

REPORT NO. KAR-99-02

V2968

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
NEW CAR ASSESSMENT PROGRAM
FRONTAL BARRIER IMPACT TEST

SATURN CORPORATION
1999 SATURN SL-1
NHTSA NO. MX0111

PREPARED BY:
KARCO ENGINEERING
9270 HOLLY ROAD
ADELANTO, CALIFORNIA 92301



DECEMBER 31, 1998
FINAL REPORT

PREPARED FOR:
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16. <i>Abstract</i> A 35 mph (56.3 km/h) frontal barrier impact test was conducted on a 1999 Saturn SL-1 4-Door Sedan at KARCO Engineering on November 20, 1996. This test was conducted to obtain data indicant of FMVSS 208, 212, 219 (partial), 301 and footwell intrusion performance. The impact velocity was 56.5 km/h. The ambient temperature at the barrier face at the time of impact was 15.5°C. The vehicle's maximum post-test static crush was 585 mm, located at the centerline of the vehicle. The test vehicle was equipped with a 3-point continuous belt system and second generation supplemental airbags at both frontal outboard-seating positions. With respect to FMVSS 208 "Occupant Crash Protection - Injury Criteria" the occupant injury response data summary is as follows: <table border="1"> <thead> <tr> <th><u>Injury Criteria</u></th><th><u>Threshold Value</u></th><th><u>Driver Dummy</u></th><th><u>Passenger Dummy</u></th></tr> </thead> <tbody> <tr> <td>Head Injury Criteria (HIC)</td><td>1000</td><td>420.0</td><td>479.1</td></tr> <tr> <td>Chest Resultant Peak 3 msec clip</td><td>60 G's</td><td>41.8</td><td>41.2</td></tr> <tr> <td>Left Femur Force</td><td>10009 N</td><td>-1877.3</td><td>-5209.1</td></tr> <tr> <td>Right Femur Force</td><td>10009 N</td><td>-3177.6</td><td>-3176.3</td></tr> </tbody> </table>				<u>Injury Criteria</u>	<u>Threshold Value</u>	<u>Driver Dummy</u>	<u>Passenger Dummy</u>	Head Injury Criteria (HIC)	1000	420.0	479.1	Chest Resultant Peak 3 msec clip	60 G's	41.8	41.2	Left Femur Force	10009 N	-1877.3	-5209.1	Right Femur Force	10009 N	-3177.6	-3176.3
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SECTION 1

PURPOSE, TEST PROCEDURE AND SUMMARY OF TEST MX0111

1.1 PURPOSE

This 35 mph (56.3 km/h) frontal barrier impact test is part of the FY' 99 New Car Assessment Program (NCAP) frontal barrier crash worthiness evaluation program sponsored by the National Highway Traffic Safety Administration (NHTSA) under Contract Number DTNH22-97-D-02007. The purpose of this test was to obtain vehicle crashworthiness, occupant restraint system performance data and lower leg data for frontal barrier impacts. The velocity used in this test was in excess of the current 30 mph (48 km/h) FMVSS 208/212/219/301 requirements.

1.2 TEST PROCEDURE

This 56.3 km/h frontal barrier impact test was conducted in accordance with the Office of Crashworthiness Standards (OCS) New Car Assessment Program (NCAP) Laboratory Indicant Test Procedure, dated 01 October 1996 and corresponding KARCO Engineering Test Procedure KTP-001, dated October 18, 1996. Data was obtained indicant of FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Retention"; FMVSS 219, "Windshield Zone Intrusion (Partial)"; and FMVSS 301 "Fuel System Integrity" performance. Procedures for receiving, inspection testing and reporting of test results are described in the test procedures and are not repeated in this report.

The test was conducted at KARCO Engineering on November 20, 1998, at a speed of 56.5 km/h. The test vehicle was instrumented with eight (8) accelerometers to measure longitudinal axis accelerations. The driver and passenger's restraint systems were instrumented with four (4) seat belt load cells to measure lap and shoulder belt tension. The specified impact velocity range was 55.5 to 57.1 km/h. The frontal barrier impact event was documented by one (1) real-time panning motion picture camera and sixteen (16) high-speed motion picture cameras. The pre- and post-test conditions were recorded by one (1) real-time motion picture camera. Camera locations and pertinent camera information is documented in the data sheets. Pre- and post-test photographs of the vehicle and dummies can be found in Appendix A.

The test vehicle contained two (2) part 572E 50th percentile adult male anthropomorphic test devices (ATDs). Both ATDs were instrumented with head, chest and, pelvic tri-axial accelerometers, left/right femur load cells, left/right lower leg sensors and left/right foot accelerometers. In addition, chest displacement and neck six-axis load and moment sensors were utilized. The ATDs were positioned in the front outboard seating positions according to the dummy placement procedures specified in the Laboratory Indicant Test Procedure. Ninety-six channels of data were recorded with a PC based (TDAS) on-board data acquisition system. The data was digitally sampled at 10,000 samples per second and processed per section IP11 of the Laboratory Indicant Test Procedure.

The Driver ATD (serial No. 35) and the right-front passenger ATD (serial No.34) were re-instrumented and calibrated for one NCAP test just prior to this test. Injury criteria were not exceeded by either ATD during this NCAP frontal barrier impact test.

1.3 SUMMARY OF 40% OFFSET BARRIER IMPACT TEST

An immovable barrier was impacted by a 1999 Saturn SL-1 4-Door at a velocity of 56.5 km/h. The test weight, with two (2) 50th percentile male ATDs, was 1255 kg. Twenty four (24) load cell barrier data channels were obtained in conducting this November 20, 1998 NCAP test. The test vehicle was equipped with a transverse mounted 1.9 liter, 4 cyl. engine and a five speed manual transmission.

The driver's Head Injury Criteria (HIC) was 420.0, the maximum chest deceleration over three (3) milliseconds was 41.8 g and the left and right femur loads were -1877.3 and -3177.6 Newtons, respectively. Chest deflection for the driver ATD was -34.5 mm. The driver ATD head contacted the the airbag and headrest, its chest and abdomen contacted the airbag, the left knee contacted the steering column and knee bolster, with the right knee contacting the knee bolster.

The right front passenger's HIC was 479.1, maximum chest deceleration over three (3) milliseconds was 41.2 g and the left and right femur loads were -5209.1 and -3176.3 Newtons respectively. Chest deflection for the passenger ATD was -20.0 mm. The passenger ATD head contacted the airbag and the "B" post, the chest and abdomen contacted the airbag and both knees contacted the glove box.

Seat belt spoolout, measured by on-board pullout potentiometers was 143.9 mm for the driver ATD and 234.3 mm for the passenger ATD. Shoulder belt stretch was 1.08 mm/cm for the driver ATD and 0.0 mm/cm for the passenger ATD. Channel failed for the passenger, no data available.

There was 100 percent windshield retention (minimum 50 percent required for passive restraint systems), no intrusion into the protected or unprotected zone of the windshield, and no Stoddard solvent leakage occurred after impact or during any phase of the rollover.

The test vehicle sustained a maximum static crush of 585 mm at the centerline of the vehicle. Both the driver side doors and the passenger side doors opened without the aid of tools.

1.4 GENERAL COMMENTS

The 1999 Saturn SL-1 4-Door 4-Door passed the requirements of FMVSS 208, FMVSS 212, FMVSS 219 and FMVSS 301-75. Data pertaining to these standards are presented in the data sheets.

The vehicle, occupant, camera and measurement data are presented in Section 2. Appendix A contains the still photograph prints. Appendix B contains the dummy, vehicle and response data traces. Appendix C contains Load Cell Barrier information. Appendix D contains the instrumentation data channel assignments. Appendix E contains the dummy calibration data and Appendix F contains the owner's manual instructions for the occupant restraint systems.

SECTION 2.

OCCUPANT AND VEHICLE INFORMATION/DATA SHEETS

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

CONVERSION FACTORS USED IN THIS REPORT:

2.2 pounds (lb.)	=	1 kilogram (kg)
1 mile (mi.)	=	1.609 kilometer (km)
1 gallon (gal.)	=	3.785 liters (L)
1 pound/square inch (psi)	=	7000 Pascal (7 kPa)

DATA SHEET NO. 1

CRASH TEST SUMMARY

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

VEHICLE REBOUND AT CENTER OF EACH WHEEL: REBOUND ANGLE = 0°

Measurements in mm	Left side	Centerline	Right Side
Vehicle Rebound	848	781	948

VEHICLE STATIC CRUSH

	Left	Center	Right
Pre-test Measurements (mm)	4159	4485	4159
Post-test Measurements (mm)	3730	3905	3755
Static Crush (mm)	-429	-580	-404
Average	-471		

DOOR OPENING AND SEAT TRACK INFORMATION

	Driver	Passenger
Door Opening (Front)	OPENED	OPENED
Door Opening (Rear)	OPENED	OPENED
Seat Track Shift (mm of shift)	0	0
Seat Back Failure	NONE	NONE

DUMMY INFORMATION

	Driver	Passenger
Dummy Type/No.	50% Male Hybrid III (S/N 35)	50% Male Hybrid III (S/N 34)
Data Channels	44	44
Visible Contact Points		
Head	AIR BAG, HEADREST	AIRBAG, HEADREST
Chest	AIRBAG	AIRBAG
Abdomen	AIRBAG	AIRBAG
Left Knee	STEERING COLUMN/KNEE BOLSTER	GLOVE BOX
Right Knee	KNEE BOLSTER	GLOVE BOX

DATA SHEET NO. 2

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

TEST VEHICLE INFORMATION			
Manufacturer	SATURN CORPORATION	VIN	1G8ZG5288XZ128523
Manufacturing Date	7/98	Delivery Date	11/5/98
Dealer	ONTARIO SATURN	NHTSA NO.	MX0111
Odometer Reading	68 mi	Fuel Type	UNLEADED
Engine Displacement	1.9 Liters	Cylinders	4
Transmission	5 SPEED MANUAL	Final Drive	FRONT
Engine Placement	TRANSVERSE	Color	RED
Tire Press./Max. Cap. Front	210 kpa	Cold Tire Press. Front	210 kpa
Tire Press./Max. Cap. Rear	182 kpa	Cold Tire Press. Rear	182 kpa
Recommend Tire Size	175/70/14	Type of Spare	TEMPORARY T115/70/145
Tire Size on Vehicle	175/70/14	Manufacturer	FIRESTONE
GVWR	1476 kg	Cargo Capacity	52 kg
GAWR Front	748 kg	GAWR Rear	728 kg
Air Conditioning	YES	Power Steering	YES
Power Brakes	YES	AM/FM/Cassette	YES
Disc Brakes (Front)	YES	Disc Brakes (Rear)	YES
Power Windows	NO	Tilt Steering	YES
Anti-lock Brakes (ABS)	NO	Power Seats	NO
Driver Airbag	YES	Passenger Airbag	YES

VEHICLE CAPACITY DATA: TYPE OF FRONT SEATS BUCKET SEATS

TOTAL NUMBER OF OCCUPANTS 5 OCCUPANTS x 68 kg. 340 kg

WEIGHT OF VEHICLE AS RECEIVED AT KARCO (with maximum fluids): 1057 kg

Data Sheet No. 2... (Continued)

VEHICLE CAPACITY WEIGHT (kg):

Vehicle Capacity Weight 392 kg
 Occupant Weight 340 kg
 Rated Cargo/Luggage Weight (RCLW) 52 kg

	FRONT	REAR	TOTAL
Right	314	196	510
Left	328	219	547
Total	642	415	1057
Percent of Total	60.7	39.3	100%

**CALCULATION OF TEST
 TARGET WEIGHT (kg):**

Total Delivered Weight 1057 kg
 RCLW 52 kg
 Weight of 2 P572 ATDs 152 kg
TARGET TEST WEIGHT 1261 kg

TEST WEIGHT OF VEHICLE WITH 2 ATDs AND BALLAST

	FRONT	REAR	TOTAL
Right	343	261	604
Left	361	290	651
Total	704	551	1255
Percent of Total	56.0	44.0	100%

Weight of Ballast secured in cargo area: 8 kg

Does not include cameras, instrumentation,
 and brake abort system.

Vehicle Components Removed For Weight Reduction:

Side mirrors, jack, tools, spare tire
 and paneling.

TEST VEHICLE ATTITUDE (mm)

	LF	RF	LR	RR
As Delivered	679	677	683	683
As Tested	648	647	644	644

Vehicle Wheelbase: 2605 mm

FUEL SYSTEM DATA:

Fuel System Capacity From Owner's Manual = 45.8 liters

Usable Capacity Figure Furnished by COTR = 45.8 liters

Test Volume Range (92 to 94% of Usable Capacity) = 42.1 to 43.0 liters

ACTUAL TEST VOLUME = 42.5 liters (With entire fuel system filled)

Test Fluid Type = Stoddard Solvent

Specific Gravity = 0.764

Kinematic Viscosity = as per ASTM Standard D484-71

Color = Red

Type of Fuel Pump = Electric X Mechanical

Does electric pump operate with ignition switch "ON" & engine "OFF"? Yes X No

DETAILS OF FUEL SYSTEM: Key operated w/automatic shut-off after a few seconds.

DATA SHEET NO. 3

POST IMPACT DATA

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

REQUIRED IMPACT VELOCITY RANGE: 55.51 km/h to 57.11 km/h

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

Trap No. 1 = 56.5 km/h Trap No. 2 = 56.4 km/h

Distance from vehicle to barrier - -

A. entering trap = 1524 mm

B. leaving trap = 305 mm

VEHICLE STATIC CRUSH: (for Frontal and Rear Impacts Only)

Vehicle Length	Left	Center	Right
Pre-test Measurements (mm)	4159	4485	4159
Post-test Measurements (mm)	3730	3905	3755
Static Crush (mm)	-429	-580	-404
Average	-471		

VEHICLE REBOUND: (from rigid barrier with rotational movement offsets only)

Measurements in mm	Left Front	Right Front	Left Rear	Right Rear
Vehicle Rebound X axis	N/A	N/A	N/A	N/A
Vehicle Rebound Y axis	N/A	N/A	N/A	N/A
Average X axis	N/A			
Average Y axis	N/A			

DATA SHEET NO. 4

TEST VEHICLE INFORMATION

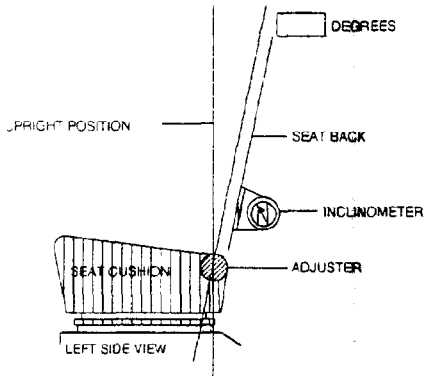
Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

1. NOMINAL DESIGN RIDING POSITION -



FRONT SEAT ASSEMBLY

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. Indicate, if applicable, how the detents are numbered (Is the first detent "0" or "1"?).

Measurement Instructions: A special application tool with pointed probes was inserted through the fabric to make contact with the rigid portion of the lower seat frame assembly approximately 13 inches above the pivot point of the seat back. The inclinometer was placed against the flat surface of the tool and the seat back angle was measured directly from the dial face. For reference purposes the first detent from the front of the seat was identified as number "1".

Seat back angle for driver's seat = 26° w/seated dummy

Measurement Instructions: A special application tool with pointed probes was inserted through the fabric to make contact with the rigid portion of the lower seat frame assembly approximately 13 inches above the pivot point of the seat back. The inclinometer was placed against the flat surface of the tool and the seat back angle was measured directly from the dial face. For reference purposes the first detent from the front of the seat was identified as number "1".

Seat back angle for passenger's seat = 26° w/seated dummy

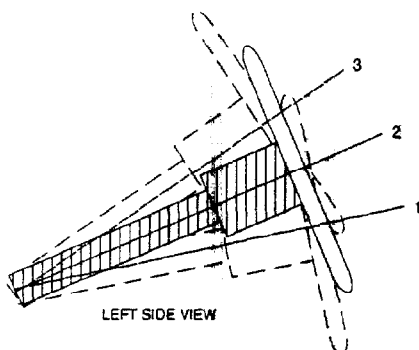
2. SEAT FORE & AFT POSITIONS:

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

Positioning of the driver's seat: 19 seating positions, set to 10th detent from the front.

Positioning of the passenger's seat (if applicable): 19 seating positions, set to 10th detent from the front.

3. STEERING COLUMN ADJUSTMENTS:



STEERING COLUMN ASSEMBLY

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:

Position No. 1 is at 19°

Position No. 2 is at 20.5°

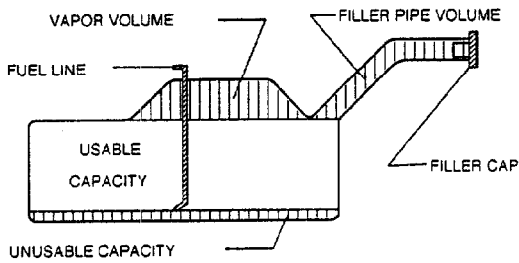
Position No. 3 is at 22°

4. SEAT BELT UPPER ANCHORAGE:

Set to mid position, per manufacturers specifications.

DATA SHEET NO. 4 (continued)

5. FUEL TANK CAPACITY DATA



5.1 A. "Usable Capacity" of standard equipment fuel tank = 45.8 liters.

B. "Usable Capacity" of optional equipment fuel tank = N/A liters.

C. "Usable Capacity" of vehicle(s) used for certification testing to requirements of FMVSS 301 = 42.1 to 43.0 liters.

VEHICLE FUEL TANK ASSEMBLY

Operational Instructions:

5.2 Amount of Stoddard solvent added to vehicle(s) used for certification test(s) = 42.5 liters

5.3 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.

Key operated w/automatic shut-off after a few seconds.

DATA SHEET NO. 5

DUMMY POSITIONING IN VEHICLE

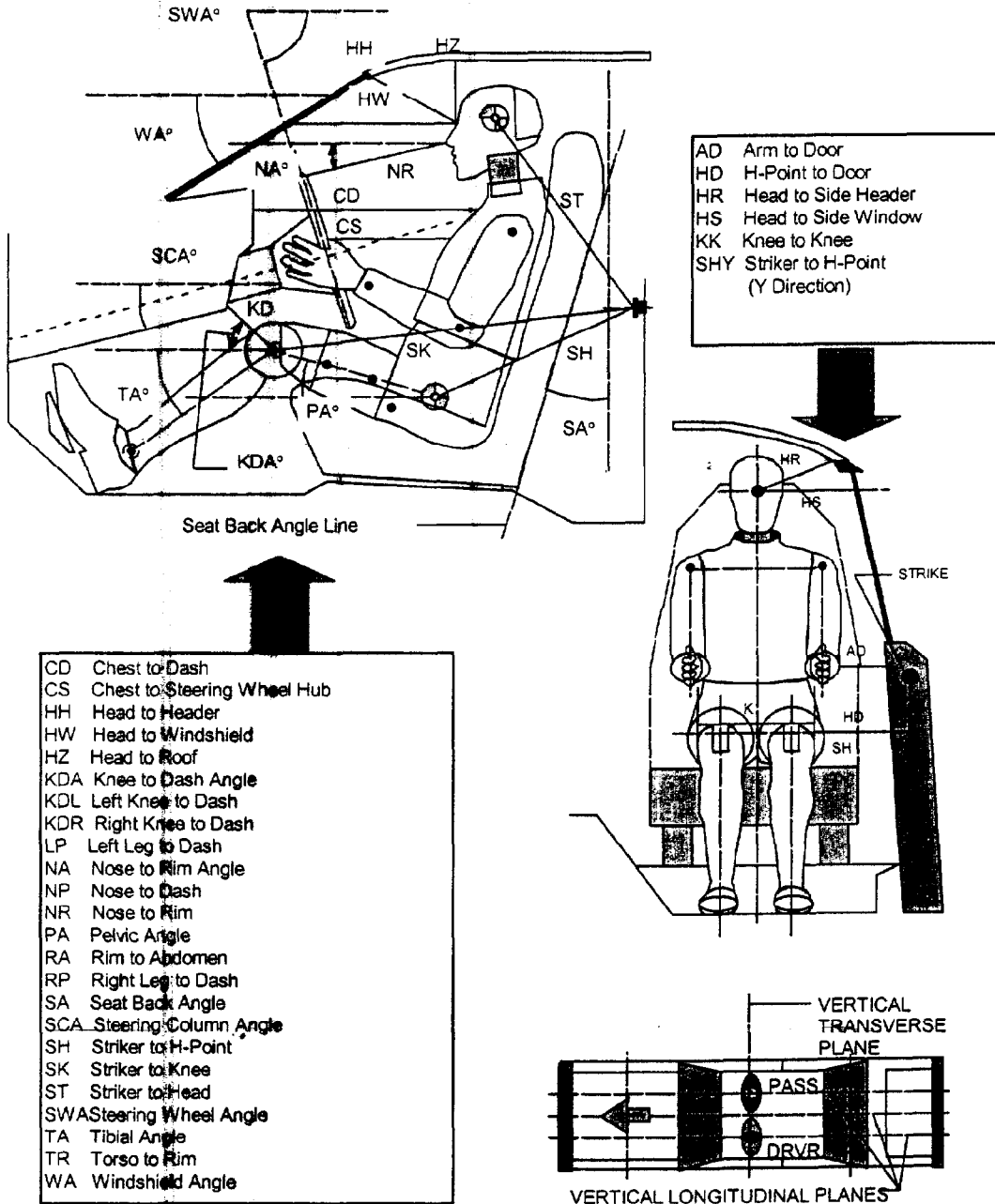
Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

DUMMY MEASUREMENT FOR FRONT SEAT PASSENGERS



DATA SHEET NO. 5...(continued)
DUMMY POSITIONING IN VEHICLE

FRONT SEAT MEASUREMENT TABLE

	DRIVER (Serial No. <u>34</u>)		PASS. (Serial No. <u>35</u>)	
	DISTANCE (mm)	ANGLE (°)	DISTANCE (mm)	ANGLE (°)
WA°		25		
SWA°		69.5		
SCA°		17		
SA°		26		15
HZ	165	90	166	90
HH	332	0	331	0
HW	578	0	565	0
HR	197		175	
NR	372	9		
CD	502		481	
CS	333	0		
RA	210	0		
KDL	175	28	160	
KDR	202		162	40
PA°		23		24.5
TA°		37		38
KK	226		200	
ST	534	7	503	6
SH	249	0	224	0
SHY	205		206	
HS	257		247	
HD	141		126	
AD	129		34	

DATA SHEET NO. 6

SEAT BELT POSITIONING DATA

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

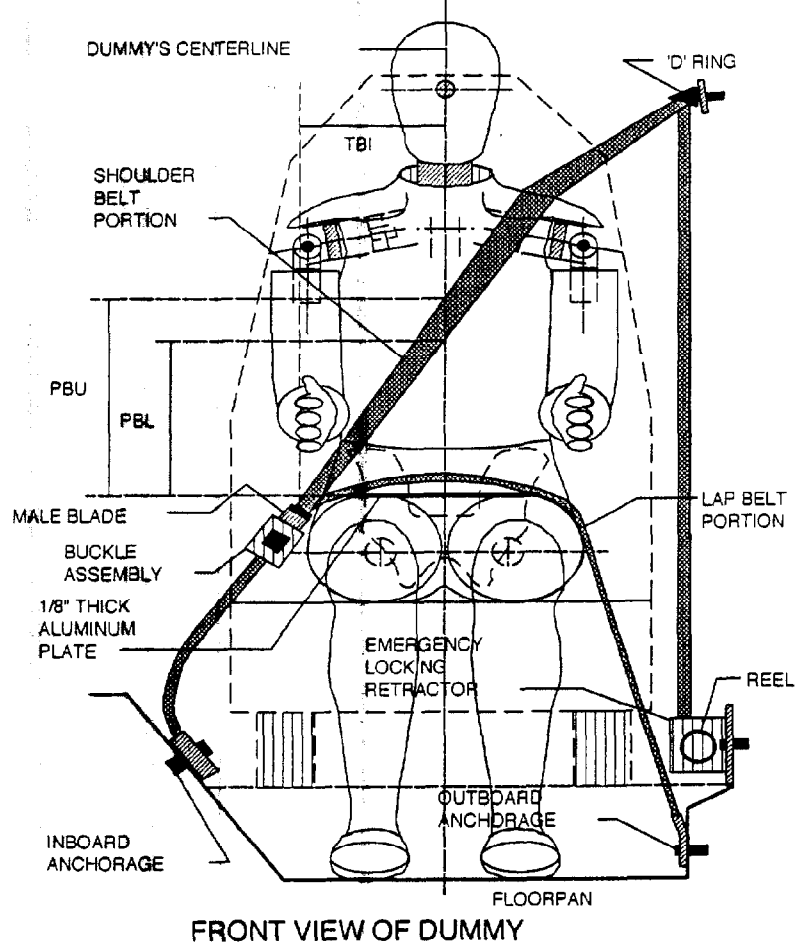
Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

SEAT BELT PLACEMENT MEASUREMENTS

Measurement Description	Units	Driver	Passenger
TCI - Dummy centerline to shoulder bolt	mm	173	170
PBU - Top surface of reference to belt upper edge	mm	312	305
PBL - Top surface of reference to belt lower edge	mm	243	222
Lap Belt tension	Newtons	10	10
Shoulder Belt tension	N/A	Retractor	Retractor

SEAT BELT POSITIONING DATA



DATA SHEET NO. 7 - VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY

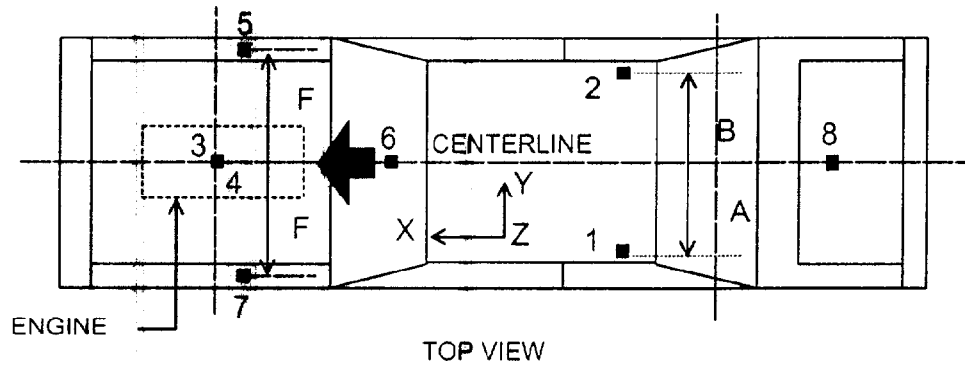
TEST VEHICLE: 1999 SATURN SL1 4 DOOR SEDAN NHTSA No.: MX0111
 TEST PROGRAM: 1999 NHTSA 35 MPH NCAP TEST DATE: 11/20/98

VEHICLE X-AXIS ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

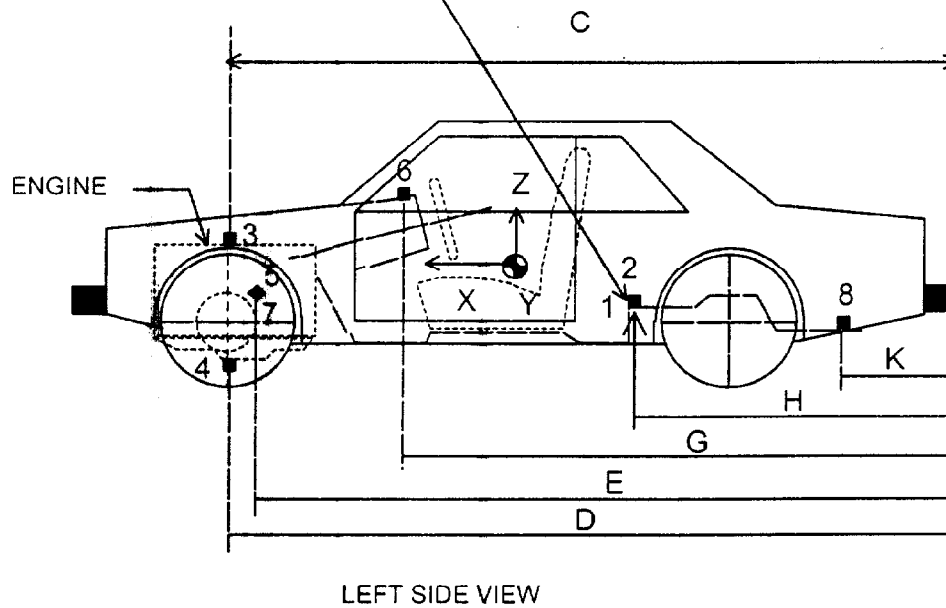
No.	Accelerometer Location	Measurements (mm)			Peak Values				
		X	Y	Z	Units	Max	Time	Min	Time
1	Left Rear X-Member (Pri.)	981	-386	530	G's	1.6	151.9	-31.7	73.7
2	Right Rear X-Member (Pri.)	981	398	530	G's	1.8	151.5	-32.2	74.1
3	Engine Top	3667	0	855	G's	25.8	54.3	-107.0	36.3
4	Engine Bottom	3675	169	174	G's	29.0	50.3	-92.3	43.4
5	Left Brake Caliper	3645	-634	263	G's	60.8	72.9	-143.1	52.6
6	Right Brake Caliper	3645	634	263	G's	63.2	66.2	-83.6	54.5
7	Instrument Panel	2881	0	890	G's	20.9	39.3	-56.1	31.5
8	Left Rear X-Member (Rednt.)	938	-336	530	G's	1.7	151.8	-32.3	73.7

Reference Points X - From Rear Surface of Vehicle Y - Vehicle Centerline Z - Ground Plane

VEHICLE ACCELEROMETER LOCATION AND DATA SUMMARY



REAR SEAT CUSHION
ASSY. FRONT ATTACHMENT
BRACKET SUPPORT



DATA SHEET NO. 8 - HYBRID III ATD INJURY CRITERIA AND SENSOR DATA

TEST VEHICLE: 1999 SATURN SL1 4 DOOR SEDAN

NHTSA No.: MX0111

TEST PROGRAM: 1999 NHTSA 35 MPH NCAP

TEST DATE: 11/20/98

HEAD PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	9.3	240.2	-49.9	76.9	10.7	257.1	-53.4	91.7
Head CG	Y	G's	4.6	59.8	-5.0	67.3	6.3	59.6	-9.8	98.1
Head CG	Z	G's	18.7	72.7	-3.0	119.7	24.1	78.3	-2.2	139.4
Head CG Resultant	N/A	G's	52.4	76.9			56.8	90.8		

CHEST PRIMARY PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	1.6	281.2	-41.8	79.8	3.0	297.7	-39.5	80.9
Chest CG	Y	G's	2.8	36.8	-5.8	81.3	5.2	79.3	-5.0	105.5
Chest CG	Z	G's	7.2	71.2	-3.9	102.6	12.1	80.2	-3.7	125.6
Chest CG Resultant	N/A	G's	42.2	79.8			41.6	80.8		

FEMUR PEAK FORCES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Femur	Z	Newtons	739.5	68.2	-1877.3	33.9	111.8	51.0	-5209.1	70.0
Right Femur	Z	Newtons	578.4	61.3	-3177.6	81.5	389.3	33.3	-3176.3	69.2

SEAT BELT SENSOR PEAK VALUES

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Lap Belt Force	N/A	Newtons	6234.3	74.4	-0.5	5.0	4237.6	67.9	-16.7	299.9
Shoulder Belt Force	N/A	Newtons	3369.9	88.3	2.8	193.1	5014.5	74.4	-4.9	230.2
Shoulder Belt Spoolout	N/A	MM	143.9	91.8	0.1	8.3	234.3	99.8	-0.2	8.6
Shoulder Belt Stretch	N/A	MM/CM	1.083	34.8	-0.014	25.6	0.000	0.0	0.000	0.0*

* No data collected on passenger belt stretch

HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	Avg G's	T ¹	T ²	HIC	Avg G's	T ¹	T ²
Head CG Primary	420.0	42.4	61.1	97.0	479.1	44.6	73.5	109.4

CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Primary	41.8	77.9	80.9	41.2	80.4	83.4

DATA SHEET NO. 8...(continued)

TEST VEHICLE: 1999 SATURN SL1 4 DOOR SEDAN NHTSA No.: MX0111
 TEST PROGRAM: 1999 NHTSA 35 MPH NCAP TEST DATE: 11/20/98

PELVIC PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Pelvis	X	G's	4.4	118.9	-44.4	76.0	2.8	120.2	-53.9	66.8
Pelvis	Y	G's	4.7	100.6	-9.0	70.4	12.8	59.0	-6.3	109.9
Pelvis	Z	G's	6.0	33.3	-27.2	81.5	3.2	256.1	-20.4	78.3

UPPER NECK PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Neck Force	X	Newtons	664.2	89.5	-263.8	138.7	813.5	88.6	-402.0	140.9
Neck Force	Y	Newtons	116.6	193.8	-211.9	66.4	236.1	72.4	-151.8	267.0
Neck Force	Z	Newtons	1709.1	64.4	-109.6	14.2	1076.7	75.0	-346.1	257.5
Neck Moment	X	N·m	7.0	65.7	-12.3	112.9	9.7	100.1	-9.5	73.6
Neck Moment	Y	N·m	72.0	70.6	-21.5	257.3	59.5	83.4	-13.6	60.4
Neck Moment	Z	N·m	9.8	112.2	-8.3	65.1	10.7	117.3	-8.4	284.1

FOOT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Foot Aft	X	G's	20.2	47.0	-71.9	68.3	51.3	45.2	-74.9	40.3
Left Foot Aft	Z	G's	27.0	44.1	-65.9	36.3	8.6	85.7	-70.6	44.8
Left Foot Fore	Z	G's	39.2	44.2	-181.1	30.6	57.8	48.4	-117.4	33.8
Right Foot Aft	X	G's	31.3	70.7	-63.6	53.0	13.5	76.6	-78.8	28.3
Right Foot Aft	Z	G's	21.2	75.1	-105.2	69.2	37.8	41.4	-63.3	27.7
Right Foot Fore	Z	G's	45.0	71.8	-151.7	51.2	63.8	32.4	-157.4	27.4

UPPER AND LOWER TIBIA PEAK FORCES AND MOMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Left Lower Moment	X	N·m	67.1	45.7	-37.0	36.8	18.2	45.6	-60.5	48.3
Left Lower Moment	Y	N·m	22.9	36.8	-52.1	67.8	99.6	70.5	-41.5	53.4
Left Lower Force	Z	Newtons	120.4	66.1	-4207.0	36.6	149.6	154.9	-3845.5	71.6
Left Upper Moment	X	N·m	22.9	40.0	-58.2	37.2	42.0	47.2	-32.9	94.5
Left Upper Moment	Y	N·m	17.6	243.4	-107.5	32.5	13.2	129.1	-113.0	72.0
Right Lower Moment	X	N·m	87.8	67.7	-29.3	54.2	22.4	32.0	-69.1	75.0
Right Lower Moment	Y	N·m	214.0	75.9	-30.5	51.1	104.9	75.1	-31.8	62.1
Right Lower Force	Z	Newtons	159.1	185.0	-5026.9	69.8	408.1	62.3	-2912.6	33.8
Right Upper Moment	X	N·m	19.7	68.0	-50.5	54.3	39.5	62.8	-8.9	150.0
Right Upper Moment	Y	N·m	12.3	220.4	-134.0	69.9	21.0	254.8	-101.5	29.1

DATA SHEET NO. 8...(continued)

TEST VEHICLE: 1999 SATURN SL1 4 DOOR SEDAN NHTSA No.: MX0111
 TEST PROGRAM: 1999 NHTSA 35 MPH NCAP TEST DATE: 11/20/98

CHEST PEAK DISPLACEMENTS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	MM	0.1	0.0	-34.5	76.7	0.3	28.8	-20.0	96.8

HEAD REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Head CG	X	G's	8.8	241.8	-48.2	76.5	11.3	257.2	-52.4	92.2
Head CG	Y	G's	4.9	75.8	-4.8	104.0	4.8	59.5	-9.5	98.7
Head CG	Z	G's	21.2	72.2	-2.6	117.6	26.9	83.2	-2.2	124.0
Head CG Resultant	N/A	G's	51.6	77.6			56.4	90.4		

CHEST REDUNDANT PEAK ACCELERATIONS

Location	Axis	Units	Driver				Passenger			
			Max	Time	Min	Time	Max	Time	Min	Time
Chest CG	X	G's	2.2	287.7	-41.1	79.6	3.2	297.0	-39.0	88.6
Chest CG	Y	G's	1.8	36.9	-6.7	77.0	6.9	79.2	-5.8	105.4
Chest CG	Z	G's	6.3	70.9	-3.9	92.1	11.0	85.2	-3.4	124.4
Chest CG Resultant	N/A	G's	41.6	79.7			40.7	80.8		

REDUNDANT HEAD INJURY CRITERIA (HIC)

Location	Driver				Passenger			
	HIC	Avg G's	T ¹	T ²	HIC	Avg G's	T ¹	T ²
Head CG Redundant	420.7	42.4	61.4	97.3	456.9	43.8	73.1	109.0

REDUNDANT CHEST CLIP (3MSEC)

Location	Driver			Passenger		
	CLIP	T ¹	T ²	CLIP	T ¹	T ²
Chest CG Redundant	40.9	78.1	81.1	40.3	80.2	83.2

DATA SHEET NO. 9**SEAT BELT PERFORMANCE ASSESSMENT TEST DATA**Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDANNHTSA No.: MX0111Test Program: 1999 35 MPH NCAP FRONTAL IMPACTTest Date: 11/20/98**BELT LENGTH DATA**

Measurement Description	Units	Driver	Passenger
Retractor reel to 'D' ring	mm	625	625
Shoulder belt length as measured on ATD	mm	830	837
Lap belt length as measured on ATD	mm	805	807
Remainder of belt on reel	mm	883	892
Total belt length for continuous webbing systems	mm	3143	3161

SHOULDER BELT SPOOL-OFF DATA

Measurement Description	Units	Driver	Passenger
As determined mechanically	mm	130.0	220.0
As determined electronically	mm	143.9	234.3

BELT STRETCH DATA

Measurement Description	Units	Driver	Passenger
Electronically from shoulder belt load cell and "D" ring	mm/cm	1.08	no data
Mechanically	mm/cm	1.00	0.00

DATA SHEET NO. 10

SUMMARY OF FMVSS 212 DATA

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

Details of windshield mounting (method of retention, type of trim, etc.):

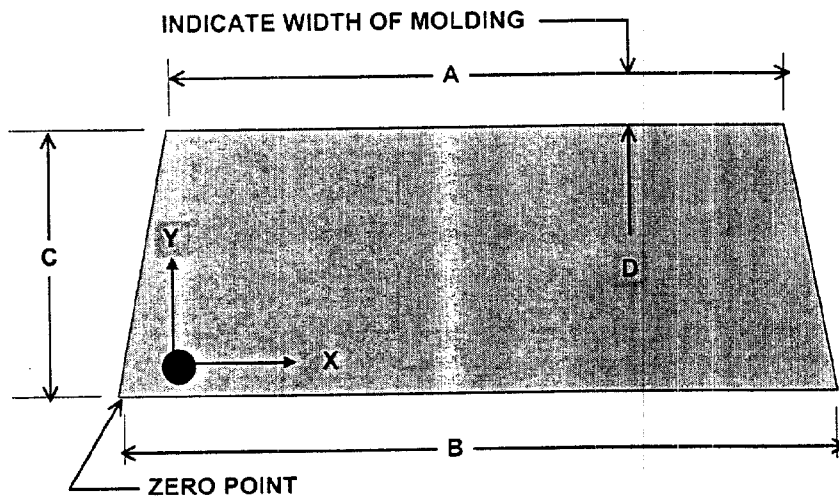
Windshield glass is secured to the vehicle frame with a rubber type adhesive, with rubber molding along the top and sides with rubber and plastic molding along the bottom.

The standard requires that the post test retention measurement be a minimum of 75 percent of the pretest total periphery measurement for vehicles not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles which are equipped with occupant passive restraints.

WINDSHIELD PERIPHERY MEASUREMENTS

	Units	Left Side	Right Side	Total
Pre-Test	mm	2145	2145	100%
Post-Test	mm	2145	2145	100%
Percent of retention	Percent	100%	100%	

Indicate area of retention failure.



FRONT VIEW OF WINDSHIELD

Width of molding: Top: 17 mm, Sides: 0 mm, Bottom: 0 mm

Temperature of windshield molding during test: 21.1 °C

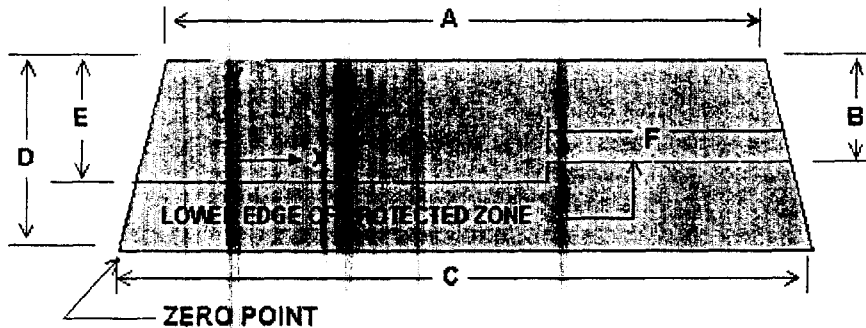
DATA SHEET NO. 11
WINDSHIELD ZONE INTRUSION FMVSS 219 (PARTIAL) DATA

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98



FRONT VIEW OF WINDSHIELD

Item	Units	Value
A	mm	1140
B	mm	345
C	mm	1550
D	mm	800
E	mm	630
F	mm	527

Provide all dimensions necessary to reproduce the protected area.

AREA OF PROTECTED ZONE FAILURES

- A. Provide coordinates of the area that the protected zone was penetrated more than 0.25 in. by a vehicle component other than one which is normally in contact with the windshield.

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

- B. Provide coordinates of the area beneath the protected zone template that the inner surface of the windshield was penetrated by a vehicle component.

X	Y
N/A	N/A
N/A	N/A
N/A	N/A
N/A	N/A

DATA SHEET NO. 12

FMVSS 301 FUEL SYSTEM INTEGRITY POST IMPACT DATA

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

Test Time: 1:45 PM

Temperature at Time of Impact: 15.5 C

STODDARD SOLVENT SPILLAGE MEASUREMENT:

- A. From impact until vehicle motion ceases - -
Actual = 0.0 oz. (Maximum Allowable = 1 ounce)
- B. For 5 minute period after vehicle motion ceases - -
Actual = 0.0 oz. (Maximum Allowable = 5 ounces)
- C. For next 25 minutes - -
Actual = 0.0 oz. (Maximum Allowable = 1 oz./minute)
- D. Provide Spillage Details: No solvent spillage occurred

DATA SHEET NO. 13

FMVSS 301 STATIC ROLLOVER DATA SHEET

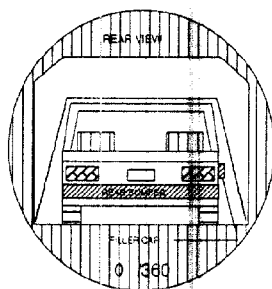
Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

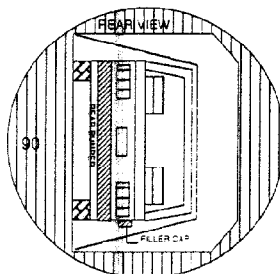
Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

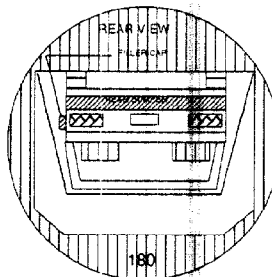
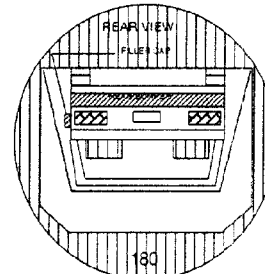
Time: 1:45 PM Temperature: 15.5 °C



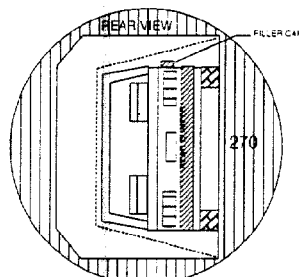
0° TO 90°



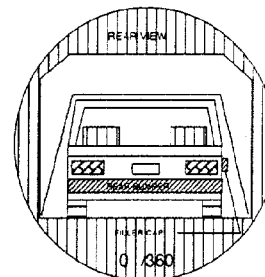
90° TO 180°



180° TO 270°



270° TO 360°



1. The specified fixture rollover rate for each 90° of rotation = 60 to 120 seconds.
2. The position hold time at each position = 300 seconds (minimum).
3. Provide details of Stoddard Solvent spillage locations:
No solvent leakage occurred during rollover testing.

TEST PHASE	Rotation Time (sec.)	Hold Time (sec.)	Spillage (oz.)
0° TO 90°	79	300	0.0
90° TO 180°	82	300	0.0
180° TO 270°	79	300	0.0
270° TO 360°	80	300	0.0

DATA SHEET NO. 14

VEHICLE MEASUREMENTS

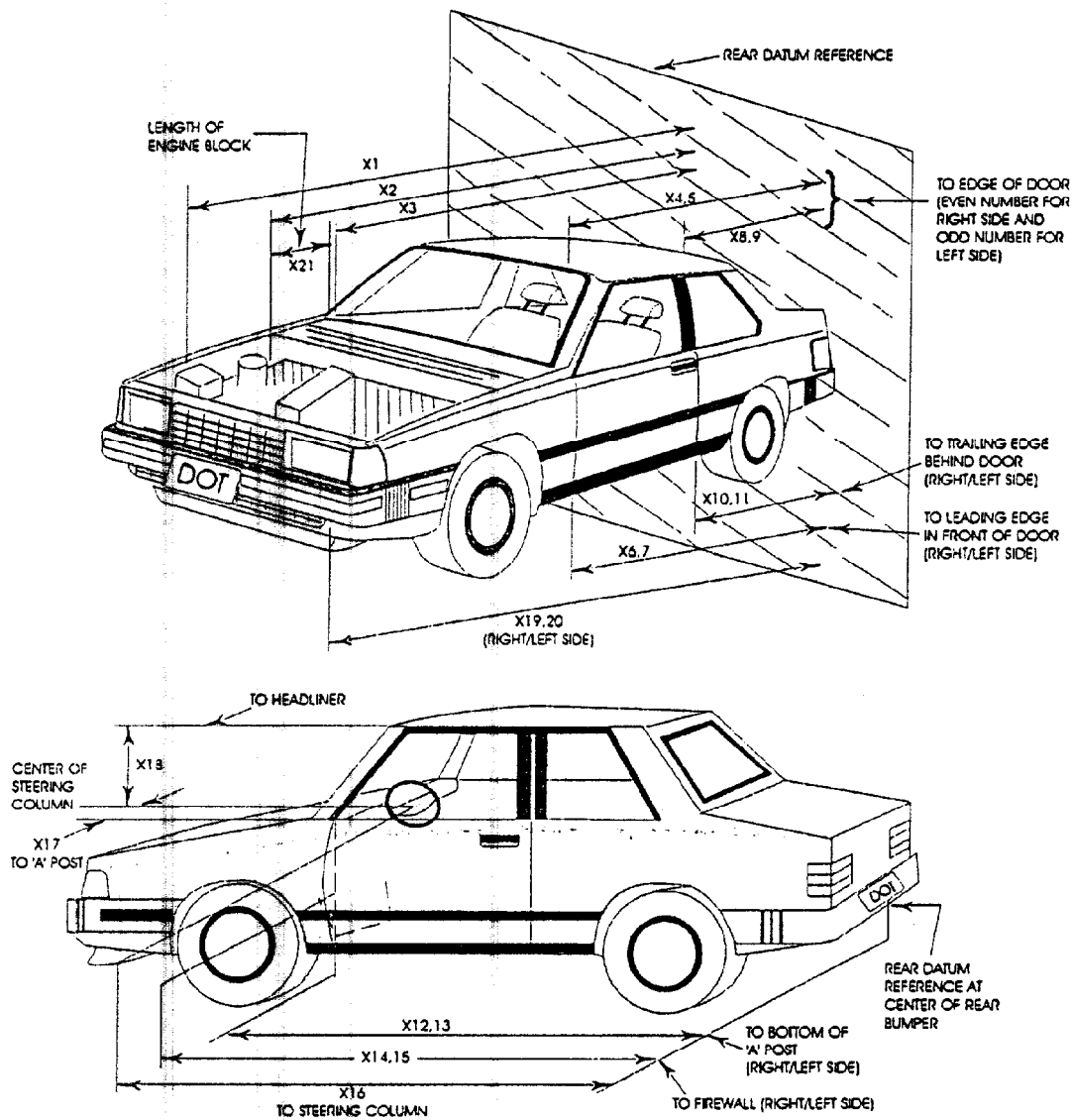
Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

No.	Measurement Description	Units	Pre-Test	Post-Test	Difference
1	Total length of vehicle at centerline	mm	4485	3905	-580
2	RSOV to front of engine	mm	3780	3430	-350
3	RSOV to firewall centerline	mm	3341	3253	-88
4	RSOV to leading edge of right door	mm	2996	2990	-6
5	RSOV to leading edge of left door	mm	2997	3000	3
6	RSOV to lower leading edge of right door	mm	2981	2978	-3
7	RSOV to lower leading edge of left door	mm	2984	2973	-11
8	RSOV to upper trailing edge of right door	mm	1998	2000	2
9	RSOV to upper trailing edge of left door	mm	2001	2004	3
10	RSOV to lower trailing edge of right door	mm	2018	2005	-13
11	RSOV to lower trailing edge of left door	mm	2019	2010	-9
12	RSOV to bottom of right 'A' pillar	mm	3036	2953	-83
13	RSOV to bottom of left 'A' pillar	mm	3039	2965	-74
14	RSOV to firewall on right side	mm	3341	3142	-199
15	RSOV to firewall of left side	mm	3348	3256	-92
16	RSOV to steering column	mm	2620	2628	8
17	Center of steering column to left 'A' pillar	mm	352	315	-37
18	Center of steering column to headlining	mm	355	389	34
19	RSOV to right side of front bumper	mm	4159	3755	-404
20	RSOV to left side of front bumper	mm	4159	3730	-429
21	Length of engine block	mm	190	160	-30
RD	RSOV to right side of dash panel	mm	2806	2775	-31
CD	RSOV to center of dash panel	mm	2728	2713	-15
LD	RSOV to left side of dash panel	mm	2822	2791	-31



DATA SHEET NO. 15

CAMERA LOCATIONS

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

No.	Camera View	Location (mm)			Angle (°)	Film Plane to Head	Lens (mm)	Speed (fps)
		X	Y	Z				
1	Right Side, Real Time	3454	10973	1245	0	1651	Zoom	24
2	Left Side, No. 1	1880	8153	1206	2	7671	13	1040
3	Left Side, No. 2	1078	6502	1499	4	6350	25	1050
4	Left Side, No. 3	31124	3454	2045	10	3429	19	1010
5	Left Side, No. 4	2108	8204	3073	12	7874	19	1000
6	Left Side, No. 5	2108	8204	2565	10	7976	19	990
7	Right Side, No. 1	1930	8331	1346	0	7874	12	980
8	Right Side, No. 2	1676	8280	1524	2	7849	40	940
9	Right Side, No. 3	3061	3556	2070	17	3378	19	1000
10	Right Side, No. 4	2438	8128	1372	14	7620	35	930
11	Overhead Overall	864	152	5944	84	N/A	13	930
12	Front View Driver	-190	356	2540	47	N/A	13	1000
13	Front View, Passenger	-190	356	2540	48	N/A	13	1000
14	Pit Camera, Engine	737	0	-1638	90	N/A	10	700
15	Pit Camera, Fuel Tank	4470	0	-1867	43	N/A	FILM	BE KE
16	Onboard, Driver	3391	254	1041	6	1143	13	500
17	Onboard, Passenger	3391	254	1041	7	1143	13	500

* X - Barrier Face Y - Monorail Centerline Z - Ground

**DATA SHEET NO. 16
REFERENCE PHOTOGRAPH TARGETS**

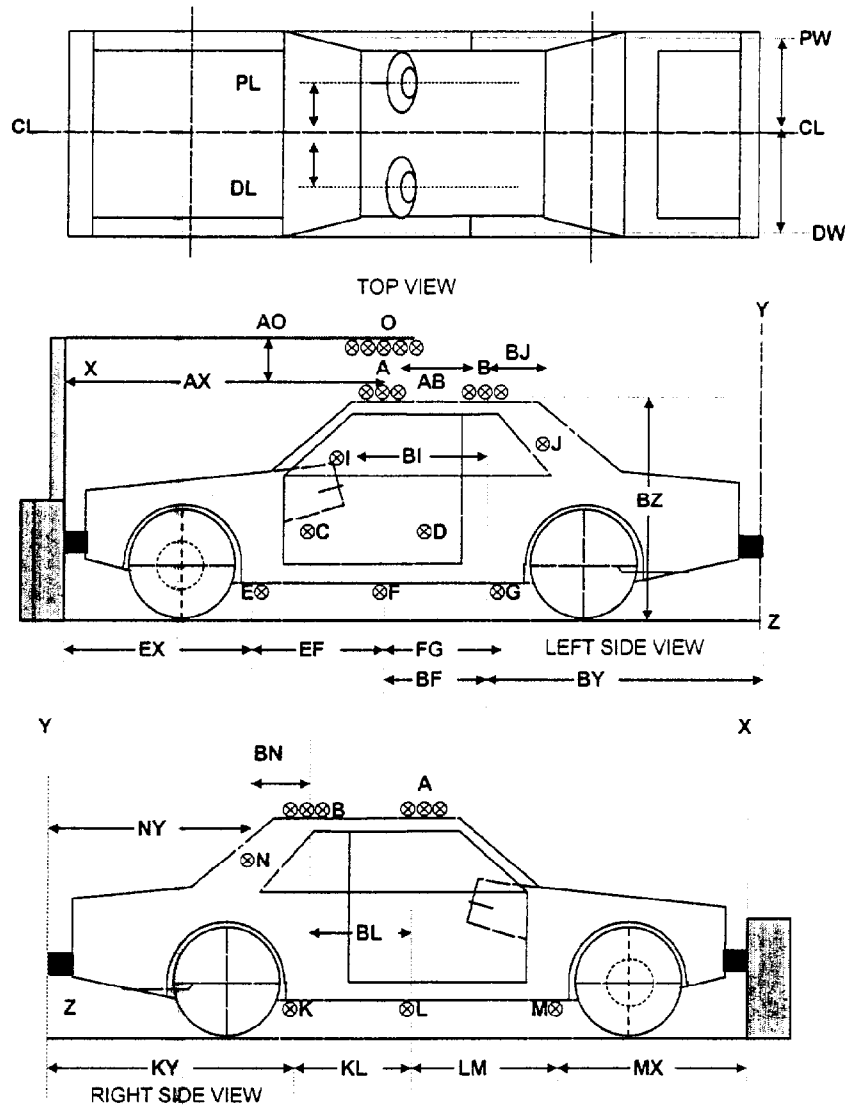
Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

Item	Value
AX	1380
AB	606
AO	152
BJ	424
BI	1200
BZ	1450
EX	1383
EF	850
FG	850
BF	736
BY	1517
NY	1045
BN	460
KY	1373
KL	866
BL	800
LM	858
MX	1415
CL/PL	350
CL/PW	765
CL/DL	350
CL/DW	765



VEHICLE INTRUSION MEASUREMENTS

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

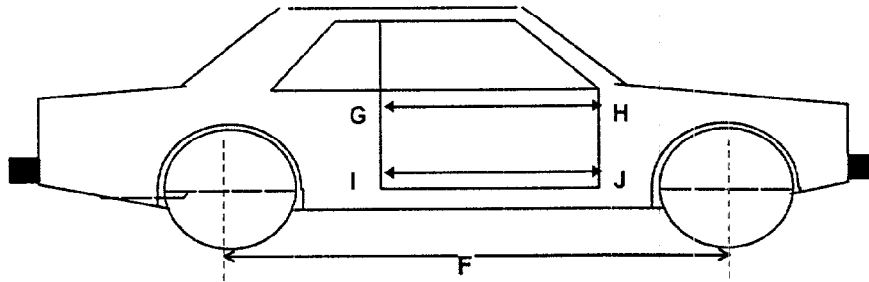
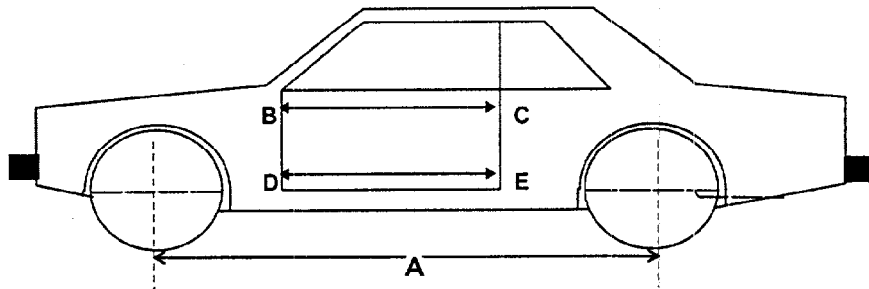
Test Date: 11/20/98

DOOR OPENING WIDTH

UNITS (mm)	LEFT SIDE		RIGHT SIDE	
MEASUREMENT	BC	DE	GH	IJ
PRE-TEST	922	860	920	865
POST-TEST	909	859	889	859
DIFFERENCE	-13	-1	-31	-6

VEHICLE WHEELBASE CHANGE

UNITS (mm)	A = LEFT SIDE WHEELBASE	F = RIGHT SIDE WHEELBASE
PRE-TEST	2605	2605
POST-TEST	2490	2530
DIFFERENCE	-115	-75



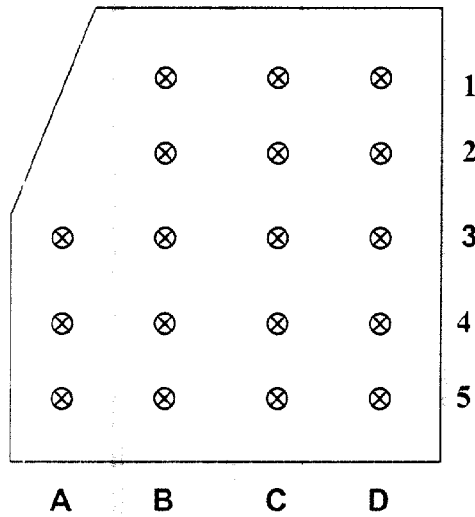
Data Sheet No. 17(Continued)

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

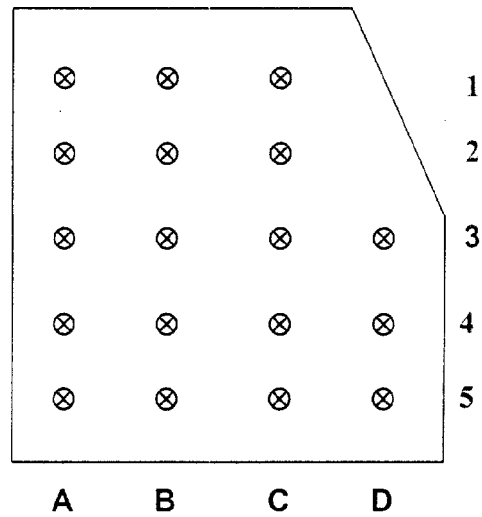
Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98



⊗ X
LEFT FRONT SEAT ANCHOR BOLT
↓
TO RSOV REFERENCE

DRIVER SIDE FLOOR PLAN



⊗ X
RIGHT FRONT SEAT ANCHOR BOLT
↓
TO RSOV REFERENCE

PASSENGER SIDE FLOORPAN

(Data Sheet No. 17Continued)

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

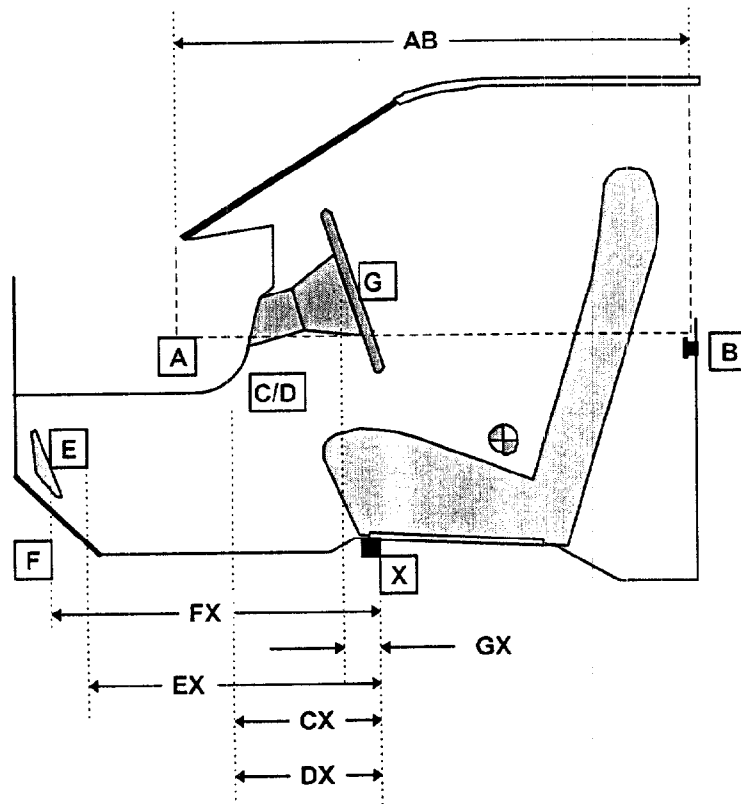
Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

DRIVER COMPARTMENT INTRUSION (Distances in mm)

REF.	DESCRIPTION	PRE-TEST	POST-TEST
AB	DOOR OPENING (INSIDE WINDOW JAM)	922	909
CX	LOWER LEFT KNEE BOLSTER TO X	365	343
DX	LOWER RIGHT KNEE BOLSTER TO X	352	345
EX	BRAKE PEDAL TO X	600	505
FX	FOOT REST TO X	632	631
GX	STEERING COLUMN HUB (CENTER) TO X	112	100

X = LEFT FRONT SEAT ANCHOR BOLT



DRIVER COMPARTMENT

(Data Sheet No. 17Continued)

DRIVER SIDE "X"

	A			B			C			D		
	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.
1				749	704	-45	757	649	-108	758	649	-109
2				669	629	-40	678	633	-45	669	622	-47
3	566	563	-3	568	568	0	567	540	-27	568	520	-48
4	470	465	-5	475	458	-17	472	444	-28	468	434	-34
5	372	364	-8	370	360	-10	371	353	-18	372	347	-25

DRIVER SIDE "Z"

	A			B			C			D		
	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.
1				99	100	1	54	40	-14	52	45	-7
2				-3	-12	-9	-14	-70	-56	-17	-65	-48
3	-48	-55	-59	-49	-91	-59	-51	-75	-60	-53	-60	-7
4	-50	-62	-12	-52	-80	-28	-61	-64	-3	-59	-56	3
5	-49	-60	-11	-47	-75	-28	-53	-95	-42	-52	-62	-10

PASSENGER SIDE "X"

	A			B			C			D		
	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.
1	781	686	-95	776	676	-100	755	650	-105			
2	680	643	-37	677	648	-29	673	615	-58			
3	580	543	-37	577	570	-7	575	571	-4	575	565	-10
4	477	466	-11	475	470	-5	475	470	-5	475	473	-2
5	373	371	-2	376	375	-1	374	370	-4	373	371	-2

PASSENGER SIDE "Z"

	A			B			C			D		
	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.	PRE-TEST	POST-TEST	DIFF.
1	-107	102	209	75	-128	-203	115	139	24			
2	-19	-6	13	-20	6	26	16	11	-5			
3	-50	-54	-4	-50	-60	-10	-40	-76	-36	-40	-43	-3
4	-50	-50	0	-52	-65	-13	-40	-60	-20	-40	-55	-15
5	-42	-29	13	-42	-66	-24	-40	-55	-15	-40	-53	-13

DRIVER

PRE	POST	DIFF.
2465	2465	0
270	270	0

PASSENGER

PRE	POST	DIFF.
2465	2465	0
2495	270	0

RSOV to anchor bolt
Ground level to anchor bolt

DATA SHEET NO. 18

OFFSET BARRIER ORIENTATION

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

(NOT REQUIRED FOR THIS TEST)

A = VEHICLE WIDTH MEASURED AT WIDEST POINT N/A mm

B = 40% OFFSET FROM LEFT EDGE OF VEHICLE N/A mm

ACTUAL OFFSET DURING TEST N/A mm = N/A %

DATA SHEET NO. 19

ACCIDENT INVESTIGATION DIVISION DATA

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98

VIN: 1G8ZG5288XZ128523 Wheelbase: 2605 mm Test Weight: 1255 kg

Vehicle Size Category: SATURN SL-1 4-DOOR SEDAN

ACCELEROMETER DATA:

LOCATION: Left and right rear floor pans

CALIBRATION PROCEDURE: 6 months/ drop test

LINEARITY: Good

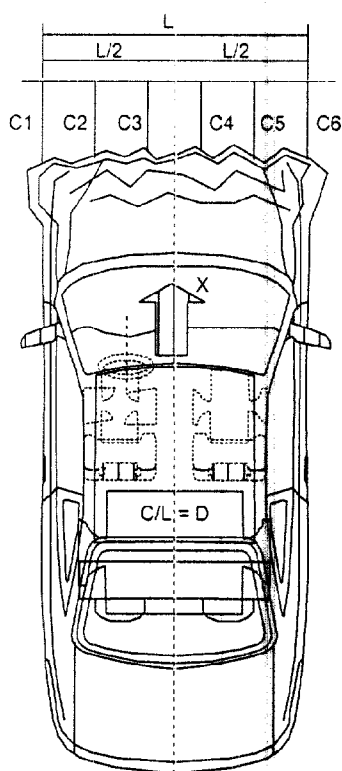
INTEGRATION ALGORITHM: NHTSA Standard

VEHICLE IMPACT SPEED: 56.5 km/h

TIME OF SEPARATION: 91.3 msec

VELOCITY CHANGE: 62.78 km/h

COLLISION DEFORMATION CLASSIFICATION (CDC) CODE: F (frontal)



IMPACT MODE: Full Frontal

CRUSH DEPTH DIMENSIONS:

C1 = 429 mm

C2 = 579 mm

C3 = 585 mm

C4 = 585 mm

C5 = 537 mm

C6 = 404 mm

MIDPOINT OF DAMAGE: Vehicle Centerline

LENGTH OF DAMAGE REGION: 1516 mm

DATA SHEET NO. 20

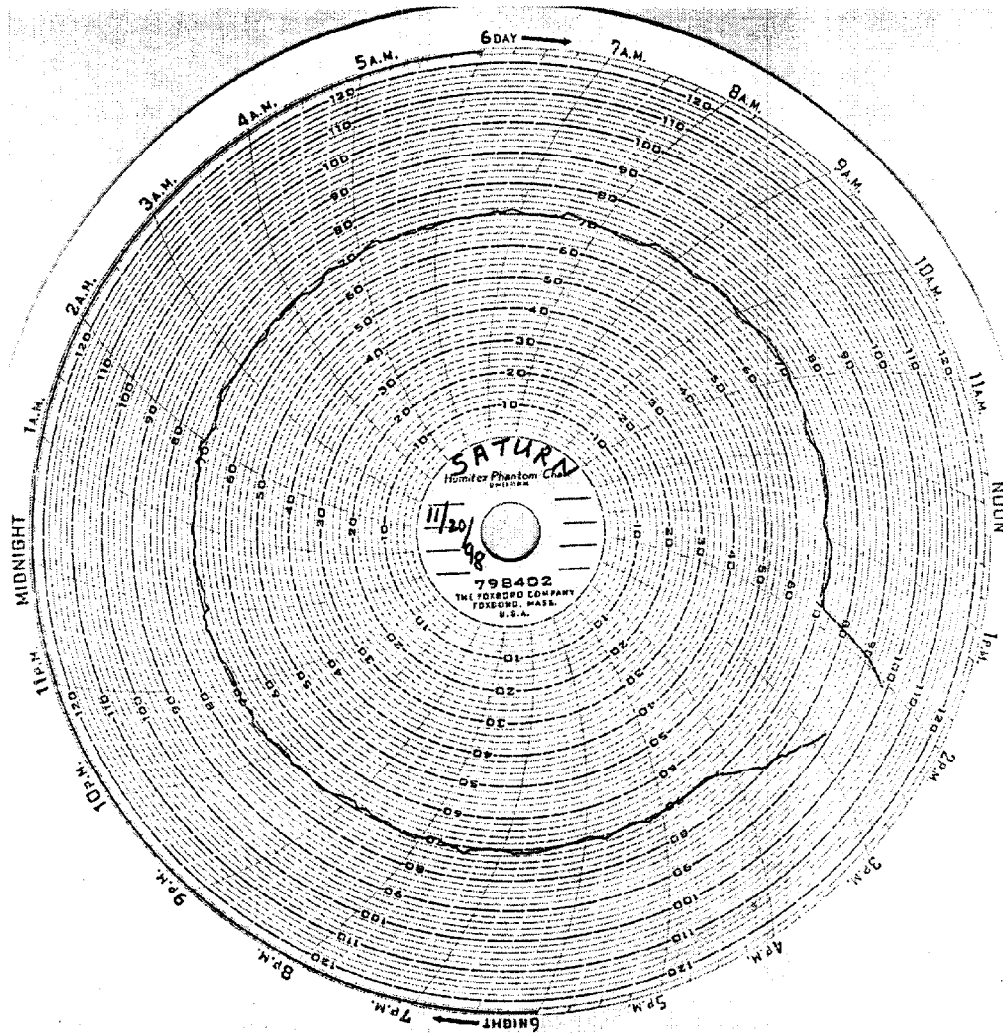
DUMMY/VEHICLE TEMPERATURE STABILIZATION

Test Vehicle: 1999 SATURN SL-1 4-DOOR SEDAN

NHTSA No.: MX0111

Test Program: 1999 35 MPH NCAP FRONTAL IMPACT

Test Date: 11/20/98



APPENDIX A
PHOTOGRAPHS

KAR99001-02

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FIGURE A-1. RIGHT FRONT AS RECEIVED

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FIGURE A-2. LEFT REAR AS RECEIVED

A-2

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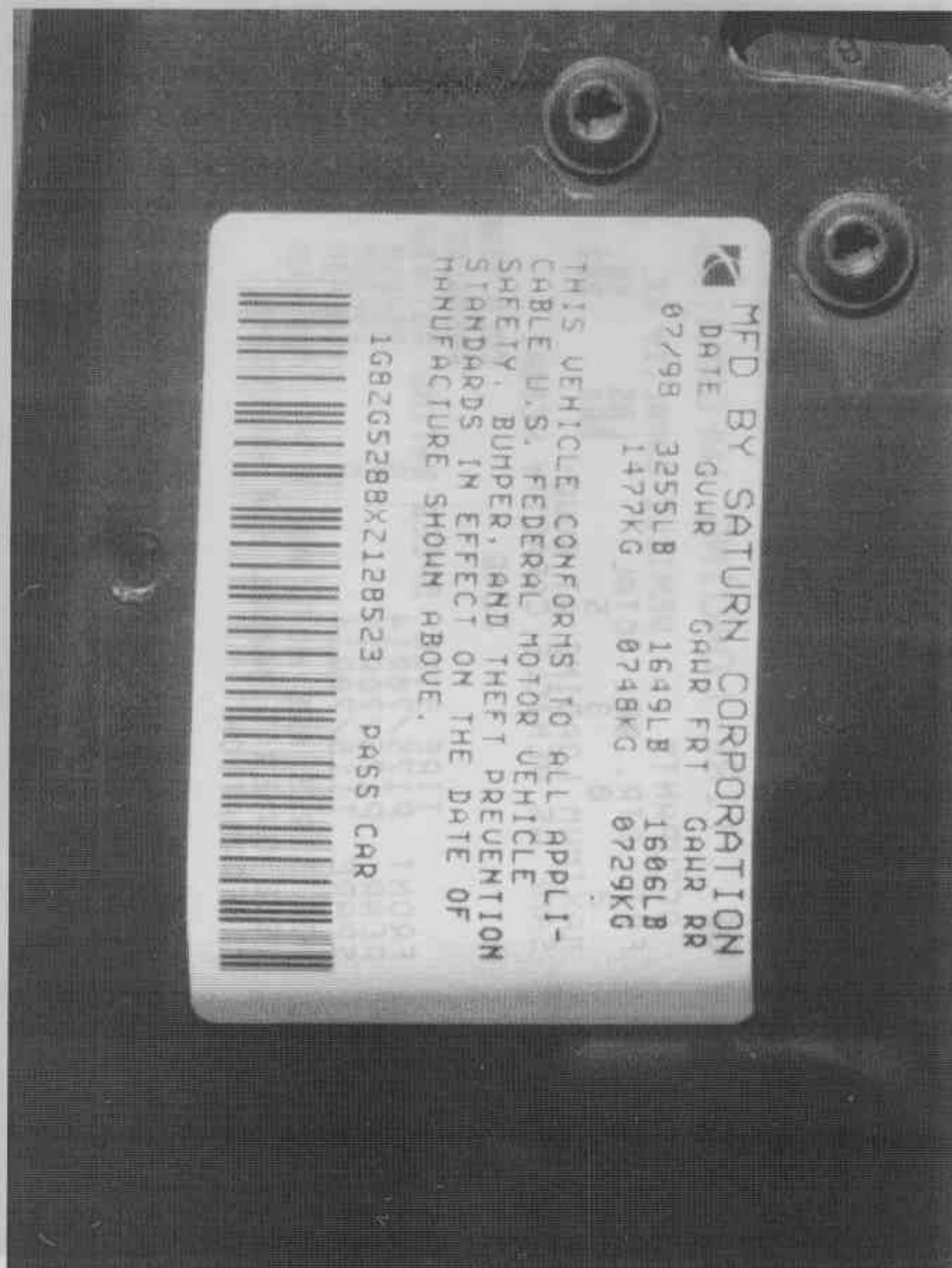


FIGURE A-3. VEHICLE CERTIFICATION LABEL

 TIRE-LOADING INFORMATION

OCCUPANTS
FRT. CTR. RR. TOTAL
2 0 3 5
VEHICLE CAPACITY WT.
LBS 864
KG 392

MAXIMUM LOADING AT GVWR:
SAME AS VEHICLE CAPACITY WEIGHT

2246

COLD TIRE
PRESSURE

	TIRE SIZE	SPEED RATING	PSI/KPA
FRONT	P175/70R14	S	30/210
REAR	P175/70R14	S	26/180
SPARE	T115/70R14	M	60/420

IF TIRES ARE HOT, ADD 4 PSI (28 KPA)
SEE OWNER'S MANUAL FOR ADDITIONAL
INFORMATION

FIGURE A-4. VEHICLE TIRE PLACARD



FIGURE A-5. PRETEST FRONT VIEW

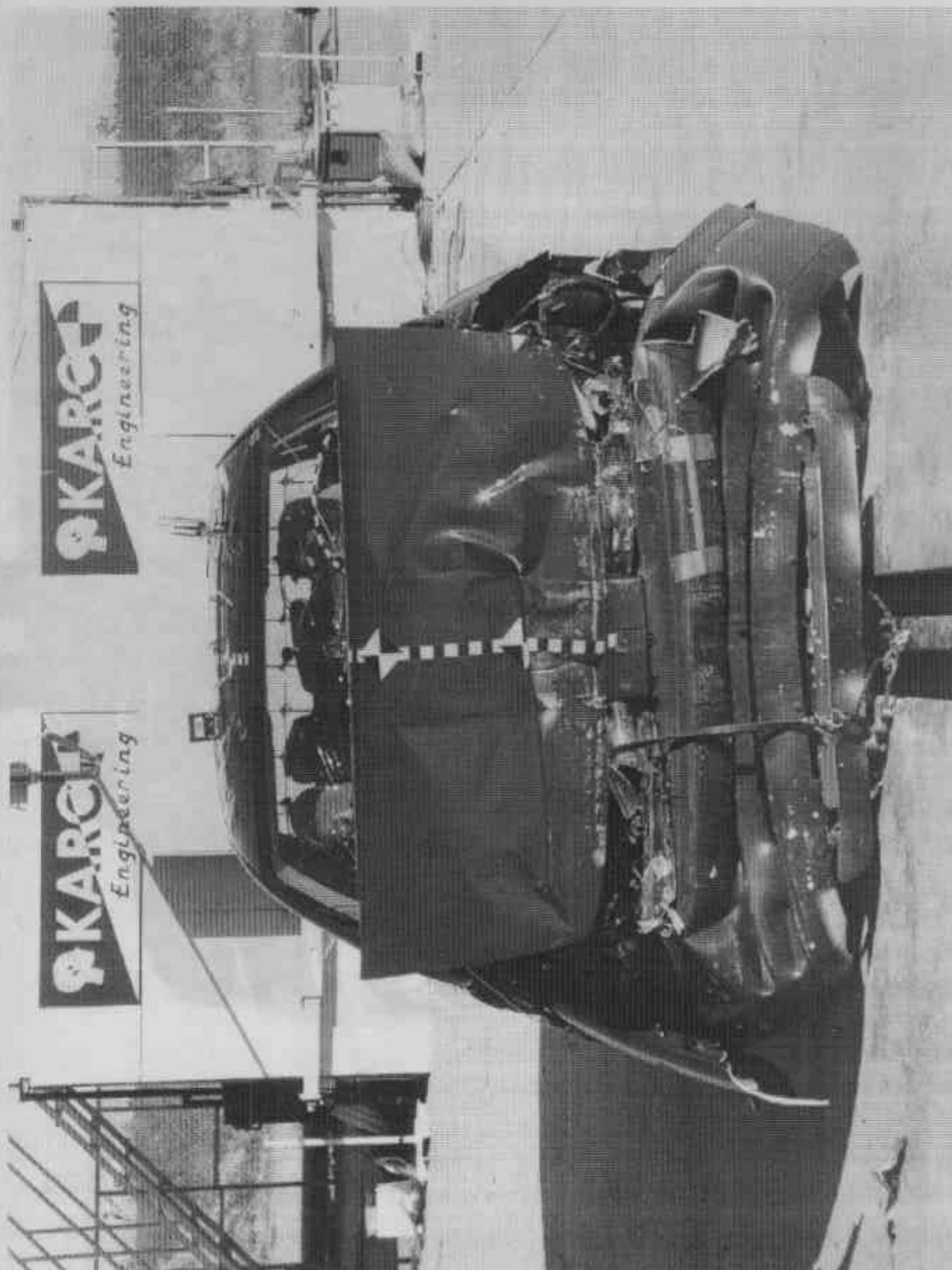


FIGURE A-6. POST TEST FRONT VIEW

A-6

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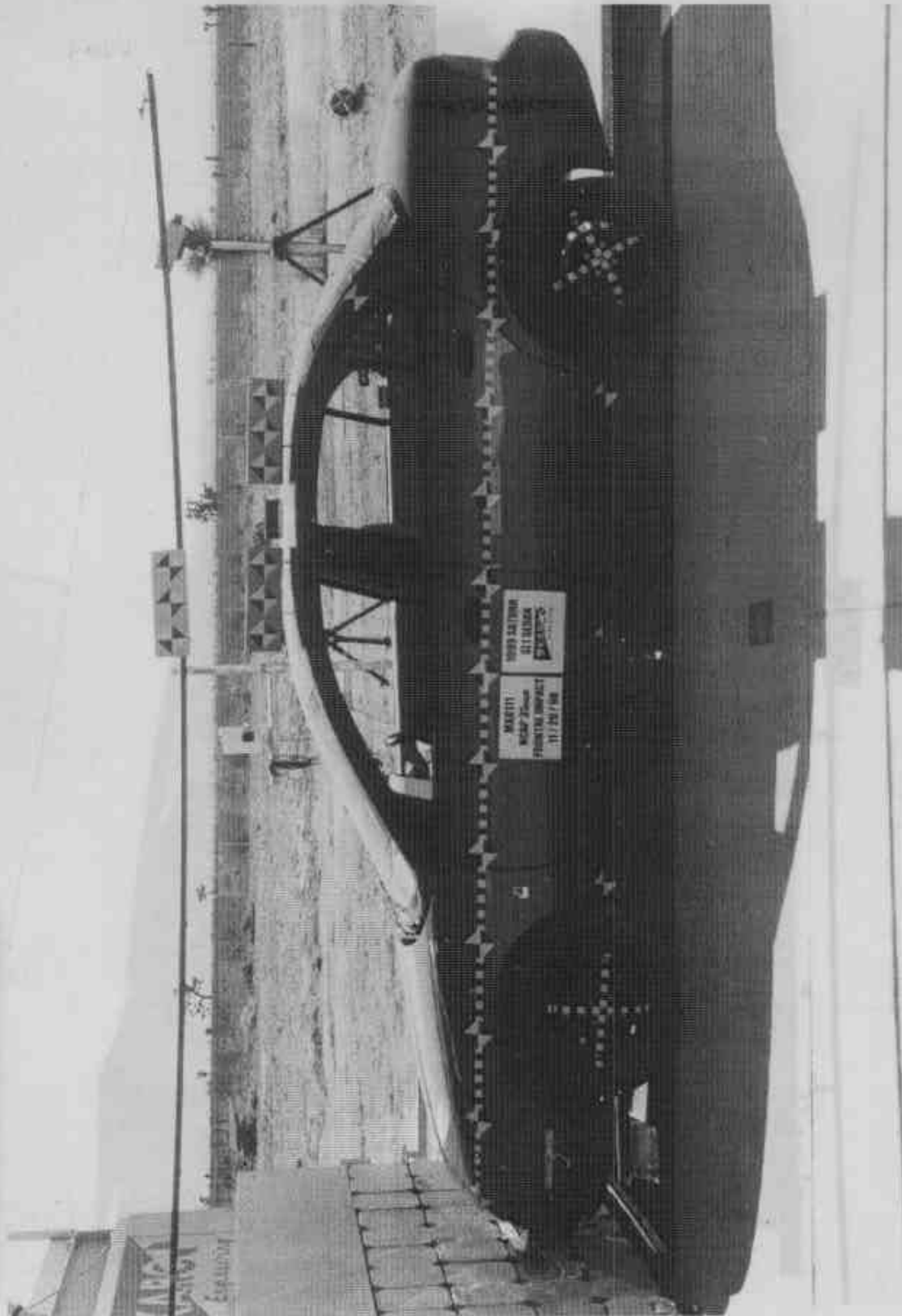


FIGURE A-7. PRETEST LEFT SIDE VIEW

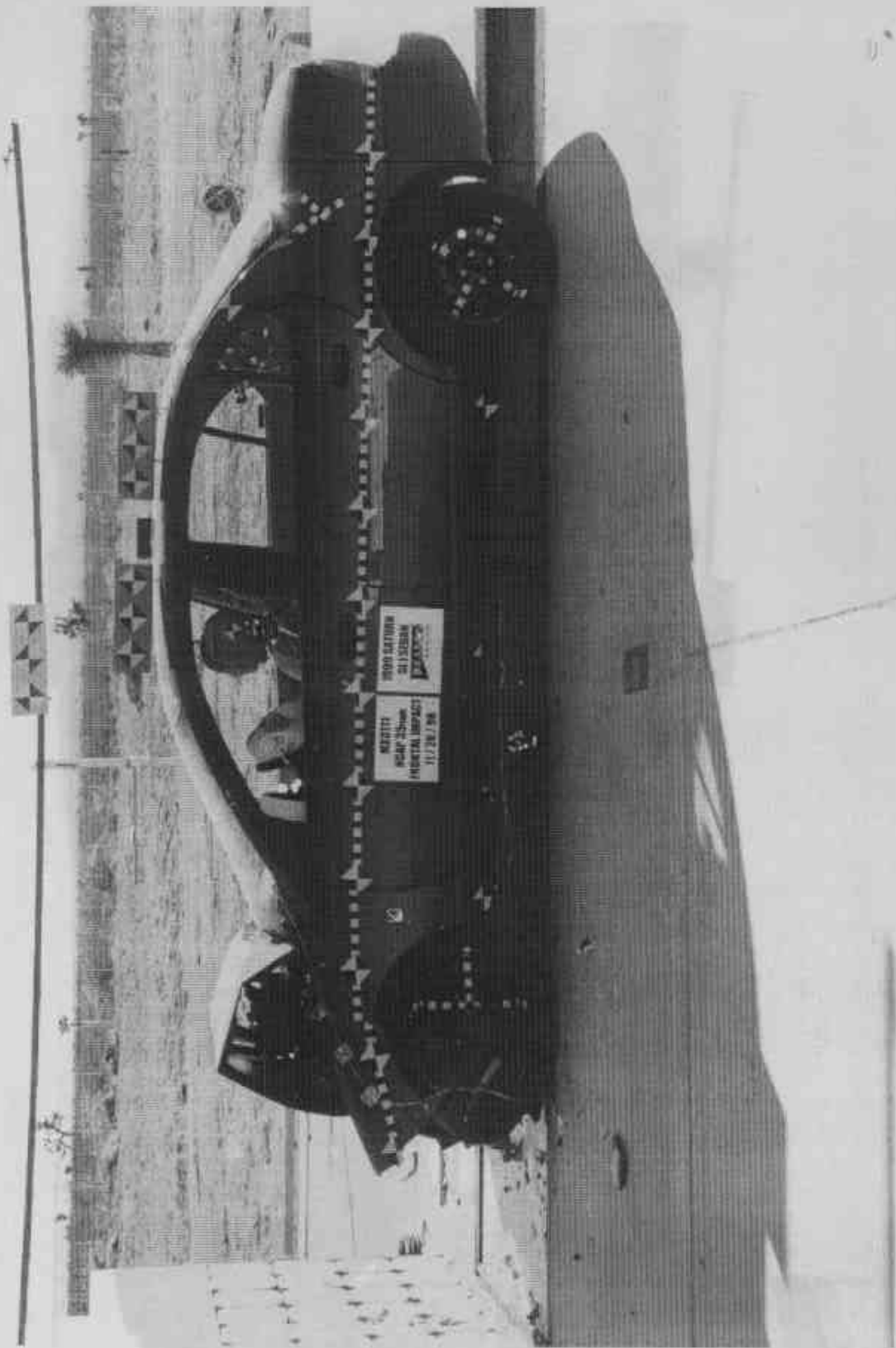


FIGURE A-8. POST TEST LEFT SIDE VIEW

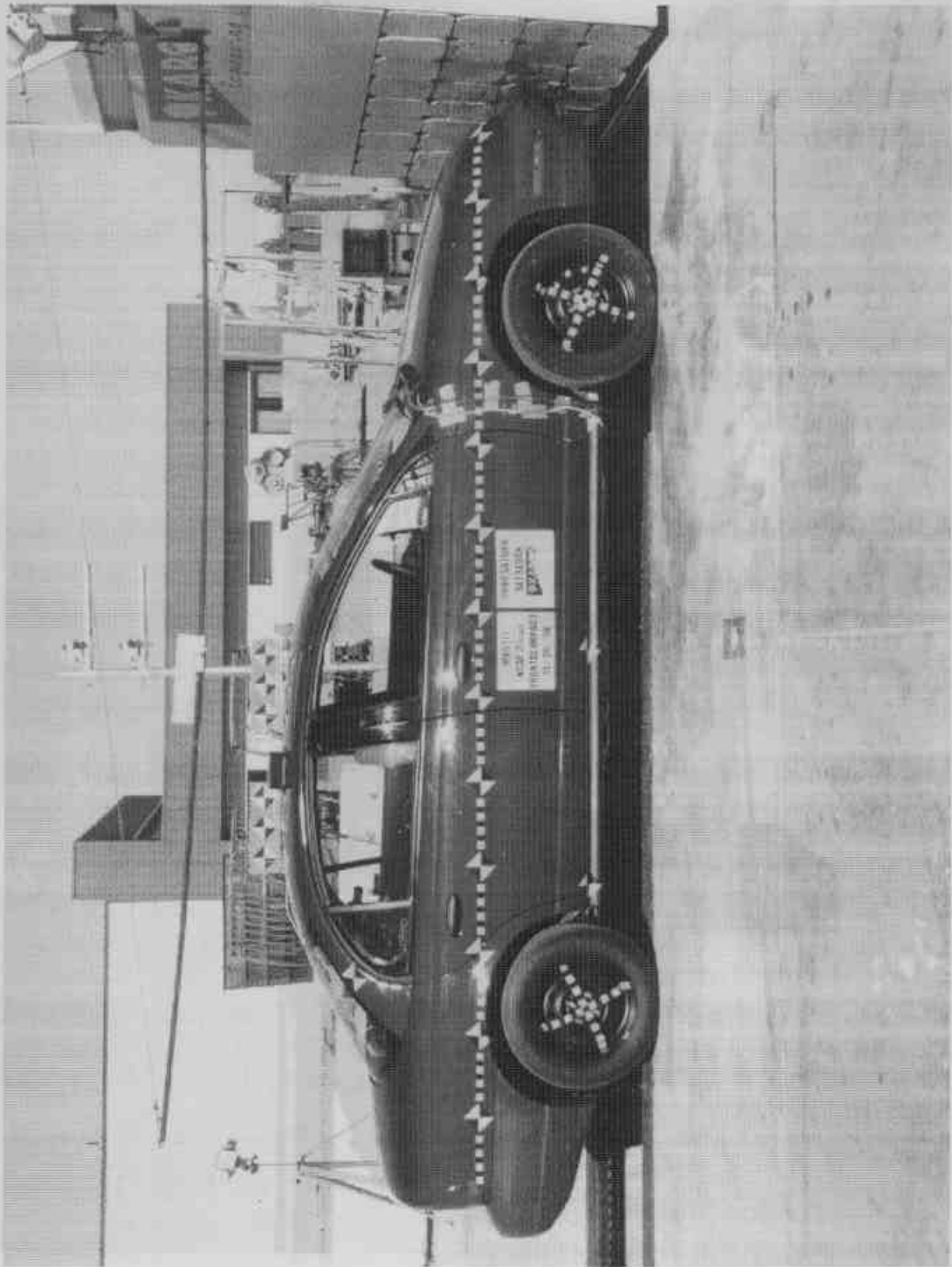


FIGURE A-9. PRETEST RIGHT SIDE VIEW



FIGURE A-10. POST TEST RIGHT SIDE VIEW

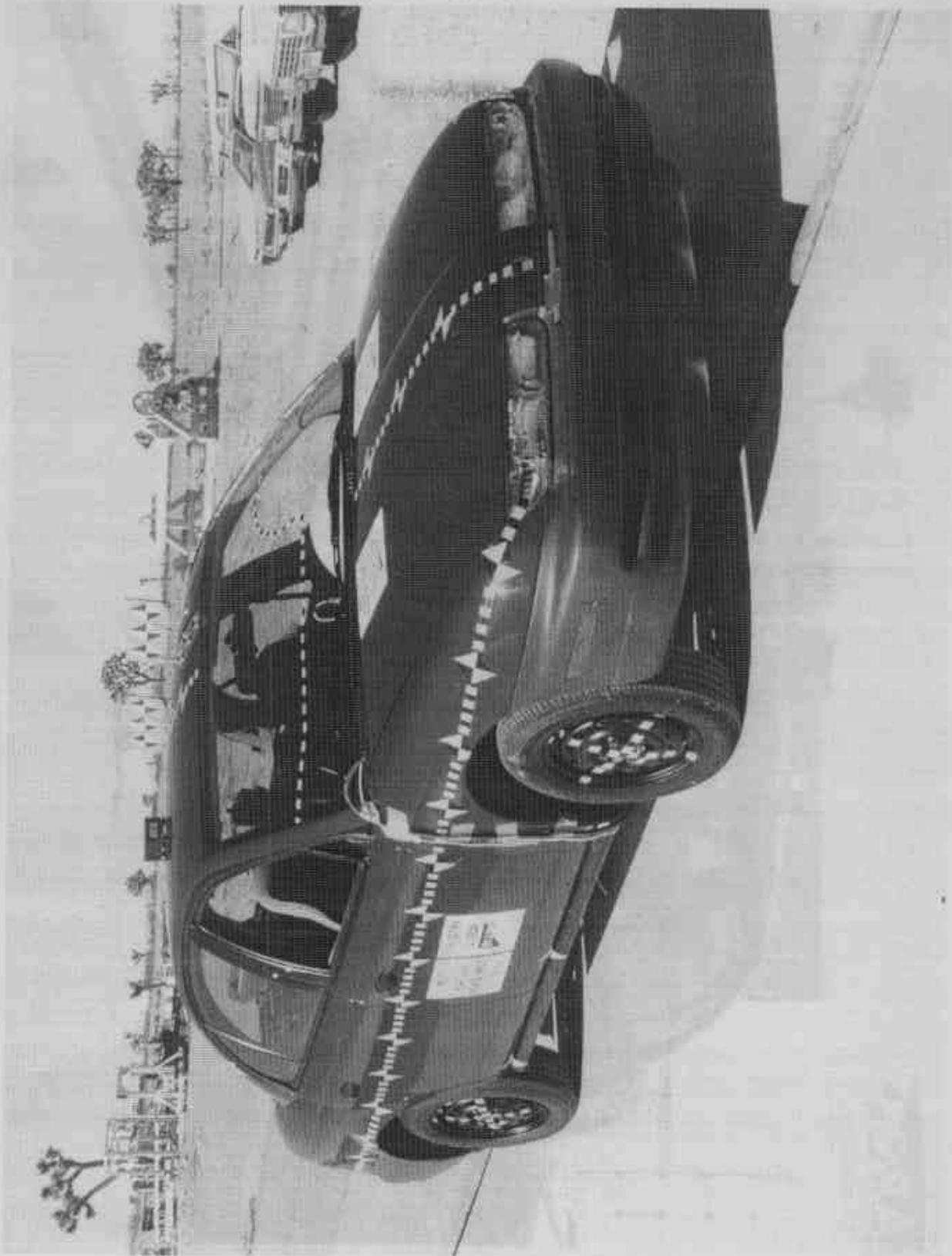


FIGURE A-11. PRETEST RIGHT FRONT VIEW

A-11

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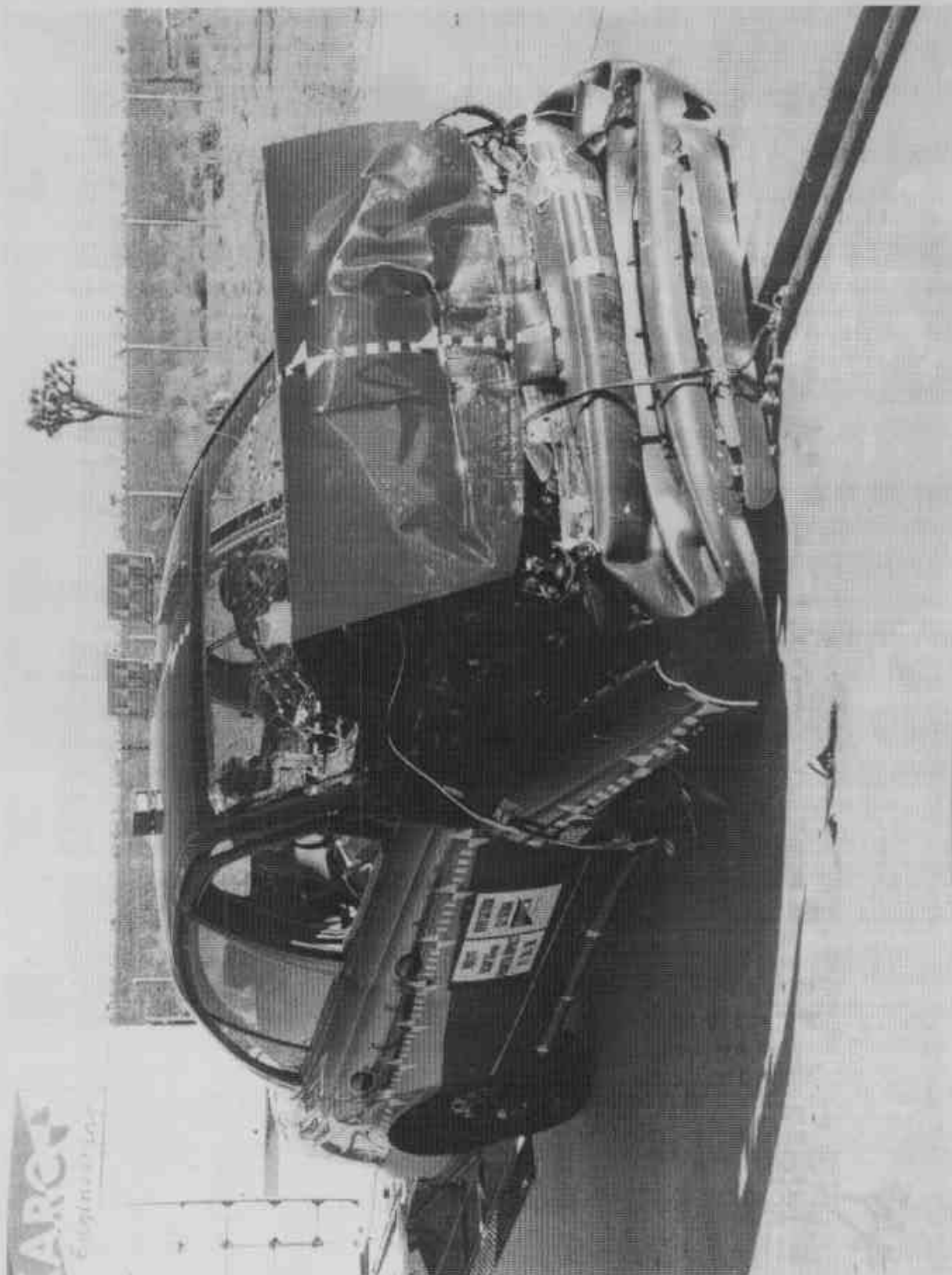


FIGURE A-12. POST TEST RIGHT FRONT VIEW

A-12

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FIGURE A-13. PRETEST LEFT REAR VIEW

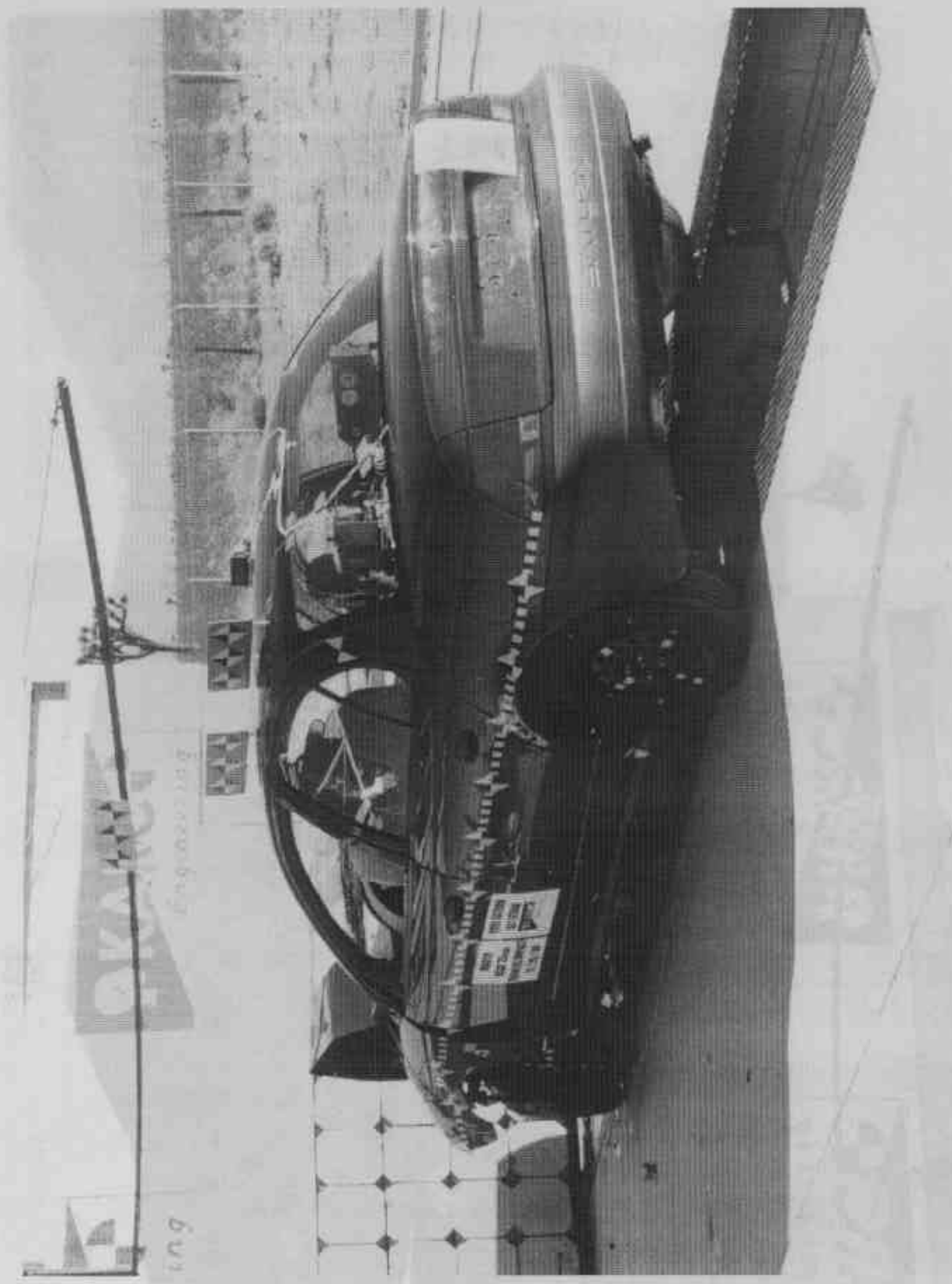


FIGURE A-14. POST TEST LEFT REAR VIEW

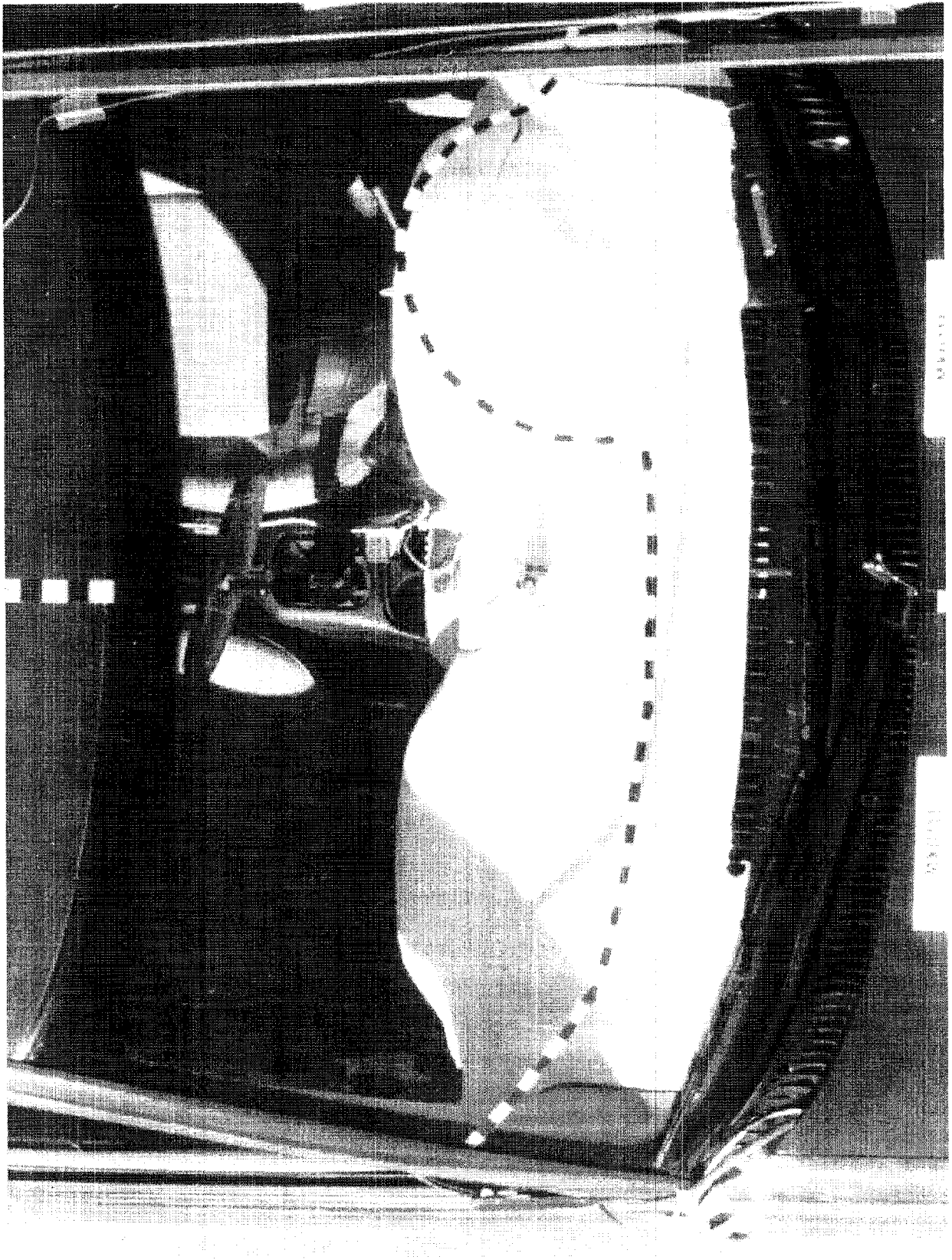


FIGURE A-15. PRETEST WINDSHIELD

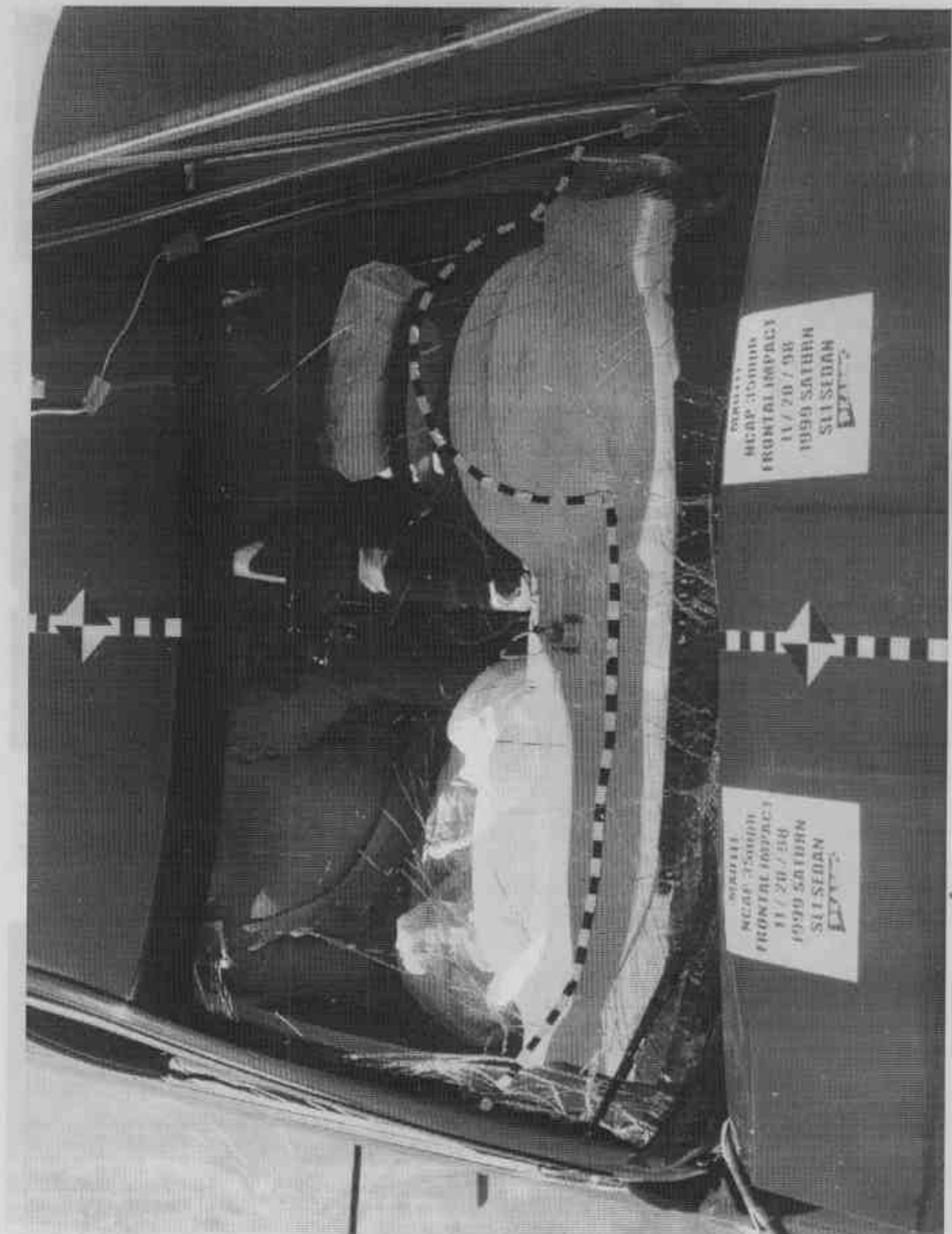


FIGURE A-16. POST TEST WINDSHIELD

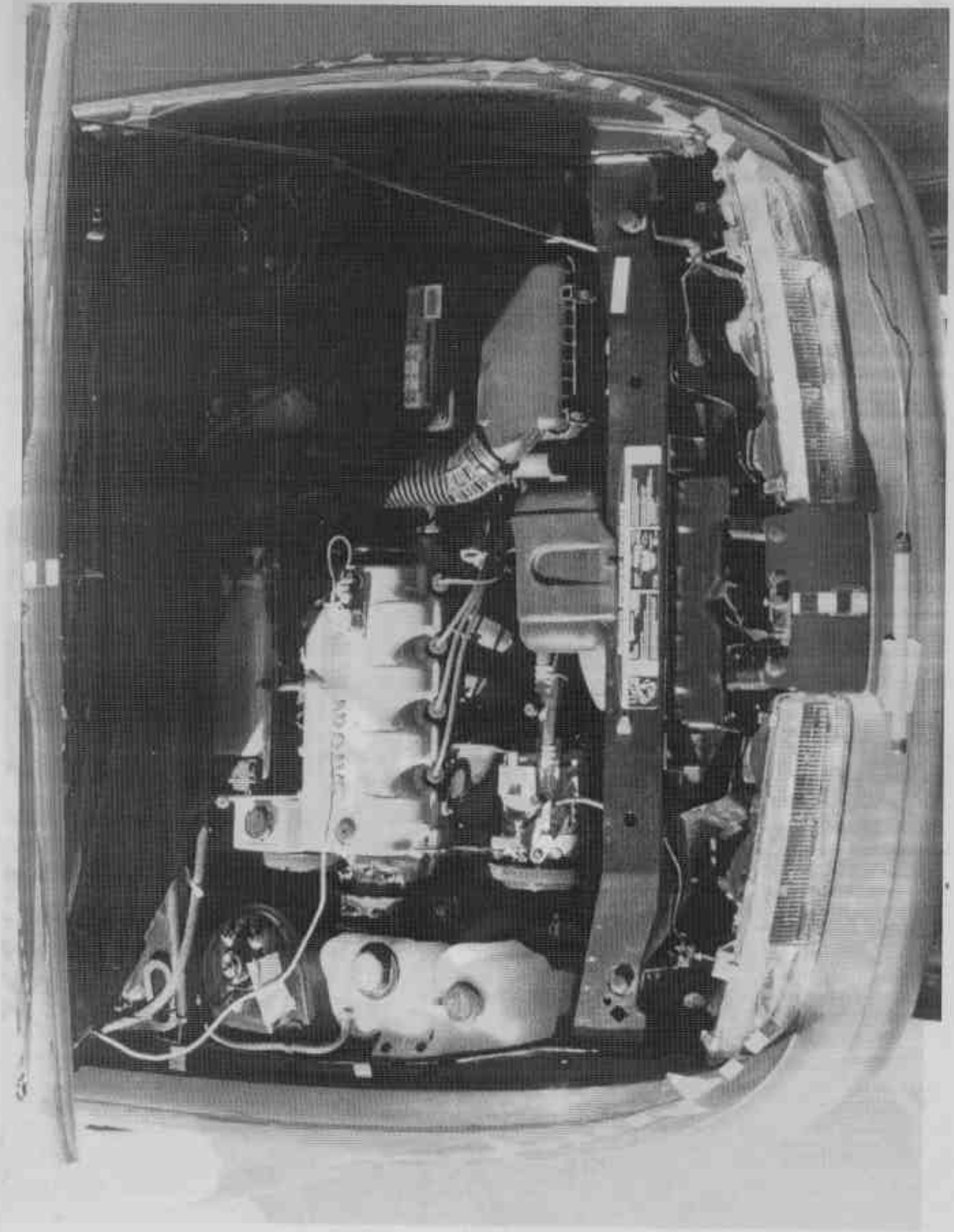


FIGURE A-17. PRETEST ENGINE COMPARTMENT

A-17

P99001-2

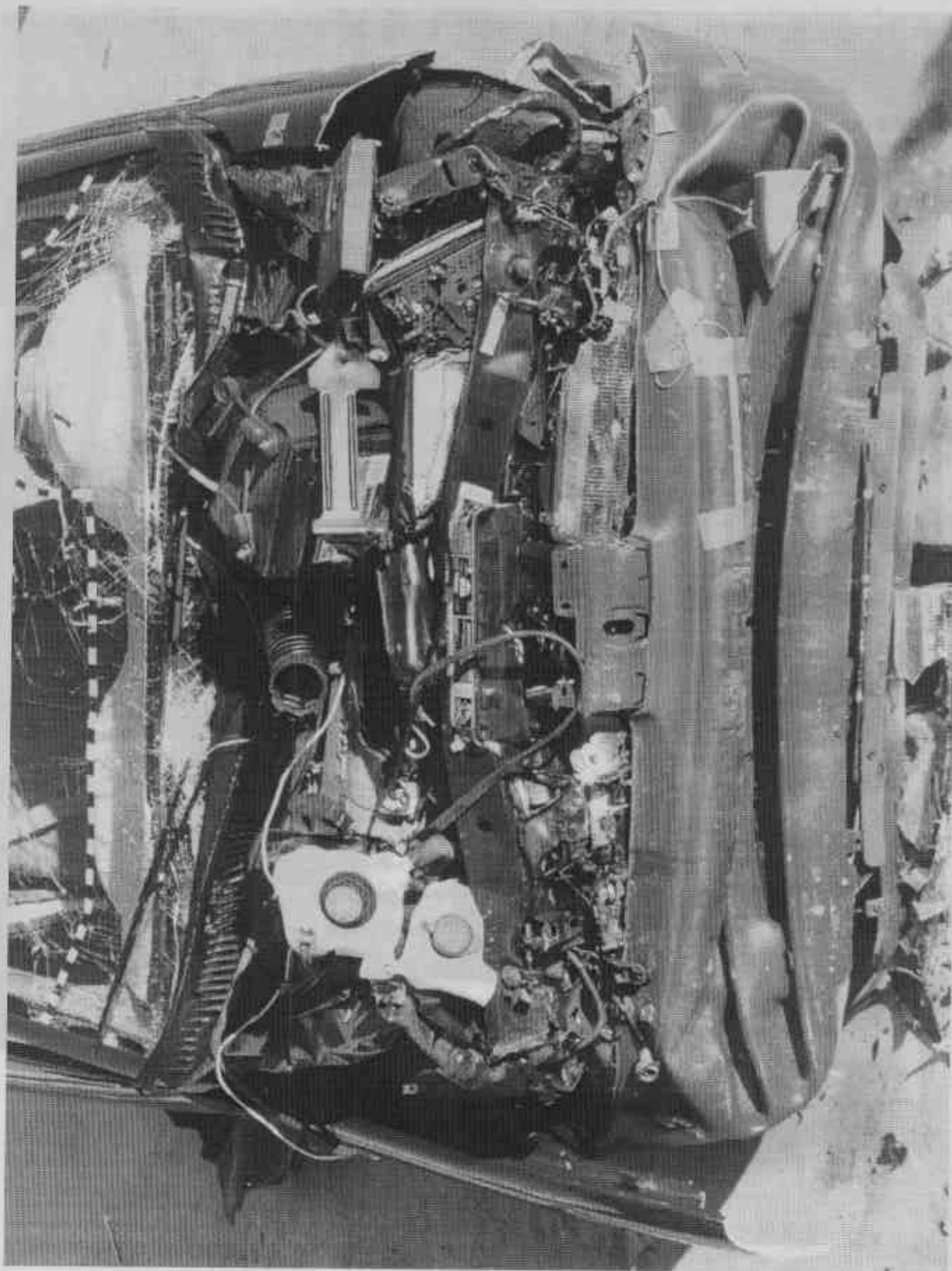


FIGURE A-18. POST TEST ENGINE COMPARTMENT

A-18

P99001-2

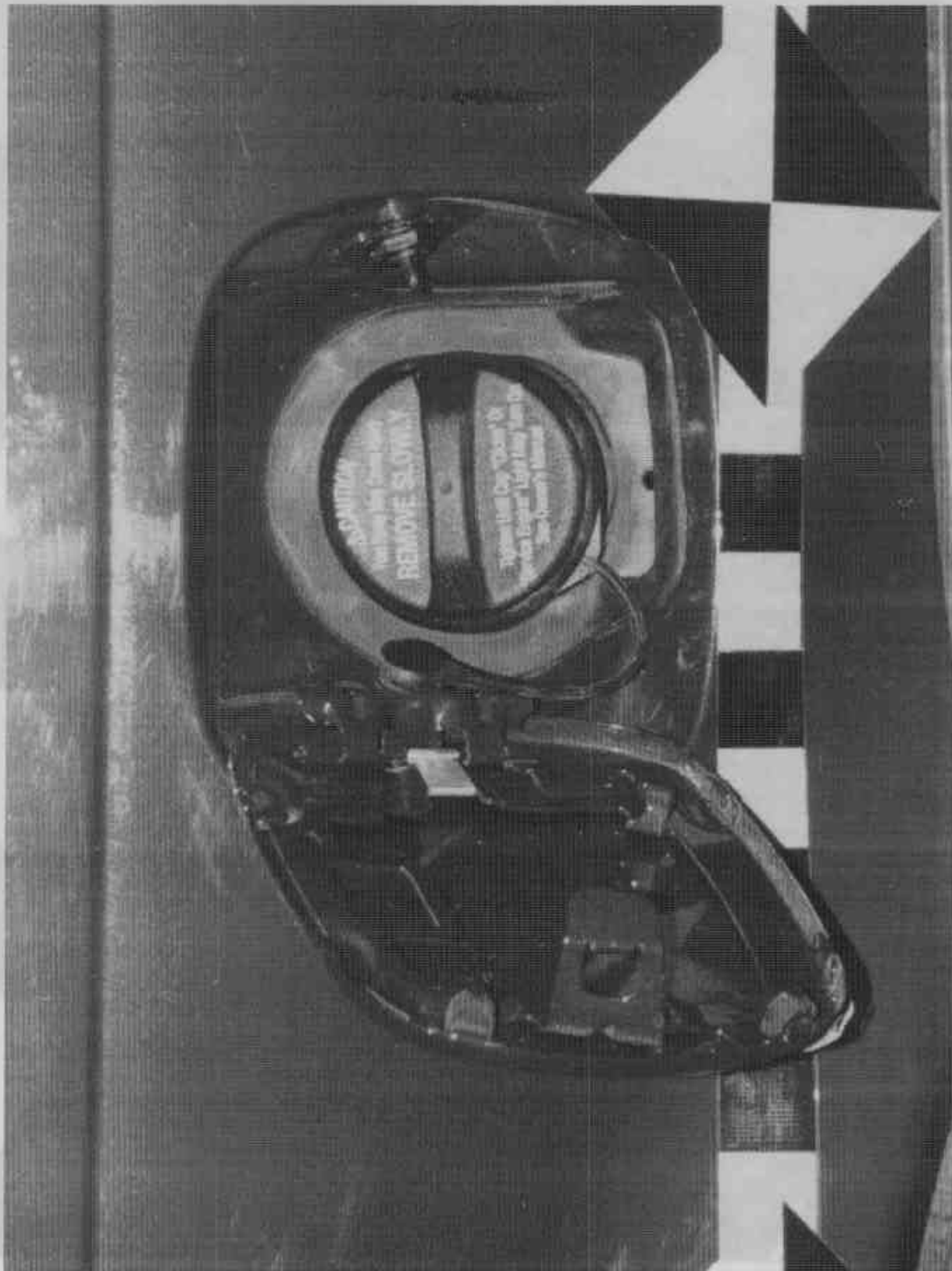


FIGURE A-19. PRETEST FUEL CAP



FIGURE A-20. POST TEST FUEL CAP

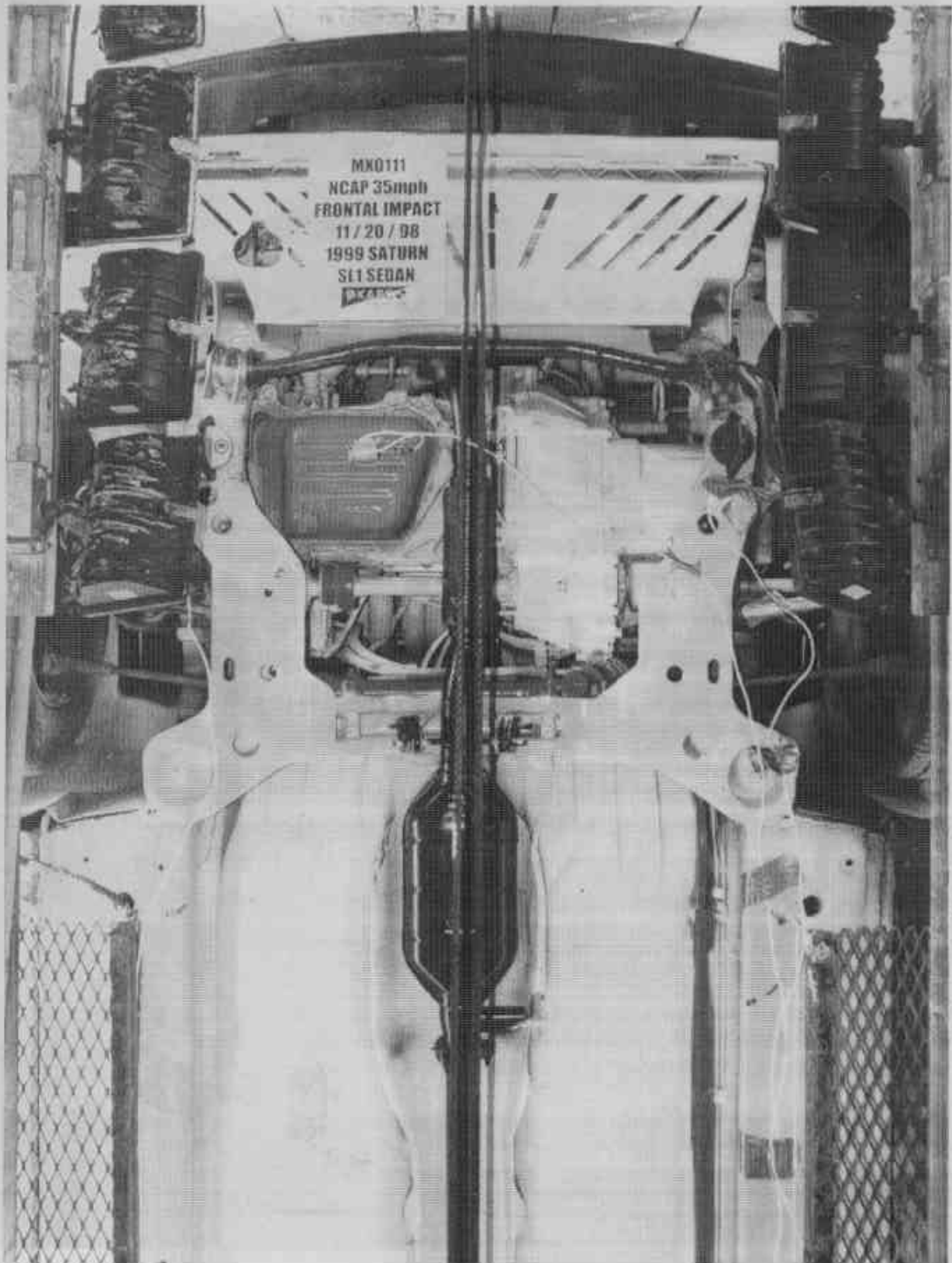


FIGURE A-21. PRETEST FRONT UNDERSIDE

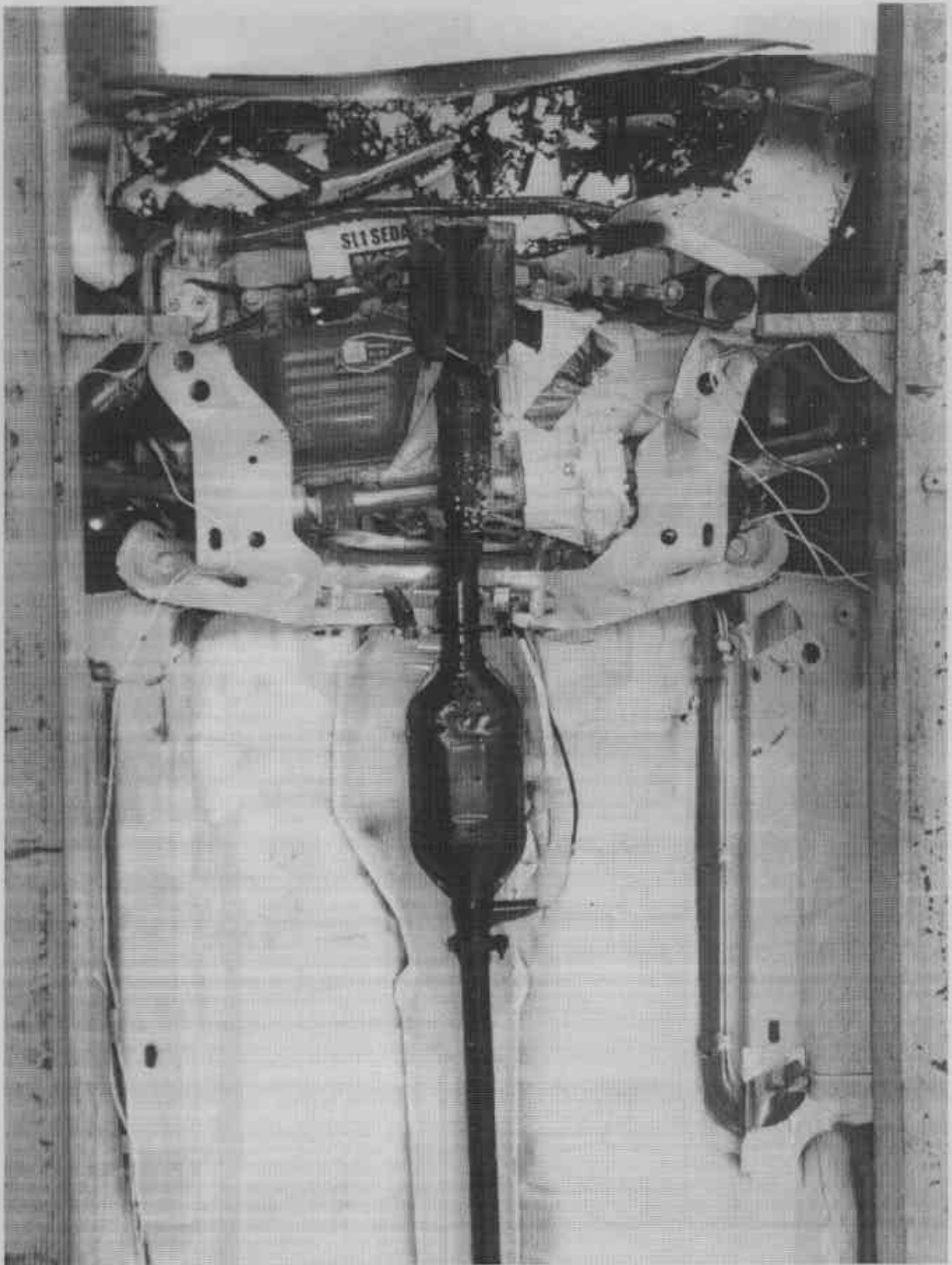


FIGURE A-22. POST TEST FRONT UNDERSIDE

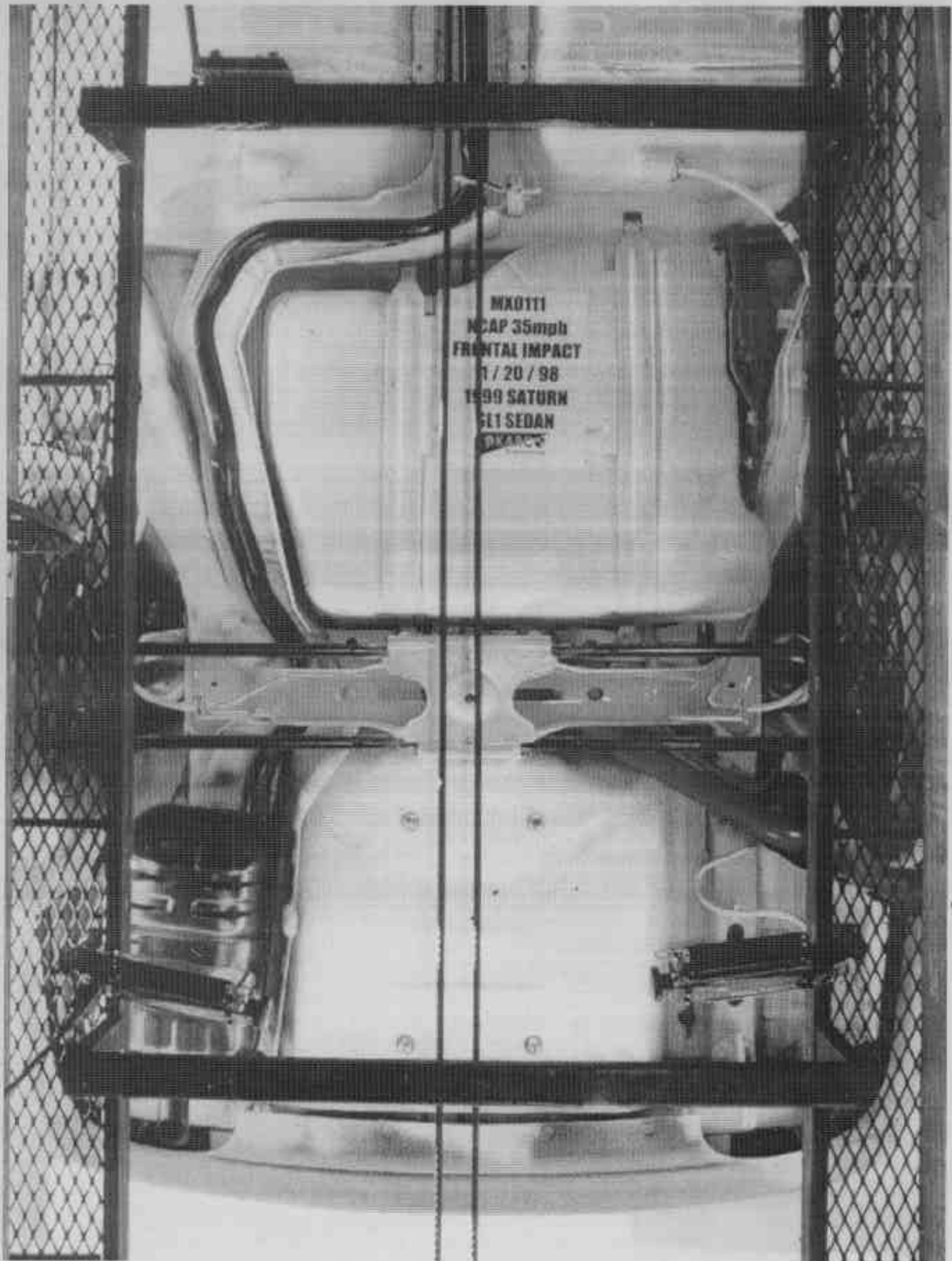


FIGURE A-23. PRETEST REAR UNDERSIDE

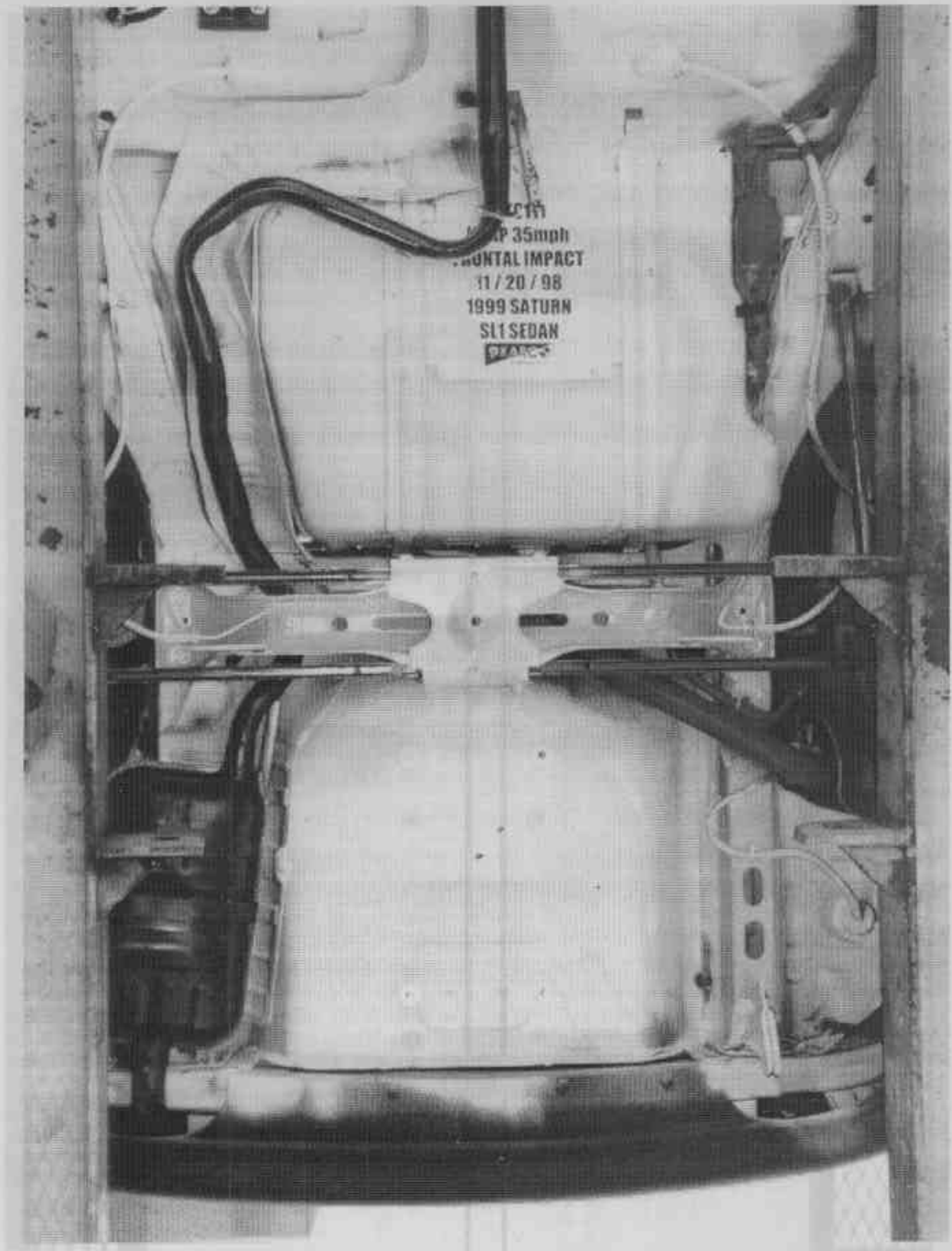


FIGURE A-24. POST TEST REAR UNDERSIDE

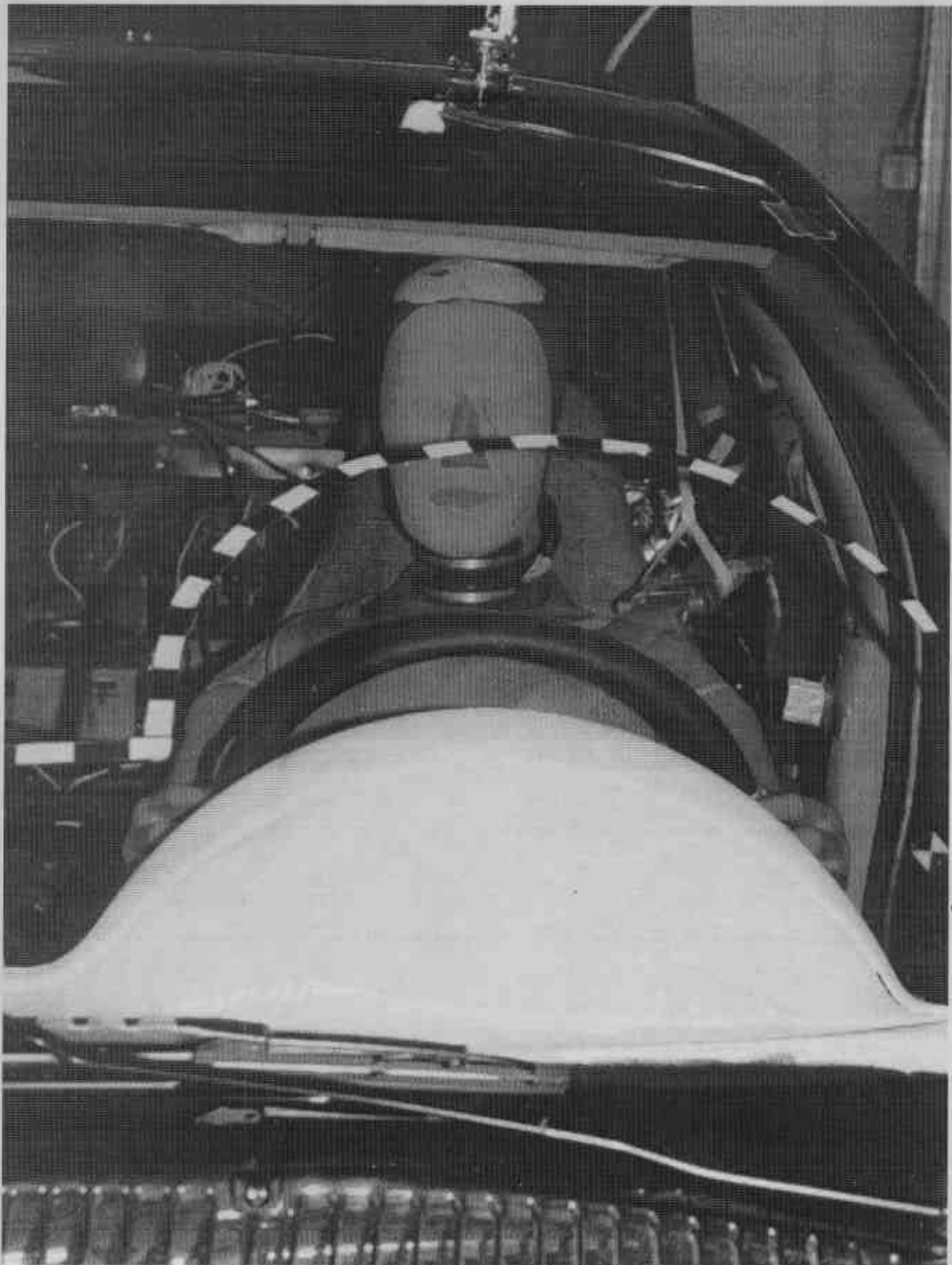


FIGURE A-25. PRETEST DRIVER DUMMY (FRONT VIEW)



