

V3191

**1999 Saturn SL1
into an IIHS 40% Left Offset Deformable Barrier
TRC Test Number: 990901-7**

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Section 1.0

Purpose and Test Procedure

Purpose and Test Summary

This 35 mph IIHS 40% left offset deformable barrier impact test has as the main objective to investigate both vehicle and occupant dynamics during an IIHS 40% left offset deformable barrier test. A secondary objective is to gather information on depowered airbags.

This test was conducted with a 1999 Saturn SL1 that impacted an IIHS 40% left offset deformable barrier. The test vehicle contained two instrumented Hybrid III 5th percentile adult female dummies.

Section 2.0

35 mph IIHS 40% Left ODB Impact Test Summary

Test Procedure

This test was conducted per VRTC personnel's instructions. Data was obtained relative to FMVSS 208, "Occupant Crash Protection," performance.

The test vehicle was instrumented with ten (11) accelerometers to measure longitudinal, lateral, and vertical axis accelerations and two (2) inductive pickup switches to measure the driver and passenger airbag fire times. The vehicle's specified impact velocity range was 55.5 to 57.1kph. The vehicle impacted an IIHS 40% left offset deformable barrier.

The test vehicle contained two (2) Hybrid III 5th percentile adult female anthropomorphic test devices (dummies). The dummies were positioned in the front outboard designated seating positions according to a draft of the Hybrid III Small Female Dummy Positioning Procedure dated 02/04/98.

Both dummies were instrumented with head and chest accelerometers to measure longitudinal, lateral, and vertical accelerations; chest deflection potentiometers; left and right femur load cells to measure axial forces; and upper neck load cells to measure forces and moments. Additionally, the driver dummy was instrumented with upper and lower tibia load cells in both legs to measure forces and moments.

The fifty-four (54) data channels were digitally sampled at 12,500 samples per second and processed per Sections 11.13 through 11.15 of the Laboratory Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and fifteen (15) high-speed motion picture cameras. The pre-test and post-test conditions were recorded by one (1) real-time motion picture camera.

The vehicle and occupant data are summarized in Section 2.0. The FMVSS 208 data are presented in Section 3.0. The vehicle, occupant, barrier, and camera measurements are presented

in Section 4.0. Appendix A contains the still photographic prints. Appendix B contains the dummy and vehicle data plots. Appendix C contains the dummy certification information. Appendix D contains the miscellaneous test information.

Test Results Summary

This IIHS 40% left offset deformable barrier test was conducted at TRC on September 1, 1999.

The test vehicle, a 1999 Saturn SL1, was equipped with airbags at the driver's and right front passenger's seating positions. The vehicle's test weight was 1187.9 kilograms. The vehicle's impact speed was 56.3 kph. The vehicle's maximum static crush was 473 millimeters.

The driver's 15-millisecond HIC was 131 and its 36-millisecond HIC was 254. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 23.5 g. The driver's chest deflection was 25.3 millimeters. The driver's left and right femur maximum compressive forces were 2817 N and 14 N, respectively. The driver's tibia indices were as follows: upper left leg 0.18, upper right leg 0.27, lower left leg 0.10, lower right leg 0.18.

The right front passenger's 15-millisecond HIC was 72 and its 36-millisecond HIC was 128. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 24.8 g. The passenger's chest deflection was 20.3 millimeters. The right front passenger's left and right femur maximum compressive forces were 1520 N and 1086 N, respectively.

Data Acquisition Explanations

The driver dummy's neck moment about the x-axis data channel, NEKXM1, recorded intermittent data between 194 and 225 ms.

The right front passenger's neck force y-axis data channel, NEKYF2, recorded questionable data between 29 and 45ms, it recorded intermittent data between 160 and 200 ms, and recorded questionable data after 250 ms.

Table 1 Crash Test Summary

Test type:	IIHS 40% Left Offset Deformable Barrier Impact
Test date:	September 1, 1999
Test time:	2312
Ambient temperature at impact area:	21° C
Vehicle year/make/ model/body style:	1999/Saturn/SL1/4-door sedan
Vehicle test weight:	1187.9 kg
Impact angle ¹ :	0°
Impact velocity ² :	
Primary:	56.3 kph
Secondary:	56.3 kph
Maximum static crush:	473 mm
Average rebound:	N/A
Number of cameras:	
Real-time:	1
High-speed:	15
Door opening data:	
Left-front:	Hard
Right-front:	Easy

¹ With respect to tow track centerline.

² Speed trap measurement ($\pm .08$ km/h accuracy)

Table 1 Crash Test Summary, Cont'd.

Dummies:	<u>Driver #289</u>	<u>Passenger #369</u>
Type:	Hybrid III 5 th percentile adult female	Hybrid III 5 th percentile adult female
Location:	Left front	Right front
Restraint:	Airbag	Airbag
Number of data channels:	15	15
Front seat data:		
Seat track failure:	None	None
Seat back failure:	None	None
Visible dummy contact points:		
Head:	Airbag, Head restraint	Airbag, Head restraint
Chest:	Airbag	Airbag
Abdomen:	None	None
Left knee:	Instrument panel	Instrument panel
Right knee:	Instrument panel	Instrument panel

Table 2 Test Vehicle Information

Vehicle year/make/
model/body style: 1999/Saturn/SL1/4-door sedan

Color: Light Silver

VIN: 1G8ZG5289XZ375422

Engine data:

Placement: Transverse/Lateral

Cylinders: 4

Displacement: 1.9 liters

Transmission data: 5 speed, X manual, ___ automatic, X overdrive

Final drive: X fwd, ___ rwd, ___ 4wd

Date vehicle received: N/A

Odometer reading: 199 miles

Dealer's name and address: Saturn of Beechmont
8549 Beechmont
Cincinnati, OH 45255

Accessories:

Power steering	Yes	Automatic transmission	No
Power brakes	Yes	Automatic speed control	No
Power seats	No	Tilting steering wheel	Yes
Power windows	No	Telescoping steering wheel	No
Tinted glass	Yes	Air conditioning	Yes
Radio	Yes	Anti-skid brake	No
Clock	No	Rear window defroster	Yes
Power door locks	Yes	Other:	None

Certification data from vehicle's label:

Vehicle manufactured by: Saturn Corporation

Date of manufacture: 06/99

VIN: 1G8ZG5289XZ375422

GVWR: 3263 lb.

GAWR: Front: 1653 lb.

Rear: 1610 lb.

Table 2 Test Vehicle Information, Cont'd.

Size of tires on vehicle:	P175/70R14
Spare tire:	Space Saver
Type of front seats:	Bucket

Tire & capacity data from vehicle's label:

Recommended tire size:	P175/70R14
Recommended cold tire pressure:	
Front:	30 psi
Rear:	26 psi
Designated Seating Capacity:	
Front	2
Rear	3
Total	5
Vehicle Capacity Weight:	849 lb.

Test vehicle attitudes:

Delivered attitude:	LF: 666 mm	RF: 665 mm	LR: 672 mm	RR: 666 mm
Fully loaded attitude:	LF: 655 mm	RF: 667 mm	LR: 644 mm	RR: 649 mm
Pre-test attitude:	LF: 658 mm	RF: 662 mm	LR: 644 mm	RR: 642 mm
Post-test attitude:	LF: N/A mm	RF: 682 mm	LR: 607 mm	RR: 678 mm

Table 2 Test Vehicle Information, Cont'd.

Weight of test vehicle as received (with maximum fluids):

Right front	318.4 kg	Right rear	213.6 kg
Left front	319.3 kg	Left rear	203.2 kg
Total front weight	637.7 kg	(60.5% of total vehicle weight)	
Total rear weight	416.8 kg	(39.5% of total vehicle weight)	
Total delivered weight	1054.5 kg		

Calculation of test vehicle's target test weight:

RCLW¹ = Rated Cargo and Luggage Weight

UDW = Unloaded Delivered Weight (1054.5 kg)

DSC² = Designated Seating Capacity (5)

RCLW¹ = 44.9 kg

Target test weight = UDW + RCLW + (number of Hybrid III Dummies x 47.6 kg per dummy)

Target test weight = 1054.5 + 44.9 + 95.2 = 1194.6 kg

Weight of test vehicle with required dummies and 3.0 kg of cargo weight:

Right front	323.4 kg	Right rear	259.9 kg
Left front	347.0 kg	Left rear	257.6 kg
Total front weight	670.4 kg	(56.4% of total vehicle weight)	
Total rear weight	517.5 kg	(43.6% of total vehicle weight)	
Total test weight	1187.9 kg	(0.6% under target test weight)	

Weight of ballast secured in vehicle: None

Components removed to meet target test weight: Muffler, rear deck trim, right rear door trim, right rear door glass, rear tail lights, and rear seat belts.

CG rearward of front wheel centerline: 1130 mm

Vehicle Wheelbase: 2595 mm

¹ Cargo weight for multi-purpose passenger vehicles, trucks, and buses is the vehicle's calculated cargo and luggage weight or 136.1 kg, whichever is less.

² The designated seating capacity is determined by counting the number of seat belts installed in the vehicle.

Table 3 Post-Impact Data

Test number: 990901-7
Test date: September 1, 1999
Test time: 2312
Test type: IIHS 40% Left Offset Deformable Barrier Impact
Impact angle: 0°
Ambient temperature at impact area: 21° C
Temperature in occupant compartment: 21° C
Impact velocity:
 Primary: 56.3 kph
 Secondary: 56.3 kph
 Specified range: 55.5 to 57.1kph

Distance from vehicle to barrier:

Entering velocity trap: 661 mm
Exiting velocity trap: 51 mm

Test vehicle static crush:

Overall length of test vehicle:

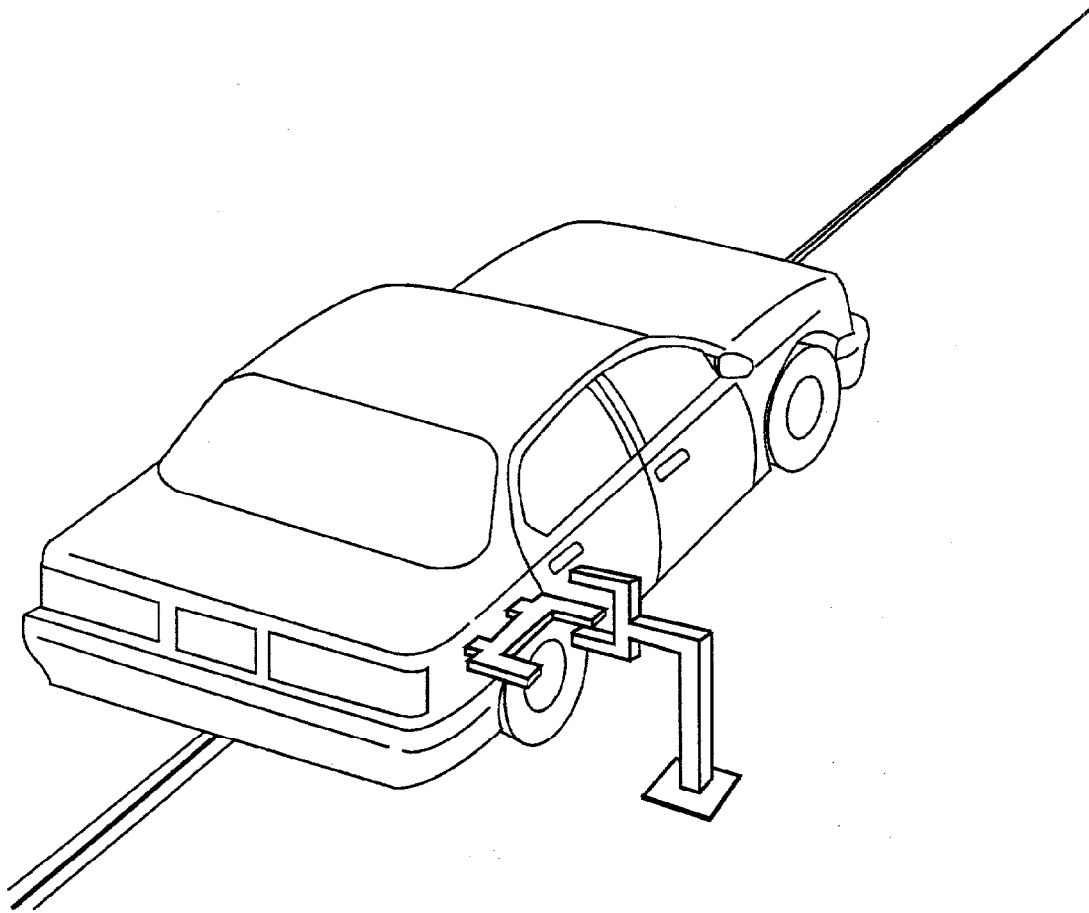
Pre-test:	L: 4443 mm	C: 4637 mm	R: 4437 mm
Post-test:	L: 4031 mm	C: 4274 mm	R: 4586 mm
Total crush:	L: 412 mm	C: 363 mm	R: -149 mm
Average crush:	209 mm		

Test vehicle rebound from IIHS 40% left offset deformable barrier:

Distance from test vehicle to barrier:

Post-test:	L: N/A	C: N/A	R: N/A
Average rebound:	N/A		

Figure 1 Impact Velocity Measurement System



The final vane clears the final emitter/receiver pair 51 millimeters before impact.

The vanes have 610-millimeter spacing.

Figure 2 Accident Investigation Division Data for 35 mph IIHS 40% Left ODB Impact

Test date: September 1, 1999

Vehicle year/make/
model/body style: 1999/Saturn/SL1/4-door sedan

VIN: 1G8ZG5289XZ375422

Build date: 06/99

Test weight: 1187.9 kg

Vehicle wheelbase: 2595 mm

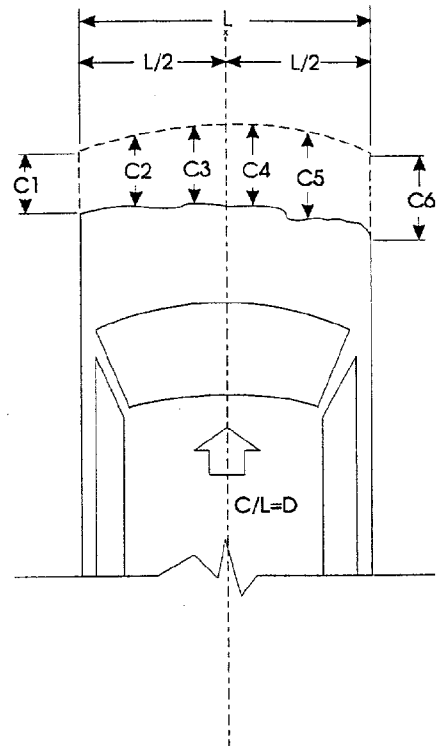
Maximum width: 1689 mm

Front overhang: 973 mm

Collision Deformation
Classification (CDC) Code: 12FDEW3

Crush depth
measurements:

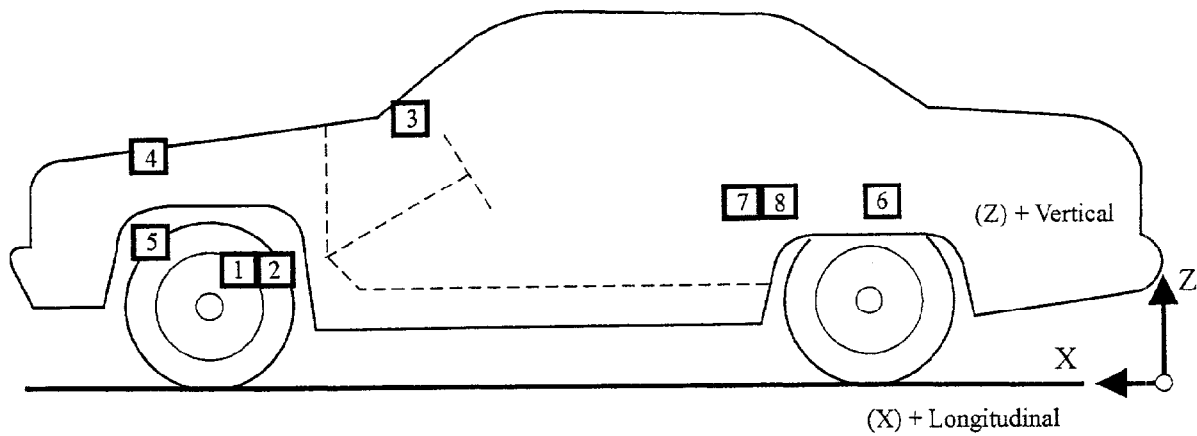
C1: 412 mm
C2: 473 mm
C3: 430 mm
C4: 208 mm
C5: 76 mm
C6: -149 mm



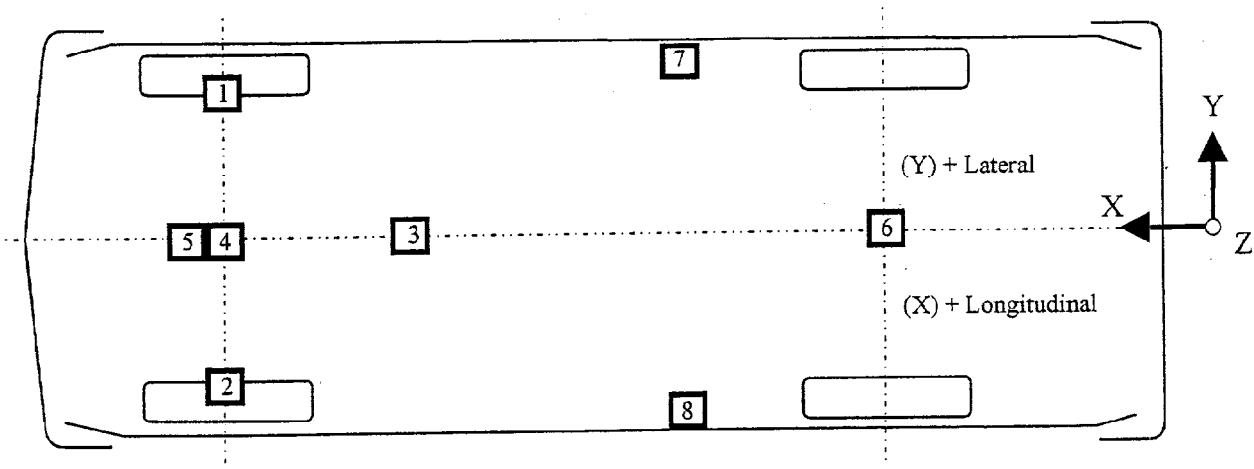
Midpoint of damage: D: Vehicle Longitudinal Centerline

Length of damaged
region: L: 1525 mm

Figure 3 Vehicle Accelerometer Placement



Side View



Bottom View

Table 4 Vehicle Accelerometer Locations and Data Summary

TEST NUMBER: 990901-7	X		Y	Z	POSITIVE DIRECTION	NEGATIVE DIRECTION
No. LOCATION						
1 LEFT BRAKE CALIPER	PRE	3635 mm	640 mm	290 mm		
	POST	3600 mm	572 mm	298 mm		
LONGITUDINAL					35.7 g @ 78.0 ms	49.1 g @ 53.7 ms
2 RIGHT BRAKE CALIPER	PRE	3635 mm	-640 mm	290 mm		
	POST	3761 mm	-650 mm	302 mm		
LONGITUDINAL					6.9 g @ 69.8 ms	36.9 g @ 91.8 ms
3 INSTRUMENT PANEL CENTER	PRE	3155 mm	-15 mm	858 mm		
	POST	3131 mm	-10 mm	841 mm		
LONGITUDINAL LATERAL					26.5 g @ 46.5 ms	30.0 g @ 108.6 ms
					31.2 g @ 38.9 ms	17.6 g @ 33.0 ms
4 ENGINE TOP	PRE	3826 mm	-18 mm	815 mm		
	POST	3740 mm	-56 mm	857 mm		
LONGITUDINAL					2.5 g @ 123.7 ms	28.8 g @ 102.2 ms
5 ENGINE BOTTOM	PRE	3685 mm	-175 mm	170 mm		
	POST	3599 mm	-213 mm	214 mm		
LONGITUDINAL					3.6 g @ 16.6 ms	30.2 g @ 110.1 ms

Table 4 Vehicle Accelerometer Locations and Data Summary, Cont'd.

TEST NUMBER: 990901-5 No. LOCATION			X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
	PRE	POST							
6 REAR VEHICLE CENTERLINE	369 mm	5 mm	560 mm						
LATERAL	369 mm	5 mm	568 mm						
VERTICAL						13.7 g	@ 99.9 ms	3.7 g	@ 294.0 ms
						10.0 g	@ 27.0 ms	10.2 g	@ 92.1 ms
7 LEFT REAR SEAT	PRE 1775 mm	425 mm	322 mm						
LONGITUDINAL	POST 1775 mm	425 mm	310 mm						
LATERAL						1.8 g	@ 183.0 ms	23.4 g	@ 109.5 ms
						6.3 g	@ 108.0 ms	2.1 g	@ 230.3 ms
8 RIGHT REAR SEAT	PRE 1755 mm	-425 mm	327 mm						
LONGITUDINAL	POST 1755 mm	-425 mm	340 mm						
LATERAL						1.3 g	@ 181.9 ms	20.0 g	@ 114.2 ms
						10.5 g	@ 108.2 ms	0.0 g	@ 284.1 ms

REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

Section 3.0

FMVSS 208 Data

Table 5 Dummy Injury Criteria

	<u>Maximum Acceleration</u>						
	Head				Chest		
	X	Y	Z	R	X	Y	Z
Driver	-34.8 g	9.7 g	28.4 g	40.3 g	-24.1 g	6.5 g	-8.2 g
Passenger	-31.0 g	7.5 g	14.8 g	32.4 g	-24.6 g	9.8 g	-5.1 g

Maximum Femur Compressive Force

	Left Femur	Right Femur
Driver	2817 N	14 N
Passenger	1520 N	1086 N

15-millisecond Head Injury Criteria¹

	HIC	Time t_1	Time t_2
Driver	131	63.7 ms	78.7 ms
Passenger	72	86.0 ms	101.0 ms

36-millisecond Head Injury Criteria¹

	HIC	Time t_1	Time t_2
Driver	254	49.0 ms	85.0 ms
Passenger	128	71.0 ms	107.0 ms

Chest Maximum Resultant Acceleration²

	Acceleration	Time t_1	Time t_2
Driver	23.5 g	118.6 ms	121.7 ms
Passenger	24.8 g	73.6 ms	76.6 ms

Maximum Chest Deflection

Driver	25.3 mm
Passenger	20.3 mm

¹ As defined in FMVSS No. 208

² Defined as equal to or exceeding 0.003 sec. duration

Dummy Kinematic Summary

Driver Dummy

Upon impact, the driver dummy translated forward impacting both knees on the instrument panel. The dummy's head and upper torso rotated forward impacting its head on the airbag. The dummy was restrained by the airbag and 3-point seat belt. The dummy's head then rotated rearward impacting the headrest. The dummy's head then rotated to the right then rearward impacting the headrest again. The dummy came to rest in the driver's seat.

Right Front Passenger Dummy

Upon impact, the right front passenger dummy translated forward impacting both knees on the instrument panel. The dummy's head and upper torso rotated forward impacting its head on the airbag. The dummy was restrained by the airbag and 3-point seat belt. The dummy's head then rotated rearward and impacted on the seat back. The dummy came to rest in the right front seat.

Section 4.0

Vehicle, Occupant, Barrier, and Camera Measurements

Figure 4 Pre-test and Post-test Measurement Points

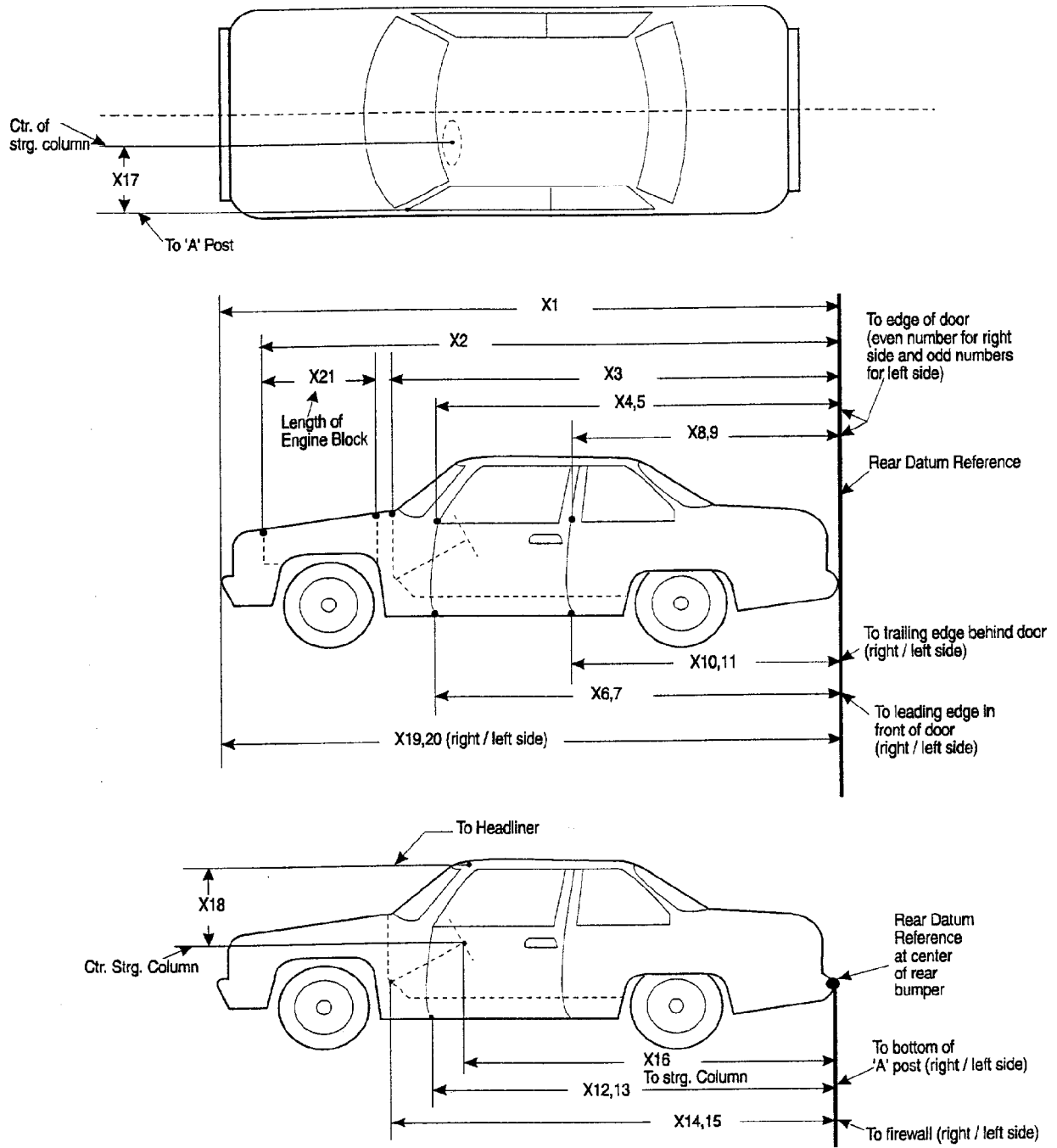


Table 6 Impacted Vehicle Measurements

Vehicle year/make/model/body style: 1999/Saturn/SL1/4-door sedan

Test Number: 990901-7

No.	Type of measurement	Pre-Test	Post-Test	Difference
X1	Total Length of Veh. at Centerline	4637	4274	363
X2	Rear Surface of Veh. to Front of Engine Block	3934	3846	88
X3	Rear Surface of Veh. to Firewall	3564	3535	29
X4	Rear Surface of Veh. to Upper Leading Edge of Right Door	3139	3131	8
X5	Rear Surface of Veh. to Upper Leading Edge of Left Door	3127	3125	2
X6	Rear Surface of Veh. to Lower Leading Edge of Right Door	3120	3112	8
X7	Rear Surface of Veh. to Lower Leading Edge of Left Door	3123	3121	2
X8	Rear Surface of Veh. to Upper Trailing Edge of Right Door	2174	2180	-6
X9	Rear Surface of Veh. to Upper Trailing Edge of Left Door	2172	2171	1
X10	Rear Surface of Veh. to Lower Trailing Edge of Right Door	2200	2190	10
X11	Rear Surface of Veh. to Lower Trailing Edge of Left Door	2197	2181	16
X12	Rear Surface of Veh. to Bottom of " A " Post on Right Side	3110	3102	8
X13	Rear Surface of Veh. to Bottom of " A " Post on Left Side	3104	3061	43
X14	Rear Surface of Veh. to Firewall--Right Side	3585	3581	4
X15	Rear Surface of Vehicle to Firewall --Left Side	3559	3484	75
X16	Rear Surface of Veh. to Steering Wheel Center	2716	2616	100
X17	Center of Steering Column to " A " Post	310	312	-2
X18	Center of Steering Column to Headliner	440	430	10
X19	Rear Surface of Veh. to Right Side of Front Bumper	4437	4586	-149
X20	Rear Surface of Veh. to Left Side of Front Bumper	4443	4031	412
X21	Length of Engine Block	420	420	0

Figure 5 Vehicle Target Locations

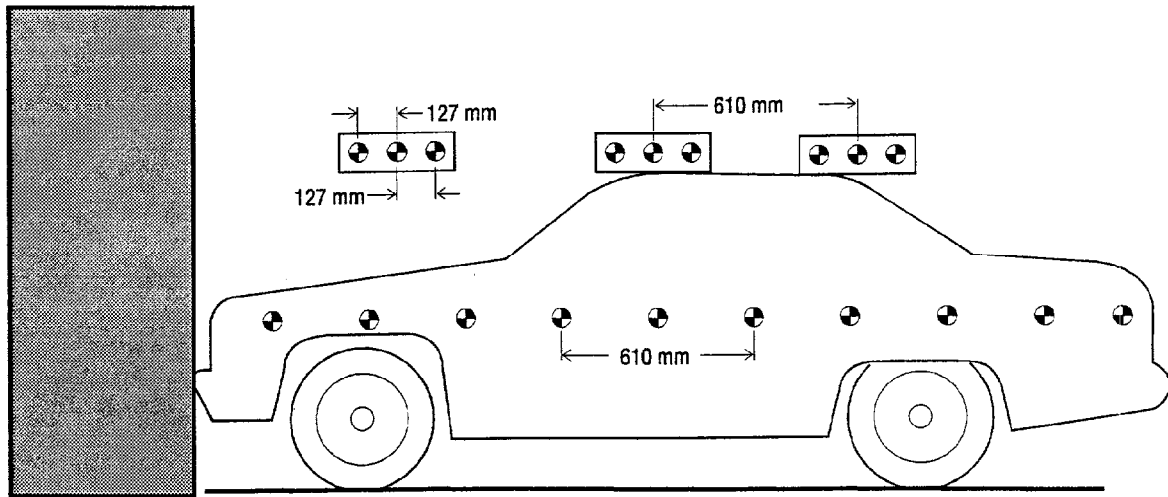


Figure 6 Dummy Measurement Locations for Front Seat Occupants

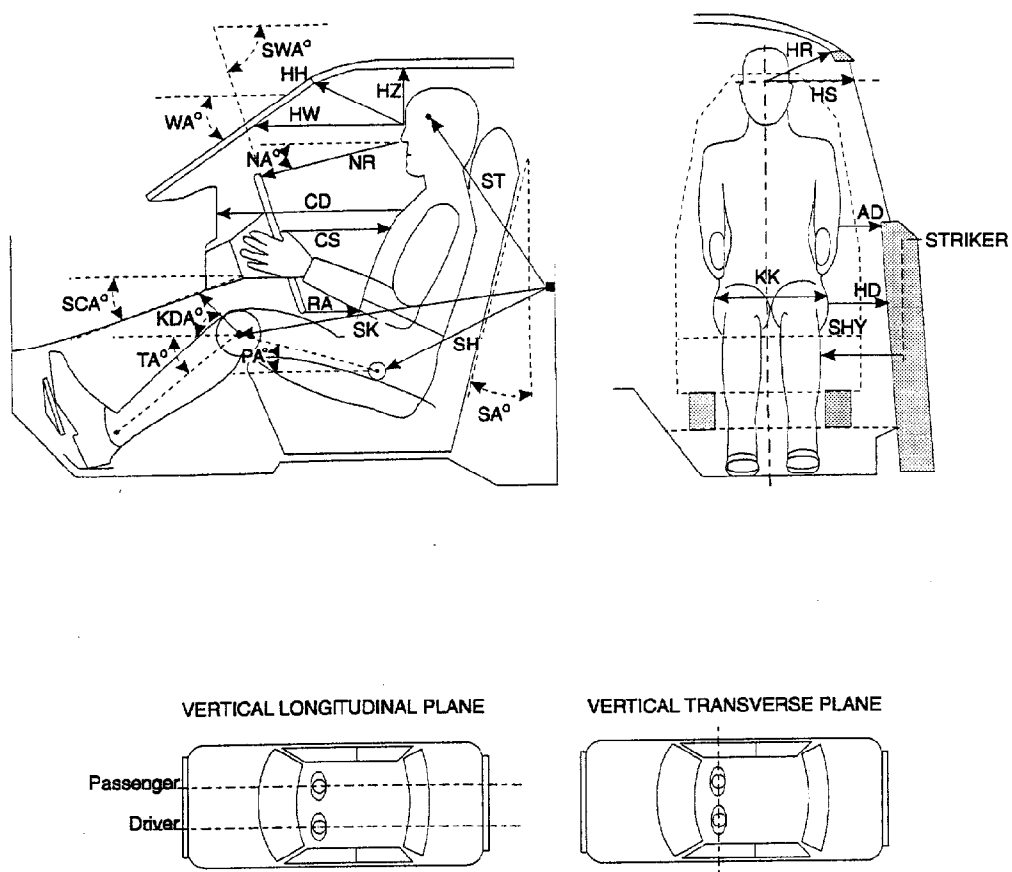


Table 7 Dummy Measurement Data For Front Seat Occupants

Designation	Type of Measurement	Driver (Serial #289)	Passenger (Serial #369)
WA	Windshield angle	25.5°	25.5°
SWA	Steering wheel angle	70.3°	N/A
SCA	Steering column angle	19.7°	N/A
SA	Seat back angle	15.0°	15.0°
HZ	Head to roof	210 mm	200 mm
HH	Head to header	300 mm	275 mm
HW	Head to windshield	640 mm	600 mm
HR	Head to side header	250 mm	245 mm
NR	Nose to rim	260 mm	N/A
NA	Nose to rim angle	4.3°	N/A
CD	Chest to dash	440 mm	370 mm
CS	Steering wheel to chest	245 mm	N/A
RA	Rim to abdomen	138 mm	N/A
KDL	Left knee to dash	170 mm	101 mm
KDR	Right knee to dash	170 mm	101 mm
KDA	Outboard knee to dash angle	50.0°	30.0°
PA	Pelvic angle	20.4°	21.3°
TA	Tibial angle	38.3°	65.0°
KK	Knee to knee	230 mm	230 mm
ST ¹	Striker to head	405 mm	425 mm
	Striker to head angle	-63.5°	-62.3°
SK	Striker to knee	645 mm	615 mm
	Striker to knee angle	13.4°	2.9°
SH	Striker to H-point	355 mm	372 mm
	Striker to H-point angle	37.8°	36.1°
SHY	Striker to H-point (Y-direction)	243 mm	245 mm
HS	Head to side window	280 mm	288 mm
HD	H-point to door	150 mm	146 mm
AD	Arm to door	45 mm	70 mm

The seat back angle (SA°) is measured relative to vertical, all other angles are measured relative to horizontal.

¹ A negative angle indicates the measurement point was above the striker.

Figure 7 Camera Positions

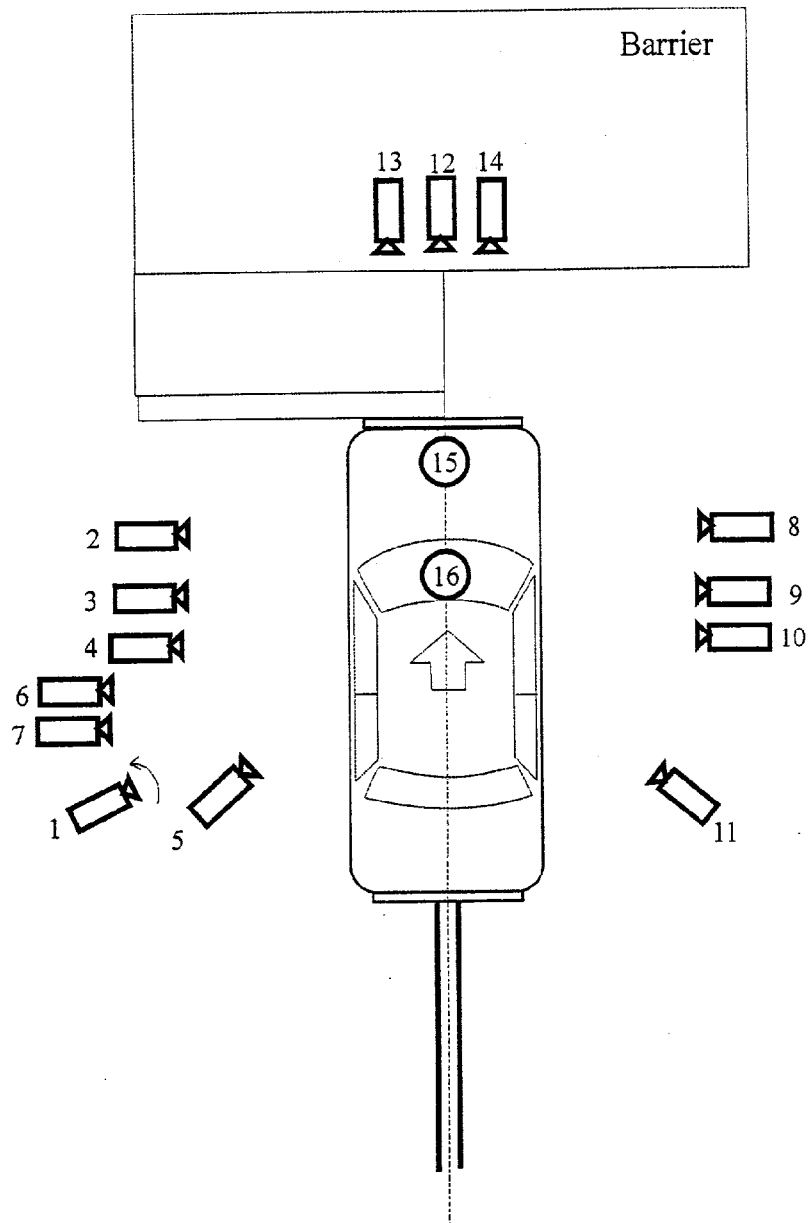


Table 8 Motion Picture Camera Locations

Vehicle year/make/model/body style: 1999/Saturn/SL1/4-door sedan

Test number: 990901-7

Camera Number	View	Camera Positions ¹			Camera Angle ²	Film Plane to Head Target	Camera Lens	Film Speed
		X	Y	Z				
1	Real-time panning	N/A	N/A	N/A	N/A	N/A	16 mm	24 frames/s
2	Left vehicle crush	-6210 mm	766 mm	710 mm	N/A	N/A	25 mm	1000 frames/s
3	Left windshield intrusion	-7260 mm	995 mm	1120 mm	N/A	N/A	50 mm	997 frames/s
4	Driver kinematics	-7270 mm	1585 mm	1132 mm	N/A	N/A	25 mm	1012 frames/s
5	Driver kinematics angled view	-2175 mm	3355 mm	1183 mm	N/A	N/A	25 mm	1062 frames/s
6	Steering column motion	-7440 mm	2695 mm	2260 mm	N/A	N/A	25 mm	997 frames/s
7	Steering column motion	-7440 mm	2695 mm	1164 mm	N/A	N/A	25 mm	1000 frames/s
8	Right overall	8400 mm	-2430 mm	920 mm	N/A	N/A	13 mm	1000 frames/s
9	Right windshield intrusion	7410 mm	-1085 mm	1121 mm	N/A	N/A	50 mm	1082 frames/s
10	Passenger kinematics	7305 mm	-540 mm	1135 mm	N/A	N/A	25 mm	1007 frames/s
11	Passenger kinematics angled view	1805 mm	-3545 mm	1188 mm	N/A	N/A	25 mm	960 frames/s
12	Windshield front view	0 mm	390 mm	2240 mm	N/A	N/A	8.5 mm	985 frames/s
13	Driver - front view	-380 mm	390 mm	2241 mm	N/A	N/A	25 mm	952 frames/s
14	Passenger - front view	345 mm	-390 mm	2241 mm	N/A	N/A	25 mm	1000 frames/s
15	Overhead - tight	0 mm	1960 mm	5700 mm	N/A	N/A	25 mm	1010 frames/s
16	Overhead - wide	0 mm	2290 mm	5700 mm	N/A	N/A	13 mm	1000 frames/s
	Real-time documentation	N/A	N/A	N/A	N/A	N/A	12-120 mm	24 frames/s

¹ +X: Film plane forward of barrier face

+Y: Film plane to left of monorail centerline

+Z: Film plane above ground level

² +Angle: Film plane angled upward from horizontal plane

Figure 8 Deformable Barrier Face Profile 1-11

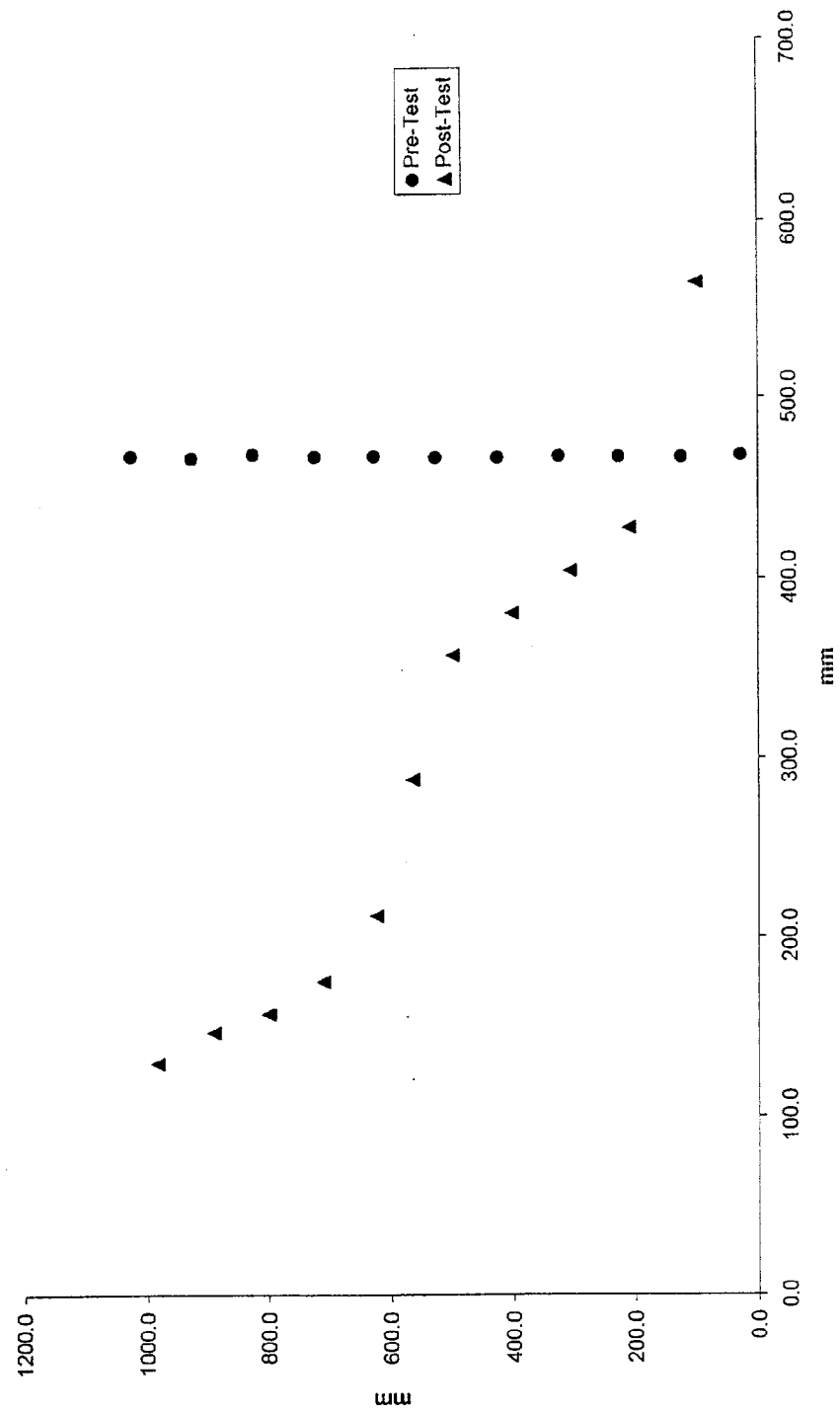


Figure 8 Deformable Barrier Face Profile 12-22

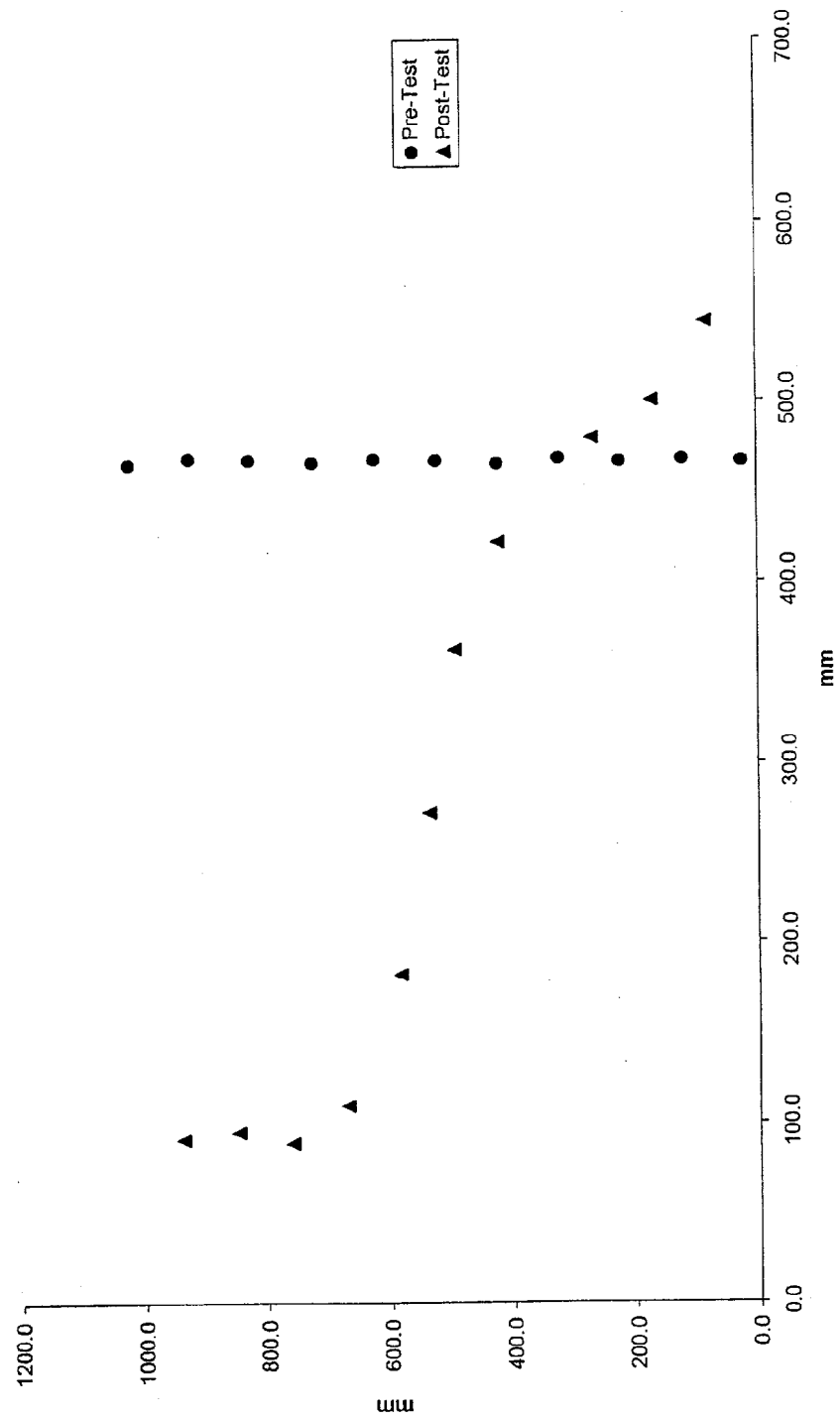


Figure 8 Deformable Barrier Face Profile 23-33

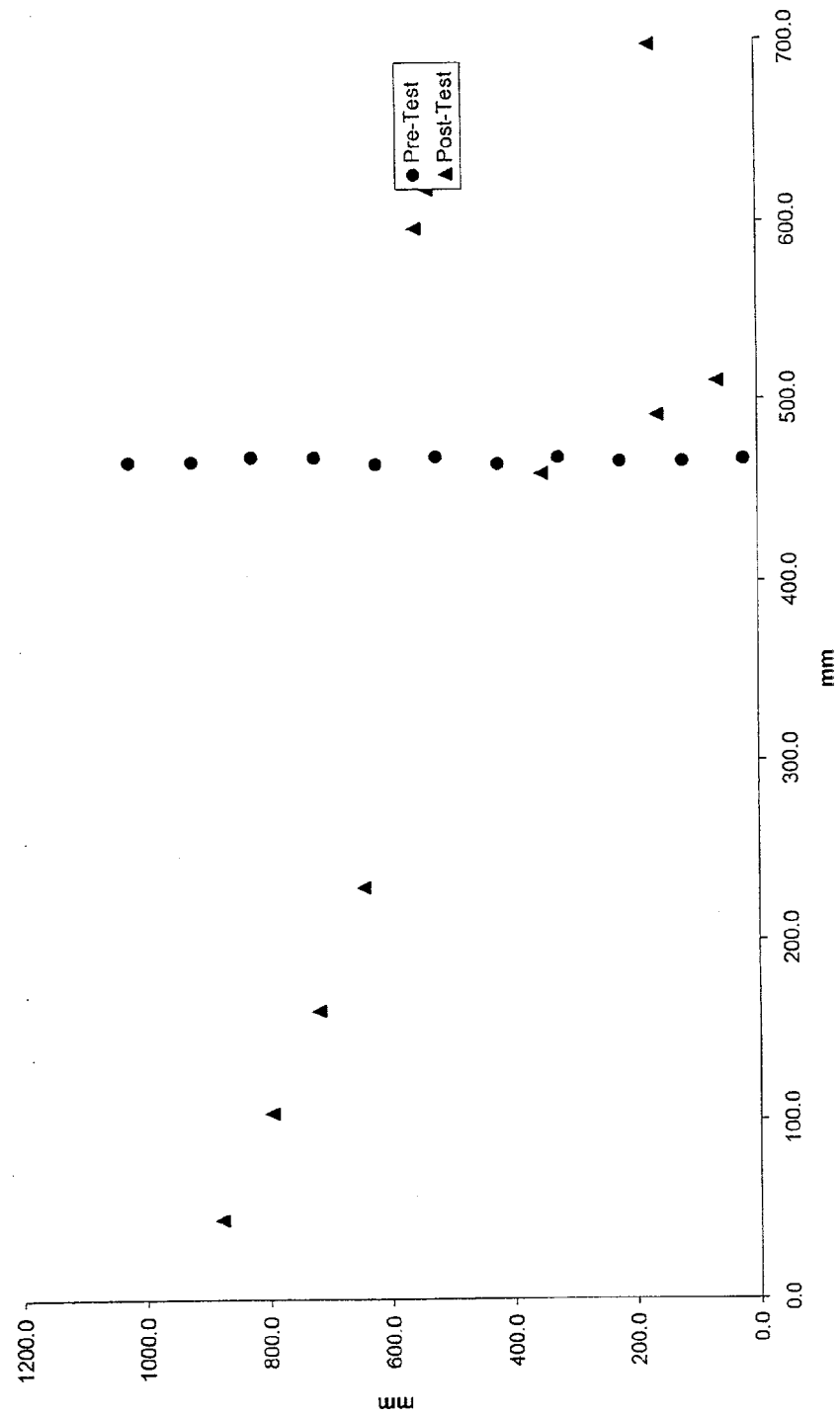


Figure 8 Deformable Barrier Face Profile 34-44

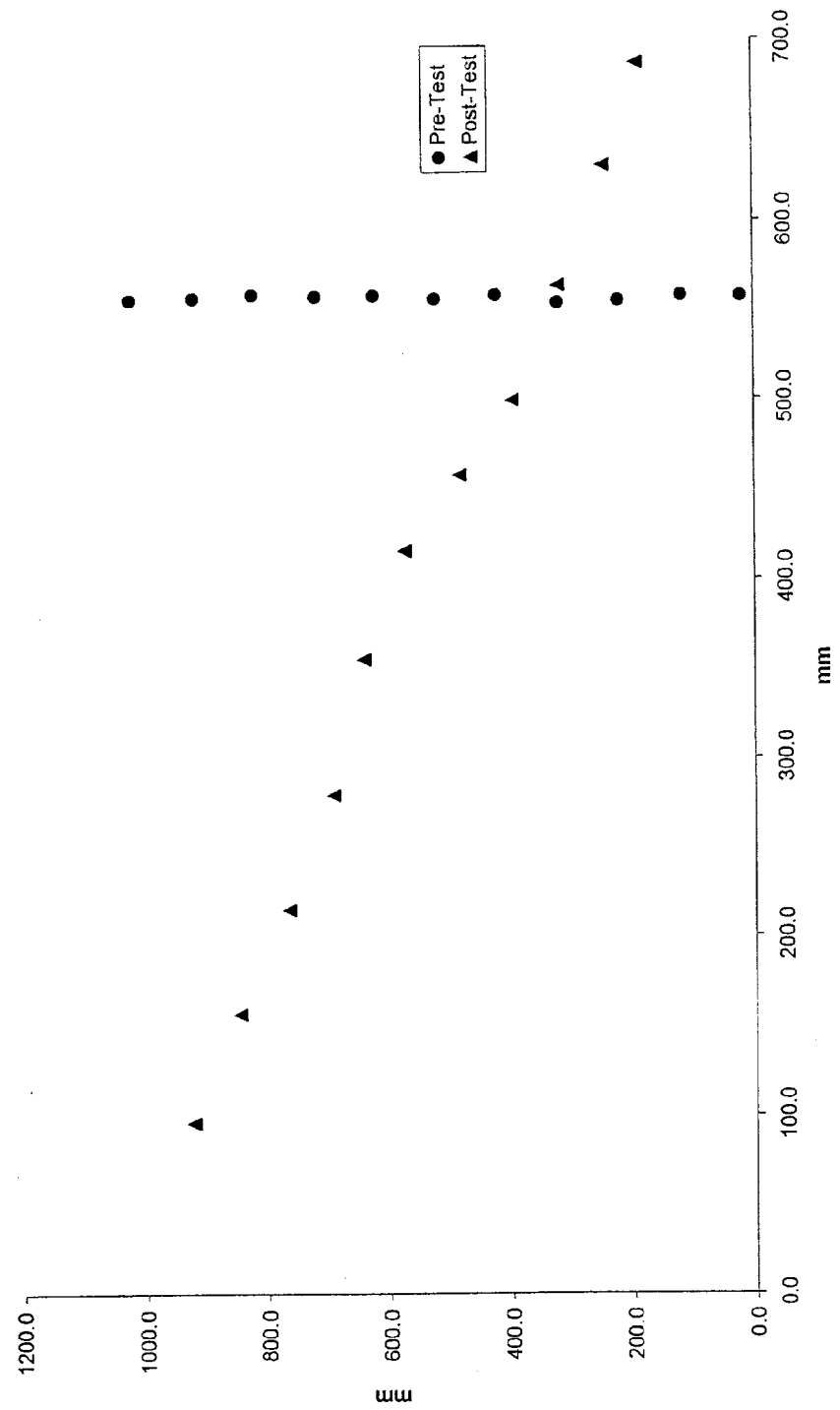


Figure 8 Deformable Barrier Face Profile 45-55

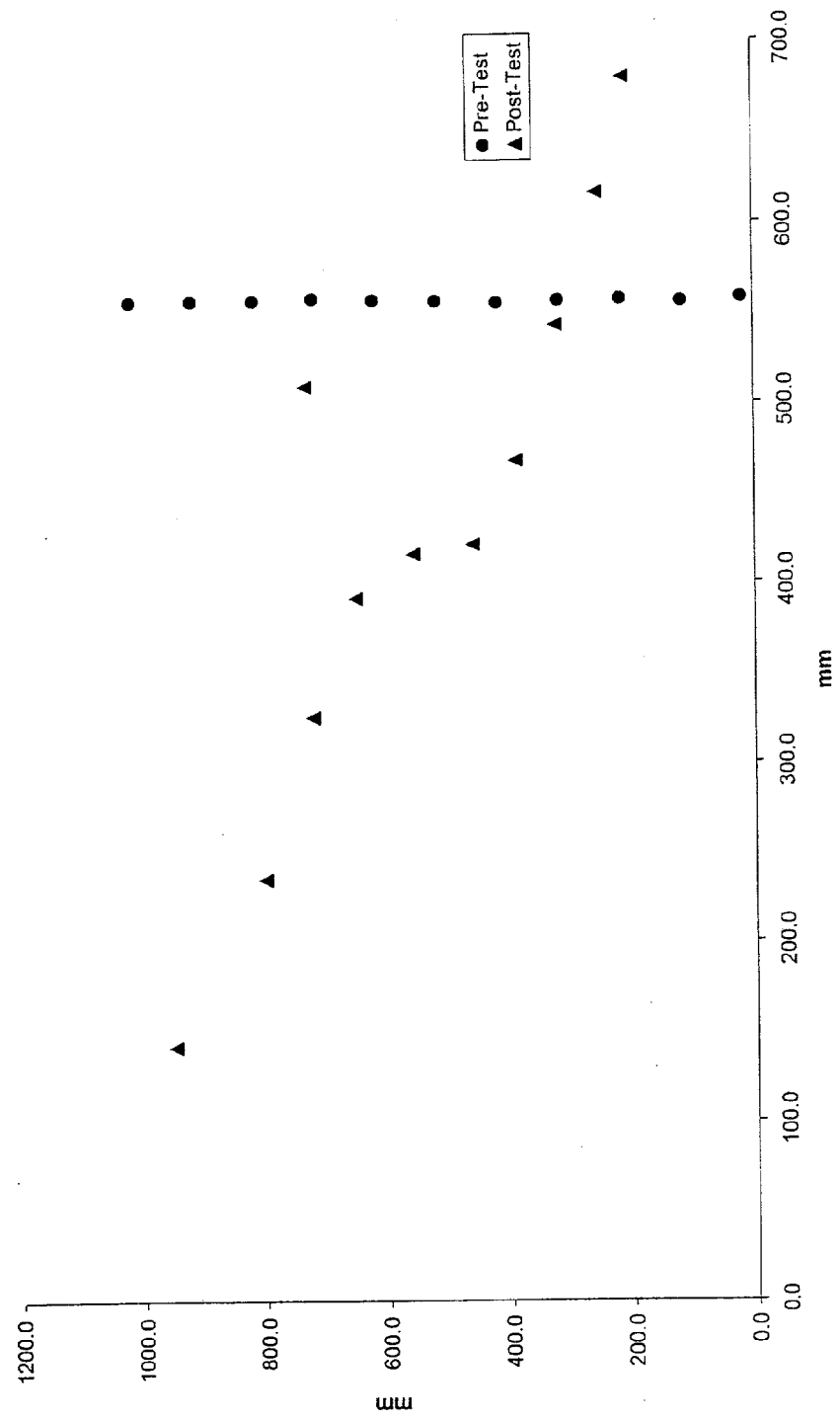


Figure 8 Deformable Barrier Face Profile 56-66

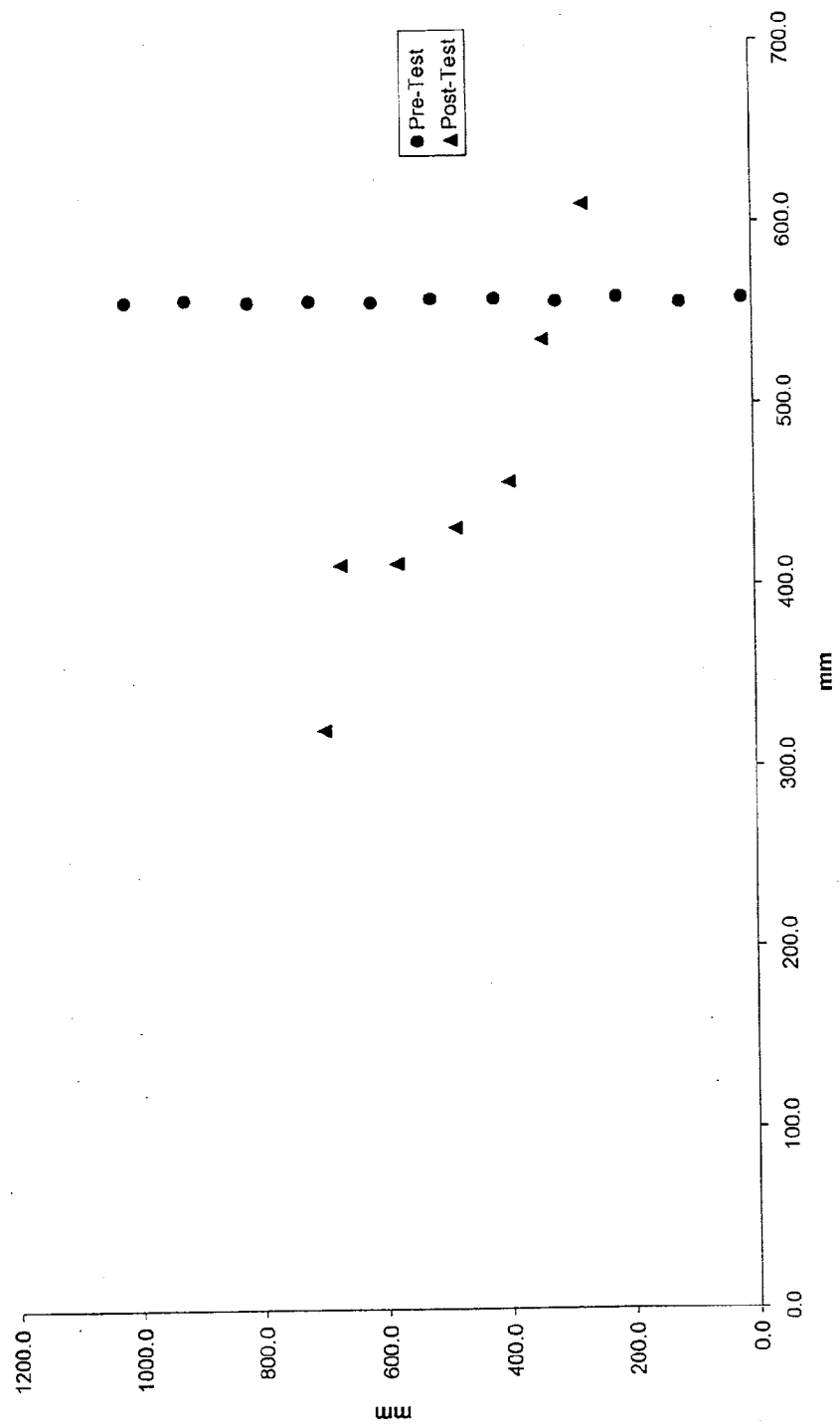


Table 9 Deformable Barrier Face Profile

Pre-Test					Post-Test					Difference				
Index	Xmm	Ymm	Zmm		Index	Xmm	Ymm	Zmm		Index	Xmm	Ymm	Zmm	
1	468.5	28.0	656.2		1	564.2	100.7	611.9		1	-95.8	-72.7	44.3	
2	467.0	125.3	655.8		2	427.5	209.7	801.8		2	39.6	-84.4	-146.0	
3	467.1	227.1	653.1		3	403.5	306.7	811.2		3	63.6	-79.7	-158.1	
4	467.3	325.3	653.2		4	380.0	402.5	820.9		4	87.4	-77.2	-167.7	
5	466.8	425.7	651.2		5	356.9	498.5	831.1		5	109.9	-72.9	-179.9	
6	467.0	527.0	648.7		6	287.7	563.8	834.0		6	179.3	-36.8	-185.3	
7	467.9	628.1	647.4		7	211.4	624.3	830.2		7	256.5	3.9	-182.9	
8	467.7	725.5	645.1		8	174.8	711.6	802.2		8	292.9	14.0	-157.1	
9	469.0	827.0	644.6		9	156.9	801.5	772.5		9	312.1	25.5	-128.0	
10	466.8	927.7	643.7		10	147.0	891.6	732.7		10	319.8	36.1	-89.0	
11	468.1	1027.1	644.4		11	129.9	984.4	699.6		11	338.2	42.7	-55.2	
12	466.5	24.0	547.5		12	544.0	82.7	505.0		12	-77.5	-58.7	42.5	
13	467.6	122.1	545.1		13	499.6	171.4	502.8		13	-32.0	-49.3	42.3	
14	466.0	224.4	542.1		14	479.2	269.4	494.9		14	-13.2	-45.1	47.3	
15	468.2	323.5	540.7		15	421.7	422.2	719.5		15	46.5	-98.7	-178.8	
16	465.3	423.2	540.1		16	362.4	493.6	723.4		16	102.9	-70.4	-183.3	
17	467.4	523.0	536.6		17	271.6	536.1	725.4		17	195.8	-13.1	-188.9	
18	468.0	624.6	534.7		18	182.3	584.4	727.4		18	285.7	40.2	-192.8	
19	466.3	725.8	533.8		19	109.9	671.0	716.5		19	356.4	54.8	-182.7	
20	467.8	828.1	532.2		20	89.1	762.1	689.5		20	378.7	66.0	-157.3	
21	469.0	926.3	530.8		21	95.3	849.4	642.7		21	373.7	76.9	-111.9	
22	465.9	1024.8	529.8		22	91.1	939.9	602.3		22	374.8	84.9	-72.6	

Table 9 Deformable Barrier Face Profile Cont'd.

Pre-Test				Post-Test				Difference			
Index	Xmm	Ymm	Zmm	Index	Xmm	Ymm	Zmm	Index	Xmm	Ymm	Zmm
23	467.2	21.9	434.5	23	509.9	65.2	398.3	23	-42.8	-43.3	36.2
24	466.0	121.7	432.8	24	490.9	162.8	391.4	24	-24.9	-41.2	41.4
25	465.9	224.0	430.7	25	459.1	351.6	396.8	25	6.8	-127.6	33.9
26	468.1	324.2	427.7	26	647.1	505.0	-9.8	26	-179.0	-180.8	437.4
27	465.0	423.4	427.7	27	617.7	536.9	-27.1	27	-152.7	-113.5	454.7
28	469.1	524.9	425.2	28	596.3	557.2	-20.6	28	-127.2	-32.3	445.8
29	465.4	623.4	423.2	29	229.5	646.7	356.9	29	235.9	-23.3	66.3
30	469.1	724.2	421.8	30	161.0	721.2	352.4	30	308.1	3.0	69.5
31	469.3	825.7	419.9	31	104.1	797.4	346.4	31	365.2	28.3	73.5
32	467.2	923.0	418.2	32	45.3	878.6	344.5	32	421.9	44.4	73.7
33	467.2	1025.4	421.1	33	696.6	173.4	315.7	33	-229.4	852.0	105.4
34	557.5	21.1	325.2	34	629.5	245.0	323.1	34	-72.0	-224.0	2.1
35	557.5	119.6	323.8	35	562.5	320.2	332.7	35	-5.0	-200.6	-8.8
36	554.7	221.8	323.1	36	498.5	395.2	342.4	36	56.2	-173.4	-19.3
37	553.7	320.5	320.5	37	457.1	481.6	352.5	37	96.6	-161.1	-32.1
38	558.2	422.0	316.4	38	415.4	572.8	359.6	38	142.8	-150.8	-43.2
39	556.4	521.6	315.0	39	355.1	640.8	337.3	39	201.3	-119.3	-22.3
40	558.3	622.5	312.9	40	278.9	692.5	302.6	40	279.4	-70.0	10.4
41	557.8	719.9	311.0	41	214.2	766.6	301.8	41	343.6	-46.7	9.1
42	558.9	822.7	309.5	42	156.1	847.0	301.3	42	402.8	-24.3	8.3
43	557.1	919.7	306.9	43	95.9	924.2	299.5	43	461.3	-4.6	7.4
44	556.4	1023.4	309.0	44	685.9	189.8	160.1	44	-129.5	833.6	149.0

Table 9 Deformable Barrier Face Profile Cont'd.

Pre-Test				Post-Test				Difference			
Index	Xmm	Ymm	Zmm	Index	Xmm	Ymm	Zmm	Index	Xmm	Ymm	Zmm
45	558.2	19.7	213.6	45	615.1	255.4	173.8	45	-56.8	-235.7	39.8
46	556.0	118.0	211.5	46	542.3	322.3	186.5	46	13.7	-204.3	25.0
47	557.1	217.8	209.2	47	467.1	388.2	200.4	47	90.1	-170.4	8.8
48	556.4	318.1	208.8	48	420.2	458.9	215.1	48	136.3	-140.8	-6.3
49	555.2	417.7	205.0	49	415.0	555.8	238.8	49	140.2	-138.1	-33.8
50	556.6	517.8	203.3	50	391.1	650.8	262.1	50	165.6	-133.1	-58.8
51	557.4	620.2	200.8	51	325.6	721.4	257.5	51	231.8	-101.3	-56.7
52	558.0	719.8	199.4	52	234.1	801.3	264.1	52	323.9	-81.6	-64.7
53	556.9	818.2	196.9	53	508.6	731.9	-43.5	53	48.3	86.3	240.4
54	556.8	919.1	194.6	54	141.5	949.8	233.7	54	415.3	-30.8	-39.1
55	556.5	1019.9	196.2	55	678.5	210.8	29.2	55	-122.1	809.1	167.0
56	558.2	16.8	107.7	56	609.3	274.7	48.3	56	-51.1	-257.9	59.4
57	555.6	117.0	105.9	57	535.4	341.2	68.7	57	20.2	-224.2	37.2
58	558.6	219.1	101.1	58	457.2	396.5	86.9	58	101.4	-177.5	14.3
59	556.3	318.0	98.5	59	431.8	483.8	111.6	59	124.5	-165.9	-13.1
60	558.4	417.8	97.0	60	412.5	578.9	142.3	60	145.9	-161.2	-45.4
61	558.6	520.6	94.5	61	411.7	671.2	177.4	61	146.9	-150.6	-82.9
62	556.9	617.6	92.2	62	320.9	698.7	211.5	62	236.0	-81.2	-119.3
63	557.7	718.2	89.7	63	791.2	516.5	45.8	63	-233.6	201.7	44.0
64	557.2	817.3	87.5	64	792.7	511.9	45.6	64	-235.5	305.4	42.0
65	558.5	919.9	85.6	65	791.5	510.7	44.9	65	-233.0	409.3	40.8
66	557.7	1017.8	84.7	66	790.2	509.9	46.6	66	-232.5	507.9	38.1

