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REPORT NUMBER: CAL-98-19

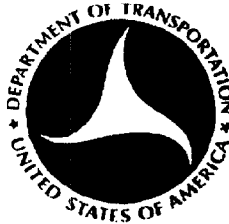
**NEW CAR ASSESSMENT PROGRAM (NCAP)
FRONTAL BARRIER IMPACT TEST**

**TOYOTA MOTOR MANUFACTURING
1998 TOYOTA SIENNA
MPV**

NHTSA NUMBER: MW5109

CALSPAN TEST NUMBER: 8413-18

**CALSPAN CORPORATION
TRANSPORTATION SCIENCE CENTER
P.O. BOX 400
BUFFALO, NEW YORK 14225**



January 27, 1998

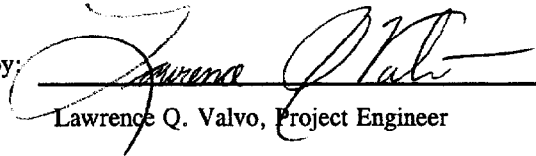
FINAL REPORT

PREPARED FOR:

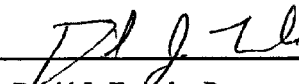
**U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Safety Performance Standards
Office of Crashworthiness Standards
Mail Code: NPS-10
400 Seventh Street, SW, Room No. 5313
Washington, DC 20590**

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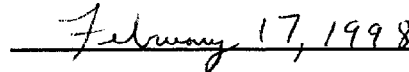
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Approval Date:


February 17, 1998

FINAL REPORT ACCEPTANCE BY OCS:

Manager, New Car Assessment Program (NCAP)
NHTSA, Office of Crashworthiness Standards

Date of Report Acceptance

COTR, New Car Assessment Program (NCAP)
NHTSA, Office of Crashworthiness Standards

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15. <i>Supplementary Notes</i>			
16. <i>Abstract</i> A frontal barrier test of a 1998 Toyota Sienna MPV was performed at Calspan Corporation crash test facility in Buffalo, New York, on January 27, 1998. The impact velocity was 56.2 kph and the temperature at the barrier face was 21.7°C. The maximum post-test vehicle crush was 581 mm. The test vehicle was equipped with driver and passenger second generation airbags and front seat belt pretensioners. With respect to FMVSS 208 "Occupant Crash Protection - Injury Criteria" both the driver and passenger appear to comply with head, chest and femur requirements.			
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TABLE OF CONTENTS

<u>Section</u>	<u>Page No.</u>
1 PURPOSE AND SUMMARY OF NCAP TEST	1-1
2 OCCUPANT AND VEHICLE INFORMATION / DATA SHEETS	2-1
DATA SHEET NO. DESCRIPTION	
1. CRASH TEST SUMMARY	2-1
2. GENERAL TEST AND VEHICLE PARAMETER DATA	2-2
3. POST IMPACT DATA	2-4
4. TEST VEHICLE INFORMATION	2-5
5. DUMMY POSITIONING IN VEHICLE	2-8
6. SEAT BELT POSITIONING DATA	2-9
7. VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY	2-11
8. DUMMY INJURY CRITERIA VALUES	2-12
9. SEAT BELT PERFORMANCE DATA	2-19
10. SUMMARY OF FMVSS 212 DATA	2-20
11. WINDSHIELD ZONE INTRUSION FMVSS 219 DATA	2-21
12. FMVSS 301 FUEL SYSTEM INTEGRITY DATA	2-22
13. FMVSS 310 ROLLOVER DATA	2-23
14. VEHICLE MEASUREMENTS	2-28
15. CAMERA DATA	2-34
16. REFERENCE PHOTO TARGETS	2-35
17. LOAD CELL LOCATIONS ON FIXED BARRIER	2-36
18. POST TEST AIR BAG DATA	2-37
19. ACCIDENT INVESTIGATION DIVISION DATA	2-38
APPENDIX A PHOTOGRAPHS	A-1
APPENDIX B VEHICLE, LOAD CELL BARRIER AND DUMMY RESPONSE DATA	B-1
APPENDIX C PART 572 B/E DUMMY CONFIGURATION AND PERFORMANCE VERIFICATION TESTS	C-1
APPENDIX D DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION	D-1

Section 1

PURPOSE AND SUMMARY OF TEST MW5109

PURPOSE

This 56.2 kph frontal barrier impact test is part of the Vehicle Barrier Impact Testing Program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract No. DTNH22-96-D-02010. 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 56.2 kph frontal barrier impact test was conducted in accordance with the Office of Market Incentives (OMI) Laboratory Indicant Test procedure.

SUMMARY

A frontal barrier was impacted by a 1998 Toyota Sienna MPV at a velocity of 56.2 kph. The test was performed at the Calspan Corporation on January 27, 1998. 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, chest, and pelvis triaxial accelerometers, chest displacement potentiometers, upper neck transducers, right/left femur load cells, and lower leg instrumentation. 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 (position 1) ATD (Serial No. 061) was used in one prior test (MW0111) where it did not exceed the FMVSS 208 injury criteria. The right-front passenger (position 2) ATD (Serial No. 245) was calibrated prior to this test. Certification details, along with instrumentation calibration data, are found in Appendix C.

The 95 channels of data were recorded on a P.C. based data acquisition system. Appendix B contains the vehicle and dummy response data traces. The Position 2 Belt Elongation potentiometer data contains data spikes between 17 and 24 ms. The Engine Top X accelerometer data is questionable after 38 ms and the Engine Bottom X accelerometer data is questionable after 40 ms.

The driver's HIC was 467.57. The maximum chest deceleration over 3 milliseconds was 42.91 g's and maximum chest deflection was -31.2 mm. Femur loads were -1184.5 Newtons on the left and -1873.9 Newtons on the right.

The right front passenger's HIC was 394.67. Maximum chest deceleration over 3 milliseconds was 42.27 g's and maximum chest deflection was -33.9 mm. Femur loads were -1847.9 Newtons on the left and -3767.8 Newtons on the right.

SECTION 2

GENERAL TEST AND VEHICLE PARAMETER DATA

DATA SHEET NO. 1 CRASH TEST SUMMARY

Vehicle NHTSA No. : MW5109 Test Mode : 56 kph Frontal Barrier

Test Date : January 27, 1998 Time: 11:15 Temperature : 21.7 °C

Vehicle Make/Model/Body Style : 1998 Toyota Sienna MPV

Vehicle Test Weight : 2048.5 kg

Vehicle/Barrier Impact Angle : 0 °

Impact Velocity : 56.2 kph

Maximum Static Crush : 581 mm

Vehicle Rebound : 636 mm

DUMMIES:

DRIVER

PASSENGER

Type :

 572E

 572E

Restraint System :

 3-Point Seat Belt with
Pretensioner, Airbag, Knee
Bolster

 3-Point Seat Belt with
Pretensioner, Airbag, Knee
Bolster

Number of Data Channels : 95

Number of Cameras : 1 Real Time

 16 High Speed

DOOR OPENING DATA : Closed/Operable - Left Front

 Closed/Operable - Right Front

Front Seat(s) Data :

DRIVER

PASSENGER

Seat Track Failure :(mm of shift)

 0

 0

Seat Back Failure :

 None

 None

VISIBLE DUMMY CONTACT POINTS :

DRIVER

PASSENGER

Head :

 Face to upper center of
airbag, back of head to
outboard side of head rest

 Face to center of airbag, back
of head to outboard side of
head rest

Abdomen :

 None

 None

Chest

 Airbag

 Airbag

Knees

 Knee Bolster

 Knee bolster below glove
compartment door.

DATA SHEET NO. 2 GENERAL TEST AND VEHICLE PARAMETER DATA

TEST VEHICLE INFORMATION :

Year/Make/Model/Body Style : 1998 Toyota Sienna MPV
NHTSA No. : MW5109 ; VIN: 4T3ZF13C9WU026599 ; Color : Black
Engine Data: 6 cylinders; - CID; 3.0 Liters; - cc
Placement : - Longitudinal or In-Line; X Transverse or Lateral
Transmission Data : 4 speeds; - Manual; X Automatic; X Overdrive
Final Drive : - Rear Wheel Drive; X Front Wheel Drive; - Four Wheel Drive
Major Options : X A/C; X Pwr.Strg.; X Pwr. Brakes
X Pwr. Windows; X Pwr. Door Locks; X Tilt Wheel
Date Received : 01/21/98 ; Odometer Reading 29 km
Selling Dealer : Downing and Hall's Toyota
& Address: 6179 Transit Road, Lockport, NY 14094

DATA FROM TIRE VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by : Toyota Motor Manufacturing
Date of Manufacture 12/97
GVWR : 2381.4 kg; GAWR: 1236.1 kg FRONT; 1236.1 kg REAR

DATA FROM TIRE PLACARD:

Tire Pressure with Maximum Capacity Vehicle Load : 300 kpa FRONT
300 kpa REAR
Recommended Tire Size : P215/65R15 95S
* Recommended Cold Tire Pressure : 220 kpa FRONT; 220 kpa REAR
Size of Tires on Test Vehicle: P215/65R15 95S ; Manufacturer: Firestone
Vehicle Capacity Data :
Type of Front Seats: - Bench; X Bucket; - Split Bench
Number of Occupants: 2 Front; 5 Rear; 7 Total
Vehicle Capacity Weight (VCW) = 579.4 kg
No. of Occupants x 68 kg = 476.3 kg
Rated Cargo/Luggage Weight (RCLW) = 103.1 kg

*Tire pressure used for test

DATA SHEET NO. 2 GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)

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

Right Front	=	<u>512.5</u>	kg	Right Rear	=	<u>376.0</u>	kg
Left Front	=	<u>517.5</u>	kg	Left Rear	=	<u>396.0</u>	kg
TOTAL FRONT	=	<u>1,030.0</u>	kg	TOTAL REAR	=	<u>772.0</u>	kg
TOTAL DELIVERED WEIGHT	=	<u>1,802.0</u>	kg				
% of Total Front of Vehicle Weight	=	<u>57.2</u>	%	% of Total Rear Weight	=	<u>42.8</u>	%

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT :

Total Delivered Weight (UDW)	=	<u>1,802.0</u>	kg
Rated Cargo/Luggage Weight (RCLW)	=	<u>103.1</u>	kg
Weight of 2 p.572 Dummies @ 76 each	=	<u>152</u>	kg
TARGET TEST WEIGHT	=	<u>2,057.1</u>	kg

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 95 KG OF CARGO WEIGHT:

Right Front	=	<u>552.0</u>	kg	Right Rear	=	<u>459.0</u>	kg
Left Front	=	<u>552.5</u>	kg	Left Rear	=	<u>485.0</u>	kg
TOTAL FRONT	=	<u>1,104.5</u>	kg	TOTAL REAR	=	<u>944.0</u>	kg
TOTAL TEST WEIGHT	=	<u>2,048.5</u>	kg				
% of Total Front Weight	=	<u>53.9</u>	%	% of Total Rear Weight	=	<u>46.1</u>	%
Weight of Ballast Secured in Vehicle Trunk Area	=	<u>91</u>	kg				
Vehicle Components Removed for Weight Reduction:		<u>None</u>					

VEHICLE ATTITUDE (all dimension in millimeters):

AS DELIVERED :	RF	<u>745</u>	LF	<u>743</u>	RR	<u>759</u>	LR	<u>753</u>
FULLY LOADED :	RF	<u>735</u>	LF	<u>733</u>	RR	<u>712</u>	LR	<u>710</u>
AS TESTED :	RF	<u>739</u>	LF	<u>733</u>	RR	<u>716</u>	LR	<u>712</u>
Vehicle's Wheel Base :		<u>2900</u>	mm					
Location of Vehicle's C.G. :		<u>1,336</u>	mm rearward of front wheel center.					

FUEL SYSTEM DATA :

Fuel System Capacity From Owner's Manual	=	<u>79</u>	liters
Usable Capacity Figure Furnished by COTR	=	<u>80.3</u>	liters
Test Volume Range (92 to 94% of Usable Capacity)	=	<u>73.9</u>	to <u>75.5</u> liters
ACTUAL TEST VOLUME	=	<u>74.2</u>	liters (with entire fuel system filled)
Test Fluid Type:	<u>Stoddard Solution</u>	; Spec. Grav.	= <u>0.764</u>
	Kinematic Viscosity	= <u>0.96</u>	centistokes; Color = <u>Orange</u>
Type of Fuel Pump:	Electric- <u>X</u>	; Mechanical-	<u>-</u>
Does Electric Pump operate with ignition switch "ON" & engine "OFF"		Yes- <u>X</u>	No- <u>-</u>
Details of Fuel System	<u>Filler - Left side, aft of rear axle. Tank - Forward of rear axle.</u>		

DATA SHEET NO. 3 POST IMPACT DATA

TYPE OF TEST:

Type of Test : Frontal Barrier Impact Angle : 0°
Test Date : January 27, 1998 Time: 11:15 Temperature: 21.7 °C
Vehicle NHTSA No. : MW5109
Required Impact Velocity Range : 55.7 to 57.1 kph

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

Trap No. 1 = 56.2 kph; Trap No. 2 = 56.2 kph
Distance from vehicle to barrier : (1) entering trap = 813 mm
(2) exiting trap = 305 mm

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

Vehicle Length:

Pre-Test Right = 4810 ; C/L = 4916 ; Left = 4805
Post-Test Right = 4320 ; C/L = 4335 ; Left = 4340
Crush Right = 490 ; C/L = 581 ; Left = 465
AVERAGE = 512 mm

VEHICLE REBOUND: (From rigid barrier only.)

Distance from front of test vehicle to impact point :

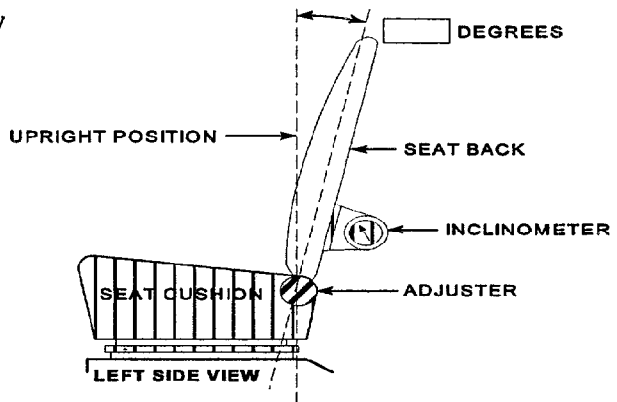
Right = 650 ; C/L = 618 ; Left = 641
AVERAGE = 636 mm

DATA SHEET NO. 4 TEST VEHICLE INFORMATION

VEHICLE IDENTIFICATION:

Model Year : 1998 Vehicle Model: Toyota Sienna Body Style : MPV

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



Seat back angle for driver's seat : 13.5
 Measurement instructions : Recline seat back 13.5 degrees rearward from its most upright position.
 Seat back angle for passenger's seat : 13.5
 Measurement instructions : Same as driver's seat.

2. Seat Fore and Aft Positioning

Positioning of the driver's seat : Place seat tracks in detent number 8, where the forward most position is detent number 0. This is the first detent rear of mid-travel (there is no detent at mid-travel).
 Positioning of the passenger's seat (if applicable) : Same as driver's seat.

3. Fuel Tank Capacity Data

3.1

A. "Usable Capacity" of the standard equipment fuel tank is 80.3 liters
 B. "Usable Capacity" of the optional equipment fuel tank is - liters
 C. "Usable Capacity" of the vehicle(s) used for certification testing to requirements of FMVSS 301 = 80.3 liters

3.2 Amount of Stoddard solvent added to vehicle(s) used for certification test(s) = 74.2 liters

3.3 Is vehicle equipped with electric fuel pump? Yes- X ; No- -

If YES, explain the vehicle operating conditions under which the fuel pump will pump fuel.

The pump operates when vehicle ignition is turned on.

DATA SHEET NO. 4 TEST VEHICLE INFORMATION (cont.)

4. STEERING COLUMN ADJUSTMENTS :

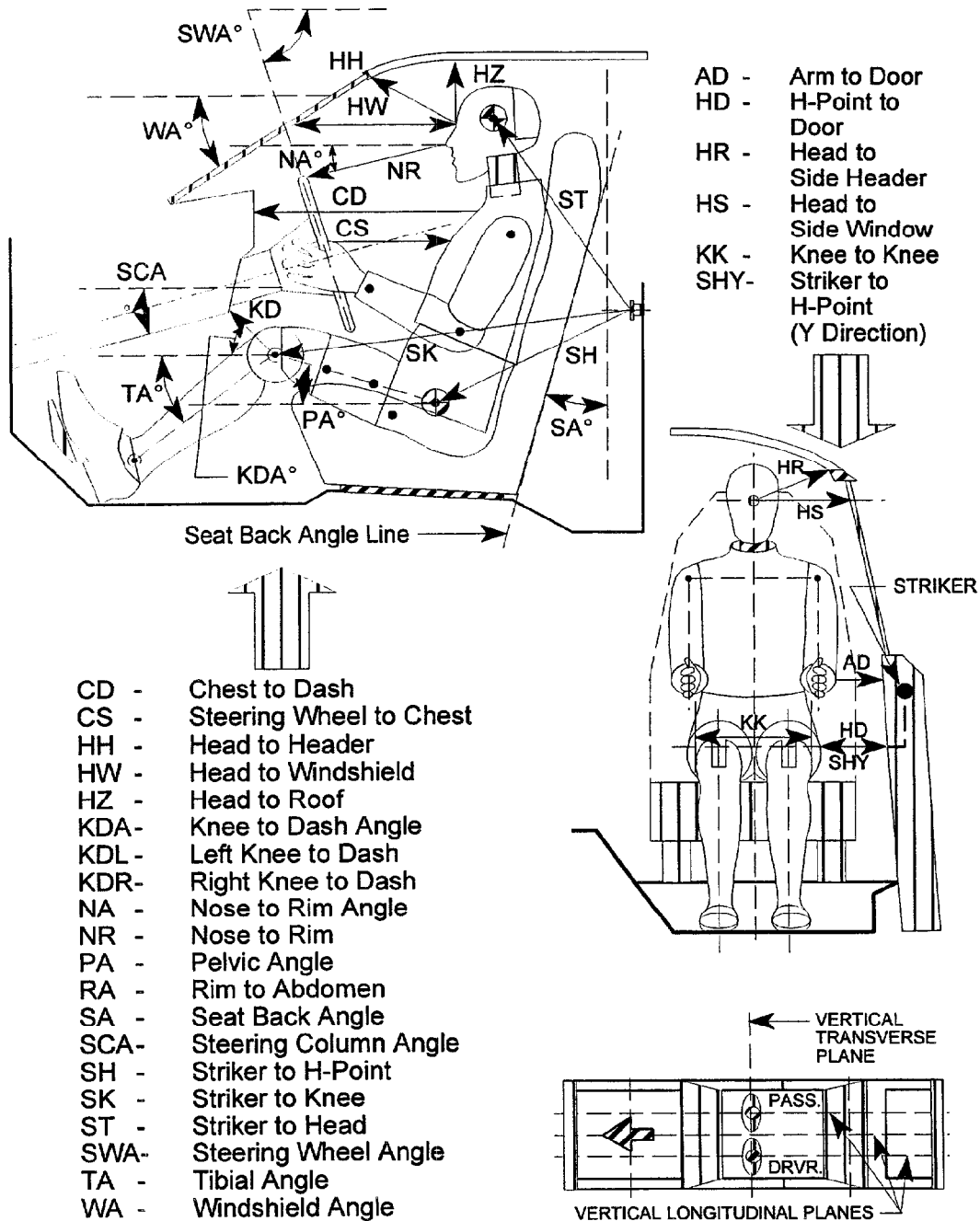
Steering wheel and column adjustments are made so that the steering wheel hub is at the geometric center of the locus it describes when it is moved through its full range of driving positions. If the tested vehicle has any of these adjustments, does your company use any specific procedures to determine the geometric center.

Operational Instructions: The tilt steering column was placed in its mid-position (detent number 2, where the highest position is detent number 0).

5. SEAT BELT UPPER ANCHORAGE

Nominal design riding position: Driver and passenger D-rings were placed in their mid-positions (detent number 2, where the highest position is detent number 0).

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS

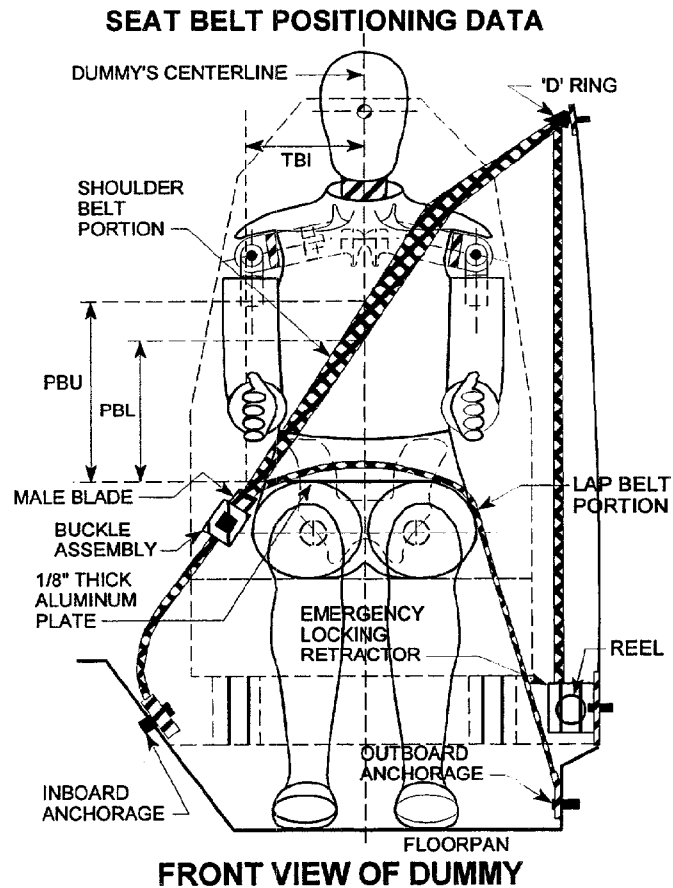


DATA SHEET NO. 5 FRONT SEAT DUMMY POSITIONING MEASUREMENTS IN VEHICLE

	DRIVER (Serial #061)			PASS. (Serial # 245)		
WA ^o	28 deg.			N/A		
SWA ^o	62 deg.			N/A		
SCA ^o	28 deg.			N/A		
SA ^o	13.5 deg.			14 deg.		
HZ	216			195		
HH	365			324		
HW	672			605		
HR	255			244		
NR	402	Angle	15 deg.	N/A		
CD	520			524		
CS	294			N/A		
RA	176			N/A		
KDL	143	Angle (KDA)	21 deg.	121		
KDR	139			125	Angle (KDA)	32 deg.
PA ^o	22.5 deg.			24.5 deg.		
TA ^o	57 deg.			52 deg.		
KK	324			270		
ST	550	Angle	25 deg.	547	Angle	30 deg.
SK	743	Angle	94 deg.	739	Angle	97 deg.
SH	376	Angle	114 deg.	383	Angle	115 deg.
SHY	268			240		
HS	338			331		
HD	178			144		
AD	118			123		

Dimensions in millimeters

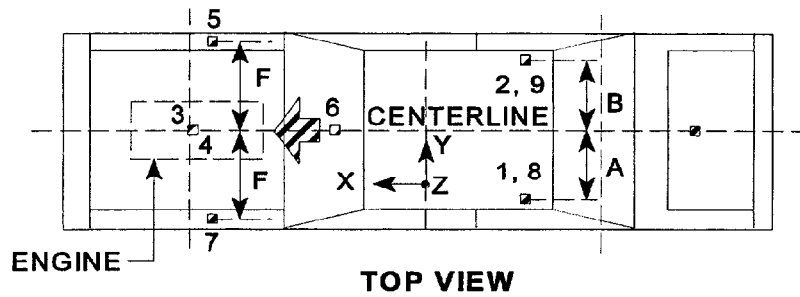
DATA SHEET NO. 6 SEAT BELT POSITIONING DATA



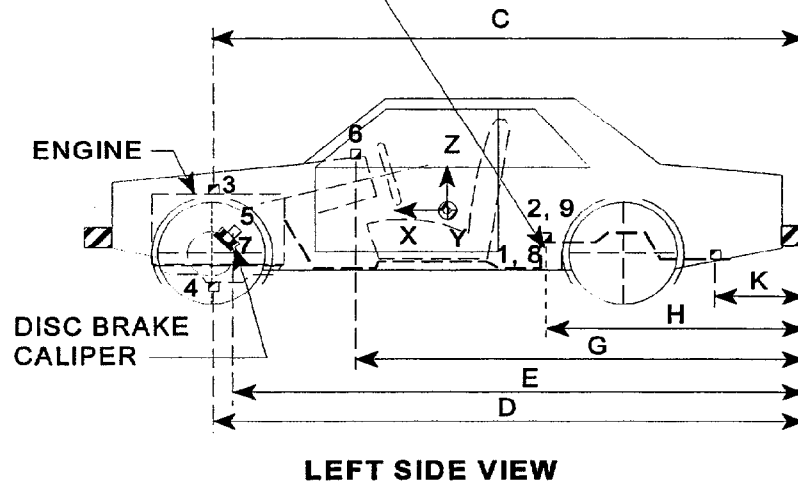
	DRIVER DUMMY (mm)	PASSENGER DUMMY (mm)
PBU -- Top surface of alum. plate to upper edge	331	337
PBL-- Top surface of alum. plate to belt lower edge	240	242
<u>LAP BELT TENSION</u>	10 Newtons	10 Newtons
<u>SHOULDER BELT TENSION</u>	Retractor †	Retractor †

† Vehicle front occupant seat belt retractors were equipped with pretensioners.

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY



REAR SEAT CUSHION
ASSY. FRONT ATTACHMENT
BRACKET SUPPORT



Note: Vehicle accelerometer location and data summary shown in DATA SHEET NO. 7

DATA SHEET NO. 7 VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

DIMENSION	LENGTH (mm)
	PRE-TEST VALUES
A Left Rear Seat Crossmember Y	655
B Right Rear Seat Crossmember Y	-655
C Top of Engine X	4372
D Bottom of Engine X	4047
E Disc Brake Calipers X	3895
F Disc Brake Calipers Y	±505
G Instrument Panel X	3154
H Rear Seat Crossmembers X	2256

LOCATION NUMBER	DESCRIPTION	MAXIMUM VALUE (g's)			
		Pos.	msec.	Neg.	msec.
1	Rear Seat X-Member @ Left Side	2.2	129.9	-32.5	40.5
2	Rear Seat X-Member @ Right Side	2.1	136.5	-34.6	45.5
3	Top of Engine Block	†	†	-98.8	25.6
4	Bottom of Engine	††	††	††	††
5	Disc Brake Caliper @ Right Side	27.4	69.0	-84.6	42.1
6	Instrument Panel	26.6	49.6	-73.4	44.5
7	Disc Brake Caliper @ Left Side	20.9	69.3	-71.6	43.7
8	Rear Seat X-Member @ Left-Redundant	2.5	130.4	-32.0	40.4
9	Rear Seat X-Member @ Right-Redundant	3.0	137.4	-33.8	45.8

† Data is questionable after 38 ms.

†† Data is questionable after 40 ms.

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES

NHTSA Test No.: MW5109 Vehicle: 1998 Toyota Sienna MPV

DESCRIPTION	UNIT	MAXIMUM VALUE			
		Pos.	msec.	Neg.	msec.
Pos. 1 Head X	g's	9.5	244.4	-57.0	75.5
Pos. 1 Head Y	g's	2.1	54.6	-15.4	81.5
Pos. 1 Head Z	g's	15.6	59.2	-0.5	18.6
Pos. 1 Head Resultant	g's	59.0	75.5	0.1	-18.8
Pos. 2 Head X	g's	17.5	237.1	-46.6	80.2
Pos. 2 Head Y	g's	9.6	80.8	-5.7	57.3
Pos. 2 Head Z	g's	25.4	93.4	-0.7	19.9
Pos. 2 Head Resultant	g's	50.2	80.2	0.0	-5.2
Pos. 1 Chest X	g's	3.3	142.2	-44.4	65.3
Pos. 1 Chest Y	g's	2.2	109.4	-5.1	52.7
Pos. 1 Chest Z	g's	6.0	46.4	-10.3	80.9
Pos. 1 Chest Resultant	g's	45.0	65.2	0.0	-32.6
Pos. 1 Chest Displacement	mm	0.1	11.6	-31.2	82.0
Pos. 2 Chest X	g's	2.9	279.2	-42.4	73.0
Pos. 2 Chest Y	g's	4.1	81.6	-2.7	90.1
Pos. 2 Chest Z	g's	9.0	95.1	-9.1	79.3
Pos. 2 Chest Resultant	g's	42.5	73.1	0.0	-34.2
Pos. 2 Chest Displacement	mm	0.0	17.4	-33.9	95.6
Pos. 1 Left Femur	N	636.0	42.1	-1184.5	56.1
Pos. 1 Right Femur	N	868.8	48.3	-1873.9	53.0
Pos. 2 Left Femur	N	278.1	31.5	-1847.9	57.5
Pos. 2 Right Femur	N	726.2	77.1	-3767.8	52.7
Pos. 1 Left Belt Load	N	6820.6	58.1	-25.3	327.6
Pos. 1 Torso Belt Load	N	5644.4	67.9	-57.3	218.1
Pos. 2 Right Belt Load	N	5666.4	57.4	-7.3	162.7
Pos. 2 Torso Belt Load	N	5884.7	71.1	-73.5	204.5

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES (cont.)

NHTSA Test No.: MW5109 Vehicle: 1998 Toyota Sienna MPV

	HEAD INJURY CRITERIA (HIC)			
	HIC**	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	467.57	58.00	94.00	44.20
Position #2 - Passenger	394.67	62.10	98.10	41.30

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

	CLIP SUMMARY*			
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
Position #1 - Driver	42.91	63.85	66.85	381.30
Position #2 - Passenger	42.27	71.62	75.12	369.89

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

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES (cont.)
HYBRID III NECK AND PELVIC DATA SHEET

Vehicle Year/Make/Model/Body Style: 1998 Toyota Sienna MPV

NHTSA Test No.: MW5109 Test Date: January 27, 1998

DESCRIPTION	UNIT	MAXIMUM VALUE			
		Pos.	msec	Neg.	msec
Pos. 1 Upper Neck Fx	N	568.0	74.7	-537.2	54.5
Pos. 1 Upper Neck Fy	N	100.6	63.5	-85.1	146.7
Pos. 1 Upper Neck Fz	N	1446.8	62.8	-222.2	21.8
Pos. 1 Neck Force Result	N	1454.0	62.8	2.7	-21.2
Pos. 1 Upper Neck Mx	N-m	4.6	195.4	-14.5	94.3
Pos. 1 Upper Neck My	N-m	54.2	71.9	-19.0	53.5
Pos. 1 Upper Neck Mz	N-m	29.9	93.2	-12.8	141.2
Pos. 1 Neck Moment Result	N-m	55.3	72.0	0.0	-29.7
Pos. 2 Upper Neck Fx	N	103.1	244.7	-769.8	90.3
Pos. 2 Upper Neck Fy	N	154.7	87.4	-99.3	264.4
Pos. 2 Upper Neck Fz	N	1266.2	68.2	-89.4	282.5
Pos. 2 Neck Force Result	N	1356.1	92.7	5.9	-6.3
Pos. 2 Upper Neck Mx	N-m	11.0	94.6	-8.9	76.1
Pos. 2 Upper Neck My	N-m	42.3	106.0	-48.4	83.7
Pos. 2 Upper Neck Mz	N-m	2.6	340.9	-6.4	98.7
Pos. 2 Neck Moment Result	N-m	49.0	83.7	0.0	-33.2
Pos. 1 Pelvic (X)	g's	3.0	137.4	-52.0	55.7
Pos. 1 Pelvic (Y)	g's	6.8	82.2	-9.4	59.8
Pos. 1 Pelvic (Z)	g's	2.4	197.4	-28.3	70.0
Pos. 1 Pelvic (R)	g's	55.3	55.7	0.1	-11.7
Pos. 2 Pelvic (X)	g's	4.2	145.8	-54.1	56.4
Pos. 2 Pelvic (Y)	g's	9.5	52.6	-6.4	69.2
Pos. 2 Pelvic (Z)	g's	3.5	37.1	-23.0	68.1
Pos. 2 Pelvic (R)	g's	56.9	56.3	0.1	-20.7

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES (cont.)
HYBRID III LOWER LEG DATA SHEET

Vehicle Year/Make/Model/Body Style: 1998 Toyota Sienna MPV
NHTSA Test No.: MW5109 Test Date: January 27, 1998

DESCRIPTION	UNIT	MAXIMUM VALUE			
		Pos.	msec	Neg.	msec
P1 Lt Upper Tibia Mx	N-m	22.9	92.2	-16.1	295.0
P1 Lt Upper Tibia My	N-m	14.0	139.0	-111.9	57.0
P1 Lt Lower Tibia Fx	N	78.8	153.9	-833.1	57.1
P1 Lt Lower Tibia Fz	N	152.6	151.3	-1152.1	46.0
P1 Lt Lower Tibia My	N-m	83.6	71.2	-28.1	56.5
P1 Rt Upper Tibia Mx	N-m	57.5	60.7	-56.0	51.1
P1 Rt Upper Tibia My	N-m	204.9	55.6	-7.7	148.8
P1 Rt Lower Tibia Fx	N	45.0	169.6	-1555.7	55.6
P1 Rt Lower Tibia Fz	N	71.7	185.0	-2210.9	55.4
P1 Rt Lower Tibia My	N-m	39.0	57.2	-38.7	48.3
Pos. 2 Lt Upper Tibia Mx	N-m	26.1	55.8	-34.7	81.2
Pos. 2 Lt Upper Tibia My	N-m	53.1	48.7	-139.7	63.6
Pos. 2 Lt Lower Tibia Fx	N	496.9	48.7	-773.5	42.8
Pos. 2 Lt Lower Tibia Fz	N	119.1	295.9	-3668.0	40.6
Pos. 2 Lt Lower Tibia My	N-m	34.4	53.3	-27.1	43.4
Pos. 2 Rt Upper Tibia Mx	N-m	21.2	31.3	-31.6	56.2
Pos. 2 Rt Upper Tibia My	N-m	10.9	57.3	-79.4	42.4
Pos. 2 Rt Lower Tibia Fx	N	23.3	10.3	-1463.4	58.8
Pos. 2 Rt Lower Tibia Fz	N	122.3	182.5	-2107.8	40.0
Pos. 2 Rt Lower Tibia My	N-m	221.1	57.2	-19.5	29.5

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES (cont.)
HYBRID III ANKLE DATA SHEET

Vehicle Year/Make/Model/Body Style: 1998 Toyota Sienna MPV
NHTSA Test No.: MW5109 Test Date: January 27, 1998

DESCRIPTION	UNIT	MAXIMUM VALUE			
		Pos.	msec	Neg.	msec
Pos. 1 Left Ankle X	g's	26.6	45.6	-49.3	57.3
Pos. 1 Left Ankle Z	g's	8.8	76.4	-45.4	61.2
Pos. 1 Left Toe Z	g's	16.1	40.9	-67.8	15.0
Pos. 1 Right Ankle X	g's	15.1	51.1	-106.1	43.6
Pos. 1 Right Ankle Z	g's	22.5	72.4	-97.7	50.9
Pos. 1 Right Toe Z	g's	22.5	65.6	-131.4	40.3
Pos. 2 Left Ankle X	g's	15.9	68.3	-150.8	48.5
Pos. 2 Left Ankle Z	g's	37.3	47.0	-48.7	41.0
Pos. 2 Left Toe Z	g's	100.8	46.9	-94.3	51.1
Pos. 2 Right Ankle X	g's	13.1	68.7	-64.3	51.4
Pos. 2 Right Ankle Z	g's	13.9	71.1	-57.4	53.8
Pos. 2 Right Toe Z	g's	77.1	52.6	-77.7	53.9

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES (cont.)
REDUNDANT DUMMY DATA

NHTSA Test No.: MW5109 Vehicle: 1998 Toyota Sienna MPV

DESCRIPTION	UNIT	MAXIMUM VALUE			
		Pos.	msec	Neg.	msec
Pos. 1 Head X(R)	g's	9.9	245.2	-60.0	75.6
Pos. 1 Head Y(R)	g's	3.6	104.2	-16.6	79.8
Pos. 1 Head Z(R)	g's	21.5	54.1	-2.0	143.5
Pos. 1 Head Resultant(RR)	g's	62.4	75.6	0.1	-27.7
Pos. 2 Head X(R)	g's	17.8	237.2	-48.2	80.8
Pos. 2 Head Y(R)	g's	15.5	61.9	-6.0	56.4
Pos. 2 Head Z(R)	g's	33.3	63.3	-8.7	123.1
Pos. 2 Head Resultant(RR)	g's	56.6	81.9	0.1	-17.6
Pos. 1 Chest X(R)	g's	3.3	142.8	-44.6	65.2
Pos. 1 Chest Y(R)	g's	2.3	100.7	-4.1	50.9
Pos. 1 Chest Z(R)	g's	6.2	46.5	-8.1	81.0
Pos. 1 Chest Resultant(RR)	g's	45.1	65.2	0.0	-37.2
Pos. 2 Chest X(R)	g's	2.9	159.1	-42.3	72.3
Pos. 2 Chest Y(R)	g's	3.0	49.9	-3.1	89.0
Pos. 2 Chest Z(R)	g's	9.7	95.2	-7.2	82.3
Pos. 2 Chest Resultant(RR)	g's	42.3	72.4	0.0	-31.6

DATA SHEET NO. 8 DUMMY INJURY CRITERIA VALUES (cont.)
REDUNDANT DUMMY DATA

NHTSA Test No.: MW5109 Vehicle: 1998 Toyota Sienna MPV

HEAD INJURY CRITERIA (HIC) REDUNDANT				
	HIC**	t ₁ (msec)	t ₂ (msec)	Average Acceleration t ₁ to t ₂
Position #1 - Driver	536.82	56.10	92.10	46.71
Position #2 - Passenger	475.91	62.40	98.40	44.51

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

CLIP SUMMARY* REDUNDANT				
	CLIP (g's)	t ₁ (msec)	t ₂ (msec)	CSI
Position #1 - Driver	42.82	63.88	66.88	373.73
Position #2 - Passenger	41.79	71.46	74.46	374.27

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

DATA SHEET NO. 9 SEAT BELT PERFORMANCE ASSESSMENT TEST DATA

BELT LENGTH DATA:

	<u>Driver</u>	<u>Passenger</u>
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	<u>2052</u>	<u>2082</u>
Shoulder belt length as measured on Part 572 Dummy.	<u>955</u>	<u>945</u>
Lap belt length as measured on Part 572 Dummy.	<u>875</u>	<u>915</u>

SHOULDER BELT SPOOL-OFF DATA:

As determined by film analysis.	<u>102</u>	<u>76</u>
As determined mechanically.	<u>†</u>	<u>†</u>
As determined electronically.	<u>†</u>	<u>†</u>

BELT STRETCH DATA:

Measured electronically between shoulder belt load cell and the "D" ring.	<u>29 mm/M</u>	<u>25 mm/M</u>
Measured mechanically.	<u>0 mm/M</u>	<u>0 mm/M</u>

Dimensions in millimeters

† Measurement device not installed, seat belt system used retractors with pretensioners.

DATA SHEET NO.10 SUMMARY OF FMVSS 212 DATA

FMVSS NO. 212 - "WINDSHIELD MOUNTING" DATA

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

Windshield is bonded in place and covered with 15 mm molding.

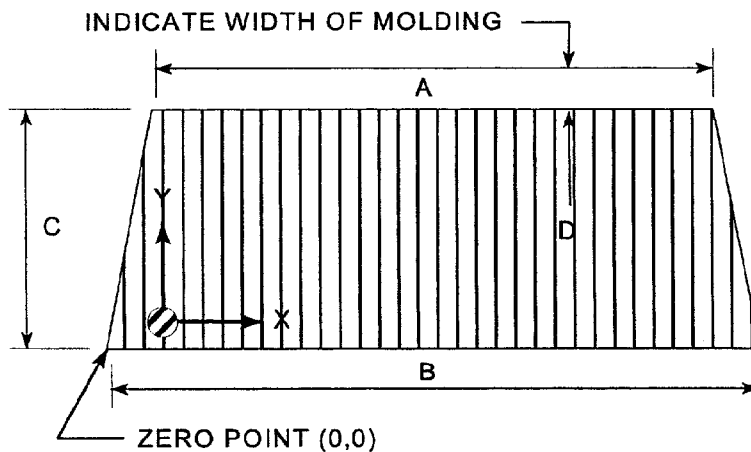
FMVSS 212 REQUIREMENTS:

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

FMVSS 212 TEST DATA

	WINDSHIELD PERIPHERY		% OF RETENTION
	PRE-TEST (mm)	POST-TEST(mm)	
RIGHT SIDE	2270	2270	100
LEFT SIDE	2270	2270	100
TOTAL	4,540	4,540	100

AREA OF RETENTION FAILURE:



DIMENSIONS (mm)	
A	1240
B	1580
C	860
D	15

FRONT VIEW OF WINDSHIELD

FAILURE DETAILS: None

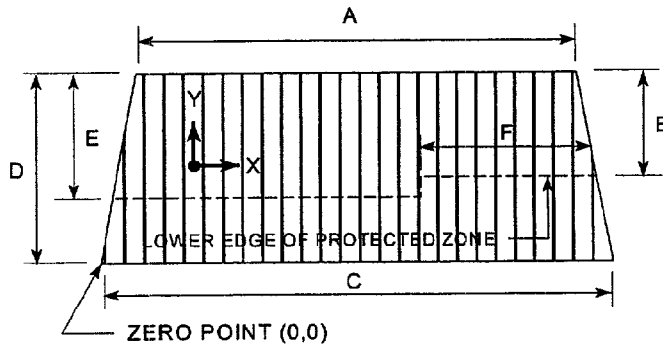
DATA SHEET NO. 11 FMVSS NO. 219 (PARTIAL) - "WINDSHIELD ZONE INTRUSION" DATA

PROTECTED ZONE LOWER EDGE REQUIREMENT:

The lower edge of the protected zone is determined by placing a 165 mm diameter rigid sphere weighing 6.8 kg in a position such that it simultaneously contacts the inner surface of the windshield and the top surface of the instrument panel including padding. The locus of points is drawn on the inner surface of the windshield contacted by the sphere across the width of the instrument panel. From the outermost contactable points extend the locus line horizontally to the edges of the windshield, then draw a line on the inner surface of the windshield below and 13 mm distant from the locus line. The **LOWER EDGE OF THE PROTECTED ZONE** is the longitudinal projection of this line onto the outer surface of the windshield.

FMVSS 219 TEST DATA:

(Dimensions in mm)



FRONT VIEW OF WINDSHIELD

DIMENSIONS	
A	1240
B	630
C	1580
D	860
E	630
F	660

DETAILS OF WINDSHIELD GLASS PENETRATION GREATER THAN 6 mm: None

(Show location of penetration on the above sketch)

COORDINATES		
	X	Y
1.	-	-
2.	-	-
3.	-	-
4.	-	-

DATA SHEET NO. 12 FMVSS NO. 301-75 "FUEL SYSTEM INTEGRITY" POST IMPACT TEST DATA

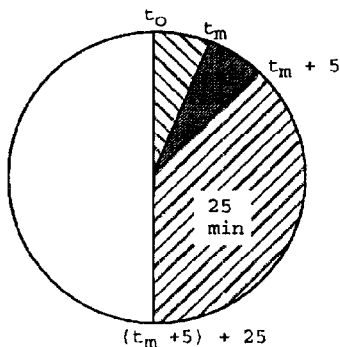
NHTSA TEST No.: MW5109 TEST DATE: January 27, 1998
VEHICLE MAKE/MODEL: 1998 Toyota Sienna

The test vehicle was filled from 92% to 94% of the manufacture's "usable" capacity. The electric fuel pump was operating if it will operate without engine operation. Two Part 572 anthropomorphic test devices were located at each of the front designated seating positions.

=====

TEST VEHICLE IMPACT TYPE: X Frontal (56 kph)
- Oblique (48 kph) with _____ deg. barrier face first contacting _____
 (driver/passenger) side
- Rear Moving Barrier (48 kph)
- Lateral Moving Barrier (32 kph)

FUEL SPILLAGE MEASUREMENT:



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

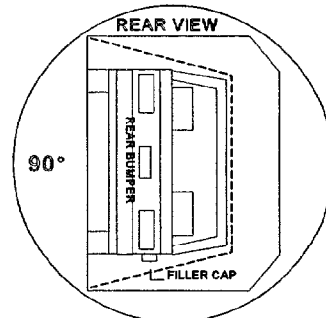
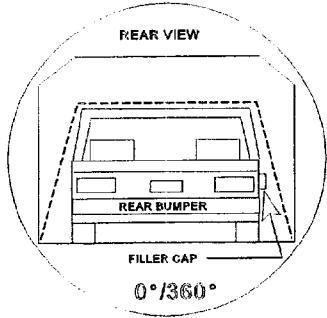
ACTUAL	MAX ALLOWED
0	28 g
0	141 g
0	28 g/min.

SOLVENT SPILLAGE DETAILS: None

DATA SHEET NO. 13 FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE:
0-90 deg.

NHTSA Test No.:
MW5109



INDETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)

1 minutes 10 seconds

FMVSS 301 Position Hold Time +

5 minutes 00 seconds

TOTAL

6 minutes 10 seconds

Next whole minute interval

7 minutes 00 seconds

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

141 g	28 g	28 g	28 g
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III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

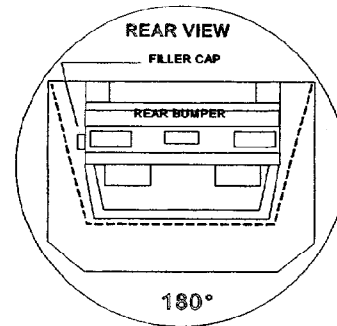
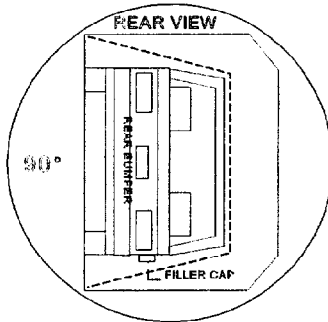
Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S): None

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

TEST PHASE:
90-180 deg.

NHTSA Test No.:
MW5109



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)

1 minutes 08 seconds

FMVSS 301 Position Hold Time +

5 minutes 00 seconds

TOTAL

6 minutes 8 seconds

Next whole minute interval

7 minutes 00 seconds

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

141 g	28 g	28 g	28 g
-------	------	------	------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

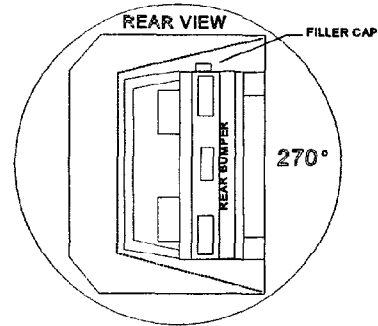
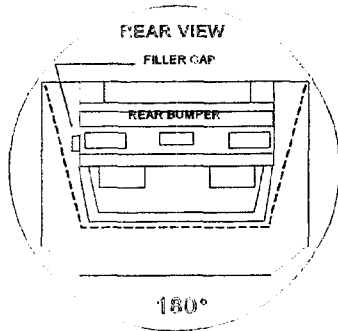
Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S): None

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

TEST PHASE:
180-270 deg.

NHTSA Test No.:
MW5109



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)

1 minutes

07 seconds

FMVSS 301 Position Hold Time +

5 minutes

00 seconds

TOTAL

6 minutes

7 seconds

Next whole minute interval

7 minutes

00 seconds

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

141 g	28 g	28 g	28 g
-------	------	------	------

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

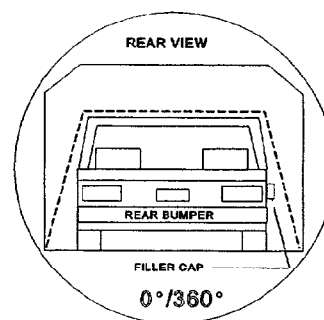
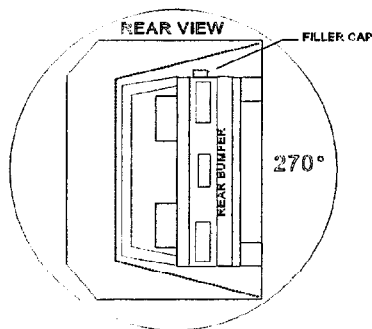
Note: Record spillage for whole minute intervals only as determined above.

IV. SOLVENT SPILLAGE LOCATION(S): None

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

TEST PHASE:
270-360 deg.

NHTSA Test No.:
MW5109



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90 deg. Rotation Time
(Spec. Range = 1 to 3 minutes)

1 minutes 06 seconds

FMVSS 301 Position Hold Time +

5 minutes 00 seconds

TOTAL

6 minutes 6 seconds

Next whole minute interval

7 minutes 00 seconds

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

141 g	28 g	28 g	28 g
-------	------	------	------

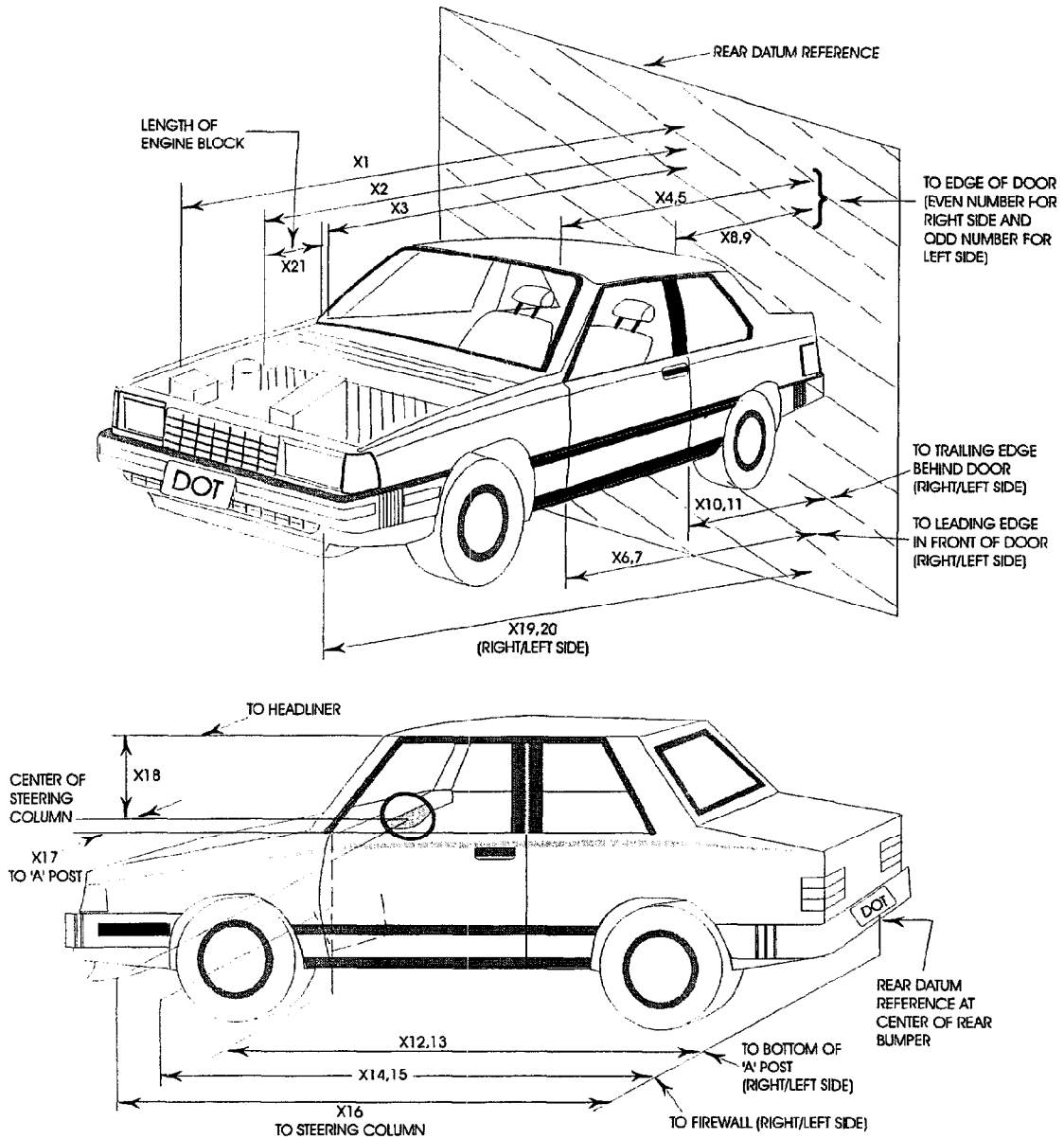
III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

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

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

IV. SOLVENT SPILLAGE LOCATION(S): None

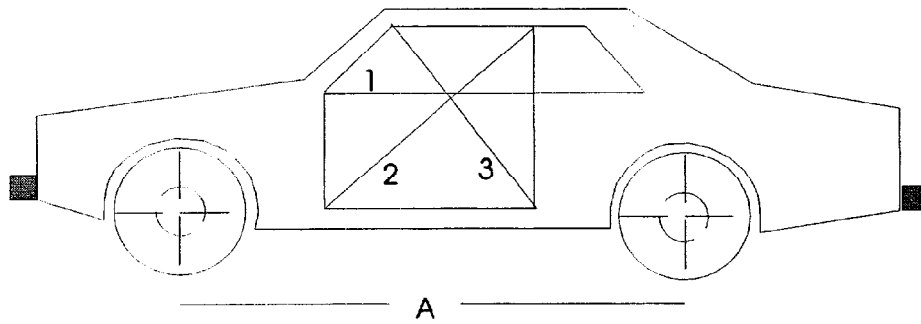
TEST VEHICLE MEASUREMENTS



DATA SHEET NO.14 VEHICLE MEASUREMENTS

No.		All Dimensions in mm		
		Pre-Test	Post-Test	Differences
X1	Total Length of Vehicle at Centerline	4916	4335	581
X2	Rear Surface of Vehicle to Front of Engine	4250	3995	255
X3	Rear Surface of Vehicle to Firewall	3710	3635	75
X4	Rear Surface of Vehicle to Upper Leading Edge of Right Door	3551	3546	5
X5	Rear Surface of Vehicle to Upper Leading Edge of Left Door	3552	3551	1
X6	Rear Surface of Vehicle to Lower Leading Edge of Right Door	3452	3432	20
X7	Rear Surface of Vehicle to Lower Leading Edge of Left Door	3453	3438	15
X8	Rear Surface of Vehicle to Upper Trailing Edge of Right Door	2372	2369	3
X9	Rear Surface of Vehicle to Upper Trailing Edge of Left Door	2376	2371	5
X10	Rear Surface of Vehicle to Lower Trailing Edge of Right Door	2418	2400	18
X11	Rear Surface of Vehicle to Lower Trailing Edge of Left Door	2418	2396	22
X12	Rear Surface of Vehicle to Bottom of "A" Post of Right Side	3416	3402	14
X13	Rear Surface of Vehicle to Bottom of "A" Post of Left Side	3424	3417	7
X14	Rear Surface of Vehicle to Firewall, Right Side	3720	3635	85
X15	Rear Surface of Vehicle to Firewall, Left Side	3745	3650	95
X16	Rear Surface of Vehicle to Steering Column	3110	3085	25
X17	Center of Steering Column to "A" Post	445	415	30
X18	Center of Steering Column to Headliner	490	430	60
X19	Rear Surface of Vehicle to Right Side of Front Bumper	4810	4320	490
X20	Rear Surface of Vehicle to Left Side of Front Bumper	4805	4340	465
X21	Length of Engine Block	470	470	0
RD	Rear Surface of Vehicle to Right Side of Dash Panel	3300	3295	5
CD	Rear Surface of Vehicle to Center of Dash Panel	3305	3245	60
LD	Rear Surface of Vehicle to Left Side of Dash Panel	3320	3285	35

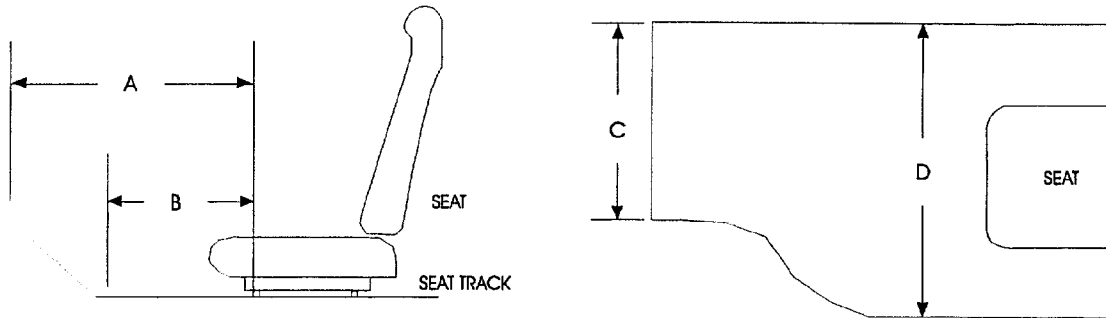
DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
VEHICLE INTRUSION MEASUREMENTS
DOOR OPENING WIDTH



UNITS (mm)	LEFT			RIGHT		
MEASUREMENT	1	2	3	1	2	3
BEFORE TEST	1105	1570	1245	1105	1580	1230
AFTER TEST	1100	1570	1240	1105	1585	1230
DIFFERENCE	5	0	5	0	-5	0

UNITS (mm)	A = WHEELBASE LEFT	A = WHEELBASE RIGHT
BEFORE TEST	2895	2890
AFTER TEST	2765	2765
DIFFERENCE	130	125

DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
VEHICLE INTRUSION MEASUREMENTS
STATIC FOOTWELL DEFORMATION



DRIVER

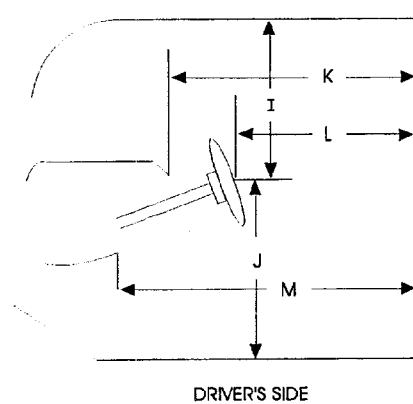
Measurement	Pre-Test	Post-Test	Difference
A	610	550	60
B	470	430	40
C	435	430	5
D	535	535	0

PASSENGER

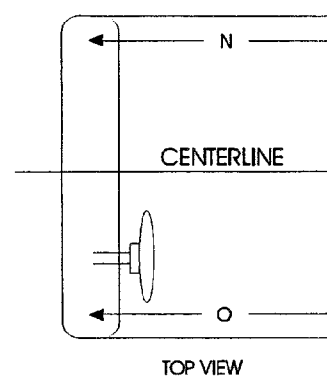
Measurement	Pre-Test	Post-Test	Difference
A	560	480	80
B	435	395	40
C	390	370	20
D	530	525	5

Units = mm

DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
VEHICLE INTRUSION MEASUREMENTS
STATIC PASSENGER COMPARTMENT INTRUSION

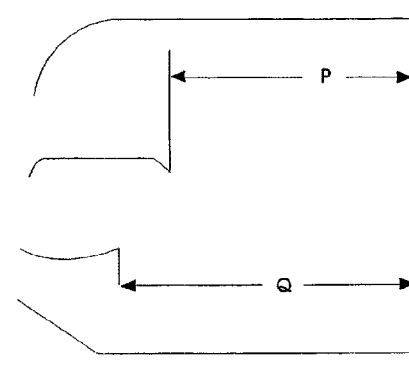


DRIVER'S SIDE



TOP VIEW

MEASUREMENTS
FROM C-PILLAR
BELT ANCHORAGE

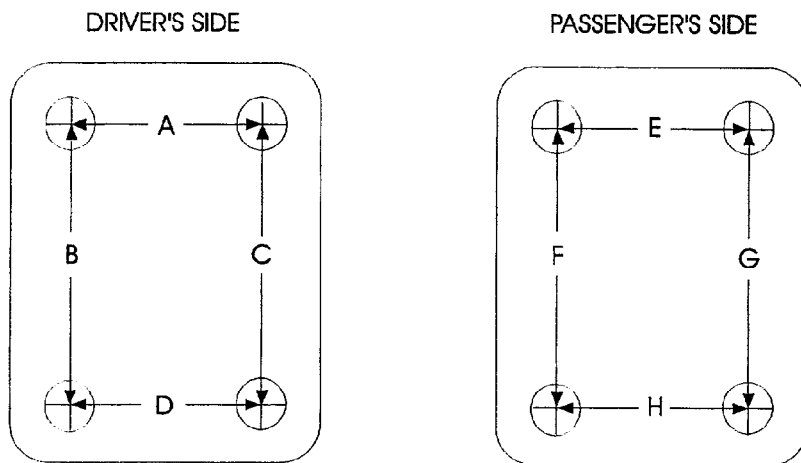


PASSENGER'S SIDE

Measurement	Pre-Test	Post-Test	Difference
I	480	420	60
J	690	750	-60
K	820	785	35
L	620	595	25
M	800	790	10
N	810	805	5
O	830	795	35
P = K (PASS.)	830	820	10
Q = M (PASS.)	805	765	40

Units = mm

DATA SHEET NO.14 VEHICLE MEASUREMENTS (cont.)
FLOORBOARD DEFORMATION



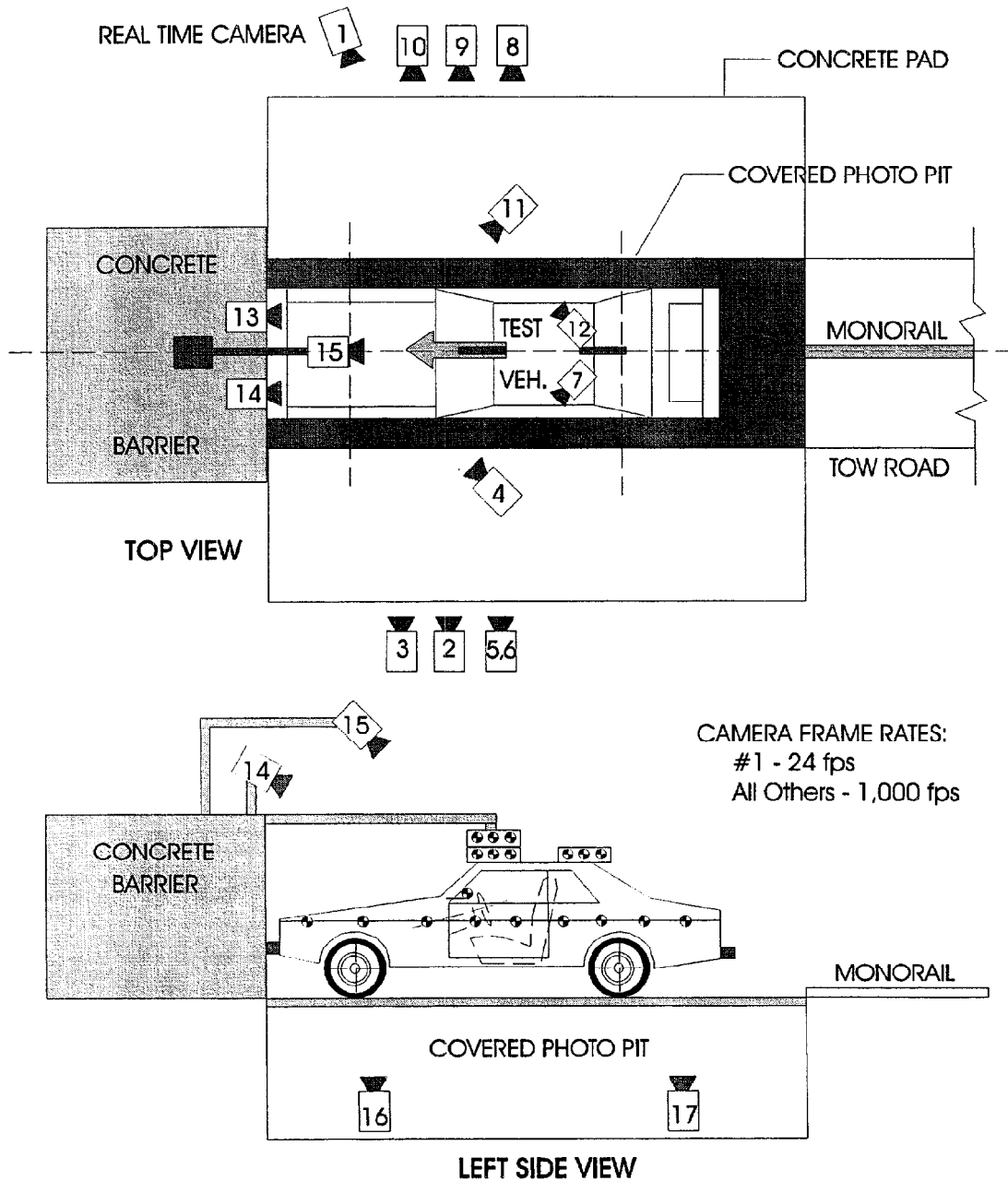
TOP VIEW THROUGH FLOOR PAN

Measurement	Pre-Test	Post-Test	Difference
A	356	375	-19
B	406	410	-4
C	406	385	21
D	350	370	-20
E	356	350	6
F	406	395	11
G	406	410	-4
H	350	360	-10

Units = mm

CAMERA POSITIONS FOR FRONTAL IMPACTS

NOTE: Camera information shown in DATA SHEET NO. 15.



DATA SHEET NO.15 HIGH-SPEED CAMERA LOCATIONS

NHTSA Test No.: MW5109 Vehicle: 1998 Toyota Sienna MPV

CAMERA NO.	VIEW	CAMERA POSITIONS (mm)*			ANGLE** (deg)	FILM PLANE TO HEAD TARGET	LENS (mm)	SPEED (fps)
1	Real-Time Camera	-	-	-	-	-	-	24
2	Overall Left Side	6816	1649	1128	-4	6334	12.5	1020
3	Left Side View	8081	1102	1145	-4	7599	25	1020
4	Driver and Interior View	4946	3029	1975	-11	-	25	1010
5	Steering Column (Bottom)	7585	1866	1170	-3	7103	25	1010
6	Steering Column (Top)	7585	1866	1790	-12	7103	25	1020
7	Left Belt	-	-	-	-	-	13	910
8	Overall Right Side	6947	2201	1198	-4	6465	13	1025
9	Right Side View	7974	1440	1218	-3	7492	25	1010
10	Right Passenger View	7754	1918	1585	-4	7272	35	1000
11	Passenger and Interior View	4750	3128	1990	-11	-	25	1010
12	Right Belt	-	-	-	-	-	13	880
13	Passenger Front View	580	490	1975	-45	-	8	1020
14	Driver Front View	580	490	1975	-44	-	8	1010
15	Windshield View	0	-130	3558	-62	-	13	1000
16	Pit View of Engine	0	832	-3048	90	-	13	1010
17	Pit View of Fuel Tank	0	2462	-3048	90	-	13	1015

*X = film plane to monorail centerline ** = referenced to horizontal plane

Y = film plane to impact location

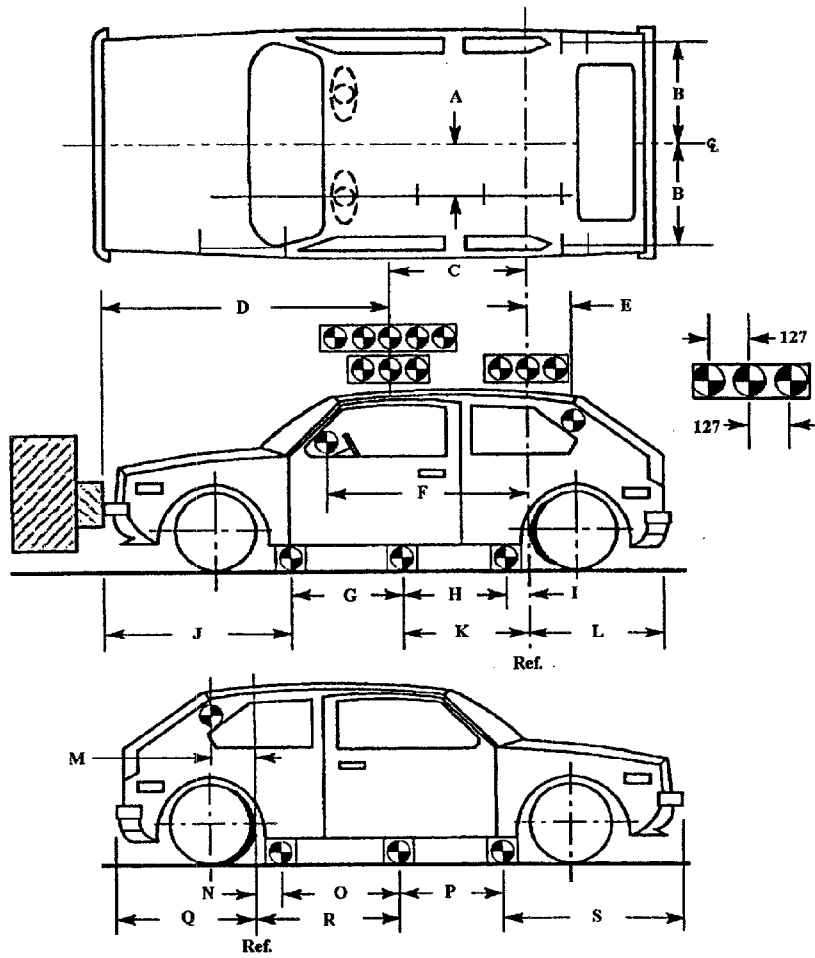
N.T. indicates No Timing

Z = film plane to ground

DATA SHEET NO. 16 VEHICLE REFERENCE PHOTO TARGET LOCATIONS

(Dimensions in millimeters)

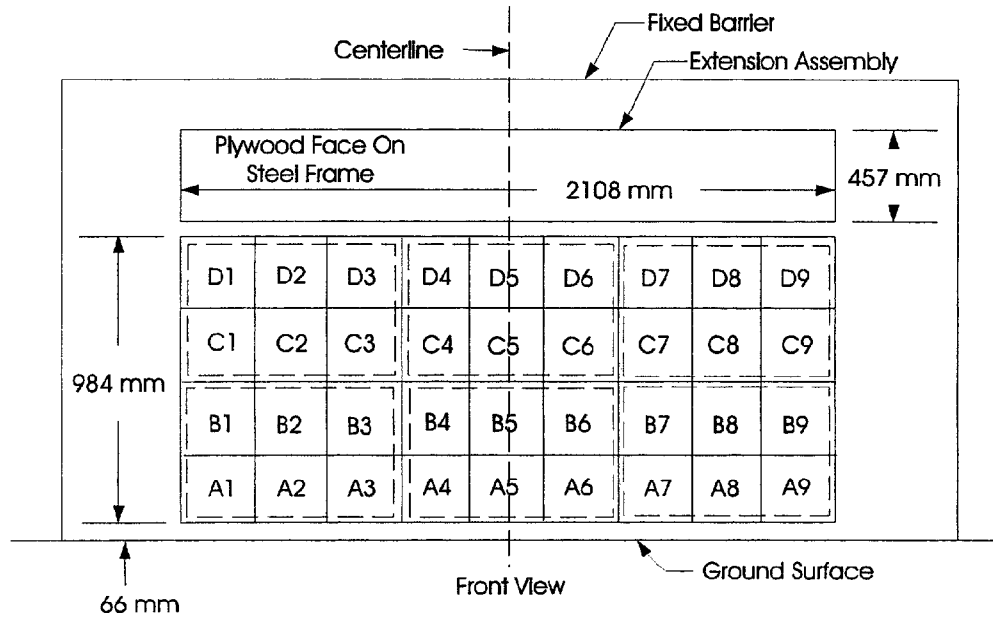
A	406
B	705
C	1219
D	2312
E	335
F	1867
G	889
H	889
I	224
J	1515
K	1113
L	1399
M	335
N	225
O	889
P	889
Q	1398
R	1114
S	1515



DATA SHEET NO. 17 LOAD CELL LOCATIONS ON FIXED BARRIER

Load Cell Barrier data was not requested for this test.

- 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)

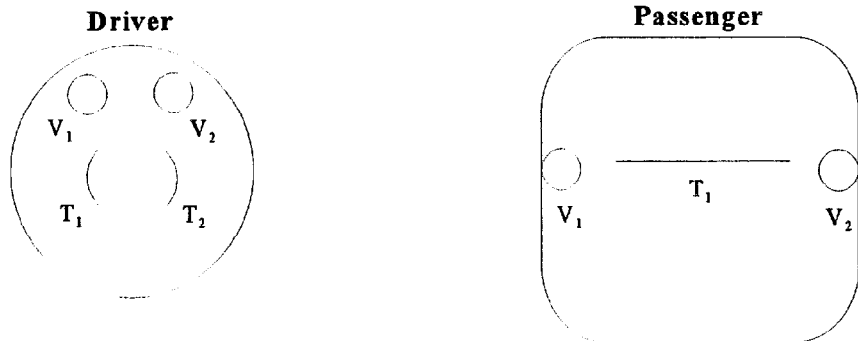
DATA SHEET NO. 18 POST TEST AIR BAG DATA

NHTSA No. : MW5109; Test Date: January 27, 1998; Technician: Lawrence Valvo

Vehicle Model Year/Make/Model: 1998 Toyota Sienna

- A. No. of vent holes: 2 -Driver 2 -Passenger
- B. Size of vent holes: (mm²) 707 -Driver 1590 -Passenger
- C. Total vent area: (mm²) 1414 -Driver 3180 -Passenger
- D. Deflated air bag length and width dimensions or, if round, diameter. (mm)
- Driver: - -Length; - -Width; 660 -Diameter
- Passenger: 700 -Height; 415 -Width; 490 -Depth
- E. Is the air bag tethered?
- Driver: X -Yes; - -No; If yes, record length of tether- 180
- Passenger: X -Yes; - -No; If yes, record length of tether- 475

Sketch the air bag showing the location of the vent holes, how the bag is tethered, and where the bag is tethered. Also describe how the tethers are attached to the bag and the steering wheel.
(Note: Not to scale; V_n = Vent hole_n, T_n = Tether_n).



- F. Record part numbers and manufacturer name of the air bag and gas generator.

