

Report Number NCAP-TRC-98-005

V 2820

2121

New Car Assessment Program (NCAP)

Flat Frontal Barrier Impact Test

Volvo Gothenburg Sweden

1998 Volvo S-70

4-Door Sedan

NHTSA Number: MW5900

TRC Test Number: 980219

Prepared By:

Transportation Research Center Inc.

10820 State Route 347

East Liberty, OH 43319



February 19, 1998

Final Report

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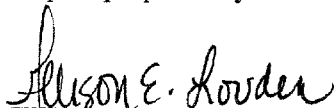
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Washington, DC 20590

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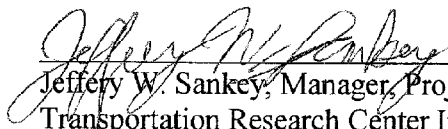
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16. Abstract A 56 kph (35 mph) flat frontal barrier impact test was conducted on a 1998 Volvo S-70 4-door sedan, NHTSA No. MW5900, at Transportation Research Center Inc. on February 19, 1998. This test was conducted in accordance with Office of Crashworthiness Standards NCAPTP090196 for the determination of vehicle crashworthiness. The barrier impact velocity was 56.3 kph. The vehicle's maximum static crush was 584 millimeters. The ambient temperature was 21° C. The driver's Head Injury Criteria (HIC) was 259. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 45.5 g. The driver's maximum chest deflection was 39 millimeters. The driver's left and right femur maximum axial forces were 2869 N and 4952 N, respectively. The passenger's HIC was 294. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 41.3 g. The passenger's maximum chest deflection was 25 millimeters. The passenger's left and right femur maximum axial forces were 2658 N and 3500 N, respectively.			
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
m ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SD Catalog No. C13.10-286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
m ³	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

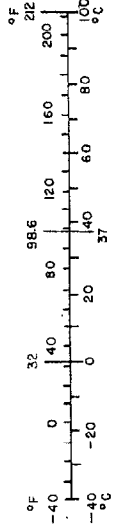


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Section 1.0

Purpose and Test Procedure

Purpose

This 56 kph (35 mph) frontal barrier impact test is part of the New Car Assessment Program (NCAP) conducted for the National Highway Traffic Safety Administration's (NHTSA) Office of Crashworthiness Standards by Transportation Research Center Inc. (TRC) under Contract Number DTNH22-96-D-22010.

The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for the subject vehicle, a 1998 Volvo S-70 4-door sedan, NHTSA Number MW5900, at an impact speed of 56.3 kph (35.0 mph) FMVSS 208, 212, 219, and 301 requirements.

Test Procedure

This 56 kph (35 mph) test was conducted in accordance with NHTSA's Office of Crashworthiness Standards Laboratory Indicant Test Procedure, NCAPTP090196. Data was obtained indicant of FMVSS 208, "Occupant Crash Protection"; FMVSS 212, "Windshield Retention"; FMVSS 219, "Windshield Zone Intrusion"; and FMVSS 301, "Fuel System Integrity," performance.

The test vehicle was instrumented with nine (9) accelerometers to measure longitudinal axis accelerations. The driver's and passenger's restraint systems were instrumented with load cells to measure lap and shoulder belt forces and potentiometers to measure shoulder belt stretch and spoolout. The vehicle impacted a flat frontal barrier. The vehicle's specified impact velocity range was 55.5 to 57.1 kph.

The test vehicle contained two (2) Part 572E 50th percentile adult male anthropomorphic test devices (dummies). The dummies were positioned in the front outboard designated seating positions according to the dummy placement procedures specified in Appendix B of the Laboratory Indicant Test Procedure. This test was the third use of the driver dummy and the first use of the passenger dummy.

Both dummies were instrumented with primary and redundant head and chest accelerometers to measure longitudinal, lateral, and vertical accelerations, and with left and right femur load cells to measure axial forces. The dummies were also instrumented with neck moment and force load cells, chest deflection potentiometers, foot accelerometers to measure longitudinal and vertical axis accelerations, and upper and lower tibia load cells to measure forces and moments.

The ninety-seven (97) data channels were digitally sampled and recorded at 12,500 samples per second and processed per Section 11.13 of the Laboratory Indicant Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and sixteen (16) high-speed motion picture cameras. The pre- and post-test conditions were recorded by one (1) real-time motion picture camera.

The vehicle and occupant data are presented in Section 2.0. The occupant, camera, and vehicle measurements are presented in Section 3.0. Appendix A contains the still photographic prints. Appendix B contains the dummy and vehicle data plots. Appendix C contains the dummy certification data. Appendix D contains miscellaneous test information. Appendix E contains the restraint system instructions from the owner's manual.

Section 2.0

Frontal Barrier Impact Test Summary

Test Results Summary

This flat frontal barrier test was conducted at TRC on February 19, 1998.

The test vehicle, a 1998 Volvo S-70 4-door sedan, NHTSA Number MW5900, was equipped with a 2.4-liter transverse engine, automatic transmission, power steering, and power brakes. The vehicle's test weight was 1738.5 kg. The vehicle's impact speed was 56.3 kph. The vehicle sustained 584 mm of static crush during the impact.

The driver's Head Injury Criteria (HIC) was 259. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 45.5 g. The driver's maximum chest deflection was 39 mm. The driver's left and right femur maximum axial forces were 2869 N and 4952 N, respectively.

The right front passenger's HIC was 294. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 41.3 g. The passenger's maximum chest deflection was 25 mm. The passenger's left and right femur maximum axial forces were 2658 N and 3500 N, respectively.

There was 97% retention of the windshield.

There was no penetration through the windshield.

Following the impact, no fluid spilled from the vehicle's fuel system prior to the static rollover test or during the static rollover test.

Data Acquisition Explanations

The driver dummy's seat belt extension potentiometer, SBED1, went open several times during the impact.

The passenger dummy's seat belt extension potentiometer, SBED2, did not measure any data.

The vehicle's engine top X-axis data channel, ENGXG1, recorded questionable data throughout the impact.

Table 1 Crash Test Summary

NHTSA number:	MW5900	
Test type:	Flat Frontal Barrier	
Test date:	02/19/98	
Test time:	1646	
Ambient temperature:	21° C	
Vehicle year/make/ model/body style:	1998/Volvo/S-70/4-door sedan	
Vehicle test weight:	1738.5 kg	
Impact angle ¹ :	0°	
Impact velocity ² :	Primary = 56.3 kph Secondary = 56.4 kph	
Maximum static crush:	584 mm	
Average rebound:	911 mm	
Dummies:	Driver #142	Passenger #192
Type:	Part 572 E	Part 572 E
Location:	Left front	Right front
Restraint:	Airbag and 3-point unbelt	Airbag and 3-point unbelt
Number of data channels:	40	40
Number of cameras:	High-speed 16 Real-time 1	

¹ With respect to tow track centerline.

² Speed trap measurement (± .08 kph accuracy)

Table 2 Test Vehicle Information

Vehicle year/make/
model/body style: 1998/Volvo/S-70/4-door sedan

Color: Blue

VIN: YV1LS5570W2506462

NHTSA number: MW5900

Engine data:

Placement: Transverse

Cylinders: 5

Displacement 2.4 liters

Transmission data: 3 speed, manual, X automatic, overdrive
 FWD, X RWD, 4WD AWD

Date vehicle received: 02/13/98

Odometer reading: 61

Dealer's name
and address: George Byers Sons Inc.
401 N. Hamilton Road, Columbus, OH 43216

Accessories:

Power steering	Yes	Automatic transmission	Yes
Power brakes	Yes	Automatic speed control	Yes
Power seats	Yes	Tilting steering wheel	Yes
Power windows	Yes	Telescoping steering wheel	Yes
Tinted glass	Yes	Air conditioning	Yes
Radio	Yes	Anti-skid brake	Yes
Clock	No	Rear window defroster	Yes

Other: Remote keyless entry, separate heater controls, heated mirrors

Certification data from vehicle's label:

Vehicle manufactured by: Volvo Gothenburg Sweden

Date of manufacture: 12/97

VIN: YV1LS5570W2506462

GVWR: 4180 lbs.

GAWR: Front: 2290 lbs.

Rear: 2000 lbs.

Table 2 Test Vehicle Information, Cont'd.

Size of tires: P195/60R15

Tire pressure with maximum
capacity vehicle load:

Front: 51 psi

Rear: 51 psi

Spare tire: T115/70D15

Type of front seats: Bucket

Type of rear seats: Bench

Tire & capacity data from vehicle's label:

Recommended tire size: P195/60R15

Recommended cold tire pressure:

Front: 36 psi

Rear: 36 psi

Designated seating capacity:

Front 2

Rear 3

Total 5

Vehicle capacity weight: 421.8 kg

Test vehicle attitude:

Delivered attitude: LF 653 mm; RF 655 mm; LR 643 mm; RR 646 mm

Pre-test attitude: LF 645 mm; RF 646 mm; LR 588 mm; RR 590 mm

Post-test attitude: LF 631 mm; RF 614 mm; LR 596 mm; RR 584 mm

Table 2 Test Vehicle Information Cont'd

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

Right front	442.3 kg	Right rear	282.6 kg
Left front	450.4 kg	Left rear	283.5 kg
Total front weight	892.7 kg	(61.2% of total vehicle weight)	
Total rear weight	566.1 kg	(38.8% of total vehicle weight)	
Total delivered weight	1458.8 kg		

Calculation of test vehicle's target test weight:

RCLW¹ = Rated cargo and luggage weight

UDW = Unloaded delivered weight (1458.8 kg)

VCW = Vehicle capacity weight (421.8 kg)

DSC = Designated seating capacity (5)

RCLW¹ = VCW - 68 (DSC) = 421.8 - 68(5) = 81.8 kg

Target test weight = UDW + RCLW¹ + (Number of Hybrid III dummies x 76 kg/dummy)

Target test weight = 1458.8 + 81.8 + 152 kg

Target test weight = 1692.6 kg

Weight of test vehicle with required dummies and 127.7 kg of cargo weight:

Right front	491.0 kg	Right rear	394.0 kg
Left front	458.0 kg	Left rear	395.5 kg
Total front weight	949.0 kg	(54.6% of total vehicle weight)	
Total rear weight	789.5 kg	(45.4% of total vehicle weight)	
Total test weight	1738.5 kg	(2.7% over target test weight)	

Weight of ballast secured in vehicle: None

Components removed to meet target test weight: Rear seat, seat belts, taillights, rear deck, and speakers.

CG rearward of front wheel centerline: 1212.5 mm

¹ Cargo weight for multipurpose passenger vehicles, trucks, and buses is the vehicle's rated cargo and luggage weight from the vehicle's label or 136 kilograms, whichever is less.

Table 3 Post-Impact Data

Test number: 980219
NHTSA number: MW5900
Test date: 02/19/98
Test time: 1646
Test type: Flat frontal barrier
Impact angle: 0°
Ambient temperature
at impact area: 21° C
Temperature in
occupant compartment: 21° C
Impact velocity:
Primary 56.3 kph
Secondary 56.4 kph
Specified range N/A

Distance from vehicle to barrier:

Entering velocity trap 381 mm
Exiting velocity trap 51 mm

Test vehicle static crush:

Overall length of test vehicle:

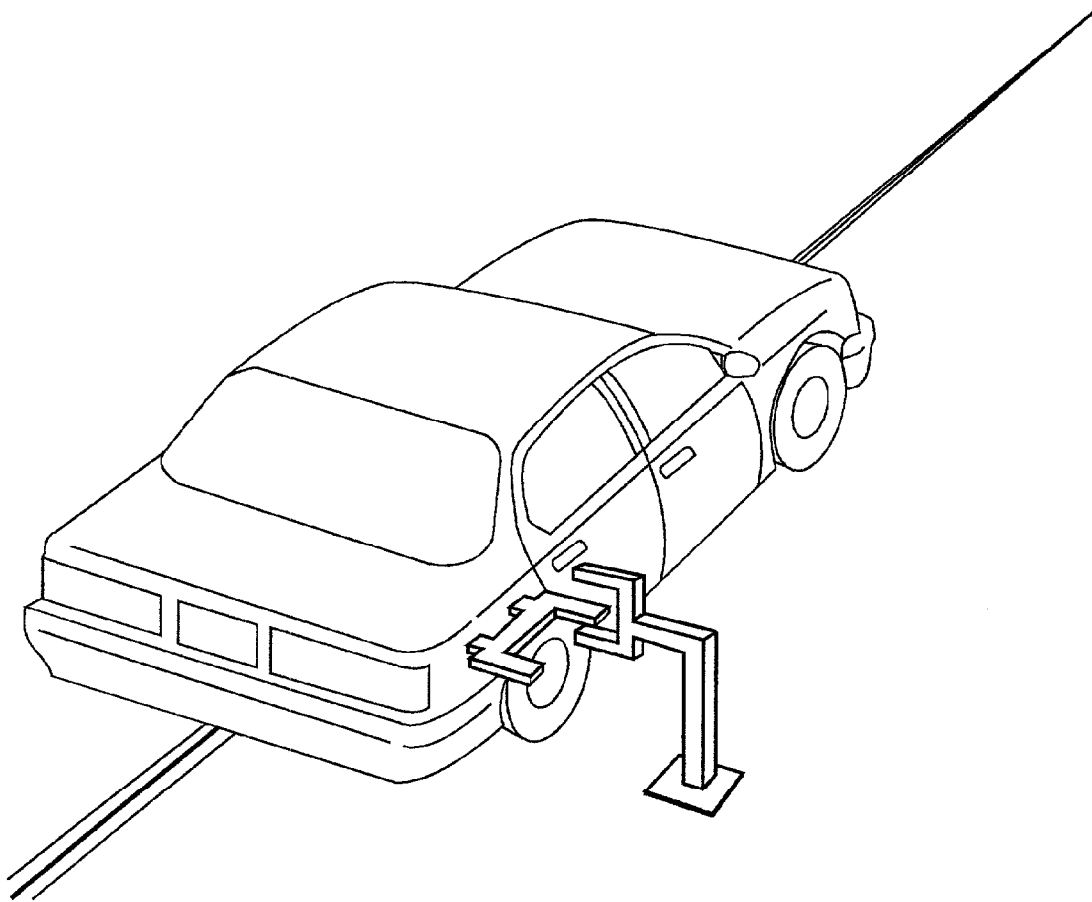
Pre-test: L 4625 mm; C 4770 mm; R 4612 mm
Post-test: L 4134 mm; C 4195 mm; R 4140 mm
Total crush: L 491 mm; C 575 mm; R 472 mm
Average crush: 513 mm

Test vehicle rebound from flat barrier:

Distance from test vehicle to barrier:

Post-test: L 929 mm; C 802 mm; R 921 mm
Average rebound 911 mm

Figure 1 Impact Velocity Measurement System



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

The vanes have 305-millimeter spacing.

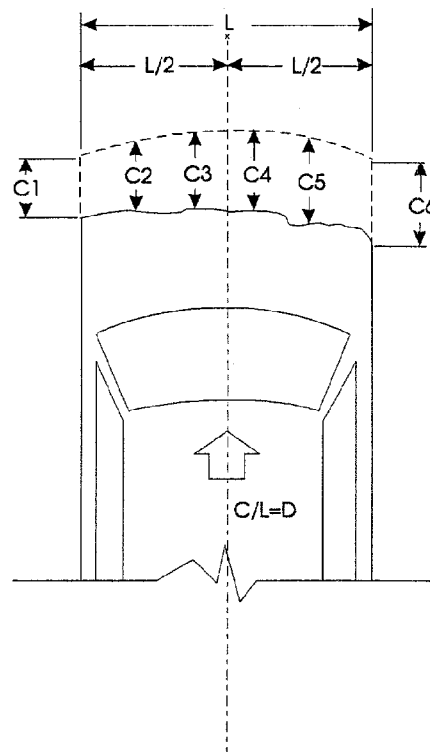
Figure 2 Accident Investigation Division Data
for 56 kph (35 mph) Frontal Barrier Impact

NHTSA number: MW5900
 Test date: 02/19/98
 Vehicle year/make/
 model/body style: 1998/Volvo/S-70/4-door sedan
 Vehicle size category: Mid-Size Car
 VIN: YV1LS5570W2506462
 Build date: 12/97
 Test weight: 1738.5 kg
 Vehicle wheelbase: 2670 mm
 Maximum width: 1752 mm
 Front overhang: 980 mm

Collision Deformation
 Classification (CDC) code: 12FDEW3

Crush depth
 measurements:

C1	=	491 mm
C2	=	547 mm
C3	=	584 mm
C4	=	575 mm
C5	=	560 mm
C6	=	472 mm



Midpoint of damage: D: Vehicle Longitudinal Centerline

Length of damaged region: L: 1524 mm

Figure 3 Vehicle Accelerometer Placement

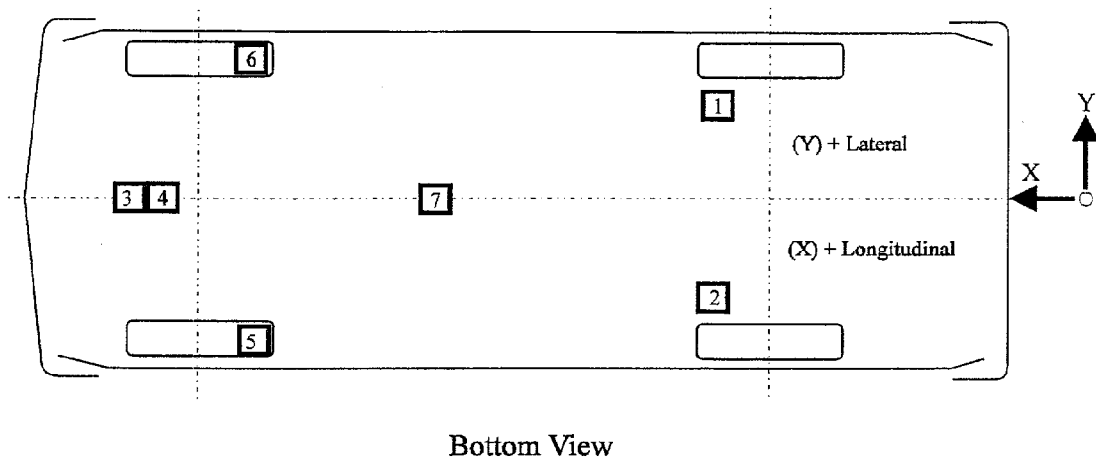
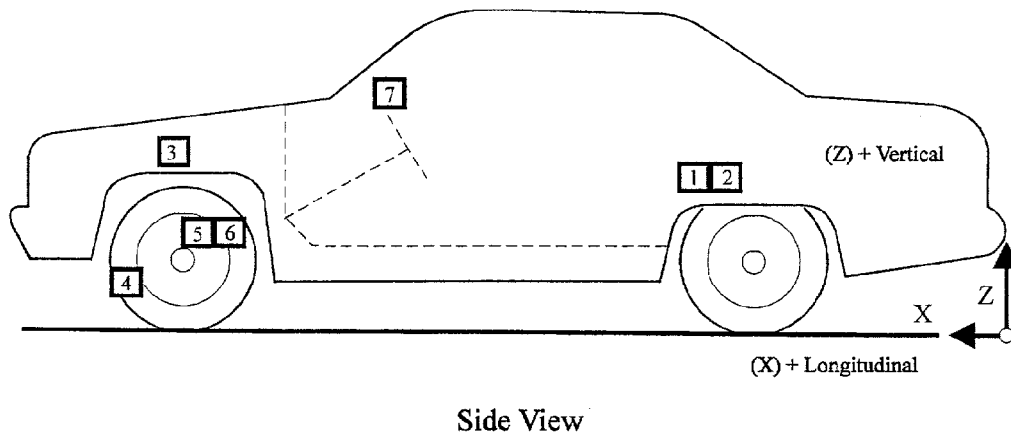


Table 4 Vehicle Accelerometer Locations and Data Summary

TEST NUMBER: 980219 No. LOCATION	X	Y	Z	POSITIVE DIRECTION	NEGATIVE DIRECTION
1 LEFT REAR SEAT CROSSMEMBER LONGITUDINAL REDUNDANT	PRE 1795 mm POST 1780 mm	408 mm 408 mm	398 mm 444 mm	1.7 g @ 134.3 ms 1.8 g @ 134.3 ms	33.3 g @ 42.2 ms 33.3 g @ 42.2 ms
2 RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL REDUNDANT	PRE 1797 mm POST 1795 mm	-405 mm -405 mm	398 mm 408 mm	1.9 g @ 135.0 ms 1.9 g @ 135.0 ms	29.9 g @ 46.7 ms 30.0 g @ 46.9 ms
3 ENGINE TOP LONGITUDINAL ¹	PRE 4010 mm POST 3711 mm	-30 mm -40 mm	776 mm 738 mm	---	---
4 ENGINE BOTTOM LONGITUDINAL	PRE 4041 mm POST 3788 mm	-125 mm -161 mm	163 mm 158 mm	55.6 g @ 42.3 ms	114.7 g @ 31.1 ms
5 RIGHT BRAKE CALIPER LONGITUDINAL	PRE 3917 mm POST 3801 mm	-677 mm -742 mm	302 mm 274 mm	26.4 g @ 71.4 ms	76.0 g @ 51.0 ms

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

TEST NUMBER: 980219 No. LOCATION	X		Y		Z		POSITIVE DIRECTION	NEGATIVE DIRECTION
	PRE	POST	PRE	POST	PRE	POST		
6 LEFT BRAKE CALIPER	3913 mm		677 mm		305 mm			
LONGITUDINAL	3786 mm		730 mm		304 mm			
							22.5 g	@ 36.9 ms
							67.7 g	@ 43.5 ms
7 INSTRUMENT PANEL	3100 mm		-10 mm		943 mm			
CENTER	3084 mm		0 mm		924 mm			
LONGITUDINAL							30.4 g	@ 34.9 ms
							61.6 g	@ 46.6 ms

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

¹See DATA ACQUISITION EXPLANATIONS

Table 5 Post-Impact Dummy/Vehicle Data

Visible Dummy Contact Points:

	<u>Driver #142</u>	<u>Passenger #192</u>
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

Door Opening:

	<u>Left</u>	<u>Right</u>
Front	Easy	Difficult, no tools required
Rear	Easy	Easy

Seat Movement:

	<u>Seat Back Failure</u>	<u>Seat Shift</u>
Front	None	None
Rear	NA	NA

Glazing Damage: The lower portion of the windshield was cracked on impact.

Other Notable Impact Effects: None

Table 6 FMVSS 208 Data Summary

Vehicle year/make/
model/body style: 1998/Volvo/S-70/4-door sedan
Vehicle NHTSA number: MW5900
Test date: 02/19/98

	Driver Dummy #142		Passenger Dummy #192	
<u>Maximum Accelerations:</u>				
Head X-axis	-38.1	g	-40.9	g
Head Y-axis	-9.4	g	6.1	g
Head Z-axis	-18.5	g	-21.8	g
Head resultant	41.1	g	41.9	g
Chest X-axis	-45.9	g	-42.9	g
Chest Y-axis	-6.0	g	5.2	g
Chest Z-axis	-8.1	g	-11.0	g
Chest resultant ¹	45.5	g	41.3	g
Chest resultant time interval ¹	.003	sec	.003	sec
<u>Head Injury Criteria (HIC) Values:</u>				
HIC ²	259		294	
HIC starting time	.049	sec	.053	sec
HIC ending time	.085	sec	.089	sec
Average head resultant acceleration during HIC time interval	34.9	g	36.7	g
<u>Maximum Chest Deflections:</u>				
Chest X-axis	39	mm	25	mm
Maximum chest deflection time	.064	sec	.083	sec
<u>Maximum Compressive Femur Forces:</u>				
Left femur	-2869	N	-2658	N
Right femur	-4952	N	-3500	N
<u>Maximum Seat Belt Forces:</u>				
Lap belt	6741	N	5271	N
Shoulder belt ³	N/A	N	N/A	N

Note: All values listed must be occurring during primary impact event.
(Head accelerations listed must be during HIC time interval.)

¹ 0.003 Sec. Minimum duration.

² The maximum HIC time interval is 36 milliseconds.

³ Shoulder belt load cells were not used.

Table 7 Hybrid III Data Summary

Vehicle year/make/
model/body style: 1998/Volvo/S-70/4-door sedan
Vehicle NHTSA number: MW5900
Test date: 02/19/98

	Driver Dummy #142	Passenger Dummy #192
<u>Maximum Forces</u>		
Neck X-axis shear force	-530 N	-395 N
Neck Y-axis shear force	156 N	-201 N
Neck Z-axis axial force	1679 N	1161 N
<u>Maximum Moments</u>		
Neck moment about X-axis	-15.3 N·m	-14.4 N·m
Neck moment about Y-axis	35.9 N·m	32.8 N·m
Neck moment about Z-axis	-18.2 N·m	11.0 N·m
<u>Maximum Accelerations:</u>		
Pelvis X-axis	-63.9 g	-26.2 g
Pelvis Y-axis	-15.6 g	7.1 g
Pelvis Z-axis	22.1 g	53.7 g
Pelvis resultant	66.1 g	55.9 g

Table 7 Hybrid III Data Summary, Cont'd.

Vehicle year/make/
model/body style: 1998/Volvo/S-70/4-door sedan
Vehicle NHTSA number: MW5900
Test date: 02/19/98

	Driver Dummy #142	Passenger Dummy #192
Left upper tibia moment about X-axis	32.2 N'm	146.2 N'm
Left upper tibia moment about Y-axis	77.4 N'm	-53.2 N'm
Right upper tibia moment about X-axis	47.2 N'm	28.2 N'm
Right upper tibia moment about Y-axis	125.7 N'm	-129.5 N'm
Left lower tibia X-axis force	-624 N	-1137 N
Left lower tibia Z-axis force	-1973 N	-4404 N
Left lower tibia moment about Y-axis	-75.4 N'm	-53.4 N'm
Right lower tibia X-axis force	-1584 N	-591 N
Right lower tibia Z-axis force	-4203 N	-1934 N
Right lower tibia moment about Y-axis	-381.7 N'm	-60.1 N'm
Left foot X-axis acceleration	-63.5 g	-100.3 g
Left foot Z-axis acceleration at heel	54.6 g	77.2 g
Left foot Z-axis acceleration at toe	163.6 g	142.6 g
Right foot X-axis acceleration	-146.1 g	-37.0 g
Right foot Z-axis acceleration at heel	154.8 g	53.6 g
Right foot Z-axis acceleration at toe	-583.1 g	84.8 g

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

Dummy Kinematic Summary

Driver Dummy

Upon impact, the driver dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head and chest were restrained by the driver's airbag as the dummy's torso was restrained by the three-point unbelt. The dummy's head rotated rearward into the head restraint as the dummy rebounded into the seat back. The dummy came to rest seated in the driver's seat, restrained by the three-point unbelt.

Right Front Passenger Dummy

Upon impact, the right front passenger dummy translated forward on the seat impacting both knees into the instrument panel. The dummy's head rotated forward as the dummy's head and chest were restrained by the passenger's airbag and the dummy's torso was restrained by the three-point unbelt. The dummy's head rotated rearward into the head restraint as the dummy rebounded into the seat back. The dummy came to rest seated upright in the right front passenger's seat, restrained by the three-point unbelt.

Table 8 Seat Belt Performance Assessment Test Data

	Driver	Passenger
<u>Belt length data:</u>		
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	2070 mm	2050 mm
Shoulder belt length as measured on Part 572 dummy.	923 mm	880 mm
Lap belt length as measured on Part 572 dummy.	642 mm	590 mm
<u>Shoulder belt spool-off length:</u>		
As determined by film analysis	25 mm	25 mm
As determined mechanically	280 mm	110 mm
As determined electronically ¹	113 mm	131 mm
<u>Belt stretch length:</u>		
As measured mechanically	0 mm/m	0 mm/m
As measured electronically ¹	0 mm/m	0 mm/m
<u>Retractor lock-up time:</u>		
As determined by shoulder belt spool-off	76 ms	79 ms

¹ See Data Acquisition Explanations

Section 3.0

FMVSS 212, 219 (partial), and 301 Data

Figure 4 FMVSS 212 Test Data

Details of windshield mounting such as retention method, trim type, etc.: Plastic trim around outer perimeter, adhesive trim around inner perimeter.

FMVSS 212 requirements: The post-test periphery retention amount must be at least 75% of the pre-test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

Windshield periphery measurements:

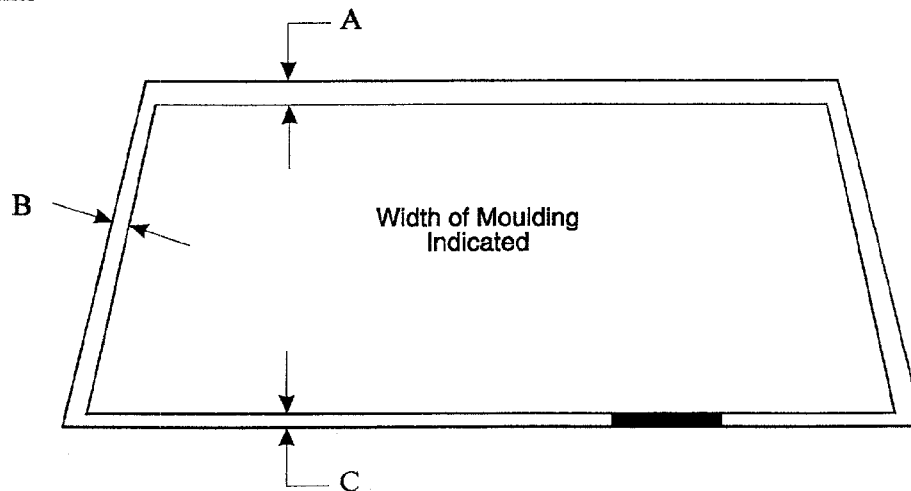
	<u>Pre-test</u>	<u>Post-test</u>	<u>Percent retention</u>
Right side	2160 mm	2050 mm	95
Left side	2160 mm	2160 mm	100
Total	4320 mm	4210 mm	97

Pre-test windshield mounting material temperature: 21° C

A = 18 mm

B = 40 mm

C = 10 mm



Front view of windshield¹

Loss of windshield retention lengths: 110 mm

¹ Indicate areas of loss of retention, if any, on windshield diagram.

Figure 5 FMVSS 219 Test Data

Protected zone lower edge requirement:

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

Windshield measurements:

A = 1325 mm

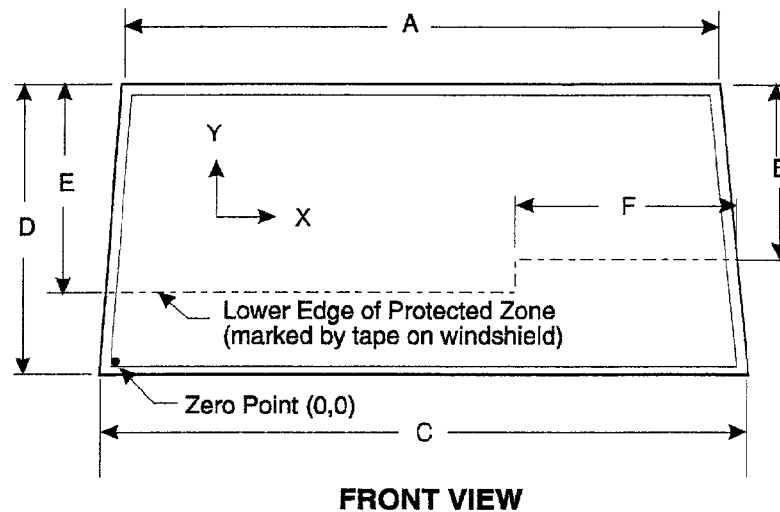
B = 455 mm

C = 1700 mm

D = 783 mm

E = 459 mm

F = 745 mm



Method of adhering protected zone template to windshield: NA

Areas of windshield template penetration greater than 6 mm: NA

Coordinates	
X	Y

- 1.
- 2.
- 3.

Areas of windshield penetration, below the protected zone, through the inner surface of the windshield: None

- 1.
- 2.
- 3.

Table 9 Fuel System Data

Vehicle year/make/ model/body style:	1998/Volvo/S-70/4-door sedan
NHTSA number:	MW5900
Fuel system capacity:	68.9 liters (from owner's manual)
Usable capacity:	68.9 liters (furnished by COTR)
Test volume range:	63.4 liters to 64.8 liters (92-94% of usable)
Actual test volume:	64.7 liters (with entire fuel system filled)
Test fluid type:	Stoddard solvent
Specific gravity:	0.764
Kinematic viscosity:	0.99 centistoke
Test fluid color:	Purple
Did electric fuel pump operate with ignition switch "on" and the engine not operating.	Yes
Details of fuel system:	The fuel tank was located behind the rear axle. The fuel filler neck was located on the right side and entered the rear of the fuel tank. The fuel lines ran up the right side of the vehicle.

Table 10 FMVSS 301 Post-Impact Test Data

NHTSA number: MW5900
Test date: 02/19/98
Vehicle year/make/
model/body style: 1998/Volvo/S-70/4-door sedan

Test requirements:

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

Test vehicle impact type:

- ☒ Frontal (57 kph)
☐ Oblique (48 kph) with ___° barrier face first contacting ___ (driver/pass.) side
☐ Rear moving barrier (48 kph)
☐ Lateral moving barrier (32 kph)

Fuel system fluid spillage measurements:

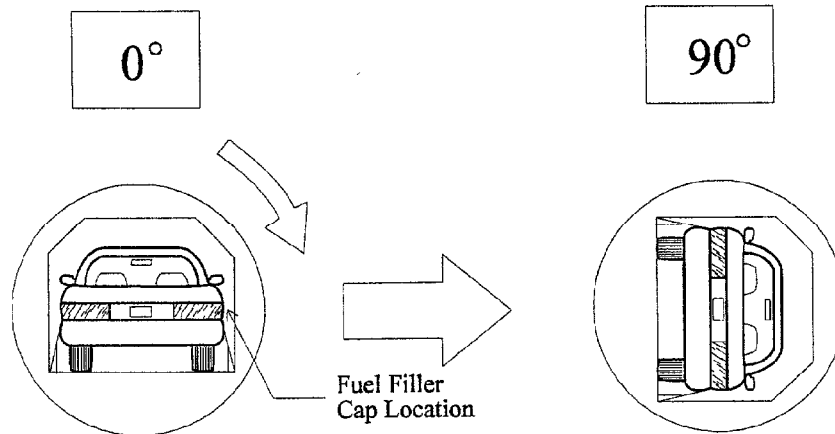
	<u>Test Results</u>	<u>Maximum Allowable</u>
1. From impact until vehicle motion ceases	0 g	28 g
2. 5-minute period after vehicle motion ceases	0 g	142 g
3. Next 25 minutes after 5-minute period	0 g	28 g/min

Fuel system fluid spillage location(s): None

Figure 6 FMVSS 301 Static Rollover Test Data

NHTSA number: MW5900

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90° = 2 minutes, 0 seconds
 FMVSS 301 position hold time = 5 minutes, 0 seconds
 Total = 7 minutes, 0 seconds
 Next whole minute interval = 7 minutes

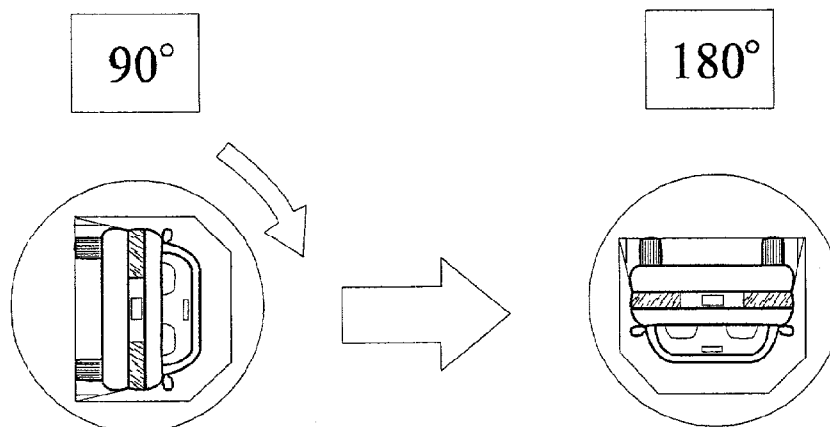
Fuel system fluid spillage measurements:

	Test Results	Maximum Allowable
<u>0° to 90° rotation (fuel filler cap down)</u>		
1. First five minutes from onset of rotation	0 g	142 g
2. Sixth minute from onset of rotation	0 g	28 g
3. Seventh minute from onset of rotation	0 g	28 g

Fuel system fluid spillage location(s): None

Figure 6 FMVSS 301 Static Rollover Test Data, Cont'd.

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90° = 2 minutes, 0 seconds

FMVSS 301 position hold time = 5 minutes, 0 seconds

Total = 7 minutes, 0 seconds

Next whole minute interval = 14 minutes

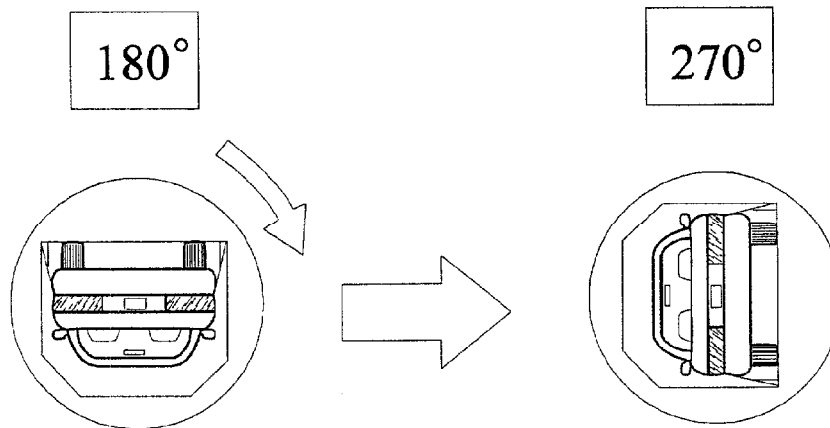
Fuel system fluid spillage measurements:

<u>90° to 180° rotation</u>		Test Results	Maximum Allowable
1.	First five minutes from onset of rotation	0 g	142 g
2.	Sixth minute from onset of rotation	0 g	28 g
3.	Seventh minute from onset of rotation	0 g	28 g

Fuel system fluid spillage location(s): None

Figure 6 FMVSS 301 Static Rollover Test Data, Cont'd.

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90° = 2 minutes, 0 seconds
 FMVSS 301 position hold time = 5 minutes, 0 seconds
 Total = 7 minutes, 0 seconds
 Next whole minute interval = 21 minutes

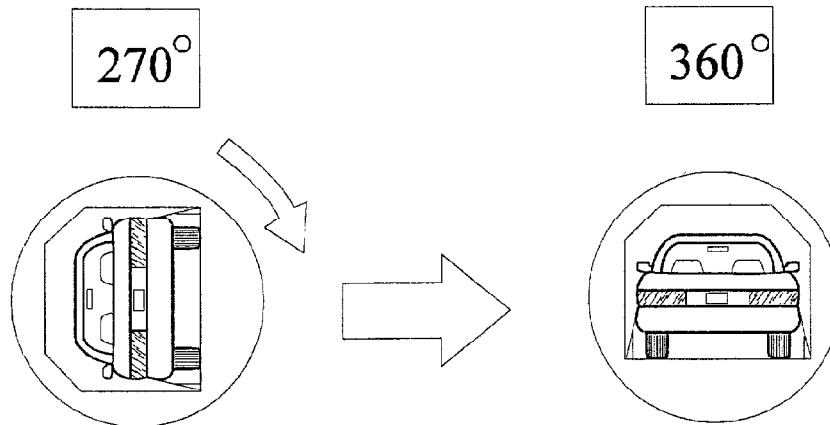
Fuel system fluid spillage measurements:

180 to 270° rotation		Test Results	Maximum Allowable
1.	First five minutes from onset of rotation	0 g	142 g
2.	Sixth minute from onset of rotation	0 g	28 g
3.	Seventh minute from onset of rotation	0 g	28 g

Fuel system fluid spillage location(s): None

Figure 6 FMVSS 301 Static Rollover Test Data, Cont'd.

Test phase



Static rollover machine rotation time information: (specified range is 1-3 minutes)

Time required for machine to rotate 90° = 2 minutes, 0 seconds

FMVSS 301 position hold time = 5 minutes, 0 seconds

Total = 7 minutes, 0 seconds

Next whole minute interval = 28 minutes

Fuel system fluid spillage measurements:

<u>270° to 360° rotation</u>	Test Results	Maximum Allowable
1. First five minutes from onset of rotation	0 g	142 g
2. Sixth minute from onset of rotation	0 g	28 g
3. Seventh minute from onset of rotation	0 g	28 g

Fuel system fluid spillage location(s): None

Section 4.0

Occupant, Camera, and Vehicle Information

Figure 7 Dummy Measurement Locations for Front Seat Occupants

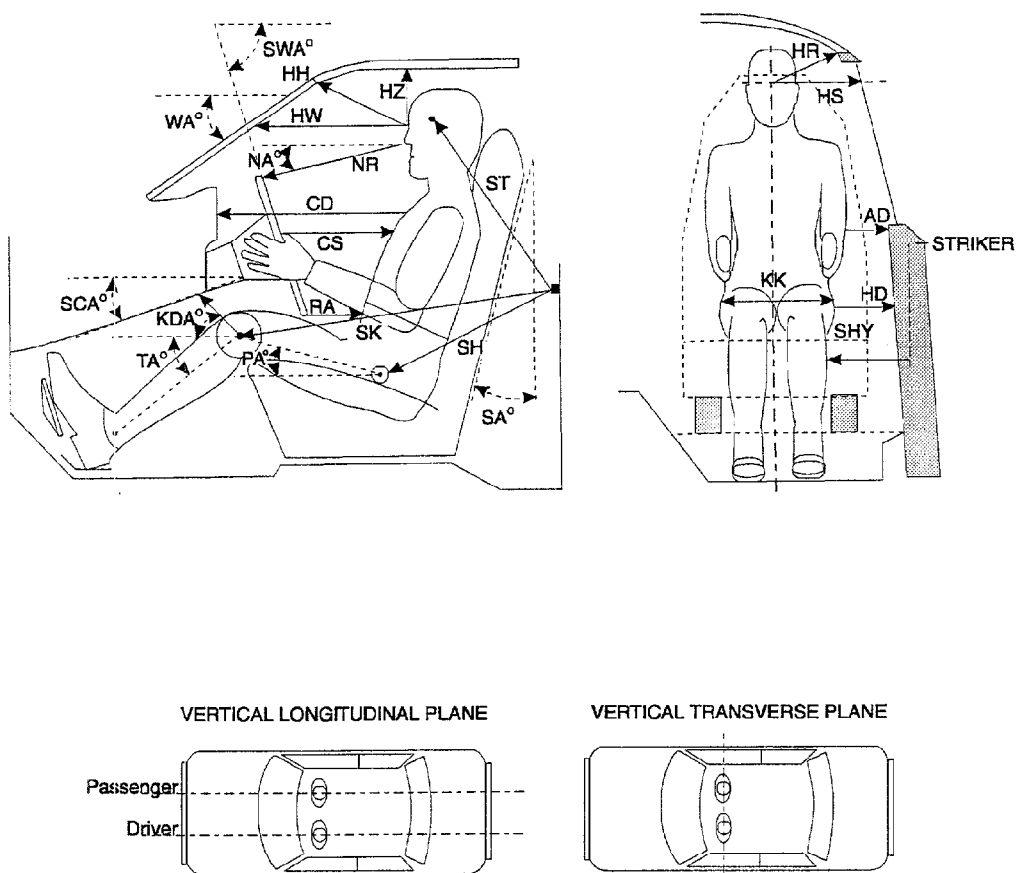


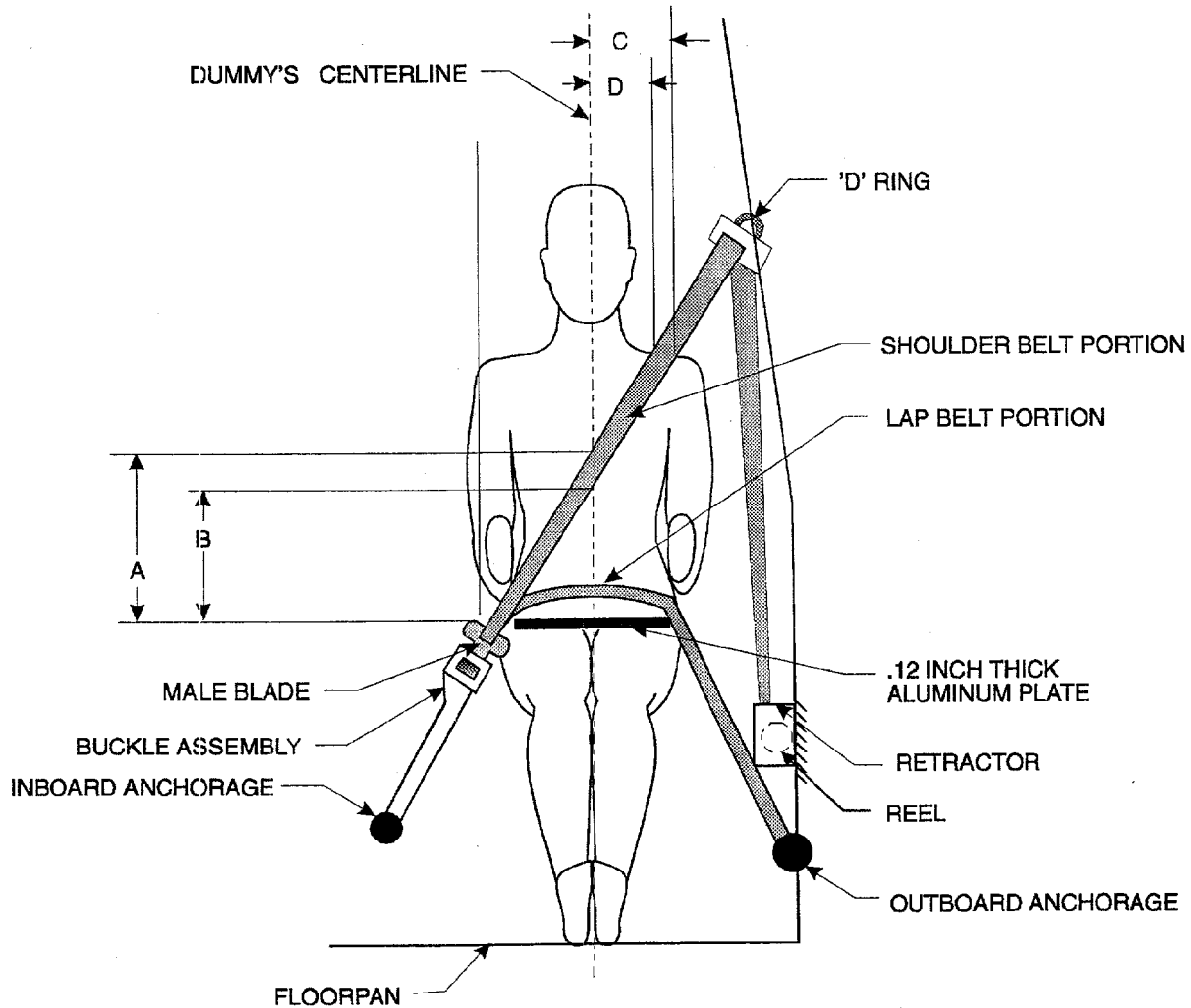
Table 11 Dummy Measurement Data For Front Seat Occupants

Designation	Type of Measurement	Driver (Serial #142)	Passenger (Serial #192)
WA	Windshield angle	28°	28°
SWA	Steering wheel angle	66°	NA
SCA	Steering column angle	24°	NA
SA	Seat back angle	18°	18°
HZ	Head to roof	147 mm	169 mm
HH	Head to header	284 mm	309 mm
HW	Head to windshield	502 mm	551 mm
HR	Head to side header	238 mm	261 mm
NR	Nose to rim	352 mm	NA
NA	Nose to rim angle	10°	NA
CD	Chest to dash	492 mm	540 mm
CS	Steering wheel to chest	298 mm	NA
RA	Rim to abdomen	179 mm	NA
KDL	Left knee to dash	171 mm	176 mm
KDR	Right knee to dash	185 mm	168 mm
KDA	Outboard knee to dash angle	25°	19°
PA	Pelvic angle	21°	24°
TA	Tibial angle	39°	40°
KK	Knee to knee	292 mm	292 mm
ST ¹	Striker to head	446 mm	420 mm
	Striker to head angle	-72°	-72°
SK ¹	Striker to knee	627 mm	657 mm
	Striker to knee angle	-9°	-11°
SH ¹	Striker to H-point	357 mm	351 mm
	Striker to H-point angle	38°	43°
SHY	Striker to H-point (Y dir.)	140 mm	240 mm
HS	Head to side window	353 mm	361 mm
HD	H-point to door	147 mm	137 mm
AD	Arm to door	86 mm	124 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 8 Seat Belt Positioning Data



	Driver	Passenger
A - Top surface of aluminum plate to belt upper edge	347 mm	316 mm
B - Top surface of aluminum plate to belt lower edge	268 mm	236 mm
C - Dummy centerline to intersection of upper torso belt and lap belt	120 mm	143 mm
D - Dummy centerline to inner edge of belt at chest flesh top	66 mm	87 mm
Lap belt tension (N)	4 mm	4 mm
Should belt tension (N)	3 mm	3 mm

Figure 9 Camera Positions

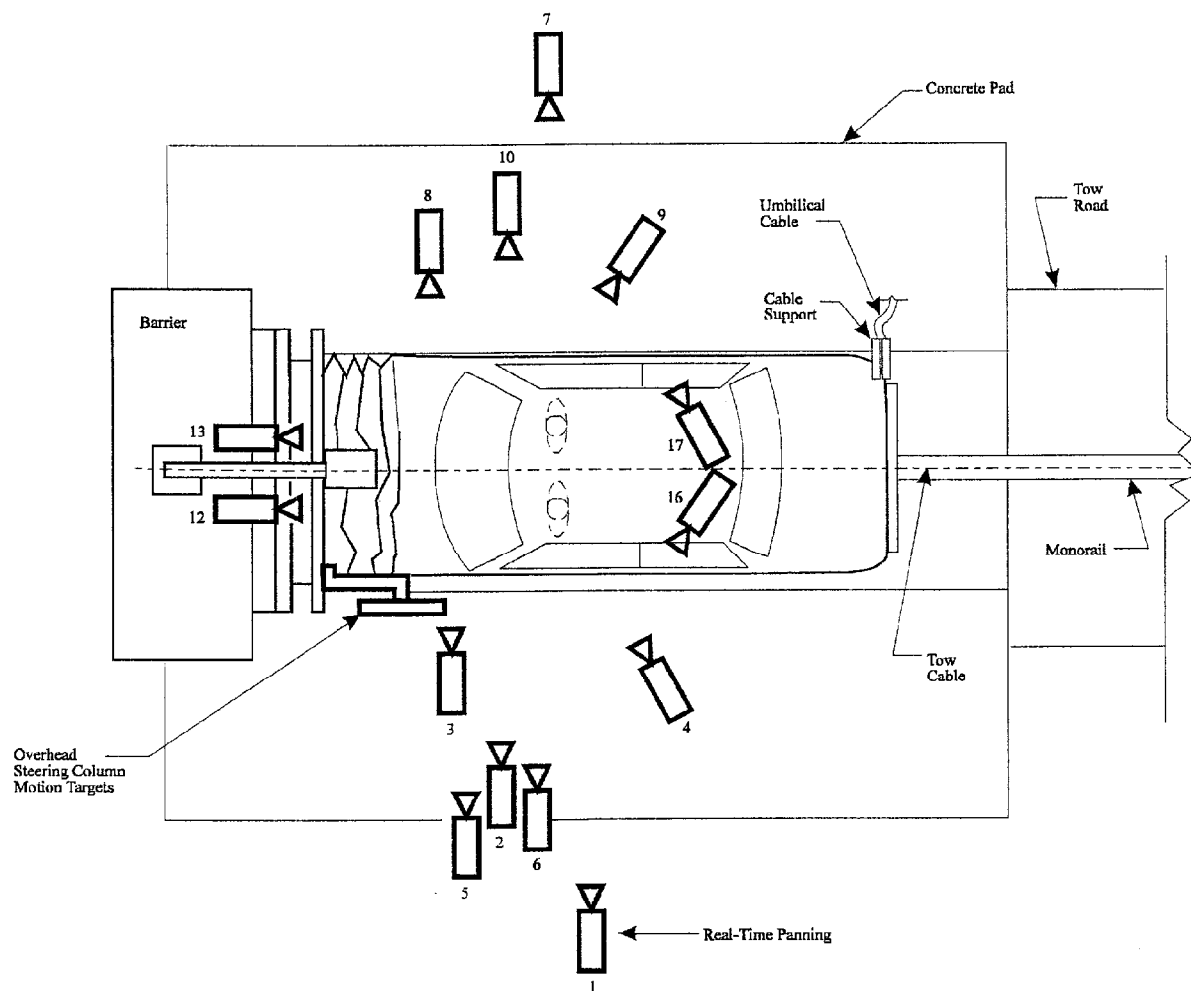


Figure 9 Camera Positions, Cont'd.

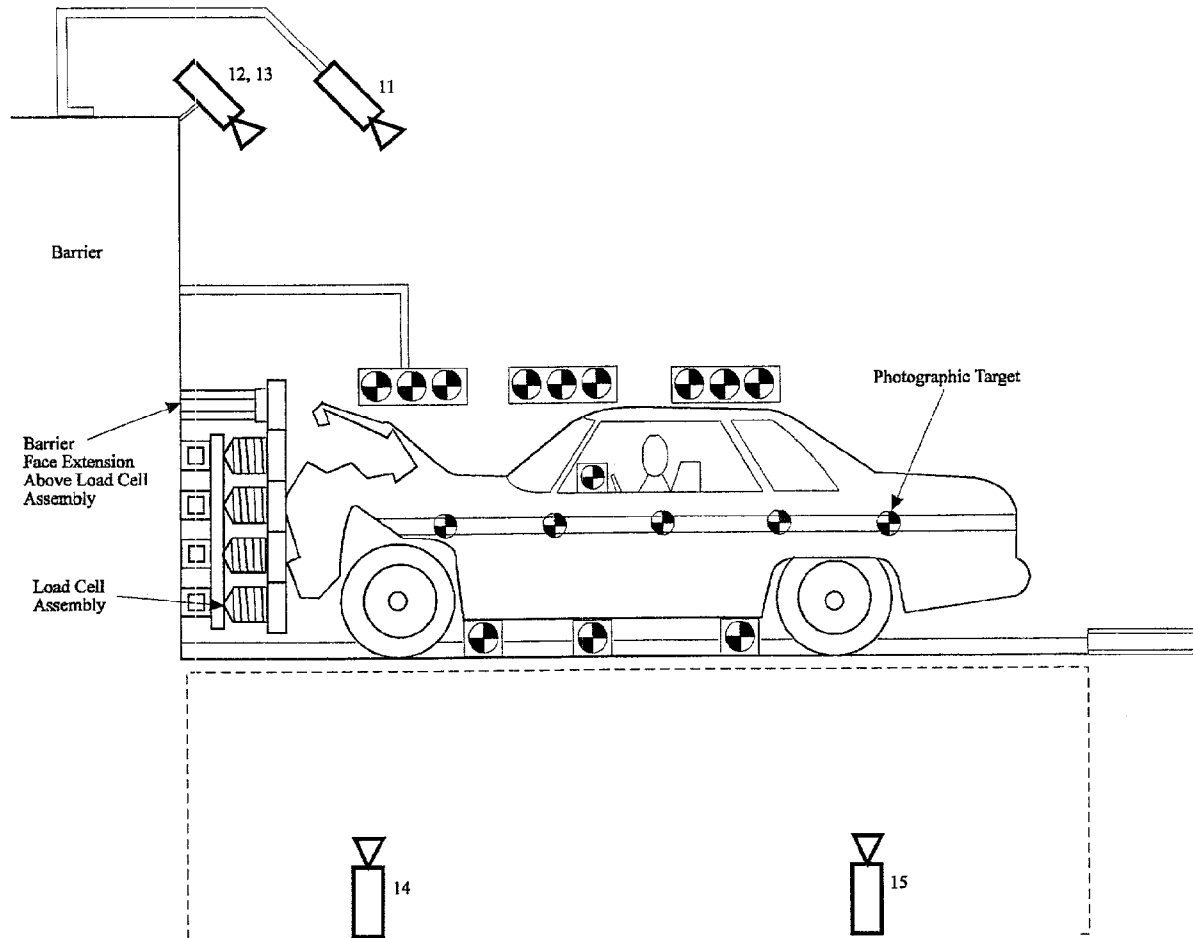


Table 12 Motion Picture Camera Locations

Test Number: 980219

Vehicle Year/Make/Model/Body Style: 1998/Volvo/S-70/4-door sedan

Camera Number	View	Camera Positions ¹			Angle ²	Film Plane to Head Target	Lens	Film Speed
		X	Y	Z				
1	Real-time panning	-3607 mm	2802 mm	1549 mm	NA	NA	16 mm	24 frames/s
2	Left Barrier to seat back	-4572 mm	8534 mm	2591 mm	-27°	7925 mm	25 mm	1002 frames/s
3	Left windshield intrusion	-1346 mm	7859 mm	1074 mm	0°	NA	50 mm	1015 frames/s
4	Dummy angled view	-1054 mm	2438 mm	1118 mm	-12°	1829 mm	25 mm	1008 frames/s
5	Column movement - upper	-3048 mm	9144 mm	2616 mm	-14°	NA	25 mm	998 frames/s
6	Column movement - lower	-3048 mm	9144 mm	1908 mm	-9°	NA	25 mm	1000 frames/s
7	Right side overall	-2065 mm	-6767 mm	942 mm	-2°	NA	13 mm	980 frames/s
8	Right windshield intrusion	-968 mm	-7775 mm	1118 mm	0°	NA	50 mm	1002 frames/s
9	Passenger angled view	-986 mm	-2438 mm	1151 mm	7°	1729 mm	25 mm	1000 frames/s
10	Right medium tight	-4674 mm	7315 mm	2540 mm	-26°	6706 mm	25 mm	1005 frames/s
11	Windshield - barrier center	-925 mm	0 mm	2489 mm	-40°	NA	13 mm	1005 frames/s
12	Driver - barrier view	-173 mm	368 mm	2159 mm	-41°	NA	17 mm	1002 frames/s
13	Passenger - barrier view	-114 mm	-351 mm	2159 mm	-40°	NA	17 mm	1002 frames/s
14	Crush & fluid spillage - front pit	-1283 mm	0 mm	-2347 mm	90°	NA	13 mm	1000 frames/s
15	Fluid spillage - rear pit	-2522 mm	0 mm	-2515 mm	90°	NA	13 mm	992 frames/s
16	Driver seat belt movement	NA	NA	NA	NA	NA	NA mm	995 frames/s
17	Passenger seat belt movement	NA	NA	NA	NA	NA	NA mm	785 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 10 Vehicle Target Locations

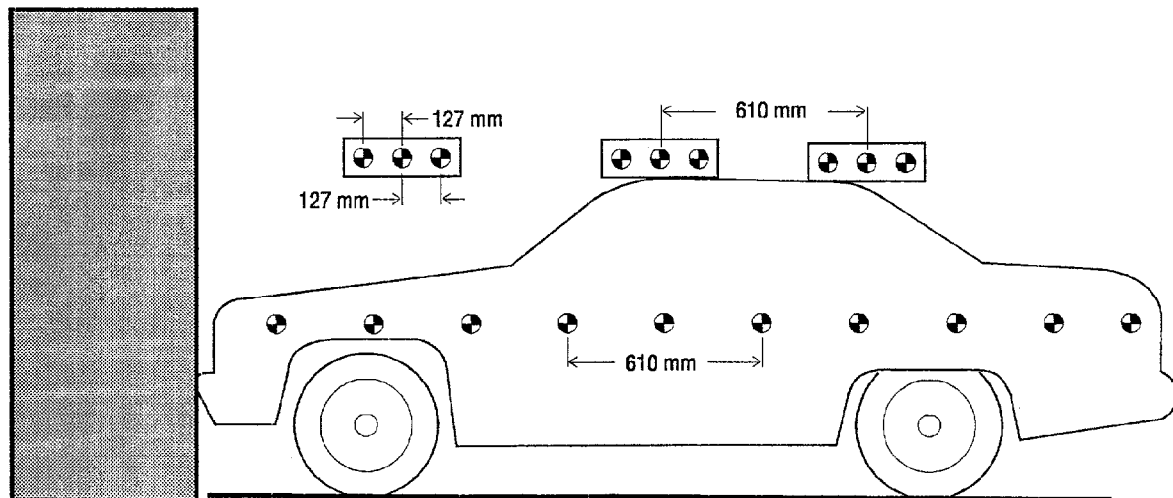


Figure 11 Pre-Test And Post-Test Measurement Points

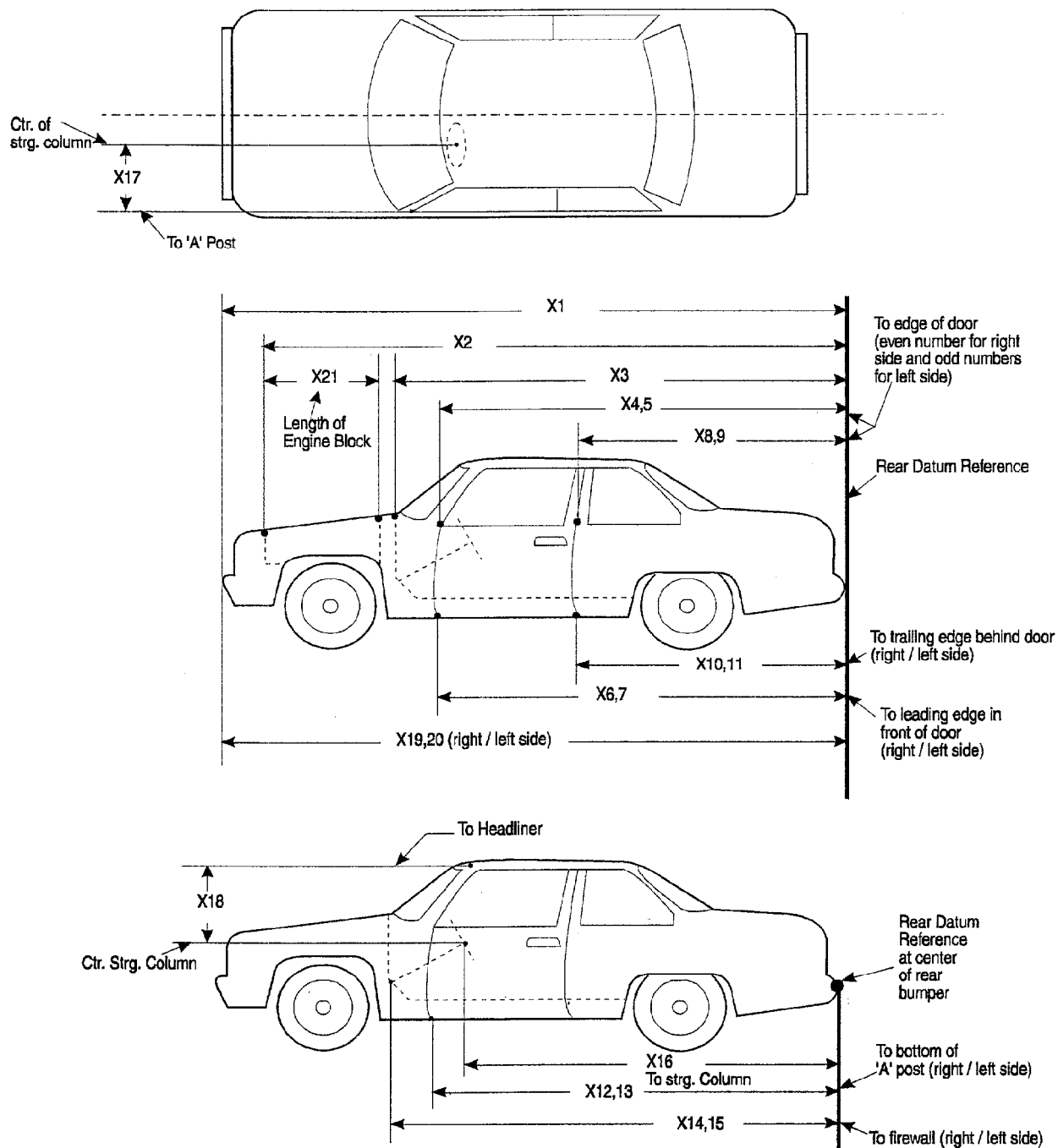


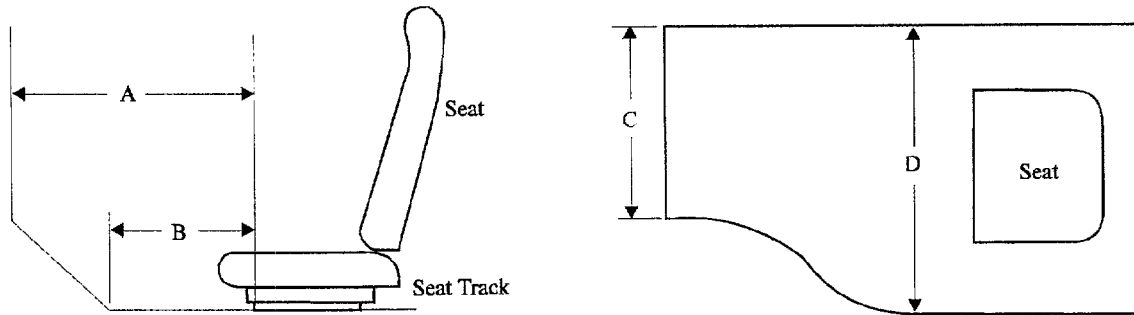
Table 13 Impacted Vehicle Measurements

Test number: 980219

Vehicle year/make/model/body style: 1998/Volvo/S-70/4-door sedan

No.	Type of measurement	Pre-test	Post-test	Difference
X1	Total length of vehicle at centerline	4770 mm	4195 mm	575 mm
X2	Rear surface of vehicle to front of engine block	4100 mm	3973 mm	127 mm
X3	Rear surface of vehicle to firewall	3610 mm	3544 mm	66 mm
X4	Rear surface of vehicle to upper leading edge of right door	3193 mm	3188 mm	5 mm
X5	Rear surface of vehicle to upper leading edge of left door	3194 mm	3192 mm	2 mm
X6	Rear surface of vehicle to lower leading edge of right door	3205 mm	3178 mm	27 mm
X7	Rear surface of vehicle to lower leading edge of left door	3194 mm	3176 mm	18 mm
X8	Rear surface of vehicle to upper trailing edge of right door	2204 mm	2199 mm	5 mm
X9	Rear surface of vehicle to upper trailing edge of left door	2203 mm	2203 mm	0 mm
X10	Rear surface of vehicle to lower trailing edge of right door	2230 mm	2202 mm	28 mm
X11	Rear surface of vehicle to lower trailing edge of left door	2227 mm	2208 mm	19 mm
X12	Rear surface of vehicle to bottom of "A" post on right side	3204 mm	3169 mm	35 mm
X13	Rear surface of vehicle to bottom of "A" post on left side	3203 mm	3196 mm	7 mm
X14	Rear surface of vehicle to firewall - right side	3632 mm	3512 mm	120 mm
X15	Rear surface of vehicle to firewall - left side	3623 mm	3565 mm	58 mm
X16	Rear surface of vehicle to steering wheel center	2785 mm	2796 mm	-11 mm
X17	Center of steering column to "A" post	341 mm	323 mm	18 mm
X18	Center of steering column to headliner	439 mm	476 mm	-37 mm
X19	Rear surface of vehicle to right side of front bumper	4612 mm	4140 mm	472 mm
X20	Rear surface of vehicle to left side of front bumper	4621 mm	4134 mm	487 mm
X21	Length of engine block	670 mm	670 mm	0 mm

Figure 12 Vehicle Intrusion Measurements
Static Footwell Deformation



Driver's Side

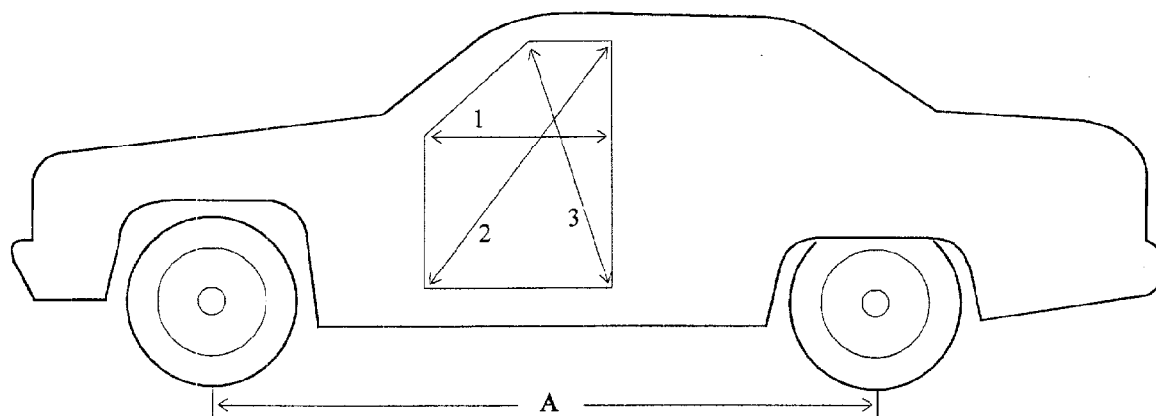
Measurement	Pre-Test	Post-Test	Difference
A	637 mm	581 mm	56 mm
B	508 mm	491 mm	17 mm
C	400 mm	404 mm	-4 mm
D	440 mm	418 mm	22 mm

Passenger's Side

Measurement	Pre-Test	Post-Test	Difference
A	594 mm	538 mm	56 mm
B	507 mm	472 mm	35 mm
C	403 mm	390 mm	13 mm
D	393 mm	373 mm	20 mm

Figure 13 Vehicle Intrusion Measurements

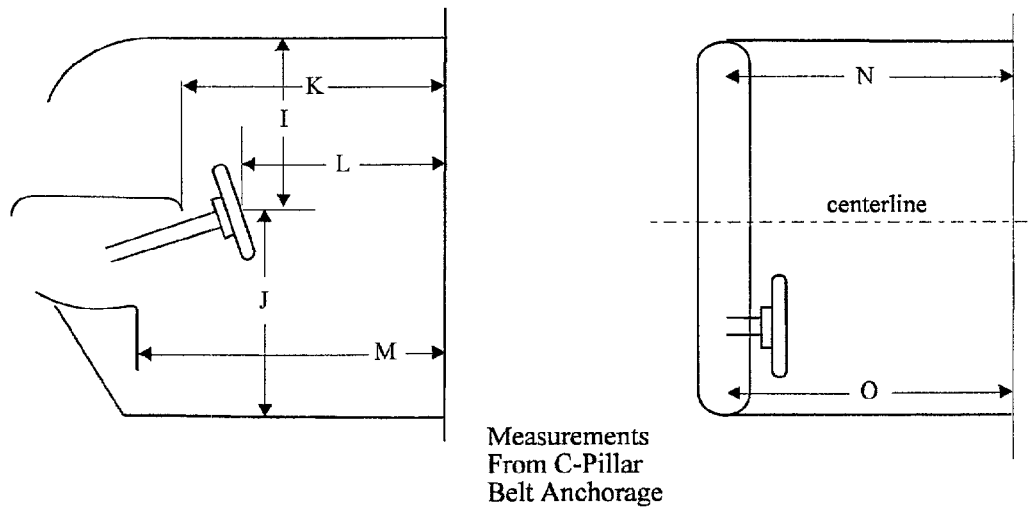
Door Opening Width



Units (mm)	Left			Right		
Measurement	1	2	3	1	2	3
Pre-Test	967 mm	1440 mm	1004 mm	968 mm	1440 mm	988 mm
Post-Test	961 mm	1448 mm	1001 mm	969 mm	1442 mm	1002 mm
Difference	6 mm	-8 mm	3 mm	-1 mm	-2 mm	-14 mm

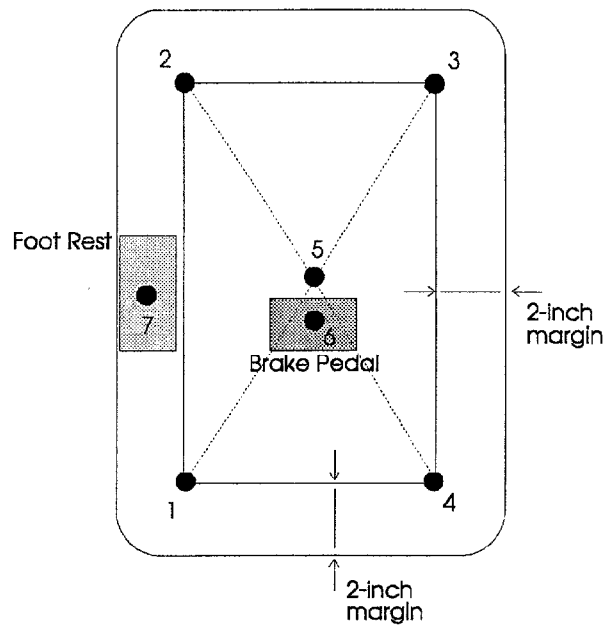
Units (mm)	A = Wheelbase Left	A = Wheelbase Right
Pre-Test	2670 mm	2670 mm
Post-Test	2602 mm	2595 mm
Difference	68 mm	75 mm

Figure 14 Vehicle Intrusion Measurements
Static Passenger Compartment Intrusion



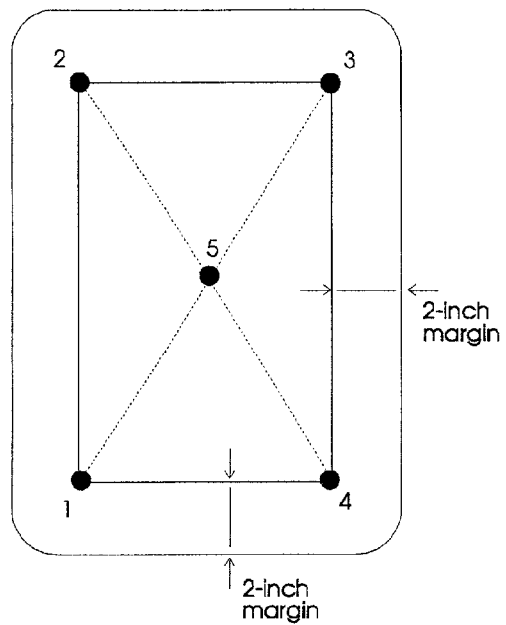
Measurement	Pre-Test	Post-Test	Difference
I	433 mm	472 mm	-39 mm
J	620 mm	563 mm	57 mm
K (driver's side)	1920 mm	1996 mm	-76 mm
L	1720 mm	1707 mm	13 mm
M (driver's side)	1370 mm	1322 mm	48 mm
N	1910 mm	1891 mm	19 mm
O	1890 mm	1869 mm	21 mm
K (passenger's side)	2010 mm	1999 mm	11 mm
M (passenger's side)	1360 mm	1300 mm	60 mm

Figure 15 Driver Toeboard Measurements



Driver Side			
		X	Z
1	Pre-Test	980	194
	Post-Test	968	211
	Crush	12	-17
2	Pre-Test	1361	206
	Post-Test	1404	179
	Crush	-43	27
3	Pre-Test	1460	194
	Post-Test	1456	133
	Crush	4	61
4	Pre-Test	1027	252
	Post-Test	1034	211
	Crush	-7	41
5	Pre-Test	1158	189
	Post-Test	N/A	141
	Crush	N/A	48
6	Pre-Test	1382	395
	Post-Test	N/A	400
	Crush	N/A	-5
7	Pre-Test	1430	324
	Post-Test	1446	300
	Crush	-16	24

Figure 16 Passenger Toeboard Measurements



Passenger Side			
		X	Z
1	Pre-Test	1055	244
	Post-Test	1080	181
	Crush	-25	63
2	Pre-Test	1474	146
	Post-Test	1480	101
	Crush	-6	45
3	Pre-Test	1365	166
	Post-Test	1430	168
	Crush	-65	-2
4	Pre-Test	980	146
	Post-Test	980	160
	Crush	0	-14
5	Pre-Test	1196	194
	Post-Test	N/A	118
	Crush	N/A	76
6	Pre-Test	N/A	N/A
	Post-Test	N/A	N/A
	Crush	N/A	N/A
7	Pre-Test	N/A	N/A
	Post-Test	N/A	N/A
	Crush	N/A	N/A