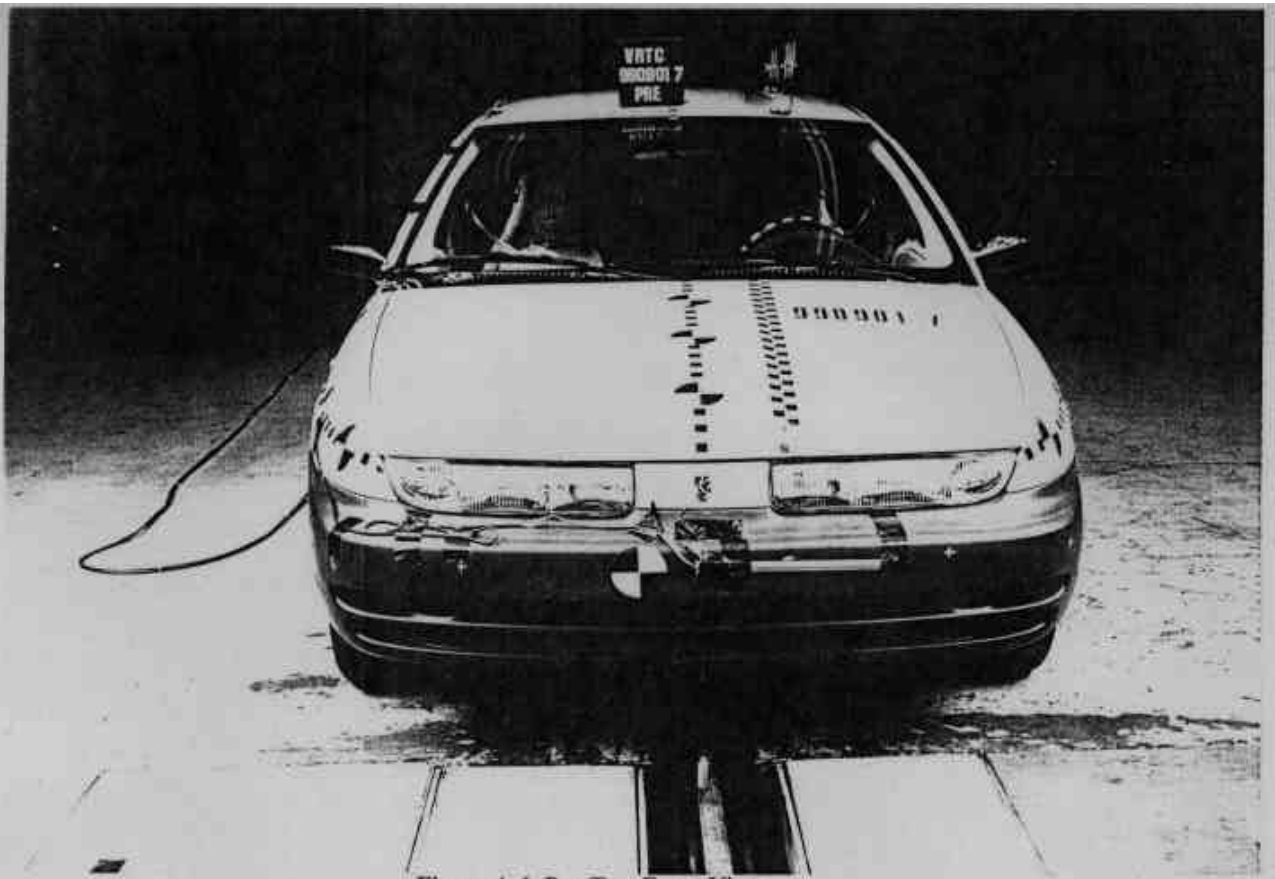


Figure A-1 Pre-Test Front View



Figure A-2 Post-Test Front View



Figure A-3 Pre-Test Left Side View



Figure A-4 Post-Test Left Side View



Figure A-5 Pre-Test Left Rear Three-Quarter View



Figure A-6 Post-Test Left Rear Three-Quarter View



Figure A-7 Pre-Test Rear View



Figure A-8 Post-Test Rear View



Figure A-9 Pre-Test Right Side View

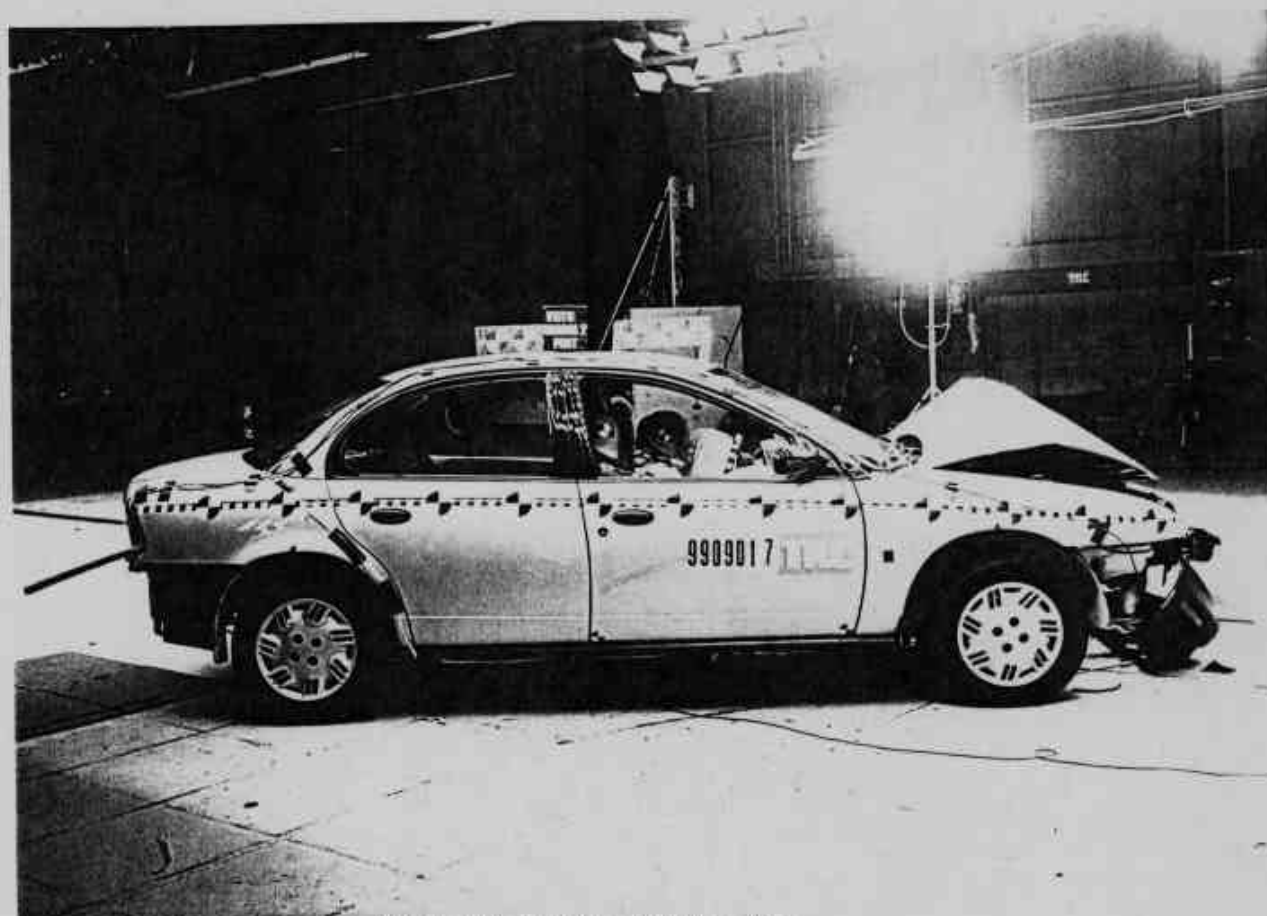


Figure A-10 Post-Test Right Side View



Figure A-11 Pre-Test Right Front Three-Quarter View



Figure A-12 Post-Test Right Front Three-Quarter View

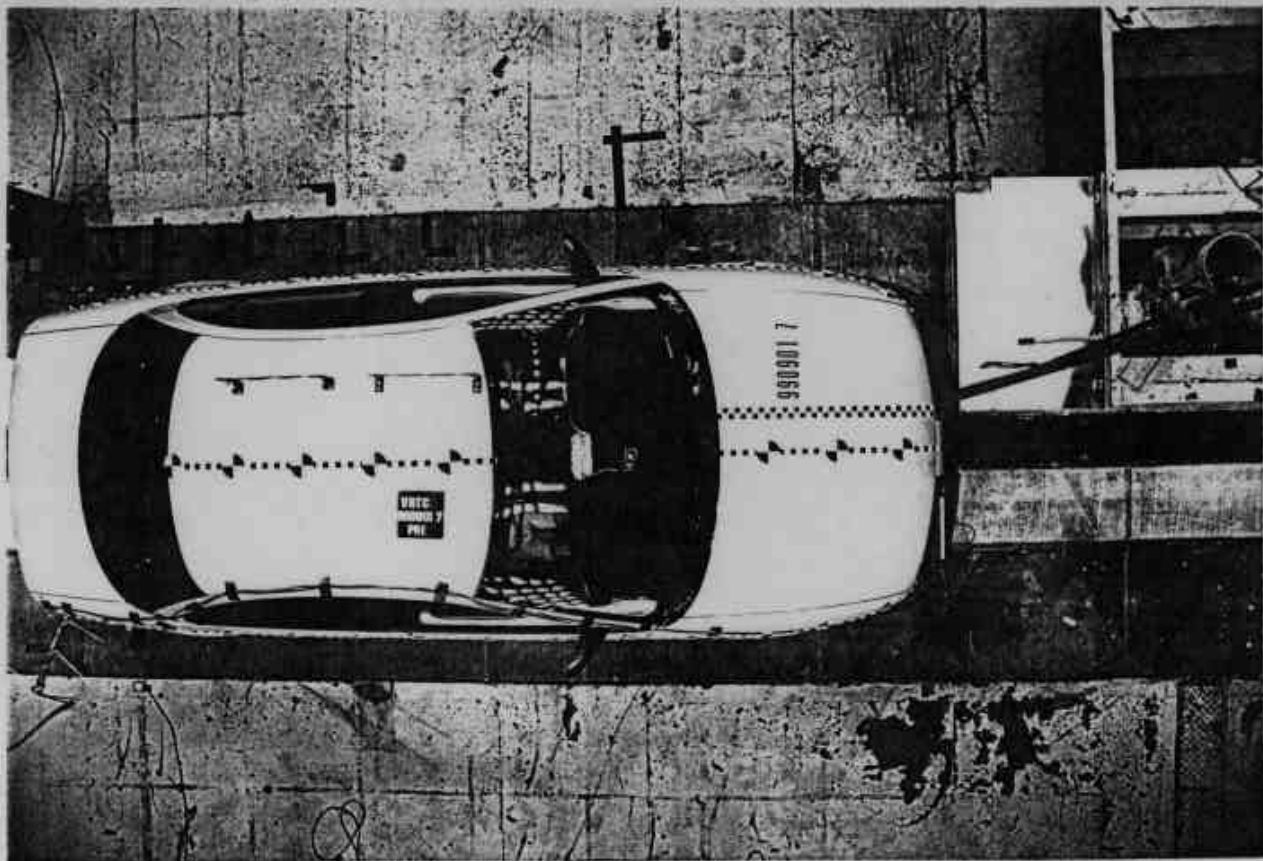


Figure A-13 Pre-Test Overhead View

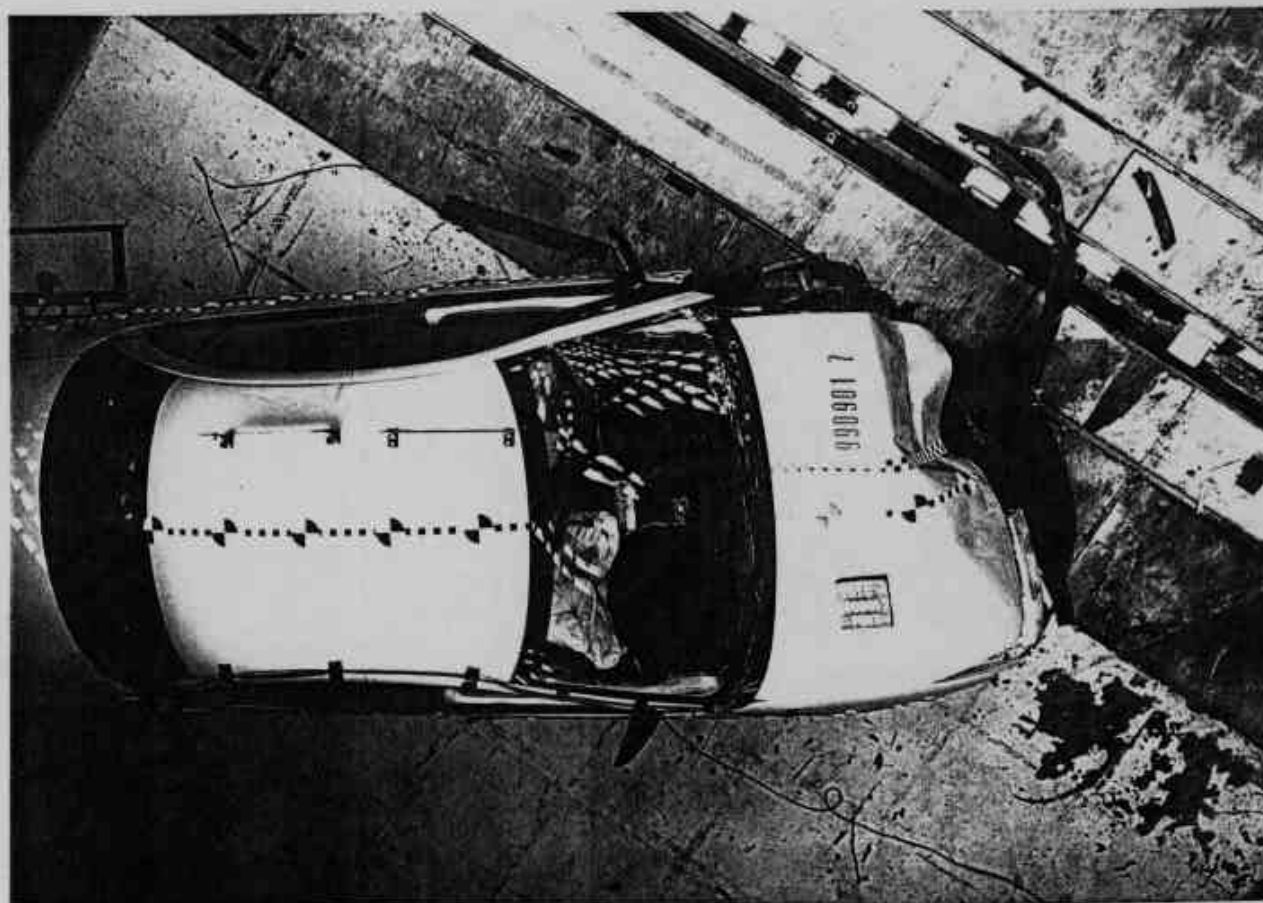


Figure A-14 Post-Test Overhead View

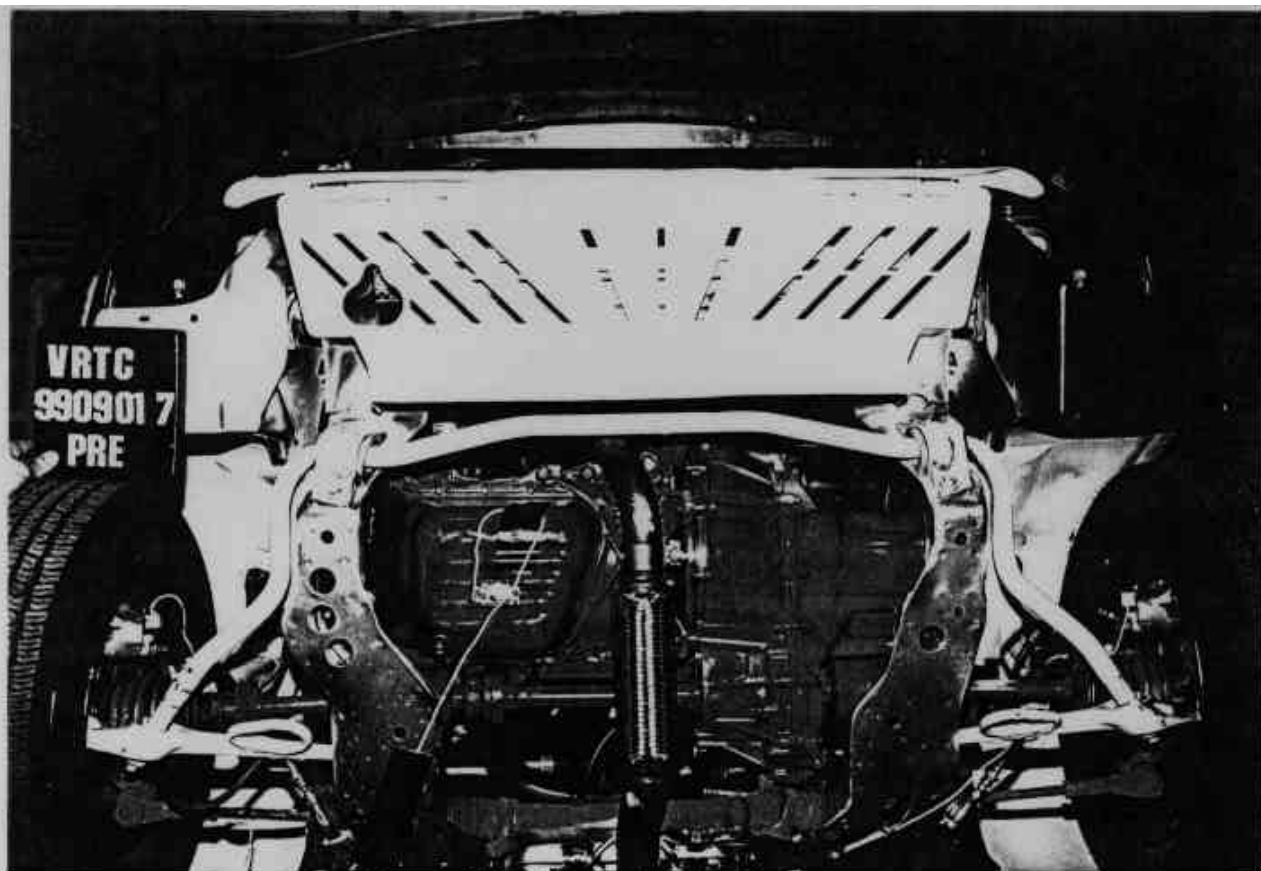


Figure A-15 Pre-Test Underbody - View 1

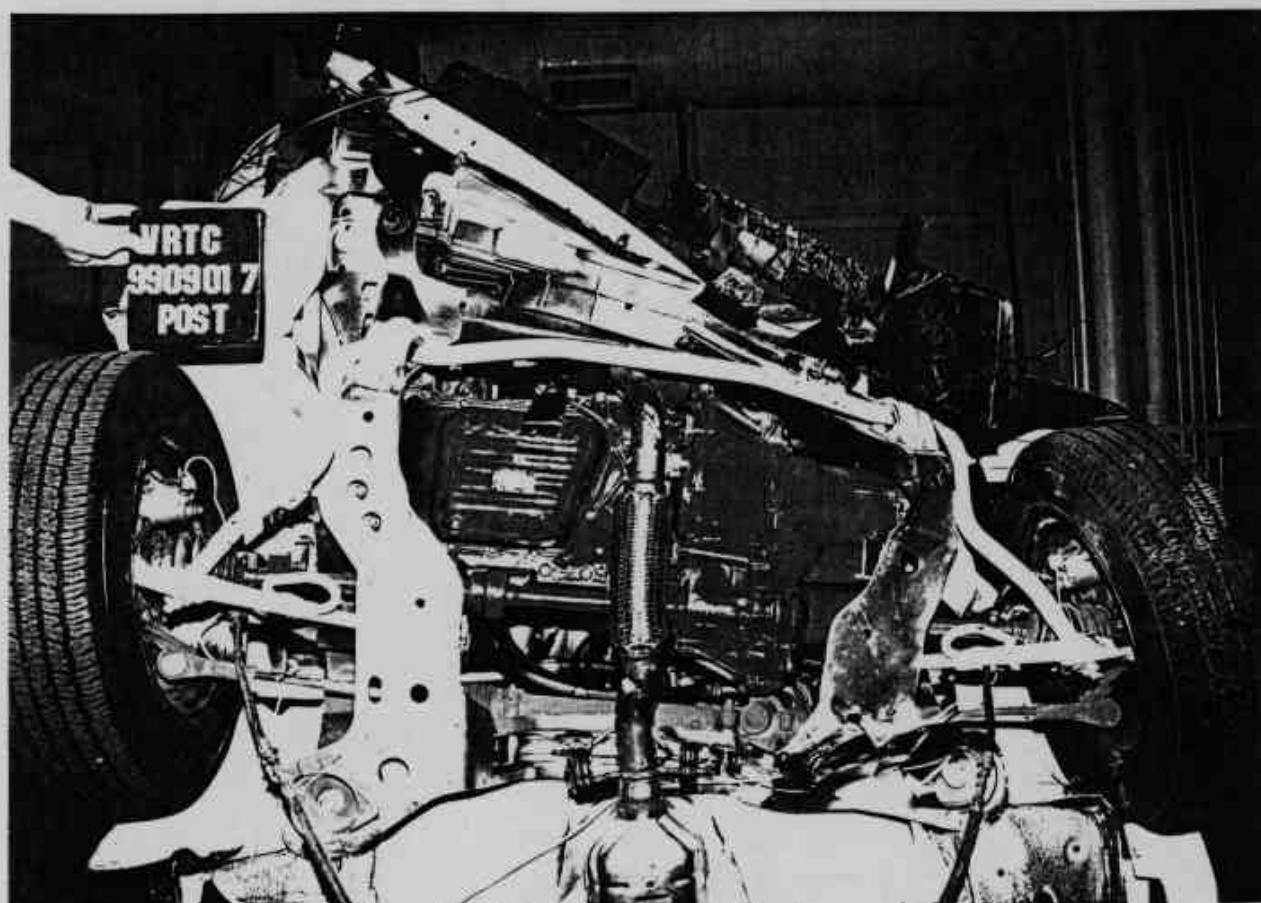


Figure A-16 Post-Test Underbody - View 1

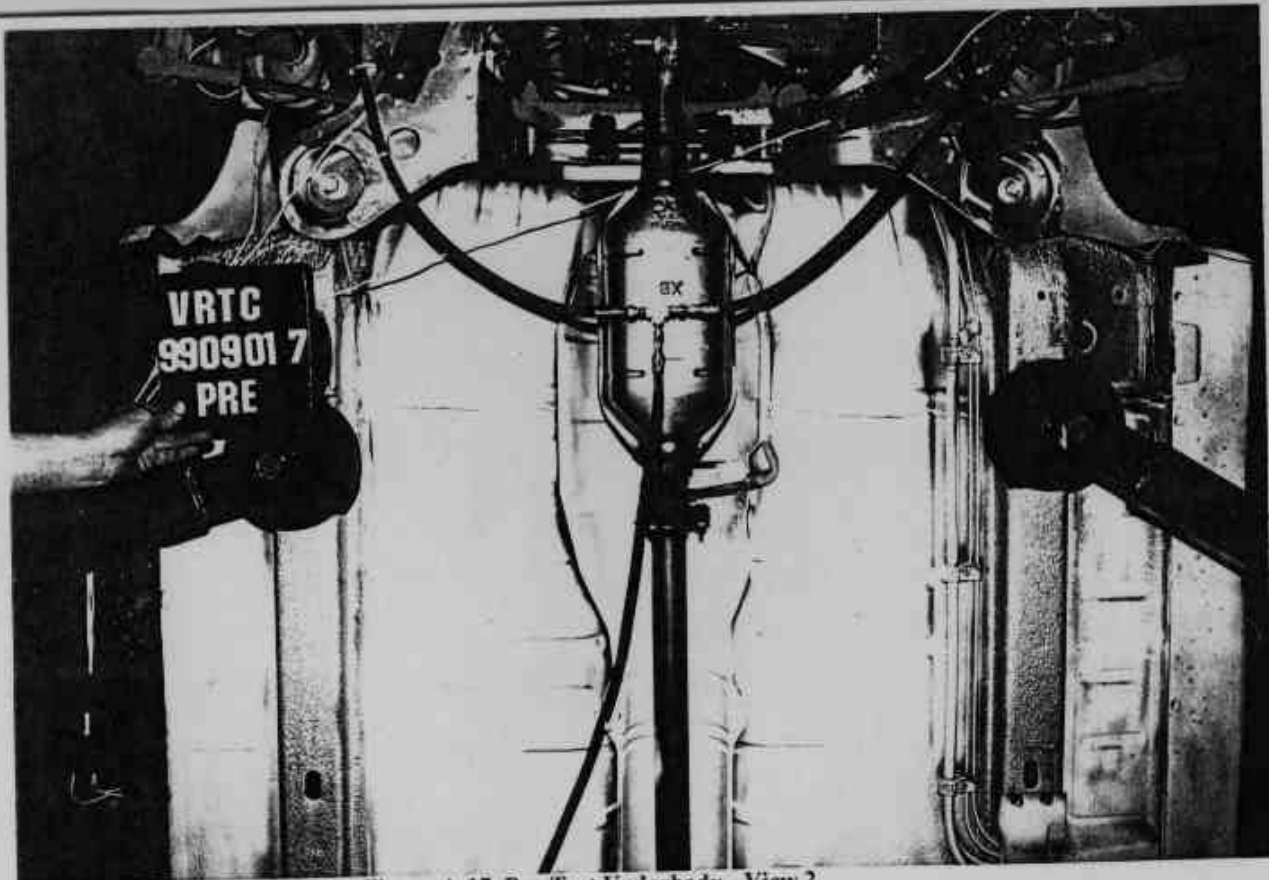


Figure A-17 Pre-Test Underbody - View 2

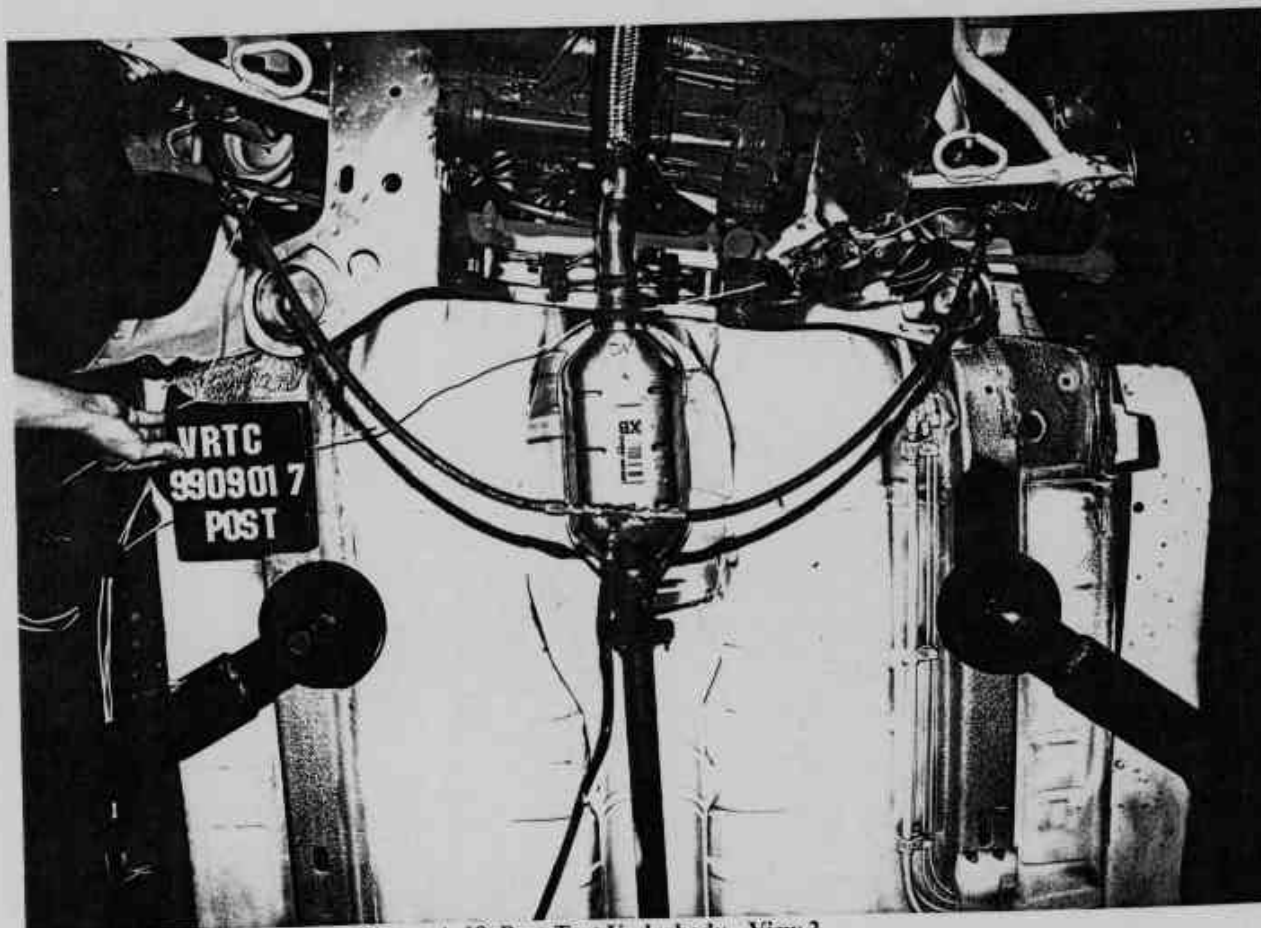


Figure A-18 Post-Test Underbody - View 2



Figure A-19 Pre-Test Underbody - View 3

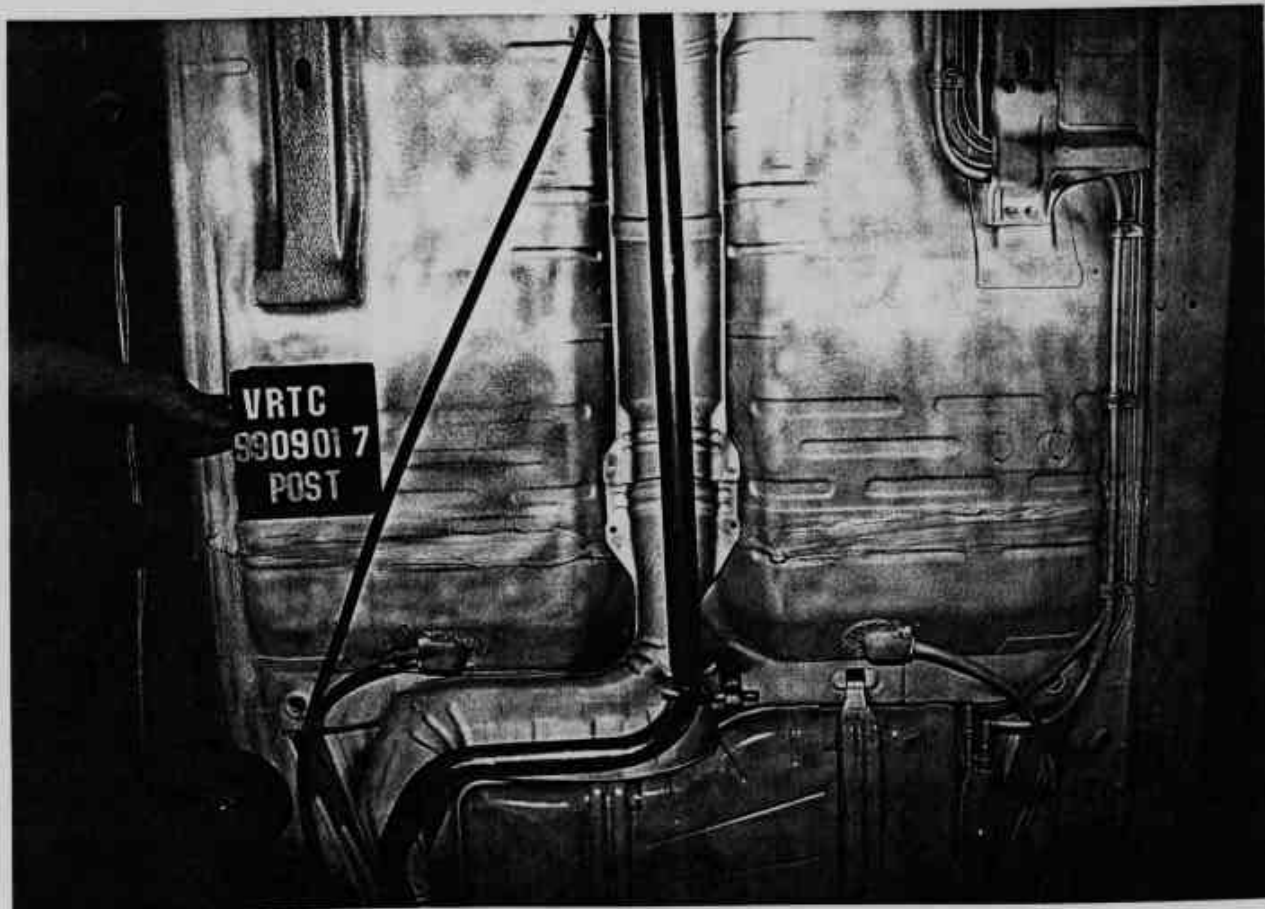


Figure A-20 Post-Test Underbody - View 3

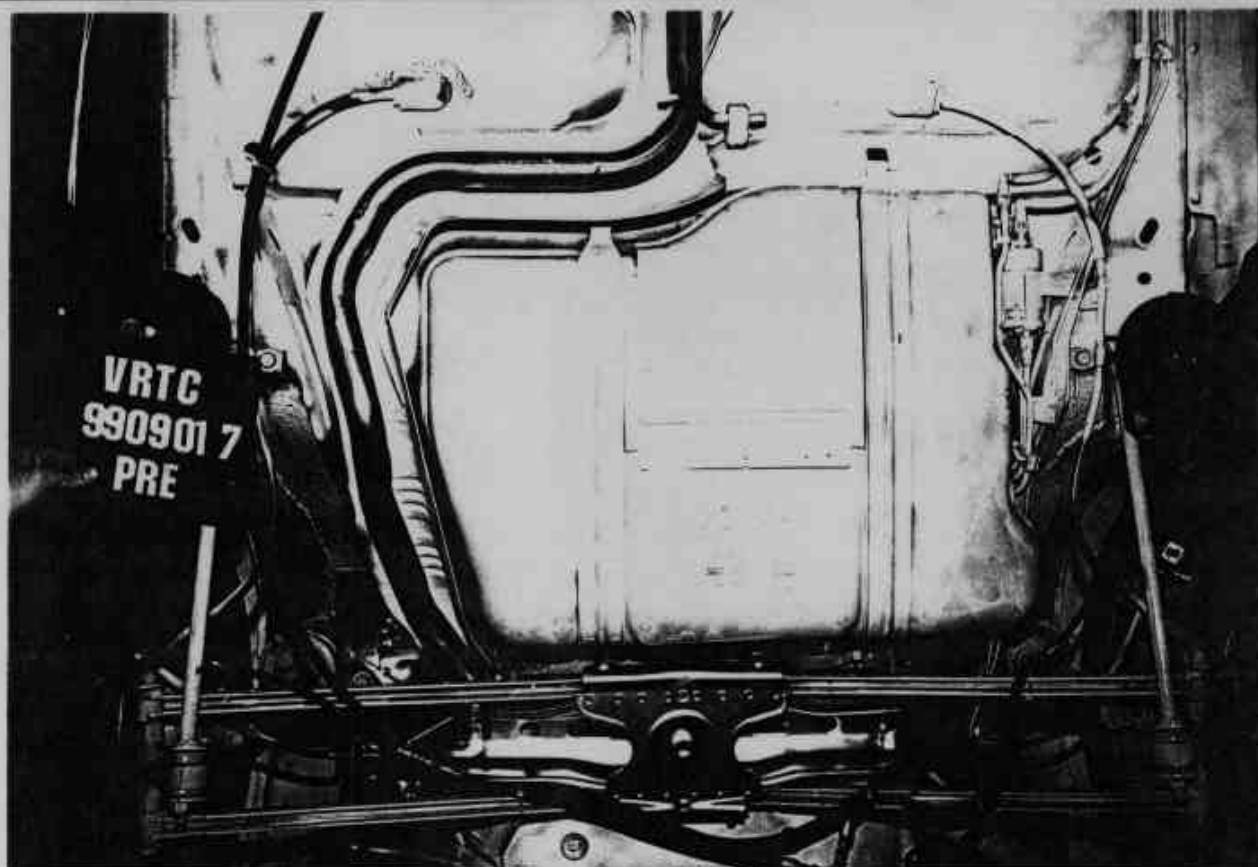


Figure A-21 Pre-Test Underbody - View 4

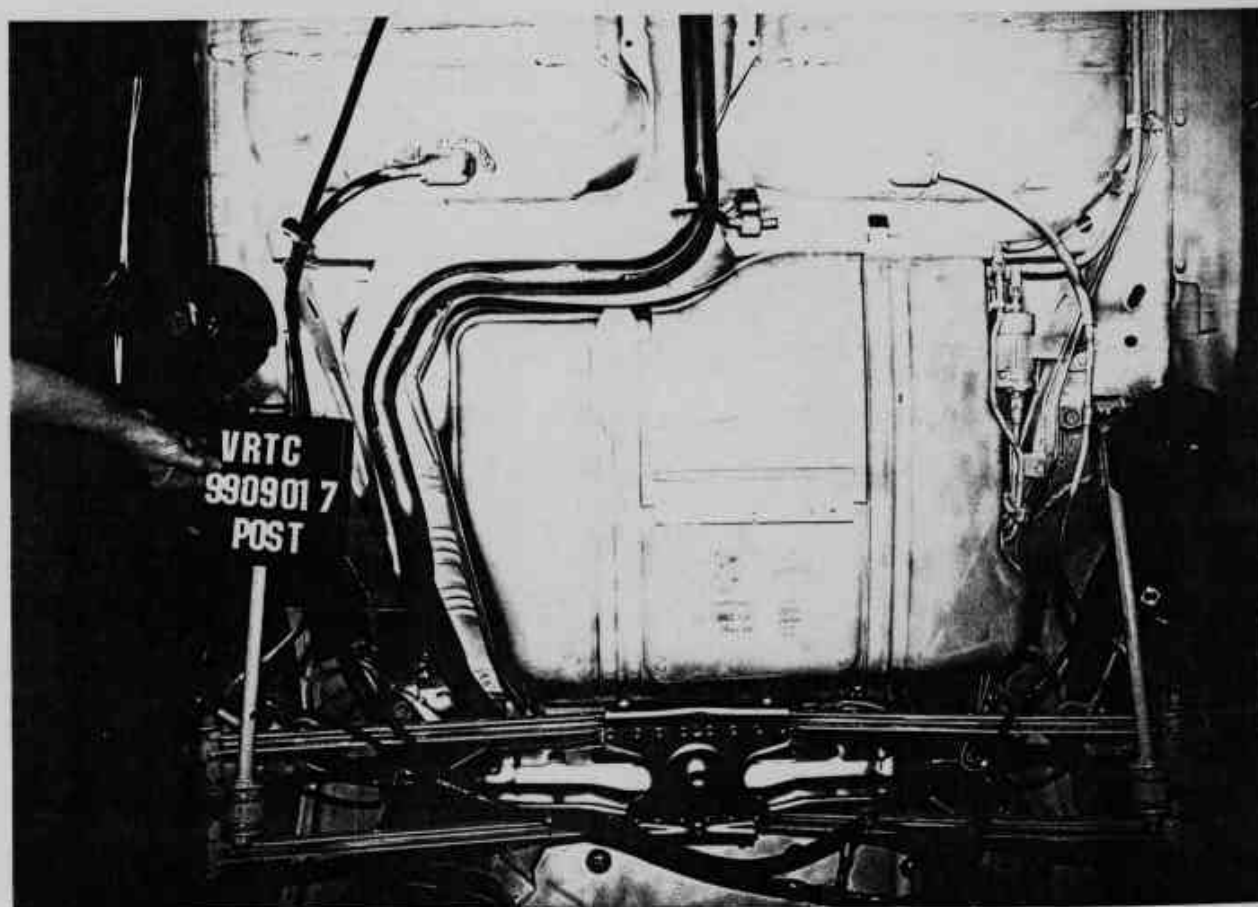


Figure A-22 Post-Test Underbody - View 4

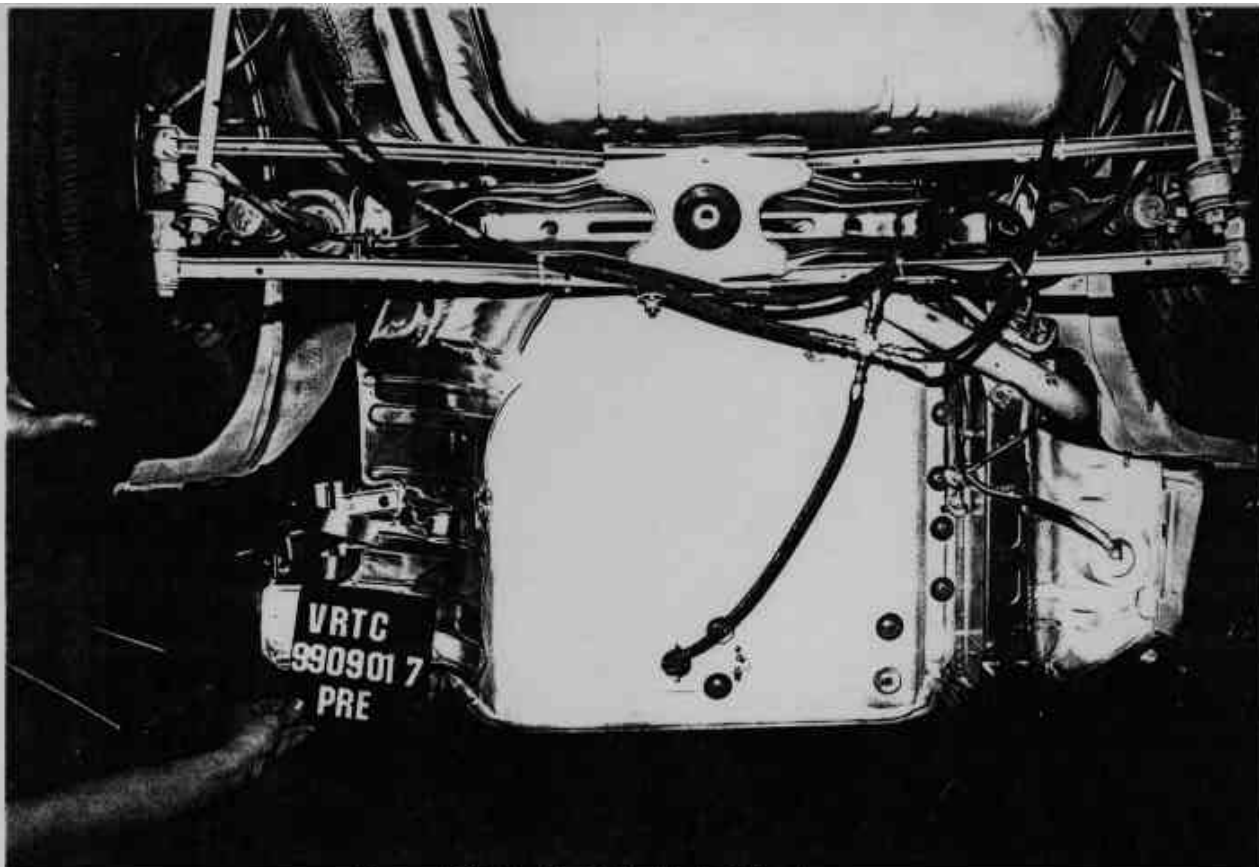


Figure A-23 Pre-Test Underbody - View 5

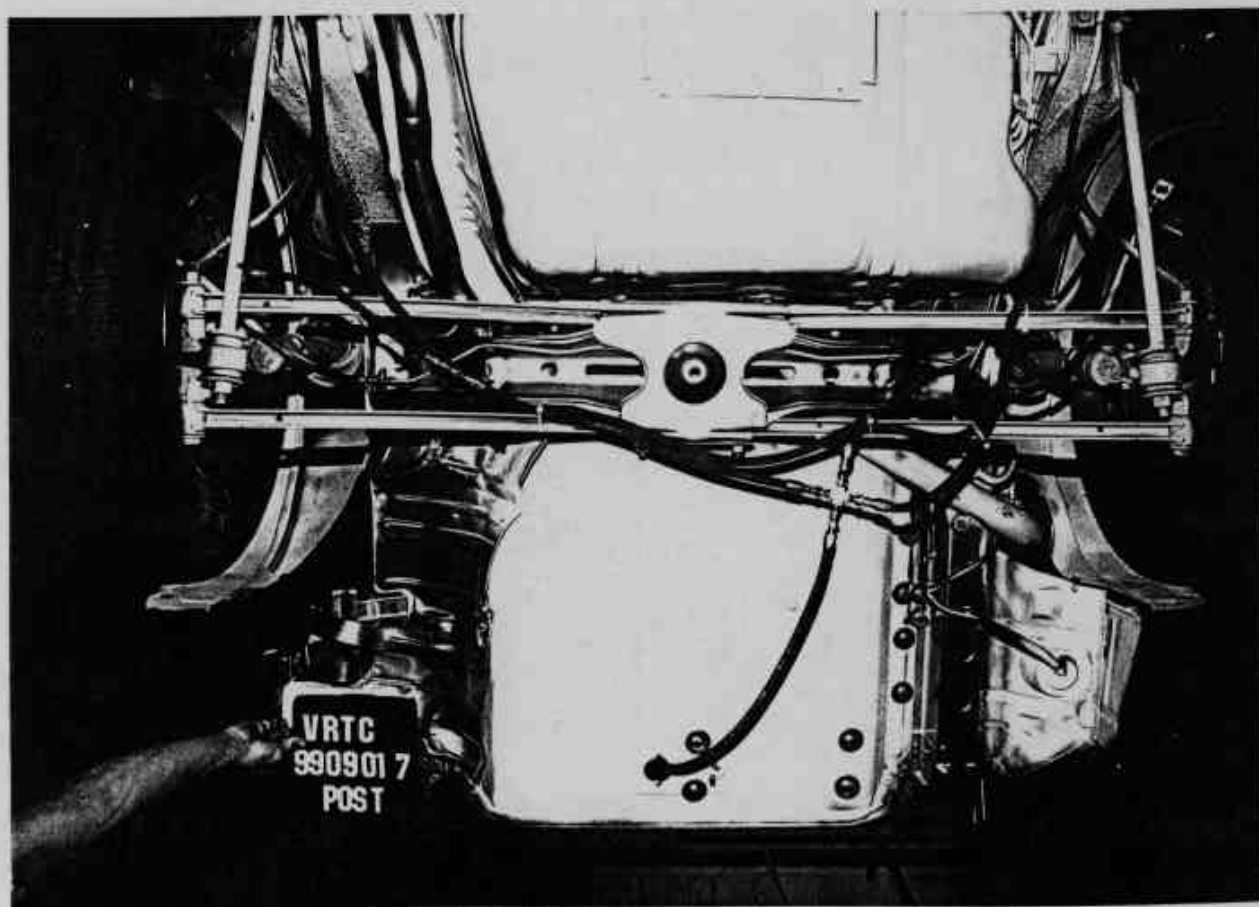


Figure A-24 Post-Test Underbody - View 5

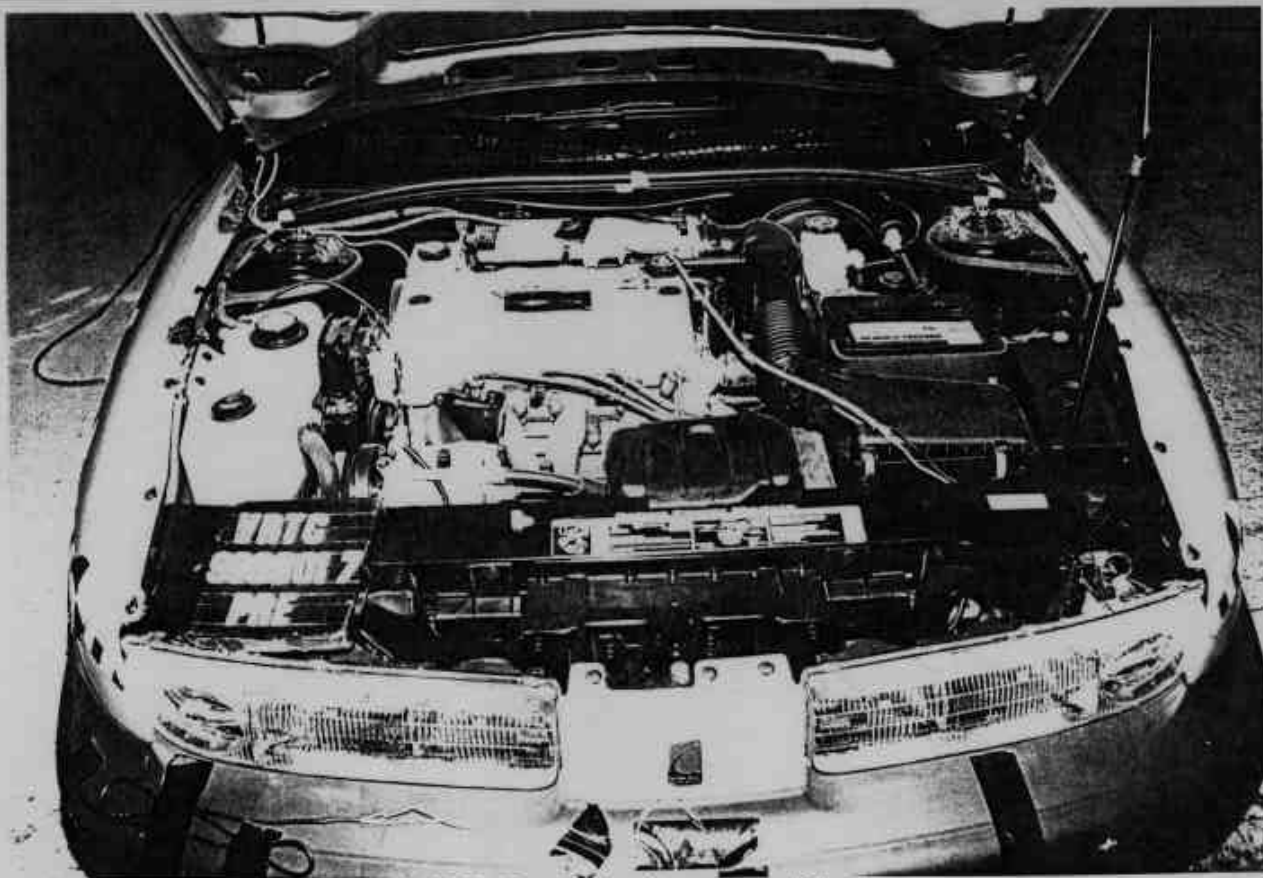


Figure A-25 Pre-Test Engine Compartment View



Figure A-26 Post-Test Engine Compartment View

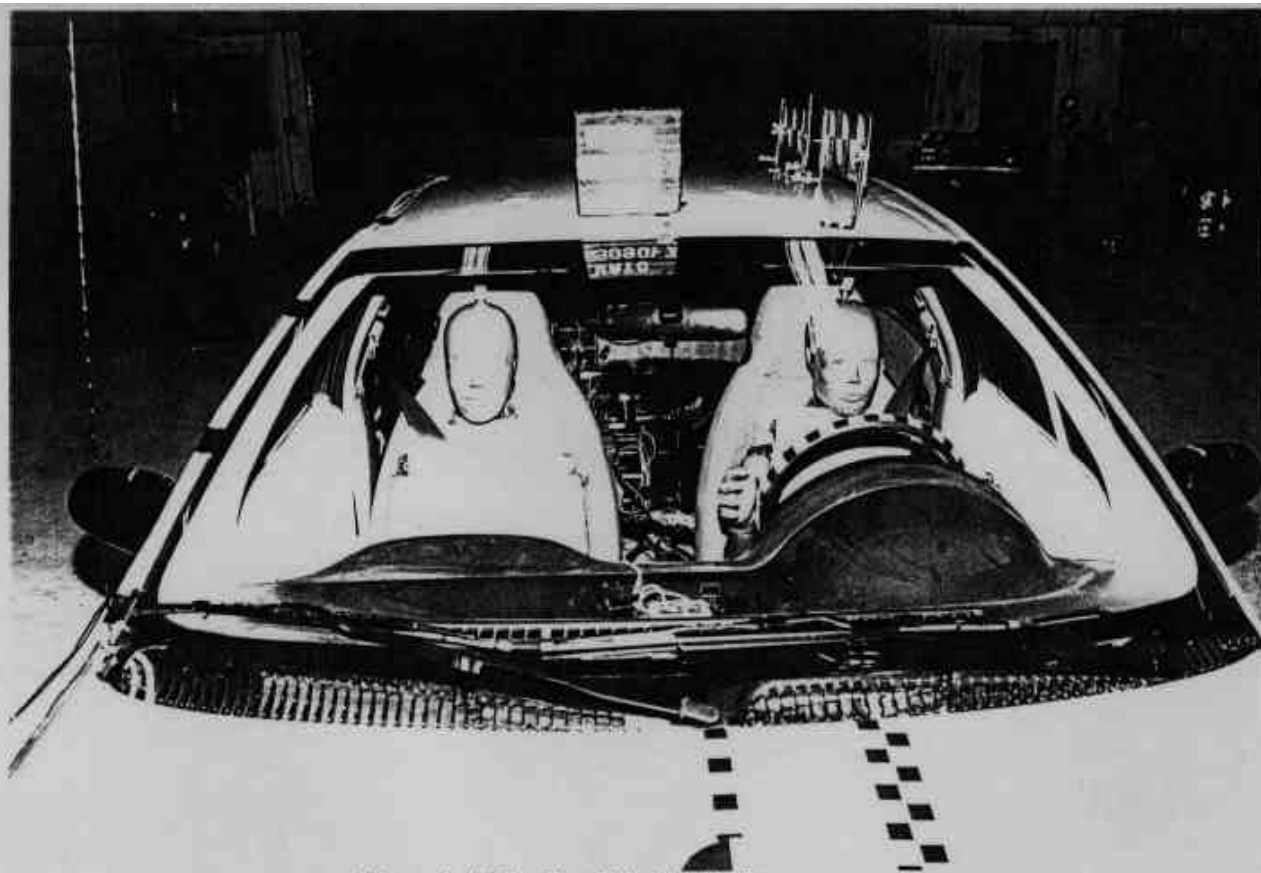


Figure A-27 Pre-Test Windshield View

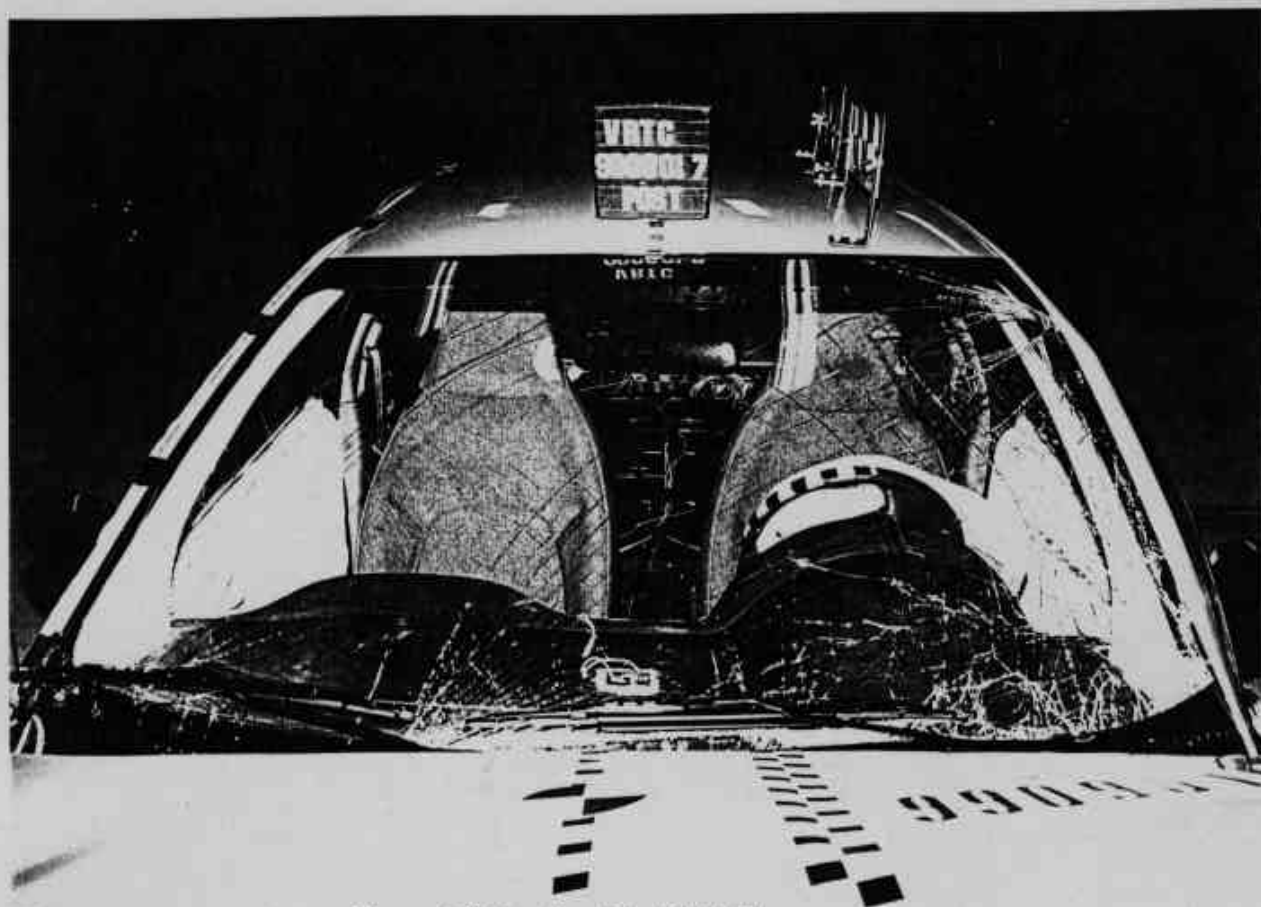


Figure A-28 Post-Test Windshield View

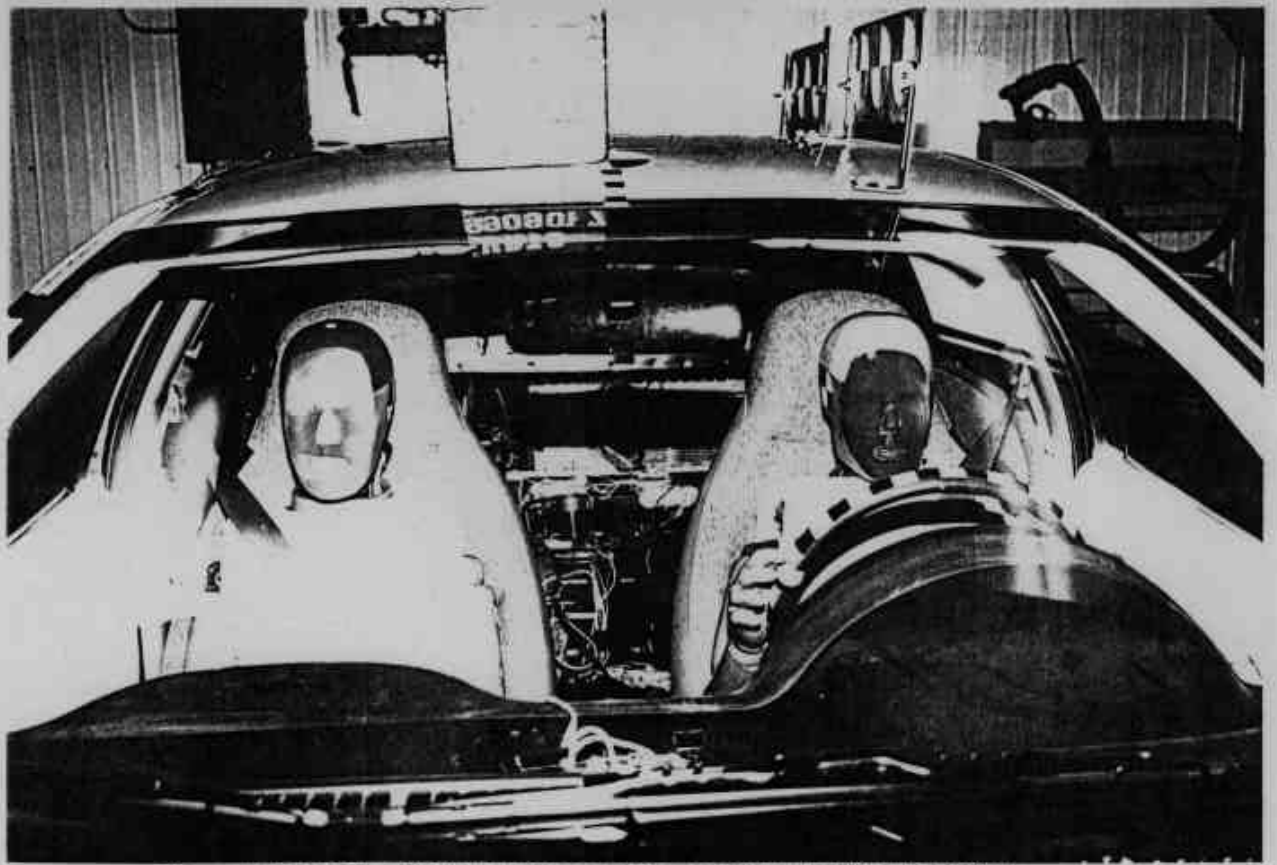


Figure A-29 Pre-Test Driver and Passenger Dummy Through Windshield View

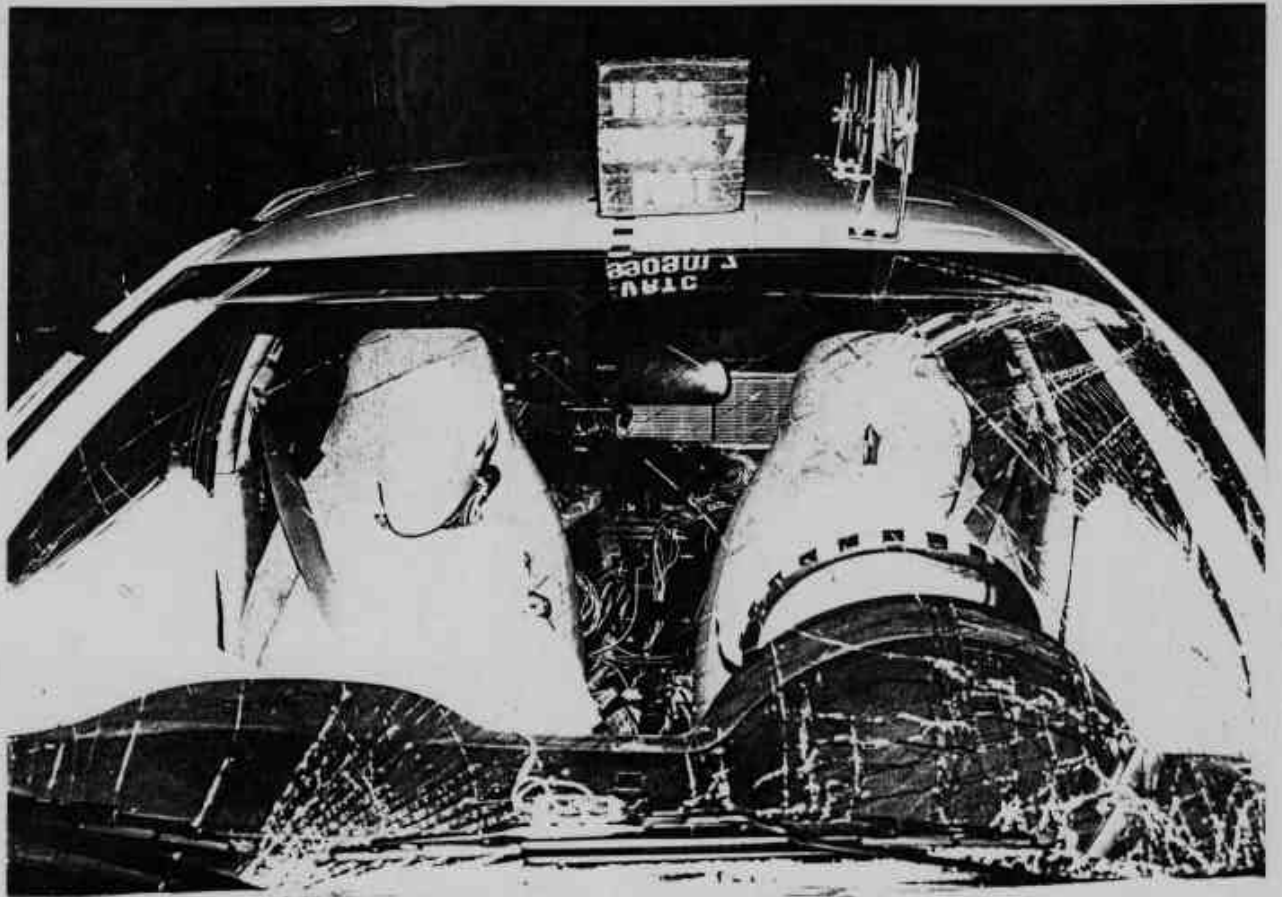


Figure A-30 Post-Test Driver and Passenger Dummy Through Windshield View

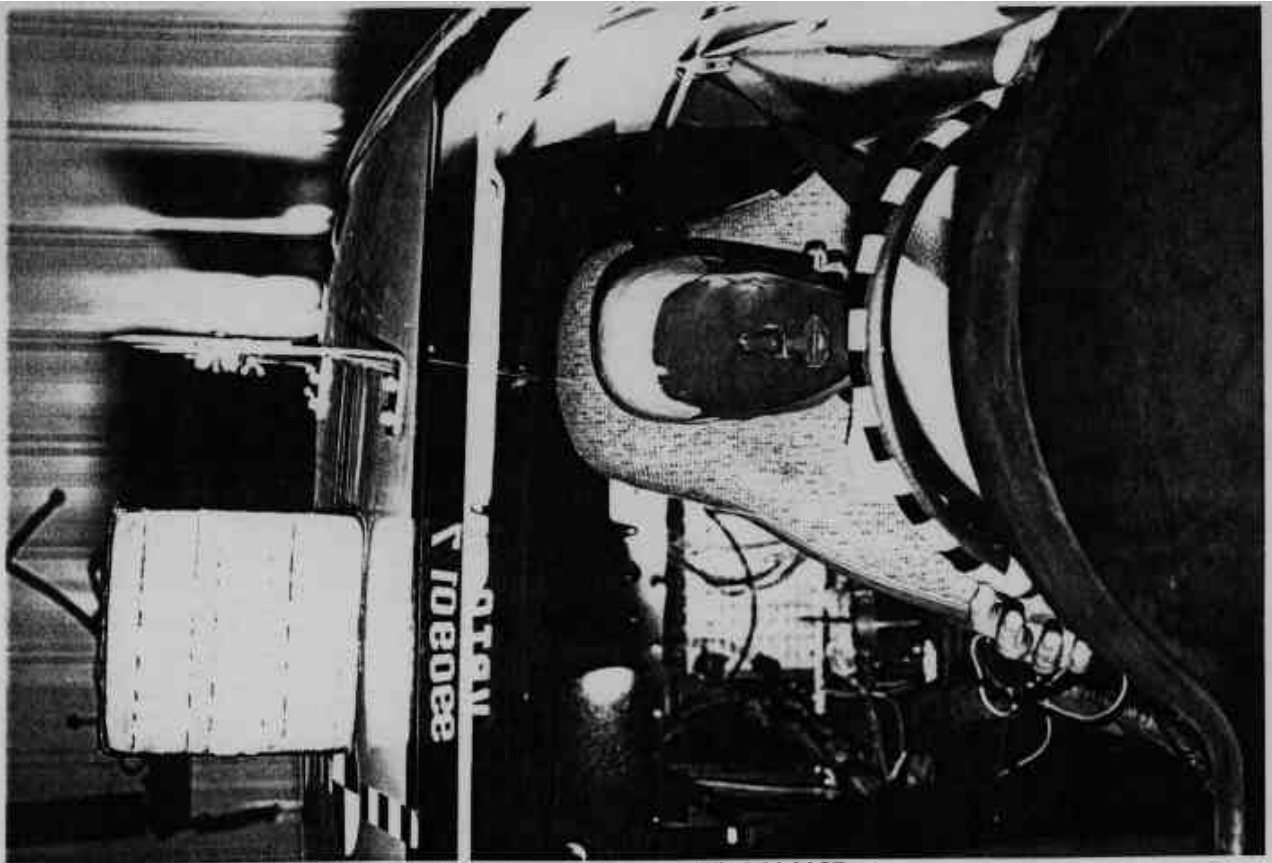


Figure A-31 Pre-Test Driver Dummy Windshield View

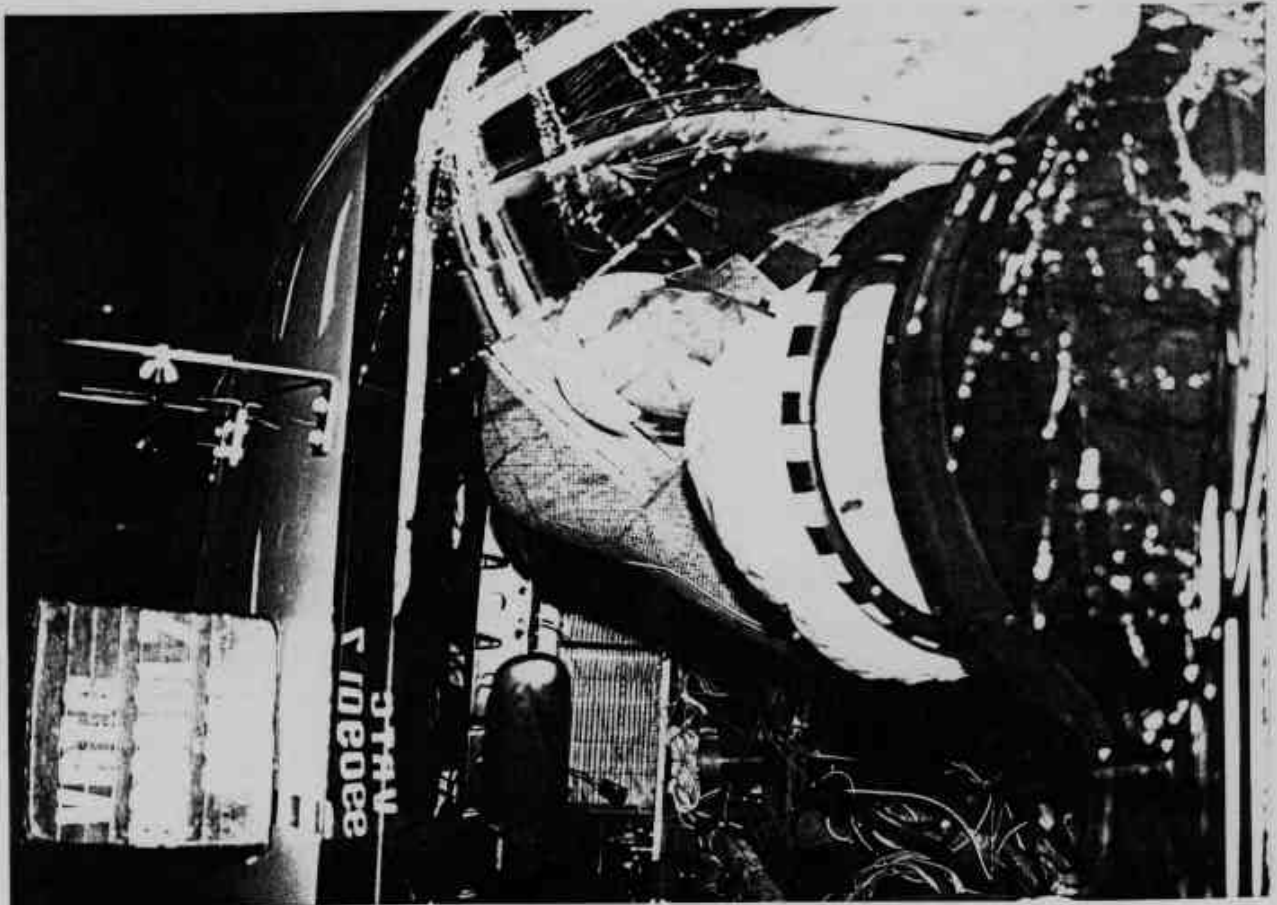


Figure A-32 Post-Test Driver Dummy Windshield View

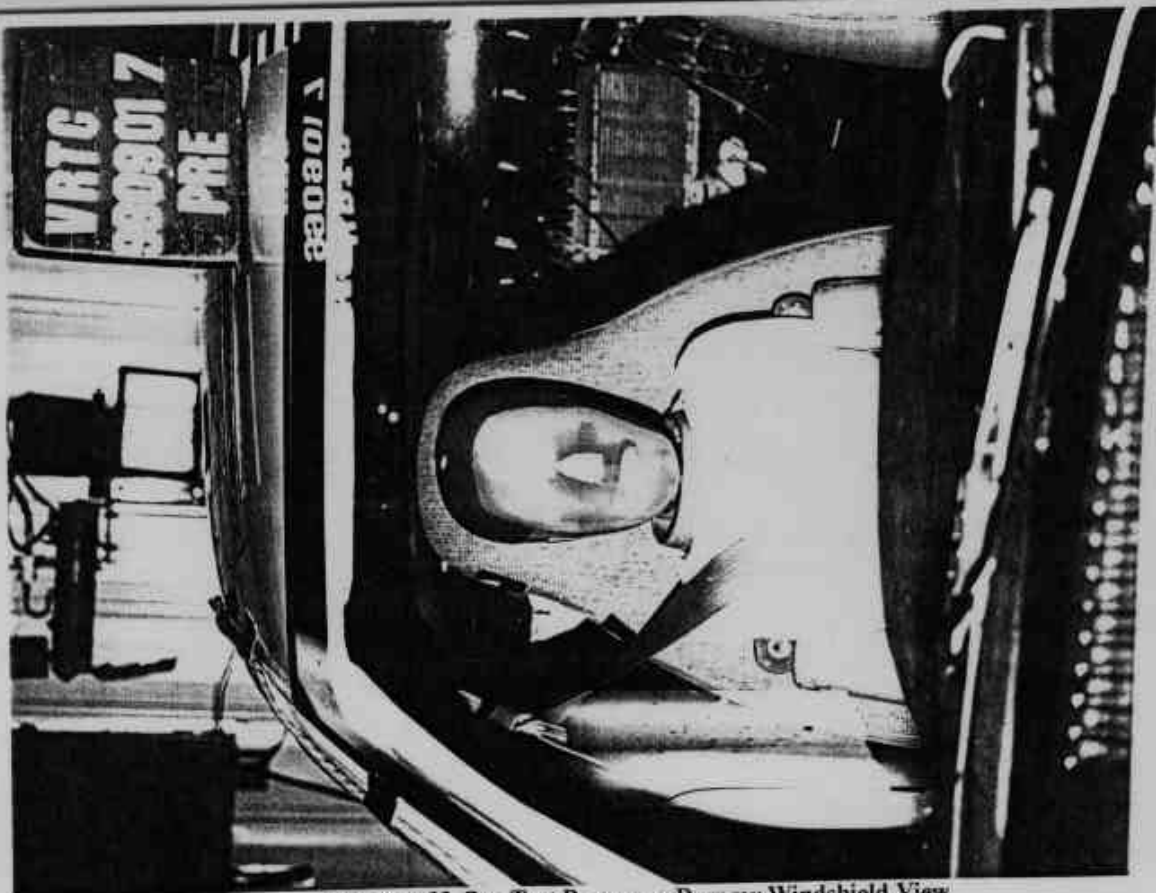


Figure A-33 Pre-Test Passenger Dummy Windshield View

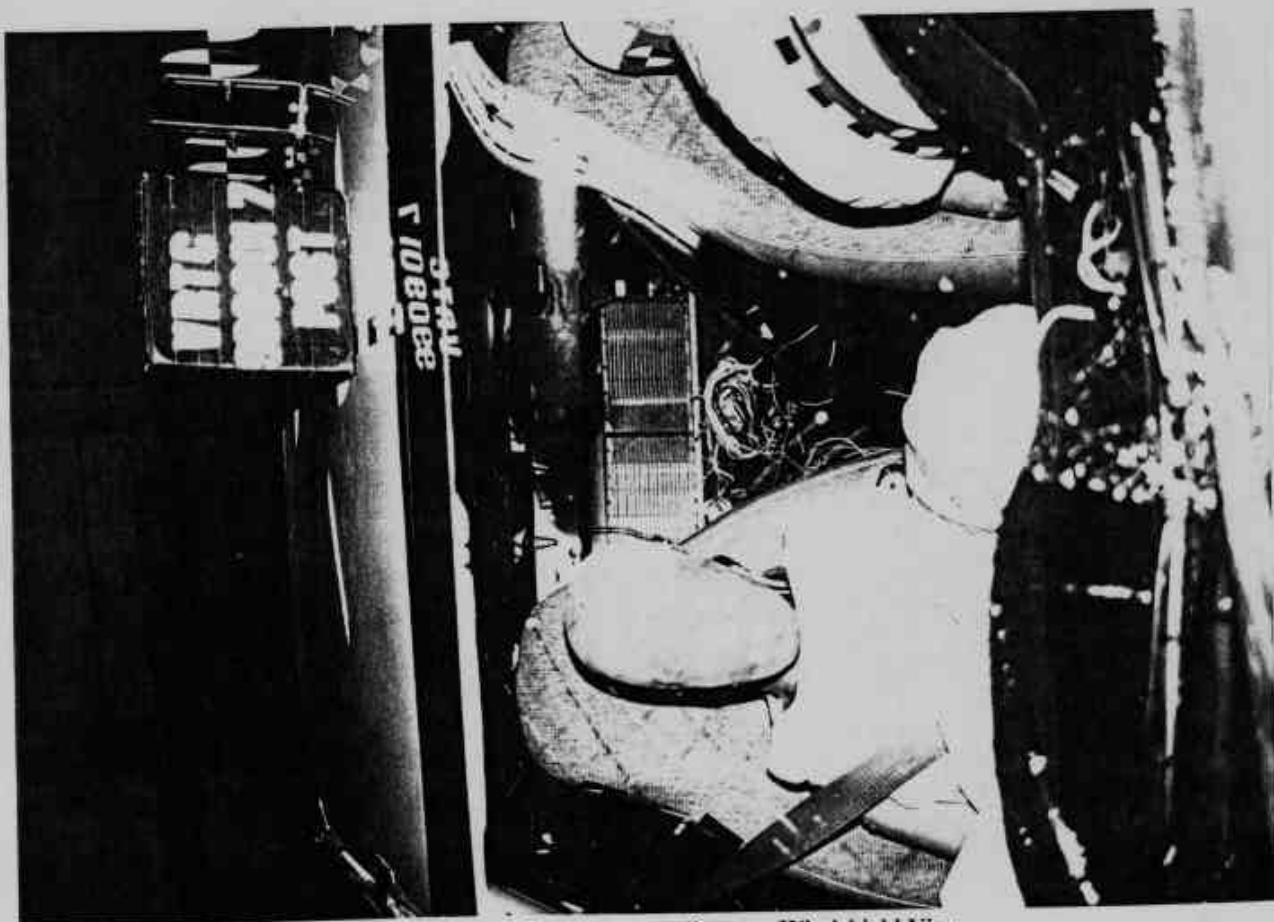


Figure A-34 Post-Test Passenger Dummy Windshield View



Figure A-35 Pre-Test Driver Dummy Position - View 1



Figure A-36 Post-Test Driver Dummy Position - View 1

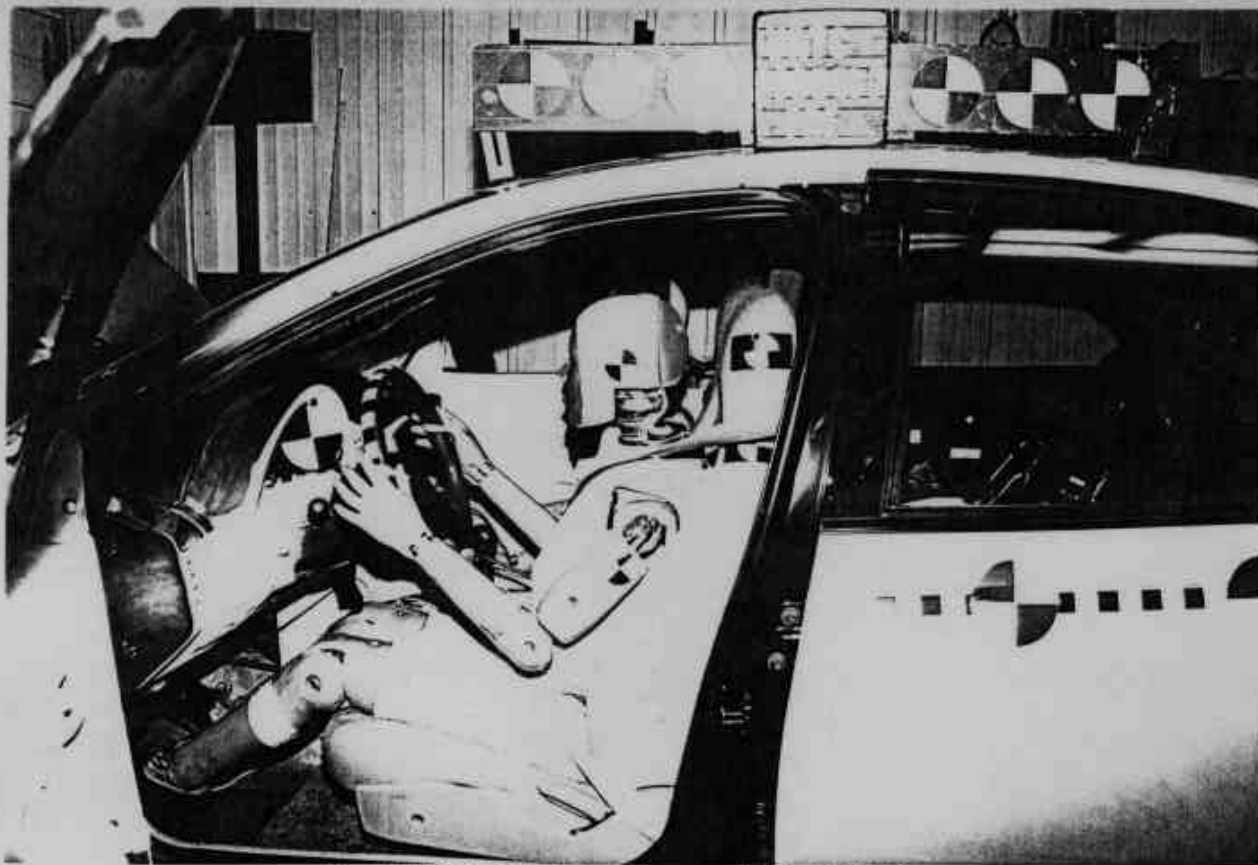


Figure A-37 Pre-Test Driver Dummy Position - View 2



Figure A-38 Post-Test Driver Dummy Position - View 2



Figure A-39 Pre-Test Driver Dummy Position - View 3



Figure A-40 Post-Test Driver Dummy Position - View 3



Figure A-41 Pre-Test Passenger Dummy Position - View 1



Figure A-42 Post-Test Passenger Dummy Position - View 1

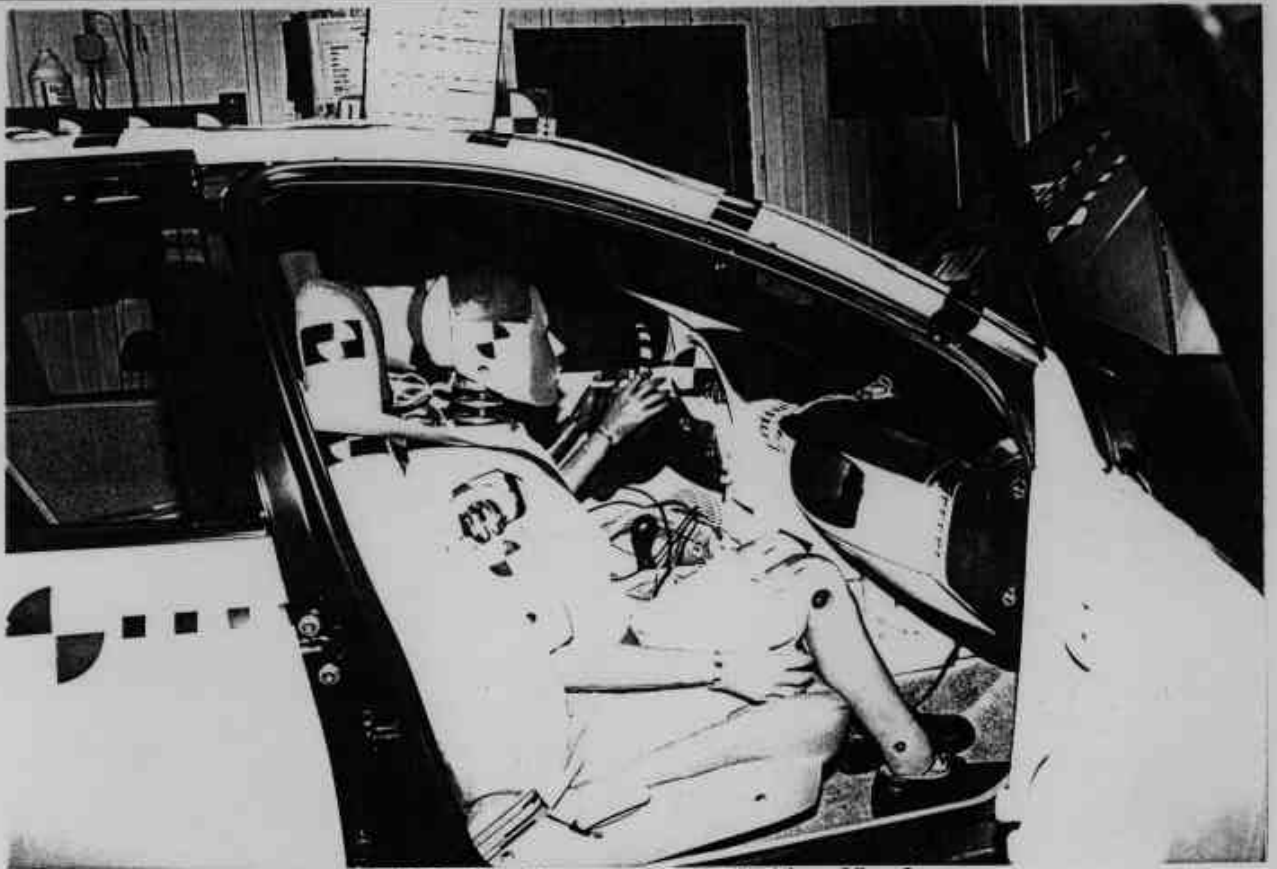


Figure A-43 Pre-Test Passenger Dummy Position - View 2



Figure A-44 Post-Test Passenger Dummy Position - View 2



Figure A-45 Pre-Test Passenger Dummy Position - View 3



Figure A-46 Post-Test Passenger Dummy Position - View 3

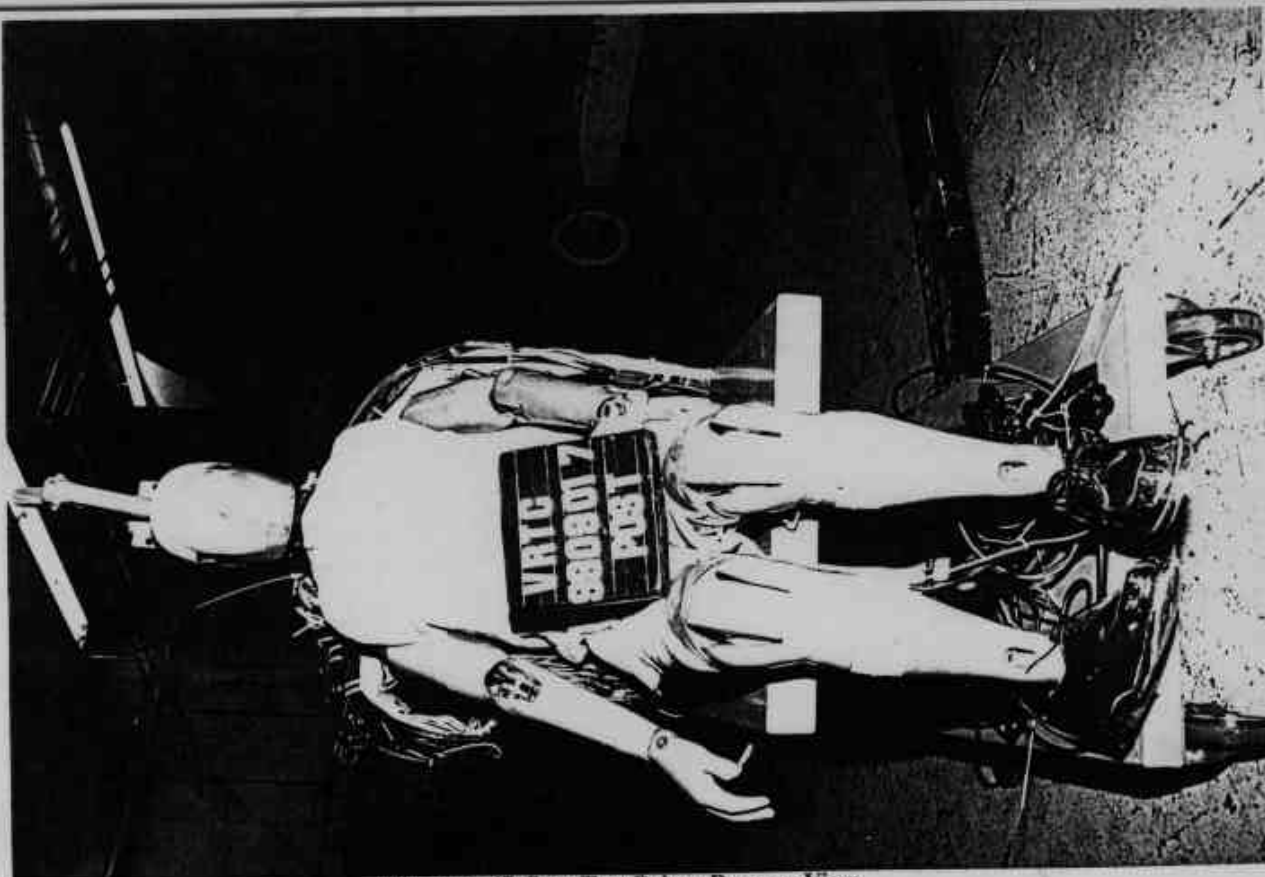


Figure A-47 Post-Test Driver Dummy View



Figure A-48 Post-Test Driver Dummy Head Contact - View 1



Figure A-49 Post-Test Driver Dummy Head Contact - View 2

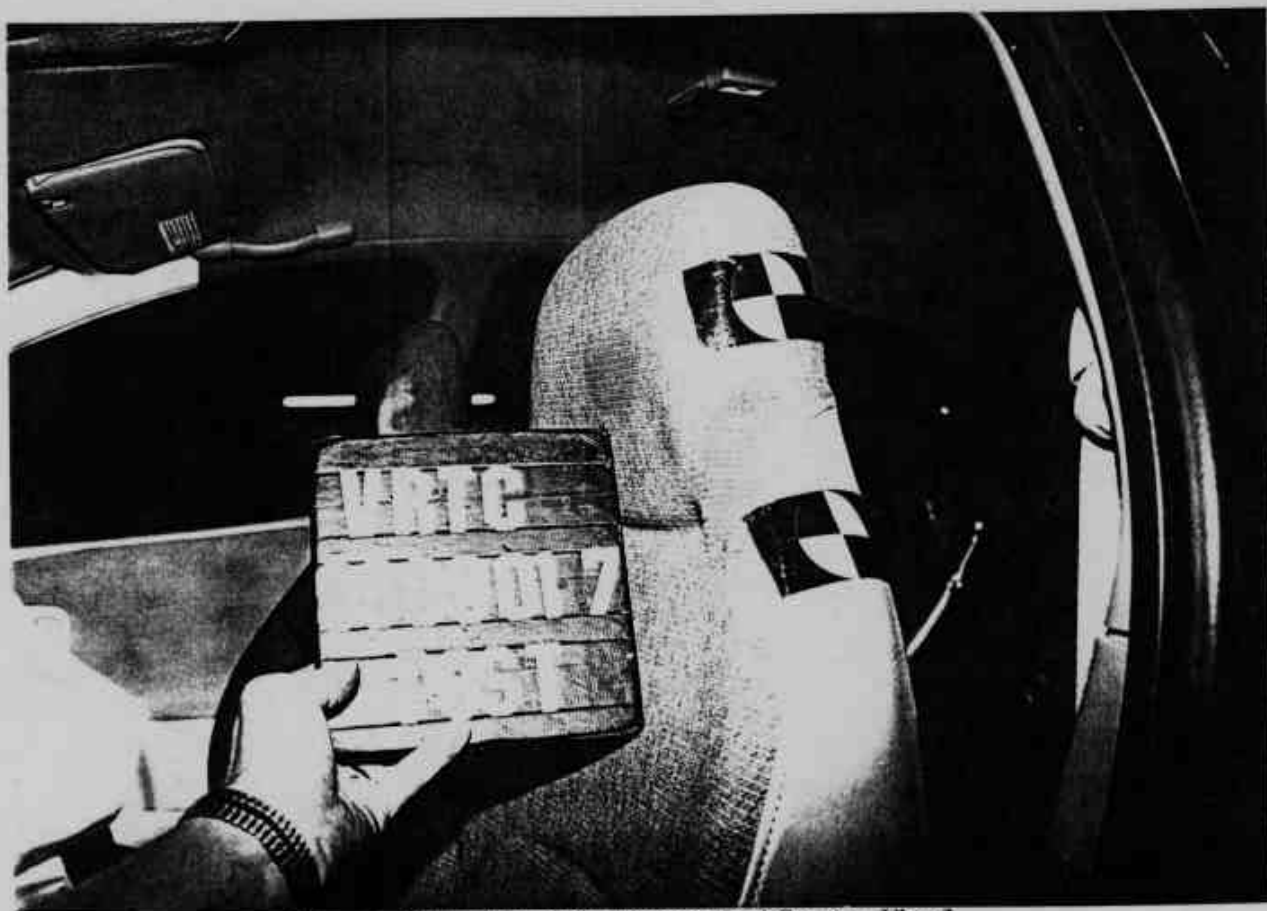


Figure A-50 Post-Test Driver Dummy Head Contact - View 3

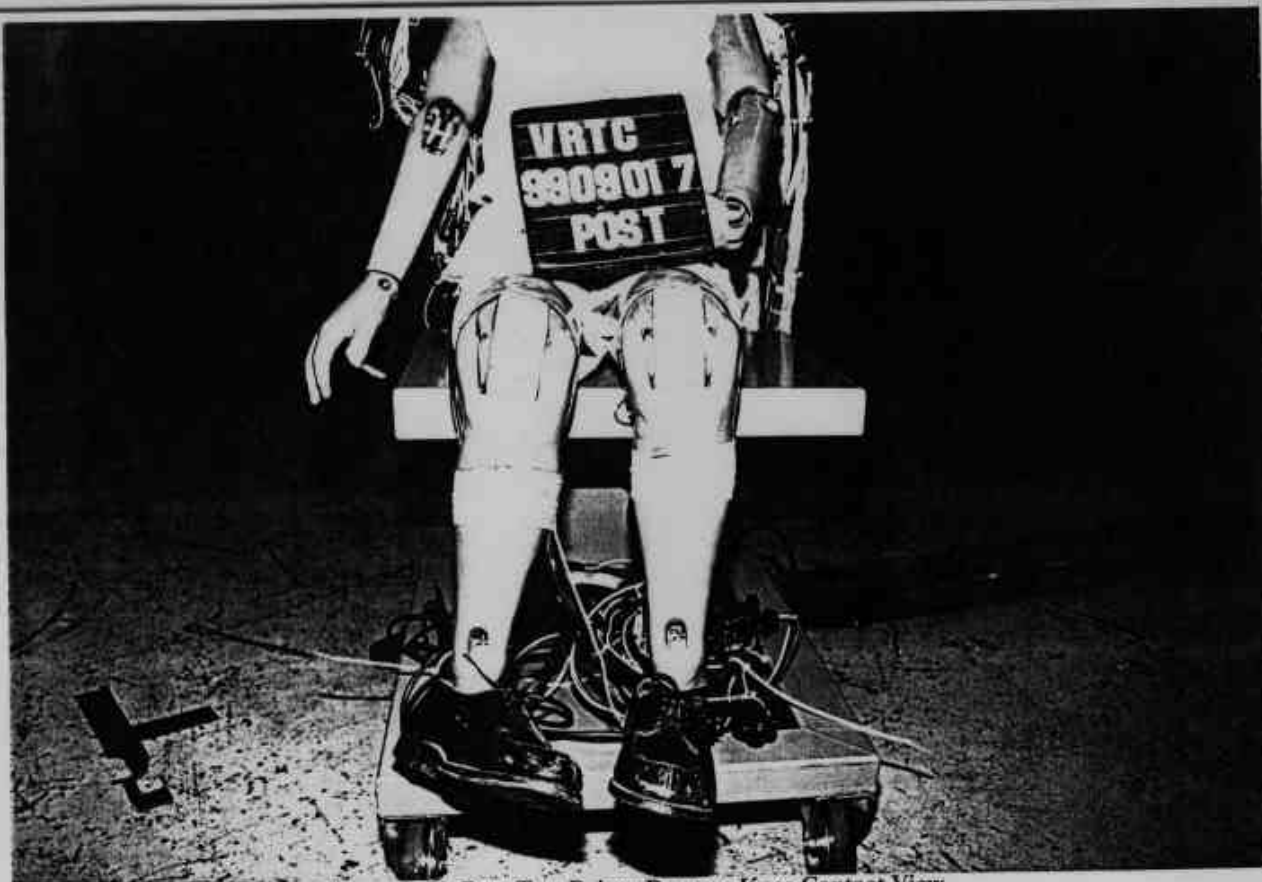


Figure A-51 Post-Test Driver Dummy Knee Contact View

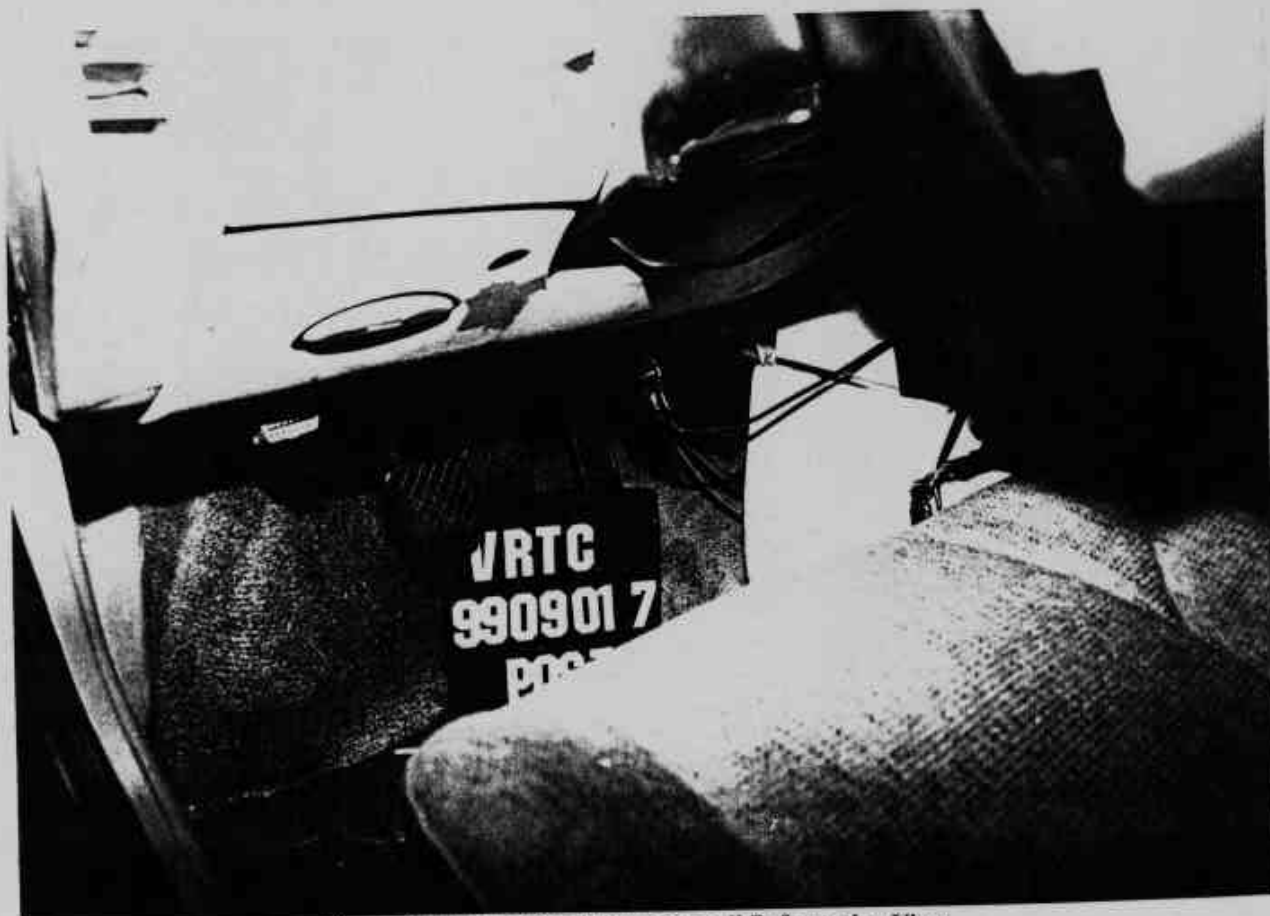


Figure A-52 Post-Test Driver Footwell Deformation View

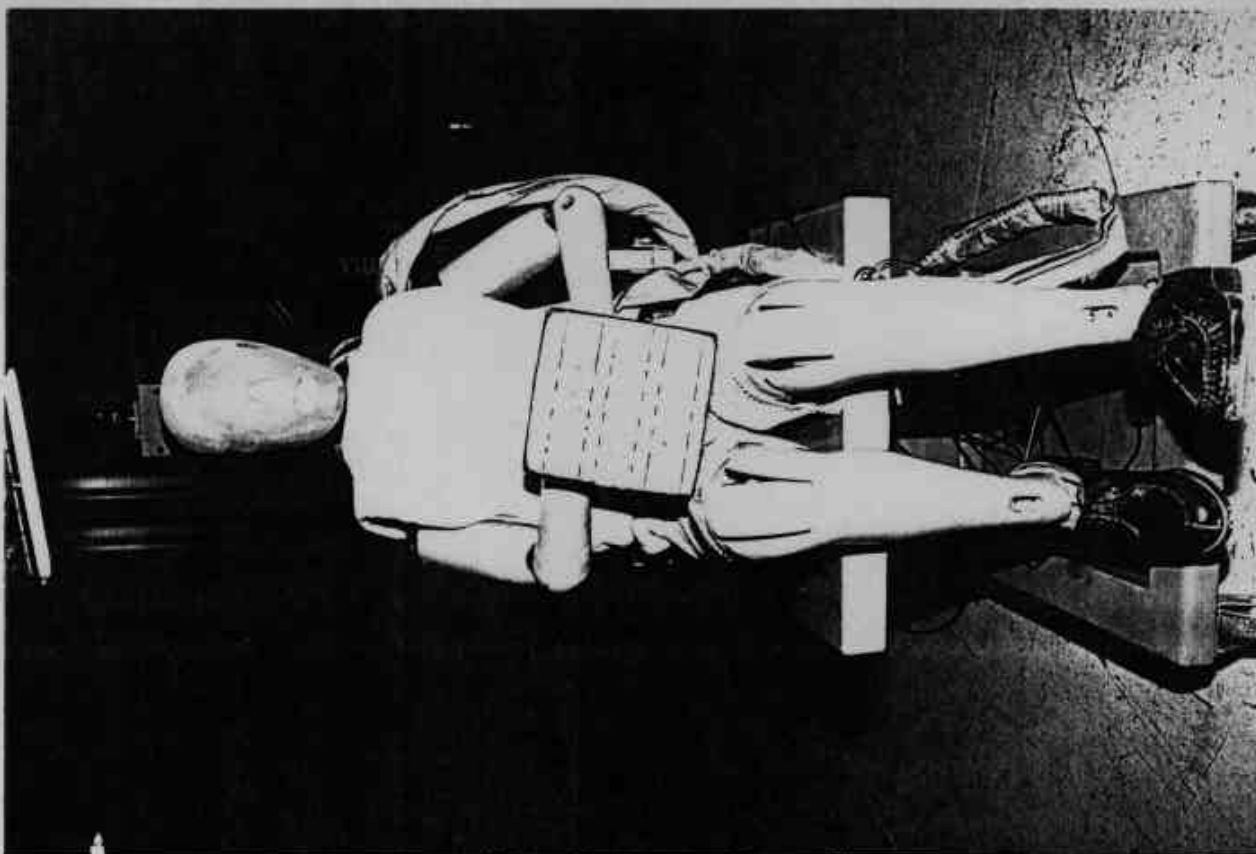


Figure A-53 Post-Test Passenger Dummy View



Figure A-54 Post-Test Passenger Dummy Head Contact - View 1



Figure A-55 Post-Test Passenger Dummy Head Contact - View 2