Driver: Air bag: 45165-08010-0A; 0005172; P014

Generator: TDR AZ9 1H FQB; 202530697A16

Passenger: Air bag: P120137-02C; TAC325L10084

Generator: Toyota: 73960-08021; Morton: 12084-03; A1S HZG 7 97 PAN 0210

DATA SHEET NO.19 ACCIDENT INVESTIGATION DIVISION DATA

FOR 56.3 KPH FRONTAL BARRIER IMPACT

Vehicle Make/Model/Body Style: Toyota Sienna MPV

NHTSA Test No.: MW5109 VIN: 4T3ZF13C9WU026599

Model Year: 1998 Build Date: 12/97 Test Date: January 27, 1998

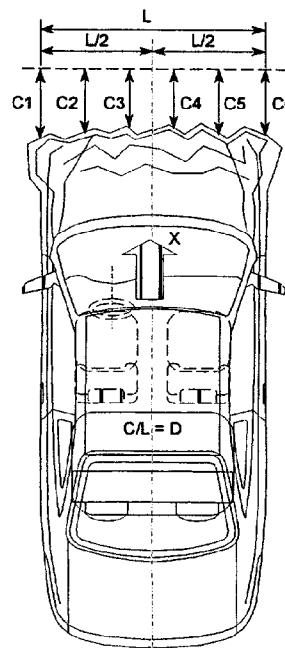
Vehicle Size Category: Minivan Test Weight: 2048.5 kg

Vehicle Wheelbase: 2900 mm; Front Overhang: 1515 mm; Overall Width: 1865 mm

Collision Deformation Classification (CDC) Code: 12FDEW2

Crush Depth Dimensions:

	PRE	POST	DIFF	
C1 =	4710	4285	-425	mm
C2 =	4865	4365	-500	mm
C3 =	4910	4350	-560	mm
C4 =	4910	4350	-560	mm
C5 =	4860	4345	-515	mm
C6 =	4705	4245	-460	mm



Midpoint of Damage: D = Vehicle Centerline
(Longitudinal)

Length of Damaged Region:

L1 = 1670 mm

L2 = 835 mm

L3 = 334 mm

Appendix A
PHOTOGRAPHS

PHOTOGRAPHS

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

PHOTOGRAPHS (continued)

<u>Figure</u>	<u>Title</u>	<u>Page</u>
A-32	PRE-TEST PASSENGER HEAD LOCATION	A-35
A-33	POST-TEST PASSENGER HEAD LOCATION	A-36
A-34	PRE-TEST DRIVER FLOOR PAN VIEW	A-37
A-35	POST-TEST DRIVER FLOOR PAN VIEW	A-38
A-36	PRE-TEST PASSENGER FLOOR PAN VIEW	A-39
A-37	POST-TEST PASSENGER FLOOR PAN VIEW	A-40
A-38	ROLLOVER VIEW	A-41
A-39	IMPACT VIEW	A-42

PHOTOGRAPH NOT AVAILABLE



Figure A-2 PRE-TEST FRONT VIEW



Figure A-3 POST-TEST FRONT VIEW



Figure A-4 PRE-TEST LEFT SIDE VIEW

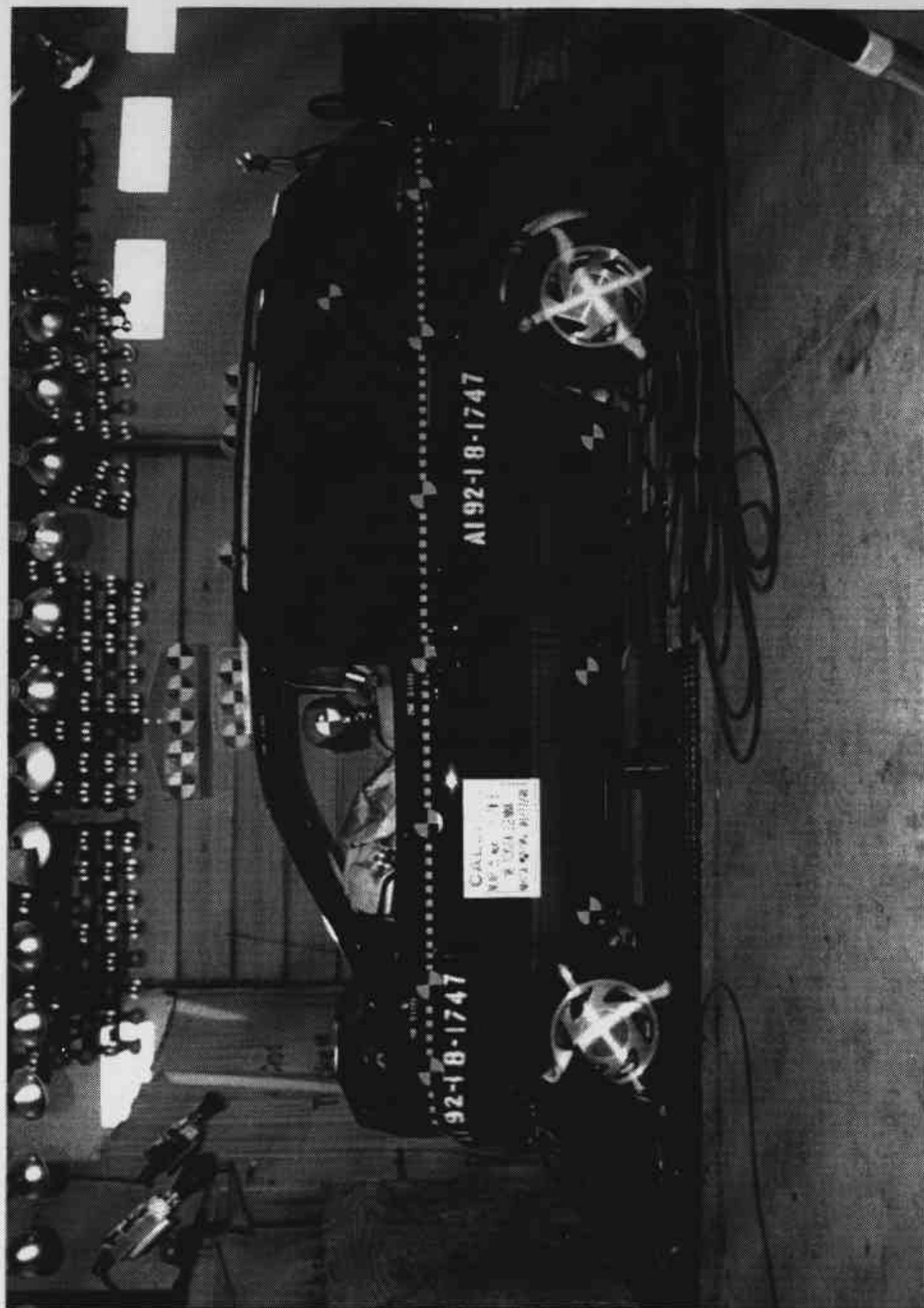


Figure A-5 POST-TEST LEFT SIDE VIEW

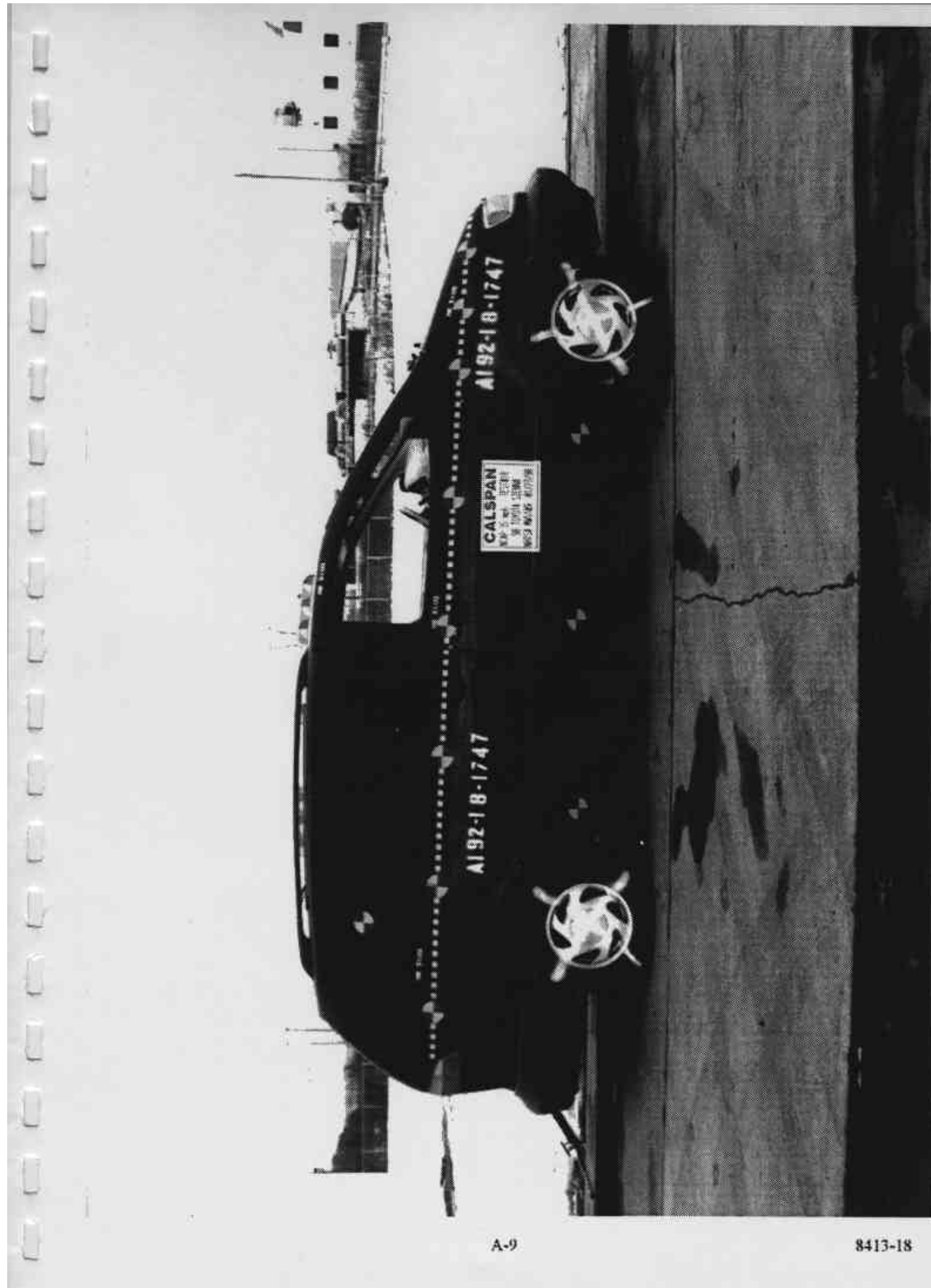


Figure A-6 PRE-TEST RIGHT SIDE VIEW

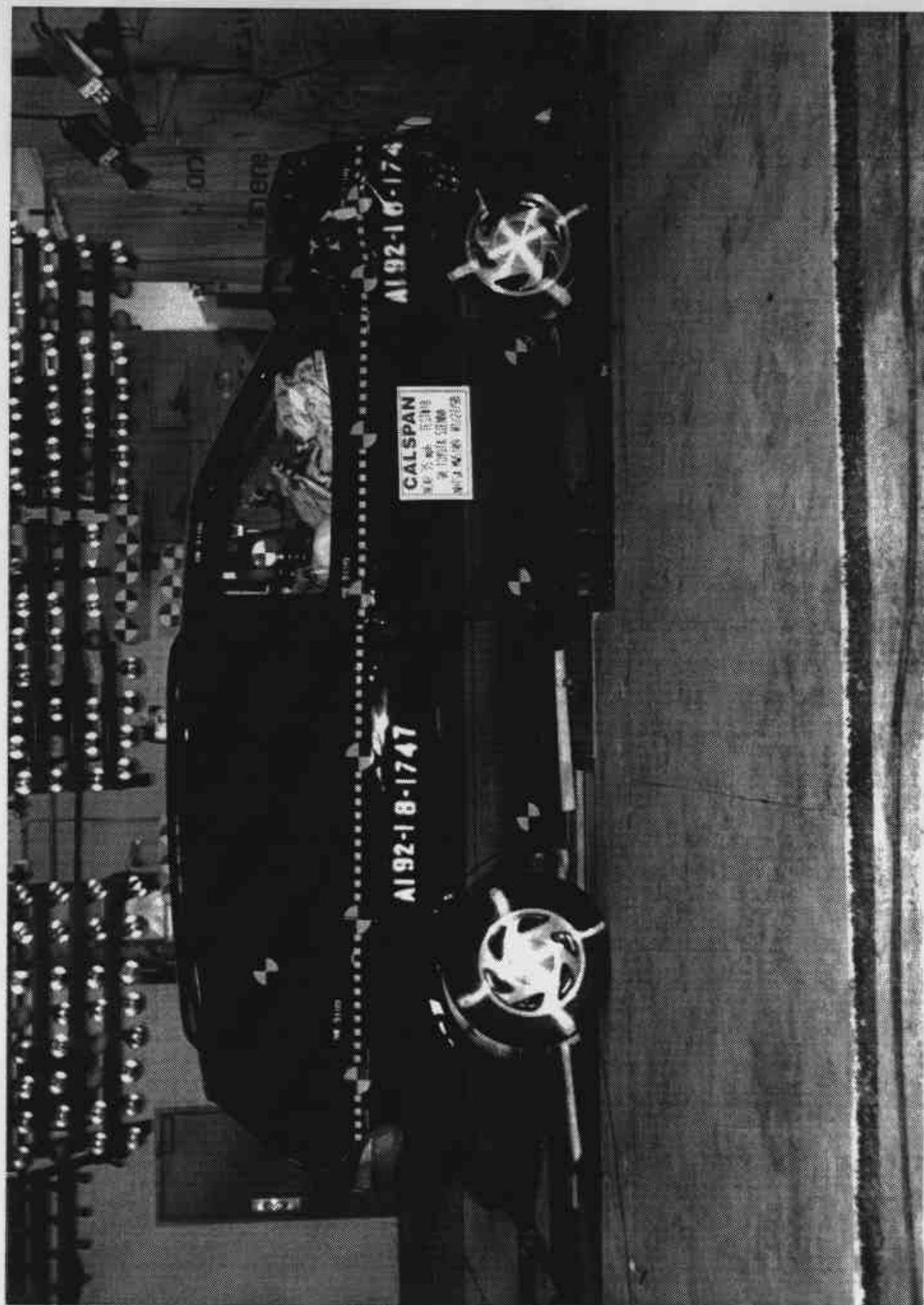


Figure A-7 POST-TEST RIGHT SIDE VIEW



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

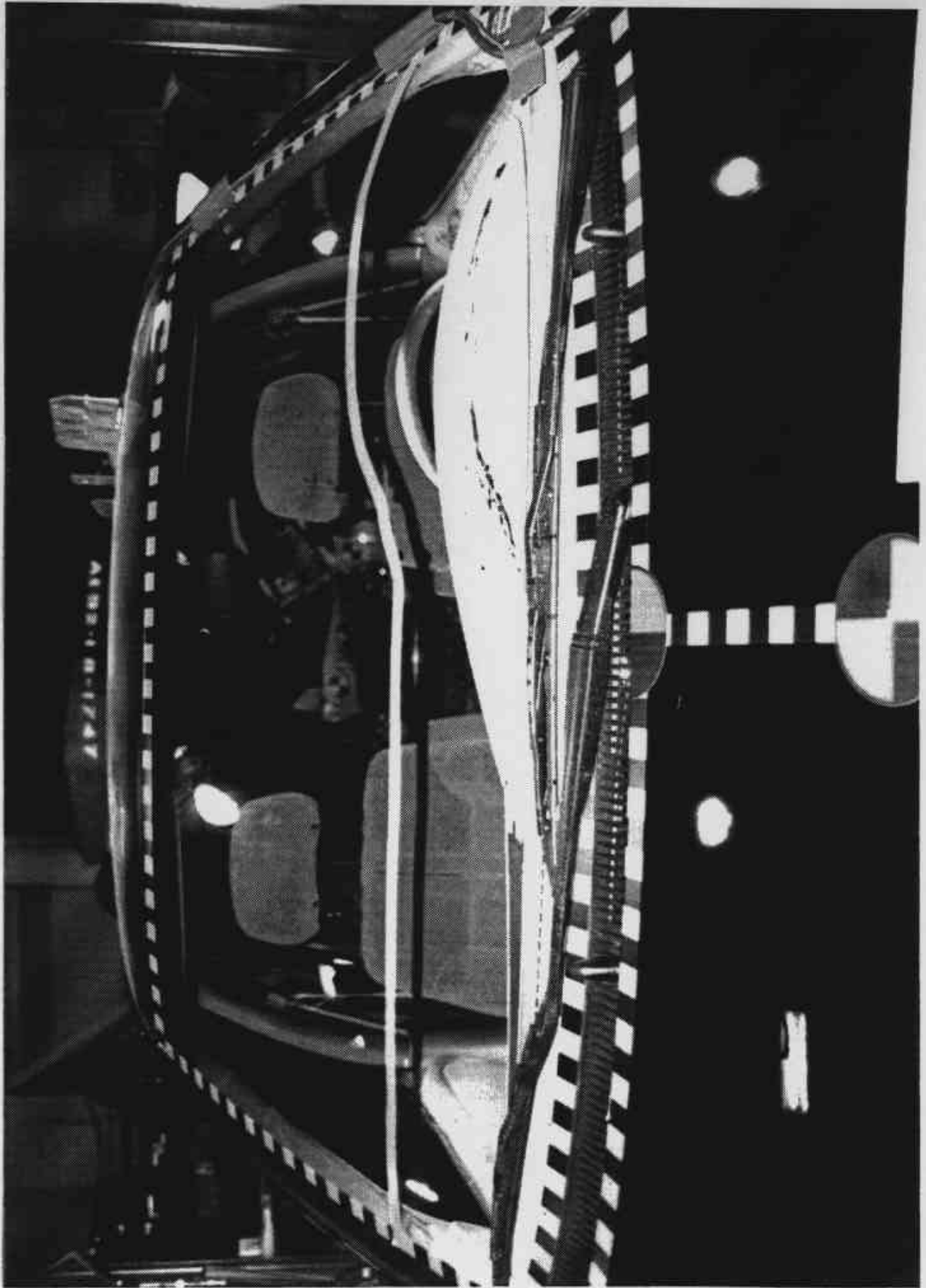


Figure A-12 PRE-TEST WINDSHIELD VIEW



Figure A-13 POST-TEST WINDSHIELD VIEW

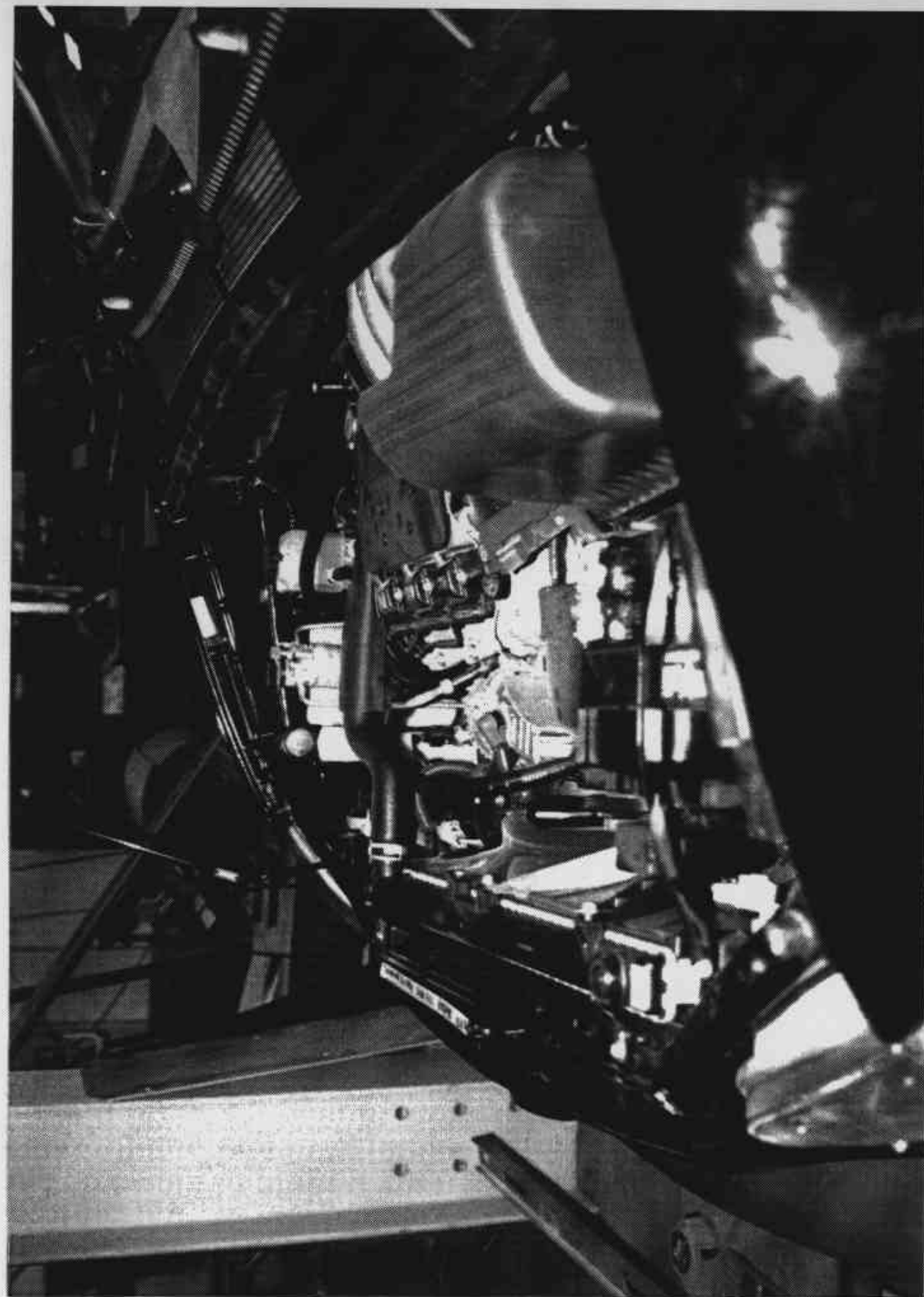


Figure A-14 PRE-TEST ENGINE COMPARTMENT VIEW

Figure A-15 FUEL CAP VIEW



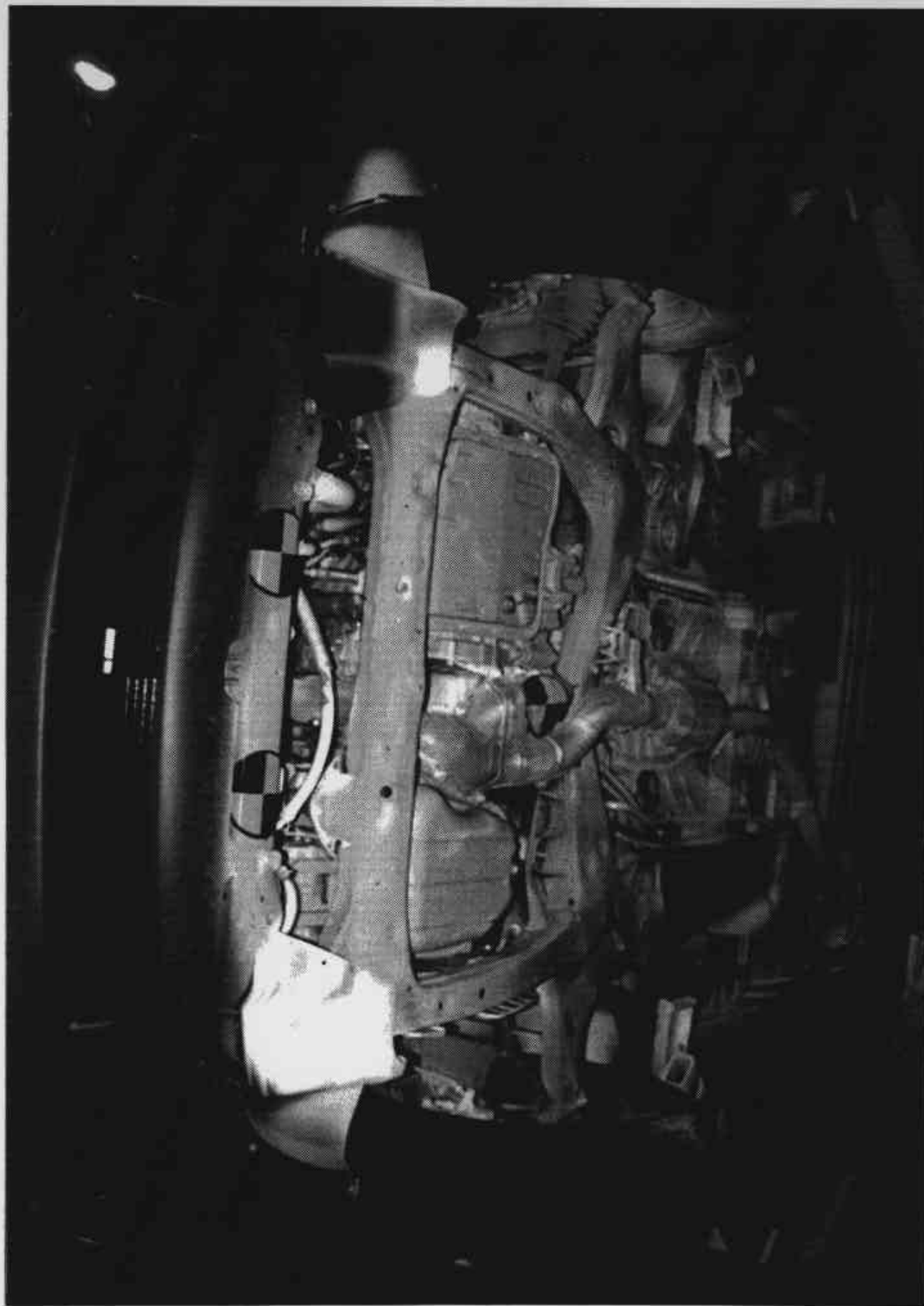


Figure A-16 PRE-TEST FRONT UNDERBODY VIEW

Figure A-17 POST-TEST FRONT UNDERBODY VIEW

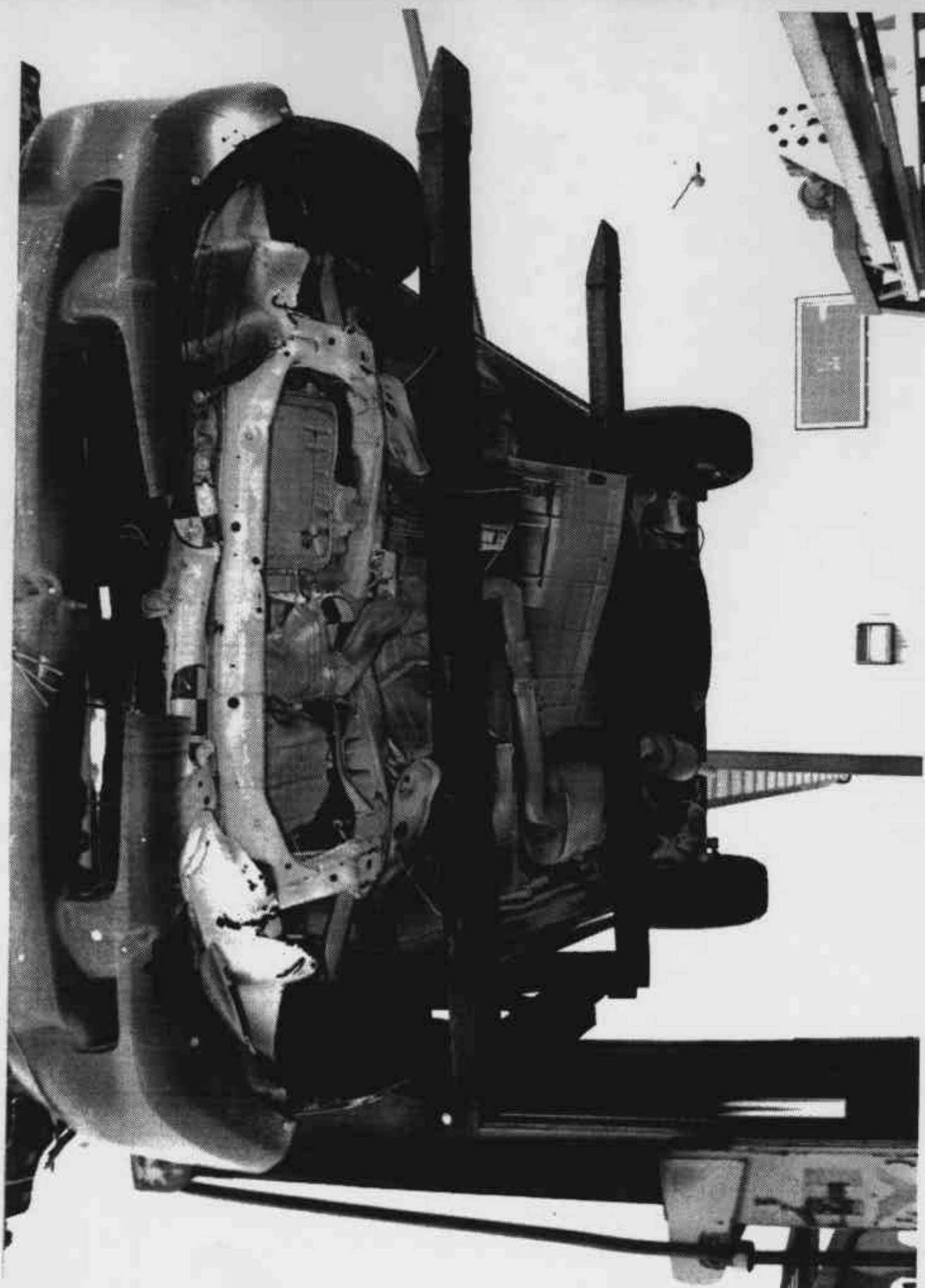
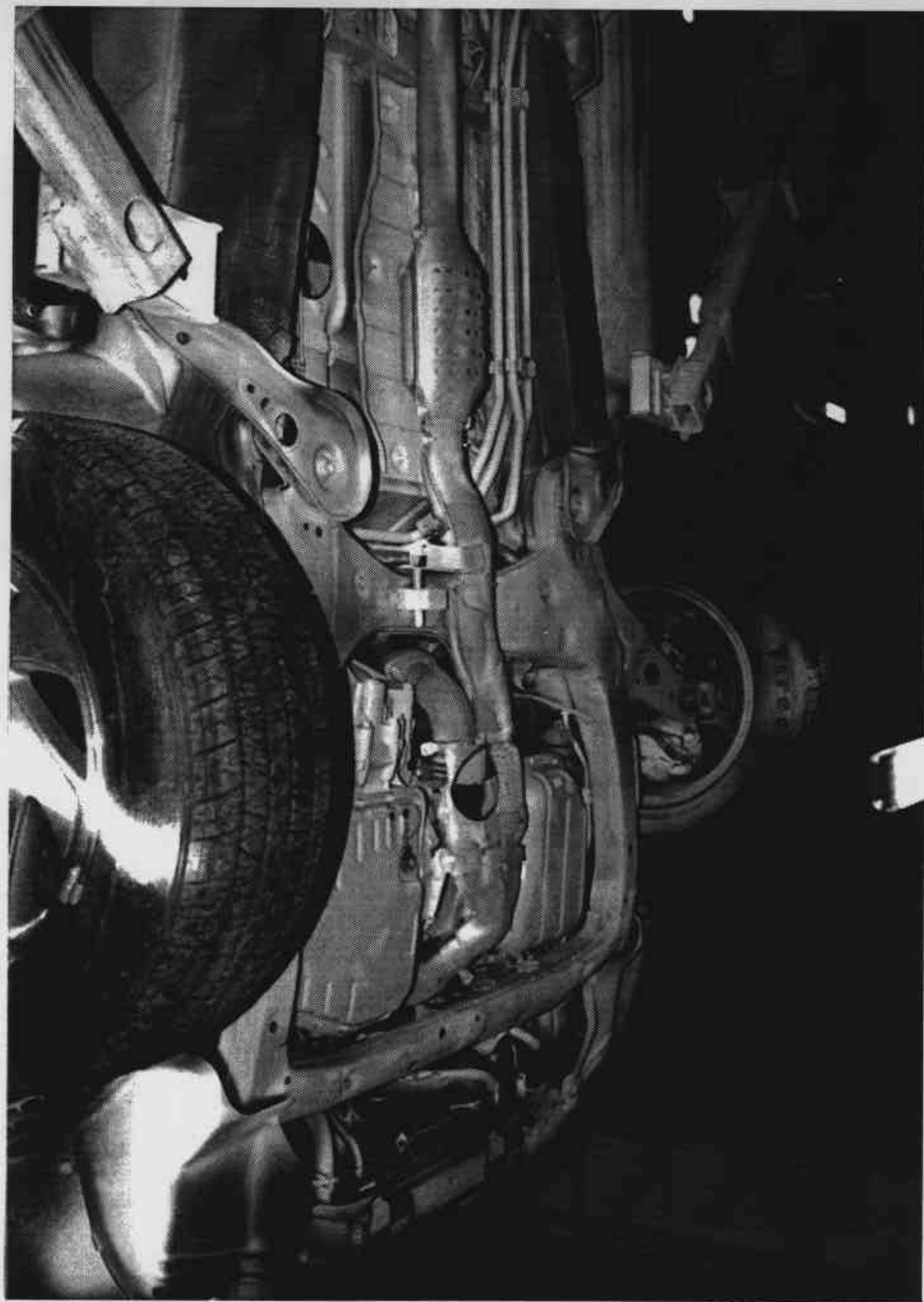


Figure A-18 PRE-TEST FRONT SIDE UNDERBODY VIEW



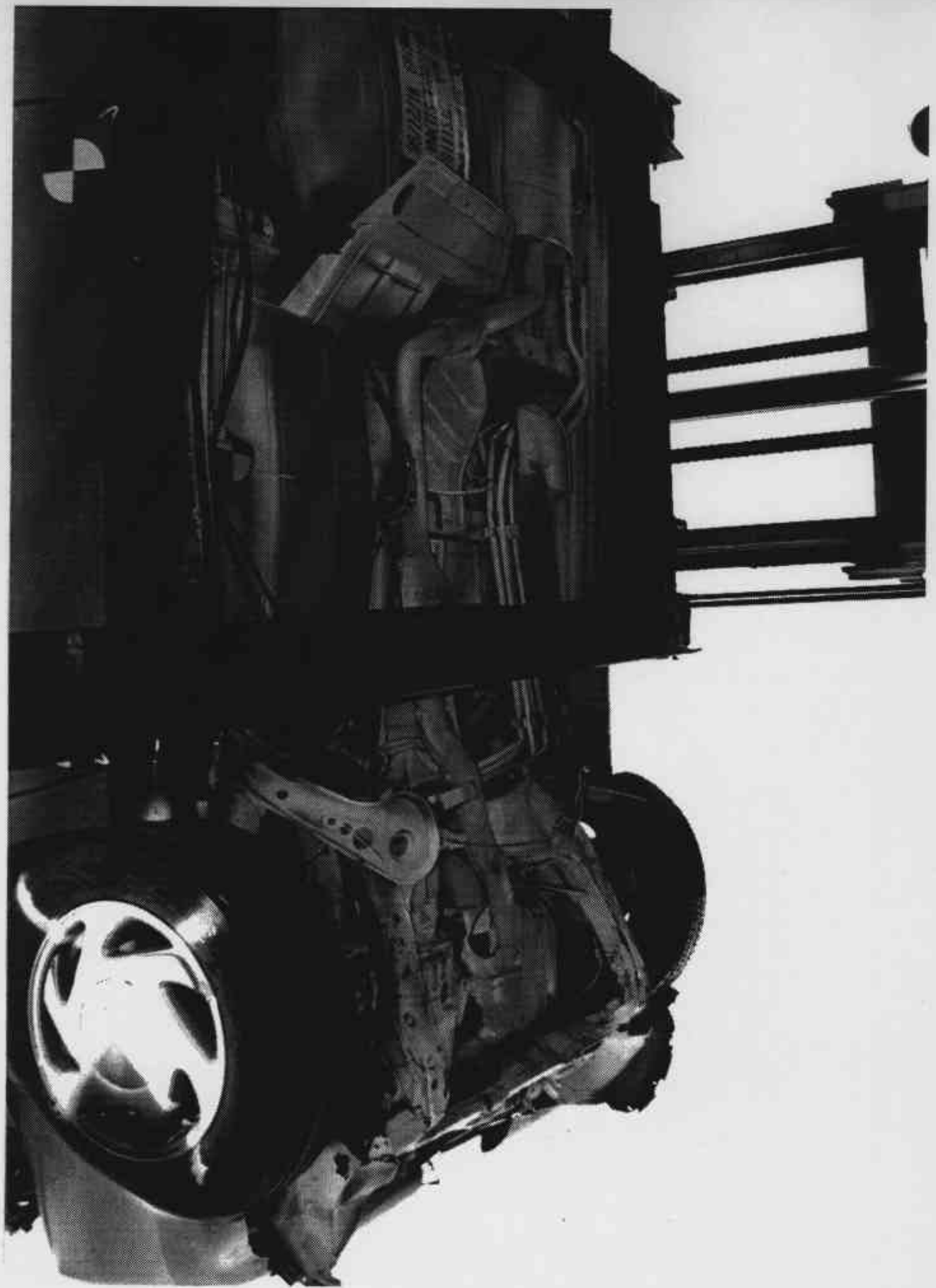


Figure A-19 POST-TEST FRONT SIDE UNDERBODY VIEW

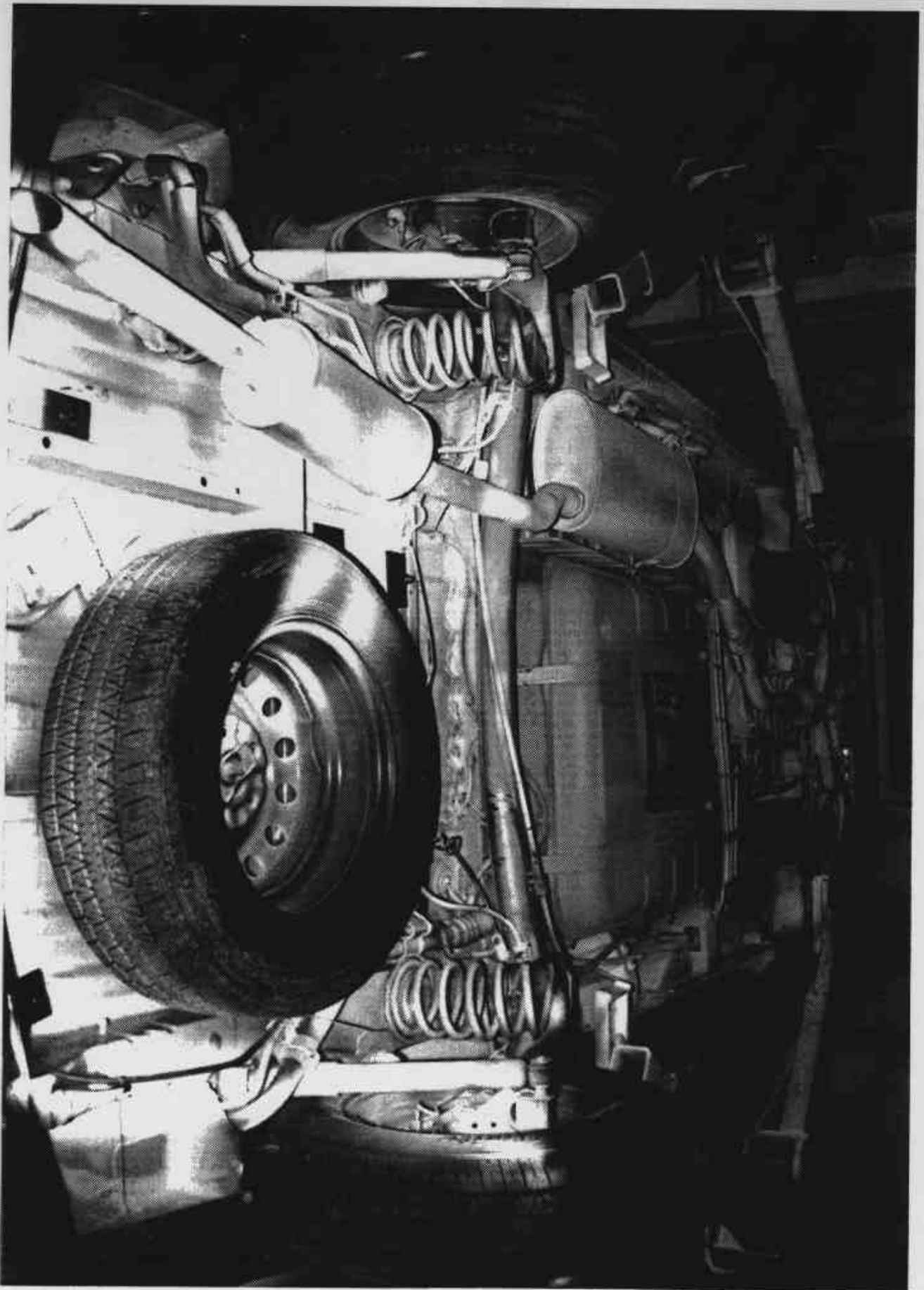


Figure A-20 PRE-TEST REAR UNDERBODY VIEW



Figure A-21 POST-TEST REAR UNDERBODY VIEW



Figure A-22 PRE-TEST DRIVER POSITION VIEW

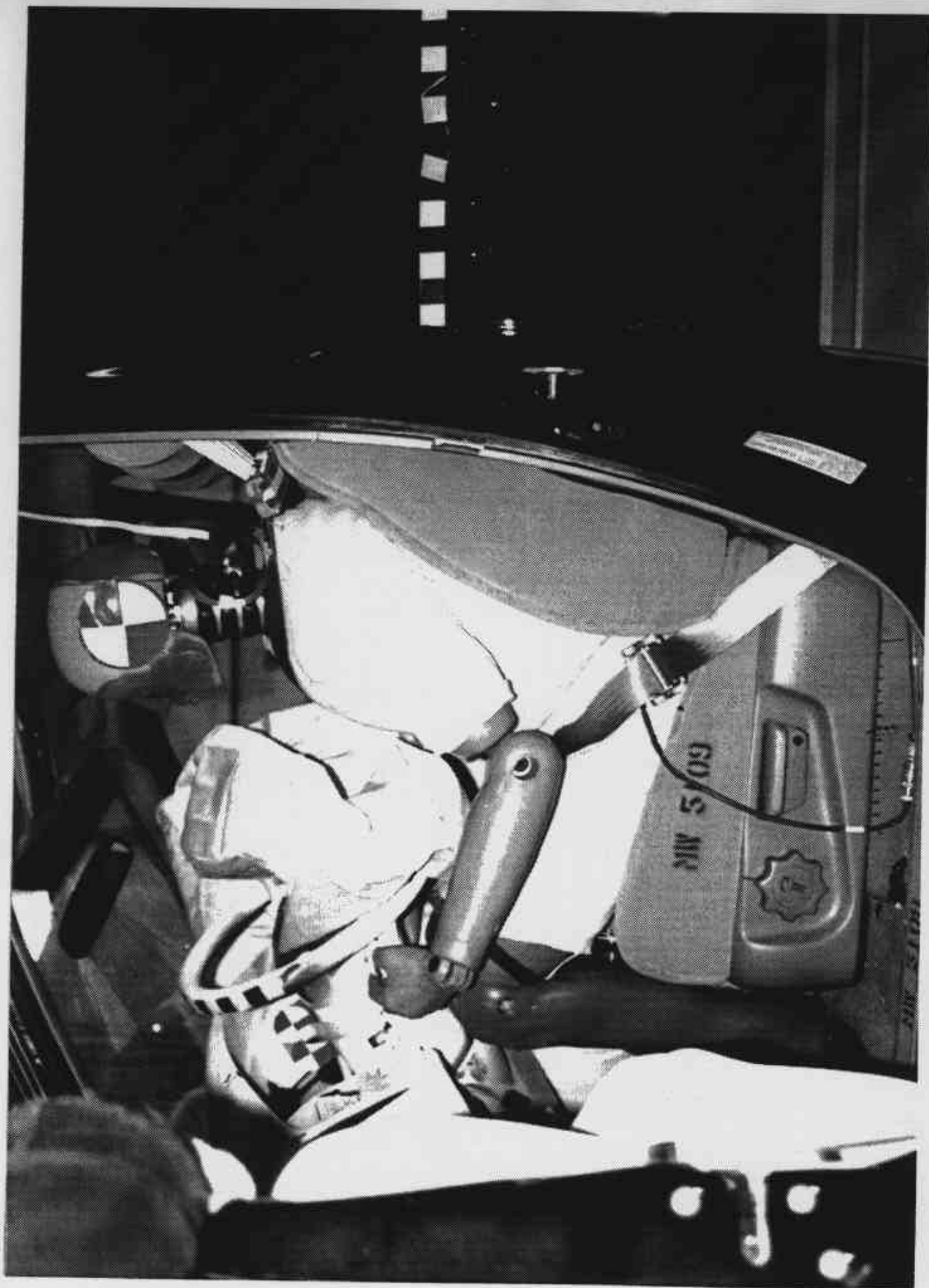


Figure A-23 POST-TEST DRIVER POSITION VIEW



Figure A-24 PRE-TEST PASSENGER POSITION VIEW



Figure A-25 POST-TEST PASSENGER POSITION VIEW

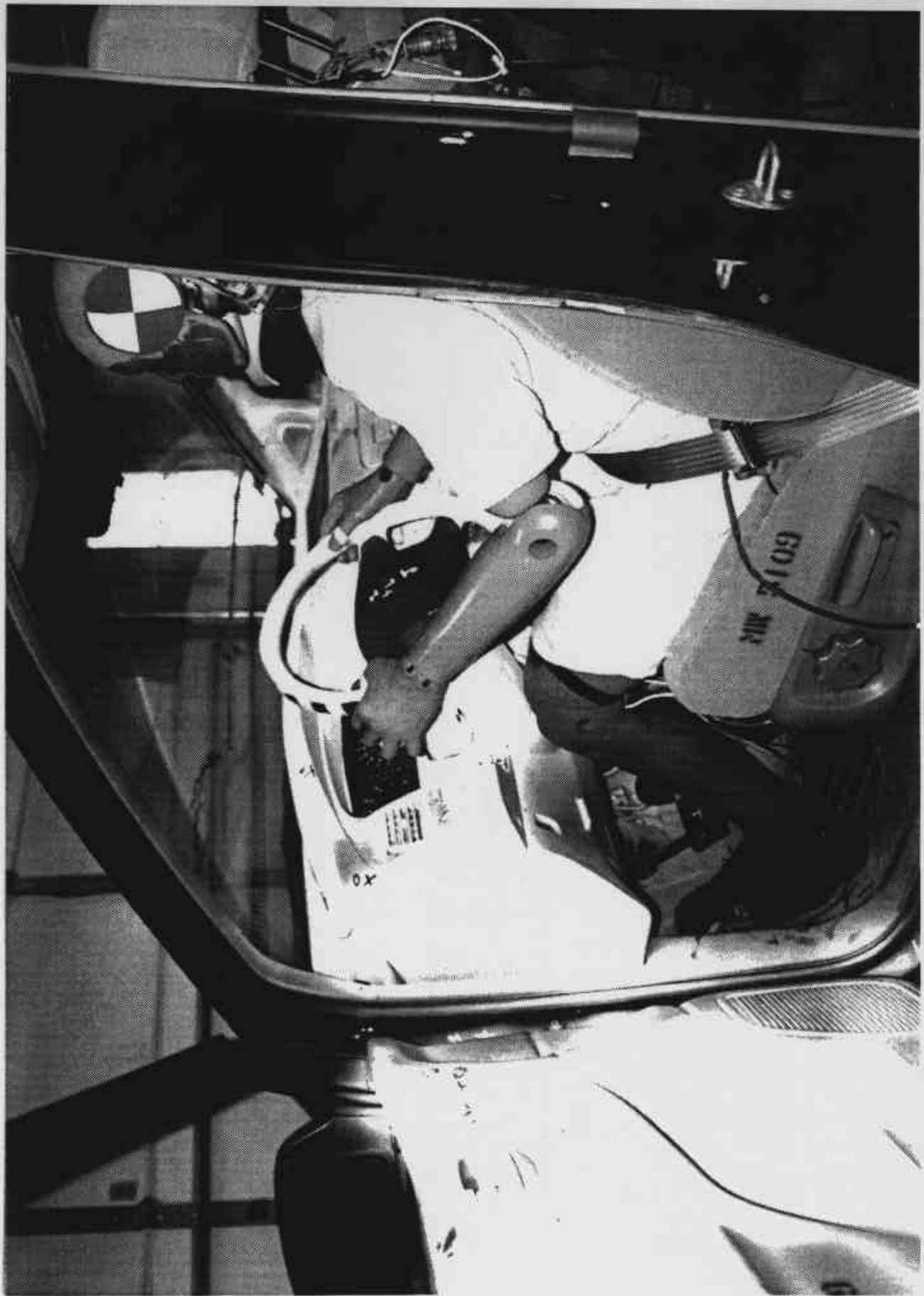


Figure A-26 PRE-TEST DRIVER AND INTERIOR VIEW

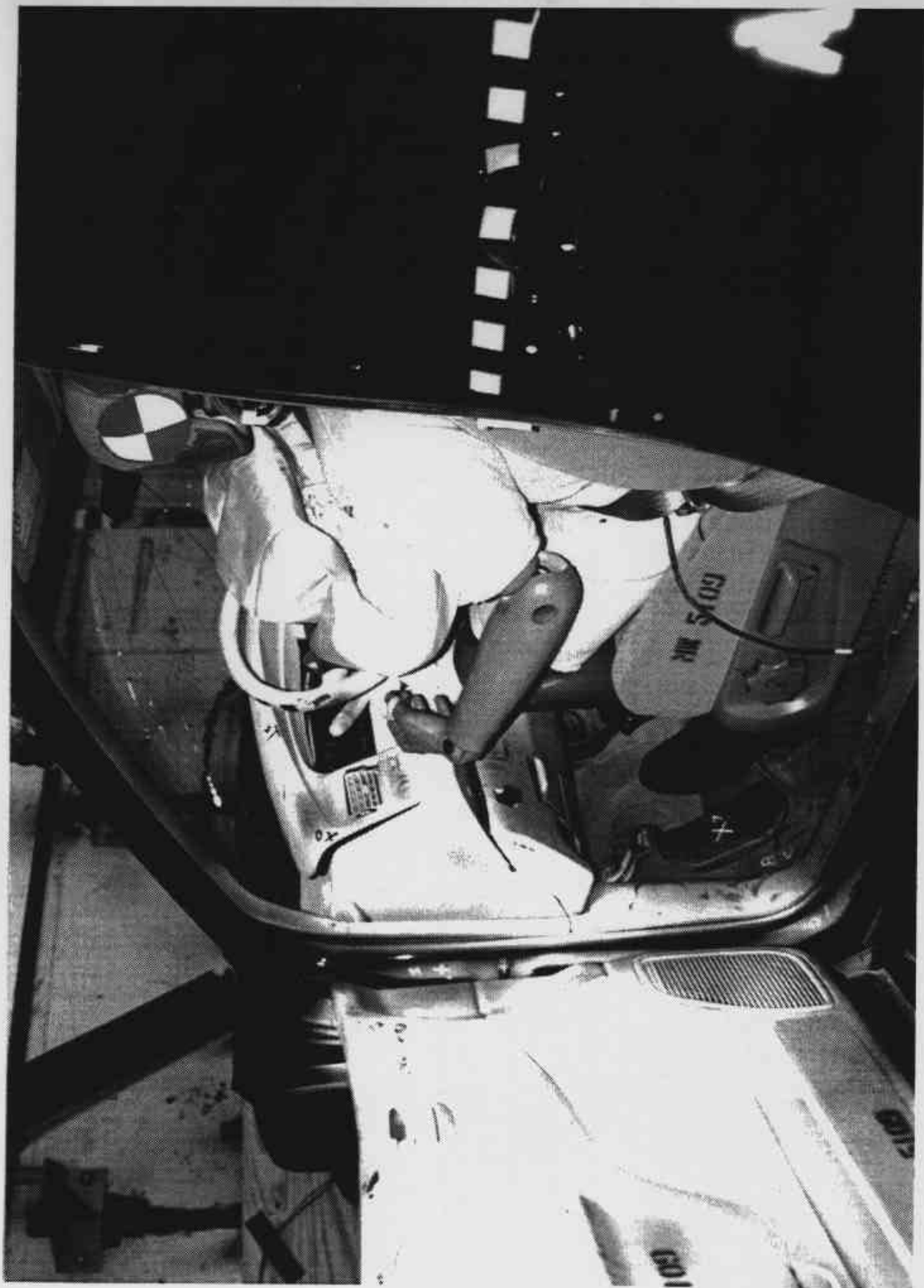


Figure A-27 POST-TEST DRIVER AND INTERIOR VIEW



Figure A-28 PRE-TEST PASSENGER AND INTERIOR VIEW



Figure A-29 POST-TEST PASSENGER AND INTERIOR VIEW

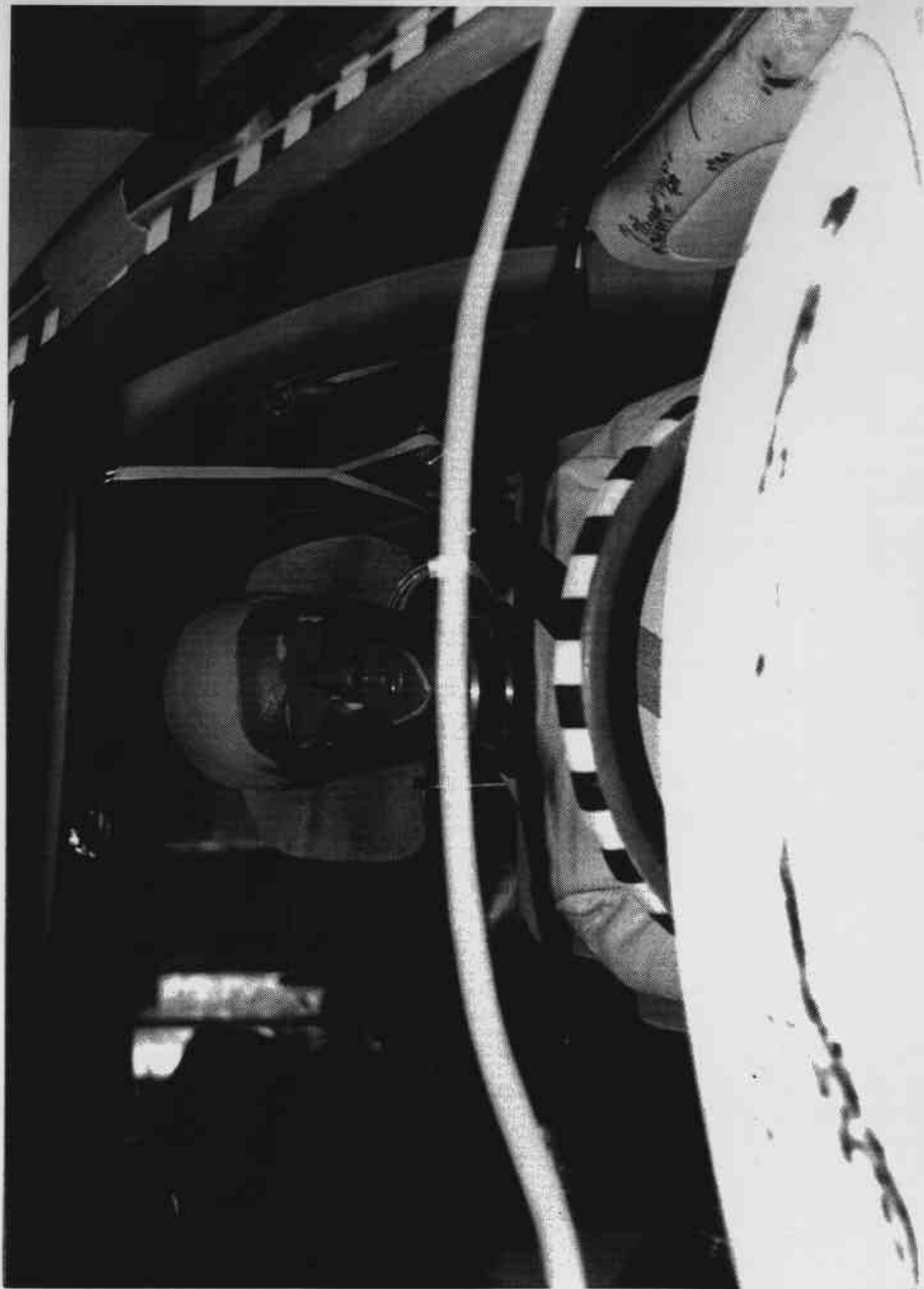


Figure A-30 PRE-TEST DRIVER HEAD LOCATION

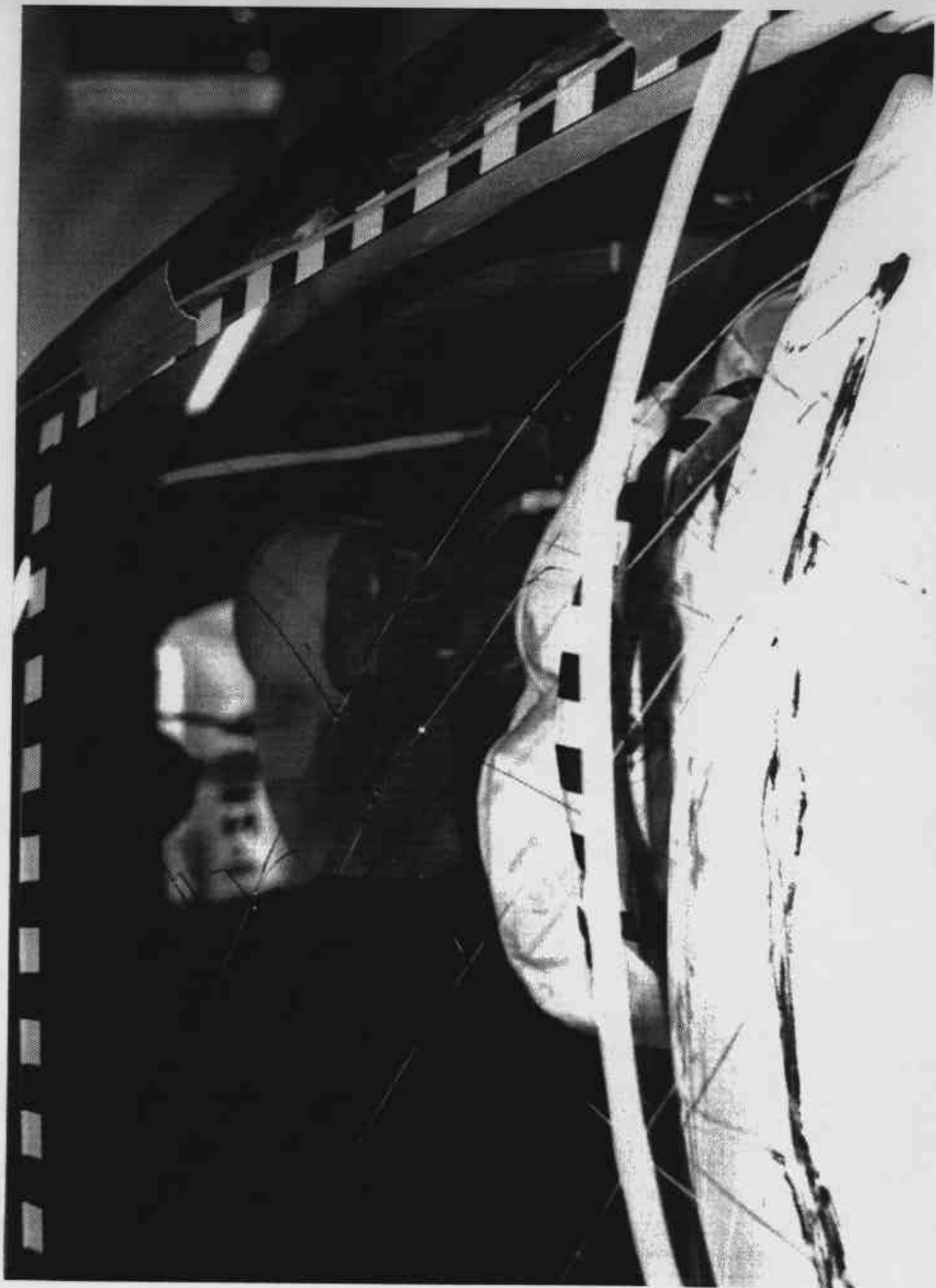


Figure A-31 POST-TEST DRIVER HEAD LOCATION

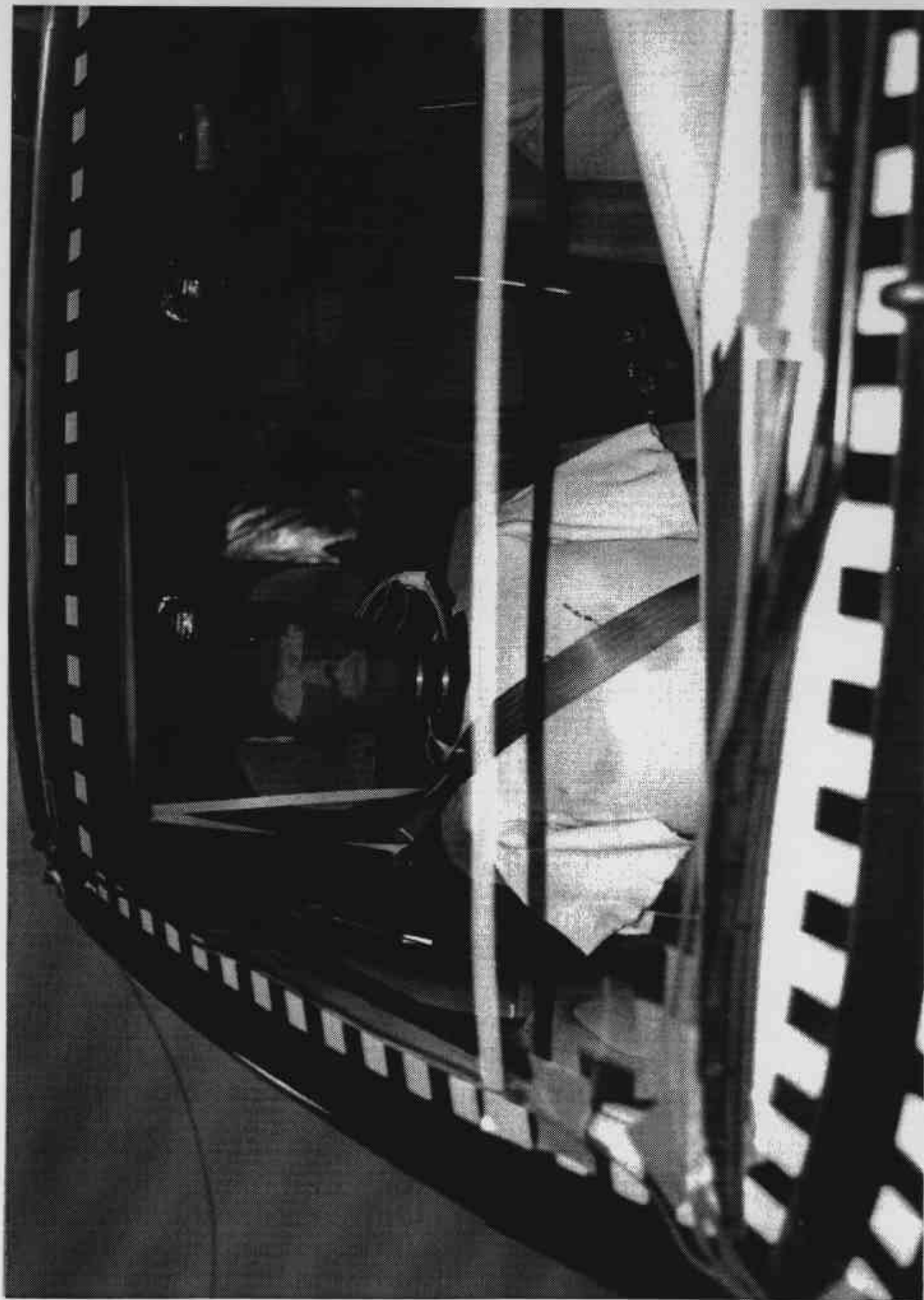


Figure A-32 PRE-TEST PASSENGER HEAD LOCATION



Figure A-33 POST-TEST PASSENGER HEAD LOCATION

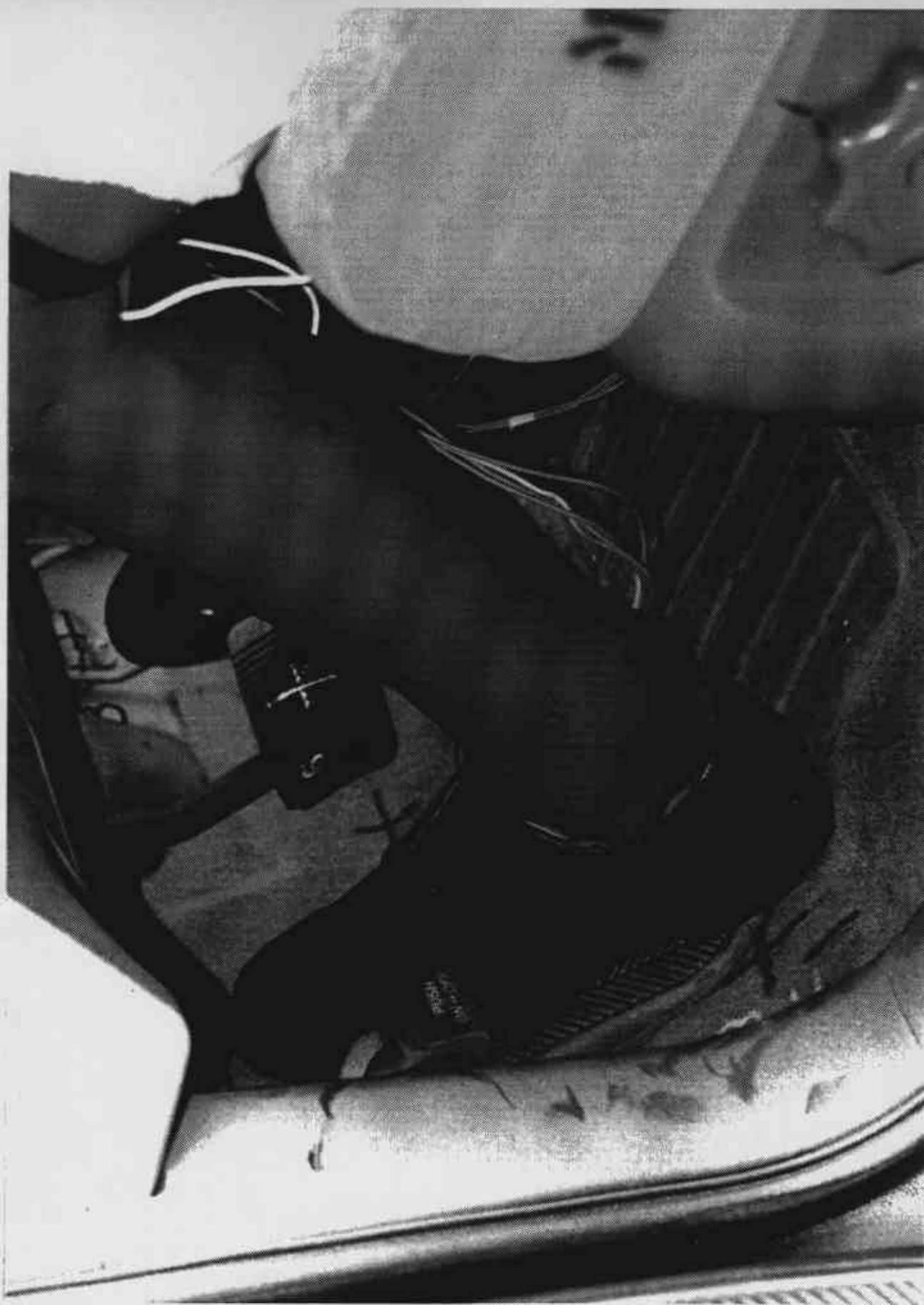


Figure A-34 PRE-TEST DRIVER FLOOR PAN VIEW



Figure A-35 POST-TEST DRIVER FLOOR PAN VIEW



Figure A-36 PRE-TEST PASSENGER FLOOR PAN VIEW



Figure A-37 POST-TEST PASSENGER FLOOR PAN VIEW

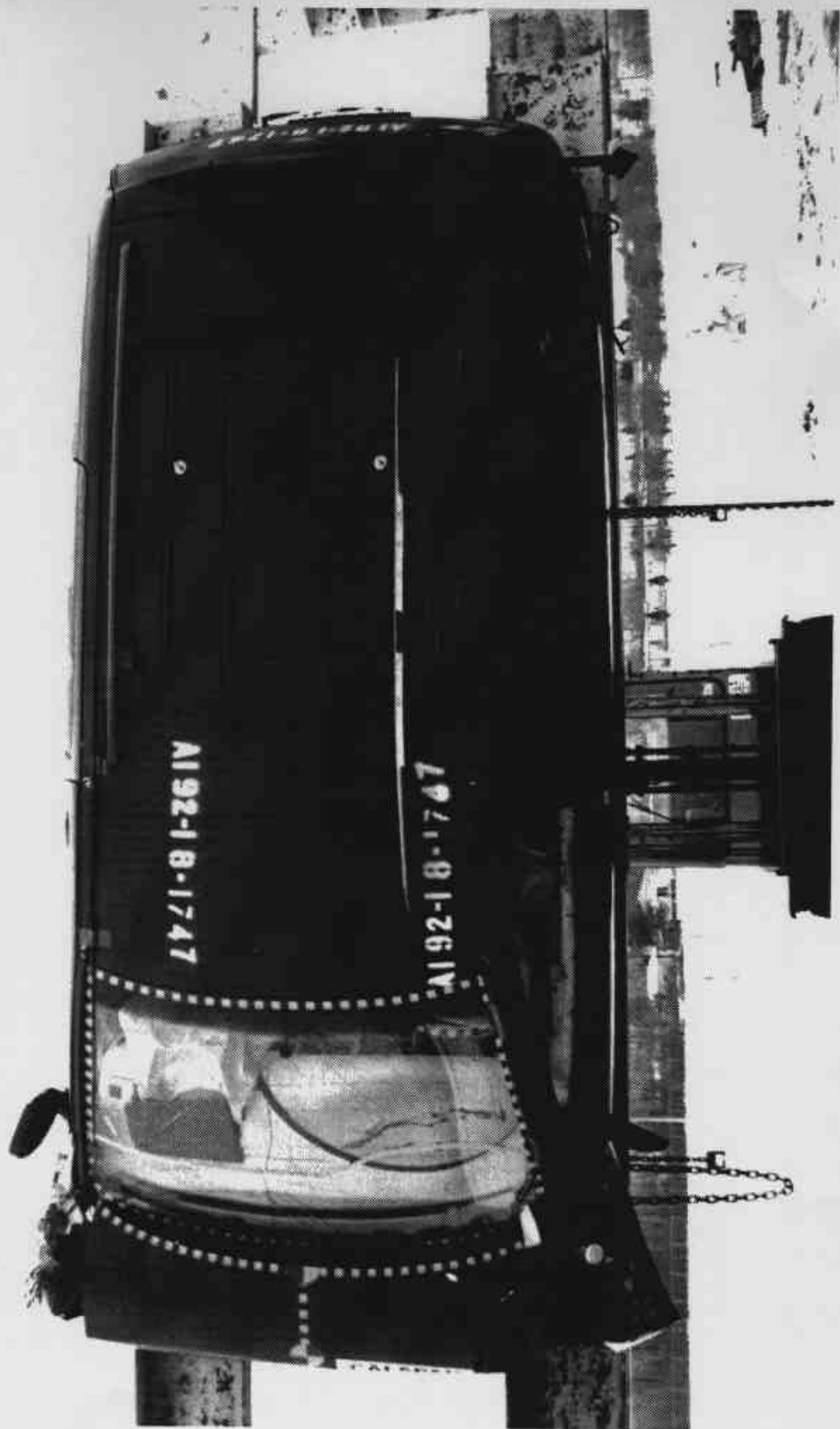


Figure A-38 ROLLOVER VIEW



Figure A-39 IMPACT VIEW

Appendix B

DUMMY, VEHICLE AND LOAD CELL BARRIER RESPONSE DATA

**Hybrid III Dummy Sign Conventions
Load Cells and Special Transducers**

Transducer	DOT/NHTSA Sign Convention (positive unless noted)
Upper Neck Load Cell	Fx Head forward Fy Head left Fz Neck in tension Mx Right ear to right shoulder My Chin to chest (flexion) Mz Chin to left shoulder (look left)
Chest Displacement Potentiometer	Compression is negative
Pelvic Load Cell (Lower Lumbar)	Fx Chest forward Fy Chest left Fz Spine in tension
Femur Load Cell	Compression is negative
Upper Tibia Load Cell (right and left leg)	Mx Support tibia, load right side center My Support tibia, load front (shin) center
Lower Tibia Load Cell (right and left leg)	Fy Foot right w/r to left Fz Tibia in tension Mx Support tibia, press right side center

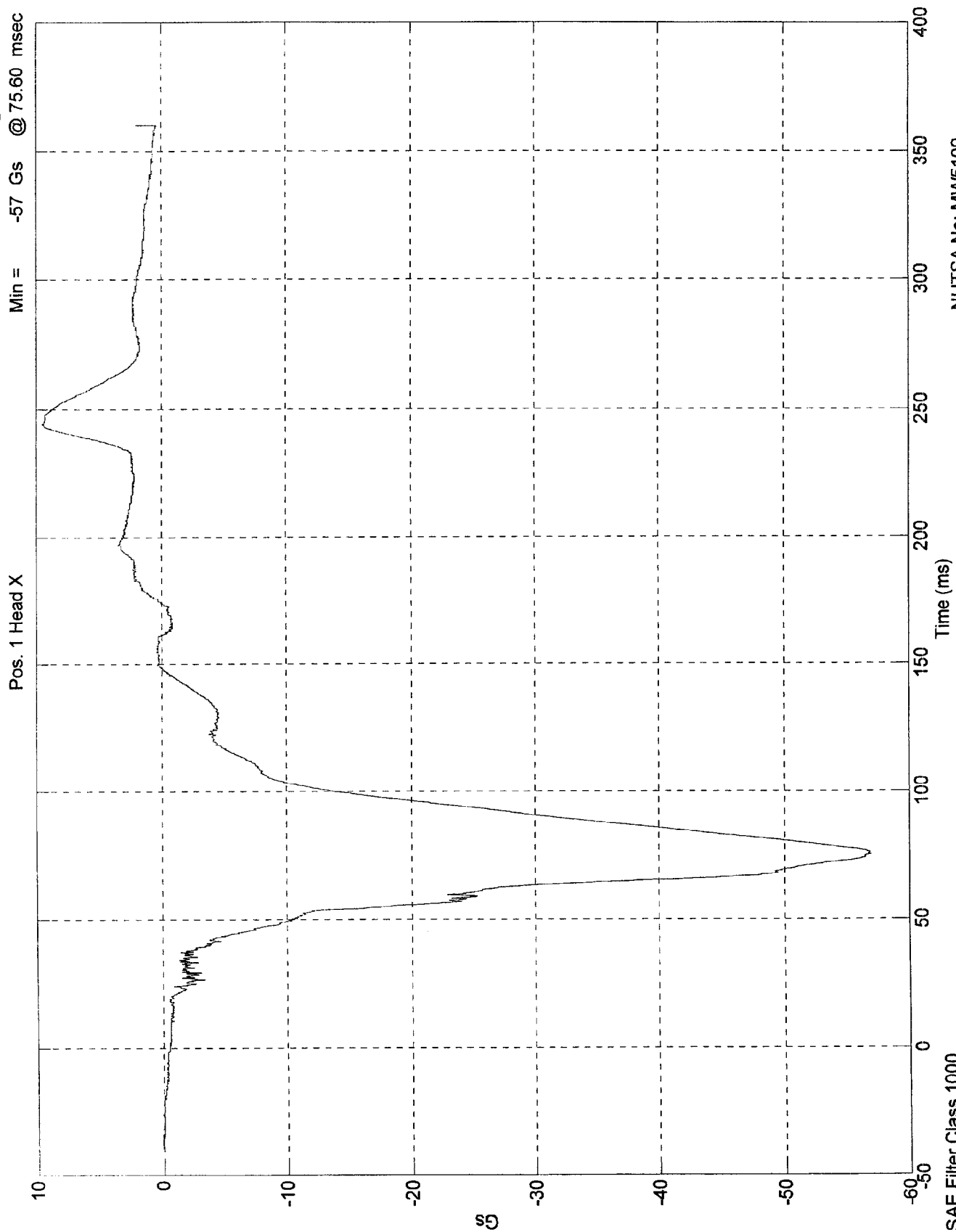
NHTSA TEST NO. MW5109

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 #18 - 1998 TOYOTA SIENNA

Max = 9.49 Gs @ 244.20 msec
Min = -57 Gs @ 75.60 msec

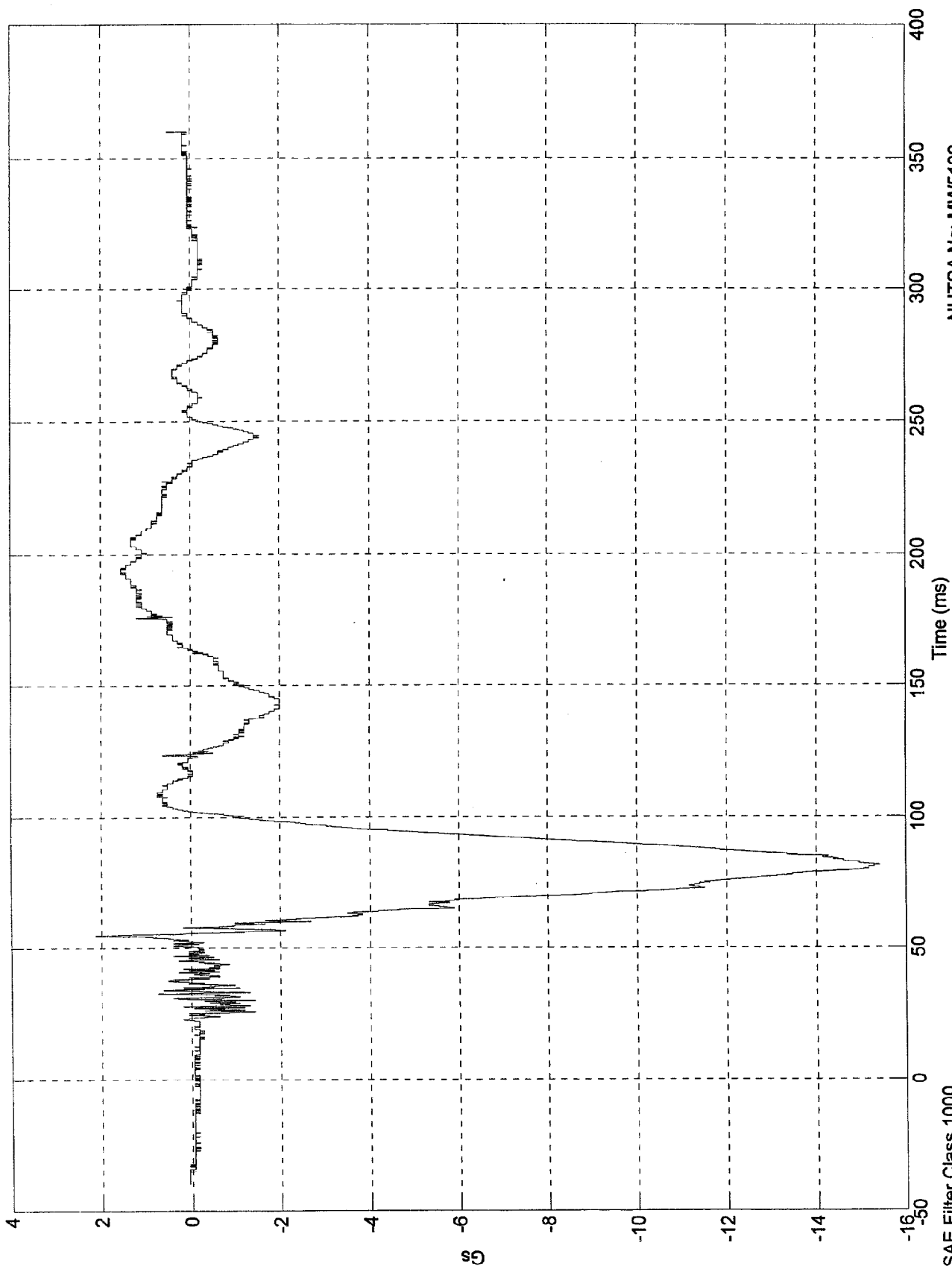


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.13 Gs @ 54.60 msec
 Min = -15.4 Gs @ 81.60 msec

Pos. 1 Head Y

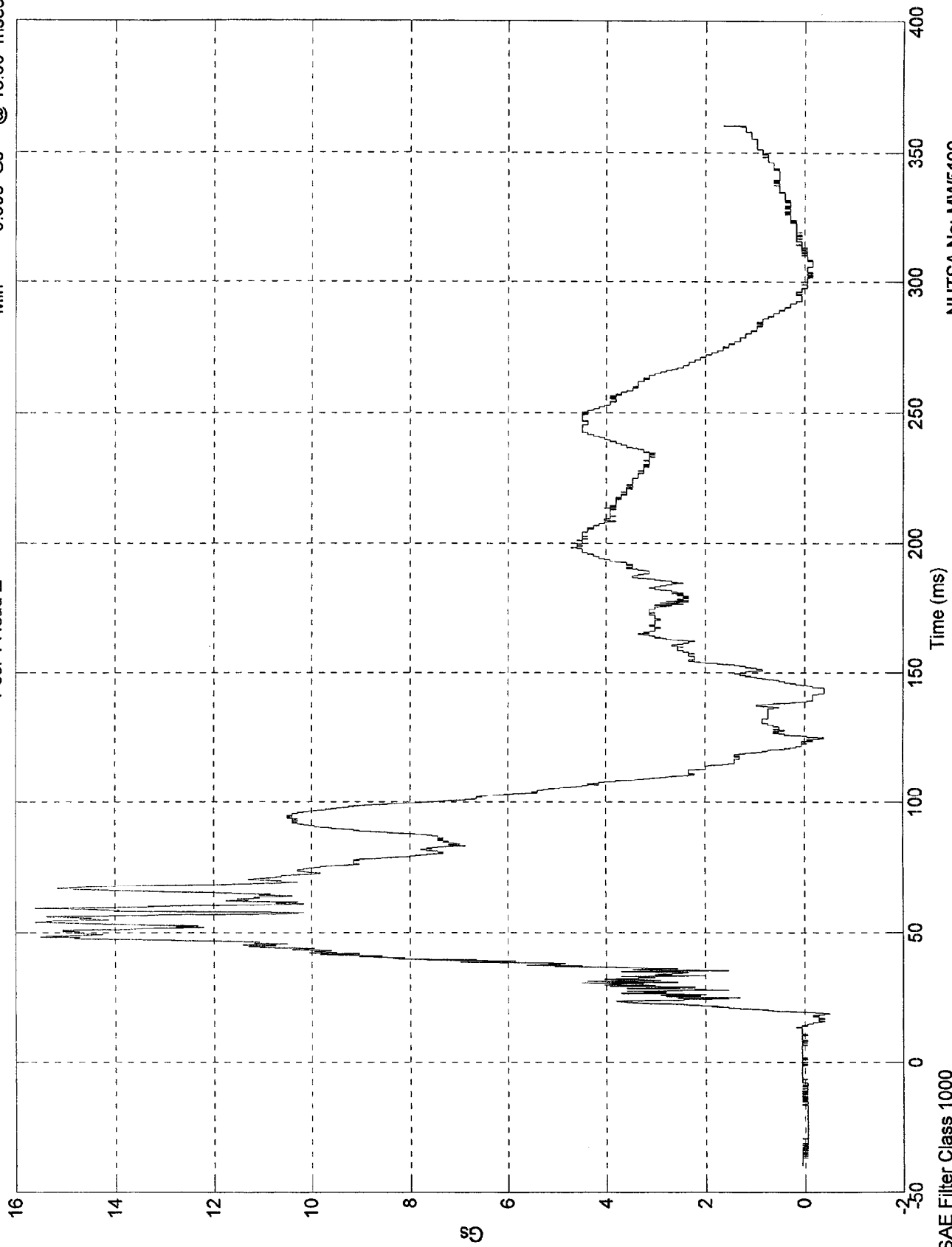


NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 15.6 Gs @ 53.90 msec
Min = -0.508 Gs @ 18.60 msec

Pos. 1 Head Z

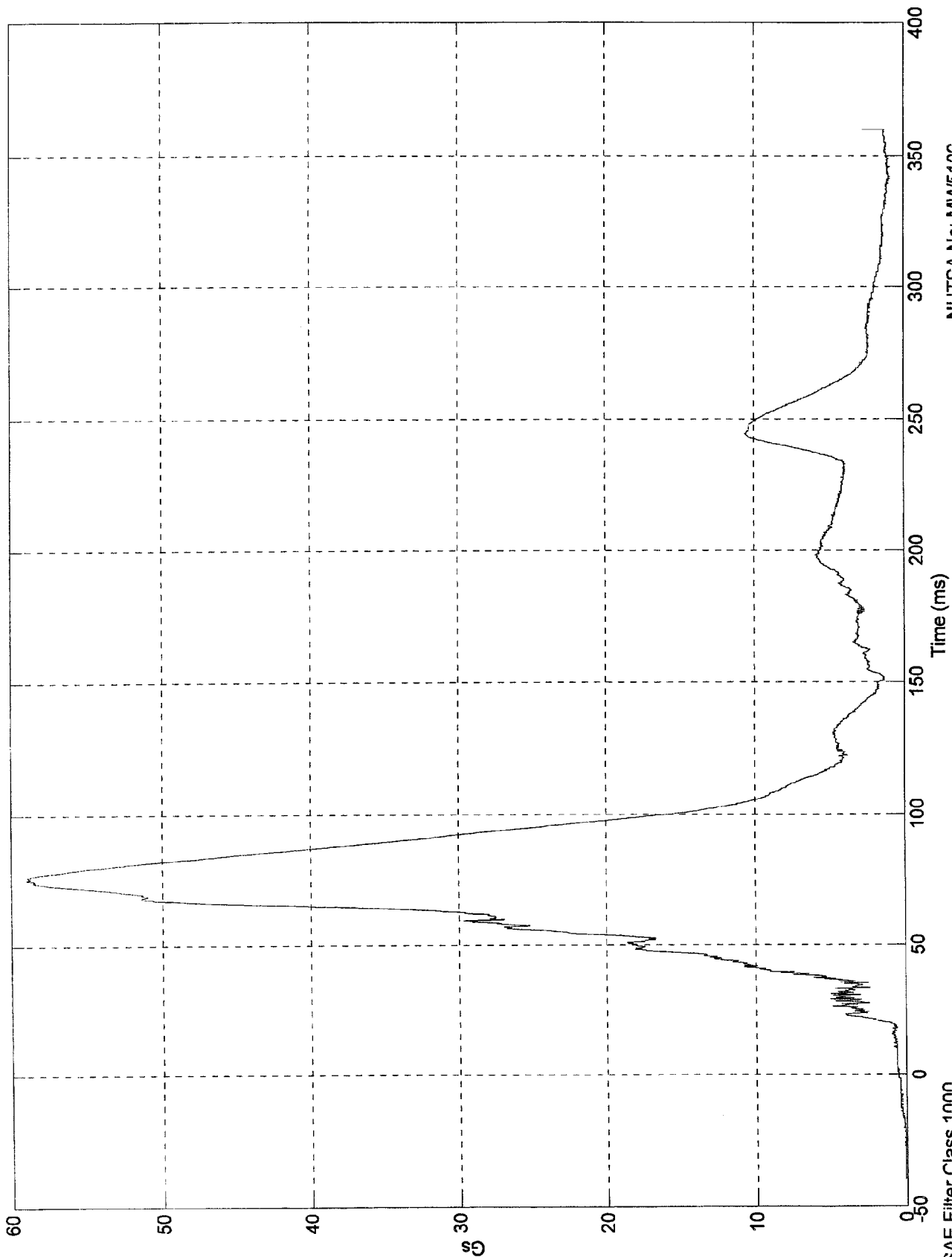


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Pos. 1 Head Resultant

Max = 59 Gs @ 75.60 msec
Min = 0.0891 Gs @ -33.90 msec



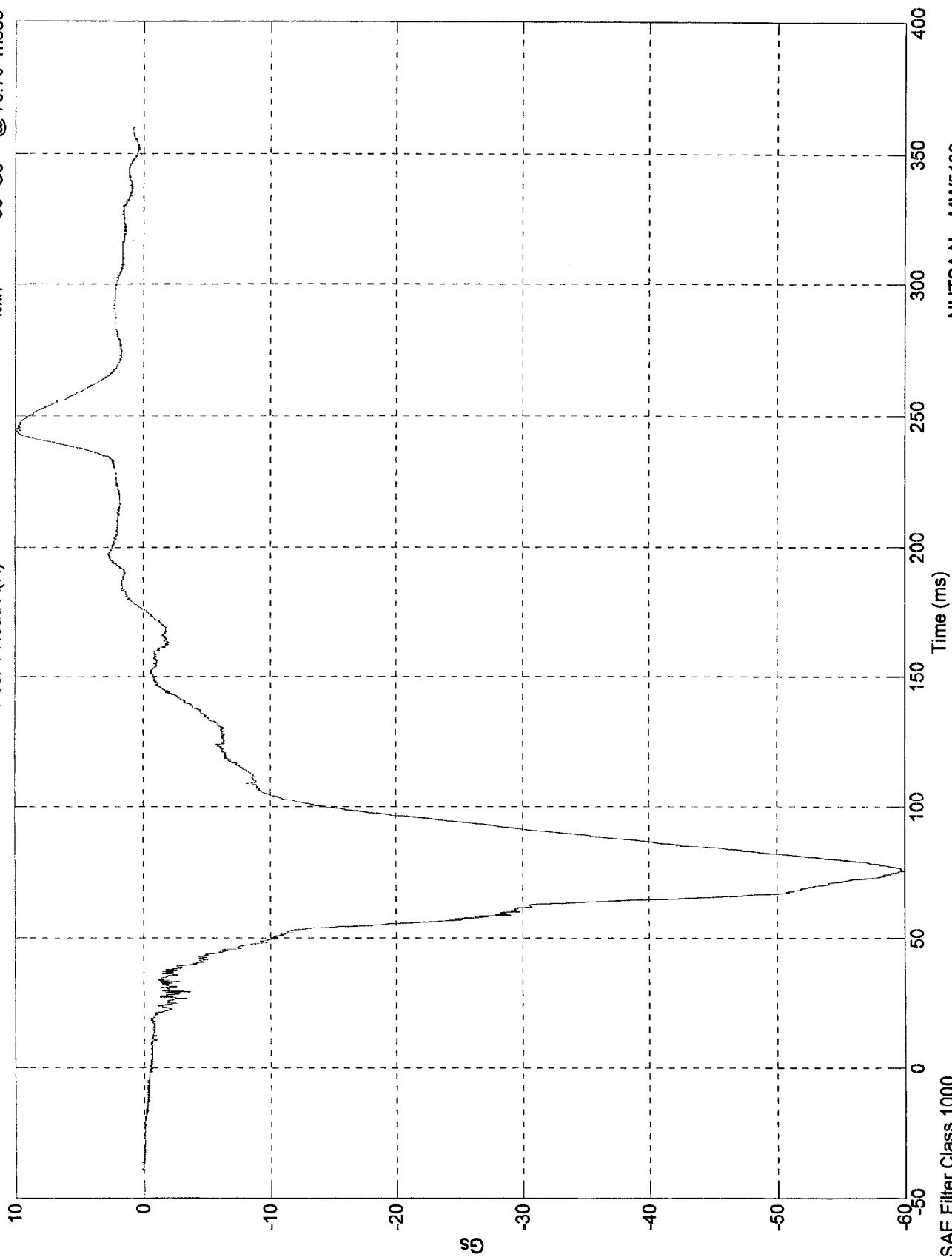
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 1000