FIGURE A-26. POST TEST DRIVER DUMMY (FRONT VIEW)

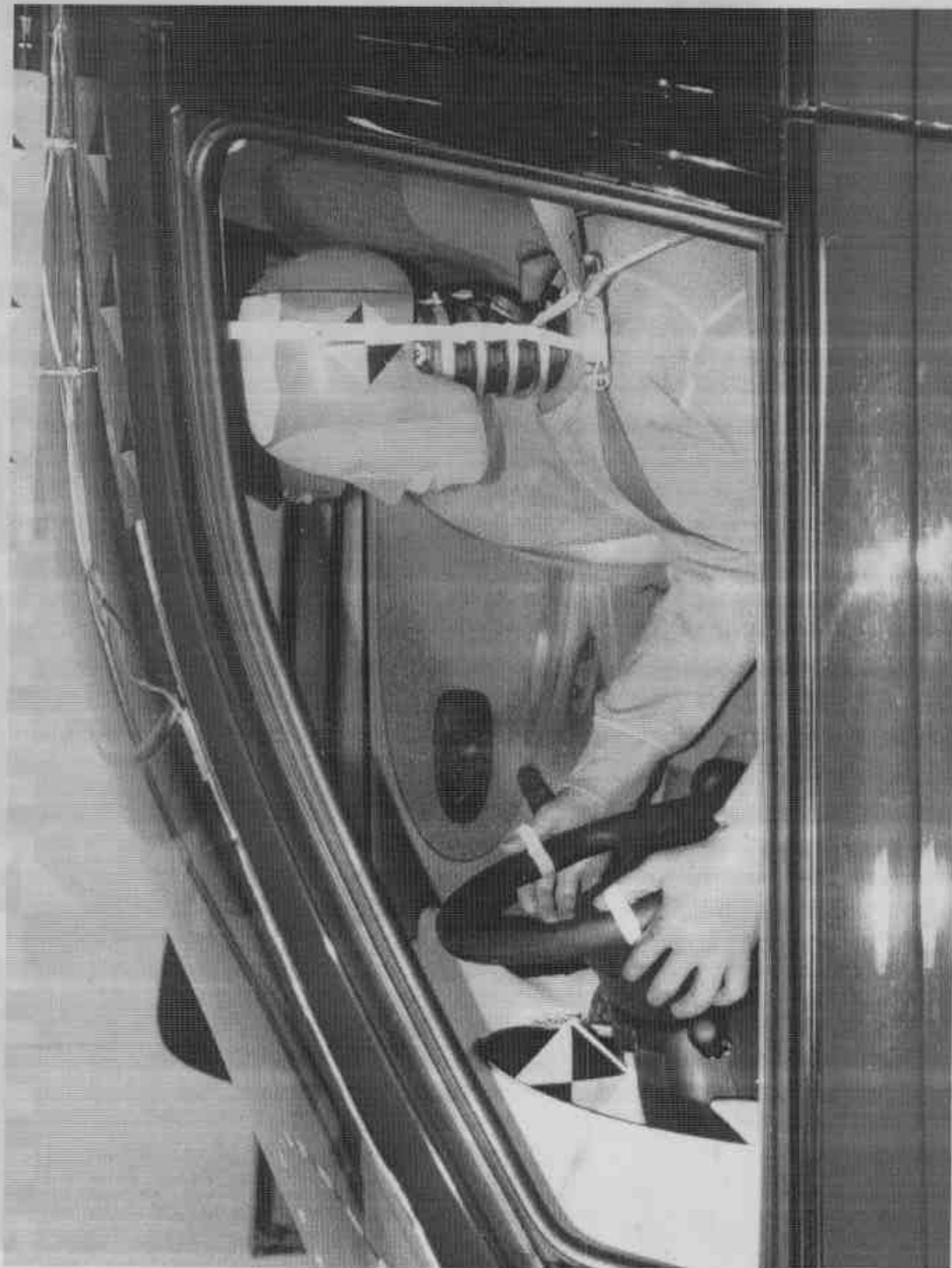


FIGURE A-27. PRETEST DRIVER DUMMY (THRU WINDOW)



FIGURE A-28. POST TEST DRIVER DUMMY (THRU WINDOW)



FIGURE A-29. PRETEST DRIVER DUMMY (DOOR OPEN)



FIGURE A-30. POST TEST DRIVER DUMMY (DOOR OPEN)



FIGURE A-31. PRETEST DRIVER DUMMY (90° TO VEHICLE)



FIGURE A-32. POST TEST DRIVER DUMMY (90° TO VEHICLE)



FIGURE A-33. PRETEST DRIVER DUMMY FEET

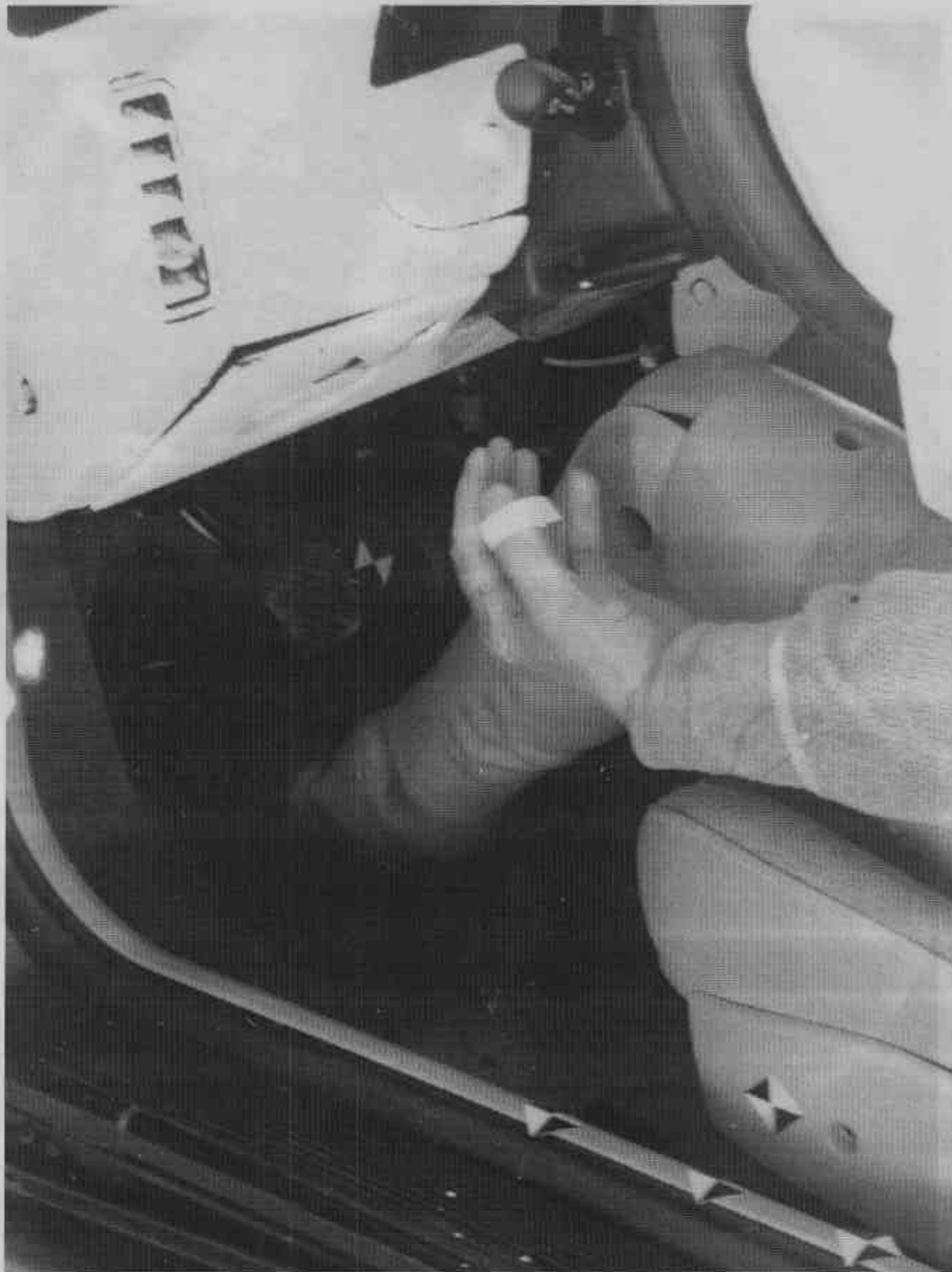


FIGURE A-34. POST TEST DRIVER DUMMY FEET AND KNEE CONTACT



FIGURE A-35. PRE TEST DRIVER KNEE BOLSTER

A-35

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FIGURE A-36. POST TEST DRIVER KNEE BOLSTER

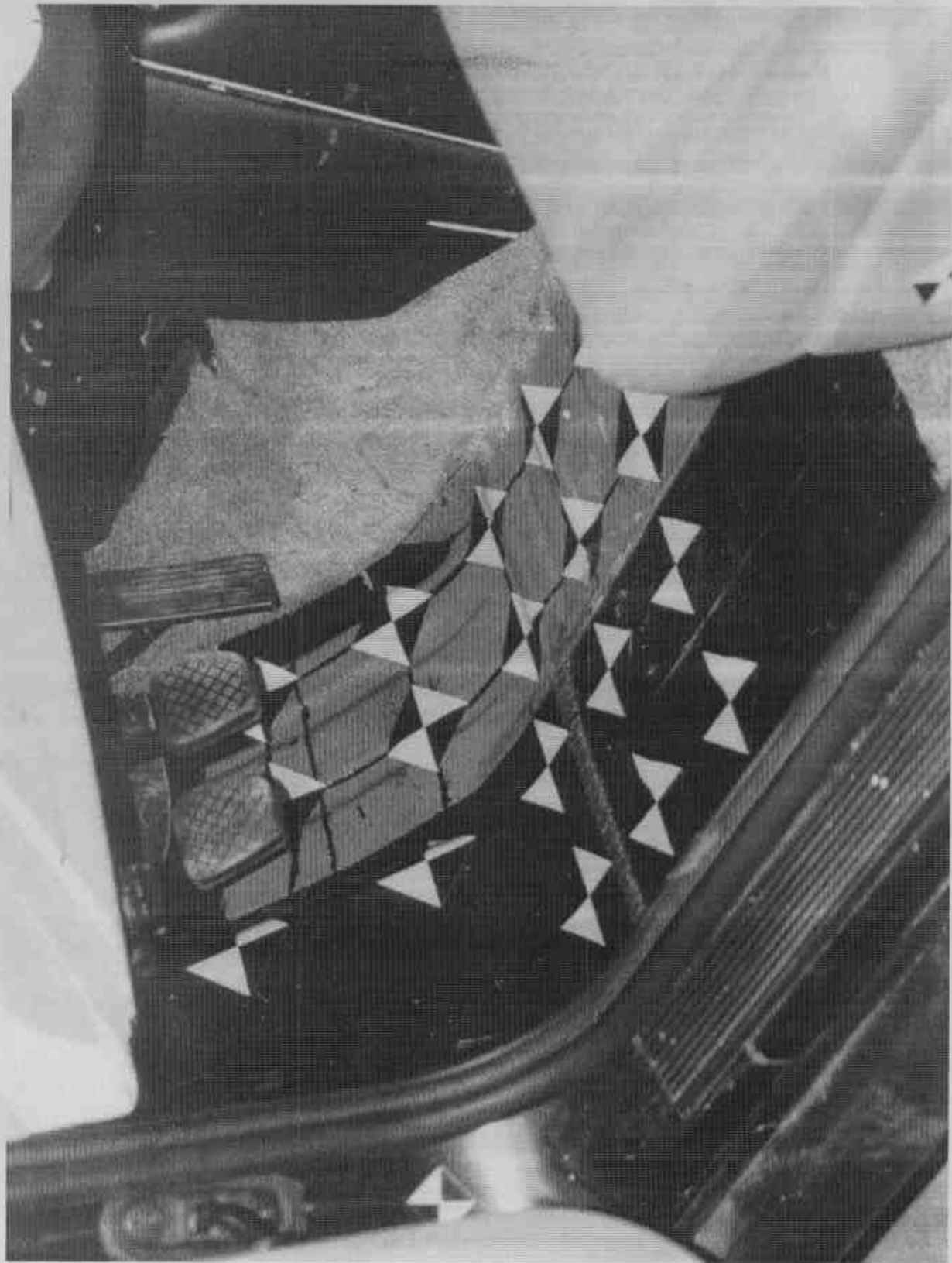


FIGURE A-37. PRE TEST DRIVER SIDE FLOOR PAN

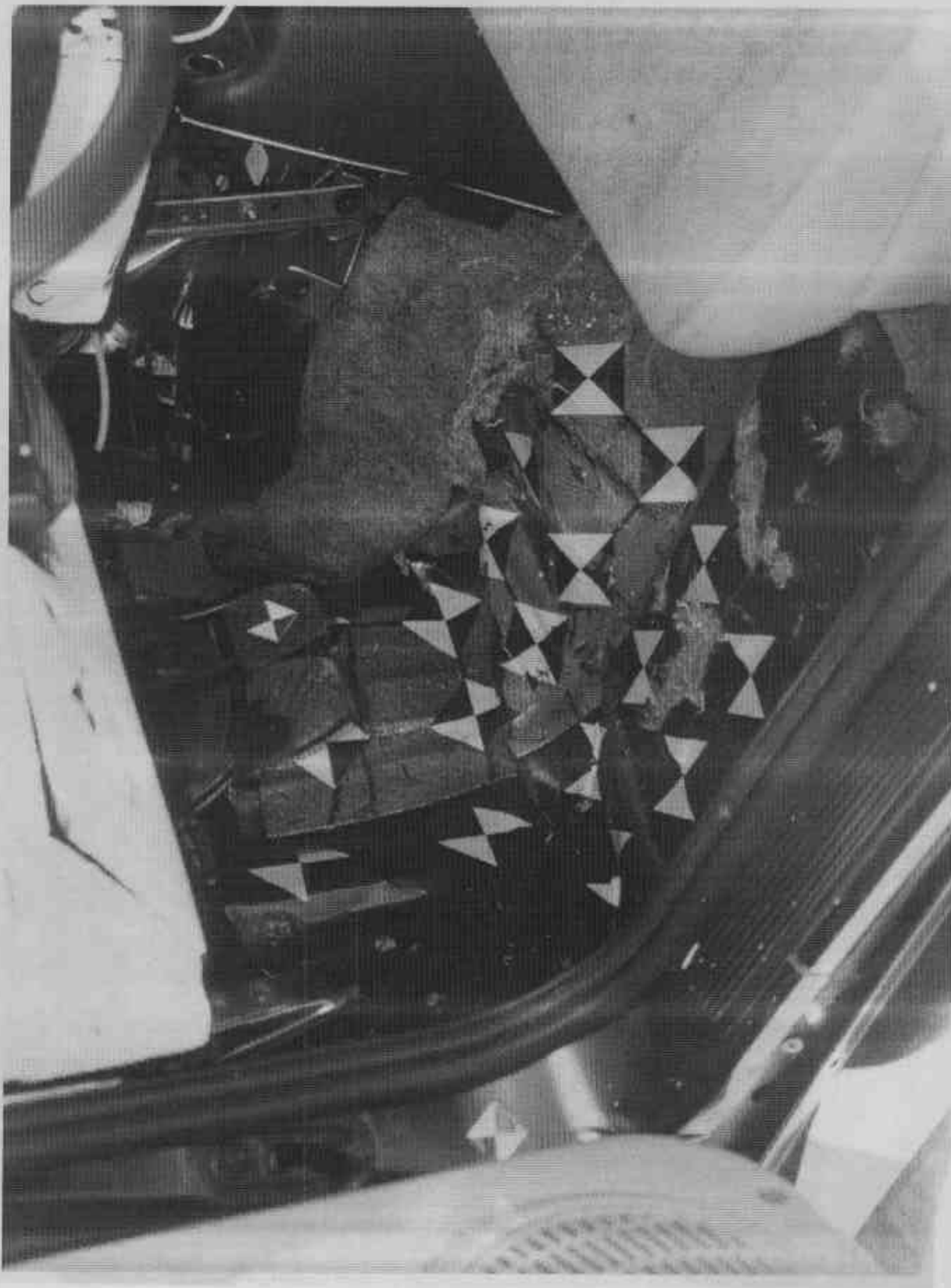


FIGURE A-38. POST TEST DRIVER SIDE FLOOR PAN



FIGURE A-39. POST TEST DRIVER HEAD



FIGURE A-40. POST TEST DRIVER DUMMY CONTACT



FIGURE A-41. PRE TEST PASSENGER DUMMY (FRONT VIEW)



FIGURE A-42. POST TEST PASSENGER DUMMY (FRONT VIEW)

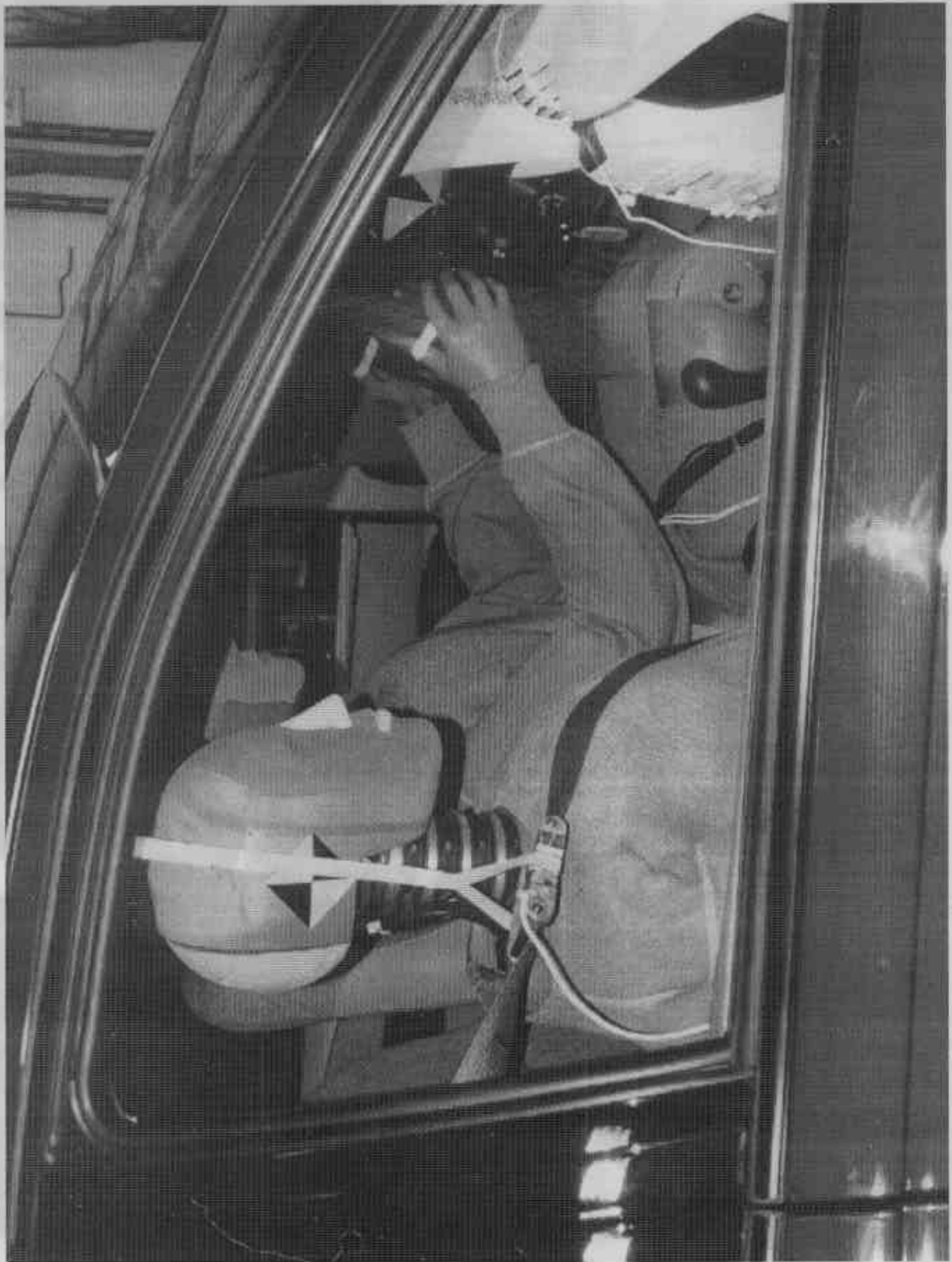


FIGURE A-43. PRE TEST PASSENGER DUMMY (THRU WINDOW)



FIGURE A-44. POST TEST PASSENGER DUMMY (THRU WINDOW)



FIGURE A-45. PRE TEST PASSENGER DUMMY (DOOR OPEN)



FIGURE A-46. POST TEST PASSENGER DUMMY (DOOR OPEN)



FIGURE A-47. PRE TEST PASSENGER DUMMY (90° TO VEHICLE)



FIGURE A-48. POST TEST PASSENGER DUMMY (90° TO VEHICLE)



FIGURE A-49. PRE TEST PASSENGER DUMMY FEET



FIGURE A-50. POST TEST PASSENGER DUMMY FEET AND CONTACT POINT

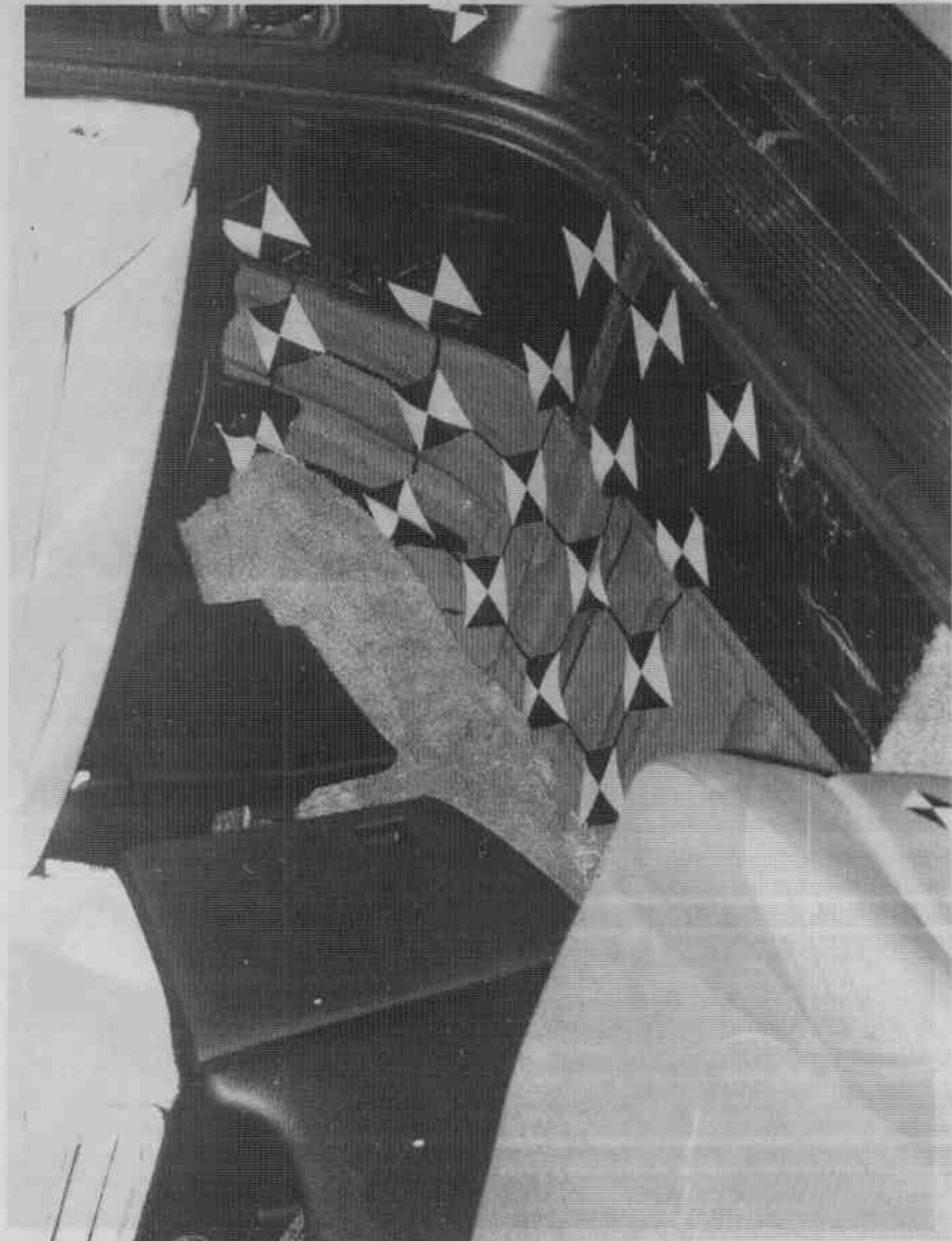


FIGURE A-51. PRETEST PASSENGER SIDE FLOOR PAN



FIGURE A-52. POST TEST PASSENGER SIDE FLOOR PAN

A-52

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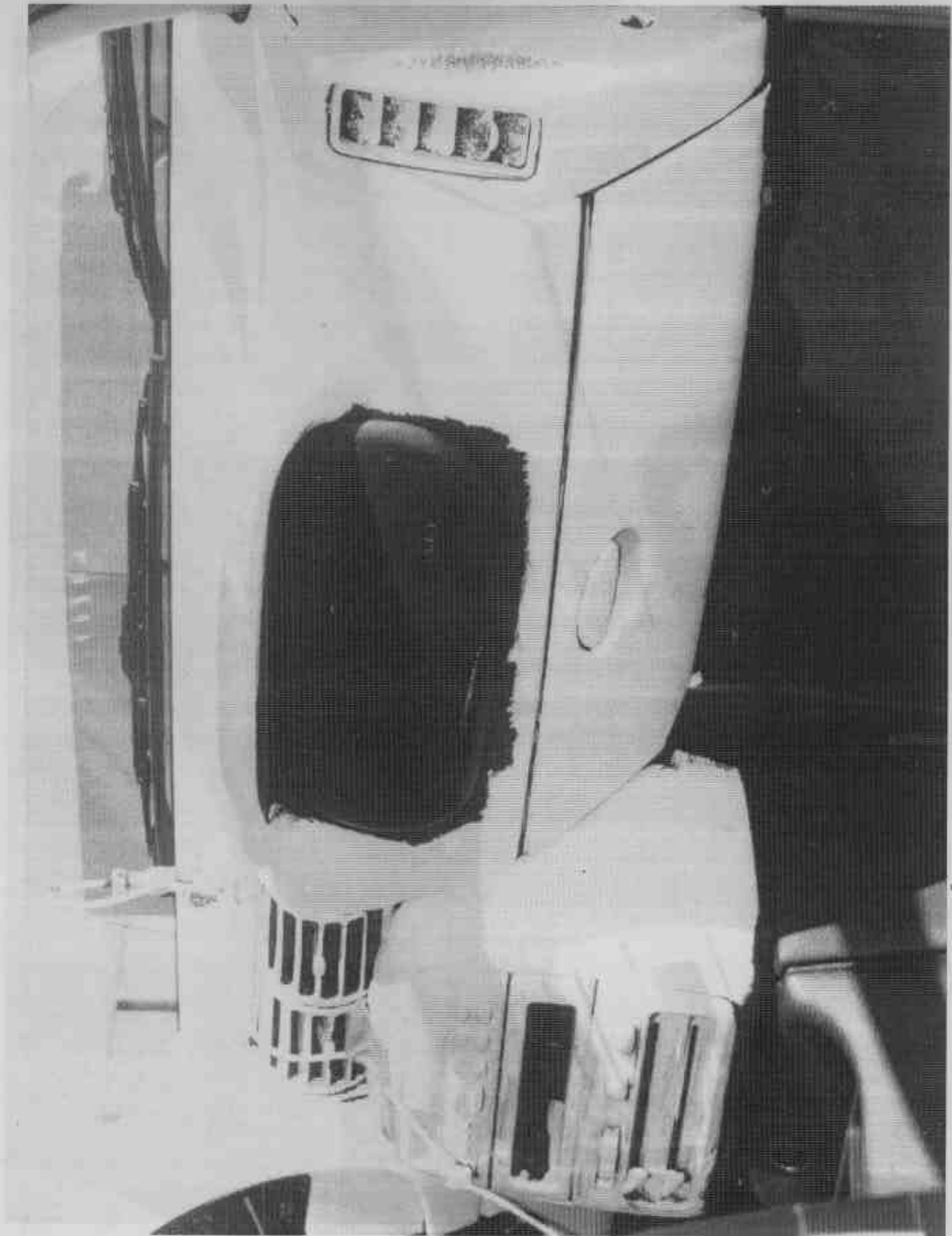


FIGURE A-53. PRE TEST PASSENGER SIDE KNEE BOLSTER



FIGURE A-54. POST TEST PASSENGER SIDE KNEE BOLSTER AND DUMMY CONTACT

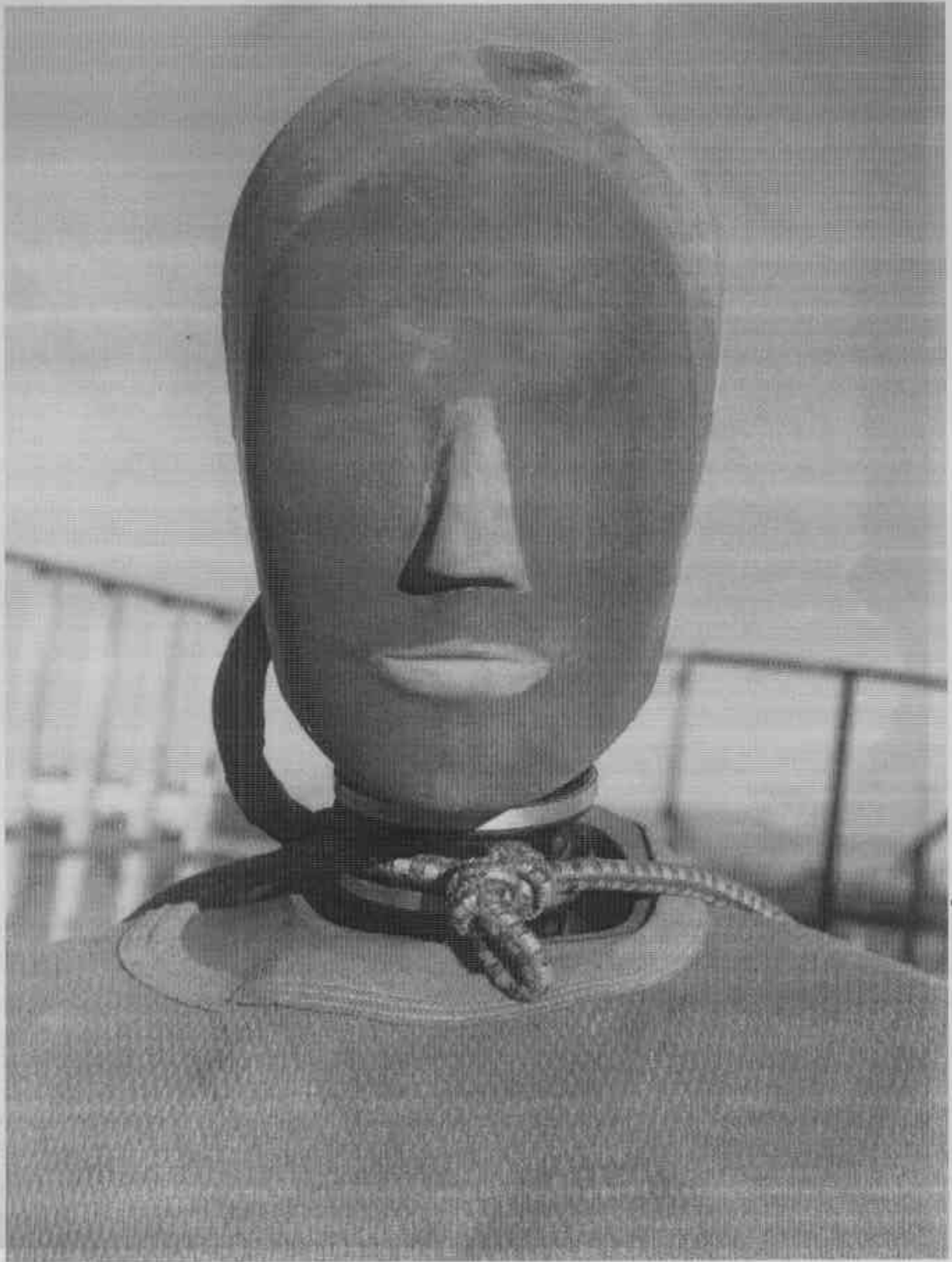


FIGURE A-55. POST TEST PASSENGER HEAD

A-55

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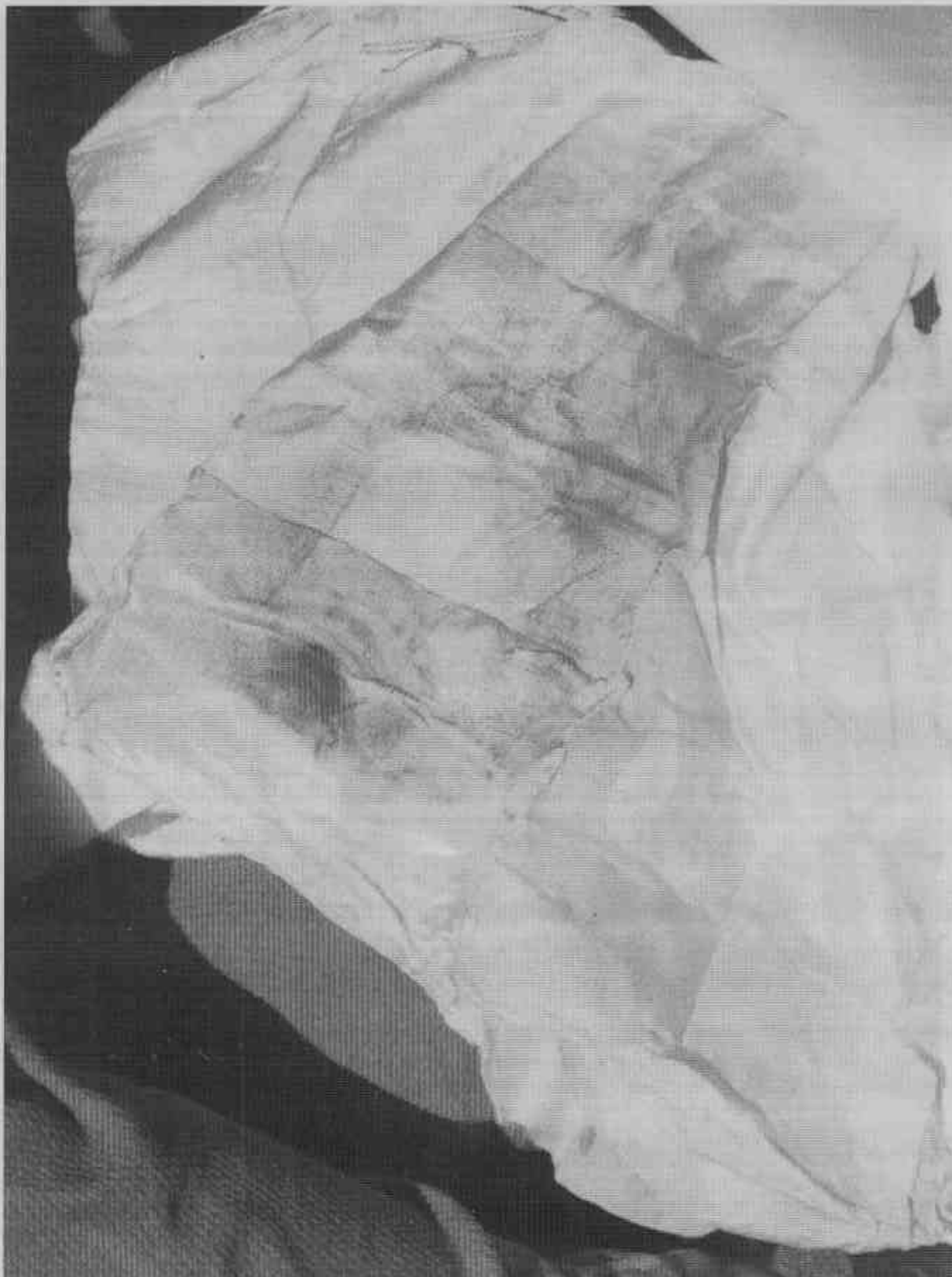


FIGURE A-56. POST TEST PASSENGER DUMMY CONTACT

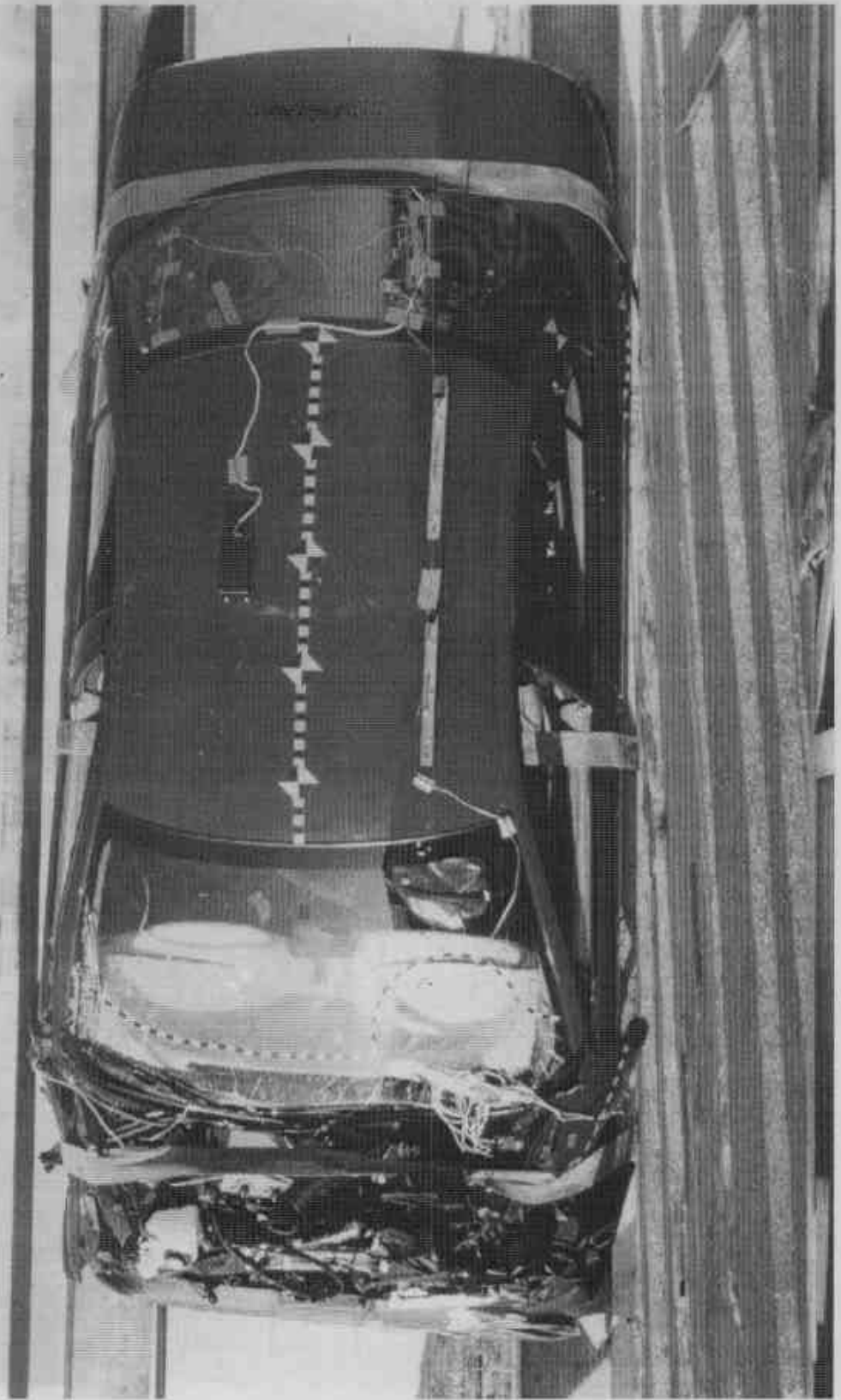


FIGURE A-57. VEHICLE ON ROLLOVER

A-57

P99001-2

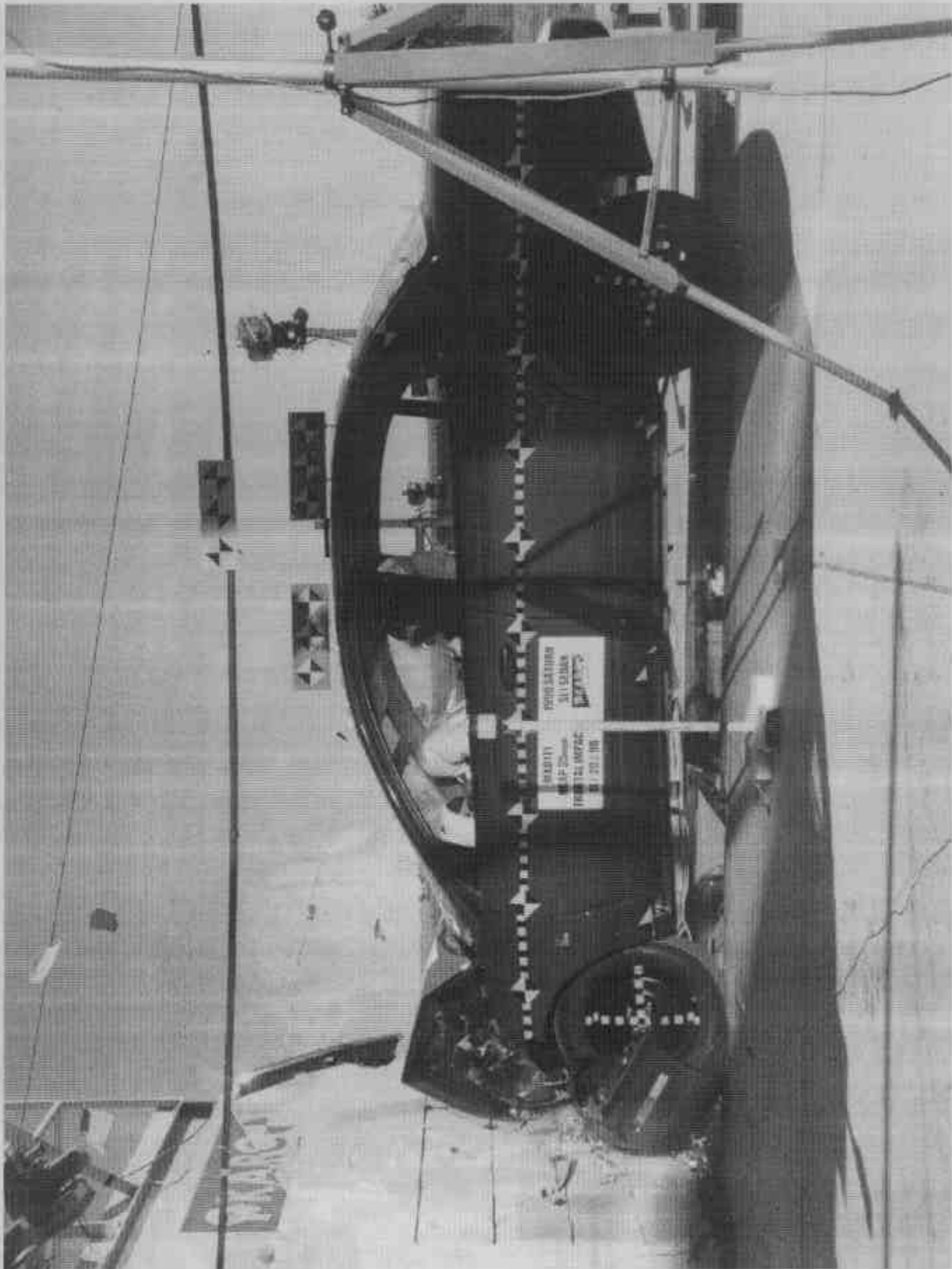


FIGURE A-58. VEHICLE DURING IMPACT

A-58

P99001-2

APPENDIX B
DUMMY AND VEHICLE RESPONSE DATA TRACES

LIST O LIST OF DATA PLOTS

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B-2	Driver Head Primary X Velocity	B-2
B-3	Driver Head Primary X Displacement	B-3
B-4	Driver Head Primary Y	B-4
B-5	Driver Head Primary Z	B-5
B-6	Driver Head Resultant Primary	B-6
B-7	Driver Head Redundant X	B-7
B-8	Driver Head Redundant X Velocity	B-8
B-9	Driver Head Redundant X Displacement	B-9
B-10	Driver Head Redundant Y	B-10
B-11	Driver Head Redundant Z	B-11
B-12	Driver Head Resultant Redundant	B-12
B-13	Driver Neck Force X	B-13
B-14	Driver Neck Force Y	B-14
B-15	Driver Neck Force Z	B-15
B-16	Driver Neck Force Resultant	B-16
B-17	Driver Neck Moment X	B-17
B-18	Driver Neck Moment Y	B-18
B-19	Driver Neck Moment Z	B-19
B-20	Driver Neck Moment Resultant	B-20
B-21	Driver Chest Primary X	B-21
B-22	Driver Chest Primary X Velocity	B-22
B-23	Driver Chest Primary X Displacement	B-23
B-24	Driver Chest Primary Y	B-24
B-25	Driver Chest Primary Z	B-25
B-26	Driver Chest Primary Resultant	B-26
B-27	Driver Chest Redundant X	B-27
B-28	Driver Chest Redundant X Velocity	B-28
B-29	Driver Chest Redundant X Displacement	B-29
B-30	Driver Chest Redundant Y	B-30
B-31	Driver Chest Redundant Z	B-31
B-32	Driver Chest Redundant Resultant	B-32
B-33	Driver Chest Displacement X	B-33
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LIST OF DATA PLOTS...(Continued)

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B-37	Driver Pelvis Y	B-37
B-38	Driver Pelvis Z	B-38
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B-40	Driver Left Femur Force	B-40
B-41	Driver Right Femur Force	B-41
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B-43	Driver Left Upper Tibia Moment Y	B-43
B-44	Driver Right Upper Tibia Moment X	B-44
B-45	Driver Right Upper Tibia Moment Y	B-45
B-46	Driver Left Lower Tibia Moment X	B-46
B-47	Driver Left Lower Tibia Moment Y	B-47
B-48	Driver Left Lower Tibia Force Z	B-48
B-49	Driver Right Lower Tibia Moment X	B-49
B-50	Driver Right Lower Tibia Moment Y	B-50
B-51	Driver Right Lower Tibia Force Z	B-51
B-52	Driver Left Foot Aft X	B-52
B-53	Driver Left Foot Aft Z	B-53
B-54	Driver Left Foot Fore Z	B-54
B-55	Driver Right Foot Aft X	B-55
B-56	Driver Right Foot Aft Z	B-56
B-57	Driver Right Foot Fore Z	B-57
B-58	Driver Lap Belt Force	B-58
B-59	Driver Shoulder Belt Force	B-59
B-60	Driver Shoulder Belt Pullout	B-60
B-61	Driver Shoulder Belt Elongation	B-61
B-62	Passenger Head Primary X	B-62
B-63	Passenger Head Primary X Velocity	B-63
B-64	Passenger Head Primary X Displacement	B-64
B-65	Passenger Head Primary Y	B-65
B-66	Passenger Head Primary Z	B-66
B-67	Passenger Head Resultant Primary	B-67
B-68	Passenger Head Redundant X	B-68
B-69	Passenger Head Redundant X Velocity	B-69
B-70	Passenger Head Redundant X Displacement	B-70

LIST OF DATA PLOTS...(Continued)

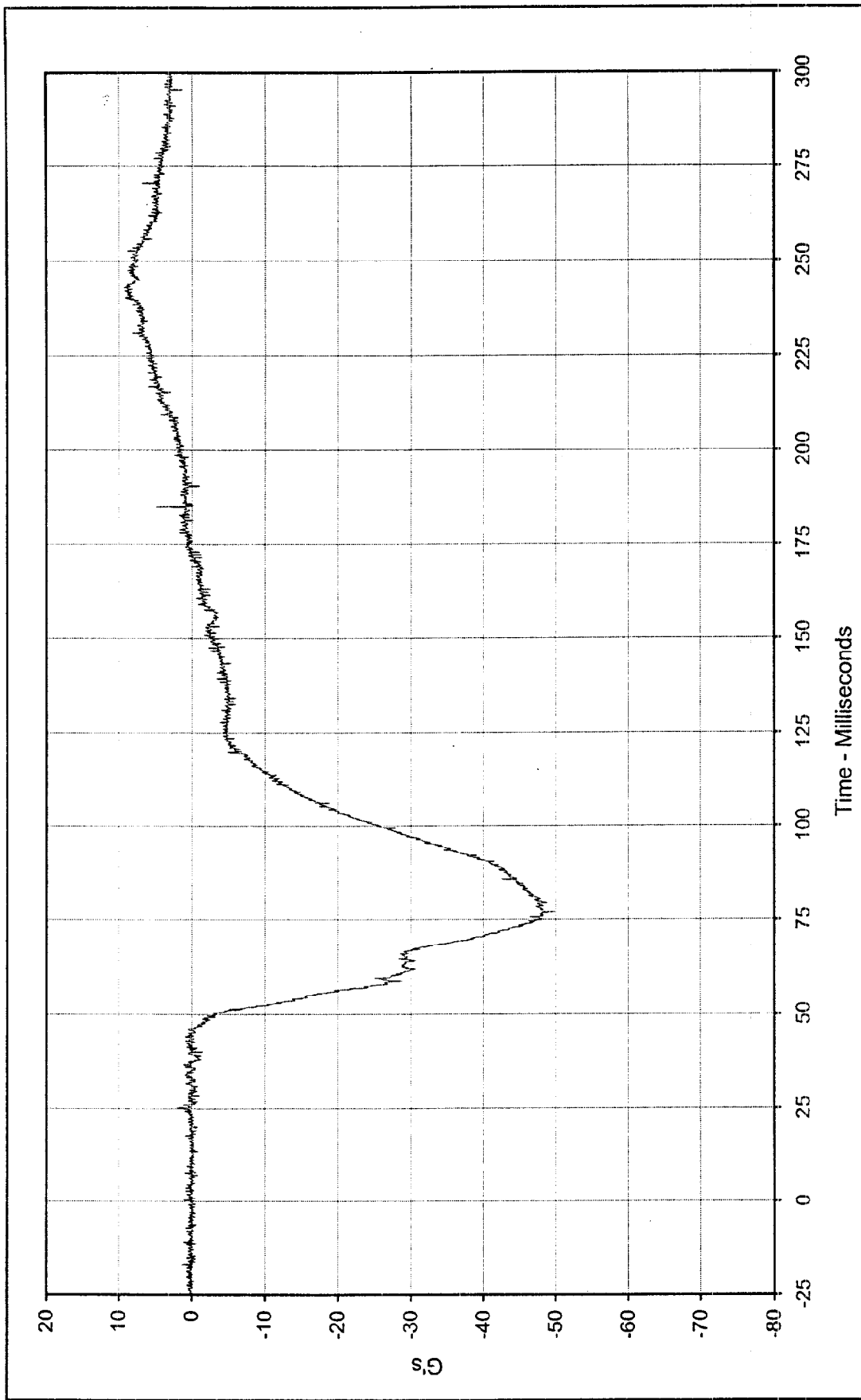
Data Plot		Page
B-71	Passenger Head Redundant Y	B-71
B-72	Passenger Head Redundant Z	B-72
B-73	Passenger Head Resultant Redundant	B-73
B-74	Passenger Neck Force X	B-74
B-75	Passenger Neck Force Y	B-75
B-76	Passenger Neck Force Z	B-76
B-77	Passenger Neck Force Resultant	B-77
B-78	Passenger Neck Moment X	B-78
B-79	Passenger Neck Moment Y	B-79
B-80	Passenger Neck Moment Z	B-80
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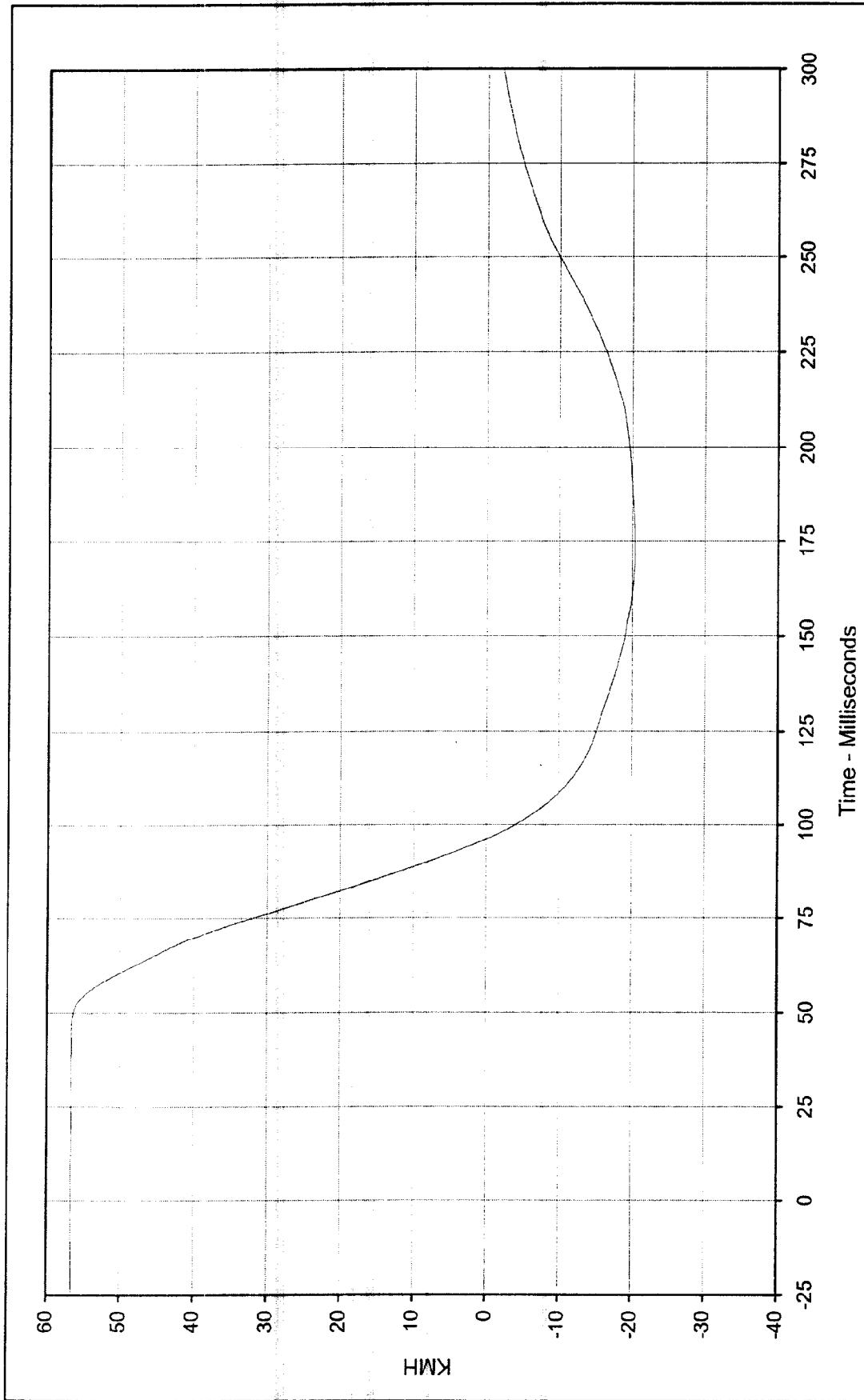
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Curve Description: Driver Head Primary X
 Maximum Value: 9.3 at 240.2 Milliseconds
 Minimum Value: -49.9 at 76.9 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-001

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

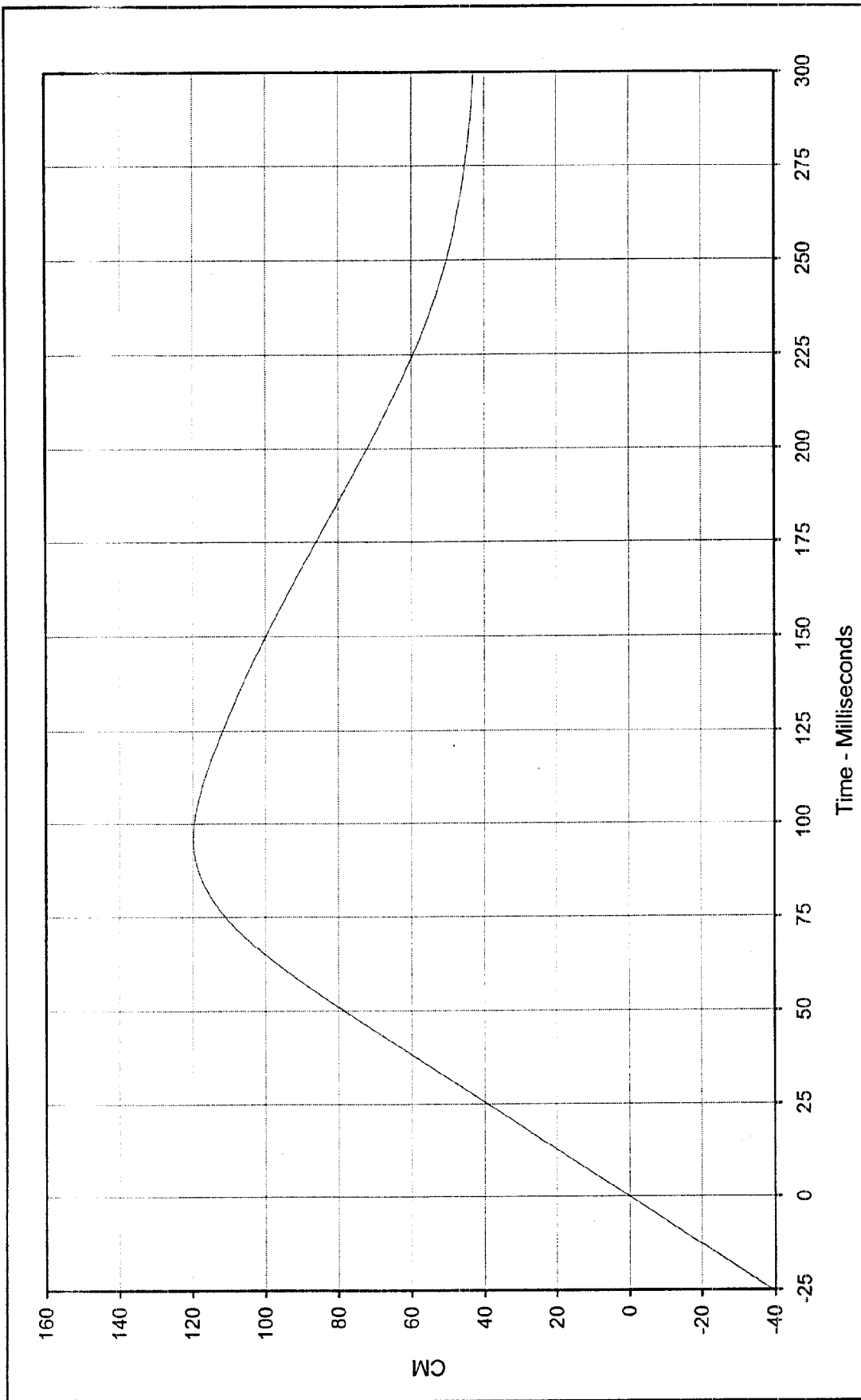




Curve Description:	Driver Head Primary X Velocity	Testing Program	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	56.7 at 26.4 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-20.4 at 172.9 Milliseconds			
SAE Filter Class:	180			
Date of Test:	11/20/98			
Curve Number:	IN1-001			

The logo for AKARCO Engineering. It features the word "AKARCO" in a large, bold, sans-serif font. To the left of the letters "A" and "K" is a circular emblem containing a stylized, abstract design. To the right of "AKARCO" is the word "Engineering" in a smaller, italicized, sans-serif font. The entire logo is set against a dark background.





Curve Description: Driver Head Primary X Displ.

Maximum Value: 119.7 at 96.0 Milliseconds

Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

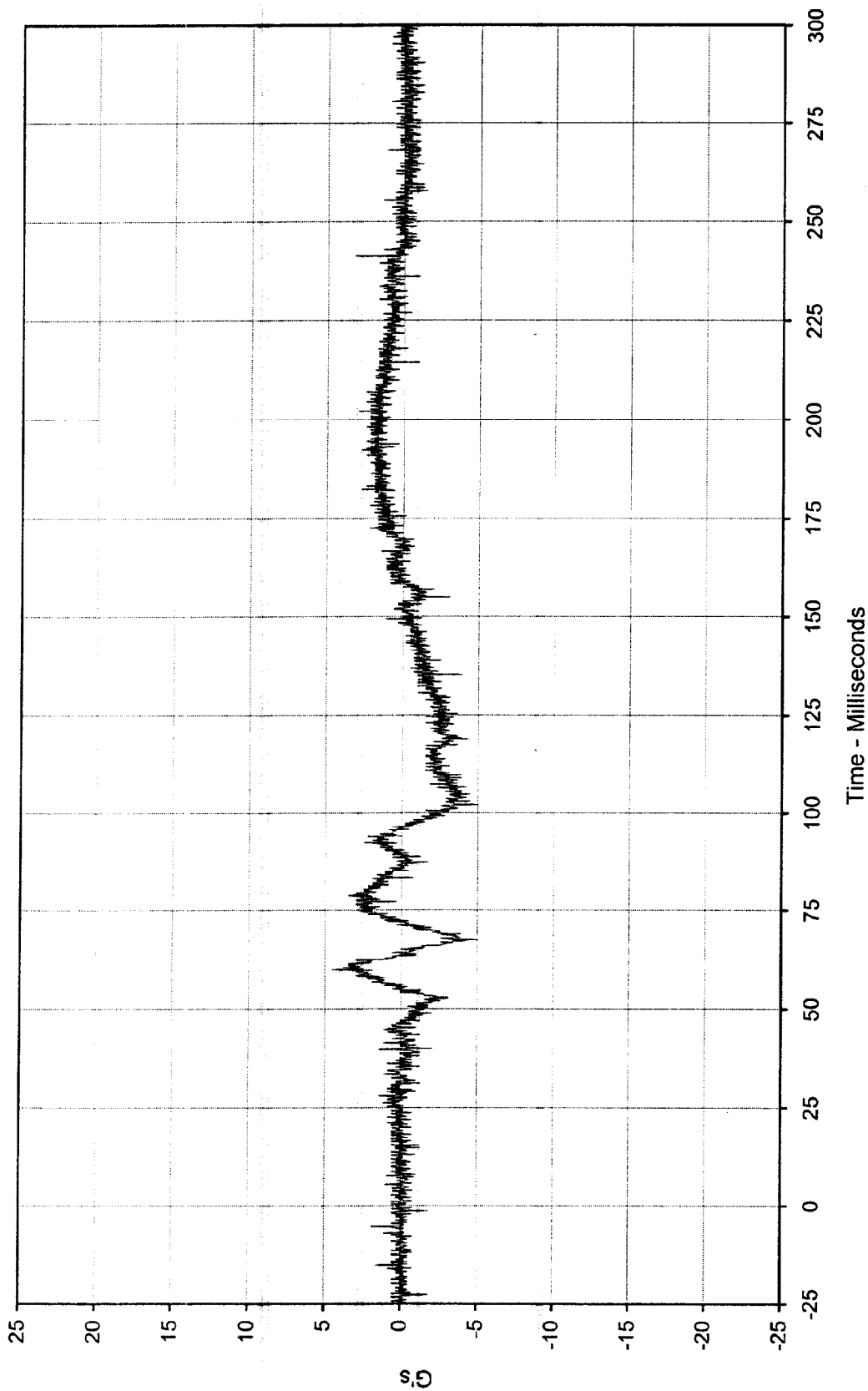
Date of Test: 11/20/98

Curve Number: IN2-001

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

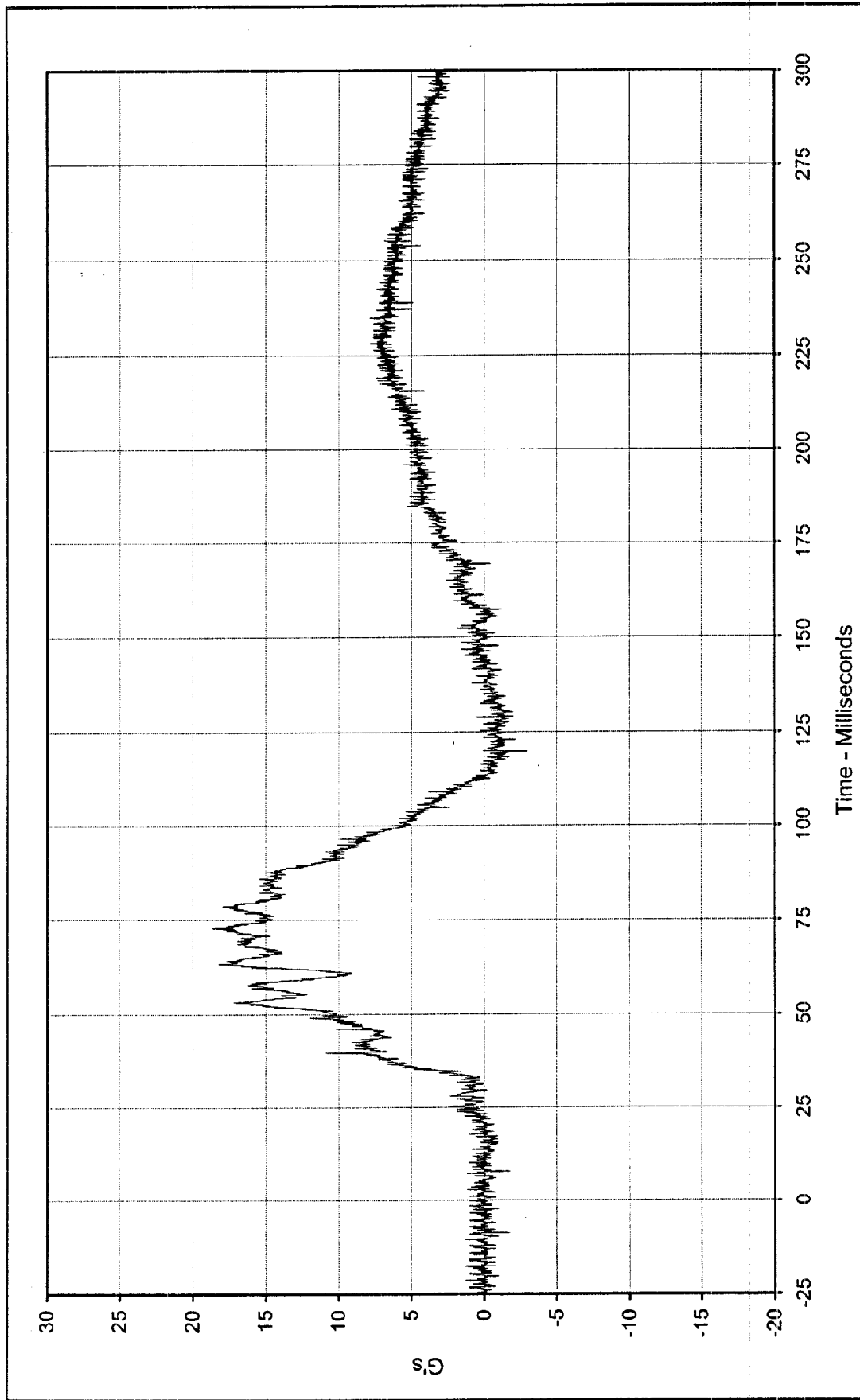
Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:	Driver Head Primary Y	Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111
Maximum Value:	4.6 at 59.8 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-5.0 at 67.3 Milliseconds		
SAE Filter Class:	1000		
Date of Test:	11/20/98		
Curve Number:	FIL-002		

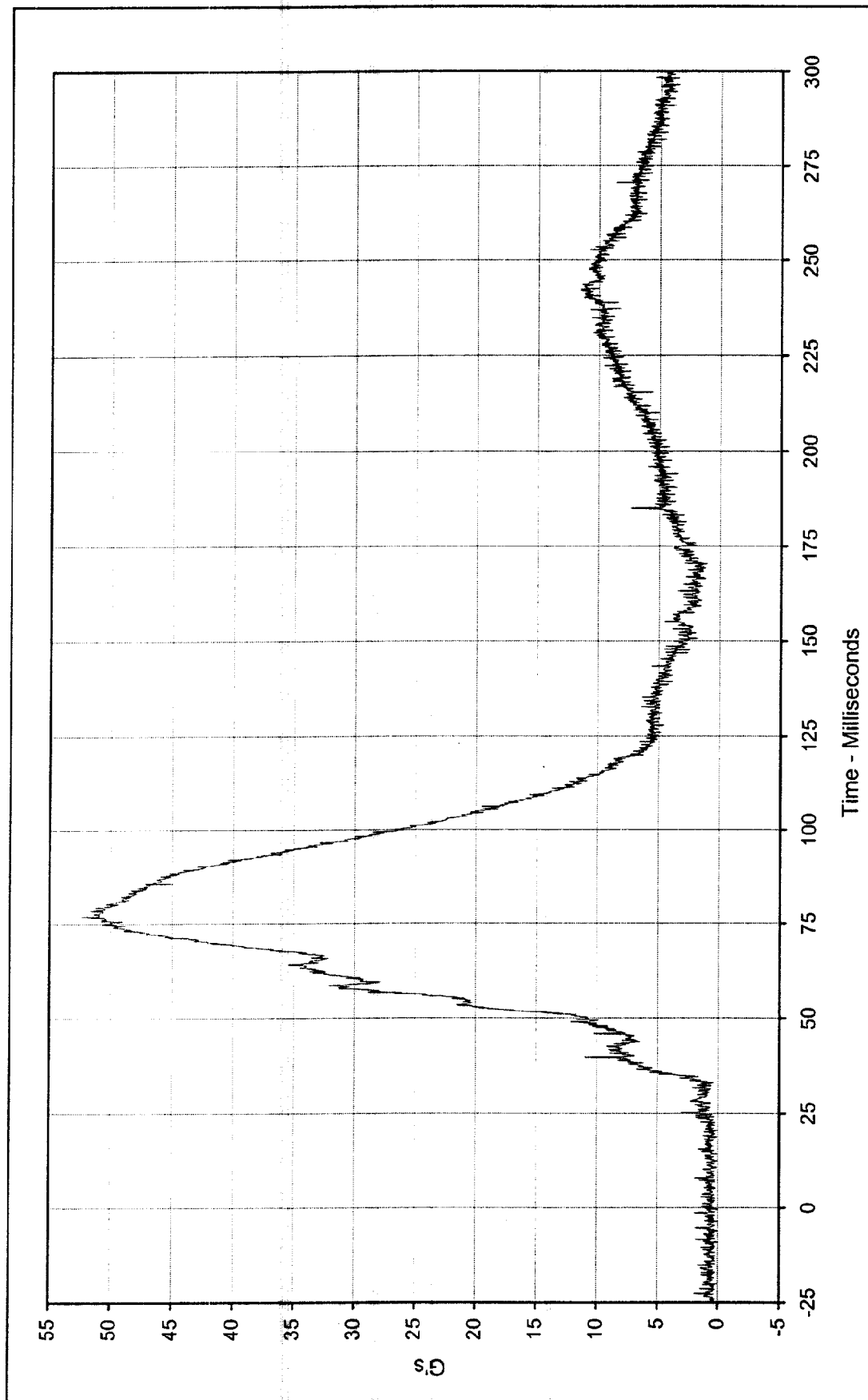




Curve Description: Driver Head Primary Z
 Maximum Value: 18.7 at 72.7 Milliseconds
 Minimum Value: -3.0 at 119.7 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-003

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

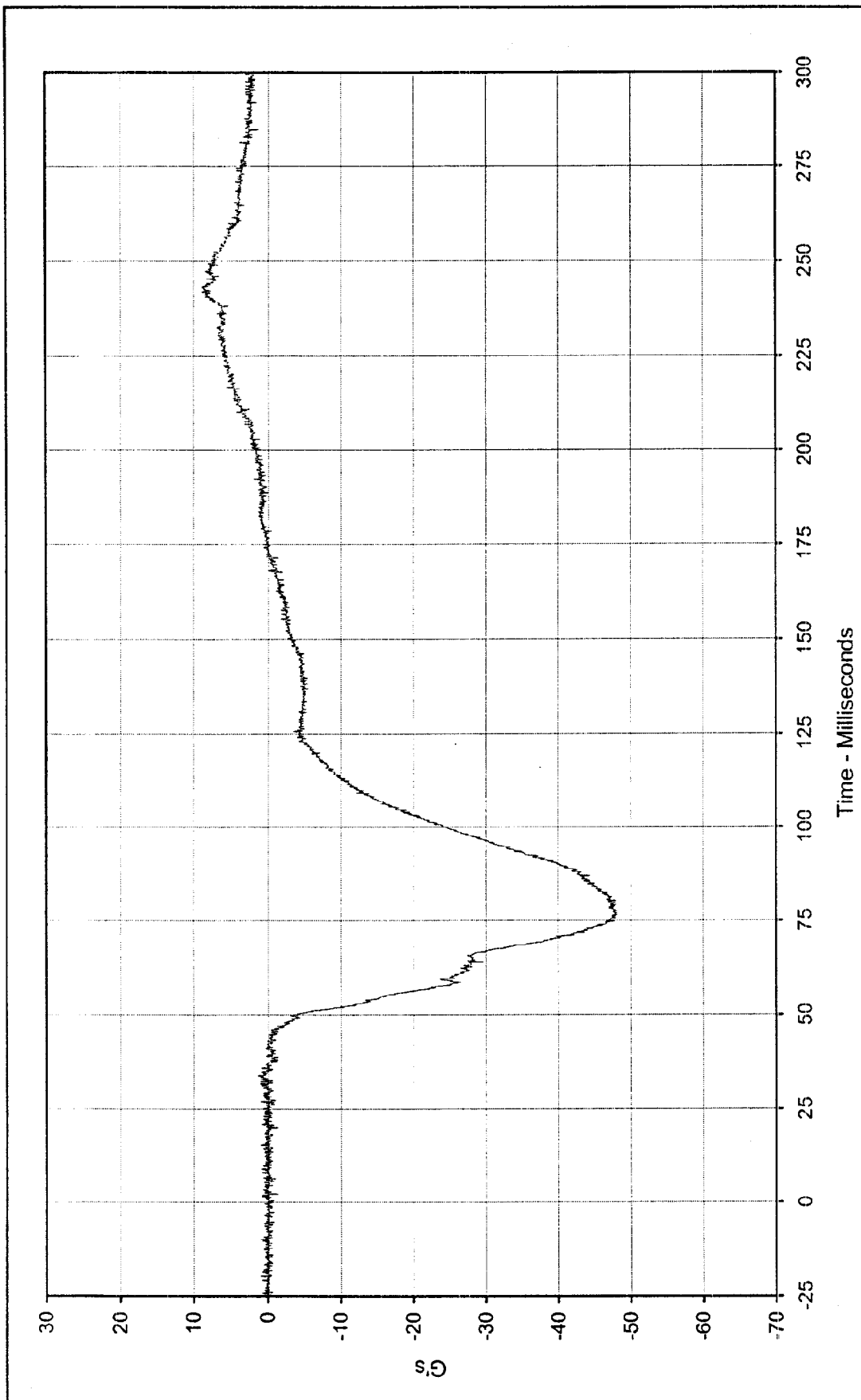




Curve Description: Driver Head Resultant Primary
Maximum Value: 52.4 at 76.9 Milliseconds
Minimum Value: 0.1 at 10.4 Milliseconds
SAE Filter Class: 1000
Date of Test: 11/20/98
Curve Number: RES-001

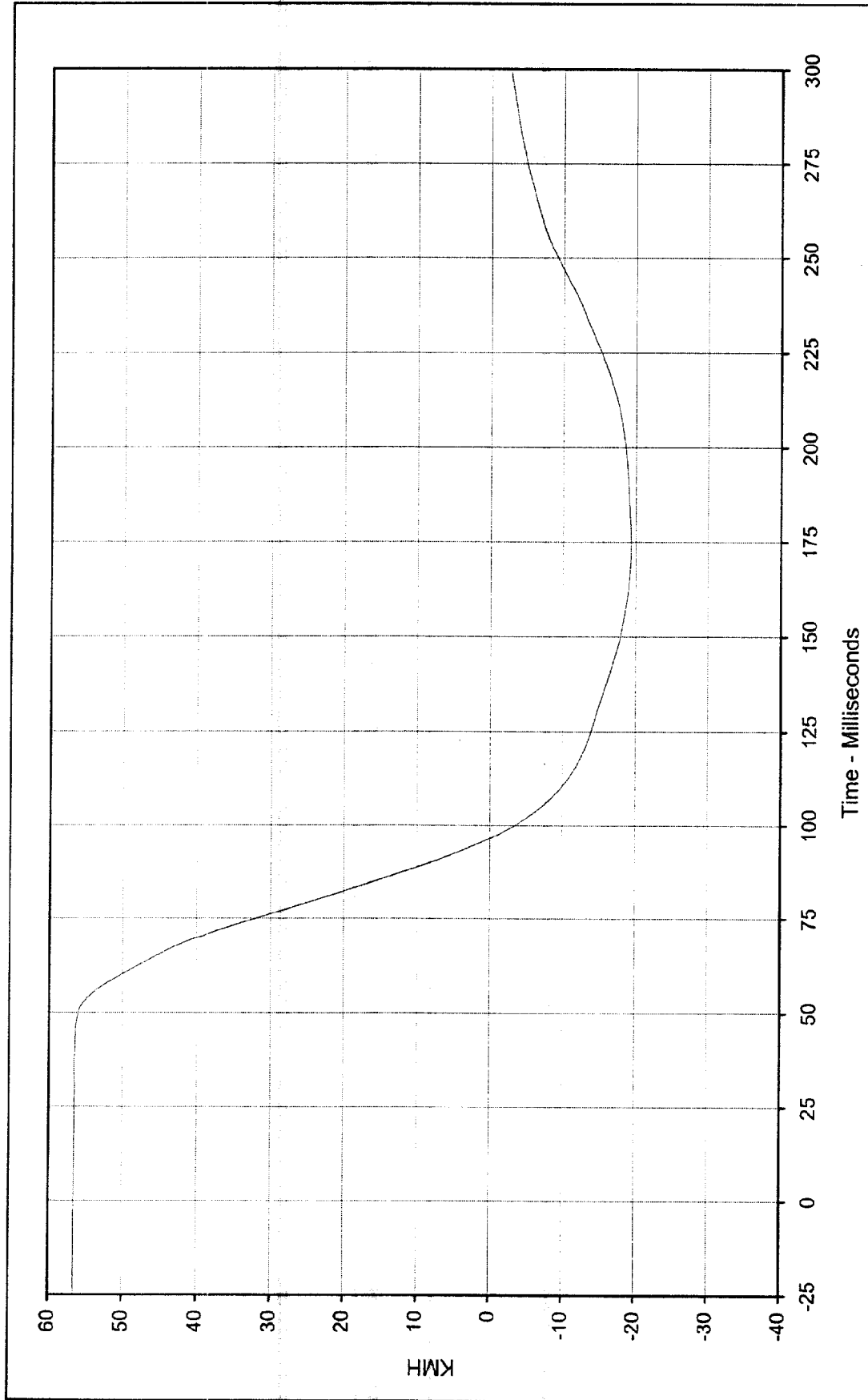
Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:		Driver Head Redundant X		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	8.8	at	241.8	Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-48.2	at	76.5	Milliseconds		
SAE Filter Class:	1000					
Date of Test:	11/20/98					
Curve Number:	FIL-004					





Curve Description: Driver Head Redundant X Velocity

Maximum Value: 56.5 at 35.6 Milliseconds

Minimum Value: -19.4 at 173.2 Milliseconds

SAE Filter Class: 180

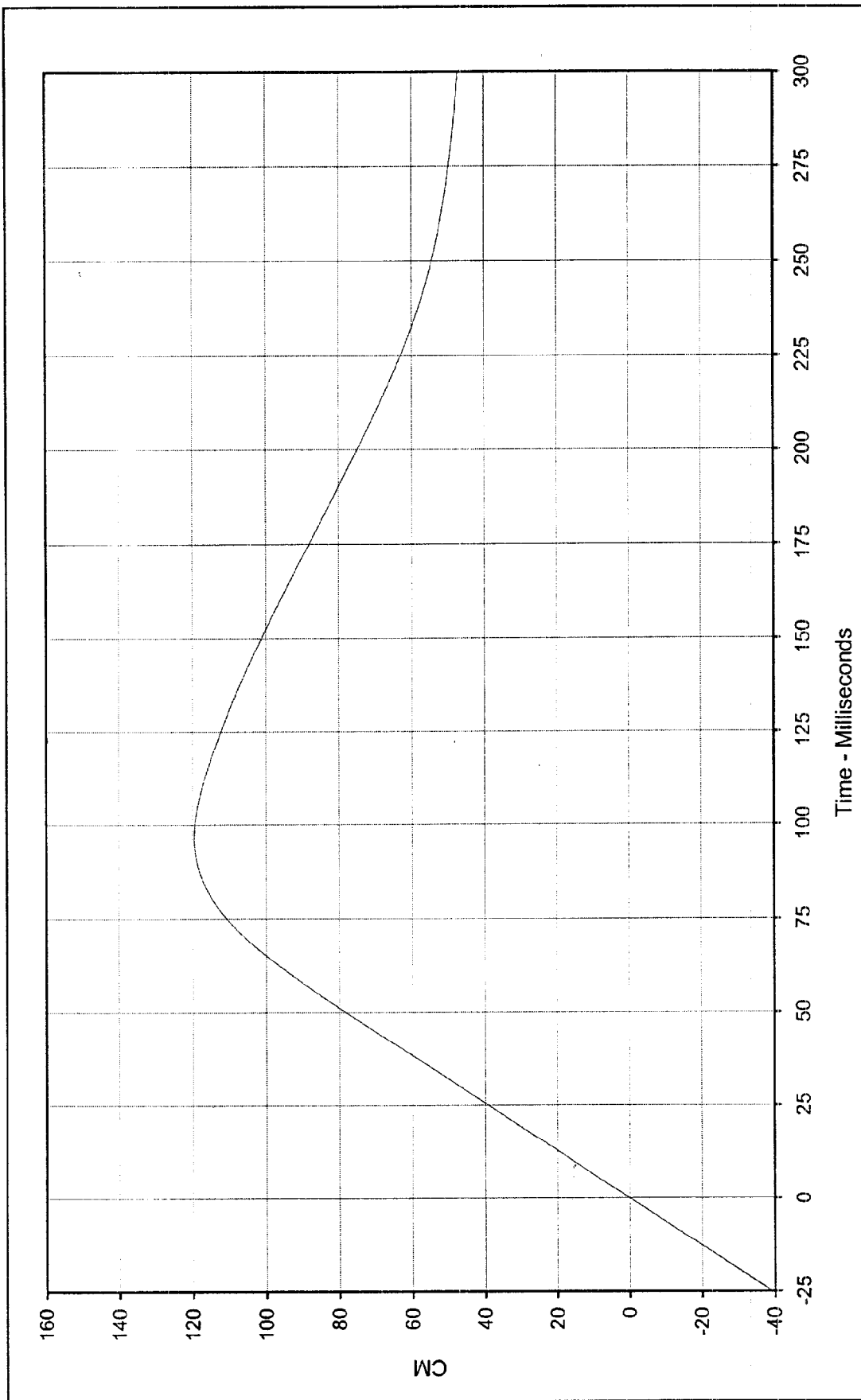
Date of Test: 11/20/98

Curve Number: IN1-004

Testing Program 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Driver Head Redundant X Displ.

Maximum Value: 119.4 at 96.4 Milliseconds

Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

Date of Test: 11/20/98

Curve Number: IN2-004

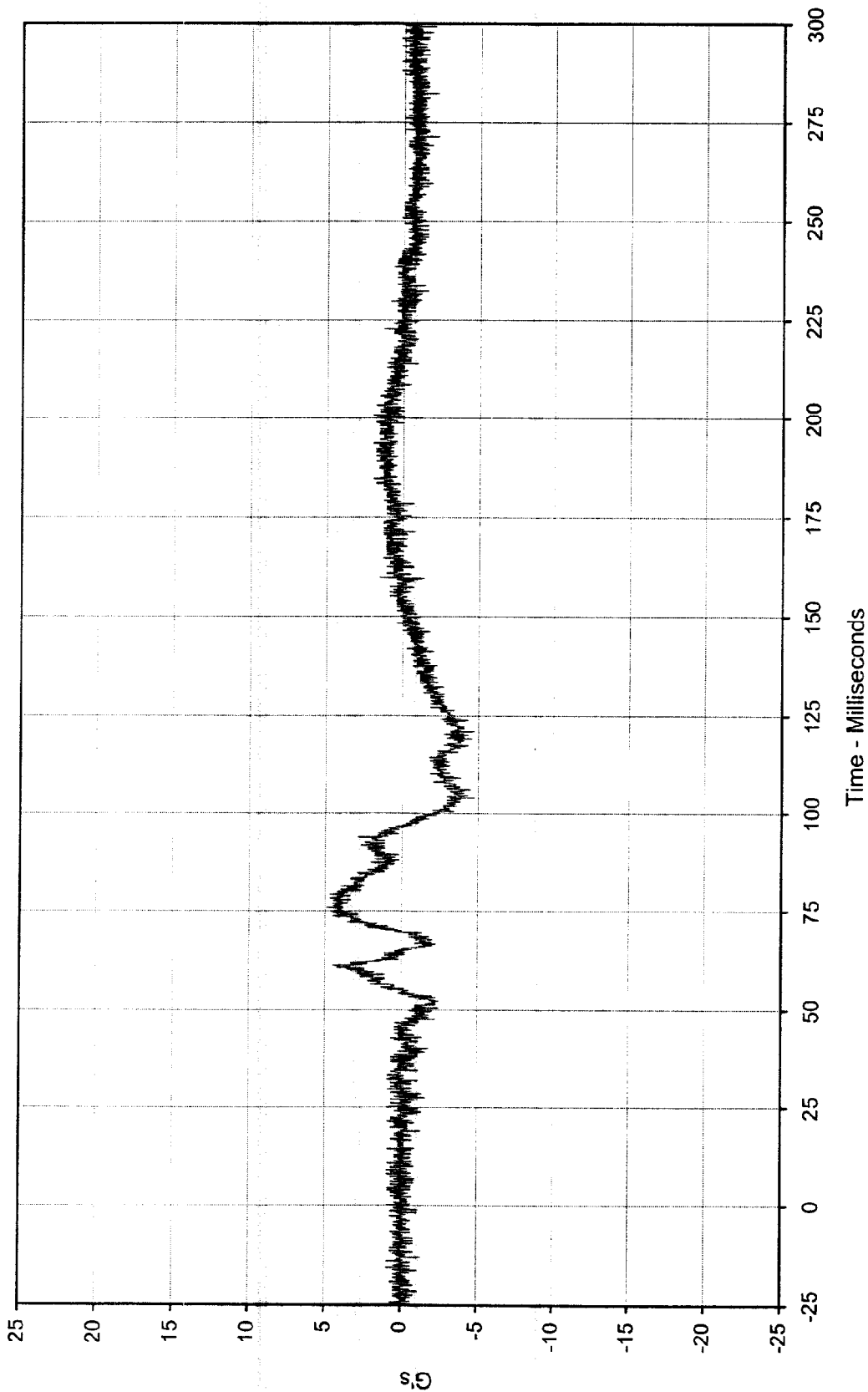
Test Program:

1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle:

1999 Saturn SL1 4 Door Sedan





Curve Description: Driver Head Redundant Y

Maximum Value: 4.9 at 75.8 Milliseconds

Minimum Value: -4.8 at 104.0 Milliseconds

SAE Filter Class: 1000

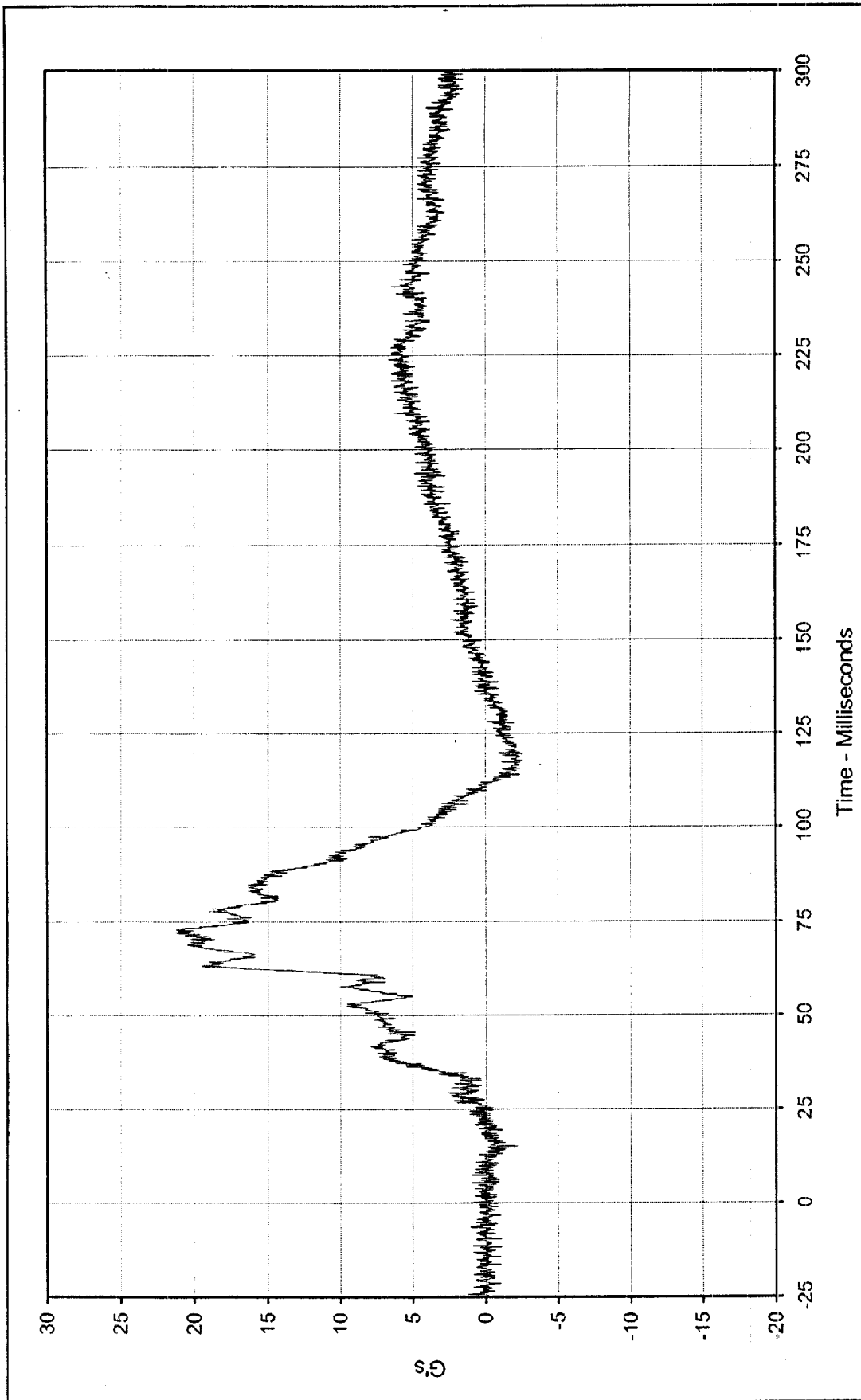
Date of Test: 11/20/98

Curve Number: FIL-005

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

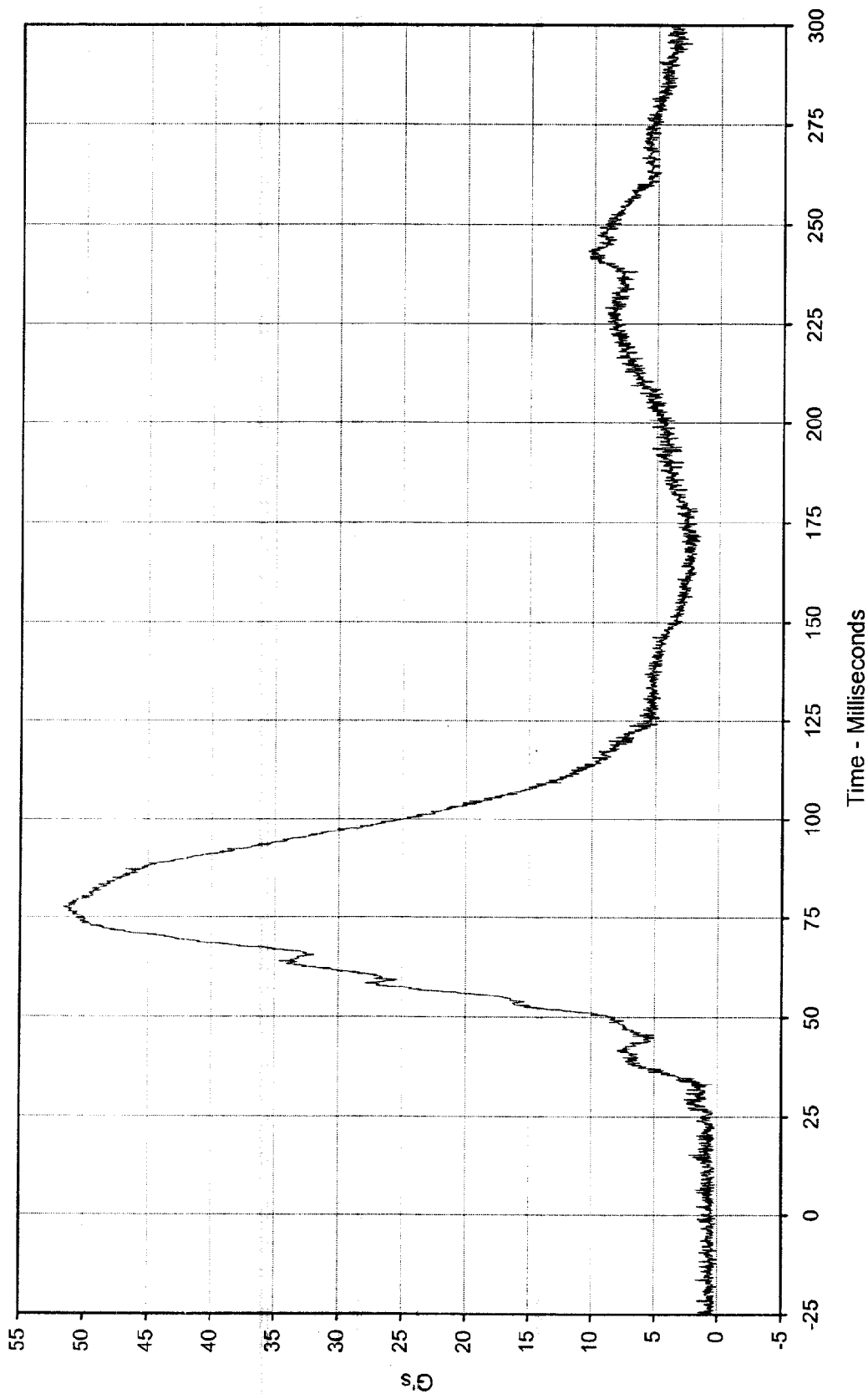
Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:	Driver Head Redundant Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	21.2	at	72.2	Milliseconds
Minimum Value:	-2.6	at	117.6	Milliseconds
SAE Filter Class:	1000	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Date of Test:	11/20/98			
Curve Number:	FIL-006			





Curve Description: Driver Head Resultant Redundant

Maximum Value: 51.6 at 77.6 Milliseconds

Minimum Value: 0.1 at 22.5 Milliseconds

SAE Filter Class: 1000

Date of Test: 11/20/98

Curve Number: RES-004

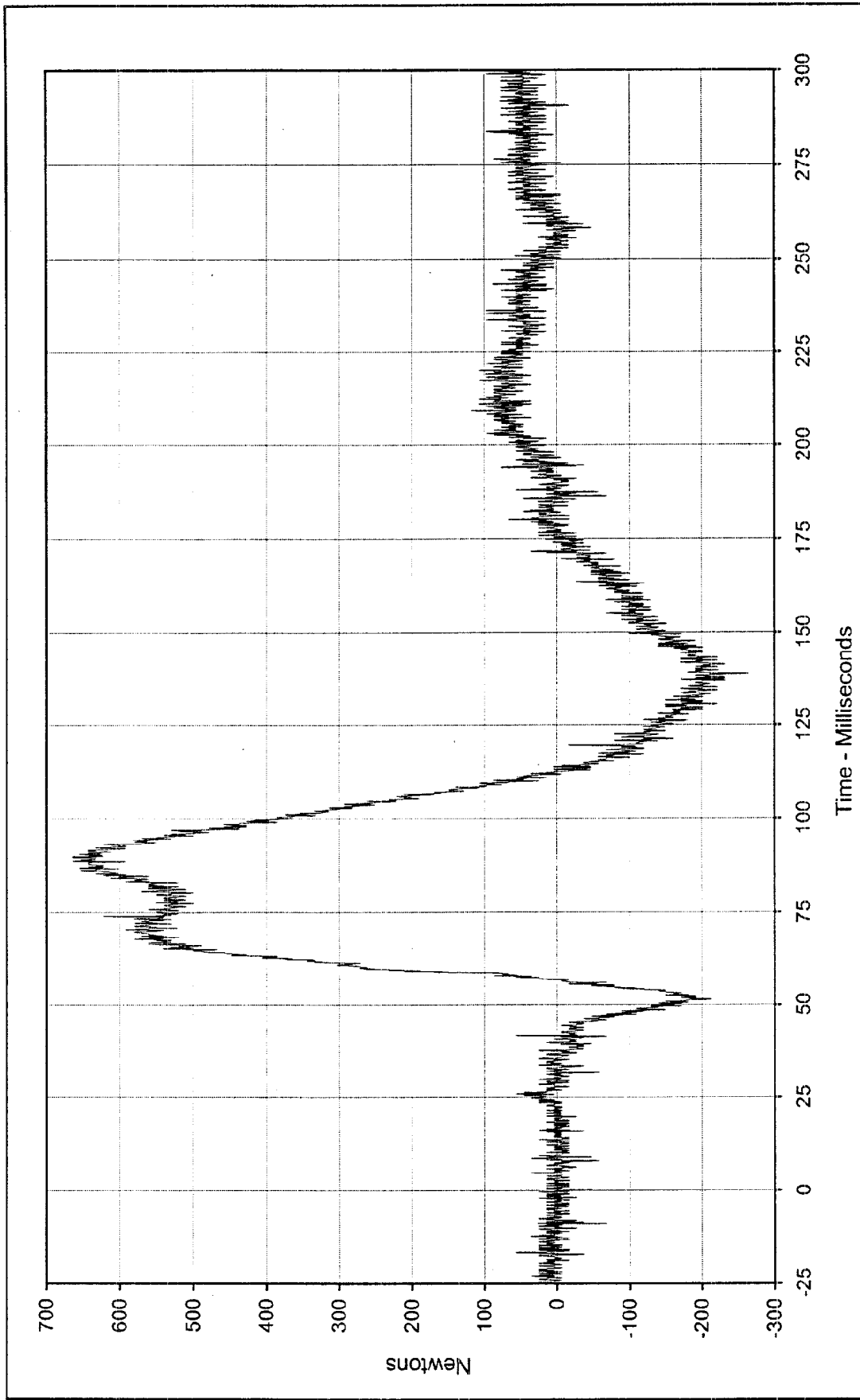
Test Program:

Test Vehicle:

1999 NHTSA 35 mph NCAP No.: MX0111

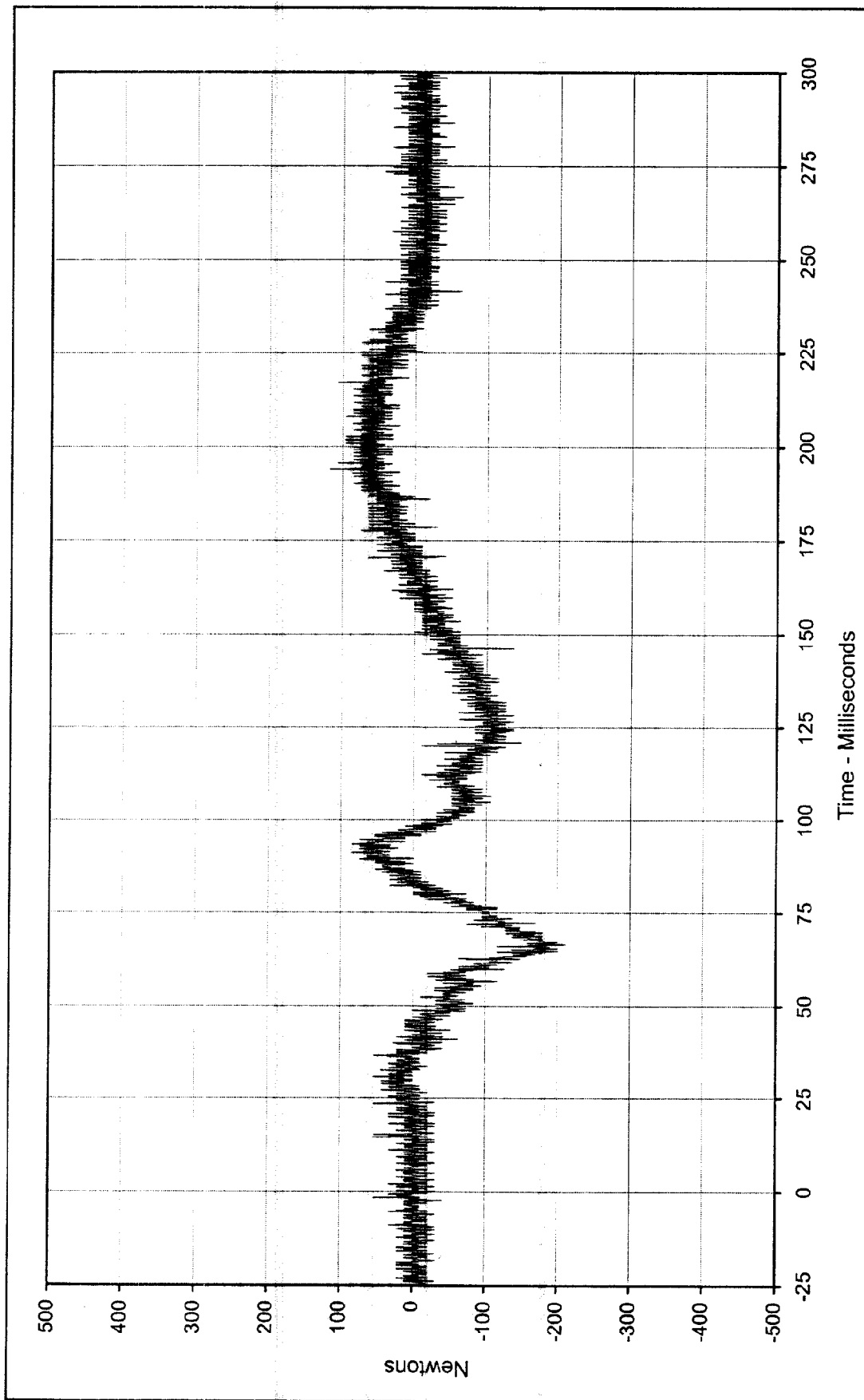
1999 Saturn SL1 4 Door Sedan





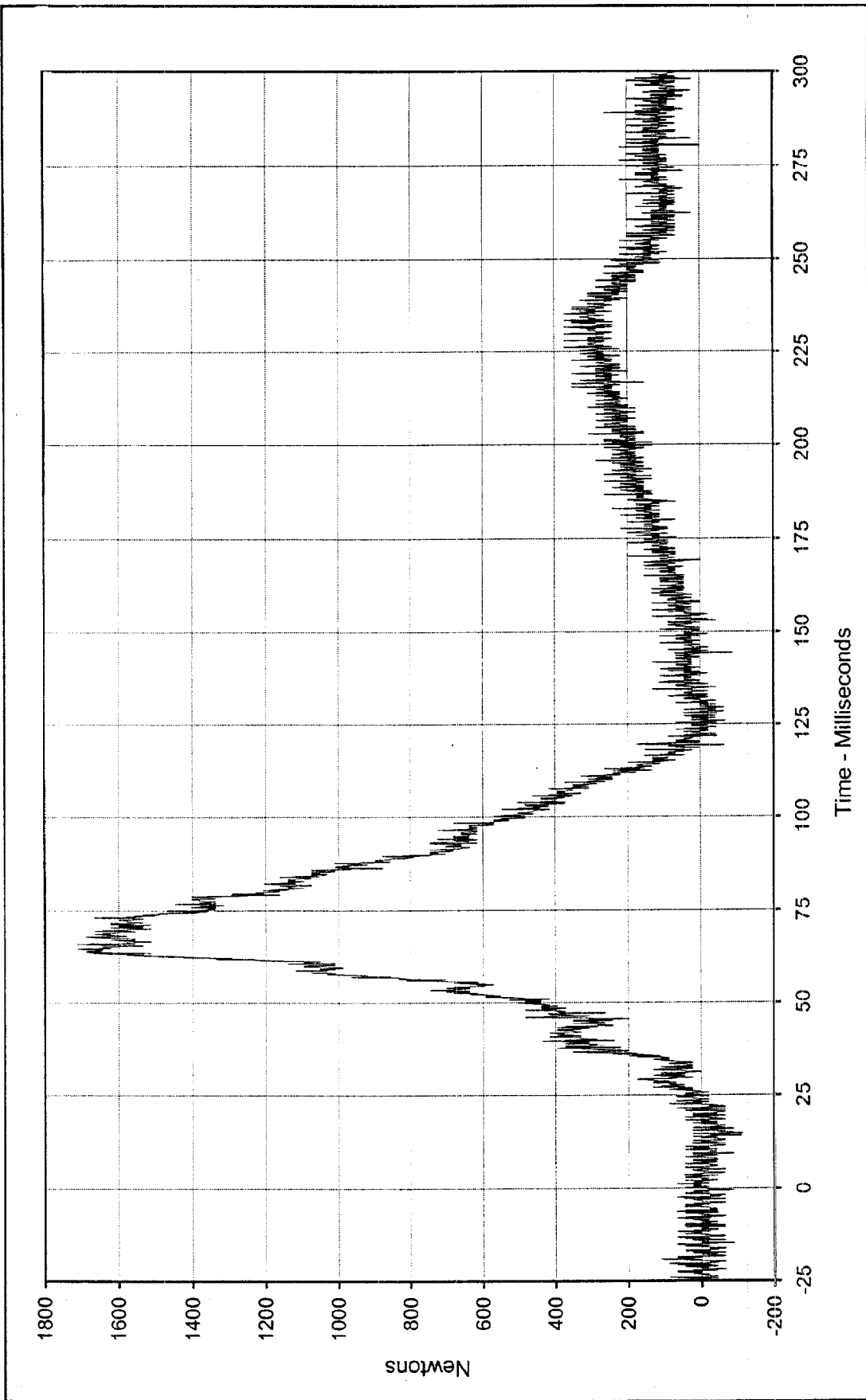
Curve Description:		Driver Neck Force X		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	664.2	at	89.5	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	





Curve Description:	Driver Neck Force Y	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	116.6 at 193.8 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-211.9 at 66.4 Milliseconds			
SAE Filter Class:	1000			
Date of Test:	11/20/98			
Curve Number:	FIL-008			

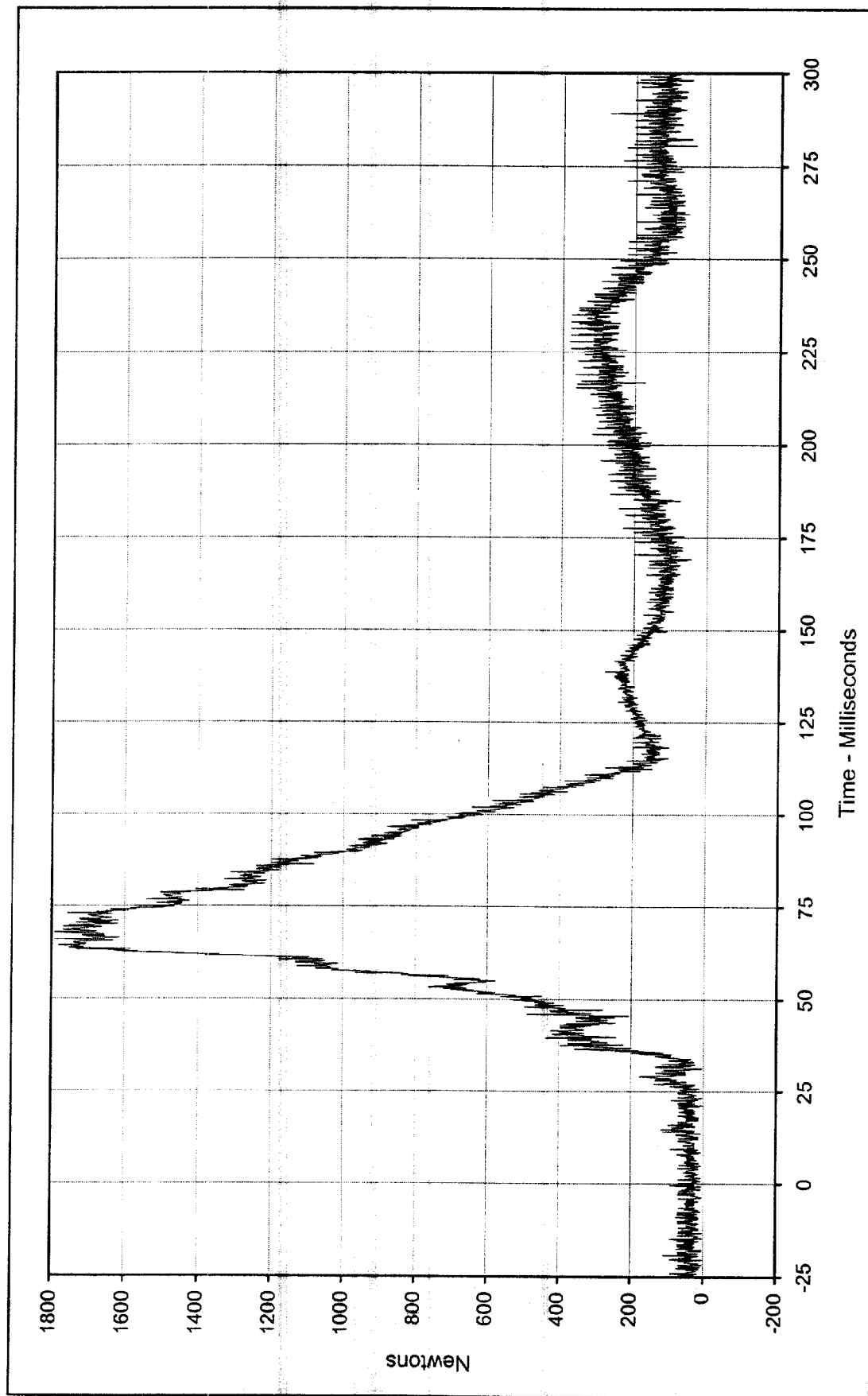




Curve Description: Driver Neck Force Z
 Maximum Value: 1709.1 at 64.4 Milliseconds
 Minimum Value: -109.6 at 14.2 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-009

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Driver Neck Force Resultant

Maximum Value: 1791.5 at 68.0 Milliseconds

Minimum Value: 4.0 at 21.3 Milliseconds

SAE Filter Class: 1000

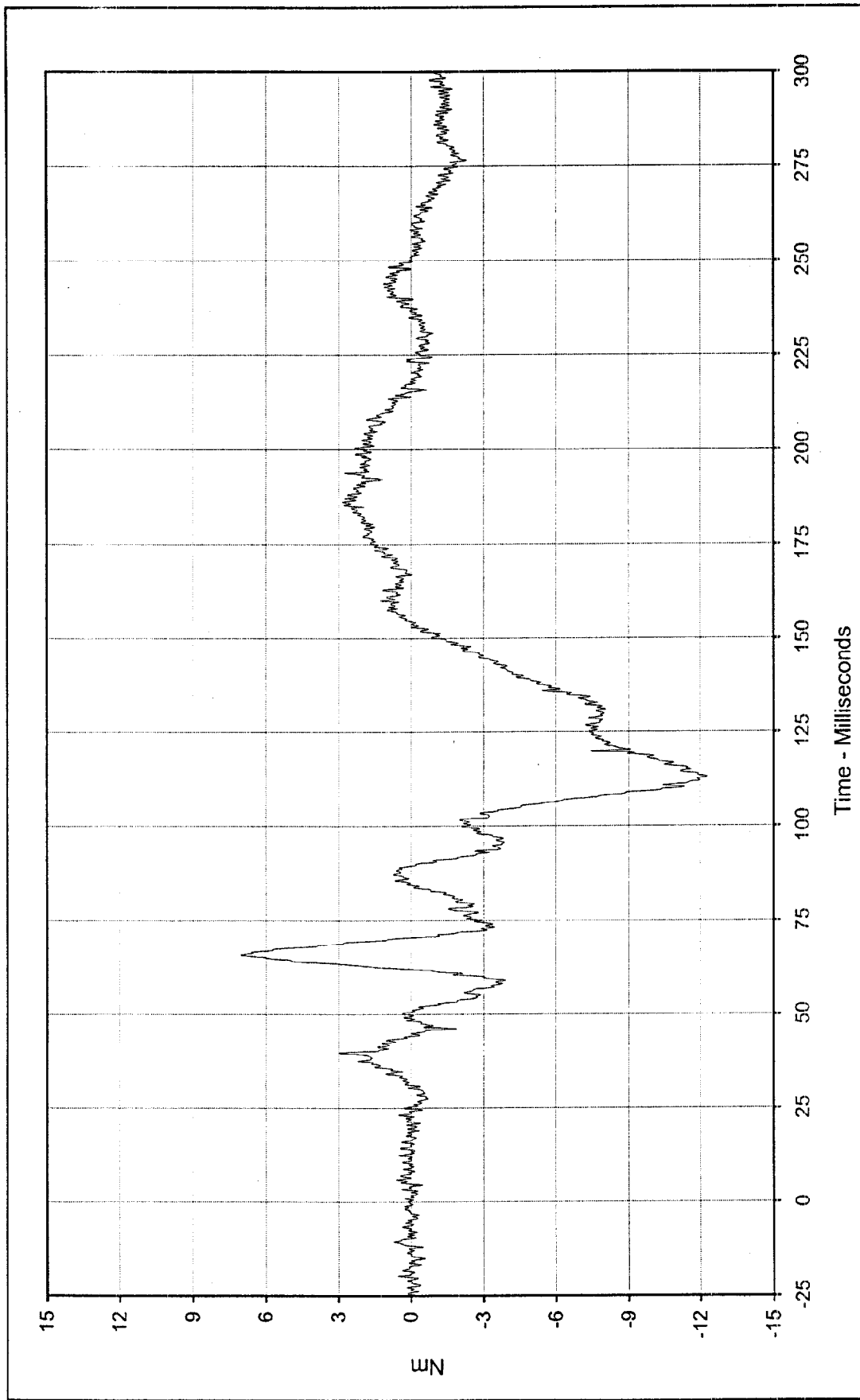
Date of Test: 11/20/98

Curve Number: RES-007

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

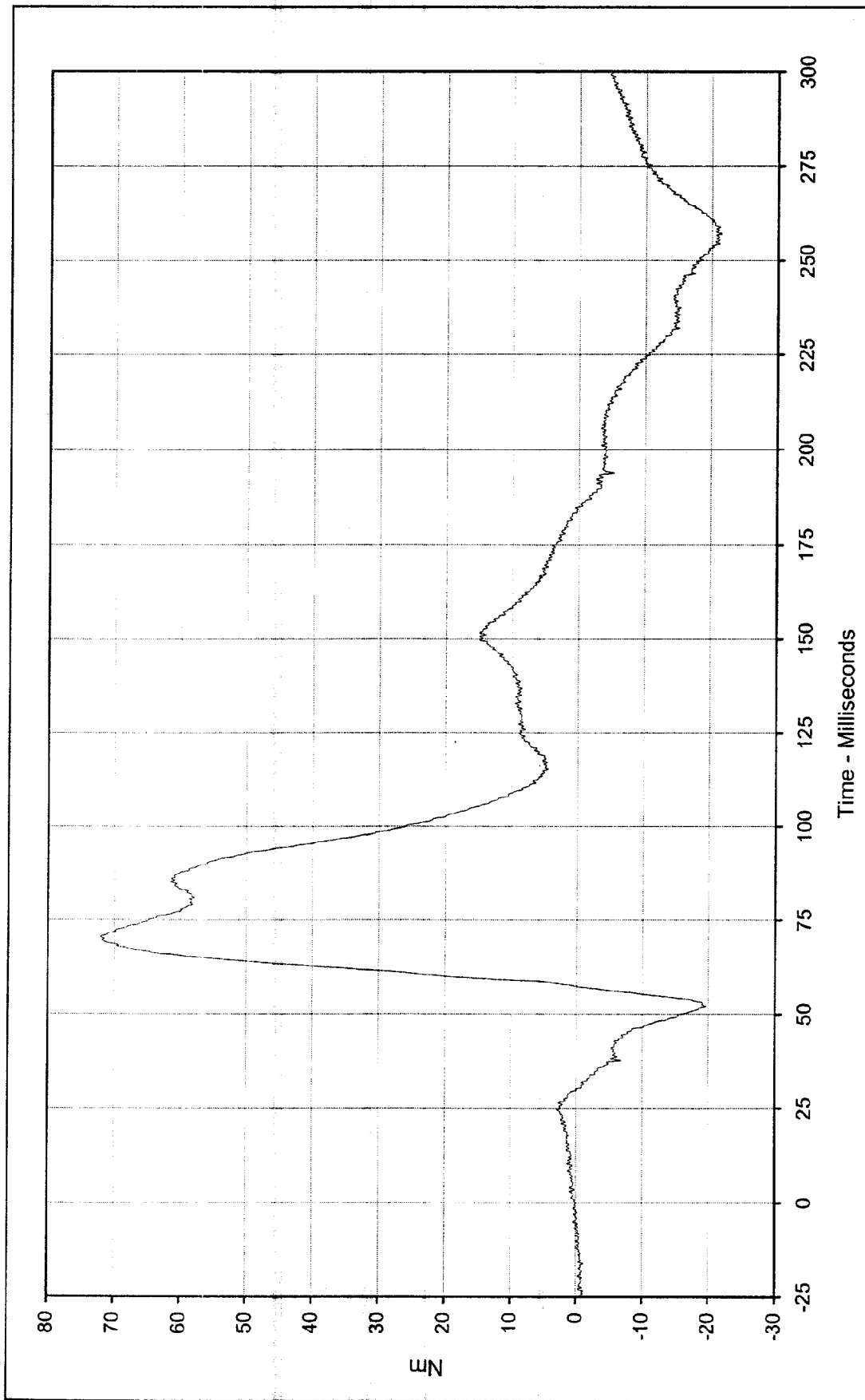
Test Vehicle: 1999 Saturn SL1 4 Door Sedan





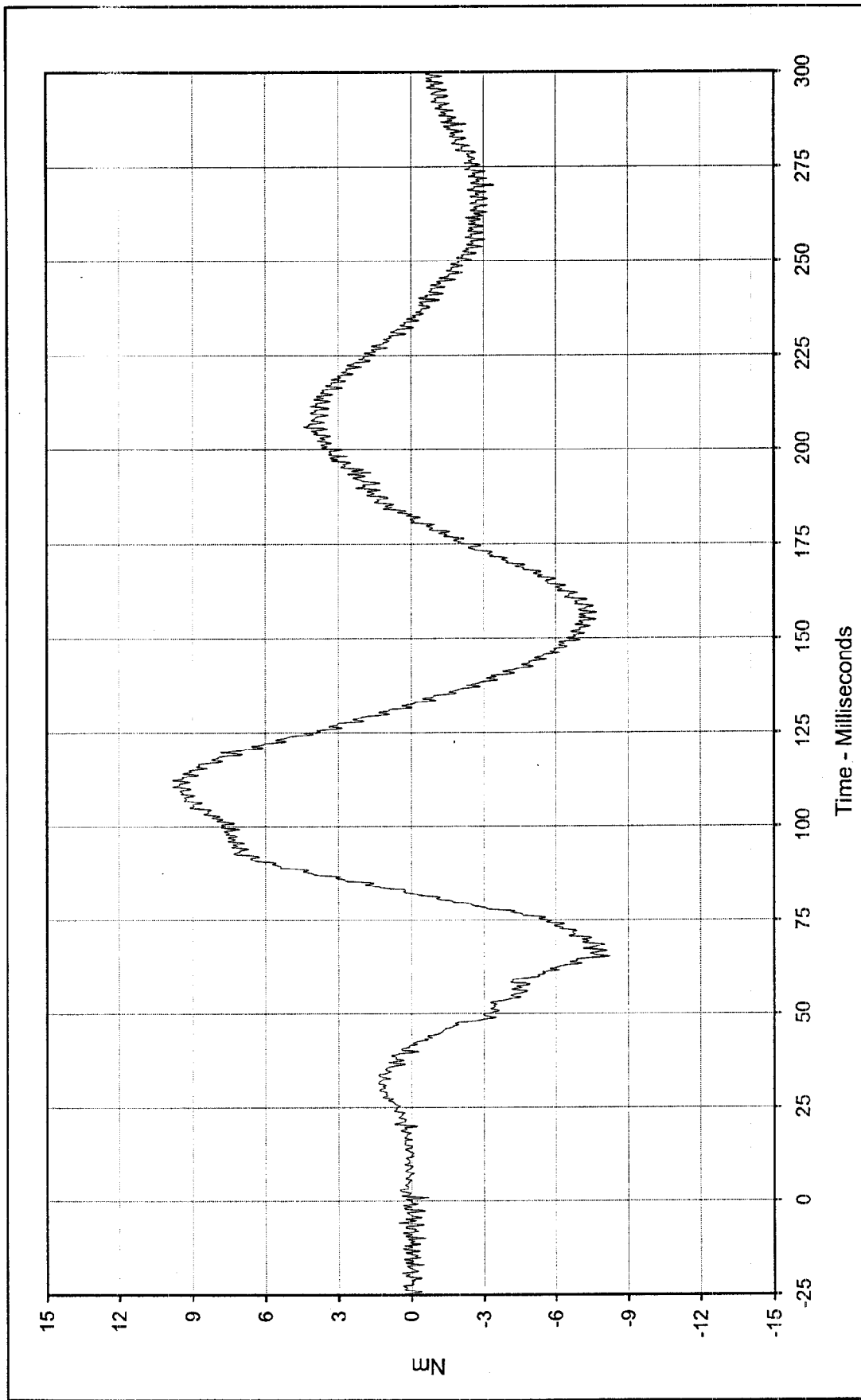
Curve Description:	Driver Neck Moment X	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	7.0	at	65.7	Milliseconds
Minimum Value:	-12.3	at	112.9	Milliseconds
SAE Filter Class:	600			
Date of Test:	11/20/98	Test Vehicle:	1999 Saturn SL 1 4 Door Sedan	
Curve Number:	FIL-010			





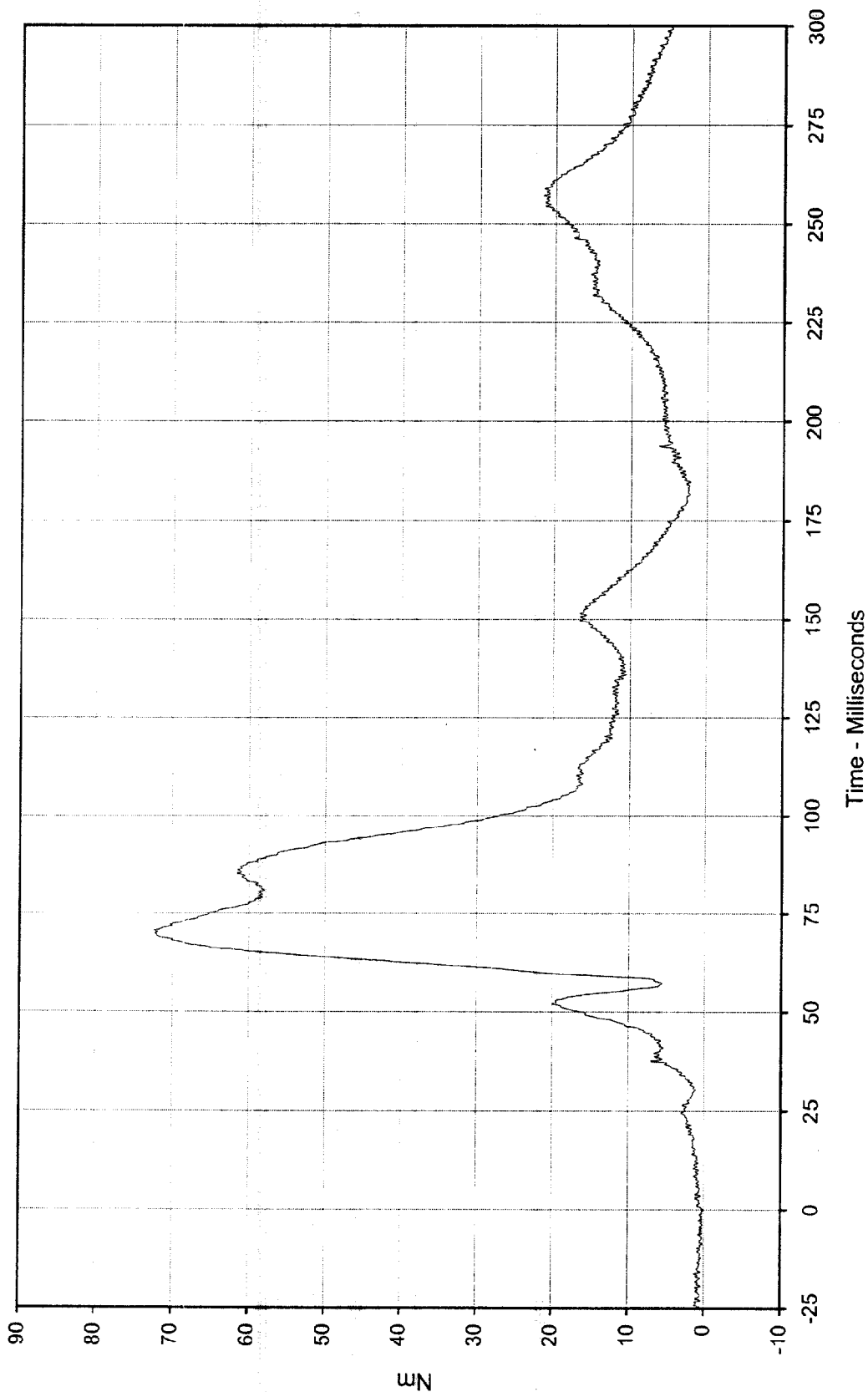
Curve Description:	Driver Neck Moment Y		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	72.0	at 70.6	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-21.5	at 257.3			
SAE Filter Class:	600				
Date of Test:	11/20/98				
Curve Number:	FIL-011				





