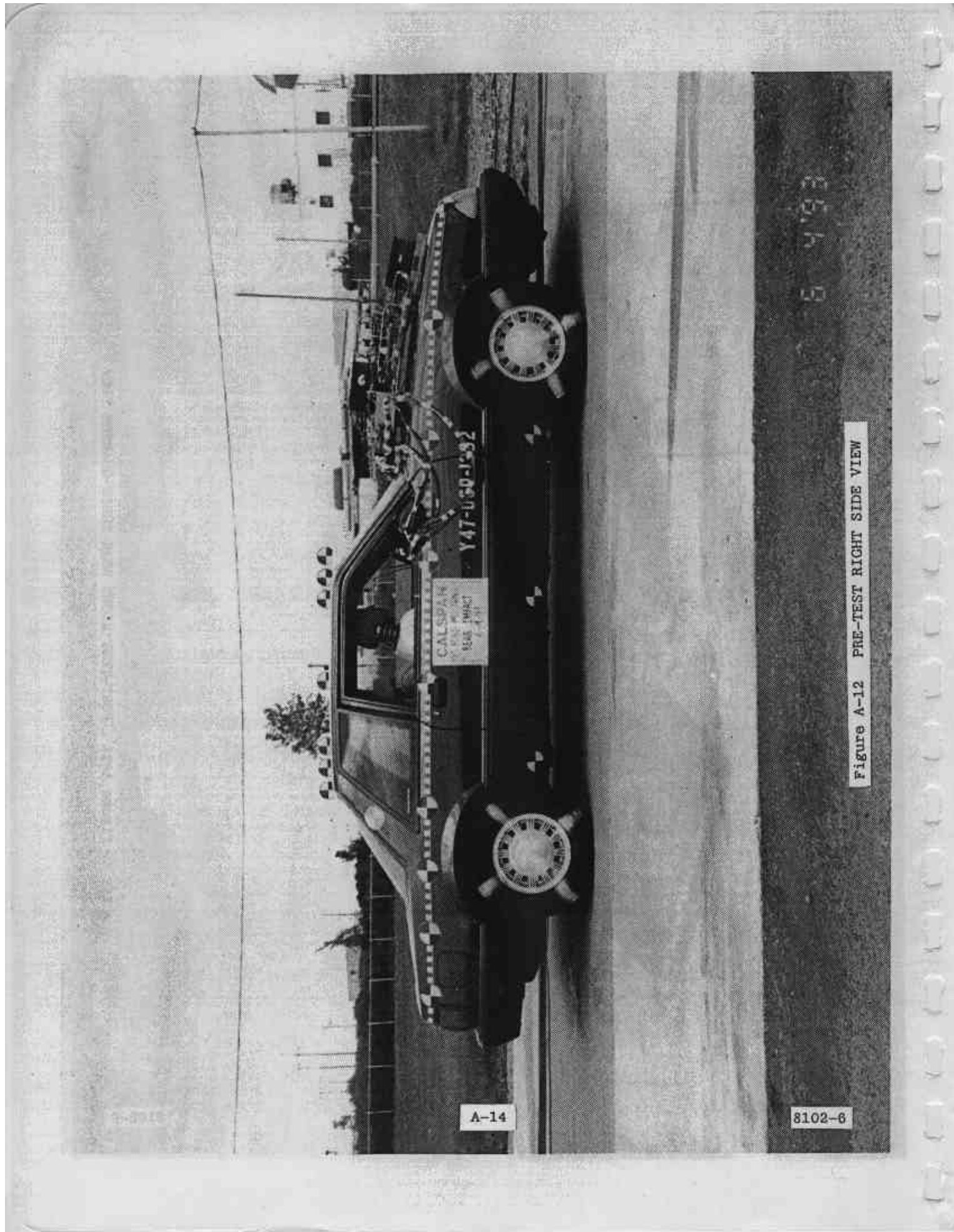
8102-6



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

A-13

8102-6



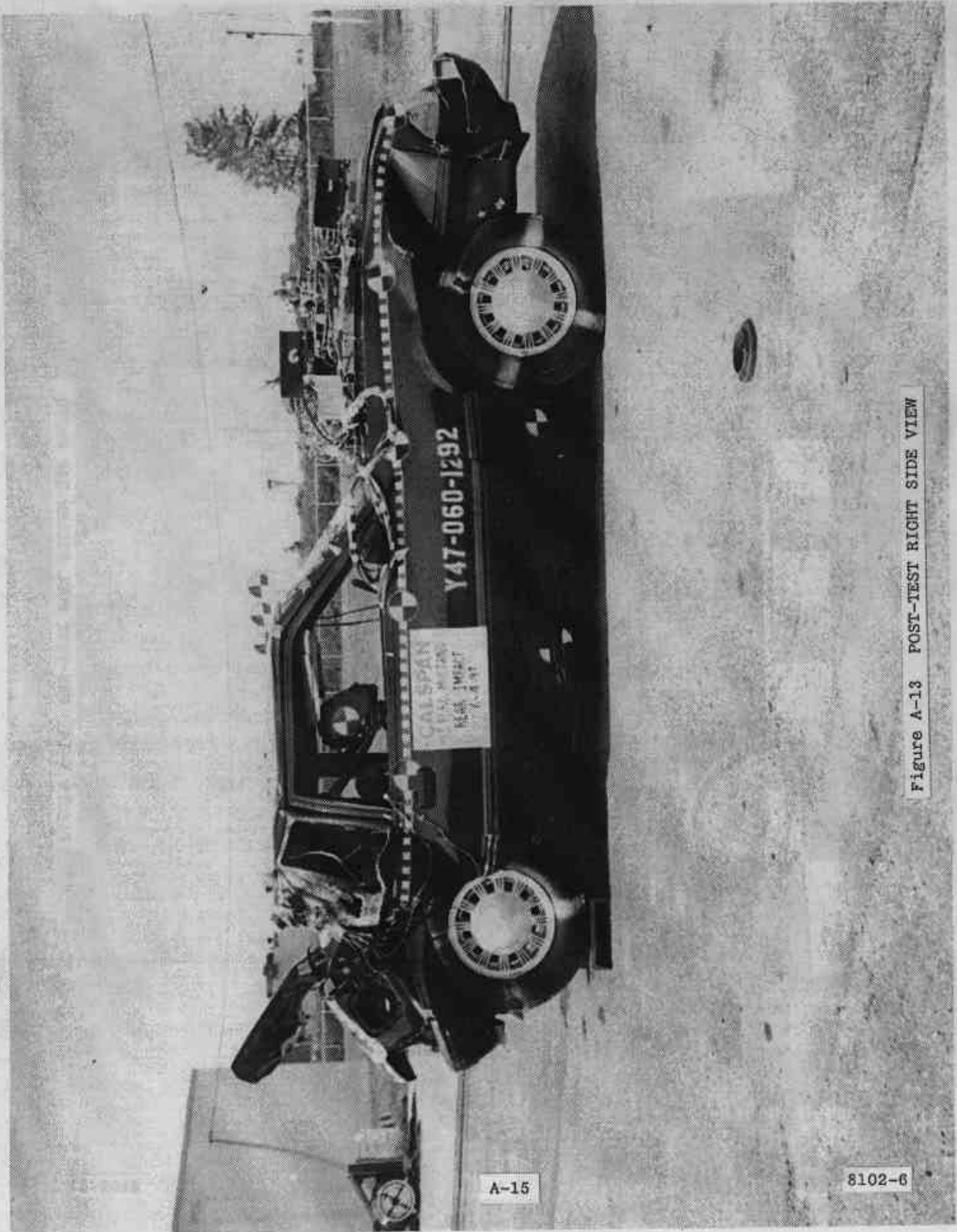


Figure A-13 POST-TEST RIGHT SIDE VIEW

A-15

8102-6

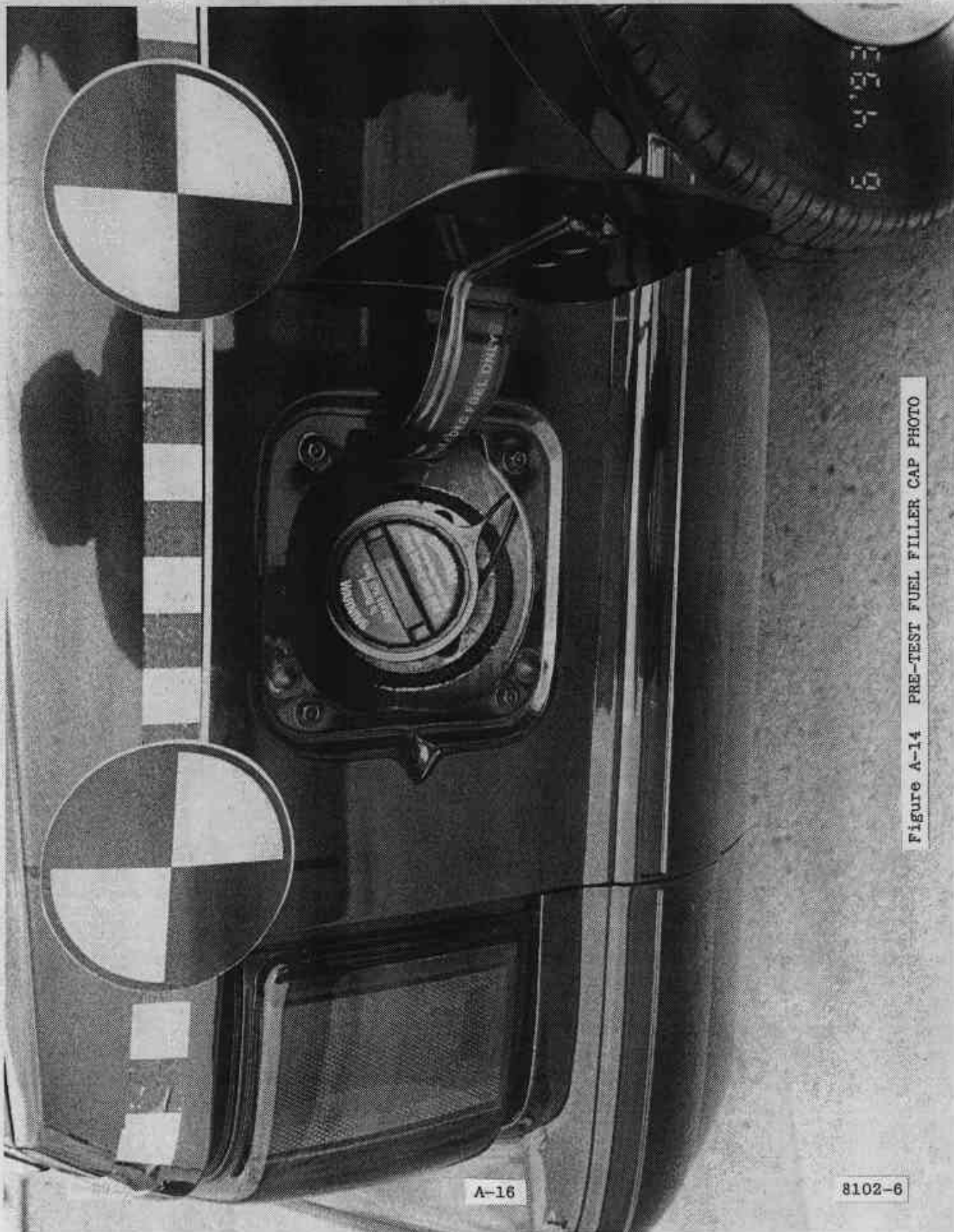


Figure A-14 PRE-TEST FUEL FILLER CAP PHOTO

A-16

8102-6

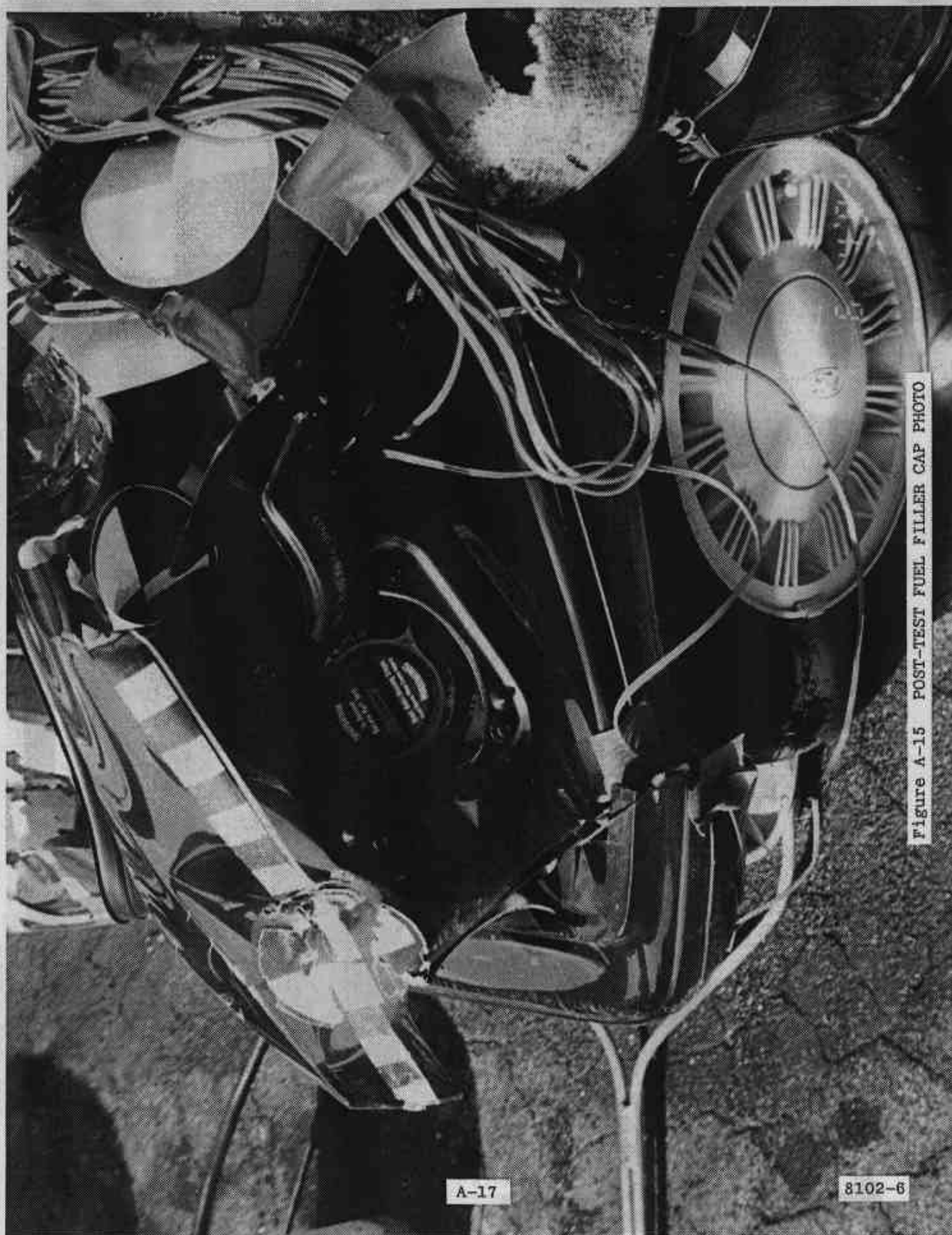


Figure A-15 POST-TEST FUEL FILLER CAP PHOTO

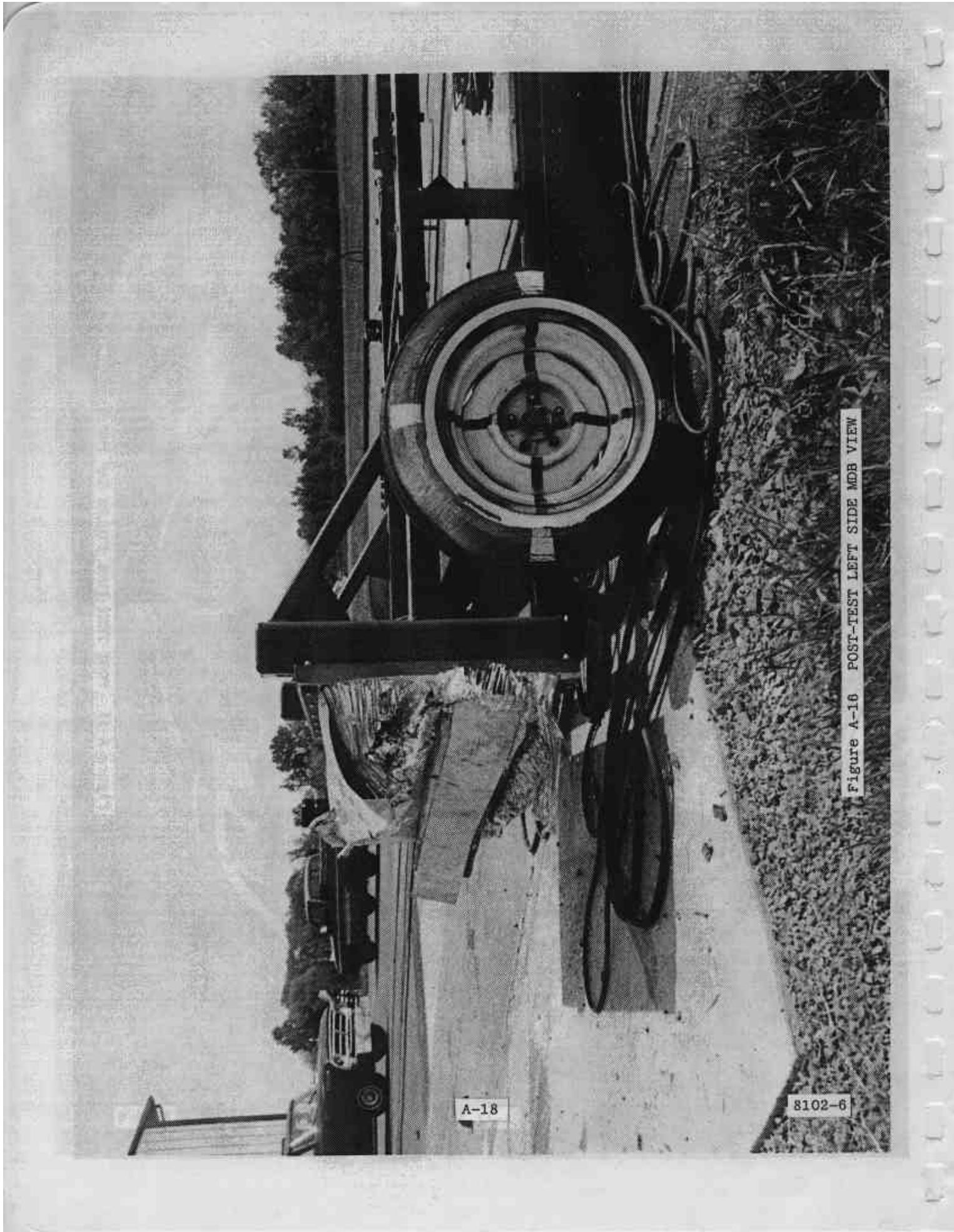


Figure A-16 POST-TEST LEFT SIDE MBB VIEW

A-18

8102-6

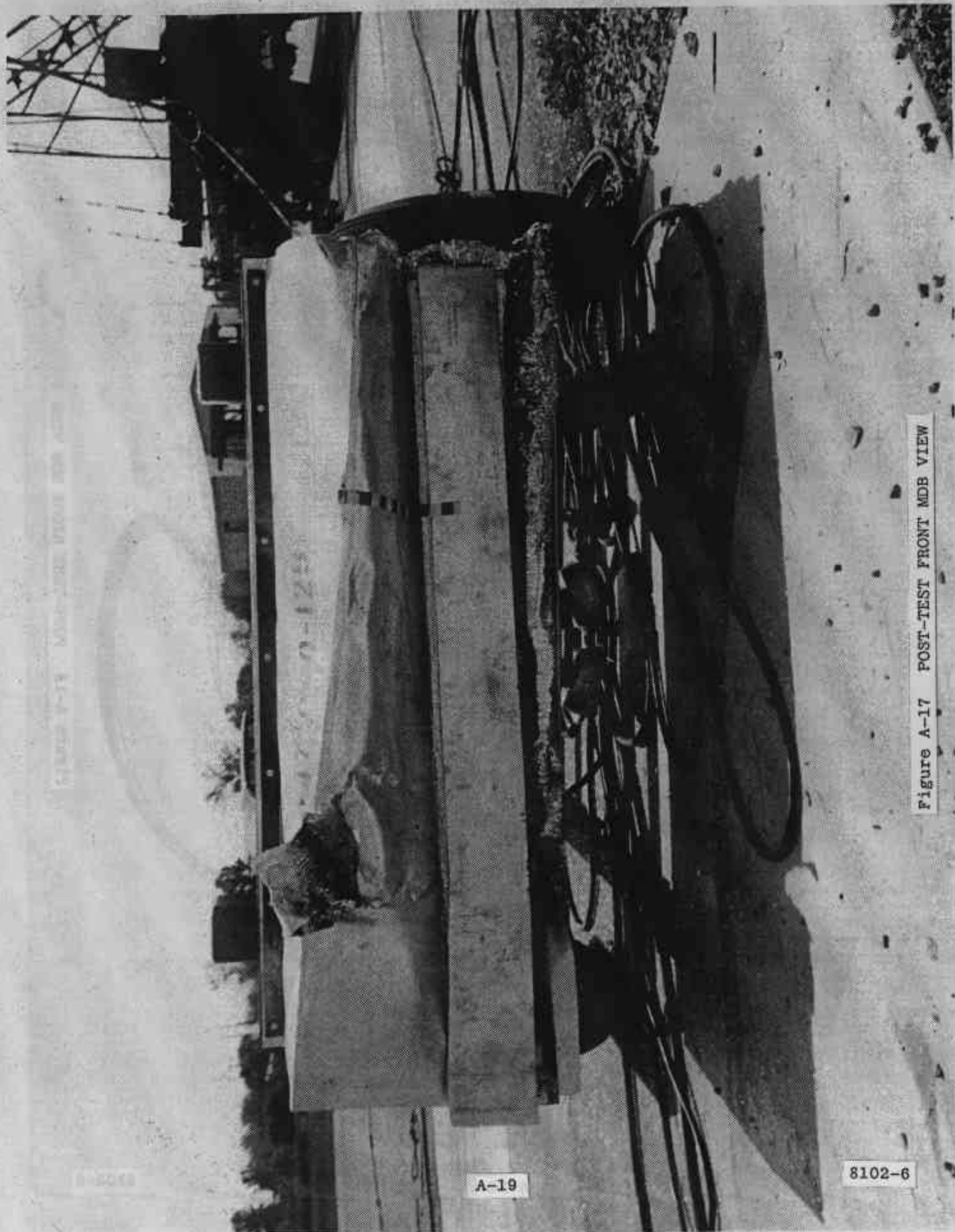


Figure A-17 POST-TEST FRONT MDB VIEW

A-19

8102-6

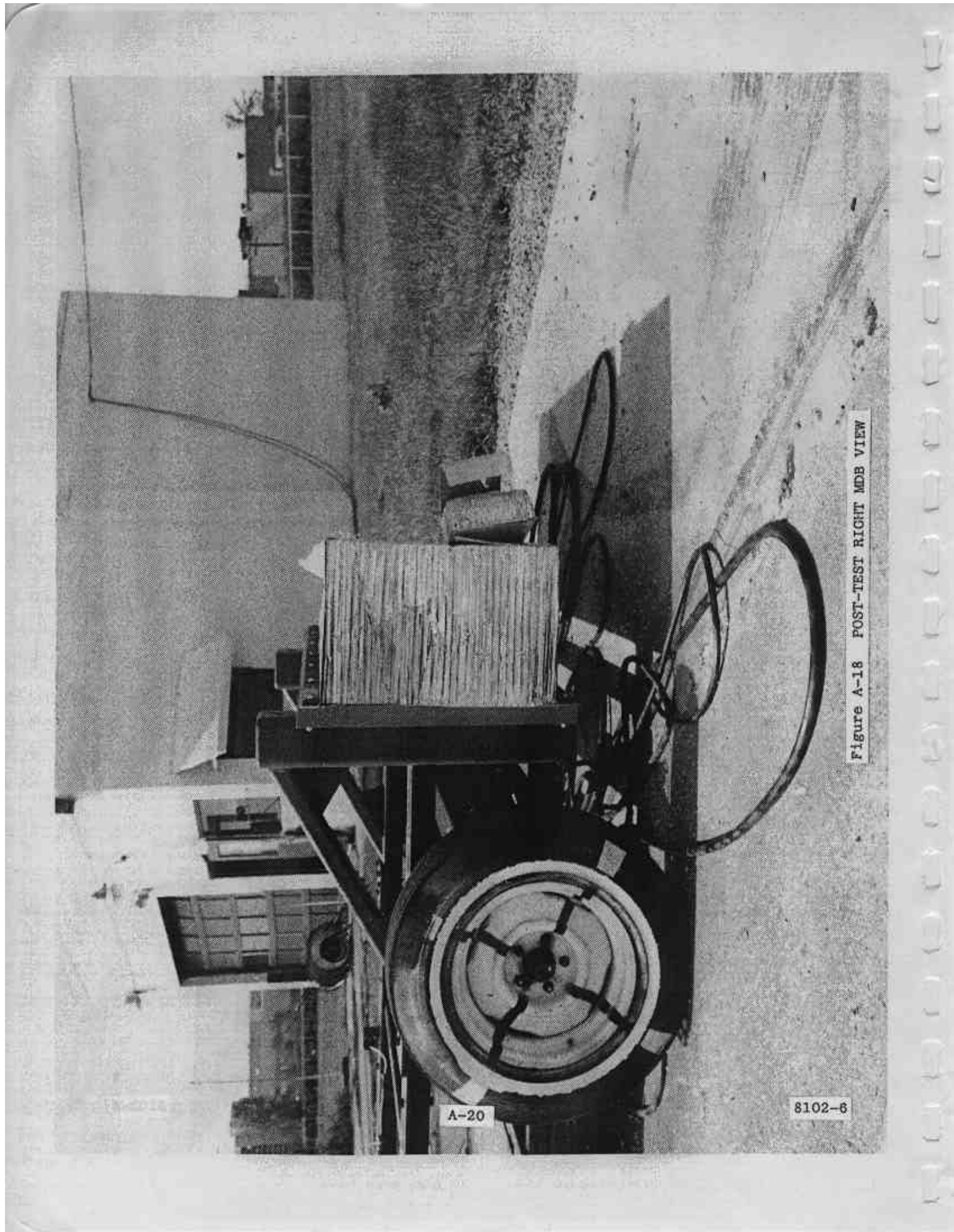
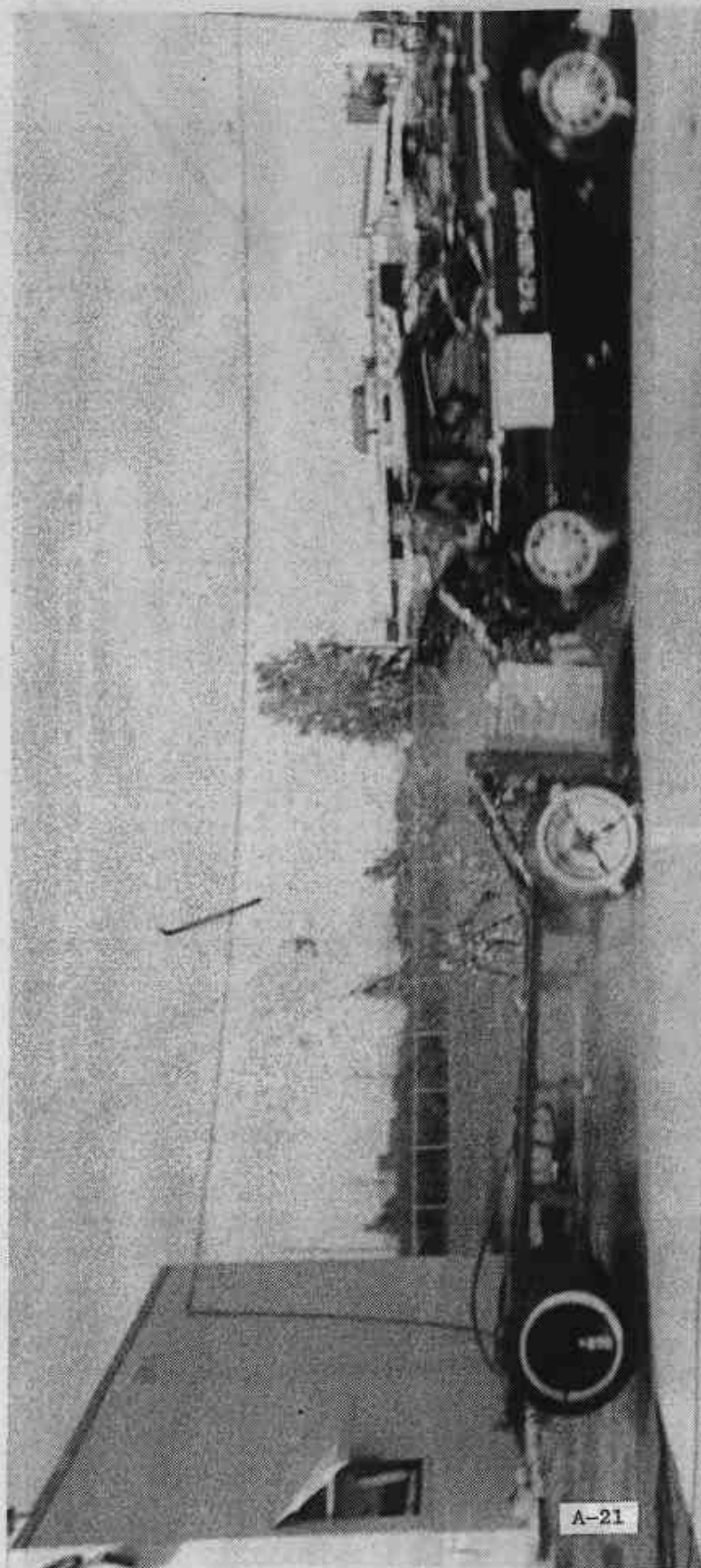