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 9.88 Gs @ 244.00 msec
Min = -60 Gs @ 75.70 msec

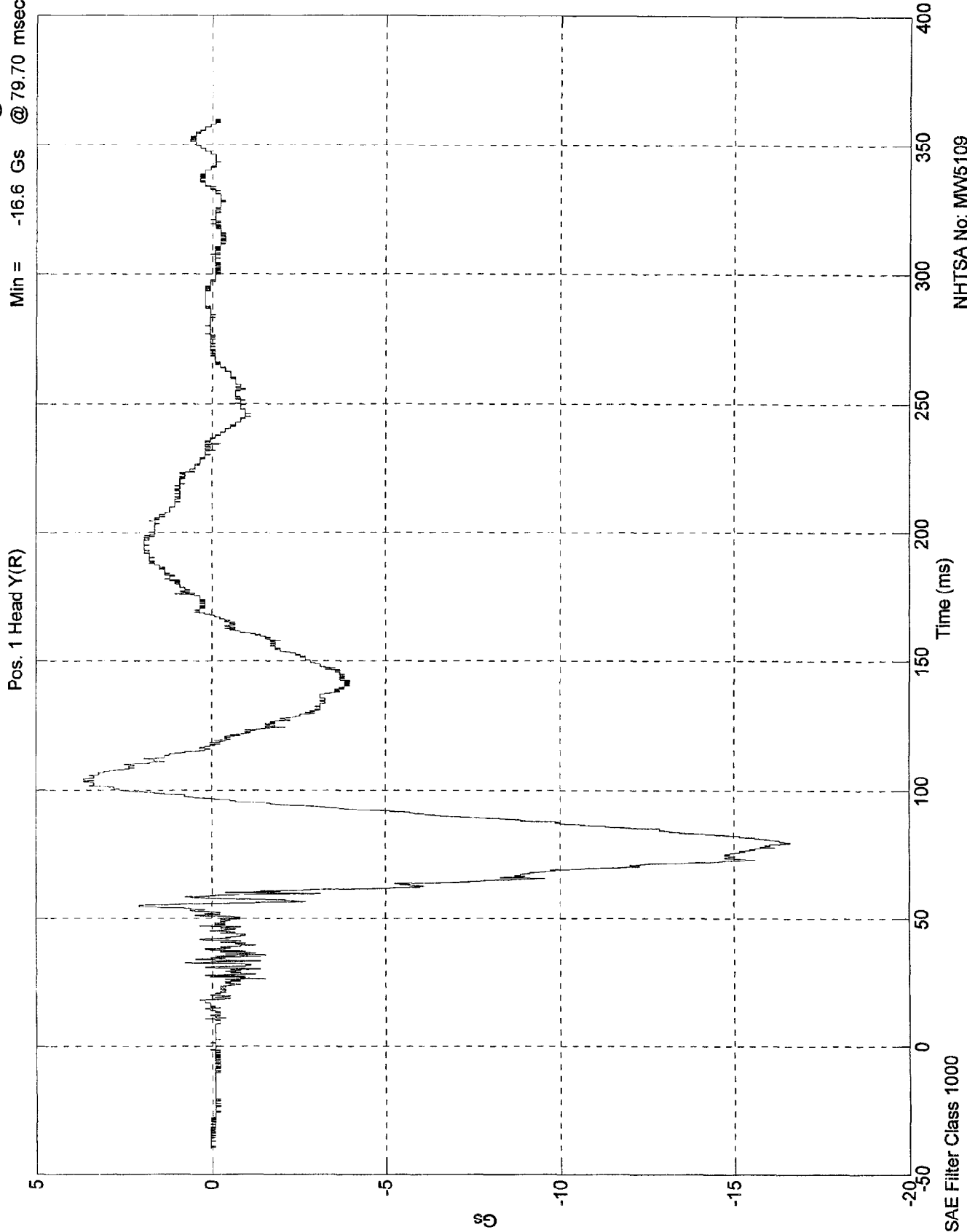
Pos. 1 Head X(R)



NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 3.64 Gs @ 103.10 msec
Min = -16.6 Gs @ 79.70 msec

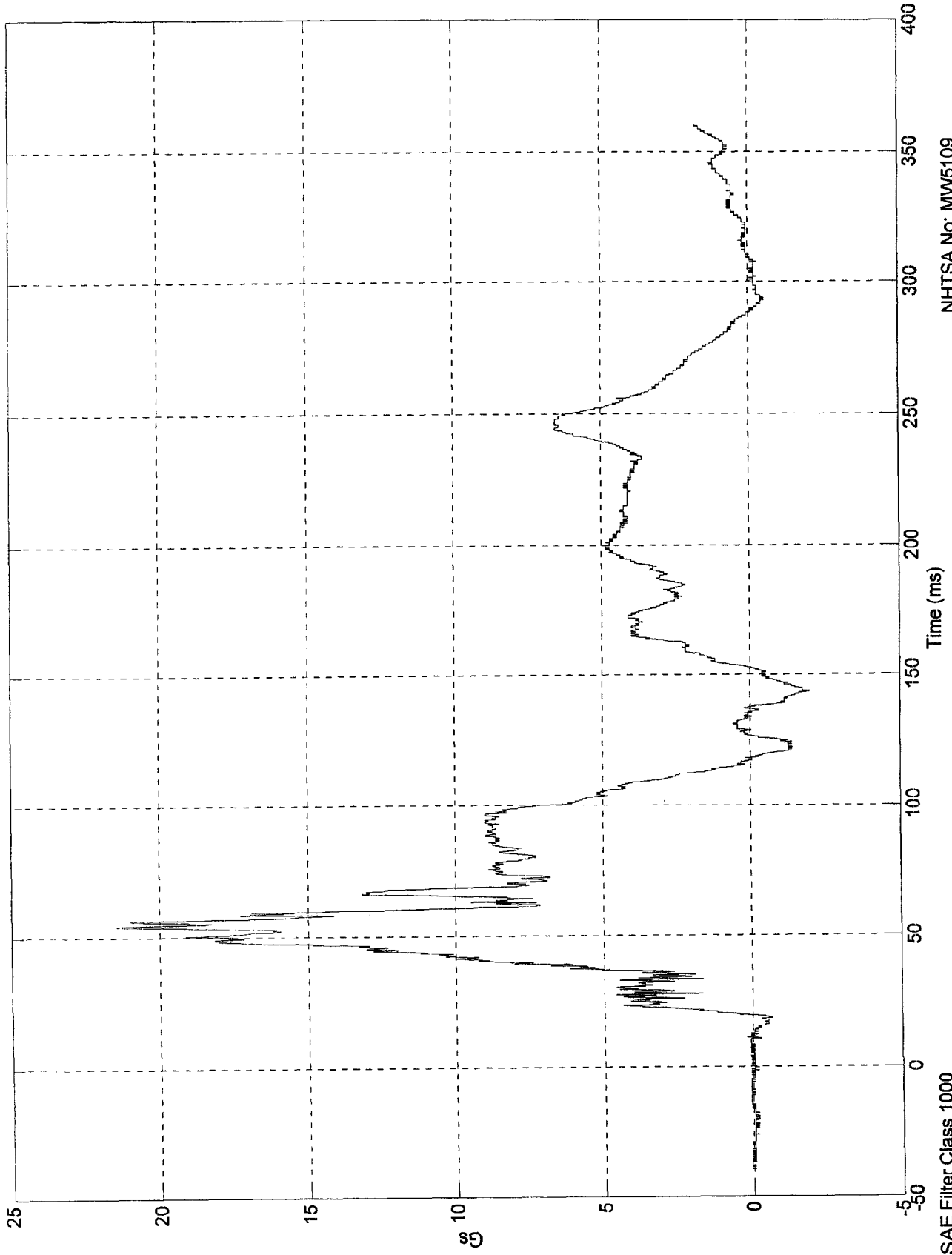


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 21.5 Gs @ 54.20 msec
Min = -2 Gs @ 143.50 msec

Pos. 1 Head Z(R)

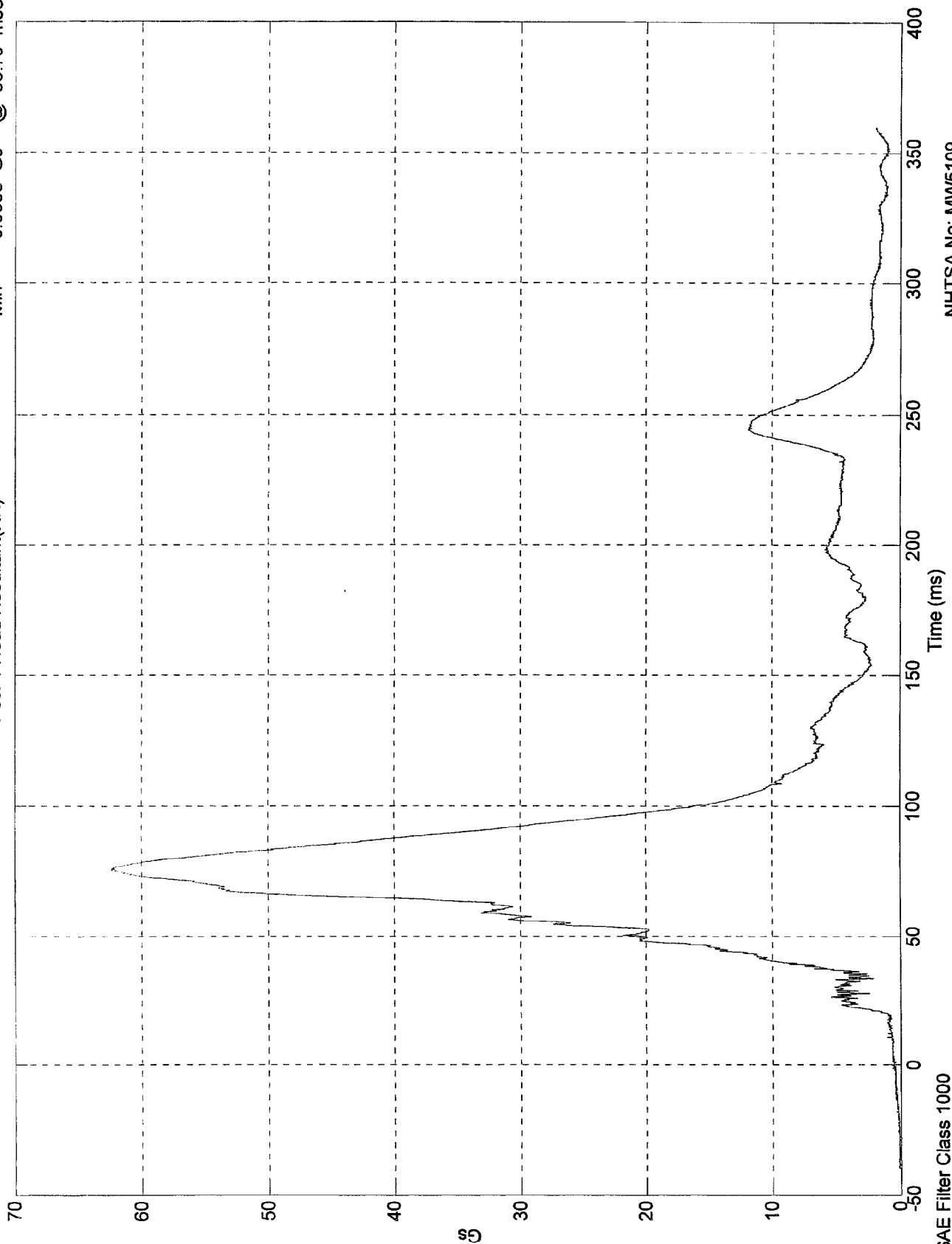


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 62.4 Gs @ 75.70 msec
Min = 0.0938 Gs @ -36.70 msec

Pos. 1 Head Resultant(RR)

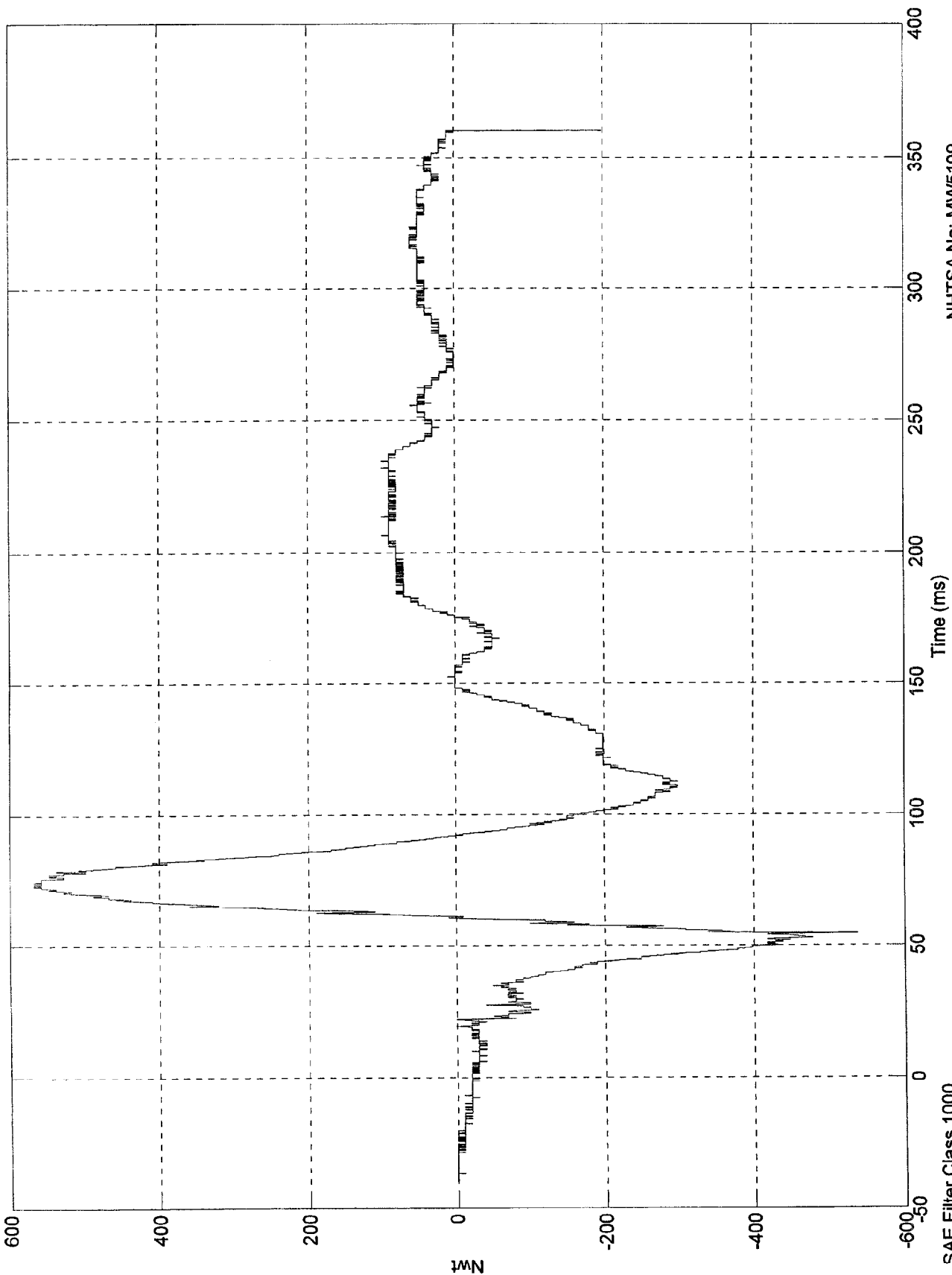


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 568 Nwt @ 73.20 msec
Min = -537 Nwt @ 54.60 msec

Pos. 1 Upper Neck Fx



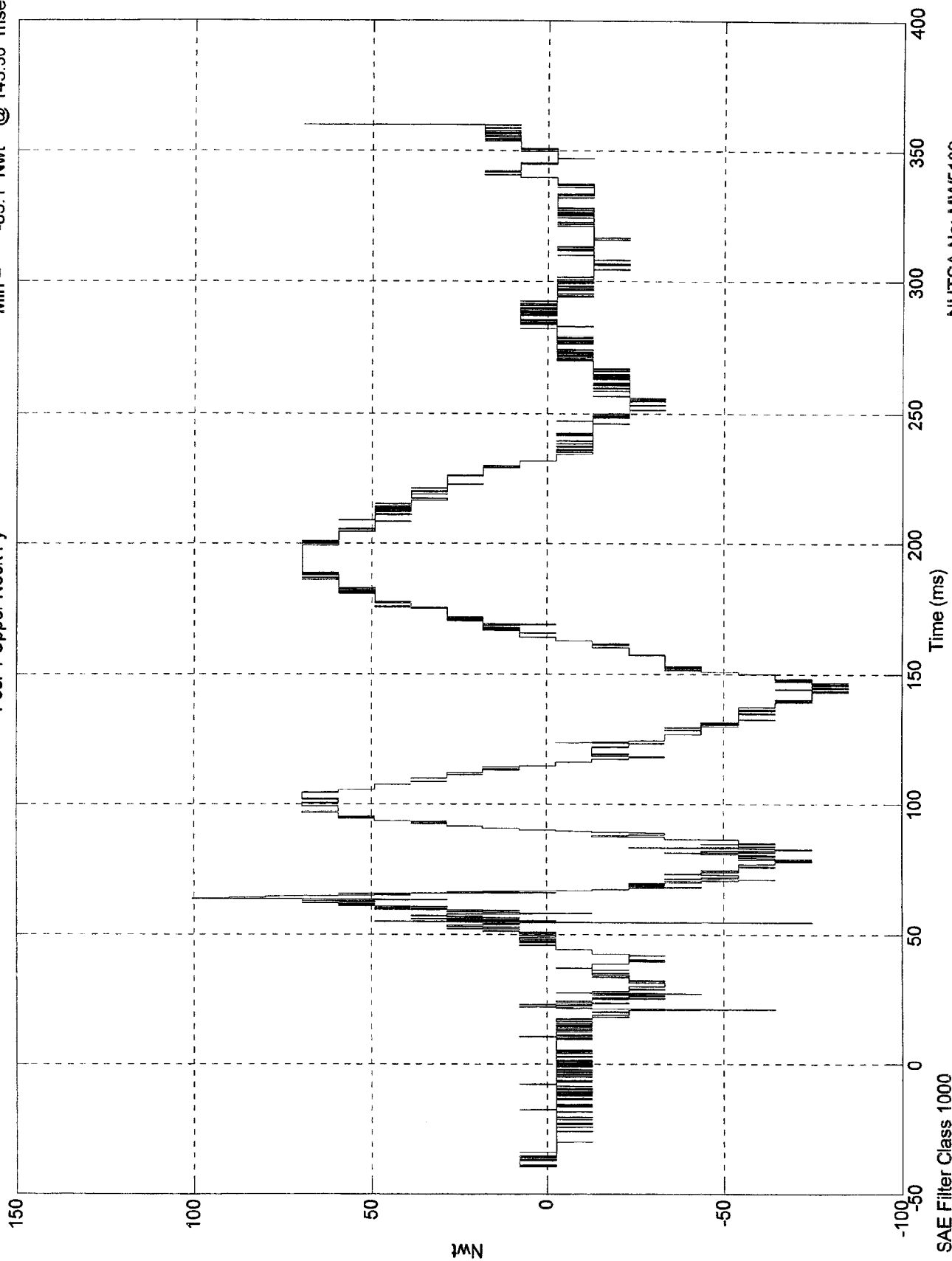
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 1000

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 101 Nwt @ 63.60 msec
Min = -85.1 Nwt @ 143.30 msec

Pos. 1 Upper Neck Fy

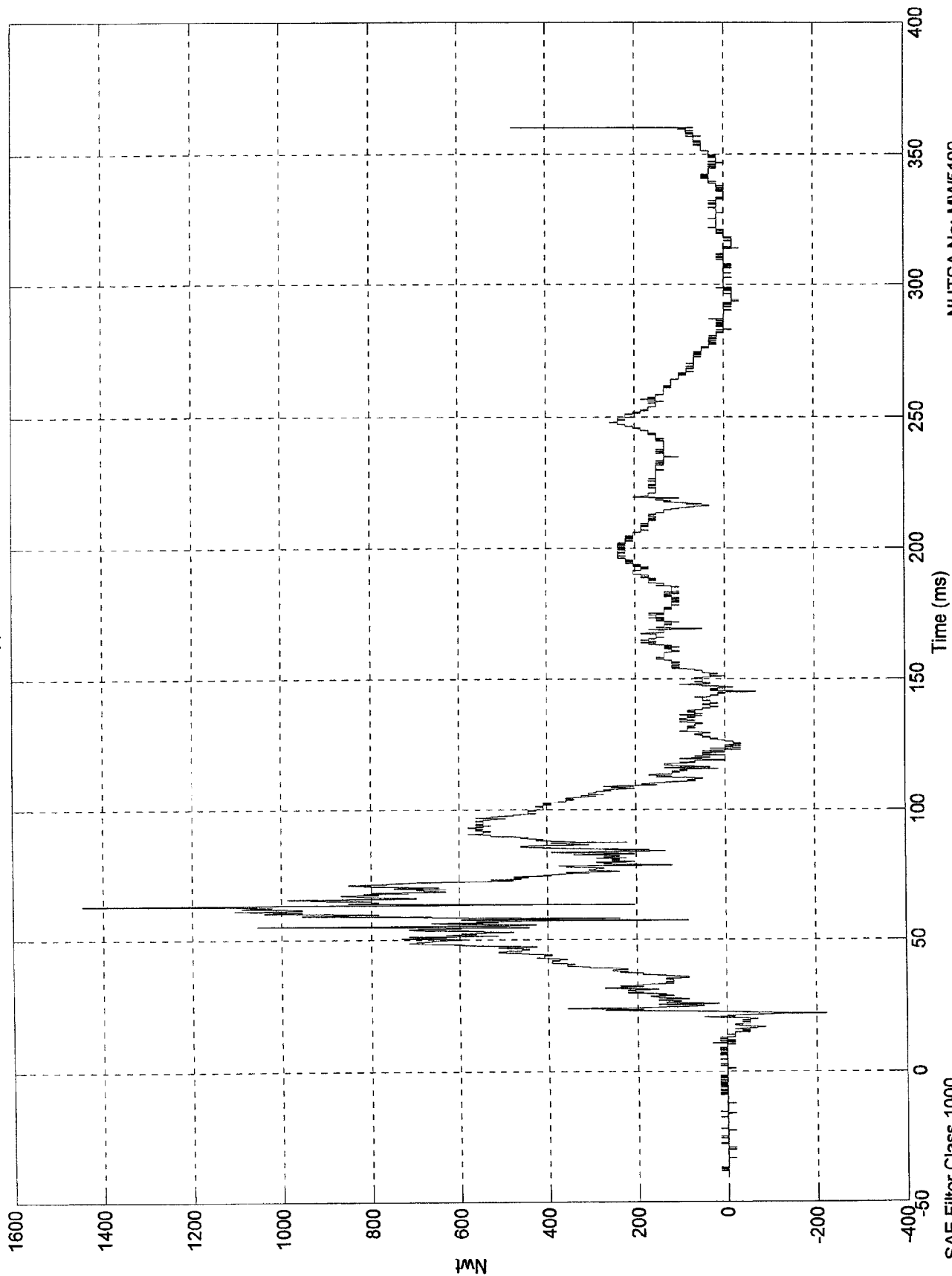


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 1.45e+003 Nwt @ 62.90 msec
Min = -222 Nwt @ 21.80 msec

Pos. 1 Upper Neck Fz



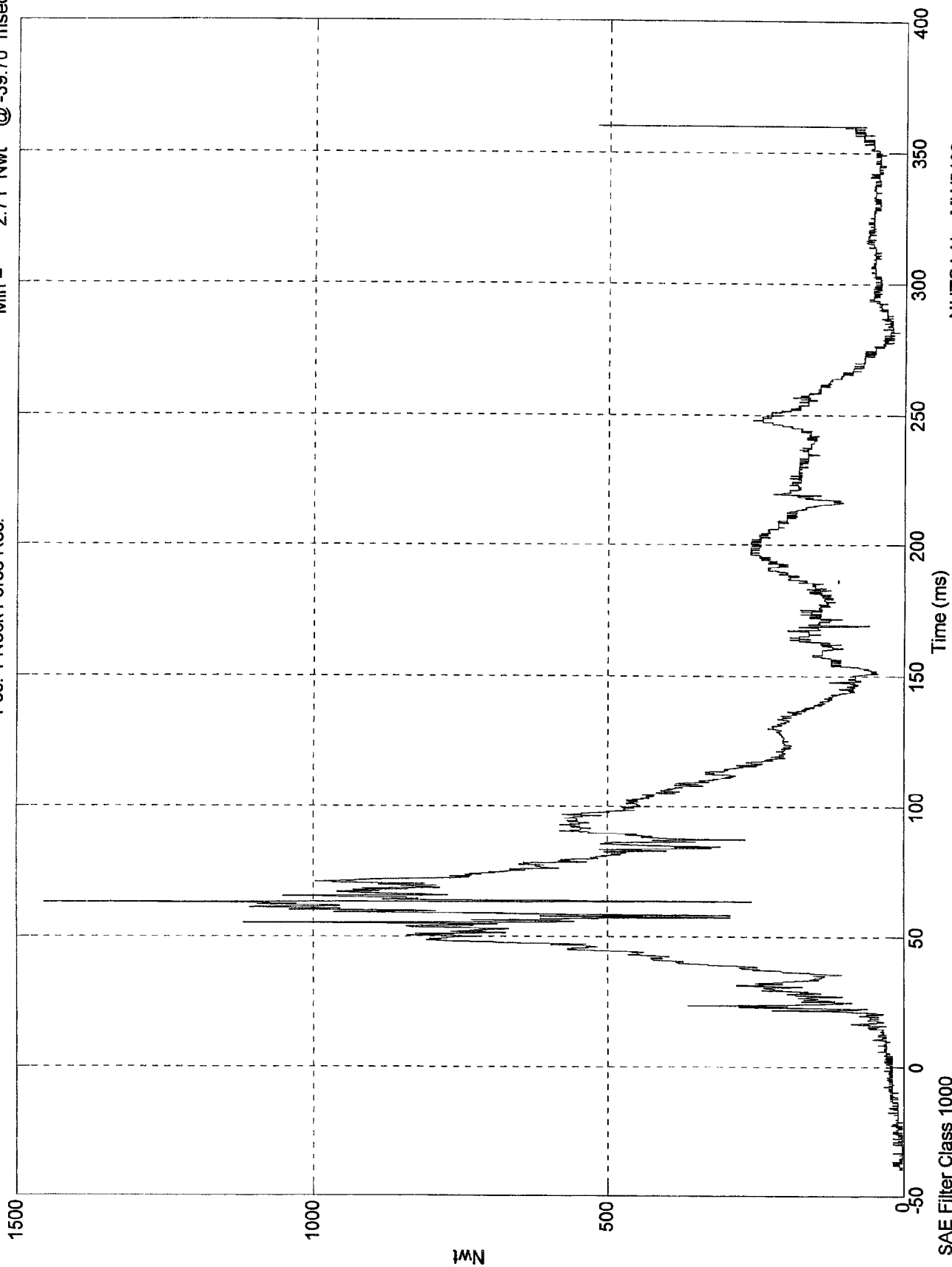
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 1000

NCAP TEST #18 - 1998 TOYOTA SIENNA

Pos. 1 Neck Force Res.

Max = 1.45e+003 Nwt @ 62.90 msec
Min = 2.71 Nwt @ -39.70 msec

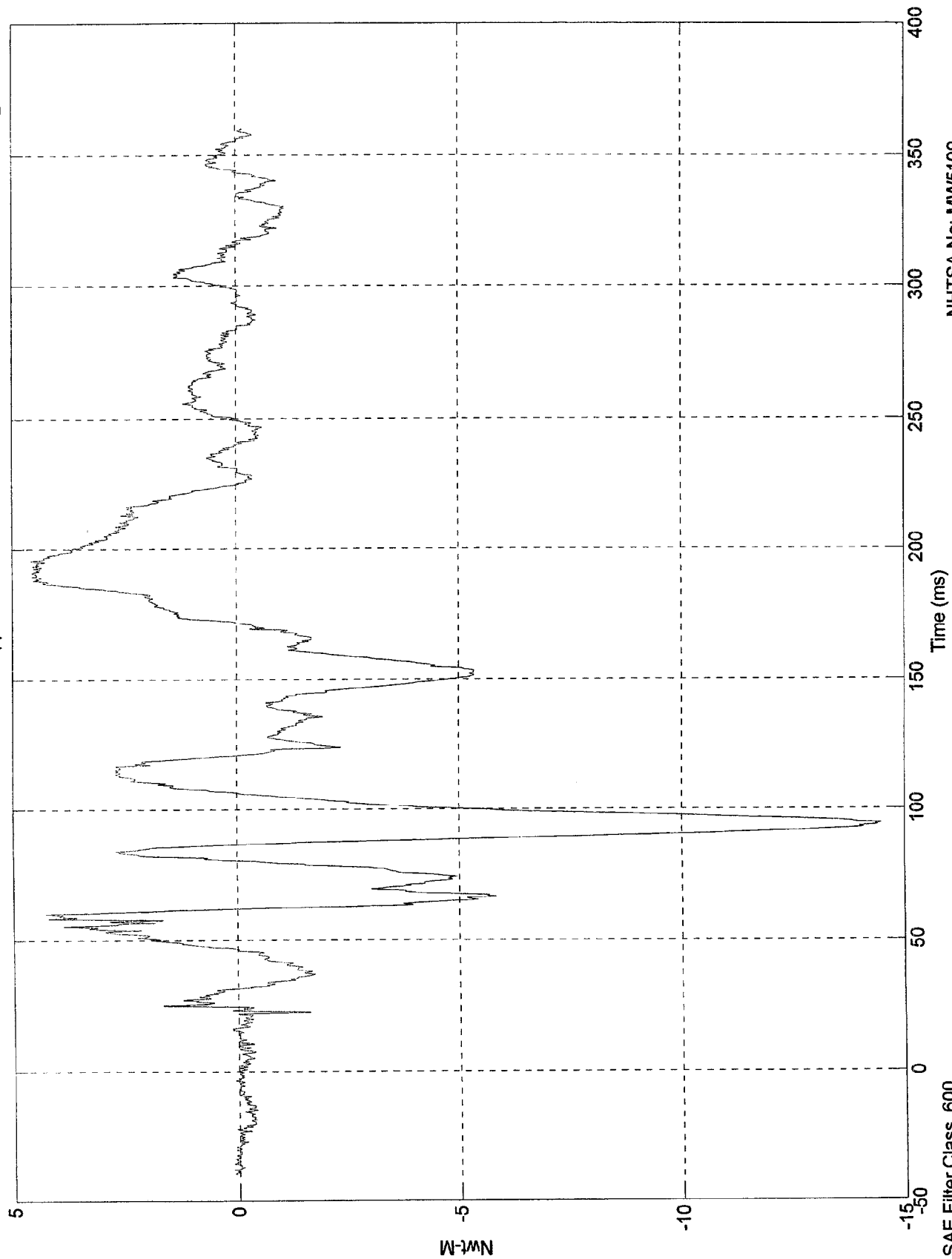


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 4.58 Nwt-M @ 195.50 msec
 Min = -14.5 Nwt-M @ 94.40 msec

Pos. 1 Upper Neck Mx



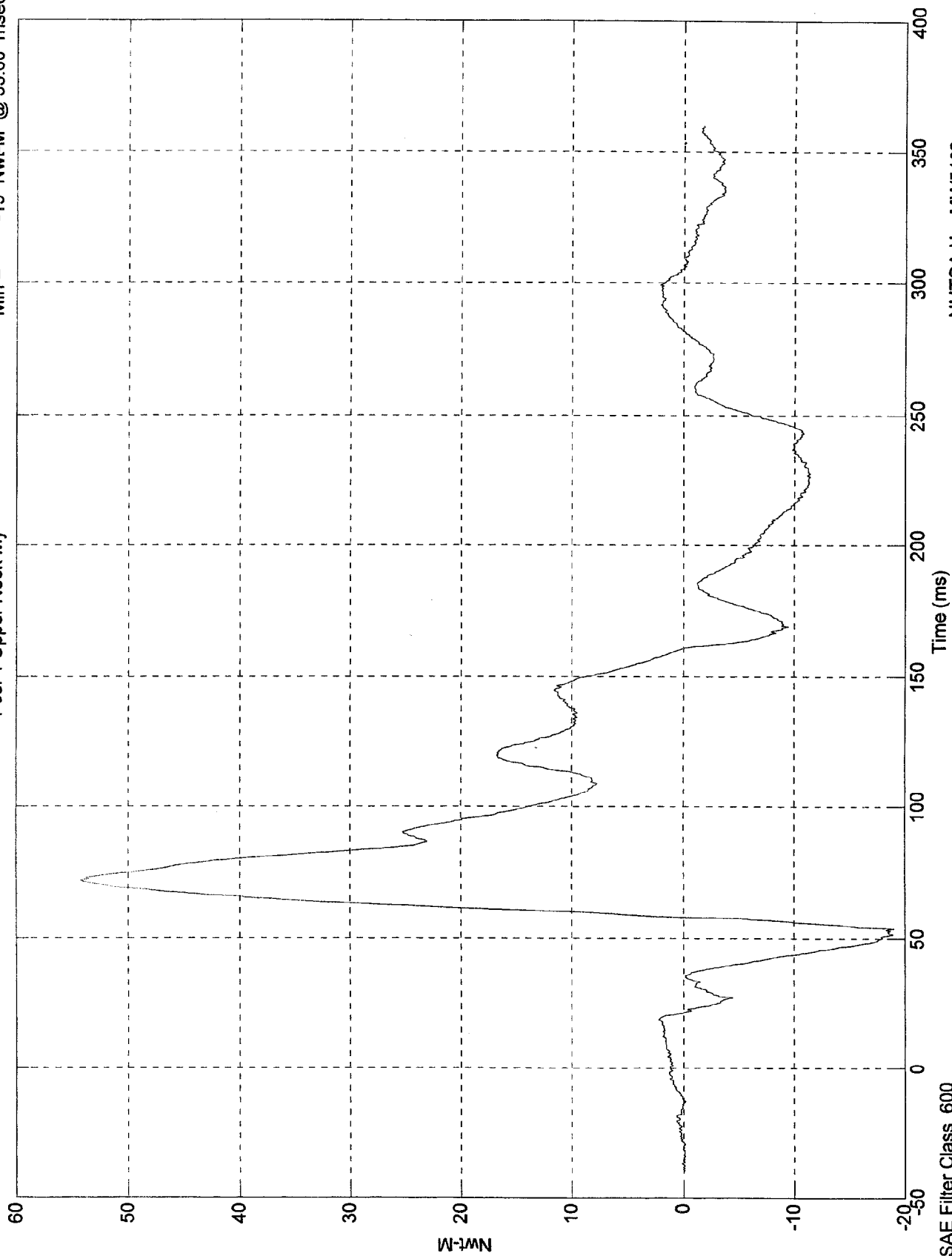
NHTSA No: MW5109
 Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Pos. 1 Upper Neck My

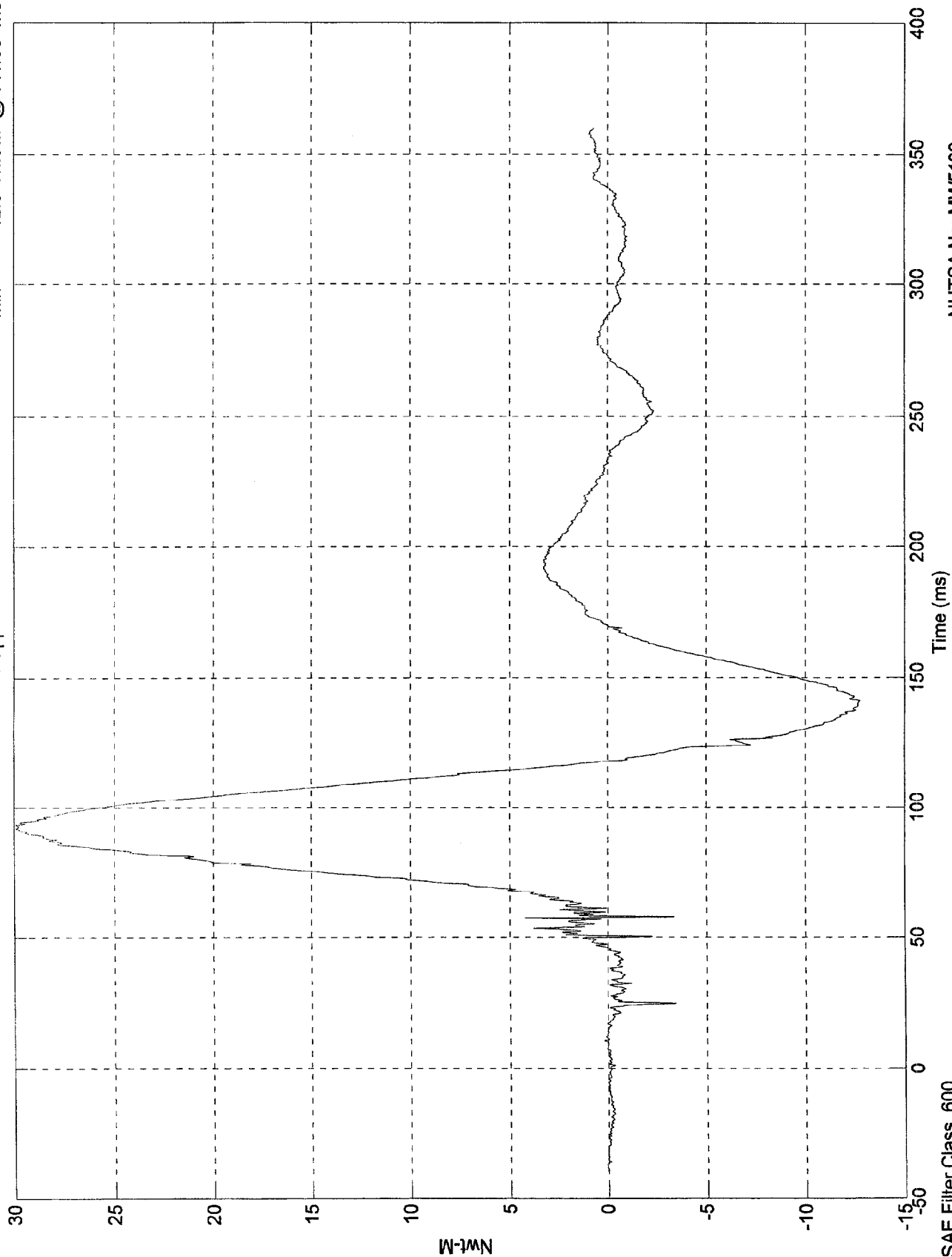
Max = 54.2 Nwt-M @ 72.00 msec
Min = -19 Nwt-M @ 53.60 msec



NHTSA No: MW5109
Date: 27 Jan 1998

Max = 29.9 Nwt-M @ 93.30 msec
Min = -12.8 Nwt-M @ 141.30 msec

Pos. 1 Upper Neck Mz

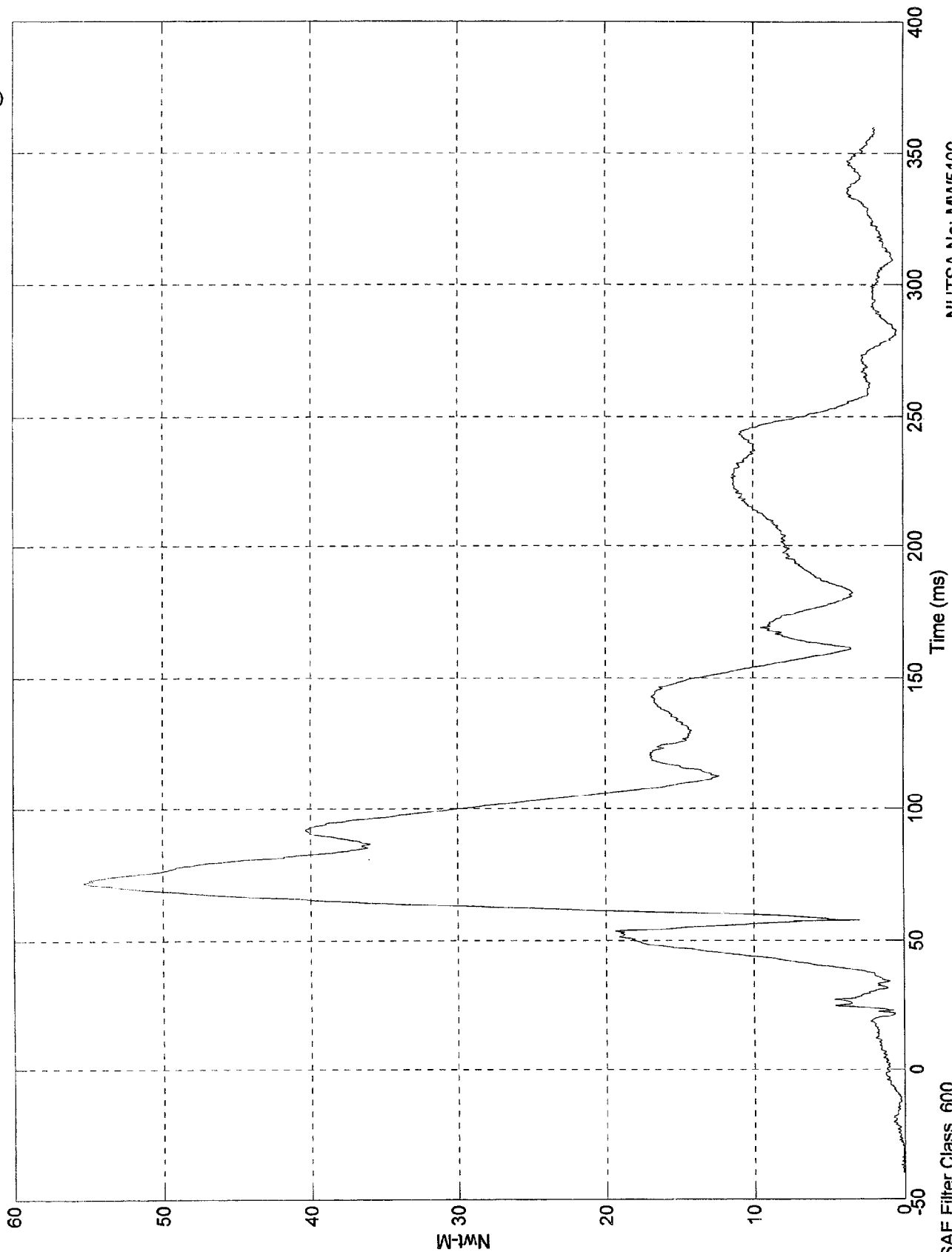


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 55.3 Nwt-M @ 72.10 msec
Min = 0.0238 Nwt-M @ -29.60 msec

Pos. 1 Neck Moment Res.



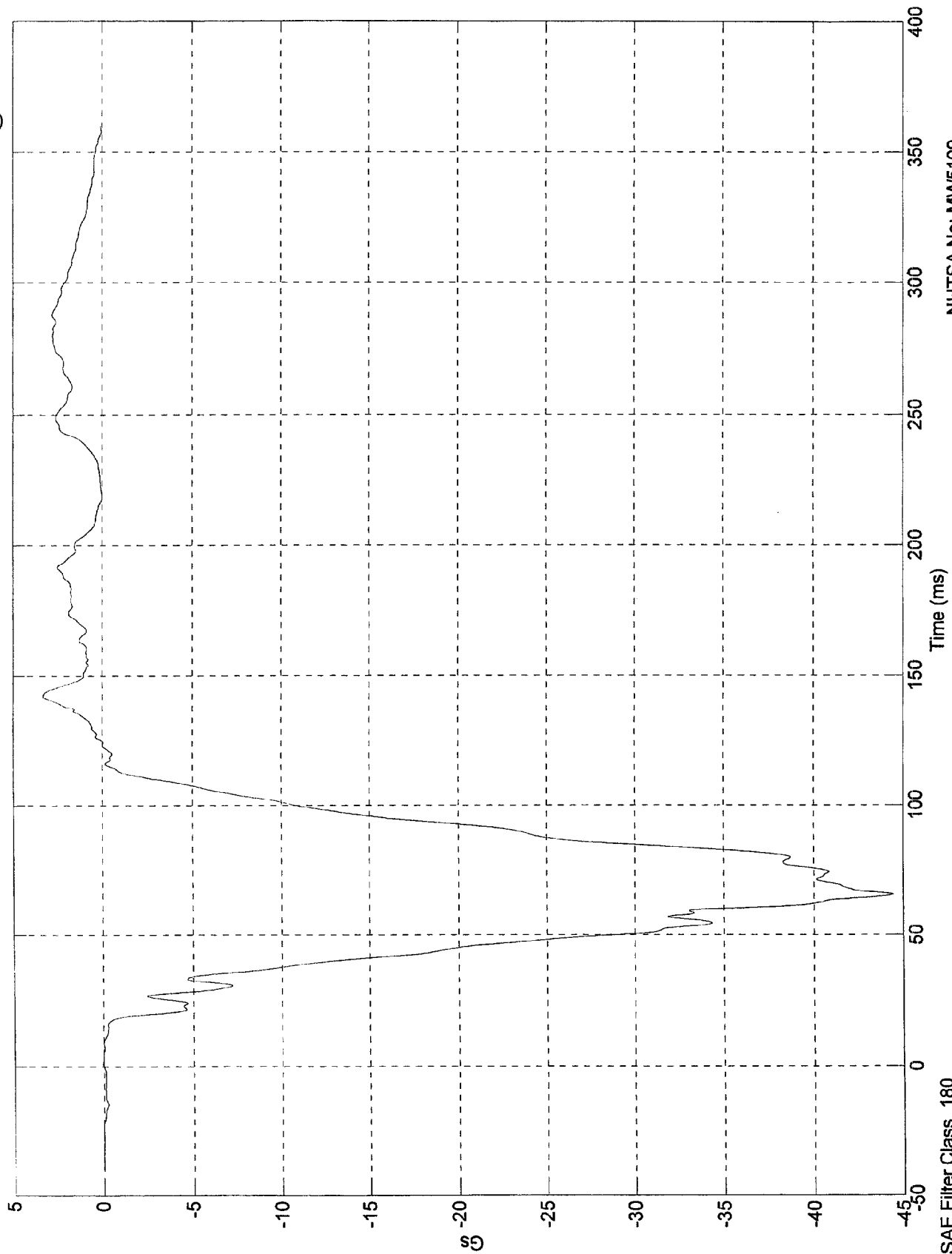
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 3.3 Gs @ 142.30 msec
Min = -44.4 Gs @ 65.40 msec

Pos. 1 Chest X



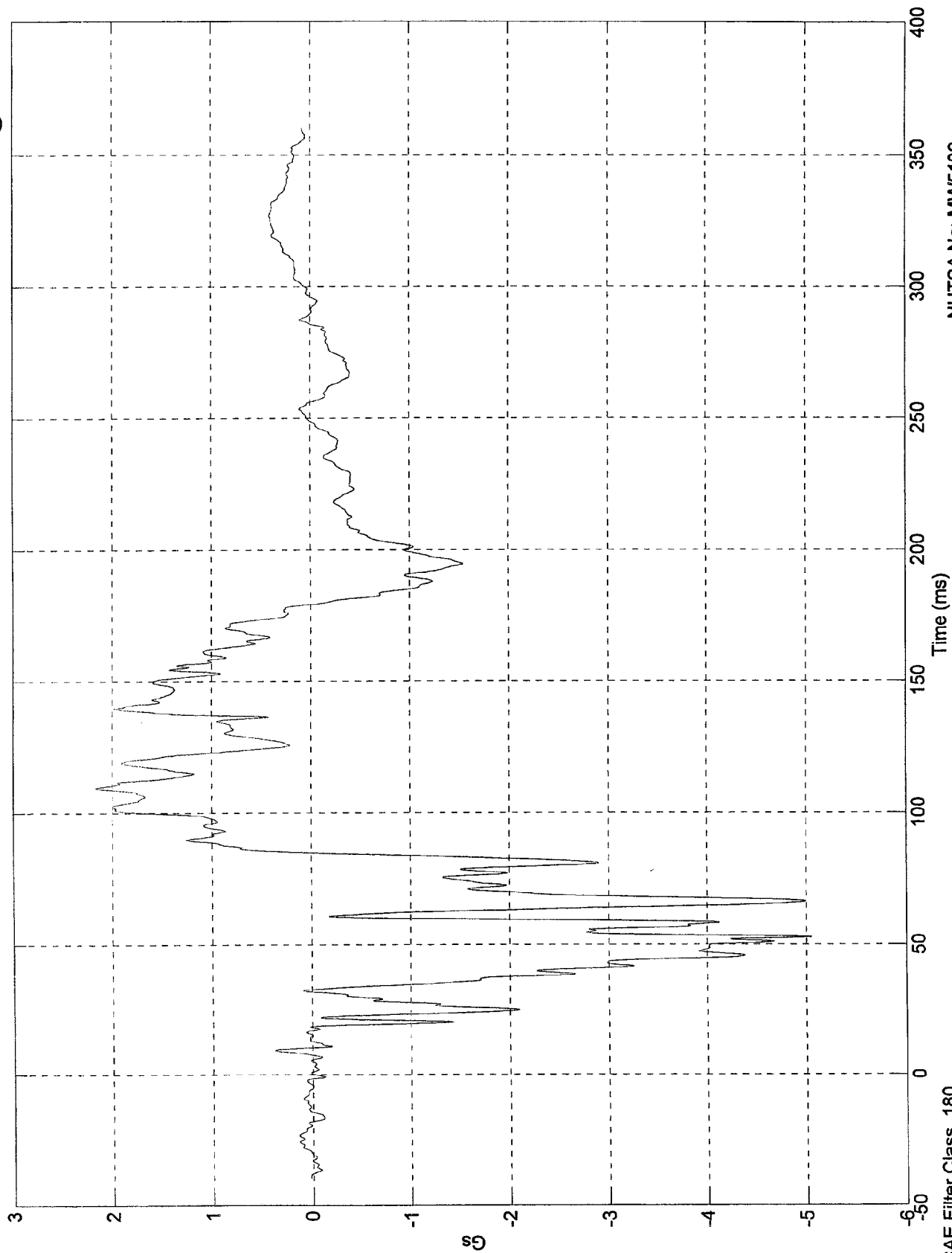
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.17 Gs @ 109.50 msec
Min = -5.05 Gs @ 52.80 msec

Pos. 1 Chest Y



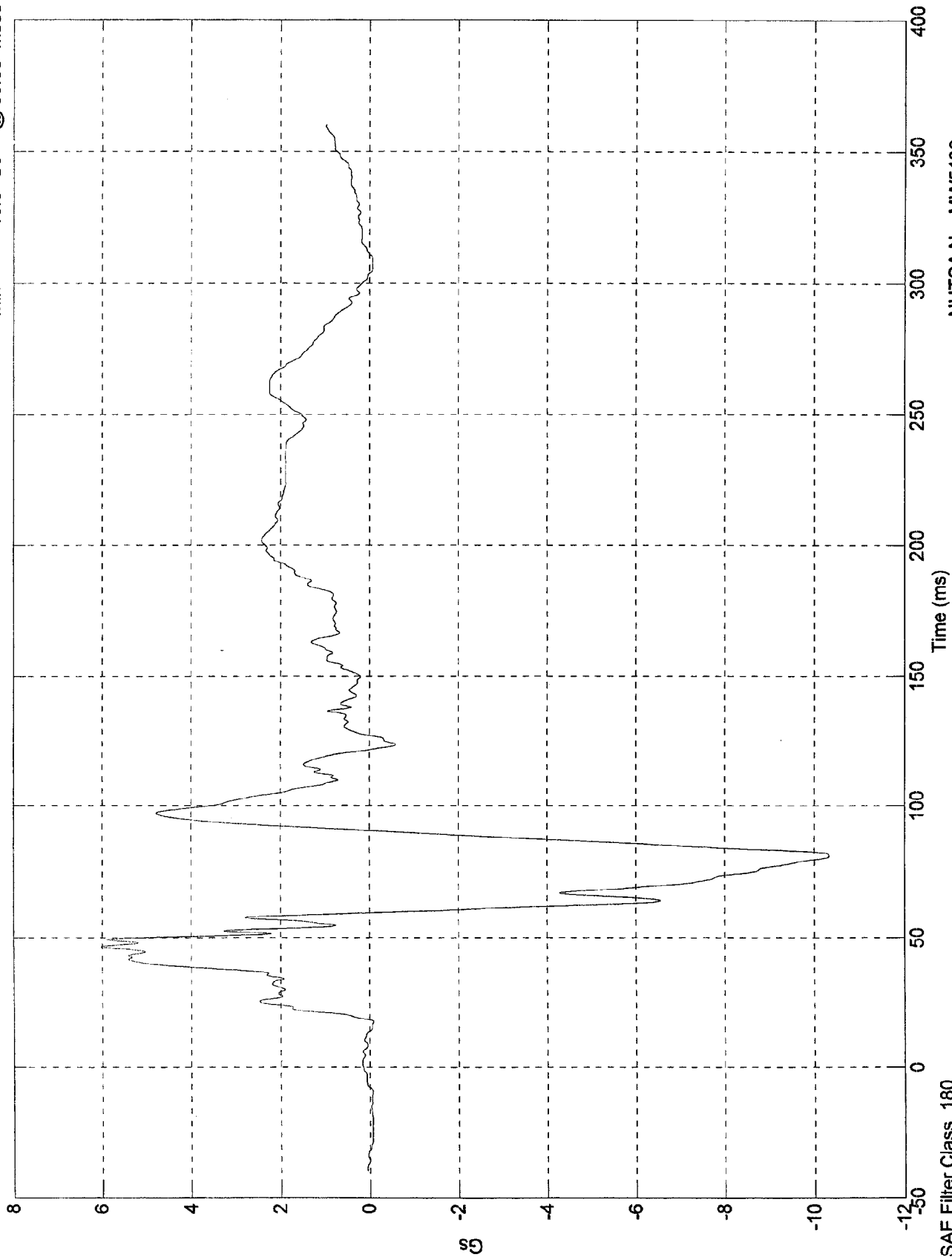
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 6.02 Gs @ 46.50 msec
Min = -10.3 Gs @ 80.90 msec

Pos. 1 Chest Z



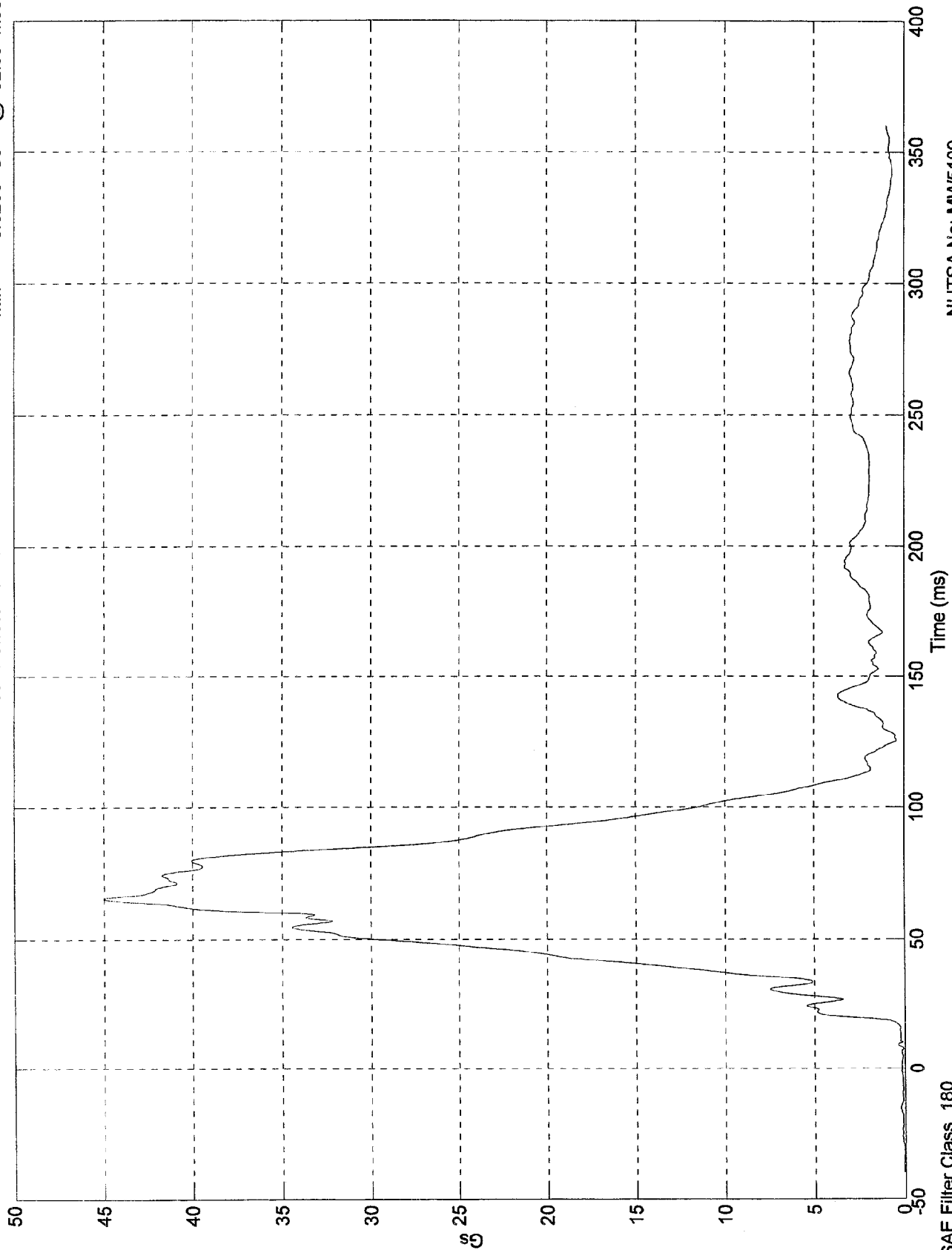
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Pos. 1 Chest Resultant

Max = 45 Gs @ 65.30 msec
Min = 0.0299 Gs @ -32.50 msec

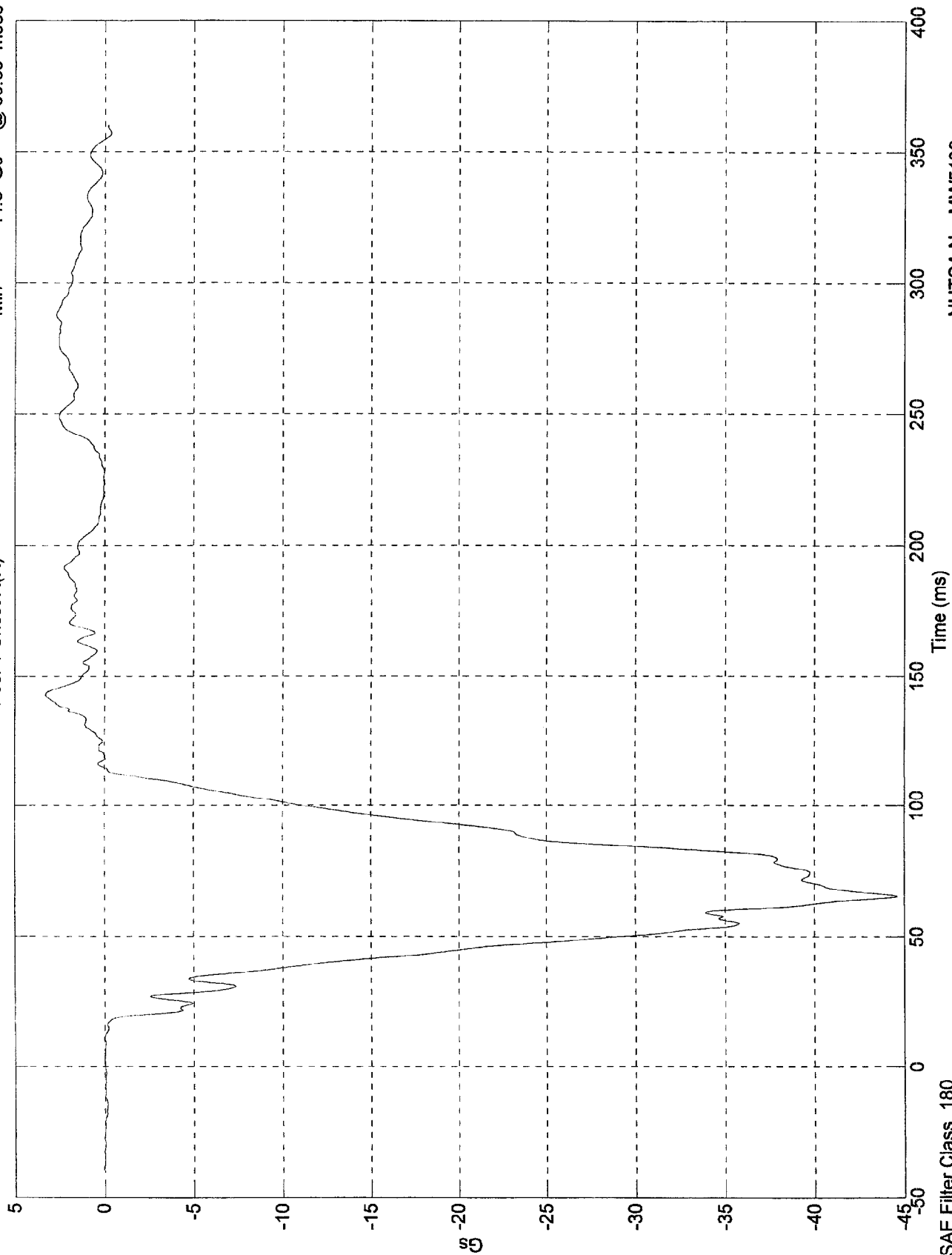


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 3.28 Gs @ 142.90 msec
Min = -44.6 Gs @ 65.30 msec

Pos. 1 Chest X(R)

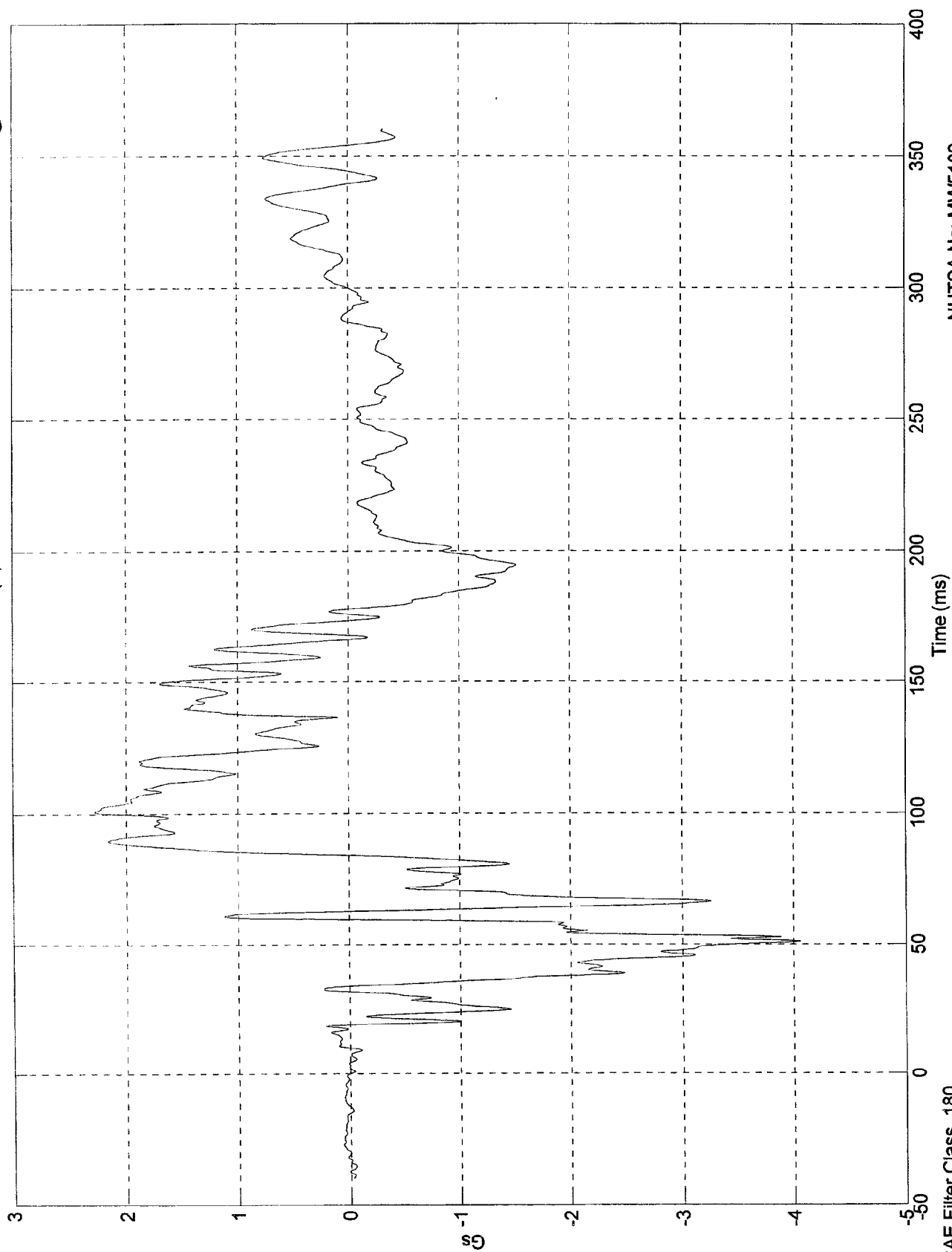


NHTSA No. MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.28 Gs @ 100.80 msec
 Min = -4.06 Gs @ 51.00 msec

Pos. 1 Chest Y(R)

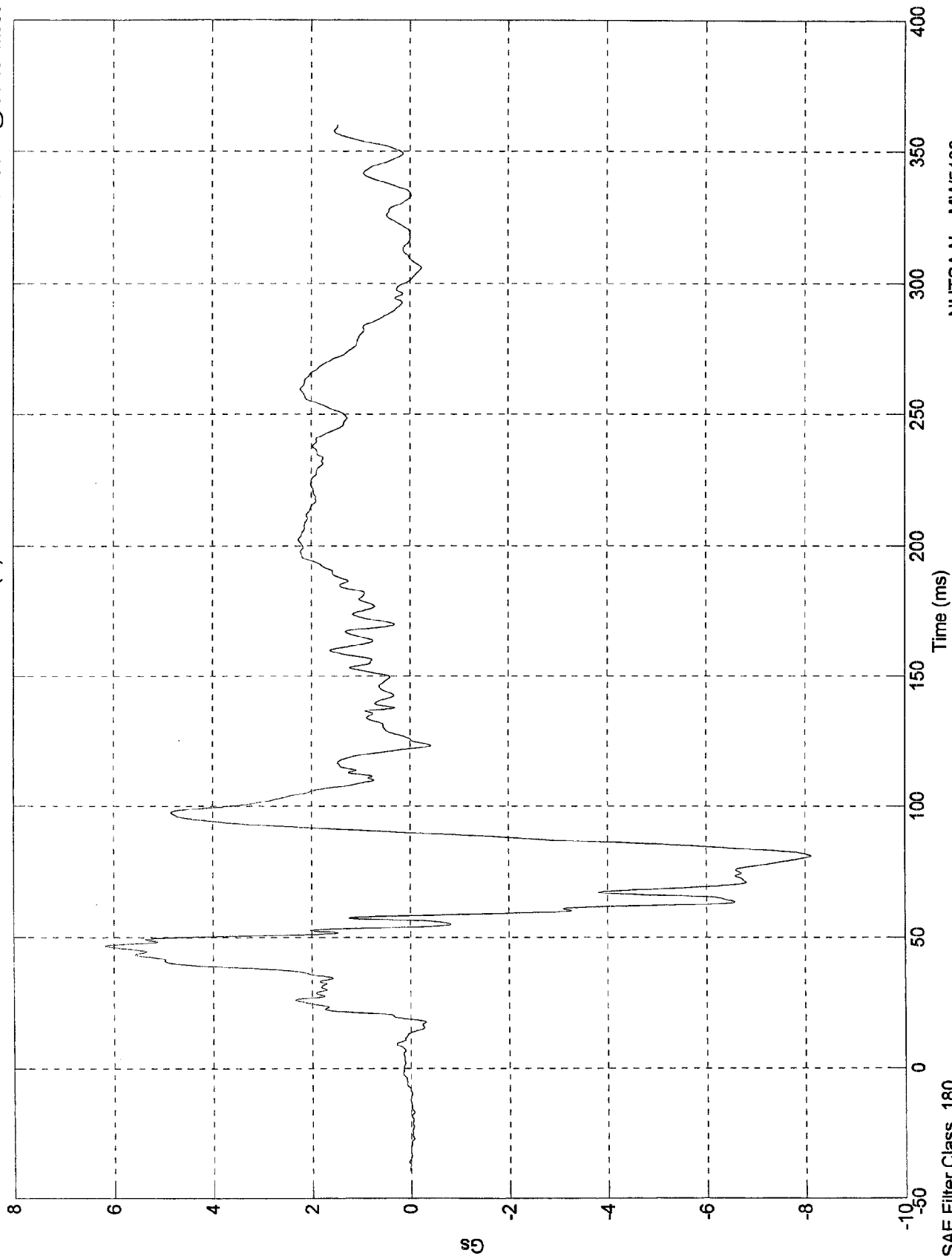


NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 6.17 Gs @ 46.60 msec
Min = -8.12 Gs @ 81.10 msec

Pos. 1 Chest Z(R)



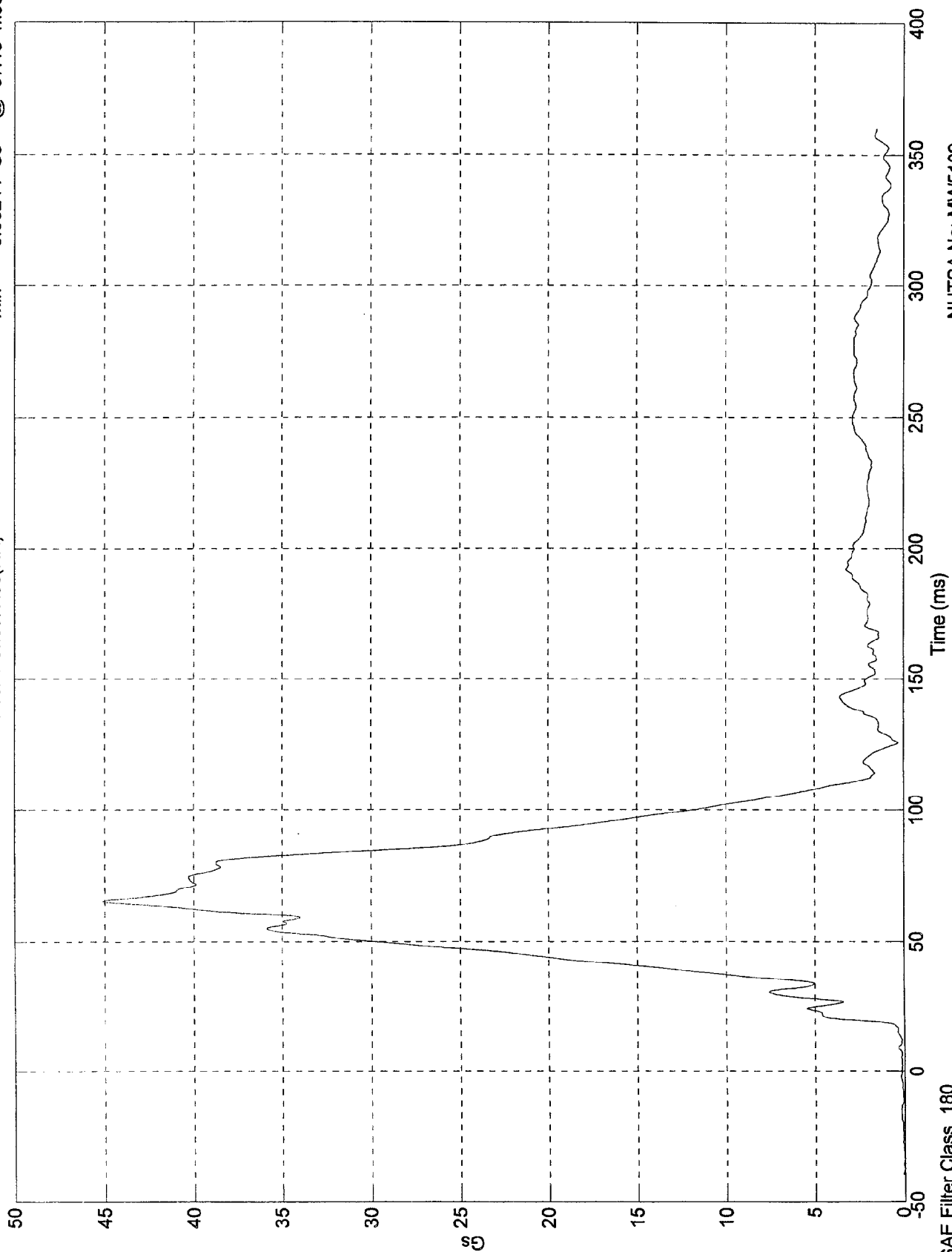
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 45.1 Gs @ 65.30 msec
Min = 0.00244 Gs @ -37.10 msec

Pos. 1 Chest Res(RR)

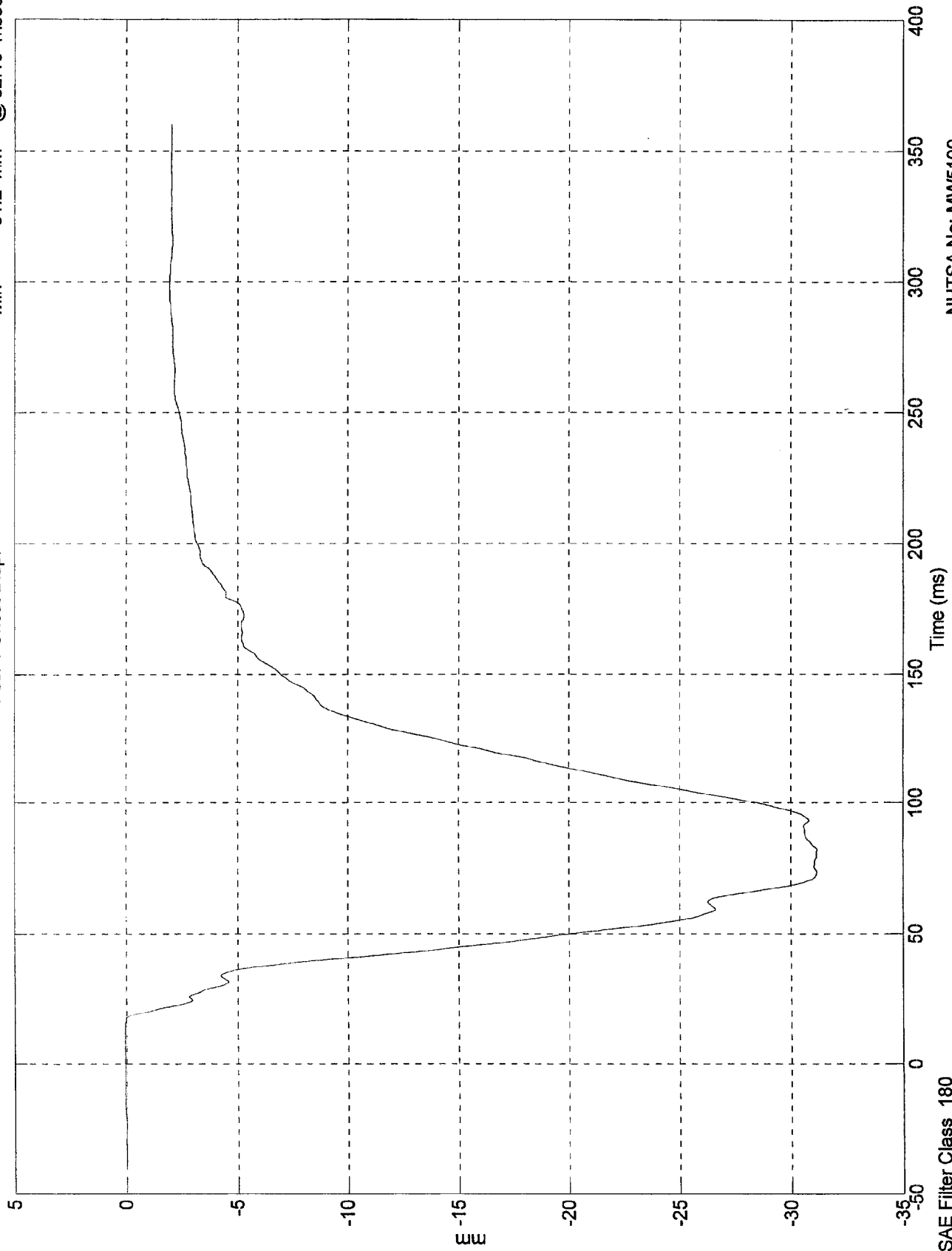


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 0.0622 mm @ 11.70 msec
Min = -31.2 mm @ 82.10 msec

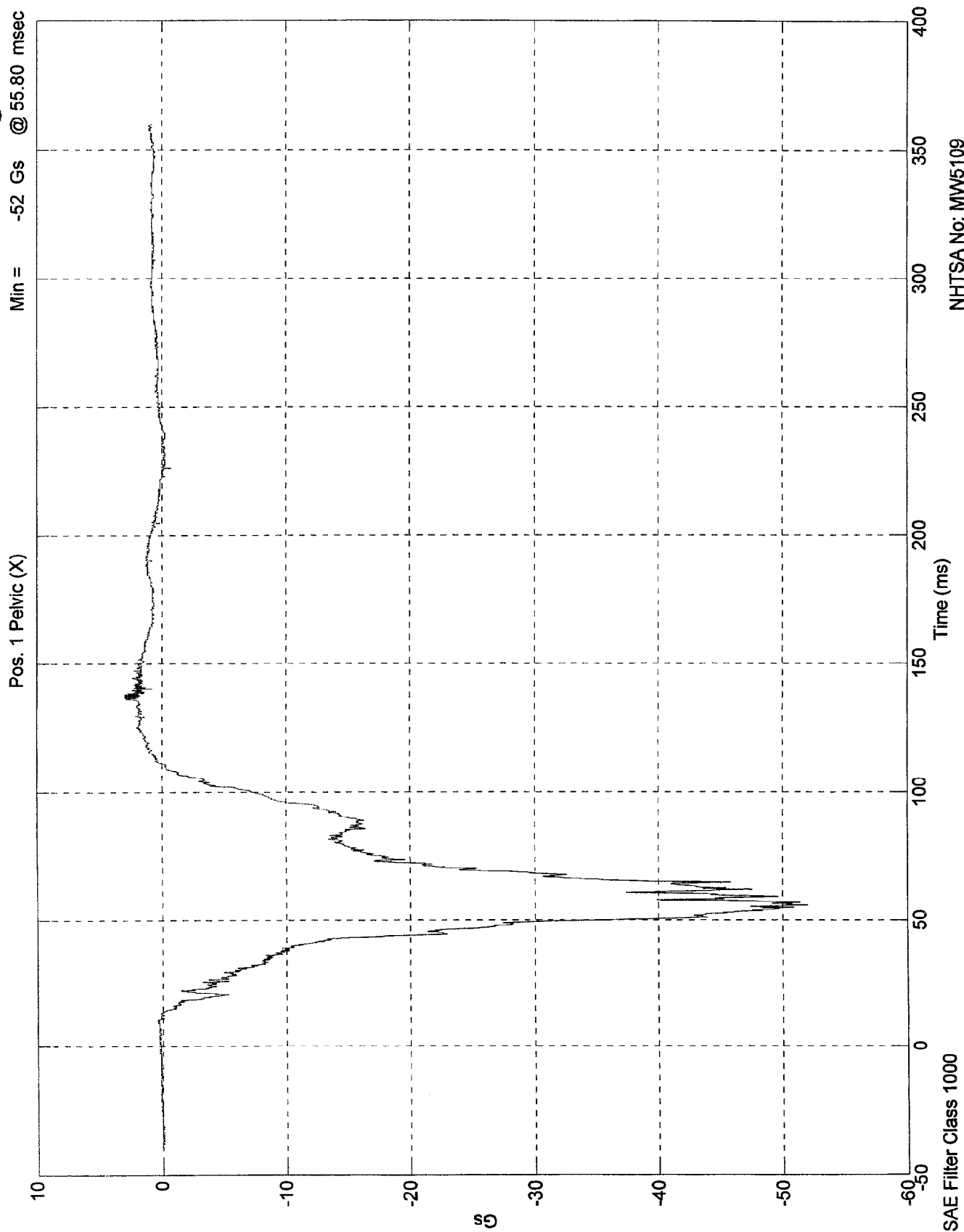
Pos. 1 Chest Disp.



NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.99 Gs @ 136.60 msec
 Min = -52 Gs @ 55.80 msec

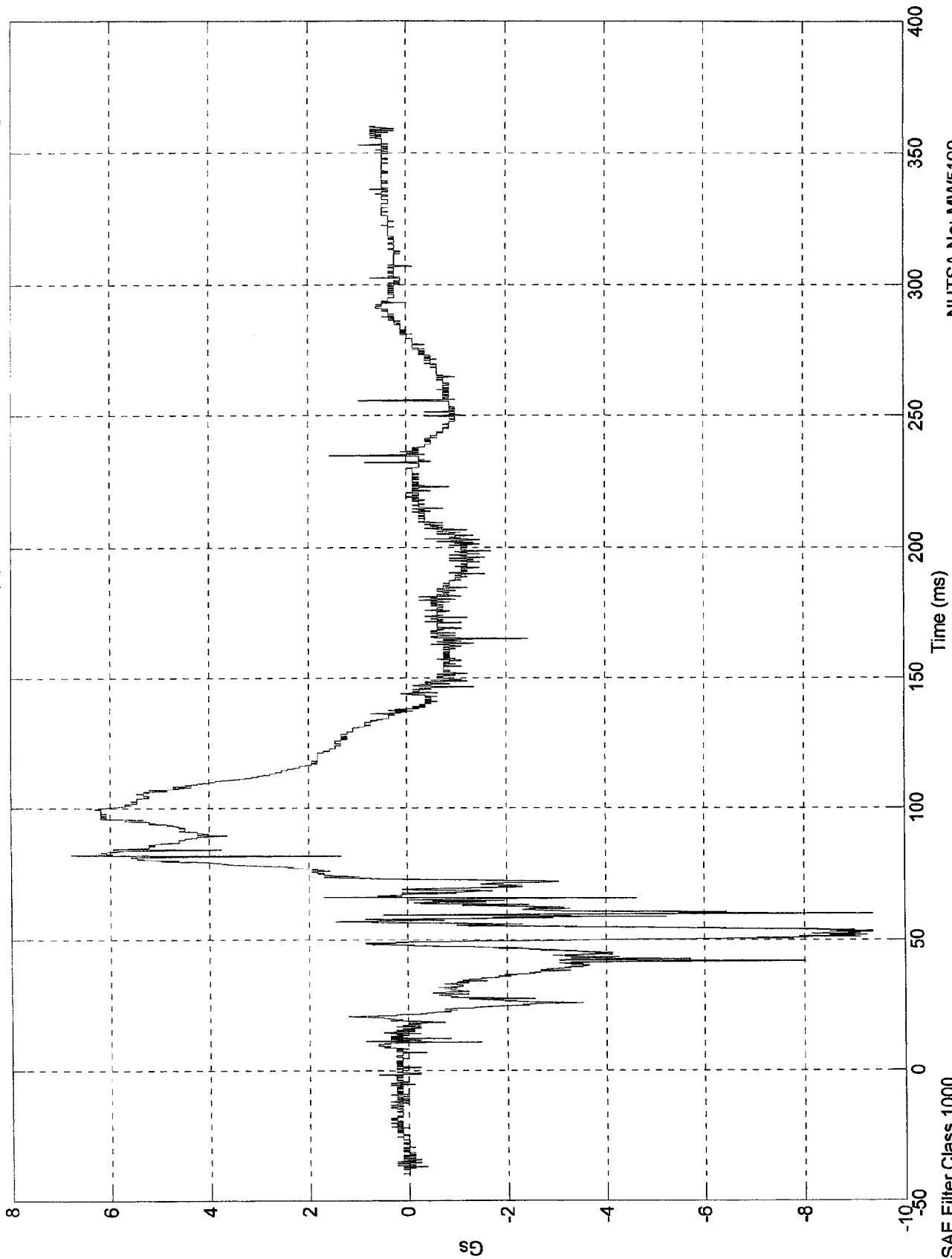


NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 6.8 Gs @ 82.30 msec
Min = -9.36 Gs @ 53.00 msec

Pos. 1 Pelvic (Y)

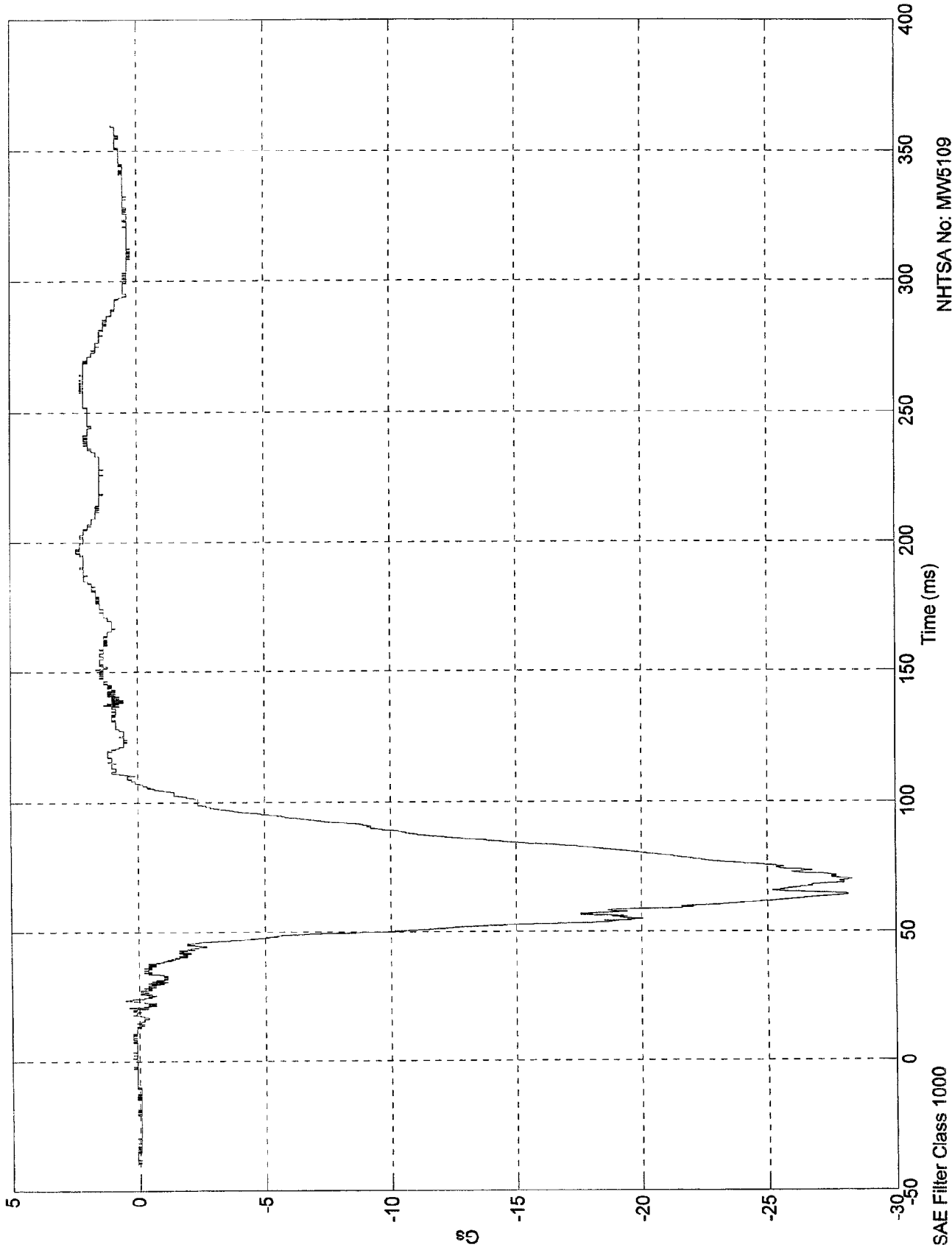


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.42 Gs @ 195.80 msec
 Min = -28.3 Gs @ 69.90 msec

Pos. 1 Pelvic (Z)

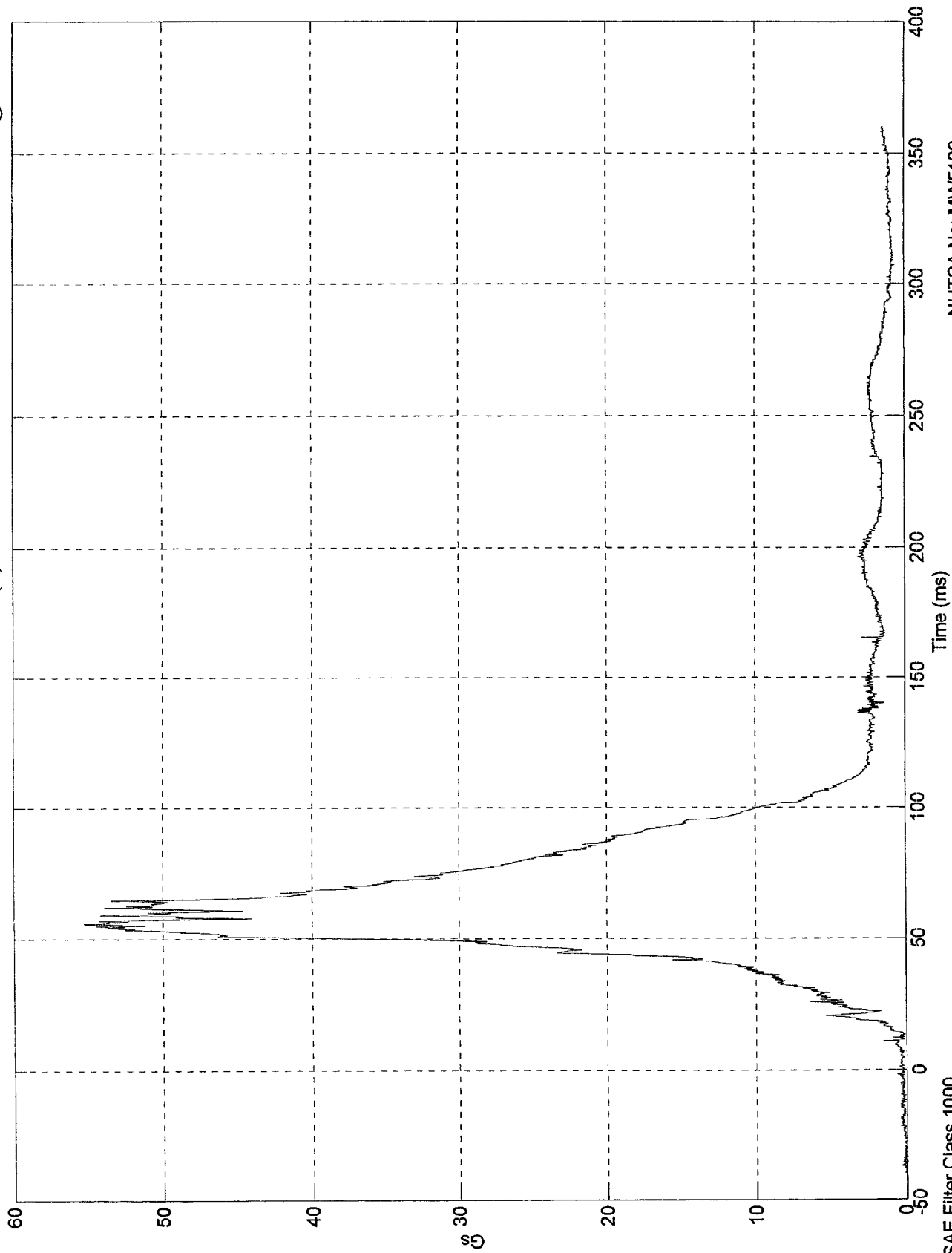


NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 55.3 Gs @ 55.80 msec
 Min = 0.0686 Gs @ -39.30 msec

Pos. 1 Pelvic (R)



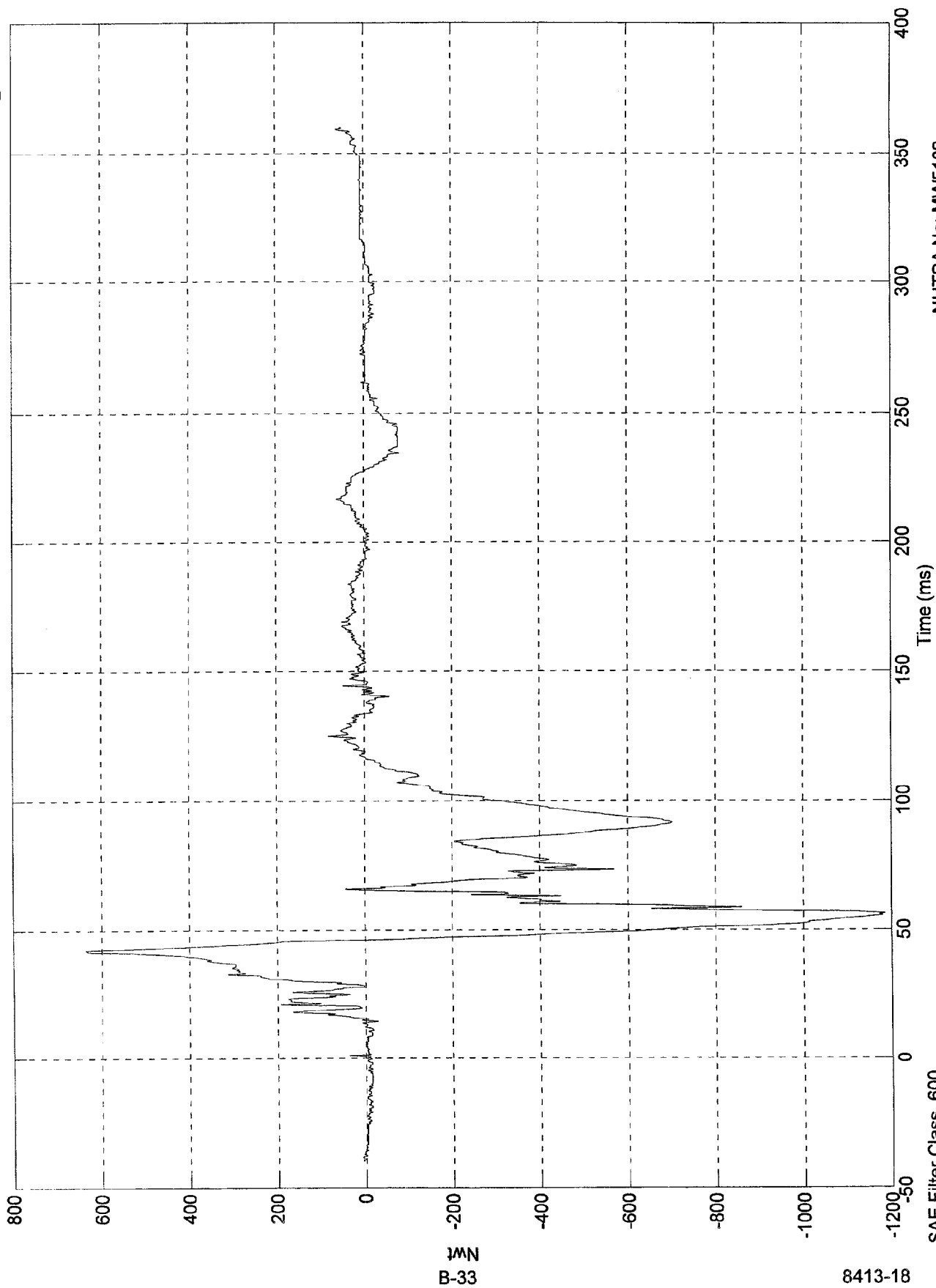
SAE Filter Class 1000

NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 636 Nwt @ 42.20 msec
Min = -1.18e+003 Nwt @ 56.20 msec

Pos. 1 Left Femur

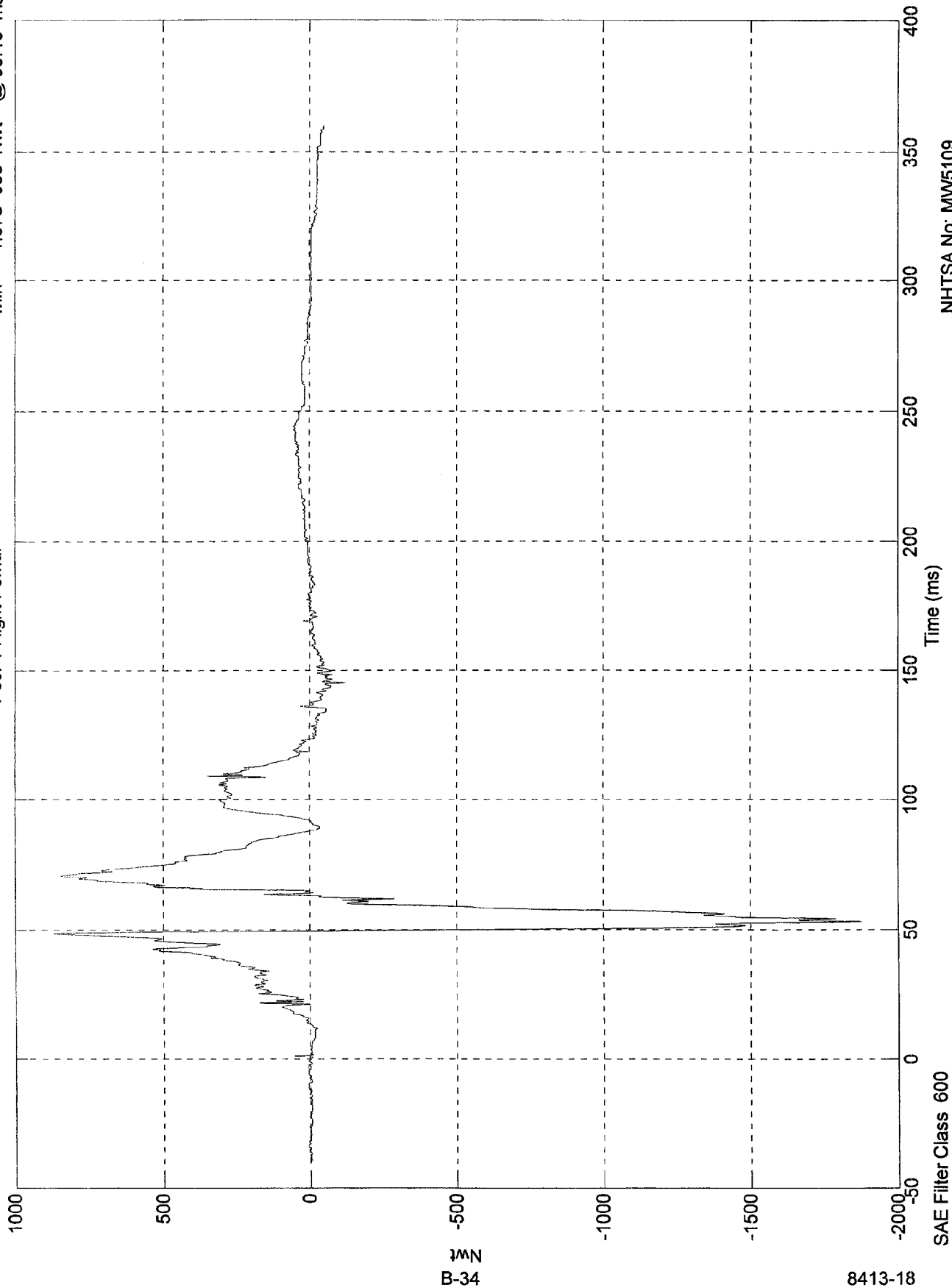


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 869 Nwt @ 48.40 msec
Min = -1.87e+003 Nwt @ 53.10 msec

Pos. 1 Right Femur

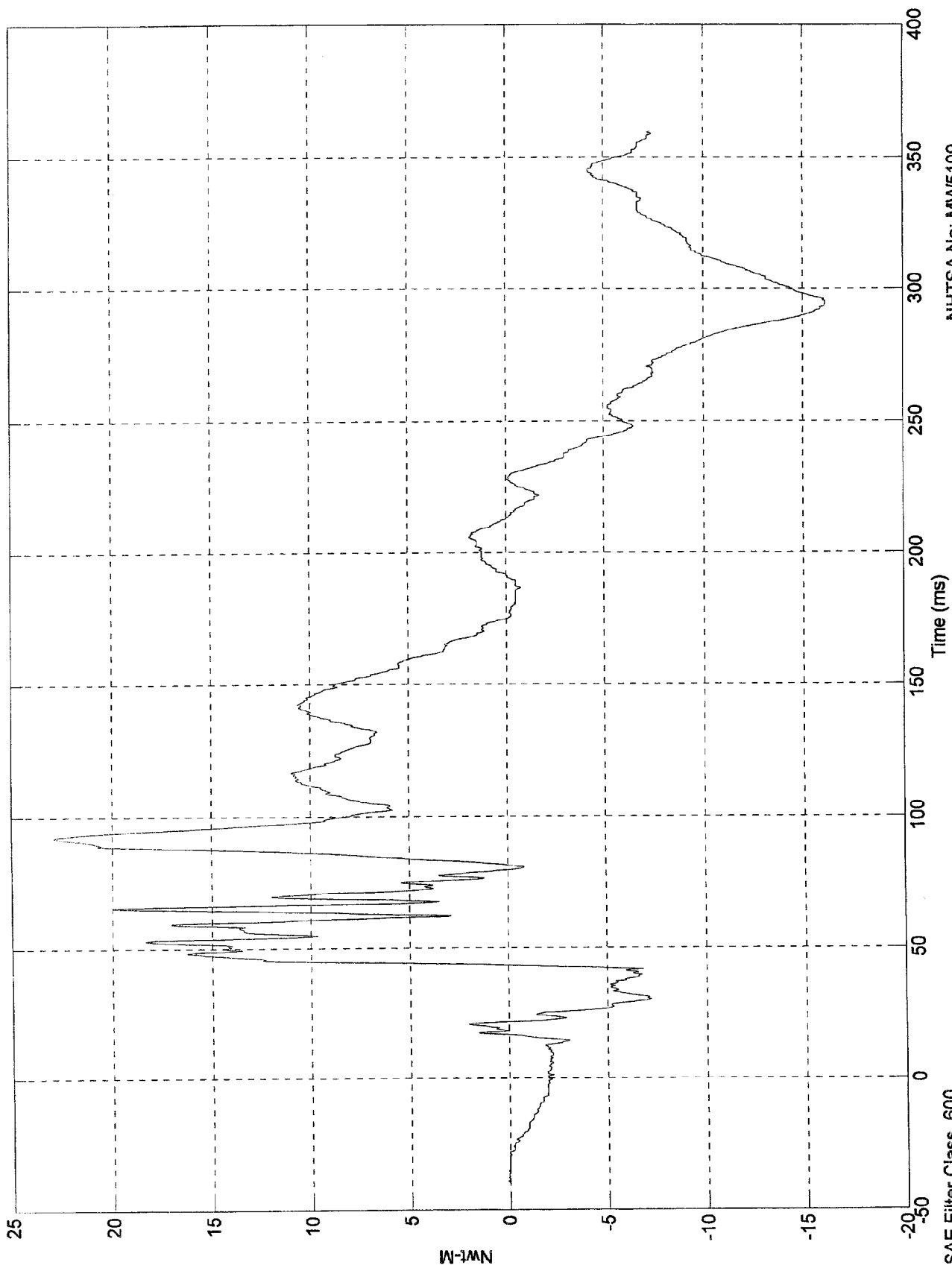


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 22.9 Nwt-M @ 92.30 msec
Min = -16.1 Nwt-M @ 295.10 msec

P1 Lt Upper Tibia Mx



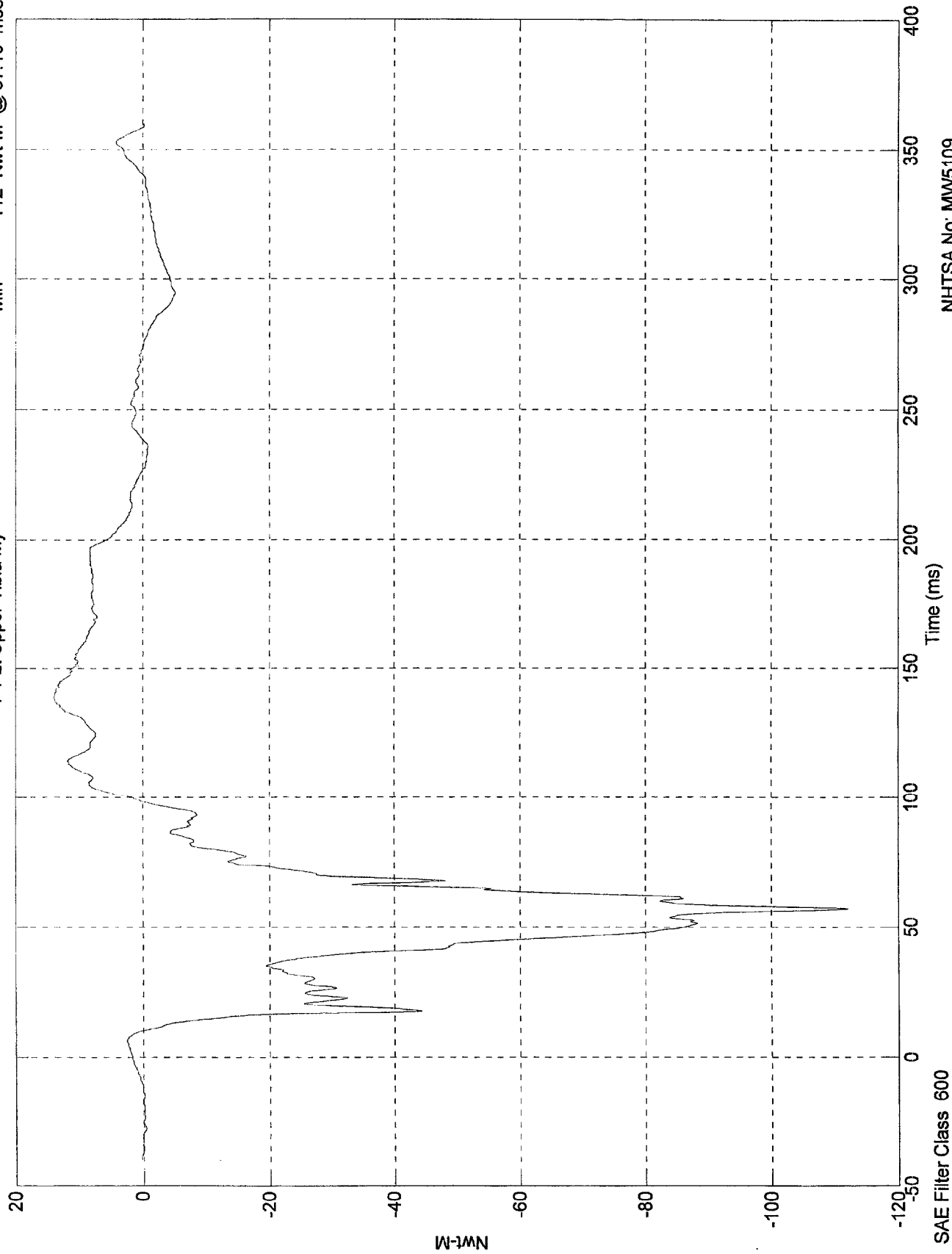
SAE Filter Class 600

NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 14 Nwt-M @ 139.10 msec
Min = -112 Nwt-M @ 57.10 msec

P1 Lt Upper Tibia My

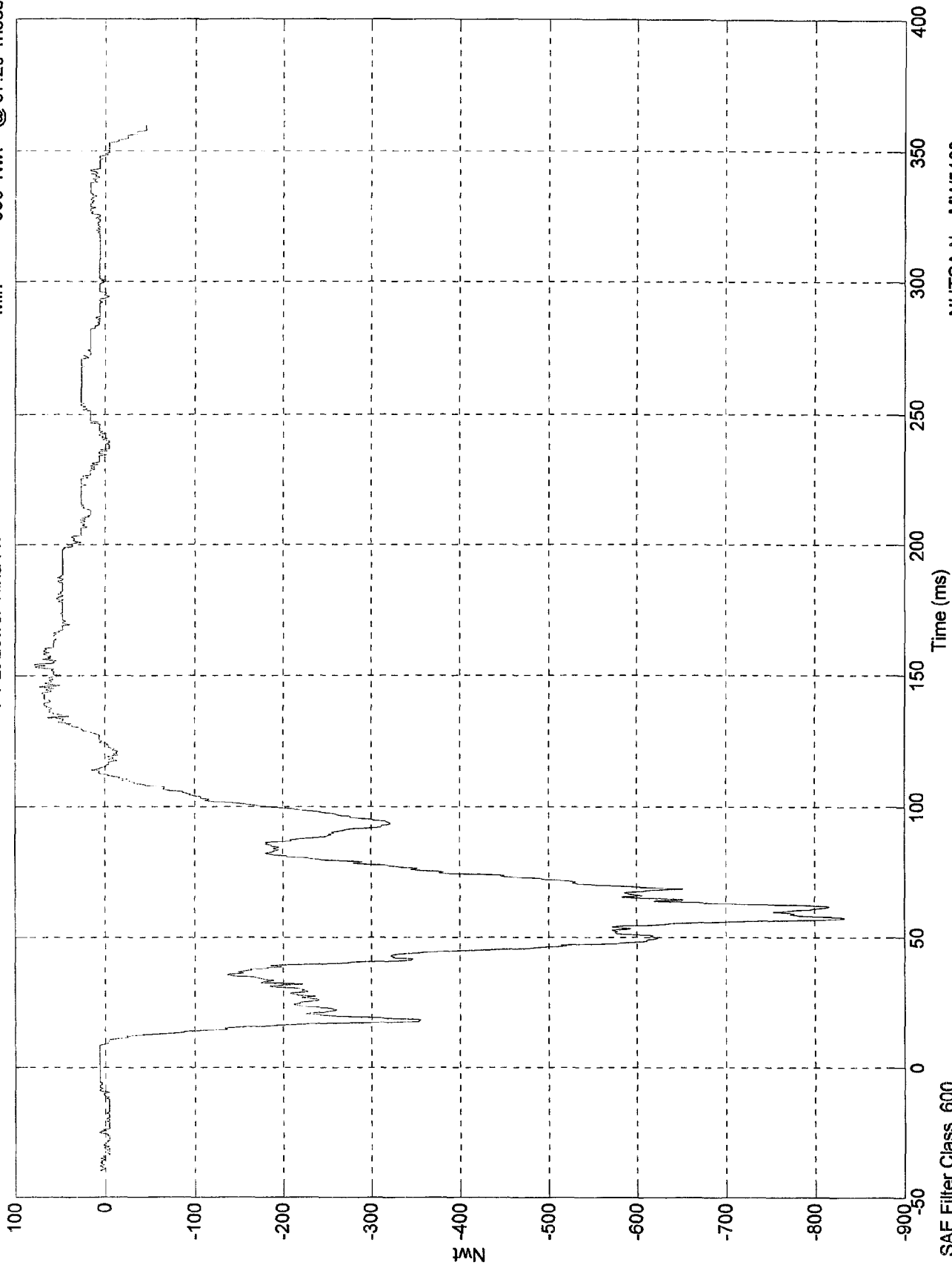


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 78.8 Nwt @ 154.00 msec
Min = -833 Nwt @ 57.20 msec

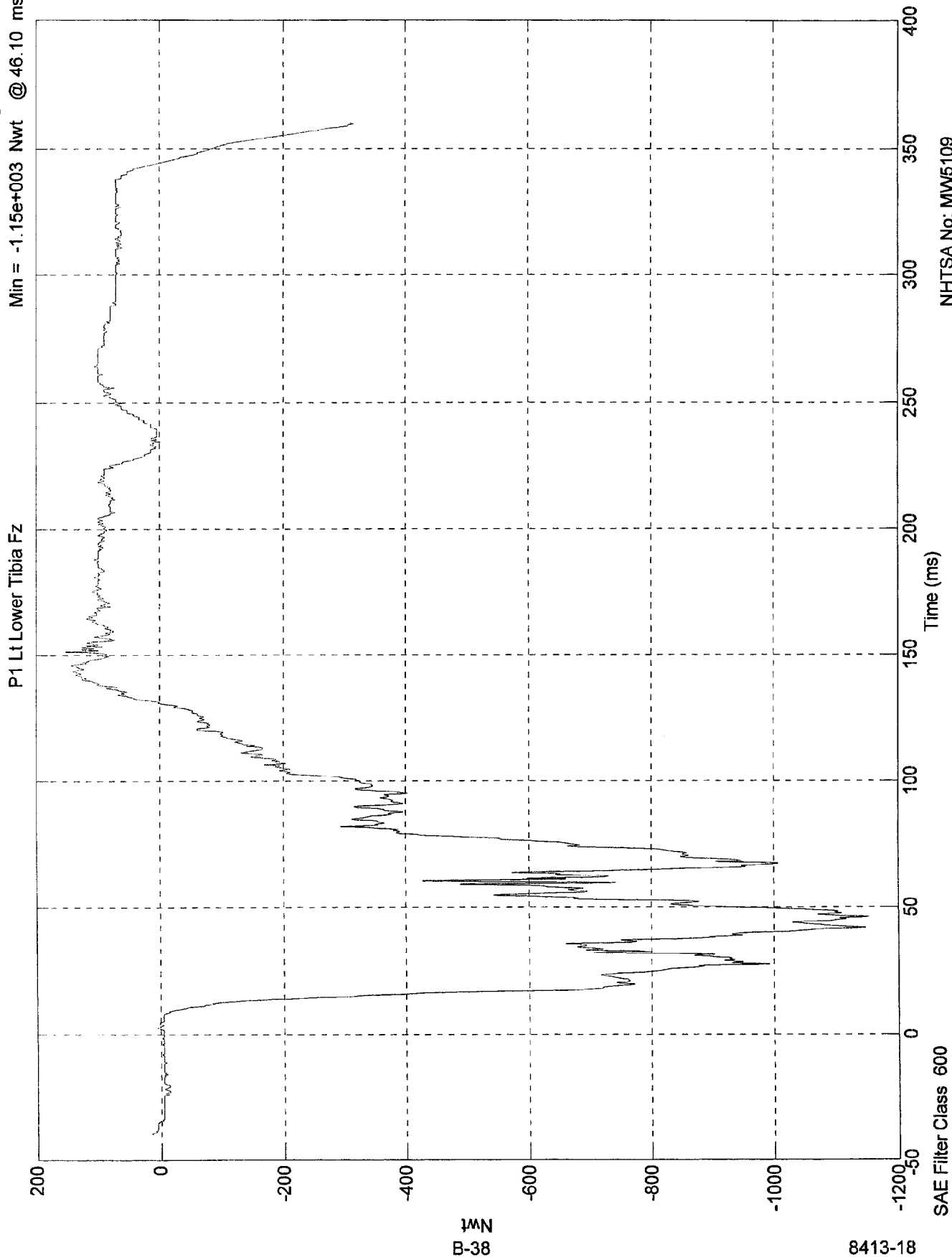
P1 Lt Lower Tibia Fx



NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

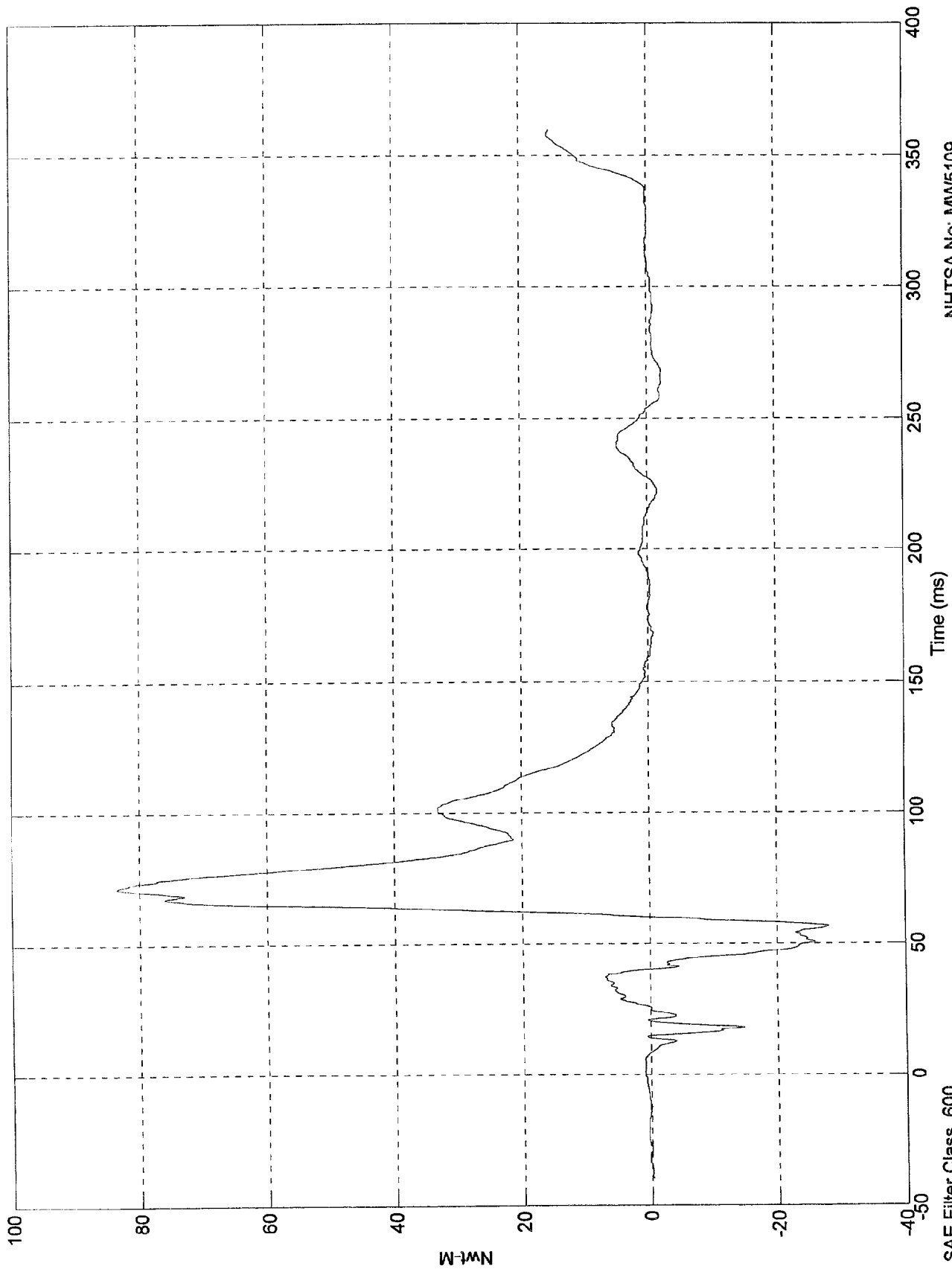
Max = 153 Nwt @ 151.40 msec
Min = -1.15e+003 Nwt @ 46.10 msec



NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 83.6 Nwt-M @ 71.30 msec
Min = -28.1 Nwt-M @ 56.60 msec

P1 Lt Lower Tibia My



NHTSA No: MW5109
Date: 27 Jan 1998

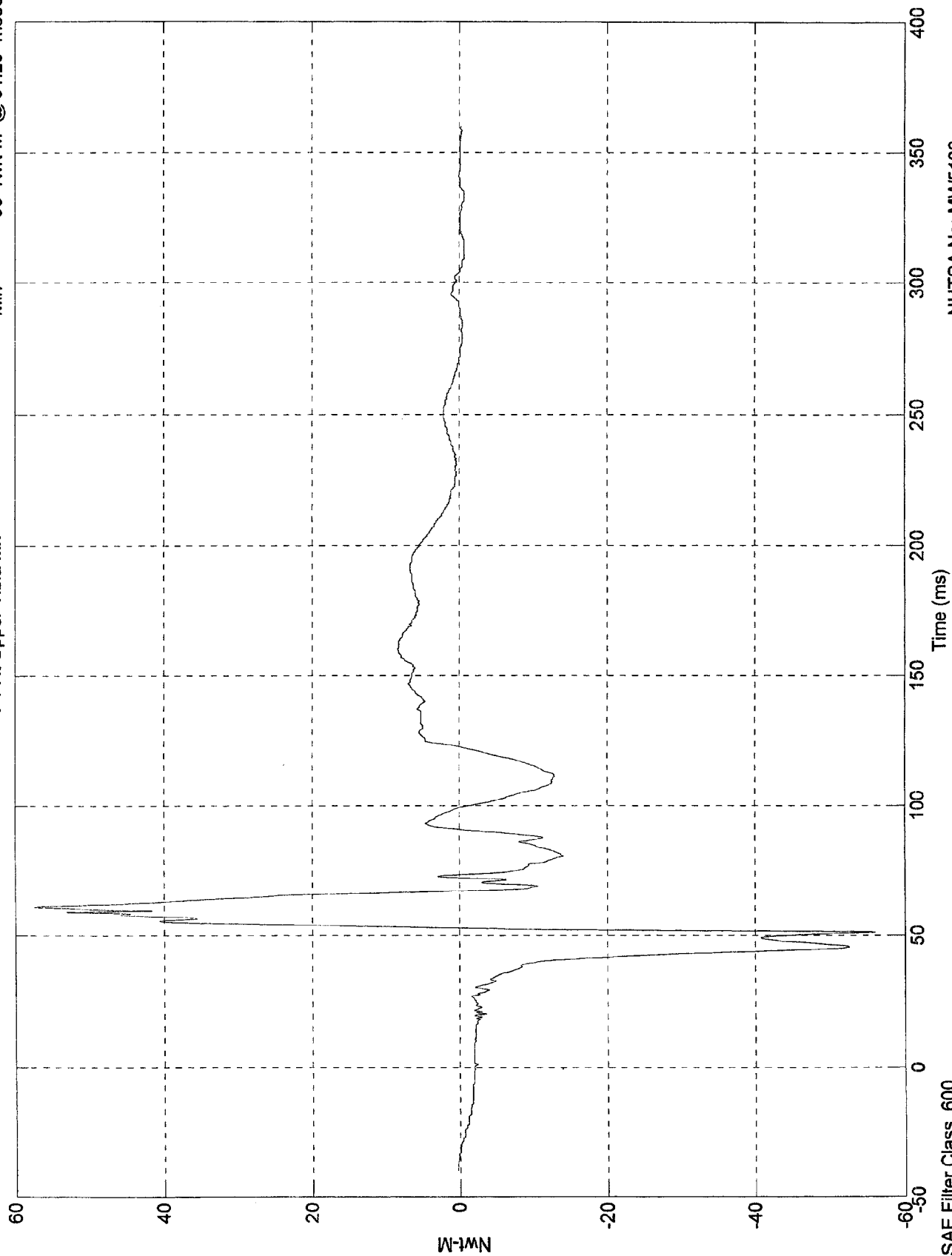
SAE Filter Class 600

Nwt-M

Time (ms)

Max = 57.5 Nwt-M @ 60.80 msec
Min = -56 Nwt-M @ 51.20 msec

P1 Rt Upper Tibia Mx



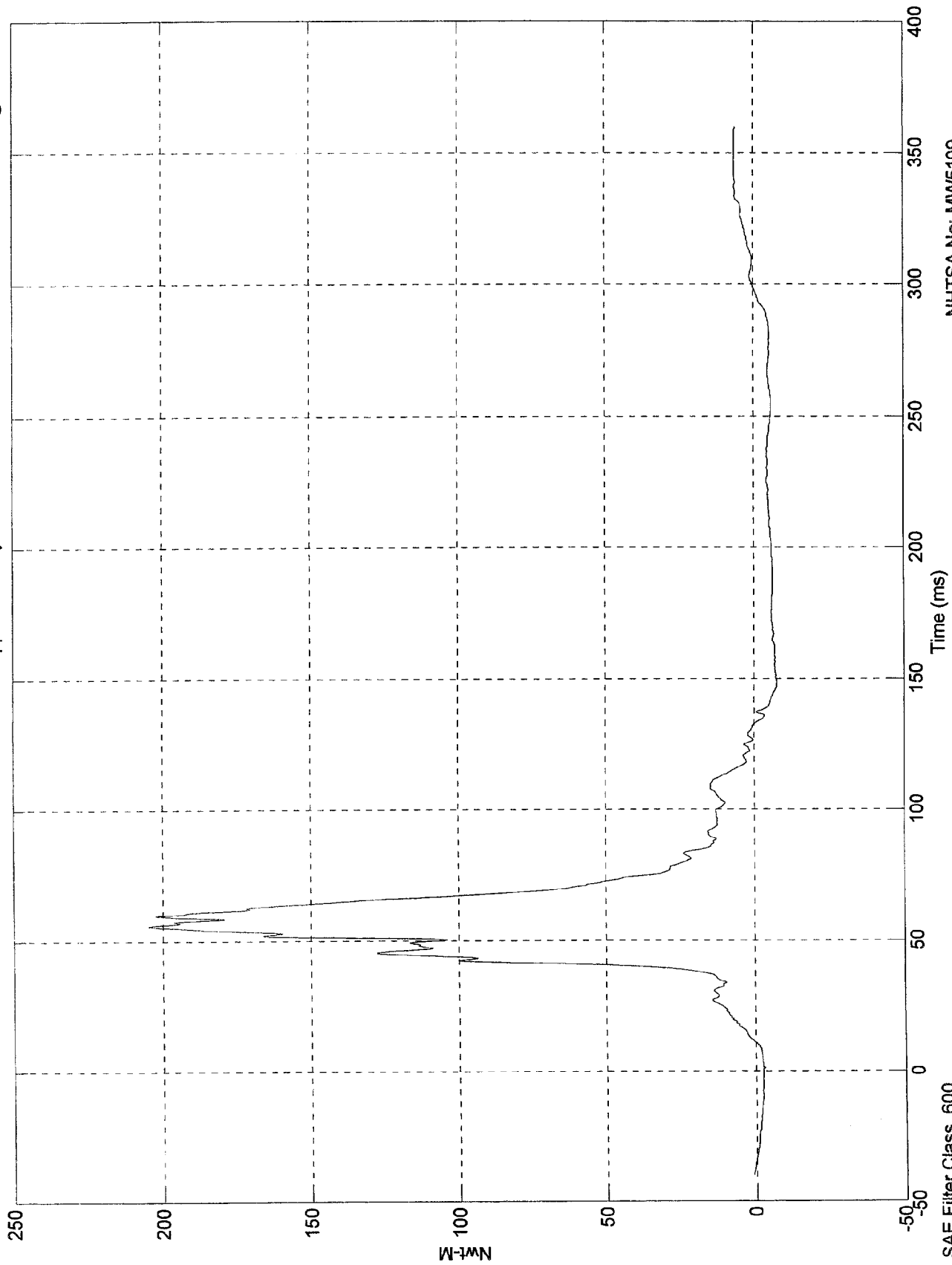
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 205 Nwt-M @ 55.70 msec
Min = -7.74 Nwt-M @ 148.90 msec

P1 Rt Upper Tibia My



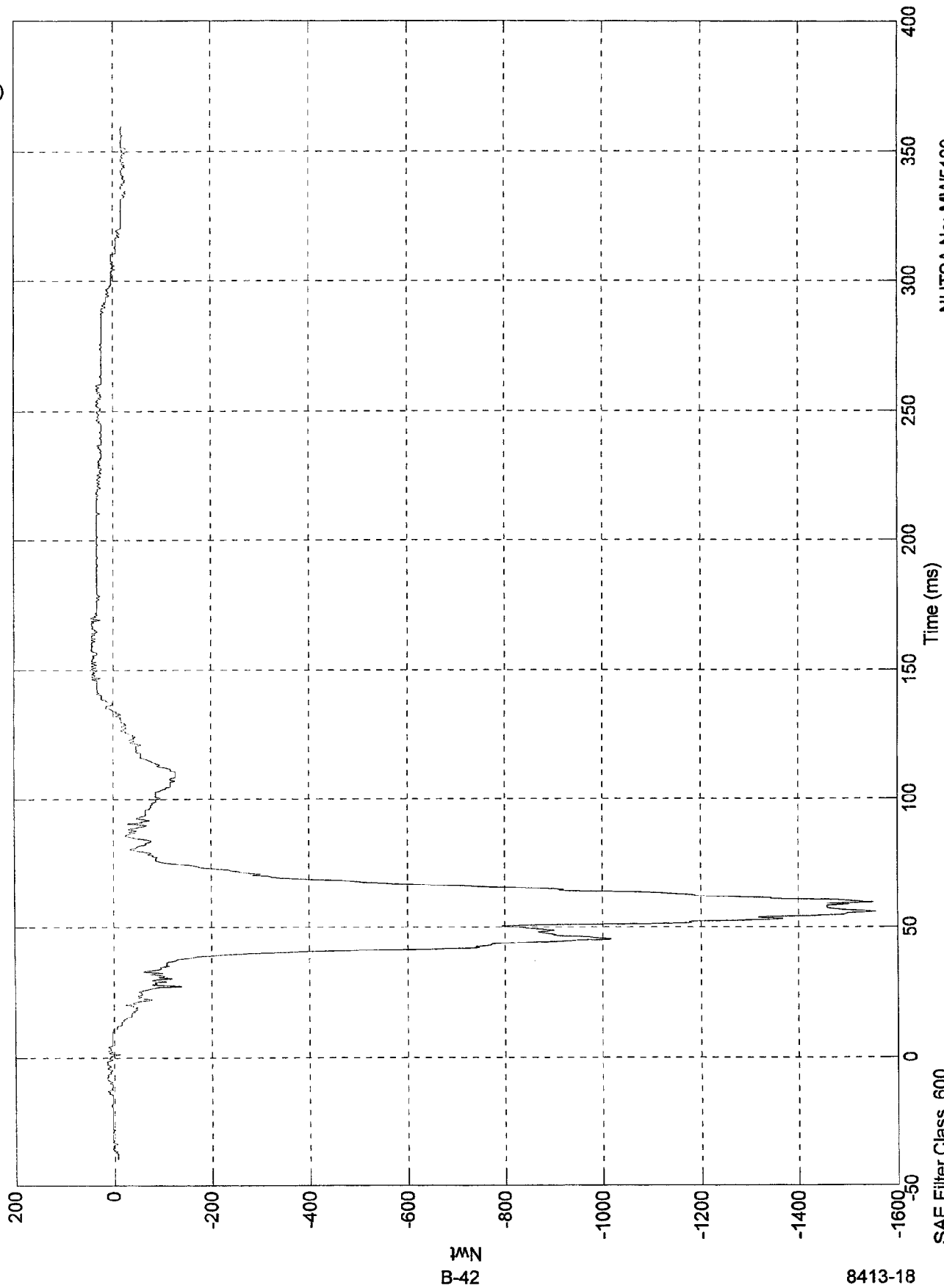
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 45 Nwt @ 169.70 msec
Min = -1.56e+003 Nwt @ 55.70 msec

P1 Rt Lower Tibia Fx



NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

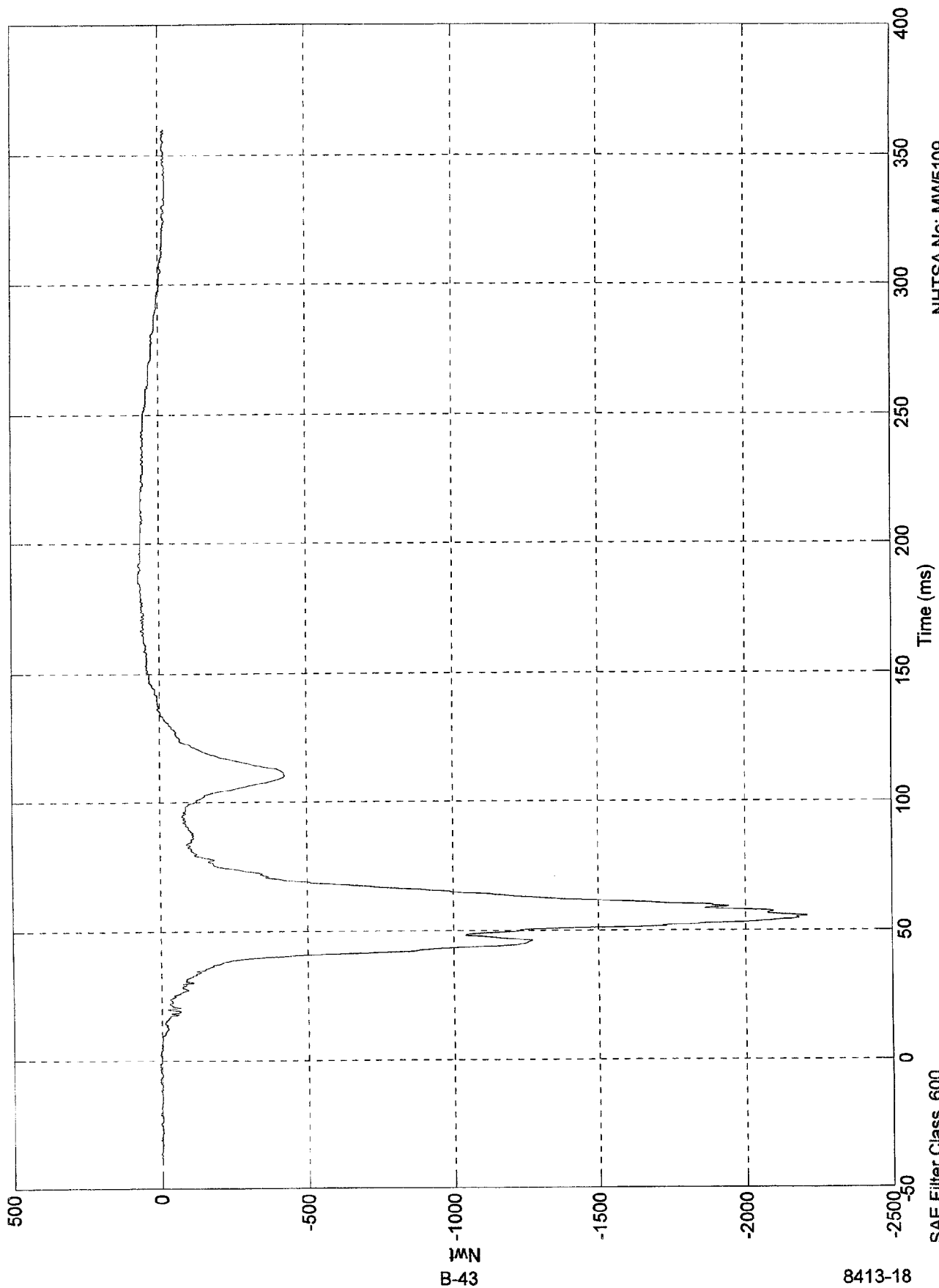
B-42

8413-18

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 71.7 Nwt @ 185.10 msec
Min = -2.21e+003 Nwt @ 55.50 msec

P1 Rt Lower Tibia Fz



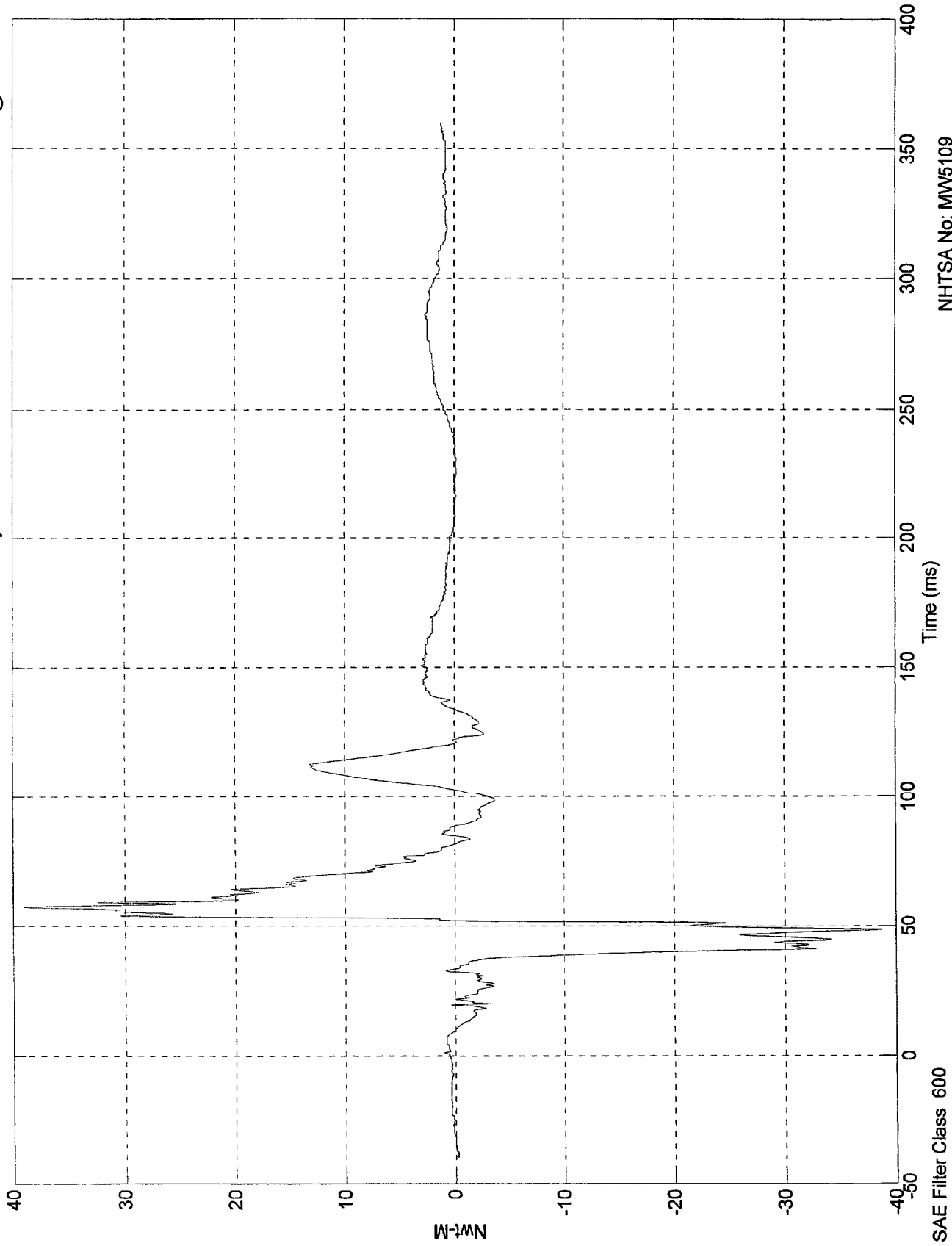
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 39 Nwt-M @ 57.30 msec
Min = -38.7 Nwt-M @ 48.40 msec

P1 Rt Lower Tibia My

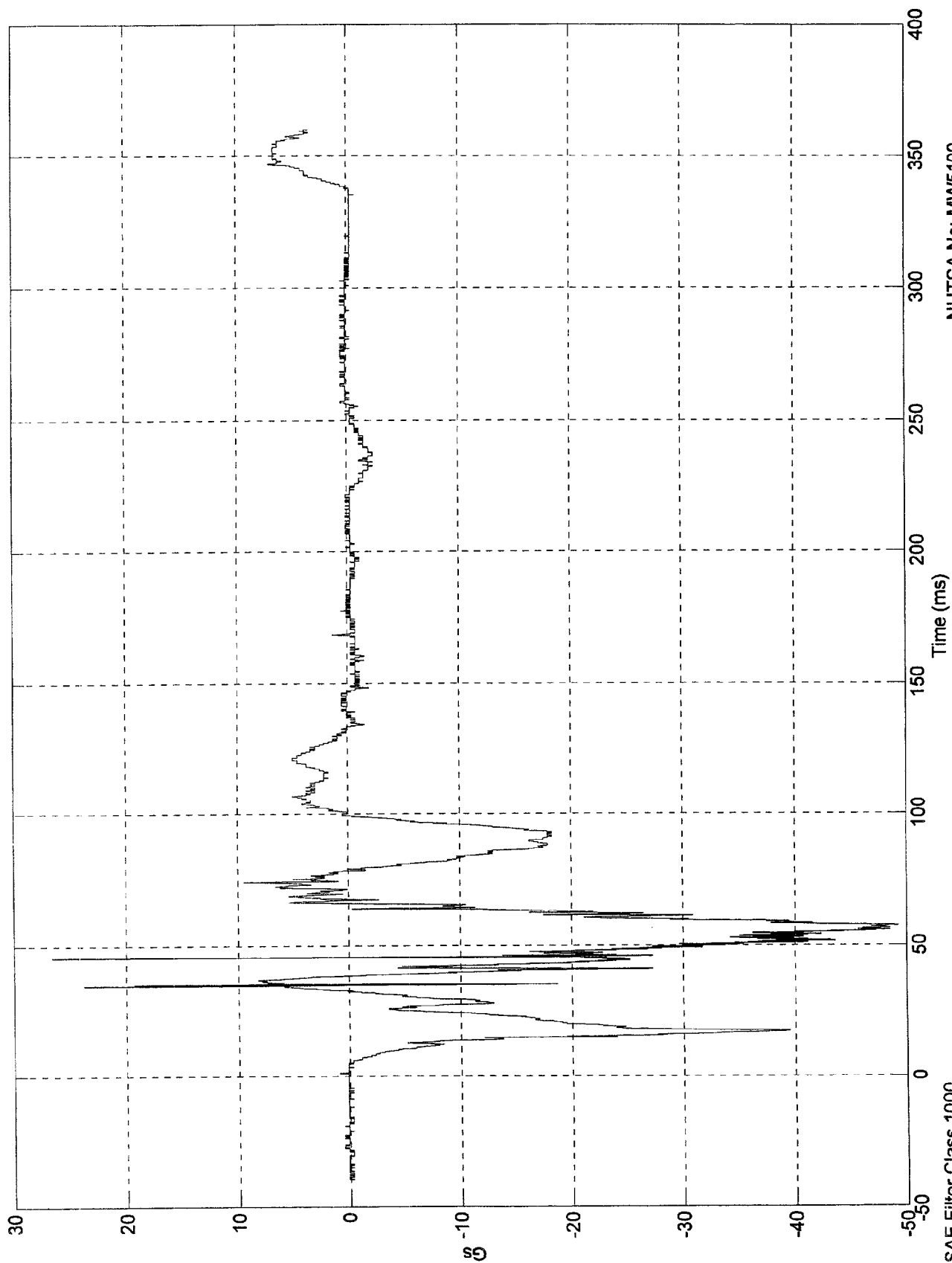


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 26.6 Gs @ 45.70 msec
Min = -49.3 Gs @ 57.40 msec

Pos. 1 Left Ankle X



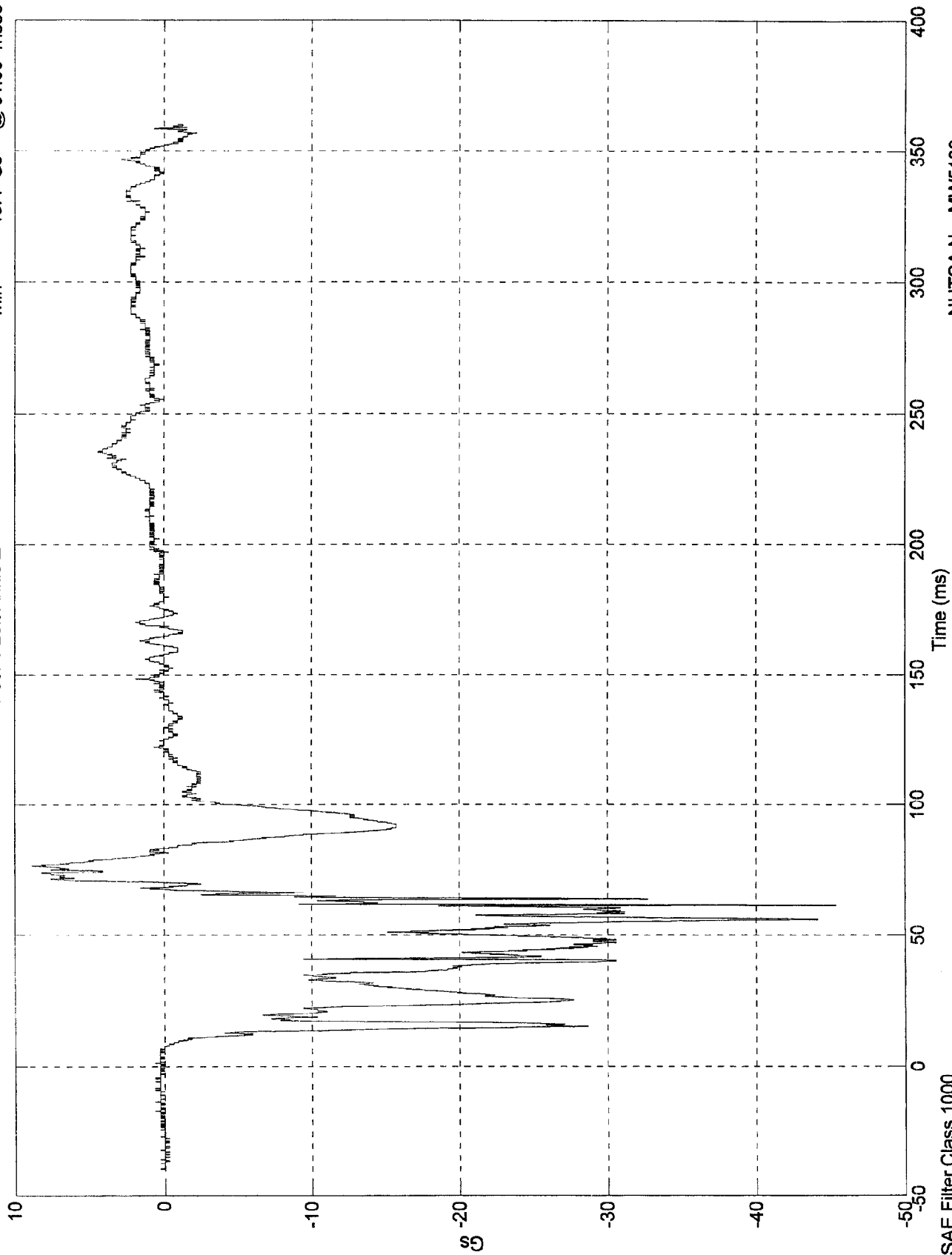
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 1000

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 8.84 Gs @ 76.50 msec
 Min = -45.4 Gs @ 61.30 msec

Pos. 1 Left Ankle Z



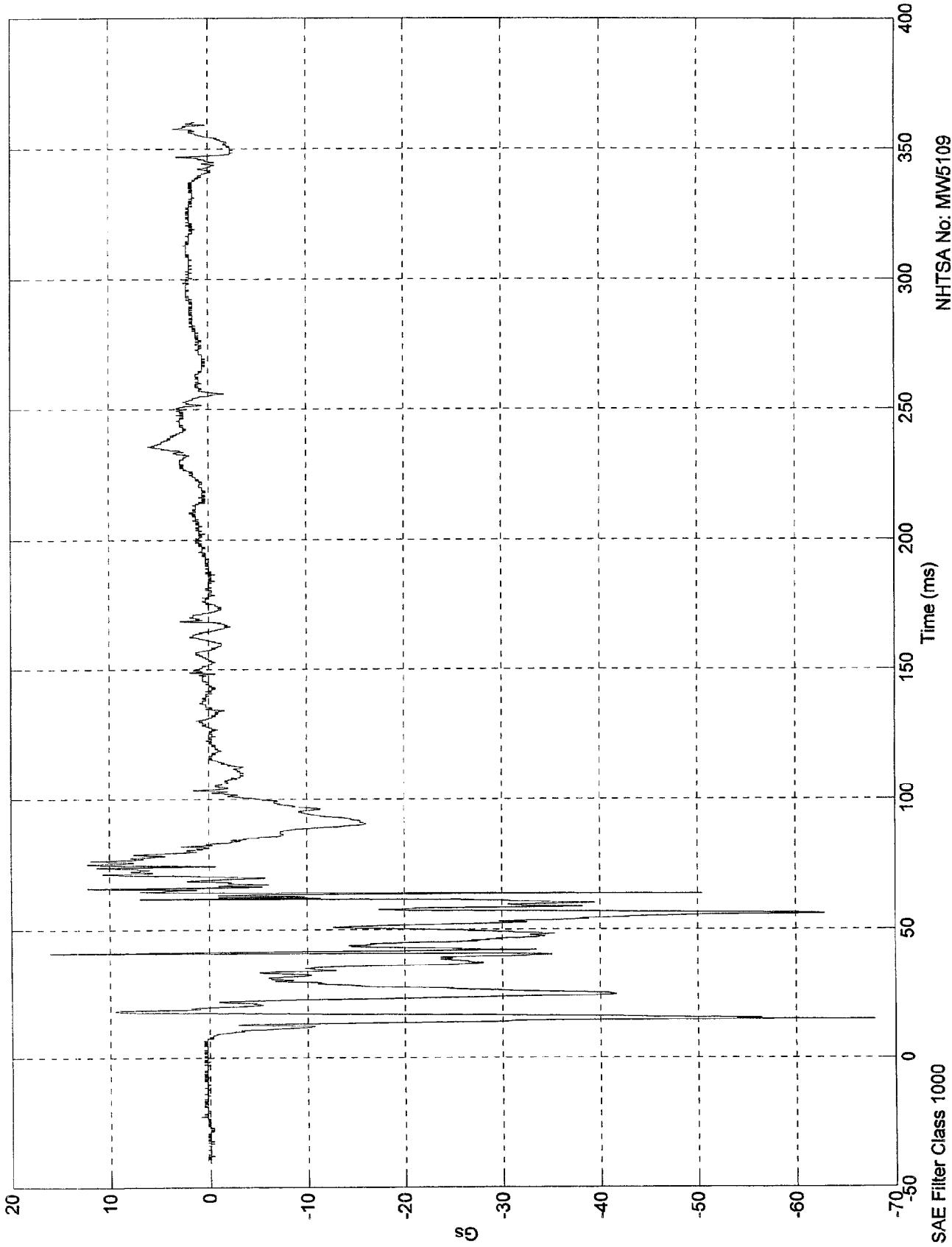
NHTSA No: MW5109
 Date: 27 Jan 1998

SAE Filter Class 1000

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 16.1 Gs @ 41.00 msec
Min = -67.8 Gs @ 15.10 msec

Pos. 1 Left Toe Z

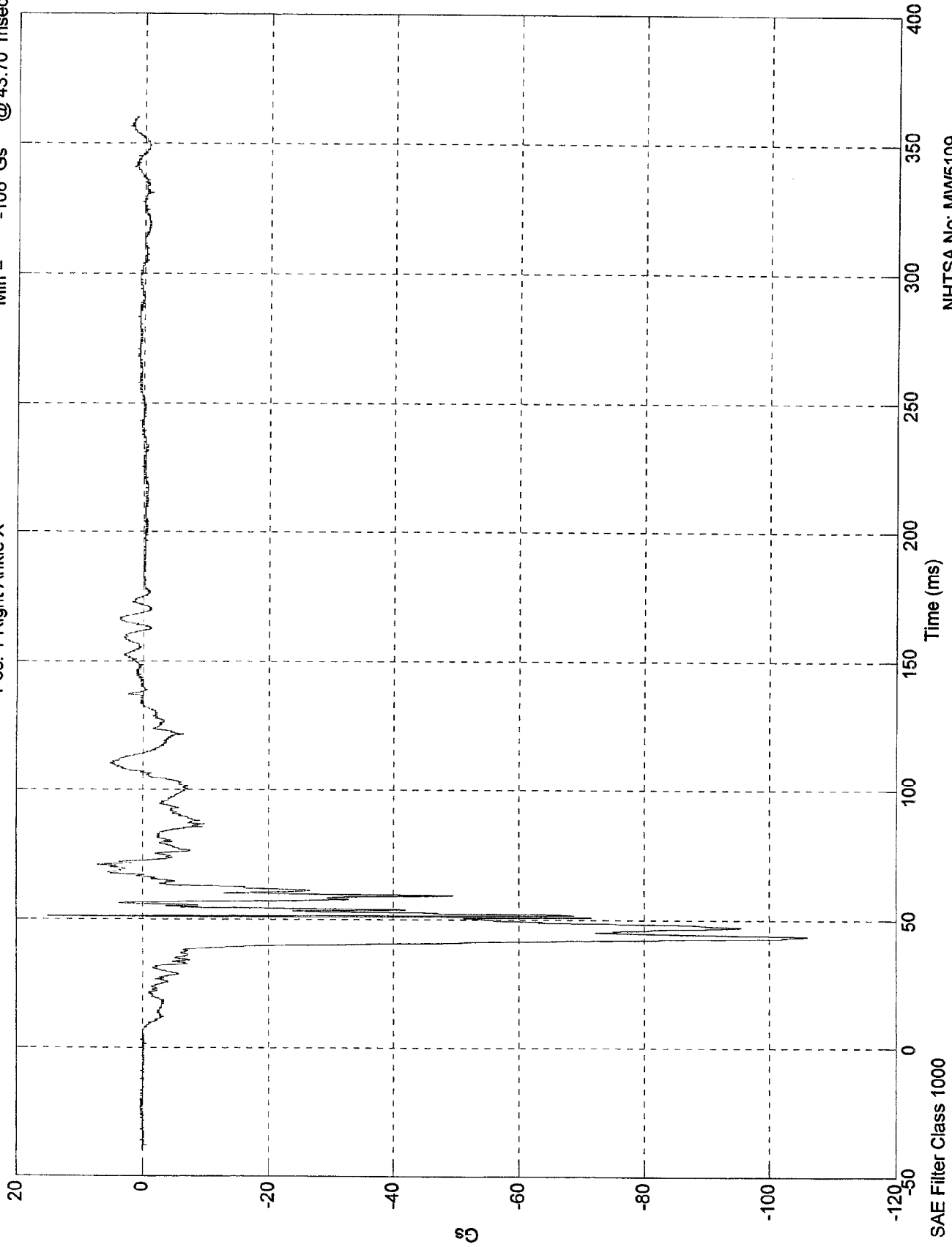


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 15.1 Gs @ 51.20 msec
Min = -106 Gs @ 43.70 msec

Pos. 1 Right Ankle X

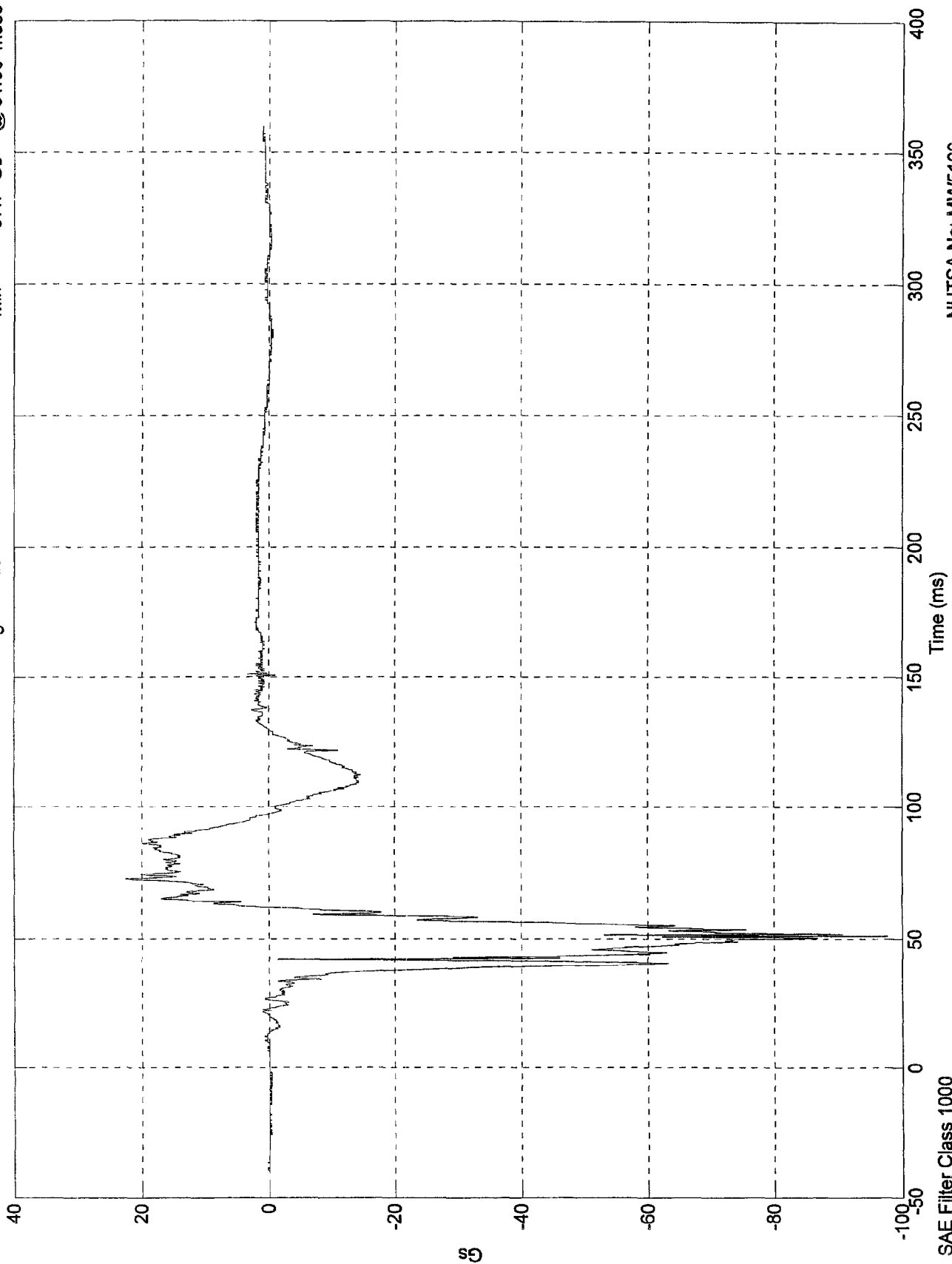


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Pos. 1 Right Ankle Z

Max = 22.5 Gs @ 72.40 msec
Min = -97.7 Gs @ 51.00 msec

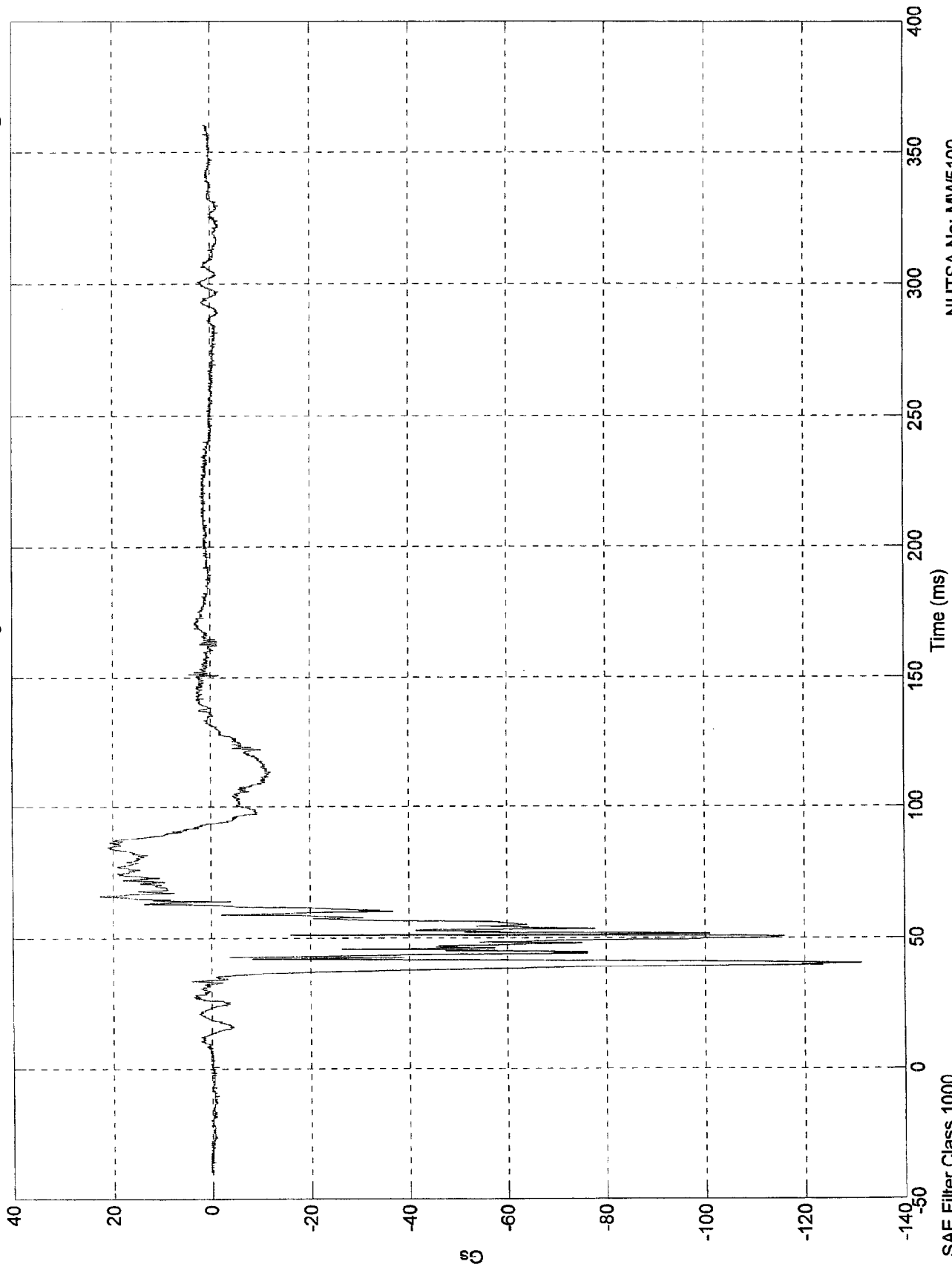


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 22.5 Gs @ 65.70 msec
Min = -131 Gs @ 40.40 msec

Pos. 1 Right Toe Z



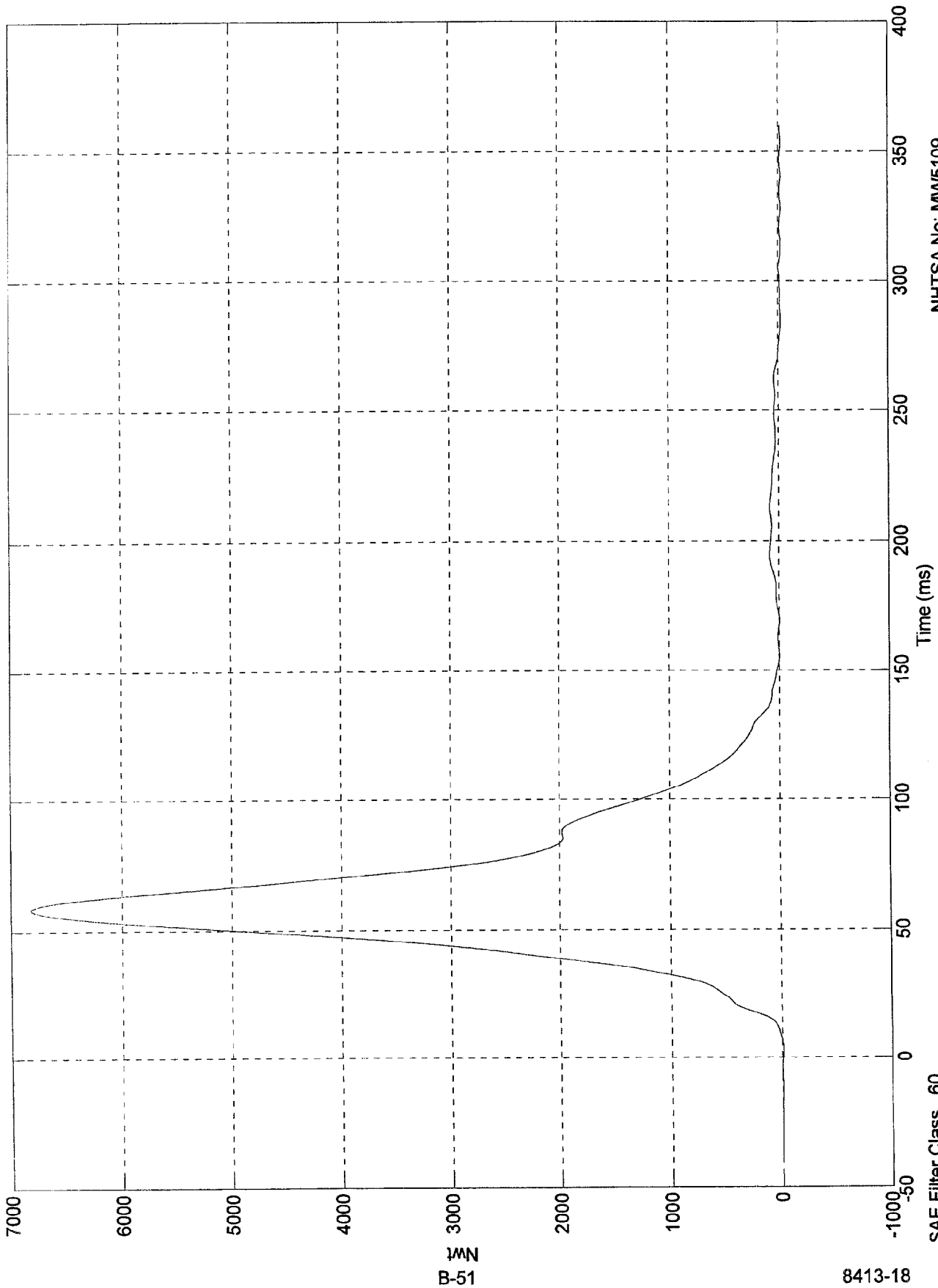
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 1000