Figure A-56 Post-Test Passenger Dummy Head Contact - View 3



Figure A-57 Post-Test Passenger Dummy Knee Contact - View 1



Figure A-58 Post-Test Passenger Dummy Knee Contact - View 2

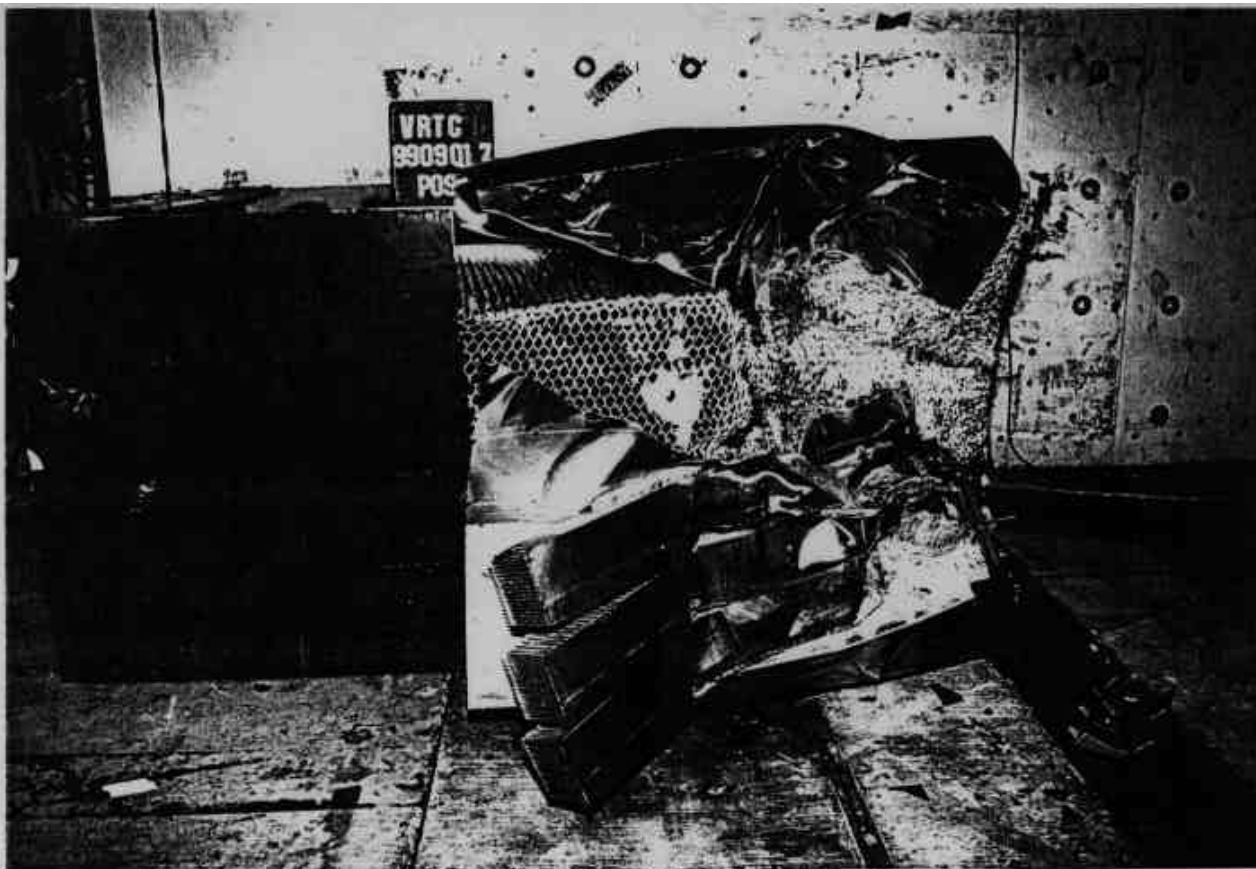


Figure A-59 Post-Test Offset Deformable Barrier - View 1



Figure A-60 Post-Test Offset Deformable Barrier - View 2

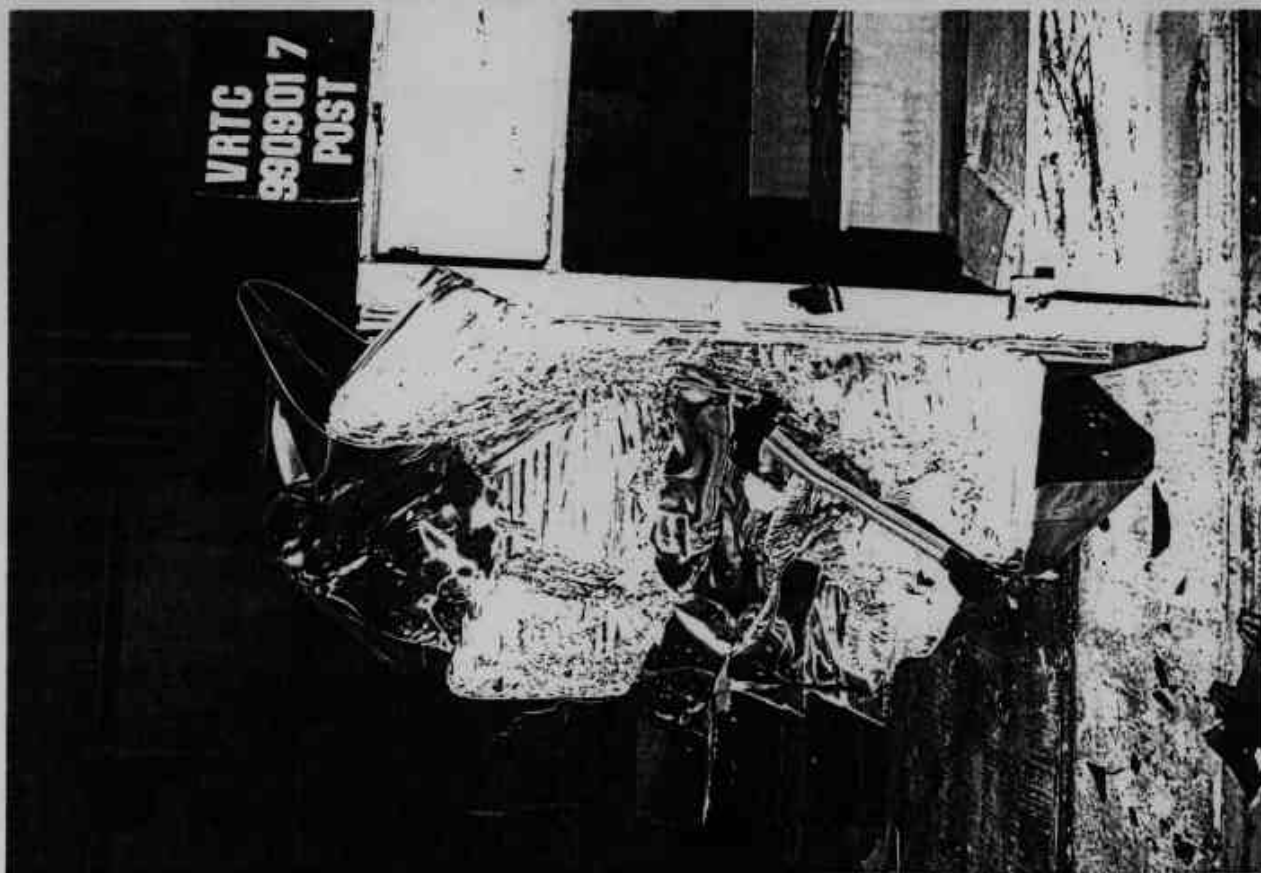


Figure A-61 Post-Test Offset Deformable Barrier - View 3



Figure A-62 Pre-Test Vehicle Certification Label View

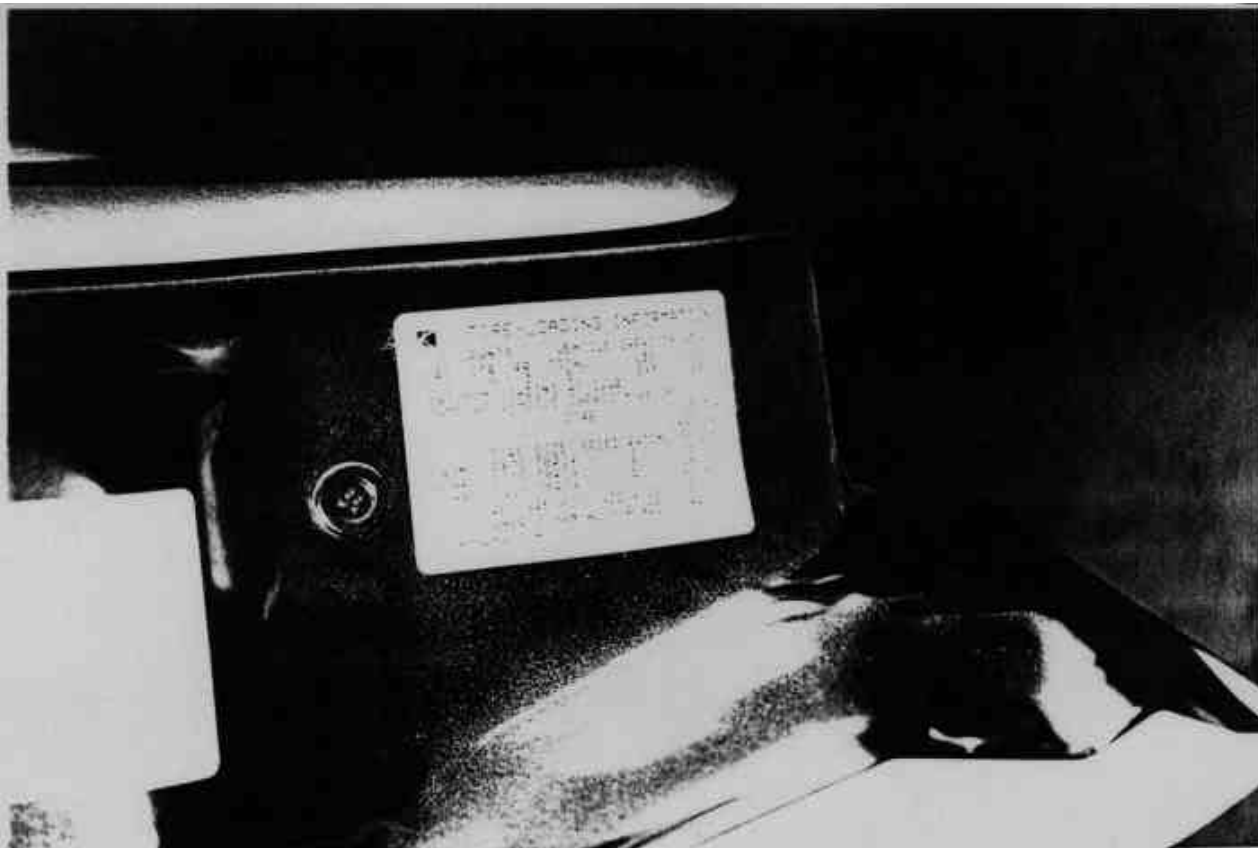


Figure A-63 Pre-Test Vehicle Tire Information Label View



Figure A-64 Impact Event

Appendix B

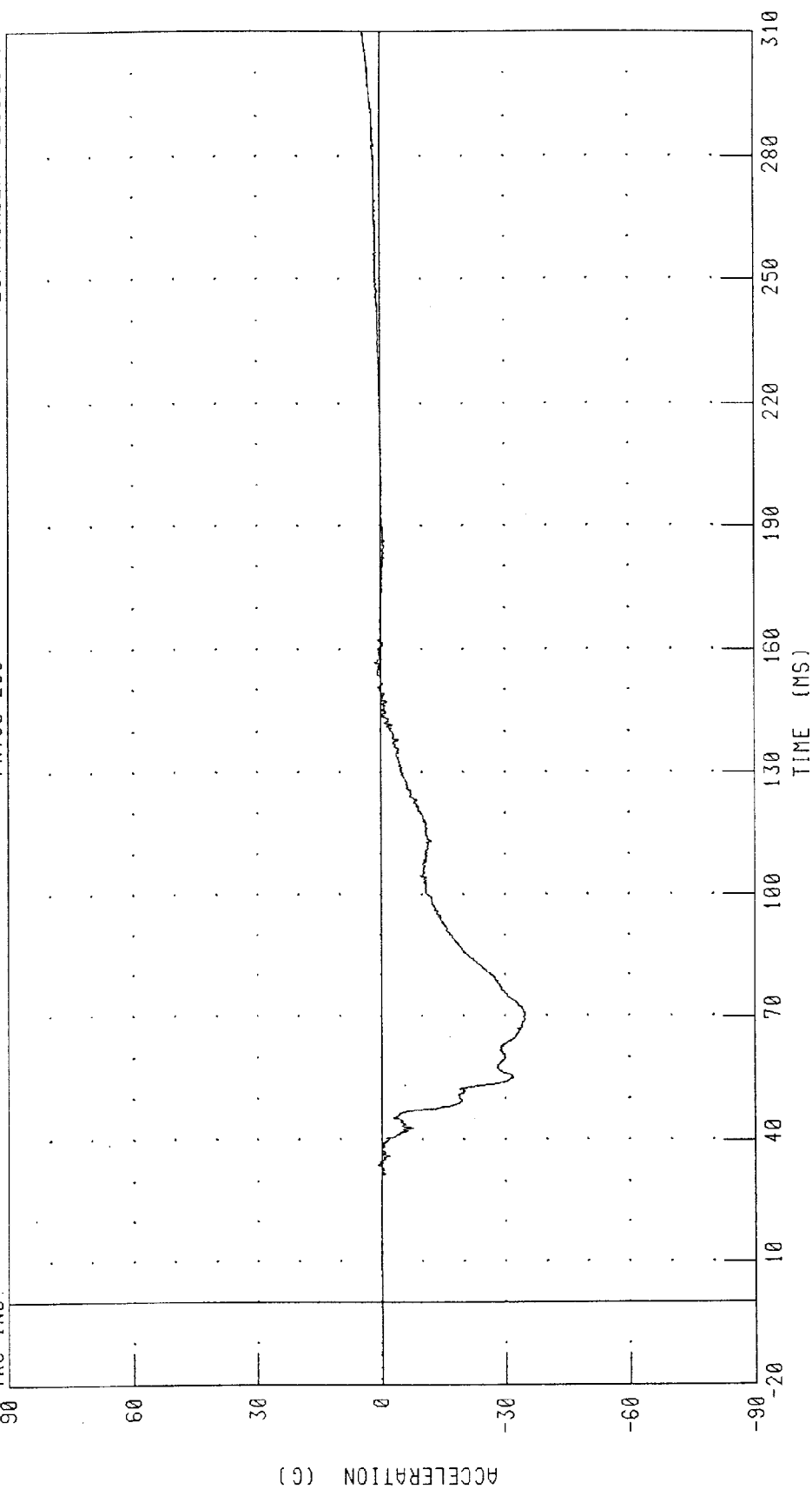
Data Plots

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER HEAD X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

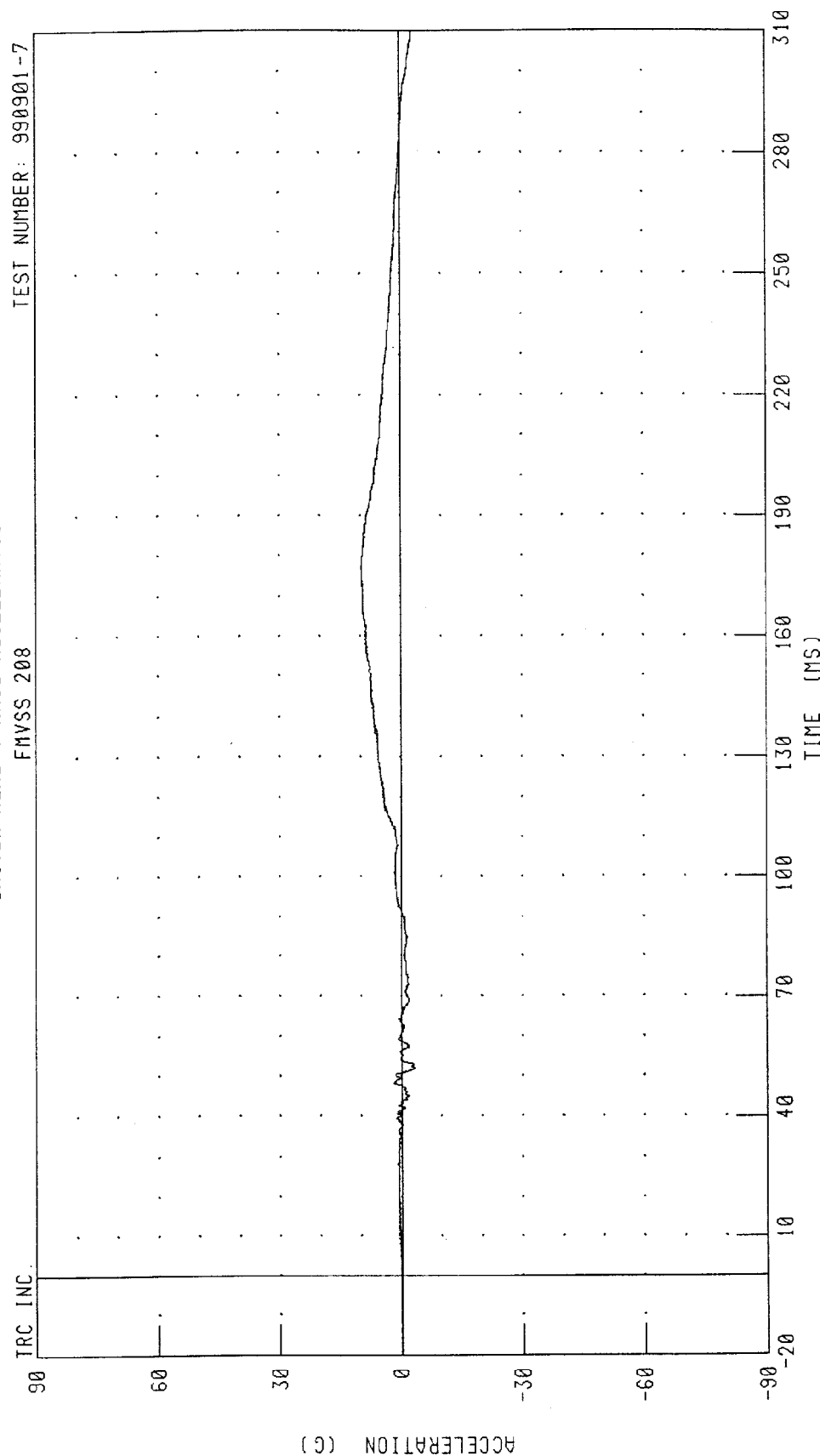
PEAK DATA: 4.09 G @ 310.00 MS, -34.85 G @ 69.20 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH

DRIVER HEAD Y-AXIS ACCELERATION

FMVSS 208

TEST NUMBER: 990901-7



CHANNEL: HEDYG1 FILTER: CH. CLASS 1000

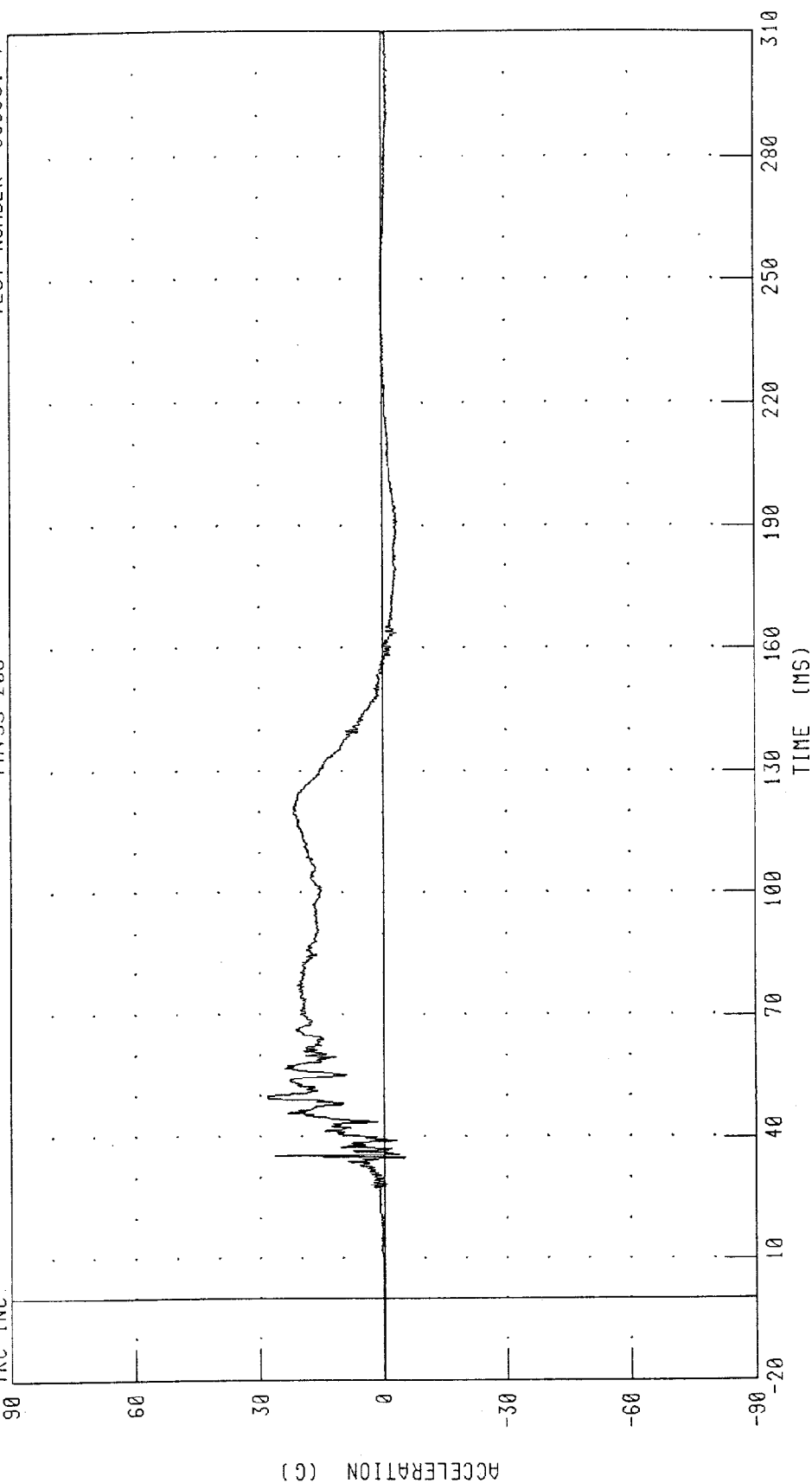
PEAK DATA: 9.72 G @ 175.92 MS, -3.34 G @ 51.84 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER HEAD Z-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: HED701 FILTER: CH. CLASS 1000

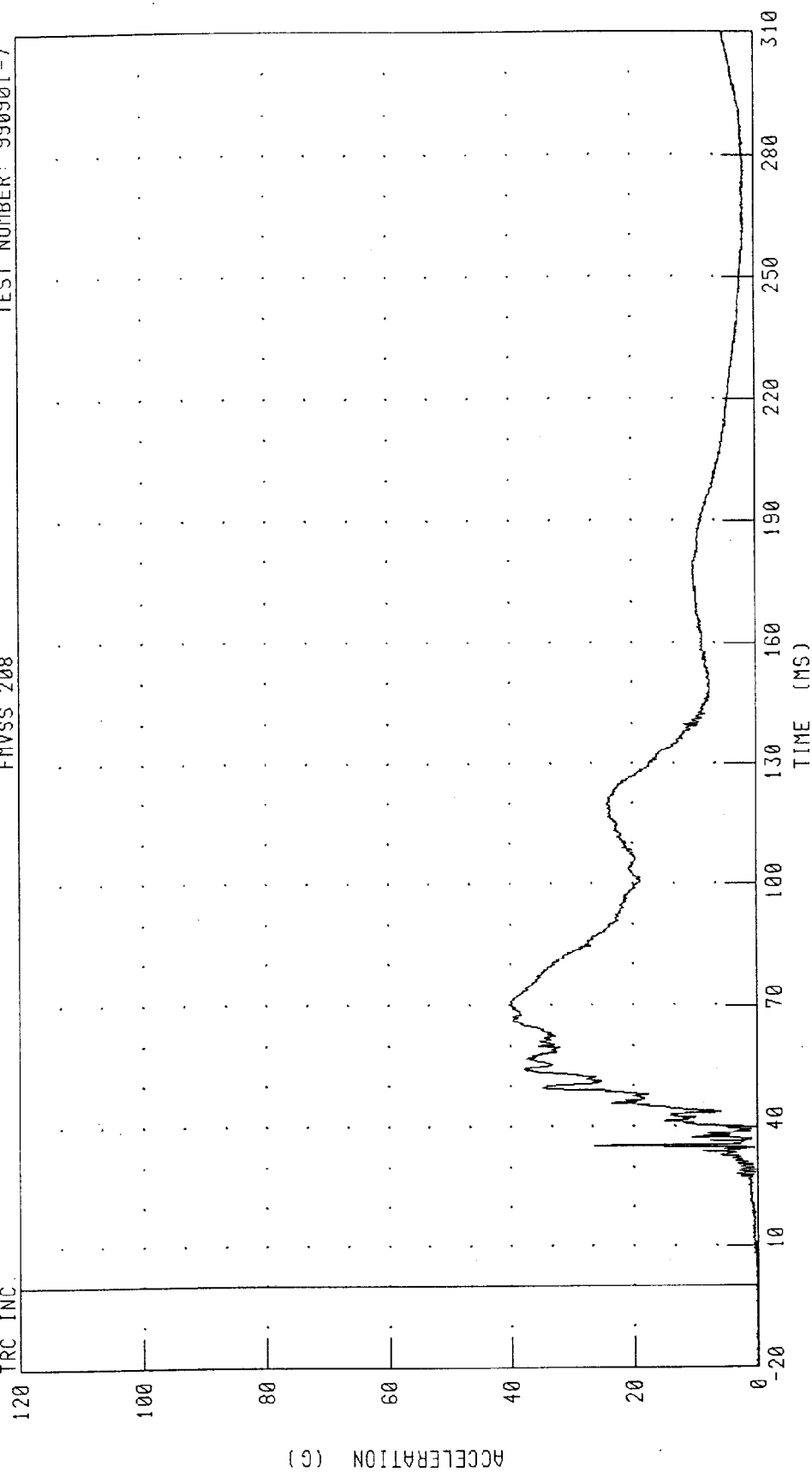
PEAK DATA: 28.42 G @ 49.52 MS; -5.30 G @ 34.96 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER HEAD RESULTANT ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

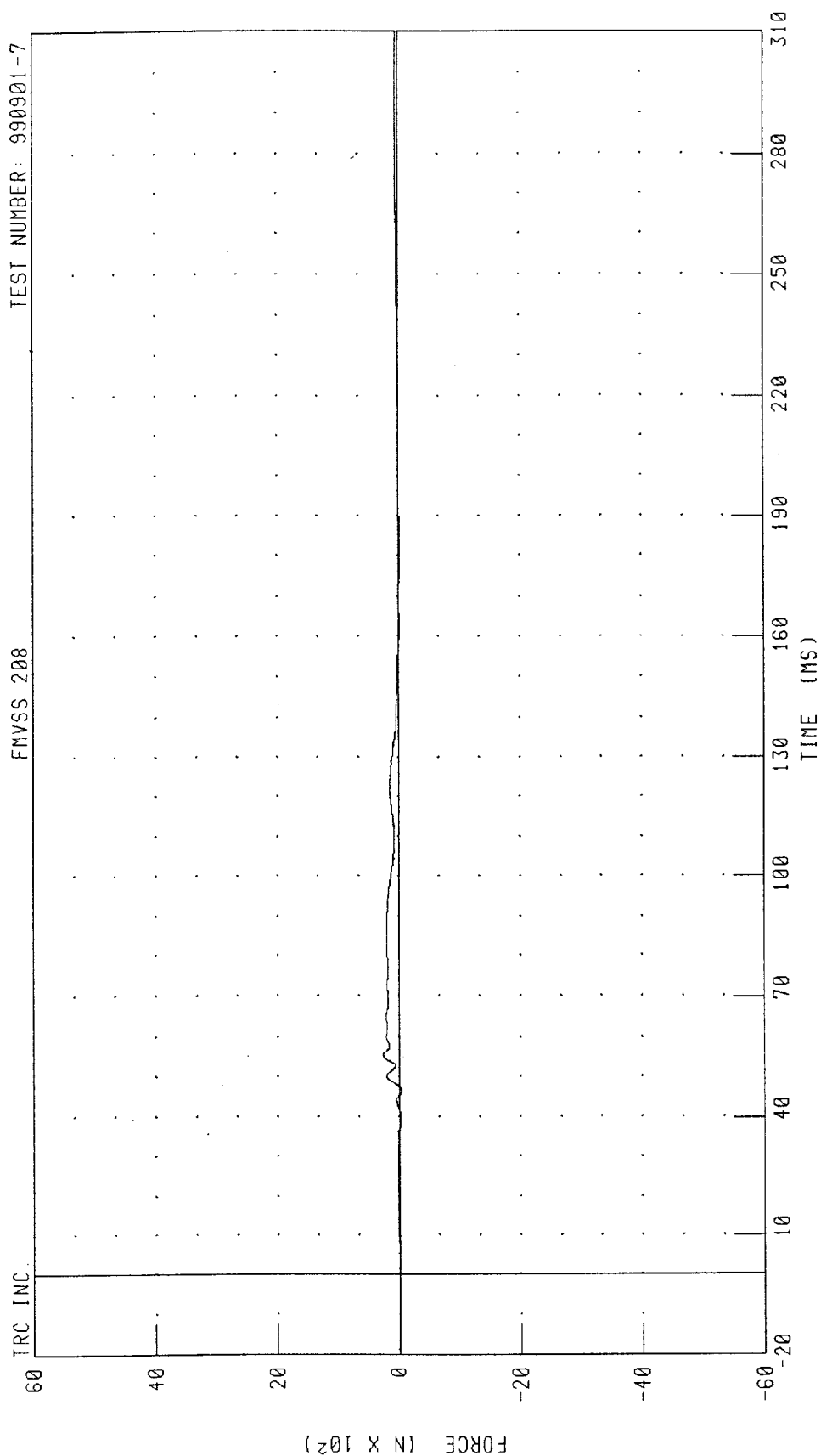
TRC INC.



CHANNEL: HEDRC1 FILTER: CH. CLASS 1000

PEAK DATA: 40.30 G @ 70.24 MS; 0.10 G @ -19.92 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER NECK X-AXIS SHEAR FORCE



CHANNEL: NEKXF1 FILTER: CH. CLASS 1000

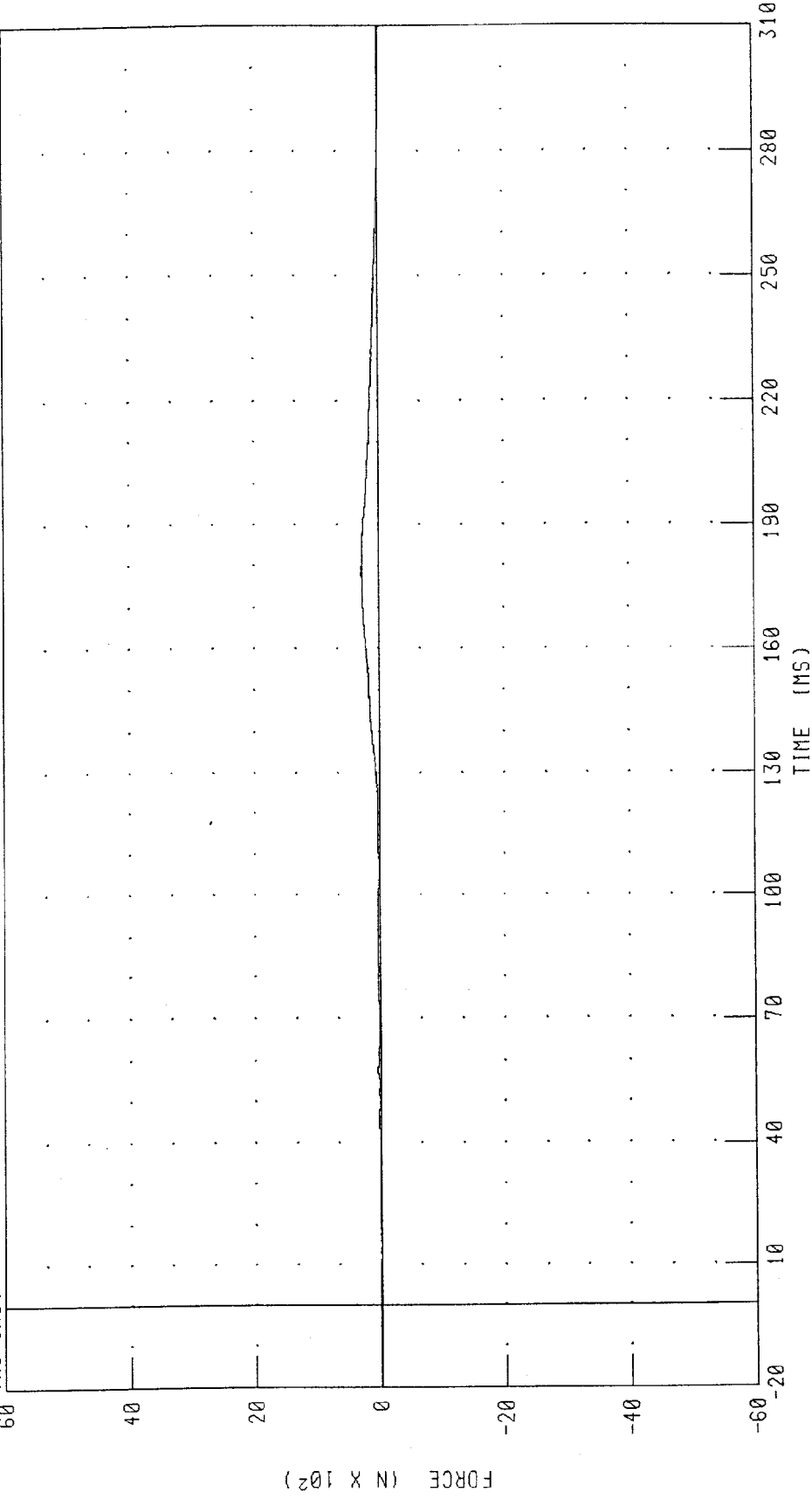
PEAK DATA: 267.73 N @ 55.20 MS, -39.78 N @ 46.16 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER NECK Y-AXIS SHEAR FORCE

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



PEAK DATA: 273.49 N @ 177.68 MS; -35.82 N @ 309.76 MS

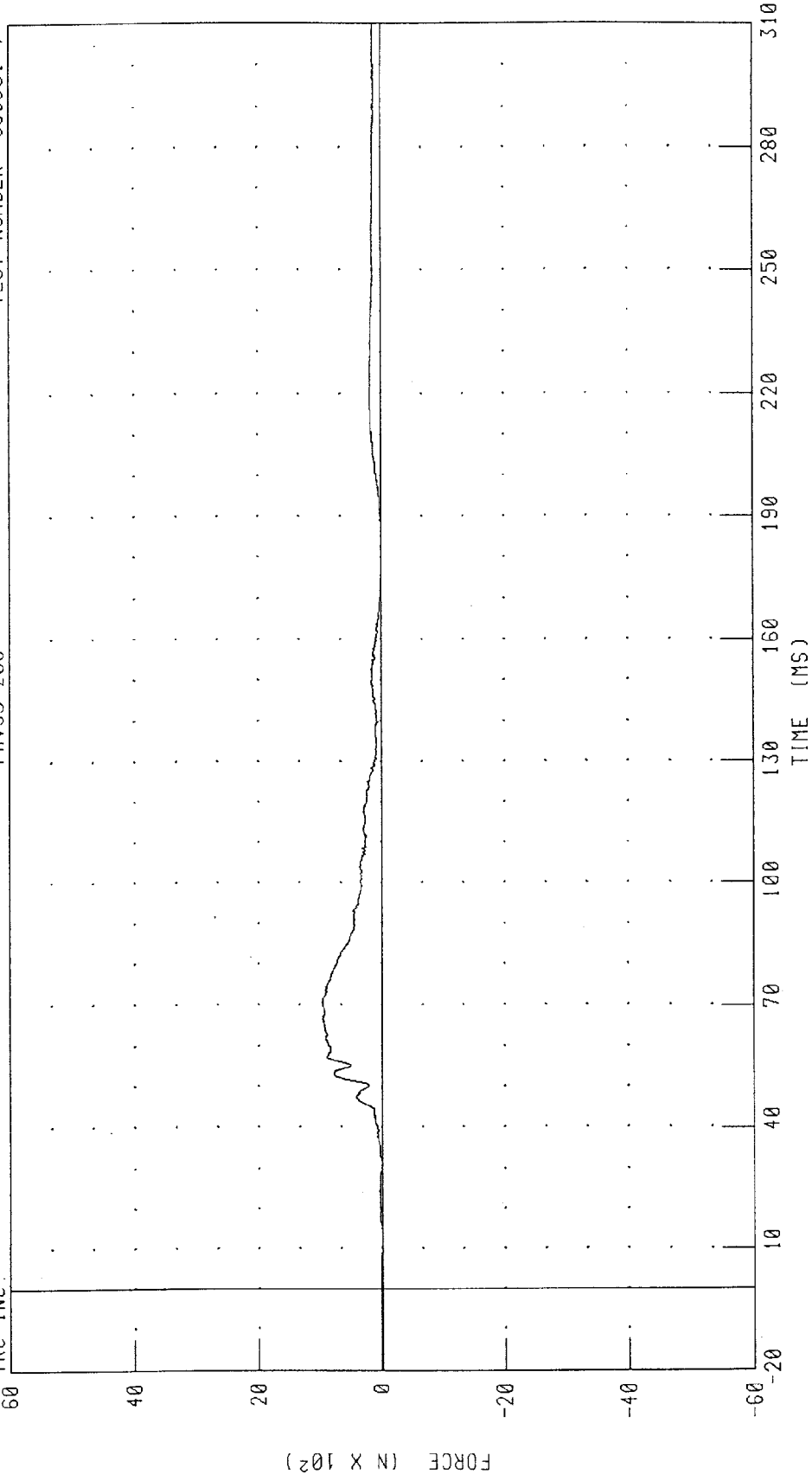
CHANNEL: NEKYF1 FILTER: CH. CLASS 1000

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER NECK Z-AXIS AXIAL FORCE

TEST NUMBER: 990901-7

FMVSS 208

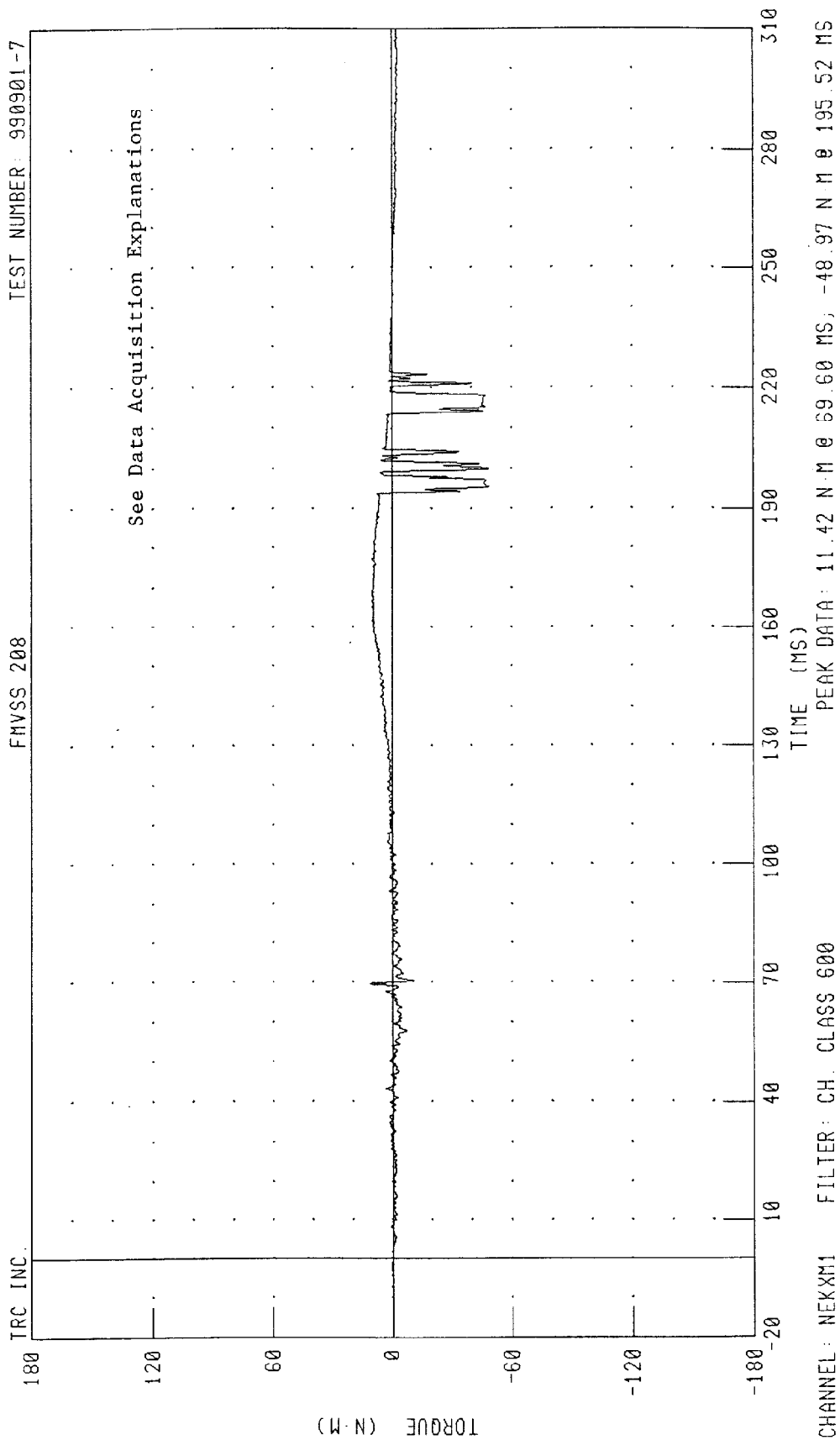
TRC INC.



CHANNEL: NEKZF1 FILTER: CH. CLASS 1000

PEAK DATA: 970.75 N @ 70.72 MS; -15.09 N @ 10.48 MS

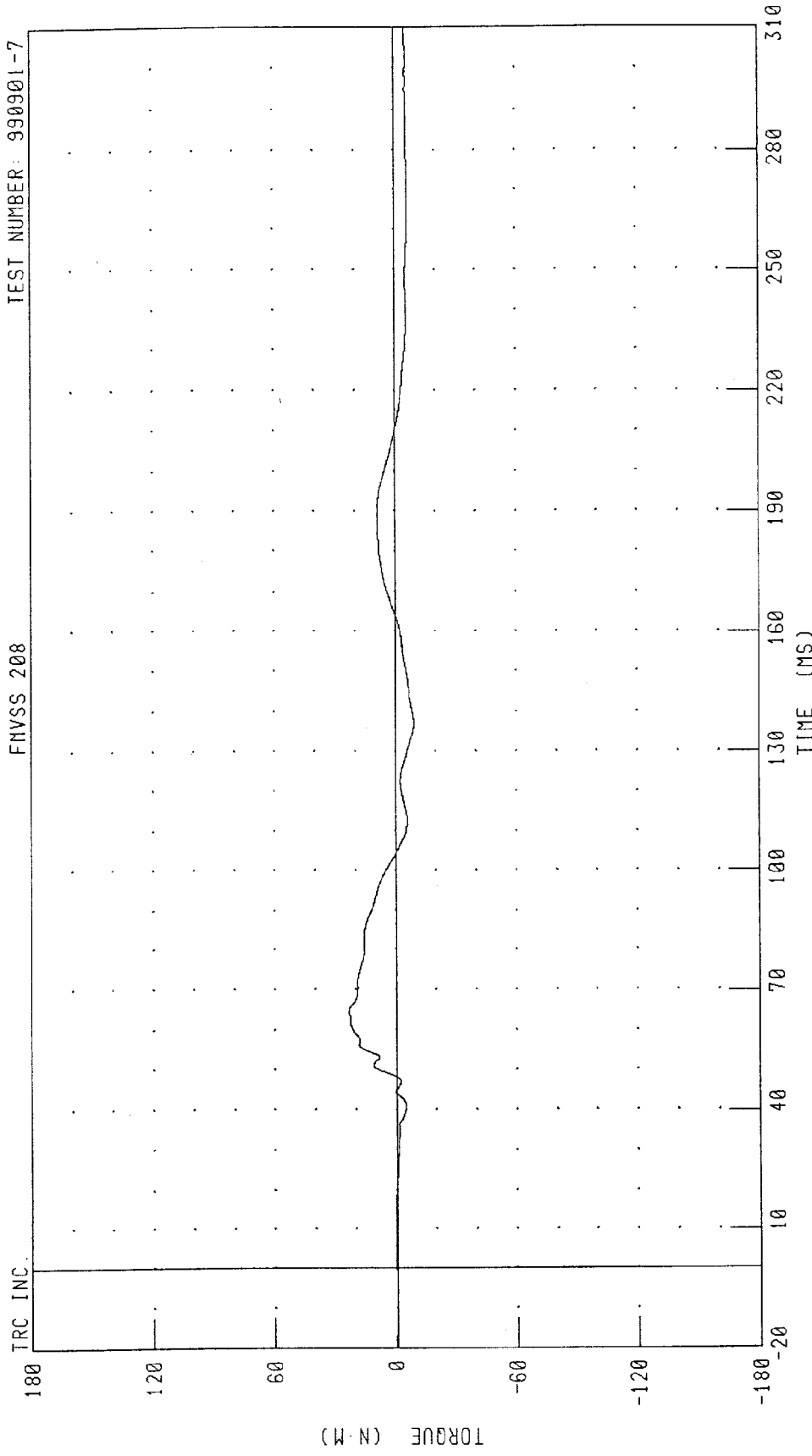
1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER NECK MOMENT ABOUT X AXIS



1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER NECK MOMENT ABOUT Y AXIS

TEST NUMBER: 990901-7

FNVS 208



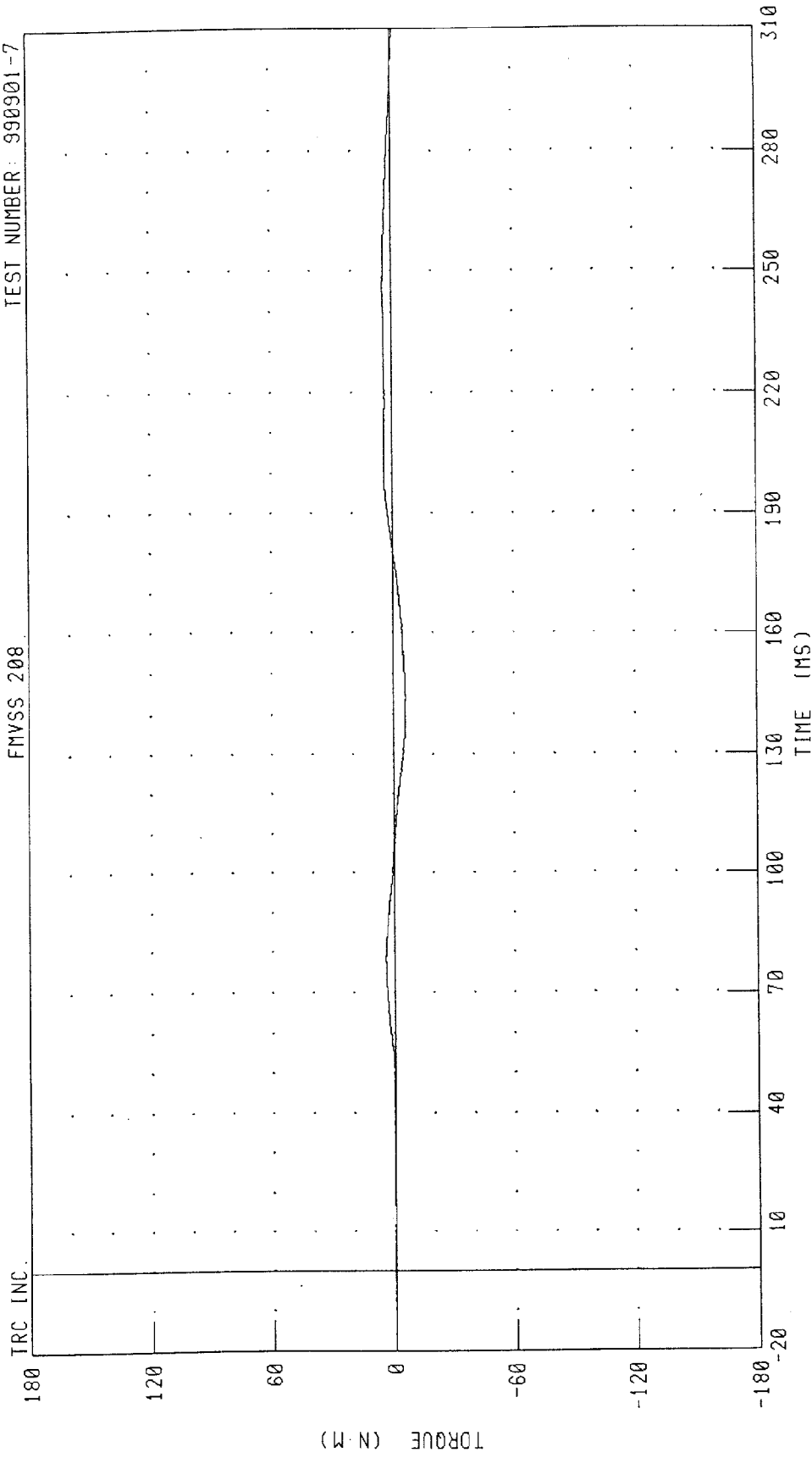
CHANNEL: NEKYM1 FILTER: CH. CLASS 600

PEAK DATA: 23.32 N M @ 64.64 MS, -9.31 N M @ 136.80 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER NECK MOMENT ABOUT Z AXIS

TEST NUMBER: 990901-7

FMVSS 208



PEAK DATA: 4.16 N·M @ 245.20 MS; -6.16 N·M @ 144.32 MS

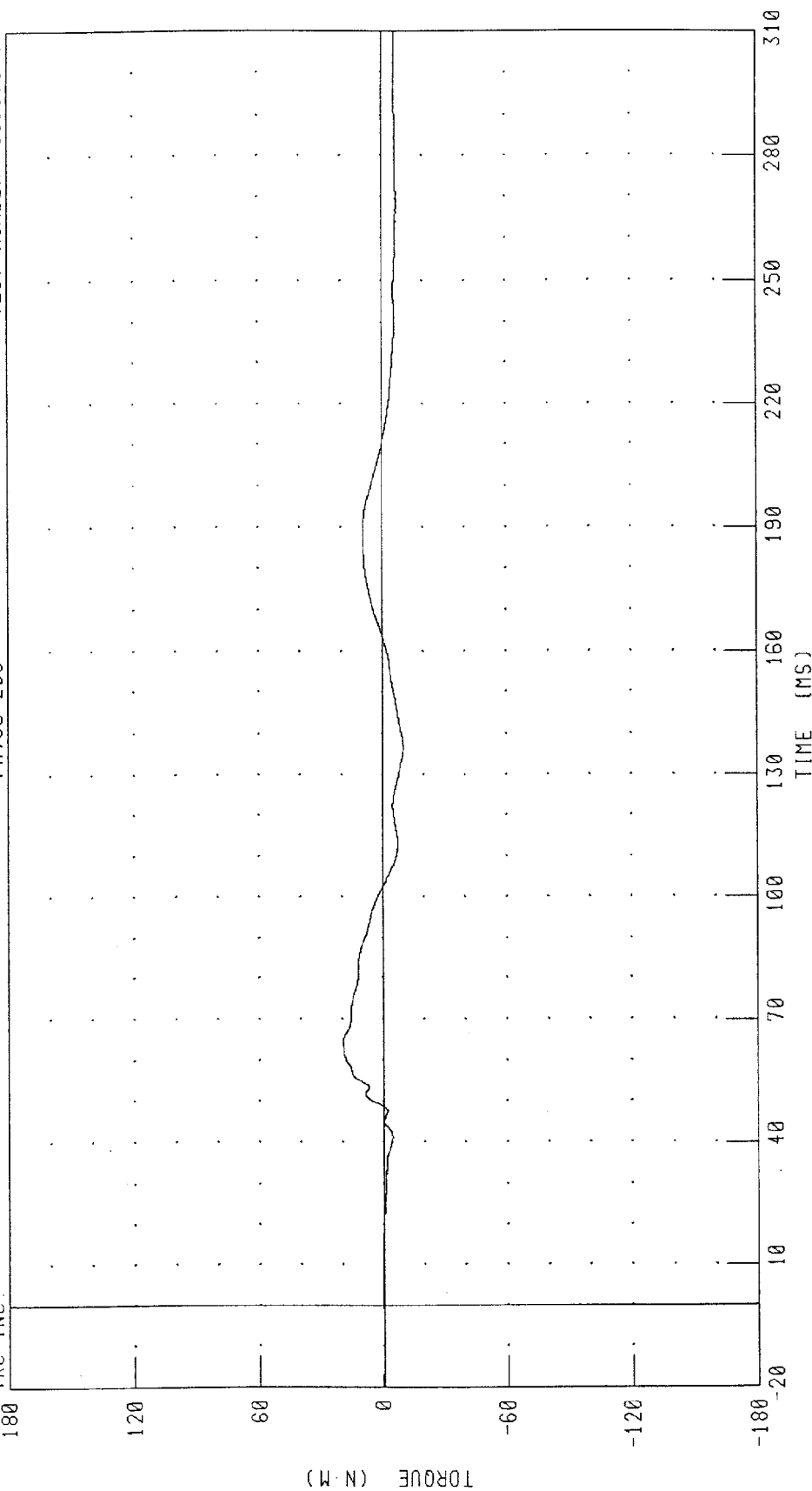
CHANNEL: NEKZM1 FILTER: CH. CLASS 600

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER NECK OCCIPITAL CONDYLE MOMENT ABOUT Y AXIS

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



PEAK DATA: 19.47 N-M @ 64.72 MS; -10.25 N-M @ 136.72 MS

CHANNEL: NEKOM1 FILTER: CH. CLASS 600

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER CHEST X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.

60

40

20

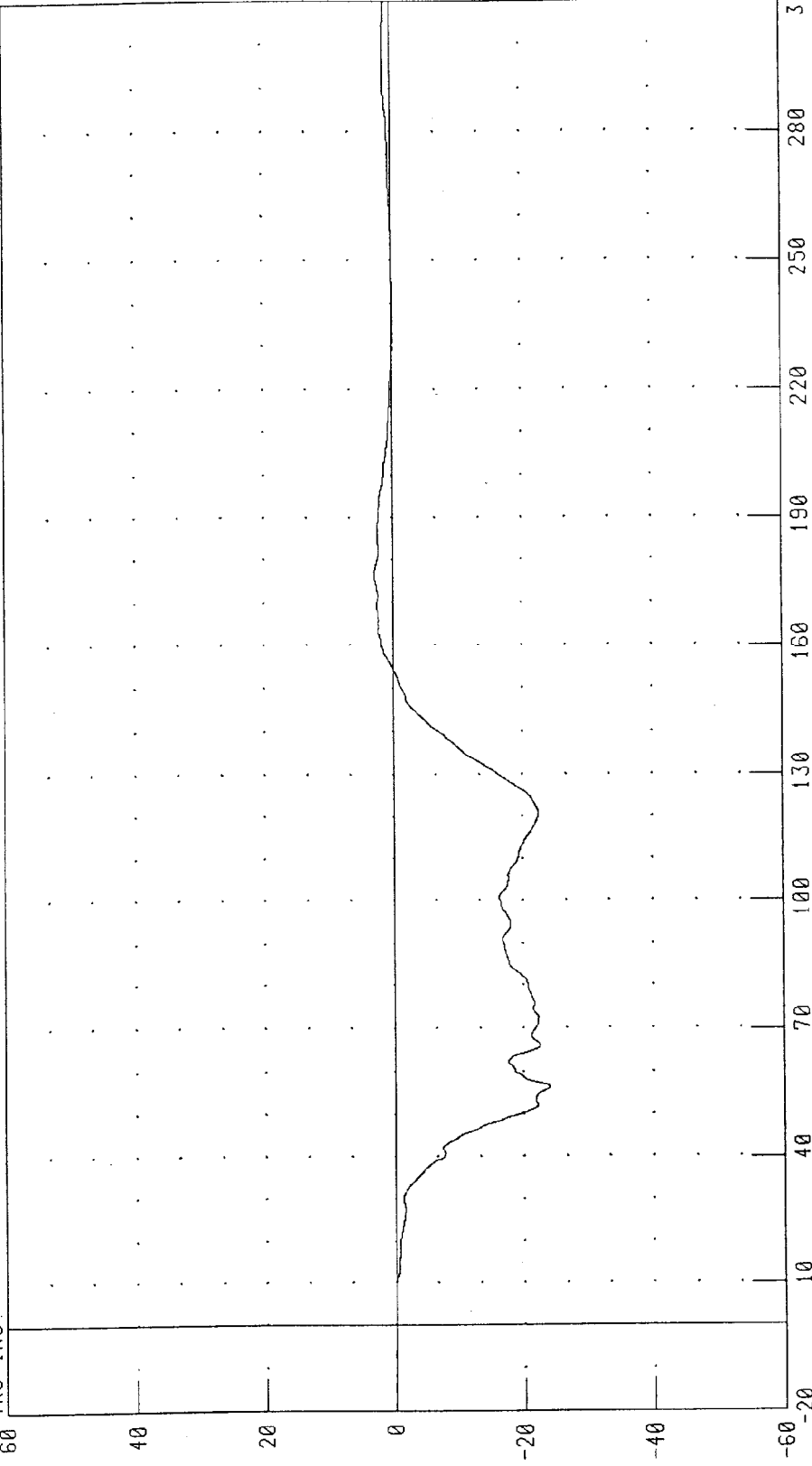
0

-20

-40

-60

ACCELERATION (G)

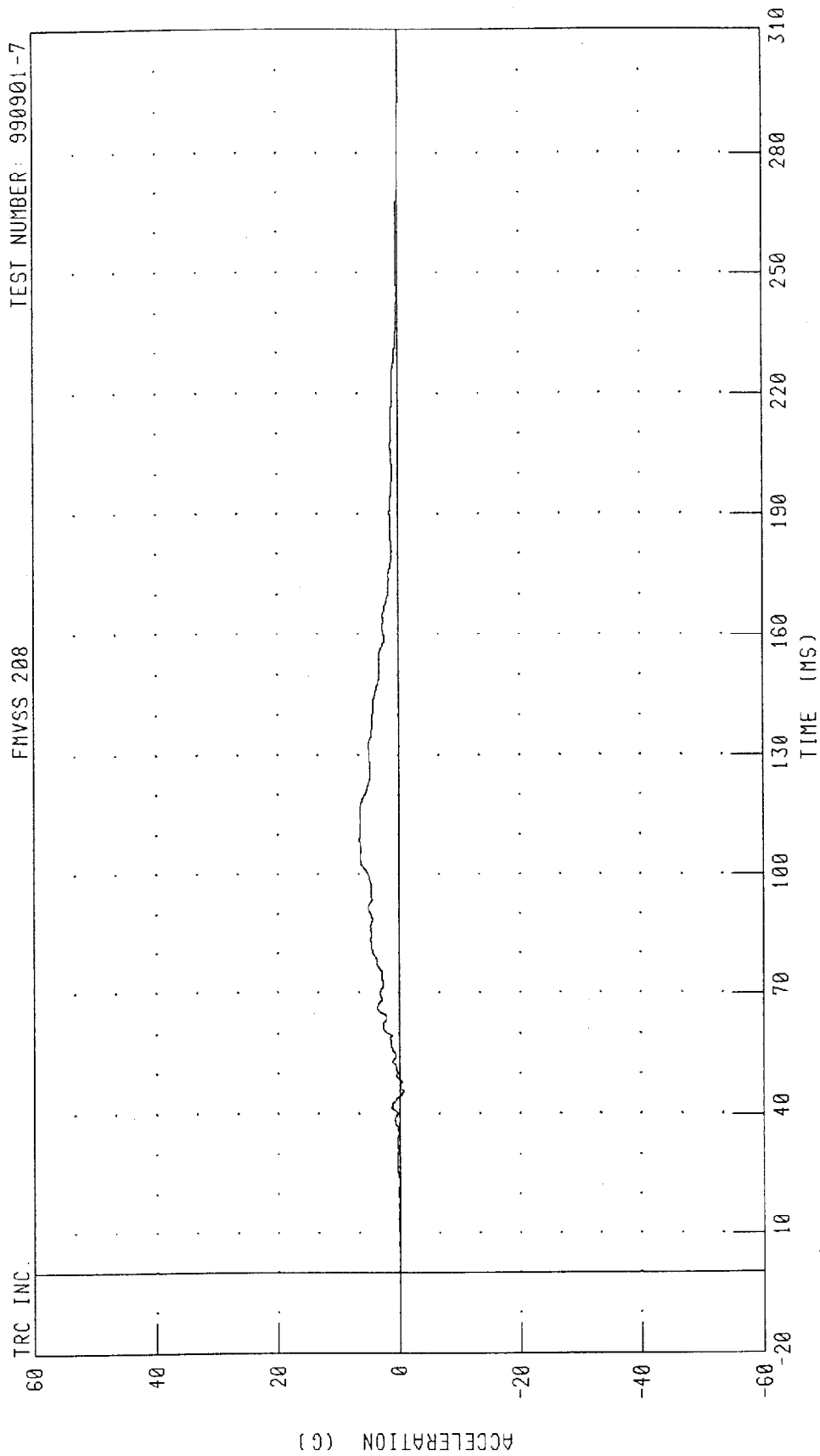


TIME (MS)

CHANNEL: CSTXC1 FILTER: CH. CLASS 180

PEAK DATA: 2.84 G @ 176.40 MS, -24.06 G @ 56.56 MS

1999 SATURN SL1 INTO [IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER CHEST Y-AXIS ACCELERATION

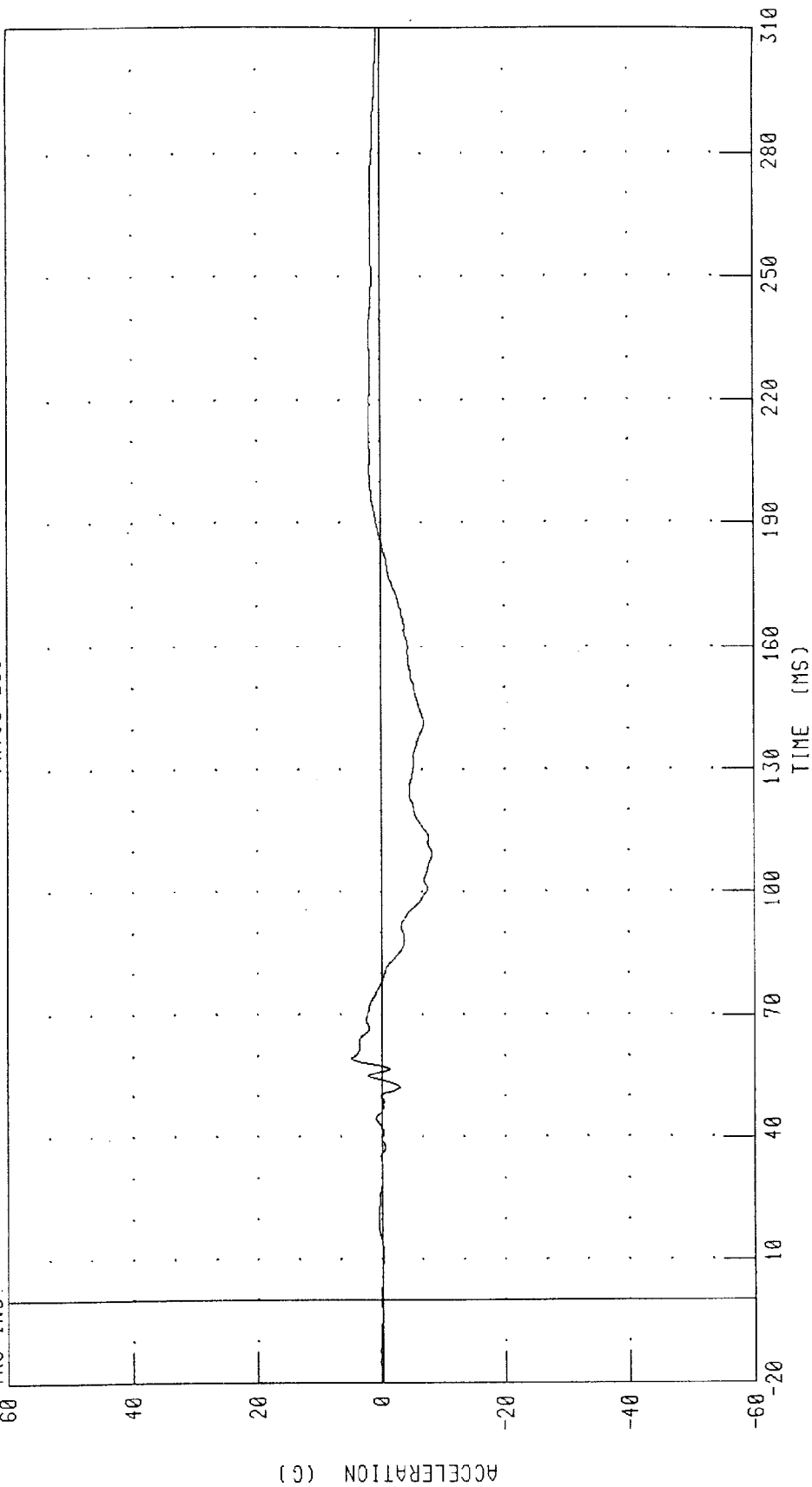


1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER CHEST Z-AXIS ACCELERATION

TEST NUMBER: 990901-7

FNVS 208

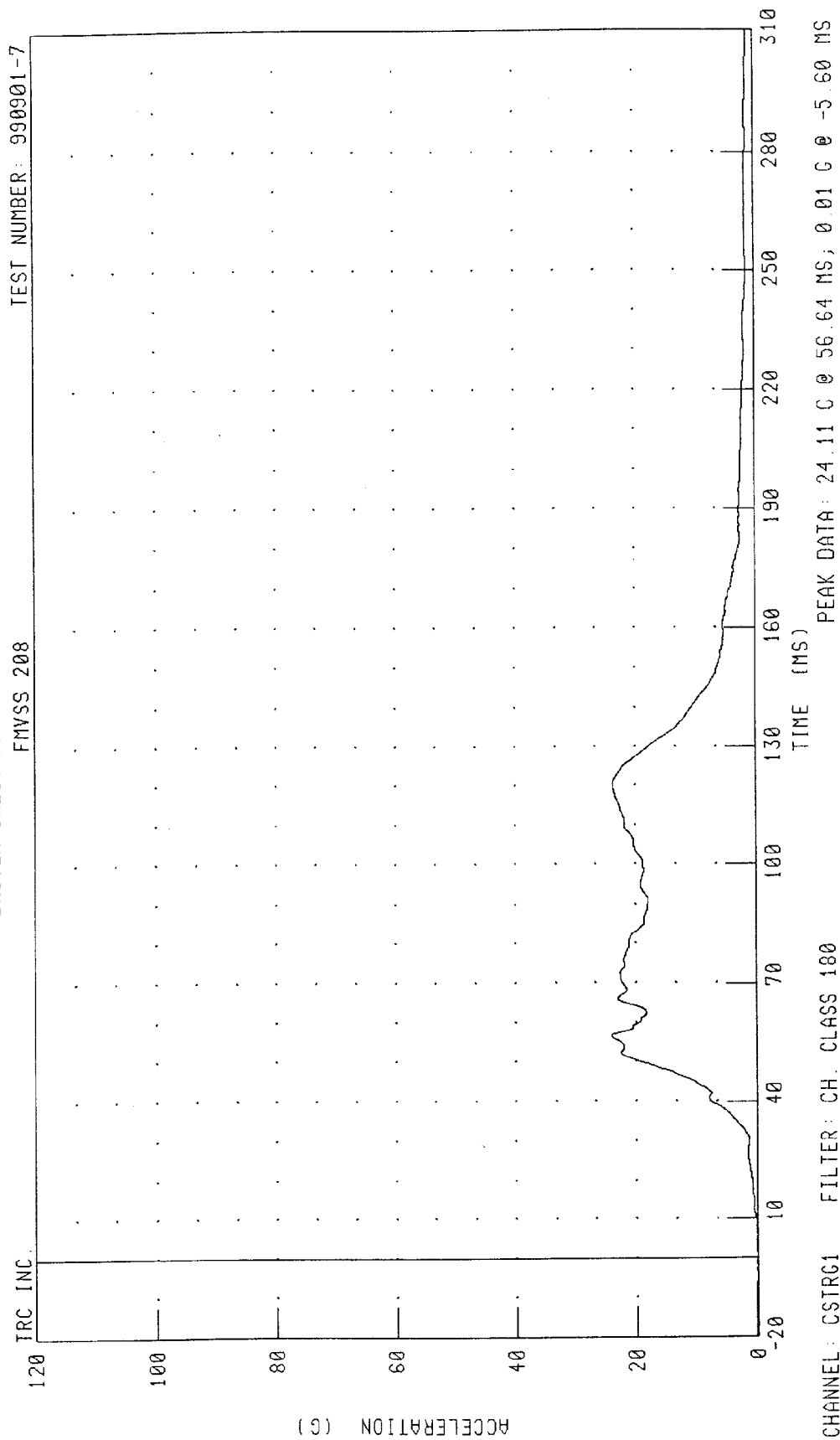
TRC INC.