Curve Description:	Driver Neck Moment Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	9.8	at	112.2	Milliseconds
Minimum Value:	-8.3	at	65.1	Milliseconds
SAE Filter Class:	600			
Date of Test:	11/20/98	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Curve Number:	FIL-012			





Curve Description: Driver Neck Moment Resultant

Maximum Value: 72.4 at 70.6 Milliseconds

Minimum Value: 0.1 at 0.0 Milliseconds

SAE Filler Class: 600

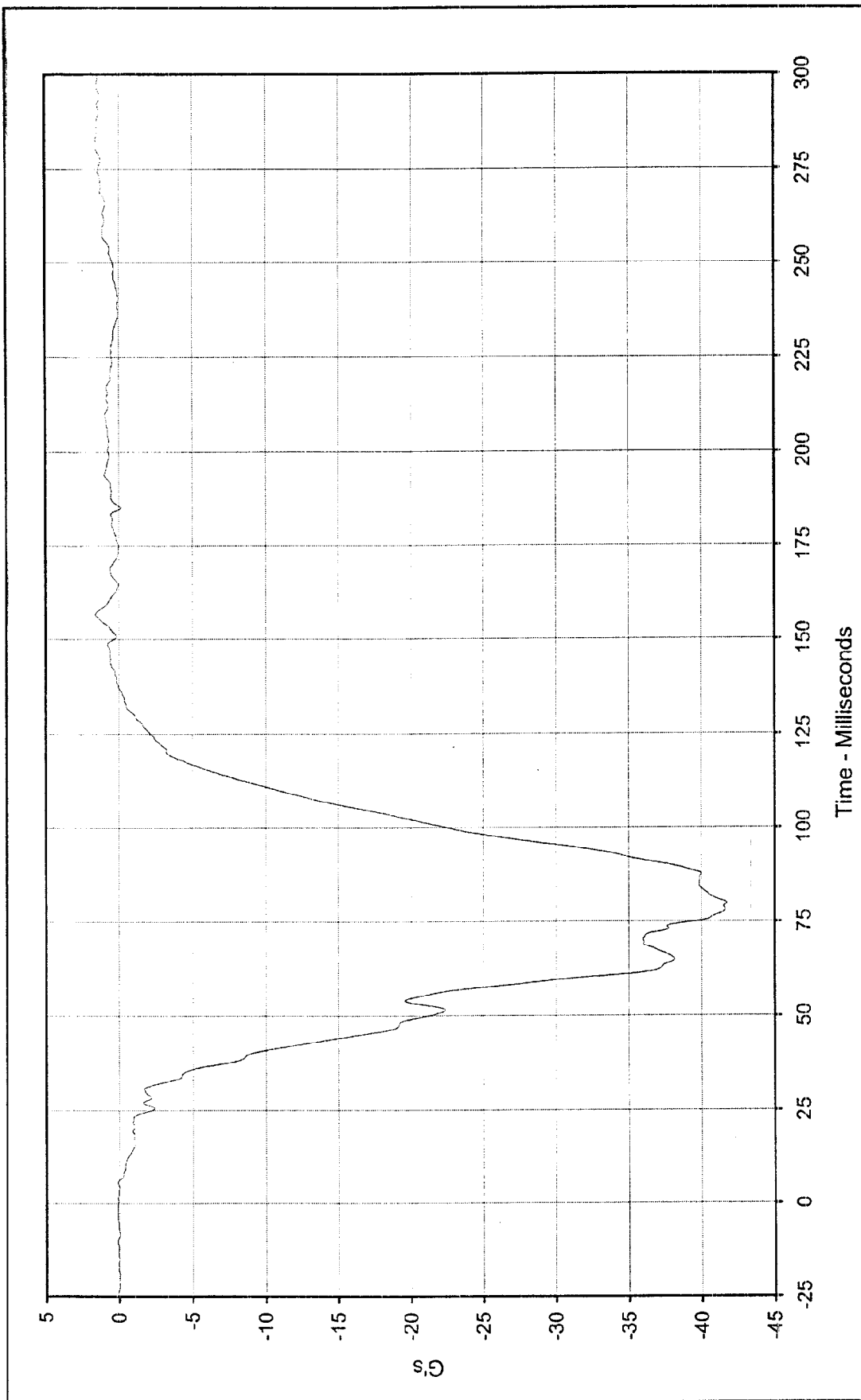
Date of Test: 11/20/98

Curve Number: RES-010

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

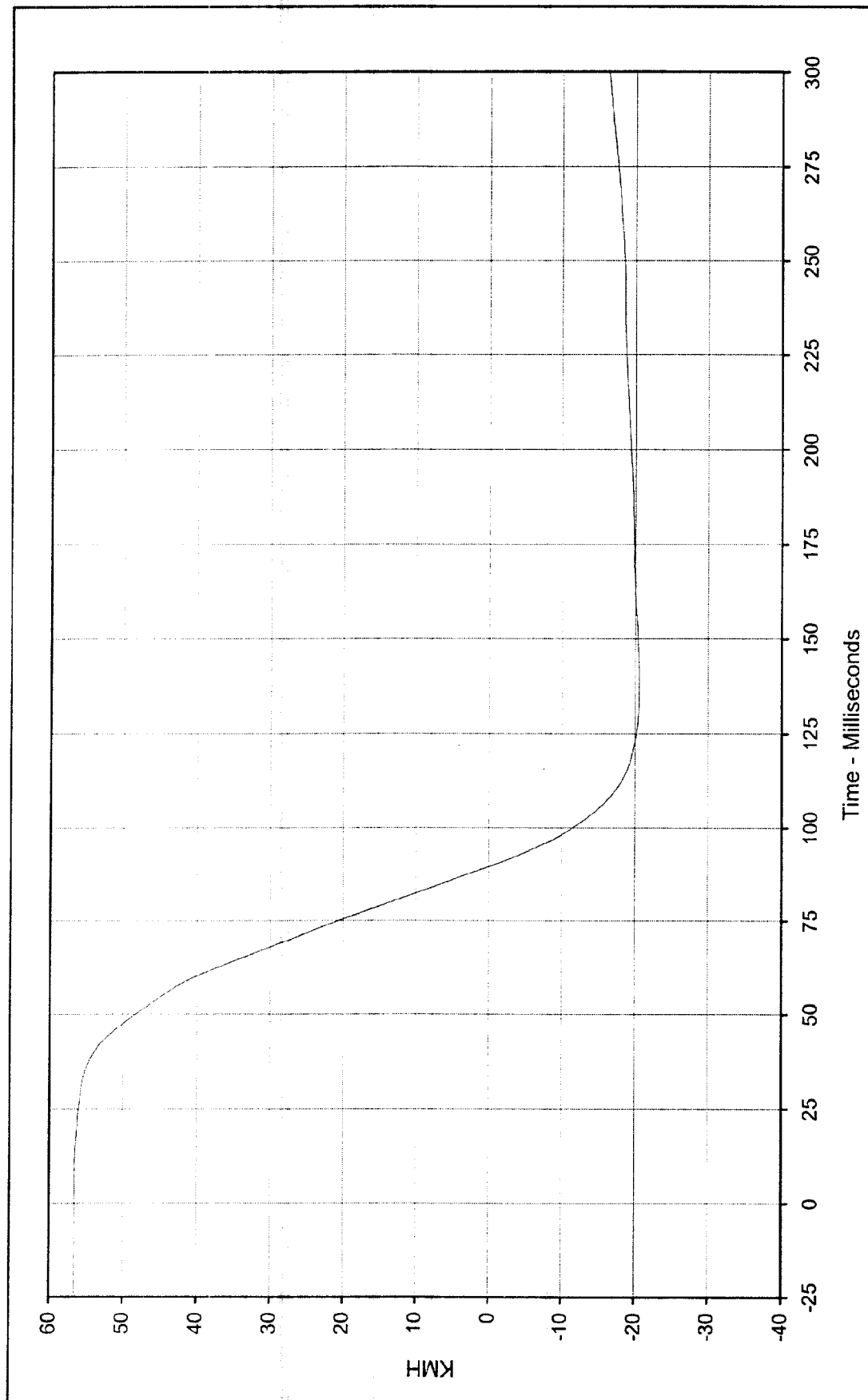




Curve Description: Driver Chest Primary X
 Maximum Value: 1.6 at 281.2 Milliseconds
 Minimum Value: -41.8 at 79.8 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: FIL-013

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan



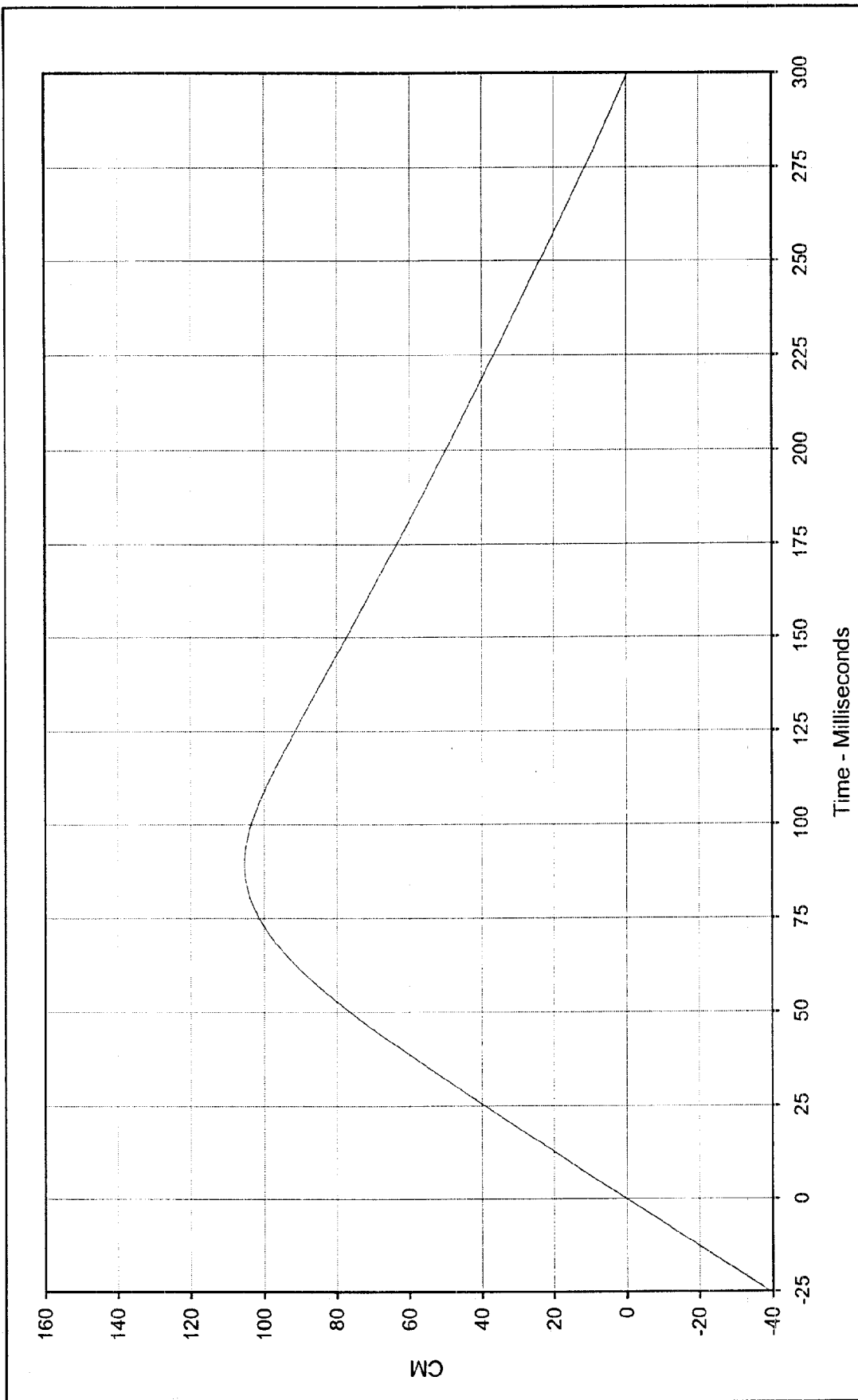


B-22

Curve Description:	Driver Chest Primary X Velocity	Testing Program	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	56.6 at 6.6 Milliseconds	Test Vehicle:	1999 Saturn SL 1 4 Door Sedan	
Minimum Value:	-20.5 at 136.9 Milliseconds			
SAE Filter Class:	180			
Date of Test:	11/20/98			
Curve Number:	IN1-013			



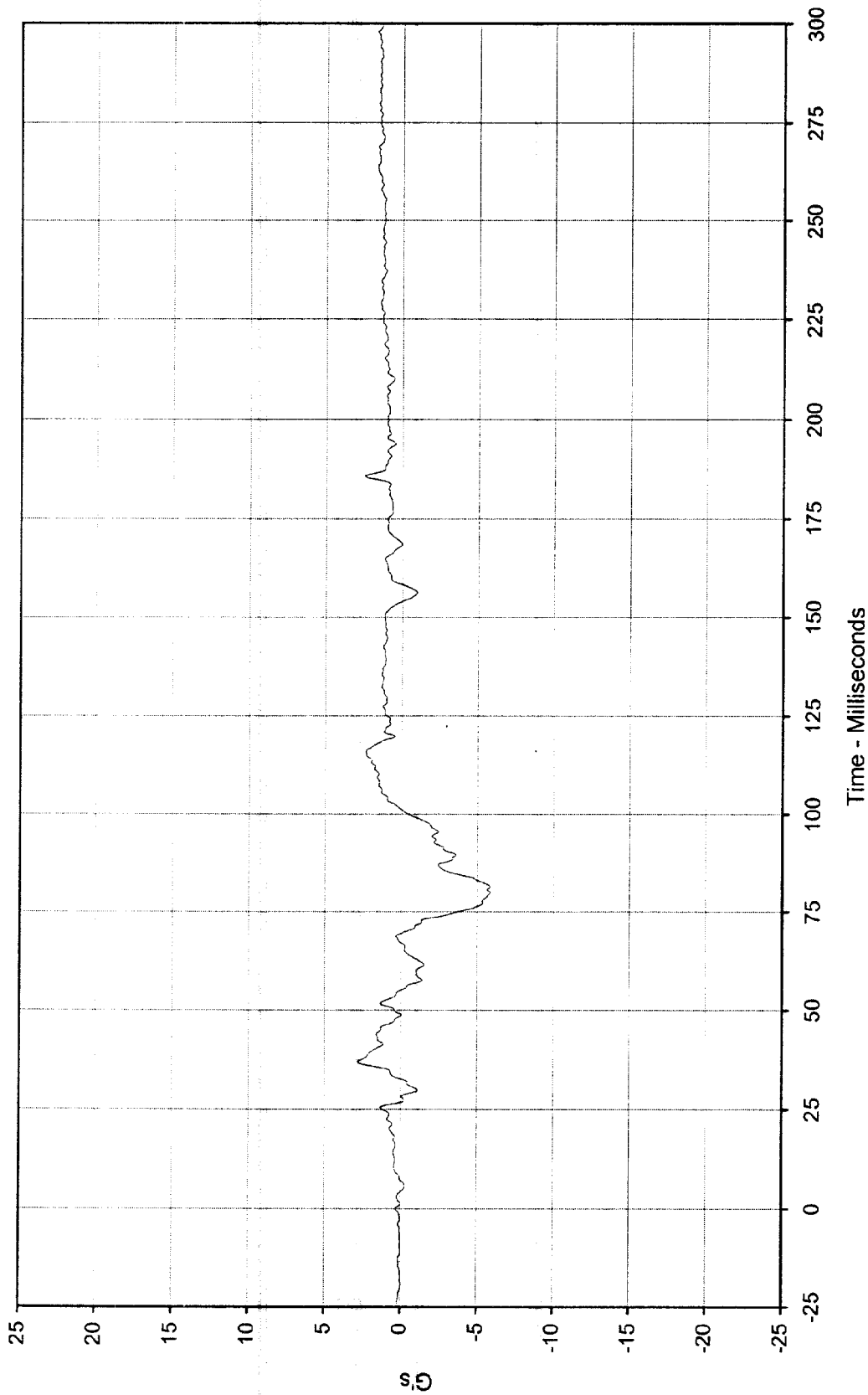
KAR99001-02



Curve Description: Driver Chest Primary X Displ.
 Maximum Value: 105.4 at 89.4 Milliseconds
 Minimum Value: -0.4 at 299.9 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: IN2-013

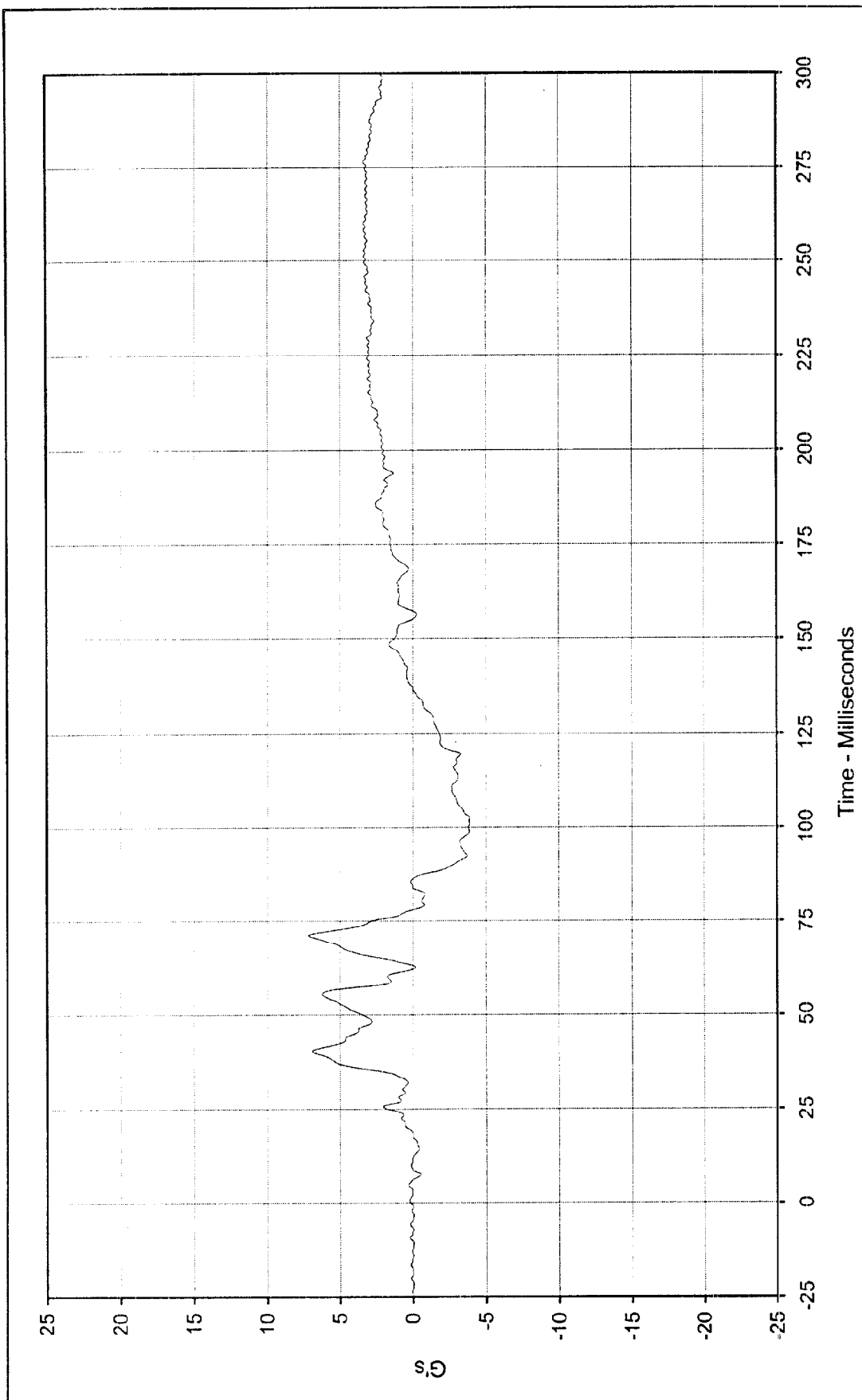
Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:	Driver Chest Primary Y	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	2.8 at 36.8 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-5.8 at 81.3 Milliseconds			
SAE Filter Class:	180			
Date of Test:	11/20/98			
Curve Number:	FIL-014			

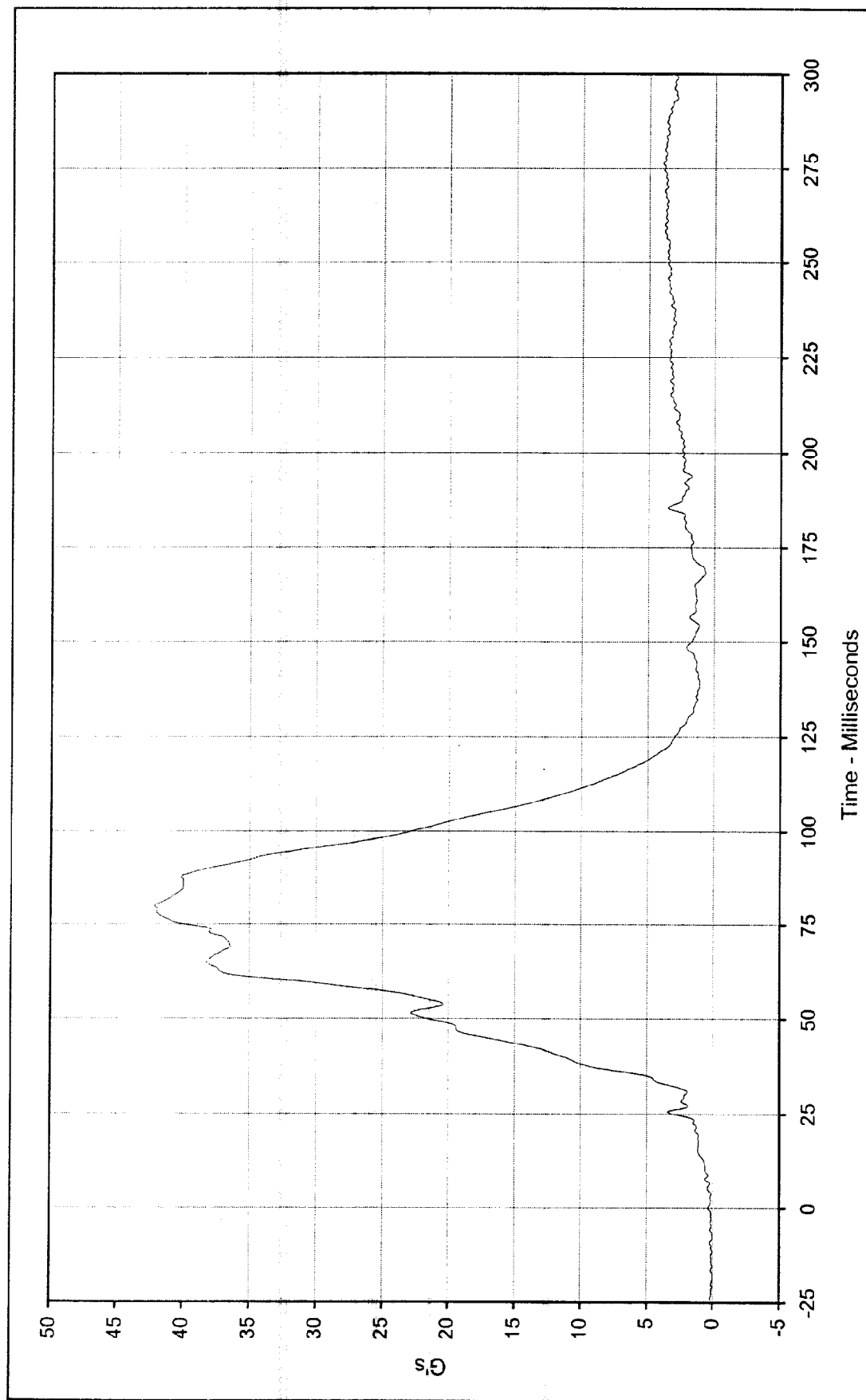




Curve Description:	Driver Chest Primary Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	7.2 at 71.2 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-3.9 at 102.6 Milliseconds			



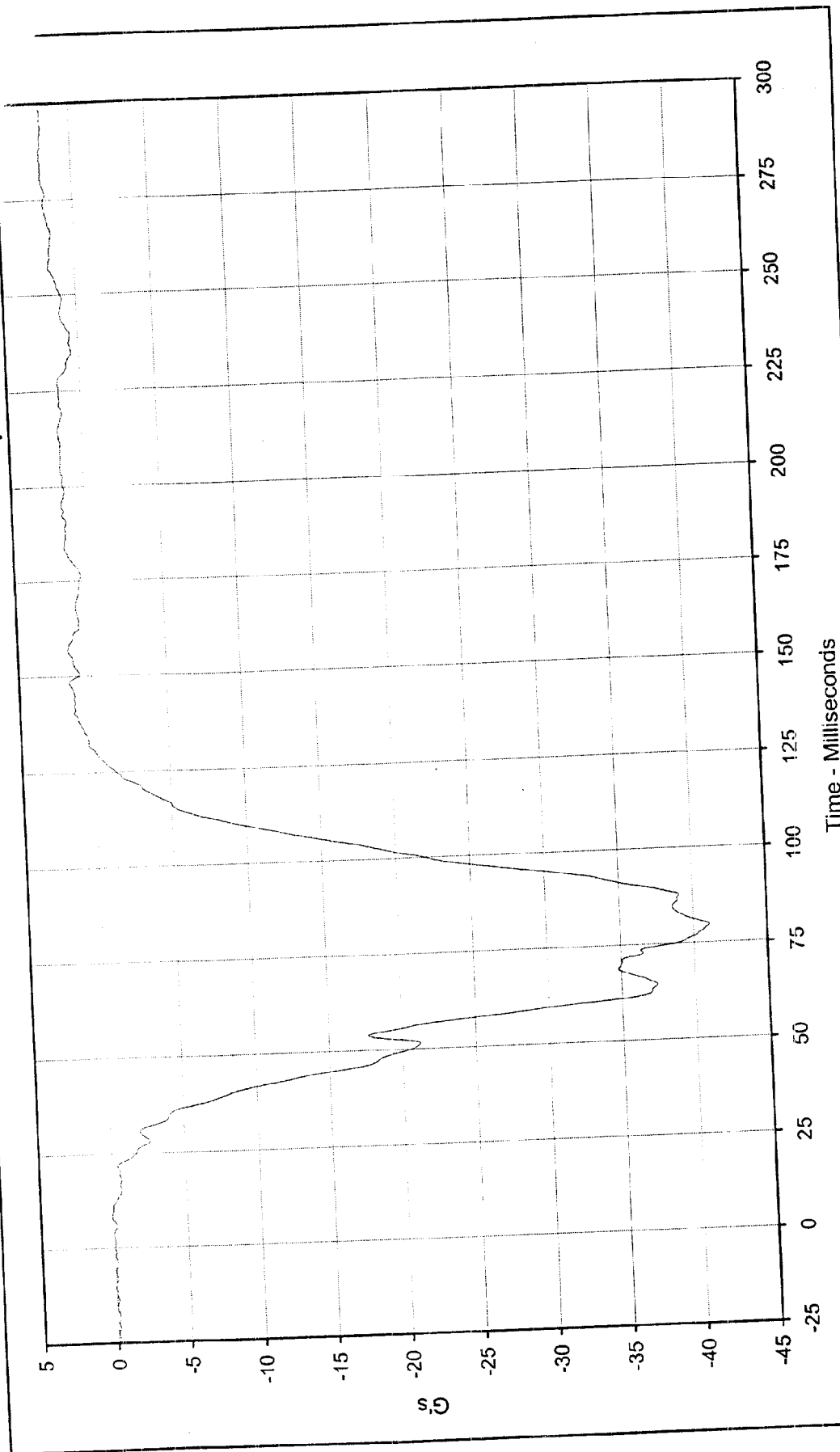
SAE Filter Class:	180
Date of Test:	11/20/98
Curve Number:	FIL-015



Curve Description: Driver Chest Resultant Primary
 Maximum Value: 42.2 at 79.8 Milliseconds
 Minimum Value: 0.1 at 3.9 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: RES-013

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

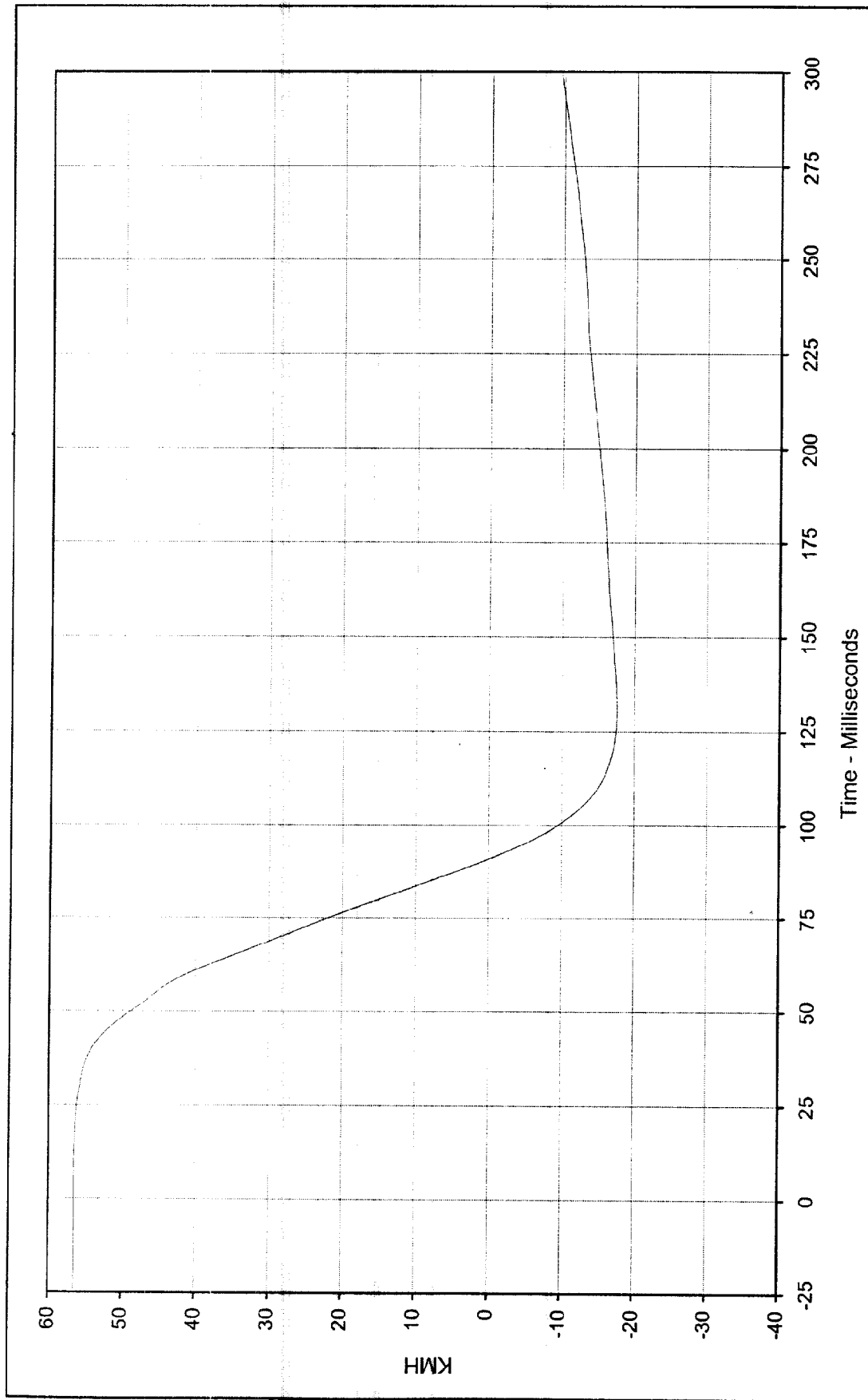




Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL 1 4 Door Sedan

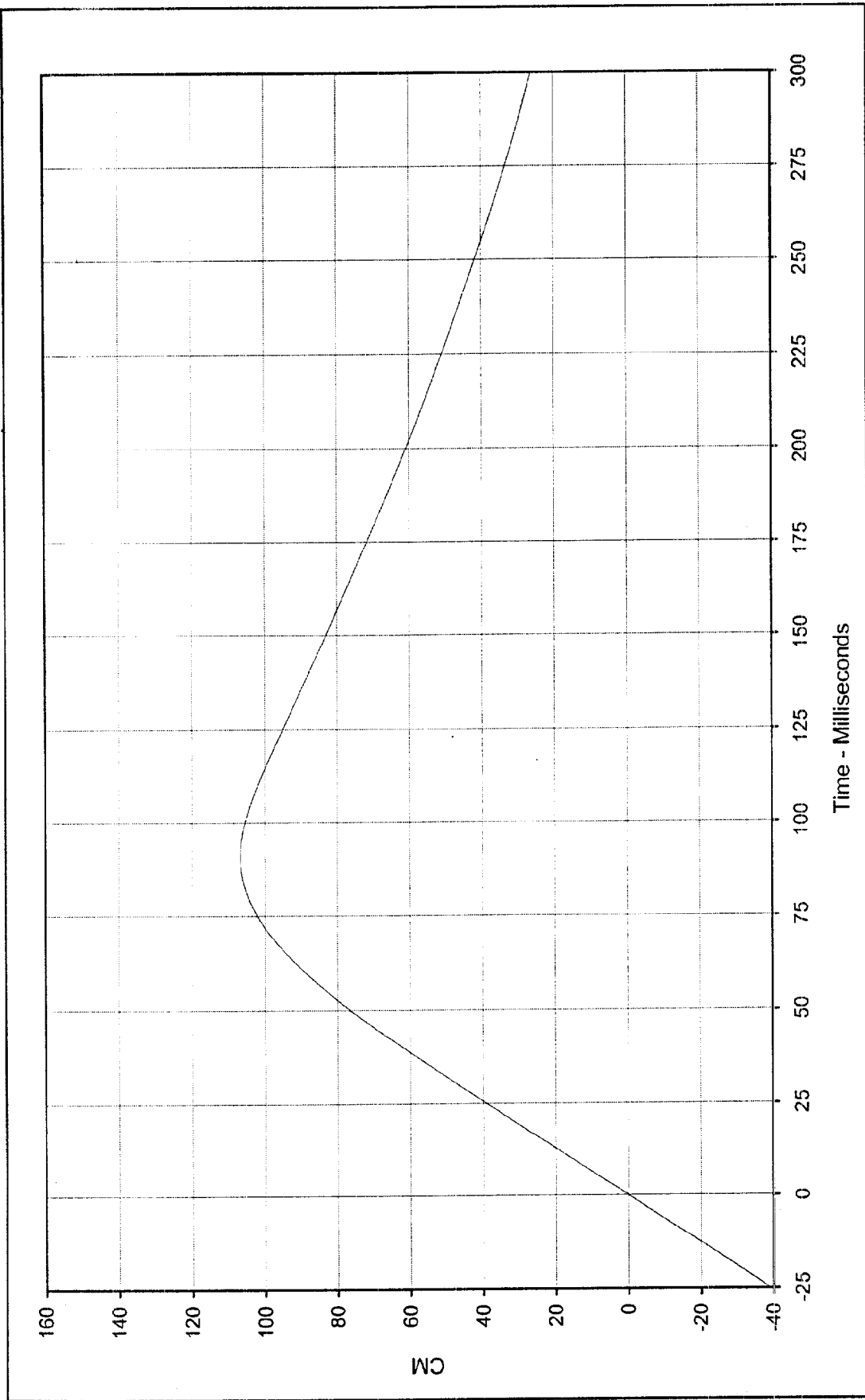


Curve Description: Driver Chest Redundant X
 Maximum Value: 2.2 at 287.7 Milliseconds
 Minimum Value: -41.1 at 79.6 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: FIL-016



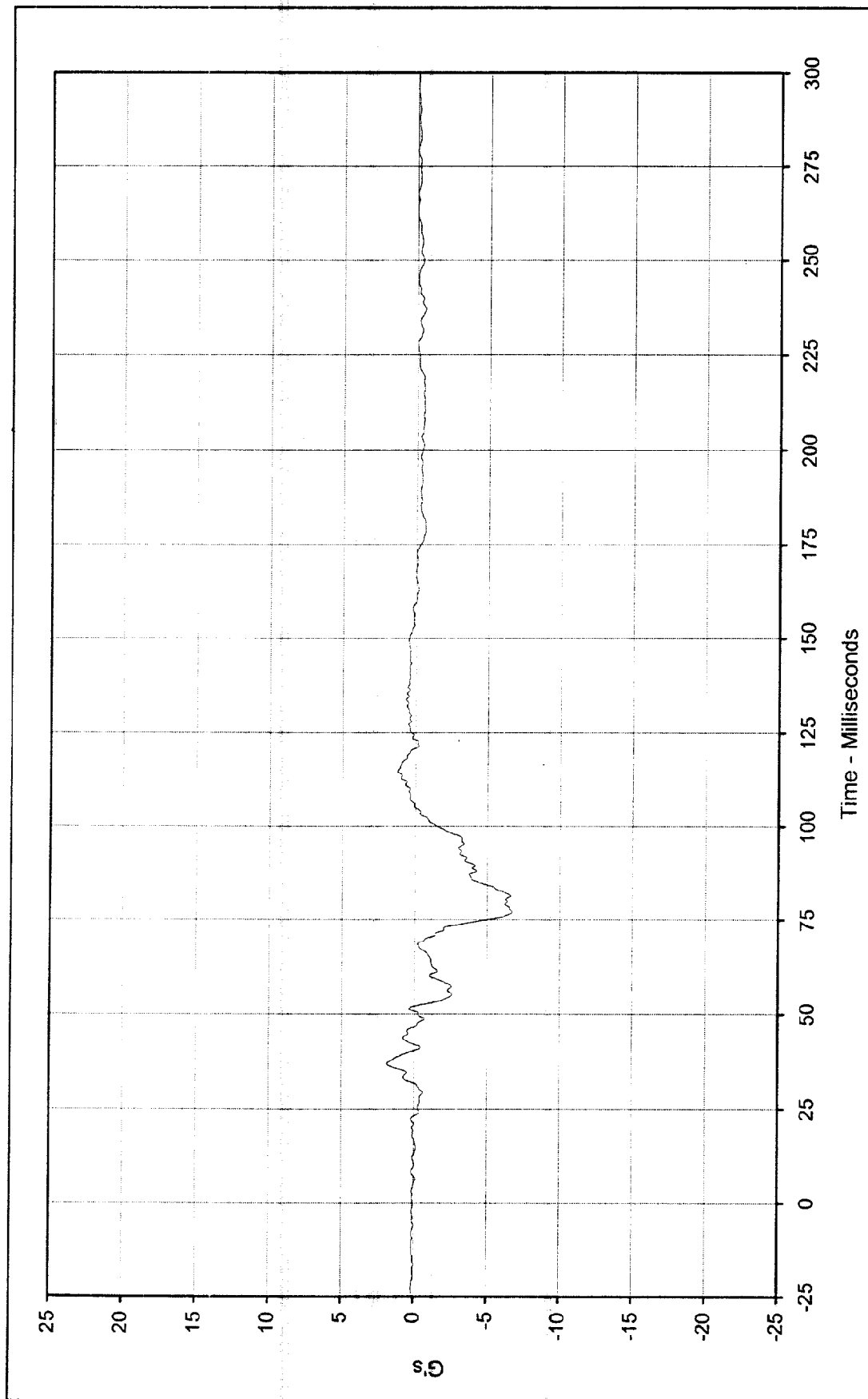
Curve Description:	Driver Chest Redundant X Velocity	Testing Program	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	56.5	at	4.5	Milliseconds
Minimum Value:	-17.6	at	130.7	Milliseconds
SAE Filter Class:	180	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Date of Test:	11/20/98			
Curve Number:	IN1-016			





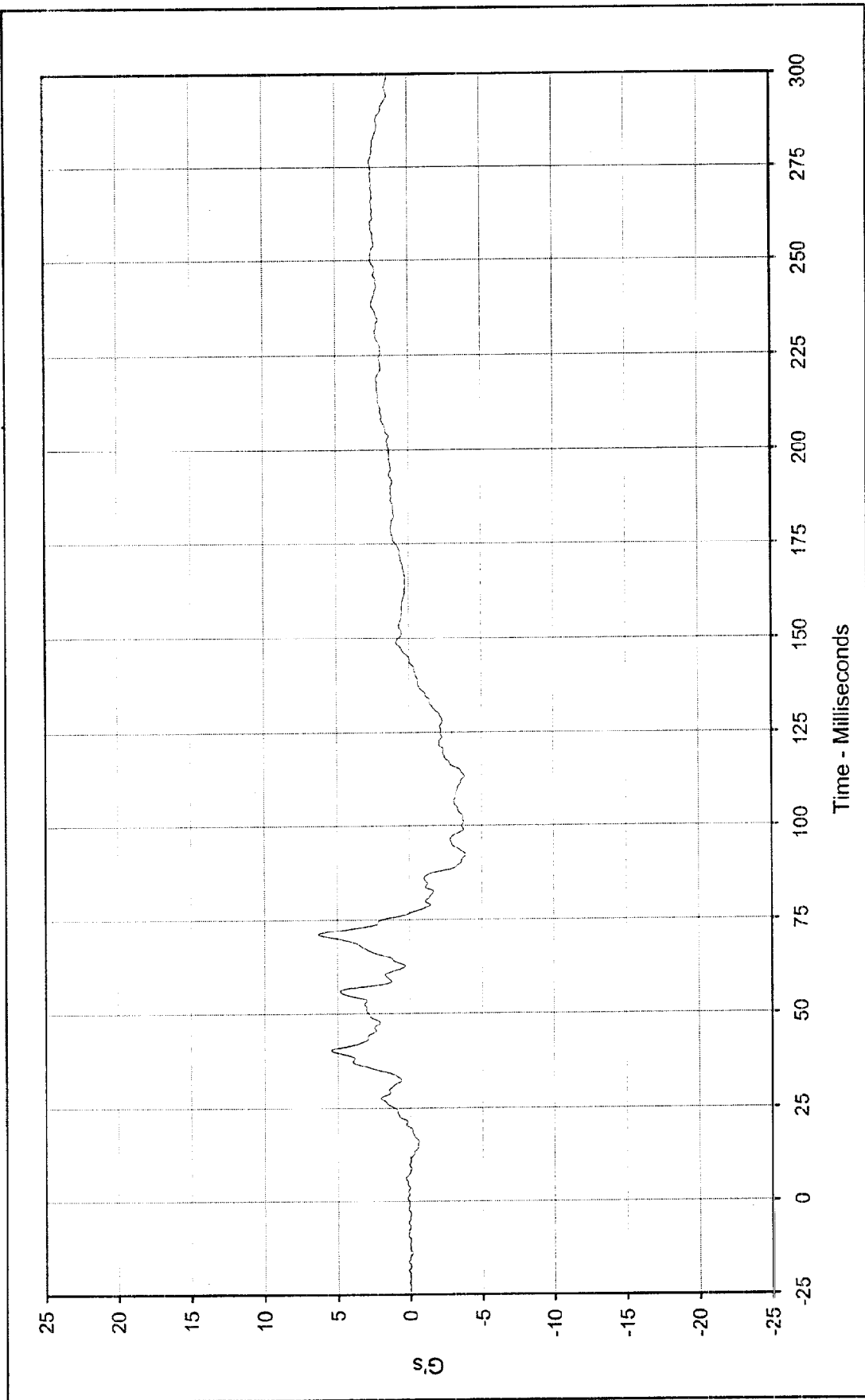
Curve Description:	Driver Chest Redundant X Displ.	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	106.7	at	90.8	Milliseconds
Minimum Value:	0.0	at	0.0	Milliseconds
SAE Filter Class:	180			
Date of Test:	11/20/98			
Curve Number:	IN2-016			
		Test Vehicle:	1999 Saturn SL1 4 Door Sedan	





Curve Description:	Driver Chest Redundant Y	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	1.8 at 36.9 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-6.7 at 77.0 Milliseconds			
SAE Filter Class:	180			
Date of Test:	11/20/98			
Curve Number:	FIL-017			

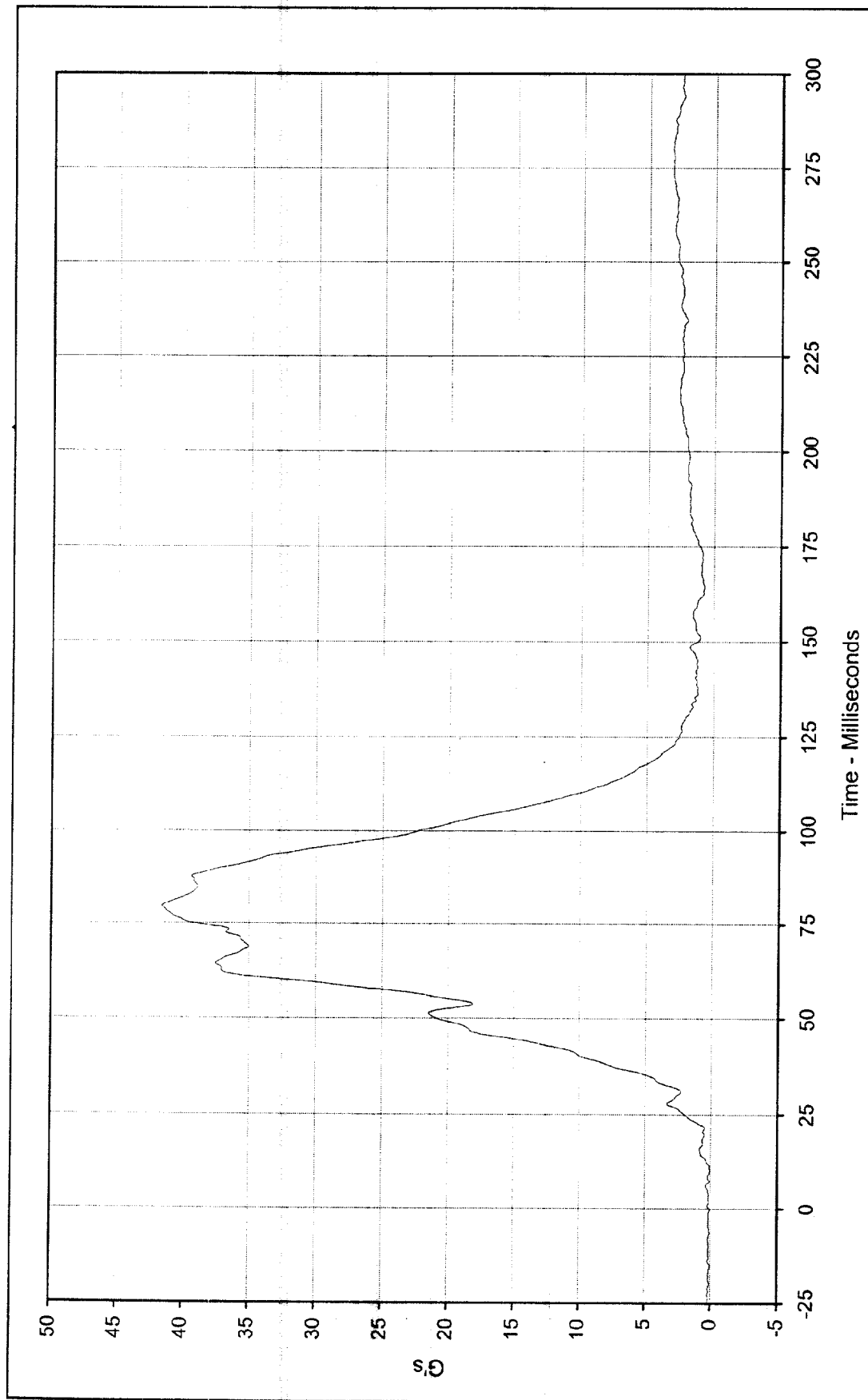




Curve Description: Driver Chest Redundant Z
 Maximum Value: 6.3 at 70.9 Milliseconds
 Minimum Value: -3.9 at 92.1 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: FIL-018

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

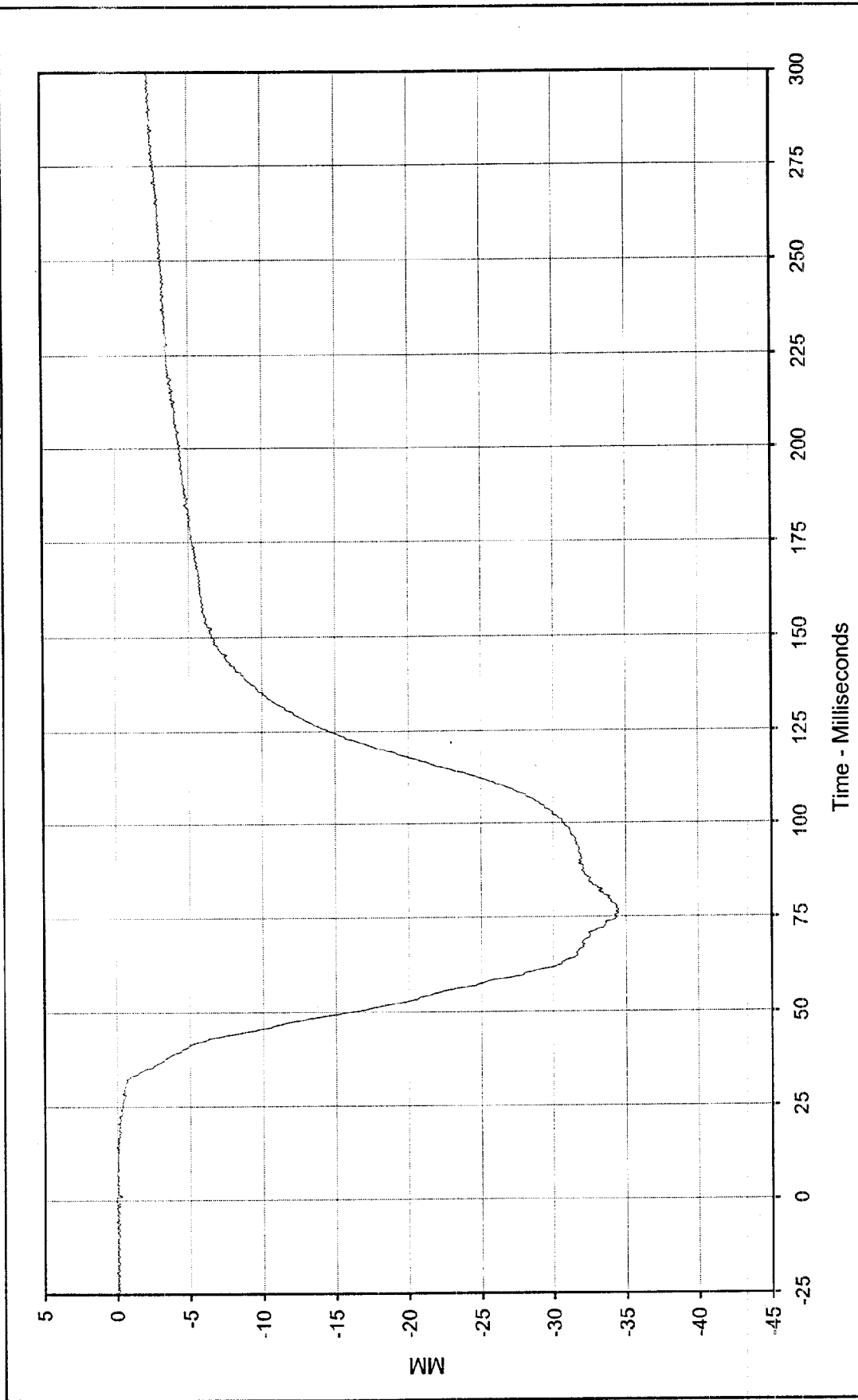




Curve Description: Driver Chest Resultant Redundant
 Maximum Value: 41.6 at 79.7 Milliseconds
 Minimum Value: 0.0 at 10.2 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: RES-016

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL 1 4 Door Sedan





Curve Description: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Program: 1999 Saturn SL1 4 Door Sedan

Maximum Value: 0.1 at 0.0 Milliseconds

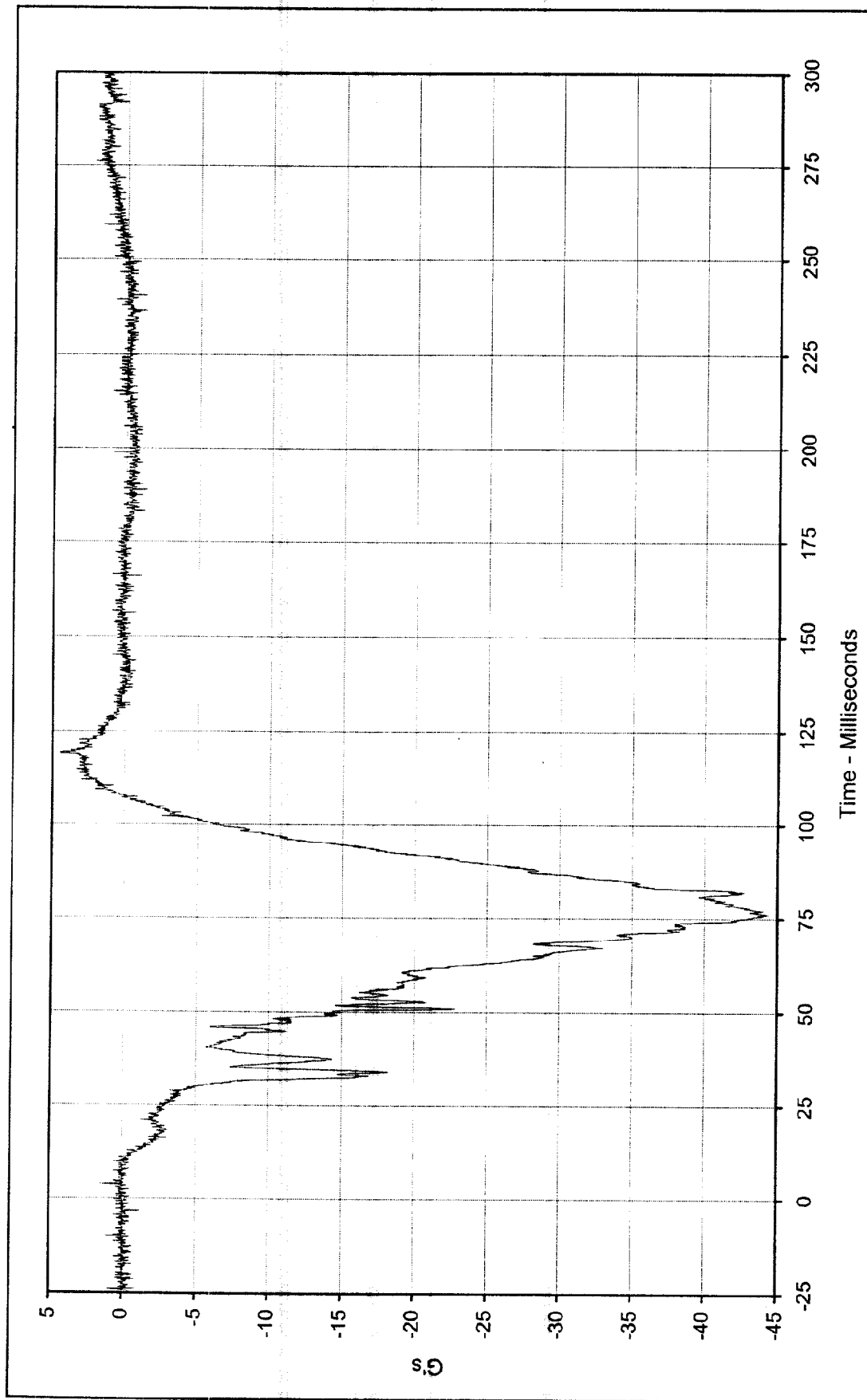
Minimum Value: -34.5 at 76.7 Milliseconds

SAE Filter Class: 600

Date of Test: 11/20/98

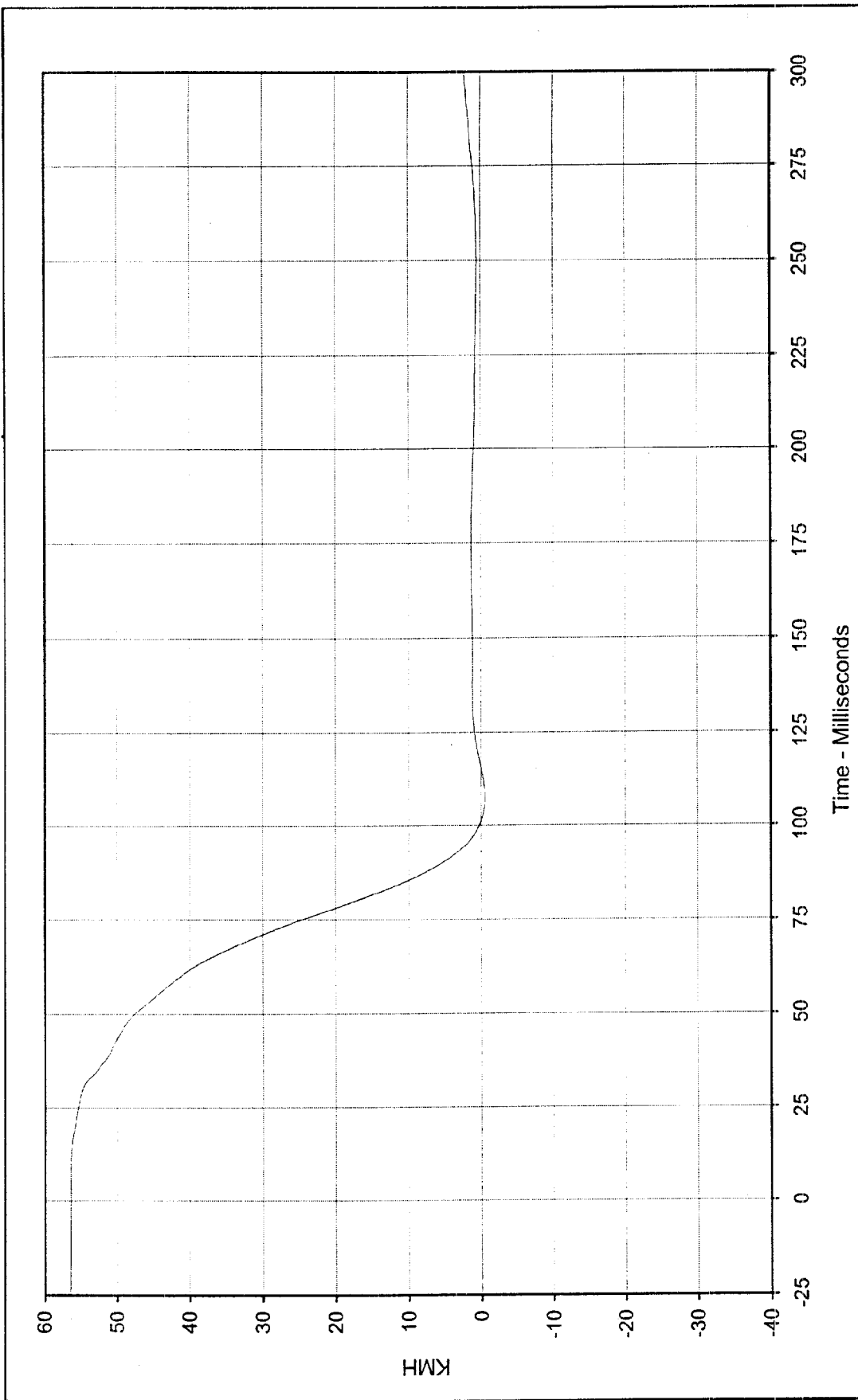
Curve Number: FIL-019





Curve Description:	Driver Pelvis X		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	4.4	at 118.9	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-44.4	at 76.0			
SAE Filter Class:	1000				
Date of Test:	11/20/98				
Curve Number:	FIL-020				

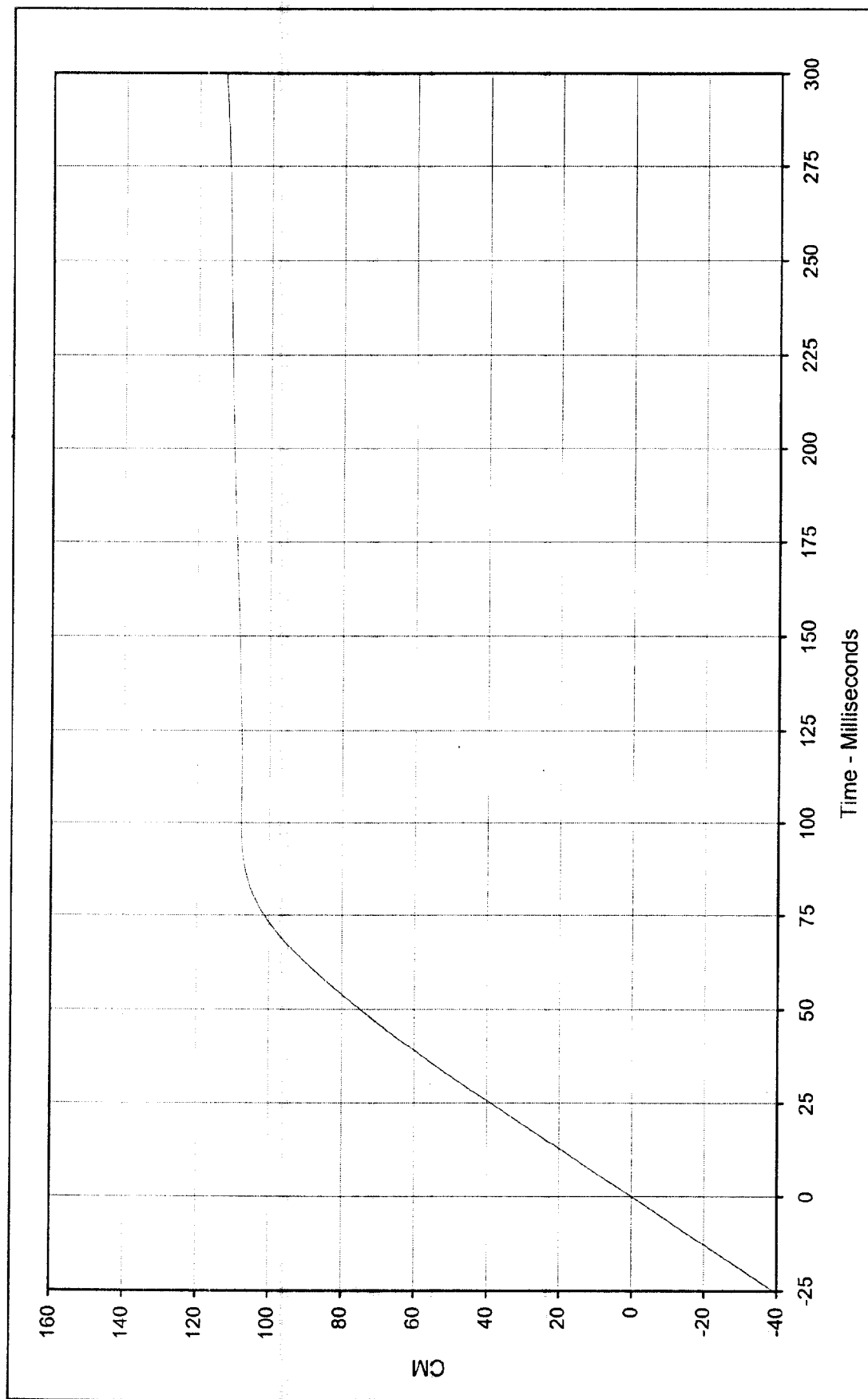




Curve Description: Testing Program 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

Driver Pelvis X Velocity
 Maximum Value: 56.5 at 7.5 Milliseconds
 Minimum Value: -0.5 at 107.6 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: IN1-020





Curve Description: Driver Pelvis X Displ. Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Maximum Value: 112.8 at 299.9 Milliseconds Test Vehicle: 1999 Saturn SL1 4 Door Sedan

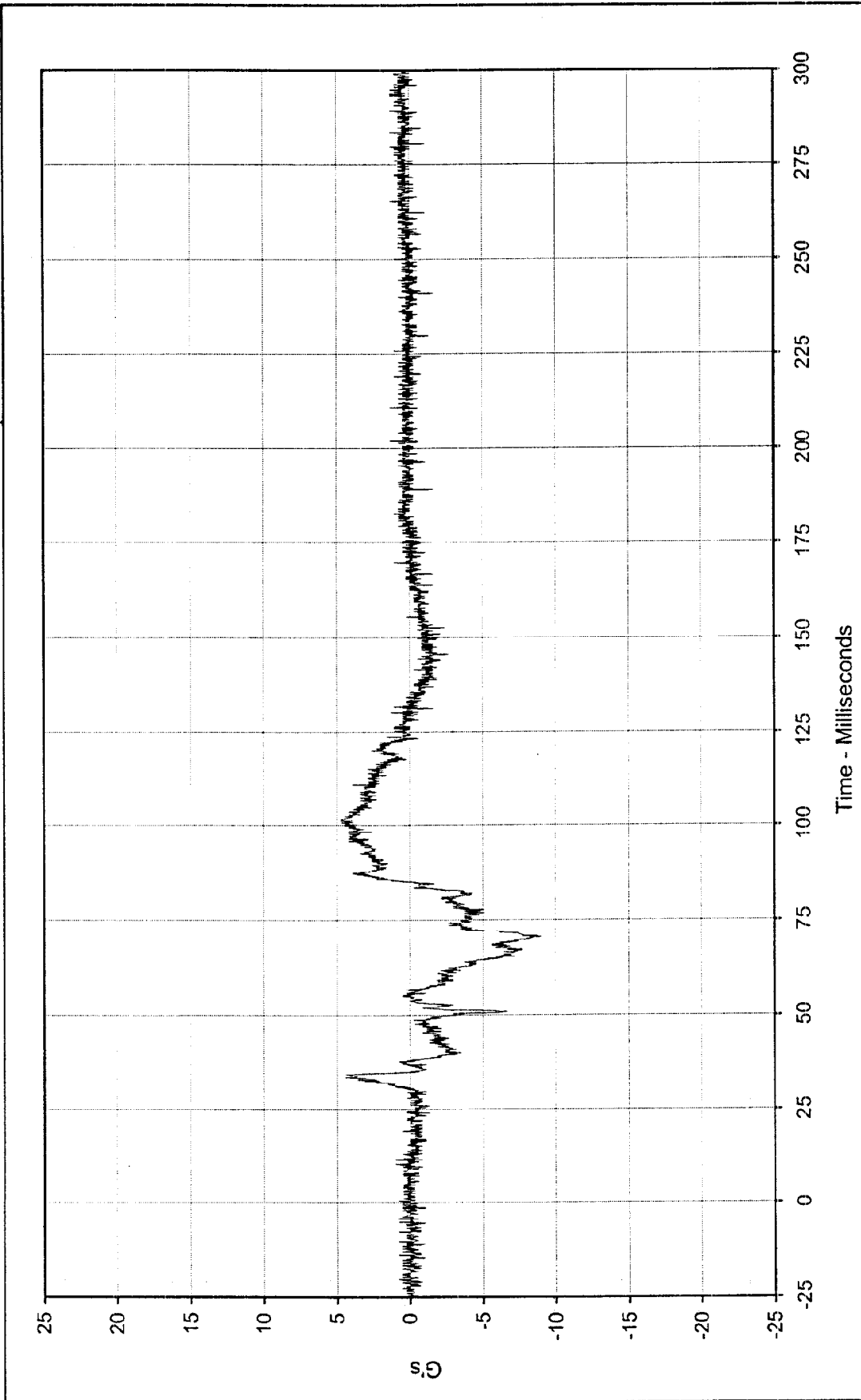
Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

Date of Test: 11/20/98

Curve Number: IN2-020

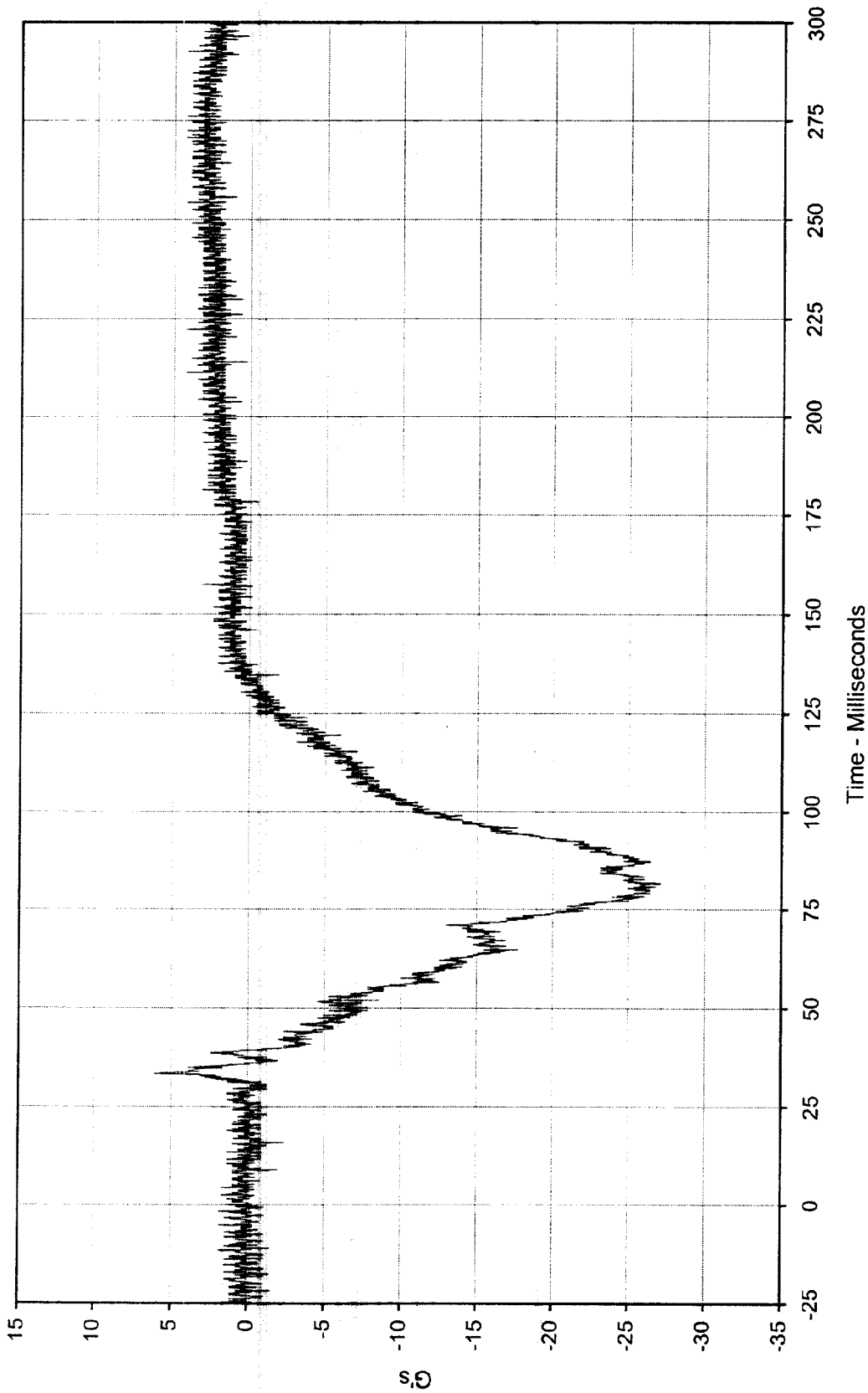




Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

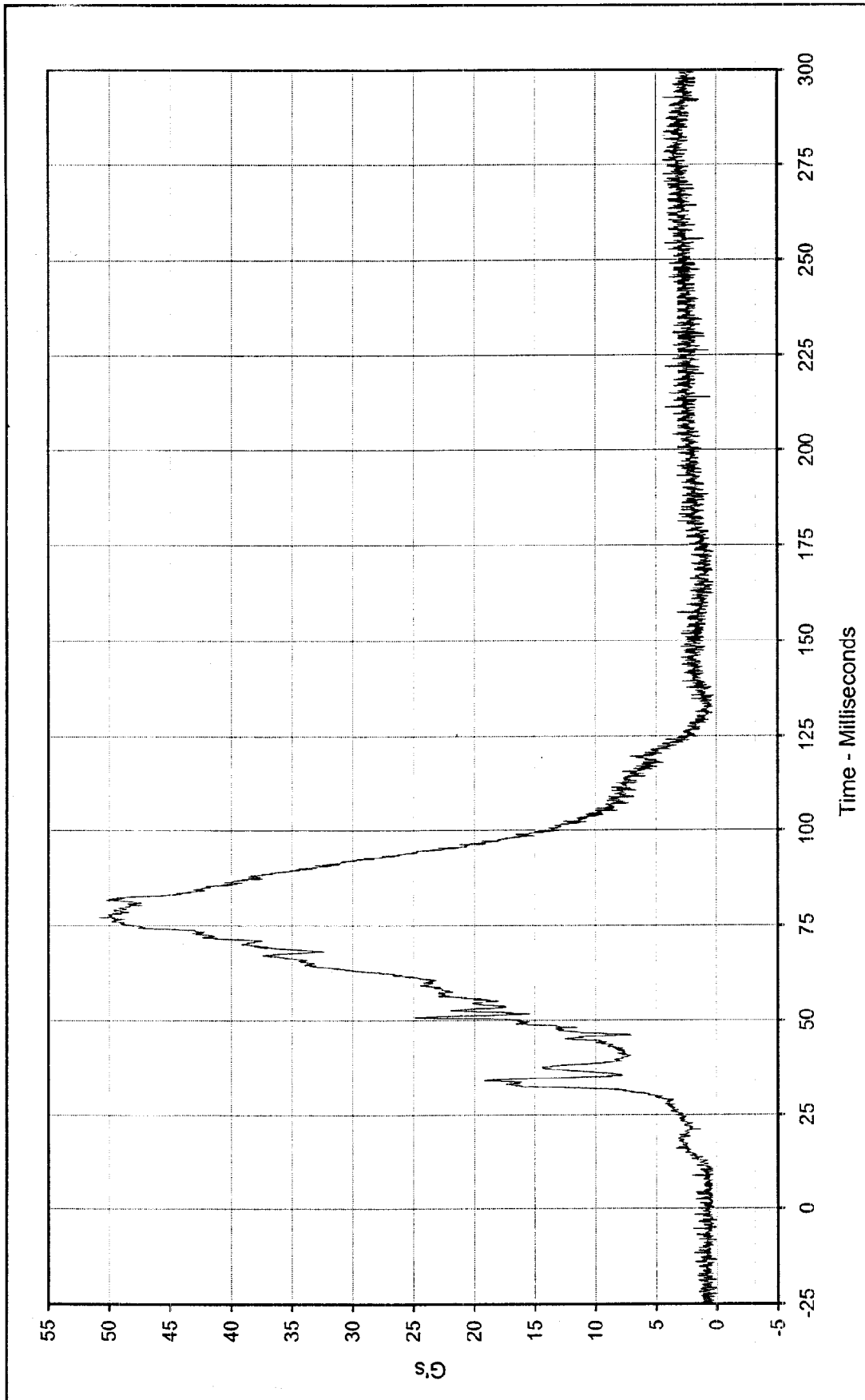
Curve Description: Driver Pelvis Y
 Maximum Value: 4.7 at 100.6 Milliseconds
 Minimum Value: -9.0 at 70.4 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-021





Curve Description:	Driver Pelvis Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	6.0 at 33.3 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-27.2 at 81.5 Milliseconds			
SAE Filter Class:	1000			
Date of Test:	11/20/98			
Curve Number:	FIL-022			

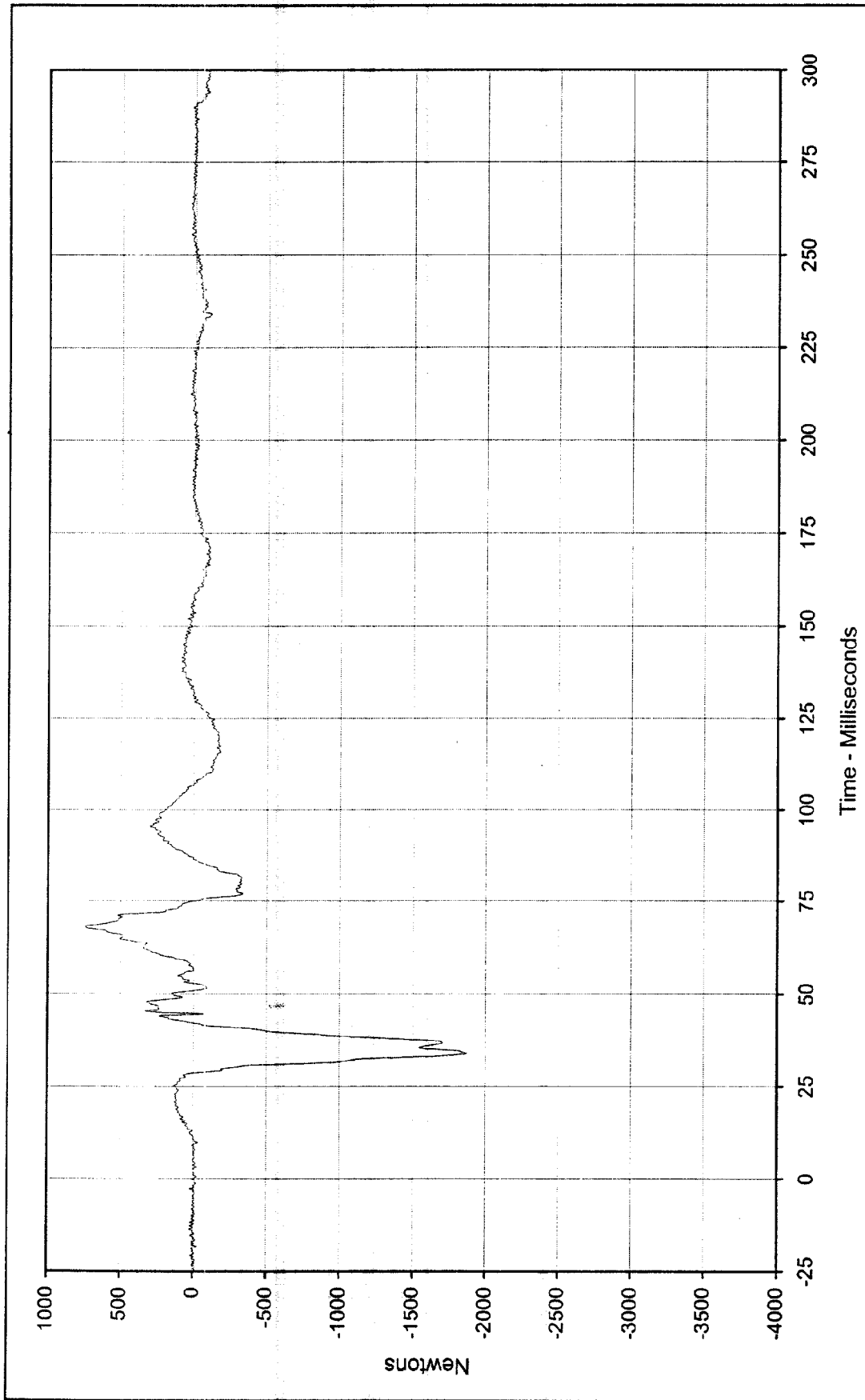




Curve Description:	Driver Pelvis Resultant	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	50.8 at 77.1 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	0.2 at 135.6 Milliseconds			



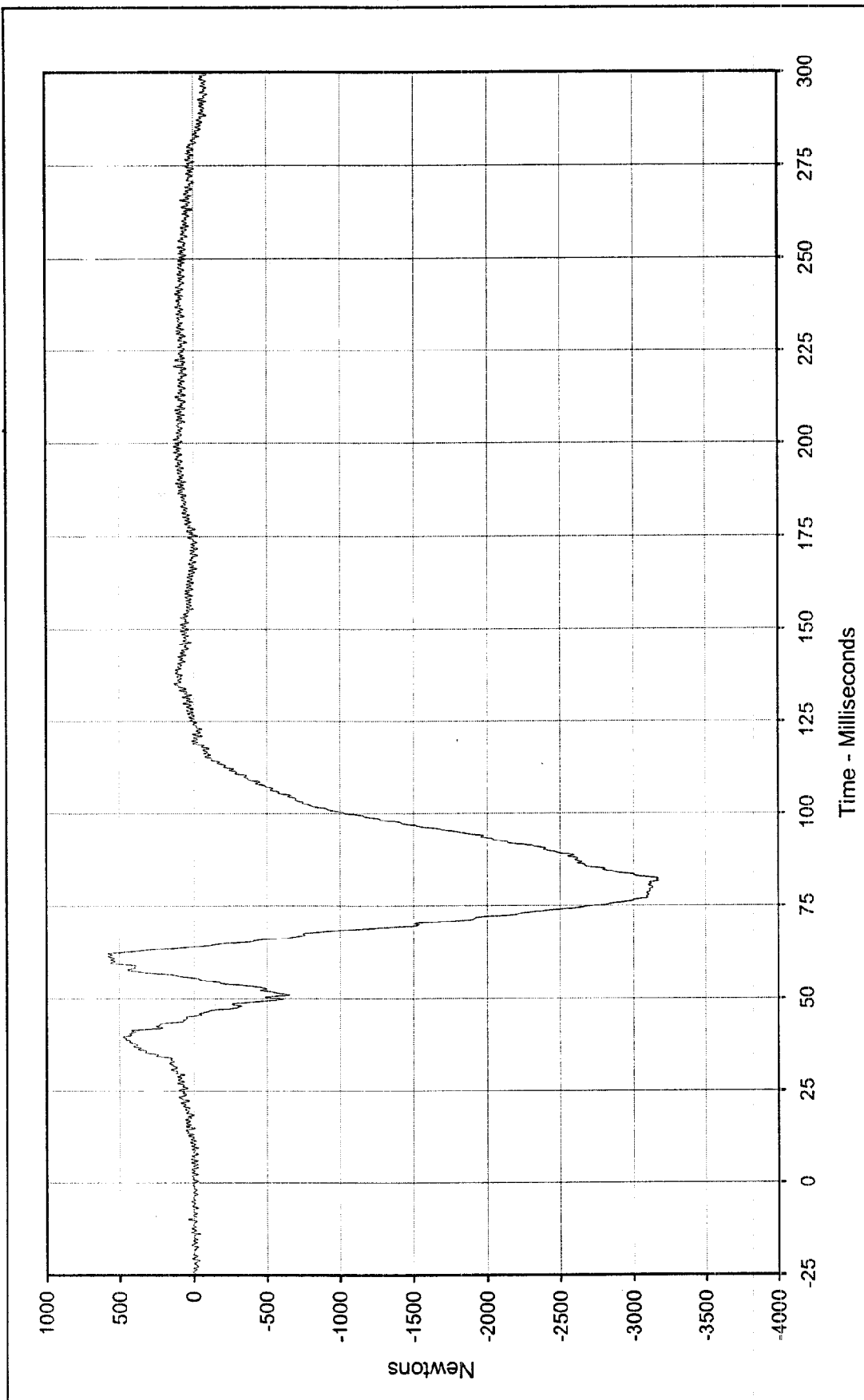
SAE Filter Class:	1000
Date of Test:	11/20/98
Curve Number:	RES-020



Curve Description: Driver Left Femur Force
 Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

Maximum Value: 739.5 at 68.2 Milliseconds
 Minimum Value: -1877.3 at 33.9 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-023

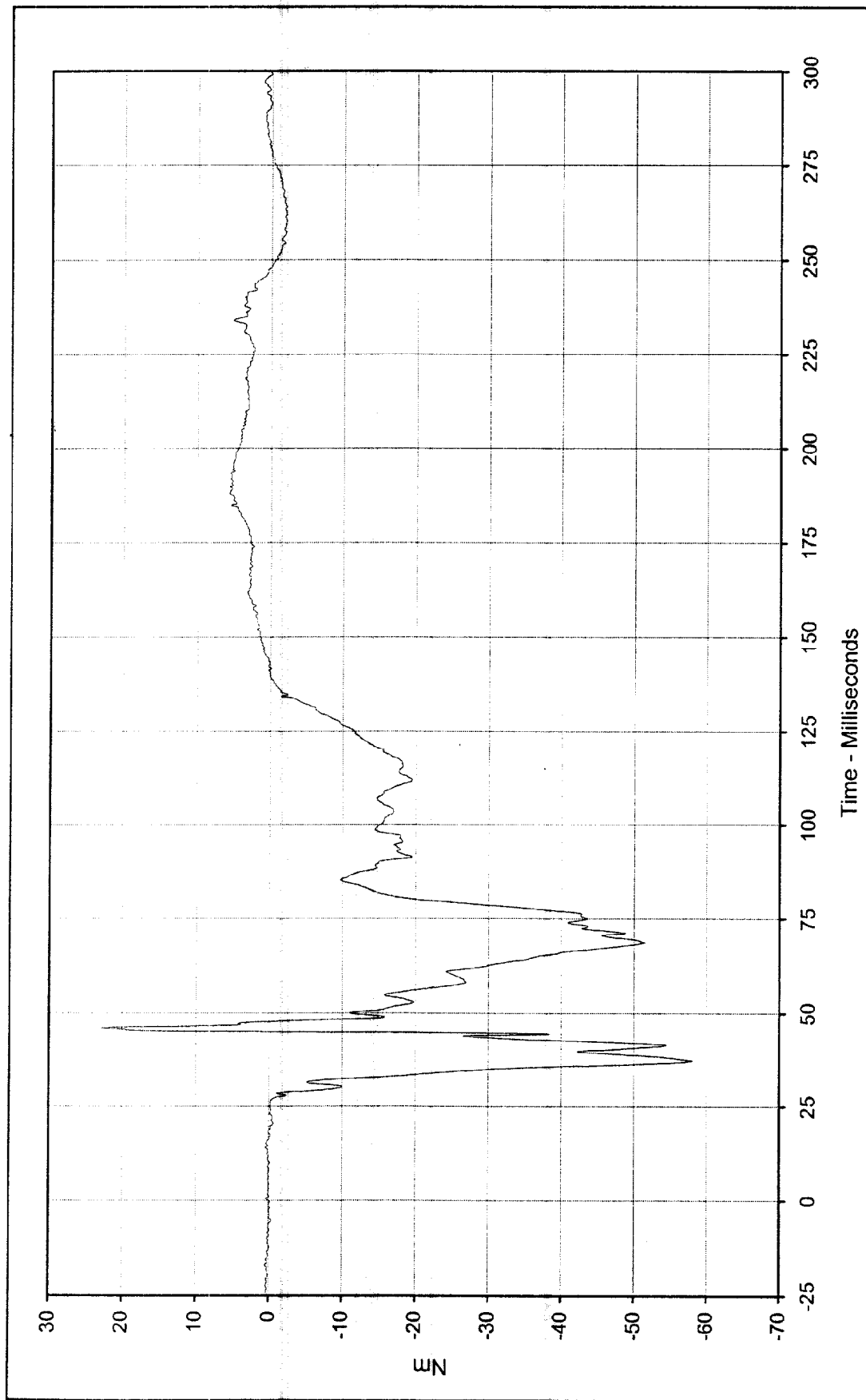




Curve Description: Driver Right Femur Force
 Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

Maximum Value: 578.4 at 61.3 Milliseconds
 Minimum Value: -3177.6 at 81.5 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-024

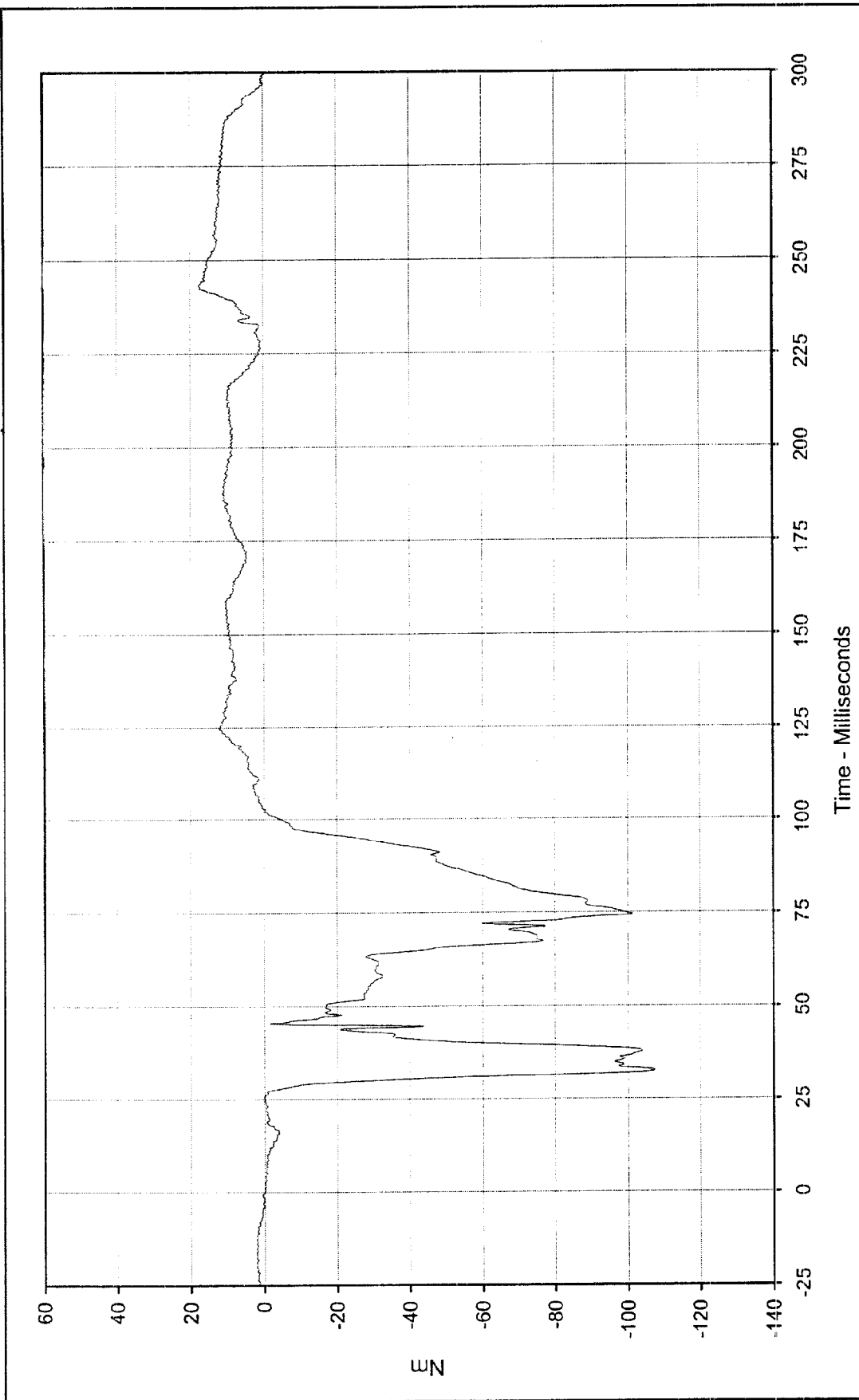




Curve Description:	Driver Left Upper Tibia Moment X		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	22.9	at 46.0 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-58.2	at 37.2 Milliseconds			
SAE Filter Class:	600				
Date of Test:	11/20/98				
Curve Number:	FIL-025				



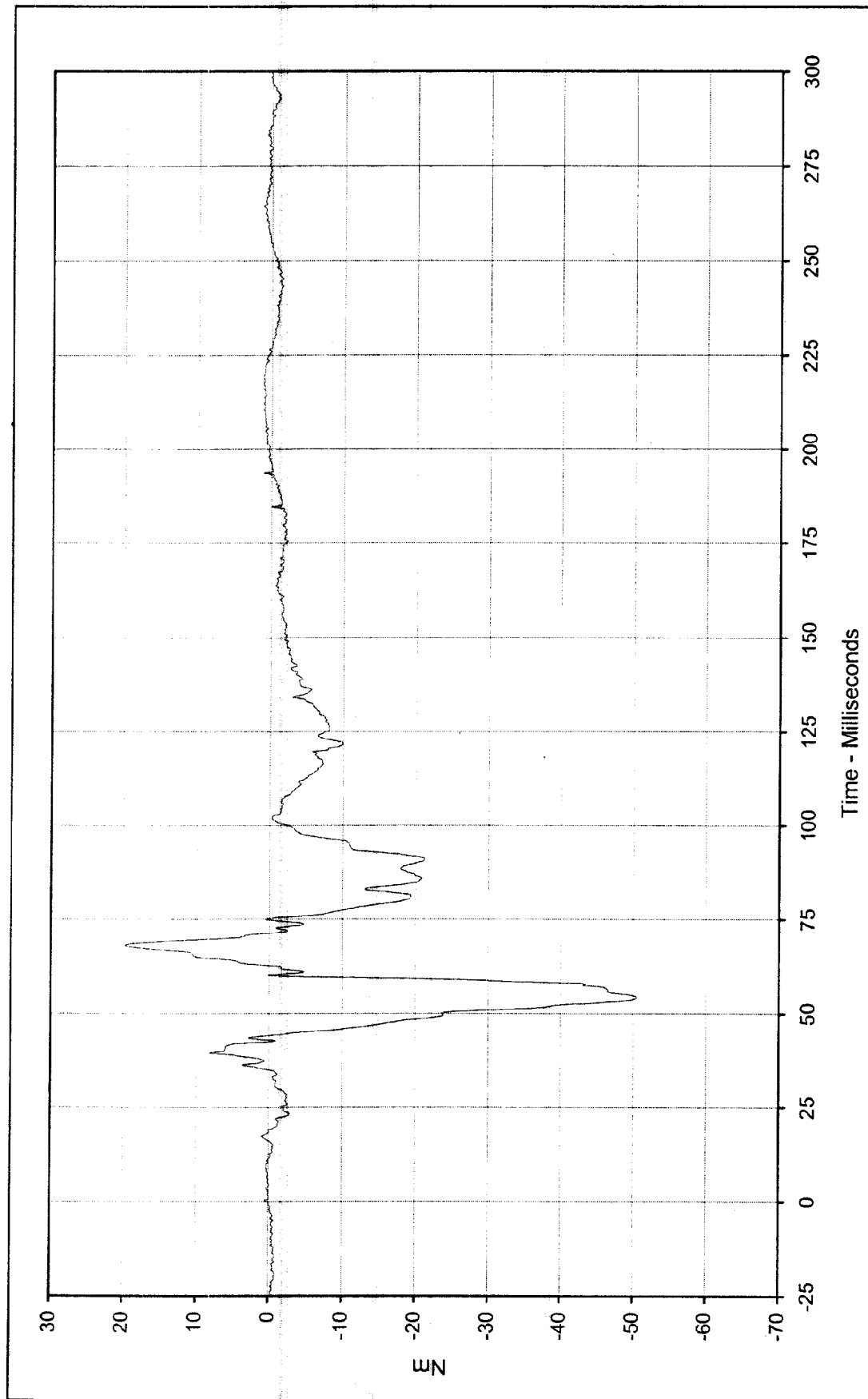




Curve Description:	Driver Left Upper Tibia Moment Y	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	17.6 at 243.4 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-107.5 at 32.5 Milliseconds			



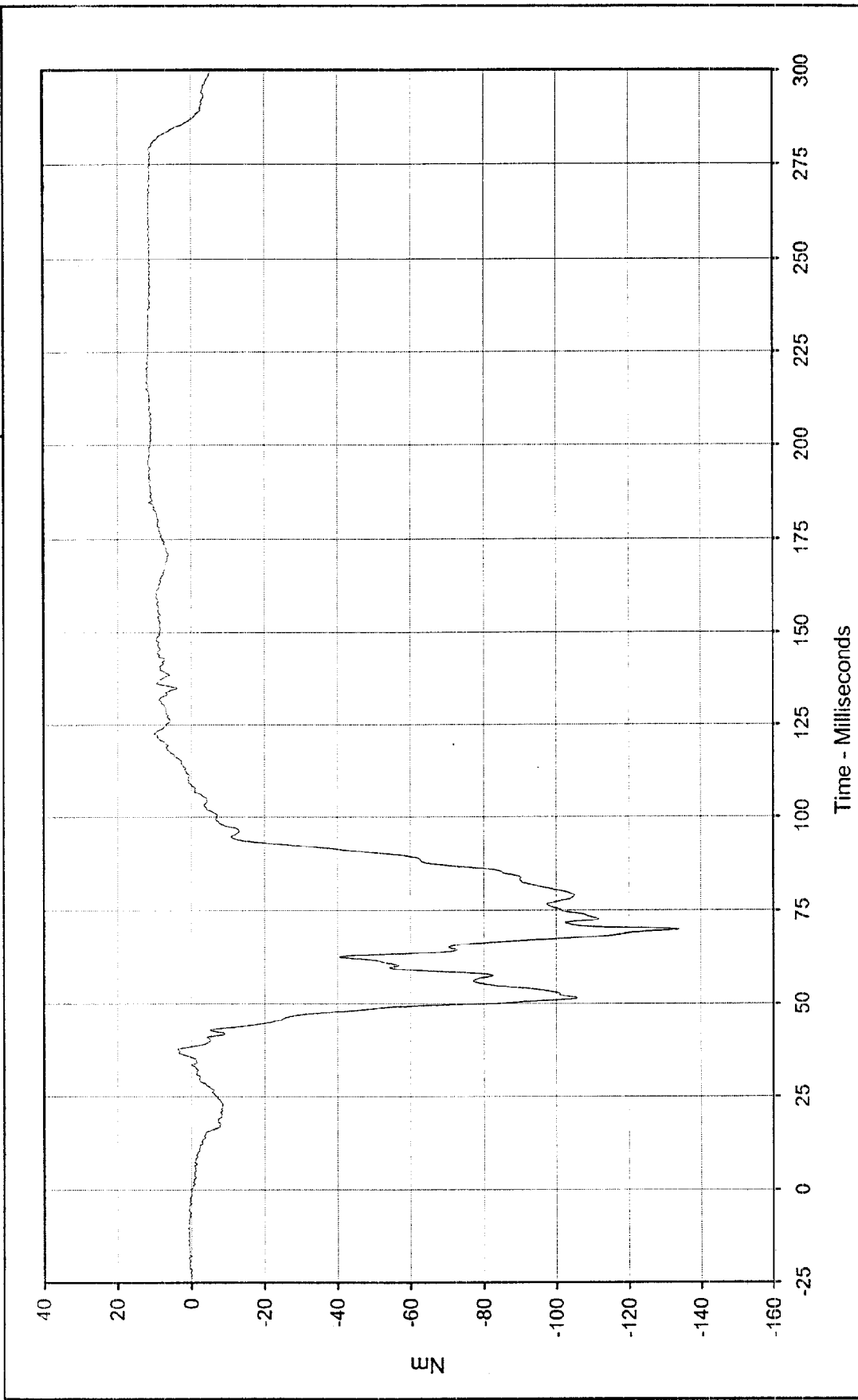
SAE Filter Class:	600
Date of Test:	11/20/98
Curve Number:	FIL-026



Curve Description: Driver Right Upper Tibia Moment X
 Maximum Value: 19.7 at 68.0 Milliseconds
 Minimum Value: -50.5 at 54.3 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-027

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

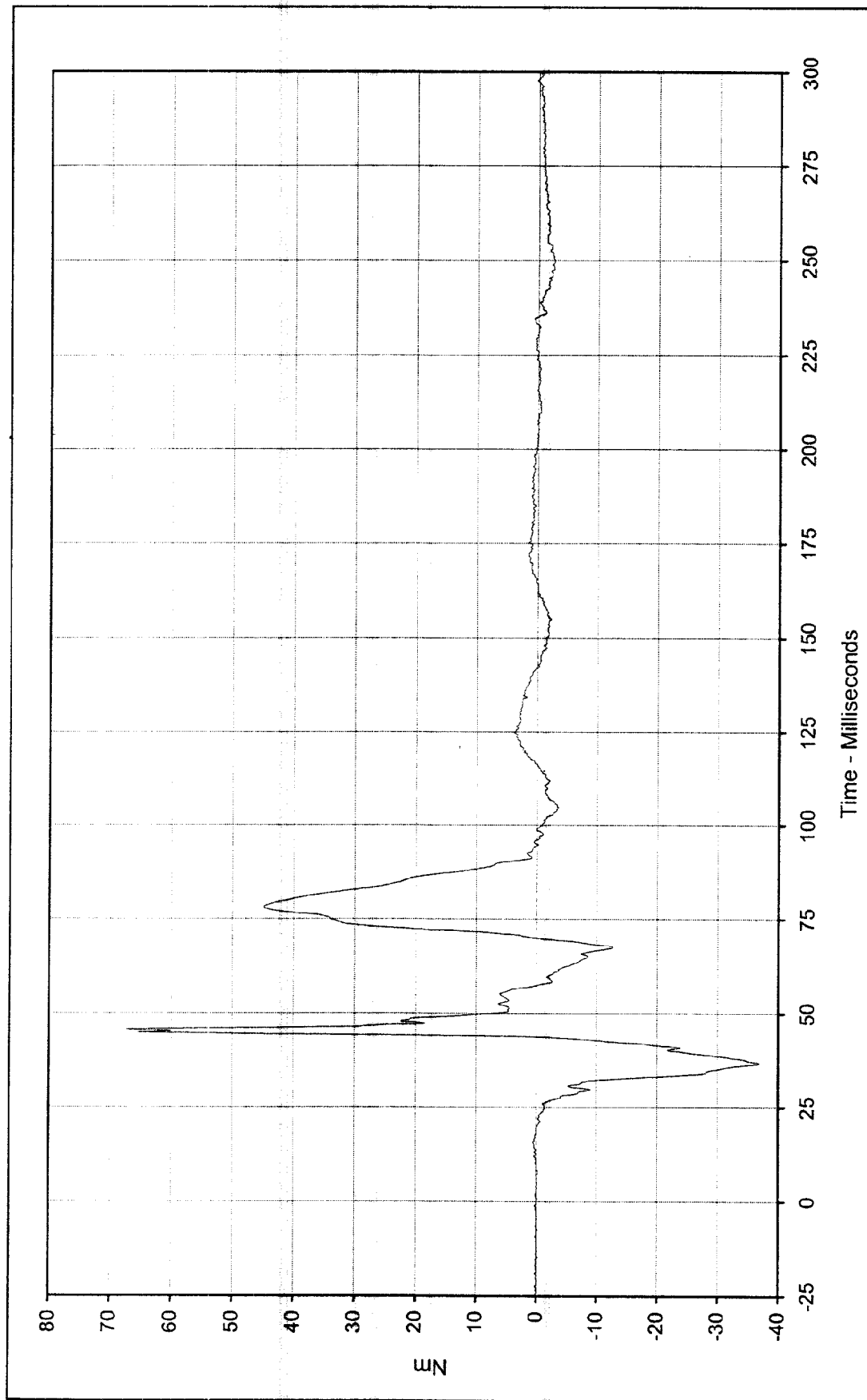




Curve Description: Driver Right Upper Tibia Moment Y
 Maximum Value: 12.3 at 220.4 Milliseconds
 Minimum Value: -134.0 at 69.9 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-028

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

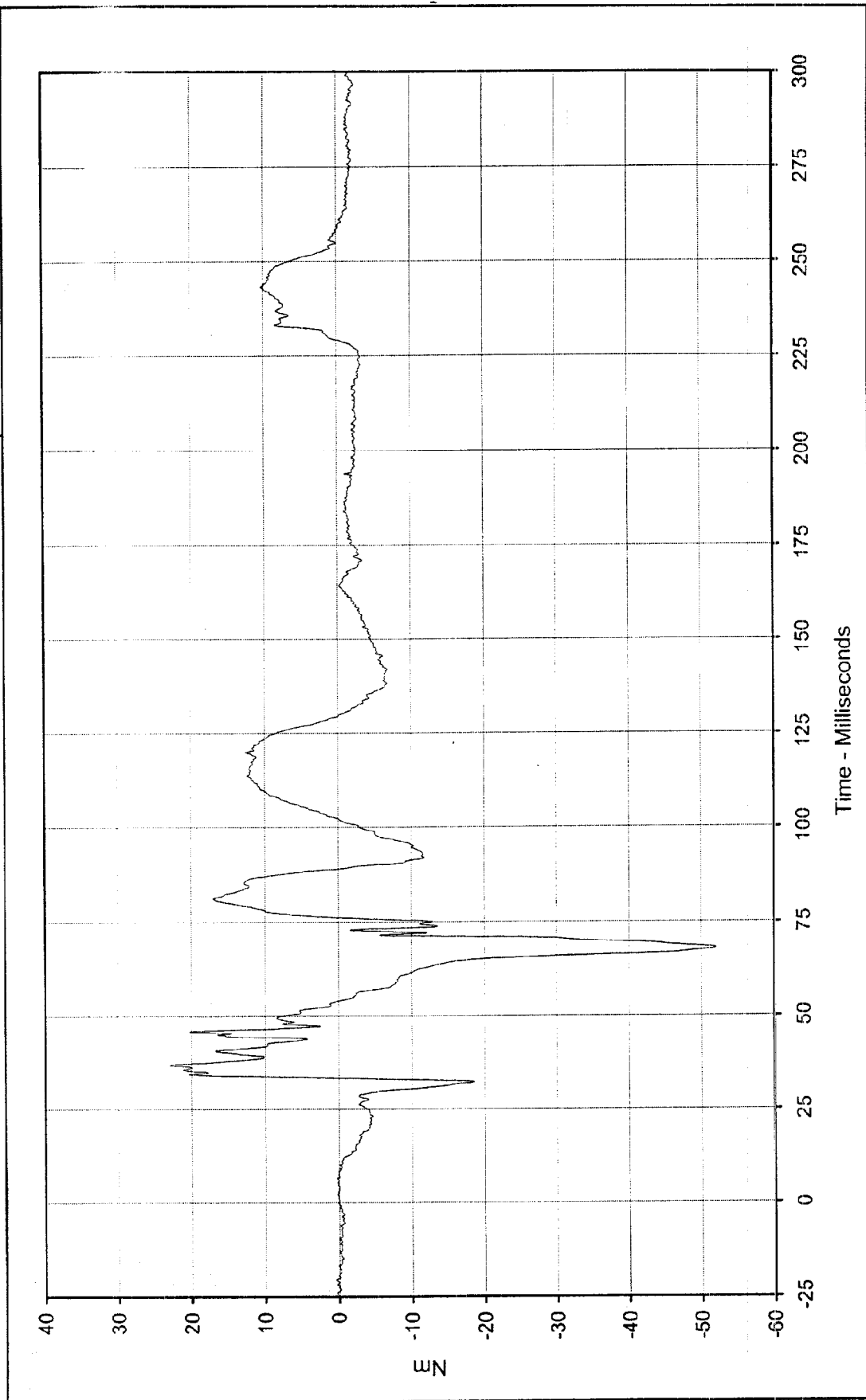




Curve Description:	Driver Left Lower Tibia Moment X		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	67.1	at 45.7 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-37.0	at 36.8 Milliseconds			
SAE Filter Class:	600				
Date of Test:	11/20/98				
Curve Number:	FIL-029				



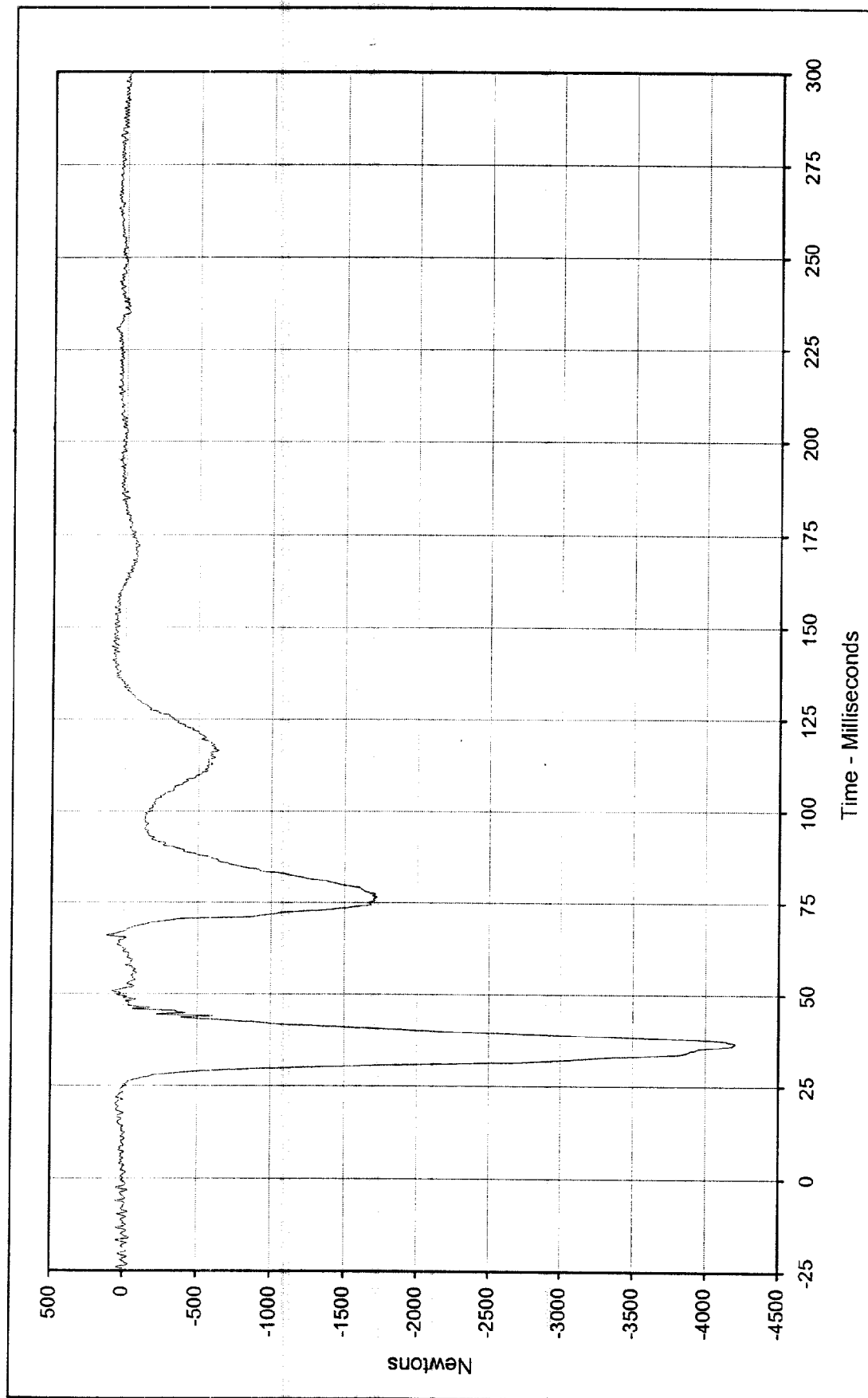




Curve Description: Driver Left Lower Tibia Moment Y
 Maximum Value: 22.9 at 36.8 Milliseconds
 Minimum Value: -52.1 at 67.8 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-030

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Driver Left Lower Tibia Force Z Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Maximum Value: 120.4 at 66.1 Milliseconds Test Vehicle: 1999 Saturn SL1 4 Door Sedan

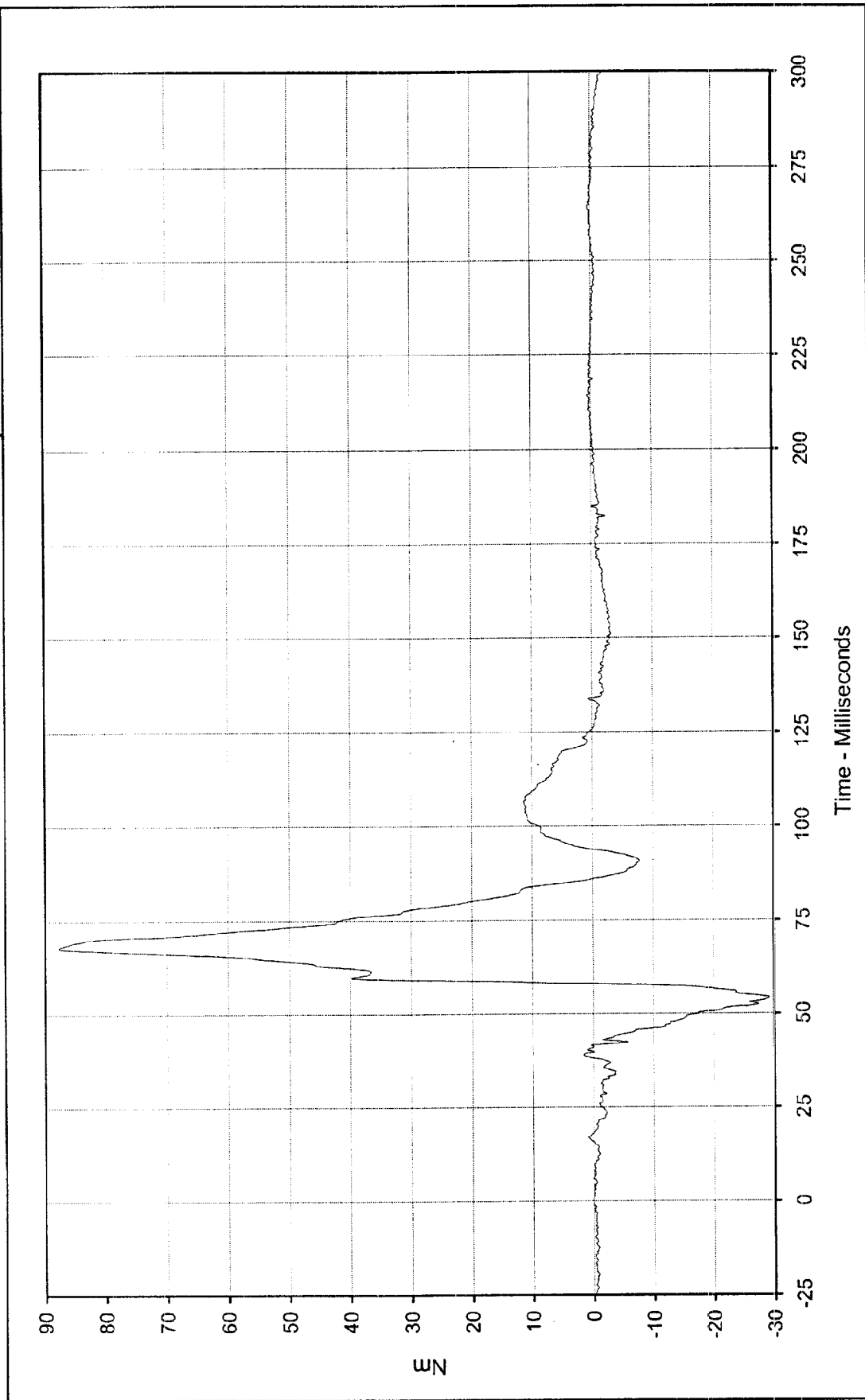
Minimum Value: -4207.0 at 36.6 Milliseconds

SAE Filter Class: 600

Date of Test: 11/20/98

Curve Number: FIL-031

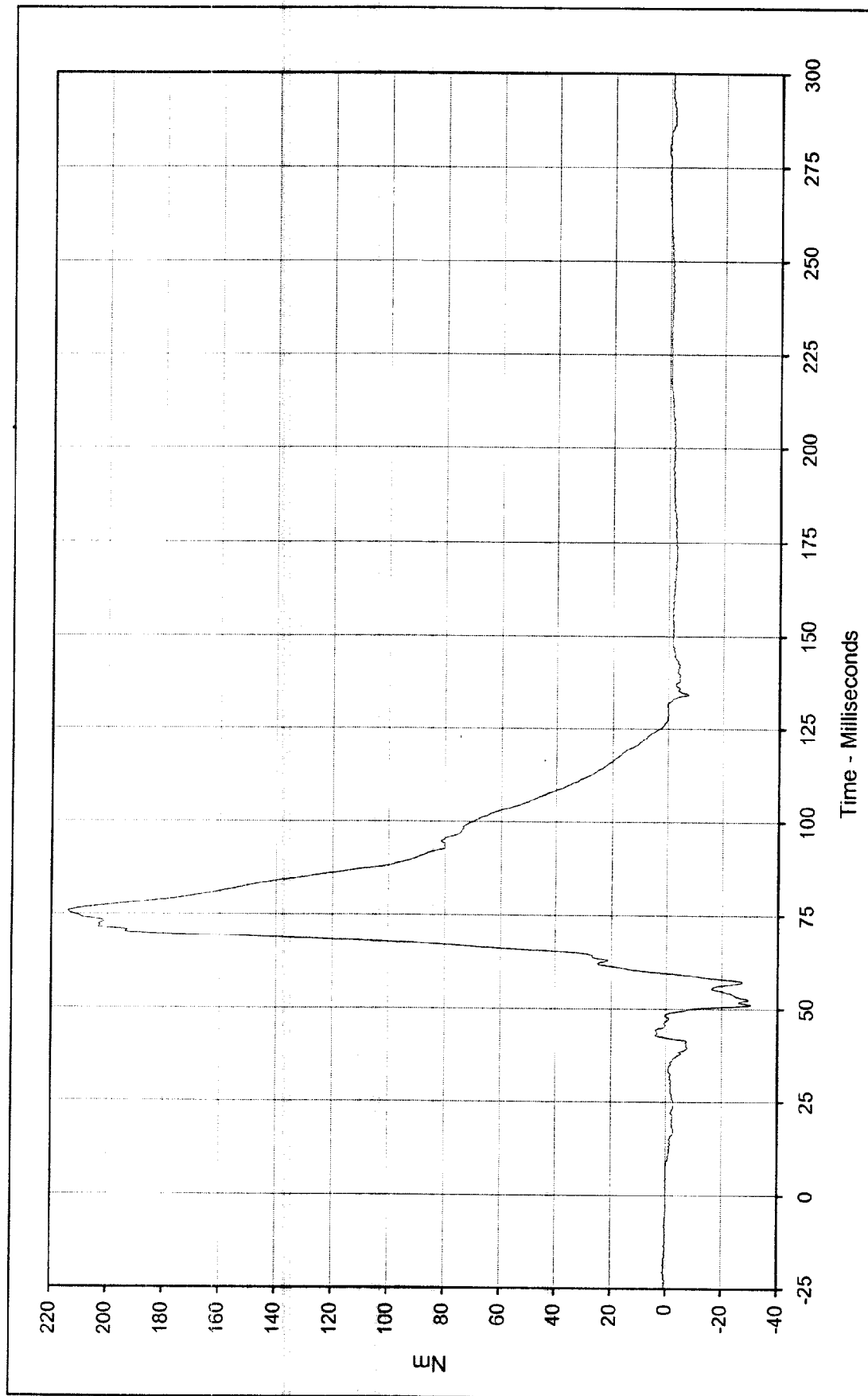




Curve Description: Driver Right Lower Tibia Moment X
 Maximum Value: 87.8 at 67.7 Milliseconds
 Minimum Value: -29.3 at 54.2 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-032

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





B-50

Curve Description: Driver Right Lower Tibia Moment Y

Maximum Value: 214.0 at 75.9 Milliseconds

Minimum Value: -30.5 at 51.1 Milliseconds

SAE Filter Class: 600

Date of Test: 11/20/98

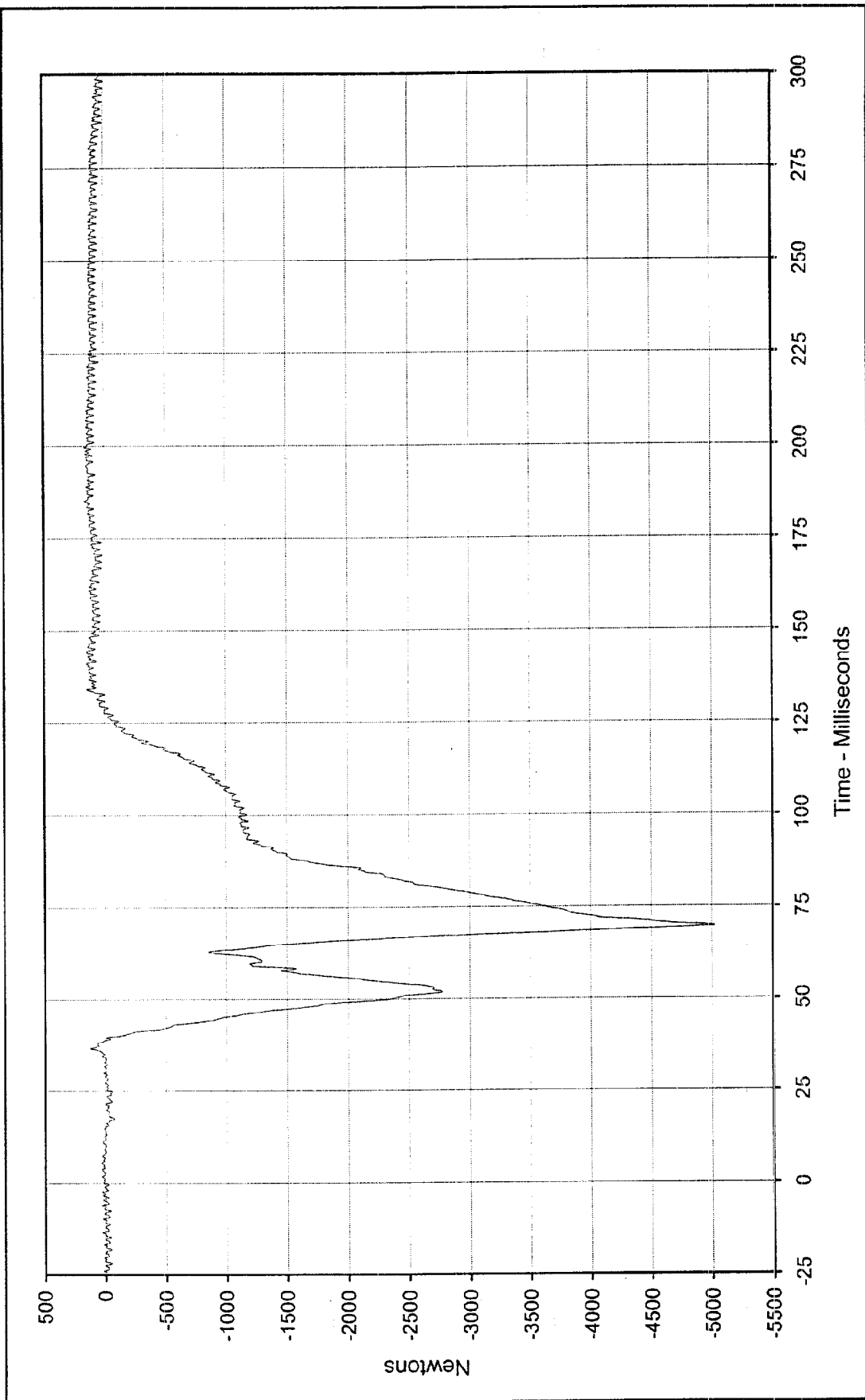
Curve Number: FIL-033

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan



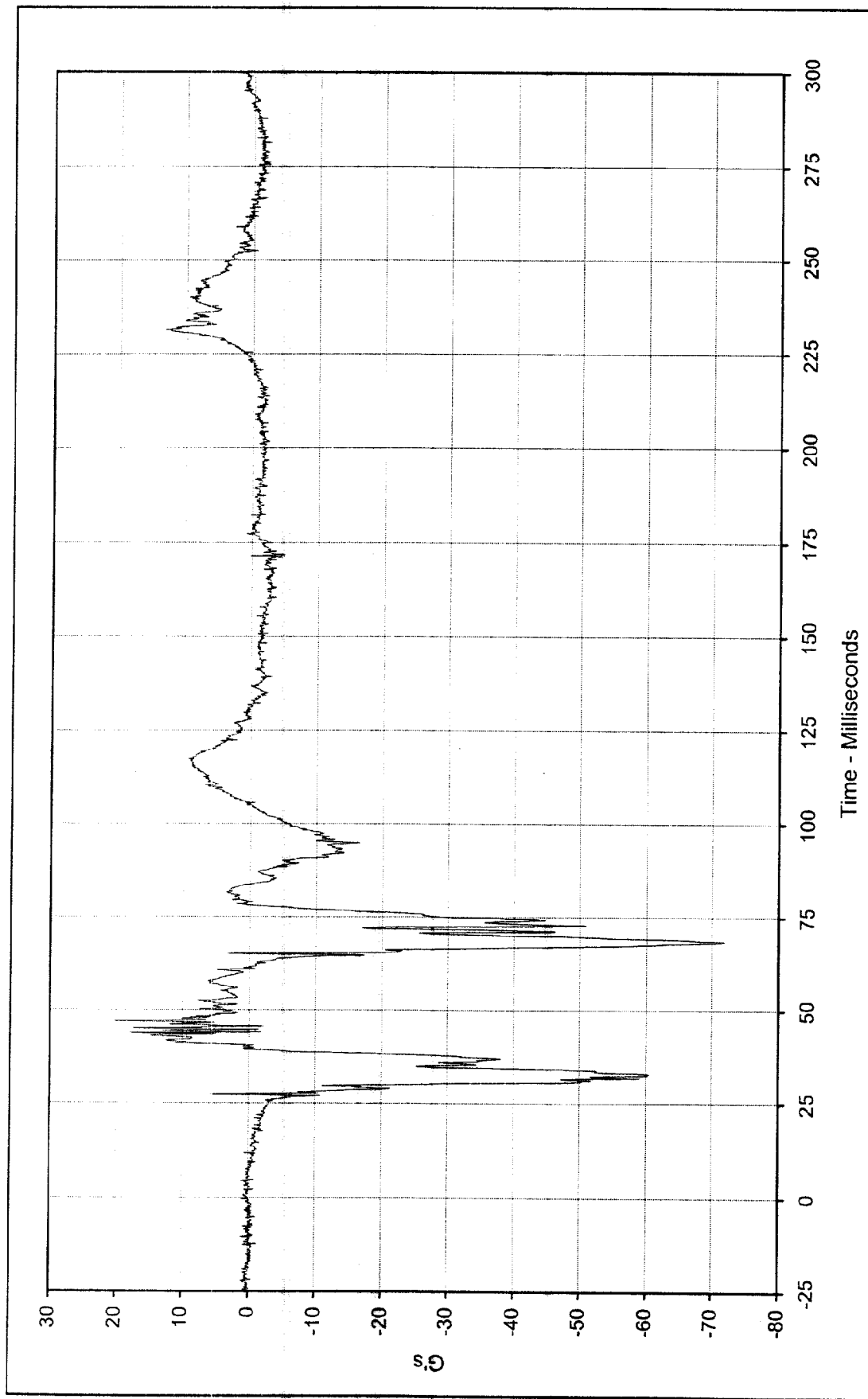
KAR99001-02



Curve Description: Driver Right Lower Tibia Force Z
 Maximum Value: 159.1 at 185.0 Milliseconds
 Minimum Value: -5026.9 at 69.8 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-034

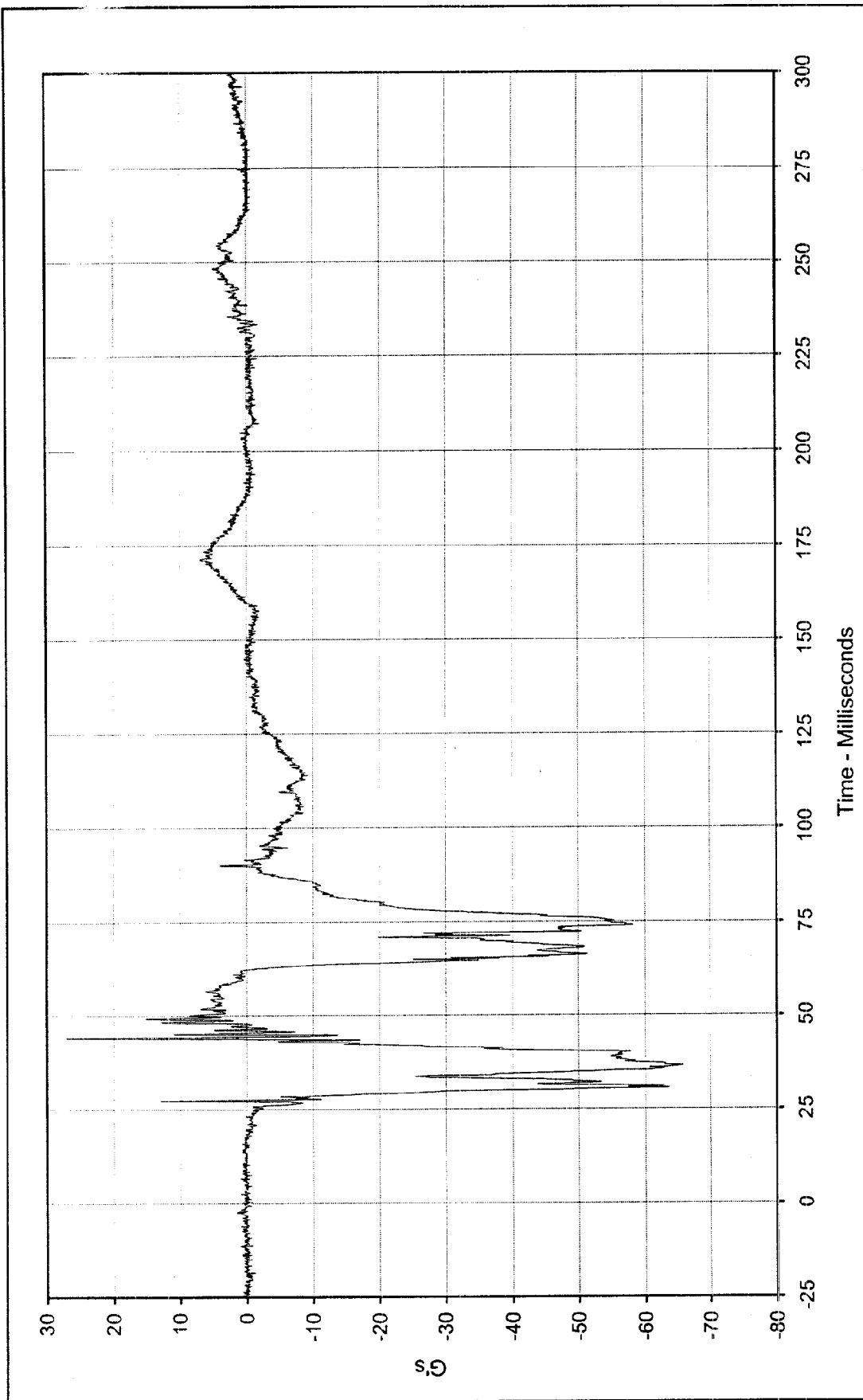
Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:	Driver Left Foot Aft X	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	20.2 at 47.0 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-71.9 at 68.3 Milliseconds			
SAE Filter Class:	1000			
Date of Test:	11/20/98			
Curve Number:	FIL-035			



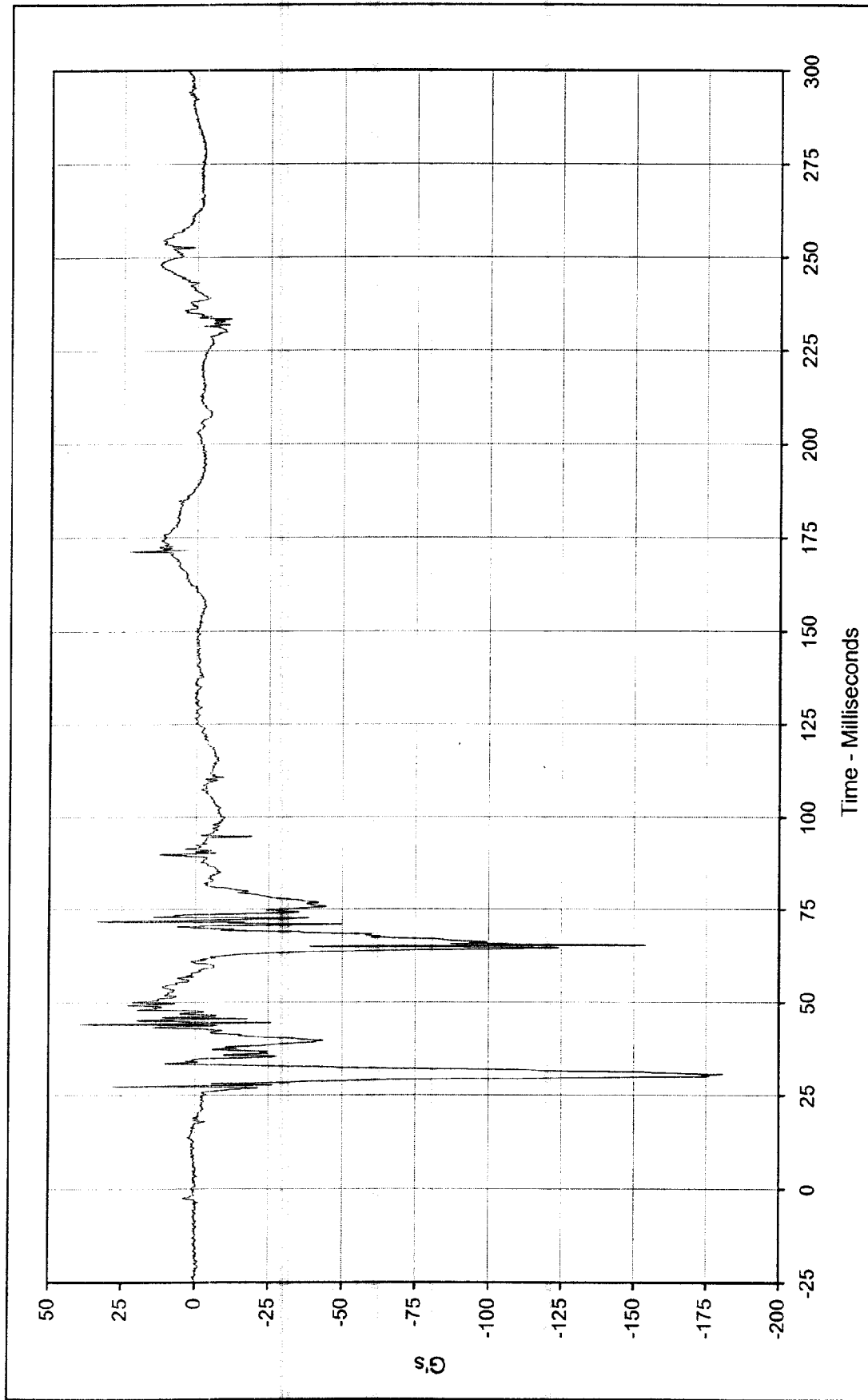


Curve Description: Driver Left Foot Aft Z

Maximum Value: 27.0 at 44.1 Milliseconds
 Minimum Value: -65.9 at 36.3 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-036