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 6.82e+003 Nwt @ 58.20 msec
 Min = -25.3 Nwt @ 327.70 msec

Pos. 1 Left Belt Load



NHTSA No: MW5109
 Date: 27 Jan 1998

SAE Filter Class 60

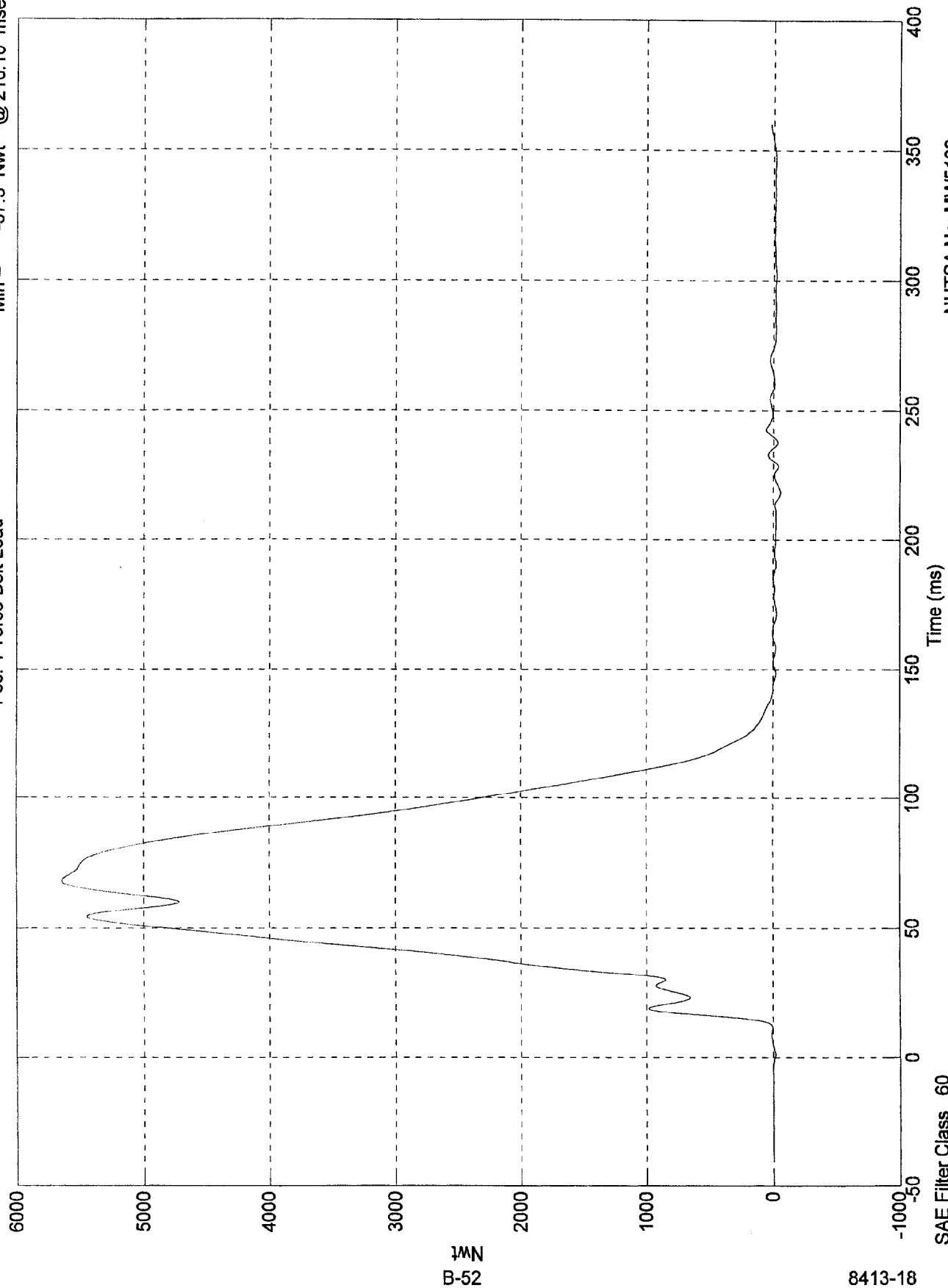
8413-18

B-51

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 5.64e+003 Nwt @ 68.00 msec
Min = -57.3 Nwt @ 218.10 msec

Pos. 1 Torso Belt Load

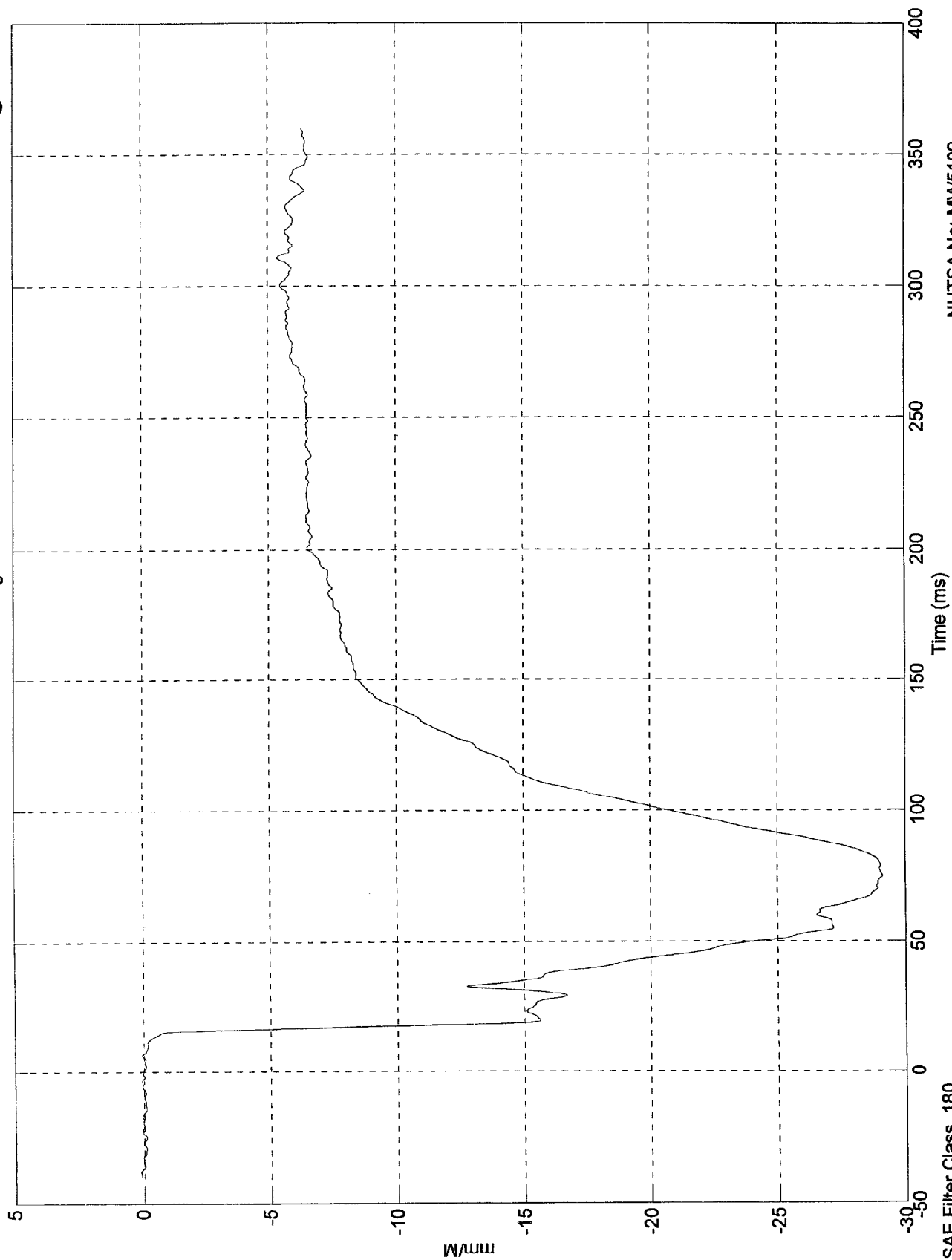


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 0.119 mm/M @ -38.20 msec
Min = -29.1 mm/M @ 75.00 msec

Pos. 1 Belt Elongation

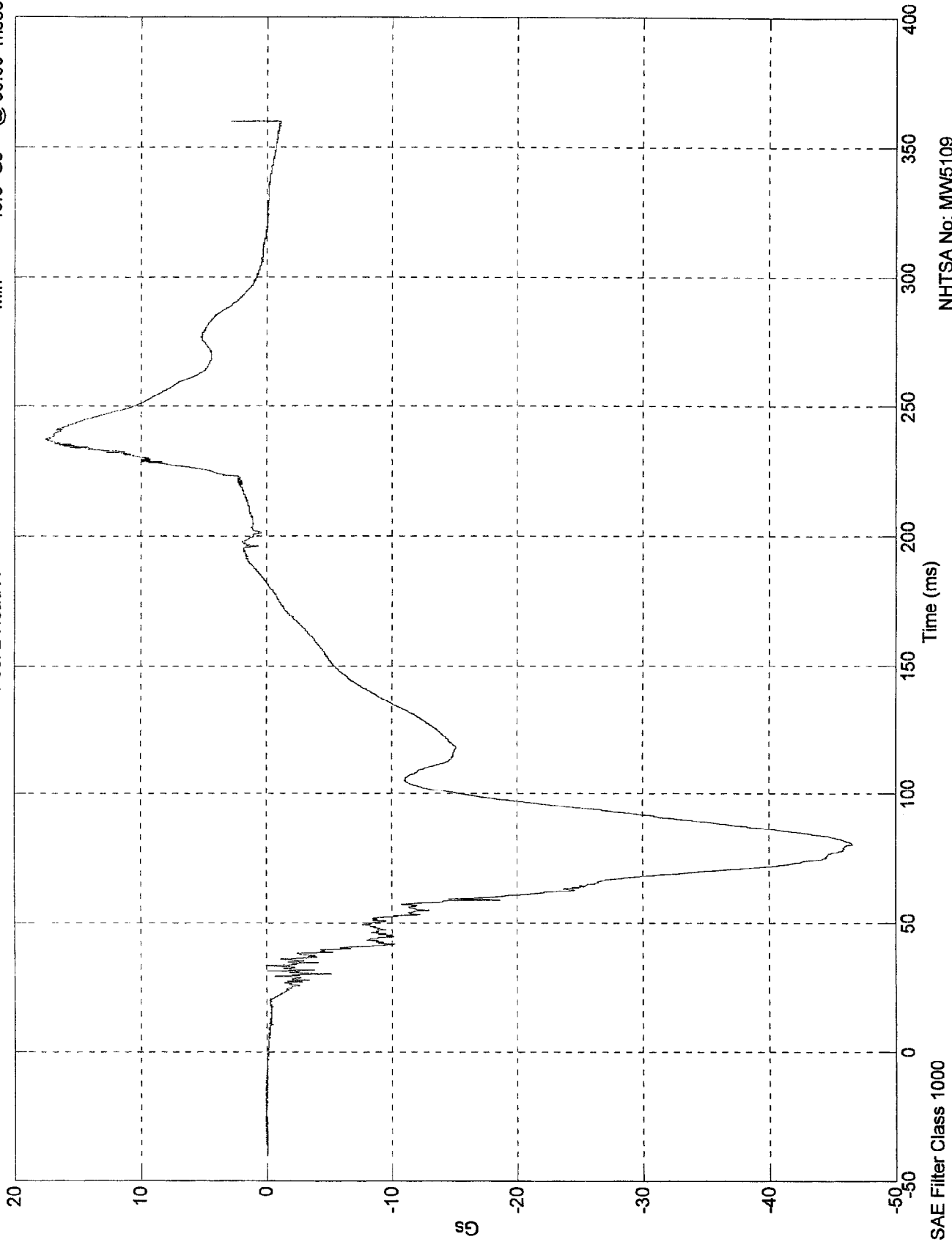


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 17.5 Gs @ 237.00 msec
Min = -46.6 Gs @ 80.30 msec

Pos. 2 Head X

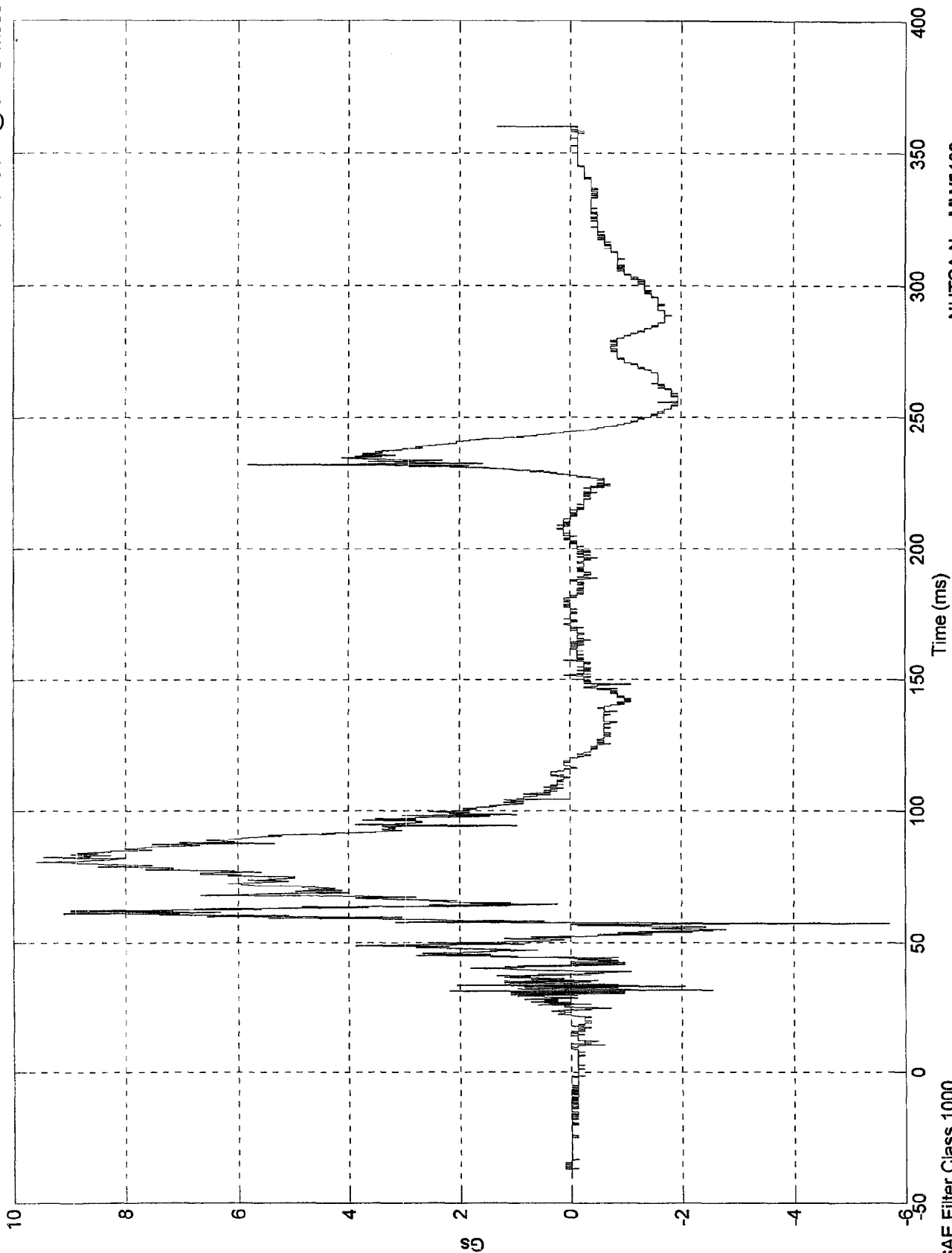


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 9.58 Gs @ 80.80 msec
Min = -5.71 Gs @ 57.40 msec

Pos. 2 Head Y



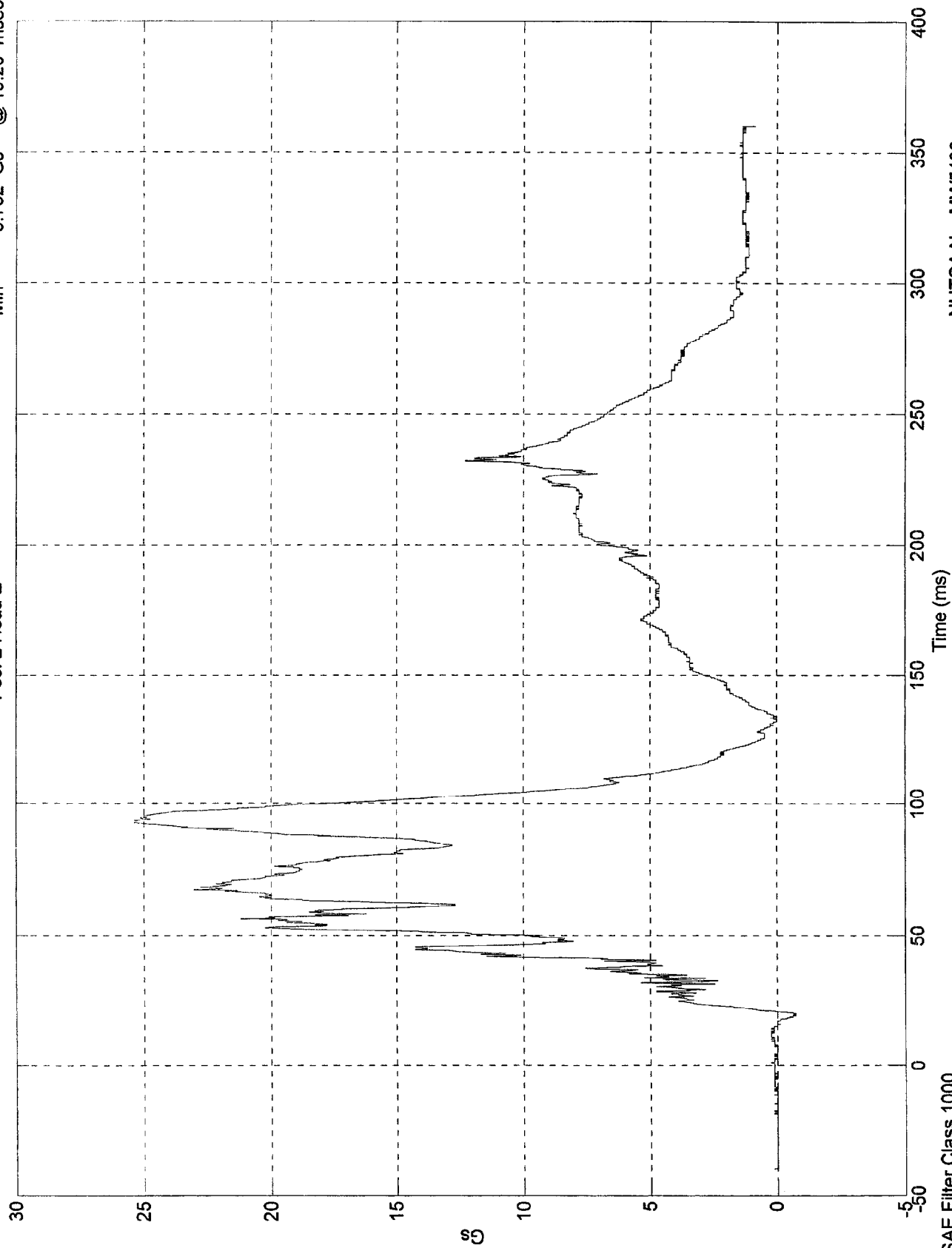
SAE Filter Class 1000

NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 25.4 Gs @ 92.60 msec
 Min = -0.732 Gs @ 19.20 msec

Pos. 2 Head Z

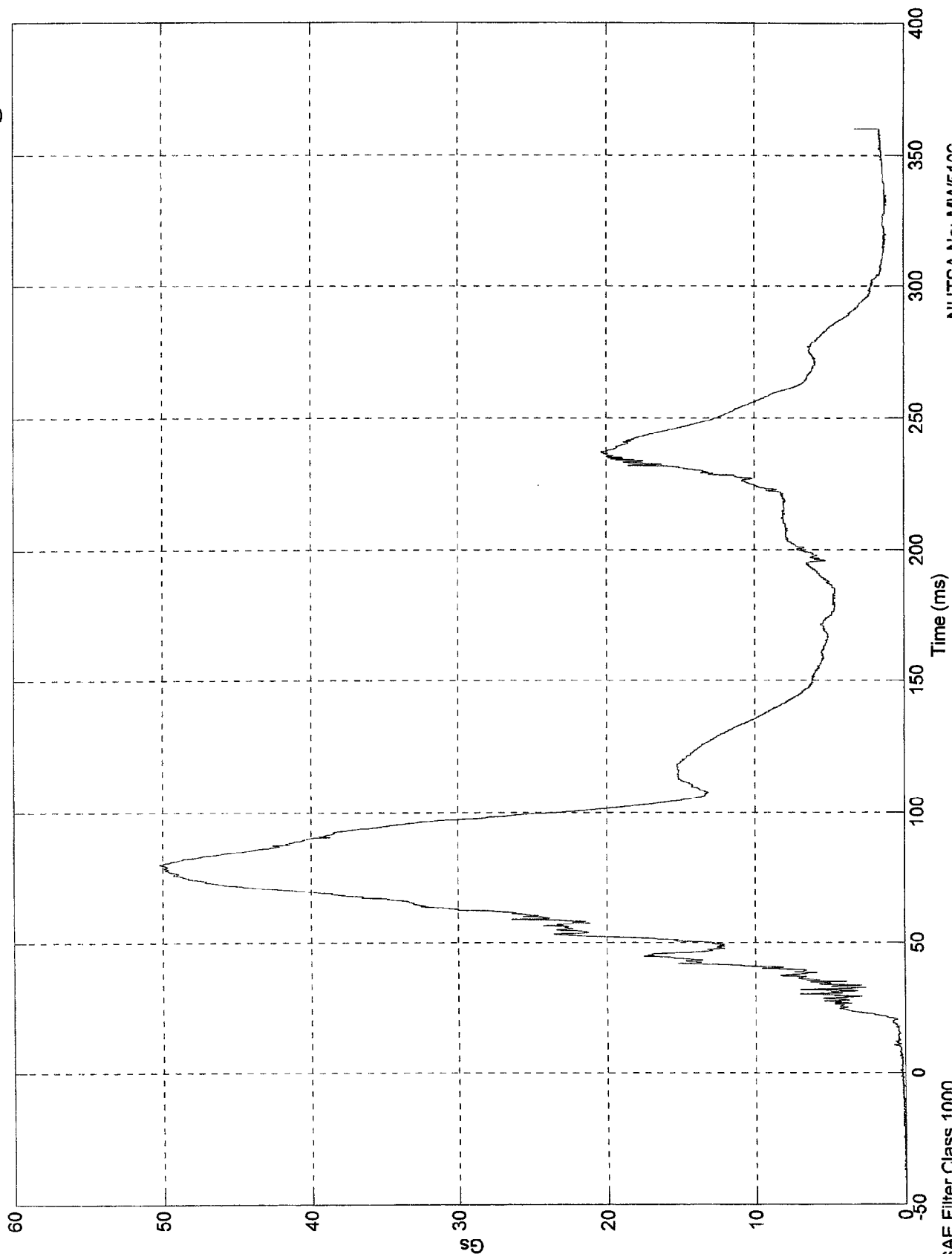


NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Pos. 2 Head Resultant

Max = 50.2 Gs @ 80.30 msec
Min = 0.0348 Gs @ -39.80 msec

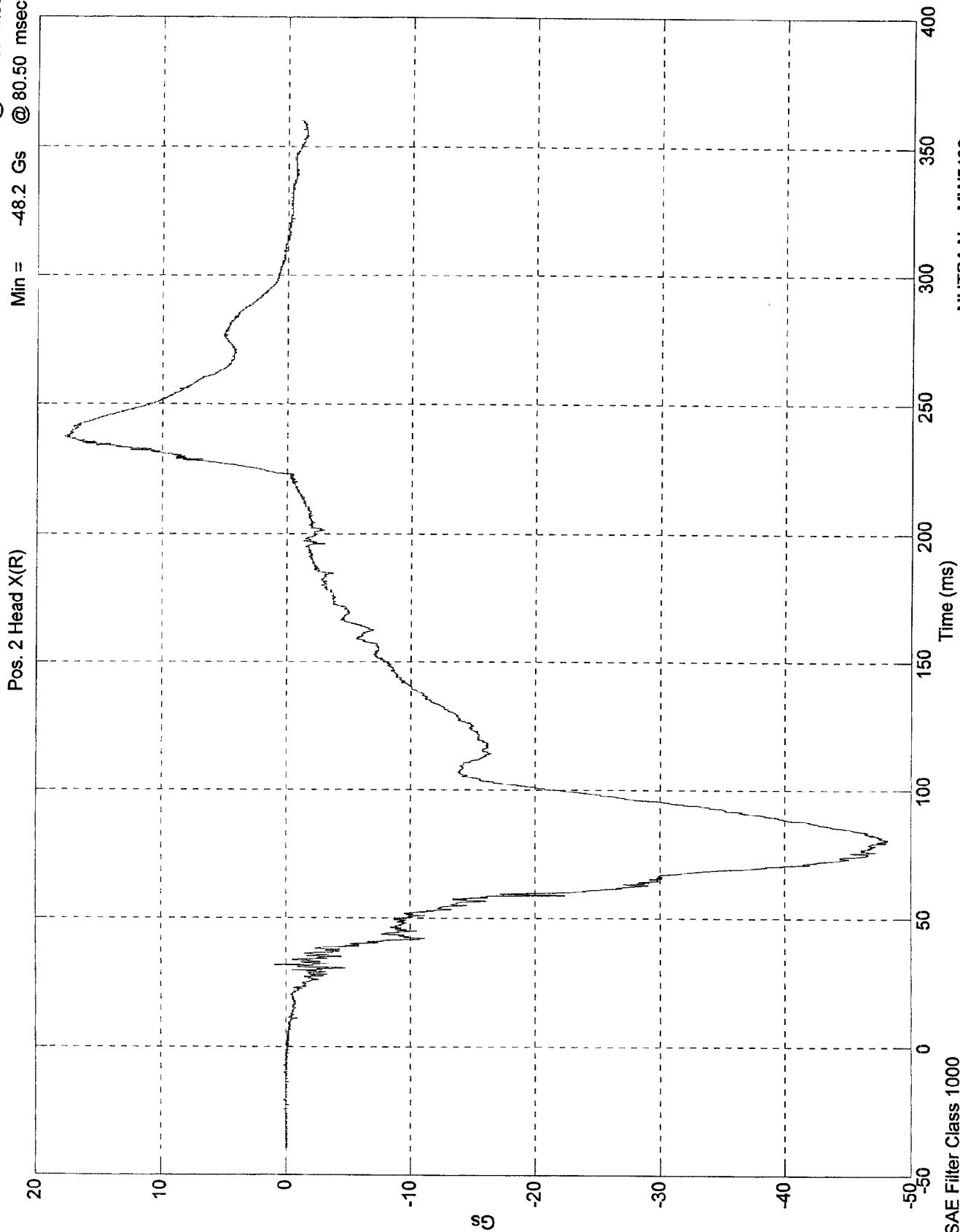


NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 1000

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 17.8 Gs @ 237.20 msec
Min = -48.2 Gs @ 80.50 msec

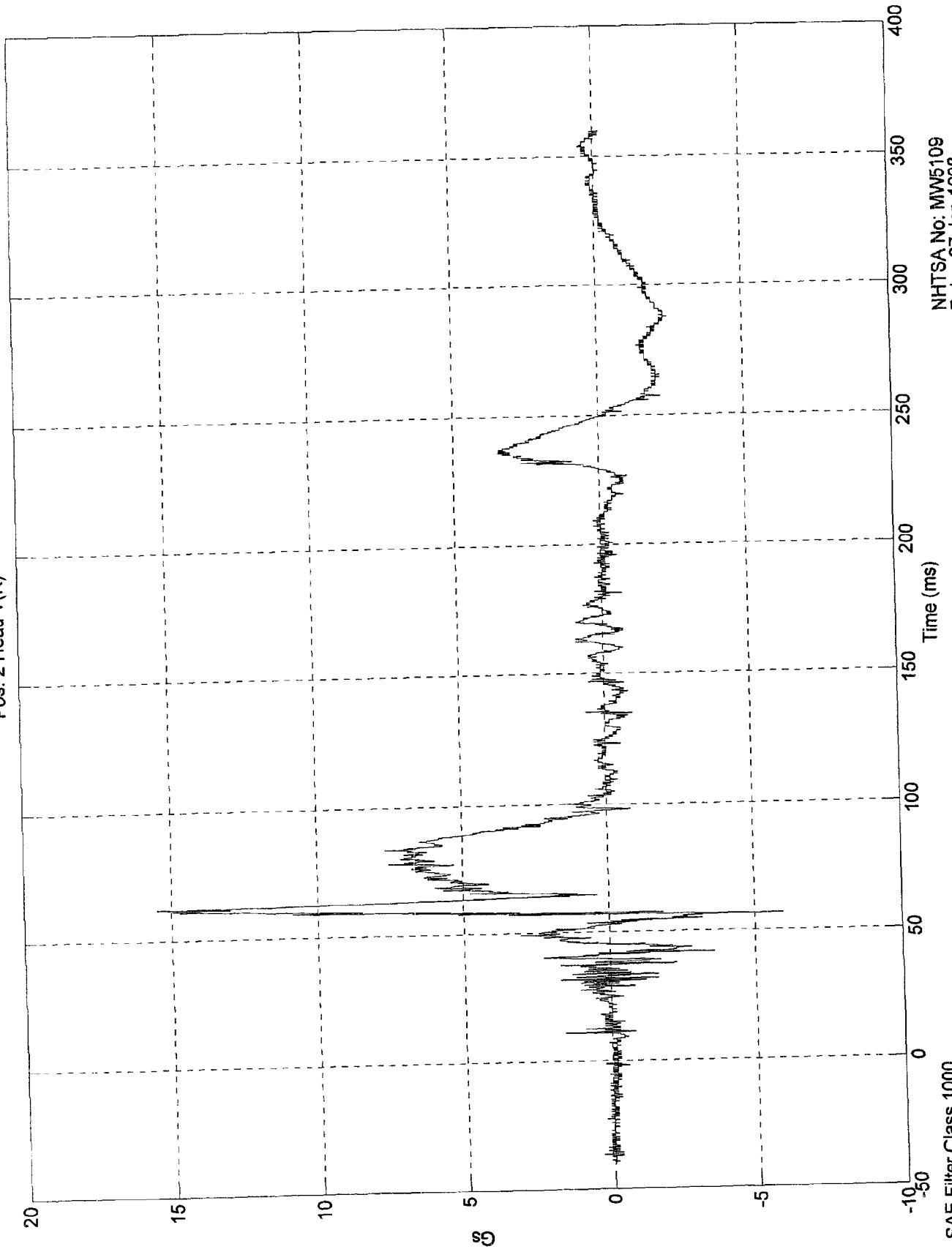


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 15.5 Gs @ 61.90 msec
Min = -5.99 Gs @ 56.50 msec

Pos. 2 Head Y(R)



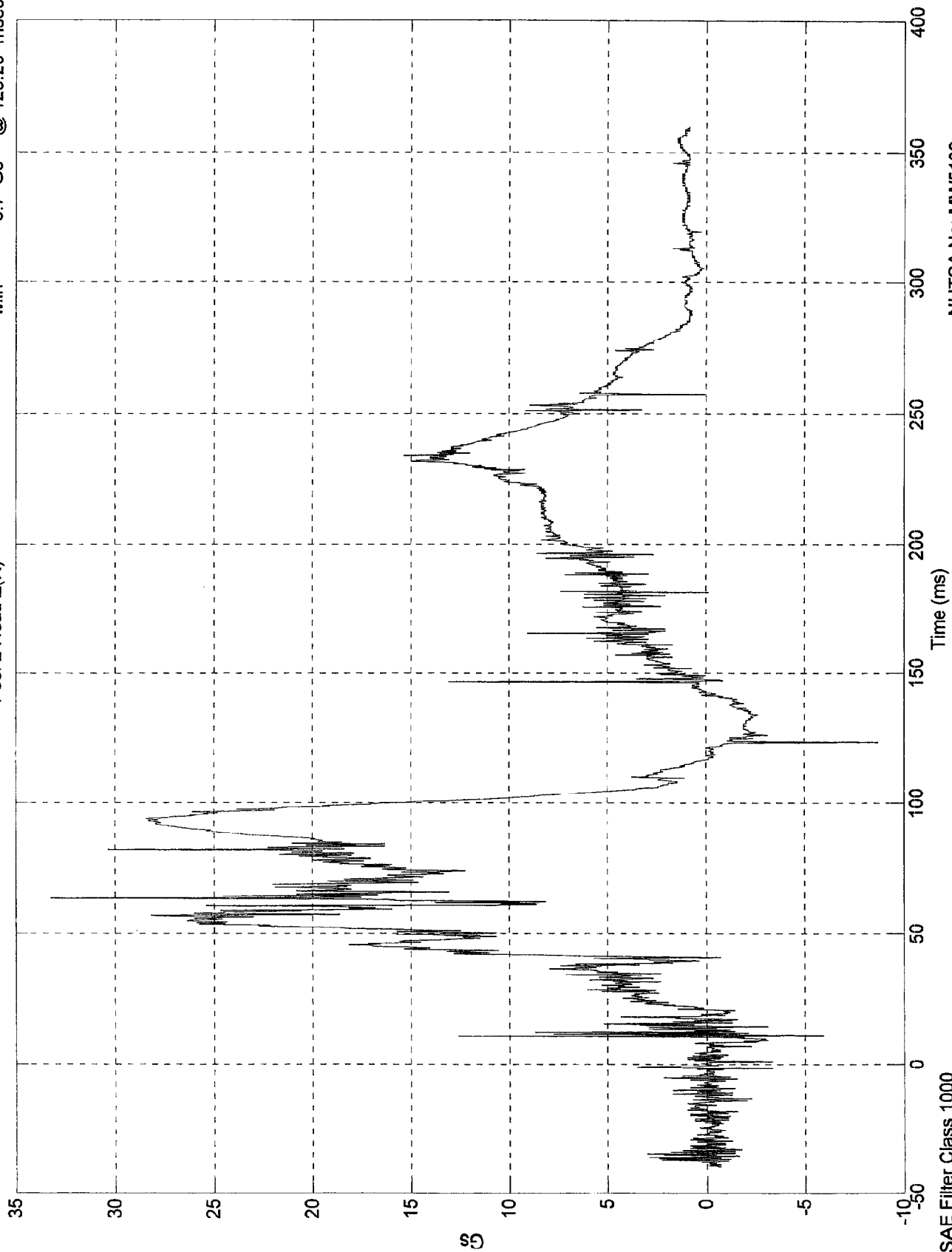
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 1000

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 33.3 Gs @ 63.40 msec
Min = -8.7 Gs @ 123.20 msec

Pos. 2 Head Z(R)

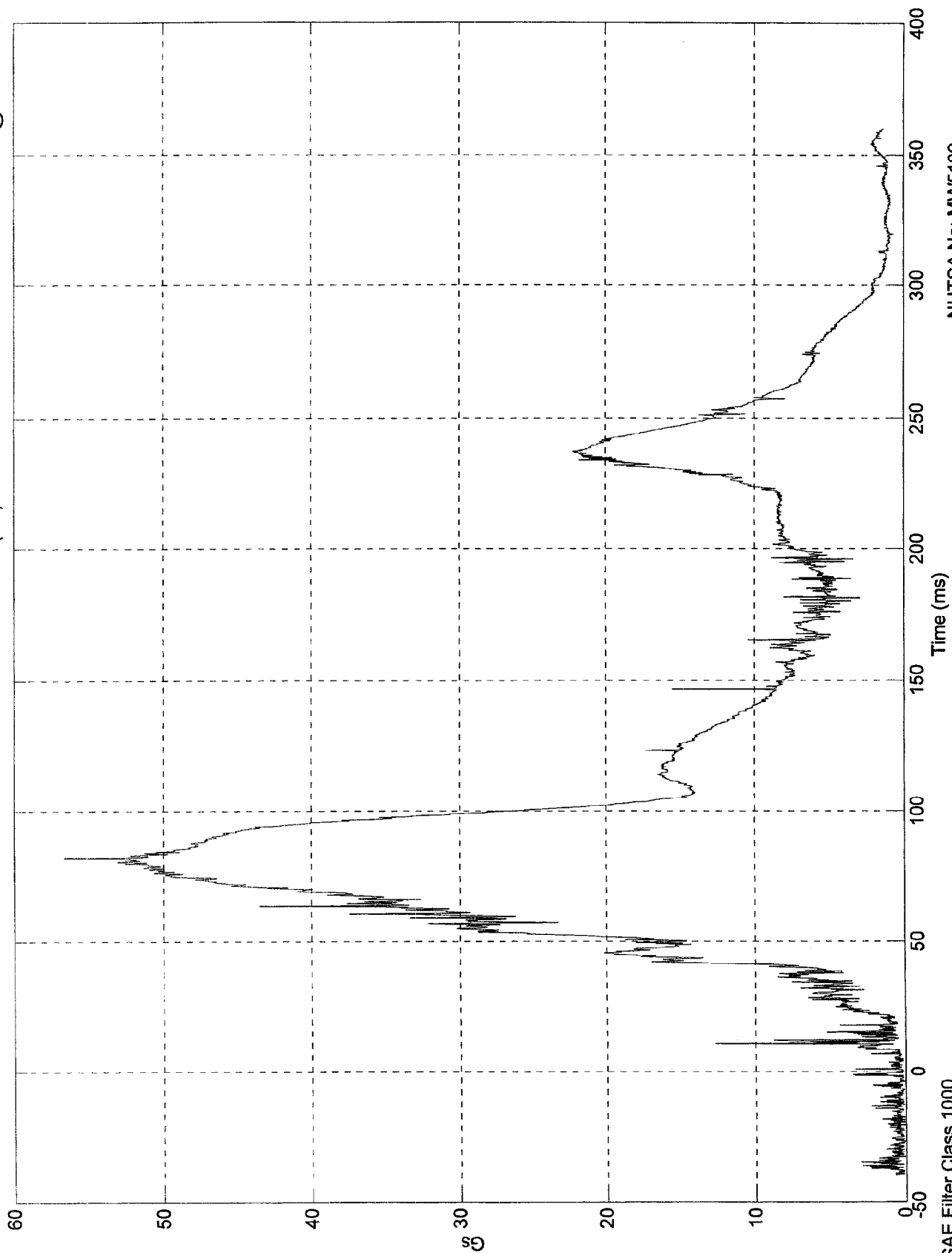


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 56.6 Gs @ 82.00 msec
 Min = 0.072 Gs @ -32.50 msec

Pos. 2 Head Resultant(RR)

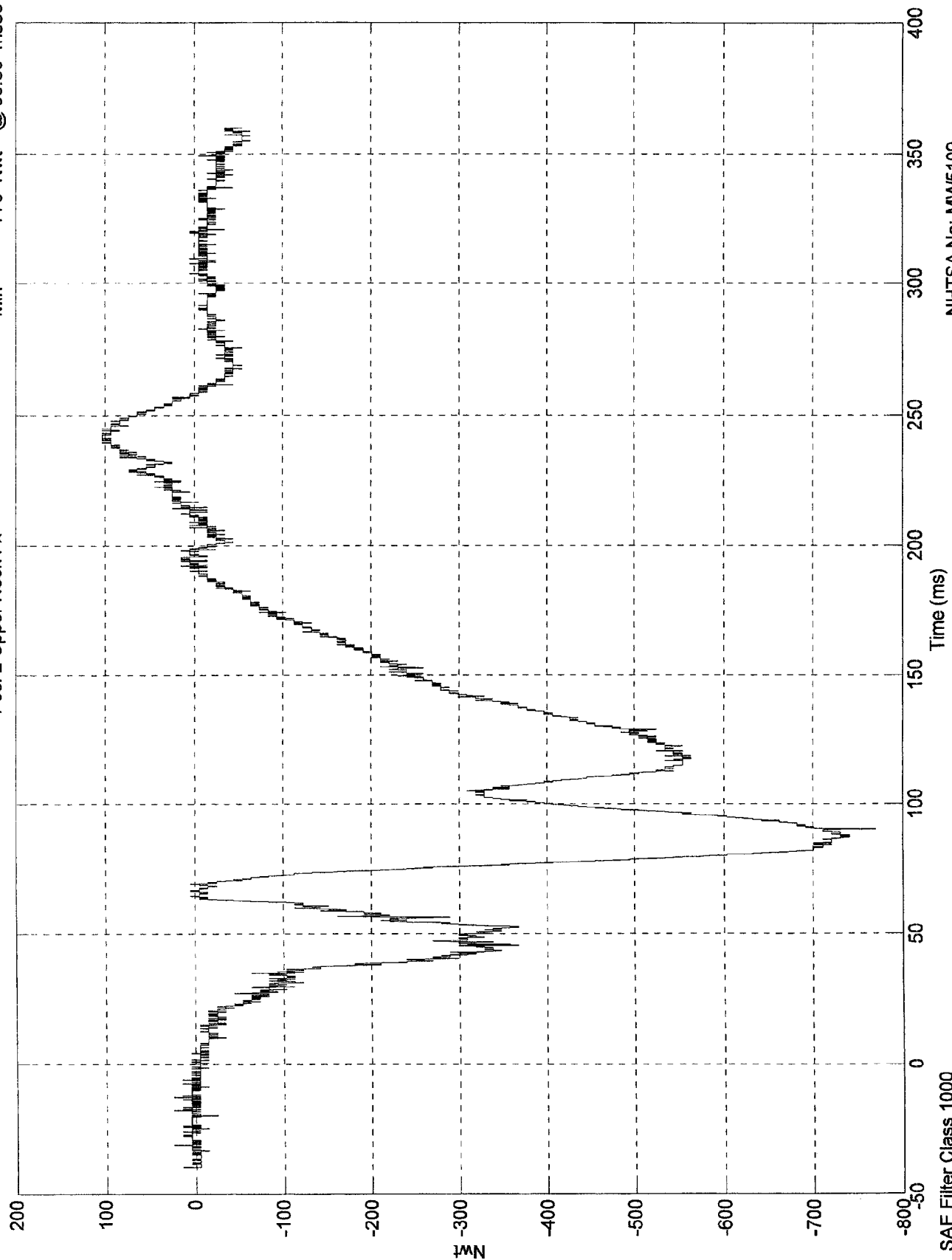


NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 103 Nwt @ 239.20 msec
 Min = -770 Nwt @ 90.30 msec

Pos. 2 Upper Neck Fx

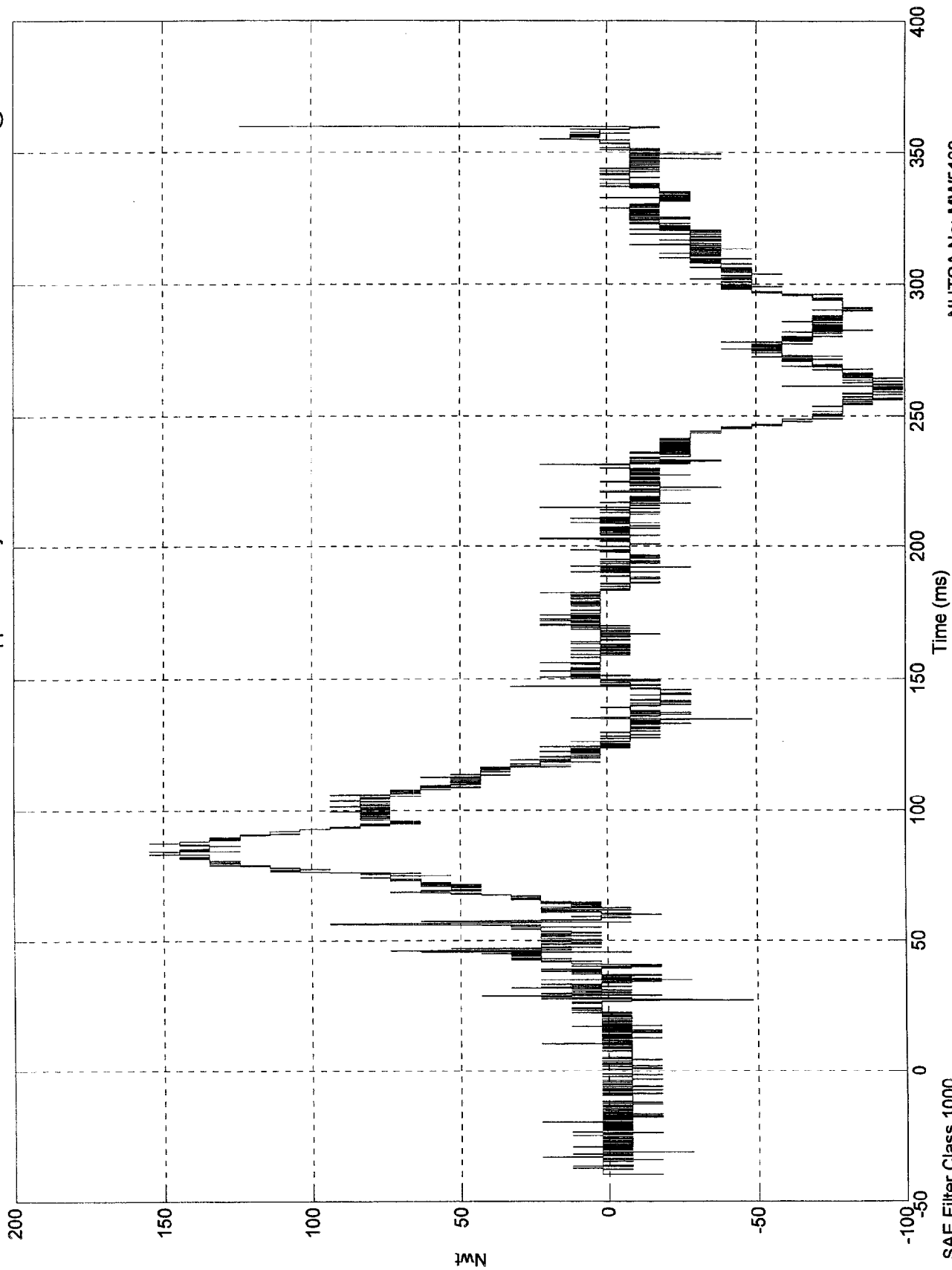


NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Pos. 2 Upper Neck Fy

Max = 155 Nwt @ 83.20 msec
Min = -99.3 Nwt @ 256.20 msec

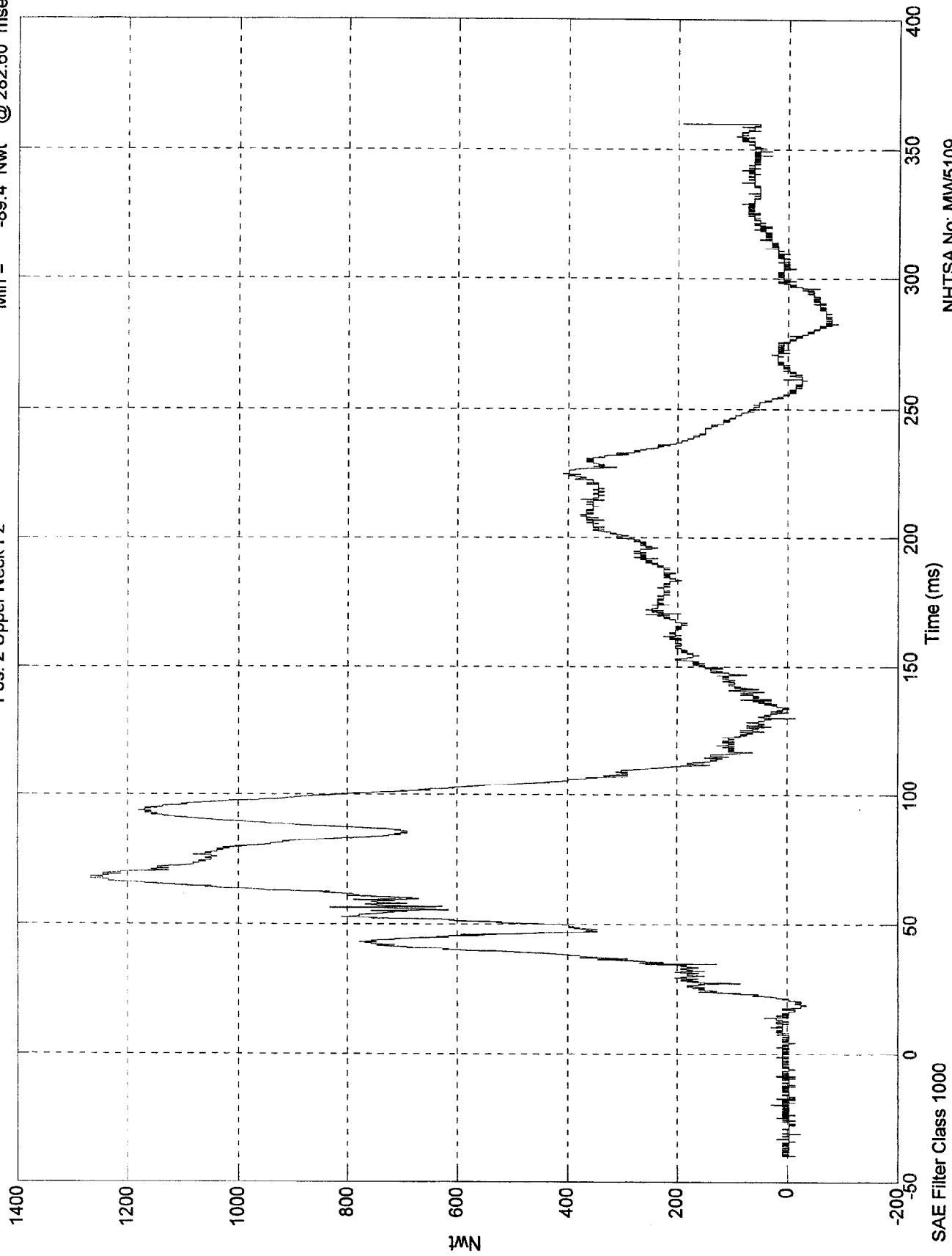


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 1.27e+003 Nwt @ 67.40 msec
Min = -89.4 Nwt @ 282.60 msec

Pos. 2 Upper Neck Fz

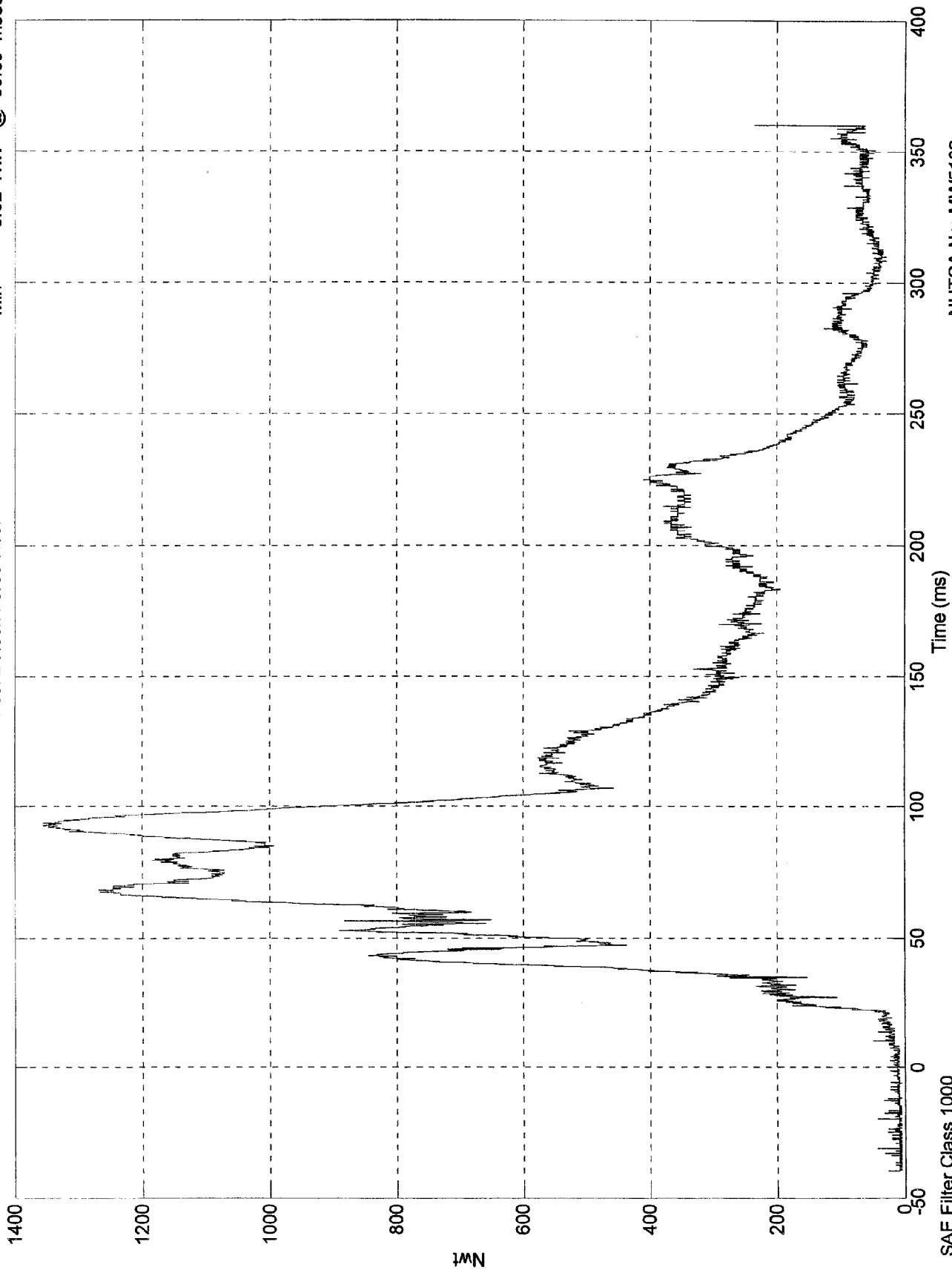


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 1.36e+003 Nwt @ 92.80 msec
Min = 5.92 Nwt @ -39.50 msec

Pos. 2 Neck Force Res.

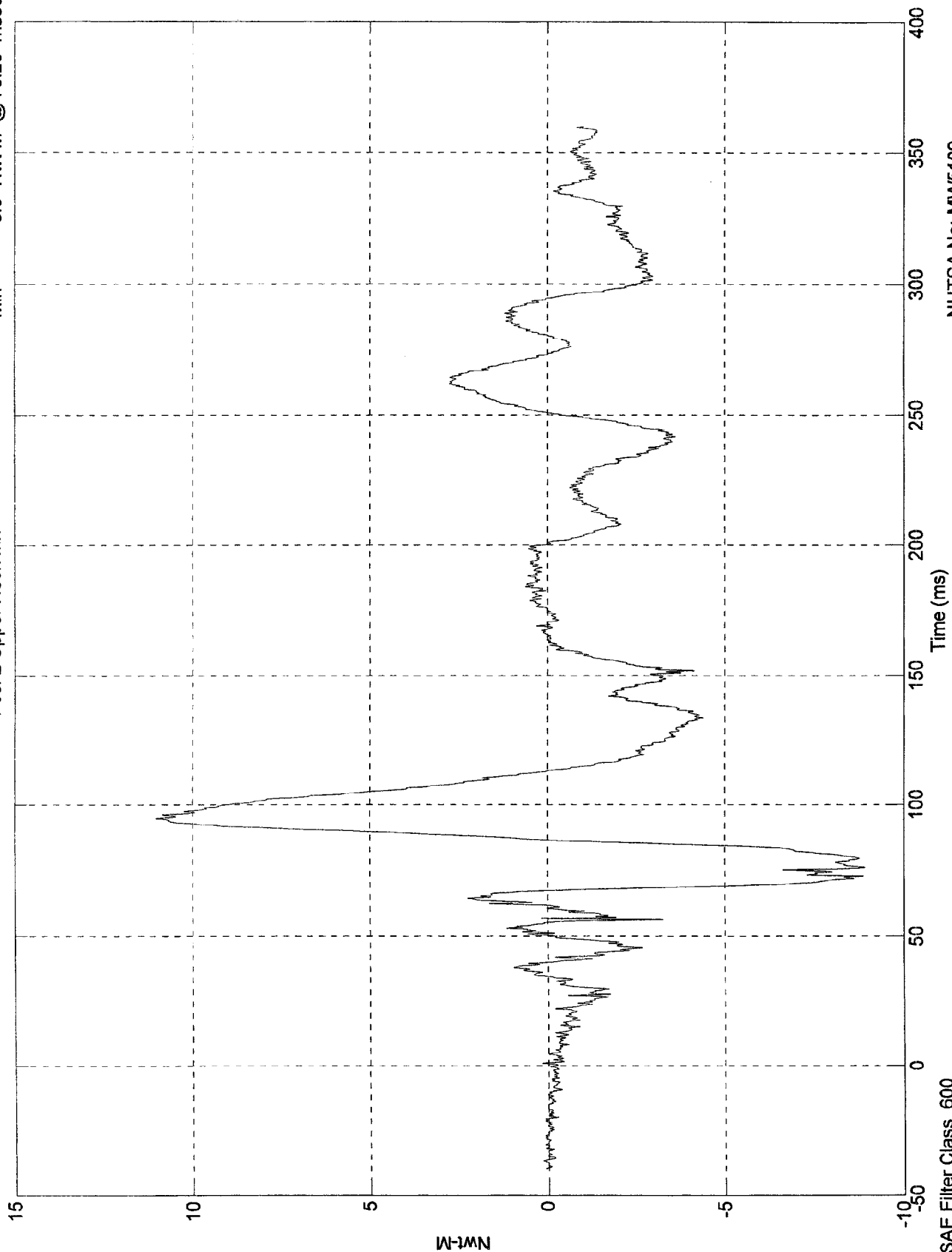


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 11 Nwt-M @ 94.70 msec
Min = -8.9 Nwt-M @ 76.20 msec

Pos. 2 Upper Neck Mx



NHTSA No: MW5109
Date: 27 Jan 1998

Nwt-M

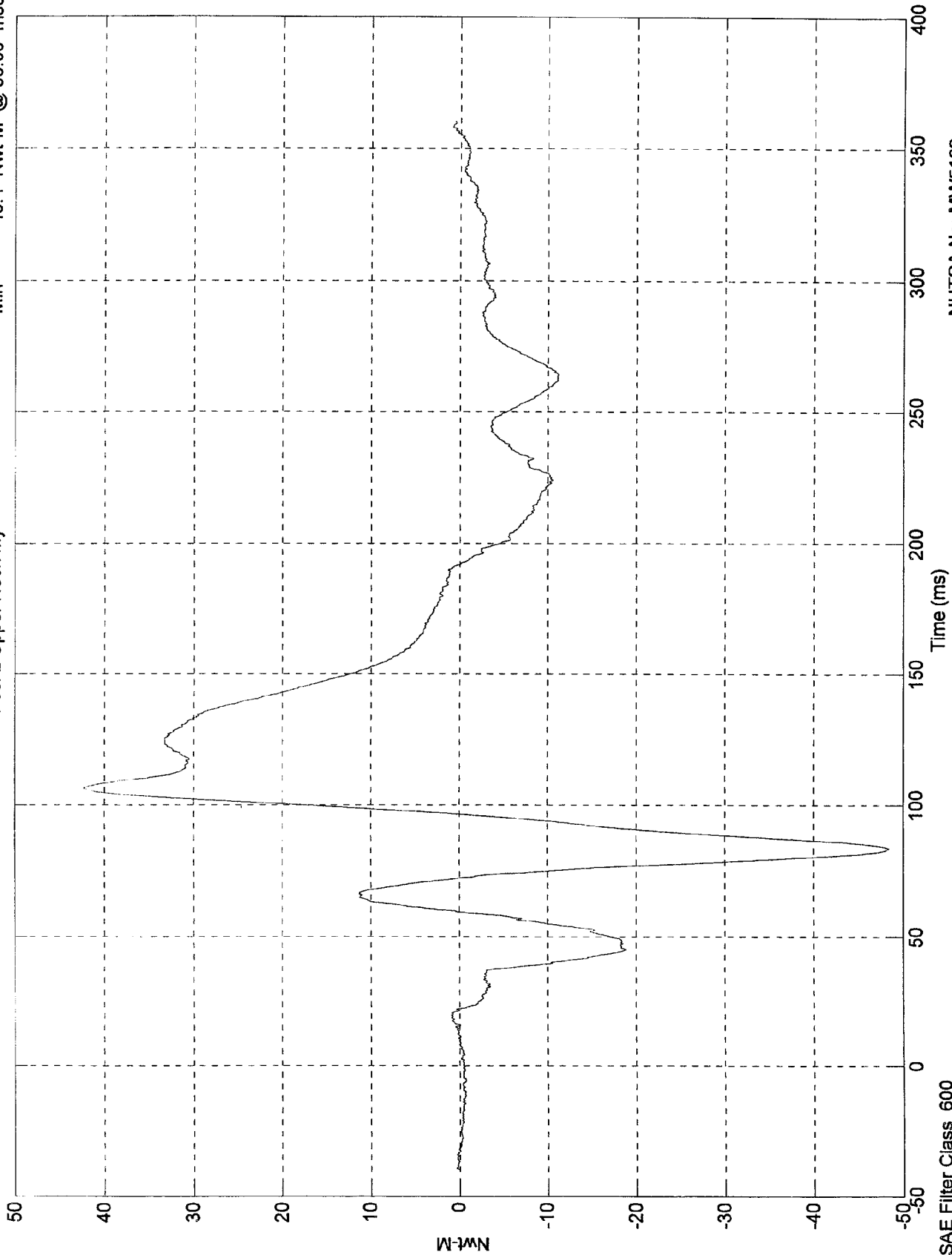
B-66

8413-18

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 42.3 Nwt-M @ 106.10 msec
Min = -48.4 Nwt-M @ 83.80 msec

Pos. 2 Upper Neck My



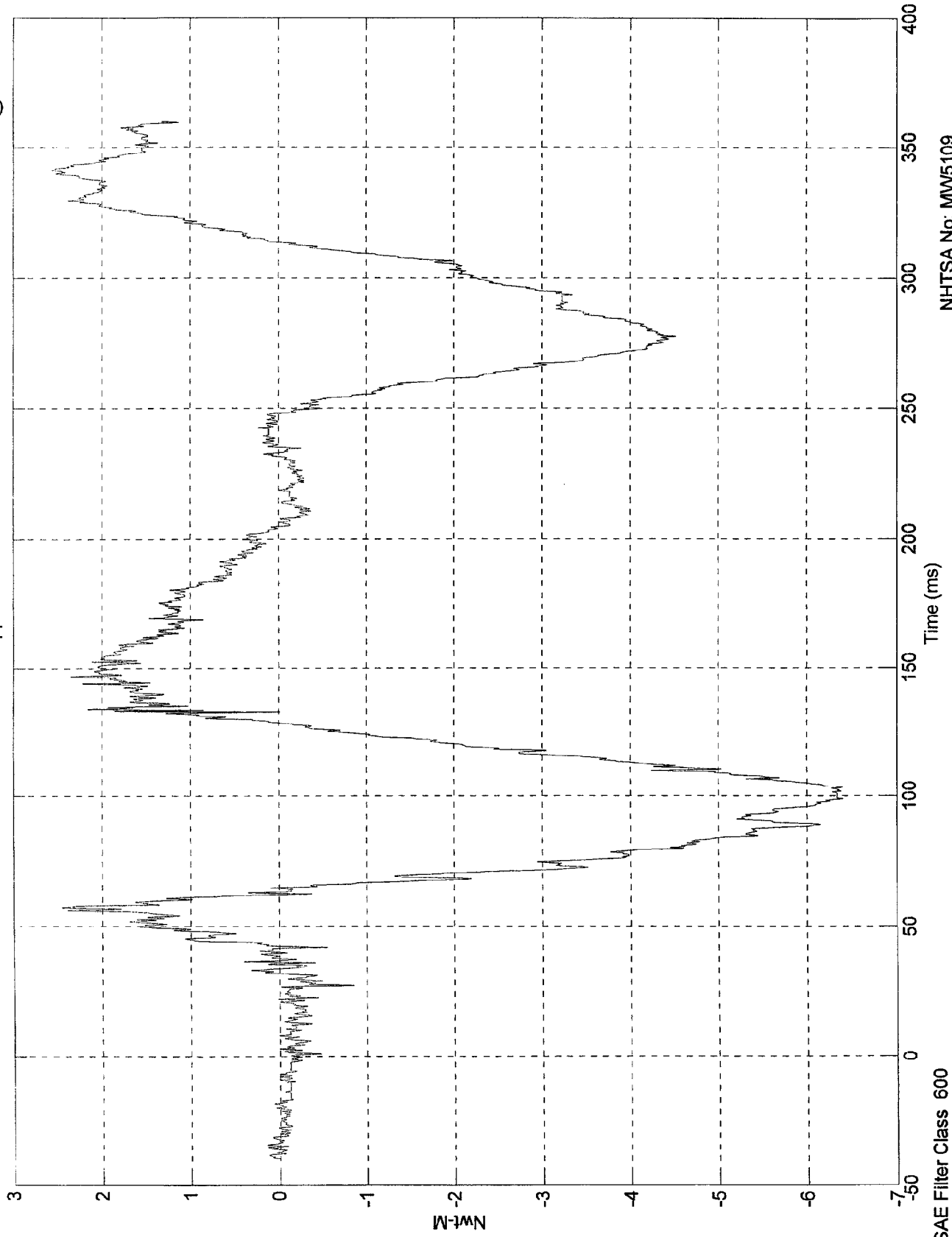
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.56 Nwt-M @ 341.00 msec
Min = -6.4 Nwt-M @ 98.80 msec

Pos. 2 Upper Neck Mz



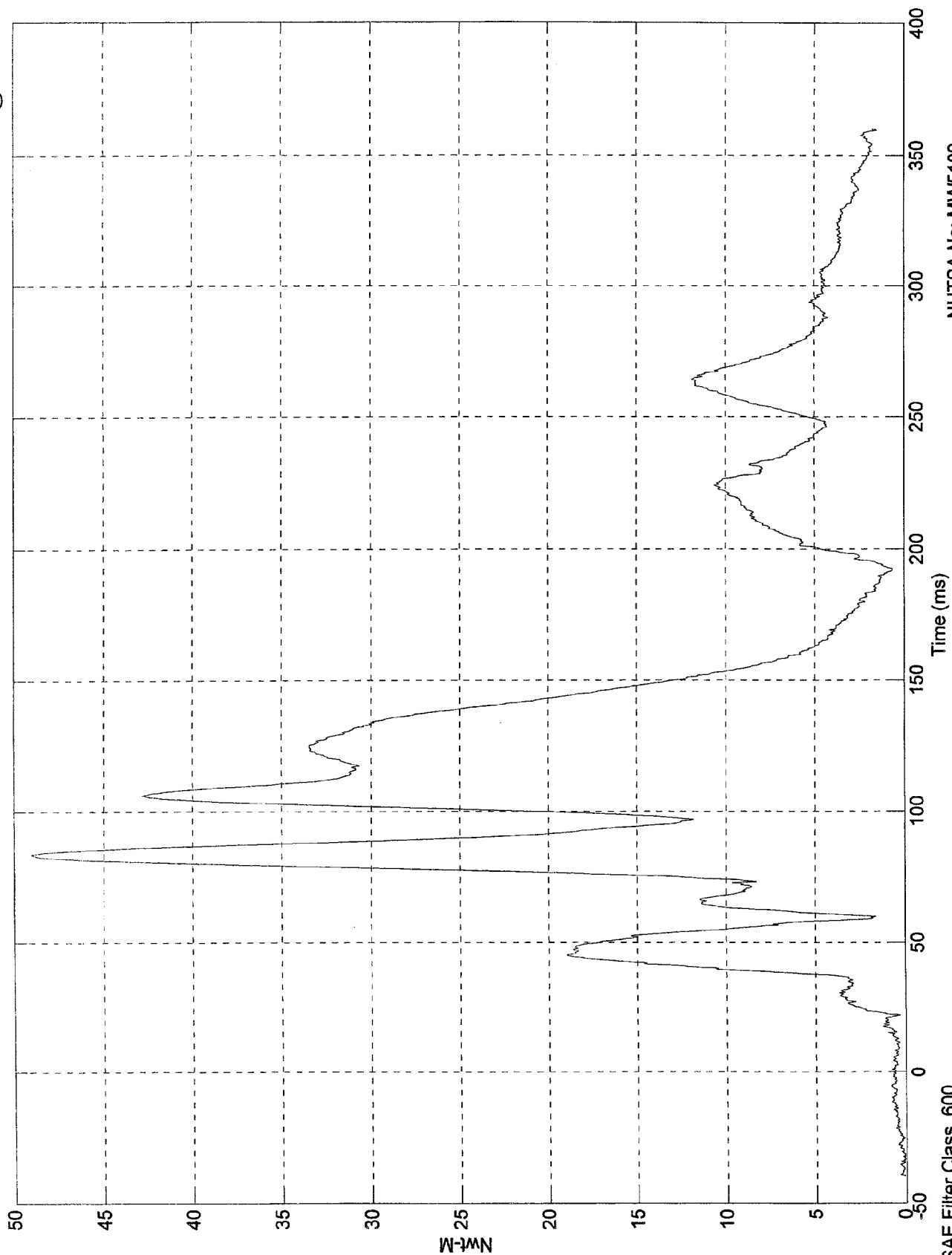
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 49 Nwt-M @ 83.70 msec
Min = 0.0272 Nwt-M @ -33.10 msec

Pos. 2 Neck Moment Res.