CHANNEL: CSTZG1 FILTER: CH. CLASS 180

PEAK DATA: 4.80 G @ 59.44 MS, -8.24 G @ 109.52 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER CHEST RESULTANT ACCELERATION



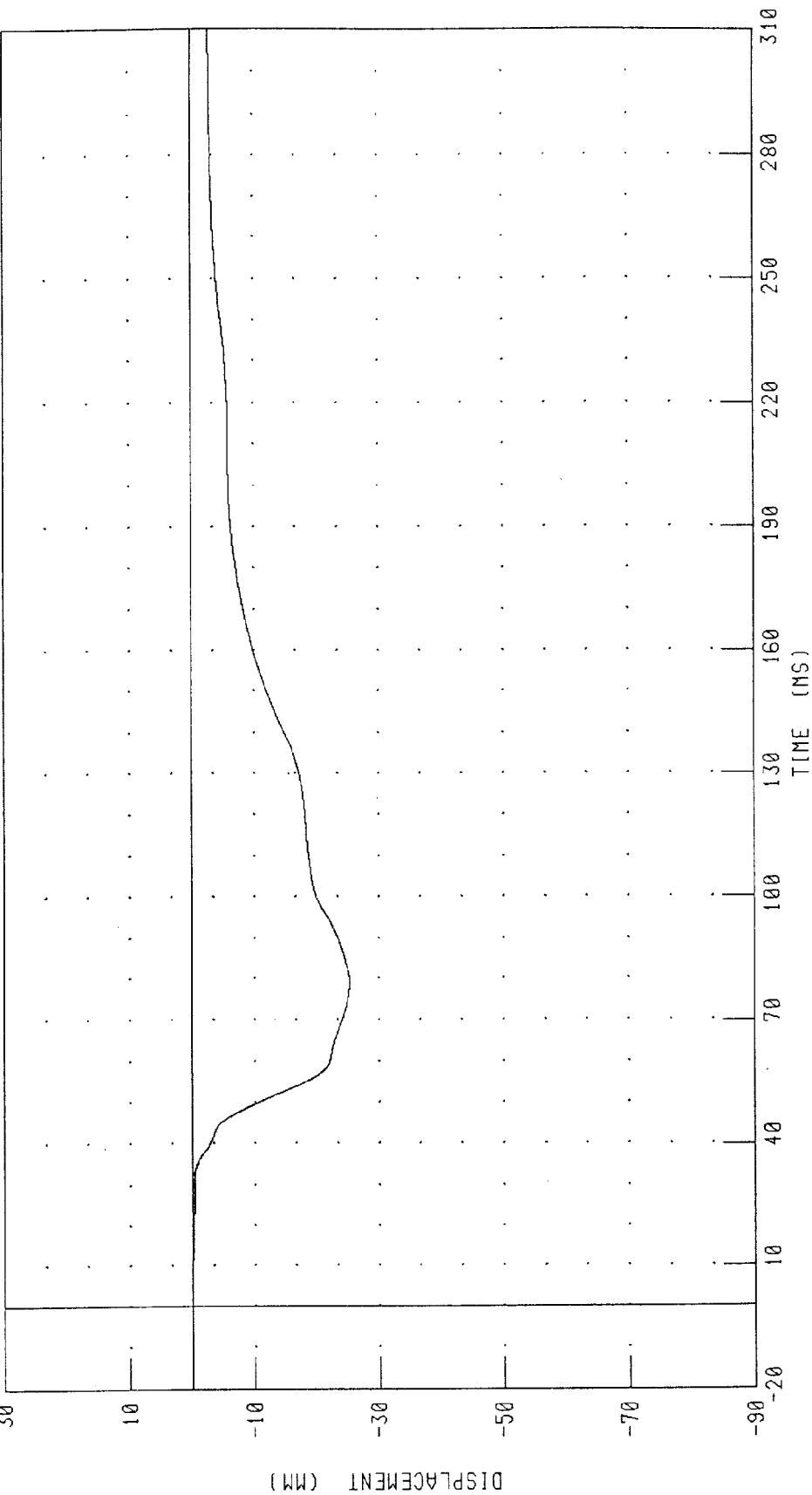
1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH

DRIVER CHEST DEFLECTION

FMVSS 208

TEST NUMBER: 990901-7

TRC INC.



CHANNEL: CSTXD1 FILTER: CH. CLASS 180

PEAK DATA: 0.00 MM @ -12.40 MS, -25.28 MM @ 79.28 MS

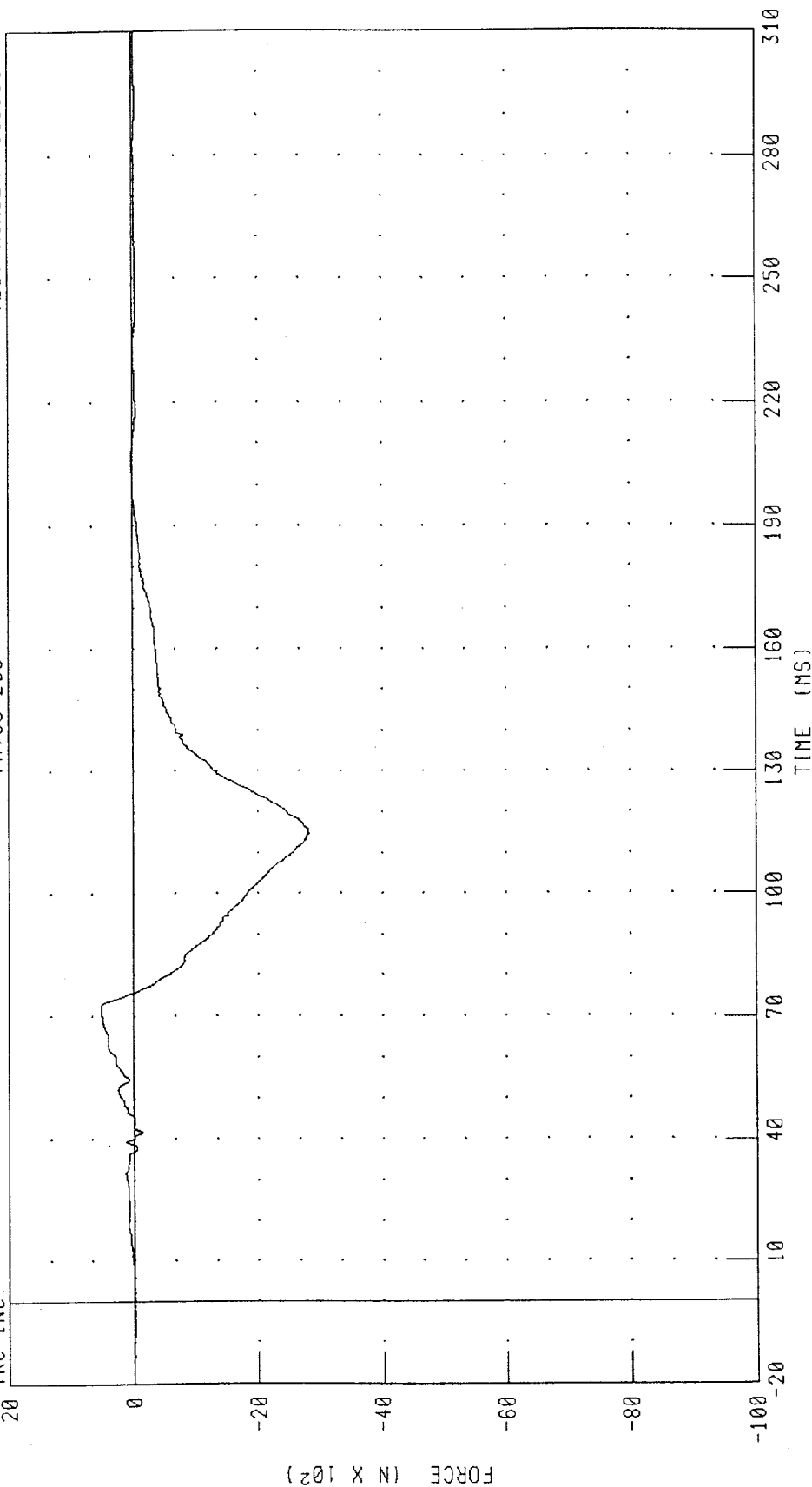
1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH

DRIVER LEFT FEMUR FORCE

FMVSS 208

TEST NUMBER: 990901-7

TRC INC.



PEAK DATA: 520.16 N @ 71.20 MS, -2816.52 N @ 115.04 MS

CHANNEL: LFMF1 FILTER: CH. CLASS 600

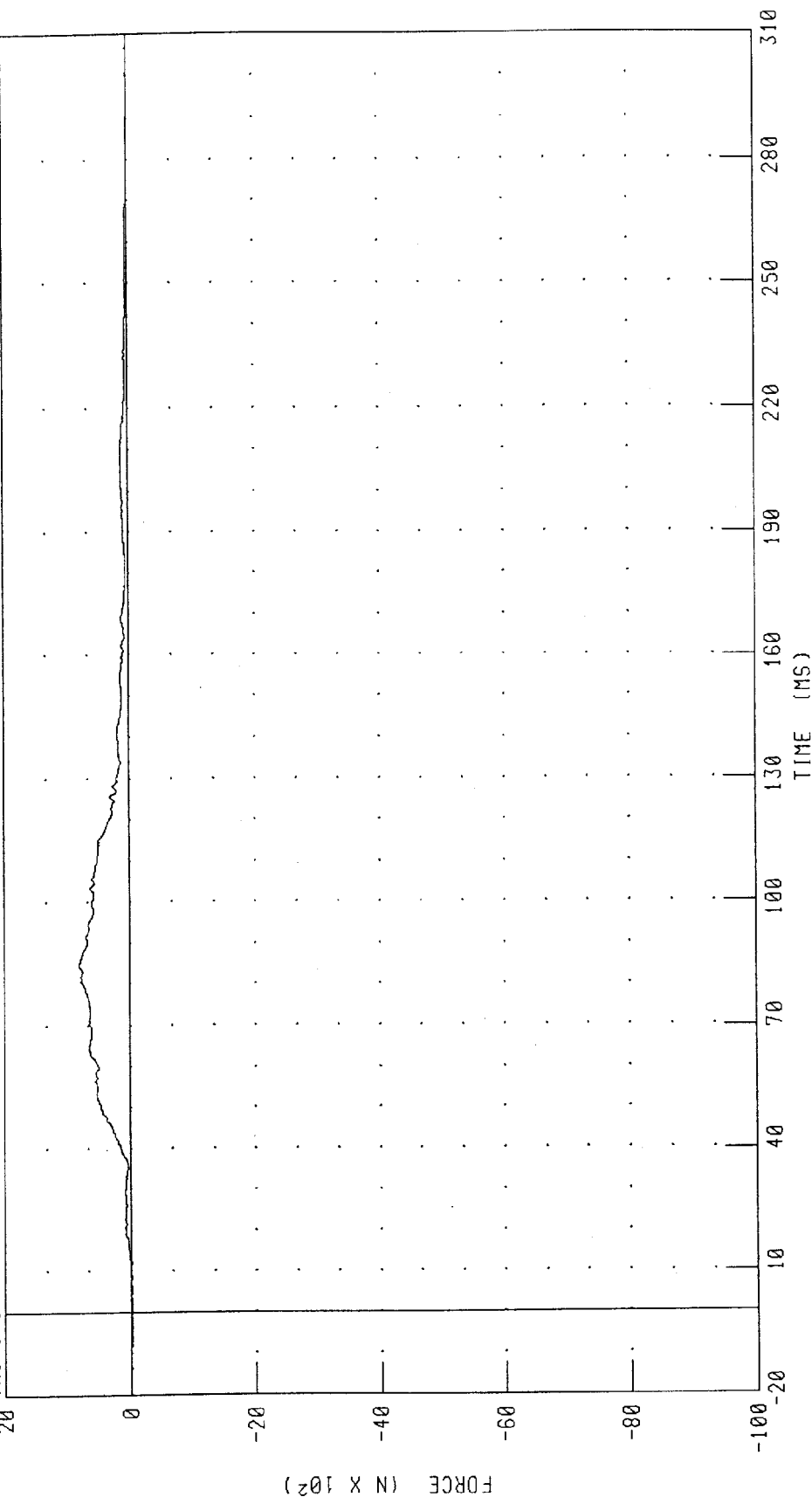
1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH

DRIVER RIGHT FEMUR FORCE

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



PEAK DATA: 818.27 N @ 84.88 MS, -13.73 N @ 12.08 MS

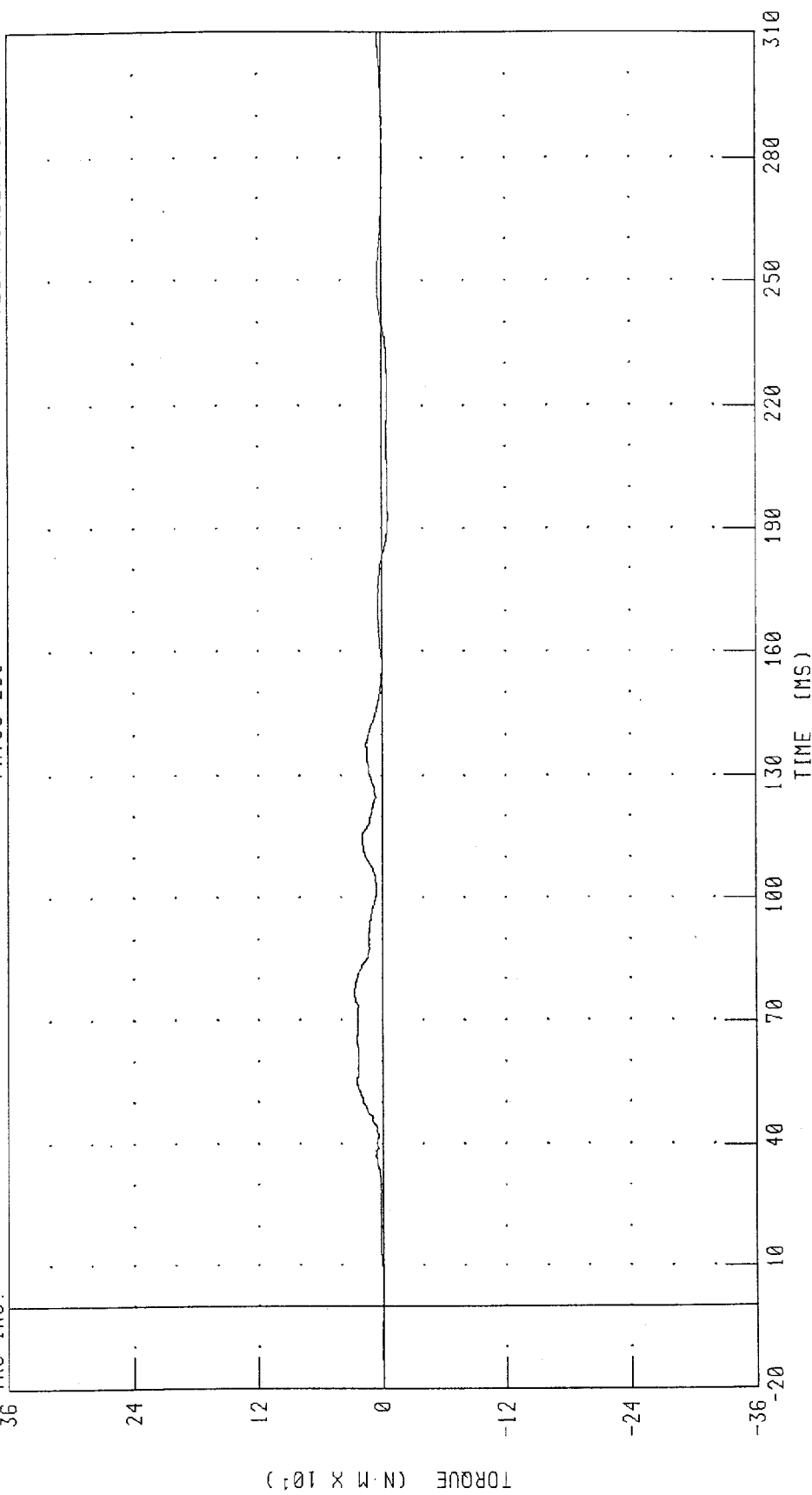
CHANNEL: RFMF1 FILTER: CH. CLASS 600

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER LEFT UPPER TIBIA MOMENT ABOUT X AXIS

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: TBLXM1 FILTER: CH. CLASS 600

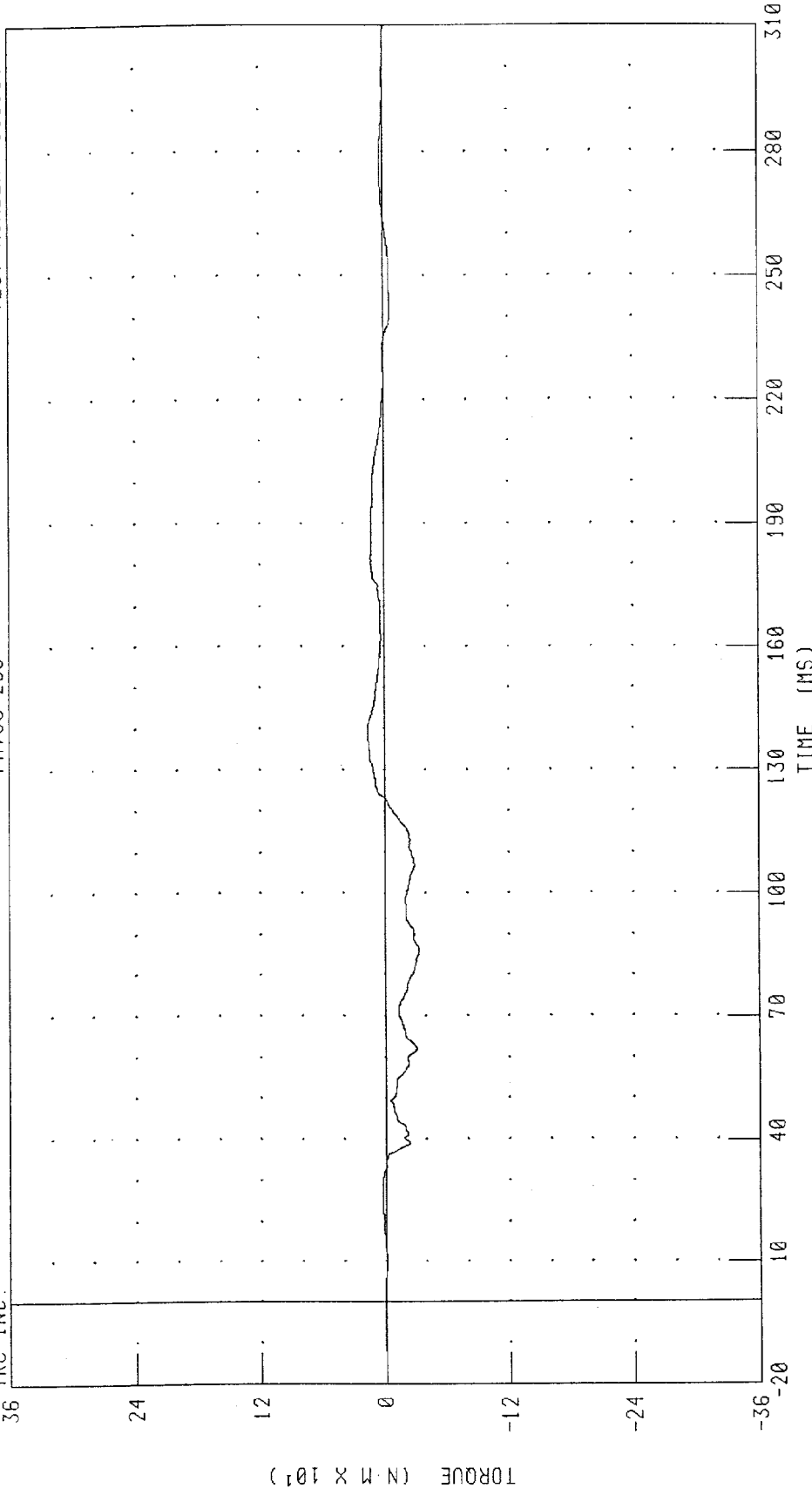
PEAK DATA: 26.74 N·m @ 77.44 ms, -6.19 N·m @ 192.88 ms

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER LEFT UPPER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: TBLYM1 FILTER: CH. CLASS 600

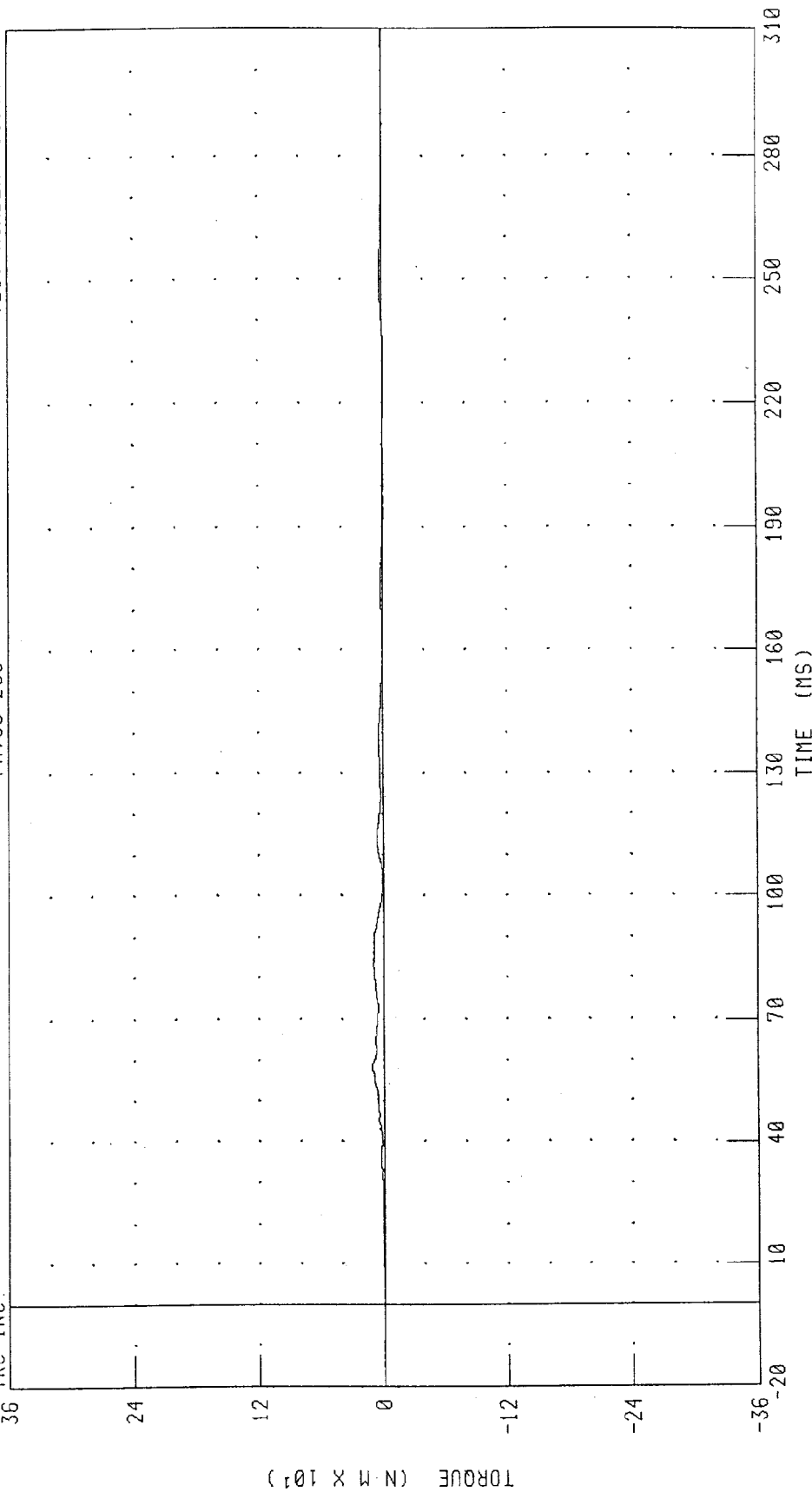
PEAK DATA: 16.12 N M @ 138.16 MS, -33.45 N M @ 86.40 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER LEFT LOWER TIBIA MOMENT ABOUT X AXIS

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



PEAK DATA: 11.08 N-M @ 58.16 MS, -1.68 N-M @ 230.08 MS

FILTER: CH. CLASS 600

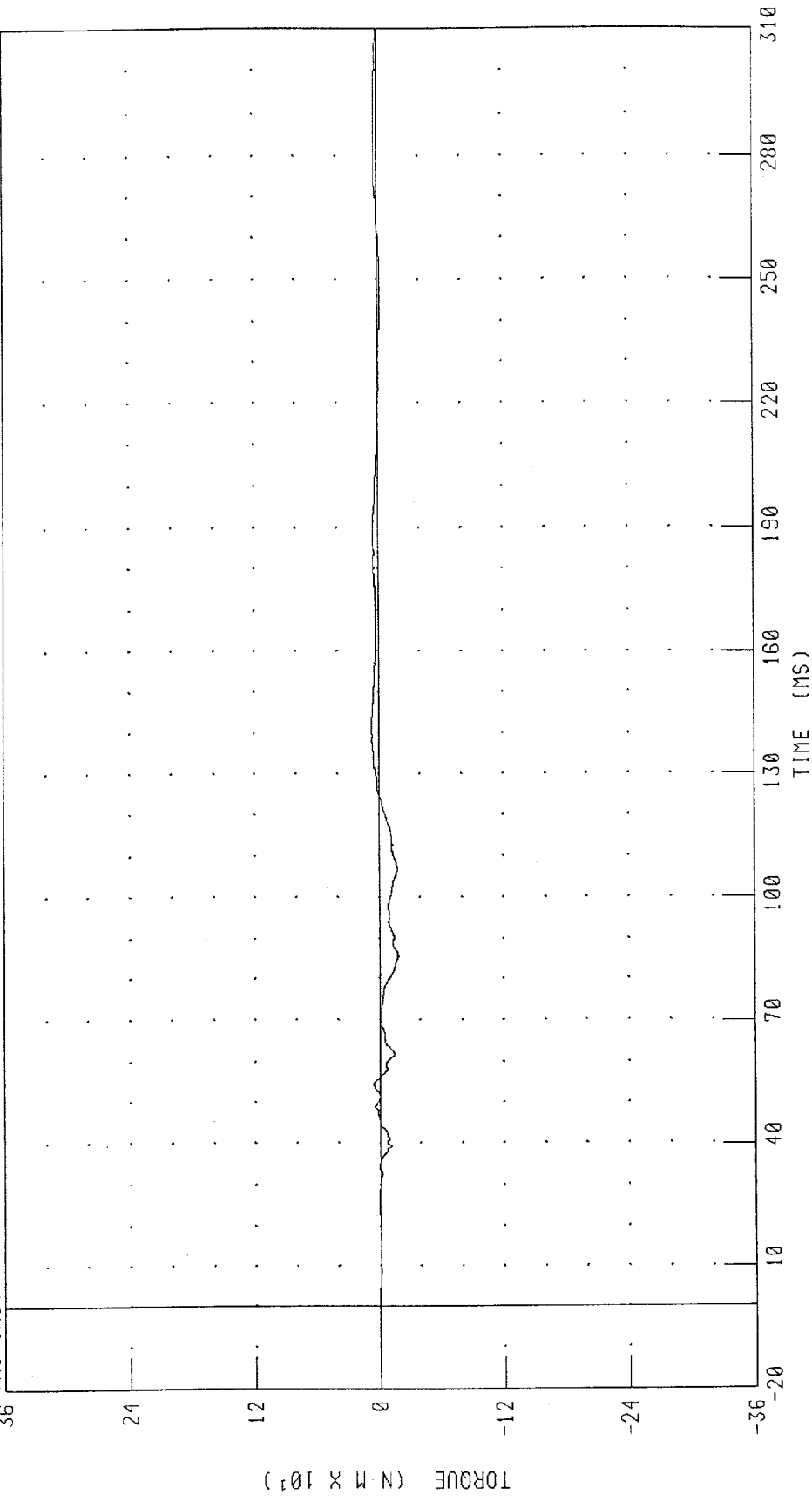
CHANNEL: ANLXM1

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER LEFT LOWER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 990901-7

FMVSS 208

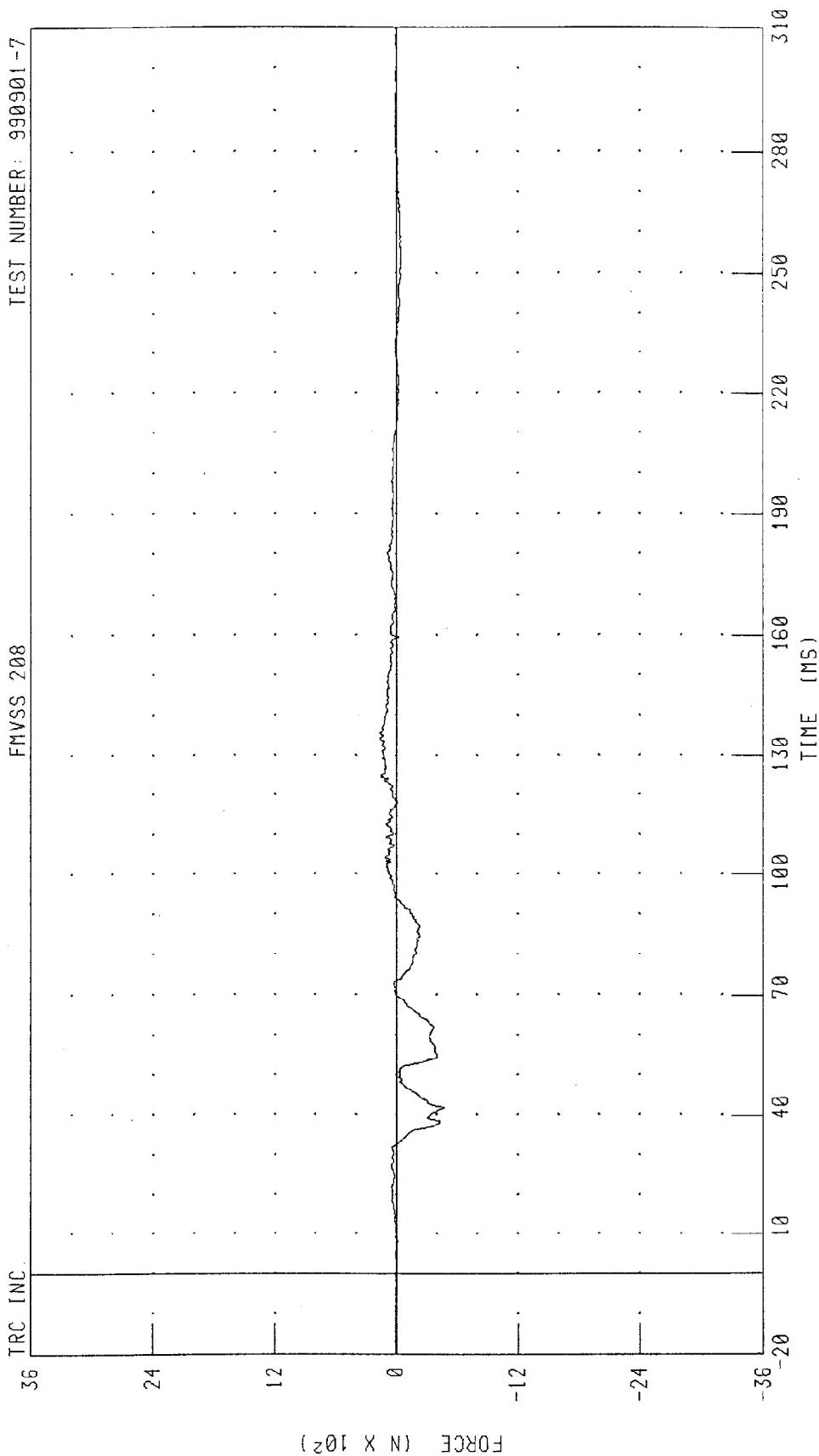
TRC INC.



PEAK DATA: 6.88 N·M @ 141.84 MS, -18.26 N·M @ 85.68 MS

CHANNEL: ANLYM1 FILTER: CH. CLASS 600

1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER LEFT TIBIA Z-AXIS FORCE



CHANNEL: TBLZF1 FILTER: CH. CLASS 600

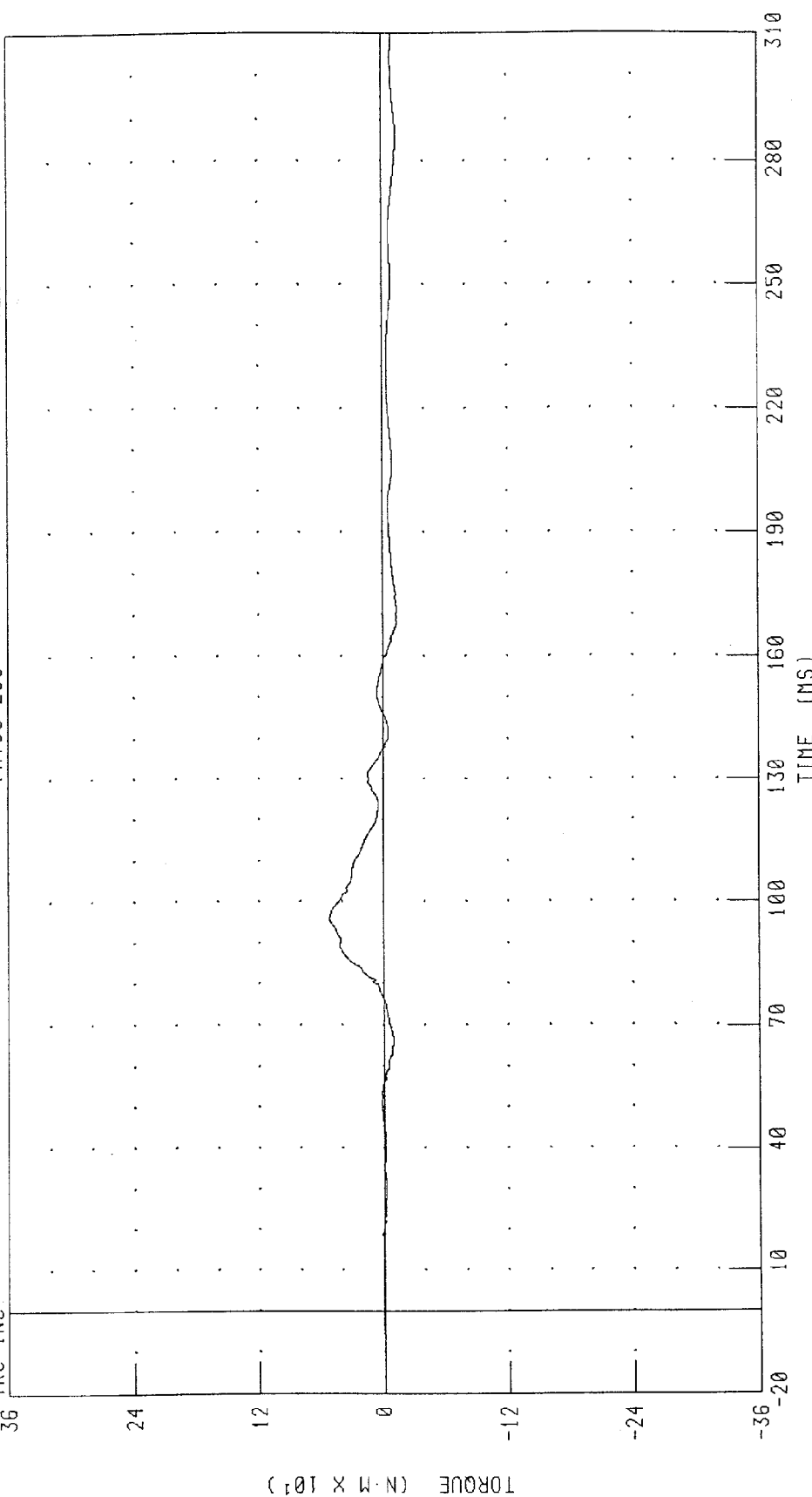
PEAK DATA: 162.59 N @ 134.32 MS, -474.04 N @ 41.76 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER RIGHT UPPER TIBIA MOMENT ABOUT X AXIS

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: TBRXM1 FILTER: CH. CLASS 600

TIME (MS)

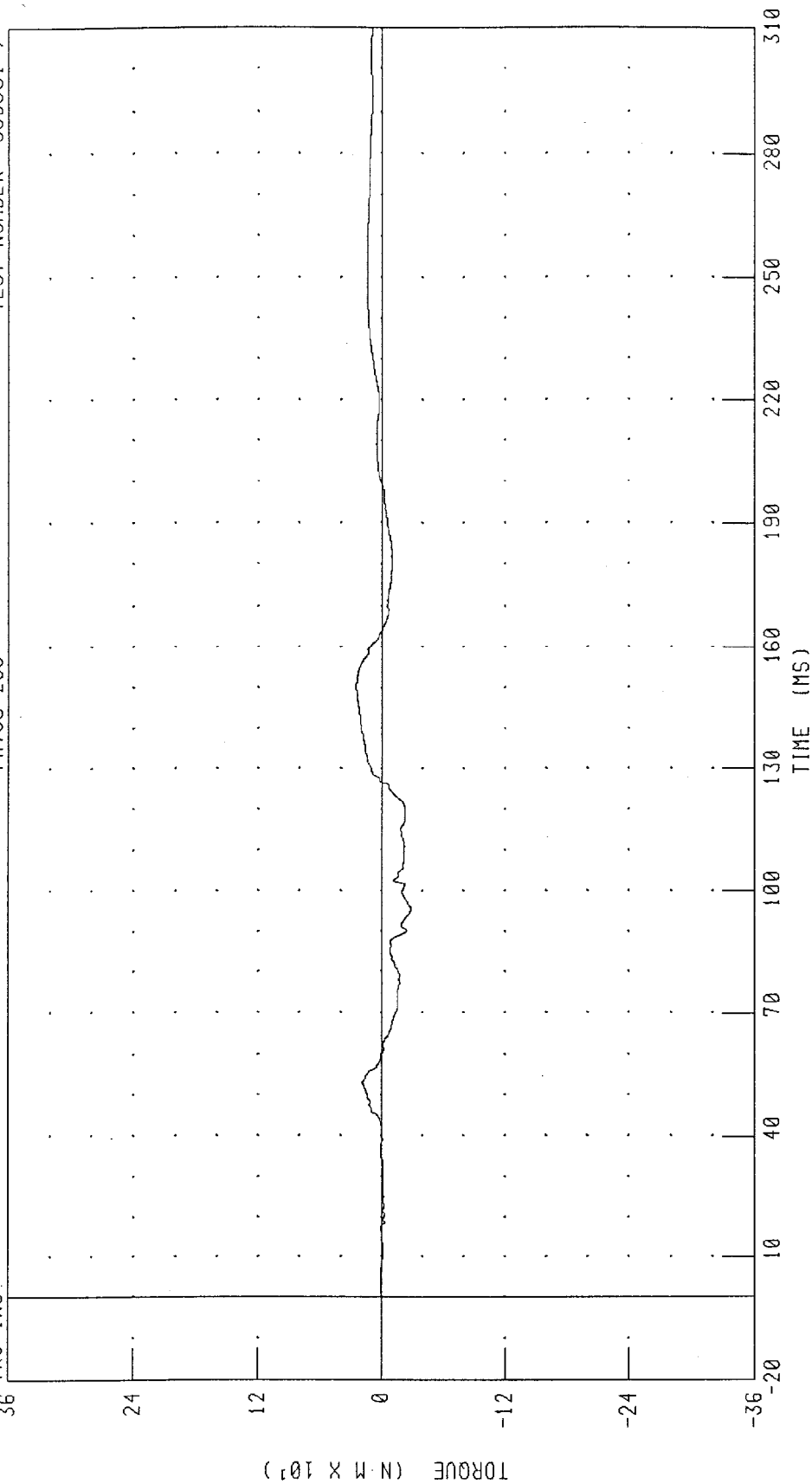
PEAK DATA: 51.93 N M @ 95.76 MS, -13.48 N M @ 286.00 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER RIGHT UPPER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: TBRYM1 FILTER: CH. CLASS 600

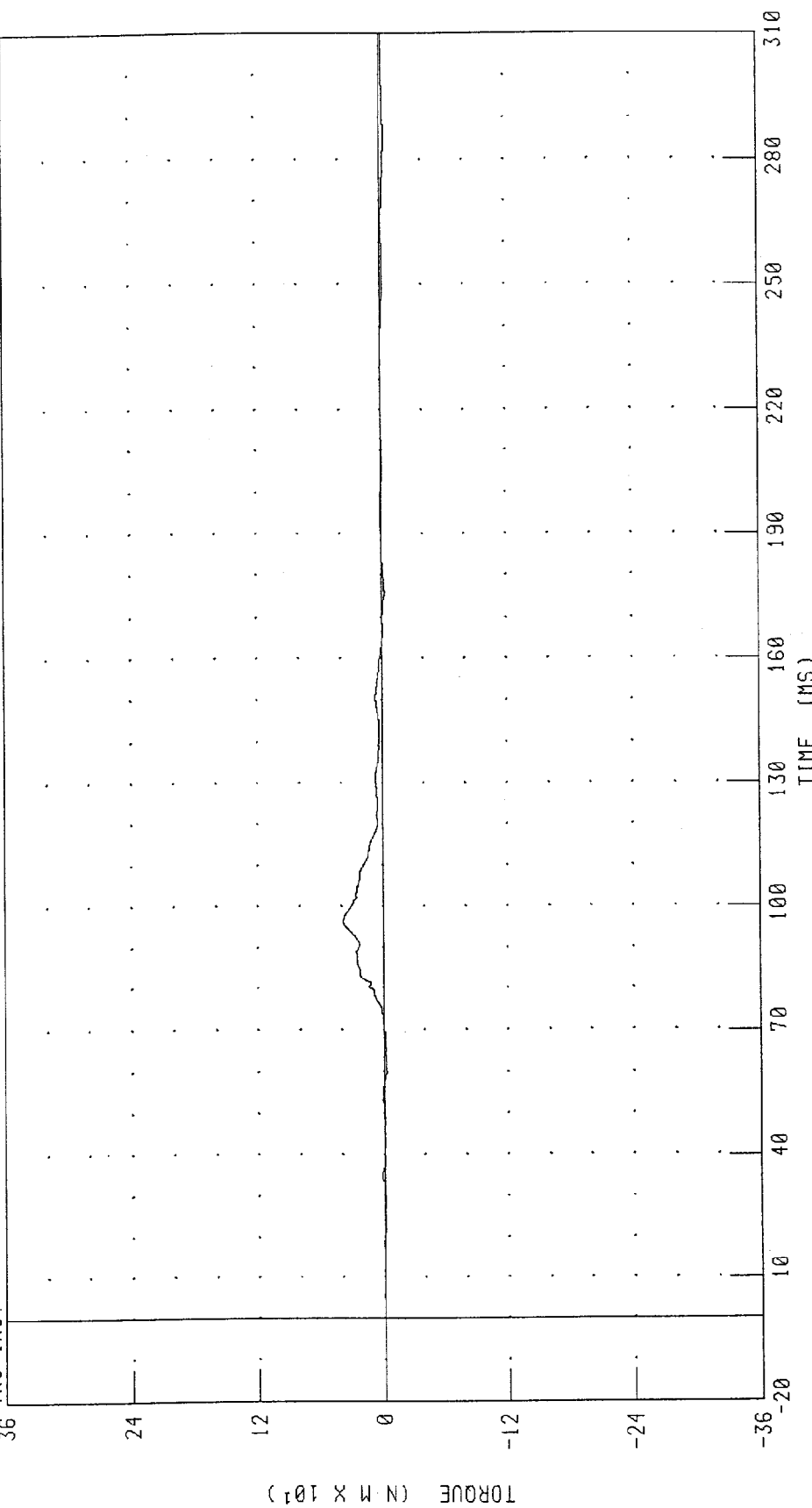
PEAK DATA: 24.82 N·m @ 150.56 ms, -28.83 N·m @ 95.60 ms

1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER RIGHT LOWER TIBIA MOMENT ABOUT X AXIS

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



PEAK DATA: 38.09 N M @ 96.16 MS, -4.10 N M @ 285.44 MS

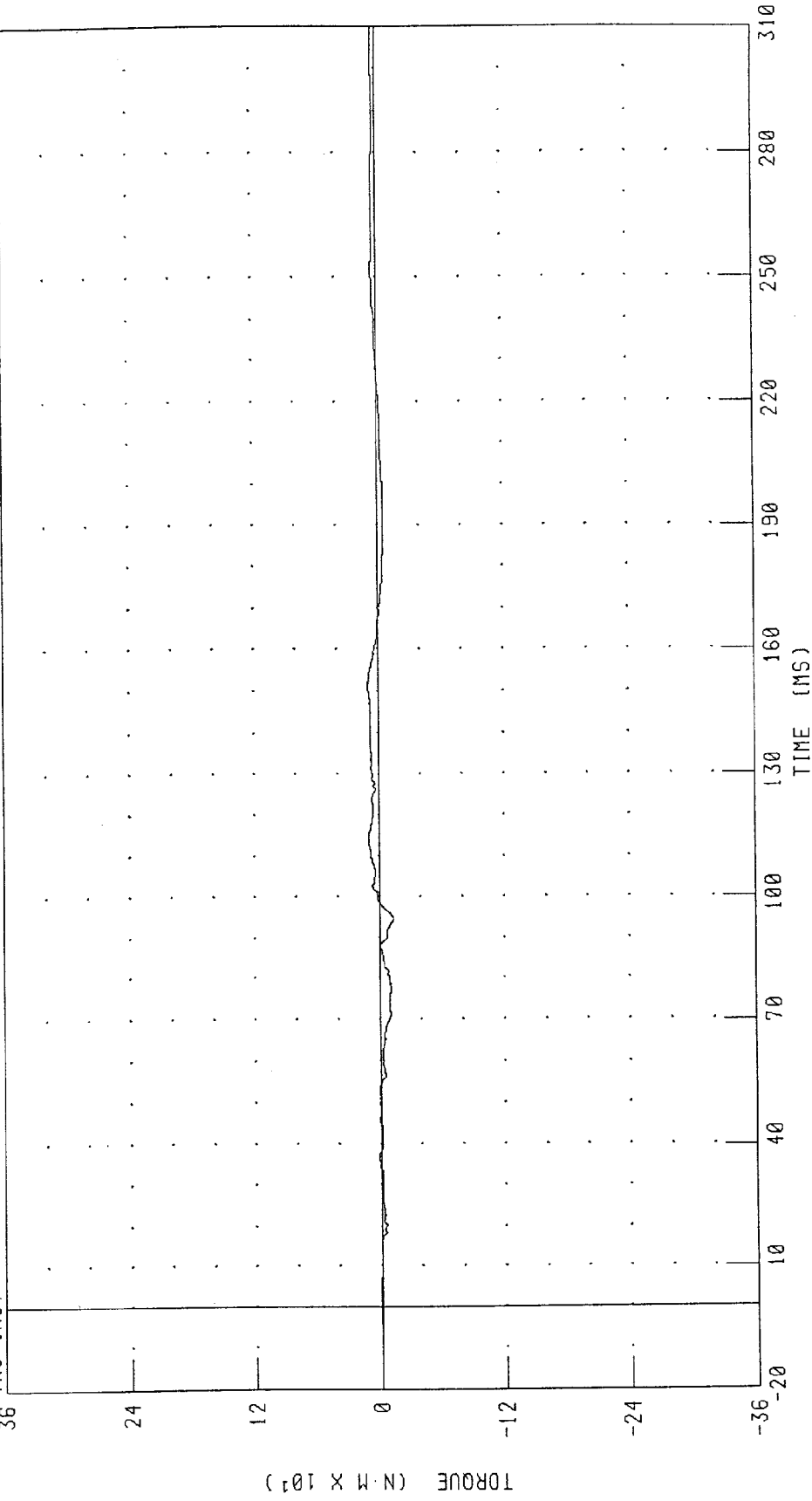
CHANNEL: ANRXM1 FILTER: CH. CLASS 600

1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER RIGHT LOWER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: ANRYM1 FILTER: CH. CLASS 600

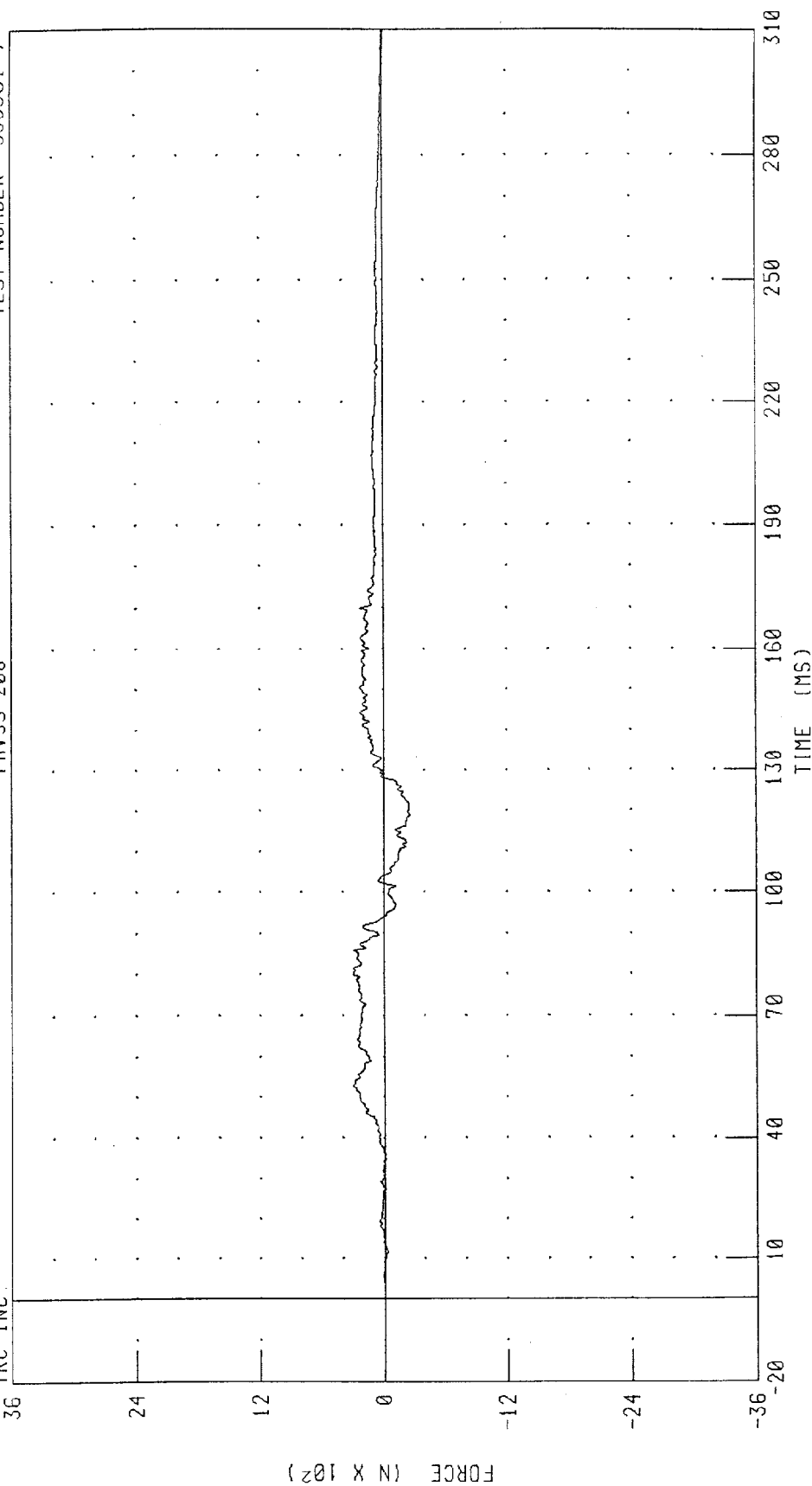
PEAK DATA: 9.86 N-M @ 113.52 MS; -13.38 N-M @ 94.56 MS

1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER RIGHT TIBIA Z-AXIS FORCE

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: TBRZF1 FILTER: CH. CLASS 600

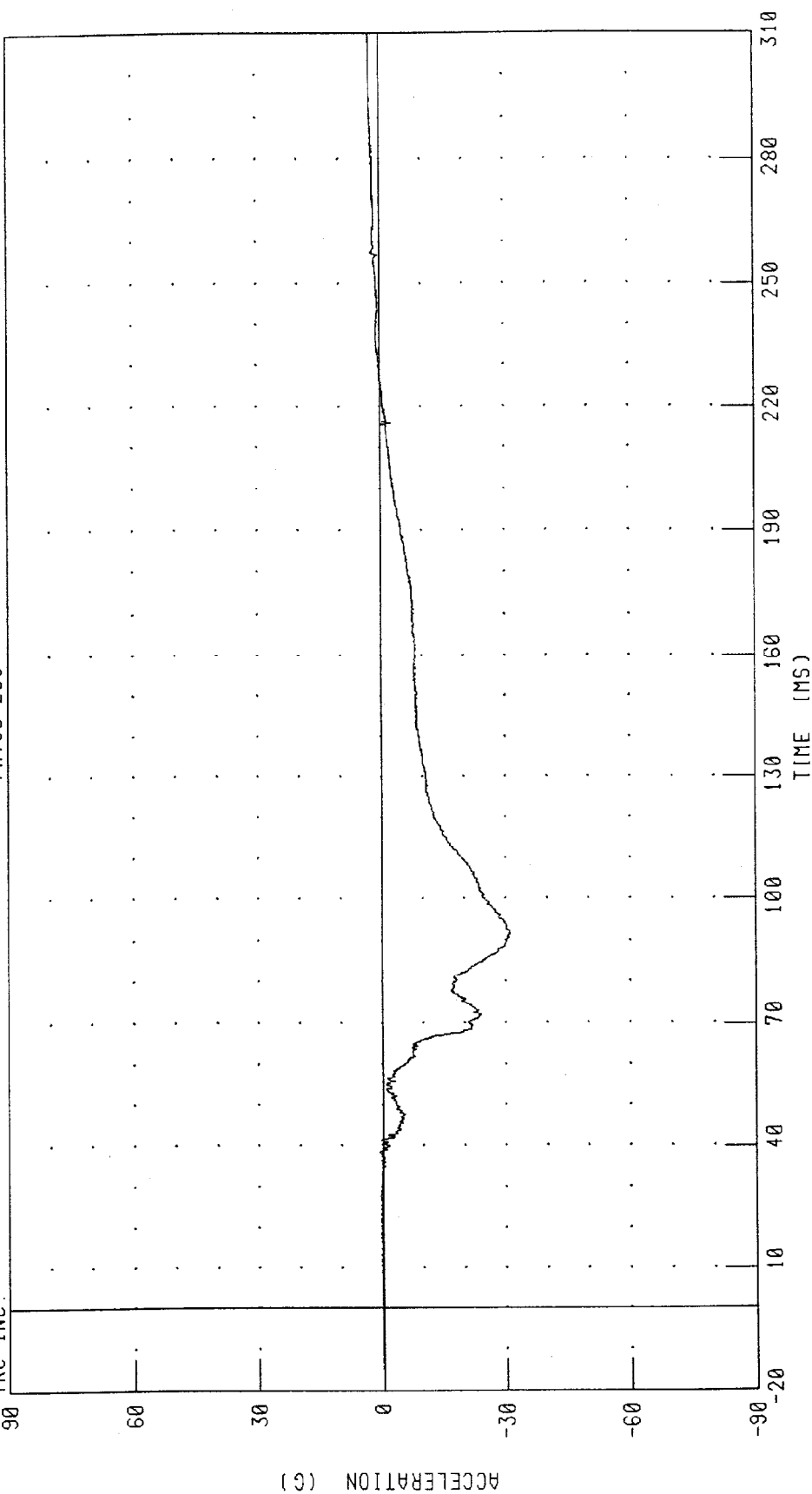
PEAK DATA: 298.44 N @ 52.80 MS; -259.12 N @ 119.04 MS

1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: HEDXC2 FILTER: CH. CLASS 1000

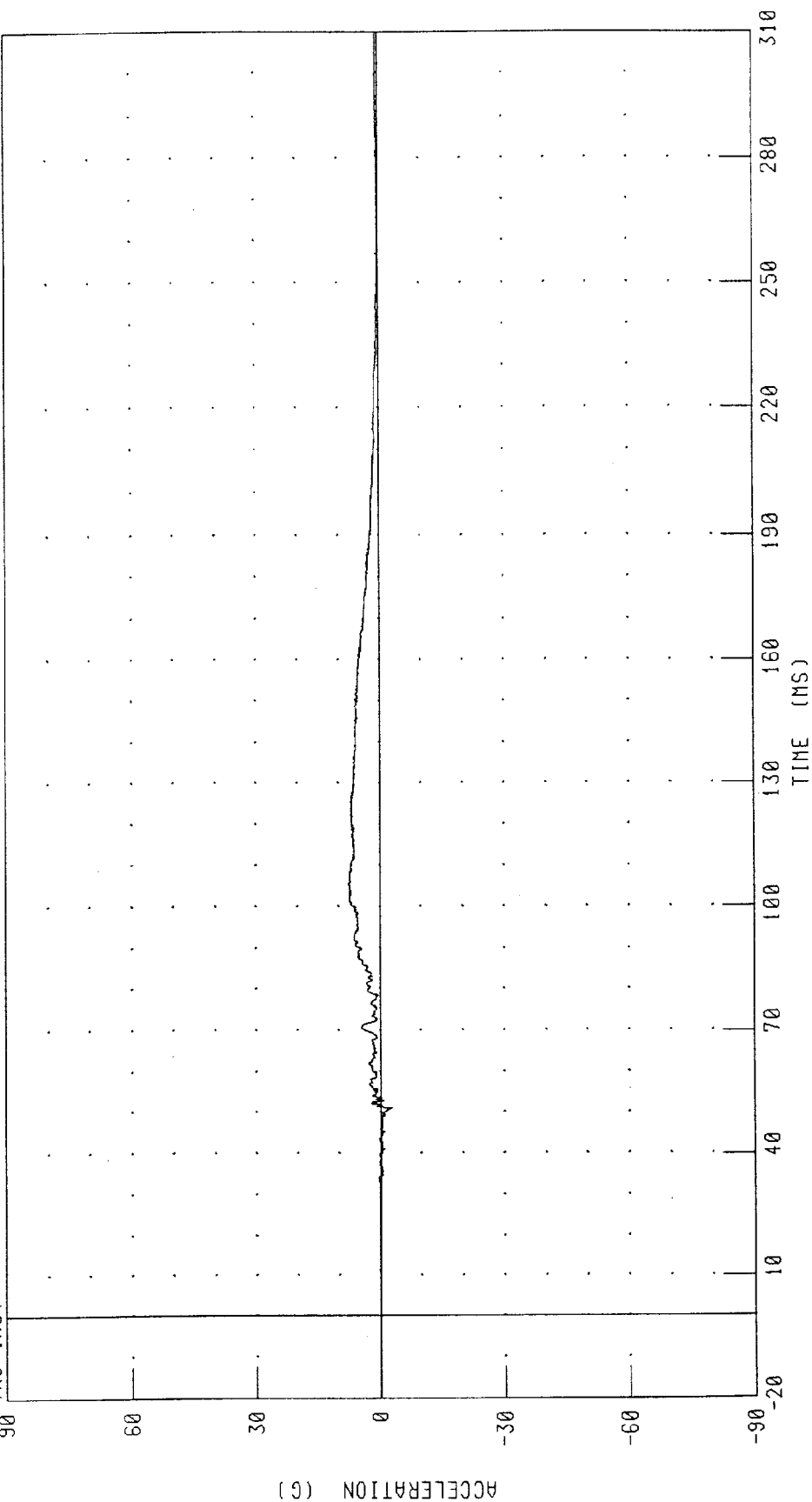
PEAK DATA: 2.79 G @ 307.84 MS, -31.01 G @ 91.52 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: HEDYC2 FILTER: CH. CLASS 1000

PEAK DATA: 7.53 G @ 105.28 MS; -2.91 G @ 51.04 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.

90

60

30

ACCELERATION (G)

-30

-60

-90

-20

10

40

70

100

130

160

190

220

250

280

310

TIME (MS)

CHANNEL: HEDZG2 FILTER: CH. CLASS 1000

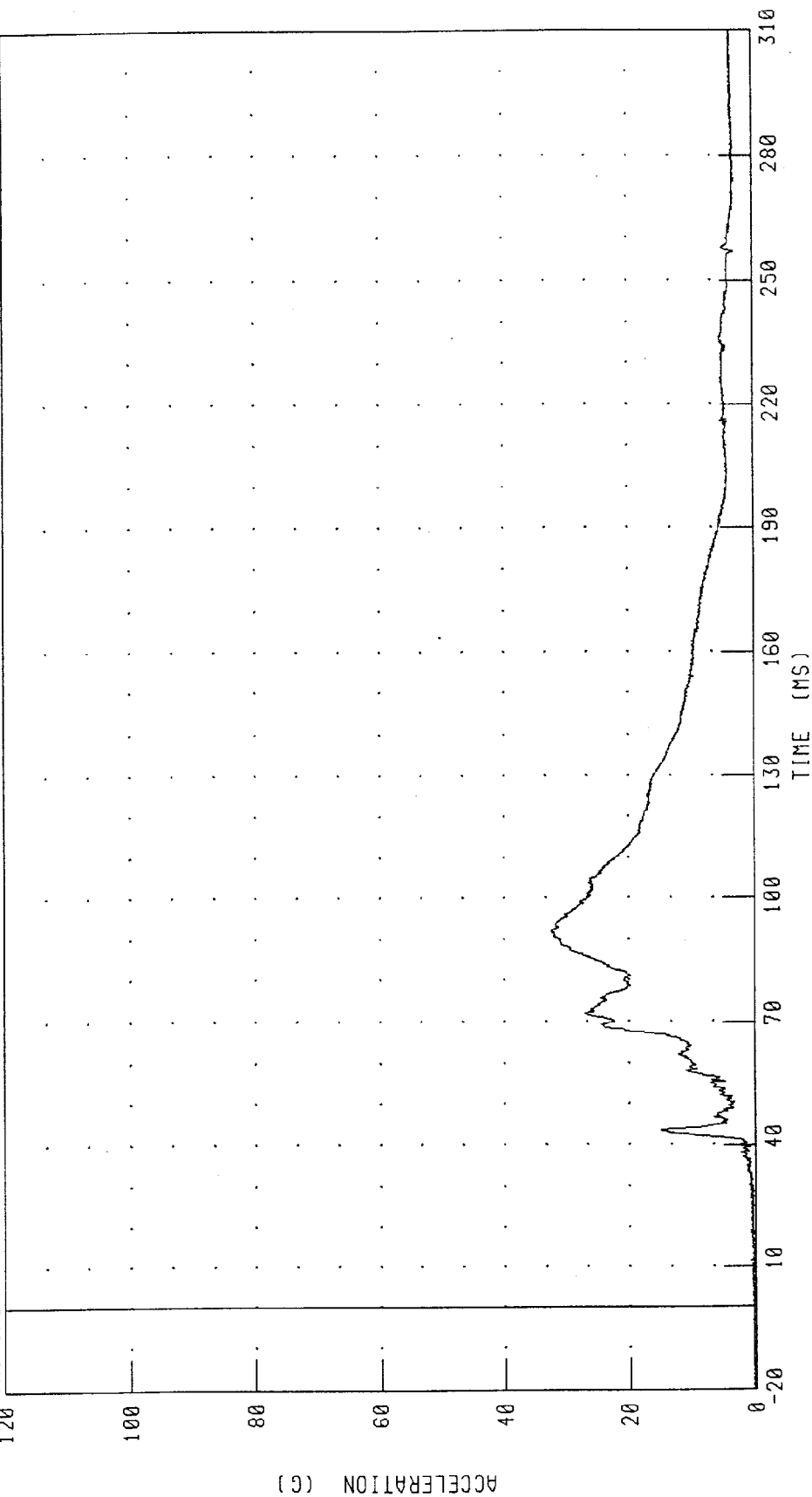
PEAK DATA: 14.75 G @ 76.64 MS, -0.29 G @ 49.84 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: HEDRC2 FILTER: CH. CLASS 1000

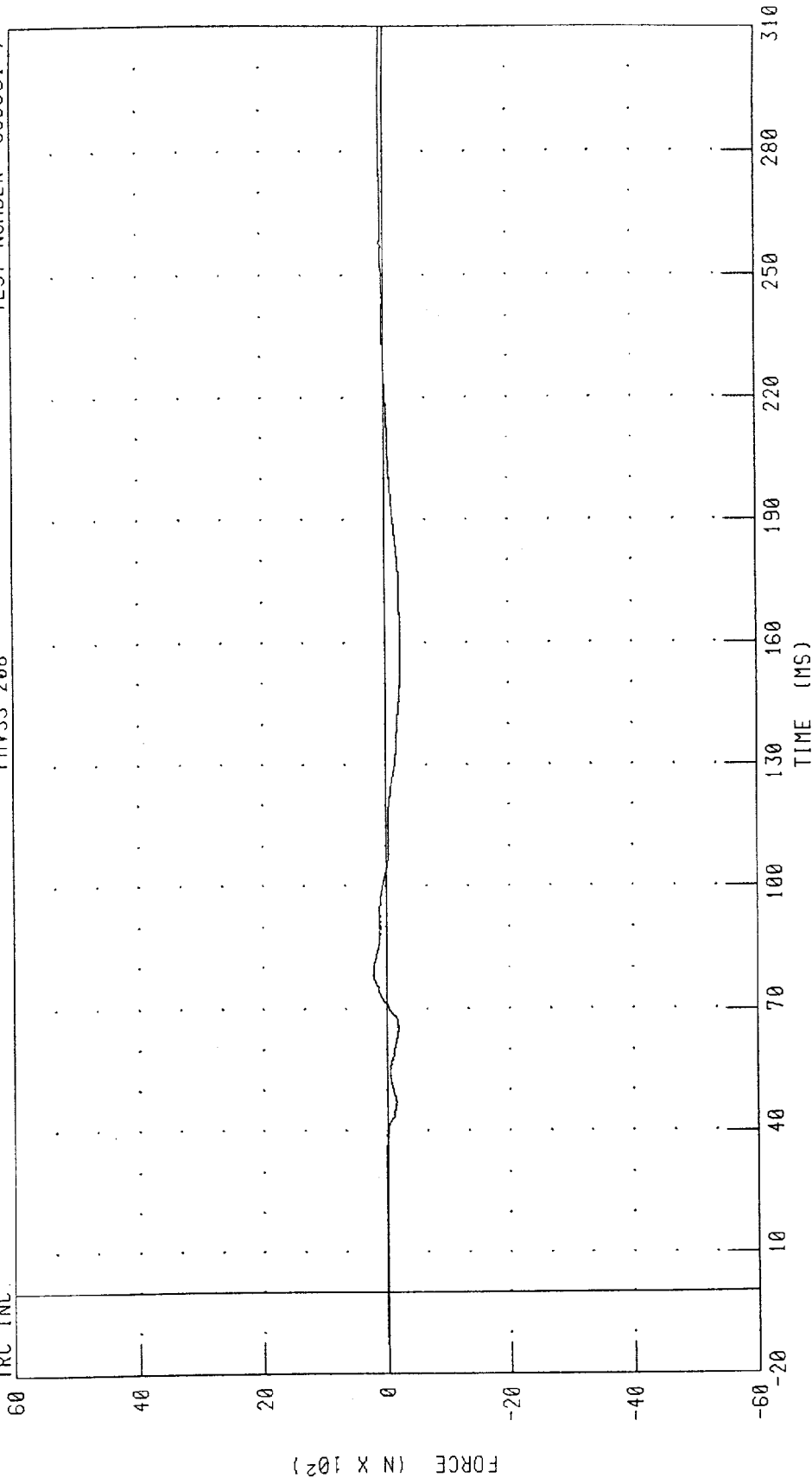
PEAK DATA: 32.36 G @ 91.92 MS; 0.11 G @ 10.96 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER NECK X-AXIS SHEAR FORCE

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



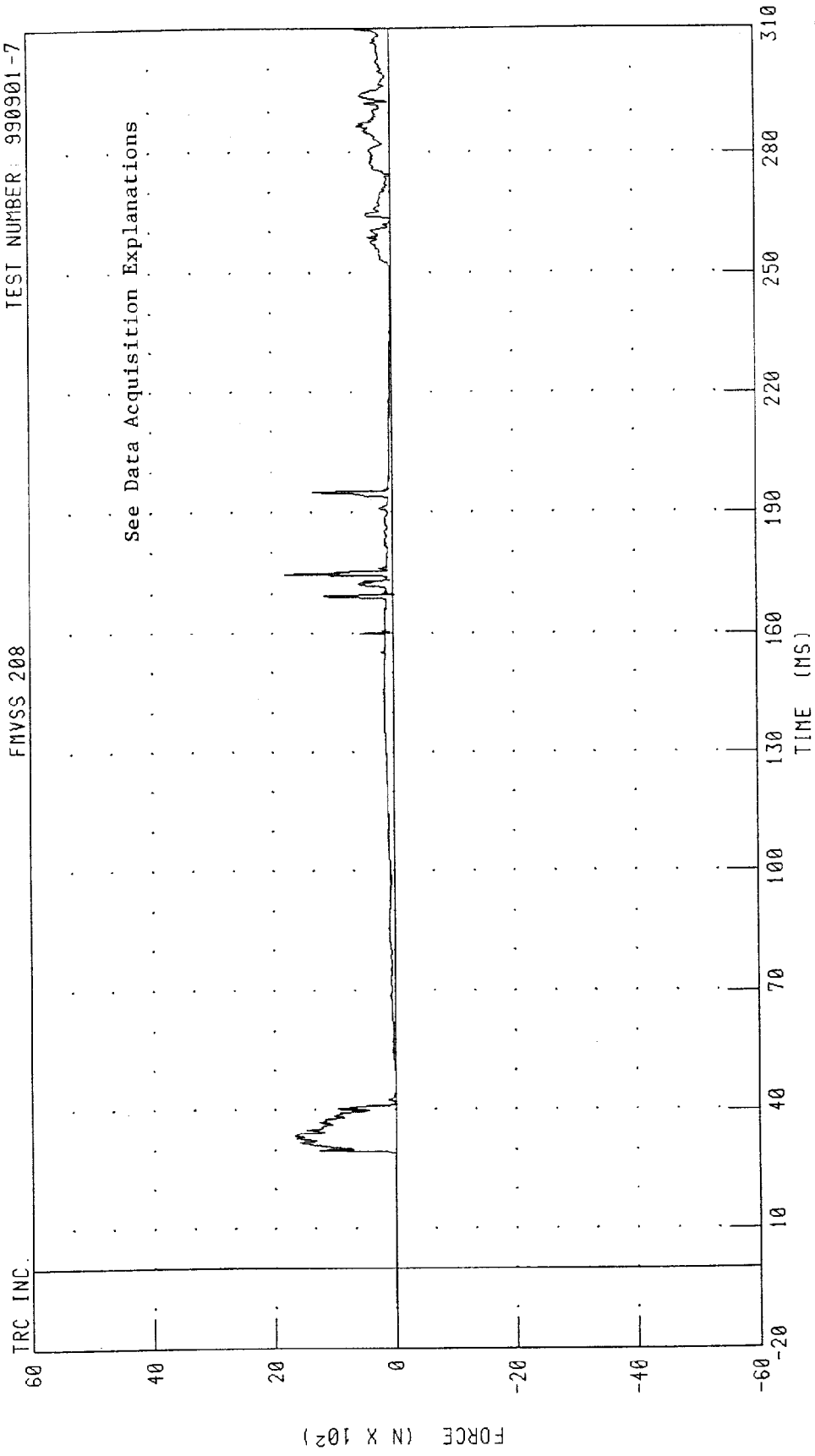
CHANNEL: NEKXF2 FILTER: CH. CLASS 1000

PEAK DATA: 209.57 N @ 78.08 MS; -250.68 N @ 155.84 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER NECK Y-AXIS SHEAR FORCE

TEST NUMBER: 990901-7

FMVSS 208



PEAK DATA: 1782.61 N @ 174.88 MS, -28.54 N @ 41.52 MS

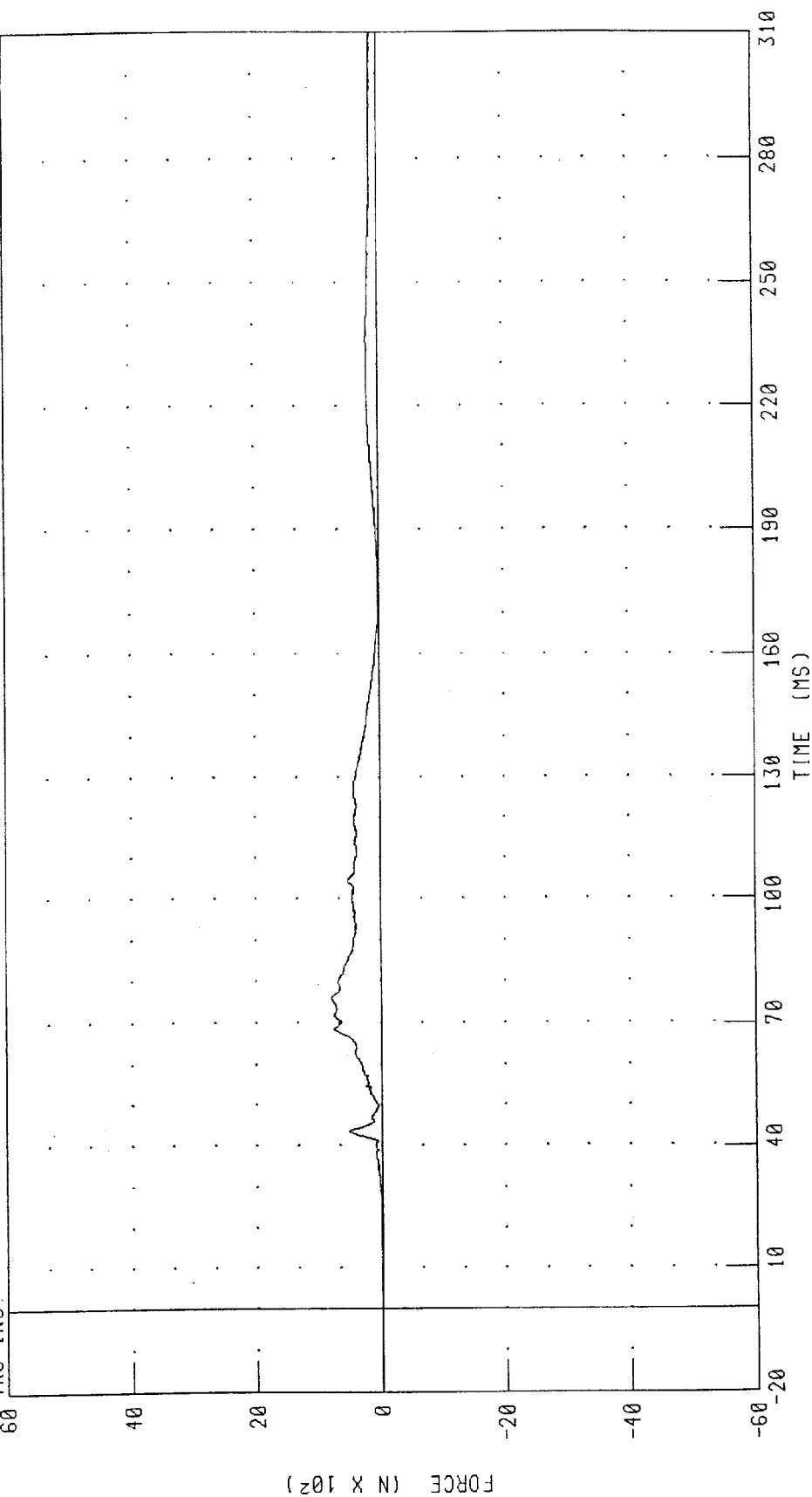
CHANNEL: NEKYF2 FILTER: CH. CLASS 1000

1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER NECK Z-AXIS AXIAL FORCE

TEST NUMBER 990901-7

FMVSS 208

TRC INC.