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

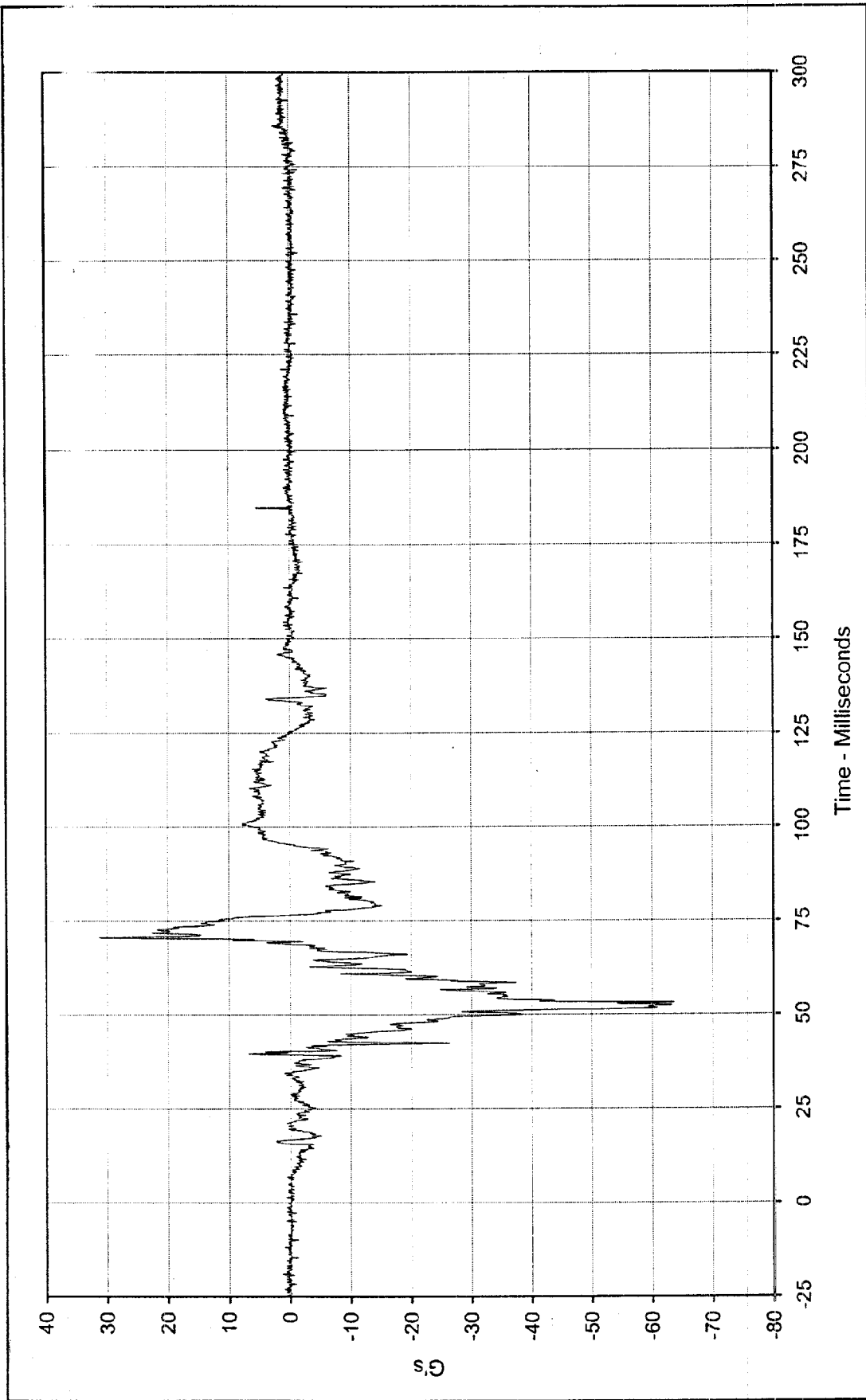




Curve Description:		Driver Left Foot Fore Z		Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111
Maximum Value:	39.2	at	44.2	Milliseconds	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-181.1	at	30.6	Milliseconds	
SAE Filter Class:	1000				
Date of Test:	11/20/98				
Curve Number:	FIL-037				



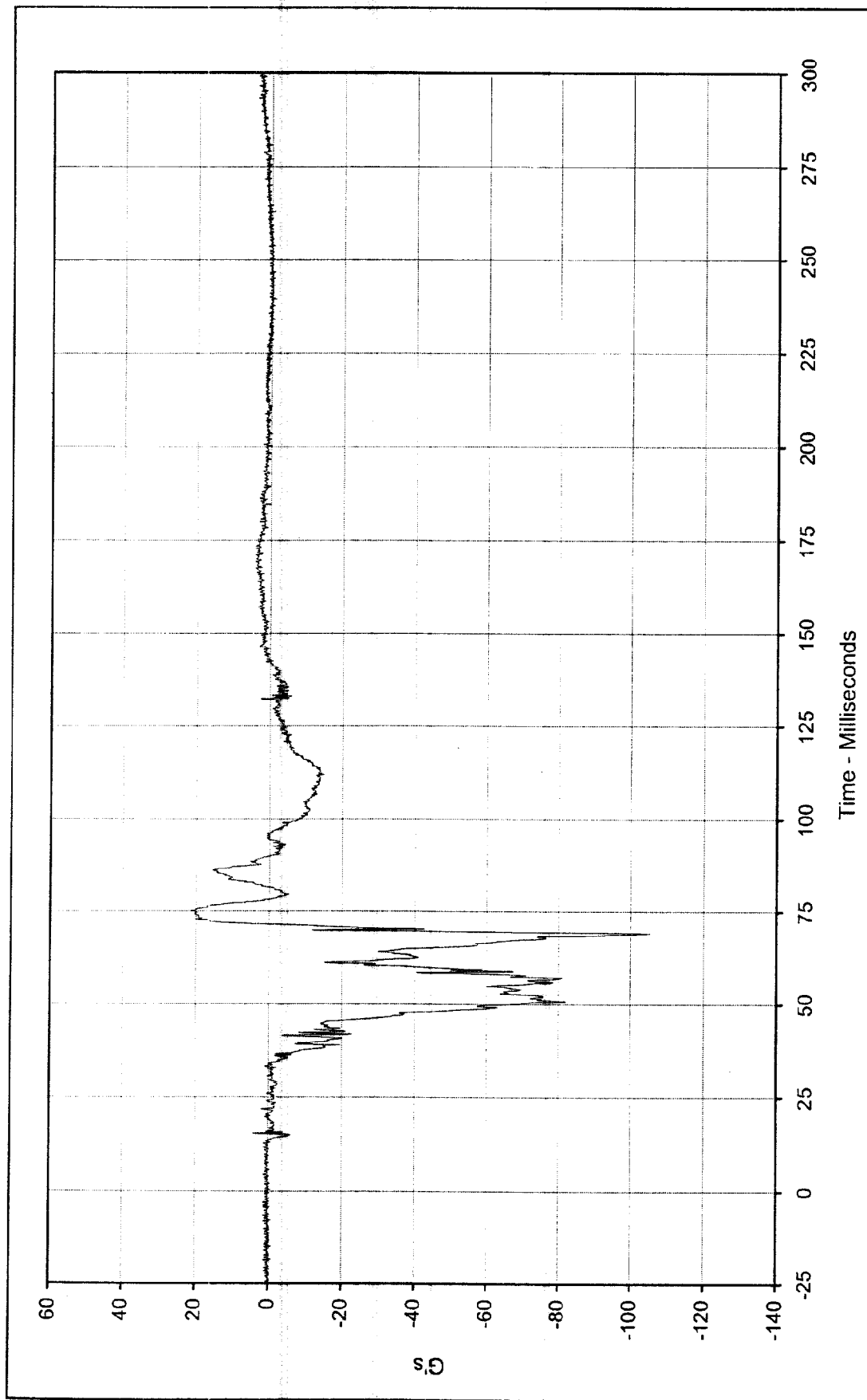




Curve Description: Driver Right Foot Aft X
 Maximum Value: 31.3 at 70.7 Milliseconds
 Minimum Value: -63.6 at 53.0 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-038

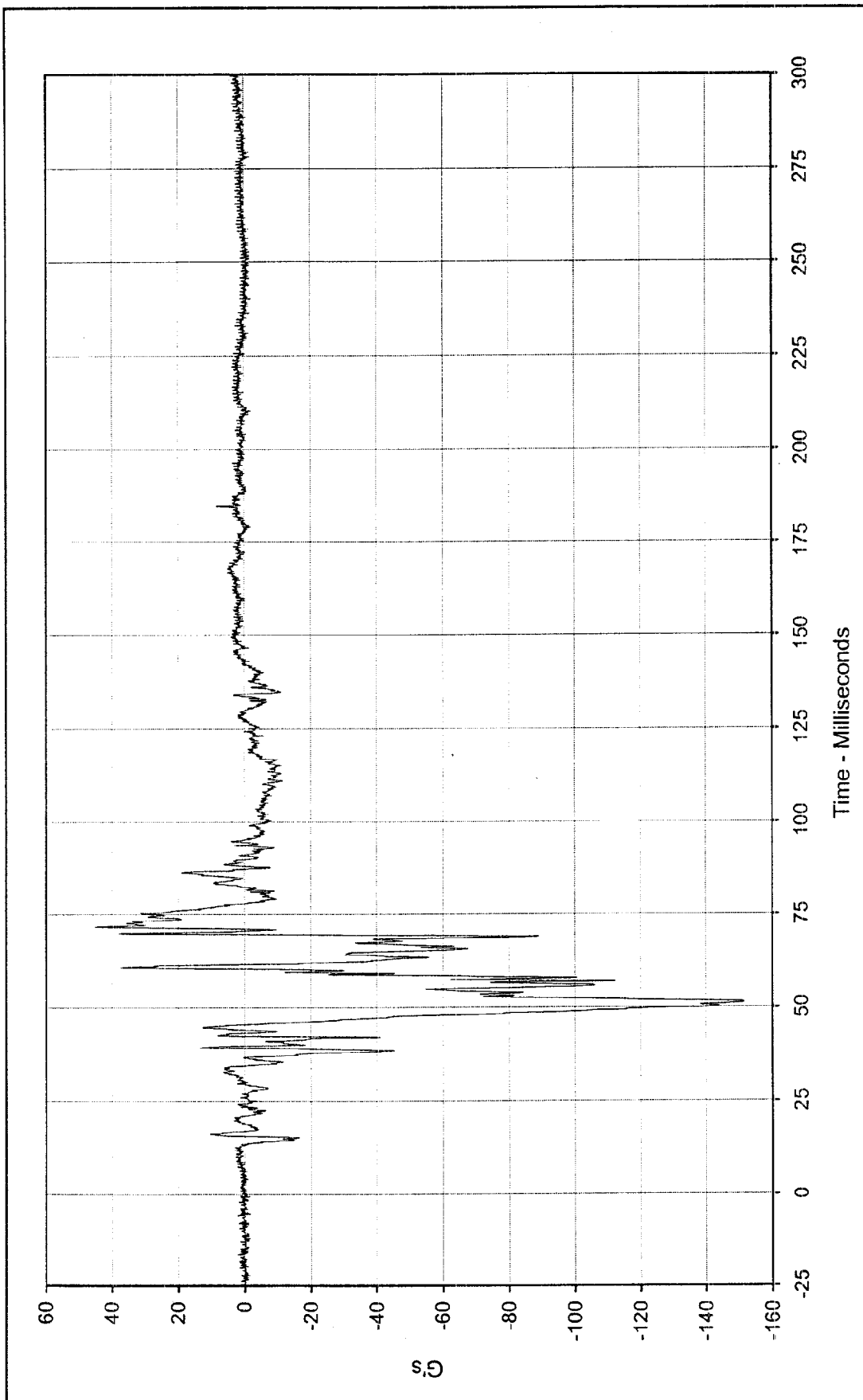
Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





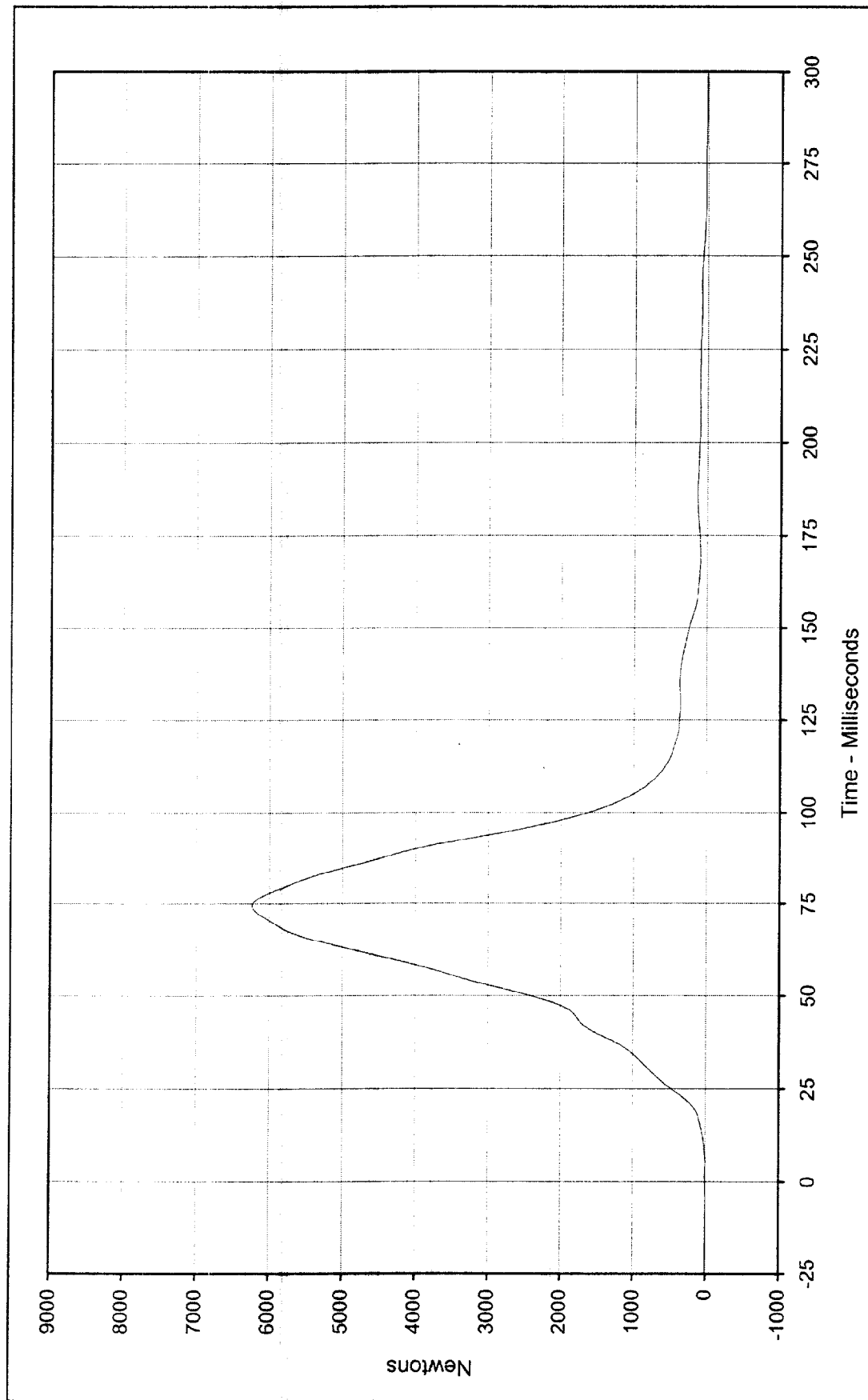
Curve Description:	Driver Right Foot Aft Z		Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111	
Maximum Value:	21.2	at 75.1	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-105.2	at 69.2			
SAE Filter Class:	1000				
Date of Test:	11/20/98				
Curve Number:	FIL-039				





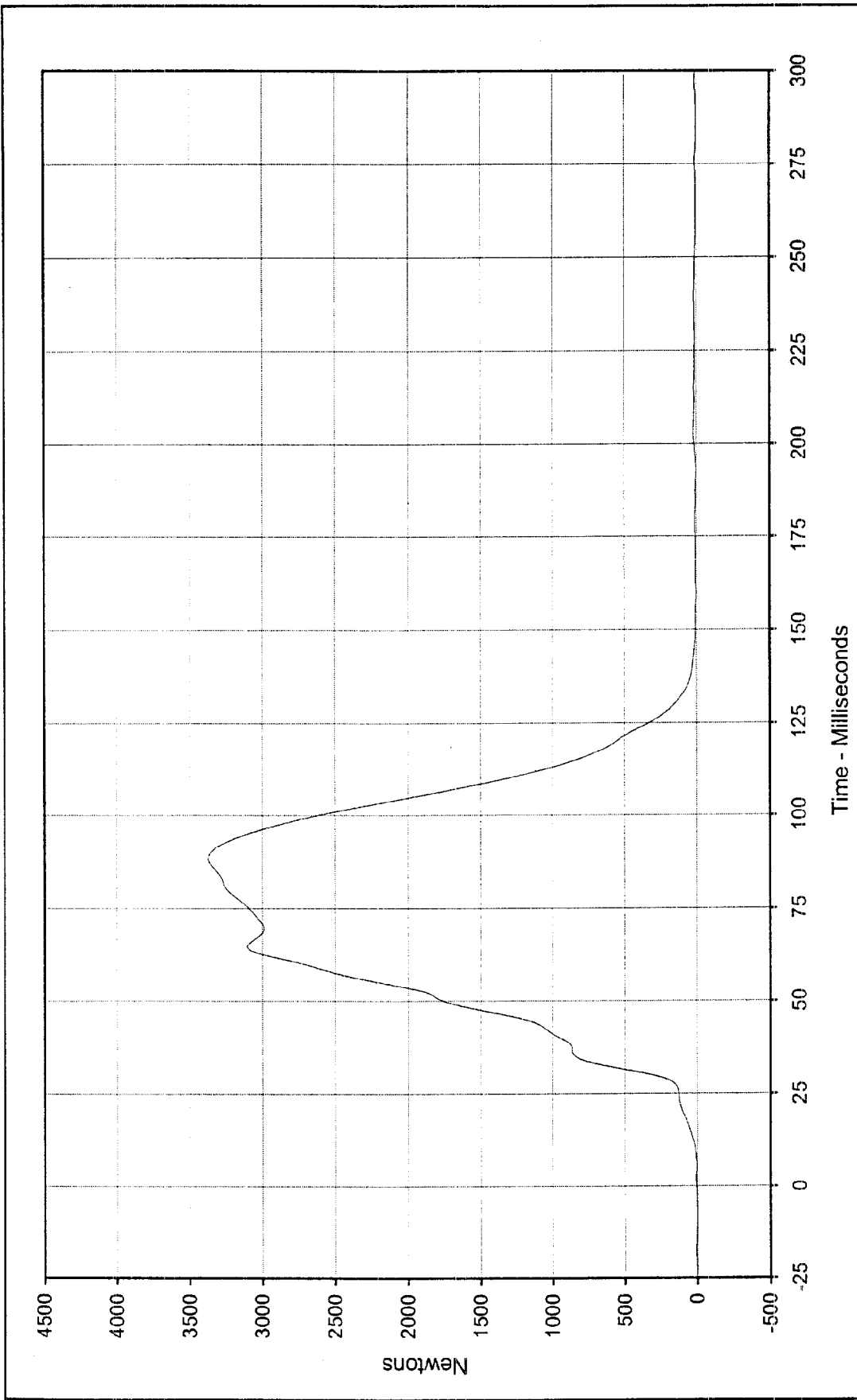
Curve Description:	Driver Right Foot Fore Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	45.0	at	71.8	Milliseconds
Minimum Value:	-151.7	at	51.2	Milliseconds
SAE Filter Class:	1000			
Date of Test:	11/20/98	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Curve Number:	FIL-040			





Curve Description:	Driver Lap Belt Force	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	6234.3 at 74.4 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-0.5 at 5.0 Milliseconds			
SAE Filter Class:	60			
Date of Test:	11/20/98			
Curve Number:	FIL-041			

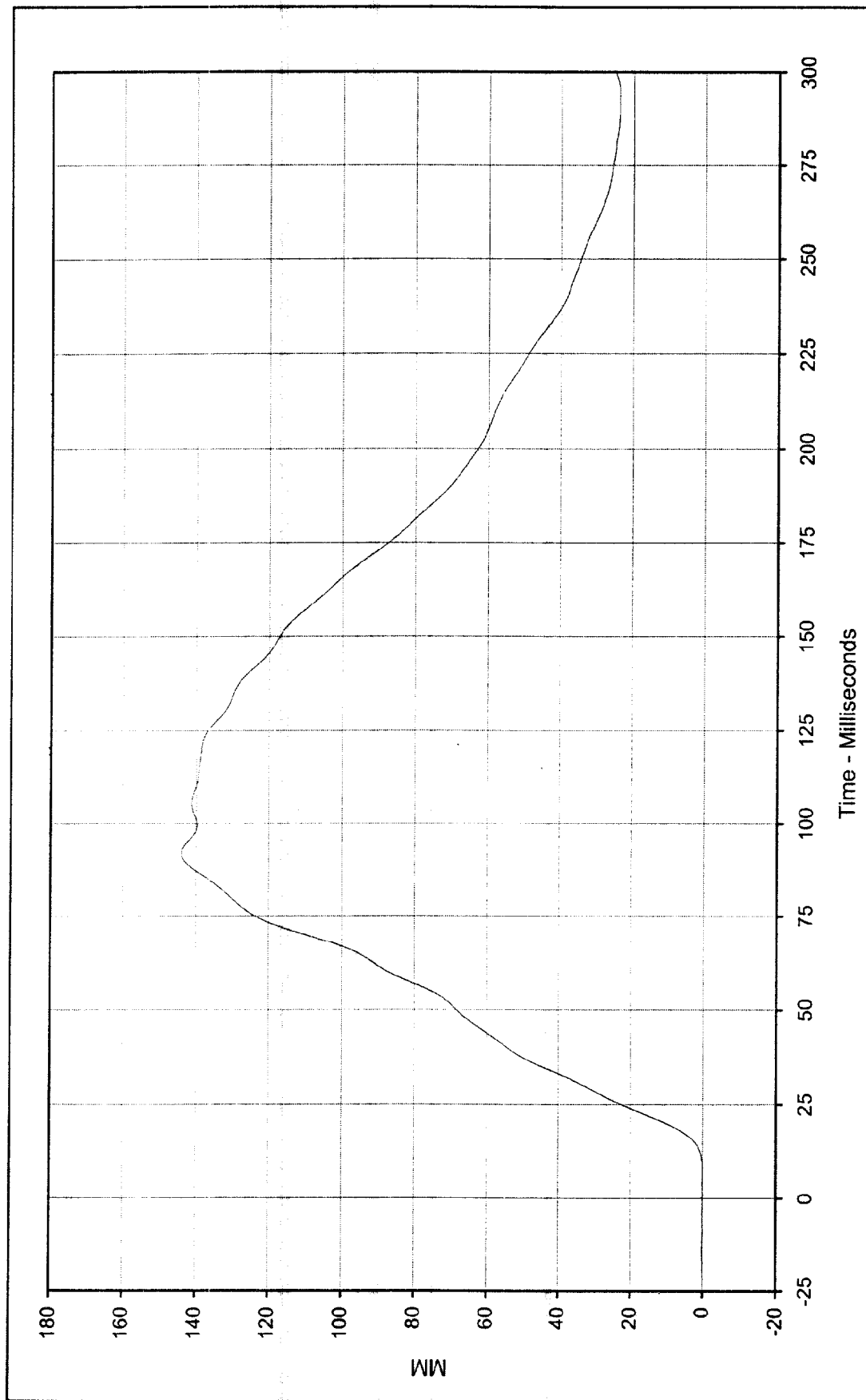




Curve Description: Driver Shoulder Belt Force
 Maximum Value: 3369.9 at 88.3 Milliseconds
 Minimum Value: 2.8 at 193.1 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-042

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL 1 4 Door Sedan

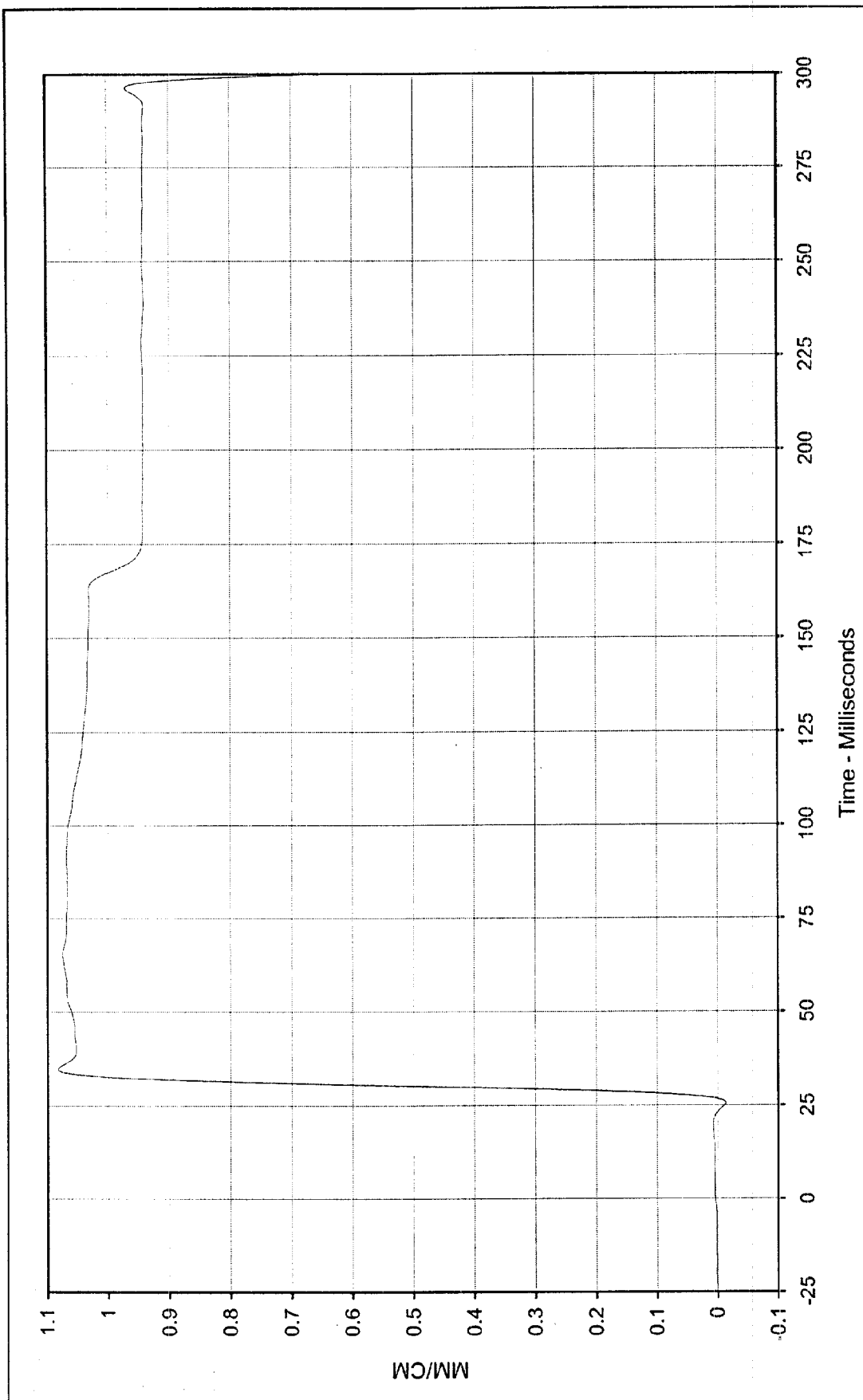




Curve Description:	Driver Shoulder Belt Pullout		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	143.9	at 91.8	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	0.1	at 8.3			
SAE Filter Class:	60				
Date of Test:	11/20/98				
Curve Number:	FIL-043				

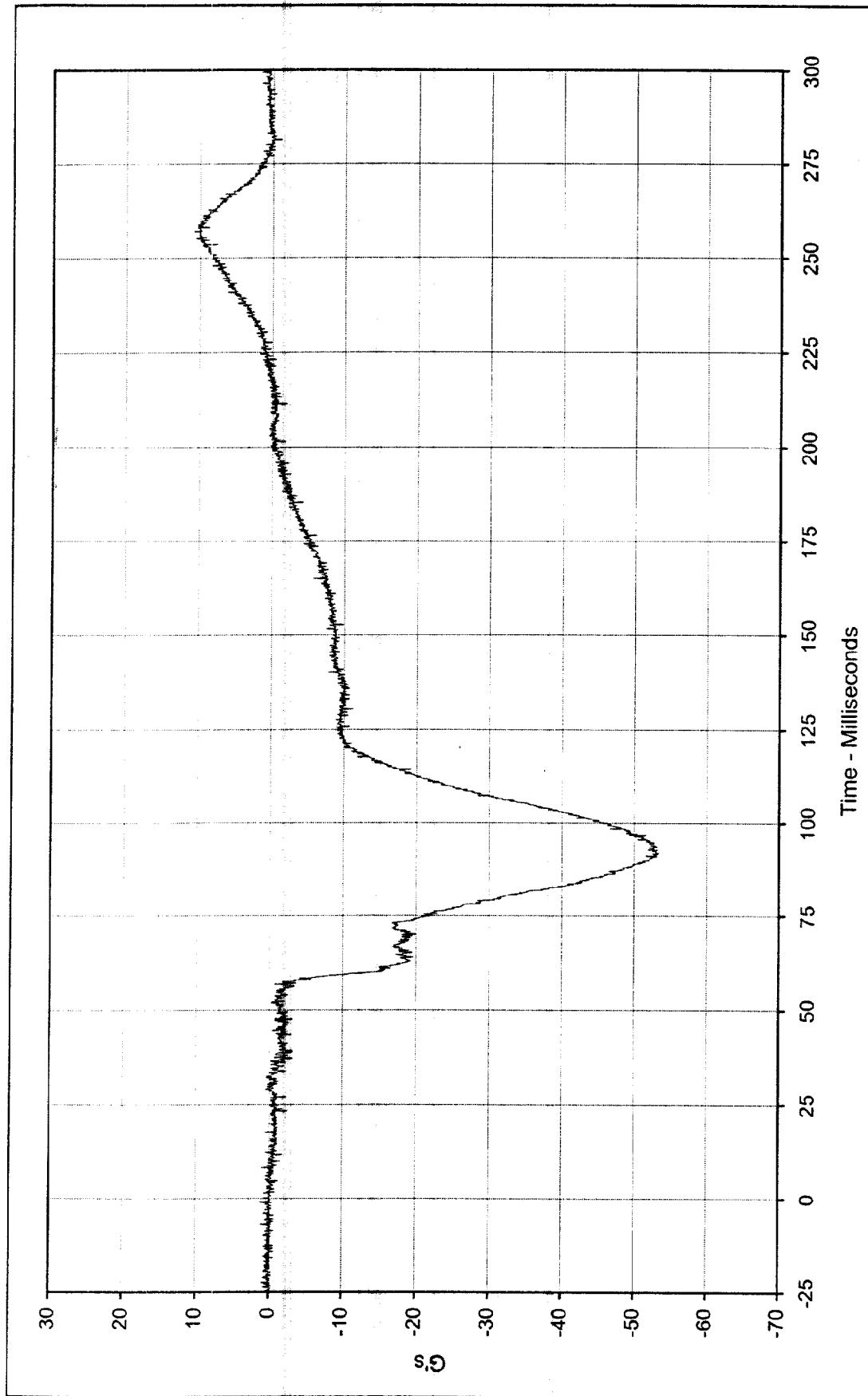






Curve Description:	Driver Shoulder Belt Elongation	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	1.08	at	34.8	Milliseconds
Minimum Value:	-0.01	at	25.6	Milliseconds
SAE Filter Class:	60			
Date of Test:	11/20/98			
Curve Number:	FIL-044			
		Test Vehicle:	1999 Saturn SL1 4 Door Sedan	





Curve Description: Passenger Head Primary X

Maximum Value: 10.7 at 257.1 Milliseconds

Minimum Value: -53.4 at 91.7 Milliseconds

SAE Filter Class: 1000

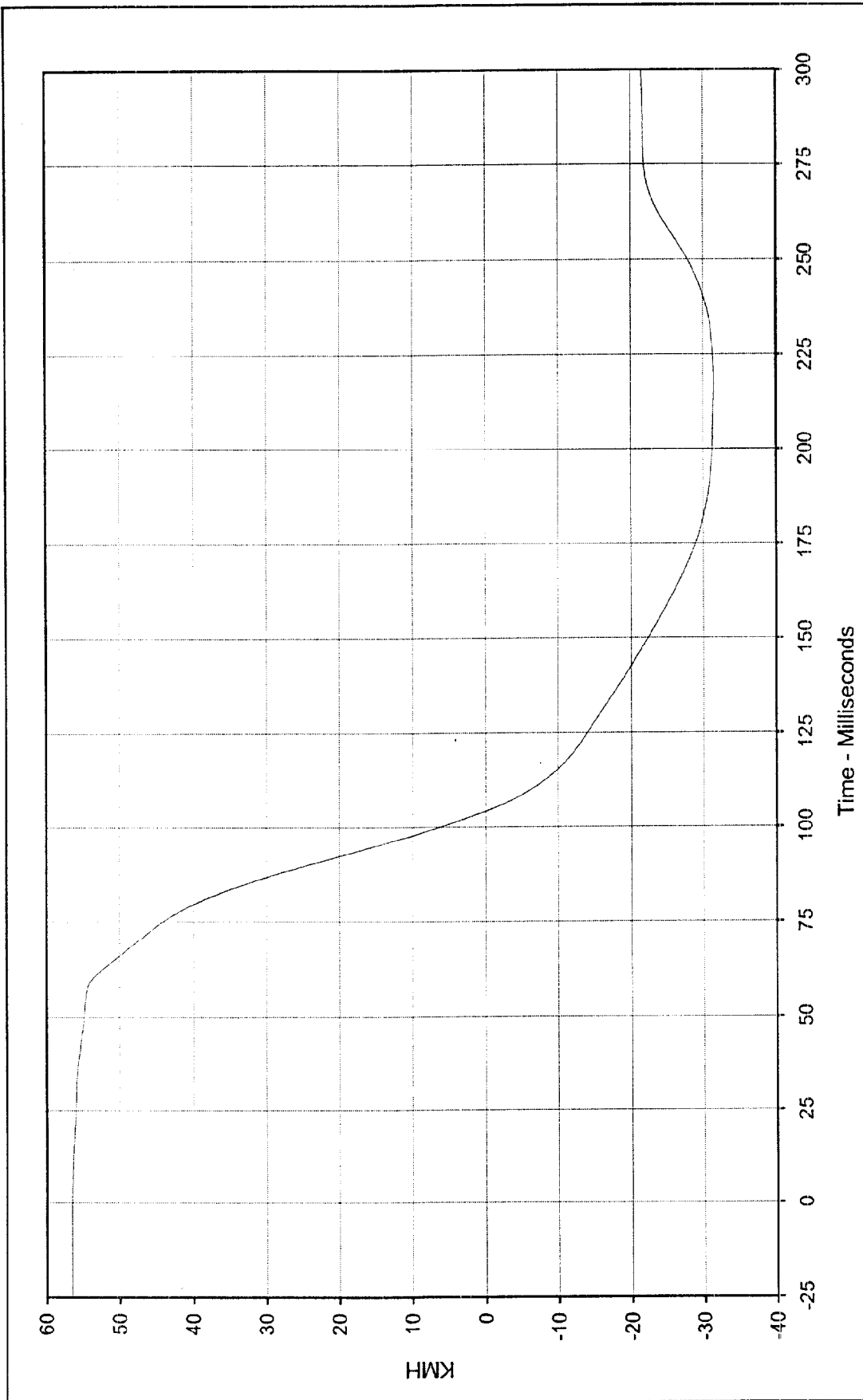
Date of Test: 11/20/98

Curve Number: FIL-045

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

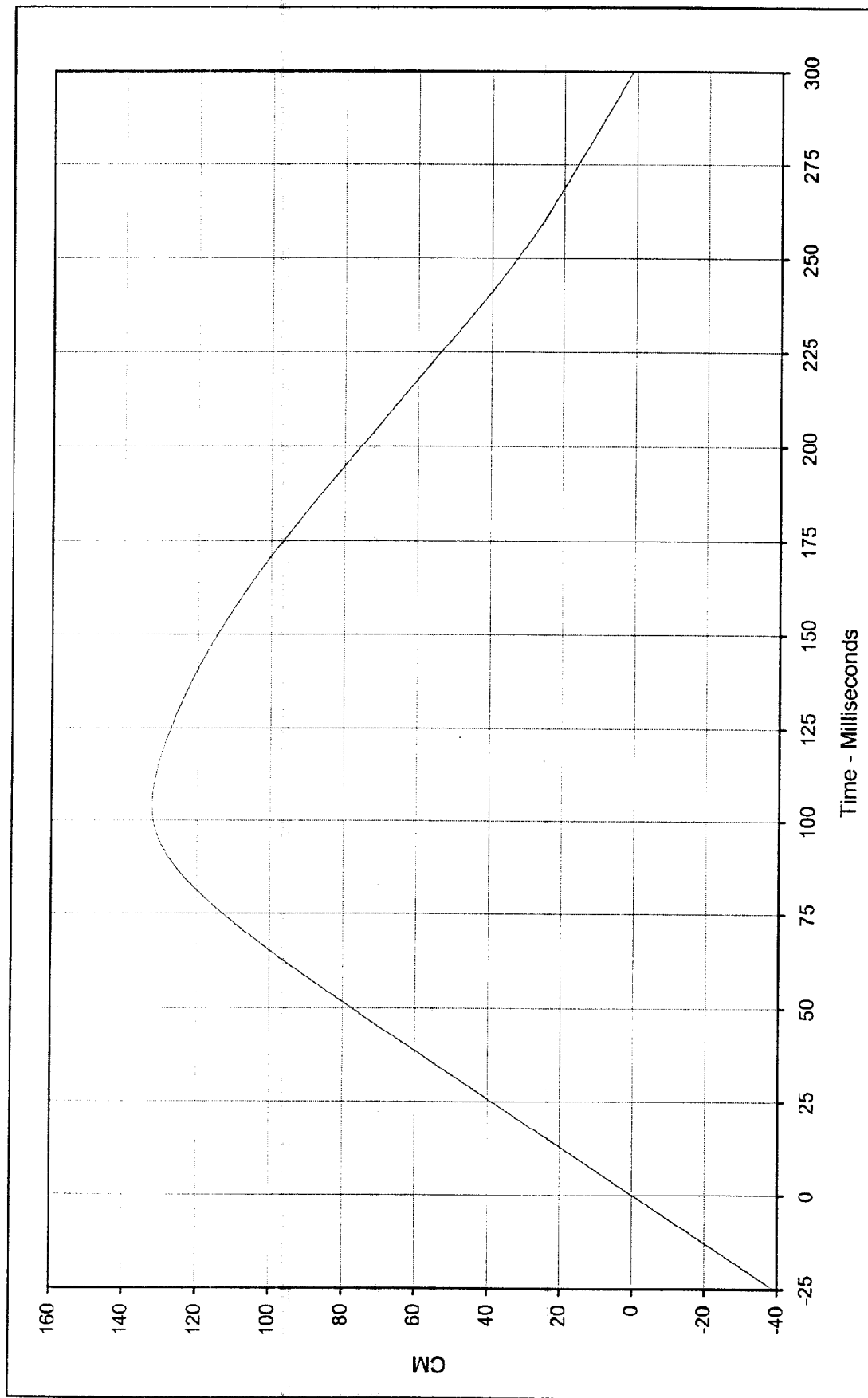




Curve Description: Passenger Head Primary X Velocity
 Maximum Value: 56.6 at 0.0 Milliseconds
 Minimum Value: -31.5 at 217.6 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: IN1-045

Testing Program 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Head Primary X Displ.

Maximum Value: 132.3 at 104.2 Milliseconds

Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

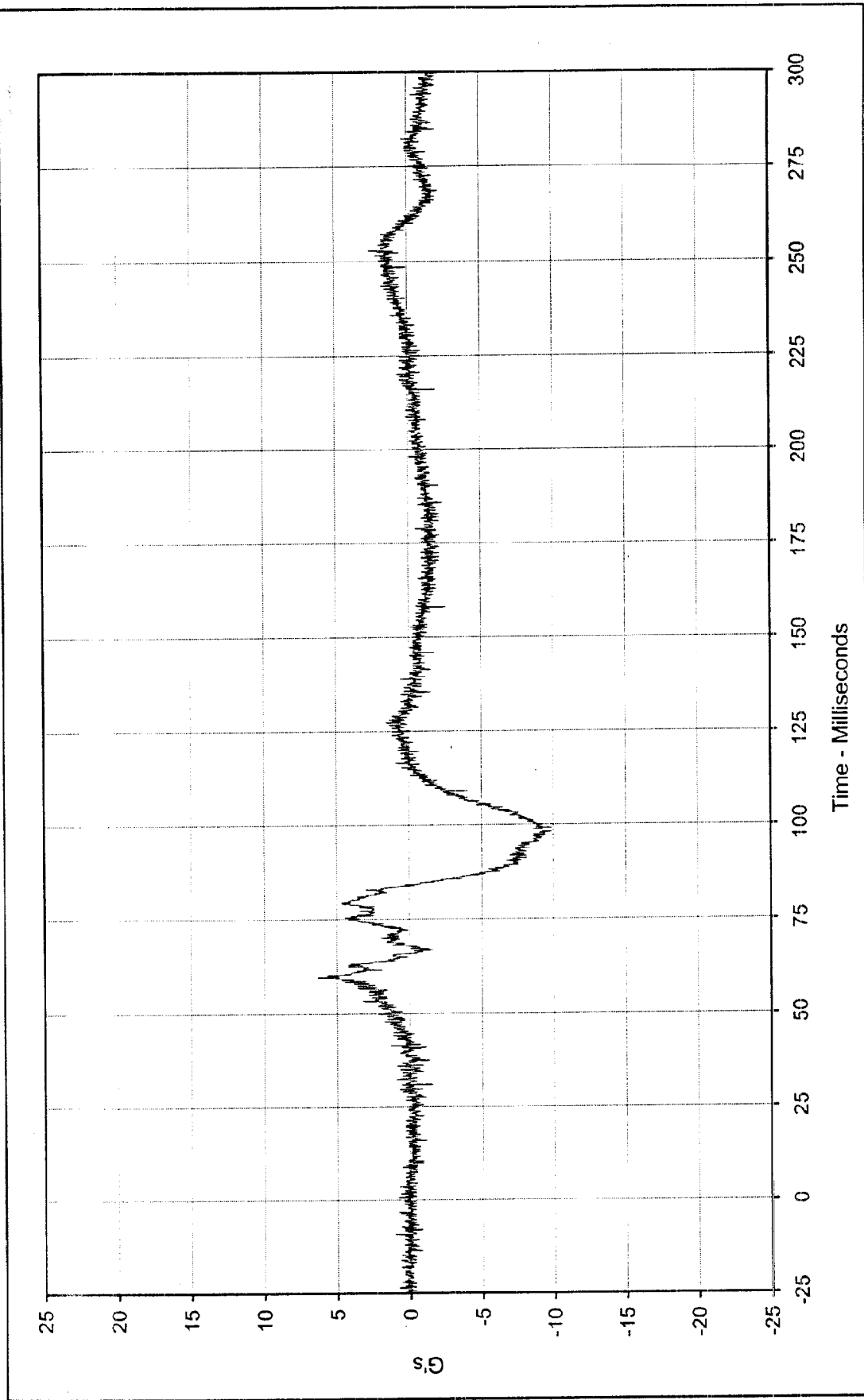
Date of Test: 11/20/98

Curve Number: IN2-045

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

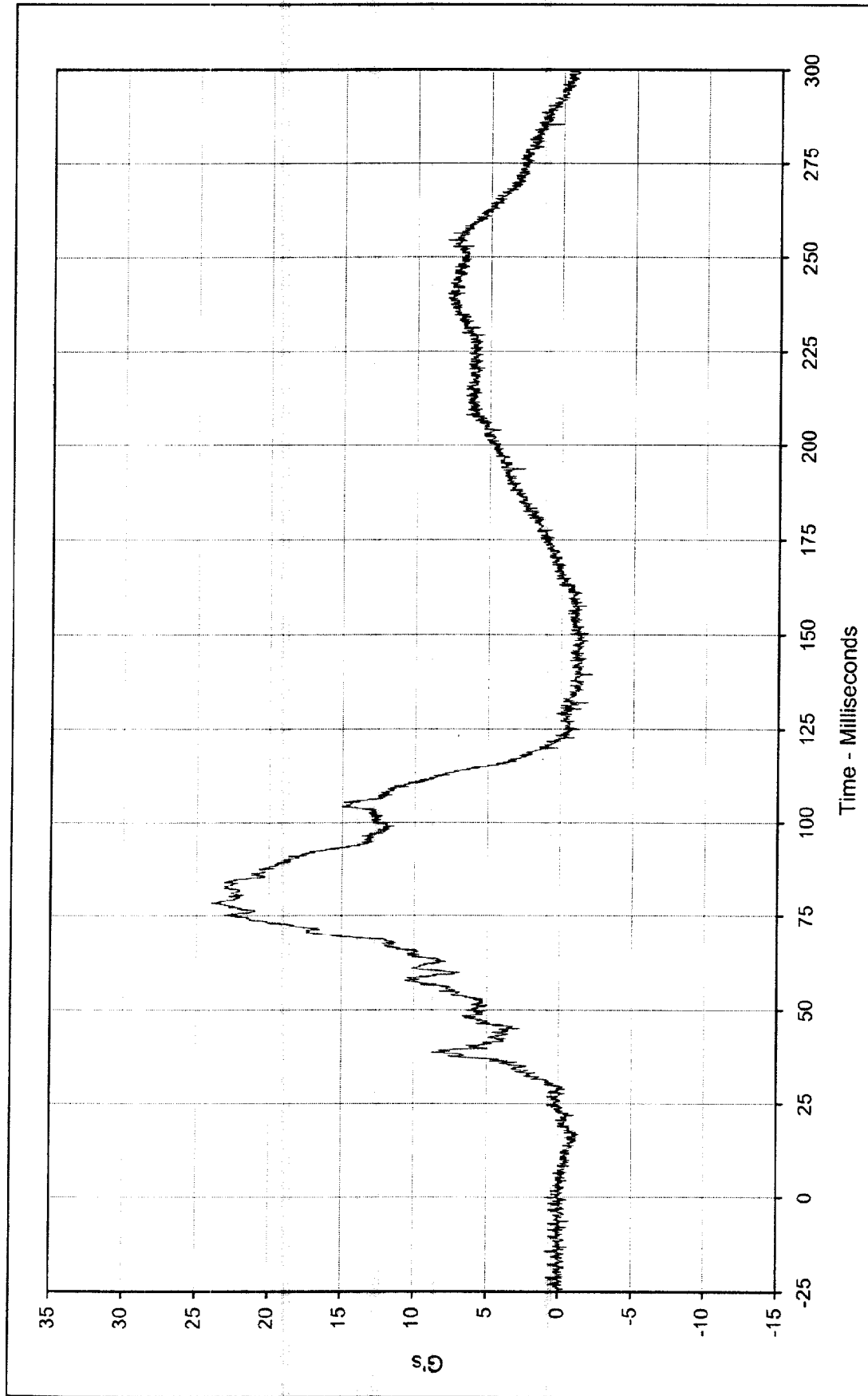




Curve Description: Passenger Head Primary Y
 Maximum Value: 6.3 at 59.6 Milliseconds
 Minimum Value: -9.8 at 98.1 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-046

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan



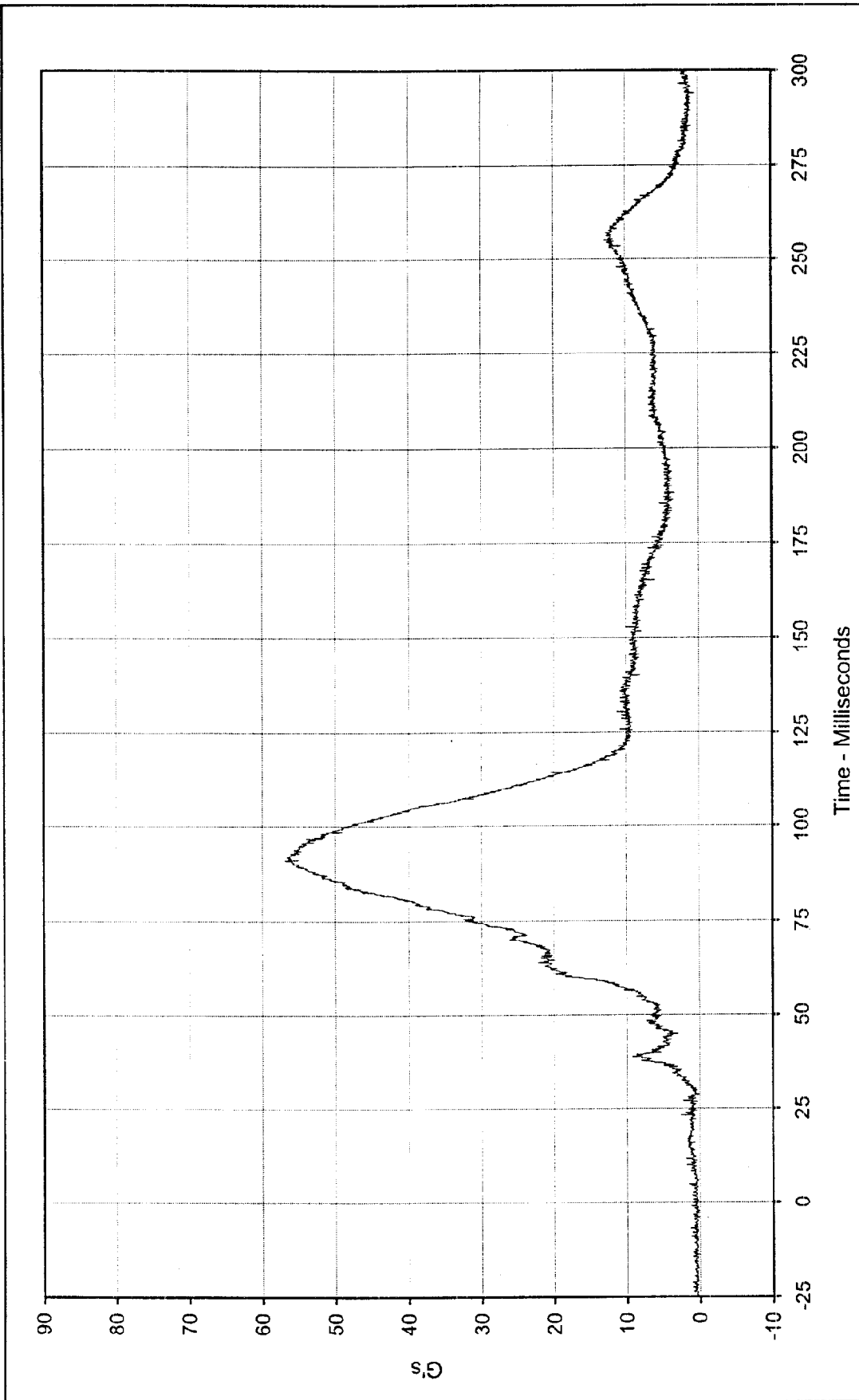


Curve Description: Passenger Head Primary Z
 Maximum Value: 24.1 at 78.3 Milliseconds
 Minimum Value: -2.2 at 139.4 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-047

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

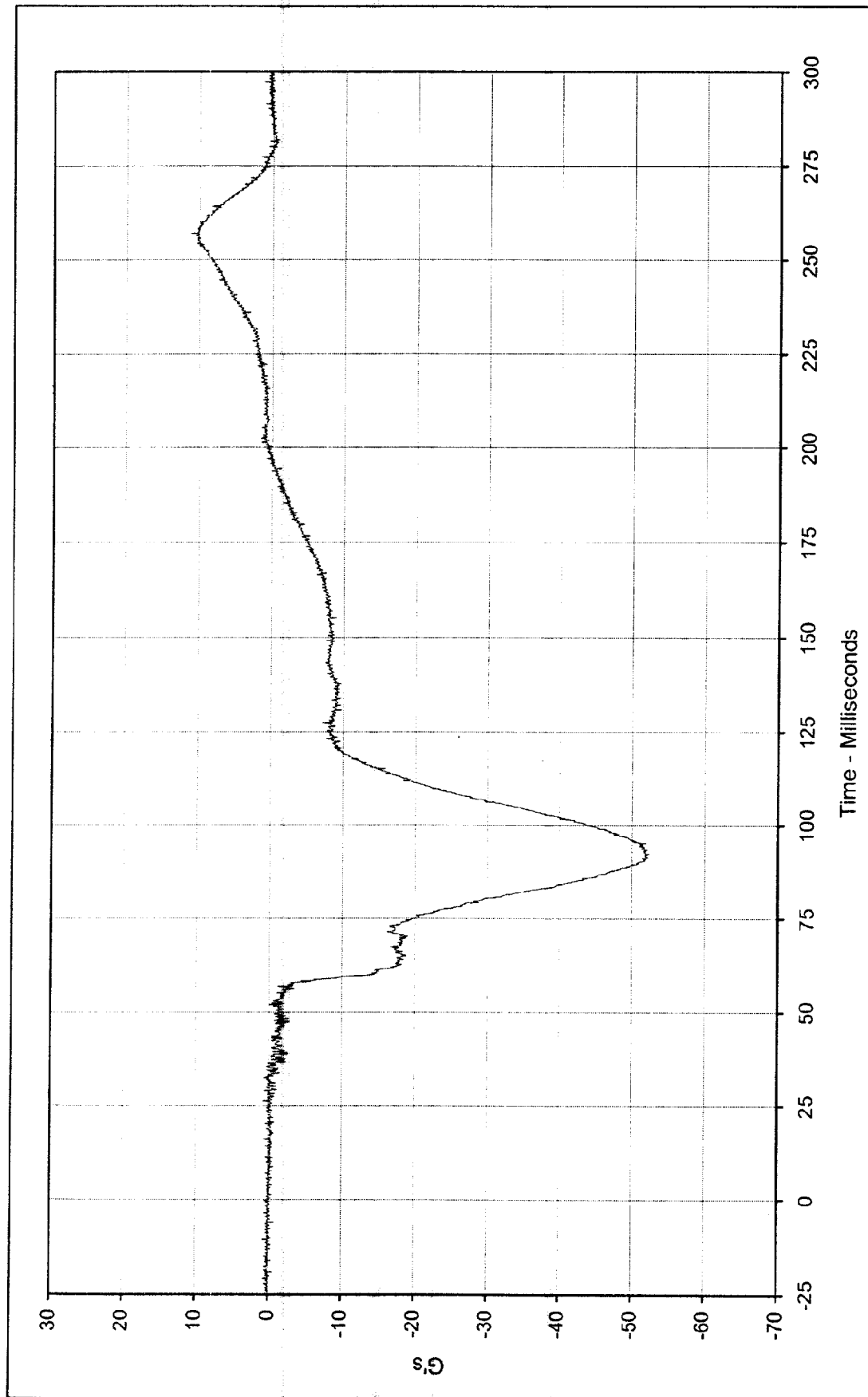




Curve Description:	Passenger Head Resultant Primary	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	56.8 at 90.8 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	0.1 at 28.5 Milliseconds			



SAE Filter Class:	1000
Date of Test:	11/20/98
Curve Number:	RES-045



Curve Description: Passenger Head Redundant X

Maximum Value: 11.3 at 257.2 Milliseconds

Minimum Value: -52.4 at 92.2 Milliseconds

SAE Filter Class: 1000

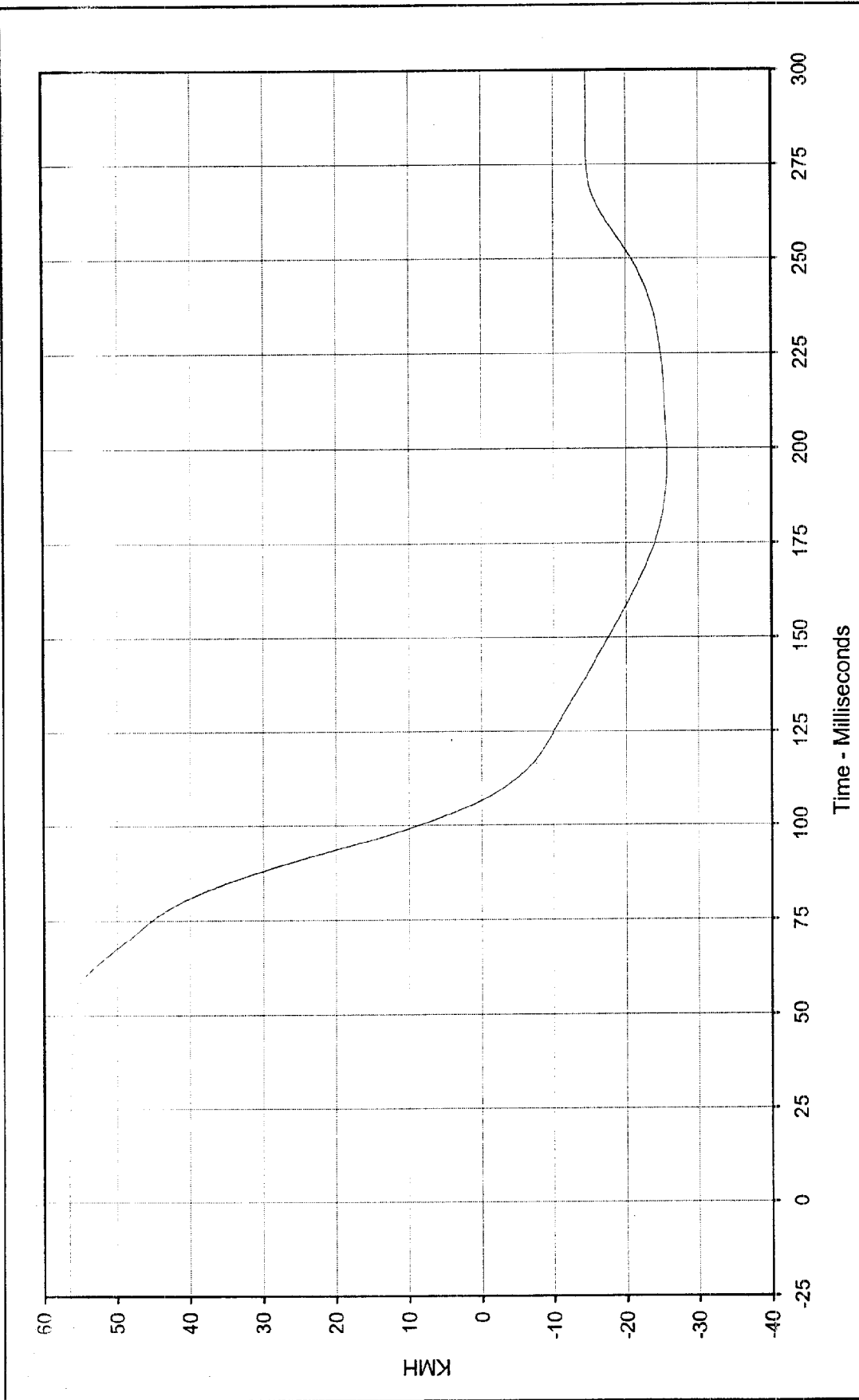
Date of Test: 11/20/98

Curve Number: FIL-048

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

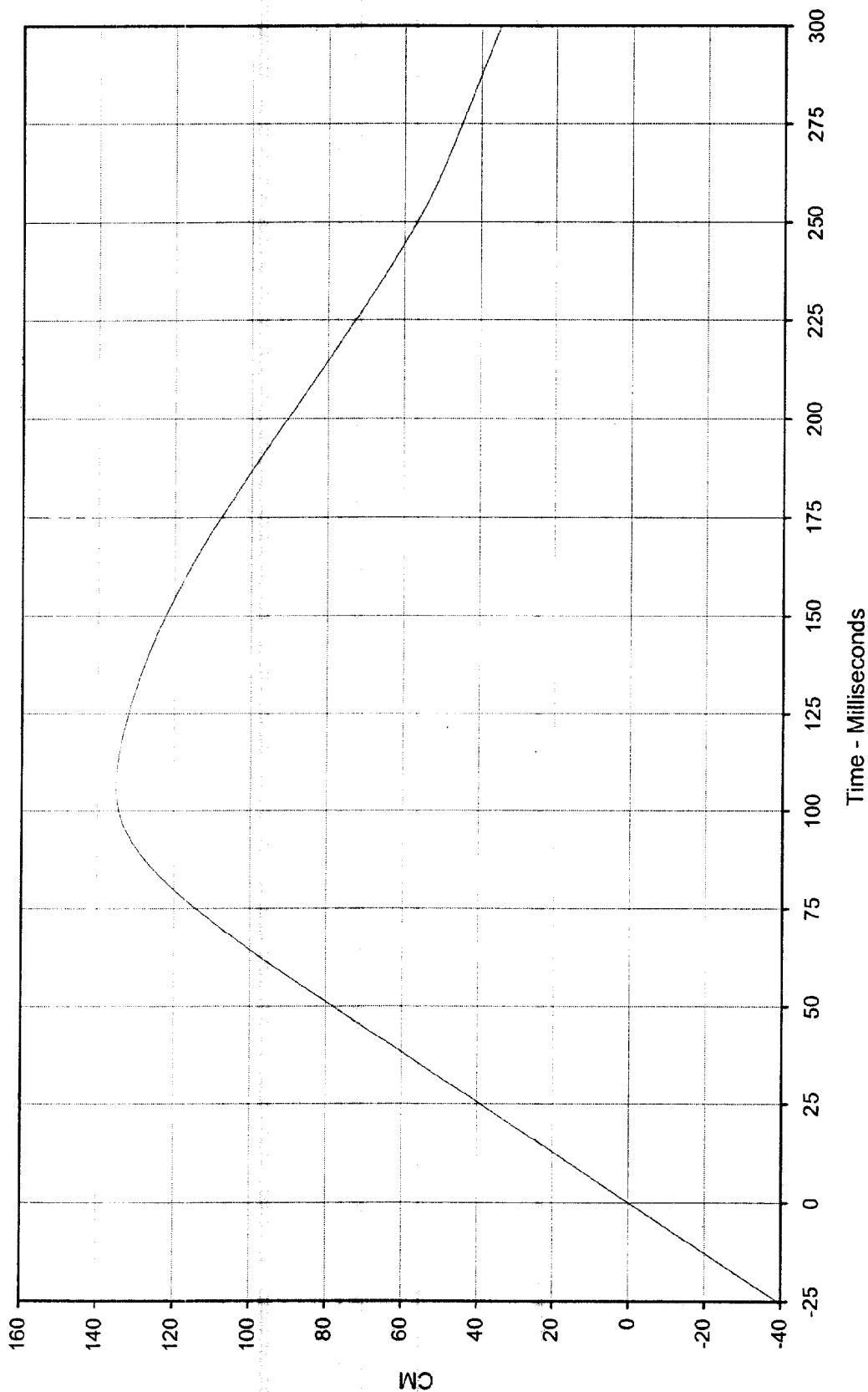




Curve Description: Passenger Head Redundant X Velocity
 Maximum Value: 56.6 at 0.0 Milliseconds
 Minimum Value: -25.7 at 196.9 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: IN1-048

Testing Program 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Head Redundant X Displ.

Maximum Value: 135.1 at 106.5 Milliseconds

Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

Date of Test: 11/20/98

Curve Number: IN2-048

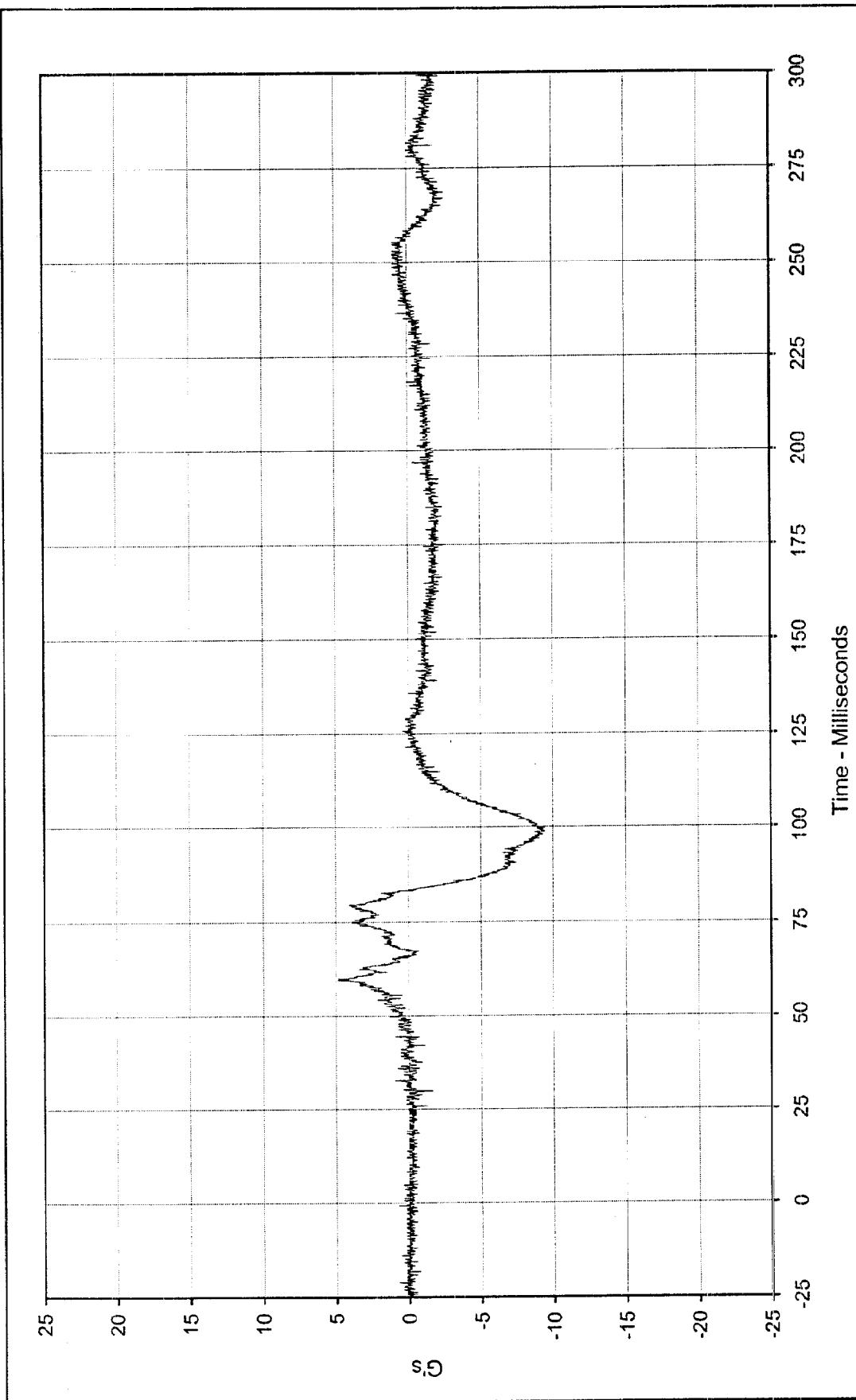
Test Program:

1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle:

1999 Saturn SL1 4 Door Sedan

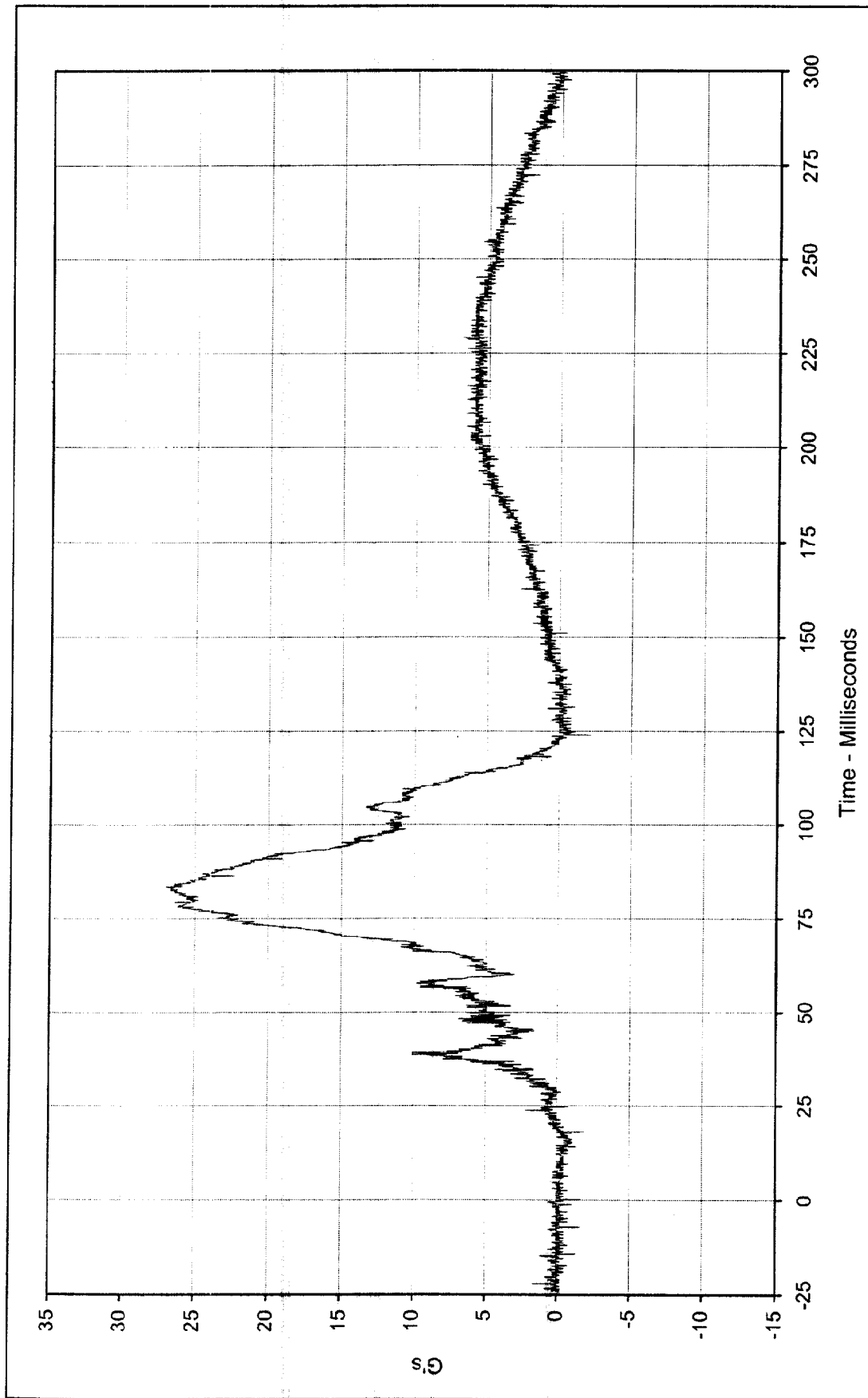




Curve Description: Passenger Head Redundant Y
 Maximum Value: 4.8 at 59.5 Milliseconds
 Minimum Value: -9.5 at 98.7 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-049

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL 1 4 Door Sedan

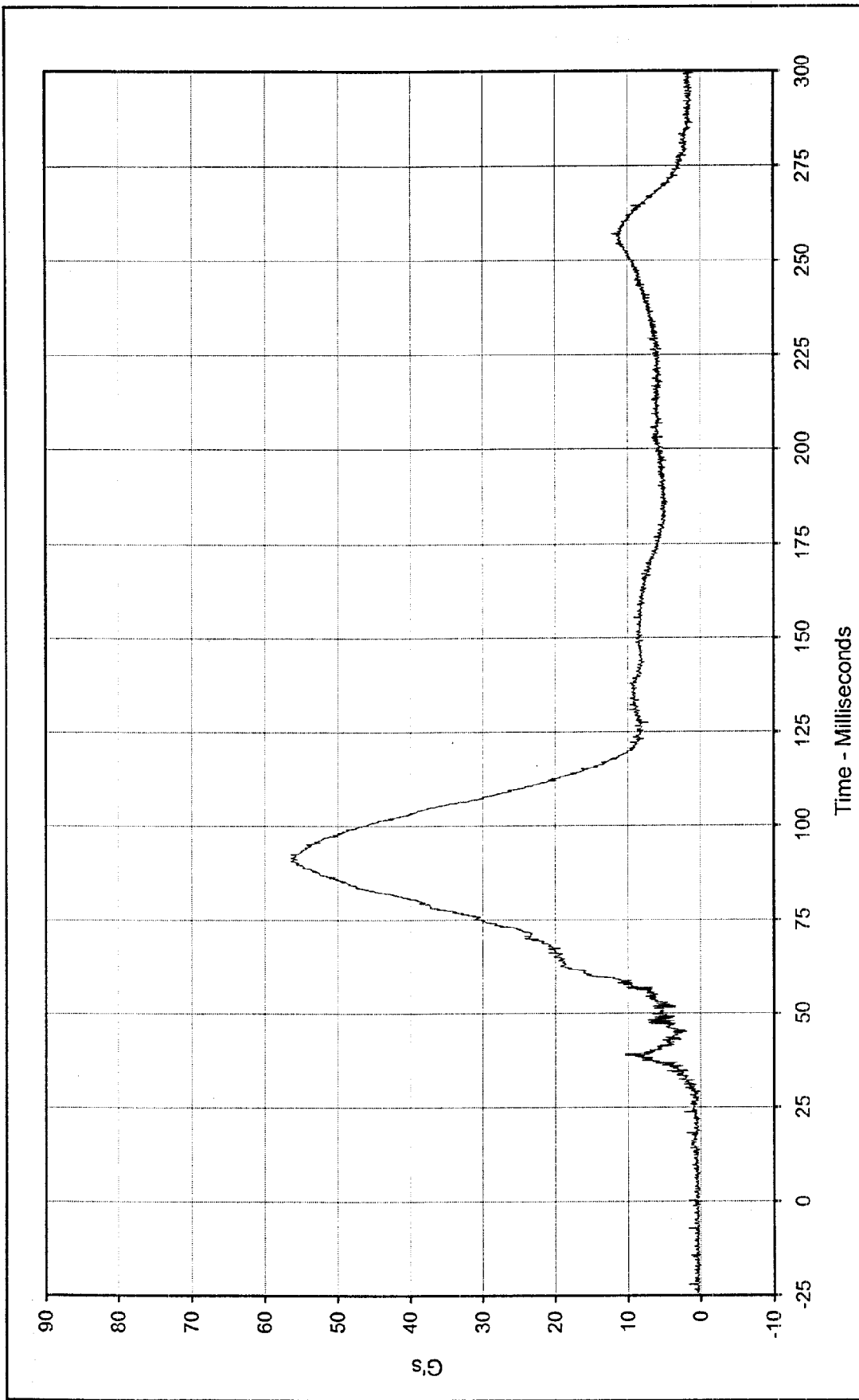




Curve Description:	Passenger Head Redundant Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	26.9	at	83.2	Milliseconds
Minimum Value:	-2.2	at	124.0	Milliseconds
SAE Filter Class:	1000	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Date of Test:	11/20/98			
Curve Number:	FIL-050			







Curve Description: Passenger Head Resultant Redundant

Maximum Value: 56.4 at 90.4 Milliseconds

Minimum Value: 0.1 at 3.5 Milliseconds

SAE Filter Class: 1000

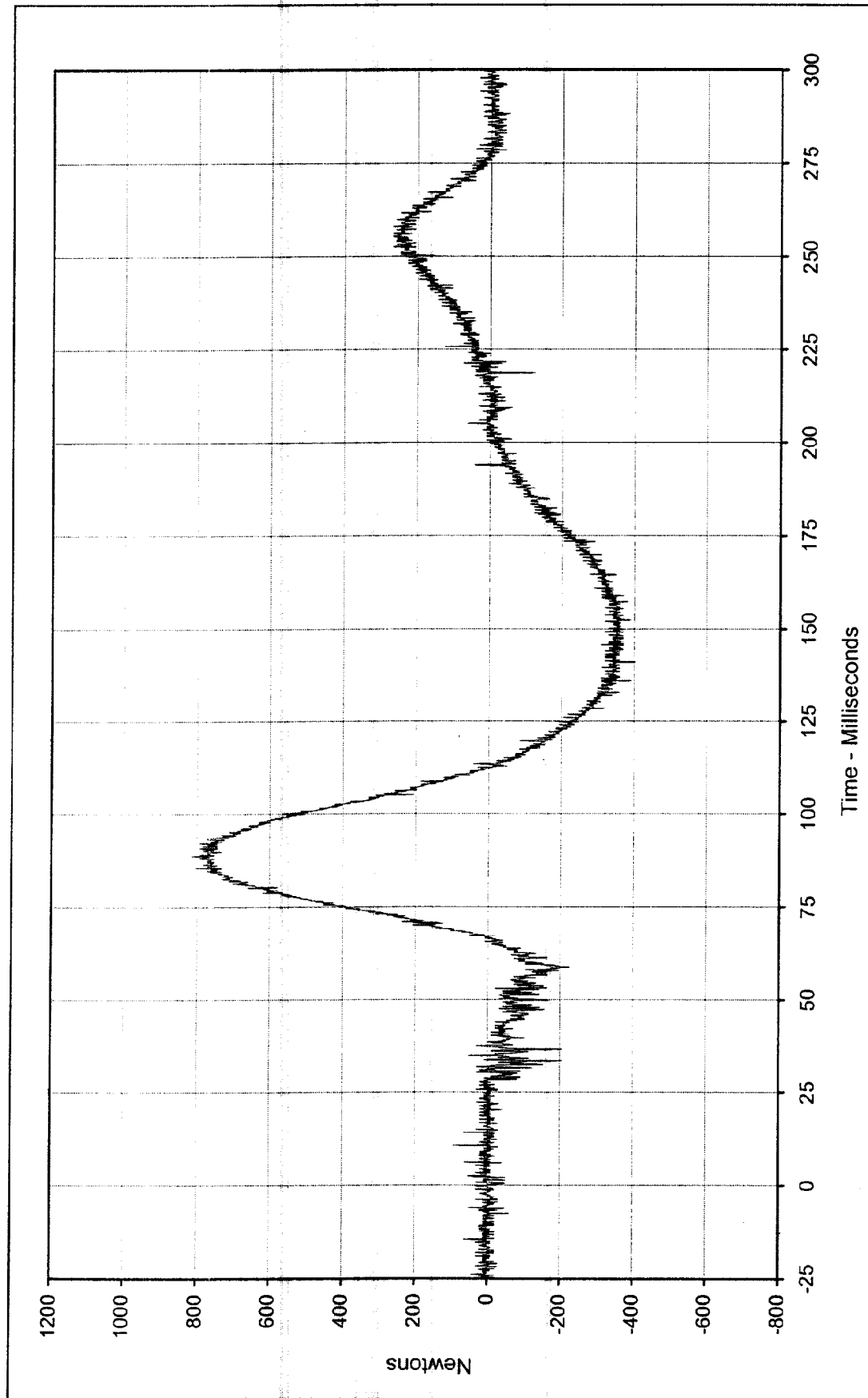
Date of Test: 11/20/98

Curve Number: RES-048

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

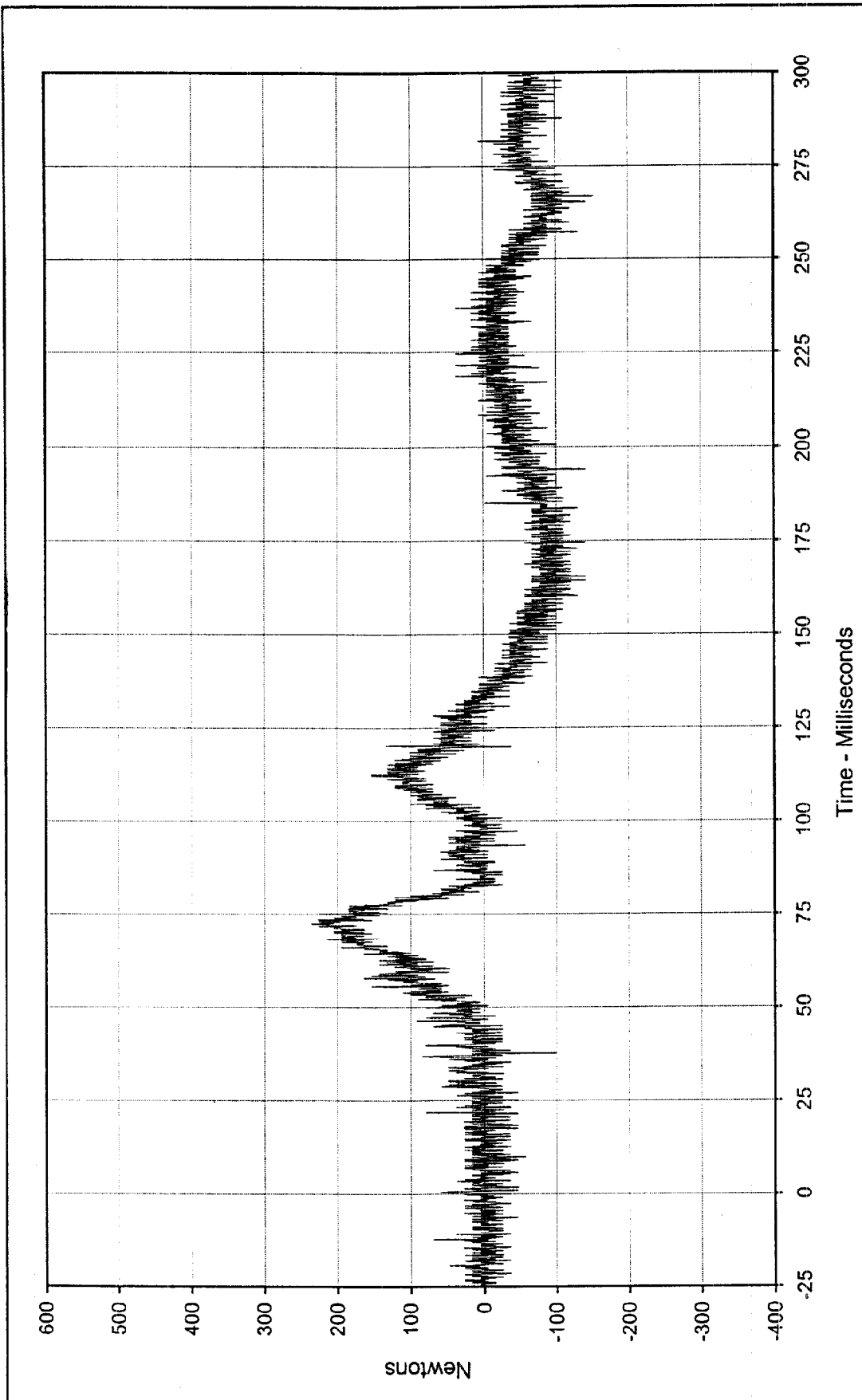
Test Vehicle: 1999 Saturn SL1 4 Door Sedan





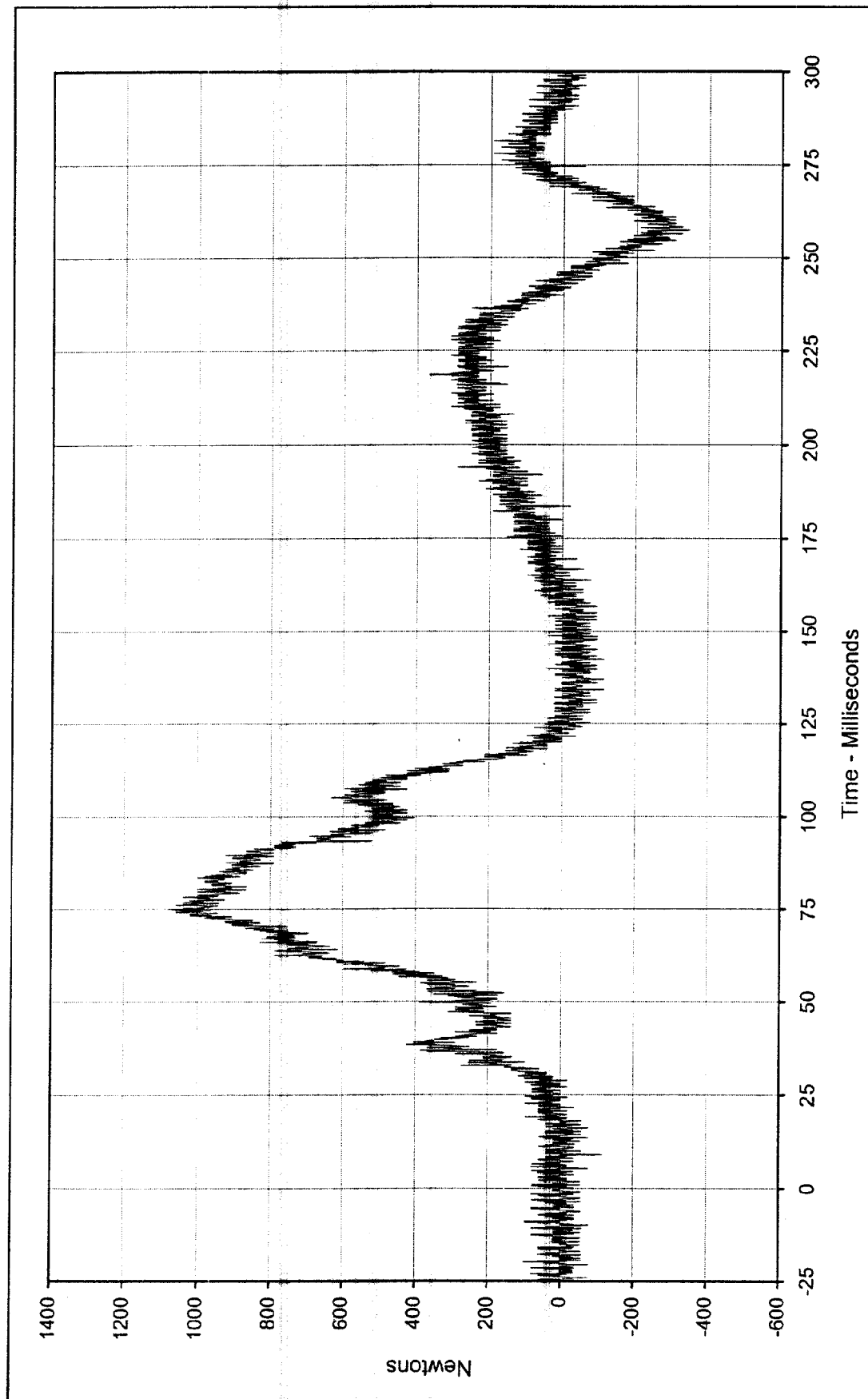
Curve Description:	Passenger Neck Force X	Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111
Maximum Value:	813.5 at 88.6 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-402.0 at 140.9 Milliseconds		
SAE Filter Class:	1000		
Date of Test:	11/20/98		
Curve Number:	FIL-051		





Curve Description:		Passenger Neck Force Y		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	236.1	at	72.4	Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-151.8	at	267.0	Milliseconds		
SAE Filter Class:	1000					
Date of Test:	11/20/98					
Curve Number:	FIL-052					





Curve Description: Passenger Neck Force Z Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Maximum Value: 1076.7 at 75.0 Milliseconds Test Vehicle: 1999 Saturn SL1 4 Door Sedan

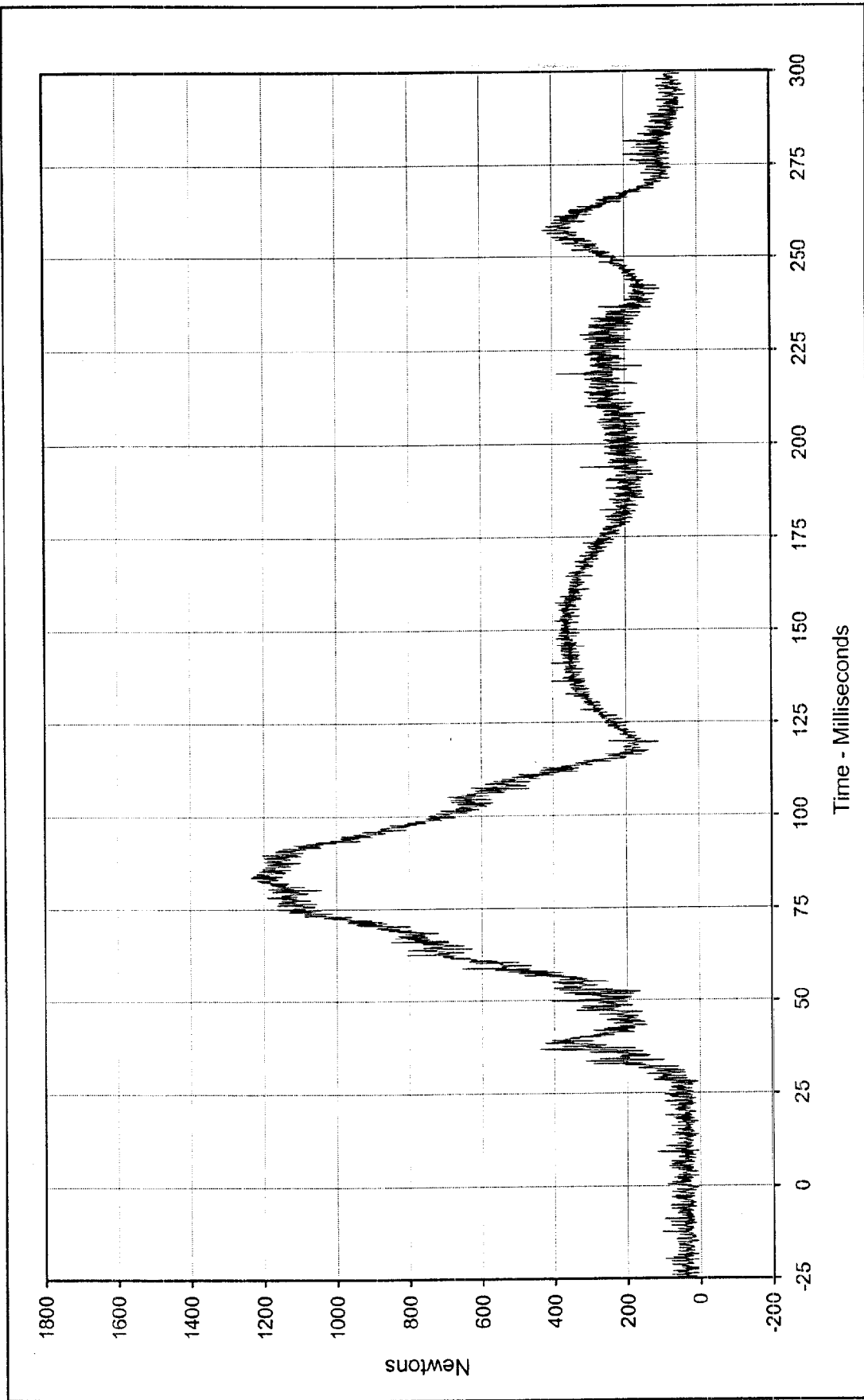
Minimum Value: -346.1 at 257.5 Milliseconds

SAE Filter Class: 1000

Date of Test: 11/20/98

Curve Number: FIL-053

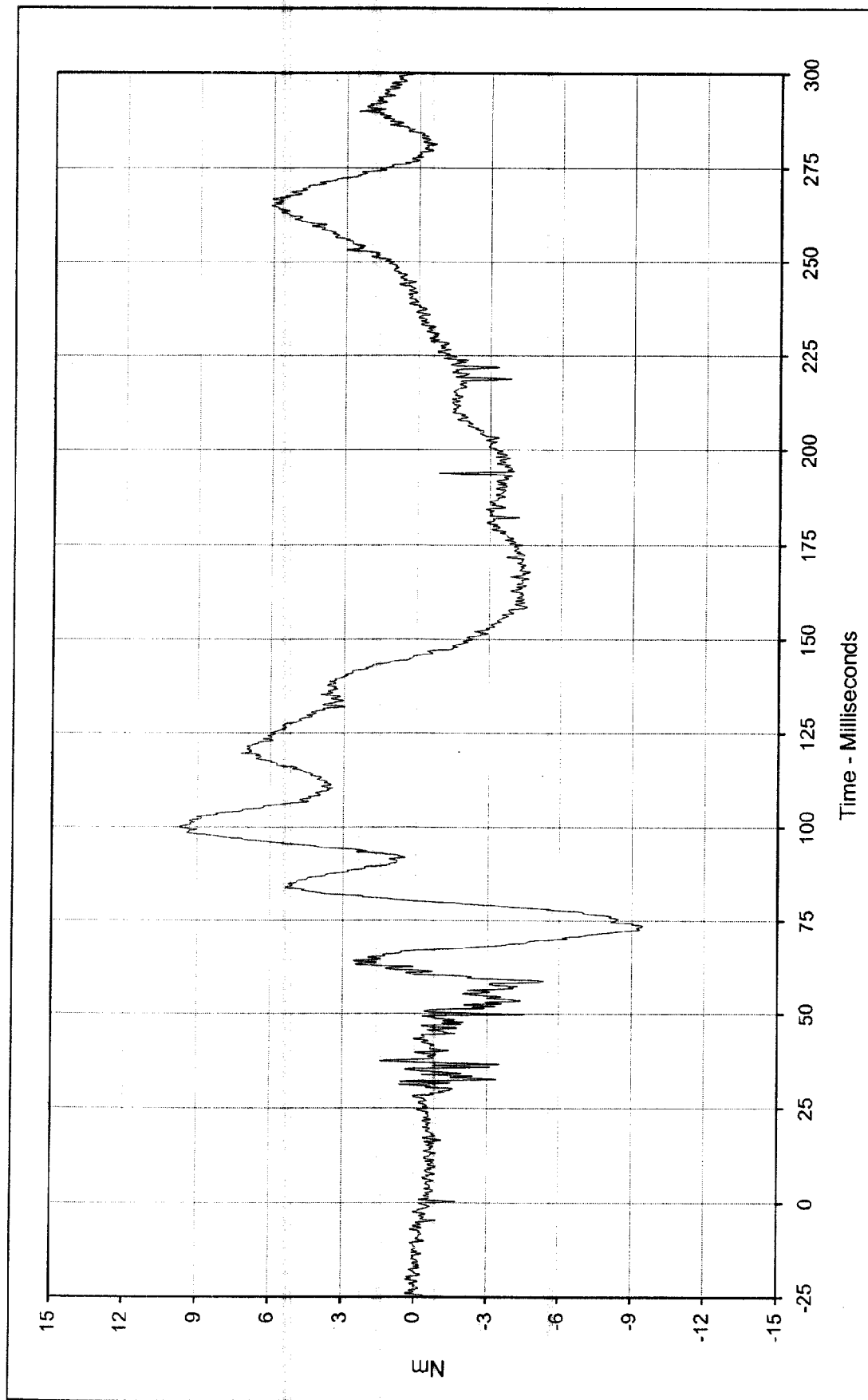




Curve Description: Passenger Neck Force Resultant
 Maximum Value: 1232.5 at 83.5 Milliseconds
 Minimum Value: 5.0 at 9.3 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: RES-051

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Neck Moment X

Maximum Value: 9.7 at 100.1 Milliseconds

Minimum Value: -9.5 at 73.6 Milliseconds

SAE Filter Class: 600

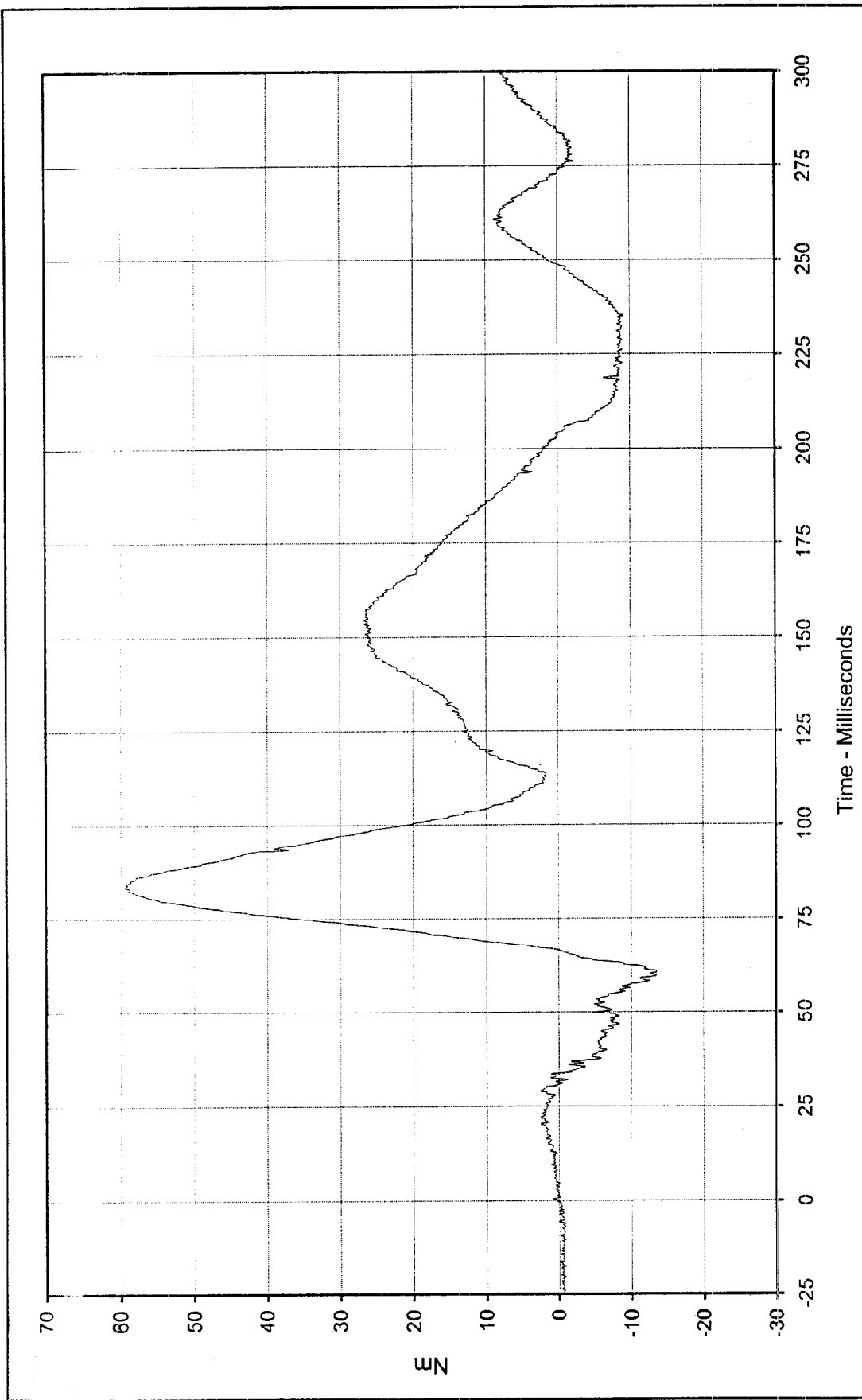
Date of Test: 11/20/98

Curve Number: FIL-054

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

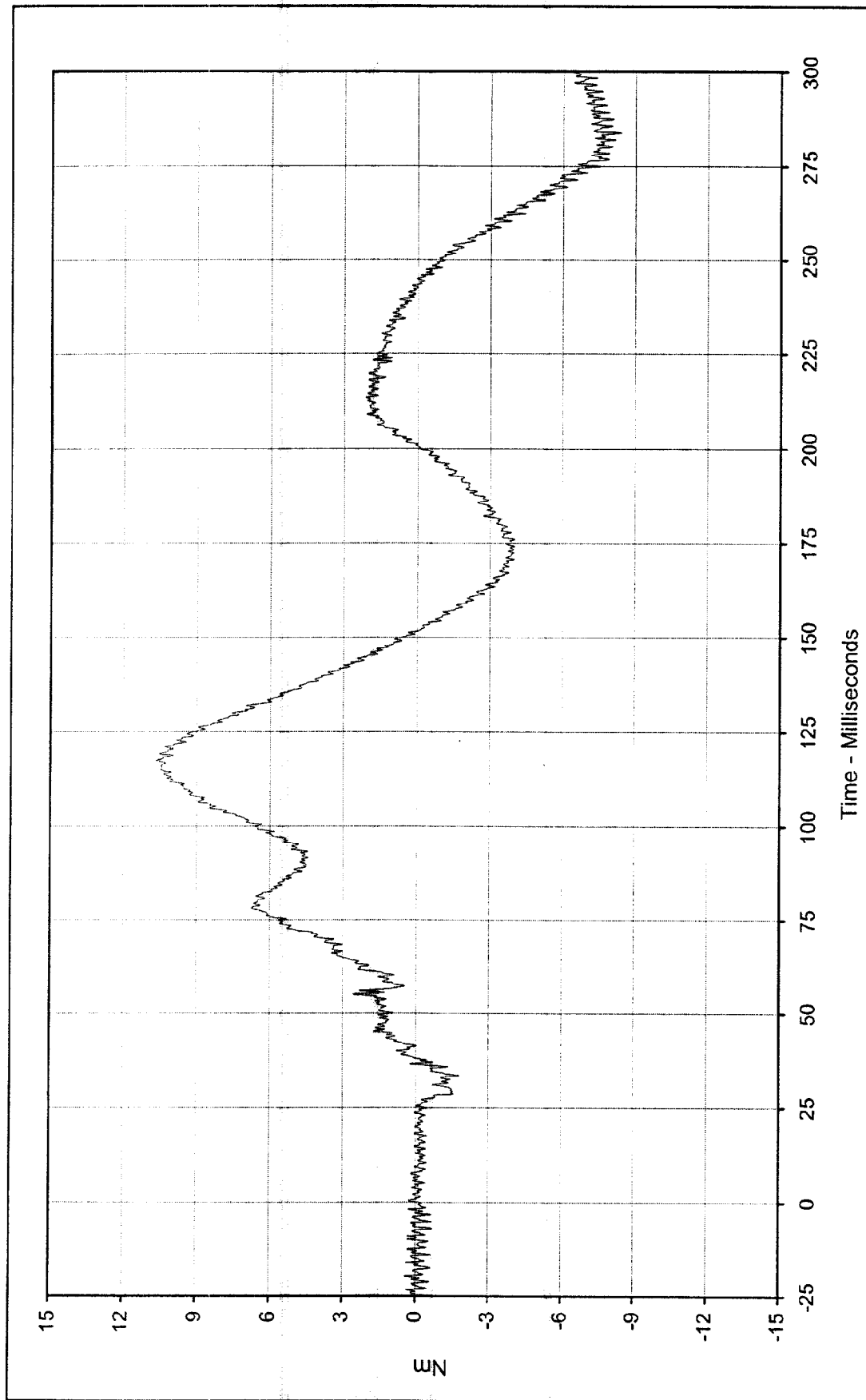




Curve Description: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Program: 1999 Saturn SL1 4 Door Sedan
 Test Vehicle:

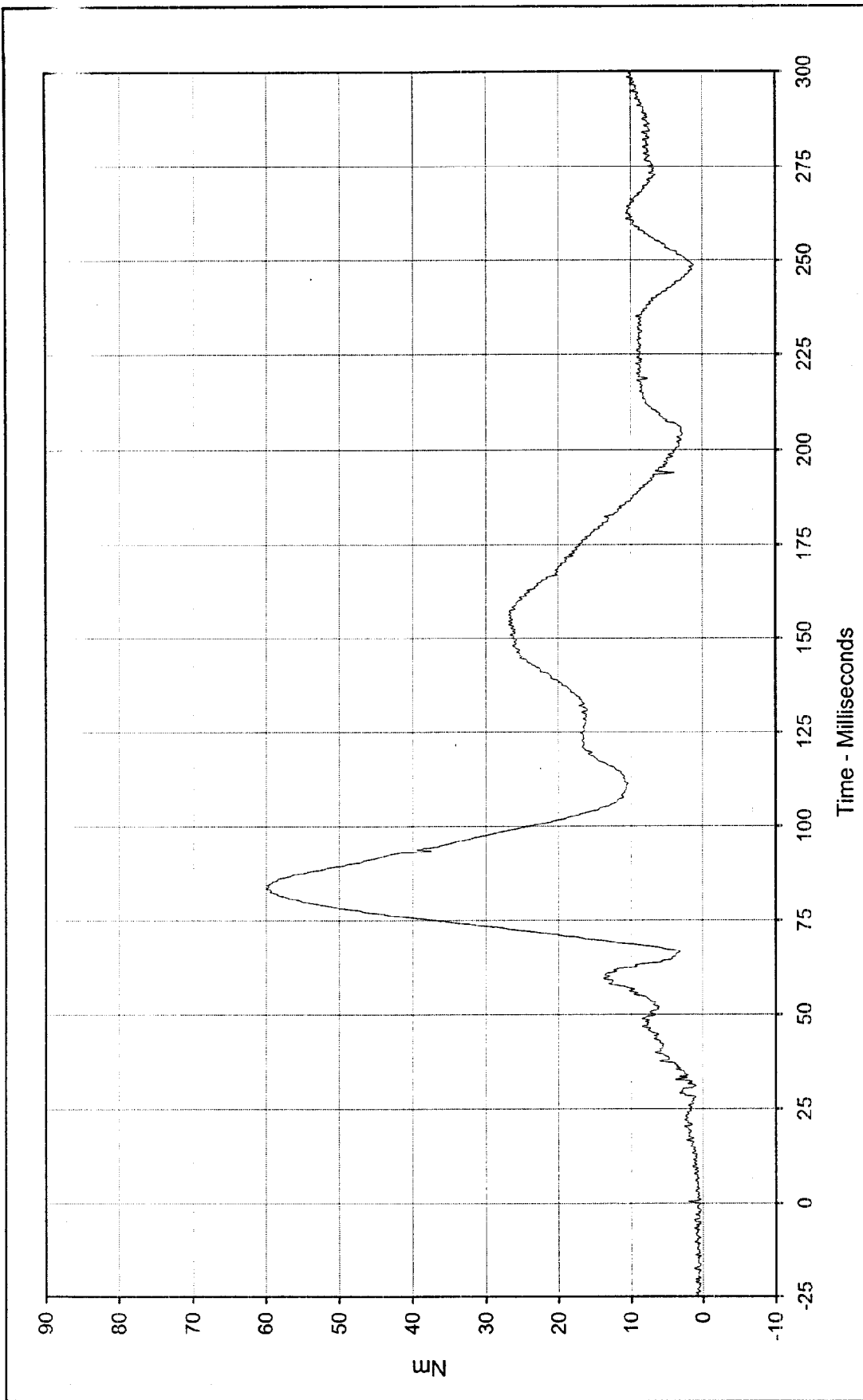
Passenger Neck Moment Y
 Maximum Value: 59.5 at 83.4 Milliseconds
 Minimum Value: -13.6 at 60.4 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-055





Curve Description:	Passenger Neck Moment Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	10.7 at 117.3 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-8.4 at 284.1 Milliseconds			
SAE Filter Class:	600			
Date of Test:	11/20/98			
Curve Number:	FIL-056			





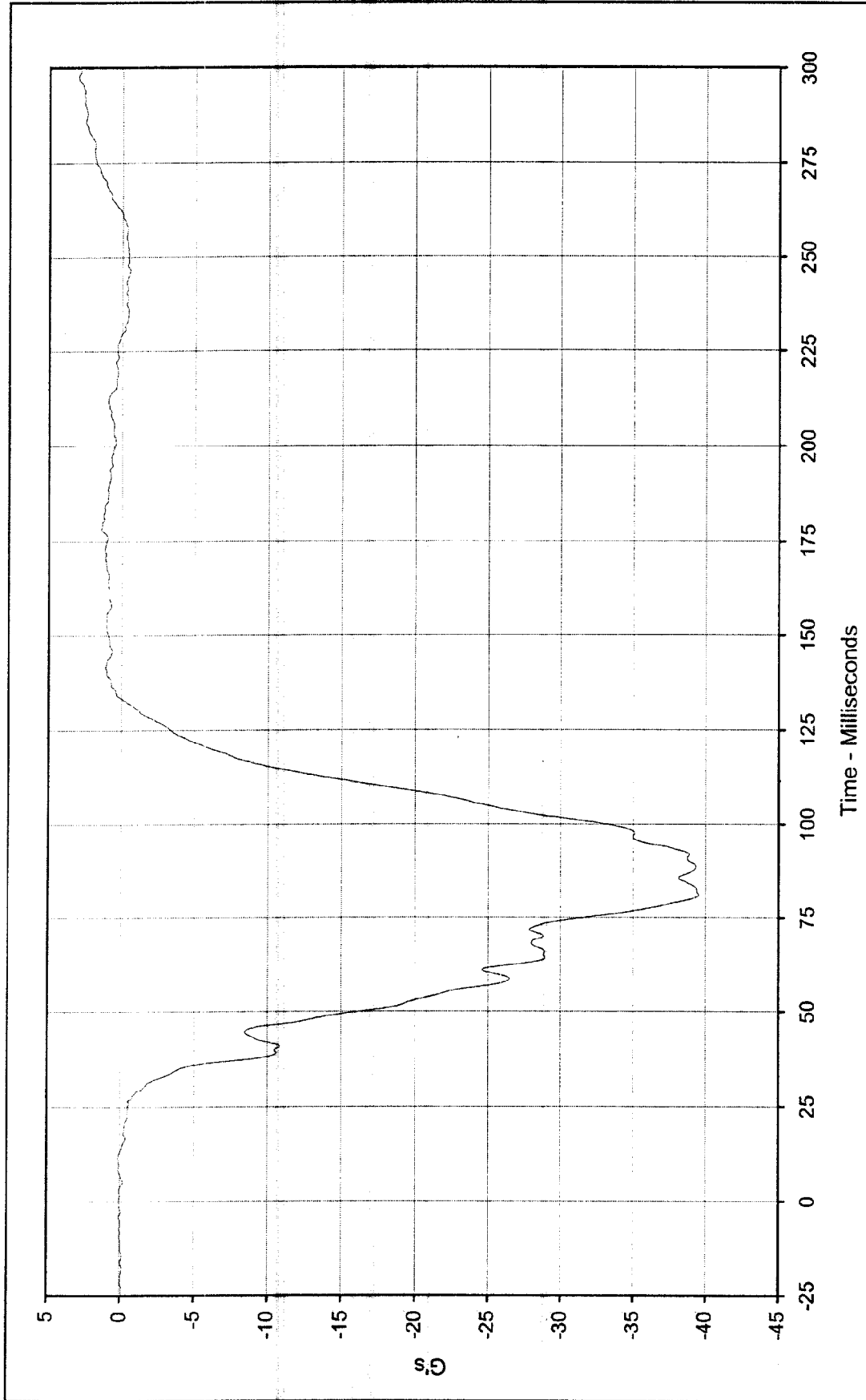
Curve Description: Passenger Neck Moment Resultant

Maximum Value:	59.9	at	83.4	Milliseconds
Minimum Value:	0.2	at	0.9	Milliseconds
SAE Filter Class:	600			
Date of Test:	11/20/98			
Curve Number:	RES-054			

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

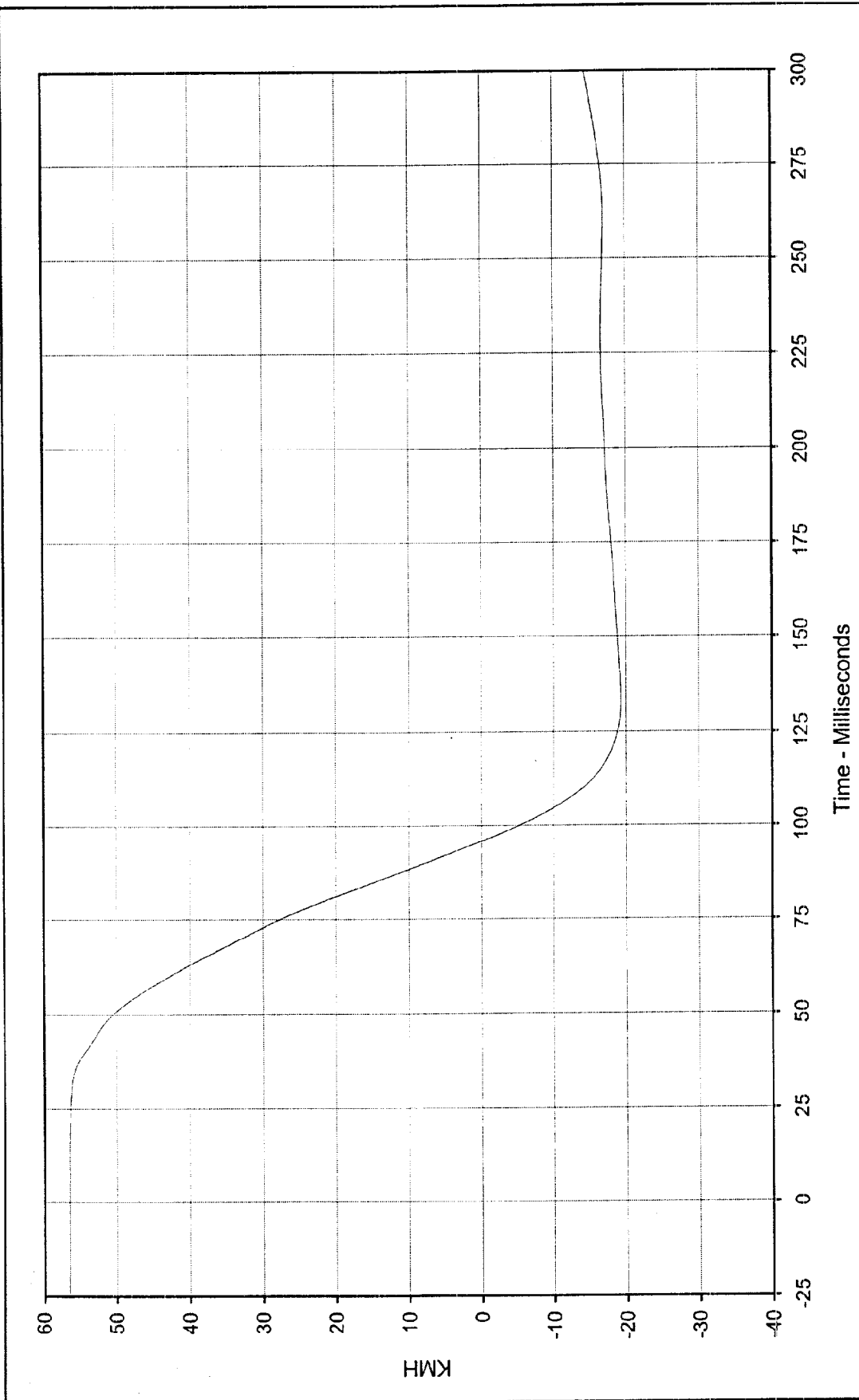
Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:	Passenger Chest Primary X	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	3.0 at 297.7 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-39.5 at 80.9 Milliseconds			
SAE Filter Class:	180			
Date of Test:	11/20/98			
Curve Number:	FIL-057			





Curve Description: Passenger Chest Primary X Velocity

Maximum Value: 56.5 at 12.9 Milliseconds

Minimum Value: -19.3 at 133.3 Milliseconds

SAE Filter Class: 180

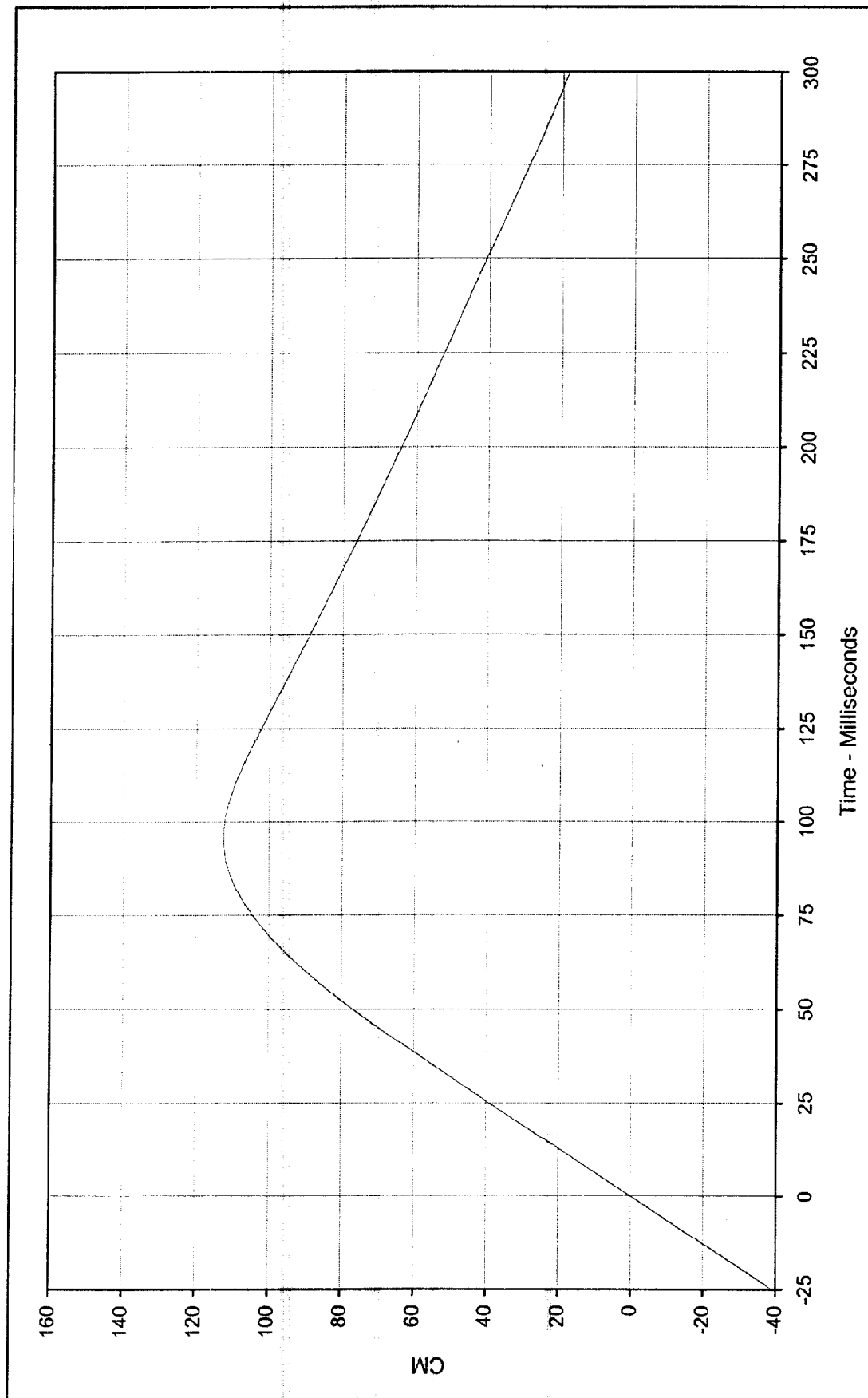
Date of Test: 11/20/98

Curve Number: IN1-057

Testing Program 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Chest Primary X Displ.

Maximum Value: 112.5 at 95.7 Milliseconds

Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

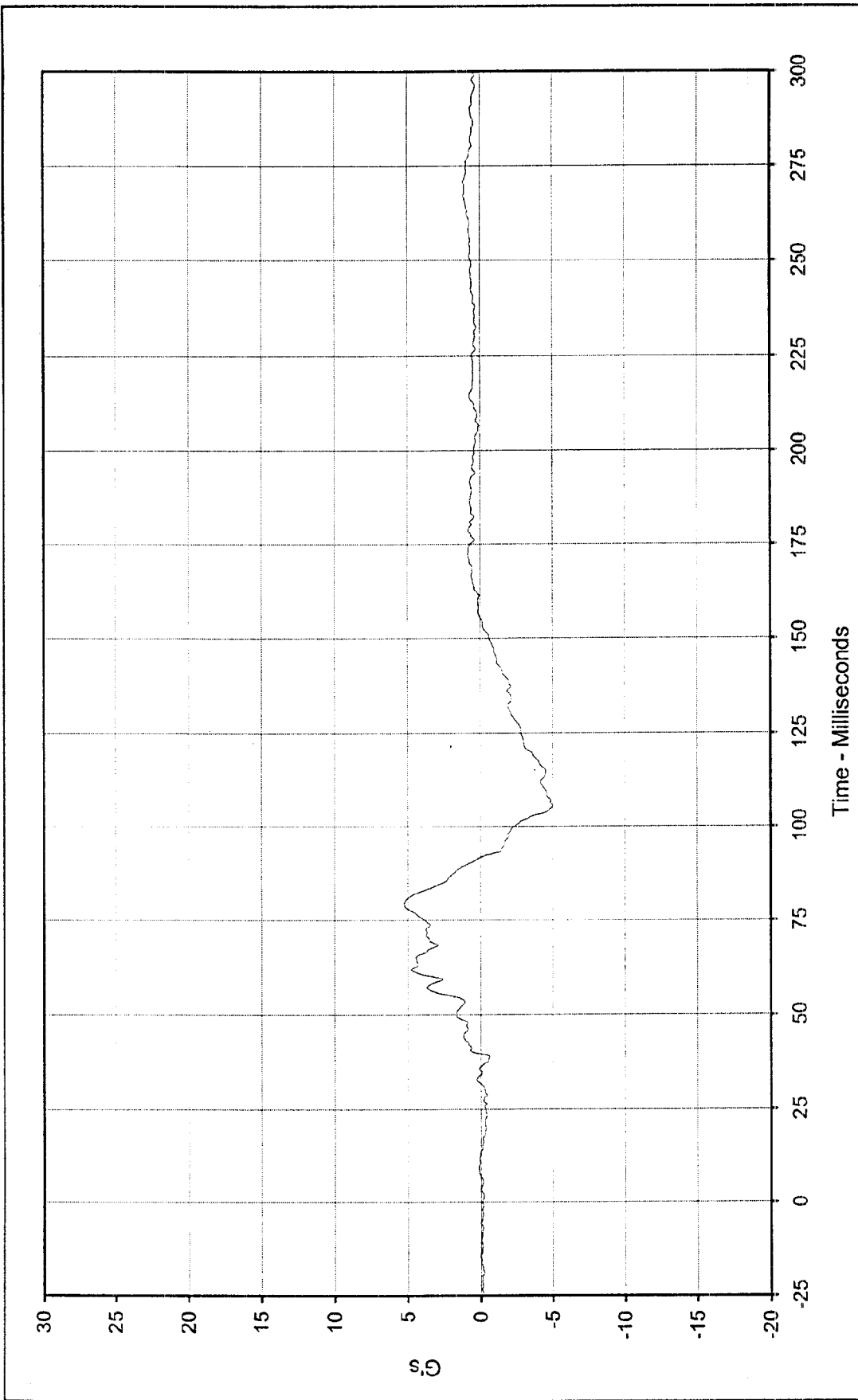
Date of Test: 11/20/98

Curve Number: IN2-057

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

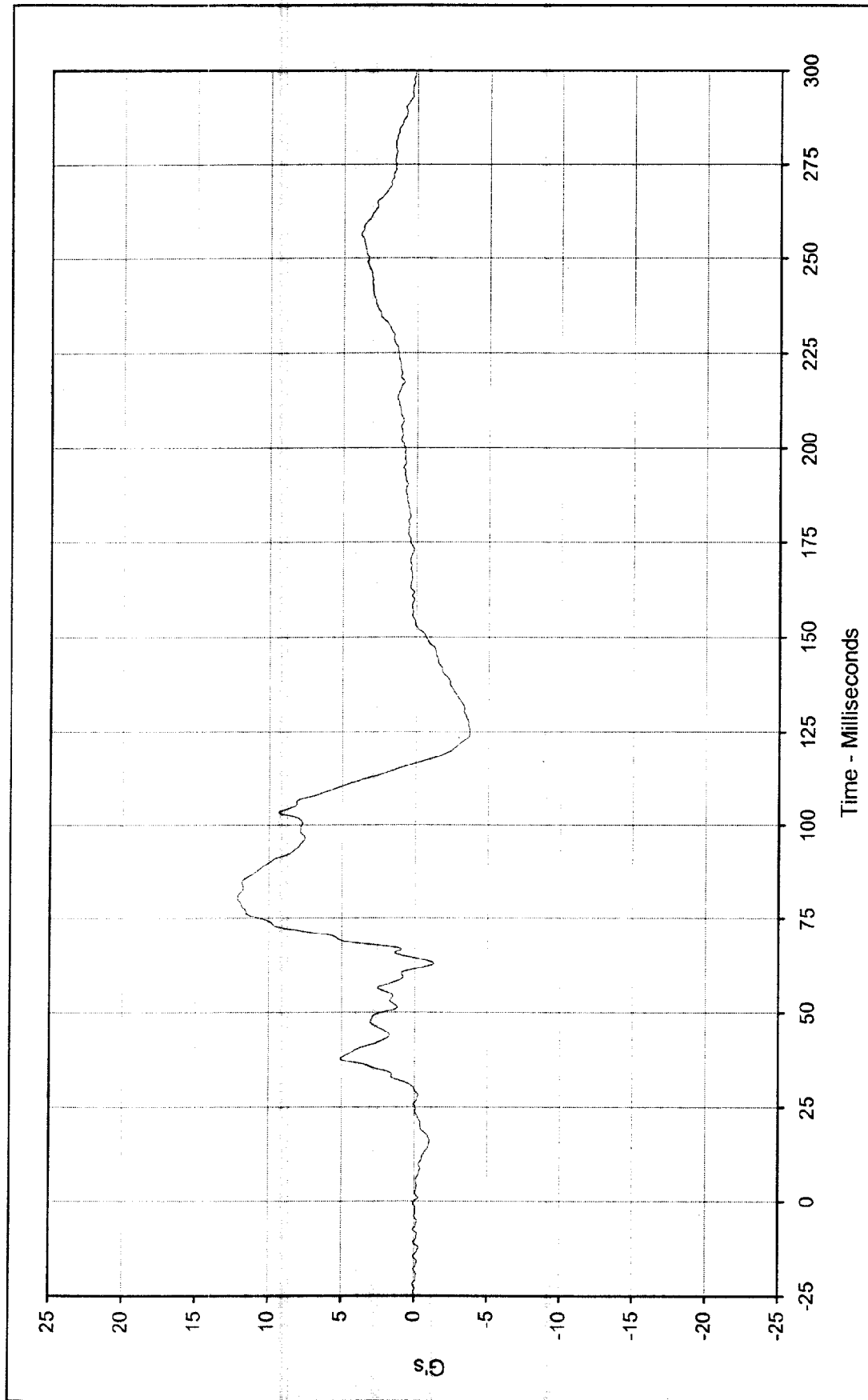




Curve Description:	Passenger Chest Primary Y	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	5.2 at 79.3 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-5.0 at 105.5 Milliseconds			

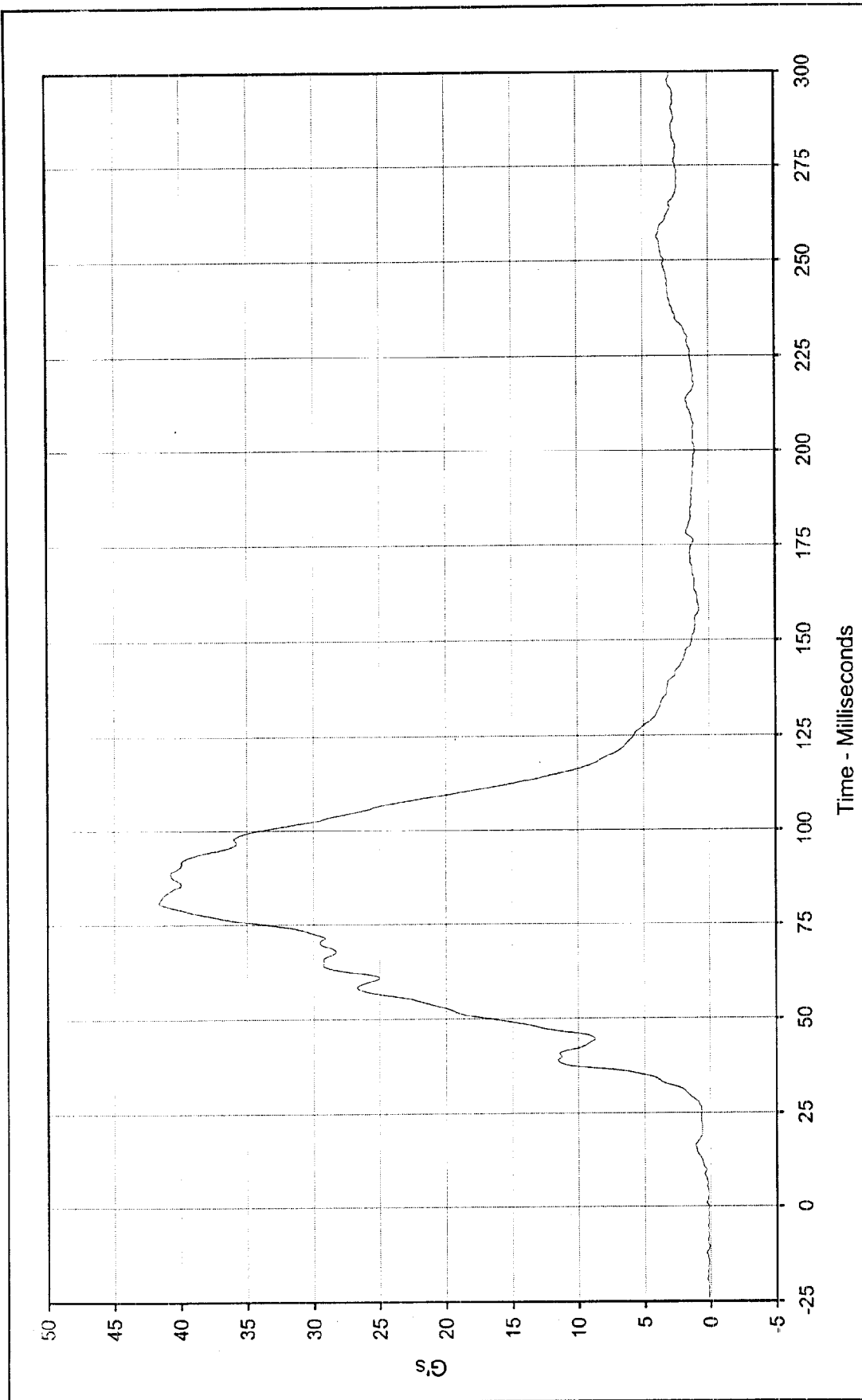


SAE Filter Class:	180
Date of Test:	11/20/98
Curve Number:	FIL-058



Curve Description:	Passenger Chest Primary Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	12.1	at	80.2	Milliseconds
Minimum Value:	-3.7	at	125.6	Milliseconds
SAE Filter Class:	180	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Date of Test:	11/20/98			
Curve Number:	FIL-059			

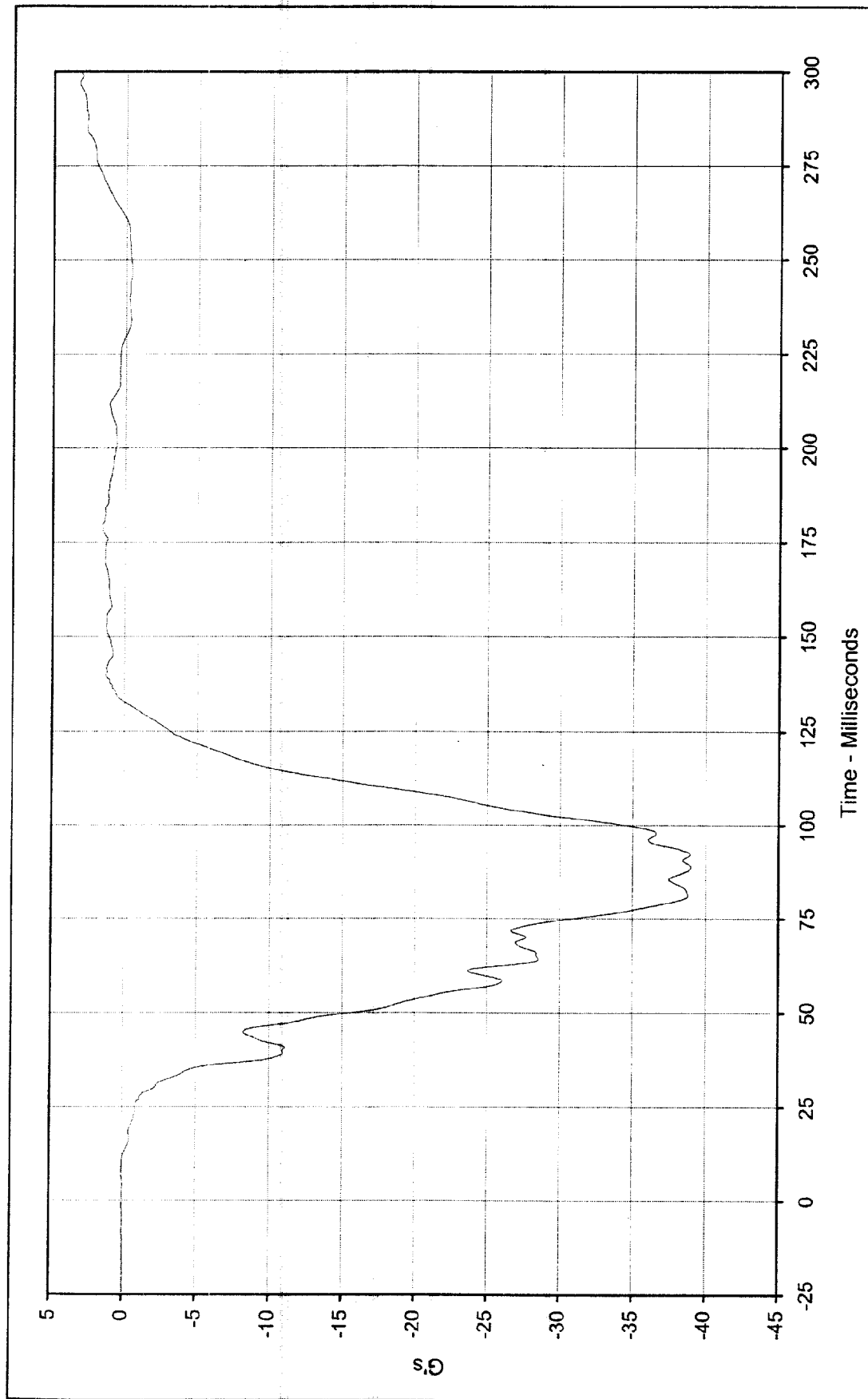




Curve Description: Passenger Chest Resultant Primary
 Maximum Value: 41.6 at 80.8 Milliseconds
 Minimum Value: 0.1 at 0.0 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: RES-057

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Chest Redundant X Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Maximum Value: 3.2 at 297.0 Milliseconds Test Vehicle: 1999 Saturn SL1 4 Door Sedan

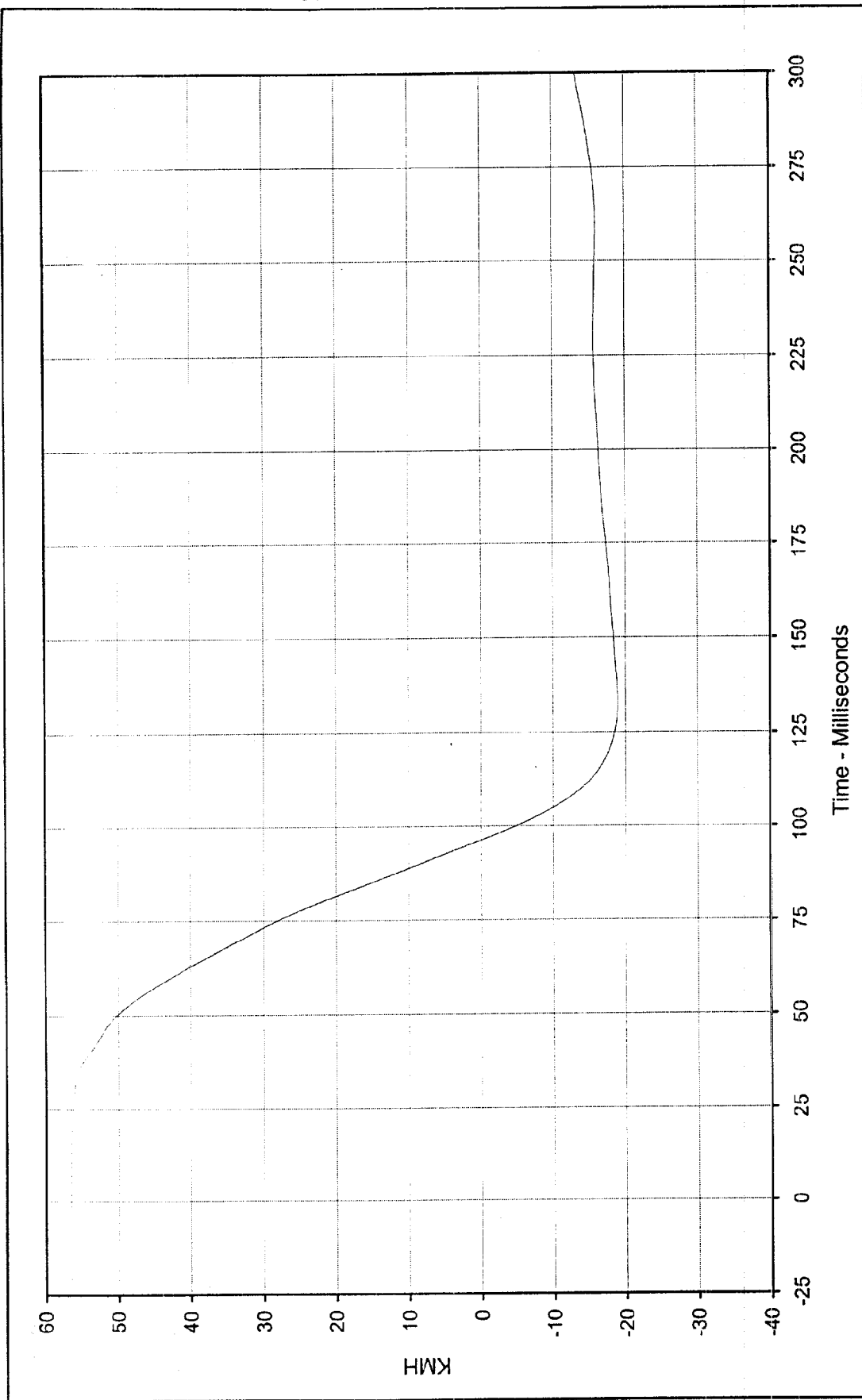
Minimum Value: -39.0 at 88.6 Milliseconds

SAE Filter Class: 180

Date of Test: 11/20/98

Curve Number: FIL-060





Curve Description: Passenger Chest Redundant X Velocity

Maximum Value: 56.6 at 11.2 Milliseconds

Minimum Value: -19.0 at 132.7 Milliseconds

SAE Filter Class: 180

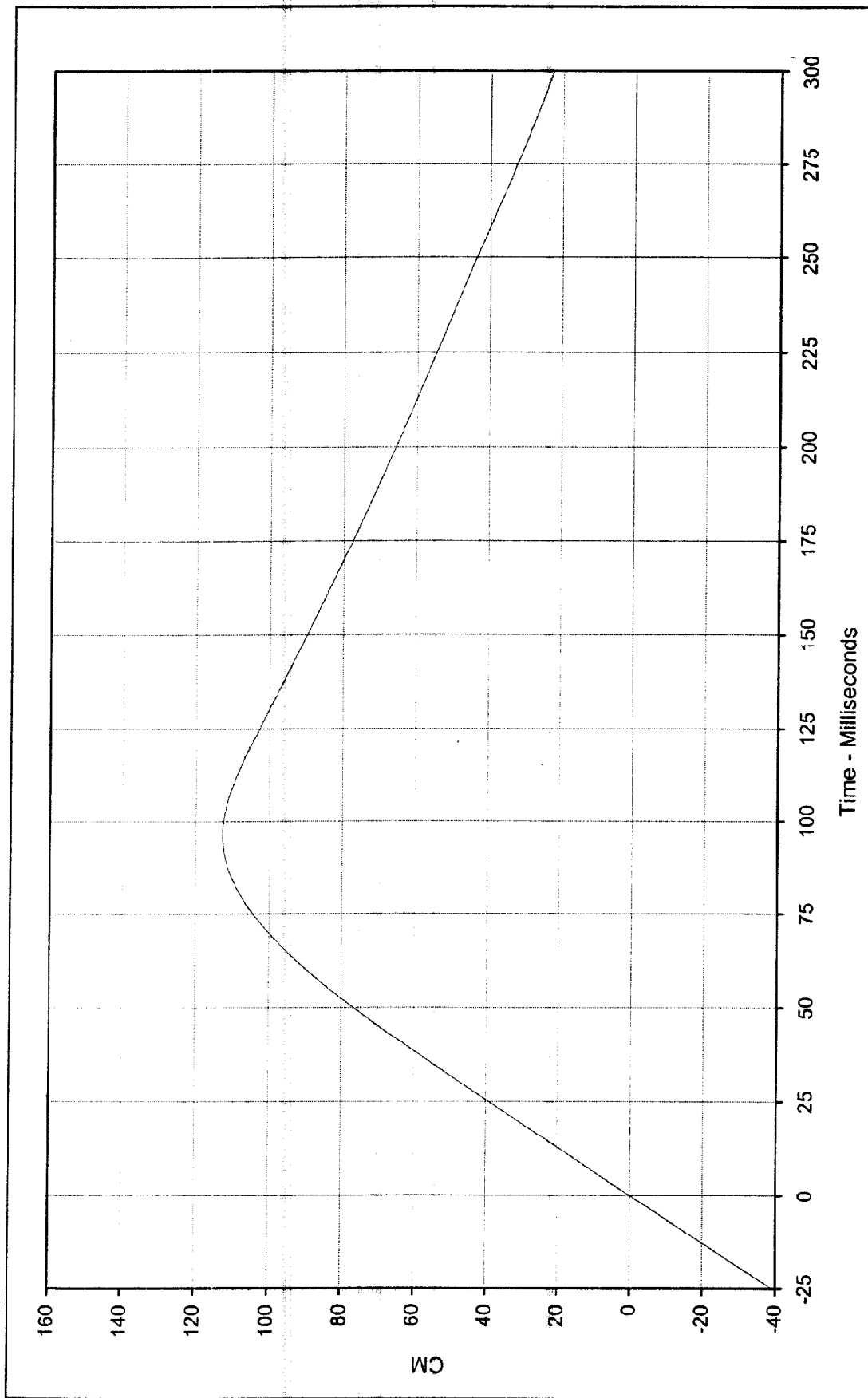
Date of Test: 11/20/98

Curve Number: IN1-060

Testing Program 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Chest Redundant X Displ.