Figure A-18 POST-TEST RIGHT MDB VIEW

A-20

8102-6



A-21

8102-6

Figure A-19 IMPACT PHOTO

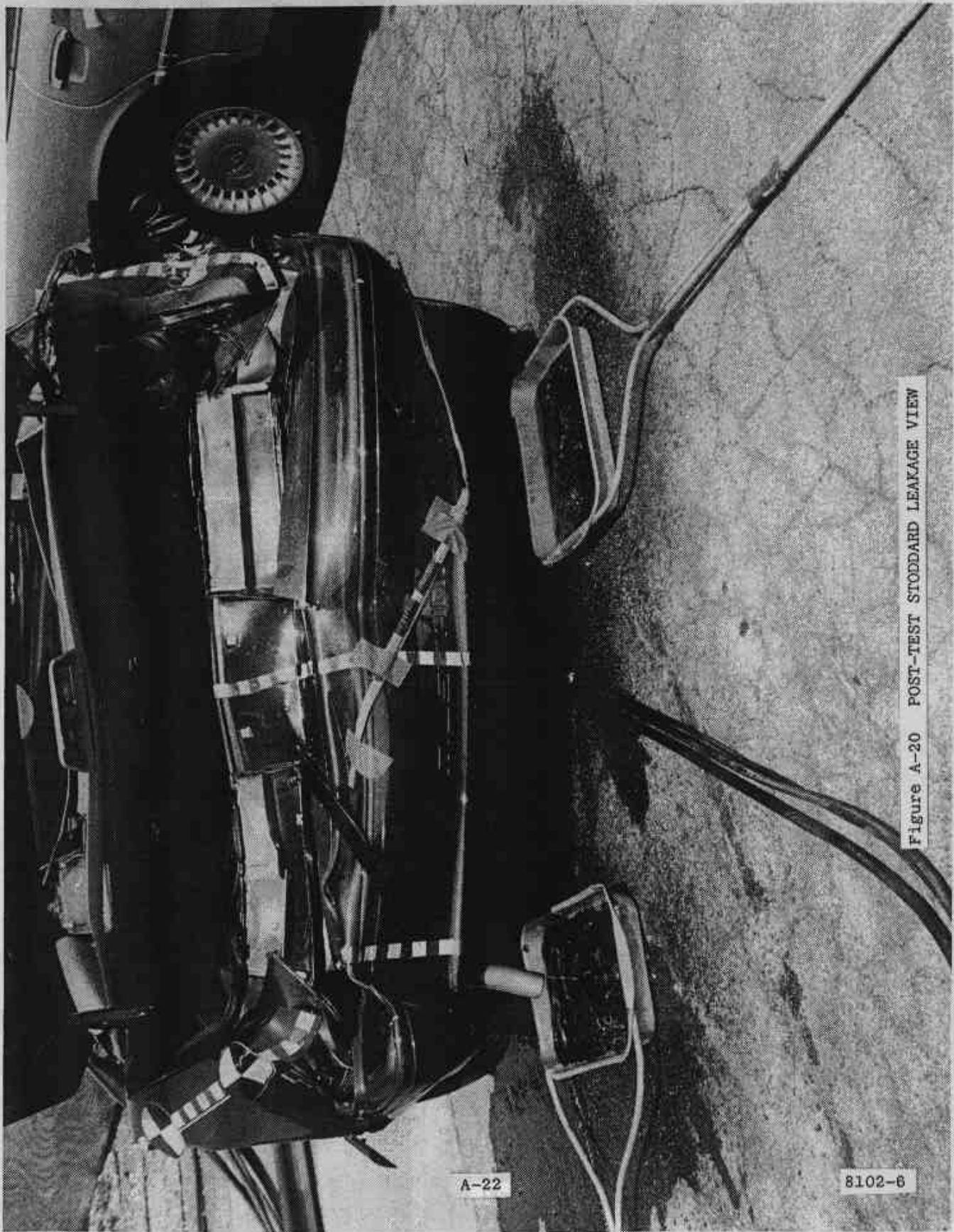


Figure A-20 POST-TEST STODDARD LEAKAGE VIEW



A-23

8102-6

Figure A-21 POST-TEST REAR UNDERBODY VIEW

Appendix B

VEHICLE AND DUMMY RESPONSE DATA

TEST VEHICLE AND MOVING BARRIER DATA

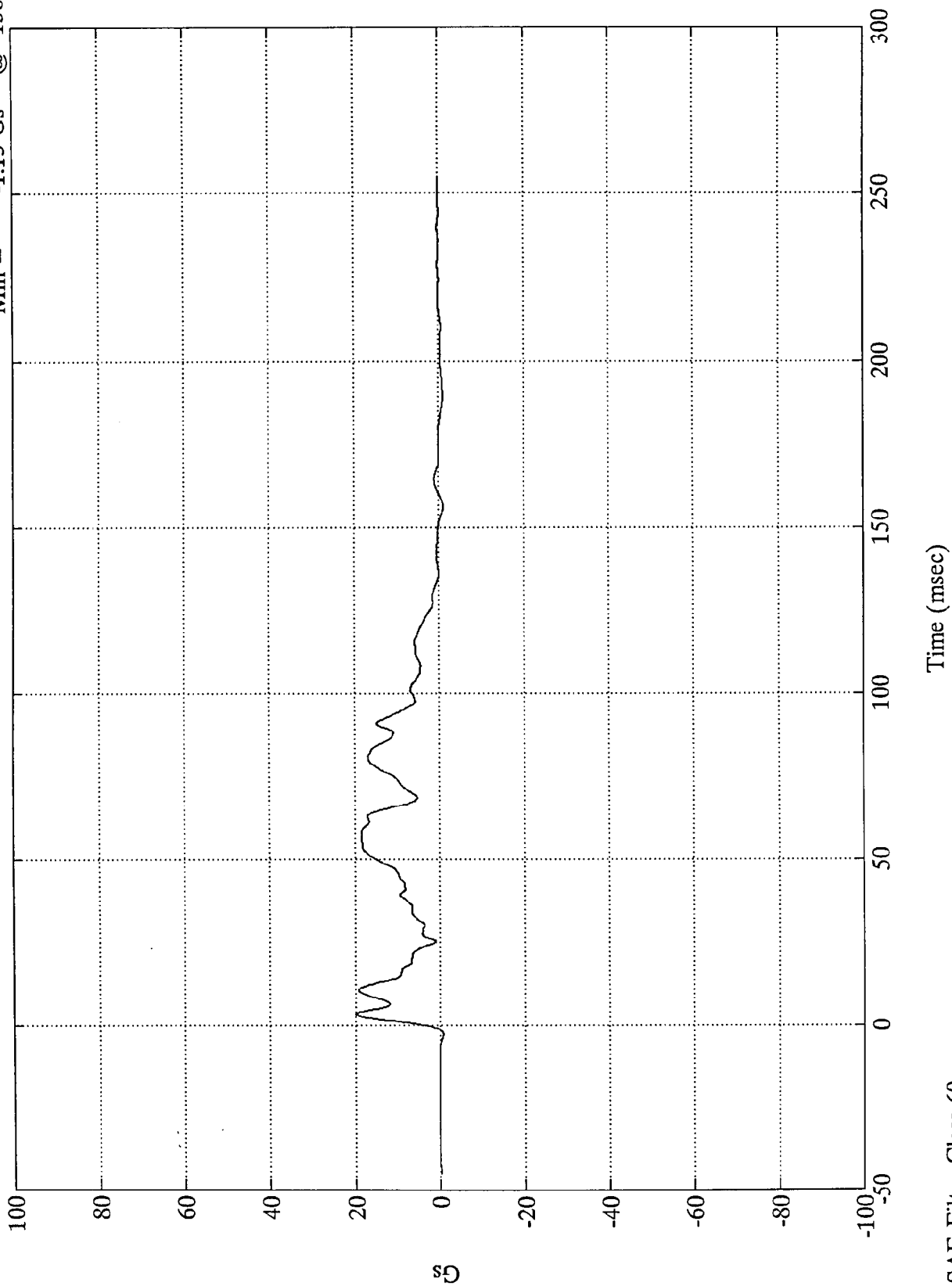
VEHICLE DATA

FILTER CHANNEL CLASS

60

TSC 301 TEST 6 - REAR IMPACT

Acc. #1 Lt Front Xmember
Max = 19.84 Gs @ 3.23 msec
Min = -1.15 Gs @ 156.47 msec



Gs

B-3

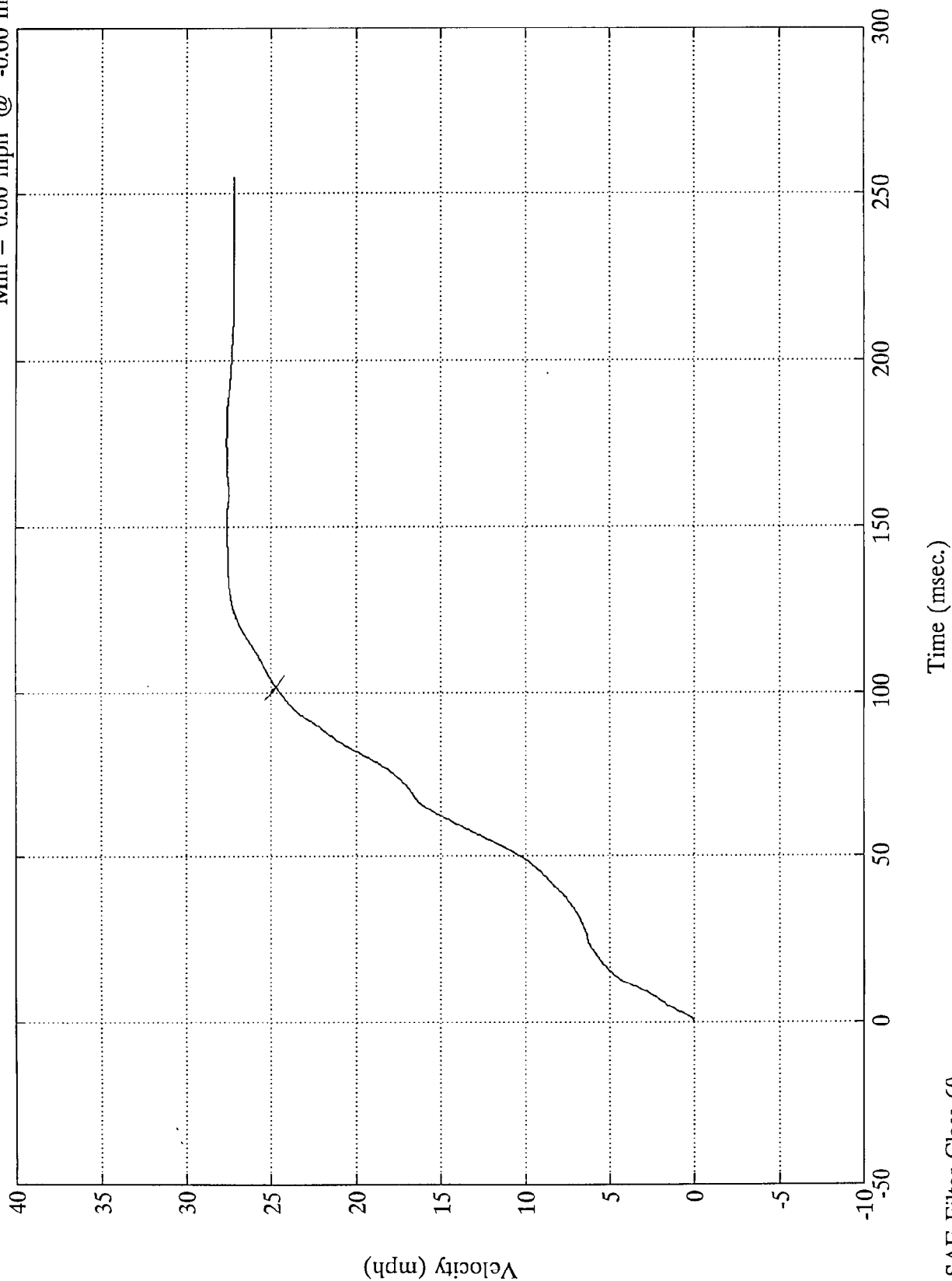
8102-6

SAE Filter Class 60

TSC 301 TEST 6 - REAR IMPACT

Acc. #1 Lt Front Xmember

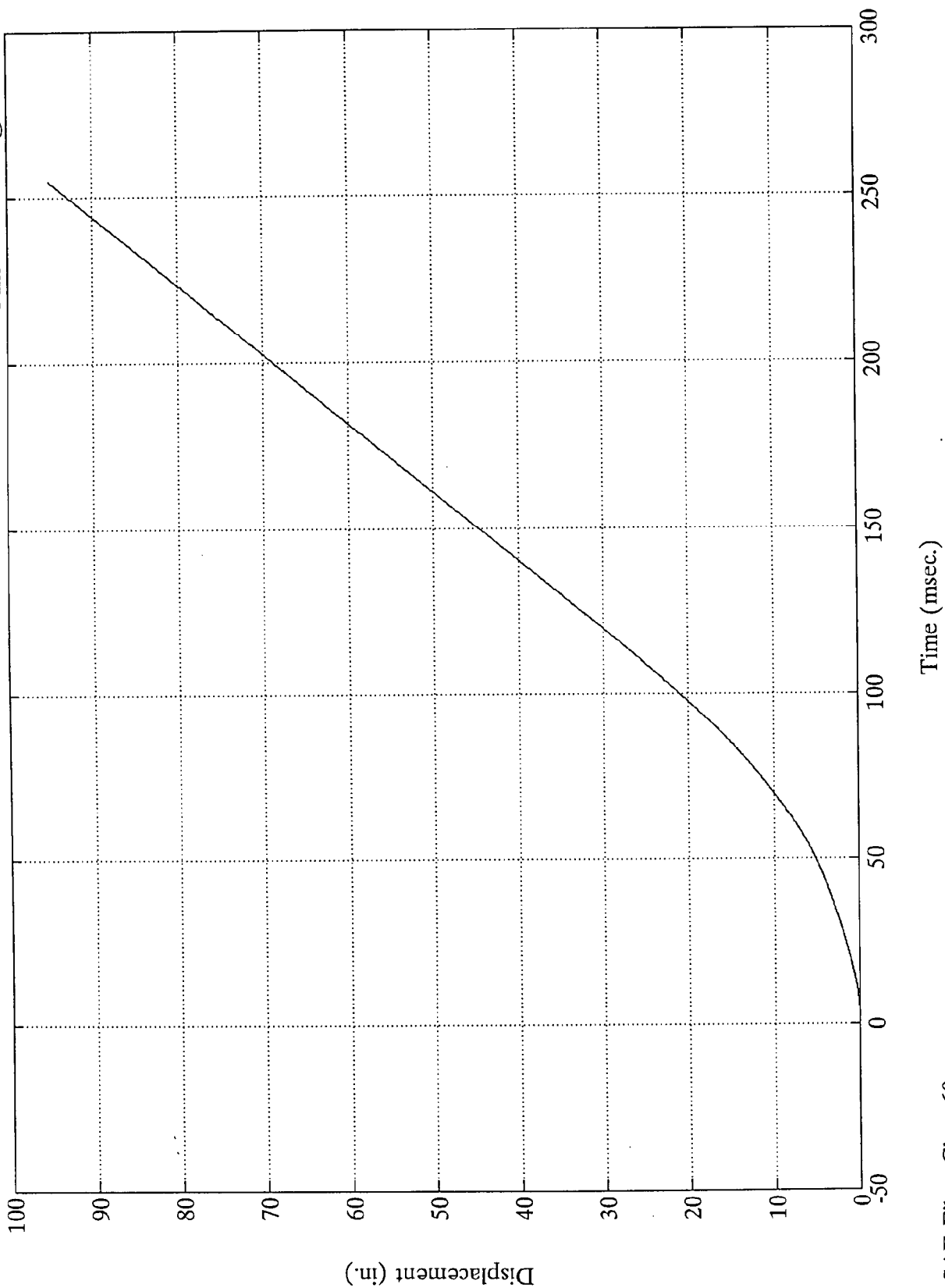
Max = 27.62 mph @ 176.64 msec
Min = 0.00 mph @ -0.00 msec



TSC 301 TEST 6 - REAR IMPACT

Acc. #1 Lt Front Xmember

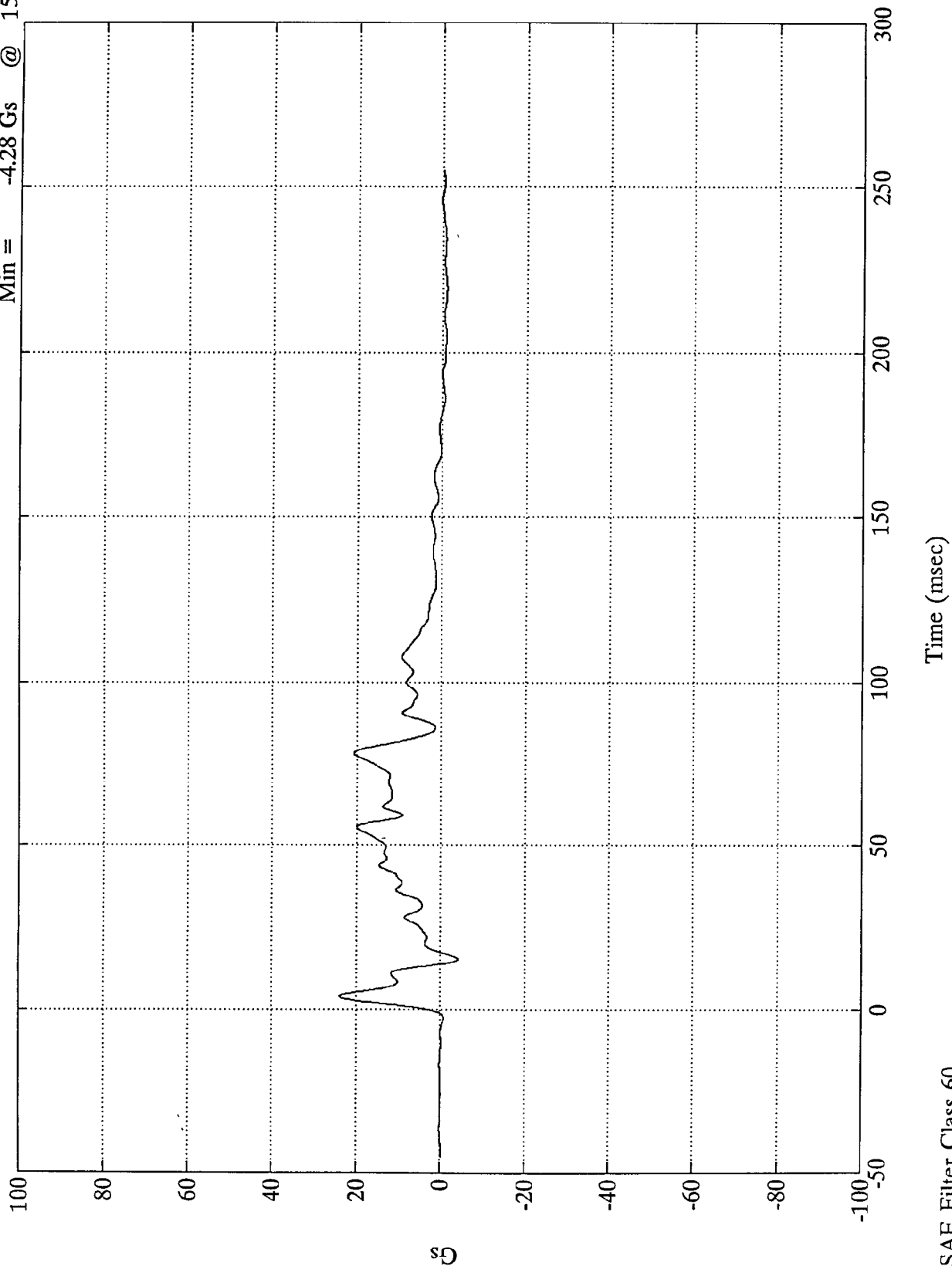
Max = 95.11 in. @ 254.88 msec
Min = 0.00 in. @ -0.00 msec



TSC 301 TEST 6 - REAR IMPACT

Max = 23.90 Gs @ 3.83 msec
Min = -4.28 Gs @ 15.47 msec

Acc. #2 Rt Front Xmember



Gs

B-6

8102-6

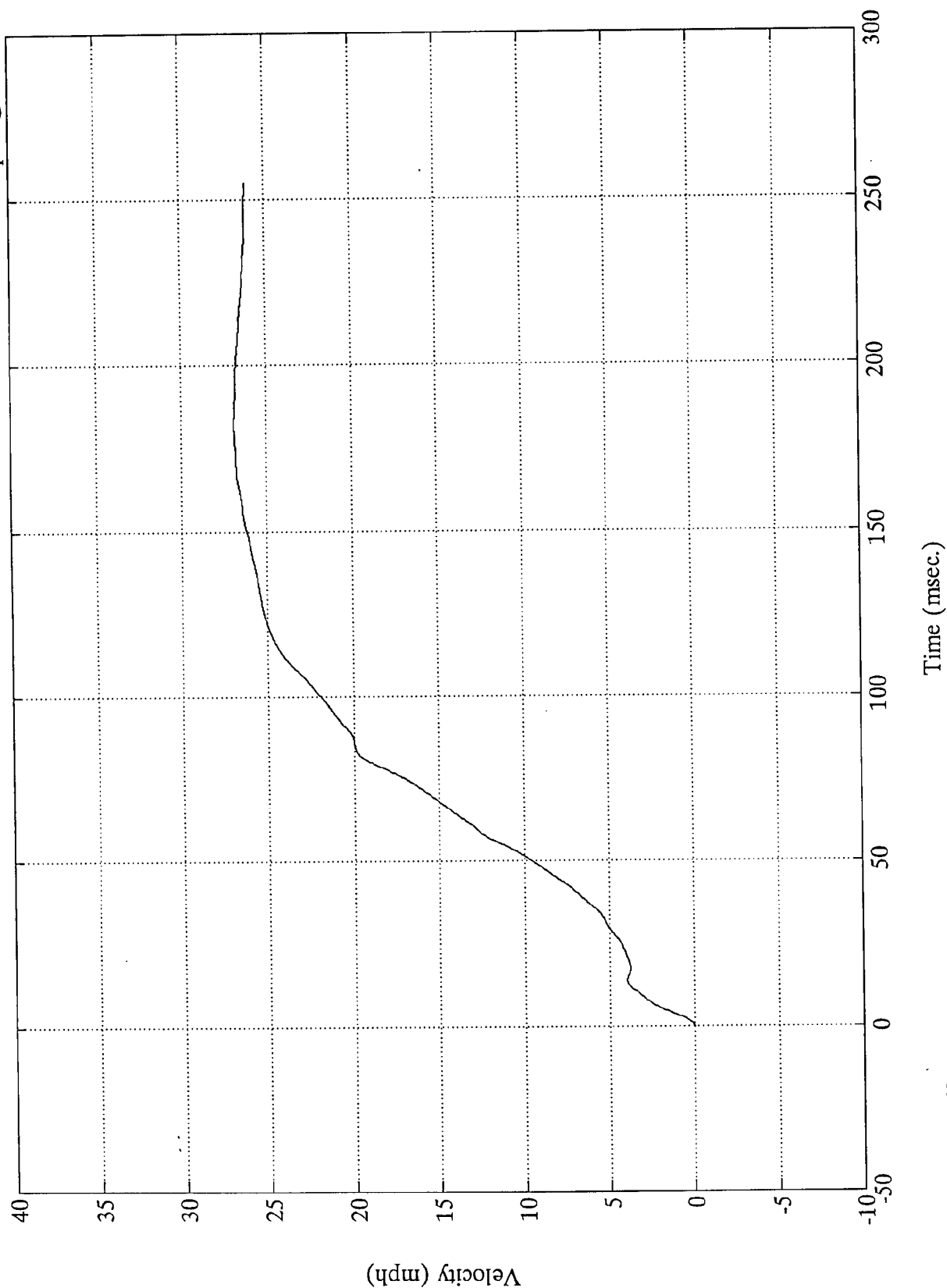
SAE Filter Class 60

Time (msec)

