

V7827

REPORT NUMBER: 301-CAL-97-03

**SAFETY COMPLIANCE TESTING FOR FMVSS 301
FUEL SYSTEM INTEGRITY**

**FUJI HEAVY INDUSTRIES
1998 SUBARU IMPREZA
4-DOOR SEDAN AWD**

NHTSA NUMBER: CW5502

CALSPAN TEST NUMBER: 8412-3

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



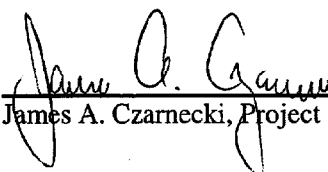
February 27, 1998

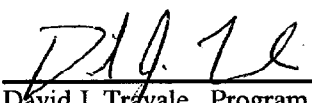
FINAL REPORT

PREPARED FOR:

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

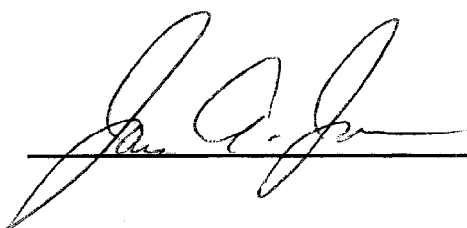
This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Prepared By: 
James A. Czarnecki, Project Engineer

Approved By: 
David J. Travale, Program Manager
Transportation Sciences Center

Approval Date: March 10, 1998

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: 

Acceptance Date: 4-2-98

APR 13 1998
10:50 AM
OVSC

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. 301-CAL-97-03		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Final Report of FMVSS301 Compliance Testing of a 1998 Subaru Impreza 4-Door Sedan AWD NHTSA No. CW5502				5. Report Date February 27, 1998	
				6. Performing Organization Code CAL	
7. Author(s) James A. Czarnecki, Project Engineer David J. Travale, Program Manager				8. Performing Organization Report No. 8412-3	
9. Performing Organization Name and Address Calspan Corporation P.O. Box 400 Buffalo, New York 14225				10. Work Unit No.	
				11. Contract or Grant No. DTNH22-95-D-11000	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Vehicle Safety Compliance (NEF-30) 400 Seventh St , S.W., Rm. 6115, Washington, D.C. 20590				13. Type of Report and Period Covered Final Test Report Feb - March 1998	
				14. Sponsoring Agency Code NEF-30	
15. Supplementary Notes					
16. Abstract Compliance tests were conducted on the subject 1998 Subaru Impreza 4-Door Sedan AWD in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-301-01 for the determination of FMVSS 301 compliance. The test vehicle appeared to comply with all requirements of FMVSS 301 "Fuel System Integrity."					
17. Key Words Compliance Testing Safety Engineering FMVSS 301			18. Distribution Statement Copies of this report are available from: NHTSA Technical Reference Division Room 5108 (NAD-52), 400 Seventh , S.W., Washington, D.C. 20590 Telephone No. (202) 366-4946		
19. Security Classif. (of this report) UNCLASSIFIED		20. Security Classif. (of this page) UNCLASSIFIED		21. No. of Pages 87	
22. Price					

TABLE OF CONTENTS

<u>Section</u>		<u>Page No.</u>
1	PURPOSE OF COMPLIANCE TEST	1-1
2	SUMMARY OF COMPLIANCE TEST RESULTS	2-1
3	COMPLIANCE TEST DATA	3-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	VEHICLE AND DUMMY RESPONSE DATA (REAR IMPACT ONLY)	B-1

LIST OF FIGURES

<u>Figure No.</u>		<u>Page No.</u>
1	PART 572 DUMMY IN-VEHICLE POSITION	3-2
2	CAMERA POSITION FOR REAR IMPACT	3-9

LIST OF TABLES

<u>Table No.</u>		<u>Page No.</u>
1	CRASH TEST SUMMARY	2-2
2	GENERAL TEST AND VEHICLE PARAMETER DATA	2-3
3	MOVING BARRIER PARAMETER DATA	2-6
4	POST-IMPACT DATA	2-7
5	FRONT SEAT OCCUPANT MEASUREMENTS	3-3
6	FMVSS NO. 301 - "FUEL SYSTEM INTEGRITY" POST-IMPACT TEST DATA	3-4
7	FMVSS NO. 301 - STATIC ROLLOVER DATA SHEET	3-5
8	HIGH-SPEED CAMERA LOCATIONS	3-10
9	TEST VEHICLE NONCOMPLIANCE NOTICE	4-2
10	LABORATORY NOTICE OF TEST FAILURE TO OVSC	4-3
11	ANTI-SIPHONING DEVICE FOR ALCOHOL FUEL VEHICLE	4-4

Section 1

PURPOSE OF COMPLIANCE TEST

This 30 mph rear moving barrier impact test is part of the Federal Motor Vehicle Safety Standard (FMVSS) 301 Compliance Test Program conducted for the National Highway Traffic Safety Administration (NHTSA) by Calspan Corporation under Contract No. DTNH22-95-D-11000. The purpose of this test was to determine if the subject vehicle, a 1998 Subaru Impreza 4-Door Sedan AWD, meets the performance requirements of FMVSS No. 301, "Fuel System Integrity." This compliance test was conducted using the requirements found in the OVSC Laboratory Test Procedure No. TP-301-01, dated March 28, 1994.

Section 2

COMPLIANCE TEST RESULTS SUMMARY

A 3113 pound 1998 Subaru Impreza 4-Door Sedan AWD was impacted from the rear by a 3959 pound moving barrier at a velocity of 29.3 mph. The test was performed by the Calspan Corporation on February 27, 1998.

One instrumented Part 572 E and non-instrumented Part 572 B, 50th percentile male Anthropomorphic Test Device (ATD) were placed in the driver and right-front passenger seating positions respectively.

Average longitudinal crush was 14.2 inches. Pre- and post-test photographs of the vehicle can be found in appendix A.

The 15.9 gallon fuel tank was filled to 92.5 percent capacity with orange Stoddard fluid prior to the impact. After the impact, there was no fluid leakage for the first 30 minutes nor during any phase of the rollover test. The vehicle appeared to comply with all the requirements of FMVSS No. 301 "Fuel System Integrity." Section 3 presents the results of these tests.

The crash event was recorded by one real-time and eight high-speed cameras. Camera locations and other pertinent camera information are found on pages 3-9 and 3-10 of this report.

Table 1

CRASH TEST SUMMARY

Vehicle NHTSA No.: CW5502 Test Mode: 30 mph Rear Barrier

Test Date: February 27, 1998 Time: 13:22 Temperature: 44 °F

Vehicle Make/Model/Body Style: 1998 Subaru Impreza 4-Door Sedan AWD

Vehicle Test Weight: 3113 lbs Impact Velocity: 29.3 mph

Static Crush: Left Side = 13.2 inches

Right Side = 13.7 inches

Centerline = 14.2 inches

Average Crush: 13.7 inches

TYPE OF FRONT OCCUPANT RESTRAINT SYSTEM INSTALLED IN TEST VEHICLE:

Driver's DSP: Airbag with 3-point belt system

Right Passenger's DSP: Airbag with 3-point belt system

VISIBLE DUMMY CONTACT POINTS:

Driver: Back of head to head rest

Passenger: Back of head to head rest

DOOR OPENING DATA:

Closed/Operable - Left Front

Closed/Operable - Right Front

Stoddard Solvent Spillage from Vehicle's Fuel System: None

Remarks: None

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATATEST VEHICLE INFORMATION:

Year/Make/Model/Body Style: 1998 Subaru Impreza 4-Door Sedan AWD

NHTSA No.: CW5502 ; VIN: JF1GC4356WG500285 ; Color: Green

Engine Data: 4 cylinders; - CID; 2.2 Liters; - cc

Placement: - Longitudinal or In-Line; x Transverse or Lateral

Transmission Data: 5 speeds; x Manual; - Automatic; - Overdrive

Final Drive: - Rear Wheel Drive; - Front Wheel Drive; x 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: 11/26/97 ; Odometer Reading 638 miles

Selling Dealer: Farrish Olds-Jeep-Subaru

& Address: 9610 Lee Highway Fairfax, Va 22031

DATA FROM TIRE VEHICLE'S CERTIFICATION LABEL:

Vehicle Manufactured by: Fuji Heavy Industries

Date of Manufacture: 6/97

GVWR: 3750 lbs.; GAWR: 1950 lbs. FRONT; 1800 lbs. REAR

DATA FROM TIRE PLACARD:

Location of Placard on Vehicle: B-Pillar

Tire Pressure with Maximum Capacity Vehicle Load: 32 psi FRONT 29 psi REAR

Recommended Tire Size: P195/60R15

* Recommended Cold Tire Pressure: 32 psi FRONT; 29 psi REAR

Size of Tires on Test Vehicle: P195/60R15

Type of Spare Tire: Temp.

Vehicle Capacity Data:

Type of Front Seats:	<u>x</u> Bench;	<u>-</u> Bucket;	<u>-</u> Split Bench
Number of Occupants:	<u>2</u> Front;	<u>3</u> Rear;	<u>5</u> Total
Vehicle Capacity Weight (VCW) =	<u>810</u> lbs.		
No. of Occupants x 150 lbs. =	<u>750</u> lbs.		
Rated Cargo/Luggage Weight (RCLW) =	<u>60</u>		

*Tire pressure used for test

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (with maximum fluids)= UDW:

Right Front	=	<u>782</u>	lbs.	Right Rear	=	<u>567</u>	lbs.
Left Front	=	<u>784</u>	lbs.	Left Rear	=	<u>602</u>	lbs.
TOTAL FRONT	=	<u>1,566</u>	lbs.	TOTAL REAR	=	<u>1,169</u>	lbs.
TOTAL DELIVERED WEIGHT	=	<u>2,735</u>	lbs.				
% of Total Front of Vehicle Weight	=	<u>57</u>	%	% of Total Rear Weight	=	<u>43</u>	%

CALCULATION OF VEHICLE'S TARGET TEST WEIGHT:

Total Delivered Weight	=	<u>2,735</u>	lbs.
Rated Cargo/Luggage Weight (RCLW)	=	<u>60</u>	lbs.
Weight of 2 p.572 Dummies, 167 & 164 lbs	=	<u>331</u>	lbs.
TARGET TEST WEIGHT	=	<u>3,126</u>	lbs.

WEIGHT OF TEST VEHICLE WITH TWO DUMMIES AND 47 POUNDS OF CARGO WEIGHT:

Right Front	=	<u>887</u>	lbs.	Right Rear	=	<u>674</u>	lbs.
Left Front	=	<u>882</u>	lbs.	Left Rear	=	<u>670</u>	lbs.
TOTAL FRONT	=	<u>1,769</u>	lbs.	TOTAL REAR	=	<u>1,344</u>	lbs.
TOTAL TEST WEIGHT	=	<u>3,113.0</u>	lbs.				
% of Total Front Weight	=	<u>56.8</u>	%	% of Total Rear Weight	=	<u>43.2</u>	%

* Weight of Ballast Secured in Vehicle Trunk Area = 0 lbs.

Type of Ballast: None

Method of Securing Ballast: None

Vehicle Components Removed for Weight Reduction: Radiator, Front Lights , Mirrors, Battery

VEHICLE ATTITUDE (all dimension in inches):

AS DELIVERED:	RF	<u>27.4</u>	LF	<u>27.2</u>	RR	<u>26.9</u>	LR	<u>26.6</u>
AS TESTED:	RF	<u>26.4</u>	LF	<u>26.1</u>	RR	<u>26.2</u>	LR	<u>25.5</u>
Vehicle's Wheel Base:		<u>99.4</u>	in.					
Location of Vehicle's C.G.:		<u>42.9</u>	inches rearward of front wheel center.					

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual	=	<u>15.9</u>	gallons
Usable Capacity Figure Furnished by COTR	=	<u>15.9</u>	gallons
Test Volume Range (91 to 94% of Usable Capacity)	=	<u>14.5</u>	to <u>14.9</u> gallons
ACTUAL TEST VOLUME=		<u>14.5</u>	gallons (with entire fuel system filled)

* Ballast weight includes the RCLW, the weight of drained vehicle fluids and the weight of any removed vehicle components less the weight of onboard instrumentation, cameras, and hardware.

Table 2

GENERAL TEST AND VEHICLE PARAMETER DATA (cont.)FUEL SYSTEM DATA (continued):

Test Fluid Type:	Stoddard Solution
Test Fluid Specific Gravity:	0.764
Test Fluid Kinematic Viscosity:	0.96 centistokes
Test Fluid Color:	Orange ("red" is preferred)
Type of Vehicle Fuel Pump:	Electric
Electric Fuel Pump Operation with Ignition Switch ON and Engine OFF - Fuel pump operated.	
Details of Fuel System:	Fuel filler on right side aft of rear axle, fuel lines run along right frame rail and fuel tank is centered above rear axle.

Table 3

MOVING BARRIER PARAMETER DATA

WEIGHT OF MOVING BARRIER:

Right Front	=	<u>1113</u>	lbs.	Right Rear	=	<u>868</u>	lbs.
Left Front	=	<u>1102</u>	lbs.	Left Rear	=	<u>878</u>	lbs.
TOTAL FRONT	=	<u>2,215</u>	lbs.	TOTAL REAR	=	<u>1,746</u>	lbs.
TOTAL BARRIER WEIGHT	=	<u>3,961</u>	lbs.				

MOVING BARRIER DIMENSIONS:

Barrier Face Height:	<u>60.0</u>	in.
Barrier Face Width:	<u>78.0</u>	in.
Barrier Face		
Ground Clearance:	<u>5.0</u>	in.
Tread Width:	<u>59.5</u>	in.
Wheel Base:	<u>120.0</u>	in.
Location of C.G.:	X: <u>52.9</u> inches rearward of front wheel center.	
	Y: <u>0.0</u> inches from longitudinal-vertical plane of symmetry.	
	Z: <u>16.3</u> inches above ground.	

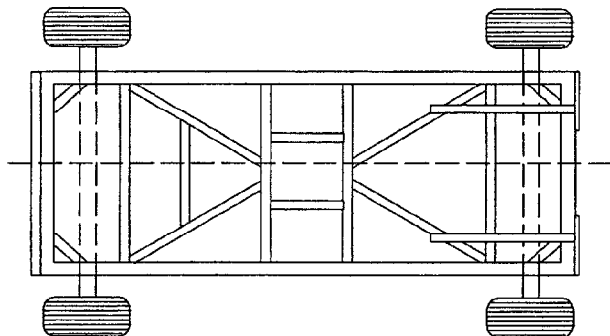
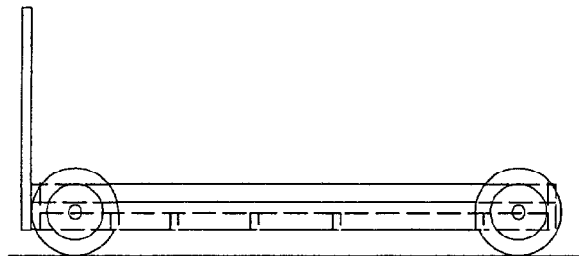


Table 4

POST IMPACT DATA

TYPE OF TEST:

Type of Test: Rear Barrier Impact Angle: 0°
 Test Date: February 27, 1998 Time: 13:22 Temperature: 44 °F
 Vehicle NHTSA No.: CW5502
 Required Impact Velocity Range: 28.9 to 29.9 mph

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

Trap No. 1 = 29.3 mph; Trap No. 2 = 29.3 mph
 Average Impact Speed = 29.3 mph

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

Vehicle Length:

Pre-Test	Right =	<u>169.5</u>	; C/L =	<u>172.0</u>	; Left =	<u>169.5</u>
Post-Test	Right =	<u>155.8</u>	; C/L =	<u>157.8</u>	; Left =	<u>156.3</u>
Crush	Right =	<u>13.7</u>	; C/L =	<u>14.2</u>	; Left =	<u>13.2</u>
AVERAGE	=	<u>13.7</u>	inches			

Section 3

COMPLIANCE TEST DATA

Figure 1

PART 572 DUMMY IN-VEHICLE POSITION
(FOR REAR IMPACTS ONLY)

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS

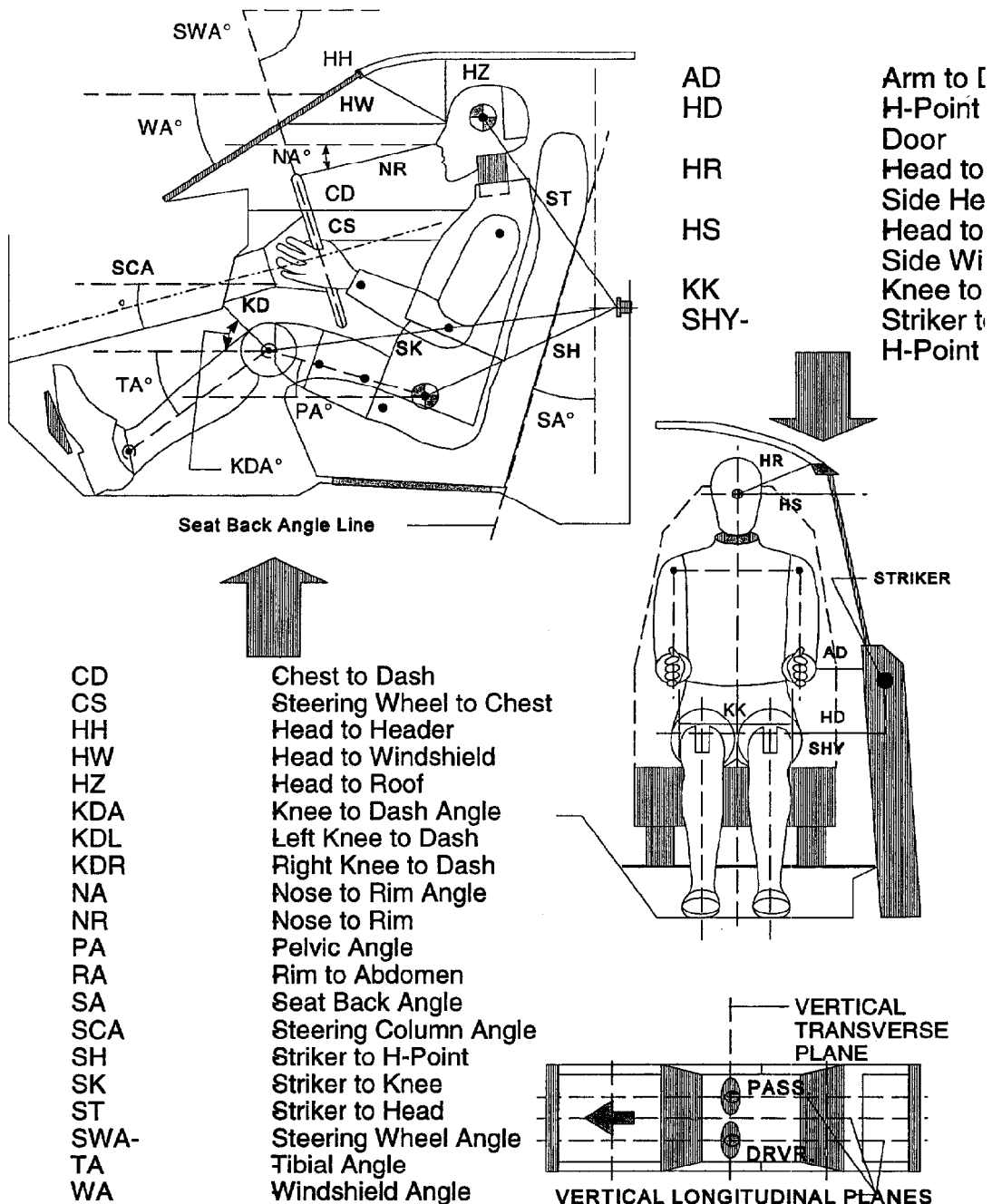


Table 5

FRONT SEAT OCCUPANT MEASUREMENTS
(FOR REAR IMPACT ONLY)

	DRIVER (Serial #152)		
WA°	29 deg.		
SWA°	65 deg.		
SCA°	25 deg.		
SA°	12 deg. on headrest		
HZ	7.5		
HH	12.1		
HW	24.2		
HR	7.7		
NR	16.2	Angle	11 deg.
CD	20.8		
CS	11.3		
RA	7.7		
KDL	6.9	Angle (KDA)	34 deg.
KDR	6.5		
PA°	25 deg.		
TA°	46 deg.		
KK	10.3		
ST	19.3	Angle	-3 deg.
SK	21.4	Angle	90 deg.
SH	7.5	Angle	129 deg.
SHY	8.7		
HS	7.4		
HD	5.3		
AD	2.1		

Table 6
FUEL SYSTEM INTEGRITY POST IMPACT TEST DATA

FMVSS NO. 301

TEST VEHICLE NHTSA NO.: CW5502 TEST DATE: February 27, 1998

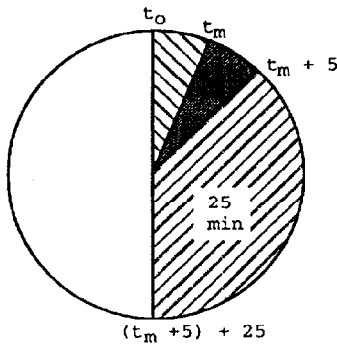
Vehicle Mfgr./Make/Model: 1998 Subaru Impreza 4-Door Sedan AWD

Test vehicle fuel tank filled to 91% to 94% of manufacturer's "usable" capacity and with electric fuel pump operating (if it will operate without engine operation). Part 572 test dummies located at each front designated seating position.

TEST VEHICLE IMPACT TYPE:

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

FUEL SPILLAGE MEASUREMENT:



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

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

SOLVENT SPILLAGE DETAILS:

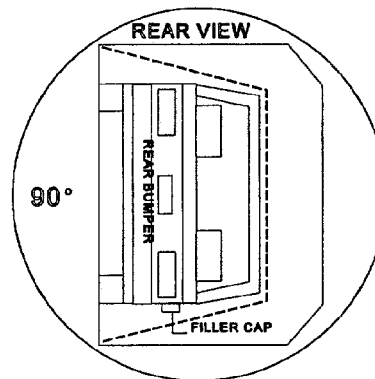
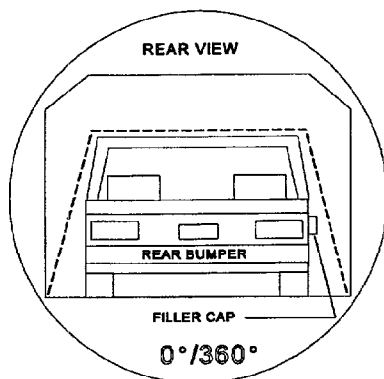
None

Table 7

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE :
90 Deg.

Vehicle NHTSA ID No. : 0-
CW5502

I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

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

FMVSS 301 Position Hold Time + 5 minutes 00 seconds
 TOTAL 6 minutes 2 seconds

Next whole minute interval 7 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a
---	---	---	-----

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

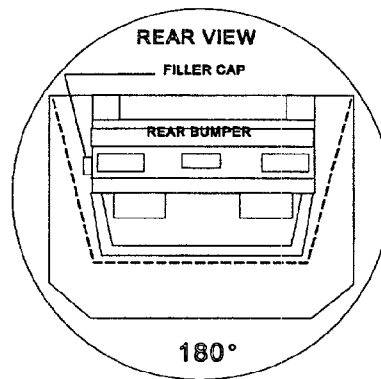
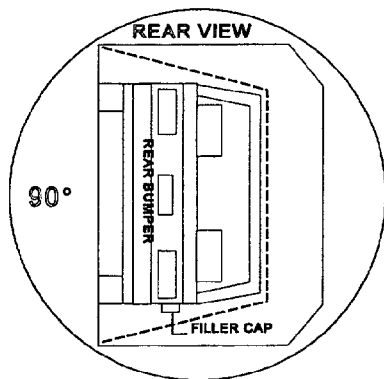
IV. SOLVENT SPILLAGE LOCATION(S):

None

Table 7
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE :
90-180 Deg.

Vehicle NHTSA ID No. :
CW5502



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time (Spec. Range = 1 to 3 minutes)	1	minutes	8	seconds
FMVSS 301 Position Hold Time +	5	minutes	00	seconds
TOTAL	6	minutes	8	seconds
Next whole minute interval	7	minutes		

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a
---	---	---	-----

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

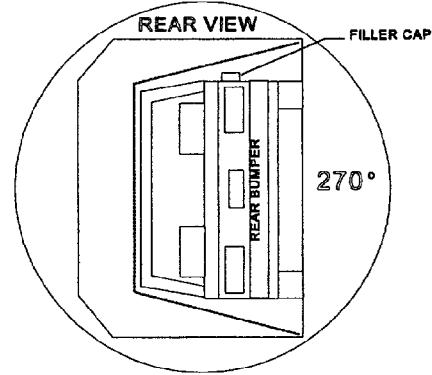
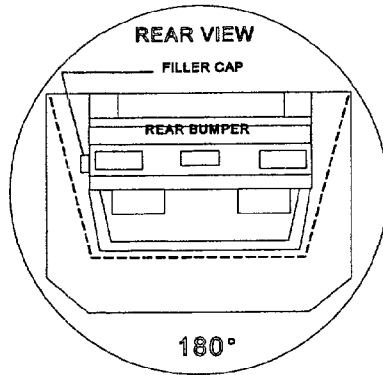
IV. SOLVENT SPILLAGE LOCATION(S):

None

Table 7
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE :
180-270 Deg.

Vehicle NHTSA ID No. :
CW5502



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

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

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a
---	---	---	-----

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

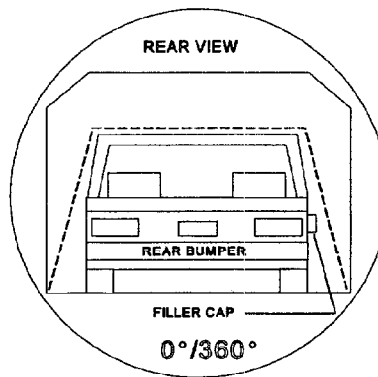
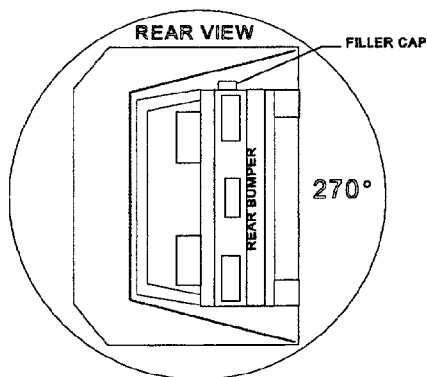
IV. SOLVENT SPILLAGE LOCATION(S):

None

Table 7
FMVSS NO. 301 STATIC ROLLOVER DATA SHEET (cont.)

TEST PHASE :
270-360 Deg.