Maximum Value: 112.7 at 96.2 Milliseconds

Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

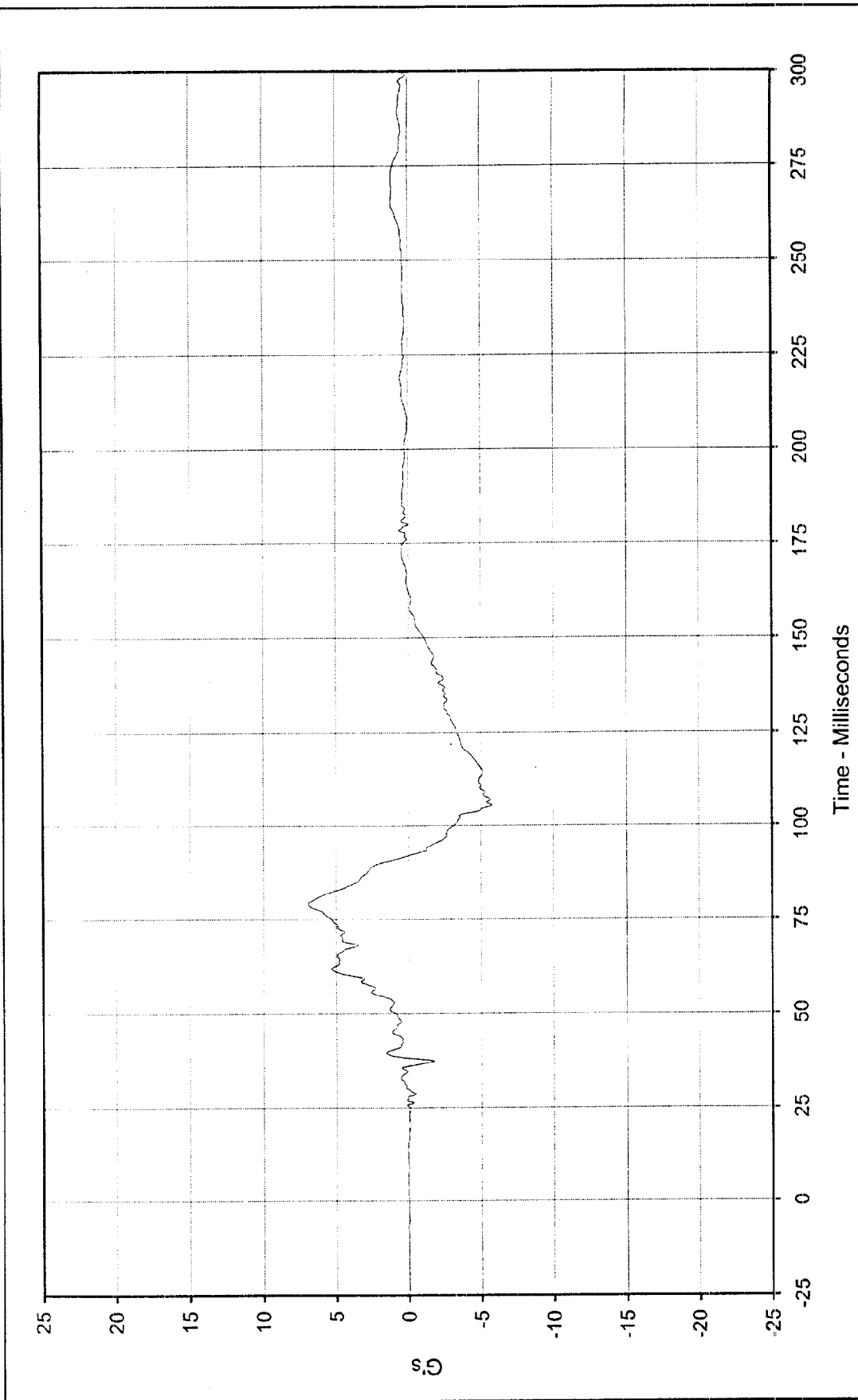
Date of Test: 11/20/98

Curve Number: IN2-060

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

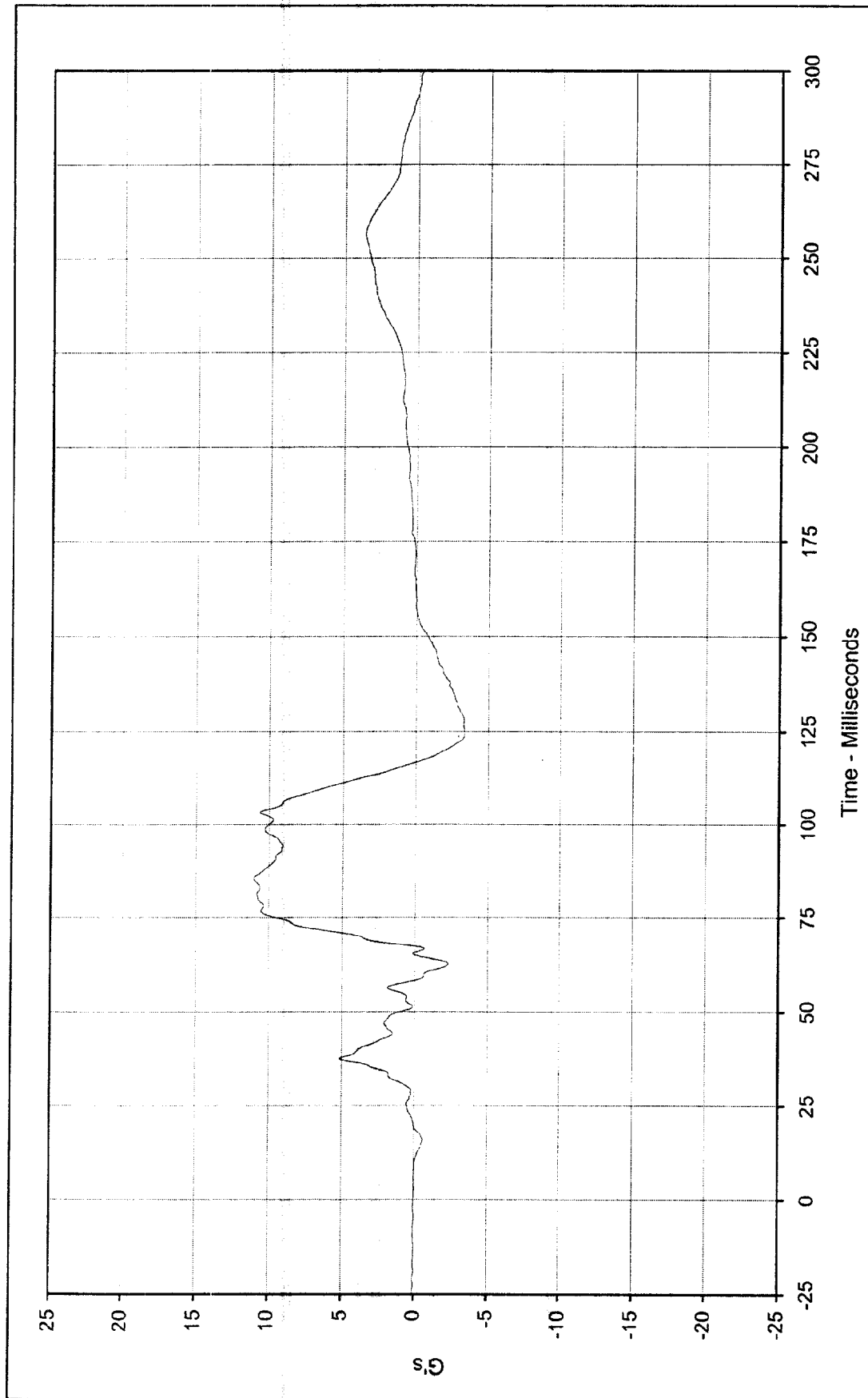




Curve Description: Passenger Chest Redundant Y
 Maximum Value: 6.9 at 79.2 Milliseconds
 Minimum Value: -5.8 at 105.4 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: FIL-061

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL 1 4 Door Sedan





Curve Description: Passenger Chest Redundant Z Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Maximum Value: 11.0 at 85.2 Milliseconds Test Vehicle: 1999 Saturn SL1 4 Door Sedan

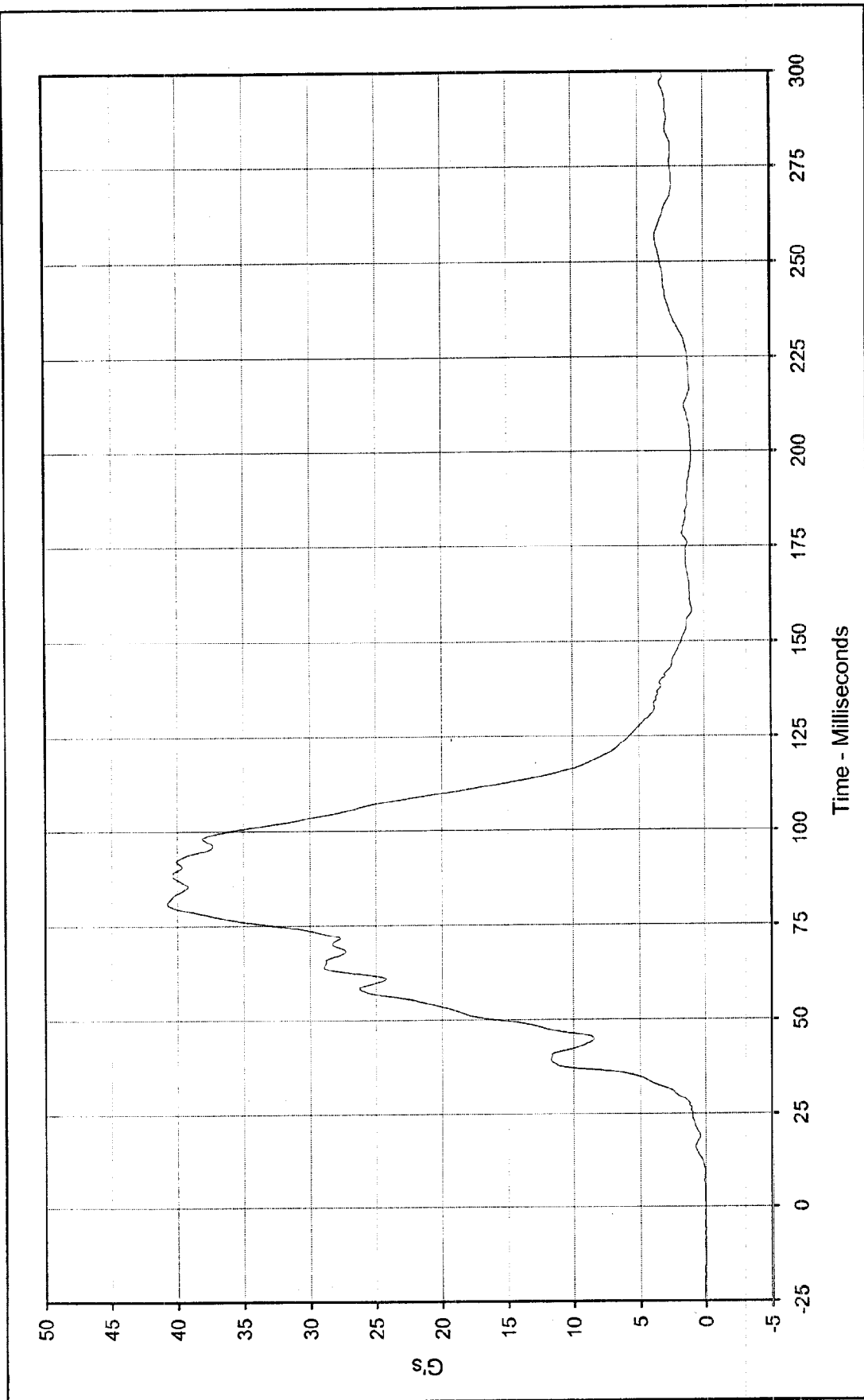
Minimum Value: -3.4 at 124.4 Milliseconds

SAE Filter Class: 180

Date of Test: 11/20/98

Curve Number: FIL-062

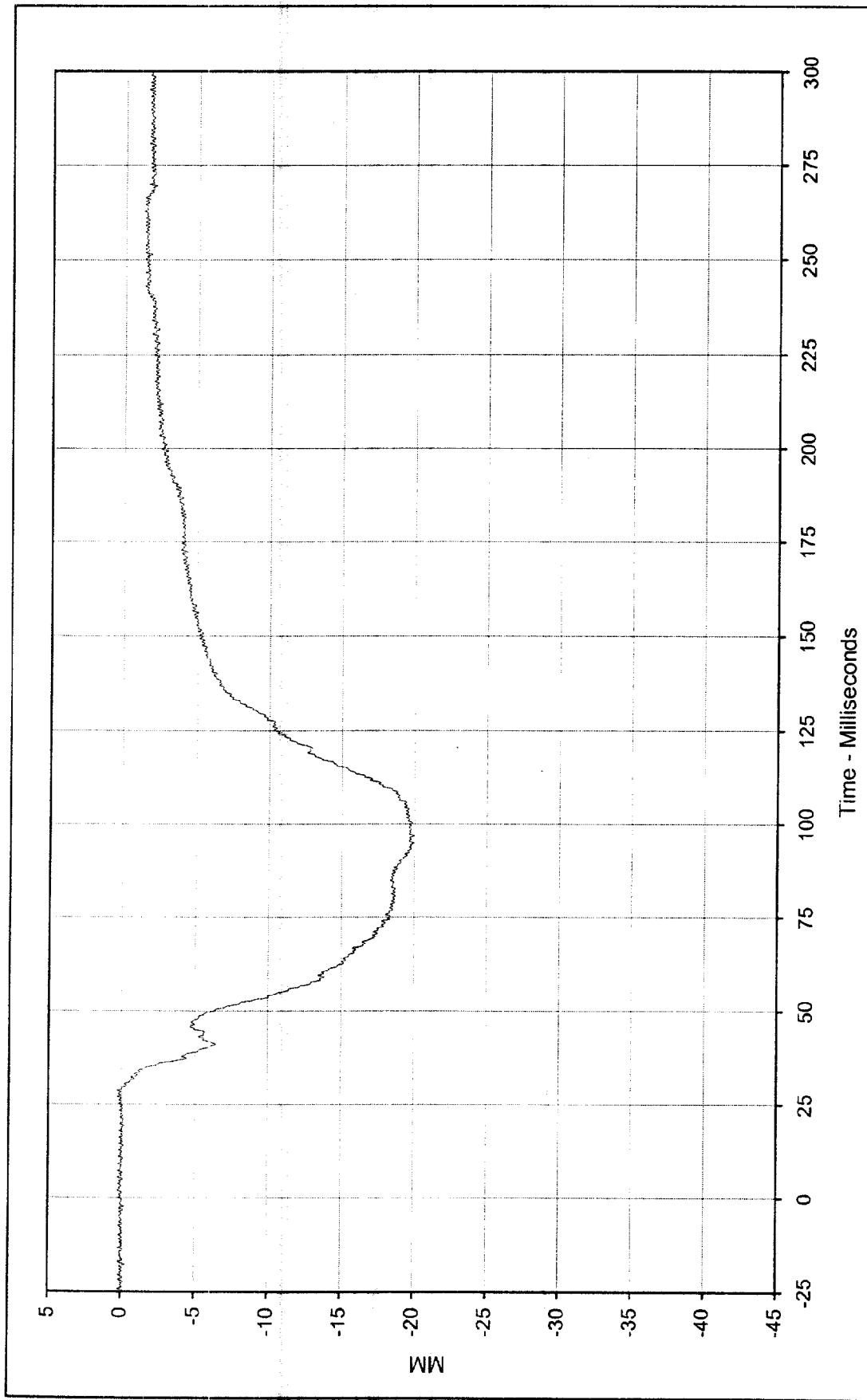




Curve Description: Passenger Chest Resultant Redundant
 Maximum Value: 40.7 at 80.8 Milliseconds
 Minimum Value: 0.0 at 0.6 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: RES-060

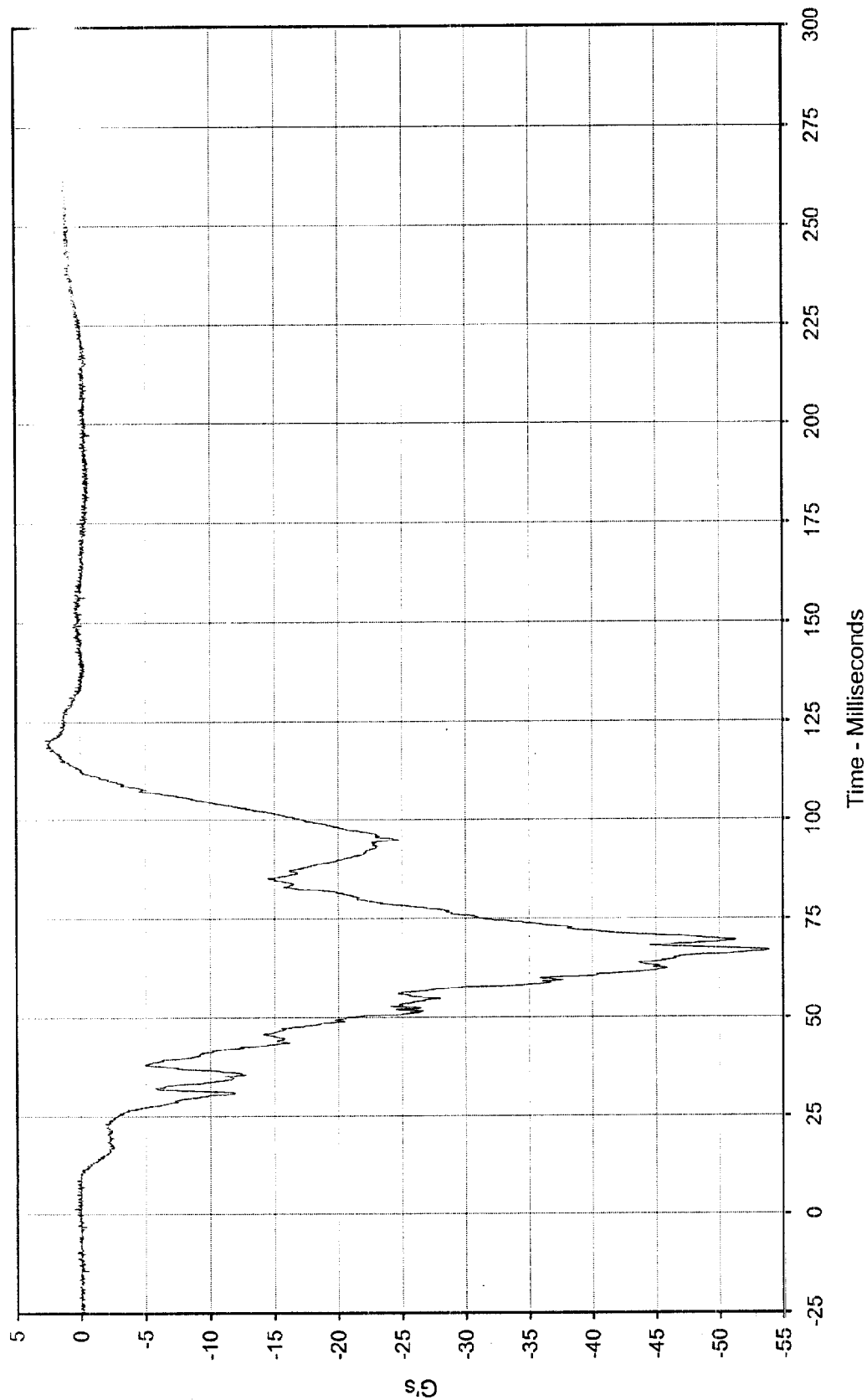
Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:	Passenger Chest Displacement X	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	0.3 at 28.8 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-20.0 at 96.8 Milliseconds			
SAE Filter Class:	600			
Date of Test:	11/20/98			
Curve Number:	FIL-063			

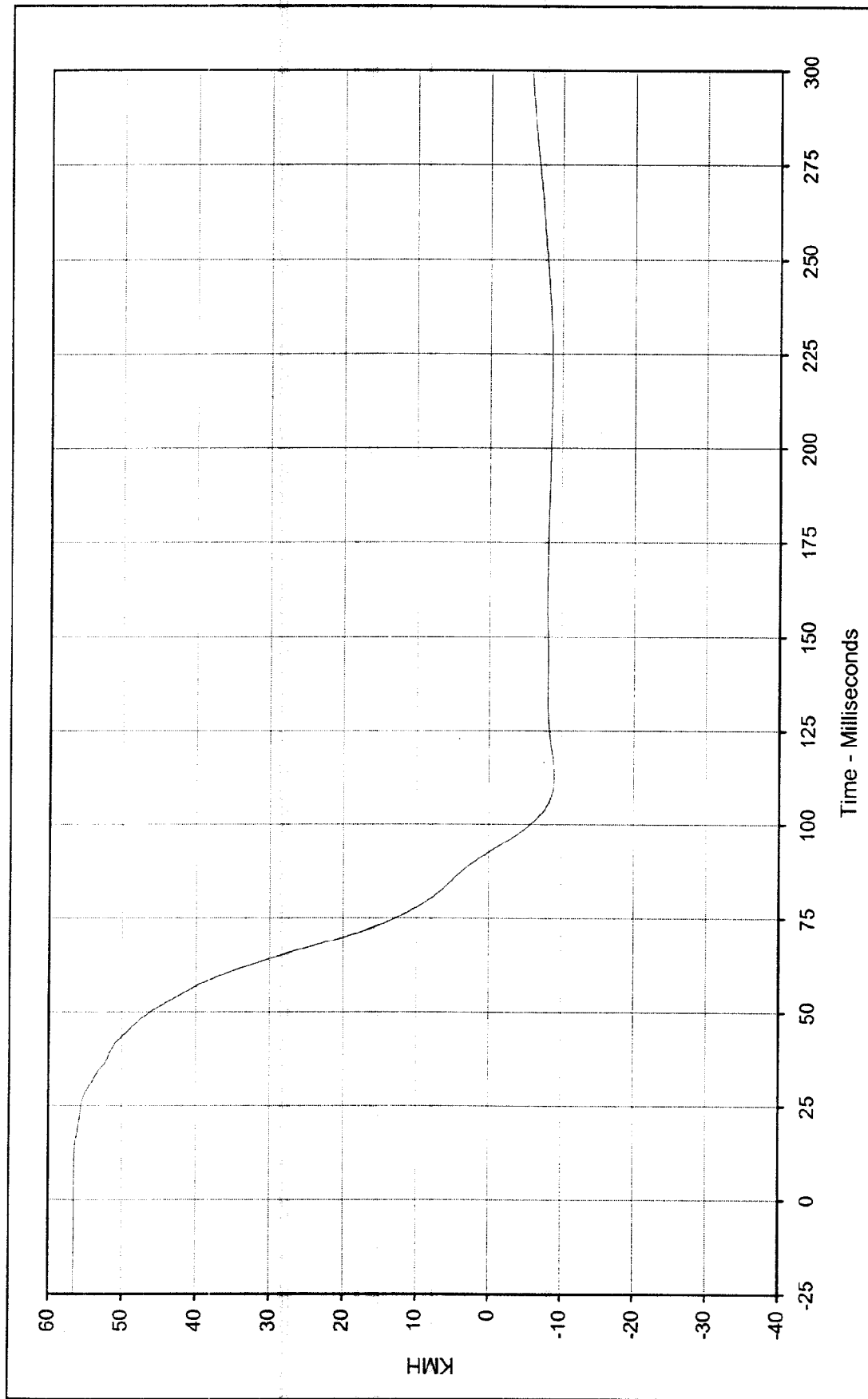




Curve Description: Passenger Pelvis X
 Maximum Value: 2.8 at 120.2 Milliseconds
 Minimum Value: -53.9 at 66.8 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-064

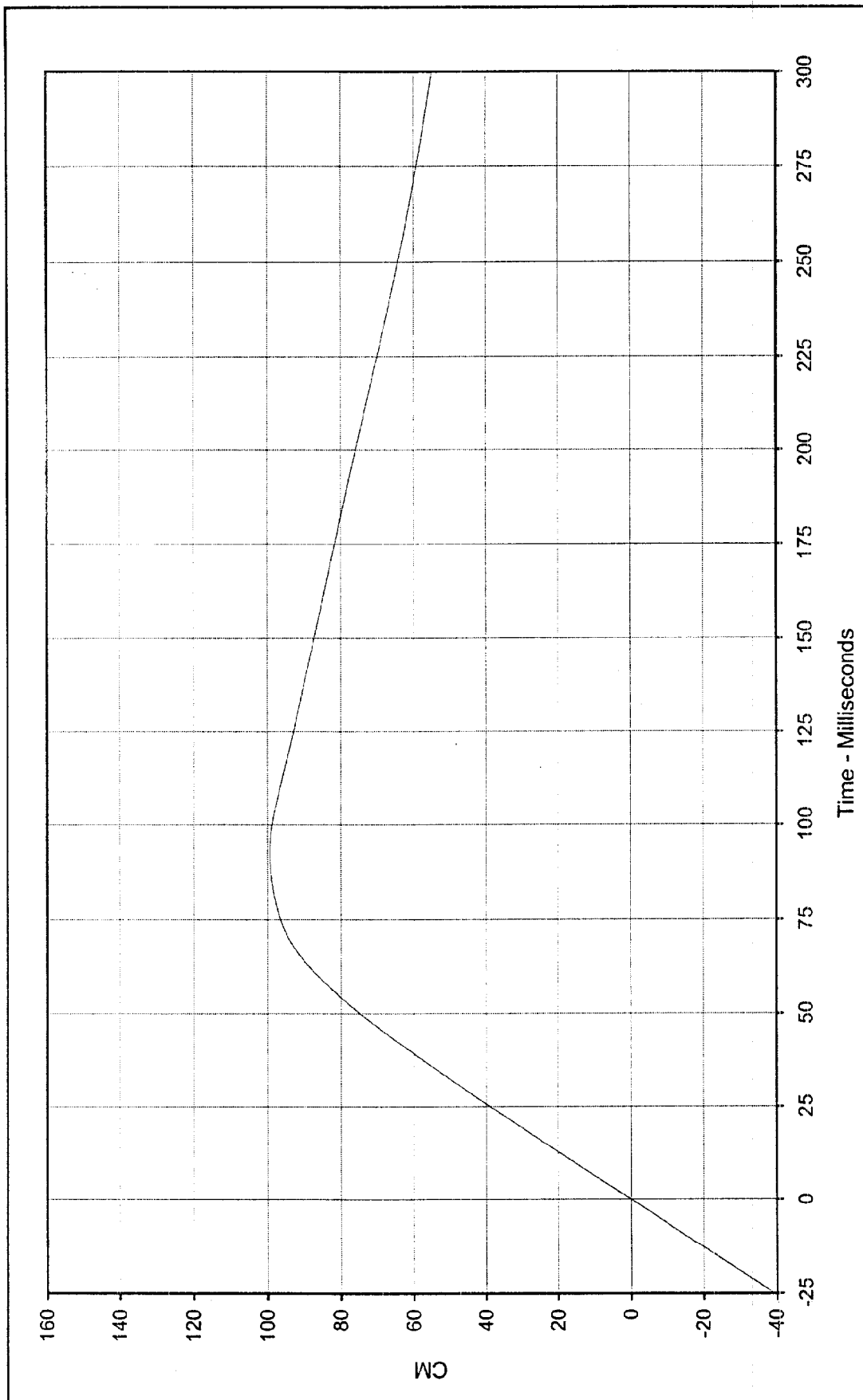
Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:	Passenger Pelvis X Velocity	Testing Program	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	56.5 at 9.6 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-9.0 at 112.5 Milliseconds			
SAE Filter Class:	180			
Date of Test:	11/20/98			
Curve Number:	IN1-064			





Curve Description: Passenger Pelvis X Displ.

Maximum Value: 99.3 at 92.5 Milliseconds

Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

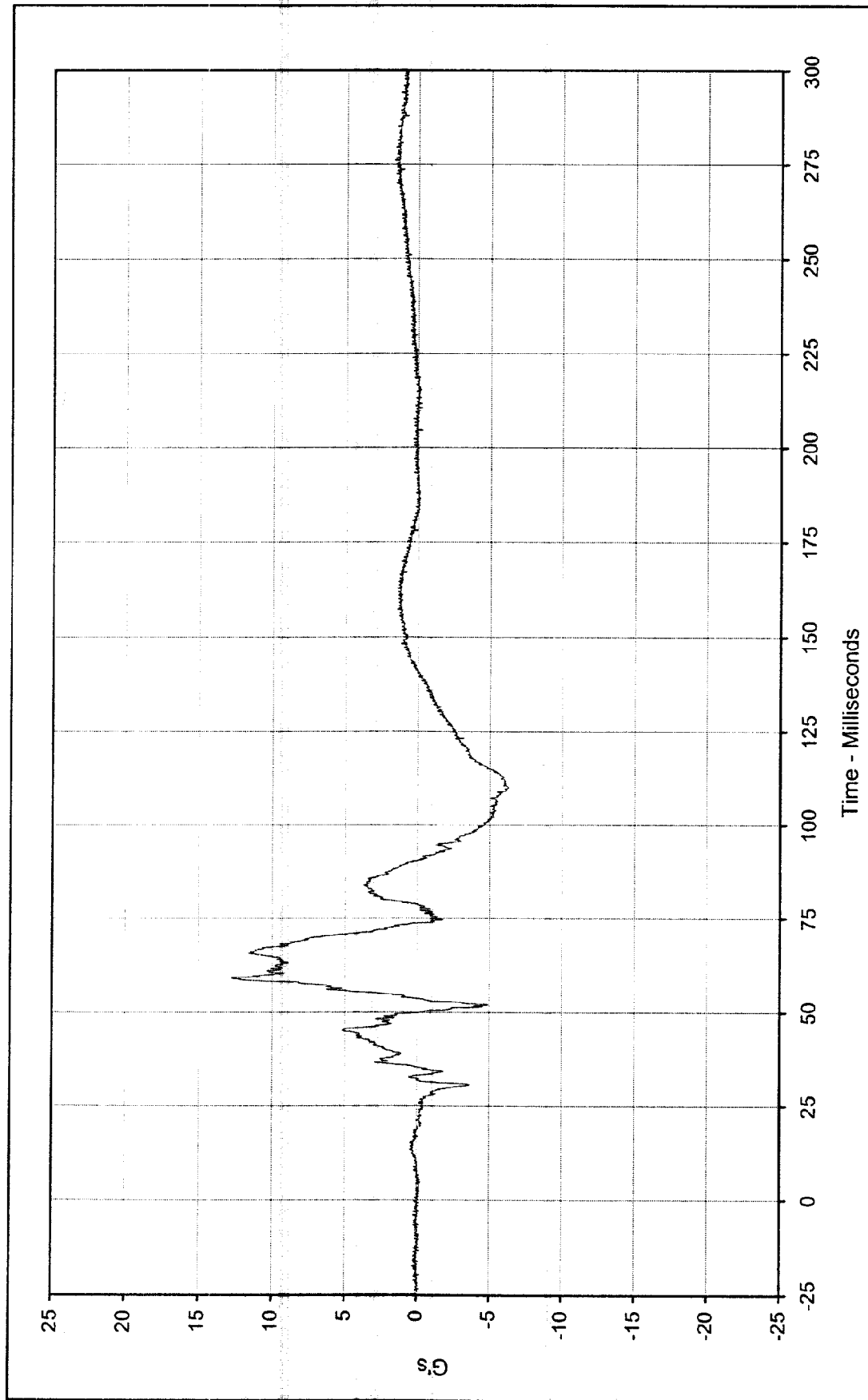
Date of Test: 11/20/98

Curve Number: IN2-064

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL 1 4 Door Sedan



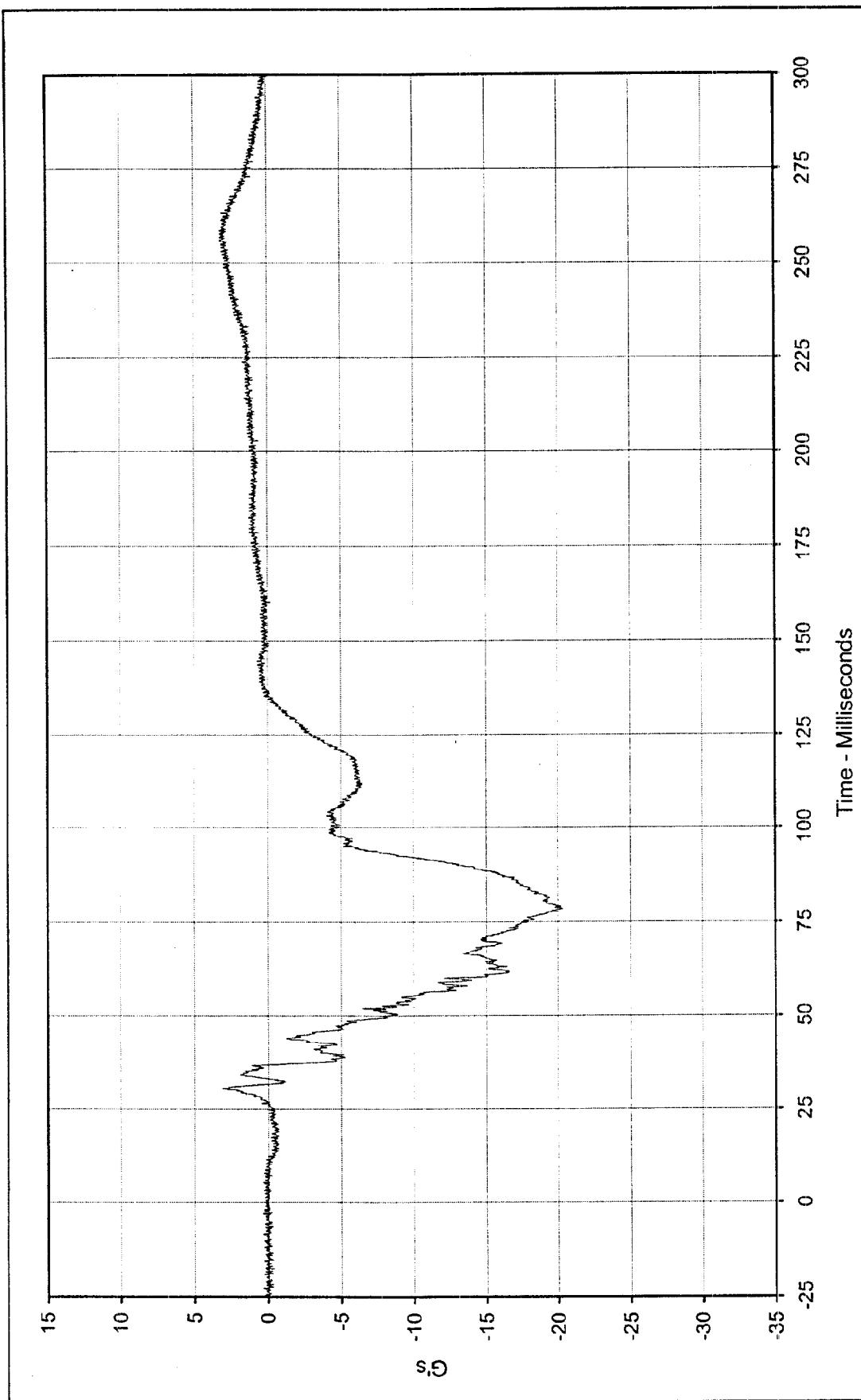


B-98

Curve Description:		Passenger Pelvis Y		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	12.8	at	59.0	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-6.3	at	109.9			
SAE Filter Class:	1000					
Date of Test:	11/20/98					
Curve Number:	FIL-065					



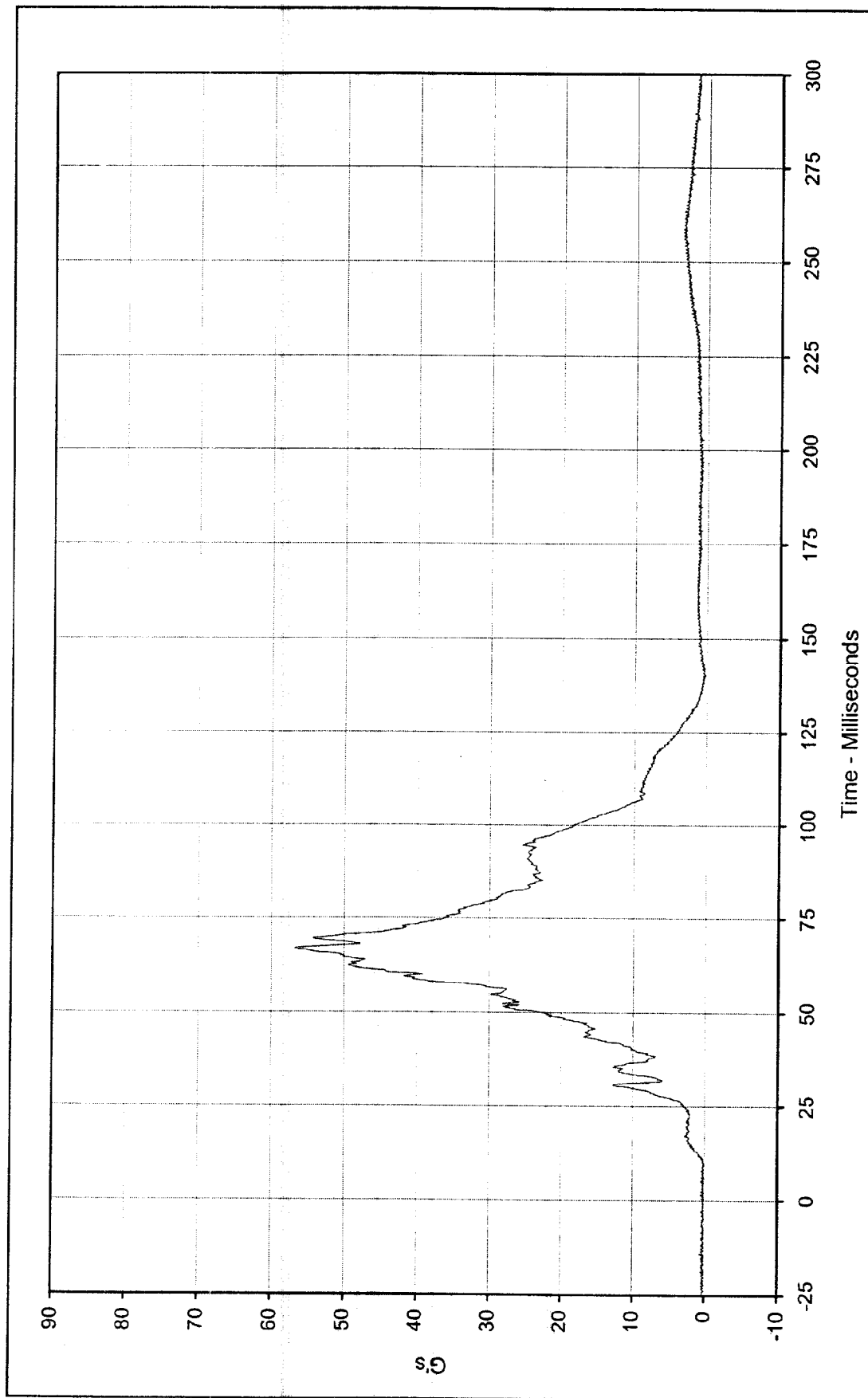
KAR99001-02



Curve Description: Passenger Pelvis Z
 Maximum Value: 3.2 at 256.1 Milliseconds
 Minimum Value: -20.4 at 78.3 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/20/98
 Curve Number: FIL-066

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan



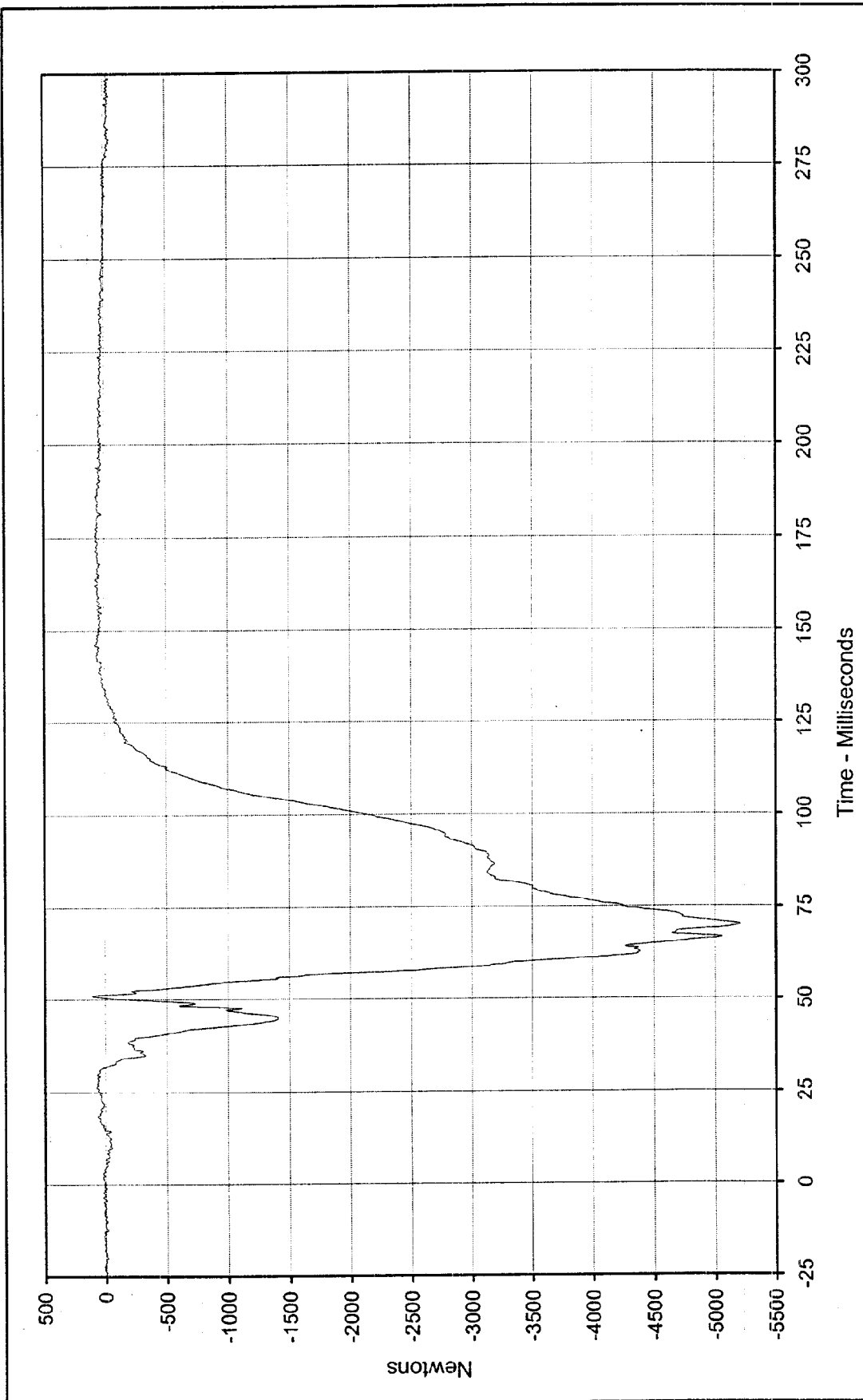


B-100

Curve Description:	Passenger Pelvis Resultant	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	56.7 at 66.9 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	0.0 at 5.7 Milliseconds			
SAE Filter Class:	1000			
Date of Test:	11/20/98			
Curve Number:	RES-064			



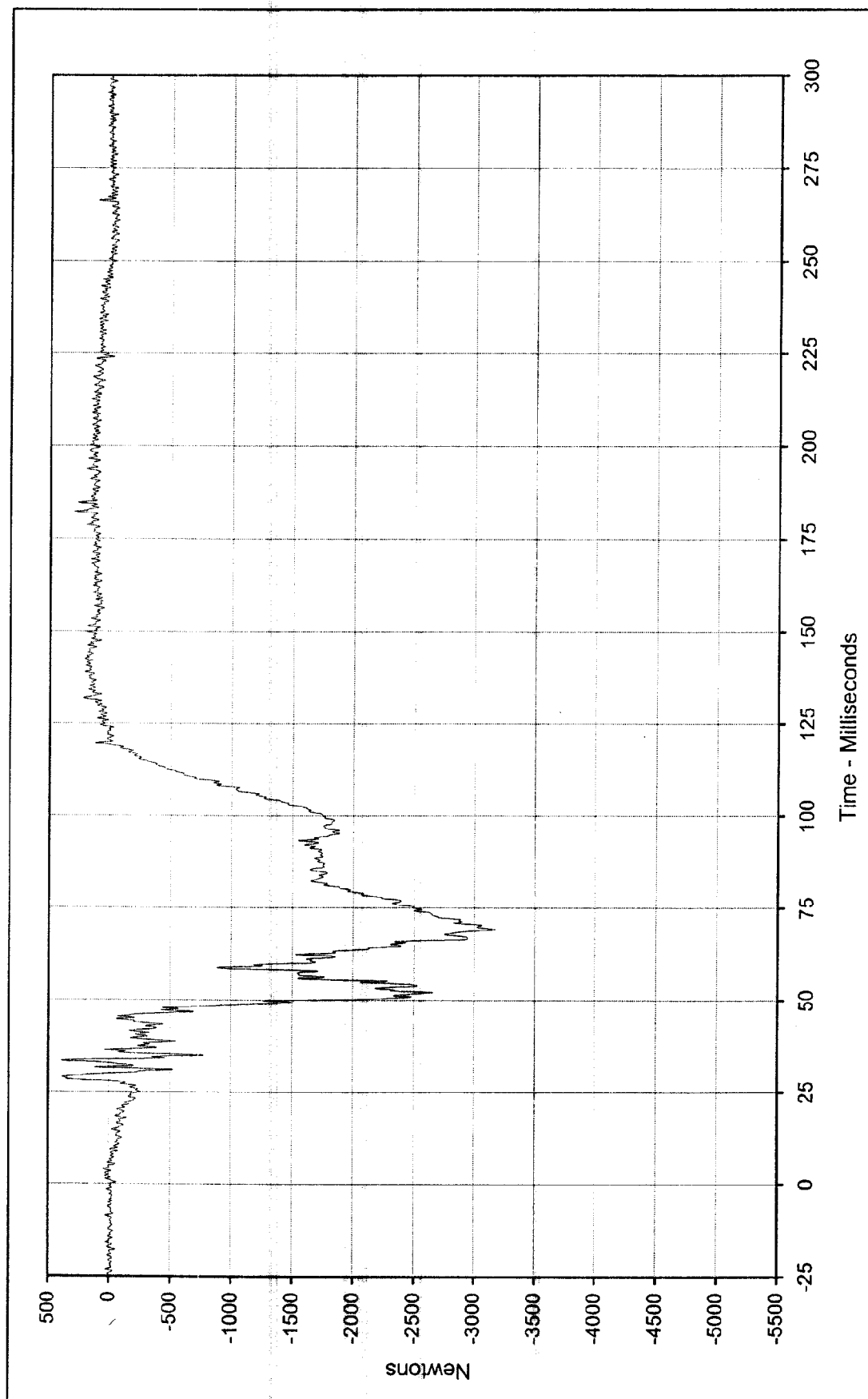
KAR99001-02



Curve Description: Passenger Left Femur Force
 Maximum Value: 111.8 at 51 Milliseconds
 Minimum Value: -5209.1 at 70.0 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-067

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Right Femur Force Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Maximum Value: 389.3 at 33.3 Milliseconds Test Vehicle: 1999 Saturn SL1 4 Door Sedan

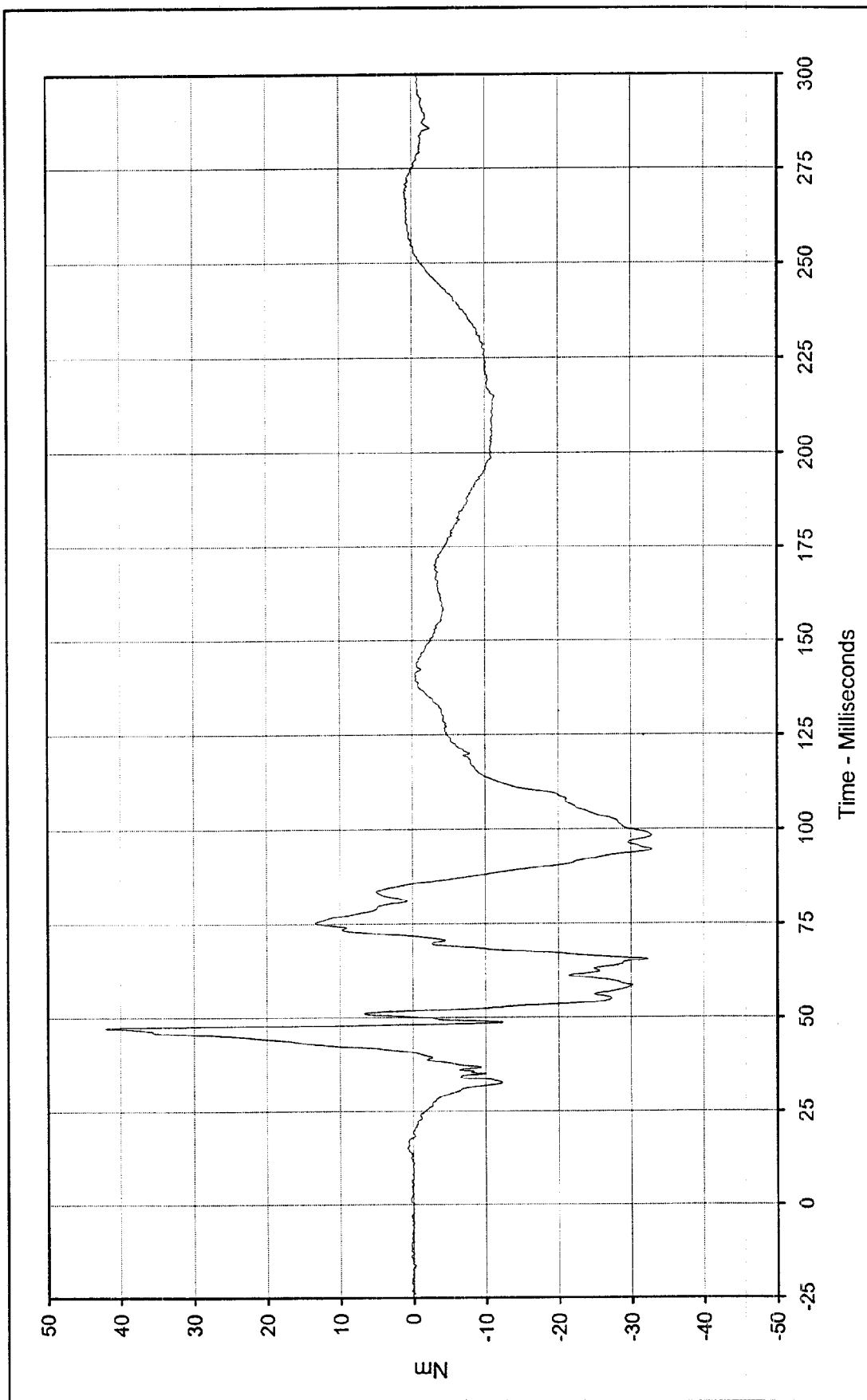
Minimum Value: -3176.3 at 69.2 Milliseconds

SAE Filter Class: 600

Date of Test: 11/20/98

Curve Number: FIL-068





Curve Description: Passenger Left Upper Tibia Moment X

Maximum Value: 42.0 at 47.2 Milliseconds

Minimum Value: -32.9 at 94.5 Milliseconds

SAE Filter Class: 600

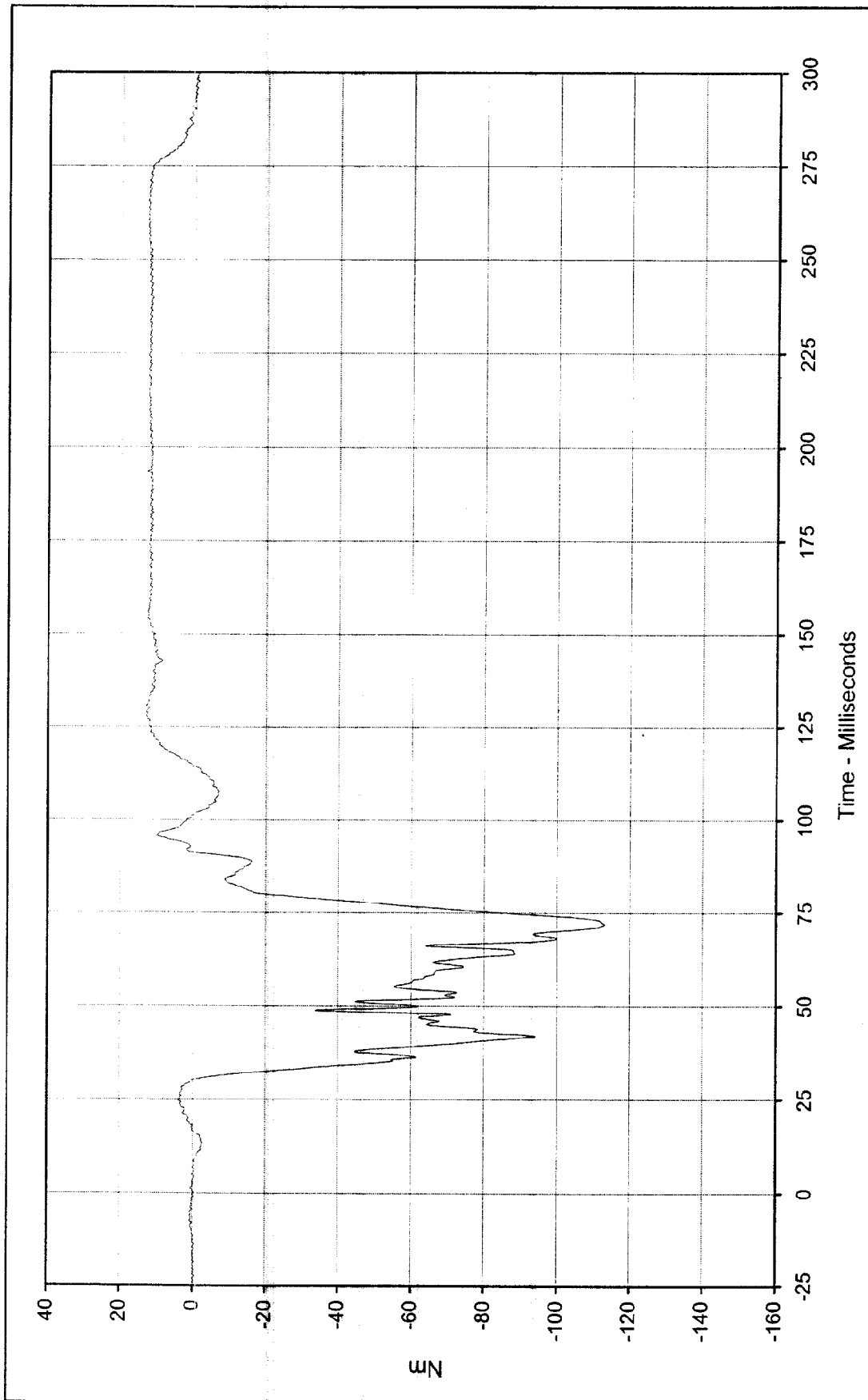
Date of Test: 11/20/98

Curve Number: FIL-069

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Left Upper Tibia Moment Y

Maximum Value: 13.2 at 129.1 Milliseconds

Minimum Value: -113.0 at 72.0 Milliseconds

SAE Filter Class: 600

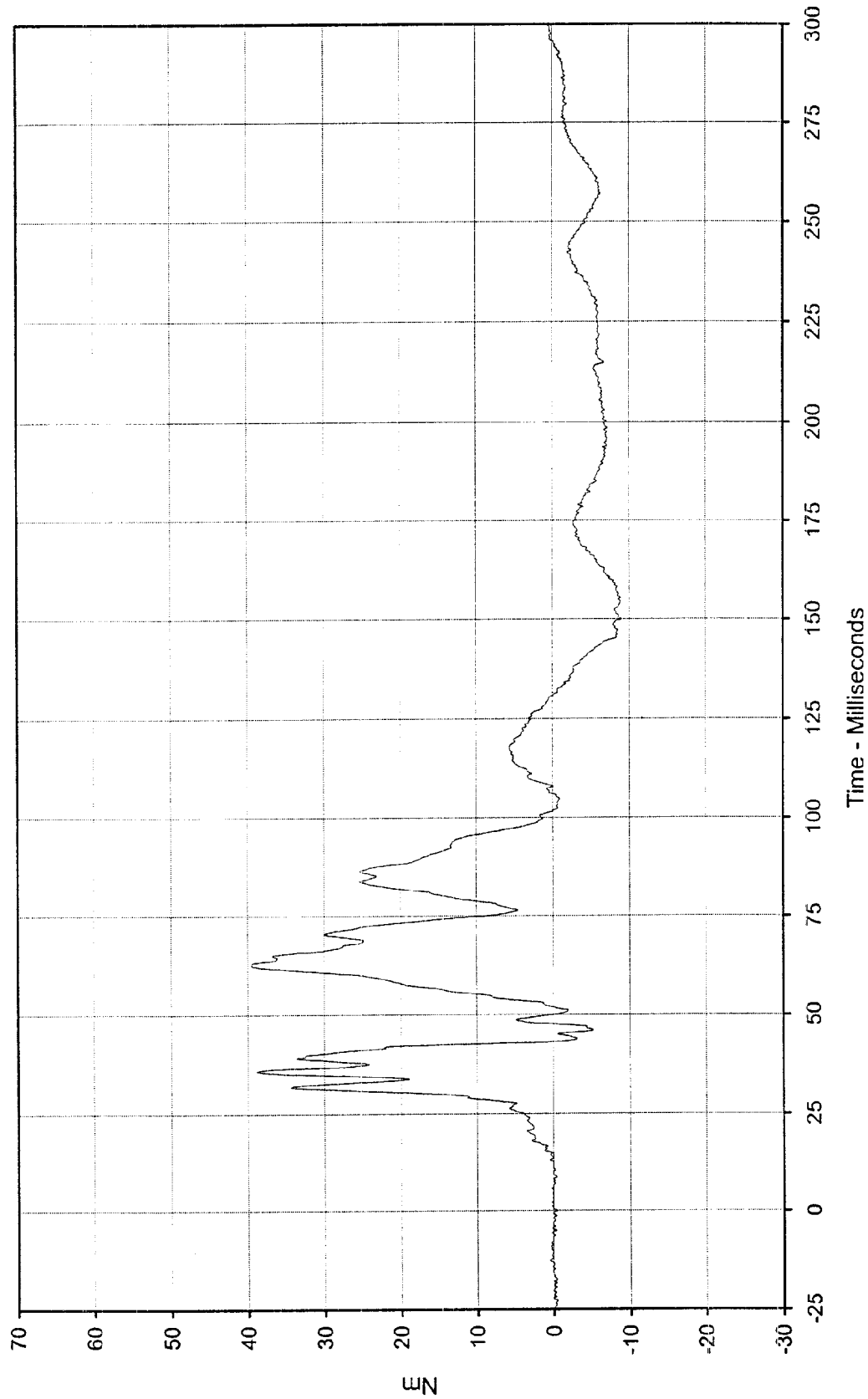
Date of Test: 11/20/98

Curve Number: FIL-070

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Right Upper Tibia Moment X

Maximum Value: 39.5 at 62.8 Milliseconds

Minimum Value: -8.9 at 150.0 Milliseconds

SAE Filter Class: 600

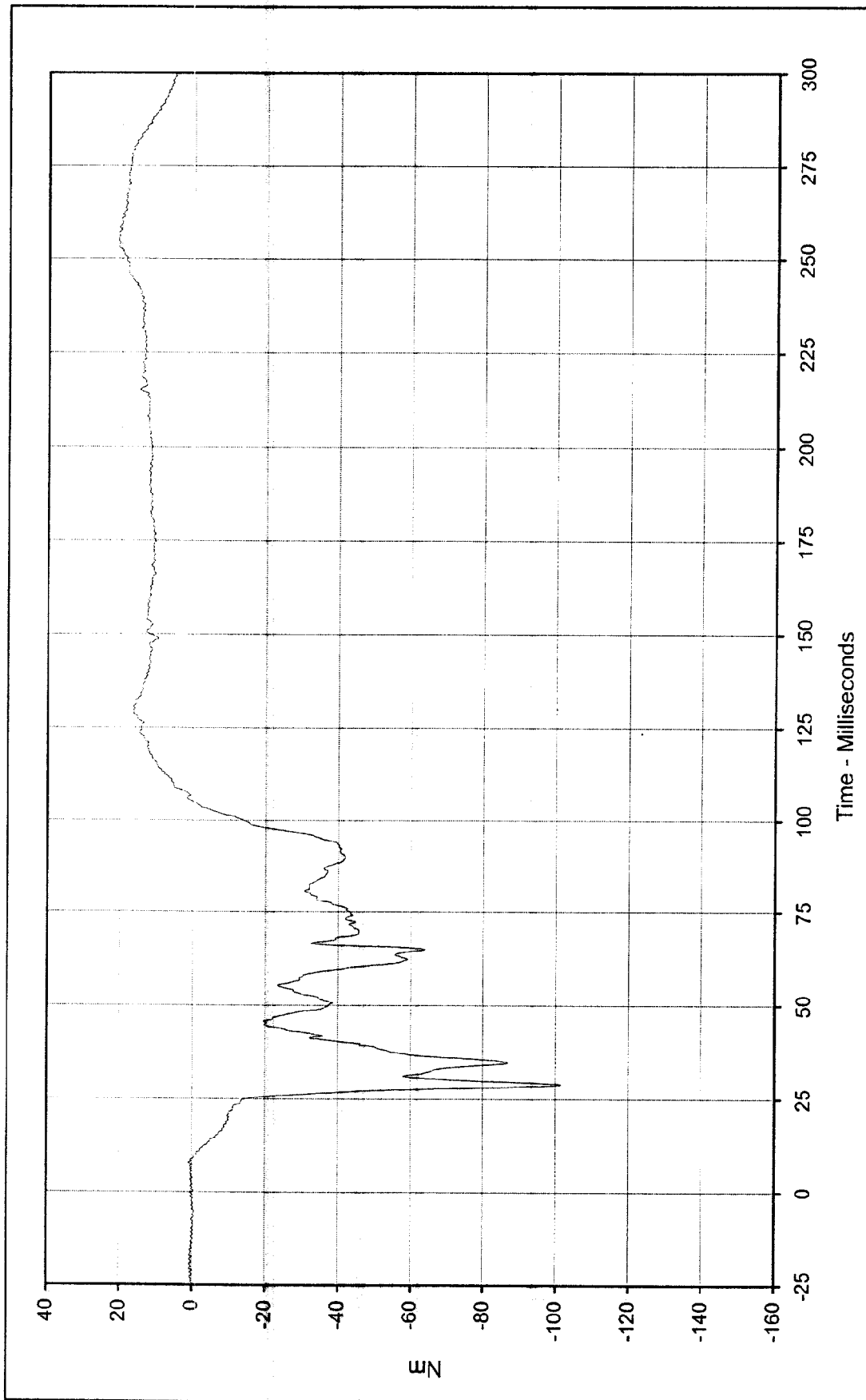
Date of Test: 11/20/98

Curve Number: FIL-071

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Right Upper Tibia Moment Y

Maximum Value: 21.0 at 254.8 Milliseconds

Minimum Value: -101.5 at 29.1 Milliseconds

SAE Filter Class: 600

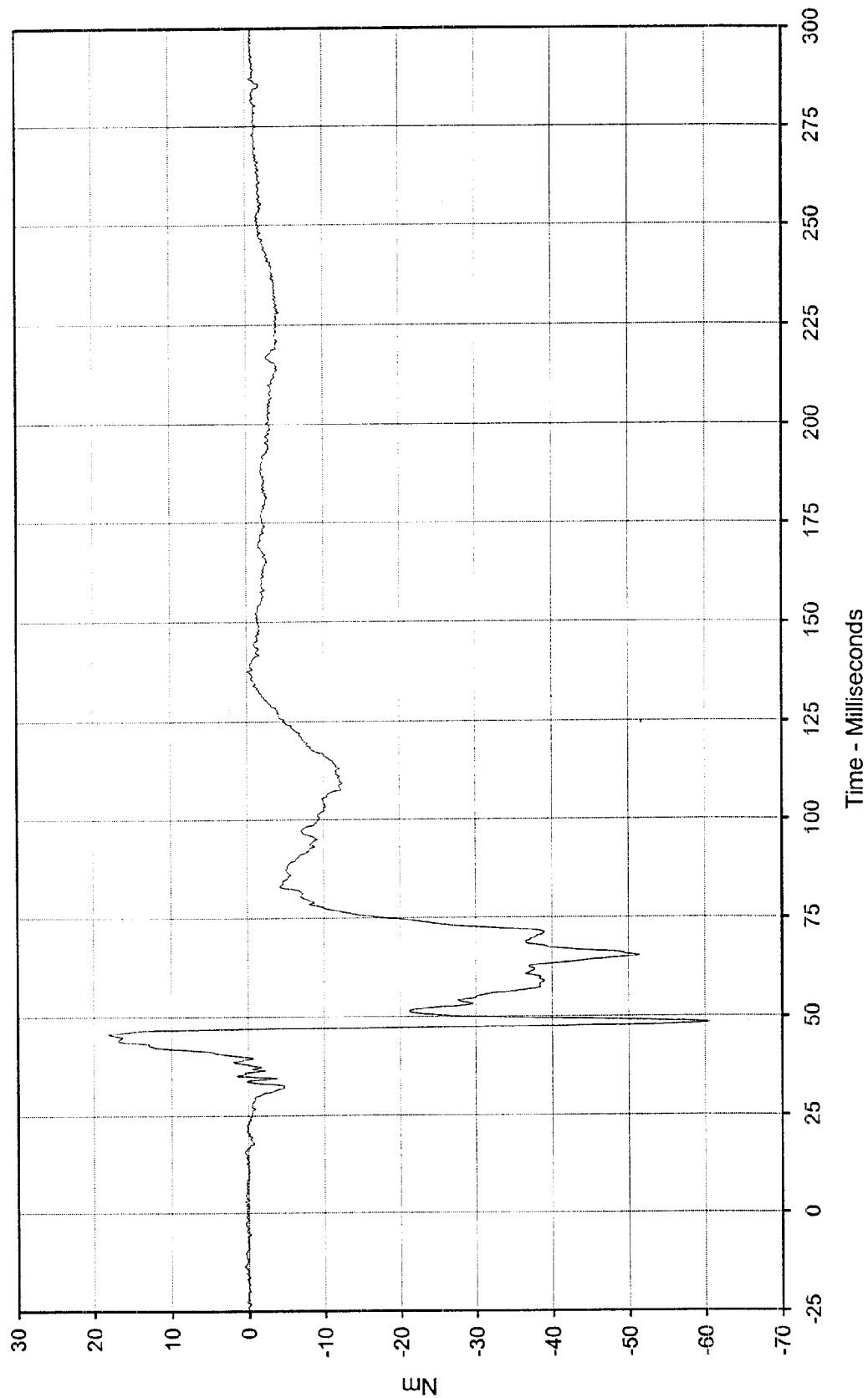
Date of Test: 11/20/98

Curve Number: FIL-072

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

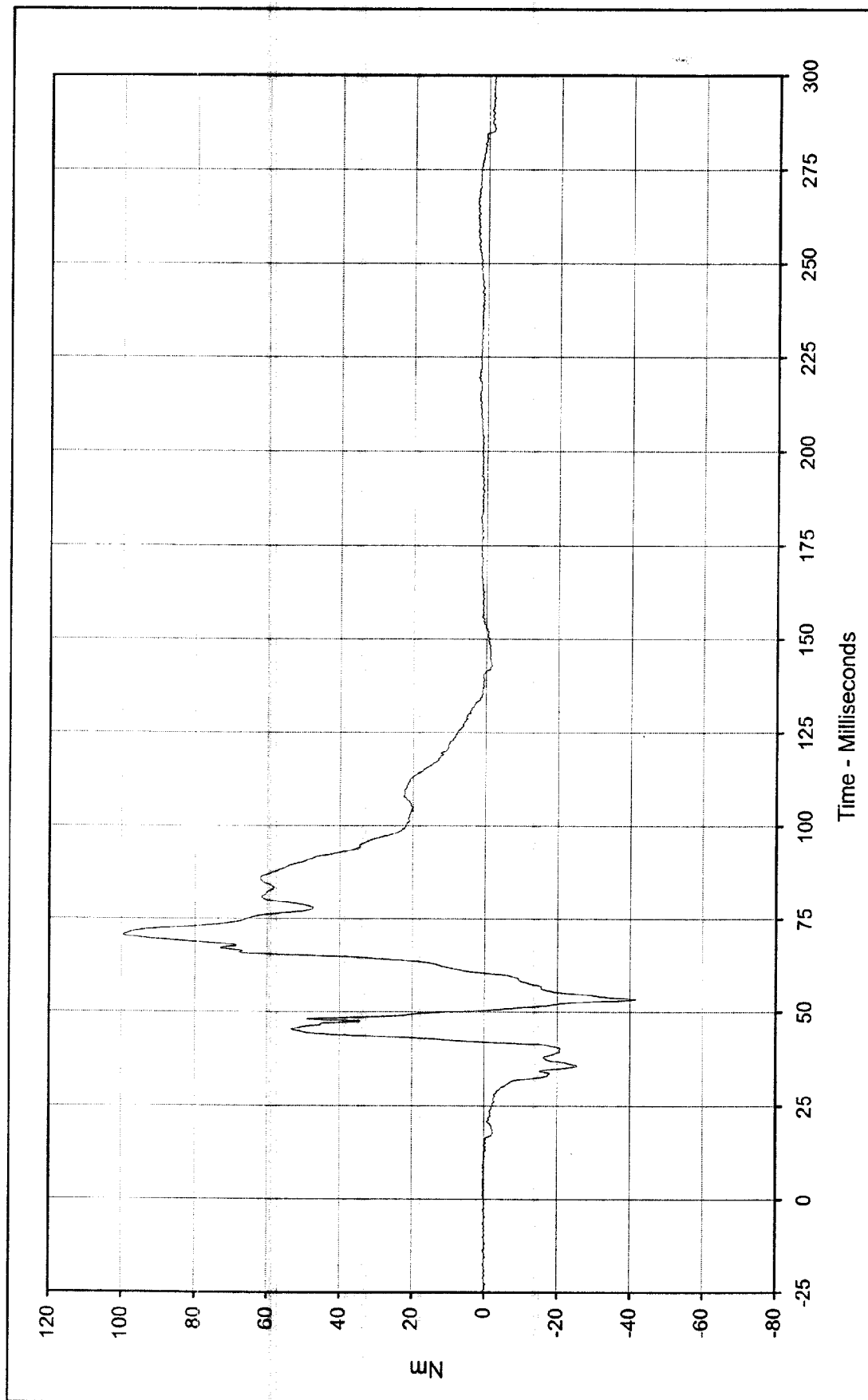




Curve Description: Passenger Left Lower Tibia Moment X
 Maximum Value: 18.2 at 45.6 Milliseconds
 Minimum Value: -60.5 at 48.3 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-073

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Left Lower Tibia Moment Y

Maximum Value: 99.6 at 70.5 Milliseconds

Minimum Value: -41.5 at 53.4 Milliseconds

SAE Filter Class: 600

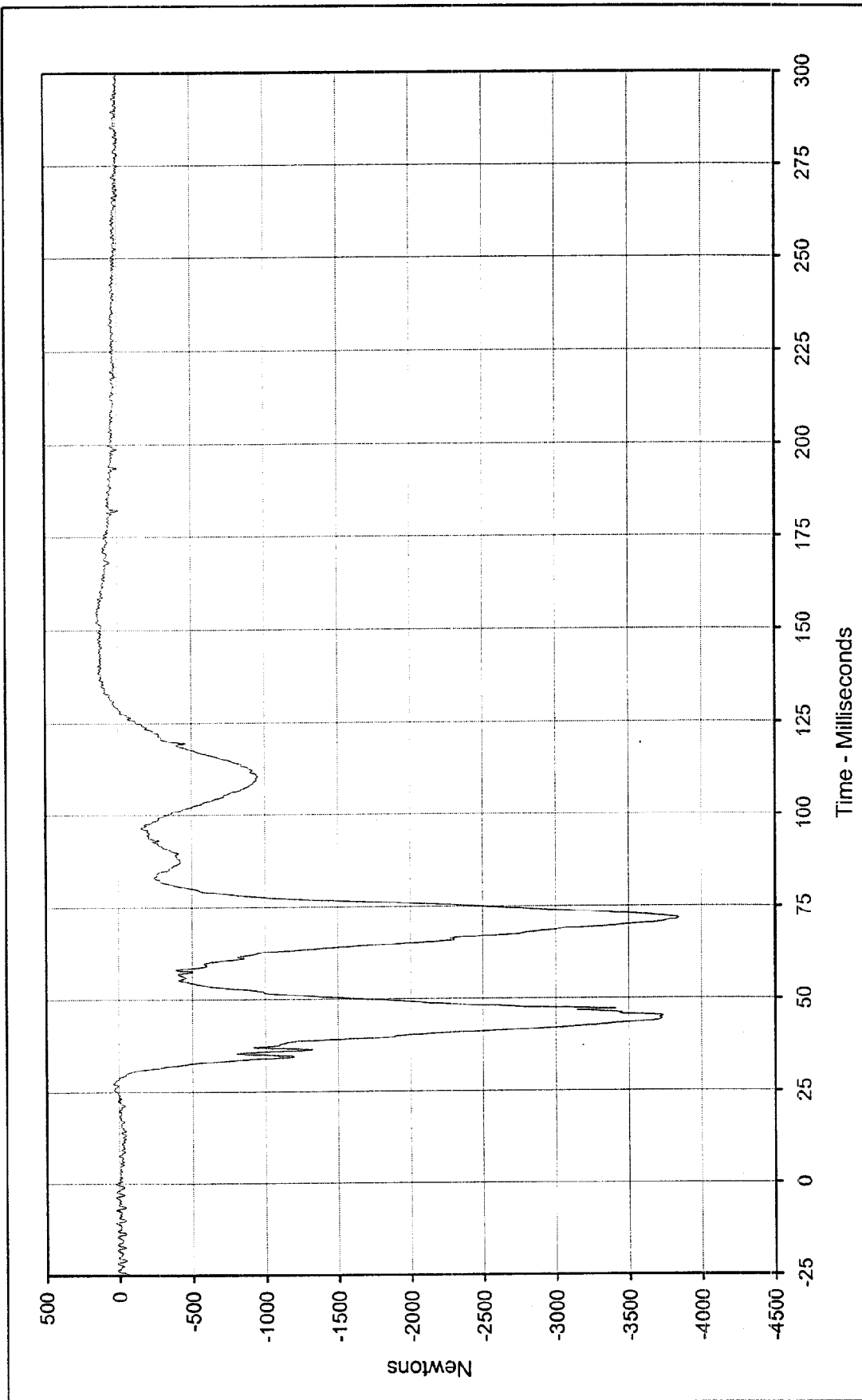
Date of Test: 11/20/98

Curve Number: FIL-074

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

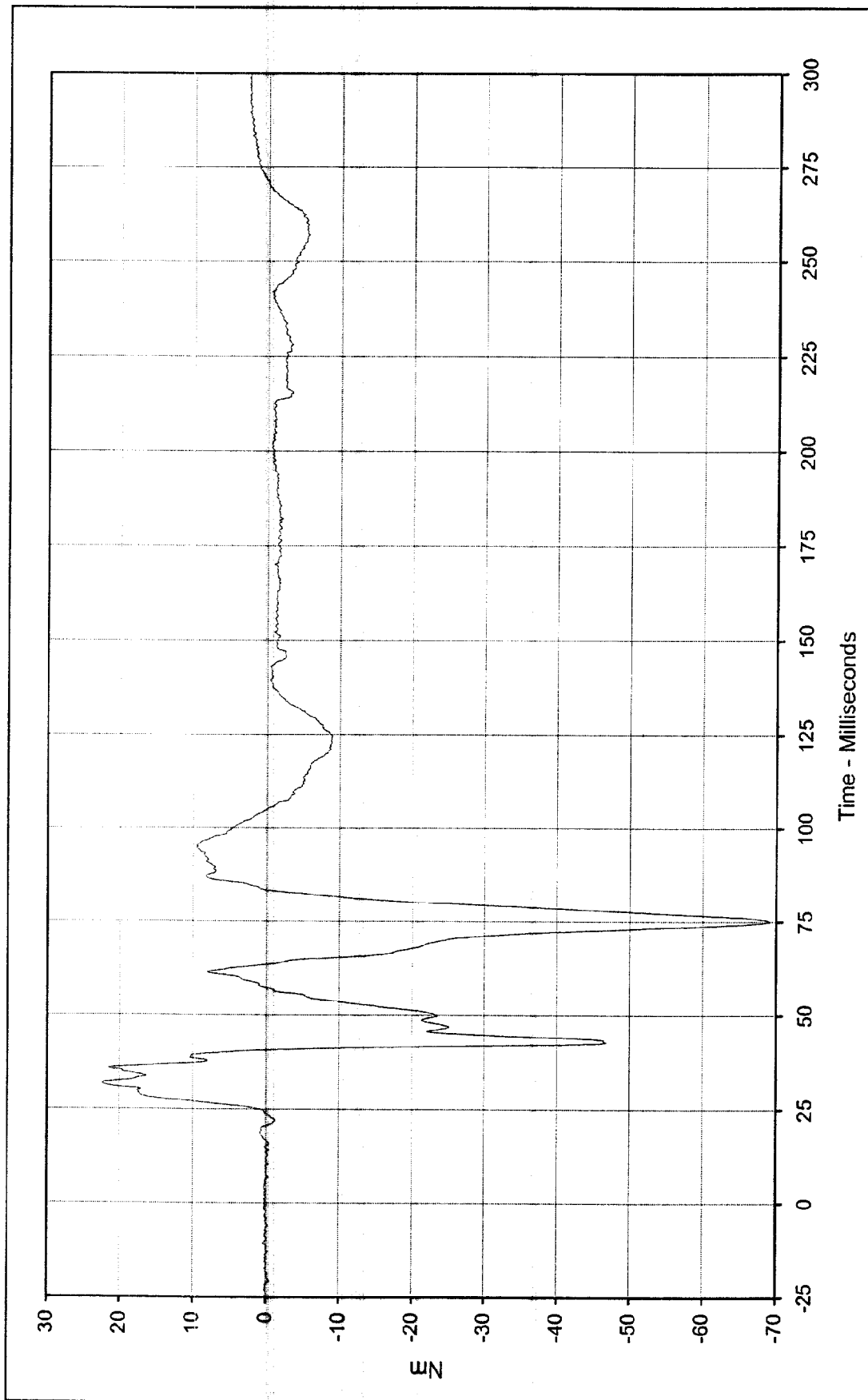




Curve Description:	Passenger Left Lower Tibia Force Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	149.6 at 154.9 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-3845.5 at 71.6 Milliseconds			



SAE Filter Class:	600
Date of Test:	11/20/98
Curve Number:	FIL-075



Curve Description: Passenger Right Lower Tibia Moment X

Maximum Value: 22.4 at 32.0 Milliseconds

Minimum Value: -69.1 at 75.0 Milliseconds

SAE Filter Class: 600

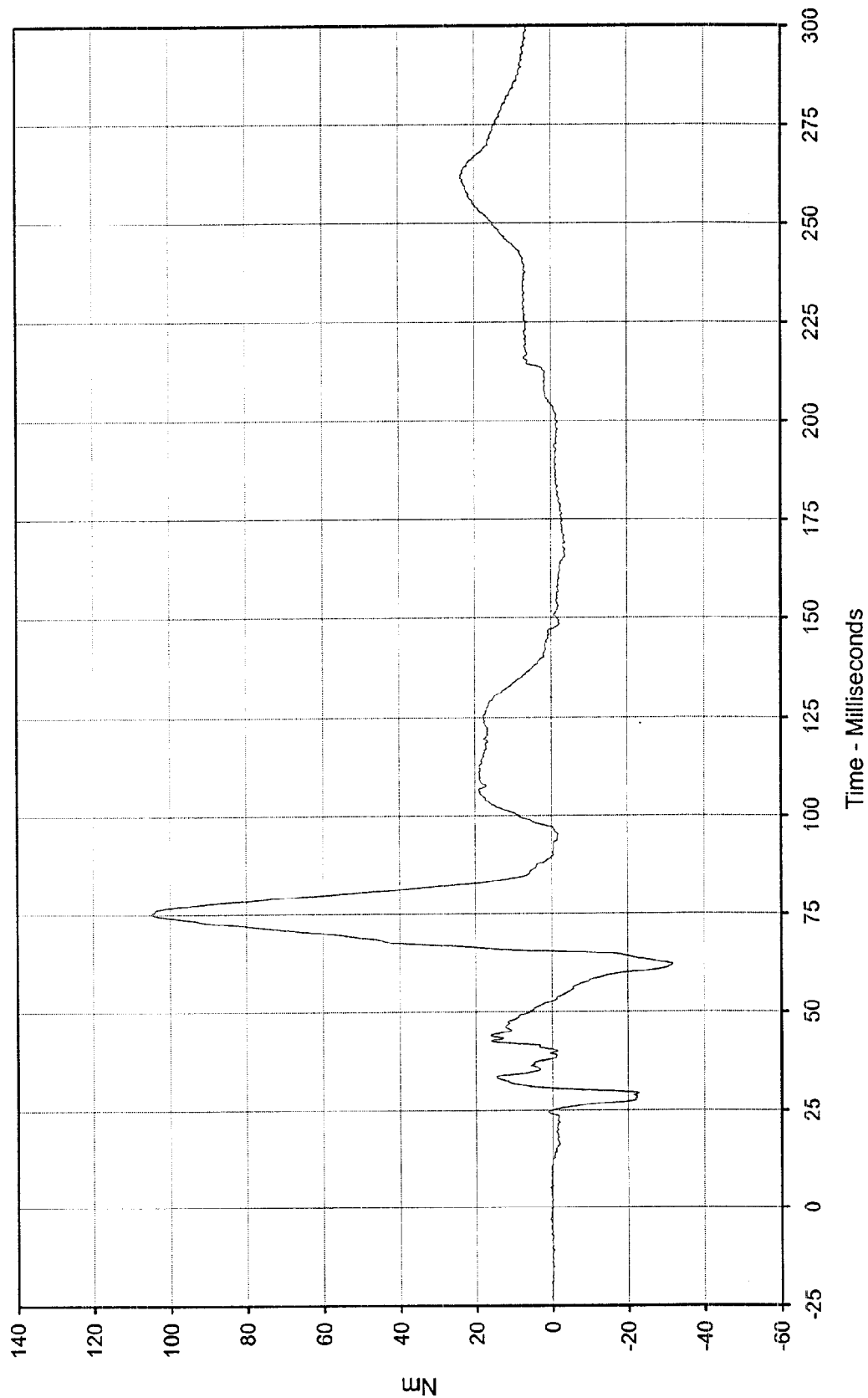
Date of Test: 11/20/98

Curve Number: FIL-076

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

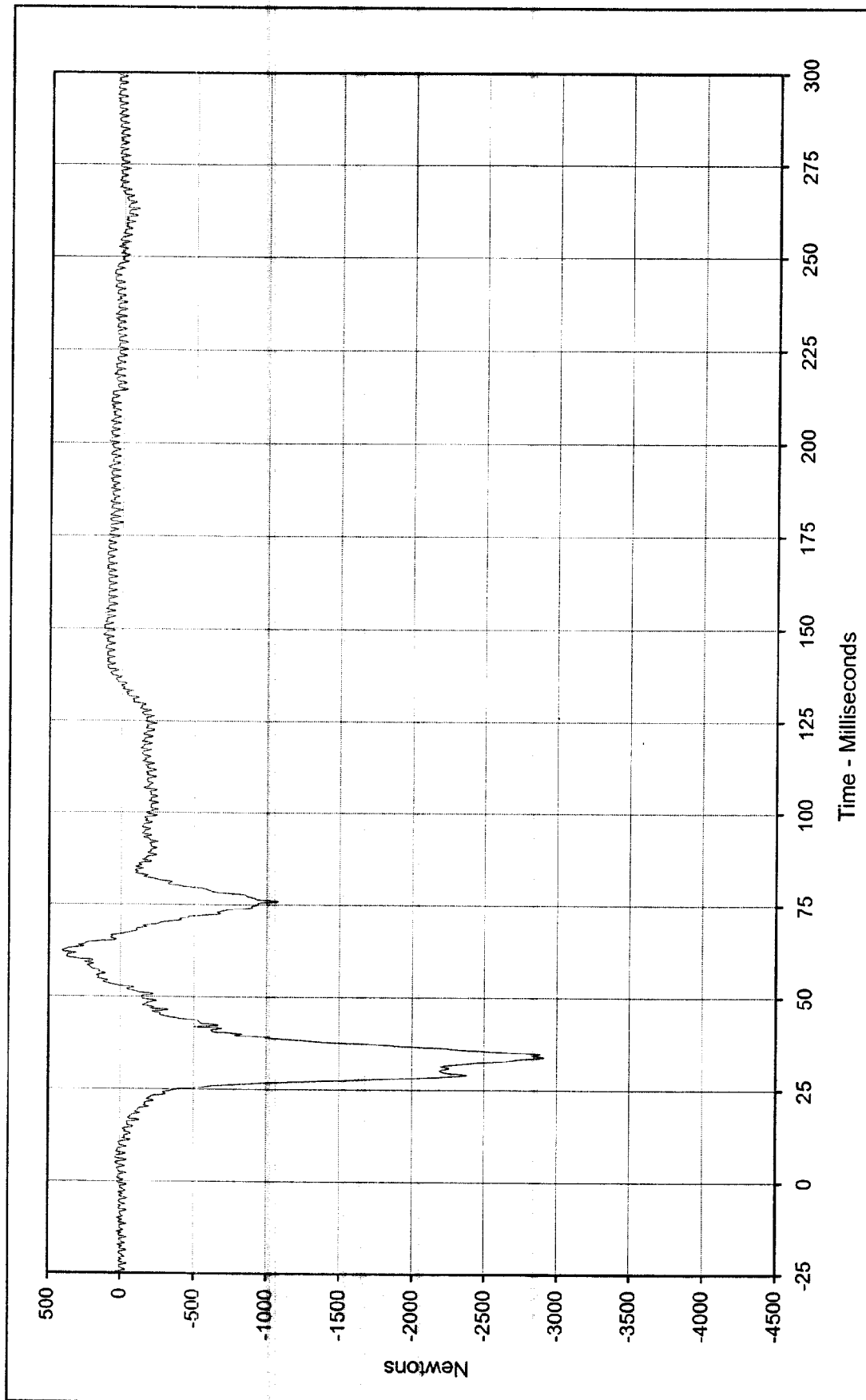




Curve Description: Passenger Right Lower Tibia Moment Y
 Maximum Value: 104.9 at 75.1 Milliseconds
 Minimum Value: -31.8 at 62.1 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/20/98
 Curve Number: FIL-077

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Right lower Tibia Force Z

Maximum Value: 408.1 at 62.3 Milliseconds

Minimum Value: -2912.6 at 33.8 Milliseconds

SAE Filter Class: 600

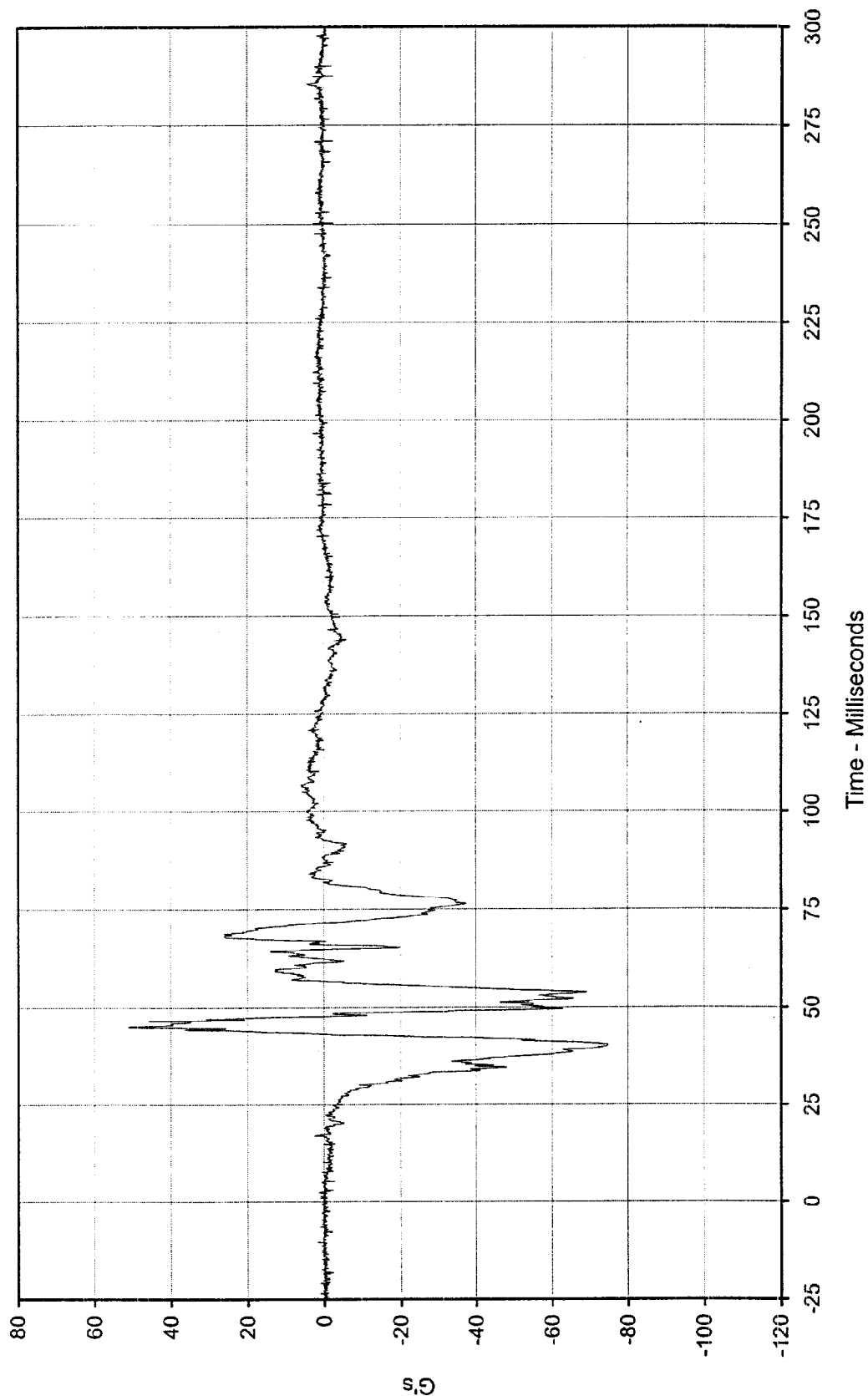
Date of Test: 11/20/98

Curve Number: FIL-078

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Passenger Left Foot Aft X

Test Program: 1999 NHTSA 35 mph NCAP

No.: MX0111

Maximum Value: 51.3 at 45.2 Milliseconds

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

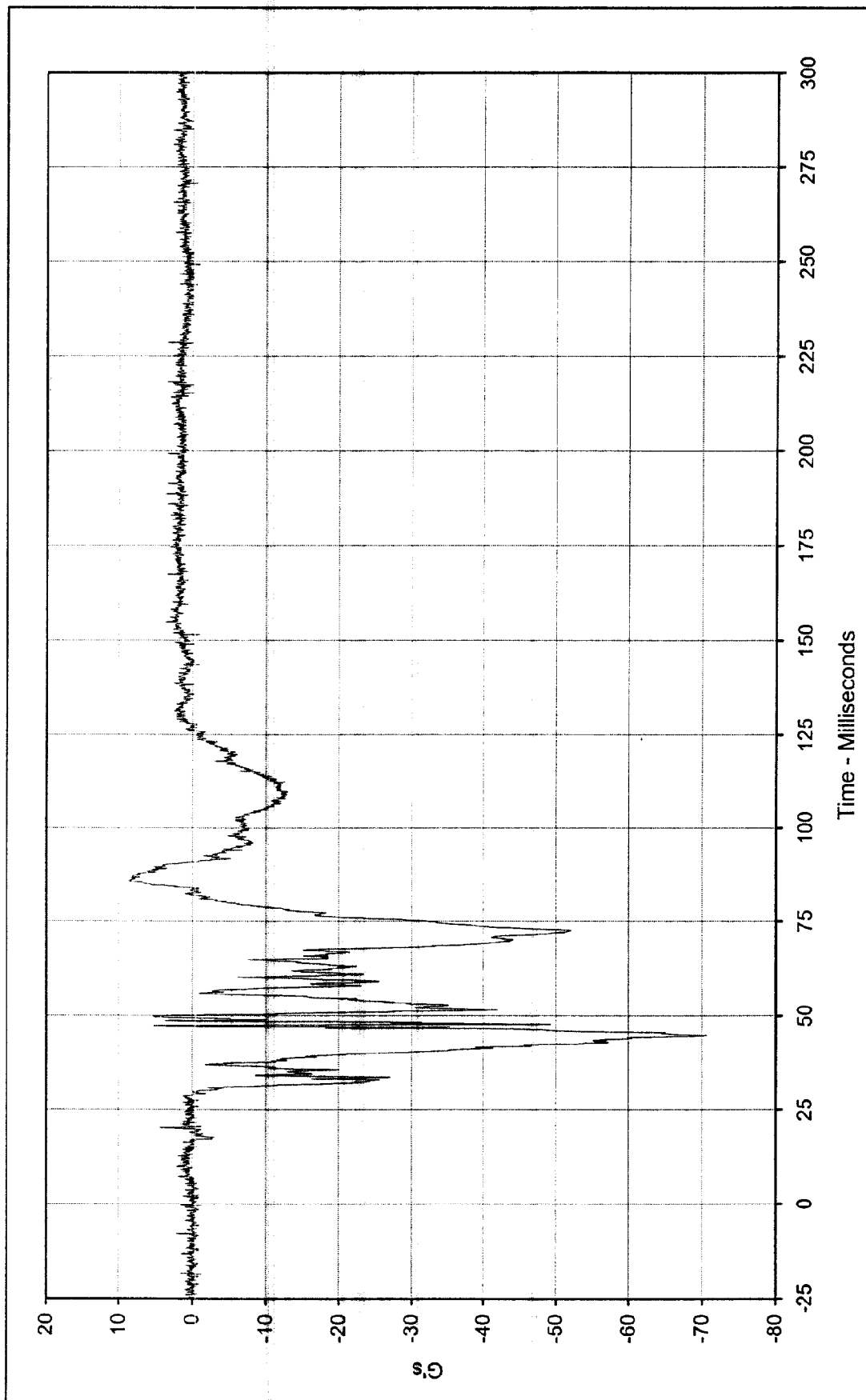
Minimum Value: -74.9 at 40.3 Milliseconds

SAE Filter Class: 1000

Date of Test: 11/20/98

Curve Number: FIL-079





Curve Description: Passenger Left Foot Aft Z Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Maximum Value: 8.6 at 85.7 Milliseconds Test Vehicle: 1999 Saturn SL1 4 Door Sedan

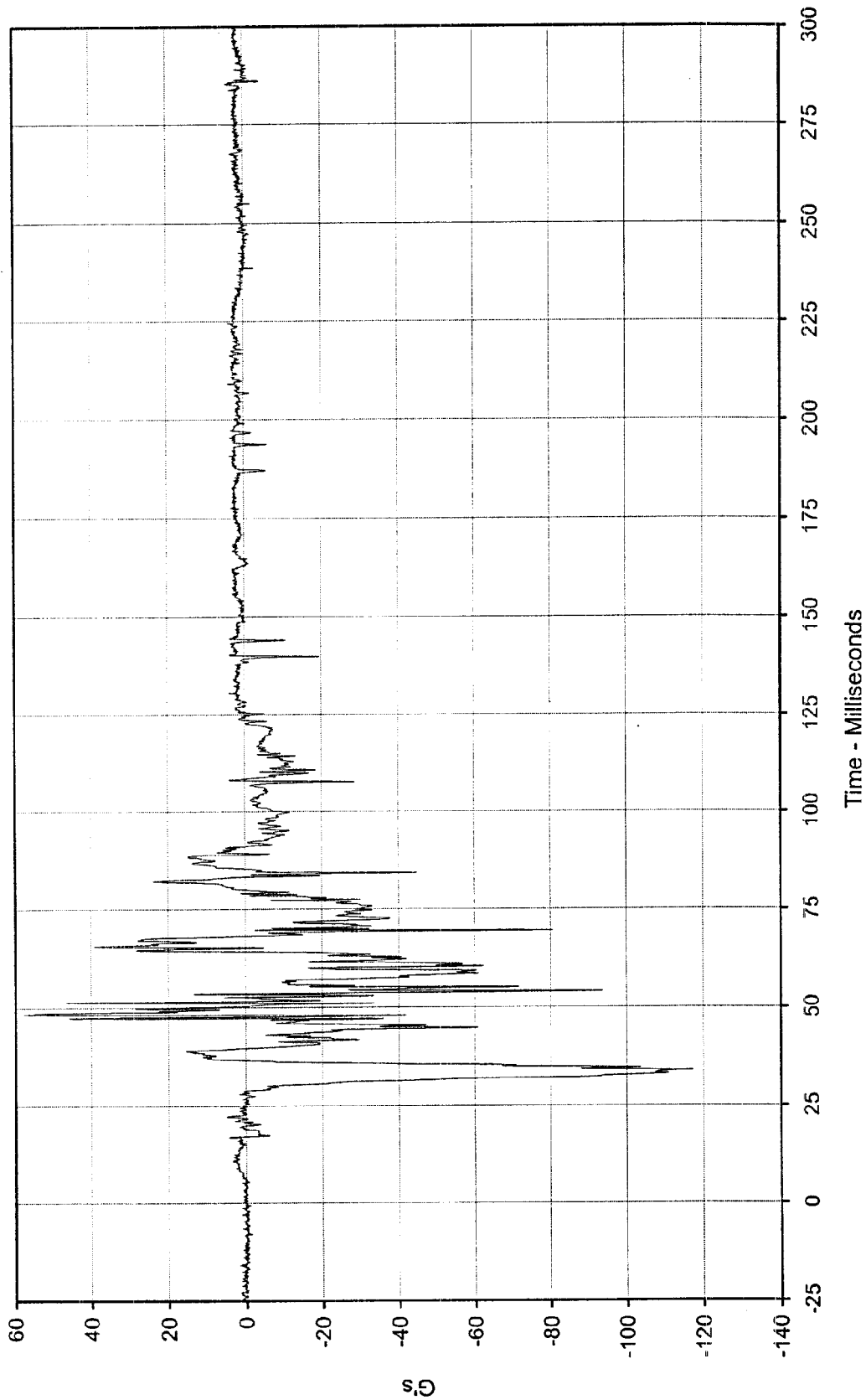
Minimum Value: -70.6 at 44.8 Milliseconds

SAE Filter Class: 1000

Date of Test: 11/20/98

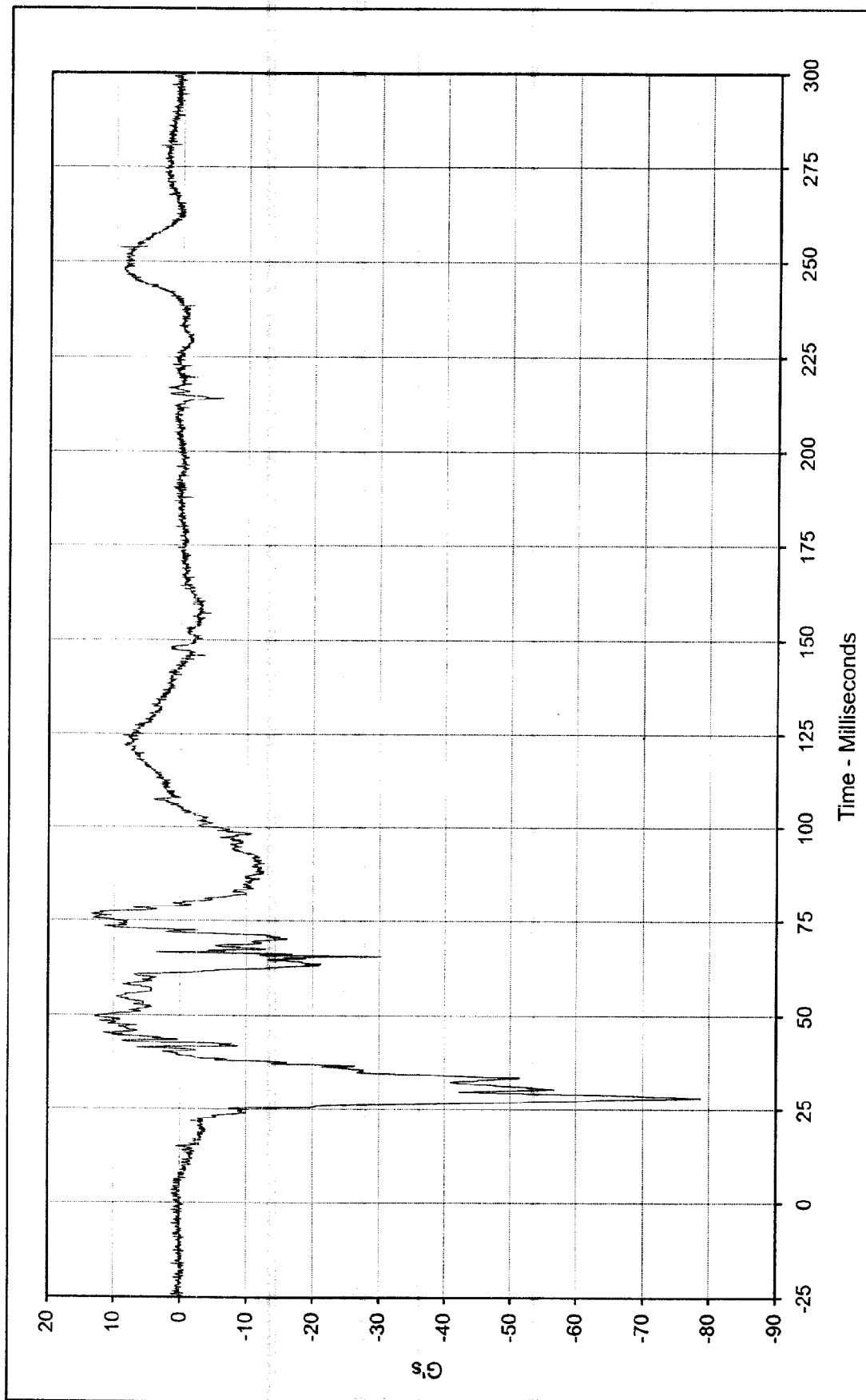
Curve Number: FIL-080





Curve Description:	Passenger Left Foot Fore Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	57.8 at 48.4 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-117.4 at 33.8 Milliseconds			
SAE Filter Class:	1000			
Date of Test:	11/20/98			
Curve Number:	FIL-081			

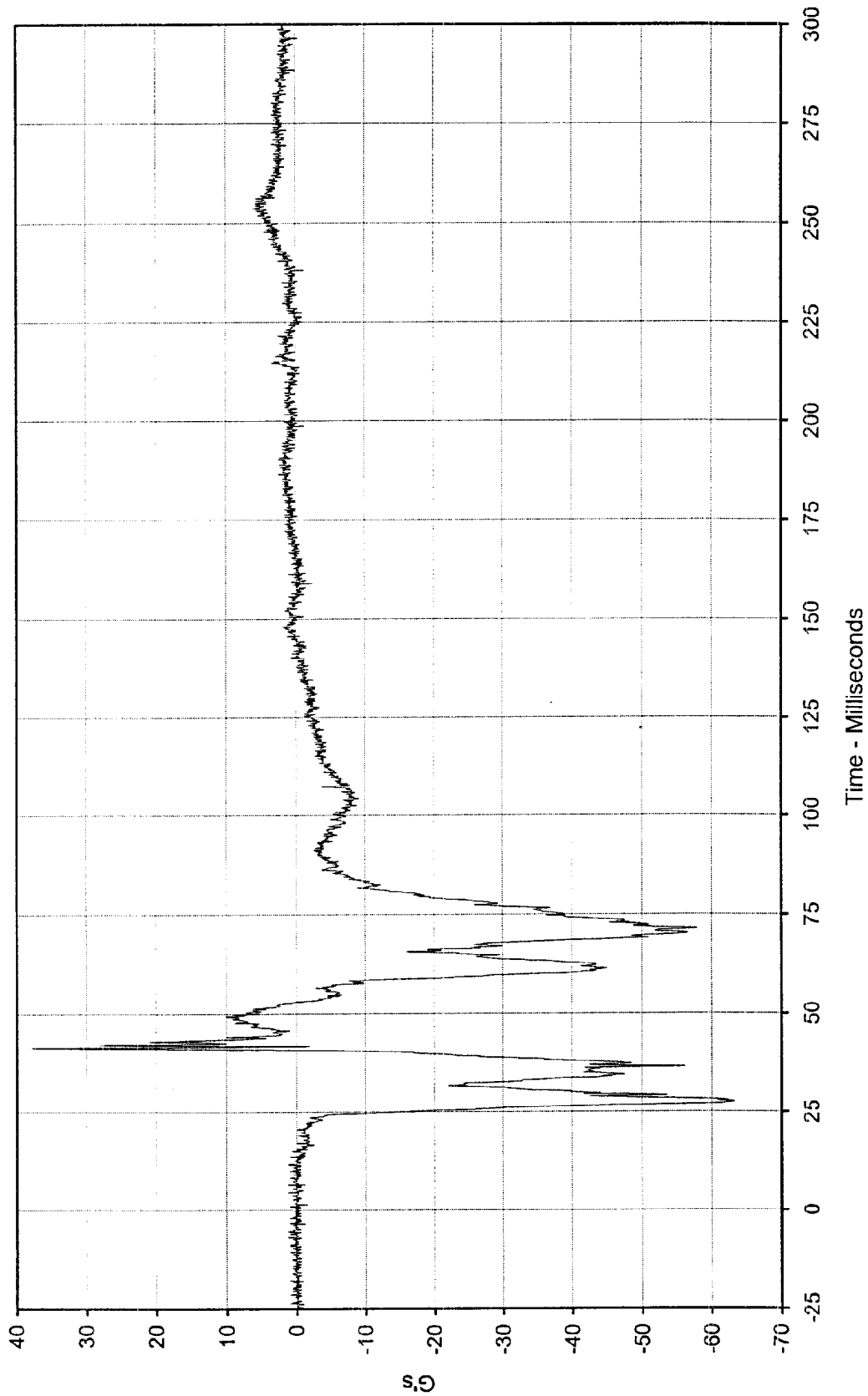




Curve Description:	Passenger Right Foot Aft X			Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	13.5	at	76.6	Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-78.8	at	28.3	Milliseconds		
SAE Filter Class:	1000					
Date of Test:	11/20/98					
Curve Number:	FIL-082					

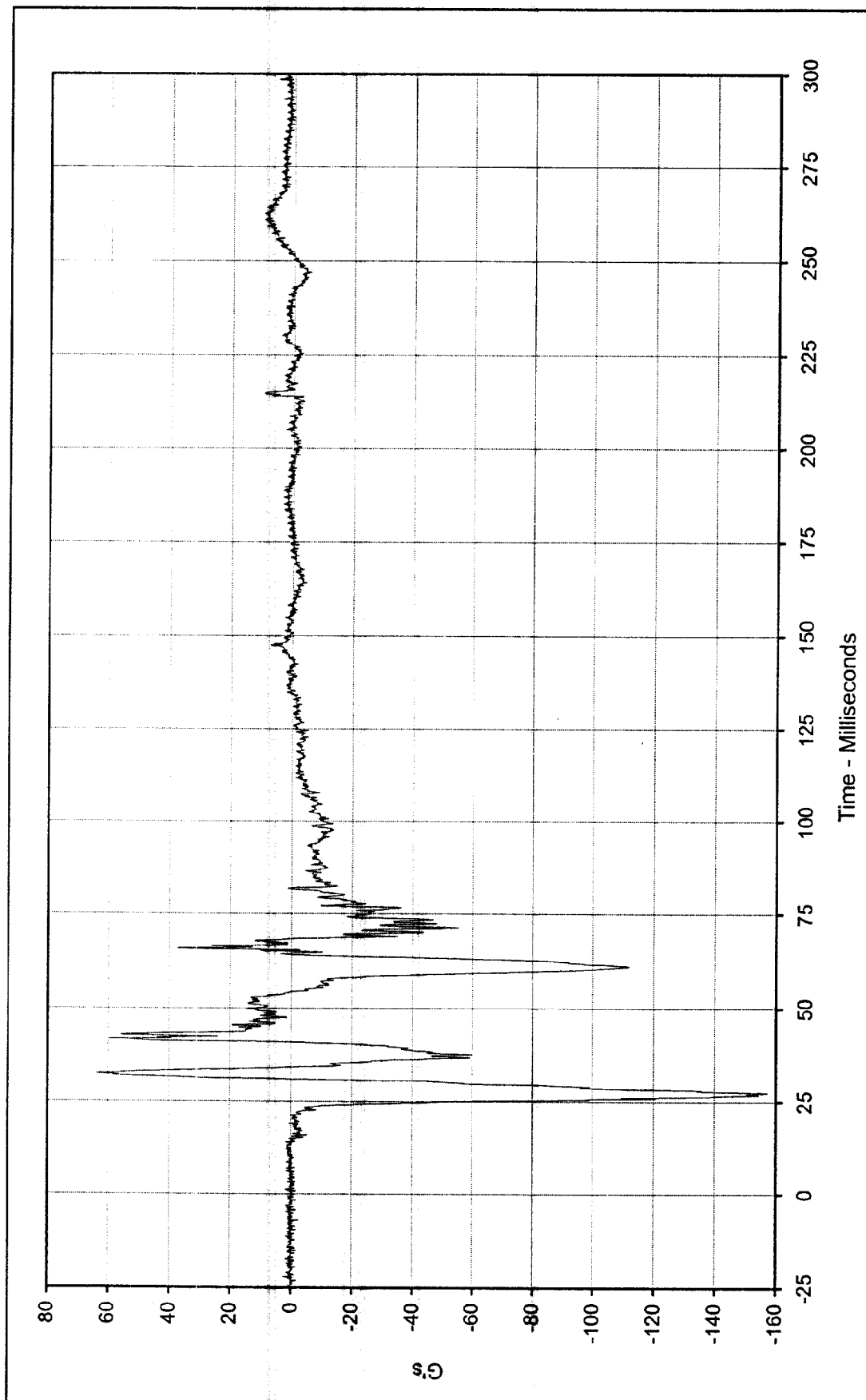






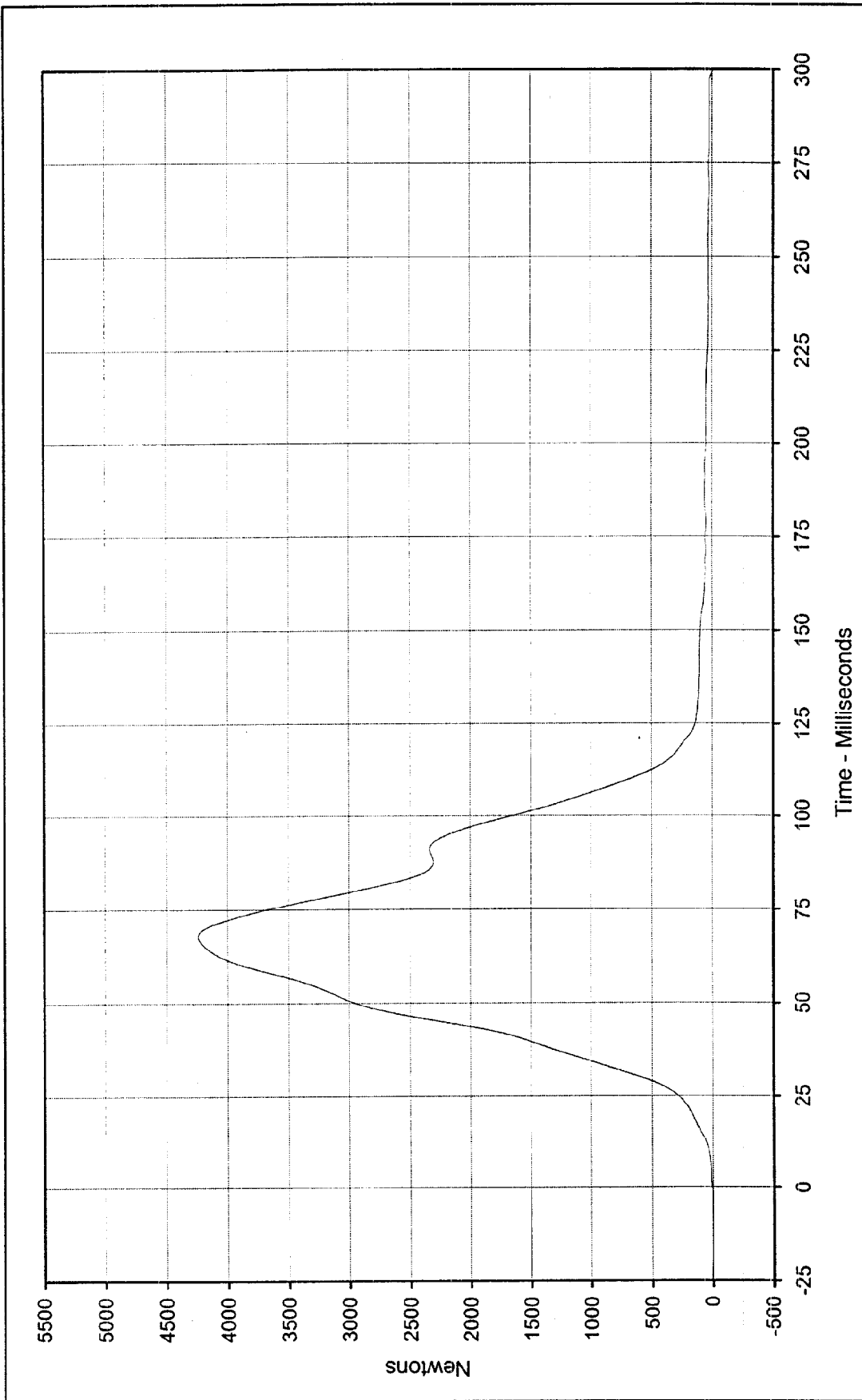
Curve Description:	Passenger Right Foot Aft Z	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	37.8 at 41.4 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-63.3 at 27.7 Milliseconds			
SAE Filter Class:	1000			
Date of Test:	11/20/98			
Curve Number:	FIL-083			





Curve Description:	Passenger Right Foot Fore Z	Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111
Maximum Value:	63.8 at 32.4 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-157.4 at 27.4 Milliseconds		
SAE Filter Class:	1000		
Date of Test:	11/20/98		
Curve Number:	FIL-084		

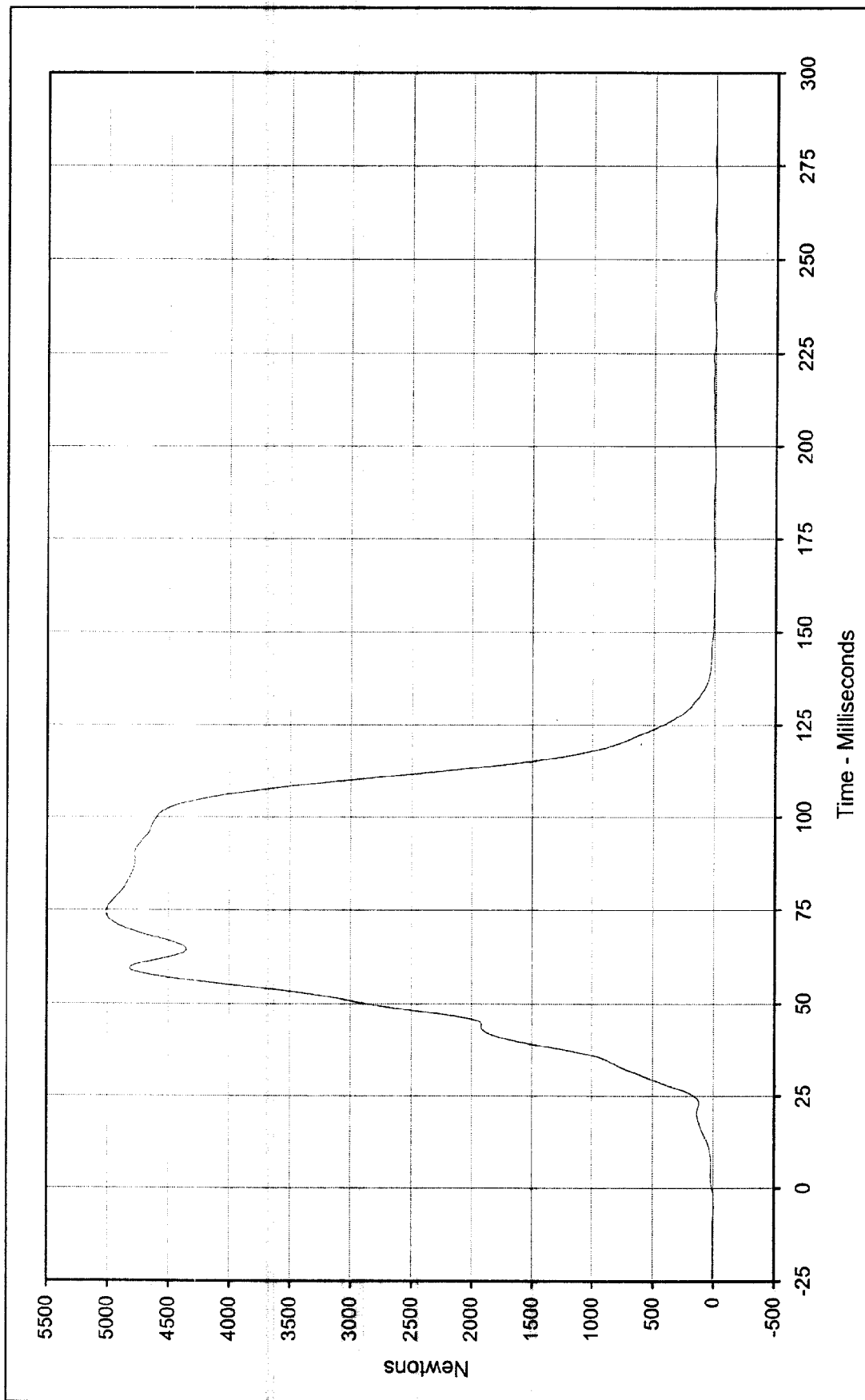




Curve Description: Passenger Lap Belt Force
 Maximum Value: 4237.6 at 67.9 Milliseconds
 Minimum Value: -16.7 at 299.9 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-085

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

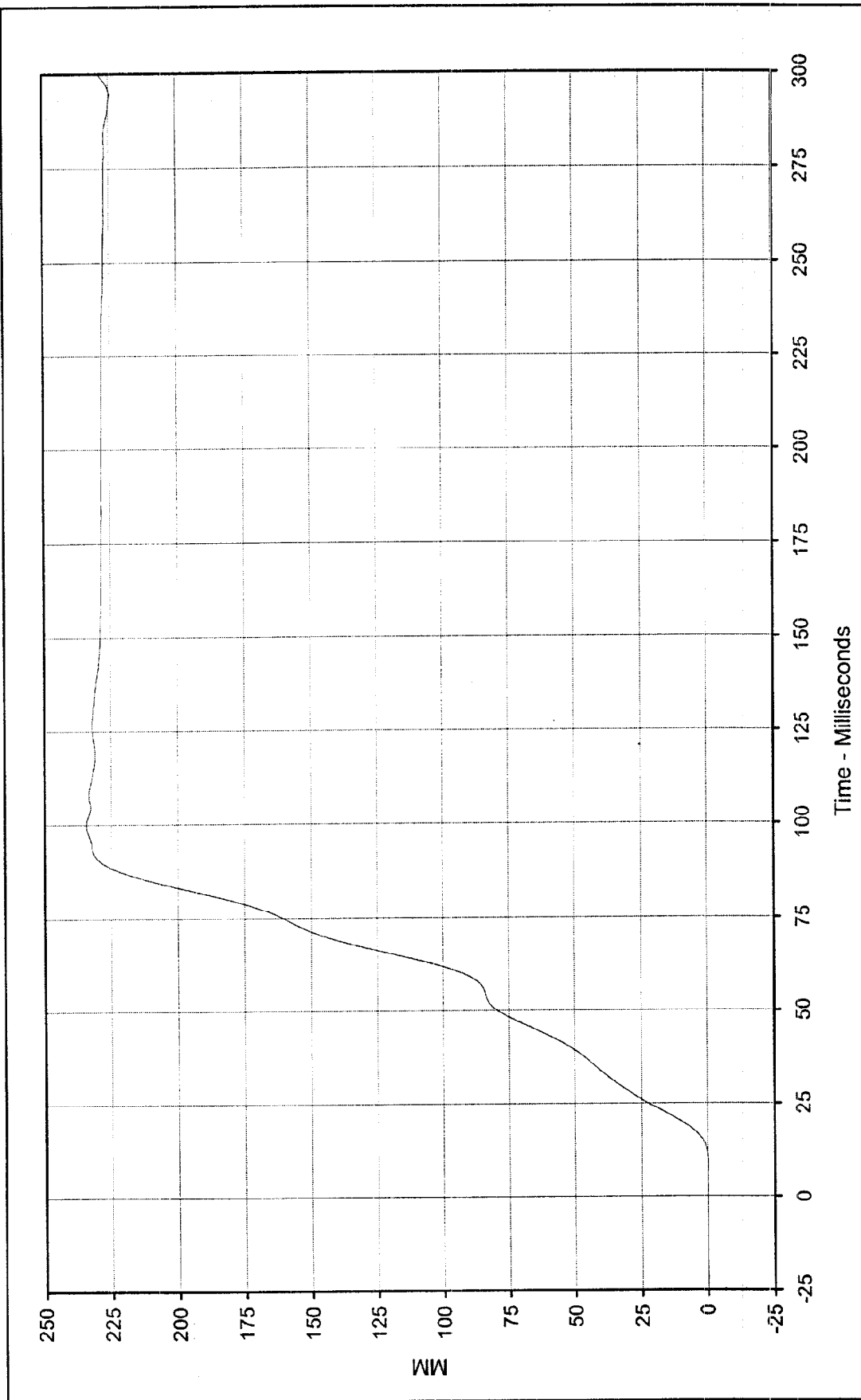




Curve Description: Passenger Shoulder Belt Force
 Maximum Value: 5014.5 at 74.4 Milliseconds
 Minimum Value: -4.9 at 230.2 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-086