Appendix A

Photographs



Figure A-1 Pre-Test Front View
A-2

980219

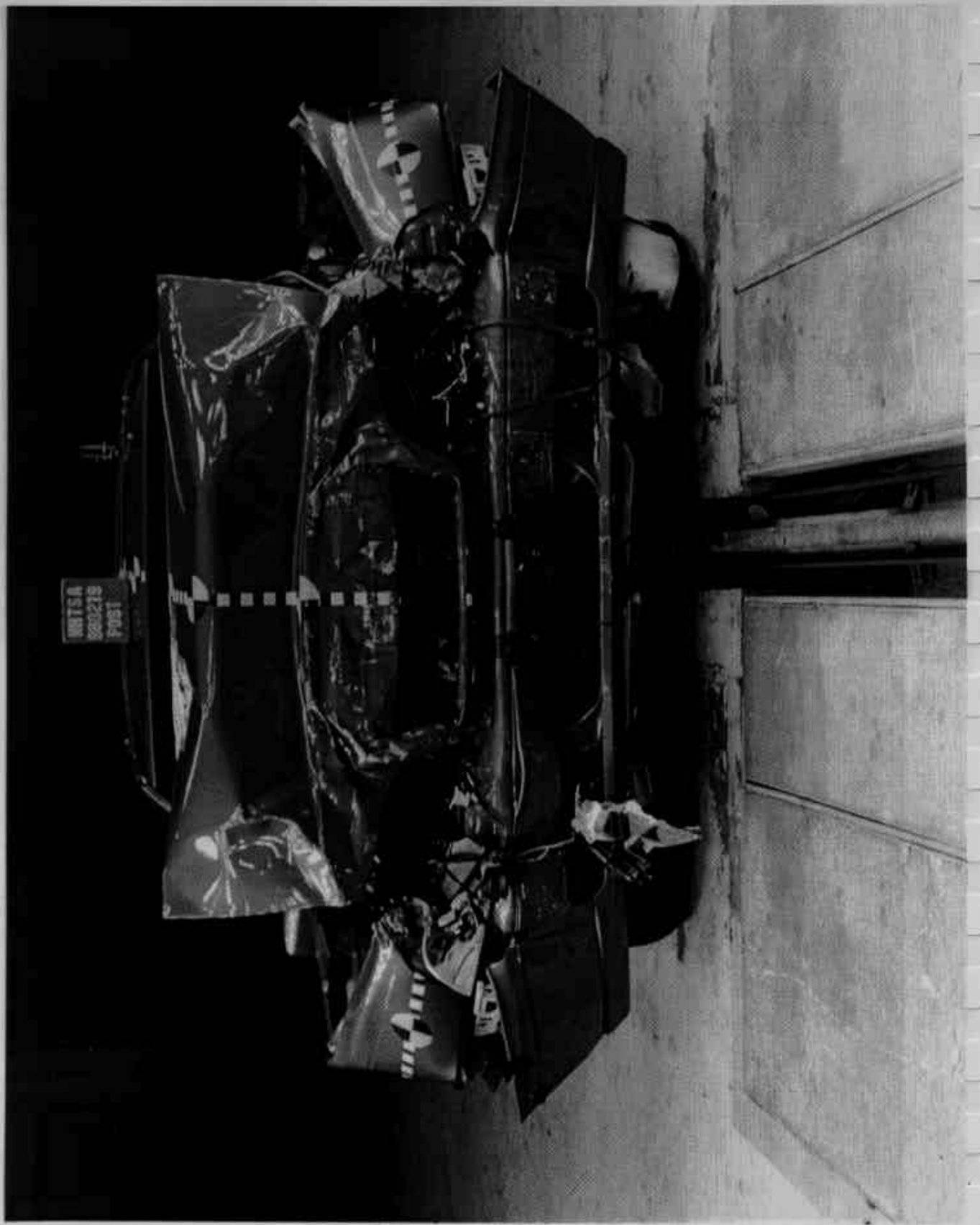


Figure A-2 Post-Test Front View
A-3

980219

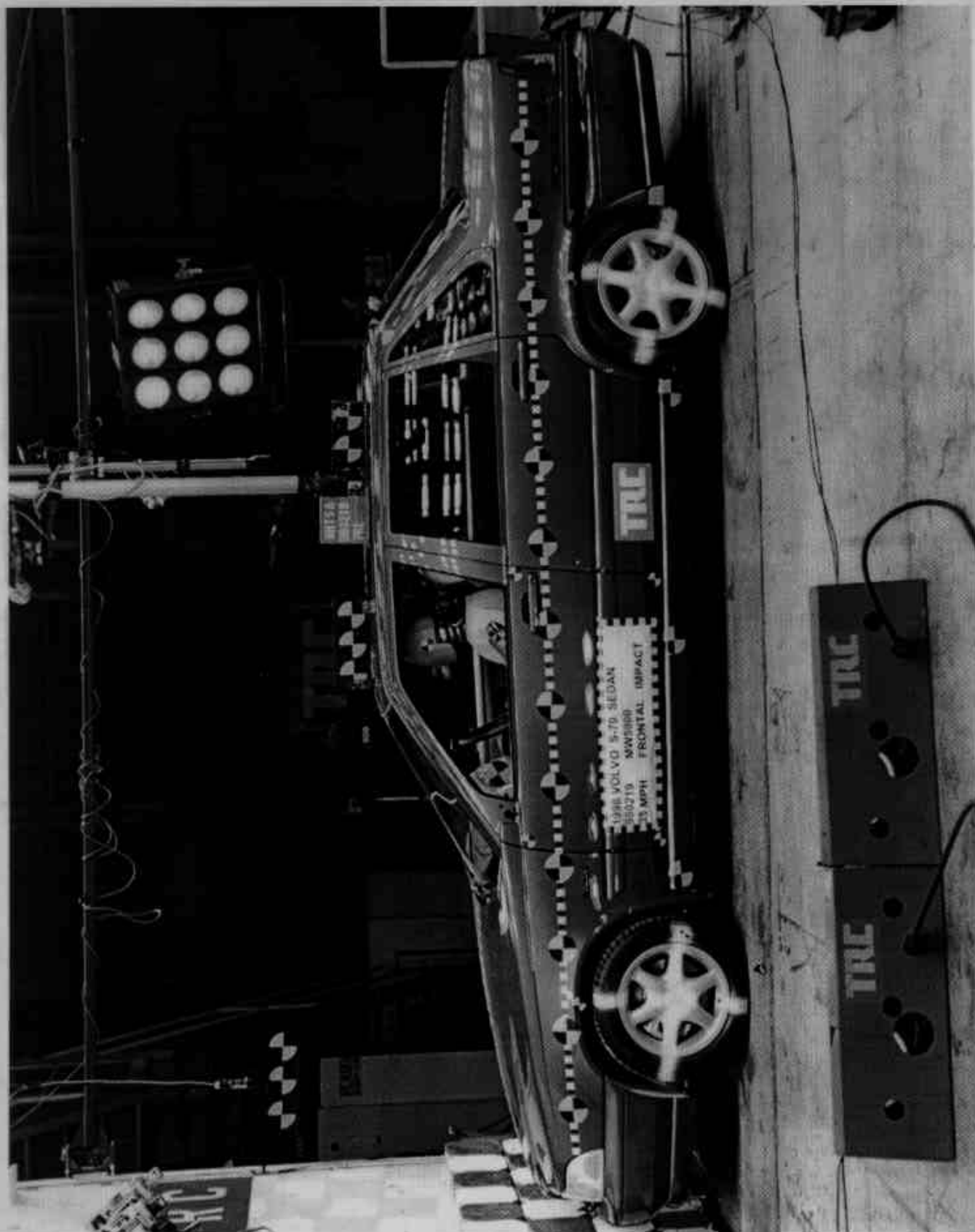


Figure A-3 Pre-Test Left Side View
A-4

980219

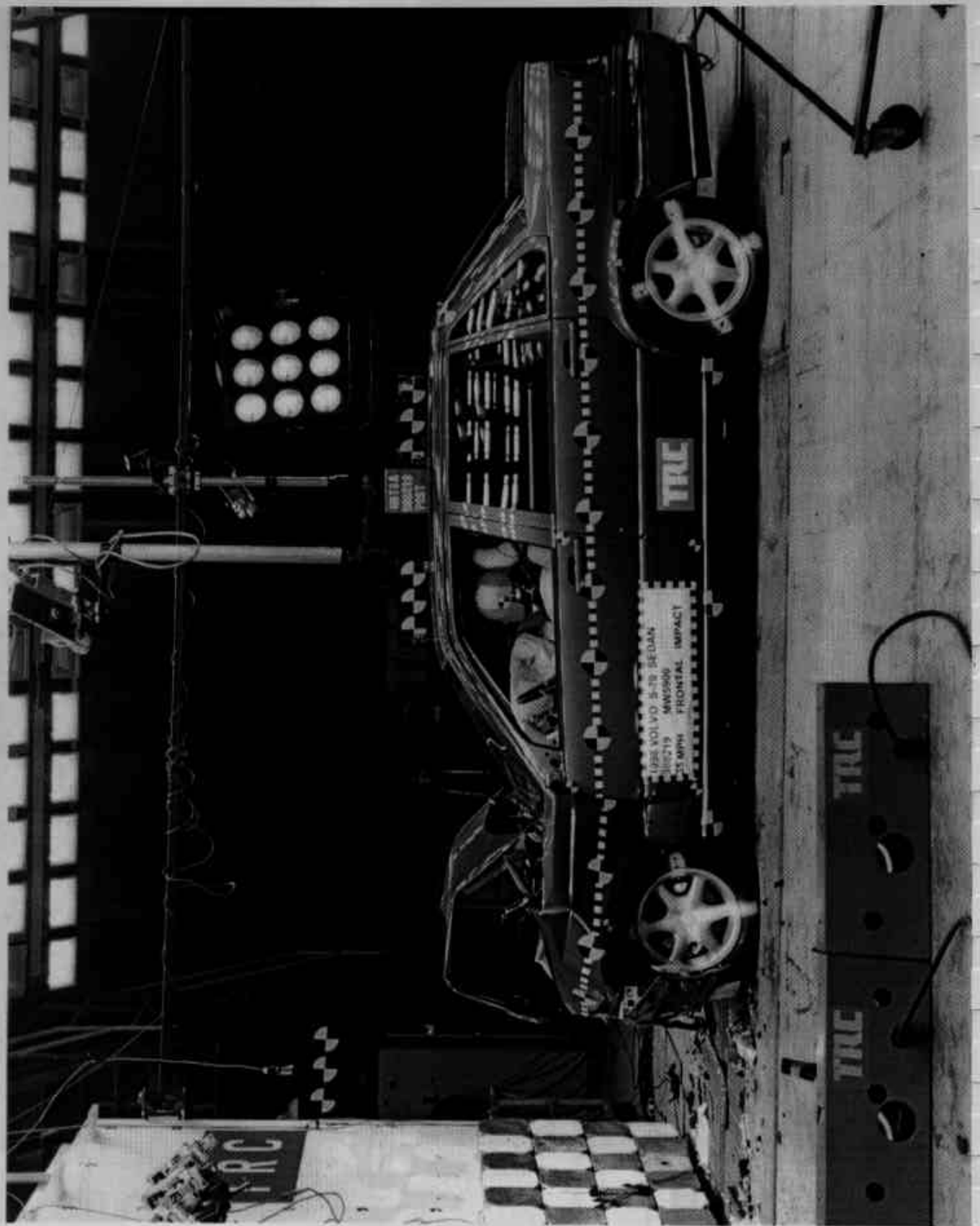


Figure A-4 Post-Test Left Side View
A-5

980219

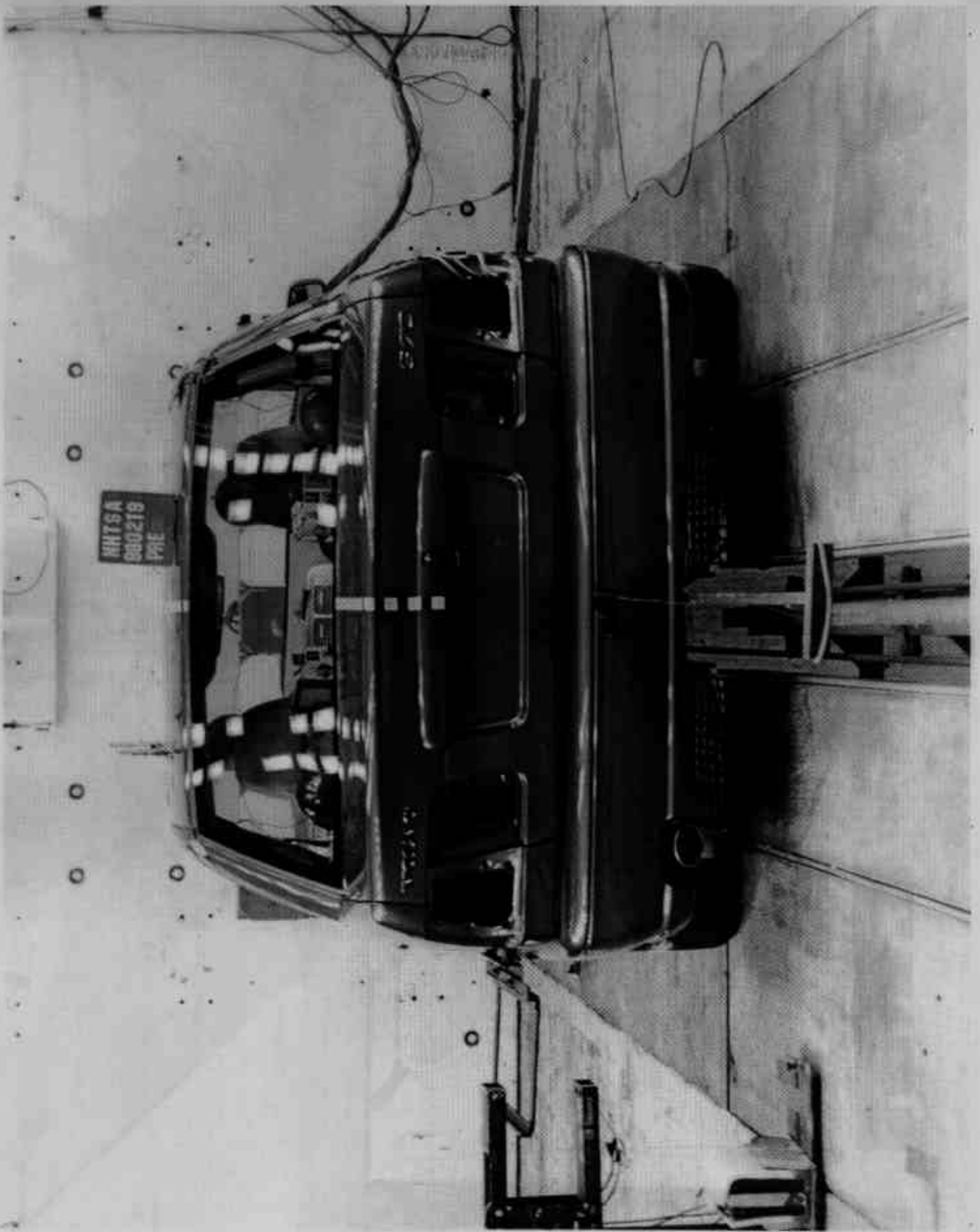


Figure A-5 Pre-Test Rear View
A-6

980219

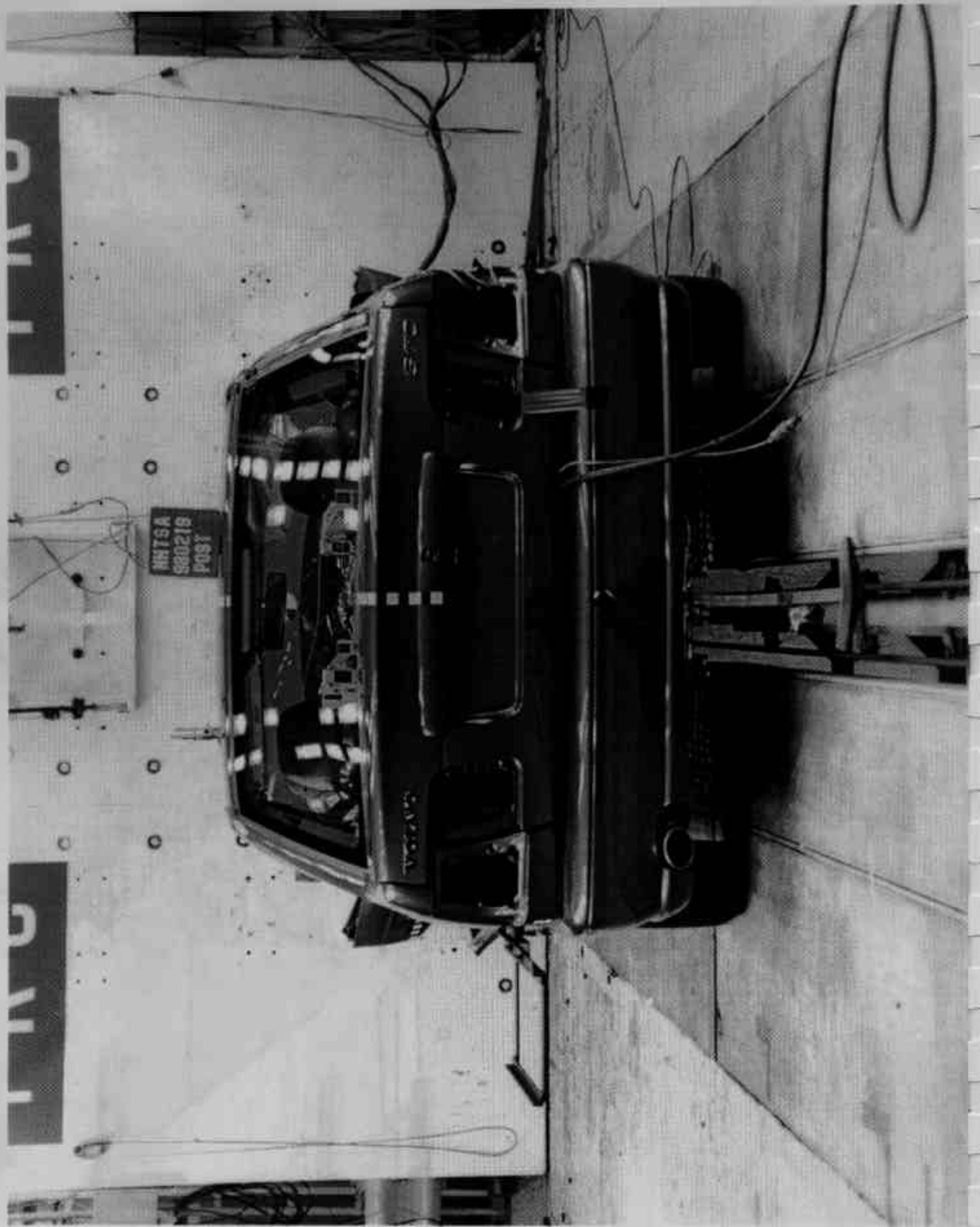


Figure A-6 Post-Test Rear View
A-7

980219

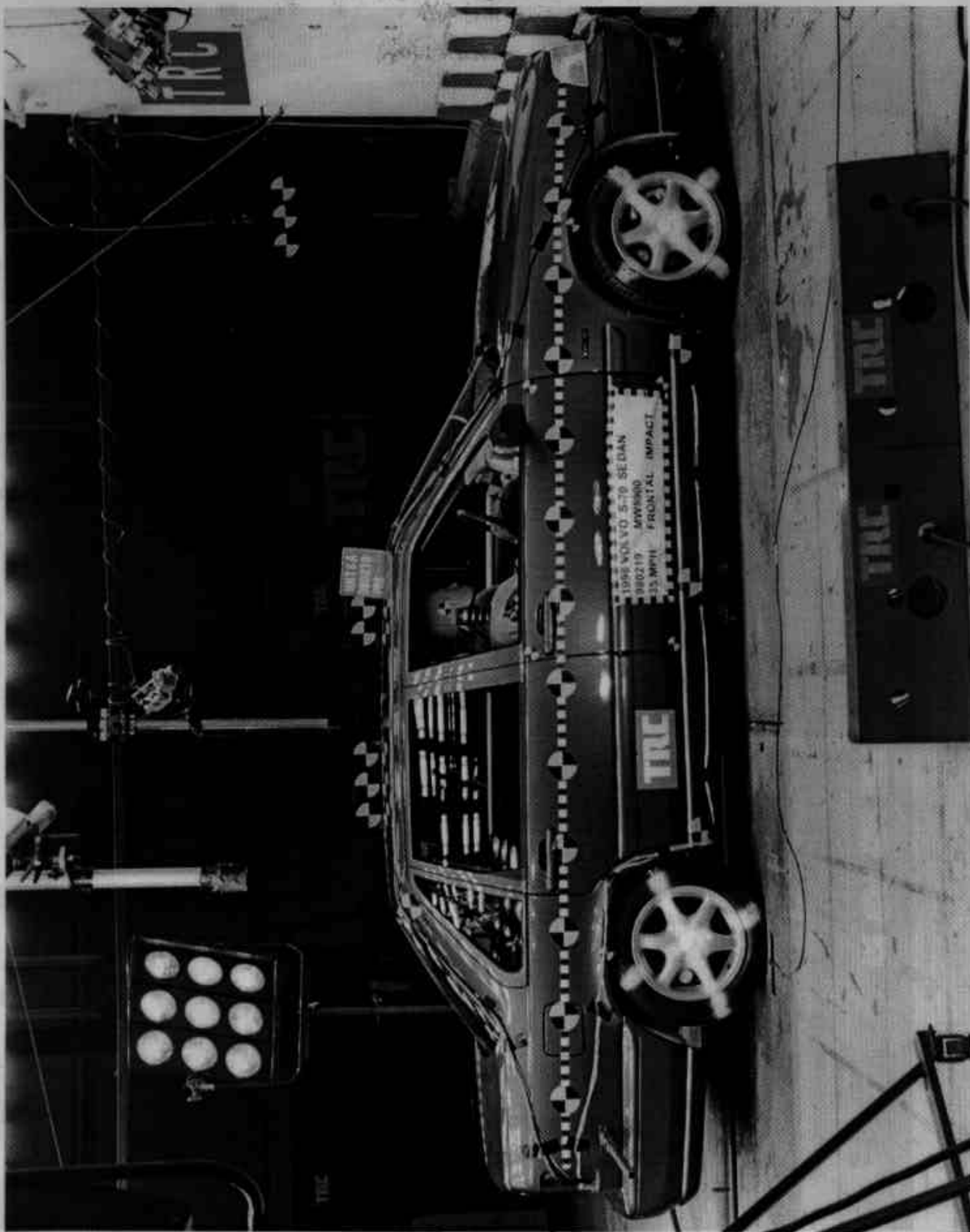


Figure A-7 Pre-Test Right Side View

A-8

980219

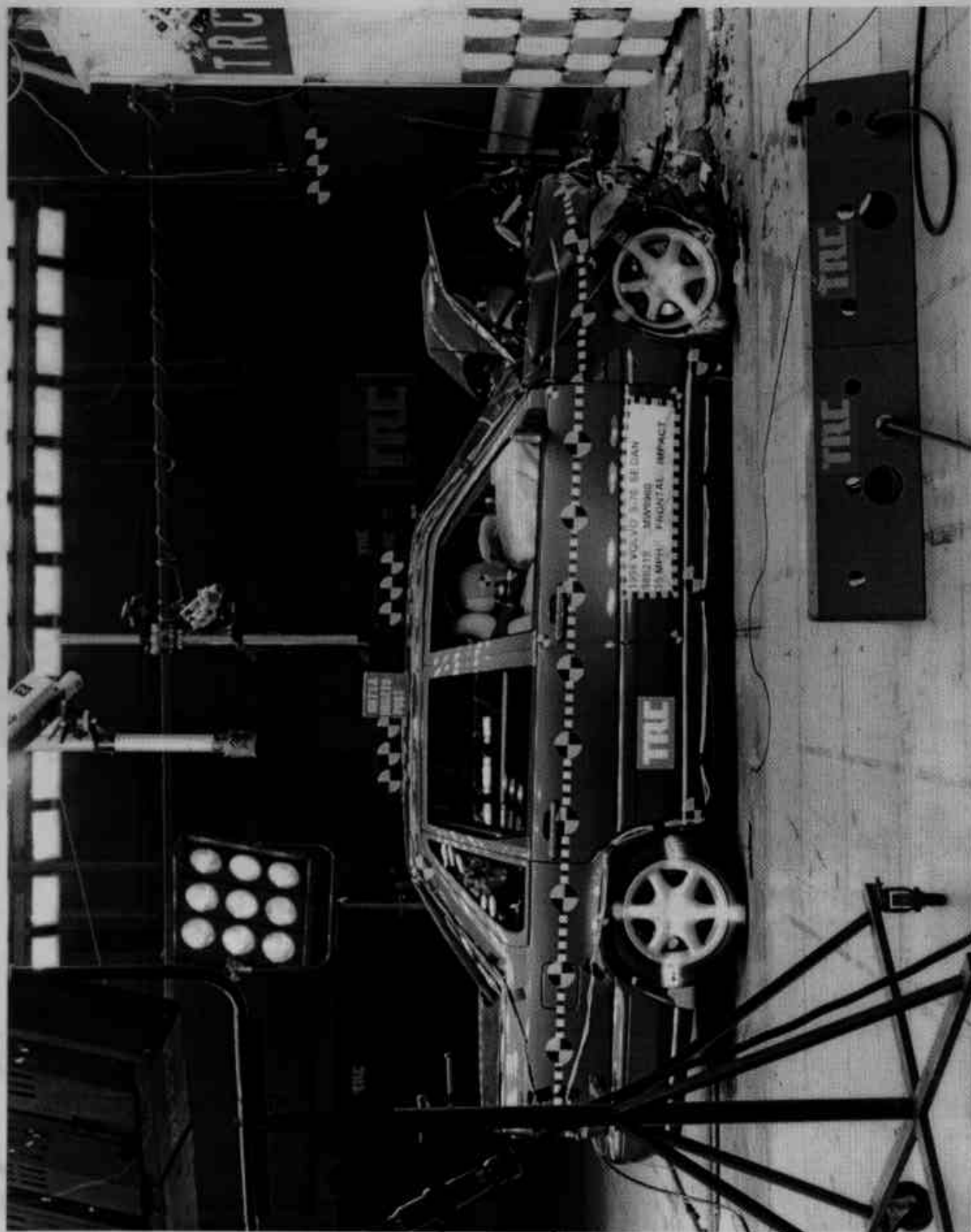


Figure A-8 Post-Test Right Side View

A-9

980219



Figure A-9 Pre-Test Right Front Three-Quarter View
A-10

980219



Figure A-10 Post-Test Right Front Three-Quarter View

A-11

980219

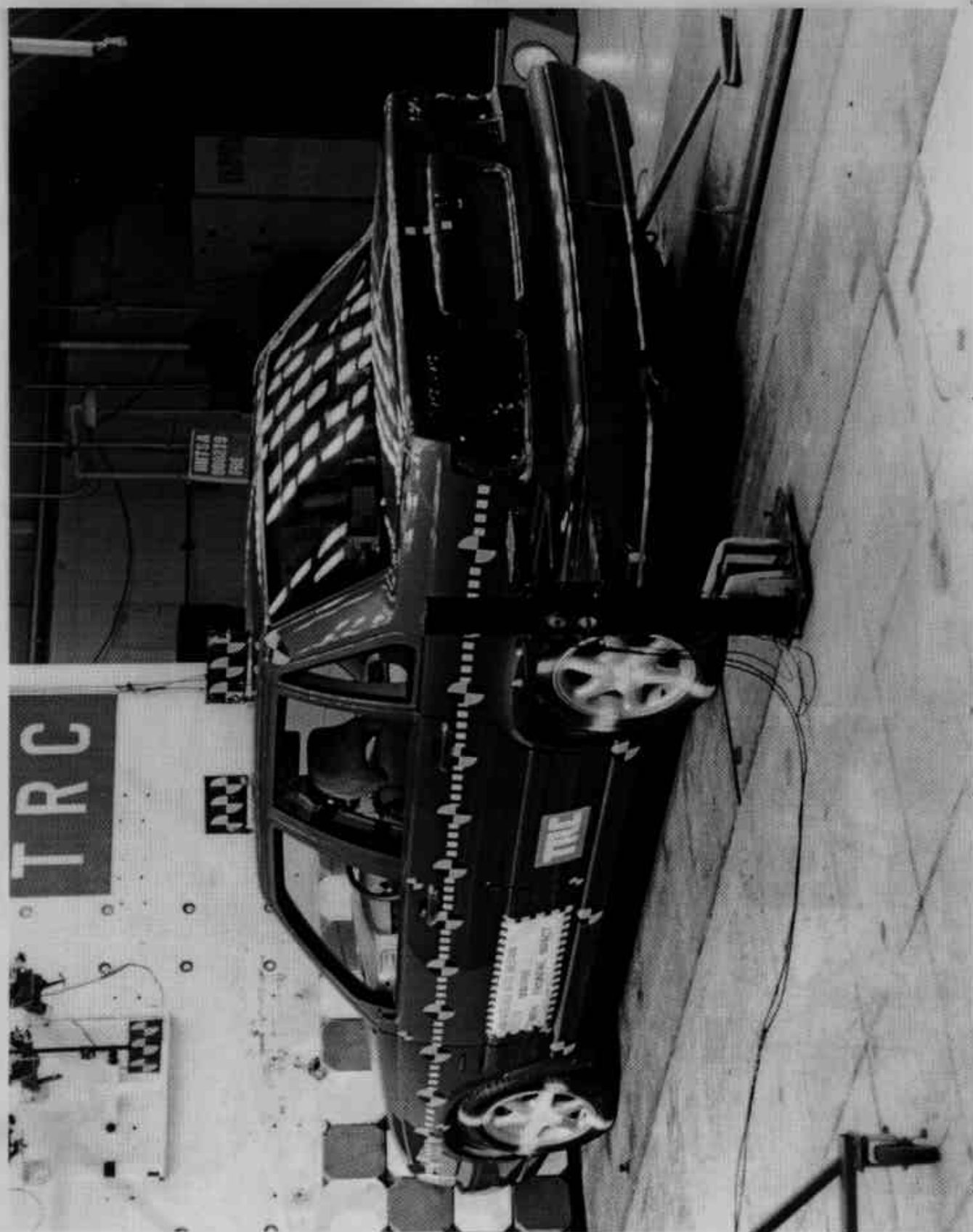


Figure A-11 Pre-Test Left Rear Three-Quarter View
A-12

980219

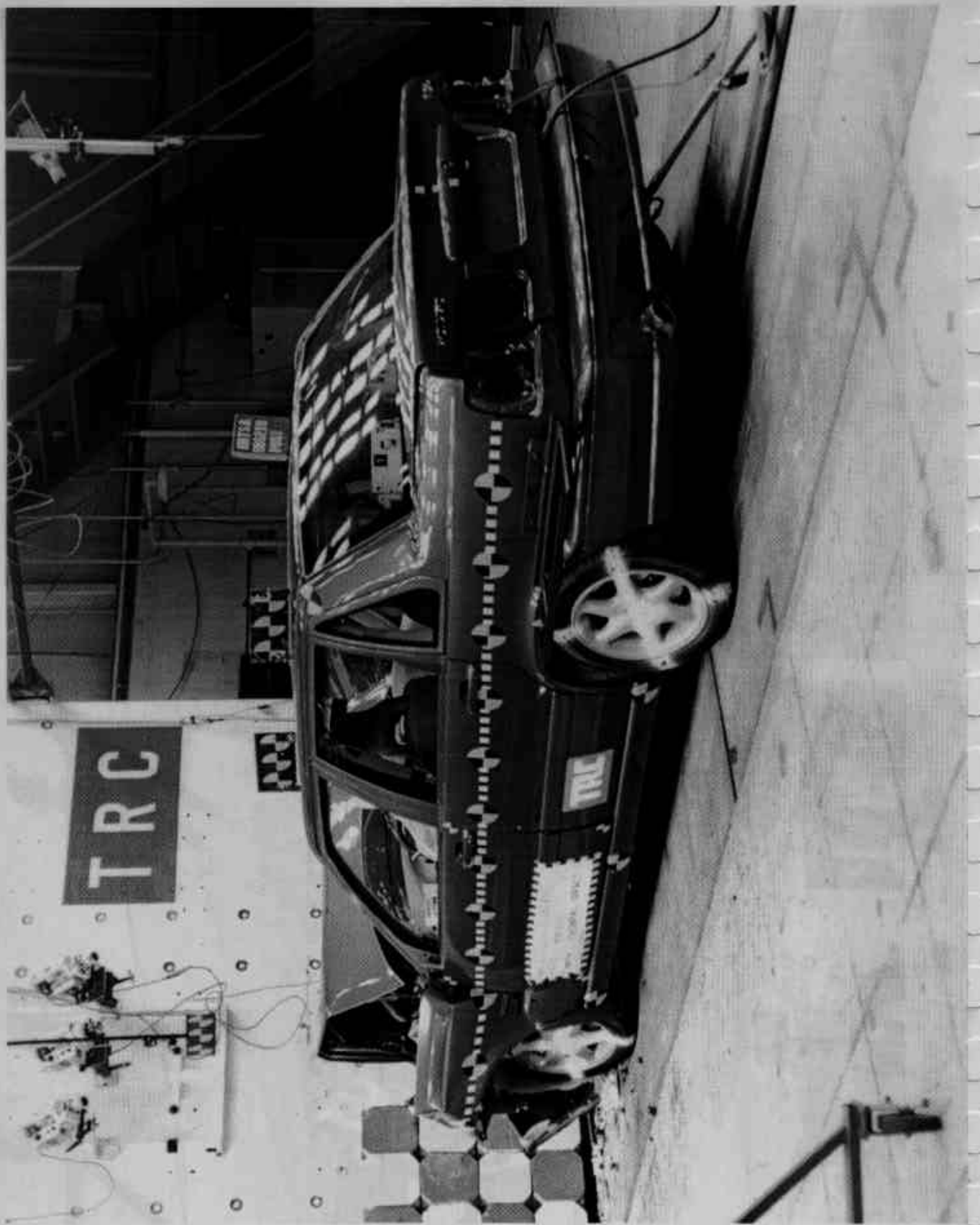


Figure A-12 Post-Test Left Rear Three-Quarter View
A-13

980219

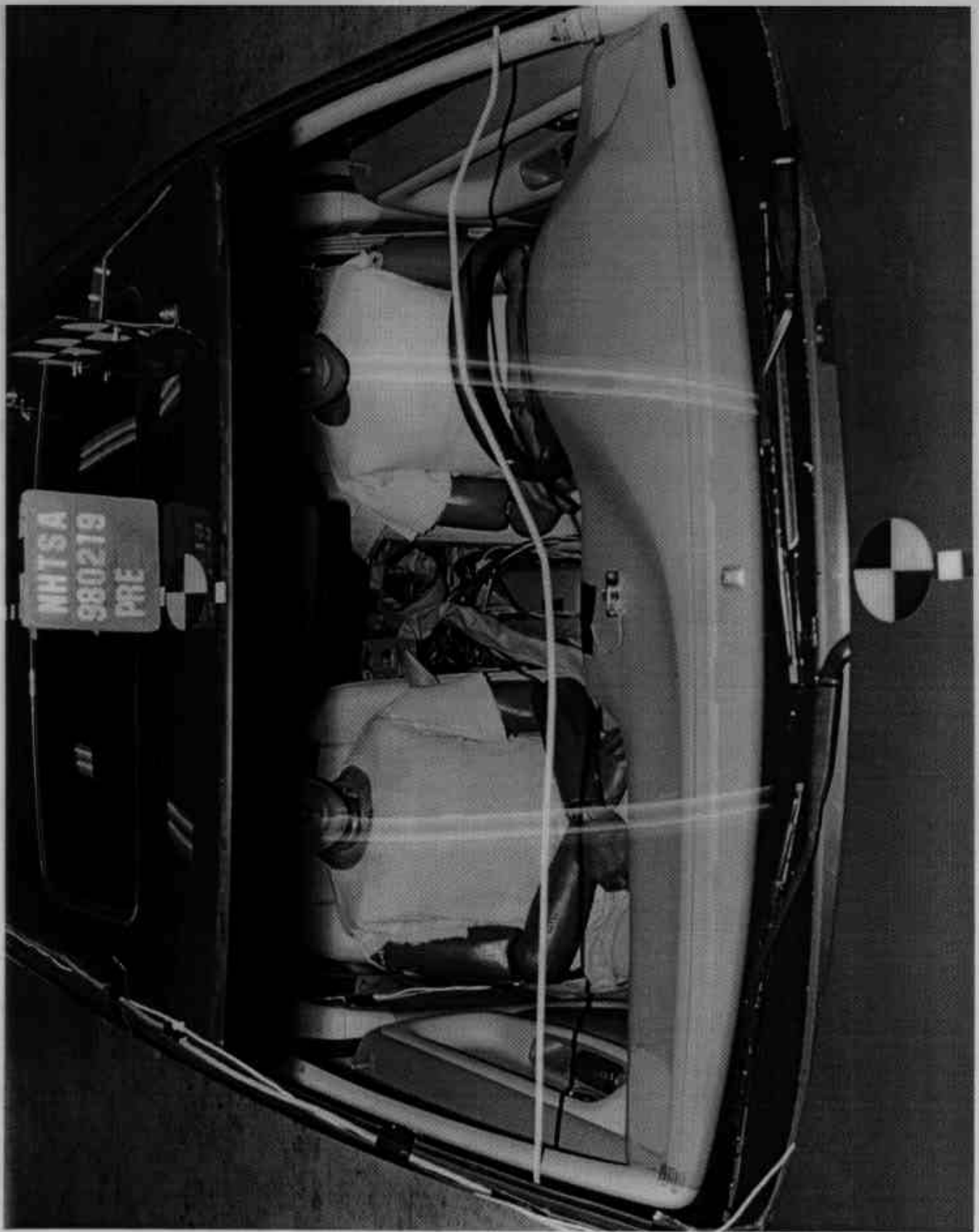


Figure A-13 Pre-Test Windshield View
A-14

980219

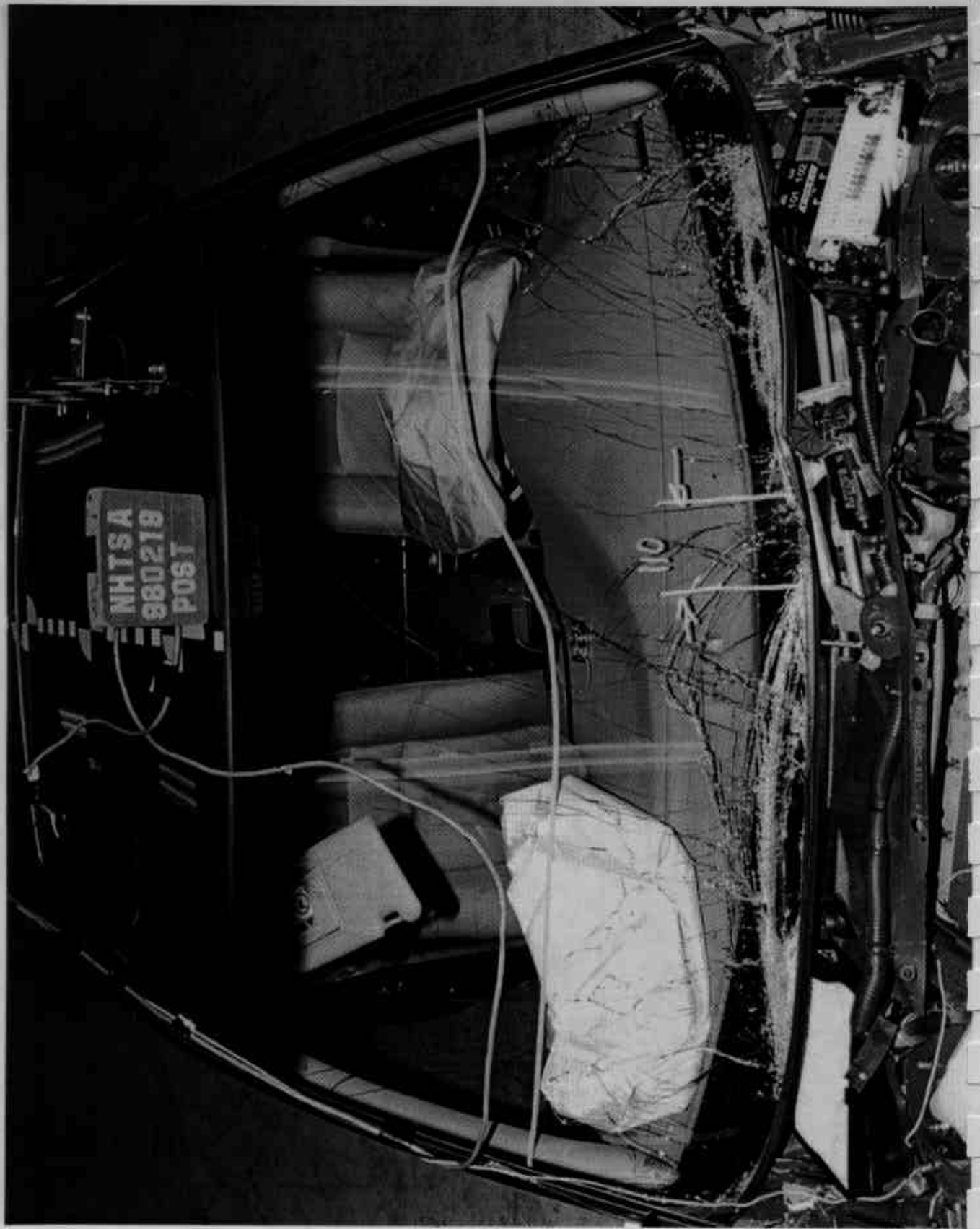


Figure A-14 Post-Test Windshield View
A-15

980219

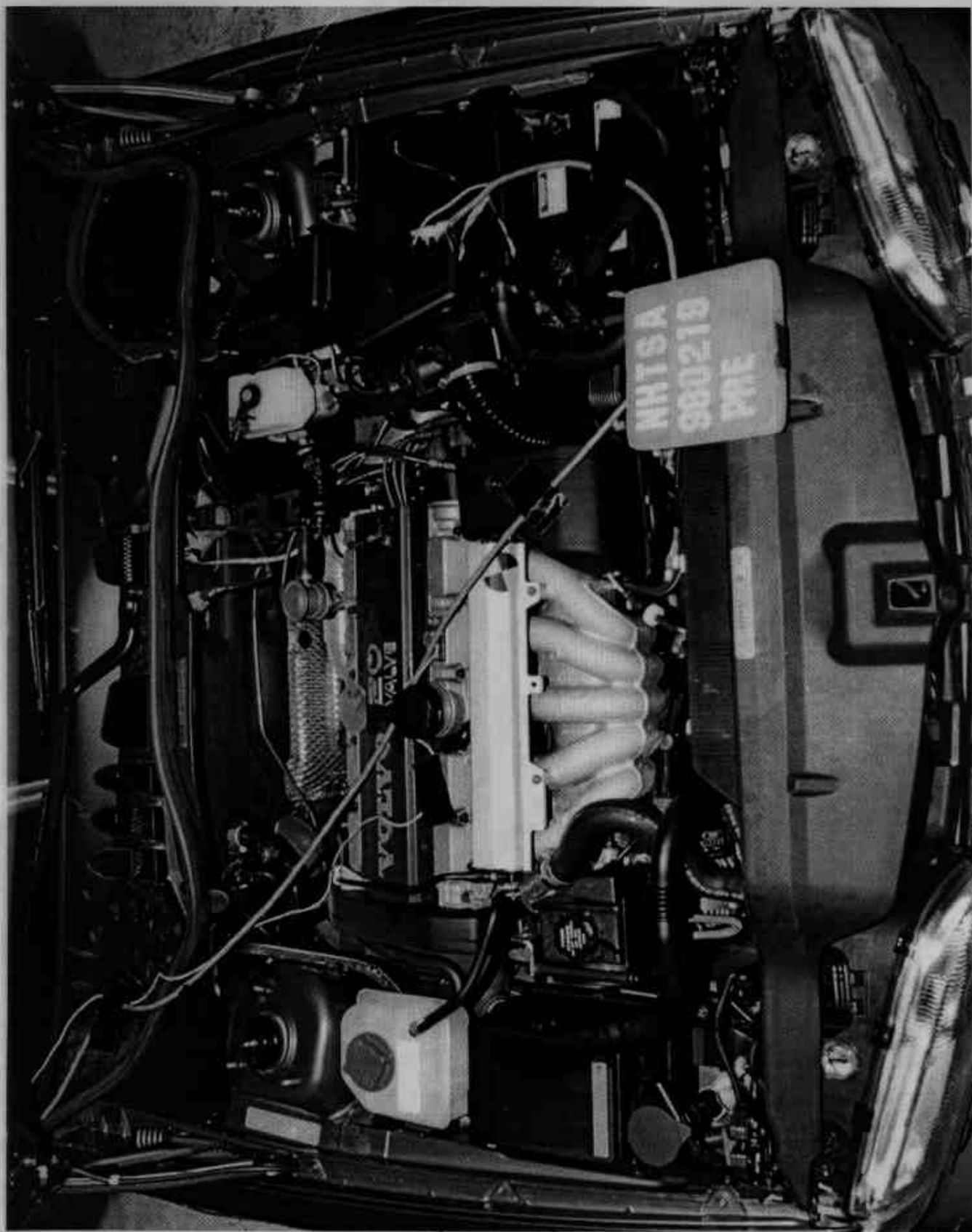


Figure A-15 Pre-Test Engine Compartment View
A-16

980219

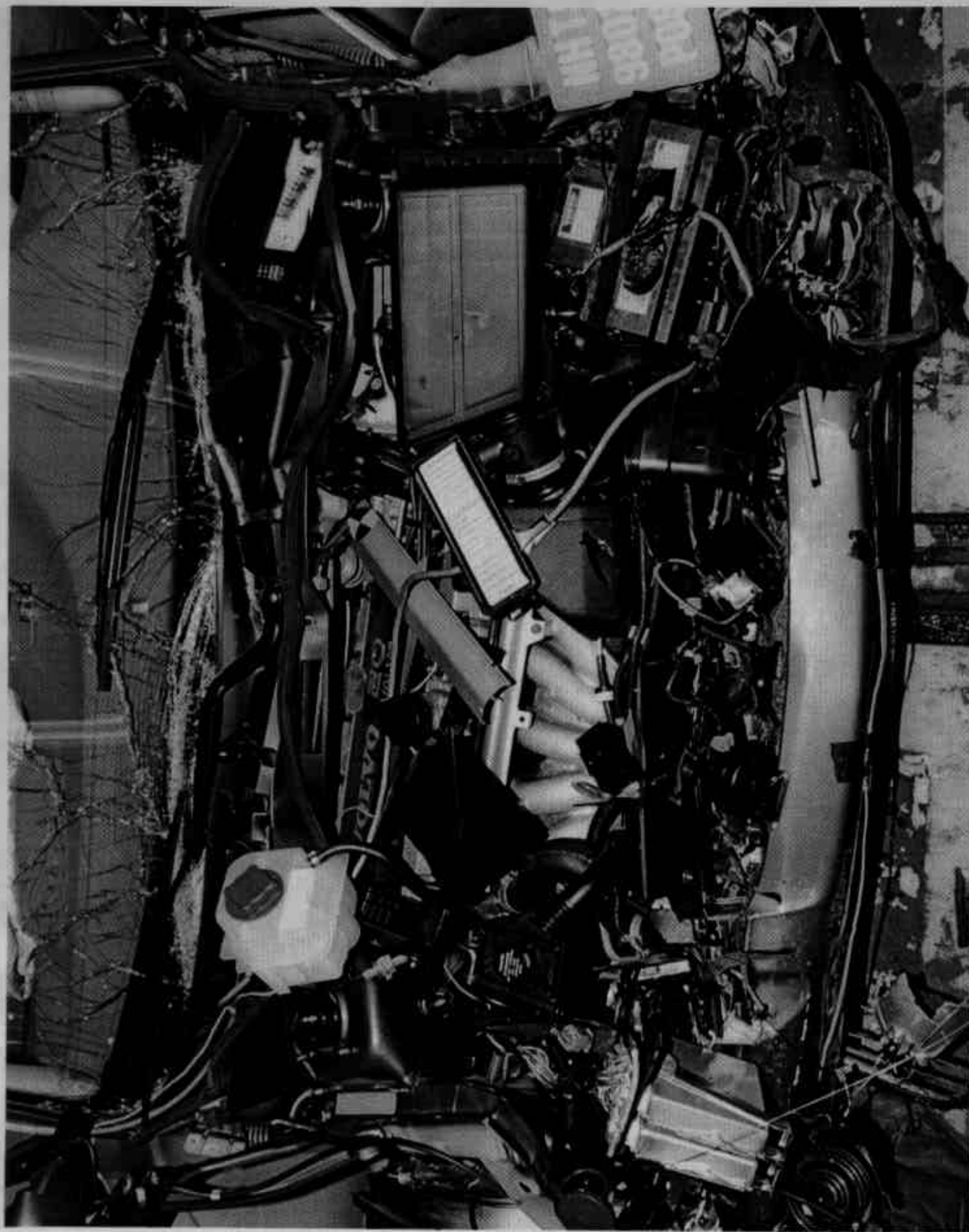


Figure A-16 Post-Test Engine Compartment View

A-17

980219



Figure A-17 Pre-Test Fuel Filler Cap View

A-18

980219



Figure A-18 Post-Test Fuel Filler Cap View
A-19

980219



Figure A-19 Pre-Test Fuel Filler Neck View
A-20

980219



Figure A-20 Post-Test Fuel Filler Neck View
A-21

980219

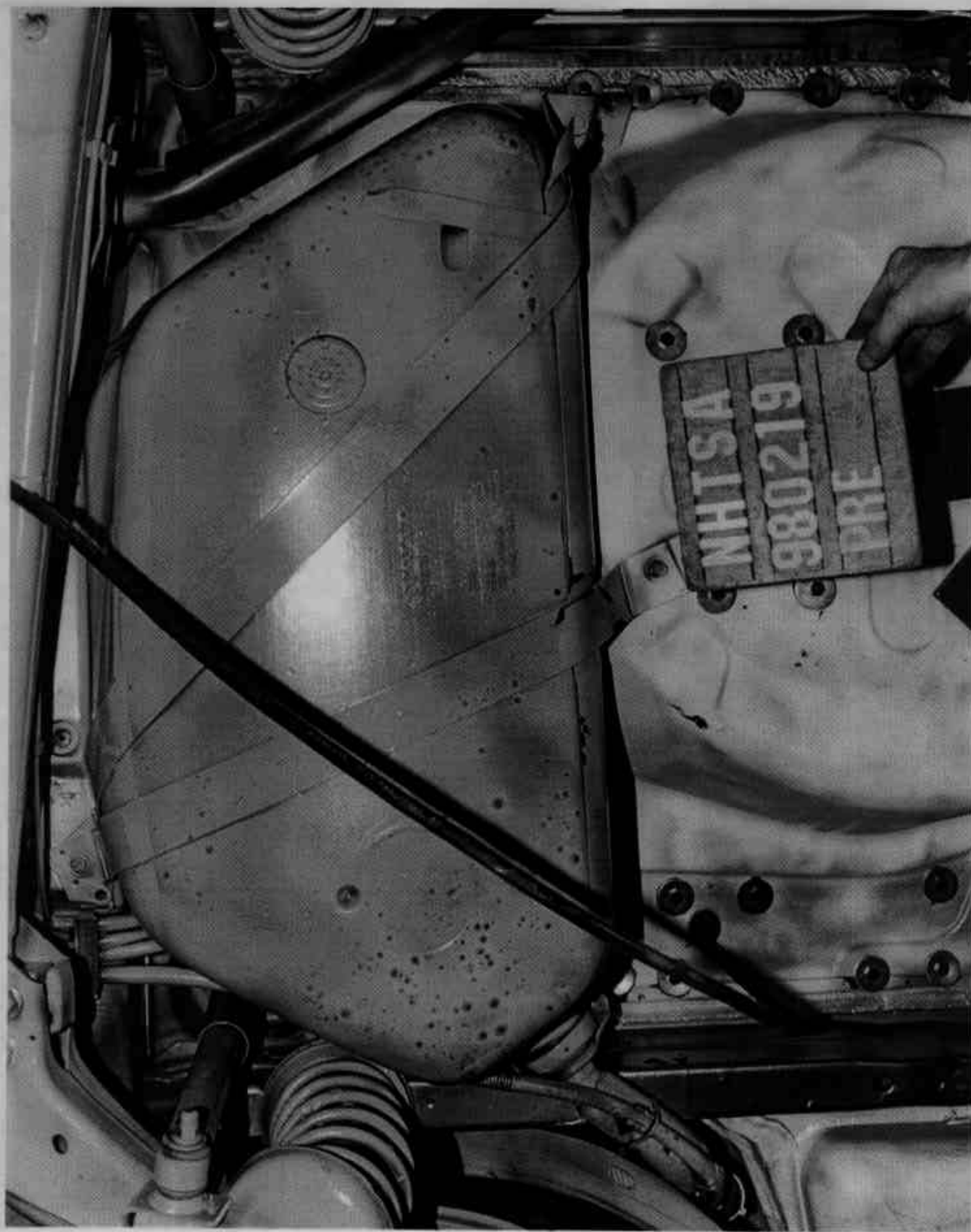


Figure A-21 Pre-Test Fuel Tank View

A-22

980219

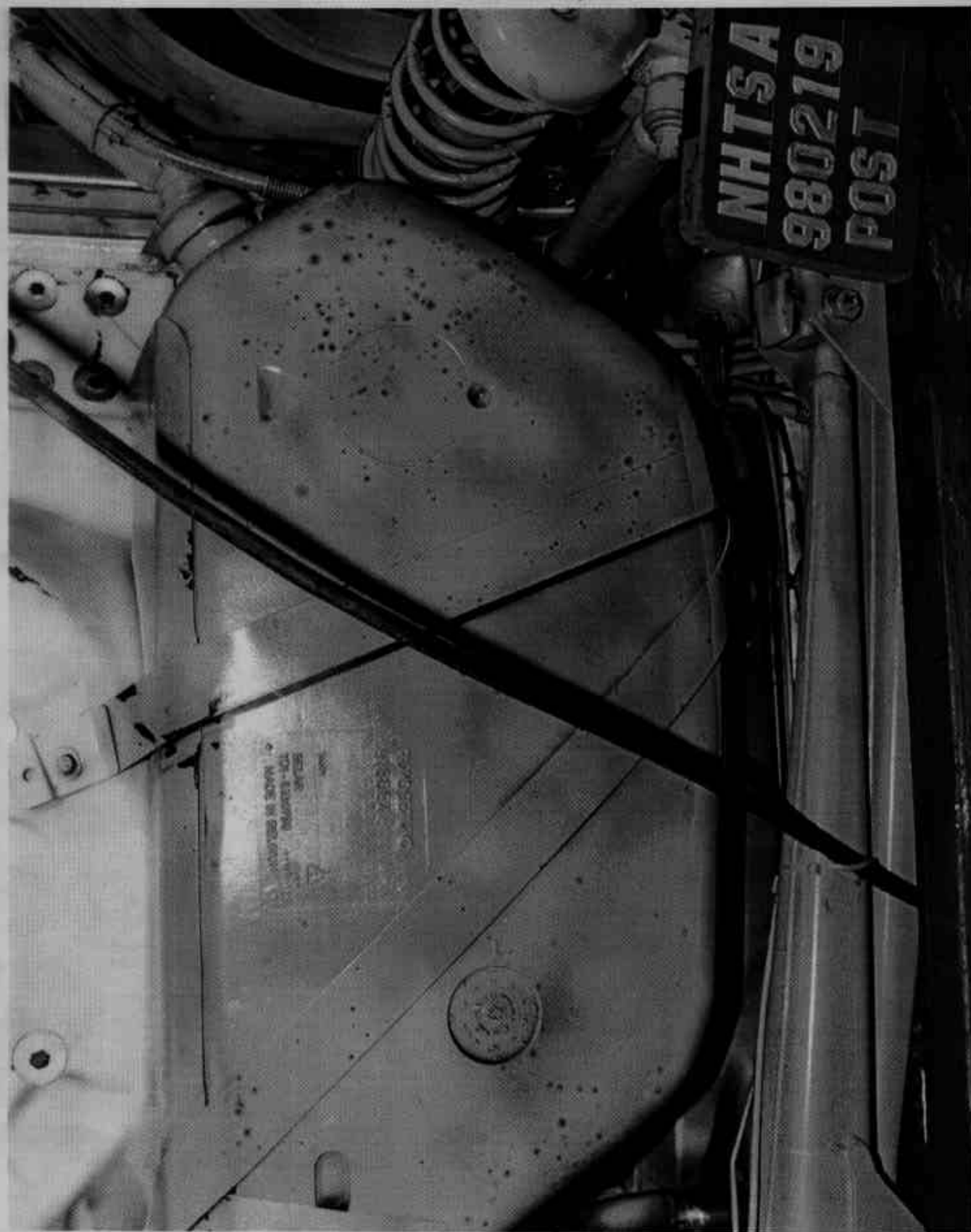


Figure A-22 Post-Test Fuel Tank View
A-23

980219



Figure A-23 Pre-Test Front Underbody View
A-24

980219

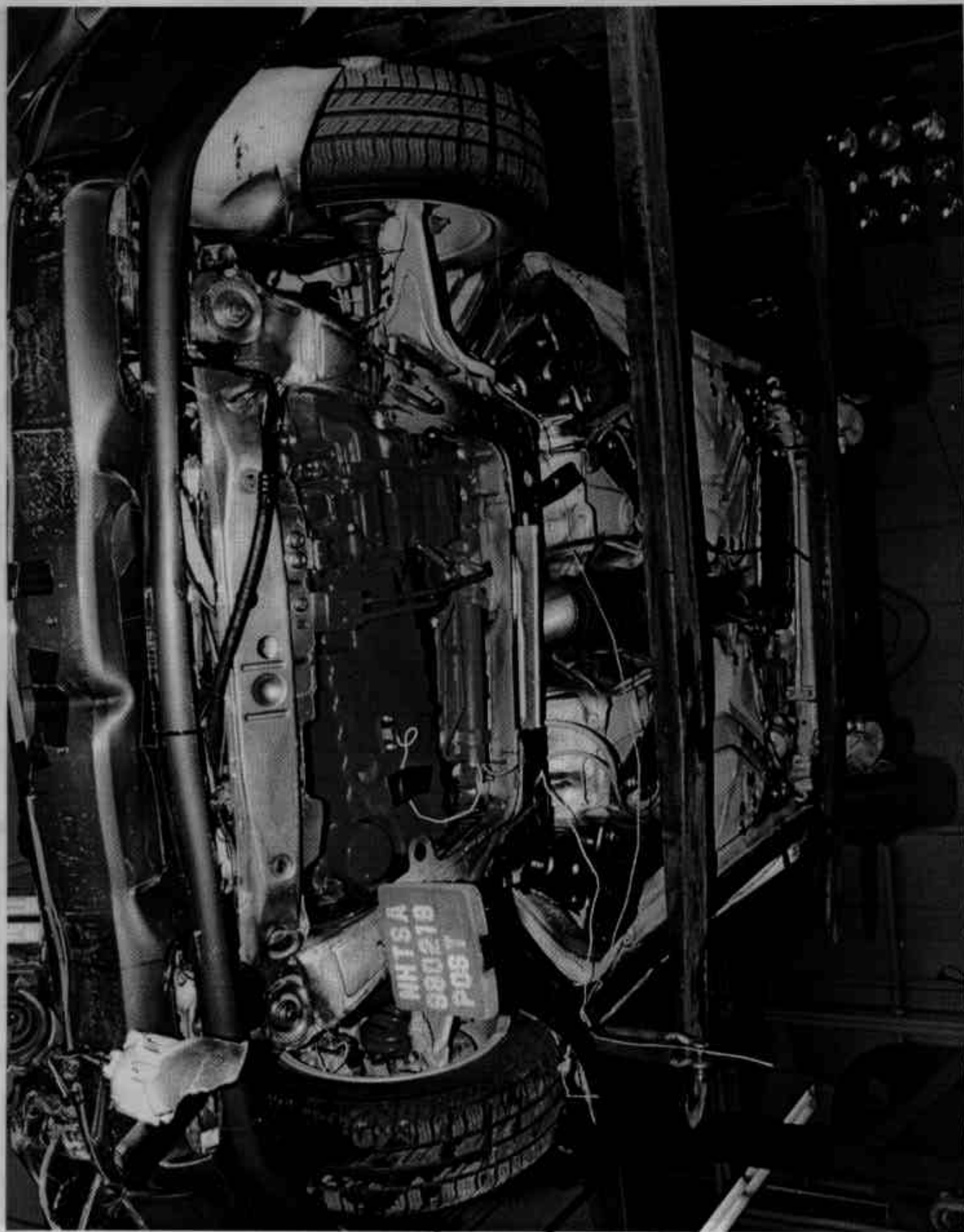


Figure A-24 Post-Test Front Underbody View
A-25

980219

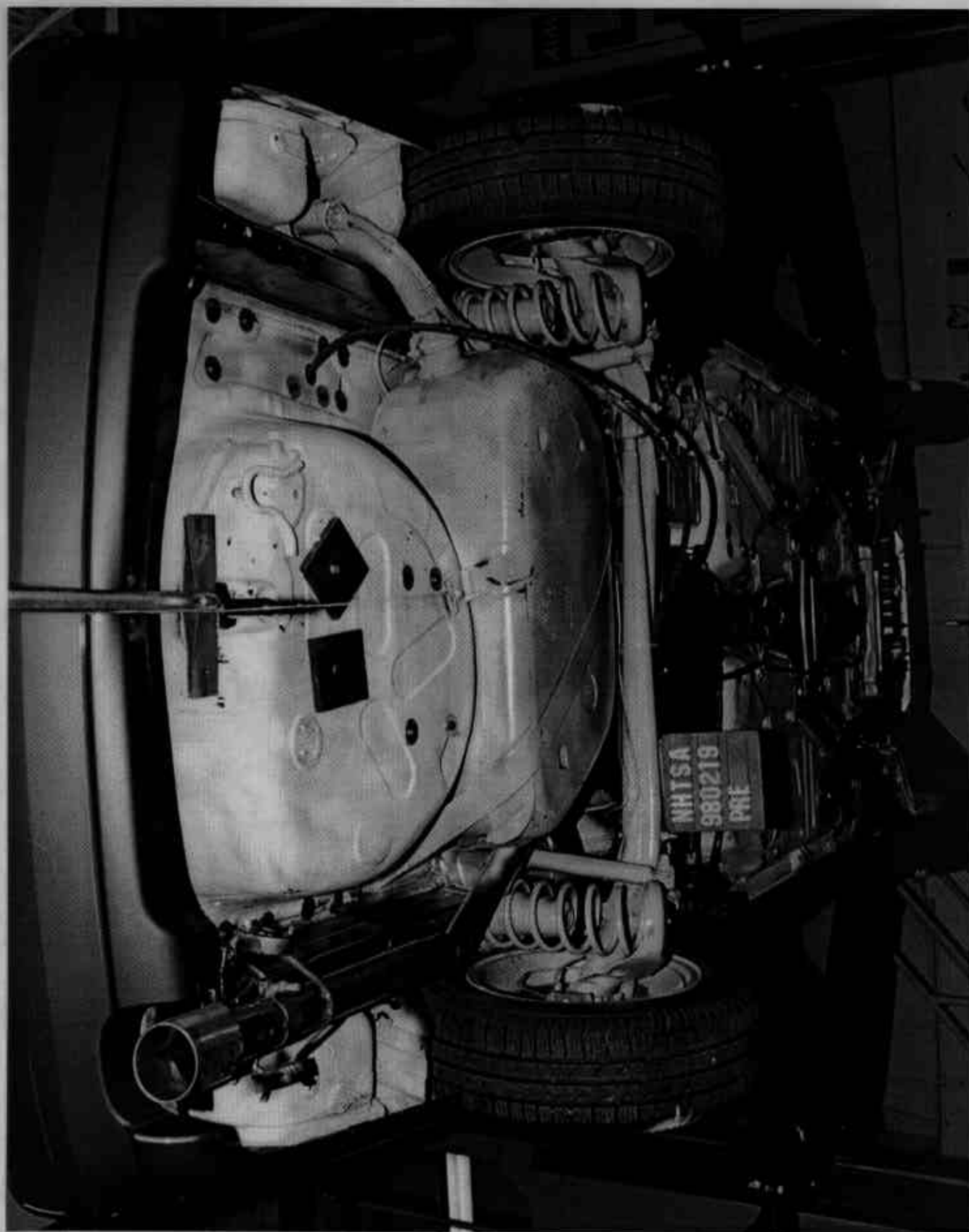


Figure A-25 Pre-Test Rear Underbody View

A-26

980219

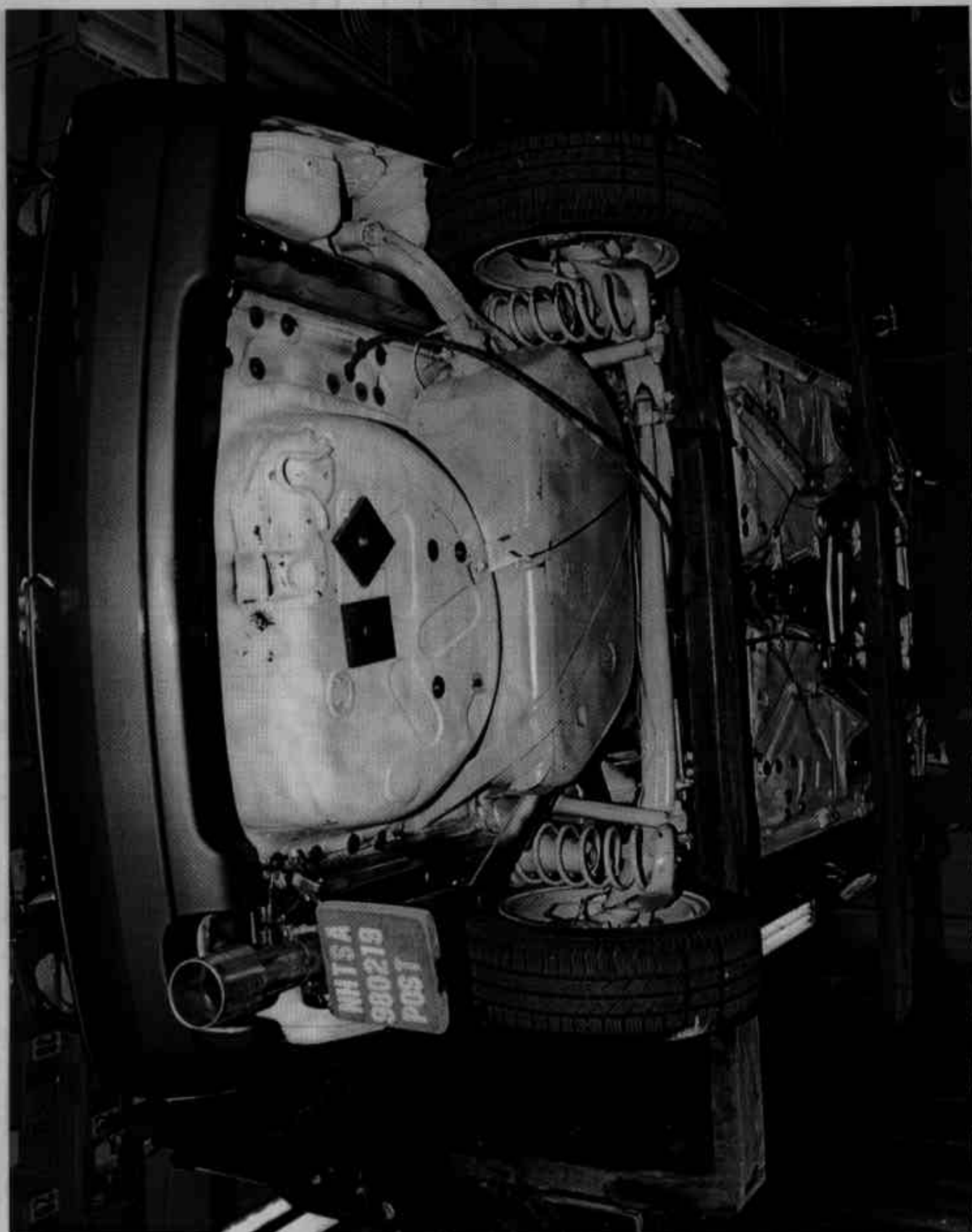


Figure A-26 Post-Test Rear Underbody View
A-27

980219



Figure A-27 Pre-Test Driver Dummy Position View

A-28

980219



Figure A-28 Post-Test Driver Dummy Position View
A-29

980219



Figure A-29 Pre-Test Passenger Dummy Position View
A-30

980219

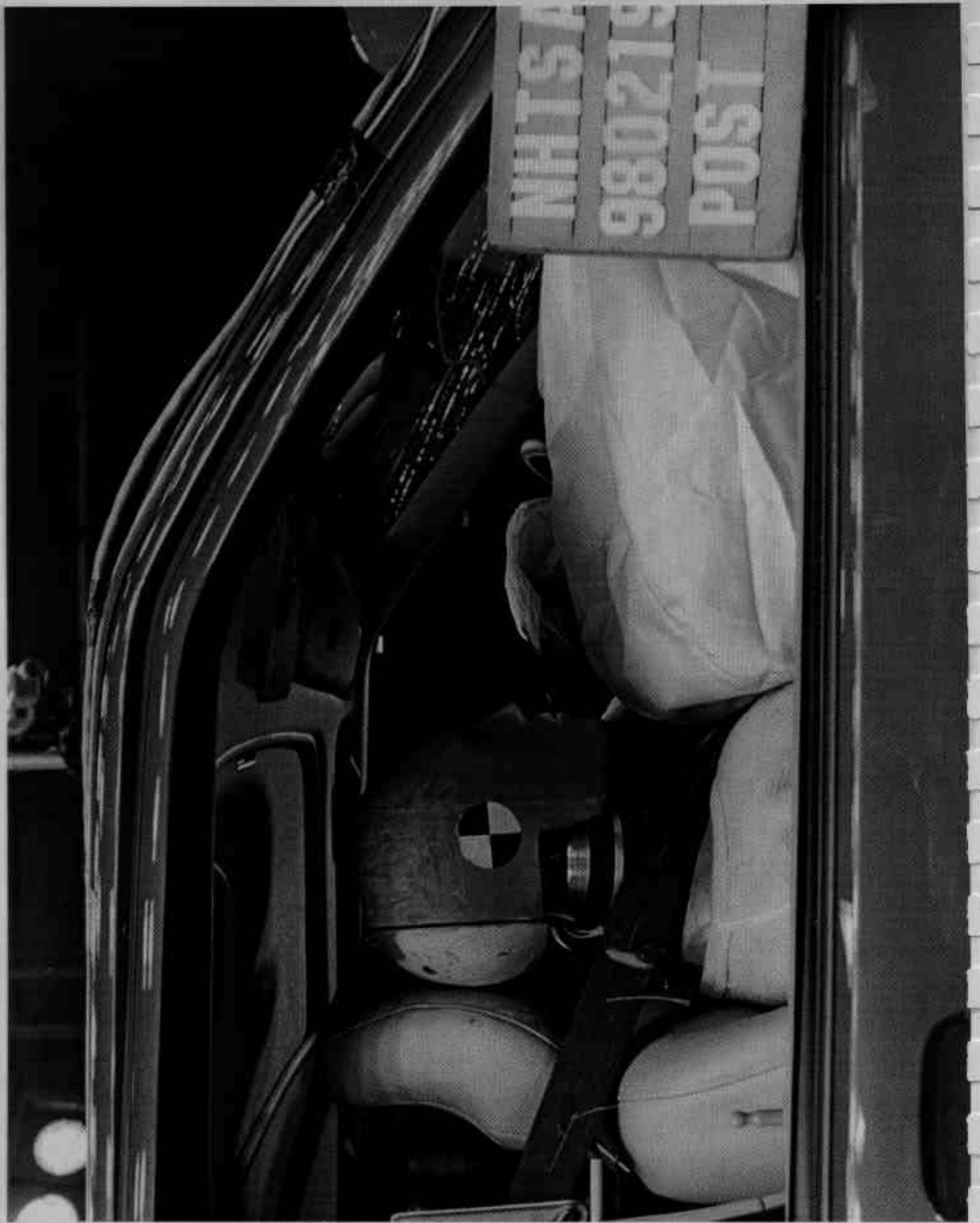


Figure A-30 Post-Test Passenger Dummy Position View

A-31

980219



Figure A-31 Pre-Test Driver Dummy and Vehicle Interior - View 1

A-32

980219



Figure A-32 Post-Test Driver Dummy and Vehicle Interior - View 1

A-33

980219

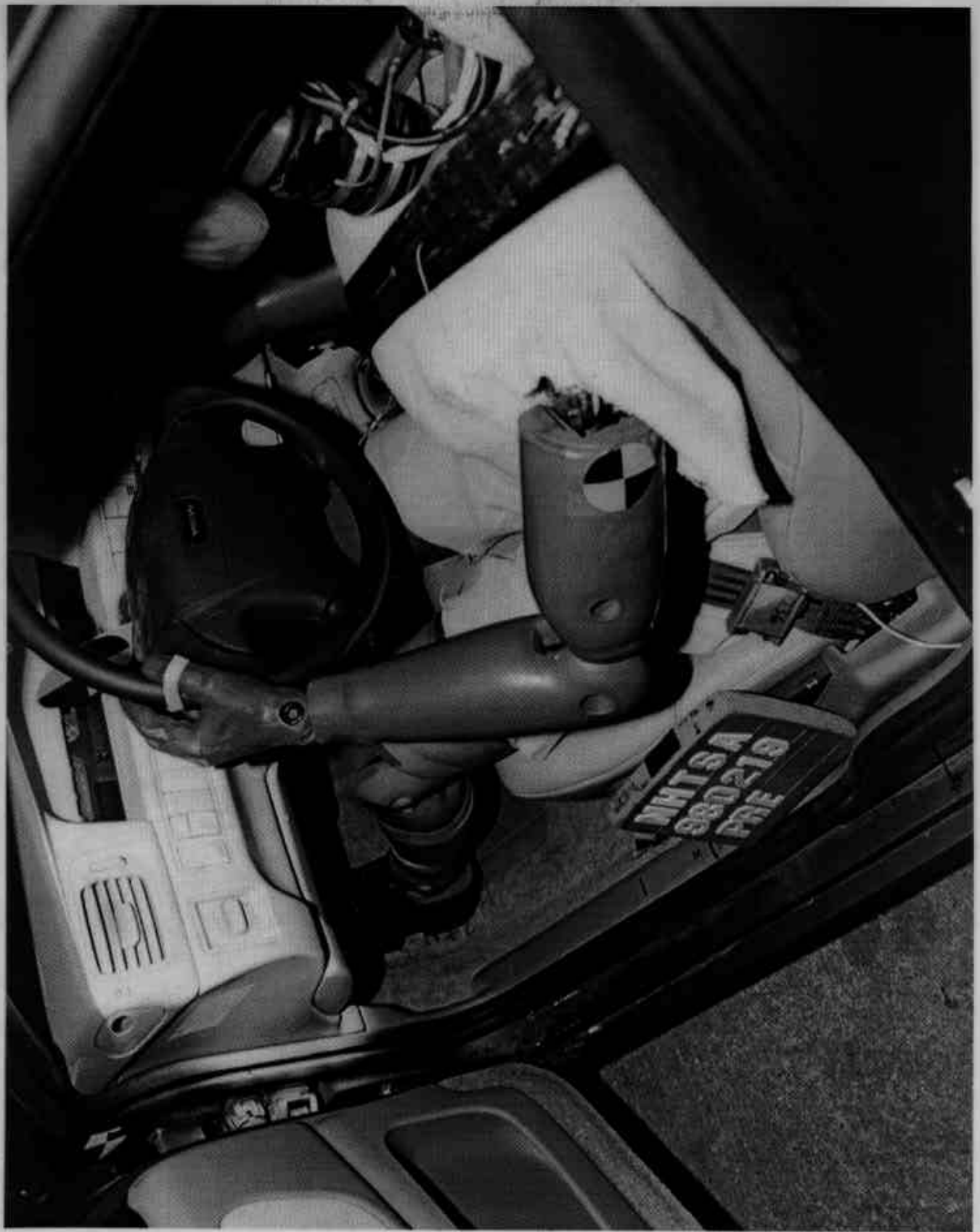


Figure A-33 Pre-Test Driver Dummy and Vehicle Interior - View 2



Figure A-34 Post-Test Driver Dummy and Vehicle Interior - View 2

A-35

980219



Figure A-35 Pre-Test Passenger Dummy and Vehicle Interior - View 1

A-36

980219



Figure A-36 Post-Test Passenger Dummy and Vehicle Interior - View 1

A-37

980219



Figure A-37 Pre-Test Passenger Dummy and Vehicle Interior - View 2

A-38

980219



Figure A-38 Post-Test Passenger Dummy and Vehicle Interior - View 2

A-39

980219



Figure A-39 Post-Test Driver Dummy View
A-40



Figure A-40. Post-Test Driver Dummy Head Contact - View 1
A-41

980219



Figure A-41 Post-Test Driver Dummy Head Contact - View 2

A-42

980219



Figure A-42 Post-Test Driver Dummy Head Contact - View 3

A-43

980219



Figure A-43 Post-Test Driver Dummy Knee Contact - View 1

A-44

980219



Figure A-44 Post-Test Driver Dummy Knee Contact - View 2

A-45

980219



Figure A-45 Post-Test Passenger Dummy View

A-46

980219

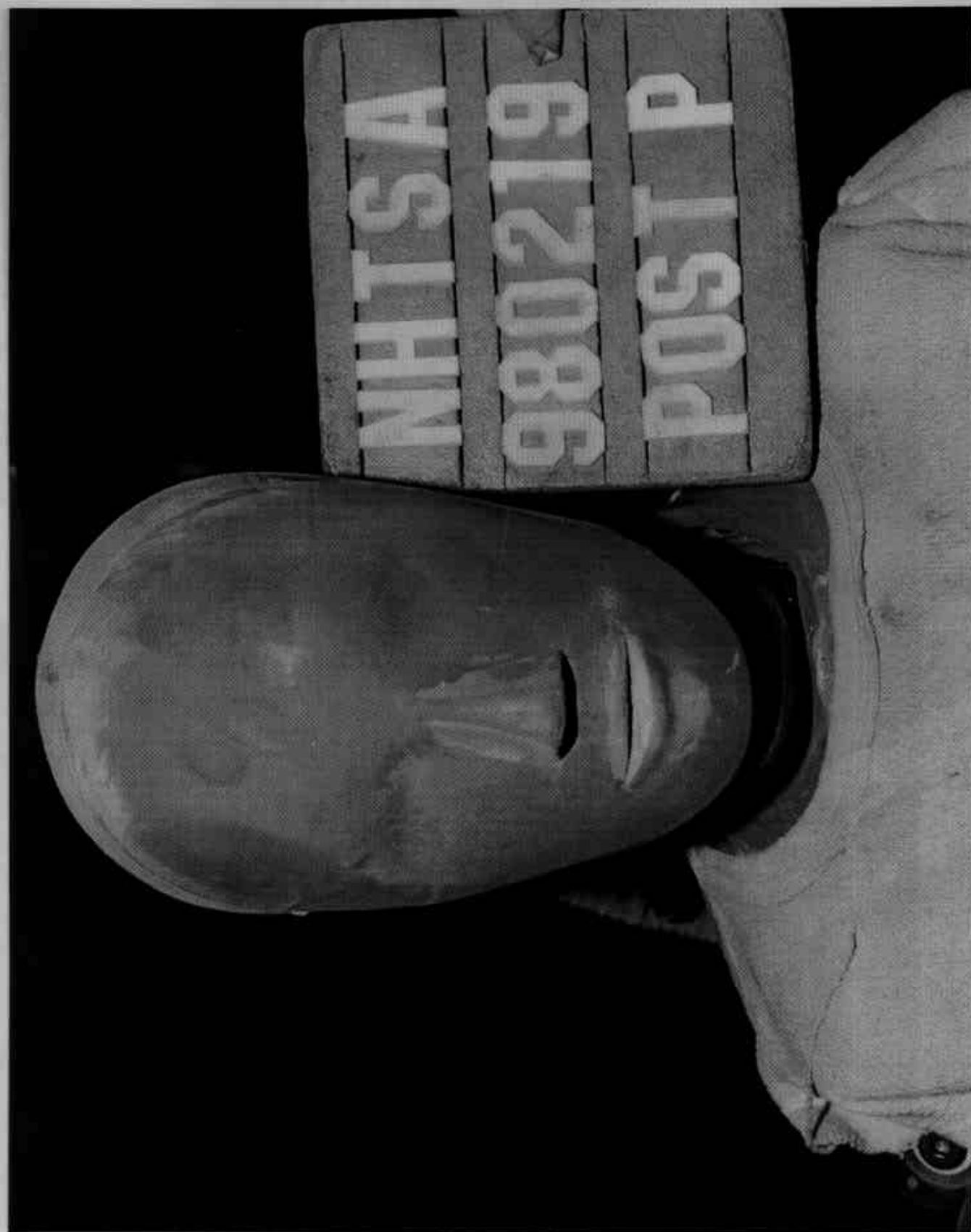


Figure A-46 Post-Test Passenger Dummy Head Contact - View 1

A-47

980219



Figure A-47 Post-Test Passenger Dummy Head Contact - View 2

A-48

980219



Figure A-48 Post-Test Passenger Dummy Head Contact - View 3

A-49

980219



Figure A-49 Post-Test Passenger Dummy Knee Contact - View 1

A-50

980219



Figure A-50 Post-Test Passenger Dummy Knee Contact - View 2

A-51

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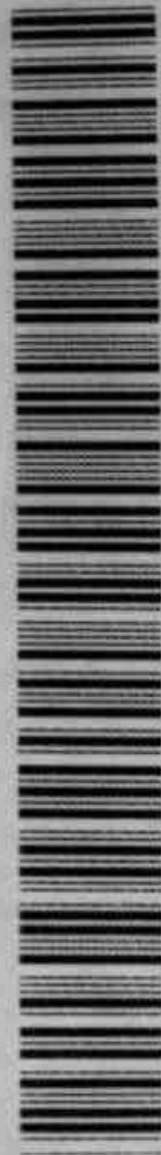
MFD. BY VOLVO GOTHENBURG SWEDEN
DATE: GV.W.R. GA.W.R.FRONT GA.W.R.REAR

12/97 4180 2290 2000 LB

THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL
MOTOR VEHICLE SAFETY, BUMPER AND THEFT PROTEC-
TION STANDARDS IN EFFECT ON THE DATE OF MANUFAC-
TURE SHOWN ABOVE.

VIN YV1LS5570W2506462 PASS.CAR

4633986



VOLVO

3514635

Figure A-51 Pre-Test Vehicle Certification Label View

VEHICLE CAPACITY		OCCUPANTS		COLD TIRE PRESSURES	
WEIGHT	FRT	RR	TOTAL	FRONT	REAR
930 LB	2	3	5	36	36
PSI					

LOAD	RECOMMENDED FOR FUEL ECONOMY		OPTIONAL PRESSURE		PSI
TIRE SIZE	95/60R15	2	1	3	32 29

IF TIRES ARE HOT FROM DRIVING ADD 4 PSI (28kPa) TO THESE RECOMMENDED PRESSURES

SPARE TIRE	INFLATION PRESSURE	PSI
		60

T115/70R15 SIZE

SEE OWNERS MANUAL FOR ADDITIONAL INFORMATION.

VOLVO

986 3514949

SEE OWNER'S MANUAL

IMPORTANT

STOP ENGINE BEFORE REFUELLING.
CLOSE CAP AFTER REFUELLING.

Figure A-52 Pre-Test Tire Load Label View

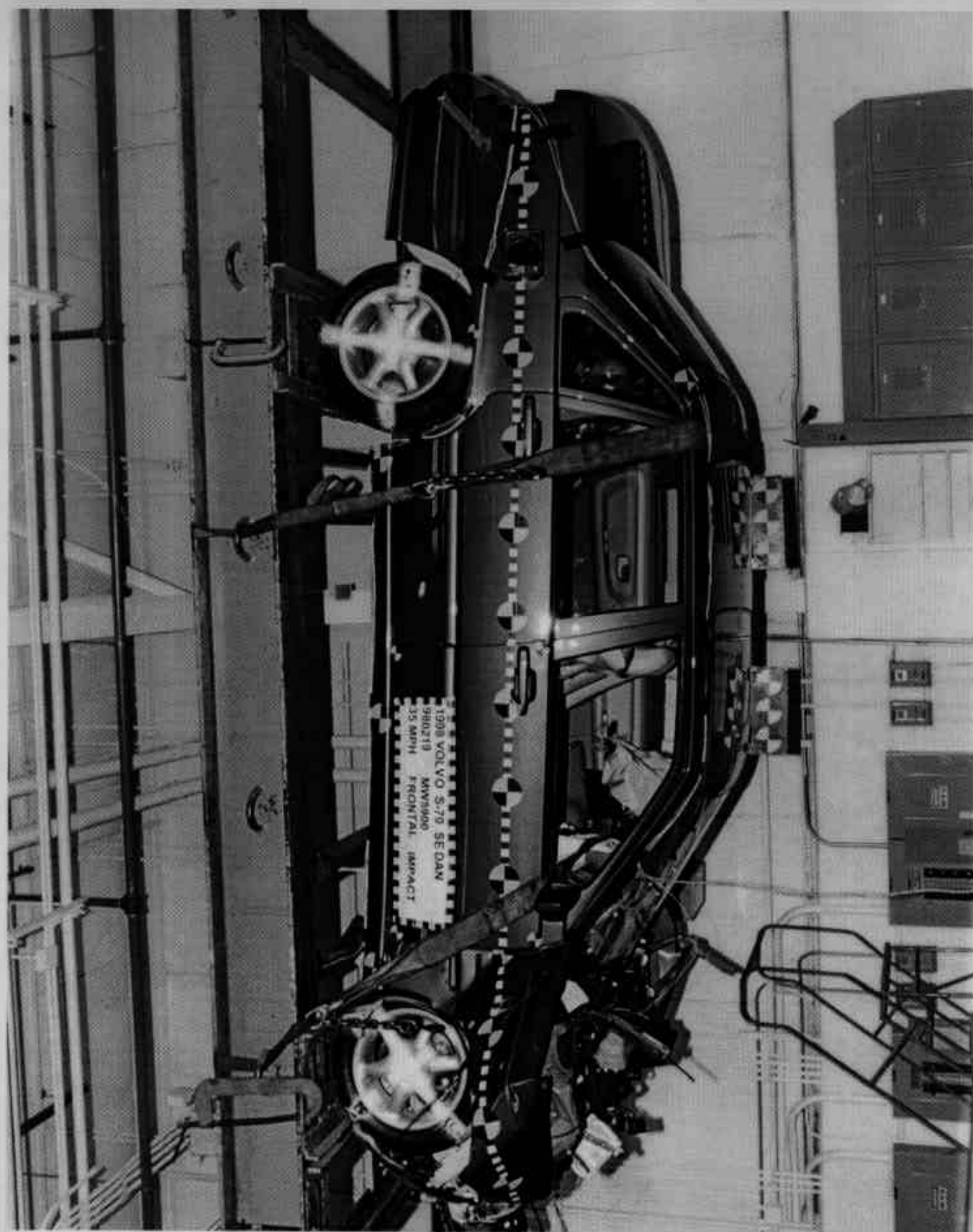


Figure A-53 Post-Test Vehicle On Static Rollover Device
A-54

980219

Appendix B

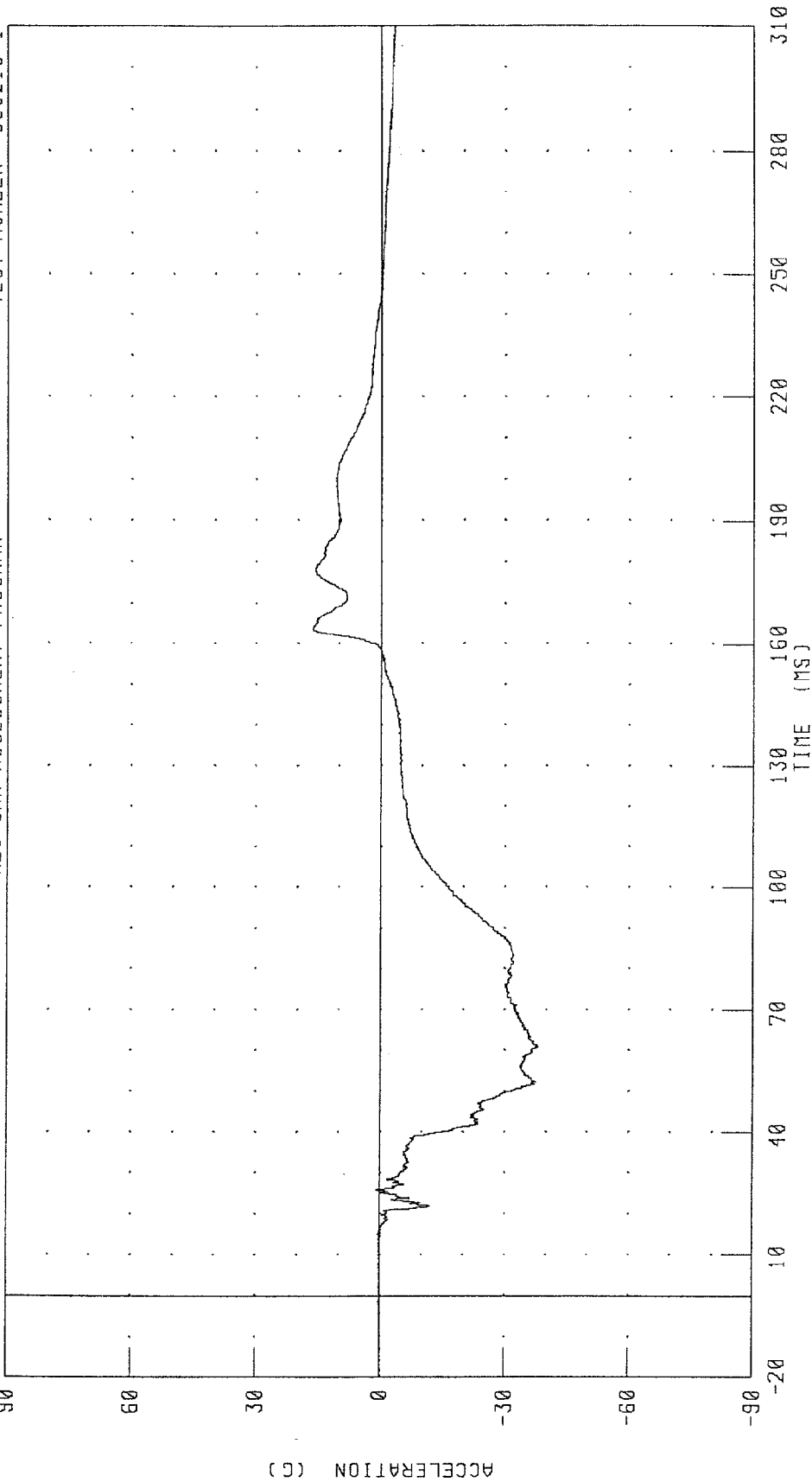
Data Plots

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER HEAD X-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

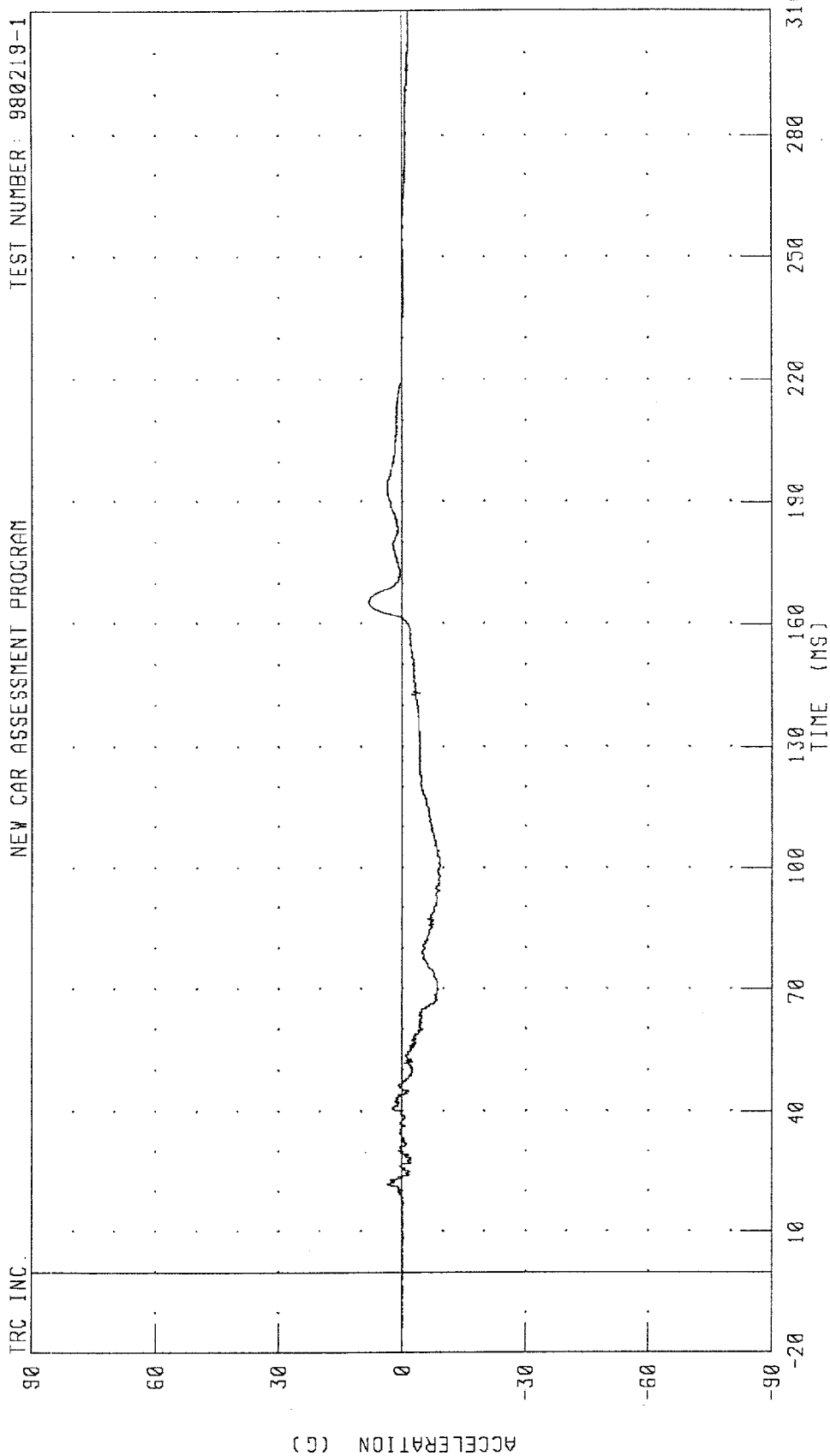


CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

PEAK DATA: 16.37 G @ 163.44 MS, -38.06 G @ 60.80 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER HEAD Y-AXIS ACCELERATION
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



PEAK DATA: 8.18 G @ 165.04 MS; -9.43 G @ 97.92 MS

CHANNEL: HEDYG1 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER HEAD Z-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

IRC INC.