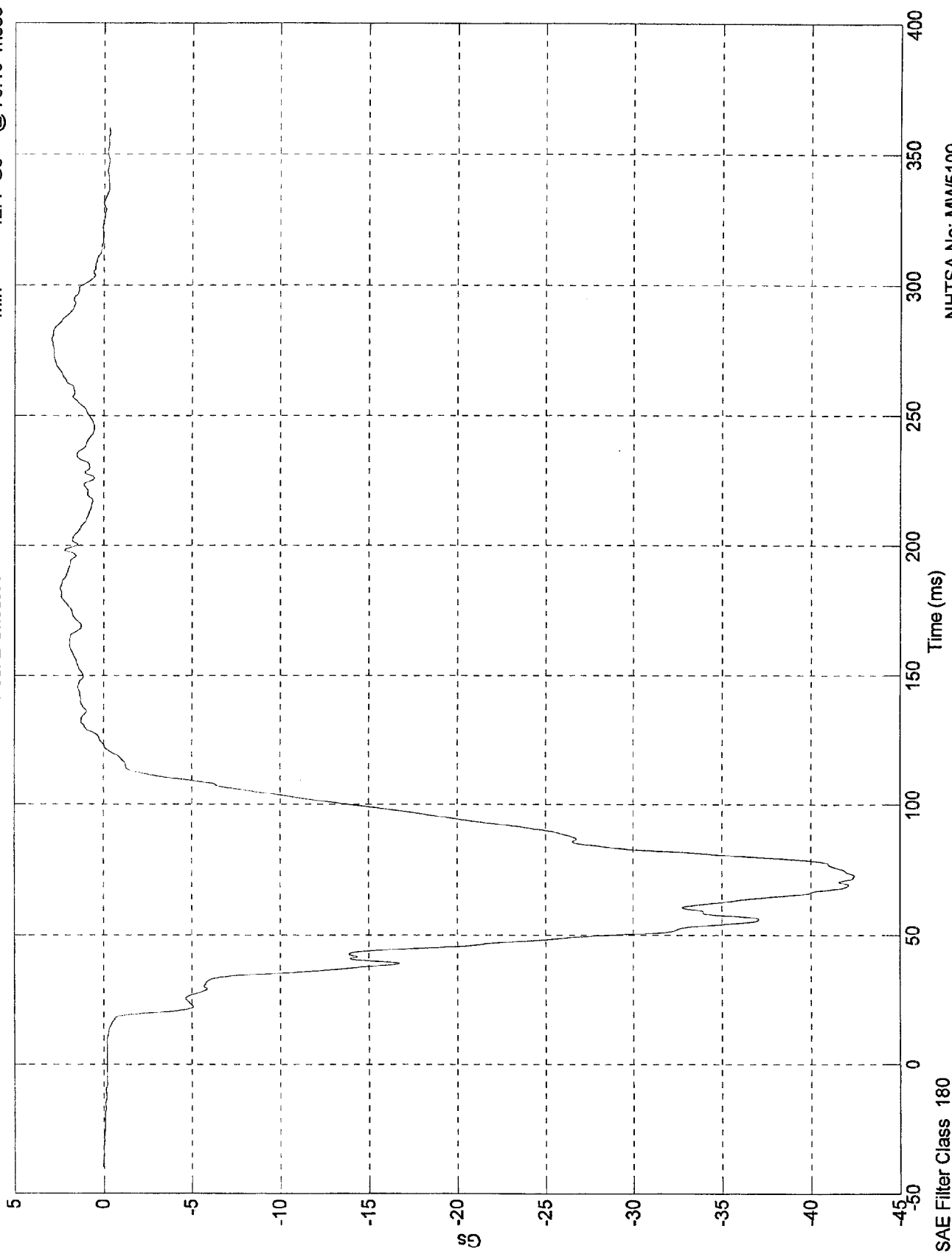
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.91 Gs @ 279.30 msec
Min = -42.4 Gs @ 73.10 msec

Pos. 2 Chest X

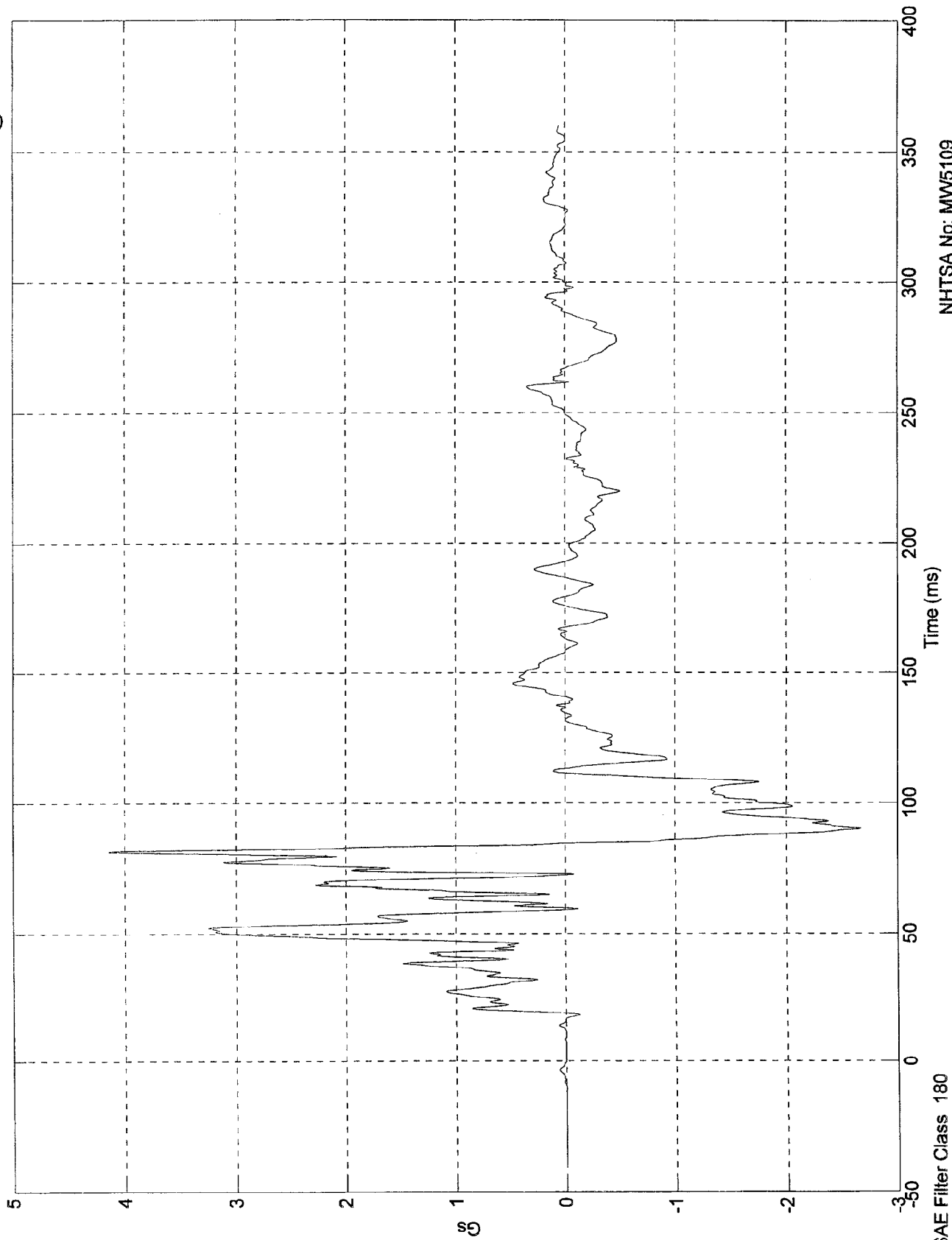


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Pos. 2 Chest Y

Max = 4.14 Gs @ 81.70 msec
Min = -2.67 Gs @ 90.20 msec



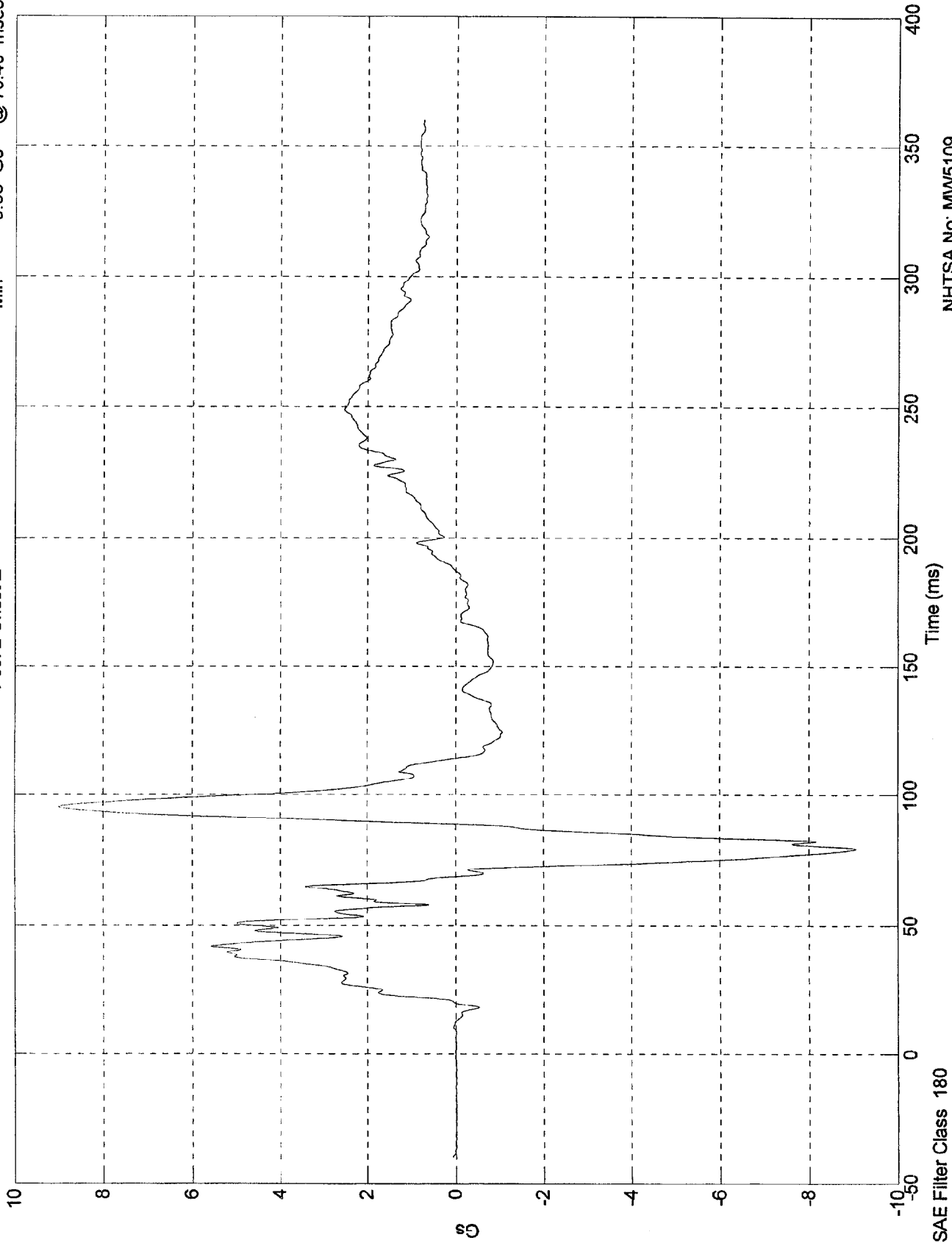
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 9 Gs @ 95.20 msec
Min = -9.05 Gs @ 79.40 msec

Pos. 2 Chest Z

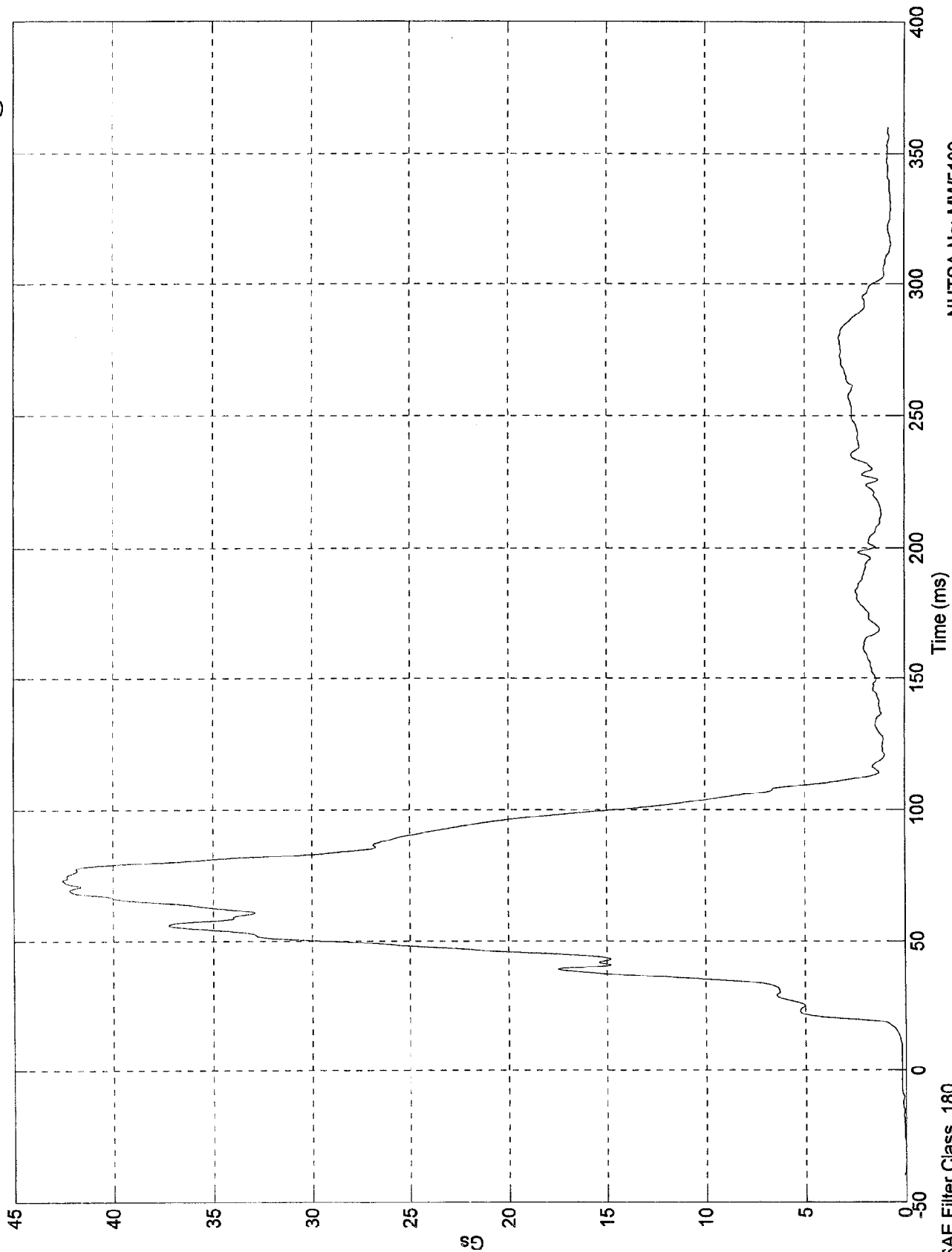


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 42.5 Gs @ 73.20 msec
Min = 0.00176 Gs @ -34.10 msec

Pos. 2 Chest Resultant



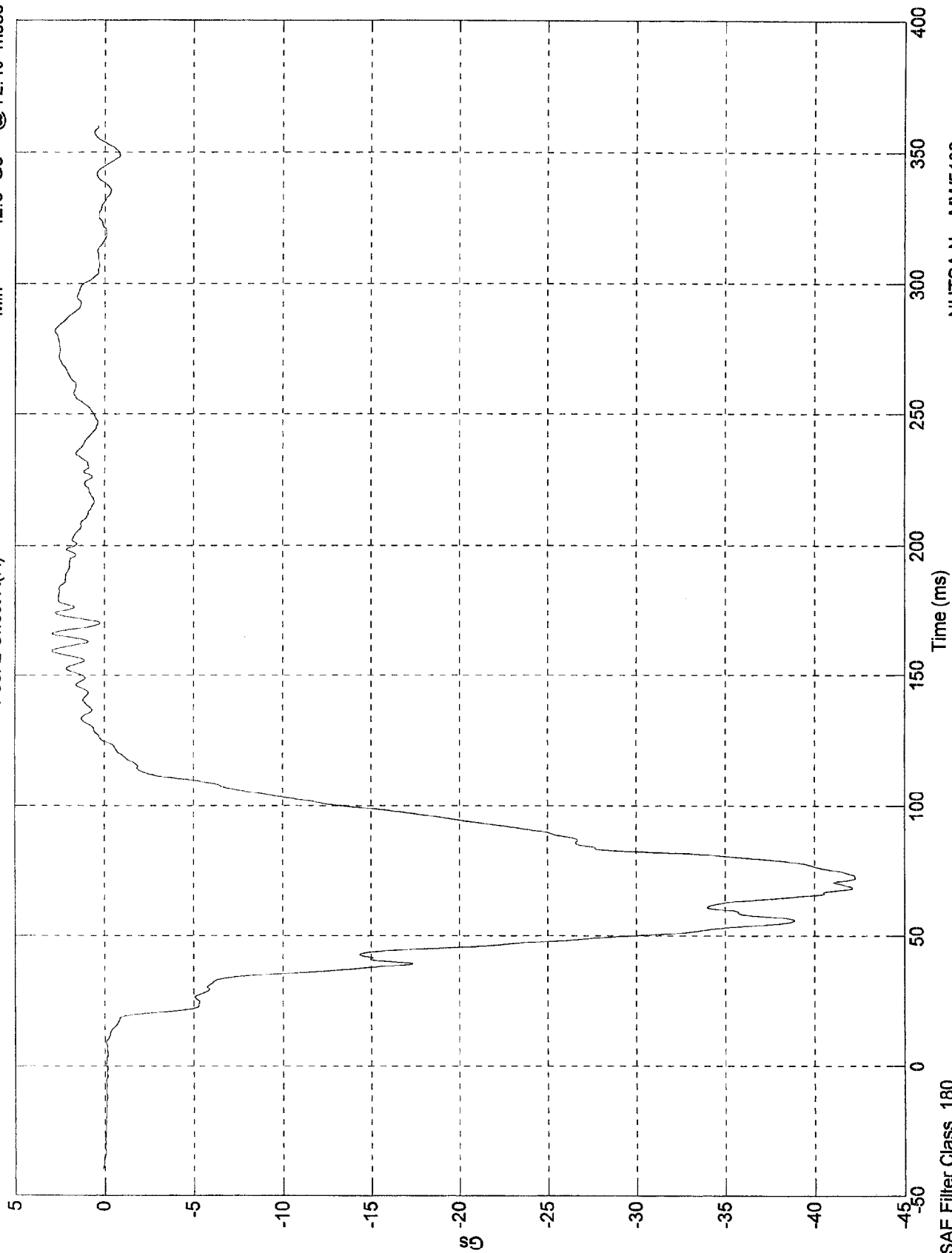
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.94 Gs @ 159.20 msec
Min = -42.3 Gs @ 72.40 msec

Pos. 2 Chest X(R)



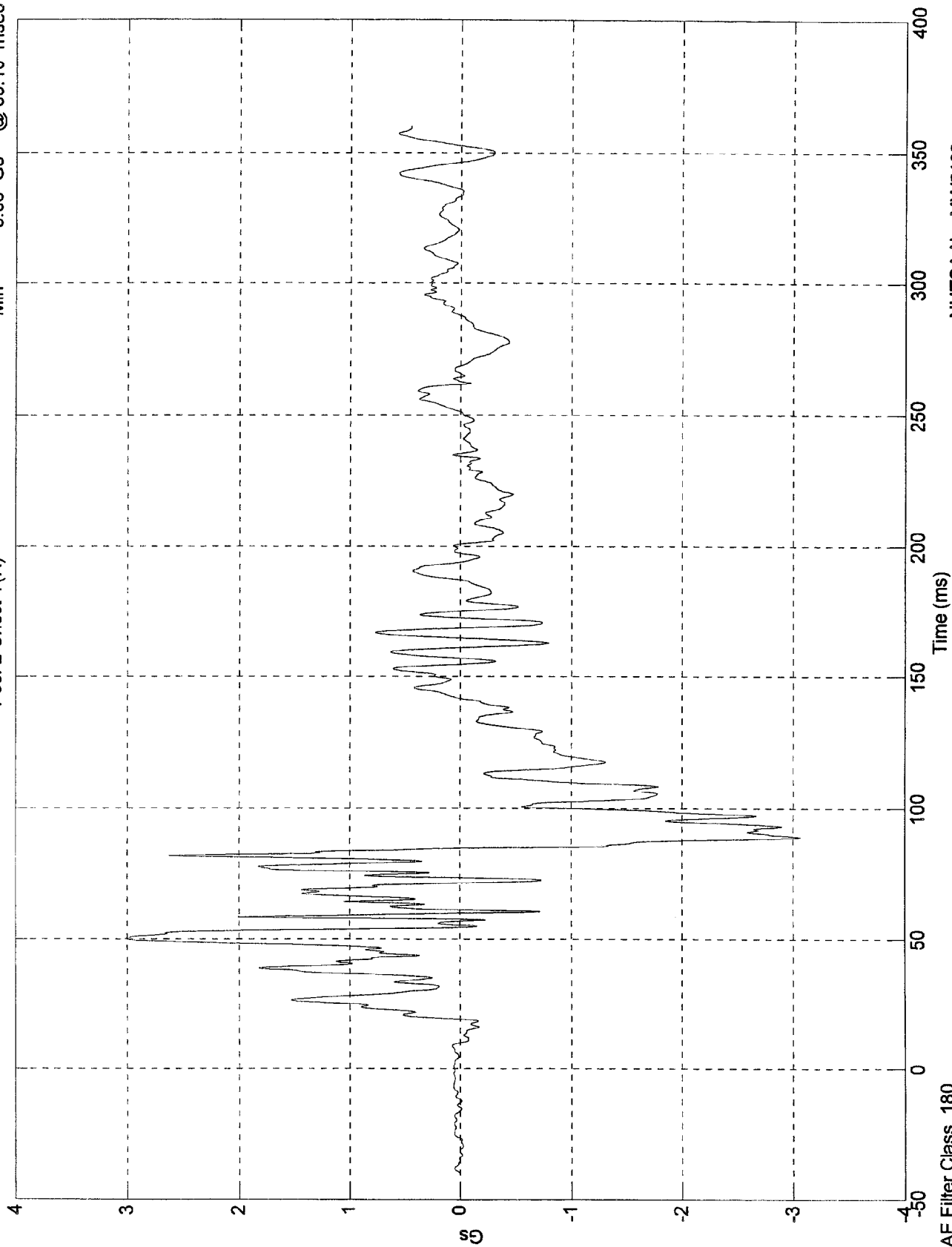
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 3.02 Gs @ 50.00 msec
Min = -3.06 Gs @ 89.10 msec

Pos. 2 Chest Y(R)



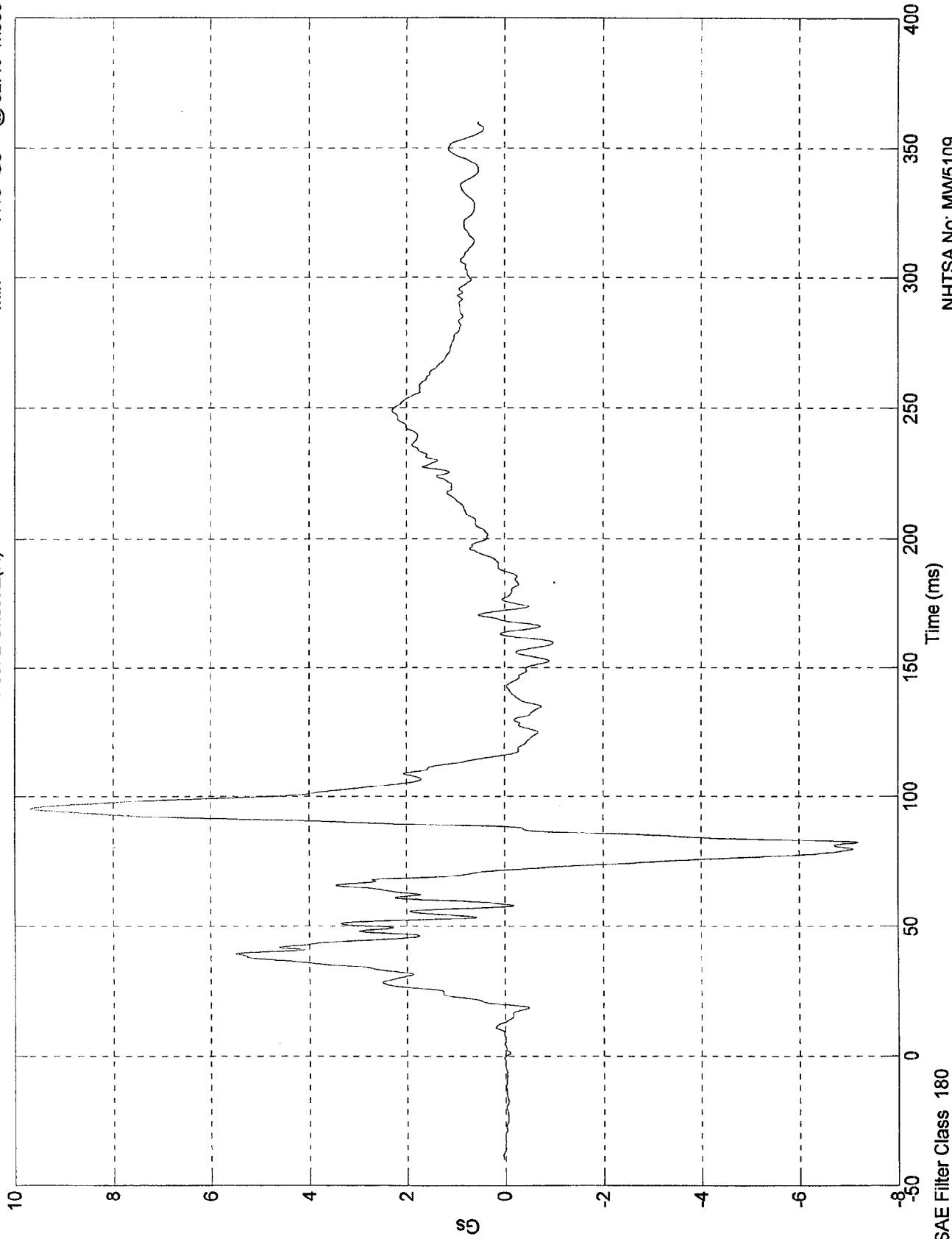
SAE Filter Class 180

NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 9.68 Gs @ 95.30 msec
Min = -7.19 Gs @ 82.40 msec

Pos. 2 Chest Z(R)

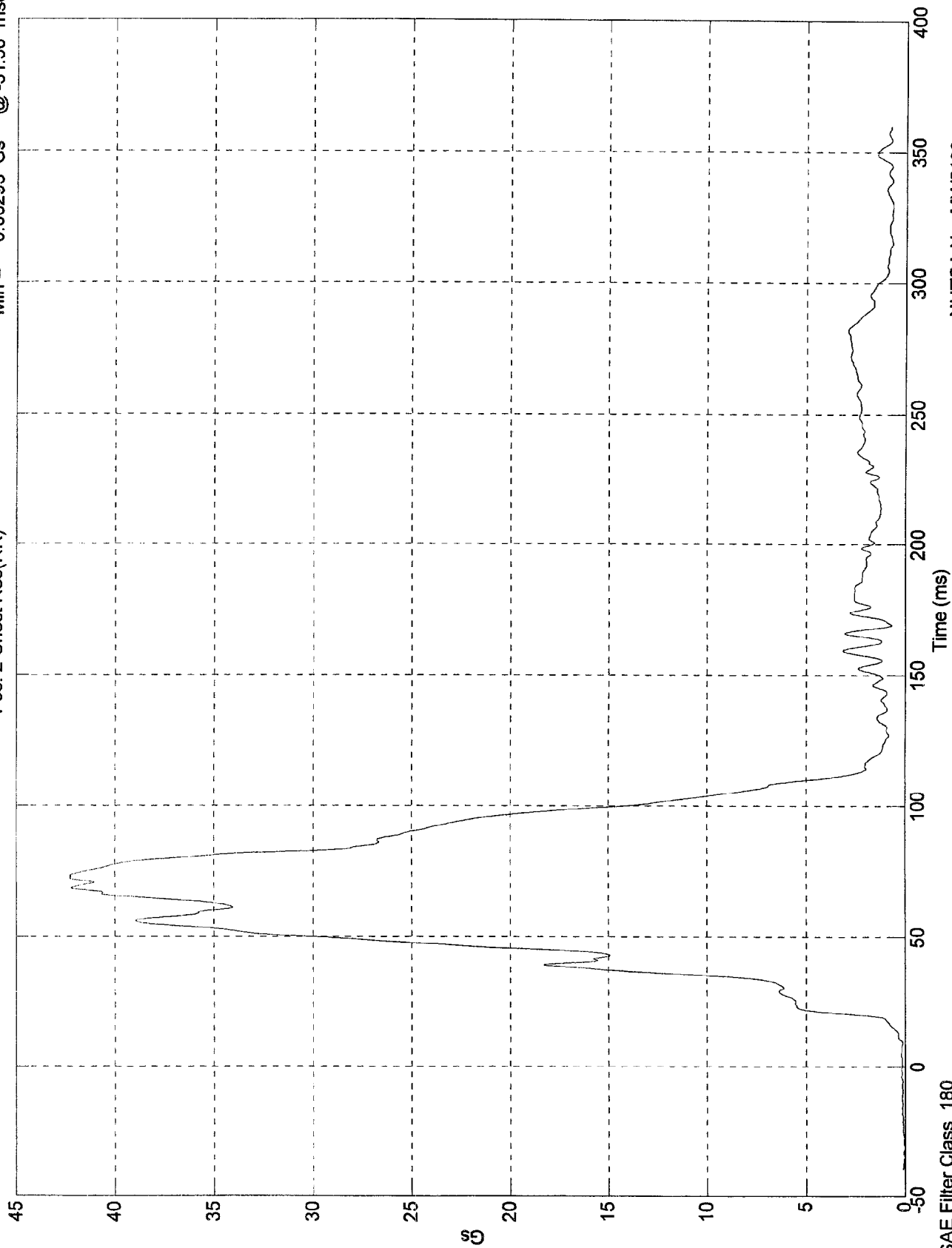


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 42.3 Gs @ 72.40 msec
Min = 0.00293 Gs @ -31.50 msec

Pos. 2 Chest Res(RR)



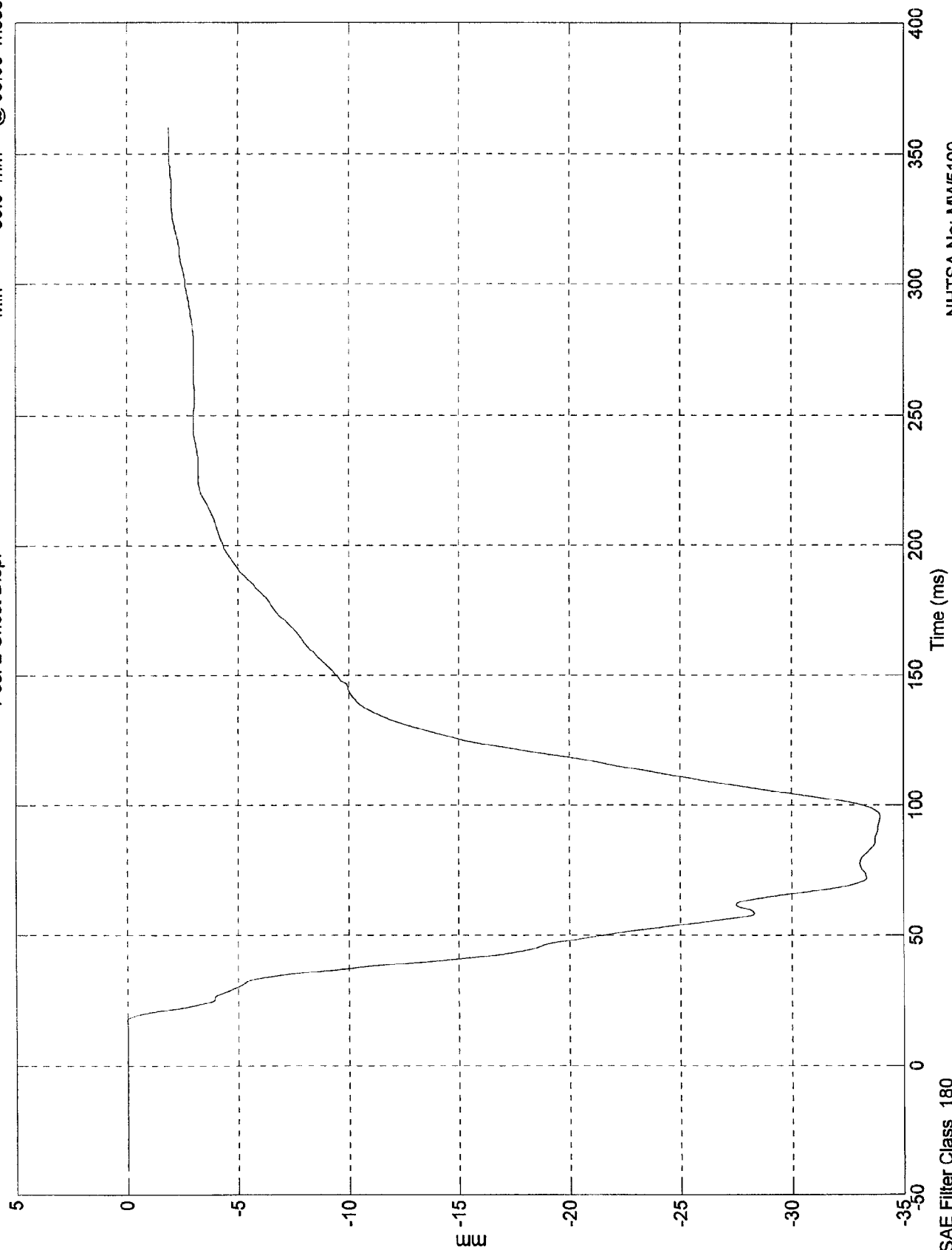
SAE Filter Class 180

NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 0.0149 mm @ 17.50 msec
Min = -33.9 mm @ 95.60 msec

Pos. 2 Chest Disp.

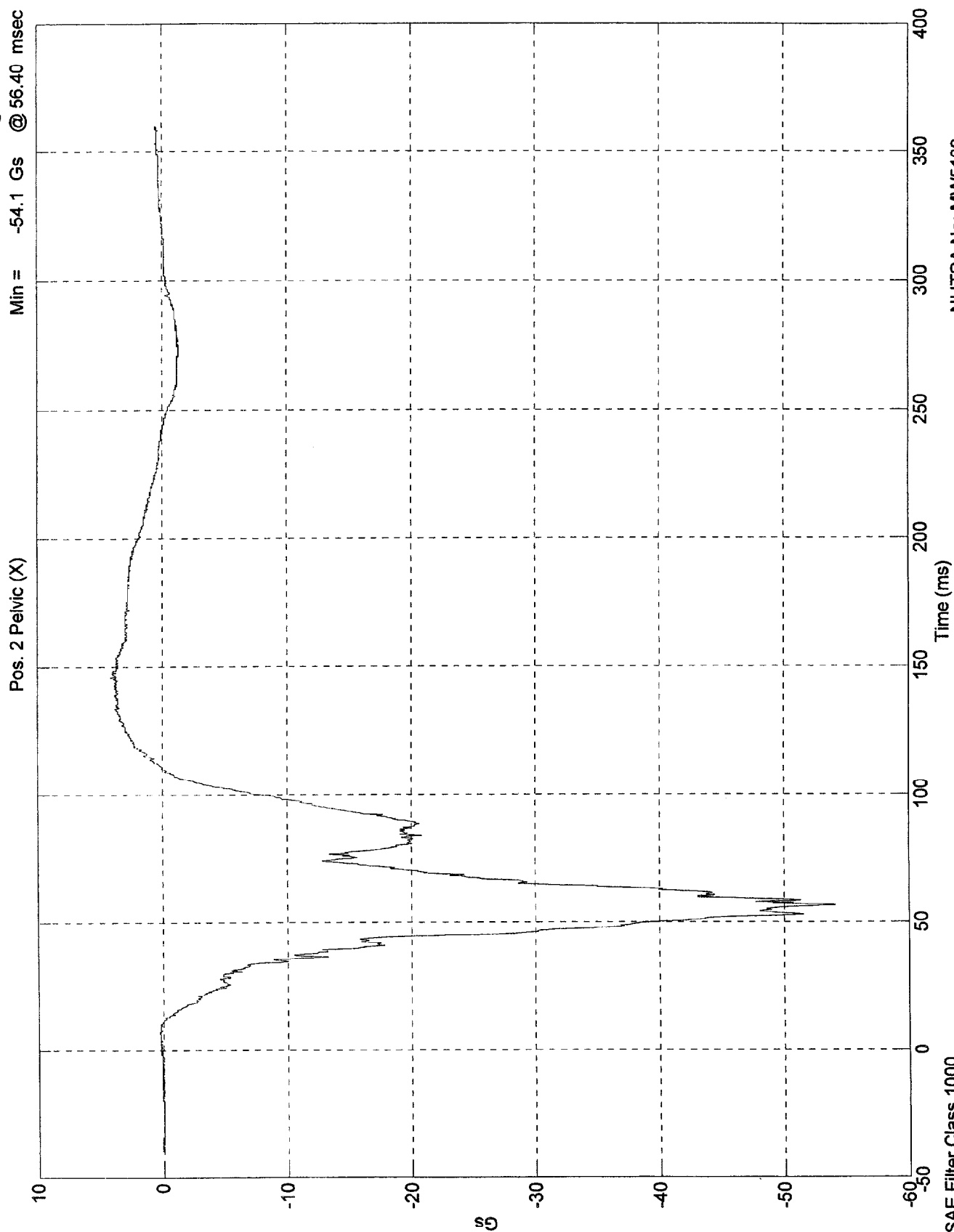


NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 4.16 Gs @ 145.80 msec
 Min = -54.1 Gs @ 56.40 msec

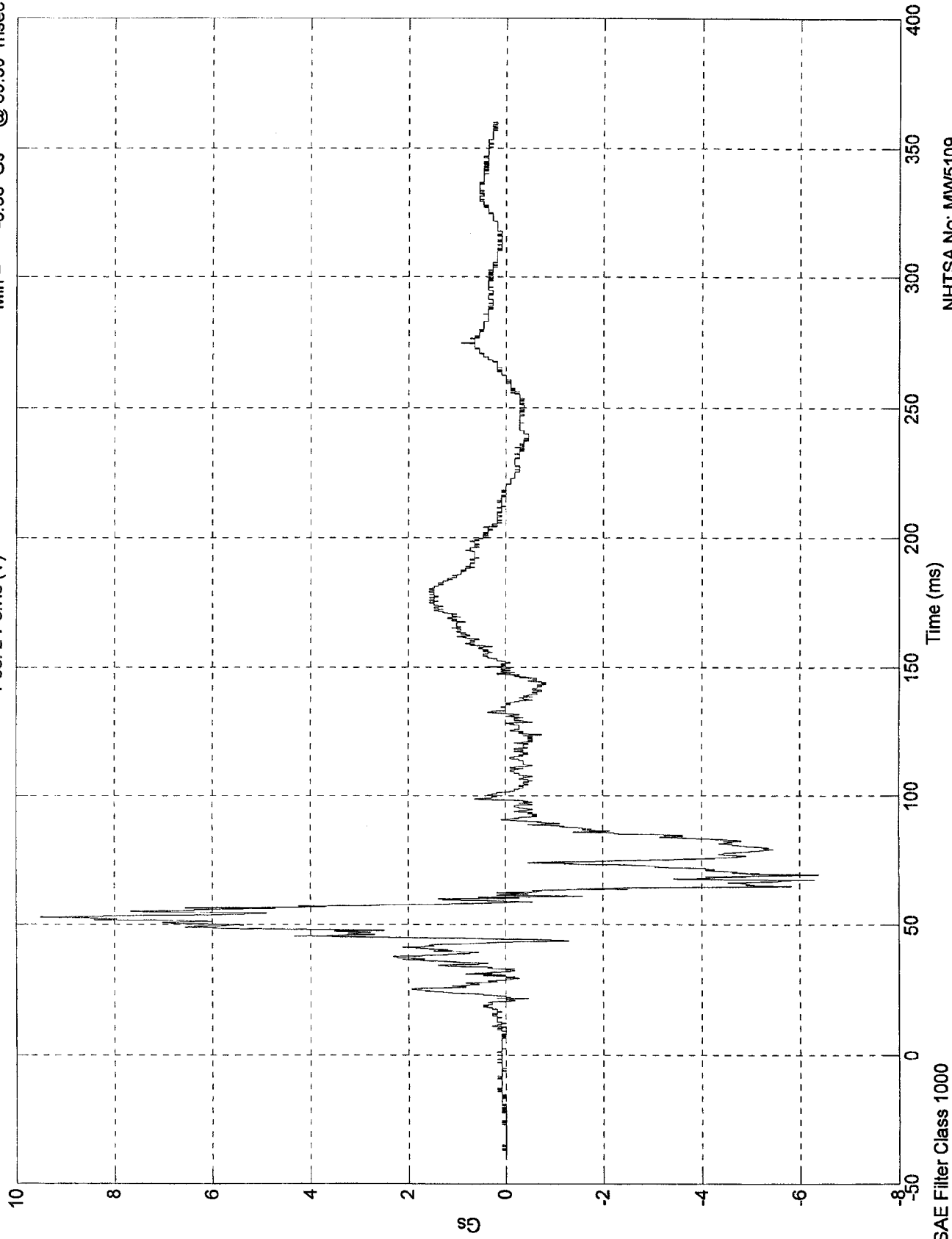


NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 9.52 Gs @ 52.70 msec
Min = -6.38 Gs @ 69.30 msec

Pos. 2 Pelvic (Y)

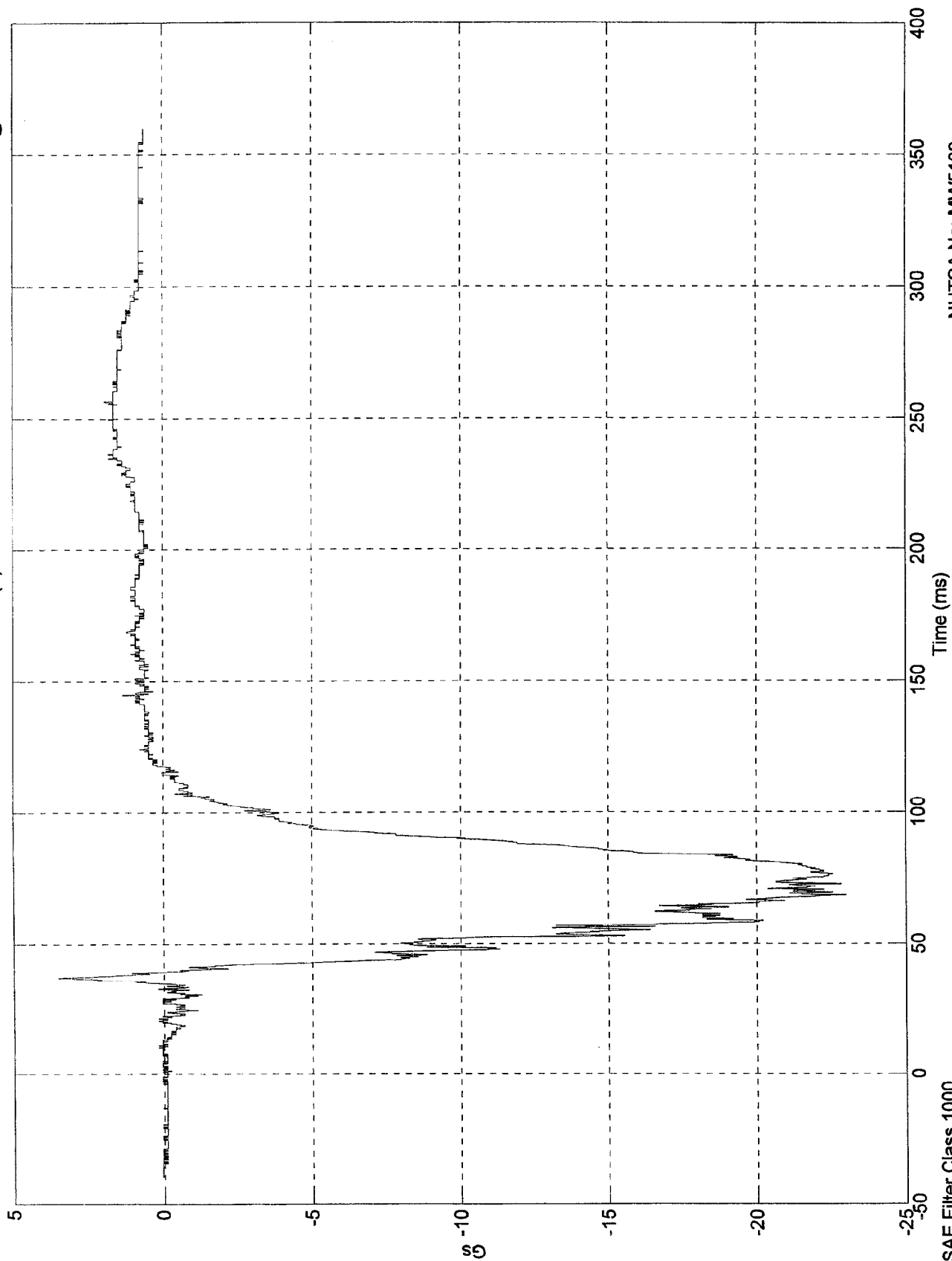


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 3.54 Gs @ 37.20 msec
Min = -23 Gs @ 68.20 msec

Pos. 2 Pelvic (Z)

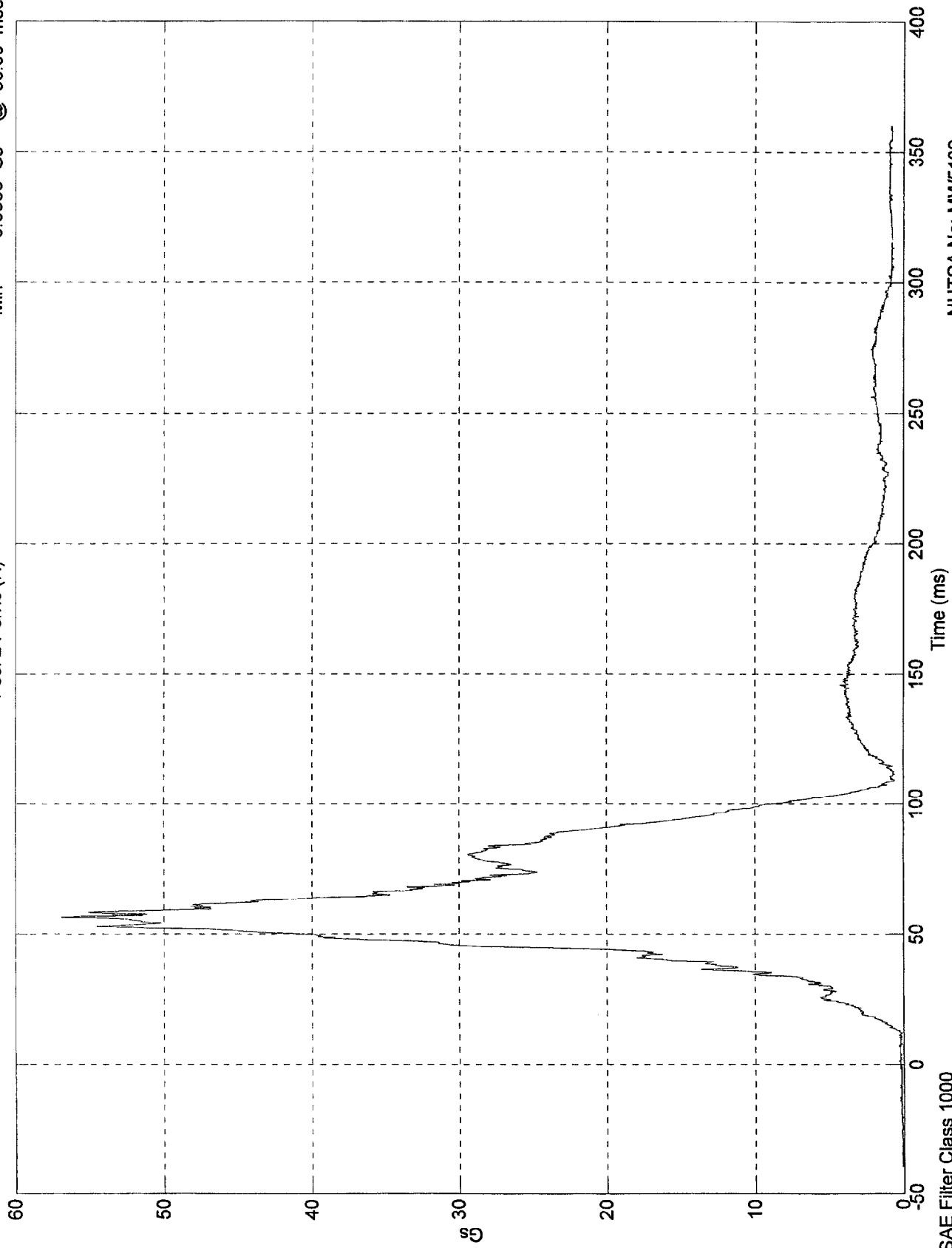


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 56.9 Gs @ 56.40 msec
Min = 0.0536 Gs @ -39.50 msec

Pos. 2 Pelvic (R)

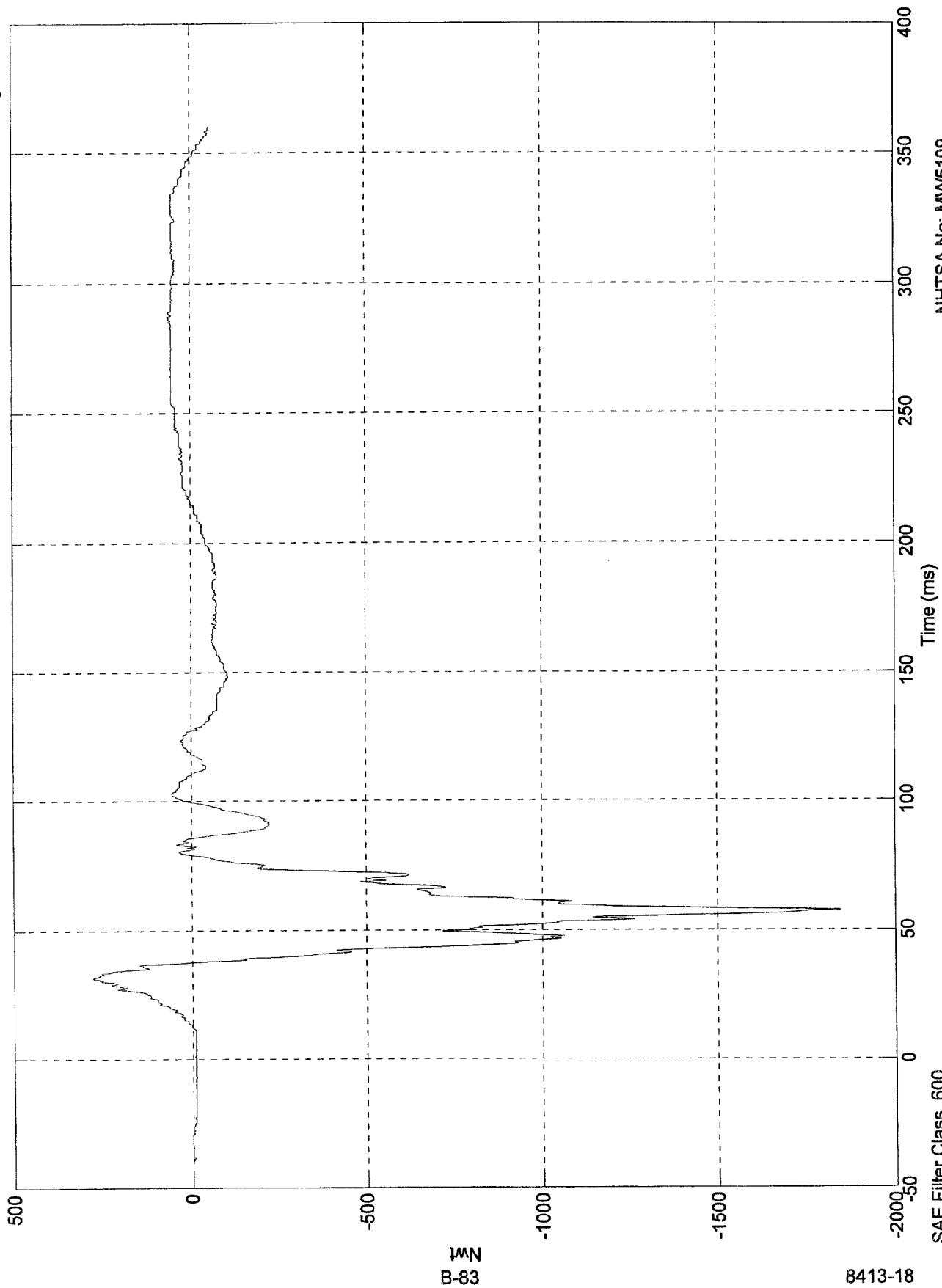


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 278 Nwt @ 31.60 msec
Min = -1.85e+003 Nwt @ 57.60 msec

Pos. 2 Left Femur

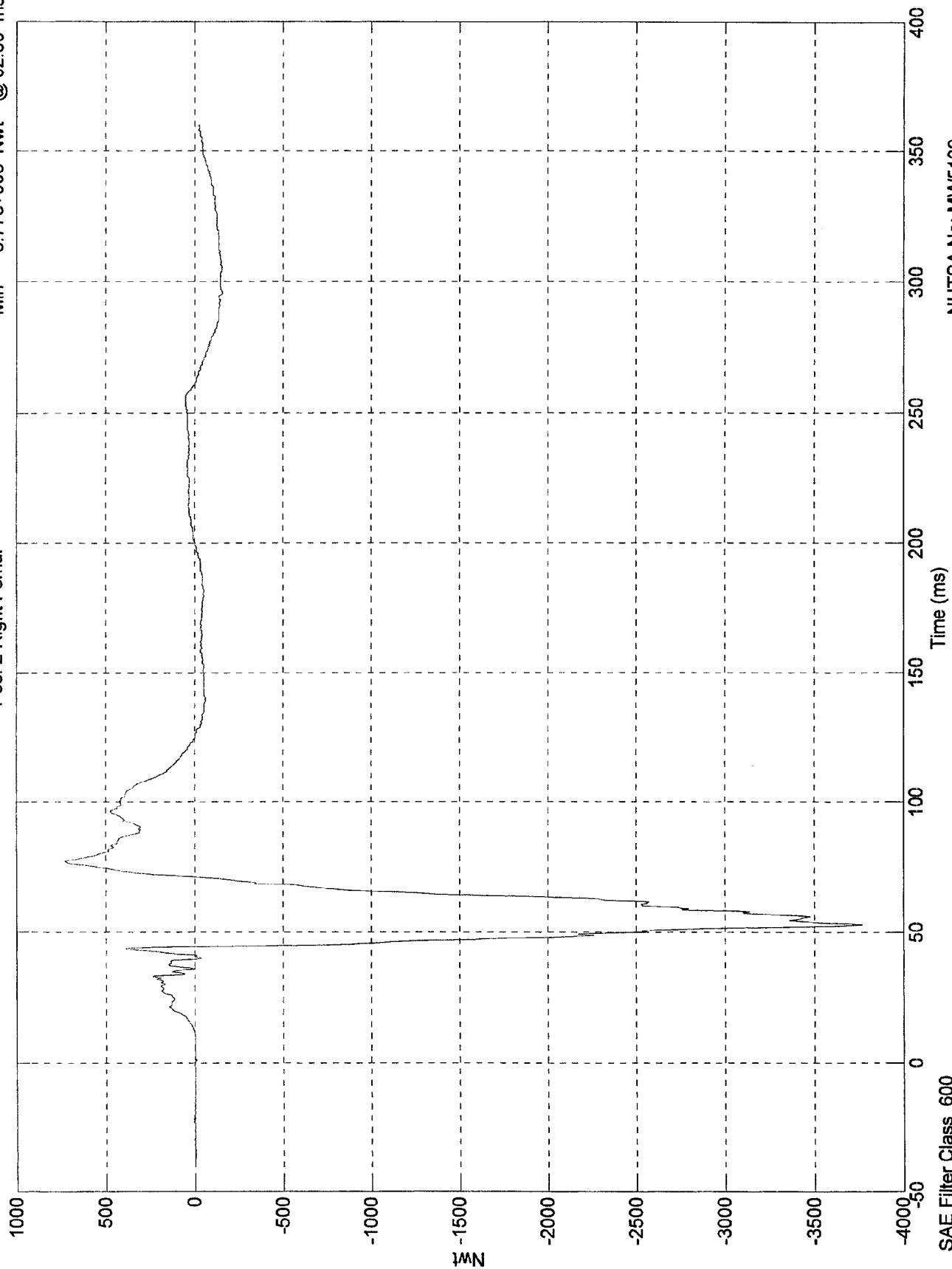


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 726 Nwt @ 77.20 msec
Min = -3.77e+003 Nwt @ 52.80 msec

Pos. 2 Right Femur

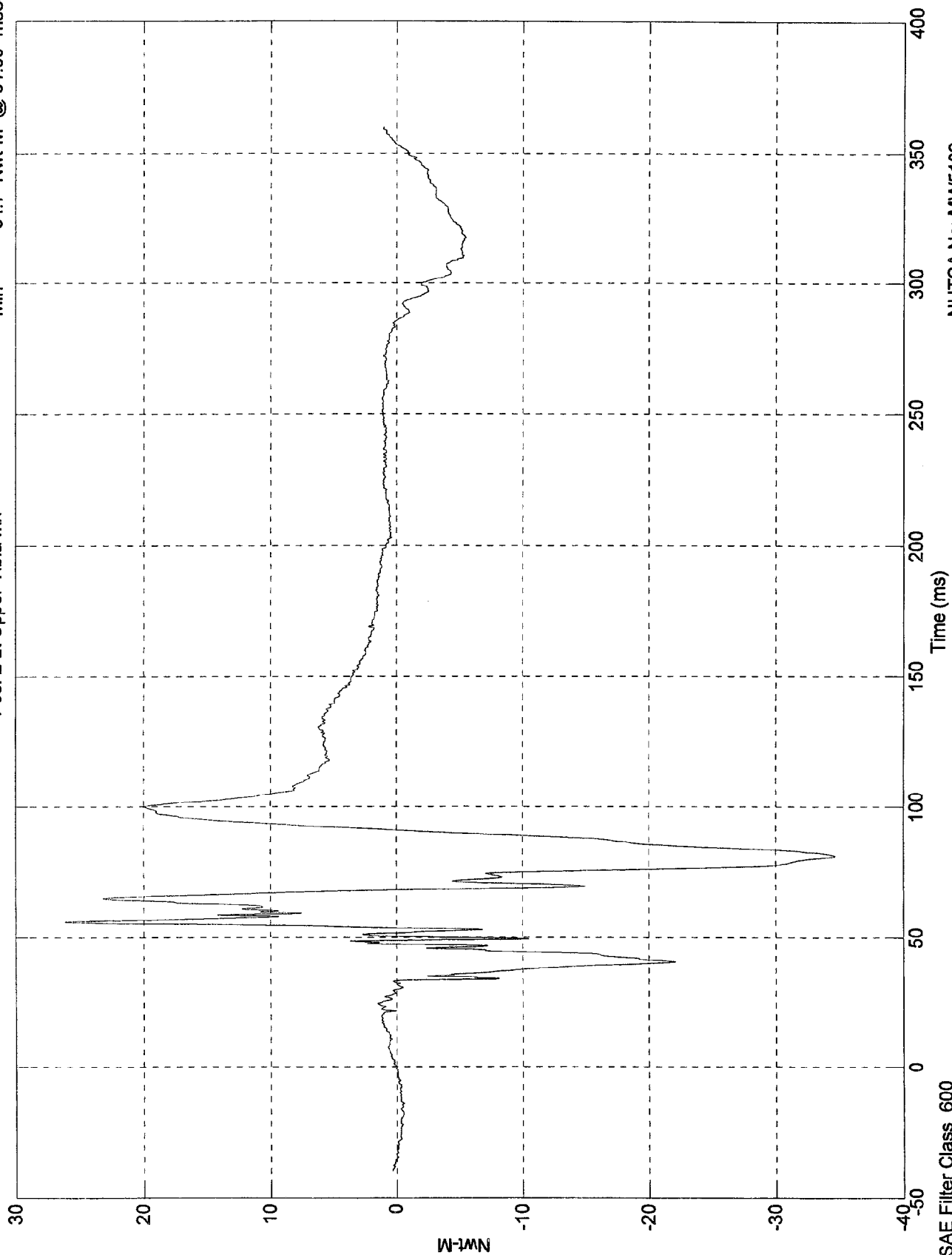


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 26.1 Nwt-M @ 55.90 msec
Min = -34.7 Nwt-M @ 81.30 msec

Pos. 2 Lt Upper Tibia Mx

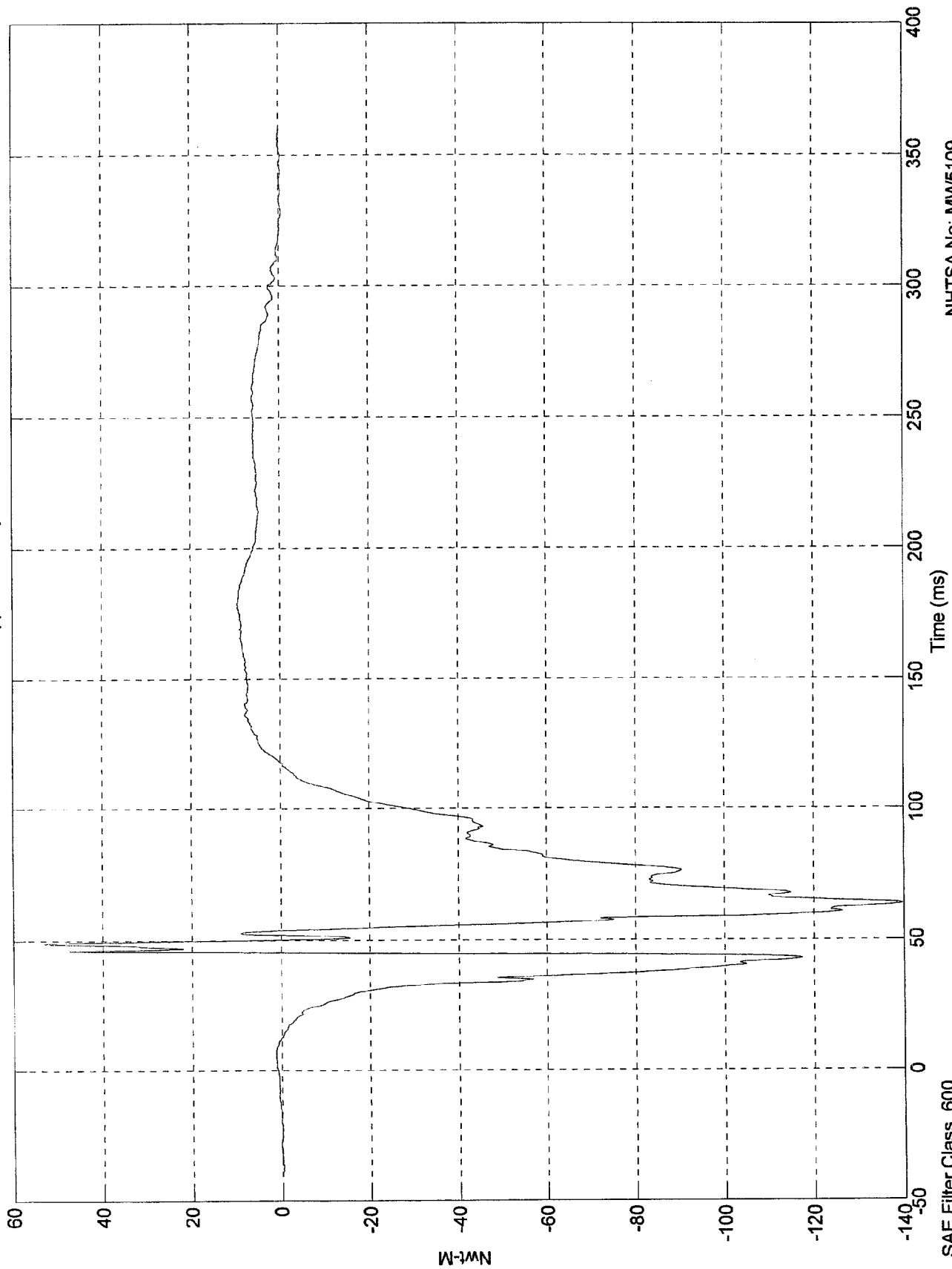


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 53.1 Nwt-M @ 48.80 msec
Min = -140 Nwt-M @ 63.70 msec

Pos. 2 Lt Upper Tibia My



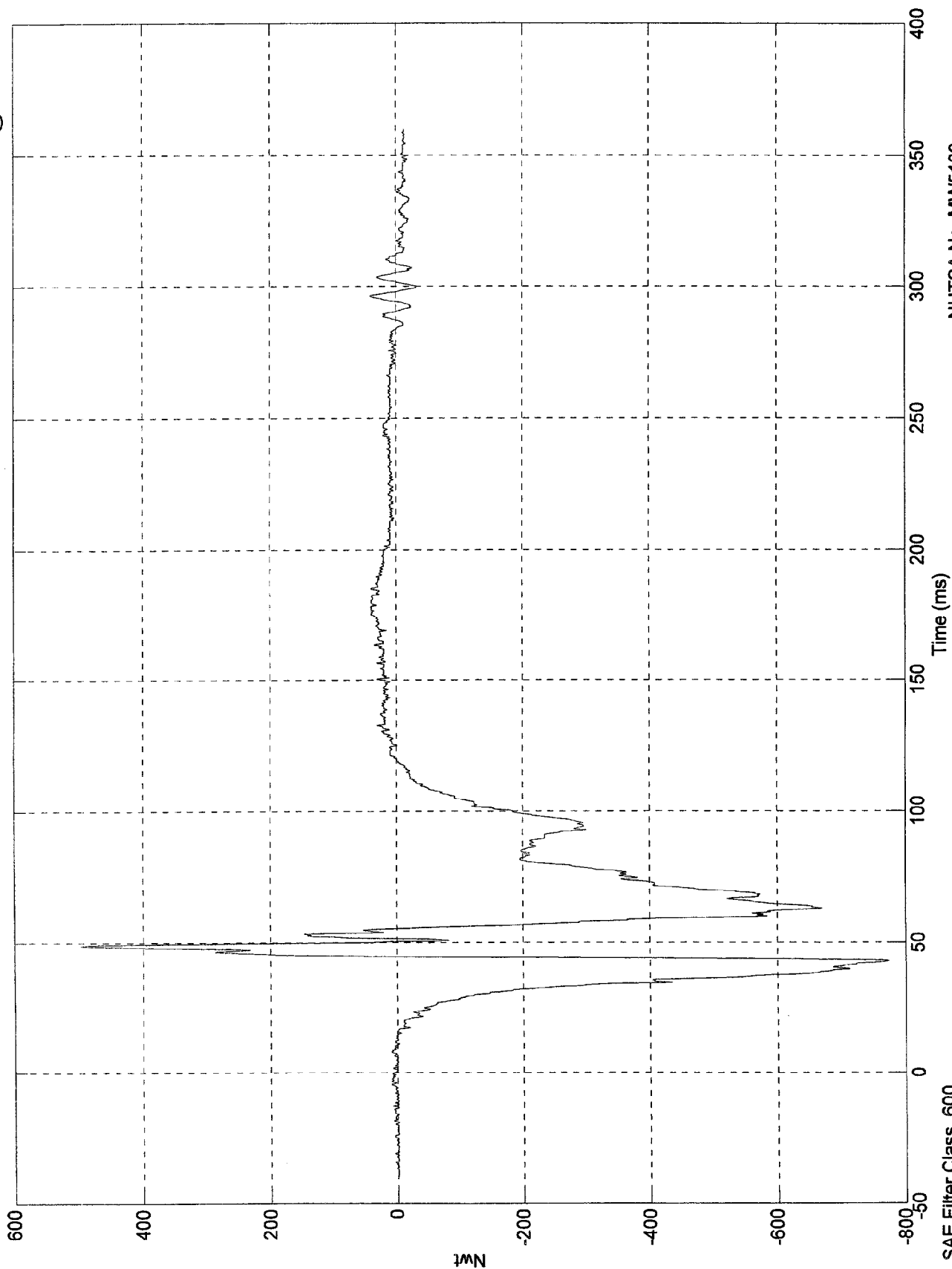
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Pos. 2 Lt Lower Tibia Fx

Max = 497 Nwt @ 48.80 msec
Min = -774 Nwt @ 42.90 msec

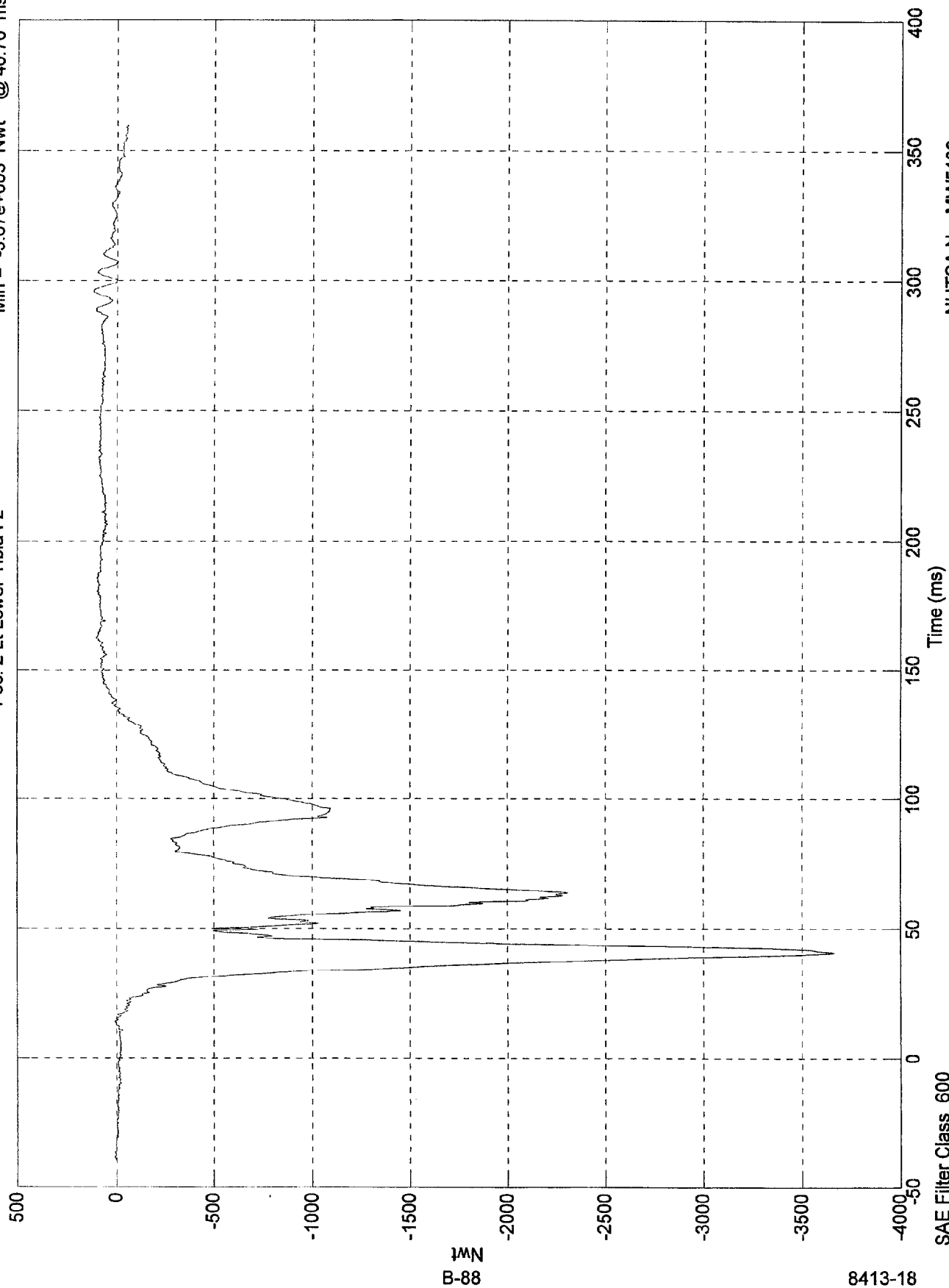


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 119 Nwt @ 296.00 msec
Min = -3.67e+003 Nwt @ 40.70 msec

Pos. 2 Lt Lower Tibia Fz

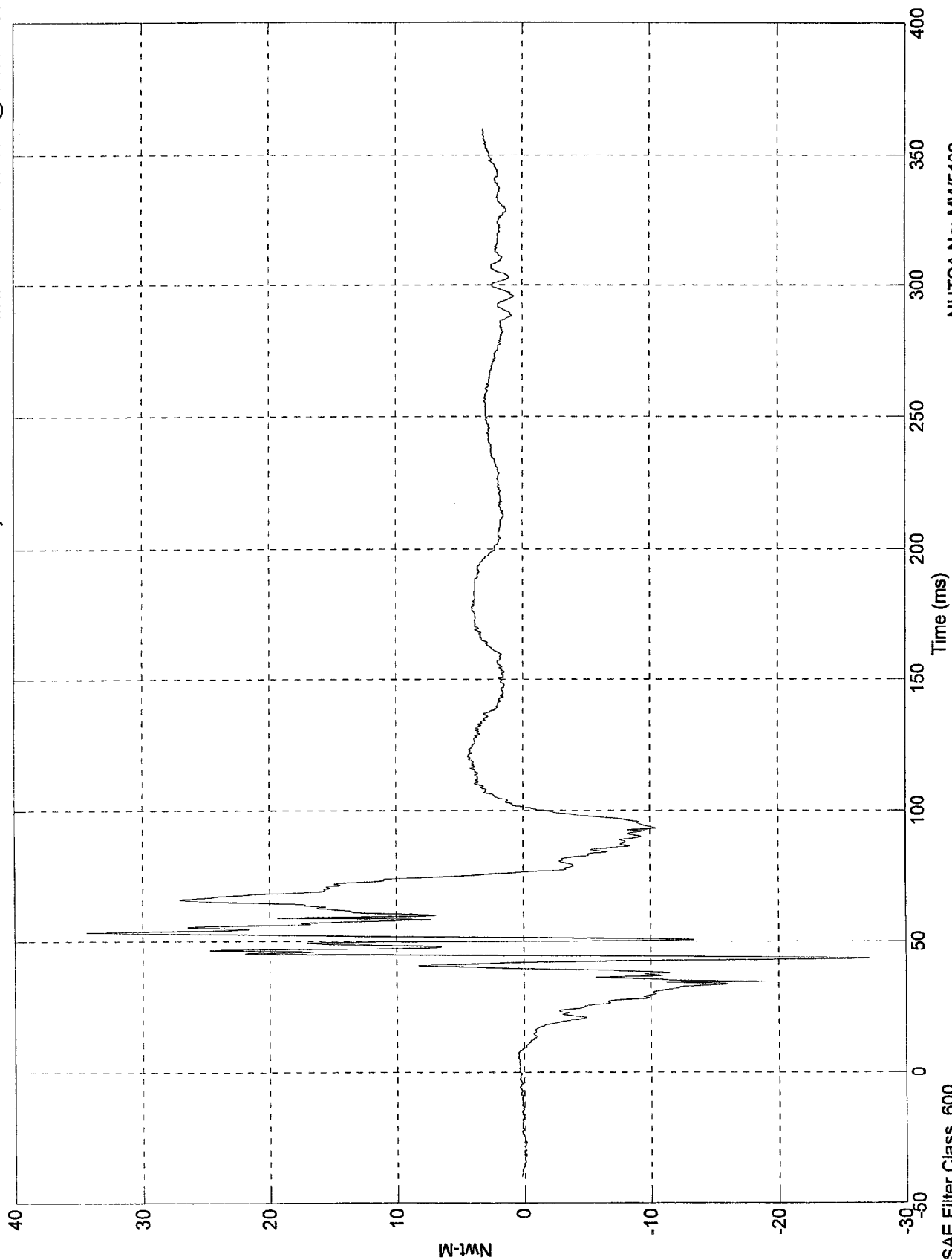


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 34.4 Nwt-M @ 53.40 msec
Min = -27.1 Nwt-M @ 43.50 msec

Pos. 2 Lt Lower Tibia My



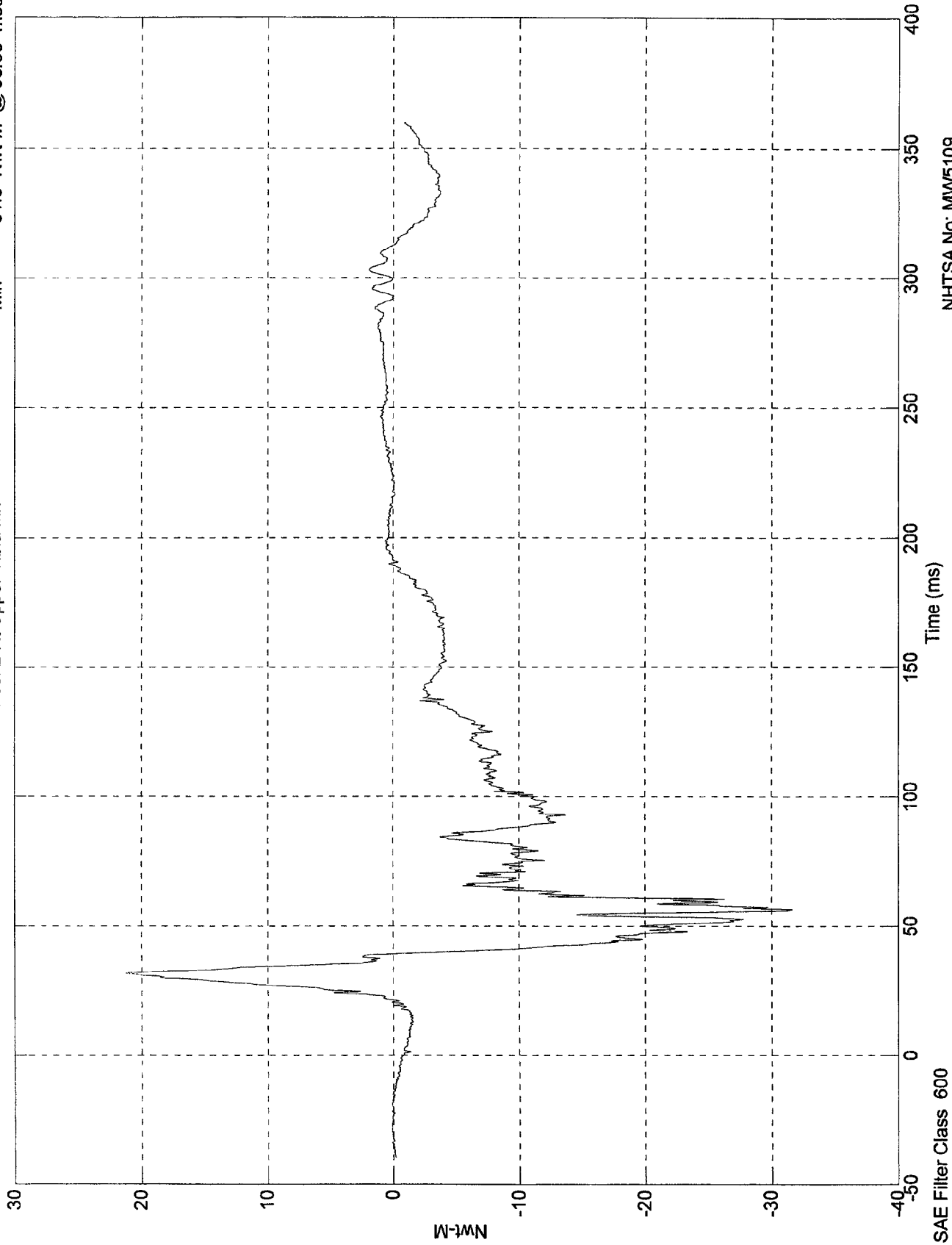
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 21.2 Nwt-M @ 31.40 msec
Min = -31.6 Nwt-M @ 56.30 msec

Pos. 2 Rt Upper Tibia Mx



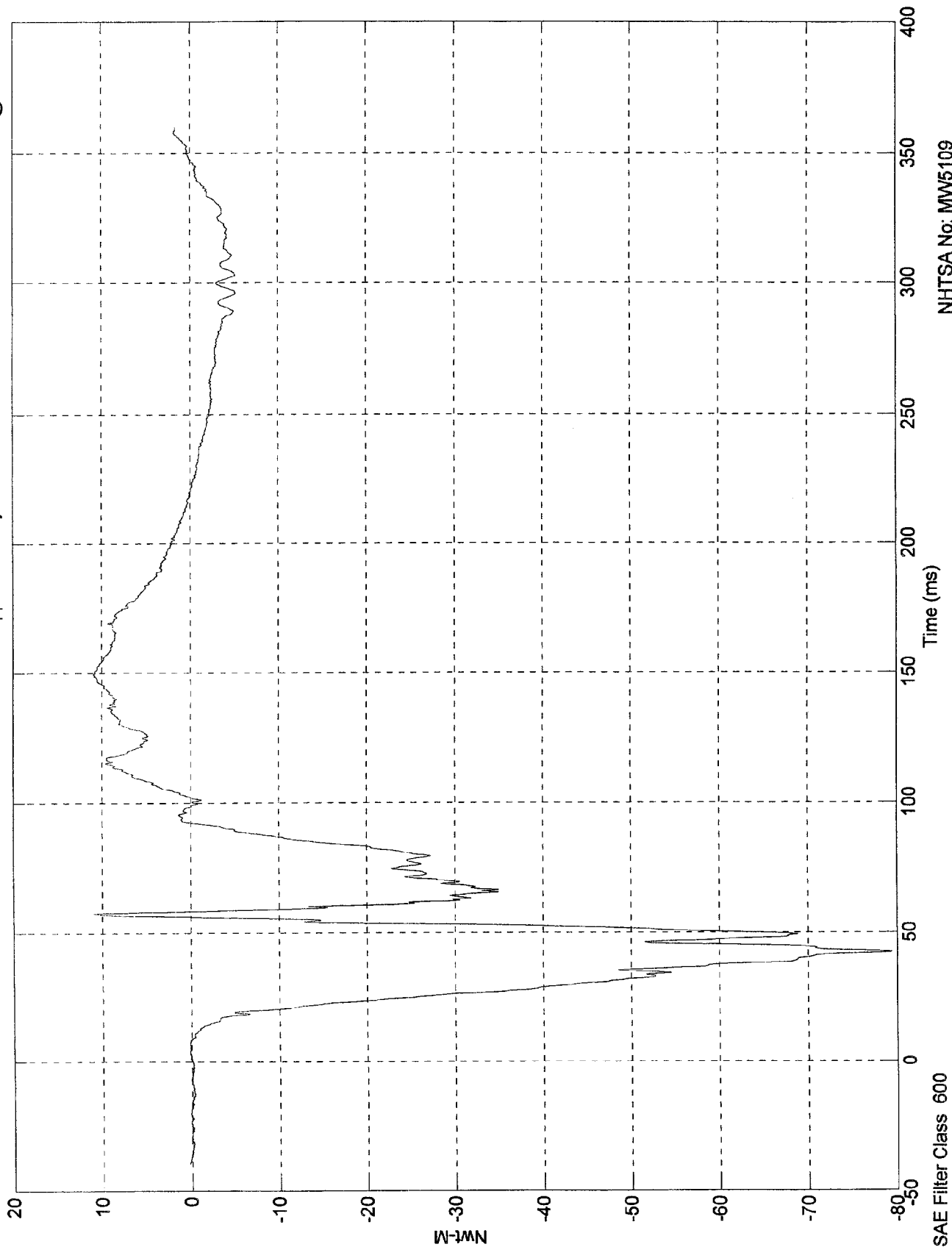
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 10.9 Nwt-M @ 57.40 msec
Min = -79.4 Nwt-M @ 42.50 msec

Pos. 2 Rt Upper Tibia My

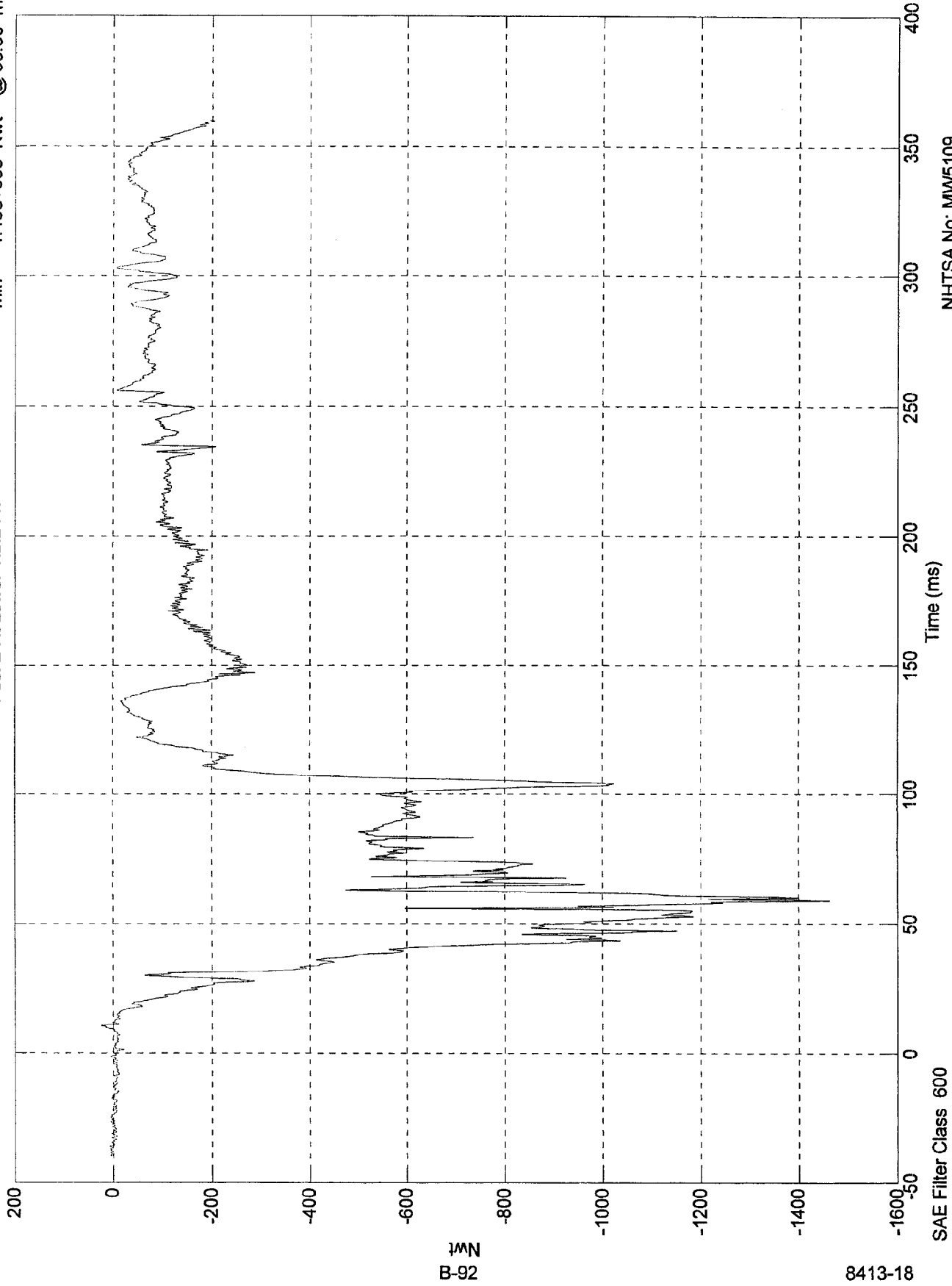


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 23.3 Nwt @ 10.40 msec
Min = -1.46e+003 Nwt @ 58.90 msec

Pos. 2 Rt Lower Tibia Fx

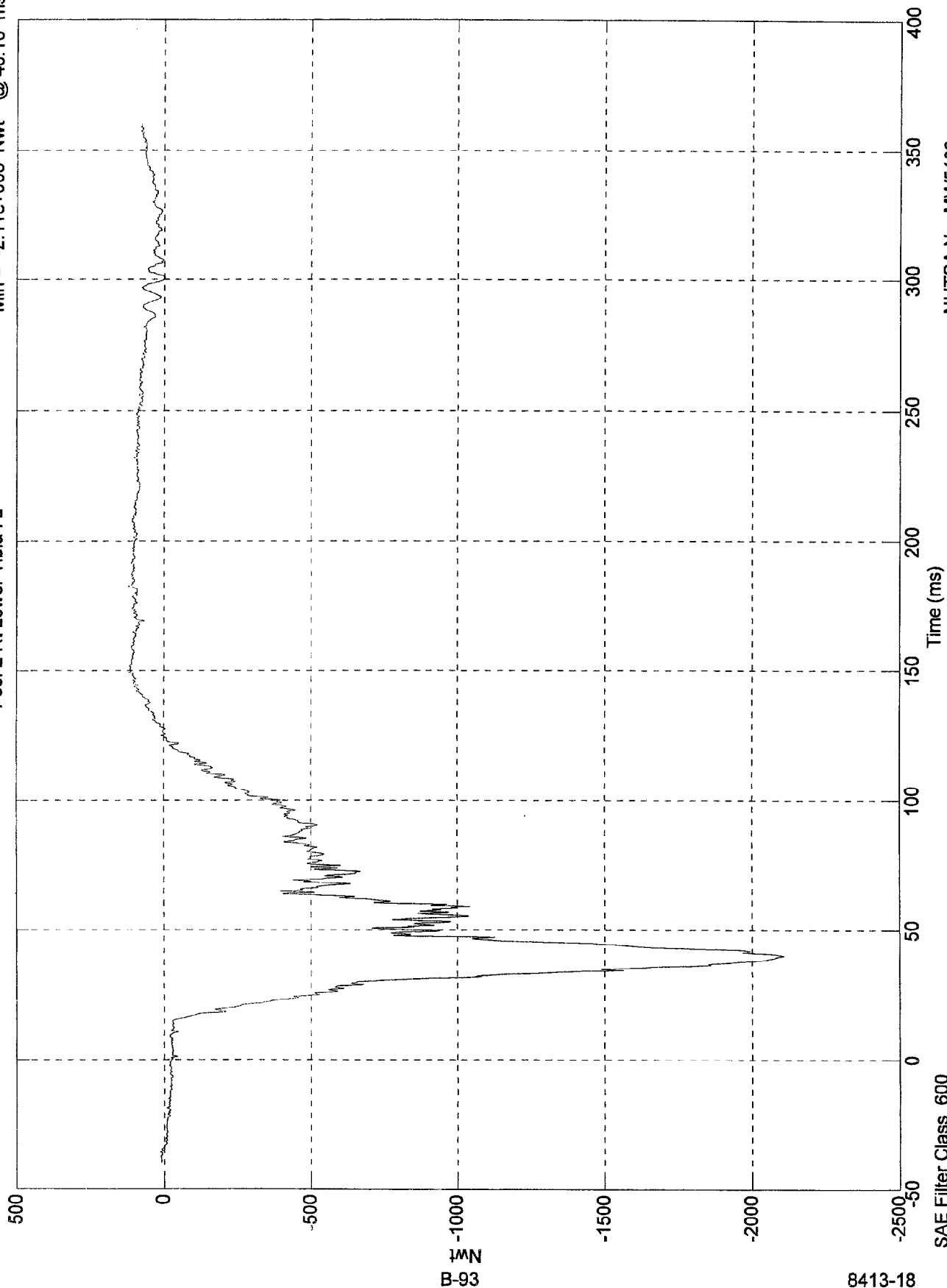


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 122 Nwt @ 182.60 msec
Min = -2.11e+003 Nwt @ 40.10 msec