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

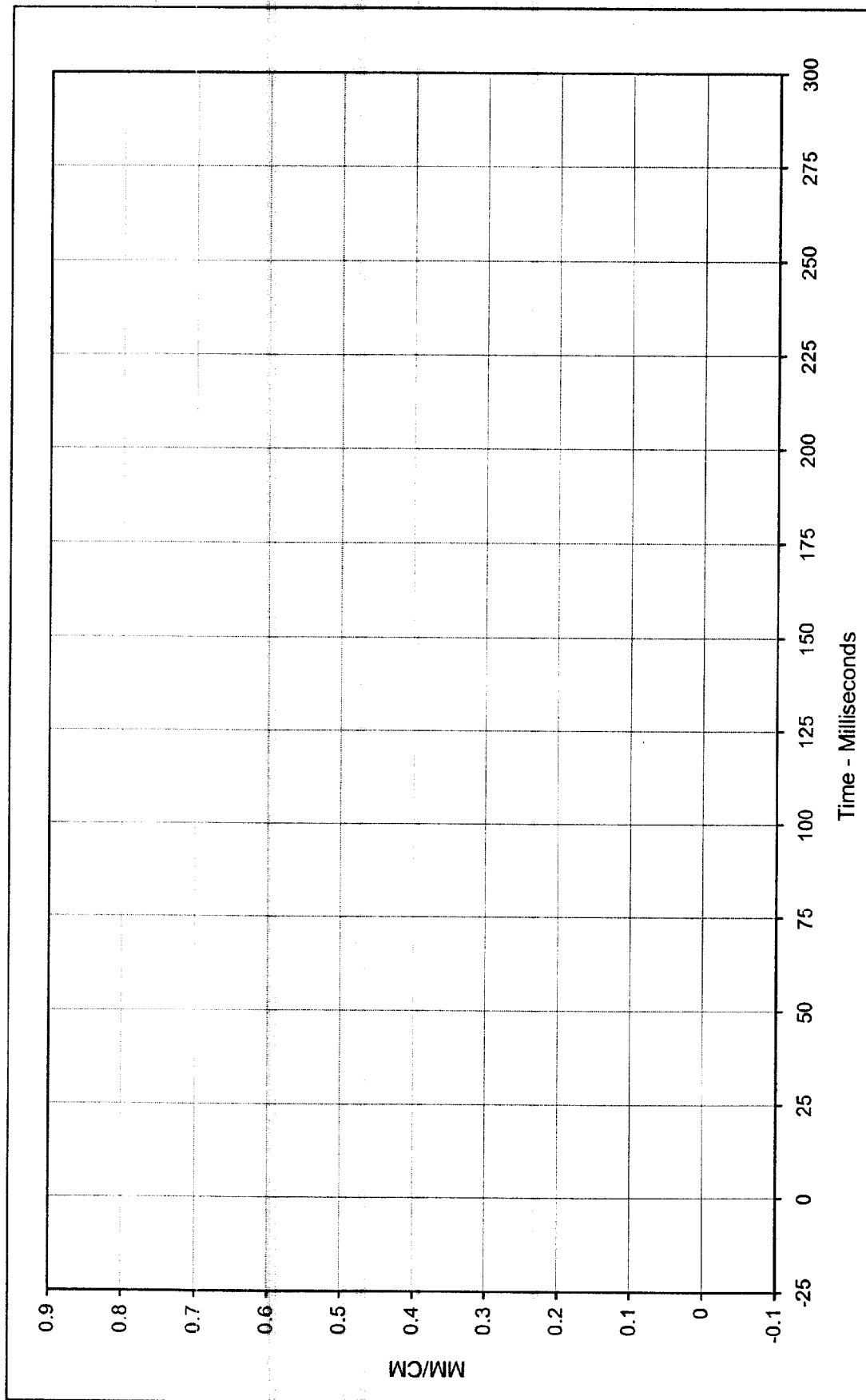




Curve Description:	Passenger Shoulder Belt Pullout	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	234.3 at 99.8 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-0.2 at 8.6 Milliseconds			



SAE Filter Class:	60
Date of Test:	11/20/98
Curve Number:	FIL-087



Curve Description: Passenger Shoulder Belt Elongation *

Maximum Value: 0.00 at 0.0 Milliseconds

Minimum Value: 0.00 at 0.0 Milliseconds

SAE Filter Class: 60

Date of Test: 11/20/98

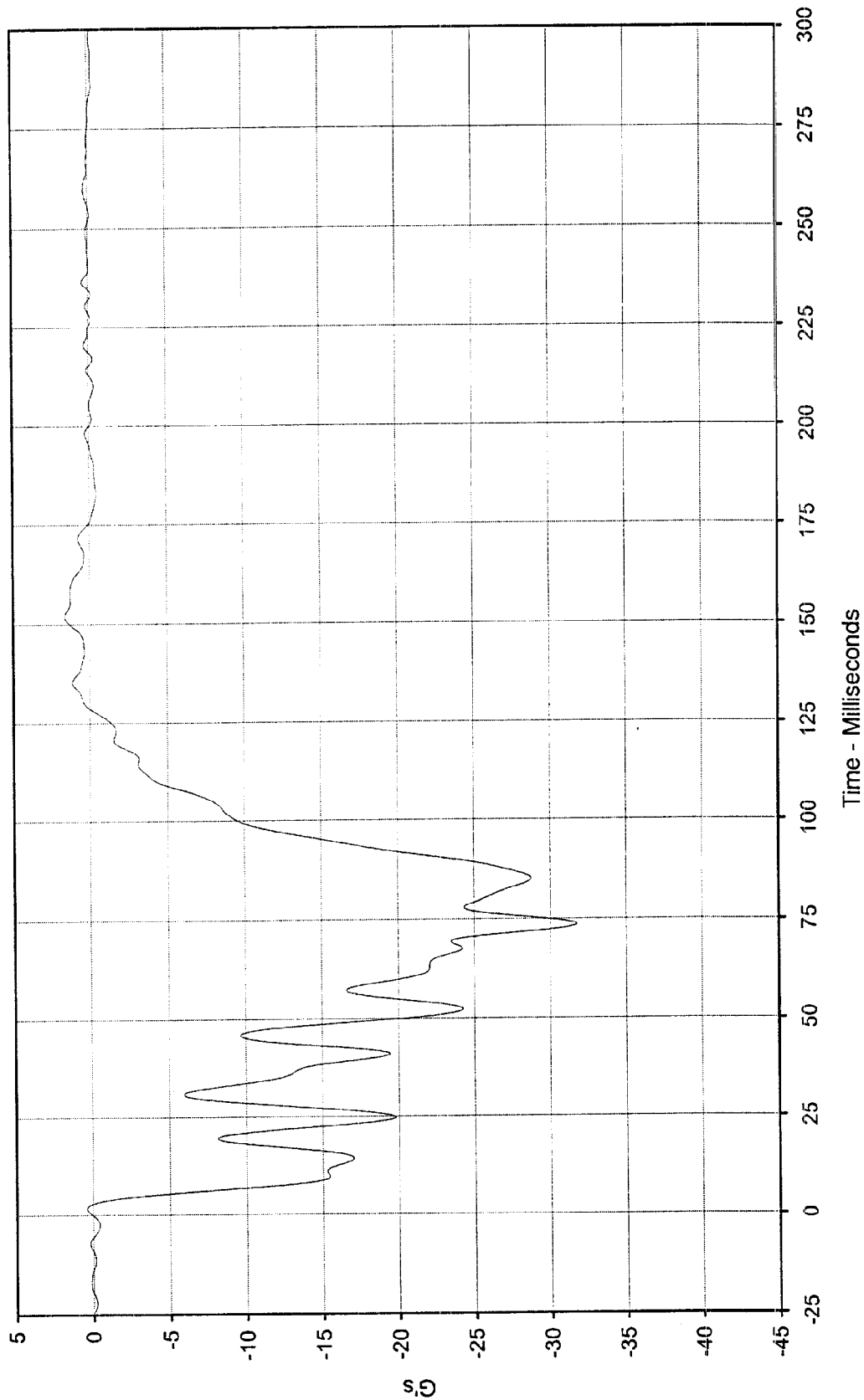
Curve Number: FIL-088

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

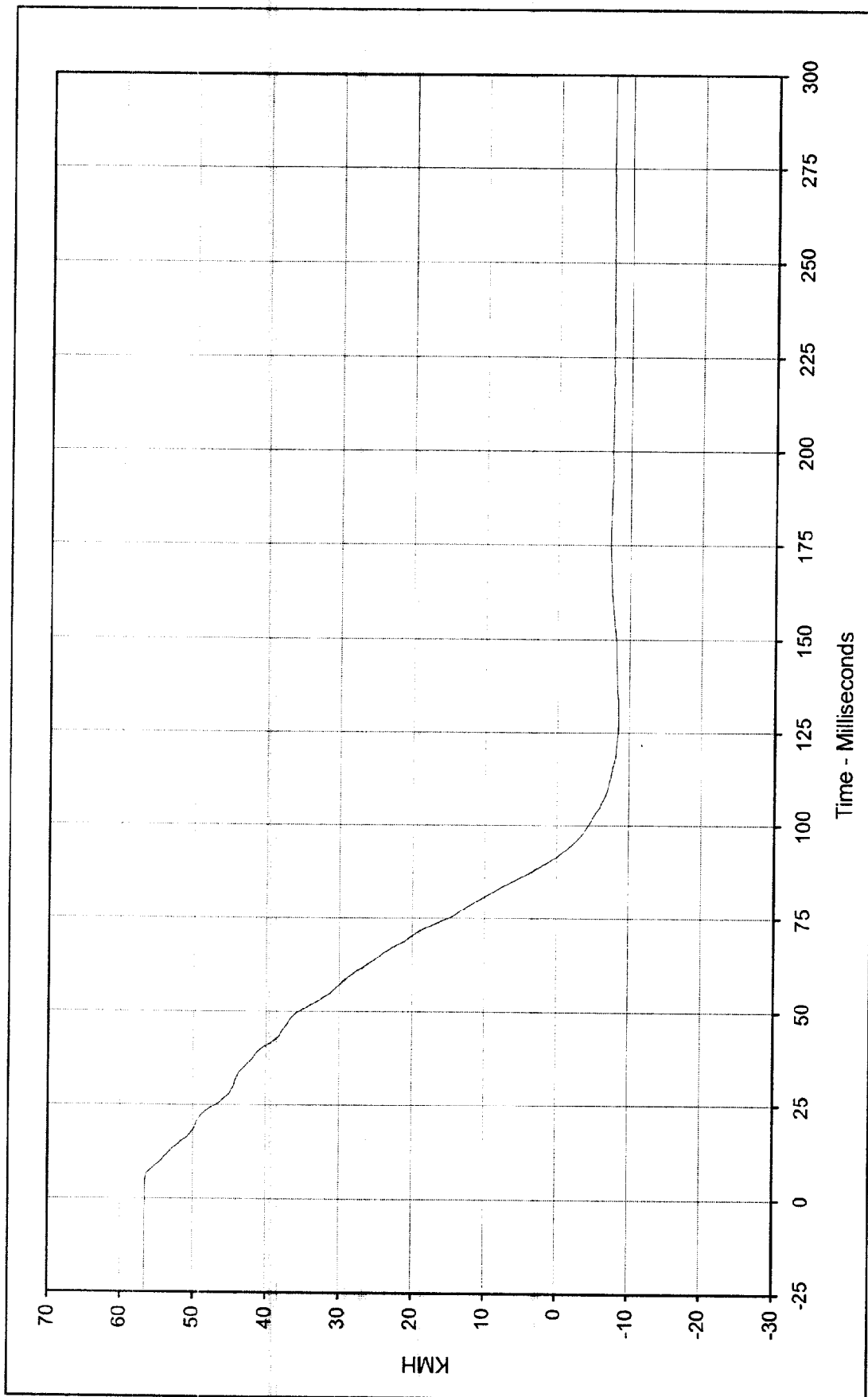


* Channel failed, No Data



Curve Description:	Vehicle Left Rear Primary	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	1.6 at 151.9 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-31.7 at 73.7 Milliseconds			
SAE Filter Class:	60			
Date of Test:	11/20/98			
Curve Number:	FIL-089			



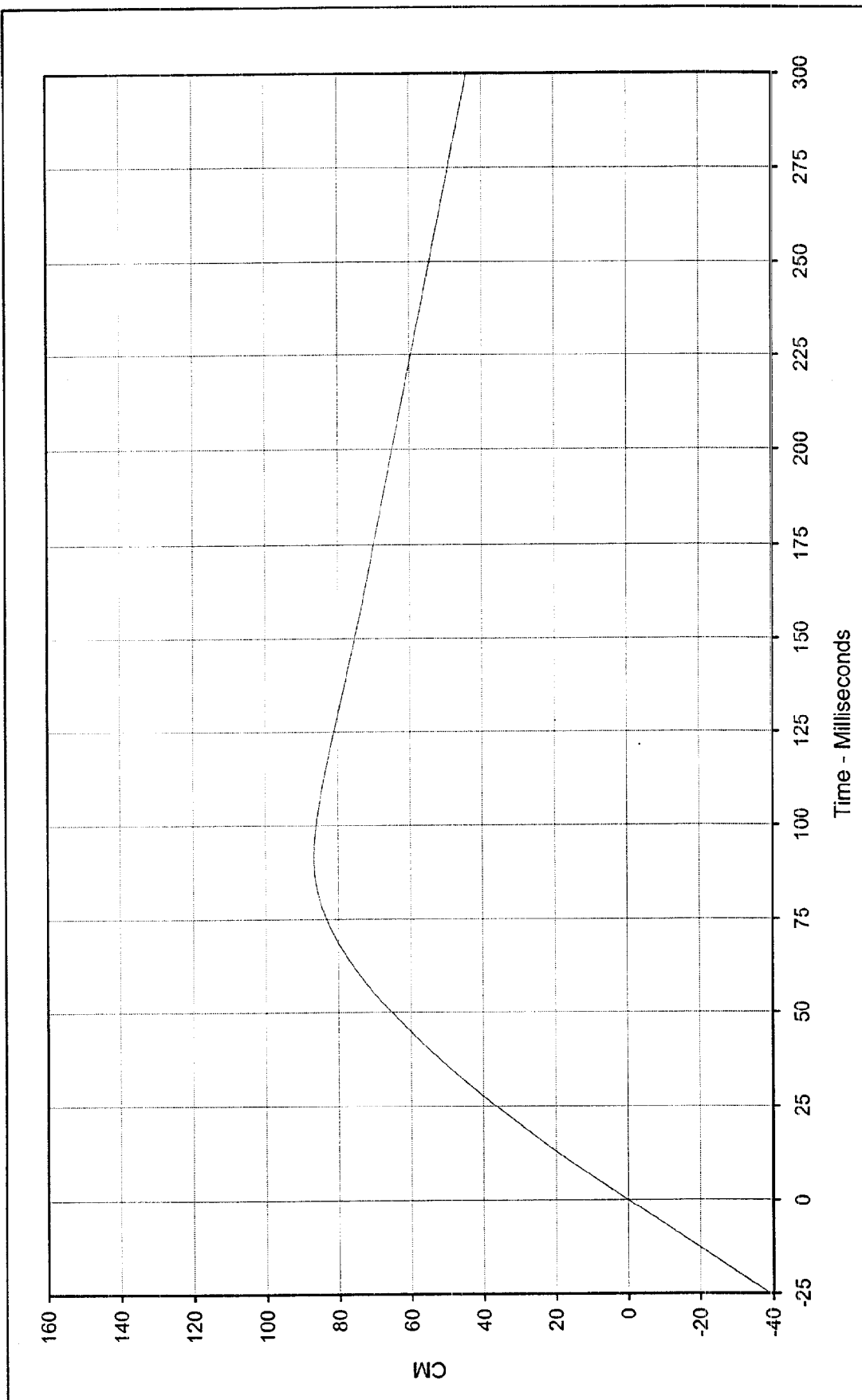


Curve Description: Vehicle Left Rear Primary Velocity
 Maximum Value: 56.5 at 3.3 Milliseconds
 Minimum Value: -8.6 at 128.3 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: IN1-089

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

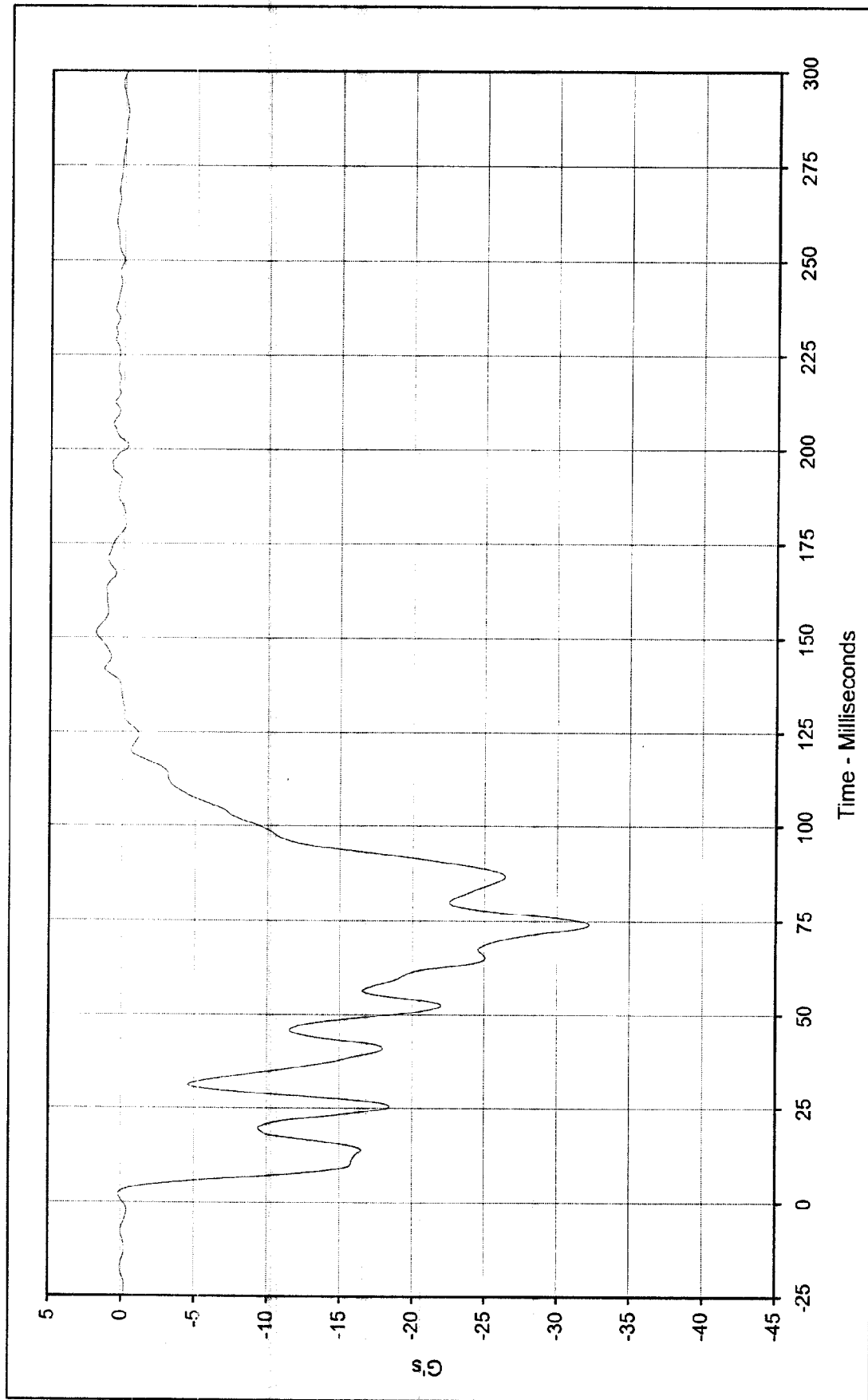




Curve Description:	Vehicle Left Rear Primary Displ.	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	86.6 at 91.3 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	0.0 at 0.0 Milliseconds			

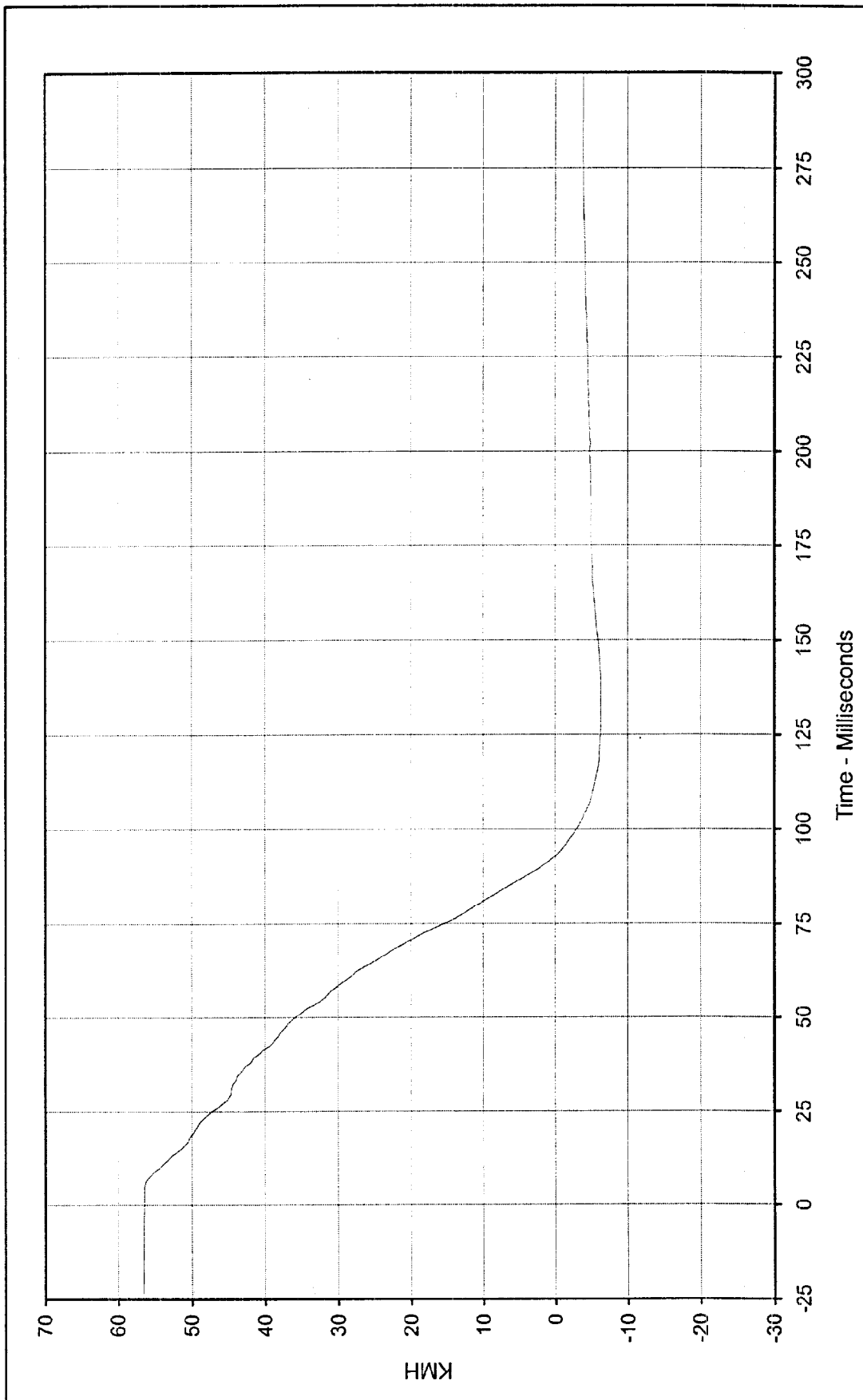


SAE Filter Class:	180
Date of Test:	11/20/98
Curve Number:	IN2-089



Curve Description:	Vehicle Right Rear Primary	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	1.8 at 151.5 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-32.2 at 74.1 Milliseconds			
SAE Filter Class:	60			
Date of Test:	11/20/98			
Curve Number:	FIL-090			

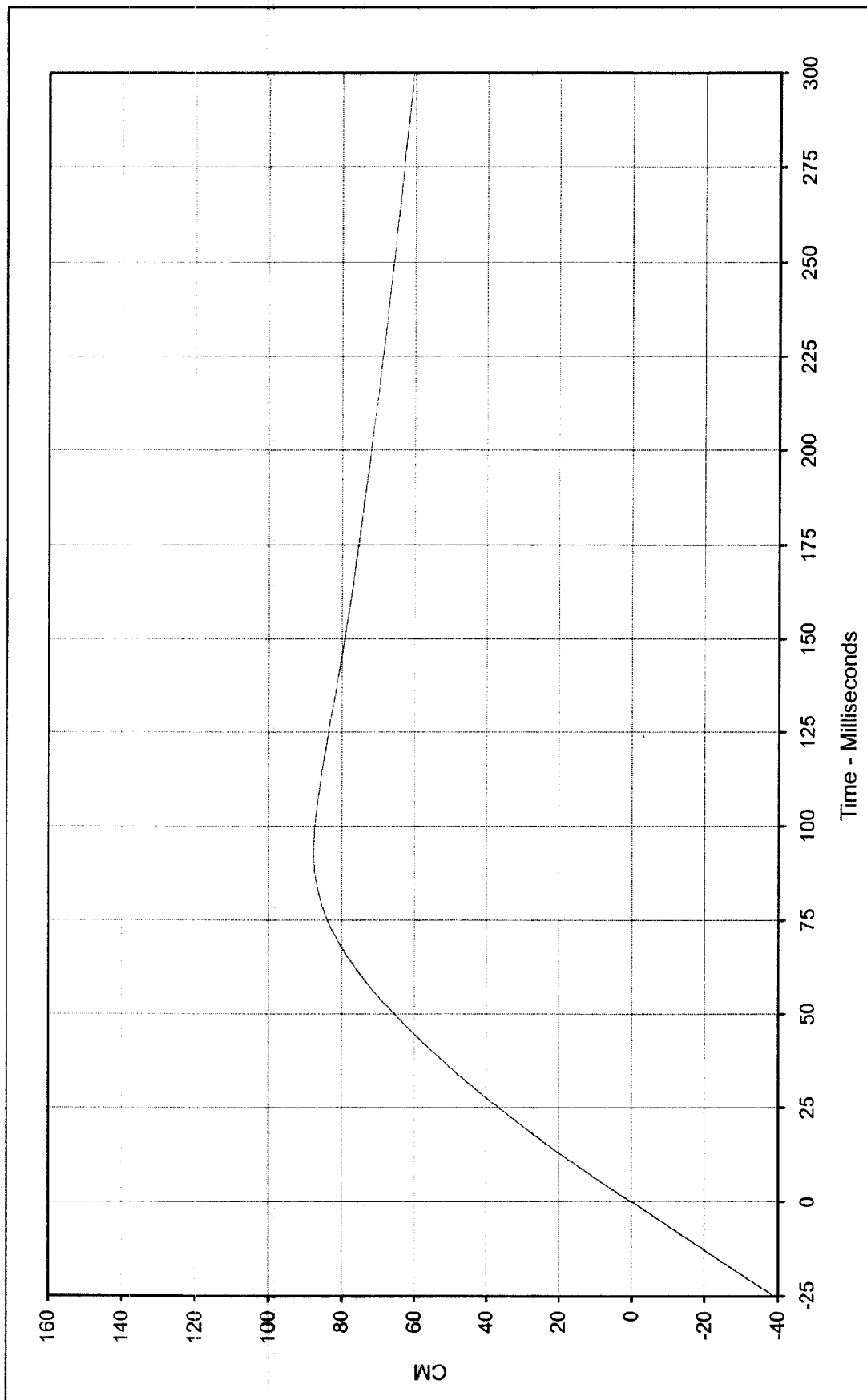




Curve Description: Vehicle Right Rear Primary Velocity
Maximum Value: 56.4 at 0.0 Milliseconds
Minimum Value: -6.4 at 133.7 Milliseconds
SAE Filter Class: 180
Date of Test: 11/20/98
Curve Number: IN1-090

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Vehicle Right Rear Primary Displ.

Maximum Value: 87.6 at 92.9 Milliseconds

Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

Date of Test: 11/20/98

Curve Number: IN2-090

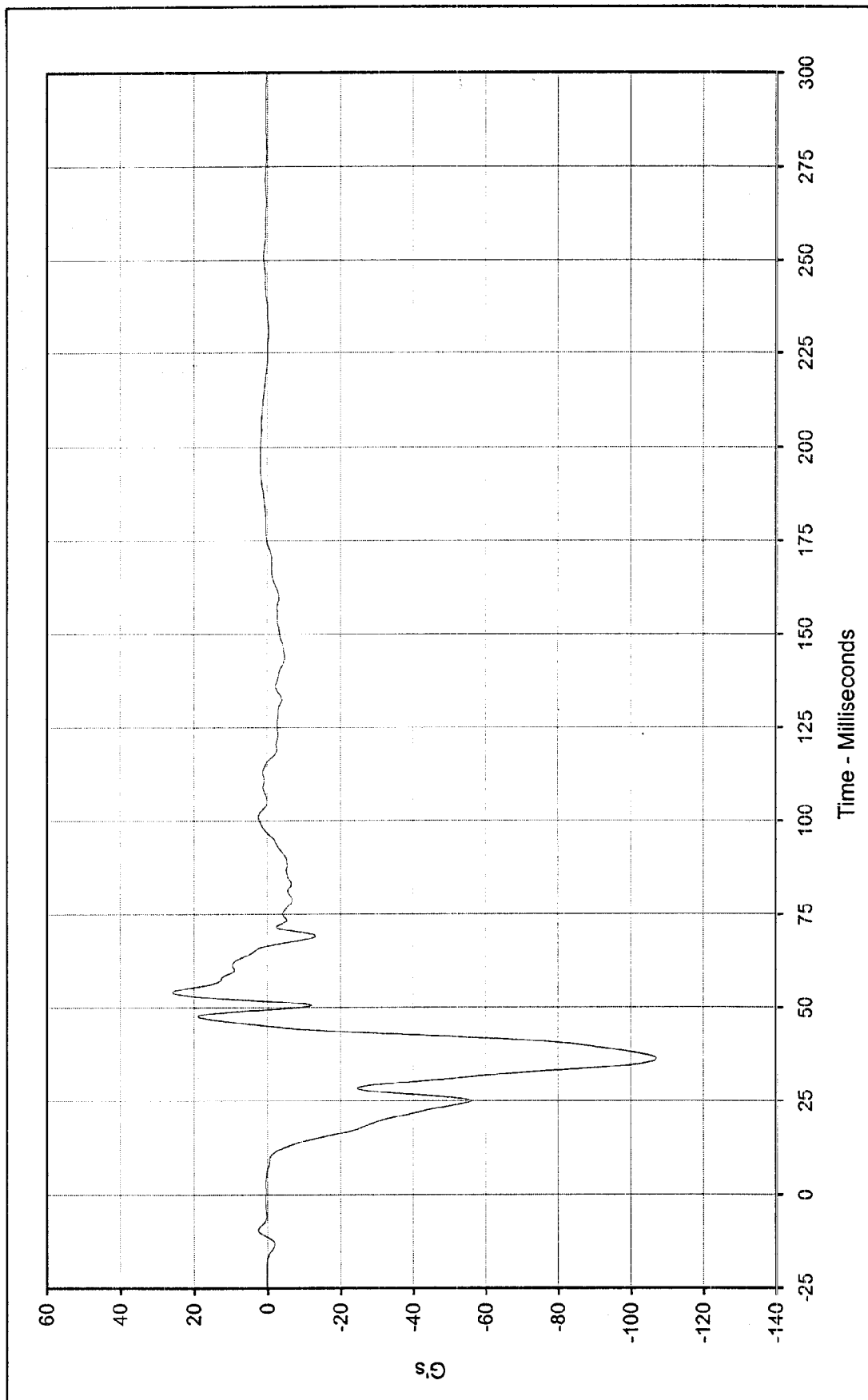
Test Program:

1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle:

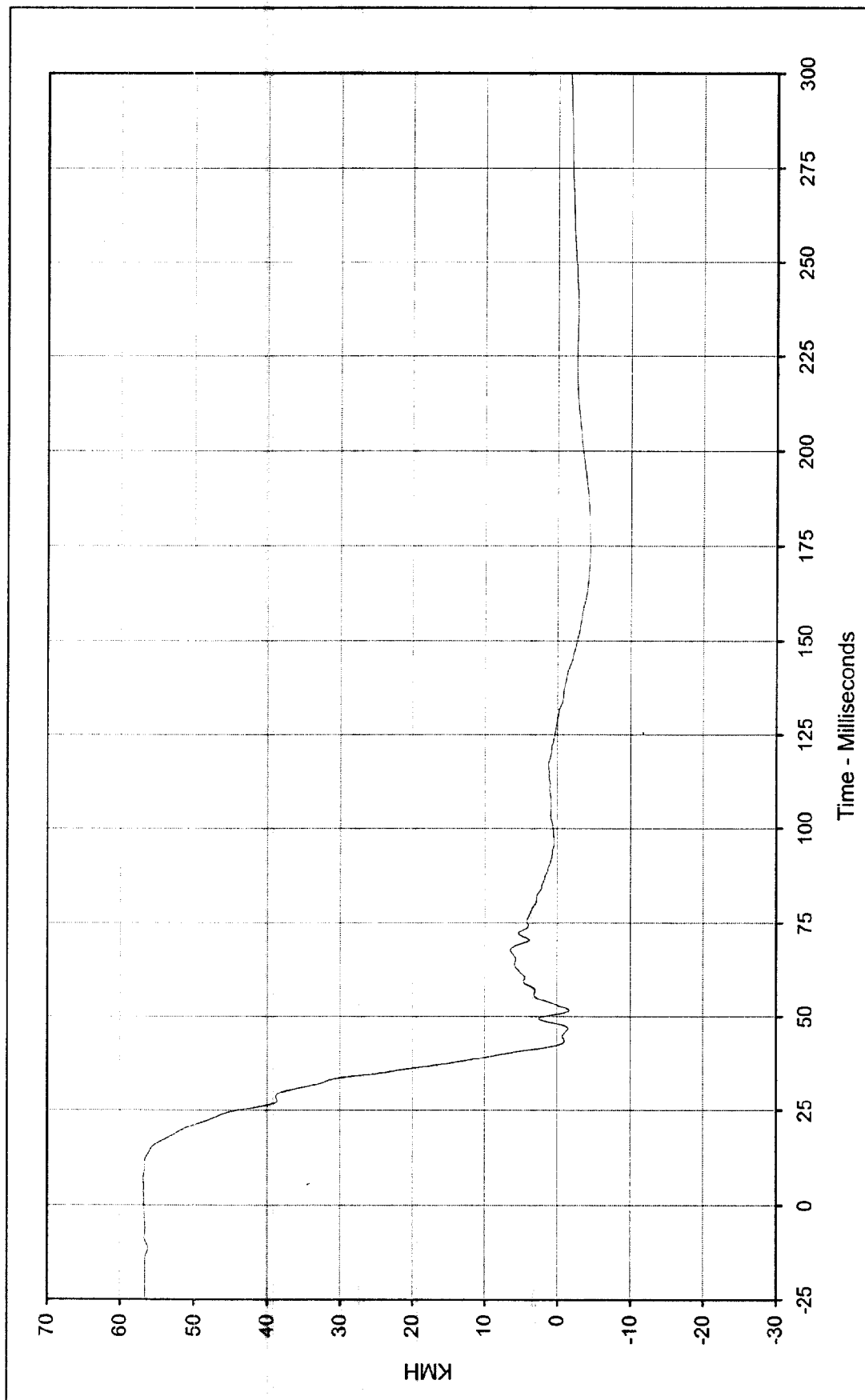
1999 Saturn SL1 4 Door Sedan





Curve Description:	Vehicle Engine Top		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	25.8	at 54.3 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-107.0	at 36.3 Milliseconds			
SAE Filter Class:	60				
Date of Test:	11/20/98				
Curve Number:	FIL-091				



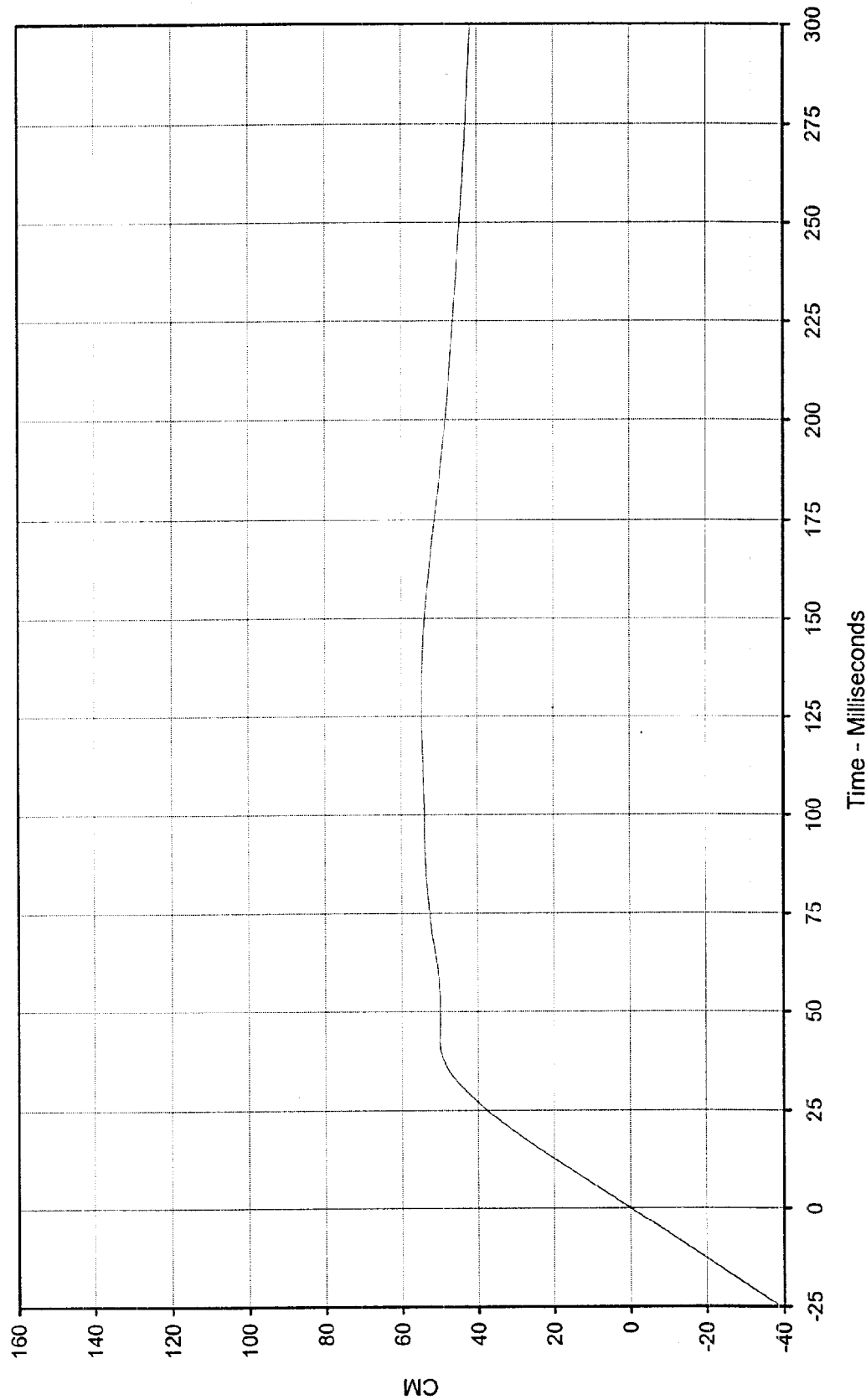


Curve Description:	Vehicle Engine Top Velocity		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	56.8	at 7.3	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-4.5	at 173.9			
SAE Filter Class:	180				
Date of Test:	11/20/98				
Curve Number:	IN1-091				



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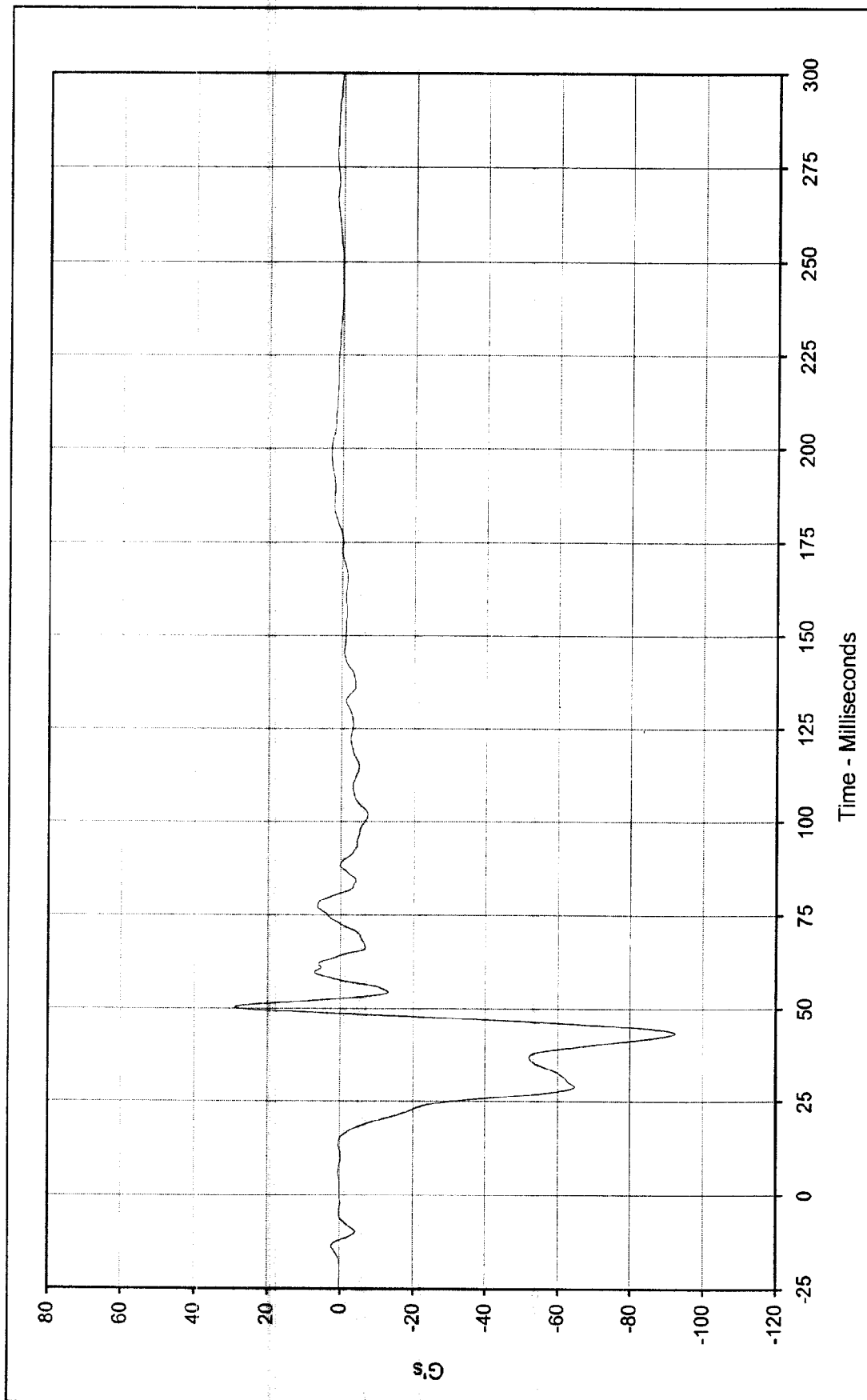




Curve Description: 1999 NHTSA 35 mph NCAP No.: MX0111
 Maximum Value: 54.5 at 128.9 Milliseconds
 Minimum Value: 0.0 at 0.0 Milliseconds

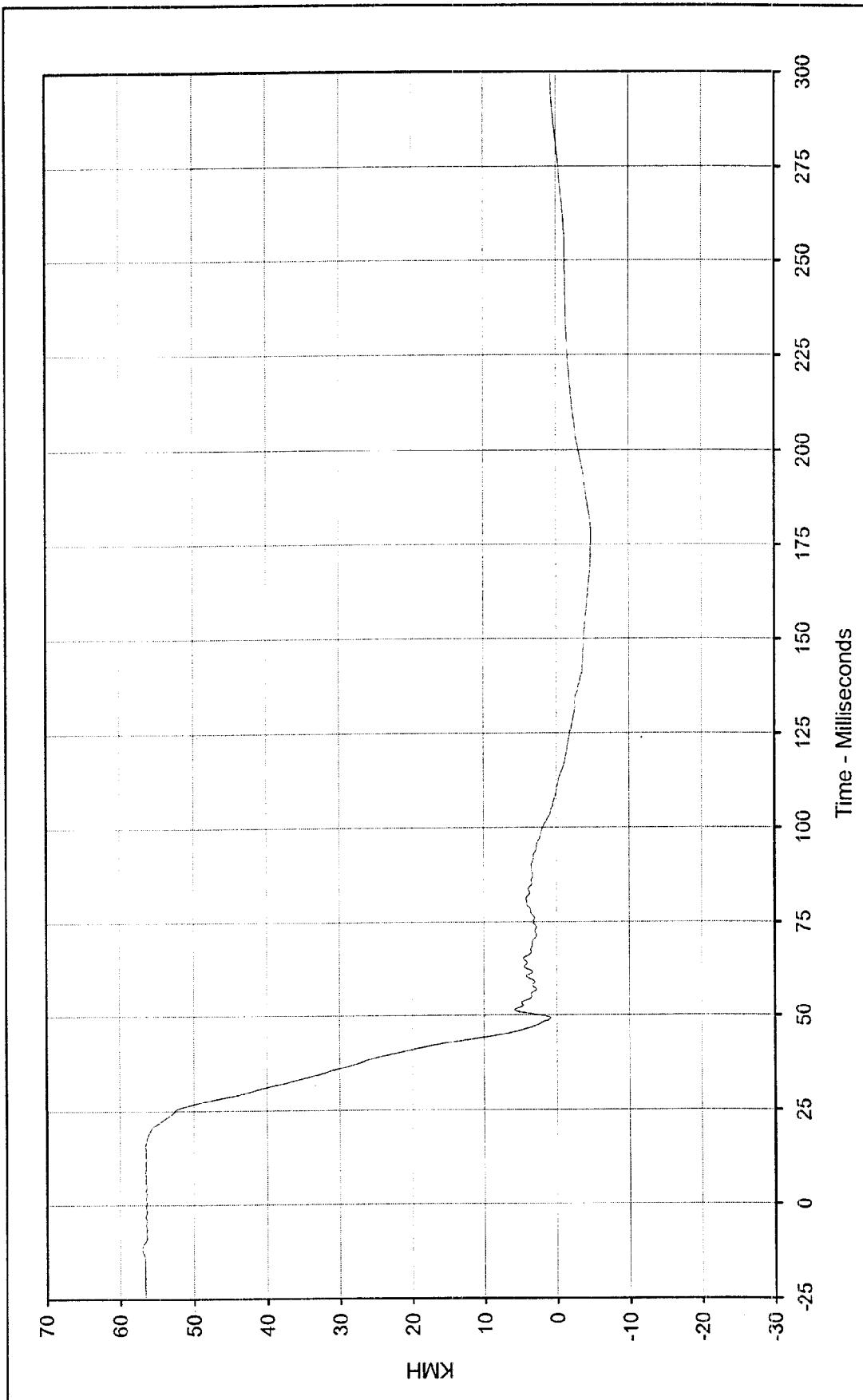


SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: IN2-091



Curve Description:	Vehicle Engine Bottom		Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111	
Maximum Value:	29.0	at 50.3 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-92.3	at 43.4 Milliseconds			
SAE Filter Class:	60				
Date of Test:	11/20/98				
Curve Number:	FIL-092				

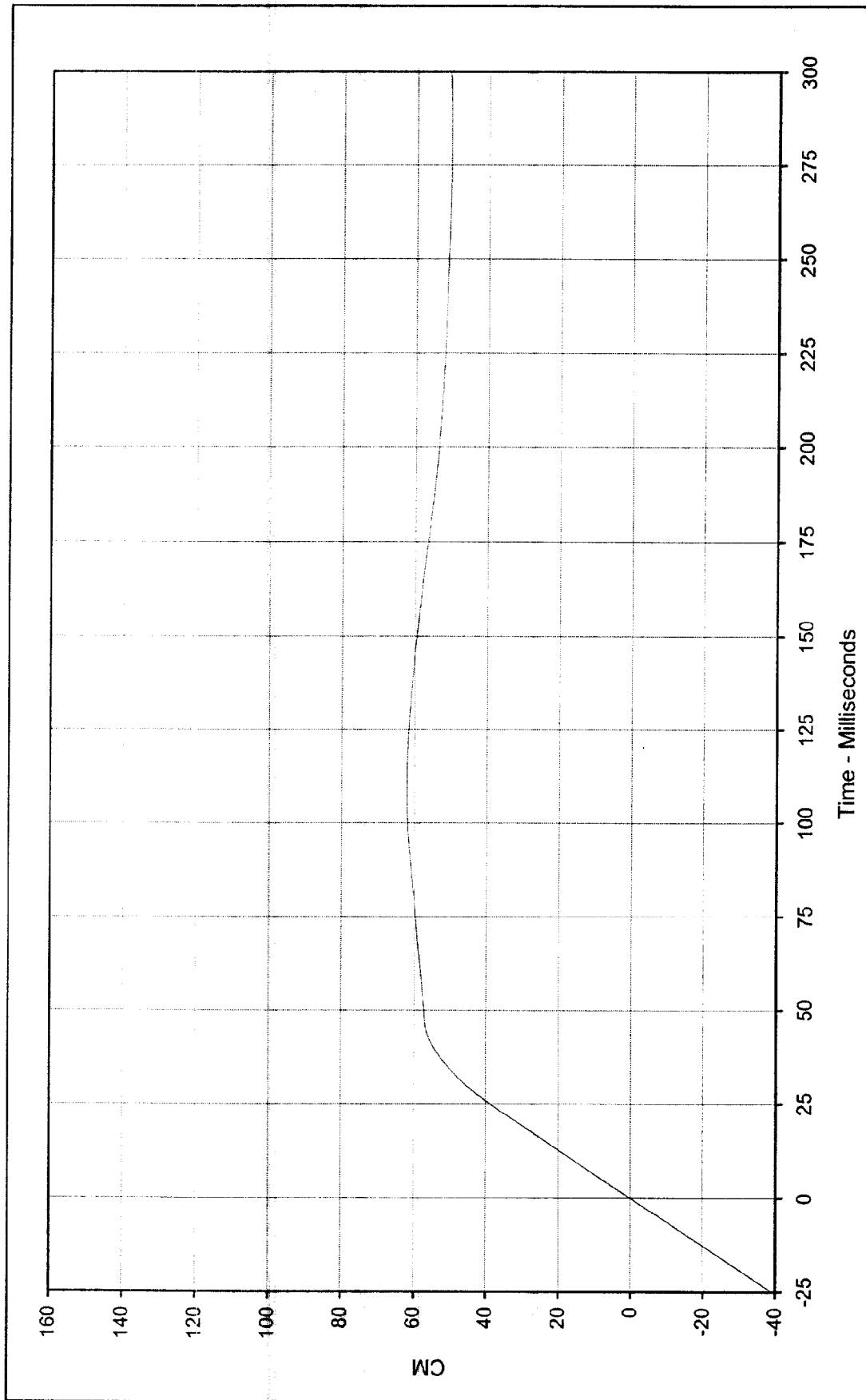




Curve Description:	Vehicle Engine Bottom Velocity	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	56.6 at 8.8 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-4.8 at 176.4 Milliseconds			

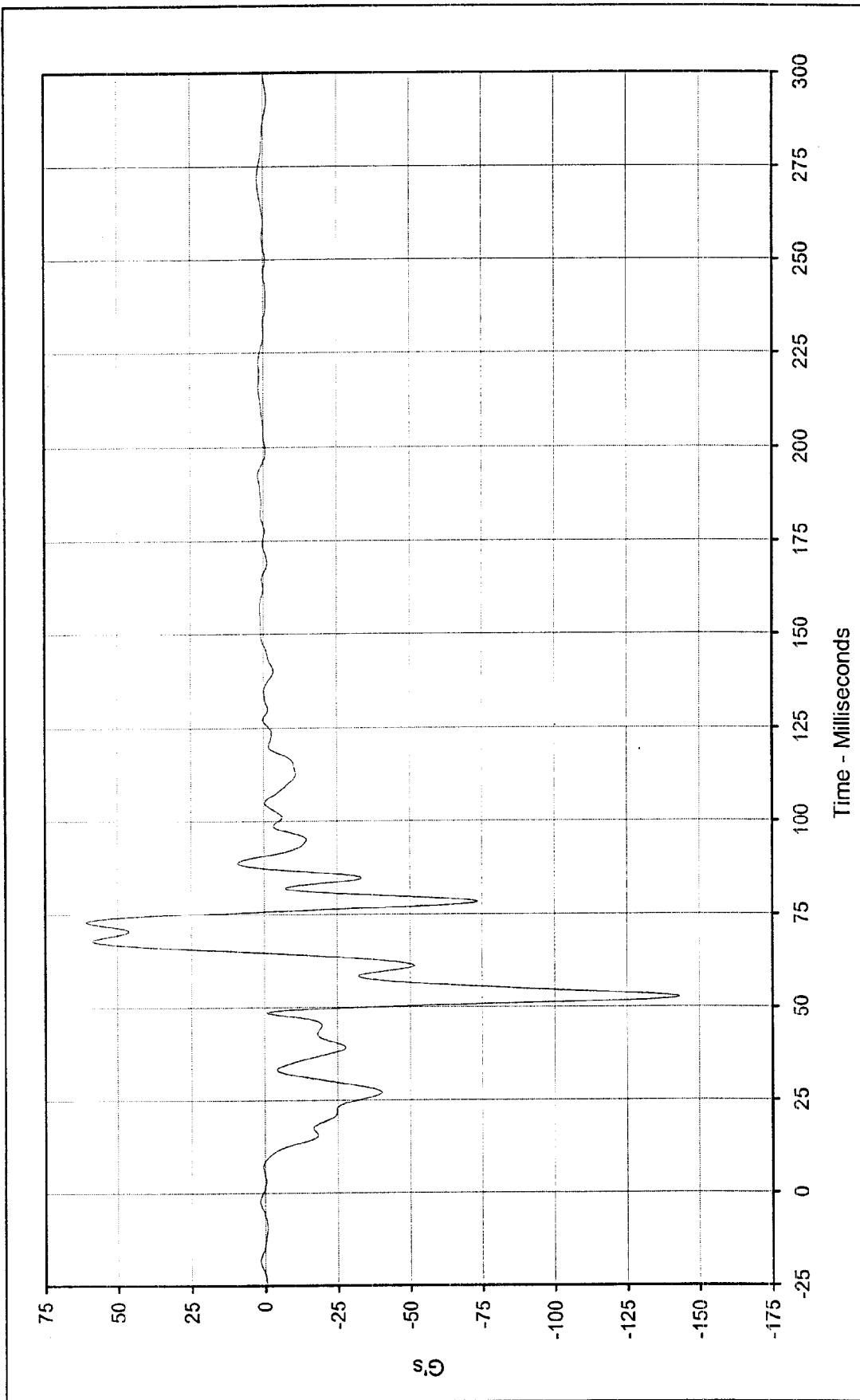


SAE Filter Class:	180
Date of Test:	11/20/98
Curve Number:	IN1-092



Curve Description:	Vehicle Engine Bottom Displ.	Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111
Maximum Value:	62.0 at 109.8 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	0.0 at 0.0 Milliseconds		
SAE Filter Class:	180		
Date of Test:	11/20/98		
Curve Number:	IN2-092		

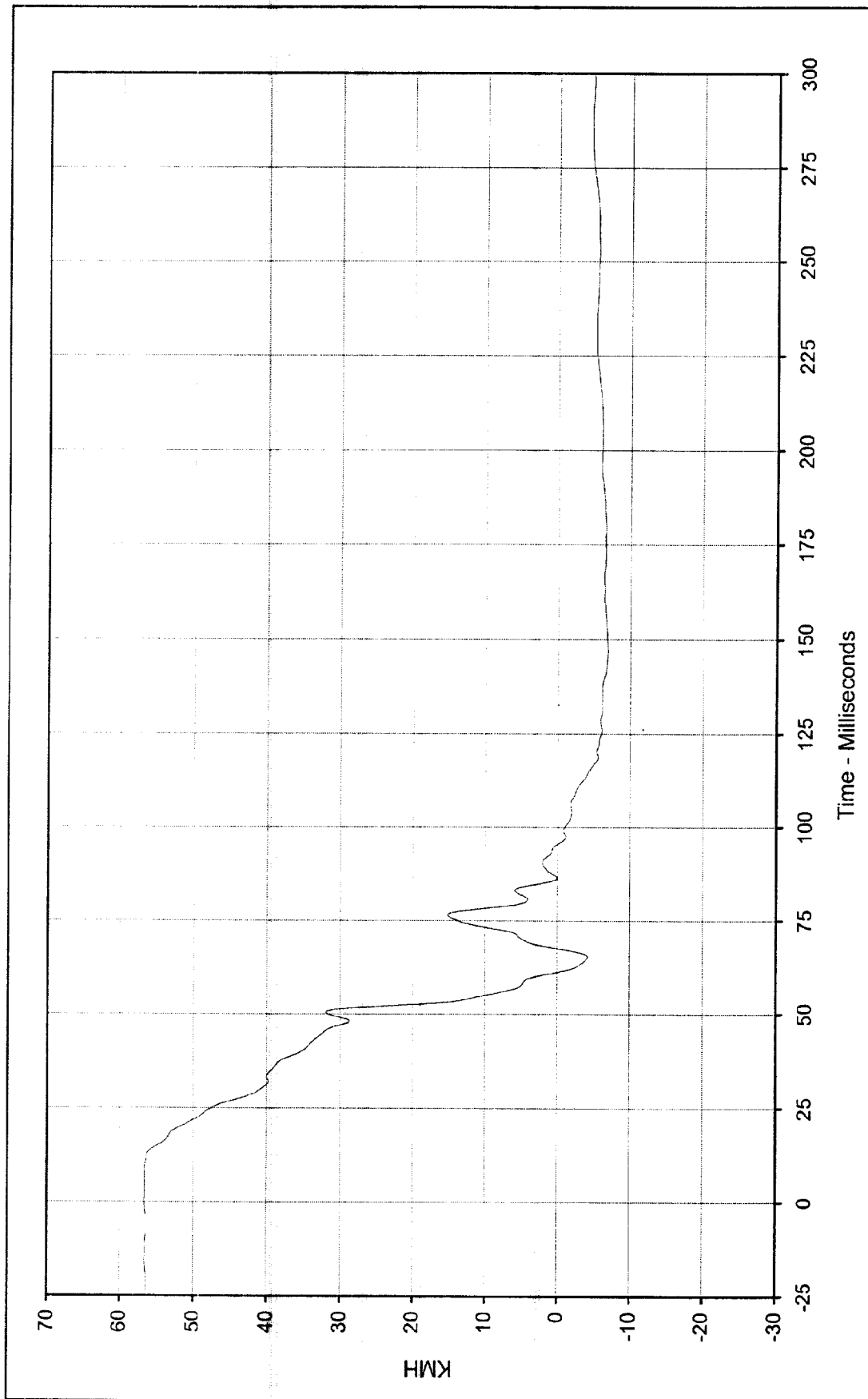




Curve Description: Vehicle Left Brake Caliper
 Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

Maximum Value: 60.8 at 72.9 Milliseconds
 Minimum Value: -143.1 at 52.6 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-093

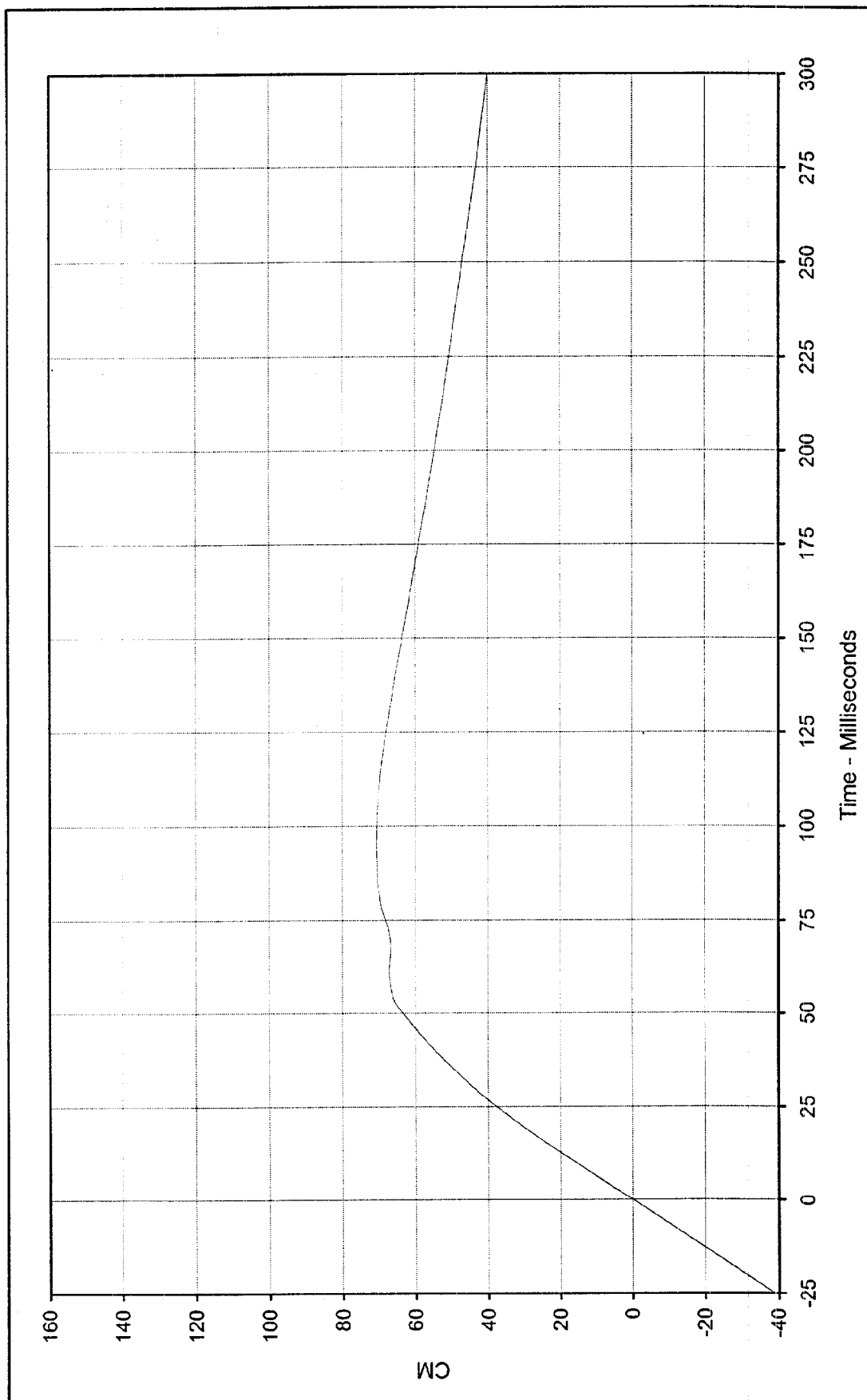




Curve Description: Vehicle Left Brake Caliper Velocity
 Maximum Value: 56.6 at 8.8 Milliseconds
 Minimum Value: -6.9 at 147.0 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: IN1-093

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

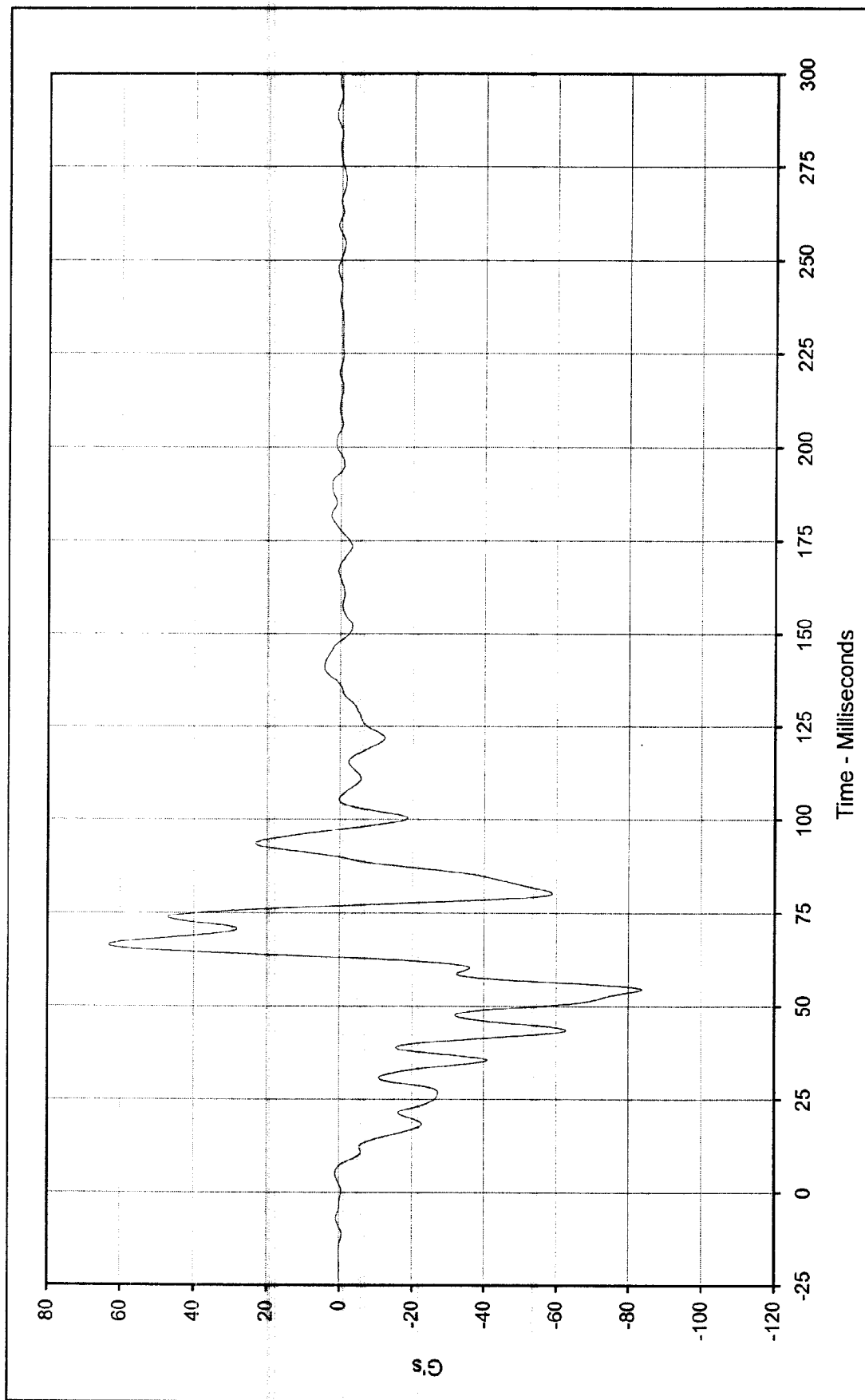




Curve Description: Vehicle Left Brake Caliper Displ.
 Maximum Value: 70.6 at 95.4 Milliseconds
 Minimum Value: -0.1 at 0.0 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: IN2-093

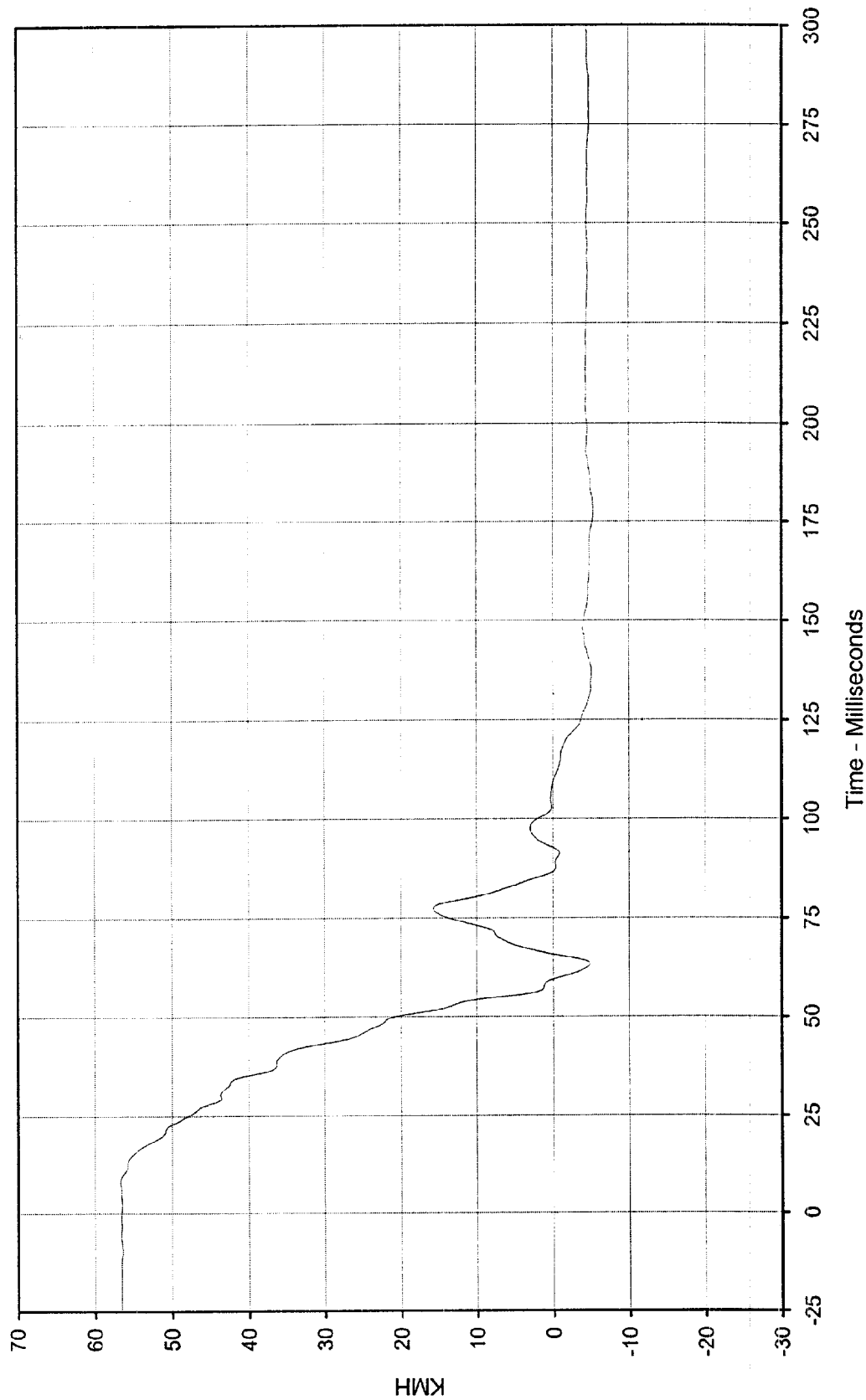
Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:	Vehicle Right Brake Caliper	Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111
Maximum Value:	63.2 at 66.2 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-83.6 at 54.5 Milliseconds		
SAE Filter Class:	60		
Date of Test:	11/20/98		
Curve Number:	FIL-094		

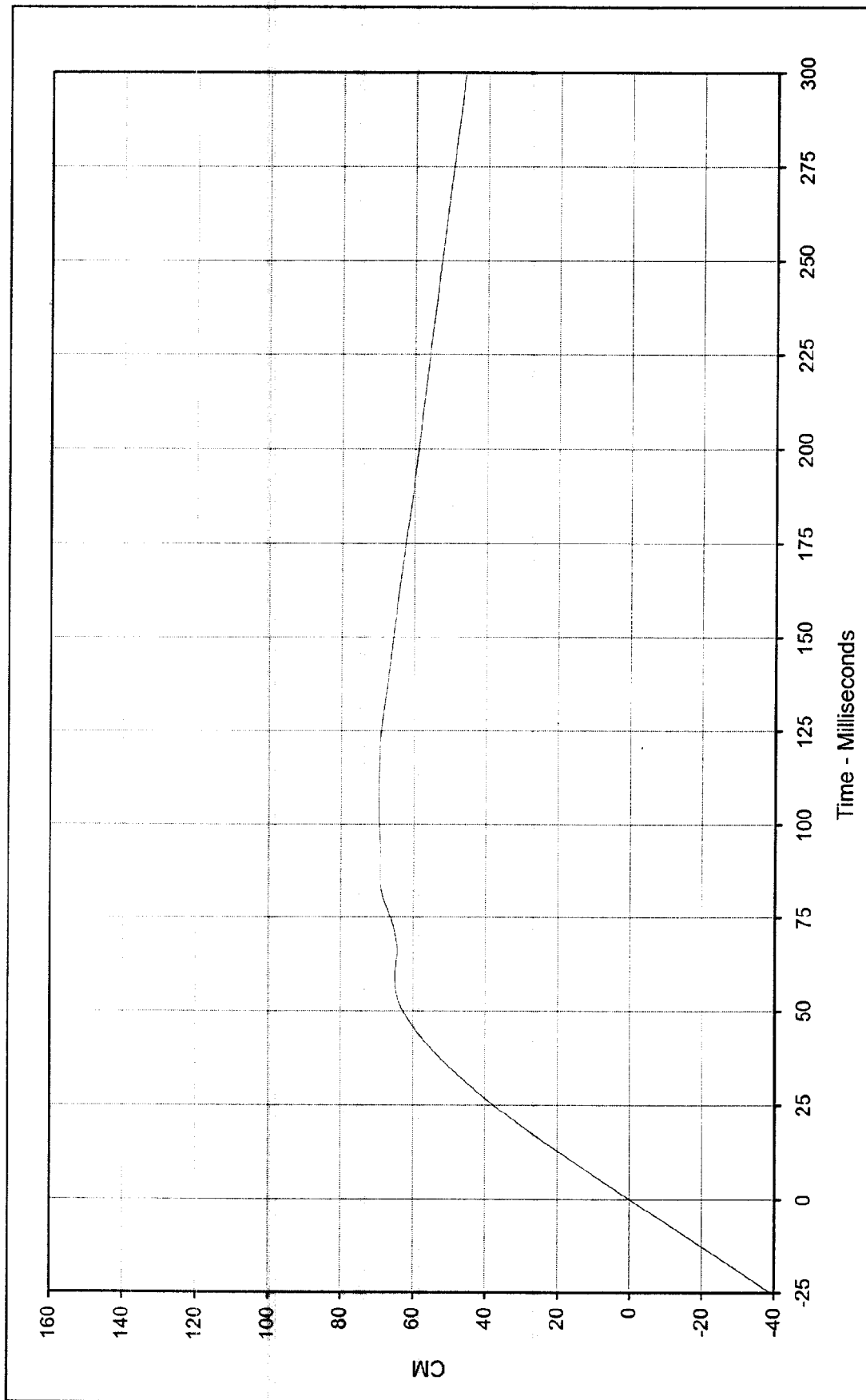




Curve Description:	Vehicle Right Brake Caliper Velocity	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	56.7 at 8.3 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-5.4 at 177.6 Milliseconds			



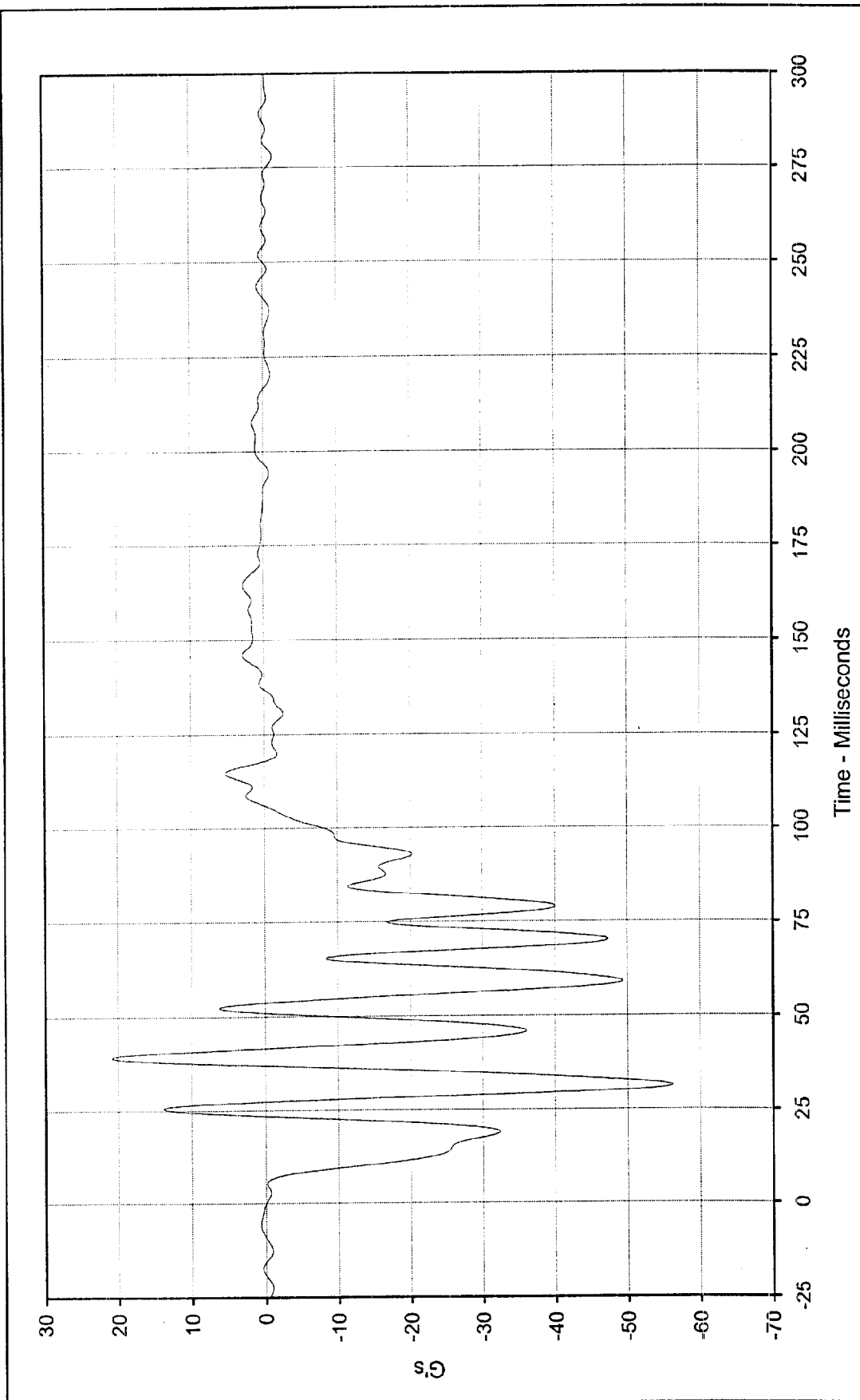
SAE Filter Class:	180
Date of Test:	11/20/98
Curve Number:	IN1-094



Curve Description: Vehicle Right Brake Caliper Displ.
Maximum Value: 69.5 at 109.5 Milliseconds
Minimum Value: 0.0 at 0.0 Milliseconds
SAE Filter Class: 180
Date of Test: 11/20/98
Curve Number: IN2-094

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
Test Vehicle: 1999 Saturn SL1 4 Door Sedan

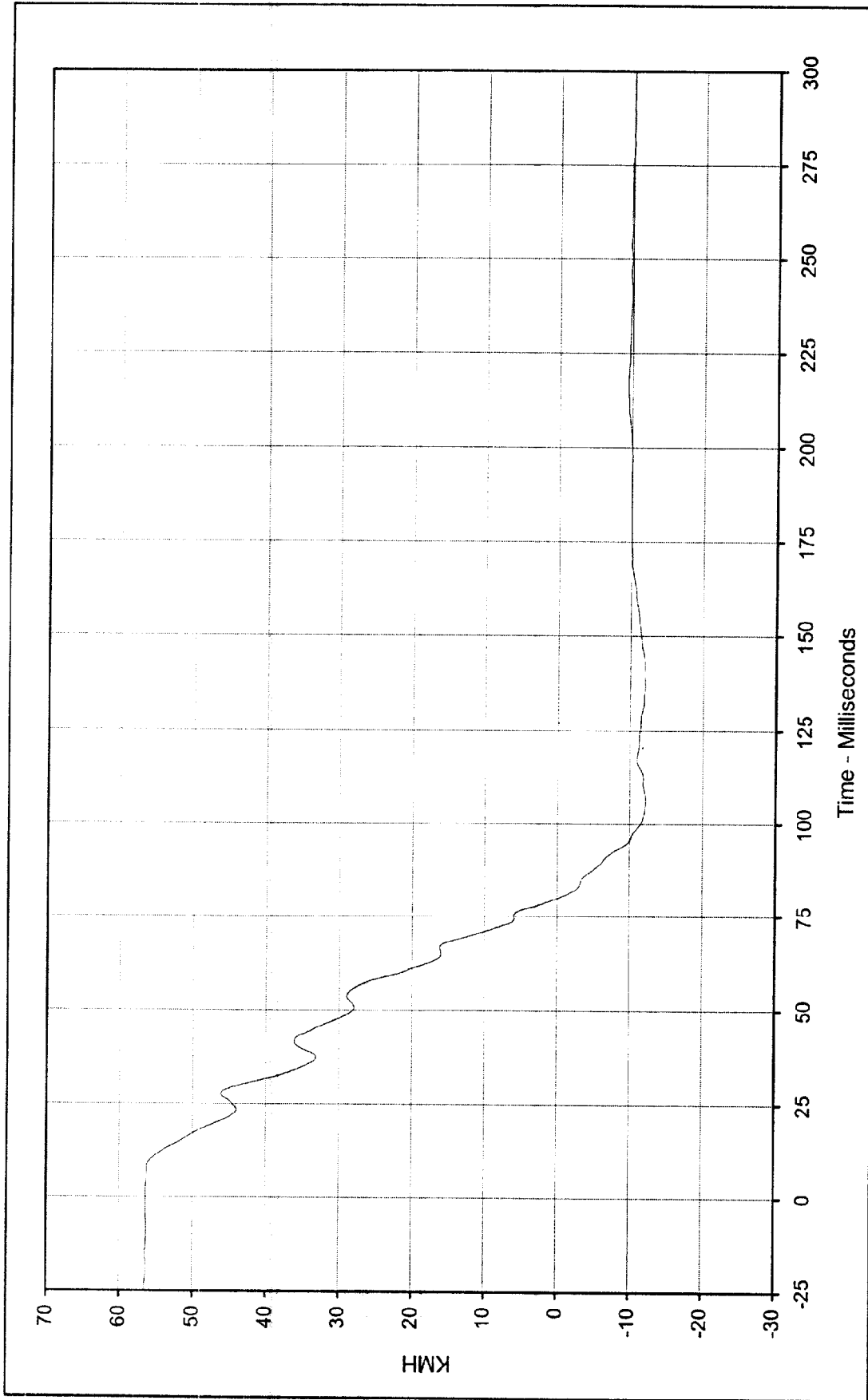




Curve Description: Vehicle Instrument Panel Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
Maximum Value: 20.9 at 39.3 Milliseconds Test Vehicle: 1999 Saturn SL1 4 Door Sedan
Minimum Value: -56.1 at 31.5 Milliseconds

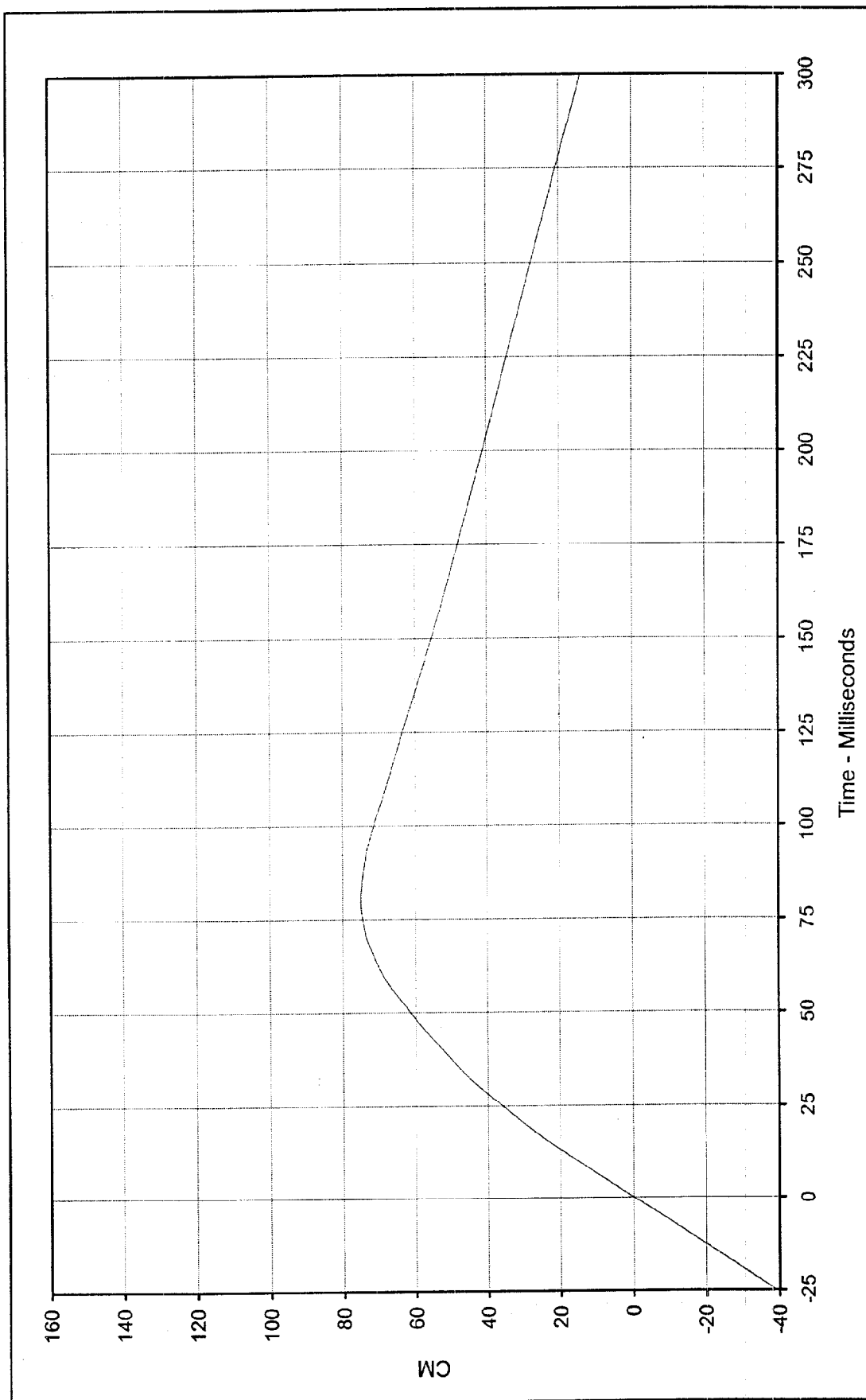


SAE Filter Class: 60
Date of Test: 11/20/98
Curve Number: FIL-095



Curve Description:	Vehicle Instrument Panel Velocity	Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111
Maximum Value:	56.4 at 0.6 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-12.2 at 106.7 Milliseconds		
SAE Filter Class:	180		
Date of Test:	11/20/98		
Curve Number:	IN1-095		

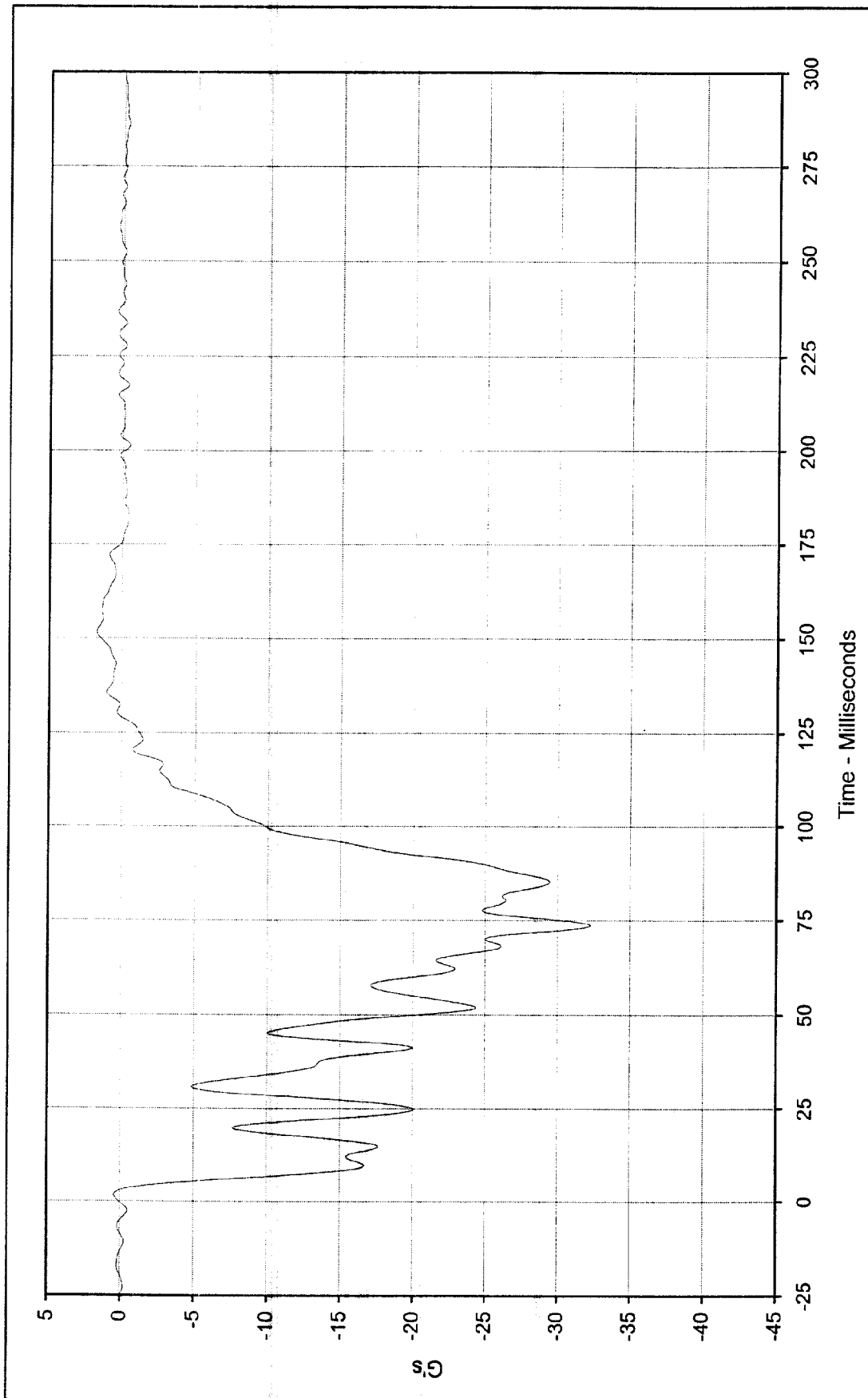




Curve Description:	Vehicle Instrument Panel Displ.	Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111
Maximum Value:	75.1 at 80.0 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-0.1 at 0.0 Milliseconds		



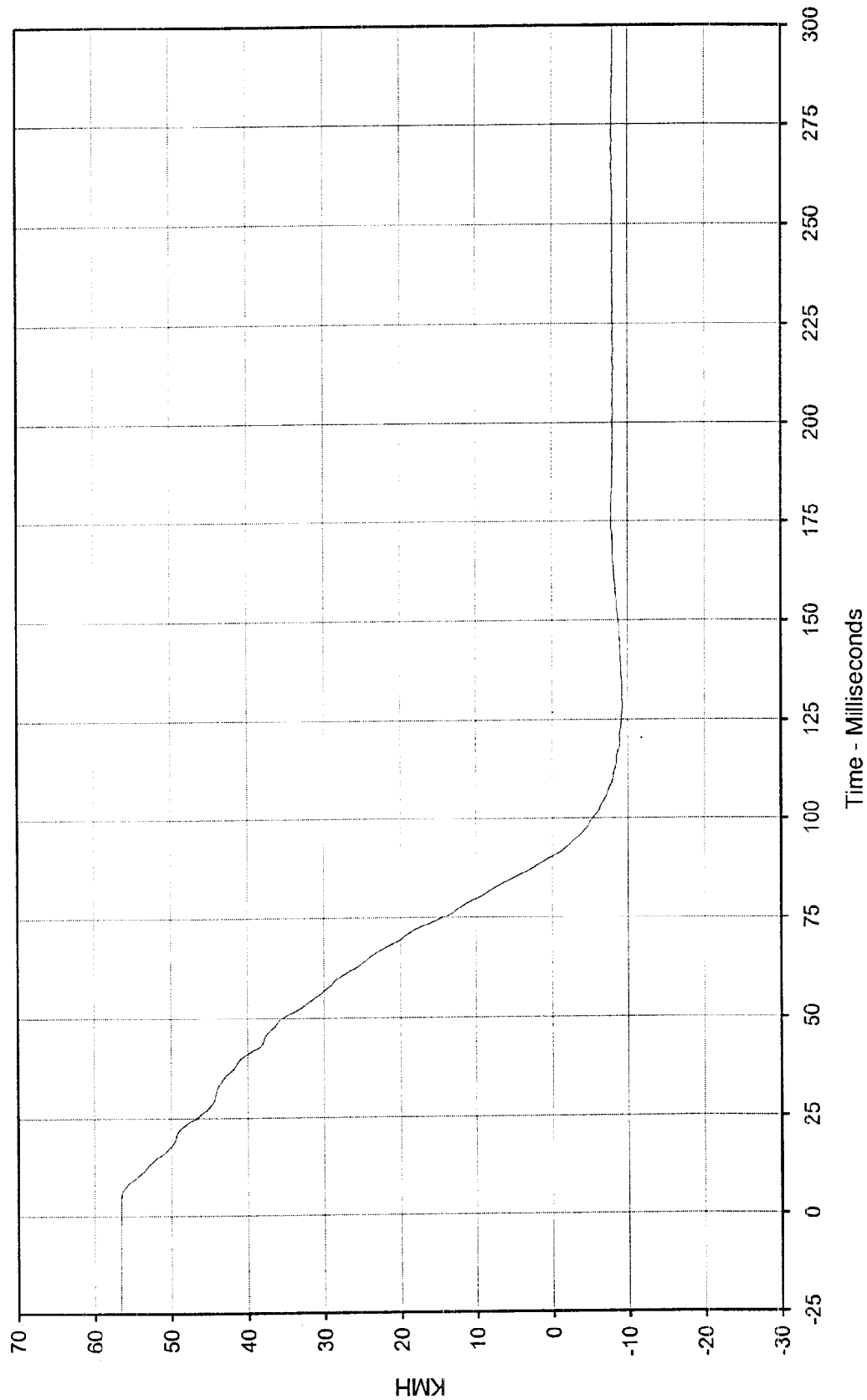
SAE Filter Class:	180
Date of Test:	11/20/98
Curve Number:	IN2-095



Curve Description:	Vehicle Left Rear Redundant		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	1.7	at 151.8	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-32.3	at 73.7			
SAE Filter Class:	60				
Date of Test:	11/20/98				
Curve Number:	FIL-096				



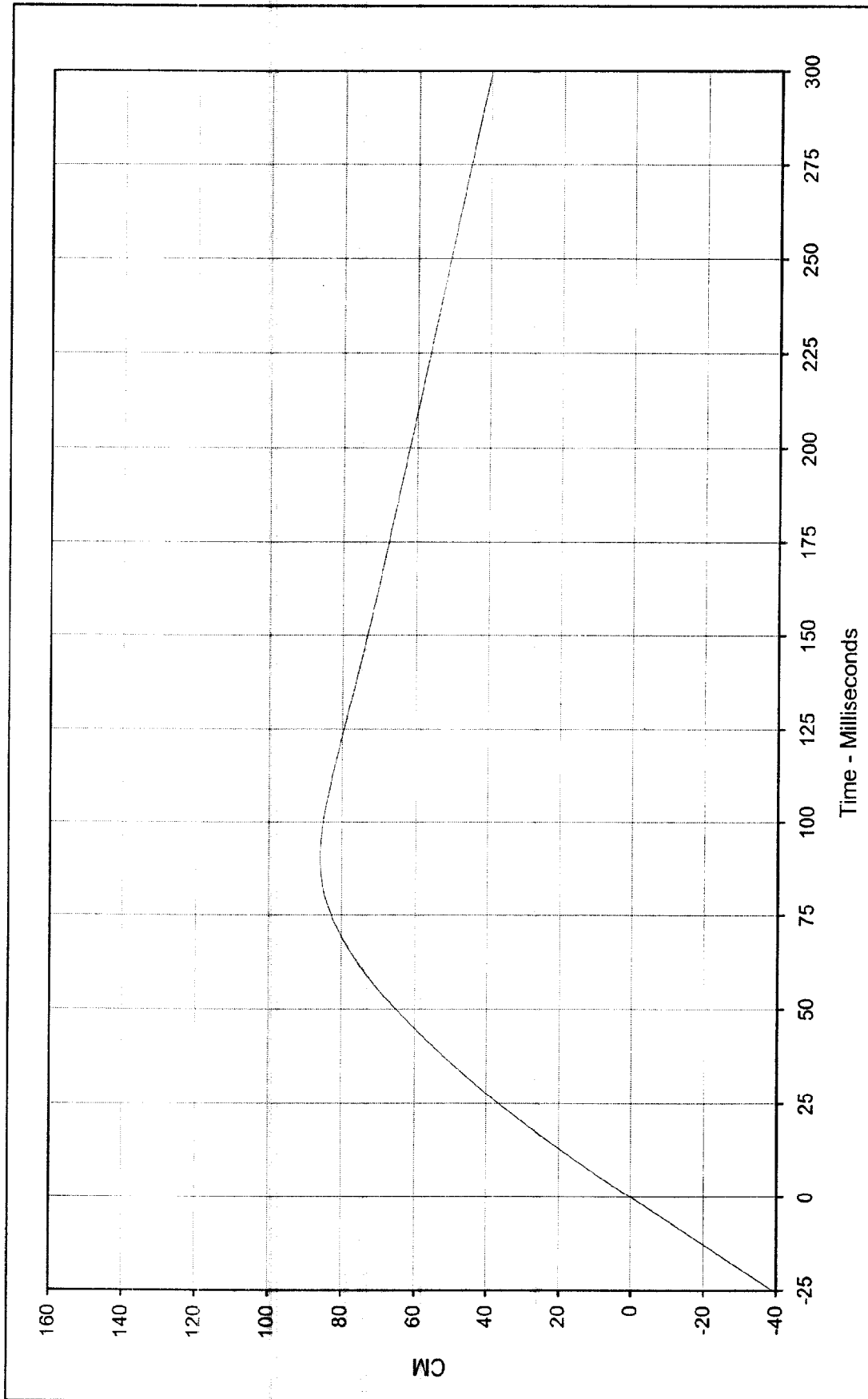




Curve Description: Vehicle Left Rear Redundant Velocity
 Maximum Value: 56.5 at 0.5 Milliseconds
 Minimum Value: -9.3 at 128.6 Milliseconds
 SAE Filter Class: 180
 Date of Test: 11/20/98
 Curve Number: IN1-096

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Vehicle Left Rear Redundant Displ.

Maximum Value: 86.0 at 90.3 Milliseconds

Minimum Value: 0.0 at 0.0 Milliseconds

SAE Filter Class: 180

Date of Test: 11/20/98

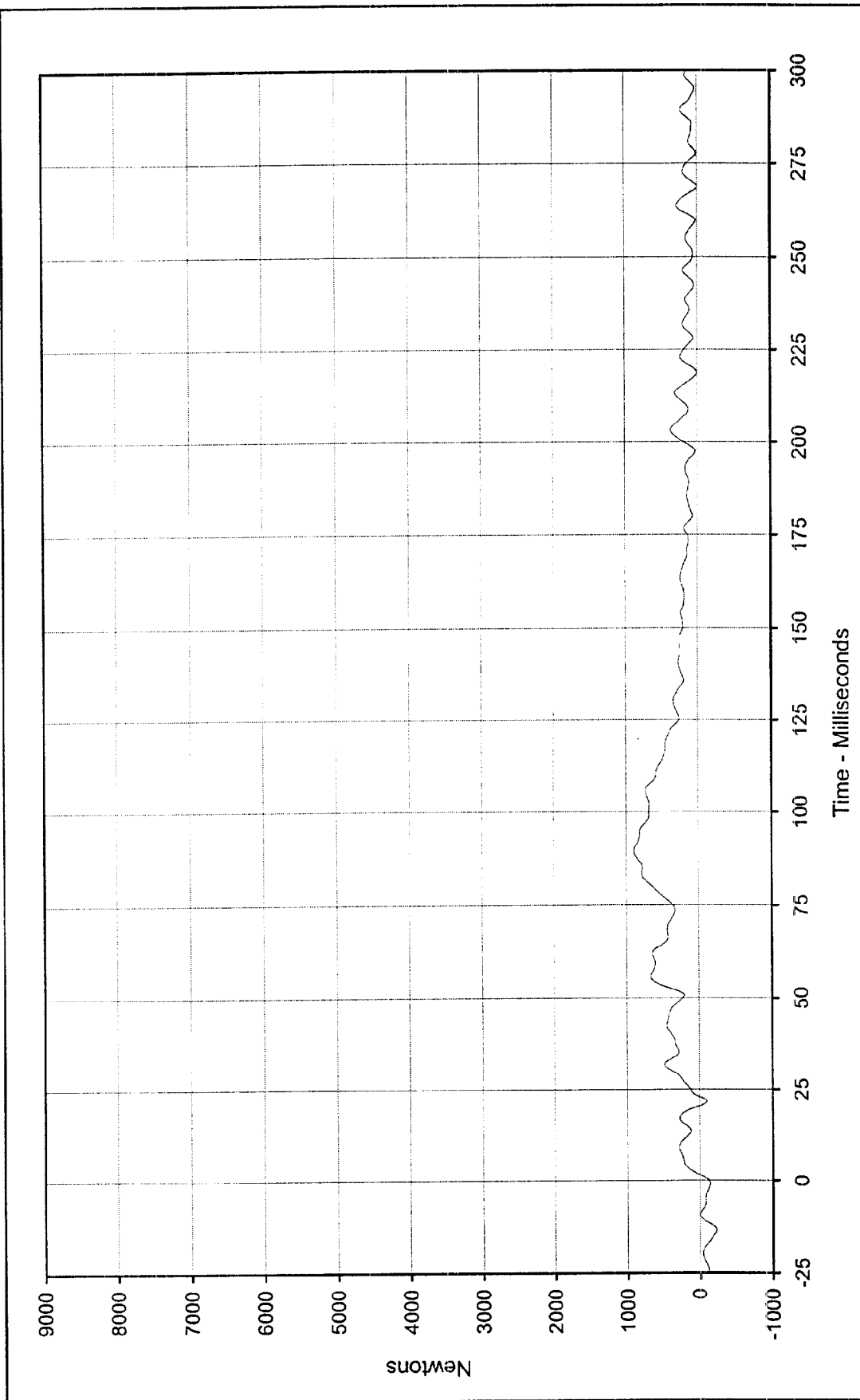
Curve Number: IN2-096

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

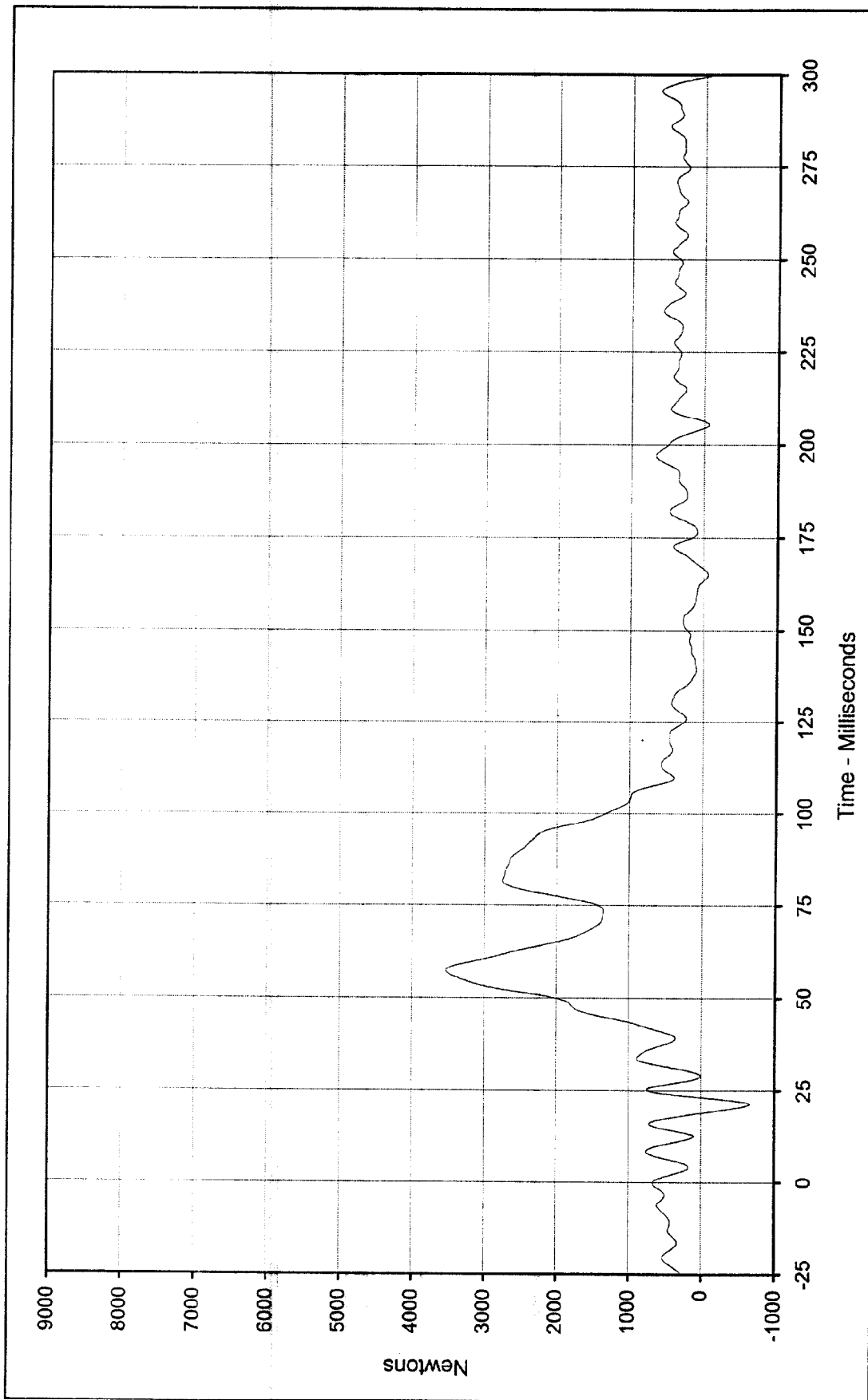


APPENDIX C
LOAD CELL BARRIER INFORMATION



Curve Description: 1999 NHTSA 35 mph NCAP No.: MX0111
 Maximum Value: 893.8 at 89.6 Milliseconds
 Minimum Value: -126.1 at 0.0 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-099

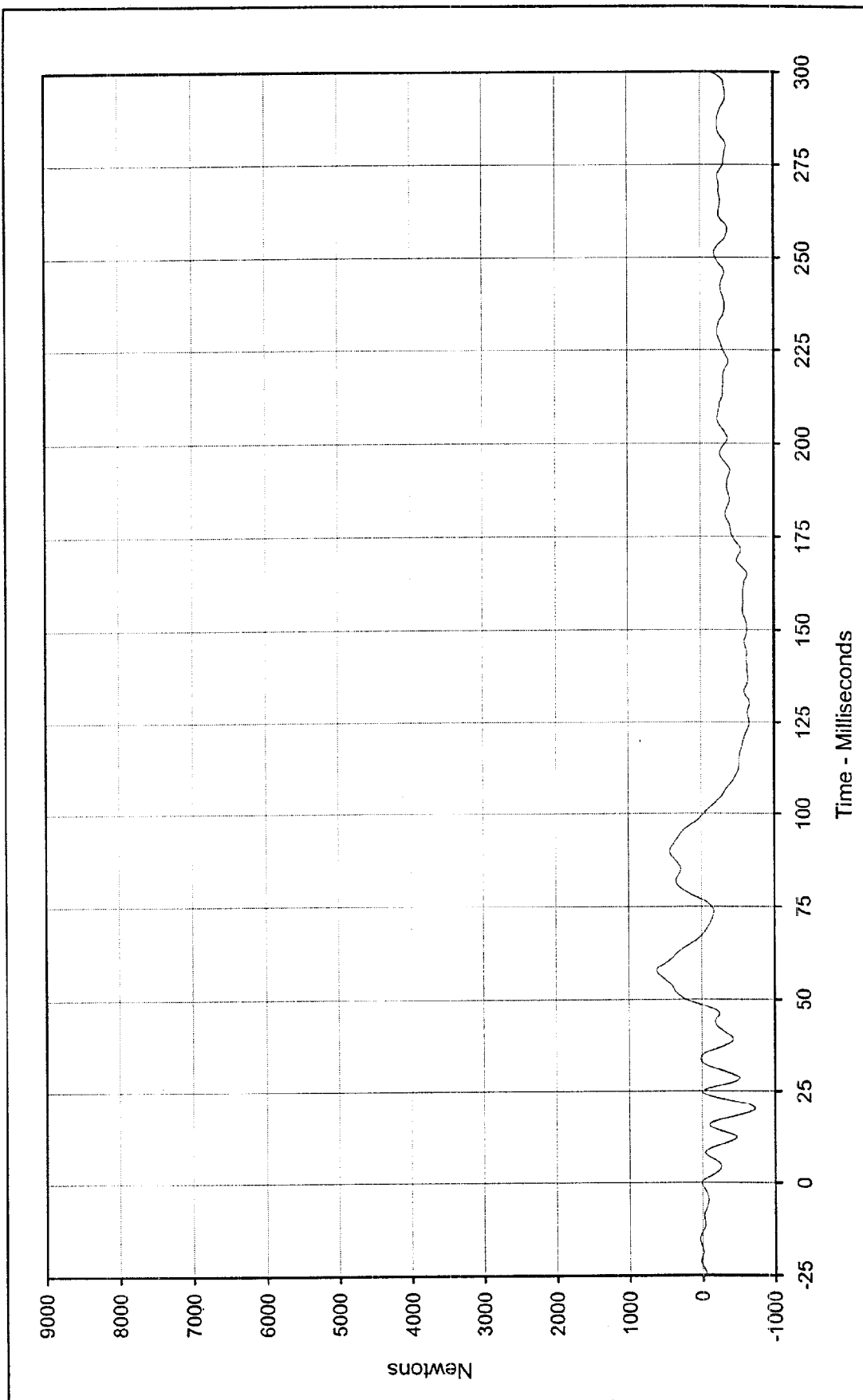




Curve Description: Barrier Force A3
 Maximum Value: 3528.4 at 57.3 Milliseconds
 Minimum Value: -670.4 at 21.3 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-100

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

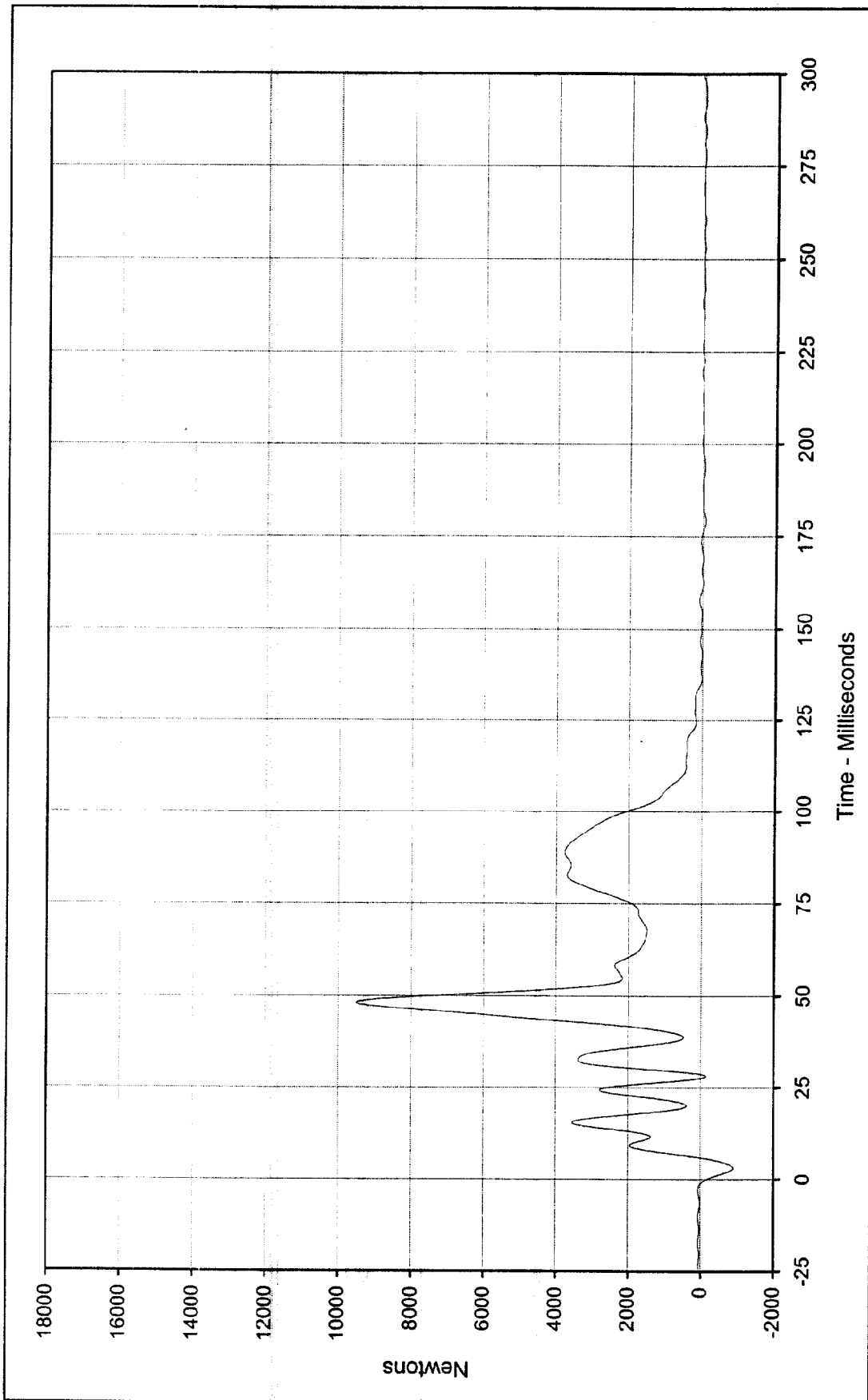




Curve Description: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Program: 1999 Saturn SL1 4 Door Sedan
 Test Vehicle:

Barrier Force A4
 Maximum Value: 620.3 at 57.8 Milliseconds
 Minimum Value: -730.0 at 20.2 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-101





Curve Description: Barrier Force A5

Maximum Value: 9513.8 at 48.1 Milliseconds

Minimum Value: -916.8 at 3.0 Milliseconds

SAE Filter Class: 60

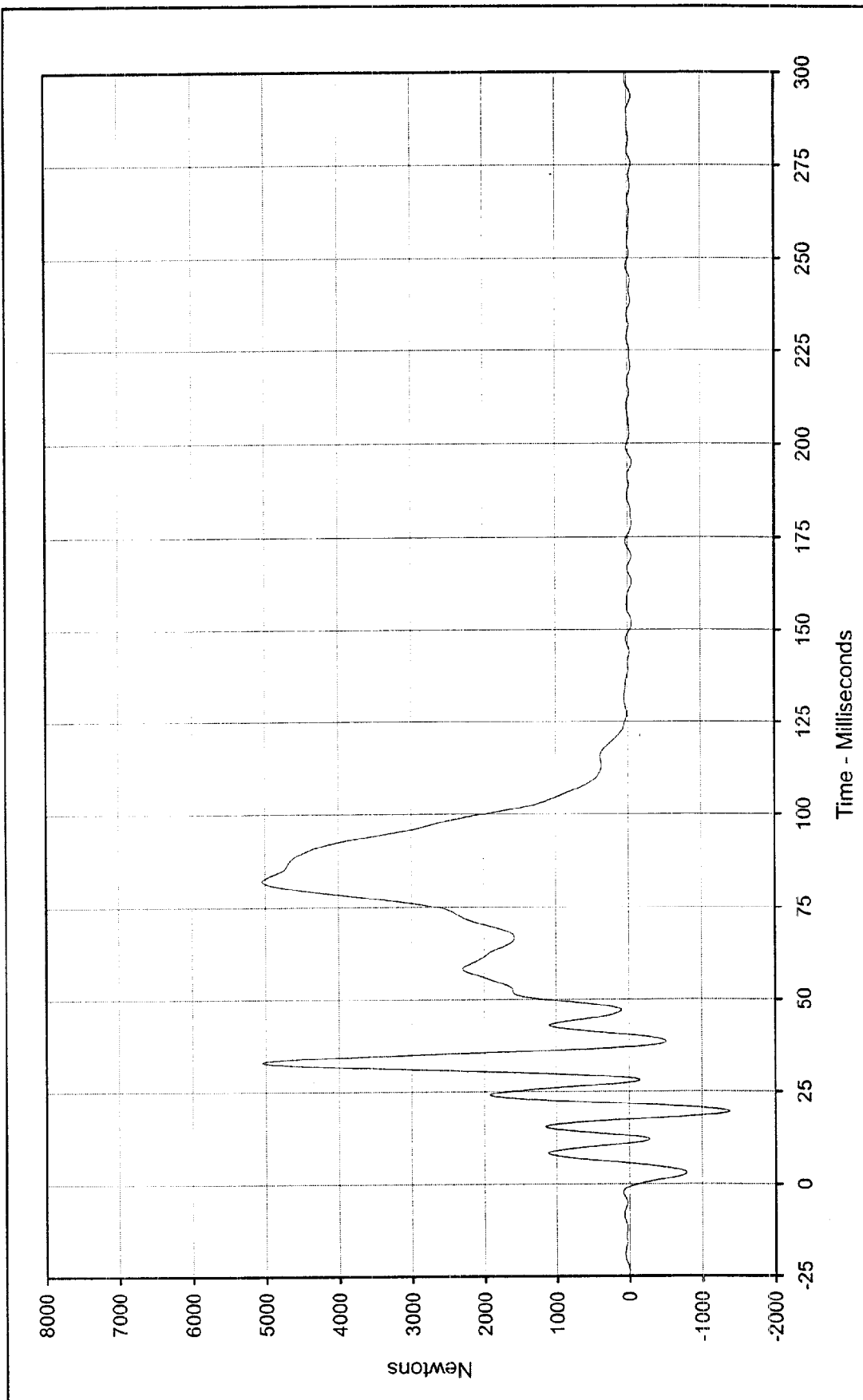
Date of Test: 11/20/98

Curve Number: FIL-102

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

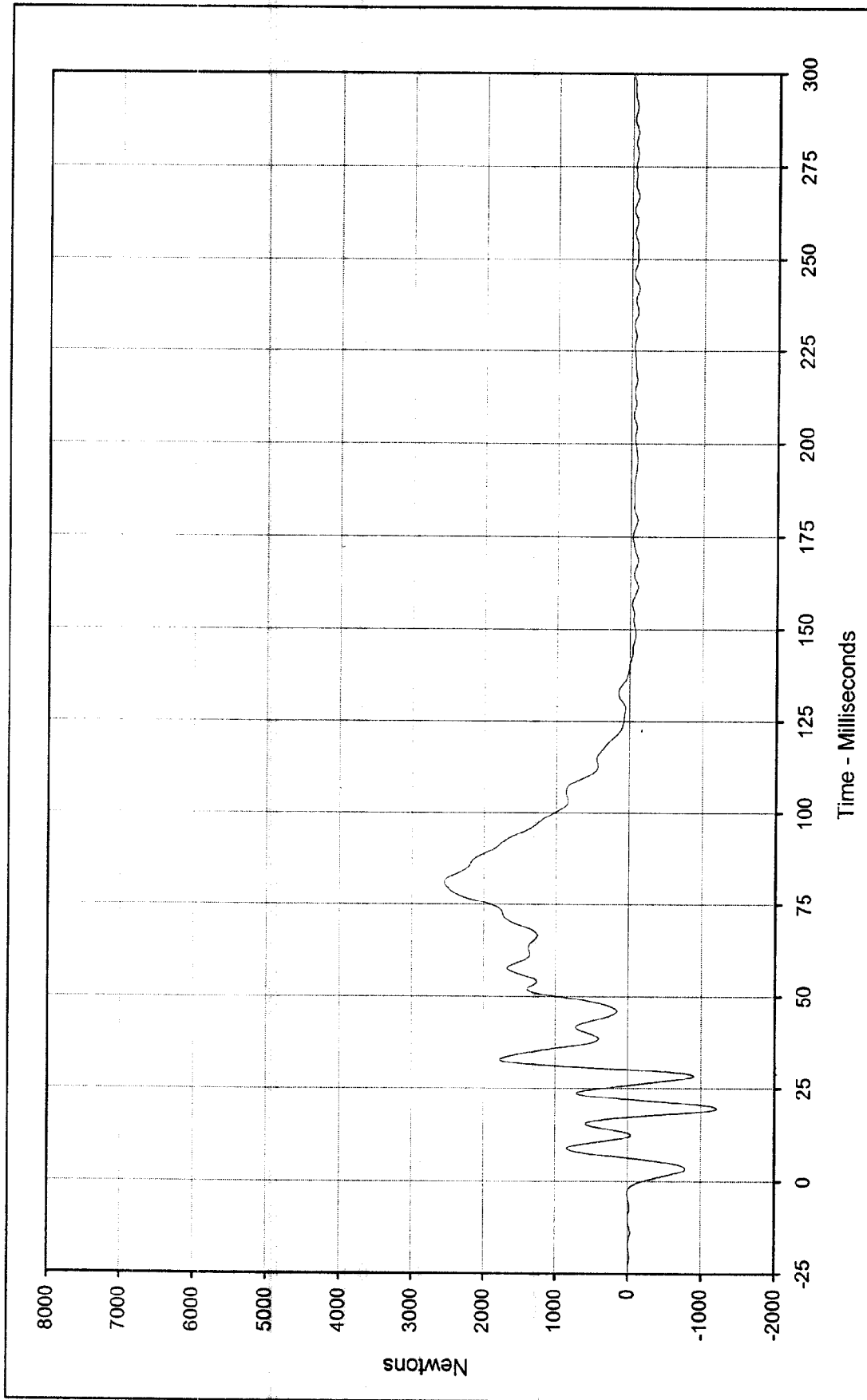




Curve Description: Barrier Force A6
 Maximum Value: 5045.8 at 33.1 Milliseconds
 Minimum Value: -1381.4 at 19.4 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-103

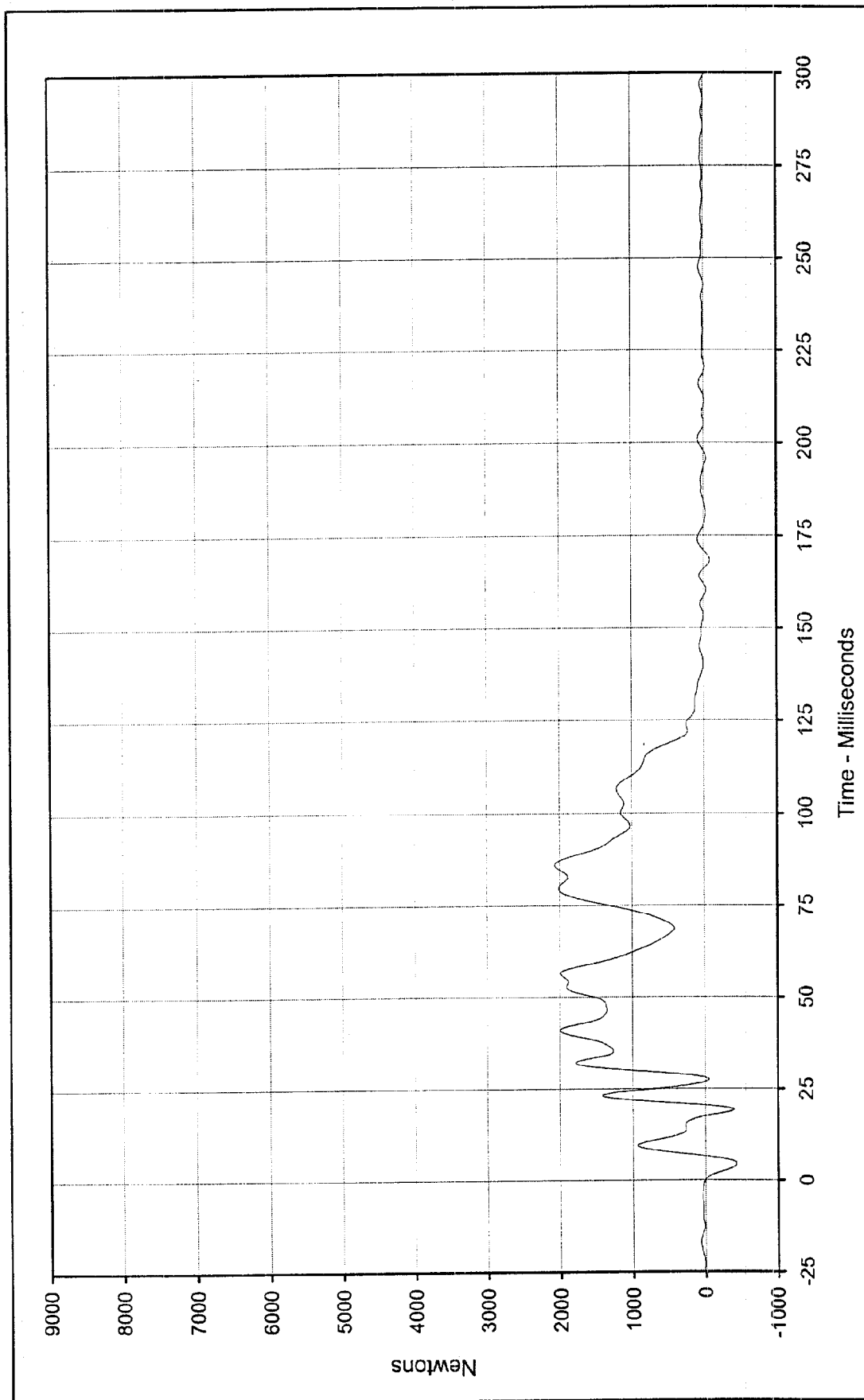
Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:		Barrier Force A7		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	2547.4	at	81.1	Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-1219.3	at	19.4	Milliseconds		
SAE Filter Class:	60					
Date of Test:	11/20/98					
Curve Number:	FIL-104					

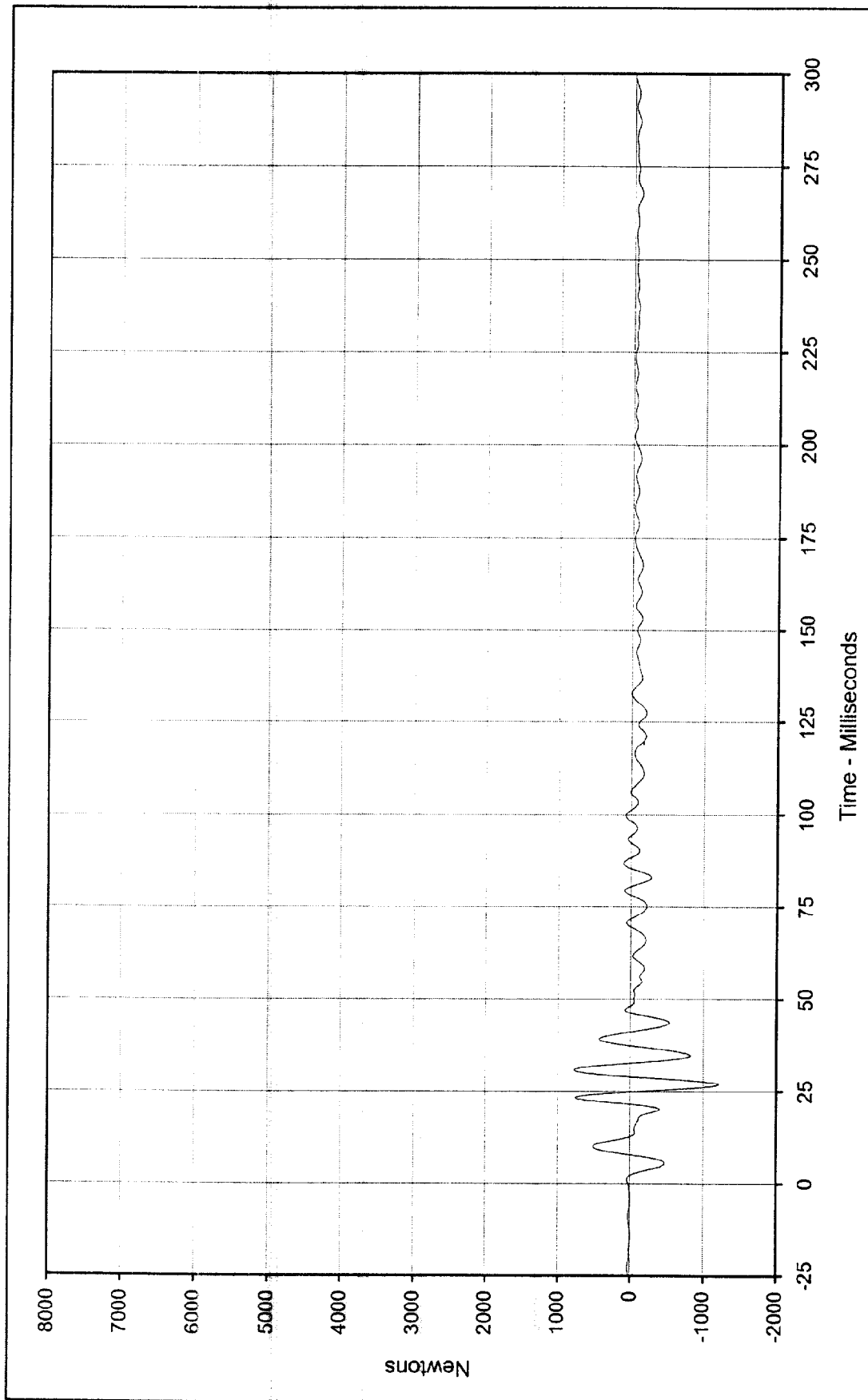




Curve Description: Barrier Force A8
 Maximum Value: 2063.9 at 86.1 Milliseconds
 Minimum Value: -429.5 at 4.5 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-105

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:

Barrier Force A9

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Maximum Value: 777.0 at 30.6 Milliseconds