90

60

30

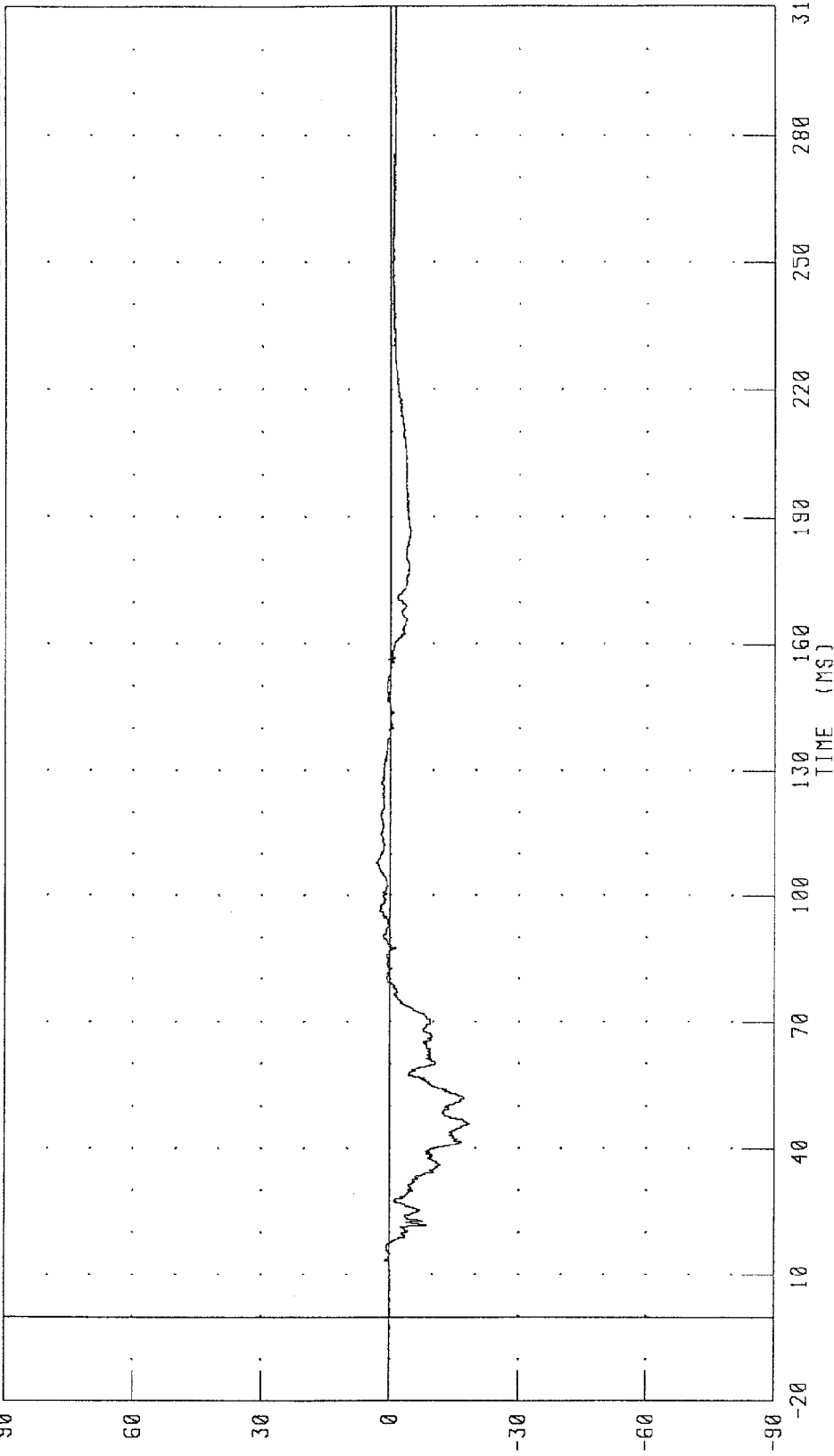
0

-30

-60

-90

ACCELERATION (G)

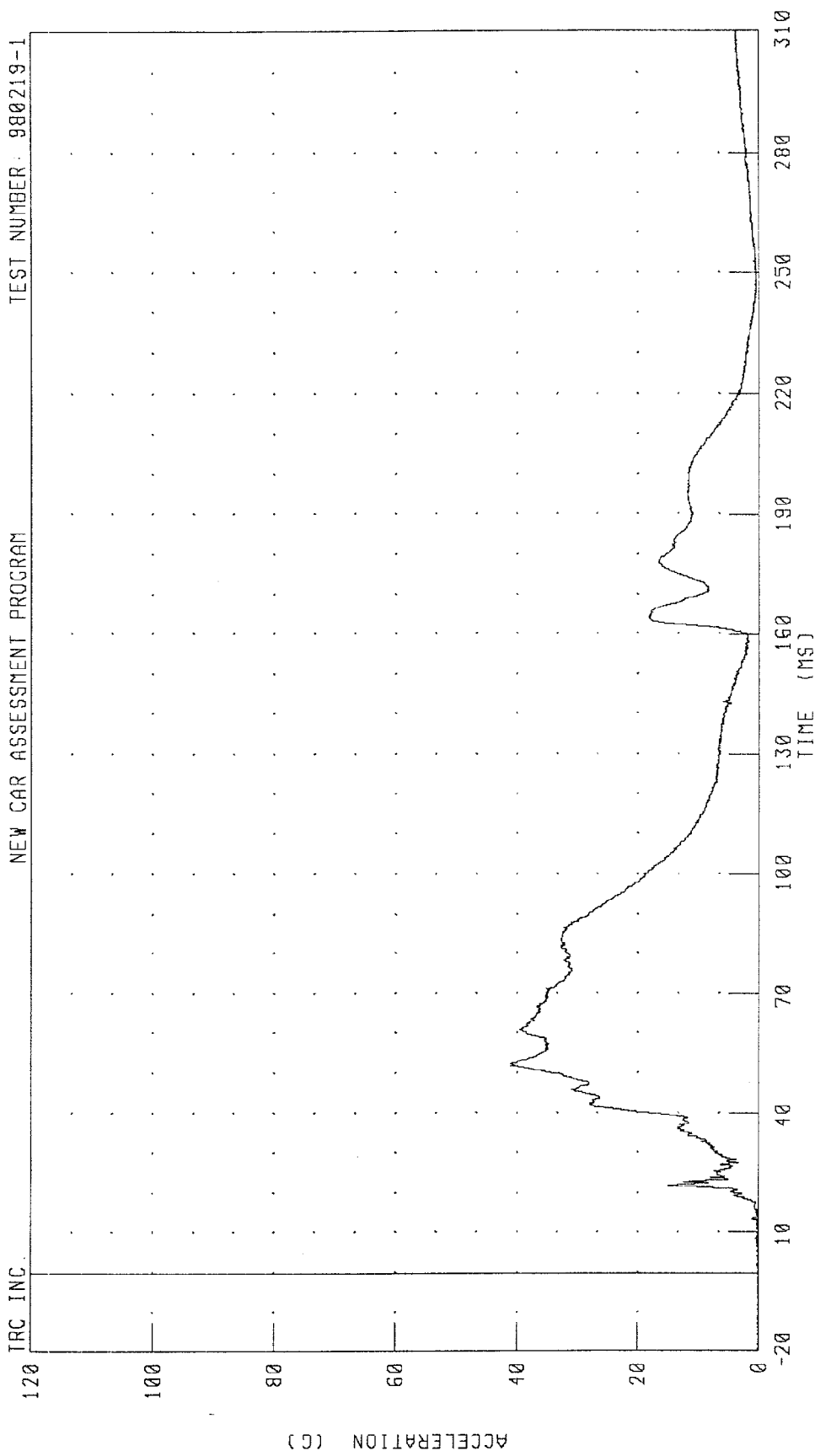


CHANNEL: HEDZG1 FILTER: CH. CLASS 1000

PEAK DATA: 3.21 G @ 107.92 MS, -18.49 G @ 184.49 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



CHANNEL: HEDRG1 FILTER: CH. CLASS 1000

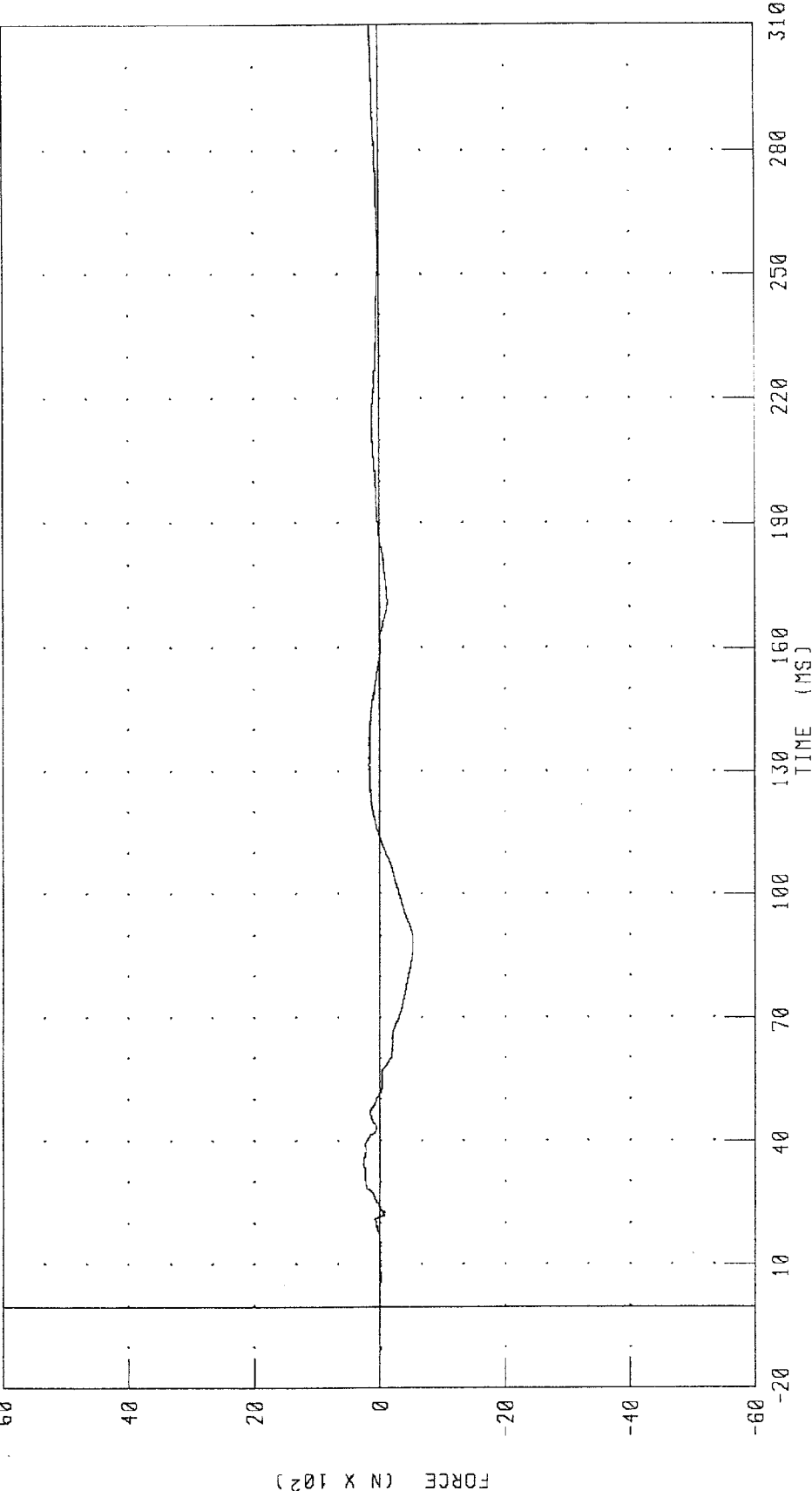
PEAK DATA: 41.13 G @ 52.24 MS, 0.11 G @ -19.92 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER NECK X-AXIS SHEAR FORCE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

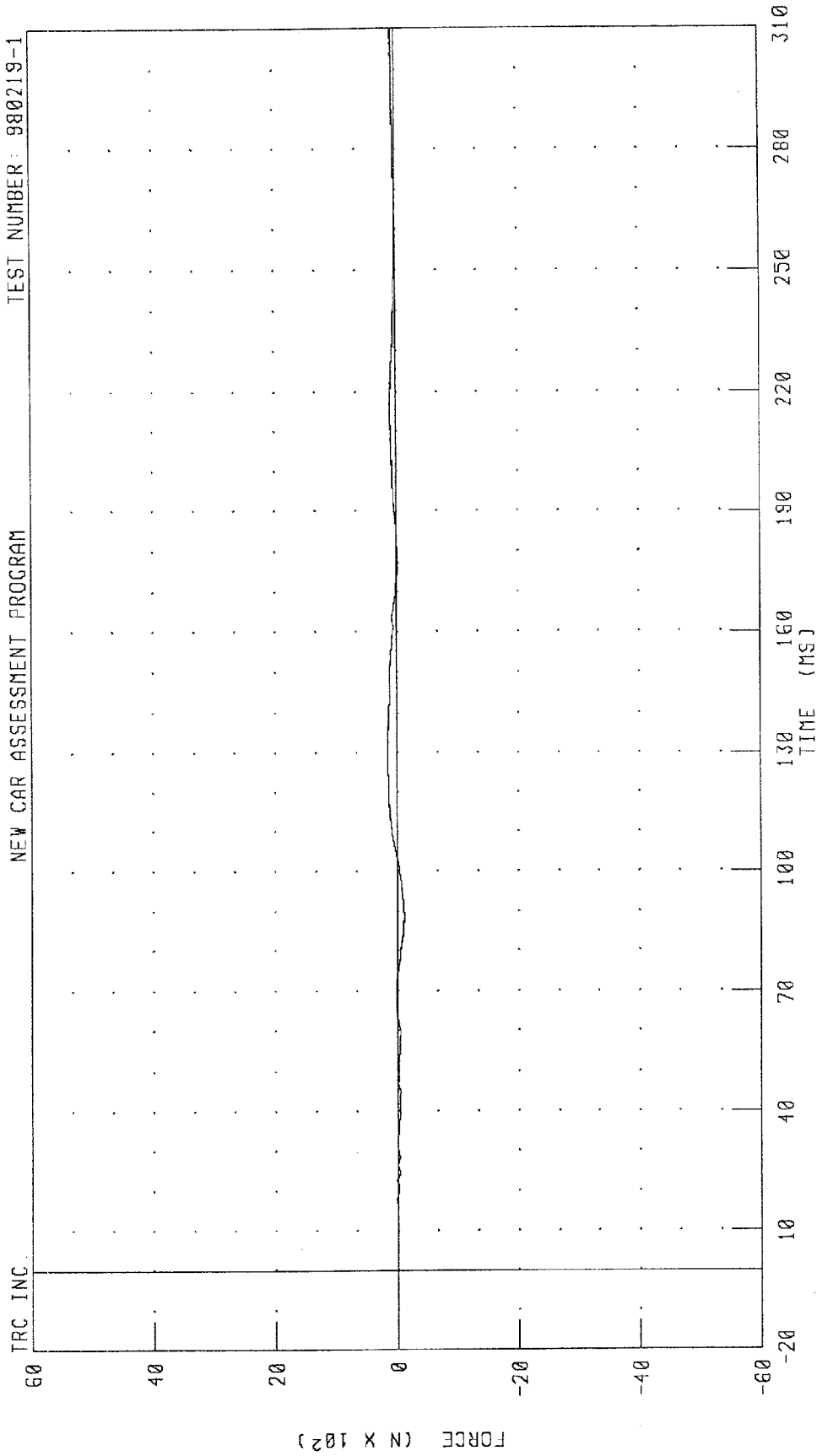


PEAK DATA: 265.52 N @ 34.16 MS, -530.09 N @ 88.00 MS

CHANNEL: NEKXF1 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER NECK Y-AXIS SHEAR FORCE
 NEW CAR ASSESSMENT PROGRAM

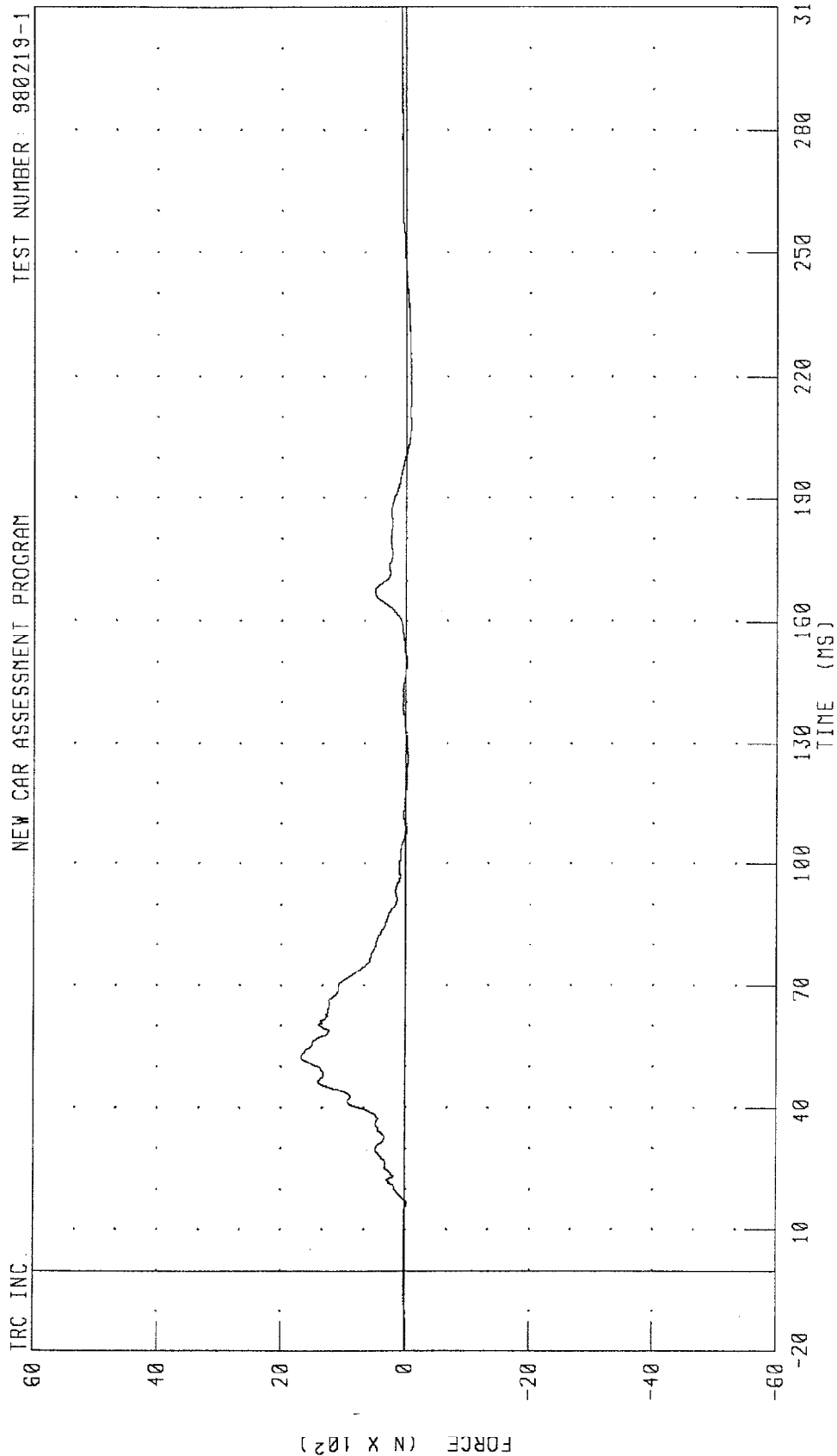
TEST NUMBER: 980219-1



CHANNEL: NEKYF1 FILTER: CH. CLASS 1000

PEAK DATA: 155.88 N @ 132.08 MS; -113.64 N @ 88.80 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER NECK Z-AXIS AXIAL FORCE

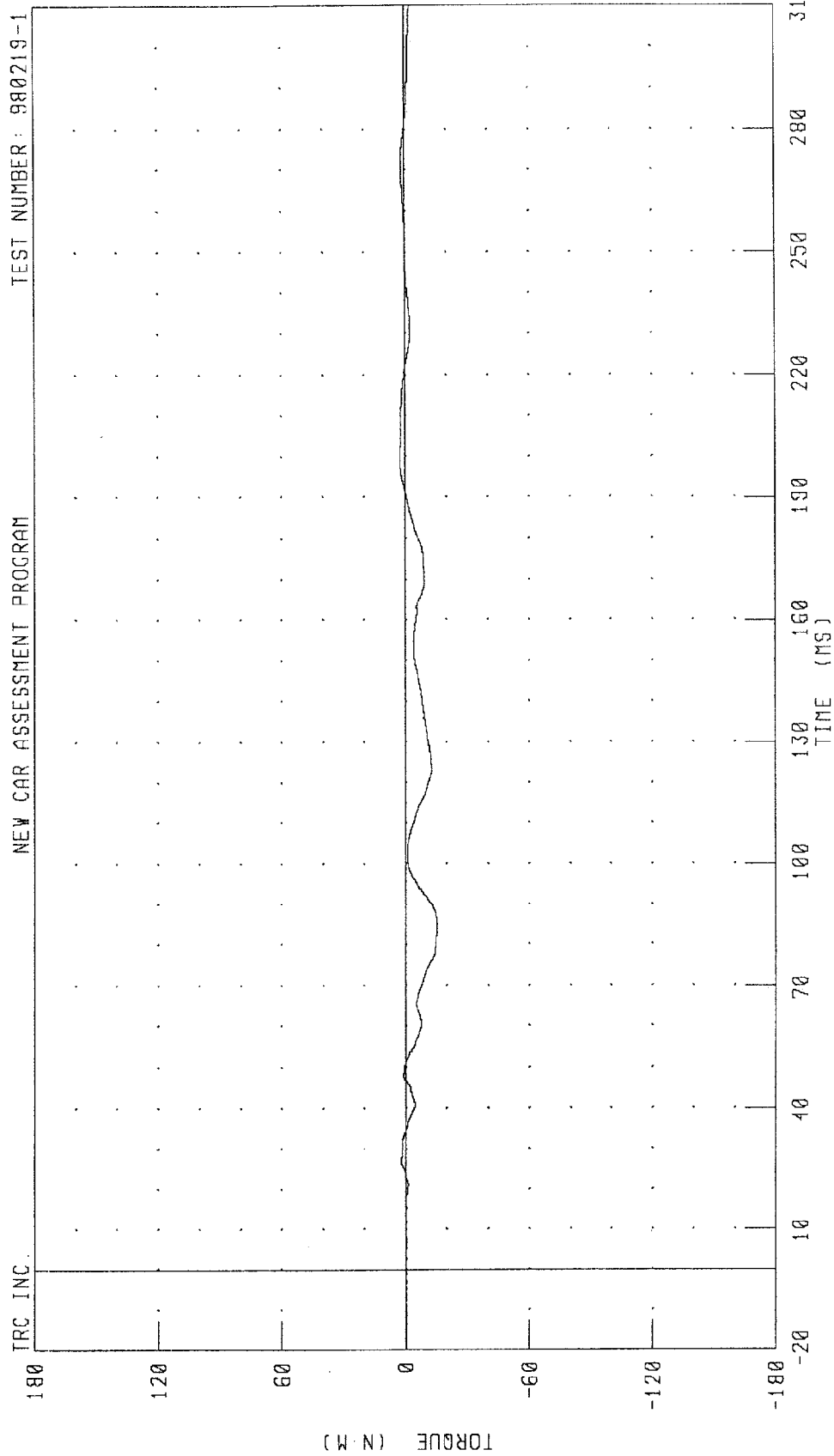


CHANNEL: NEKZF1 FILTER: CH. CLASS 1000

PEAK DATA: 1679.13 N @ 52.32 MS; -86.79 N @ 208.08 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER NECK MOMENT ABOUT X AXIS
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



CHANNEL: NEKX11 FILTER: CH. CLASS 600

PEAK DATA: 2.57 N-M @ 199.12 MS; -15.29 N-M @ 86.00 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

DRIVER NECK MOMENT ABOUT Y AXIS

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

TRC INC.

180

120

60

TORQUE (N·M)

0

-60

-120

-180

-20

10

40

70

100

130

160

190

220

250

280

310

TIME (MS)

CHANNEL: NEKYM1 FILTER: CH. CLASS 600

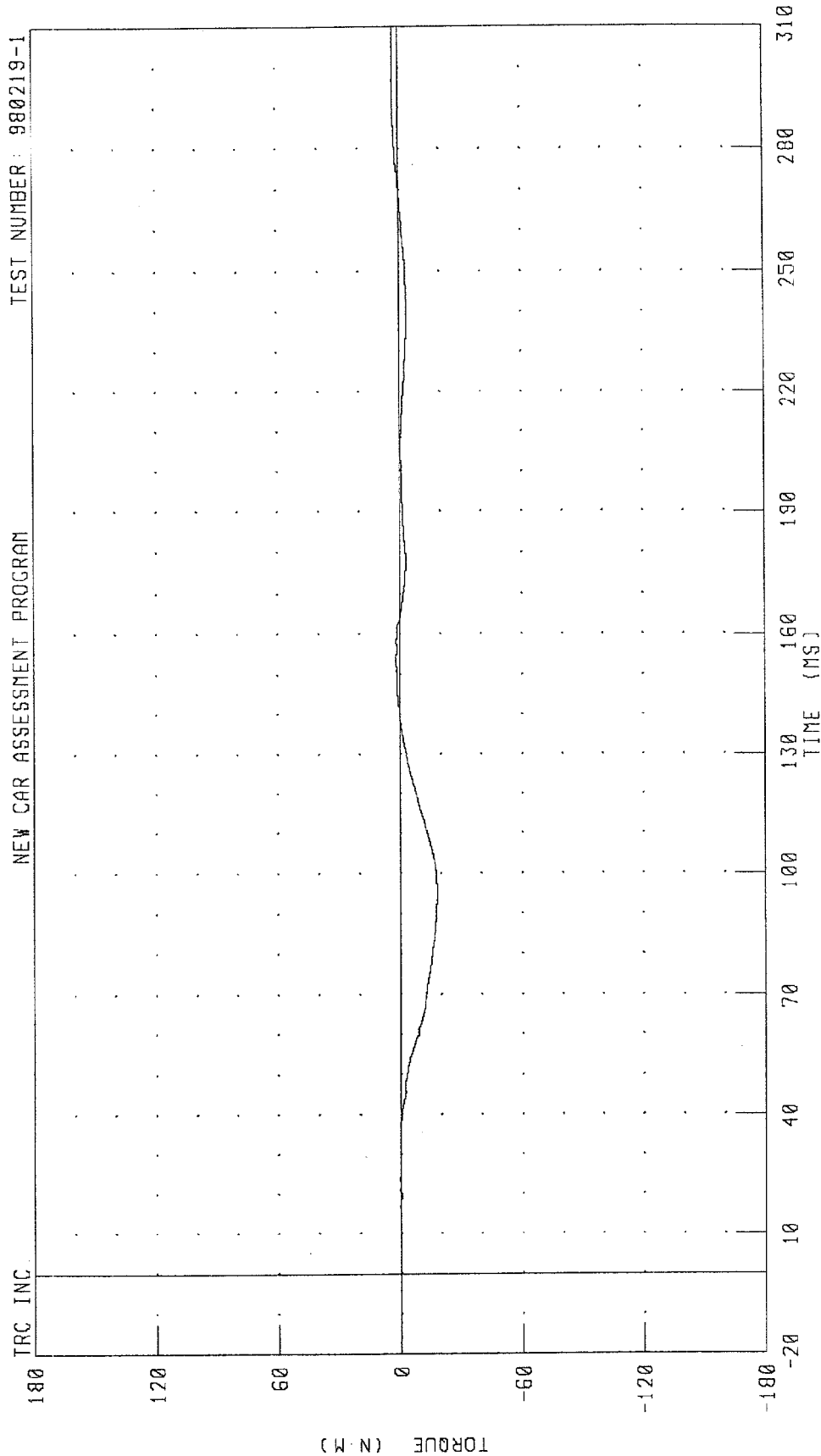
PEAK DATA: 35.88 N·M @ 89.12 MS; -15.11 N·M @ 34.16 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

DRIVER NECK MOMENT ABOUT Z AXIS

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



CHANNEL: NEKZM1 FILTER: CH. CLASS 600

PEAK DATA: 2.83 N.M @ 296.80 MS; -18.21 N.M @ 96.64 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER CHEST X-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

60

40

20

0

-20

-40

-60

ACCELERATION (G)

TIME (MS)

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310

CHANNEL: CSTXG1 FILTER: CH. CLASS 180

PEAK DATA: 6.16 G @ 165.04 MS, -45.87 G @ 61.28 MS

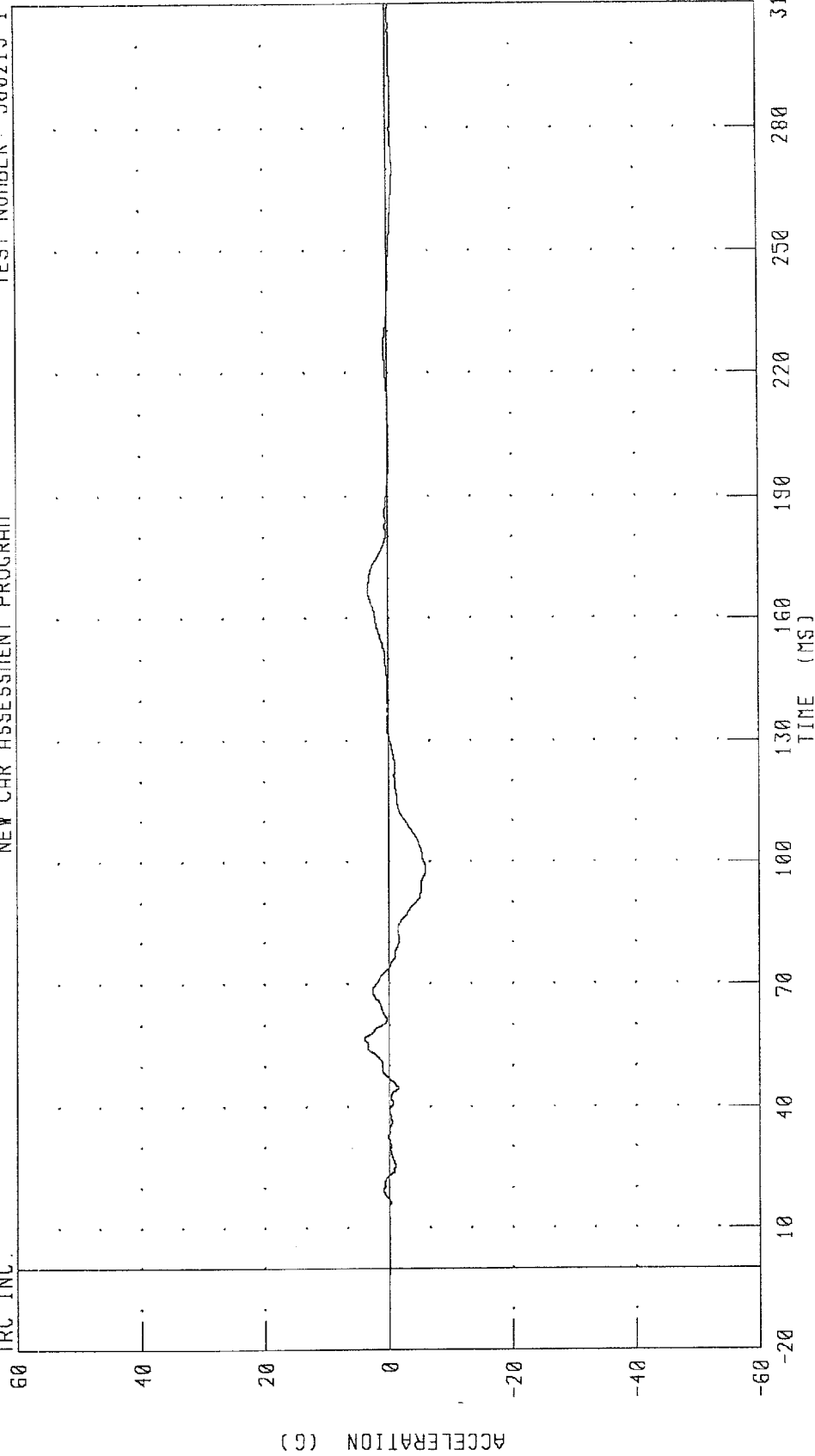
1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

DRIVER CHEST Y-AXIS ACCELERATION

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

TRC INC.



CHANNEL: CSTYG1 FILTER: CH. CLASS 180

PEAK DATA: 3.93 G @ 56.64 MS, -5.99 G @ 98.08 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER CHEST Z-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

60

40

20

ACCELERATION (G)

-20

-40

-60

TIME (MS)

310

280

250

220

190

160

130

100

70

40

10

CHANNEL: CSTZG1 FILTER: CH. CLASS 180

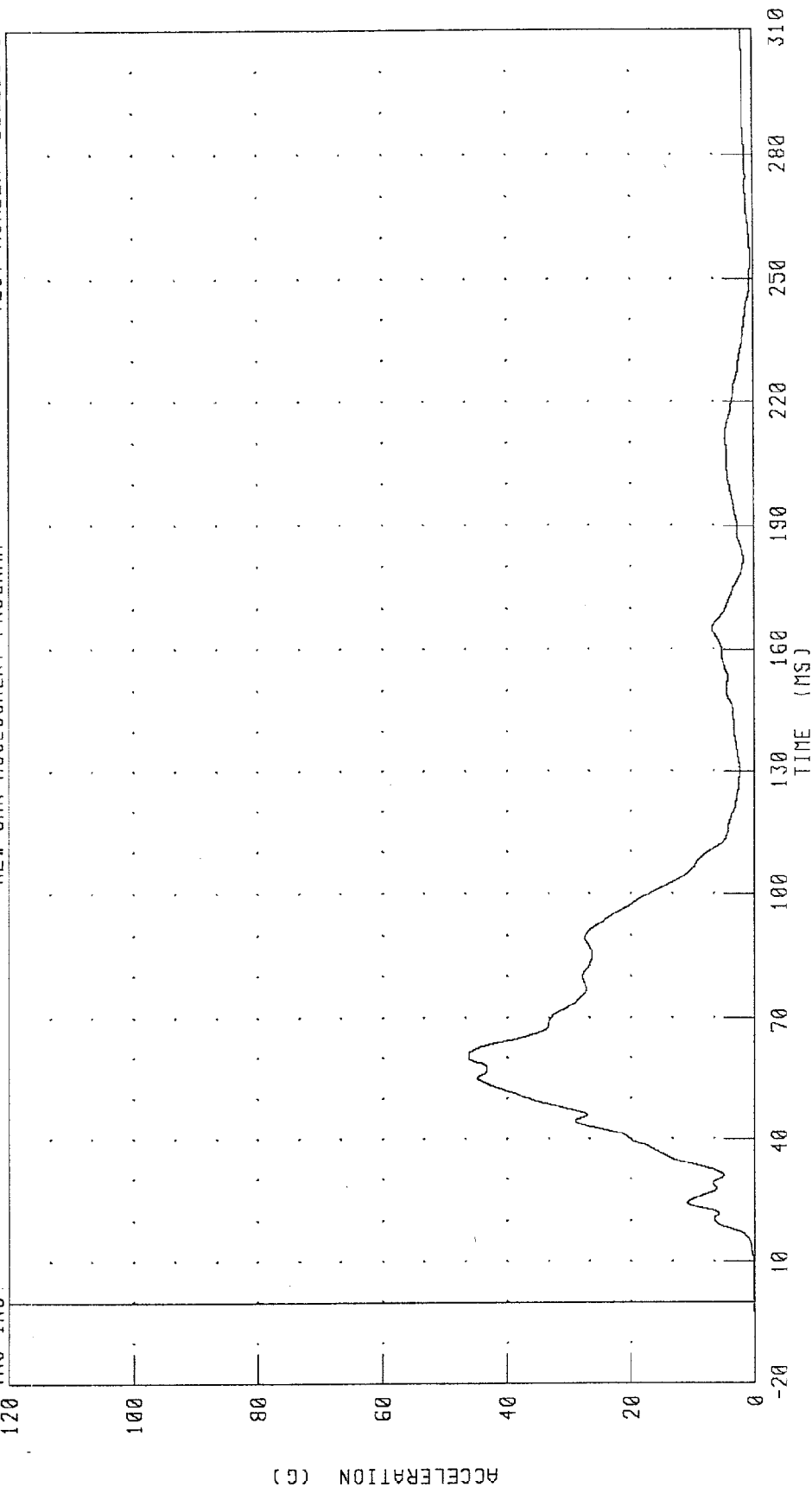
PEAK DATA: 6.87 G @ 89.28 MS; -8.06 G @ 45.68 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER CHEST RESULTANT ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: CSTRG1 FILTER: CH. CLASS 180

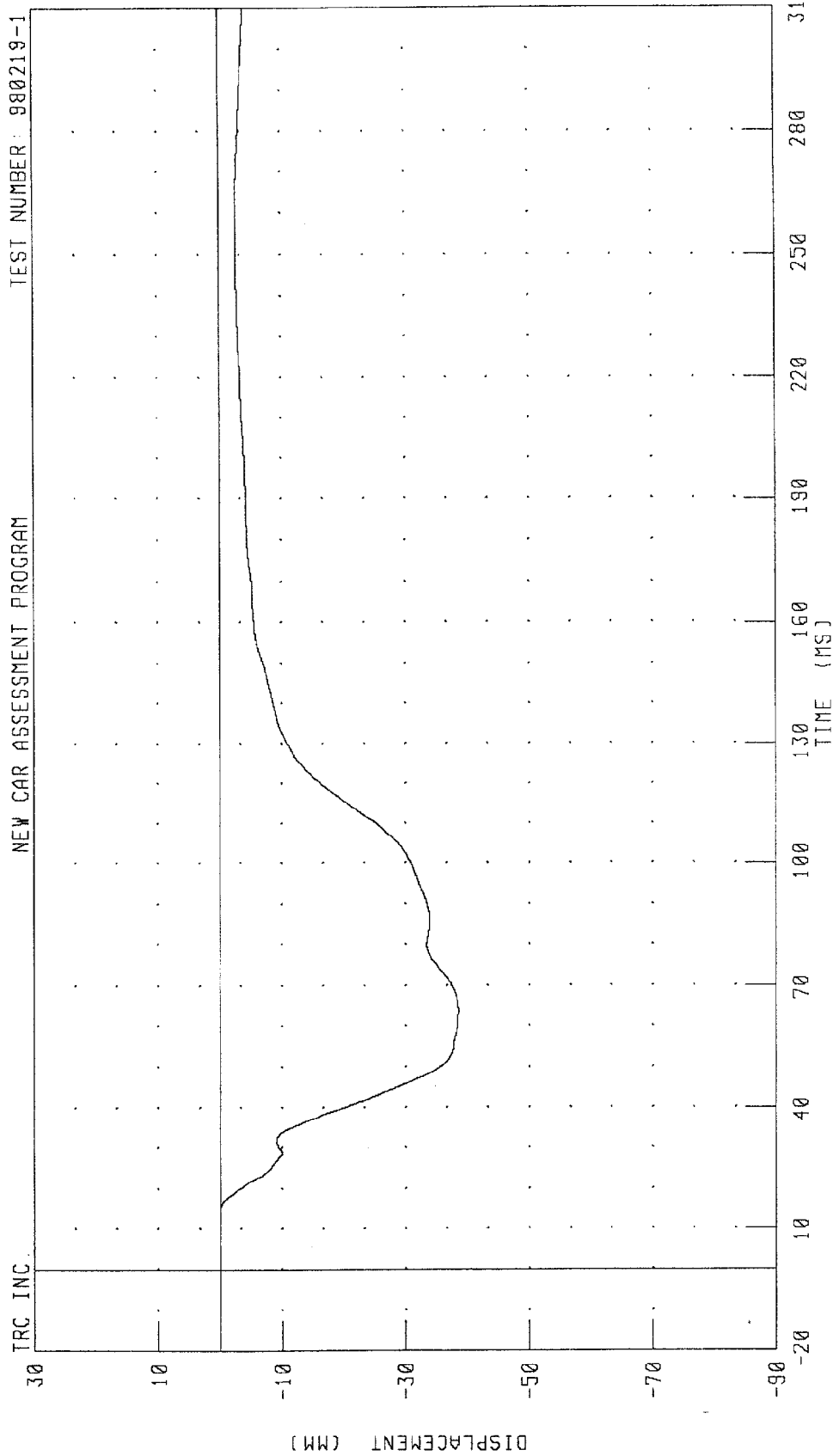
PEAK DATA: 46.17 G @ 61.20 MS; 0.01 G @ -14.16 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

DRIVER CHEST DEFLECTION

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

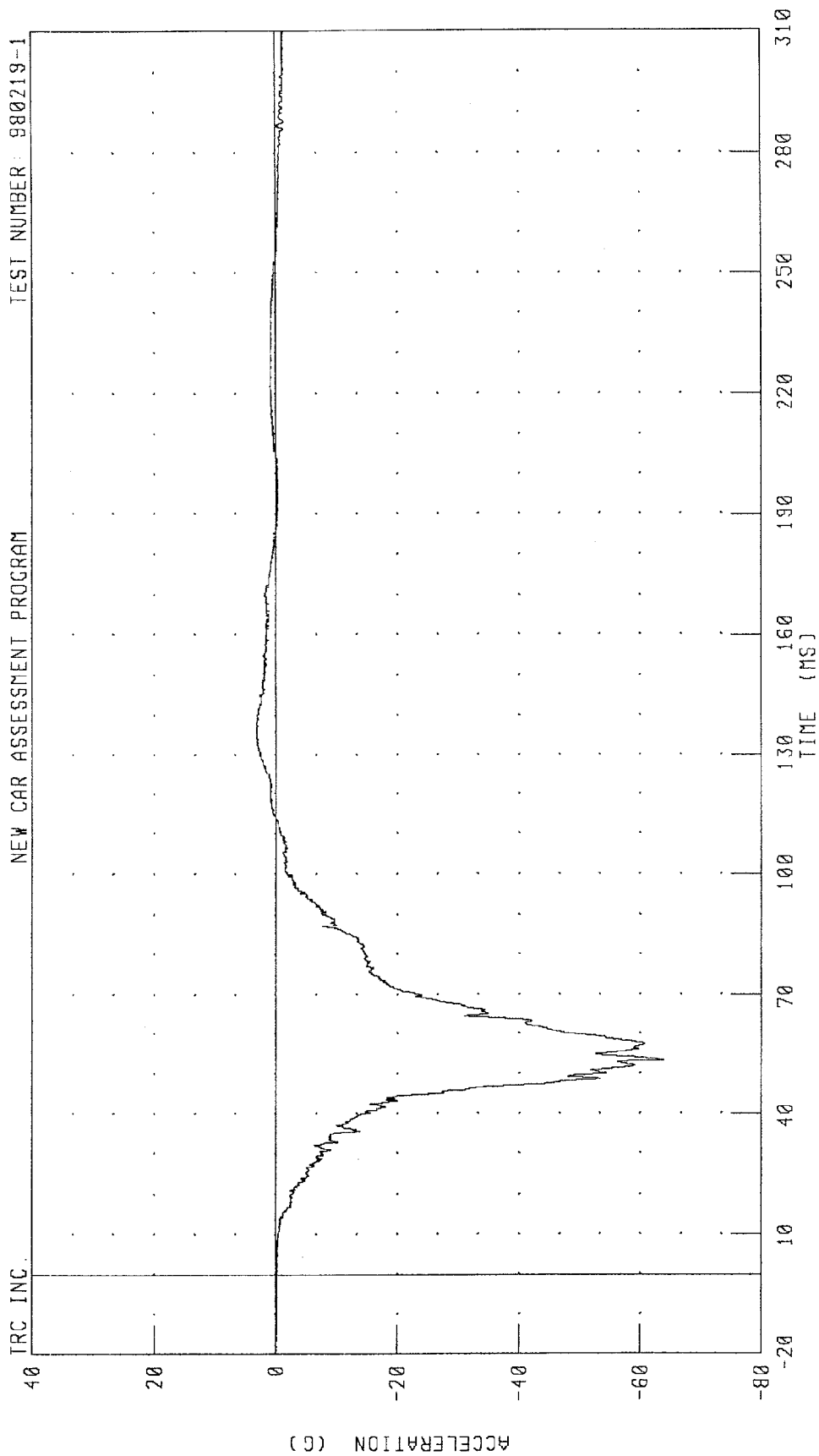


CHANNEL: CSTXD1 FILTER: CH. CLASS 180

PEAK DATA: 0.03 MM @ -7.44 MS, -38.61 MM @ 63.76 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER PELVIS X-AXIS ACCELERATION
 NEW CAR ASSESSMENT PROGRAM

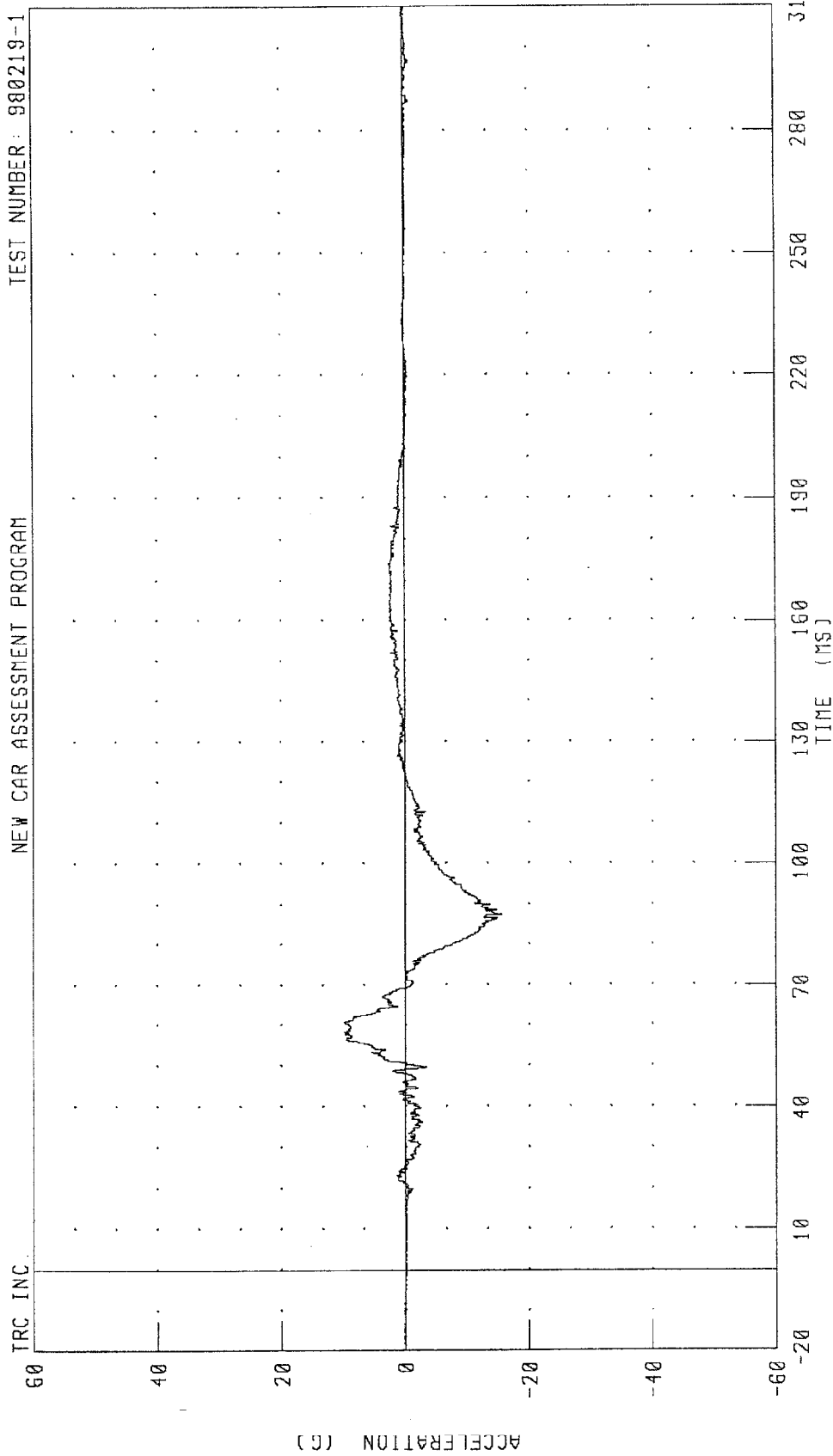
TEST NUMBER: 980219-1



CHANNEL: PEVXC1 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER PELVIS Y-AXIS ACCELERATION
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



PEAK DATA: 9.81 G @ 58.24 MS; -15.64 G @ 87.36 MS

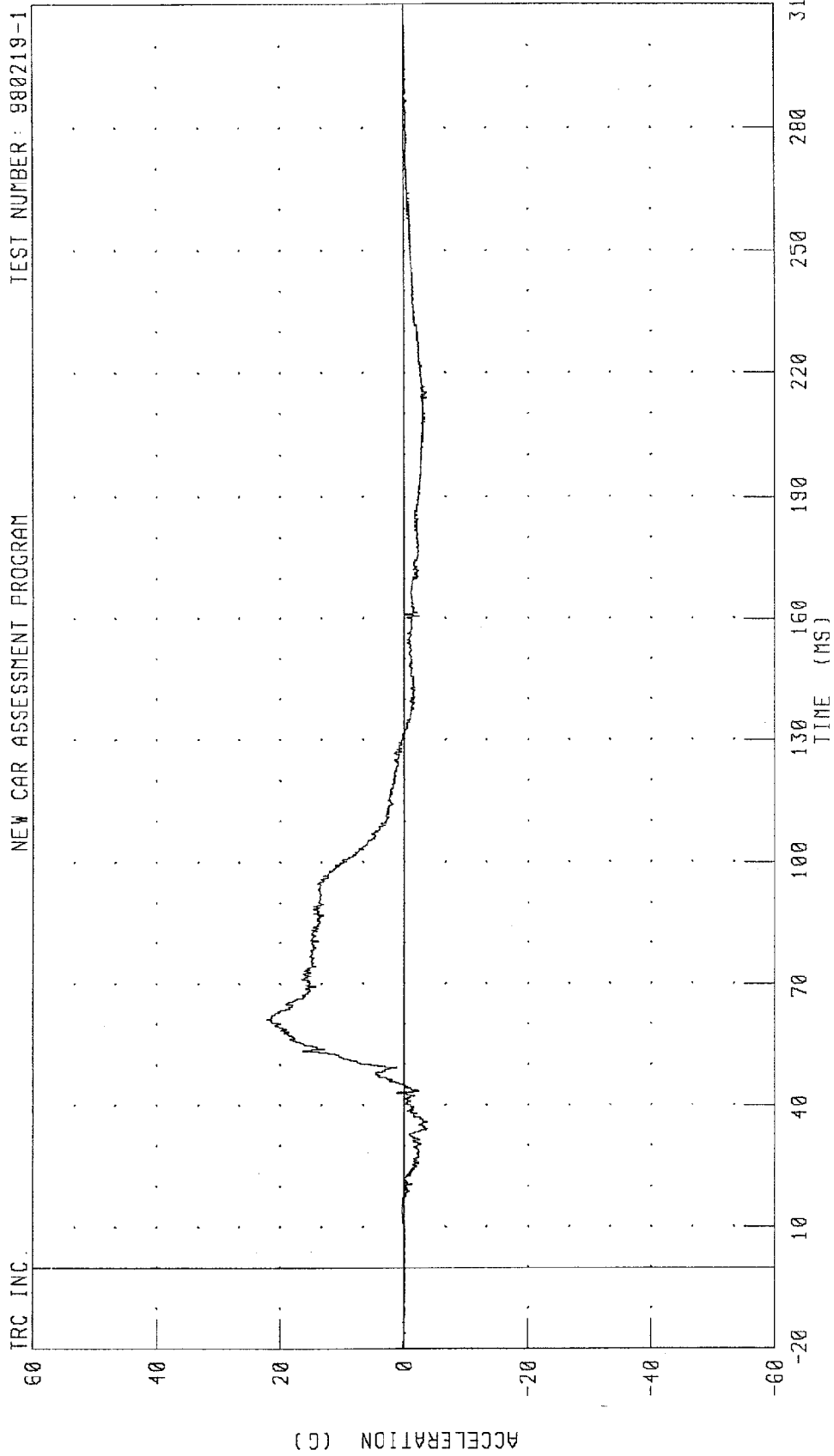
CHANNEL: PEVYG1 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

DRIVER PELVIS 2-AXIS ACCELERATION

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



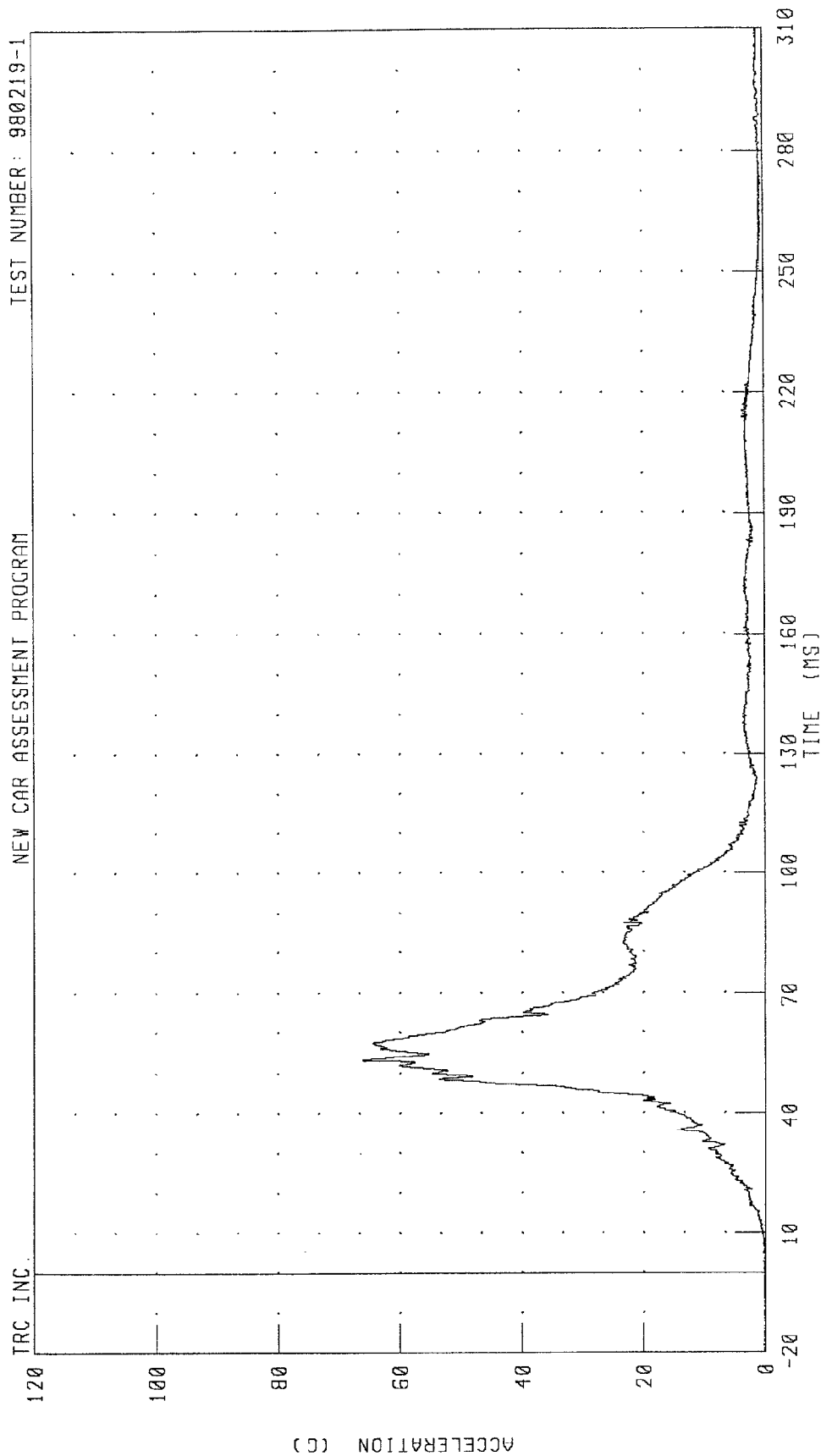
PEAK DATA: 22.13 G @ 61.28 MS; -3.71 G @ 34.40 MS

CHANNEL: PEVZG1 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER PELVIS RESULTANT ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM



CHANNEL: PEVRG1 FILTER: CH. CLASS 1000

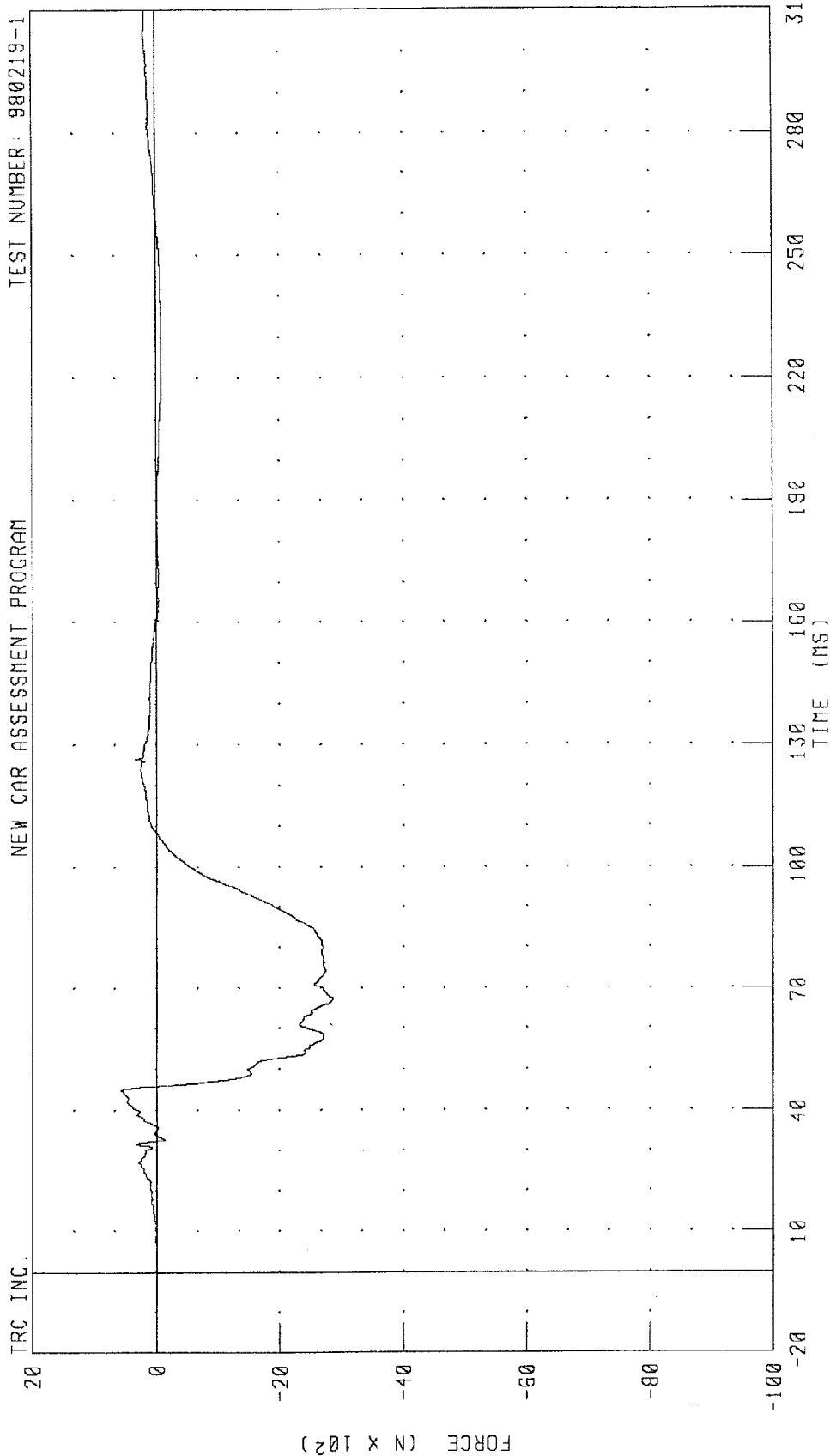
PEAK DATA: 66.05 G @ 53.36 MS; 0.07 G @ -20.00 MS

1988 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

DRIVER LEFT FEMUR FORCE

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



CHANNEL: LFMF1 FILTER: CH. CLASS 600

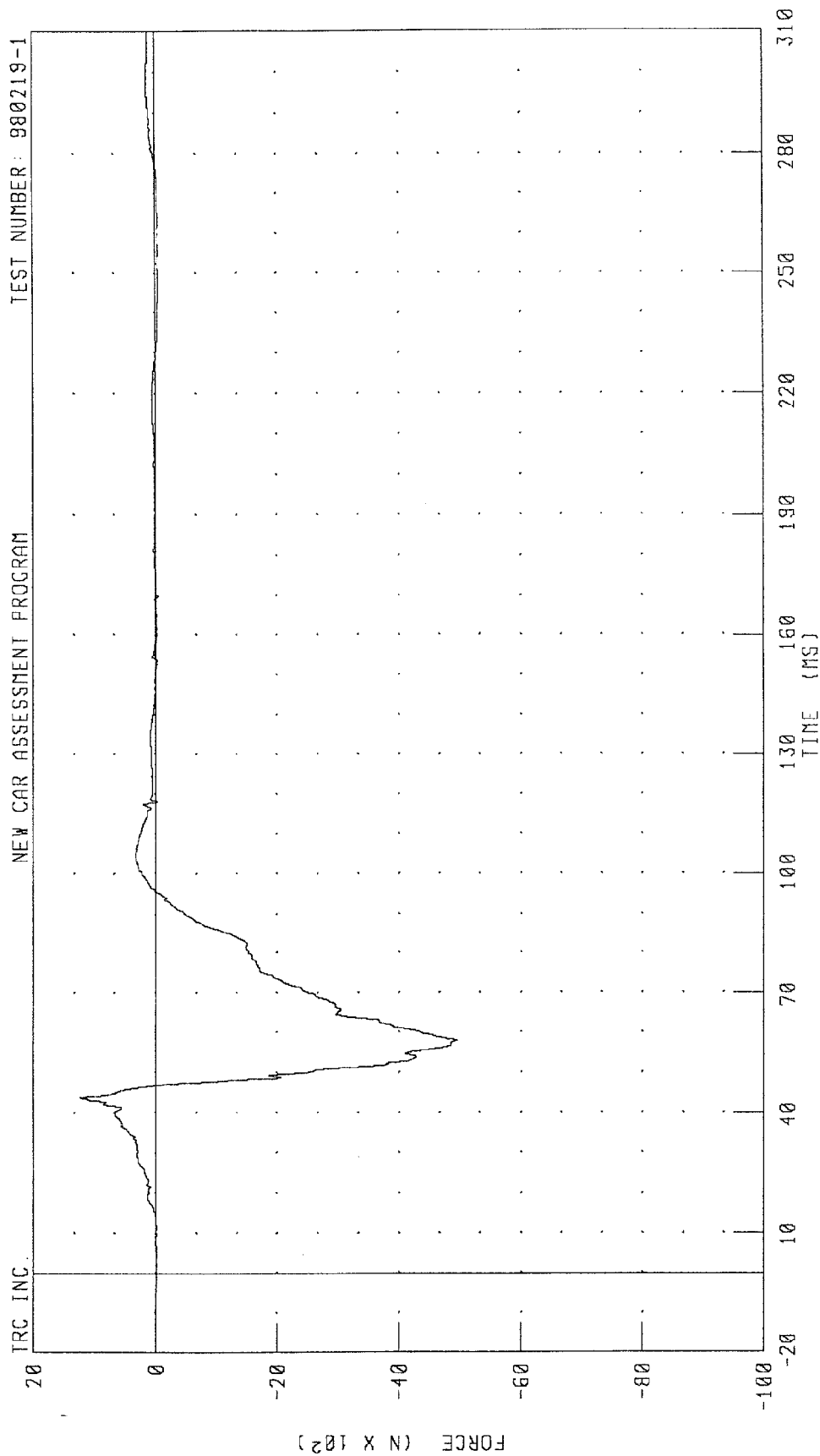
PEAK DATA: 570.56 N @ 44.96 MS; -2869.11 N @ 67.36 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

DRIVER RIGHT FEMUR FORCE

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



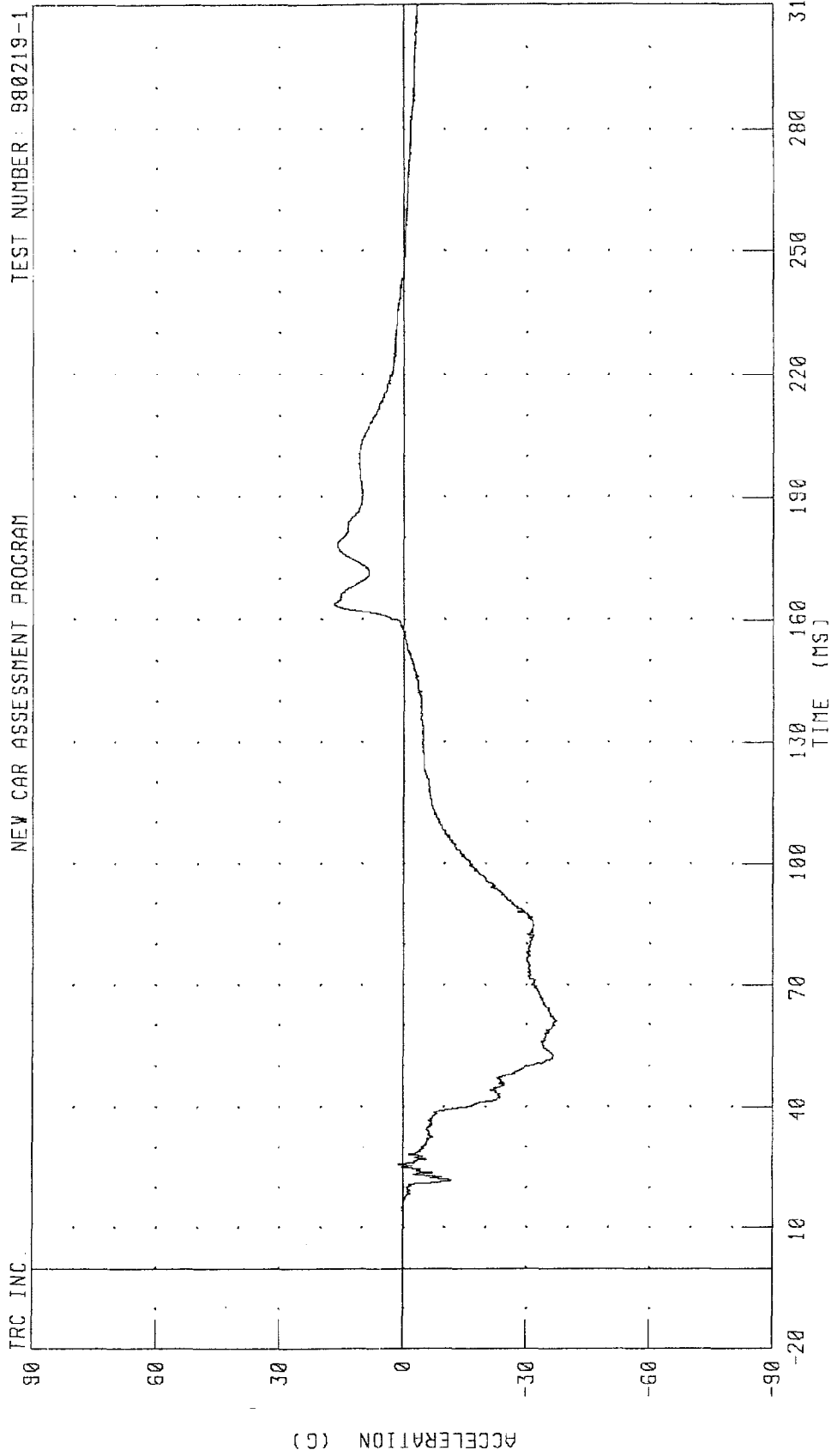
CHANNEL: RFMF1 FILTER: CH. CLASS 600

PEAK DATA: 1226.88 N @ 43.76 MS, -4952.14 N @ 57.92 MS

1998 VCLV0 S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER HEAD X-AXIS ACCELERATION - REDUNDANT

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



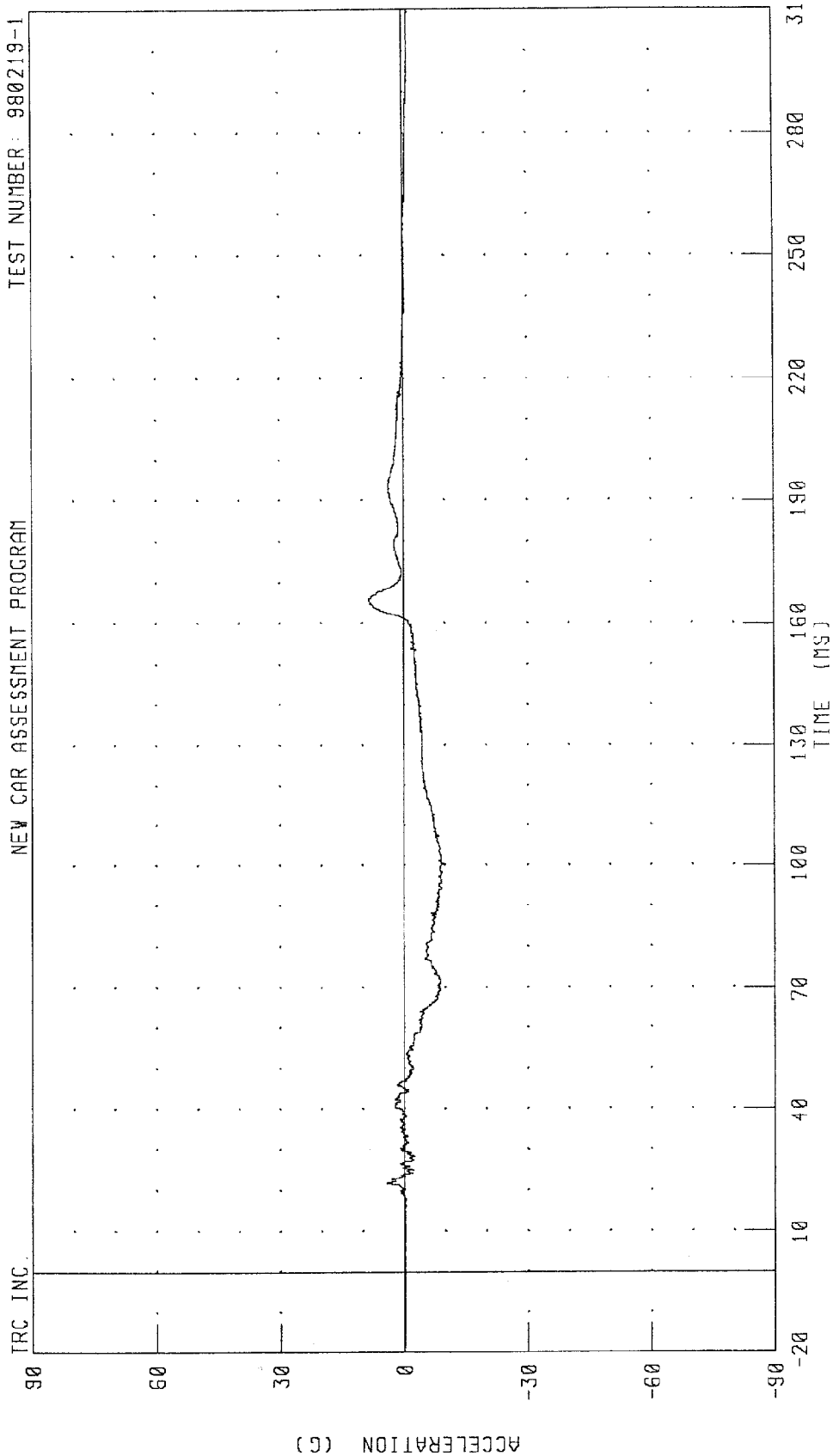
CHANNEL: HEDXR1 FILTER: CH. CLASS 1000

PEAK DATA: 16.89 G @ 163.60 MS, -37.22 G @ 60.88 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER HEAD Y-AXIS ACCELERATION - REDUNDANT

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM



PEAK DATA: 8.28 G @ 165.60 MS; -9.62 G @ 100.24 MS

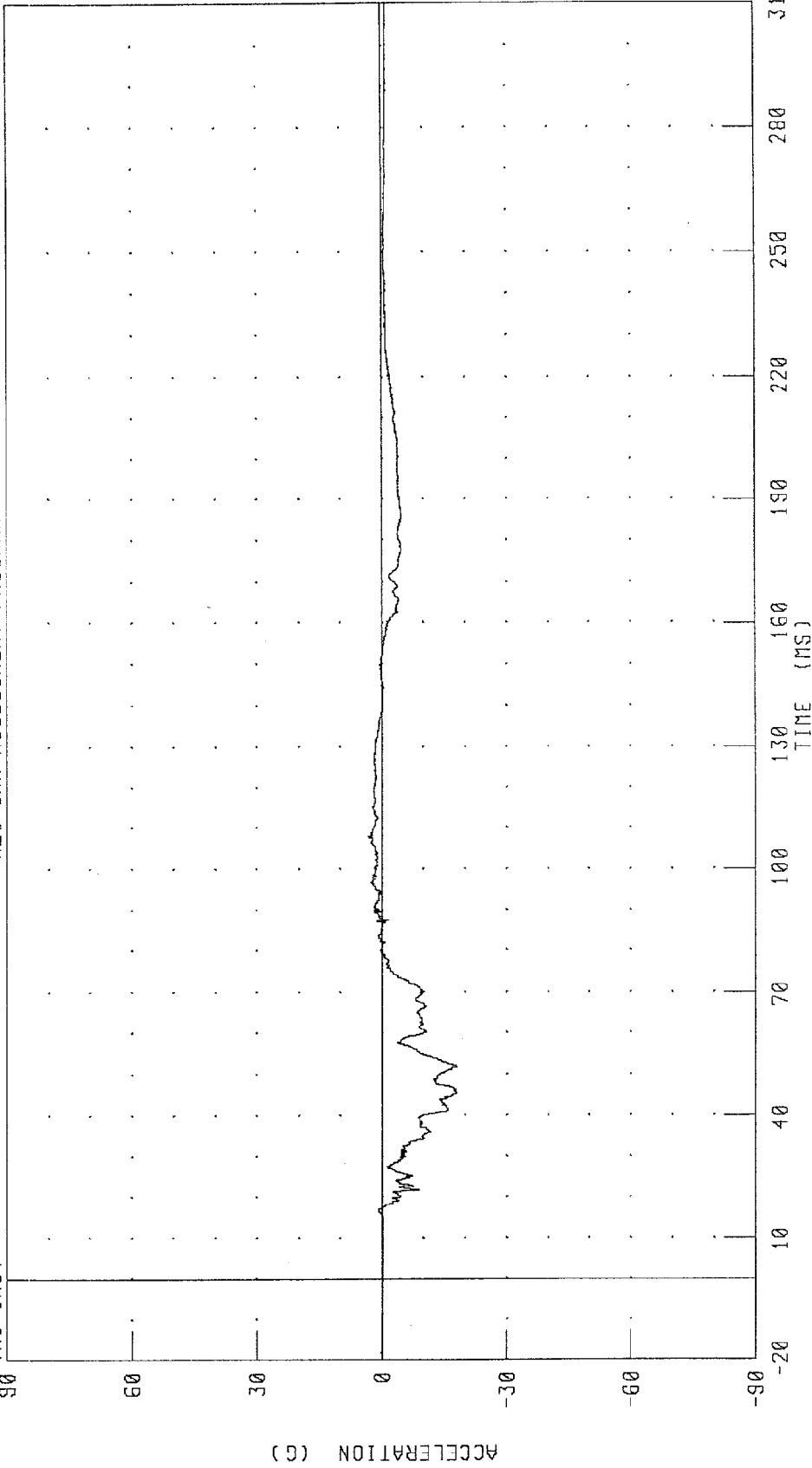
CHANNEL: HEDYR1 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER HEAD Z-AXIS ACCELERATION - REDUNDANT

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

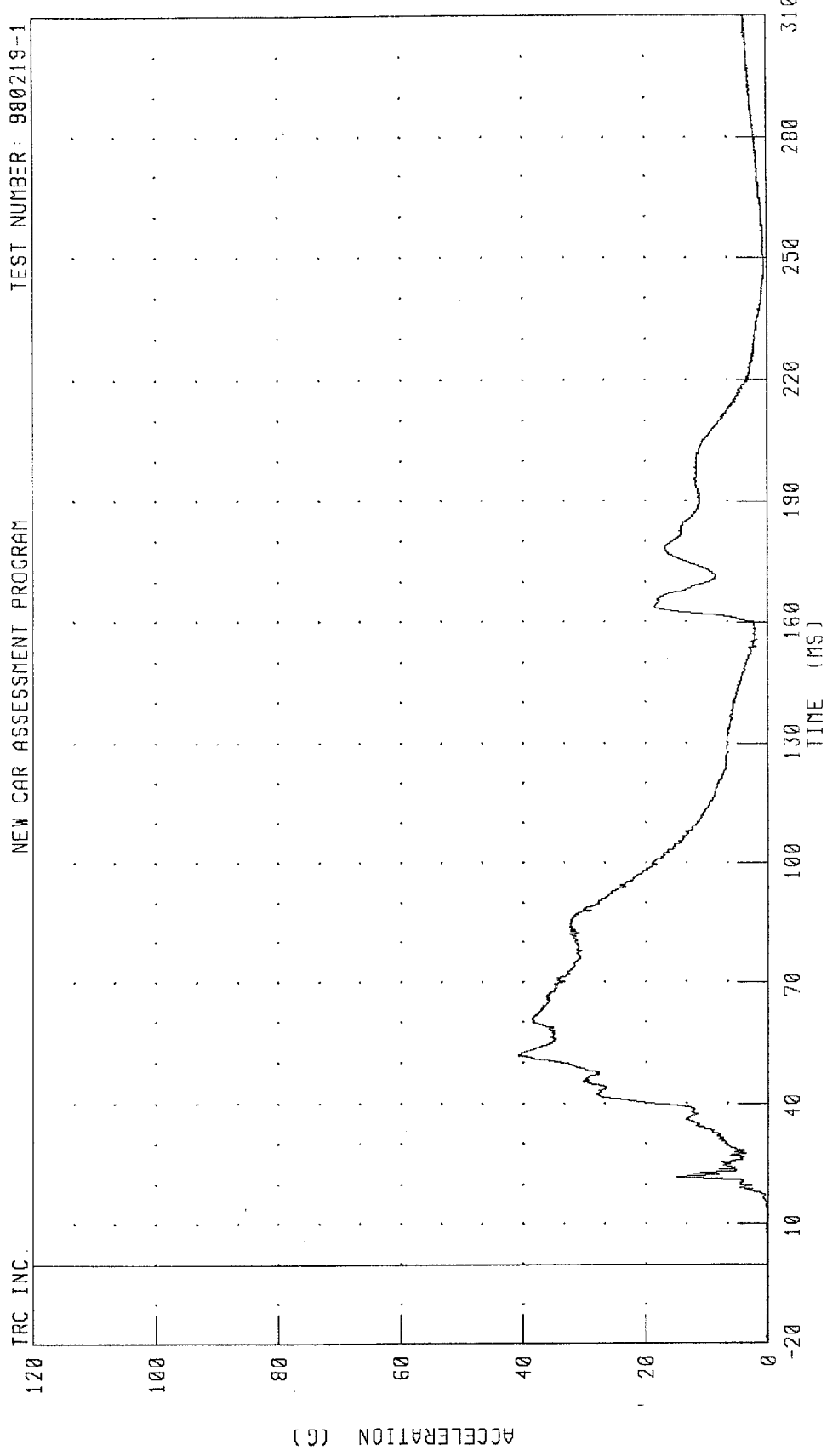
TRC INC.



CHANNEL: HEDZR1 FILTER: CH. CLASS 1000

PEAK DATA: 3.41 G @ 107.76 MS; -18.08 G @ 45.52 MS

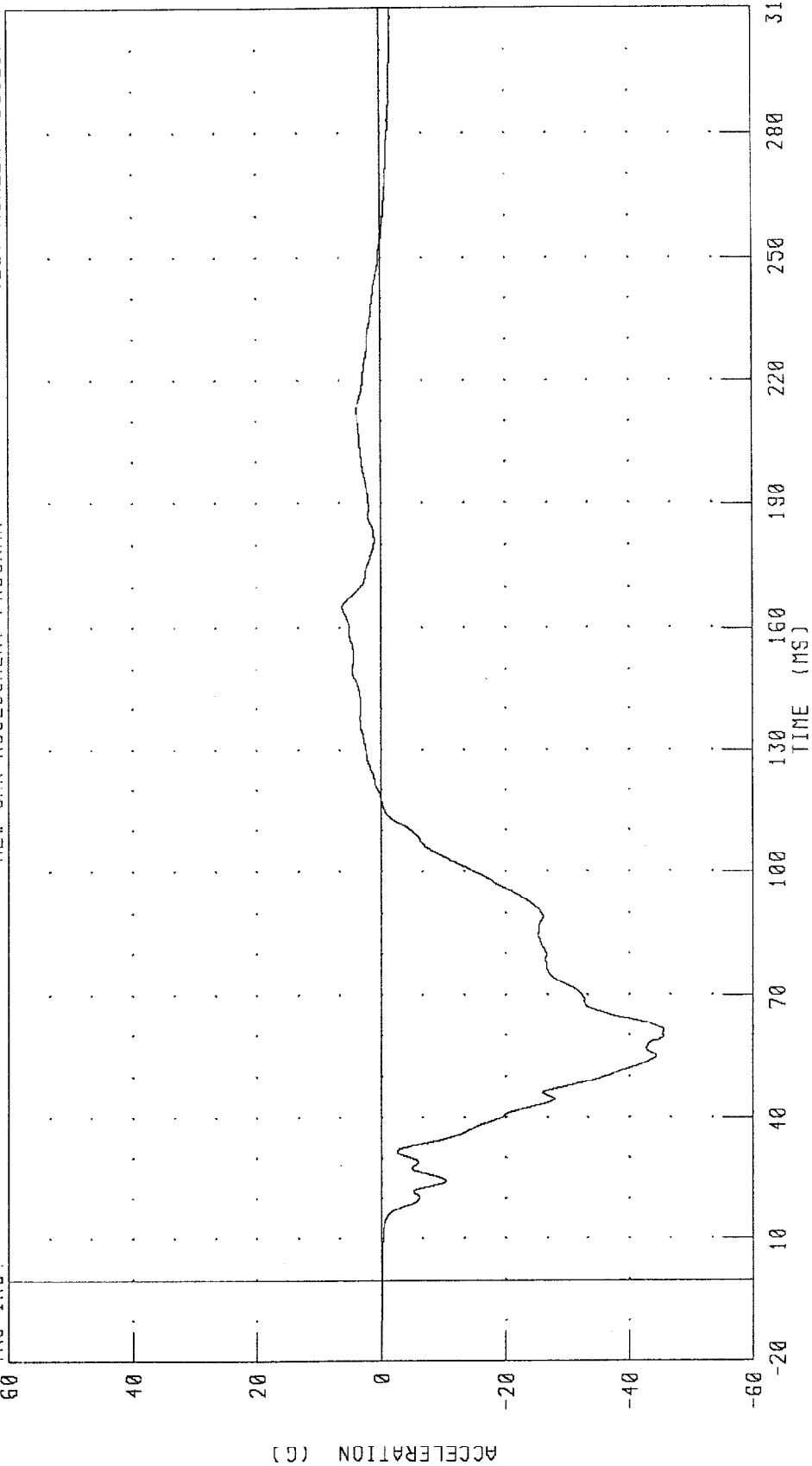
1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER HEAD RESULTANT ACCELERATION -- REDUNDANT



1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER CHEST X-AXIS ACCELERATION - REDUNDANT
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

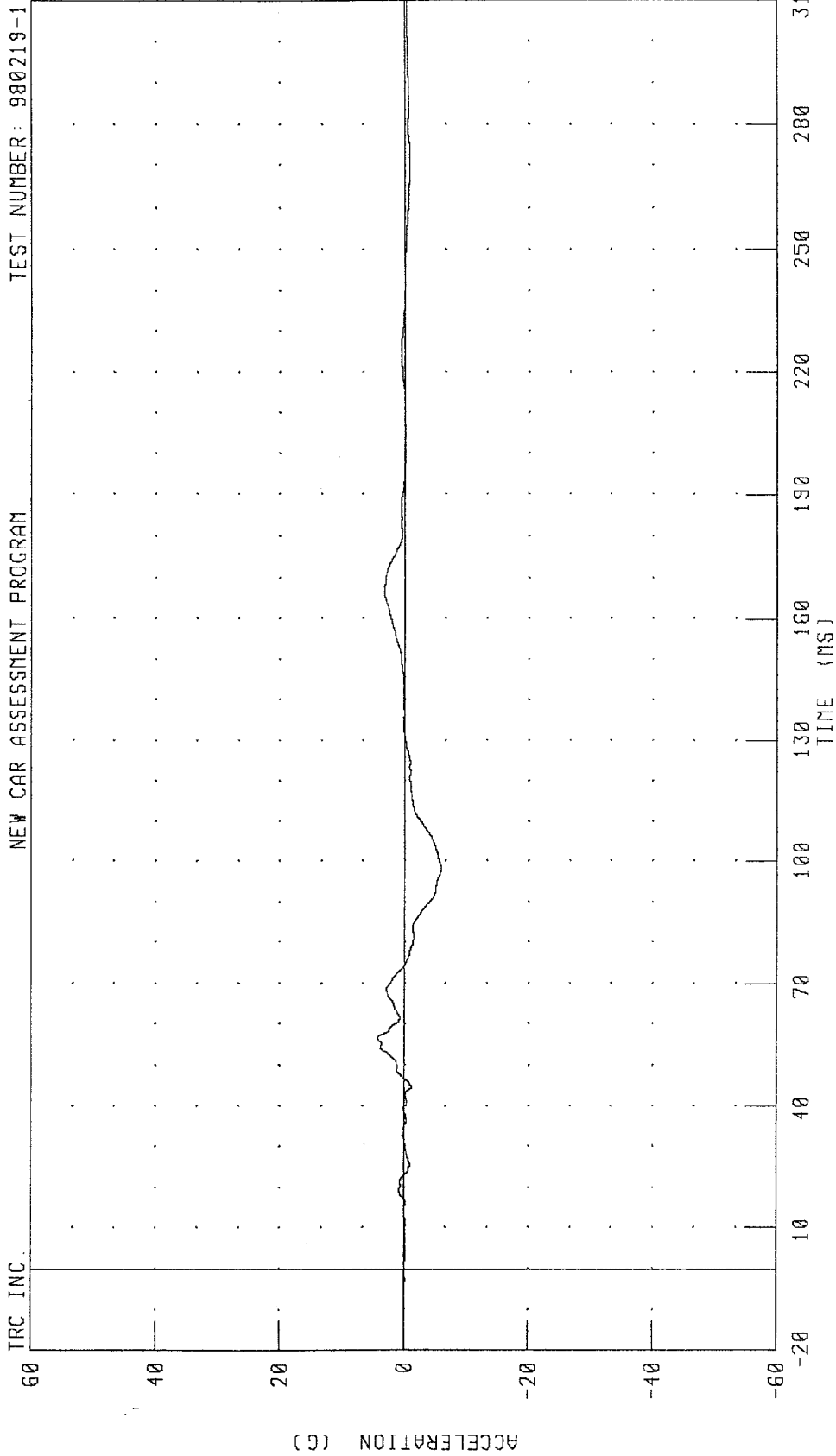
TRC INC.