CHANNEL: NEKZF2 FILTER: CH. CLASS 1000

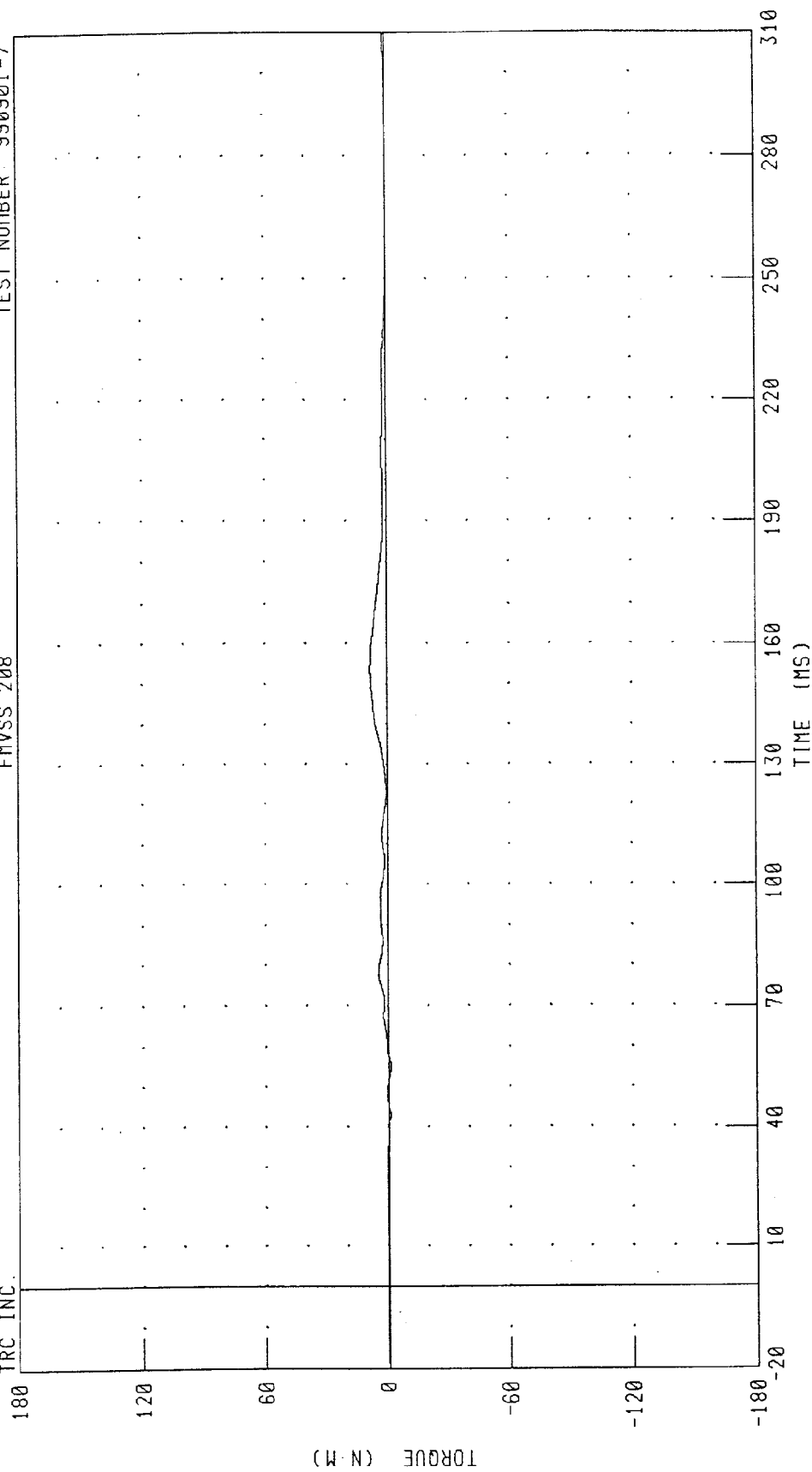
PEAK DATA: 781.43 N @ 75.76 MS, -0.26 N @ -19.60 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER NECK MOMENT ABOUT X AXIS

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: NEKX2 FILTER: CH. CLASS 600

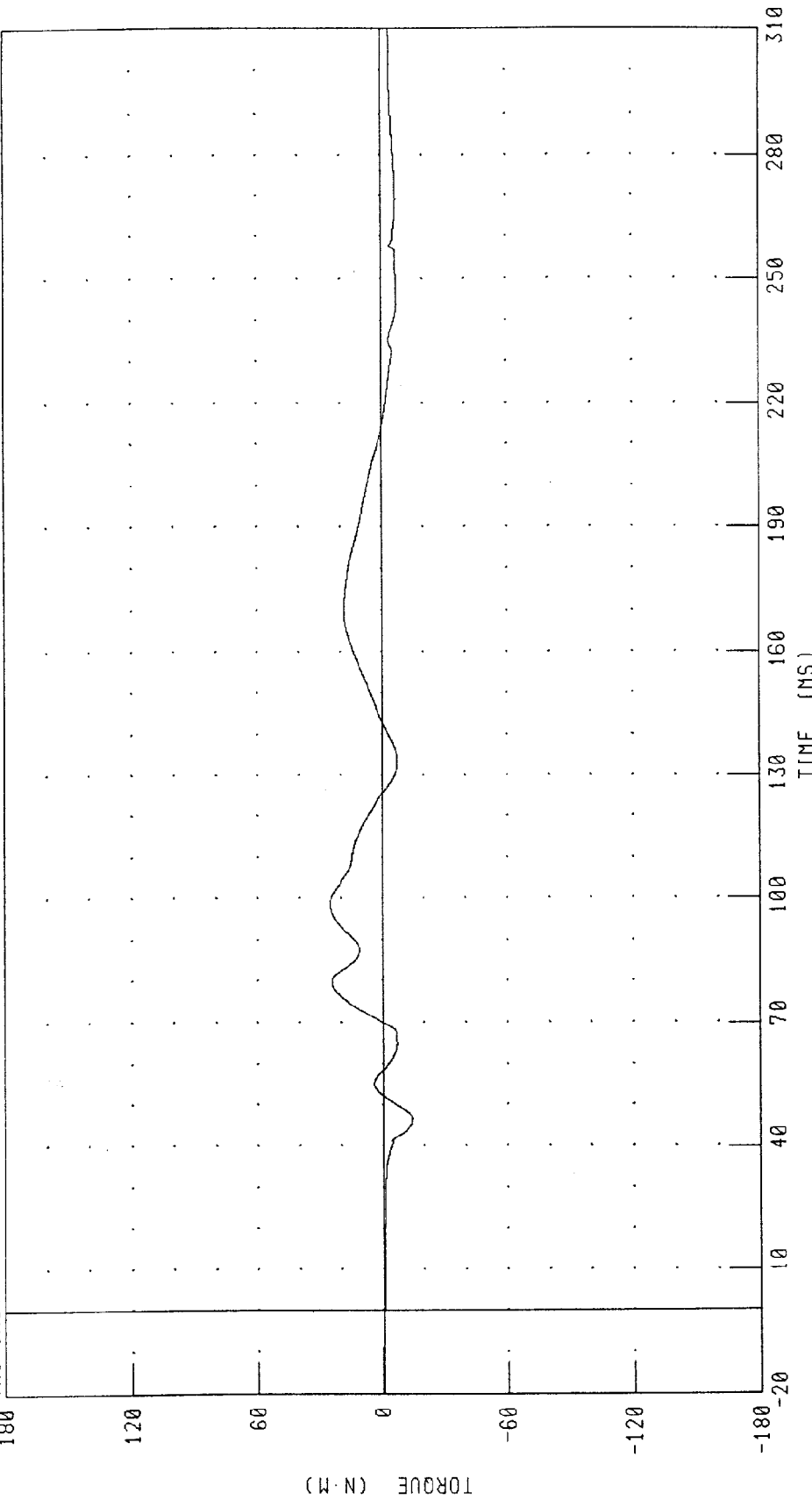
PEAK DATA: 8.21 N-M @ 154.40 MS, -1.26 N-M @ 54.64 MS

1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER NECK MOMENT ABOUT Y AXIS

TEST NUMBER: 990901-7

FMVSS 208

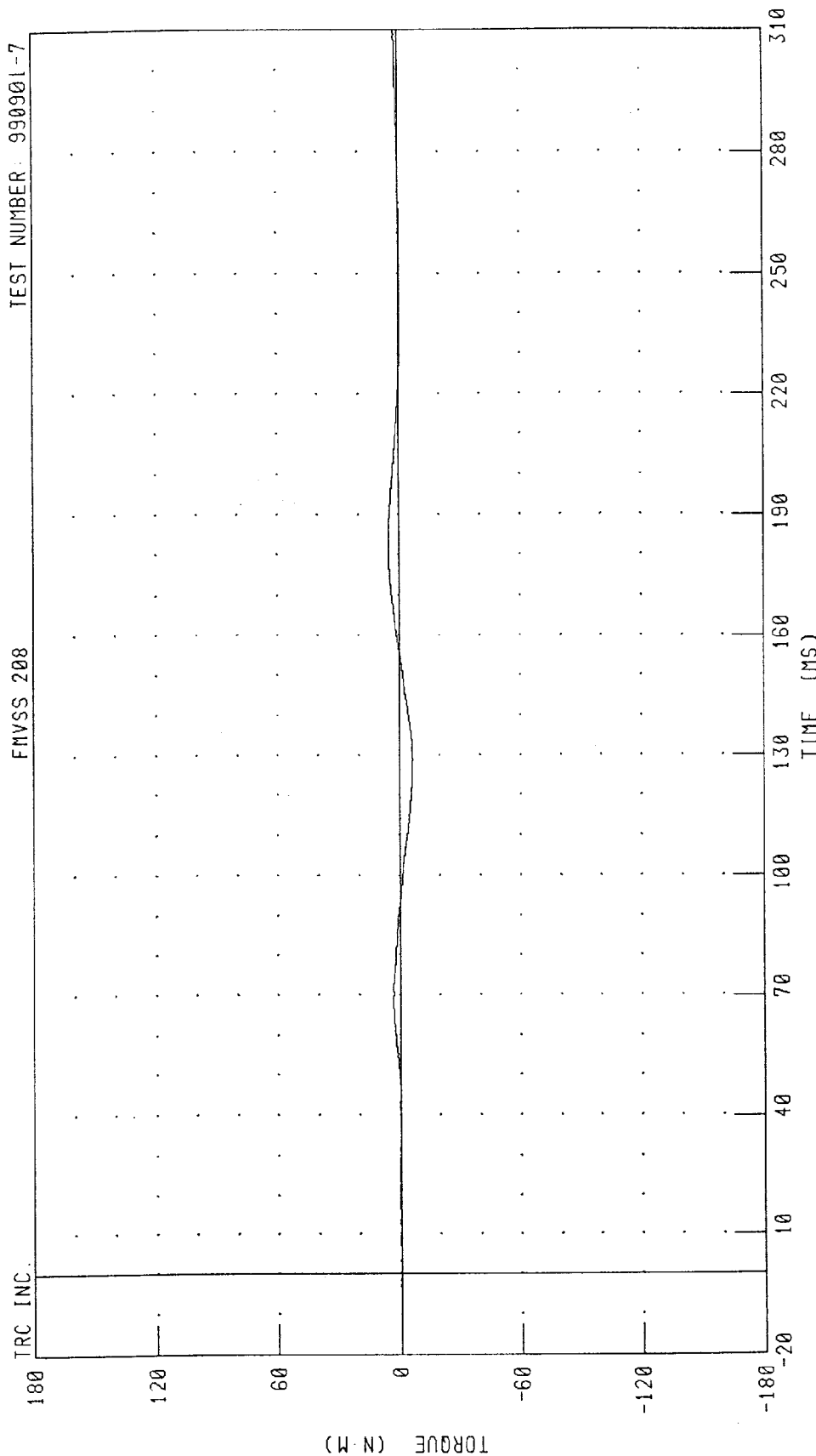
TRC INC



CHANNEL: NEKYM2 FILTER: CH. CLASS 600

PEAK DATA: 25 15 N-M @ 98.80 MS, -14.23 N-M @ 46.64 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER NECK MOMENT ABOUT Z AXIS



CHANNEL: NEKZM2 FILTER: CH. CLASS 600

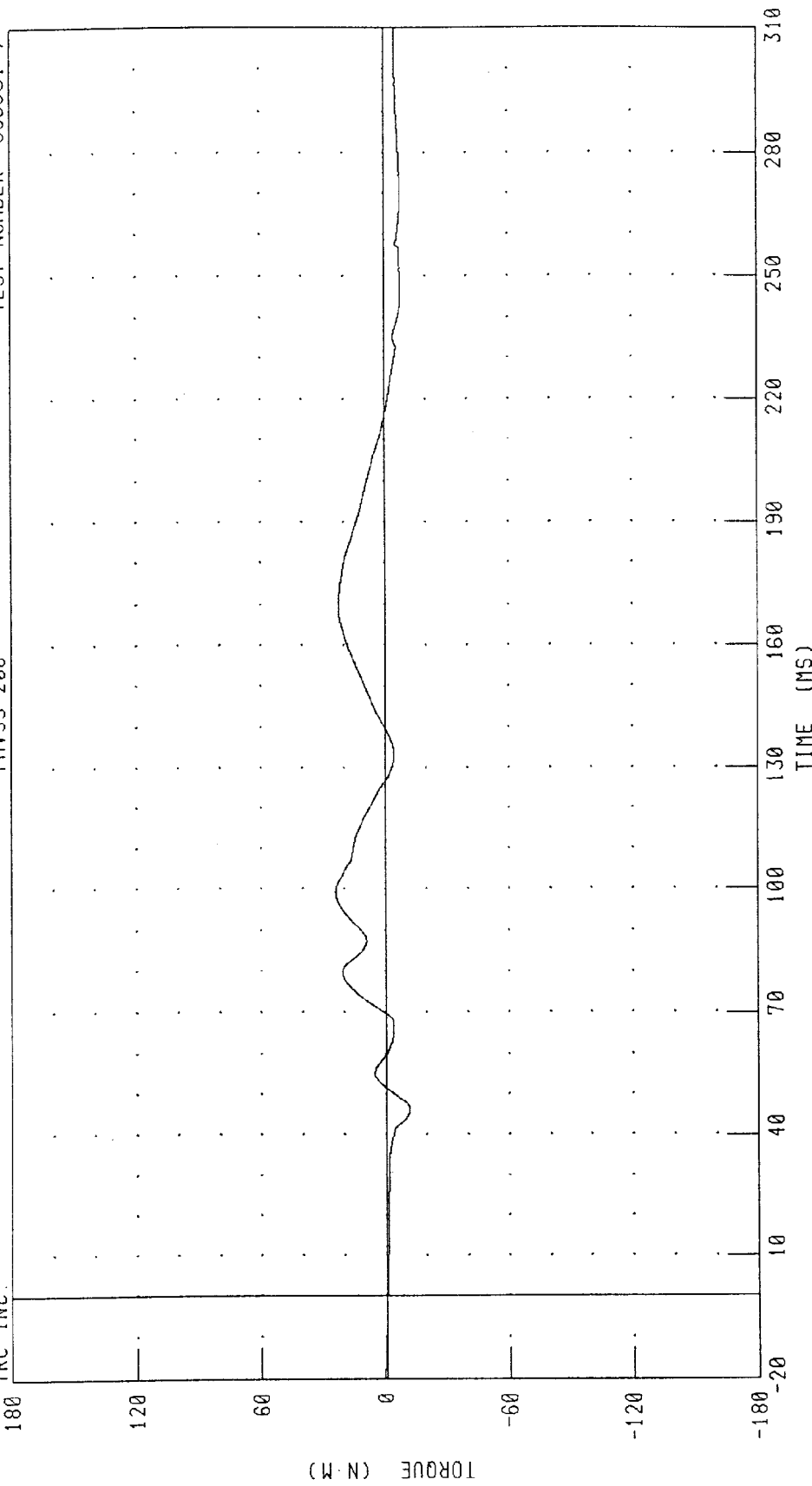
PEAK DATA: 5.01 N-M @ 181.68 MS, -6.59 N-M @ 129.12 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER NECK OCCIPITAL CONDYLE MOMENT ABOUT Y AXIS

TEST NUMBER: 990901-7

ENVSS 208

TRC INC.



PEAK DATA: 23.91 N-M @ 99.20 MS, -11.59 N-M @ 16.64 MS

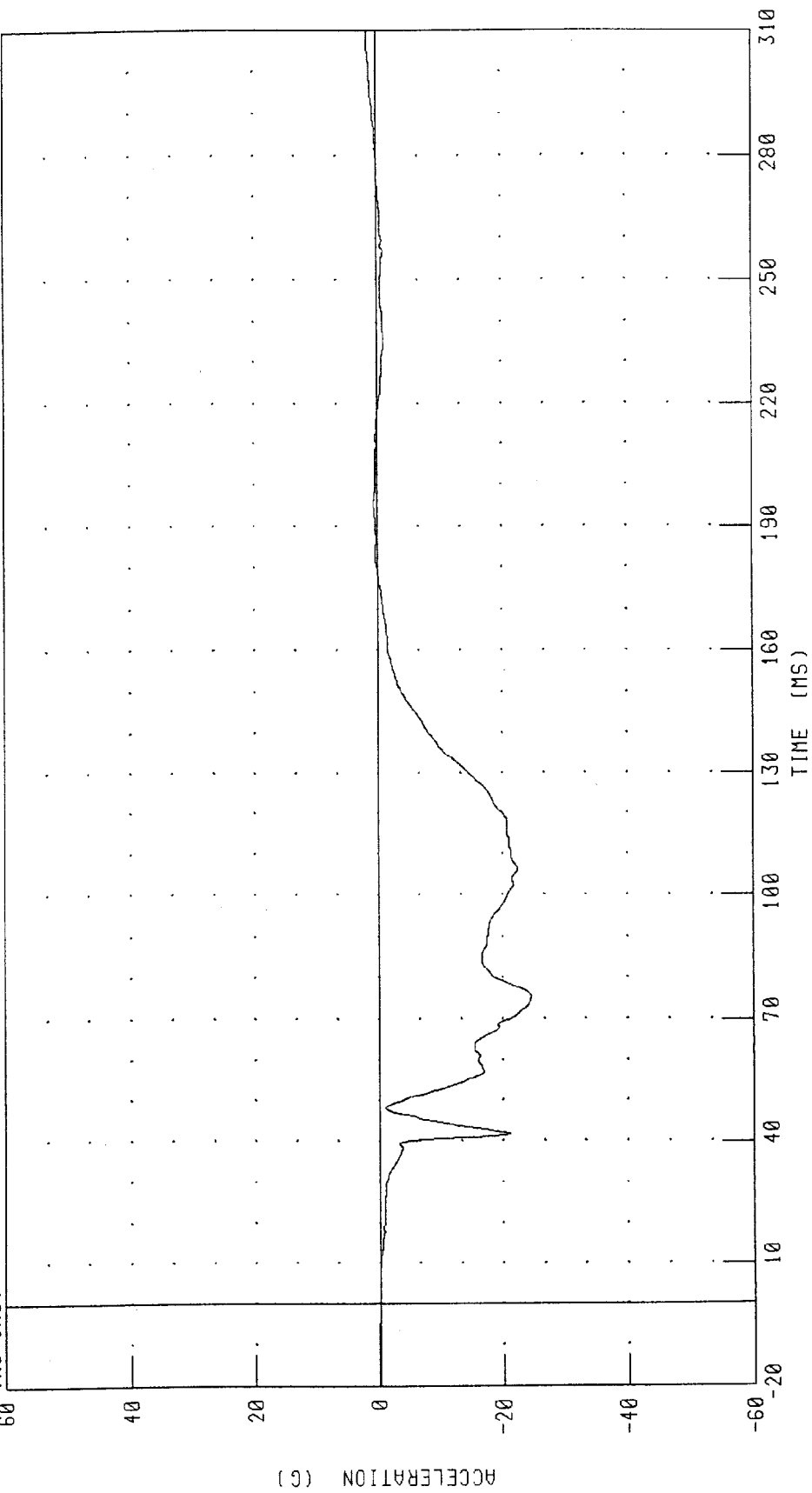
CHANNEL: NEKOM2 FILTER: CH. CLASS 600

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: CSTXG2 FILTER: CH. CLASS 180

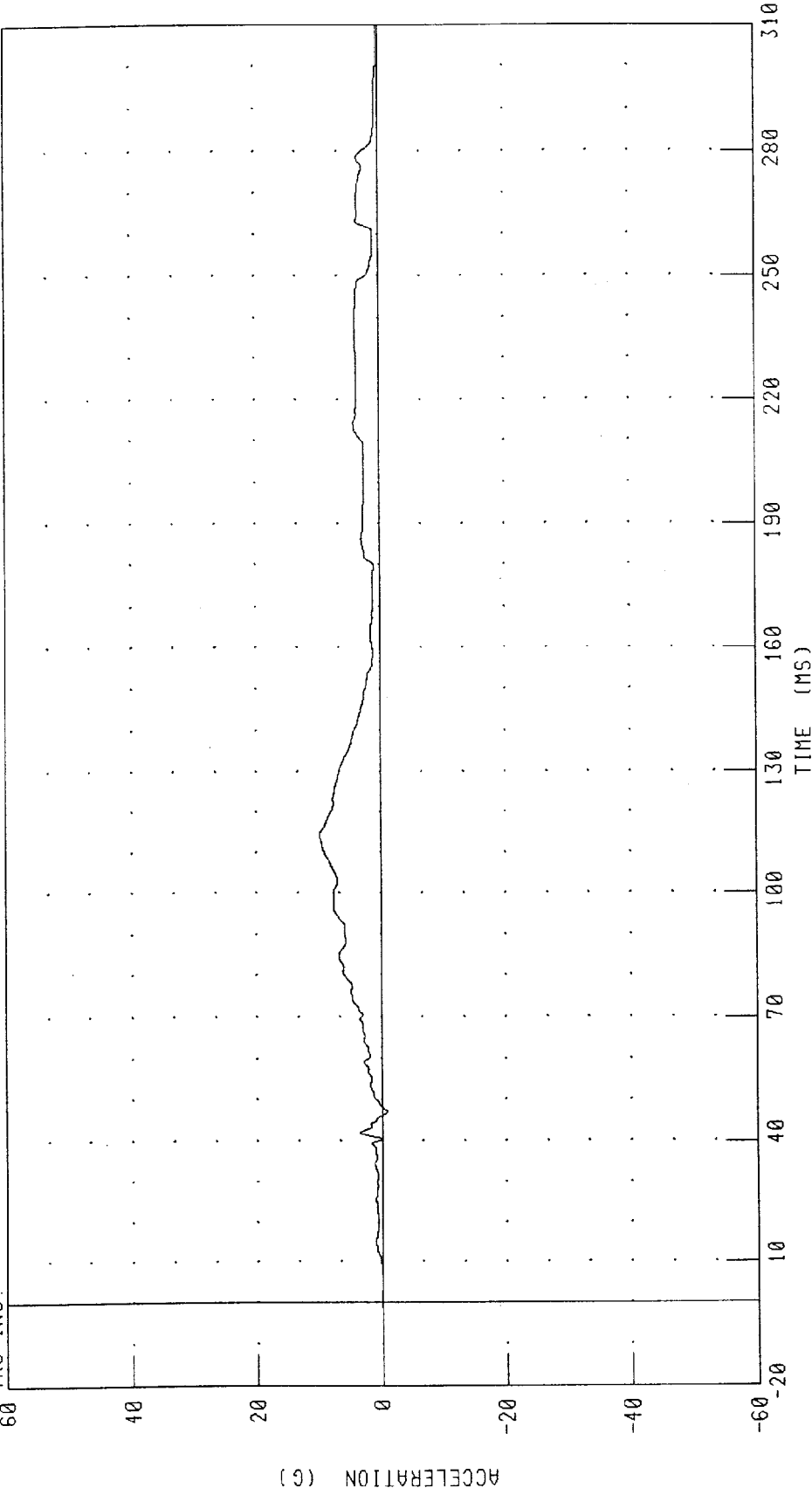
PEAK DATA: 1.51 G @ 309.68 MS, -24.60 G @ 75.52 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: CSTYC2 FILTER: CH. CLASS 180

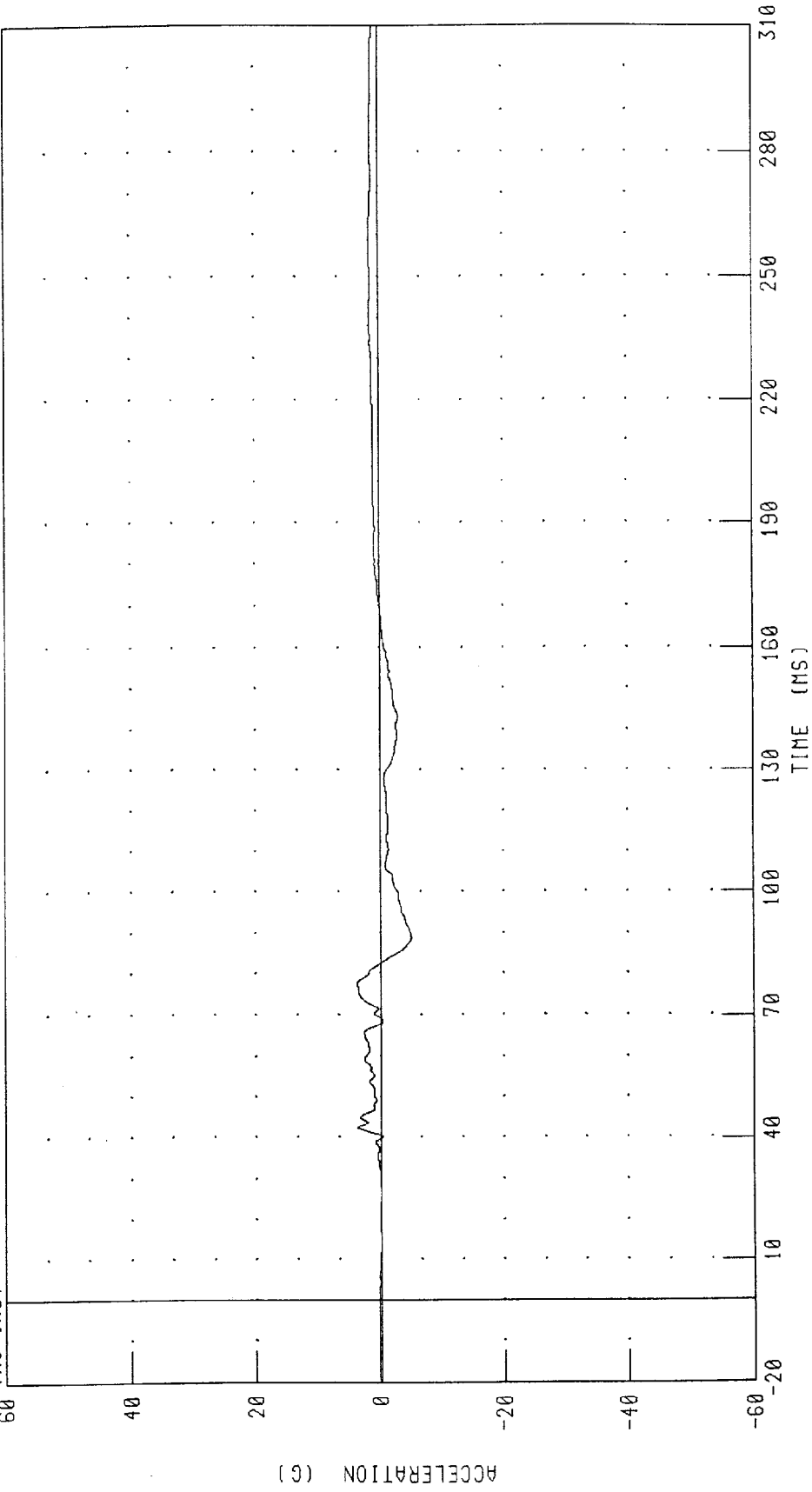
PEAK DATA: 55.79 G @ 114.40 MS, -0.92 G @ 47.20 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



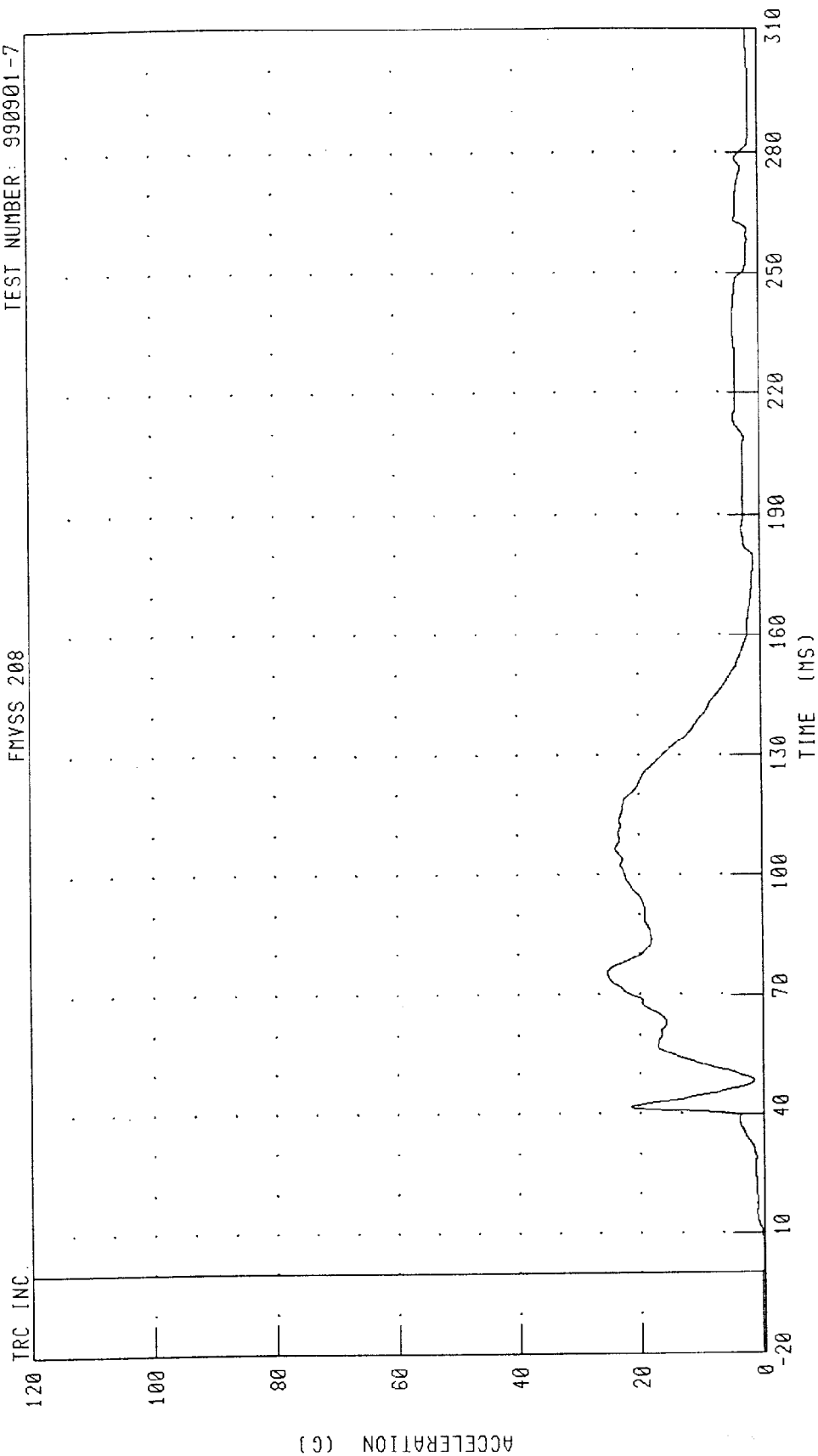
CHANNEL: CSTZC2 FILTER: CH. CLASS 180

PEAK DATA: 3.71 G @ 42.40 MS, -5.08 G @ 88.96 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208



CHANNEL: CSTRG2 FILTER: CH. CLASS 180

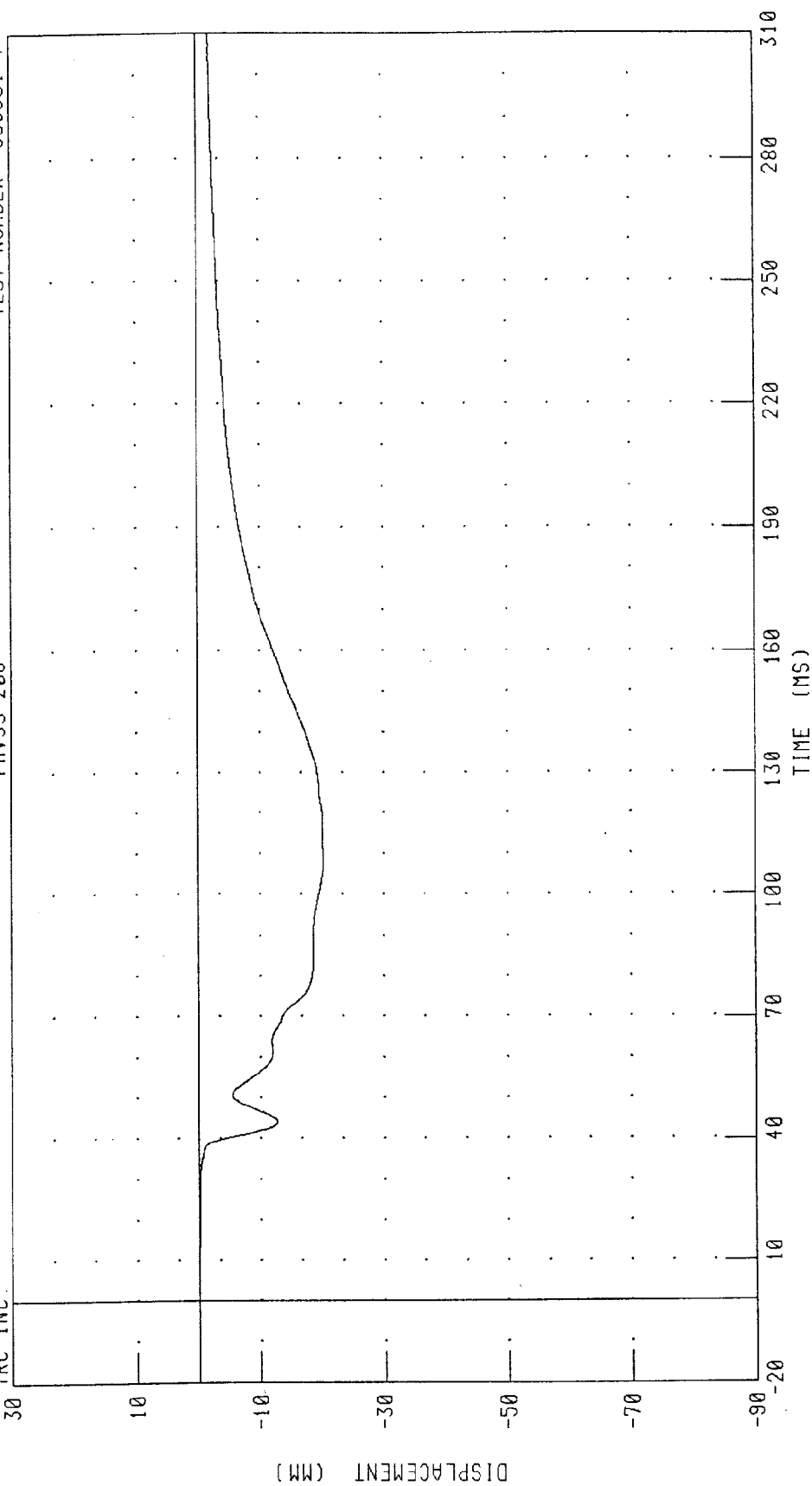
PEAK DATA: 25.29 G @ 75.52 MS, 0.02 G @ -20 00 MS

1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER CHEST DEFLECTION

TEST NUMBER: 990901-7

FNVS 208

TRC INC.



CHANNEL: CSTXD2 FILTER: CH. CLASS 180

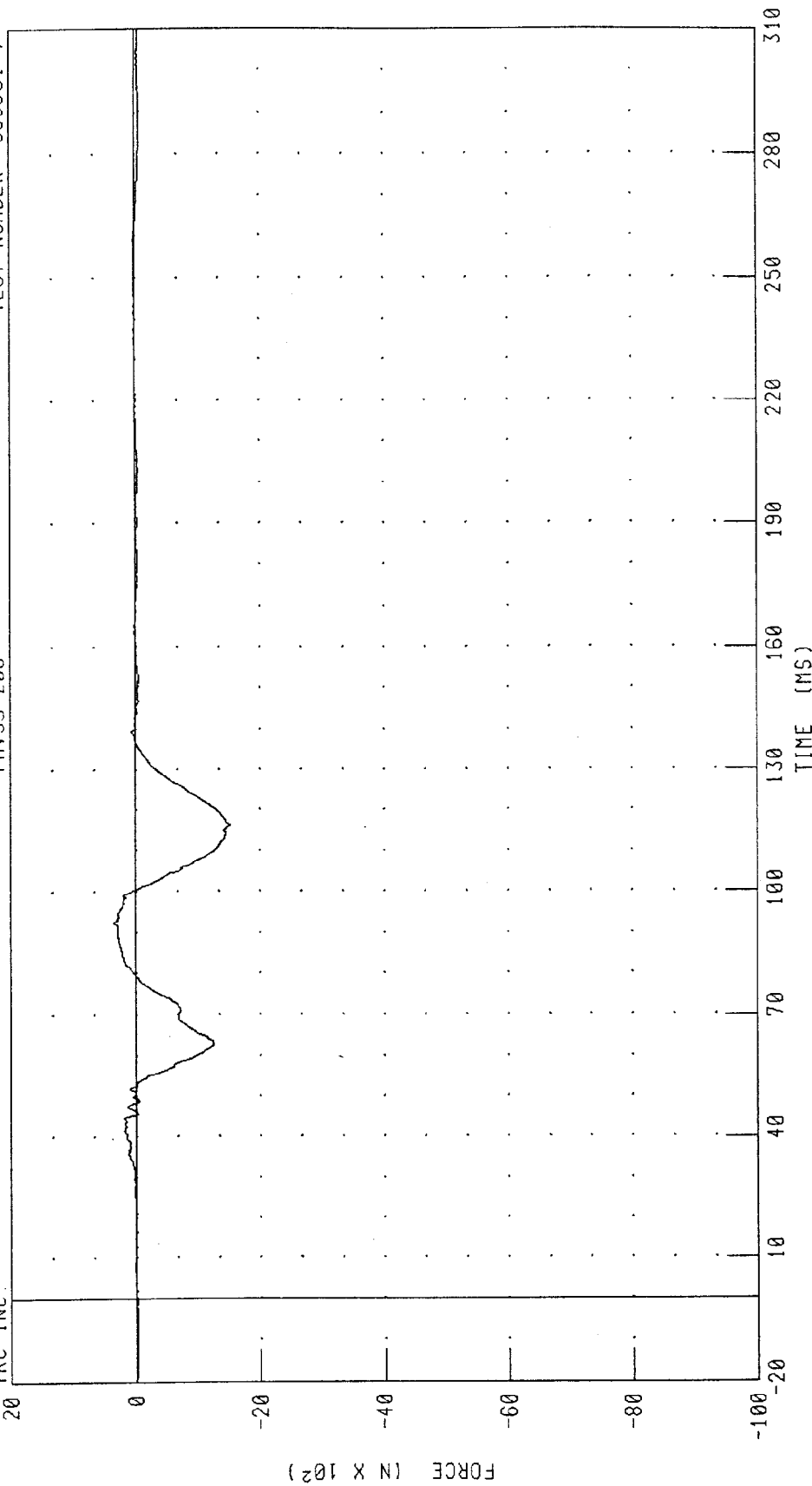
PEAK DATA: 0.00 MM @ -20.00 MS; -20.31 MM @ 108.00 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER LEFT FEMUR FORCE

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



PEAK DATA: 368.82 N @ 92.40 MS, -1520.12 N @ 116.24 MS

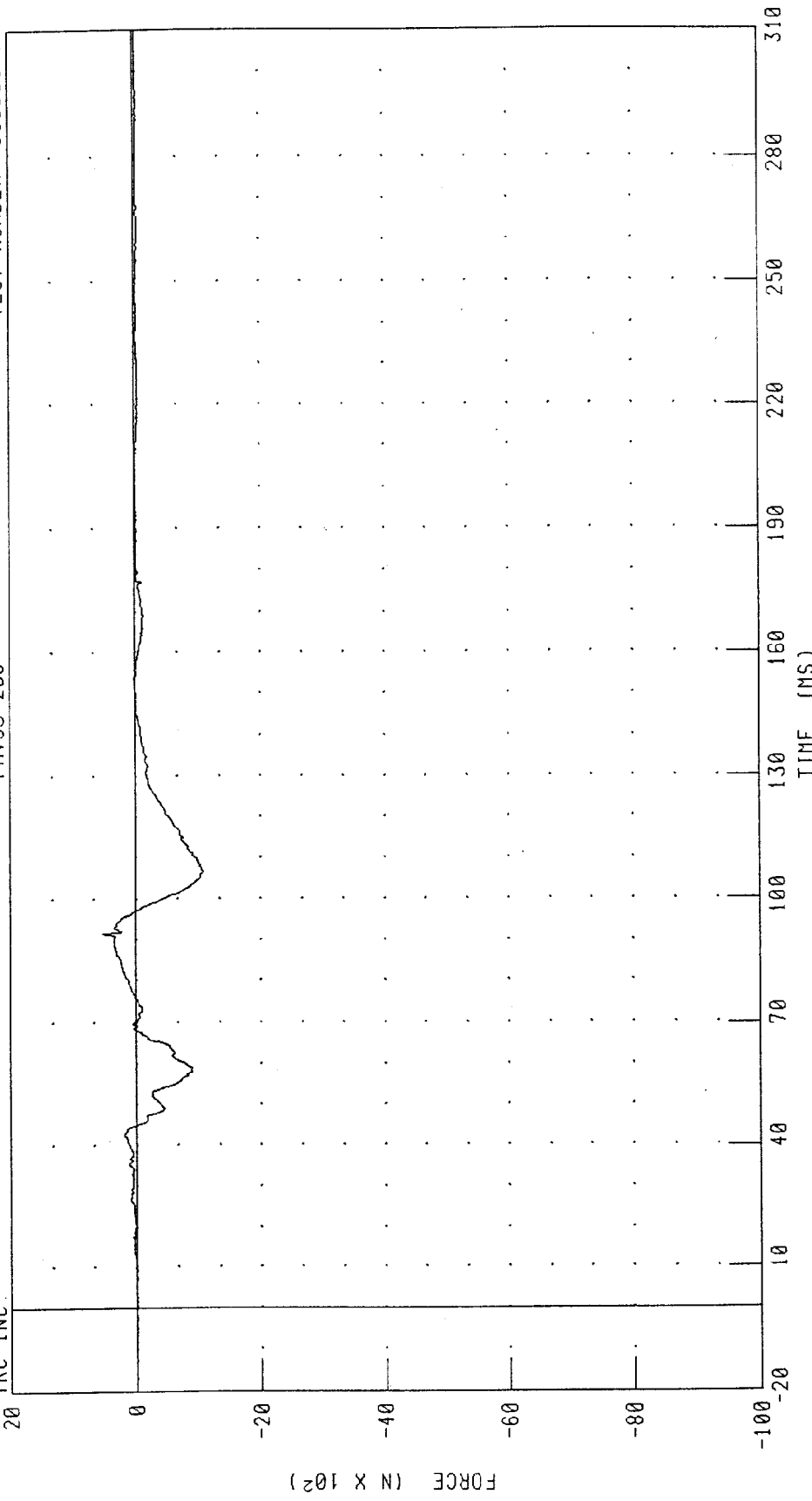
CHANNEL: LFMF2 FILTER: CH. CLASS 600

1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



PEAK DATA: 527.45 N @ 91.68 MS; -1085.76 N @ 106.56 MS

FILTER: CH. CLASS 600

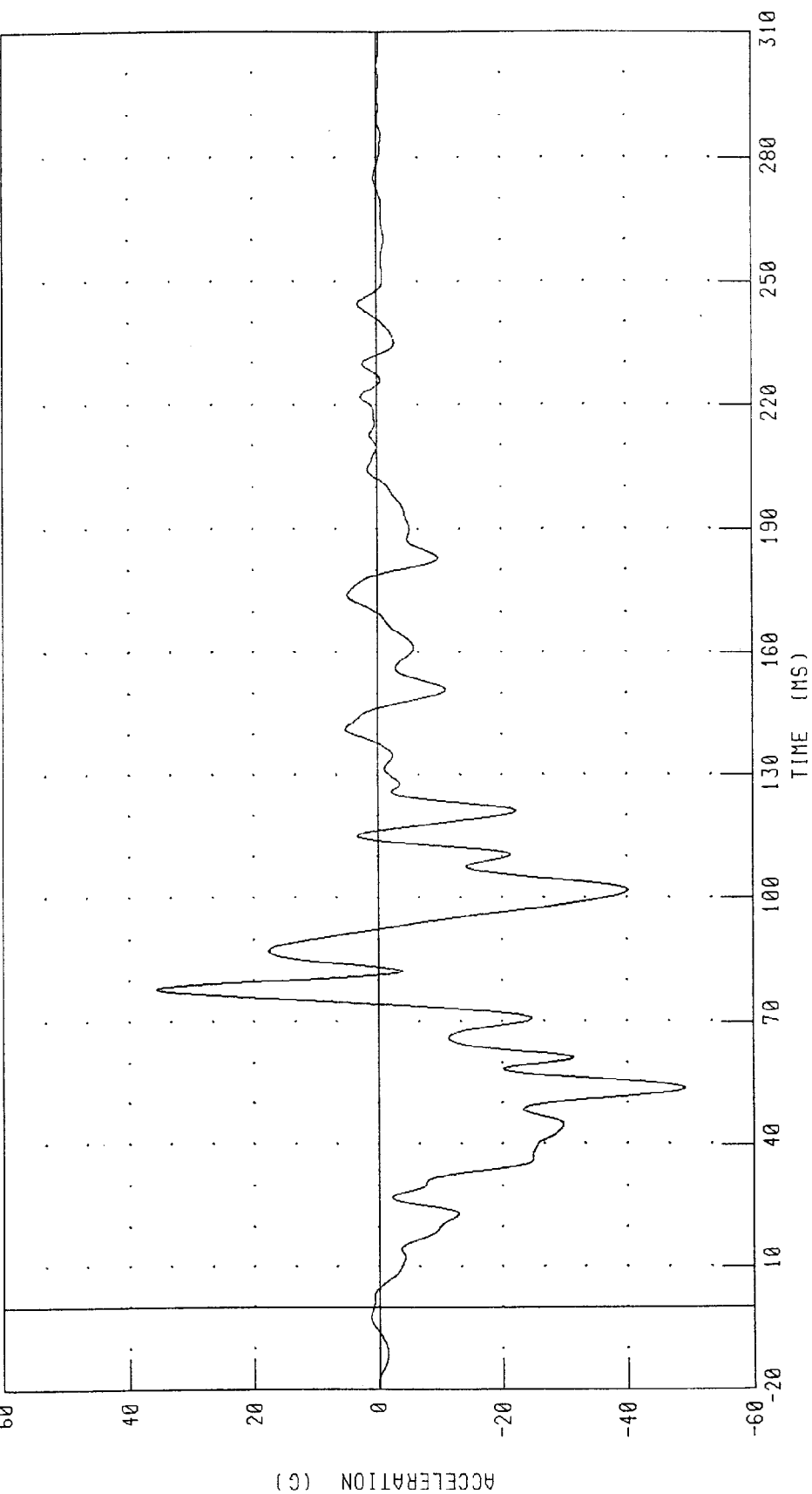
CHANNEL: RFMF2

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
LEFT BRAKE CALIPER X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FNVS 208

TRC INC.



CHANNEL: BCLXG1 FILTER: CH. CLASS 60

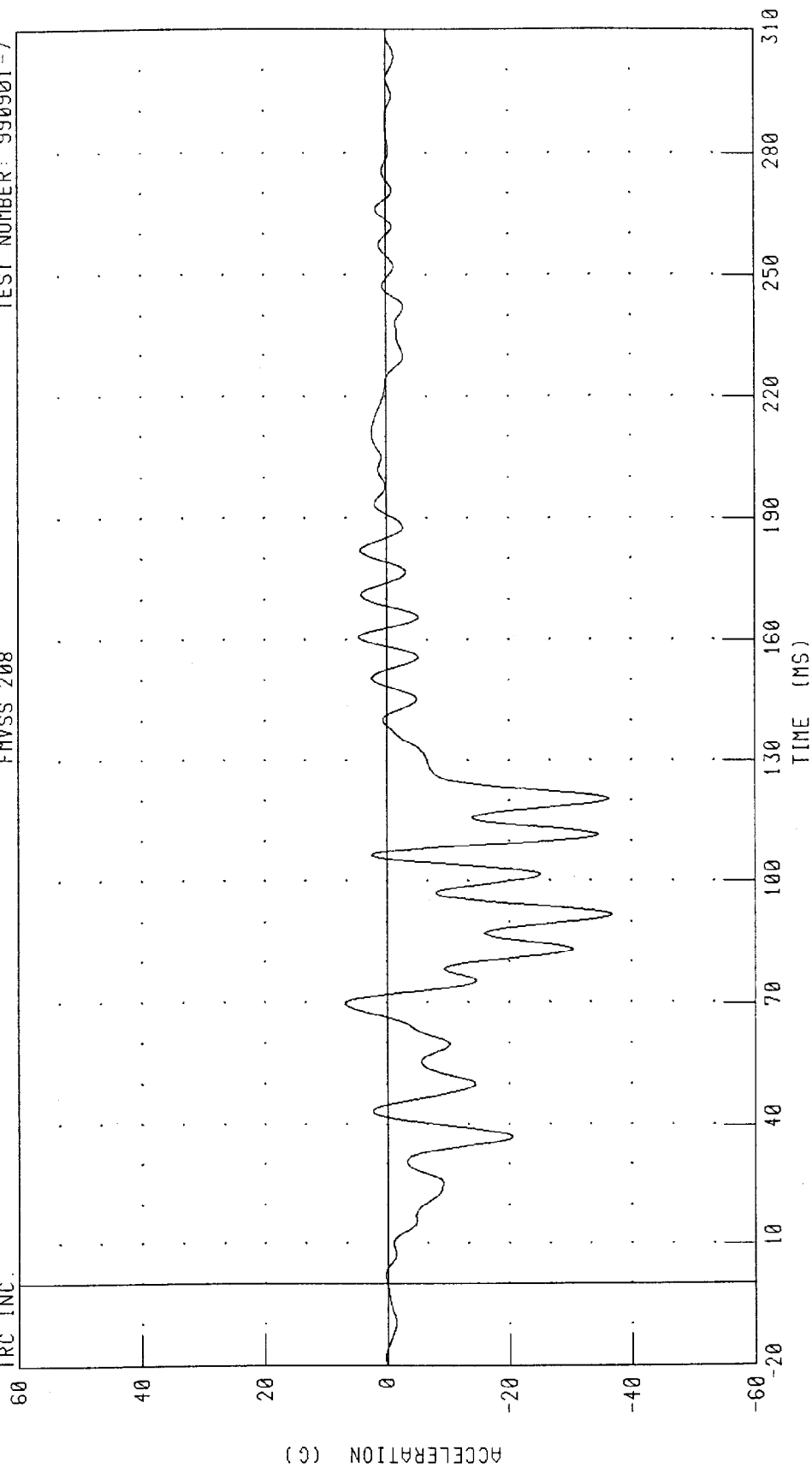
PEAK DATA: 35.71 G @ 78.00 MS, -49.15 G @ 53.68 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT BRAKE CALIPER X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: BCRXG1 FILTER: CH. CLASS 60

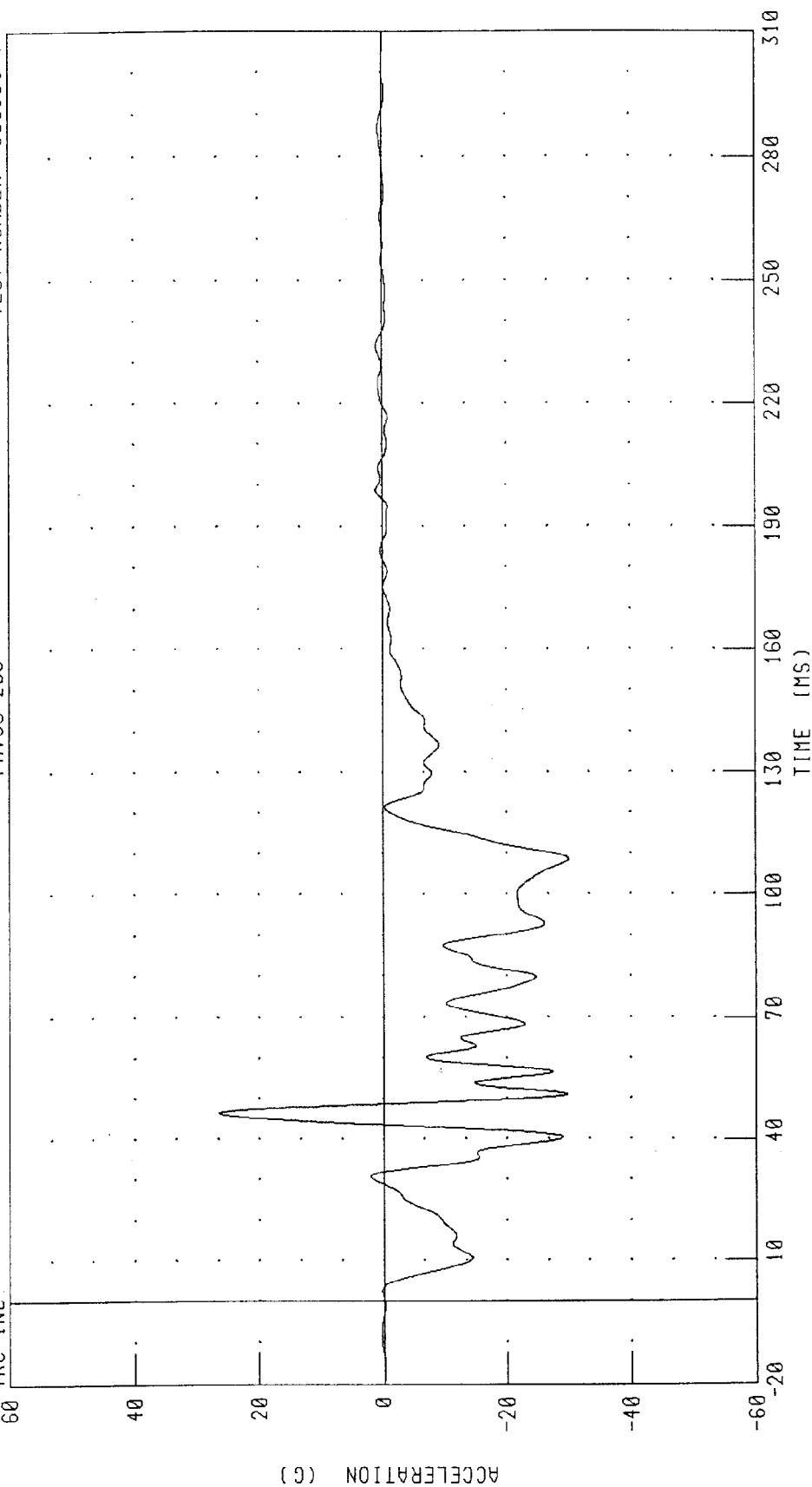
PEAK DATA: 6.86 G @ 69.84 MS; -36.88 G @ 91.84 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DASH PANEL CENTER X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FHVSS 208

TRC INC



CHANNEL: DPCXG1 FILTER: CH. CLASS 60

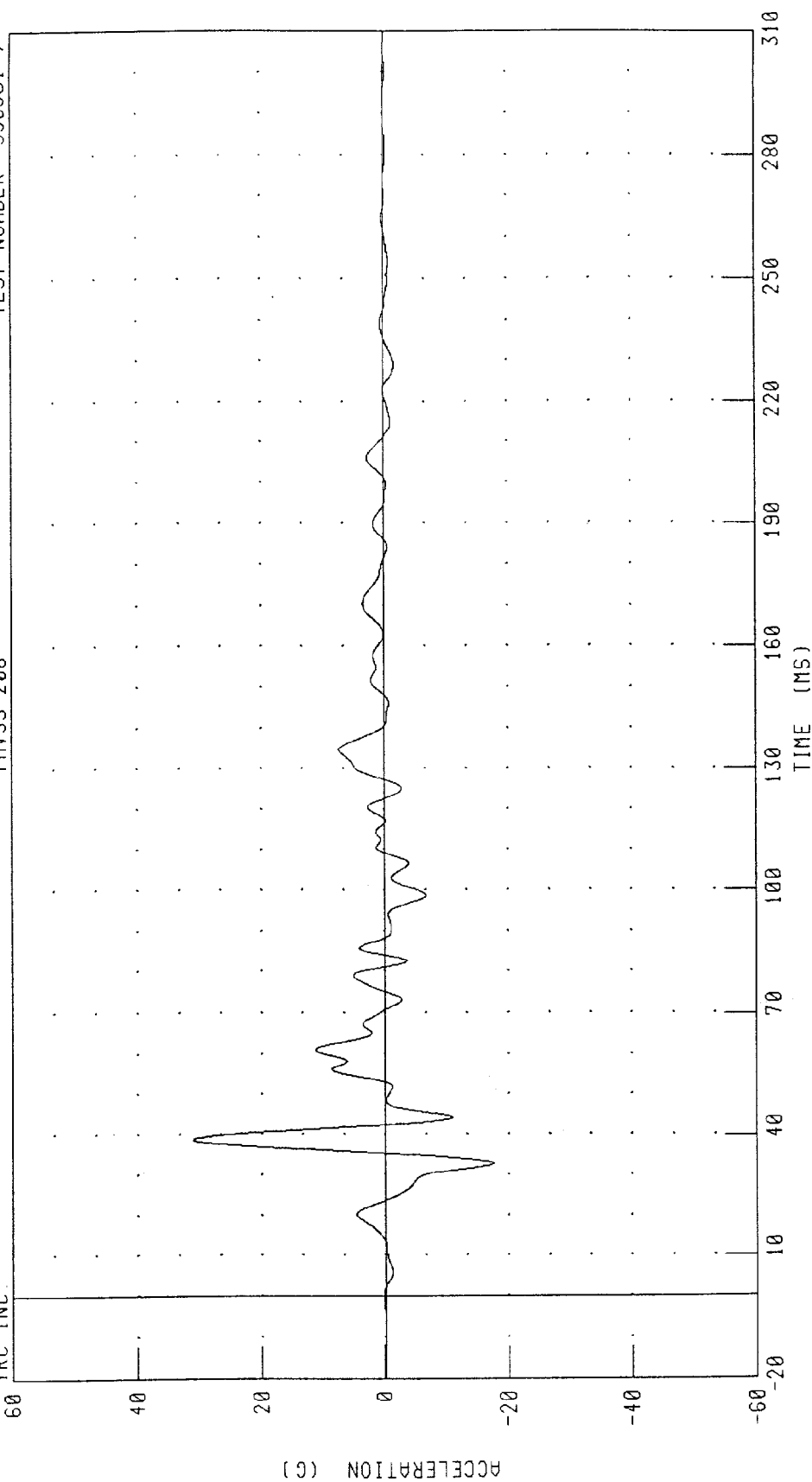
PEAK DATA: 26.46 G @ 46.48 MS, -30.02 G @ 100.56 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
DASH PANEL CENTER Y-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: DPCYG1 FILTER: CH. CLASS 60

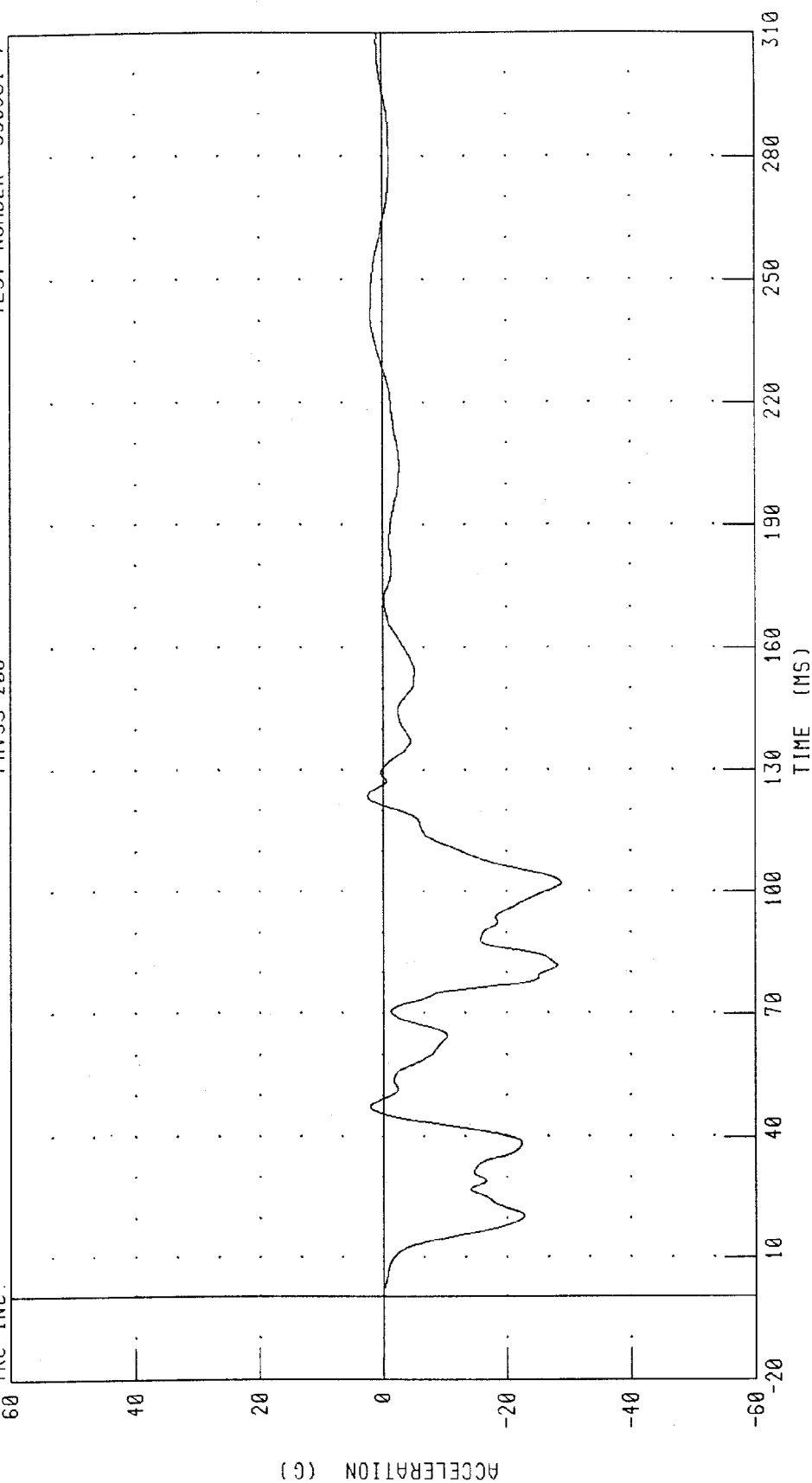
PEAK DATA: 31.15 G @ 38.88 MS, -17.64 G @ 32.96 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
ENGINE TOP X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FNVSS 208

TRC INC.



CHANNEL: ENGCG1 FILTER: CH. CLASS 60

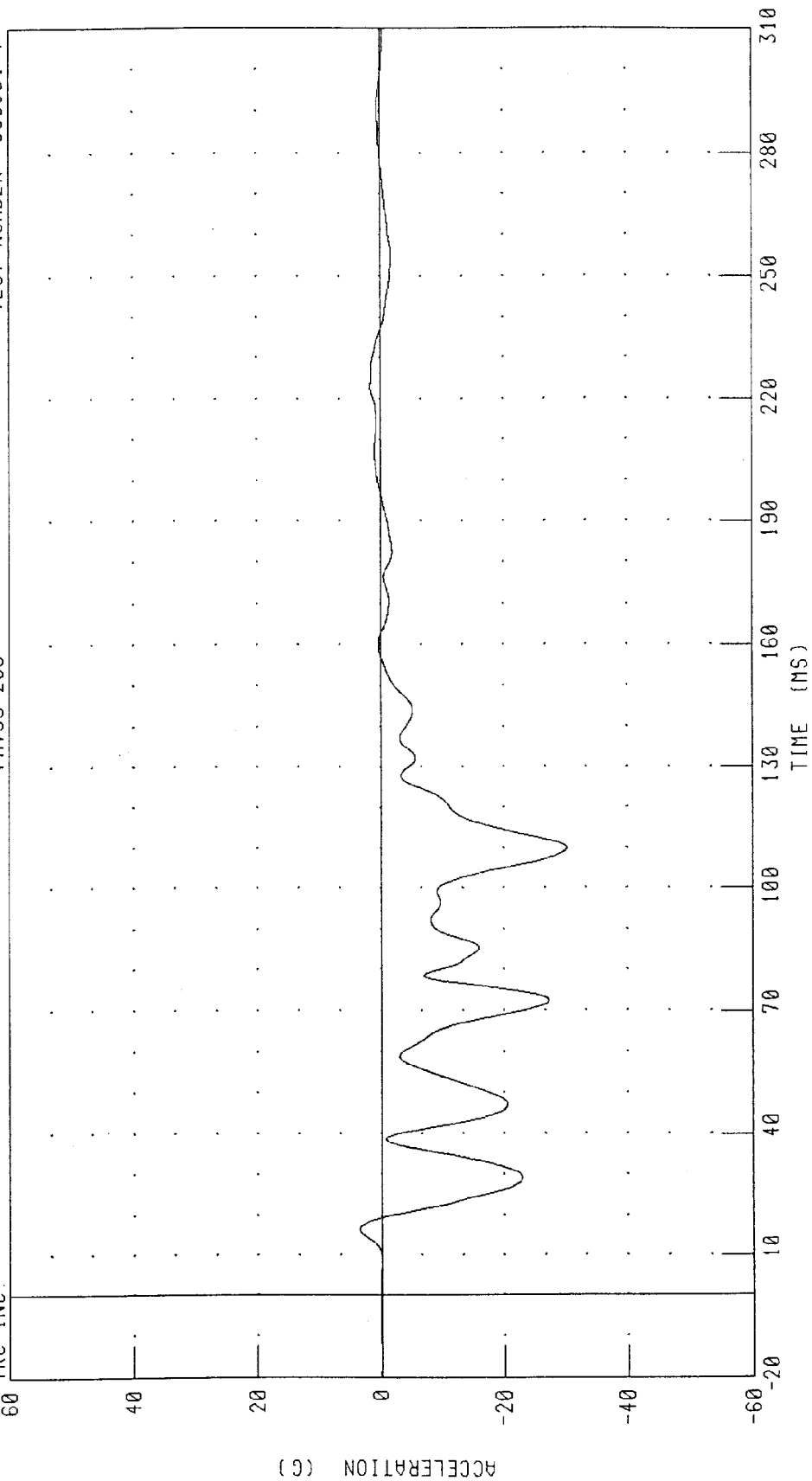
PEAK DATA: 2.49 G @ 123.68 MS, -28.81 G @ 102.24 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
ENGINE BOTTOM X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: ENCXC2 FILTER: CH. CLASS 60

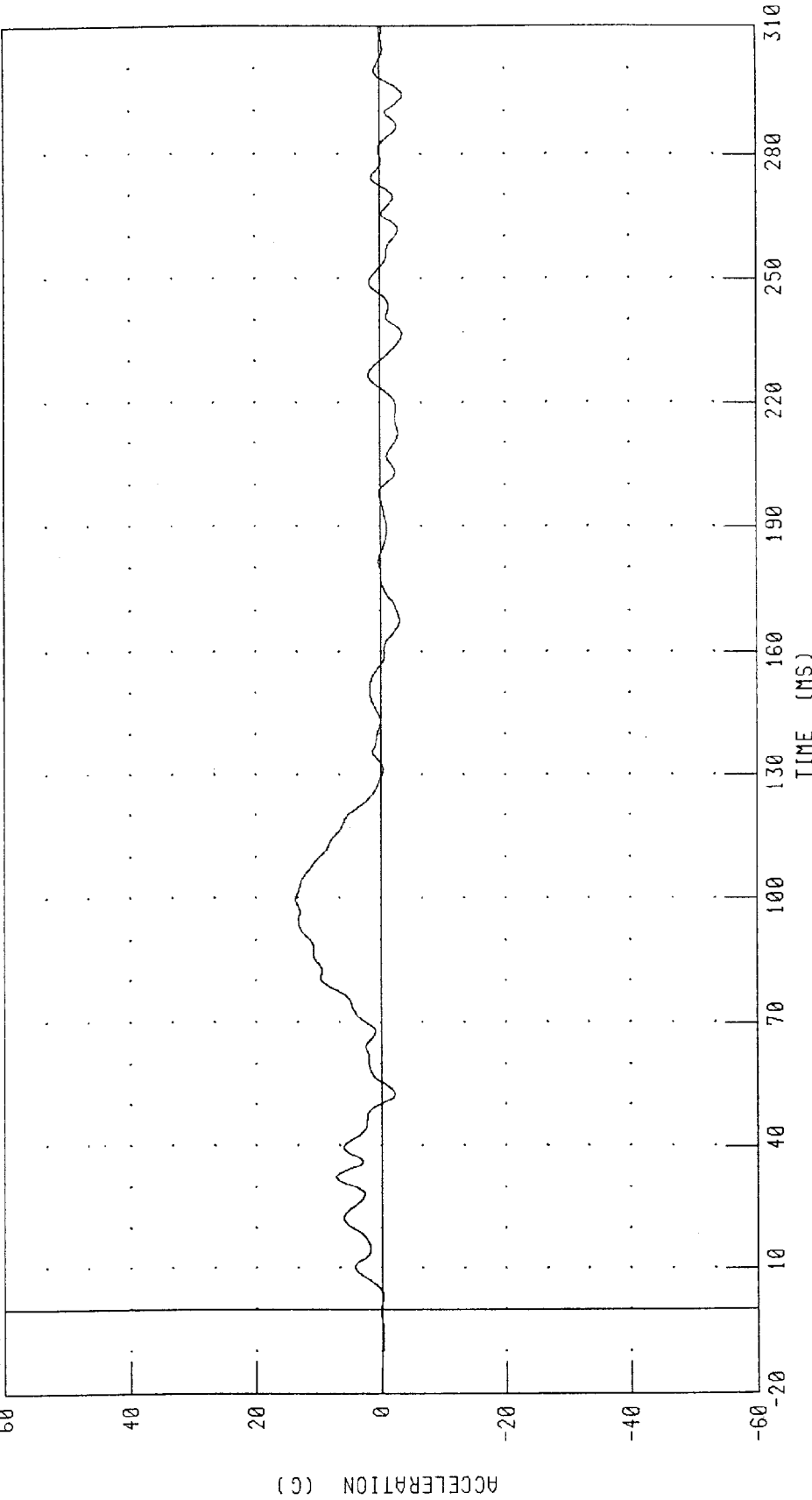
PEAK DATA: 3.56 G @ 16.64 MS, -30.21 G @ 110.08 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
VEHICLE REAR CENTER Y-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: RDKYG1 FILTER: CH. CLASS 60

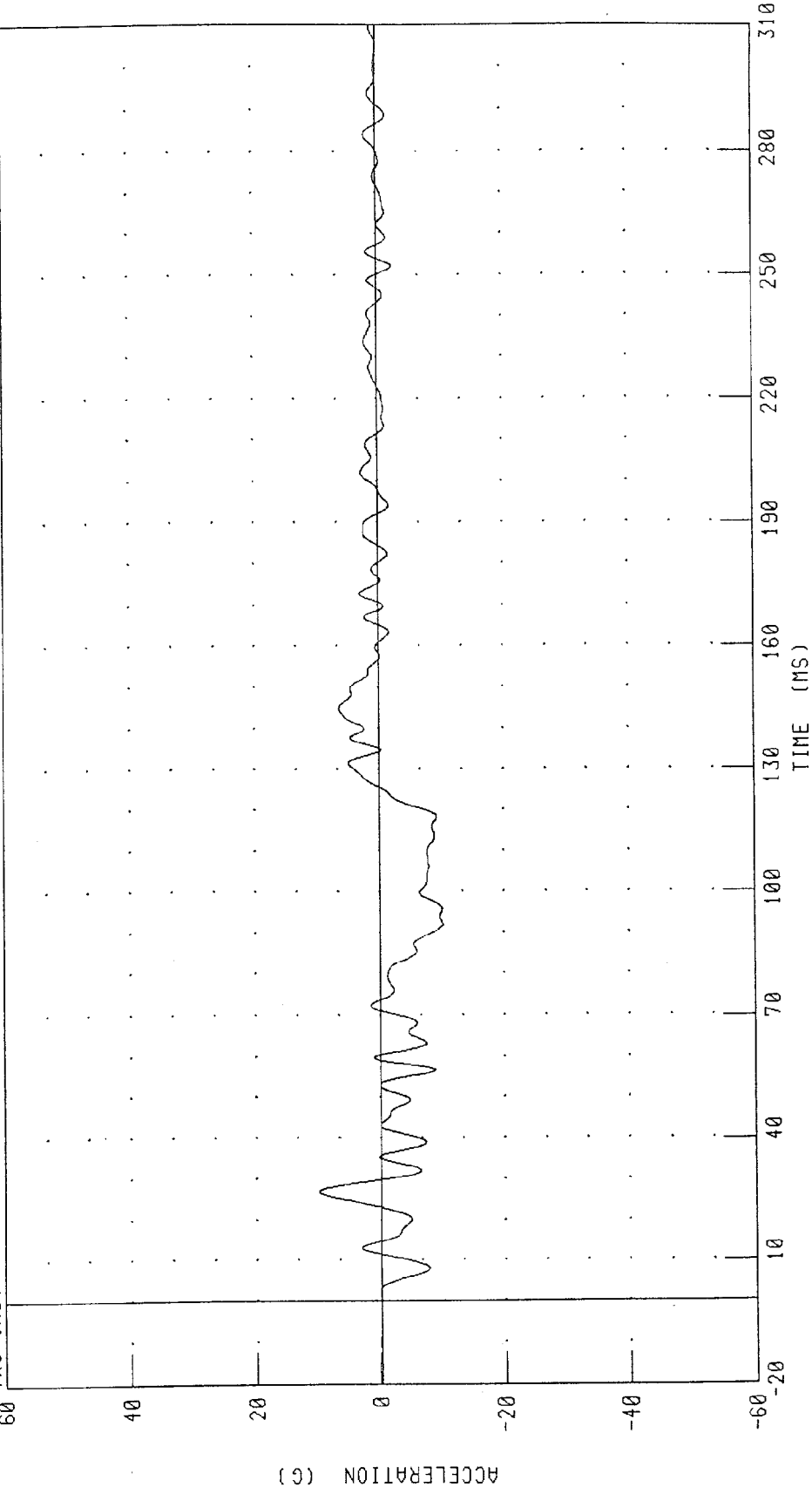
PEAK DATA: 13.66 G @ 99.92 MS, -3.66 G @ 294.00 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
VEHICLE REAR CENTER Z-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: RDKZG1 FILTER: CH. CLASS 60

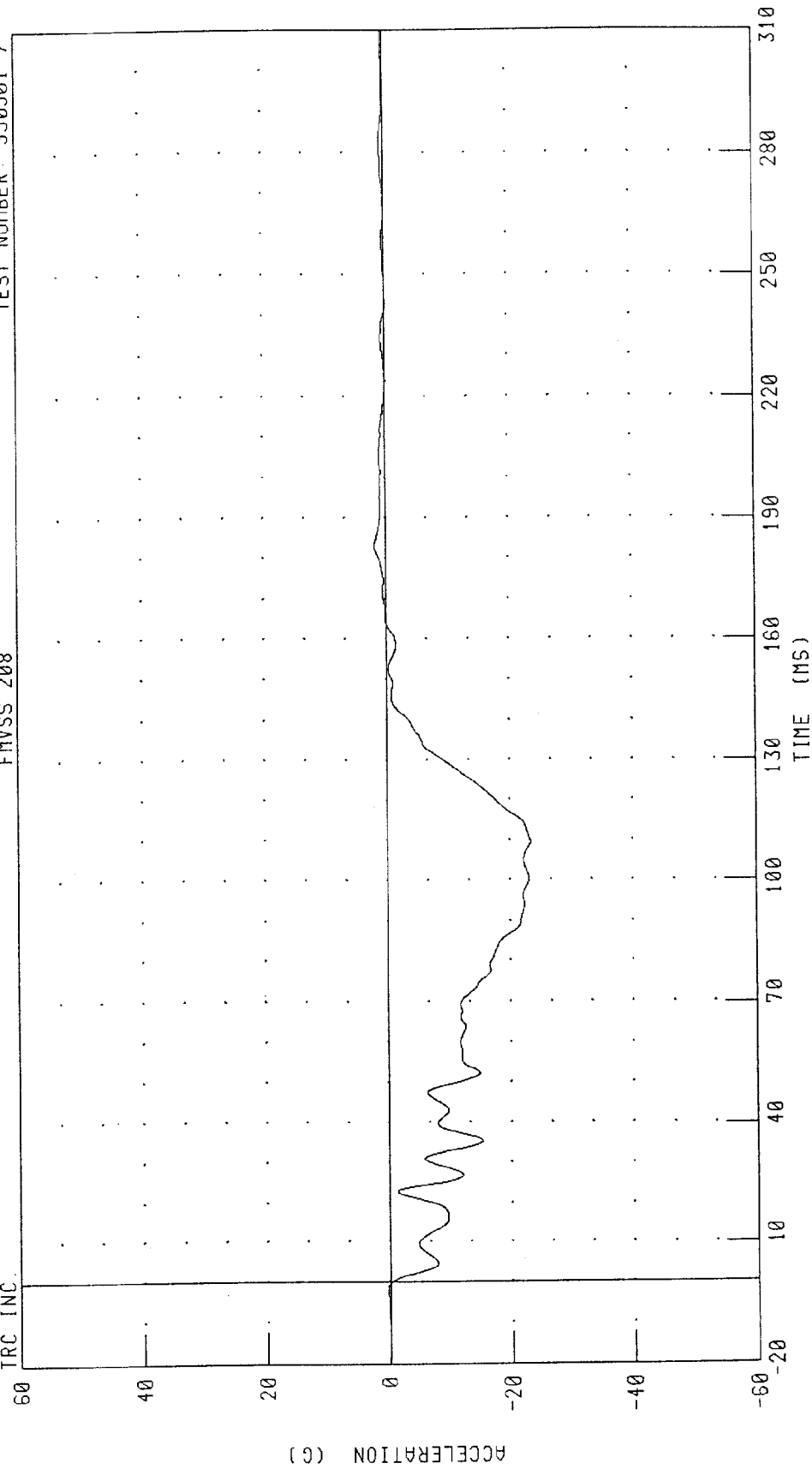
PEAK DATA: 9.97 G @ 26.96 MS, -10.18 G @ 92.08 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
LEFT REAR SEAT X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



PEAK DATA: 1.75 G @ 182.96 MS, -23.41 G @ 109.52 MS

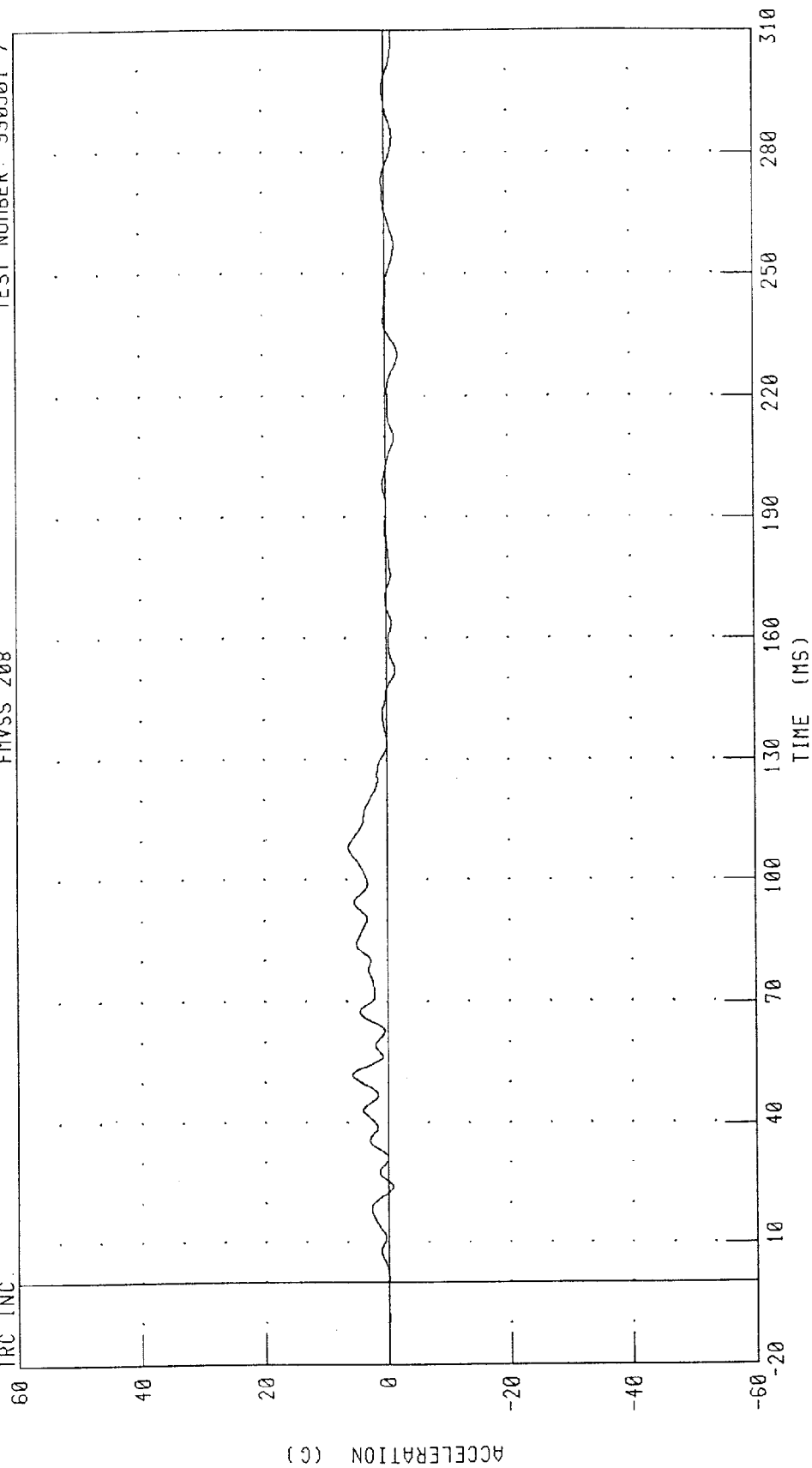
CHANNEL: TLRXG1 FILTER: CH. CLASS 60

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
LEFT REAR SEAT Y-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



CHANNEL: TLRYG1 FILTER: CH. CLASS 60

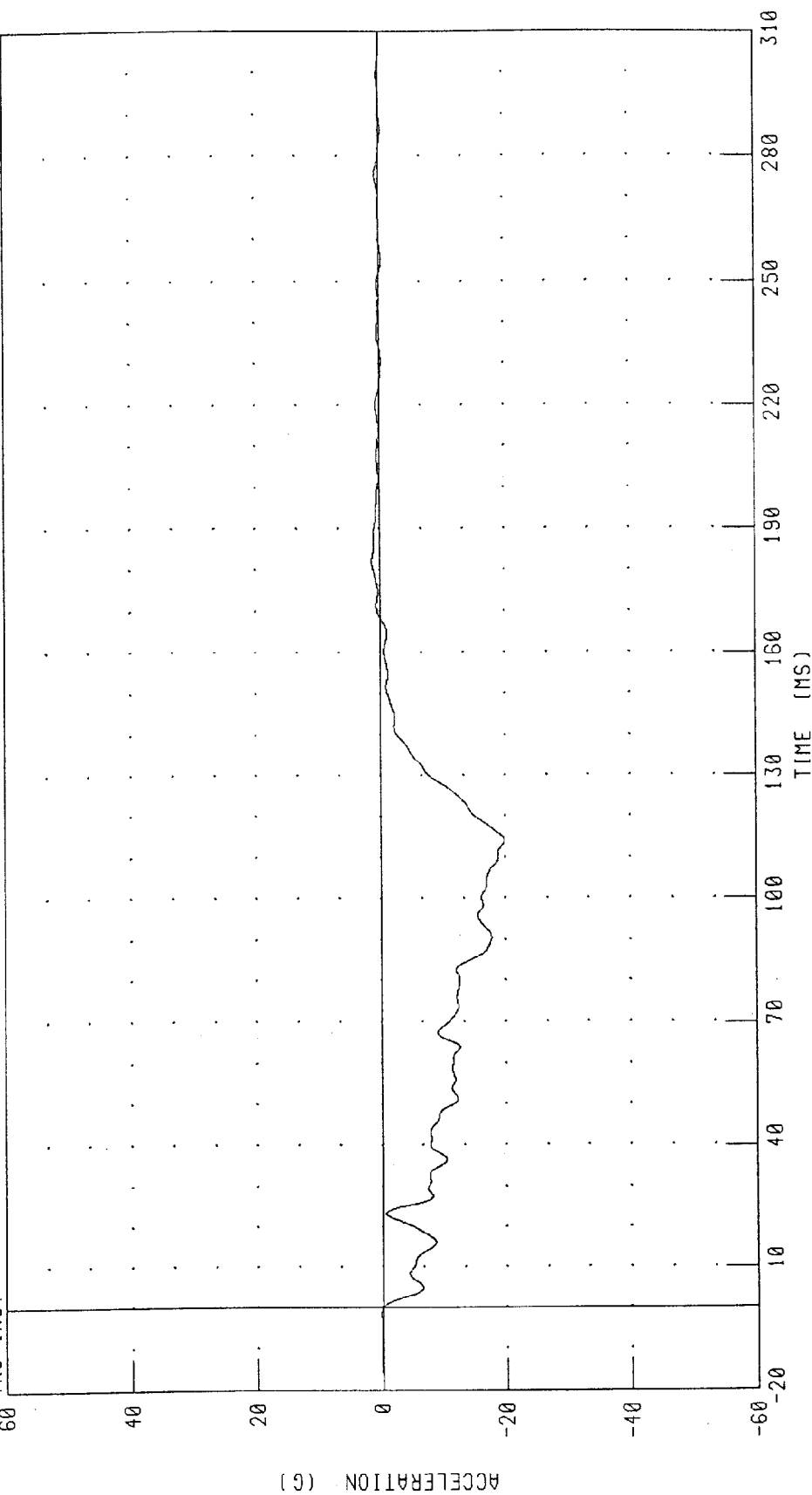
PEAK DATA: 6.31 G @ 108.00 MS; -2.06 G @ 230.32 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT REAR SEAT X-AXIS ACCELERATION

TEST NUMBER: 990901-7

FNVS 208

TRC INC.



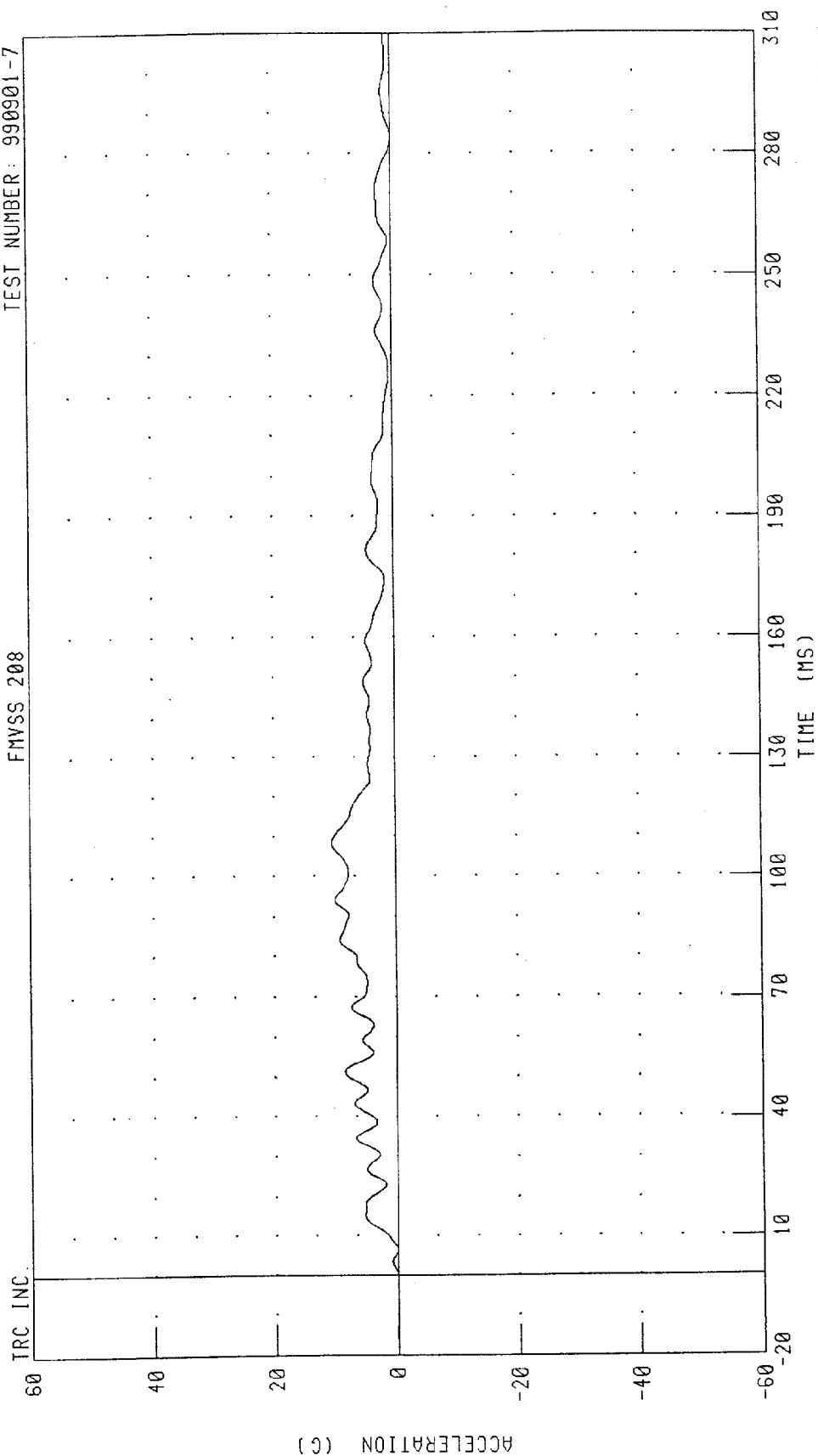
CHANNEL: TRRXG1 FILTER: CH. CLASS 60

PEAK DATA: 1.26 G @ 181.92 MS, -19.97 G @ 114.24 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
RIGHT REAR SEAT Y-AXIS ACCELERATION

TEST NUMBER: 990901-7

FMVSS 208



CHANNEL: TRRYG1 FILTER: CH. CLASS 60

PEAK DATA: 10.48 G @ 108.24 MS; -0.14 G @ -8.32 MS

1999 SATURN SL1 INTO IIHS 40% LEFT OFFSET BARRIER AT 35 MPH
DRIVER SIDE INDUCTIVE AIRBAG FIRE PICKUP

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.