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

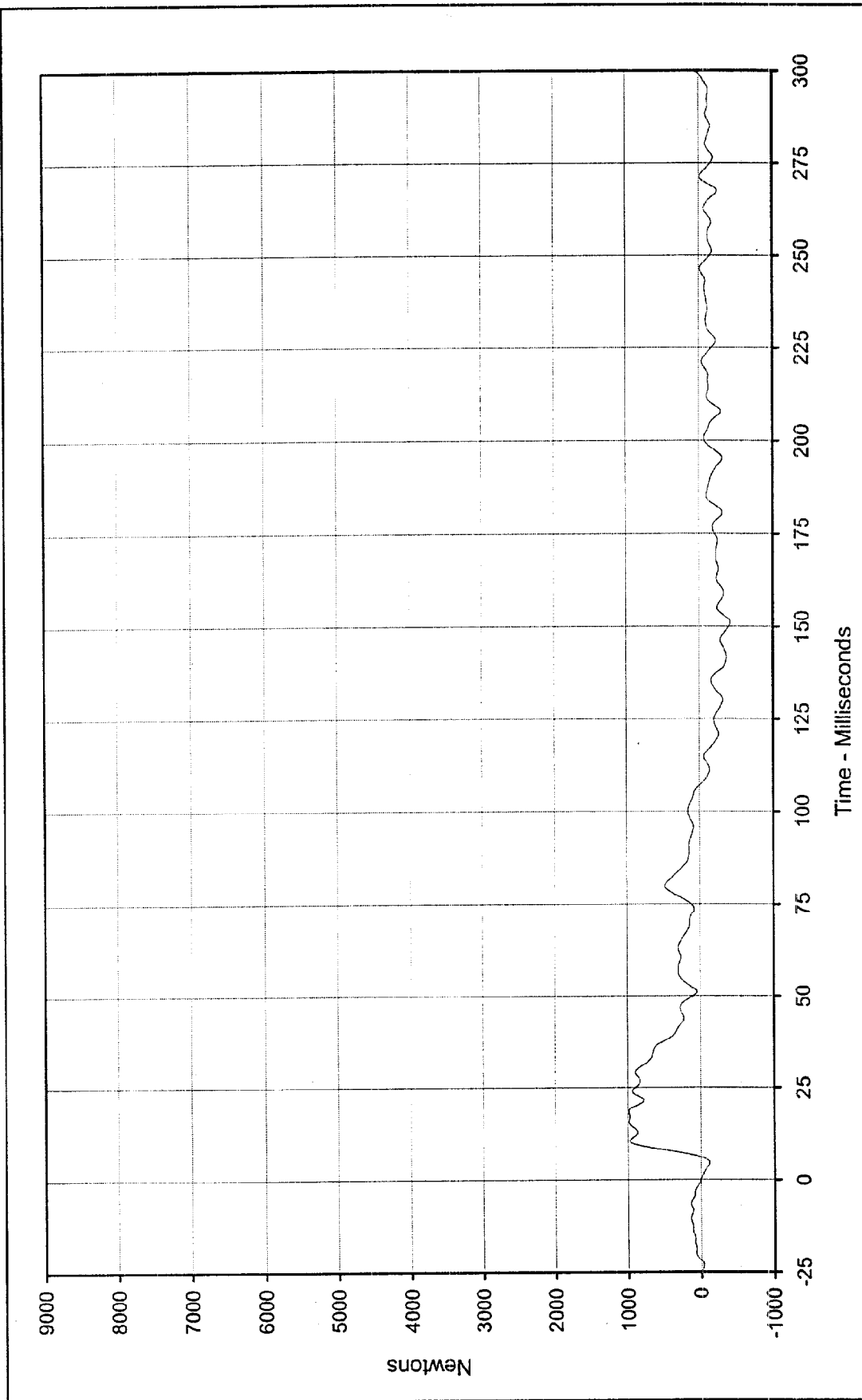
Minimum Value: -1213.1 at 26.9 Milliseconds

SAE Filter Class: 60

Date of Test: 11/20/98

Curve Number: FIL-106

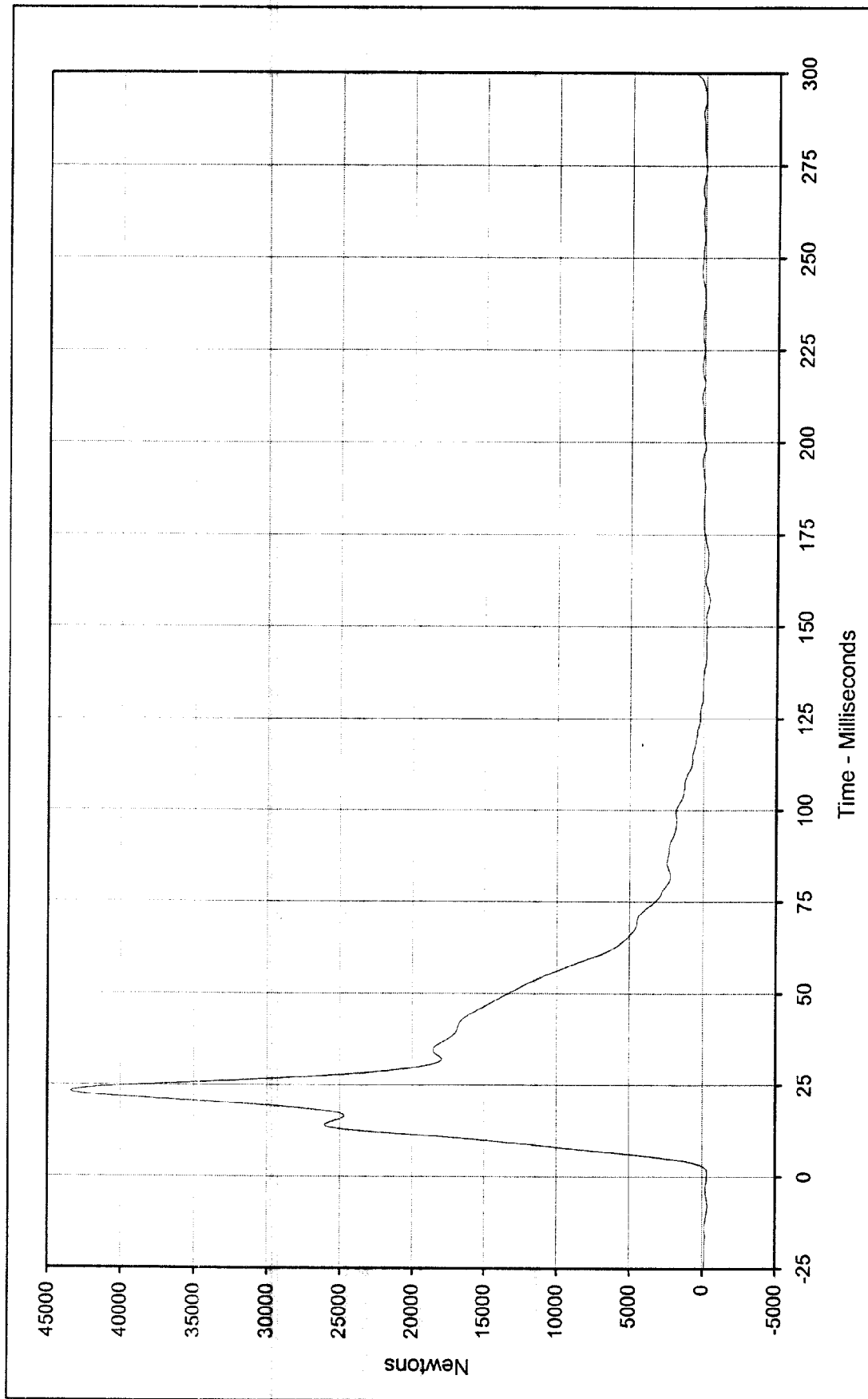




Curve Description: Barrier Force B2
 Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Maximum Value: 990.6 at 18.4 Milliseconds
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan
 Minimum Value: -425.6 at 151.0 Milliseconds



SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-108



Curve Description: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Program:

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

Test Program:

Barrier Force B3

Maximum Value: 43377.6 at 23.2 Milliseconds

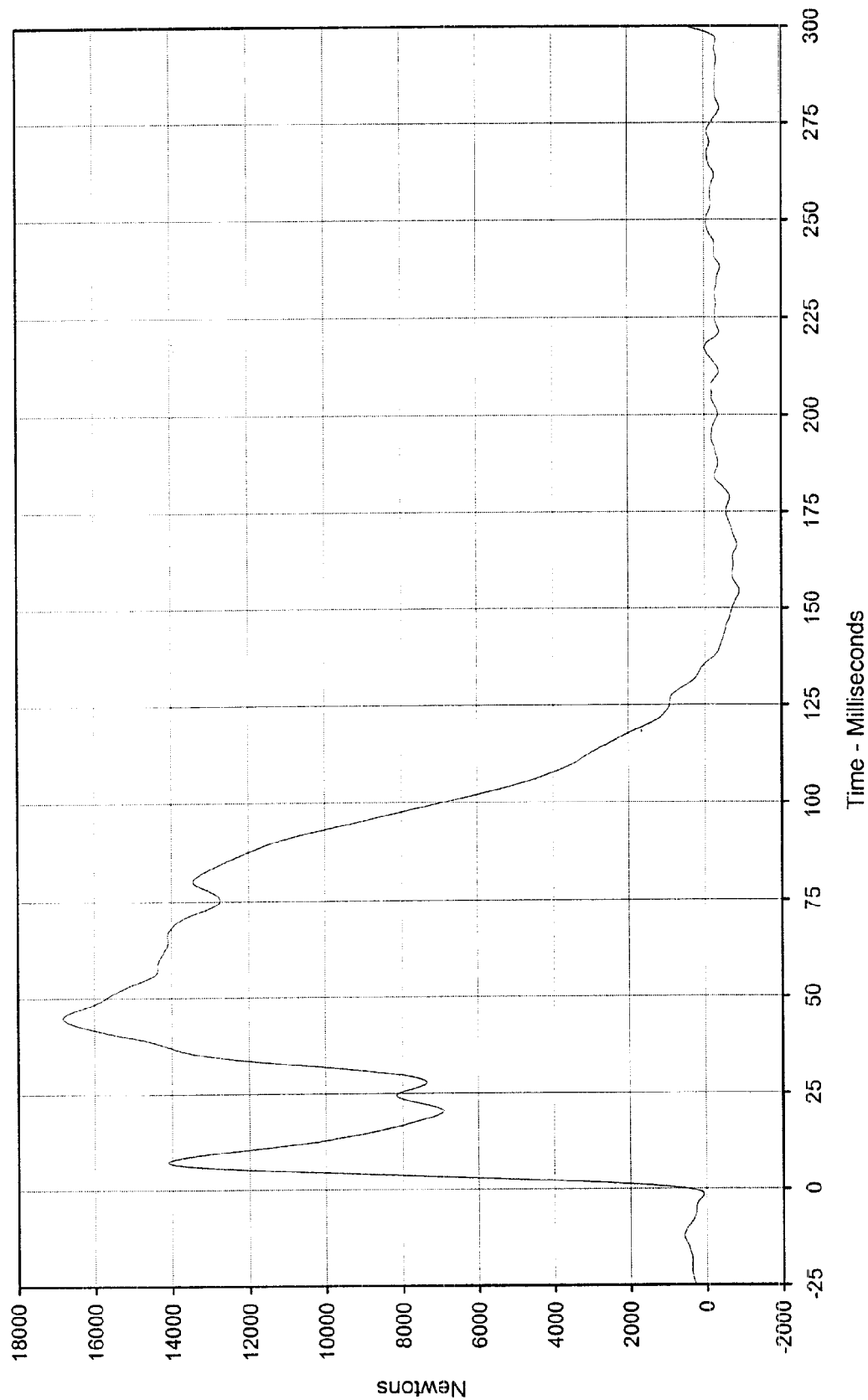
Minimum Value: -384.2 at 157.3 Milliseconds

SAE Filter Class: 60

Date of Test: 11/20/98

Curve Number: FIL-109

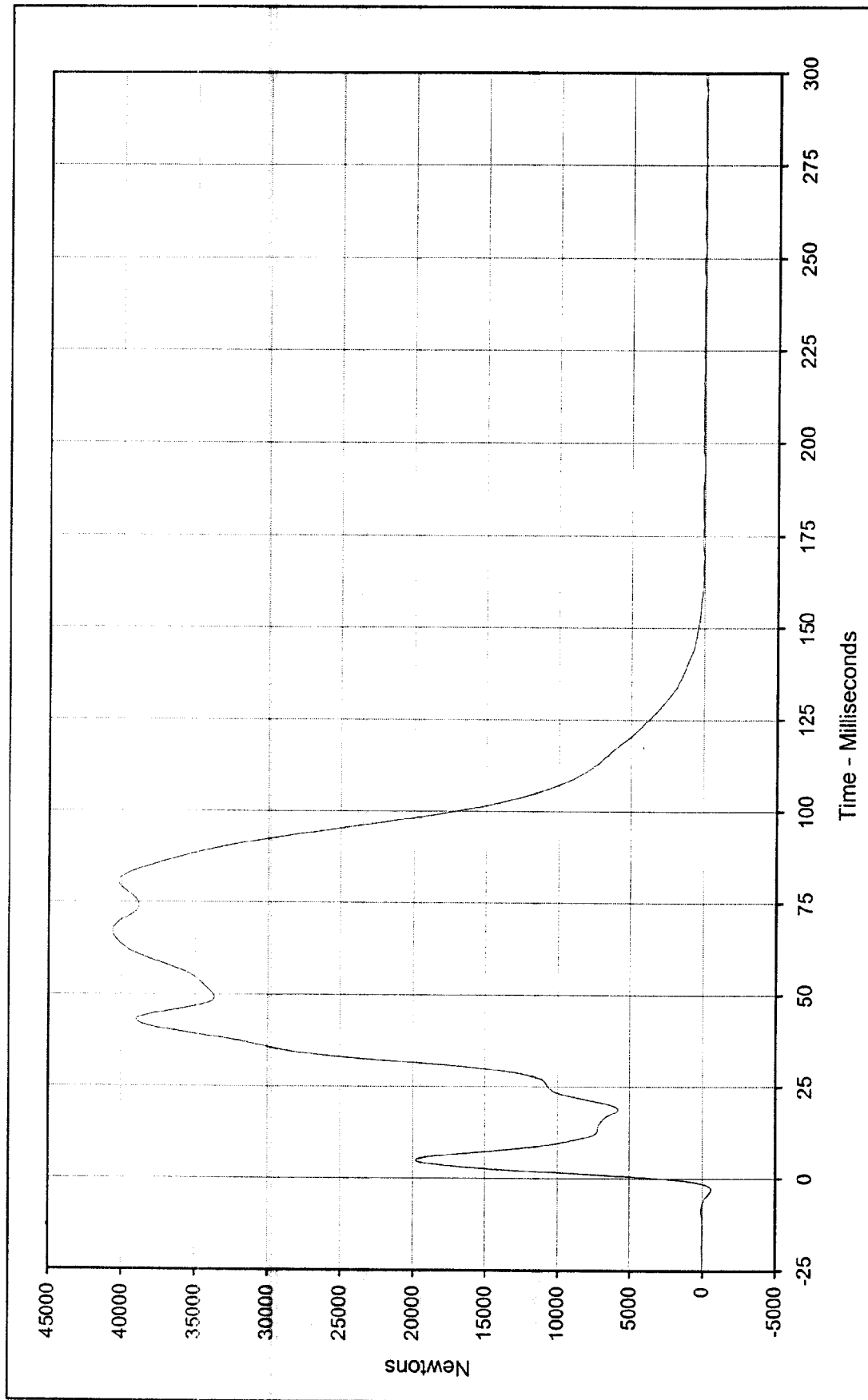




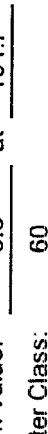
Curve Description: Barrier Force B4
 Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

Maximum Value: 16829.9 at 44.6 Milliseconds
 Minimum Value: -915.3 at 154.7 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-110



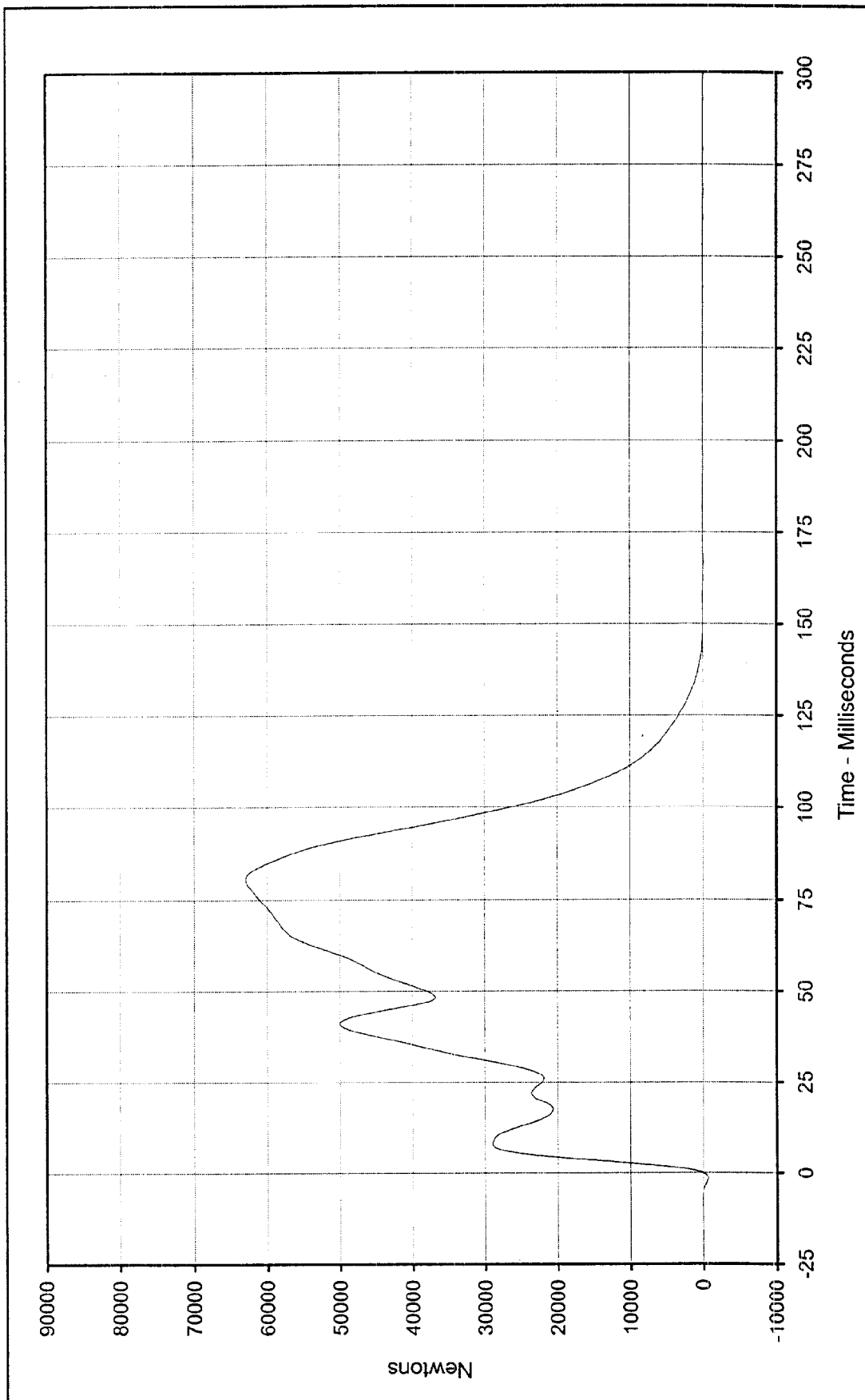


Curve Description:	Barrier Force B5		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	40602.8	at 66.9	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-8.3	at 194.7			
SAE Filter Class:	60				
Date of Test:	11/20/98				
Curve Number:	FIL-111				



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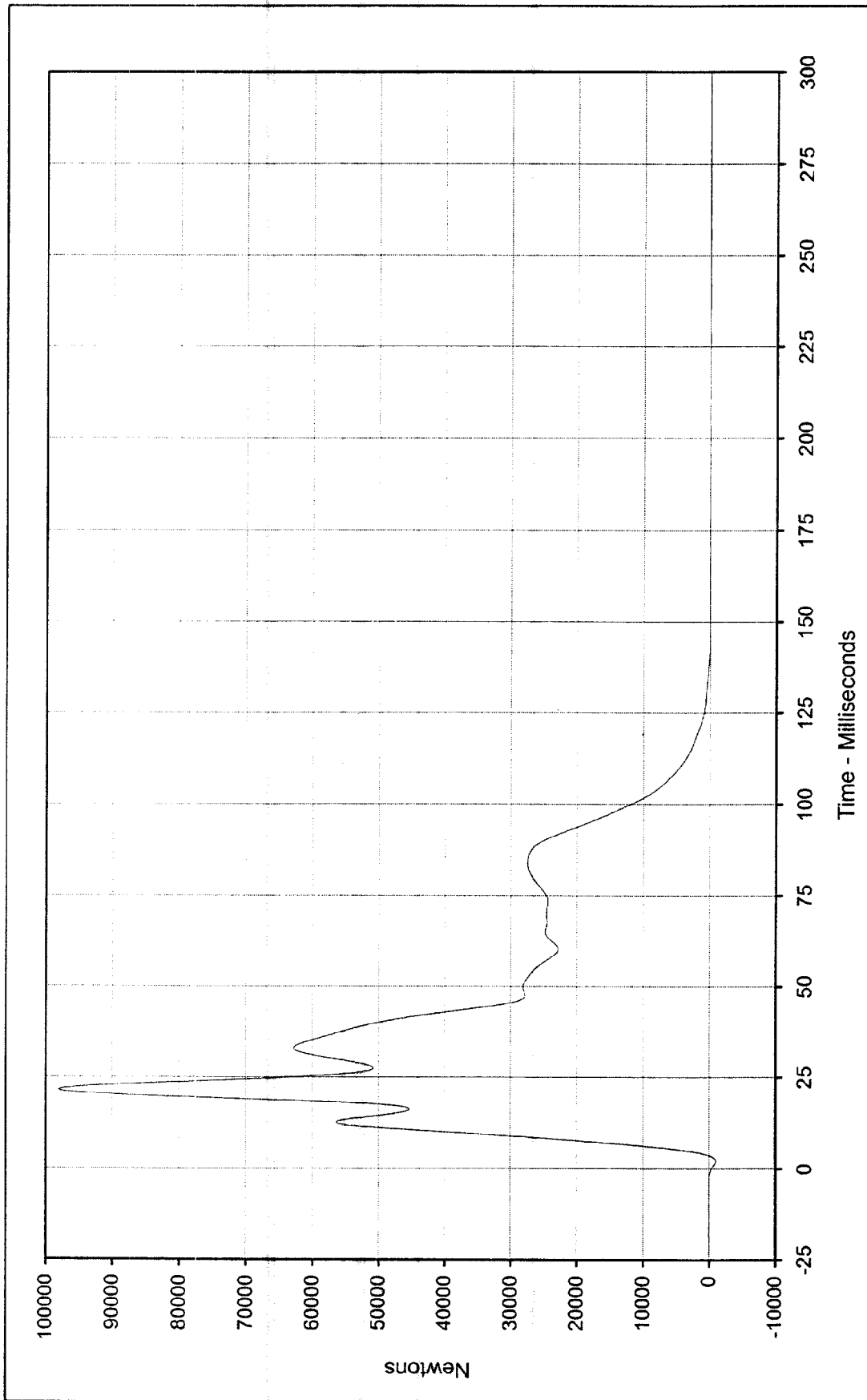




Curve Description: Barrier Force B6
 Maximum Value: 62960.7 at 80.6 Milliseconds
 Minimum Value: -131.5 at 299.9 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-112

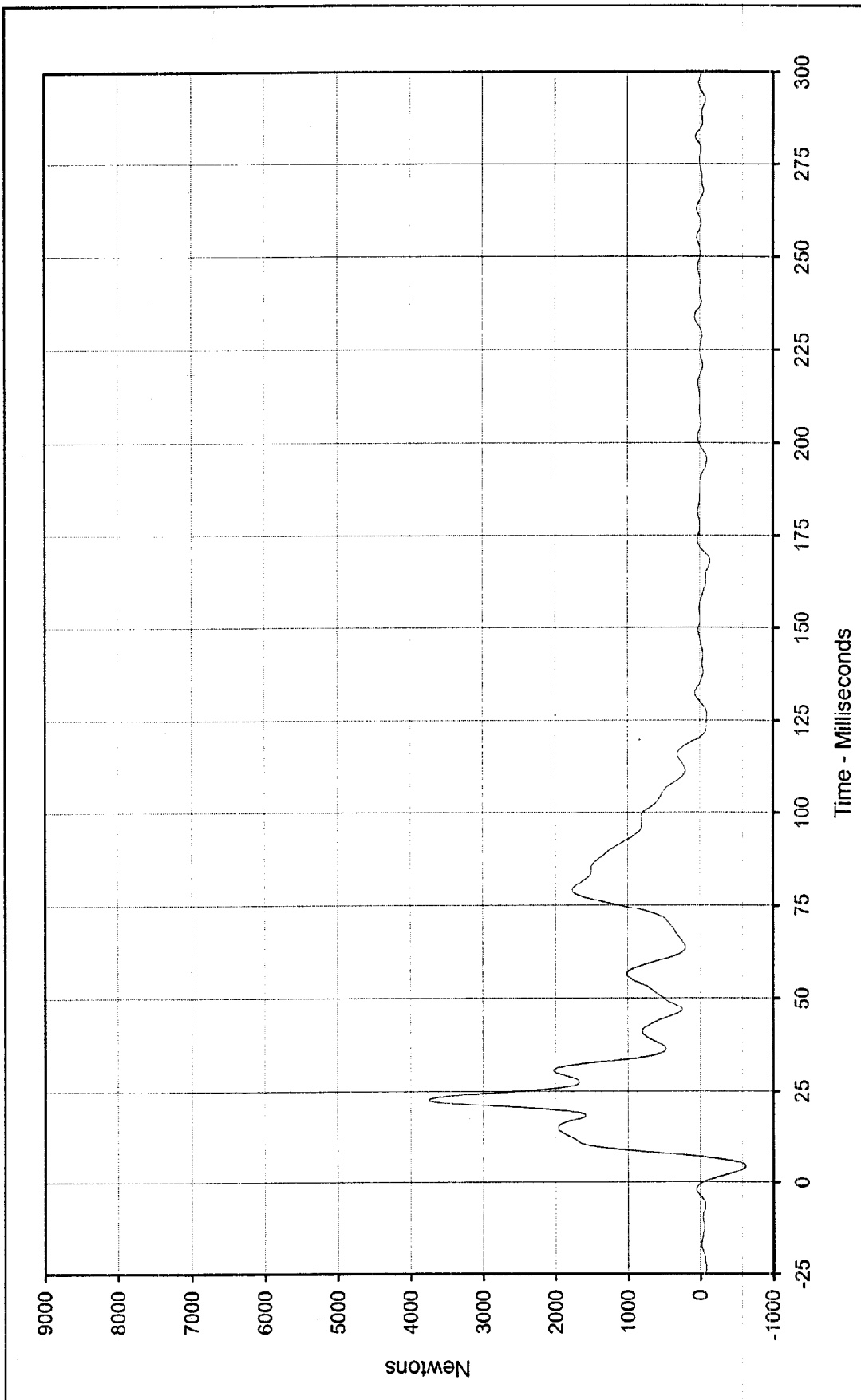
Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:	Barrier Force B7	Test Program:	1999 NHTSA 35 mph NCAP No.: MX0111
Maximum Value:	98004.2 at 21.6 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-1048.2 at 2.1 Milliseconds		
SAE Filter Class:	60		
Date of Test:	11/20/98		
Curve Number:	FIL-113		

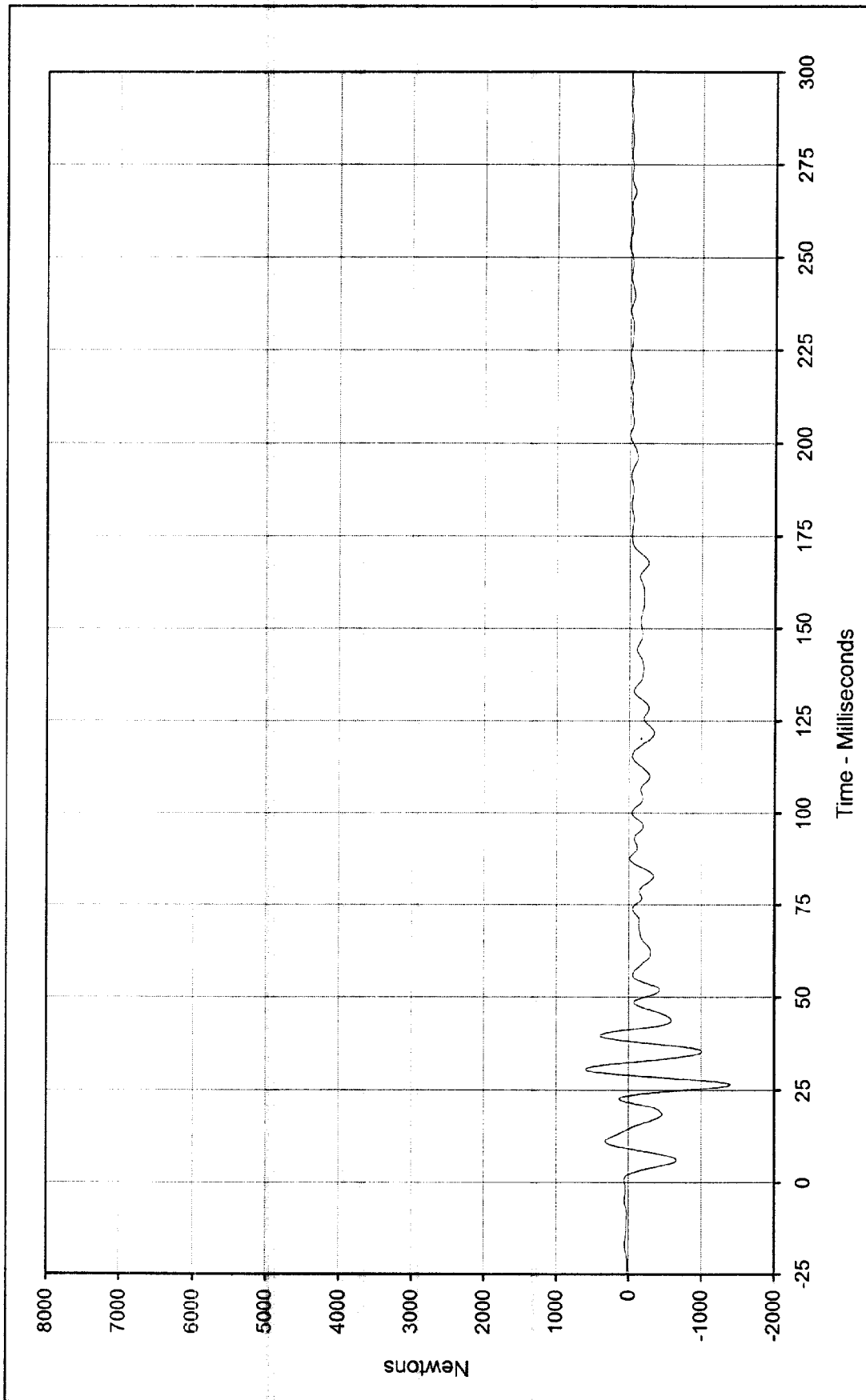




Curve Description:	Barrier Force B8	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	3753.0 at 22.7 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-627.0 at 4.5 Milliseconds			



SAE Filter Class:	60
Date of Test:	11/20/98
Curve Number:	FIL-114

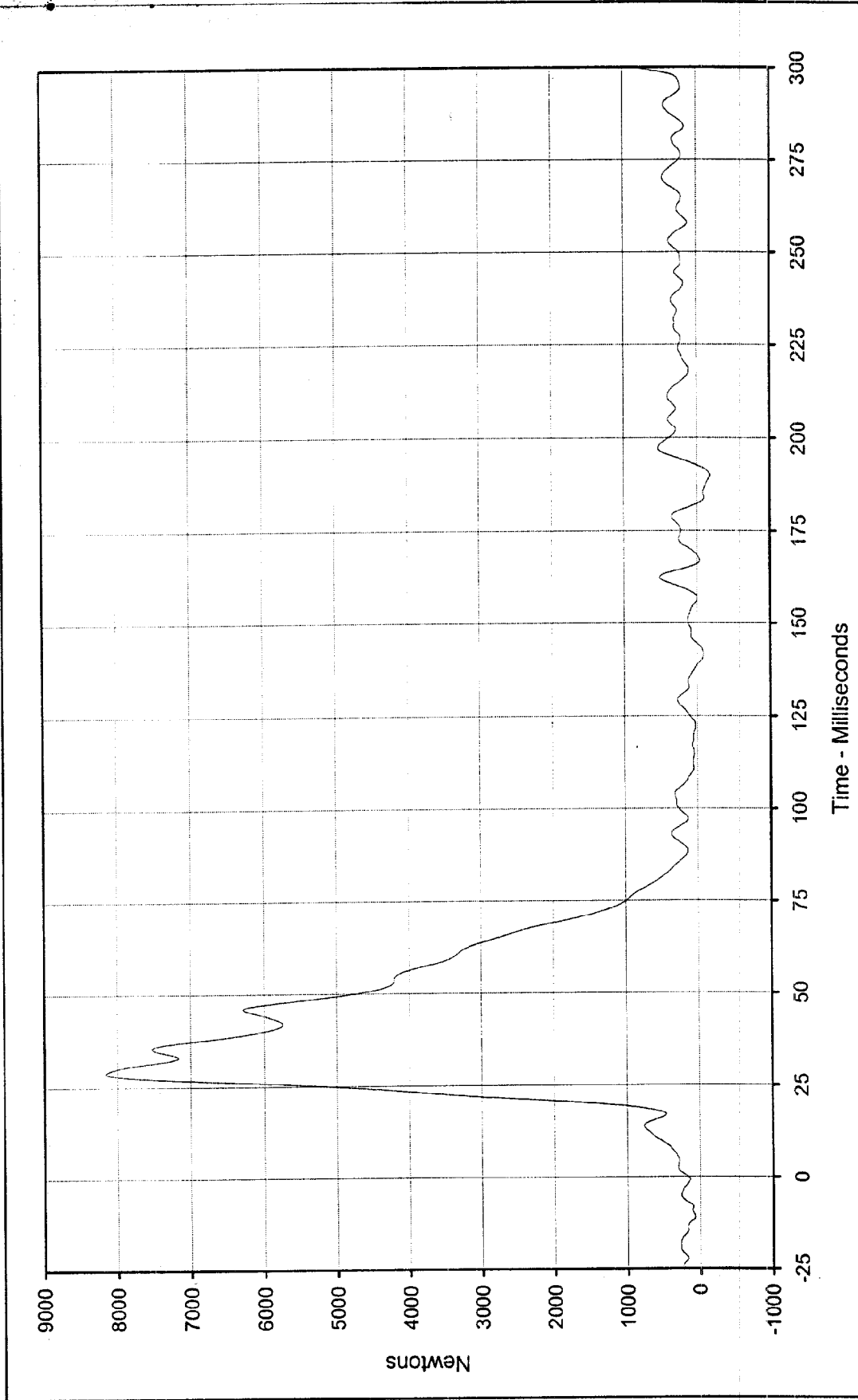


Curve Description:		Barrier Force B9		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	592.1	at	30.6	Milliseconds	Test Vehicle: 1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-1407.2	at	26.6	Milliseconds		
SAE Filter Class:	60					
Date of Test:	11/20/98					
Curve Number:	FIL-115					



KARCO
Engineering

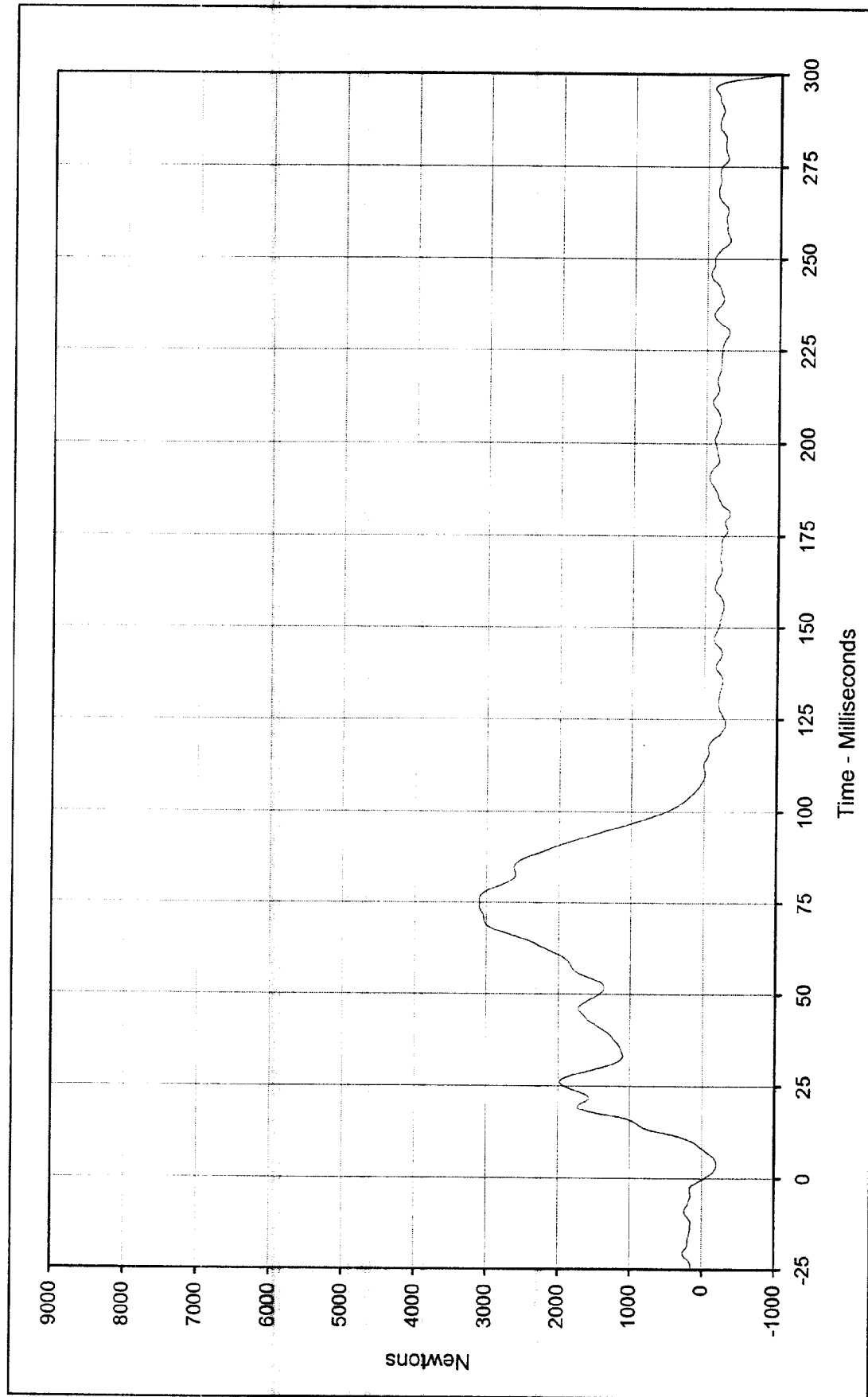




Curve Description:	Barrier Force C2	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	8162.1 at 28.8 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-184.8 at 190.0 Milliseconds			



SAE Filter Class:	60
Date of Test:	11/20/98
Curve Number:	FIL-117



Curve Description:

Barrier Force C3

Maximum Value:

3094.8

at

73.8

Milliseconds

Minimum Value:

-1041.2

at

299.9

Milliseconds

SAE Filter Class:

60

Date of Test:

11/20/98

Curve Number:

FIL-118

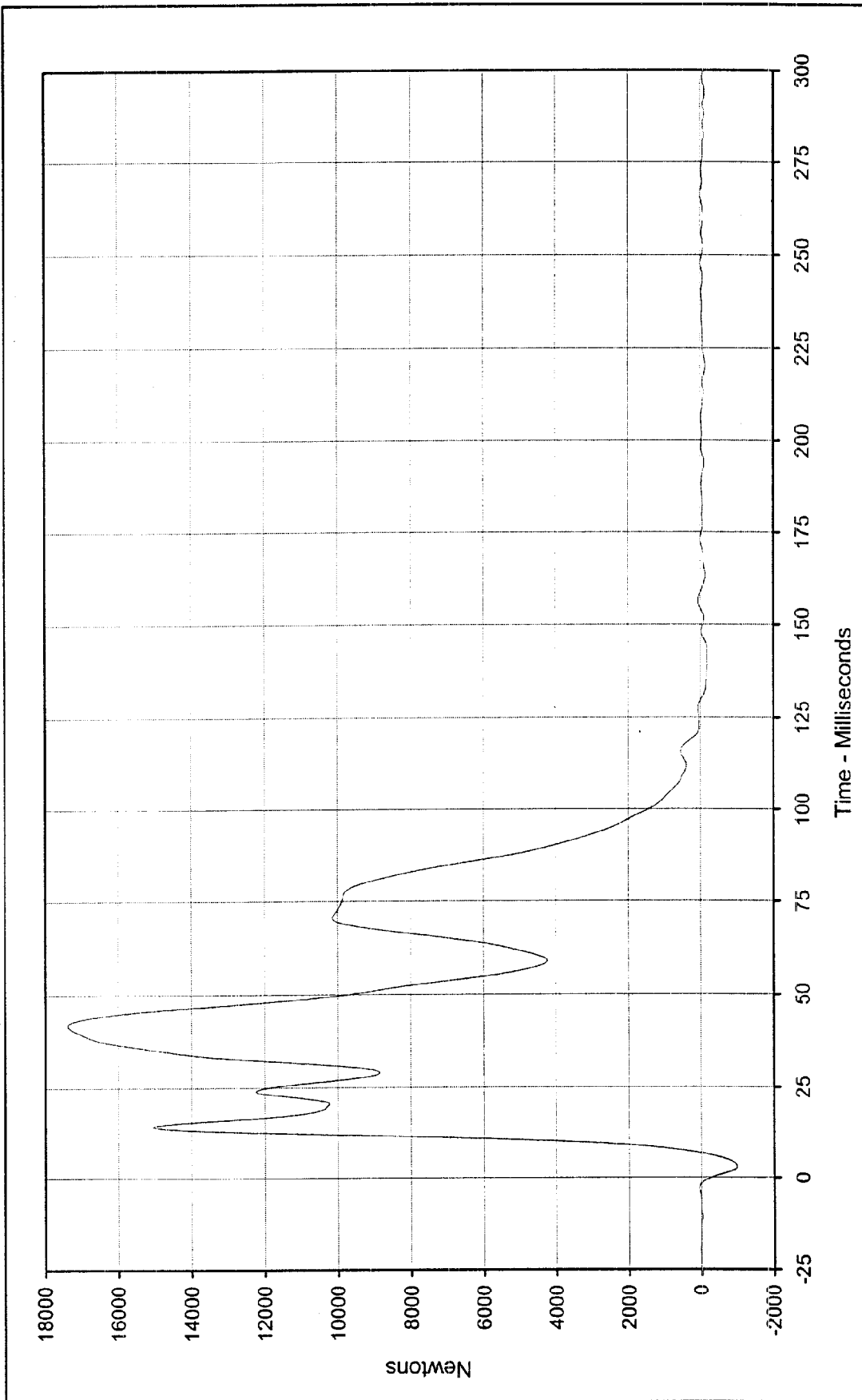
Test Program:

1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle:

1999 Saturn SL1 4 Door Sedan

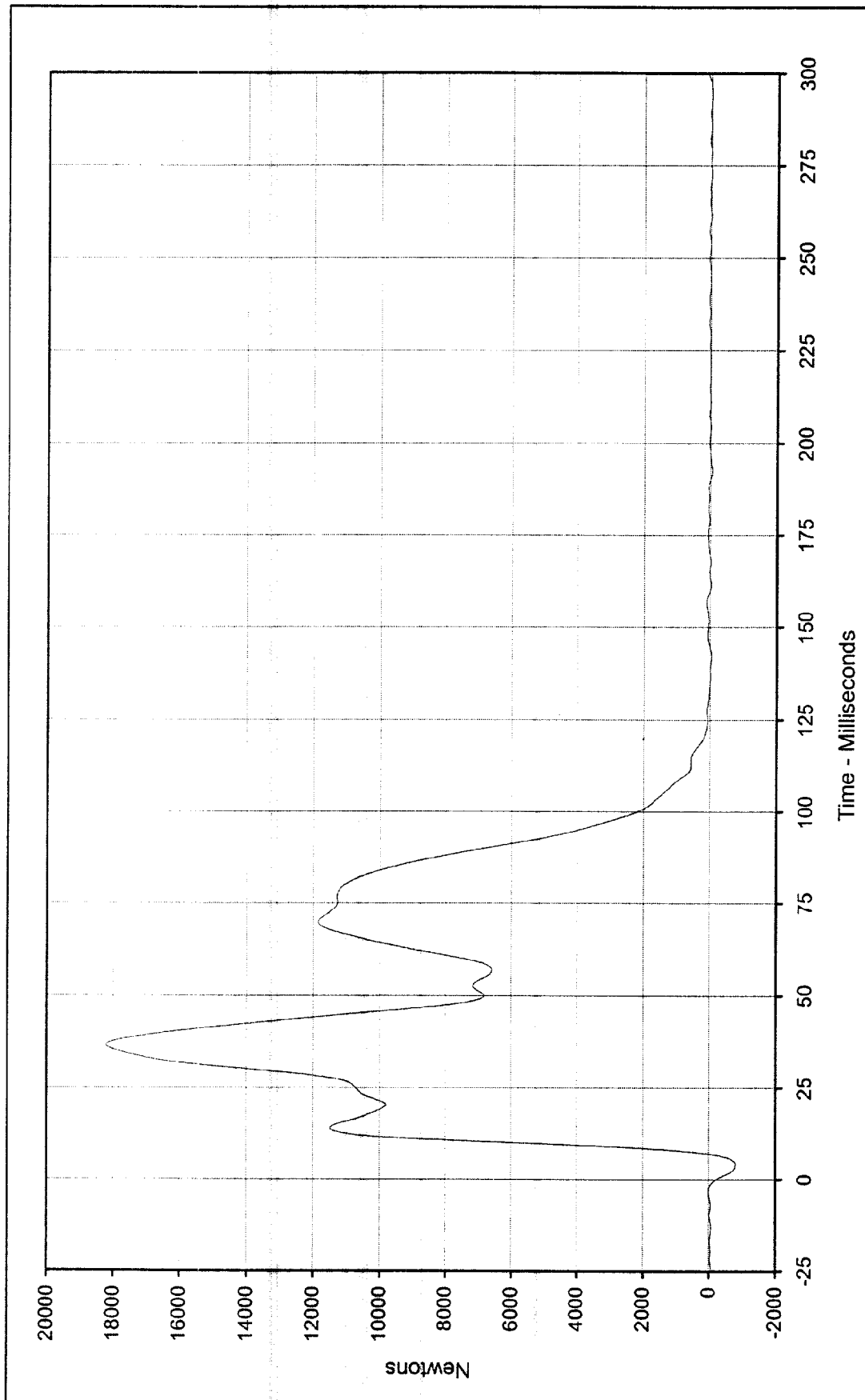




Curve Description: Barrier Force C4
 Maximum Value: 17386.8 at 41.7 Milliseconds
 Minimum Value: -993.4 at 2.9 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-119

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:

Barrier Force C5

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Maximum Value: 18211.9 at 36.6 Milliseconds

Test Vehicle: 1999 Saturn SL1 4 Door Sedan

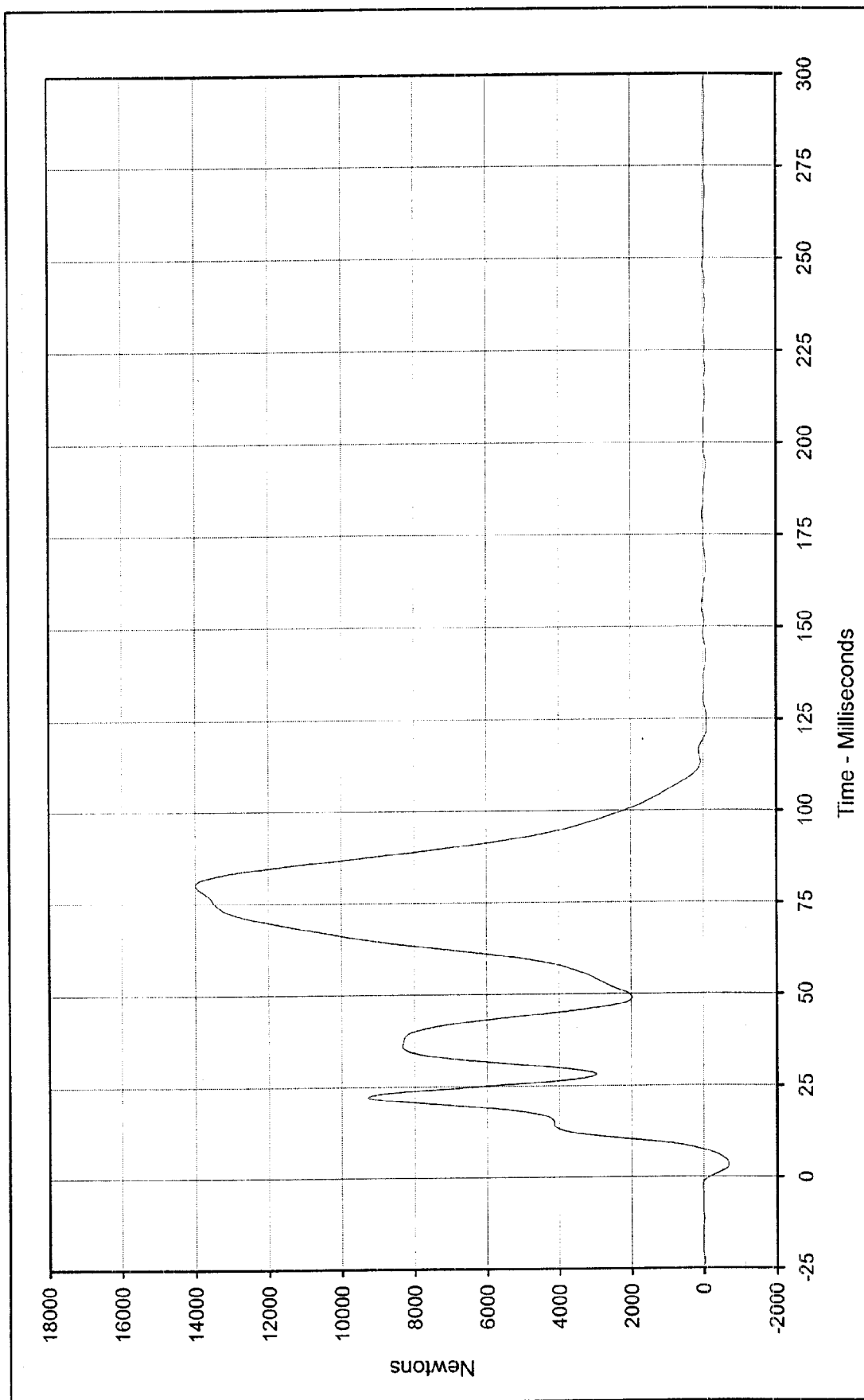
Minimum Value: -816.8 at 4.2 Milliseconds

SAE Filter Class: 60



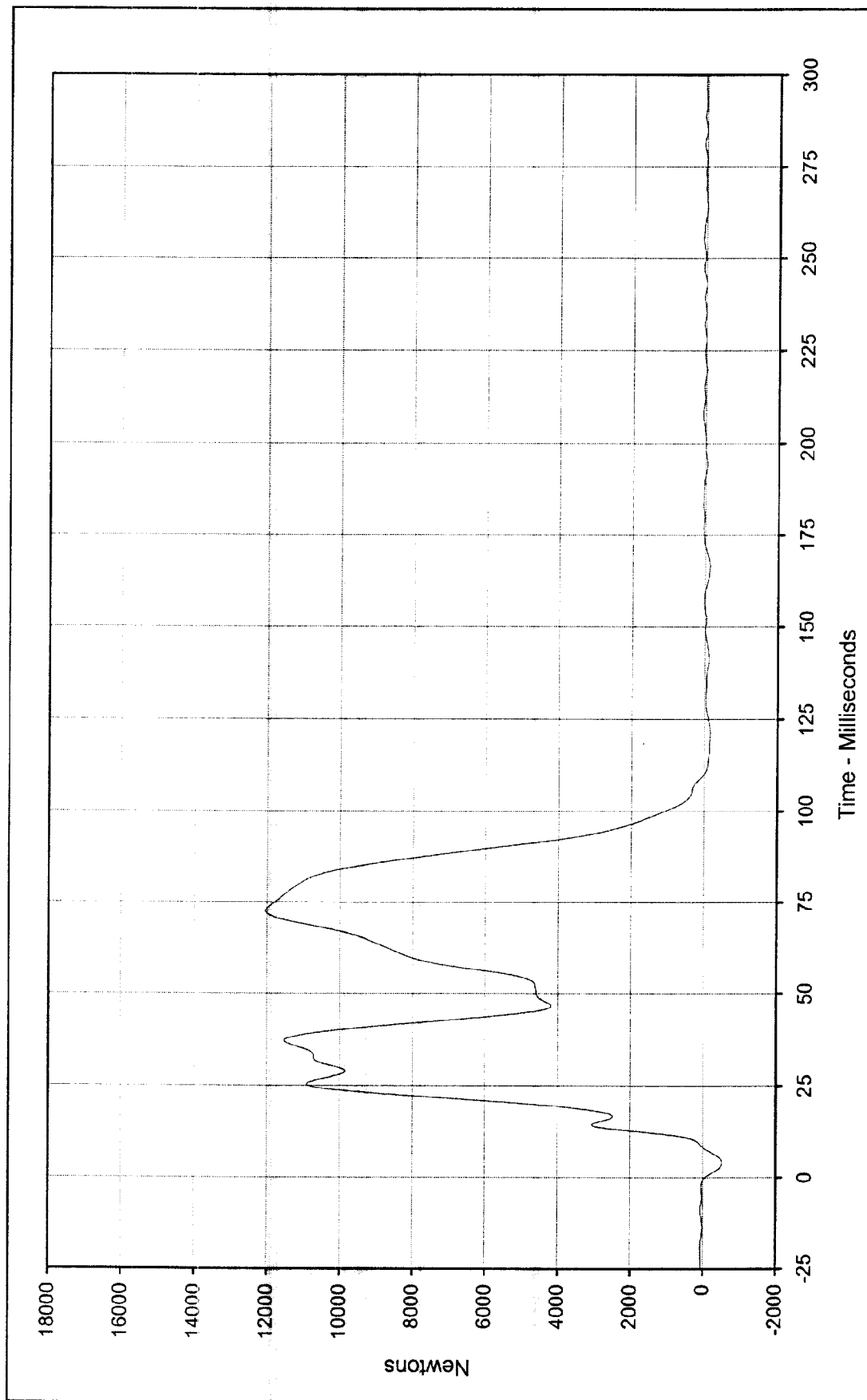
Date of Test: 11/20/98

Curve Number: FIL-120



Curve Description:	Barrier Force C6	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	13995.4 at 80.1 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-691.2 at 3.2 Milliseconds			
SAE Filter Class:	60			
Date of Test:	11/20/98			
Curve Number:	FIL-121			

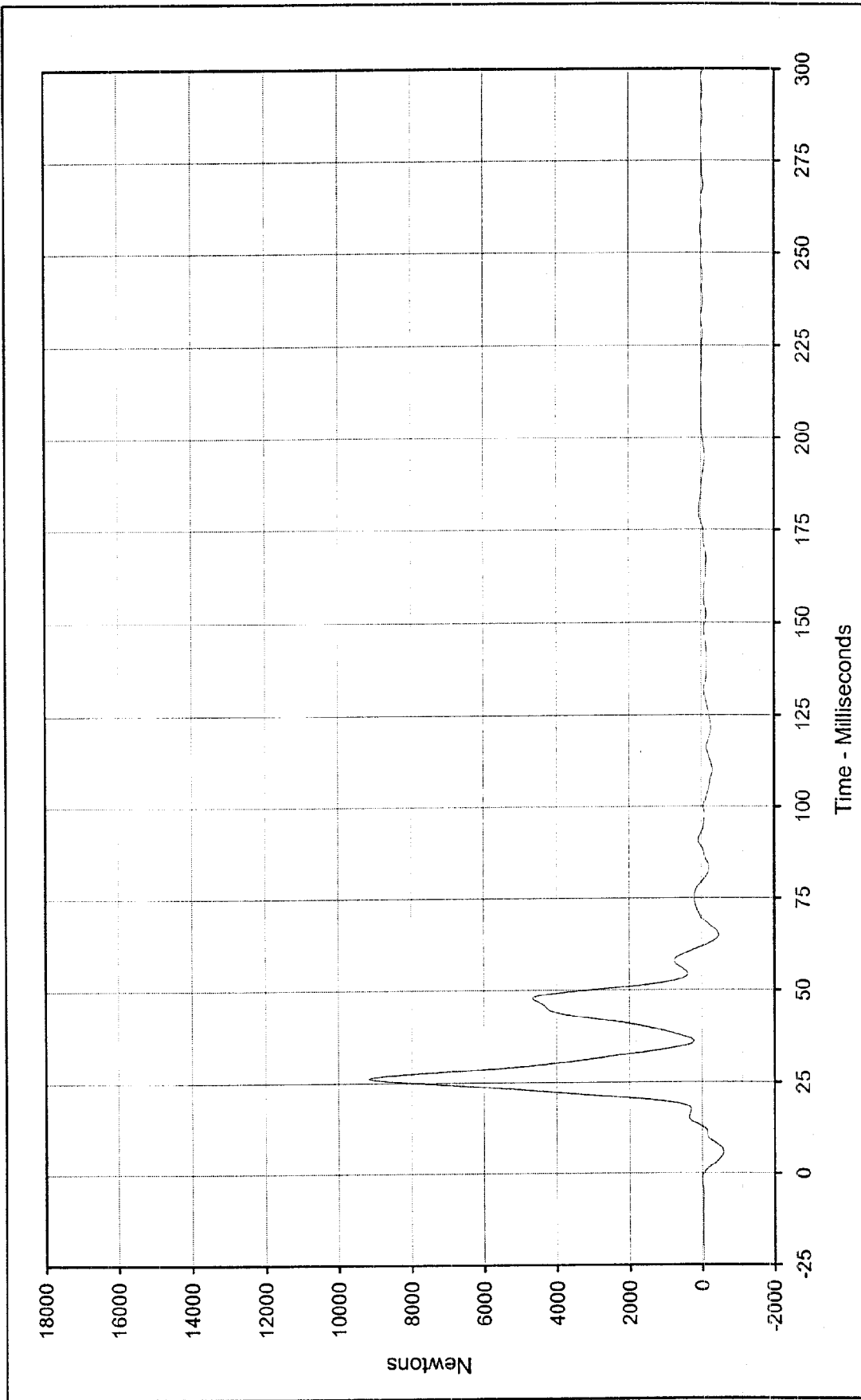




Curve Description: Barrier Force C7
 Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan

Maximum Value: 12043.9 at 72.5 Milliseconds
 Minimum Value: -544.2 at 4.1 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-122

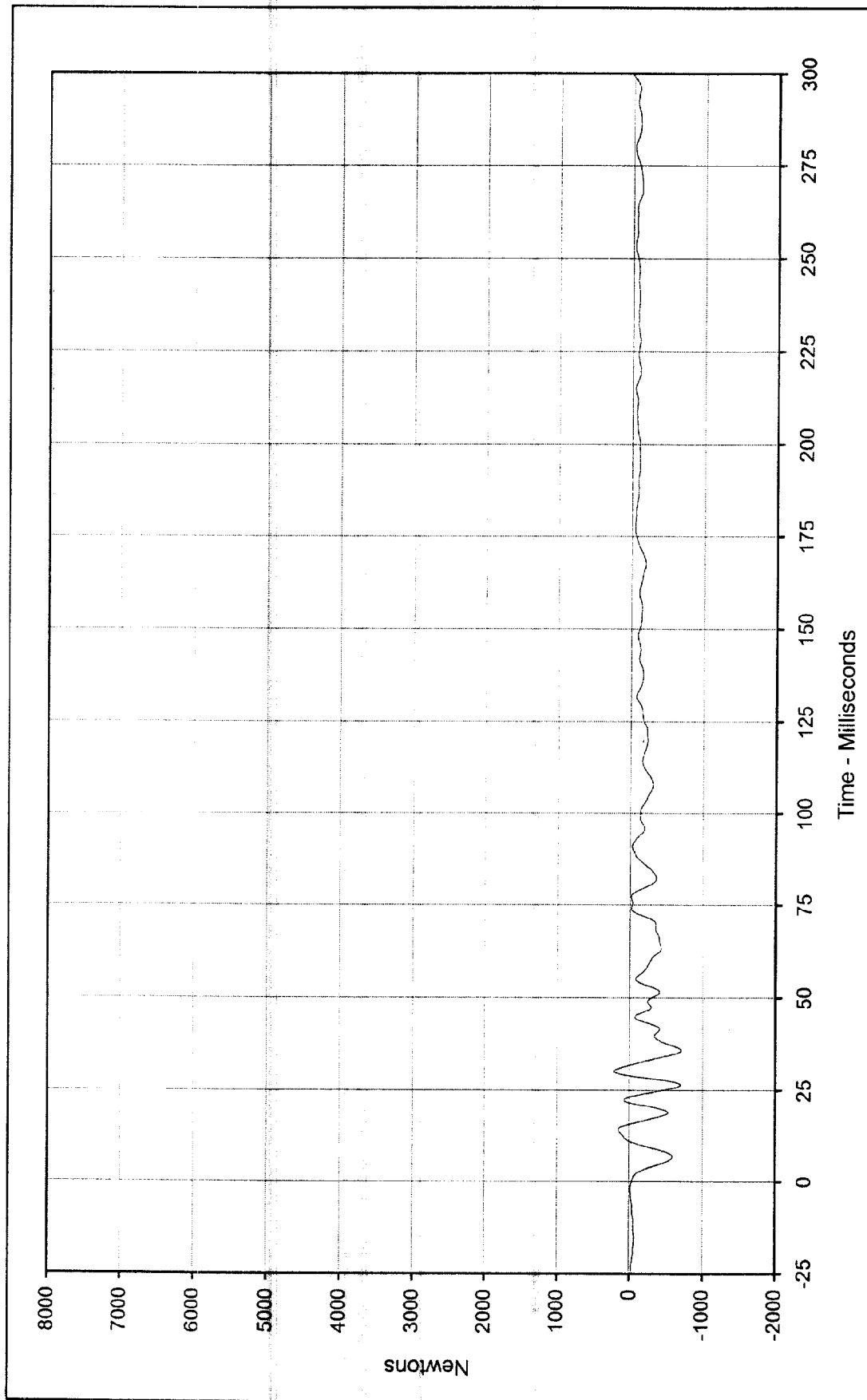




Curve Description: Barrier Force C8
 Maximum Value: 9185.1 at 26.2 Milliseconds
 Minimum Value: -589.7 at 5.8 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: FIL-123

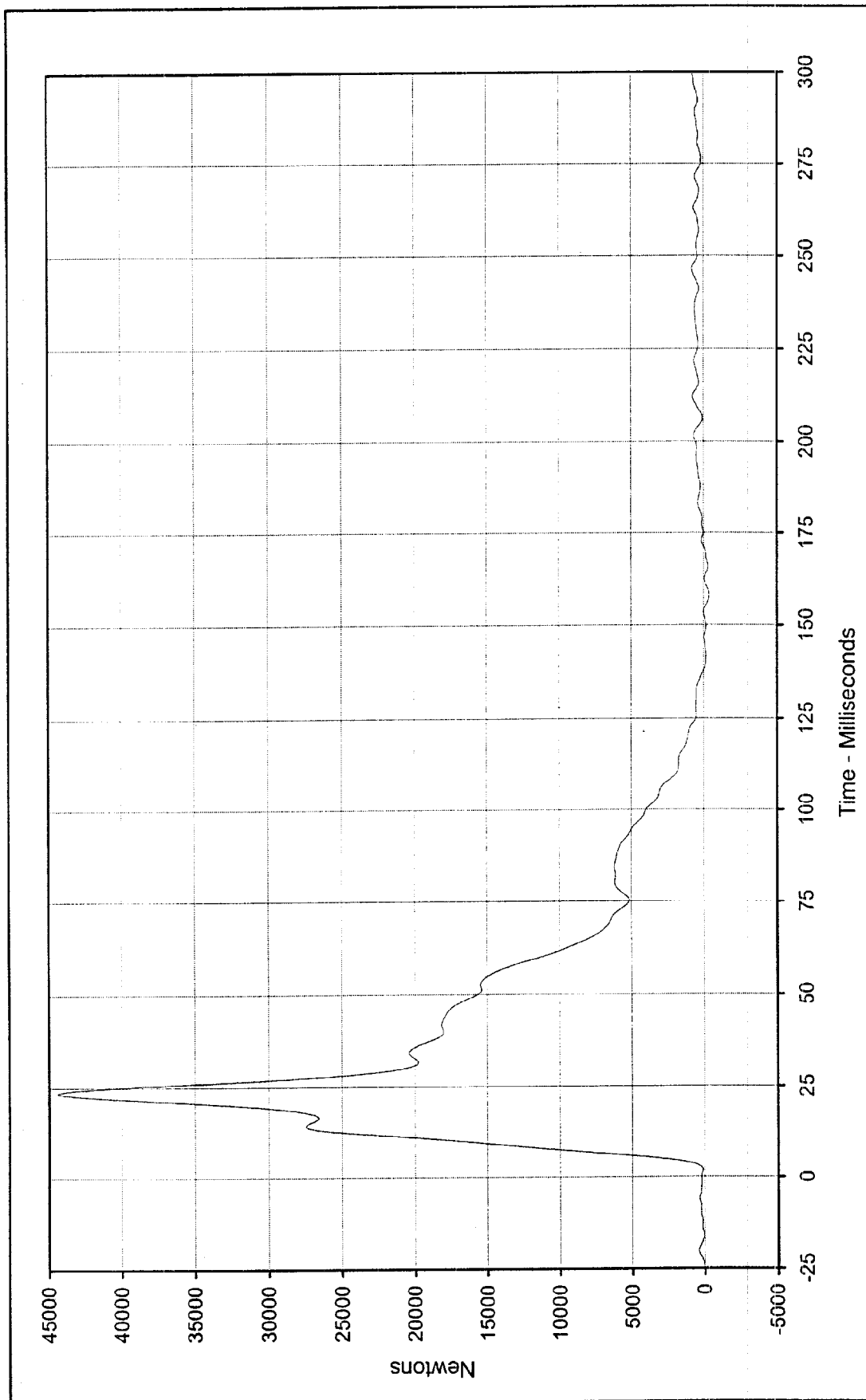
Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:		Barrier Force C9		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	213.0	at	30.2	Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan
Minimum Value:	-711.7	at	35.8	Milliseconds		
SAE Filter Class:	60					
Date of Test:	11/20/98					
Curve Number:	FIL-124					

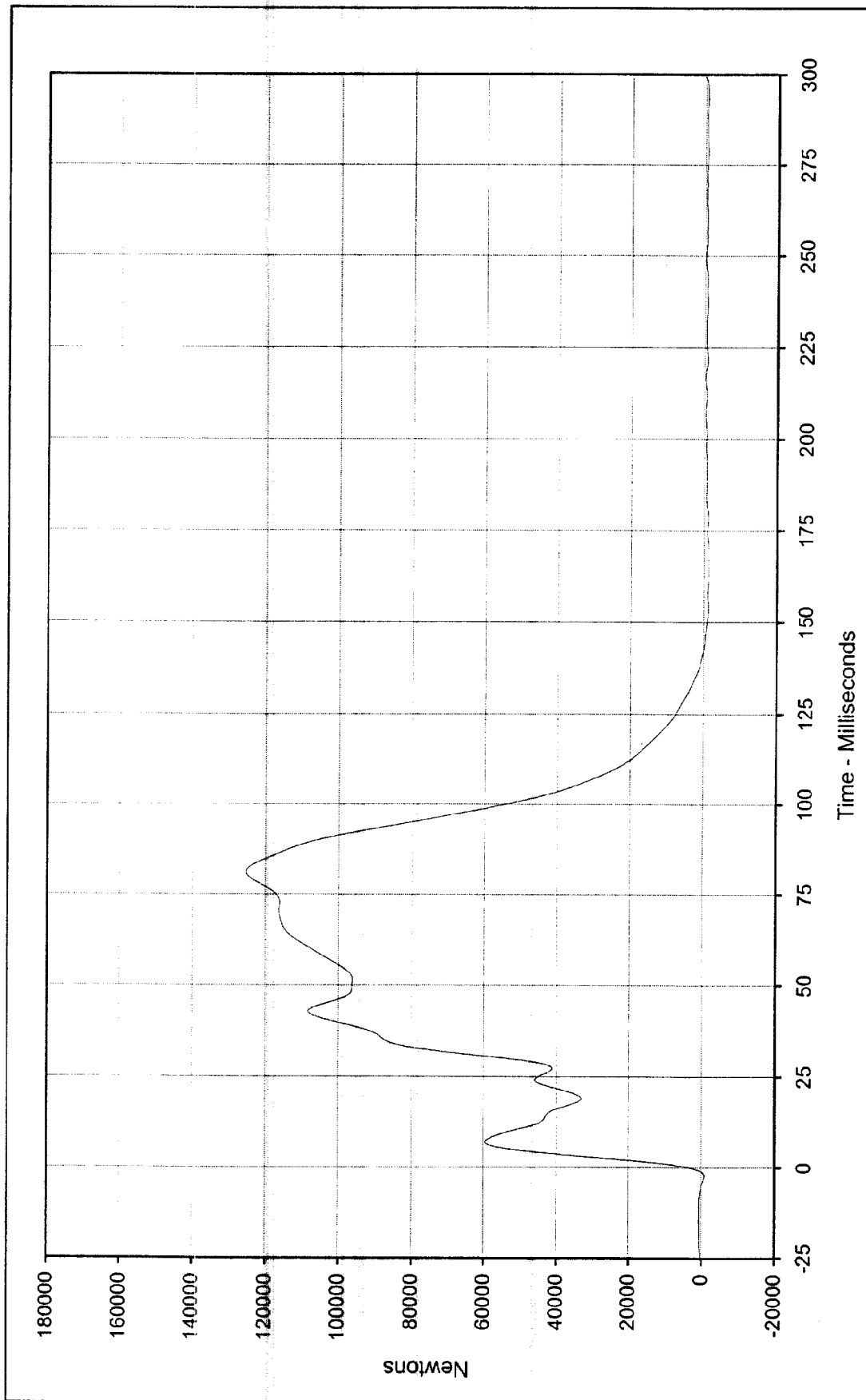




Curve Description: Barrier Force Sum No.1
 Maximum Value: 44422.6 at 23.4 Milliseconds
 Minimum Value: -404.6 at 158.4 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: SUM-001

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description:

Barrier Force Sum No.2

Maximum Value: 125253.1 at 81.0 Milliseconds

Minimum Value: -1460.0 at 165.7 Milliseconds

SAE Filter Class: 60

Date of Test: 11/20/98

Curve Number: SUM-002

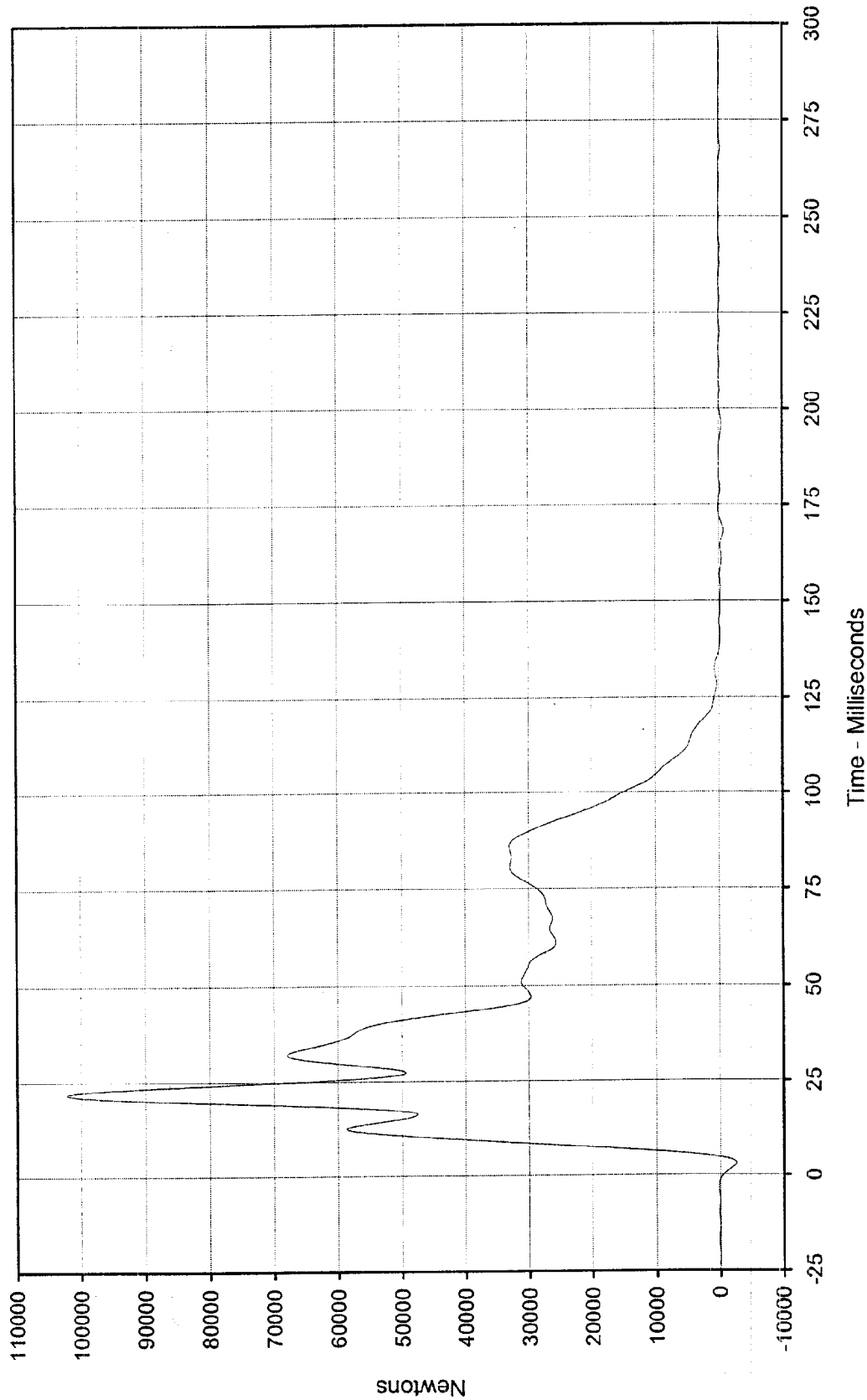
Test Program:

1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle:

1999 Saturn SL1 4 Door Sedan

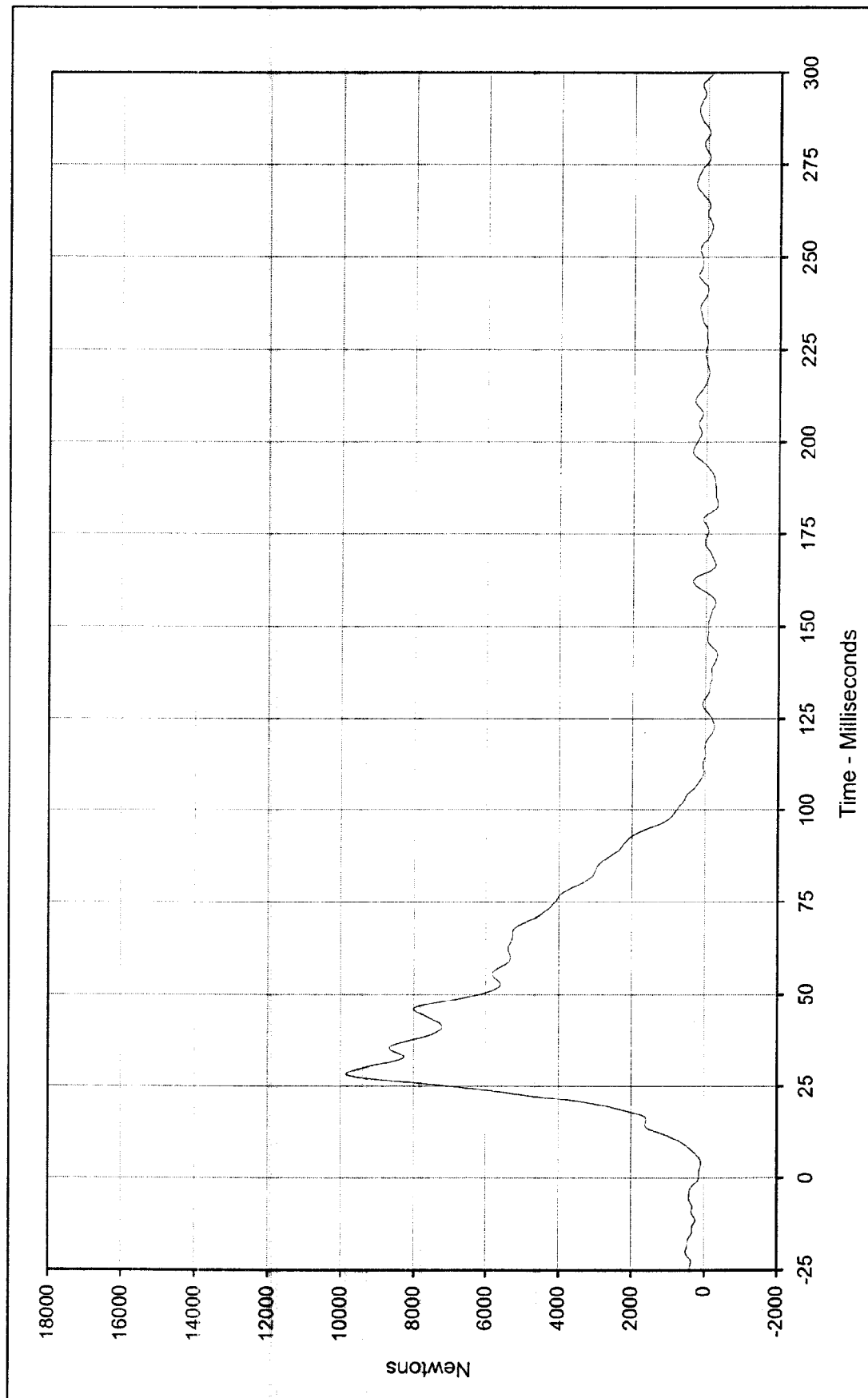




Curve Description:	Barrier Force Sum No.3		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	102201.7	at 21.8	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-2606.7	at 3.0			
SAE Filter Class:	60				
Date of Test:	11/20/98				
Curve Number:	SUM-003				



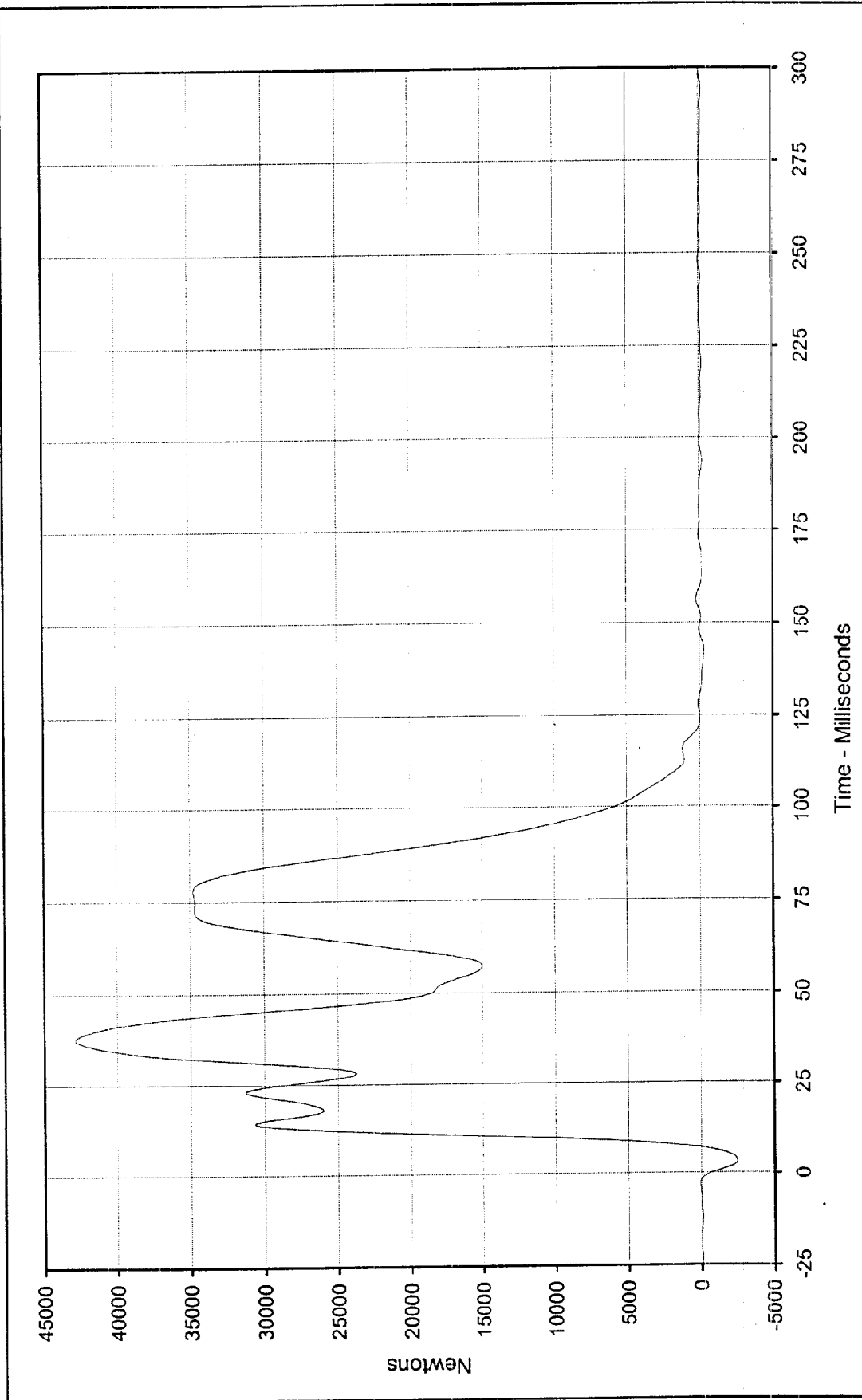




Curve Description:	Barrier Force Sum No.4		Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	9856.2	at 28.4	Milliseconds		
Minimum Value:	-320.7	at 183.1	Milliseconds		
SAE Filter Class:	60		Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Date of Test:	11/20/98				
Curve Number:	SUM-004				



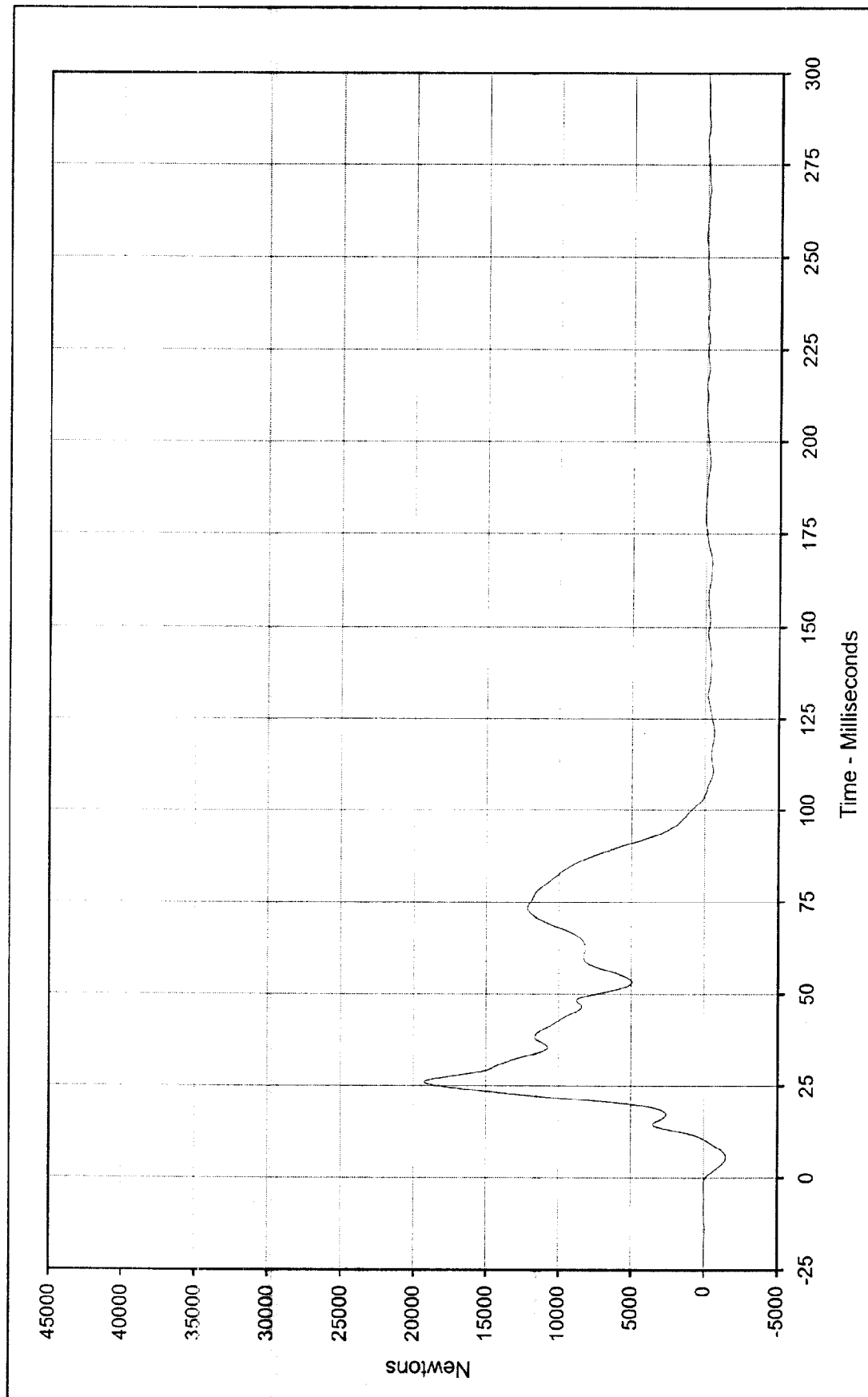




Curve Description:	Barrier Force Sum No.5	Test Program:	1999 NHTSA 35 mph NCAP	No.: MX0111
Maximum Value:	42848.1 at 37.5 Milliseconds	Test Vehicle:	1999 Saturn SL1 4 Door Sedan	
Minimum Value:	-2470.8 at 3.1 Milliseconds			



SAE Filter Class:	60
Date of Test:	11/20/98
Curve Number:	SUM-005



Curve Description: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Program: 1999 Saturn SL1 4 Door Sedan

Barrier Force Sum No.6

Maximum Value: 19255.3 at 26.0 Milliseconds

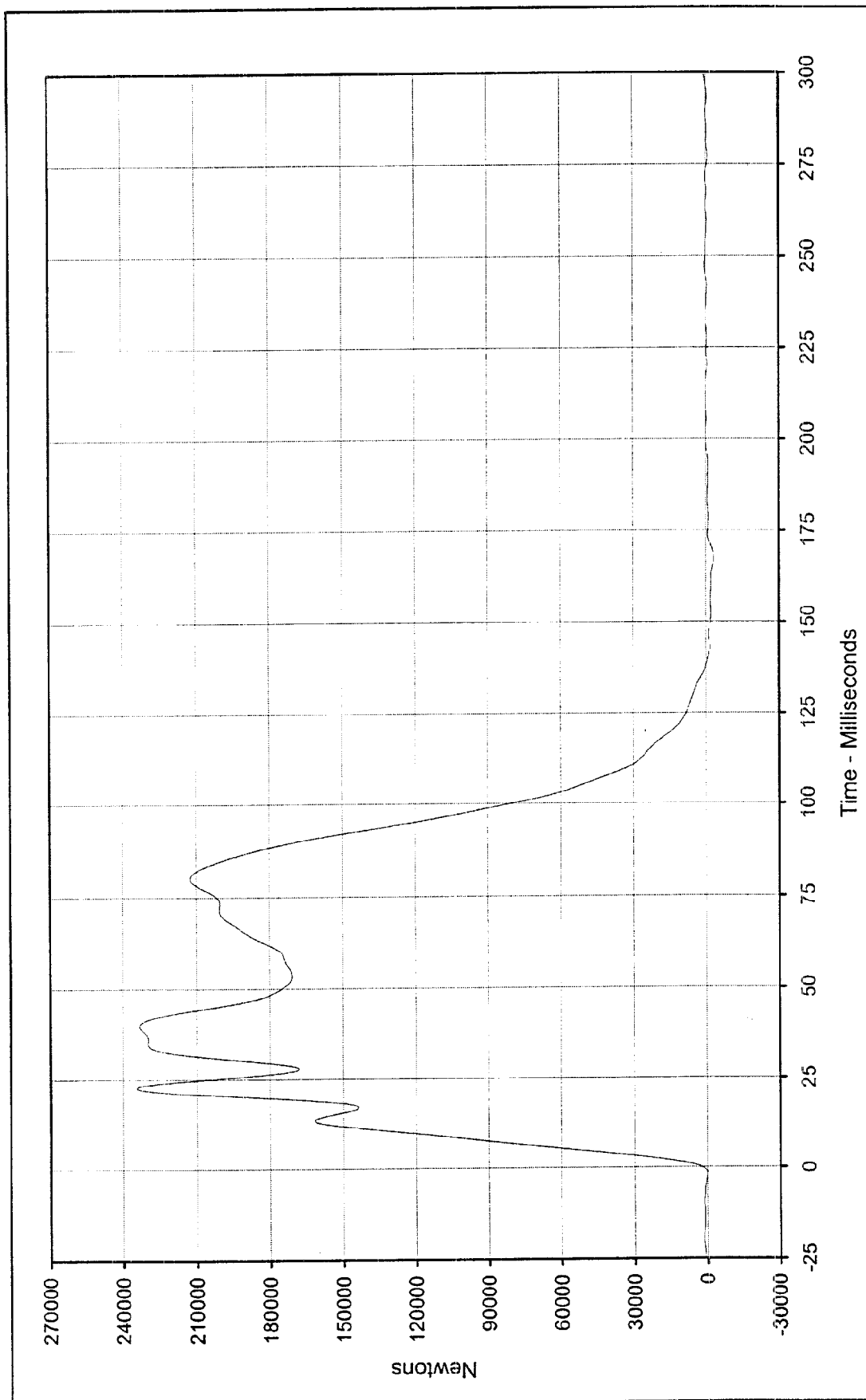
Minimum Value: -1534.3 at 5.5 Milliseconds

SAE Filter Class: 60

Date of Test: 11/20/98

Curve Number: SUM-006

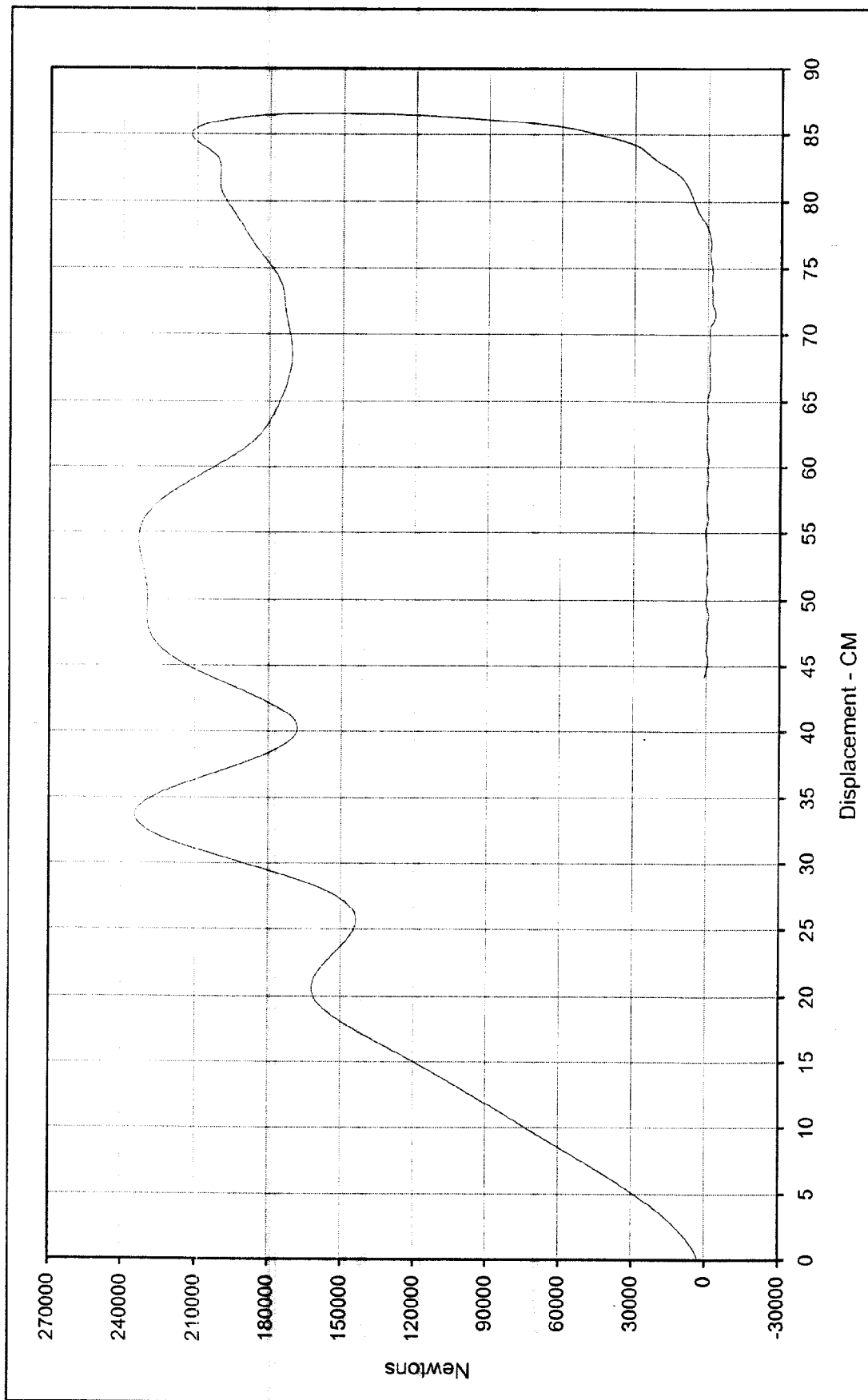




Curve Description: Barrier Force Sum Total
 Maximum Value: 234555.6 at 22.8 Milliseconds
 Minimum Value: -3252.9 at 167.2 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/20/98
 Curve Number: SUM-007

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111
 Test Vehicle: 1999 Saturn SL1 4 Door Sedan





Curve Description: Sum Force Total vs. Dynamic Crush

Maximum Displ.: 86.6 at 91.3 Milliseconds

Maximum Force: 234555.6 at 22.8 Milliseconds

SAE Filter Class: N/A

Date of Test: 11/20/98

Curve Number: XYY-001

Test Program: 1999 NHTSA 35 mph NCAP No.: MX0111

Test Vehicle: 1999 Saturn SL1 4 Door Sedan



BARRIER LOAD CELL SUMMARY DATA

TEST VEHICLE: 1999 SATURN SL1 4 DOOR SEDAN

NHTSA No.: MX0111

TEST PROGRAM: 1999 NHTSA 35 MPH NCAP

TEST DATE: 11/20/98

BARRIER LOAD CELL PEAK FORCES

Location	Units	Max	Time	Min	Time
Barrier Force A2	Newtons	893.8	89.6	-126.1	0.0
Barrier Force A3	Newtons	3528.4	57.3	-670.4	21.3
Barrier Force A4	Newtons	620.3	57.8	-730.0	20.2
Barrier Force A5	Newtons	9513.8	48.1	-916.8	3.0
Barrier Force A6	Newtons	5045.8	33.1	-1381.4	19.4
Barrier Force A7	Newtons	2547.4	81.1	-1219.3	19.4
Barrier Force A8	Newtons	2063.9	86.1	-429.5	4.5
Barrier Force A9	Newtons	777.0	30.6	-1213.1	26.9
Barrier Force B2	Newtons	990.6	18.4	-425.6	151.0
Barrier Force B3	Newtons	43377.6	23.2	-384.2	157.3
Barrier Force B4	Newtons	16829.9	44.6	-915.3	154.7
Barrier Force B5	Newtons	40602.8	66.9	-8.3	194.7
Barrier Force B6	Newtons	62960.7	80.6	-131.5	299.9
Barrier Force B7	Newtons	98004.2	21.6	-1048.2	2.1
Barrier Force B8	Newtons	3753.0	22.7	-627.0	4.5
Barrier Force B9	Newtons	592.1	30.6	-1407.2	26.6
Barrier Force C2	Newtons	8162.1	28.8	-184.8	190.0
Barrier Force C3	Newtons	3094.8	73.8	-1041.2	299.9
Barrier Force C4	Newtons	17386.8	41.7	-993.4	2.9
Barrier Force C5	Newtons	18211.9	36.6	-816.8	4.2
Barrier Force C6	Newtons	13995.4	80.1	-691.2	3.2
Barrier Force C7	Newtons	12043.9	72.5	-544.2	4.1
Barrier Force C8	Newtons	9185.1	26.2	-589.7	5.8
Barrier Force C9	Newtons	213.0	30.2	-711.7	35.8
Barrier Force Sum No.1	Newtons	44422.6	23.4	-404.6	158.4
Barrier Force Sum No.2	Newtons	125253.1	81.0	-1460.0	165.7
Barrier Force Sum No.3	Newtons	102201.7	21.8	-2606.7	3.0
Barrier Force Sum No.4	Newtons	9856.2	28.4	-320.7	183.1
Barrier Force Sum No.5	Newtons	42848.1	37.5	-2470.8	3.1
Barrier Force Sum No.6	Newtons	19255.3	26.0	-1534.3	5.5
Barrier Force Sum Total	Newtons	234555.6	22.8	-3252.9	167.2

Barrier Load cells A1,B1,C1, and D1 through D9 (12 locations) were not recorded.

APPENDIX D
INSTRUMENTATION DATA CHANNEL ASSIGNMENTS

KAR99001-02

1999 NHTSA 35 mph NCAP
Instrumentation Data Channel Assignments
Driver A.T.D Serial Number 35
11/20/98

1999 Chevrolet Saturn SL1 4 Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
1	HEAD, PRIMARY	X	GPAC027	Accel., 1/2 bridge	Endevco	7264-2000	G
2	HEAD, PRIMARY	Y	GPAC002	Accel., 1/2 bridge	Endevco	7264-2000	G
3	HEAD, PRIMARY	Z	GPAC003	Accel., 1/2 bridge	Endevco	7264-2000	G
4	HEAD, REDUNDANT	X	GPAC032	Accel., 1/2 bridge	Endevco	7264-2000	G
5	HEAD, REDUNDANT	Y	GPAC021	Accel., 1/2 bridge	Endevco	7264-2000	G
6	HEAD, REDUNDANT	Z	GPAC026	Accel., 1/2 bridge	Endevco	7264-2000	G
7	NECK FORCE	X	GPUN01FX	Load cell, six axis neck	R. A. Denton	1716A	N
8	NECK FORCE	Y	GPUN01FY	Load cell, six axis neck	R. A. Denton	1716A	N
9	NECK FORCE	Z	GPUN01FZ	Load cell, six axis neck	R. A. Denton	1716A	N
10	NECK MOMENT	X	GPUN01MX	Load cell, six axis neck	R. A. Denton	1716A	N.m
11	NECK MOMENT	Y	GPUN01MY	Load cell, six axis neck	R. A. Denton	1716A	N.m
12	NECK MOMENT	Z	GPUN01MZ	Load cell, six axis neck	R. A. Denton	1716A	N.m
13	CHEST, PRIMARY	X	GPAC005	Accel., 1/2 bridge	Endevco	7264-2000	G
14	CHEST, PRIMARY	Y	GPAC011	Accel., 1/2 bridge	Endevco	7264-2000	G
15	CHEST, PRIMARY	Z	GPAC010	Accel., 1/2 bridge	Endevco	7264-2000	G
16	CHEST, REDUNDANT	X	GPAC034	Accel., 1/2 bridge	Endevco	7264-2000	G
17	CHEST, REDUNDANT	Y	GPAC023	Accel., 1/2 bridge	Endevco	7264-2000	G
18	CHEST, REDUNDANT	Z	GPAC020	Accel., 1/2 bridge	Endevco	7264-2000	G
19	CHEST DISPLACEMENT	X	GPCP002	Rotary Pot Chest	Servo	14CBI	MM
20	PELVIS, PRIMARY	X	GPAC025	Accel., 1/2 bridge	Endevco	7264-2000	G
21	PELVIS, PRIMARY	Y	GPAC022	Accel., 1/2 bridge	Endevco	7264-2000	G
22	PELVIS, PRIMARY	Z	GPAC019	Accel., 1/2 bridge	Endevco	7264-2000	G
23	LEFT FEMUR FORCE	Z	KEFF001	Load cell, Femur	R.A. Denton	2121	N
24	RIGHT FEMUR FORCE	Z	GPLC001	Load cell, Femur	G.S.E.	2430	N

1999 NHTSA 35 mph NCAP
Instrumentation Data Channel Assignments
Driver A.T.D Serial Number 35
11/20/98
1999 Chevrolet Saturn SL1 4 Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
25	UP. TIBIA LEFT MOM.	X	GPOT09MX	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
26	UP. TIBIA LEFT MOM.	Y	GPOT09MY	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
27	UP. TIBIA RIGHT MOM.	X	GPOT09MX	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
28	UP. TIBIA RIGHT MOM.	Y	GPOT09MY	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
29	LWR. TIBIA LEFT MOM.	X	GPLT09MX	3 ch., lower tibia gage	R. A. Denton	3093	N.m
30	LWR. TIBIA LEFT MOM.	Y	GPLT09MY	3 ch., lower tibia gage	R. A. Denton	3093	N.m
31	LWR. TIBIA LEFT FORCE	Z	GPLT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
32	LWR. TIBIA RIGHT MOM.	X	GPLT09MX	3 ch., lower tibia gage	R. A. Denton	3093	N.m
33	LWR. TIBIA RIGHT MOM.	Y	GPLT09MY	3 ch., lower tibia gage	R. A. Denton	3093	N.m
34	LWR. TIBIA RIGHT FORCE	Z	GPLT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
35	FOOT LEFT	X	KEIC002X	Accel., Foot Triax	I.C. Sensor	3031-500	G
36	FOOT LEFT	Y	KEIC002Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
37	FOOT LEFT	Z	KEIC002Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
38	FOOT RIGHT	X	KEIC001X	Accel., Foot Triax	I.C. Sensor	3031-500	G
39	FOOT RIGHT	Y	KEIC001Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
40	FOOT RIGHT	Z	KEIC001Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
41	LAP BELT FORCE	X	KELC003	Load cell, Seat belt	Lebow	3371	N
42	SHOULDER BELT FORCE	X	KELC004	Load cell, Seat belt	Lebow	3371	N
43	SHOULDER BELT SPOOL	X	KEPP001	Pullout pot	Celesco	PTX101-0030	CM
44	SHOULDER BELT ELONG.	X	KEEP001	Linear pot., belt stretch	E.T.I.	LCP8-10 10K	MM/CM

1999 NHTSA 35 mph NCAP
Instrumentation Data Channel Assignments
Driver A.T.D Serial Number 34
11/20/98
1999 Chevrolet Saturn SL1 4 Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
45	HEAD, PRIMARY	X	KEAC039	Accel., 1/2 bridge	Endevco	7264-2000	G
46	HEAD, PRIMARY	Y	KEAC038	Accel., 1/2 bridge	Endevco	7264-2000	G
47	HEAD, PRIMARY	Z	KEAC027	Accel., 1/2 bridge	Endevco	7264-2000	G
48	HEAD, REDUNDANT	X	KEAC031	Accel., 1/2 bridge	Endevco	7264-2000	G
49	HEAD, REDUNDANT	Y	KEAC032	Accel., 1/2 bridge	Endevco	7264-2000	G
50	HEAD, REDUNDANT	Z	KEAC026	Accel., 1/2 bridge	Endevco	7264-2000	G
51	NECK FORCE	X	GPUN02FX	Load cell, six axis neck	R. A. Denton	1716A	N
52	NECK FORCE	Y	GPUN02FY	Load cell, six axis neck	R. A. Denton	1716A	N
53	NECK FORCE	Z	GPUN02FZ	Load cell, six axis neck	R. A. Denton	1716A	N
54	NECK MOMENT	X	GPUN02MX	Load cell, six axis neck	R. A. Denton	1716A	N.m
55	NECK MOMENT	Y	GPUN02MY	Load cell, six axis neck	R. A. Denton	1716A	N.m
56	NECK MOMENT	Z	GPUN02MZ	Load cell, six axis neck	R. A. Denton	1716A	N.m
57	CHEST, PRIMARY	X	GPAC031	Accel., 1/2 bridge	Endevco	7264-2000	G
58	CHEST, PRIMARY	Y	GPAC024	Accel., 1/2 bridge	Endevco	7264-2000	G
59	CHEST, PRIMARY	Z	GPAC029	Accel., 1/2 bridge	Endevco	7264-2000	G
60	CHEST, REDUNDANT	X	KEAC023	Accel., 1/2 bridge	Endevco	7264-200	G
61	CHEST, REDUNDANT	Y	KEAC022	Accel., 1/2 bridge	Endevco	7264-200	G
62	CHEST, REDUNDANT	Z	KEAC024	Accel., 1/2 bridge	Endevco	7264-200	G
63	CHEST DISPLACEMENT	X	GPCP001	Rotary Pot Chest	Servo	14CBI	MM
64	PELVIS, PRIMARY	X	KEAC019	Accel., 1/2 bridge	Endevco	7264-200	G
65	PELVIS, PRIMARY	Y	KEAC020	Accel., 1/2 bridge	Endevco	7264-200	G
66	PELVIS, PRIMARY	Z	KEAC021	Accel., 1/2 bridge	Endevco	7264-200	G
67	LEFT FEMUR FORCE	Z	KEFF002	Load cell, Femur	R.A. Denton	2121	N
68	RIGHT FEMUR FORCE	Z	KEFF003	Load cell, Femur	R.A. Denton	2121	N

1999 NHTSA 35 mph NCAP
Instrumentation Data Channel Assignments
Driver A.T.D Serial Number 34
11/20/98
1999 Chevrolet Saturn SL1 4 Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
69	UP. TIBIA LEFT MOM.	X	GPU09MX	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
70	UP. TIBIA LEFT MOM.	Y	GPU09MY	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
71	UP. TIBIA RIGHT MOM.	X	GPU09MX	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
72	UP. TIBIA RIGHT MOM.	Y	GPU09MY	2 ch., Upper tibia gage	R. A. Denton	1583	N.m
73	LWR. TIBIA LEFT MOM.	X	GPT09MX	3 ch., lower tibia gage	R. A. Denton	3093	N.m
74	LWR. TIBIA LEFT MOM.	Y	GPT09MY	3 ch., lower tibia gage	R. A. Denton	3093	N.m
75	LWR. TIBIA LEFT FORCE	Z	GPT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
76	LWR. TIBIA RIGHT MOM.	X	GPT09MX	3 ch., lower tibia gage	R. A. Denton	3093	N.m
77	LWR. TIBIA RIGHT MOM.	Y	GPT09MY	3 ch., lower tibia gage	R. A. Denton	3093	N.m
78	LWR. TIBIA RIGHT FORCE	Z	GPT09FZ	3 ch., lower tibia gage	R. A. Denton	3093	N
79	FOOT LEFT	X	KEIC003X	Accel., Foot Triax	I.C. Sensor	3031-500	G
80	FOOT LEFT	Y	KEIC003Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
81	FOOT LEFT	Z	KEIC003Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
82	FOOT RIGHT	X	KEIC004X	Accel., Foot Triax	I.C. Sensor	3031-500	G
83	FOOT RIGHT	Y	KEIC004Y	Accel., Foot Triax	I.C. Sensor	3031-500	G
84	FOOT RIGHT	Z	KEIC004Z	Accel., Foot Triax	I.C. Sensor	3031-500	G
85	LAP BELT FORCE	X	KELC001	Load cell, Seat belt	Lebow	3371	N
86	SHOULDER BELT FORCE	X	KELC002	Load cell, Seat belt	Lebow	3371	N
87	SHOULDER BELT SPOOL	X	KEPP001	Pullout pot	Celesco	PTX101-0030	MM
88	SHOULDER BELT ELONG.	X	KEEP001	Linear pot., belt stretch	E.T.I.	LCP8-10 10K	MM/CM

1999 NHTSA 35 mph NCAP
Instrumentation Data Channel Assignments
Vehicle Accelerometers
11/20/98
1999 Chevrolet Saturn SL1 4 Door Sedan

CH.	LOCATION	AXIS	IDENT. NO.	DESCRIPTION	MFR	MODEL	UNITS
89	Left Rear X-Member (Pri.)	X	KEVA005	Accel., Vehicle block	I.C. Sensor	3031-500	G
90	Right Rear X-Member (Pri.)	X	KEVA006	Accel., Vehicle block	I.C. Sensor	3031-200	G
91	Engine Top	X	KEVA011	Accel., Vehicle block	I.C. Sensor	3031-200	G
92	Engine Bottom	X	KEVA007	Accel., Vehicle block	I.C. Sensor	3031-500	G
93	Left Brake Caliper	X	KEVA008	Accel., Vehicle block	I.C. Sensor	3031-500	G
94	Right Brake Caliper	X	KEVA009	Accel., Vehicle block	I.C. Sensor	3031-500	G
95	Instrument Panel	X	KEVA004	Accel., Vehicle block	I.C. Sensor	3031-500	G
96	Left Rear X-Member (Rednt.)	X	KEVA010	Accel., Vehicle block	I.C. Sensor	3031-200	G

APPENDIX E
DUMMY CALIBRATION DATA



Hybrid III Calibration Data Sheet

50TH Percentile Male

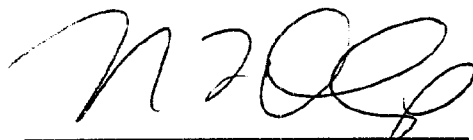
Left Knee Impact Test

ATD Serial No.: 34

Part Serial No.: n/a

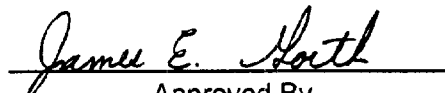
Test I.D.: KN001

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	2.073 to 2.134	2.080	Pass
Peak Probe Force	Newtons	4715 to 5782	5627.6	Pass
Overall Test Results				Pass


Laboratory Technician

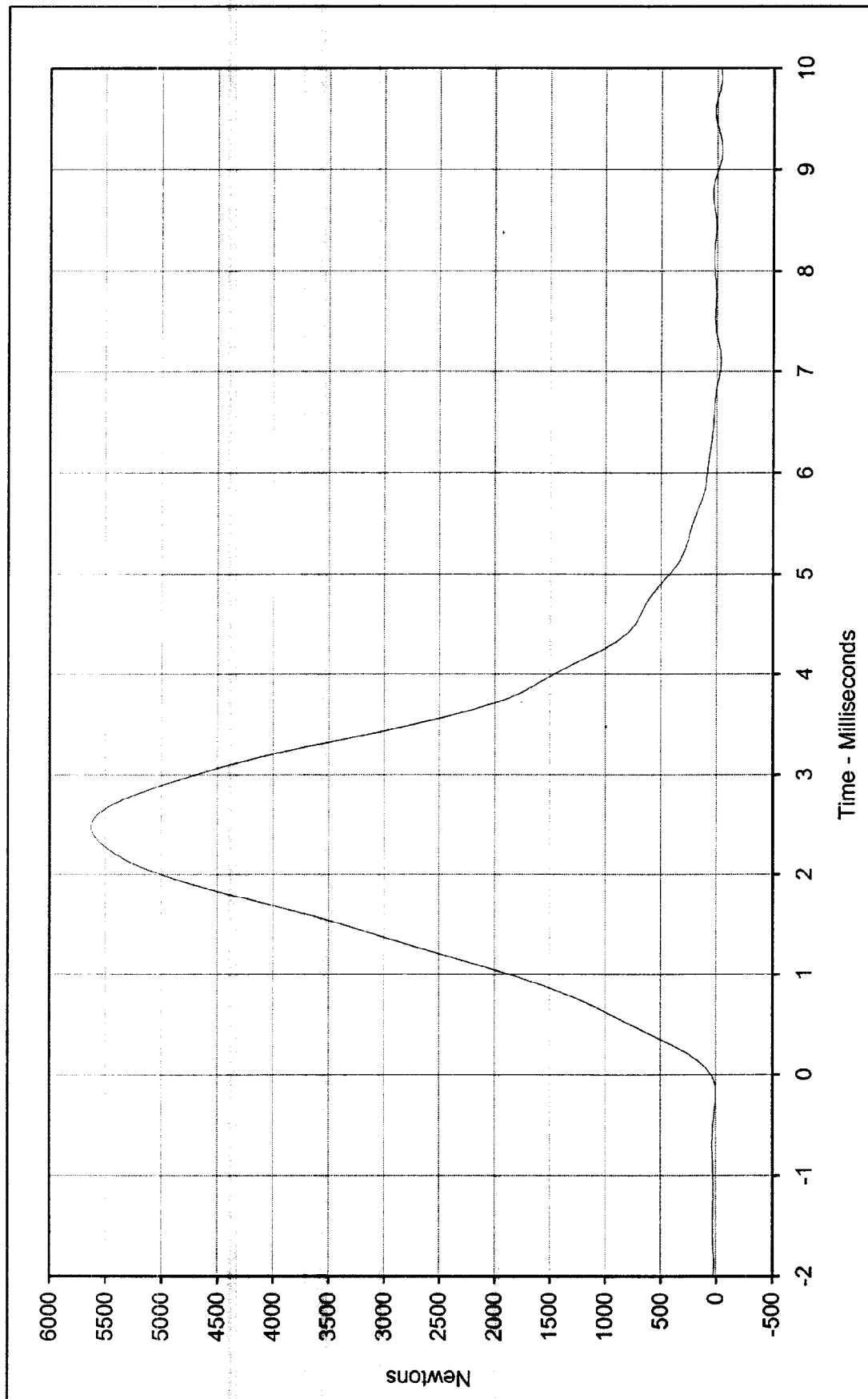
November 12, 1998

Test Date


Approved By

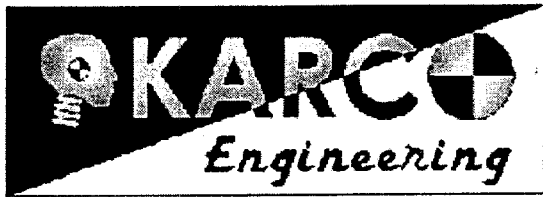
12/14/98

Date



Curve Description: _____ Testing Program: Hybrid III Left Knee Impact Test
 Maximum Value: 5627.6 at 2.5 Milliseconds
 Minimum Value: -36.2 at 7.1 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/12/98
 ATD Serial No.: 34





Hybrid III Calibration Data Sheet

50TH Percentile Male

Right Knee Impact Test

ATD Serial No.: 34

Part Serial No.: n/a

Test I.D.: KN002

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	2.073 to 2.134	2.080	Pass
Peak Probe Force	Newtons	4715 to 5782	5466.8	Pass
Overall Test Results				Pass



Laboratory Technician

November 12, 1998

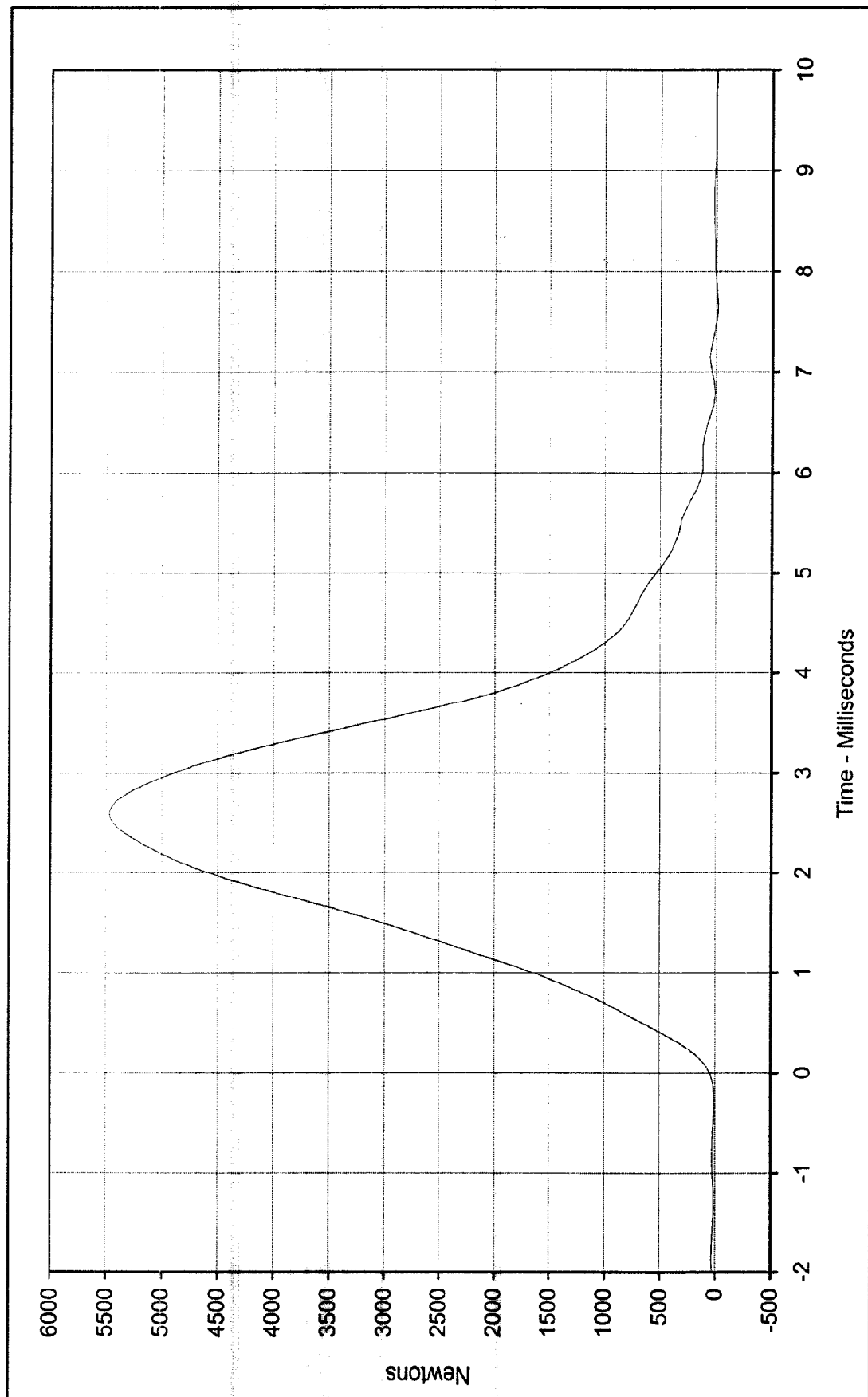
Test Date



Approved By

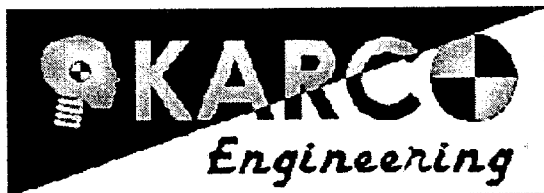
12/14/98

Date



Curve Description: _____ Testing Program: Hybrid III Right Knee Impact Test
 Maximum Value: 5466.8 at 2.6 Milliseconds
 Minimum Value: -14.9 at 7.7 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/12/98
 ATD Serial No.: 34





Hybrid III Calibration Data Sheet

50TH Percentile Male

Head Drop Calibration

ATD Serial No.: 034

Part Serial No.: n/a

Test I.D.: HED05

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	256.0	Pass
Peak Lateral Acceleration	G's	≤15.0	2.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

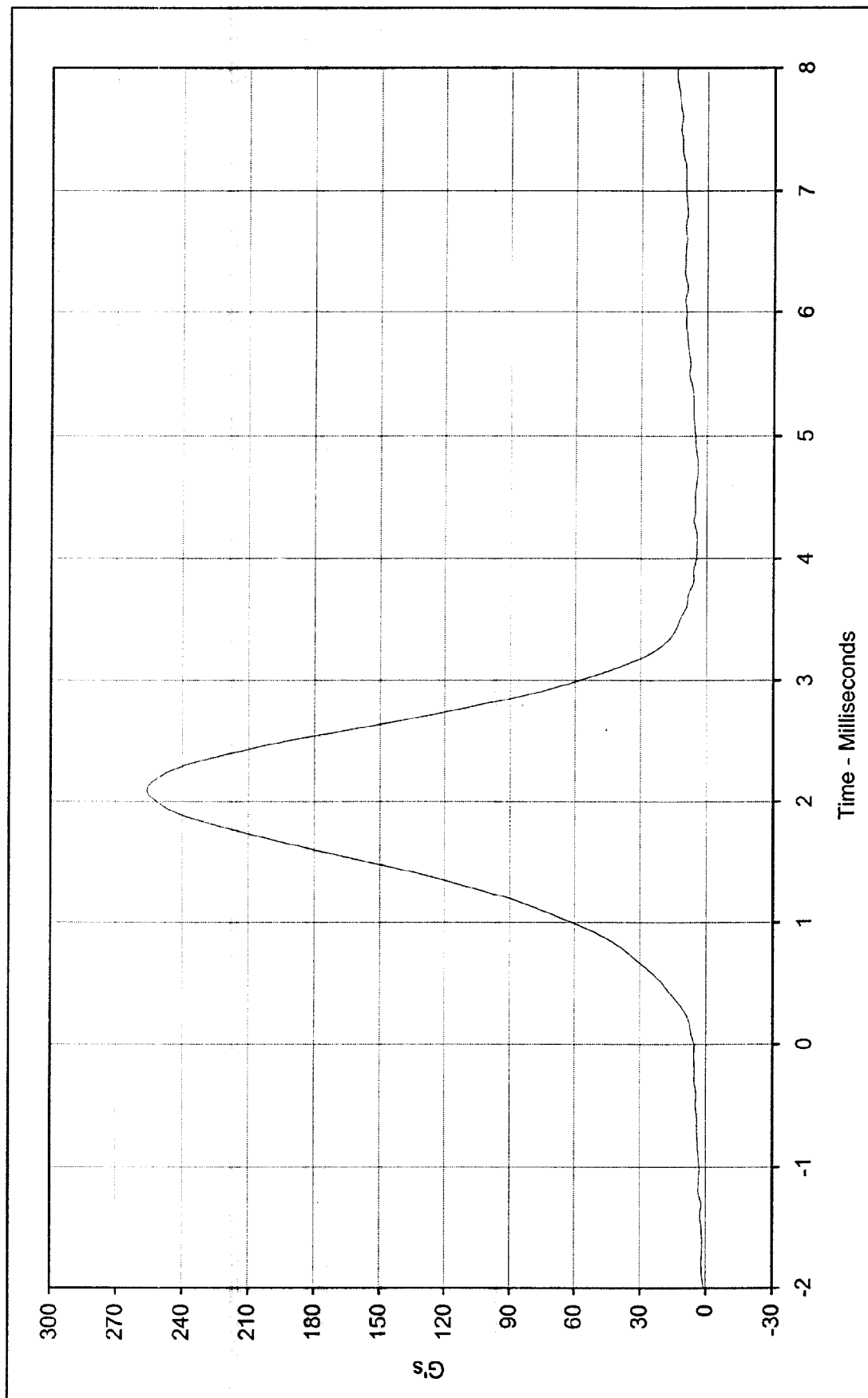

Approved By

November 9, 1998

Test Date

12/14/98

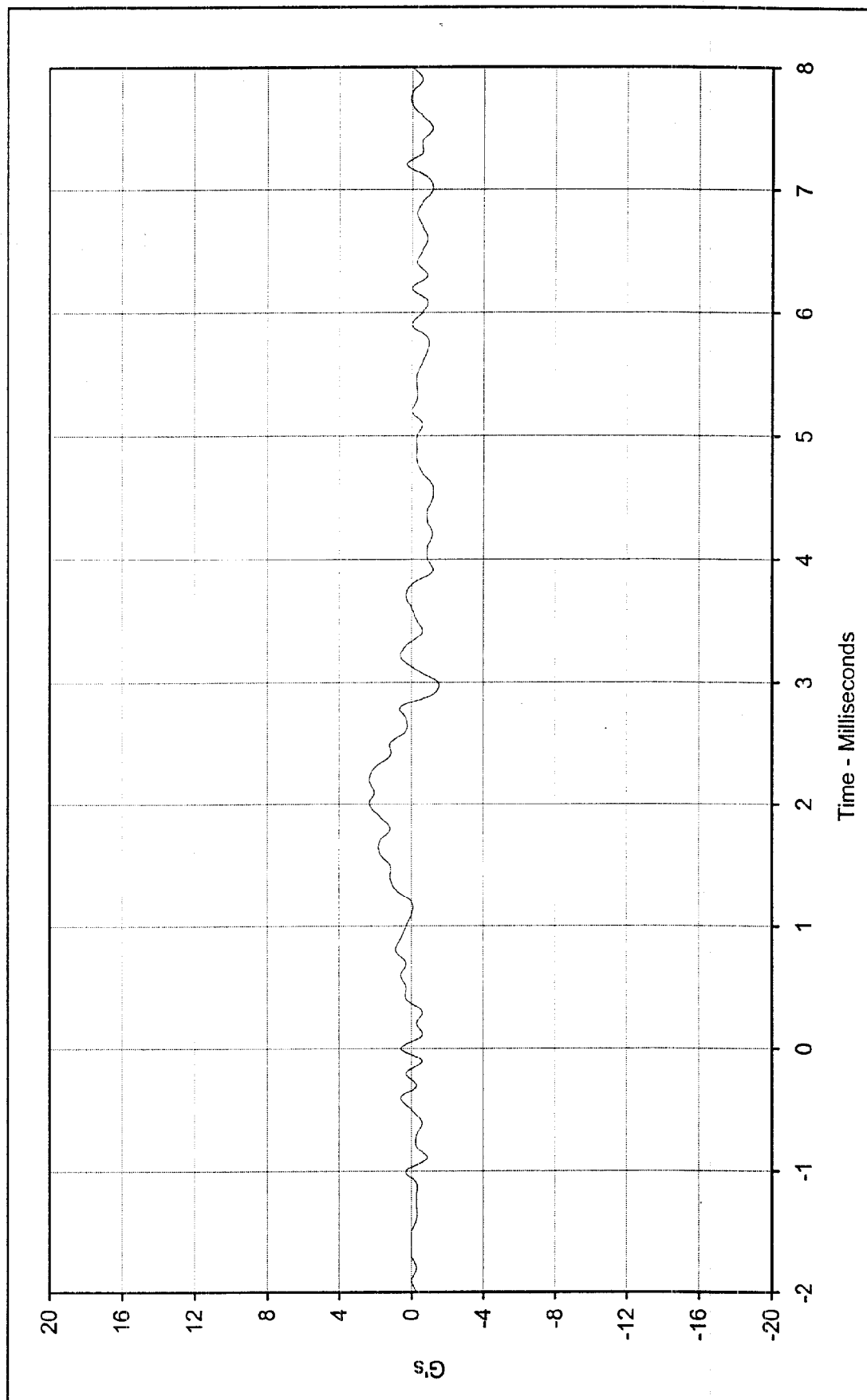
Date



Testing Program Hybrid III Head Drop Calibration (Male)
 Test Information: S/N of Part: n/a Test I.D.: HED05



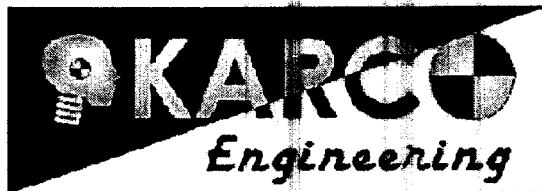
Curve Description: Head Resultant Acceleration
 Maximum Value: 256.0 at 2.1 Milliseconds
 Minimum Value: 0.9 at -2.0 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/9/98
 ATD Serial No.: 034



Curve Description: Head Acceleration Y Axis
 Testing Program Hybrid III Head Drop Calibration (Male)
 Test Information: S/N of Part: n/a Test I.D.: HED05

Maximum Value: 2.3 at 2.0 Milliseconds
 Minimum Value: -1.5 at 3.0 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/9/98
 ATD Serial No.: 034





Hybrid III Calibration Data Sheet

50TH Percentile Male

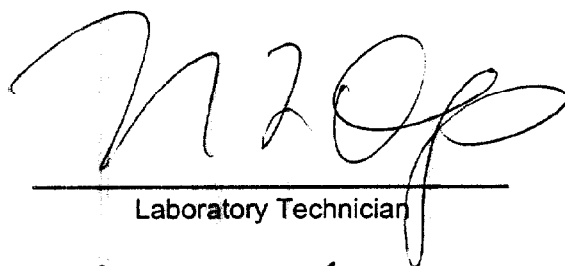
Thorax Impact Test

ATD Serial No.: 034

Part Serial No.: N/A

Test I.D.: CH34A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/s	6.58 to 6.82	6.71	Pass
Peak Probe Force	Newtons	5159 to 5893	5578	Pass
Peak Sternum Displacement	CM	6.35 to 7.26	6.73	Pass
Internal Hysteresis	%	69 to 85	74.0	Pass
Overall Test Results				Pass



Laboratory Technician



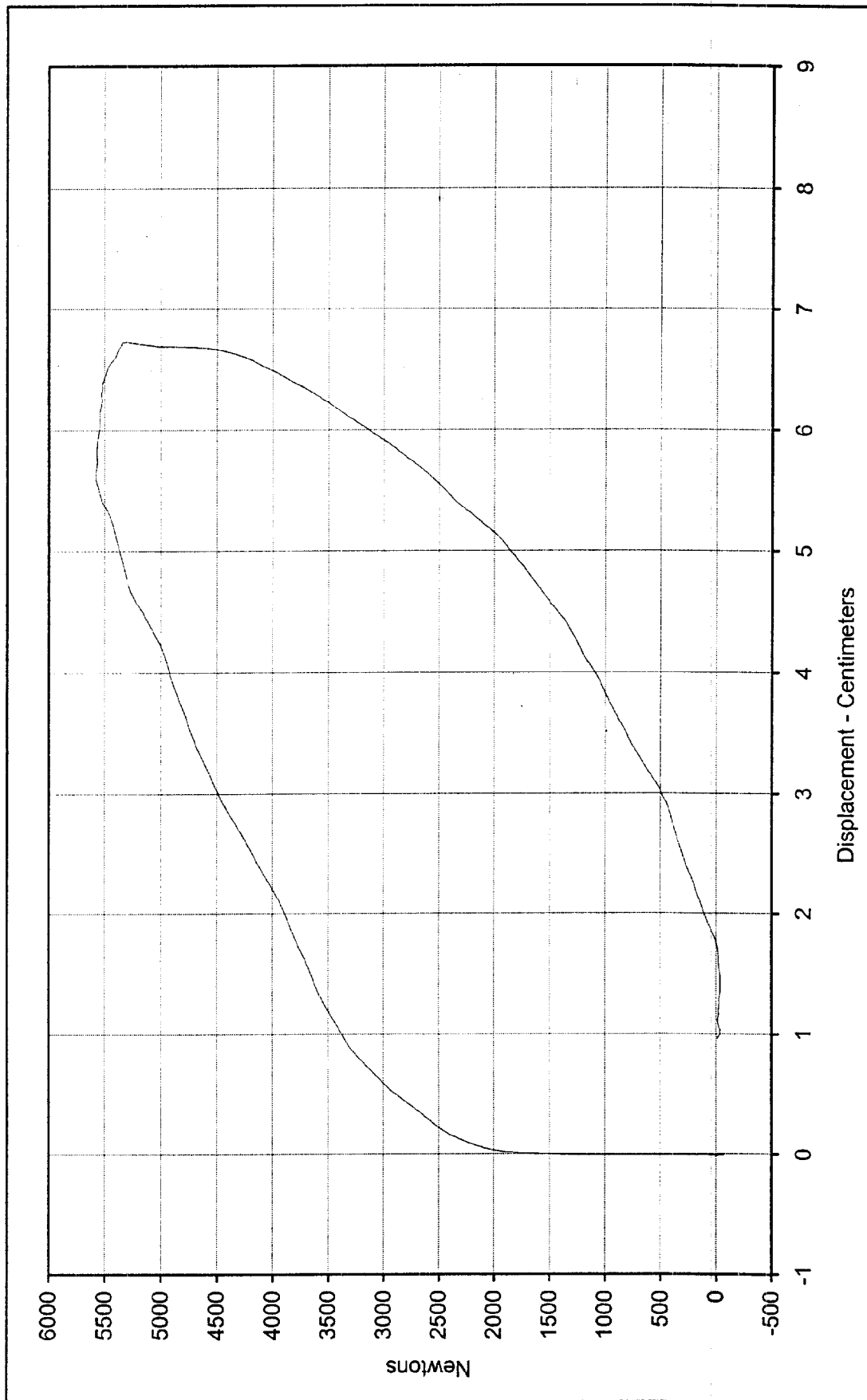
Approved By

November 13, 1998

Test Date

12/14/98

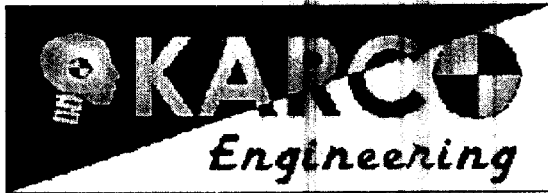
Date



Curve Description:	Probe Force vs. Chest Displacement	Testing Program	Hybrid III Thorax Impact Test
Probe Force:	5578.0 Newtons	Test Information:	S/N of Part: N/A Test I.D.: CH34A

Chest Displ.:	6.73 Centimeters
SAE Filter Class:	180
Date of Test:	11/13/98
ATD Serial No.:	034