CHANNEL: CSTXR1 FILTER: CH. CLASS 180

PEAK DATA: 6.26 G @ 165.12 MS, -45.57 G @ 61.20 MS

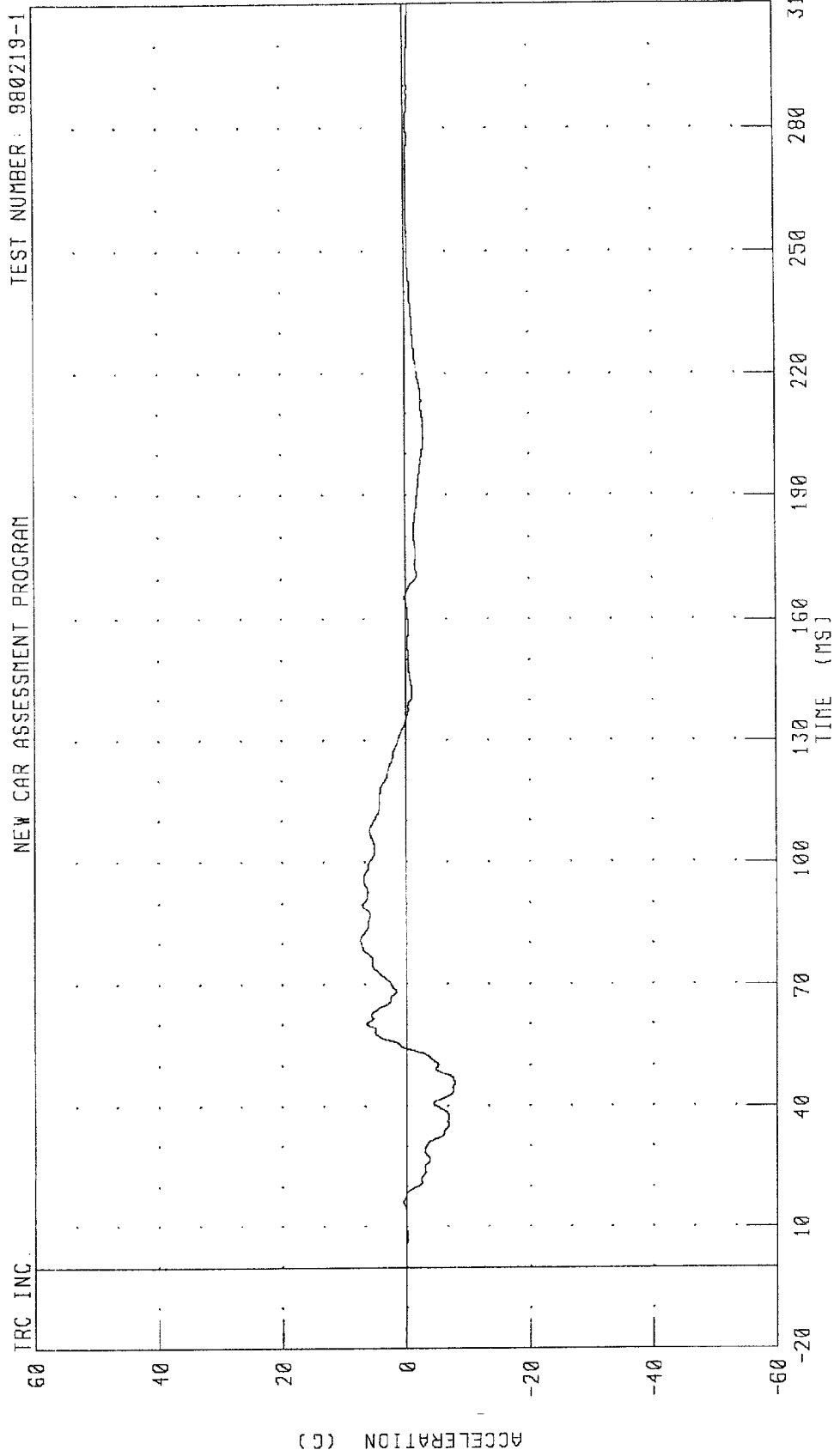
1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER CHEST Y-AXIS ACCELERATION - REDUNDANT



1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER CHEST Z-AXIS ACCELERATION - REDUNDANT

TEST NUMBER: 980219-1

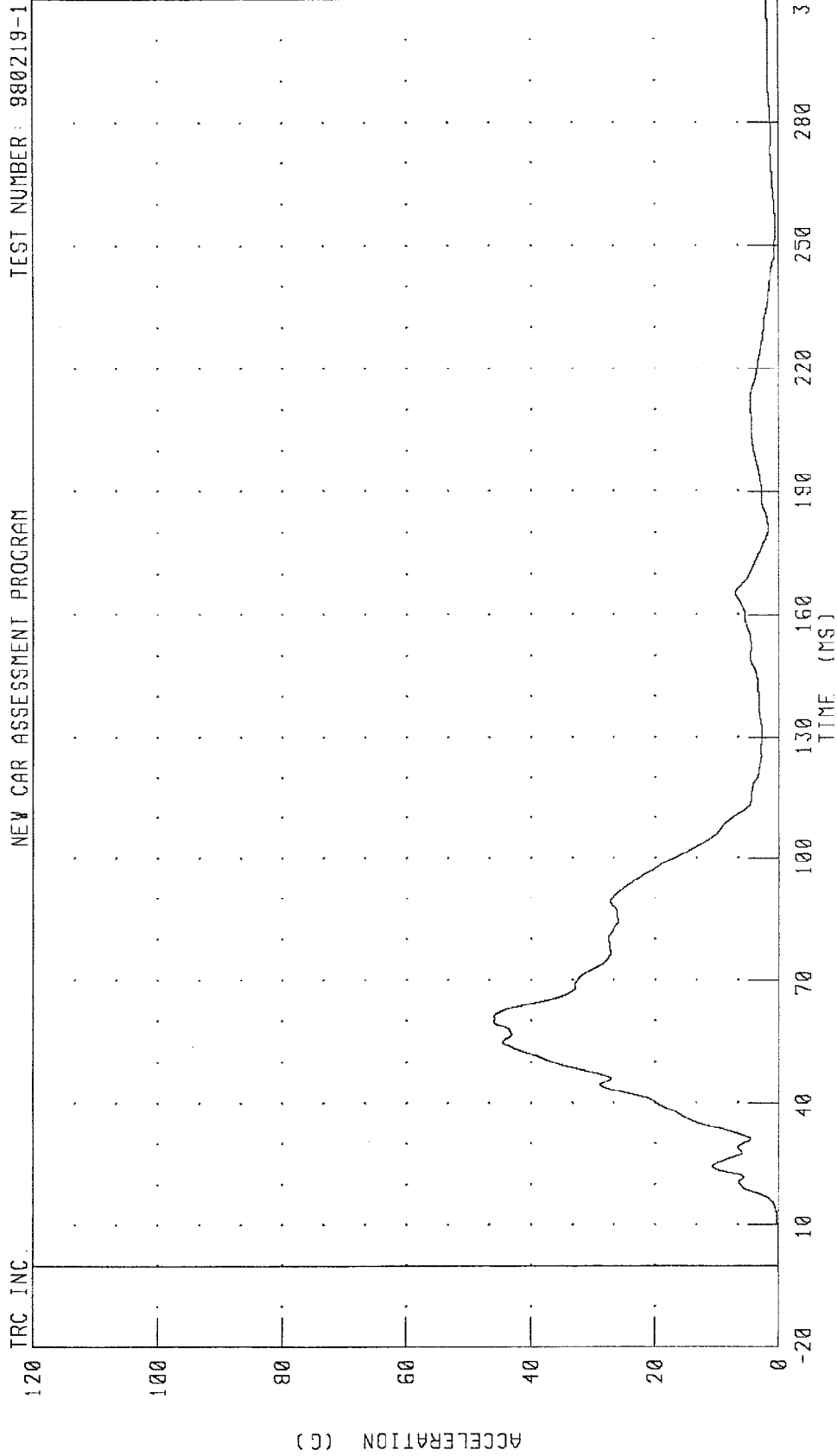
NEW CAR ASSESSMENT PROGRAM



CHANNEL: CSTZR1 FILTER: CH. CLASS 180

PEAK DATA: 7.39 G @ 80.88 MS; -7.78 G @ 45.84 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER CHEST RESULTANT ACCELERATION - REDUNDANT



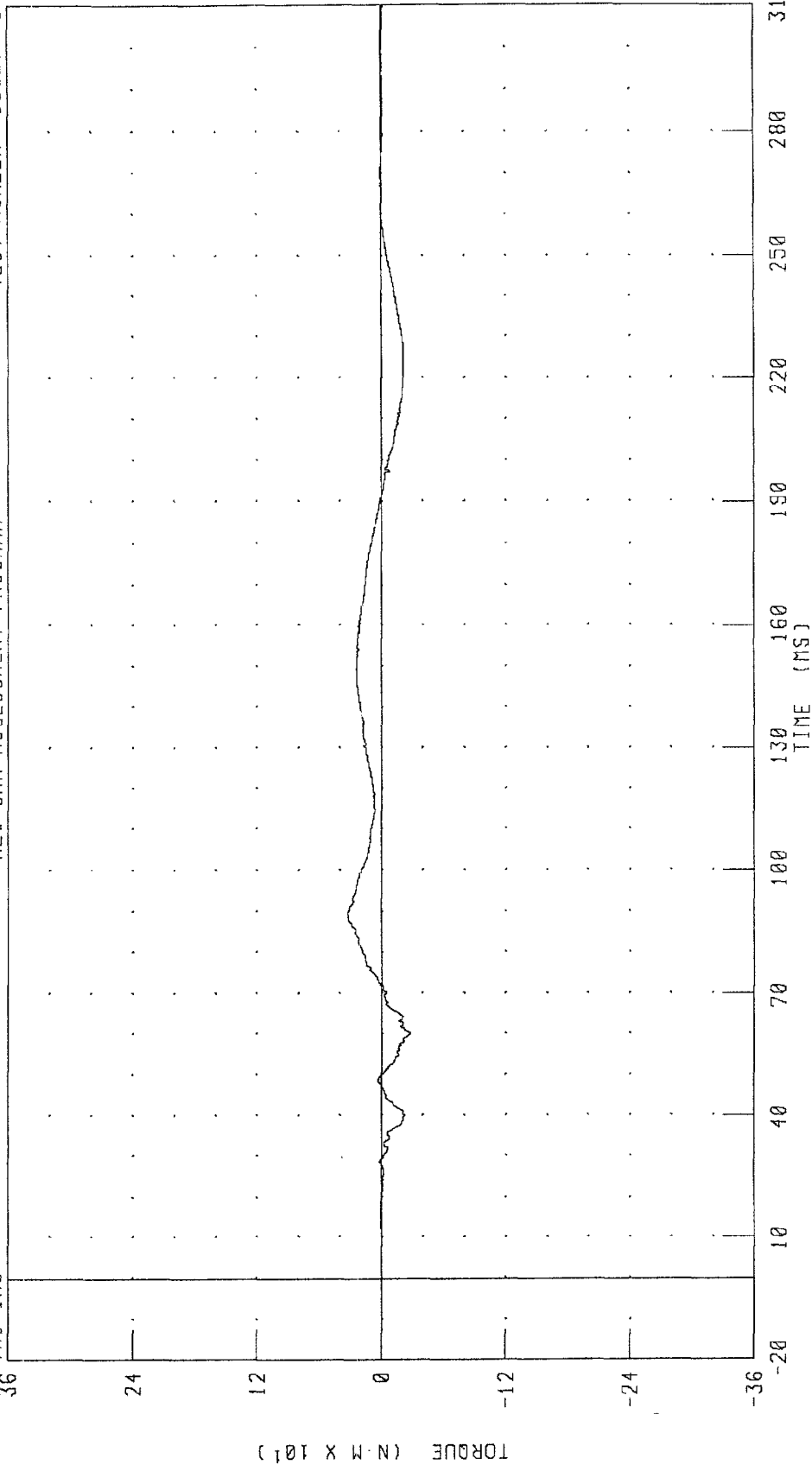
CHANNEL: CSTR1 FILTER: CH. CLASS 180

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER LEFT UPPER TIBIA MOMENT ABOUT X AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC



CHANNEL: TBLXM1 FILTER: CH. CLASS 600

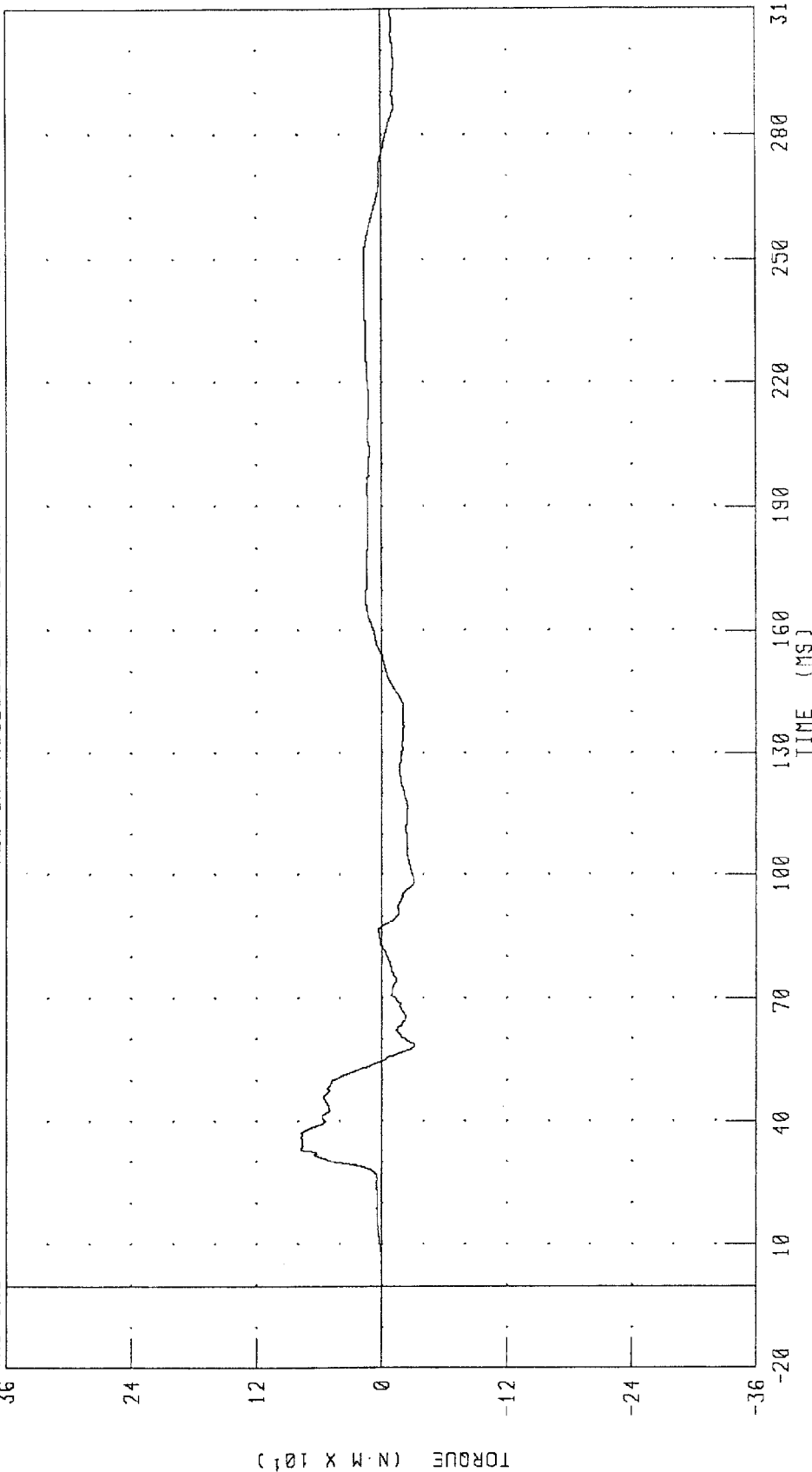
PEAK DATA: 32 22 N-M @ 89.60 MS, -27.22 N-M @ 60.00 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER LEFT UPPER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



PEAK DATA: 77.36 N.M @ 33.20 MS; -31.74 N.M @ 58.64 MS

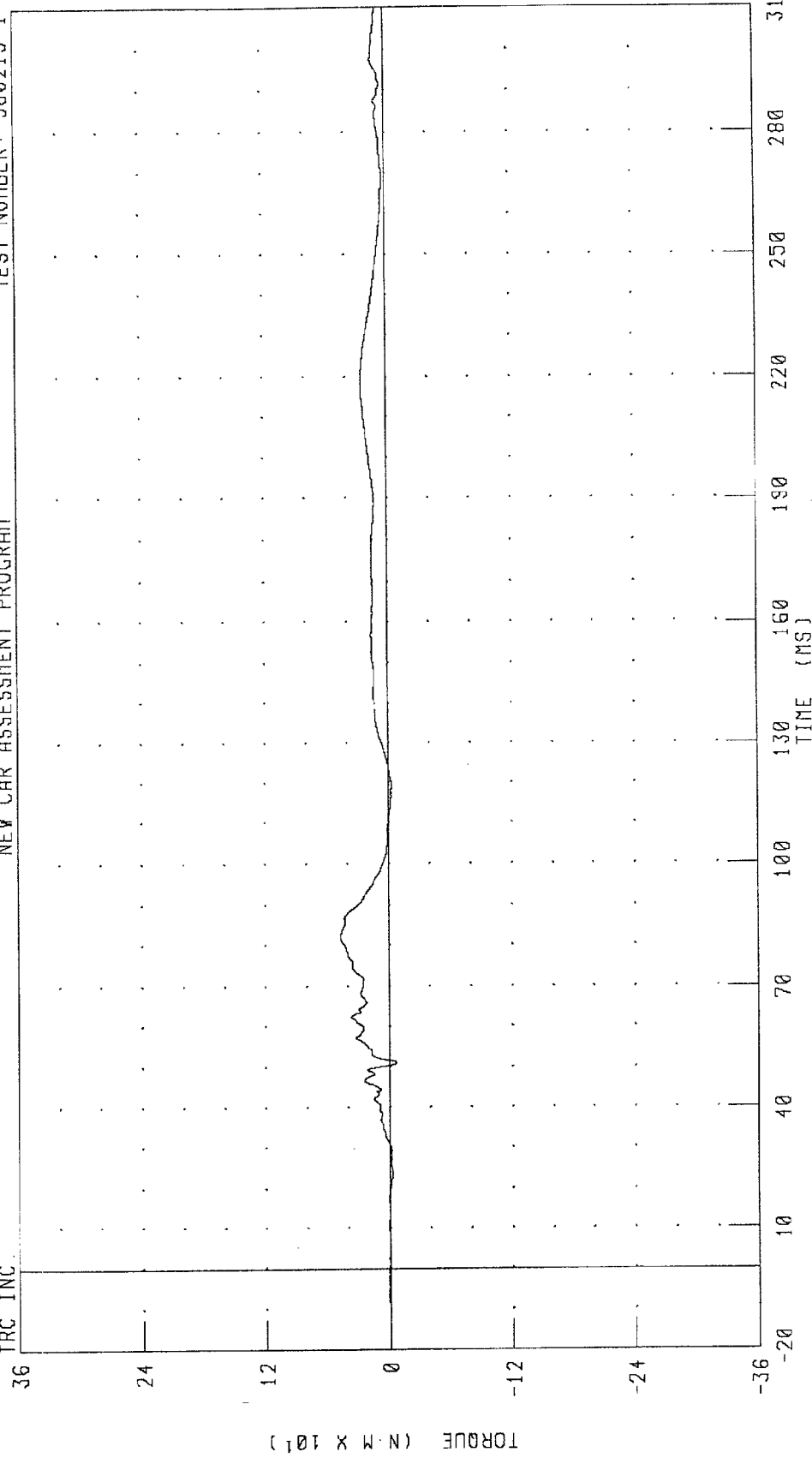
CHANNEL: TBLYM1 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT UPPER TIBIA MOMENT ABOUT X AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



PEAK DATA: 47.22 N·m @ 81.52 MS; -7.20 N·m @ 51.04 MS

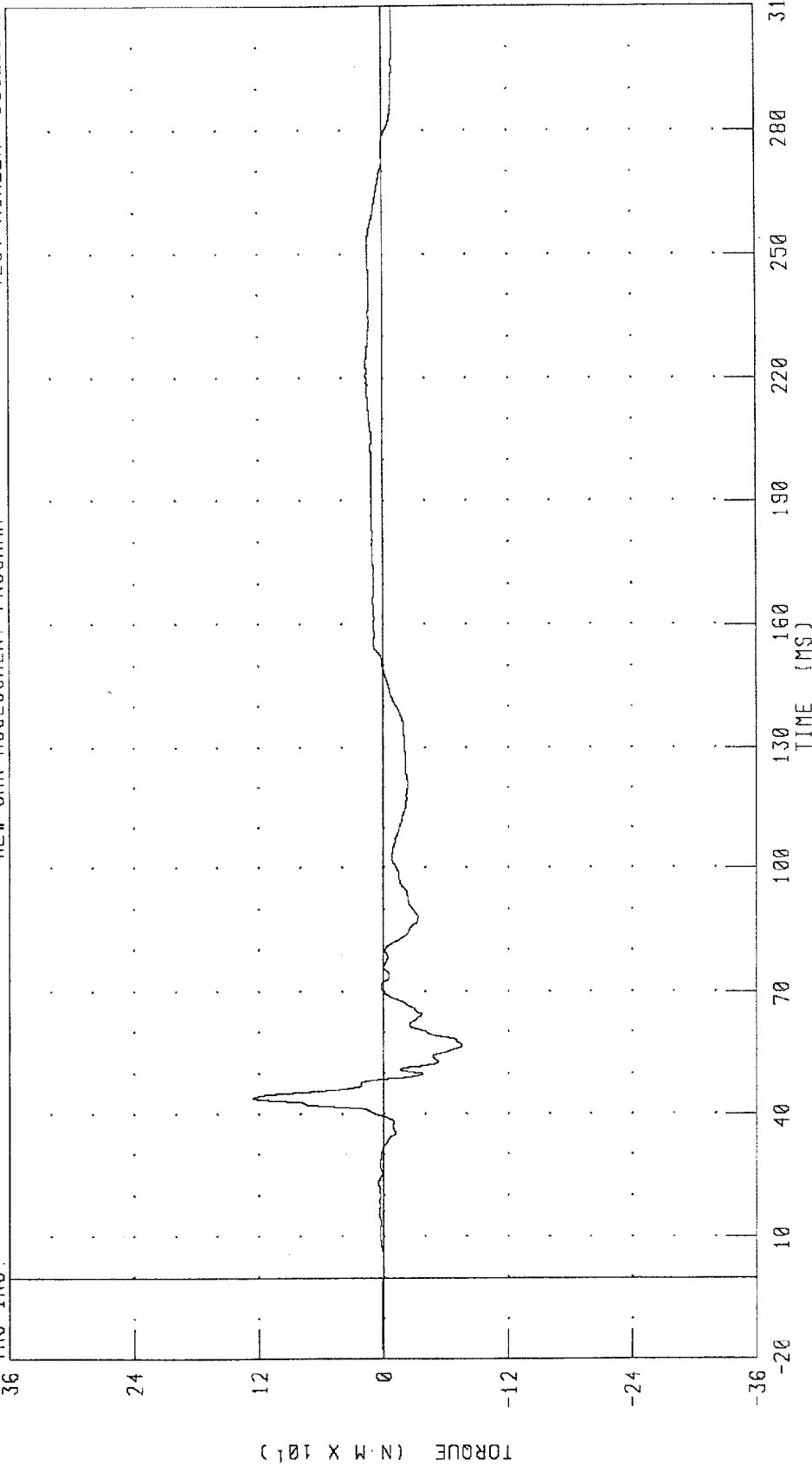
CHANNEL: TBRXM1 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER RIGHT UPPER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



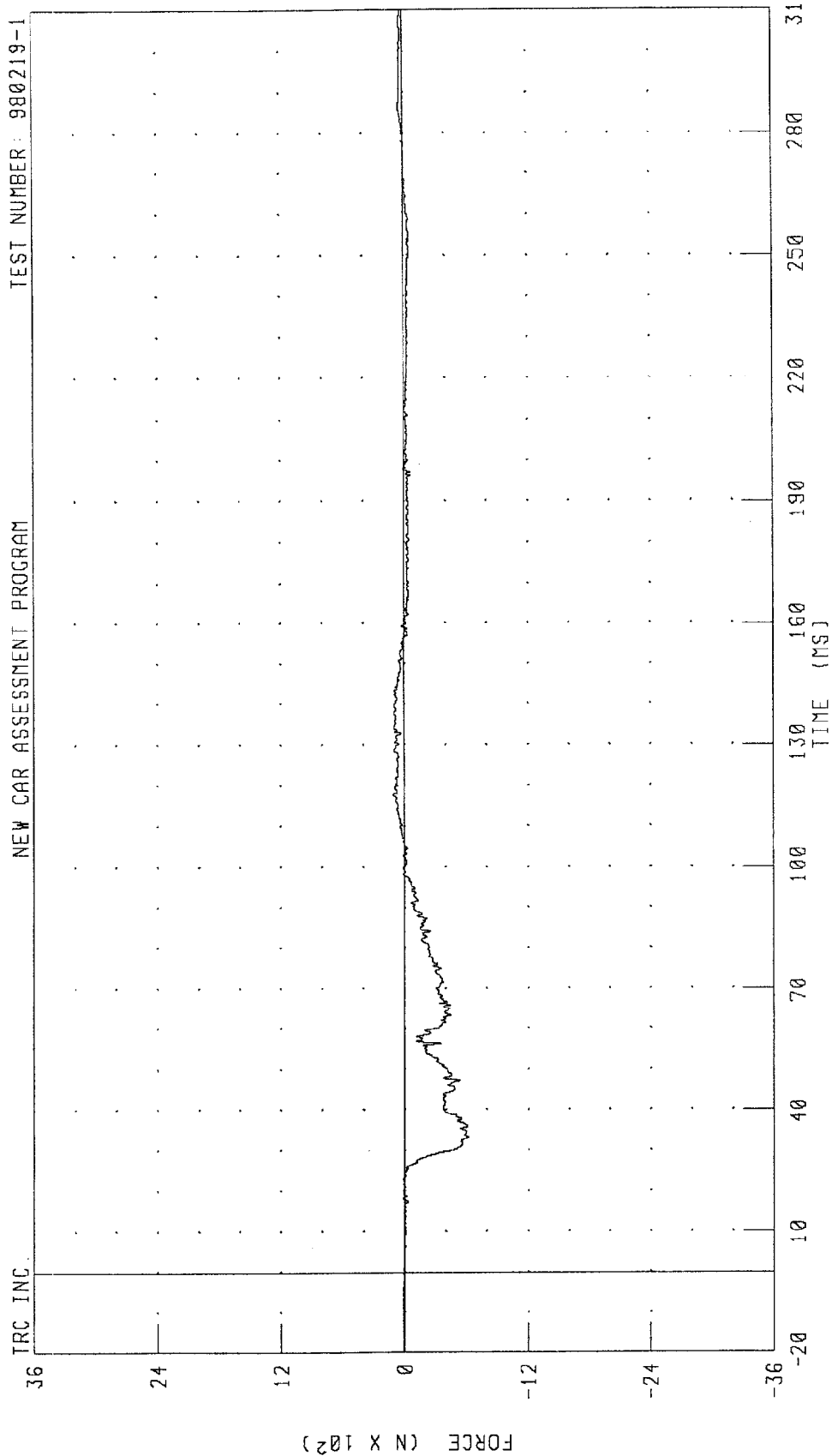
CHANNEL: TBRYM1 FILTER: CH. CLASS 600

PEAK DATA: 125.73 N-M @ 43.92 MS; -75.08 N-M @ 56.72 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER LEFT LOWER TIBIA X-AXIS FORCE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM



PEAK DATA: 112.80 N @ 117.84 MS; -623.93 N @ 33.20 MS

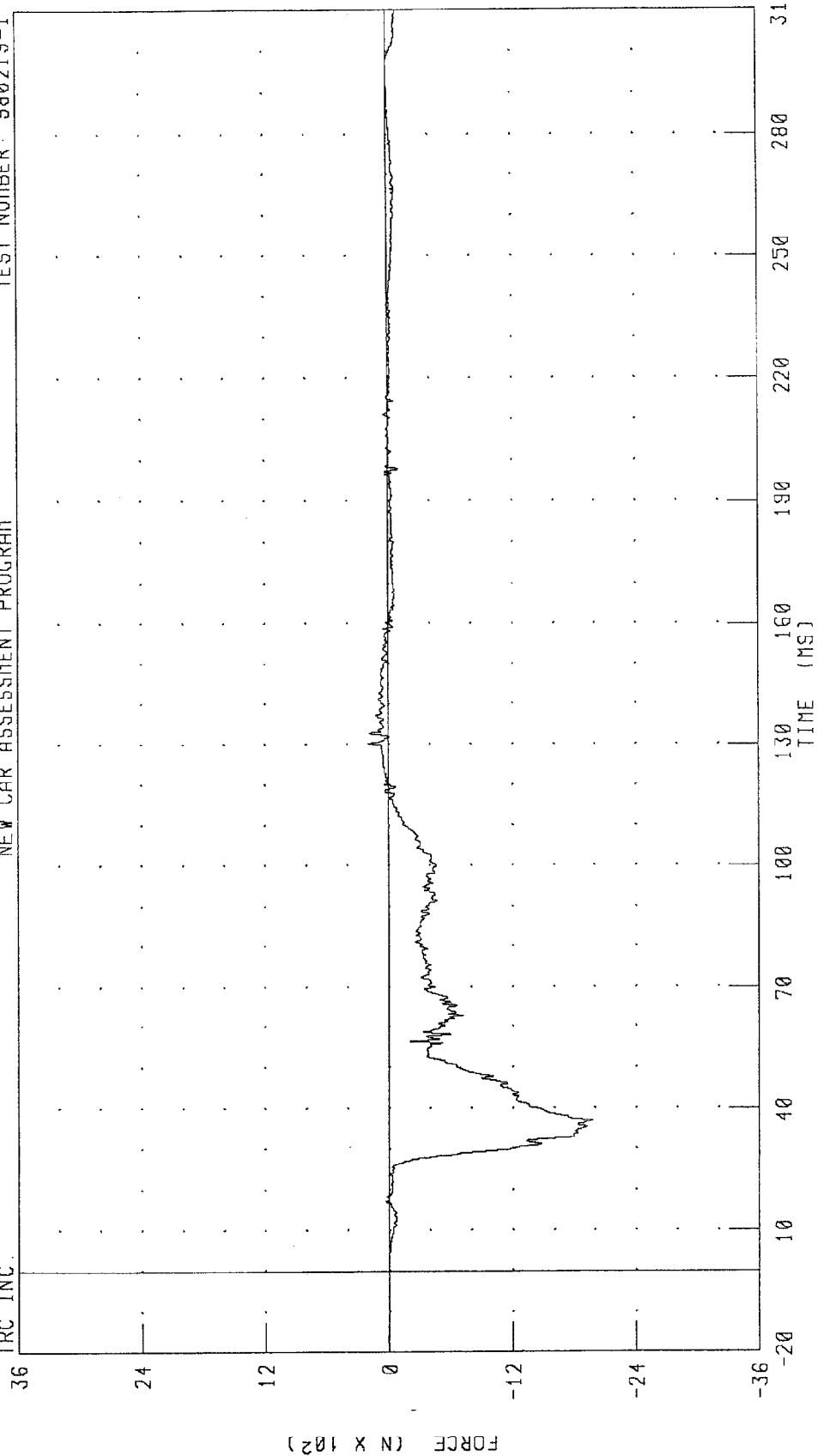
CHANNEL: ANLXF1 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER LEFT LOWER TIBIA Z-AXIS FORCE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: ANLZF1 FILTER: CH. CLASS 600

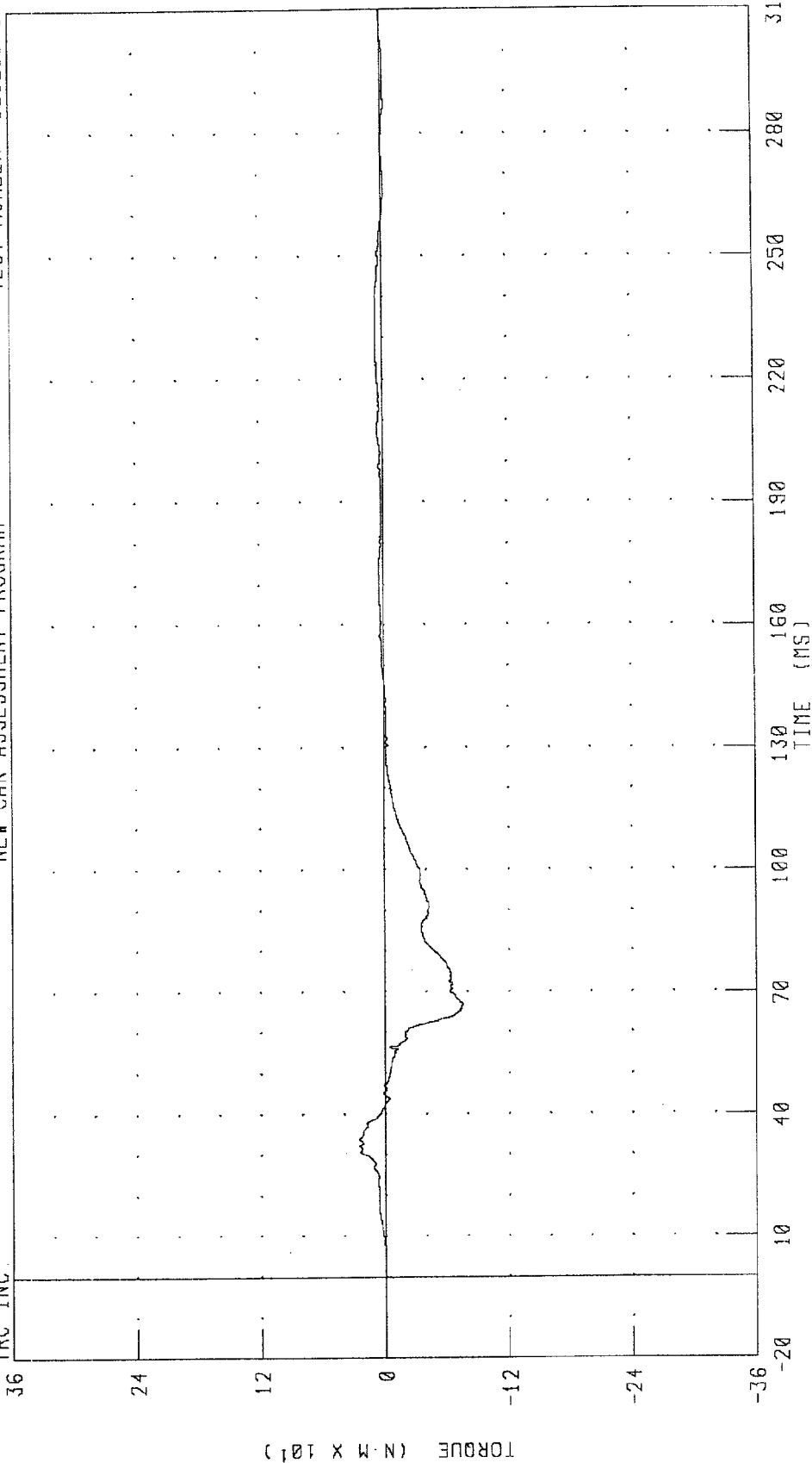
PEAK DATA: 196.04 N @ 130.16 MS, -1972.67 N @ 36.96 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER LEFT LOWER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: ANLYM1 FILTER: CH. CLASS 600

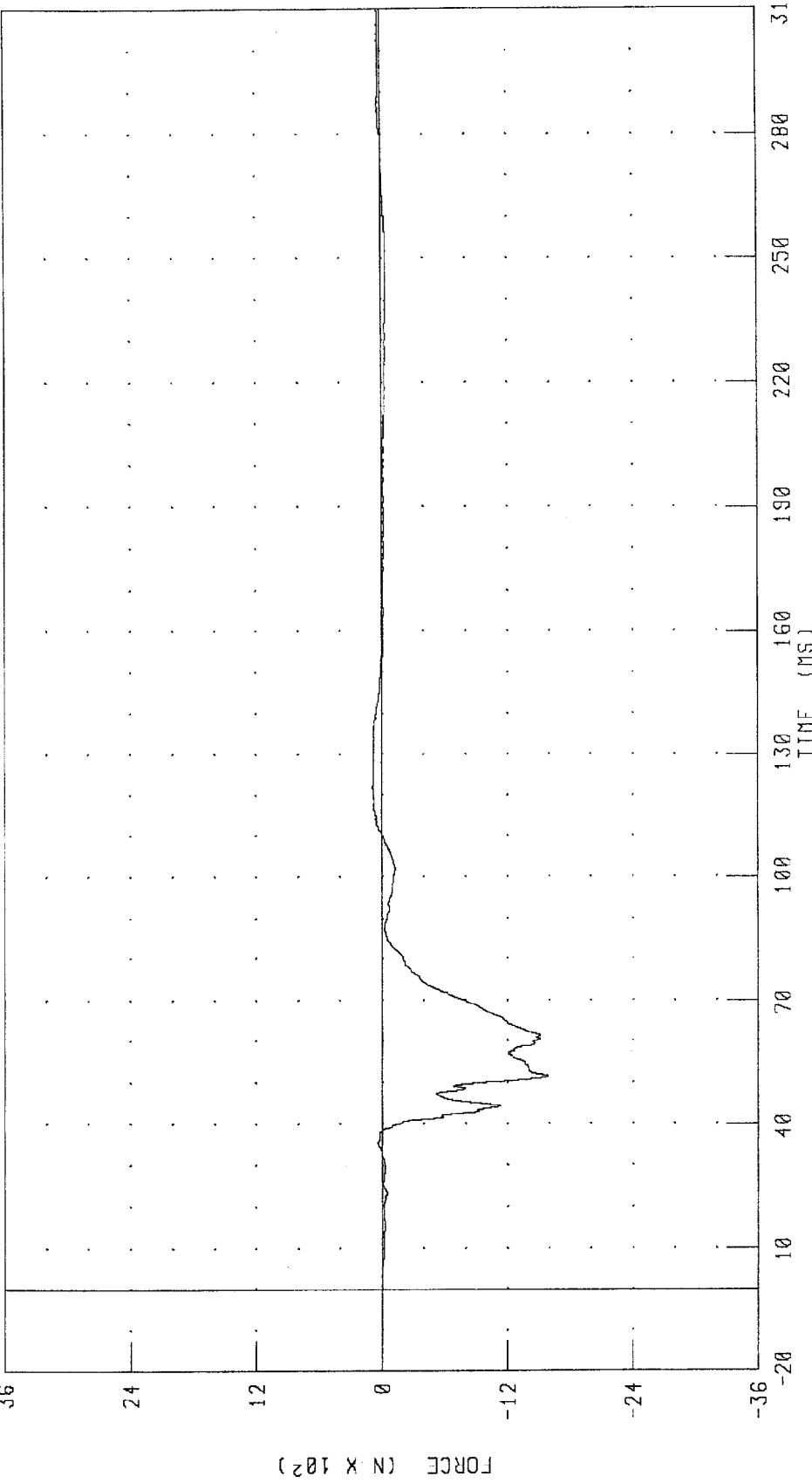
PEAK DATA: 25.29 N·m @ 32.24 ms; -75.40 N·m @ 66.96 ms

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT LOWER TIBIA X-AXIS FORCE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



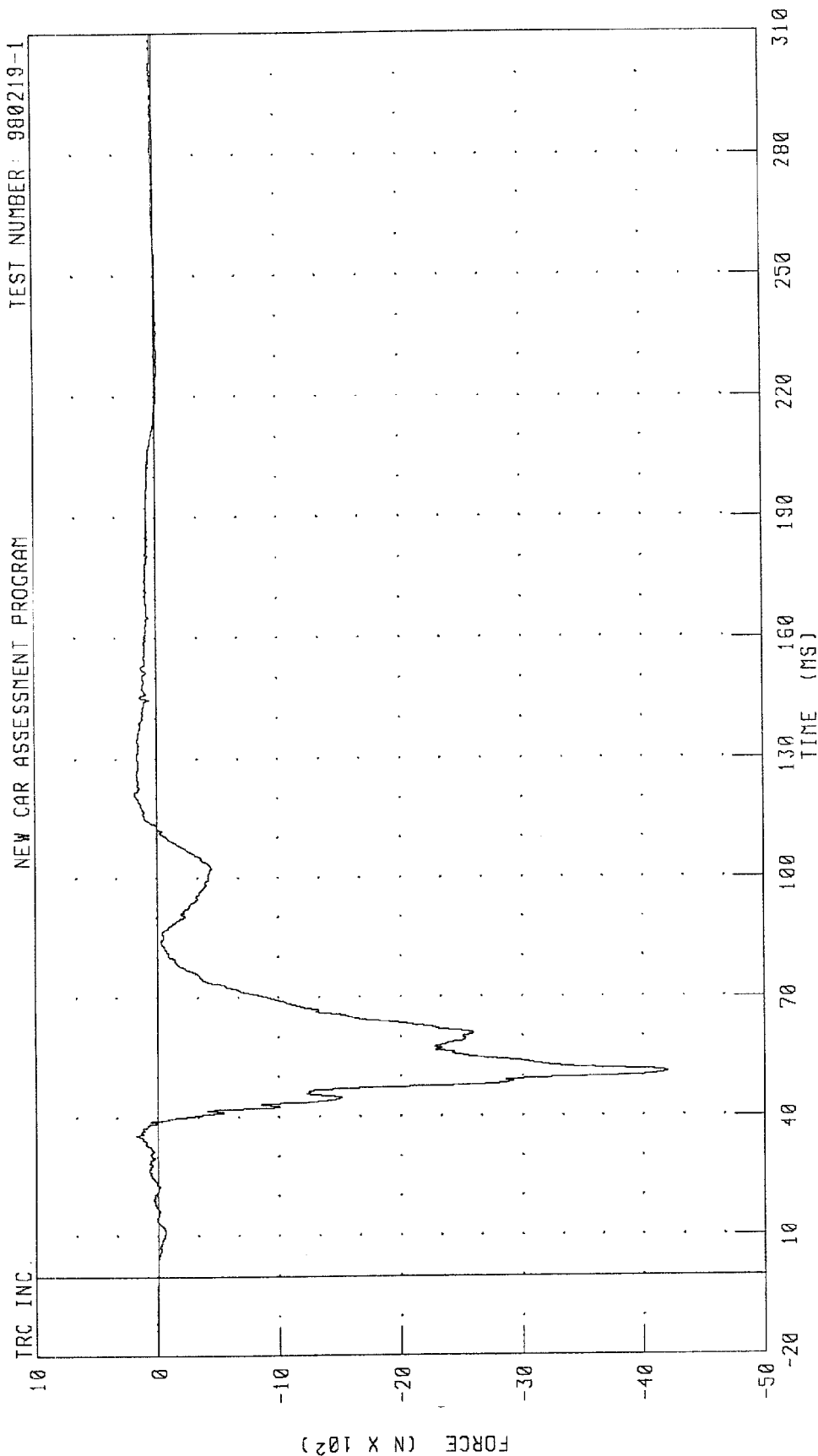
CHANNEL: ANRFX1 FILTER: CH. CLASS 600

PEAK DATA: 88.46 N @ 122.08 MS; -1584.21 N @ 51.44 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT LOWER TIBIA Z-AXIS FORCE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM



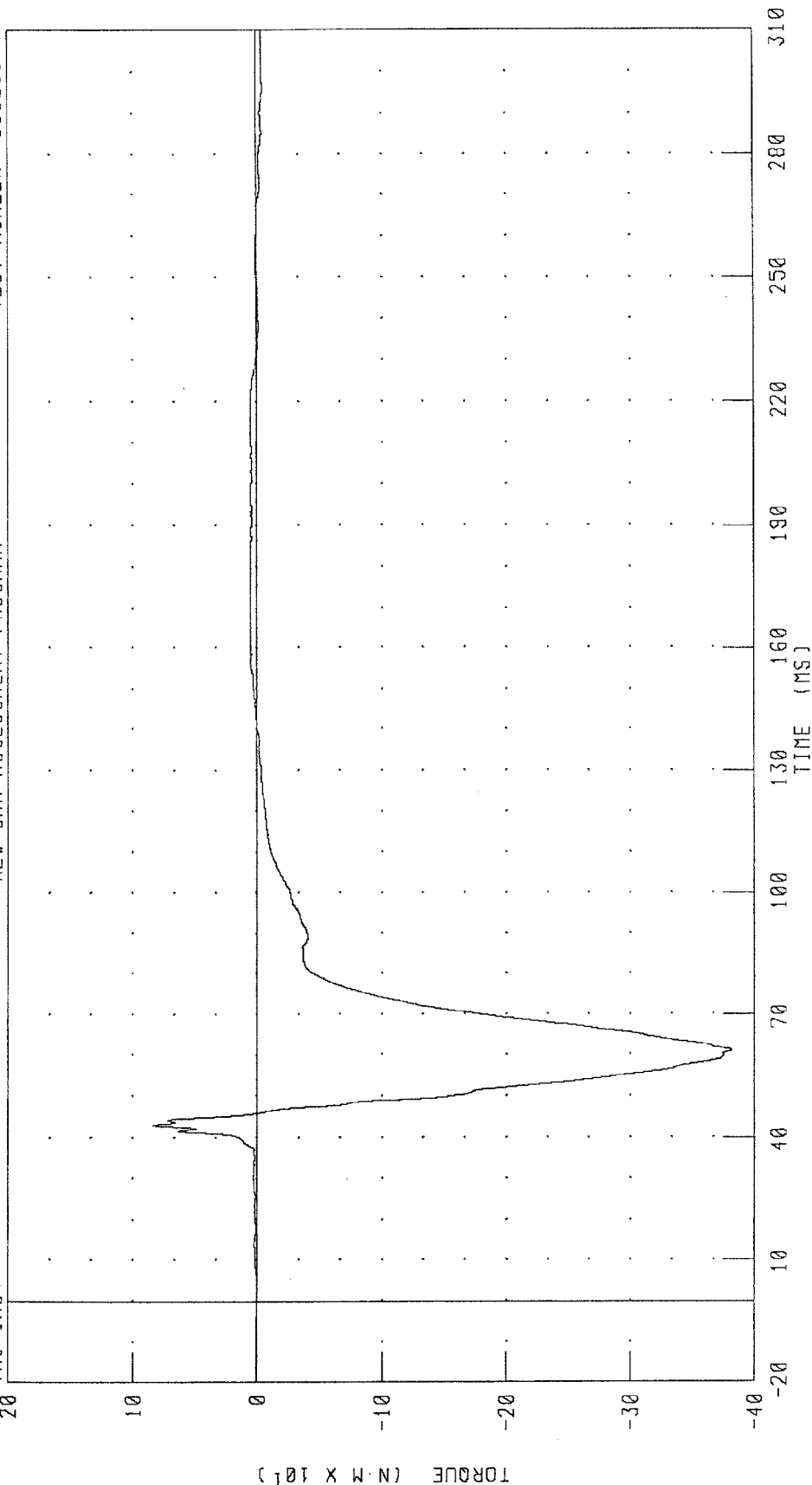
CHANNEL: ANRZF1 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT LOWER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

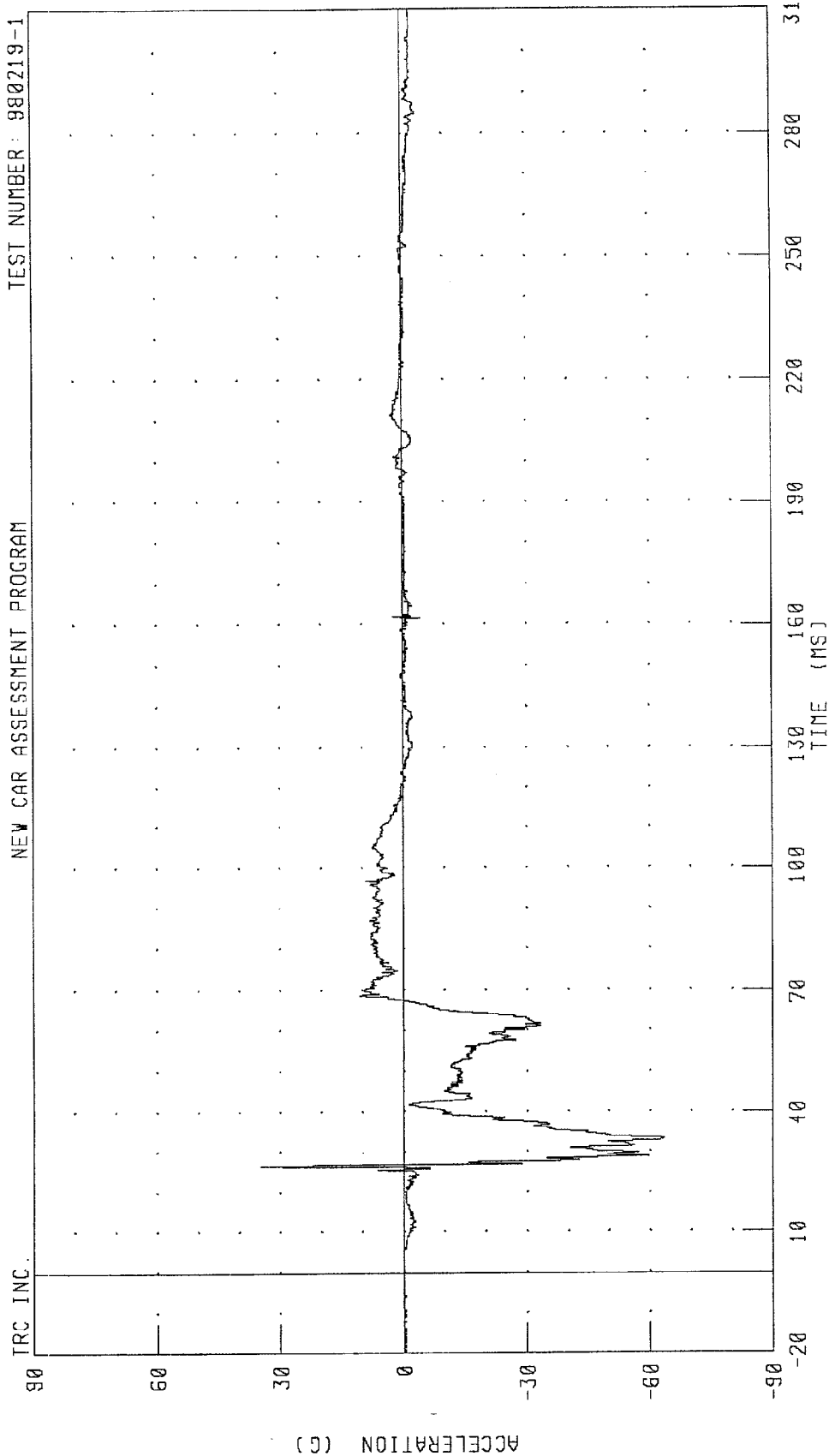


CHANNEL: ANRYM1 FILTER: CH. CLASS 600

PEAK DATA: 83.64 N.M @ 43.04 MS; -381.73 N.M @ 60.96 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER LEFT FOOT X-AXIS ACCELERATION
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



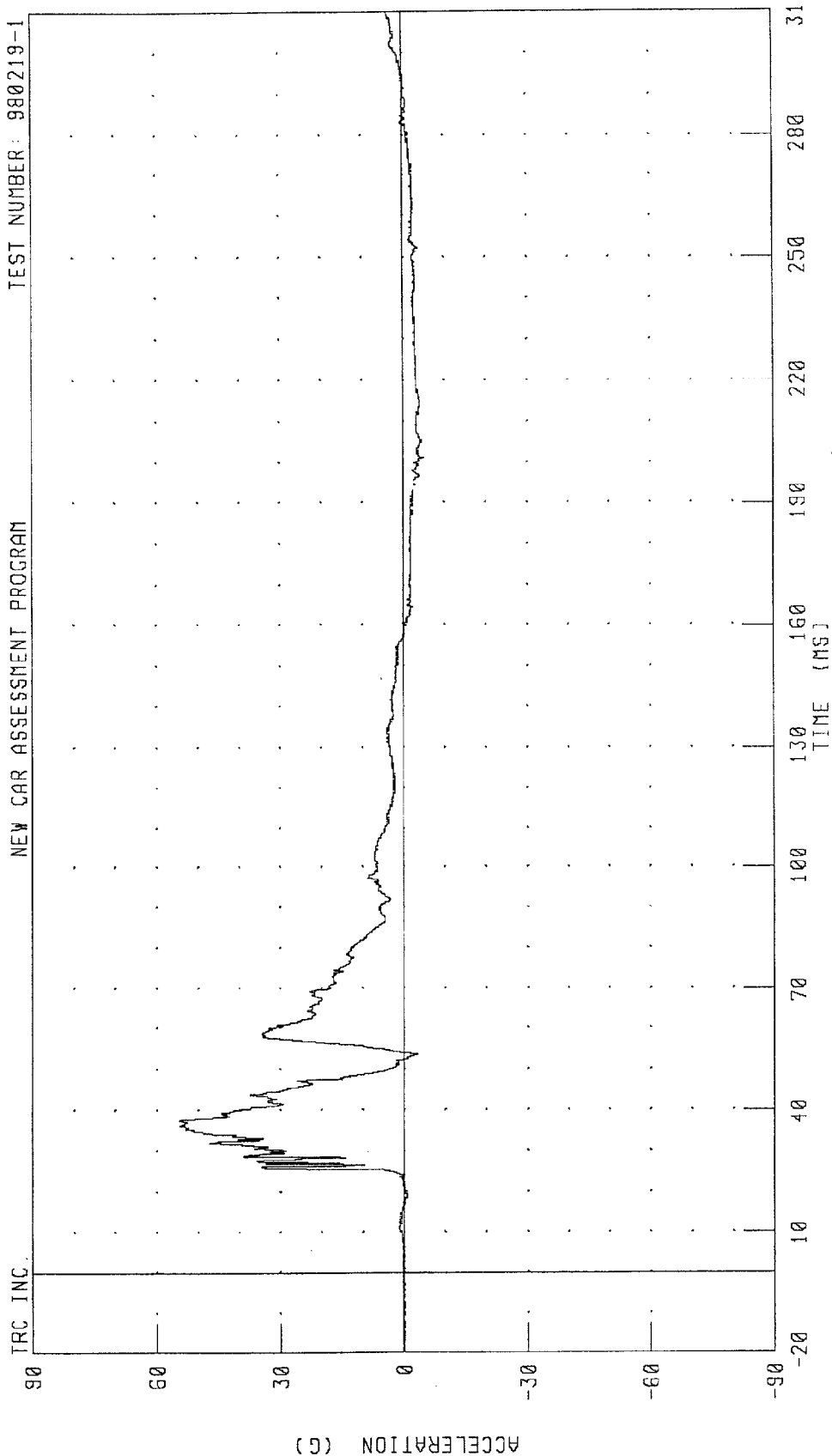
CHANNEL: FTLXG1 FILTER: CH. CLASS 1000

PEAK DATA: 34.93 G @ 26.72 MS, -63.52 G @ 33.36 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER LEFT FOOT Z-AXIS ACCELERATION AT HEEL

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM



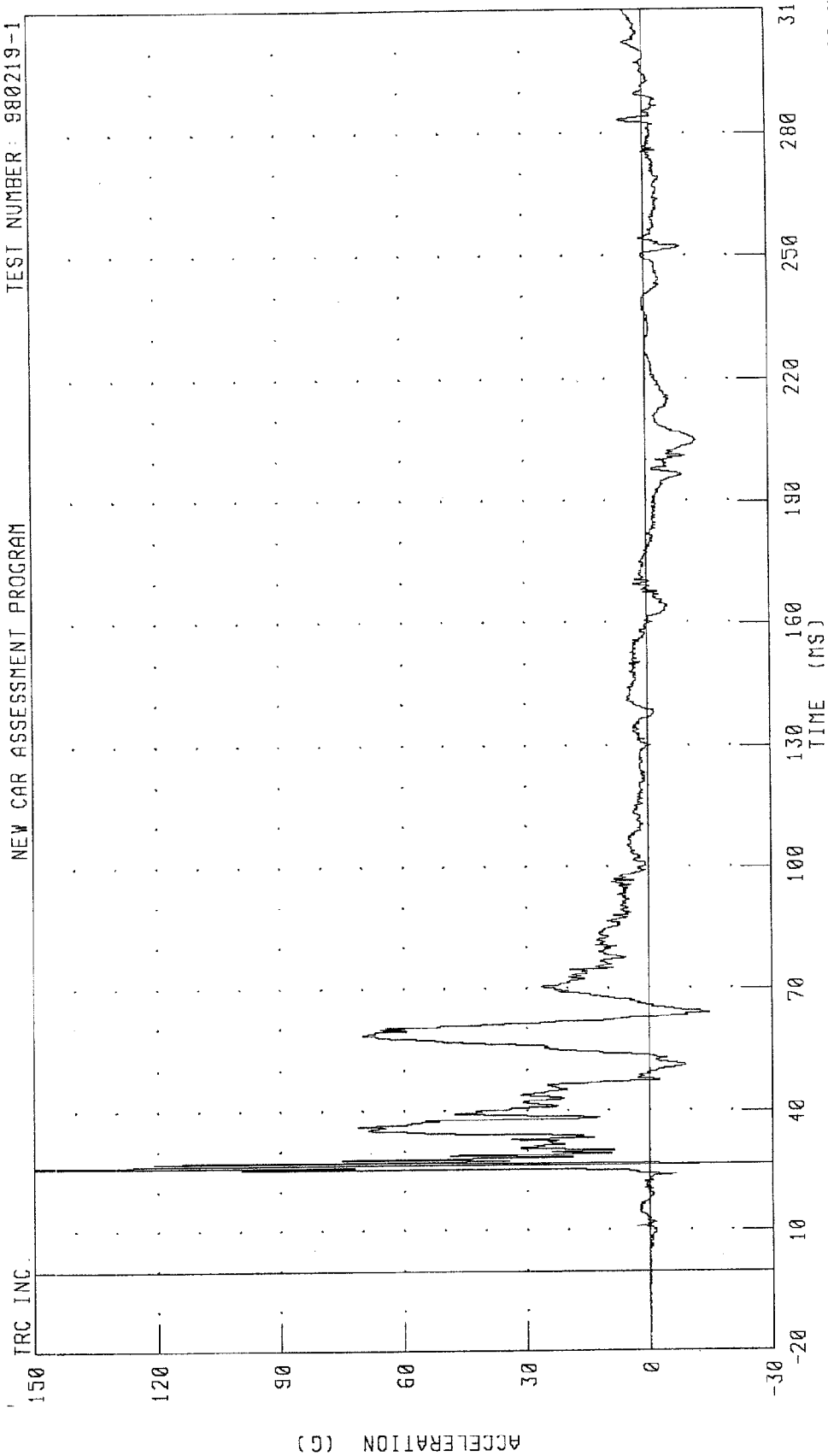
PEAK DATA: 54.64 G @ 37.44 MS; -4.94 G @ 201.20 MS

CHANNEL: FTLZH1 FILTER: CH. CLASS 1000

1998 VCLV0 S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER LEFT FOOT Z-AXIS ACCELERATION AT TOE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM



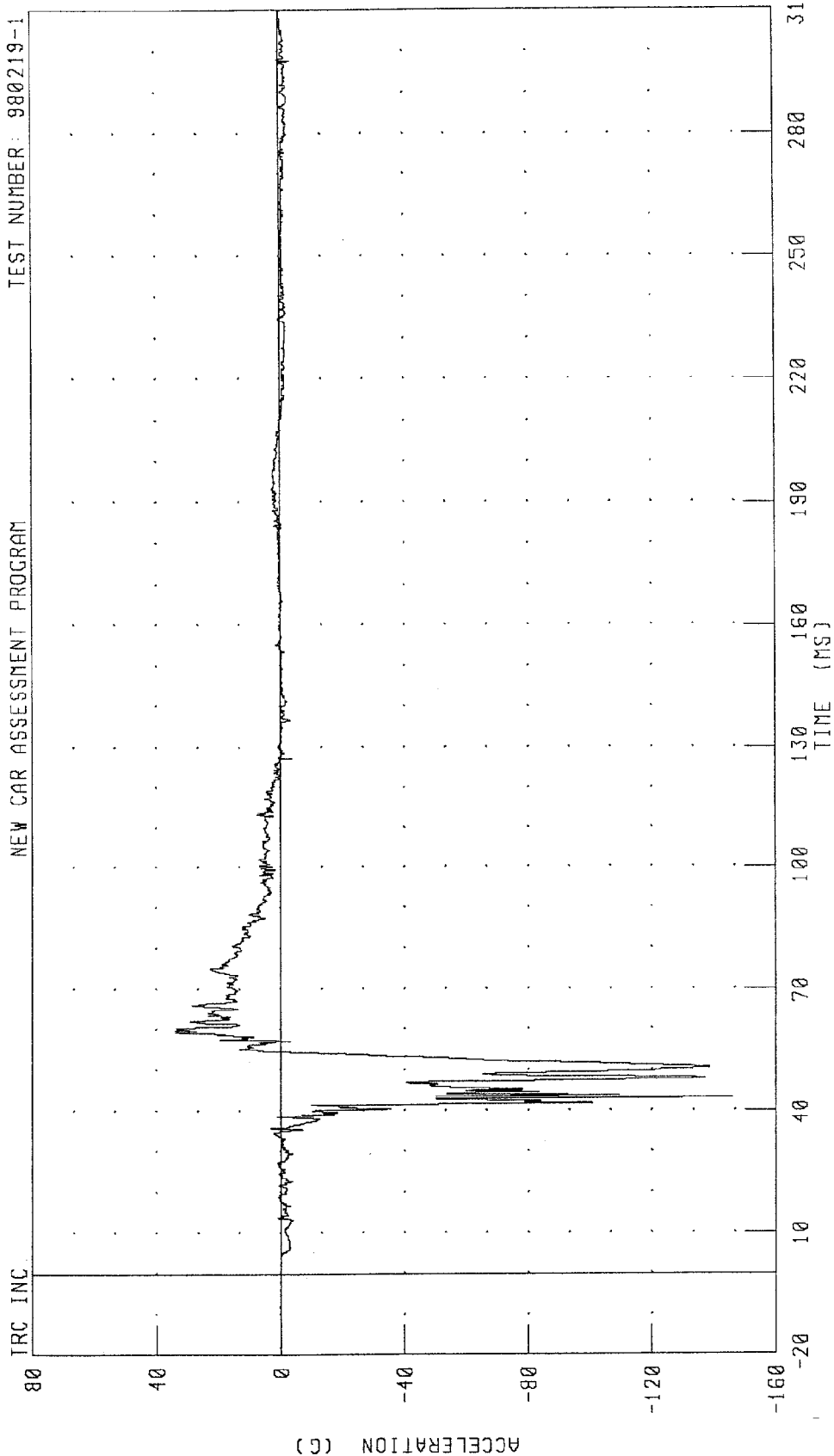
CHANNEL: FTLZT1 FILTER: CH. CLASS 1000

PEAK DATA: 163.56 G @ 26.24 MS; -29.62 G @ 26.72 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER RIGHT FOOT X-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM



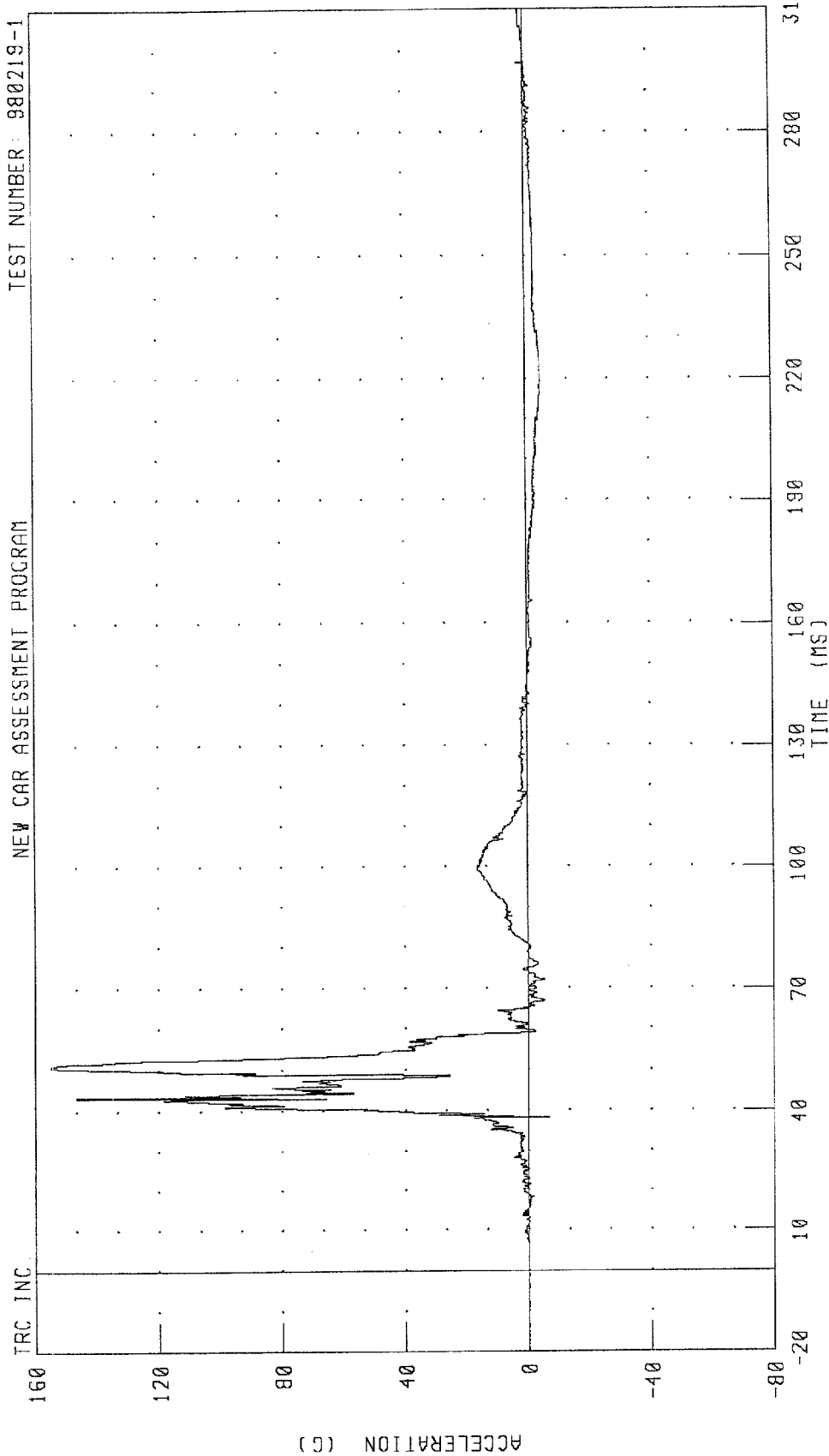
PEAK DATA: 33.81 G @ 59.28 MS; -146.10 G @ 43.28 MS

CHANNEL: FTRXC1 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT FOOT Z-AXIS ACCELERATION AT HEEL

TEST NUMBER: 980219-1

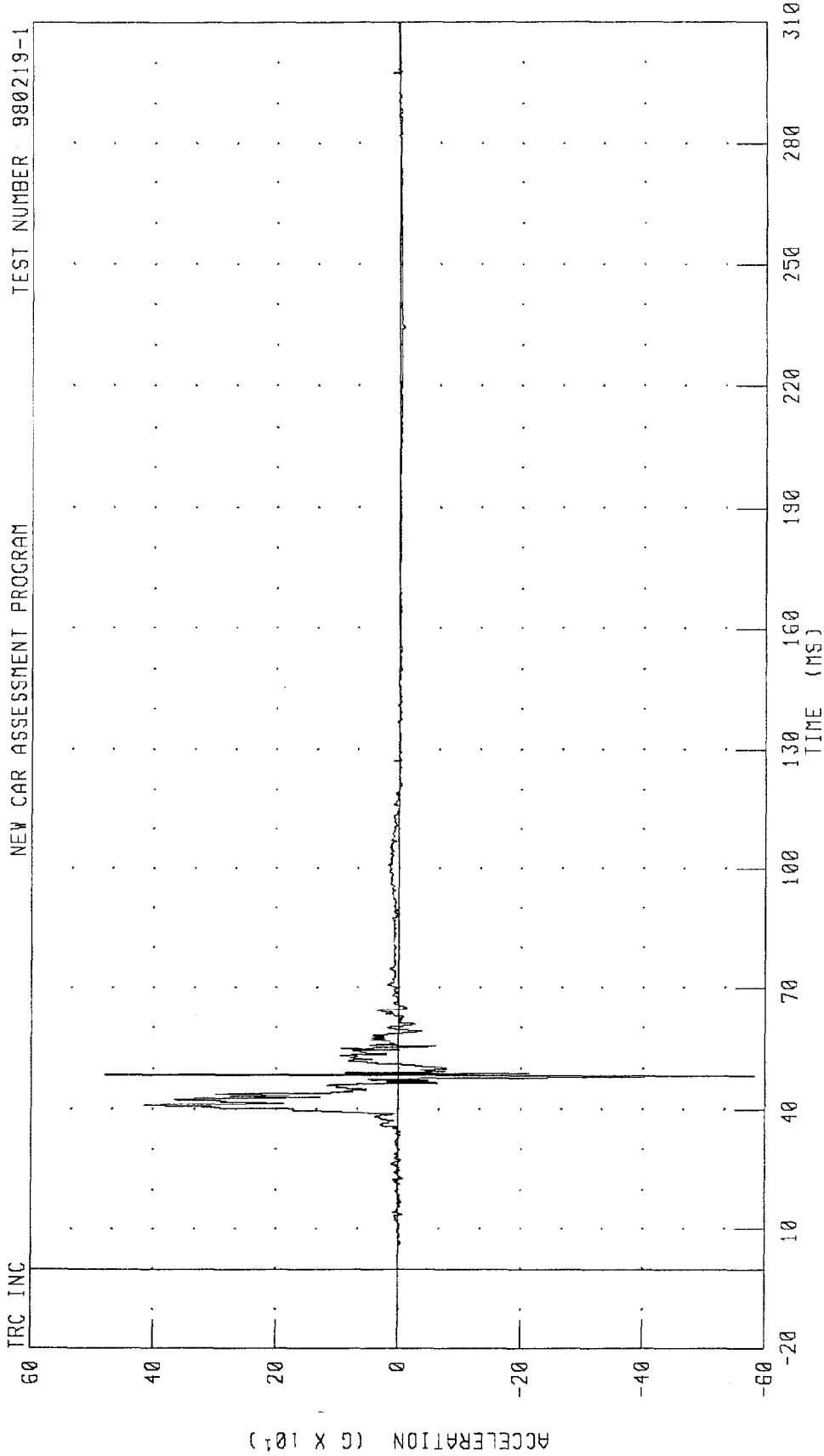
NEW CAR ASSESSMENT PROGRAM



PEAK DATA: 154.82 G @ 50.72 MS; -6.60 G @ 38.32 MS

CHANNEL: FTRZH1 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 DRIVER RIGHT FOOT Z-AXIS ACCELERATION AT TOE

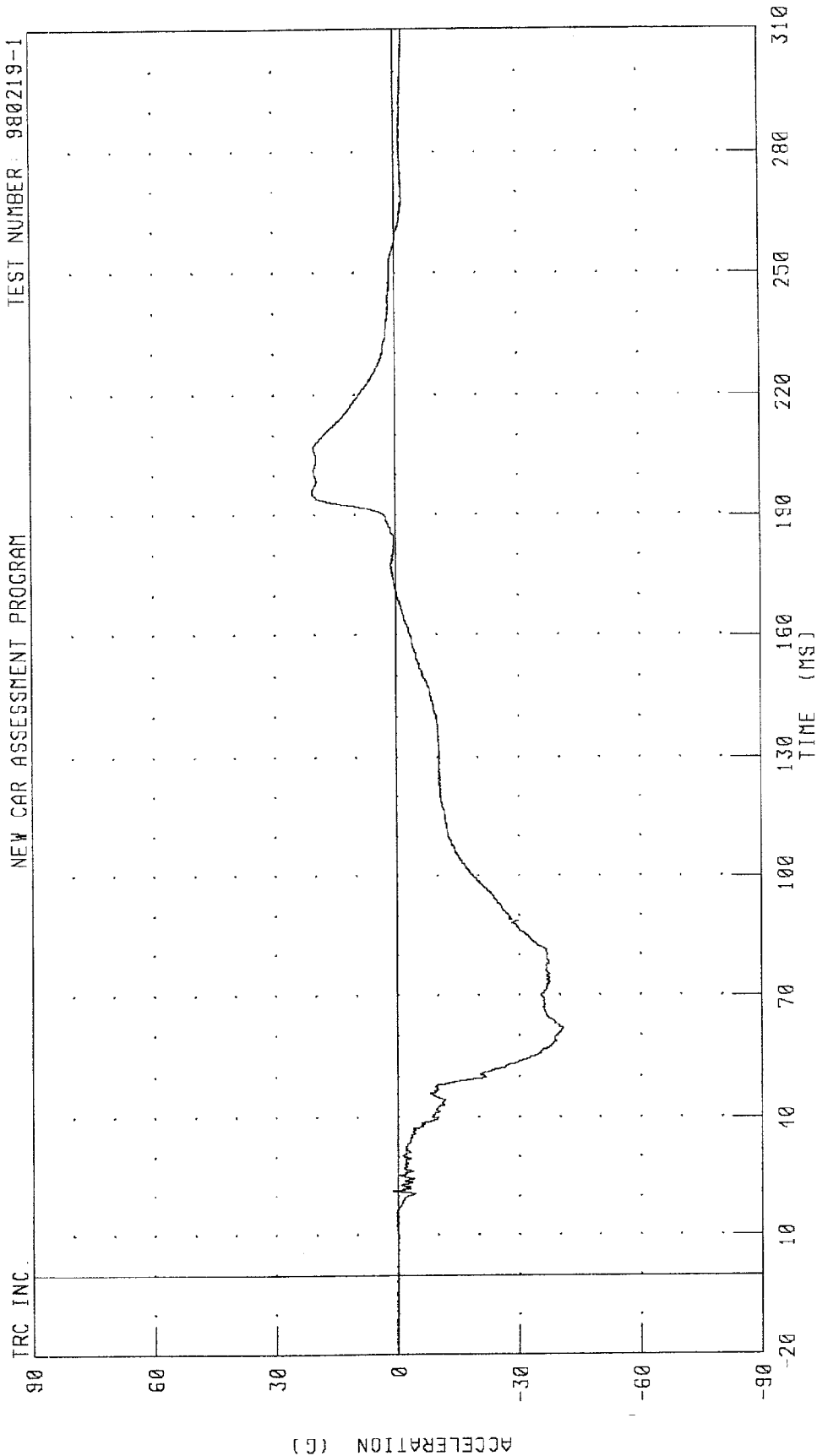


PEAK DATA: 480.07 G @ 48.48 MS; -583.10 G @ 48.24 MS

CHANNEL: FTRZT1 FILTER: CH CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 PASSENGER HEAD X-AXIS ACCELERATION
 NEW CAR ASSESSMENT PROGRAM

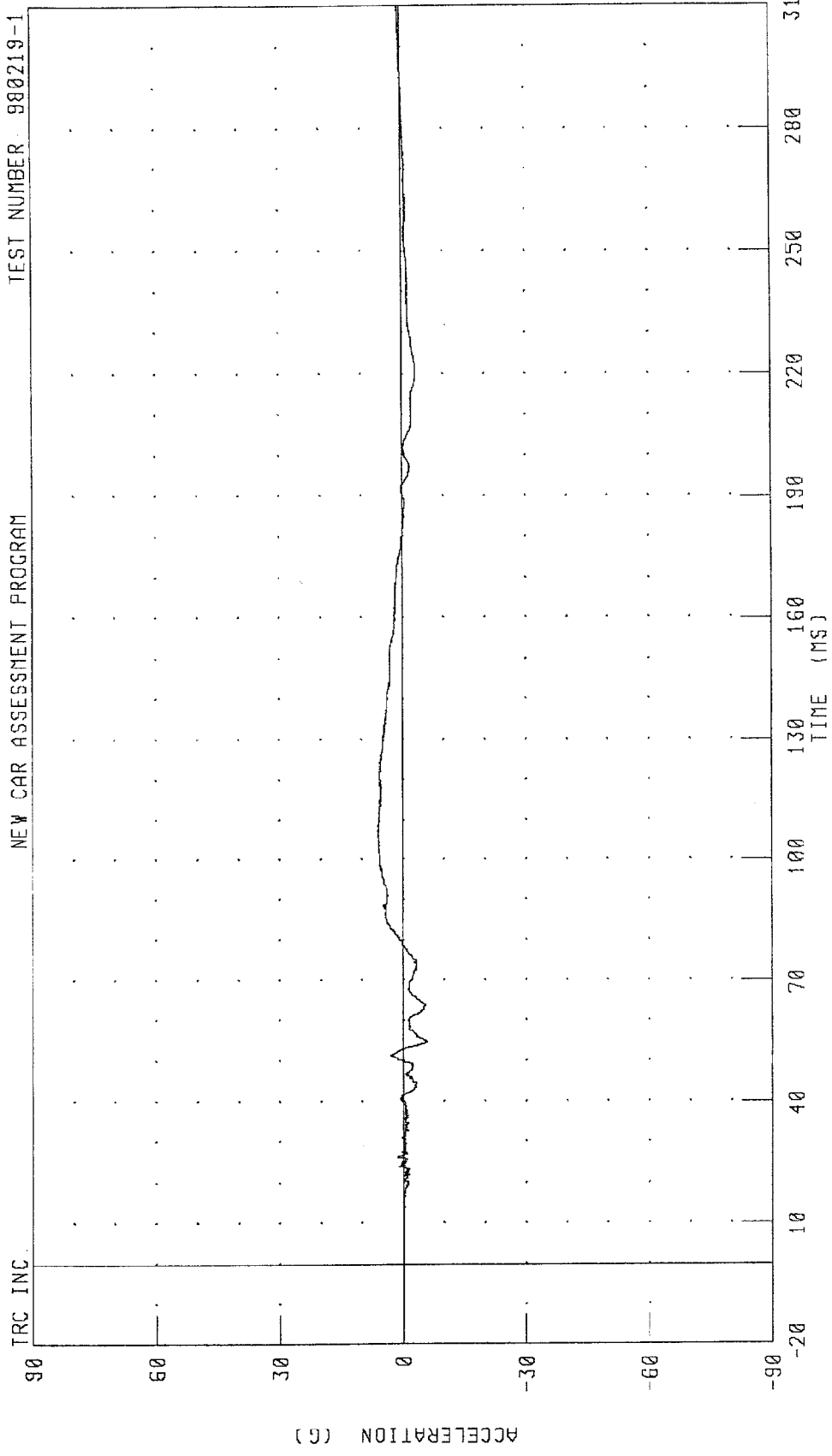
TEST NUMBER: 980219-1



CHANNEL: HEDXG2 FILTER: CH. CLASS 1000

PEAK DATA: 20.48 G @ 195.36 MS; -40.87 G @ 205.36 MS

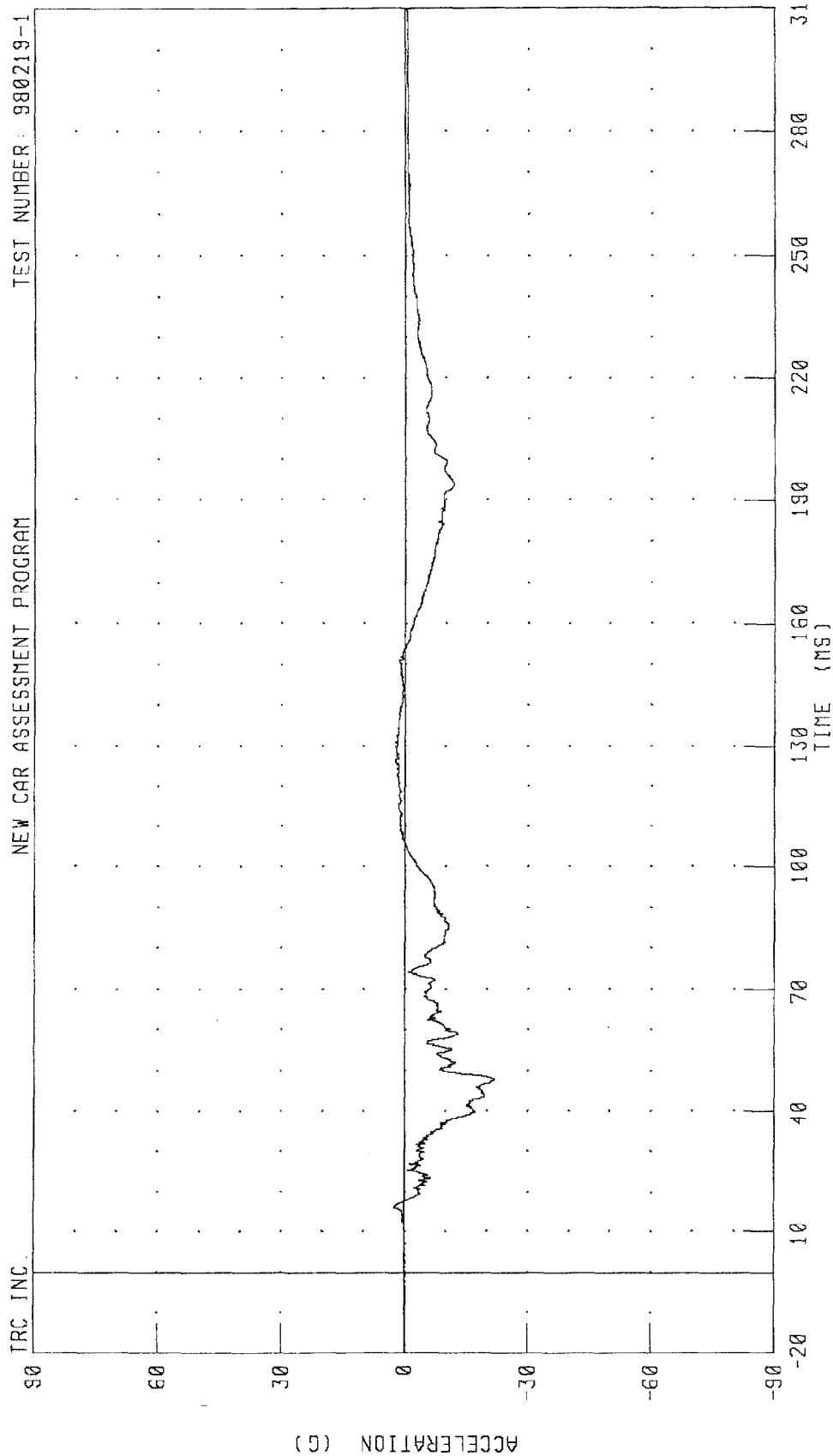
1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER HEAD Y-AXIS ACCELERATION



CHANNEL: HEDYG2 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER HEAD Z-AXIS ACCELERATION
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



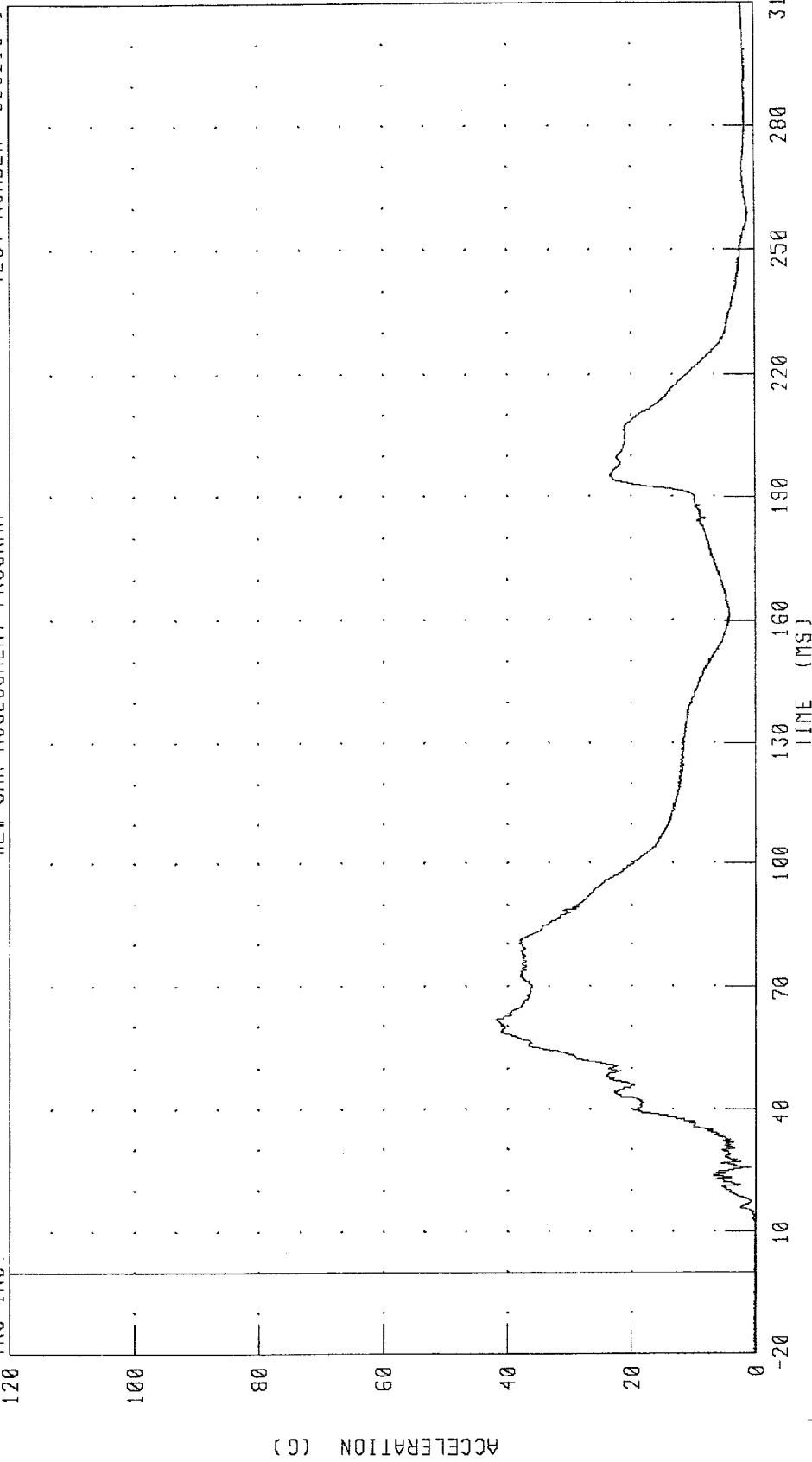
CHANNEL: HED702 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER HEAD RESULTANT ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

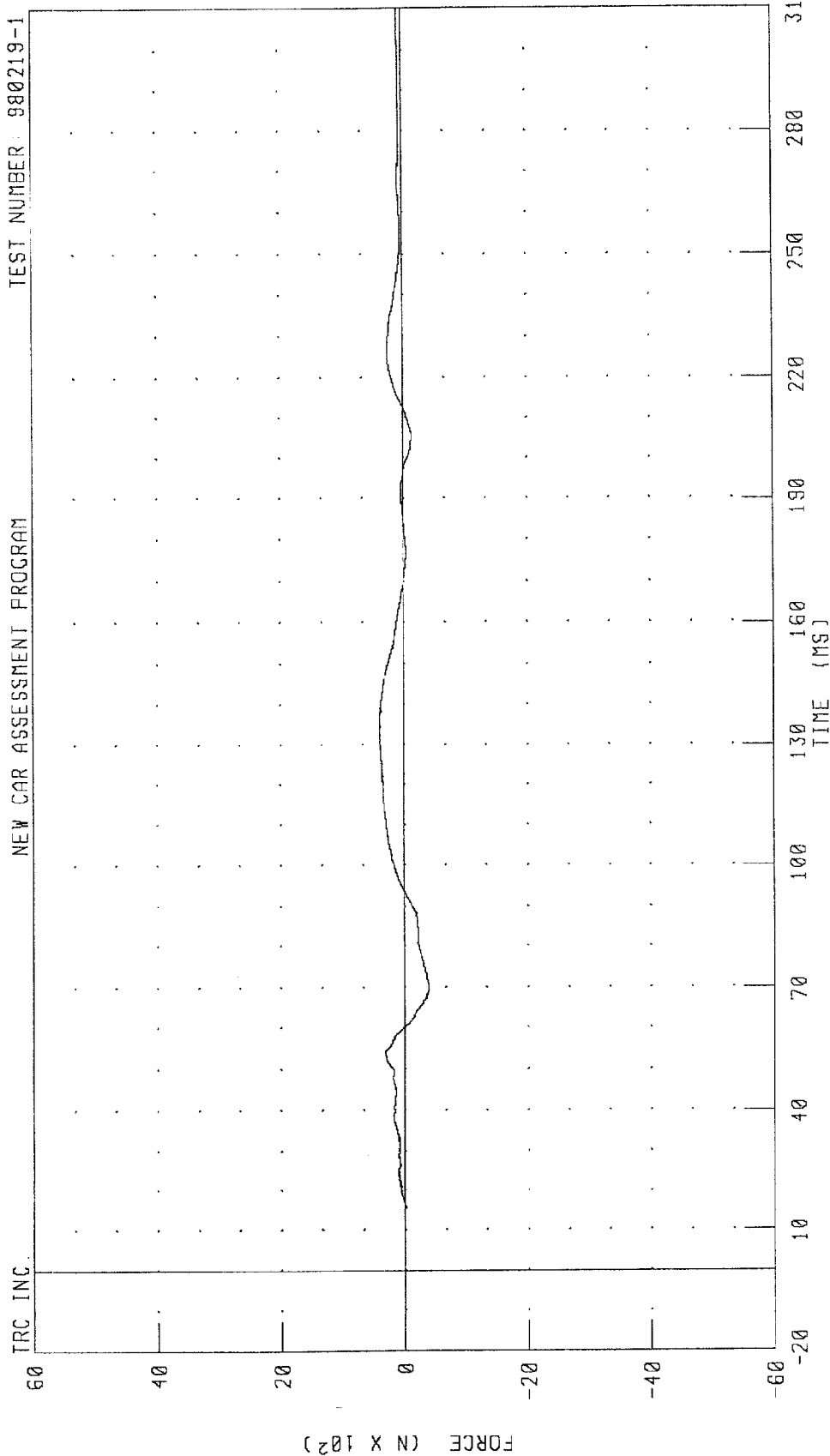


CHANNEL: HEDRG2 FILTER: CH. CLASS 1000

PEAK DATA: 41.89 G @ 61.76 MS; 0.05 G @ -19.84 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 PASSENGER NECK X-AXIS SHEAR FORCE
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



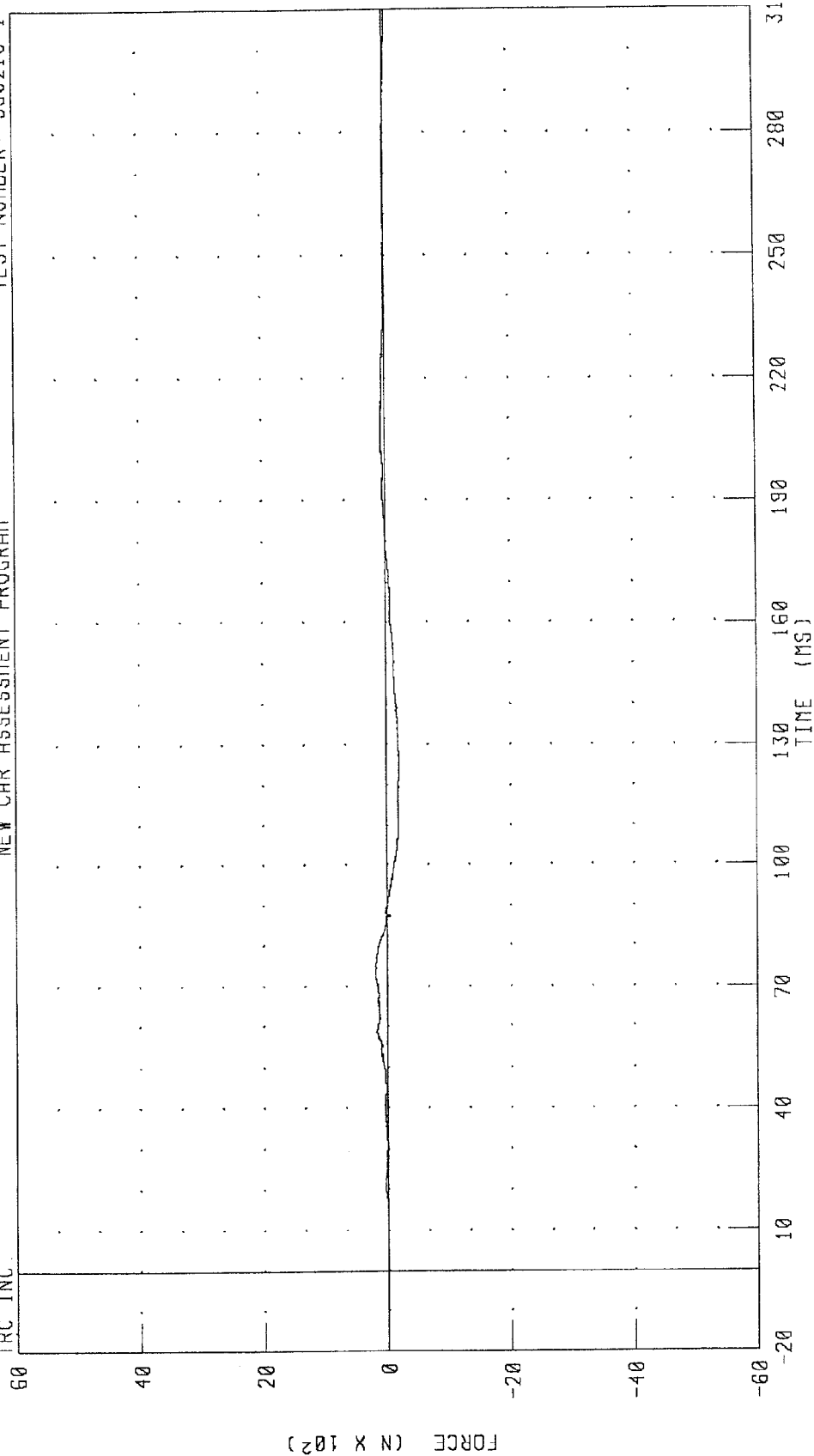
CHANNEL: NEKXF2 FILTER: CH. CLASS 1000

PEAK DATA: 391.60 N @ 139.12 MS; -394.64 N @ 69.60 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER NECK Y-AXIS SHEAR FORCE
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

TRC INC.