120

80

40

0

-40

-80

-120

VOLTAGE (V X 10⁻¹)

TIME (MS)

10 40 70 100 130 160 190 220 250 280 310

CHANNEL: ABSQ1

FILTER: CH. CLASS 1000

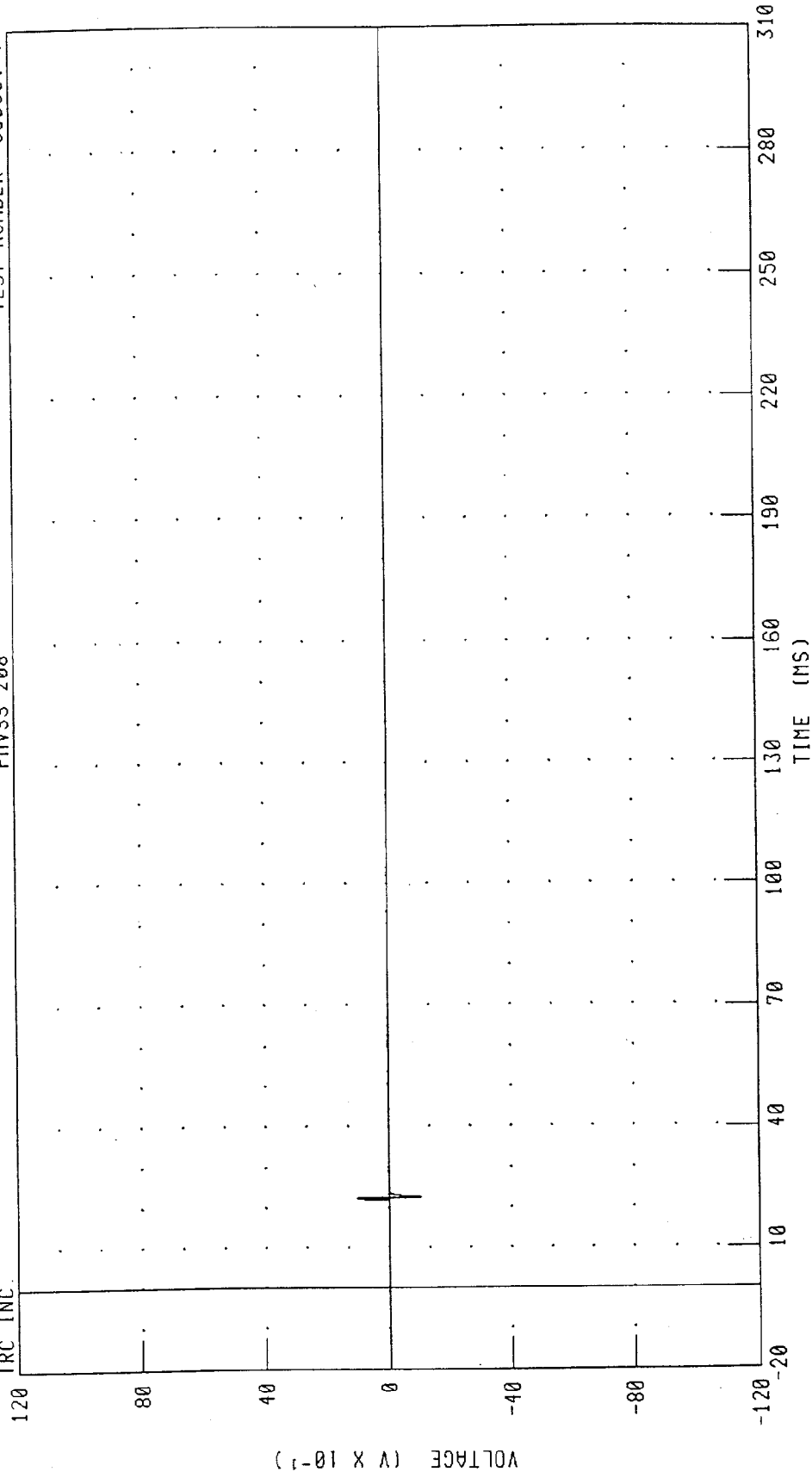
PEAK DATA: 1.02 V @ 22.08 MS; -1.02 V @ 22.88 MS

1999 SATURN SL1 INTO IHS 40% LEFT OFFSET BARRIER AT 35 MPH
PASSENGER SIDE INDUCTIVE AIRBAG FIRE PICKUP

TEST NUMBER: 990901-7

FMVSS 208

TRC INC.



PEAK DATA: 1.02 V @ 22.08 MS; -1.02 V @ 22.48 MS

CHANNEL: ABSQ2 FILTER: CH. CLASS 1000

Appendix C

Dummy Certification

Post-Test Dummy Certification

Driver Dummy S/N 289

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III SMALL FEMALE

22-SEP-99

TRC INC.

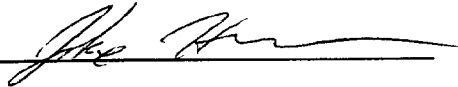
TEST NO: 289C10HD1

S.FEMALE SN289 HEAD DROP CAL10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	55.0 %
PEAK RESULTANT ACCELERATION	250 - 300 G	280.87 G
PEAK LATERAL ACCELERATION	15 G MAX	-2.78 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

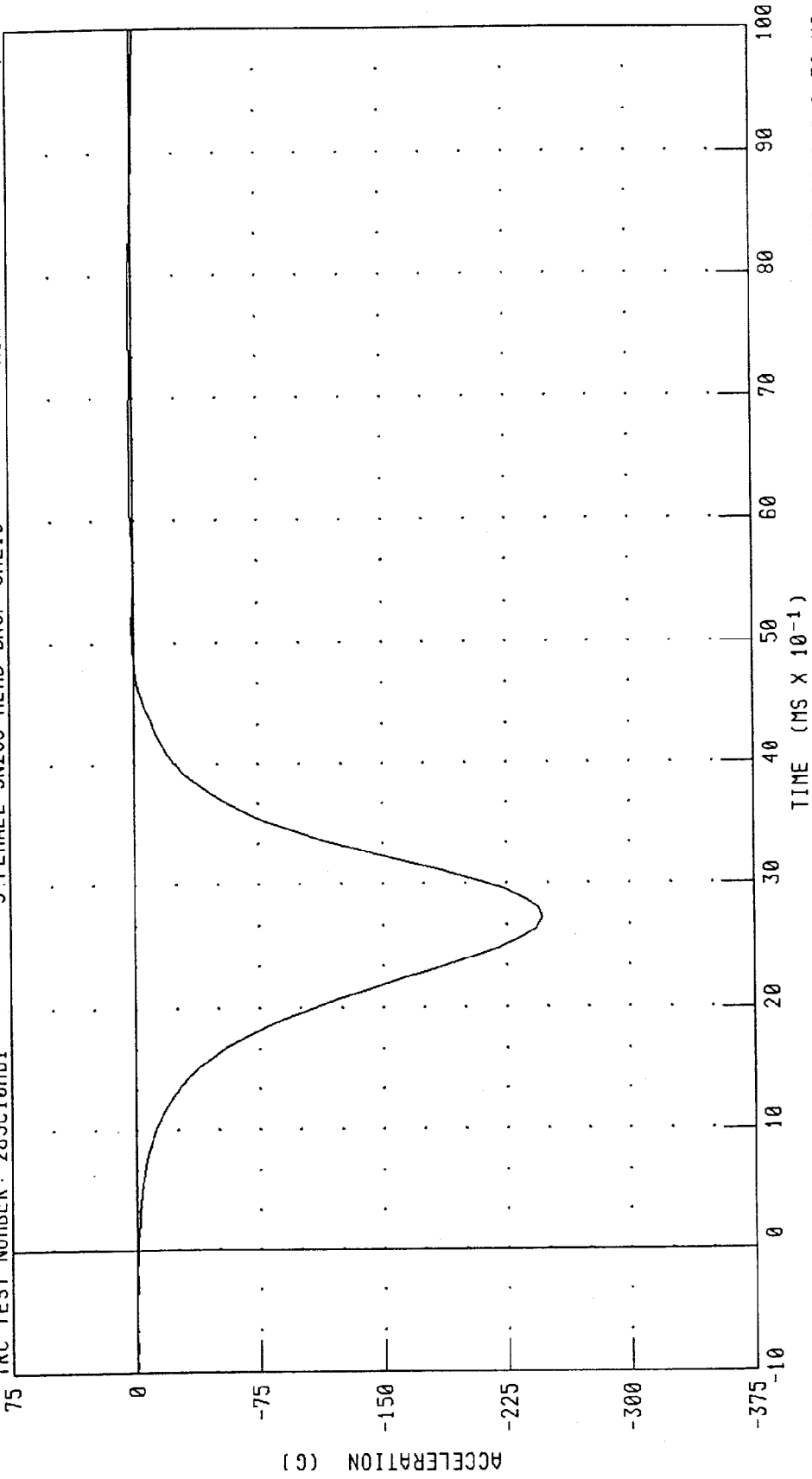
TECHNICIAN



RUN NUMBER: 092299.0903;2

SMALL FEMALE HYBRID III HEAD CALIBRATION
HEAD ACCELERATION X AXIS

TRC TEST NUMBER: 289C10HD1 S. FEMALE SN289 HEAD DROP CAL10 RUN NUMBER: 092299 0903,2



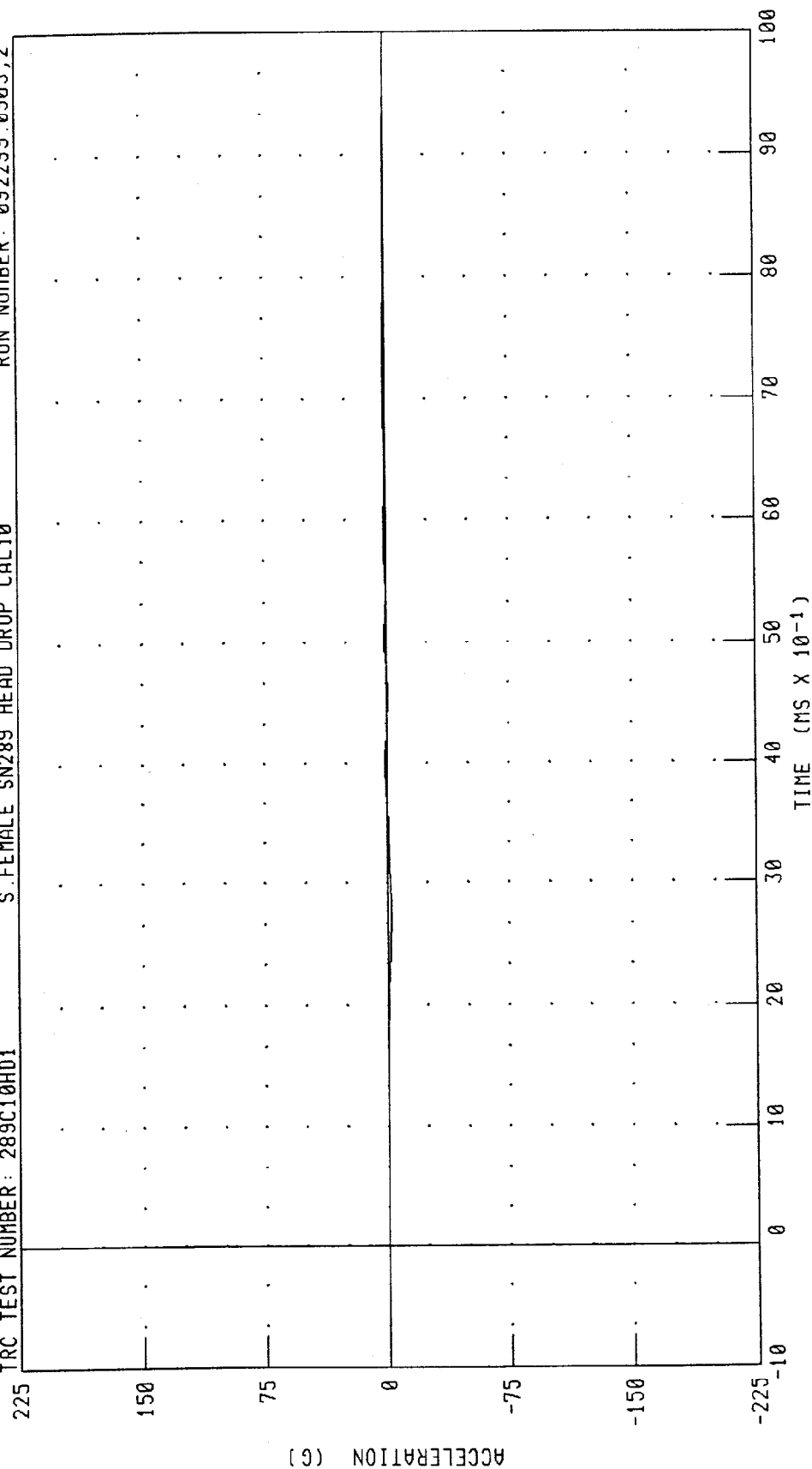
CHANNEL: HEDXC FILTER: CH. CLASS 1000 PEAK DATA: 2.28 G @ 7.84 MS; -246.61 G @ 2.72 MS

SMALL FEMALE HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS

TRC TEST NUMBER: 289C10HD1

S. FEMALE SN289 HEAD DROP CAL10

RUN NUMBER: 092299.0903;2



PEAK DATA: 1.25 G @ 3.92 MS; -2.78 G @ 2.80 MS

CHANNEL: HEDYC FILTER: CH. CLASS 1000

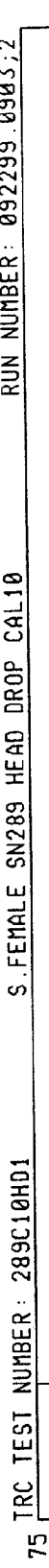
SMALL FEMALE HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Z AXIS

S.FEMALE SN289 HEAD DROP CAL10

RUN NUMBER: 092299.0903;2

TRC TEST NUMBER: 289C10HD1



ACCELERATION (G)

TIME (MS X 10⁻¹)

PEAK DATA: 0.89 G @ 9.04 MS, -134.42 G @ 2.72 MS

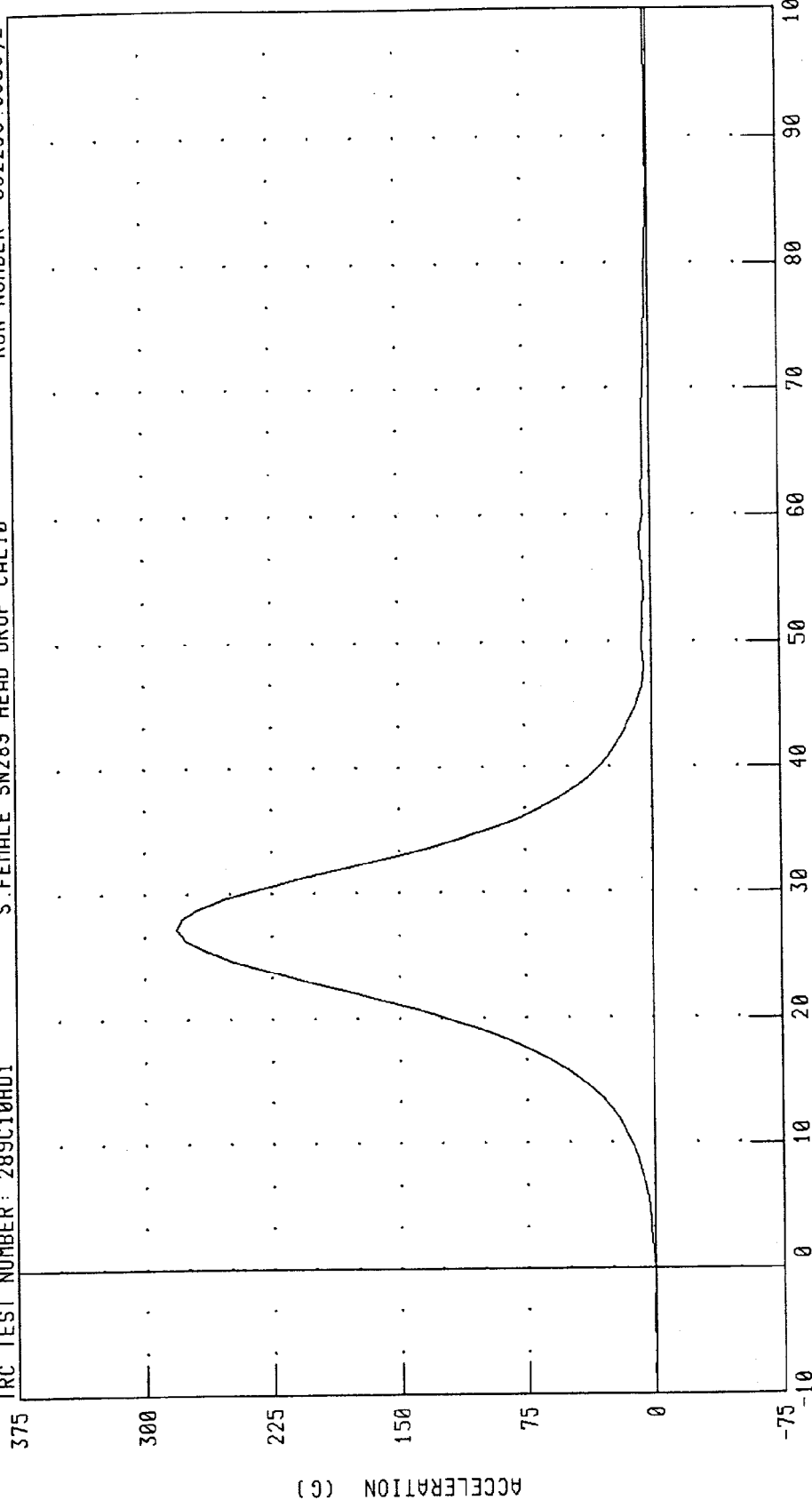
CHANNEL: HEDZG FILTER: CH. CLASS 1000

SMALL FEMALE HYBRID III HEAD CALIBRATION
HEAD RESISTANT ACCELERATION

TRC TEST NUMBER: 289C10HD1

S. FEMALE SN289 HEAD DROP CAL10

RUN NUMBER: 092299.0903;2



PEAK DATA: 280.88 G @ 2.72 MS; 0.11 G @ -0.88 MS

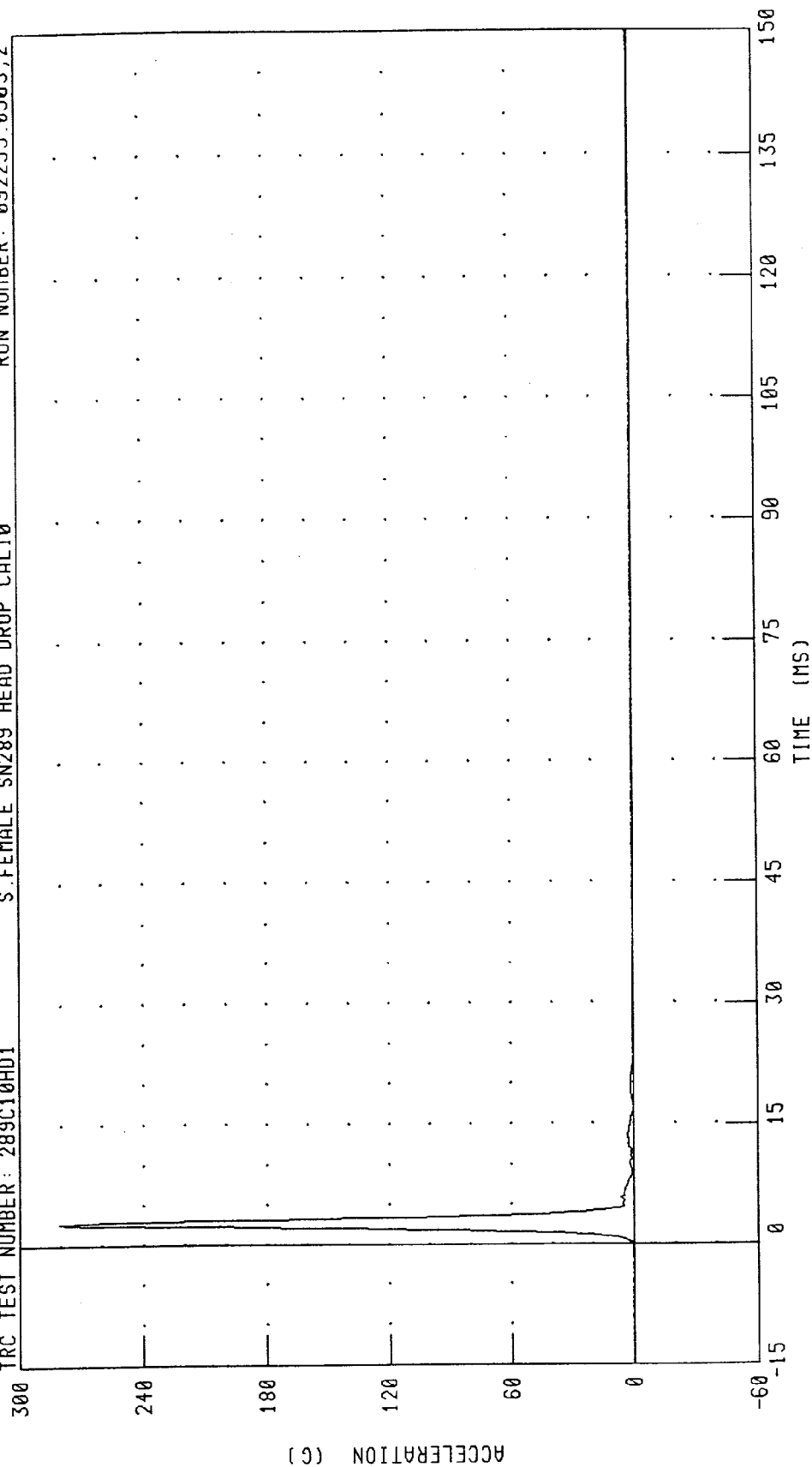
CHANNEL: HEDRG FILTER: CH. CLASS 1000

SMALL FEMALE HYBRID III HEAD CALIBRATION
CHECK PLOT - HEAD RESULTANT ACCELERATION

TRC TEST NUMBER: 289C10HD1

S.FEMALE SN289 HEAD DROP CAL10

RUN NUMBER: 092299.0903;2



CHANNEL: HEDRG FILTER: CH. CLASS 1000

PEAK DATA: 280.88 G @ 2.72 MS; 0.11 G @ -14.72 MS

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III SMALL FEMALE

22-SEP-99

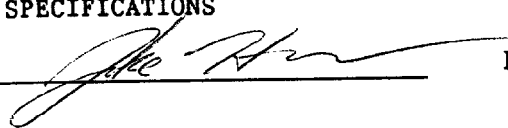
NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 289C10NF1 S.FEMALE SN289 NECK FLEX.CAL10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	55.0 %
IMPACT VELOCITY	6.89 - 7.13 M/S	7.06 M/S
INTEGRATED PENDULUM VELOCITY	10 MS 2.1 - 2.5 M/S	2.19 M/S
	20 MS 4.0 - 5.0 M/S	4.40 M/S
	30 MS 5.8 - 7.0 M/S	6.49 M/S
PEAK D-PLANE ROTATION	80 - 92 DEG.	86.23 DEG.
PEAK MOMENT ABOUT OCCIPITAL CONDYLE DURING ROTATION	69 - 84 NM	71.49 NM
POSITIVE MOMENT DECAY TIME FROM TO TO 10NM	80 - 100 MS	88.8 MS

TEST MEETS SPECIFICATIONS

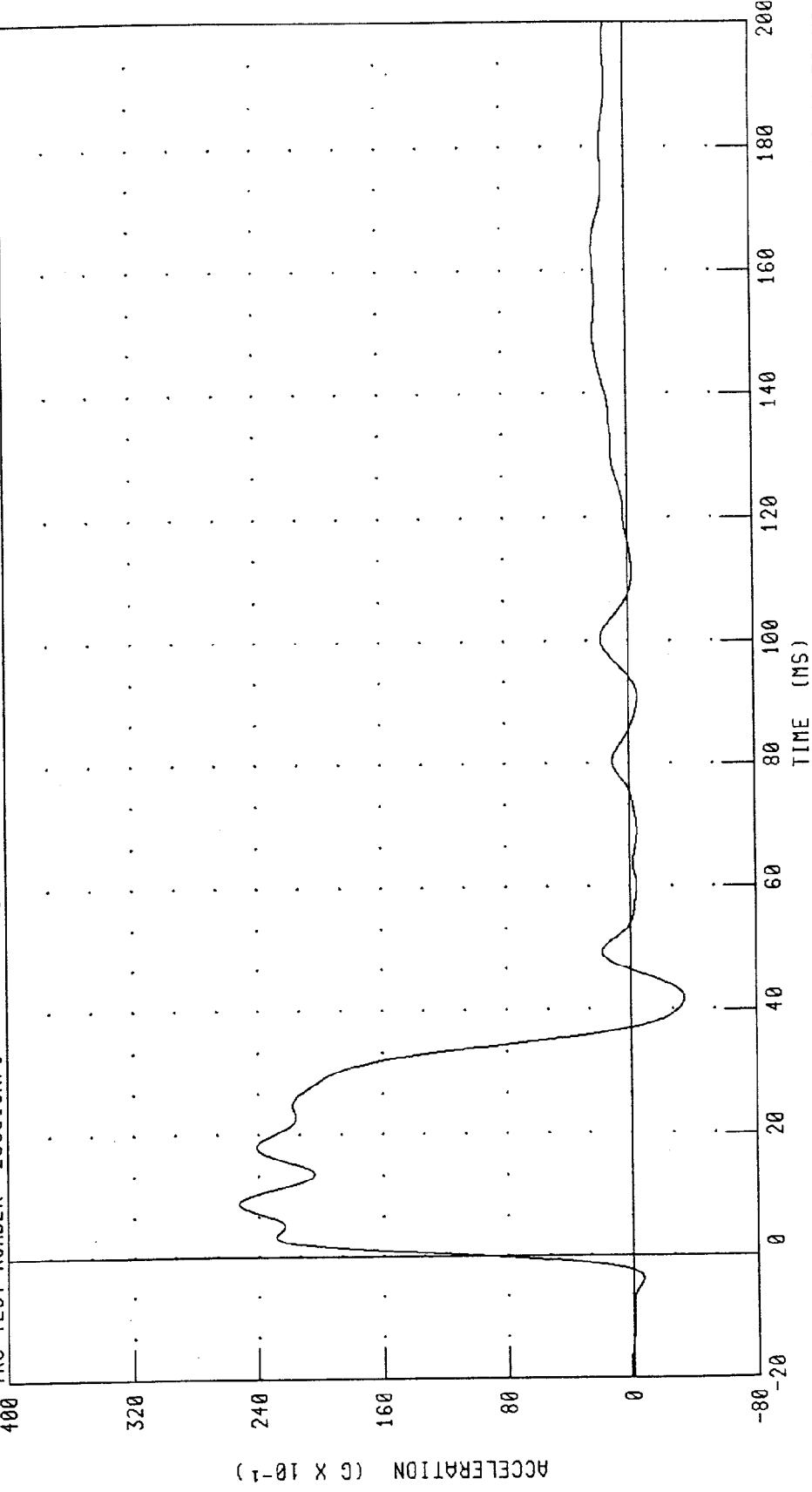
TECHNICIAN



RUN NUMBER: 092299.1256;1

SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION
PENDULUM DECELERATION

TRC TEST NUMBER: 289C10NF1 S. FEMALE SN289 NECK FLEX. CAL10 RUN NUMBER: 092299.1302;1



CHANNEL: PENXC FILTER: CH. CLASS 60 PEAK DATA: 25.25 G @ 8.88 MS; -3.41 G @ 41.76 MS

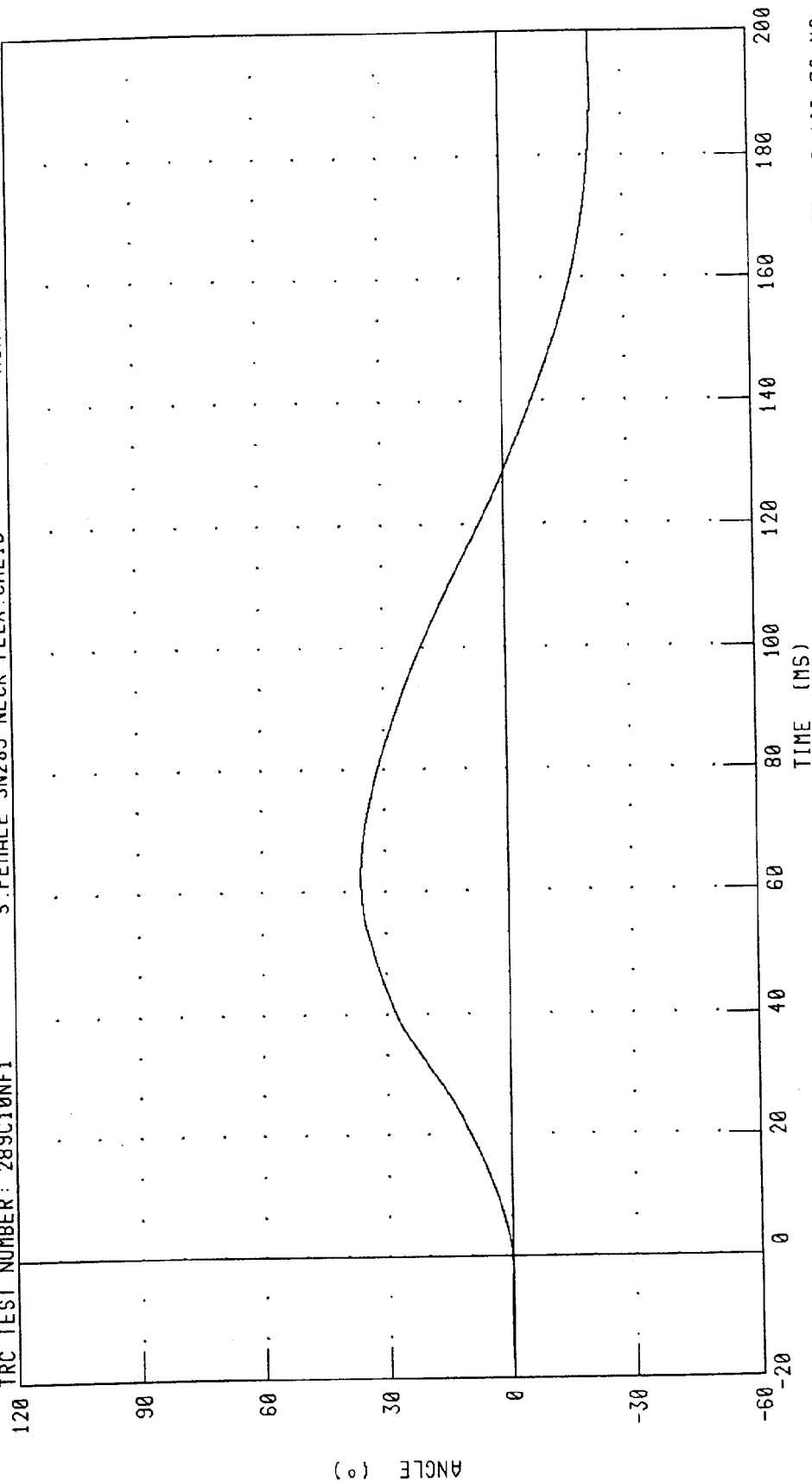
SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

RUN NUMBER: 092299.1302,1

TRC TEST NUMBER: 289C10NF1

S. FEMALE SN289 NECK FLEX. CAL10



PEAK DATA: 35.93 ° @ 62.24 MS; -22.37 ° @ 190.72 MS

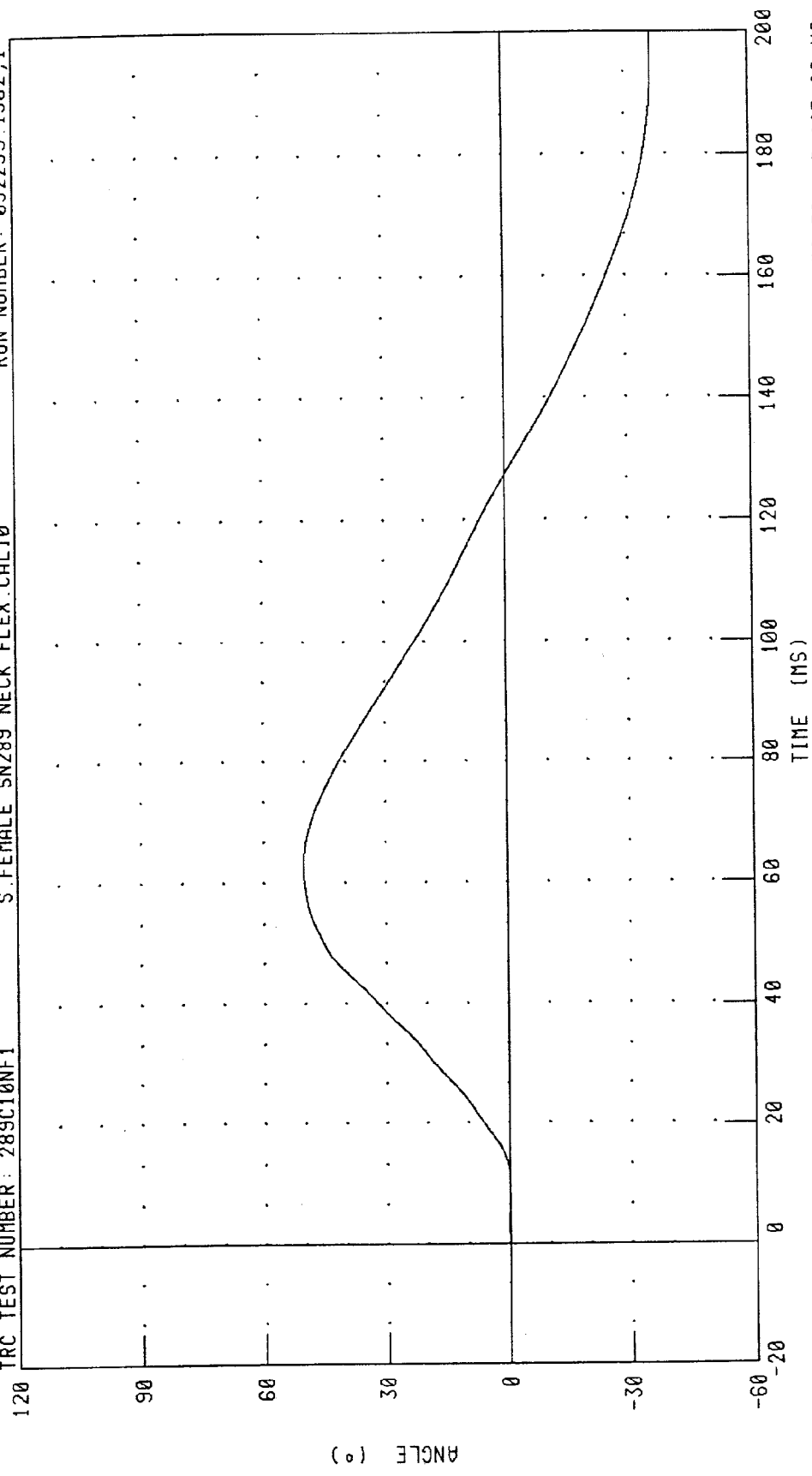
CHANNEL: BETA FILTER: CH. CLASS 60

SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 289C10NF1

RUN NUMBER: 092299.1302.1

S. FEMALE SN289 NECK FLEX. CAL10



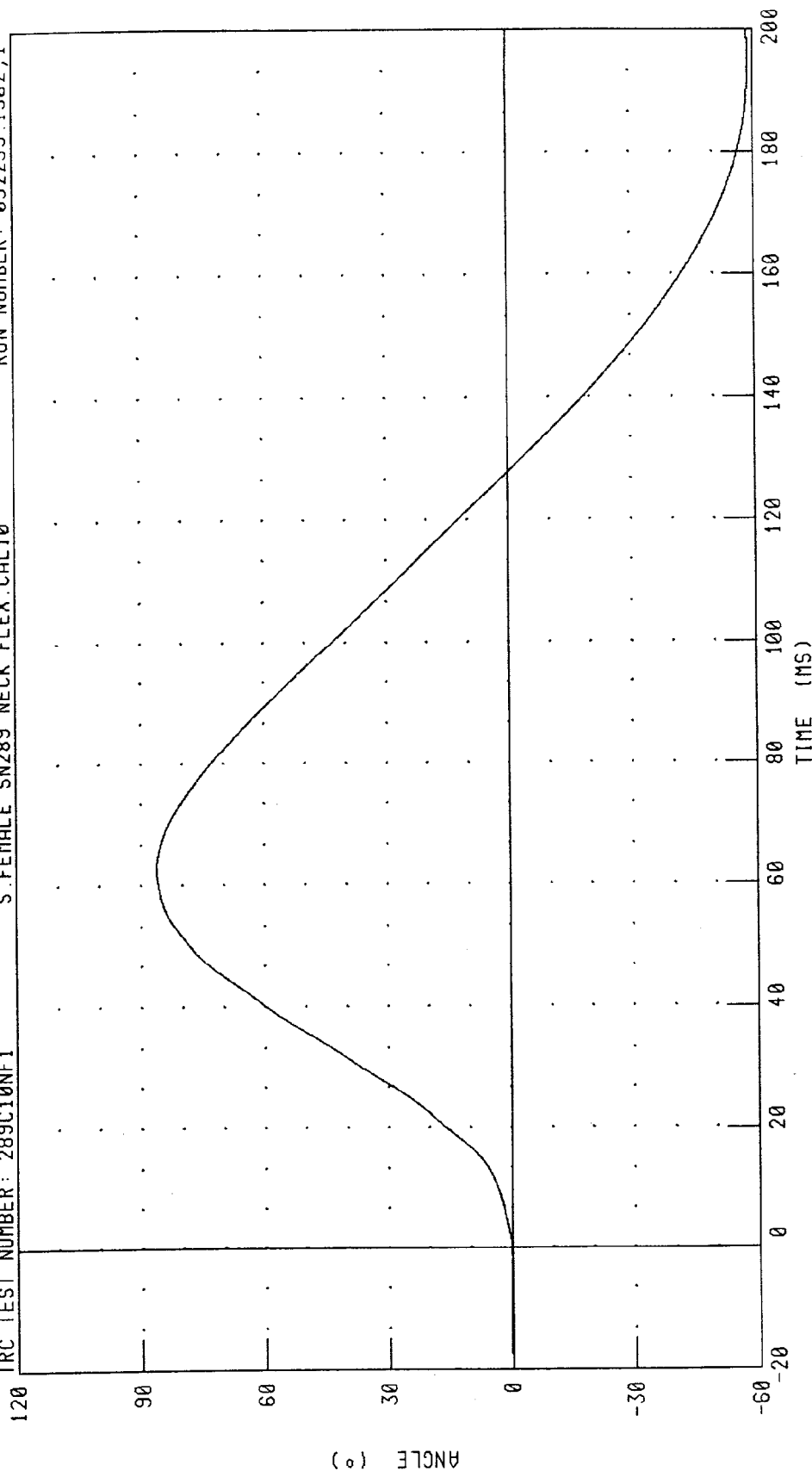
CHANNEL: THETA FILTER: CH. CLASS 60

PEAK DATA: 50.31 ° @ 62.72 MS; -36.50 ° @ 197.28 MS

SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 289C10NF1 S.FEMALE SN289 NECK FLEX.CAL10 RUN NUMBER: 092299.1302,1



PEAK DATA: 86.24 ° @ 62.64 MS; -58.79 ° @ 193.92 MS

CHANNEL: TOTAL FILTER: CH. CLASS 60

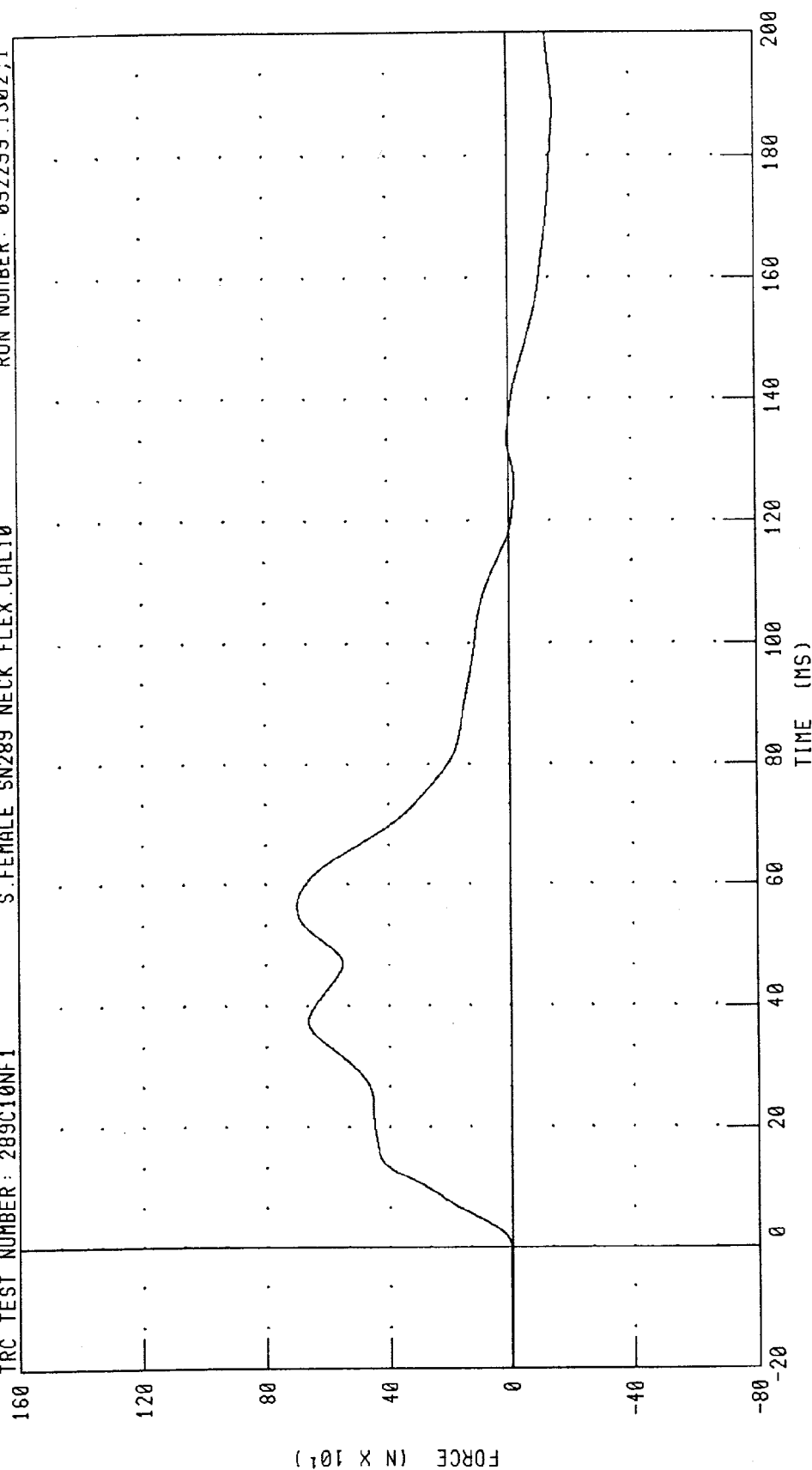
SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 289C10NF1

S.FEMALE SN289 NECK FLEX.CAL10

RUN NUMBER: 092299.1302;1

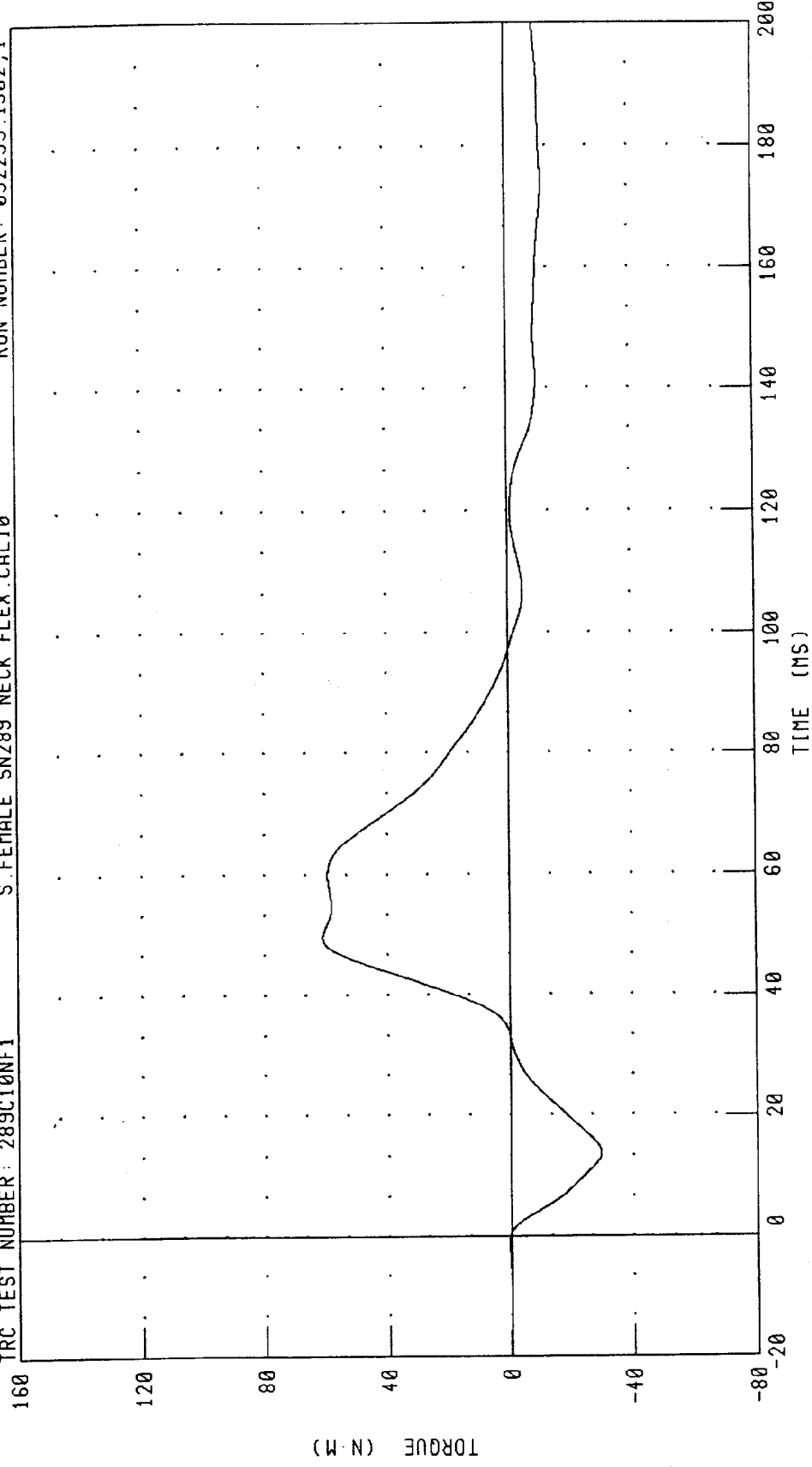


CHANNEL: NEKXF FILTER: CH. CLASS 60

PEAK DATA: 698.99 N @ 56.40 MS, -149.18 N @ 187.84 MS

SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION
NECK MOMENT Y AXIS

TRC TEST NUMBER: 289C10NF1 S. FEMALE SN289 NECK FLEX. CAL10 RUN NUMBER: 092299.1302.1



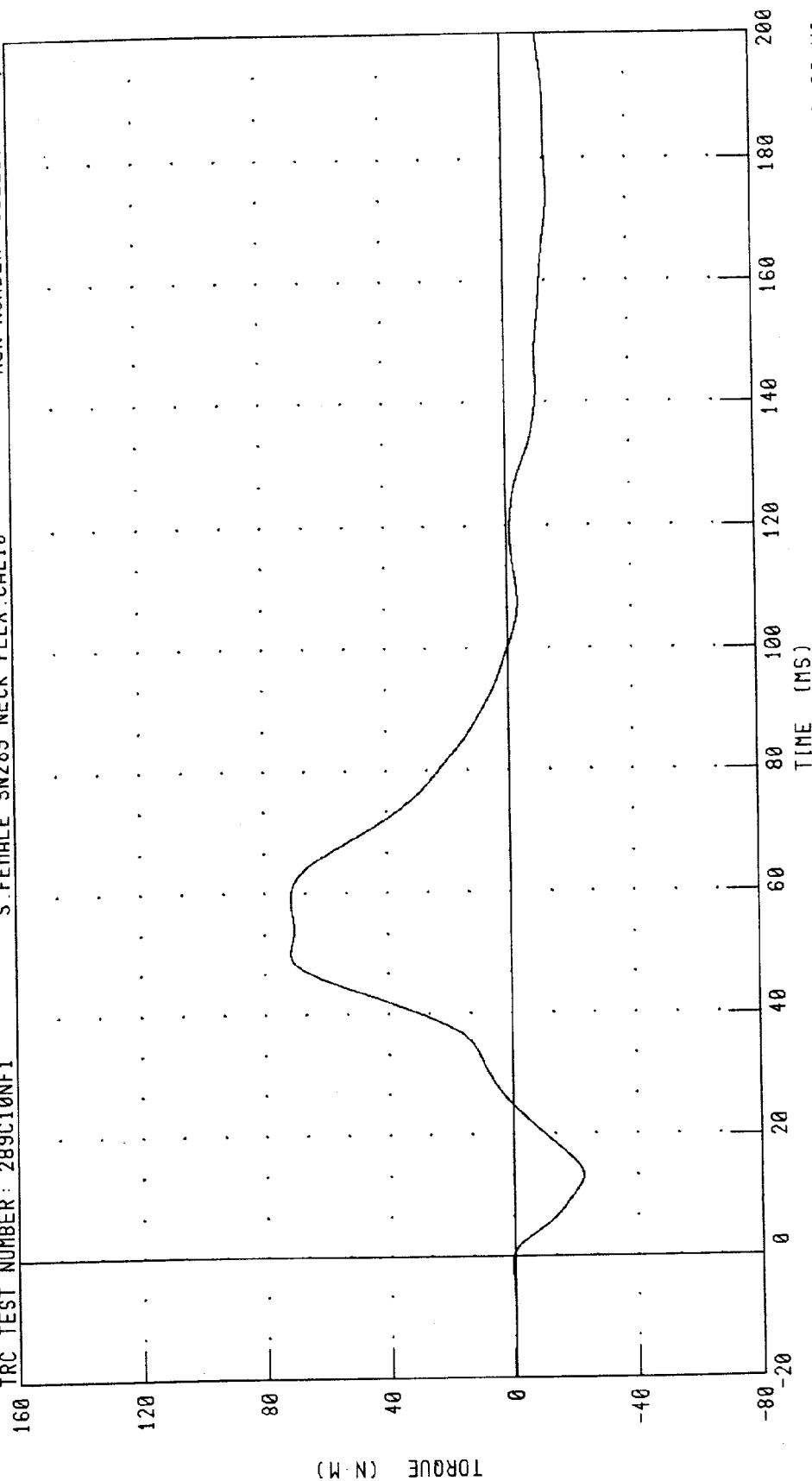
CHANNEL: NEKYM FILTER: CH. CLASS 60 PEAK DATA: 61.04 N-M @ 49.68 MS; -29.64 N-M @ 13.68 MS

SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

RUN NUMBER: 092299.1302.1

TRC TEST NUMBER: 289C10NF1

S. FEMALE SN289 NECK FLEX. CAL10



PEAK DATA: 71.61 N·M @ 50.24 MS; -22.47 N·M @ 13.28 MS

CHANNEL: NEKOM FILTER: CH. CLASS 60

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III SMALL FEMALE

22-SEP-99

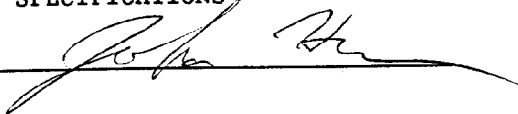
NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 289C10NE1 S.FEMALE SN289 NECK EXT. CAL10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6 - 22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	55.0 %
IMPACT VELOCITY	5.95 - 6.19 M/S	6.14 M/S
INTEGRATED PENDULUM VELOCITY	10 MS	1.5 - 1.9 M/S
	20 MS	3.1 - 3.9 M/S
	30 MS	4.6 - 5.6 M/S
PEAK D-PLANE ROTATION	97 - 109 DEG.	104.93 DEG.
PEAK MOMENT ABOUT OCCIPITAL CONDYLE DURING ROTATION	55 - 69 NM	-63.07 NM
NEGATIVE MOMENT DECAY TIME FROM TO TO -10 NM LEVEL	94 - 114 MS	102.08 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN



RUN NUMBER: 092299.1326;1

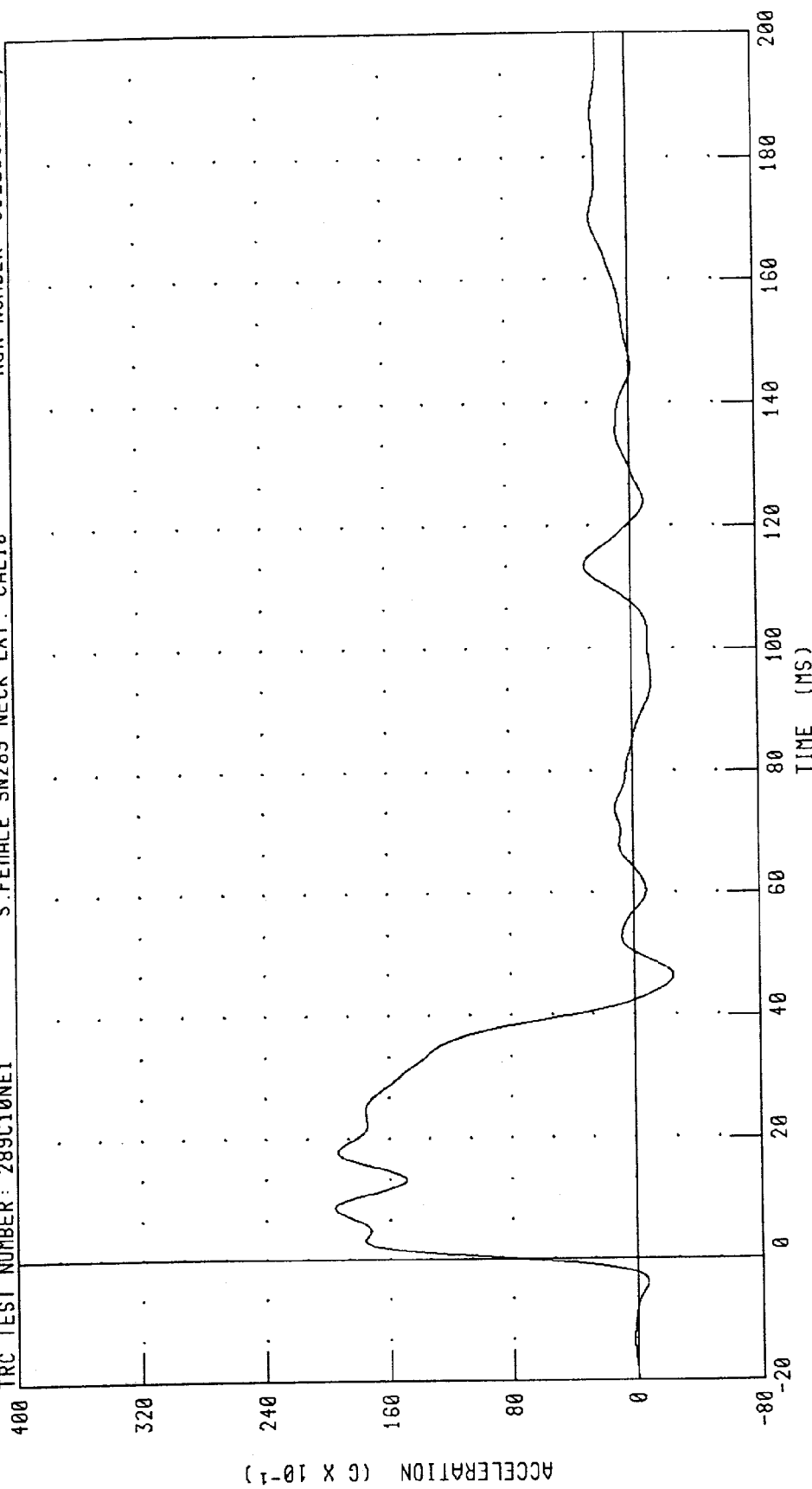
SMALL FEMALE NECK EXTENSION CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 289C10NE1

S. FEMALE SN289 NECK EXT. CAL10

RUN NUMBER: 092299.1331;1



PEAK DATA: 19.54 G @ 8.72 MS; -2.47 G @ 46.32 MS

CHANNEL: PENXC FILTER: CH. CLASS 60

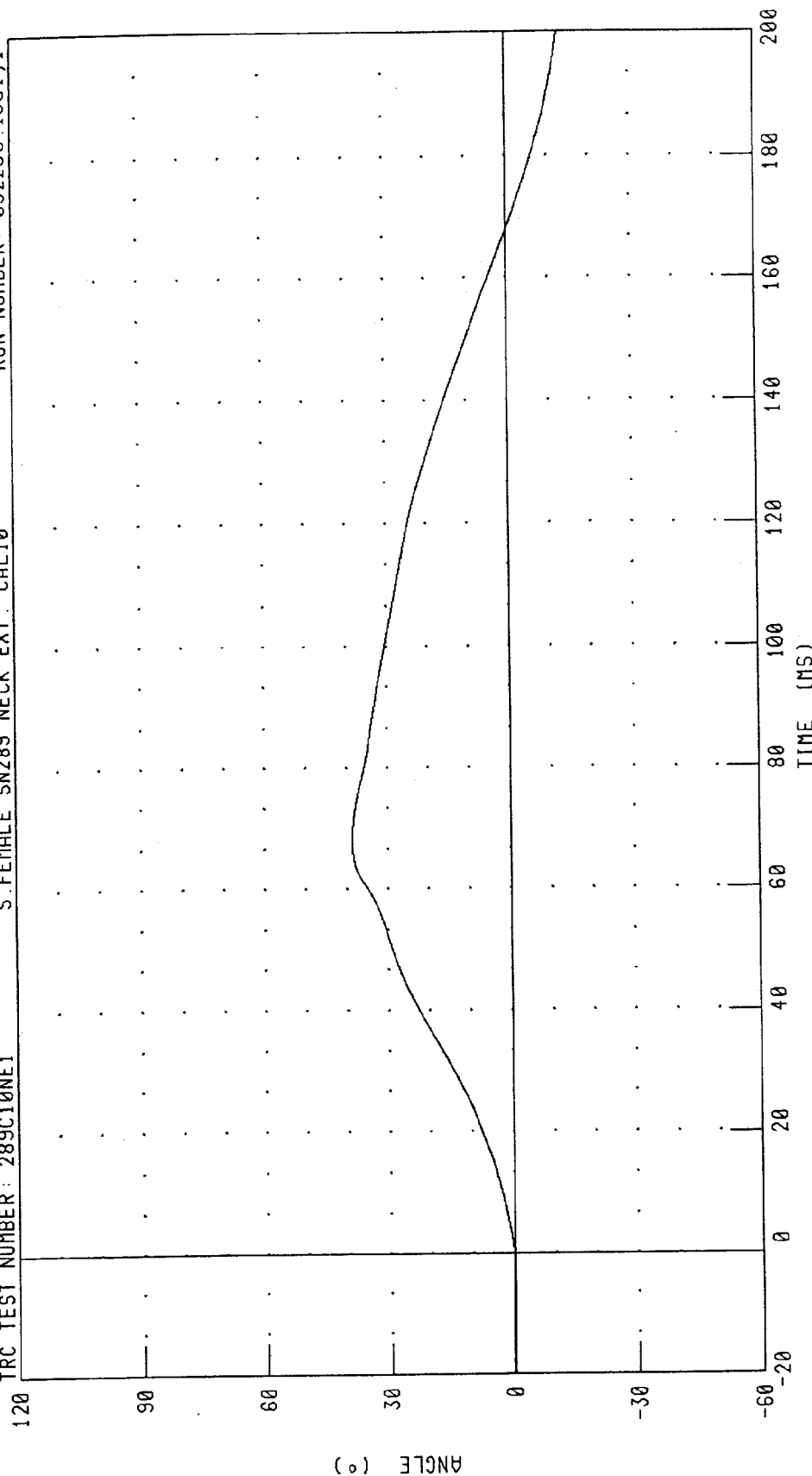
SMALL FEMALE NECK EXTENSION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 289C10NE1

S. FEMALE SN289 NECK EXT. CAL10

RUN NUMBER: 092299.1331.1



PEAK DATA: 38.54 ° @ 68.16 MS, -12.79 ° @ 200.00 MS

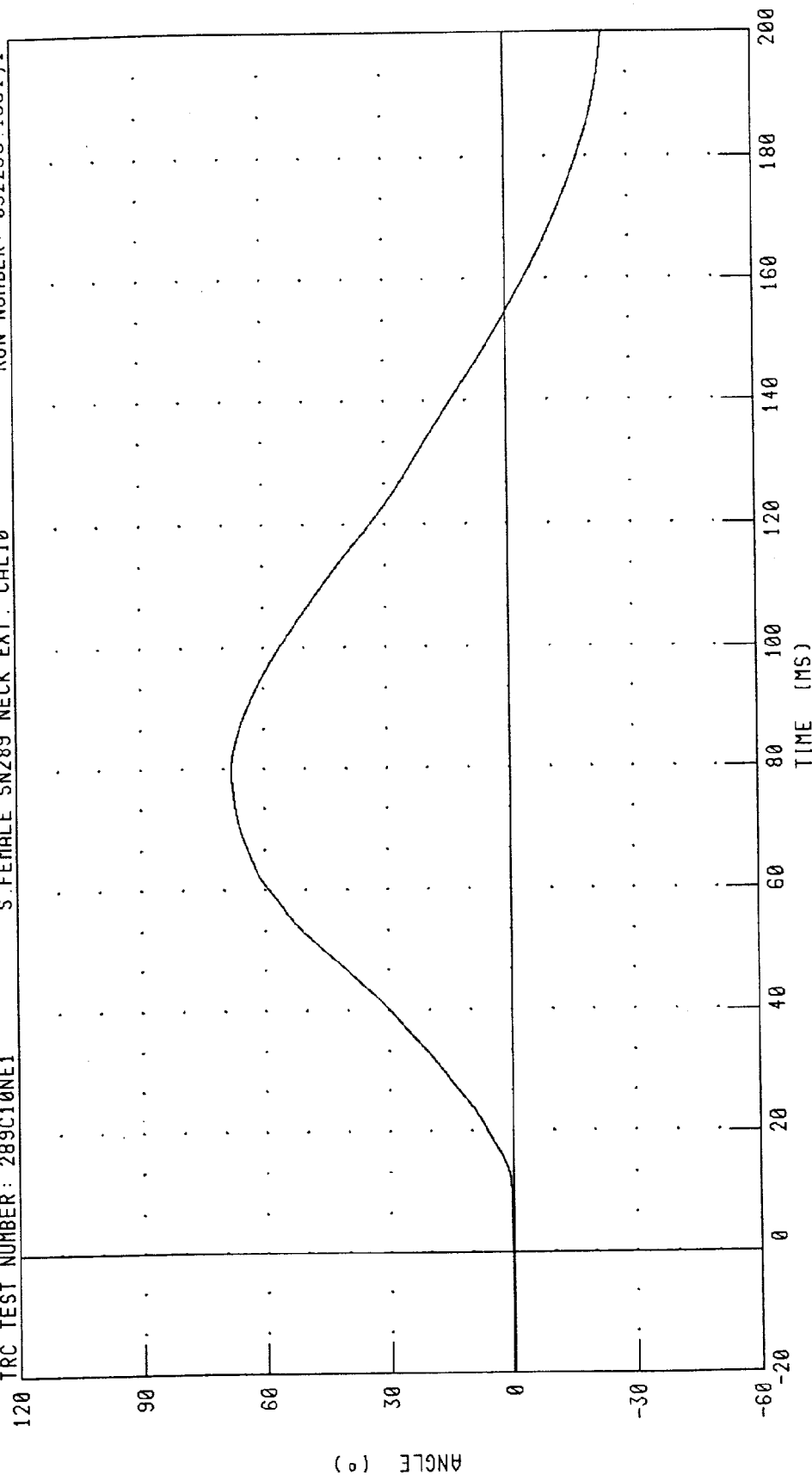
CHANNEL: BETA FILTER: CH. CLASS 60

SMALL FEMALE NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 289C10NE1

S. FEMALE SN289 NECK EXT. CAL10

RUN NUMBER: 092299.1331.1



PEAK DATA: 67.98 ° @ 79.52 MS; -23.97 ° @ 200.00 MS

CHANNEL: THETA FILTER: CH. CLASS 60

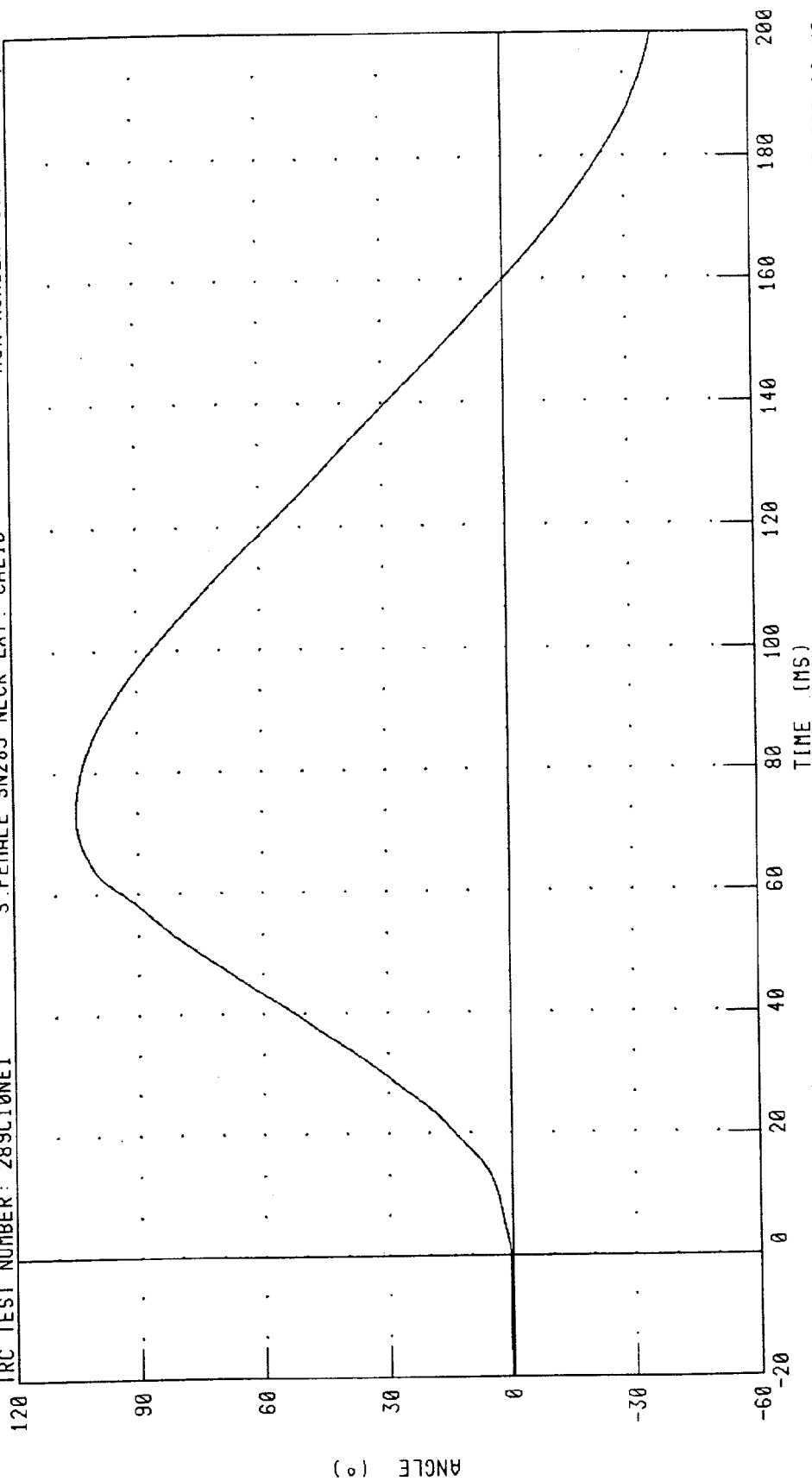
SMALL FEMALE NECK EXTENSION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 289C10NE1

S. FEMALE SN289 NECK EXT. CAL10

RUN NUMBER: 092299.1331;1



PEAK DATA: 104.93 ° @ 73.20 MS; -36.76 ° @ 200.00 MS

CHANNEL: TOTAL FILTER: CH. CLASS 60

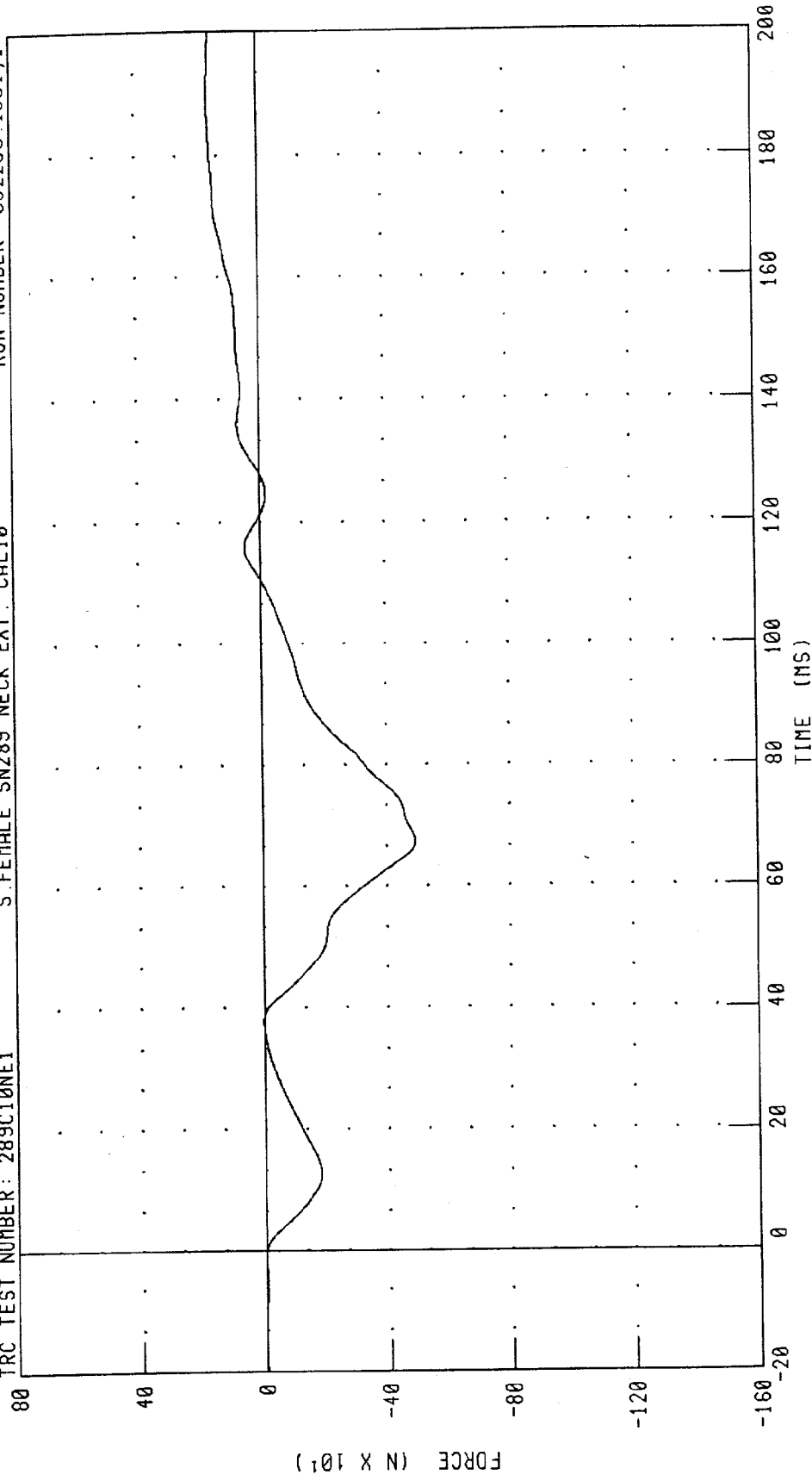
SMALL FEMALE NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 289C10NE1

S. FEMALE SN289 NECK EXT. CAL10

RUN NUMBER: 092299.1331;1



CHANNEL: NEKXF FILTER: CH. CLASS 60

PEAK DATA: 164.49 N @ 189.52 MS, -493.65 N @ 67.52 MS

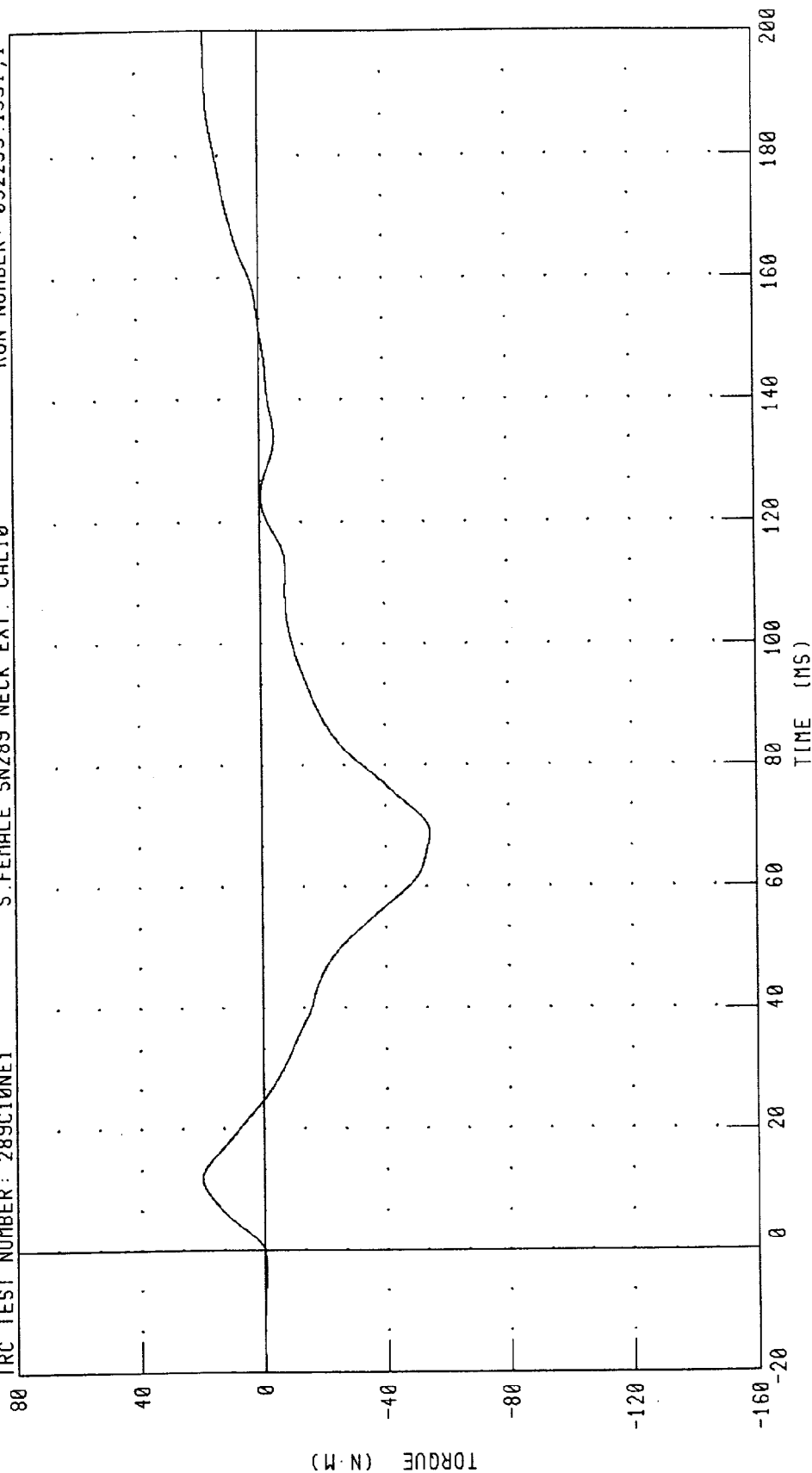
SMALL FEMALE NECK EXTENSION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER: 289C10NE1

S. FEMALE SN289 NECK EXT. CAL10

RUN NUMBER: 092299.1331,1



PEAK DATA: 20 17 N·M @ 11.92 MS; -54.41 N·M @ 68.88 MS

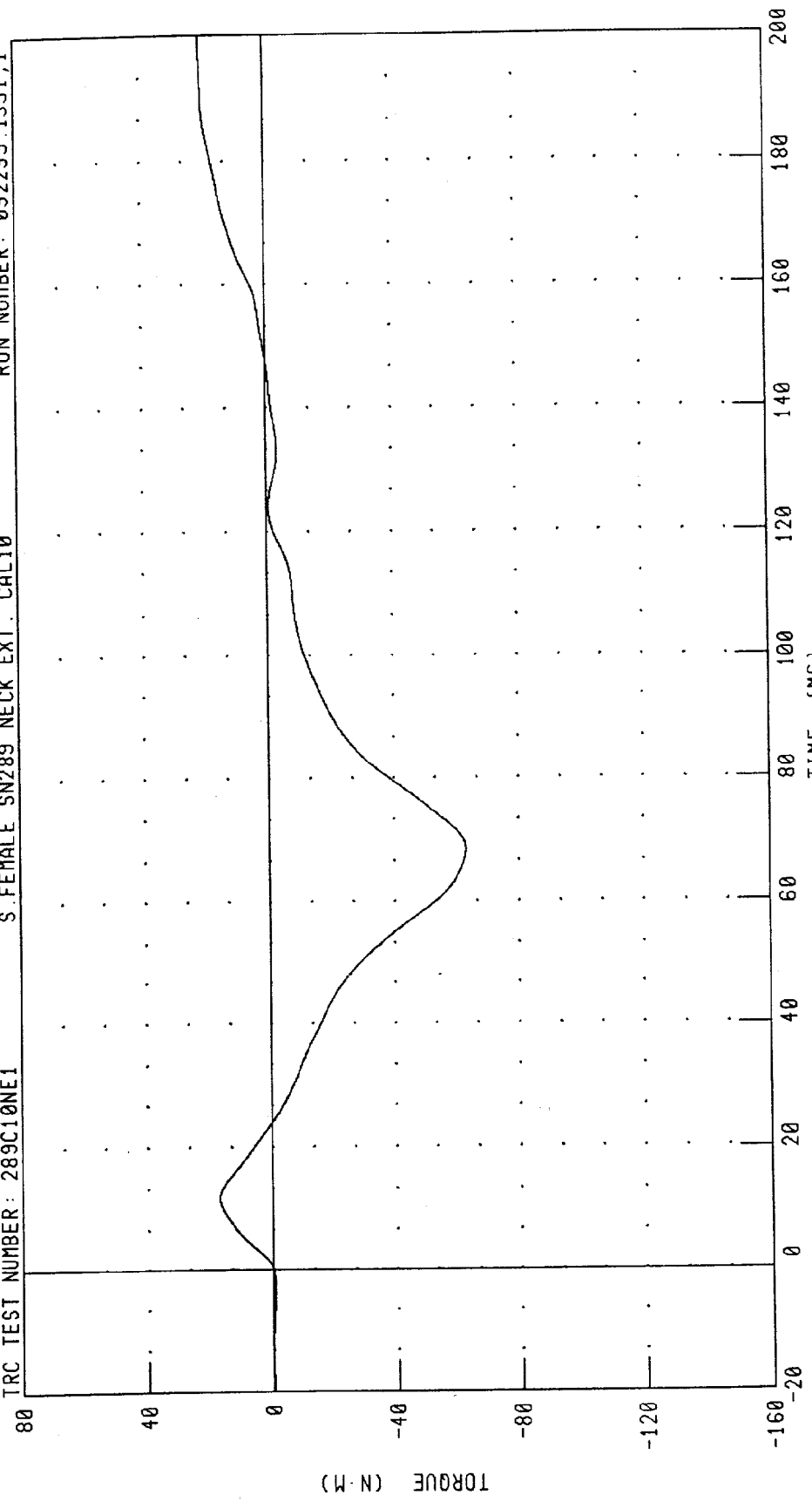
CHANNEL: NEKYH FILTER: CH. CLASS 60

SMALL FEMALE NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 289C10NE1

S. FEMALE SN289 NECK EXT. CAL10

RUN NUMBER: 092299.1331;1



PEAK DATA: 20.85 N-M @ 200.00 MS; -63.07 N-M @ 68.56 MS

CHANNEL: NEKOM FILTER: CH. CLASS 60

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III SMALL FEMALE

23-SEP-99

TRC INC.