TSC 301 TEST 6 - REAR IMPACT

Acc. #2 Rt Front Xmember

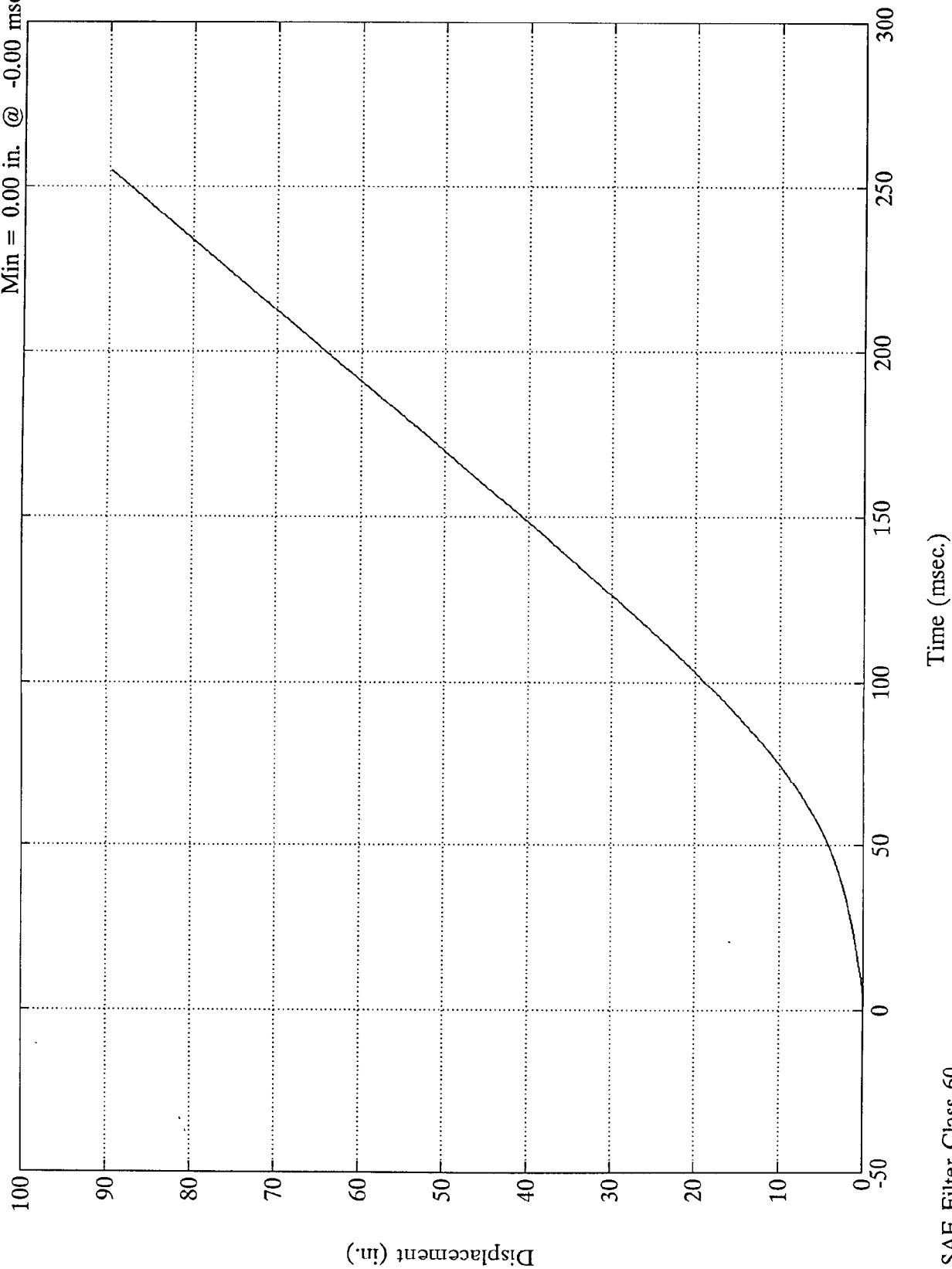
Max = 26.90 mph @ 182.88 msec
Min = 0.00 mph @ -0.00 msec



TSC 301 TEST 6 - REAR IMPACT

Acc. #2 Rt Front Xmember

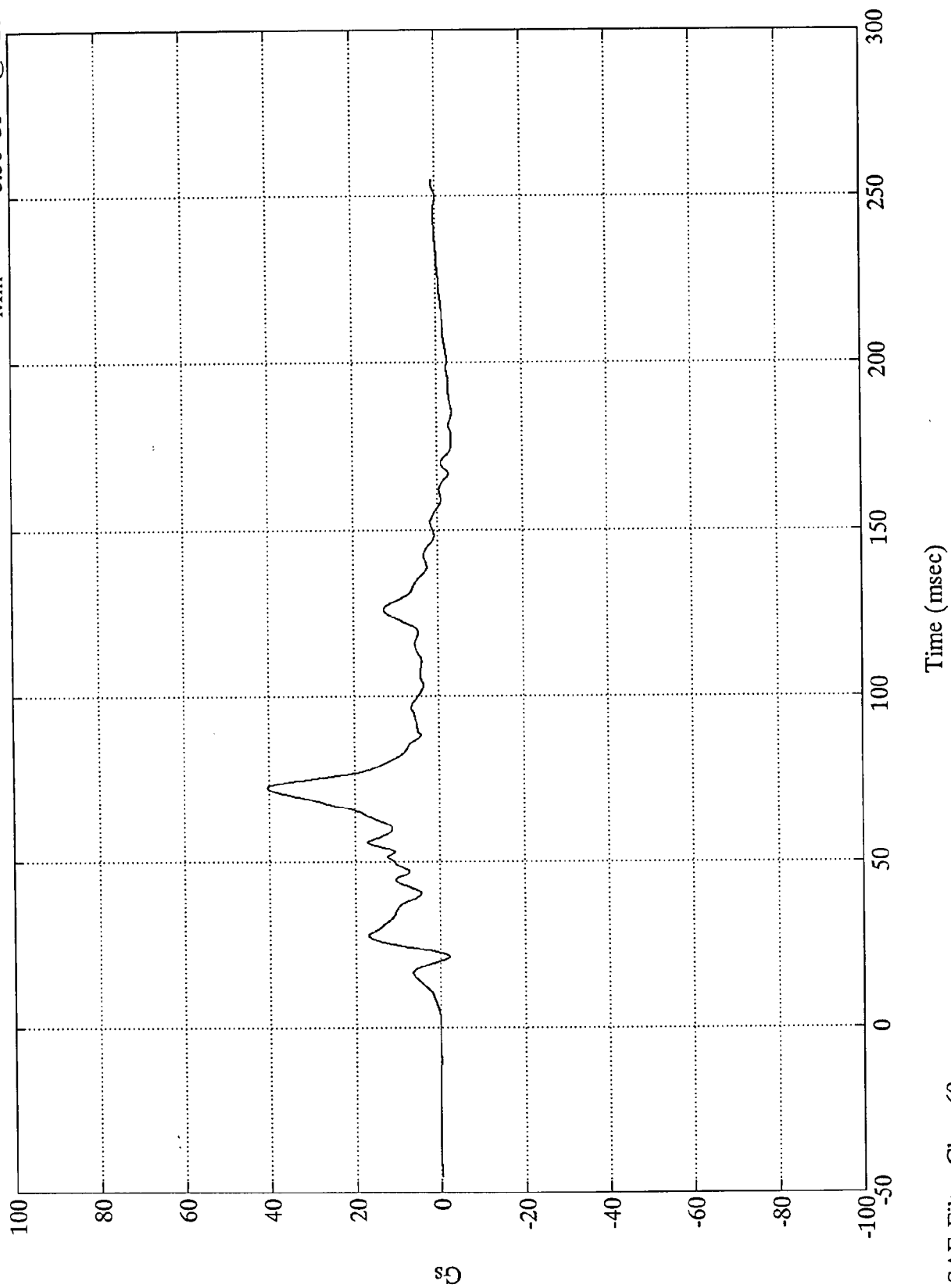
Max = 89.72 in. @ 254.88 msec
Min = 0.00 in. @ -0.00 msec



TSC 301 TEST 6 - REAR IMPACT

Acc. #3 Engine Top

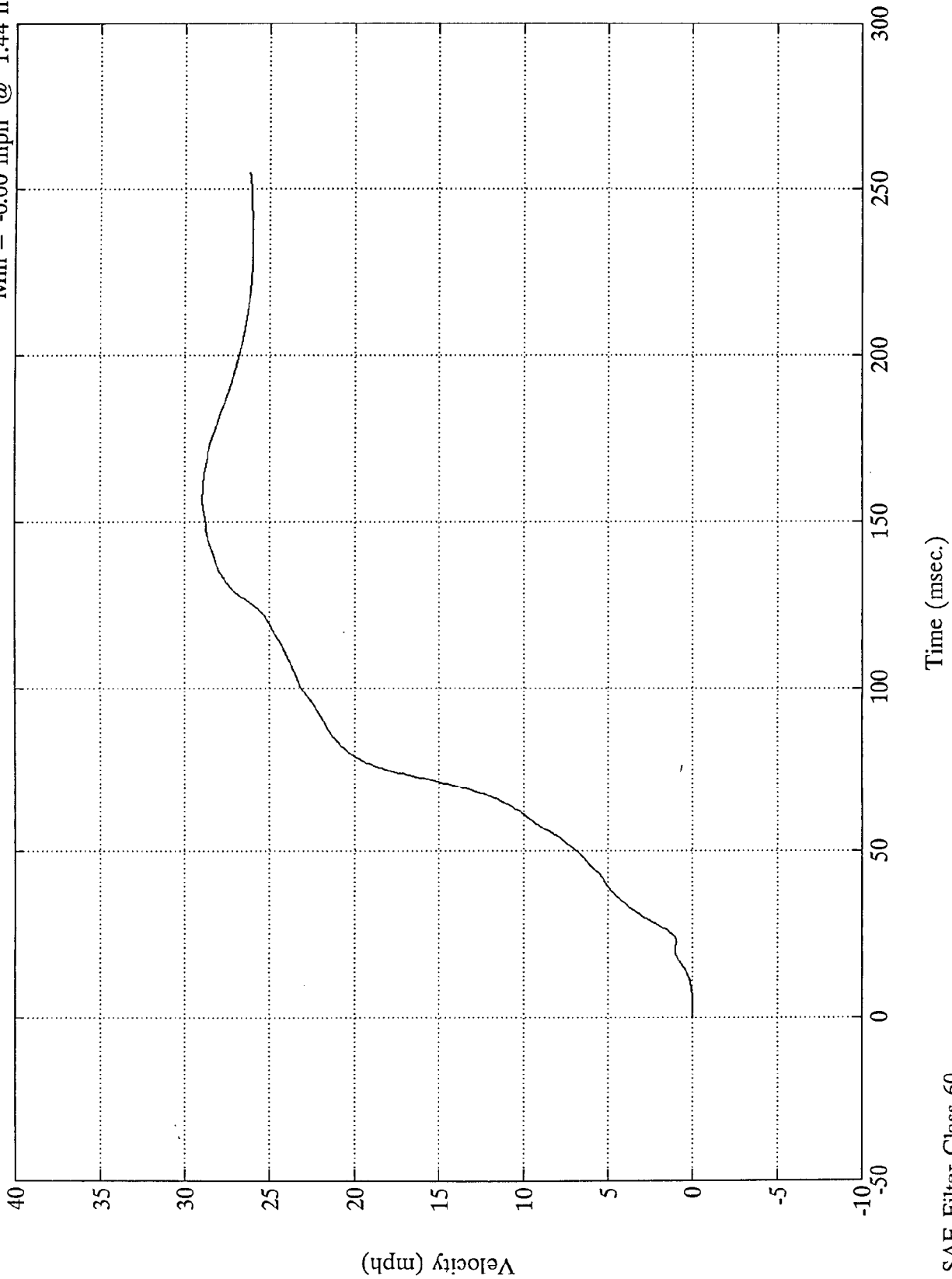
Max = 40.49 Gs @ 72.24 msec
Min = -3.56 Gs @ 185.28 msec



TSC 301 TEST 6 - REAR IMPACT

Acc. #3 Engine Top

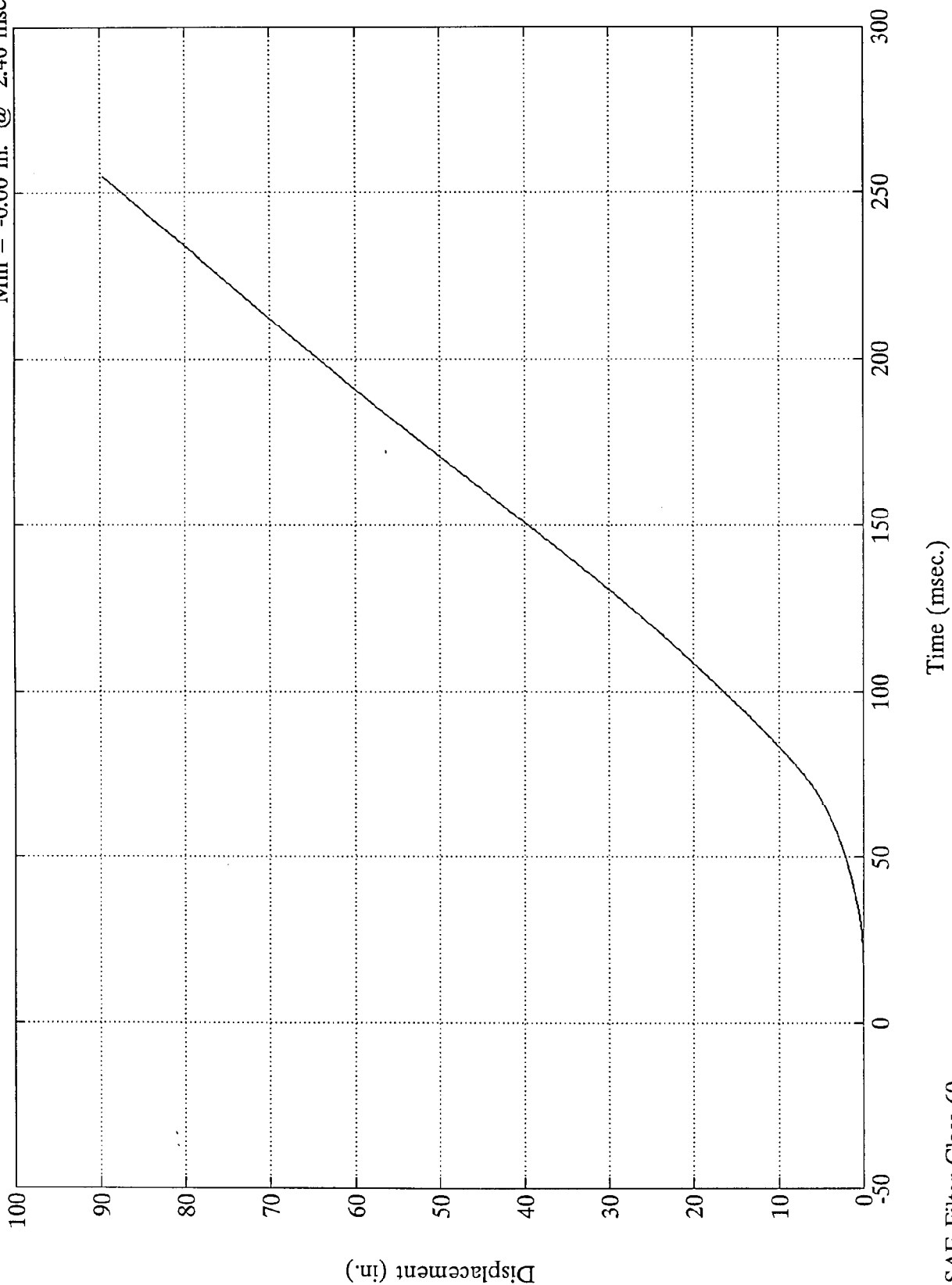
Max = 28.98 mph @ 157.20 msec
Min = -0.00 mph @ 1.44 msec



TSC 301 TEST 6 - REAR IMPACT

Acc. #3 Engine Top

Max = 89.60 in. @ 254.88 msec
Min = -0.00 in. @ 2.40 msec

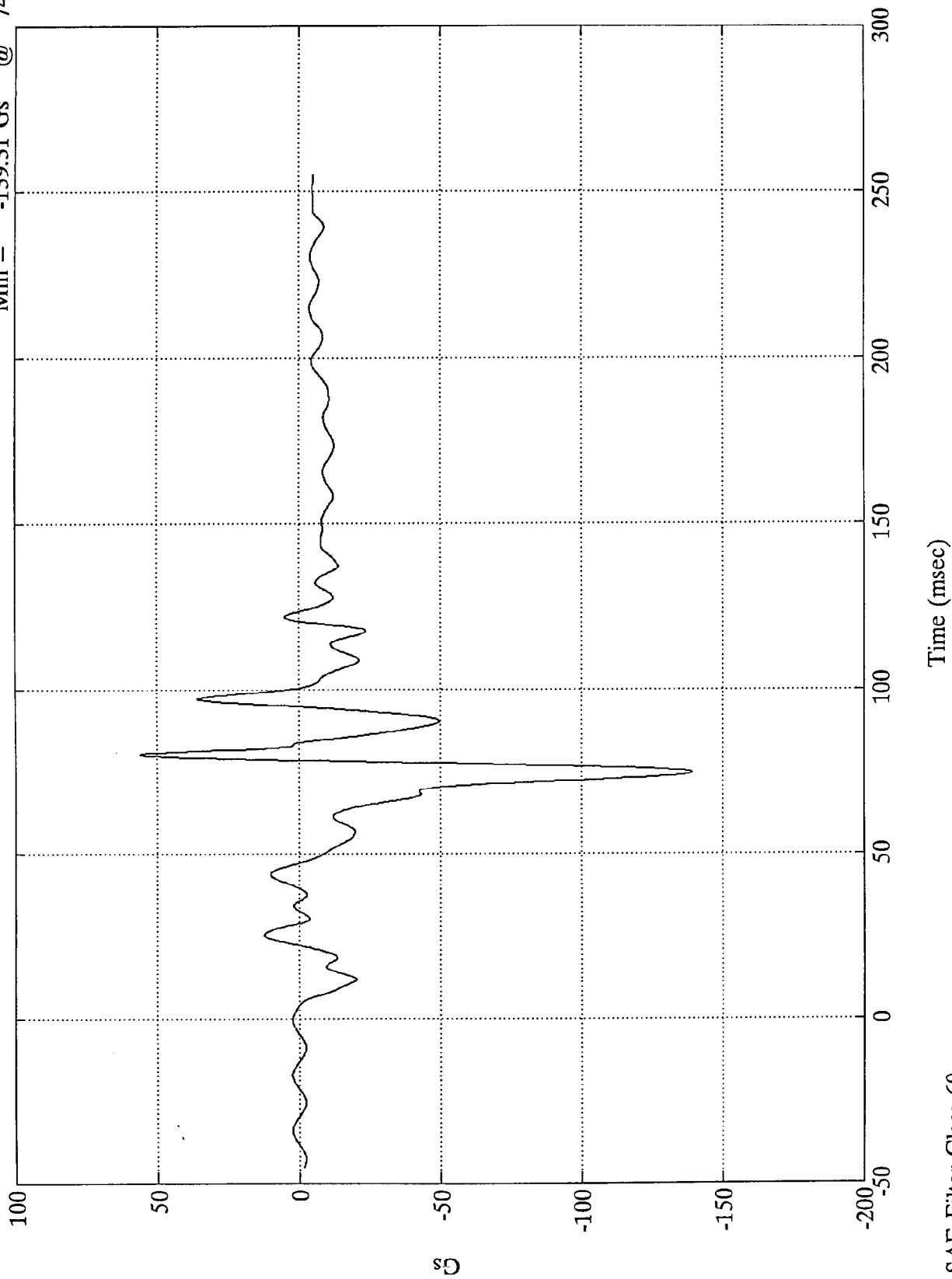


SAE Filter Class 60

TSC 301 TEST 6 - REAR IMPACT

Acc. #4 L.F. Seat Back

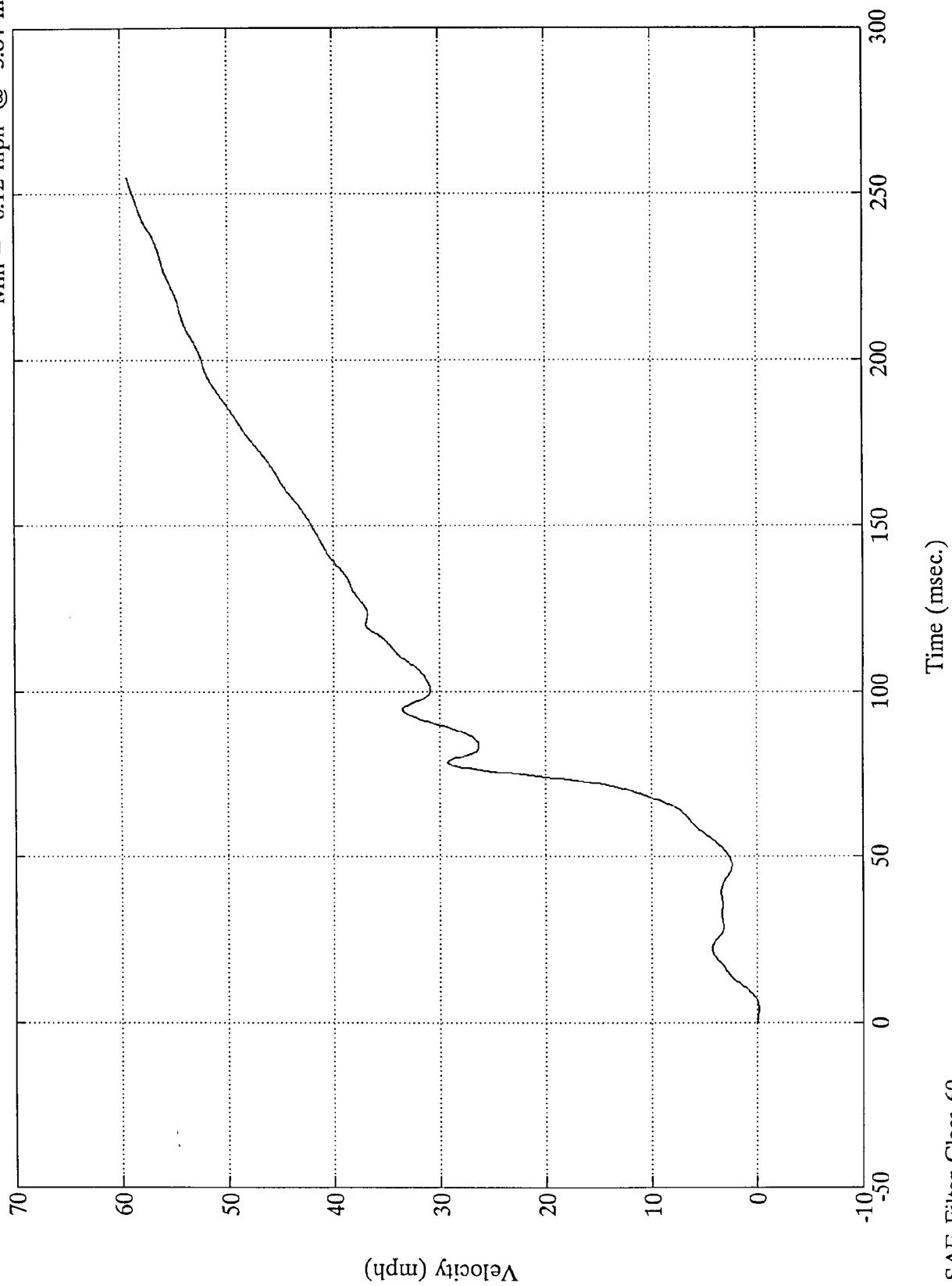
Max = 56.01 Gs @ 80.15 msec
 Min = -139.31 Gs @ 74.51 msec



TSC 301 TEST 6 - REAR IMPACT

Acc. #4 L.F. Seat Back

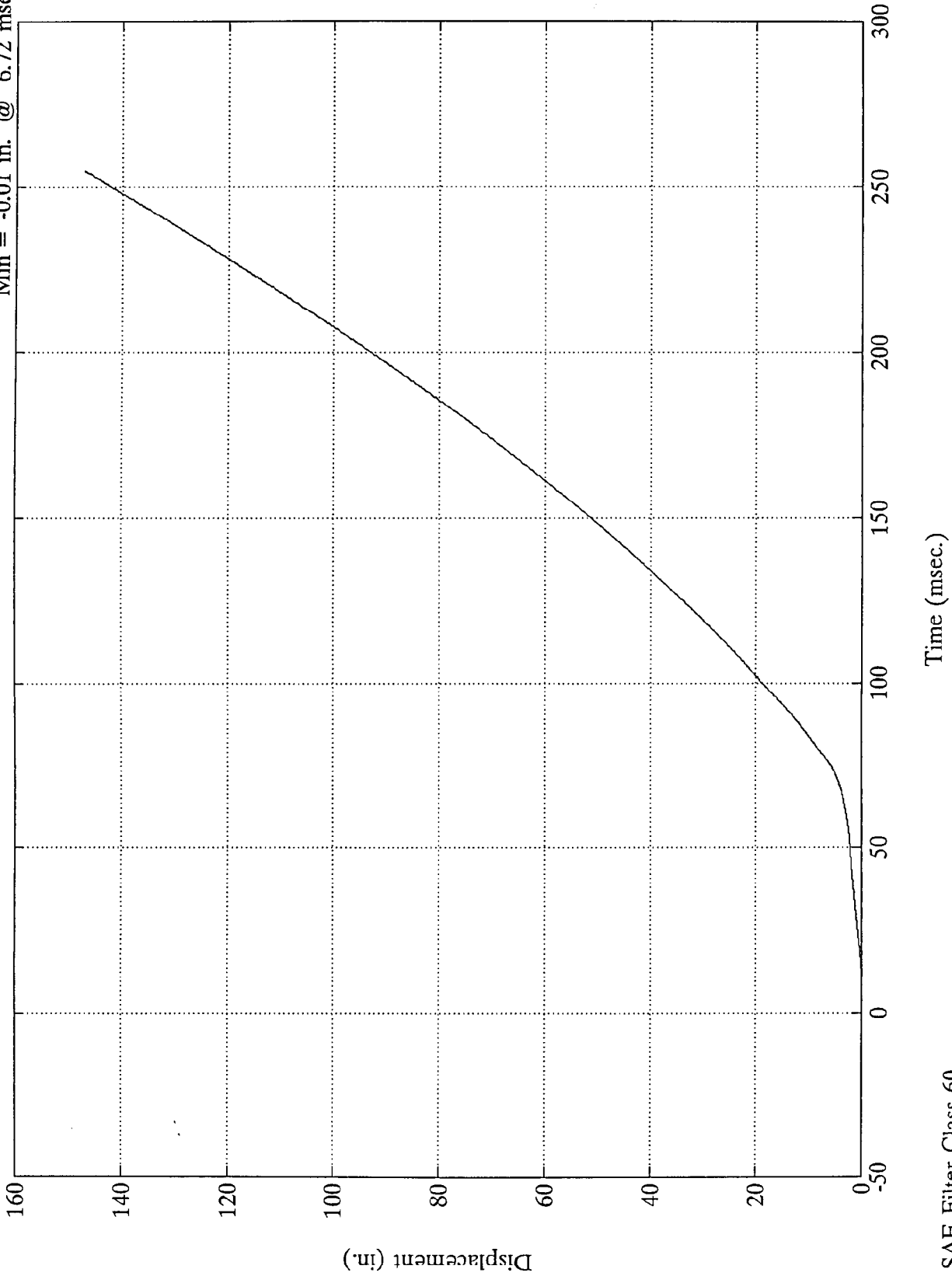
Max = 59.36 mph @ 254.88 msec
Min = -0.12 mph @ 3.84 msec