Pos. 2 Rt Lower Tibia Fz



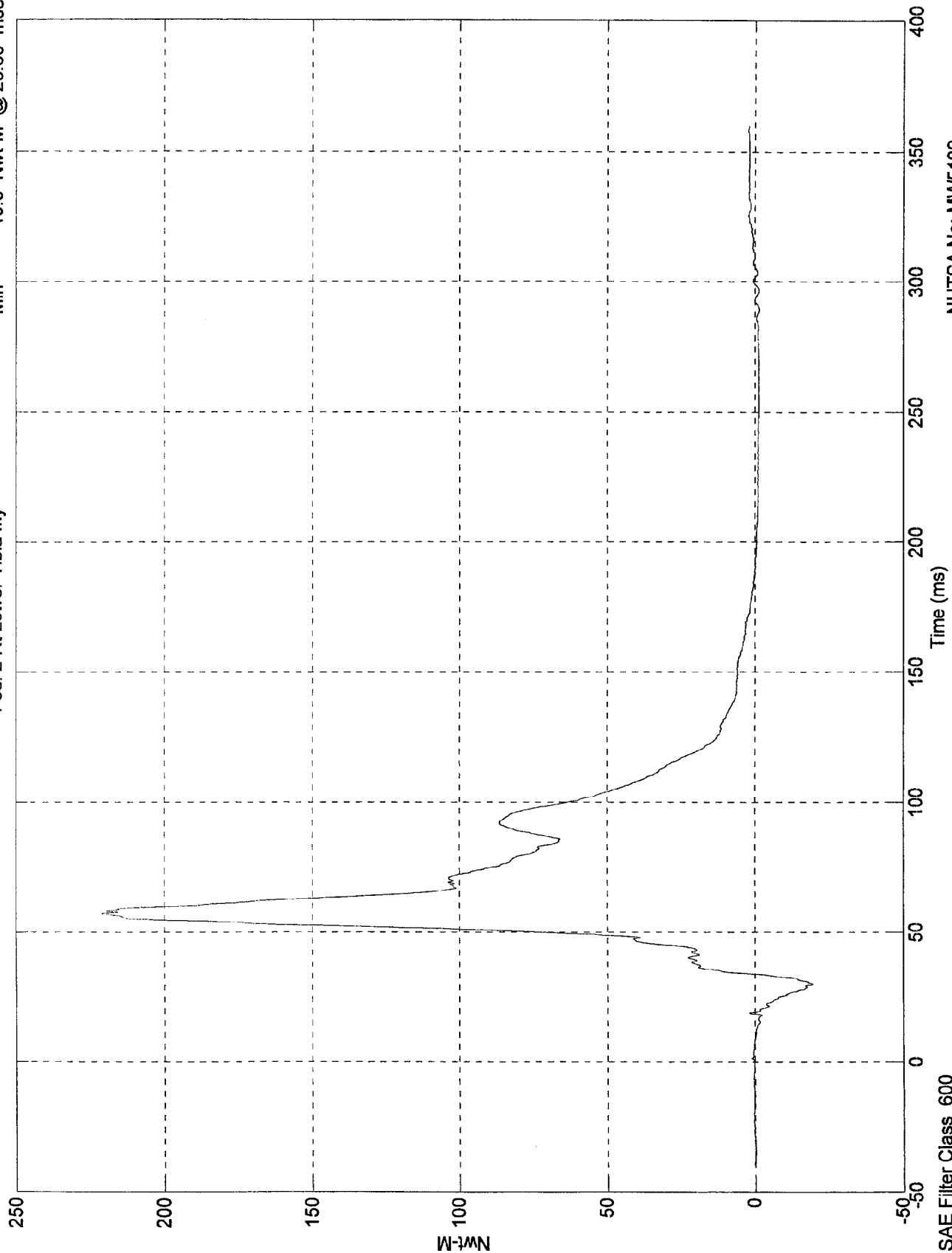
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 600

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 221 Nwt-M @ 57.30 msec
Min = -19.5 Nwt-M @ 29.60 msec

Pos. 2 Rt Lower Tibia My

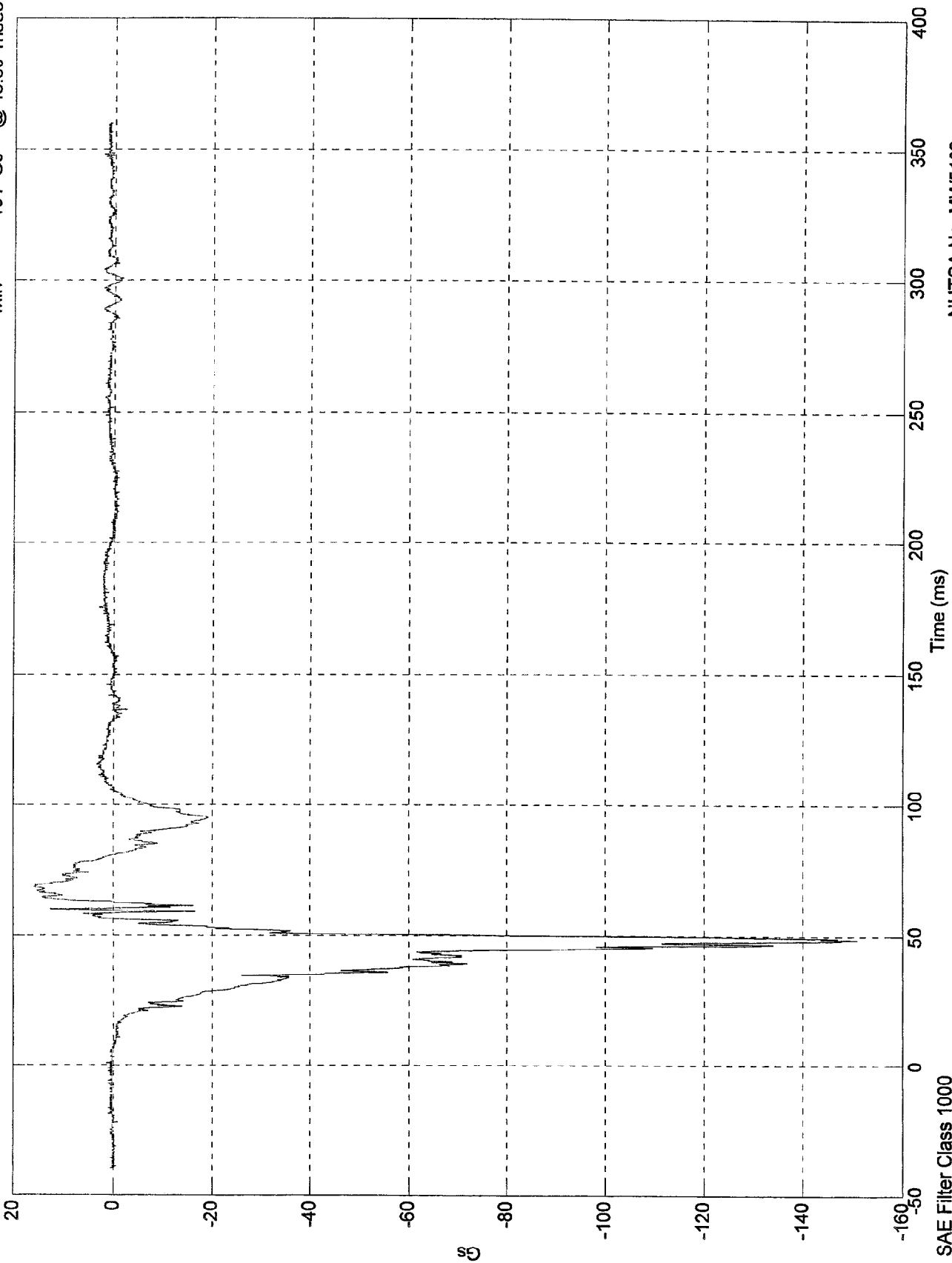


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 15.9 Gs @ 68.40 msec
Min = -151 Gs @ 48.60 msec

Pos. 2 Left Ankle X



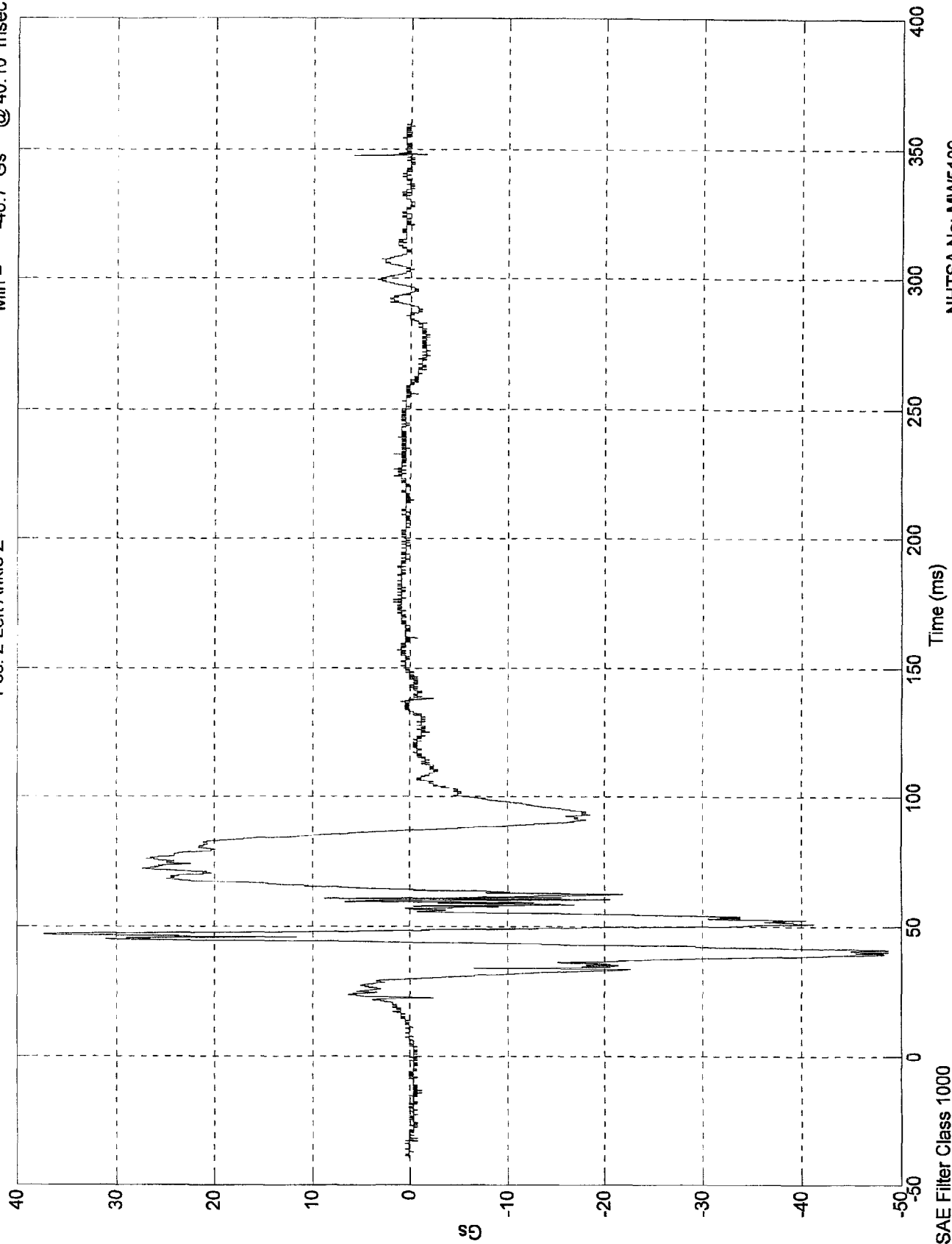
SAE Filter Class 1000

NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 37.3 Gs @ 47.10 msec
Min = -48.7 Gs @ 40.10 msec

Pos. 2 Left Ankle Z



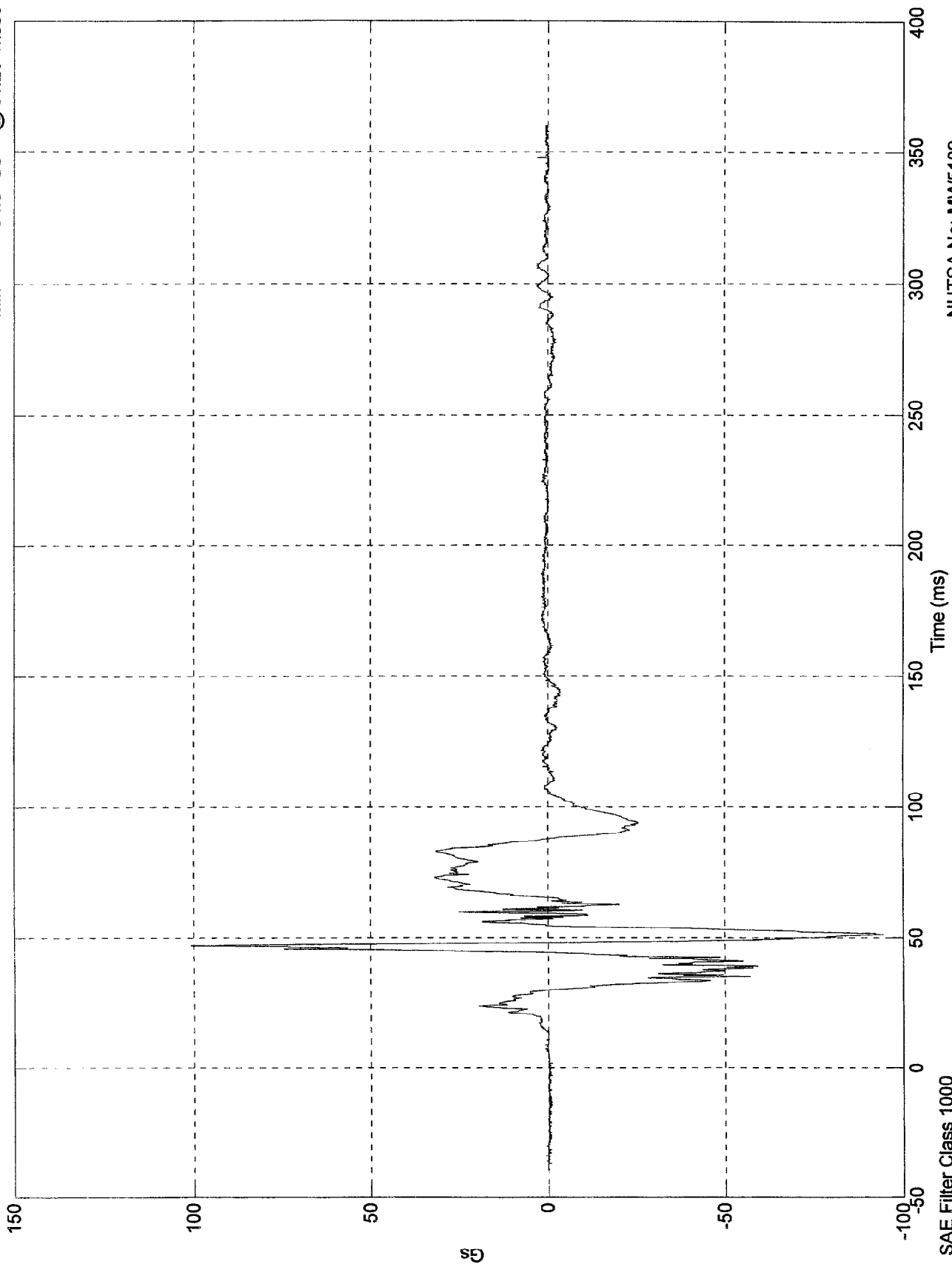
SAE Filter Class 1000

NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 101 Gs @ 47.00 msec
Min = -94.3 Gs @ 51.20 msec

Pos. 2 Left Toe Z

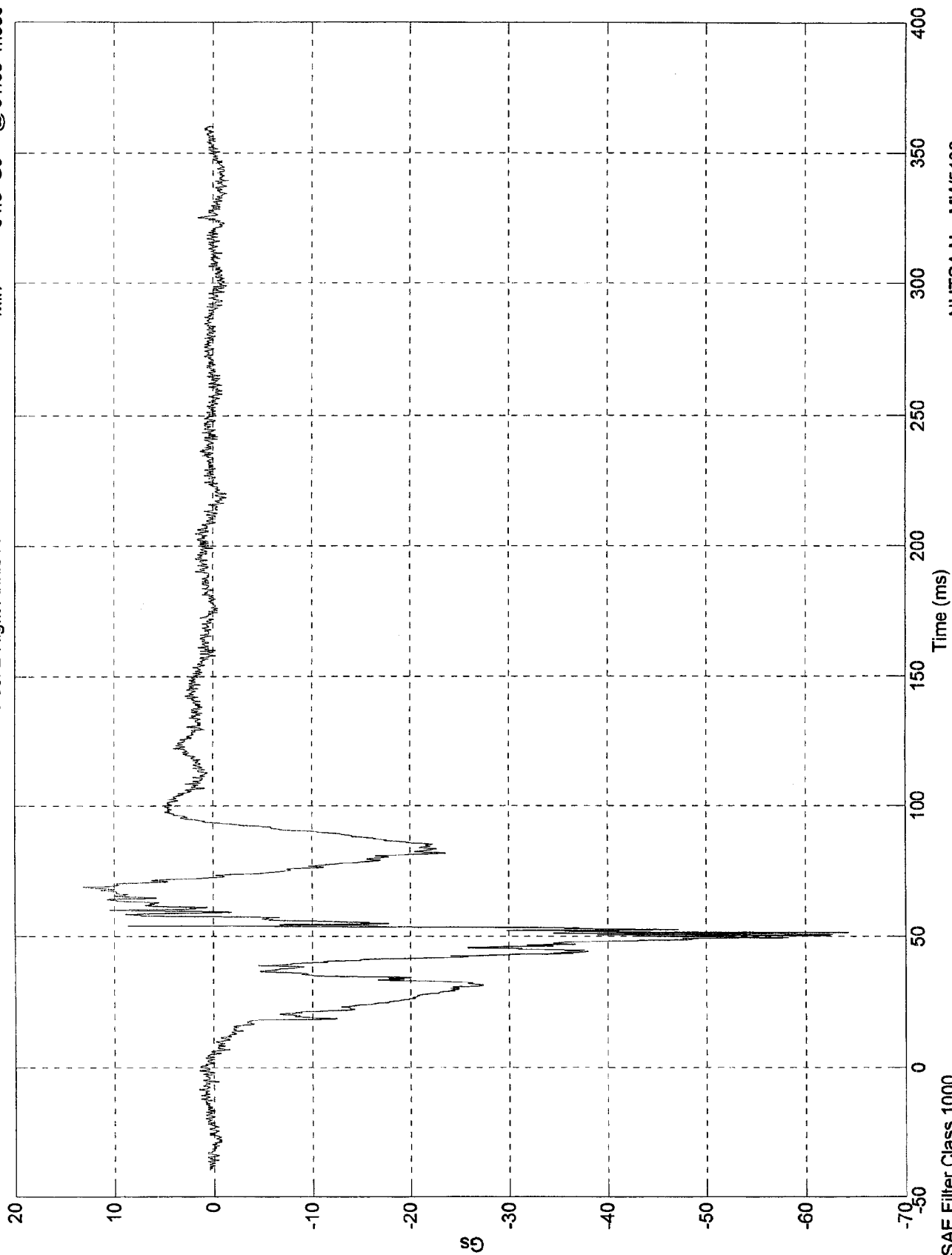


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 13.1 Gs @ 68.70 msec
Min = -64.3 Gs @ 51.50 msec

Pos. 2 Right Ankle X

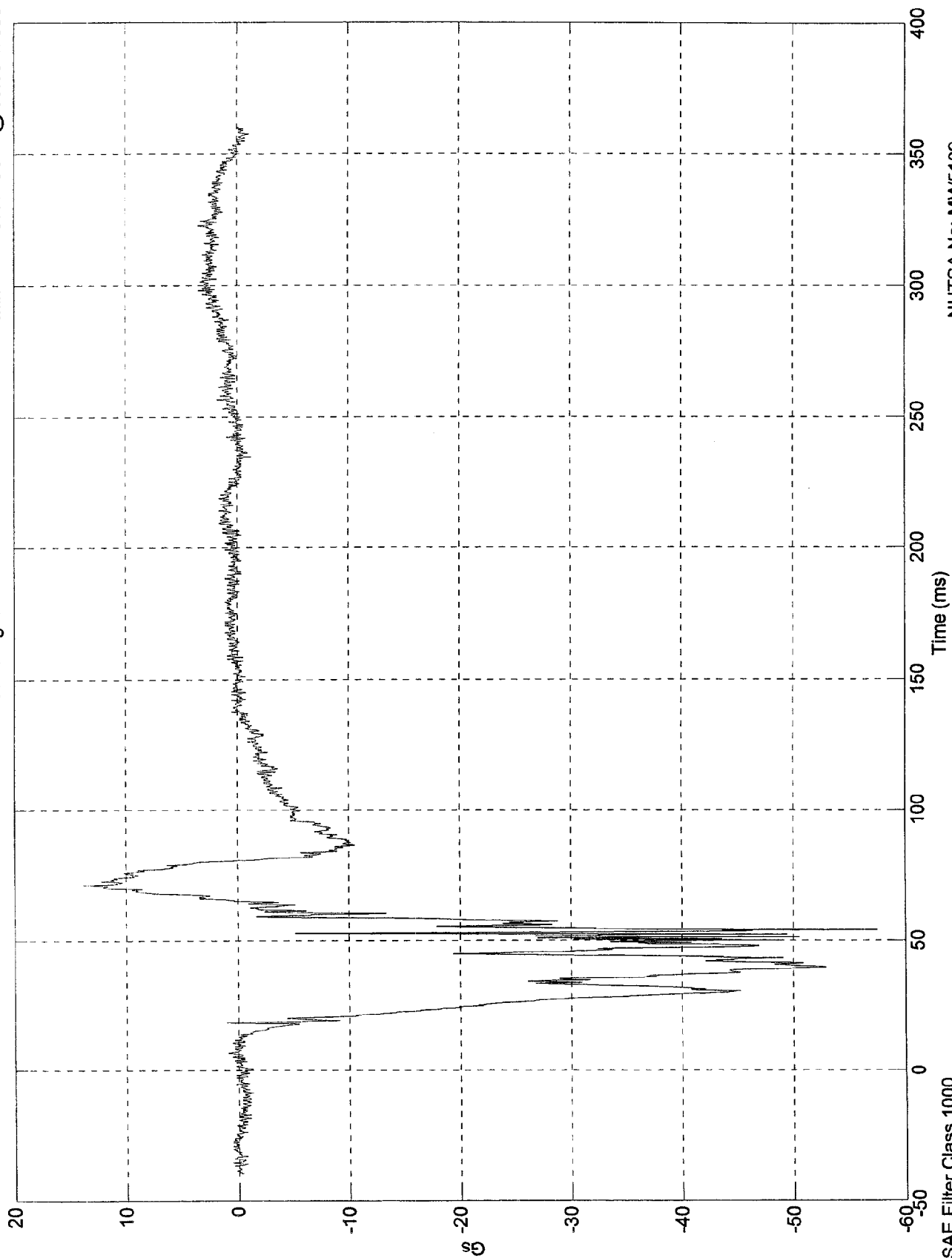


NHTSA No: MW5109
Date: 28 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 13.9 Gs @ 71.20 msec
 Min = -57.4 Gs @ 53.90 msec

Pos. 2 Right Ankle Z

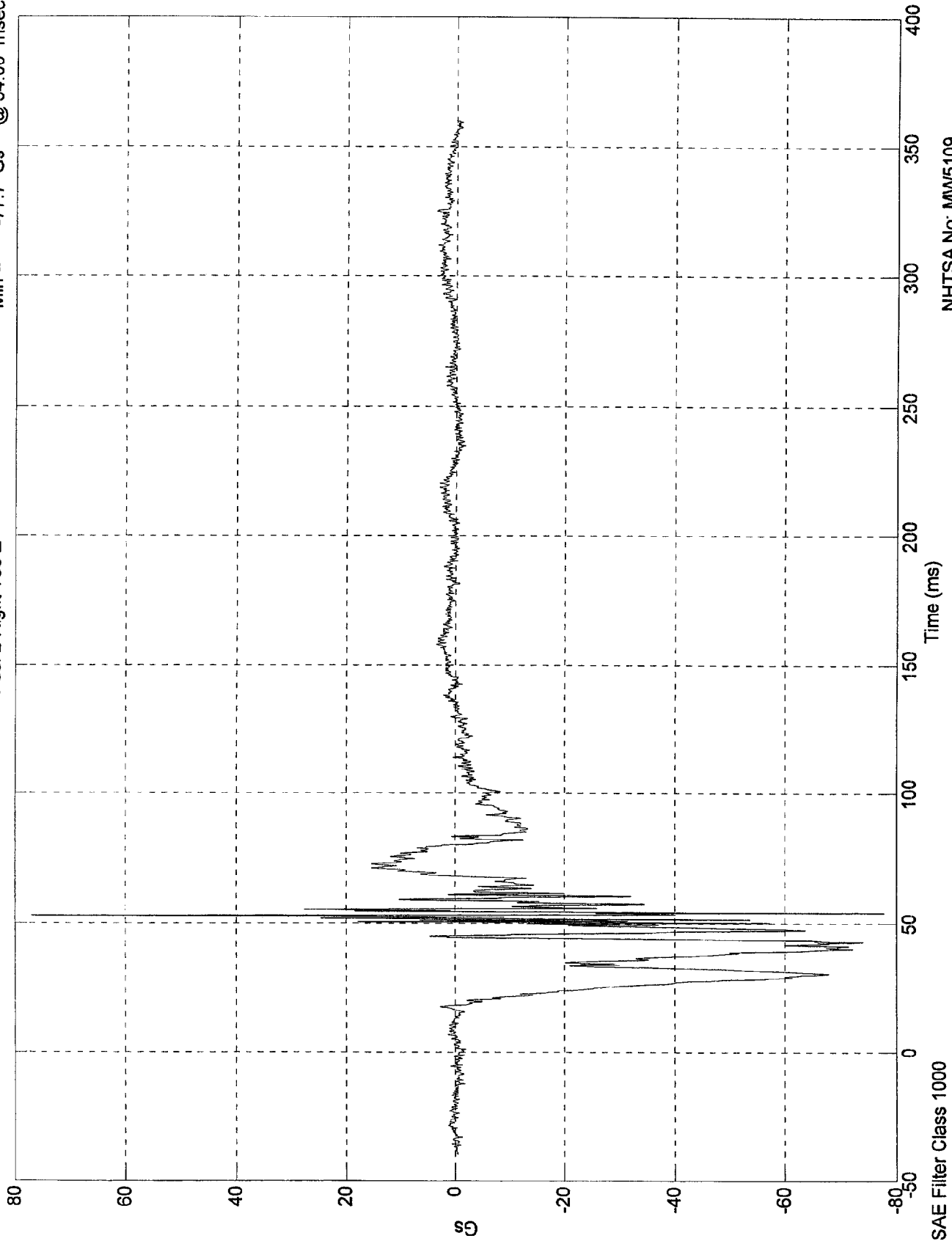


NHTSA No: MW5109
 Date: 28 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 77.1 Gs @ 52.70 msec
Min = -77.7 Gs @ 54.00 msec

Pos. 2 Right Toe Z

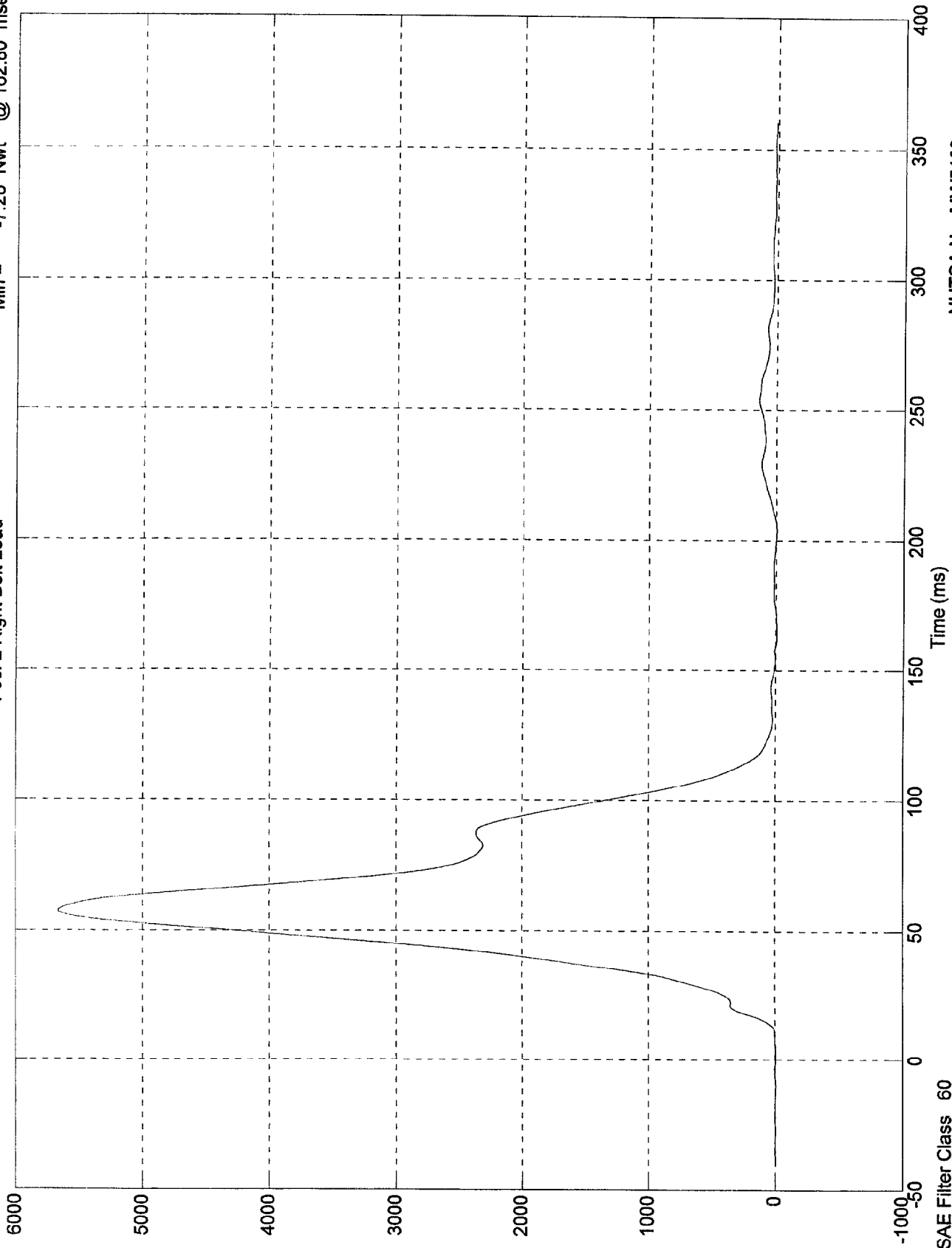


NHTSA No: MW5109
Date: 28 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Pos. 2 Right Belt Load

Max = 5.67e+003 Nwt @ 57.50 msec
Min = -7.28 Nwt @ 162.80 msec

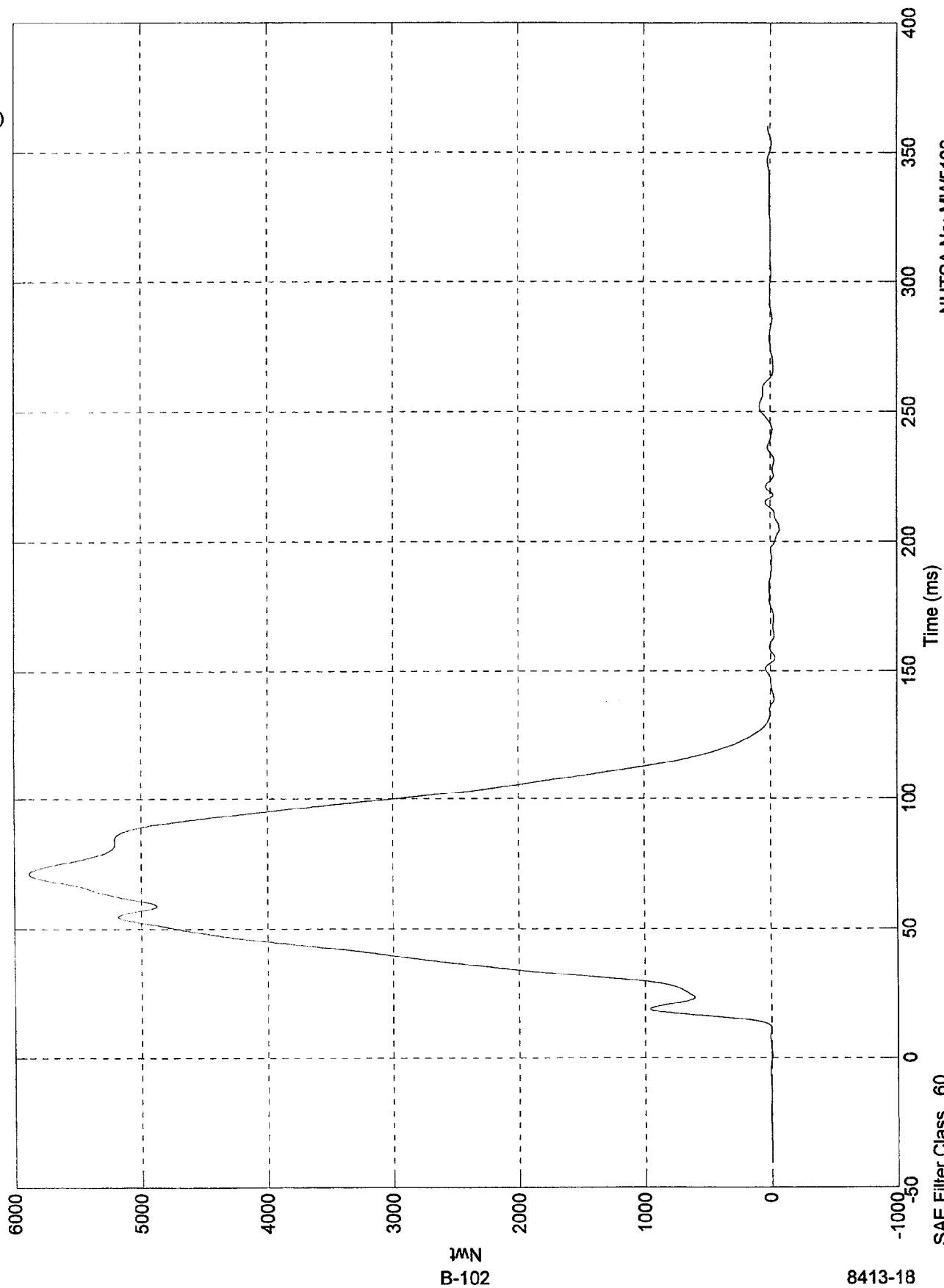


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 5.88e+003 Nwt @ 71.20 msec
Min = -73.5 Nwt @ 204.60 msec

Pos. 2 Torso Belt Load

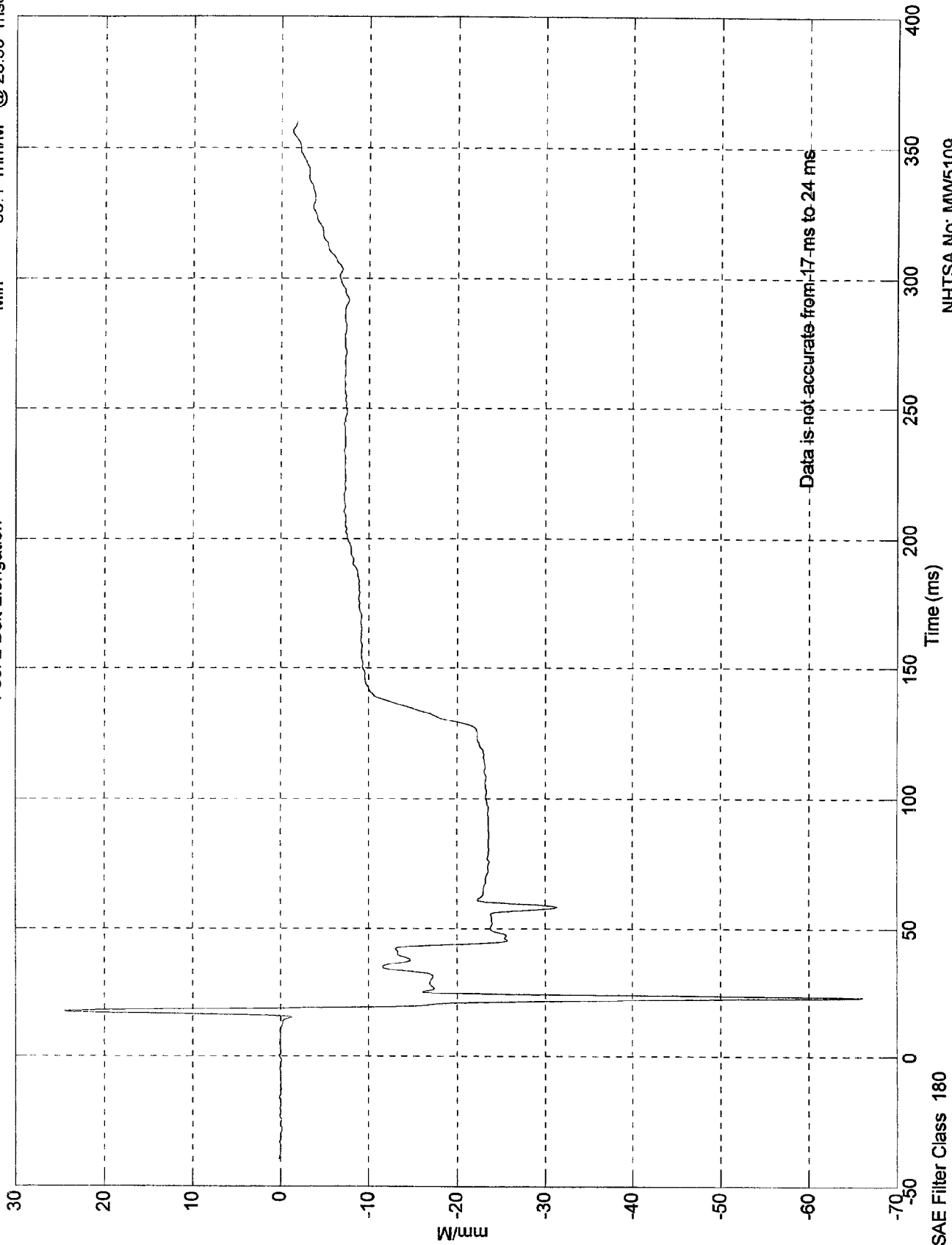


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 24.5 mm/M @ 17.60 msec
Min = -66.1 mm/M @ 23.30 msec

Pos. 2 Belt Elongation



Data is not accurate from 17 ms to 24 ms

NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NHTSA TEST NO. MW5109

VEHICLE DATA

FILTER CHANNEL CLASS

Acceleration

60

Velocity

180

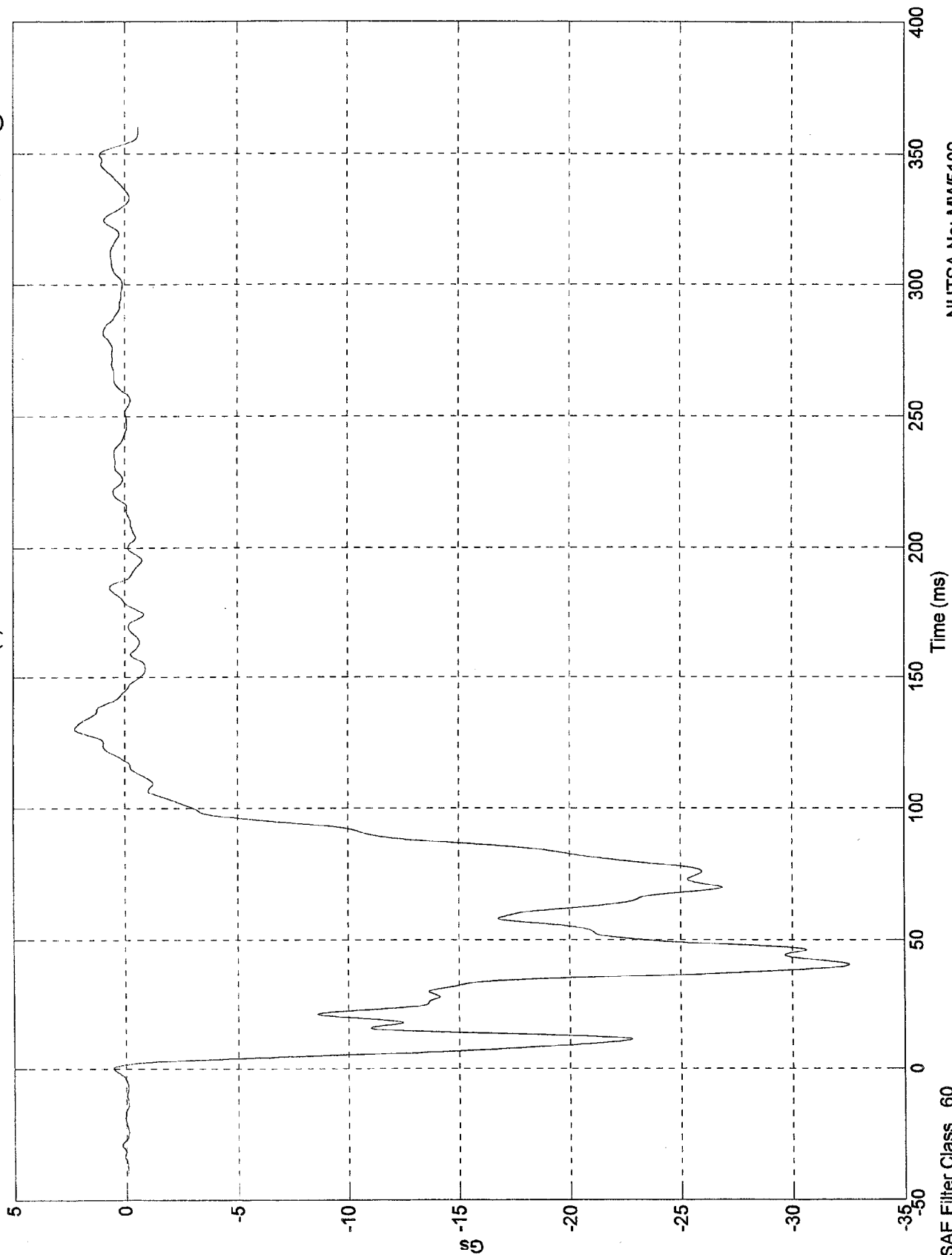
Displacement

180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.24 Gs @ 130.00 msec
Min = -32.5 Gs @ 40.60 msec

Acc. #1(x) Left Rear X

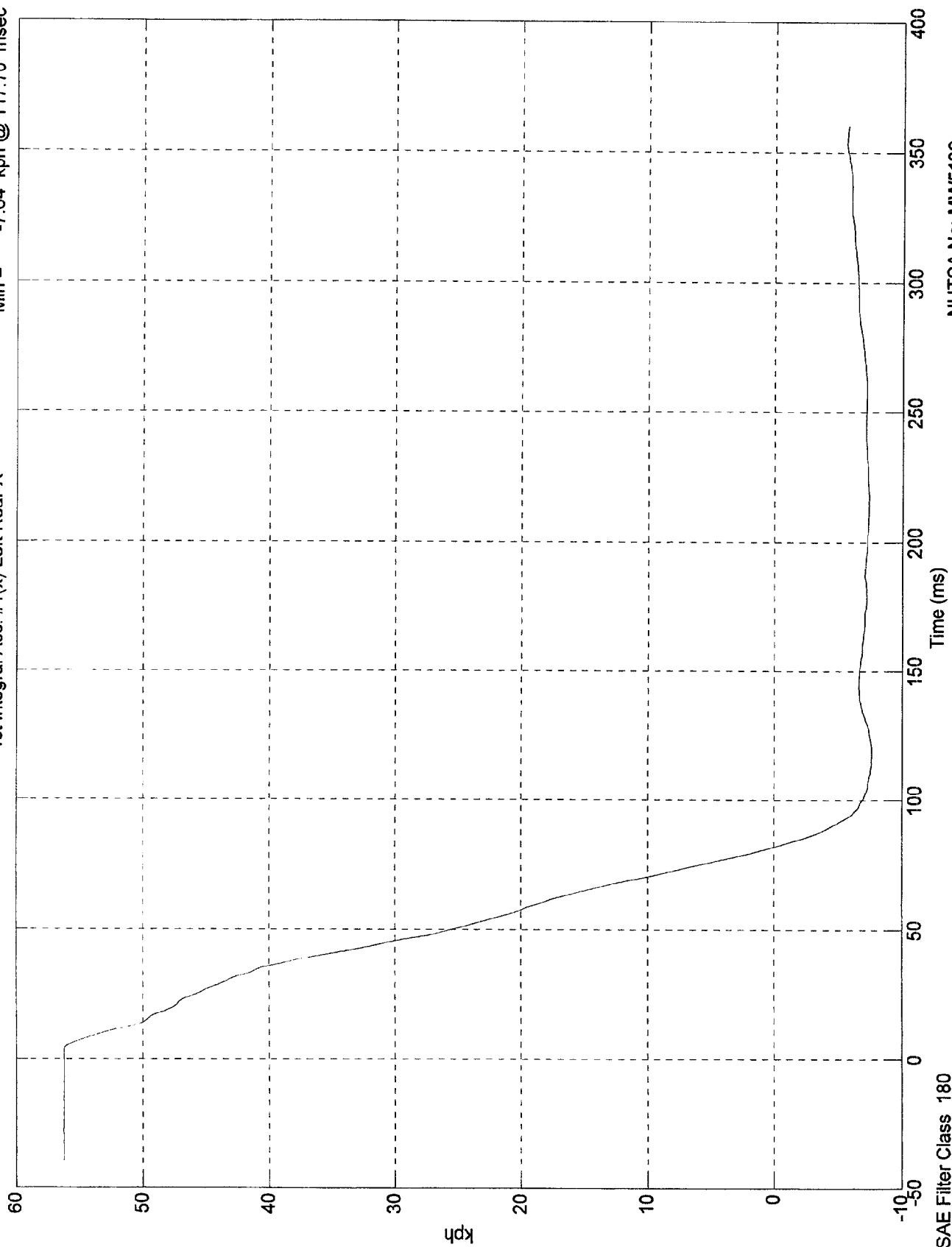


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 56.2 kph @ -27.70 msec
Min = -7.64 kph @ 117.70 msec

1st Integral Acc. #1(x) Left Rear X

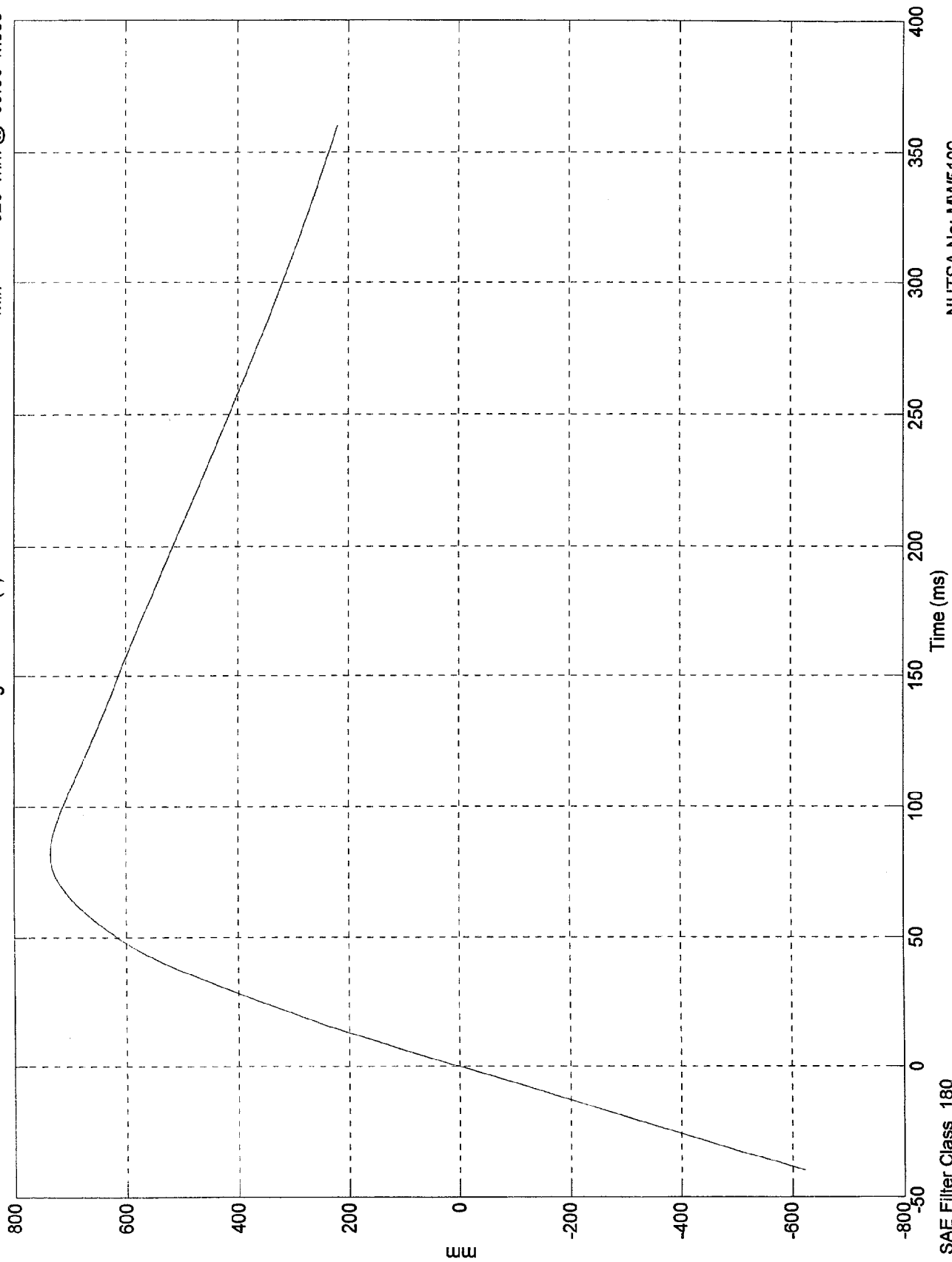


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 735 mm @ 82.10 msec
Min = -623 mm @ -39.90 msec

2nd Integral Acc. #1(x) Left Rear X

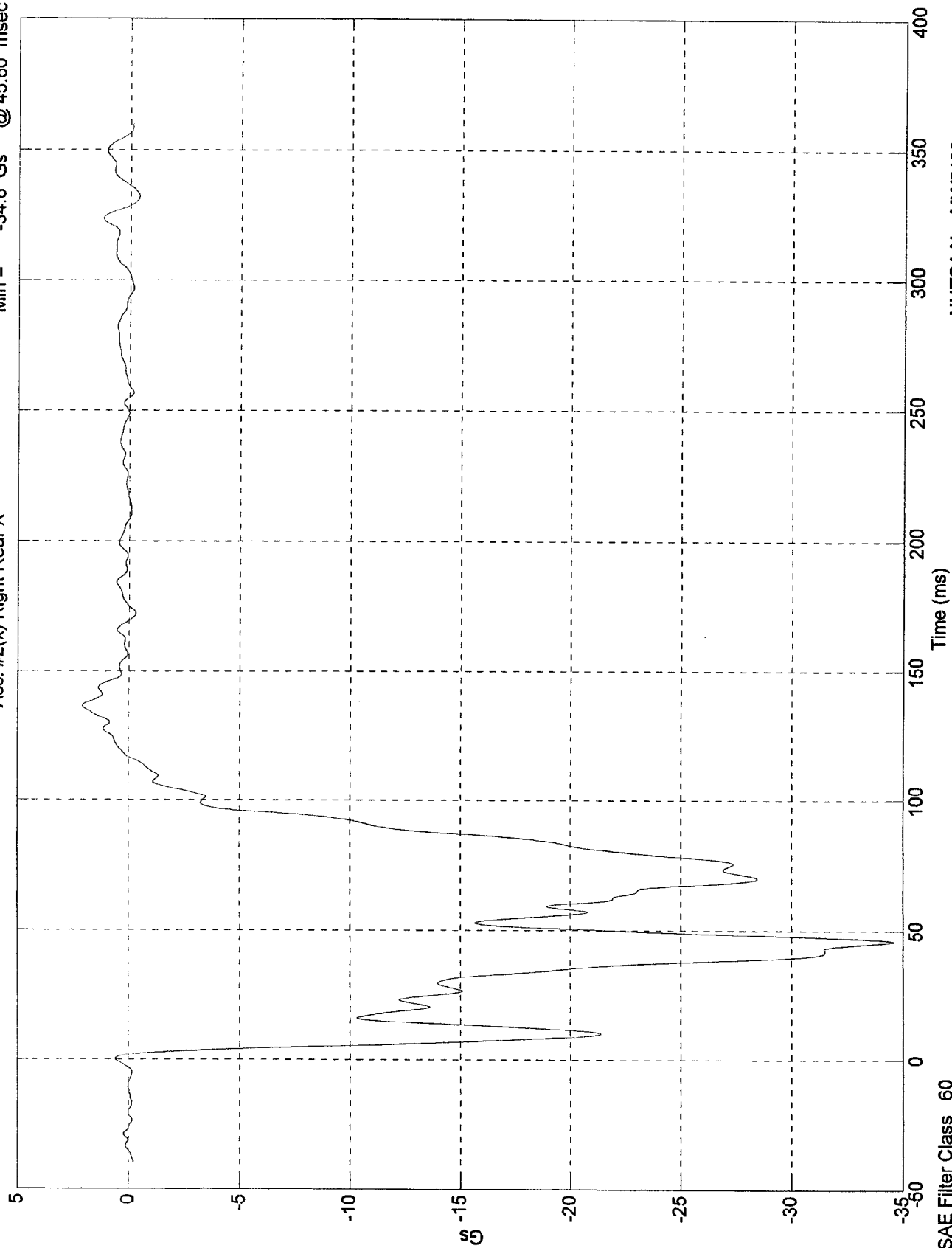


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.09 Gs @ 136.60 msec
 Min = -34.6 Gs @ 45.60 msec

Acc. #2(x) Right Rear X

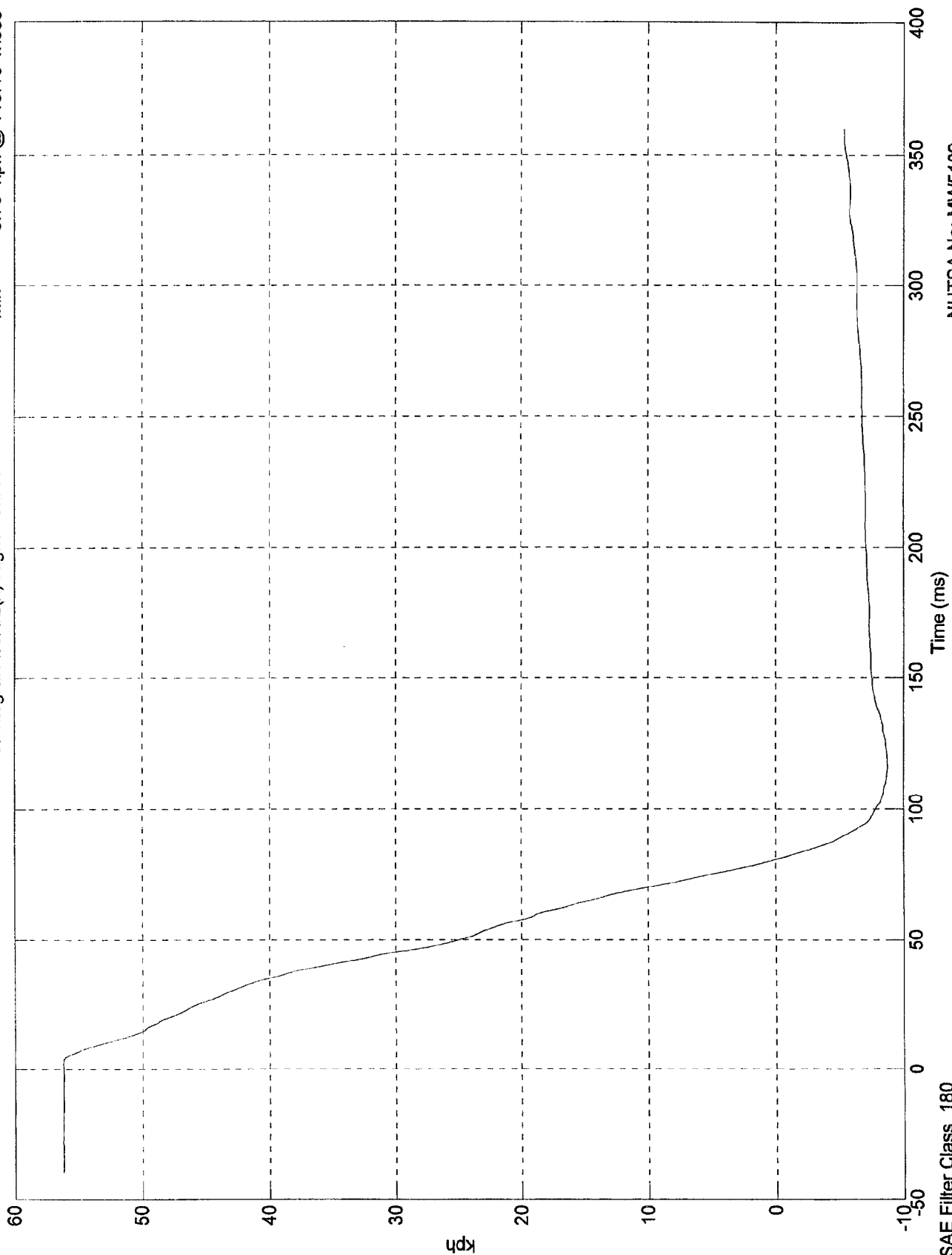


NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 56.3 kph @ -27.90 msec
Min = -8.75 kph @ 116.10 msec

1st Integral Acc. #2(x) Right Rear X

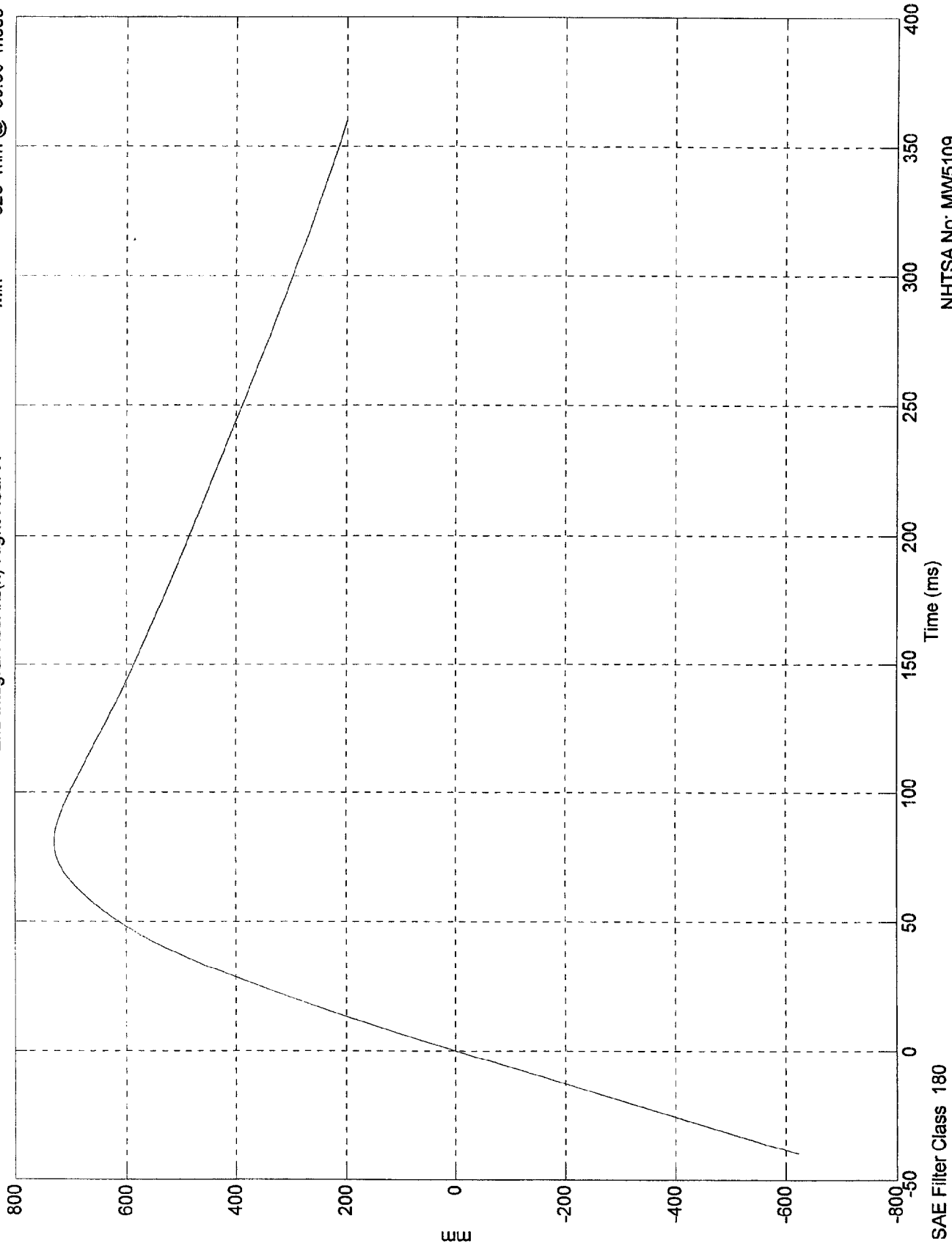


NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

Max = 729 mm @ 80.80 msec
Min = -623 mm @ -39.90 msec

2nd Integral Acc. #2(x) Right Rear X

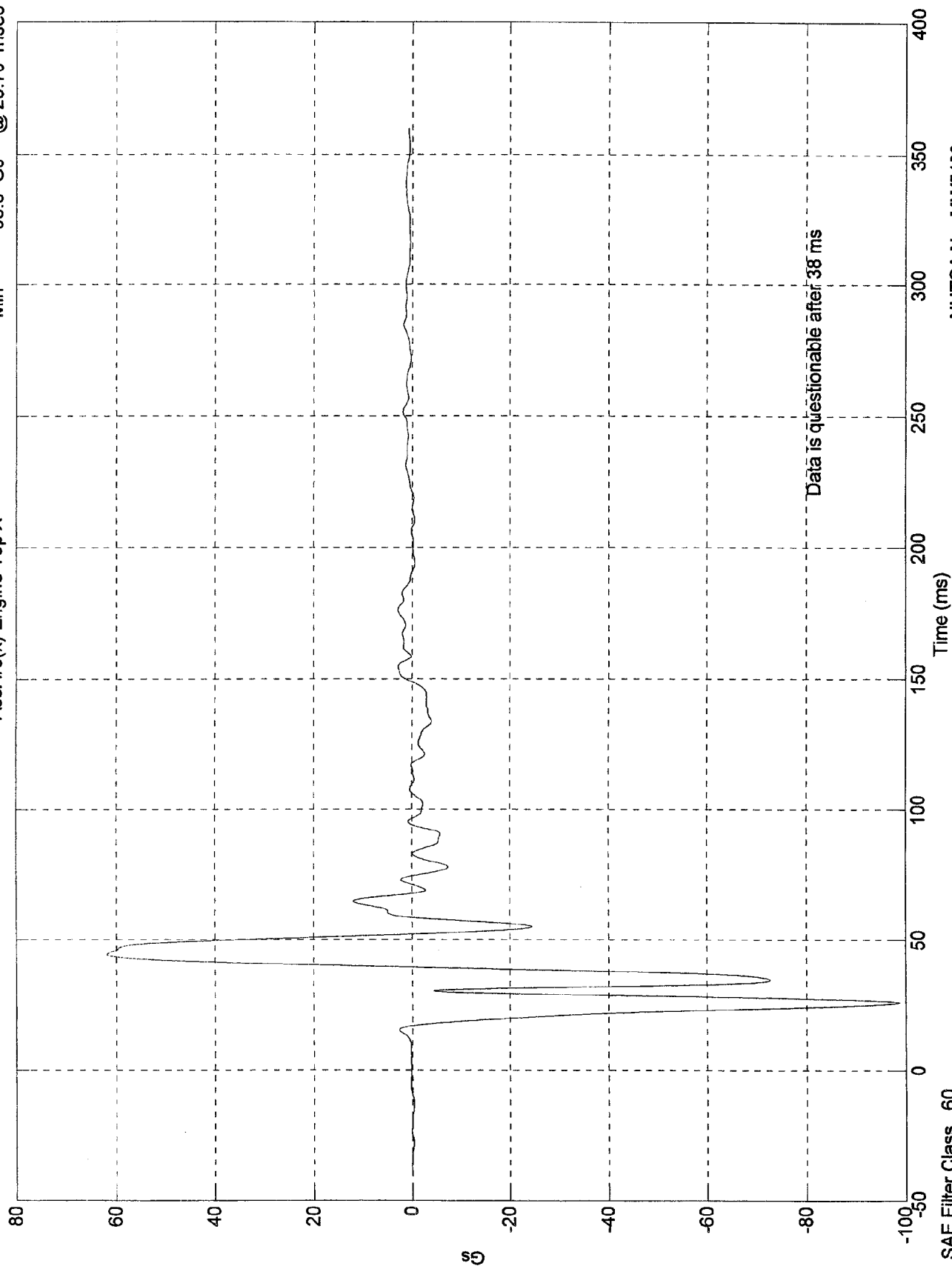


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Acc. #3(x) Engine Top X

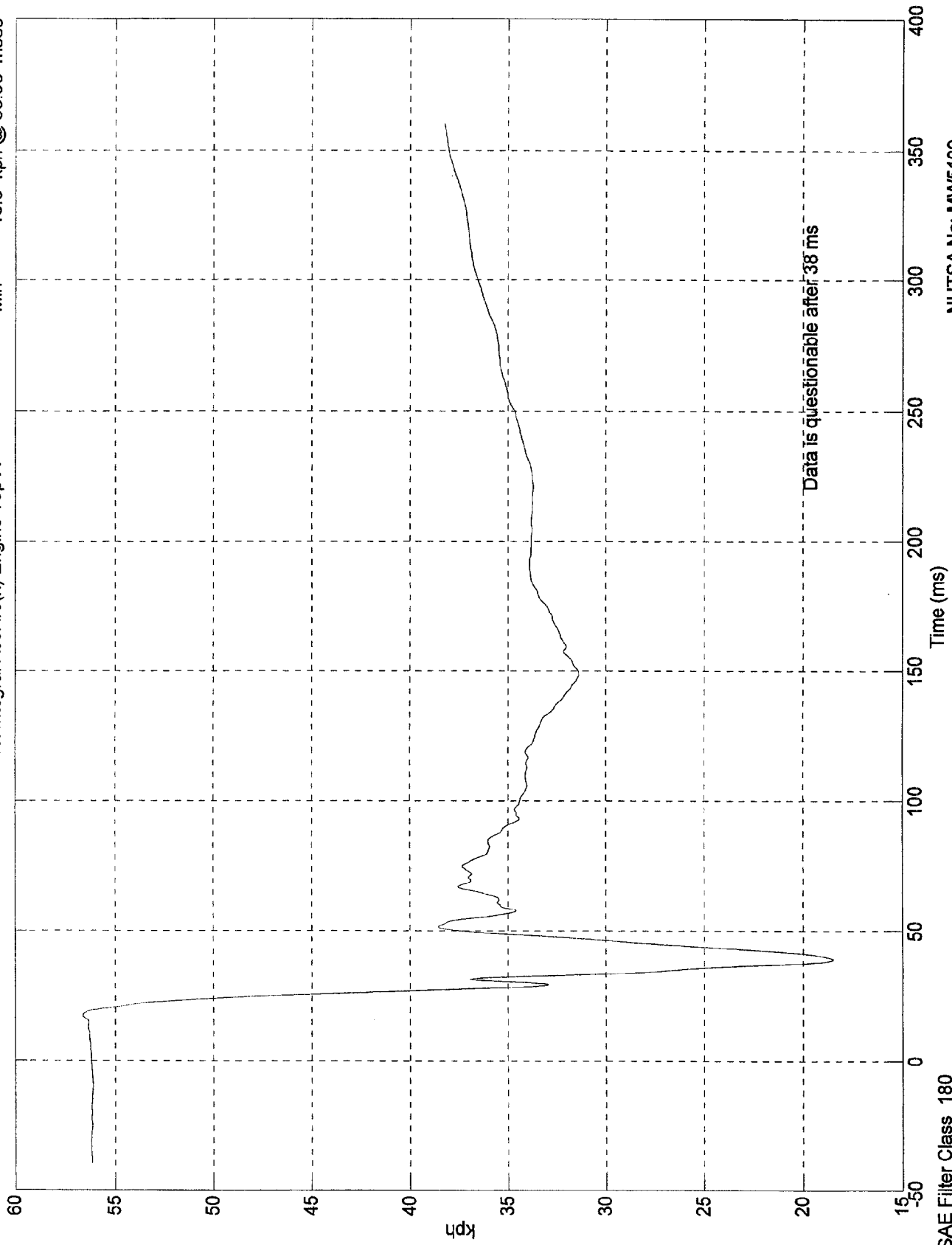
Max = 61.9 Gs @ 44.20 msec
Min = -98.8 Gs @ 25.70 msec



NHTSA No: MW5109
Date: 27 Jan 1998

Max = 56.6 kph @ 17.10 msec
Min = 18.5 kph @ 38.90 msec

1st Integral Acc. #3(x) Engine Top X

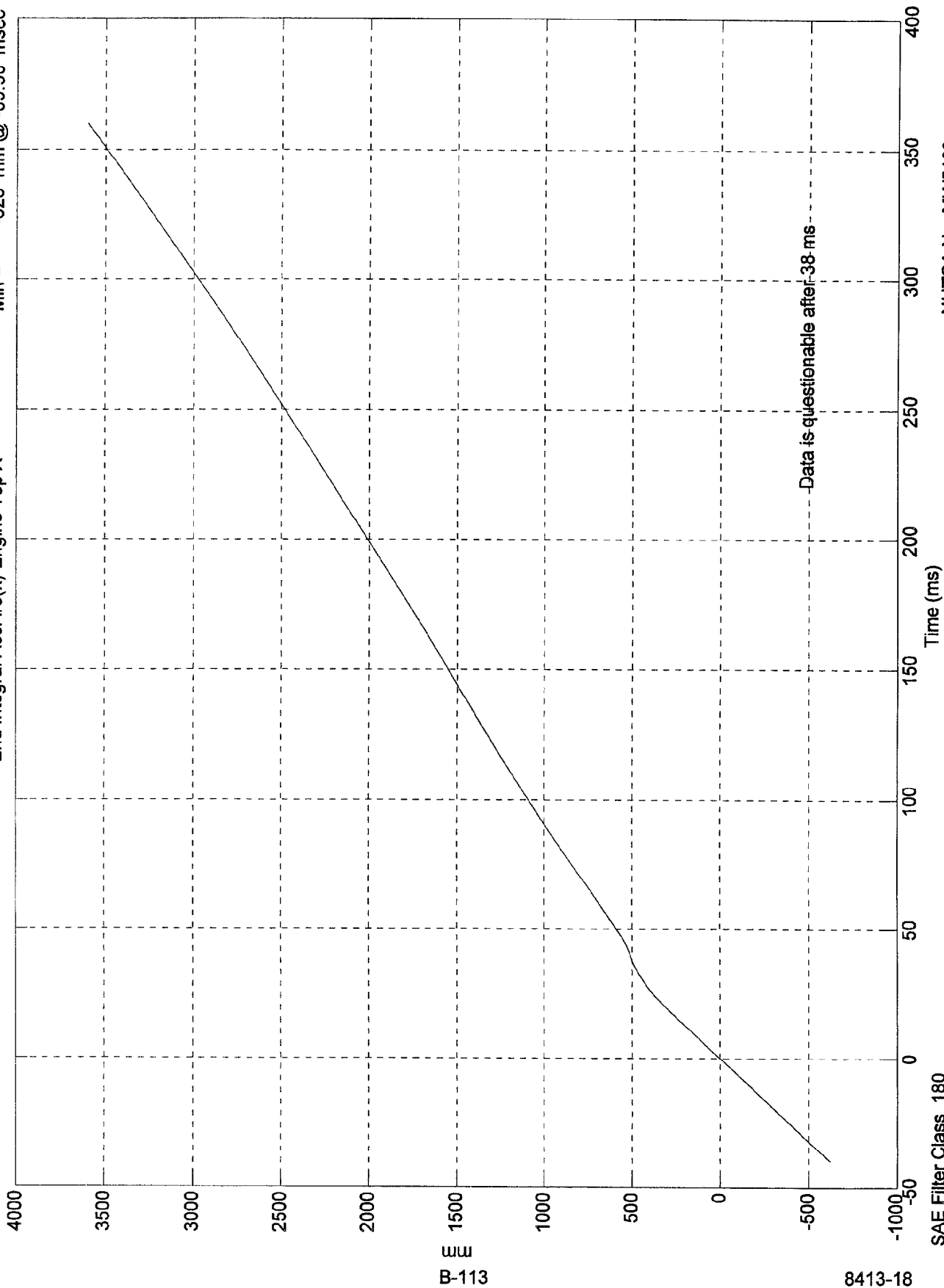


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

2nd Integral Acc. #3(x) Engine Top X

Max = 3.6e+003 mm @ 360.00 msec
Min = -623 mm @ -39.90 msec

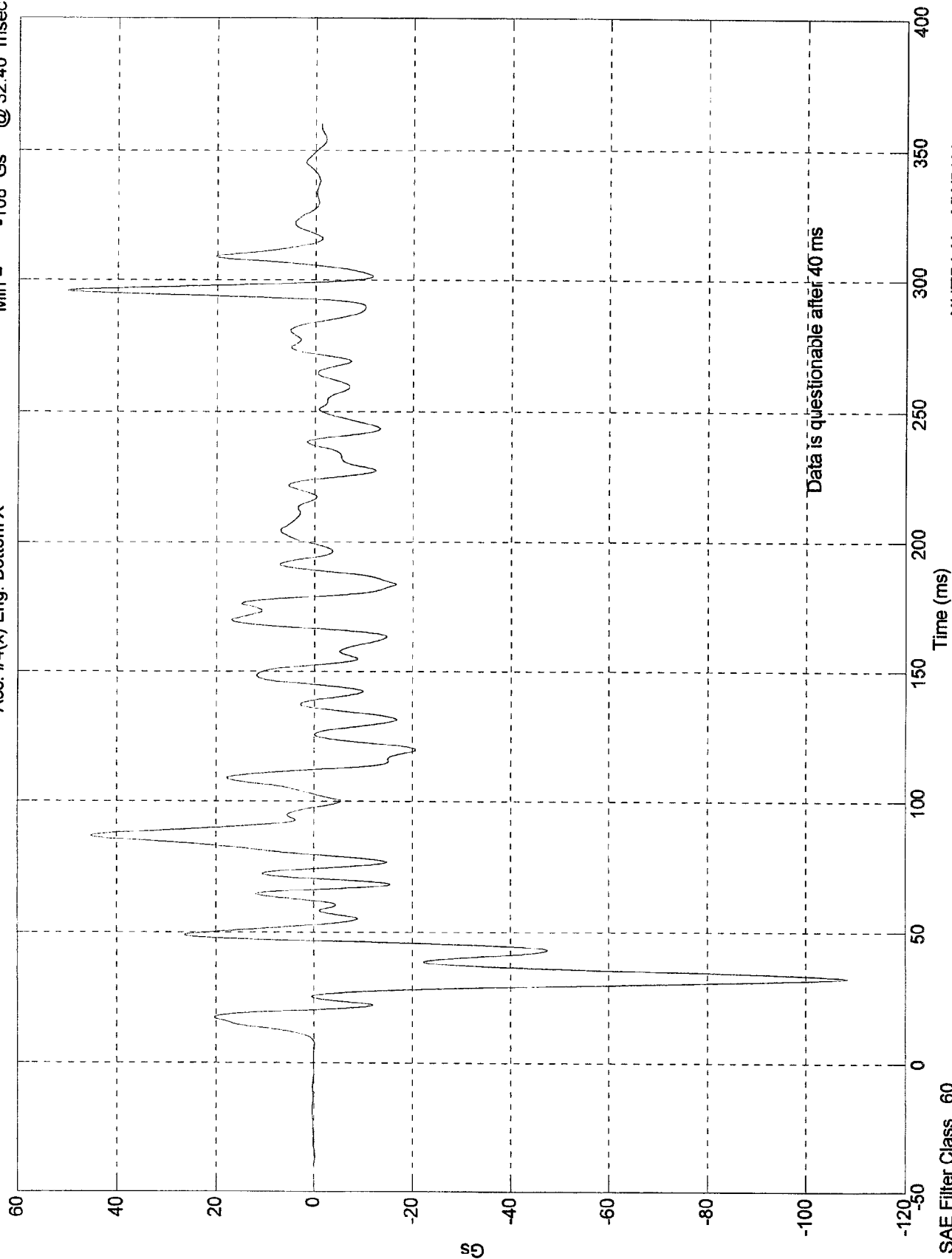


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 50 Gs @ 295.90 msec
Min = -108 Gs @ 32.40 msec

Acc. #4(x) Eng. Bottom X



SAE Filter Class 60

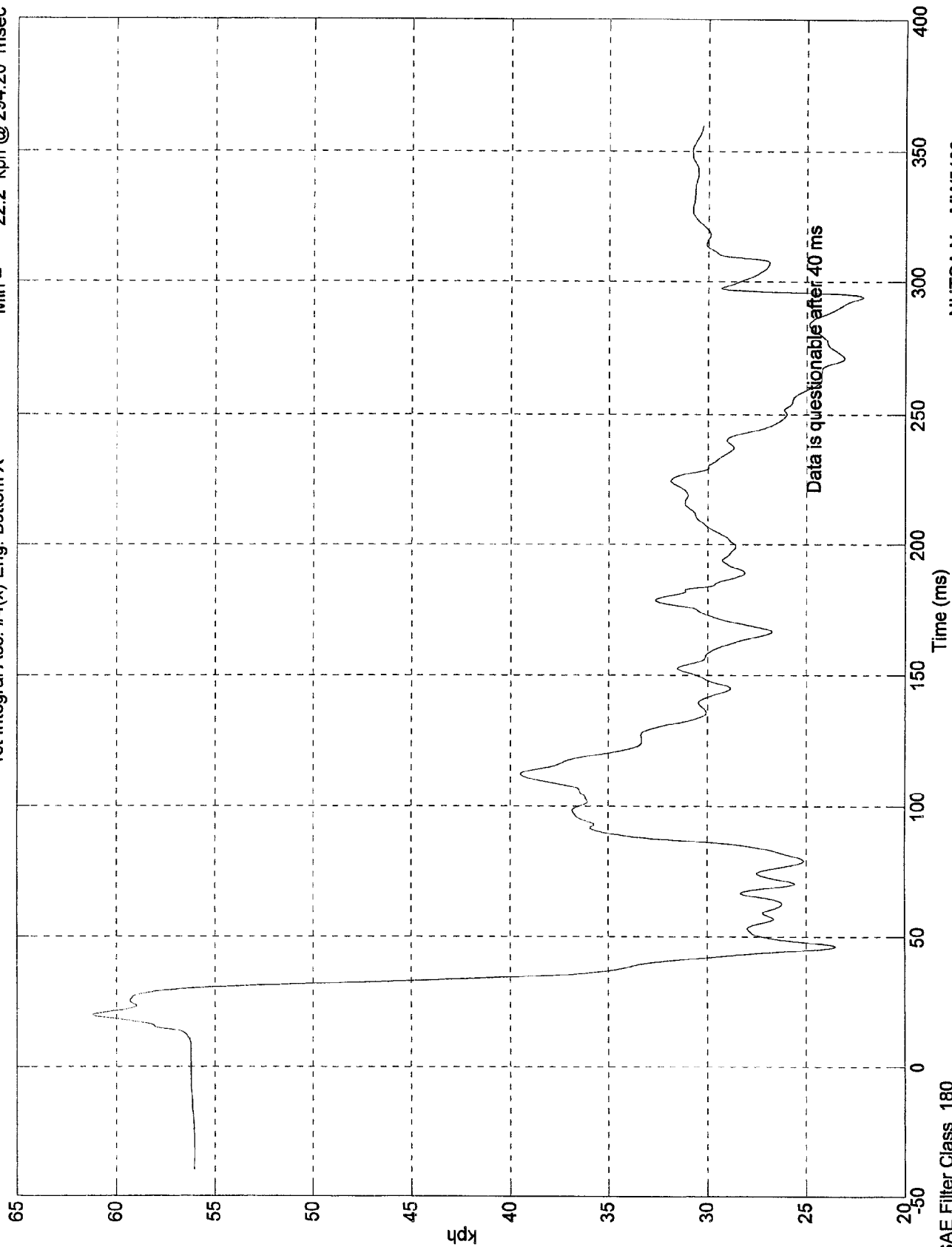
Data is questionable after 40 ms

NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 61.2 kph @ 20.10 msec
Min = 22.2 kph @ 294.20 msec