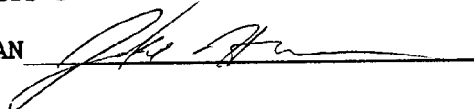
TEST NO: 289C10TH4

S.FEMALE SN289 THORAX CAL10

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	55.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.59 M/S
MAXIMUM DEFLECTION	48 - 55 MM	50.8 MM
MAXIMUM RESISTIVE FORCE WITHIN DEFLECTION CORRIDOR	3900 - 4400 N	4317. N
INTERNAL HYSTERESIS	69% - 85%	73.2%

TEST MEETS SPECIFICATIONS

TECHNICIAN



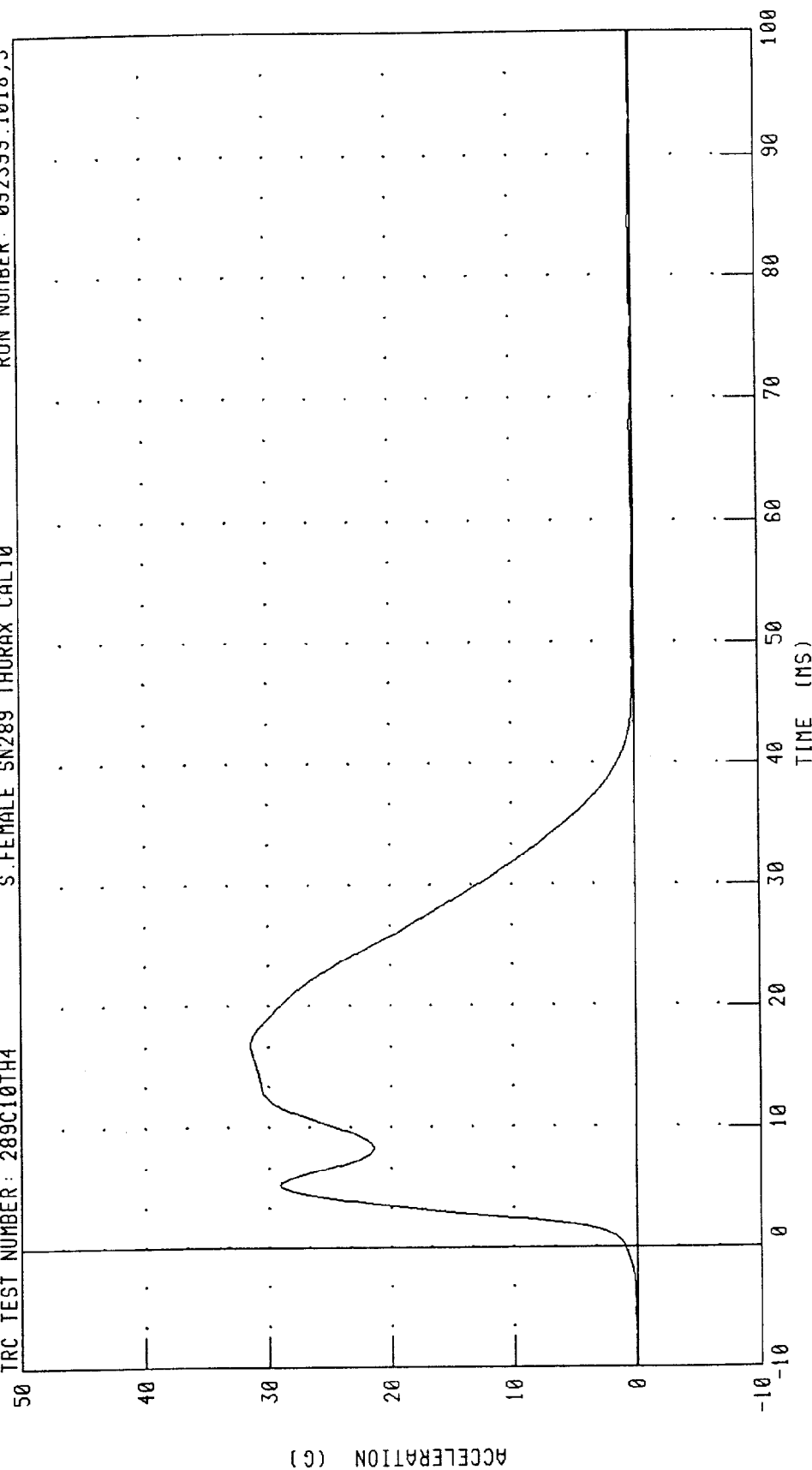
RUN NUMBER: 092399.1015;3

SMALL FEMALE THORAX CALIBRATION
PENDULUM DECELERATION

TRC TEST NUMBER: 289C10TH4

S.FEMALE SN289 THORAX CAL10

RUN NUMBER: 092399.1018,3



CHANNEL: PENXG FILTER: CH. CLASS 180

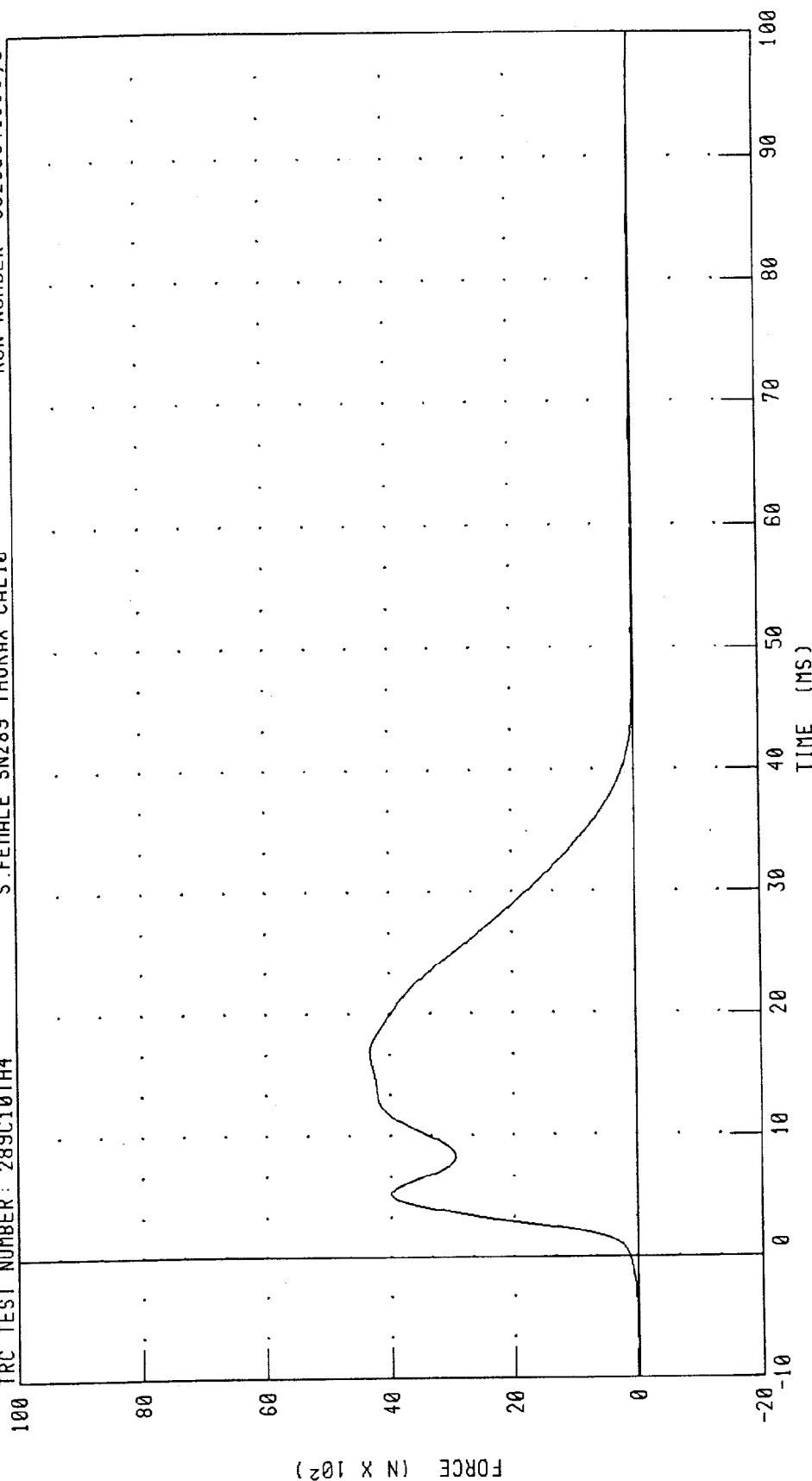
PEAK DATA: 31.46 G @ 16.88 MS; 0.00 G @ 76.24 MS

SMALL FEMALE THORAX CALIBRATION
PENDULUM FORCE

TRC TEST NUMBER: 289C10TH4

S. FEMALE SN289 THORAX CAL10

RUN NUMBER: 092399.1018.3

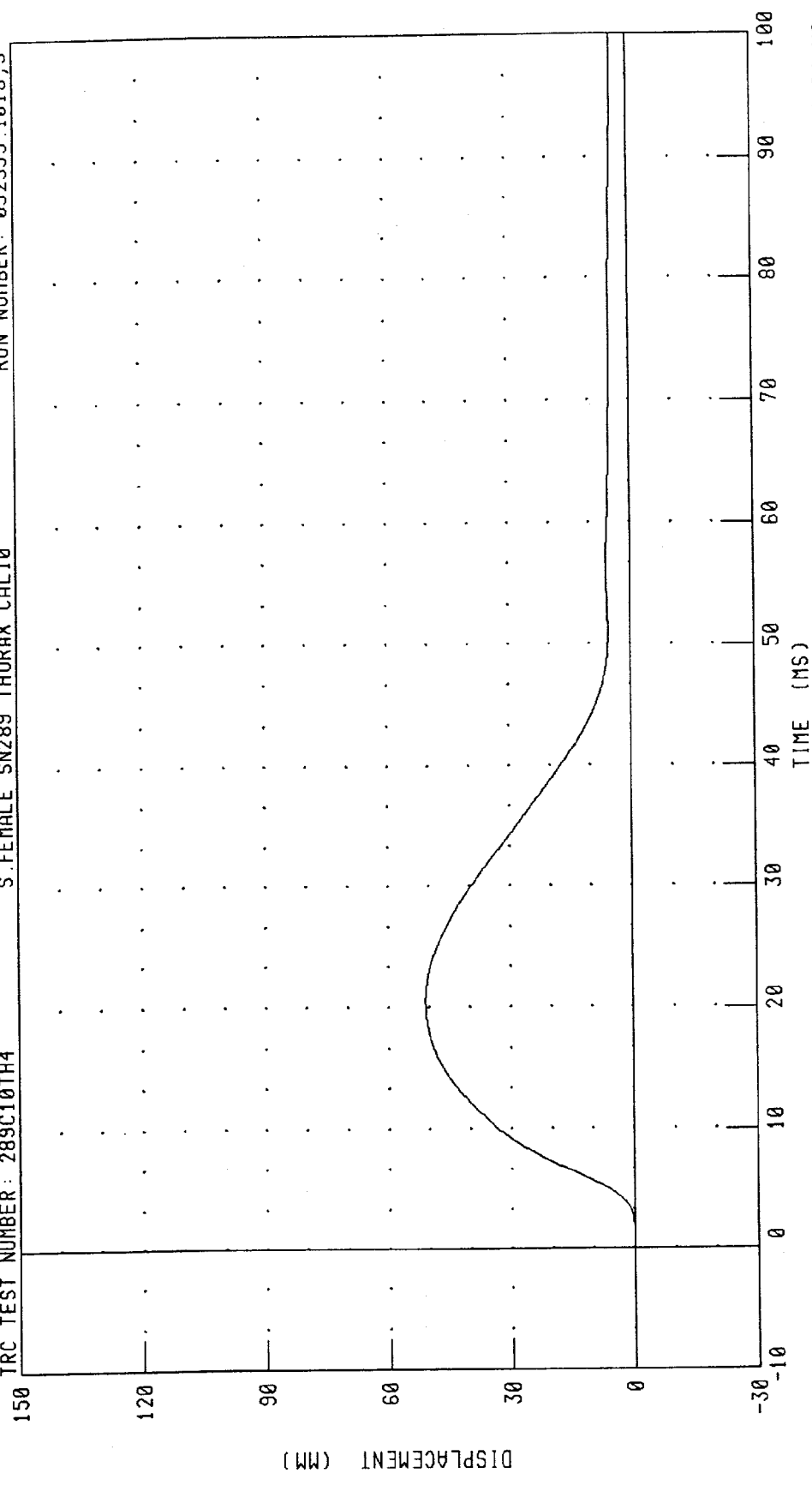


PEAK DATA: 4317.84 N @ 16.88 MS; 0.26 N @ 76.24 MS

CHANNEL: PENXF FILTER: CH. CLASS 180

SMALL FEMALE THORAX CALIBRATION
STERNUM DISPLACEMENT

TRC TEST NUMBER: 289C10TH4 S. FEMALE SN289 THORAX CAL10 RUN NUMBER: 092399.1018;3



CHANNEL: CSTXD FILTER: CH. CLASS 180 PEAK DATA: 50.89 MM @ 20.56 MS; 0.00 MM @ -4.64 MS

SMALL FEMALE THORAX CALIBRATION CHEST DISPLACEMENT VS PENDULUM FORCE

TRC TEST NUMBER: 289C10TH4

S. FEMALE SN289 THORAX CAL10

RUN NUMBER: 092399.1018;3

100

80

60

40

20

0

-20

-10

FORCE (N X 10²)

0

10

20

30

40

50

60

70

80

90

100

DISPLACEMENT (MM)

PEAK DATA:

50.89 MM @ 20.56 MS;

4317.84 N @ 16.88 MS;

0.00 MM @ -4.64 MS

0.26 N @ 76.24 MS

CHANNEL: CSTXD

PENXF

FILTER: CH. CLASS 180

CH. CLASS 180

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III SMALL FEMALE

22-SEP-99

TRC INC.

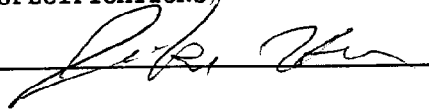
TEST NO: 289C10RK1

S.FEMALE SN289 R.KNEE CAL10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	55.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.07 M/S
PEAK KNEE IMPACT FORCE 3.0 KG PENDULUM	3360 - 4080 N	3605.6 N

TEST MEETS SPECIFICATIONS

TECHNICIAN



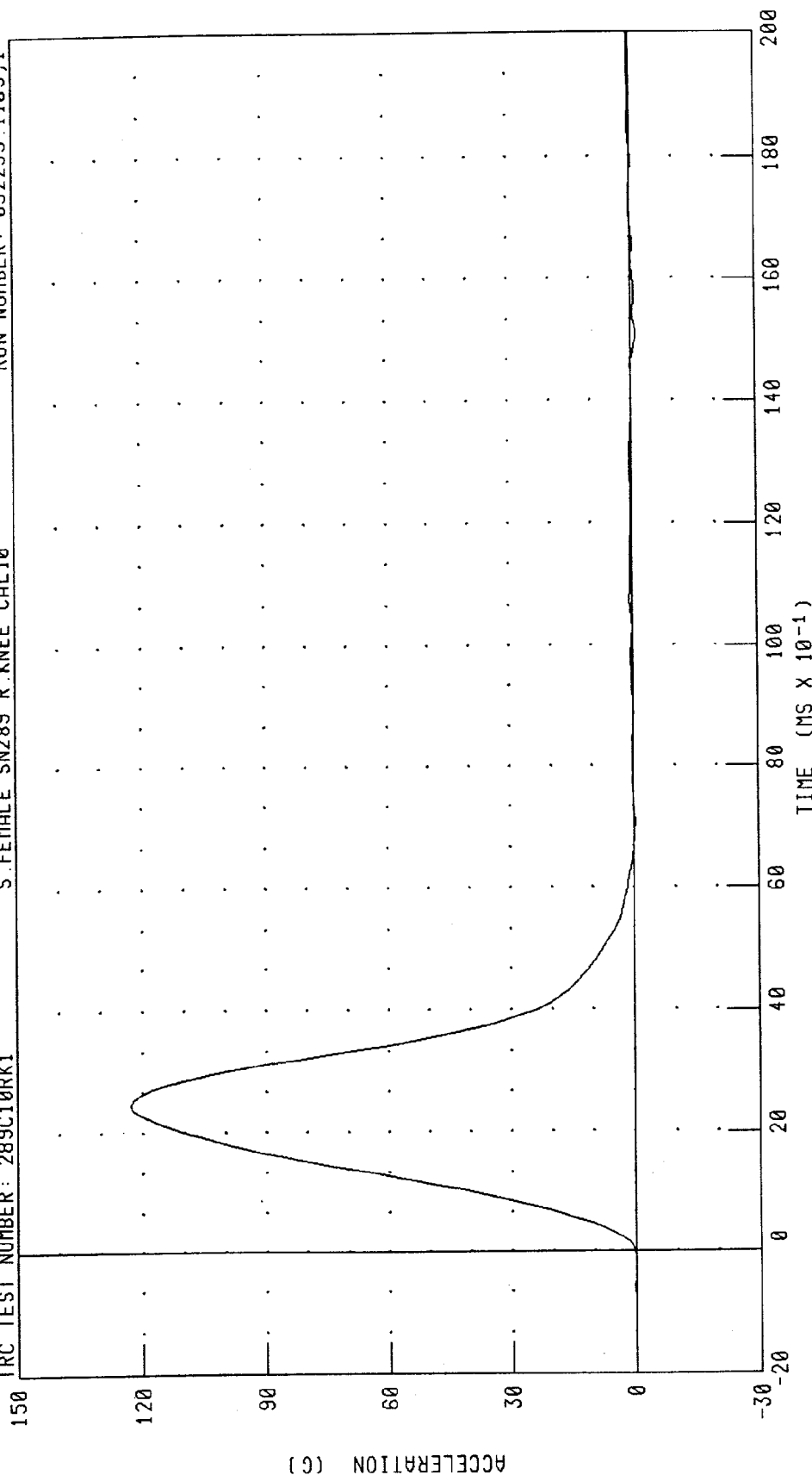
RUN NUMBER: 092299.1104;1

SMALL FEMALE HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 289C10RK1

S. FEMALE SN289 R. KNEE CAL10

RUN NUMBER: 092299.1105.1



CHANNEL: PENXC

FILTER: CH. CLASS 600

PEAK DATA: 122.82 G @ 2.48 MS;

-1.31 G @ 15.04 MS

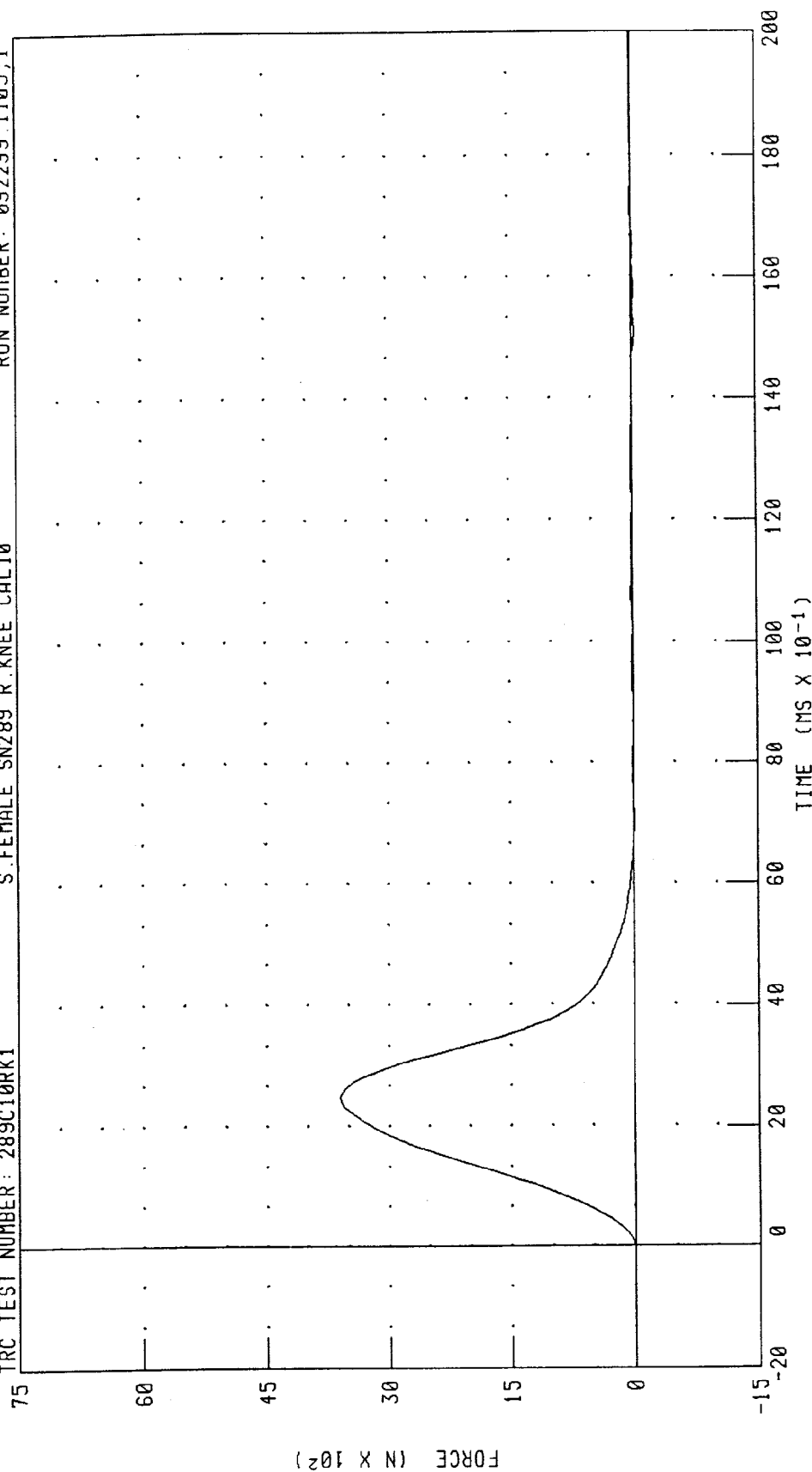
SMALL FEMALE HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KC PEND.)

TRC TEST NUMBER: 289C10RK1

S. FEMALE SN289 R. KNEE CAL10

RUN NUMBER: 092299.1105.1



CHANNEL: PENXF

FILTER: CH. CLASS 600

TIME (MS X 10⁻¹)

PEAK DATA: 3605.69 N @ 2.48 MS; -38.31 N @ 15.04 MS

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

HYBRID III SMALL FEMALE

22-SEP-99

TRC INC.

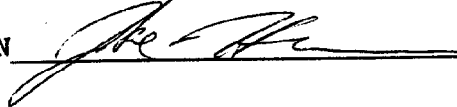
TEST NO: 289C10LK1

S.FEMALE SN289 LEFT KNEE CAL10

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	55.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.07 M/S
PEAK KNEE IMPACT FORCE 3.0 KG PENDULUM	3360 - 4080 N	3432.1 N

TEST MEETS SPECIFICATIONS

TECHNICIAN



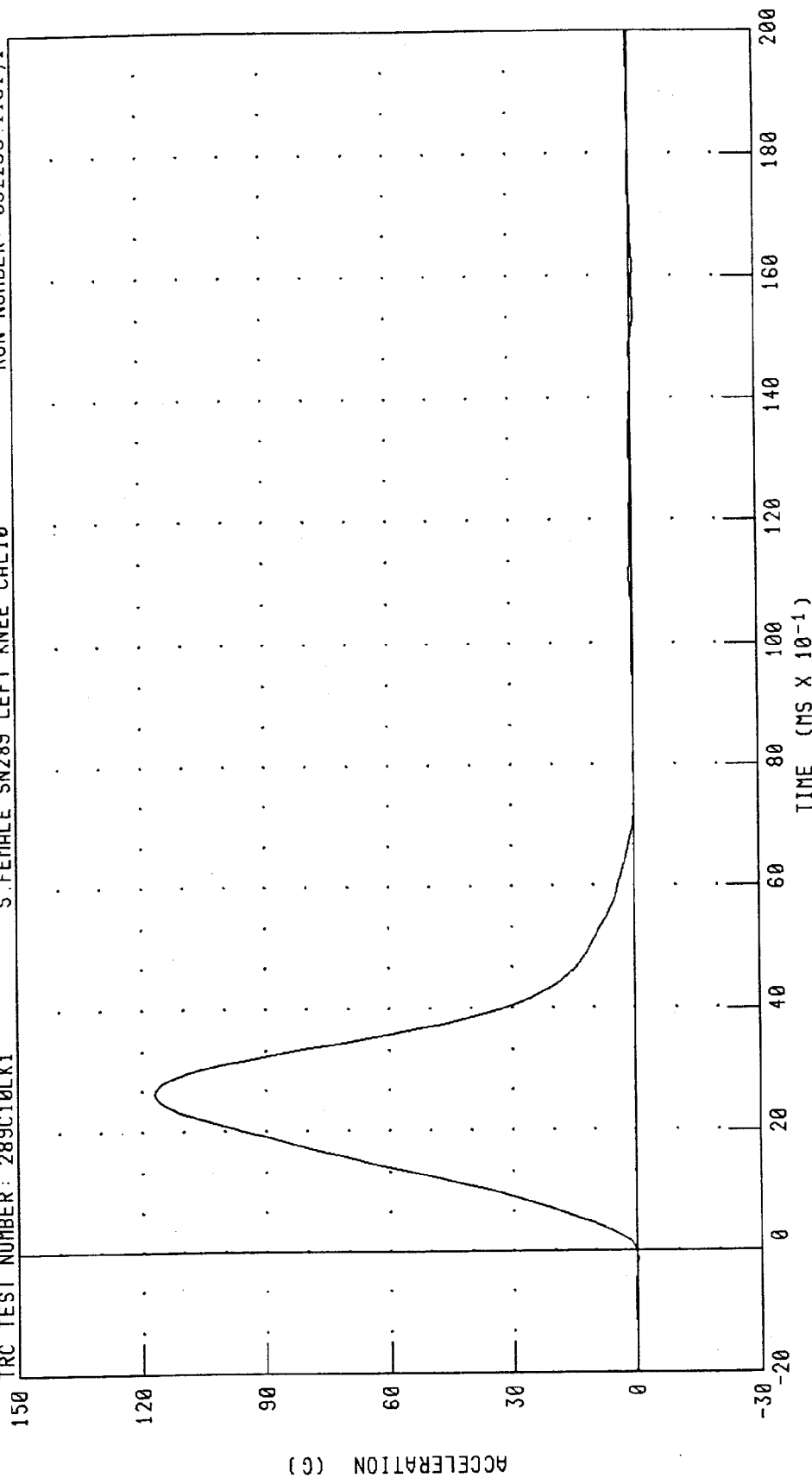
RUN NUMBER: 092299.1058;1

SMALL FEMALE HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 289C10LK1

S. FEMALE SN289 LEFT KNEE CAL10

RUN NUMBER: 092299.1101.1



CHANNEL: PENXG FILTER: CH. CLASS 600

PEAK DATA: 116.91 G @ 2.64 MS; -0.91 G @ 15.44 MS

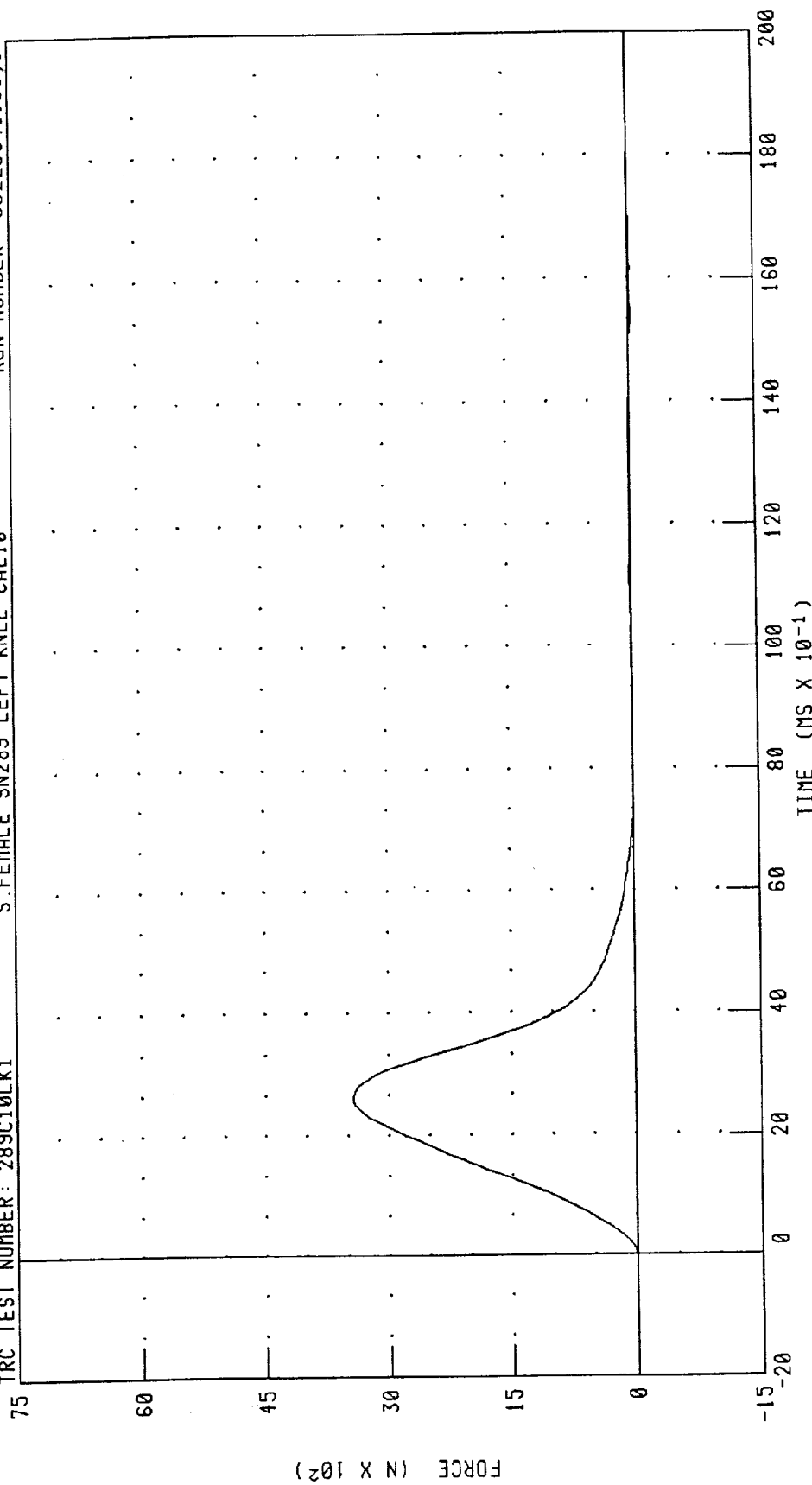
SMALL FEMALE HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

TRC TEST NUMBER: 289C10LK1

S. FEMALE SN289 LEFT KNEE CAL10

RUN NUMBER: 092299.1101.1



PEAK DATA: 3432.13 N @ 2.64 MS; -26.83 N @ 15.44 MS

CHANNEL: PENXF FILTER: CH. CLASS 600

Post-Test Dummy Certification

Passenger Dummy S/N 369

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III SMALL FEMALE

03-SEP-99

TRC INC.

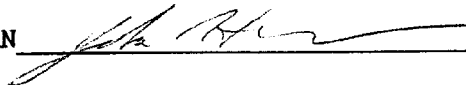
TEST NO: 369C6HD1

S.FEMALE SN369 HEAD DROP CAL6

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	55.0 %
PEAK RESULTANT ACCELERATION	250 - 300 G	263.39 G
PEAK LATERAL ACCELERATION	15 G MAX	-8.25 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN



RUN NUMBER: 090399.1057;1

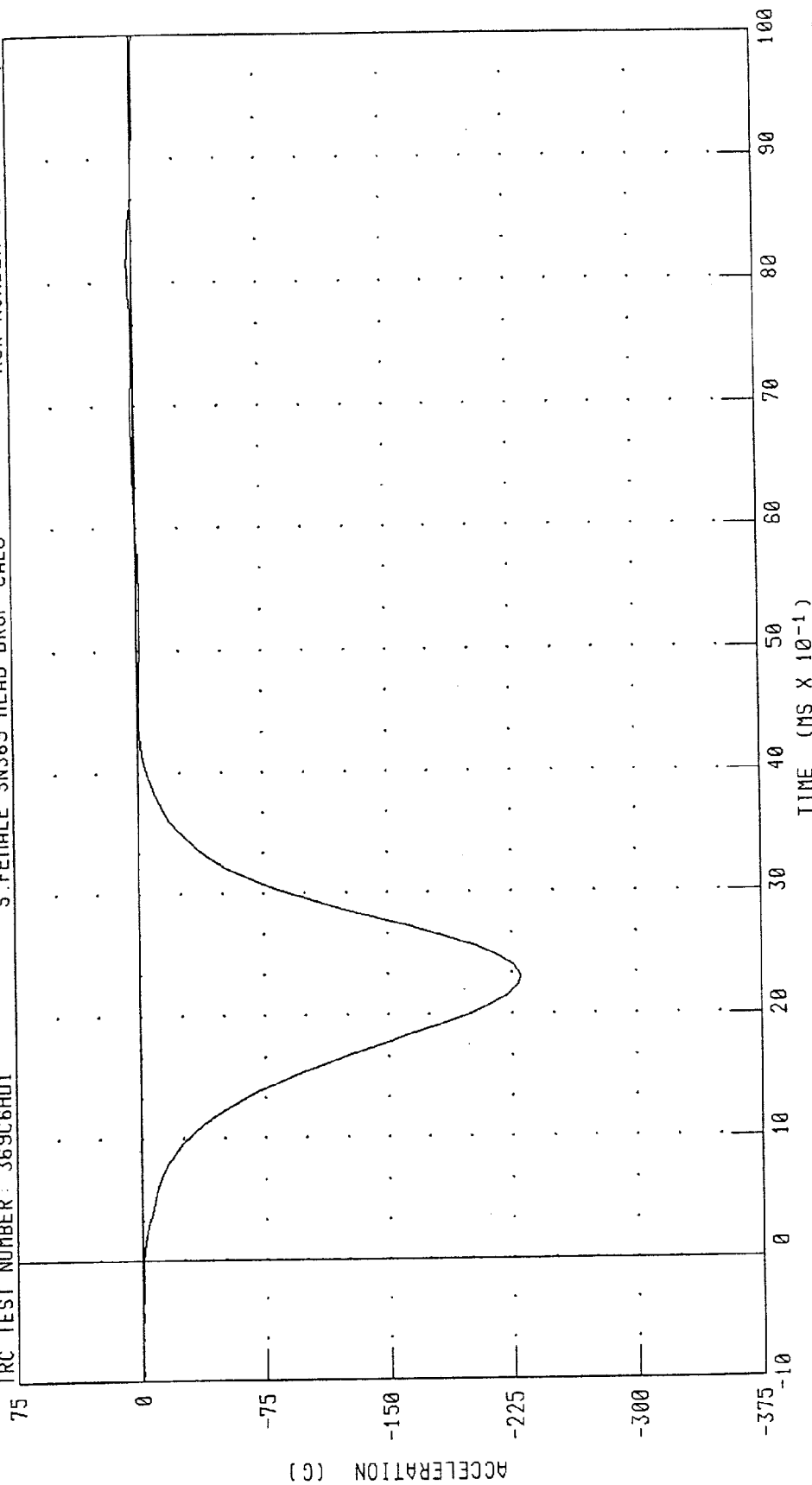
SMALL FEMALE HYBRID III HEAD CALIBRATION

HEAD ACCELERATION X AXIS

S.FEMALE SN369 HEAD DROP CAL6

RUN NUMBER: 090399.1059,1

TRC TEST NUMBER: 369C6HD1



PEAK DATA: 3.08 G @ 8.16 MS, -230.50 G @ 2.32 MS

CHANNEL: HEDXC FILTER: CH. CLASS 1000

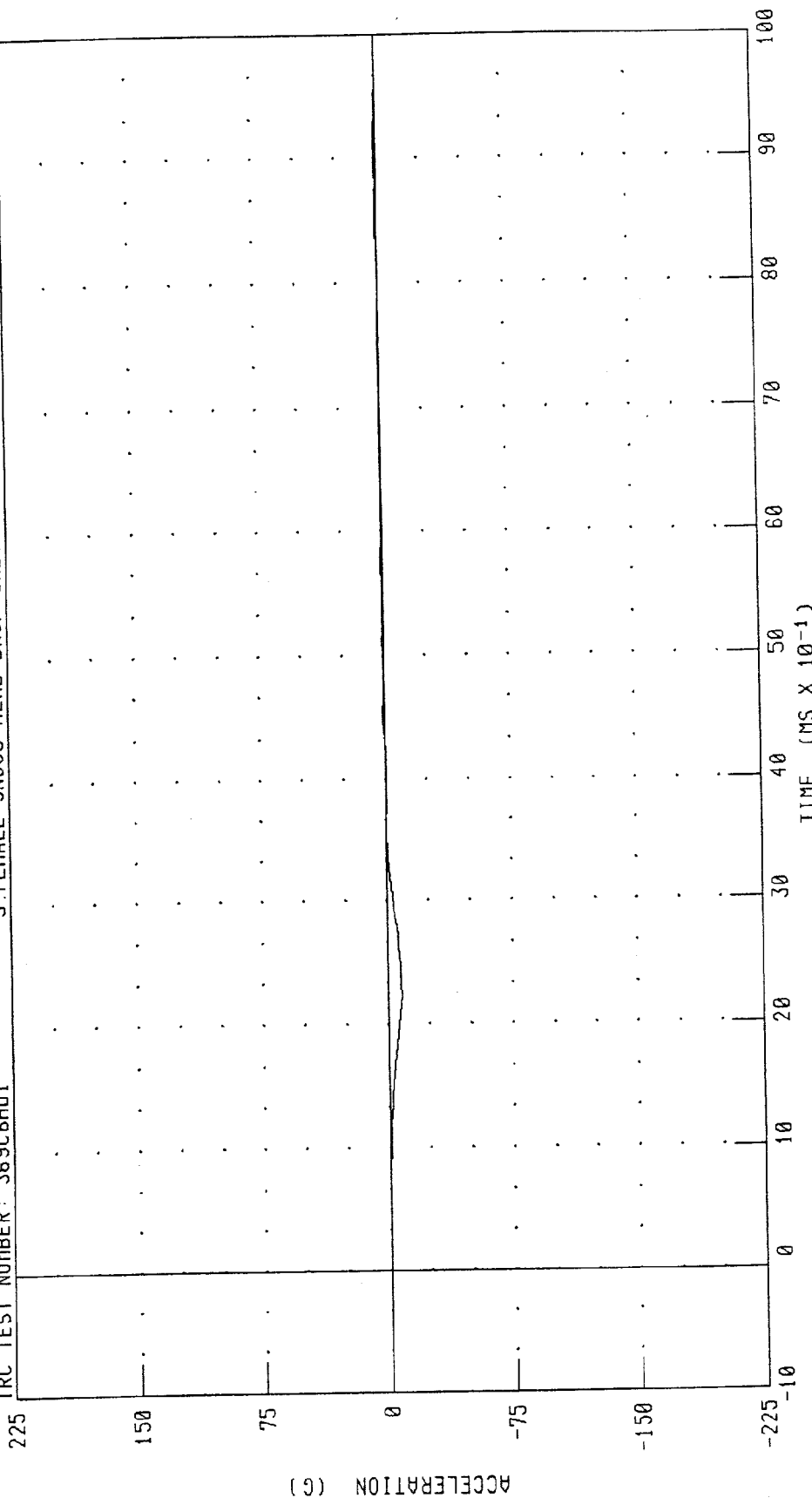
SMALL FEMALE HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Y AXIS

S. FEMALE SN369 HEAD DROP CAL6

RUN NUMBER: 090399.1059;1

TRC TEST NUMBER: 369C6HD1



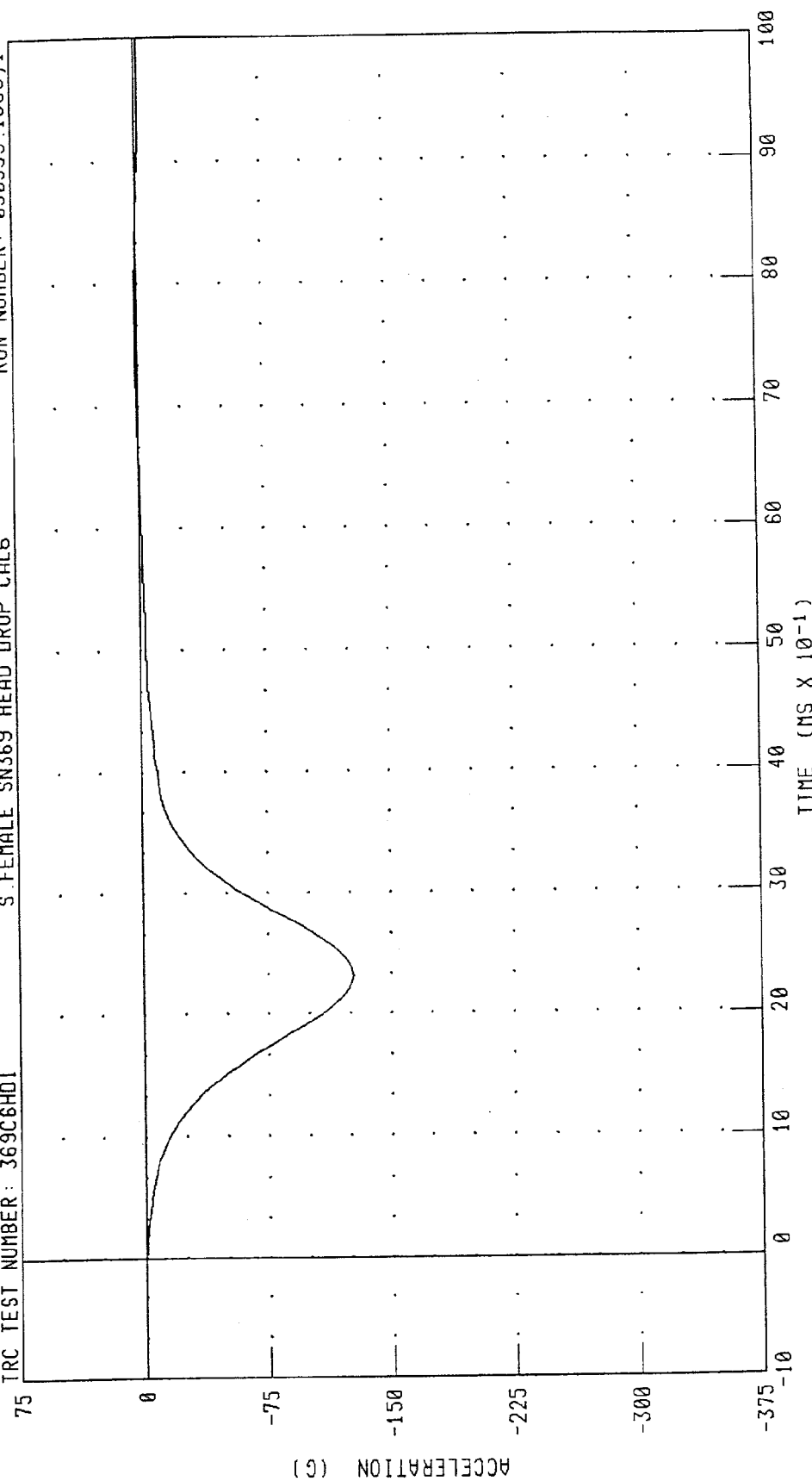
CHANNEL: HEDYG FILTER: CH. CLASS 1000

SMALL FEMALE HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Z AXIS

TRC TEST NUMBER: 369C6HD1

S. FEMALE SN369 HEAD DROP CAL6

RUN NUMBER: 090399.1059,1



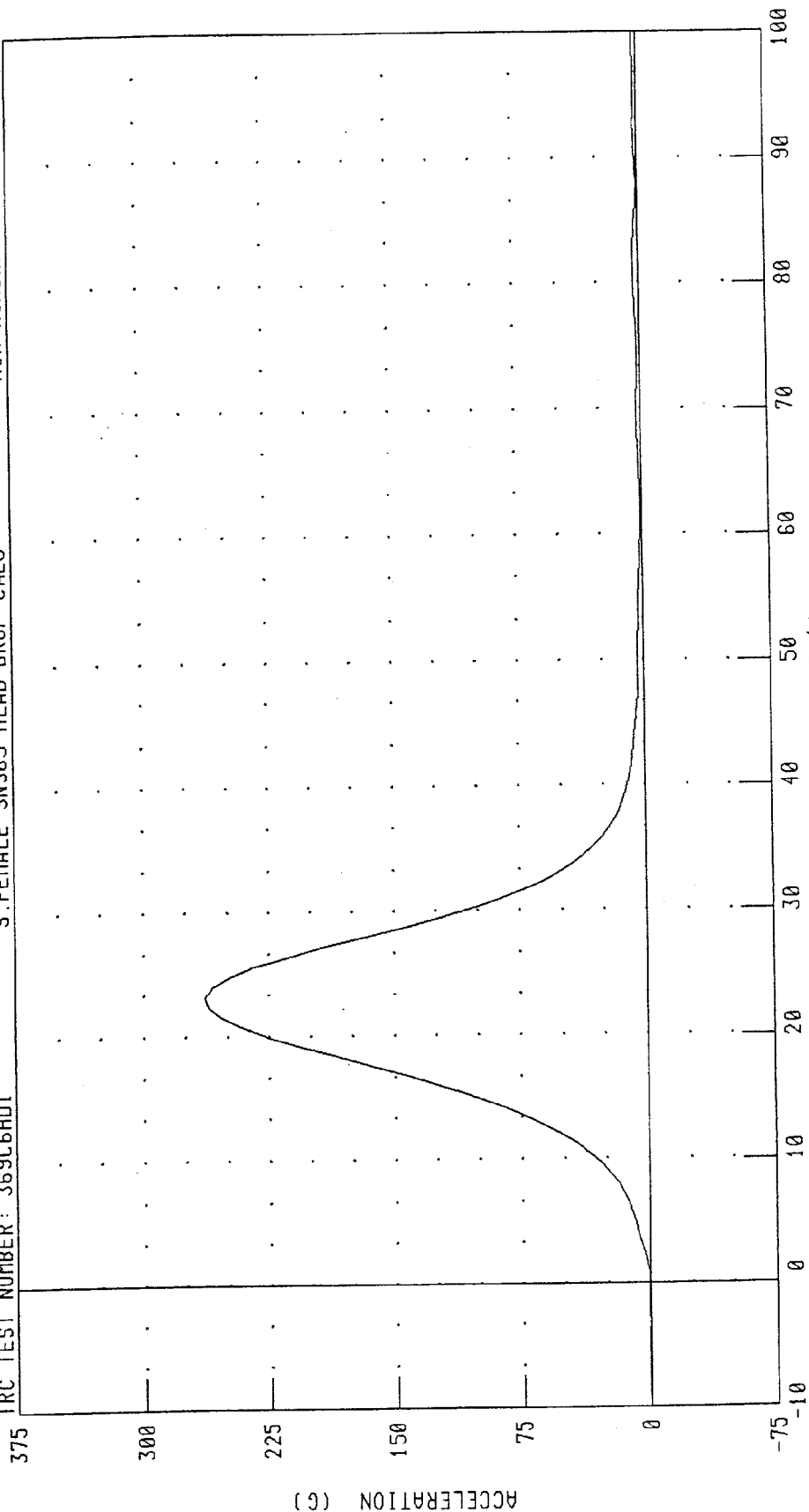
PEAK DATA: 1.64 G @ 7.76 MS; -127.22 G @ 2.32 MS

CHANNEL: HEDZC FILTER: CH. CLASS 1000

SMALL FEMALE HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION
S.FEMALE SN369 HEAD DROP CALG

RUN NUMBER: 090399.1059;1

TRC TEST NUMBER: 369C6HDI



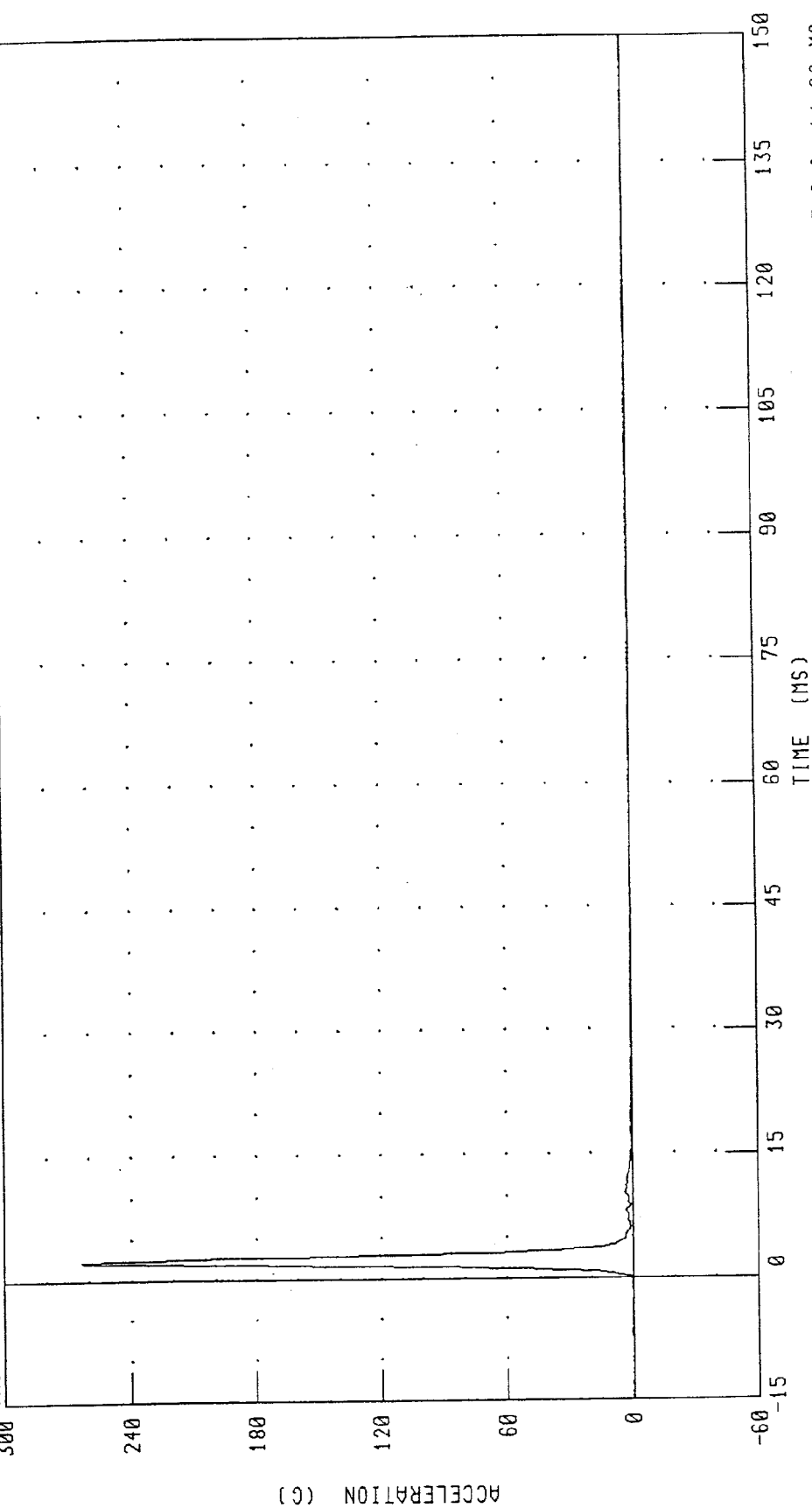
PEAK DATA: 263.40 G @ 2.32 MS; 0.14 G @ -0.96 MS

CHANNEL: HEDRG FILTER: CH. CLASS 1000

SMALL FEMALE HYBRID III HEAD CALIBRATION
CHECK PLOT - HEAD RESULTANT ACCELERATION
S. FEMALE SN369 HEAD DROP CAL6

TRC TEST NUMBER: 369C6H01

RUN NUMBER: 090399.1059;1



CHANNEL: HEDRC FILTER: CH. CLASS 1000

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III SMALL FEMALE

03-SEP-99

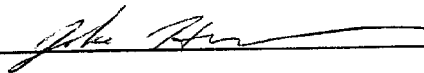
NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 369C6NF1 S.FEMALE SN369 NECK FLEX. CAL6

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	55.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	7.06 M/S
INTEGRATED PENDULUM VELOCITY	10 MS	2.1 - 2.5 M/S	2.18 M/S
	20 MS	4.0 - 5.0 M/S	4.34 M/S
	30 MS	5.8 - 7.0 M/S	6.44 M/S
PEAK D-PLANE ROTATION		78 - 96 DEG.	79.39 DEG.
PEAK MOMENT ABOUT OCCIPITAL CONDYLE DURING ROTATION INT		69 - 83 NM	73.67 NM
POSITIVE MOMENT DECAY TIME FROM TO TO 10NM		80 - 100 MS	89.2 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN



RUN NUMBER: 090399.1310;1

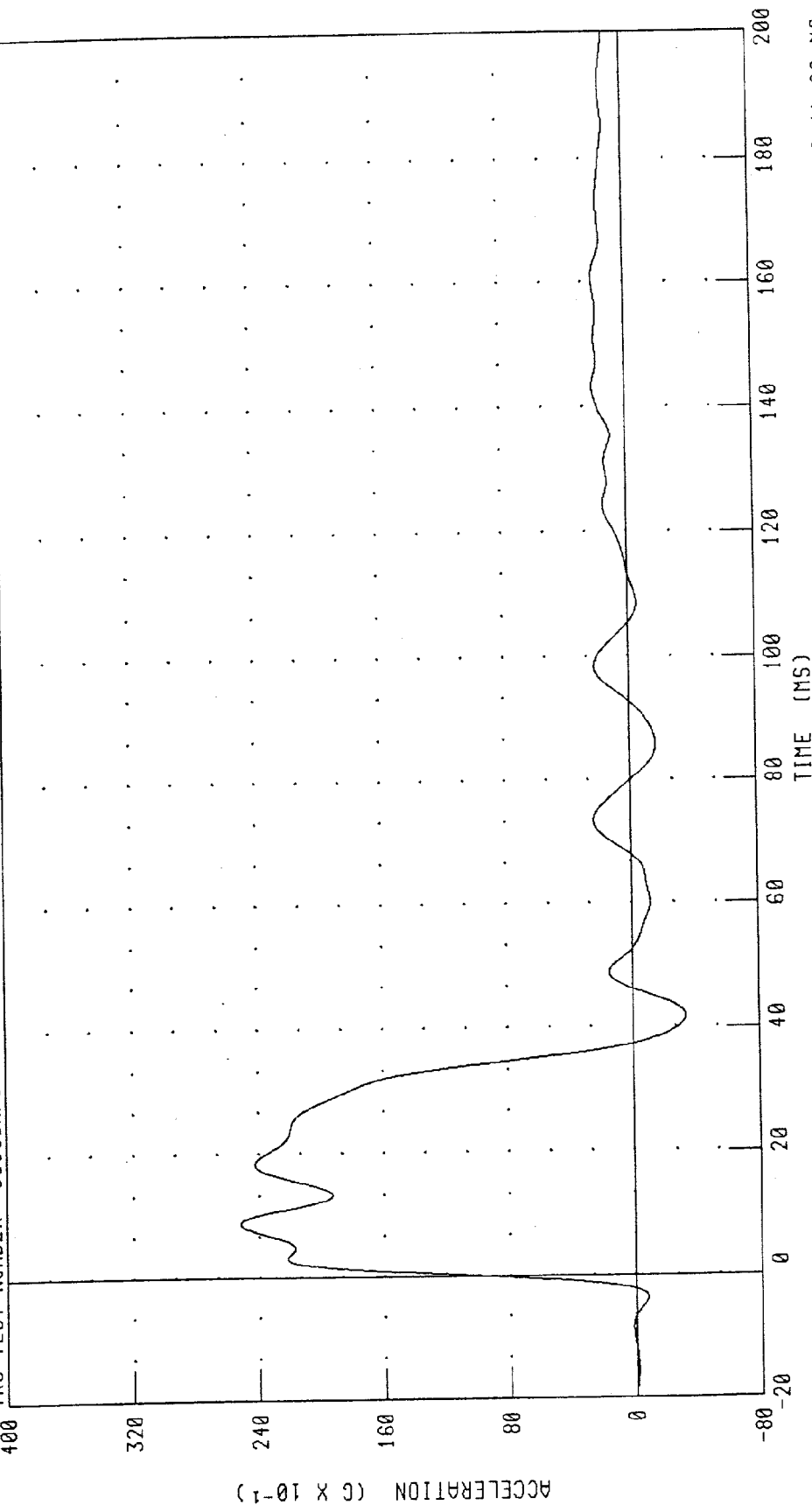
SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 369C6NF1

S. FEMALE SN369 NECK FLEX. CAL6

RUN NUMBER: 090399.1335;1



PEAK DATA: 25.19 G @ 8.88 MS; -3.36 G @ 41.68 MS

CHANNEL: PENXC FILTER: CH. CLASS 60

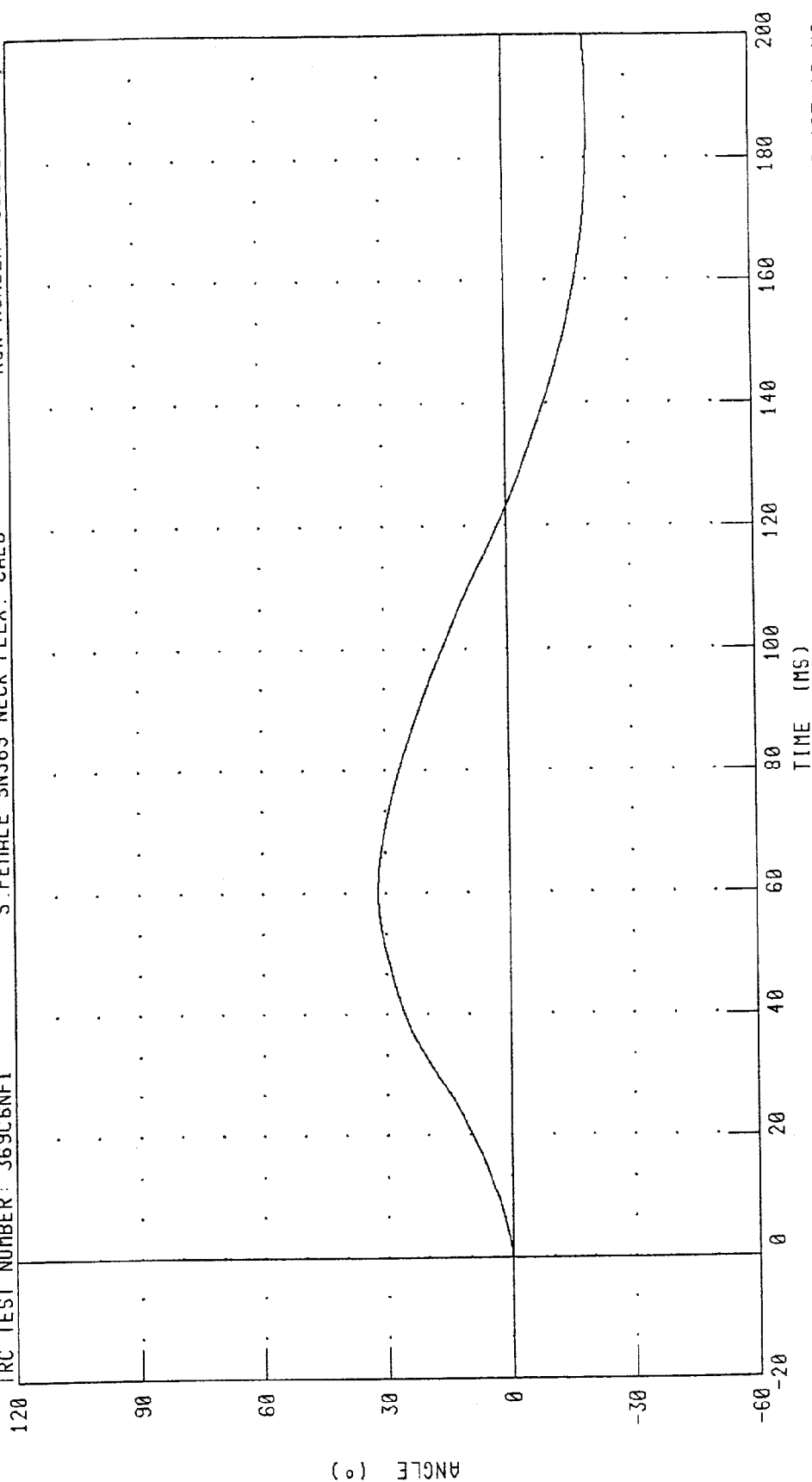
SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 369C6NF1

S. FEMALE SN369 NECK FLEX. CAL6

RUN NUMBER: 090399.1335.1



PEAK DATA: 31.84 ° @ 60.00 MS; -20.61 ° @ 185.12 MS

FILTER: CH. CLASS 60

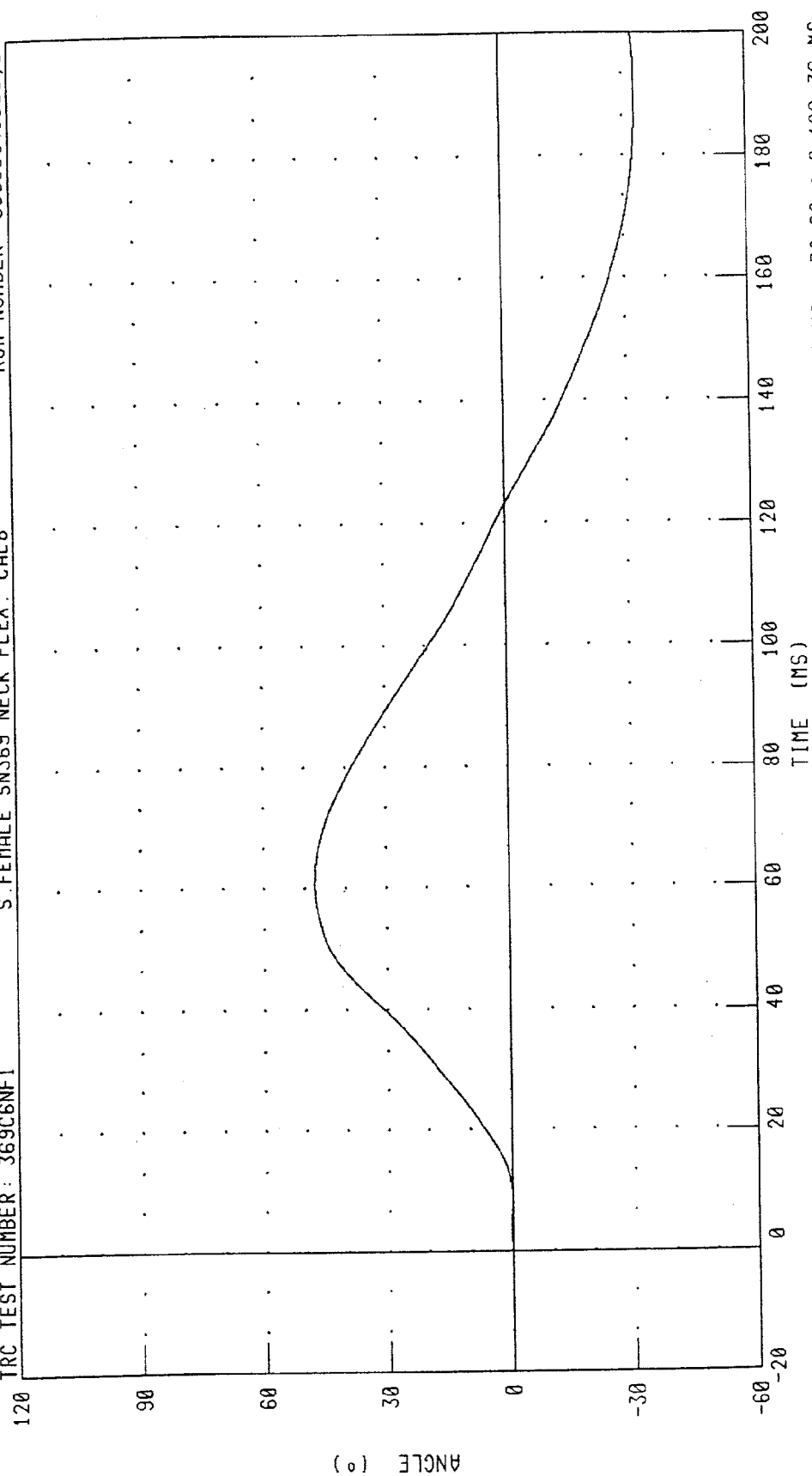
CHANNEL: BETA

SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 369C6NF1

S. FEMALE SN369 NECK FLEX. CAL6

RUN NUMBER: 090399 1335;1

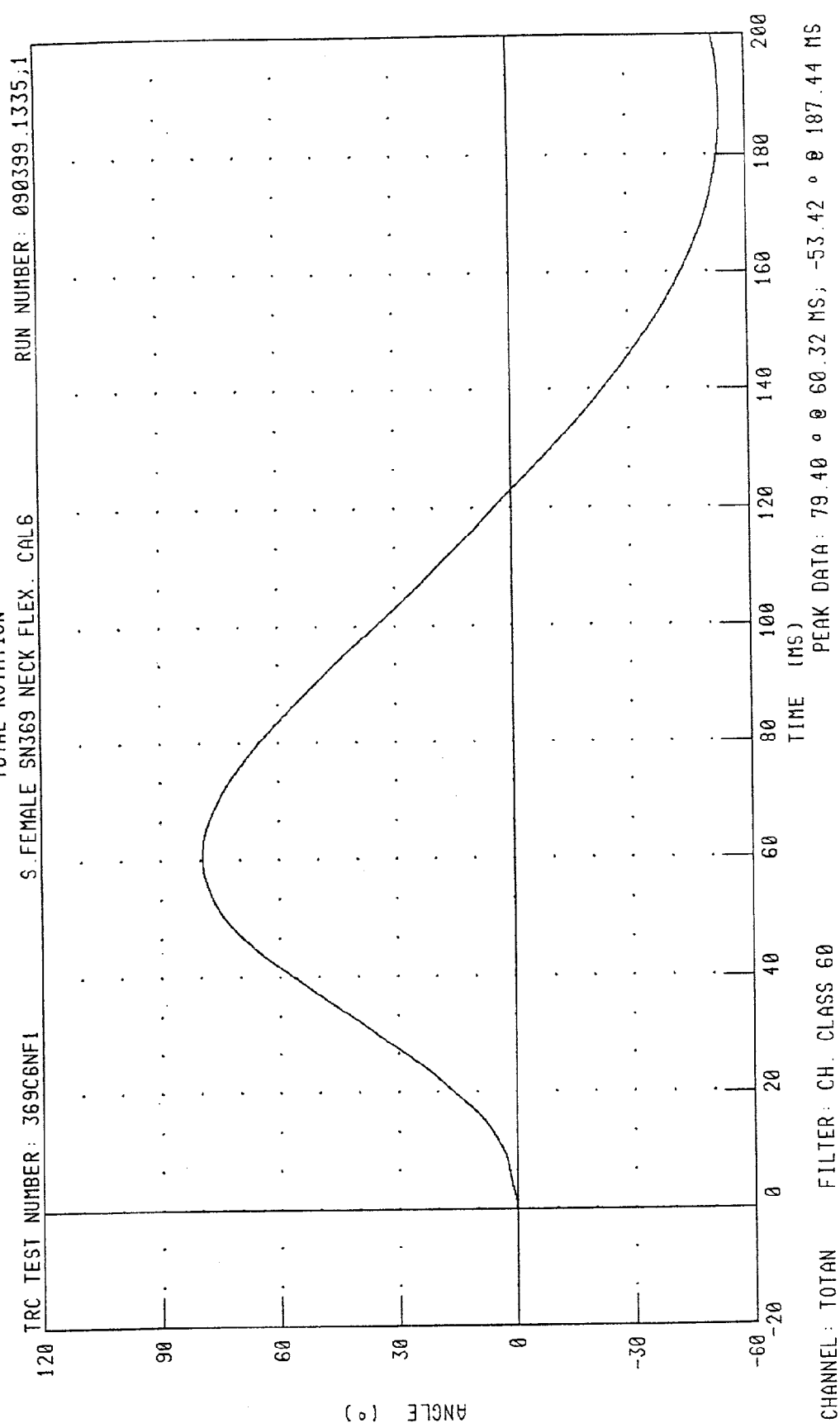


PEAK DATA: 47.56 ° @ 60.48 MS; -32.86 ° @ 189.36 MS

CHANNEL: THETA FILTER: CH. CLASS 60

SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION



CHANNEL: TOTAL FILTER: CH. CLASS 60

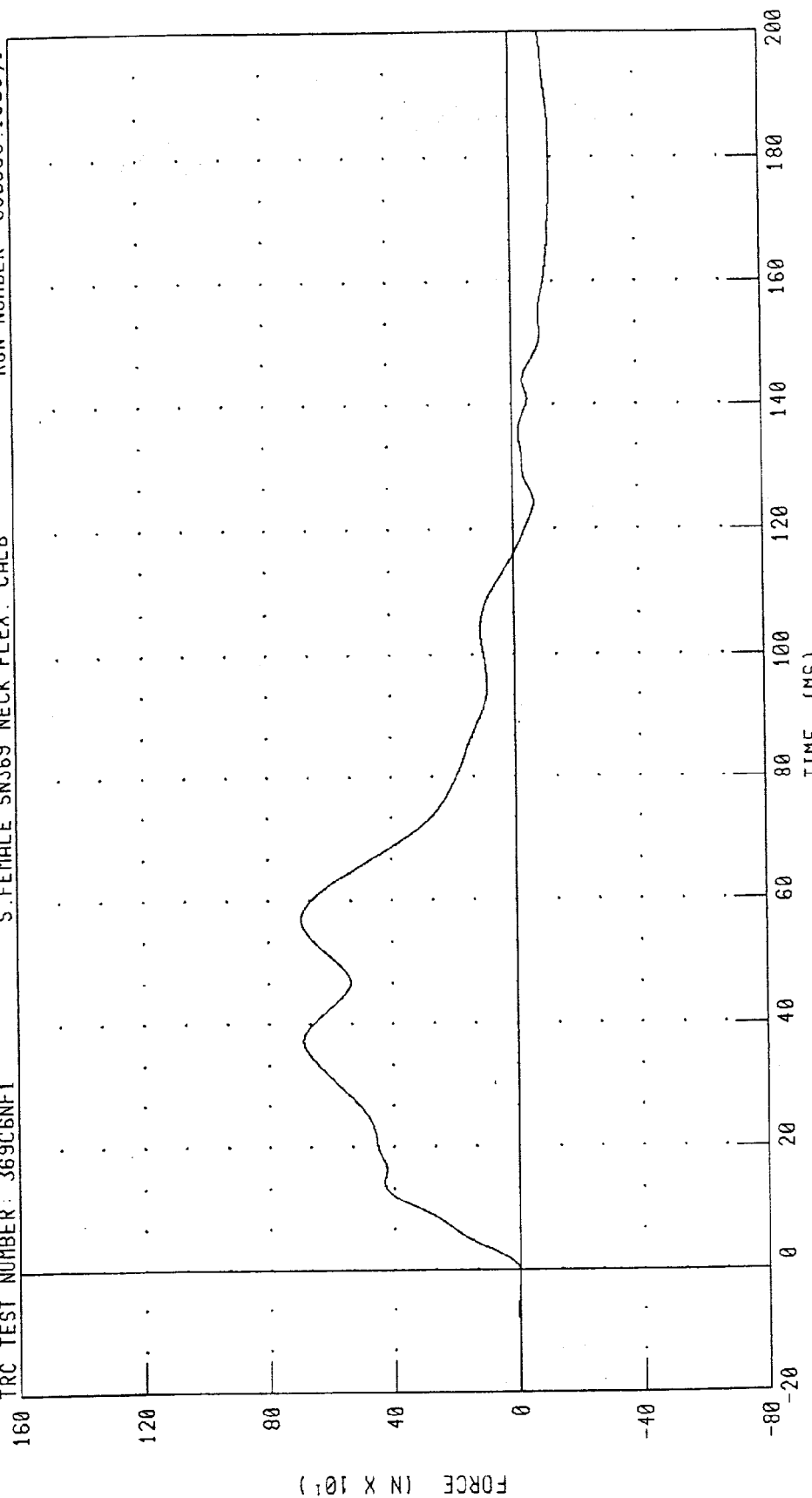
SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 369C6NF1

S. FEMALE SN369 NECK FLEX. CALS

RUN NUMBER: 090399.1335;1



PEAK DATA: 692.92 N @ 57.04 MS; -126.62 N @ 176.56 MS

CHANNEL: NEKXF FILTER: CH. CLASS 60

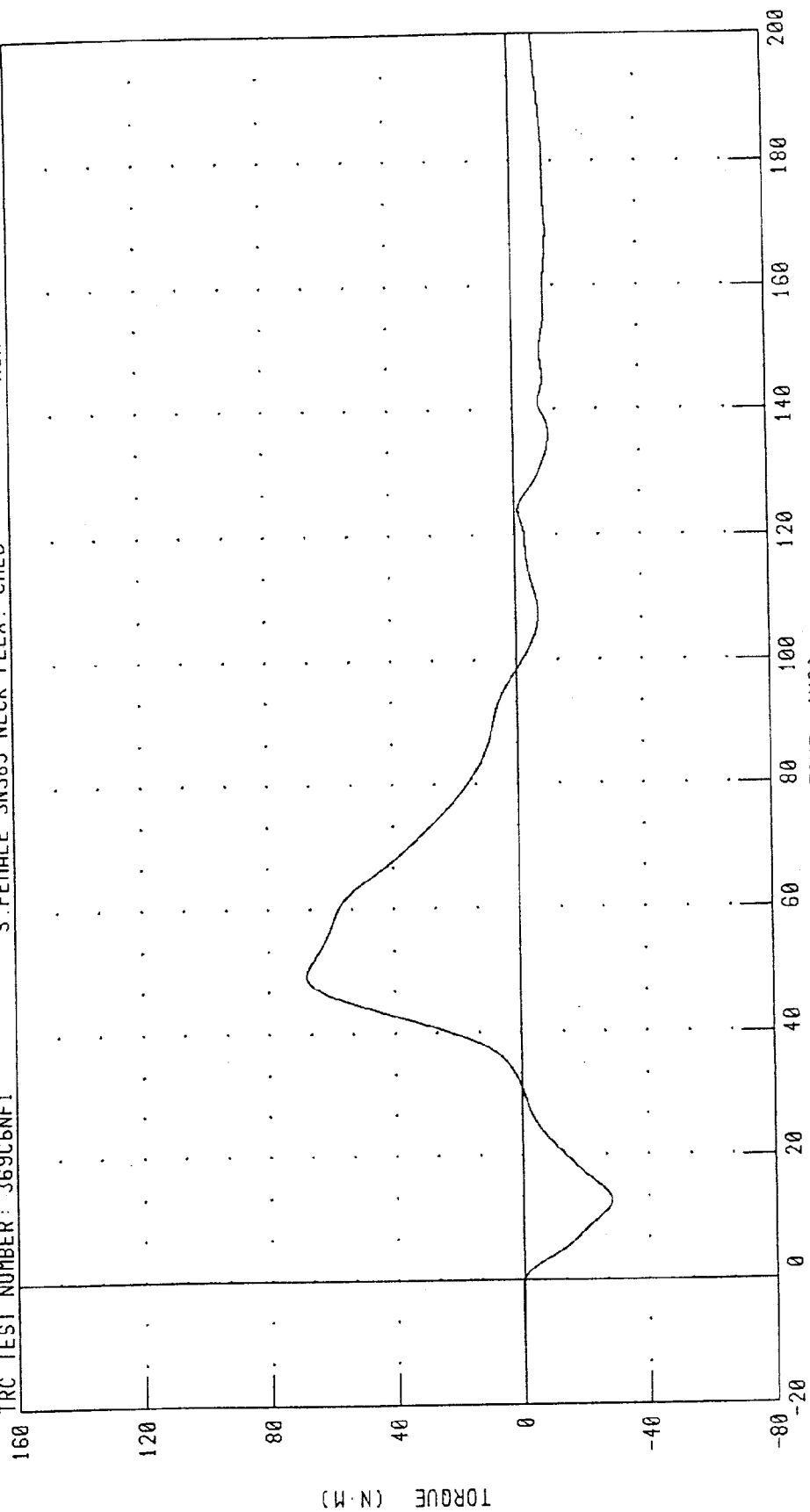
SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT Y AXIS

RUN NUMBER: 090399.1335;1

S. FEMALE SN369 NECK FLEX. CAL6

TRC TEST NUMBER: 369C6NF1



PEAK DATA: 67.88 N.M @ 49.36 MS; -28.23 N.M @ 12.80 MS

FILTER: CH. CLASS 60

CHANNEL: NEKYM

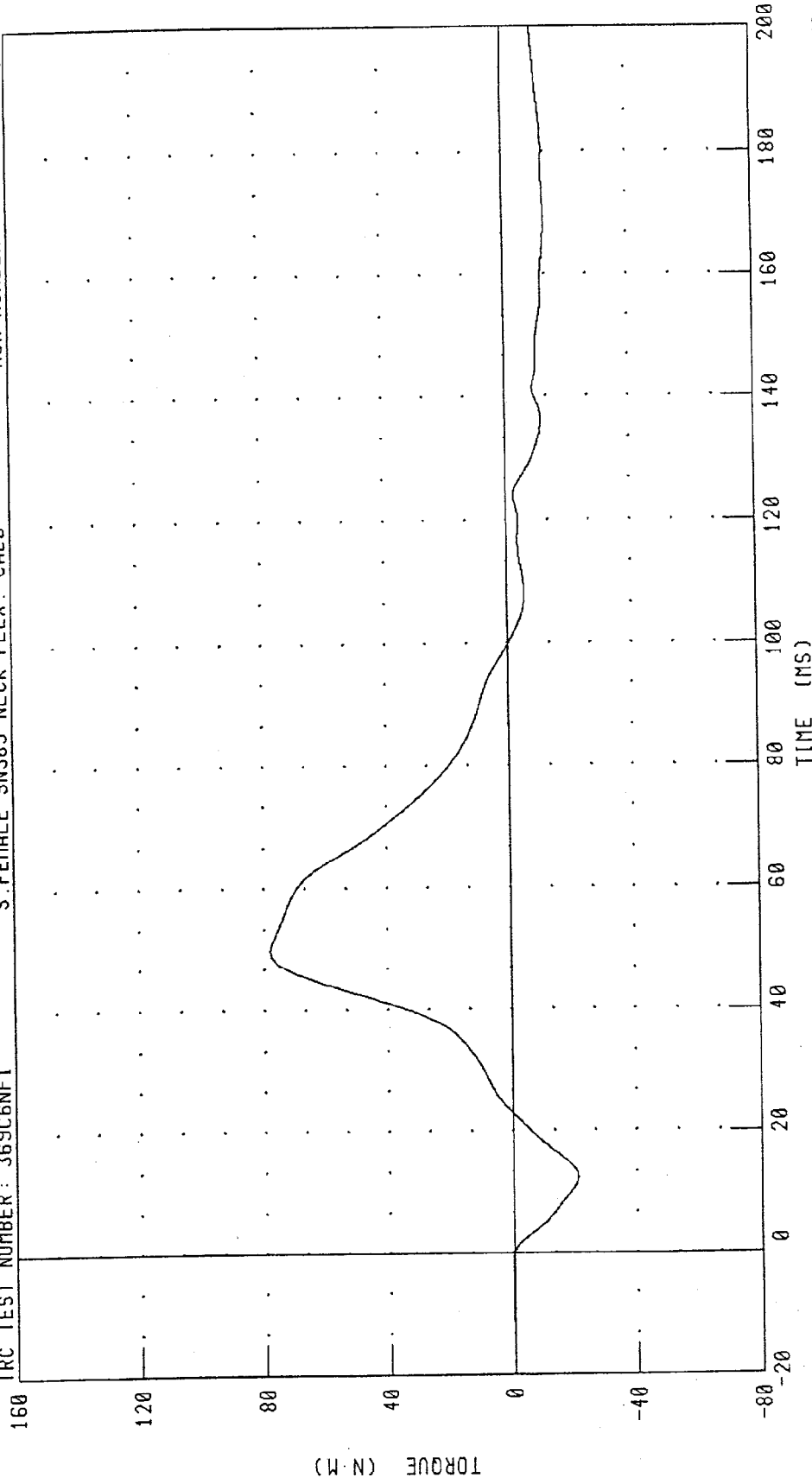
SMALL FEMALE HYBRID III NECK FLEXION CALIBRATION

TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

S. FEMALE SN369 NECK FLEX. CAL6

RUN NUMBER: 090399.1335;1

TRC TEST NUMBER: 369C6NF1



PEAK DATA: 77.96 N.M @ 49.84 MS; -20.94 N.M @ 12.40 MS

CHANNEL: NEKOM FILTER: CH. CLASS 60

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III SMALL FEMALE

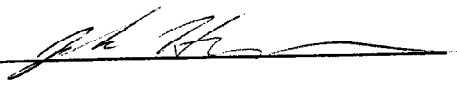
03-SEP-99

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 369C6NE2 S.FEMALE SN369 NECK EXT. CAL6

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6 - 22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	55.0 %
IMPACT VELOCITY	5.95 - 6.19 M/S	6.00 M/S
INTEGRATED PENDULUM VELOCITY	10 MS 1.5 - 1.9 M/S	1.70 M/S
	20 MS 3.1 - 3.9 M/S	3.41 M/S
	30 MS 4.6 - 5.6 M/S	5.10 M/S
PEAK D-PLANE ROTATION	97 - 109 DEG.	106.46 DEG.
PEAK MOMENT ABOUT OCCIPITAL CONDYLE DURING ROTATION INT	-55 / -69 NM	-57.49 NM
NEGATIVE MOMENT DECAY TIME FROM TO TO -10 NM	94 - 114 MS	108.4 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN 