TSC 301 TEST 6 - REAR IMPACT

Acc. #4 L.F. Seat Back

Max = 147.10 in. @ 254.88 msec
Min = -0.01 in. @ 6.72 msec

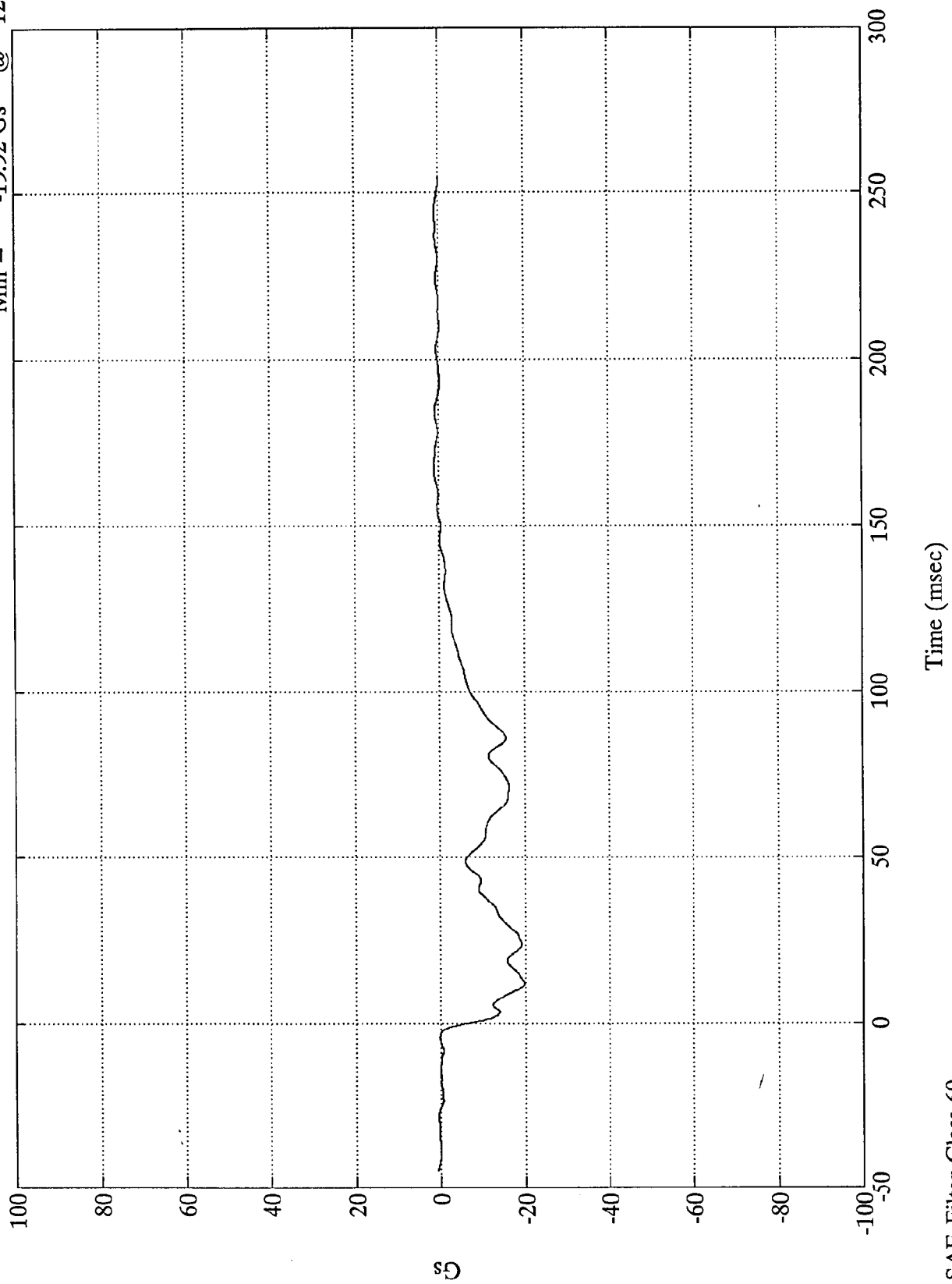


SAE Filter Class 60

TSC 301 TEST 6 - REAR IMPACT

MDB Left Rail

Max = 1.09 Gs @ 168.36 msec
Min = -19.92 Gs @ 12.11 msec



B-15

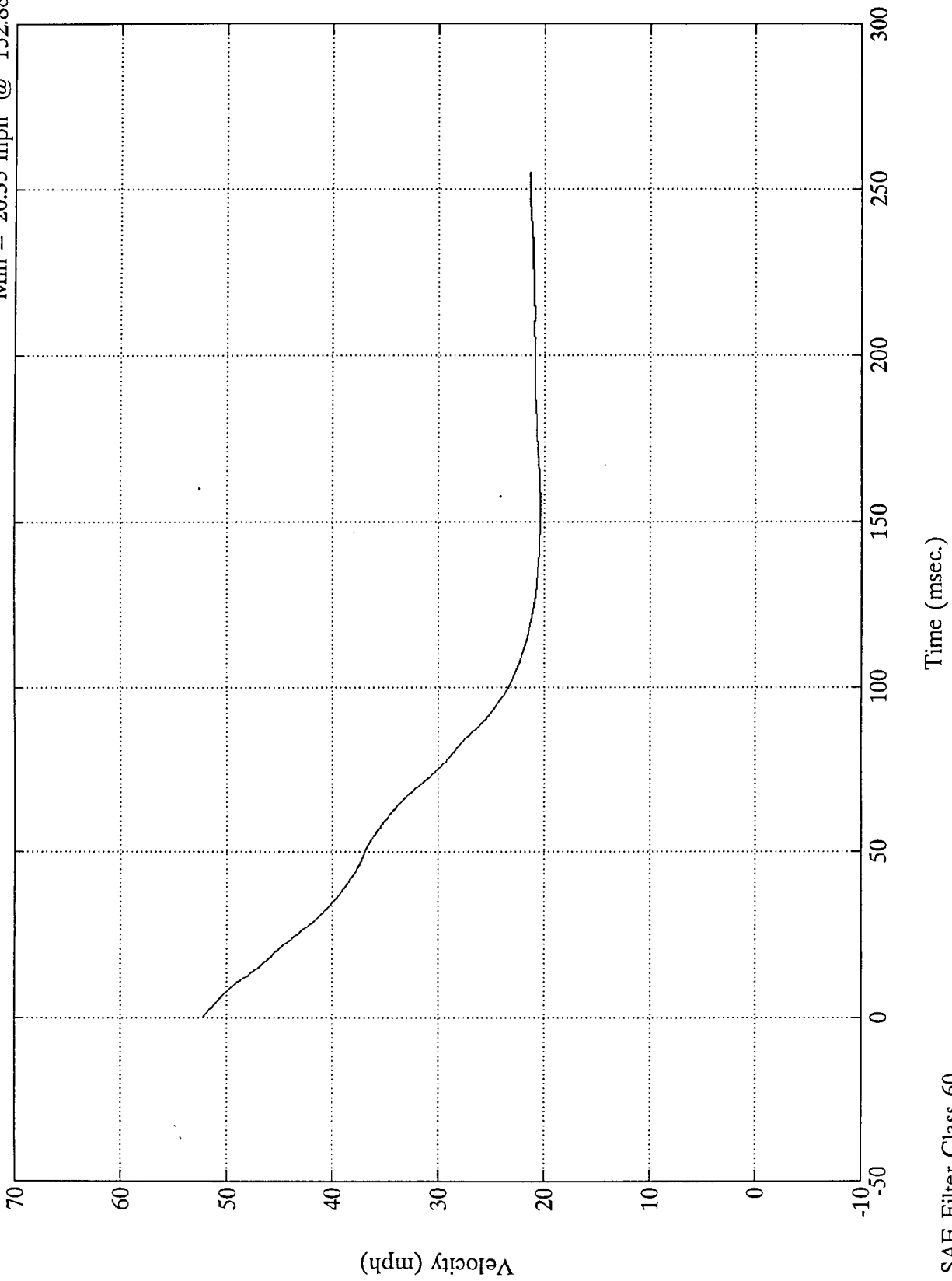
8102-6

SAE Filter Class 60

TSC 301 TEST 6 - REAR IMPACT

Max = 52.20 mph @ -0.00 msec
Min = 20.35 mph @ 152.88 msec

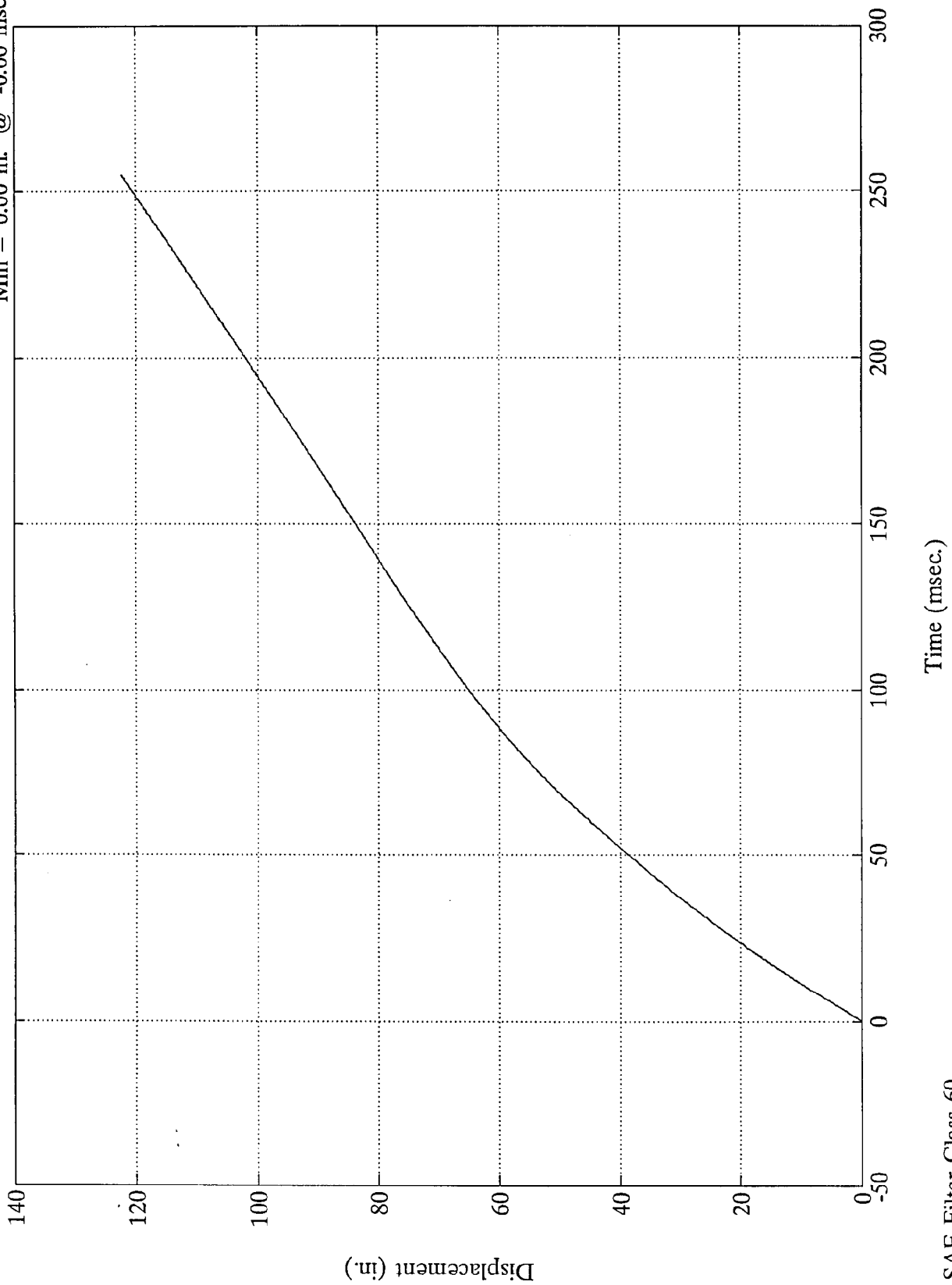
MDB Left Rail



TSC 301 TEST 6 - REAR IMPACT

MDB Left Rail

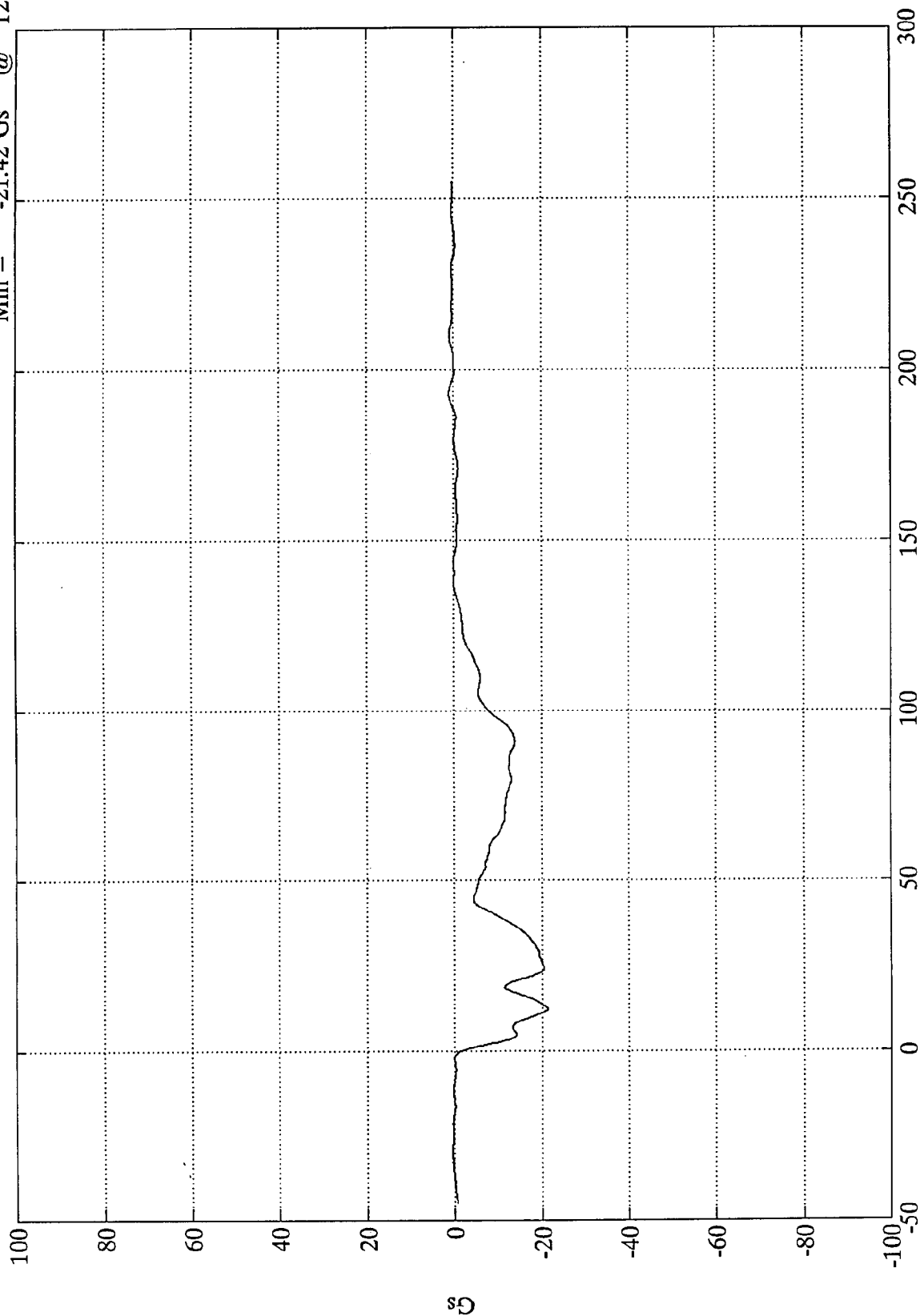
Max = 122.30 in. @ 254.88 msec
Min = 0.00 in. @ -0.00 msec



TSC 301 TEST 6 - REAR IMPACT

Max = 1.08 Gs @ 192.96 msec
 Min = -21.42 Gs @ 12.11 msec

MBD Right Rail



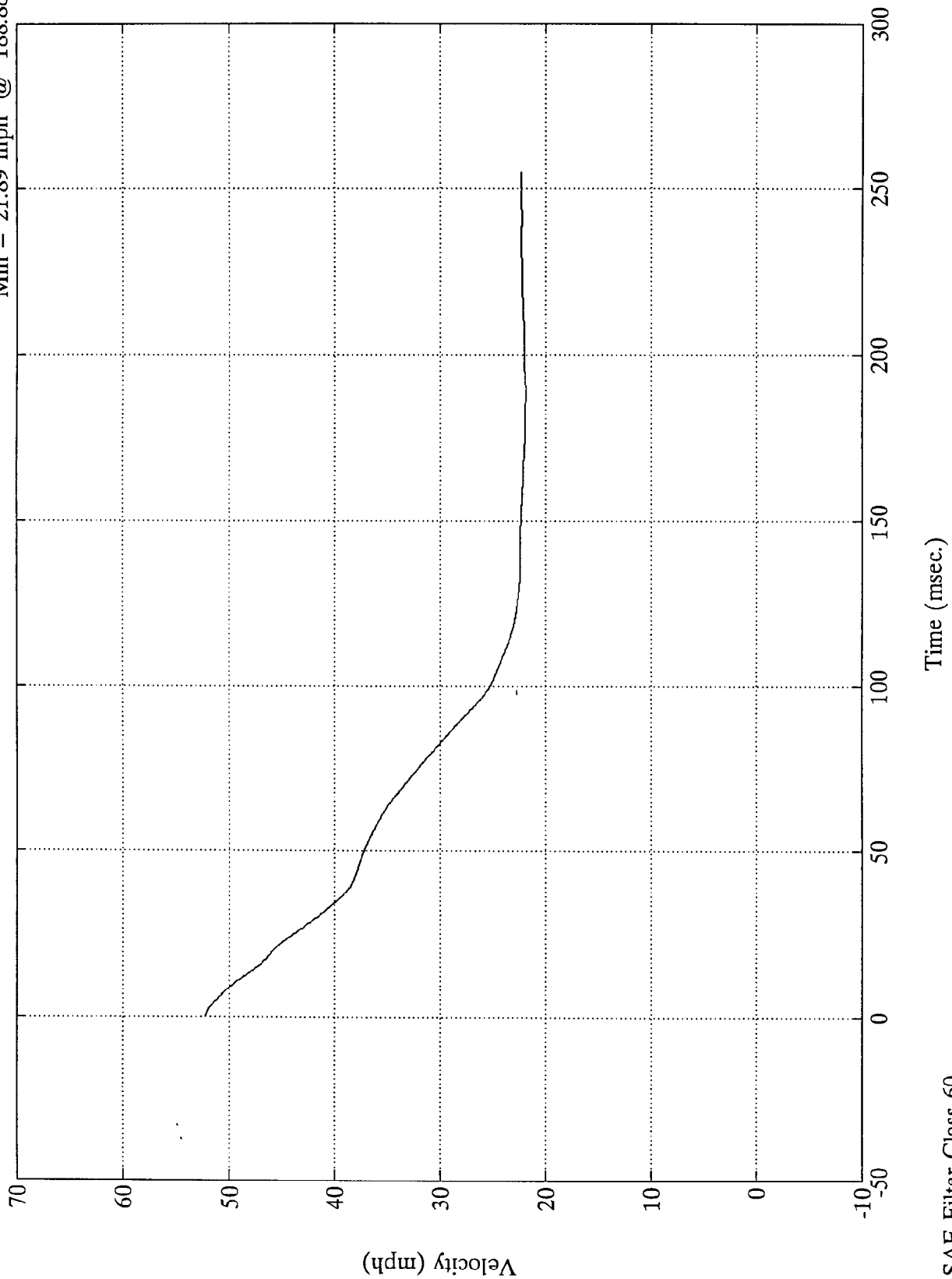
Time (msec)

SAE Filter Class 60

TSC 301 TEST 6 - REAR IMPACT

MDB Right Rail

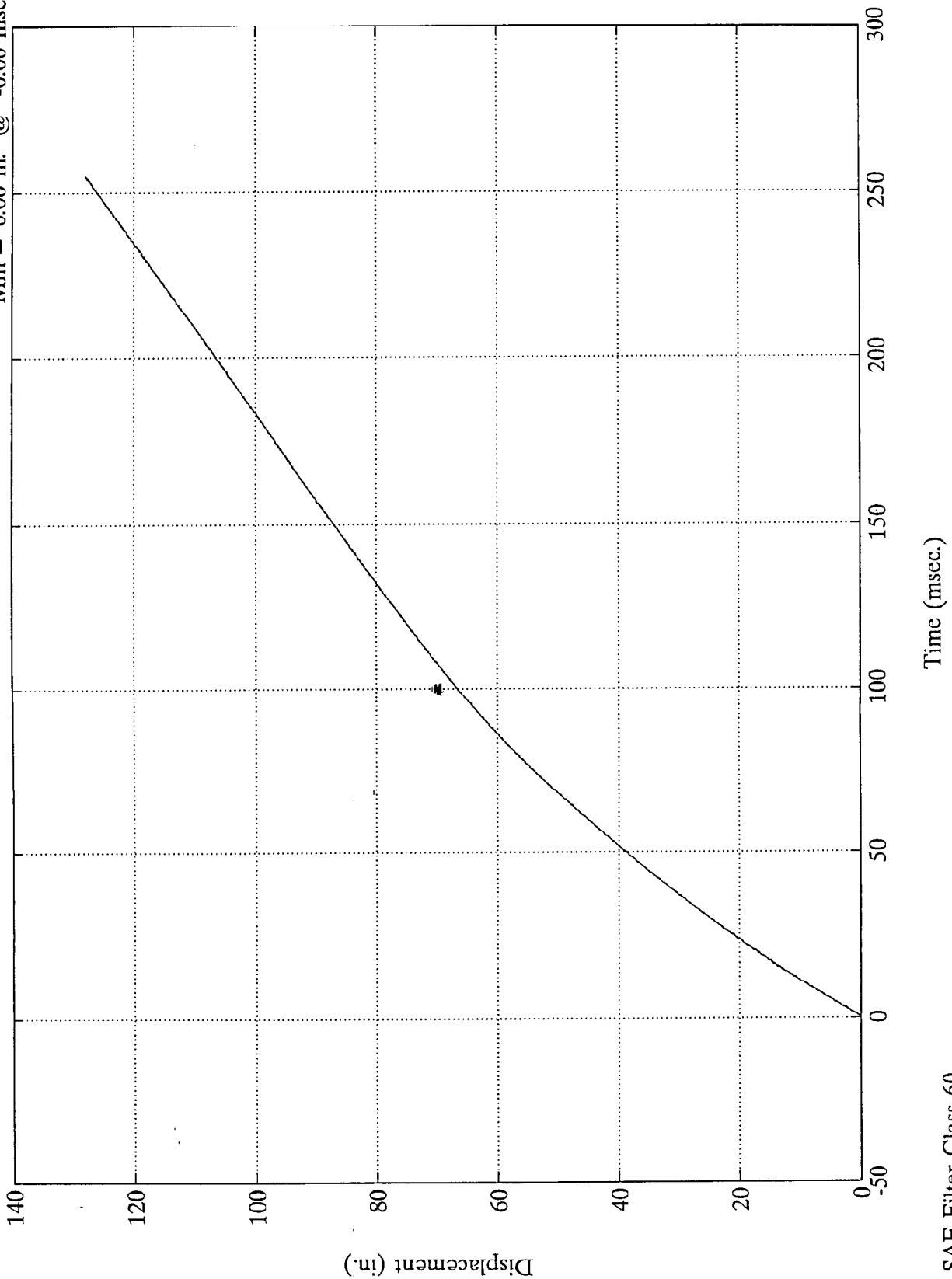
Max = 52.20 mph @ -0.00 msec
Min = 21.89 mph @ 188.88 msec



TSC 301 TEST 6 - REAR IMPACT

MDB Right Rail

Max = 127.90 in. @ 254.88 msec
Min = 0.00 in. @ -0.00 msec



B-20

8102-6

SAE Filter Class 60

TEST NO. Y49-060-1292

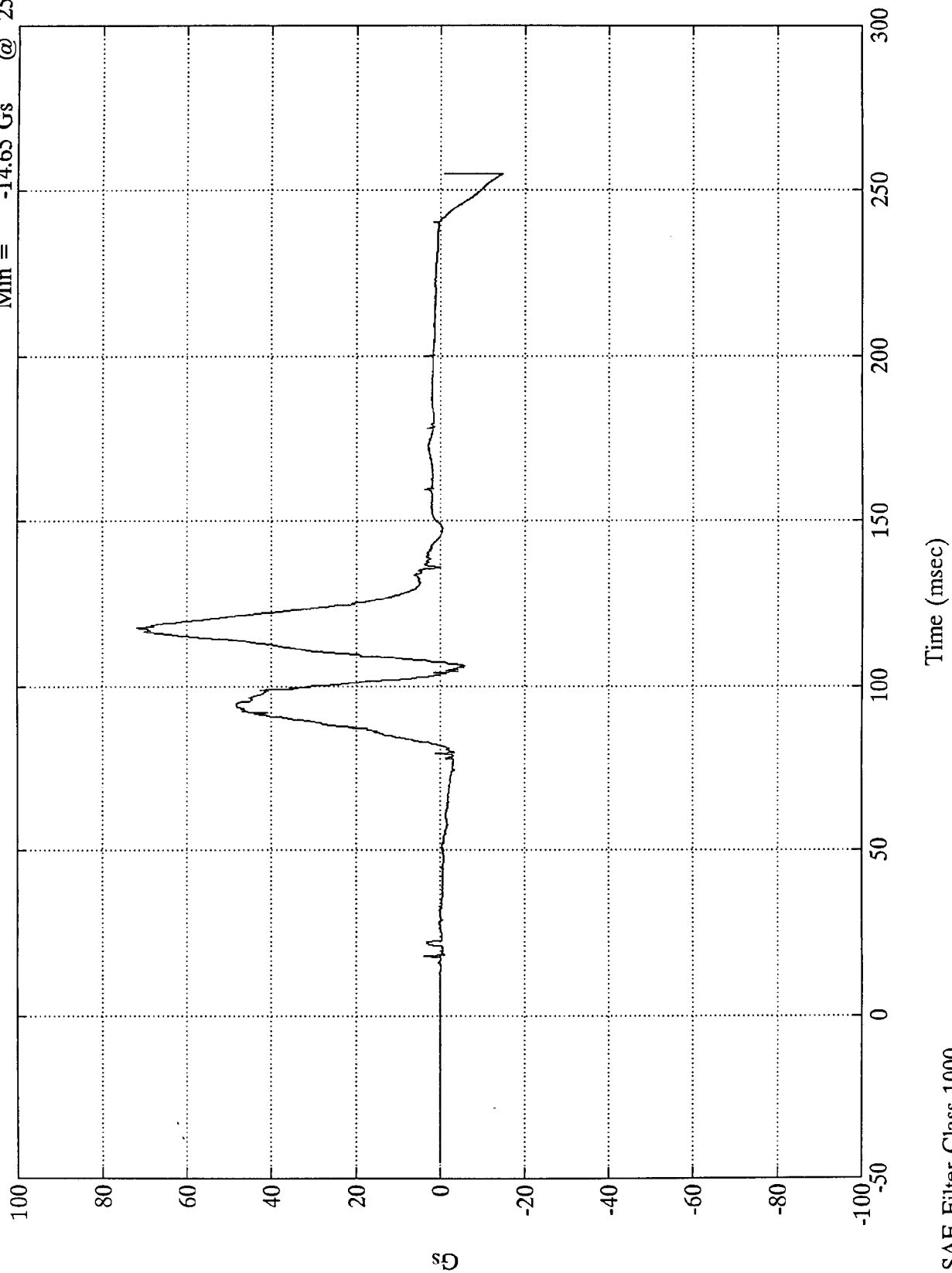
DUMMY DATA

CLASS	FILTER CHANNEL
Head Accelerations	1000
Chest Accelerations	180
Femur Forces	600
Chest Deflection	180
Upper Neck Forces	1000
Upper Neck Moment	600
Upper Tibia Forces, Moments	600