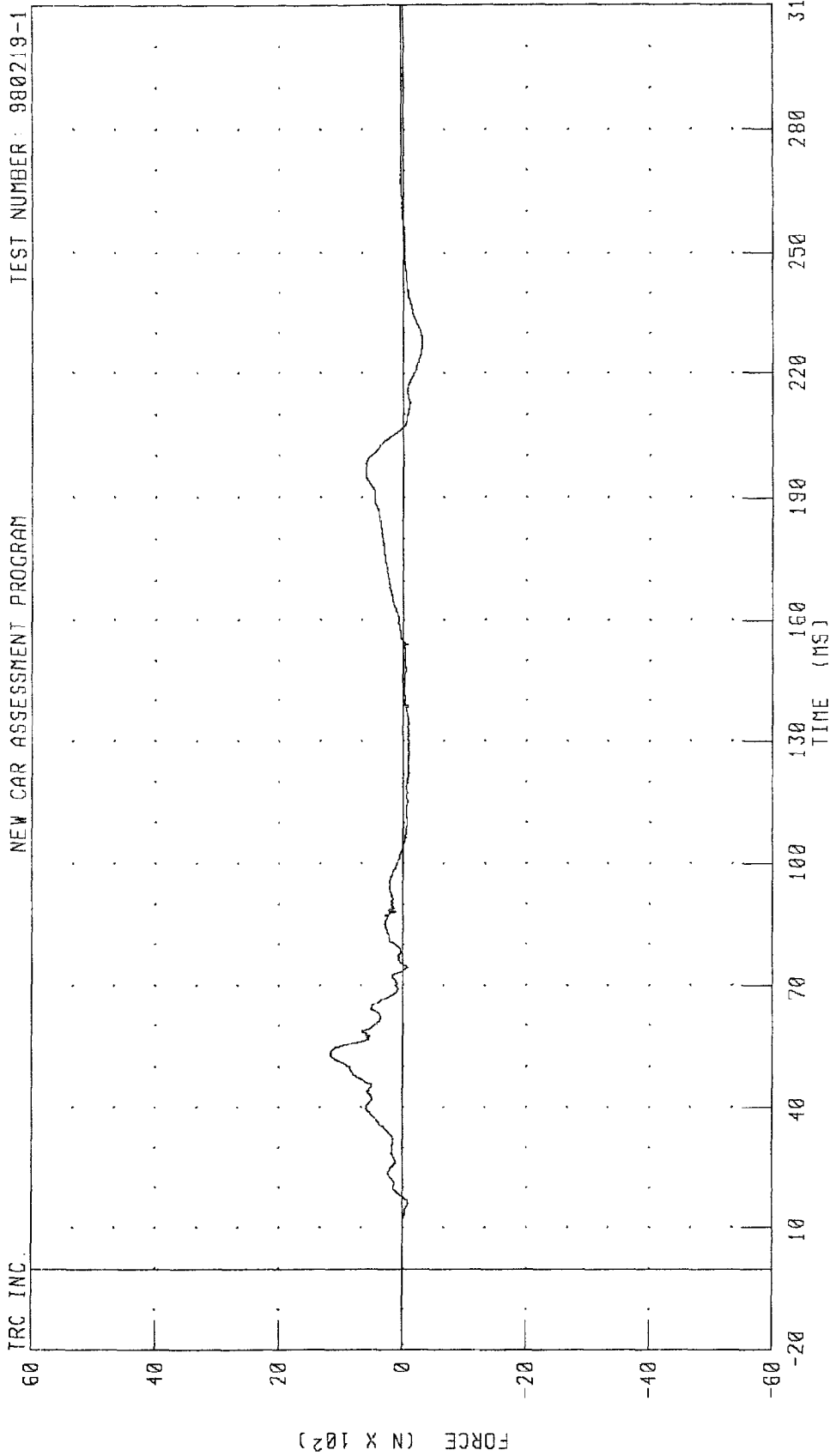


PEAK DATA: 194.40 N @ 72.96 MS; -201.16 N @ 121.60 MS

CHANNEL: NEKYF2 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 PASSENGER NECK Z-AXIS AXIAL FORCE
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



PEAK DATA: 1161.44 N @ 52.72 MS; -304.85 N @ 227.36 MS

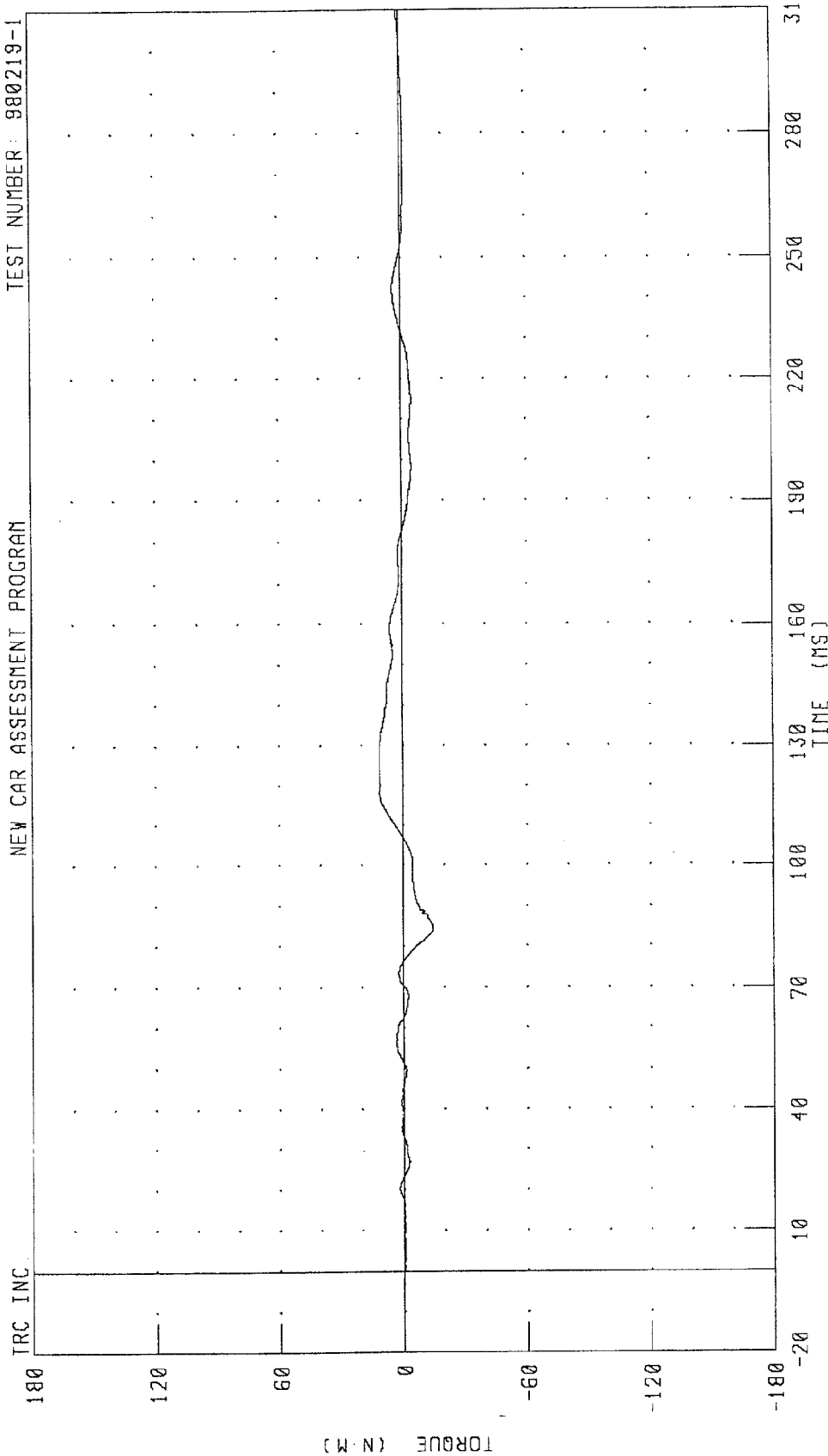
CHANNEL: NEKZF2 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER NECK MOMENT ABOUT X AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: NEKXM2 FILTER: CH. CLASS 600

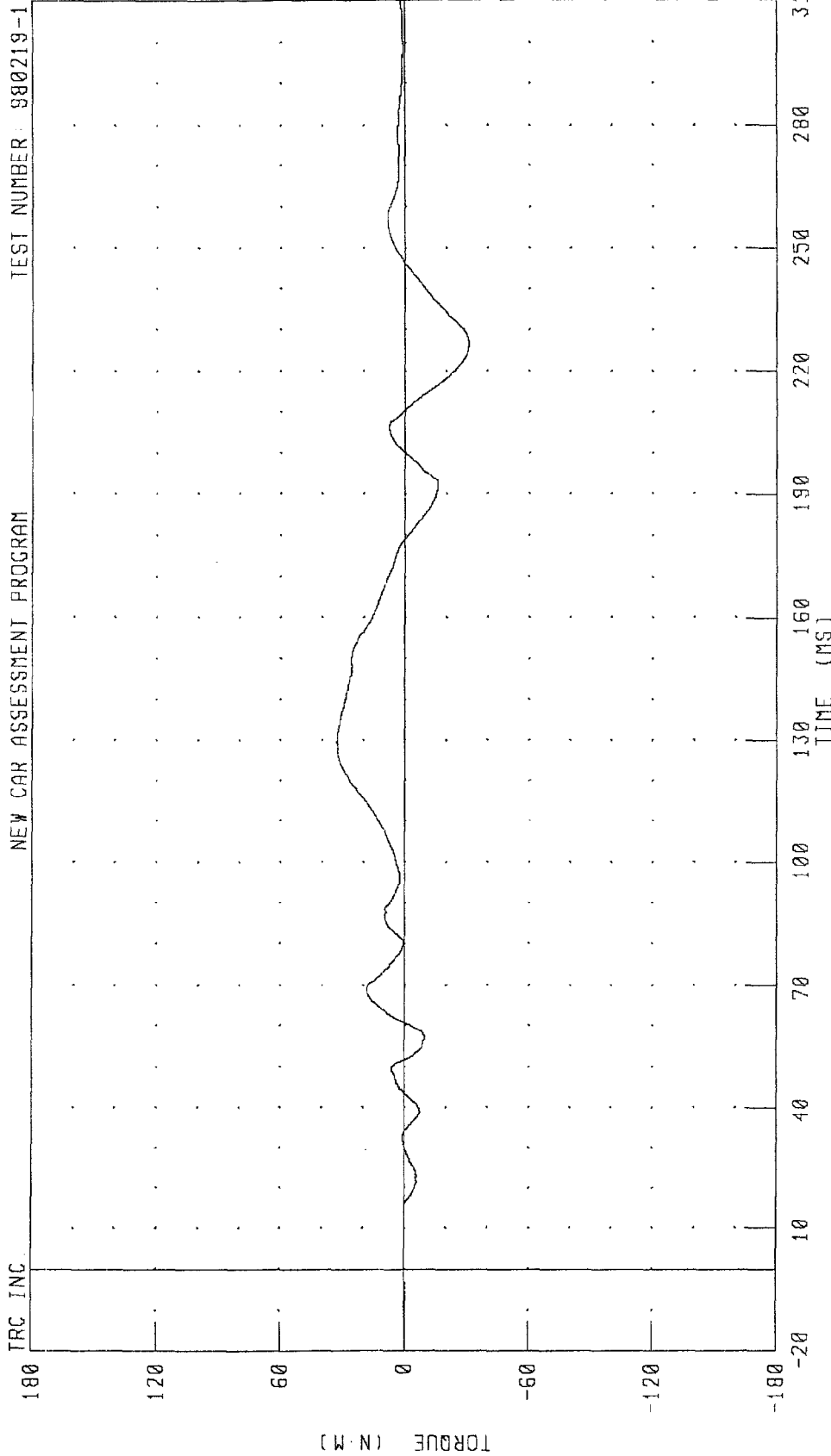
PEAK DATA: 11.50 N M @ 118.16 MS, -14.37 N M @ 84.40 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER NECK MOMENT ABOUT Y AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



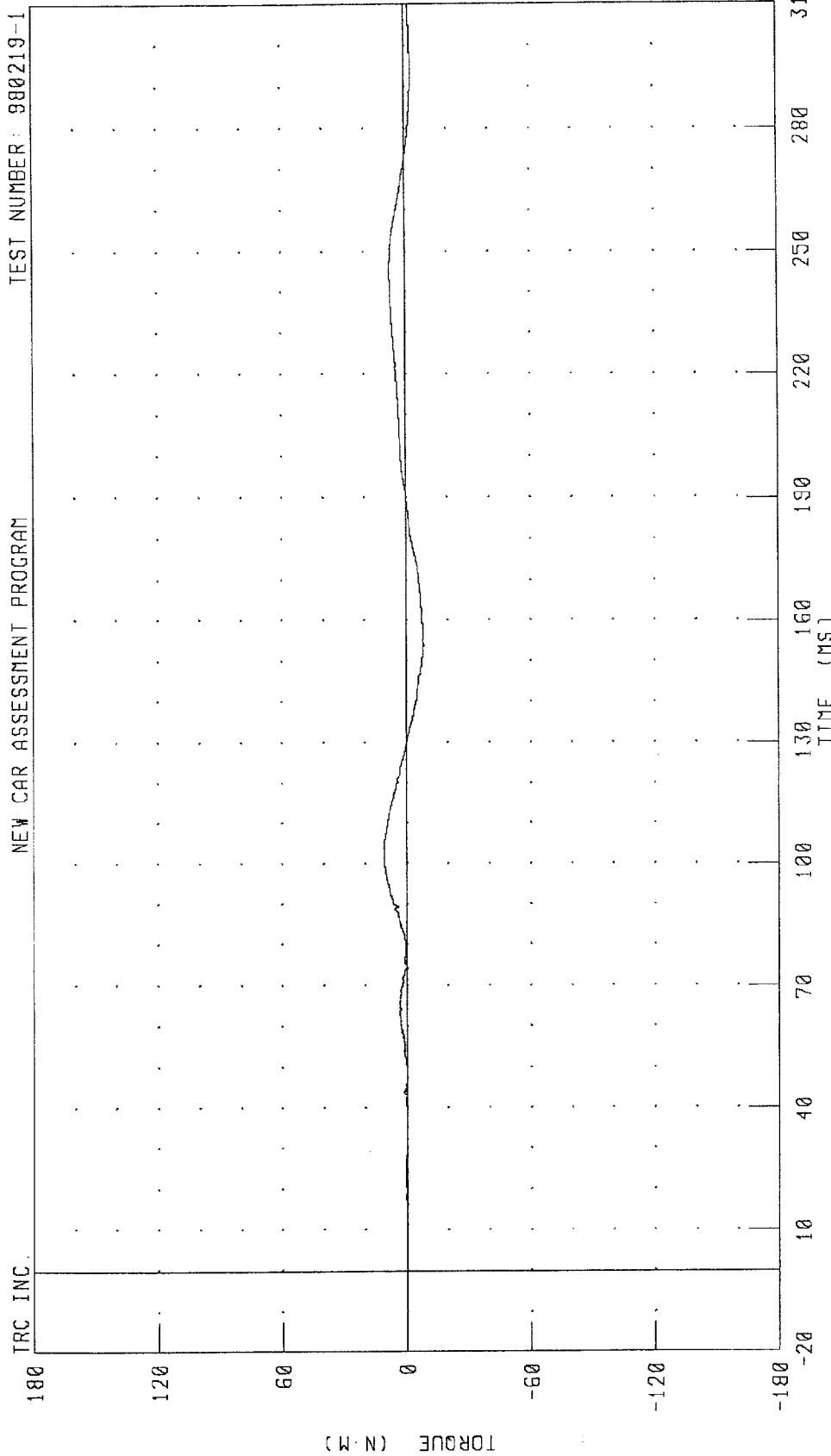
PEAK DATA: 32.81 N·M @ 129.52 MS; -30.79 N·M @ 226.56 MS

CHANNEL: NEKYM2 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER NECK MOMENT ABOUT Z AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM



CHANNEL: NEKZM2 FILTER: CH. CLASS 600

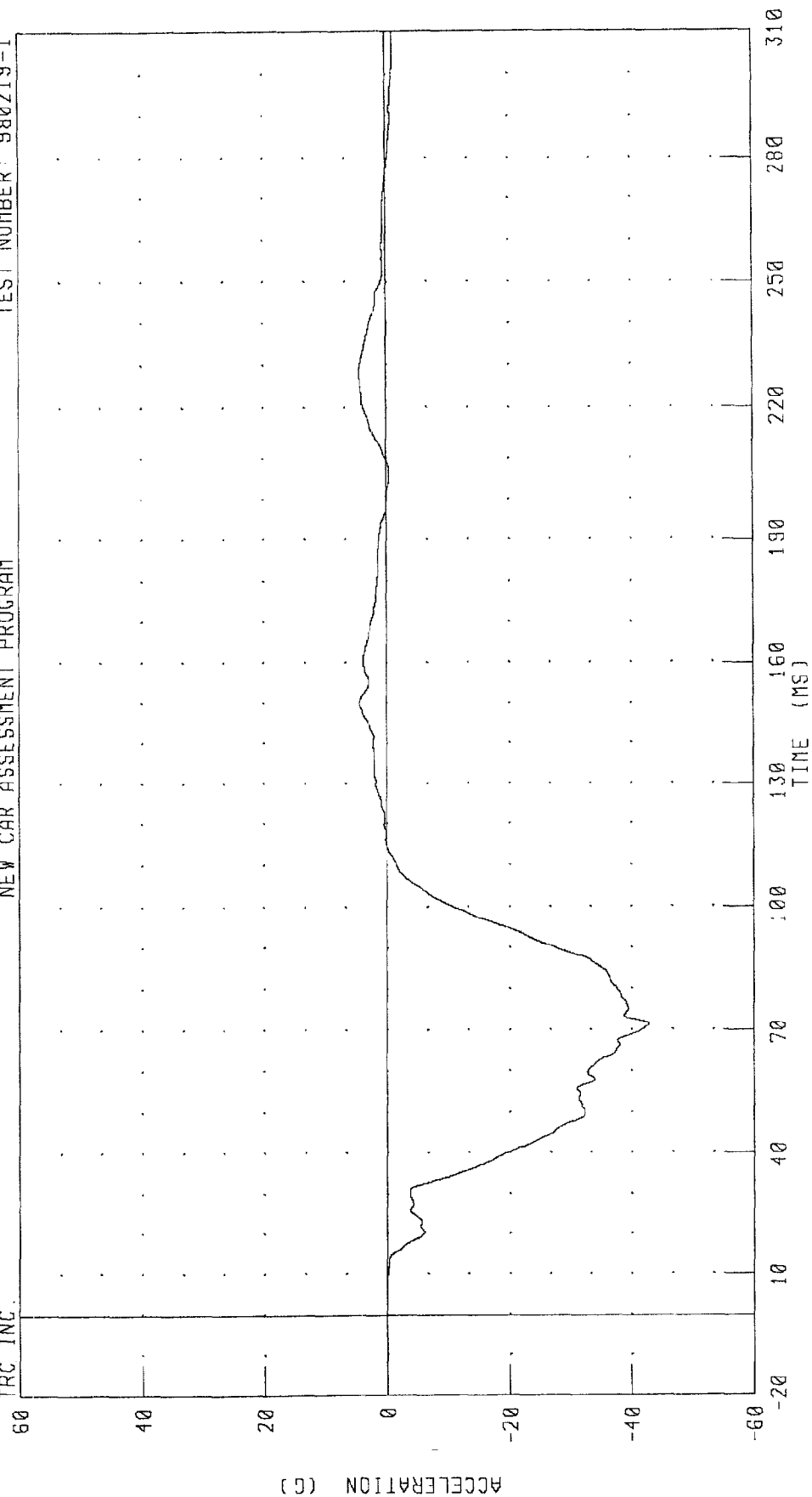
PEAK DATA: 10.95 N.M @ 102.80 MS; -8.85 N.M @ 154.16 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER CHEST X-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: CSTXC2 FILTER: CH. CLASS 180

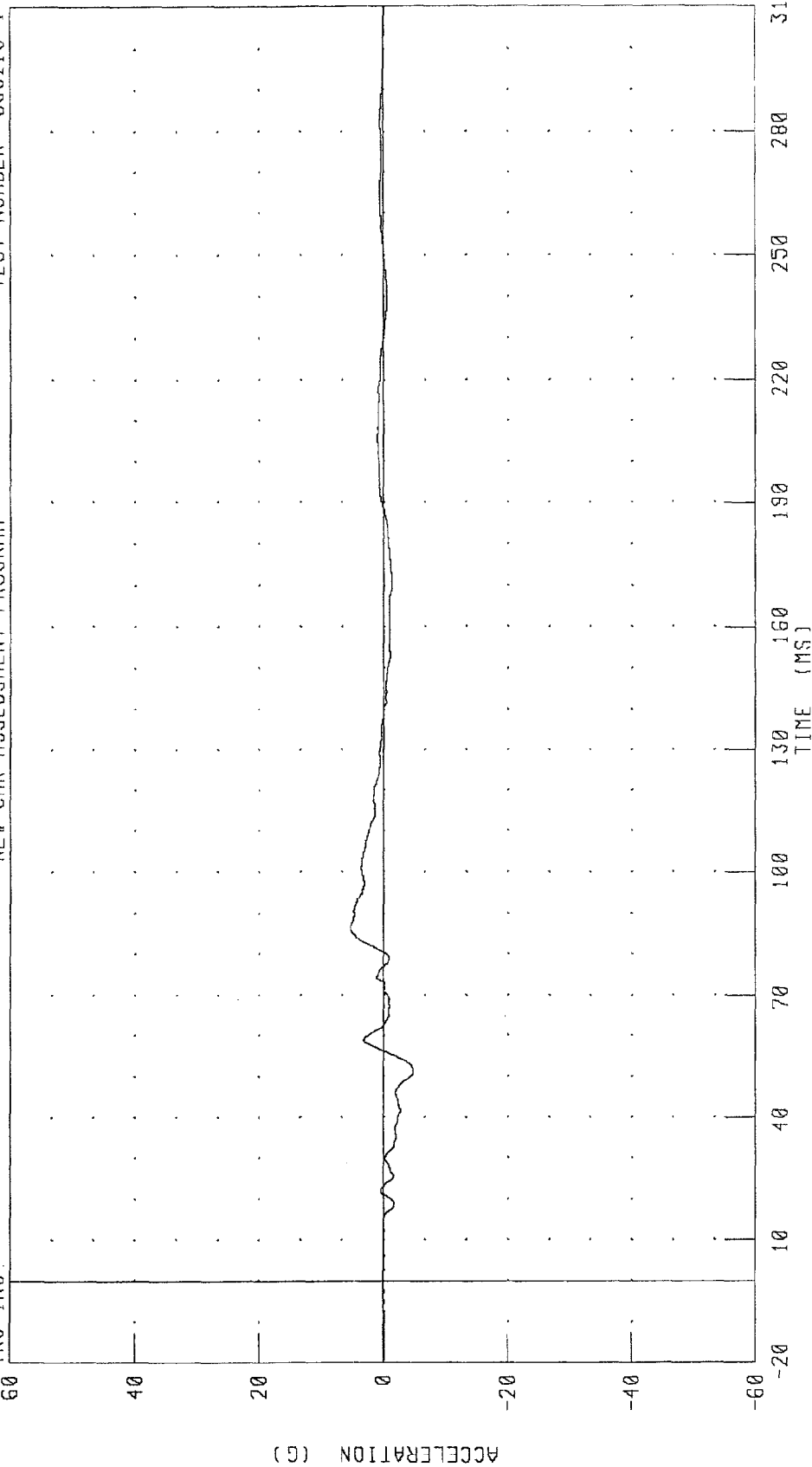
PEAK DATA: 4.44 G @ 227.92 MS; -42.88 G @ 71.52 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER CHEST Y-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: CSTYG2 FILTER: CH. CLASS 180

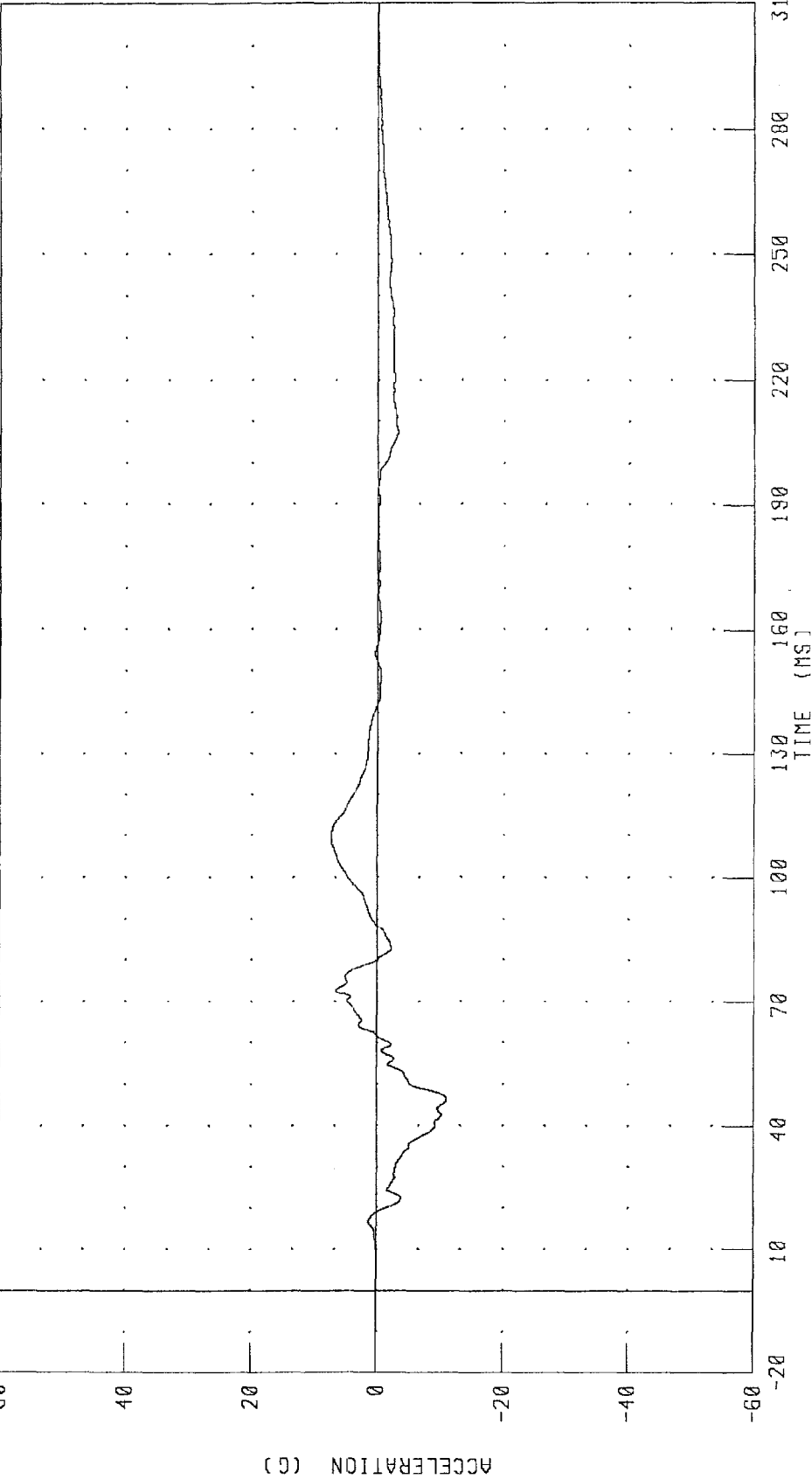
PEAK DATA: 5.23 G @ 86.48 MS; -4.81 G @ 51.12 MS

1988 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER CHEST Z-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



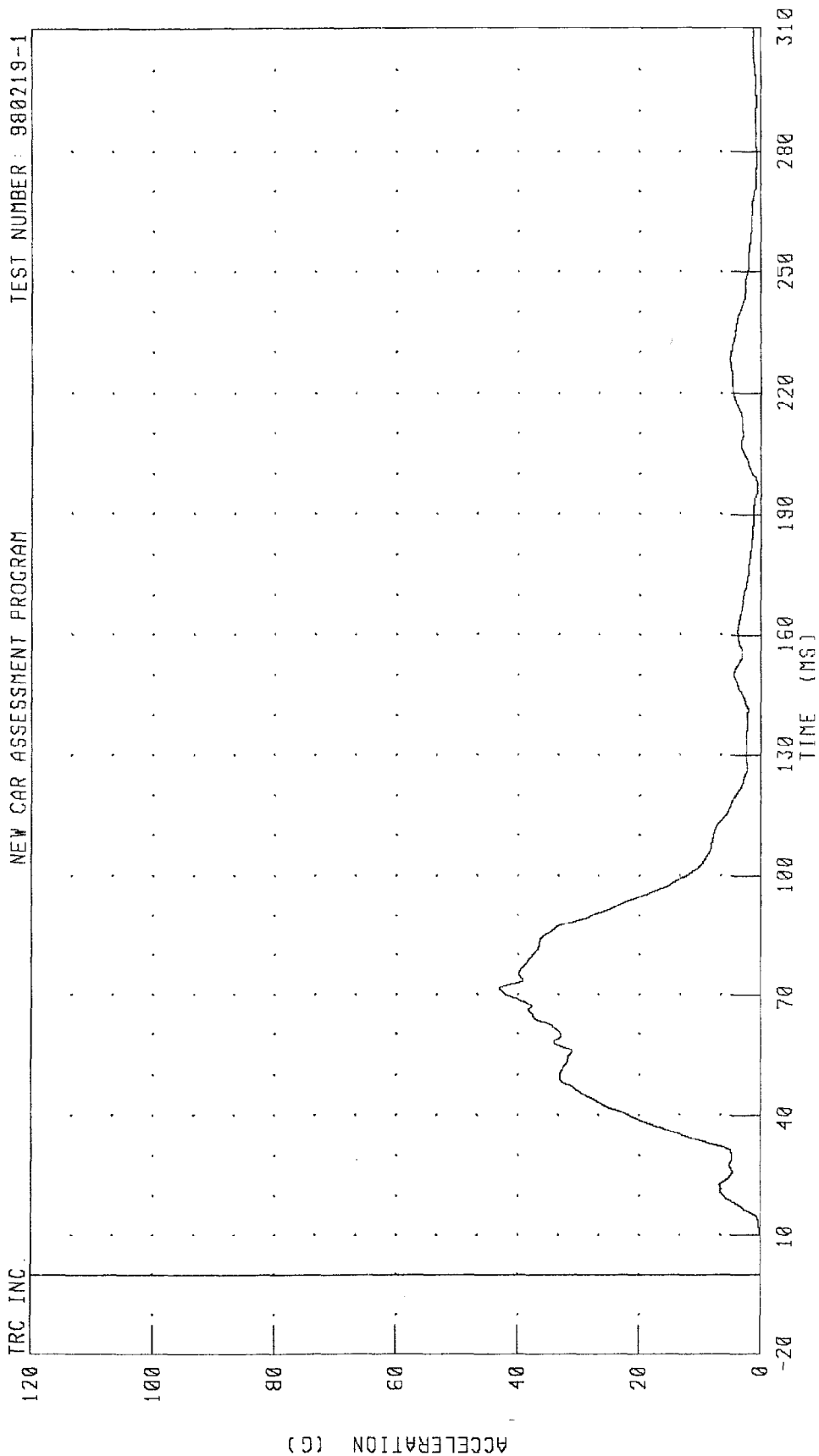
CHANNEL: CSTZC2 FILTER: CH. CLASS 180

PEAK DATA: 7.35 G @ 110.16 MS; -11.00 G @ 46.16 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER CHEST RESULTANT ACCELERATION

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



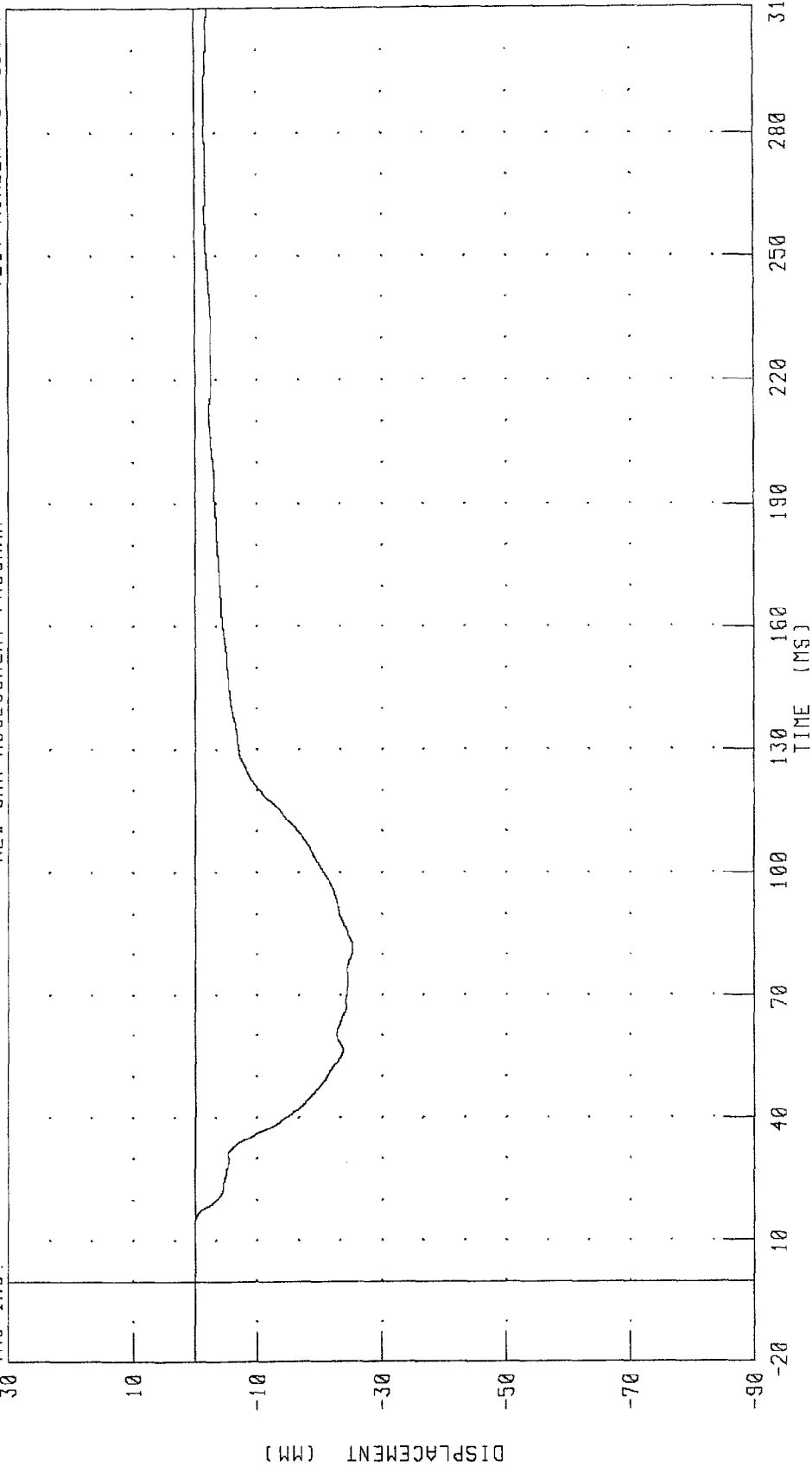
CHANNEL: CSTRG2 FILTER: CH. CLASS 180

PEAK DATA: 43.10 G @ 71.52 MS; 0.01 G @ -20.00 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER CHEST DEFLECTION
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

TRC INC.

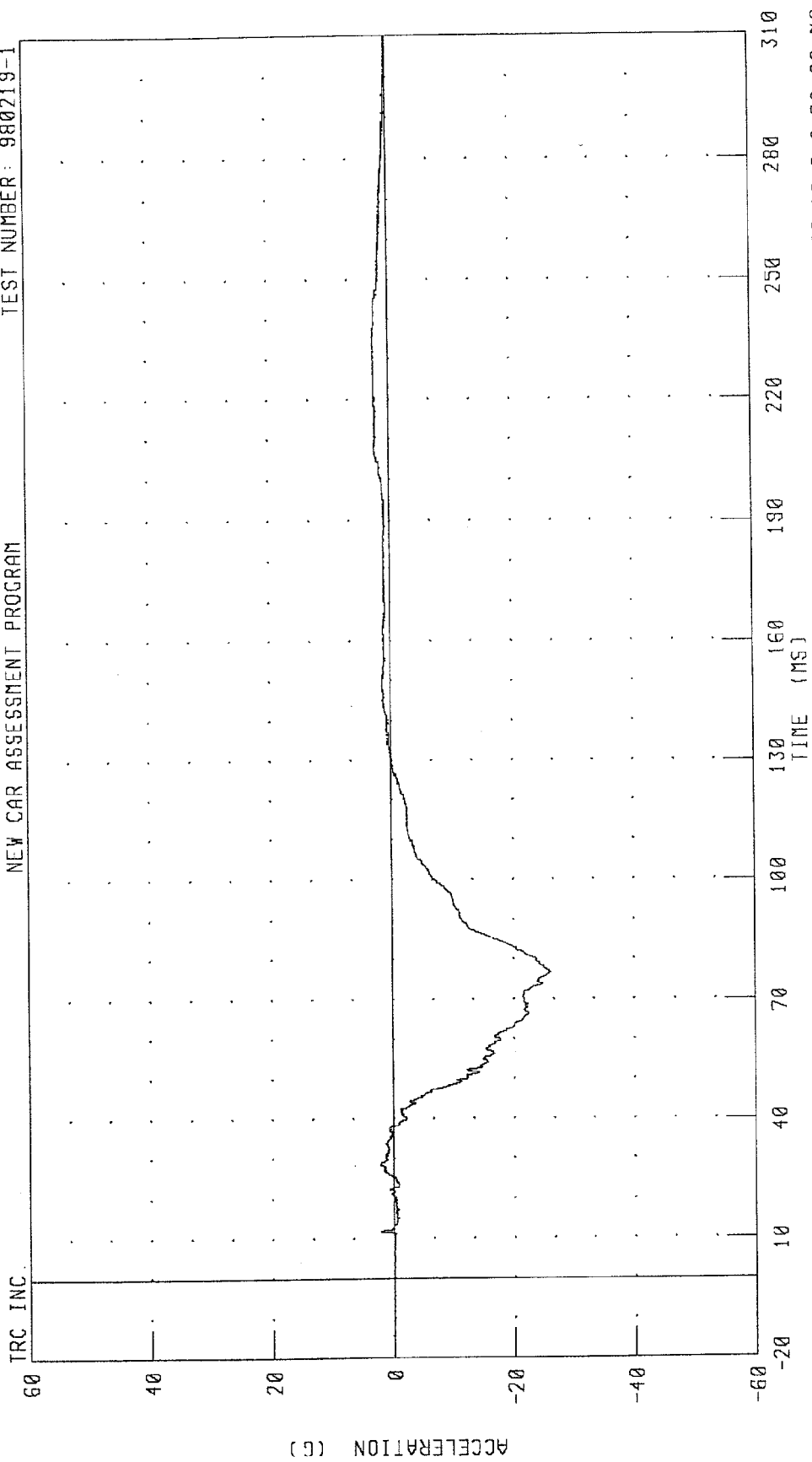


PEAK DATA: 0.01 MM @ 14.48 MS, -25.23 MM @ 82.64 MS

CHANNEL: CSTXD2 FILTER: CH. CLASS 180

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER PELVIS X-AXIS ACCELERATION
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

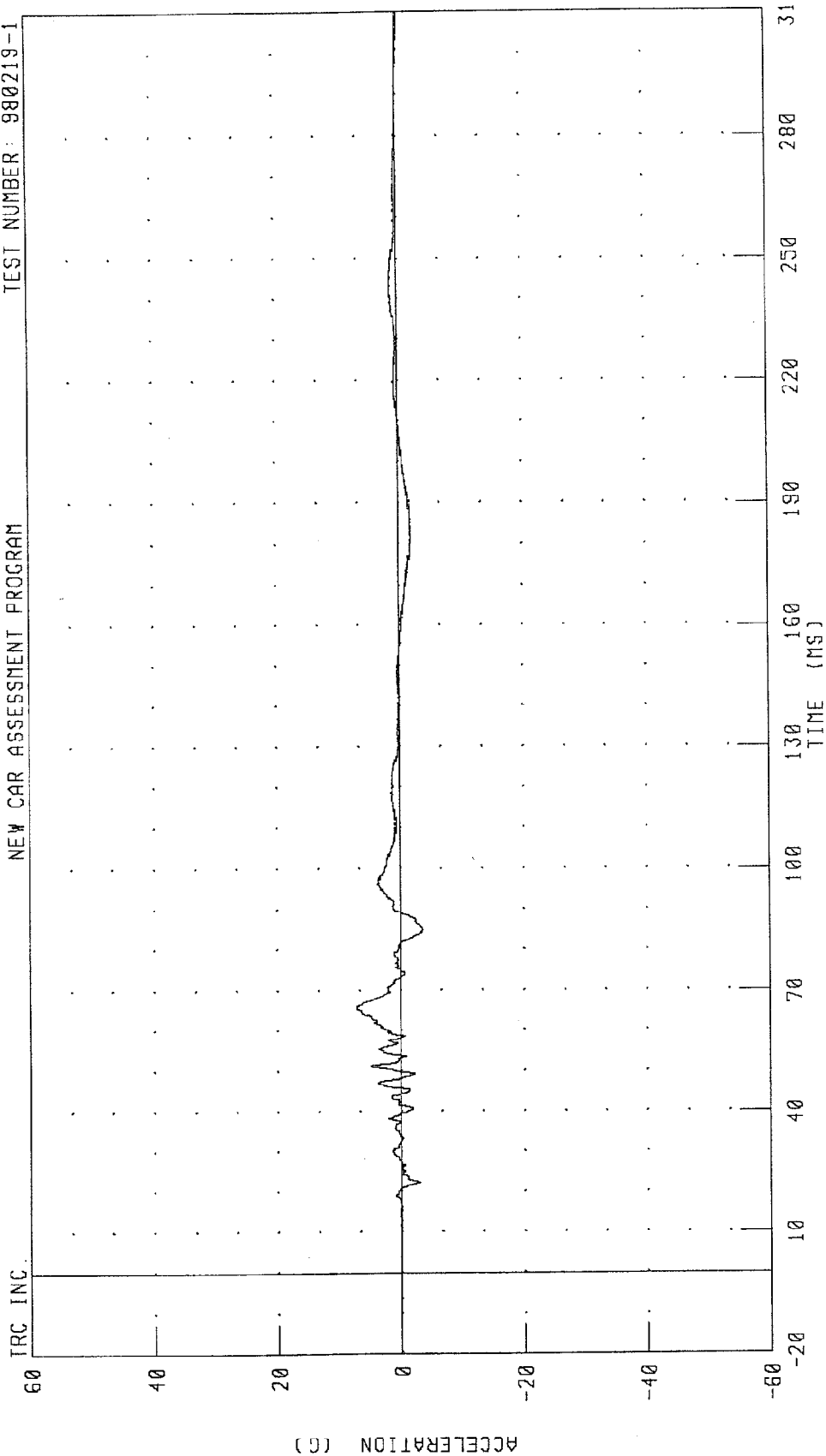


PEAK DATA: 2.56 G @ 226.24 MS; -26.18 G @ 76.80 MS

CHANNEL: PEVXG2 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER PELVIS Y-AXIS ACCELERATION
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



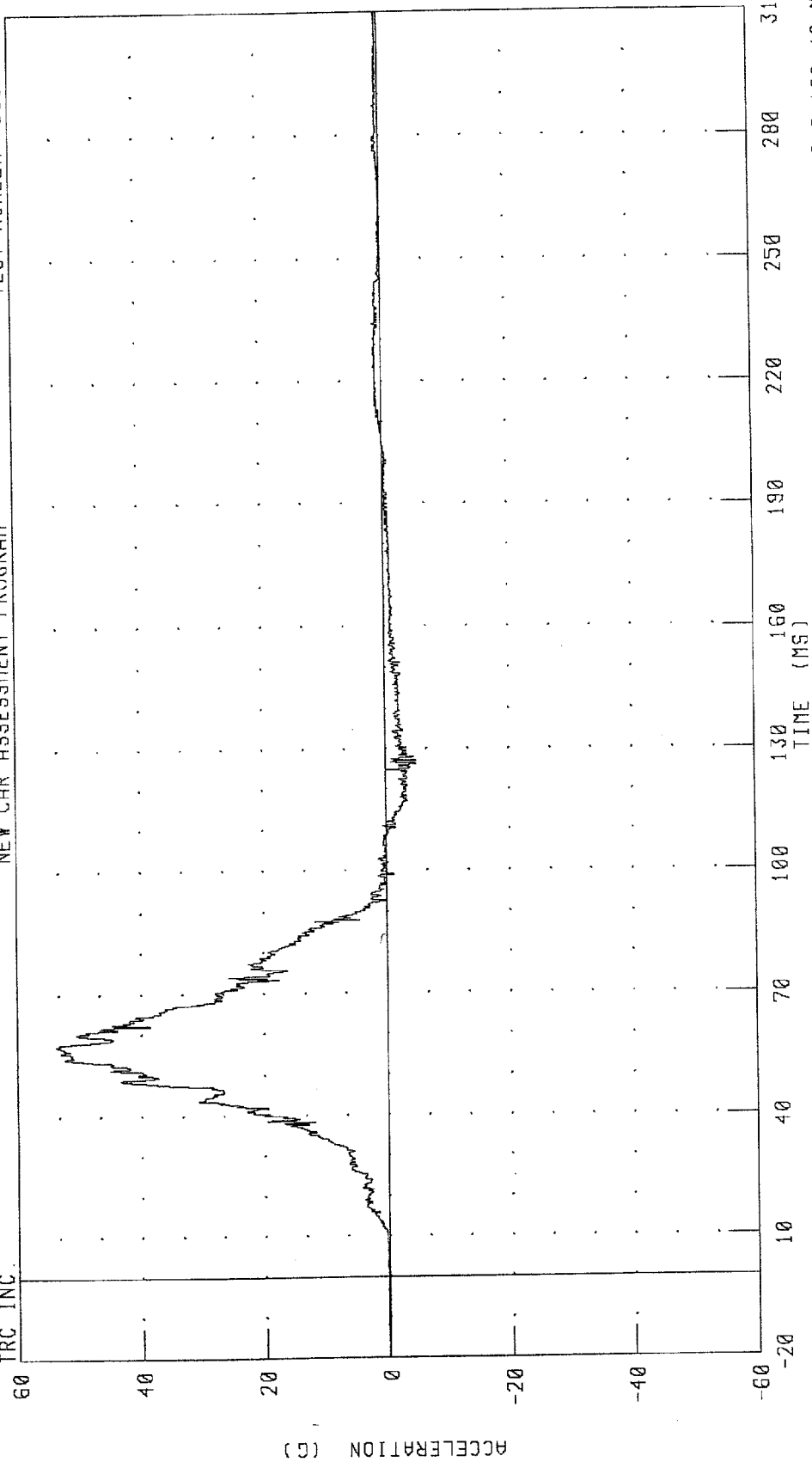
PEAK DATA: 7.11 G @ 65.44 MS; -3.76 G @ 84.88 MS

CHANNEL: PEVYG2 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER PELVIS Z-AXIS ACCELERATION
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

TRC INC.



CHANNEL: PEVZG2 FILTER: CH. CLASS 1000

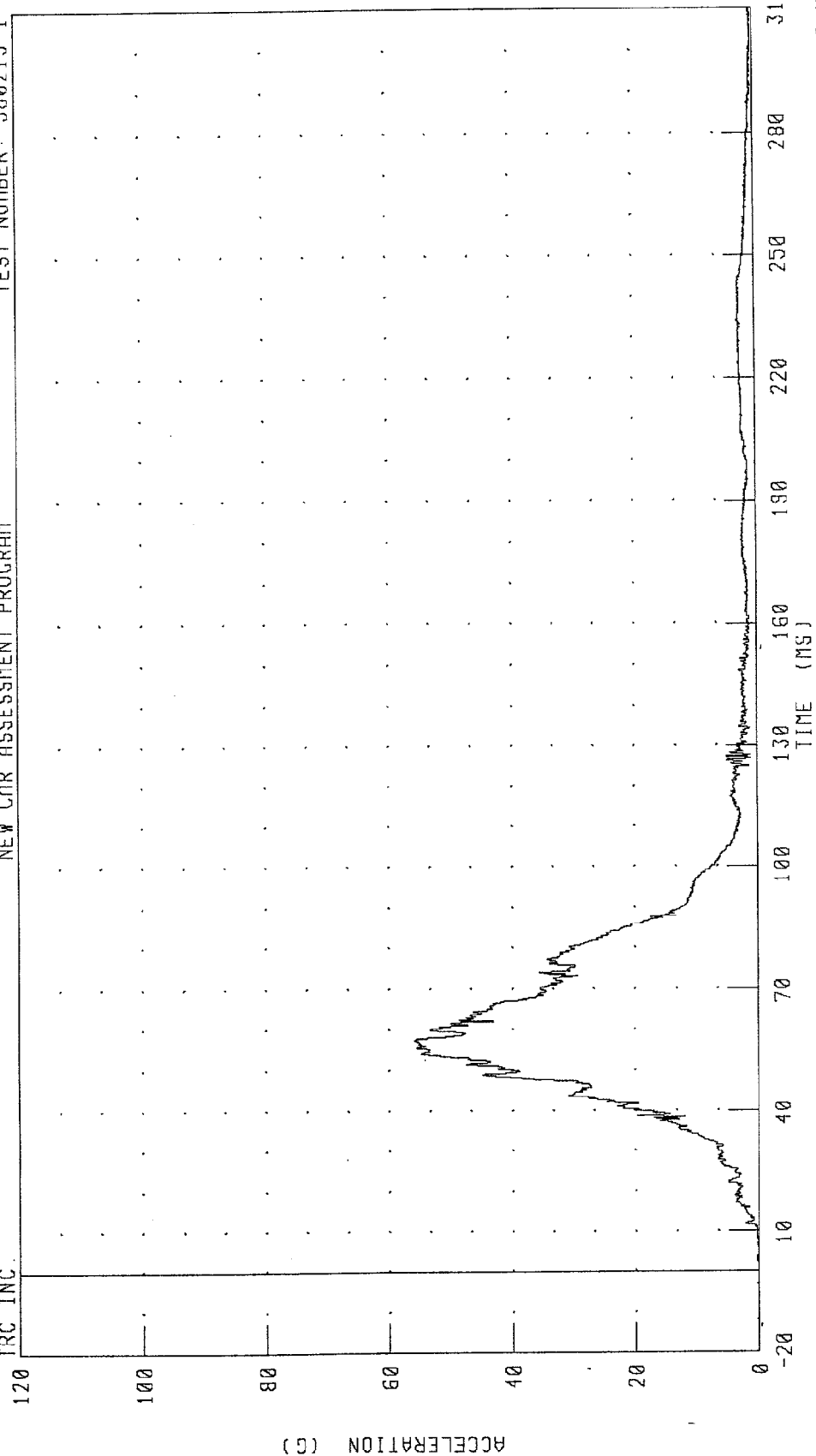
PEAK DATA: 53.71 G @ 57.20 MS; -4.89 G @ 126.40 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER PELVIS RESULTANT ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: PEVRG2 FILTER: CH. CLASS 1000

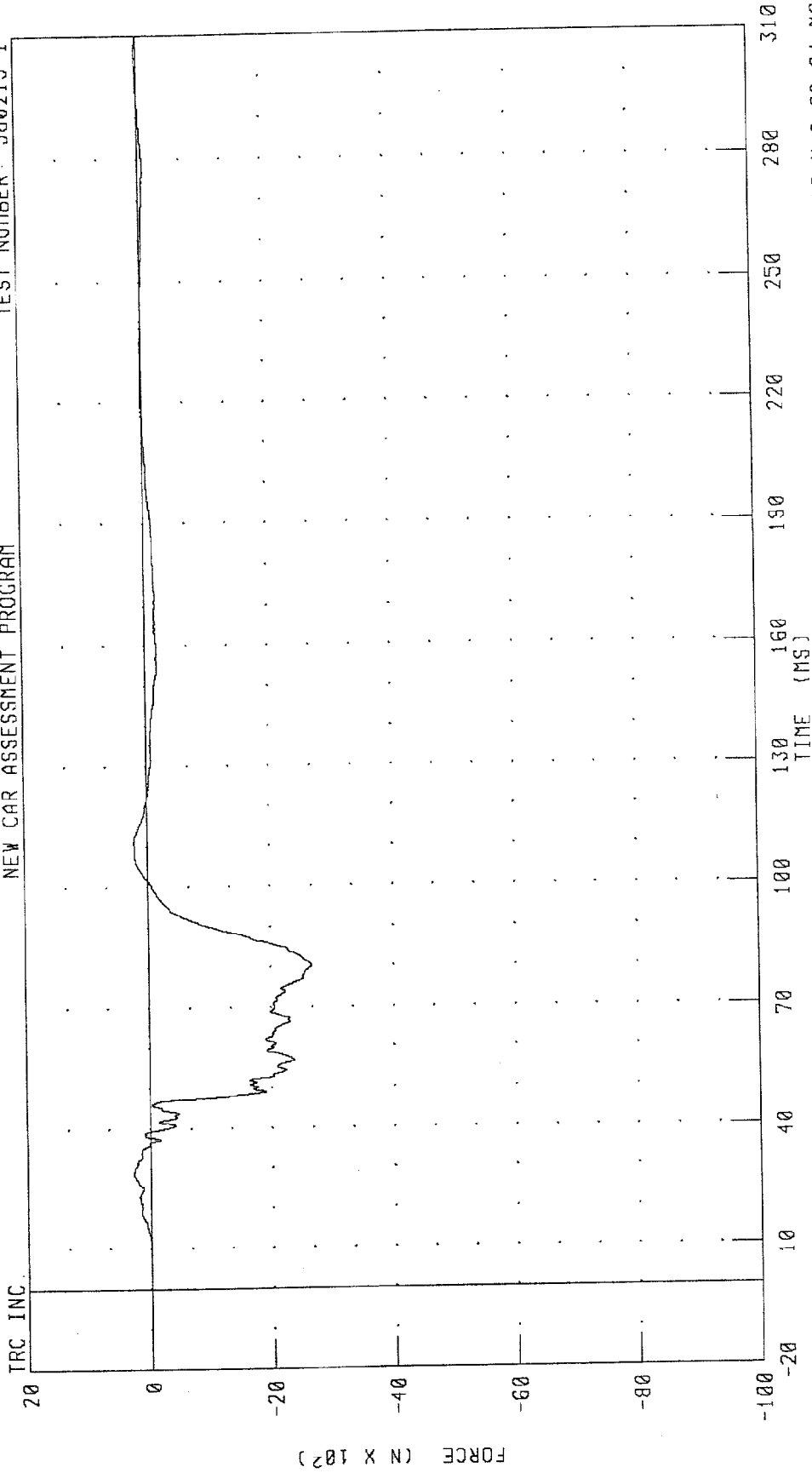
PEAK DATA: 55.91 G @ 57.28 MS; 0.02 G @ -20.00 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

PASSENGER LEFT FEMUR FORCE

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



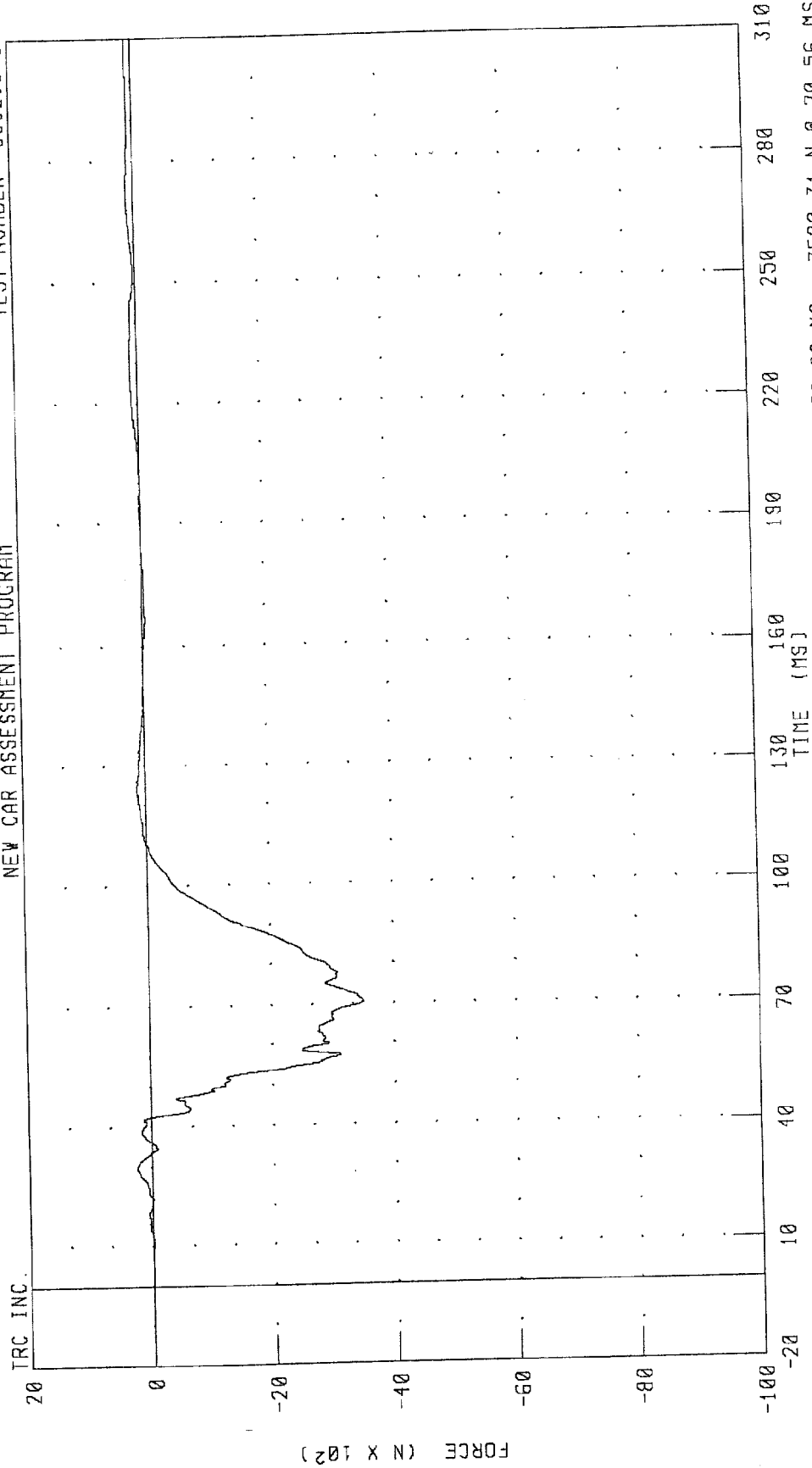
CHANNEL: LFMF2 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

PASSENGER RIGHT FEMUR FORCE

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

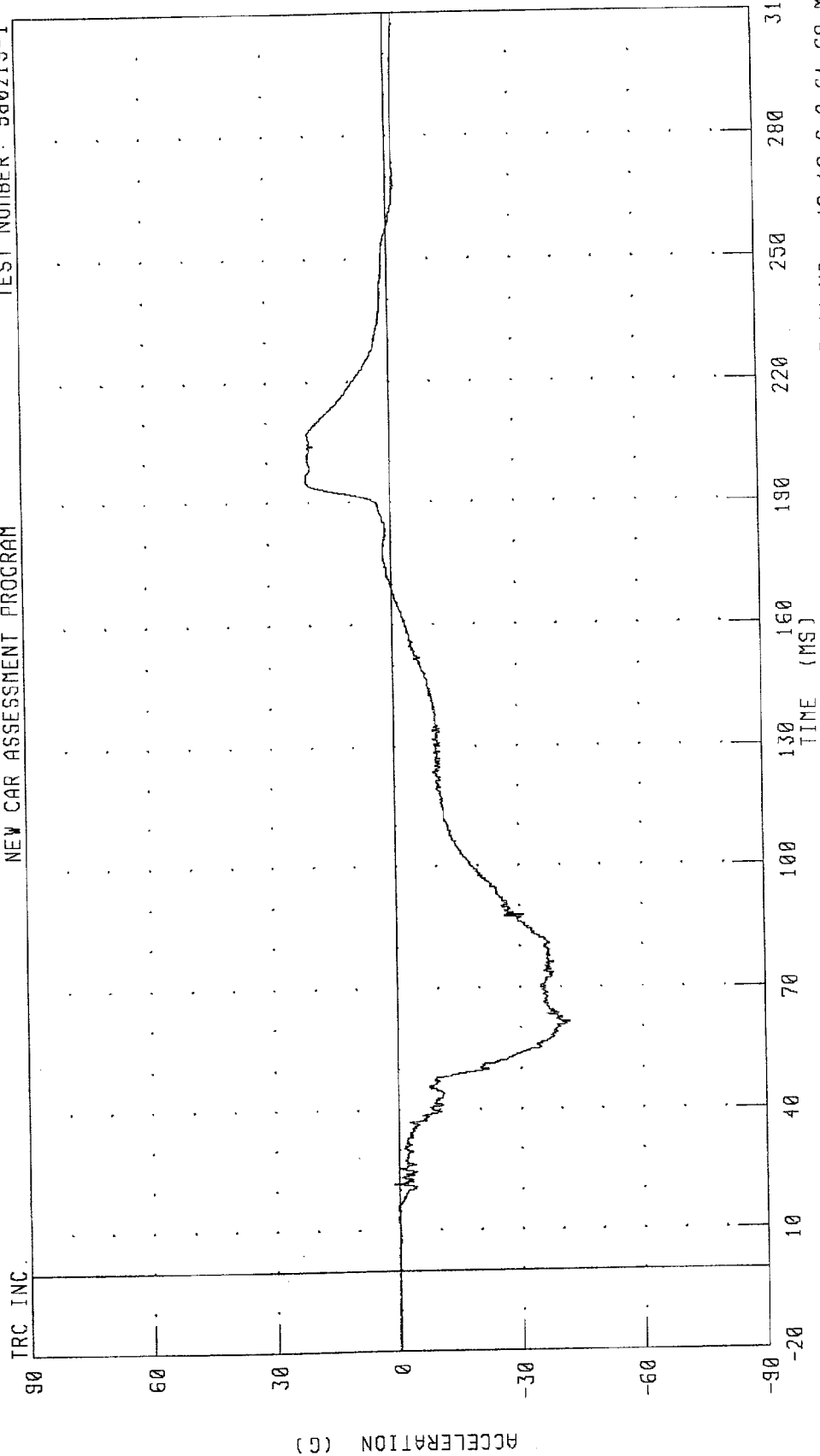


CHANNEL: RFMF2 FILTER: CH CLASS 600

PEAK DATA: 239.04 N @ 29.28 MS; -3500.31 N @ 70.56 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER HEAD X-AXIS ACCELERATION - REDUNDANT
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

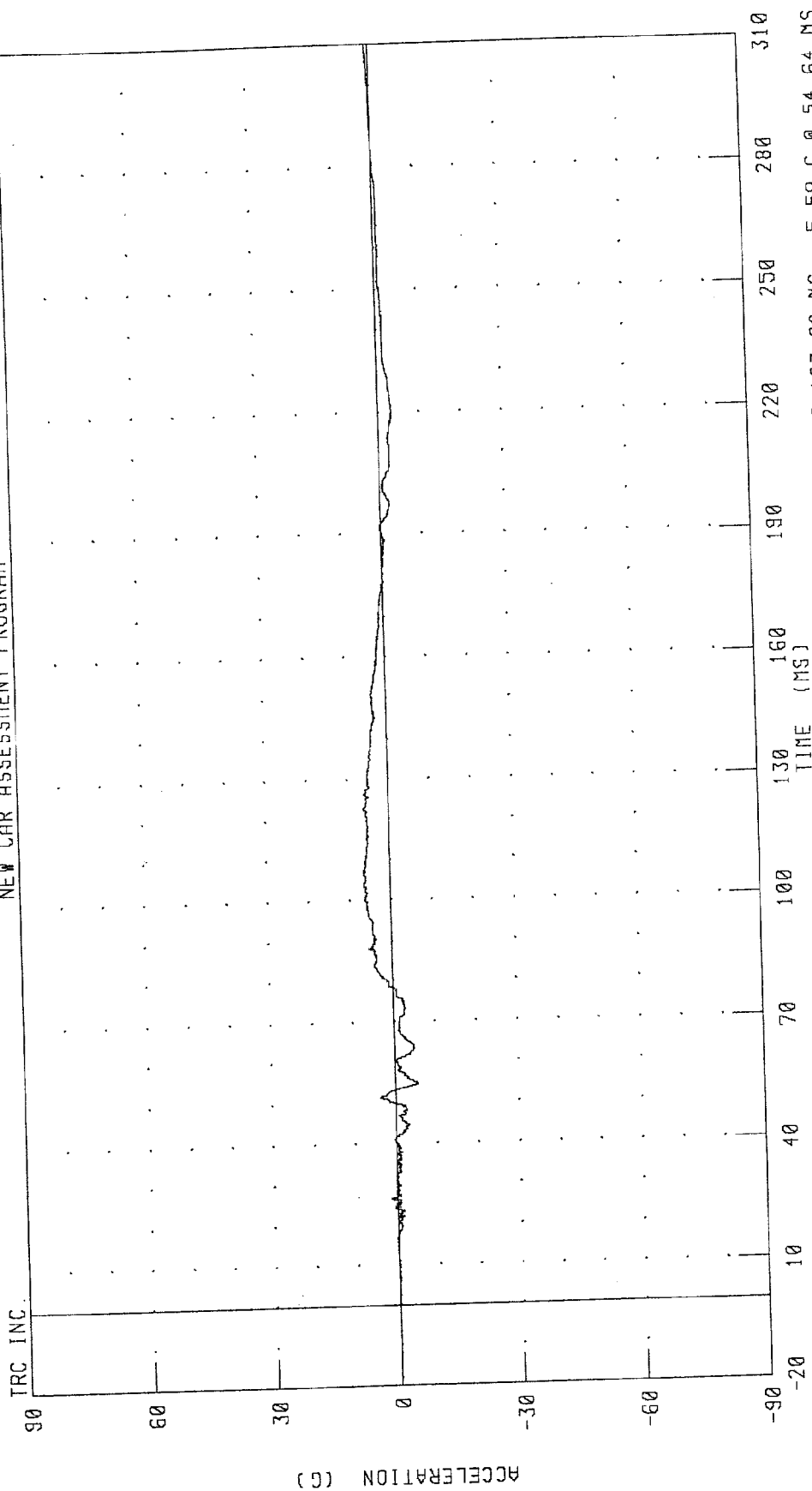


PEAK DATA: 20.86 G @ 195.44 MS; -42.18 G @ 61.68 MS

CHANNEL: HEDXR2 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER HEAD Y-AXIS ACCELERATION - REDUNDANT
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

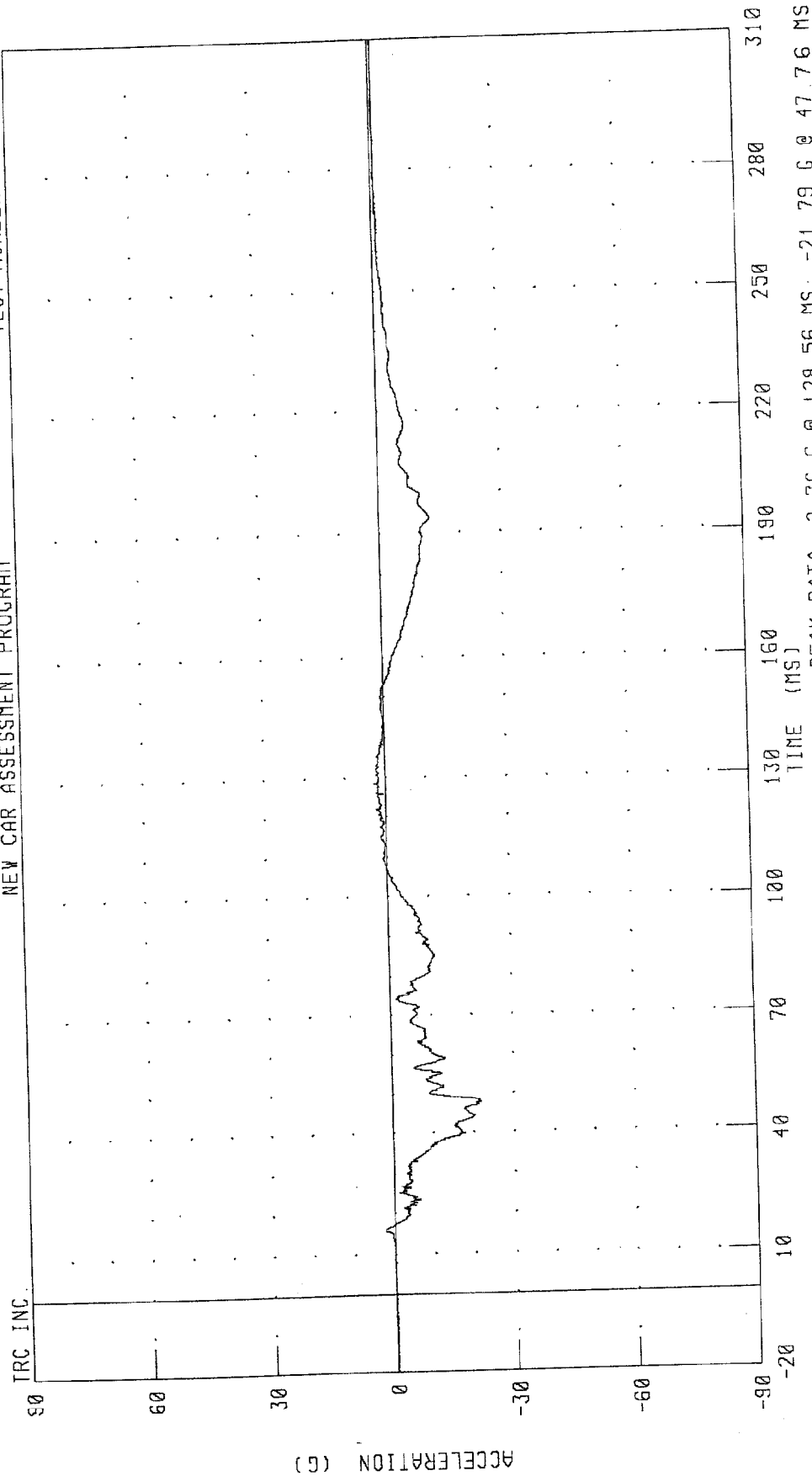


PEAK DATA: 6.48 G @ 103.60 MS; -5.58 G @ 54.64 MS

CHANNEL: HEDYR2 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER HEAD Z-AXIS ACCELERATION - REDUNDANT
NEW CAR ASSESSMENT PROGRAM

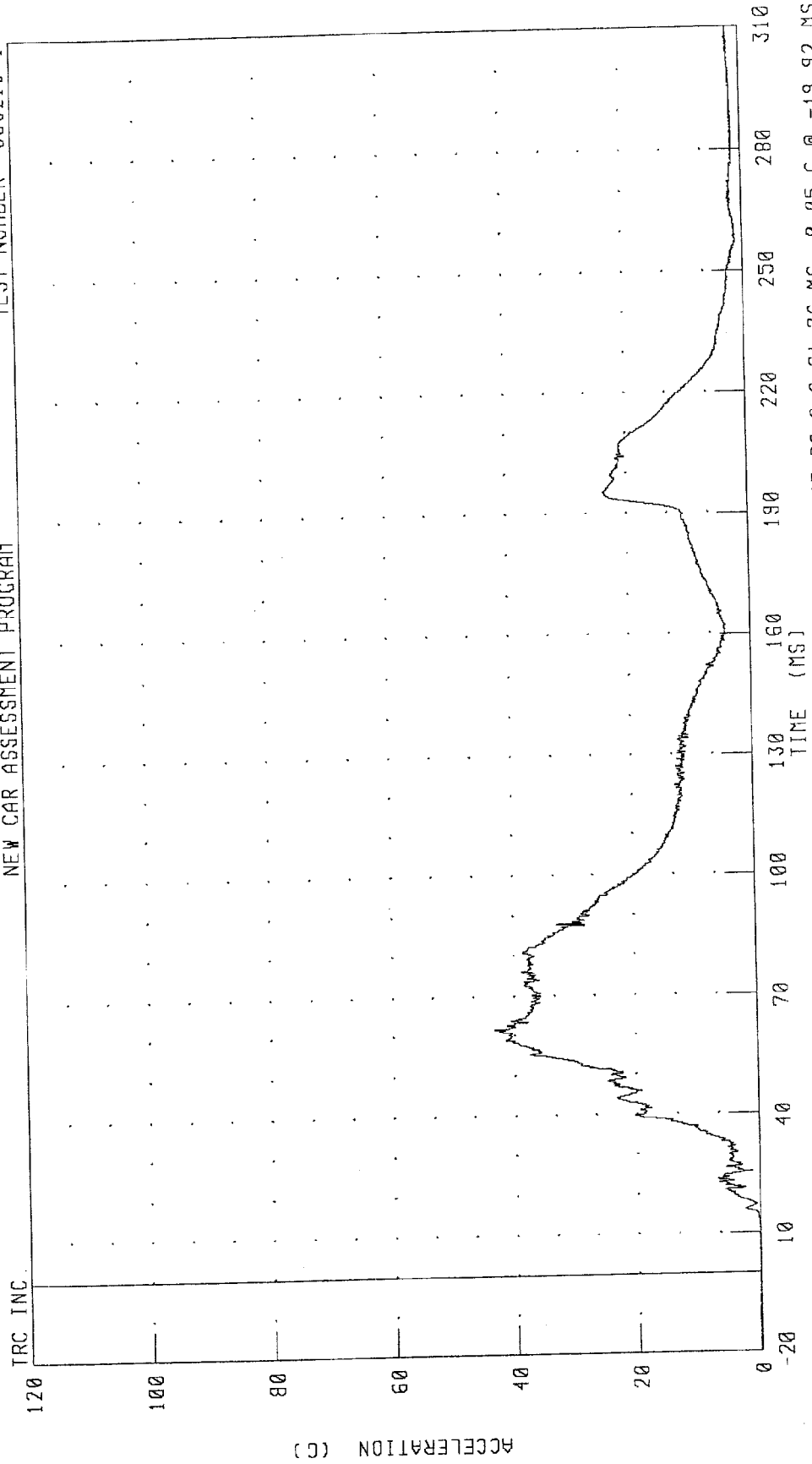
TEST NUMBER: 980219-1



CHANNEL: HEDZR2 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER HEAD RESULTANT ACCELERATION - REDUNDANT
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



CHANNEL: HEDRR2 FILTER: CH. CLASS 1000

PEAK DATA: 43.22 G @ 61.76 MS, 0.05 G @ -19.92 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER CHEST X-AXIS ACCELERATION - REDUNDANT

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

60

40

20

0

-20

-40

-60

ACCELERATION (G)

TIME (MS)

310

280

250

220

190

160

130

100

70

40

10

CHANNEL: CSTXR2 FILTER: CH. CLASS 180

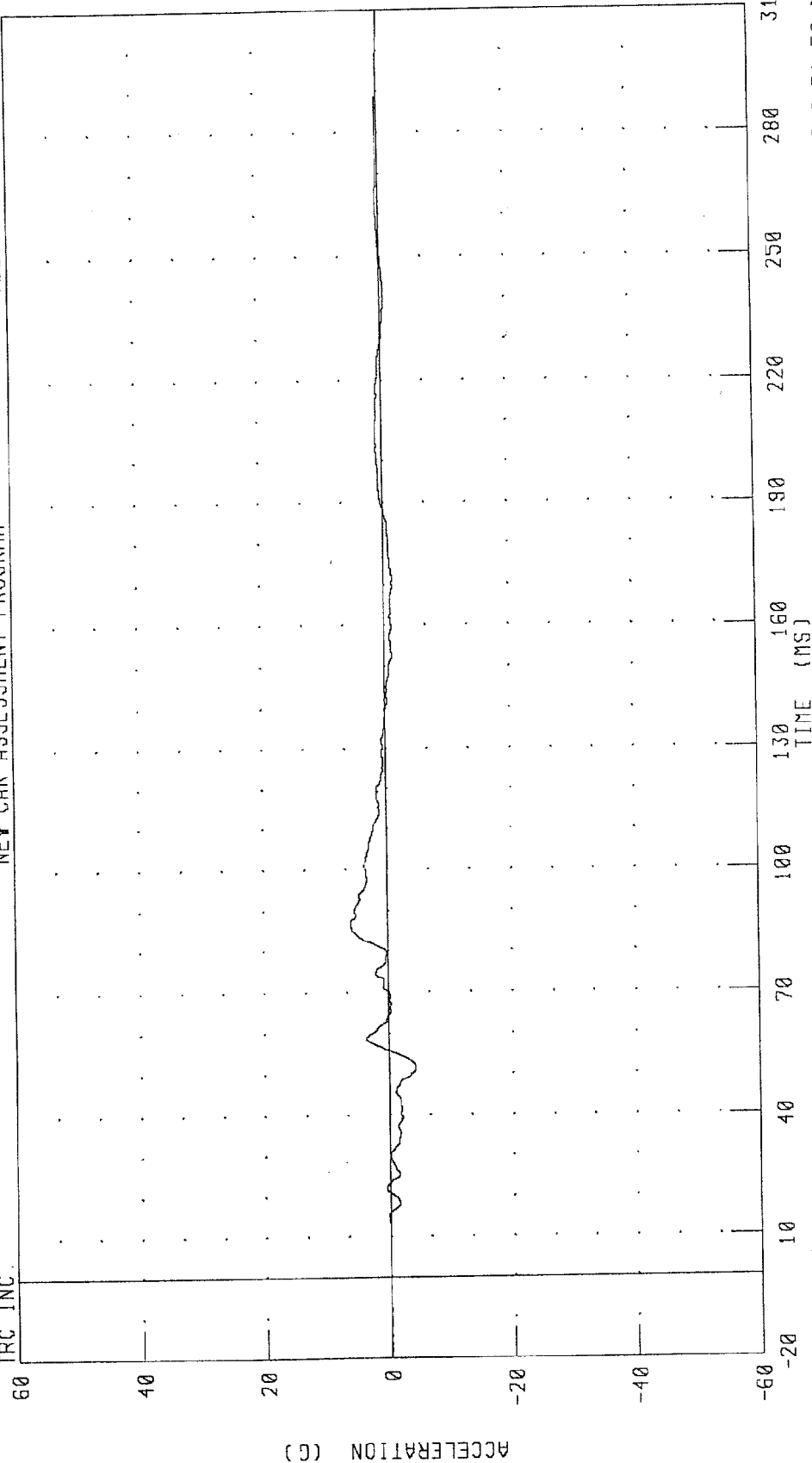
PEAK DATA: 4.41 G @ 227.84 MS; -42.39 G @ 71.52 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER CHEST Y-AXIS ACCELERATION - REDUNDANT

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



PEAK DATA: 6.00 G @ 87.12 MS; -4.29 G @ 51.52 MS

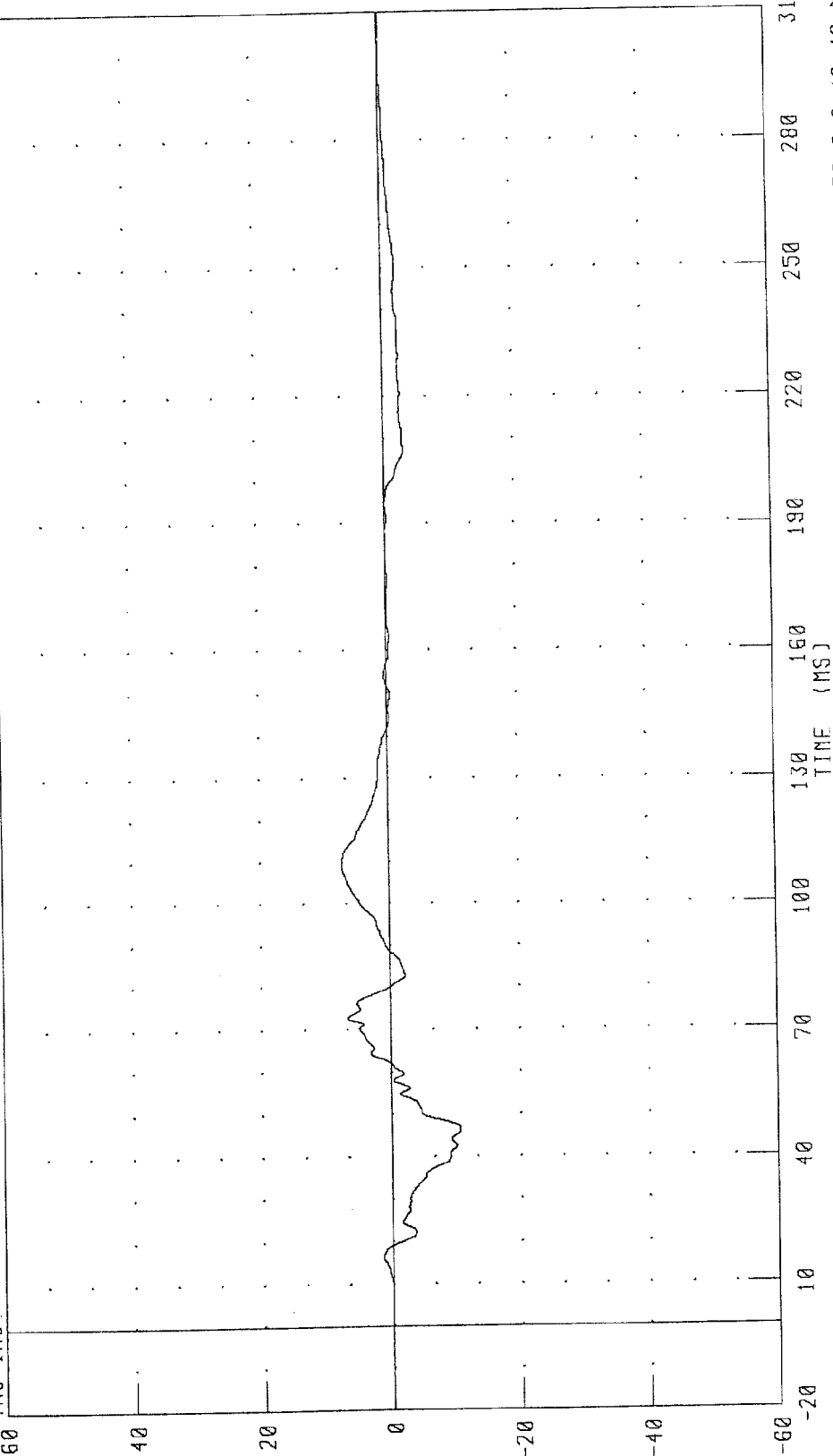
CHANNEL: CSTYR2 FILTER: CH. CLASS 180

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER CHEST Z-AXIS ACCELERATION - REDUNDANT

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

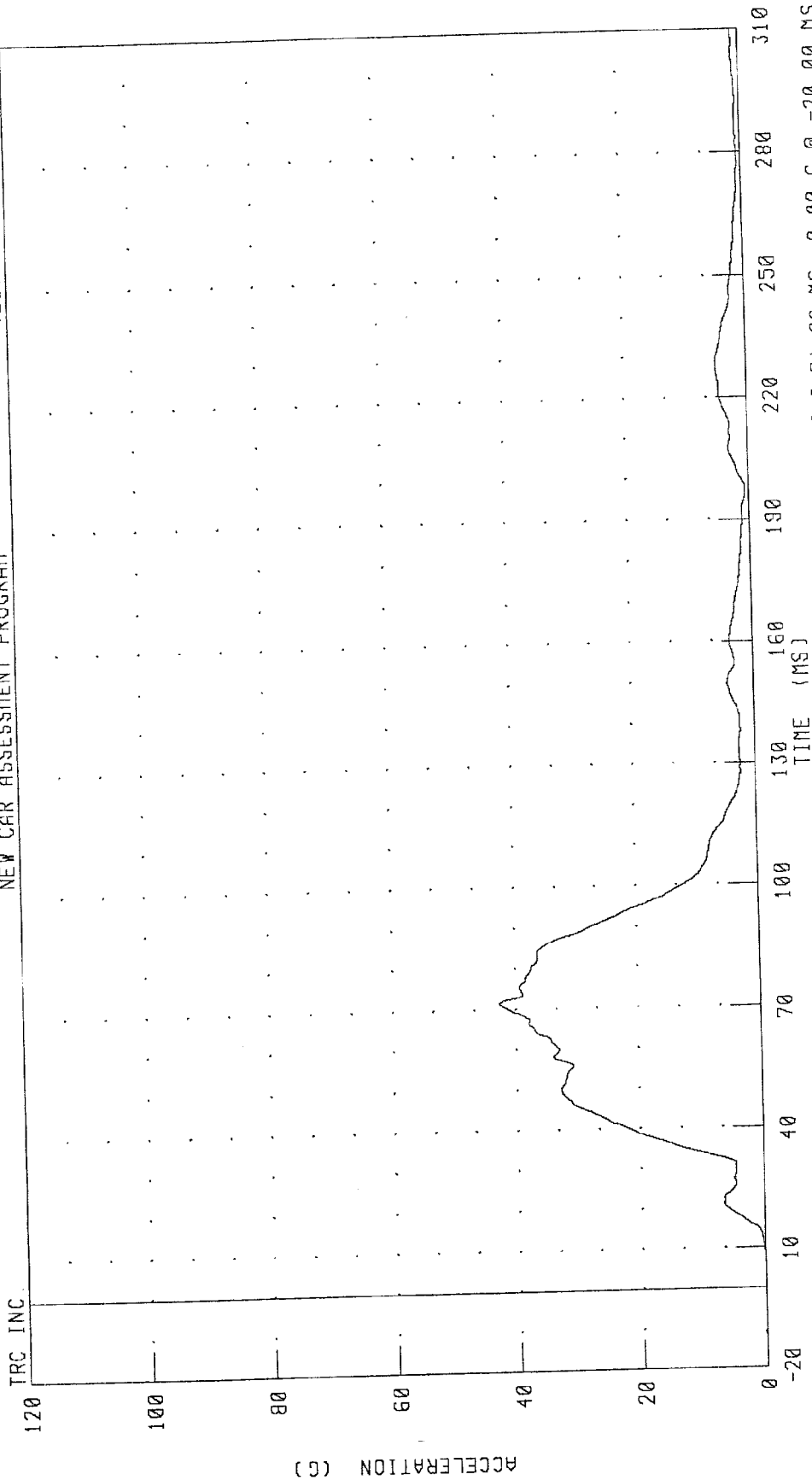


PEAK DATA: 7.34 G @ 108.96 MS; -10.72 G @ 46.40 MS

CHANNEL: CSTZR2 FILTER: CH. CLASS 180

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER CHEST RESULTANT ACCELERATION - REDUNDANT
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



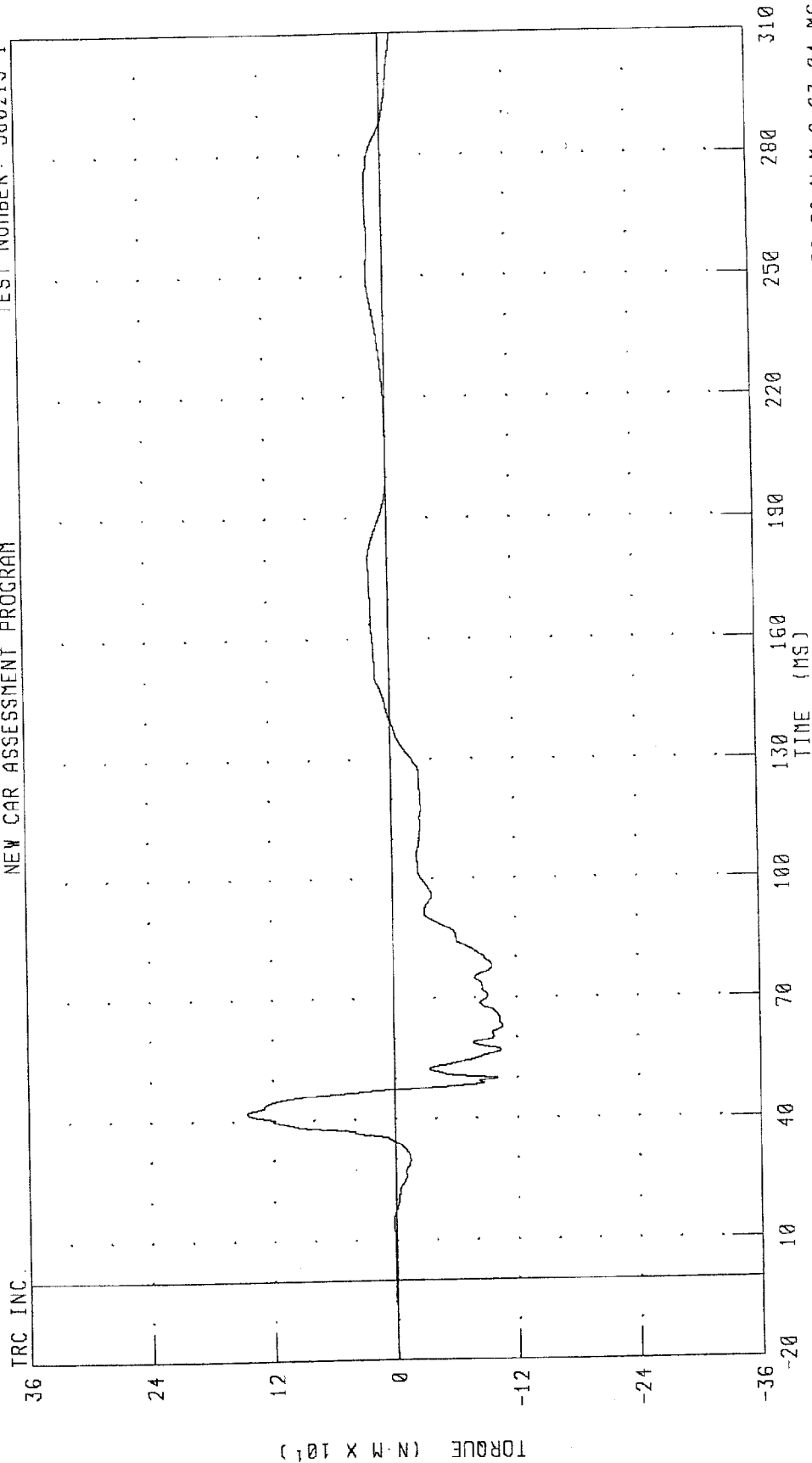
CHANNEL: CSTRR2 FILTER: CH. CLASS 180

PEAK DATA: 42.63 G @ 71.60 MS; 0.00 G @ -20.00 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER LEFT UPPER TIBIA MOMENT ABOUT X AXIS

TEST NUMBER: 980219-1

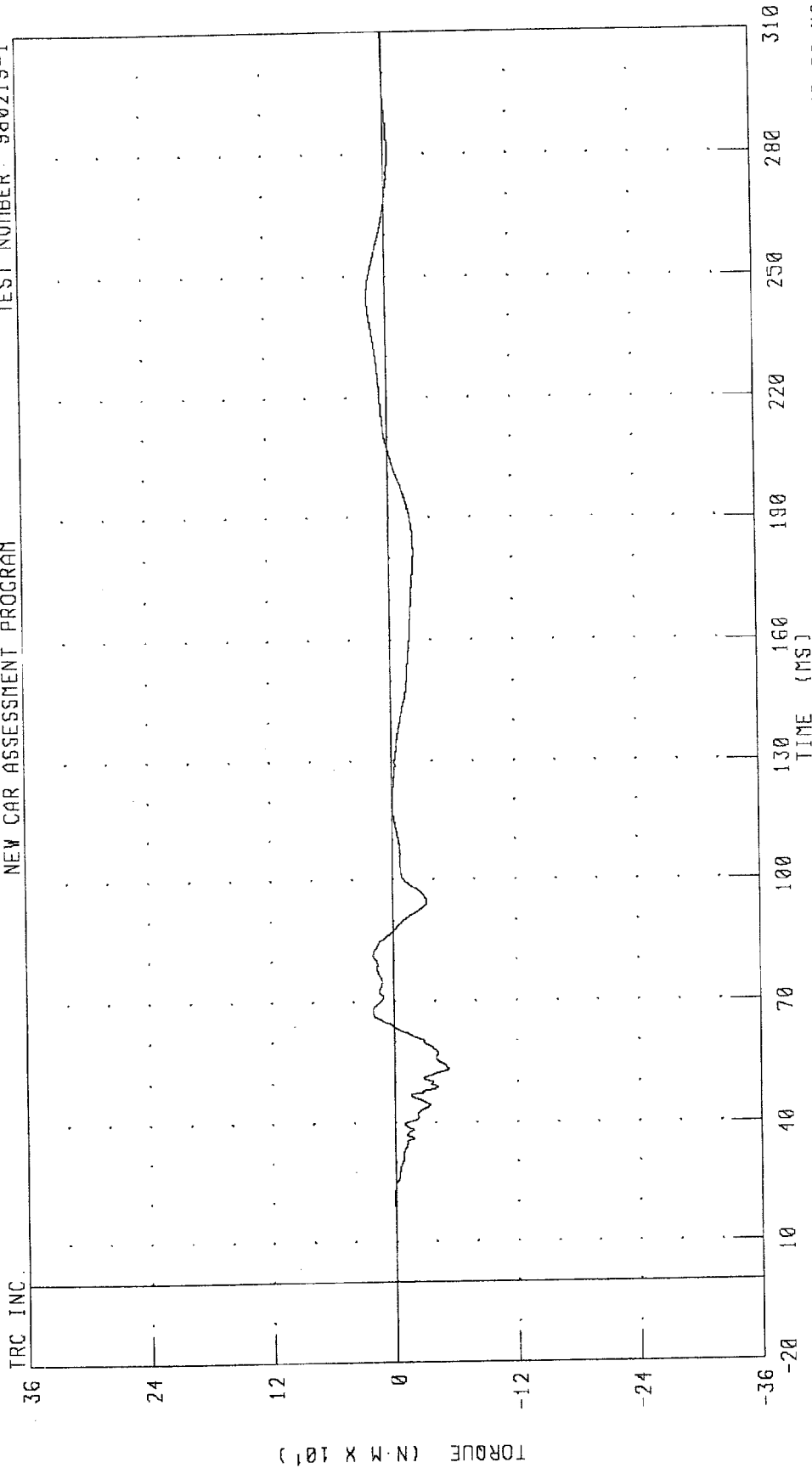
NEW CAR ASSESSMENT PROGRAM



CHANNEL: TBLXM2 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 PASSENGER LEFT UPPER TIBIA MOMENT ABOUT Y AXIS
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



PEAK DATA: 20.65 N-M @ 67.36 MS, -53.21 N-M @ 53.28 MS

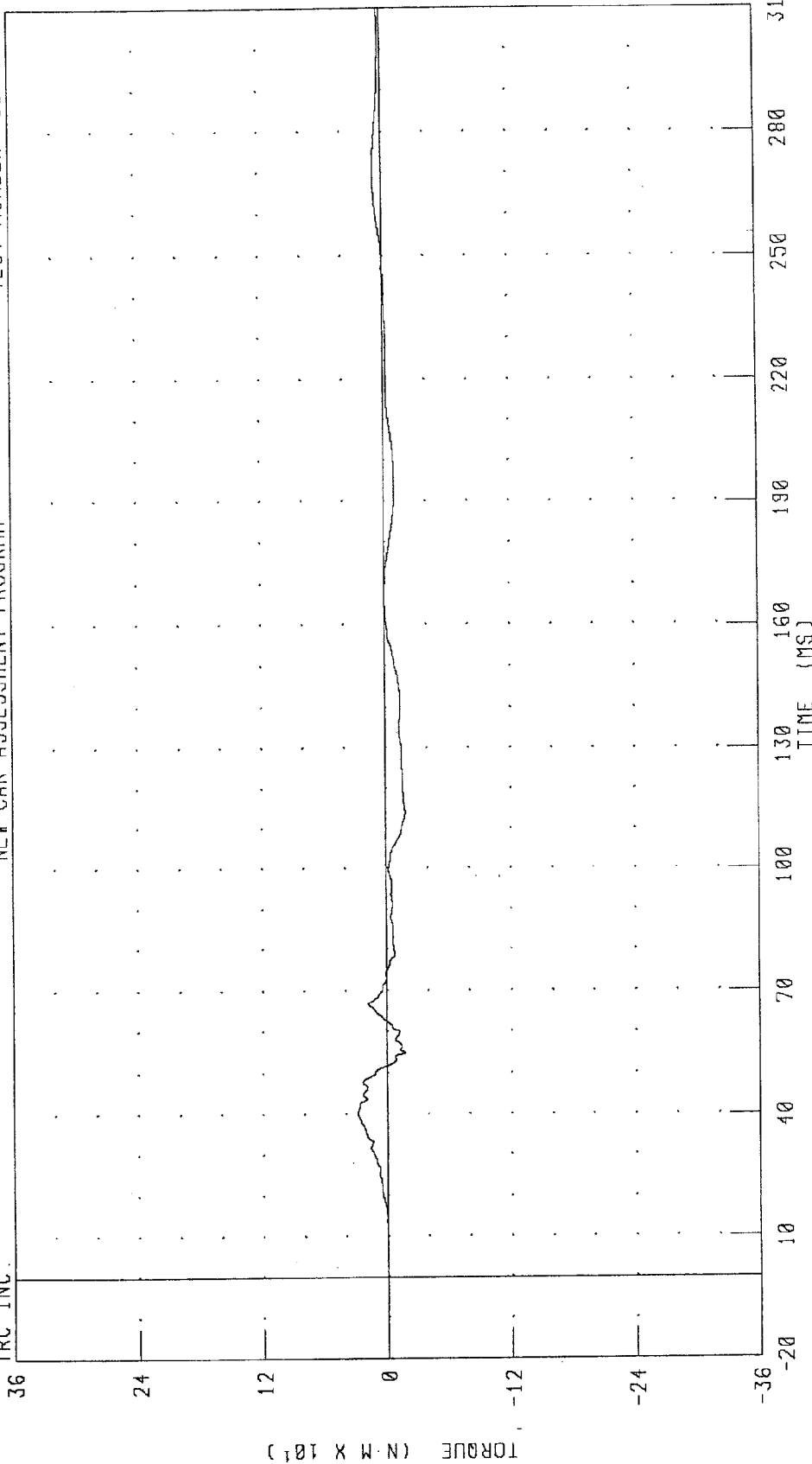
CHANNEL: TBLYM2 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER RIGHT UPPER TIBIA MOMENT ABOUT X AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