Vehicle NHTSA ID No. :
CW5502



I. DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

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

FMVSS 301 Position Hold Time + 5 minutes 00 seconds

TOTAL 6 minutes 2 seconds

Next whole minute interval 7 minutes

II. FMVSS 301 REQUIREMENTS:

(1) Time Period

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

(2) Maximum Allowable Solvent Spillage

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

III. ACTUAL TEST VEHICLE SOLVENT SPILLAGE:

0	0	0	n/a
---	---	---	-----

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

IV. SOLVENT SPILLAGE LOCATION(S):

None

Figure 2

CAMERA POSITIONS FOR REAR IMPACTS

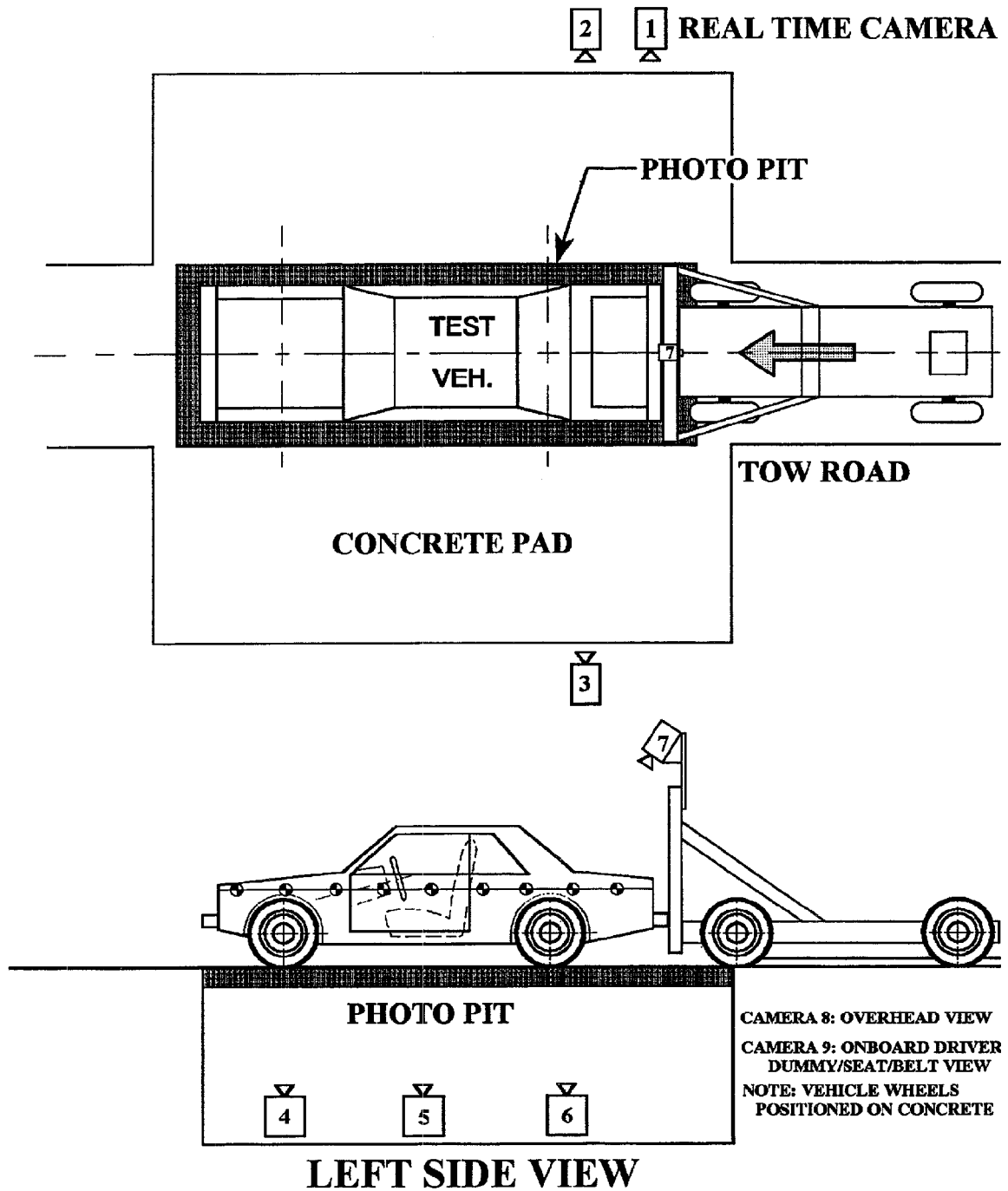


Table 8

HIGH-SPEED CAMERA LOCATIONSNHTSA No. : CW5502 Vehicle : 1998 Subaru Impreza 4-Door Sedan AWD

CAMERA NO.	VIEW	CAMERA POSITIONS (inches)*			ANGLE** (degrees)	LENS (mm)	SPEED (fps)
		X	Y	Z			
1	Real-Time Camera	-	-	-	-	-	24
2	Right Side View	441.6	35.7	43.1	0	25	1030
3	Left Side View	468.2	89.2	38.3	1	25	750
4	Vehicle Front Underbody View	0	136.3	-77	90	13	610
5	Vehicle Mid-Section Underbody View	0	78.0	-77	90	13	760
6	Vehicle Rear Underbody View	0	41.2	-77	90	13	600
7	Moving Barrier View	0	0	99	-105	7.5	n/a
8	Overhead Overall View	-20	0	386	-90	25	n.t.
9	Onboard Driver Dummy/Seat/Belt View	-	-	-	-	12.5	740

* X = film plant to monorail centerline (+ to left of rail)

Y = film plane to impact location (+ ahead of impact location)

Z = film plane to ground (+ above ground)

** = referenced to horizontal plane

Appendix A
PHOTOGRAPHS

LIST OF PHOTOGRAPHS

<u>Figure</u>	<u>Photograph Title</u>	<u>Page No.</u>
A-1	PRE-TEST FRONT VIEW	A-3
A-2	POST-TEST FRONT VIEW	A-4
A-3	PRE-TEST LEFT SIDE VIEW	A-5
A-4	POST-TEST LEFT SIDE VIEW	A-6
A-5	PRE-TEST RIGHT SIDE VIEW	A-7
A-6	POST-TEST RIGHT SIDE VIEW	A-8
A-7	PRE-TEST REAR VIEW	A-9
A-8	POST-TEST REAR VIEW	A-10
A-9	PRE-TEST LEFT FRONT THREE-QUARTER VIEW	A-11
A-10	POST-TEST LEFT FRONT THREE-QUARTER VIEW	A-12
A-11	PRE-TEST RIGHT REAR THREE-QUARTER VIEW	A-13
A-12	POST-TEST RIGHT REAR THREE-QUARTER VIEW	A-14
A-13	PRE-TEST FRONT UNDERBODY VIEW	A-15
A-14	POST-TEST FRONT UNDERBODY VIEW	A-16
A-15	PRE-TEST REAR UNDERBODY VIEW	A-17
A-16	POST-TEST REAR UNDERBODY VIEW	A-18
A-17	CERTIFICATION PLACARD	A-19
A-18	TIRE PLACARD	A-20
A-19	ROLLOVER 90°	A-21
A-20	ROLLOVER 180°	A-22
A-21	ROLLOVER 270°	A-23
A-22	ROLLOVER 360°	A-24