TSC 301 TEST 6 - REAR IMPACT

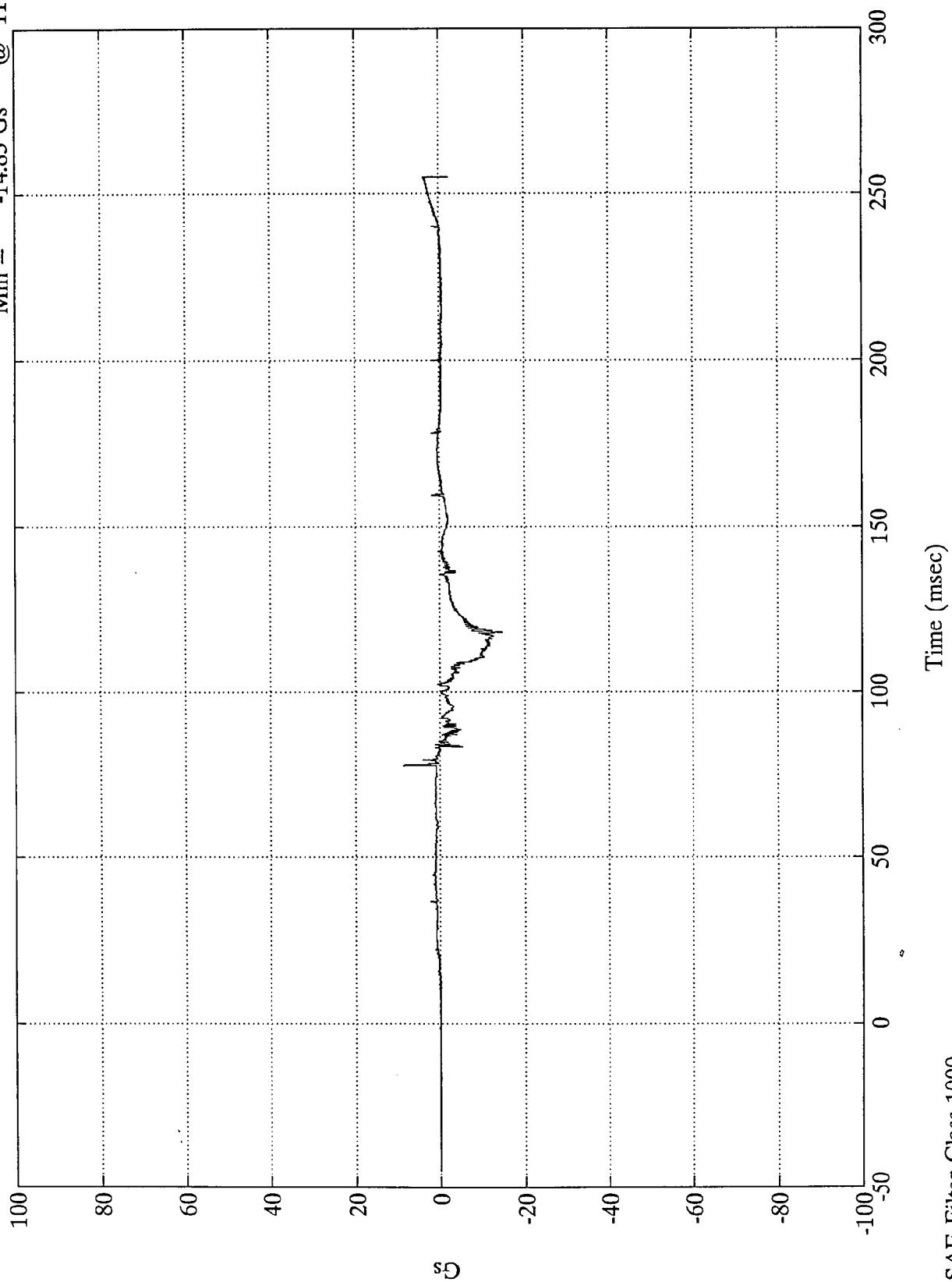
Pos. 1 Head X

Max = 71.75 Gs @ 117.72 msec
Min = -14.65 Gs @ 254.75 msec



TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Head Y
Max = 8.72 Gs @ 77.64 msec
Min = -14.83 Gs @ 117.96 msec



B-23

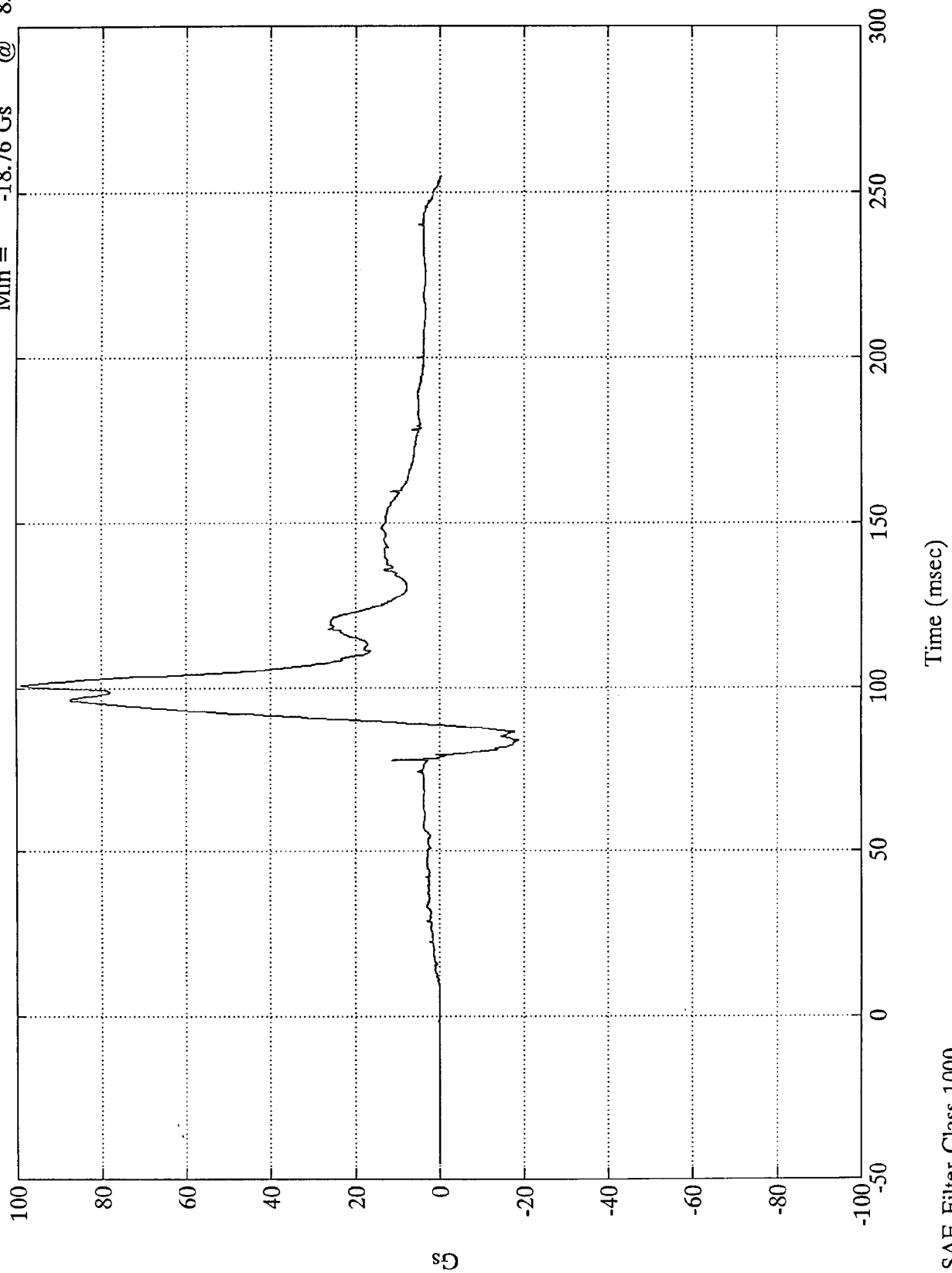
8102-6

SAE Filter Class 1000

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Head Z

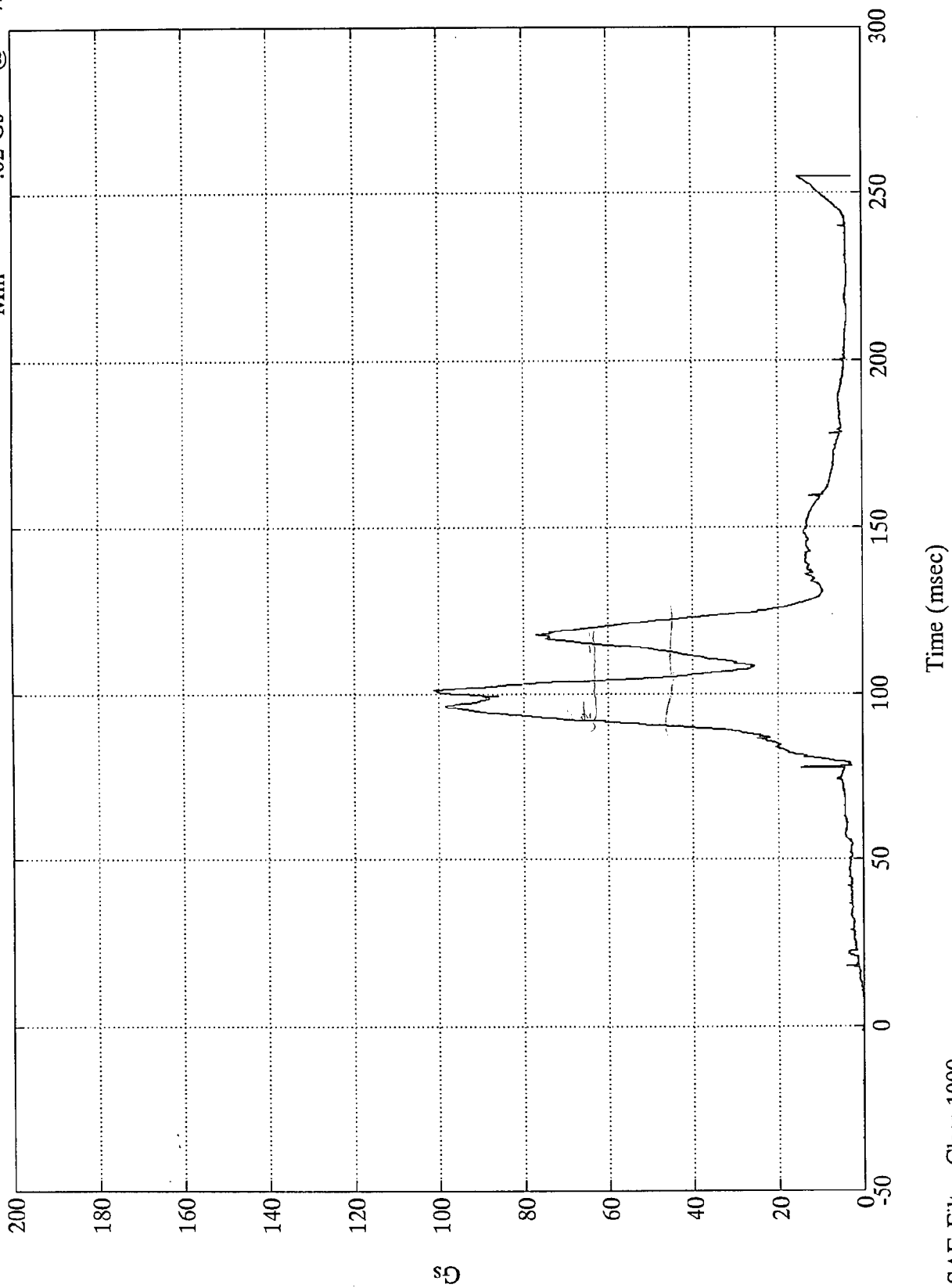
Max = 98.85 Gs @ 100.91 msec
Min = -18.76 Gs @ 83.63 msec



TSC 301 TEST 6 - REAR IMPACT

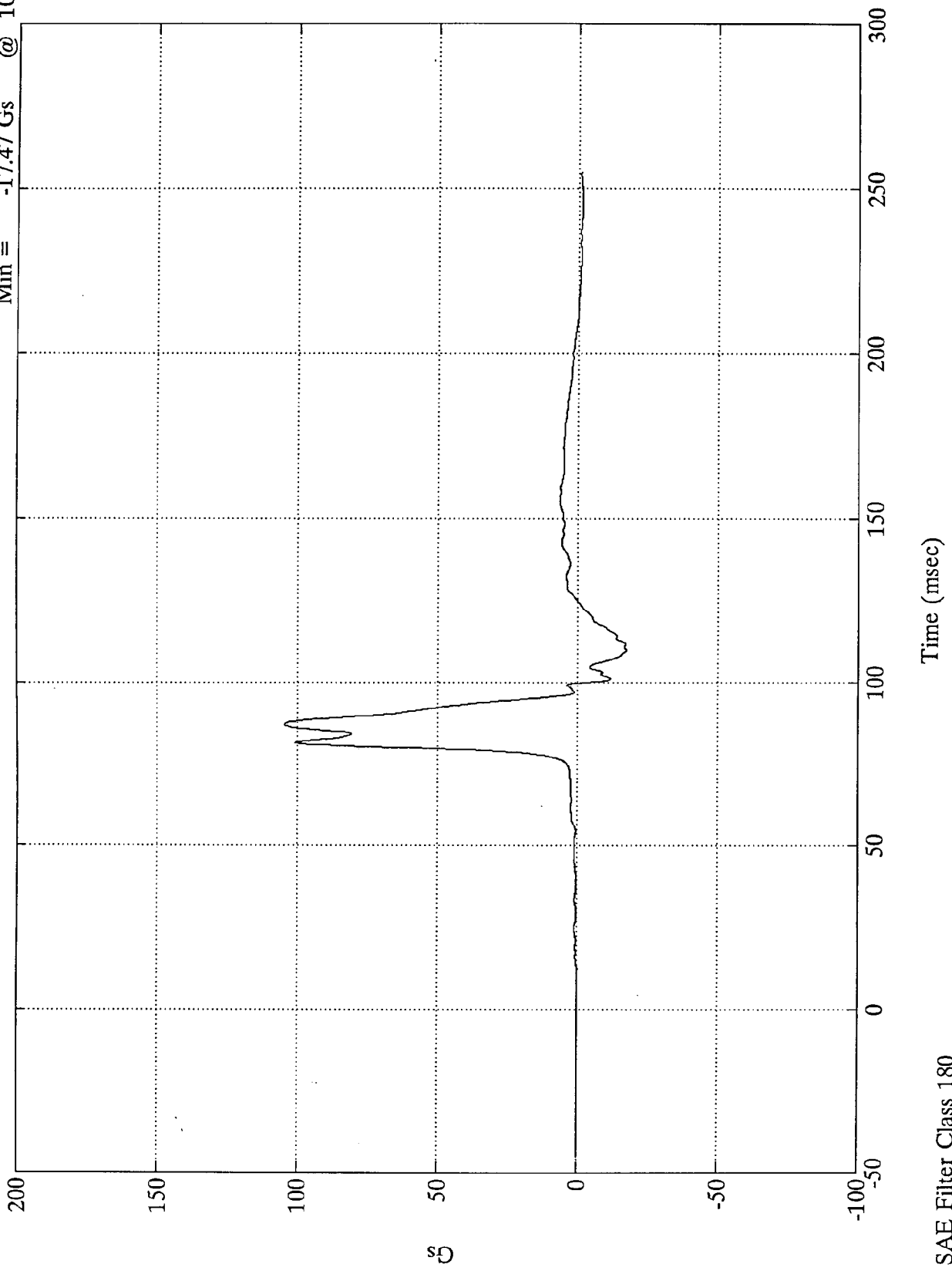
Pos. 1 Head Resultant

Max = 101.22 Gs @ 100.91 msec
Min = .02 Gs @ 7.31 msec



TSC 301 TEST 6 - REAR IMPACT

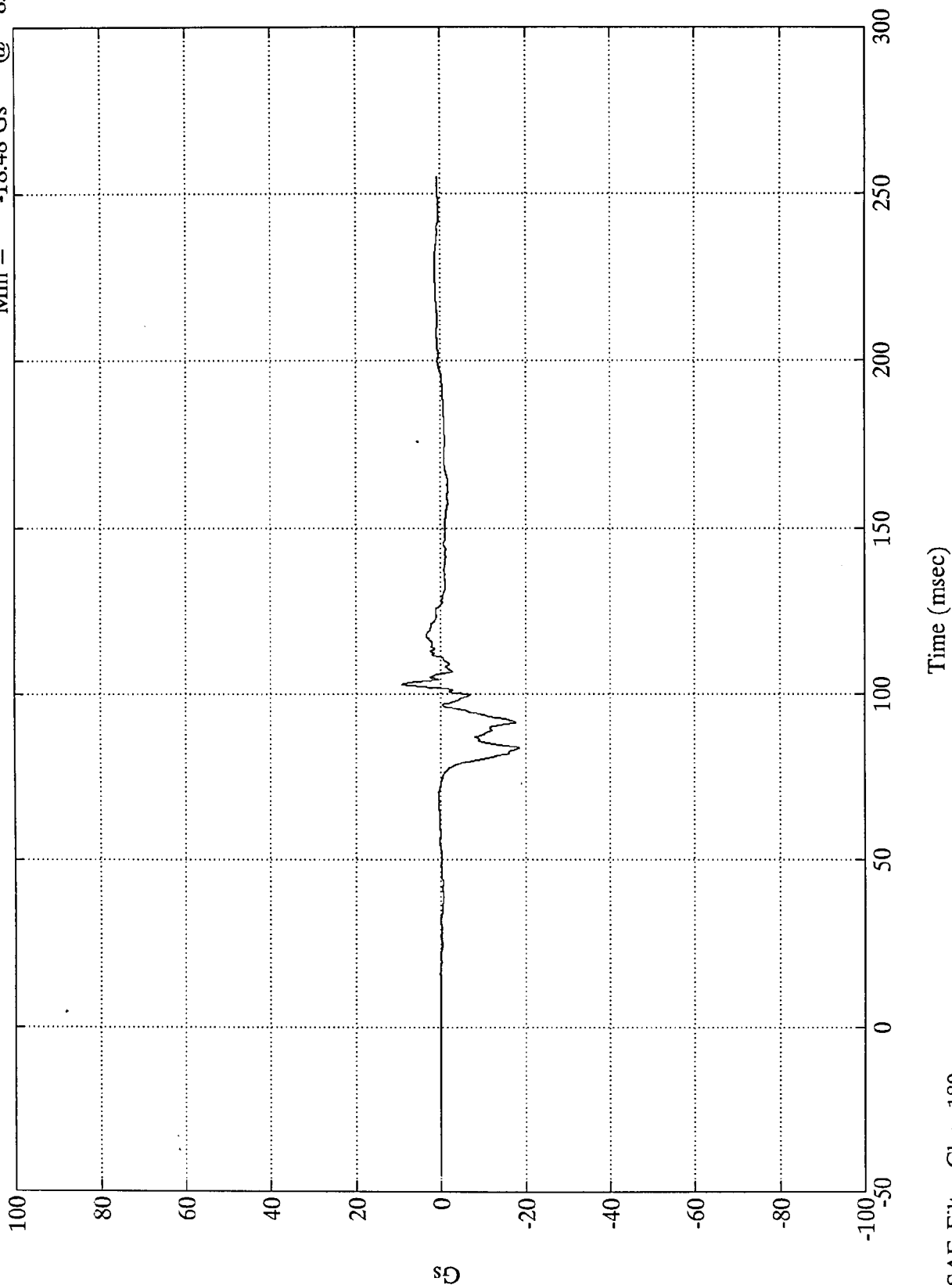
Pos. 1 Chest X
Max = 104.76 Gs @ 86.76 msec
Min = -17.47 Gs @ 109.80 msec



TSC 301 TEST 6 - REAR IMPACT

Max = 9.19 Gs @ 102.83 msec
Min = -18.48 Gs @ 83.28 msec

Pos. 1 Chest Y



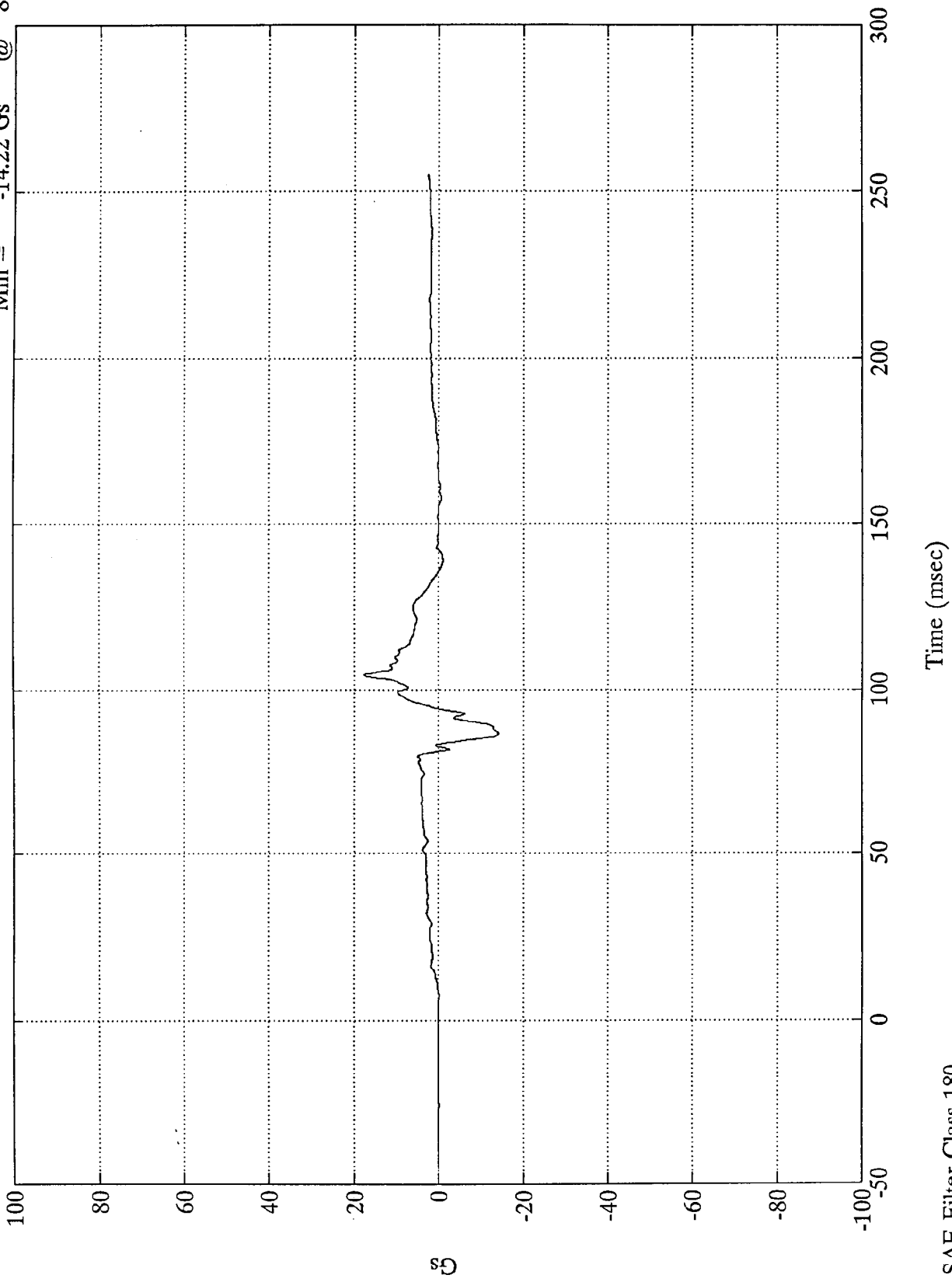
B-27

8102-6

SAE Filter Class 180

TSC 301 TEST 6 - REAR IMPACT

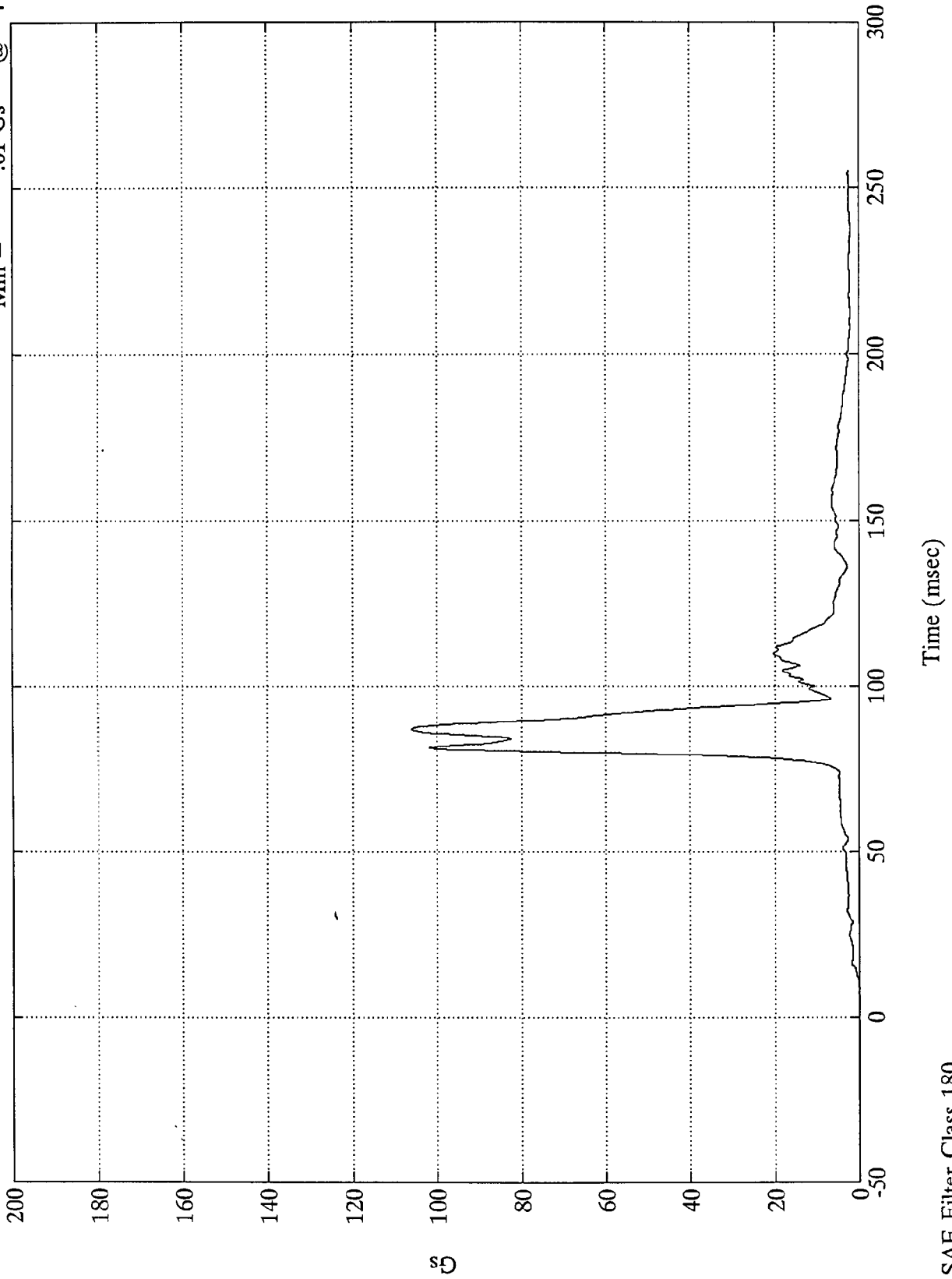
Pos. 1 Chest Z
 Max = 17.62 Gs @ 104.63 msec
 Min = -14.22 Gs @ 86.40 msec



TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Chest Resultant

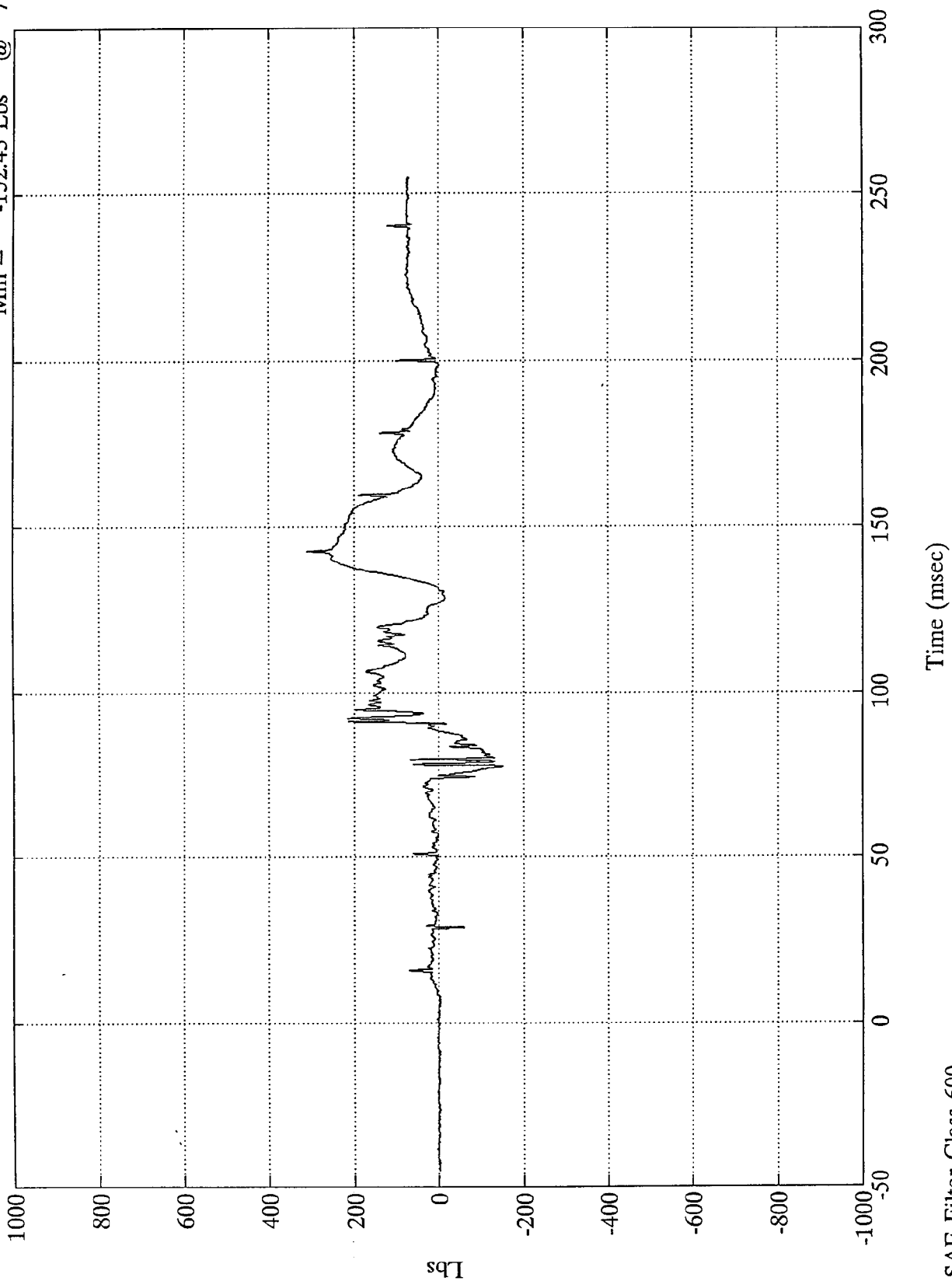
Max = 106.01 Gs @ 86.76 msec
Min = .01 Gs @ -44.04 msec



TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Left Femur

Max = 311.83 Lbs @ 142.68 msec
Min = -152.43 Lbs @ 77.16 msec



B-30

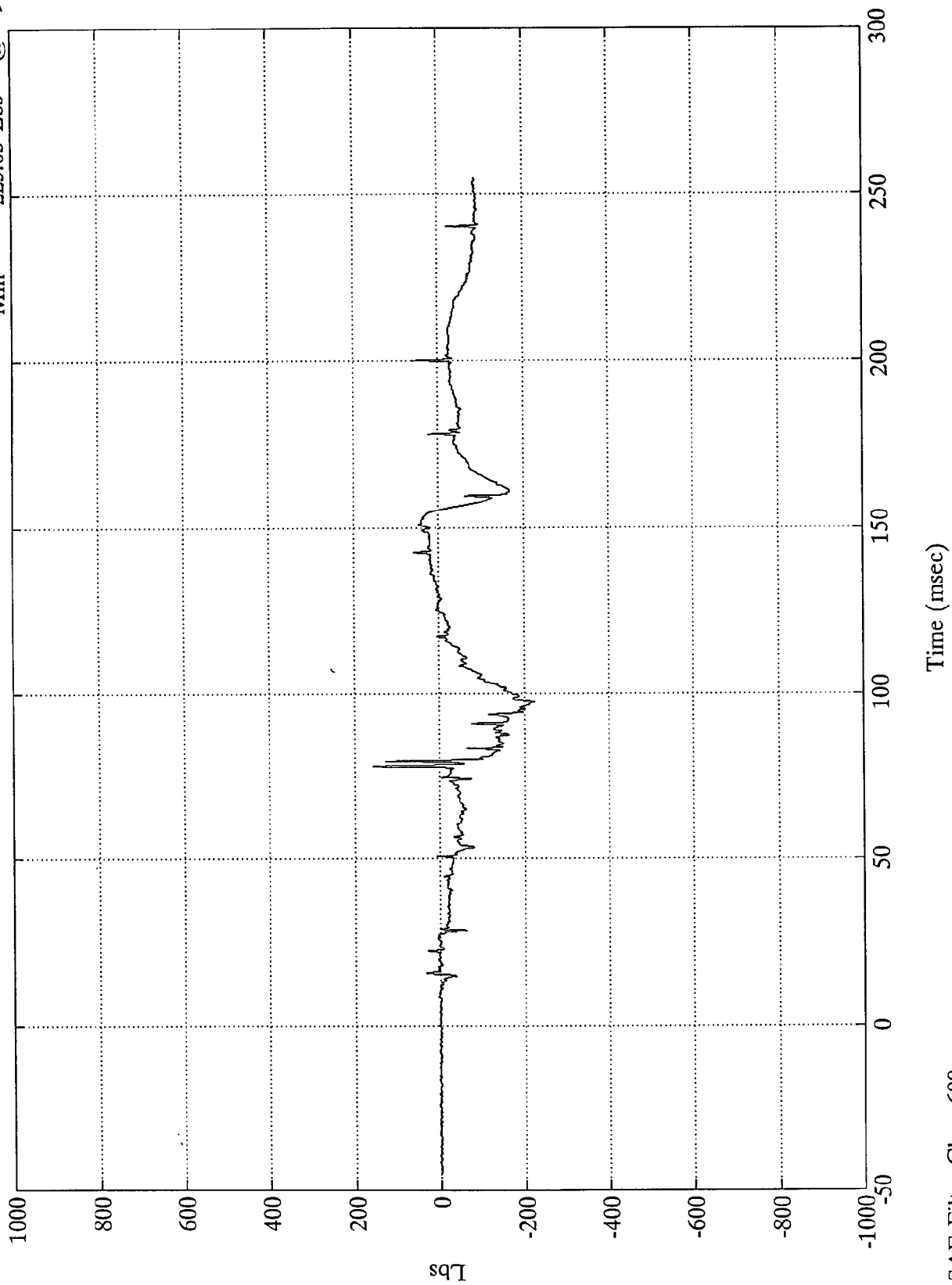
8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Right Femur

Max = 157.05 Lbs @ 77.76 msec
Min = -225.03 Lbs @ 97.19 msec



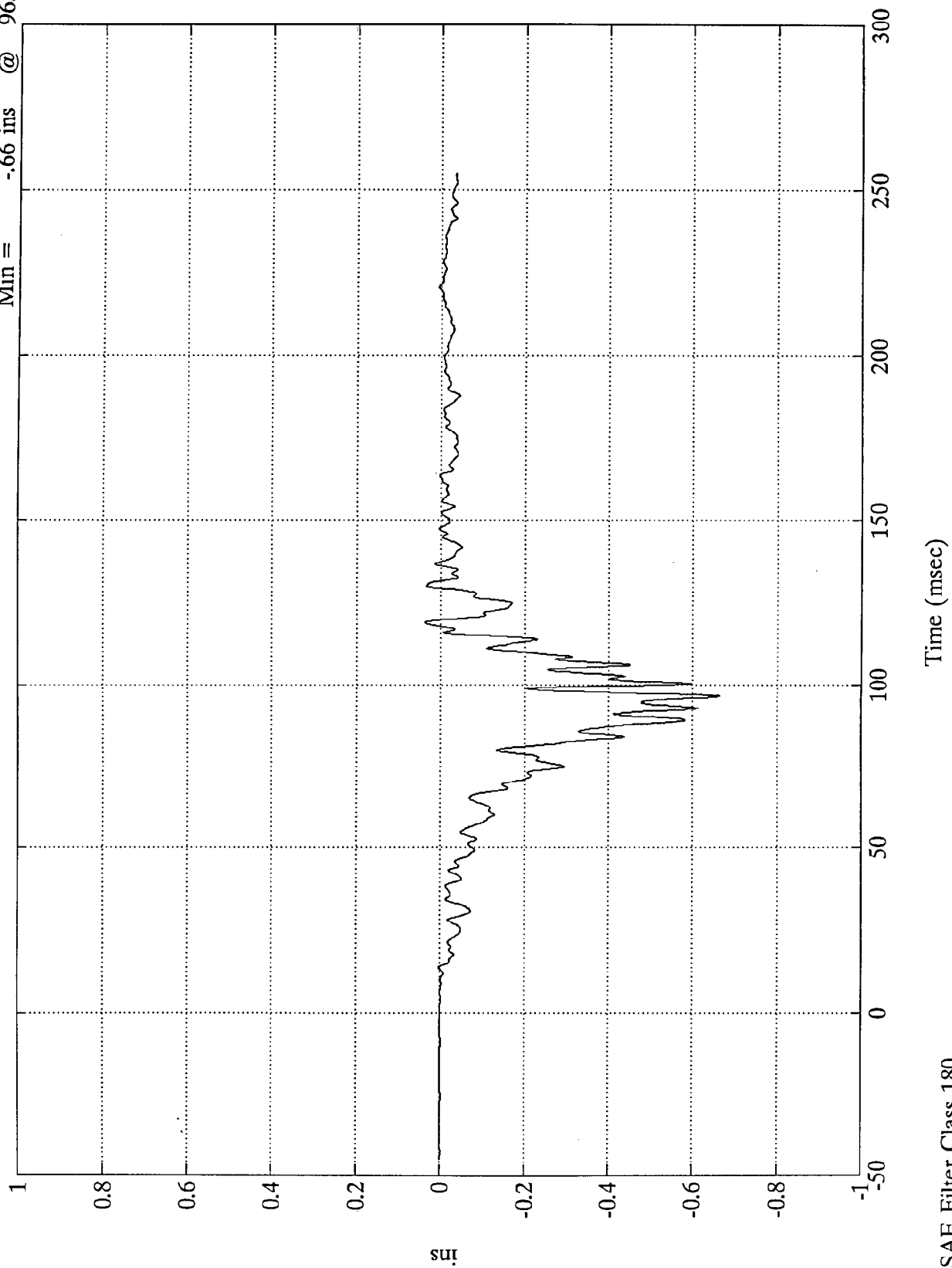
B-31

8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

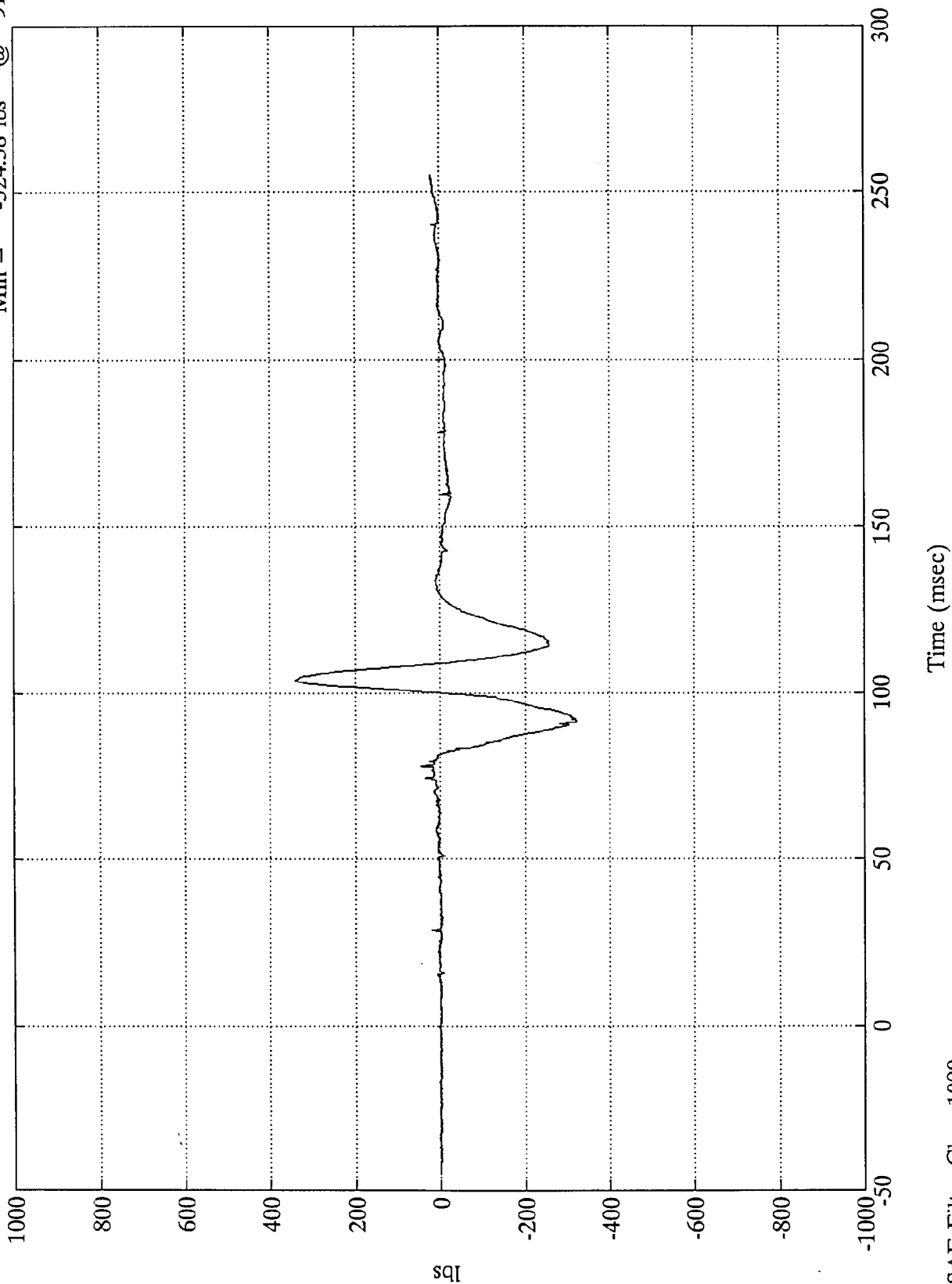
Pos. 1 Chest Deflection
Max = .04 ins @ 119.16 msec
Min = -.66 ins @ 96.23 msec



TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Upper Neck Fx

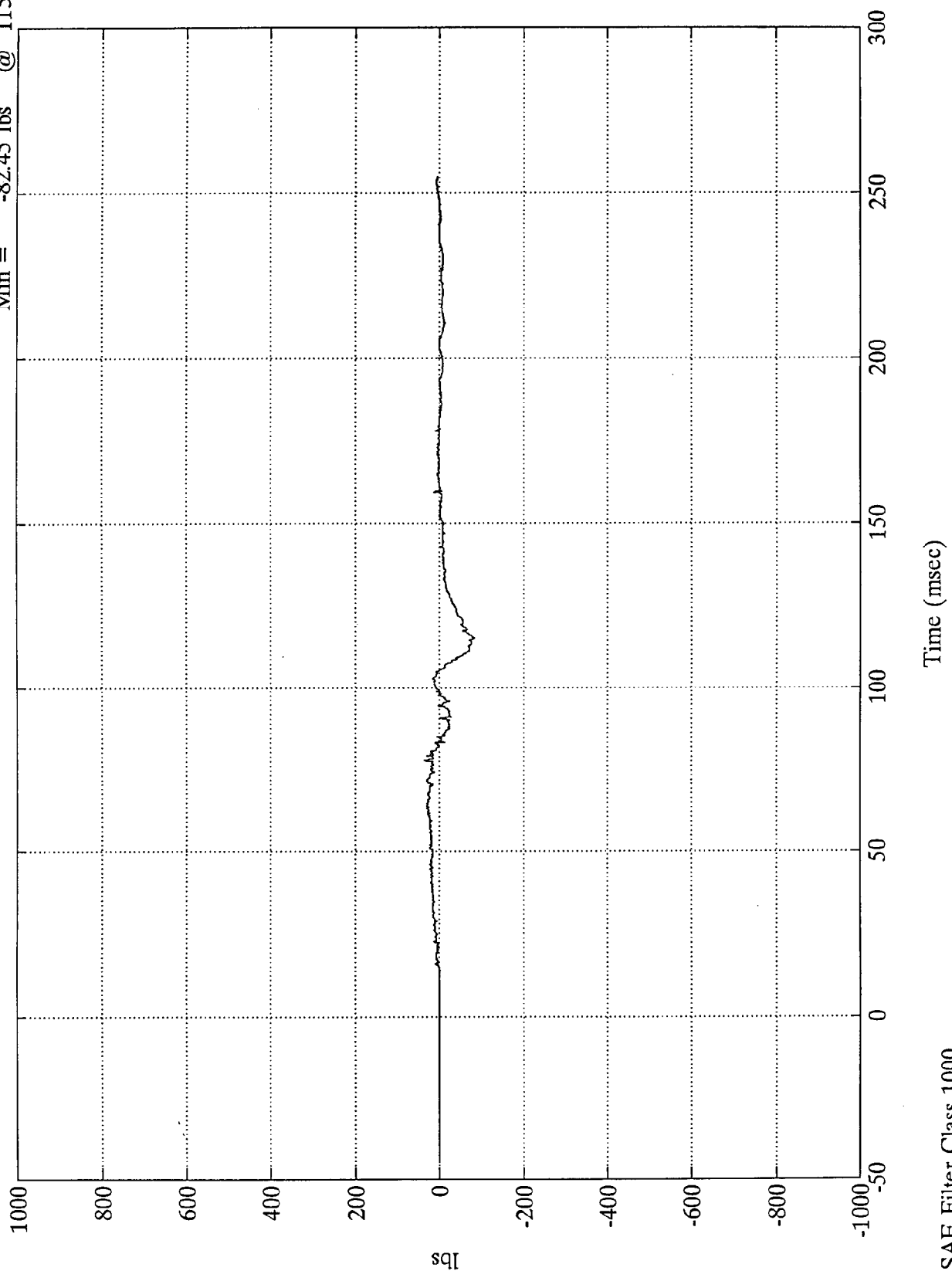
Max = 339.74 lbs @ 103.80 msec
Min = -324.38 lbs @ 91.31 msec



TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Upper Neck Fy

Max = 35.67 lbs @ 77.76 msec
Min = -82.45 lbs @ 115.08 msec

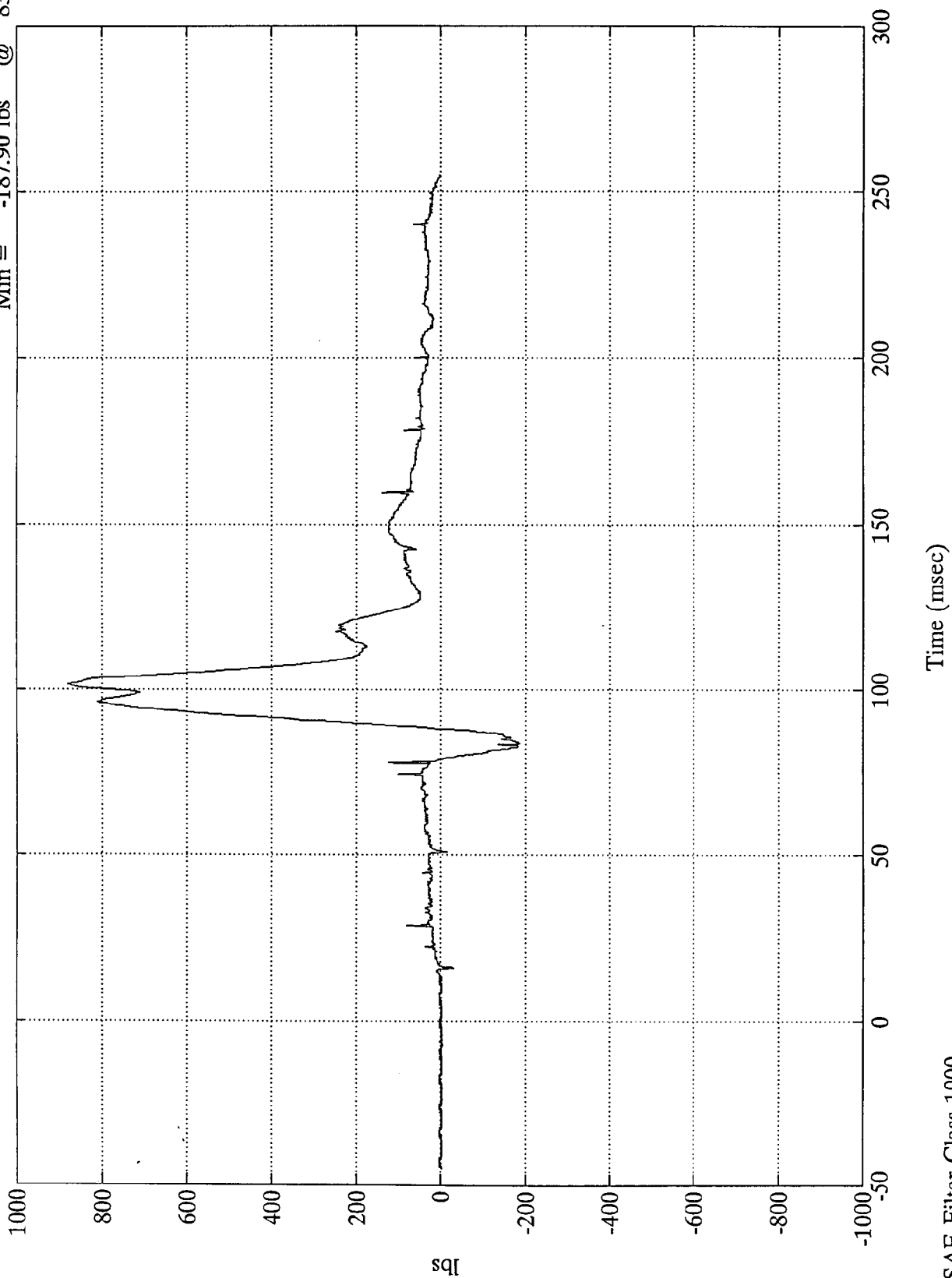


SAE Filter Class 1000

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Upper Neck Fz

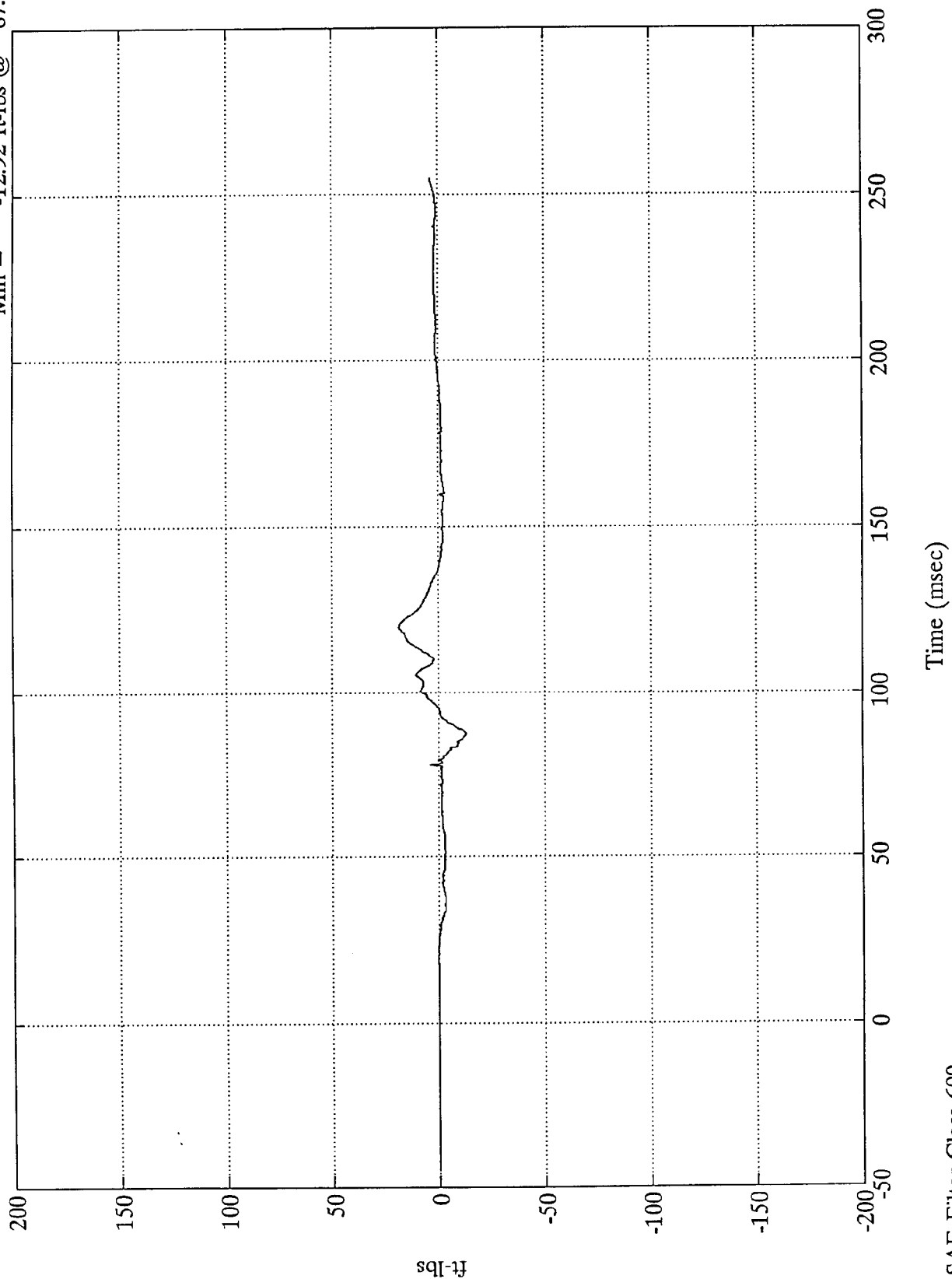
Max = 878.93 lbs @ 101.52 msec
Min = -187.90 lbs @ 83.40 msec



TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Upper Neck Mx

Max = 18.68 ft-lbs @ 119.63 msec
Min = -12.92 ft-lbs @ 87.24 msec

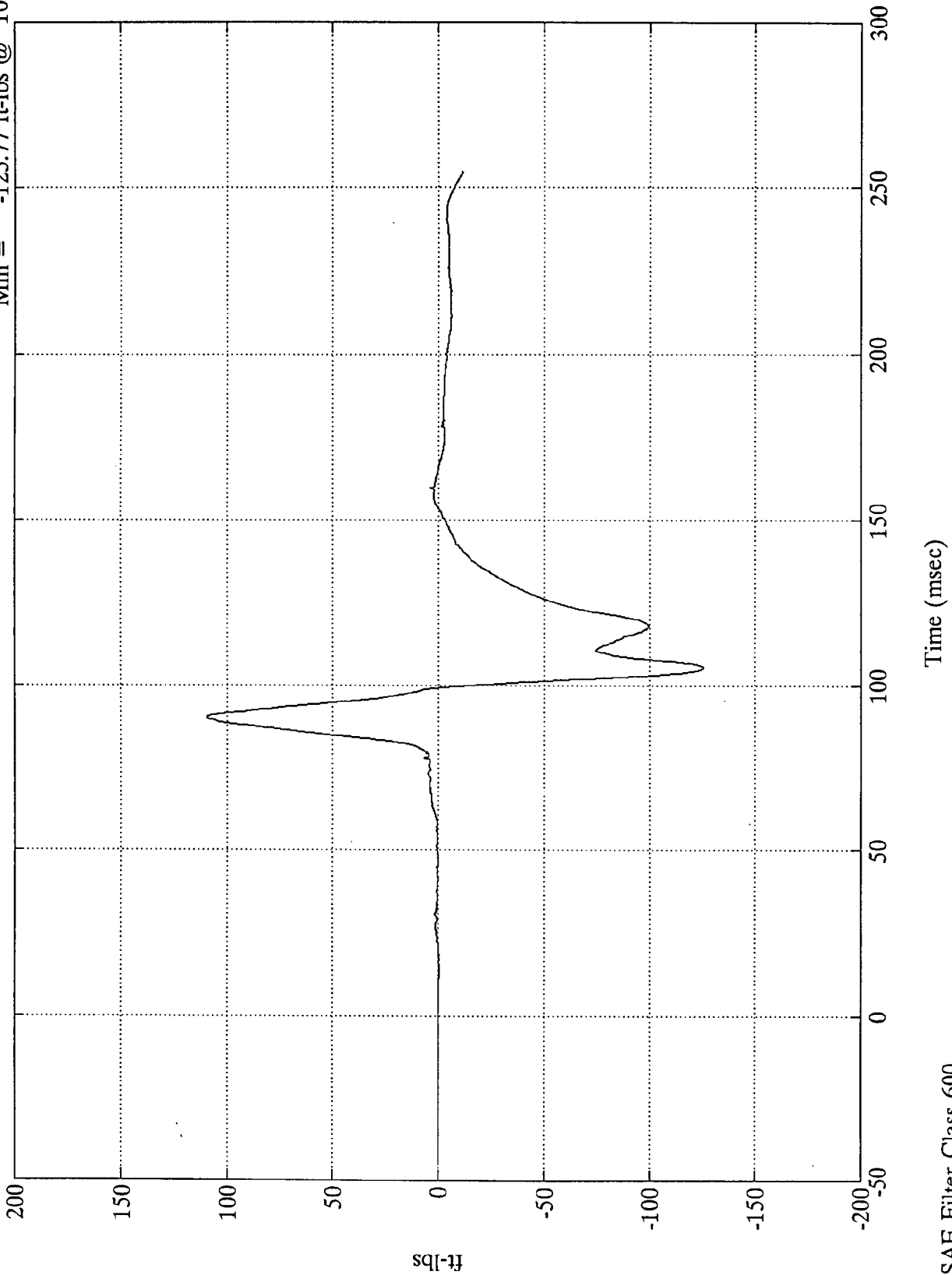


SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Upper Neck My

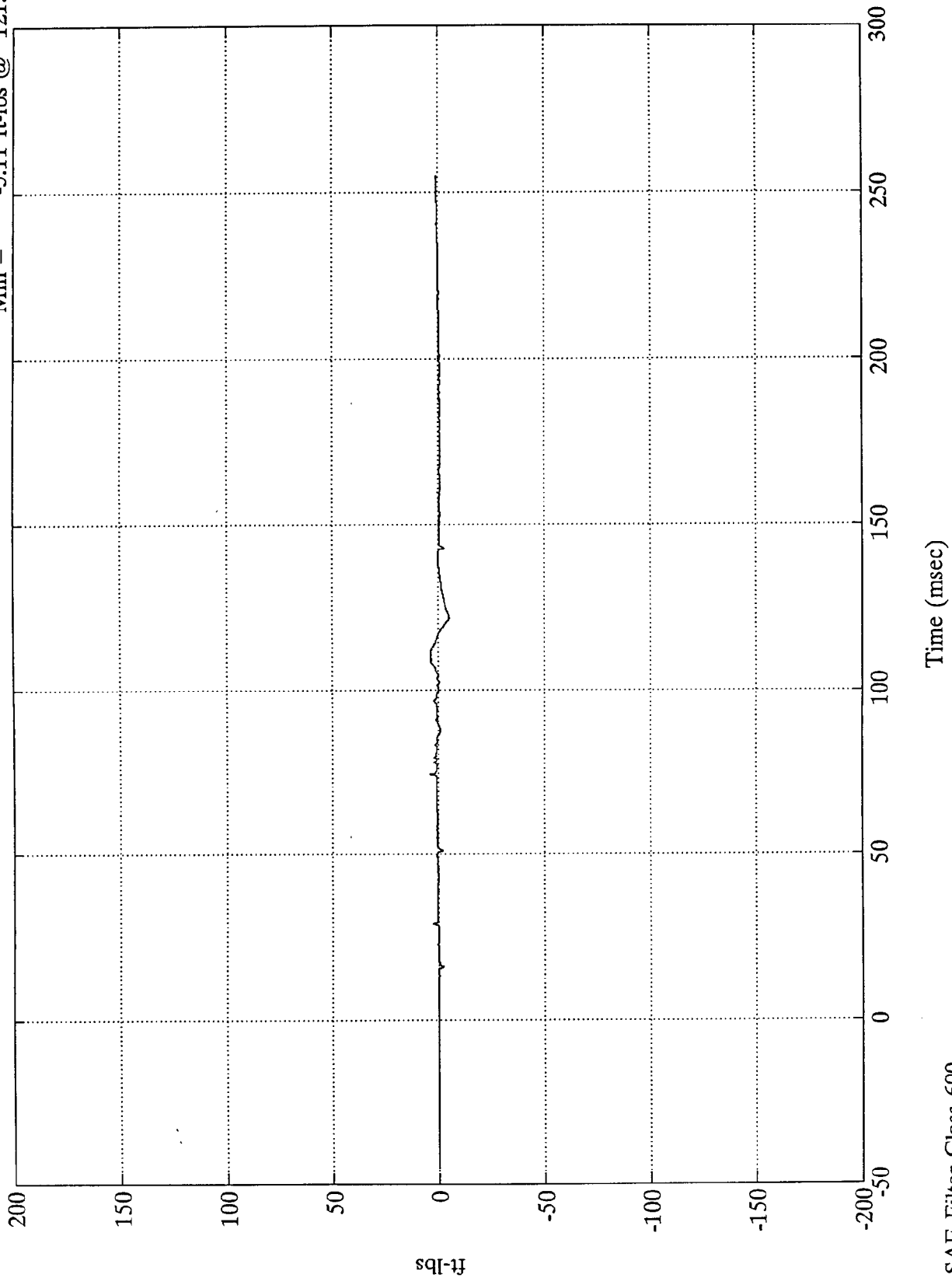
Max = 109.33 ft-lbs @ 90.00 msec
Min = -125.77 ft-lbs @ 105.48 msec



TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Upper Neck Mz

Max = 3.99 ft-lbs @ 74.27 msec
Min = -5.11 ft-lbs @ 121.80 msec



B-38

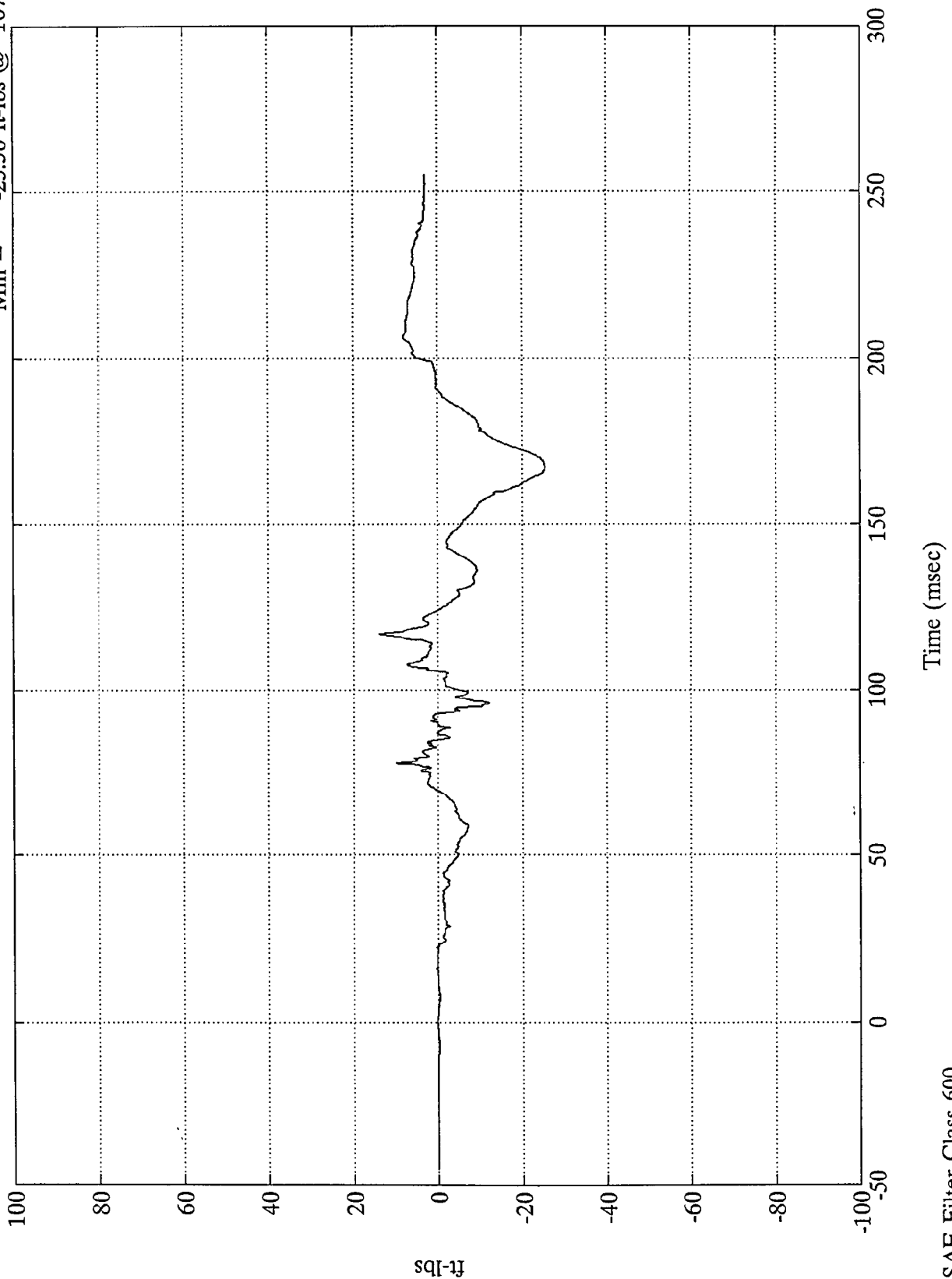
8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Lt Upper Tibia Mx

Max = 13.99 ft-lbs @ 116.76 msec
Min = -25.50 ft-lbs @ 167.16 msec



sq[-1]
ft-lbs
B-39

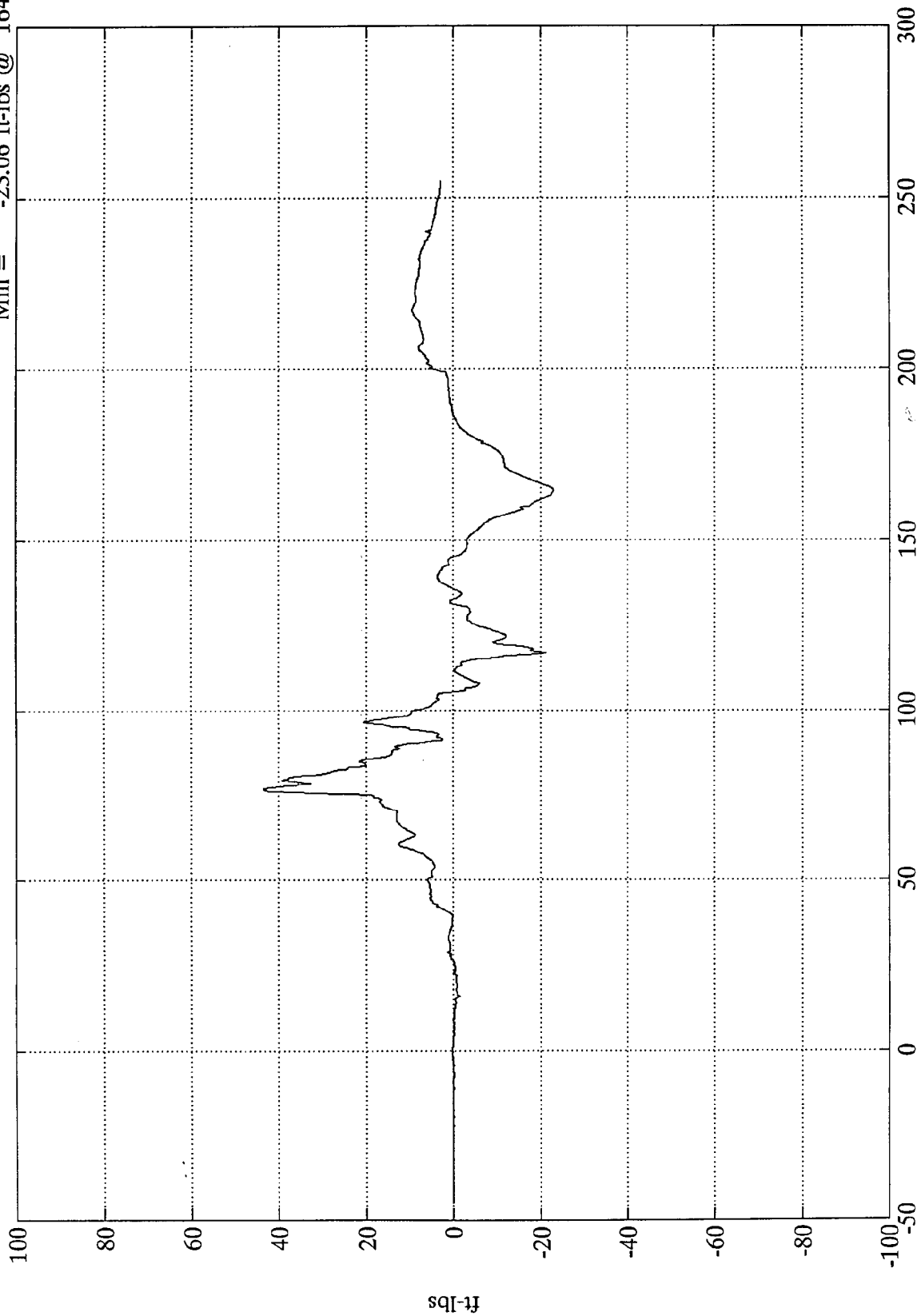
8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Lt Upper Tibia My

Max = 43.42 ft-lbs @ 76.92 msec
Min = -23.06 ft-lbs @ 164.64 msec



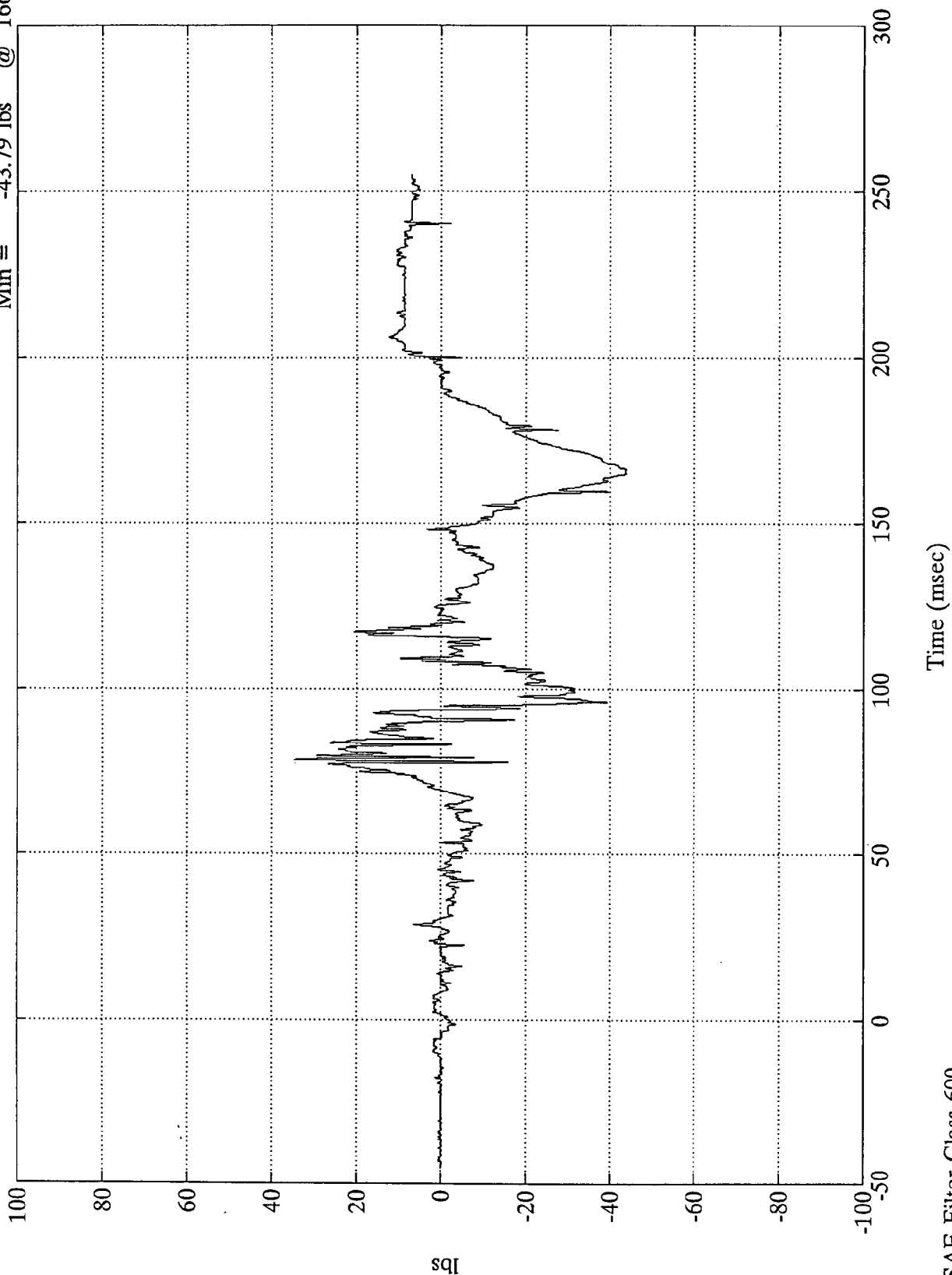
Time (msec)

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Lt Lower Tibia Fy

Max = 34.68 lbs @ 78.48 msec
Min = -43.79 lbs @ 166.32 msec



sqi
B-41

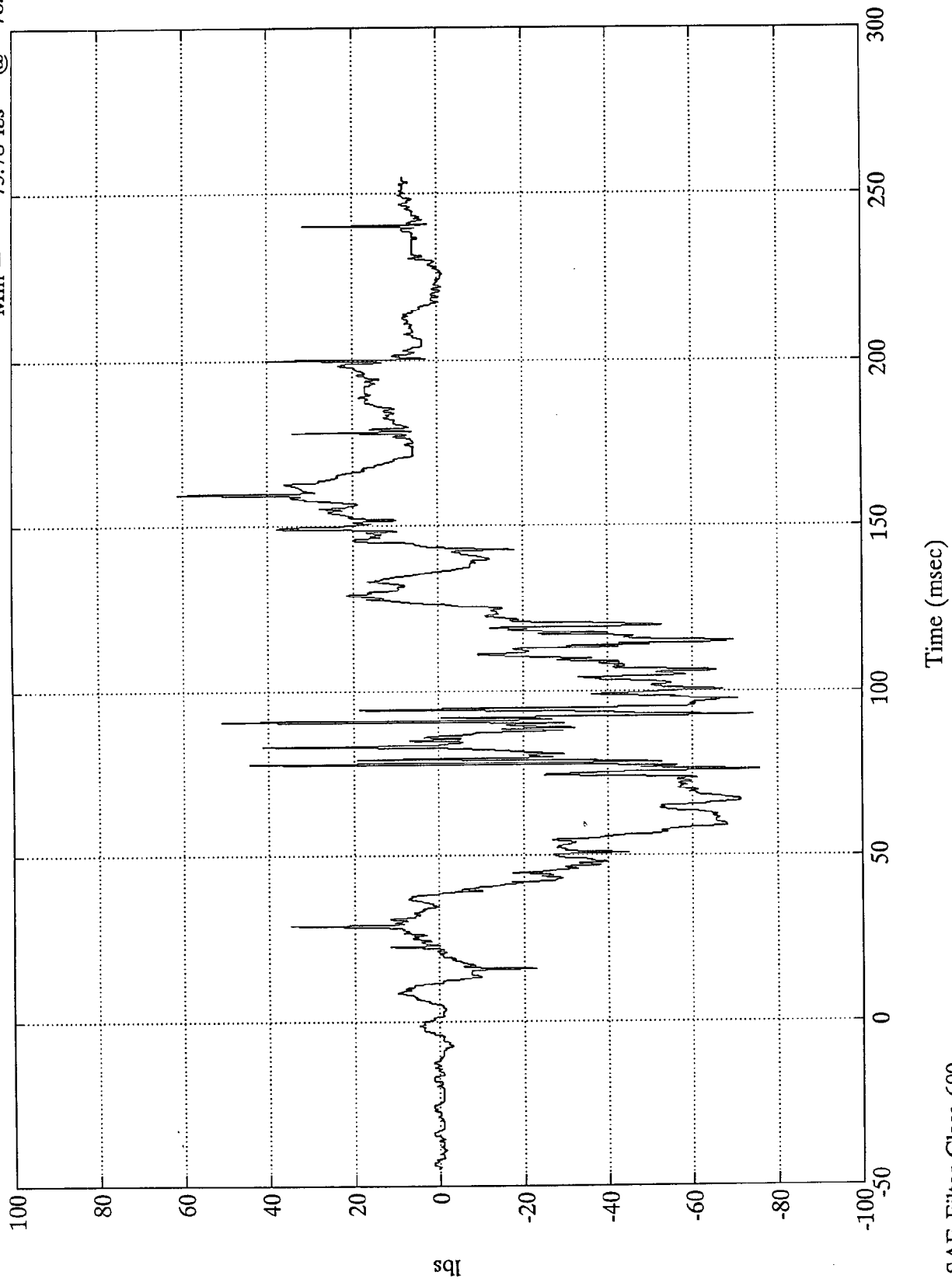
8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Lt Lower Tibia Fz

Max = 61.13 lbs @ 159.72 msec
Min = -75.78 lbs @ 76.08 msec



sqi
B-42

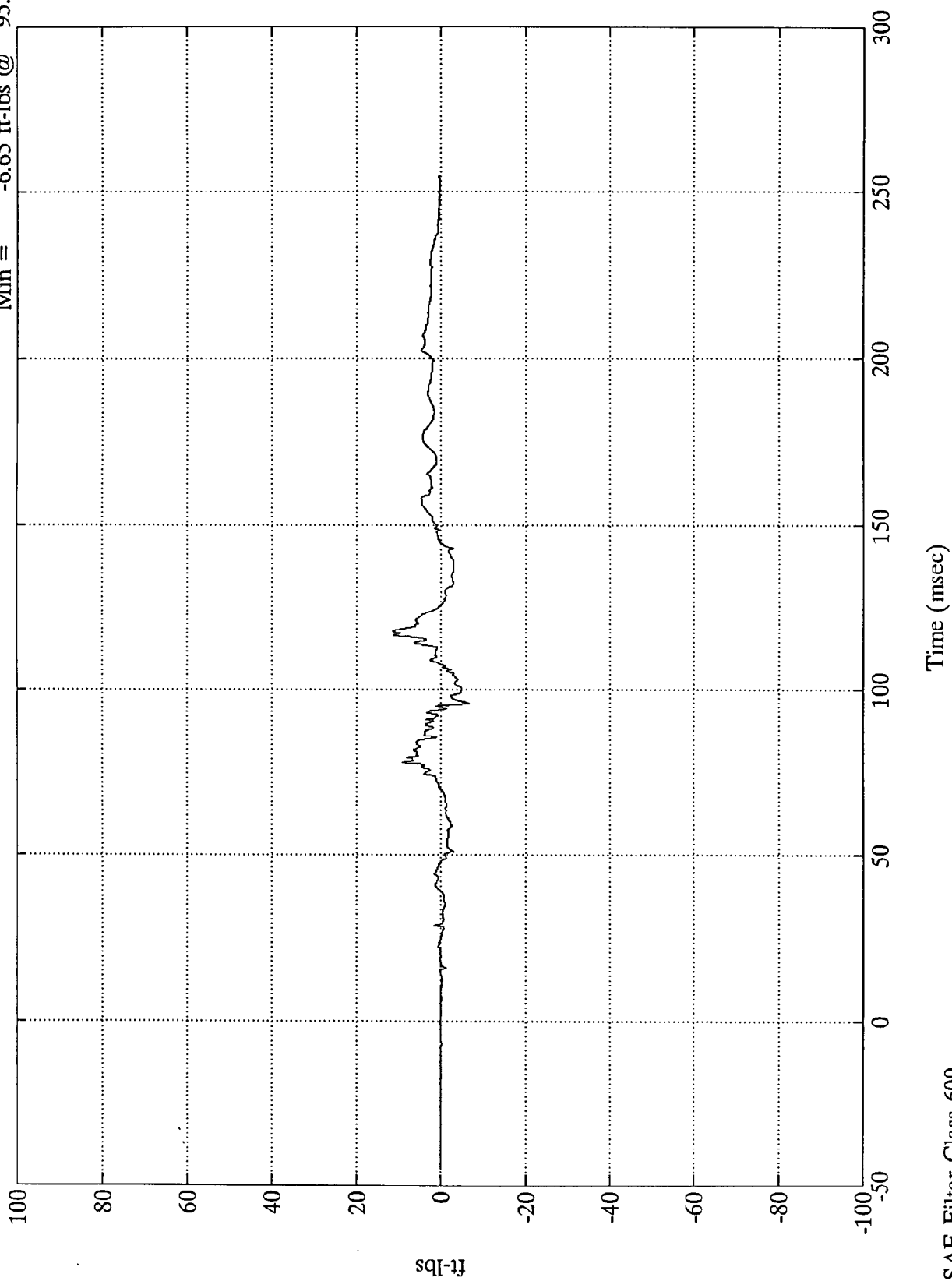
8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Lt Lower Tibia Mx