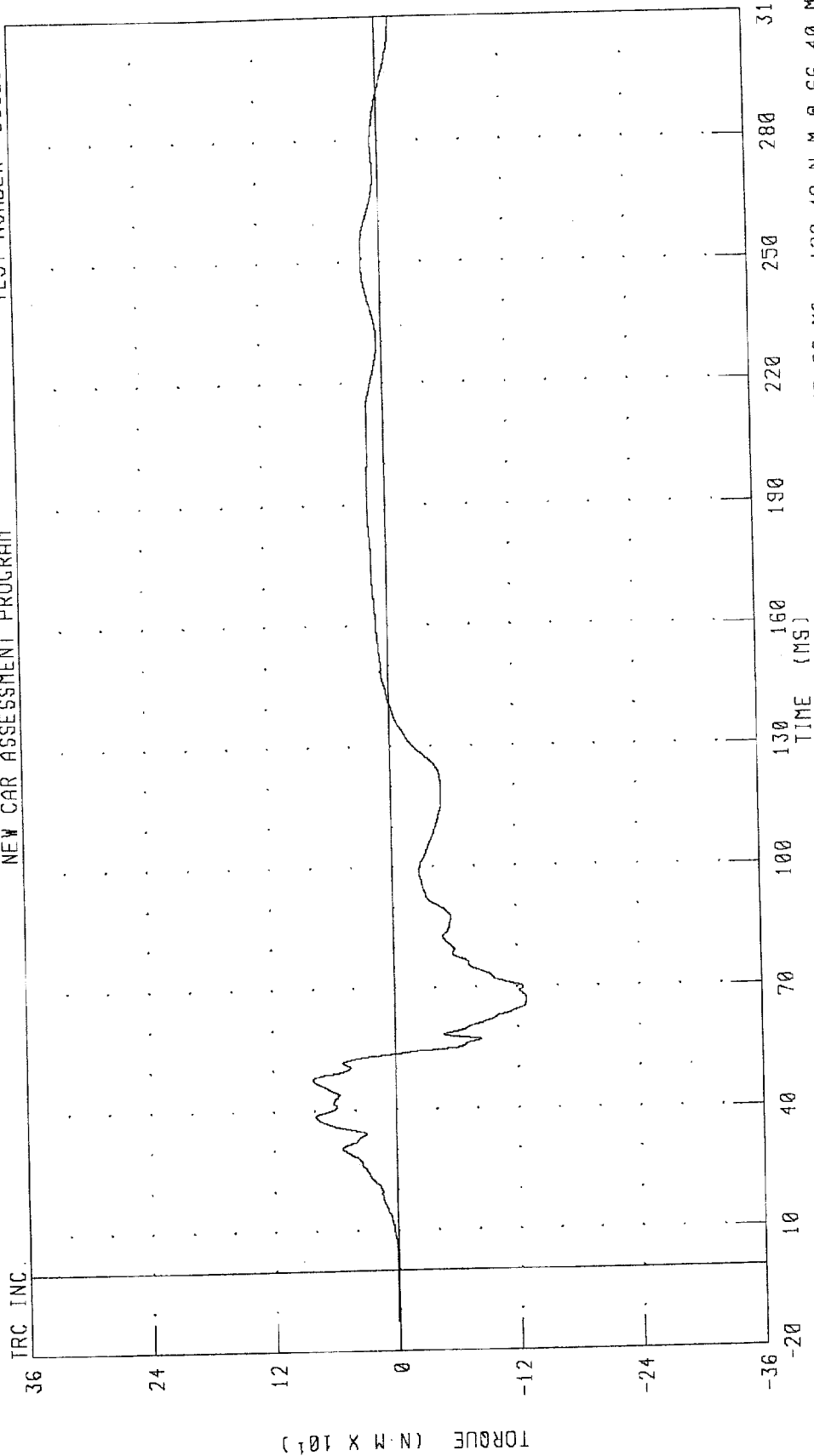
CHANNEL: TBRXM2 FILTER: CH. CLASS 600

PEAK DATA: 28.21 N·m @ 40.32 MS, -18.94 N·m @ 114.00 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER RIGHT UPPER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM



PEAK DATA: 81.84 N-M @ 47.60 MS; -129.48 N-M @ 66.40 MS

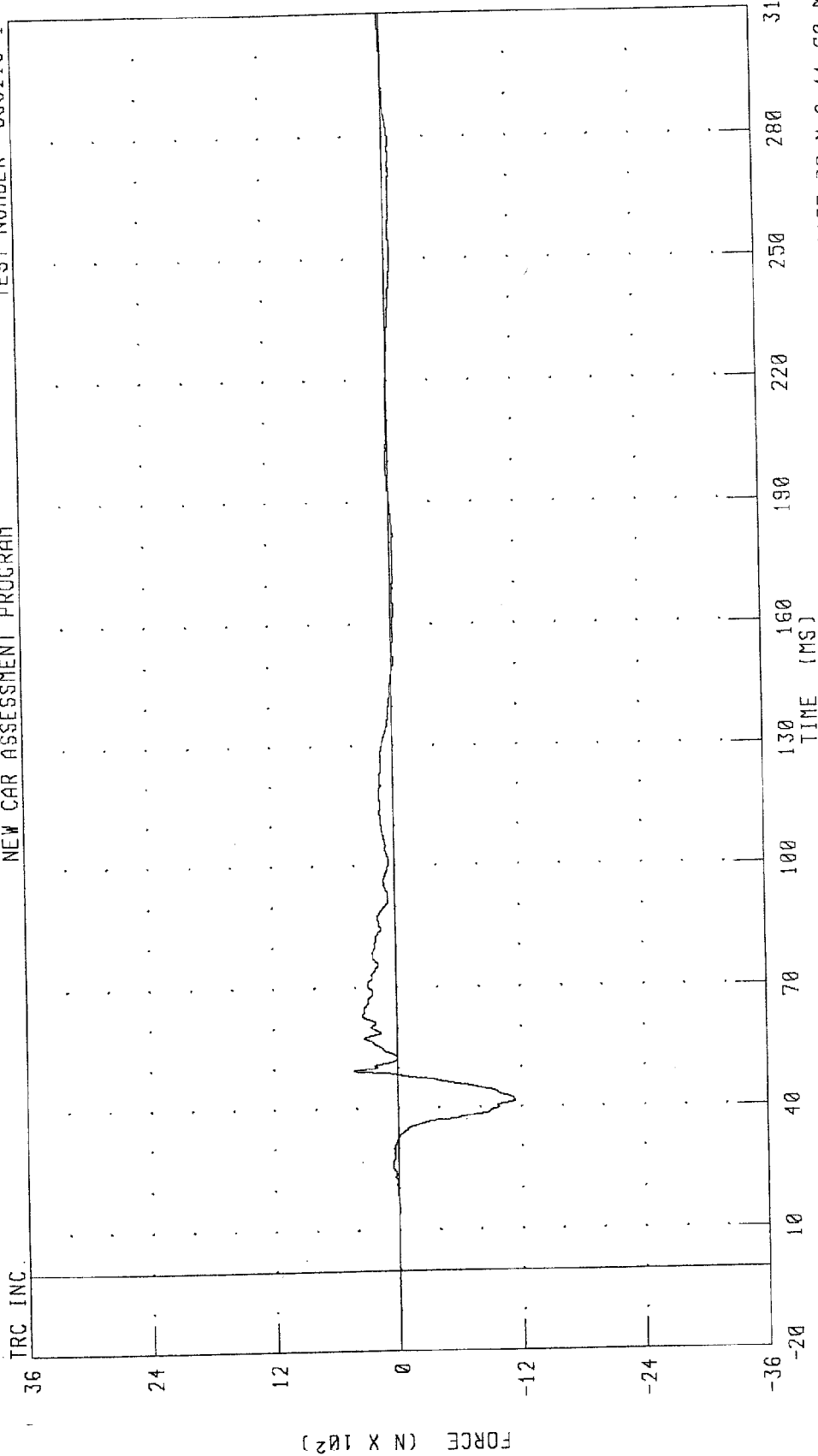
CHANNEL: TBRYM2 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

PASSENGER LEFT LOWER TIBIA X-AXIS FORCE

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



PEAK DATA: 428.61 N @ 49.44 MS; -1137.39 N @ 41.60 MS

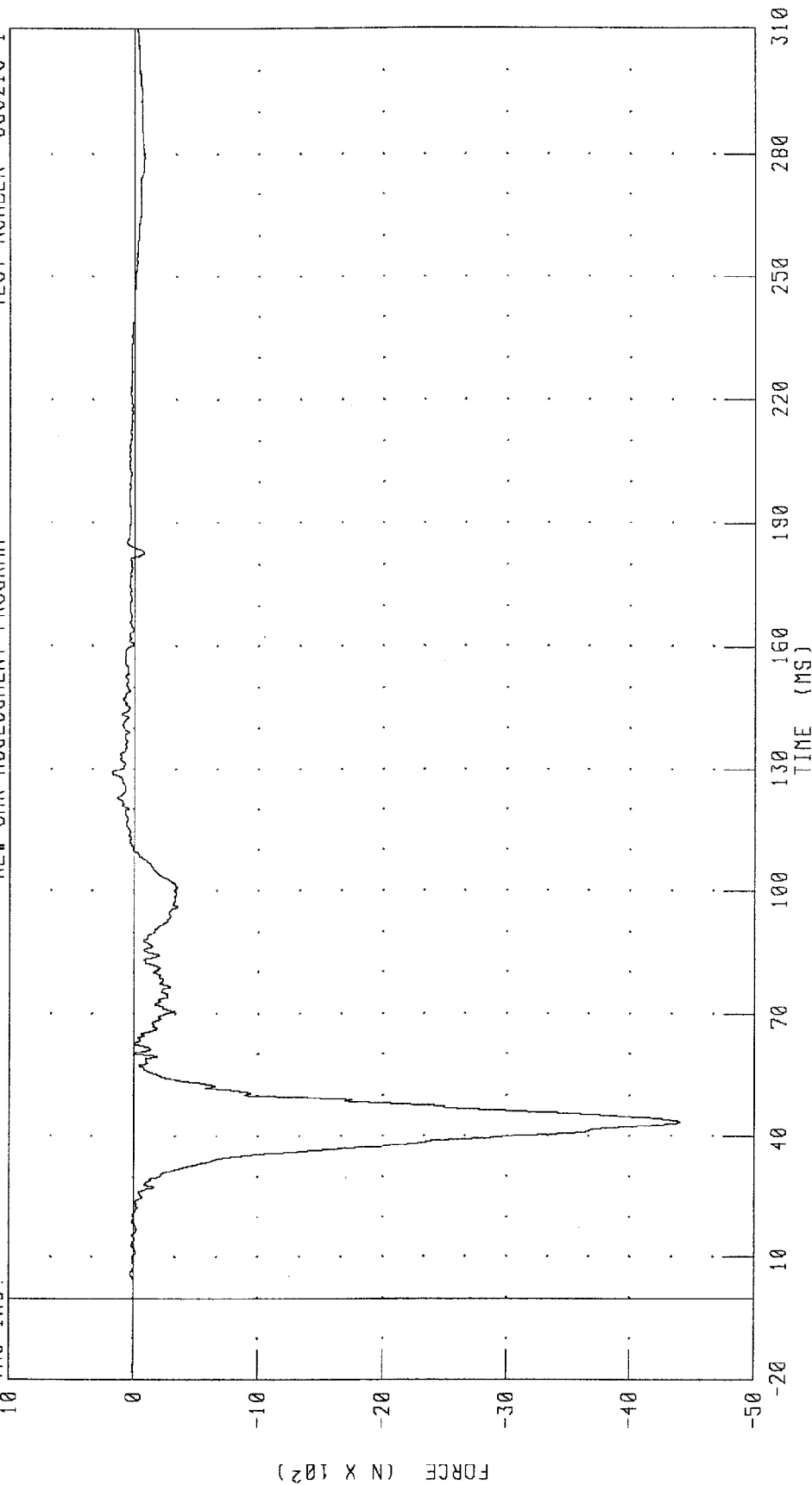
CHANNEL: ANLXF2 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER LEFT LOWER TIBIA Z-AXIS FORCE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: ANLZF2 FILTER: CH. CLASS 600

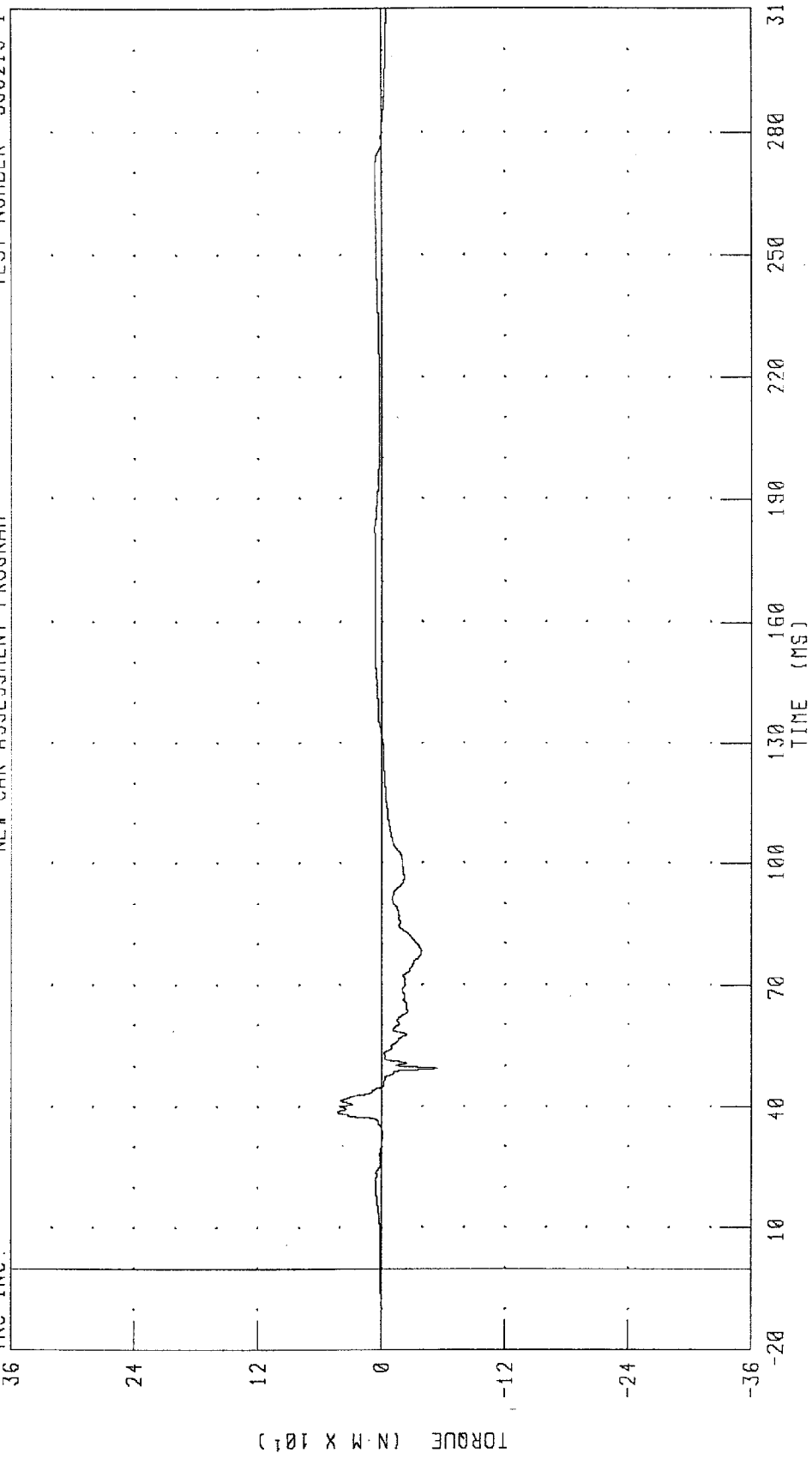
PEAK DATA: 178.26 N @ 129.20 MS, -4403.93 N @ 43.44 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER LEFT LOWER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: ANLYM2 FILTER: CH. CLASS 600

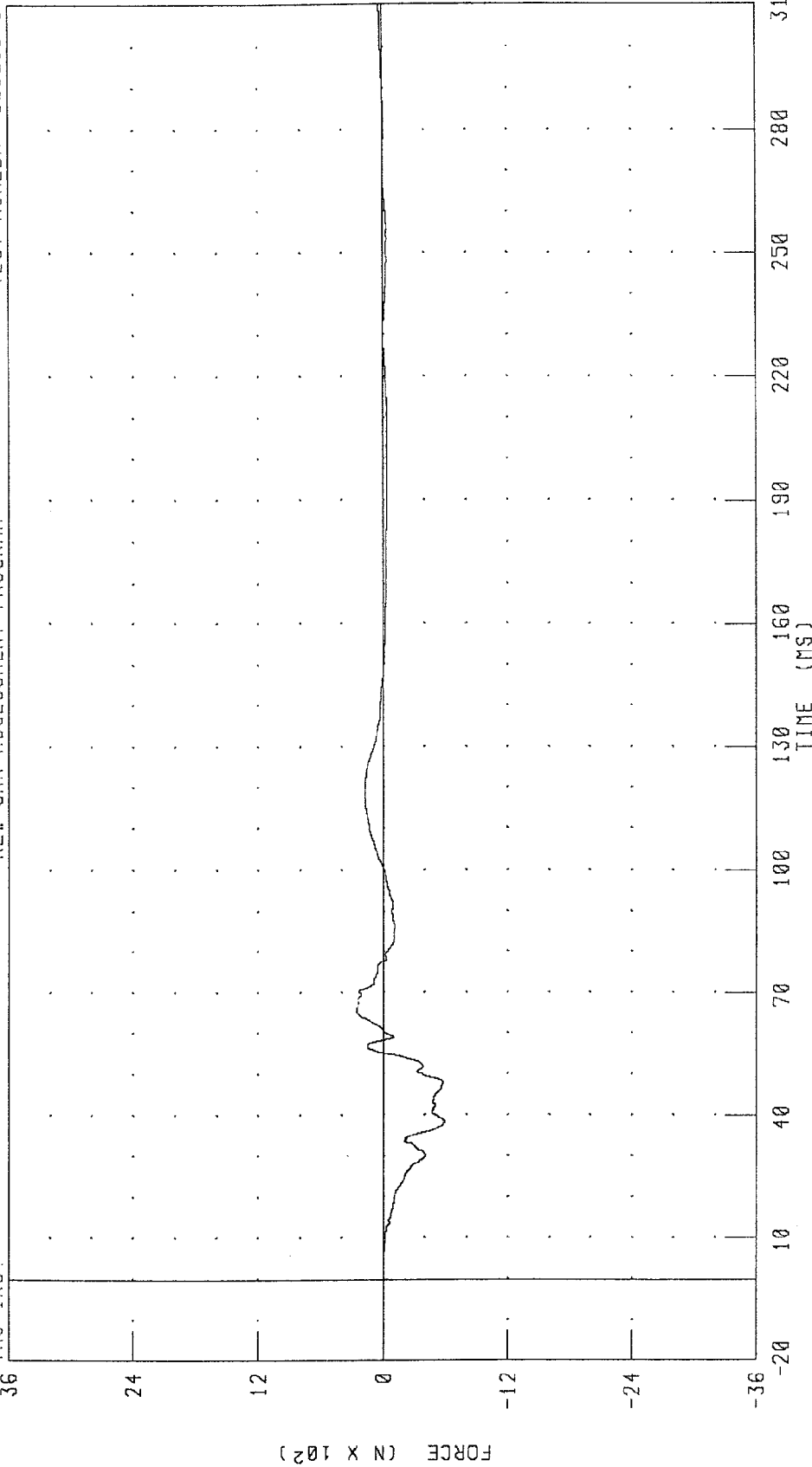
PEAK DATA: 43.15 N·m @ 38.72 ms; -53.36 N·m @ 49.44 ms

1988 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER RIGHT LOWER TIBIA X-AXIS FORCE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



PEAK DATA: 260.68 N @ 65.44 MS; -590.68 N @ 38.40 MS

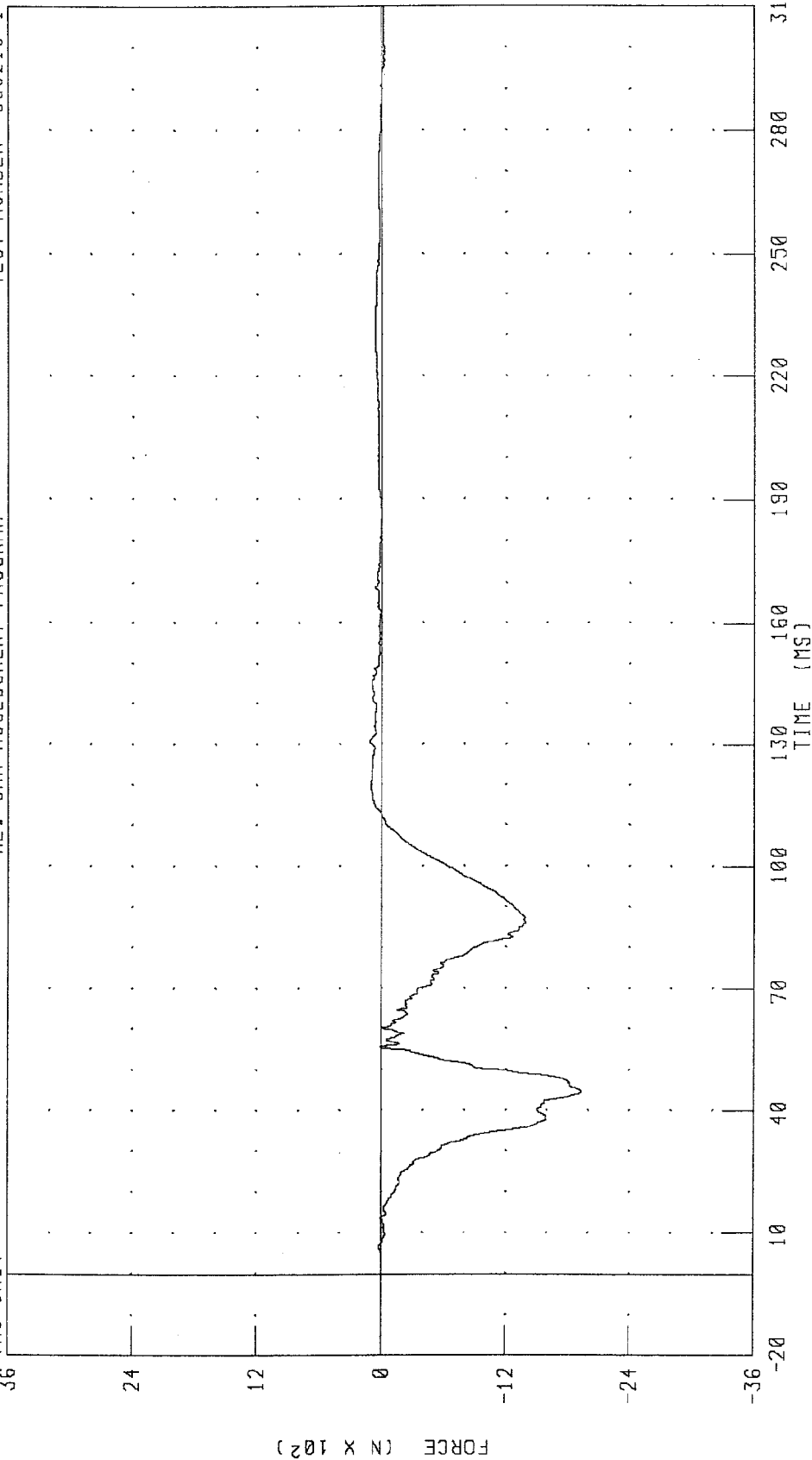
CHANNEL: ANR XF2 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER RIGHT LOWER TIBIA Z-AXIS FORCE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: ANRZF2 FILTER: CH. CLASS 600

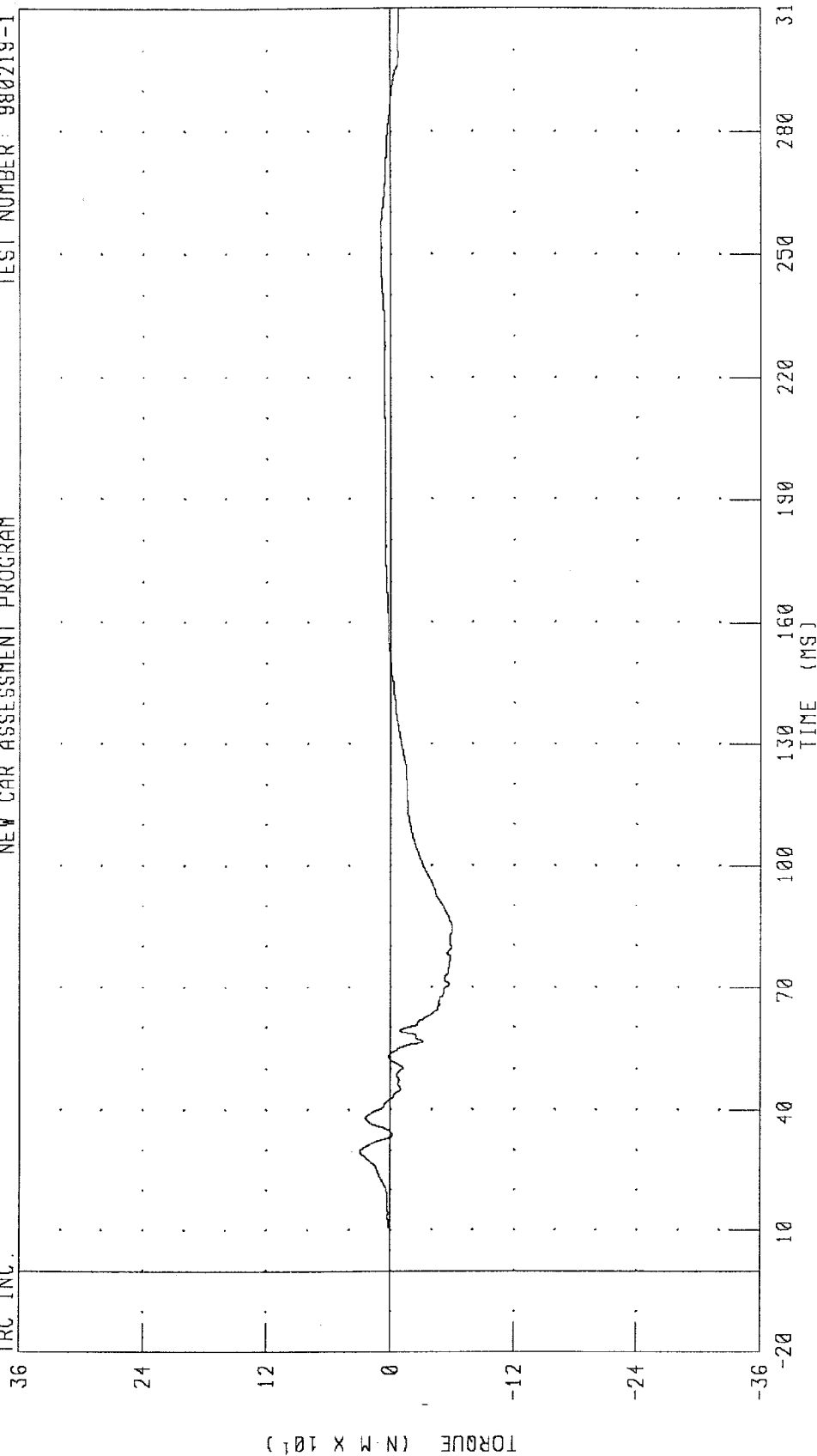
PEAK DATA: 109.00 N @ 131.04 MS; -1934.09 N @ 44.64 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER RIGHT LOWER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



PEAK DATA: 29.68 N·M @ 29.76 MS; -60.07 N·M @ 84.64 MS

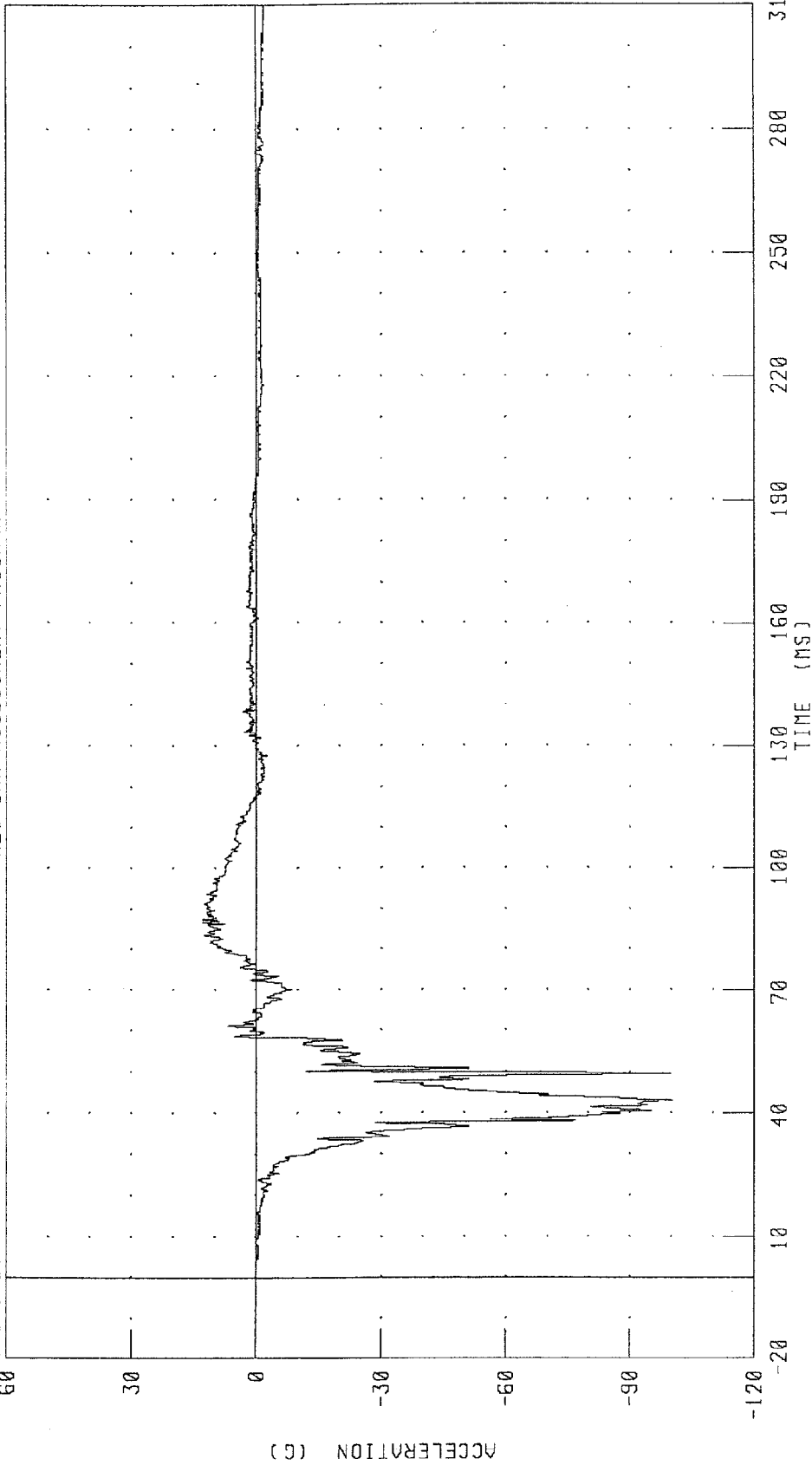
CHANNEL: ANRYM2 FILTER: CH. CLASS 600

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER LEFT FOOT X-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: FTLXG2 FILTER: CH. CLASS 1000

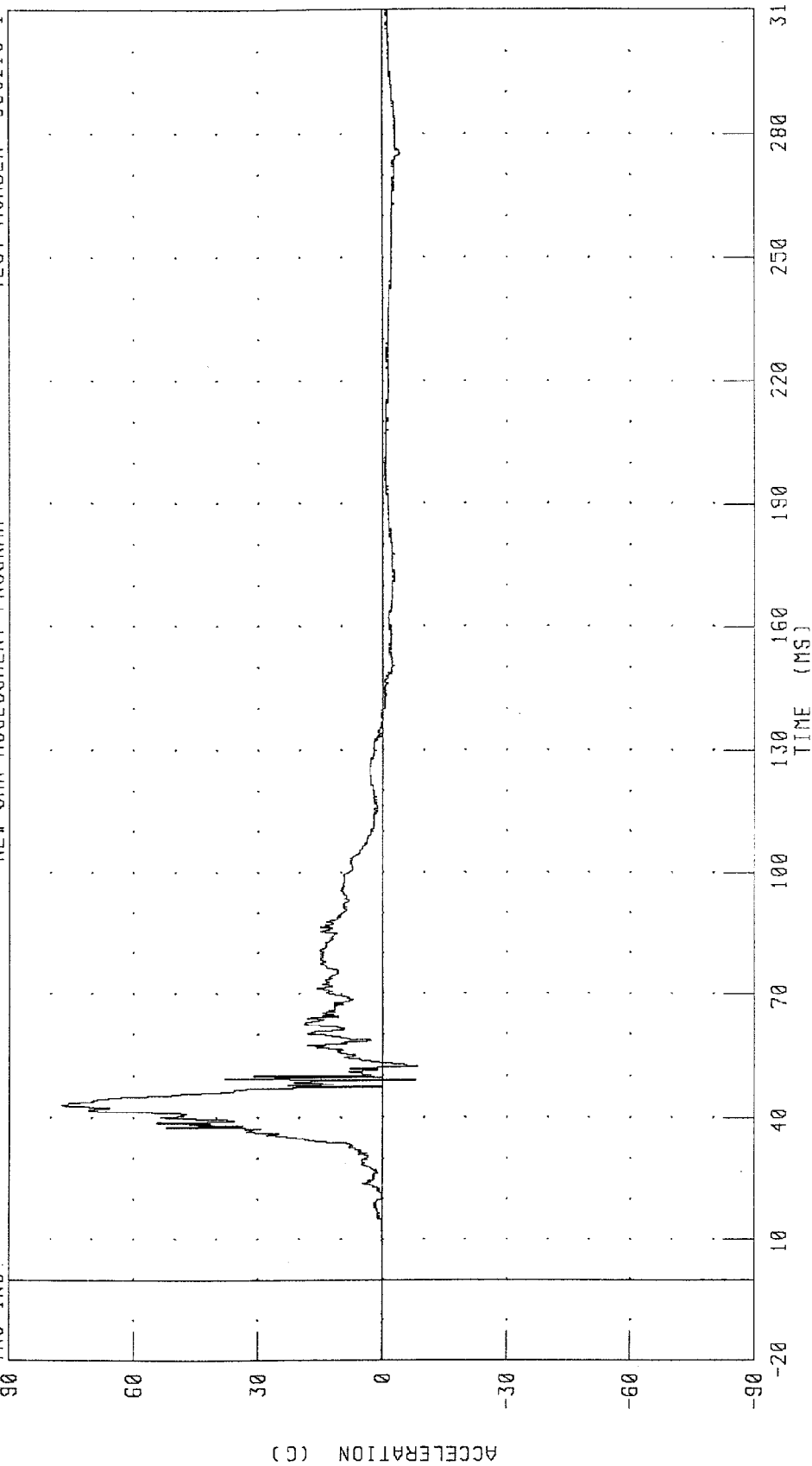
PEAK DATA: 12.83 G @ 86.72 MS; -100.25 G @ 43.12 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER LEFT FOOT Z-AXIS ACCELERATION AT HEEL

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: FTLZH2 FILTER: CH. CLASS 1000

PEAK DATA: 77.20 G @ 42.96 MS; -8.27 G @ 52.32 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER LEFT FOOT Z-AXIS ACCELERATION AT TOE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

150

120

90

60

30

-30

ACCELERATION (G)

310 280 250 220 190 160 130 100 70 40 10

TIME (MS)

CHANNEL: FTLZT2 FILTER: CH. CLASS 1000

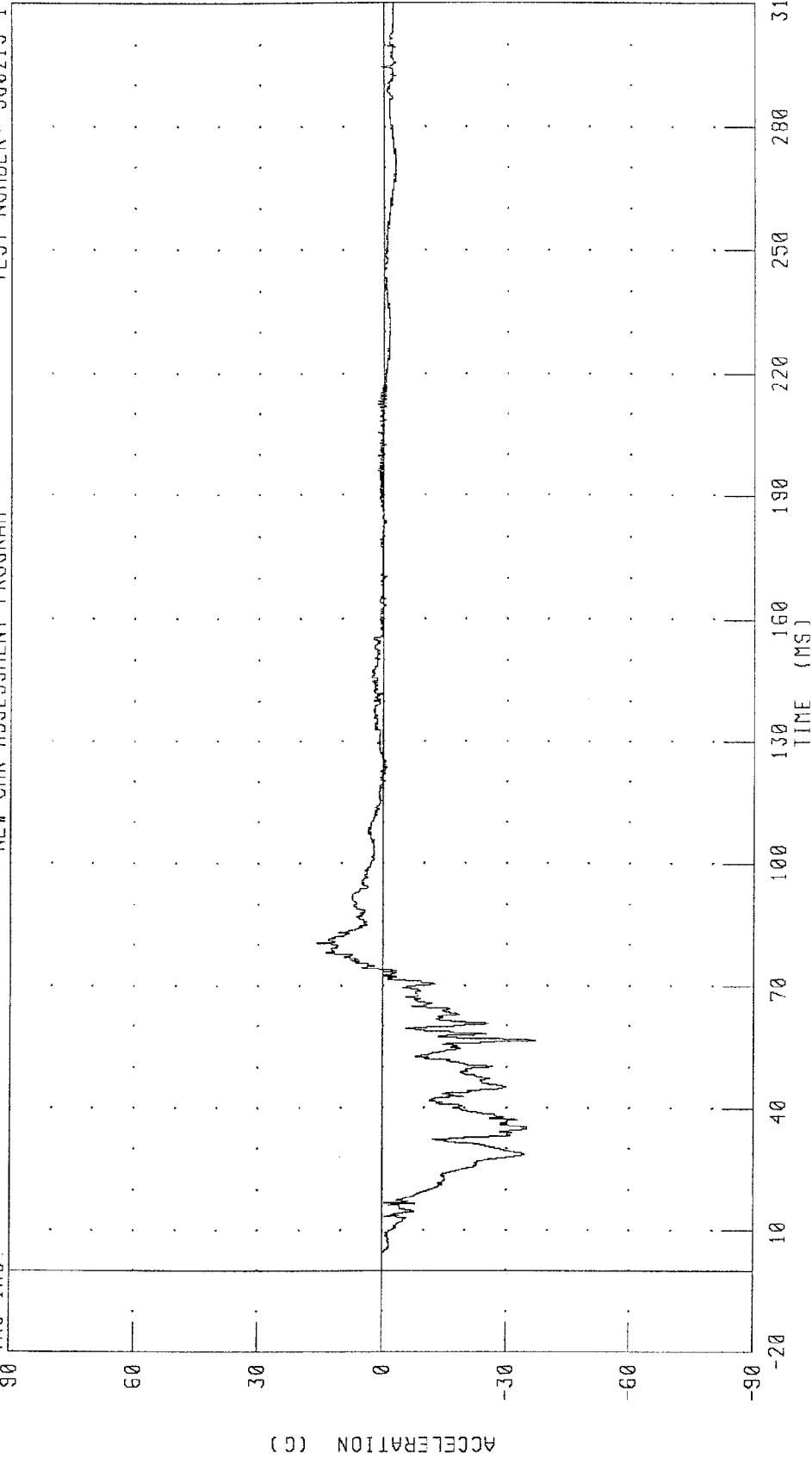
PEAK DATA: 142.62 G @ 38.08 MS, -24.04 G @ 31.92 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER RIGHT FOOT X-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: FTRXC2 FILTER: CH. CLASS 1000

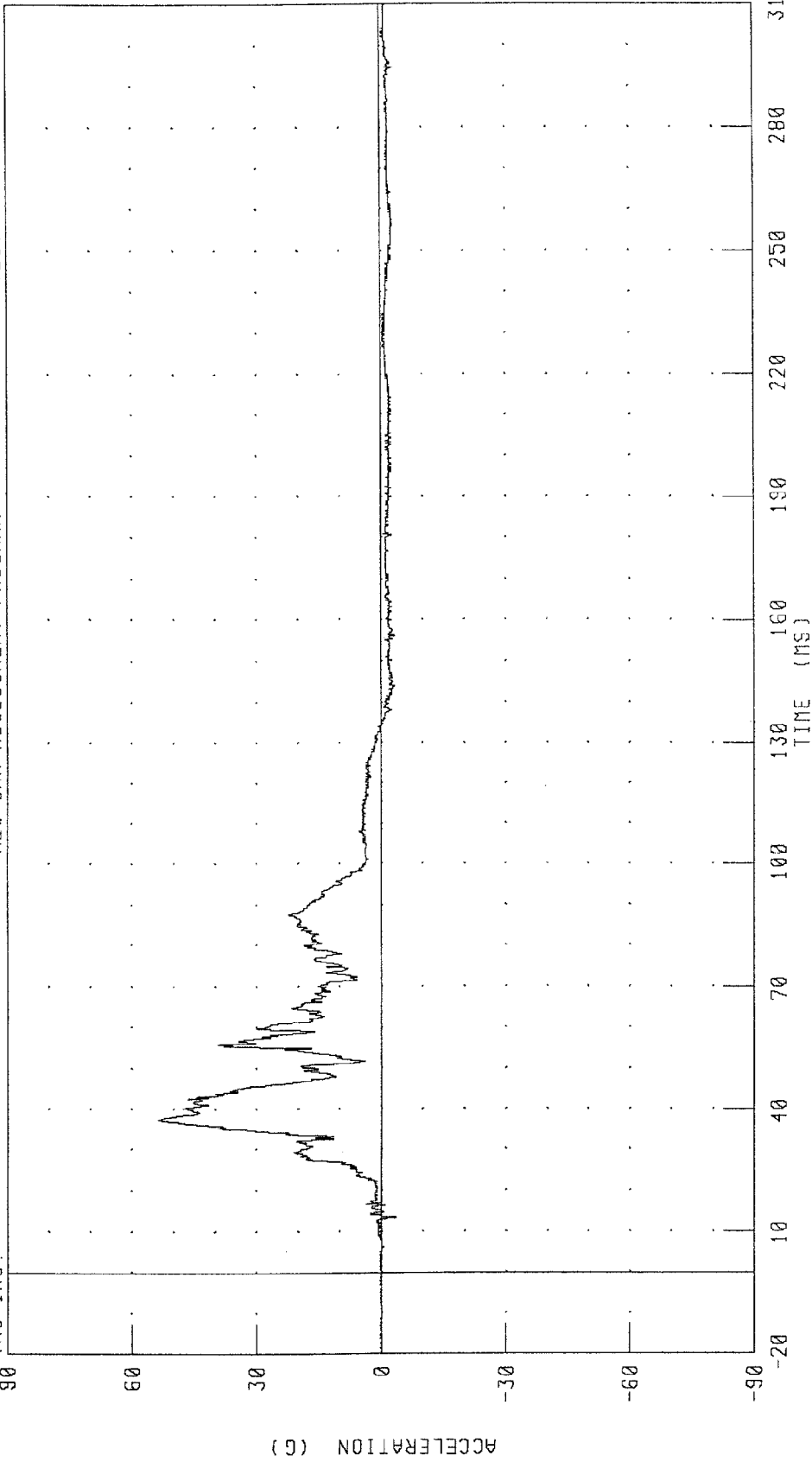
PEAK DATA: 16.10 G @ 80.48 MS; -36.99 G @ 56.56 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER RIGHT FOOT Z-AXIS ACCELERATION AT HEEL

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



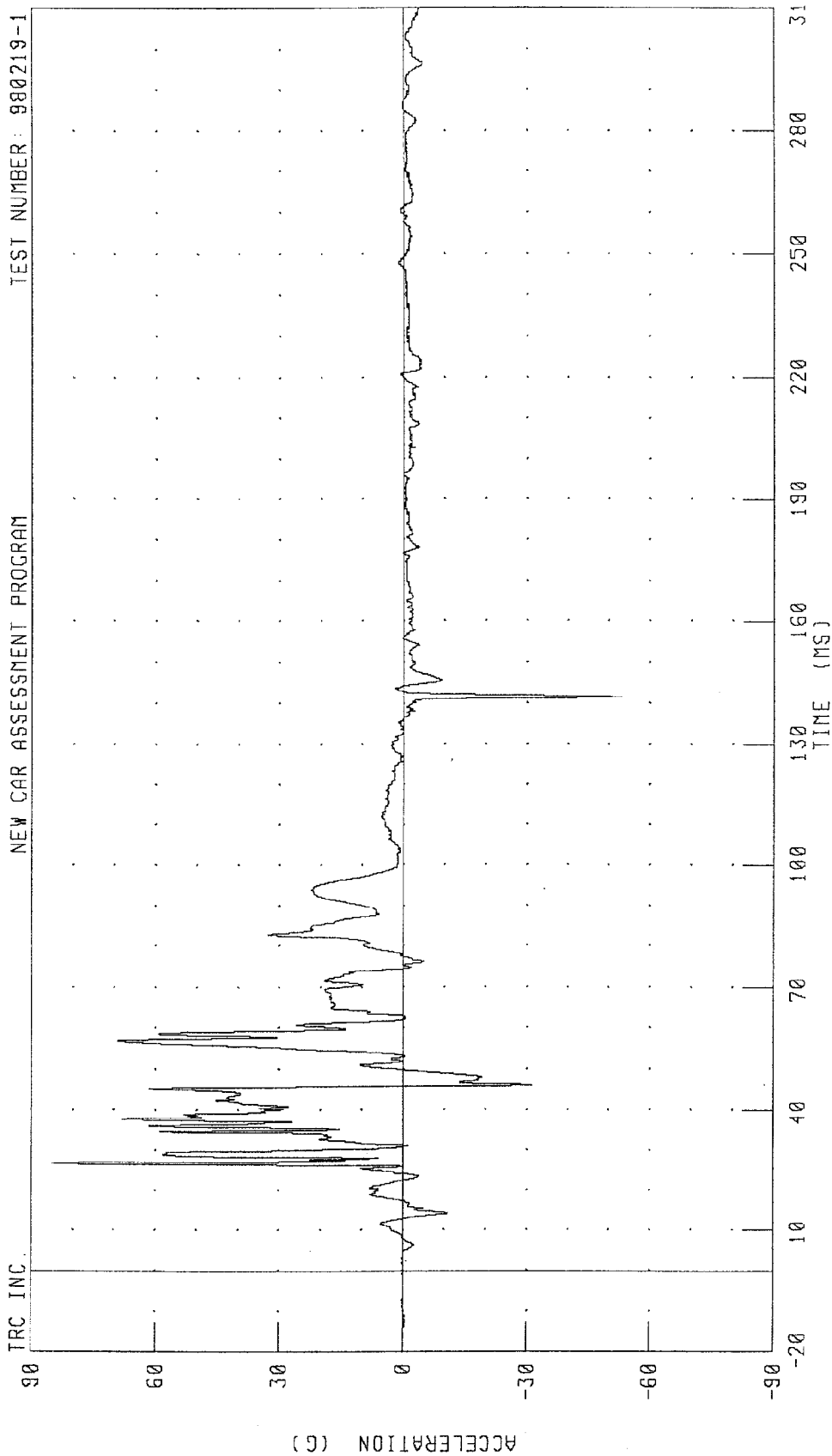
CHANNEL: FTRZH2 FILTER: CH. CLASS 1000

PEAK DATA: 53.62 G @ 37.44 MS; -3.66 G @ 13.44 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER RIGHT FOOT Z-AXIS ACCELERATION AT TOE

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM



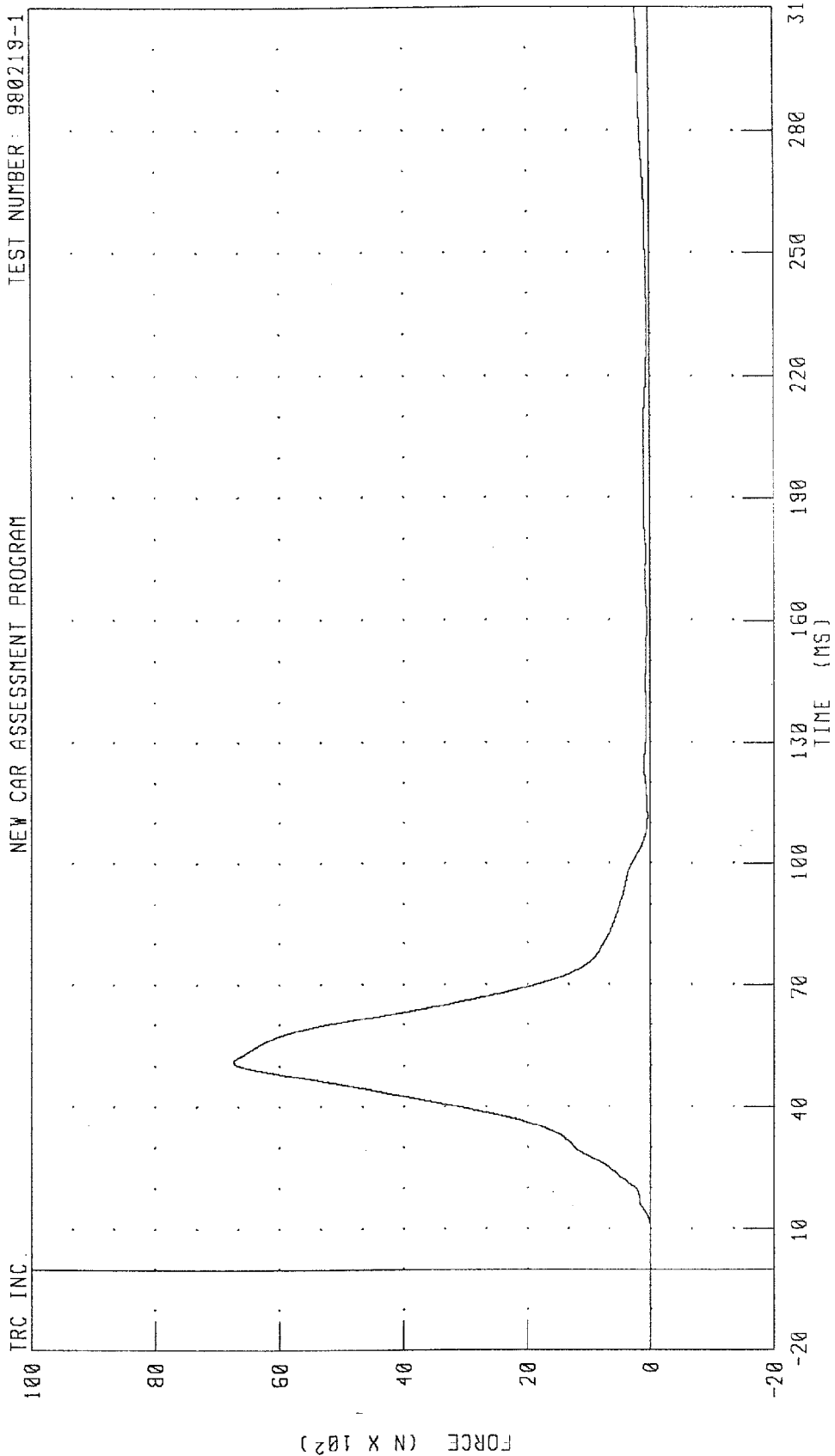
CHANNEL: FTR2T2 FILTER: CH. CLASS 1000

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

DRIVER LAP BELT OUTBOARD FORCE

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

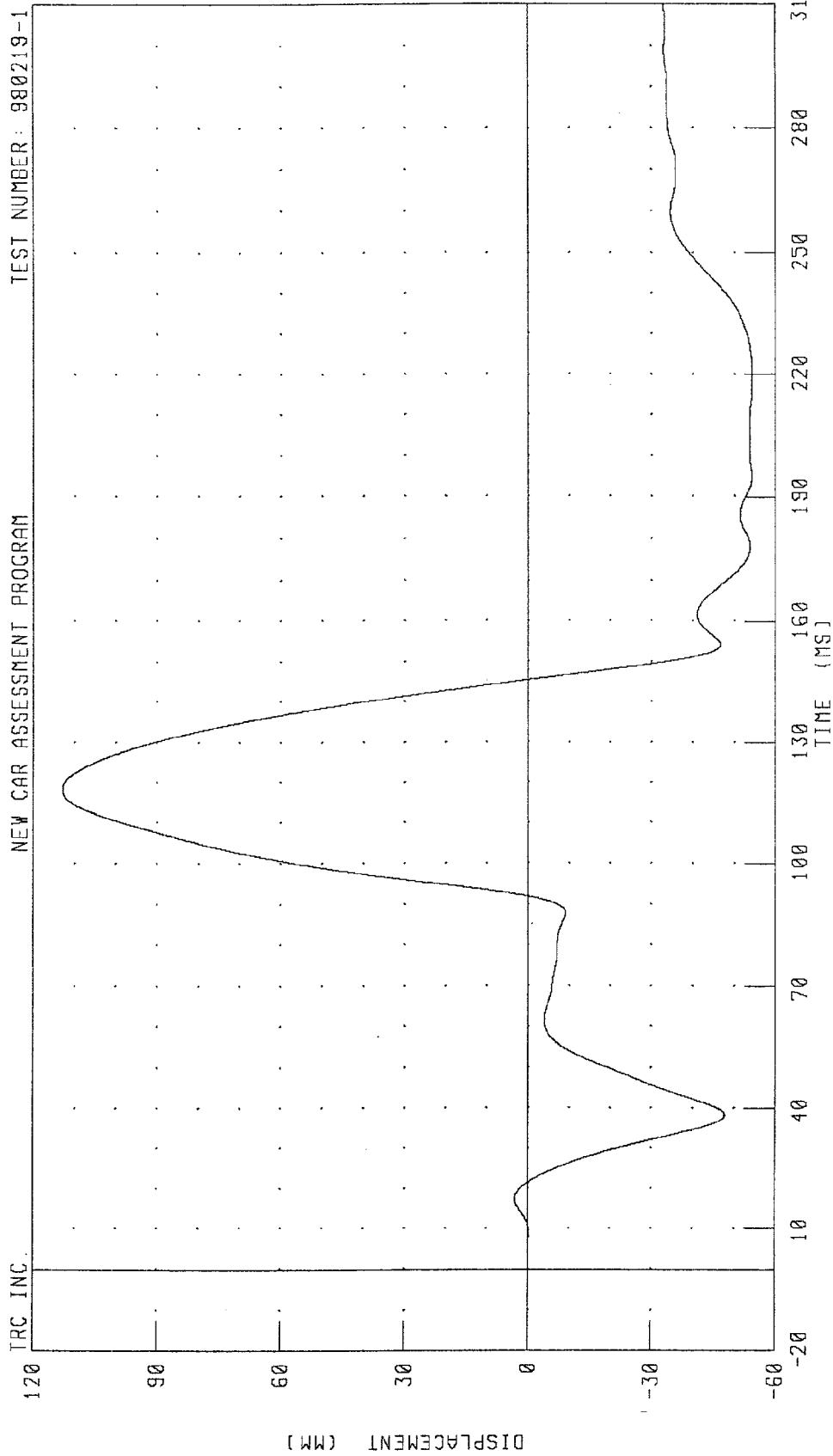


CHANNEL: LBOFI FILTER: CH. CLASS 60

PEAK DATA: 6741.22 N @ 51.04 MS; -1.84 N @ 0.48 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
DRIVER SHOULDER BELT DISPLACEMENT
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



PEAK DATA: 112.90 MM @ 118.32 MS; -54.43 MM @ 217.12 MS

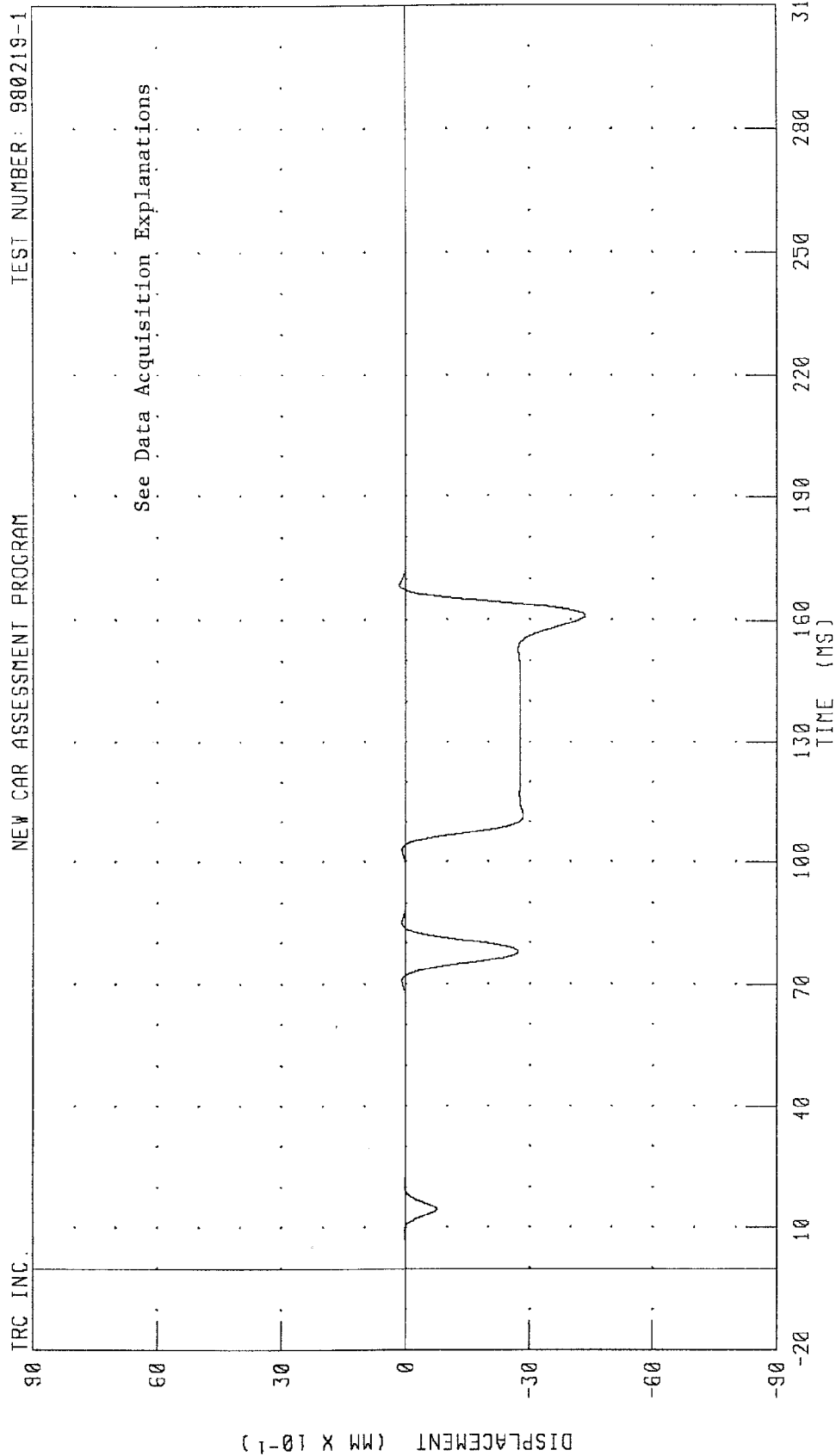
CHANNEL: SHBD1 FILTER: CH. CLASS 60

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

DRIVER SEAT BELT EXTENSION

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

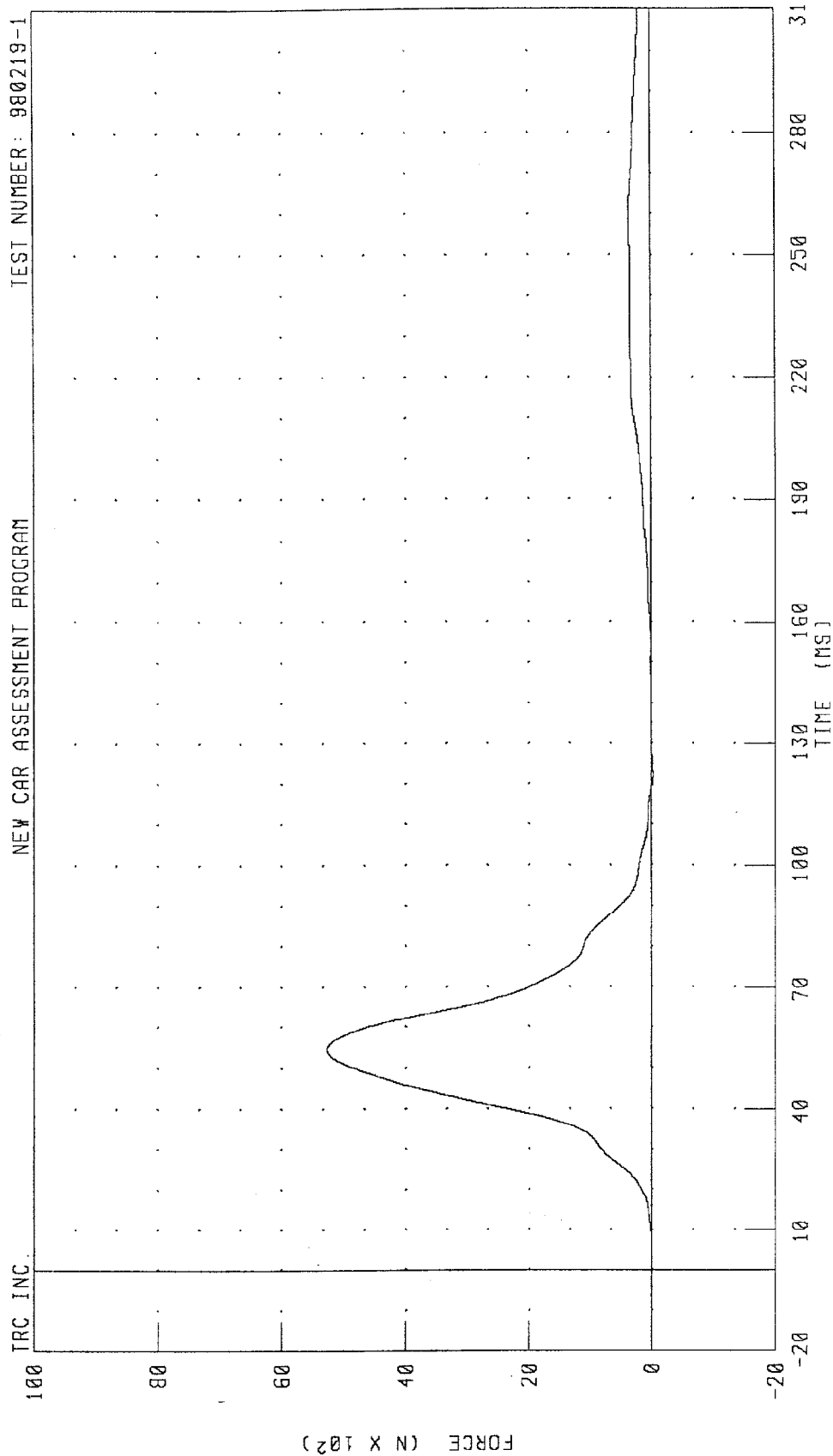


CHANNEL: SBED1 FILTER: CH. CLASS 60

PEAK DATA: 0.15 MM @ 168.64 MS; -4.35 MM @ 161.12 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER LAP BELT OUTBOARD FORCE
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



CHANNEL: LBOF2 FILTER: CH. CLASS 60

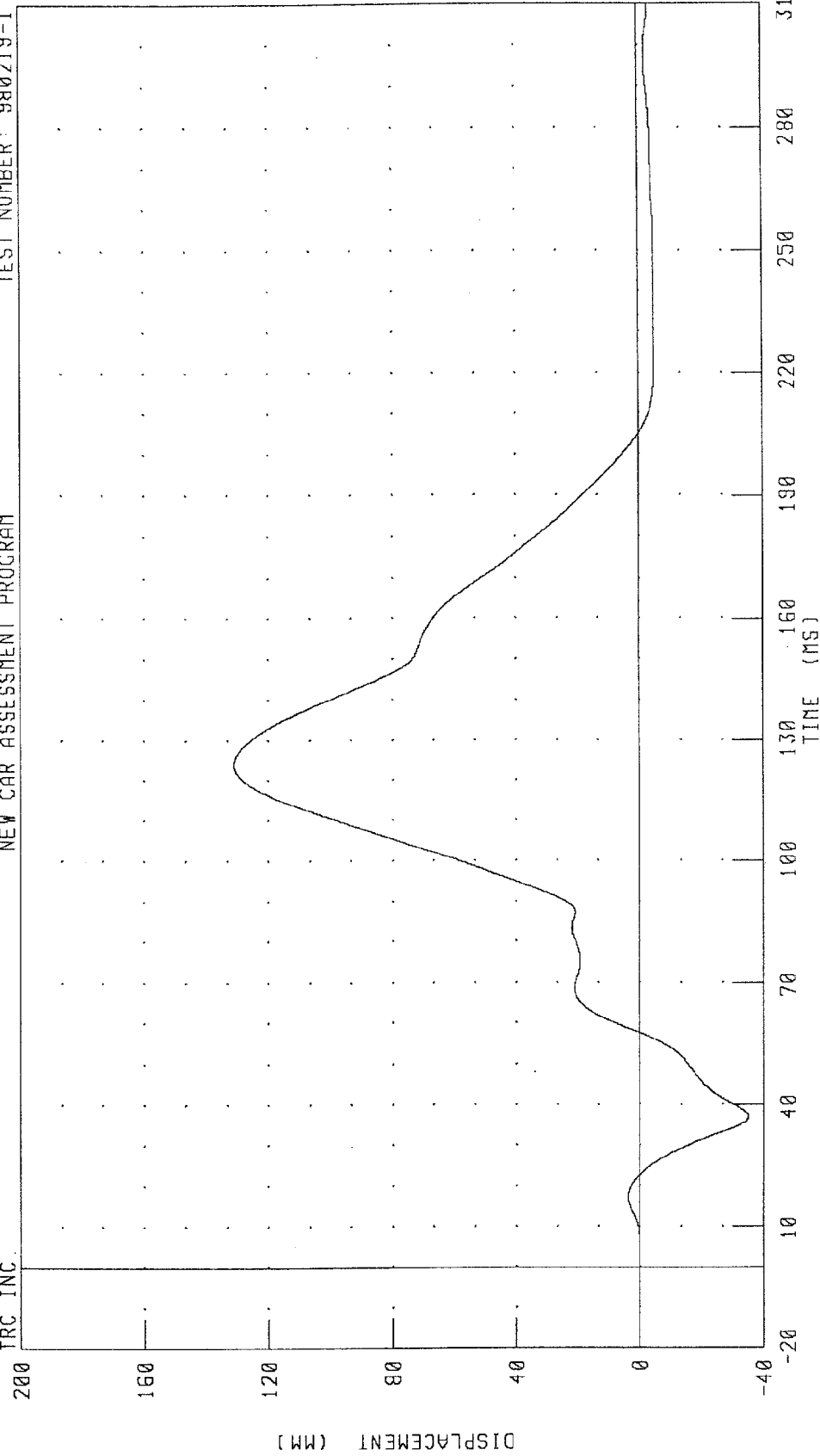
PEAK DATA: 5271.09 N @ 54.48 MS; -21.95 N @ 122.24 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER SHOULDER BELT DISPLACEMENT

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

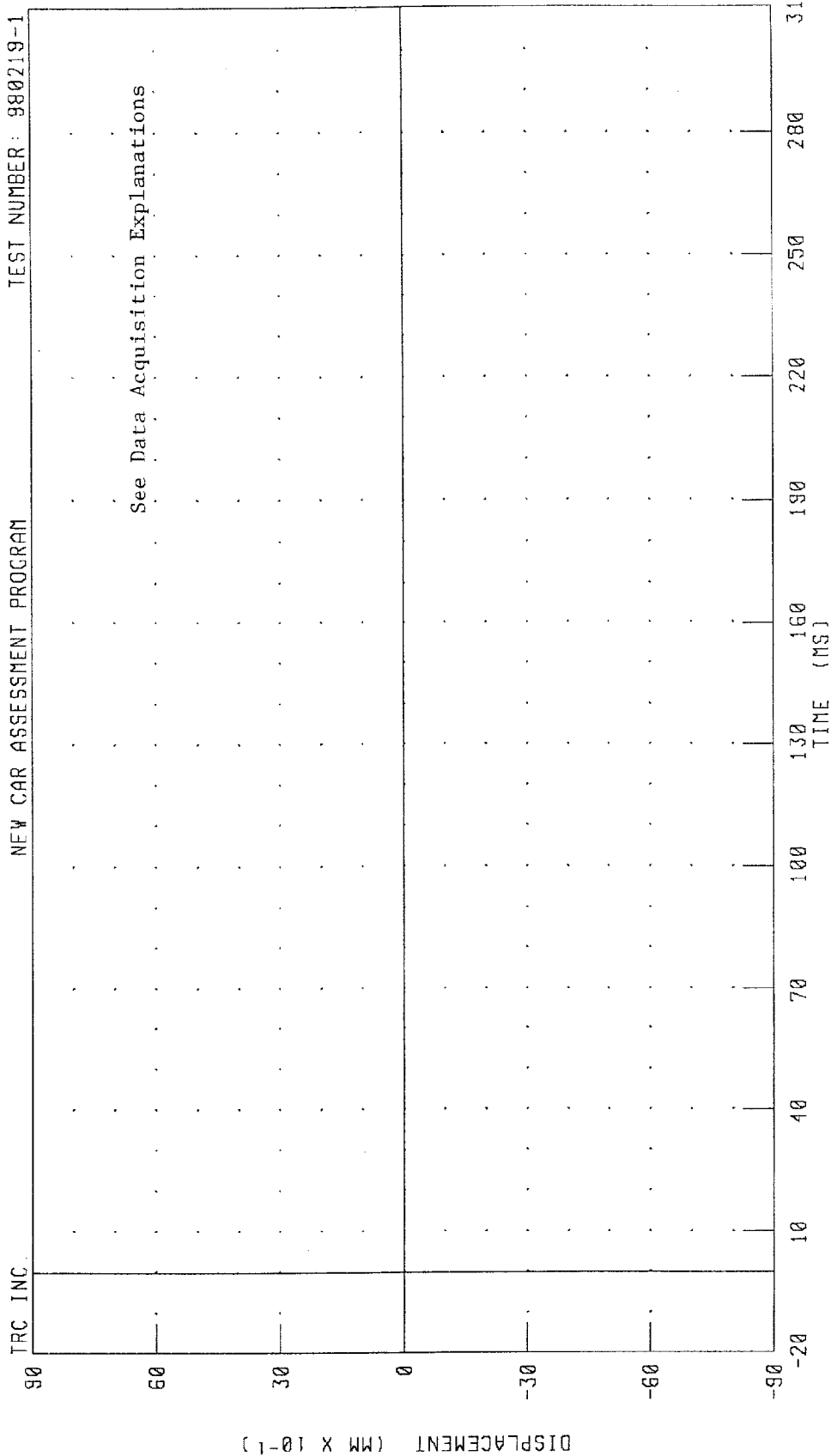


PEAK DATA: 131.11 MM @ 124.16 MS; -34.94 MM @ 37.04 MS

CHANNEL: SH002 FILTER: CH. CLASS 60

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
PASSENGER SEAT BELT EXTENSION
NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

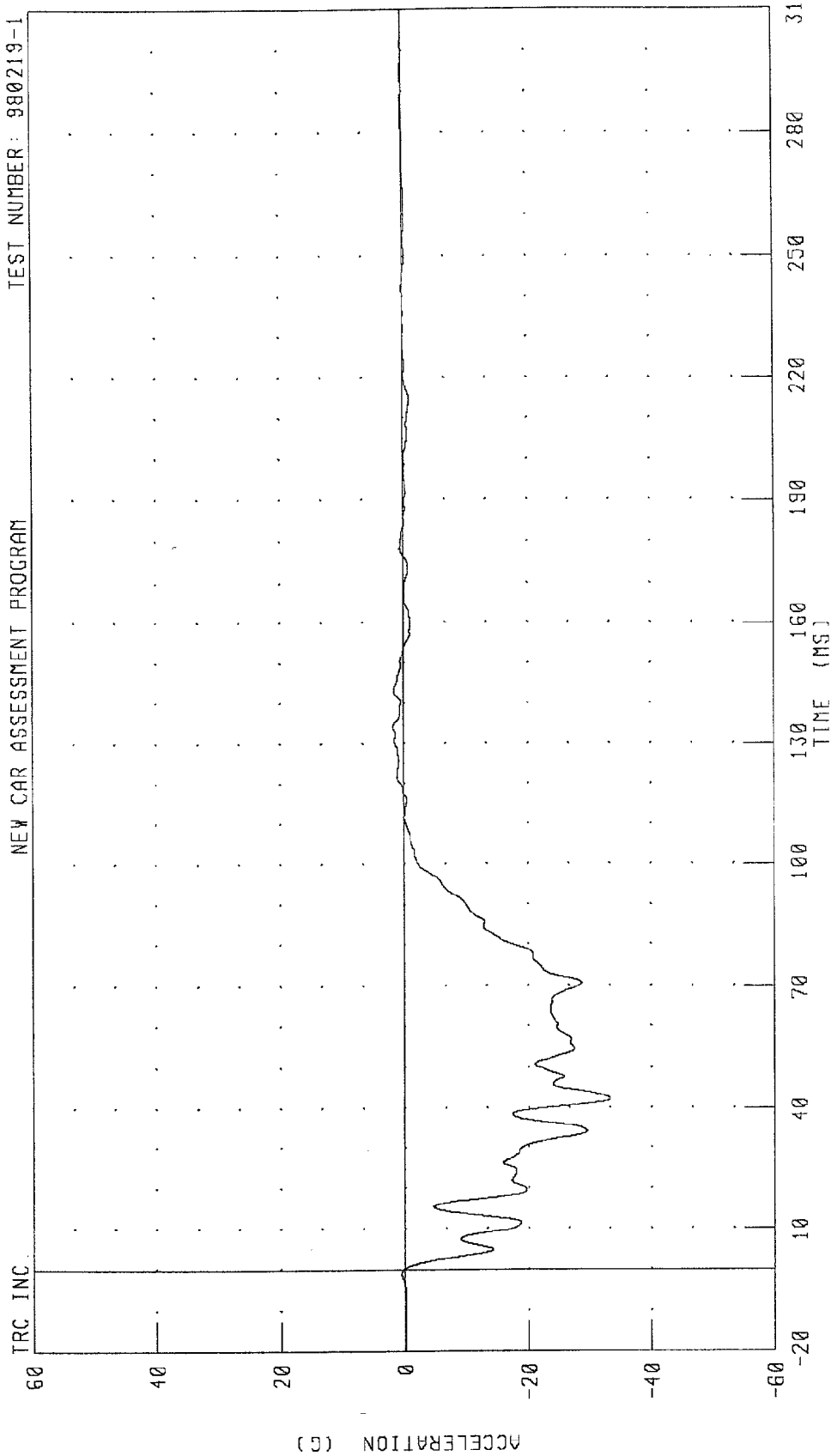


CHANNEL: SBED2 FILTER: CH. CLASS 60

PEAK DATA: 0 00 MM @ 310.00 MS; 0.00 MM @ -20.00 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 LEFT REAR SEAT X-AXIS ACCELERATION
 NEW CAR ASSESSMENT PROGRAM

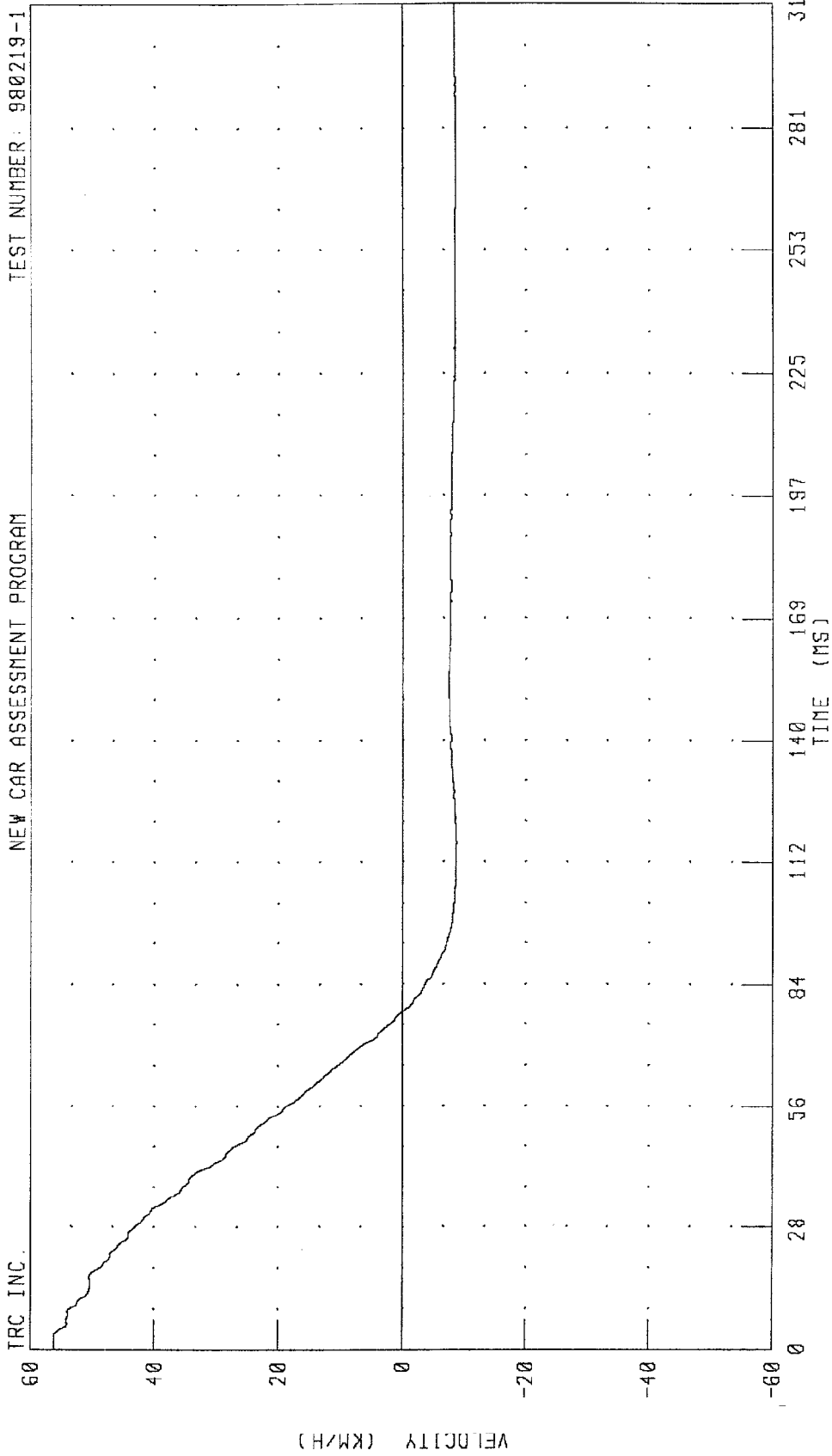
TEST NUMBER: 980219-1



CHANNEL: TLRXG1 FILTER: CH. CLASS 60

1998 CHEVROLET SILVERADO PICKUP INTO FLAT FRONTAL BARRIER
 LEFT REAR SEAT X-AXIS VELOCITY
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



PEAK DATA: 56.11 KM/H @ 2.72 MS, -8.72 KM/H @ 117.20 MS

CHANNEL: TLRXV1 FILTER: CH. CLASS 180

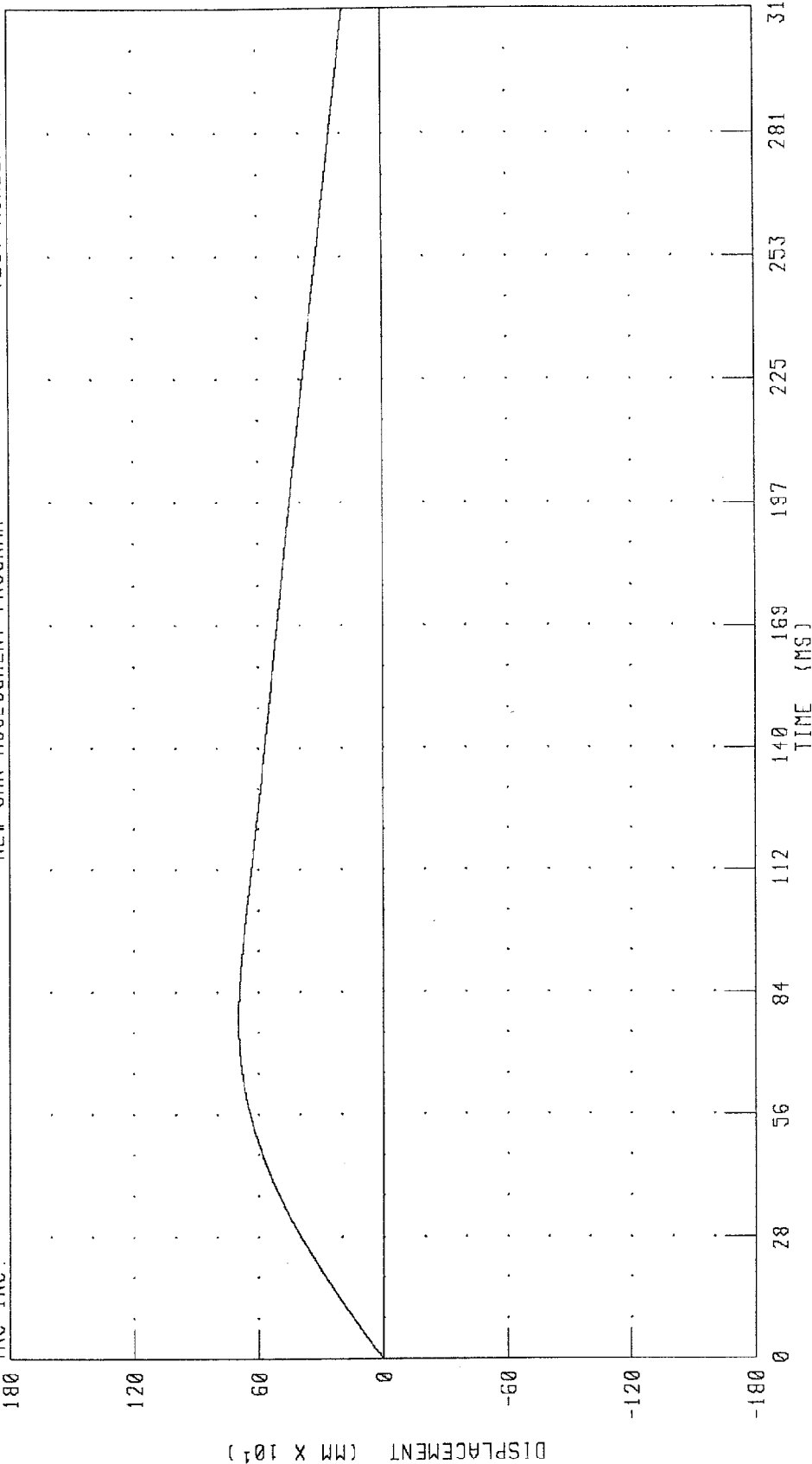
1998 CHEVROLET SILVERADO PICKUP INTO FLAT FRONTAL BARRIER

LEFT REAR SEAT X-AXIS DISPLACEMENT

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

TRC INC.



CHANNEL: TLRX01 FILTER: CH. CLASS 180

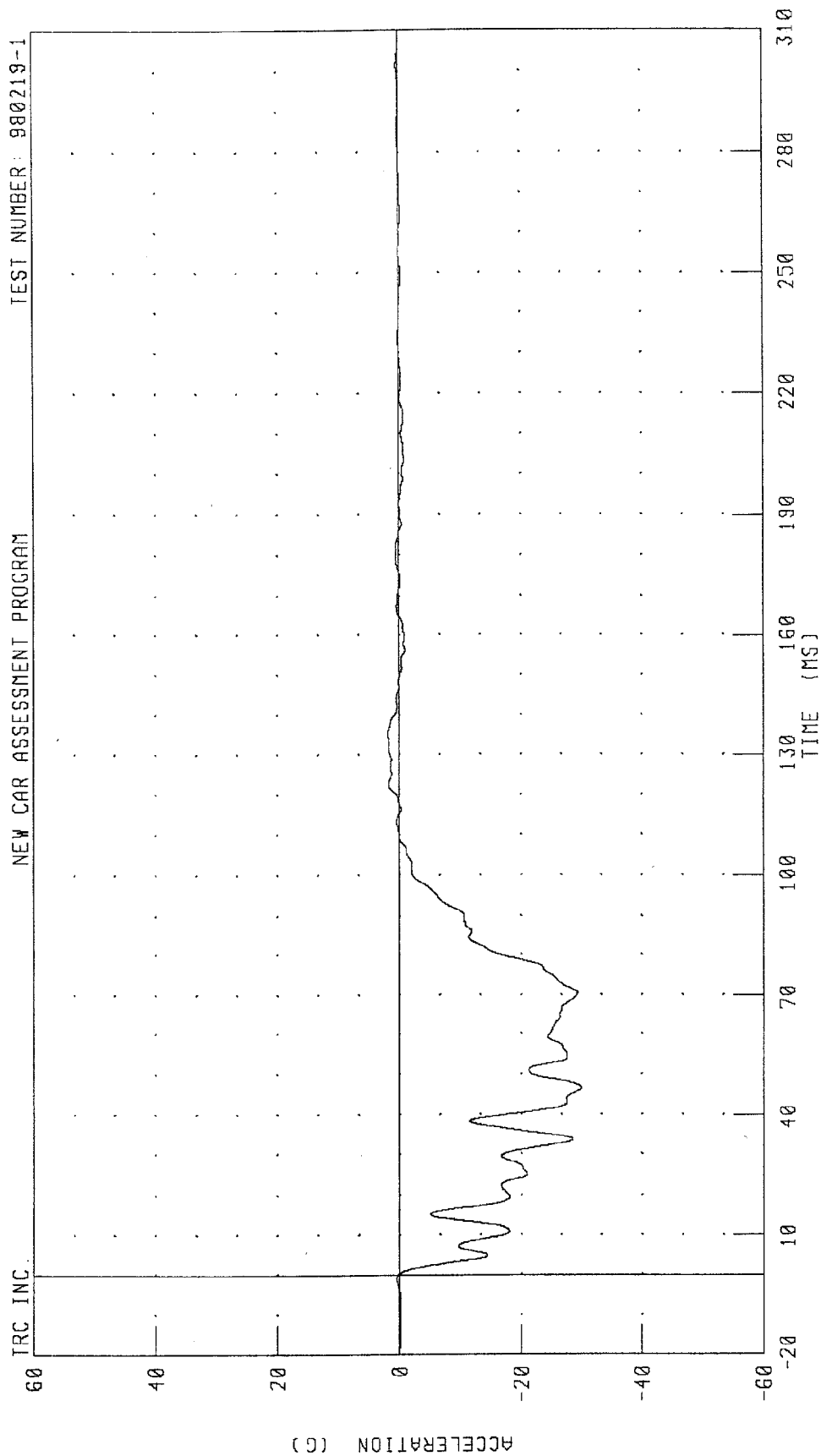
PEAK DATA: 695.68 MM @ 78.08 MS; 0.00 MM @ 0.00 MS

1998 CHEVROLET SILVERADO PICKUP INTO FLAT FRONTAL BARRIER

RIGHT REAR SEAT X-AXIS ACCELERATION

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



CHANNEL: TRRXG1 FILTER: CH. CLASS 60

PEAK DATA: 1.94 G @ 135.04 MS; -29.93 G @ 46.72 MS

1998 CHEVROLET SILVERADO PICKUP INTO FLAT FRONTAL BARRIER

RIGHT REAR SEAT X-AXIS VELOCITY

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

60

40

20

0

-20

-40

-60

VELOCITY (KM/H)

TIME (MS)

PEAK DATA: 56.12 KM/H @ 2.64 MS; -8.87 KM/H @ 108.00 MS

CHANNEL: TRRXV1 FILTER: CH. CLASS 180

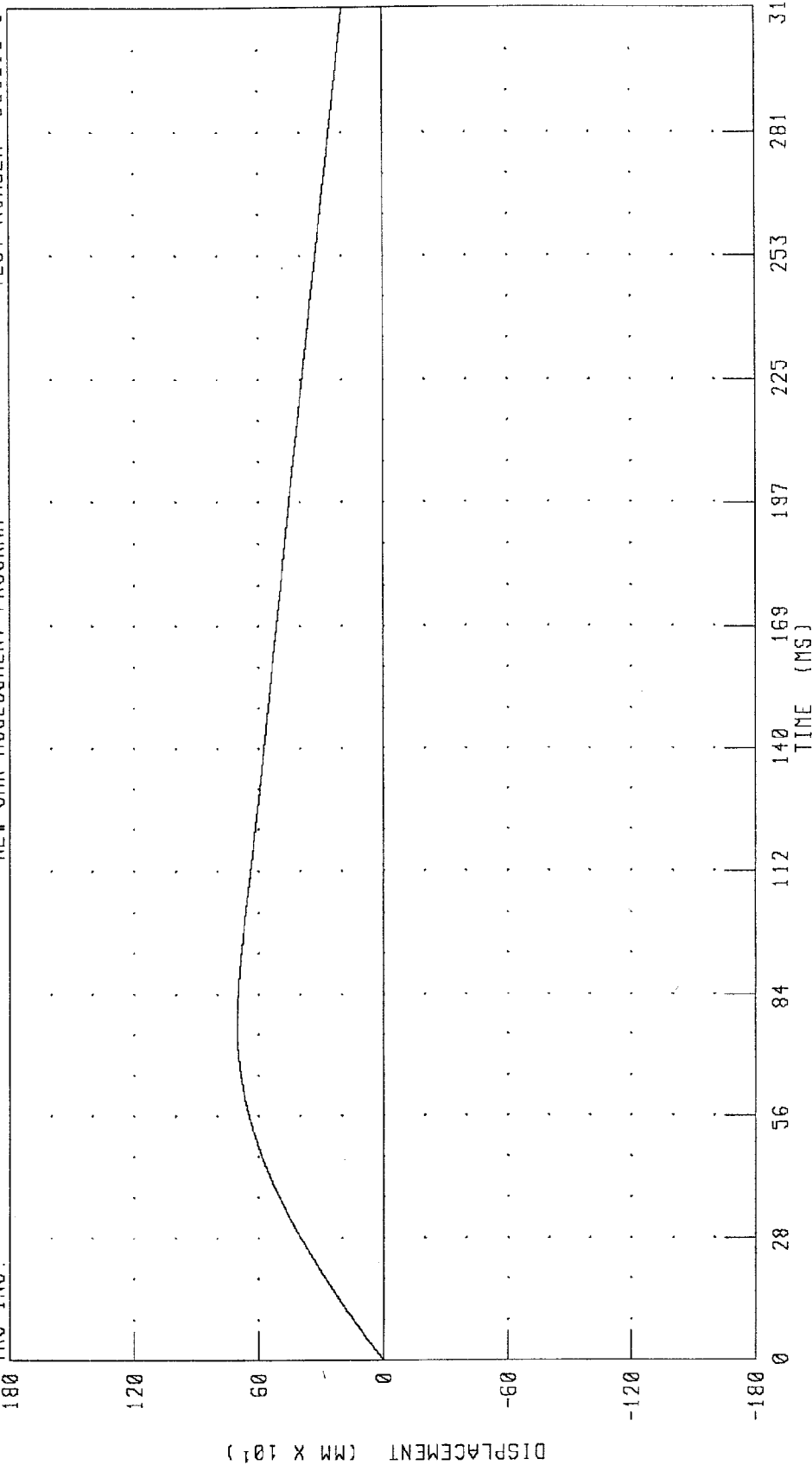
1998 CHEVROLET SILVERADO PICKUP INTO FLAT FRONTAL BARRIER

RIGHT REAR SEAT X-AXIS DISPLACEMENT

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

TRC INC.