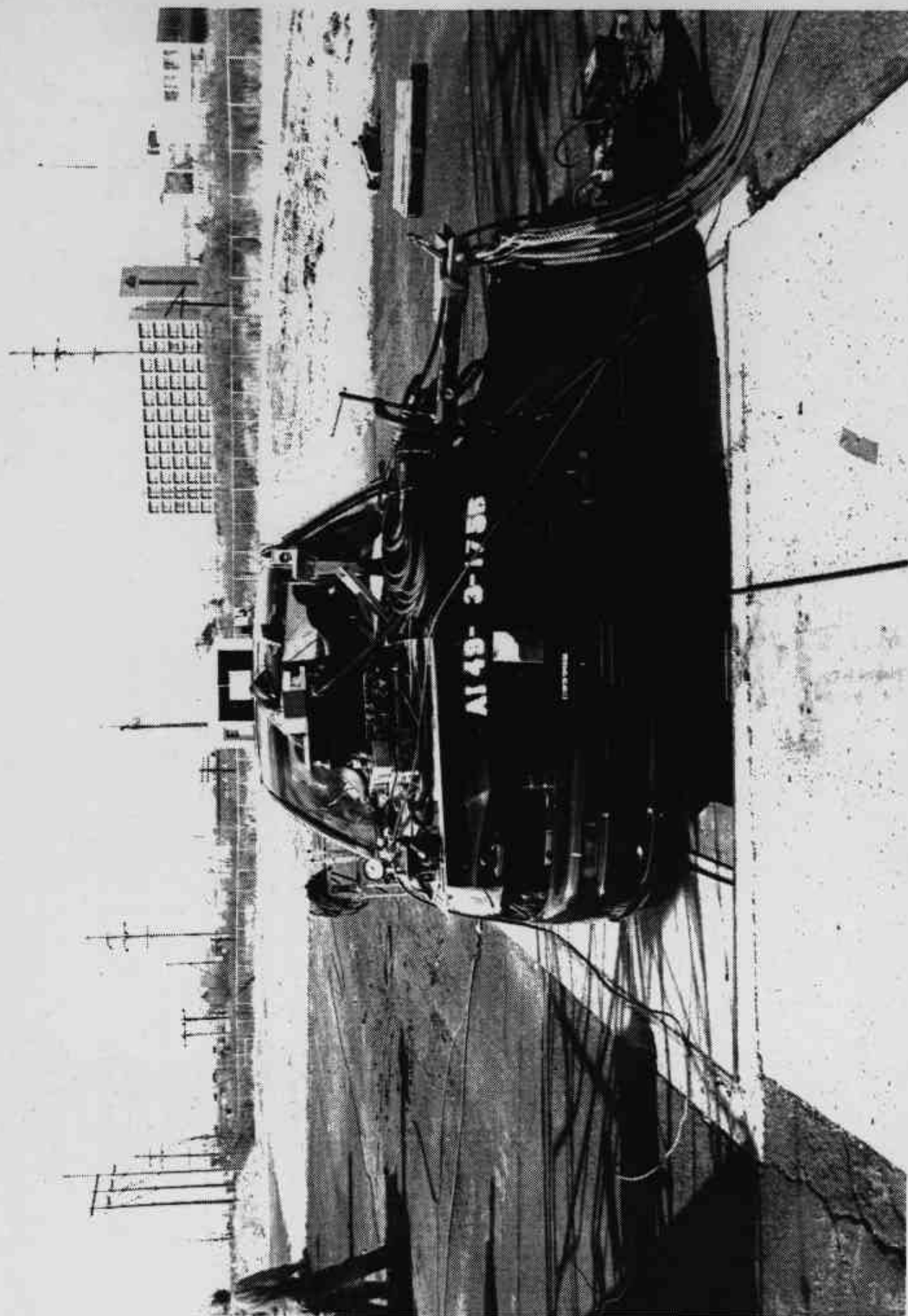


Figure A-1 PRE-TEST FRONT VIEW



Figure A-2 POST-TEST FRONT VIEW

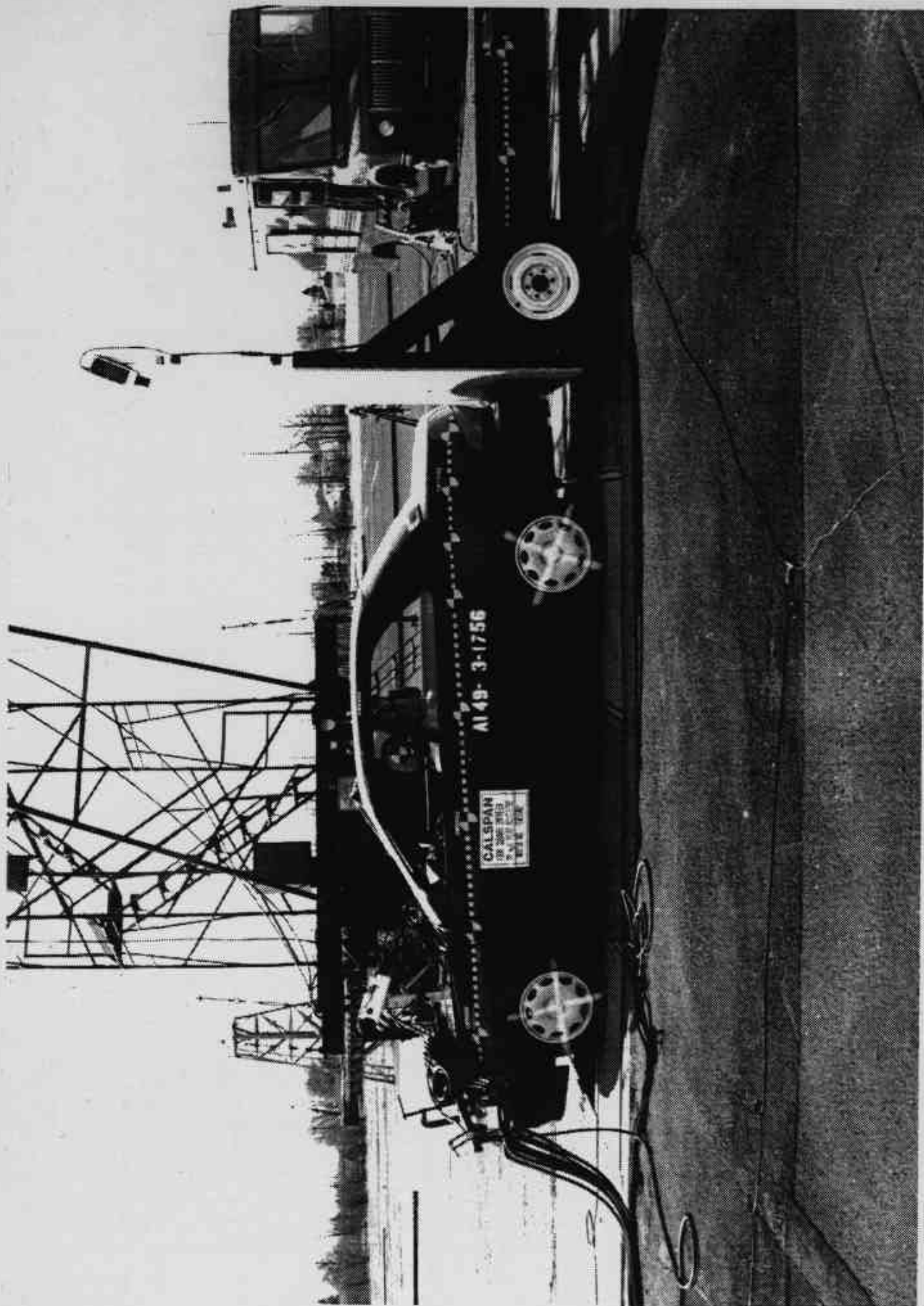


Figure A-3 PRE-TEST LEFT SIDE VIEW



Figure A-4 POST-TEST LEFT SIDE VIEW

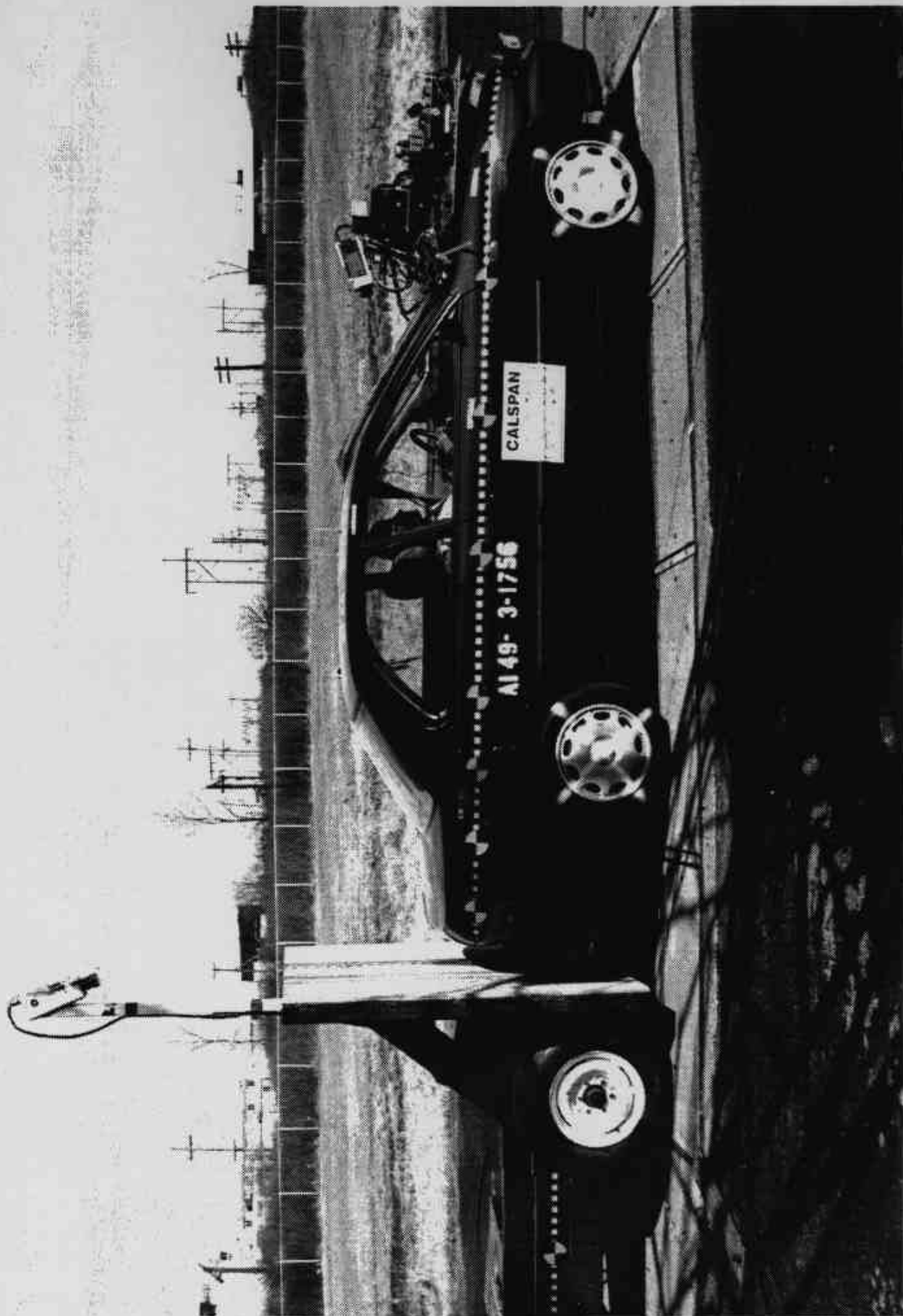


Figure A-5 PRE-TEST RIGHT SIDE VIEW

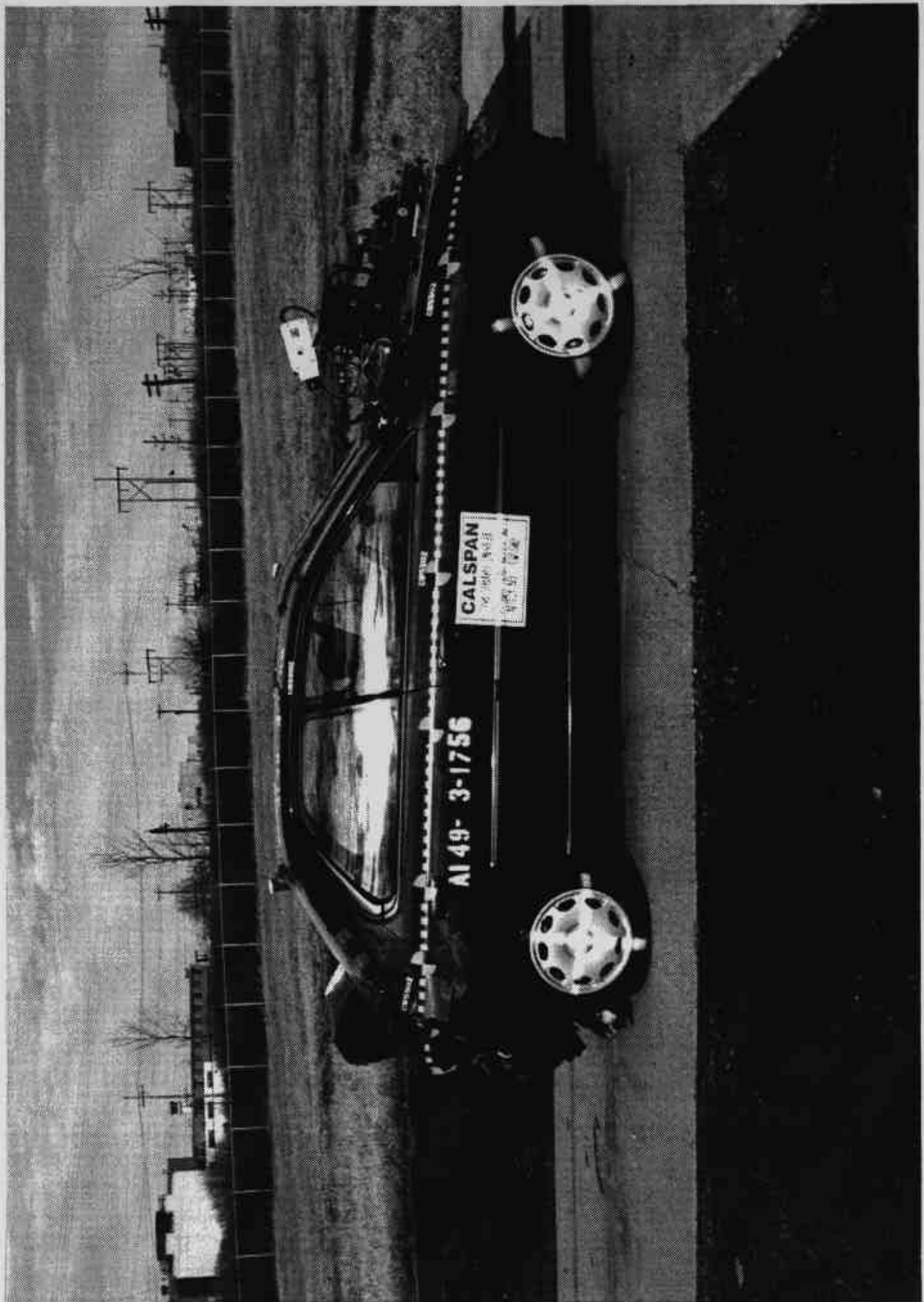


Figure A-6 POST-TEST RIGHT SIDE VIEW

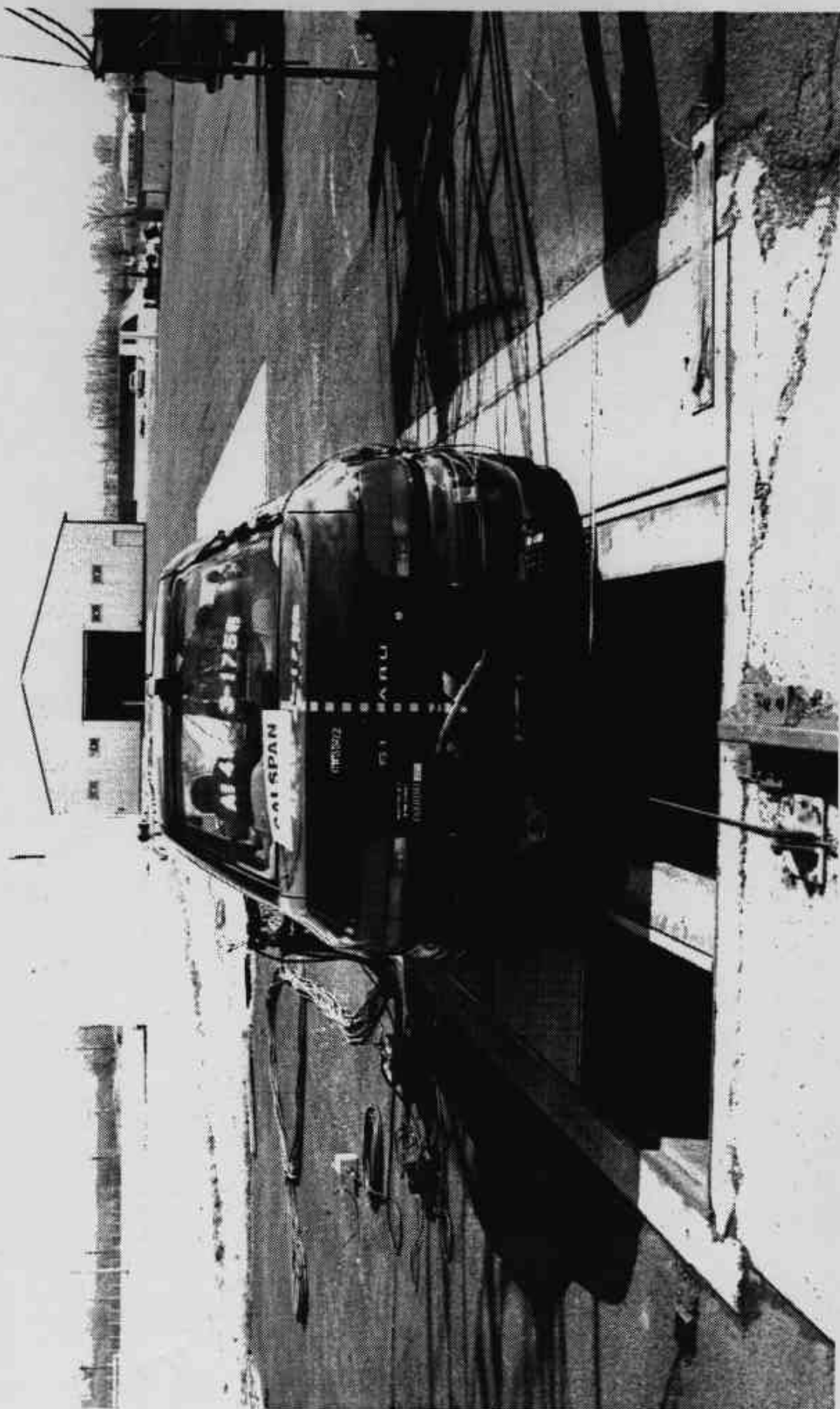


Figure A-7 PRE-TEST REAR VIEW

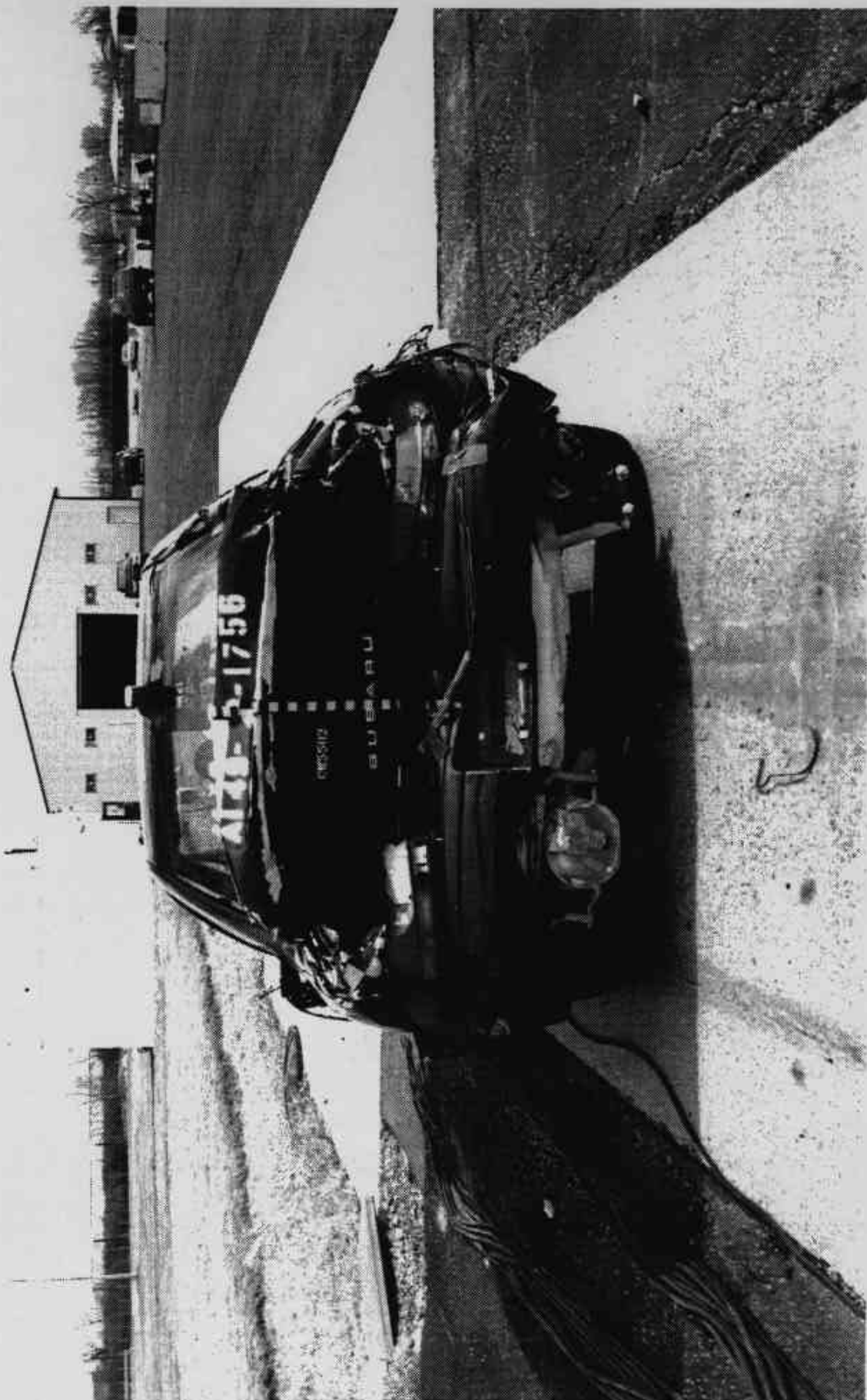


Figure A-8 POST-TEST REAR VIEW

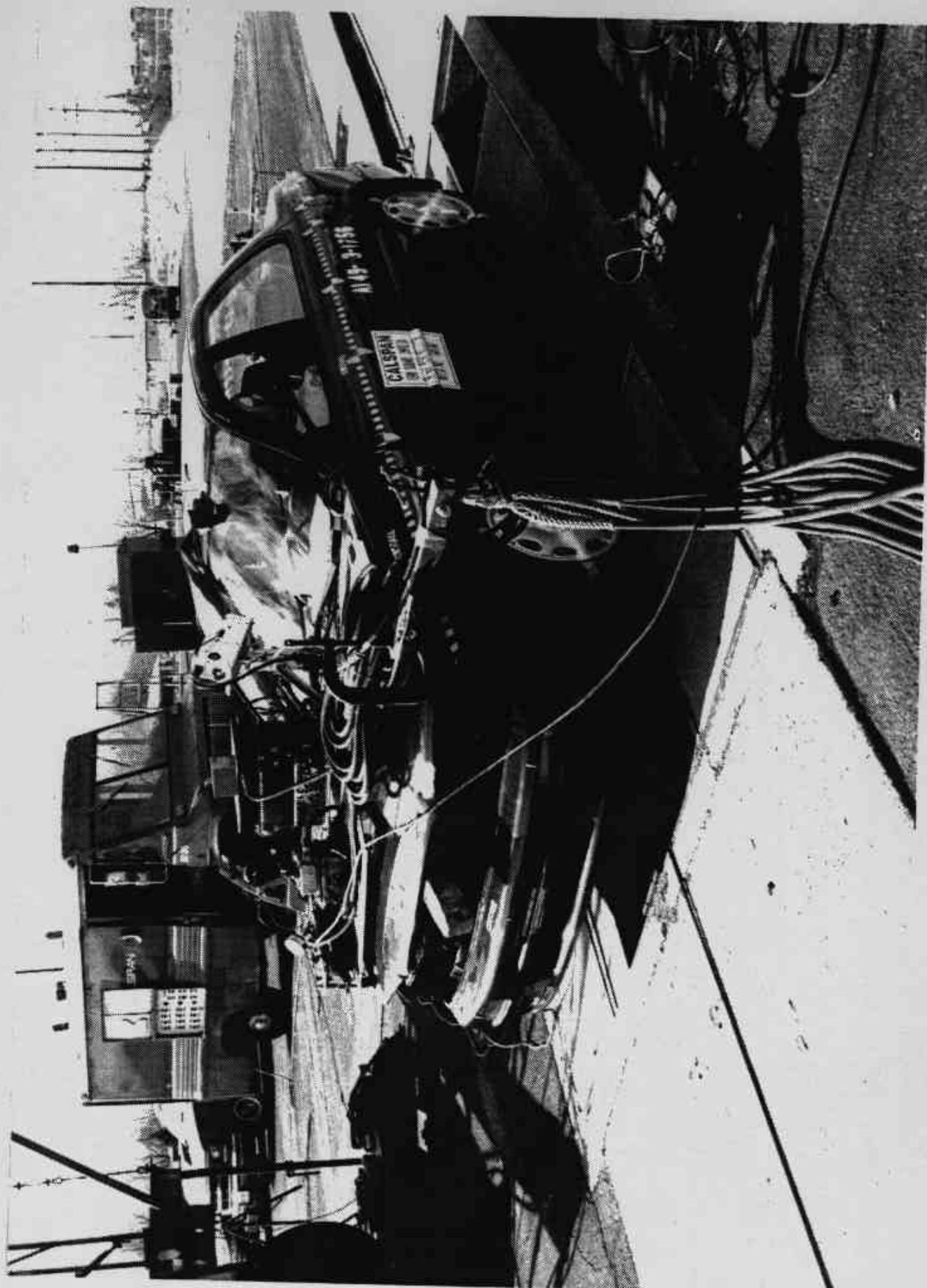


Figure A-9 PRE-TEST LEFT FRONT THREE-QUARTER VIEW



Figure A-10 POST-TEST LEFT FRONT THREE-QUARTER VIEW

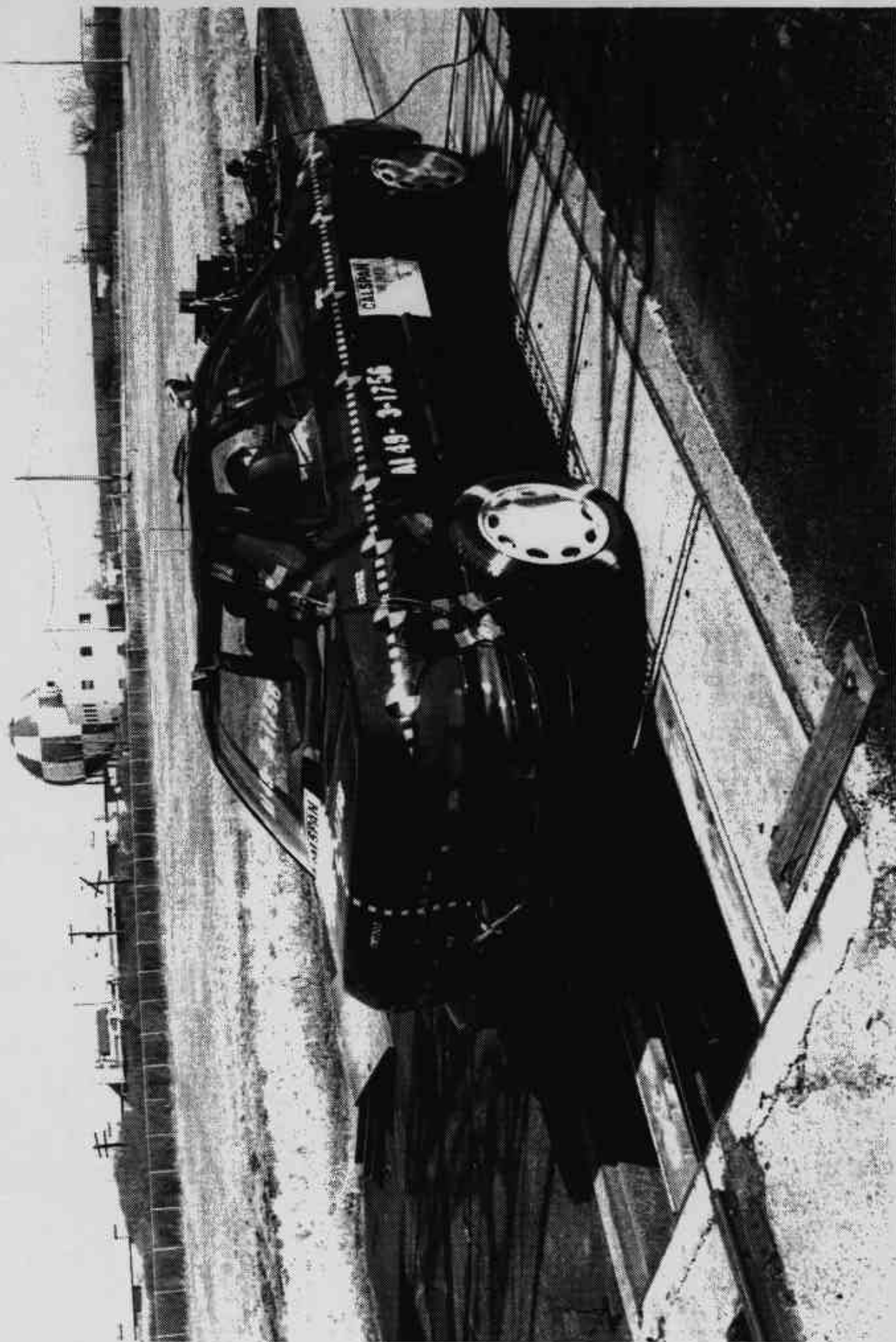


Figure A-11 PRE-TEST RIGHT REAR THREE-QUARTER VIEW

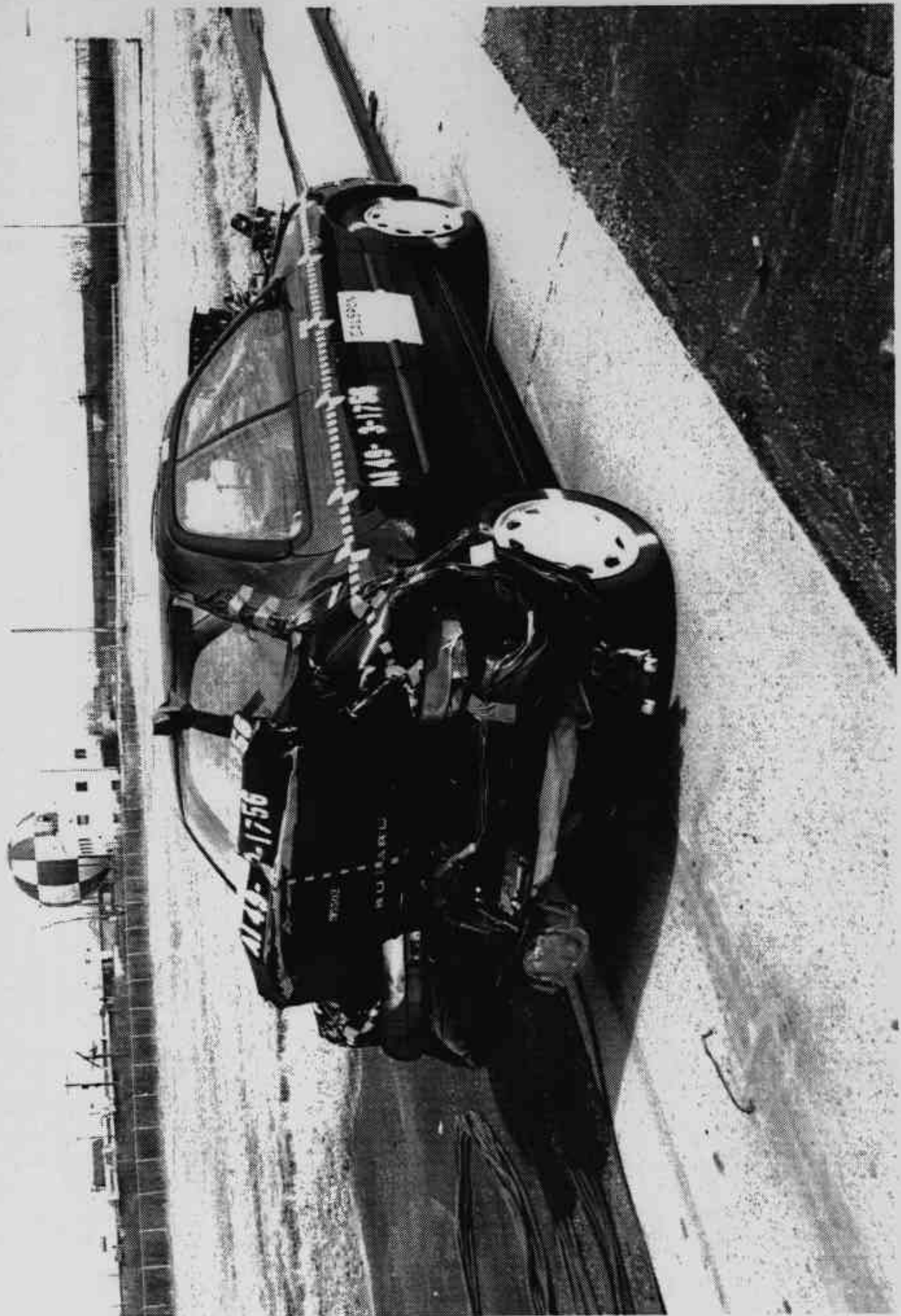


Figure A-12 POST-TEST RIGHT REAR THREE-QUARTER VIEW

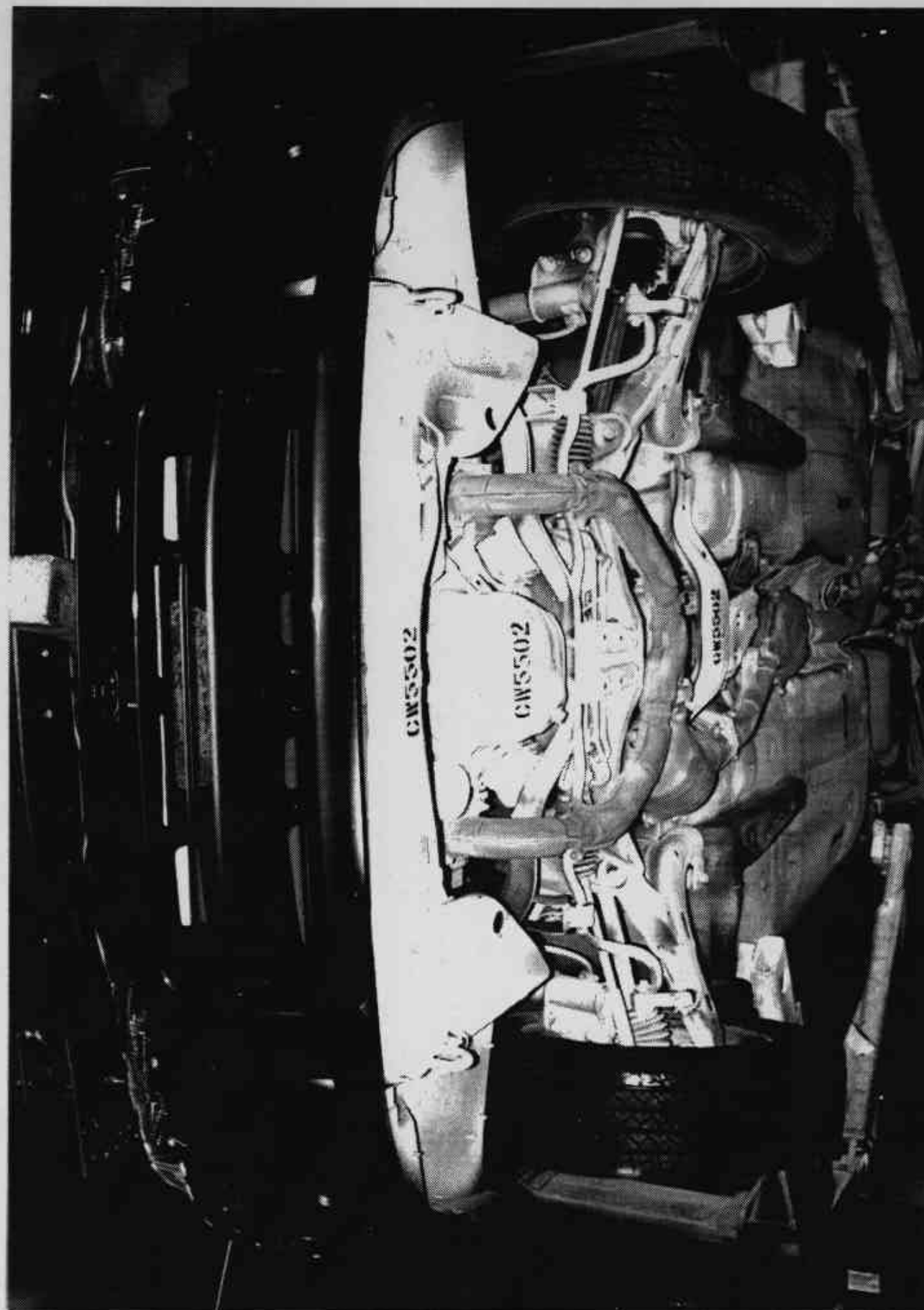


Figure A-13 PRE-TEST FRONT UNDERBODY VIEW



Figure A-14 POST-TEST FRONT UNDERBODY VIEW

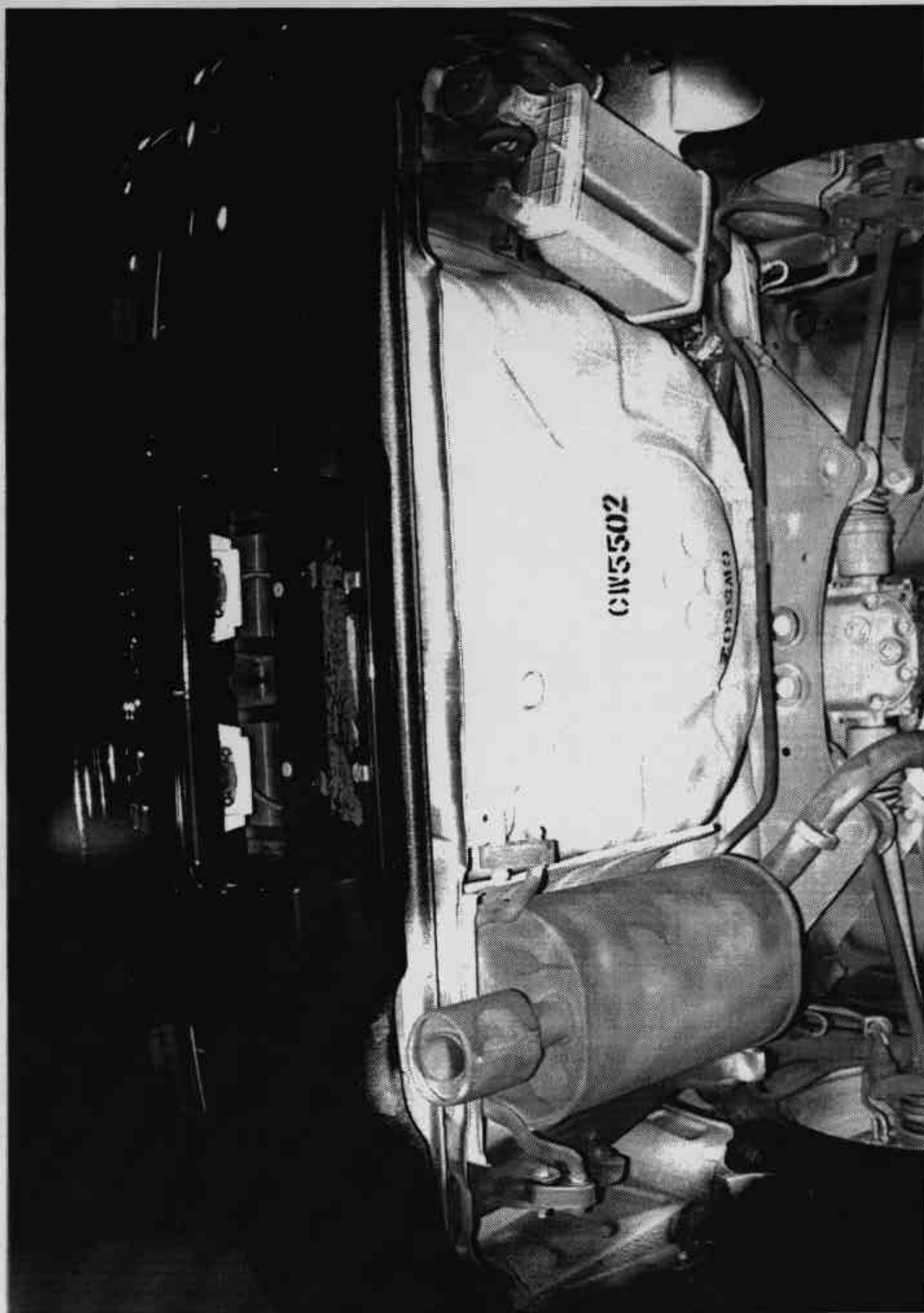
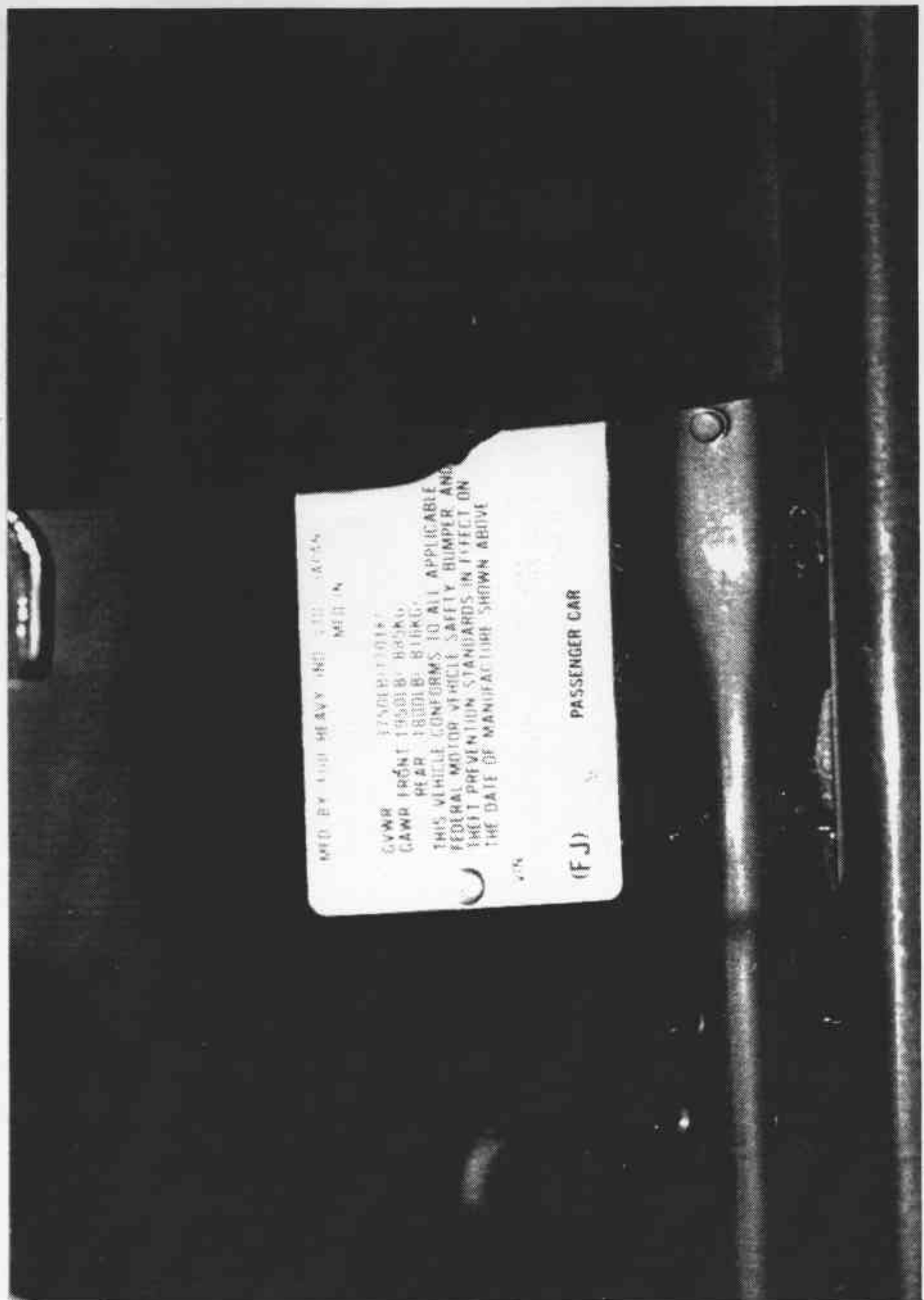


Figure A-15 PRE-TEST REAR UNDERBODY VIEW



Figure A-16 POST-TEST REAR UNDERBODY VIEW



WEIGHT BY 1000 LBS (NEED TO BE 1000 LBS)
NEED TO BE 1000 LBS

GVWR 17500 LBS
GVAR FRONT 10000 LBS
GVGR REAR 10000 LBS

THIS VEHICLE CONFORMS TO ALL APPLICABLE
FEDERAL MOTOR VEHICLE SAFETY BUMPER AND
THEFT PREVENTION STANDARDS IN EFFECT ON
THE DATE OF MANUFACTURE SHOWN ABOVE

PASSENGER CAR

(FJ)