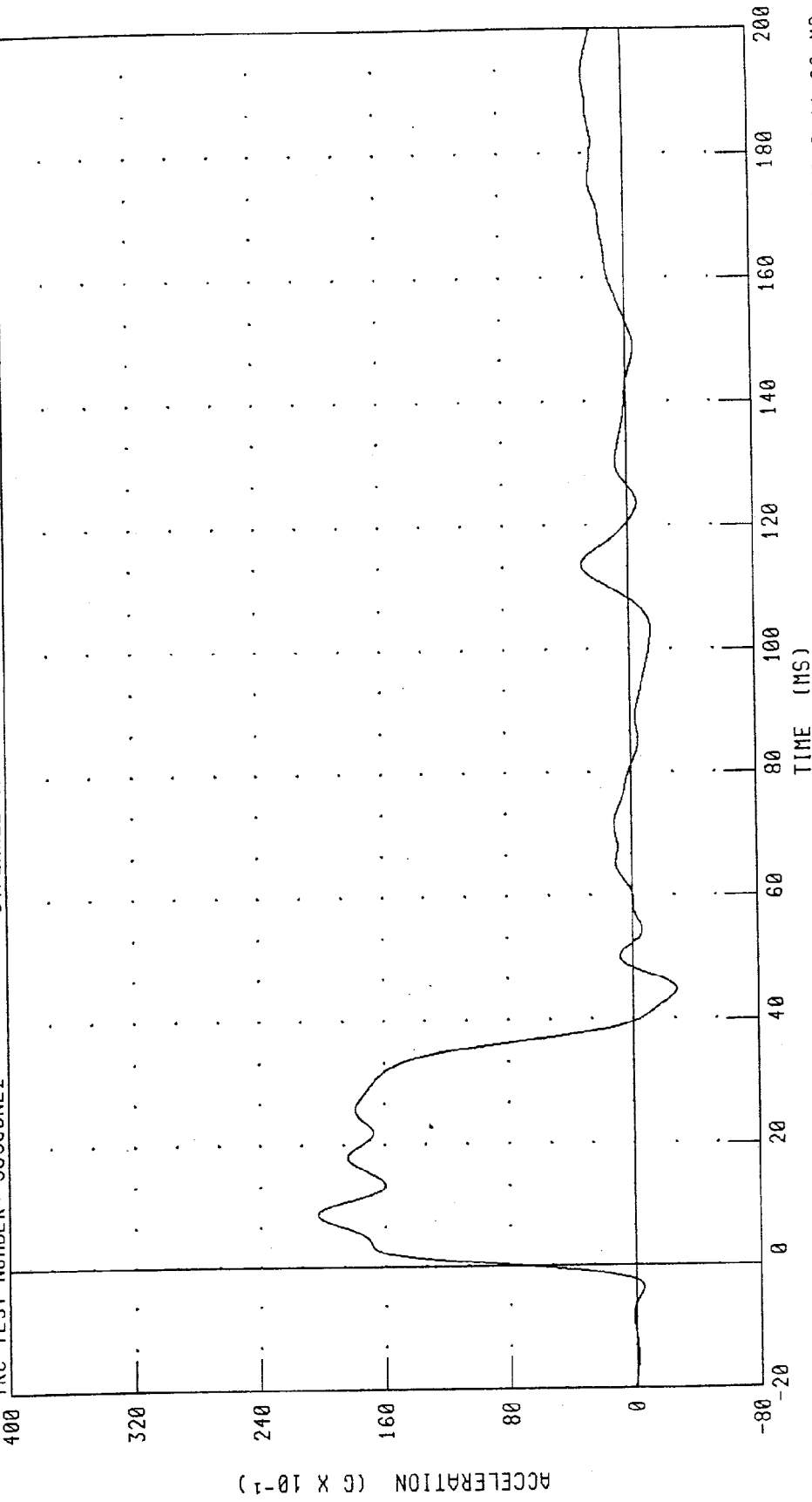
RUN NUMBER: 090399.1428;1

SMALL FEMALE NECK EXTENSION CALIBRATION
PENDULUM DECELERATION

TRC TEST NUMBER: 369C6NE2

S. FEMALE SN369 NECK EXT. CAL6

RUN NUMBER: 090399.1434;1



PEAK DATA: 20.32 G @ 8.80 MS; -2.77 G @ 44.80 MS

CHANNEL: PENXC FILTER: CH. CLASS 60

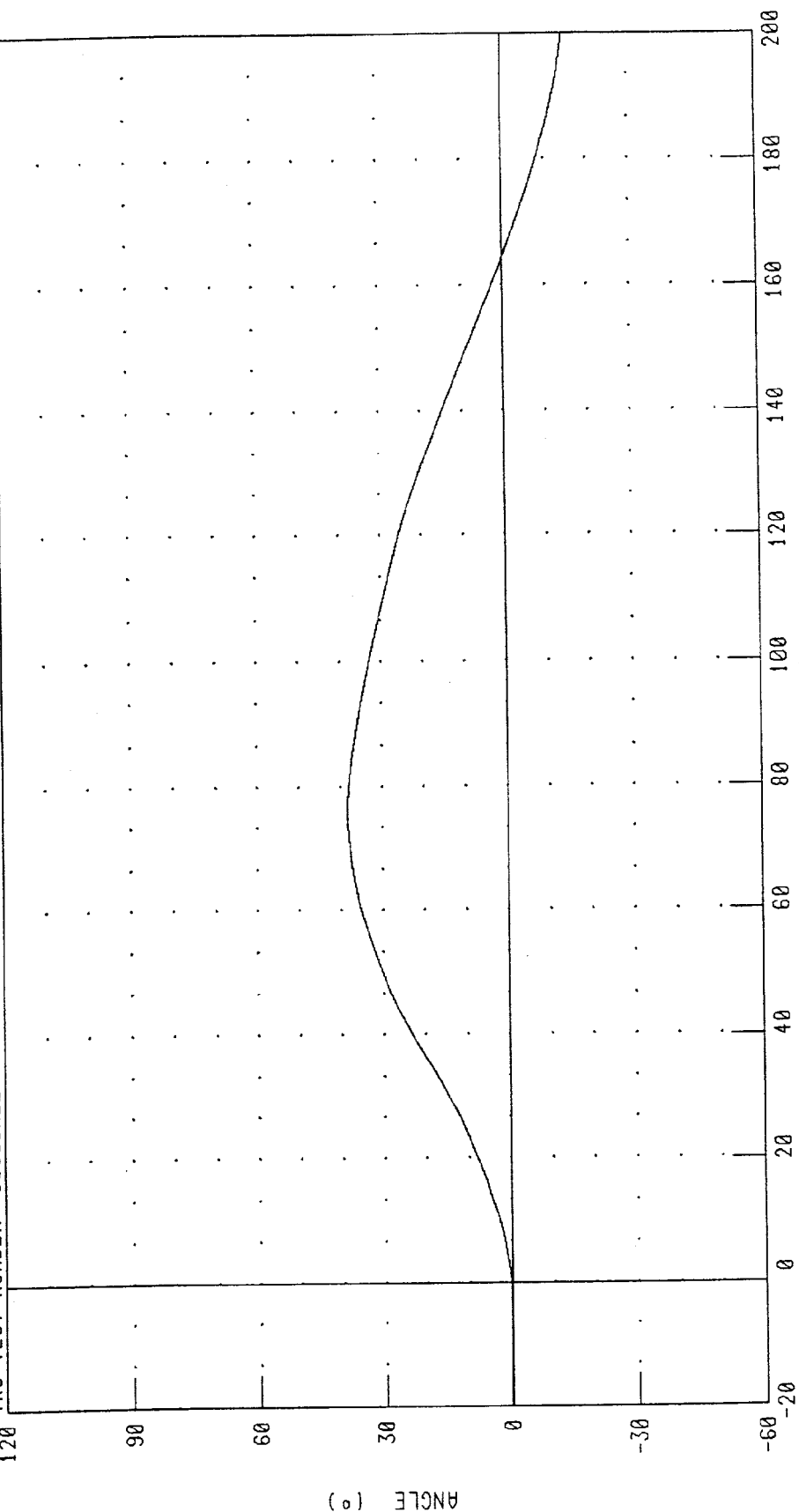
SMALL FEMALE NECK EXTENSION CALIBRATION

ROTATION ABOUT BASE OF NECK

S. FEMALE SN369 NECK EXT. CALG

RUN NUMBER: 090399.1434;1

TRC TEST NUMBER: 369C6NE2



PEAK DATA: 38.32 ° @ 75.68 MS; -14.70 ° @ 200.00 MS

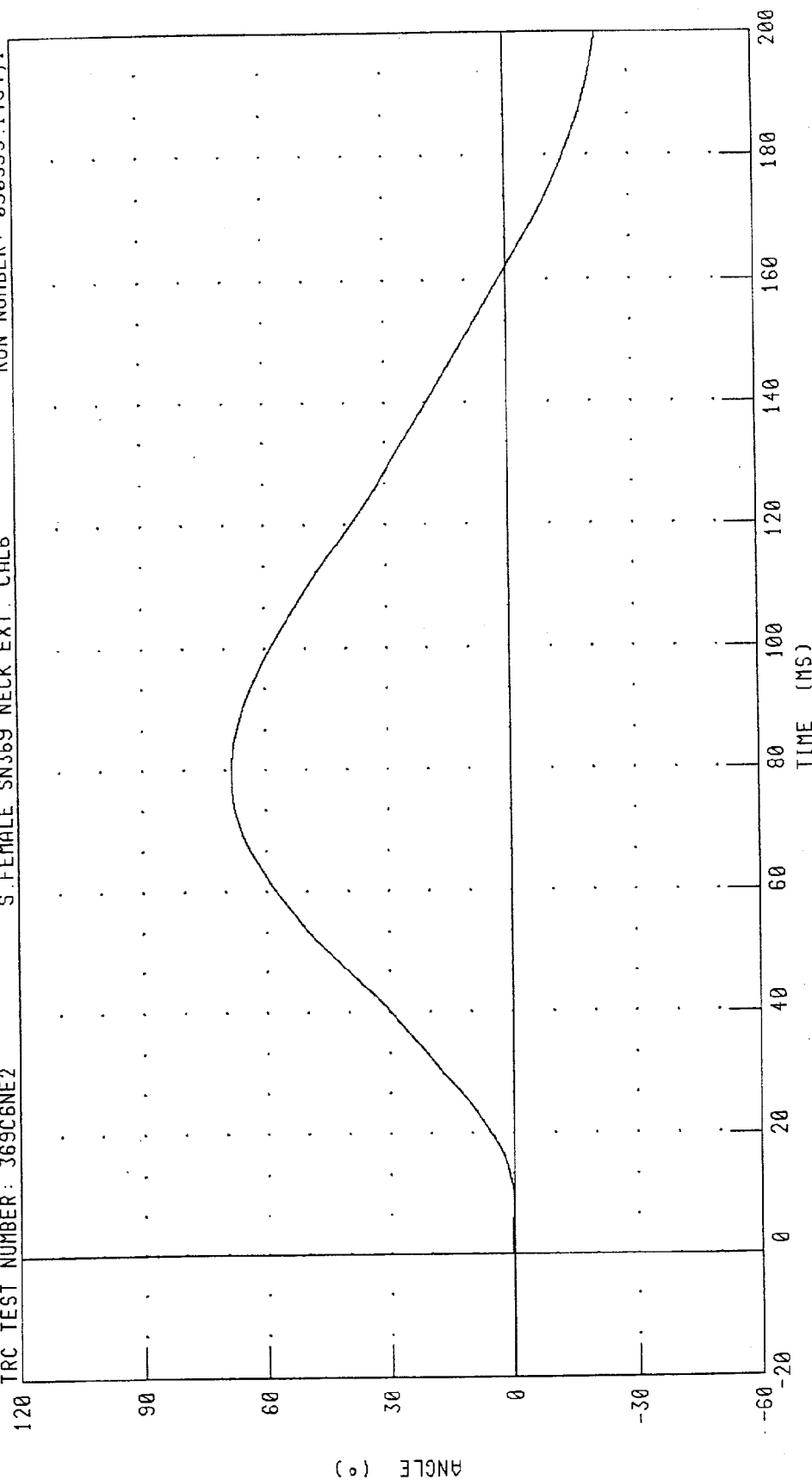
CHANNEL: BETA FILTER: CH. CLASS 60

SMALL FEMALE NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 369CBNE2

S. FEMALE SN369 NECK EXT. CALG

RUN NUMBER: 090399.1434,1



PEAK DATA: 68.24 ° @ 78.88 MS, -22.33 ° @ 200.00 MS

CHANNEL: THETA FILTER: CH. CLASS 60

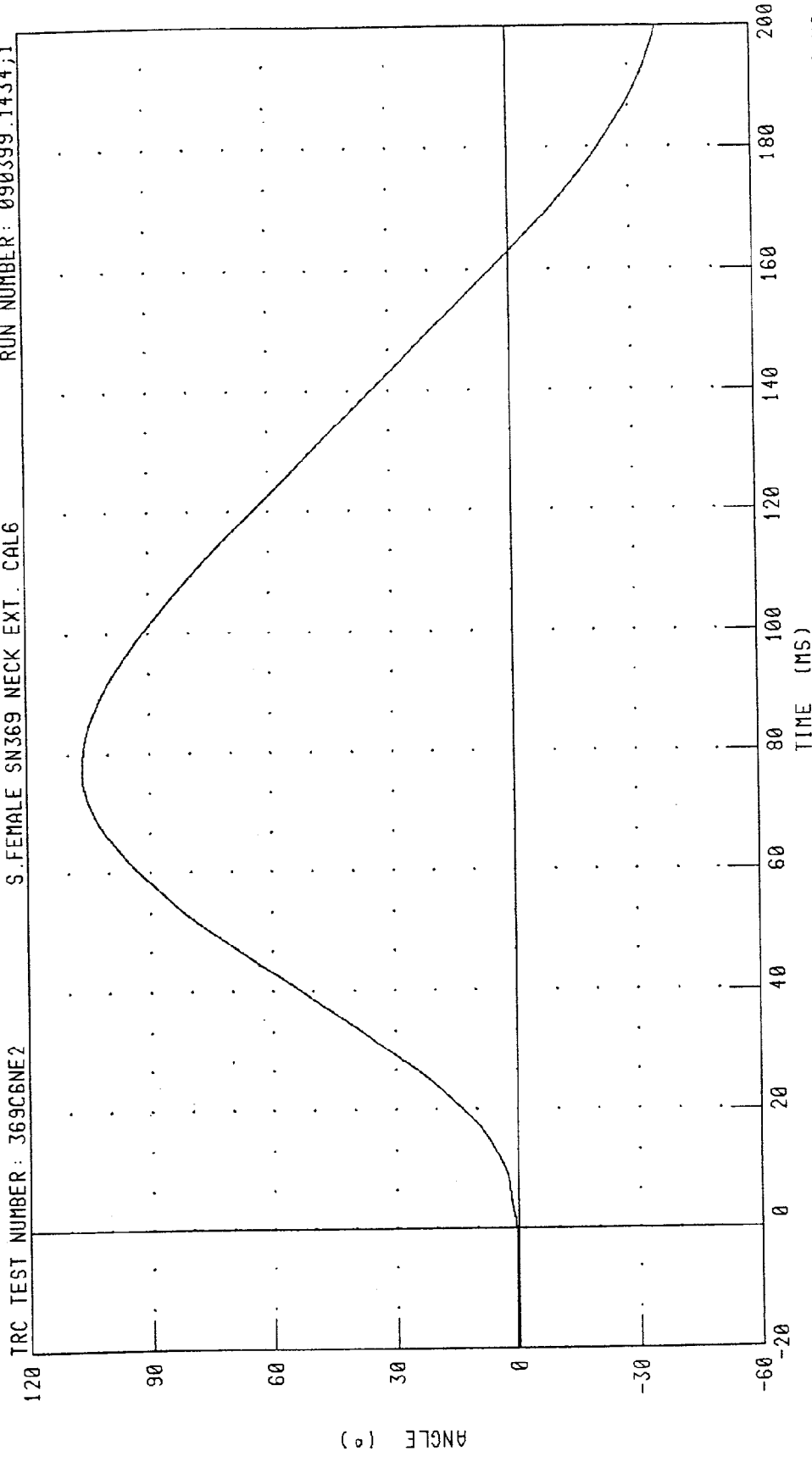
SMALL FEMALE NECK EXTENSION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 369C6NE2

S.FEMALE SN369 NECK EXT. CAL6

RUN NUMBER: 090399.1434;1



PEAK DATA: 106.47 ° @ 76.96 MS, -37.04 ° @ 200.00 MS

CHANNEL: TOTAN FILTER: CH. CLASS 60

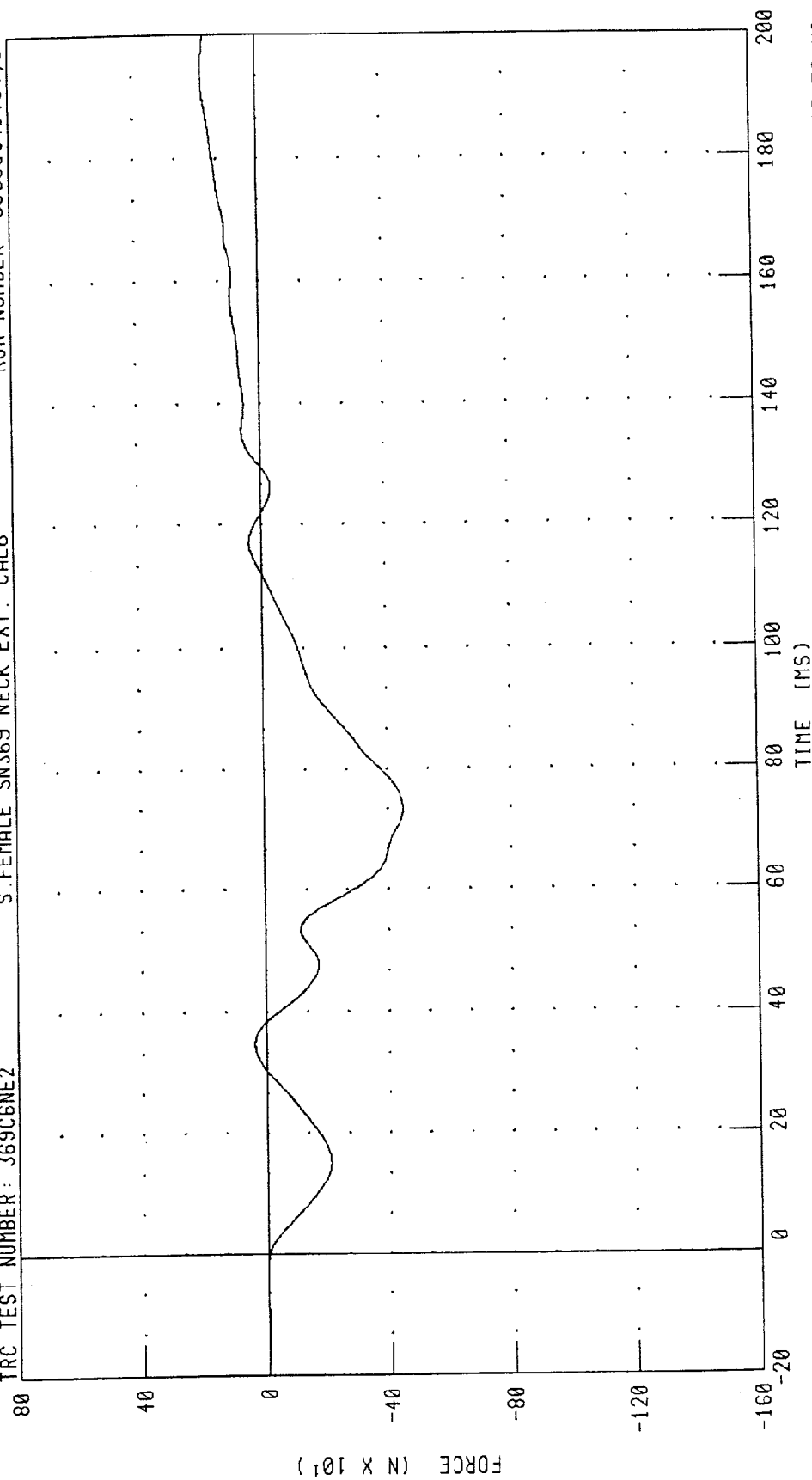
SMALL FEMALE NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

RUN NUMBER: 090399.1434;1

S.FEMALE SN369 NECK EXT. CAL6

TRC TEST NUMBER: 369CGNE2



PEAK DATA: 178.66 N @ 193.52 MS; -451.45 N @ 73.36 MS

CHANNEL: NEKXF FILTER: CH. CLASS 60

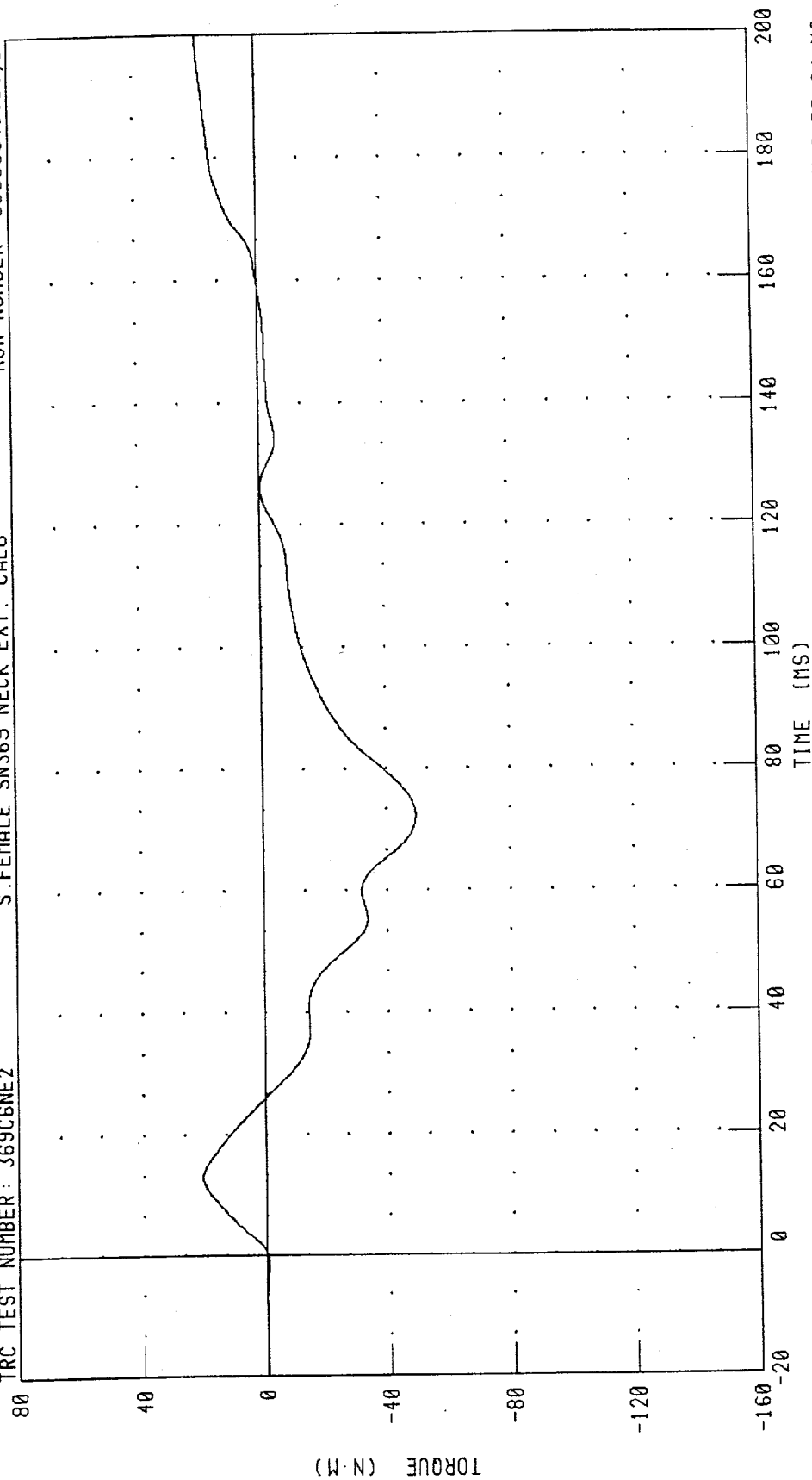
SMALL FEMALE NECK EXTENSION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER: 369C6NE2

S. FEMALE SN369 NECK EXT. CAL6

RUN NUMBER: 090399.1434,1



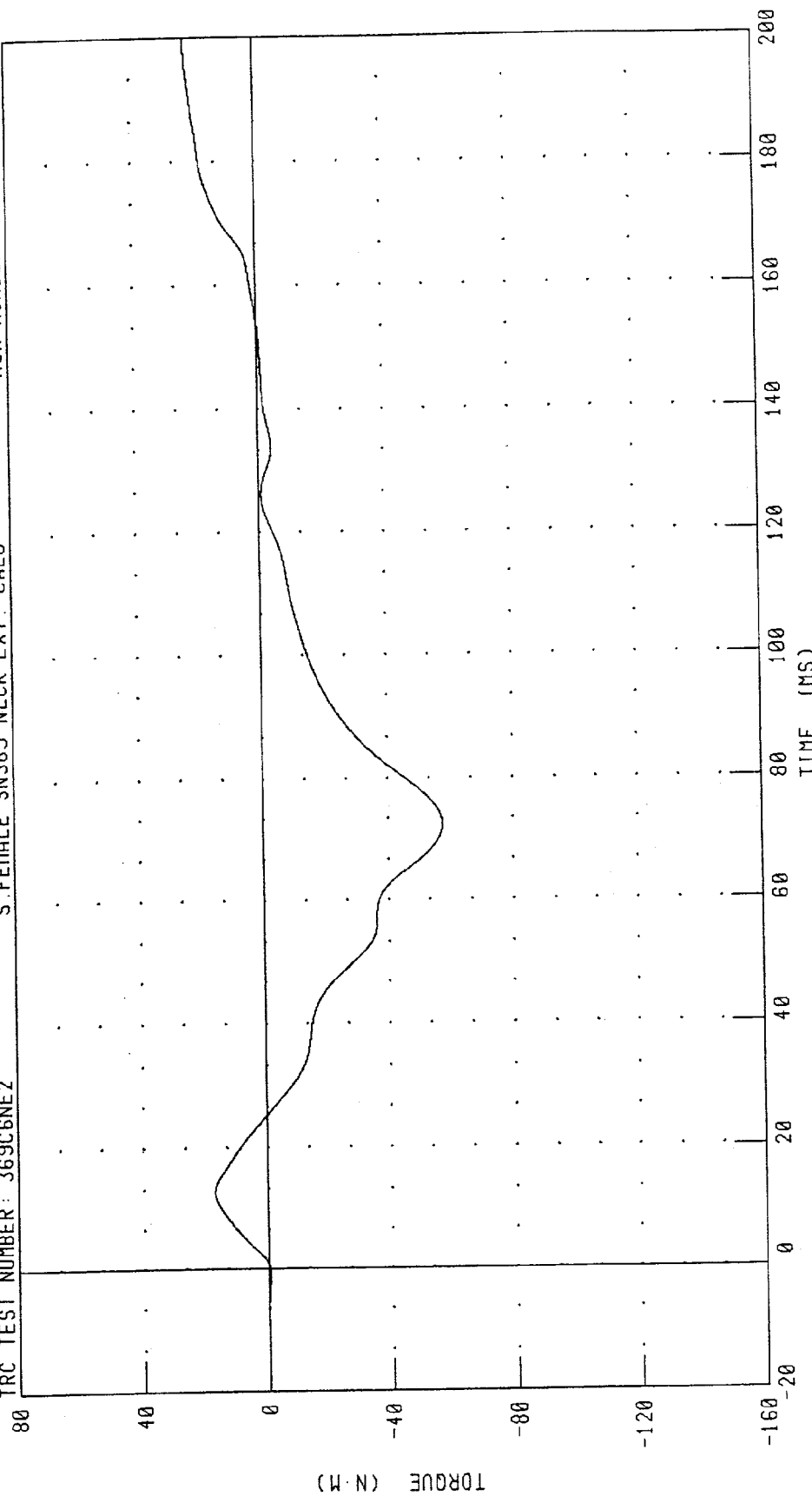
PEAK DATA: 20.81 N·M @ 13.04 MS; -49.50 N·M @ 72.24 MS

CHANNEL: NEKYM FILTER: CH. CLASS 60

SMALL FEMALE NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE
S. FEMALE SN369 NECK EXT. CAL6

TRC TEST NUMBER: 369C6NE2

RUN NUMBER: 090399.1434;1



PEAK DATA: 22.52 N·M @ 200.00 MS; -57.49 N·M @ 72.48 MS

CHANNEL: NEKOM FILTER: CH. CLASS 60

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III SMALL FEMALE

03-SEP-99

TRC INC.

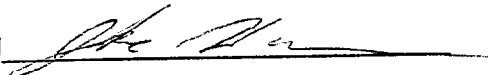
TEST NO: 369C6TH1

S.FEMALE SN369 THORAX CAL06

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	55.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.62 M/S
MAXIMUM DEFLECTION	48 - 55 MM	53.7 MM
MAXIMUM RESISTIVE FORCE DURING DEFECTION CORRIDOR	3900 - 4400 N	4182. N
INTERNAL HYSTERESIS	69% - 85%	71.5%

TEST MEETS SPECIFICATIONS

TECHNICIAN



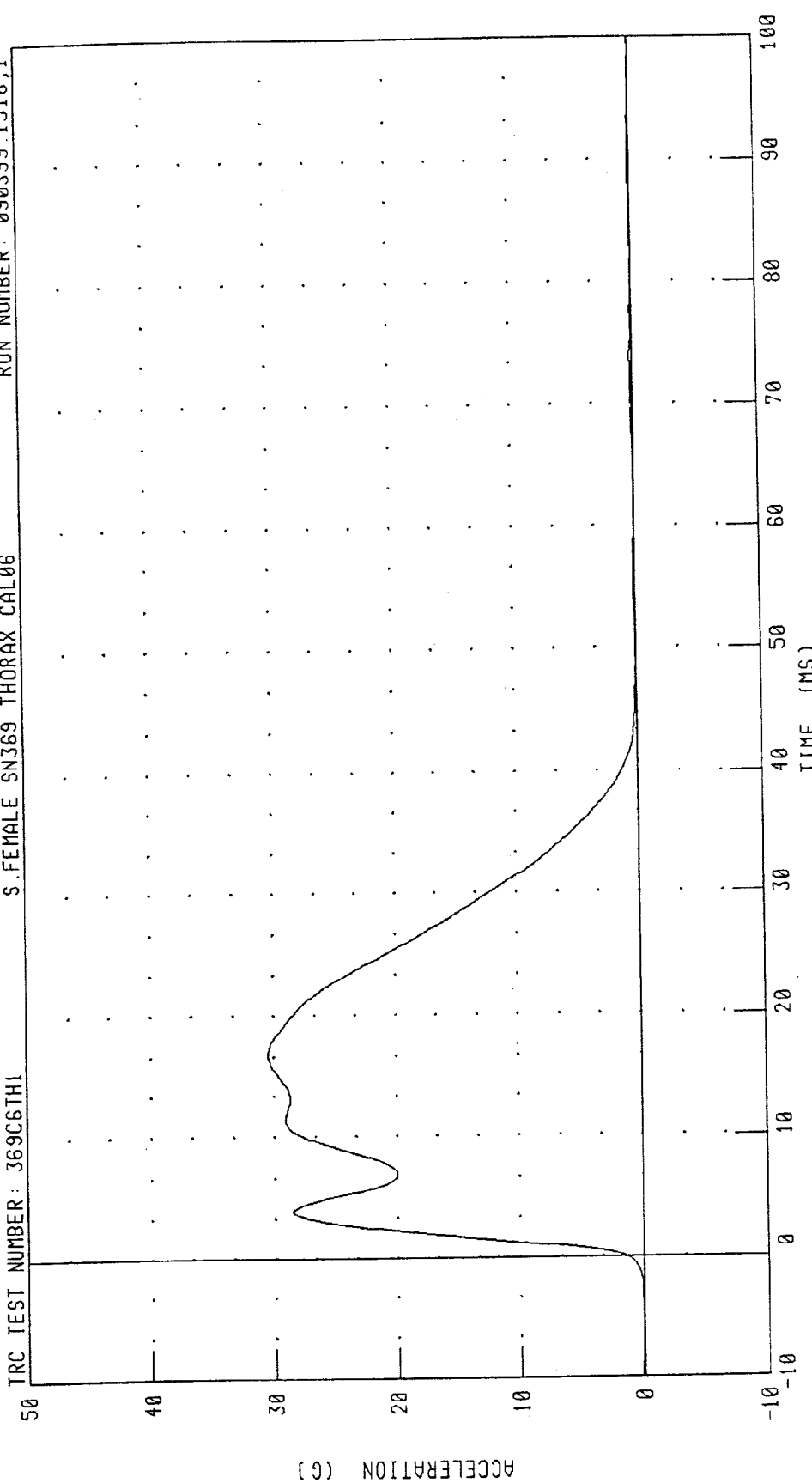
RUN NUMBER: 090399.1512;1

SMALL FEMALE THORAX CALIBRATION
PENDULUM DECELERATION

TRC TEST NUMBER: 369C6TH1

S.FEMALE SN369 THORAX CAL06

RUN NUMBER: 090399.1516.1



PEAK DATA: 30.48 G @ 16.88 MS; 0.00 G @ 82.32 MS

CHANNEL: PENXC FILTER: CH. CLASS 180

SMALL FEMALE THORAX CALIBRATION

PENDULUM FORCE

RUN NUMBER: 090399.1516;1

S. FEMALE SN369 THORAX CAL06

TRC TEST NUMBER: 369C6TH1

100

80

60

40

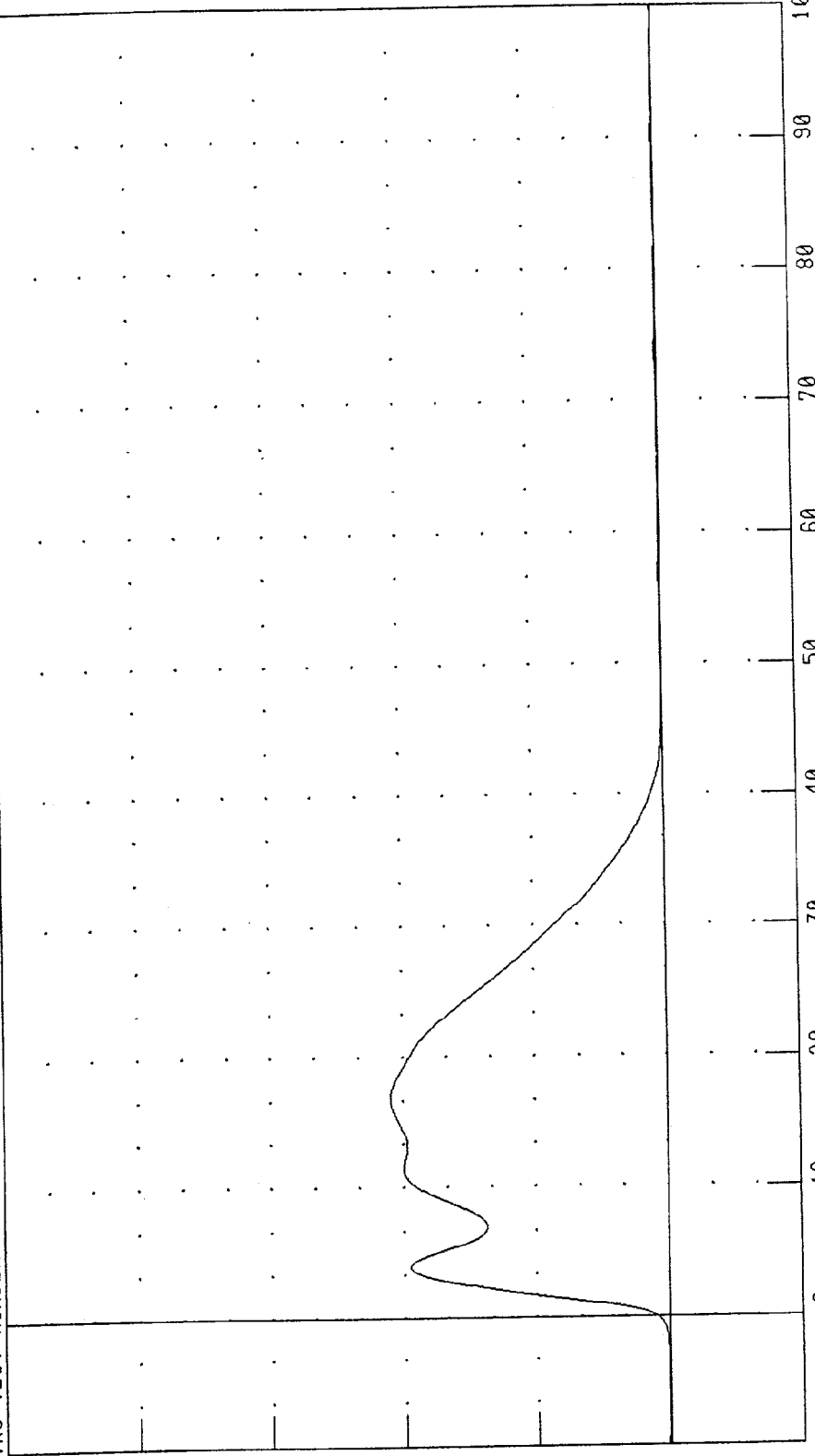
20

0

-20

-10

FORCE (N X 10²)



TIME (MS)

PEAK DATA: 4182.07 N @ 16.88 MS; 0.31 N @ 82.32 MS

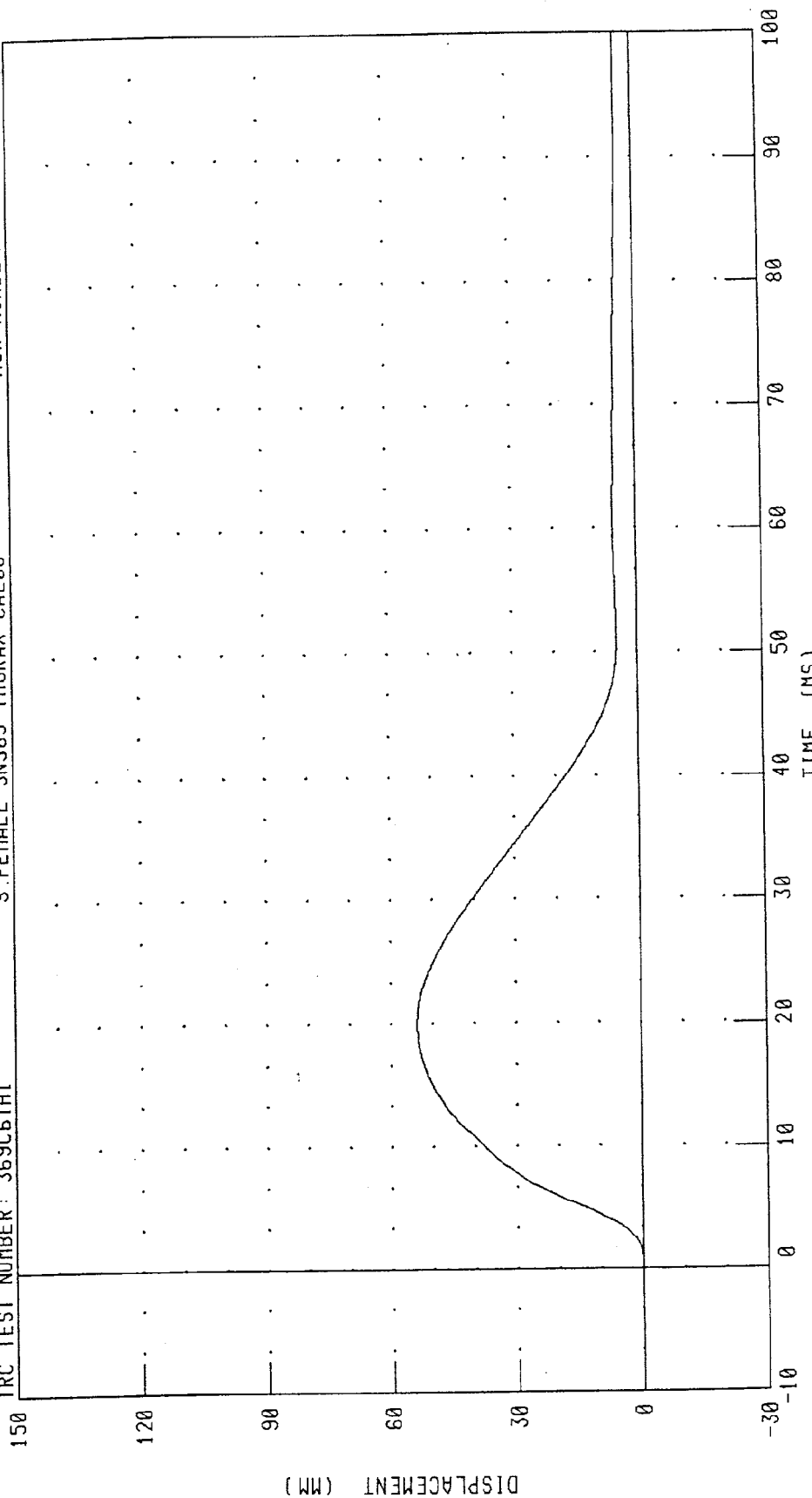
CHANNEL: PENXF FILTER: CH. CLASS 180

SMALL FEMALE THORAX CALIBRATION
STERNUM DISPLACEMENT

TRC TEST NUMBER: 369C6TH1

S. FEMALE SN369 THORAX CAL06

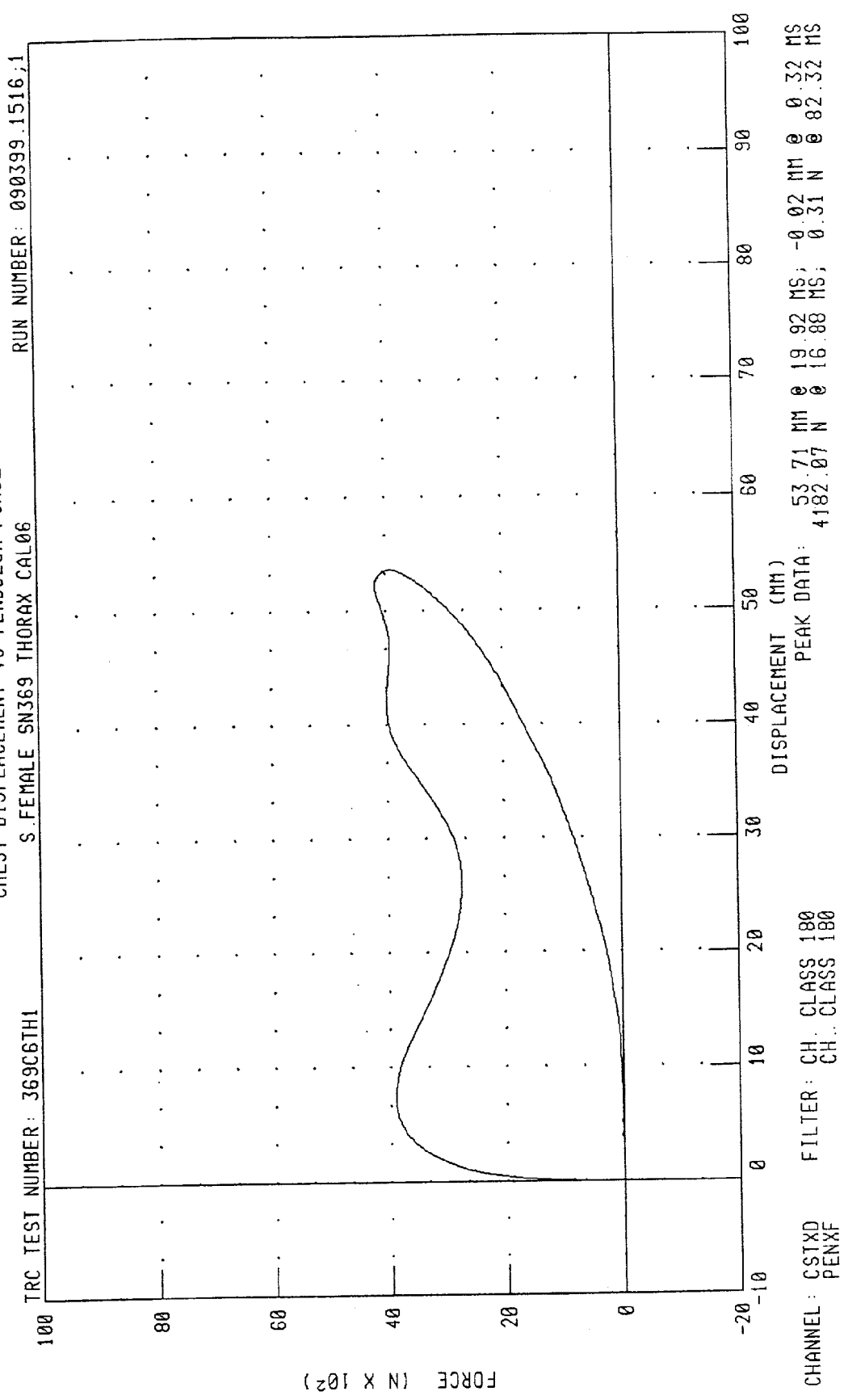
RUN NUMBER: 090399.1516;1



PEAK DATA: 53.71 MM @ 19.92 MS; -0.02 MM @ 0.32 MS

CHANNEL: CSTXD FILTER: CH. CLASS 180

SMALL FEMALE THORAX CALIBRATION
CHEST DISPLACEMENT VS PENDULUM FORCE



TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III SMALL FEMALE

03-SEP-99

TRC INC.

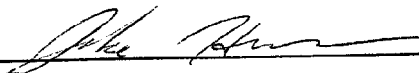
TEST NO: 369C6RK2

S.FEMALE SN369 R.KNEE CAL6

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	55.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.07 M/S
PEAK KNEE IMPACT FORCE 3.0 KG PENDULUM	3360 - 4080 N	3728.0 N

TEST MEETS SPECIFICATIONS

TECHNICIAN



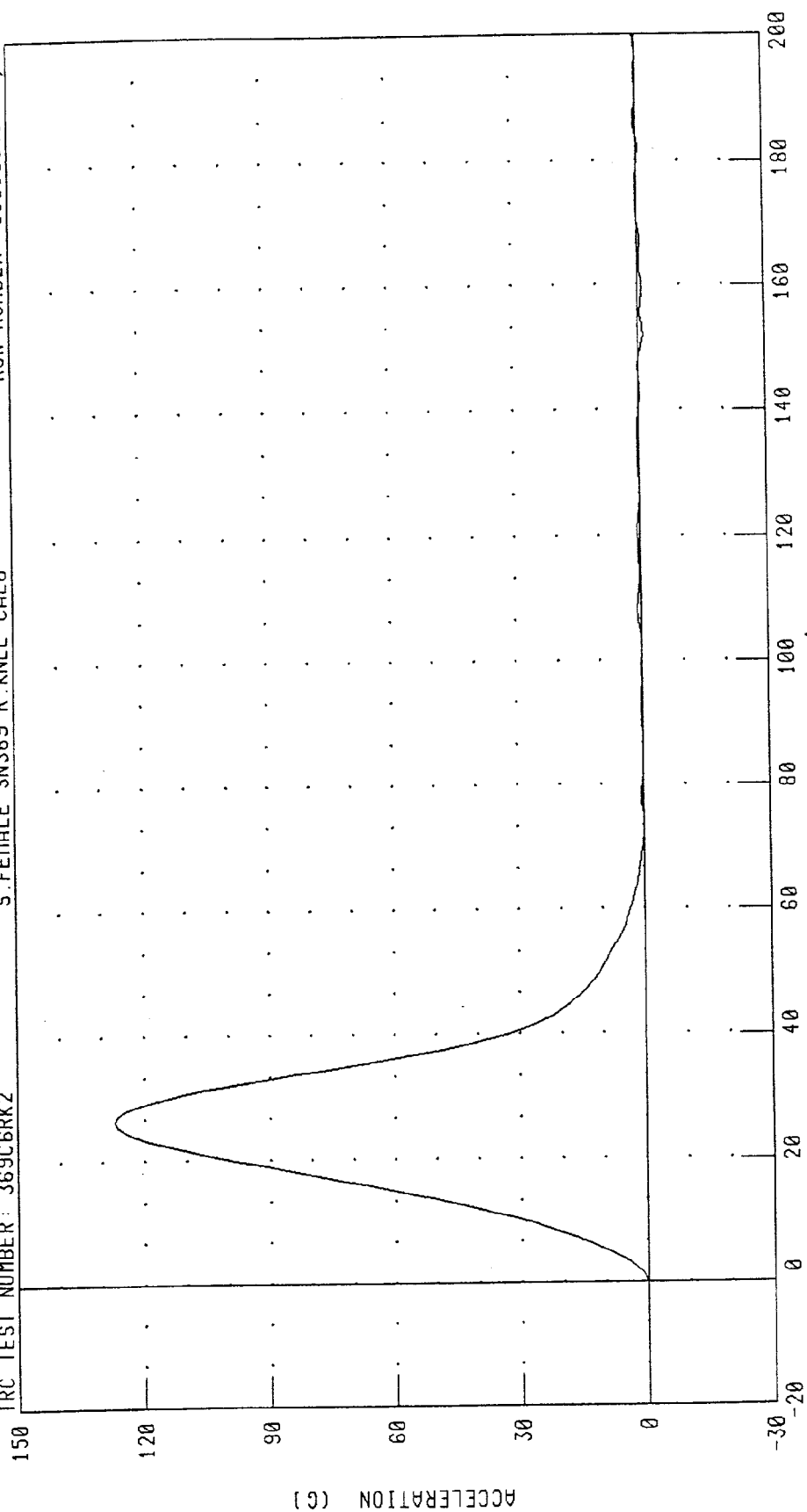
RUN NUMBER: 090399.1226;1

SMALL FEMALE HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

S.FEMALE SN369 R.KNEE CAL6

RUN NUMBER: 090399.1227,1

TRC TEST NUMBER: 369C6RK2



PEAK DATA: 126.99 G @ 2.64 MS; -1.24 G @ 15.20 MS

CHANNEL: PENXC FILTER: CH. CLASS 600

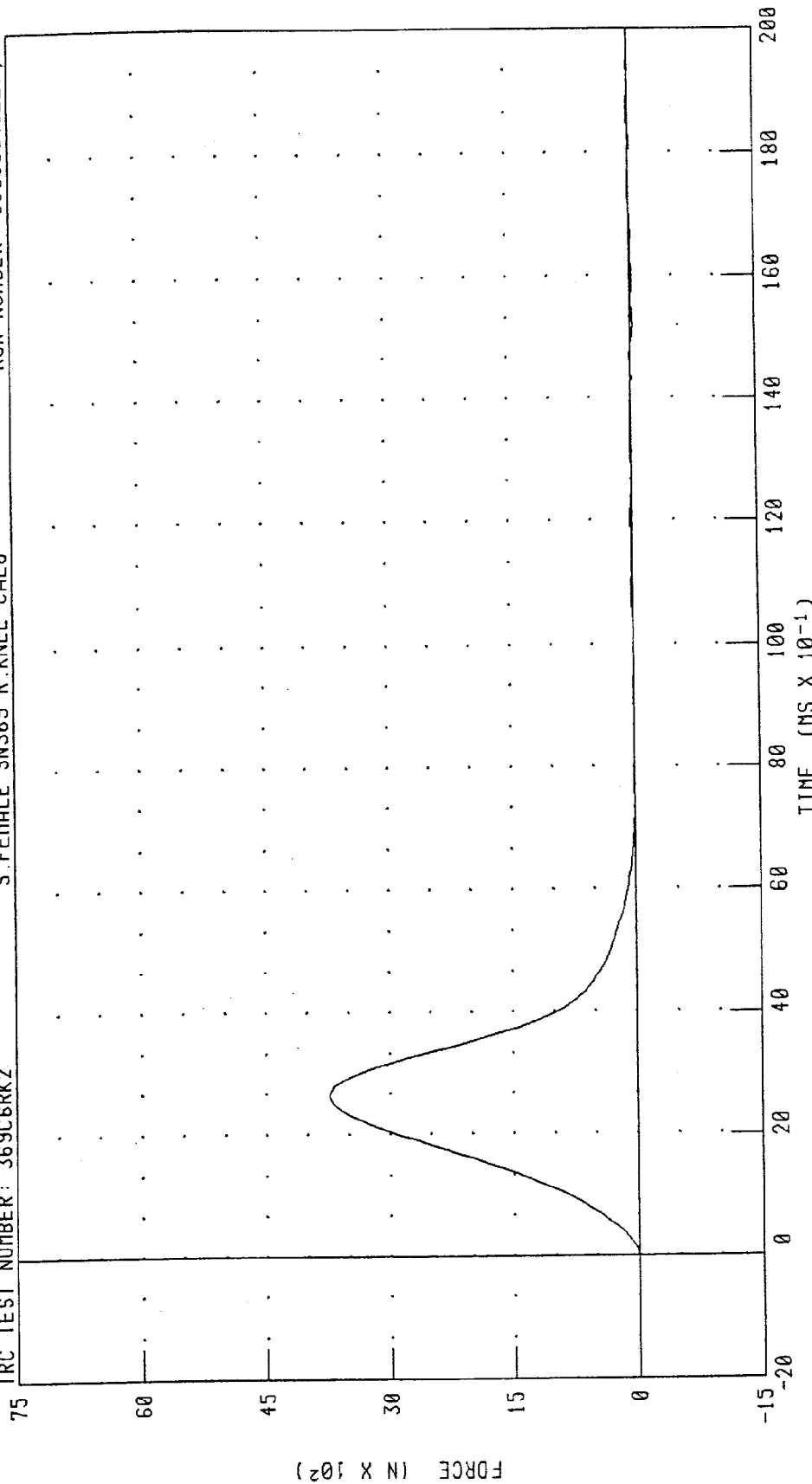
SMALL FEMALE HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

S. FEMALE SN369 R. KNEE CAL6

RUN NUMBER: 090399.1227,1

TRC TEST NUMBER: 369C6RK2



TIME (MS X 10⁻¹)

PEAK DATA: 3728.01 N @ 2.64 MS; -36.48 N @ 15.20 MS

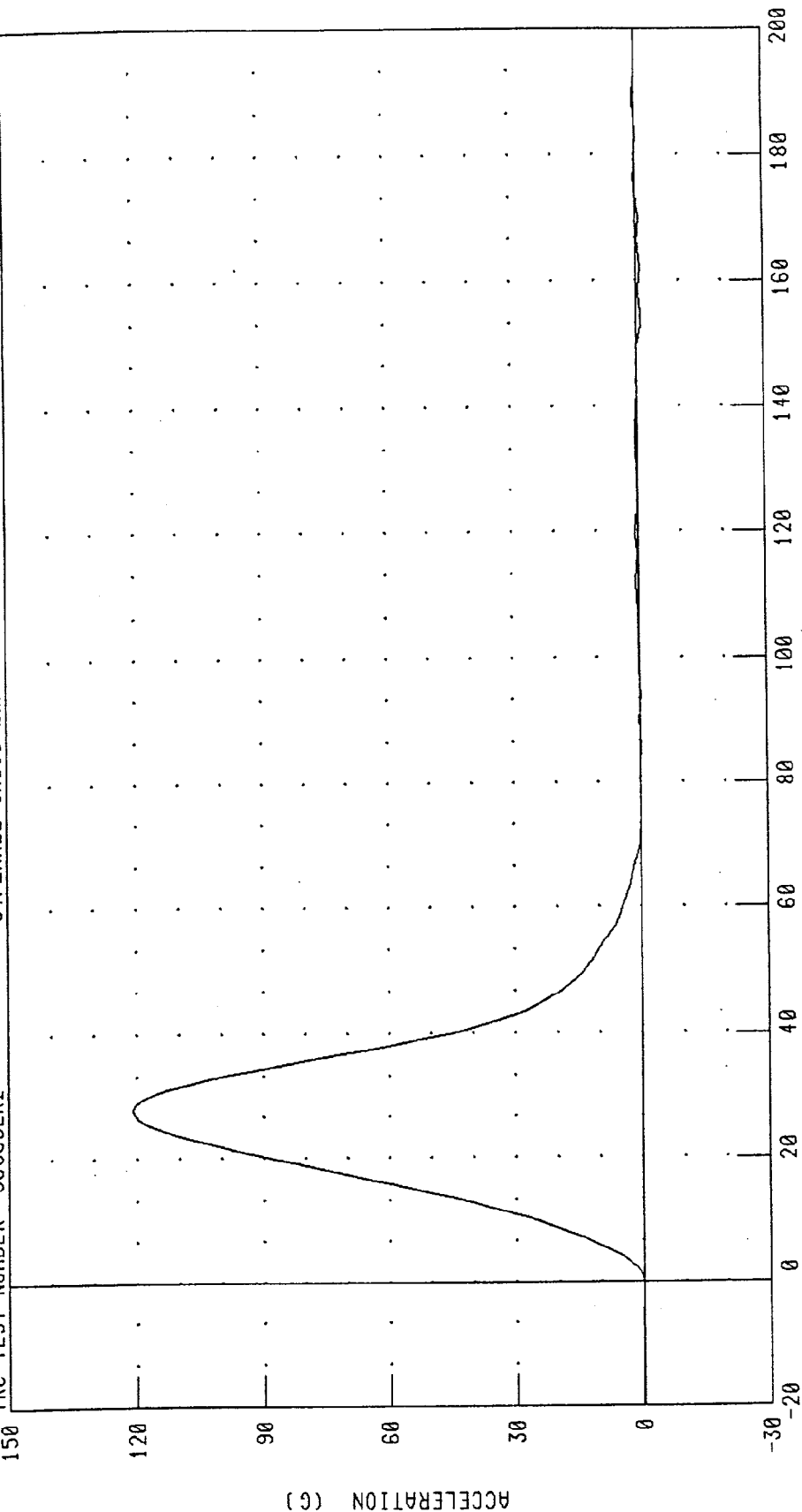
CHANNEL: PENXF FILTER: CH. CLASS 600

SMALL FEMALE HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 369C6LK2

S.FEMALE SN369 LEFT KNEE CALS

RUN NUMBER: 090399.1230.1



CHANNEL: PENXC FILTER: CH. CLASS 600

PEAK DATA: 120.96 G @ 2.80 MS; -1.18 G @ 15.44 MS

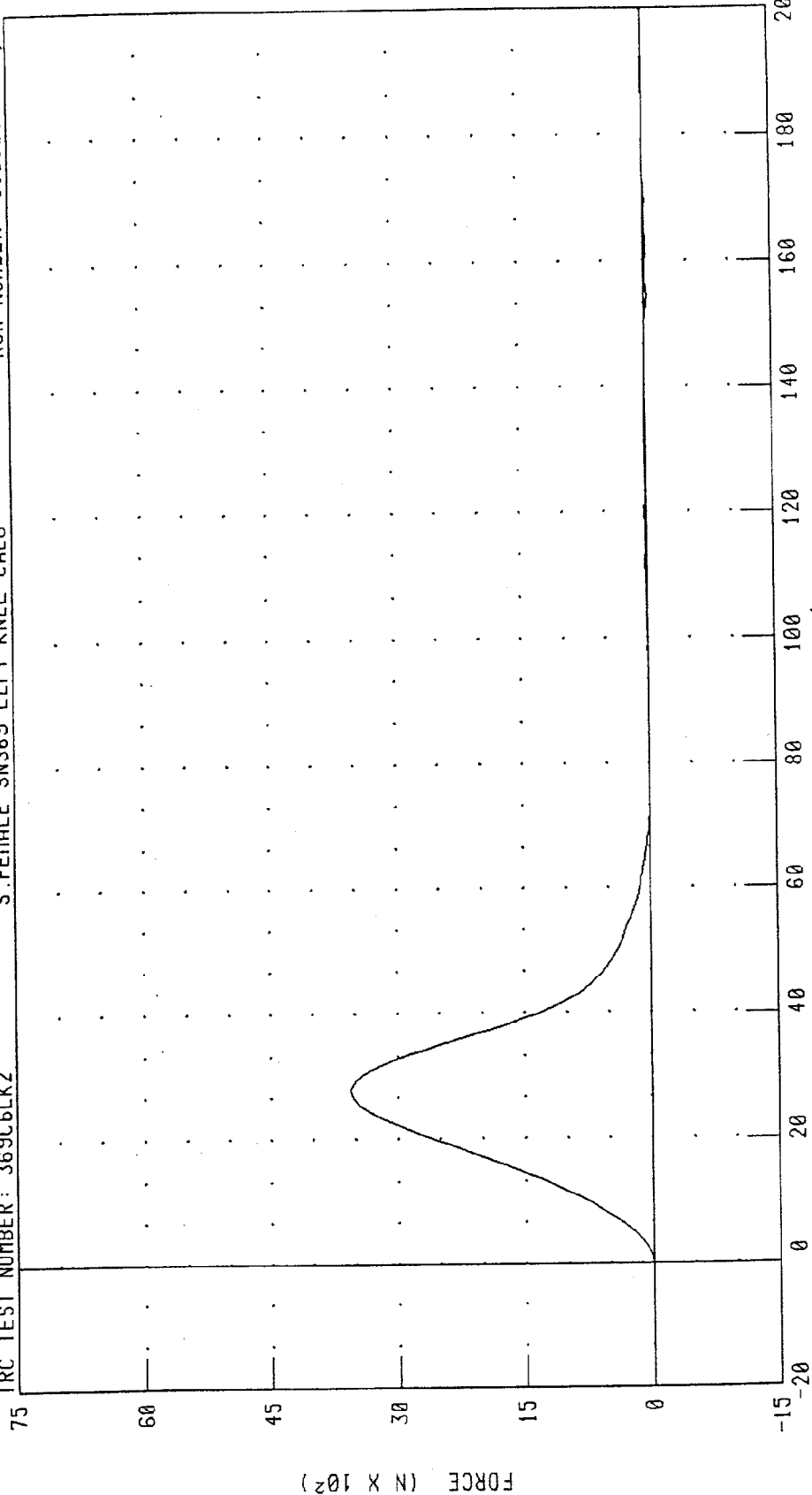
SMALL FEMALE HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

S.FEMALE SN369 LEFT KNEE CAL6

RUN NUMBER: 090399.1230;1

TRC TEST NUMBER: 369C6LK2



PEAK DATA: 3551.10 N @ 2.80 MS; -34.68 N @ 15.44 MS

CHANNEL: PENXF FILTER: CH. CLASS 600

Appendix D

Miscellaneous Test Information

Dummy Sign Convention

Accelerometers:

+X: Forward
+Y: Rightward
+Z: Downward

Potentiometers:

+Chest longitudinal deflection: Outward

Load cells:

+Femur force: Tension

Neck load cells:

+X force: Head rearward
+Y force: Head leftward
+Z force: Head upward (tension on neck)
+X moment: Left ear rotating toward left shoulder
+Y moment: Chin rotating toward chest
+Z moment: Chin rotating toward left shoulder

Filtering Data

J211 MAR95

Load Cell Barrier Forces Class 60

Vehicle Structural Accelerations Class 60

Occupant

Head Accelerometer Class 1000

Neck Class 60

Chest Accelerometer Class 180

Chest Deflection Class 180

Femur Force Class 600

Sternum Accelerometer Class 180

Lower Leg Class 600

Accelerometer Information

Engineer: Rhule
 Test Date: Feb-98
 Dummy S/N: 289
 Type: 5th female

Mnemonic Parameter Being Measured	Description	Model Number	Serial Number	Mfr.	Sensitivity Mv/g @100 Hz	Cal Due Date	Full-Scale Desired G	Direction Of Positive Polarity
CSTXG	Chest X	7264	J20599	Endevco	0.2054	10/07/99	200	FWD
CSTYG	Chest Y	7264	J20580	Endevco	0.2237	10/07/99	200	LEFT
CSTZG	Chest Z	7264	EH88J	Endevco	0.2833	10/07/99	200	UP
STTXG	Sternum top X	7264	J20569	Endevco	0.2179	10/07/99	2000	FWD
STMXG	Sternum middle X	7264	J20064	Endevco	0.2279	10/07/99	2000	FWD
STBXG	Sternum bottom X	7264	J20570	Endevco	0.2230	10/07/99	2000	FWD
SPTXG	Spine top X	7264	J19872	Endevco	0.2406	10/07/99	200	REAR
SPMXG	Spine middle X	7264	J19877	Endevco	0.2472	10/07/99	200	REAR
SPBXG	Spine bottom X	7264	J19890	Endevco	0.2267	10/07/99	200	REAR
HEDXG	Head X	7264	J20165	Endevco	0.2225	10/07/99	200	REAR
HEDYG	Head Y	7264	J19865	Endevco	0.2129	10/07/99	200	LEFT
HEDZG	Head Z	7264	J19934	Endevco	0.2452	10/07/99	200	UP
PEVXG	Pelvis X	7264	CY06H	Endevco	0.3020	10/07/99	200	REAR
PEVYG	Pelvis Y	7264	AGAC4	Endevco	0.2385	10/07/99	200	LEFT
PEVZG	Pelvis Z	7264	BF65J	Endevco	0.3357	10/07/99	200	UP
PEVYGA	Pelvis Y	7264	J20218	Endevco	0.2473	10/27/99	200	RIGHT

Accelerometer Information

Engineer: Rhule
 Test Date: Feb-98
 Dummy S/N: 289
 Type: Hybrid III 5th percentile

Mnemonic Parameter Being Measured	Description	Model Number	Serial Number	Sensitivity (mV/V)	Cal Due Date	Full-Scale Desired G	Direction Of Positive Polarity
Neck Load Cell							
NEKXF	Neck X-force	1716	425	1.6944 @ 2,000 lbs	10/07/99	2000	Head forward/chest rearward
NEKYF	Neck Y-force	1716	425	1.6421 @ 2,000 lbs	10/07/99	2000	Head left/chest right
NEKZF	Neck Z-force	1716	425	1.1515 @ 3,000 lbs	10/07/99	3000	Head up/chest down
NEKXM	Neck X-moment	1716	425	1.5817 @ 2500 in-lbs	10/07/99	2500	Right ear to right shoulder
NEKYM	Neck Y-moment	1716	425	1.6308 @ 2500 in-lbs	10/07/99	2500	Chin forward to sternum
NEKZM	Neck Z-moment	1716	425	2.2688 @ 2500 in-lbs	10/07/99	2500	Chin to left shoulder
Femur Load Cells							
Left femur							
LFXF	Left femur X-force	1914	0259	1.9091 @ 3000 lbs	10/07/99	3000	Knee upward/upper femur down
LFMYF	Left femur Y-force	1914	0259	1.9105 @ 3000 lbs	10/07/99	3000	Knee left/upper femur right
LFMZf	Left femur Z-force	1914	0259	1.1840 @ 5000 lbs	10/07/99	5000	Knee forward/pelvis rearward
LFXM	Left femur X-moment	1914	0259	1.4989 @ 3000 in-lbs	10/07/99	3000	Knee left, hold upper femur in place
LFMYM	Left femur Y-moment	1914	0259	1.5040 @ 3000 in-lbs	10/07/99	3000	Knee up, hold upper femur in place
LFMZM	Left femur Z-moment	1914	0259	2.6742 @ 3000 in-lbs	10/07/99	3000	Twist knee to right, hold up femur
Right femur							
RFXF	Right femur X-force	1914	0257	1.9130 @ 3000 lbs	10/07/99	3000	Knee upward/upper femur down
RFMYF	Right femur Y-force	1914	0257	1.9299 @ 3000 lbs	10/07/99	3000	Knee left/upper femur right
RFMZf	Right femur Z-force	1914	0257	1.1926 @ 5000 lbs	10/07/99	5000	Knee forward/pelvis rearward
RFXM	Right femur X-moment	1914	0257	1.4705 @ 3000 in-lbs	10/07/99	3000	Knee left, hold upper femur in place
RFMYM	Right femur Y-moment	1914	0257	1.5124 @ 3000 in-lbs	10/07/99	3000	Knee up, hold upper femur in place
RFMZM	Right femur Z-moment	1914	0257	2.5006 @ 3000 in-lbs	10/07/99	3000	Twist knee to right, hold up femur

Engineer: Rhule
Test Date: Feb-98
Dummy S/N: 289
Type: Hybrid III 5th percentile

[illegible]

TRANSDUCER INFORMATION

5th Female HYBRID III DUMMY SERIAL NO.: 289v ; MFR.: ; SEATING POSITION: DR
 PROJECT-SEGMENT NO.: 096017 1514 ; ENGINEER: JJ ; TEST DATE: 9-1-99 -3

MNEMONIC PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NO.	SERIAL NO.	MFR.	SENSITIVITY	CAL DATE	FULL SCALE (ENGR. UNITS)		DIRECTION OF POSITIVE POLARITY	CABLE NO.
							DESIRED	ACTUAL		
KNLLF	LEFT KNEE LEFT SENSOR FORCE	1587	-LEFT	DEN	1.2872mv/v at 2000 lb.	1997	2,000 lbs. 9,000 N			-LEFT
KNLMF	LEFT KNEE RIGHT SENSOR FORCE	"	-RIGHT	"	1.2866 mv/v at 2000 lb.	"	2,000 lbs. 9,000 N			-RIGHT
KNRMF	RIGHT KNEE LEFT SENSOR FORCE	"	-LEFT	"	1.3049 mv/v at 2000 lb.	"	2,000 lbs. 9,000 N			-LEFT
KNRLF	RIGHT KNEE RIGHT SENSOR FORCE	"	-RIGHT	"	1.2844 mv/v at 2000 lb.	"	2,000 lbs. 9,000 N			-RIGHT
KNLXD	LEFT KNEE DISPLACEMENT	8TC1- 2702	018L V	SERV O	981.2 mv/v/in	8-11- 1999	1 inch 25 mm			018L
KNRXD	RIGHT KNEE DISPLACEMENT	"	018R V	"	1016 mv/v/in	"	1 inch 25 mm			018R
TBLXF	LEFT UPPER TIBIA X AXIS FORCE	3115	265-FX V	DEN	1.9815 mv/v at 2500 lb.	8-11- 1999	2,500 lbs. 11,000 N			265-FX
TBLXM	LEFT UPPER TIBIA MOMENT ABOUT X AXIS	"	265-MX	"	2.9510 mv/v at 3500 in- lb.	"	300 ft-lbs 400 N-m			265-MX
TBLYM	LEFT UPPER TIBIA MOMENT ABOUT Y AXIS	"	265-MY	"	3.0172 mv/v at 3500 in- lb.	"	300 ft-lbs 400 N-m			265-MY

TRANSDUCER INFORMATION

5th Female HYBRID III DUMMY SERIAL NO.: 289v; MFR.: _____; SEATING POSITION: DR _____
 PROJECT-SEGMENT NO.: 096017-1514; ENGINEER: JJ _____; TEST DATE: 9-1-99-3

MNEMONIC PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NO.	SERIAL NO.	MFR.	SENSITIVITY	CAL DATE	FULL SCALE (ENGR. UNITS)		DIRECTION OF POSITIVE POLARITY	CABLE NO.
							DESIRED	ACTUAL		
TBLZF	LEFT UPPER TIBIA Z AXIS FORCE	3115	265-FZ	DEN	1.1181 mv/v at 2500 lb.	8-11- 1999	2,500 lbs. 11,000 N			265-FZ
TBRXF	RIGHT UPPER TIBIA X AXIS FORCE	"	266-FX V	"	1.9341 mv/v at 2500 lb.	"	2,500 lbs. 11,000 N			266-FX
TBRXM	RIGHT UPPER TIBIA MOMENT ABOUT X AXIS	"	266-MX	"	2.9020 mv/v at 3500 in- lb.	"	300 ft-lbs 400 N-m			266-MX
TBYM	RIGHT UPPER TIBIA MOMENT ABOUT Y AXIS	"	266-MY	"	2.9367 mv/v at 3500 in- lb.	"	300 ft-lbs 400 N-m			266-MY
TBRZF	RIGHT UPPER TIBIA Z AXIS FORCE	"	266-FZ	"	1.0885 mv/v at 2500 lb.	"	2,500 lbs. 11,000 N			266-FZ
ANLXF	LEFT LOWER TIBIA X-AXIS FORCE	3287	178-FX V	"	1.9204 mv/v at 2500 lb.	"	2,500 lbs. 11,000 N			178-FX
ANLZF	LEFT LOWER TIBIA Z-AXIS FORCE	"	178-FZ	"	1.0526 mv/v at 2500 lb.	"	2,500 lbs. 11,000 N			178-FZ
ANLXM	LEFT LOWER TIBIA MOMENT ABOUT X AXIS	"	178-MX	"	2.9612 mv/v at 3500 in- lb.	"	300 ft-lbs 400 N-m			178-MX
ANLYM	LEFT LOWER TIBIA MOMENT ABOUT Y AXIS	"	178-MY	"	2.9779 mv/v at 3500 in - lb.	"	300 ft-lbs 400 N-m			178-MY

SEATING POSITION: DR _____

5th Female HYBRID III DUMMY SERIAL NO.: 289v___; MFR.: _____;

PROJECT SEGMENT NO. 096017-1514 ; ENGINEER: JJ

TEST DATE: 9-1-99-3

[illegible]

TRANSDUCER INFORMATION

5th Female HYBRID III DUMMY SERIAL NO.: 3691; MFR.: ; SEATING POSITION: PASS

PROJECT-SEGMENT NO.: 096017 1514; ENGINEER: JJ; TEST DATE: 9-1-99 -3

MNEMONIC PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NO.	SERIAL NO.	MFR.	SENSITIVITY	CAL DUE DATE	FULL SCALE (ENGR. UNITS) DESIRED ACTUAL	DIRECTION OF POSITIVE POLARITY	CABLE NO.
HEDXG HAP	HEAD X-AXIS ACCEL.	7264	A20FJ	End.	.2563 mv/g at 10 volts	12-2- 1999	400 g	Rear	A20FJ
HEDYG HLR	HEAD Y-AXIS ACCEL.	"	A31FJ	"	.2683 mv/g at 10 volts	"	400 g	Left	A31FJ
HEDZG HIS	HEAD Z-AXIS ACCEL.	"	CL95H	"	.2822 mv/g at 10 volts	"	400 g	Up	CL95H
NEKXF NFX	NECK X-AXIS SHEAR FORCE	1716A	0534	DEN	1.7247 mv/v at 2000 lbs.	12-2- 1999	2,000 lbs. 9,000 N		FX
NEKYF NFY	NECK Y-AXIS SHEAR FORCE	"	"	"	1.6643 mv/v at 2000 lbs.	"	2,000 lbs. 9,000 N		FY
NEKZF NFZ	NECK Z-AXIS AXIAL FORCE	"	"	"	1.1561 mv/v at 3000 lbs.	"	3,000 lbs. 13,500 N		FZ
NEKXM NMX	NECK MOMENT ABOUT X AXIS	"	"	"	1.6355 mv/v at 2500 in. lbs.	"	200 ft·lbs 275 N·m		MX
NEKYM NMY	NECK MOMENT ABOUT Y AXIS	"	"	"	1.6430 mv/v at 2500 in. lbs.	"	200 ft·lbs 275 N·m		MY
NEKZM NMZ	NECK MOMENT ABOUT Z AXIS	"	"	"	2.3186 mv/v at 2500 in. lbs.	"	200 ft·lbs 275 N·m		MZ

TRANSDUCER INFORMATION

5th Female HYBRID III DUMMY SERIAL NO.: 3691; MFR.: ; SEATING POSITION: PASS

PROJECT-SEGMENT NO.: 096017 1514; ENGINEER: JJ; TEST DATE: 9-1-99 -3

MNEMONIC PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NO.	SERIAL NO.	MFR.	SENSITIVITY	CAL. DUE DATE	FULL SCALE (ENGR. UNITS) DESIRED ACTUAL	DIRECTION OF POSITIVE POLARITY	CABLE NO.
CSTXG CAP	CHEST X-AXIS ACCEL.	7264	A72JJ	End.	.2773 mv/g at 10 volts	12-2- 1999	400 g	Forward	A72JJ
CSTYG CLR	CHEST Y-AXIS ACCEL.	"	A69JJ	"	.2702 mv/g at 10 volts	"	400 g	Left	A69JJ
CSTZG CIS	CHEST Z-AXIS ACCEL.	"	A34FJ	"	.2565 mv/g at 10 volts	"	400 g	Up	A34FJ
CSTXD CAPD	CHEST DEFLECTION	14CB1- 2897	1188	Bourn	43.6 mv/v/in	"	6 inch 150 mm	Extension	1188
PEVXG PAP	PELVIS X-AXIS ACCEL.	7264	CY31H	End.	.2031 mv/g at 10 volts	"	400 g	Rear	C14981
PEVYG PLR	PELVIS Y-AXIS ACCEL.	"	A51JJ	"	.2917 mv/g at 10 volts	"	400 g	Left	C15183
PEVZG PIS	PELVIS Z-AXIS ACCEL.	"	A75JJ	"	.2695 mv/g at 10 volts	"	400 g	Up	C15184
LFMF LF	LEFT FEMUR FORCE	2430	1006	DEN	0.9459 mv/v at 3000 lbs.	12-2- 1999	1300 Kg 3,000 lbs. 13,500 N	Extension	1518
RFMF RF	RIGHT FEMUR FORCE	"	1007	"	0.9114 mv/v at 3000 lbs.	"	1300 Kg 3,000 lbs. 13,500 N	Extension	71

5th Female HYBRID III DUMMY SERIAL NO.: 3691; MFR.: _____; SEATING POSITION: _____ PASS _____
PROJECT-SEGMENT NO.: 096017 1514; ENGINEER: JJ _____; TEST DATE: 9-1-99 -3 _____

[illegible]

Vehicle Instrumentation Placement

Vehicle year/make/model/body style: 1999/Saturn/SL1/4-door sedan

Test number: 990901-7

Number	Location	Axis	Manufacturer	Model	S/N	Orientation (+ Sensing)
1	Left Brake Caliper	X	Entran	EGE-73BE-0QT	99A28-Z04	Rearward
2	Right Brake Caliper	X	Entran	EGE-73BE-0QT	99A28-Z21	Forward
3	Instrument Panel Center	X	Endevco	7264-2000T	J27471	Forward
		Y	Endevco	7264-2000T	J27229	Left
4	Engine Top	X	Entran	EGE-73BE-0QT	99A28-Z23	Forward
5	Engine Bottom	X	Endevco	EGE-73BE-0QT	99A28-Z08	Rearward
6	Vehicle Rear Center	Y	Endevco	7264-2000T	J25921	Right
		Z	Entran	EGE-73BE-0QT	99A28-Z15	Up
7	Left Rear Seat Crossmember	X	Endevco	7264-2000T	J28469	Forward
		Y	Endevco	7264-2000T	J27328	Left
8	Right Rear Seat Crossmember	X	Entran	EGE-73BE-0QT	99A28-Z07	Forward
		Y	Entran	EGE-73BE-0QT	99A28-Z01	Left
9	Driver Airbag	N/A	Fluke	Y8101A	IP1	N/A
10	Passenger Airbag	N/A	Fluke	Y8101A	IP2	N/A

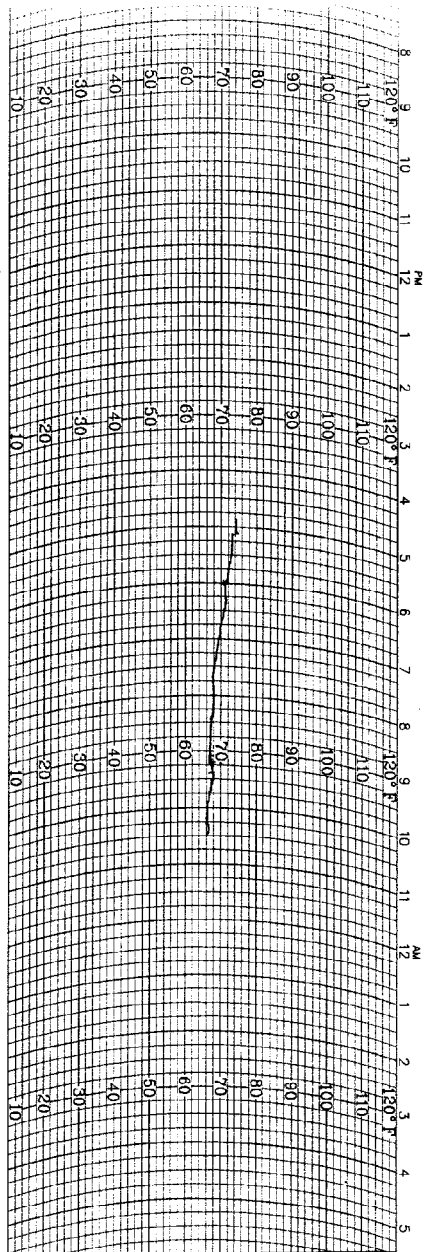
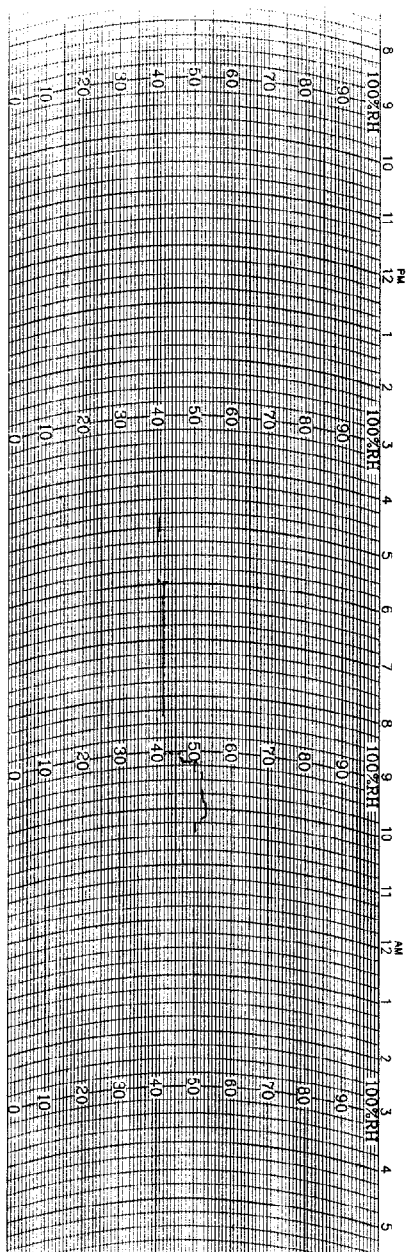
Description Of Timing Marks On TRC High-Speed Film

All TRC high-speed cameras are equipped with red LEDs which put timing marks on the right edge of the film. TRC uses a single timing generator to generate the timing for all cameras. This allows the timing marks to be common to all cameras. The timing marks can be used to measure camera speed (frames per second) or to locate a point in time before or after the time-zero event.

The timing marks appear on the film as small red marks on the right edge of the film. Round marks are left by the Photo-Sonics and Stalex cameras while horizontal bars are left by the Hycam, Locam, and Fastax II cameras.

The timing generator puts out a pulse for every millisecond plus it generates additional pulses for hundredths and tenths of seconds. To explain this further, we can use an example of a camera running at 1000 frames per second.

1. Every frame will have **one** LED appear in it. This indicates a *millisecond* pulse.
2. Every ten frames will have **two** LEDs appear in it. These indicate a *millisecond* pulse plus a *hundredth of a second* pulse.
3. Every one hundred frames will have **three** LEDs appear in it. These indicate a *millisecond* pulse, a *hundredth of a second* pulse, and a *tenth of a second* pulse.



WeatherMeasure
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HYGROTHERMOGRAPH
1 DAY

CHART NO. W599123
C311-D-HF
ECN 2717
6-9-87

VCTR

0-1-6A