CHANNEL: TRRXD1 FILTER: CH. CLASS 180

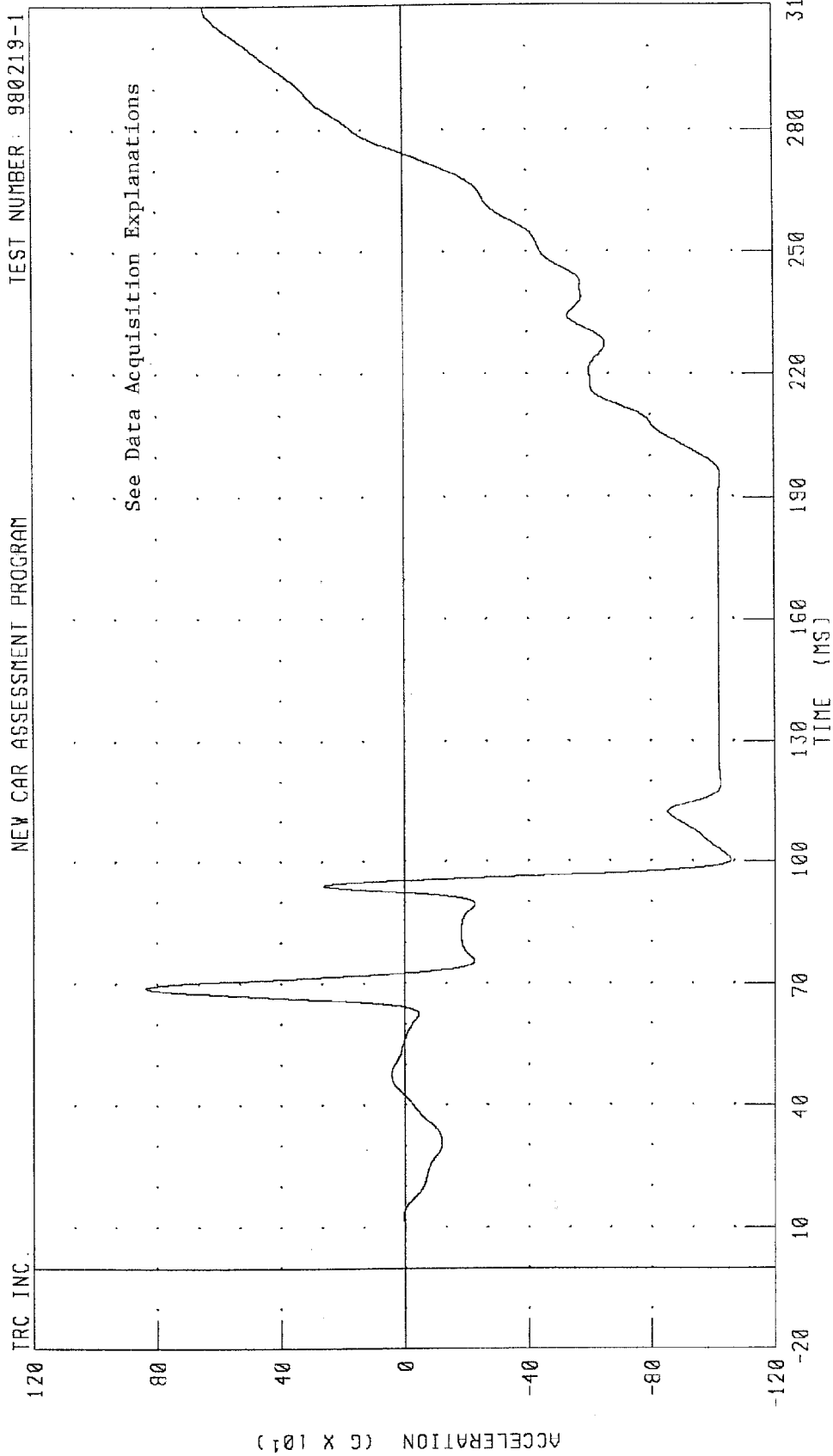
PEAK DATA: 702.99 MM @ 77.52 MS; 0.00 MM @ 0.00 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER

ENGINE TOP X-AXIS ACCELERATION

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

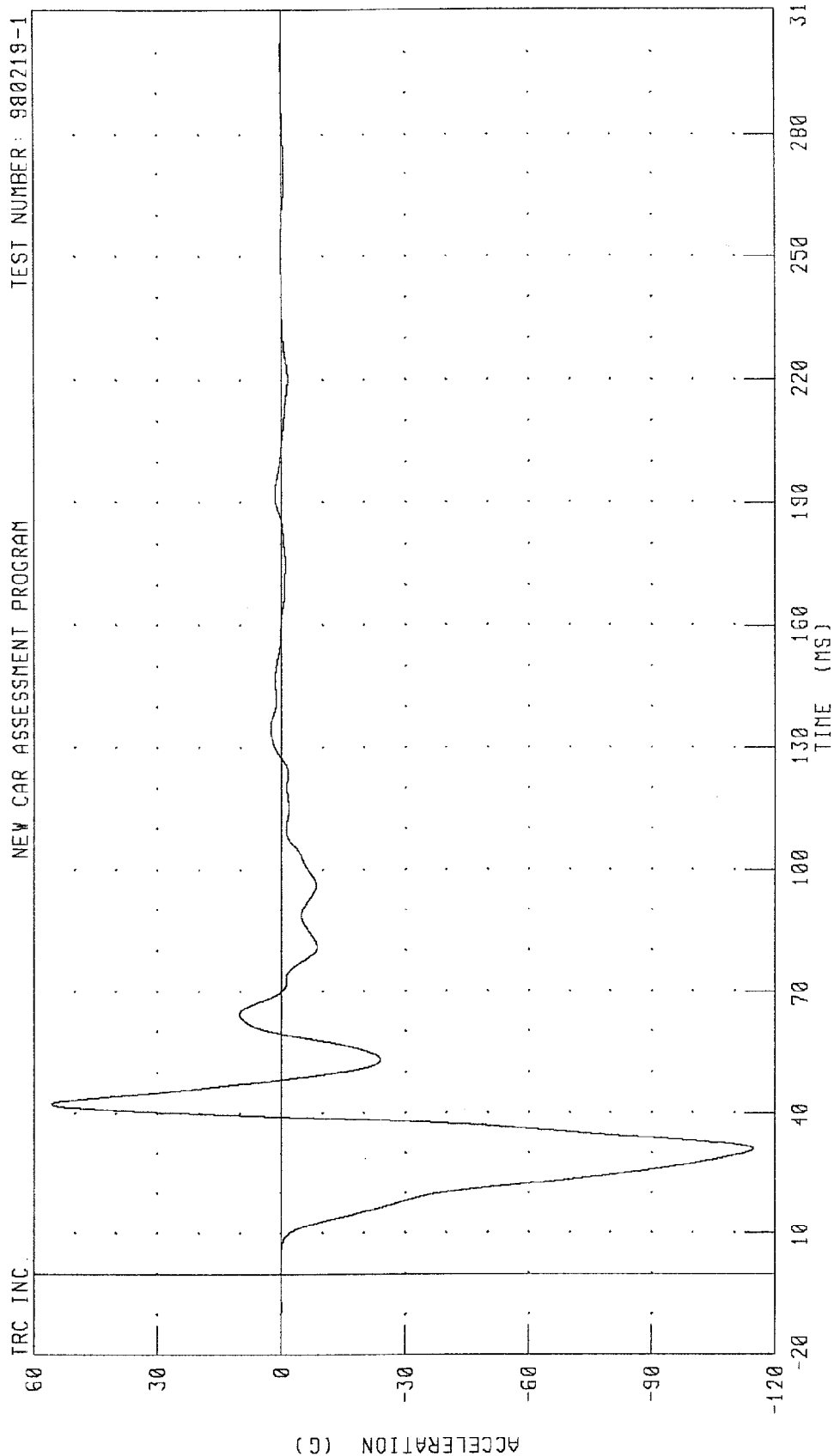


PEAK DATA: 837.79 G @ 69.04 MS; -1056.99 G @ 100.32 MS

CHANNEL: ENGXC1 FILTER: CH. CLASS 60

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 ENGINE BOTTOM X-AXIS ACCELERATION
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



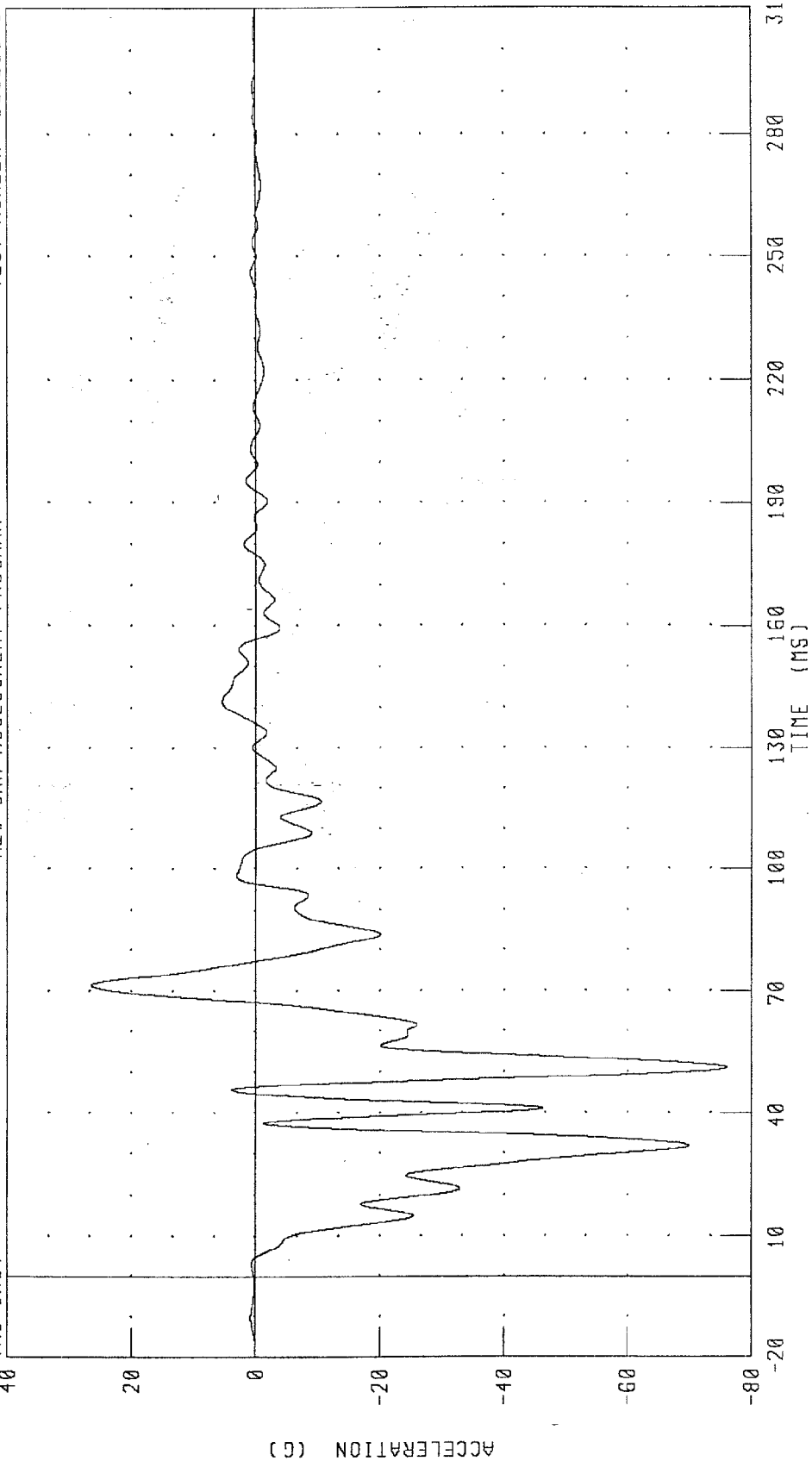
CHANNEL: ENGXC2 FILTER: CH. CLASS 60

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
RIGHT BRAKE CALIPER X-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.

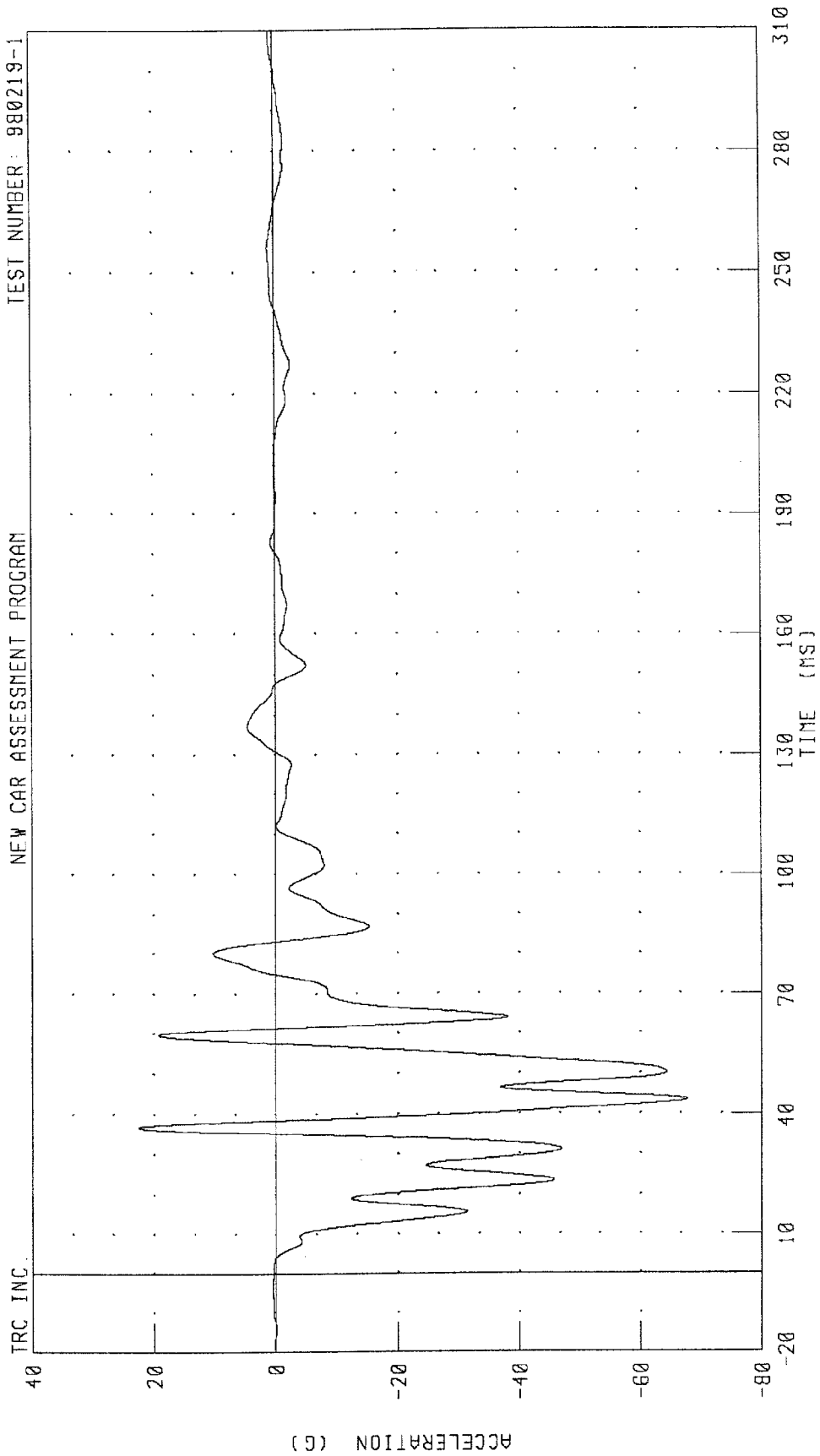


CHANNEL: BCRXG1 FILTER: CH. CLASS 60

PEAK DATA: 26.41 G @ 71.44 MS; -76.01 G @ 51.04 MS

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
 LEFT BRAKE CALIPER X-AXIS ACCELERATION
 NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1

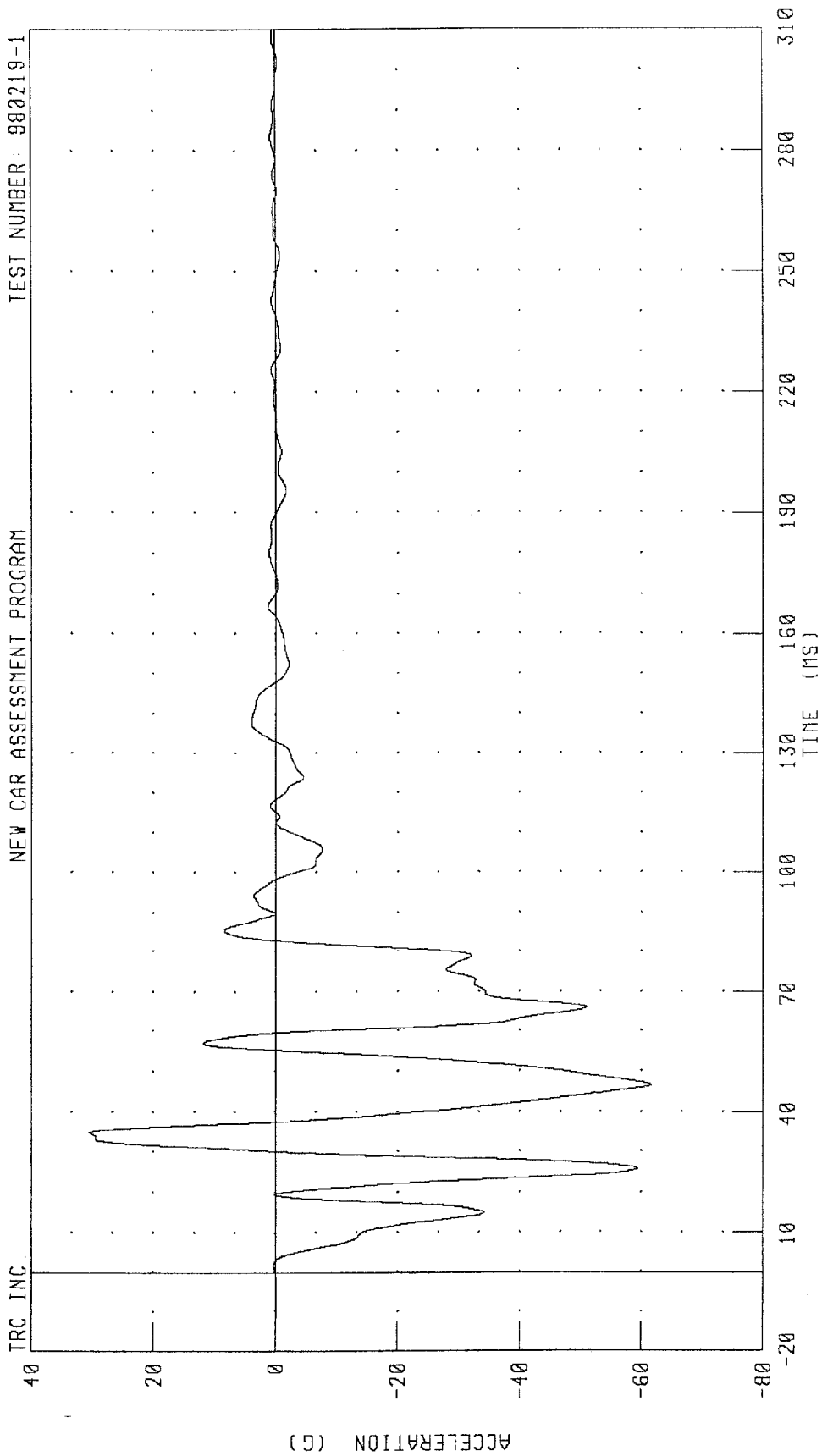


CHANNEL: BCLXG1 FILTER: CH. CLASS 60

1998 VOLVO S-70 SEDAN INTO FLAT FRONTAL BARRIER
INSTRUMENT PANEL CENTER X-AXIS ACCELERATION

NEW CAR ASSESSMENT PROGRAM

TEST NUMBER: 980219-1



CHANNEL: DPCXG1 FILTER: CH. CLASS 60

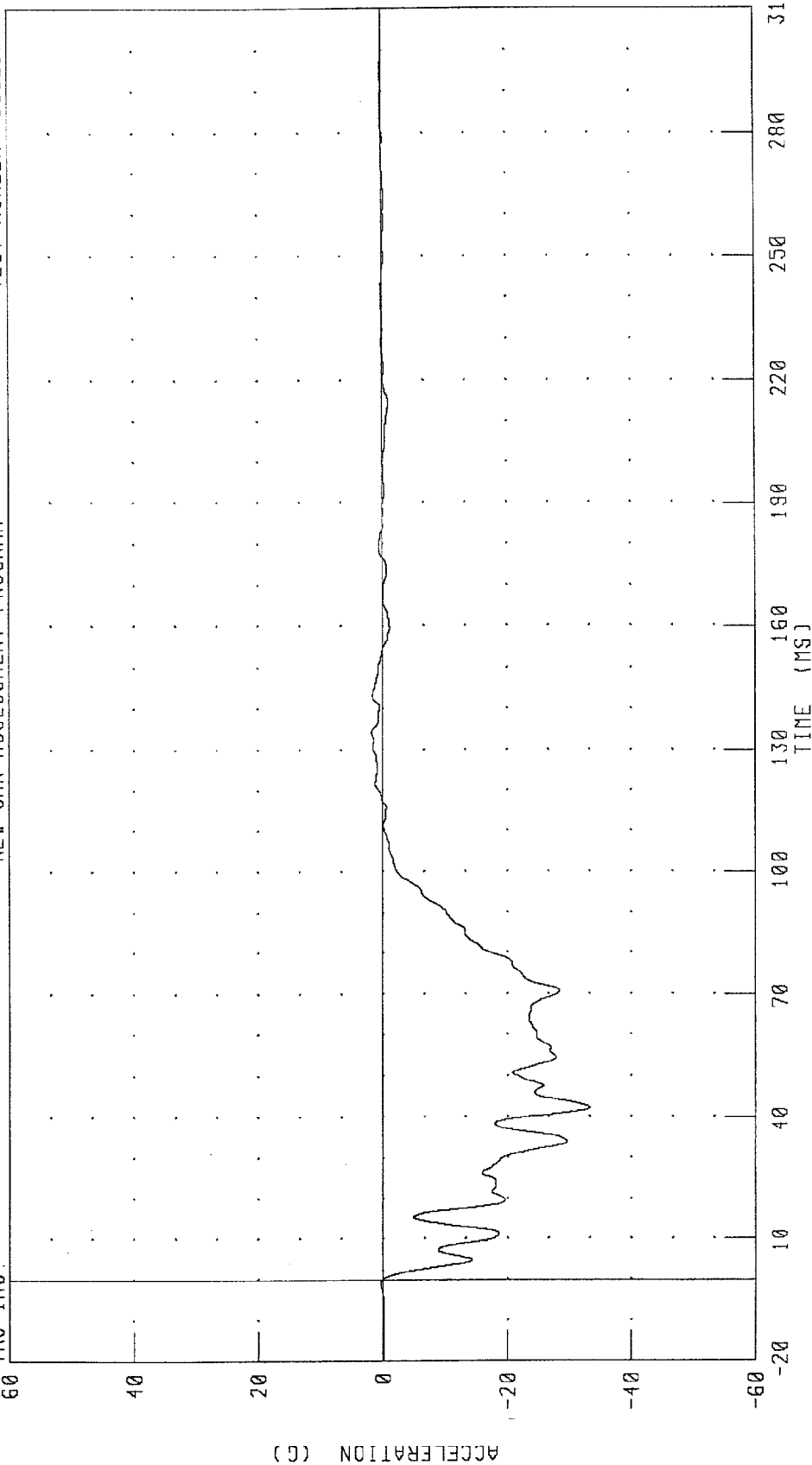
PEAK DATA: 30.39 G @ 34.88 MS; -61.61 G @ 46.56 MS

1998 CHEVROLET SILVERADO PICKUP INTO FLAT FRONTAL BARRIER
LEFT REAR SEAT REDUNDANT X-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: TLXGA FILTER: CH. CLASS 60

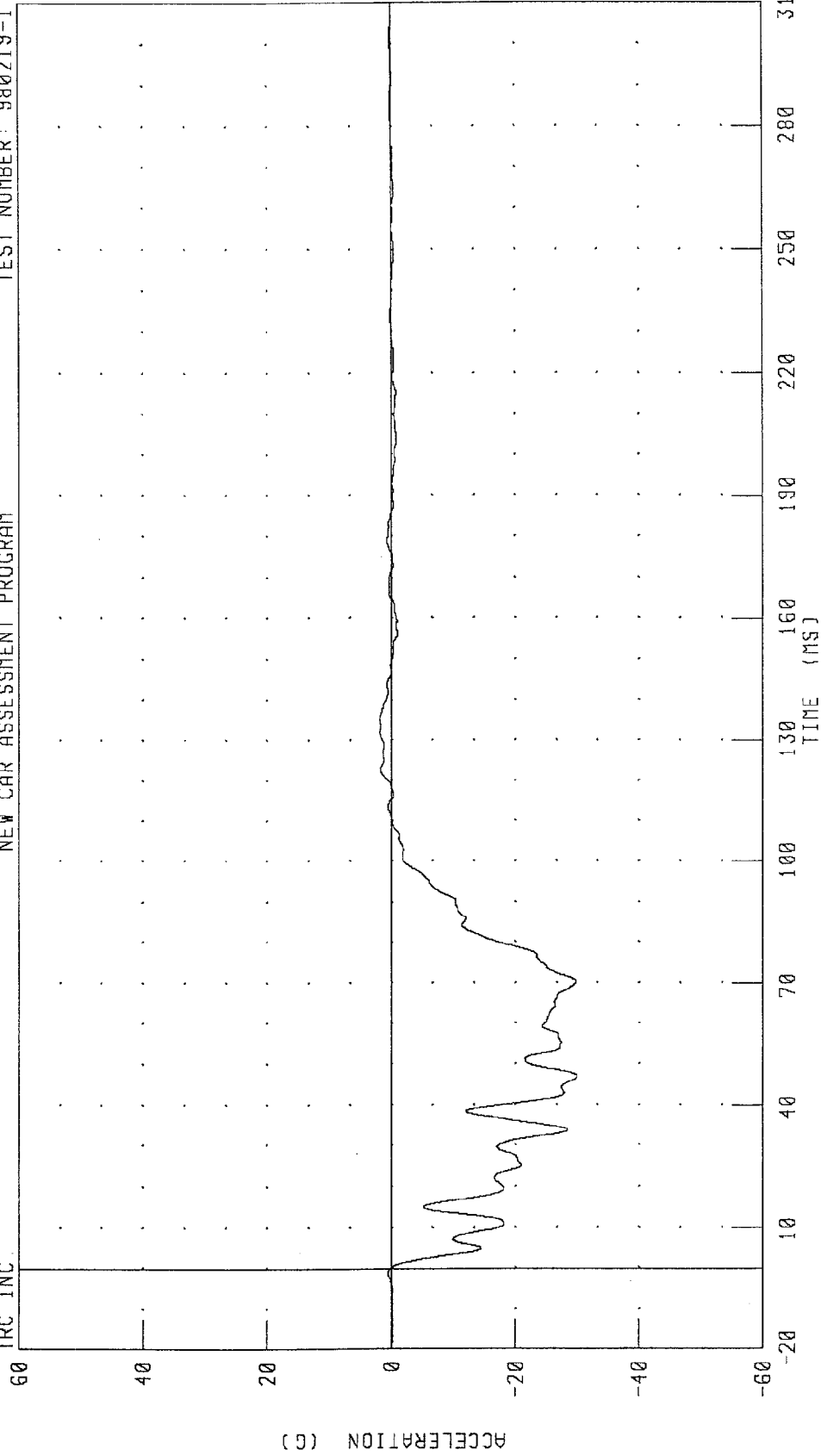
PEAK DATA: 1.80 G @ 134.32 MS, -33.30 G @ 42.24 MS

1998 CHEVROLET SILVERADO PICKUP INTO FLAT FRONTAL BARRIER
 RIGHT REAR SEAT REDUNDANT X-AXIS ACCELERATION

TEST NUMBER: 980219-1

NEW CAR ASSESSMENT PROGRAM

TRC INC.



CHANNEL: TRRXGA FILTER: CH. CLASS 60

Appendix C

Dummy Certification Data

Pre-test Certification Data

Driver Dummy S/N: 142

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III EXTERNAL DIMENSIONS

SN142 HUMANOID

07-02-98

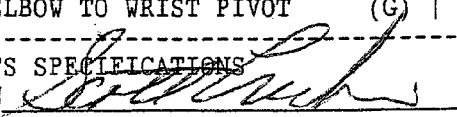
TRC INC.

TEST NO: 142C39ED1

572E SN142 EXT.DIMENSION CAL39

TEST PARAMETER	(DIMEN.)	SPECIFICATION	TEST RESULTS
LOCATION FOR CHEST CIRCUMFERENCE (AA)		429 - 434 MM	432. MM
LOCATION FOR WAIST CIRCUMFERENCE (BB)		226 - 231 MM	229. MM
CHEST CIRCUMFERENCE	(Y)	970 -1001 MM	983. MM
WAIST CIRCUMFERENCE	(Z)	836 - 866 MM	848. MM
CHEST DEPTH	(O)	213 - 229 MM	218. MM
H-POINT HEIGHT	(C)	84 - 89 MM	86. MM
H-POINT FROM SEATBACK	(D)	135 - 140 MM	137. MM
SKULL CAP TO BACKLINE	(H)	41 - 46 MM	43. MM
TOTAL SITTING HEIGHT	(A)	879 - 889 MM	879. MM
THIGH CLEARANCE	(F)	140 - 155 MM	152. MM
BUTTOCK KNEE LENGTH	(K)	579 - 605 MM	582. MM
BUTTOCK POPLITEAL LENGTH	(N)	452 - 478 MM	455. MM
POPLITEAL HEIGHT	(L)	429 - 455 MM	442. MM
KNEE PIVOT HEIGHT	(M)	485 - 500 MM	495. MM
FOOT LENGTH	(P)	252 - 267 MM	257. MM
FOOT BREADTH	(W)	91 - 107 MM	99. MM
SHOULDER PIVOT FROM BACKLINE	(E)	84 - 94 MM	91. MM
SHOULDER BREADTH	(V)	422 - 437 MM	432. MM
SHOULDER PIVOT HEIGHT	(B)	506 - 521 MM	513. MM
ELBOW REST HEIGHT	(J)	191 - 211 MM	198. MM
SHOULDER-ELBOW LENGTH	(I)	330 - 345 MM	338. MM
BACK OF ELBOW TO WRIST PIVOT	(G)	290 - 305 MM	292. MM

DUMMY MEETS SPECIFICATIONS

TECHNICIAN 

RUN NUMBER: 030298.0925

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

TRC INC.

TEST NO: 142C39HD1

572E SN142 HEAD DROP CAL 39

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	247.80 G
PEAK LATERAL ACCELERATION	15 G MAX	-6.55 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN

John K. Clunette

RUN NUMBER: 020798.0917;1

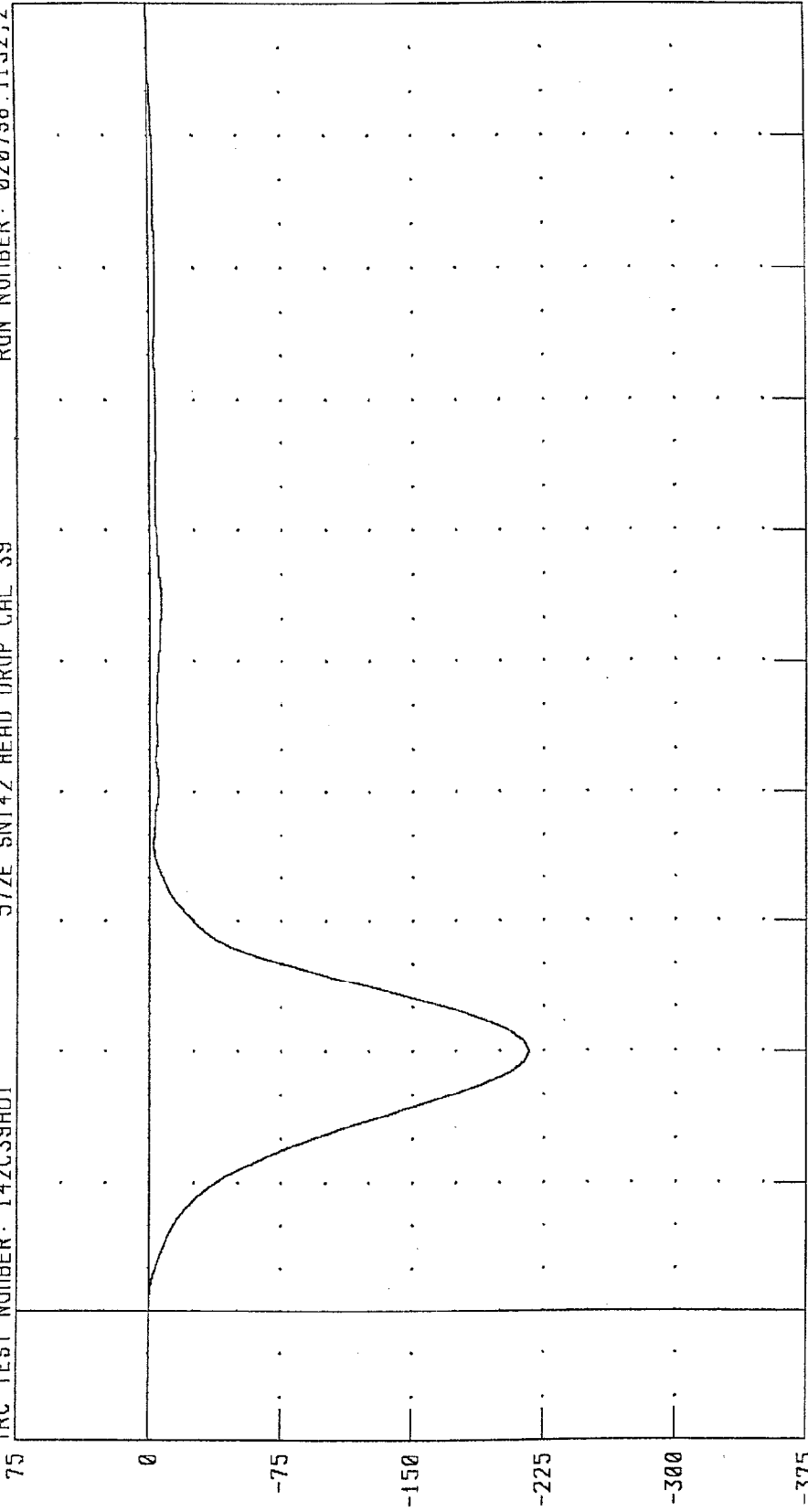
PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION X AXIS

572E SN142 HEAD DROP CAL 39

RUN NUMBER: 020798.1132;2

TRC TEST NUMBER: 142C39HD1



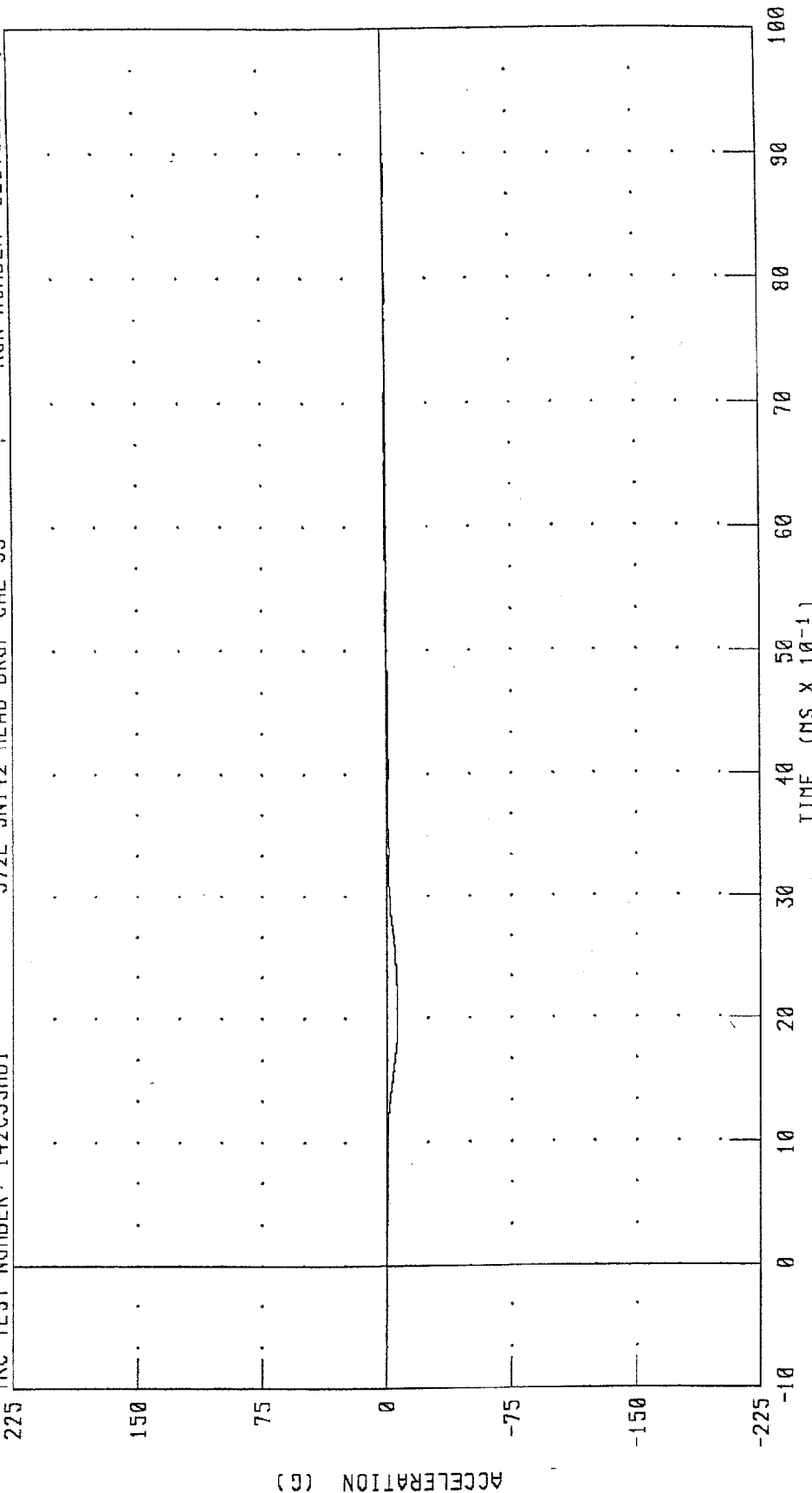
PEAK DATA: 0.05 G @ 0.00 MS; -216.81 G @ 2.00 MS

FILTER: CH CLASS 1000

CHANNEL: HEDXG

PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS

TRC TEST NUMBER: 142C39HD1 572E SNI42 HEAD DROP CAL 39 RUN NUMBER: 020798.1132,2

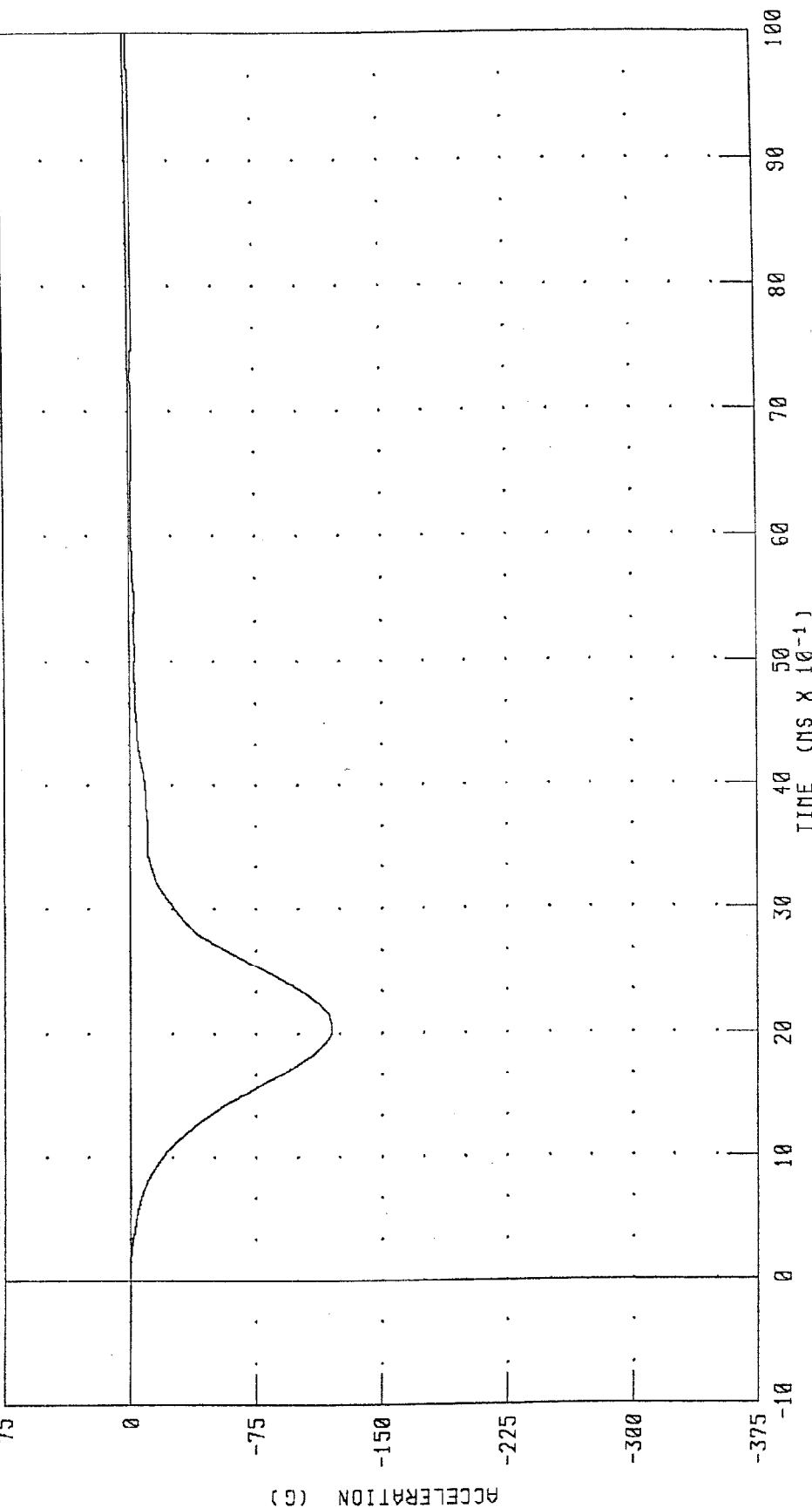


CHANNEL: HEDYG FILTER: CH. CLASS 1000 PEAK DATA: 0.75 G @ 5.36 MS; -6.56 G @ 2.08 MS

PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Z AXIS

TRC TEST NUMBER: 142C39HD1 572E SN142 HEAD DROP CAL 39 RUN NUMBER: 020798.1132;2



CHANNEL: HEDZG FILTER: CH. CLASS 1000

PEAK DATA: 0.10 G @ 0.08 MS; -120.43 G @ 2.08 MS

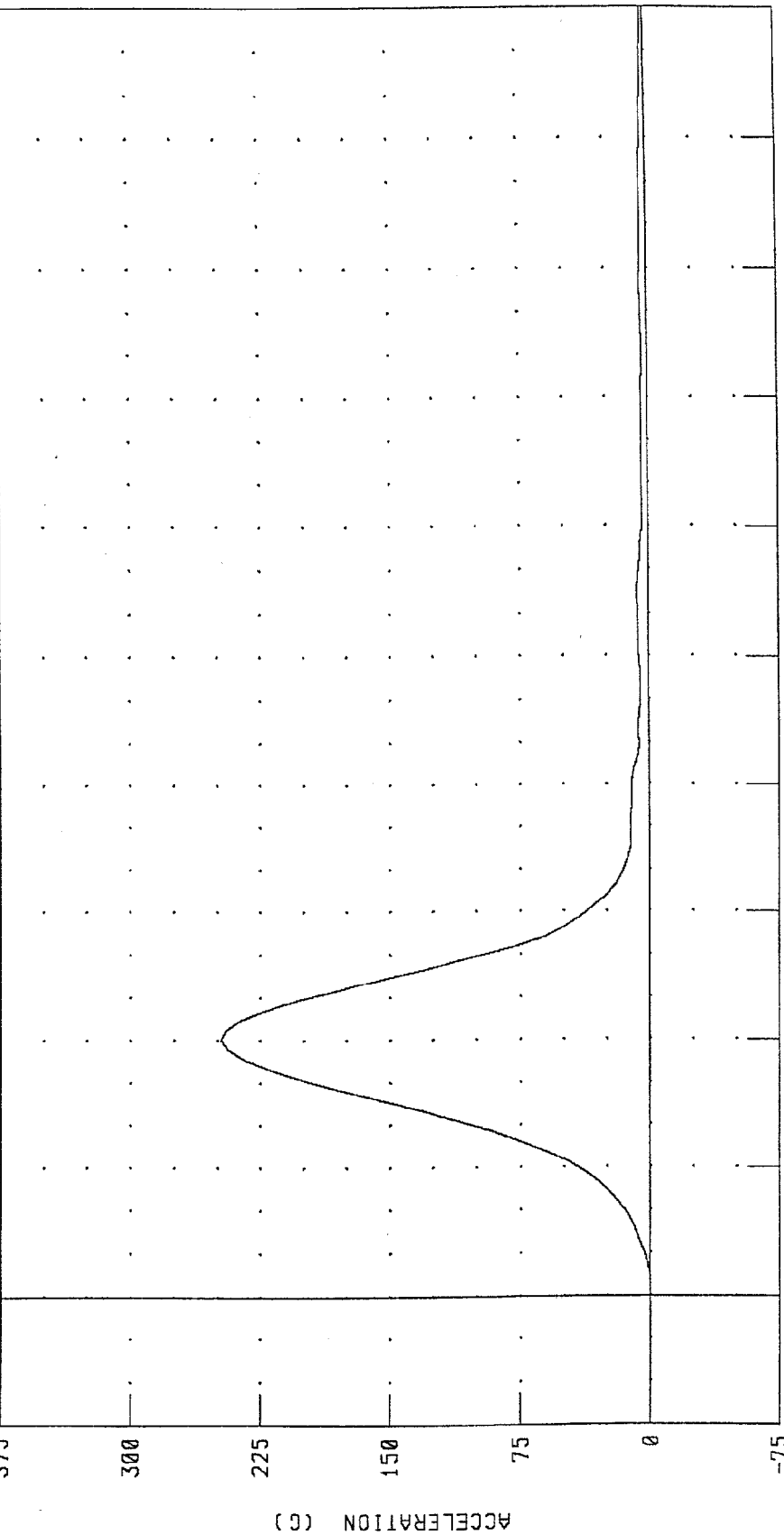
PART 572-E HYBRID III HEAD CALIBRATION

HEAD RESULTANT ACCELERATION

TRC TEST NUMBER: 142C39HD1

572E SN142 HEAD DROP CAL 39

RUN NUMBER: 020798.1132.2



CHANNEL: HEDRG FILTER: CH. CLASS 1000 PEAK DATA: 247.80 G @ 2.00 MS; 0.05 G @ -0.08 MS

TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

TRC INC.

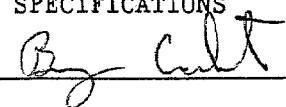
TEST NO: 142C39NF4

572E SN142 NECK FLEXION CAL39

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	37.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	7.06 M/S
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	22.50 G
	20 MS	17.60 - 22.60 G	21.59 G
	30 MS	12.50 - 18.50 G	17.89 G
MAX PENDULUM G		29 G MAX	22.56 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	17.82 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	39.20 MS
D PLANE	MAX	64 - 78 DEG.	73.58 DEG.
ROTATION	TIME	57 - 64 MS	60.48 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88.2 - 108.5 NM	98.54 NM
	TIME	47 - 58 MS	53.28 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	117.60 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	102.80 MS

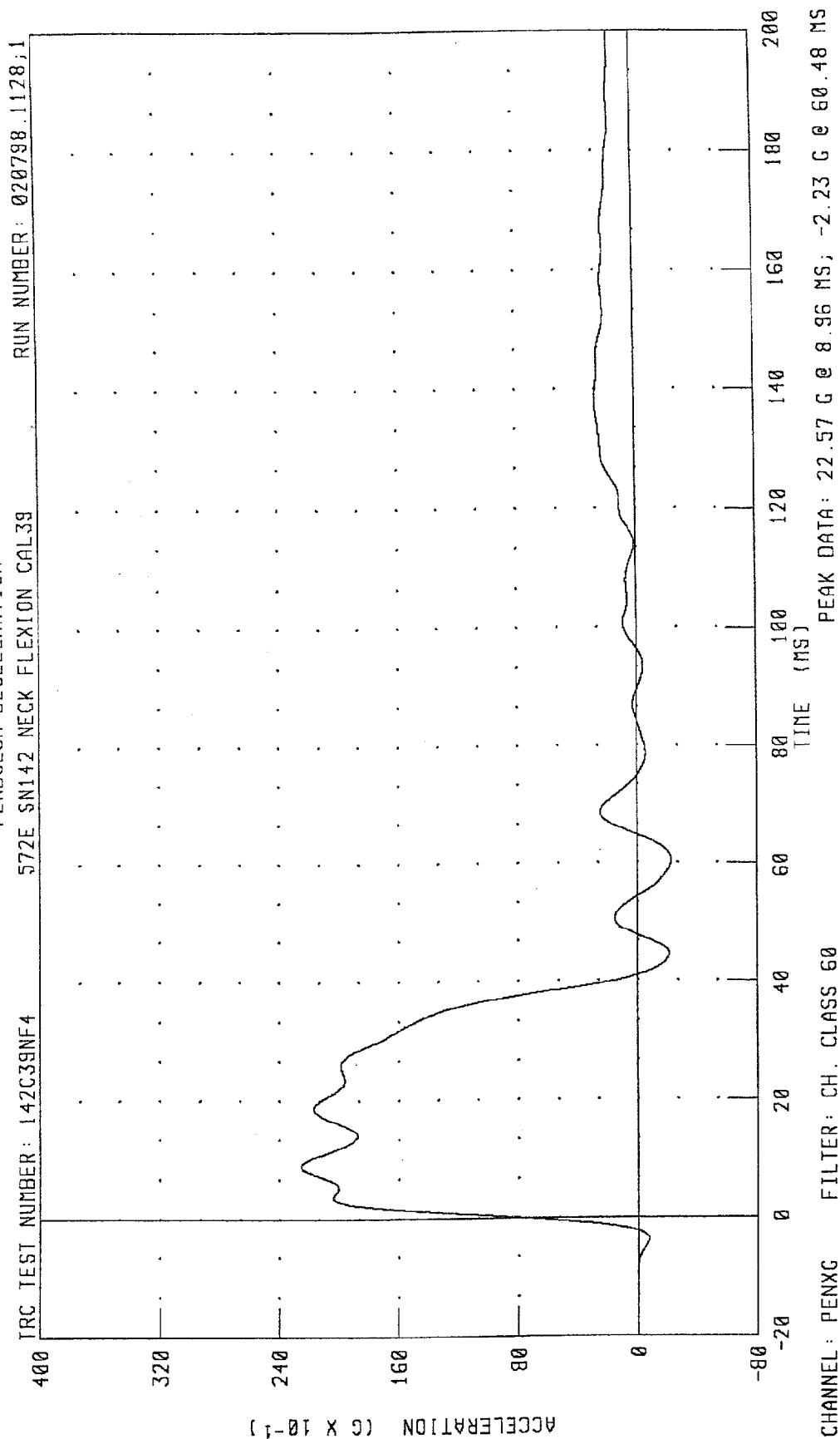
TEST MEETS SPECIFICATIONS

TECHNICIAN



RUN NUMBER: 020798.1148;2

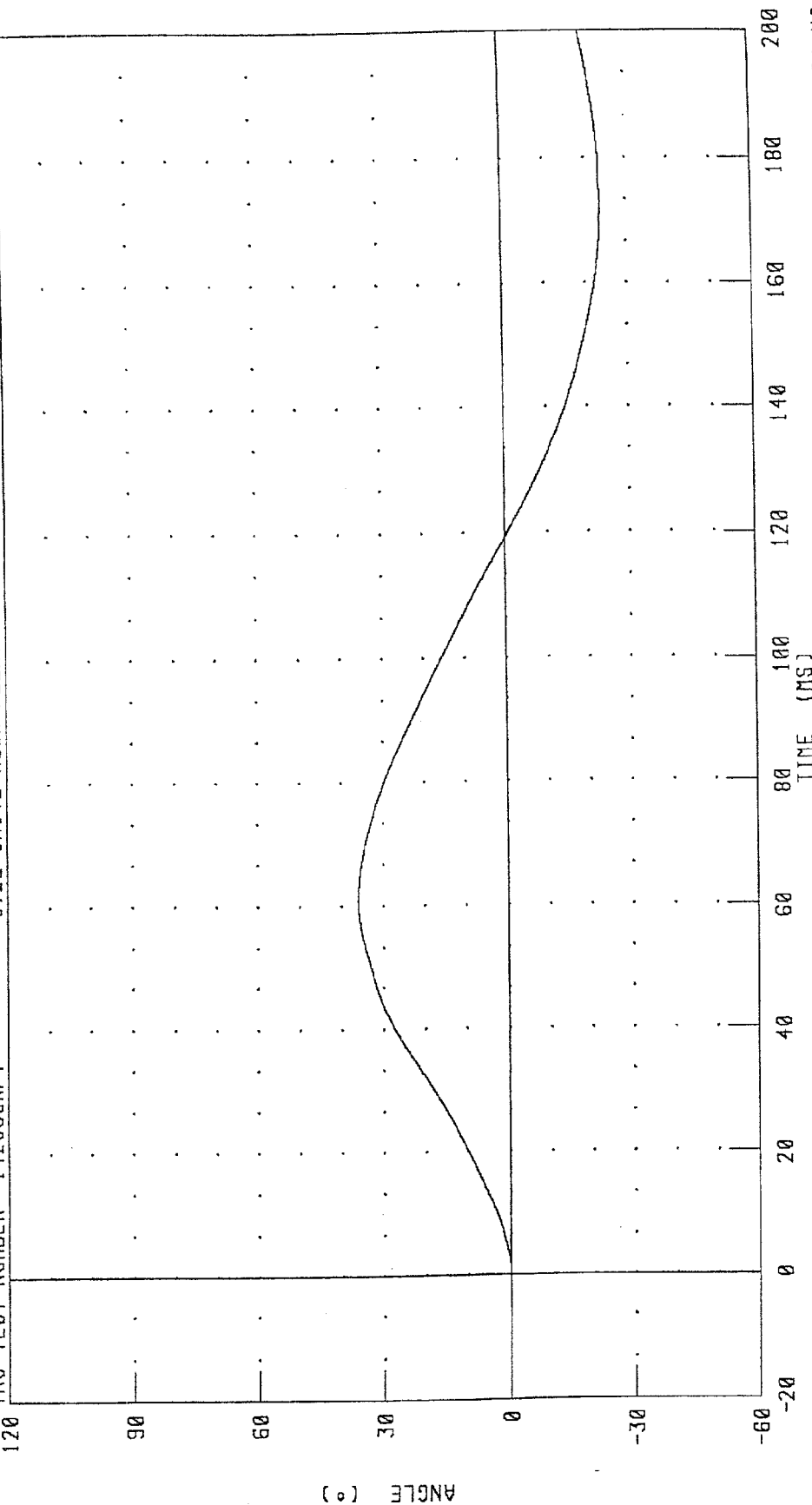
PART 572-E HYBRID III NECK FLEXION CALIBRATION
 PENDULUM DECELERATION



PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 142C39NF4 572E SN142 NECK FLEXION CAL39 RUN NUMBER: 020798.1128;1

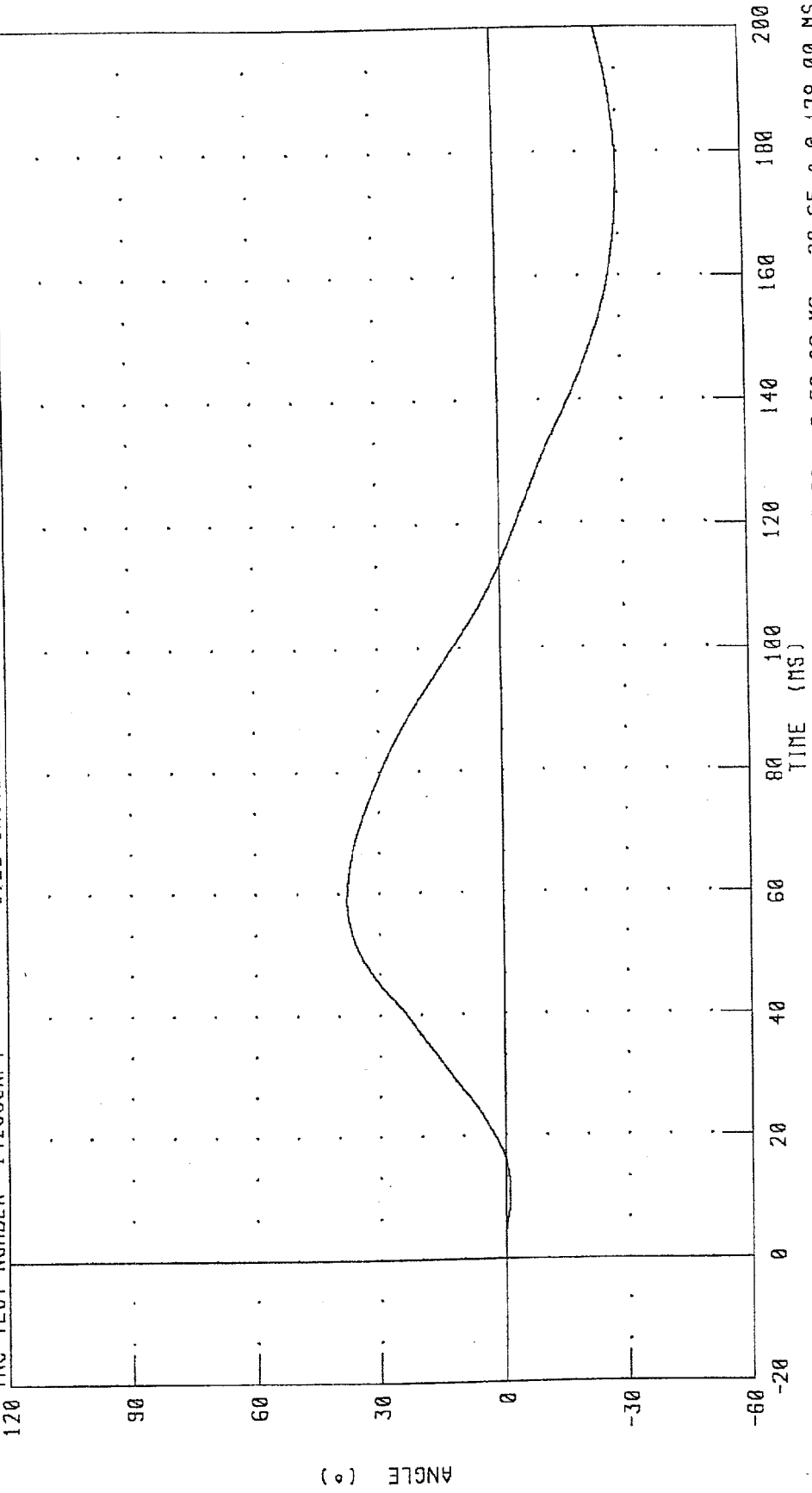


CHANNEL: BETA FILTER: CH. CLASS 60 PEAK DATA: 35.87 ° @ 61.04 MS; -23.72 ° @ 173.04 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT OCCIPITAL CONDYLE

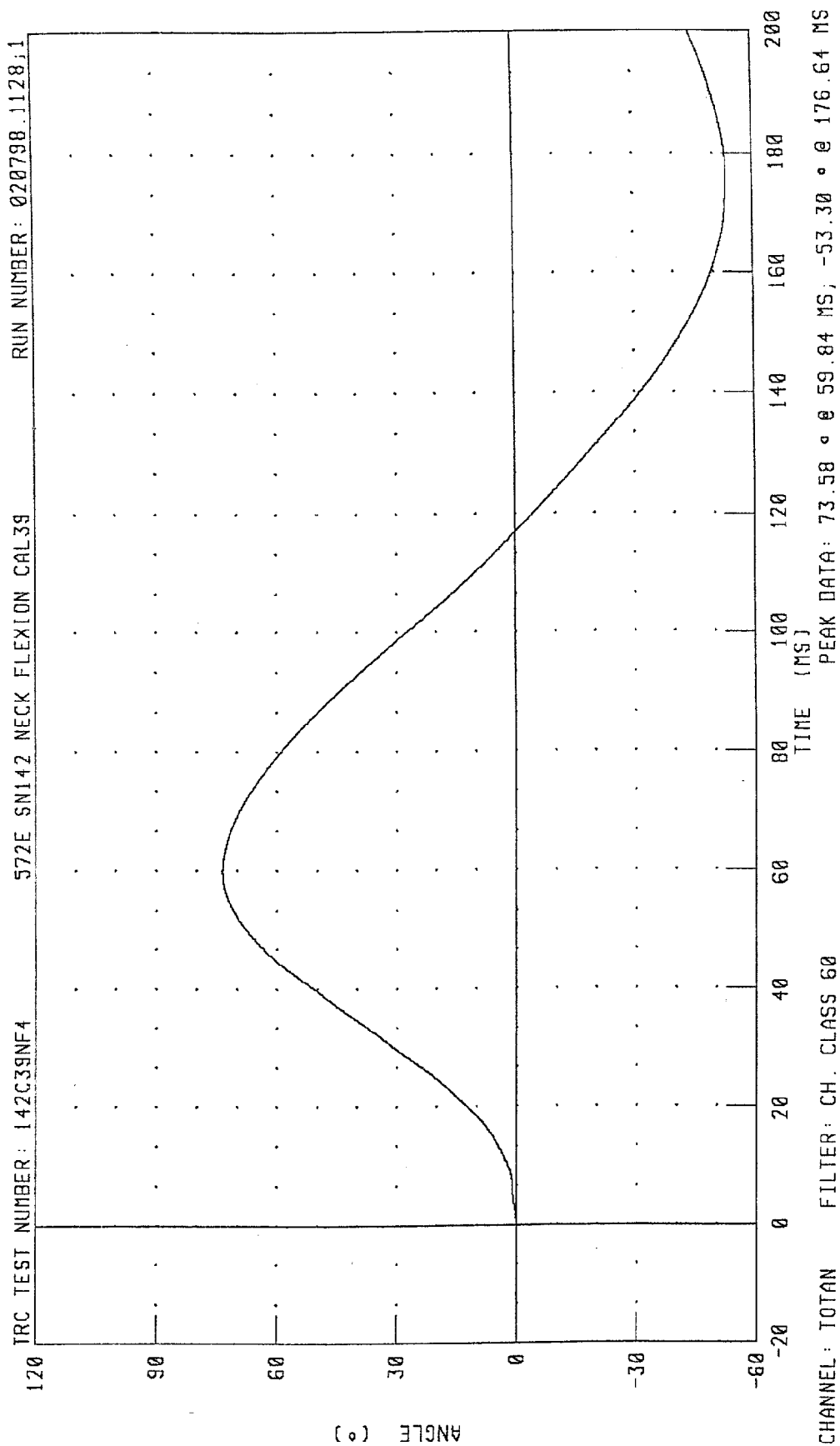
TRC TEST NUMBER: 142C39NF4 572E SN142 NECK FLEXION CAL39 RUN NUMBER: 020798.1128.1



CHANNEL: THETA FILTER: CH. CLASS 60 PEAK DATA: 37.80 ° @ 58.80 MS; -29.65 ° @ 178.00 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION



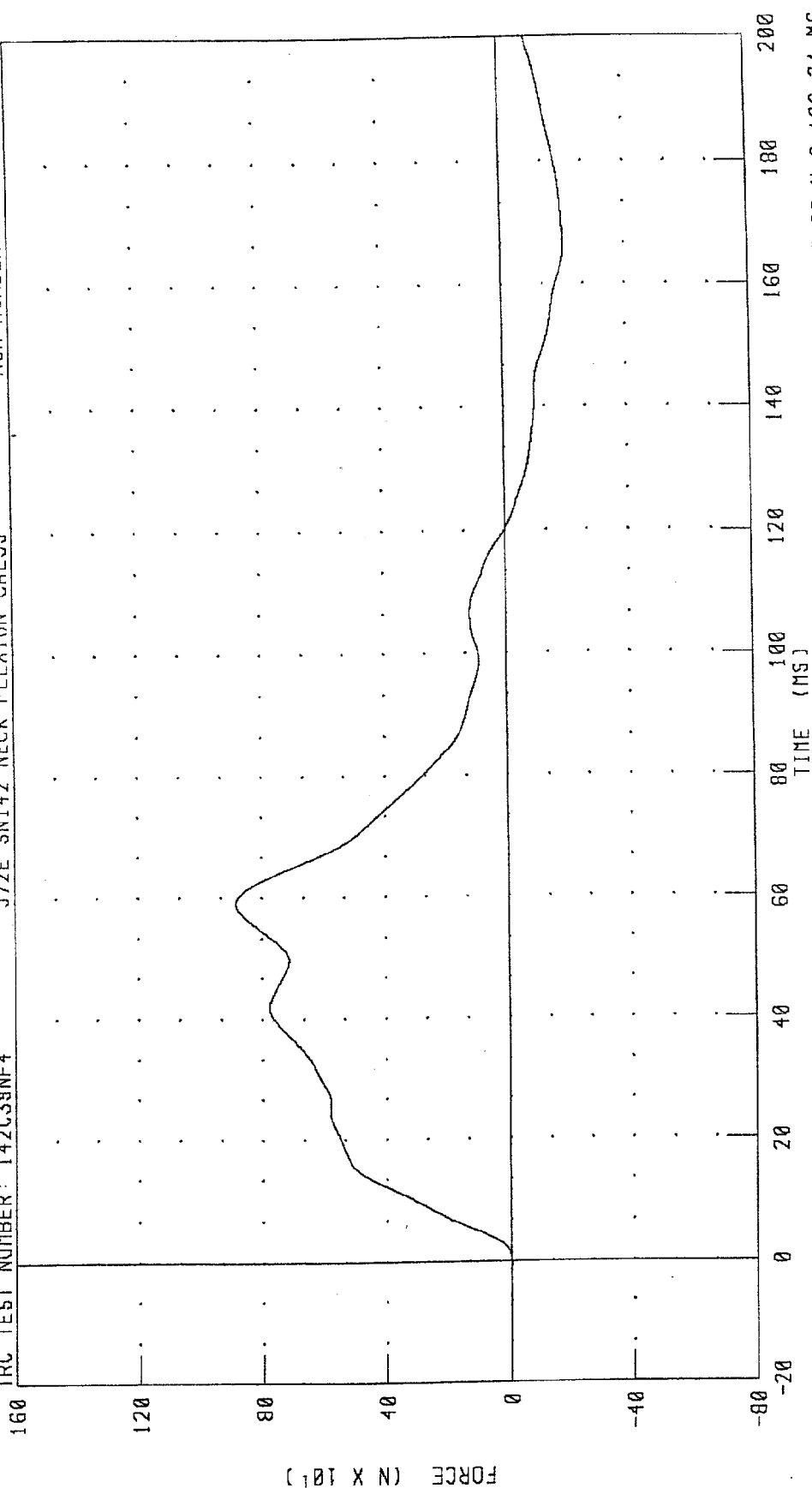
PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 142C39NF4

572E SN142 NECK FLEXION CAL39

RUN NUMBER: 020798.1128.1



CHANNEL: NEKXF FILTER: CH. CLASS 60

PEAK DATA: 883.70 N @ 58.96 MS; -203.80 N @ 166.24 MS

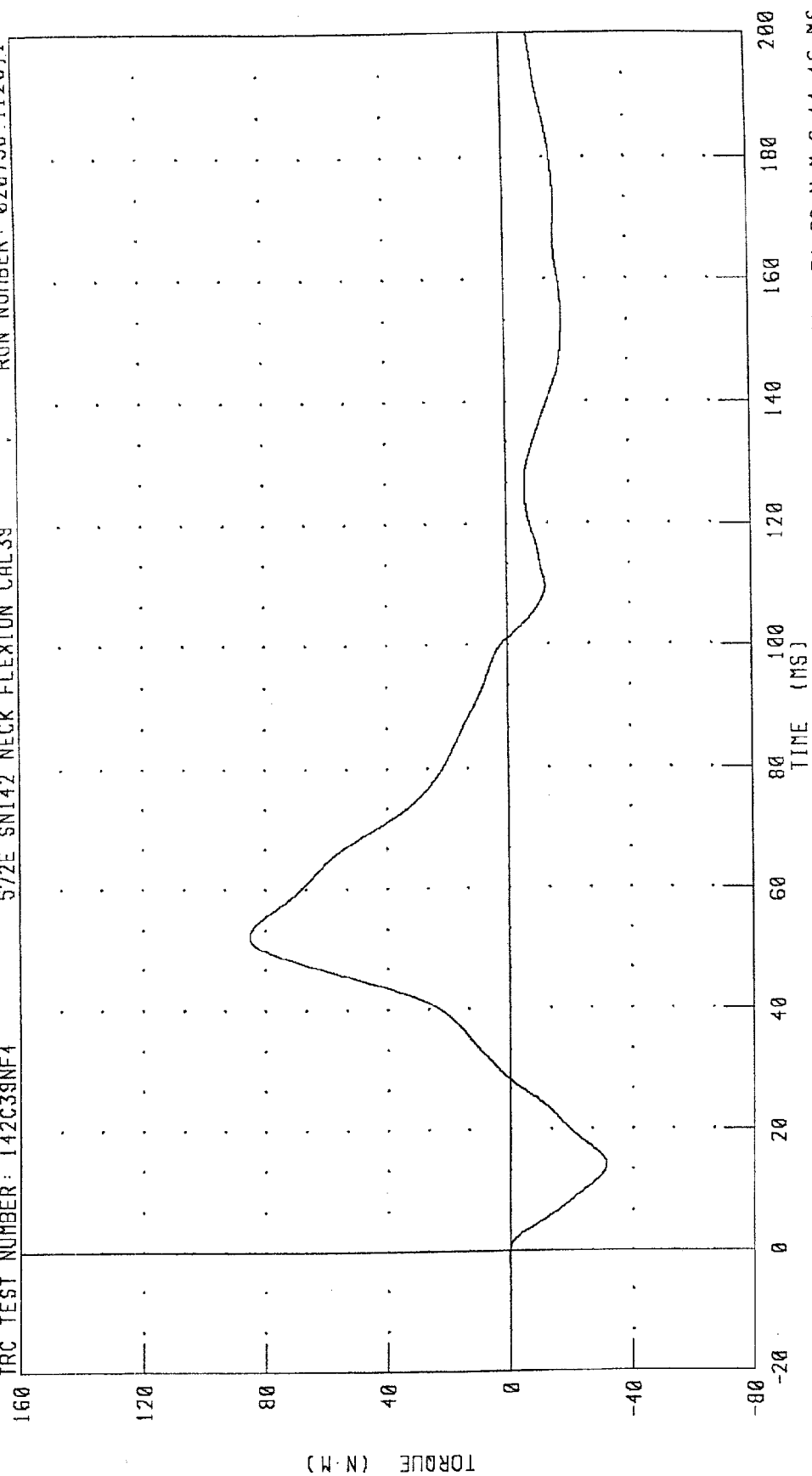
PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER: 142C39NF4

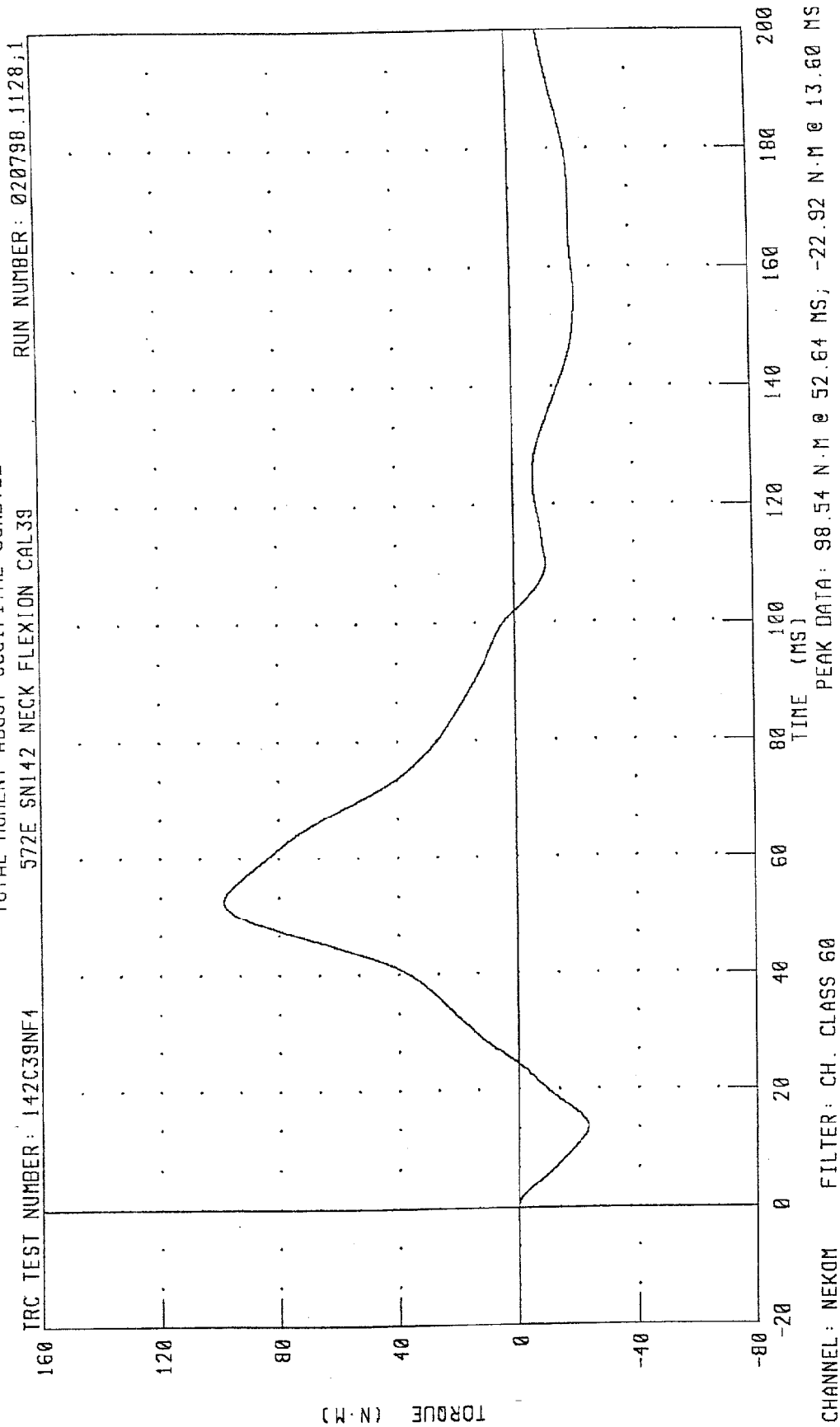
572E SNI42 NECK FLEXION CAL39

RUN NUMBER: 020798.1128;1



CHANNEL: NEKYM FILTER: CH. CLASS 60 PEAK DATA: 85.20 N.M @ 52.32 MS; -31.22 N.M @ 14.16 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE



TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 142C39NE3 572E SN142 NECK EXT. CAL39

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6 - 22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	37.0 %
IMPACT VELOCITY		5.95 - 6.19 M/S	6.00 M/S
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.40 G
	20 MS	14.00 - 19.00 G	16.96 G
	30 MS	11.00 - 16.00 G	15.43 G
MAX PENDULUM G		22 G MAX	17.75 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	15.41 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	40.56 MS
D PLANE	MAX	81 - 106 DEG.	93.11 DEG.
ROTATION	TIME	72 - 82 MS	75.60 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-80.0/-52.9 NM	-68.48 NM
	TIME	65 - 79 MS	70.48 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	153.60 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	138.80 MS

TEST MEETS SPECIFICATIONS

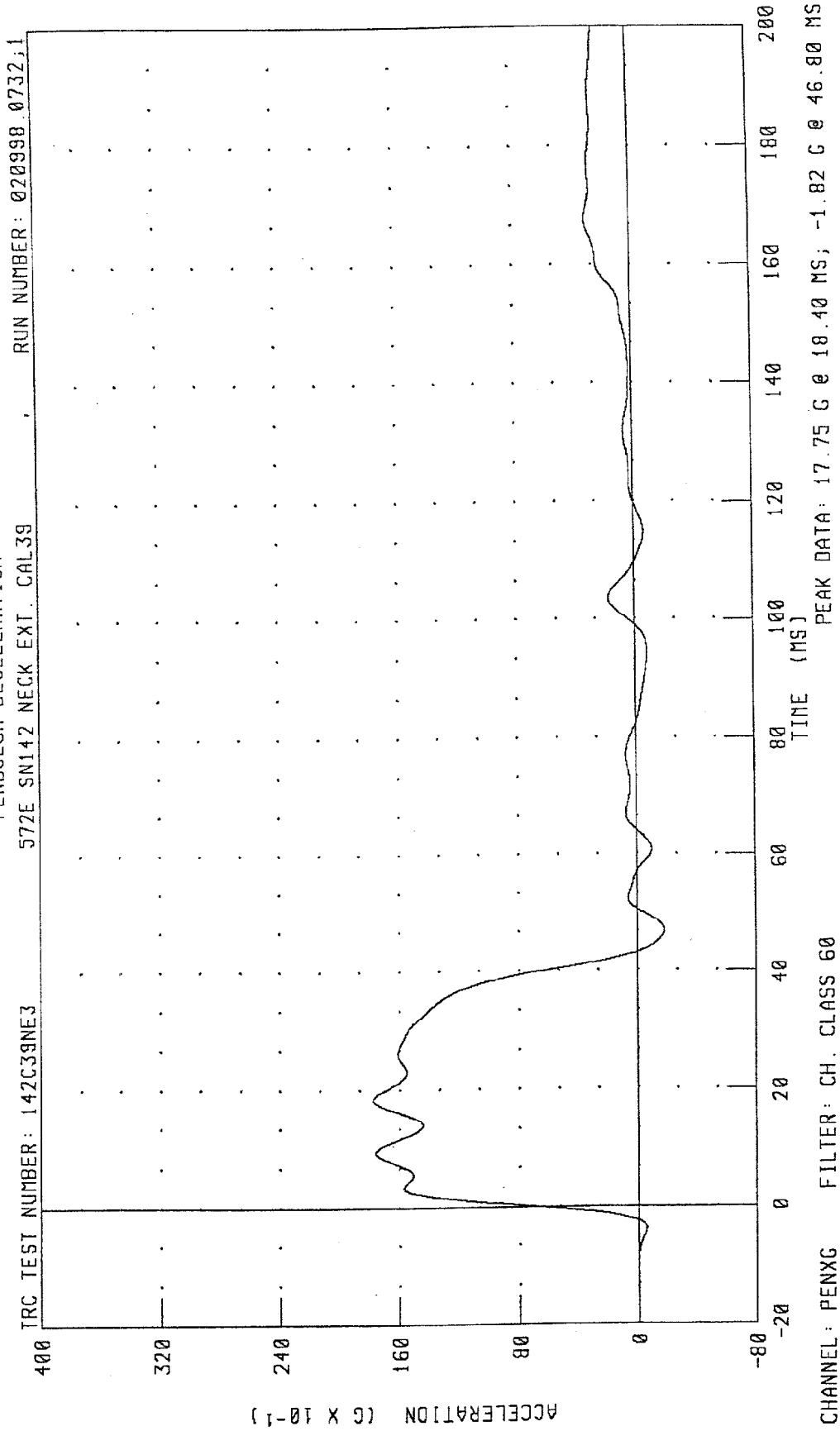
TECHNICIAN

By [Signature]

RUN NUMBER: 020998.0731;1

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

PENDULUM DECELERATION



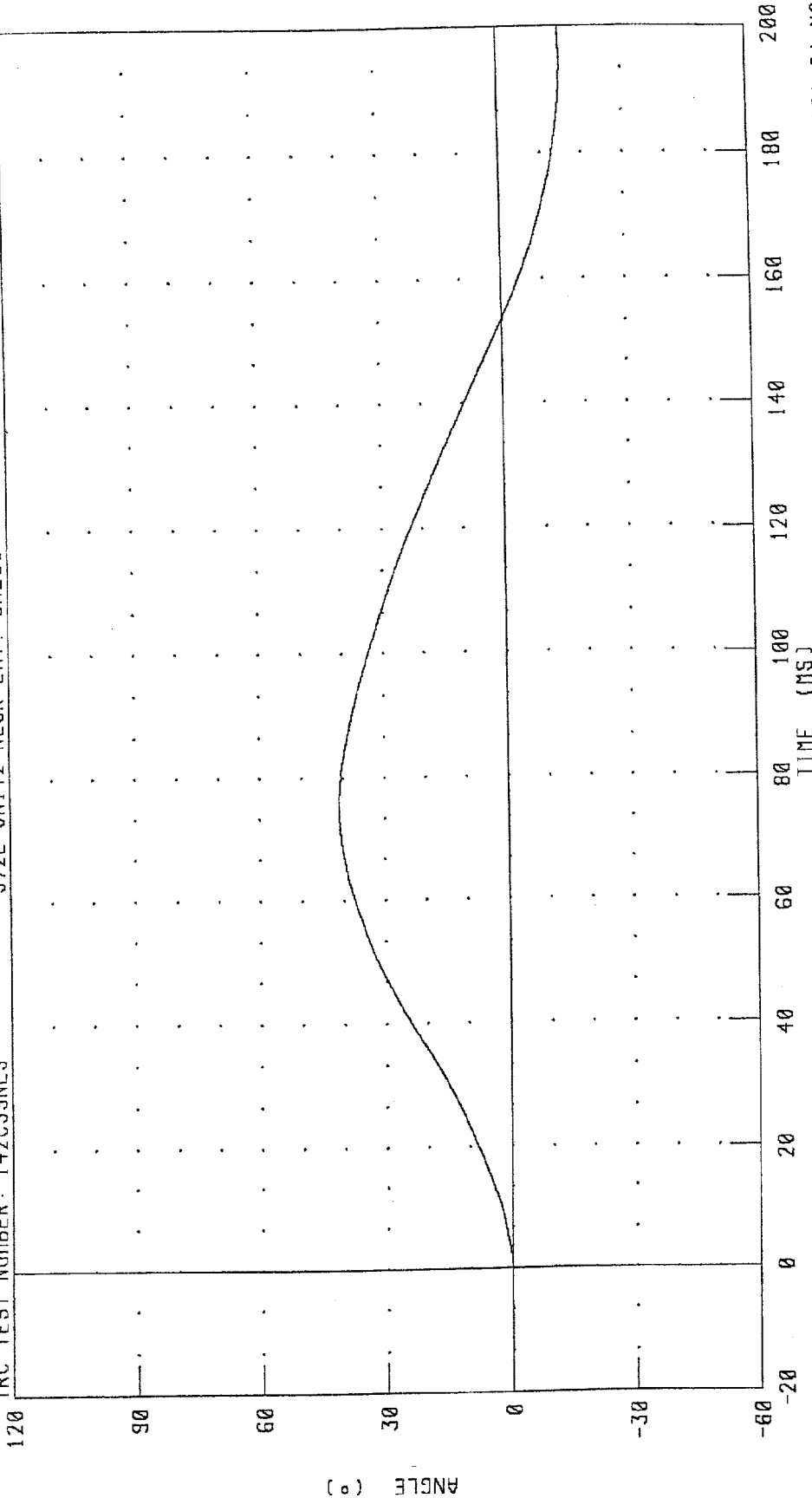
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

ROTATION ABOUT BASE OF NECK

572E SN142 NECK EXT. CAL39

TRC TEST NUMBER: 142C39NE3

RUN NUMBER: 020998.0732;1



PEAK DATA: 40.90 ° @ 75.12 MS, -15.11 ° @ 194.64 MS

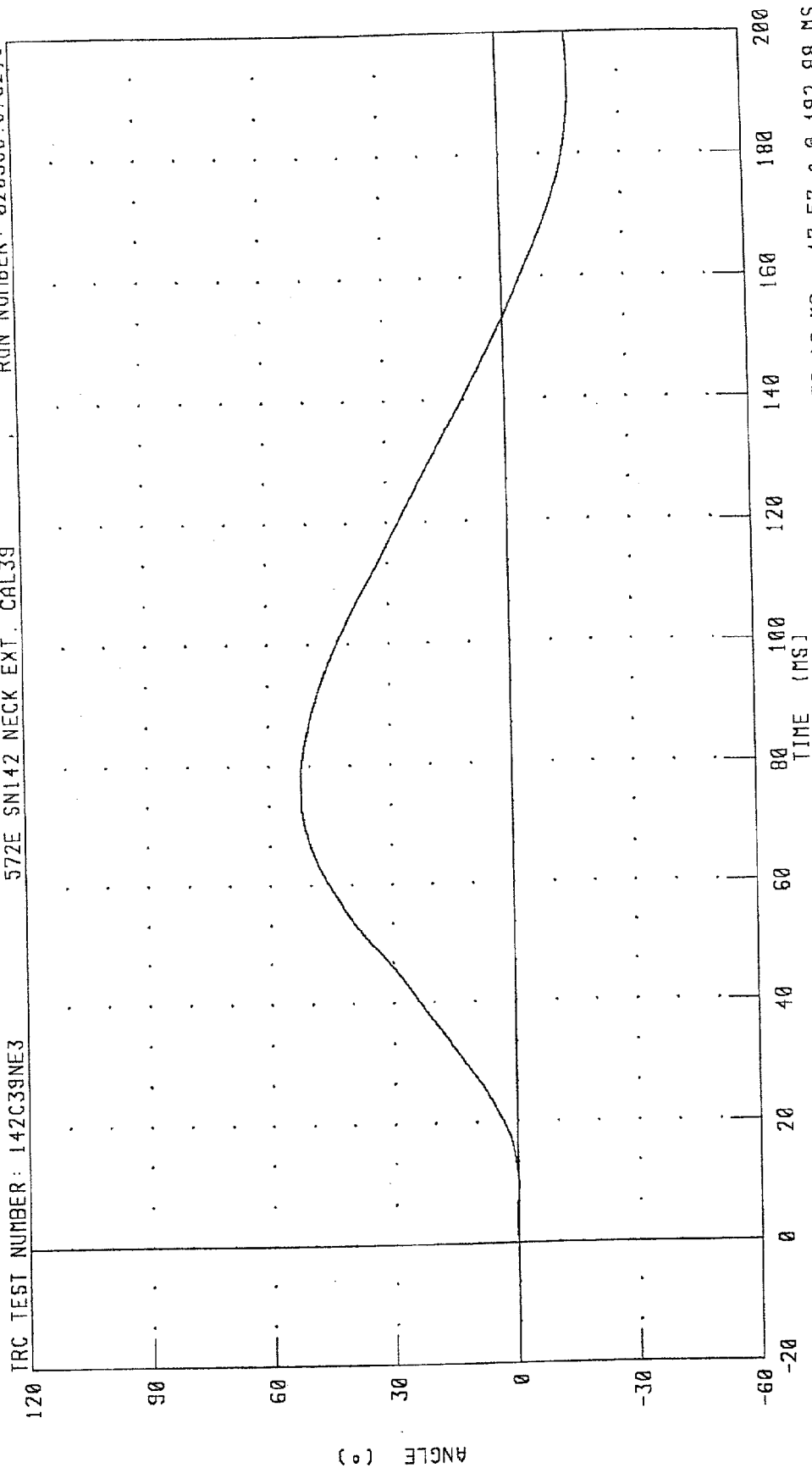
CHANNEL: BETA FILTER: CH. CLASS 60

ANGLE (°)