Figure A-17 CERTIFICATION PLACARD



Figure A-18 TIRE PLACARD

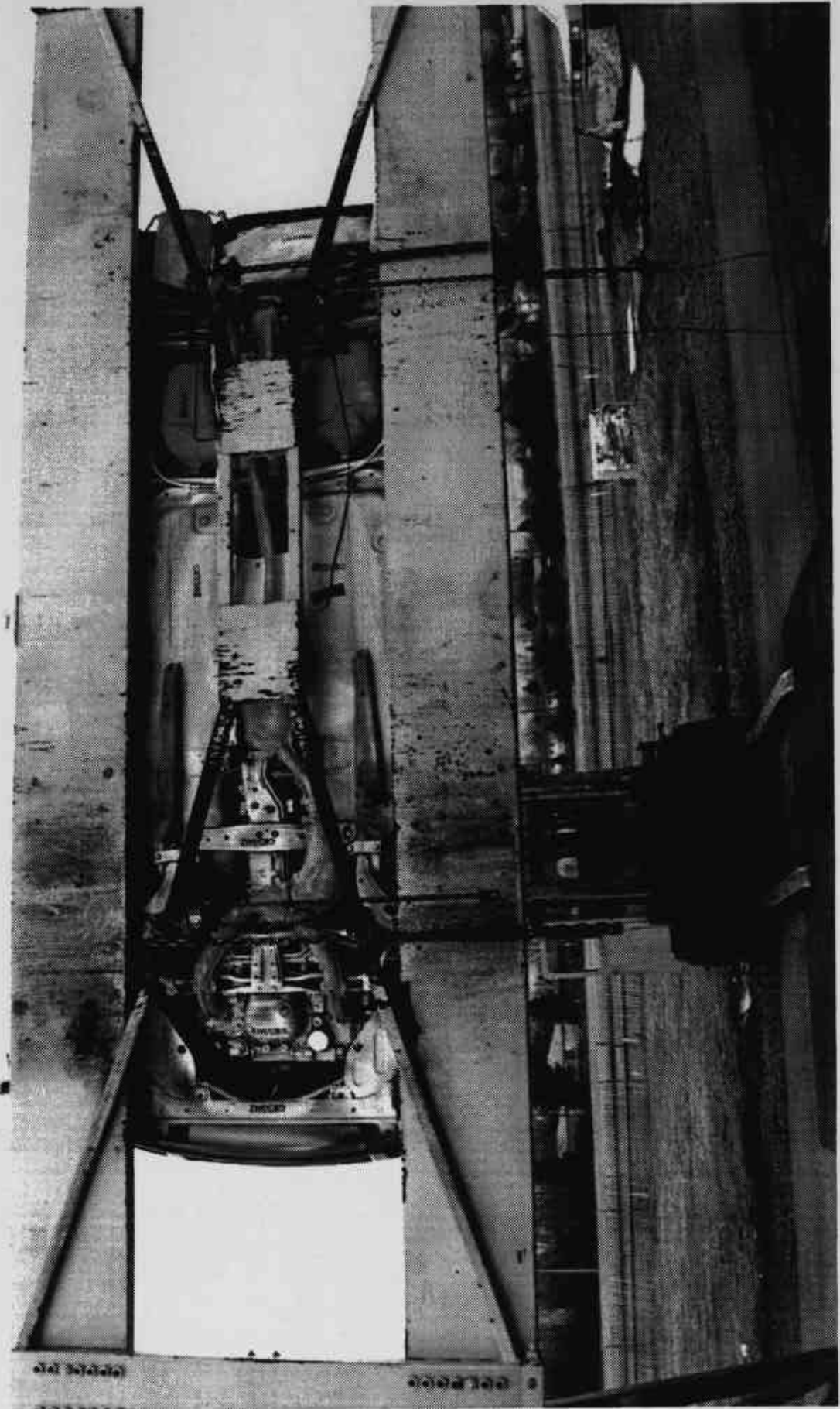


Figure A-19 ROLLOVER 90°

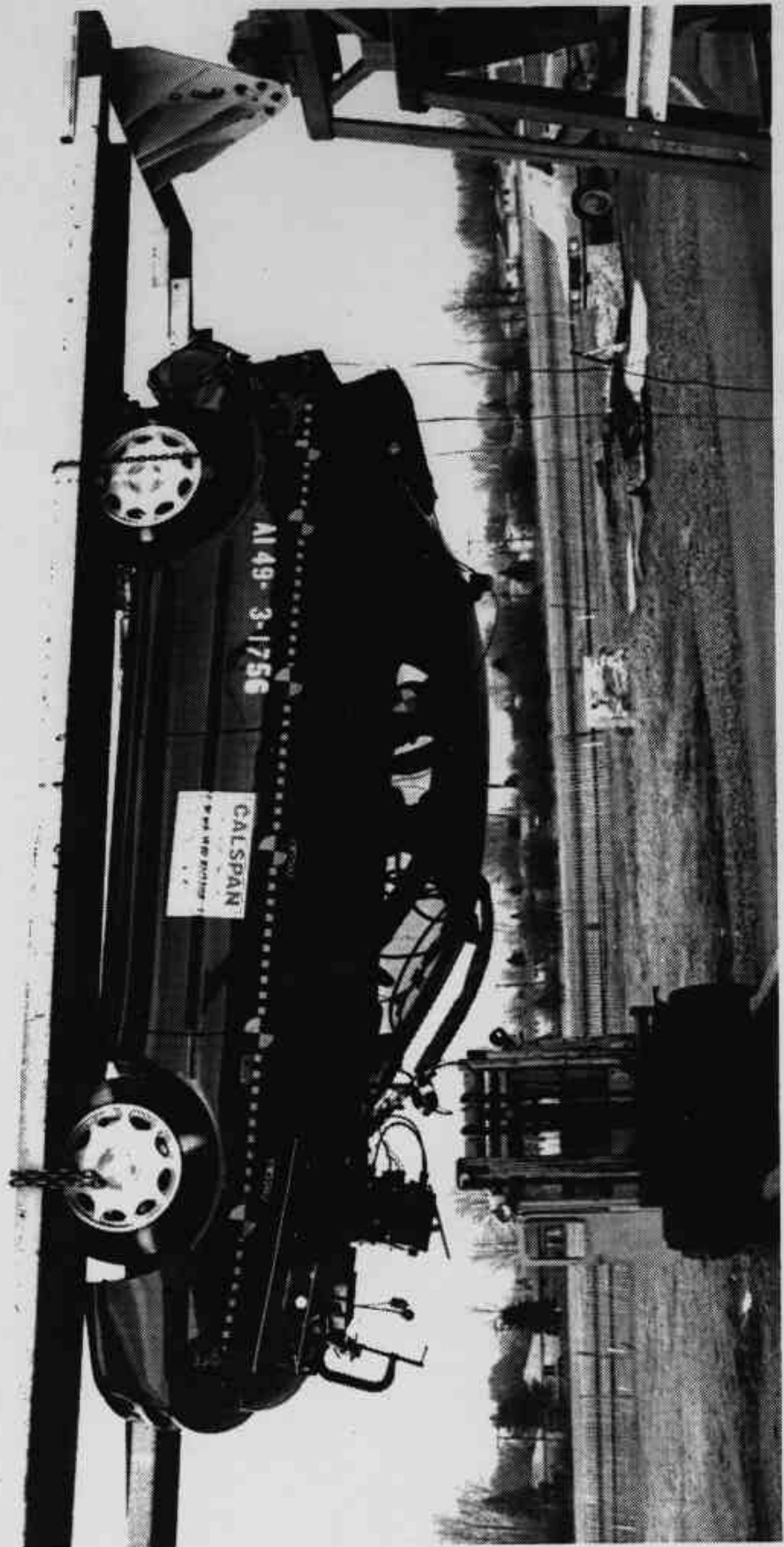


Figure A-20 ROLLOVER 180°

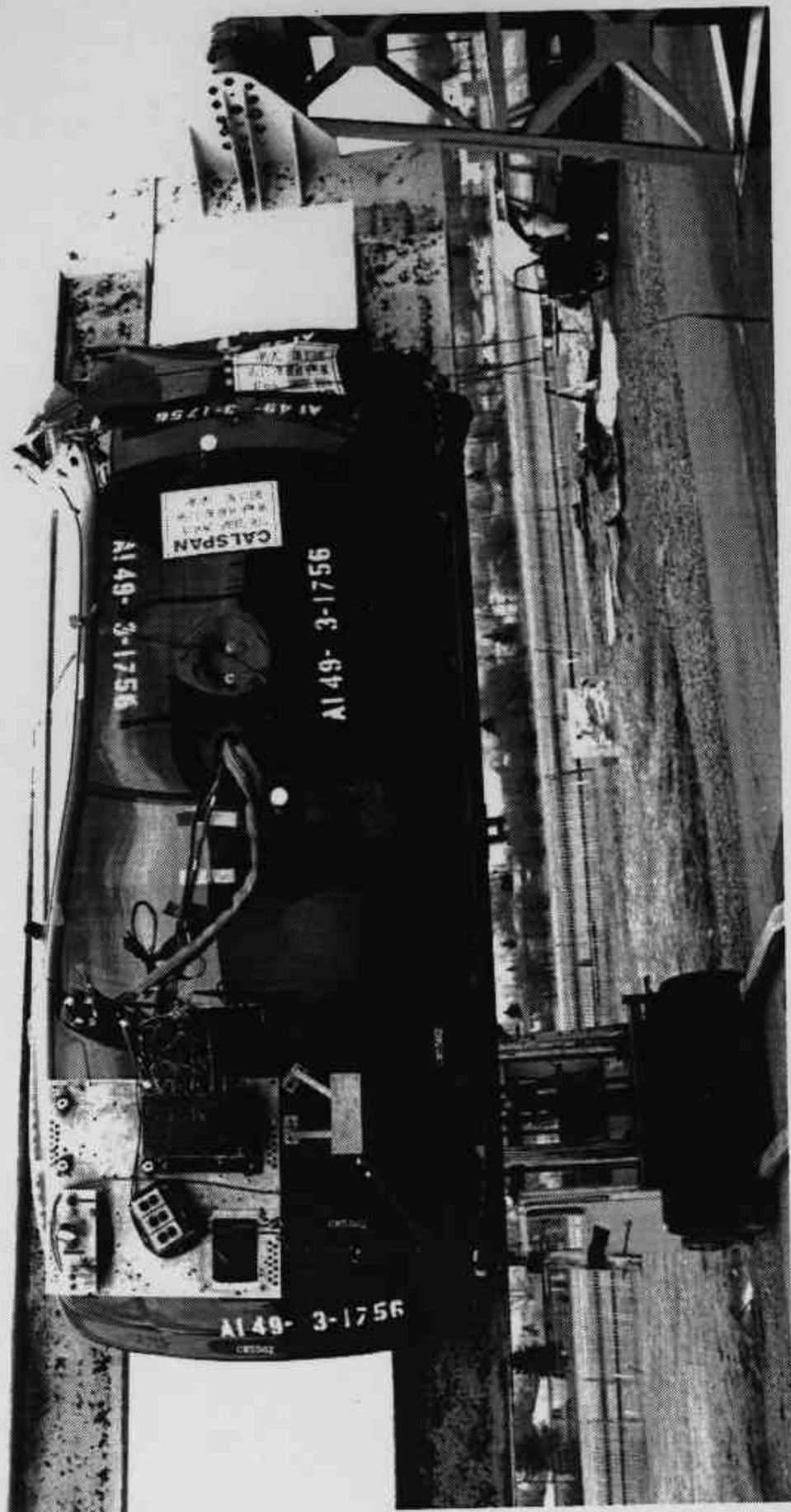


Figure A-21 ROLLOVER 270°

PHOTOGRAPH NOT AVAILABLE

Appendix B

VEHICLE AND DUMMY RESPONSE DATA

(REAR IMPACT ONLY)

FACILITY: track TEST DATE: 27 Feb 1998
 RUN #: 1756 TEST TIME: 13:22:25
 SERIES #: 1 BOARD: a

TITLE: 301 Rear 30 MPH-1998 Subaru Impreza

CHANNEL NUMBER	DESCRIPTION	ENGR UNIT	MAXIMUM		MINIMUM		FILTER CLASS
			AMP	msec	AMP	msec	
1	Pos. 1 Head X	Gs	26.3	128.0	-2.4	64.1	1000.0
2	Pos. 1 Head Y	Gs	1.4	80.9	-8.2	133.4	1000.0
3	Pos. 1 Head Z	Gs	23.7	117.6	-.2	35.6	1000.0
4	Pos. 1 Chest Disp	ins	.0	114.9	.0	333.2	60.0
5	Pos. 1 Chest X	Gs	11.5	84.3	-1.8	359.3	180.0
6	Pos. 1 Chest Y	Gs	.8	36.9	-3.6	138.9	180.0
7	Pos. 1 Chest Z	Gs	5.9	59.3	-1.3	169.4	180.0
8	Pos. 1 Lap Belt Load	lbs	25.5	359.1	-4.1	196.8	60.0
9	Pos. 1 Pelvic X	Gs	16.6	59.0	-2.9	355.7	1000.0
10	Pos. 1 Pelvic Y	Gs	2.3	99.5	-2.1	69.1	1000.0
11	Pos. 1 Pelvic Z	Gs	7.6	71.0	-1.8	173.1	1000.0
12	Pos. 1 Belt Spoolout	ins	.0	-35.1	-2.0	258.7	60.0
13	Pos. 1 Upper Neck Fx	lbs	55.8	132.0	-22.2	65.6	1000.0
14	Pos. 1 Upper Neck Fy	lbs	14.2	84.7	-39.4	191.5	1000.0
15	Pos. 1 Upper Neck Fz	lbs	353.7	116.8	-35.6	27.4	1000.0
16	Left Rear Xmember X	Gs	20.8	4.4	-2.3	141.2	60.0
17	Pos. 1 Head Resultant	Gs	30.6	126.1	.0	.6	1000.0
18	Pos. 1 Chest Resultant	Gs	12.5	83.7	.0	-34.7	180.0
19	Pos. 1 Pelvic Res.	Gs	18.1	59.0	.0	3.9	1000.0
20	Pos. 1 Upper Neck F(Res)	lbs	353.9	116.8	1.4	8.7	1000.0

V2 36 ms Fixed Duration HIC SUMMARY: Pos. 1 Head Resultant

hic: 117.89
 t1 = 105.700 msec
 t2 = 141.700 msec
 Average G's Over Hic Duration = 25.47

CLIP V2.1 SUMMARY: Pos. 1 Chest Resultant

Peak Resultant (3 ms CLIPPED DURATION) = 12.209 G's
 Tstart = 82.4532 ms
 Tend = 85.4532 ms
 CSI = 28.259

FACILITY: track TEST DATE: 27 Feb 1998
 RUN #: 1756 TEST TIME: 13:22:25
 SERIES #: 1 BOARD: b

TITLE: 301 Rear 30 MPH-1998 Subaru Impreza

CHANNEL NUMBER	DESCRIPTION	ENGR UNIT	MAXIMUM		MINIMUM		FILTER CLASS
			AMP	msec	AMP	msec	
1	Pos. 1 Upper Neck Mx	Ft-Lbs	3.1	81.3	-6.2	151.7	600.0
2	Pos. 1 Upper Neck My	Ft-Lbs	9.3	130.4	-9.5	114.2	600.0
3	Pos. 1 Upper Neck Mz	Ft-Lbs	3.2	271.2	-10.3	160.5	600.0
4	Right Rear Xmember X	Gs	21.2	4.7	-1.5	141.4	60.0
5	Upper Seatback X	Gs	45.0	80.8	-16.1	19.4	60.0
6	Lower Seatback X	Gs	42.1	81.3	-9.7	19.0	60.0
7	NULL		.0	359.9	.0	359.9	1000.0
8	NULL		.0	359.9	.0	359.9	1000.0
17	Pos. 1 Neck Moment Res.	Ft-Lbs	14.4	149.0	.0	-34.3	600.0

TEST NO. CW5502

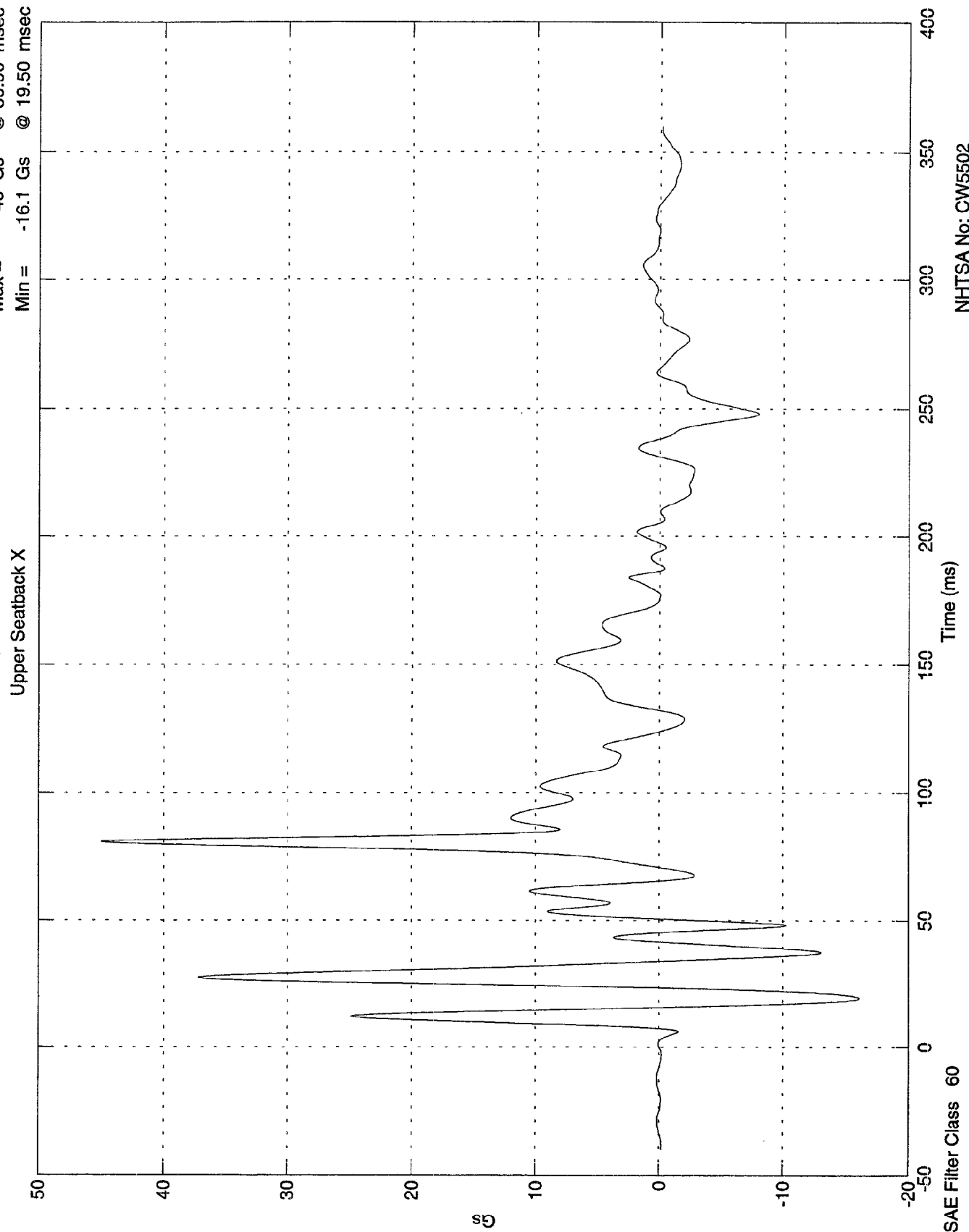
VEHICLE

SAE FILTER CHANNEL CLASS

60

Note: Angular seatback position is measured in degrees of rotation from the initial (design) position.

301 Rear 30 MPH-1998 Subaru Impreza

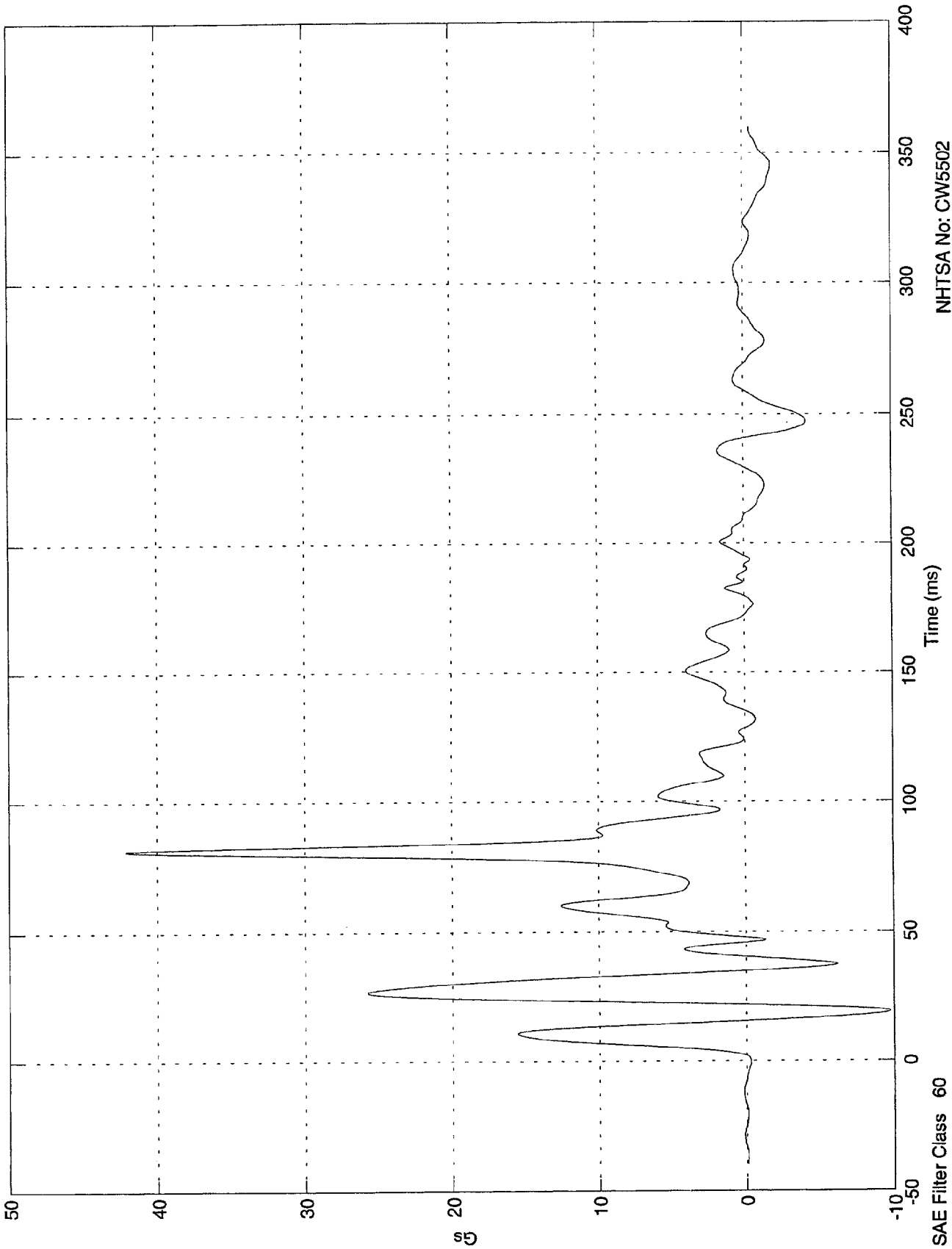


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 42.1 Gs @ 81.40 msec
Min = -9.74 Gs @ 19.10 msec

Lower Seatback X

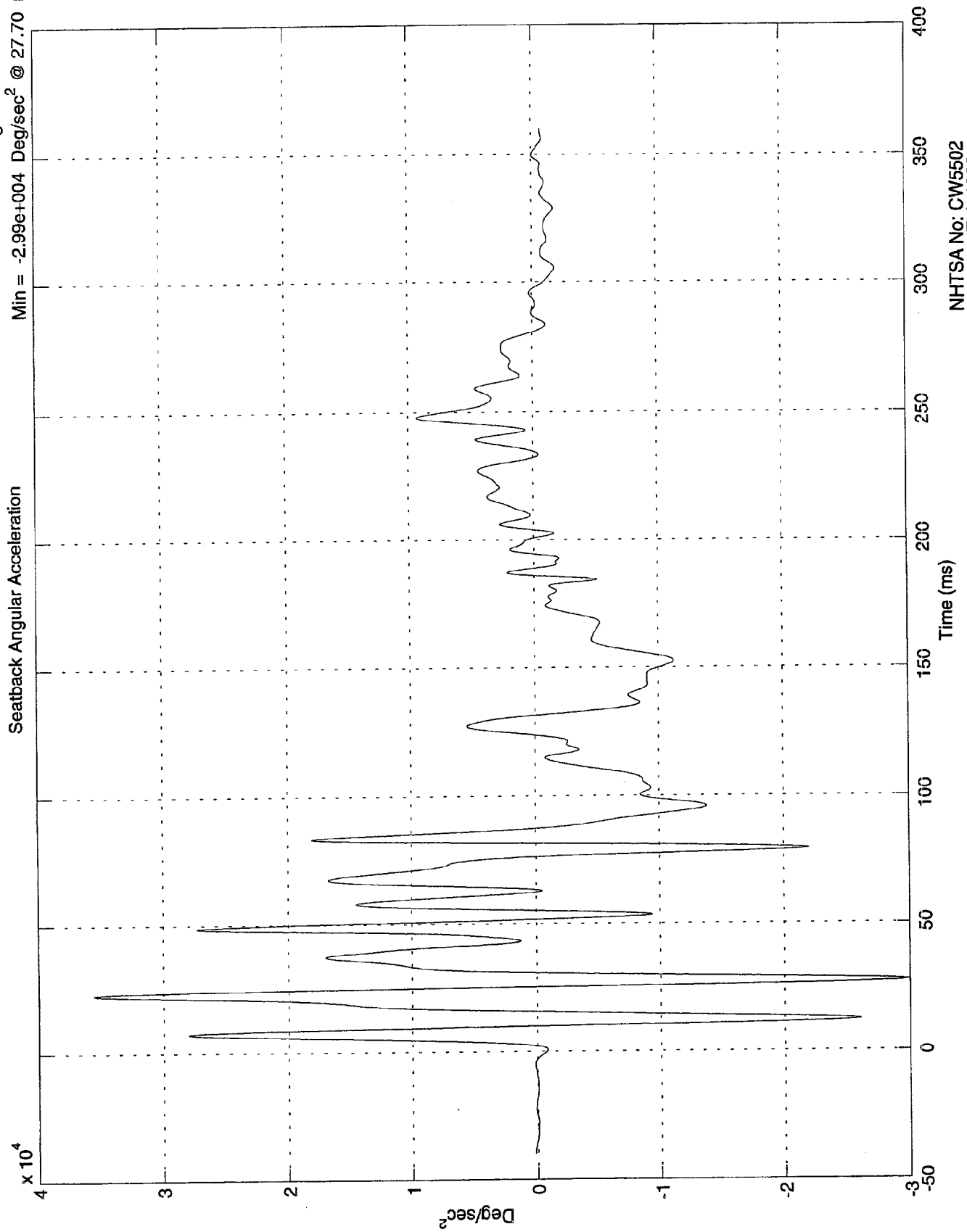


NHTSA No: CW5502
Date: 27 Feb 1998

SAE Filter Class 60

301 Rear 30 MPH-1998 Subaru Impreza

Max = 3.56e+004 Deg/sec² @ 22.90 msec
Min = -2.99e+004 Deg/sec² @ 27.70 msec

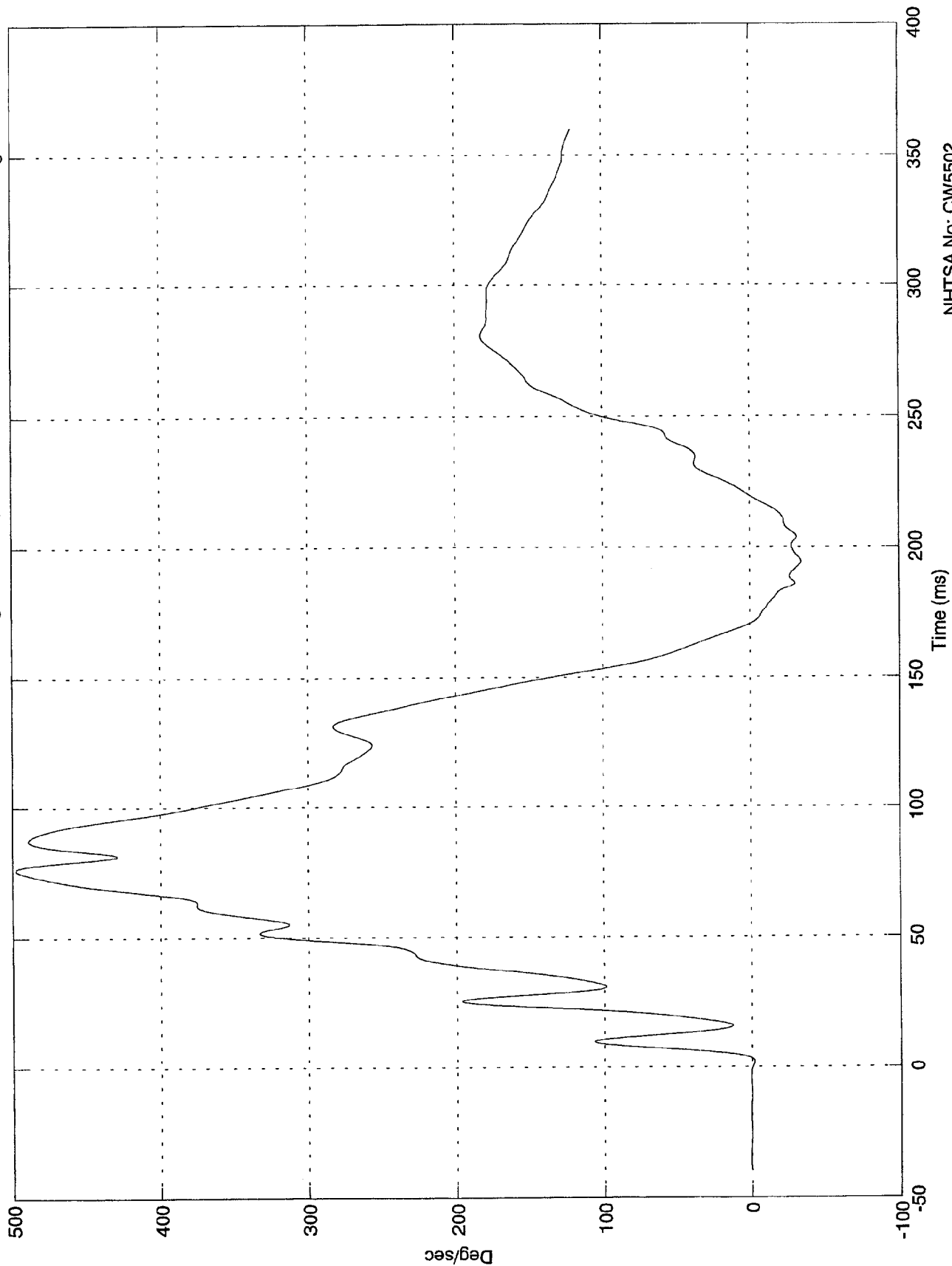


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

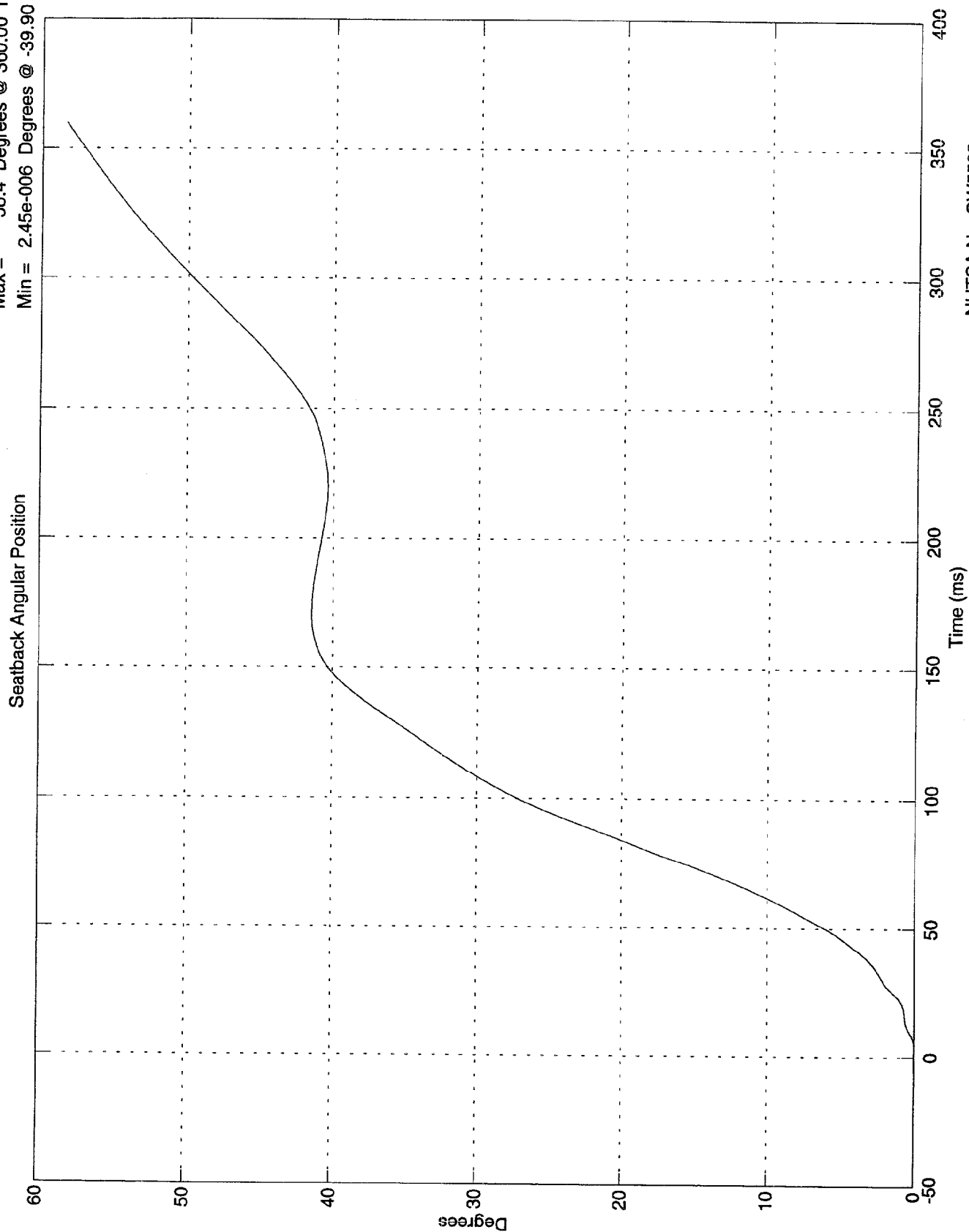
Max = 498 Deg/sec @ 76.20 msec
Min = -34.9 Deg/sec @ 194.40 msec