Hybrid III Calibration Data Sheet

50TH Percentile Male

Neck Flexion Test

ATD Serial No.: 034Part Serial No.: n/aTest I.D.: NEC20

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	40	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.96	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	23.0	Pass
	20 Msec.	G's	17.6 to 22.6	20.0	Pass
	30 Msec.	G's	12.5 to 18.5	17.8	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.8	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	37.7	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	70.9	Pass
	Time	Msec.	57.0 to 64.0	63.3	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	126.5	Pass
Moment About Occipital Condyle	Maximum	N • m	84.1 to 108.5	85.1	Pass
	Time	Msec.	47.0 to 58.0	55.6	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	103.9	Pass
Overall Test Results					Pass

Laboratory Technician

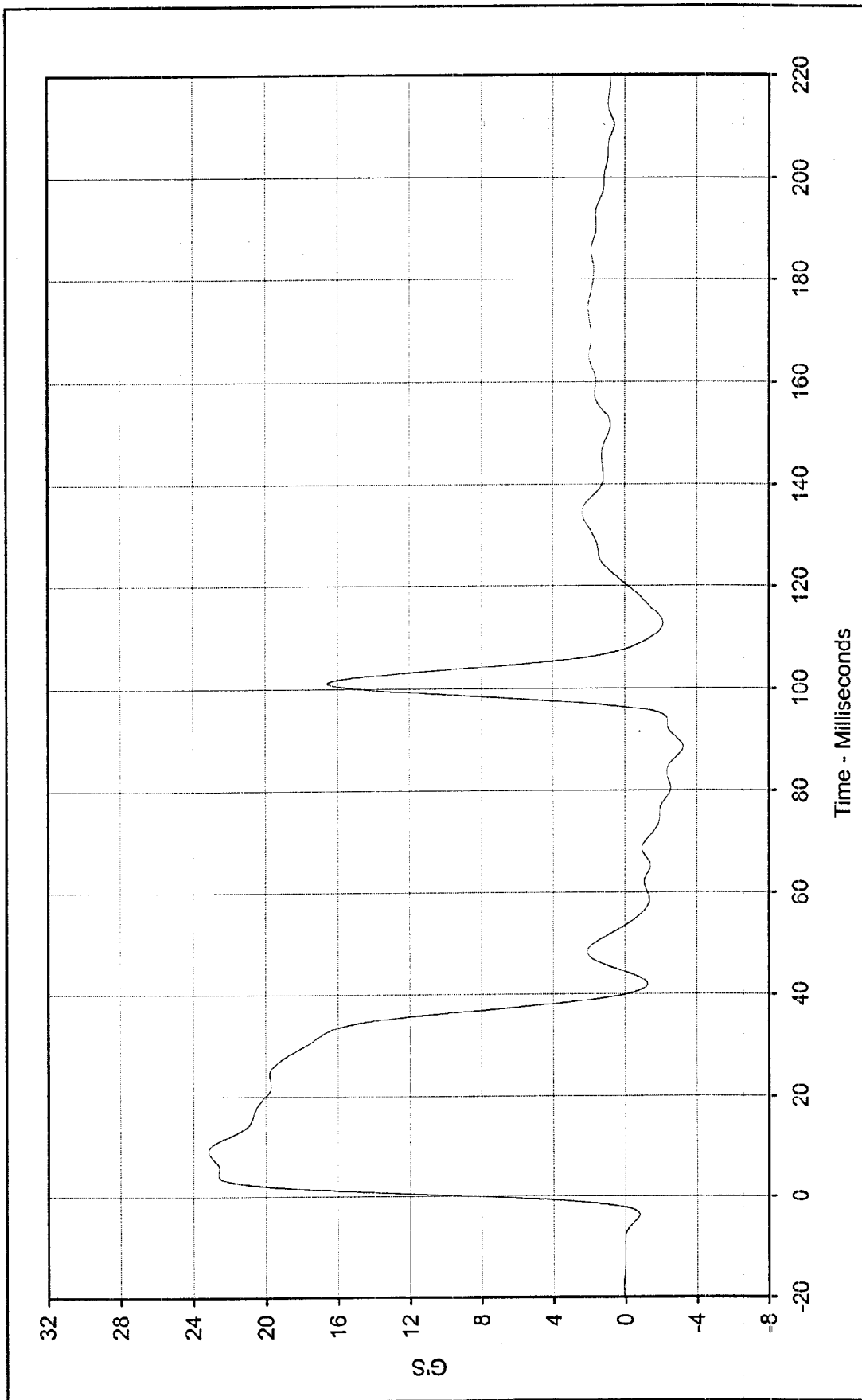
Approved By

November 9, 1998

Test Date

12/14/98

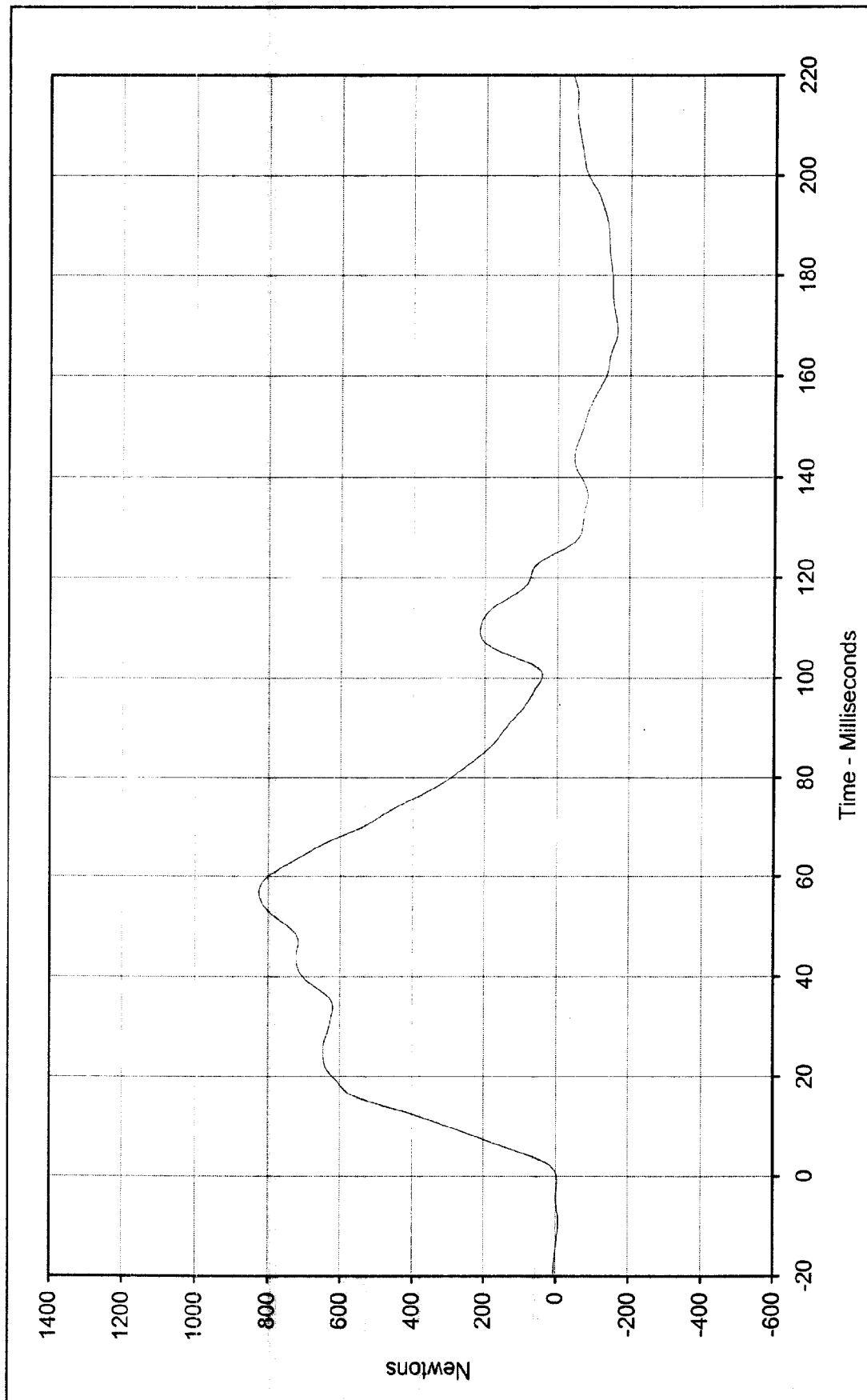
Date



Curve Description: Pendulum Deceleration Testing Program Hybrid III Neck Flexion Test (Male)
 Maximum Value: 23.2 at 9.1 Milliseconds Test Information: S/N of Part: n/a Test I.D.: NEC20
 Minimum Value: -3.2 at 88.4 Milliseconds



SAE Filter Class: 60
 Date of Test: 11/9/98
 ATD Serial No.: 034



Curve Description: Neck Force X Testing Program Hybrid III Neck Flexion Test (Male)

Maximum Value: 825.0 at 56.9 Milliseconds Test Information: S/N of Part: n/a Test I.D.: NEC20

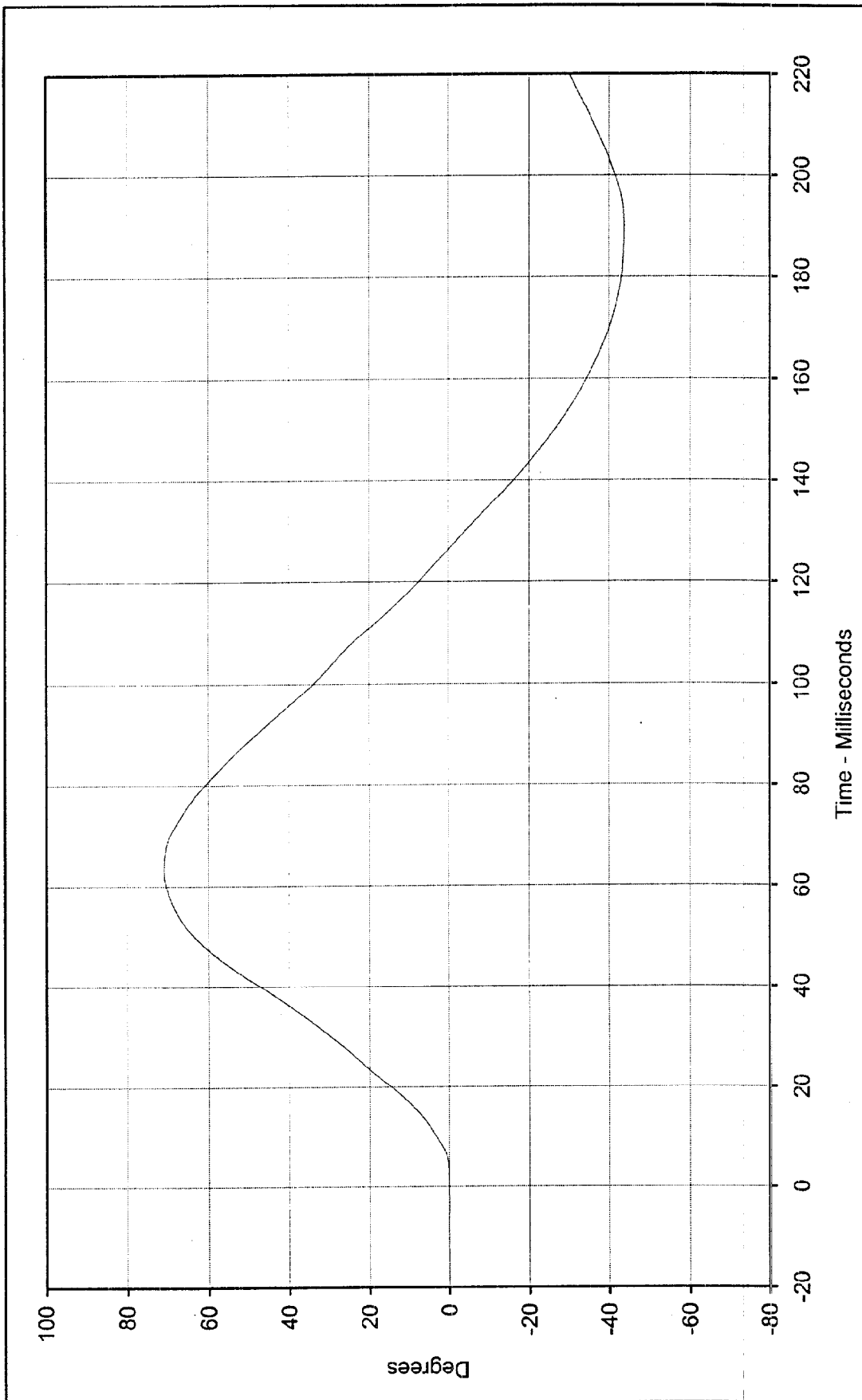
Minimum Value: -164.0 at 169.0 Milliseconds

SAE Filter Class: 60

Date of Test: 11/9/98

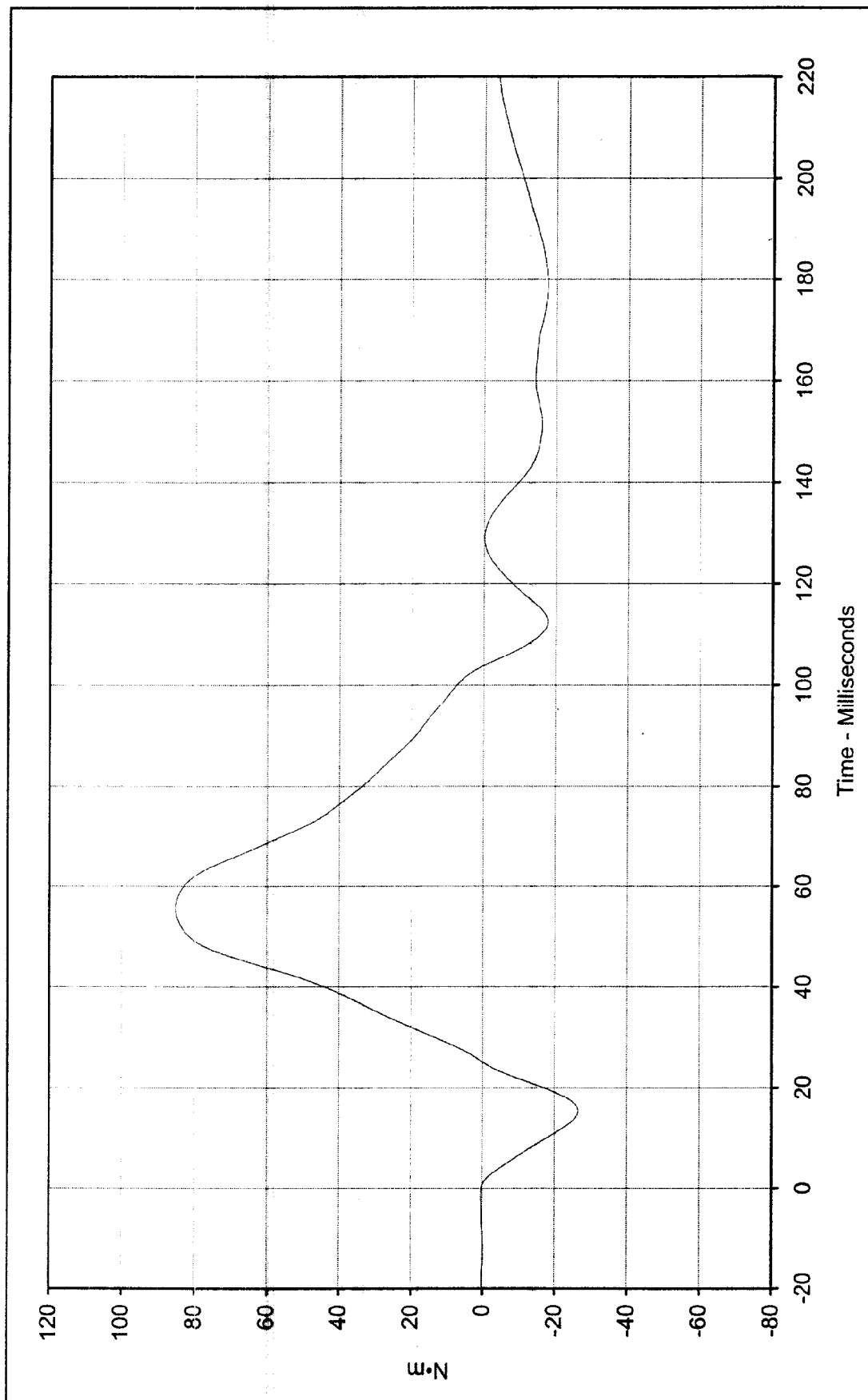
ATD Serial No.: 034





Curve Description: _____ Testing Program: Hybrid III Neck Flexion Test (Male)
 Maximum Value: 70.9 at 63.3 Milliseconds
 Minimum Value: -43.6 at 189.3 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/9/98
 ATD Serial No.: 034





Curve Description: Moment About Occipital Condyles

Maximum Value: 85.1 at 55.6 Milliseconds

Minimum Value: -26.6 at 15.3 Milliseconds

SAE Filter Class: 60

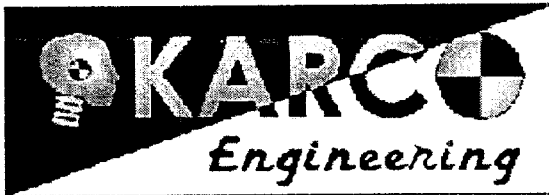
Date of Test: 11/9/98

ATD Serial No.: 034

Testing Program Hybrid III Neck Flexion Test (Male)

Test Information: S/N of Part: n/a Test I.D.: NEC20





Hybrid III Calibration Data Sheet

50TH Percentile Male

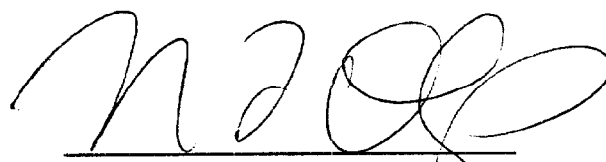
Neck Extension Test

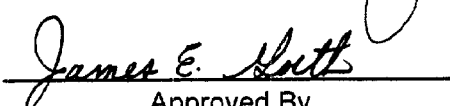
ATD Serial No.: 034

Part Serial No.: n/a

Test I.D.: NEC06

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.18	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	17.2	Pass
	20 Msec.	G's	14.0 to 19.0	15.4	Pass
	30 Msec.	G's	11.0 to 16.0	12.8	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	12.8	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	45.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	92.9	Pass
	Time	Msec.	72.0 to 82.0	78.4	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	156.9	Pass
Moment About Occipital Condyle	Maximum	N • m	-52.9 to- 79.9	-72.5	Pass
	Time	Msec.	65.0 to 79.0	67.7	Pass
Negative Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	143.9	Pass
			Overall Test Results		Pass


 Laboratory Technician

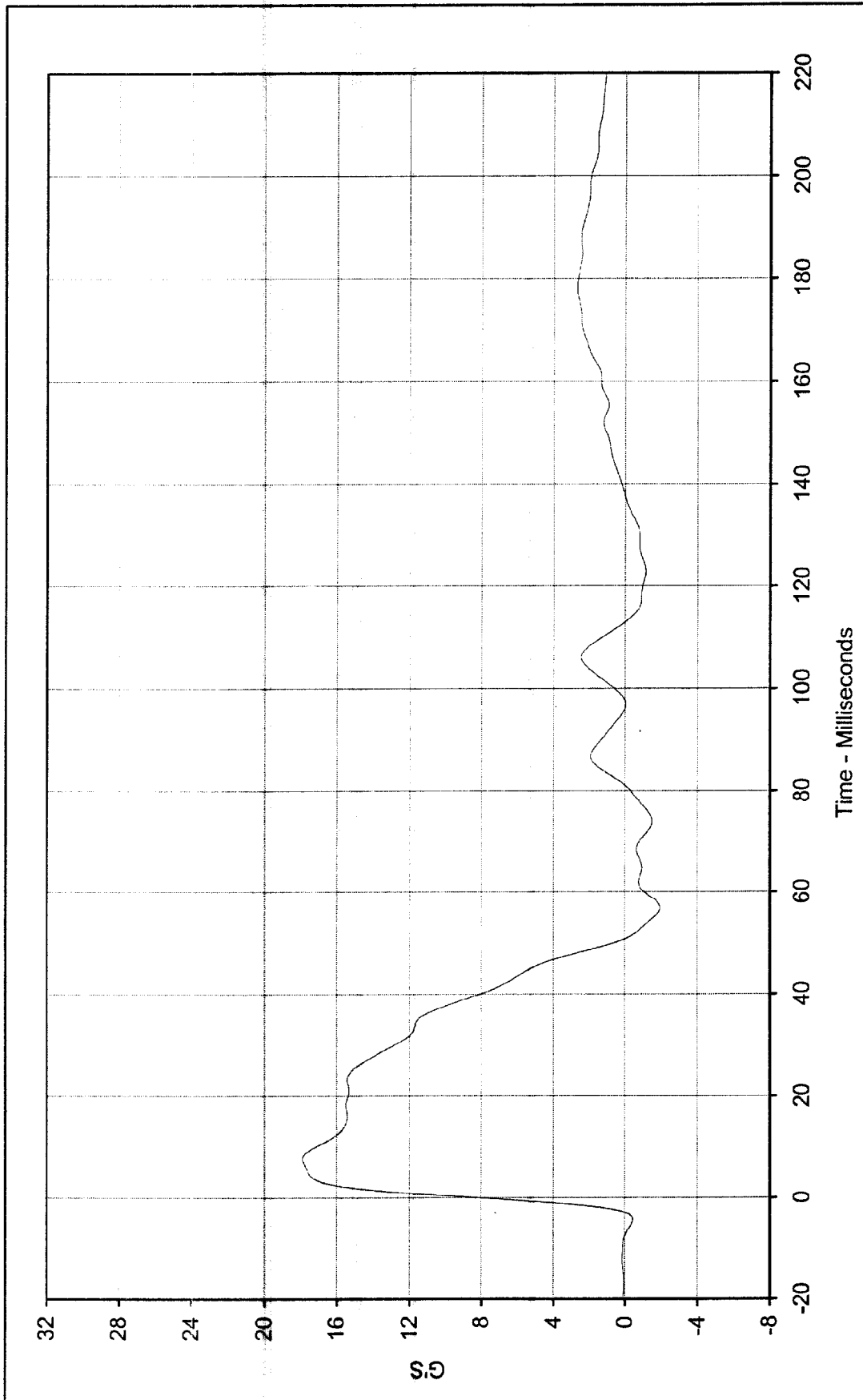

 Approved By

November 9, 1998

Test Date

12/14/98

Date



Curve Description: Pendulum Deceleration

Maximum Value: 17.9 at 7.7 Milliseconds

Minimum Value: -1.9 at 56.8 Milliseconds

SAE Filter Class: 60

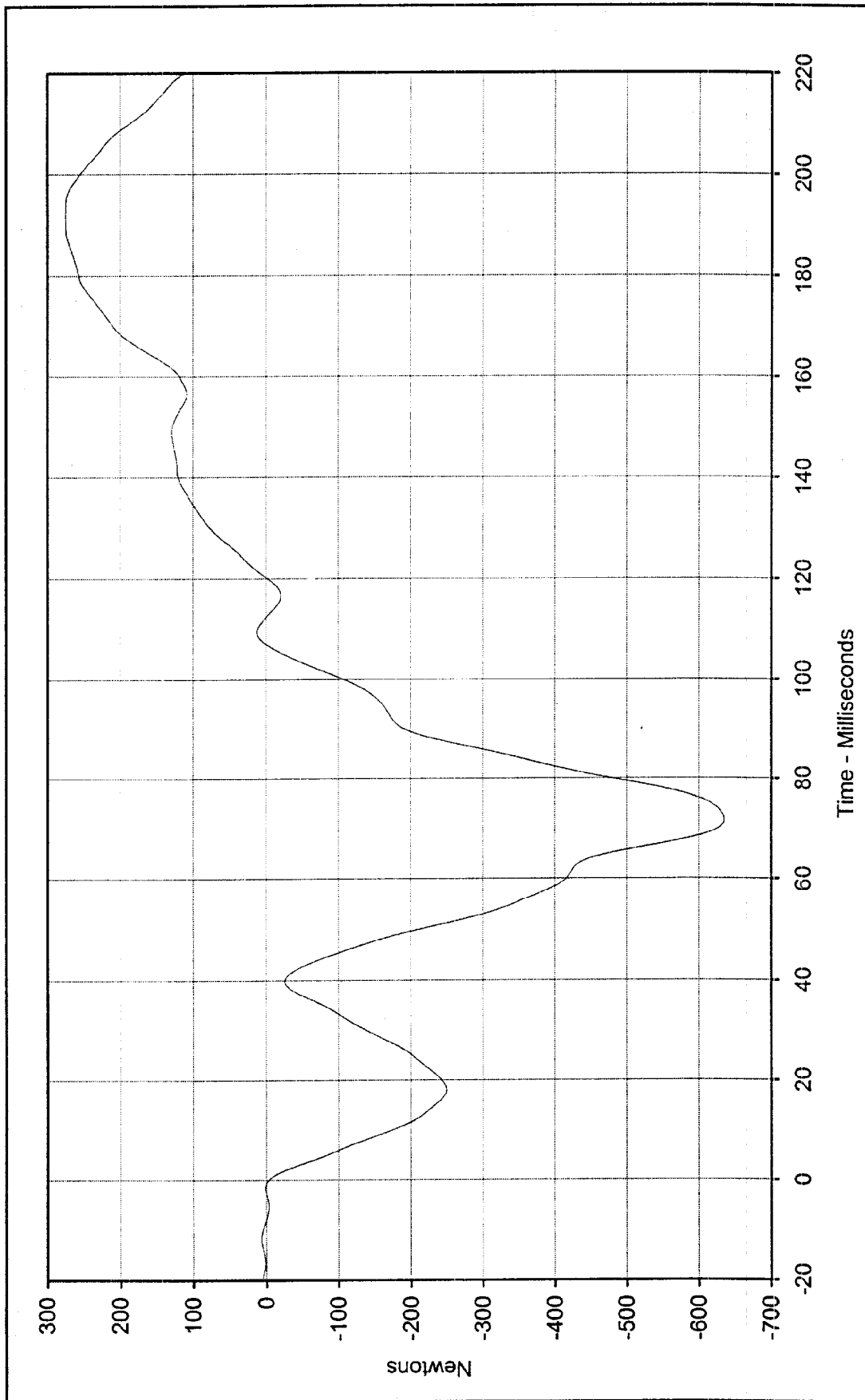
Date of Test: 11/9/98

ATD Serial No.: 034

Testing Program Hybrid III Neck Extension Test (Male)

Test Information: S/N of Part: n/a Test I.D.: NEC06

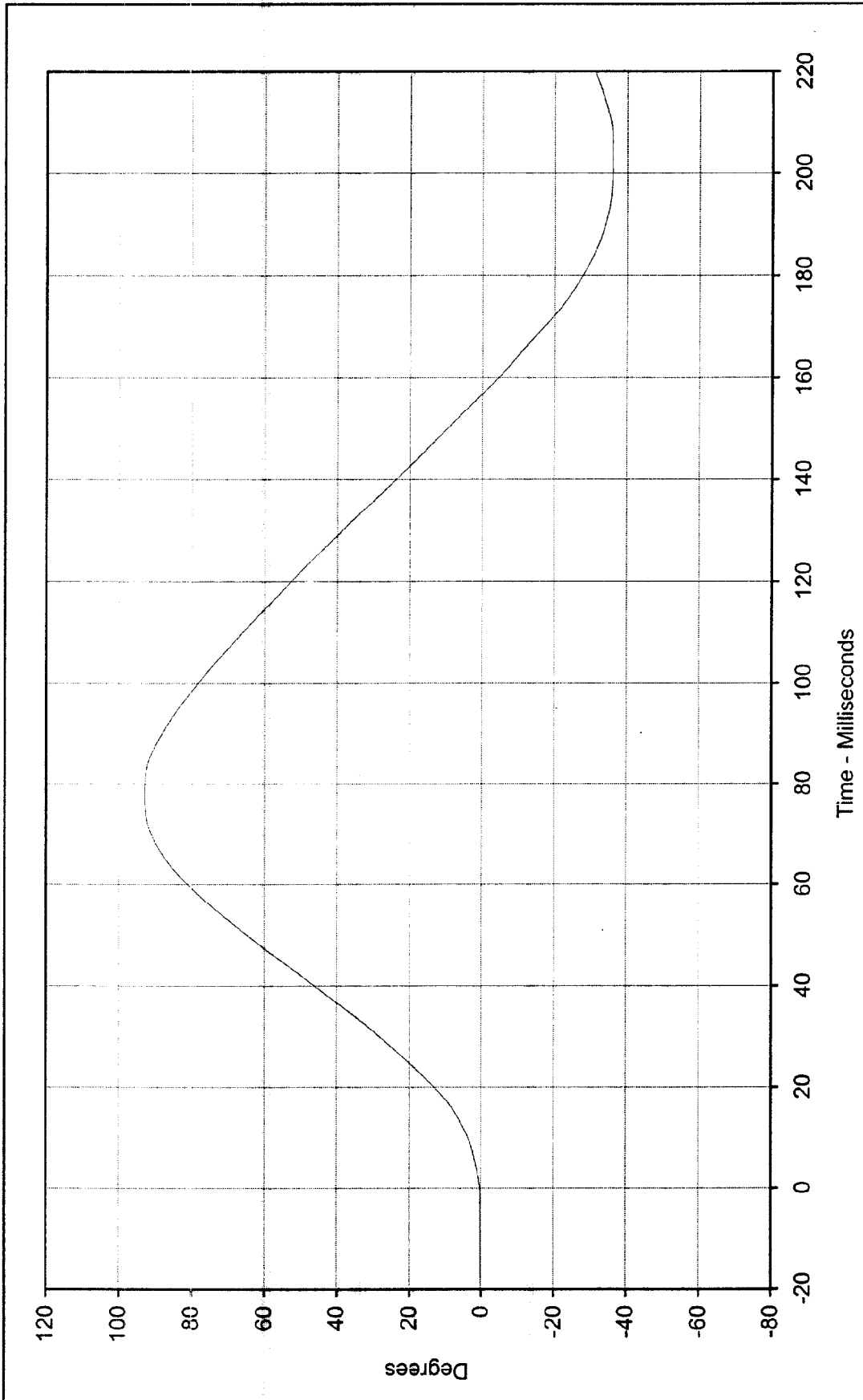




Curve Description: Neck Force X
 Maximum Value: 274.7 at 191.4 Milliseconds
 Minimum Value: -635.4 at 71.6 Milliseconds
 SAE Filter Class: 60
 Date of Test: 11/9/98
 ATD Serial No.: 034

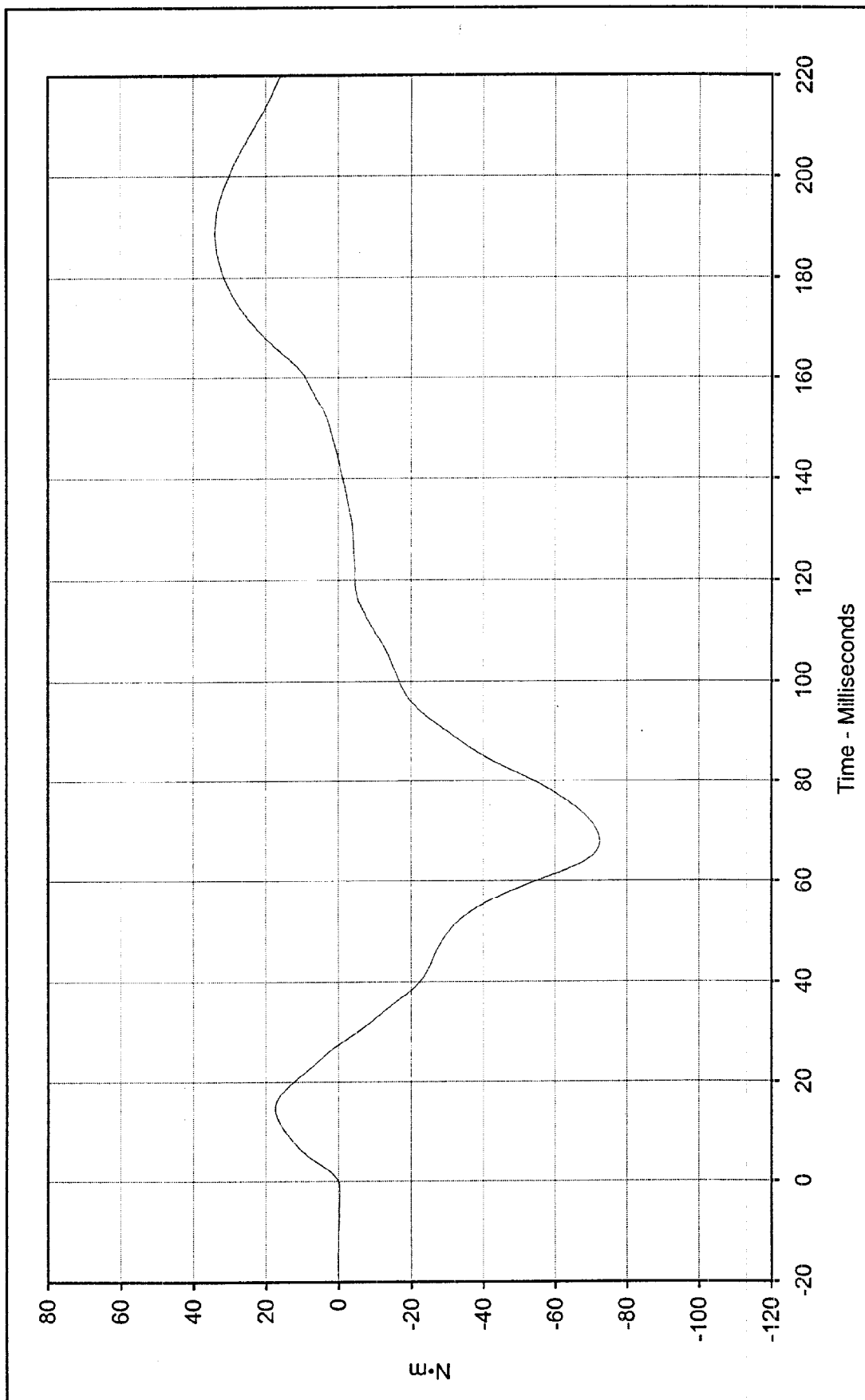
Testing Program: Hybrid III Neck Extension Test (Male)
 Test Information: S/N of Part: n/a Test I.D.: NEC06





Curve Description: _____ Testing Program _____ Hybrid III Neck Extension Test (Male)
 Maximum Value: _____ at _____ Milliseconds
 Minimum Value: _____ at _____ Milliseconds
 SAE Filter Class: _____
 Date of Test: _____
 ATD Serial No.: _____





Curve Description: Moment About Occipital Condyles
 Testing Program Hybrid III Neck Extension Test (Male)
 Maximum Value: 33.9 at 188.6 Milliseconds
 Test Information: S/N of Part: n/a Test I.D.: NEC06
 Minimum Value: -72.5 at 67.7 Milliseconds



SAE Filter Class: 60
 Date of Test: 11/9/98
 ATD Serial No.: 034



Hybrid III Calibration Data Sheet

50TH Percentile Male

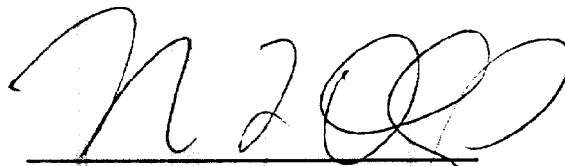
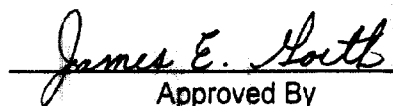
External Measurements

ATD Serial No.: 034

Part Serial No.: N/A

Test I.D.: N/A

External Measurement Data				
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory temperature	°C	20.4 to 22.1	21.9	Pass
Laboratory relative humidity	%	10 to 70	44	Pass
A - Total sitting height	mm	878.8 to 889.0	888.4	Pass
B - Shoulder pivot height	mm	505.5 to 520.7	506.5	Pass
C - "H" point height	mm	83.8 to 88.9	87.5	Pass
D - "H" point from seat back	mm	134.6 to 139.7	138.5	Pass
E - Shoulder pivot from back	mm	83.8 to 94.0	91.0	Pass
F - Thigh clearance	mm	139.7 to 154.9	153.3	Pass
G - Elbow back to wrist pivot	mm	289.6 to 304.8	300.8	Pass
H - Skull cap to back line	mm	40.6 to 45.7	44.5	Pass
I - Shoulder to elbow length	mm	330.2 to 345.4	335.7	Pass
J - Elbow rest height	mm	190.5 to 210.8	207.5	Pass
K - Buttock to knee length	mm	579.1 to 604.5	603.4	Pass
L - Popliteal length	mm	429.3 to 454.7	451.5	Pass
M - Knee pivot height	mm	485.1 to 500.4	500.2	Pass
N - Buttock popliteal length	mm	452.1 to 477.5	476.4	Pass
O - Chest depth	mm	213.4 to 228.6	225.5	Pass
P - Foot length	mm	251.5 to 266.7	255.6	Pass
V - Shoulder breadth	mm	421.6 to 436.9	229.5	Pass
W - Foot breadth	mm	91.4 to 106.7	104.0	Pass
Y - Chest circumference	mm	970.3 to 1000.8	981.0	Pass
Z - Waist circumference	mm	835.7 to 866.1	865.3	Pass
AA - Location for chest circumference	mm	429.3 to 434.3	431.0	Pass
BB - Location for waist circumference	mm	226.1 to 231.1	230.0	Pass
Overall Test Results				Pass

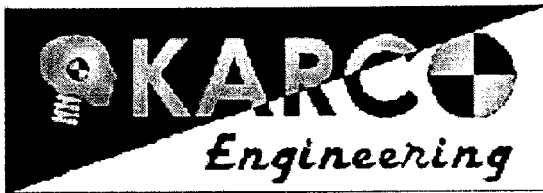

 Laboratory Technician

 Approved By

November 16, 1998

Test Date

12/14/98

Date



Hybrid III Calibration Data Sheet

50TH Percentile Male

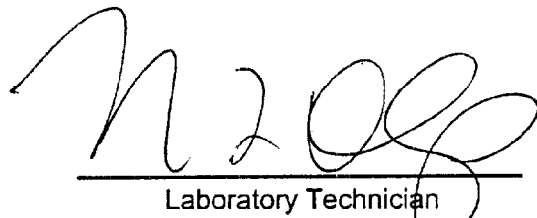
Left Knee Impact Test

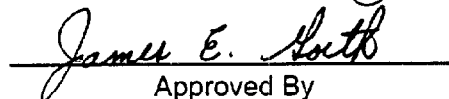
ATD Serial No.: 35

Part Serial No.: n/a

Test I.D.: KN003

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	2.073 to 2.134	2.119	Pass
Peak Probe Force	Newtons	4715 to 5782	5354.3	Pass
Overall Test Results				Pass


Laboratory Technician

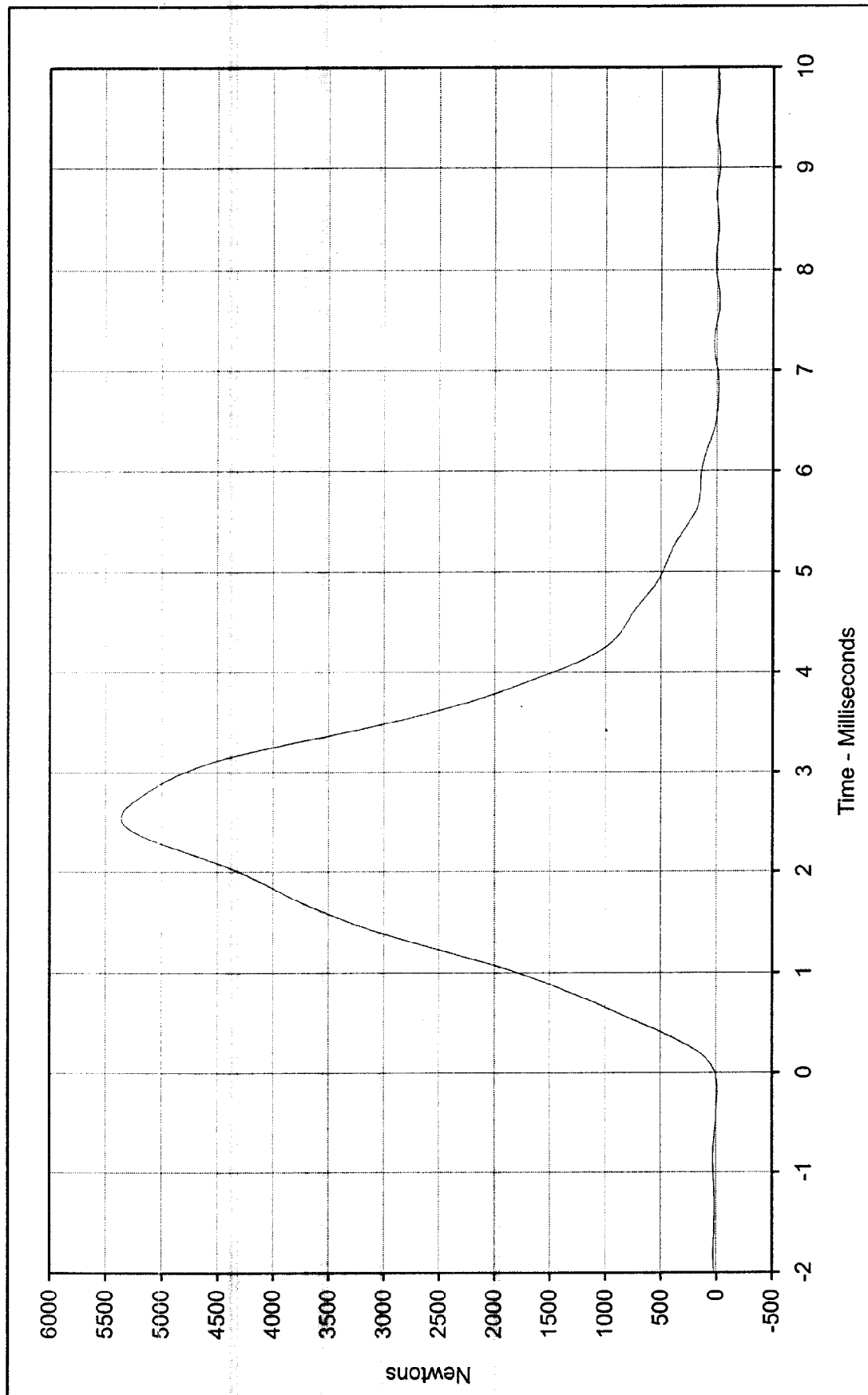

Approved By

November 12, 1998

Test Date

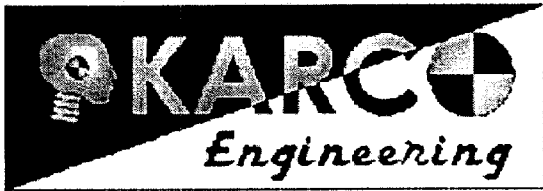
12/14/98

Date



Curve Description: _____ Testing Program: Hybrid III Left Knee Impact Test
 Maximum Value: 5354.3 at 2.5 Milliseconds
 Minimum Value: -24.7 at 7.7 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/12/98
 ATD Serial No.: 35





Hybrid III Calibration Data Sheet

50TH Percentile Male

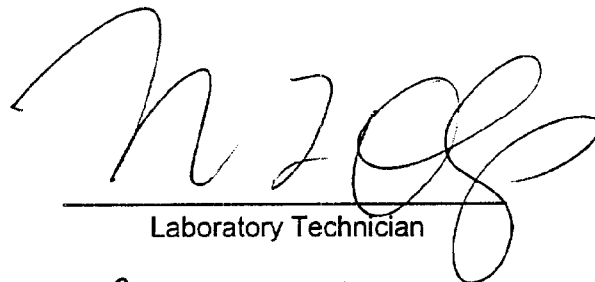
Right Knee Impact Test

ATD Serial No.: 35

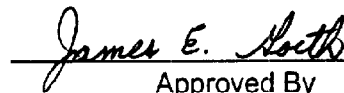
Part Serial No.: n/a

Test I.D.: KN004

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.5	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	30	Pass
Probe Velocity	m/s	2.073 to 2.134	2.101	Pass
Peak Probe Force	Newtons	4715 to 5782	5539.5	Pass
Overall Test Results				Pass



Laboratory Technician



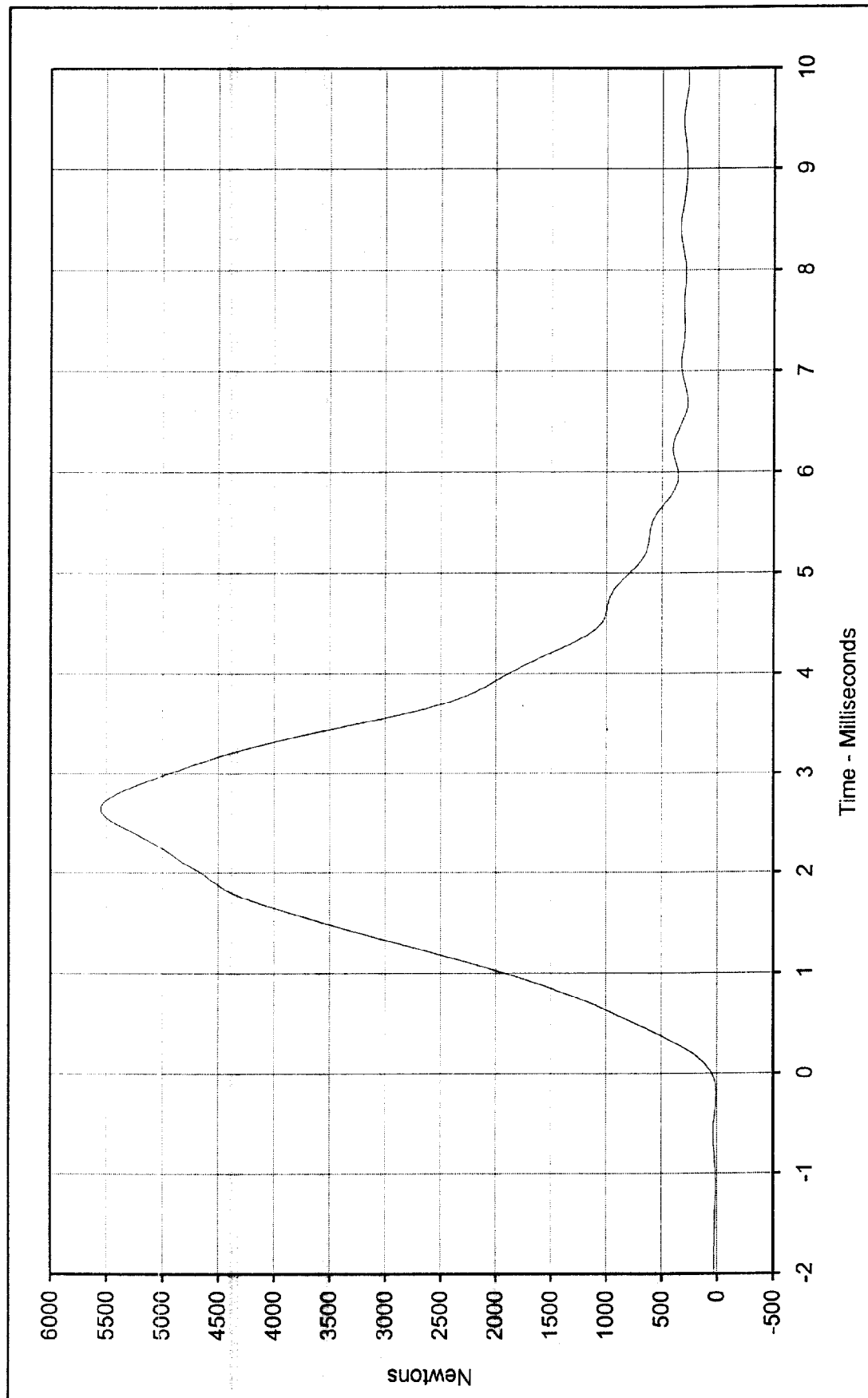
Approved By

November 12, 1998

Test Date

12/14/98

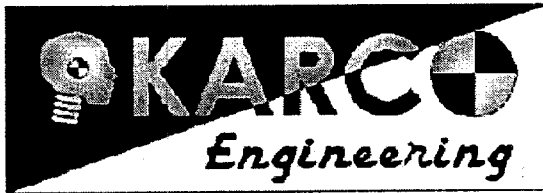
Date



Testing Program: Hybrid III Right Knee Impact Test
 Test Information: Part S/N: n/a Test I.D.: KN004



Curve Description: Probe Force
 Maximum Value: 5539.5 at 2.6 Milliseconds
 Minimum Value: 5.7 at -0.2 Milliseconds
 SAE Filter Class: 600
 Date of Test: 11/12/98
 ATD Serial No.: 35



Hybrid III Calibration Data Sheet

50TH Percentile Male

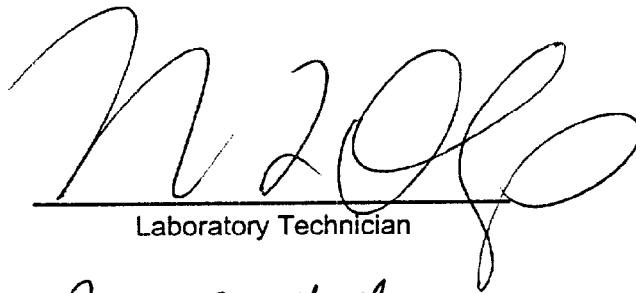
Head Drop Calibration

ATD Serial No.: 035

Part Serial No.: n/a

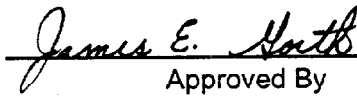
Test I.D.: HAD01

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	18.9 to 25.6	21.1	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Peak Resultant Acceleration	G's	225.0 to 275.0	251.7	Pass
Peak Lateral Acceleration	G's	≤15.0	2.3	Pass
Is Acceleration Unimodal?	Yes/No	Yes	Yes	Pass
Overall Test Results				Pass


Laboratory Technician

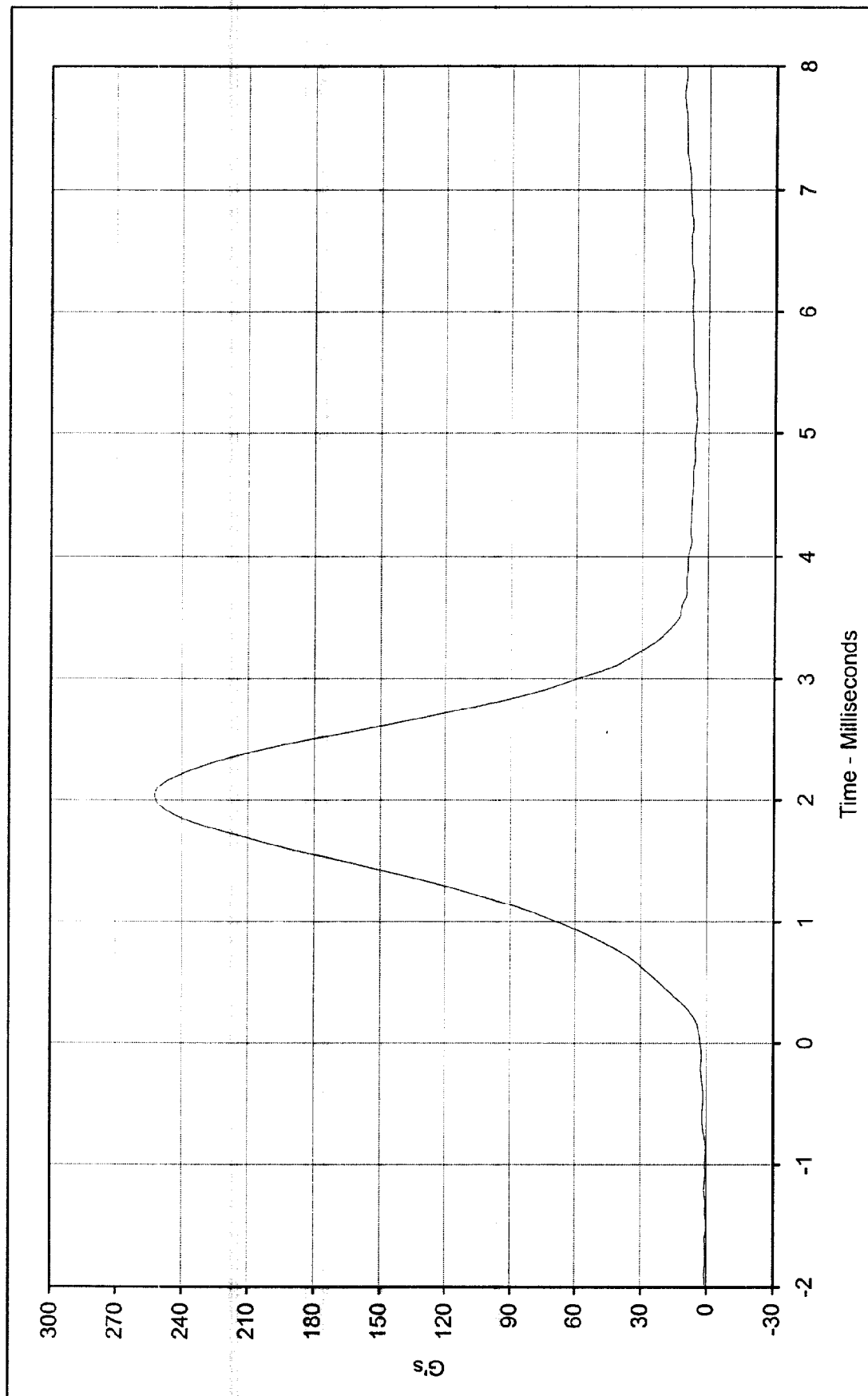
November 2, 1998

Test Date


Approved By

12/14/98

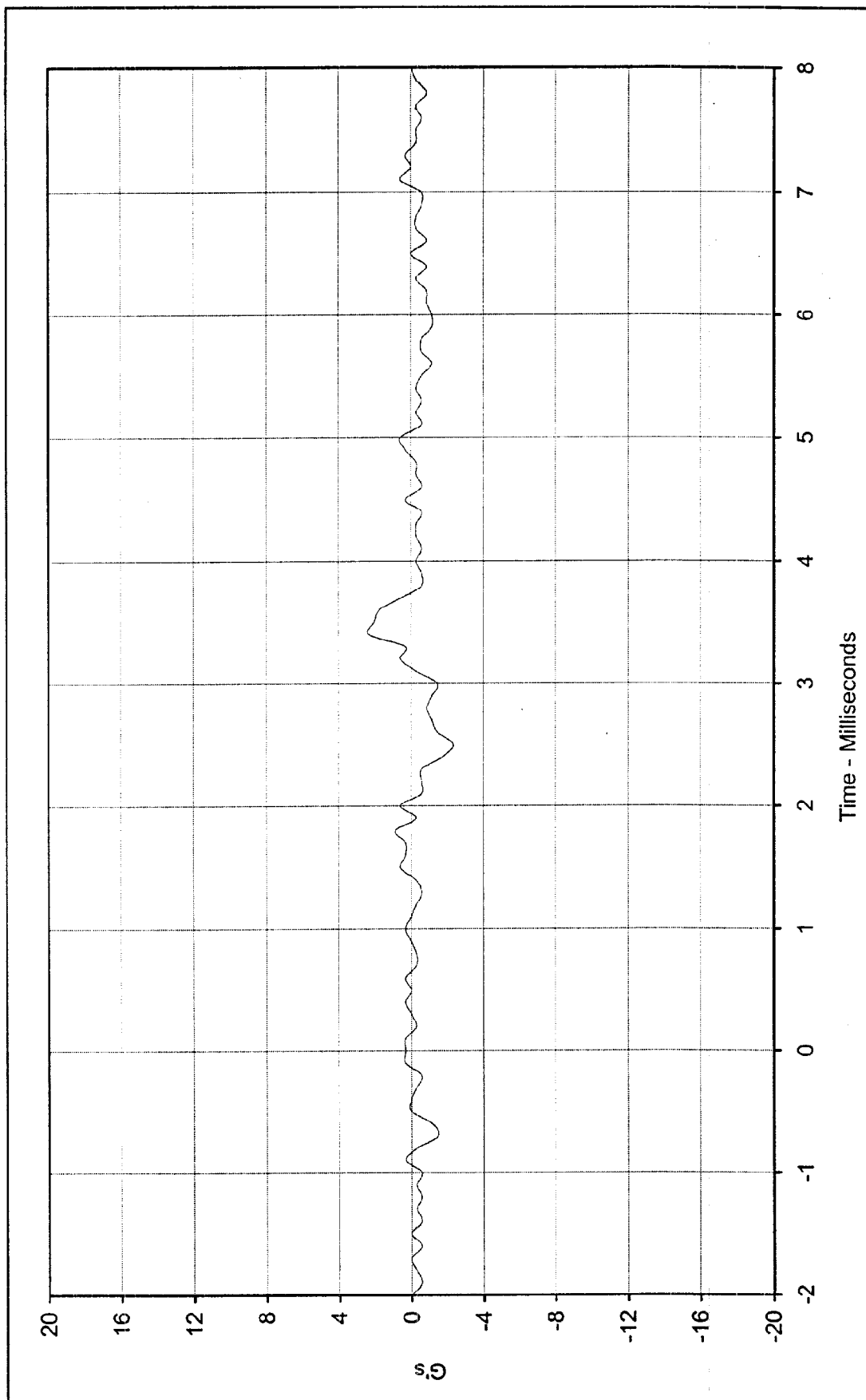
Date



Curve Description: Hybrid III Head Drop Calibration (Male)
 Testing Program: S/N of Part: n/a Test I.D.: HAD01

Head Resultant Acceleration
 Maximum Value: 251.7 at 2.0 Milliseconds
 Minimum Value: 0.0 at -1.5 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/2/98
 ATD Serial No.: 035

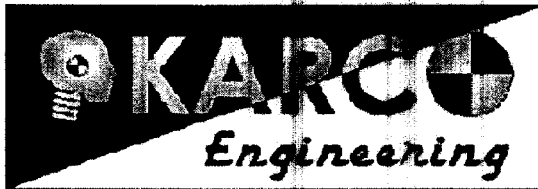




Testing Program Hybrid III Head Drop Calibration (Male)
 Test Information: S/N of Part: n/a Test I.D.: HAD01

Curve Description: Head Acceleration Y Axis
 Maximum Value: 2.3 at 3.4 Milliseconds
 Minimum Value: -2.3 at 2.5 Milliseconds
 SAE Filter Class: 1000
 Date of Test: 11/2/98
 ATD Serial No.: 035





Hybrid III Calibration Data Sheet

50TH Percentile Male

Thorax Impact Test

ATD Serial No.: 035

Part Serial No.: N/A

Test I.D.: CH35A

Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory Temperature	°C	20.6 to 22.2	21.2	Pass
Laboratory Relative Humidity	%	10 to 70	39	Pass
Probe Velocity	m/s	6.58 to 6.82	6.68	Pass
Peak Probe Force	Newtons	5159 to 5893	5755	Pass
Peak Sternum Displacement	CM	6.35 to 7.26	6.55	Pass
Internal Hysteresis	%	69 to 85	72.5	Pass
Overall Test Results				Pass

Laboratory Technician

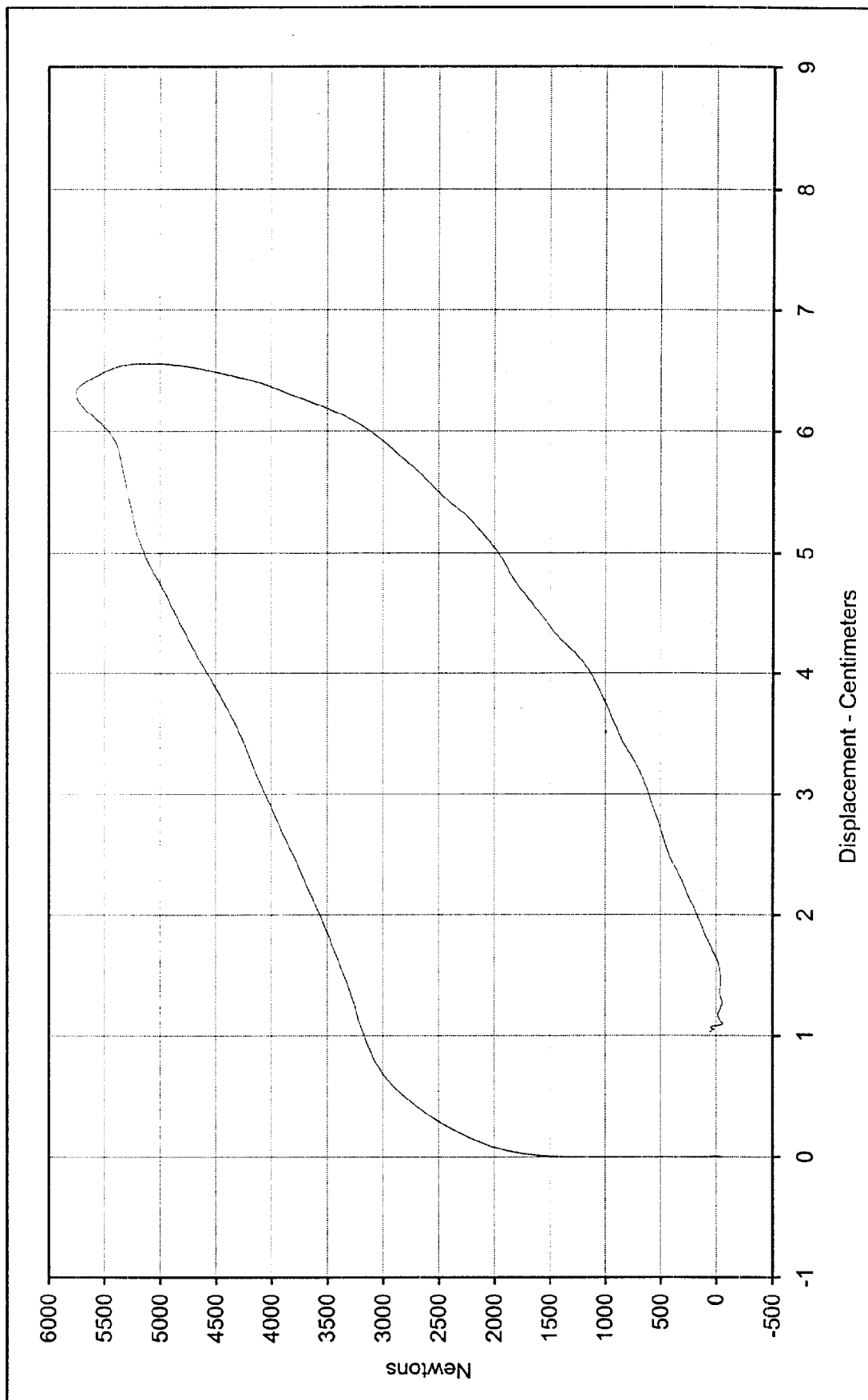
Approved By

November 13, 1998

Test Date

12/14/98

Date



Curve Description: Probe Force vs. Chest Displacement

Probe Force:	5754.6	Newton
Chest Displ.:	6.55	Centimeters
SAE Filter Class:	180	
Date of Test:	11/13/98	
ATD Serial No.:	035	

Testing Program Hybrid III Thorax Impact Test

Test Information: S/N of Part: N/A Test I.D.: CH35A





Hybrid III Calibration Data Sheet

50TH Percentile Male

Neck Flexion Test

ATD Serial No.: 035

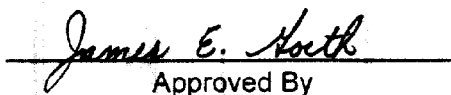
Part Serial No.: n/a

Test I.D.: NEC11

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.7	Pass
Laboratory Relative Humidity		%	10 to 70	40	Pass
Pendulum Velocity		m/s	6.89 to 7.13	6.93	Pass
Pendulum Deceleration	10 Msec.	G's	22.5 to 27.5	22.7	Pass
	20 Msec.	G's	17.6 to 22.6	20.2	Pass
	30 Msec.	G's	12.5 to 18.5	17.5	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 29.0	17.5	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	34.0 to 42.0	35.5	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	64.0 to 78.0	77.3	Pass
	Time	Msec.	57.0 to 64.0	63.9	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	113.0 to 128.0	126.1	Pass
Moment About Occipital Condyle	Maximum	N • m	84.1 to 108.5	88.6	Pass
	Time	Msec.	47.0 to 58.0	57.7	Pass
Positive Moment Decay, Time To Zero Crossing		Msec.	97.0 to 107.0	103.5	Pass
Overall Test Results					Pass



Laboratory Technician



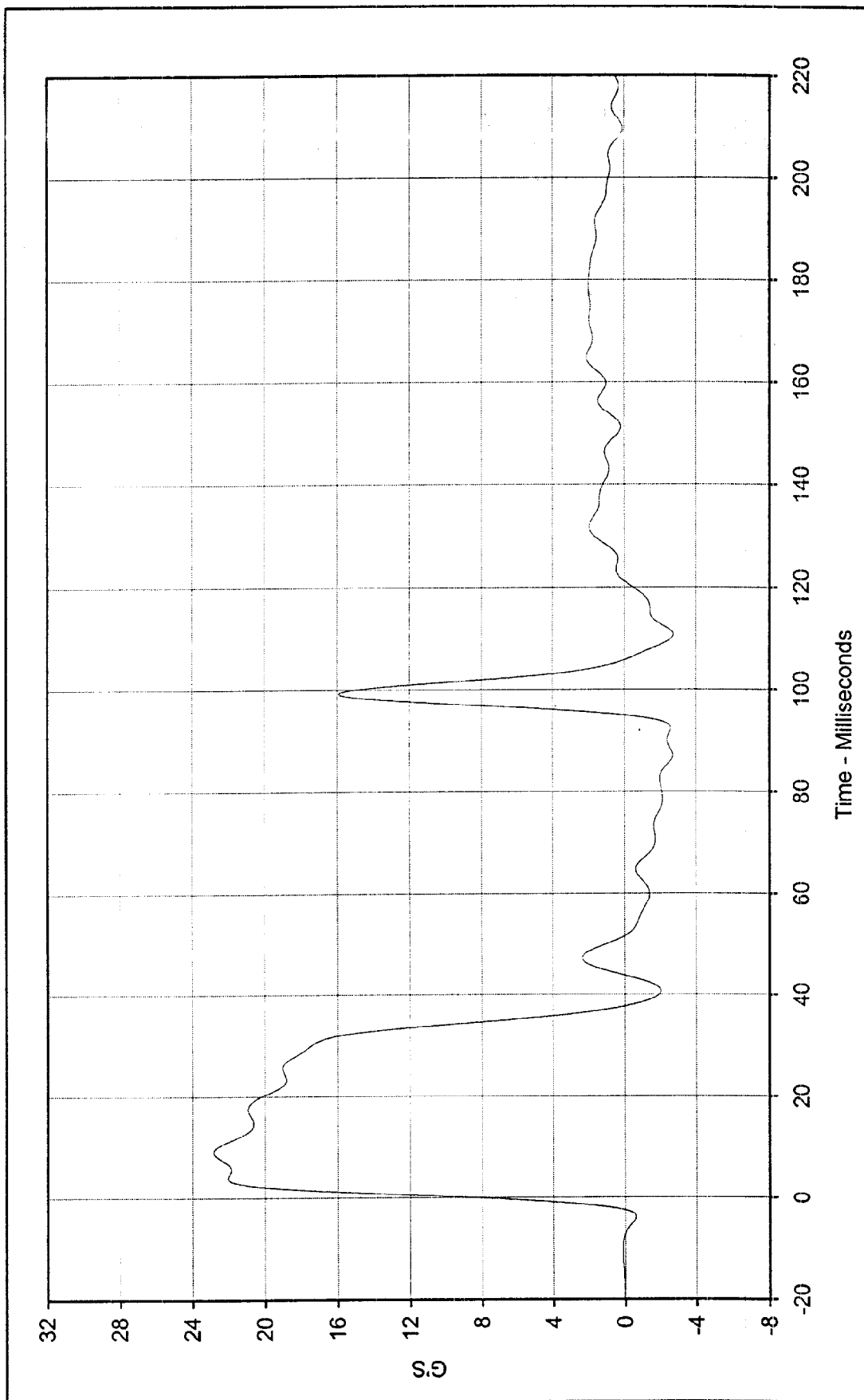
Approved By

October 30, 1998

Test Date

12/14/98

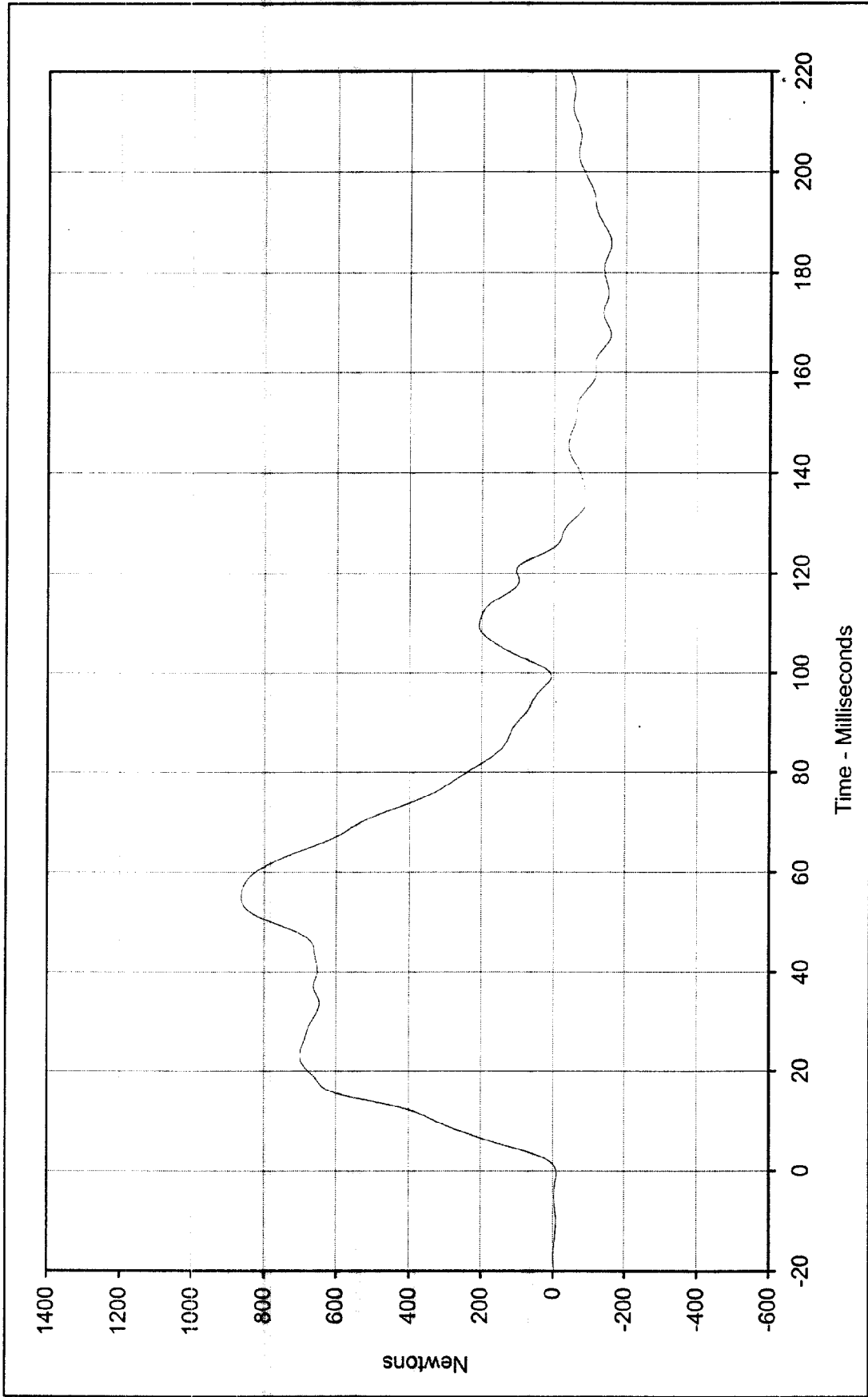
Date



Curve Description: Pendulum Deceleration Testing Program Hybrid III Neck Flexion Test (Male)
 Maximum Value: 22.8 at 9.1 Milliseconds Test Information: S/N of Part: n/a Test I.D.: NEC11
 Minimum Value: -2.7 at 110.7 Milliseconds

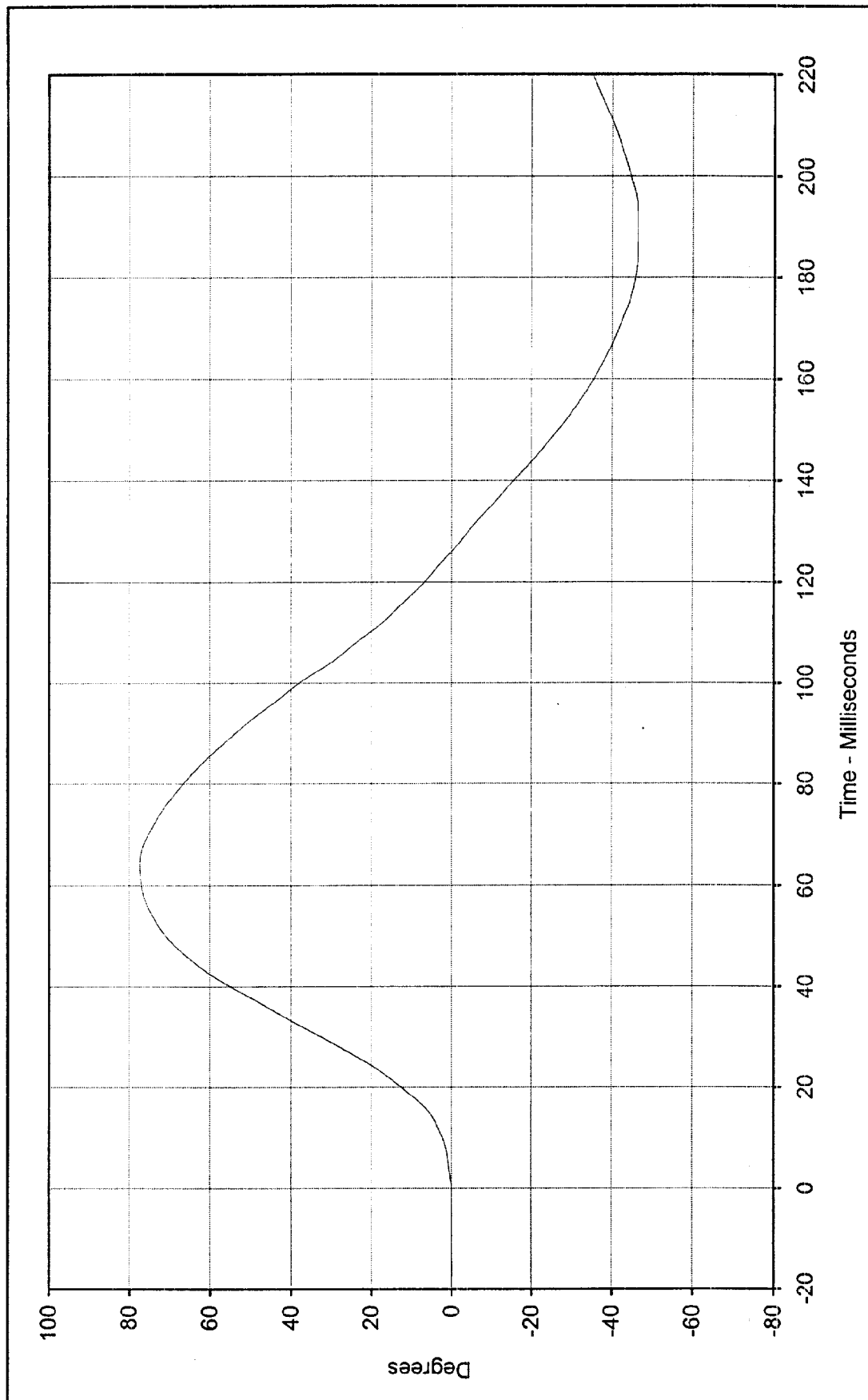


SAE Filter Class: 60
 Date of Test: 10/30/98
 ATD Serial No.: 035



Curve Description:	Neck Force X	Testing Program	Hybrid III Neck Flexion Test (Male)
Maximum Value:	862.2 at 55.0 Milliseconds	Test Information:	S/N of Part: n/a Test I.D.: NEC11
Minimum Value:	-158.4 at 185.8 Milliseconds		
SAE Filter Class:	60		
Date of Test:	10/30/98		
ATD Serial No.:	035		

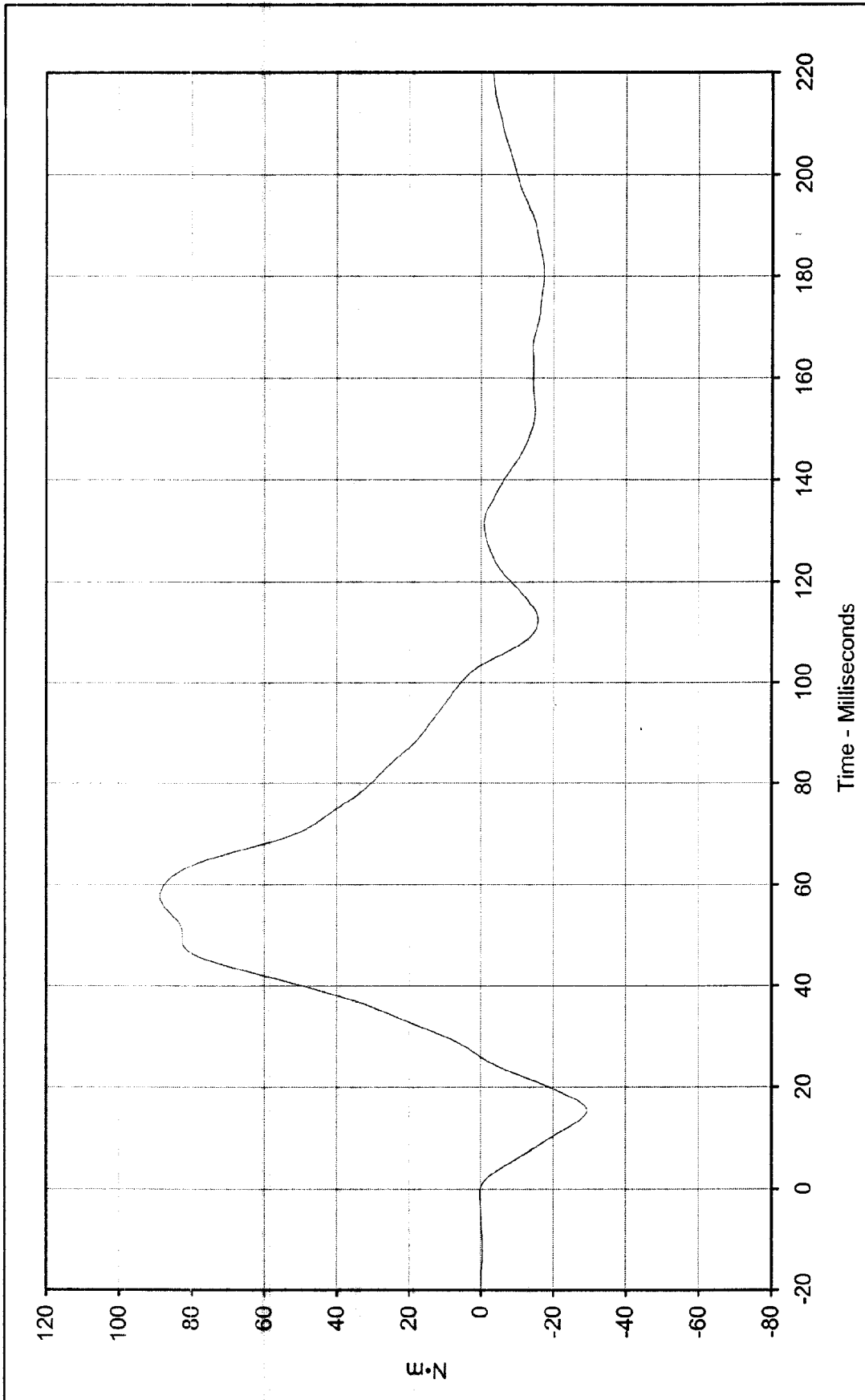




Curve Description: "D" Plane Rotation
 Maximum Value: 77.3 at 63.9 Milliseconds
 Minimum Value: -46.4 at 191.0 Milliseconds
 SAE Filter Class: 60
 Date of Test: 10/30/98
 ATD Serial No.: 035

Testing Program: Hybrid III Neck Flexion Test (Male)
 Test Information: S/N of Part: n/a Test I.D.: NEC11





Curve Description: Moment About Occipital Condyles

Maximum Value: 88.6 at 57.7 Milliseconds

Minimum Value: -29.4 at 15.3 Milliseconds

SAE Filter Class: 60

Date of Test: 10/30/98

ATD Serial No.: 035

Testing Program Hybrid III Neck Flexion Test (Male)

Test Information: S/N of Part: n/a Test I.D.: NEC11





Hybrid III Calibration Data Sheet

50TH Percentile Male

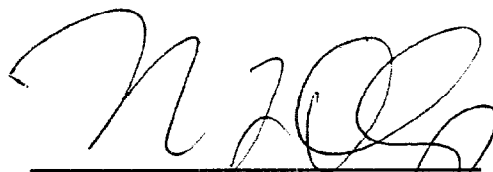
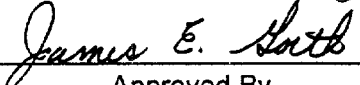
Neck Extension Test

ATD Serial No.: 035

Part Serial No.: n/a

Test I.D.: NEC12

Tested Parameter		Units	Specification	Result	Pass/Fail
Laboratory Temperature		°C	20.6 to 22.2	21.1	Pass
Laboratory Relative Humidity		%	10 to 70	36	Pass
Pendulum Velocity		m/s	5.95 to 6.19	6.08	Pass
Pendulum Deceleration	10 Msec.	G's	17.2 to 21.2	17.8	Pass
	20 Msec.	G's	14.0 to 19.0	17.6	Pass
	30 Msec.	G's	11.0 to 16.0	15.5	Pass
Peak Pendulum Decel. after 30 Msec.		G's	≤ 22.0	15.5	Pass
Deceleration Decay, Time to Cross 5 G's		Msec.	38.0 to 46.0	44.0	Pass
Maximum "D" Plane Rotation	Maximum	Degrees	81.0 to 106.0	99.0	Pass
	Time	Msec.	72.0 to 82.0	79.3	Pass
"D" Plane Rotation Decay, Time To Zero Crossing		Msec.	147.0 to 174.0	162.8	Pass
Moment About Occipital Condyle	Maximum	N • m	-52.9 to- 79.9	-68.9	Pass
	Time	Msec.	65.0 to 79.0	73.0	Pass
Negative Moment Decay, Time To Zero Crossing		Msec.	120.0 to 148.0	145.0	Pass
Overall Test Results					Pass

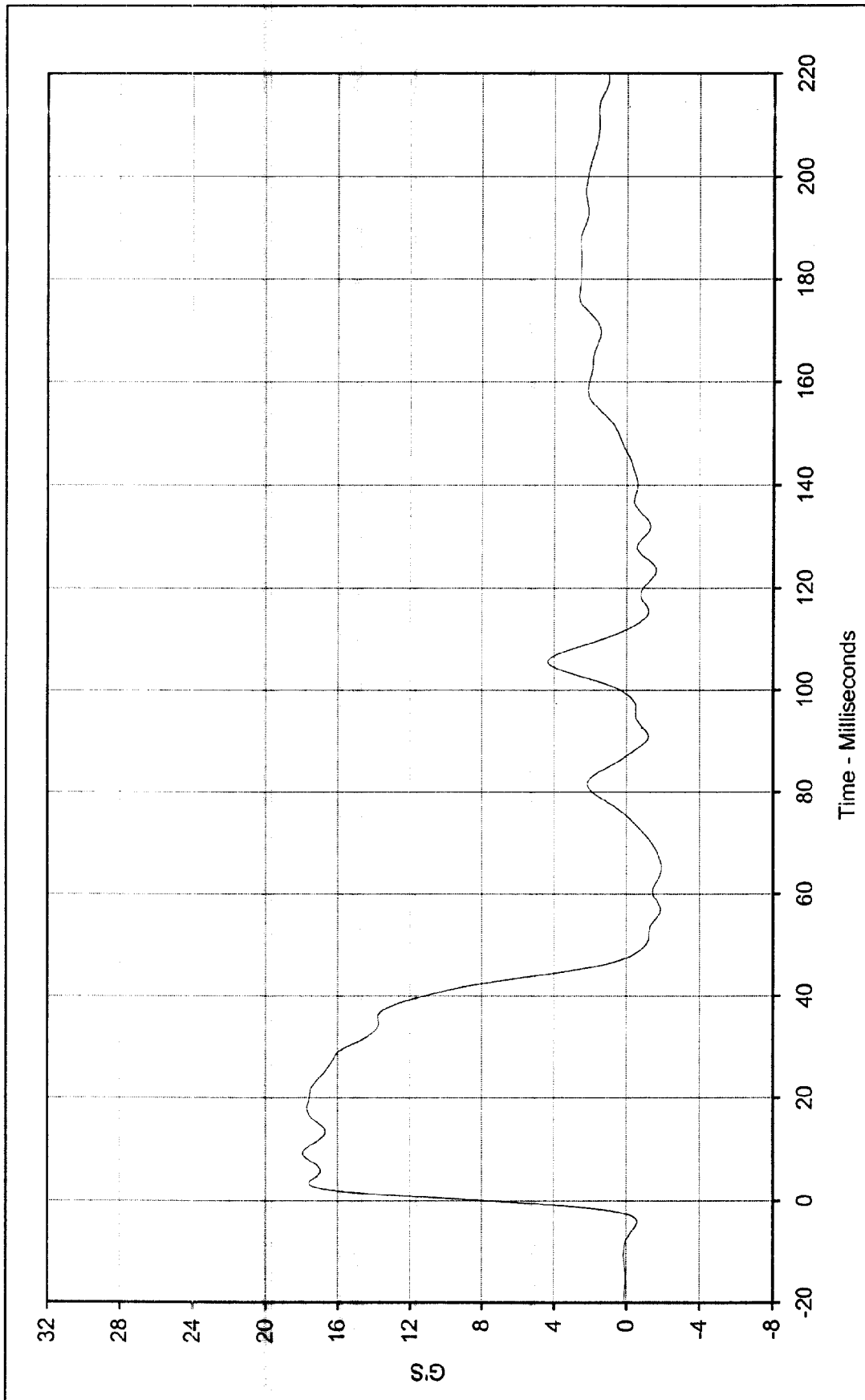

 Laboratory Technician

 Approved By

October 30, 1998

Test Date

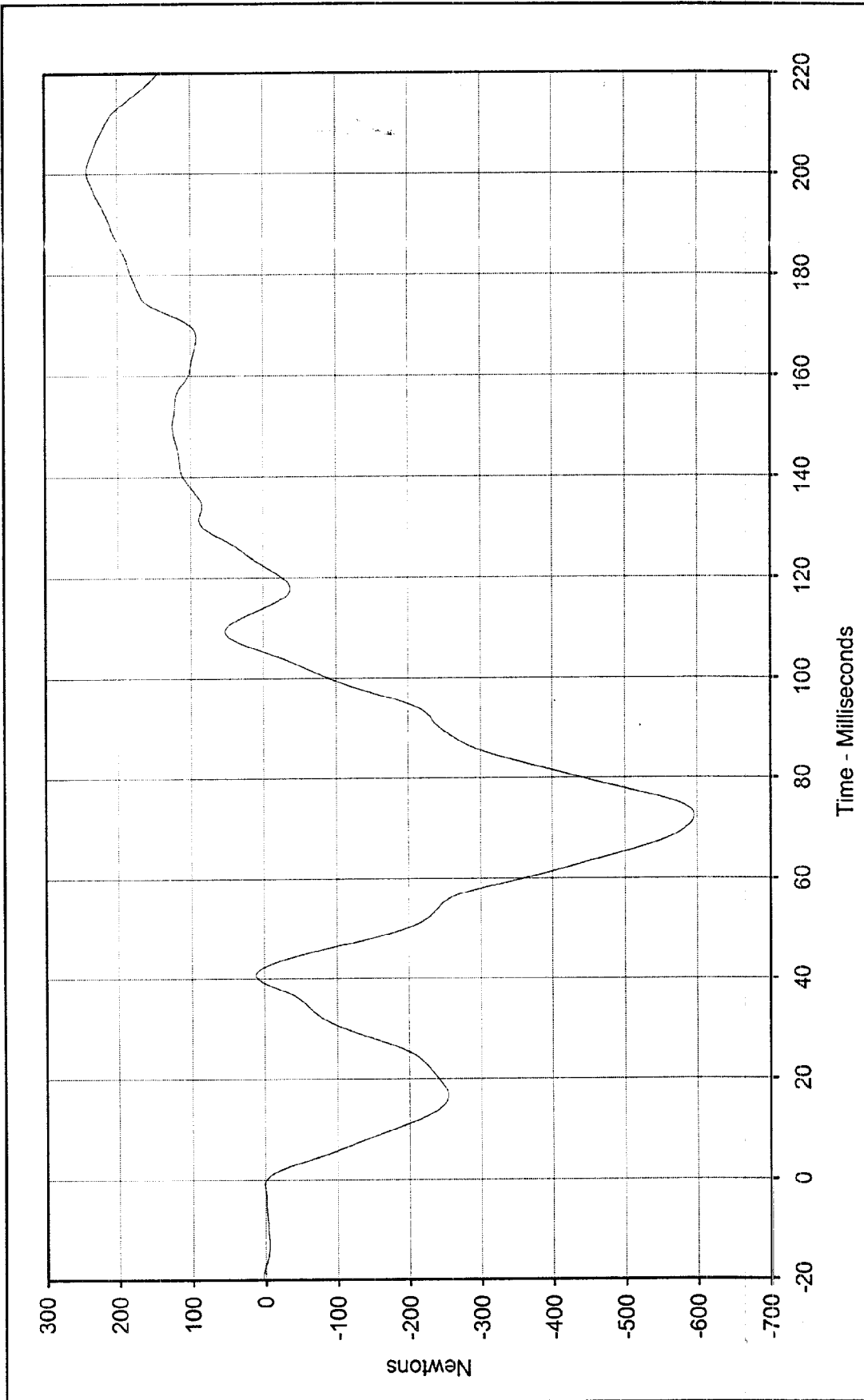
12/14/98

Date



Curve Description:	Pendulum Deceleration	Testing Program	Hybrid III Neck Extension Test (Male)
Maximum Value:	17.9 at 9.2 Milliseconds	Test Information:	S/N of Part: n/a Test I.D.: NEC12
Minimum Value:	-1.9 at 65.1 Milliseconds		
SAE Filter Class:	60		
Date of Test:	10/30/98		
ATD Serial No.:	035		

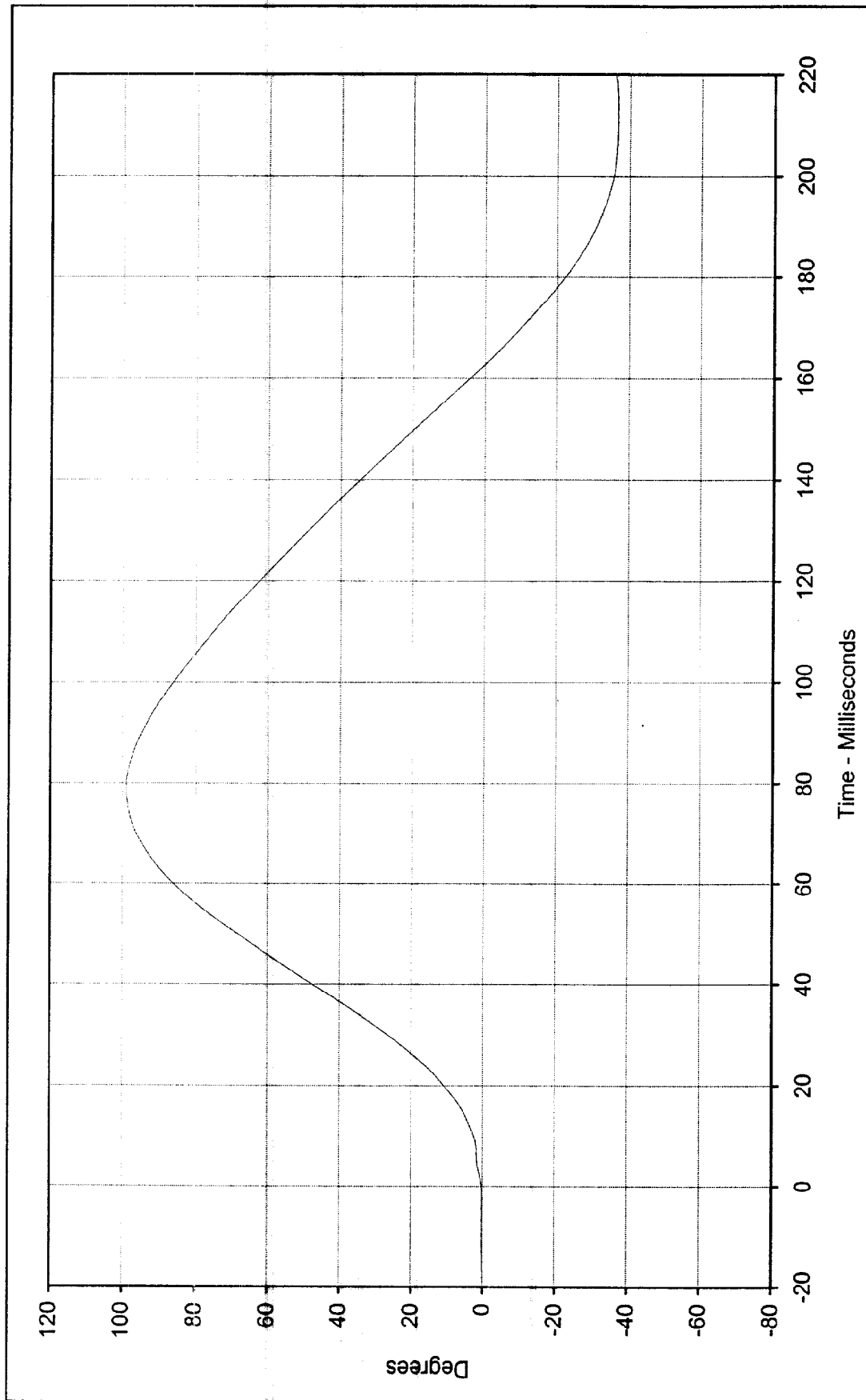




Curve Description: Neck Force X
 Maximum Value: 241.7 at 200.6 Milliseconds
 Minimum Value: -595.9 at 72.4 Milliseconds
 SAE Filter Class: 60
 Date of Test: 10/30/98
 ATD Serial No.: 035

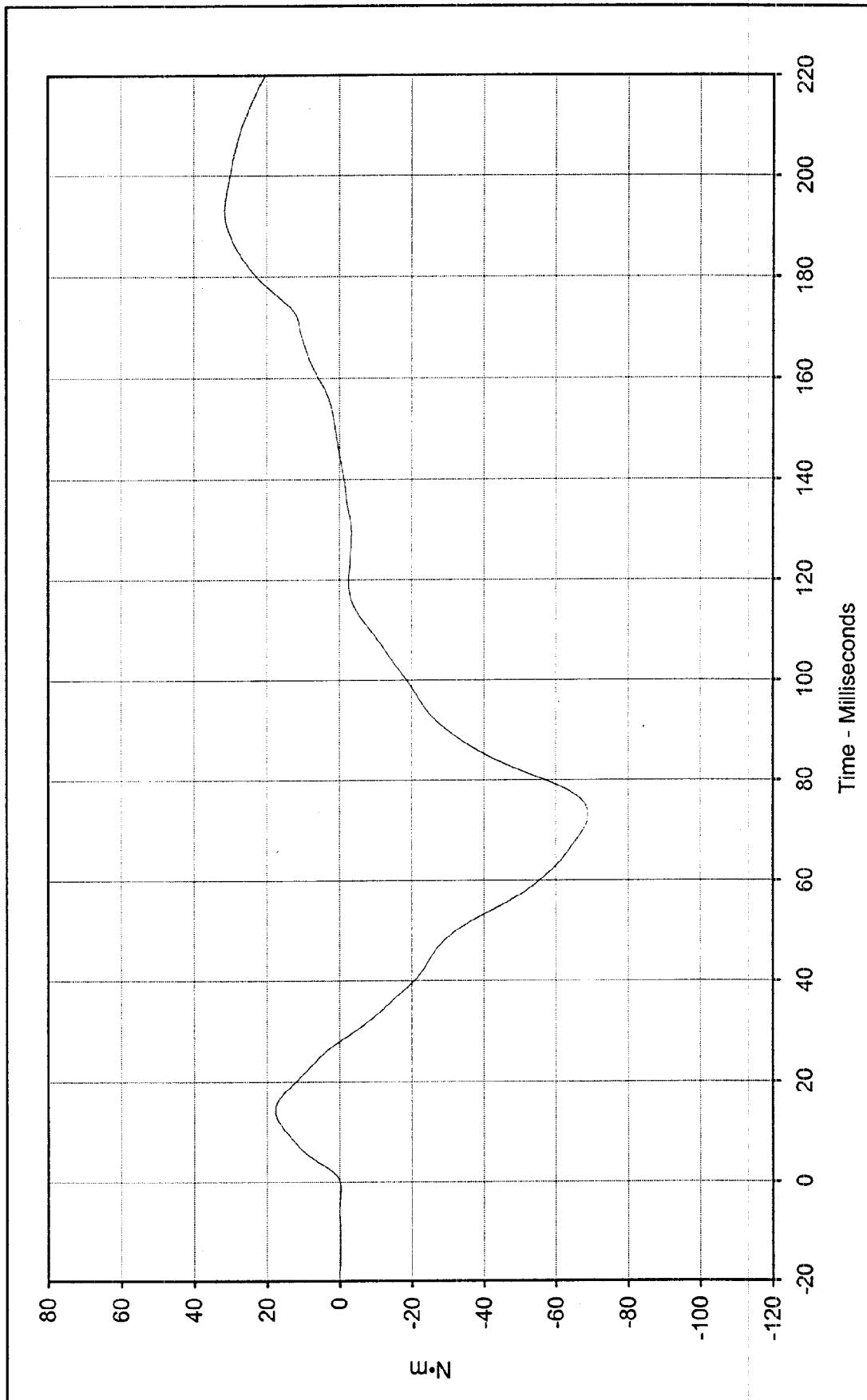
Testing Program: Hybrid III Neck Extension Test (Male)
 Test Information: S/N of Part: n/a Test I.D.: NEC12





Curve Description:	"D" Plane Rotation		Testing Program	Hybrid III Neck Extension Test (Male)	
Maximum Value:	99.0	at 79.3	Test Information:	S/N of Part: n/a	Test I.D.: NEC12
Minimum Value:	-36.7	at 210.5			
SAE Filter Class:	60				
Date of Test:	10/30/98				
ATD Serial No.:	035				



Curve Description: Moment About Occipital CondylesMaximum Value: 31.6 at 192.9 MillisecondsMinimum Value: -68.9 at 73.0 MillisecondsSAE Filter Class: 60Date of Test: 10/30/98ATD Serial No.: 035Testing Program Hybrid III Neck Extension Test (Male)Test Information: S/N of Part: n/a Test I.D.: NEC12



Hybrid III Calibration Data Sheet

50TH Percentile Male

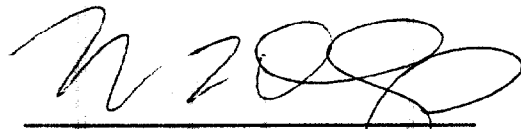
External Measurements

ATD Serial No.: 035

Part Serial No.: N/A

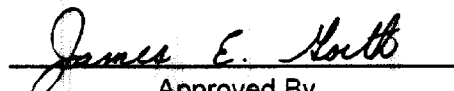
Test I.D.: N/A

External Measurement Data				
Tested Parameter	Units	Specification	Result	Pass/Fail
Laboratory temperature	°C	20.4 to 22.1	21.9	Pass
Laboratory relative humidity	%	10 to 70	44	Pass
A - Total sitting height	mm	878.8 to 889.0	888.5	Pass
B - Shoulder pivot height	mm	505.5 to 520.7	507.5	Pass
C - "H" point height	mm	83.8 to 88.9	88.0	Pass
D - "H" point from seat back	mm	134.6 to 139.7	136.0	Pass
E - Shoulder pivot from back	mm	83.8 to 94.0	92.0	Pass
F - Thigh clearance	mm	139.7 to 154.9	153.0	Pass
G - Elbow back to wrist pivot	mm	289.6 to 304.8	300.1	Pass
H - Skull cap to back line	mm	40.6 to 45.7	44.0	Pass
I - Shoulder to elbow length	mm	330.2 to 345.4	340.0	Pass
J - Elbow rest height	mm	190.5 to 210.8	206.0	Pass
K - Buttock to knee length	mm	579.1 to 604.5	602.5	Pass
L - Popliteal length	mm	429.3 to 454.7	445.0	Pass
M - Knee pivot height	mm	485.1 to 500.4	489.5	Pass
N - Buttock popliteal length	mm	452.1 to 477.5	470.0	Pass
O - Chest depth	mm	213.4 to 228.6	226.7	Pass
P - Foot length	mm	251.5 to 266.7	265.0	Pass
V - Shoulder breadth	mm	421.6 to 436.9	431.0	Pass
W - Foot breadth	mm	91.4 to 106.7	105.2	Pass
Y - Chest circumference	mm	970.3 to 1000.8	990.0	Pass
Z - Waist circumference	mm	835.7 to 866.1	863.0	Pass
AA - Location for chest circumference	mm	429.3 to 434.3	430.0	Pass
BB - Location for waist circumference	mm	226.1 to 231.1	229.0	Pass
Overall Test Results				Pass


 Laboratory Technician

November 16, 1998

Test Date


 Approved By

12/14/98

Date

APPENDIX F
VEHICLE OWNER'S MANUAL
OCCUPANT RESTRAINT INSTRUCTIONS

KAR99001-02



Seats and Restraint Systems

Here you'll find information about the seats in your Saturn, and how to use your safety belts properly. You can also learn about some things you should **not** do with air bags and safety belts.

SEATS AND SEAT CONTROLS

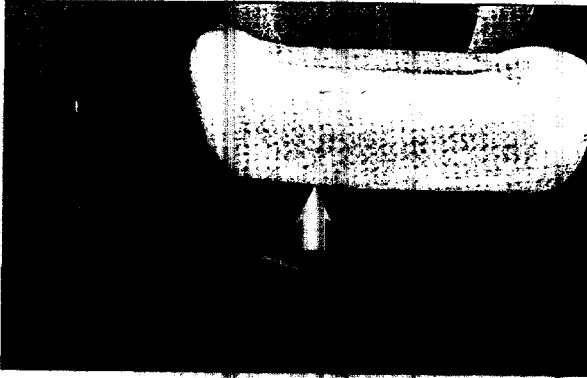
This section tells you about the seats -how to adjust them, and also about reclining front seatbacks, and head restraints.

Manual Seat

CAUTION

You can lose control of the vehicle if you try to adjust a manual driver's seat while the vehicle is moving. The sudden movement could startle and confuse you, or make you push a pedal when you don't want to. Adjust the driver's seat only when the vehicle is not moving.

Lift the lever under the front seat to unlock it. Slide the seat to where you want it. Then release the lever and try to move the seat with your body, to make sure the seat is locked into place.



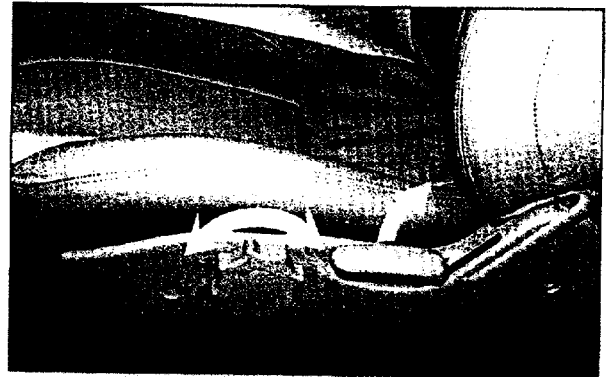
Seat Cushion Adjuster (Option)

Turn the knob to raise or lower your seat cushion.

Reclining Front Seatback(s)

To adjust the seatback, lean forward slightly and lift the lever on the outer side of the seat. Adjust to a comfortable position and release the lever, pushing down to assure the seatback is locked.

Don't have a seatback reclined when your vehicle is moving.



CAUTION

Sitting in a reclined position when your vehicle is in motion can be dangerous. Even if you buckle up, your safety belts can't do their job when you're reclined like this.



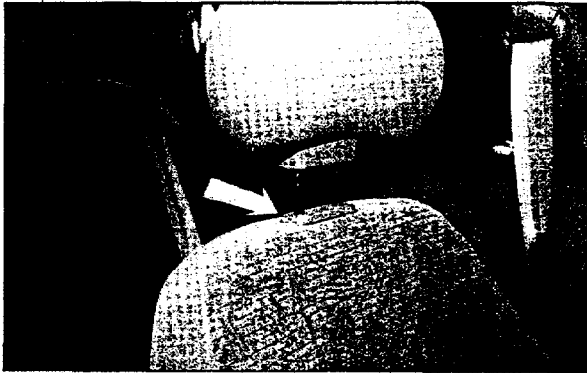
CAUTION (Continued)

The shoulder belt can't do its job. In a crash you could go into it, receiving neck or other injuries. The lap belt can't do its job either. In a crash the belt could go up over your abdomen. The belt forces would be there, but not at your pelvic bones. This could cause serious internal injuries.

Also, in a crash you could slip out from under the lap belt and be thrown out of the car and seriously injured.

For proper protection when the vehicle is in motion, have the seatback upright. Then sit well back in the seat and wear your safety belt properly.

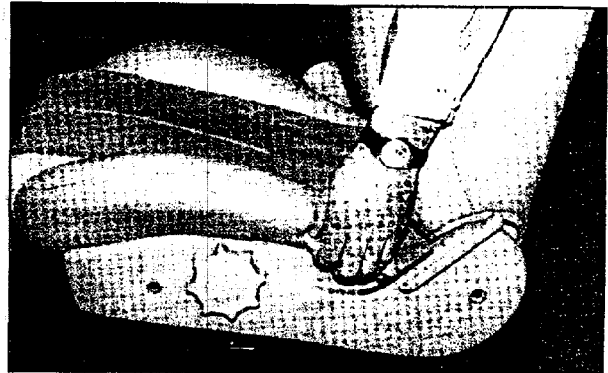
Head Restraints (SL2, SW2, SC2 Models Only)



Slide the head restraint up or down so that the top of the restraint is closest to the top of your ears. This position reduces the chance of a neck injury in a crash.

There are four positions available. When the head restraint is raised to the highest position, it locks into place. To lower the head restraint from this position, you must push the release button towards the rear of the vehicle and push the restraint downward.

Driver's Seatback Latch



On SC1 and SC2 models, the driver's seatback folds forward to let people get into the back seat.

To fold the seatback forward, pull this latch and the seatback will fold forward.

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To return the seatback to the upright position, just push the seatback rearward.

When you return the seatback to its upright position, make sure the seatback is locked.

CAUTION

Always press rearward on the seatback to be sure it is locked. If it isn't, the seatback could move forward in a sudden stop or crash, and that could cause injury to the person sitting there.

Easy Entry Seat (SC1, SC2 Models Only)

The right front passenger seat of your vehicle makes it easy to get in and out of the rear seat.

When you pull up on the recliner release lever, the seatback will tilt forward and the whole seat will slide forward.

After someone gets into the rear seat area, move the seatback to its upright position, and slide the seat rearward until it locks. The seat will return to approximately the middle of the seat track.

CAUTION

If an easy entry right front seat isn't locked, it can move. In a sudden stop or crash, the person sitting there could be injured. After you've used it, be sure to push rearward on an easy entry seat to be sure it is locked.

To get out of the rear seat area, pull up on the recliner release lever. The seatback will tilt forward and the whole seat will slide forward.

Driver's Lumbar Support (SL2, SC2, SW2 Models Only)

Support of the lower back (lumbar) can be adjusted by moving the lever on the inner side of the seatback. Support is increased by pulling the lever forward and down. The lever has three positions. The upward position gives the least support, the middle position gives moderate support, and the lower position gives maximum support.



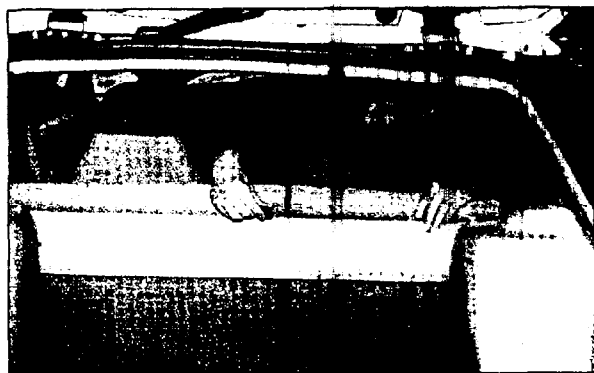
Split Fold-Down Rear Seatback

Your Saturn is equipped with split fold-down rear seatbacks. This feature is designed to increase the cargo area of your Saturn. The sedan and coupe models allow either section to be lowered independently. The station wagon is designed to allow the right side rear seatback to be lowered independently. Lowering the left side rear seatback will also lower the right side rear seatback. To fold down the right section of the seatback, pull on the strap on the corner of the seatback.



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To lower the station wagon full rear seatback, push downward on the push knob located in the center of the rear seatback. When you fold the seatback up, be sure the latches engage by pushing rearward with your hand over the latch locations and then by pulling on them to ensure that all latches are secure.



CAUTION

Always pull forward on the top of the seatback at the area of the latch to be sure it is locked. If it isn't, the seatback could move forward in a sudden stop or crash, and that could cause injury to the occupants.

Seats and Restraint Systems

13

SAFETY BELTS: THEY'RE FOR EVERYONE

This section of the manual tells you how to use safety belts properly. It also tells you some things you should not do with safety belts. And it explains the Supplemental Inflatable Restraint or "air bag" system.

CAUTION

Don't let anyone ride where he or she can't wear a safety belt properly. If you are in a crash and you're not wearing a safety belt, your injuries can be *much* worse. You can hit things inside the vehicle or be ejected from it. You can be seriously injured or killed. In the same crash, you might not be injured or killed if you are buckled up. Always fasten your safety belt, and check that your passengers' belts are fastened properly too.

CAUTION

It is extremely dangerous to ride in a cargo area, inside or outside of a vehicle. In a collision, people riding in these areas are more likely to be seriously injured or killed.

Do not allow people to ride in any area of your vehicle that is not equipped with seats and safety belts.

Be sure everyone in your vehicle is in a seat and using a safety belt properly.

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Your vehicle has a light that comes on as a reminder to buckle up. (See "Safety Belt Reminder Light" in the Index.) In most states and Canadian provinces, the law says to wear safety belts. Here's why: **They work.**

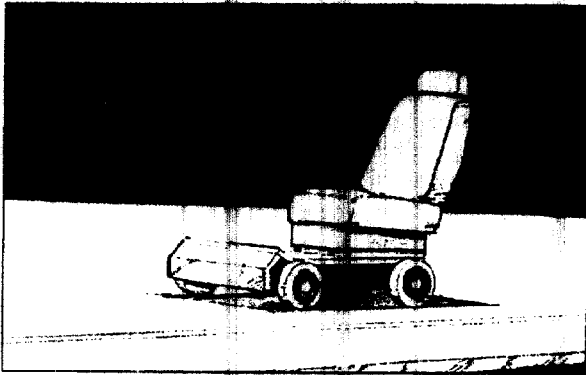
You never know if you'll be in a crash. If you do have a crash, you don't know if it will be a bad one.

A few crashes are mild, and some crashes can be so serious that even buckled up a person wouldn't survive. But most crashes are in between. In many of them, people who buckle up can survive and sometimes walk away. Without belts, they could have been badly hurt or killed.

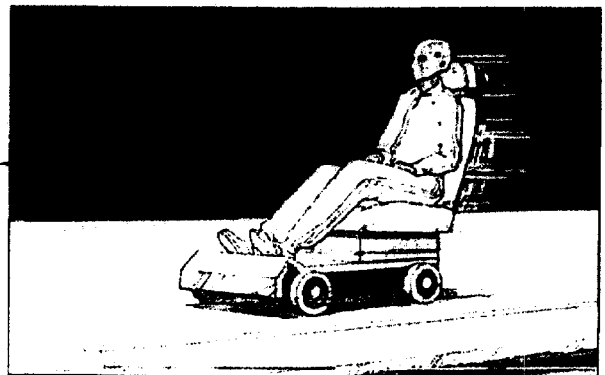
After more than 30 years of safety belts in vehicles, the facts are clear. In most crashes buckling up does matter ... a lot!

WHY SAFETY BELTS WORK

When you ride in or on anything, you go as fast as it goes.

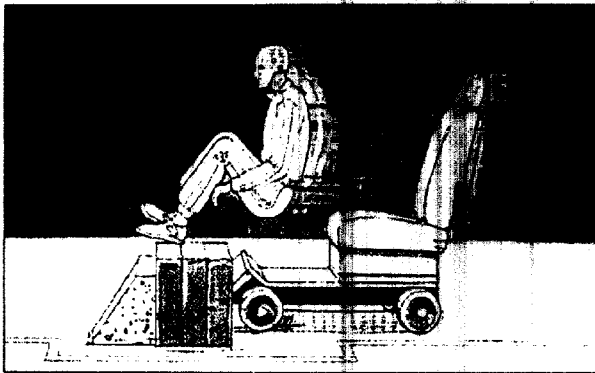


Take the simplest vehicle. Suppose it's just a seat on wheels.



Put someone on it.

16



Get it up to speed. Then stop the vehicle. The rider doesn't stop.



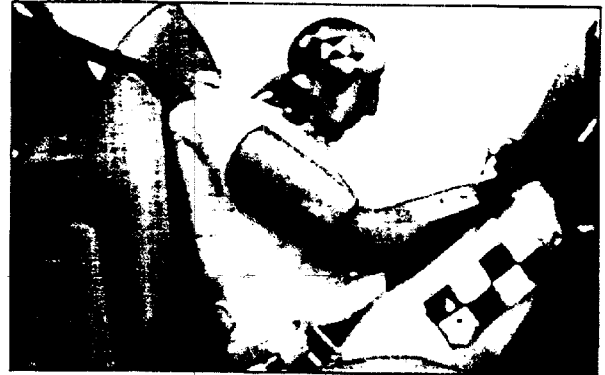
The person keeps going until stopped by something. In a real vehicle, it could be the windshield ...

Seats and Restraint Systems

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or the instrument panel ...



or the safety belts!

With safety belts, you slow down as the vehicle does. You get more time to stop. You stop over more distance, and your strongest bones take the forces. That's why safety belts make such good sense.

Here Are Questions Many People Ask About Safety Belts — and the Answers

Q: Won't I be trapped in the vehicle after an accident if I'm wearing a safety belt?

A: You could be — whether you're wearing a safety belt or not. Safety belts can be unbuckled, even if you're upside down. Your chance of being conscious during and after an accident, so you **can** unbuckle and get out, is much greater if you are wearing your belt.

Q: If my vehicle has air bags, why should I have to wear safety belts?

A: "Air Bags," or Supplemental Inflatable Restraint systems, are standard for the driver and front passenger. They are supplemental systems only — so they work with safety belts, not instead of them. Every "air bag" system ever offered for sale has required the use of safety belts. Even if you're in a vehicle that has "air bags," you still have to buckle up to get the most protection. That's true not only in frontal collisions, but especially in side and other collisions.

Q: If I'm a good driver, and I never drive far from home, why should I wear safety belts?

A: You may be an excellent driver, but if you're in an accident — even one that isn't your fault — you and your passengers can be hurt. Being a good driver doesn't protect you from things beyond your control, such as bad drivers.

Most accidents occur within 25 miles (40 km) of home. And the greatest number of serious injuries and deaths occur at speed of less than 40 m.p.h. (65 km/h).

Safety belts are for everyone.

HOW TO WEAR SAFETY BELTS PROPERLY

Adults

This section is for people of adult size only.

Be aware that there are special things to know about safety belts and children. And there are different rules for babies and smaller children. If a child will be riding in your Saturn, see the section called "Children." Follow those rules for everyone's protection.

First, you'll want to know which restraint systems your vehicle has. We'll start with the driver position.

DRIVER POSITION

This section describes the driver's restraint system.

Lap-Shoulder Belt

The driver has a lap-shoulder belt. Here's how to wear it properly.

1. Close and lock the door.
2. Adjust the seat (to see how, see the Index under "Seats.") so you can sit up straight.

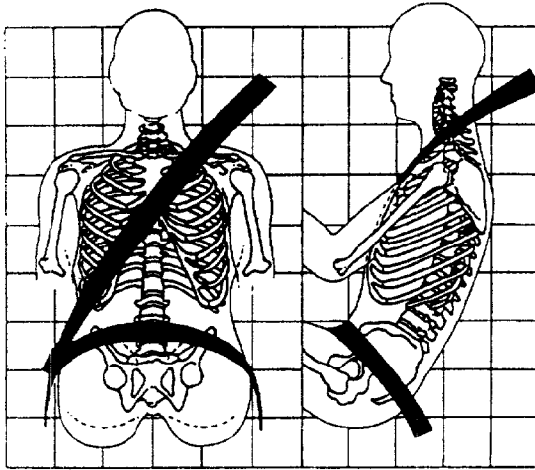


3. Pick up the latch plate and pull the belt across you. Don't let it get twisted. The safety belt may lock if you pull the belt across you very quickly. If this happens, let the belt go back slightly to unlock it. Then pull the belt across you more slowly.
4. Push the latch plate into the buckle until it clicks. Pull up on the latch plate to make sure it is secure. If the belt stops before it reaches the buckle, let it go back all the way and start again.

Make sure the release button on the buckle is positioned so you would be able to unbuckle the safety belt quickly if you ever had to.



5. To make the lap part tight, pull down on the buckle end of the belt as you pull up on the shoulder belt.



The lap part of the belt should be worn low and snug on the hips, just touching the thighs. In a crash, this applies force to the strong pelvic bones. And you'd be less likely to slide under the lap belt. If you slid under it, the belt would apply force at your abdomen. This could cause serious or even fatal injuries. The shoulder belt should go over the shoulder and across the chest. These parts of the body are best able to take belt restraining forces.

The safety belt locks if there's a sudden stop or crash, or if you pull the belt quickly enough out of the retractor.

Shoulder Belt Height Adjuster (SL1, SL2, SW1 S W2 Models Only)

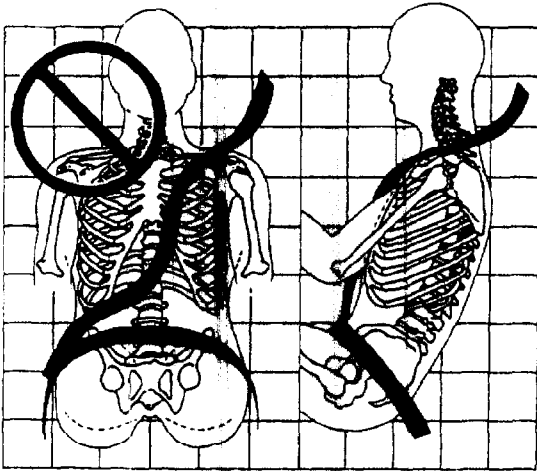


To move it up or down, grasp the adjuster knob and move the height adjuster to the desired position. After you move the adjuster to where you want it, try to move it down without touching the knob to make sure it has locked into position.

Adjust the height so that the shoulder portion of the belt is centered on your shoulder. The belt should be away from your face and neck, but not falling off your shoulder.

Before you begin to drive, move the shoulder belt adjuster to the height that is right for you.

Q: What's wrong with this?



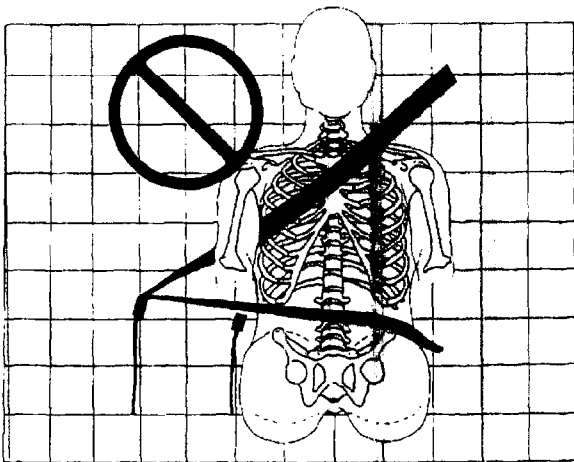
A: The shoulder belt portion of the safety belt is too loose. It won't give nearly as much protection this way.

 CAUTION

You can be seriously hurt if your shoulder belt is too loose. In a crash you would move forward too much, which could increase injury. The shoulder belt should fit against your body.

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Q: What's wrong with this?

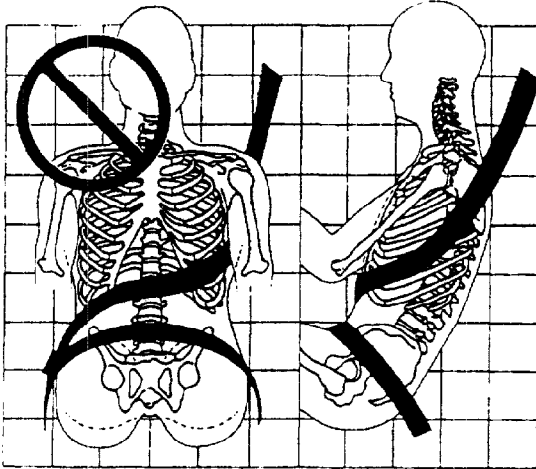


A: The belt is buckled in the wrong place.

 CAUTION

You can be seriously hurt if your belt is buckled in the wrong place like this. In a crash, the belt would go up over your abdomen. The belt forces would be there, not at the pelvic bones. This could cause serious internal injuries. Always buckle your belt into the buckle nearest you.

Q: What's wrong with this?



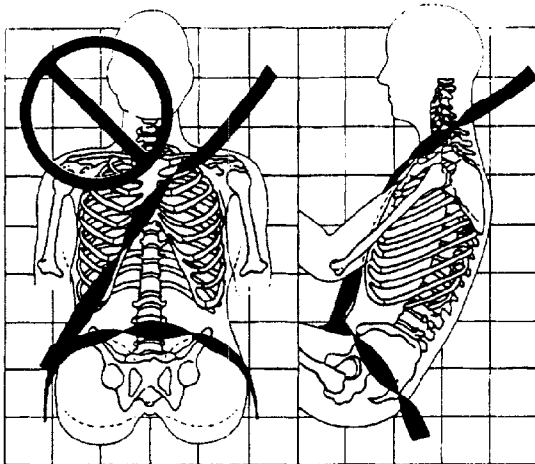
A: The shoulder belt is worn under the arm. It should be worn over the shoulder at all times

 CAUTION

You can be seriously injured if you wear the shoulder belt under your arm. In a crash, your body would move too far forward, which would increase the chance of head and neck injury. Also, the belt would apply too much force to the ribs, which aren't as strong as shoulder bones. You could also severely injure internal organs like your liver or spleen.

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Q: What's wrong with this?



A: The belt is twisted across the body.

 CAUTION

You can be seriously injured by a twisted belt. In a crash, you wouldn't have the full width of the belt to spread impact forces. If a belt is twisted, make it straight so it can work properly, or ask your Saturn retailer to fix it.



To unlatch the safety belt, just push the button on the buckle. The belt should go back out of the way.

Before you close the door, be sure the belt is out of the way. If you slam the door on it, you can damage both the belt and your vehicle.

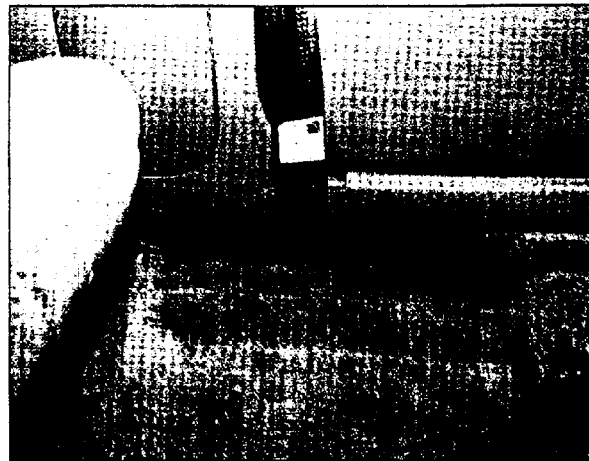
Shoulder Belt Presenter (SC1, SC2 Models Only)



The SC front driver- and passenger positions have a presenter arm feature attached to the shoulder portion of the safety belt.

The presenter arm helps position the belt forward to decrease the effort needed to reach the latch plate of the safety belt, especially when the seat is in the full forward position.

1. While standing outside of the vehicle, position the arm towards the front of the vehicle (if the arm is not already in that position).
2. Sit in the vehicle and adjust the seat so you can sit up straight.
3. Fasten your safety belt. (See "How to Wear Safety Belts Properly" in the previous pages in this section.)



4. Position the arm so that the shoulder portion of the belt is centered on your shoulder. The belt should be away from your face and neck, but not falling off your shoulder.

CAUTION

The safety belt webbing on the slide bar must be free to move with the presenter arm. Do not place any items between the slide bar and the interior trim of the vehicle. Items placed in the way of the safety belt will not allow the presenter arm to do its job. You or others could be injured.

Rear Seat Entry/Exit

To gain access to the rear seat, push the presenter arm down and rearward until it is completely out of the door opening. The lower portion of the belt will also slide completely out of the door opening, allowing access to the rear seat.

NOTICE

Do not use the presenter arm as an aid to exit the vehicle. Using the presenter arm in this way will break it.

Right Front Passenger Position

To learn how to wear the right front passenger's safety belt properly, see "Driver Position" earlier in this section. The right front passenger's safety belt works in much the same way as the driver's safety belt -- except for one thing.

If you ever pull the shoulder portion of the belt out all the way, you will engage the child restraint locking feature. If this happens, just let the belt go back all the way and start again.

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SUPPLEMENTAL INFLATABLE RESTRAINT SYSTEM — "AIR BAG"

This section explains the Supplemental Inflatable Restraint (SIR) or "Air Bag" system. Your Saturn has dual "Reduced Force" frontal air bags -- one for the driver and another air bag for the right front passenger.

Reduced Force frontal air bags are designed to help reduce the risk of injury from the force of an inflating air bag. But even these air bags must inflate very quickly if they are to do their job and comply with federal regulations. Here are the most important things to know about the air bag system:

CAUTION

Children who are up against, or very close to, an air bag when it inflates can be seriously injured or killed. This is true even though your vehicle has dual Reduced Force air bags. Air bags plus lap-shoulder belts offer the best protection for adults and older children, but not for young children and infants.

CAUTION (Continued)

Neither the vehicle's safety belt system nor its air bag system is designed for them. Young children and infants need the protection that a child restraint system can provide. Always secure children properly in your vehicle. To read how, see the part of this manual called "Children" and see the caution labels on the sunvisors and the right front passenger's safety belt.

CAUTION

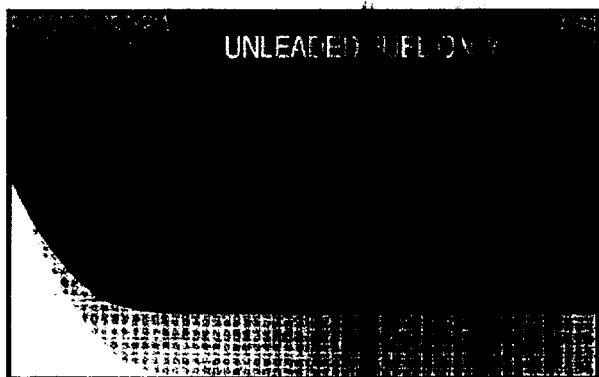
Air bags inflate with great force, faster than the blink of an eye. If you're too close to an inflating air bag, it could seriously injure you. This is true even with Reduced Force frontal air bags. Safety belts help keep you in position before and during a crash. Always wear your safety belt, even with Reduced Force air bags. The driver should sit as far back as possible while still maintaining control of the vehicle.

CAUTION

You can be severely injured or killed in a crash if you aren't wearing your safety belt - even if you have air bags. Wearing your safety belt during a crash helps reduce your chance of hitting things inside the vehicle or being ejected from it. Air bags are "supplemental restraints" to the safety belts. All air bags - even Reduced Force air bags are designed to work with safety belts, but don't replace them. Air bags are designed to work only in moderate to severe crashes where the front of your vehicle hits something. They aren't designed to inflate in rollover, rear, side, or low-speed frontal crashes. And, for unrestrained occupants, Reduced Force air bags may provide less protection in frontal crashes than more forceful air bags have provided in the past. Everyone in your vehicle should wear a safety belt properly - whether or not there's an air bag for that person.

Air Bag Readiness Light

There is an air bag readiness light on the instrument panel which shows a driver or right-front passenger properly belted, with an inflated air bag labeled as "air bag". The diagnostic system checks the air bag's electrical system for malfunctions. The light tells you if there is an electrical problem.



You will see the light flash seven times when you turn your ignition to "RUN" or "START."

Then the light should go out, which means the system is ready.

Remember, if the air bag readiness light doesn't come on when you start your vehicle, or stays on, or comes on when you are driving, your air bag system may not work properly. Have your vehicle serviced right away.

How the Air Bag System Works



Q: Where are the air bags?

A: The driver's air bag is in the middle of the steering wheel. The right-front passenger's air bag is located in the instrument panel on the passenger's side.



Q: When should an air bag inflate?

A: An air bag is designed to inflate in moderate to severe frontal or near-frontal crashes. The air bag will inflate only if the impact speed is above the system's designed "threshold level". If your Saturn went straight into a wall that didn't move or deform, the threshold level is about 10 to 15 m.p.h. (16 to 24 km/h).

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The threshold level can vary, however, with specific vehicle design, so that it can be somewhat above or below this range. If your Saturn strikes something that will move or deform, such as a parked car, the threshold level will be higher. The air bags are also not designed to inflate in rollovers, side impacts, or rear impacts because inflation would not help the occupant. It is possible that in a crash only one of the two air bags in your Saturn will deploy. This is rare, but can happen in a crash just severe enough to make an air bag inflate.

In any particular crash, no one can say whether the airbag(s) should have inflated simply because of the damage to a vehicle or because of what the repair costs were. Inflation is determined by the angle of the impact and how quickly the vehicle slows down in frontal or near-frontal impacts.

Q: What makes an air bag inflate?

A: In an impact of sufficient severity, the air bag sensing system detects that the vehicle is in a crash. The sensing system triggers a release of gas from the inflator, which inflates the air bag. The inflator, air bag and related hardware are all part of the air bag modules inside the steering wheel and in the instrument panel in front of the right front passenger.

Q: How does an air bag restrain?

A: In moderate to severe frontal or near-frontal collisions, even belted occupants can contact the steering wheel or instrument panel. Air bags supplement the protection provided by safety belts. Air bags distribute the force of the impact more evenly over the occupant's upper body, stopping the occupant more gradually. But, air bags would not help you in many types of collisions, including rollovers, rear and side impacts, primarily because an occupant's motion is not toward those air bags. Air bags should never be regarded as anything more than a supplement to safety belts and then in only moderate to severe frontal or near-frontal collisions.

Q: What will you see after air bag inflation?

A: After the air bag inflates, it quickly deflates, so quickly that some people may not even realize the air bag inflated. Some components of the air bag module in the steering wheel hub for the driver's air bag, or the instrument panel for the right front passenger's bag will be hot for a short time. The parts of the bag that come into contact with you may be warm, but not too hot to touch. There will be some smoke and dust coming from vents in the deflated air bags. Air bag inflation doesn't prevent the driver from seeing or from being able to steer the vehicle, nor does it stop people from leaving the vehicle.

 CAUTION

When an air bag inflates, there is dust in the air. This dust could cause breathing problems for people with a history of asthma or other breathing trouble. To avoid this, everyone in the vehicle should get out as soon as it is safe to do so. If you have breathing problems but can't get out of the vehicle after an air bag inflates, then get fresh air by opening a window or door.

In many crashes severe enough to inflate an air bag, windshields are broken by vehicle deformation. Additional windshield breakage may also occur from the right front passenger air bag.

- Air bags are designed to inflate only once. After they inflate, you'll need some new parts for your air bag system. If you don't get them replaced, the air bag system won't be there to help protect you in another crash. A new system will include the air bag modules and possibly other parts. The Saturn Service Manual has information about the need to replace other parts.
- Your vehicle is equipped with a crash sensing and diagnostic module, which records information about the air bag system if the air bag deploys during a crash. The module records information about the readiness of the system, when the sensors are activated and driver's safety belt usage at deployment.
- Let only qualified technicians work on your air bag system. Improper service can mean that your air bag system won't work properly. See your Saturn retailer for service.