1st Integral Acc. #4(x) Eng. Bottom X

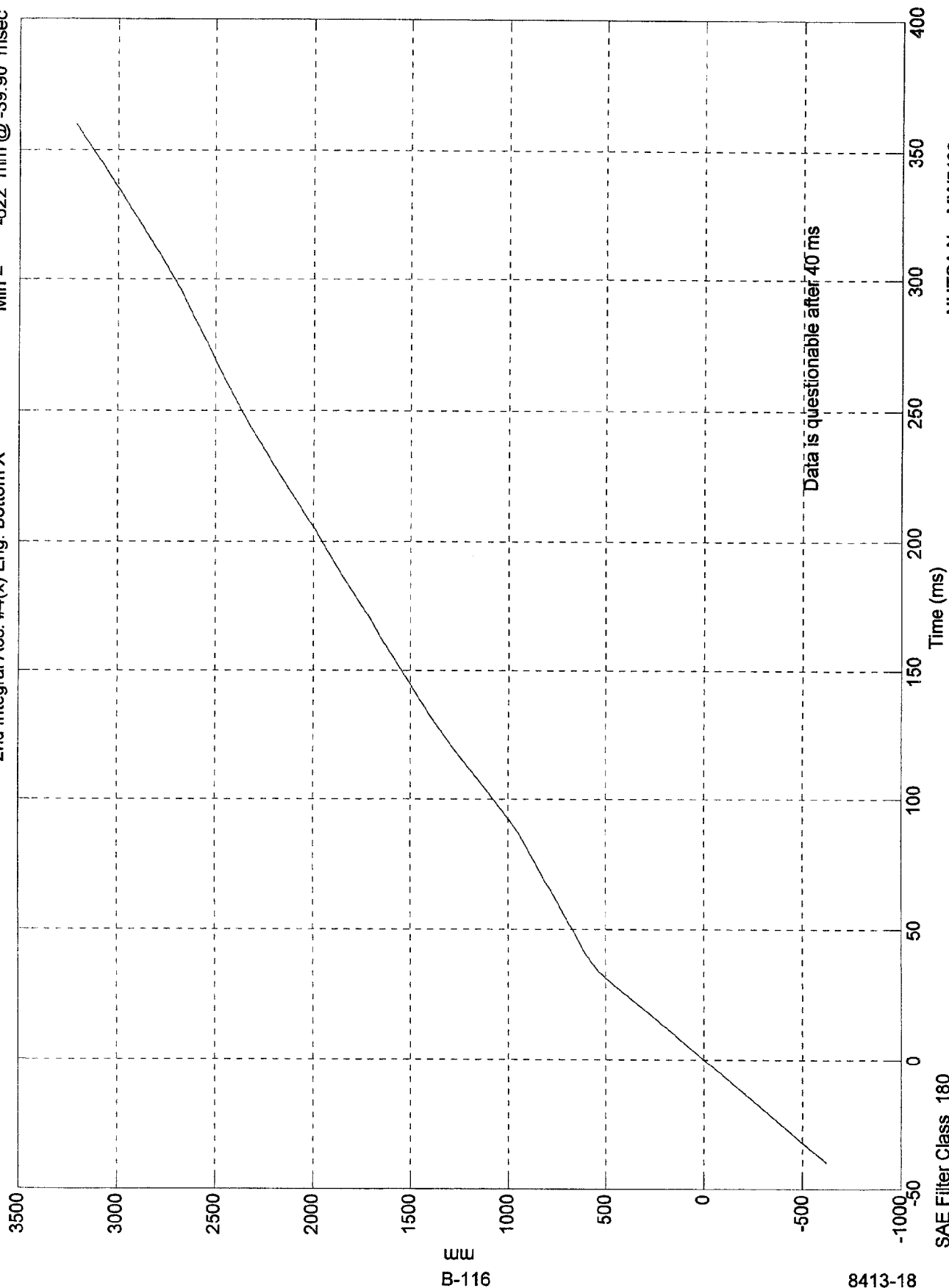


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

2nd Integral Acc. #4(x) Eng. Bottom X

Max = 3.21e+003 mm @ 360.00 msec
Min = -622 mm @ -39.90 msec



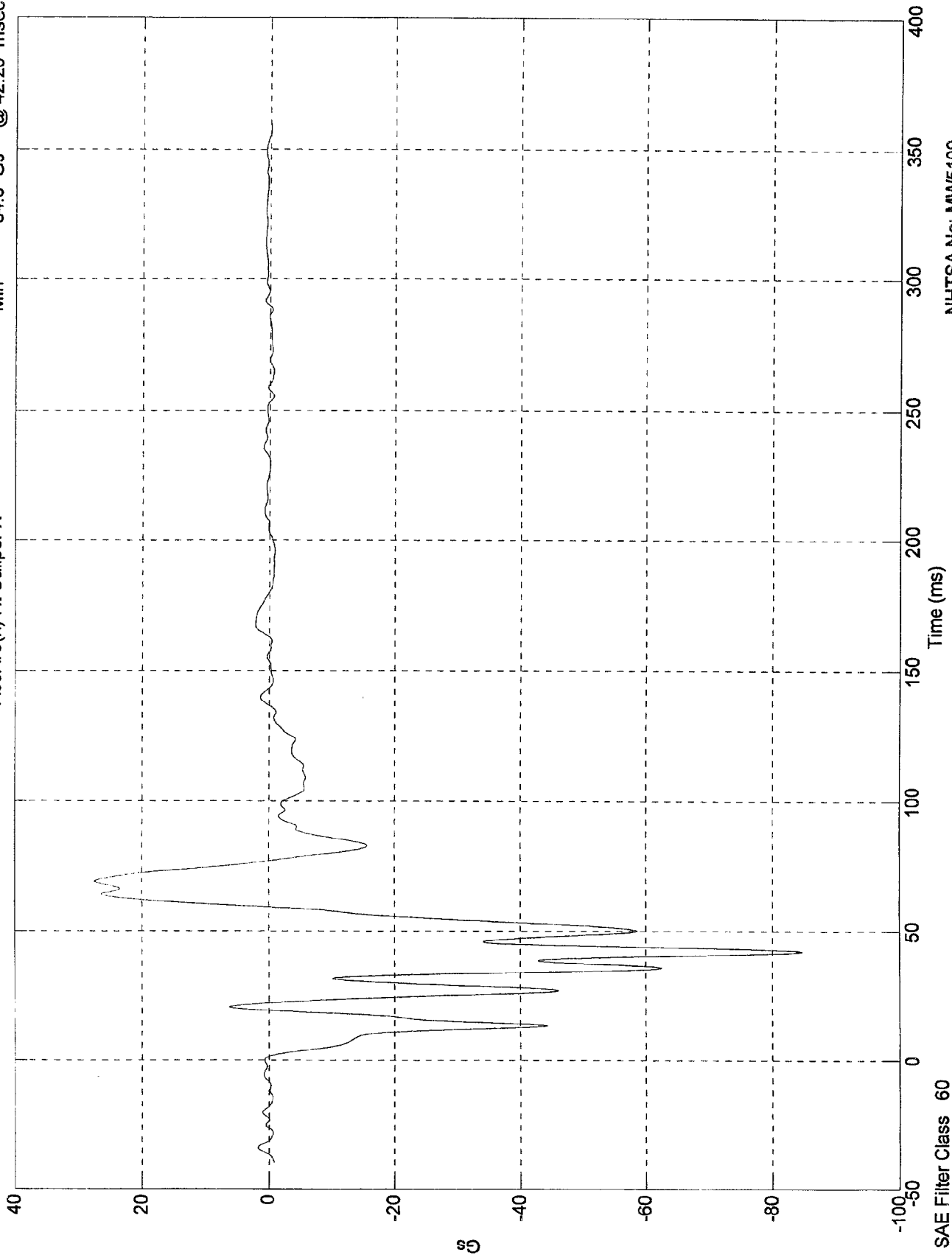
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 27.4 Gs @ 69.10 msec
 Min = -84.6 Gs @ 42.20 msec

Acc. #5(x) Rt Caliper X

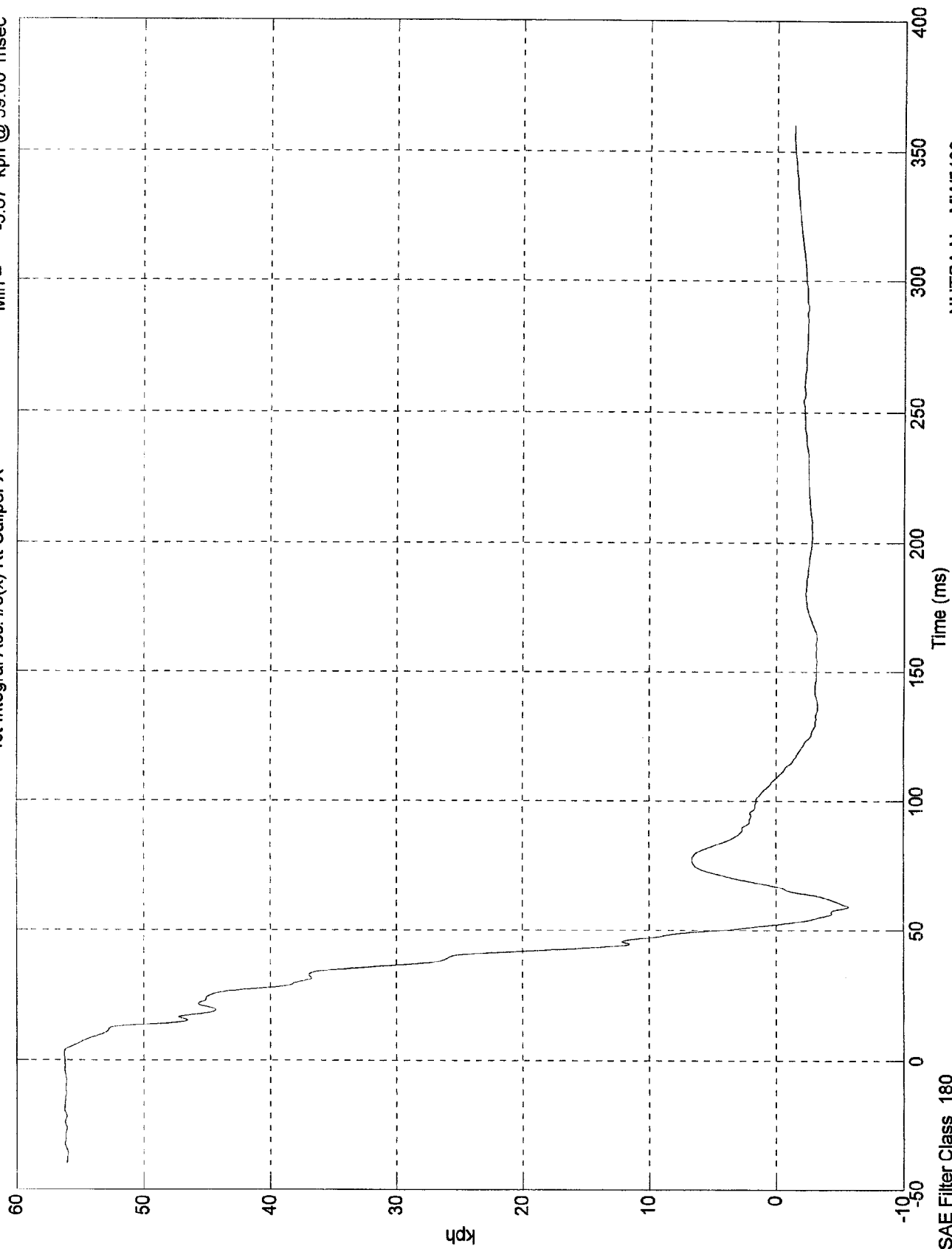


NHTSA No: MW5109
 Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 56.3 kph @ 2.50 msec
Min = -5.67 kph @ 59.00 msec

1st Integral Acc. #5(x) Rt Caliper X

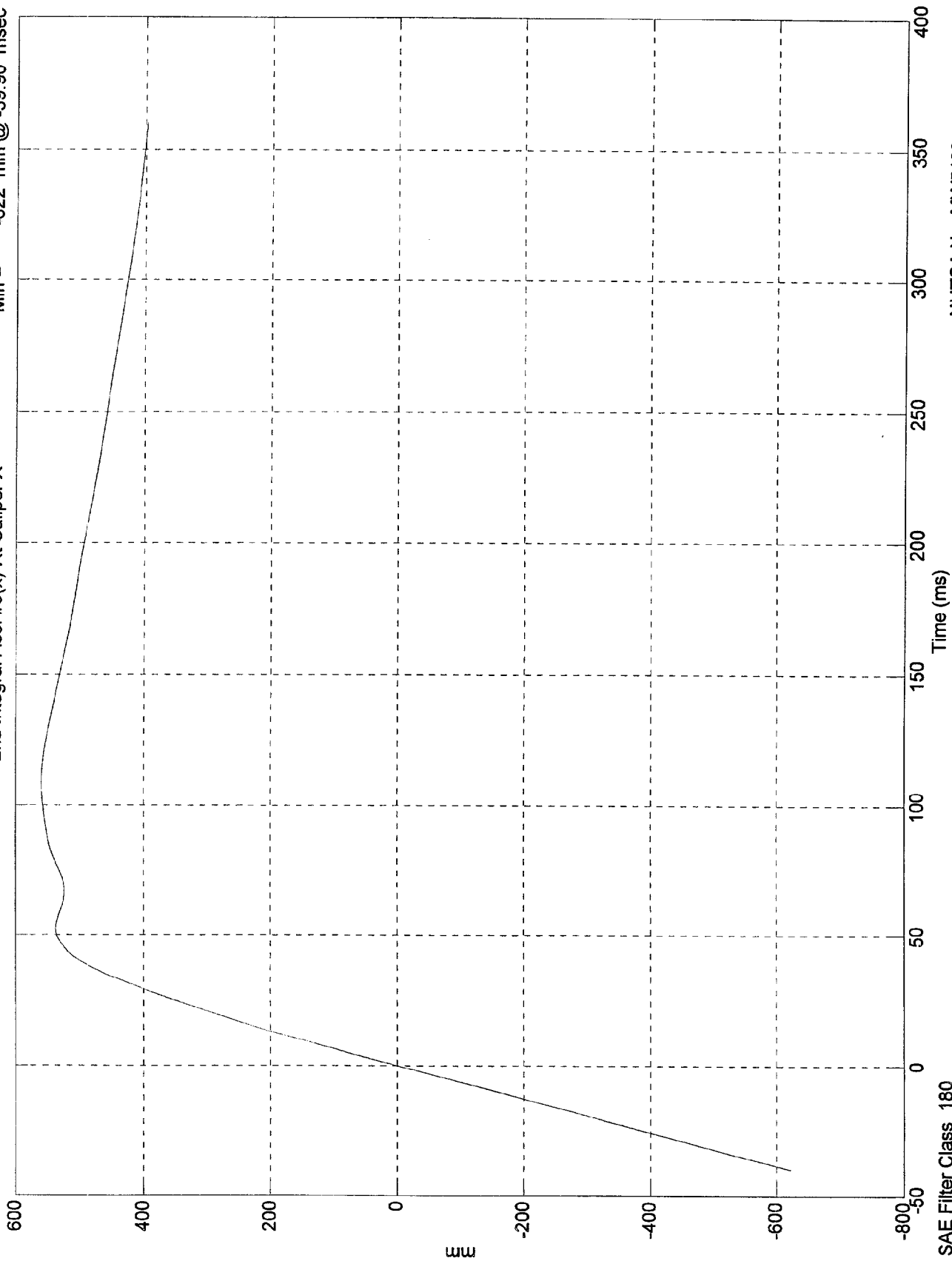


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 559 mm @ 108.90 msec
Min = -622 mm @ -39.90 msec

2nd Integral Acc. #5(x) Rt Caliper X

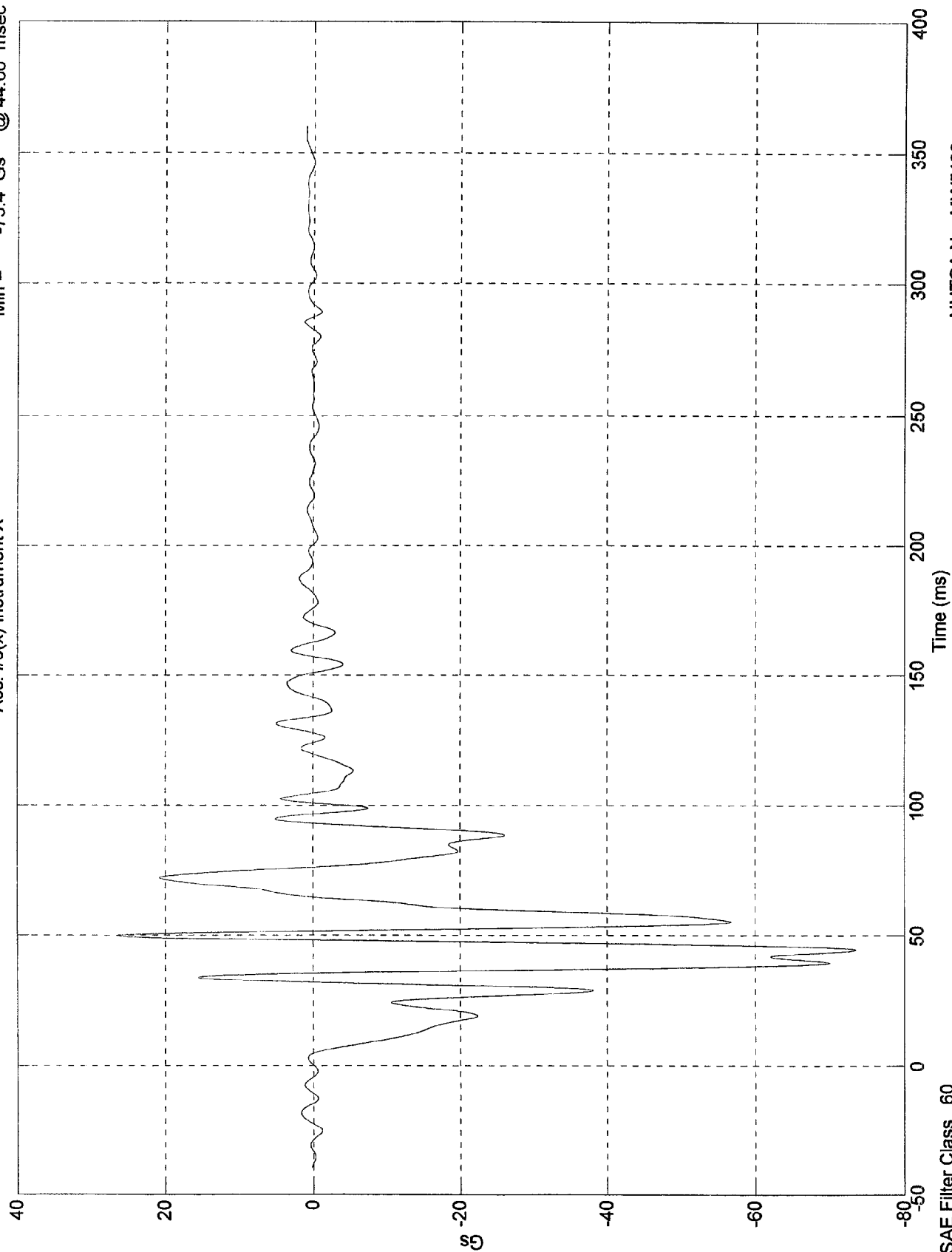


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 26.6 Gs @ 49.70 msec
Min = -73.4 Gs @ 44.60 msec

Acc. #6(x) Instrument X

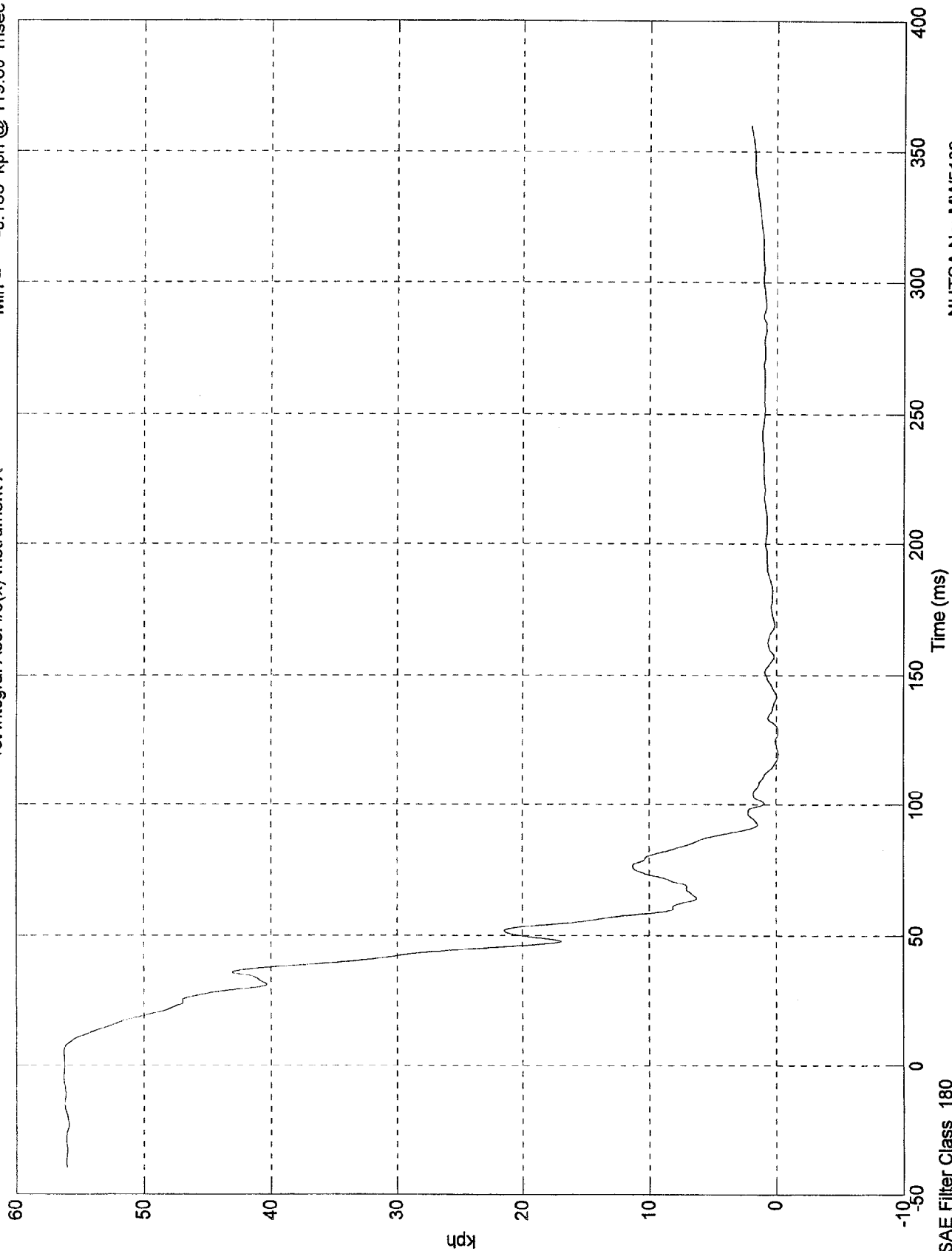


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 56.3 kph @ 4.80 msec
Min = -0.183 kph @ 119.60 msec

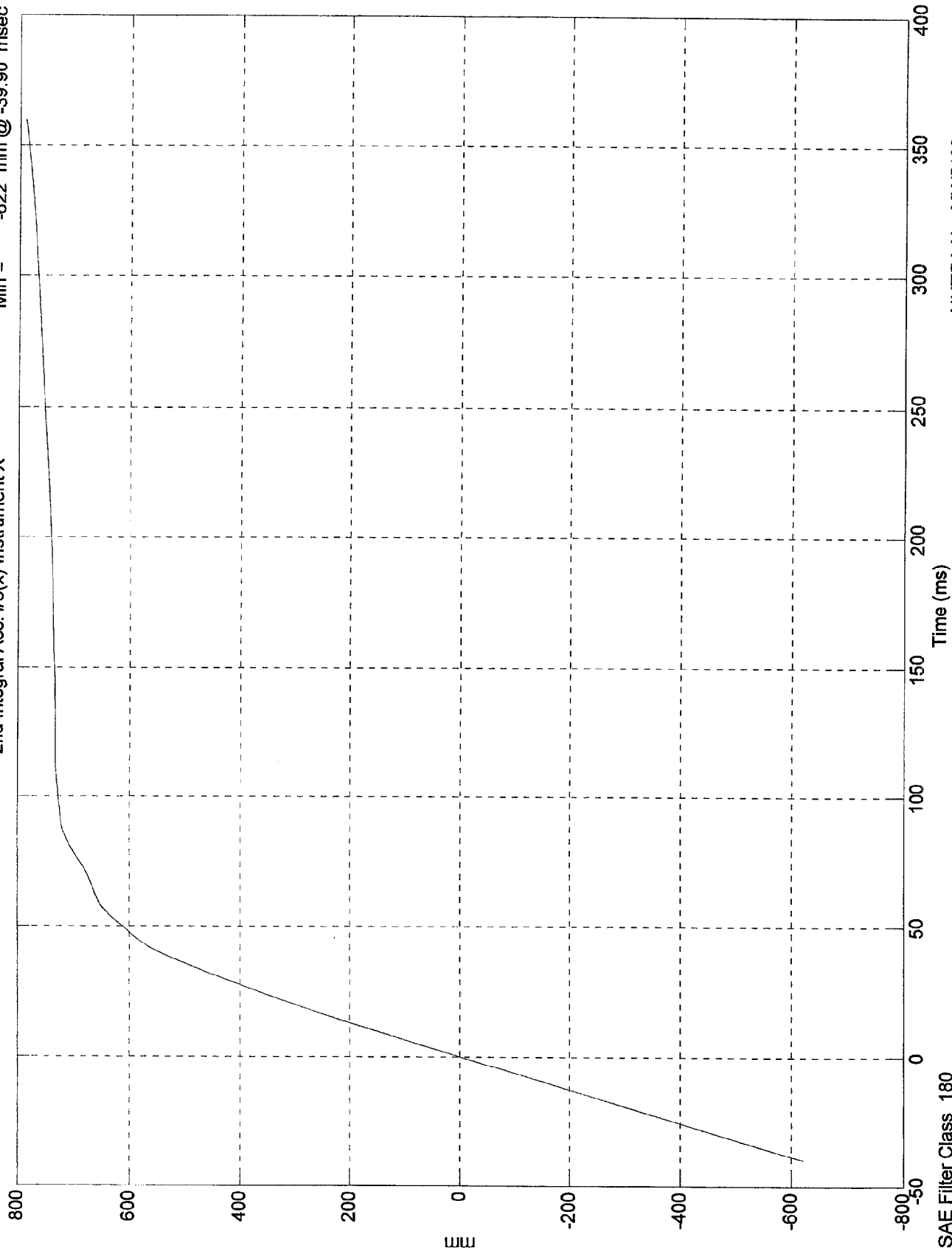
1st Integral Acc. #6(x) Instrument X



NHTSA No: MW5109
Date: 27 Jan 1998

Max = 789 mm @ 360.00 msec
Min = -622 mm @ -39.90 msec

2nd Integral Acc. #6(x) Instrument X



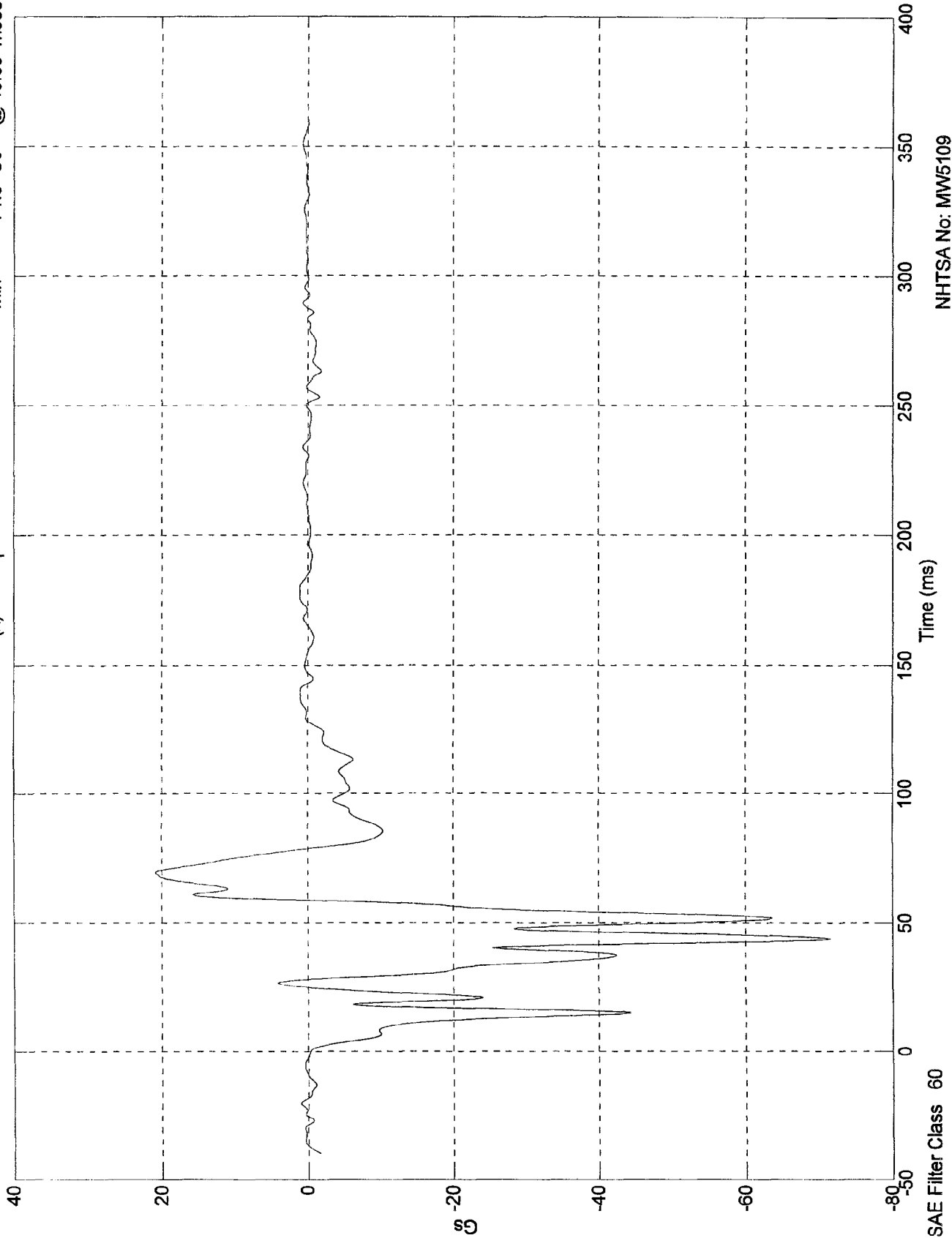
NHTSA No: MW5109
Date: 27 Jan 1998

SAE Filter Class 180

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 20.9 Gs @ 69.40 msec
Min = -71.6 Gs @ 43.80 msec

Acc. #7(x) Lt Caliper X

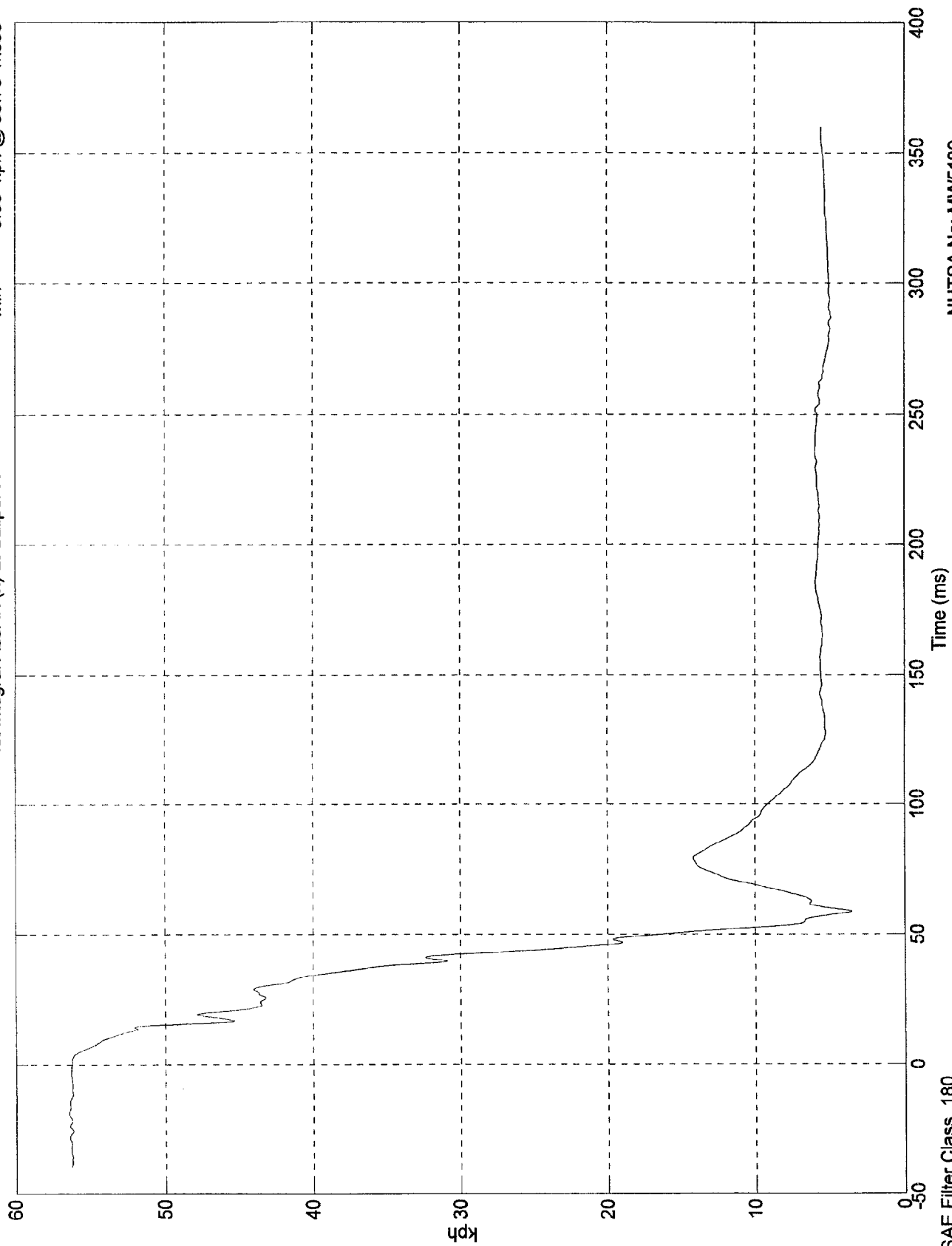


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 56.4 kph @ -19.00 msec
Min = 3.55 kph @ 58.70 msec

1st Integral Acc. #7(x) Lt Caliper X

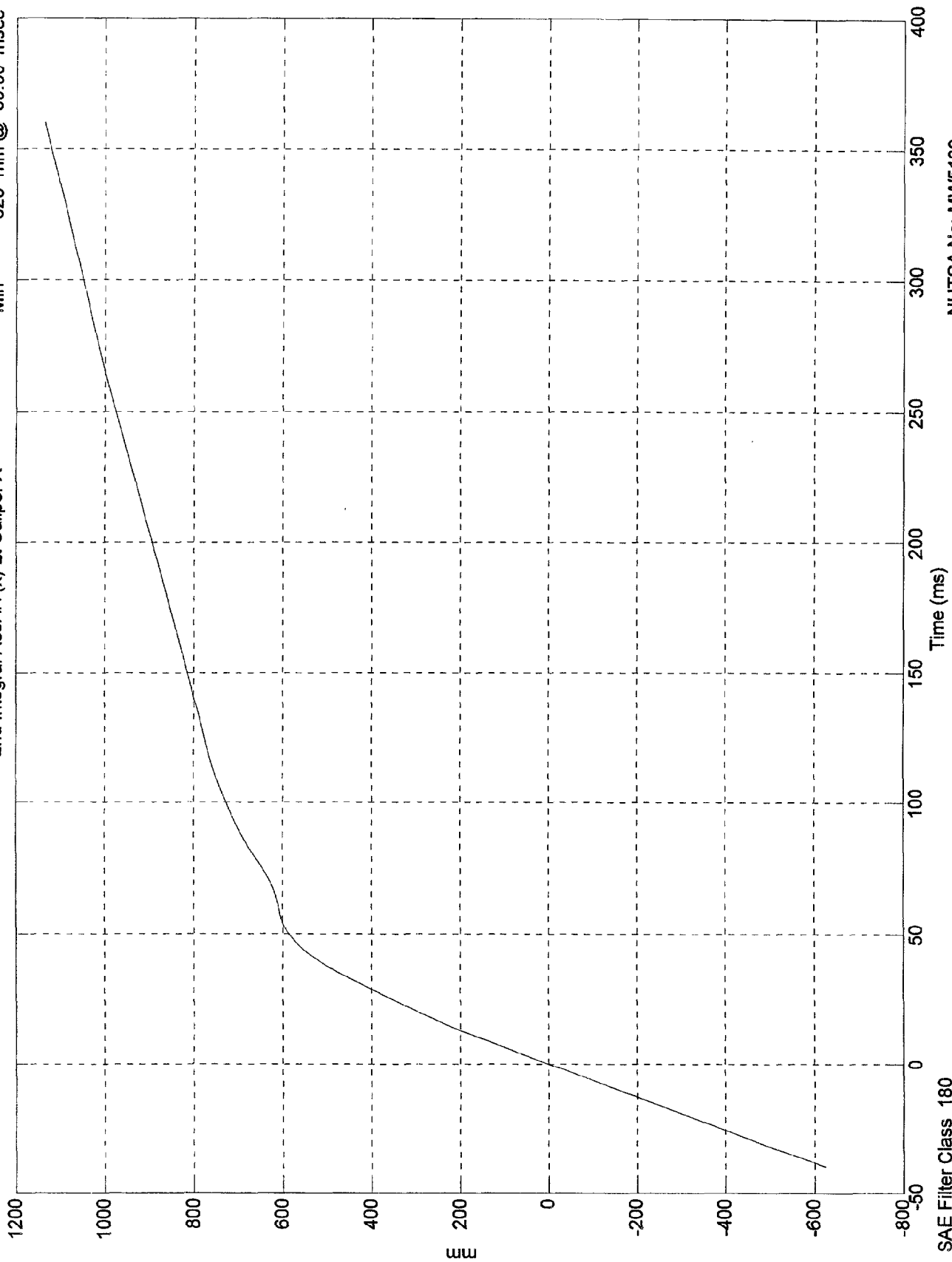


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 1.14e+003 mm @ 360.00 msec
Min = -623 mm @ -39.90 msec

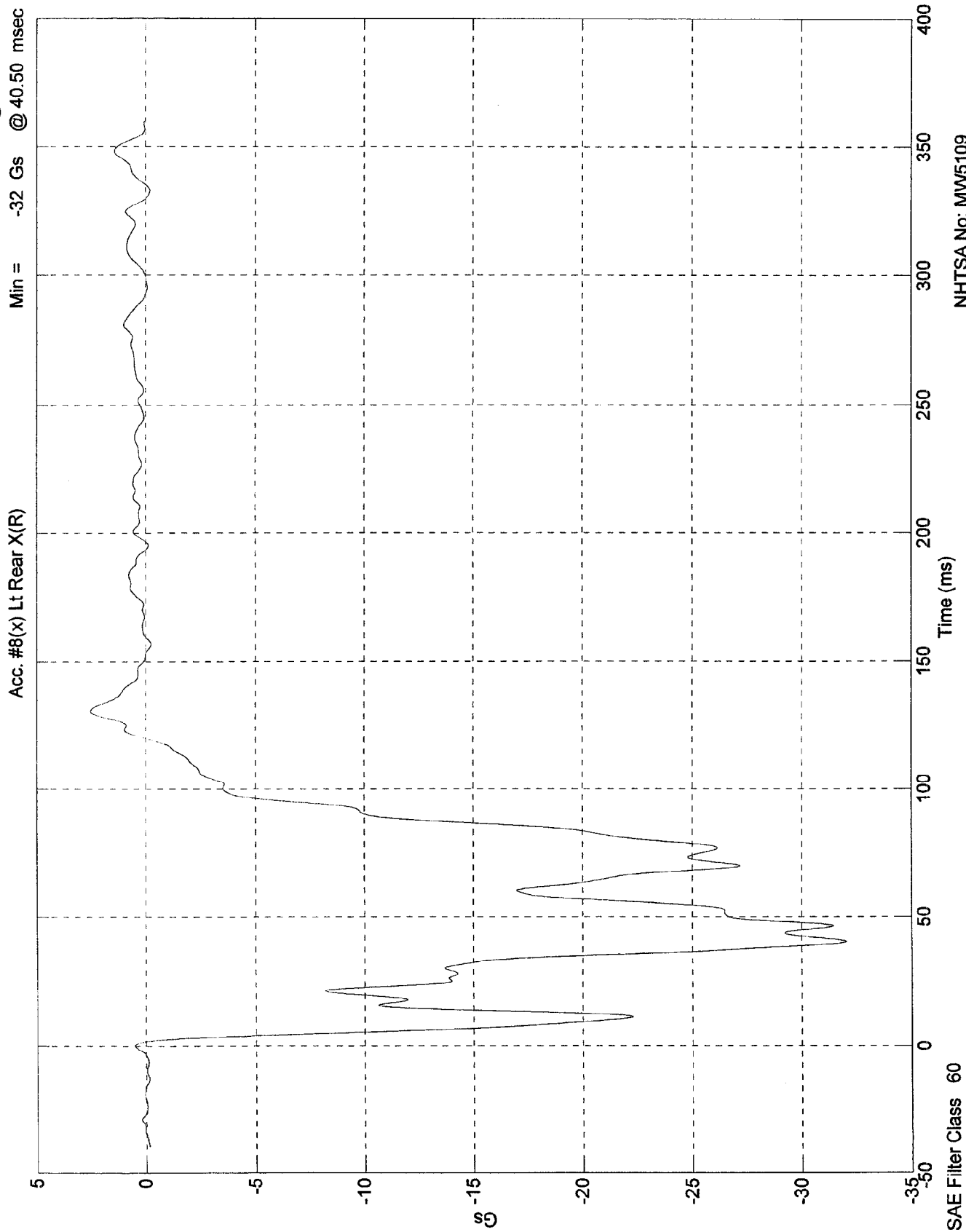
2nd Integral Acc. #7(x) Lt Caliper X



NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.54 Gs @ 130.50 msec
Min = -32 Gs @ 40.50 msec

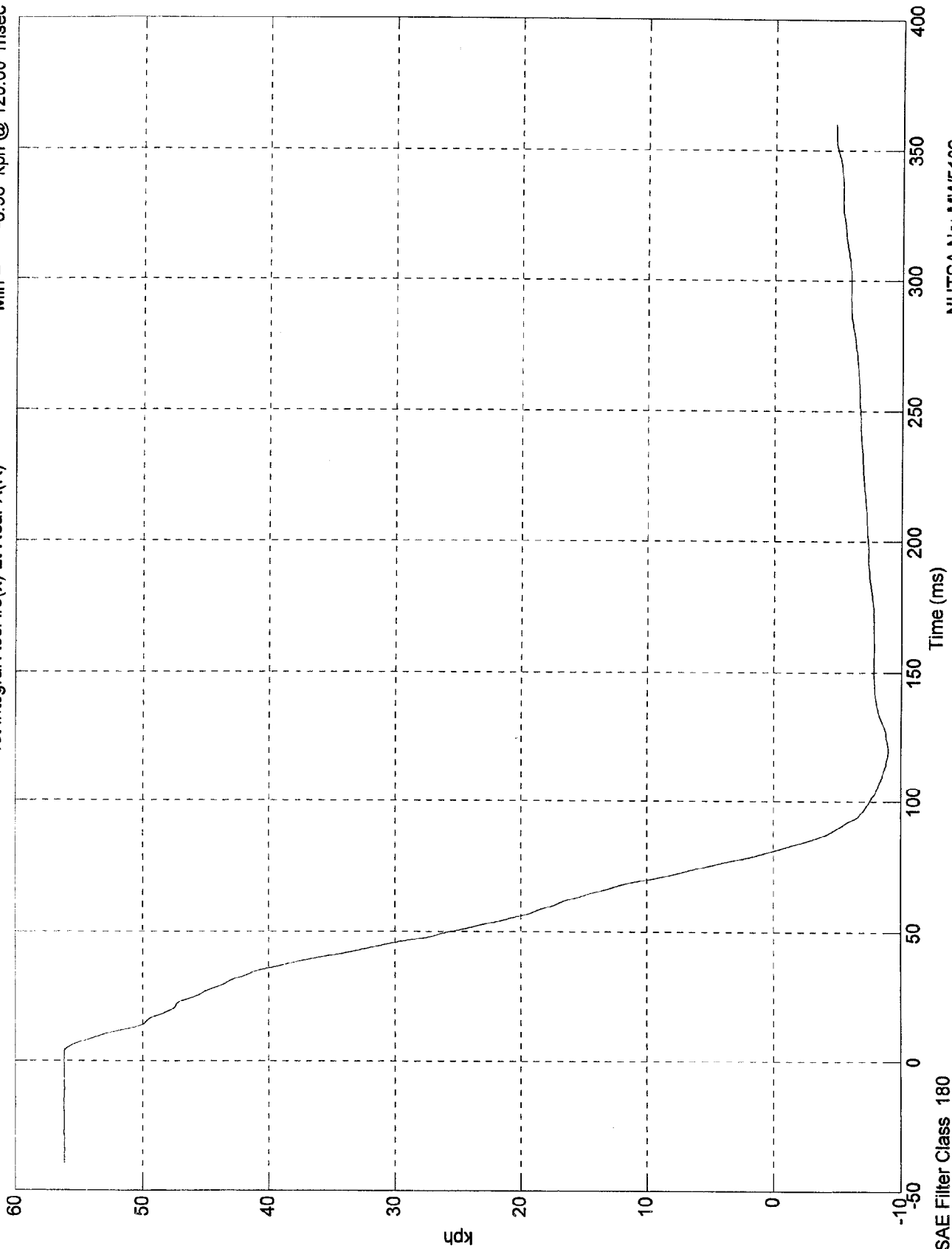


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 56.2 kph @ -27.70 msec
Min = -8.98 kph @ 120.00 msec

1st Integral Acc. #8(x) Lt Rear X(R)

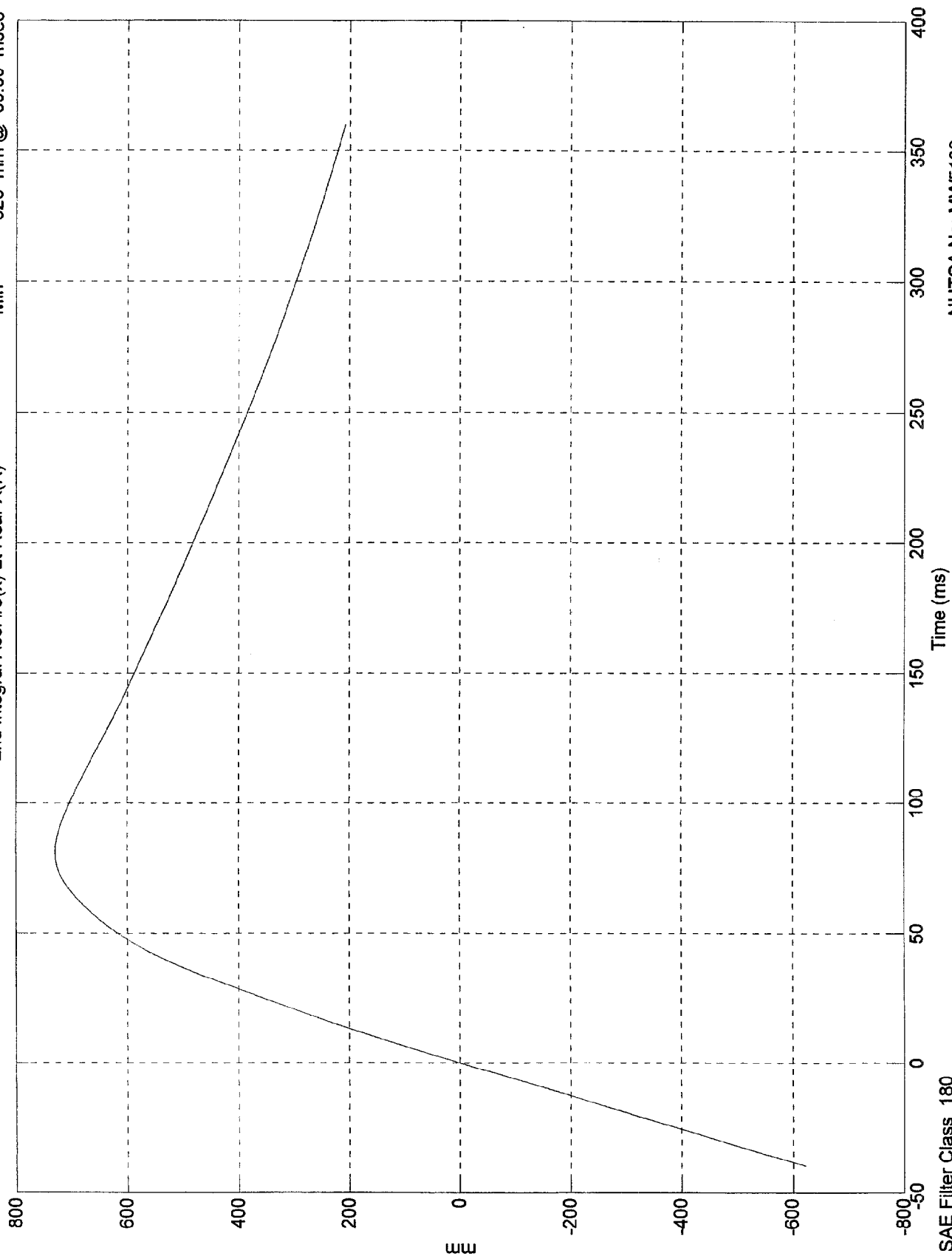


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 730 mm @ 81.10 msec
Min = -623 mm @ -39.90 msec

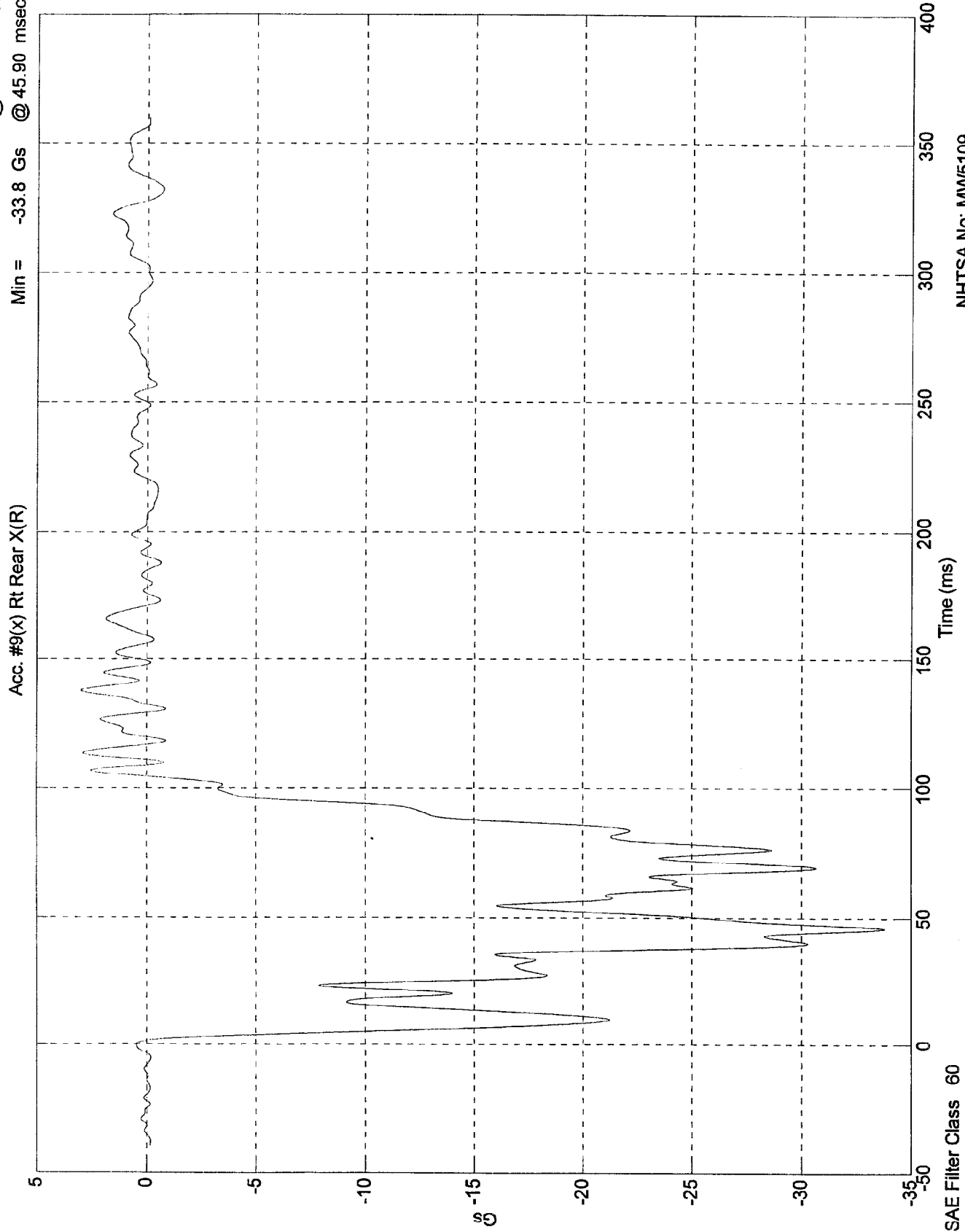
2nd Integral Acc. #8(x) Lt Rear X(R)



NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 2.98 Gs @ 137.50 msec
Min = -33.8 Gs @ 45.90 msec

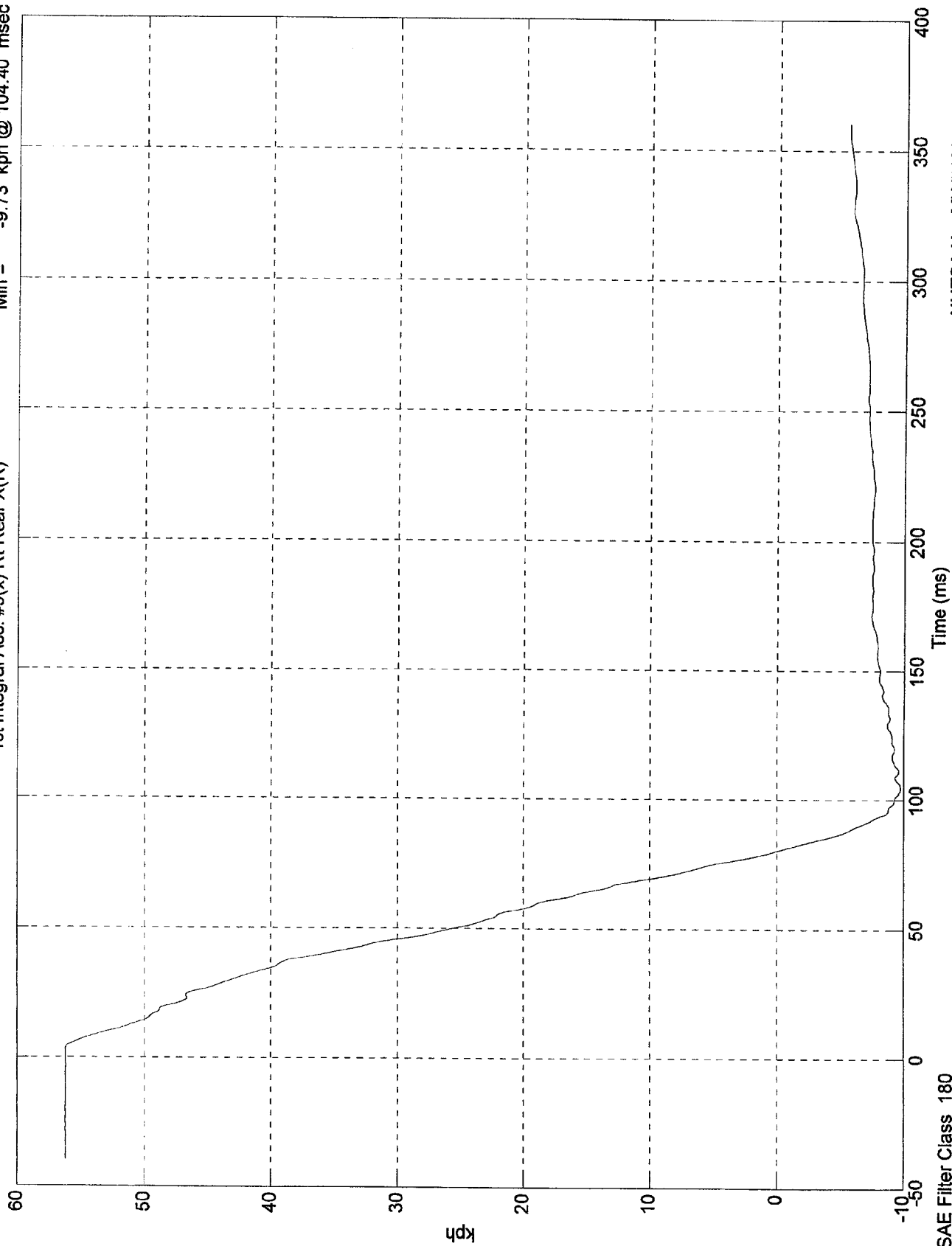


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 56.2 kph @ -24.50 msec
Min = -9.73 kph @ 104.40 msec

1st Integral Acc. #9(x) Rt Rear X(R)

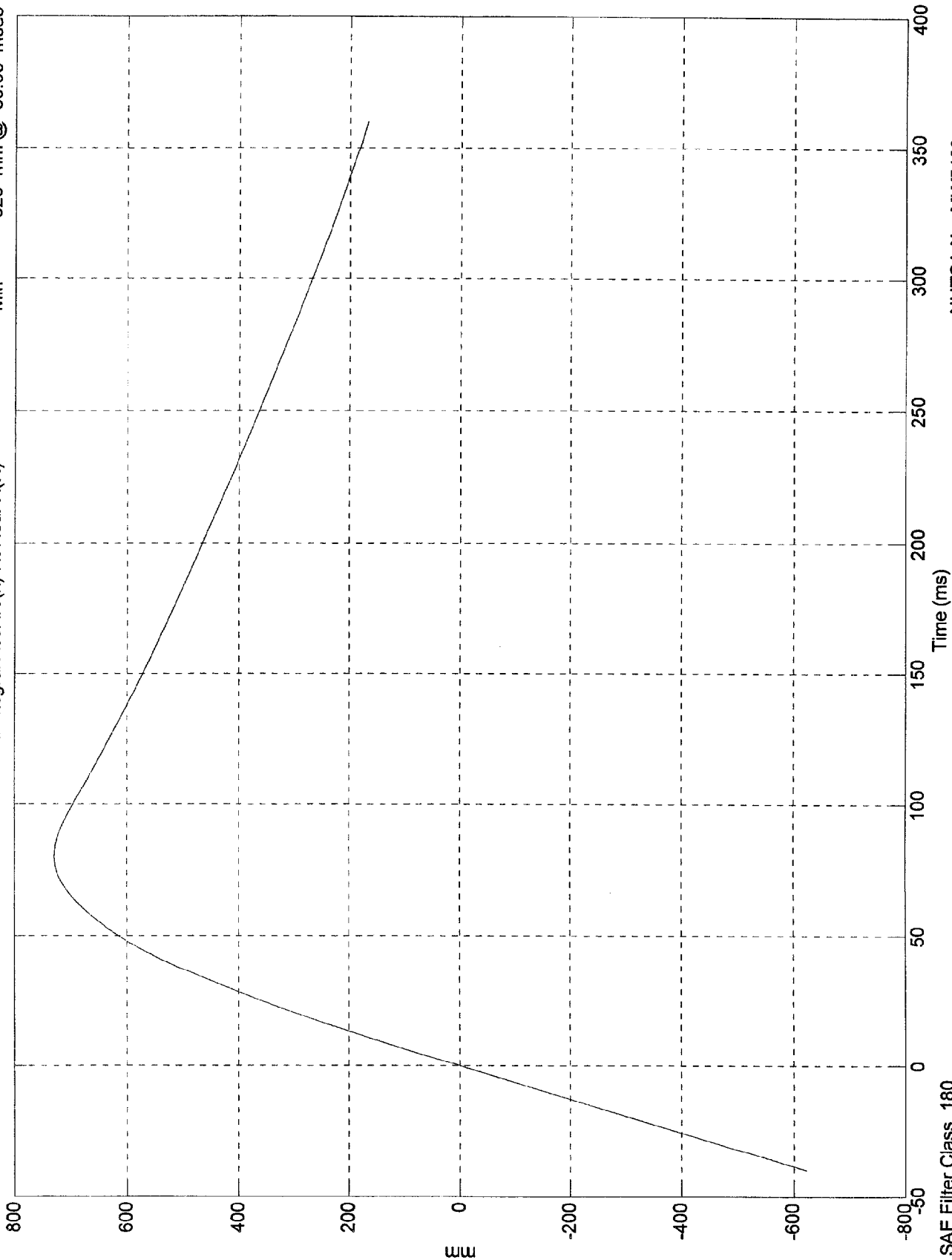


NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 729 mm @ 80.30 msec
Min = -623 mm @ -39.90 msec

2nd Integral Acc. #9(x) Rt Rear X(R)

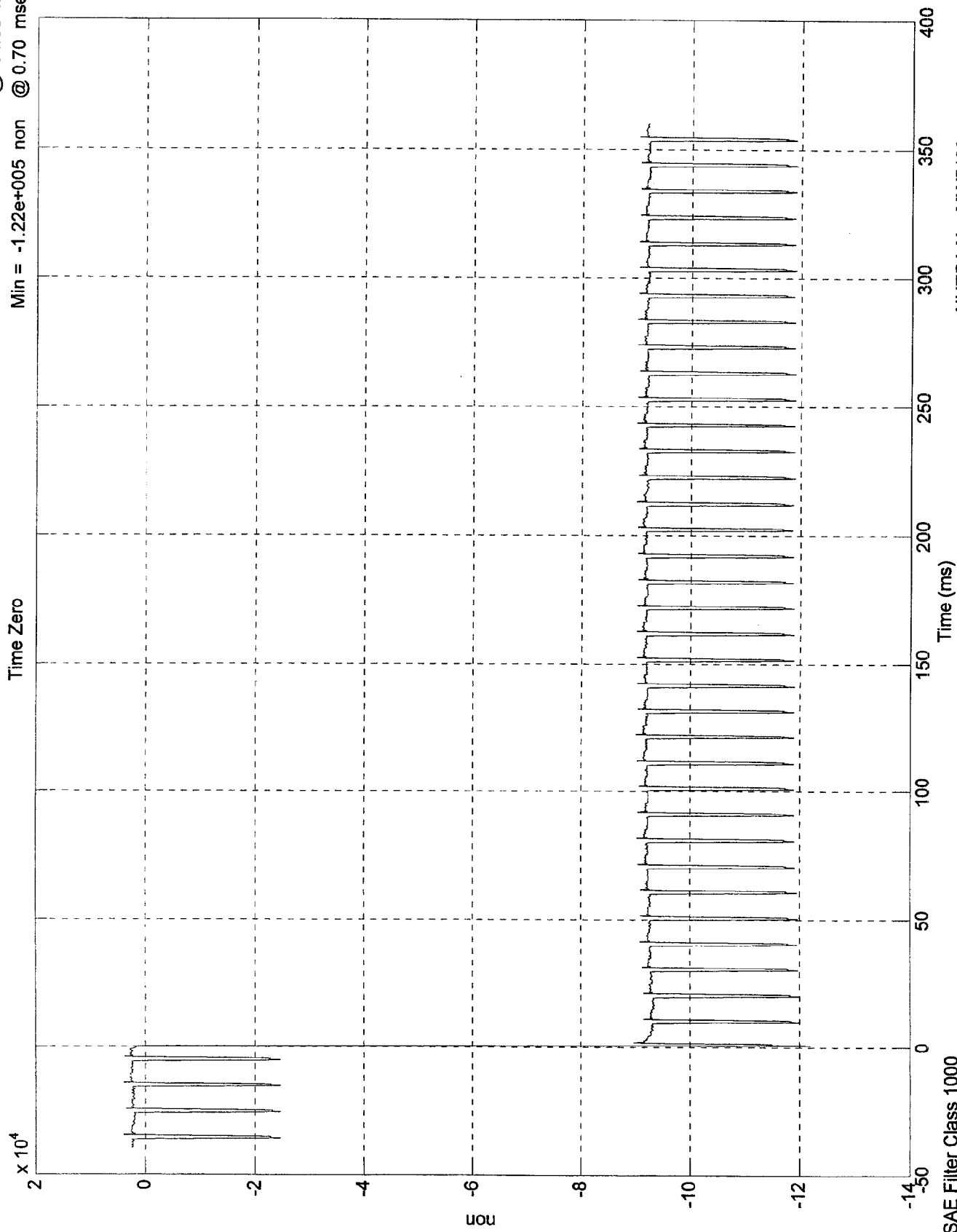


SAE Filter Class 180

NHTSA No: MW5109
Date: 27 Jan 1998

NCAP TEST #18 - 1998 TOYOTA SIENNA

Max = 3.84e+003 non @ -34.50 msec
 Min = -1.22e+005 non @ 0.70 msec



NHTSA No: MW5109
 Date: 28 Jan 1998

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. A summary of the test results, and Part 572 specifications are included in this Appendix.

Dummy serial numbers and certification dates are:

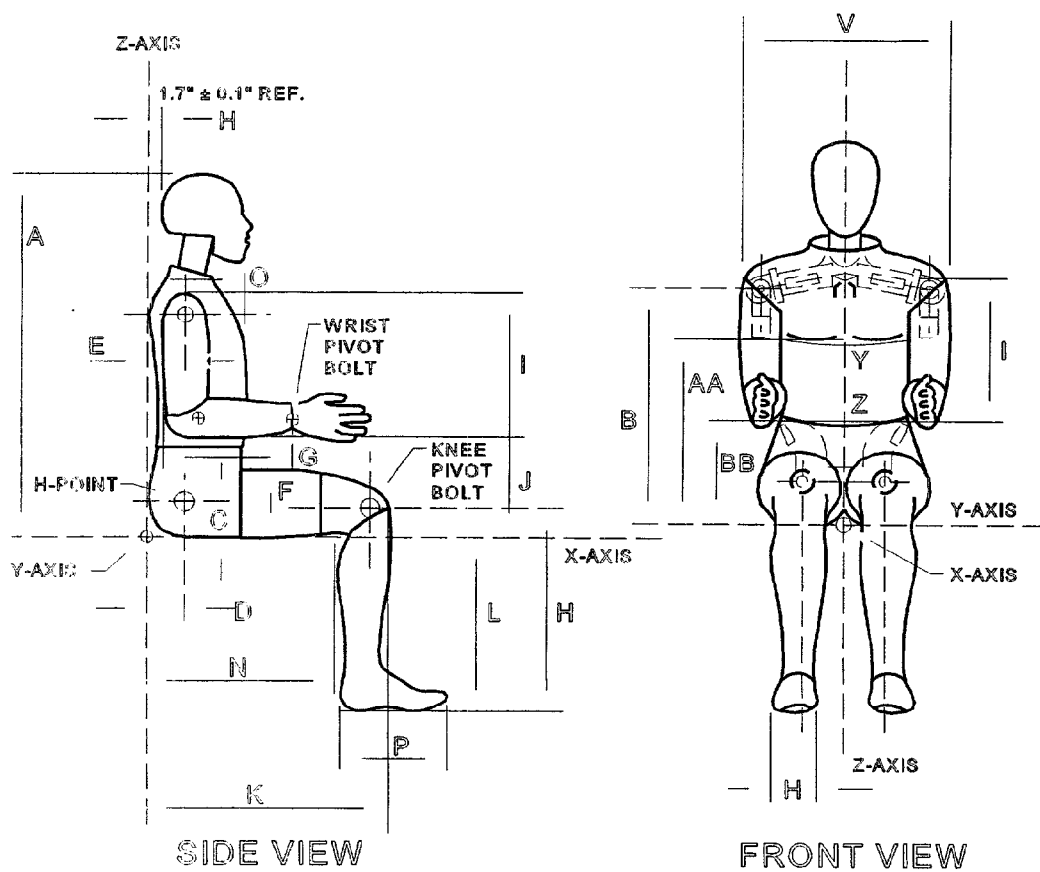
<u>Position No./Location</u>	<u>Serial No.</u>	<u>Completion Date</u>
#1/Driver	061	1/21/98
#2/Right Front Passenger	245	1/21/98

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.

DUMMY CONFIGURATION DIMENSIONS

EXTERNAL DIMENSIONS SPECIFICATIONS



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.
(REF: S572.31(A)(6))

PART 572E
HEAD DROP TEST

Dummy Serial Number 061
Calspan Sequential Test Number 1
Date 01/16/98
Workfile 061198.hdp

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	34
Peak Resultant Acceleration	225-275 G's	259.7
Peak Lateral Acceleration	15 G's Max	11.4
Is Acceleration Curve Unimodal?	YES	YES

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number 061
 Calspan Sequential Test Number 1
 Date 01/19/98
 Workfile 061198.nfl

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	40
Impact Velocity		22.60 - 23.40 Ft/s	23.00
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	23.40
	20 ms	17.60 - 22.60 G's	19.94
	30 ms	12.50 - 18.50 G's	16.46
Max Pendulum G's Above 30 ms		29 G's Max	16.46
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	42.00
D Plane Rotation	Max	64 - 78 Deg	66.51
	Time	57 - 64 ms	57.75
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	65.10
	Time	47 - 58 ms	54.13
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	119.25
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	98.63

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number 061
Calspan Sequential Test Number 1
Date 01/19/98
Workfile 061198.nex

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	40
Impact Velocity		19.50 - 20.30 Ft/s	19.90
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	17.51
	20 ms	14.00 - 19.00 G's	16.23
	30 ms	11.00 - 16.00 G's	14.02
Max Pendulum G's Above 30 ms		22 G's Max	14.02
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	45.38
D Plane Rotation	Max	81 - 106 Deg	88.93
	Time	72 - 82 ms	78.00
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs	-40.58
	Time	65 - 79 ms	71.88
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	159.38
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	137.88

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 061
Calspan Sequential Test Number 1
Date 01/19/98
Workfile 061198.th3

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70
Relative Humidity	10% - 70%	40
Pendulum Velocity	21.6 - 22.4 Ft/s	21.61
Maximum Deflection	2.50 - 2.86 in	2.50
Maximum Resistive Force	1160 - 1325 Lbs	1309.04
Internal Hysteresis	69 - 85 %	71.8

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
KNEE IMPACT TEST

Dummy Serial Number 061
Calspan Sequential Test Number 1
Date 01/21/98
Workfile 061198

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66 - 78 Deg F	70
Relative Humidity	10% - 70%	40
Probe Velocity	6.8 - 7.0 Ft/s	6.90
Peak Knee Impact Force	1060 - 1300 Lbs	1286.0
RIGHT KNEE		
Temperature	66 - 78 Deg F	70
Relative Humidity	10% - 70%	40
Probe Velocity	6.8 - 7.0 Ft/s	6.91
Peak Knee Impact Force	1060 - 1300 Lbs	1140.0

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
EXTERNAL DIMENSIONS

Dummy Serial Number 061
Calspan Sequential Test Number 1
Date 01-19-98

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			40
Location for Chest Circumference	AA	16.9 - 17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.1 in	9.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	39.4
Waist Circumference	Z	32.9 - 34.1 in	33.5
Chest Depth	O	8.4 - 9.0 in	8.5
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Total Sitting Height	A	34.6 - 35.0 in	34.6
Thigh Clearance	F	5.5 - 6.1 in	6.1
Buttock Knee Length	K	22.8 - 23.8 in	23.2
Buttock Popliteal Length	N	17.8 - 18.8 in	18.3
Popliteal Height	L	16.9 - 17.9 in	17.7
Knee Pivot Height	M	19.1 - 19.7 in	19.4
Foot Length	P	9.9 - 10.5 in	10.1
Foot Breadth	W	3.6 - 4.2 in	3.8
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.5
Shoulder Breadth	V	16.6 - 17.2 in	16.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.1
Elbow Rest Height	J	7.5 - 8.3 in	7.7
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.4
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.6

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
HEAD DROP TEST

Dummy Serial Number 245
Calspan Sequential Test Number 1
Date 01/16/98
Workfile 245198.hdp

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	66-78 Deg F	70
Relative Humidity	10% - 70%	33
Peak Resultant Acceleration	225-275 G's	260.9
Peak Lateral Acceleration	15 G's Max	11.4
Is Acceleration Curve Unimodal?	YES	YES

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK FLEXION TEST

Dummy Serial Number 245
 Calspan Sequential Test Number 1
 Date 01/19/98
 Workfile 245198.nfl

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70%	40
Impact Velocity		22.60 - 23.40 Ft/s	23.00
Pendulum Deceleration	10 ms	22.50 - 27.50 G's	23.66
	20 ms	17.60 - 22.60 G's	20.53
	30 ms	12.50 - 18.50 G's	17.56
Max Pendulum G's Above 30 ms		29 G's Max	17.56
Deceleration - Time Curve Decay Time to 5 G's		34 - 42 ms	39.13
D Plane Rotation	Max	64 - 78 Deg	66.12
	Time	57 - 64 ms	58.88
Moment About Occipital Condyle	Max	65 - 80 Ft-Lbs	66.03
	Time	47 - 58 ms	51.75
Rotation Angle - Time Curve Decay Time to Zero		113 - 128 ms	117.88
Positive Moment - Time Curve Decay Time to Zero		97 - 107 ms	97.75

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
NECK EXTENSION TEST

Dummy Serial Number 245
 Calspan Sequential Test Number 1
 Date 01/16/98
 Workfile 245198.nex

6 Axis Neck Transducer

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature		69-72 Deg F	70
Relative Humidity		10% - 70 %	34
Impact Velocity		19.50 - 20.30 Ft/s	19.90
Pendulum Deceleration	10 ms	17.20 - 21.20 G's	18.68
	20 ms	14.00 - 19.00 G's	17.03
	30 ms	11.00 - 16.00 G's	14.47
Max Pendulum G's Above 30 ms		22 G's Max	14.47
Deceleration - Time Curve Decay Time to 5 G's		38 - 46 ms	42.13
D Plane Rotation	Max	81 - 106 Deg	90.10
	Time	72 - 82 ms	76.63
Moment About Occipital Condyle	Max	-59.0 - -39.0 Ft-Lbs	-44.32
	Time	65 - 79 ms	71.63
Rotation Angle - Time Curve Decay Time to Zero		147 - 174 ms	156.75
Positive Moment - Time Curve Decay Time to Zero		120 - 148 ms	137.75

Remarks:

Laboratory Technician: B. Swiecicki

PART 572E
THORAX IMPACT TEST

Dummy Serial Number 245
Calspan Sequential Test Number 1
Date 01/20/98
Workfile 245198.th3

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature	69-72 Deg F	70
Relative Humidity	10% - 70%	40
Pendulum Velocity	21.6 - 22.4 Ft/s	21.63
Maximum Deflection	2.50 - 2.86 in	2.55
Maximum Resistive Force	1160 - 1325 Lbs	1279.49
Internal Hysteresis	69 - 85 %	73.8

Remarks:

Laboratory Technician: B. Swiecicki

**PART 572E
KNEE IMPACT TEST**

Dummy Serial Number 245
Calspan Sequential Test Number 1
Date 01/21/98
Workfile 245198

TEST PARAMETER	SPECIFICATION	TEST RESULTS
LEFT KNEE		
Temperature	66 - 78 Deg F	70
Relative Humidity	10% - 70%	40
Probe Velocity	6.8 - 7.0 Ft/s	6.91
Peak Knee Impact Force	1060 - 1300 Lbs	1184.0
RIGHT KNEE		
Temperature	66 - 78 Deg F	70
Relative Humidity	10% - 70%	40
Probe Velocity	6.8 - 7.0 Ft/s	6.93
Peak Knee Impact Force	1060 - 1300 Lbs	1188.0

Remarks:

Laboratory Technician: B. Swiecicki

**PART 572E
EXTERNAL DIMENSIONS**

Dummy Serial Number 245
Calspan Sequential Test Number 1
Date 01-19-98

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature			70
Relative Humidity			40
Location for Chest Circumference	AA	16.9 - 17.1 in	17.0
Location for Waist Circumference	BB	8.9 - 9.1 in	9.0
Chest Circumference (With Jacket)	Y	38.2 - 39.4 in	39.0
Waist Circumference	Z	32.9 - 34.1 in	33.6
Chest Depth	O	8.4 - 9.0 in	8.4
H-Point Height	C	3.3 - 3.5 in	3.4
H-Point from Backline	D	5.3 - 5.5 in	5.4
Skull Cap to Backline	H	1.6 - 1.8 in	1.7
Total Sitting Height	A	34.6 - 35.0 in	34.9
Thigh Clearance	F	5.5 - 6.1 in	6.0
Buttock Knee Length	K	22.8 - 23.8 in	23.4
Buttock Popliteal Length	N	17.8 - 18.8 in	18.2
Popliteal Height	L	16.9 - 17.9 in	17.5
Knee Pivot Height	M	19.1 - 19.7 in	19.2
Foot Length	P	9.9 - 10.5 in	10.2
Foot Breadth	W	3.6 - 4.2 in	3.8
Shoulder Pivot from Backline	E	3.3 - 3.7 in	3.5
Shoulder Breadth	V	16.6 - 17.2 in	16.8
Shoulder Pivot Height	B	19.9 - 20.5 in	20.2
Elbow Rest Height	J	7.5 - 8.3 in	8.0
Shoulder - Elbow Length	I	13.0 - 13.6 in	13.2
Back of Elbow to Wrist Pivot	G	11.4 - 12.0 in	11.6

Remarks:

Laboratory Technician: B. Swiecicki

Appendix D

DUMMY, VEHICLE AND LABORATORY INSTRUMENT CALIBRATION

INSTRUMENT CALIBRATION FOR DRIVER DUMMY

(6 Month Calibration Minimum)

DRIVER DUMMY (S/N 061)	Serial #	Manufacturer	Calibration	
			Last	Next
Head				
X	C14883	ENDEVCO	8/97	2/98
Y	C14972	ENDEVCO	8/97	2/98
Z	C15018	ENDEVCO	8/97	2/98
Chest				
X	AL6C4	ENDEVCO	8/97	2/98
Y	AE8W7	ENDEVCO	8/97	2/98
Z	A57G	ENDEVCO	8/97	2/98
Right Femur Load Cell	952	GSE	1/98	7/98
Left Femur Load Cell	951	GSE	1/98	7/98
Neck Load Cell	446	DENTON	10/97	4/98
X	446	DENTON	10/97	4/98
Y	446	DENTON	10/97	4/98
Z	446	DENTON	10/97	4/98
Neck Moment	446	DENTON	10/97	4/98
X	446	DENTON	10/97	4/98
Y	446	DENTON	10/97	4/98
Z	446	DENTON	10/97	4/98
Chest Deflection Gauge	061	HUMANOID	11/97	5/98
Hybrid III Use Only				
Lap Belt Load Cells	706	LEBOW	1/98	7/98
Shoulder Belt Load Cells	707	LEBOW	1/98	7/98
Spool-Out Potentiometer	NA	MAGNETEK	NA	NA
Belt Stretch Transducer	E1	CALSPAN	9/97	3/98

INSTRUMENT CALIBRATION FOR DRIVER DUMMY

(6 Month Calibration Minimum)

DRIVER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head				
X (R)	A13937	ENDEVCO	10/97	4/98
Y (R)	A13517	ENDEVCO	10/97	4/98
Z (R)	A13941	ENDEVCO	10/97	4/98
Chest				
X (R)	A13811	ENDEVCO	10/97	4/98
Y (R)	A13828	ENDEVCO	10/97	4/98
Z (R)	A13883	ENDEVCO	10/97	4/98
Pelvic				
X	AC2P5	ENDEVCO	8/97	2/98
Y	ADL50	ENDEVCO	8/97	2/98
Z	A59J	ENDEVCO	8/97	2/98
Left Upper Tibia				
Mx	038	DENTON	10/97	4/98
Left Upper Tibia				
My	038	DENTON	10/97	4/98
Left Lower Tibia				
Fy	032	DENTON	10/97	4/98
Left Lower Tibia				
Fz	032	DENTON	10/97	4/98
Left Lower Tibia				
Mx	032	DENTON	10/97	4/98
Right Upper Tibia				
Mx	045	DENTON	10/97	4/98
Right Upper Tibia				
My	045	DENTON	10/97	4/98
Right Lower Tibia				
Fy	041	DENTON	10/97	4/98
Right Lower Tibia				
Fz	041	DENTON	10/97	4/98
Right Lower Tibia				
Mx	041	DENTON	10/97	4/98

INSTRUMENT CALIBRATION FOR DRIVER DUMMY

(6 Month Calibration Minimum)

DRIVER DUMMY	Serial #	Manufacture	Calibration	
			Last	Next
Left Foot Front Z	A14058	ENDEVCO	9/97	3/98
Left Foot Rear X	APA58	ENDEVCO	10/97	4/98
Left Foot Rear Z	A14150	ENDEVCO	9/97	3/98
Right Foot Front Z	A14124	ENDEVCO	9/97	3/98
Right Foot Rear X	A14181	ENDEVCO	9/97	3/98
Right Foot Rear Z	A14126	ENDEVCO	9/97	3/98

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY

(6 Month Calibration Minimum)

PASSENGER DUMMY (S/N 245)	Serial #	Manufacturer	Calibration	
			Last	Next
Head X	ADL98	ENDEVCO	8/97	2/98
Y	AE8K0	ENDEVCO	8/97	2/98
Z	ADMB6	ENDEVCO	8/97	2/98
Chest X	A26A	ENDEVCO	8/97	2/98
Y	A27A	ENDEVCO	8/97	2/98
Z	A51A	ENDEVCO	8/97	2/98
Right Femur Load Cell	232	GSE	1/98	7/98
Left Femur Load Cell	231	GSE	1/98	7/98
Neck Load Cell X	440	DENTON	1/98	7/98
Y	440	DENTON	1/98	7/98
Z	440	DENTON	1/98	7/98
Neck Moment X	440	DENTON	1/98	7/98
Y	440	DENTON	1/98	7/98
Z	440	DENTON	1/98	7/98
Chest Deflection Gauge	245	HUMANOID	10/97	4/98
Hybrid III Use Only				
Lap Belt Load Cells	635	LEBOW	1/98	7/98
Shoulder Belt Load Cells	711	LEBOW	1/98	7/98
Spool-Out Potentiometer	NA	MAGNETEK	NA	NA
Belt Stretch Transducer	E3	CALSPAN	9/97	3/98

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY

(6 Month Calibration Minimum)

PASSENGER DUMMY	Serial #	Manufacturer	Calibration	
			Last	Next
Head				
X (R)	A13829	ENDEVCO	11/97	5/98
Y (R)	AC8F6	ENDEVCO	8/97	2/98
Z (R)	ACCW0	ENDEVCO	8/97	2/98
Chest				
X (R)	AHRC9	ENDEVCO	8/97	2/98
Y (R)	AC7W8	ENDEVCO	8/97	2/98
Z (R)	ACC06	ENDEVCO	8/97	2/98
Pelvic				
X	AL6N5	ENDEVCO	1/98	7/98
Y	AL6R7	ENDEVCO	1/98	7/98
Z	A12C	ENDEVCO	1/98	7/98
Left Upper Tibia	Mx	DENTON	10/97	4/98
Left Upper Tibia	My	DENTON	10/97	4/98
Left Lower Tibia	Fy	DENTON	10/97	4/98
Left Lower Tibia	Fz	DENTON	10/97	4/98
Left Lower Tibia	Mx	DENTON	10/97	4/98
Right Upper Tibia	Mx	DENTON	10/97	4/98
Right Upper Tibia	My	DENTON	10/97	4/98
Right Lower Tibia	Fy	DENTON	10/97	4/98
Right Lower Tibia	Fz	DENTON	10/97	4/98
Right Lower Tibia	Mx	DENTON	10/97	4/98

INSTRUMENT CALIBRATION FOR PASSENGER DUMMY

(6 Month Calibration Minimum)

PASSENGER DUMMY	Serial #	Manufacture	Calibration	
			Last	Next
Left Foot Front Z	A13011	ENDEVCO	9/97	3/98
Left Foot Rear X	A13506	ENDEVCO	9/97	3/98
Left Foot Rear Z	A12268	ENDEVCO	9/97	3/98
Right Foot Front Z	J18418	ENDEVCO	8/97	2/98
Right Foot Rear X	AEWK1	ENDEVCO	8/97	2/98
Right Foot Rear Z	AKD92	ENDEVCO	8/97	2/98

INSTRUMENT CALIBRATION FOR VEHICLE ACCELEROMETERS

(6 Month Calibration Minimum)

	Serial #	Manufacturer	Calibration	
			Last	Next
Left Seat Rear Crossmember	D29	ICS	9/97	3/98
Right Rear Seat Crossmember	X26	ICS	9/97	3/98
Top of Engine	X91	ICS	10/97	4/98
Bottom of Engine	AZ17	ICS	10/97	4/98
Left Disc Brake Caliper	D85	ICS	9/97	3/98
Right Disc Brake Caliper	Y98	ICS	8/97	2/98
Instrument Panel	A86	CEC	10/97	4/98
Left Seat Rear Crossmember (R)	D31	ICS	10/97	4/98
Right Seat Rear Crossmember (R)	Y171	ICS	10/97	4/98