Seatback Angular Velocity



NHTSA No: CW5502
Date: 27 Feb 1998

Max = 58.4 Degrees @ 360.00 msec
 Min = 2.45e-006 Degrees @ -39.90 msec

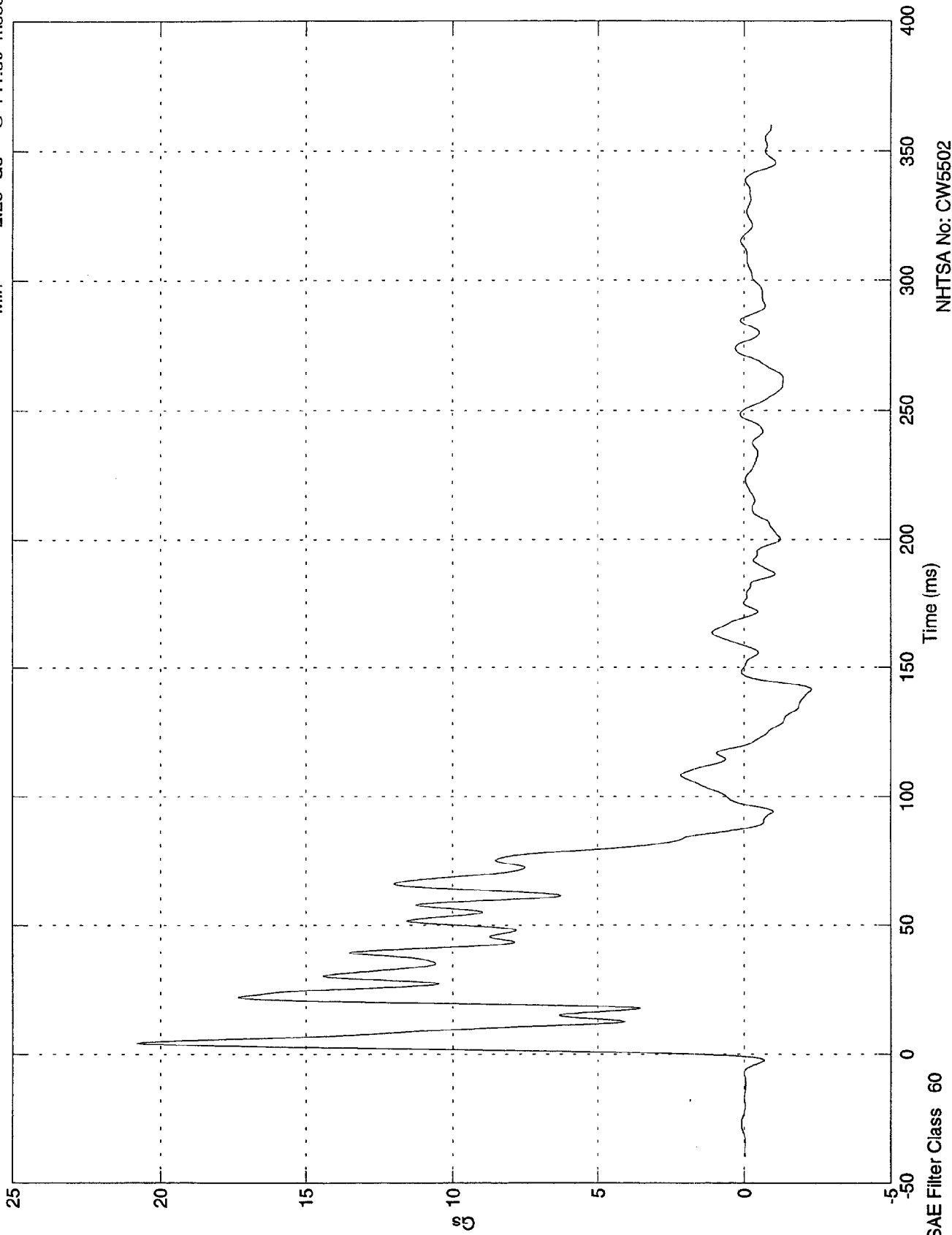


NHTSA No: CW5502
 Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 20.8 Gs @ 4.50 msec
Min = -2.28 Gs @ 141.30 msec

Left Rear Xmember X



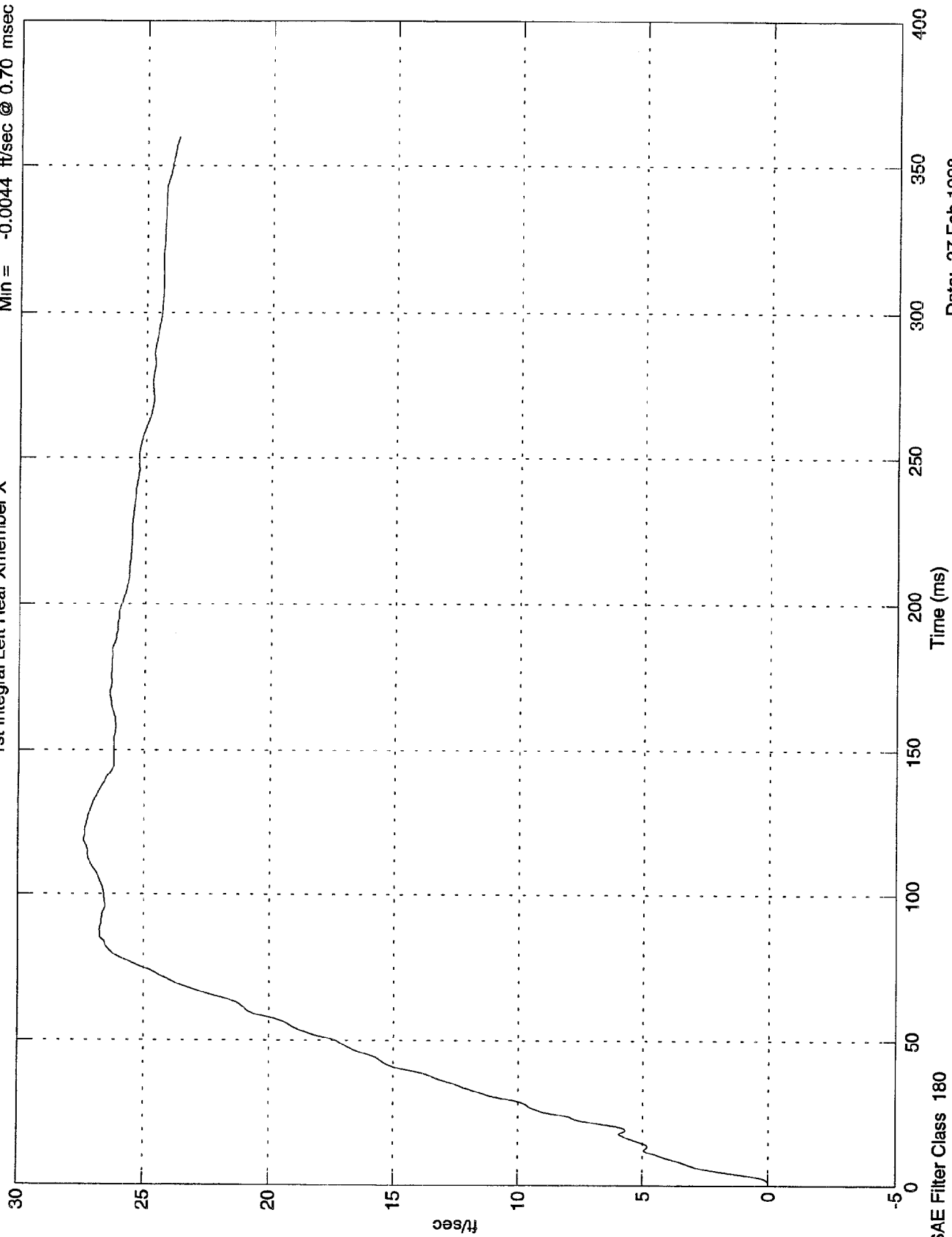
NHTSA No: CW5502
Date: 27 Feb 1998

SAE Filter Class 60

301 Rear 30 MPH-1998 Subaru impreza

Max = 27.4 ft/sec @ 118.90 msec
Min = -0.0044 ft/sec @ 0.70 msec

1st Integral Left Rear Xmember X

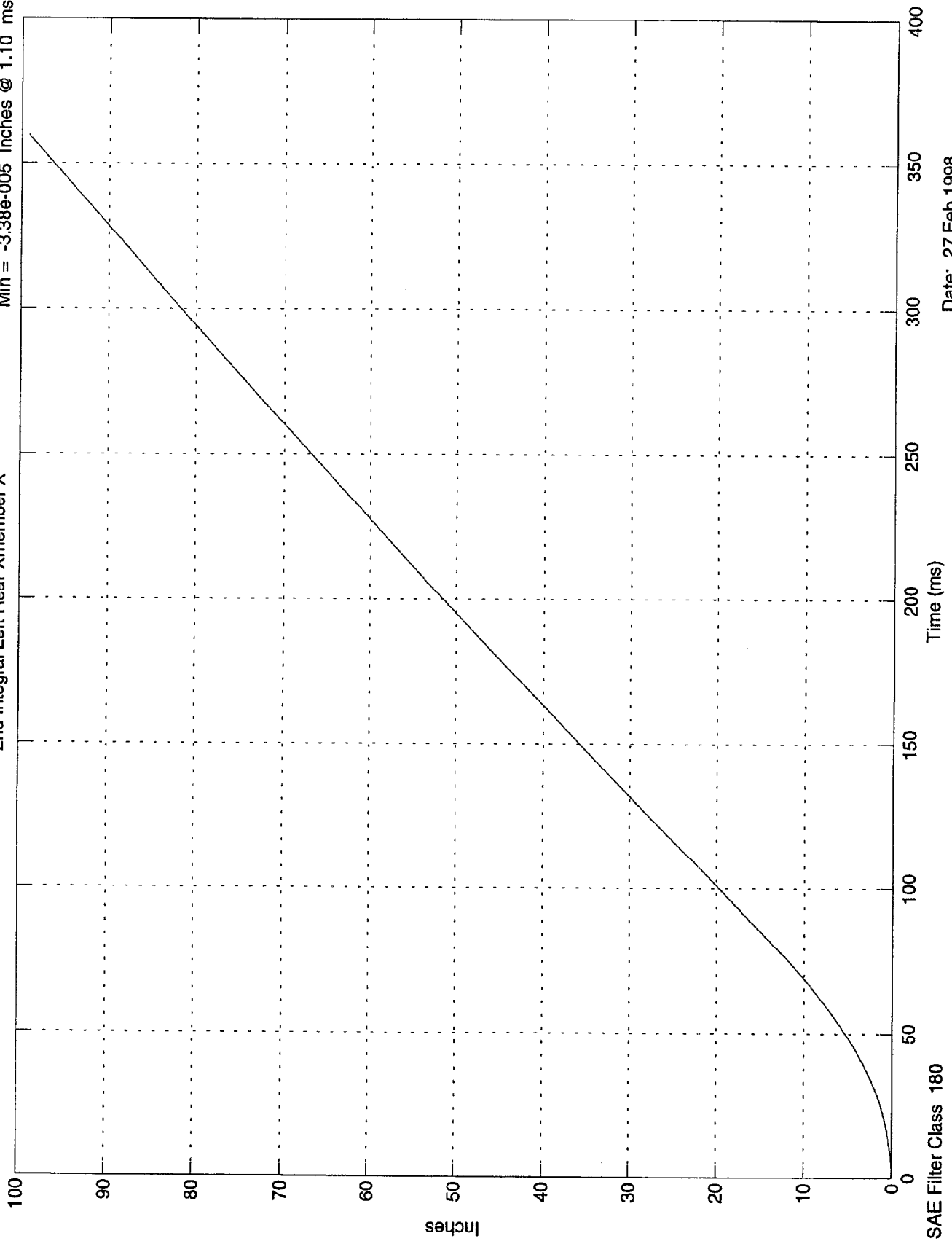


Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 99.2 Inches @ 360.00 msec
Min = -3.38e-005 Inches @ 1.10 msec

2nd Integral Left Rear Xmember X

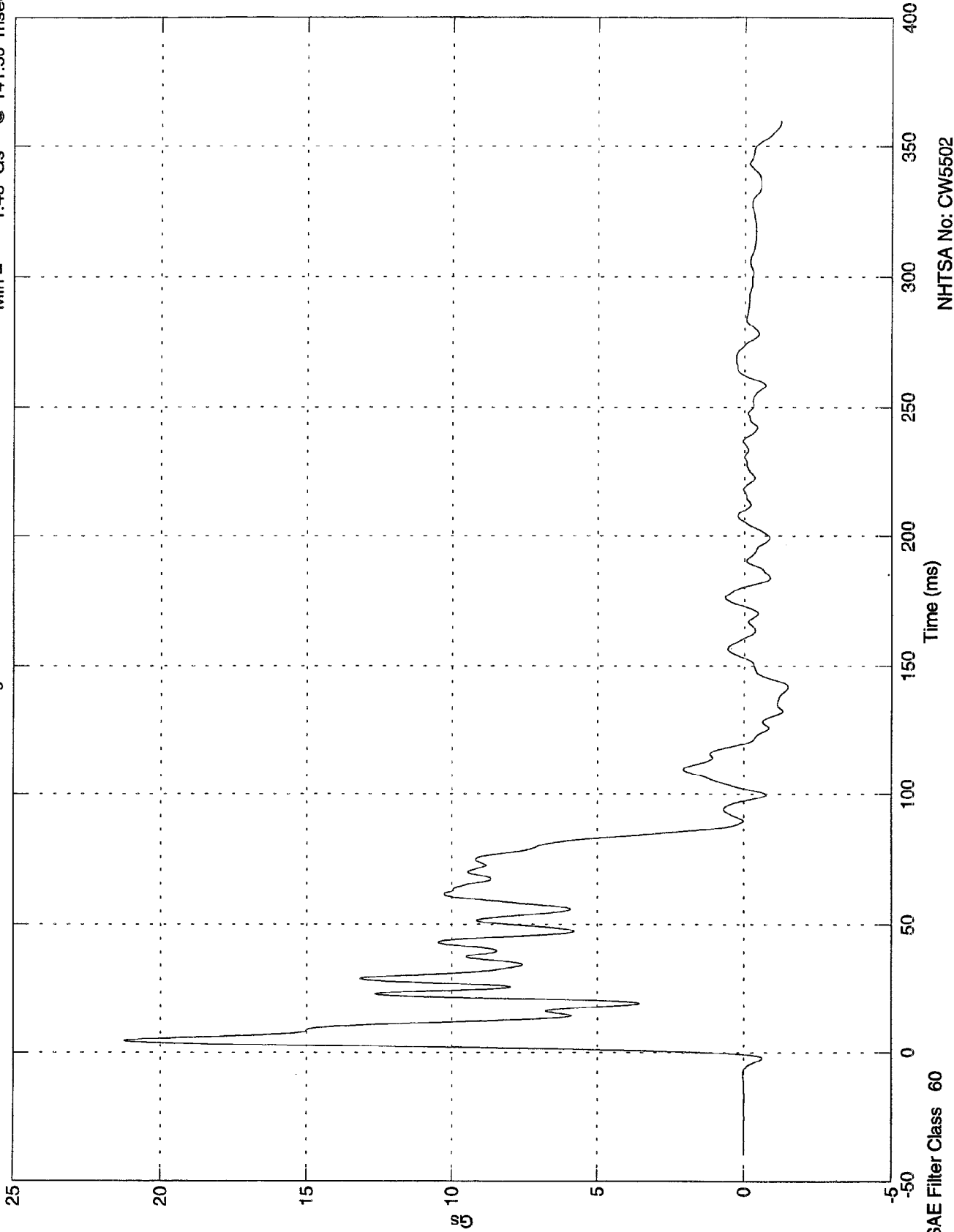


Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 21.2 Gs @ 4.80 msec
Min = -1.48 Gs @ 141.50 msec

Right Rear Xmember X

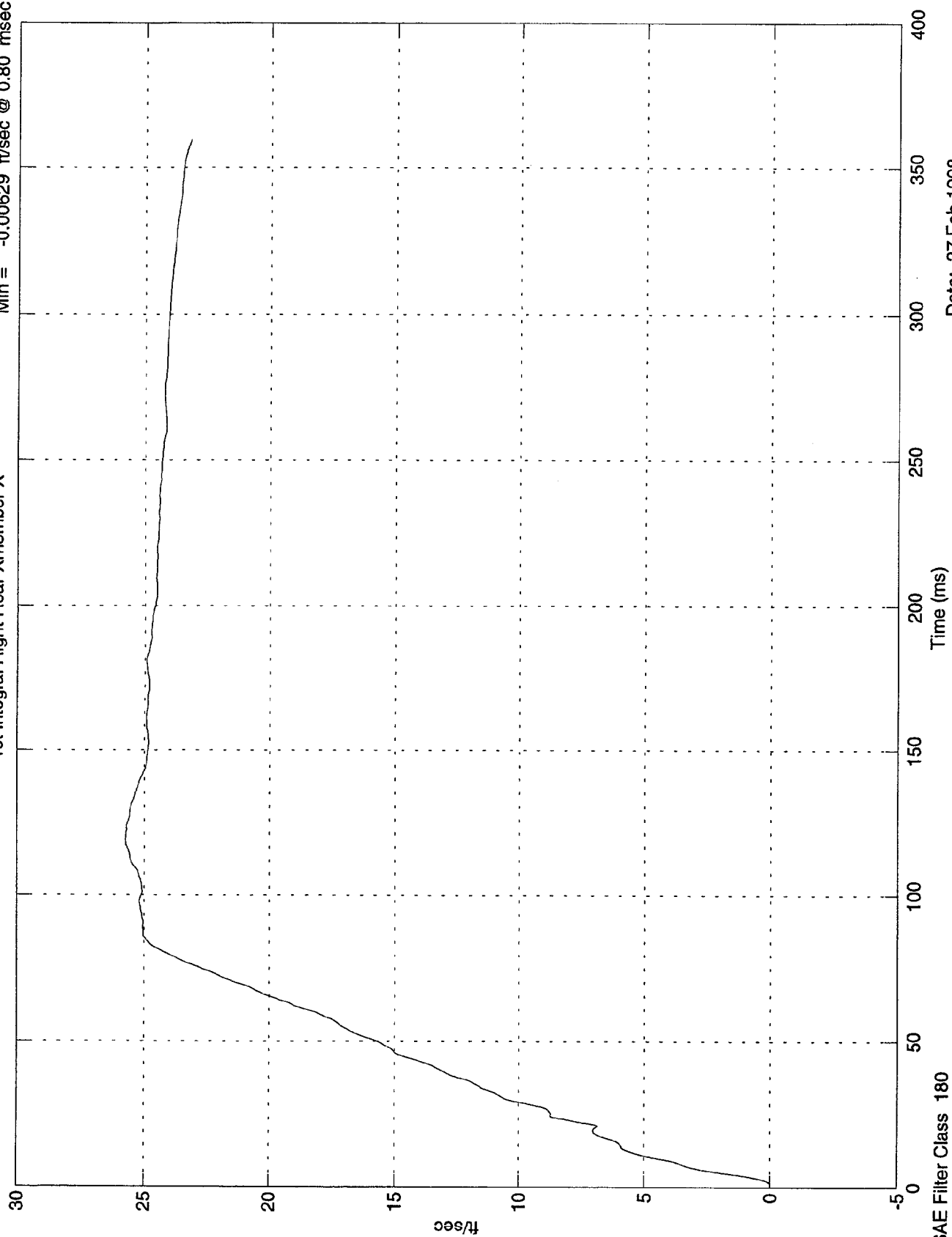


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 25.7 ft/sec @ 119.30 msec
Min = -0.00629 ft/sec @ 0.80 msec

1st Integral Right Rear Xmember X



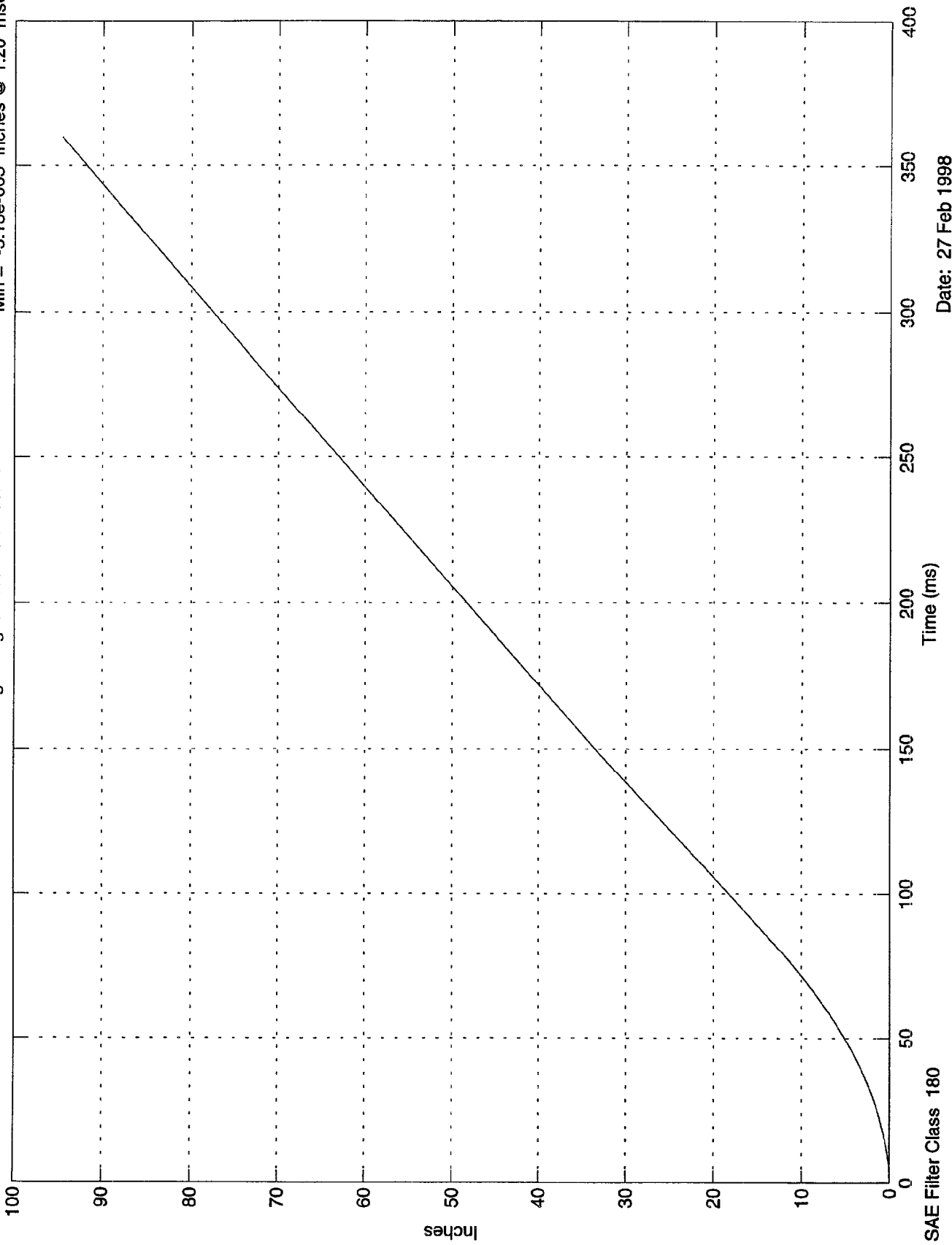
SAE Filter Class 180

Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

2nd Integral Right Rear Xmember X

Max = 94.6 Inches @ 360.00 msec
Min = -5.13e-005 Inches @ 1.20 msec



Date: 27 Feb 1998

SAE Filter Class 180

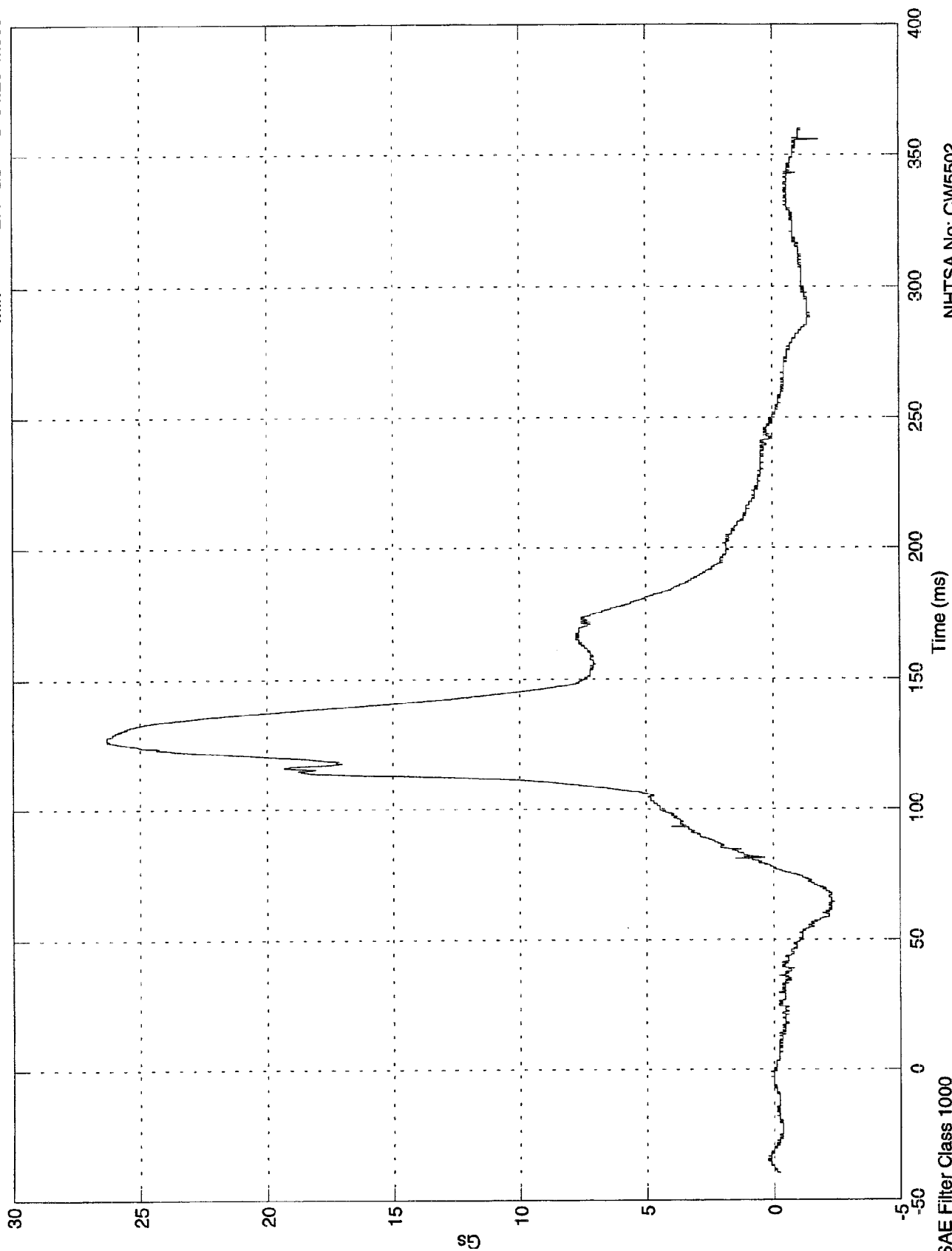
TEST NO. CW5502

DRIVER DUMMY (Pos. 1)	SAE FILTER CHANNEL CLASS
Head Accelerations	1000
Chest Accelerations	180
Pelvic Accelerations	1000
Upper Neck Forces	1000
Upper Neck Moments	600
Belt Forces	60
Belt Spoolout	60