Max = 11.51 ft-lbs @ 117.59 msec
Min = -6.65 ft-lbs @ 95.76 msec



B-43

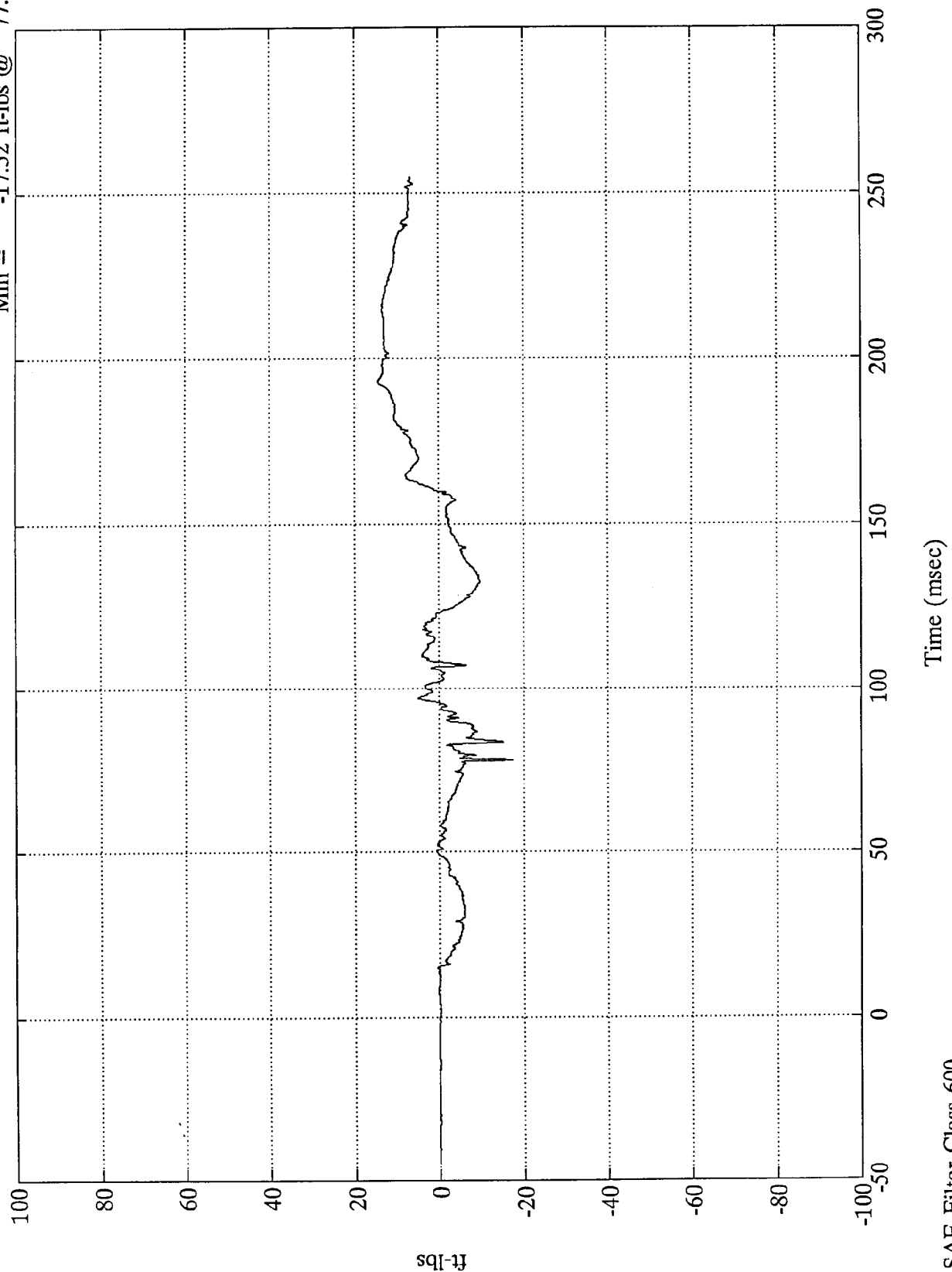
8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Rt Upper Tibia Mx

Max = 14.26 ft-lbs @ 192.96 msec
Min = -17.52 ft-lbs @ 77.88 msec



ft-lbs
B-44

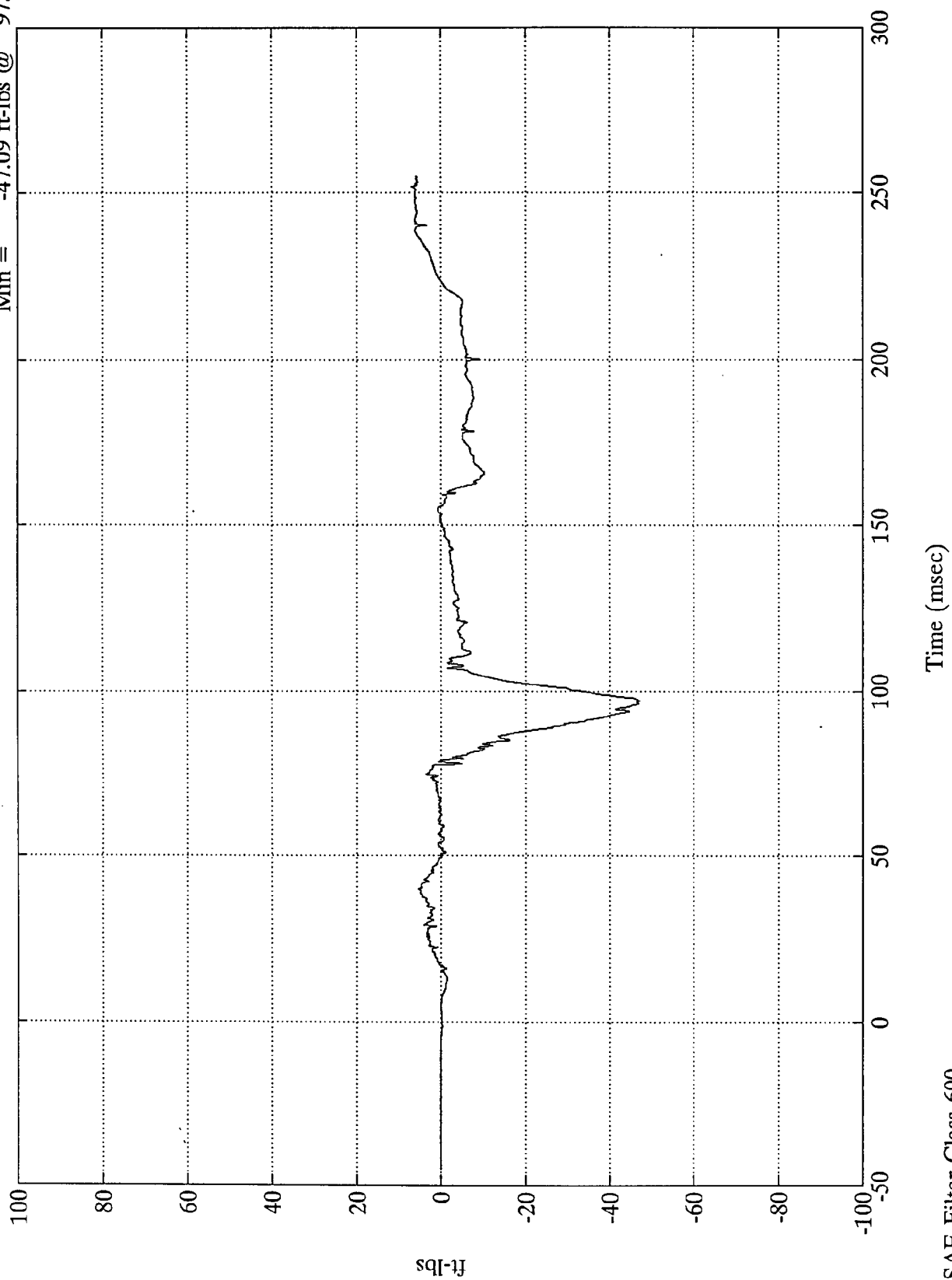
8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

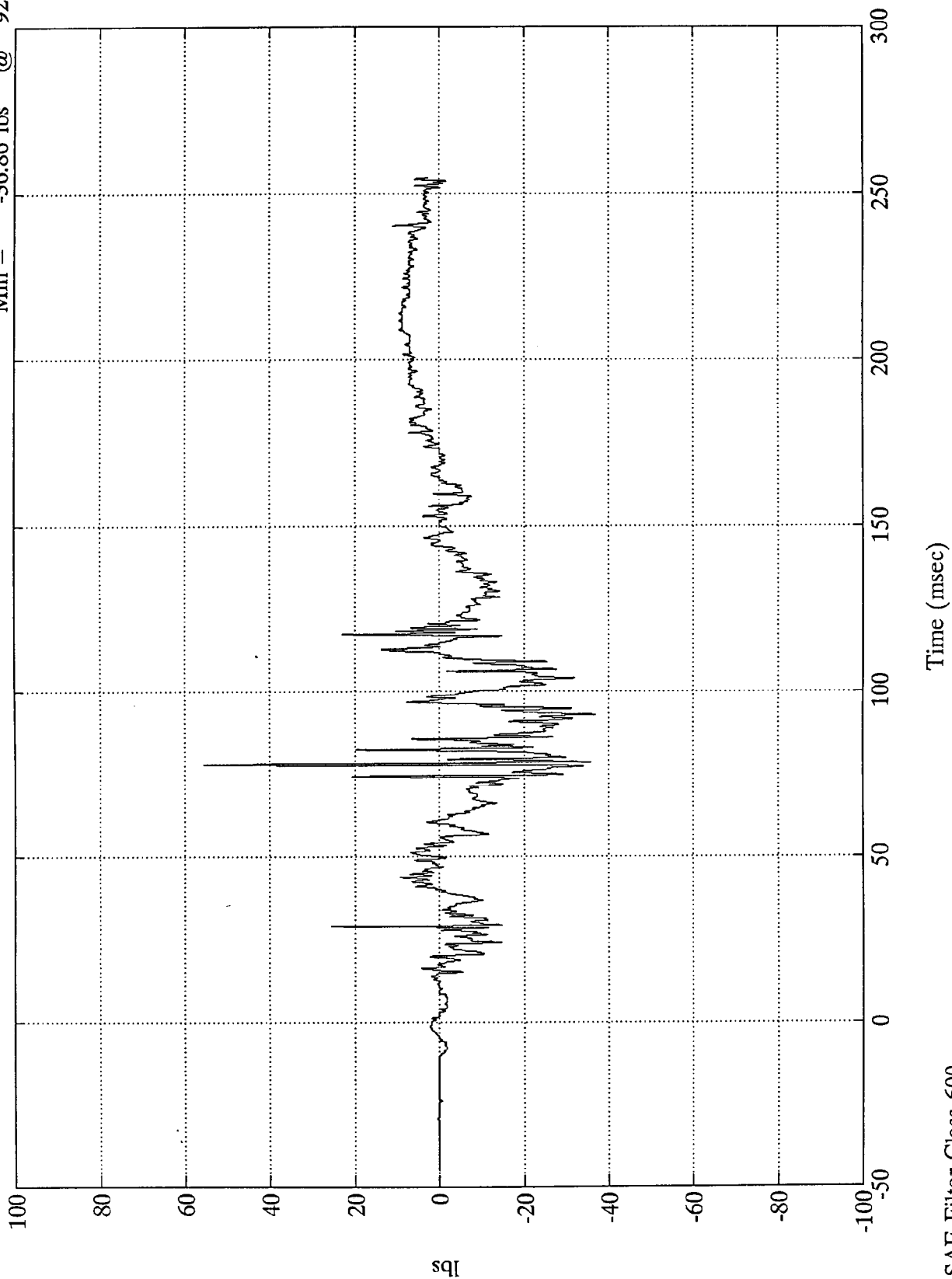
Pos. 1 Rt Upper Tibia My

Max = 6.97 ft-lbs @ 251.76 msec
Min = -47.09 ft-lbs @ 97.08 msec



TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Rt Lower Tibia Fy Max = 55.46 lbs @ 77.88 msec
 Min = -36.86 lbs @ 92.64 msec



sqI

B-46

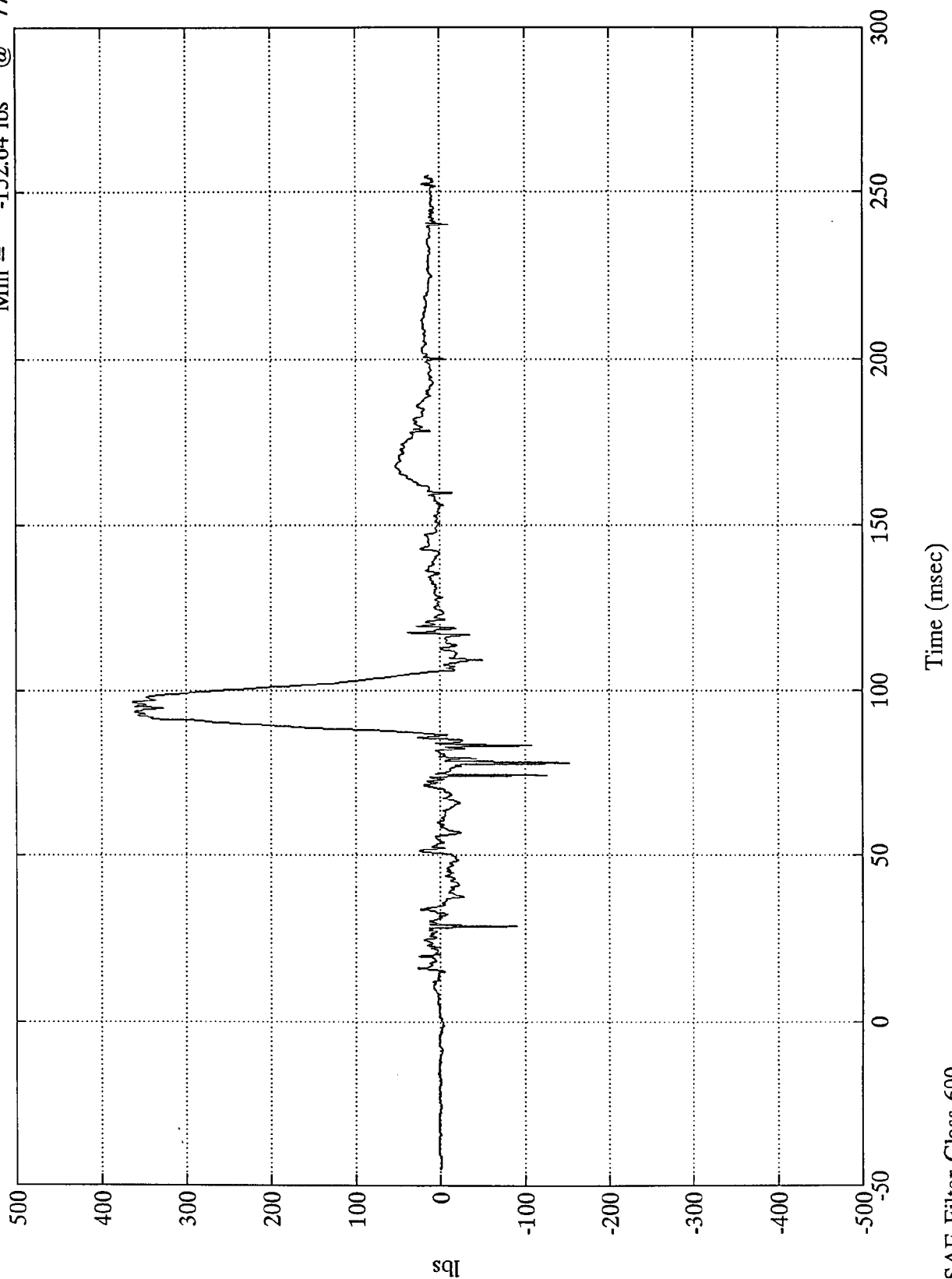
8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Rt Lower Tibia Fz

Max = 363.08 lbs @ 96.36 msec
Min = -152.64 lbs @ 77.88 msec



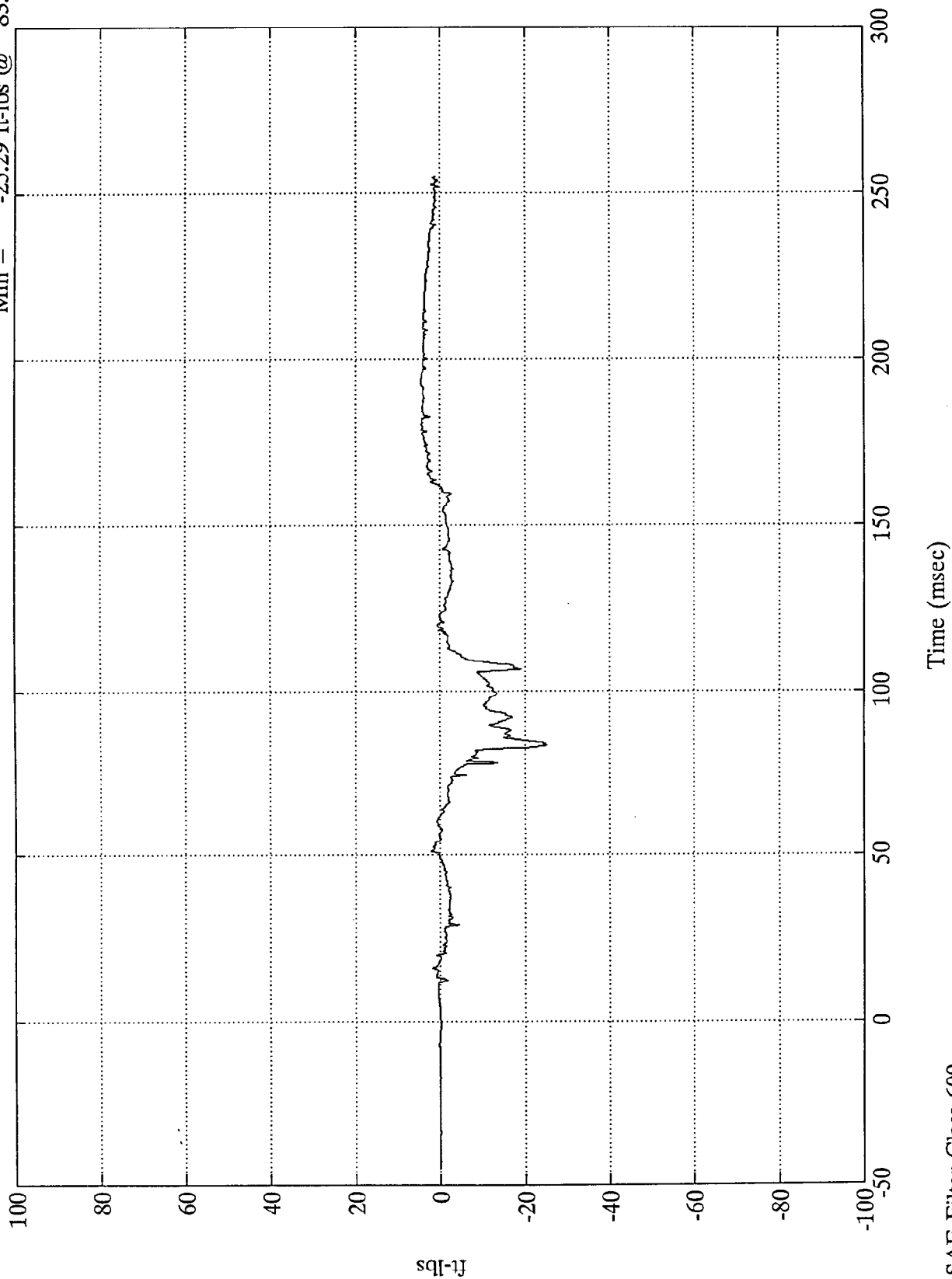
B-47

8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

Pos. 1 Rt Lower Tibia Mx
Max = 4.59 ft-lbs @ 193.20 msec
Min = -25.29 ft-lbs @ 83.16 msec



B-48

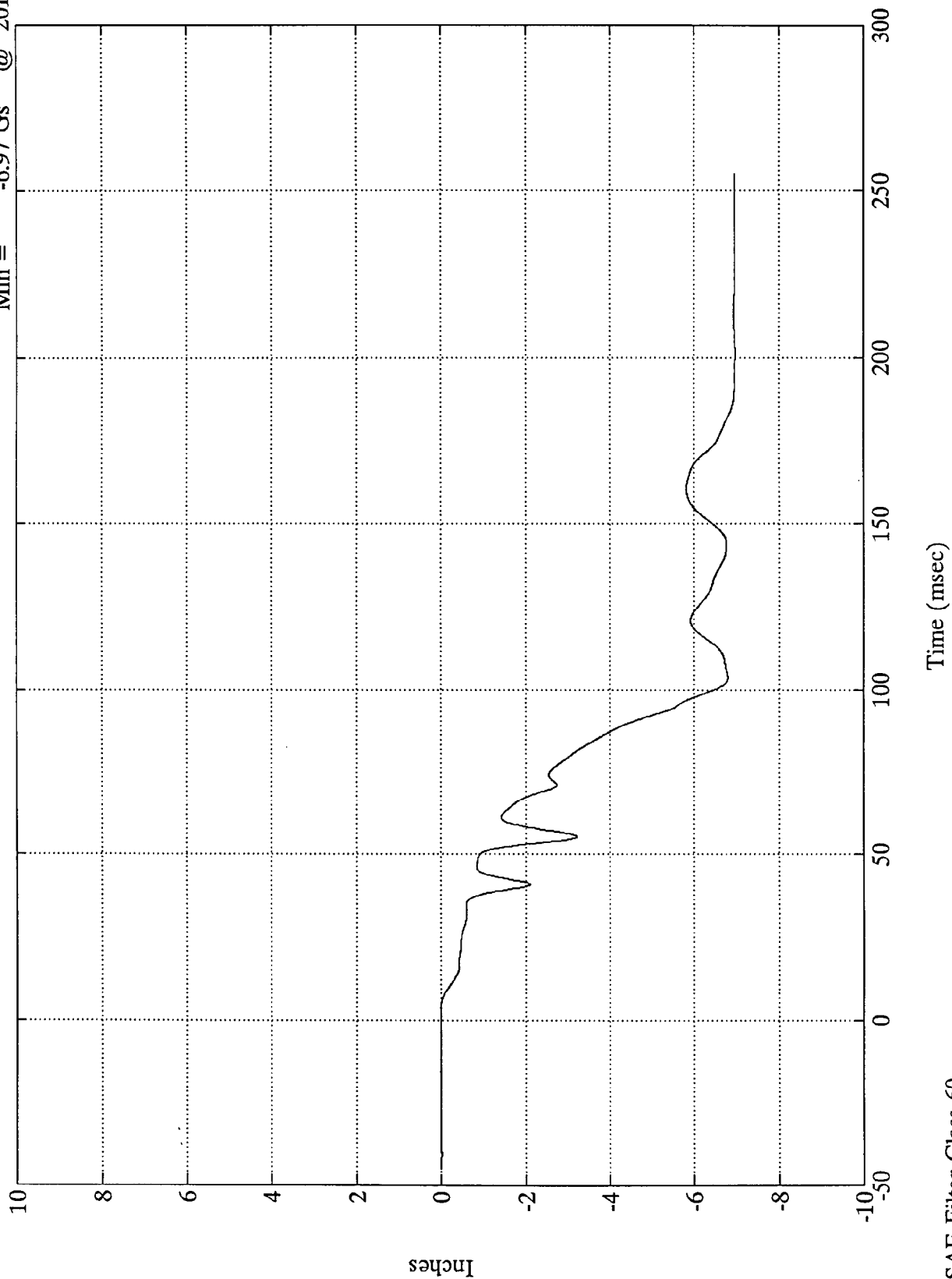
8102-6

SAE Filter Class 600

TSC 301 TEST 6 - REAR IMPACT

L.F. Seat Displacement

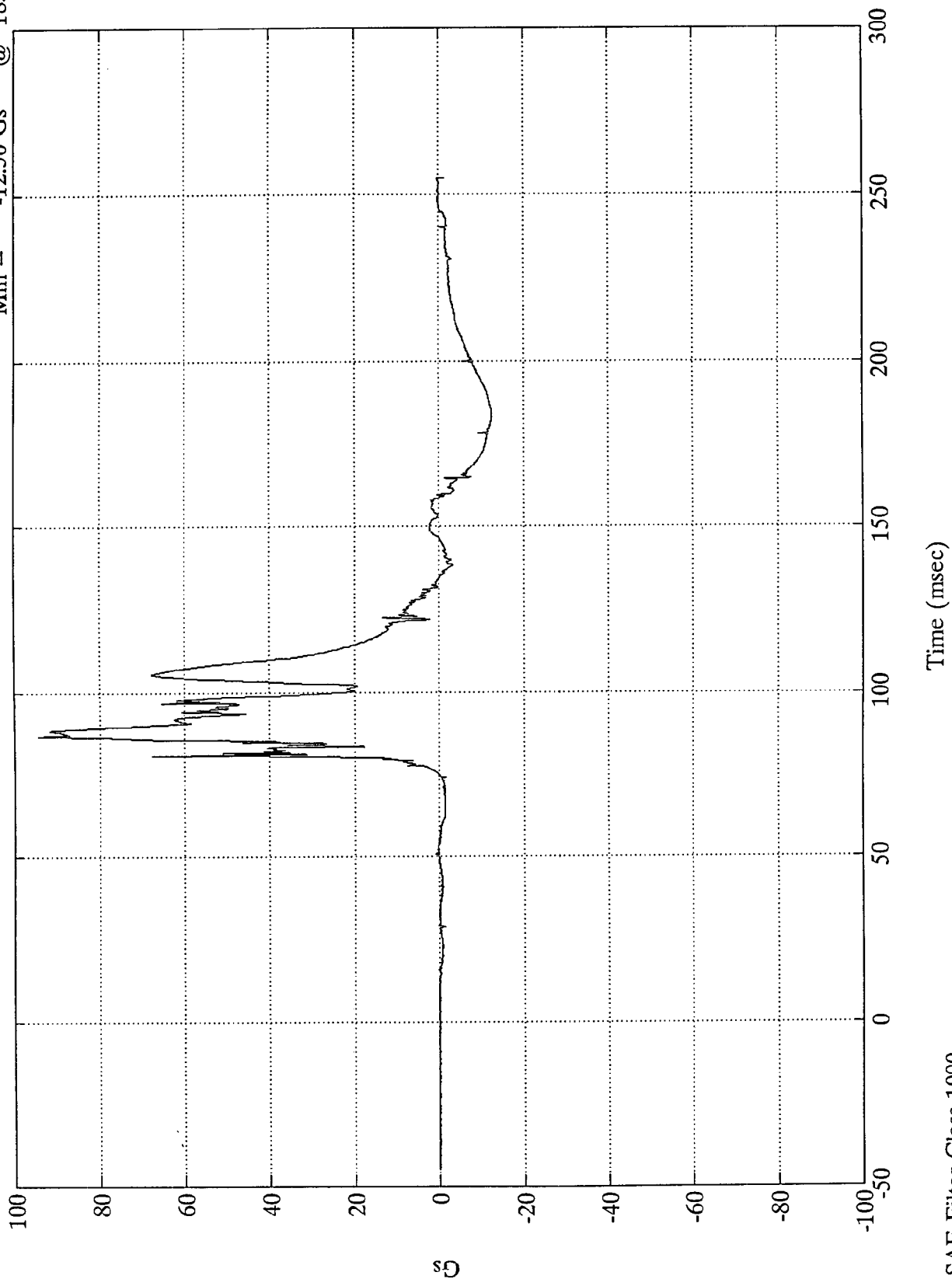
Max = .01 Gs @ -33.36 msec
Min = -6.97 Gs @ 201.12 msec



TSC 301 TEST 6 - REAR IMPACT

Max = 94.47 Gs @ 86.63 msec
 Min = -12.50 Gs @ 183.96 msec

Pos. 2 Head X



8102-6
 B-50

SAE Filter Class 1000