301 Rear 30 MPH-1998 Subaru Impreza

Max = 26.3 Gs @ 126.20 msec
Min = -2.4 Gs @ 64.20 msec

Pos. 1 Head X

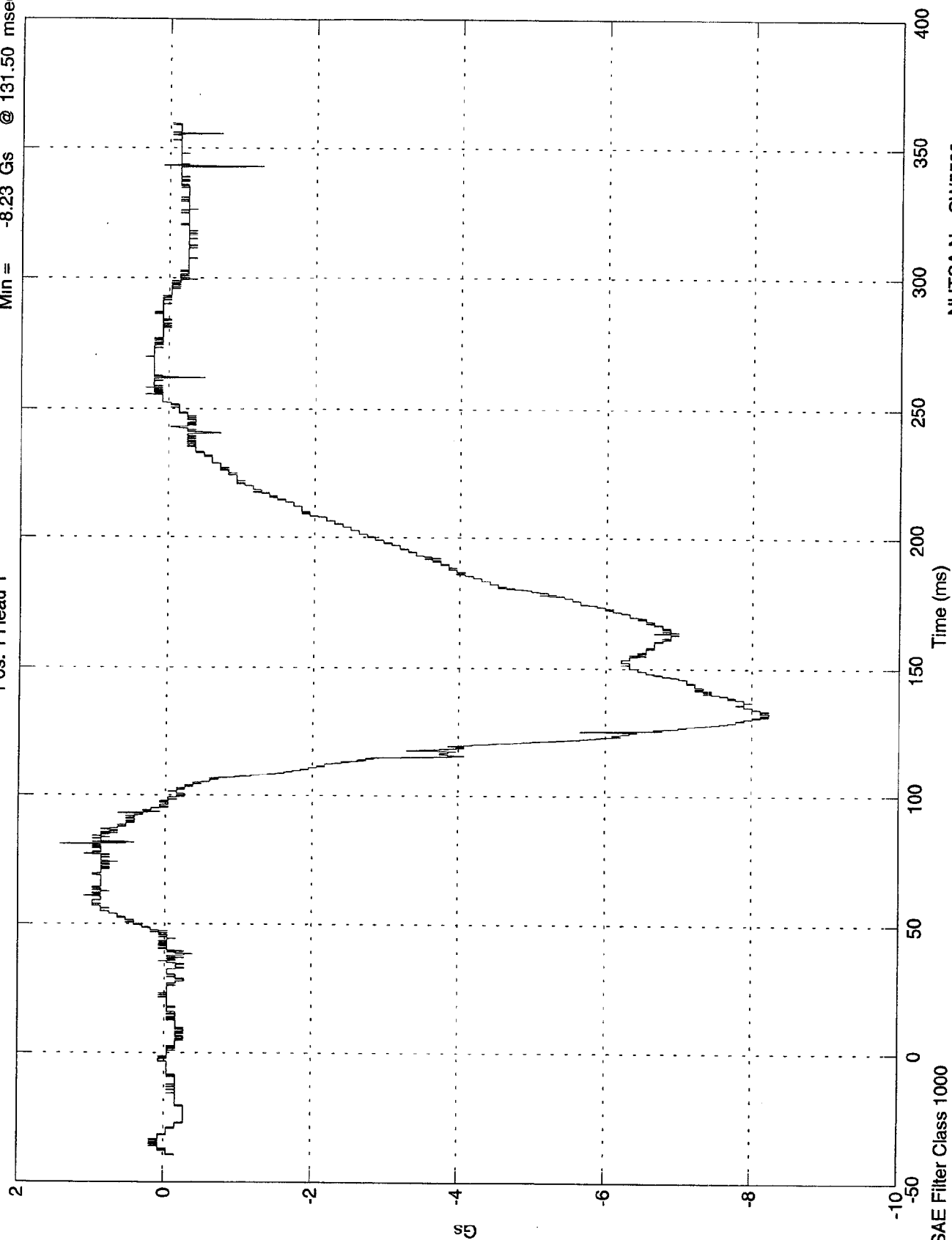


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 1.43 Gs @ 81.00 msec
Min = -8.23 Gs @ 131.50 msec

Pos. 1 Head Y

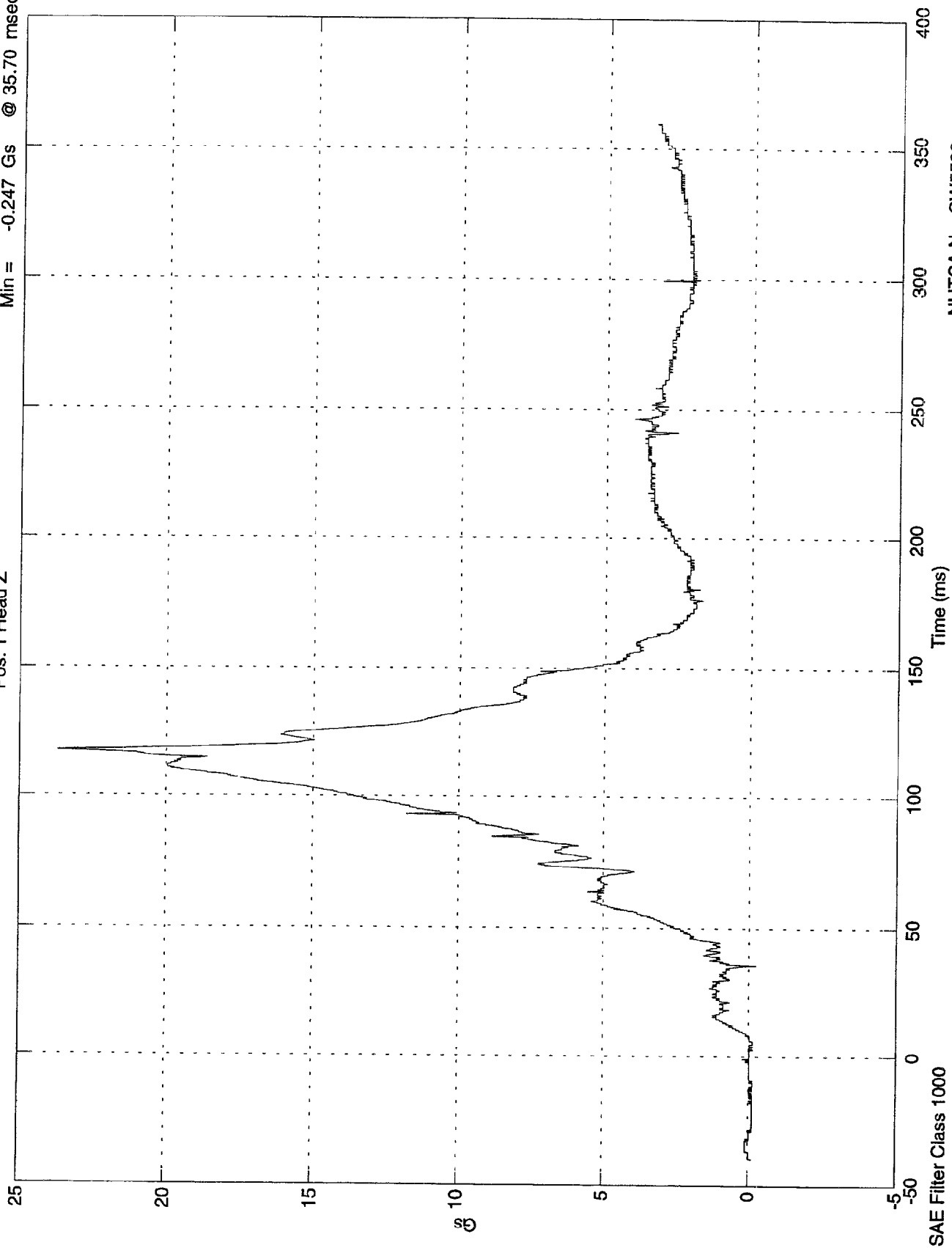


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 23.7 Gs @ 117.70 msec
Min = -0.247 Gs @ 35.70 msec

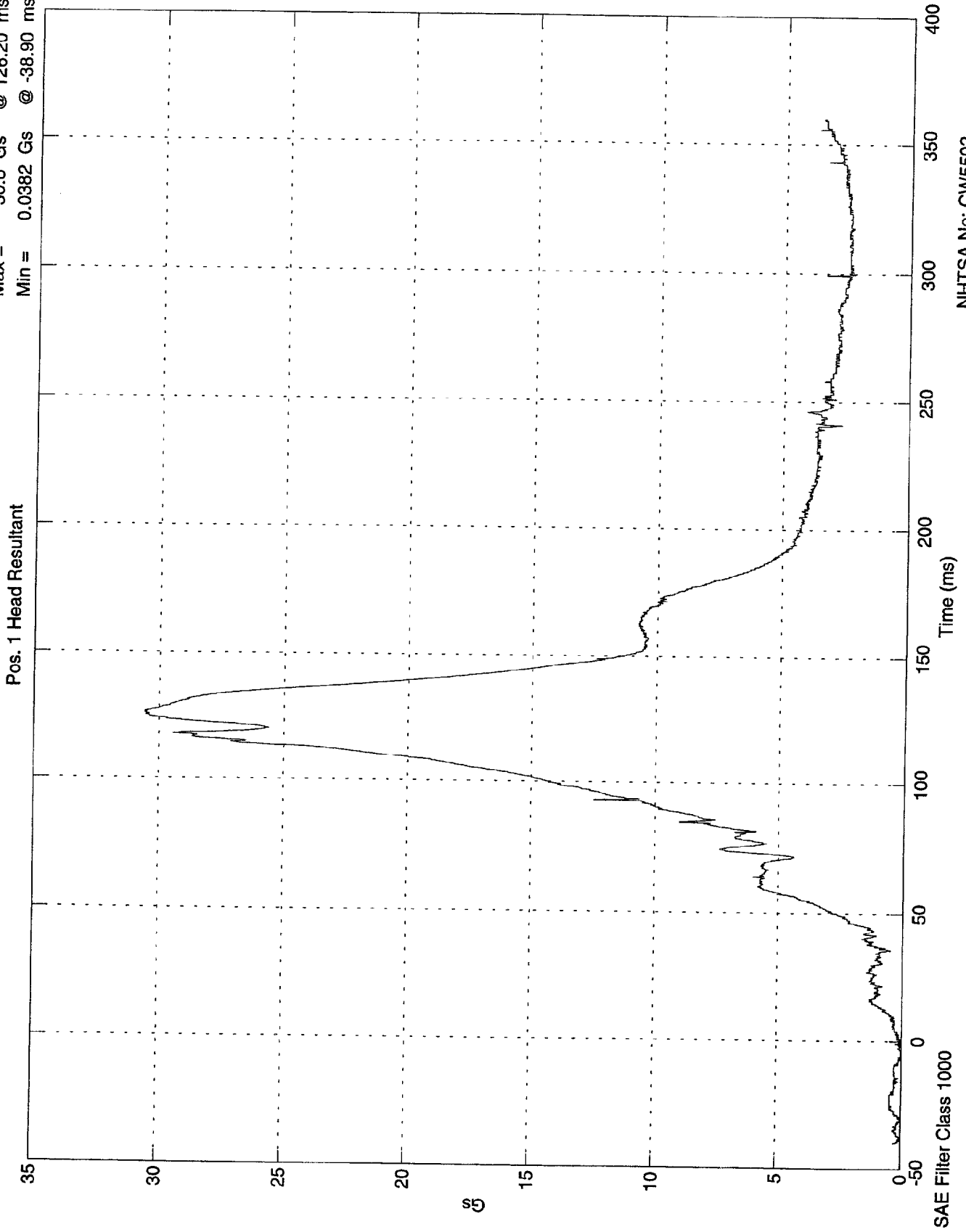
Pos. 1 Head Z



NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 30.6 Gs @ 126.20 msec
Min = 0.0382 Gs @ -38.90 msec

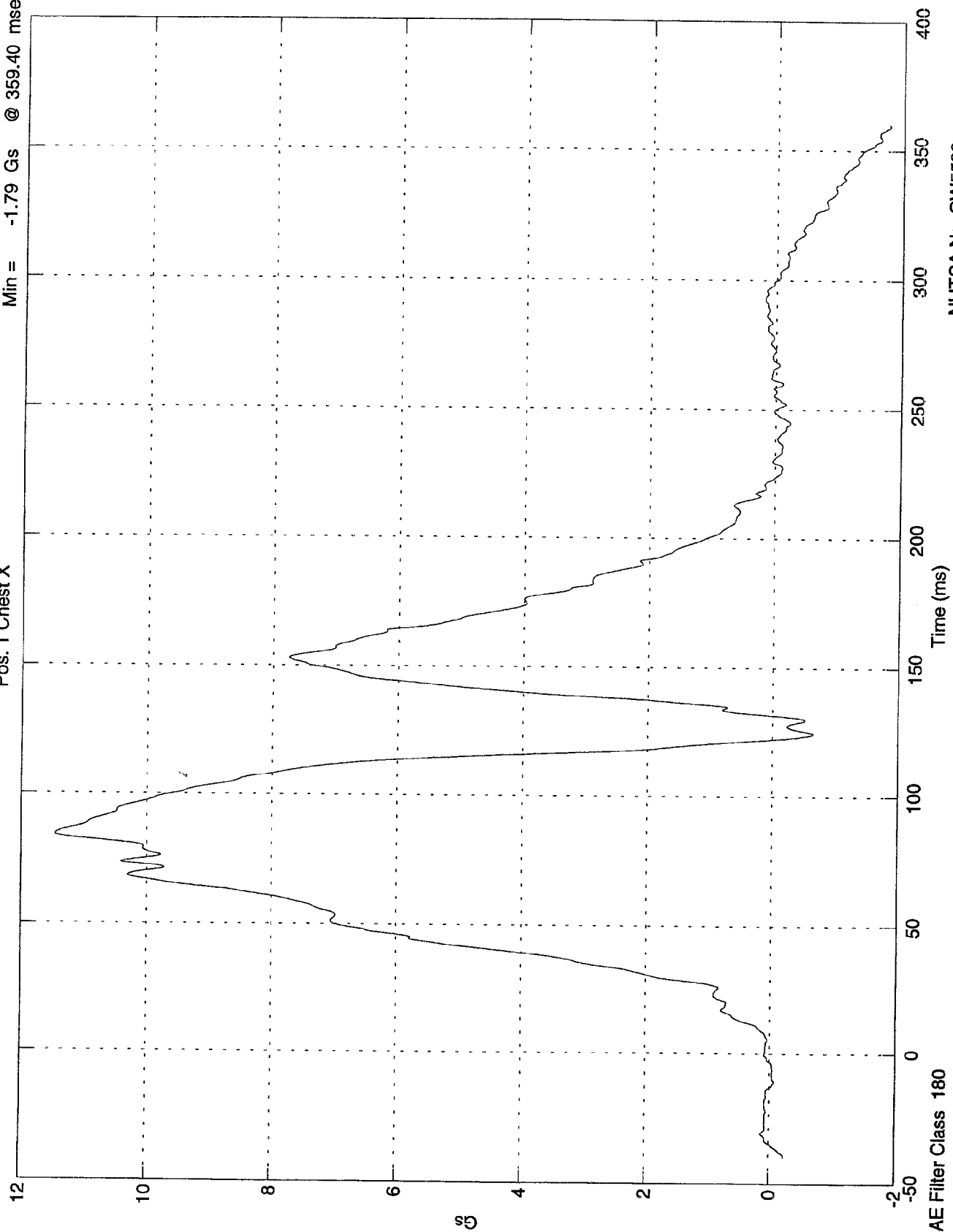


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 11.5 Gs @ 84.40 msec
Min = -1.79 Gs @ 359.40 msec

Pos. 1 Chest X

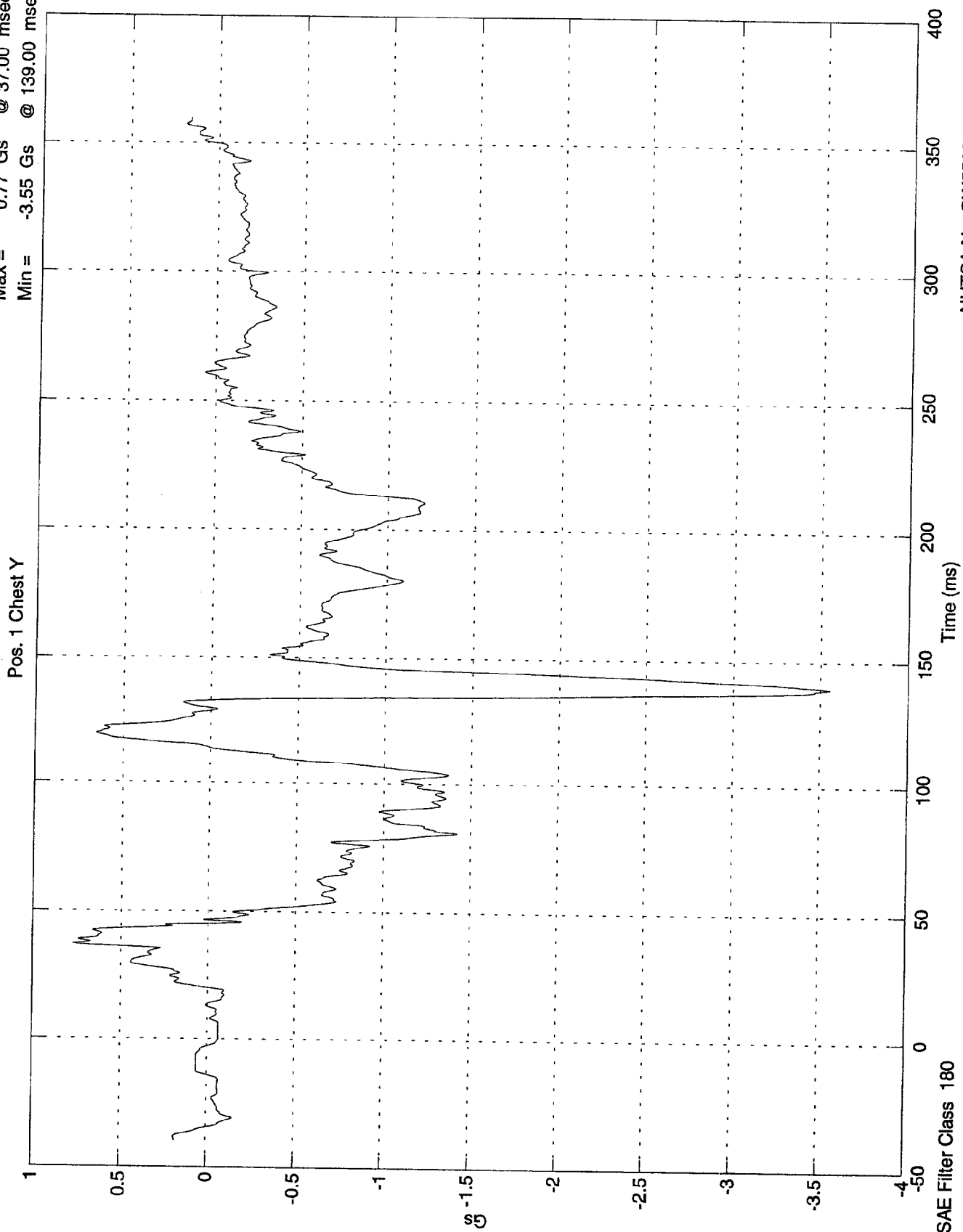


SAE Filter Class 180

NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 0.77 Gs @ 37.00 msec
Min = -3.55 Gs @ 139.00 msec

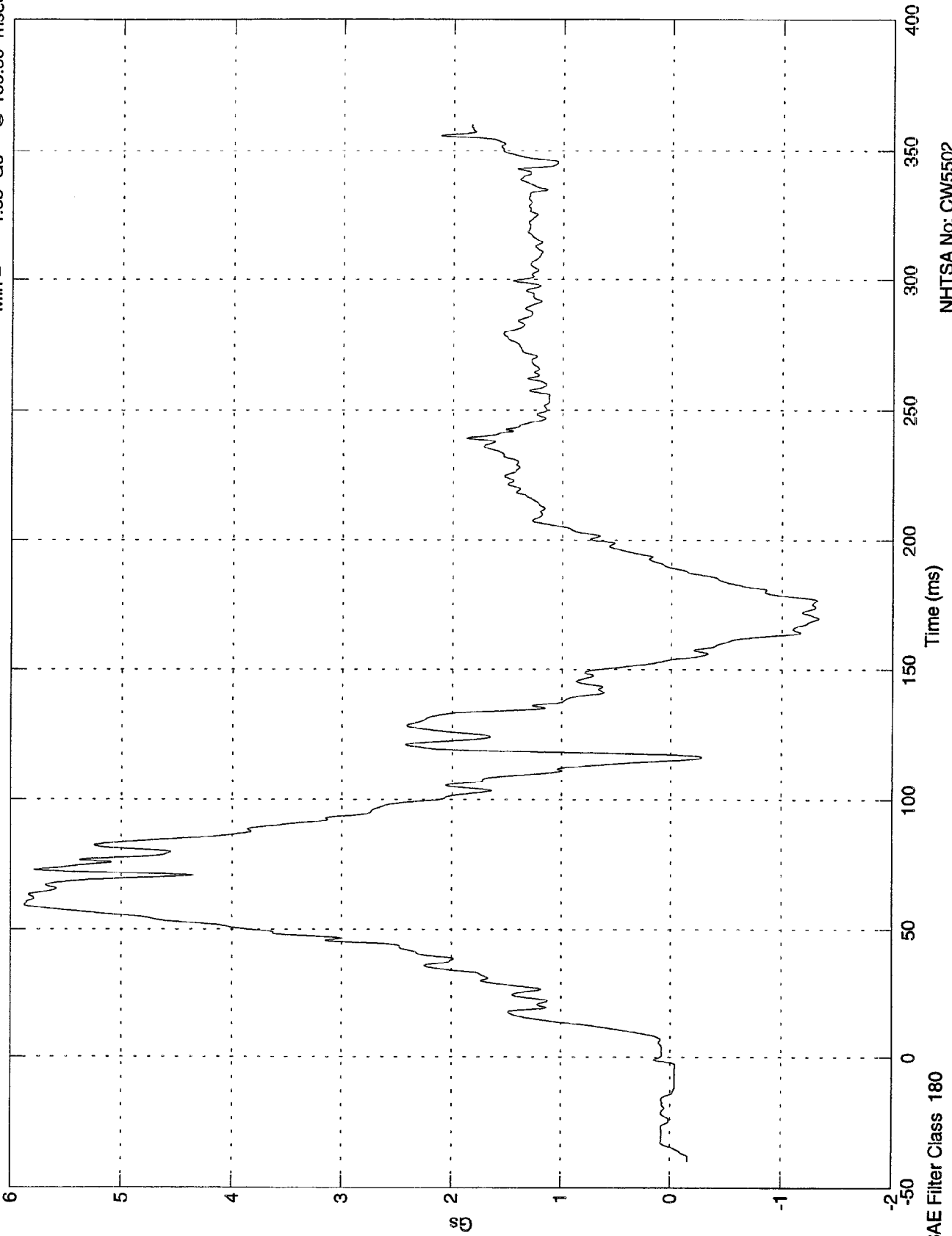


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 5.88 Gs @ 59.40 msec
Min = -1.33 Gs @ 169.50 msec

Pos. 1 Chest Z

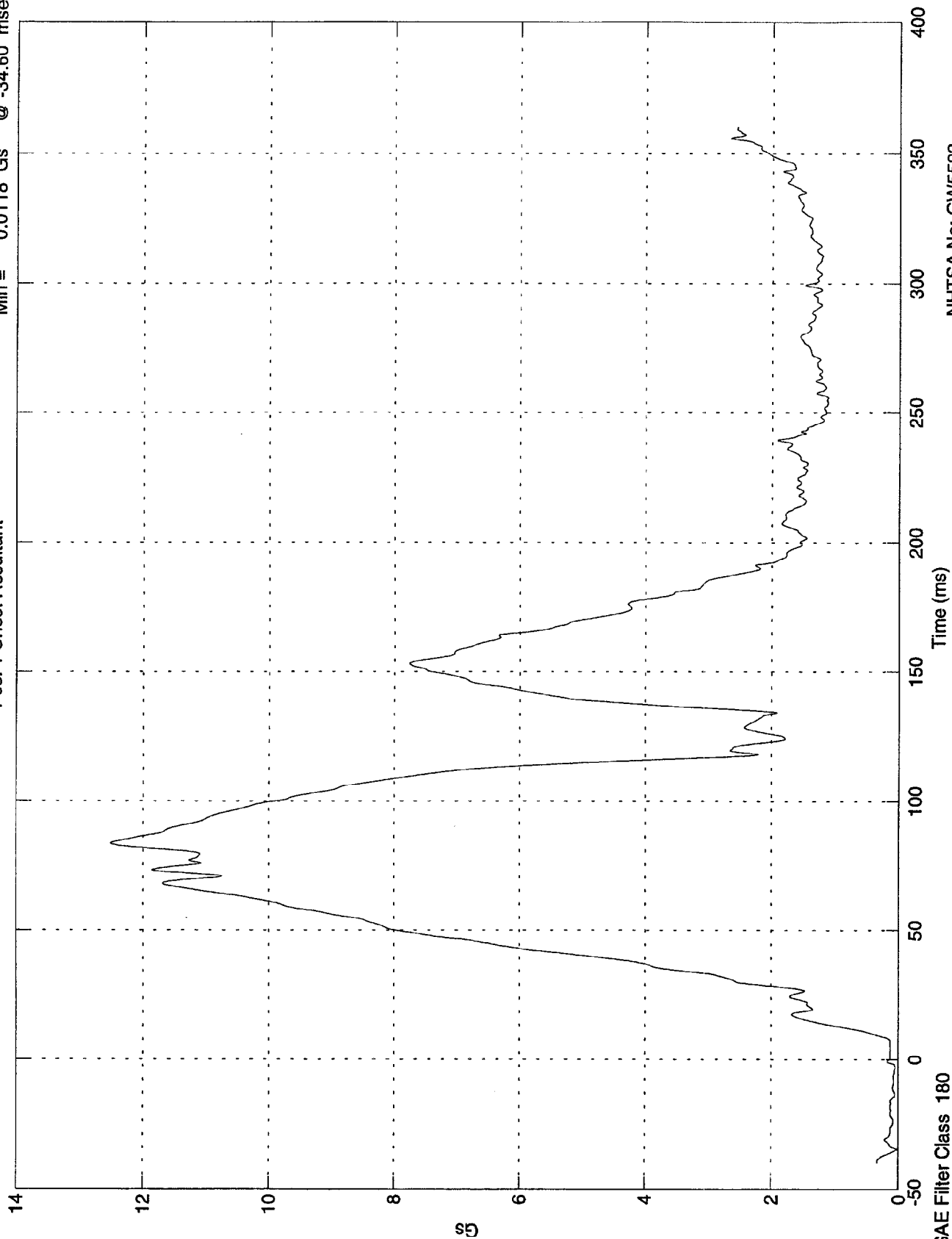


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 12.5 Gs @ 83.80 msec
Min = 0.0118 Gs @ -34.60 msec

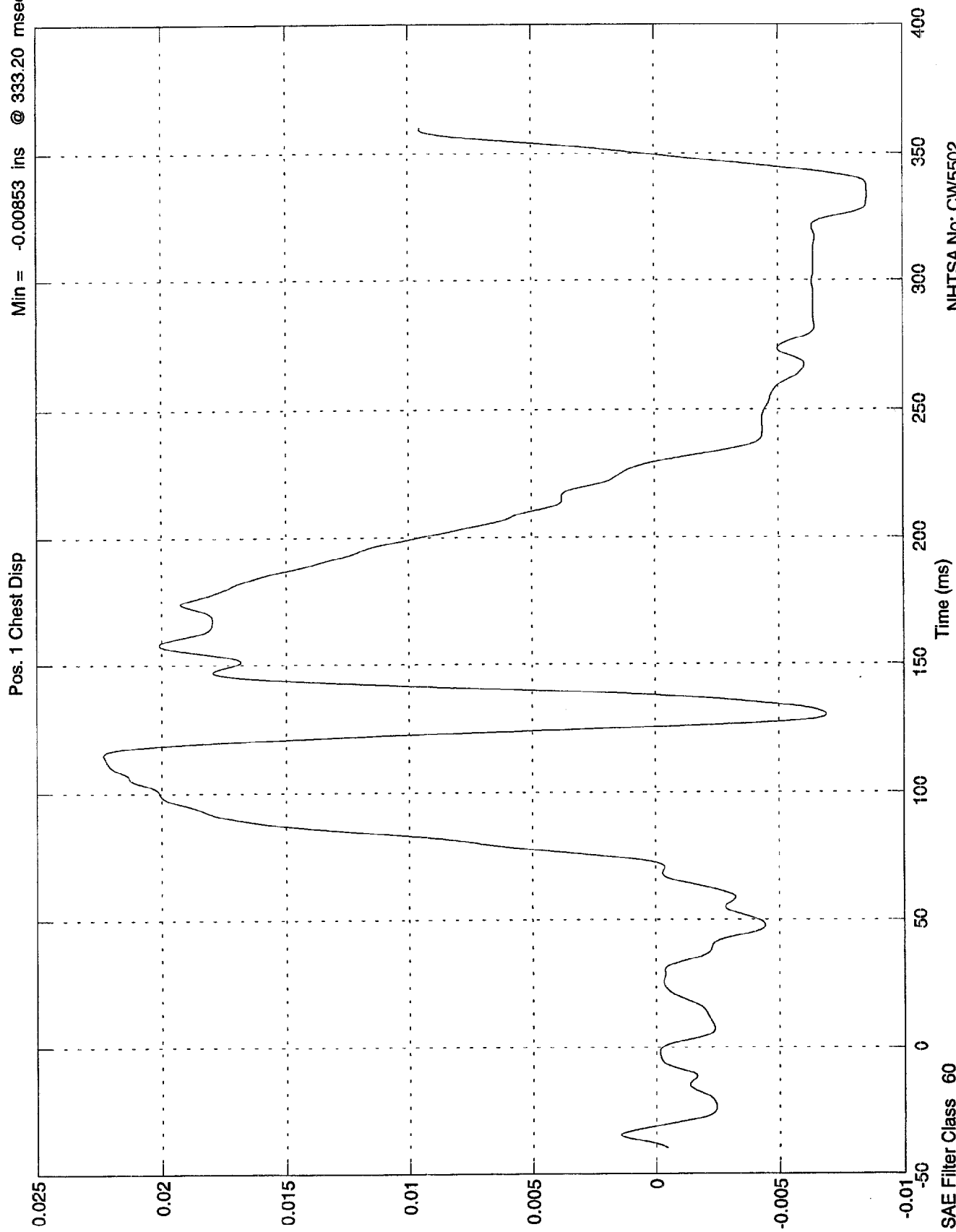
Pos. 1 Chest Resultant



NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 0.0223 ins @ 114.90 msec
Min = -0.00853 ins @ 333.20 msec

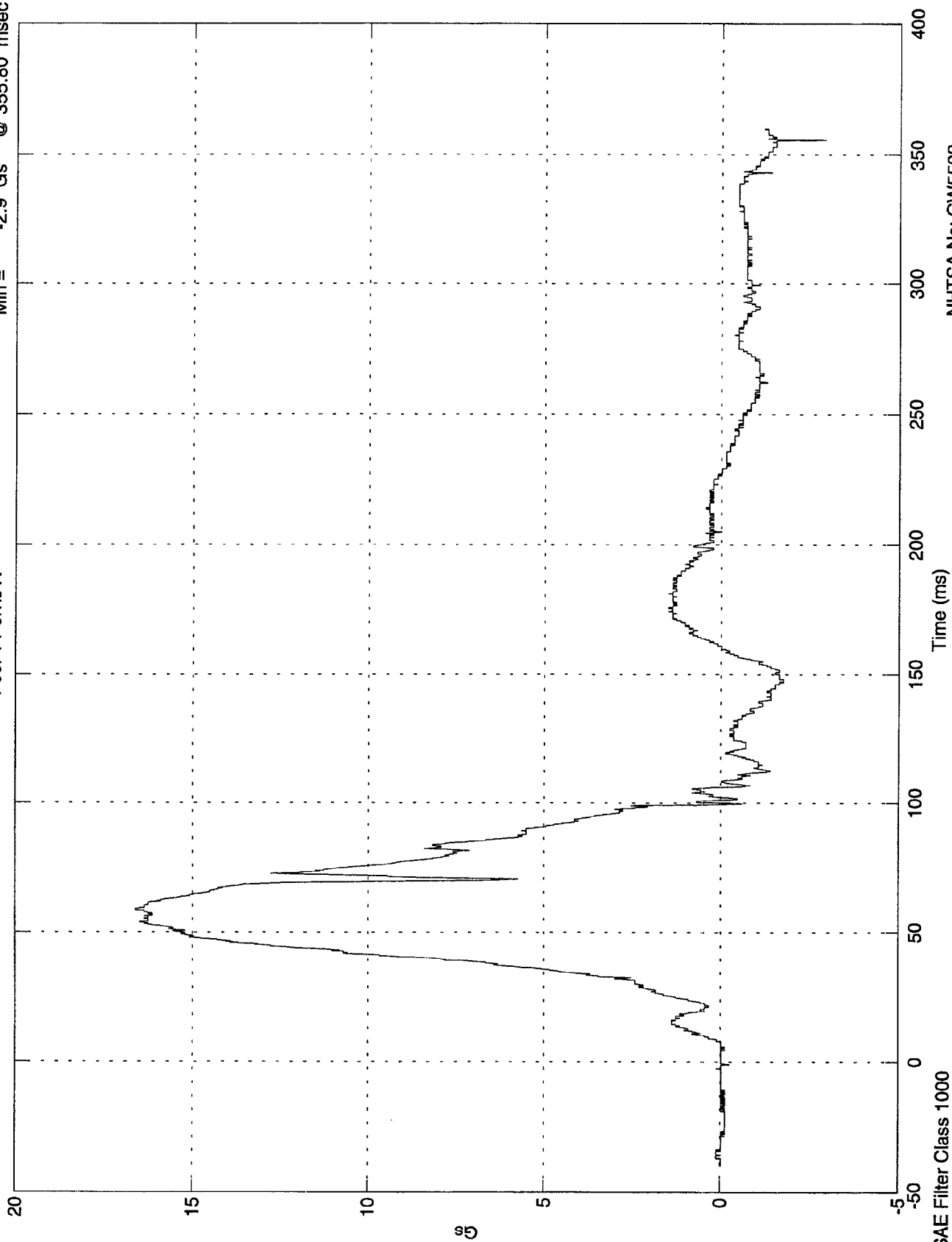


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 16.6 Gs @ 58.50 msec
Min = -2.9 Gs @ 355.80 msec

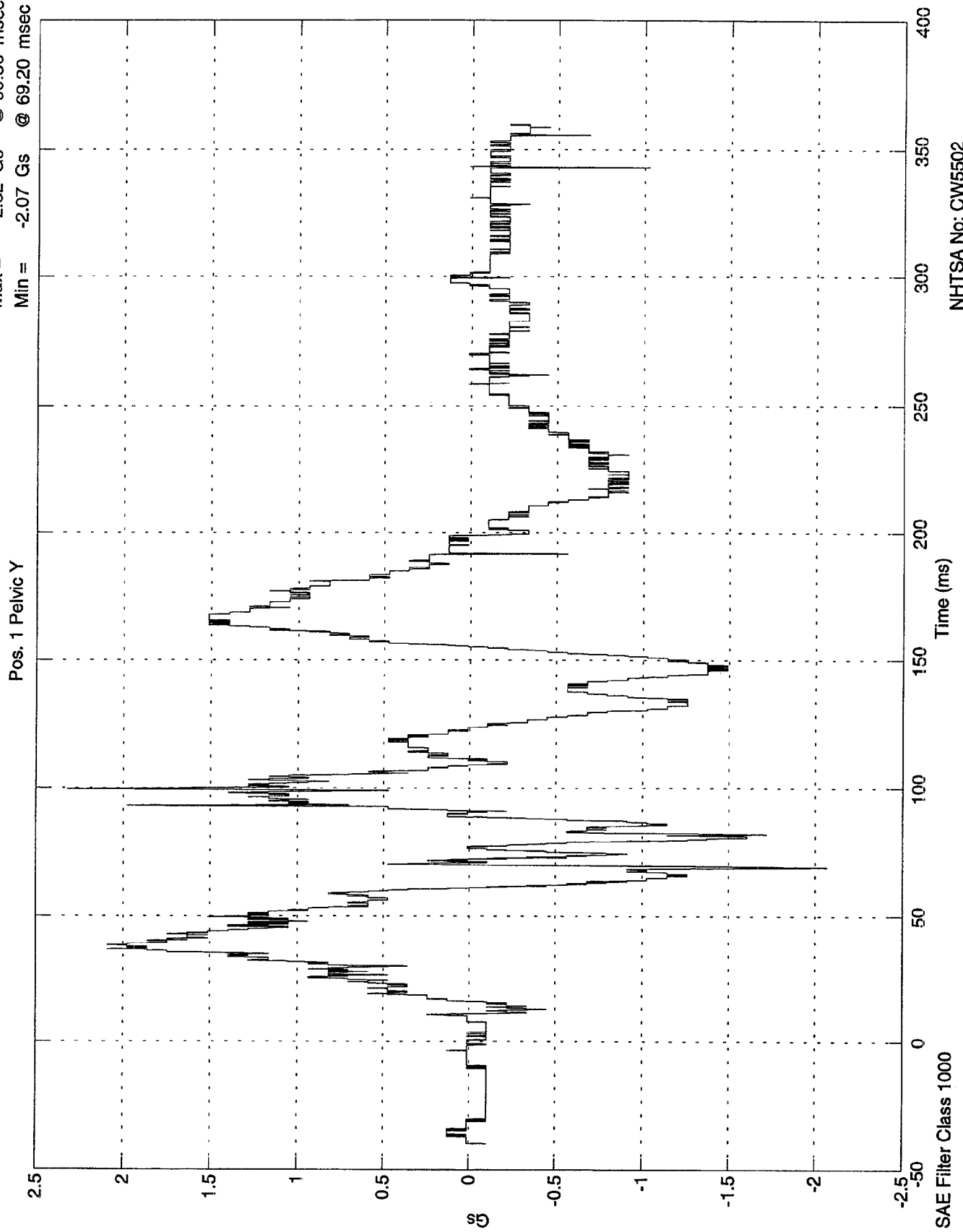
Pos. 1 Pelvic X



NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

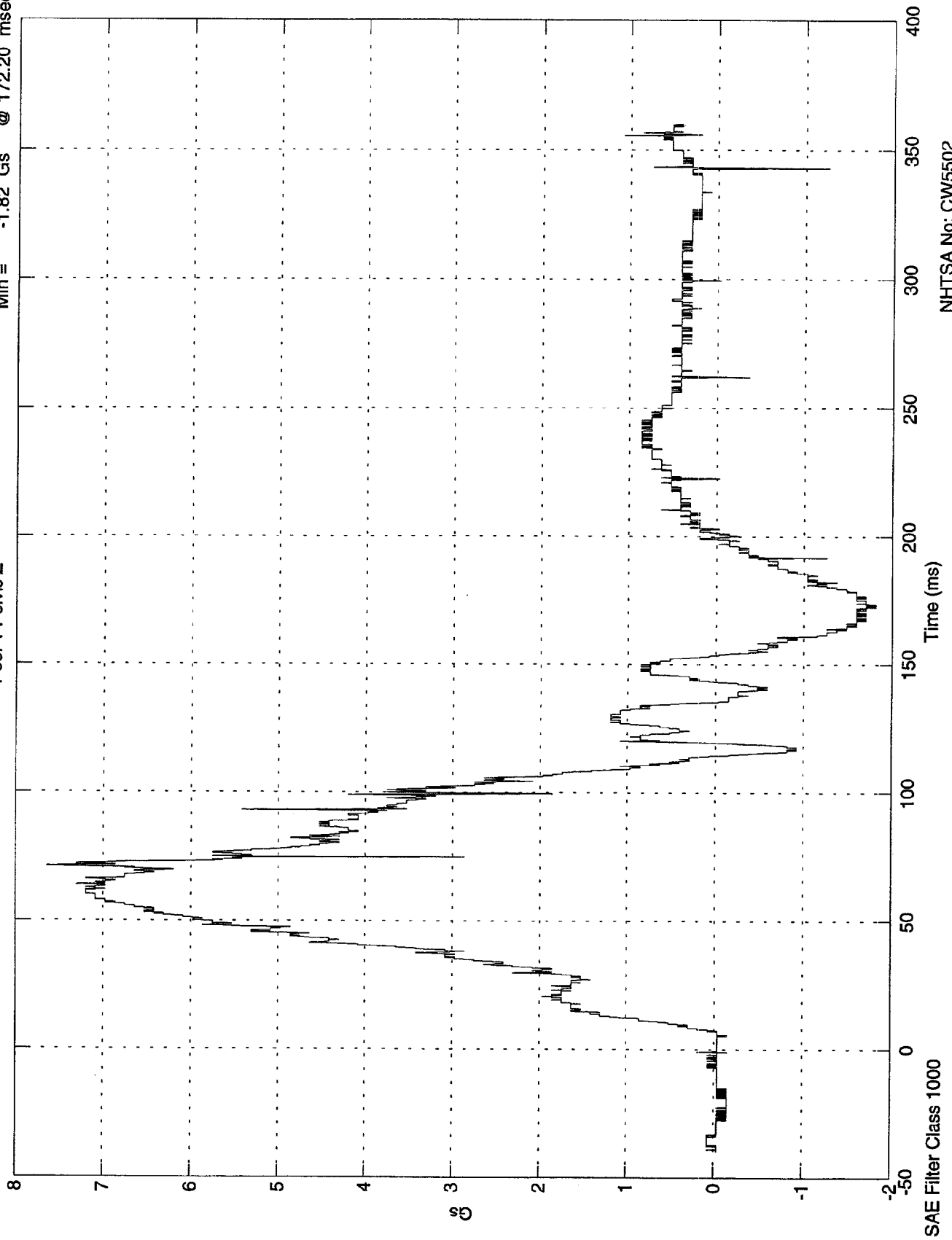
Max = 2.32 Gs @ 99.50 msec
Min = -2.07 Gs @ 69.20 msec



301 Rear 30 MPH-1998 Subaru Impreza

Max = 7.64 Gs @ 71.10 msec
Min = -1.82 Gs @ 172.20 msec

Pos. 1 Pelvic Z

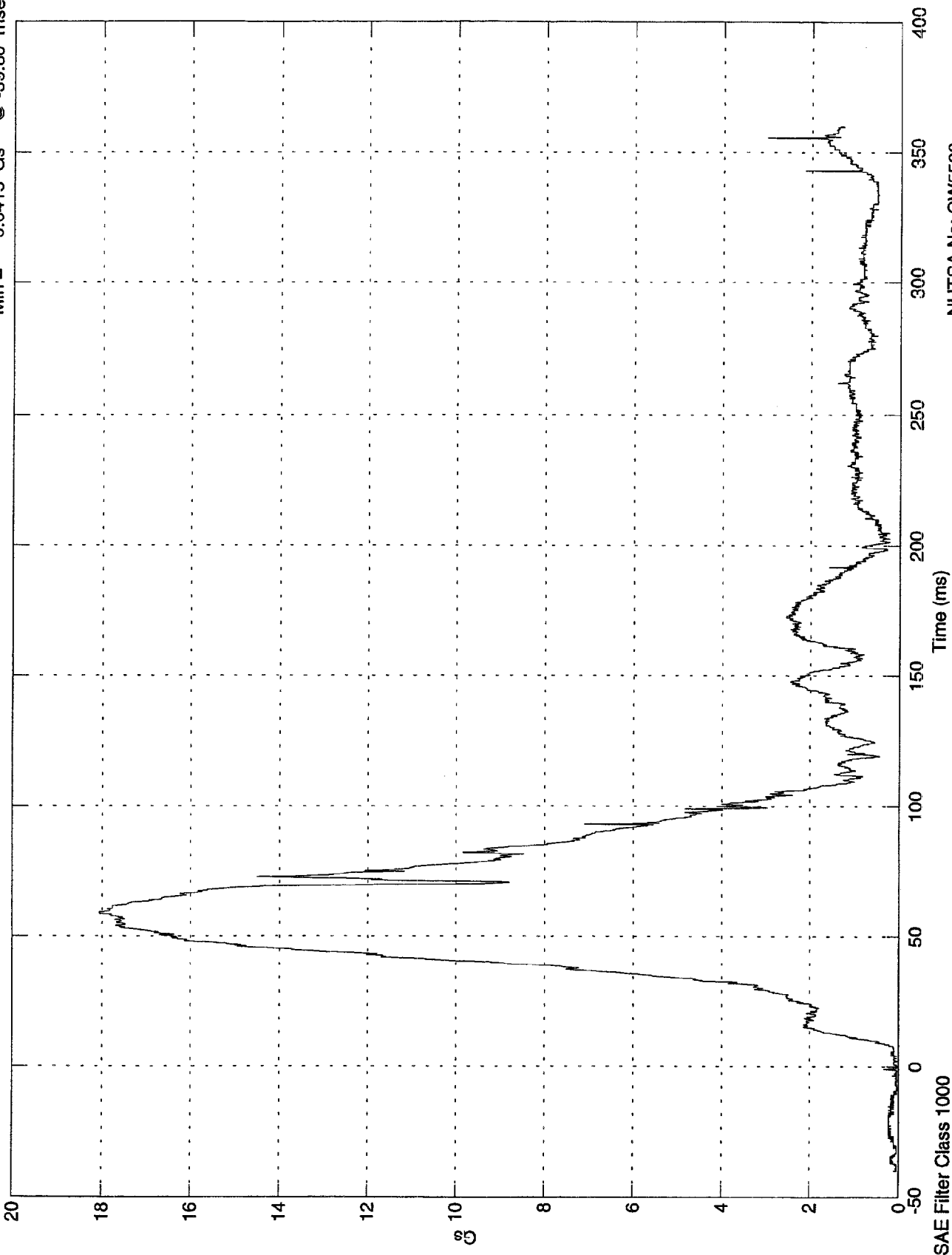


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Pos. 1 Pelvic Res.

Max = 18.1 Gs @ 58.70 msec
Min = 0.0415 Gs @ -39.80 msec

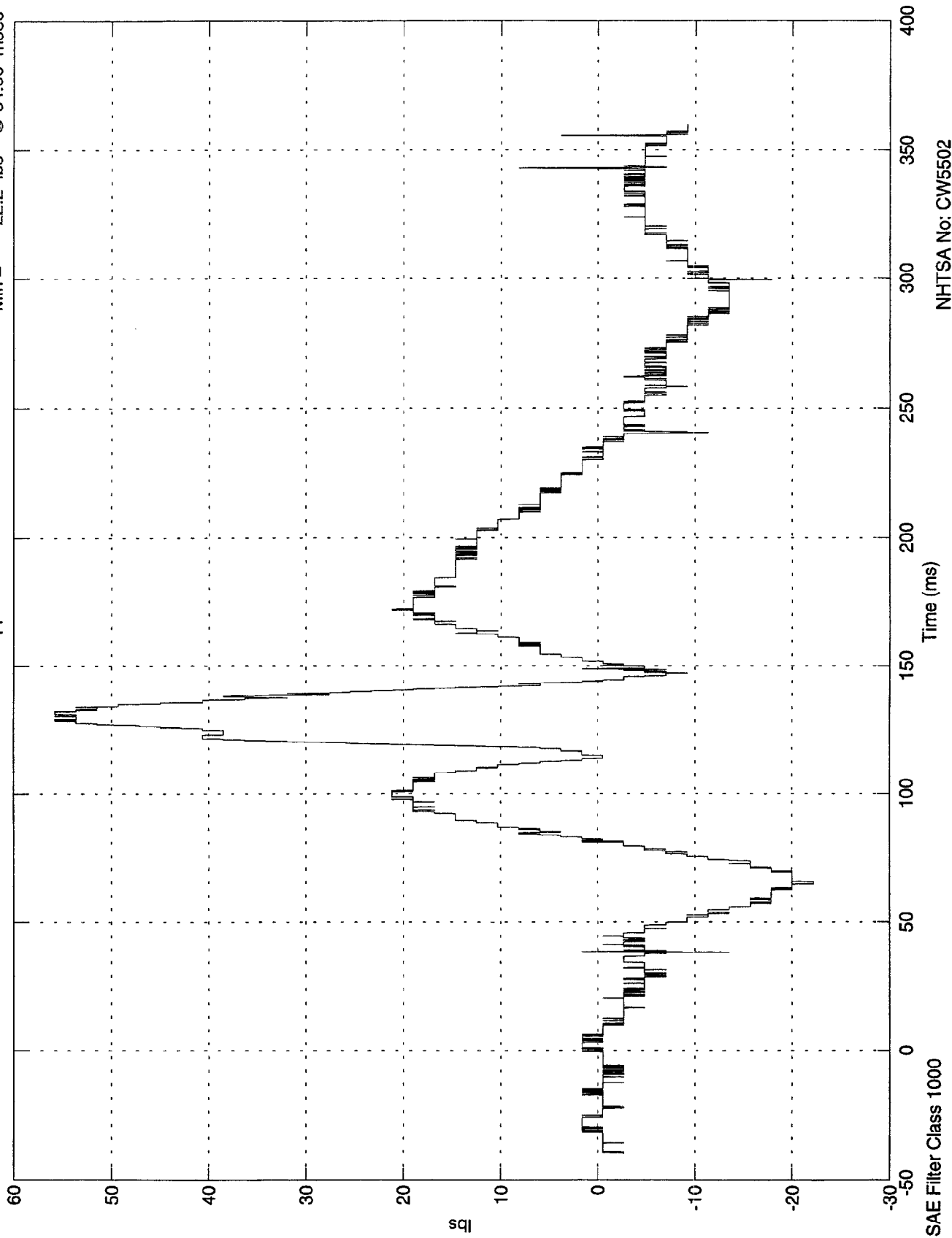


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 55.8 lbs @ 128.10 msec
Min = -22.2 lbs @ 64.90 msec

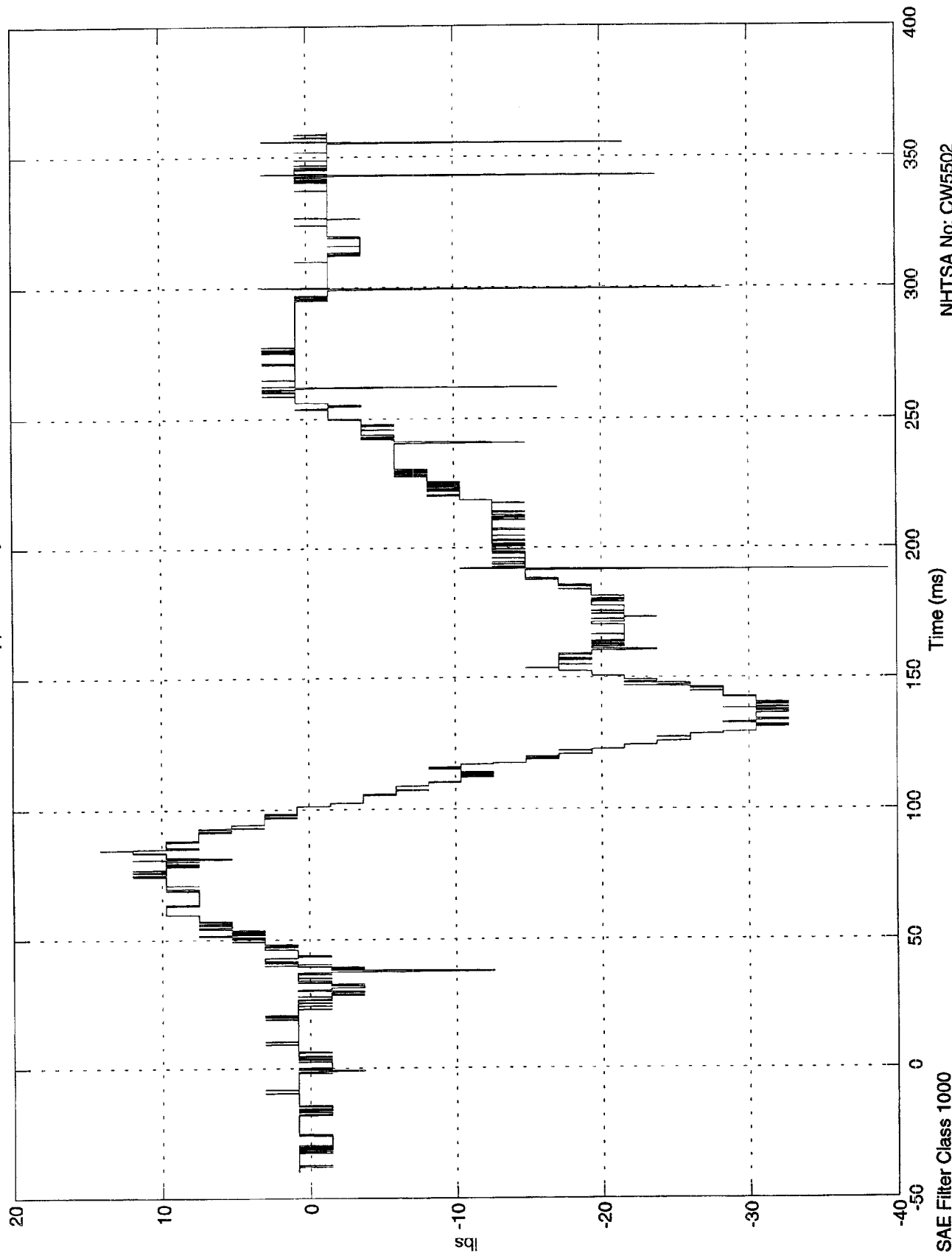
Pos. 1 Upper Neck Fx



301 Rear 30 MPH-1998 Subaru Impreza

Max = 14.2 lbs @ 84.80 msec
Min = -39.4 lbs @ 191.60 msec

Pos. 1 Upper Neck Fy

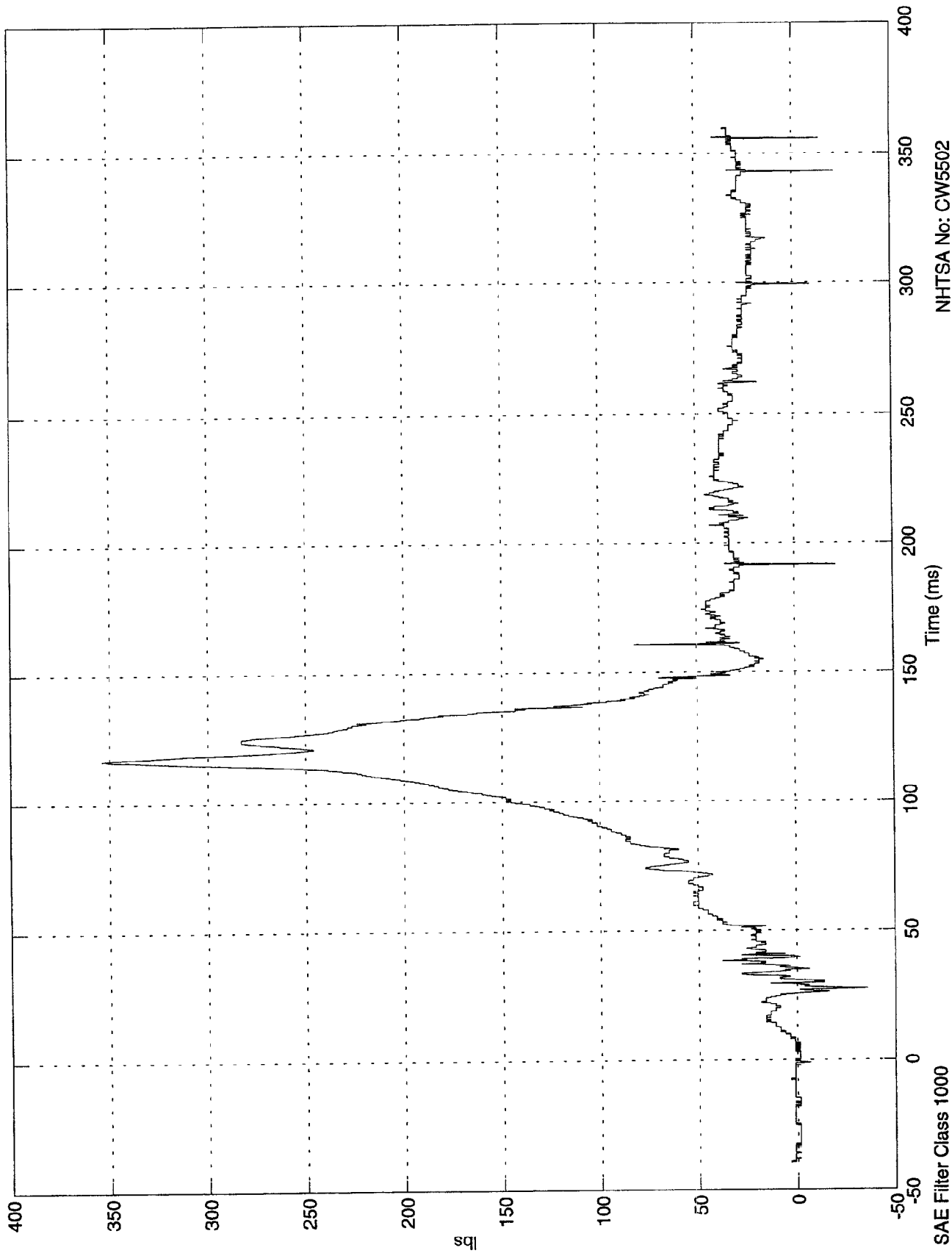


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 354 lbs @ 116.90 msec
Min = -35.6 lbs @ 27.50 msec

Pos. 1 Upper Neck Fz

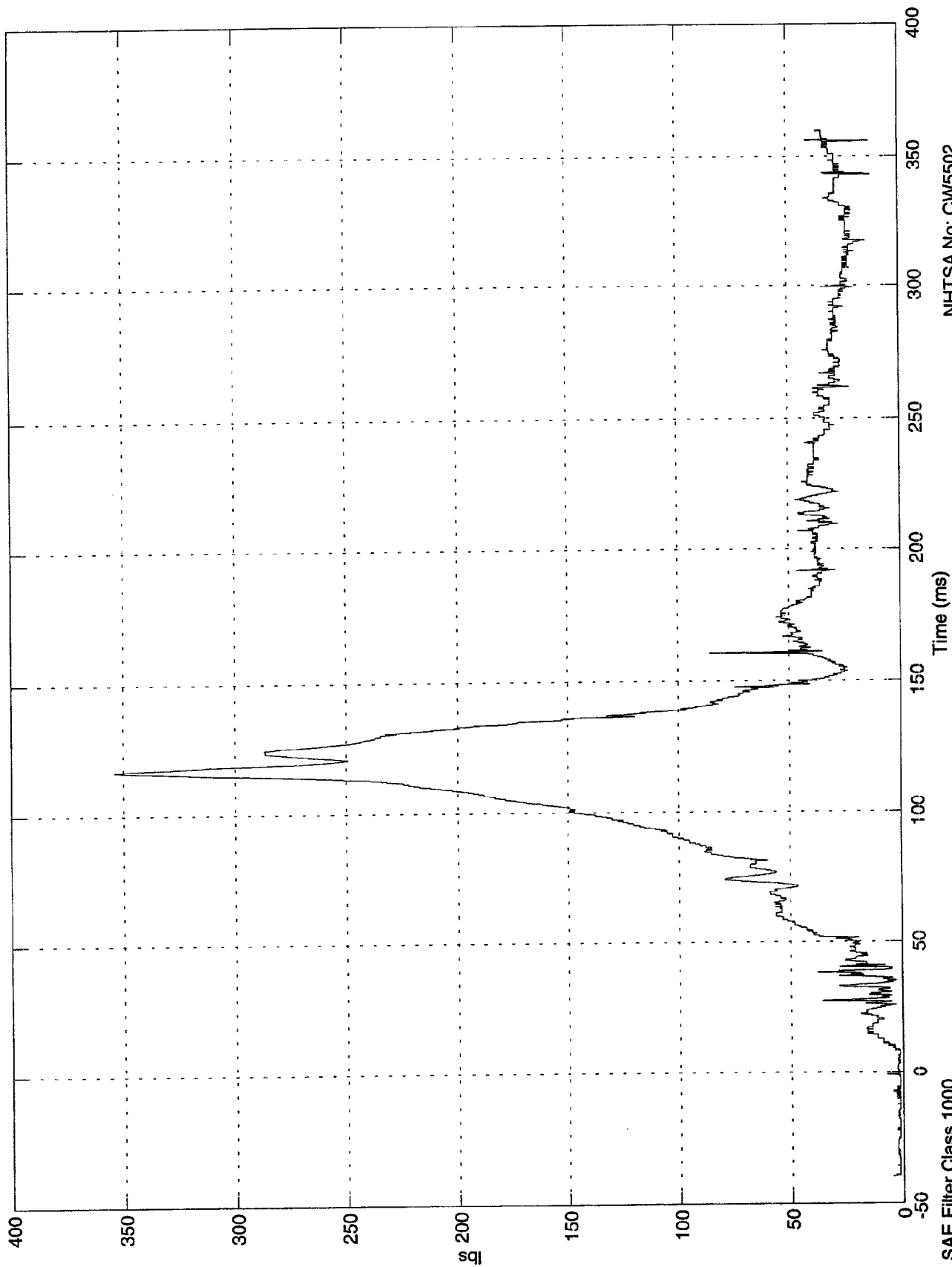


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 354 lbs @ 116.90 msec
Min = 1.44 lbs @ -39.50 msec

Pos. 1 Upper Neck F(Res)

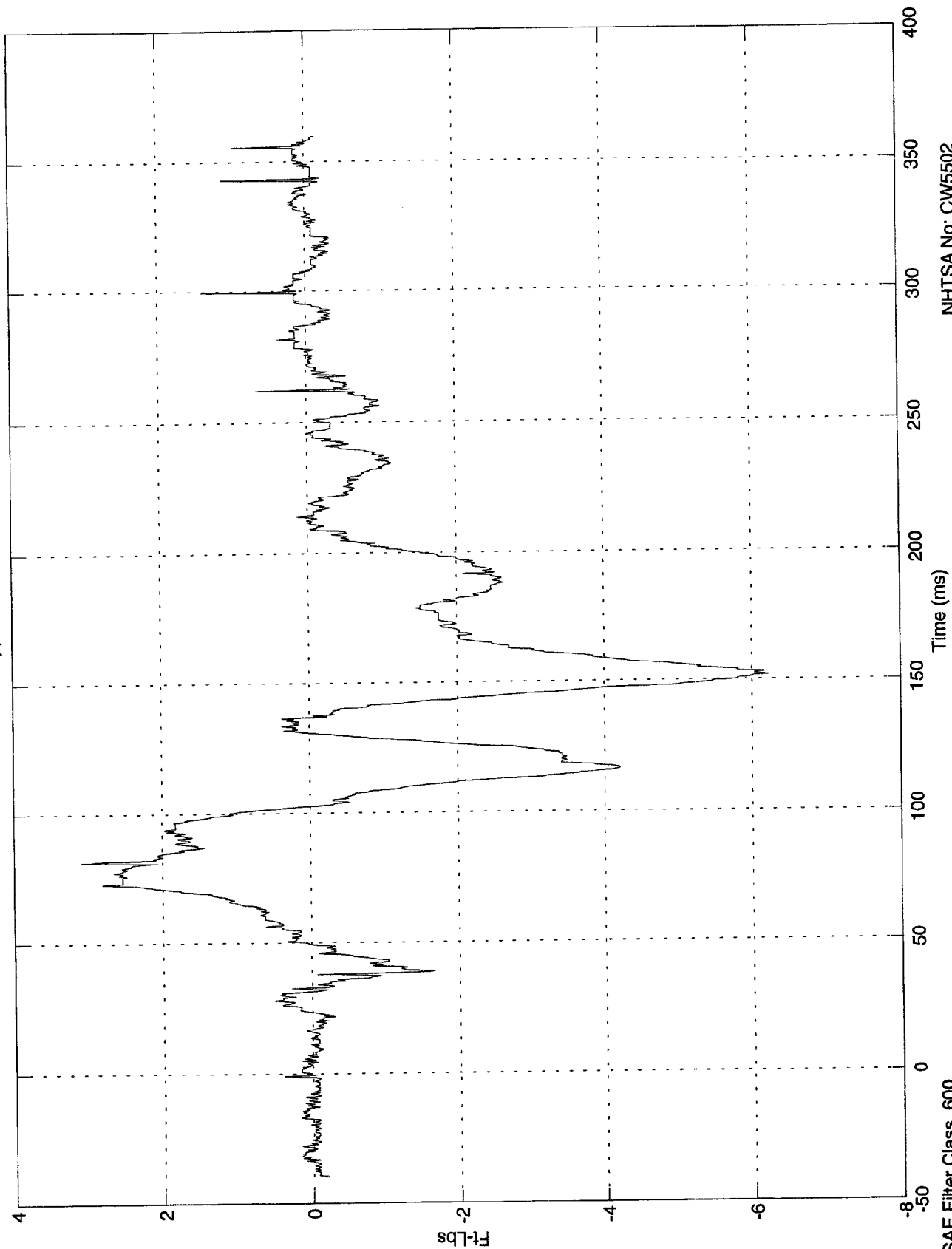


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru impreza

Max = 3.09 Ft-Lbs @ 81.40 msec
Min = -6.22 Ft-Lbs @ 151.80 msec

Pos. 1 Upper Neck Mx



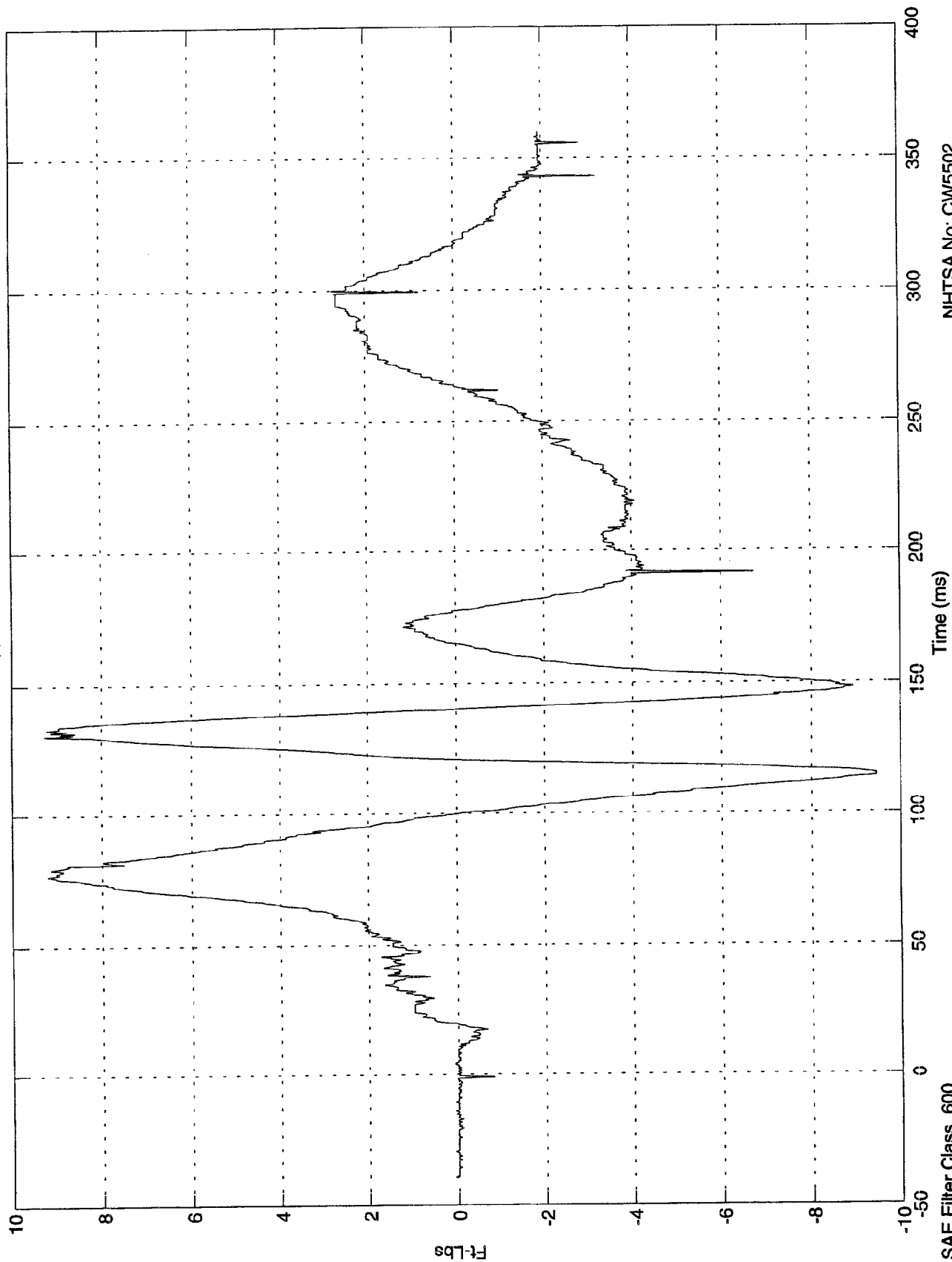
NHTSA No: CW5502
Date: 27 Feb 1998

SAE Filter Class 600

301 Rear 30 MPH-1998 Subaru Impreza

Max = 9.29 Ft-Lbs @ 130.50 msec
Min = -9.46 Ft-Lbs @ 114.30 msec

Pos. 1 Upper Neck My



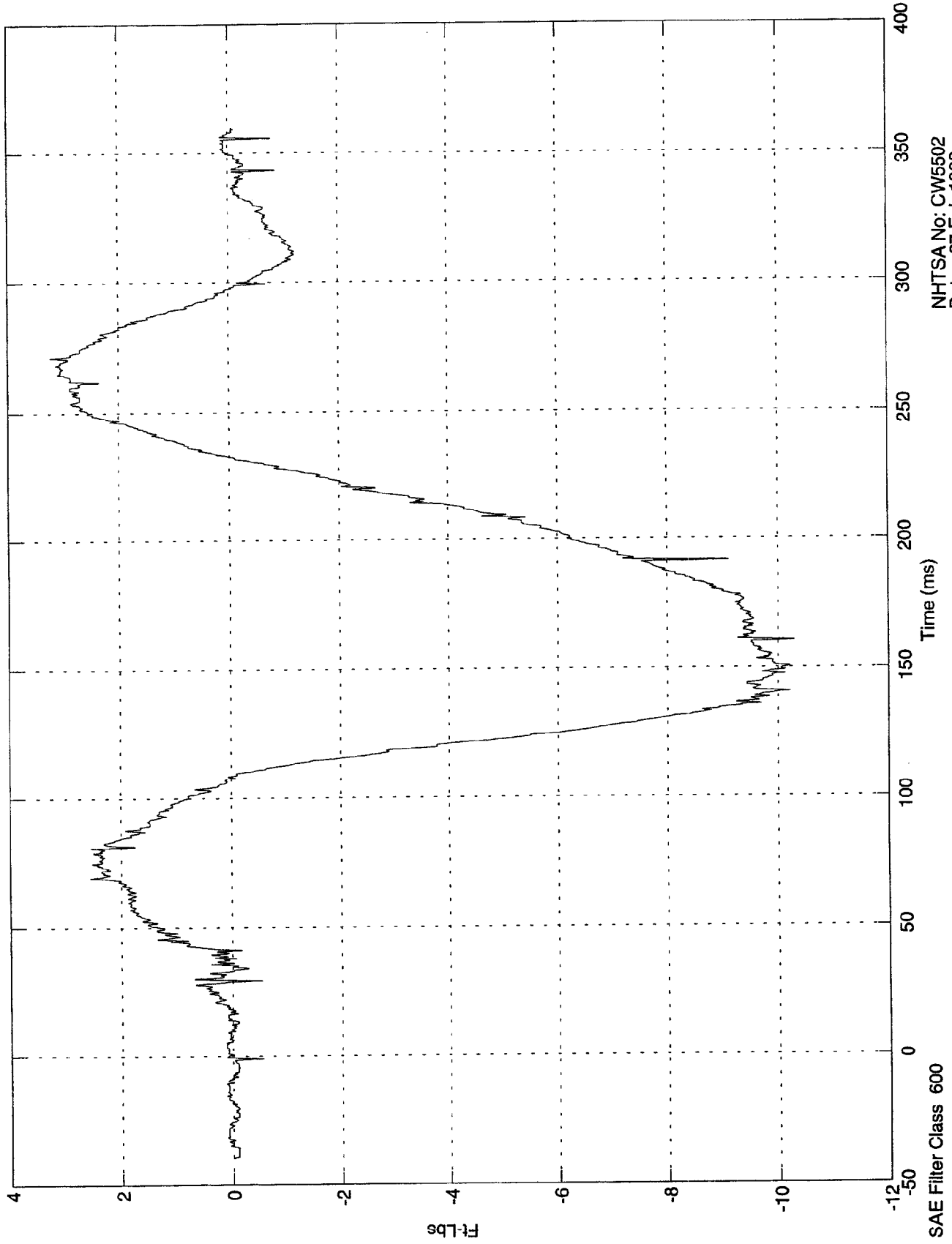
SAE Filter Class 600

NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 3.22 Ft-Lbs @ 271.30 msec
Min = -10.3 Ft-Lbs @ 160.60 msec

Pos. 1 Upper Neck Mz



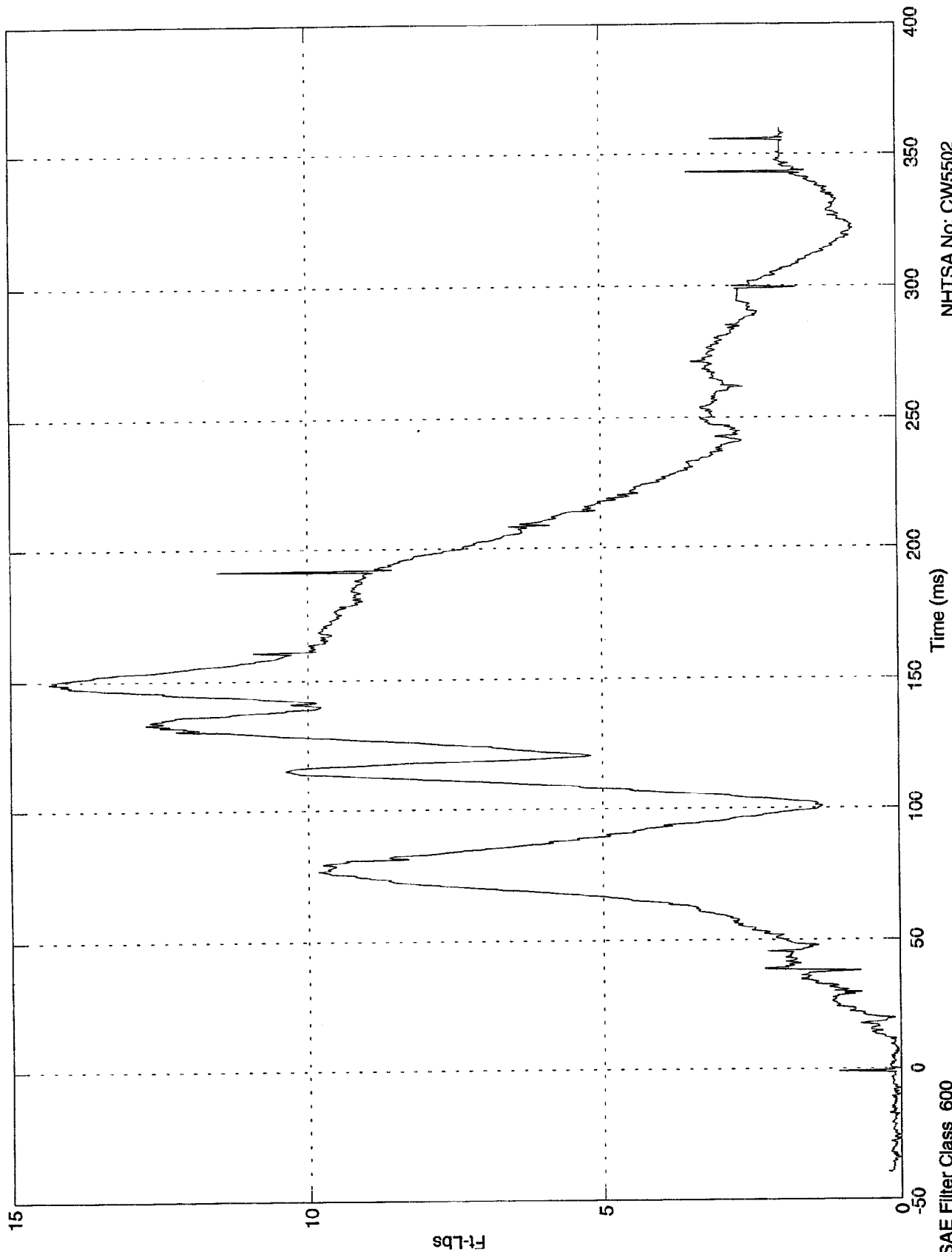
NHTSA No: CW5502
Date: 27 Feb 1998

SAE Filter Class 600

301 Rear 30 MPH-1998 Subaru Impreza

Max = 14.4 Ft-Lbs @ 149.10 msec
Min = 0.00938 Ft-Lbs @ -34.20 msec

Pos. 1 Neck Moment Res.



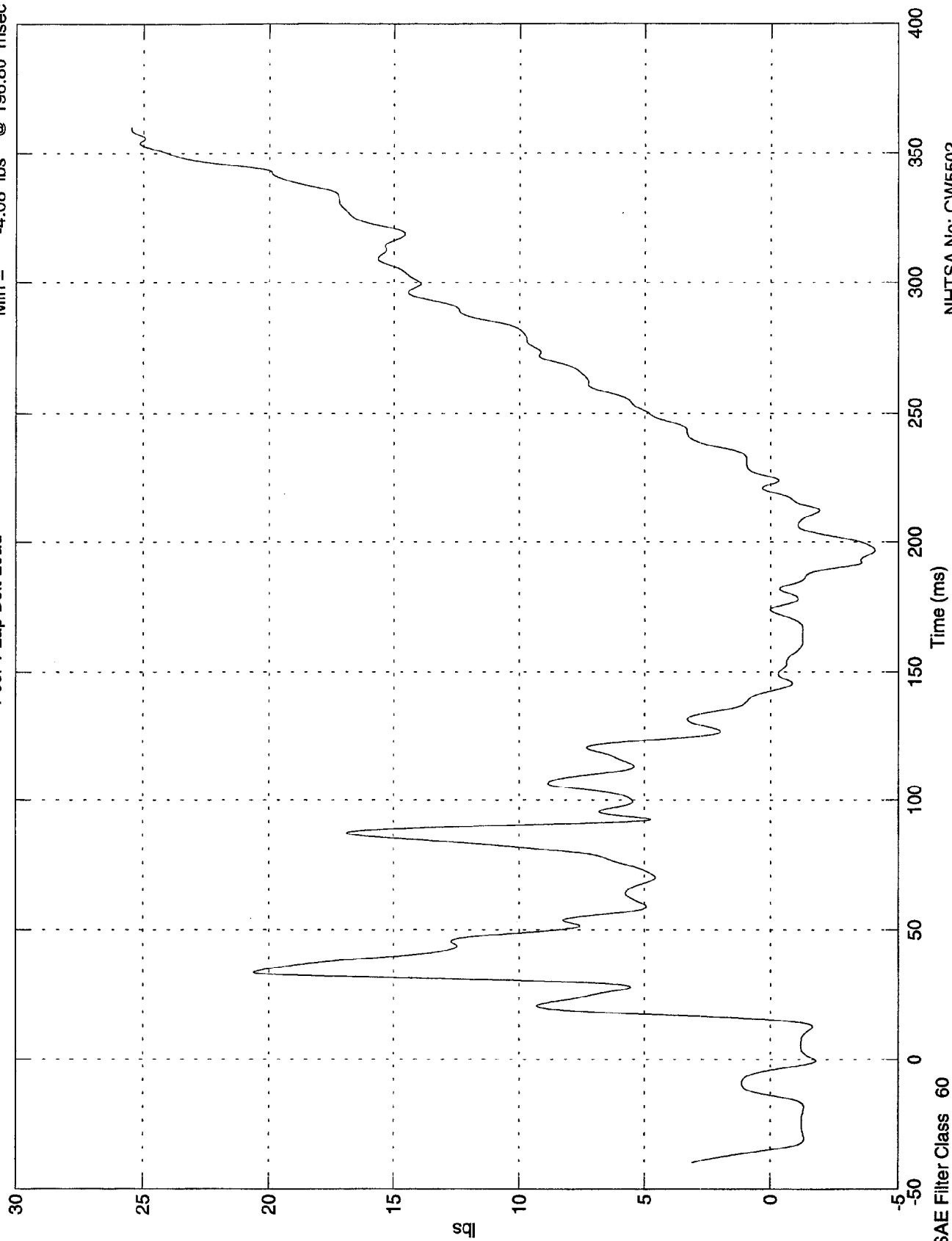
NHTSA No: CW5502
Date: 27 Feb 1998

SAE Filter Class 600

301 Rear 30 MPH-1998 Subaru Impreza

Max = 25.5 lbs @ 359.20 msec
Min = -4.08 lbs @ 196.80 msec

Pos. 1 Lap Belt Load

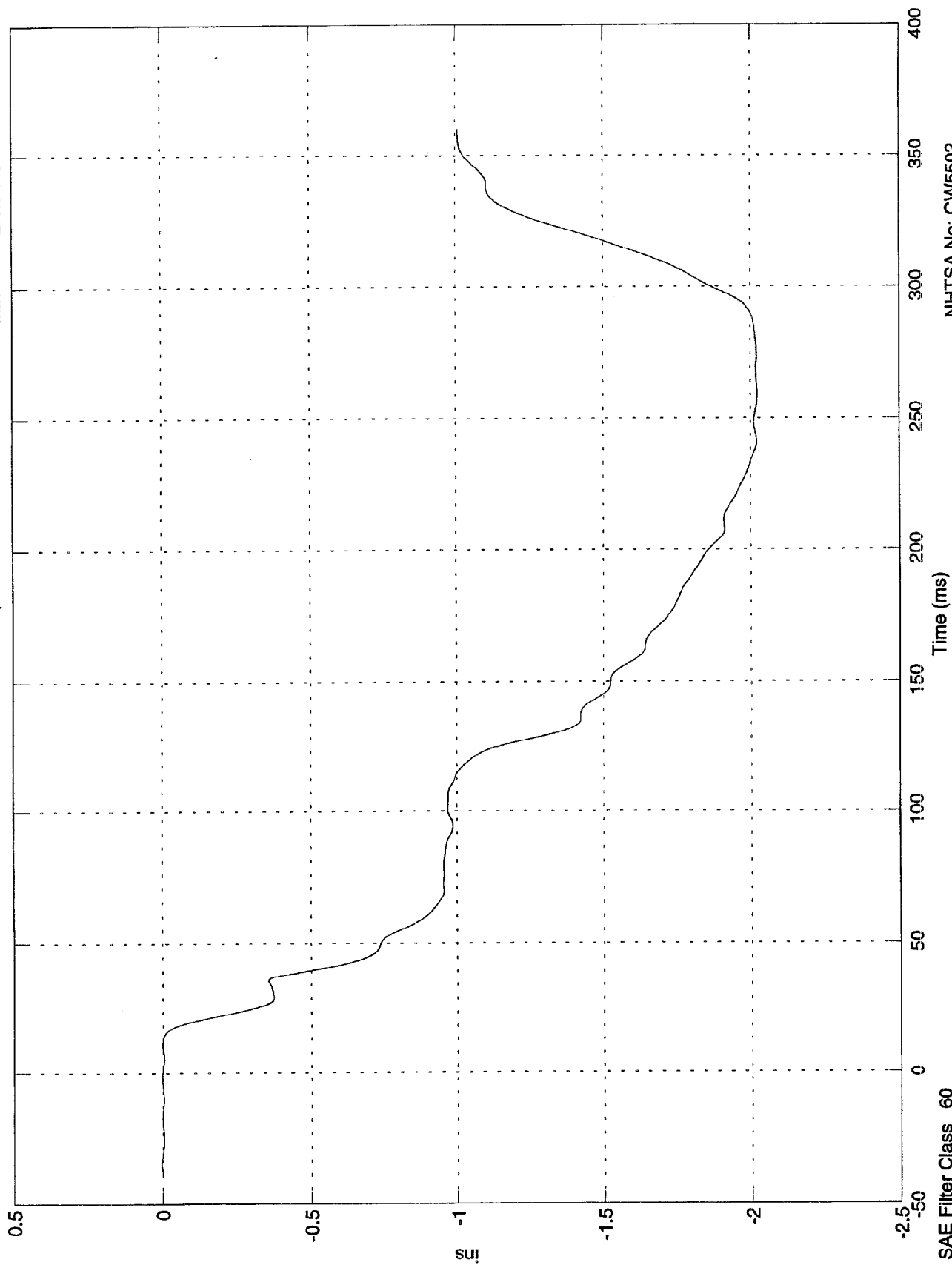


NHTSA No: CW5502
Date: 27 Feb 1998

301 Rear 30 MPH-1998 Subaru Impreza

Max = 0.00376 ins @ -35.00 msec
Min = -2.02 ins @ 258.40 msec

Pos. 1 Belt Spoolout



SAE Filter Class 60

NHTSA No: CW5502
Date: 27 Feb 1998