TIME (MS)

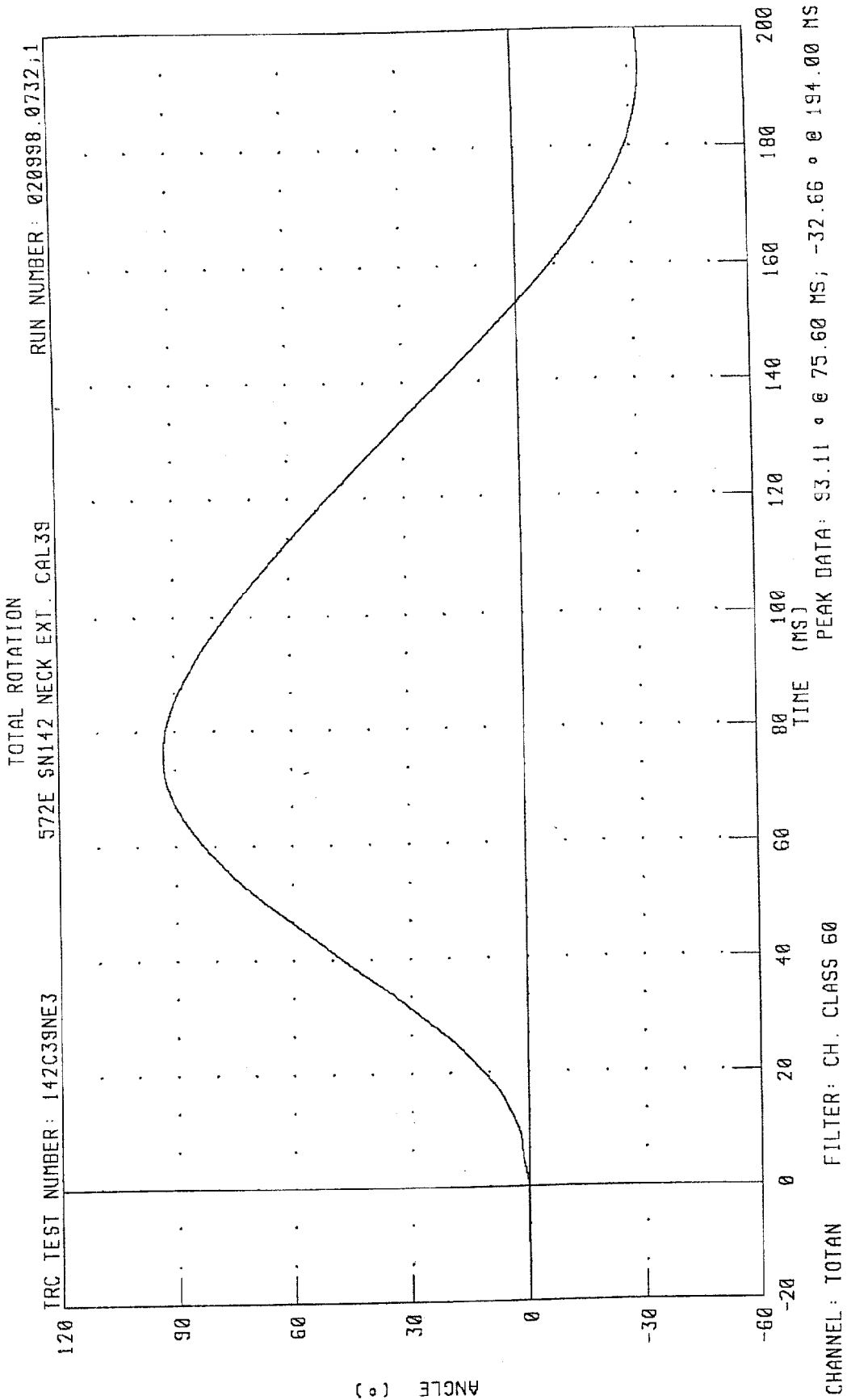
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
 ROTATION ABOUT OCCIPITAL CONDULE

TRC TEST NUMBER: 142C39NE3 572E SN142 NECK EXT. CAL39 RUN NUMBER: 020998.0732;1



CHANNEL: THETA FILTER: CH. CLASS 60

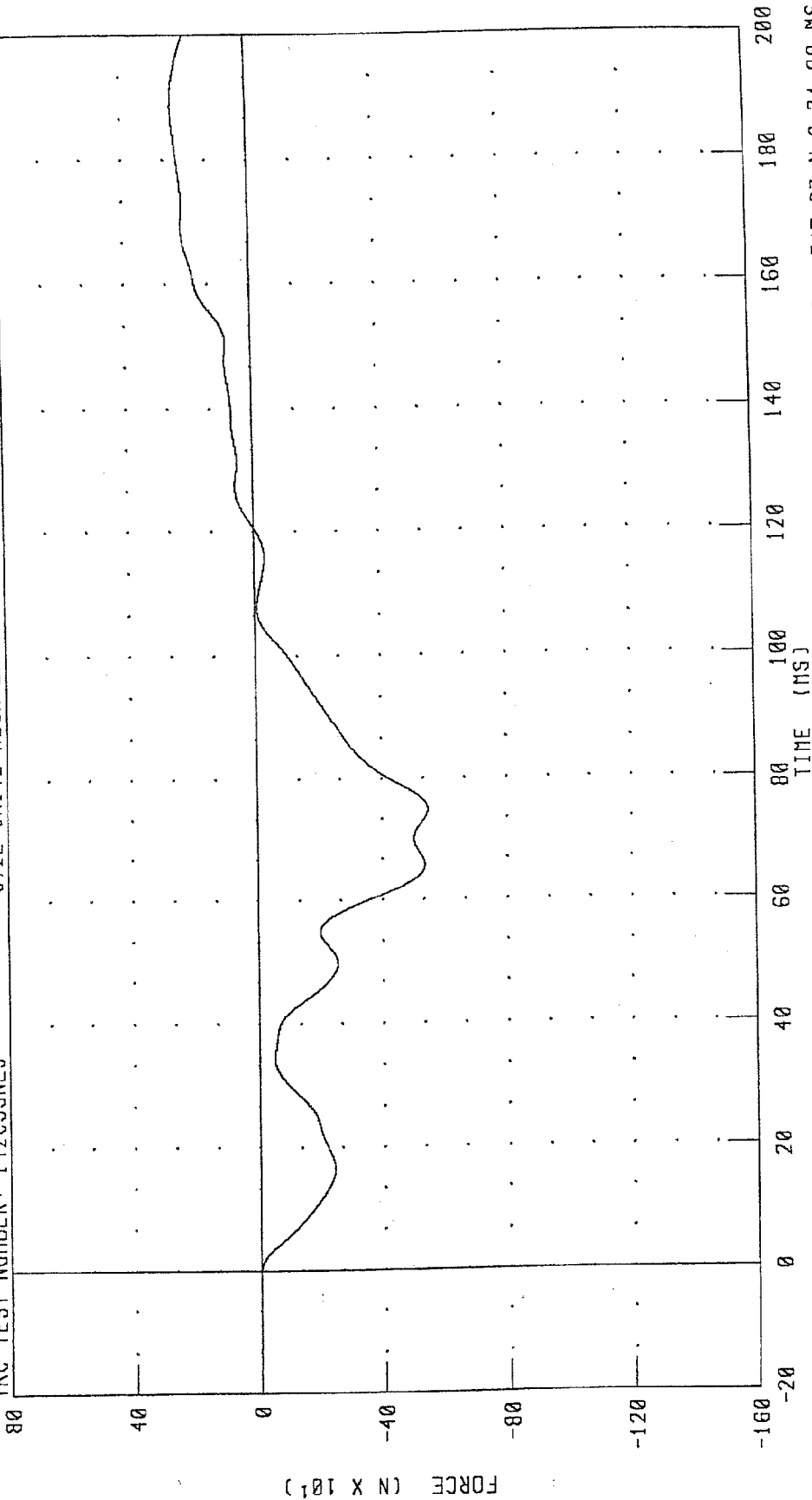
PART 572-E HYBRID III NECK EXTENSION CALIBRATION



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 142C39NE3 572E SNI42 NECK EXT. CAL39 RUN NUMBER: 020998.0732;1

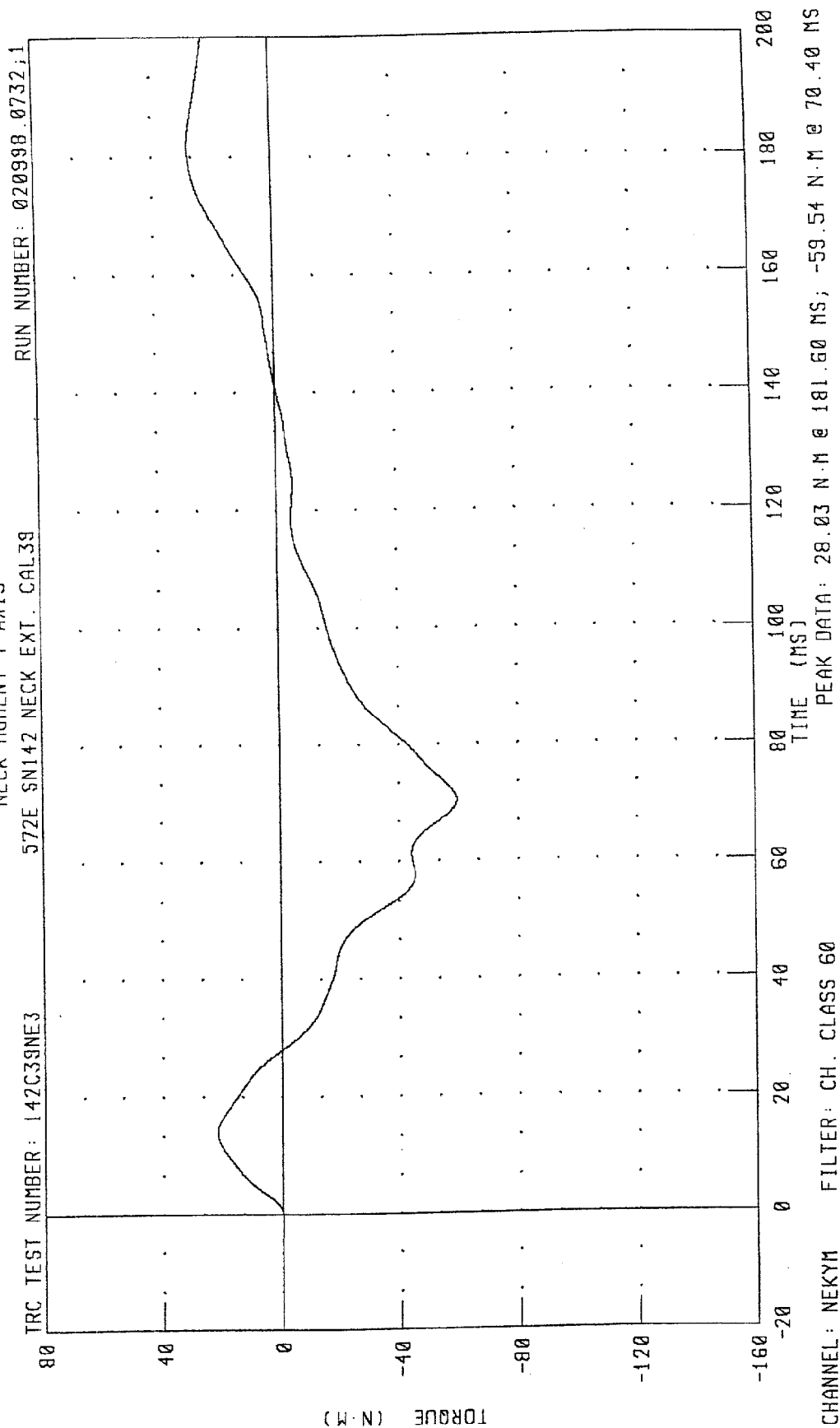


CHANNEL: NEKXF FILTER: CH. CLASS 60

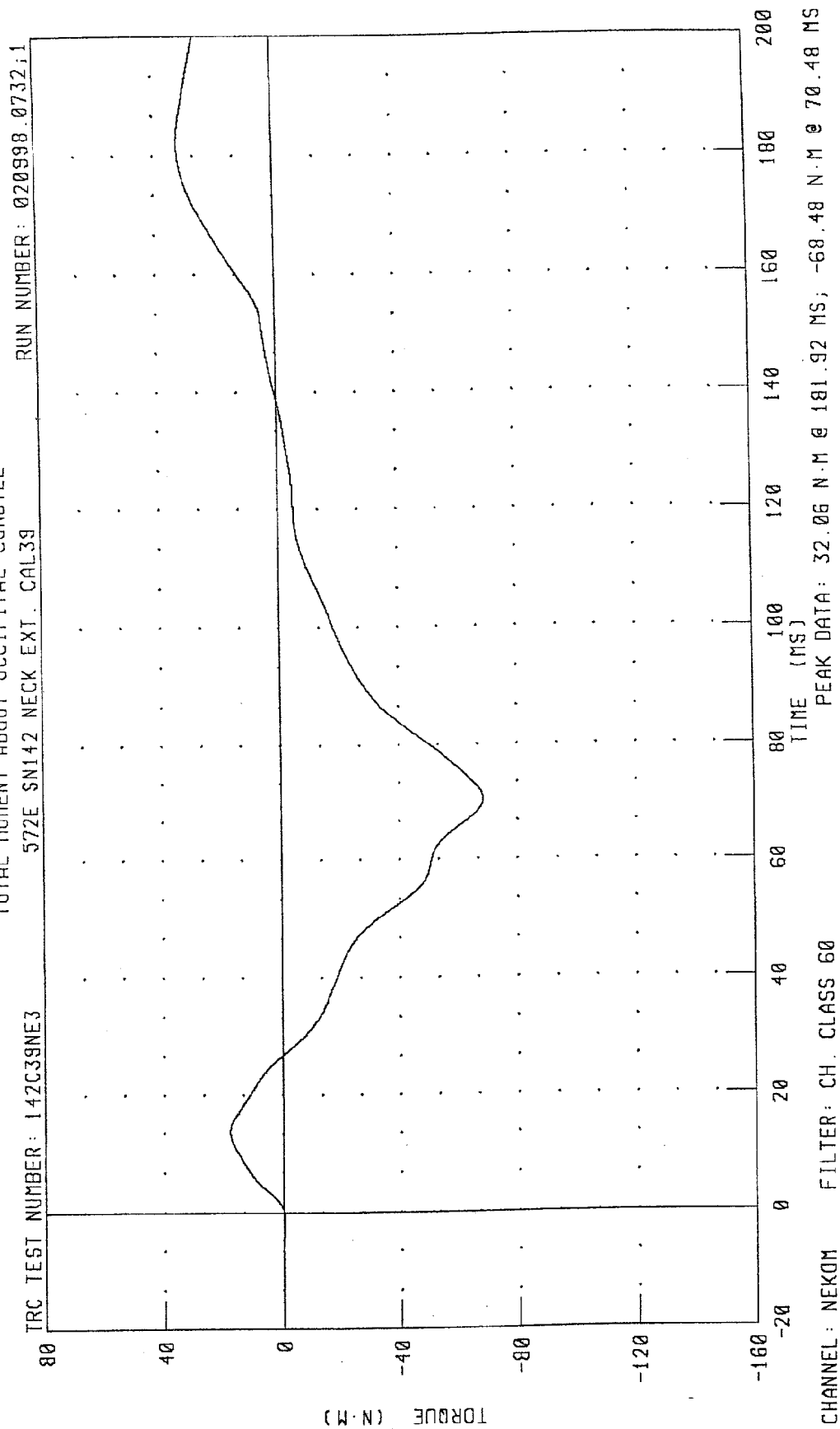
PEAK DATA: 238.67 N @ 188.72 MS; -547.83 N @ 74.88 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK MOMENT Y AXIS



PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE



TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

TRC INC.

TEST NO: 142C39TH1

572E SN142 H.S.THORAX CAL39

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.71 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	72.5 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5670. N
INTERNAL HYSTERESIS	69% - 85%	70.9%

TEST MEETS SPECIFICATIONS

TECHNICIAN

By C. A.

RUN NUMBER: 020998.1022;1

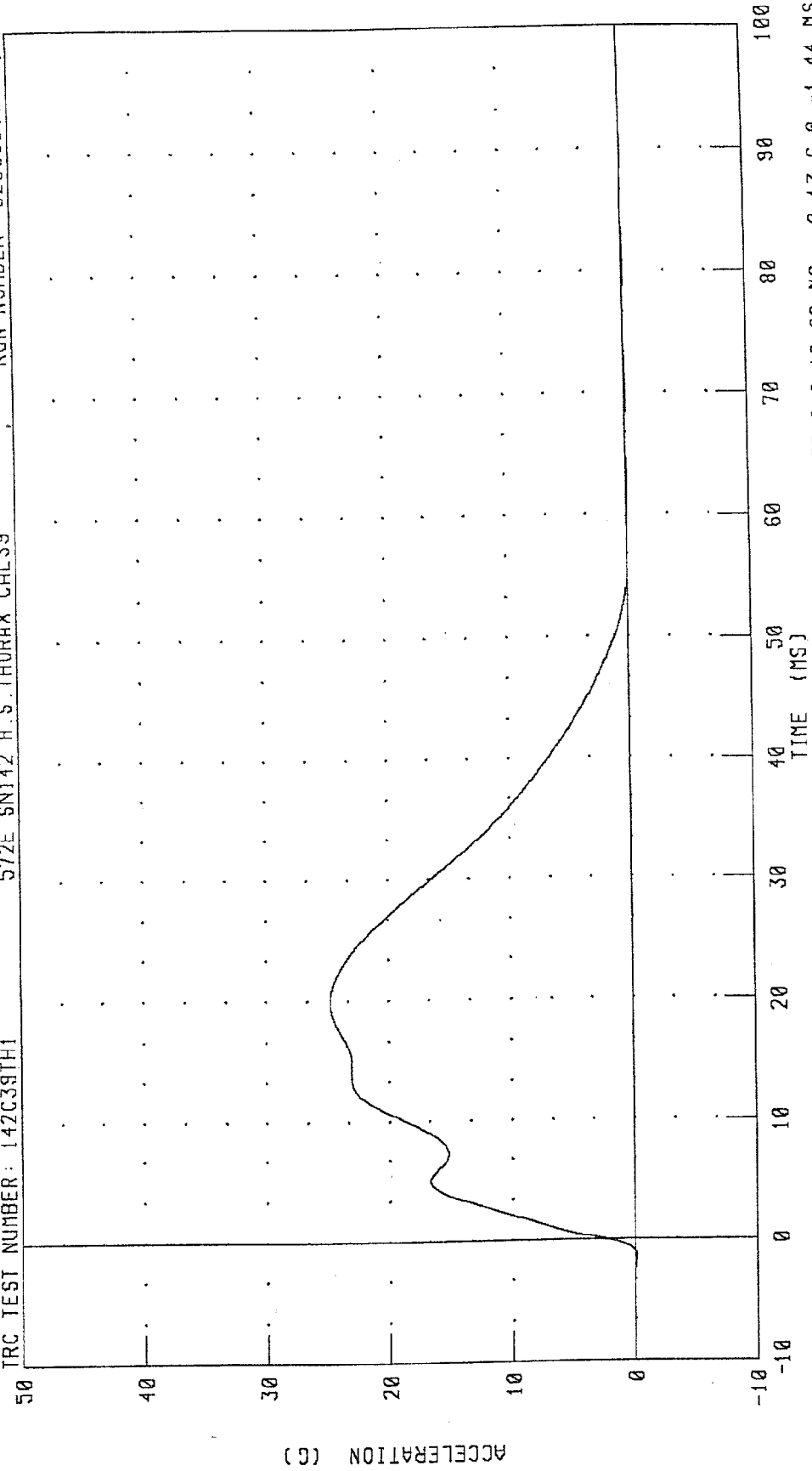
PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 142C39TH1

572E SN142 H.S. THORAX CAL39

RUN NUMBER: 020998.1023;1



CHANNEL: PENXC FILTER: CH. CLASS 180

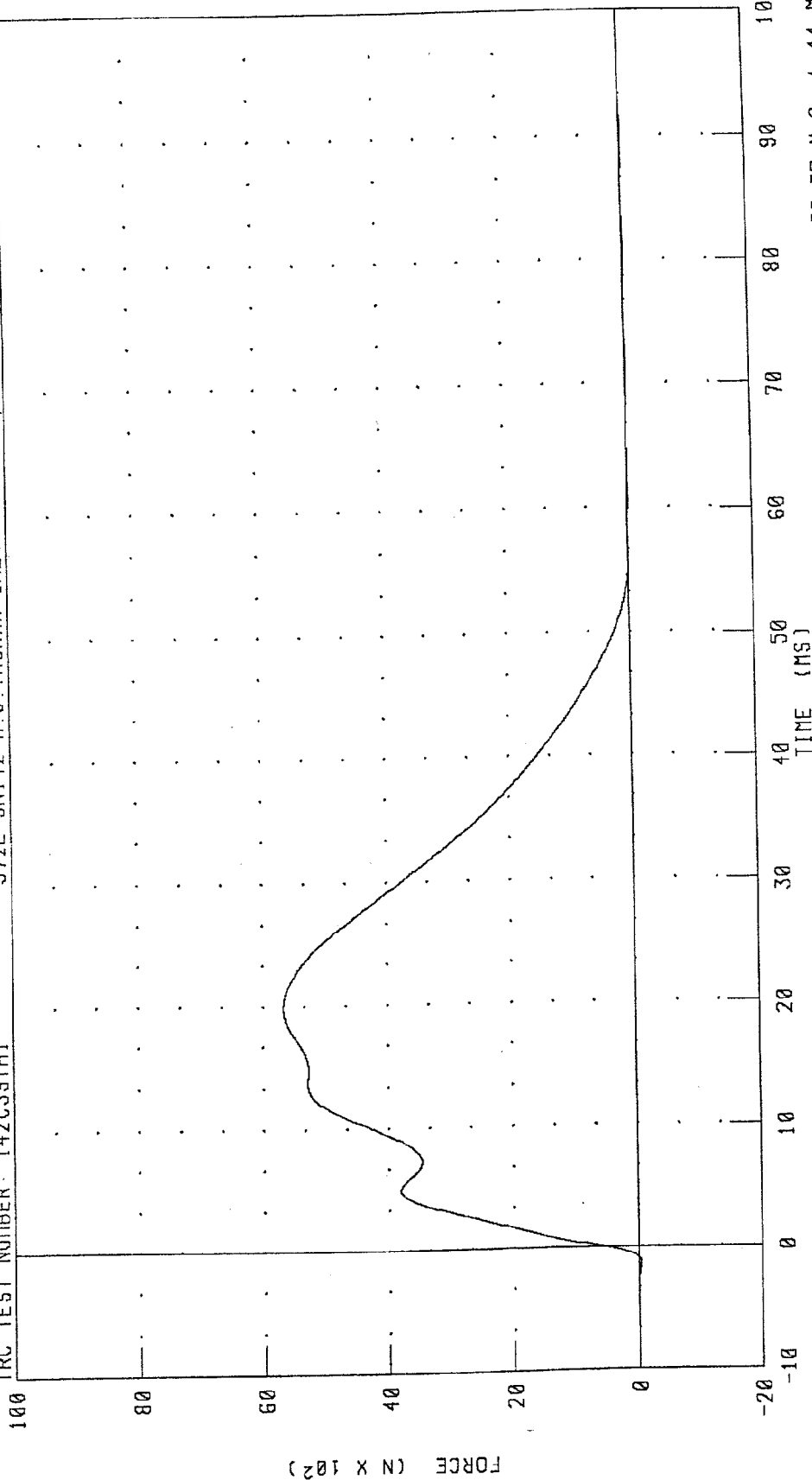
PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM FORCE

TRC TEST NUMBER: 142C39TH1

572E SN142 H.S. THORAX CAL39

RUN NUMBER: 020998.1023;1



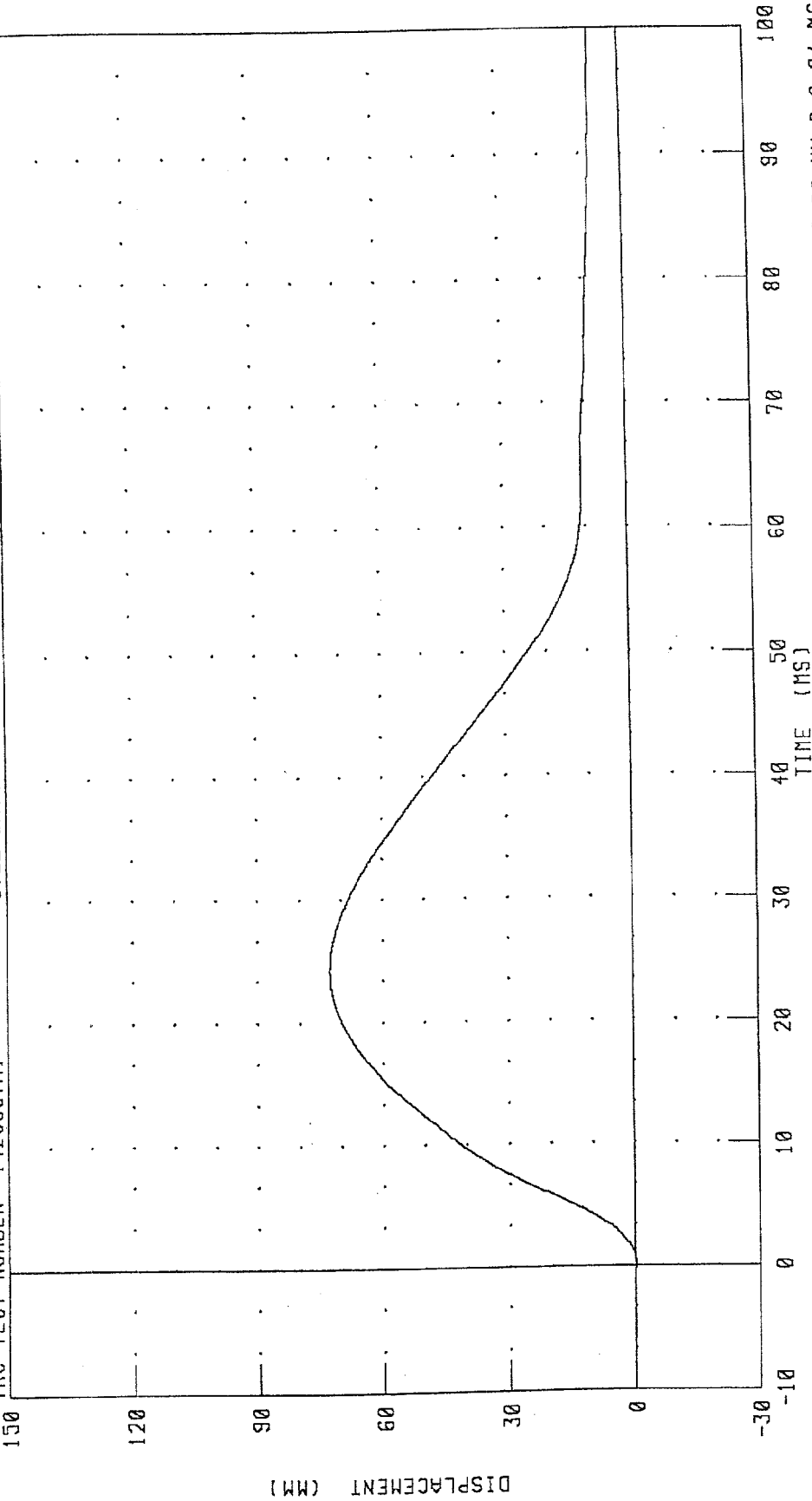
CHANNEL: PENXF FILTER: CH. CLASS 180

PEAK DATA: 5670.55 N @ 19.92 MS; -30.37 N @ -1.44 MS

PART 572-E HYBRID III THORAX CALIBRATION

STERNUM DISPLACEMENT

TRC TEST NUMBER: 142C39TH1 572E SN142 H.S. THORAX CAL39 RUN NUMBER: 020990.1023.1



CHANNEL: CSTXD FILTER: CH. CLASS 180

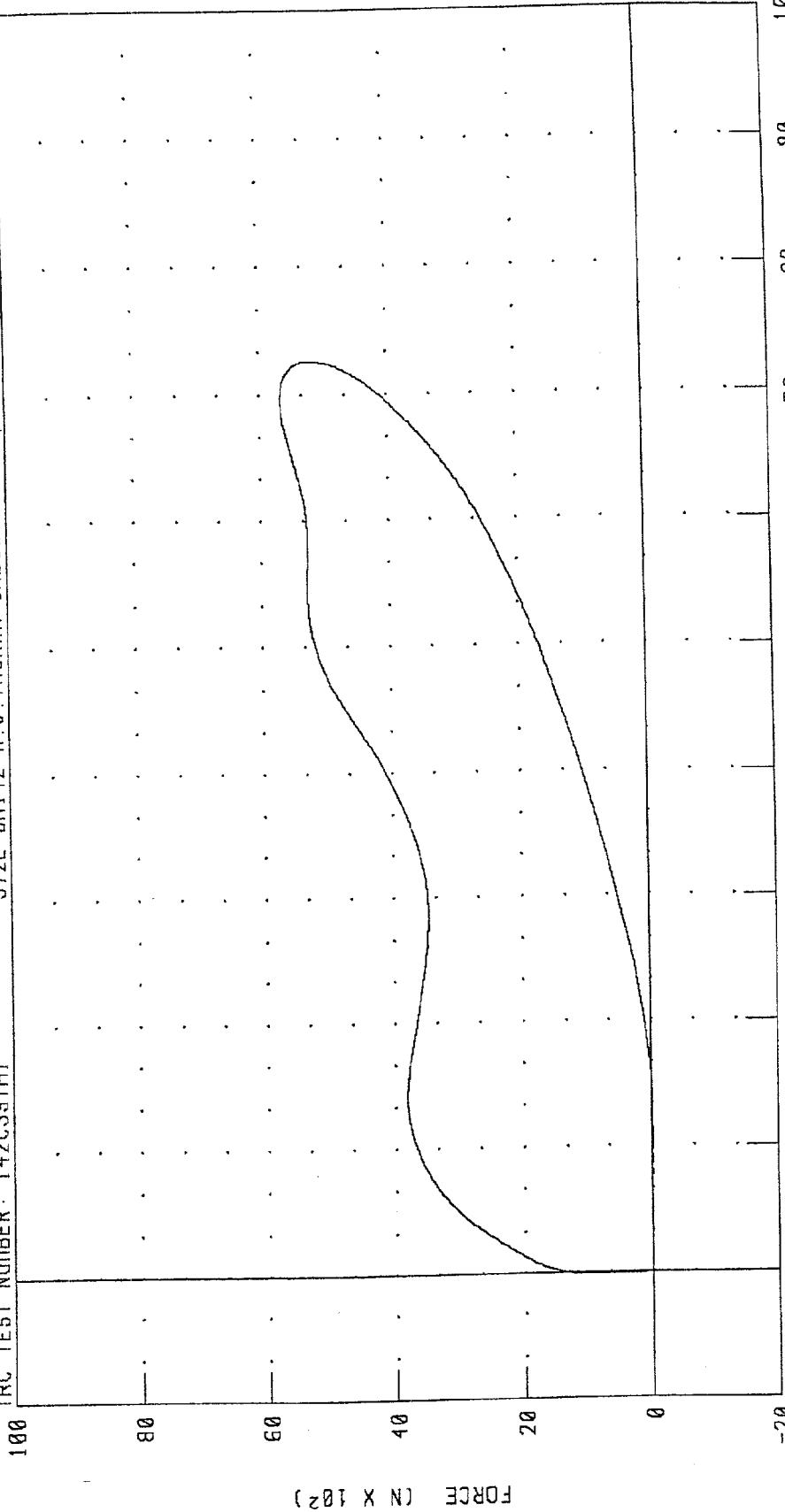
PEAK DATA: 72.59 MM @ 24.24 MS; -0.09 MM @ 0.24 MS

PART 572-E HYBRID III THORAX CALIBRATION
CHEST DISPLACEMENT VS PENDULUM FORCE

TRC TEST NUMBER: 142C39TH1

572E SN142 H.S. THORAX CAL39

RUN NUMBER: 020998.1023.1



CHANNEL: CSTXD
PENXF

FILTER: CH. CLASS 180
CH. CLASS 180

DISPLACEMENT (MM)

PEAK DATA: 72.59 MM @ 24.24 MS; -0.09 NM @ 0.24 MS
5670.55 N @ 19.92 MS; -30.37 N @ -1.44 MS

TRANSPORTATION RESEARCH CENTER INC.

RIGHT HIP JOINT FEMUR FLEXION TEST

HYBRID III PART 572E

07-FEB-98

TRC INC.

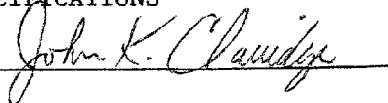
TEST NO: 142C39HR1

RIGHT HIP FLEX 0 DEGREES

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
ROTATION RATE	5 - 10 deg/sec	YES
TORQUE @ 30 deg ROTATION	<= 94.9 Nm	72.9 Nm
ROTATION @ 203.4 Nm TORQUE	40 - 50 deg.	44.2 deg.

TEST MEETS SPECIFICATIONS

TECHNICIAN



RUN NUMBER: 020798.1107;1

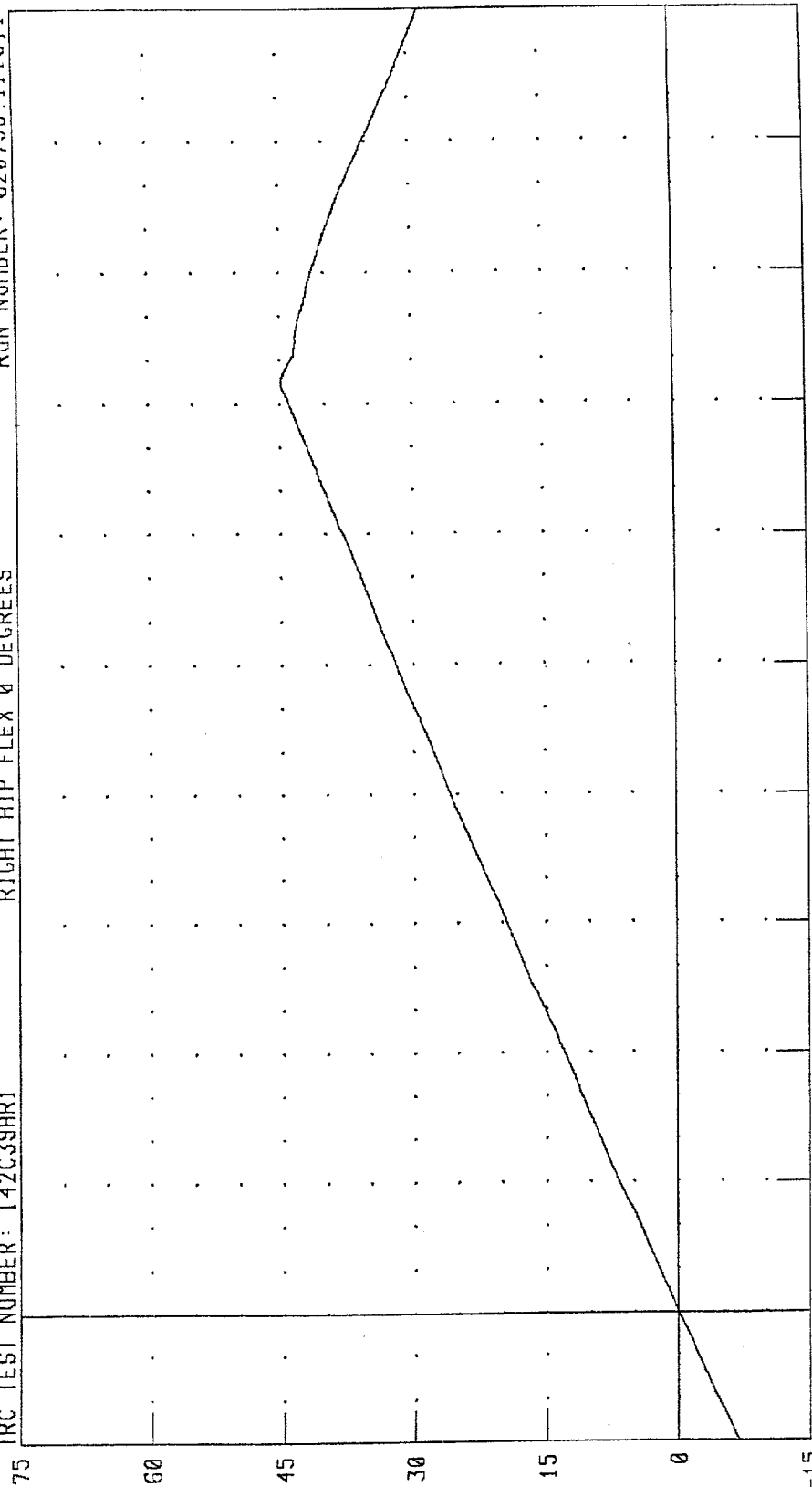
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

RIGHT HIP FLEXION ROTATION

TRC TEST NUMBER: 142C39HR1

RIGHT HIP FLEX 0 DEGREES

RUN NUMBER: 020798.1119;1



PEAK DATA: 44.85 ° @ 5.76 S; -9.68 ° @ -0.95 S

CHANNEL: RHPXD FILTER: CH. CLASS 60

ANGLE (°)

980219

C-31

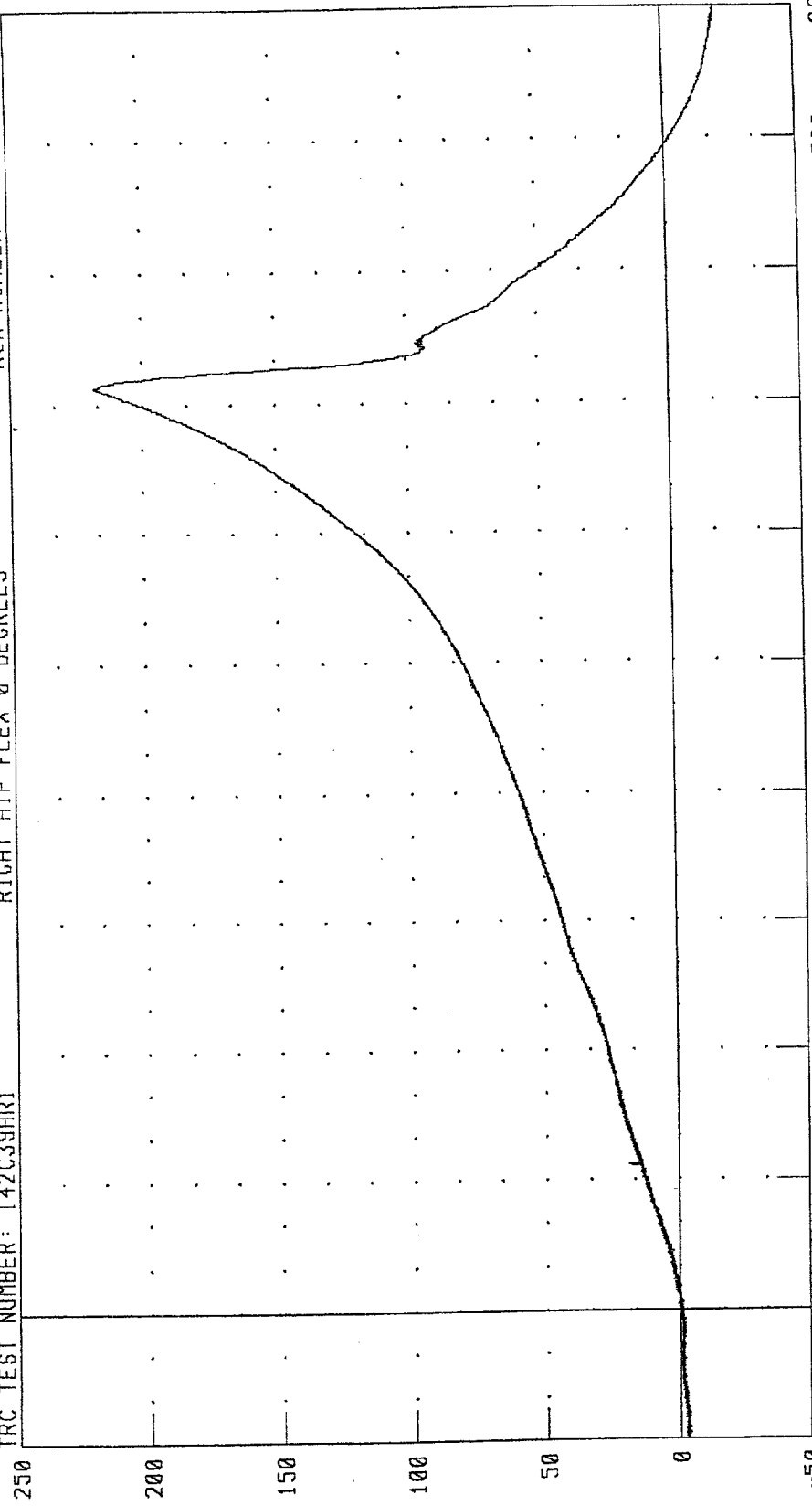
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

RIGHT HIP FLEXION MOMENT

RUN NUMBER: 020798.1119;1

TRC TEST NUMBER: 142C39HR1

RIGHT HIP FLEX 0 DEGREES

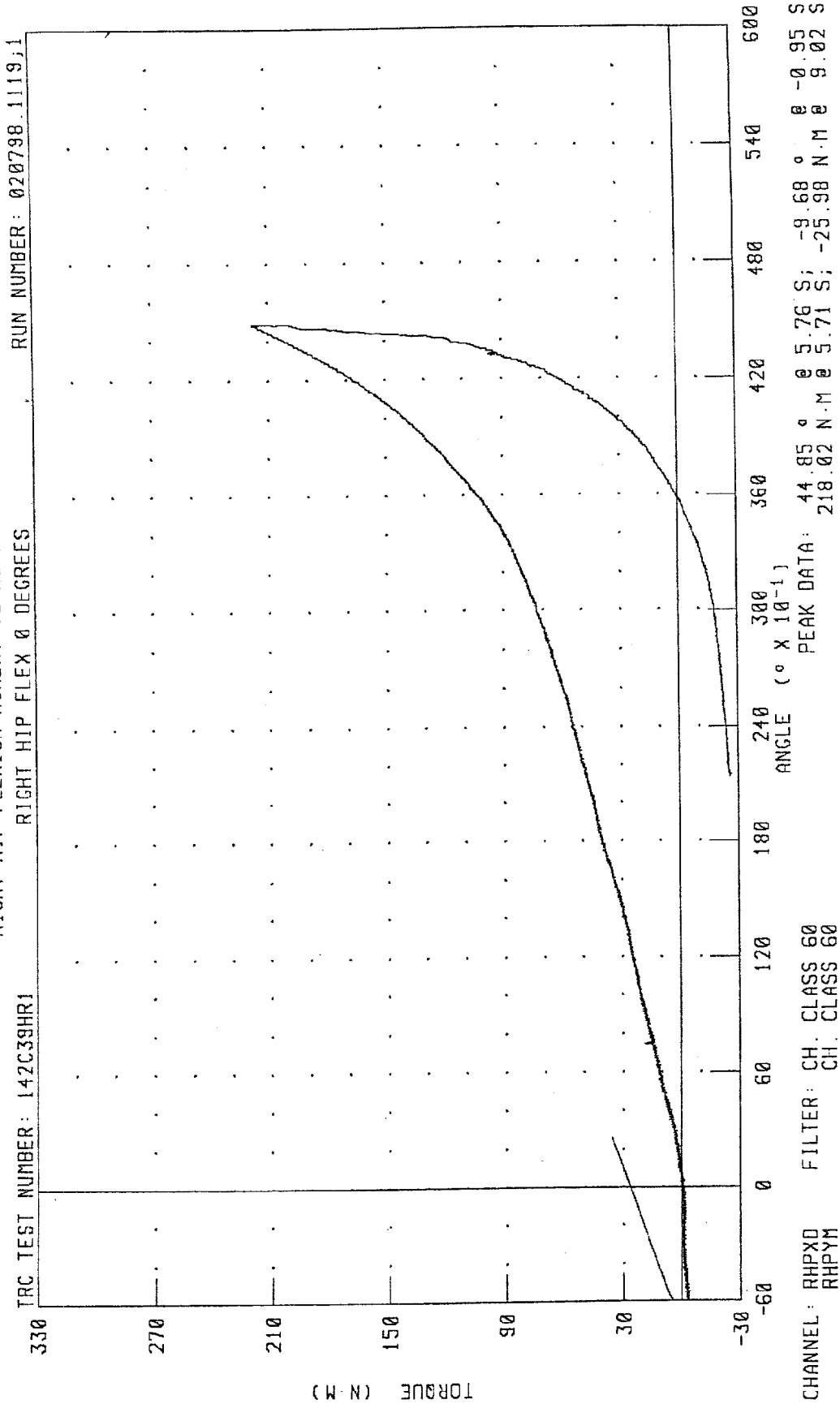


PEAK DATA: 218.02 N.M @ 5.71 S; -25.98 N.M @ 9.02 S

FILTER: CH. CLASS 60

CHANNEL: RHPYM

HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
 RIGHT HIP FLEXION MOMENT VS ROTATION ANGLE



TRANSPORTATION RESEARCH CENTER INC.

LEFT HIP JOINT FEMUR FLEXION TEST

HYBRID III PART 572E

07-FEB-98

TRC INC.

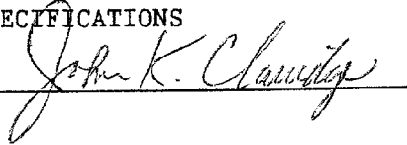
TEST NO: 142C39HL1

LEFT HIP FLEX 0 DEGREES

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
ROTATION RATE	5 - 10 deg/sec	YES
TORQUE @ 30 deg ROTATION	<= 94.9 Nm	66.5 Nm
ROTATION @ 203.4 Nm TORQUE	40 - 50 deg.	43.3 deg.

TEST MEETS SPECIFICATIONS

TECHNICIAN



RUN NUMBER: 020798.1104;1

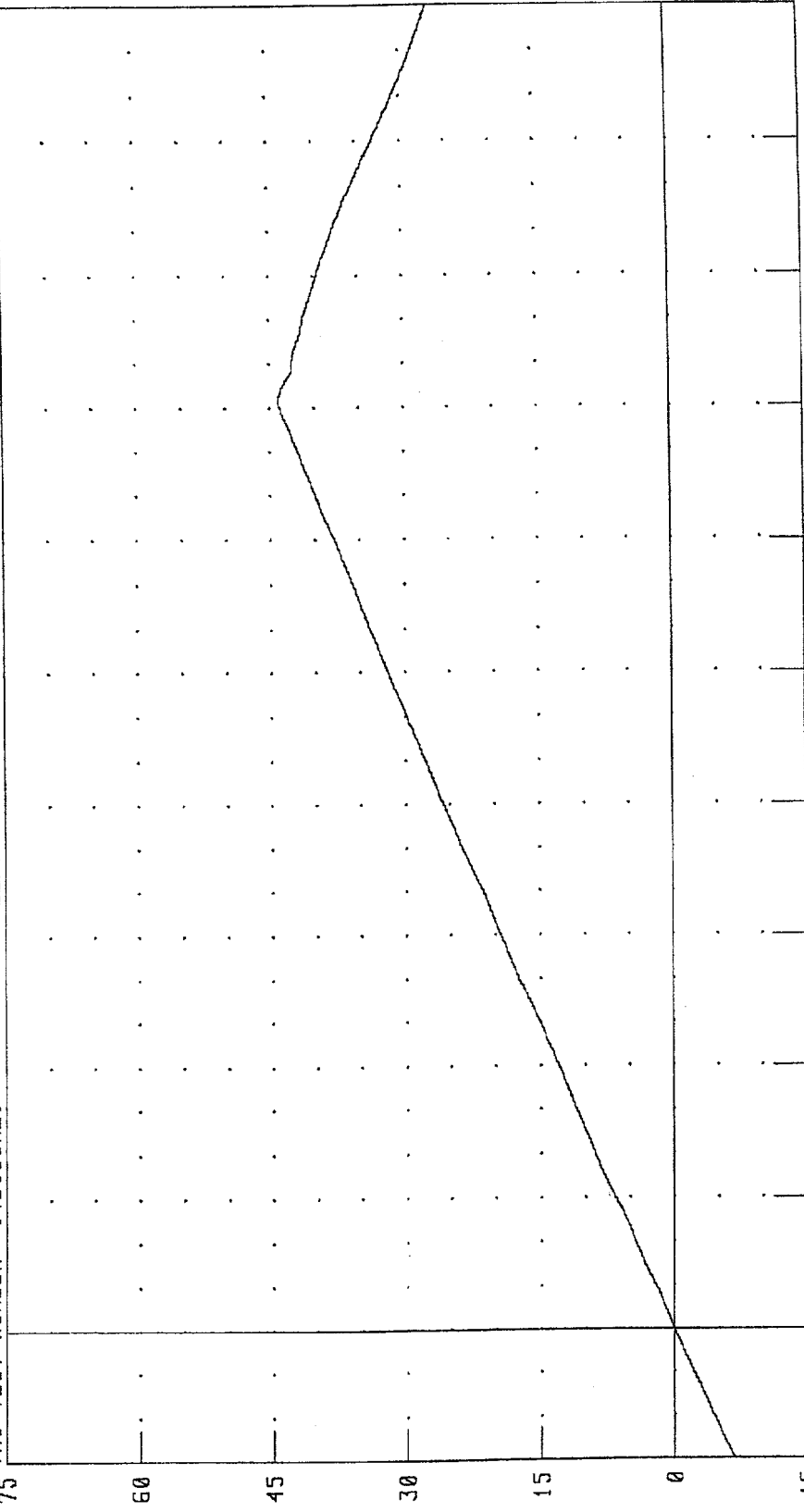
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

LEFT HIP FLEXION ROTATION

LEFT HIP FLEX 0 DEGREES

RUN NUMBER: 020798.1107;1

TRC TEST NUMBER: 142C39HL1

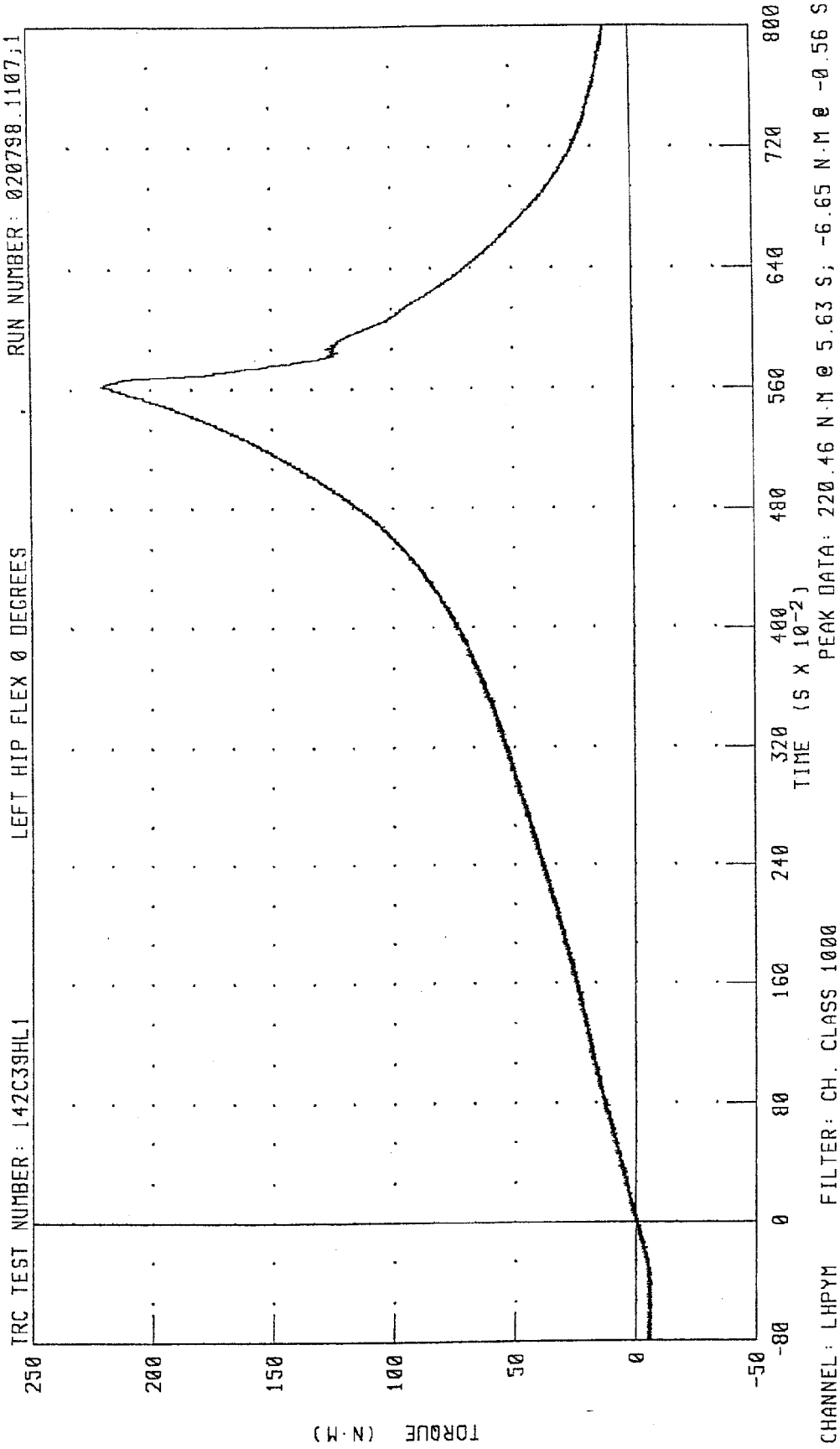


PEAK DATA: 44.01 ° @ 5.63 S, -7.81 ° @ -0.91 S

CHANNEL: LHPXD FILTER: CH. CLASS 1000

HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

LEFT HIP FLEXION MOMENT

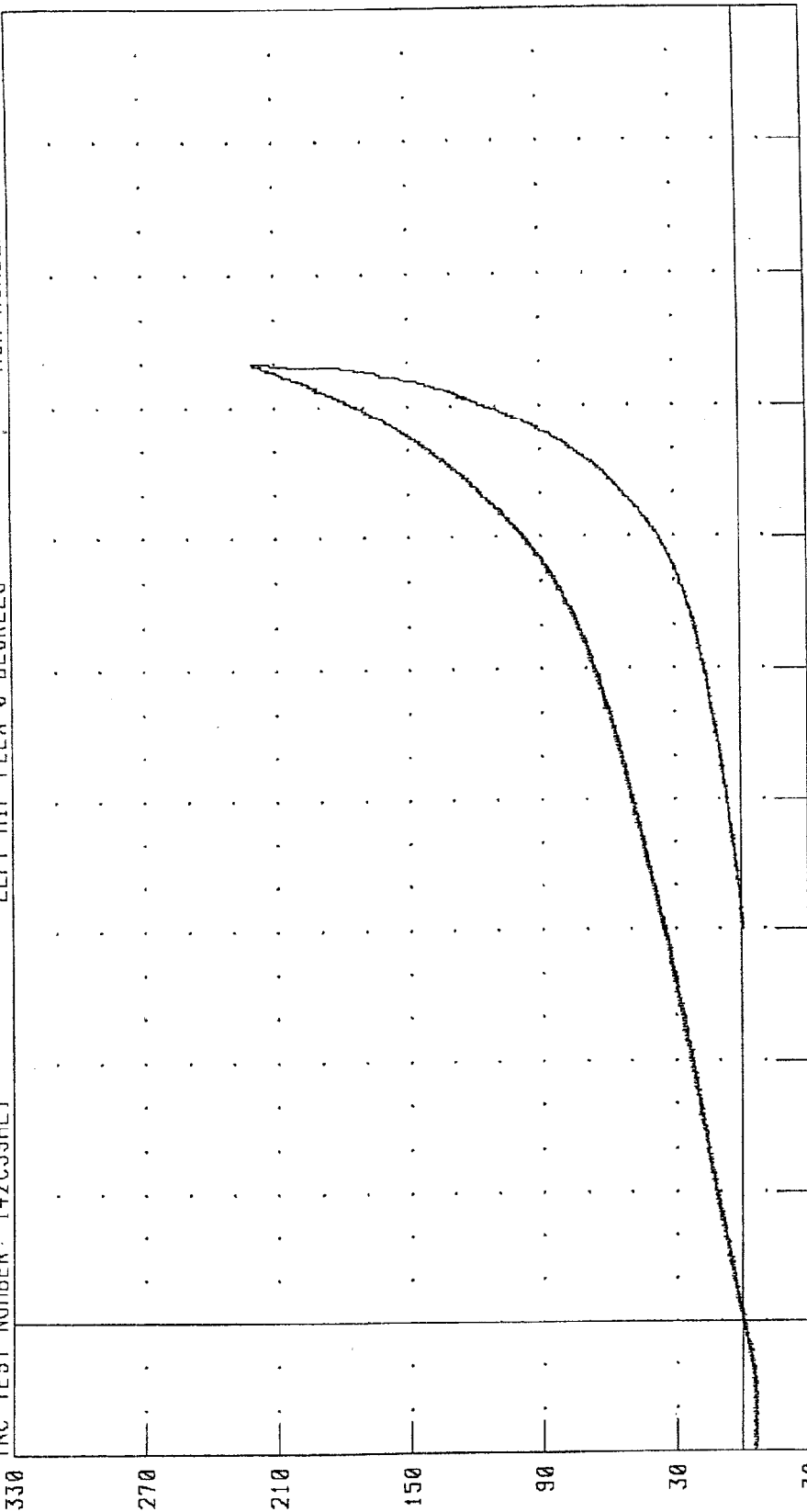


HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES
LEFT HIP FLEXION MOMENT VS ROTATION ANGLE

TRC TEST NUMBER: 142C39HL1

LEFT HIP FLEX 0 DEGREES

RUN NUMBER: 020798.1107,1



PEAK DATA: 44.01 ° @ 5.63 S; -7.81 ° @ -0.91 S
220.46 N·M @ 5.63 S; -6.65 N·M @ -0.56 S

CHANNEL: LHPXD
LHPYM

FILTER: CH. CLASS 1000
CH. CLASS 1000

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

TRC INC.

TEST NO: 142C39RK1

572E SN142 RIGHT KNEE CAL 39

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.11 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5695.7 N

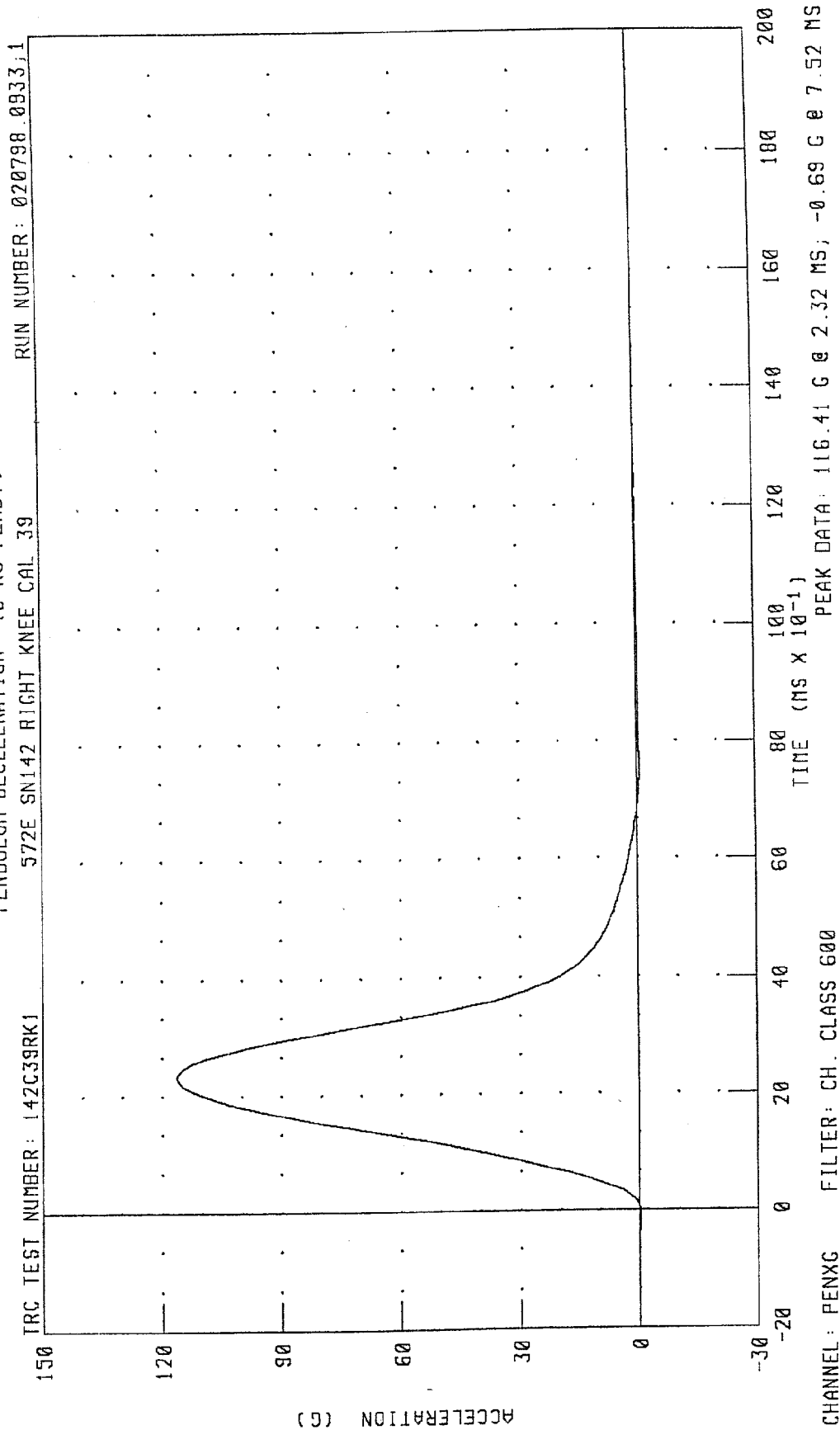
TEST MEETS SPECIFICATIONS

TECHNICIAN

John K. Clauwidge

RUN NUMBER: 020798.0933;1

PART 572-E HYBRID III RIGHT KNEE CALIBRATION
 PENDULUM DECELERATION (5 KG PEND.)



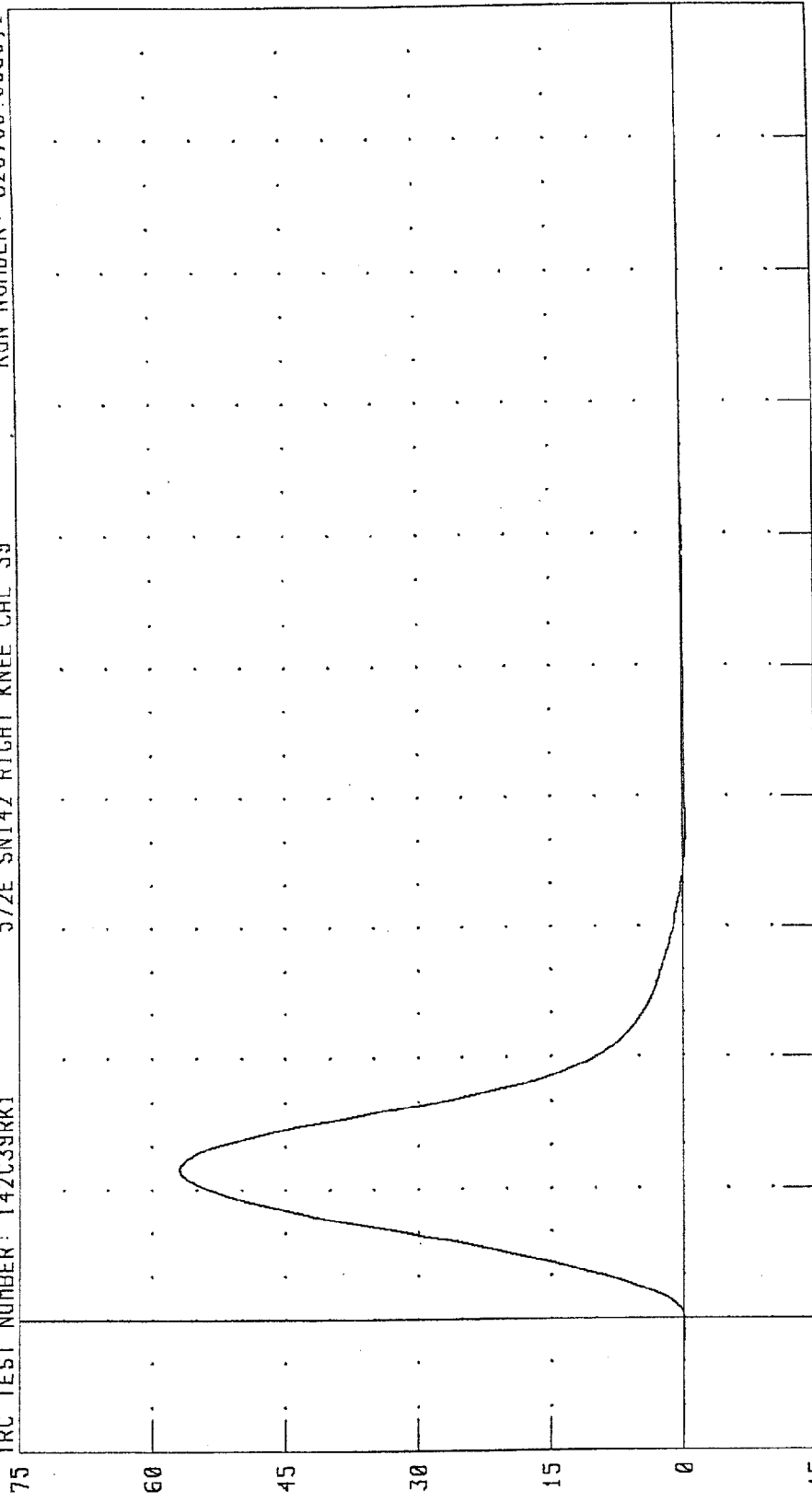
PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

572E SN142 RIGHT KNEE CAL 39

RUN NUMBER: 020798.0933;1

TRC TEST NUMBER: 142C39RK1



CHANNEL: PENXF FILTER: CH. CLASS 600
 TIME (MS X 10⁻¹)
 PEAK DATA: 5695.76 N @ 2.32 MS; -33.88 N @ 7.52 MS

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

TRC INC.

TEST NO: 142C39LK1

572E SN142 LEFT KNEE CAL 39

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.11 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5239.8 N

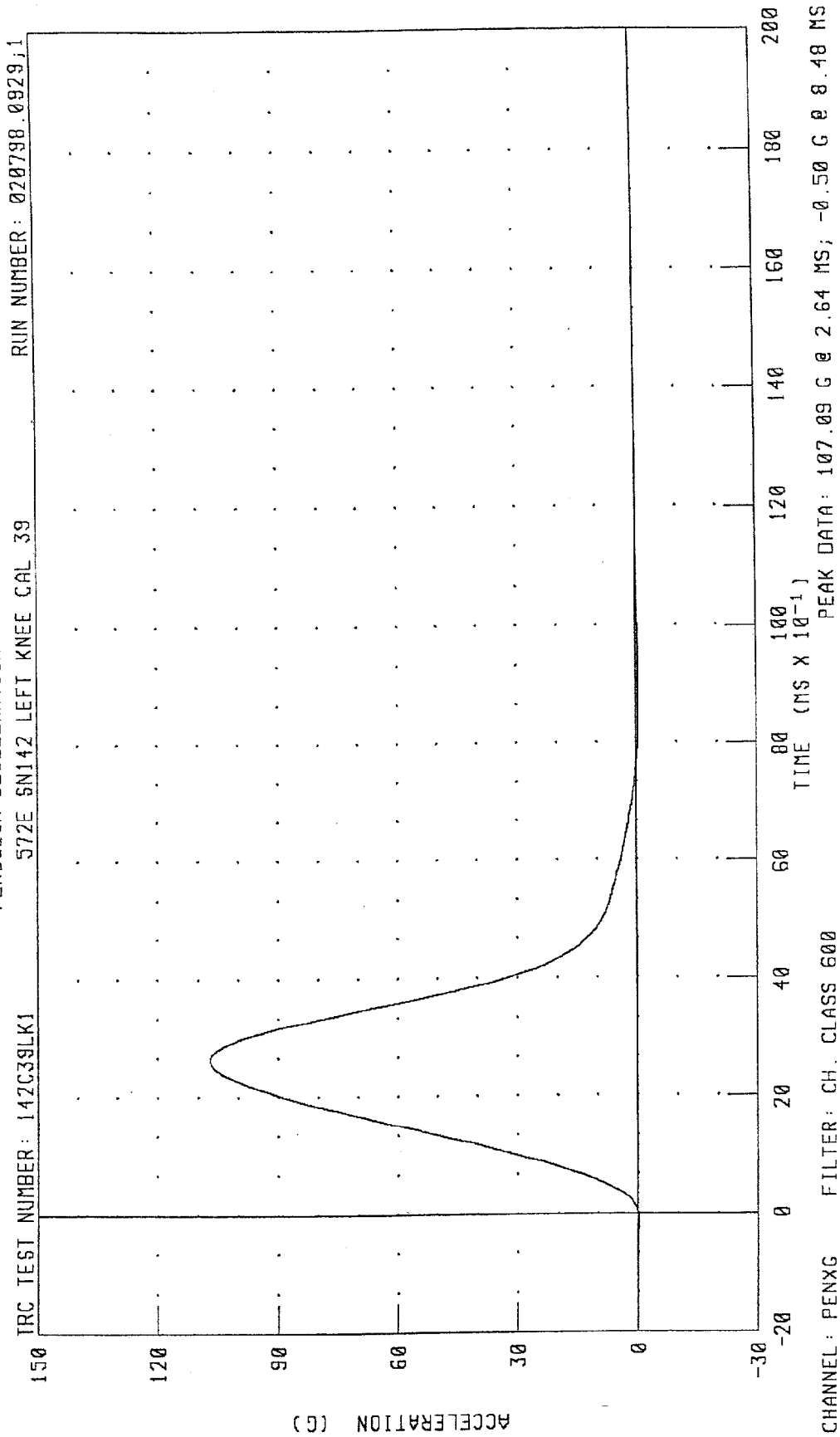
TEST MEETS SPECIFICATIONS

TECHNICIAN

John K. Clavidge

RUN NUMBER: 020798.0927;1

PART 572-E HYBRID III LEFT KNEE CALIBRATION
 PENDULUM DECELERATION (5 KG PEND.)



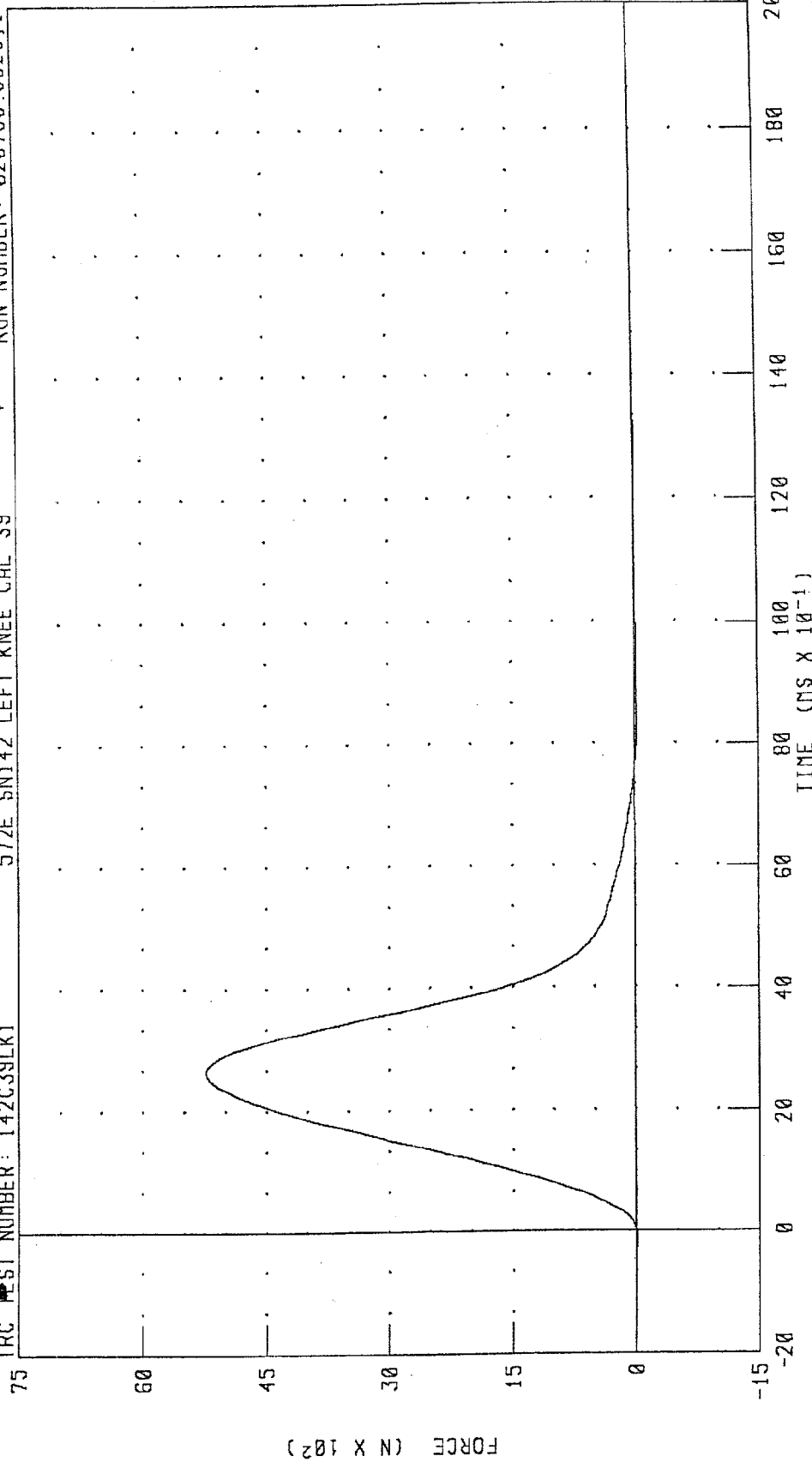
PART 572-E HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

TRC TEST NUMBER: 142C39LK1

572E SN142 LEFT KNEE CAL 39

RUN NUMBER: 020798.0929;1



CHANNEL: PENXF FILTER: CH. CLASS 600

PEAK DATA: 5239.85 N @ 2.64 MS; -24.24 N @ 8.48 MS

Pre-test Certification Data

Passenger Dummy S/N: 192

TRANSPORTATION RESEARCH CENTER INC.
HYBRID III EXTERNAL DIMENSIONS

SN192 ALDERSON

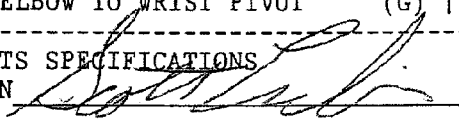
07-02-98

TRC INC.

TEST NO: 192C38ED1

572E SN192 EXT.DIMENSION CAL38

TEST PARAMETER	(DIMEN.)	SPECIFICATION	TEST RESULTS
LOCATION FOR CHEST CIRCUMFERENCE (AA)		429 - 434 MM	432. MM
LOCATION FOR WAIST CIRCUMFERENCE (BB)		226 - 231 MM	229. MM
CHEST CIRCUMFERENCE	(Y)	970 -1001 MM	980. MM
WAIST CIRCUMFERENCE	(Z)	836 - 866 MM	861. MM
CHEST DEPTH	(O)	213 - 229 MM	216. MM
H-POINT HEIGHT	(C)	84 - 89 MM	89. MM
H-POINT FROM SEATBACK	(D)	135 - 140 MM	137. MM
SKULL CAP TO BACKLINE	(H)	41 - 46 MM	43. MM
TOTAL SITTING HEIGHT	(A)	879 - 889 MM	884. MM
THIGH CLEARANCE	(F)	140 - 155 MM	145. MM
BUTTOCK KNEE LENGTH	(K)	579 - 605 MM	602. MM
BUTTOCK POPLITEAL LENGTH	(N)	452 - 478 MM	475. MM
POPLITEAL HEIGHT	(L)	429 - 455 MM	447. MM
KNEE PIVOT HEIGHT	(M)	485 - 500 MM	498. MM
FOOT LENGTH	(P)	252 - 267 MM	262. MM
FOOT BREADTH	(W)	91 - 107 MM	99. MM
SHOULDER PIVOT FROM BACKLINE	(E)	84 - 94 MM	94. MM
SHOULDER BREADTH	(V)	422 - 437 MM	427. MM
SHOULDER PIVOT HEIGHT	(B)	506 - 521 MM	511. MM
ELBOW REST HEIGHT	(J)	191 - 211 MM	203. MM
SHOULDER-ELBOW LENGTH	(I)	330 - 345 MM	333. MM
BACK OF ELBOW TO WRIST PIVOT	(G)	290 - 305 MM	295. MM

DUMMY MEETS SPECIFICATIONS
TECHNICIAN 

RUN NUMBER: 030298.0921

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

TRC INC.

TEST NO: 192C38HD1

572E SN192 HEAD DROP CAL 38

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	256.16 G
PEAK LATERAL ACCELERATION	15 G MAX	-9.23 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

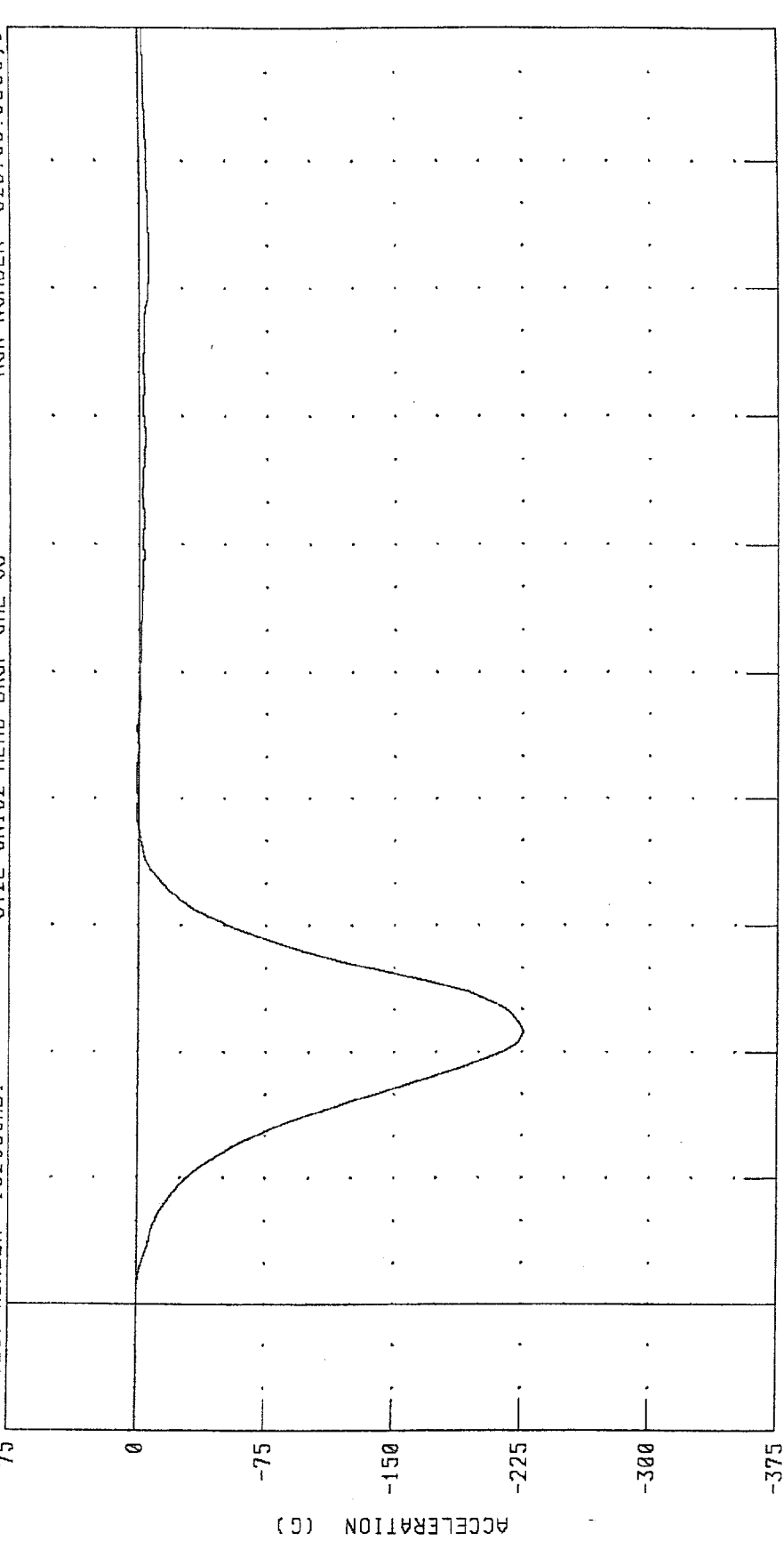
TECHNICIAN John K. Clavidge

RUN NUMBER: 020798.0849;1

PART 572-E HYBRID III HEAD CALIBRATION

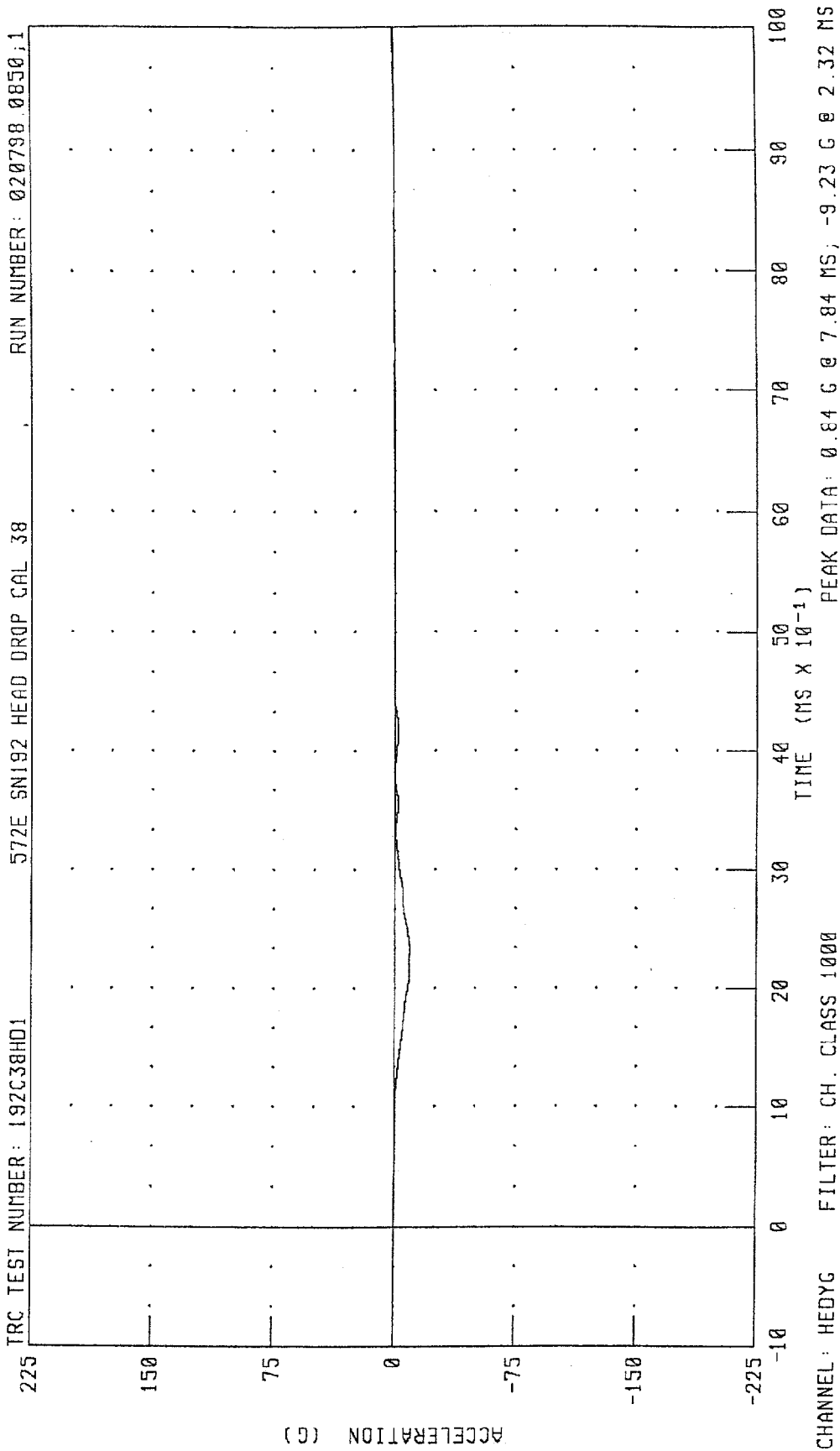
HEAD ACCELERATION X AXIS

TRC TEST NUMBER: 192C38HDI 572E SN192 HEAD DROP CAL 38 RUN NUMBER: 020798.0850;1



CHANNEL: HEDXG FILTER: CH. CLASS 1000
 PEAK DATA: 1.30 G @ 4.16 MS; -226.00 G @ 2.16 NS

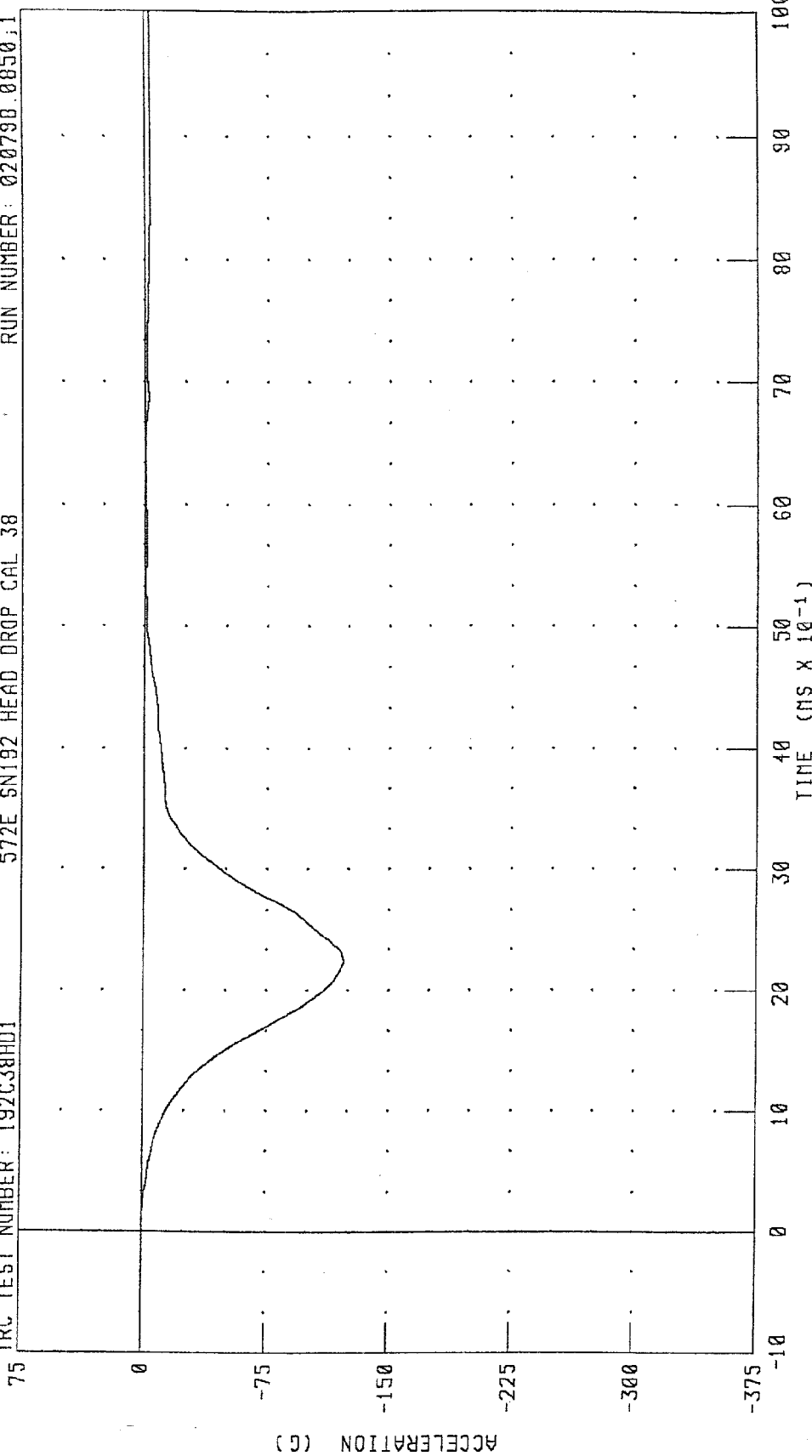
PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS



PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Z AXIS

TRC TEST NUMBER: 192C38HD1 572E SN192 HEAD DROP CAL 38 RUN NUMBER: 020798.0850;1



CHANNEL: HEDZG FILTER: CH. CLASS 1000

PEAK DATA: -0.03 G @ -0.40 MS, -122.50 G @ 2.24 MS

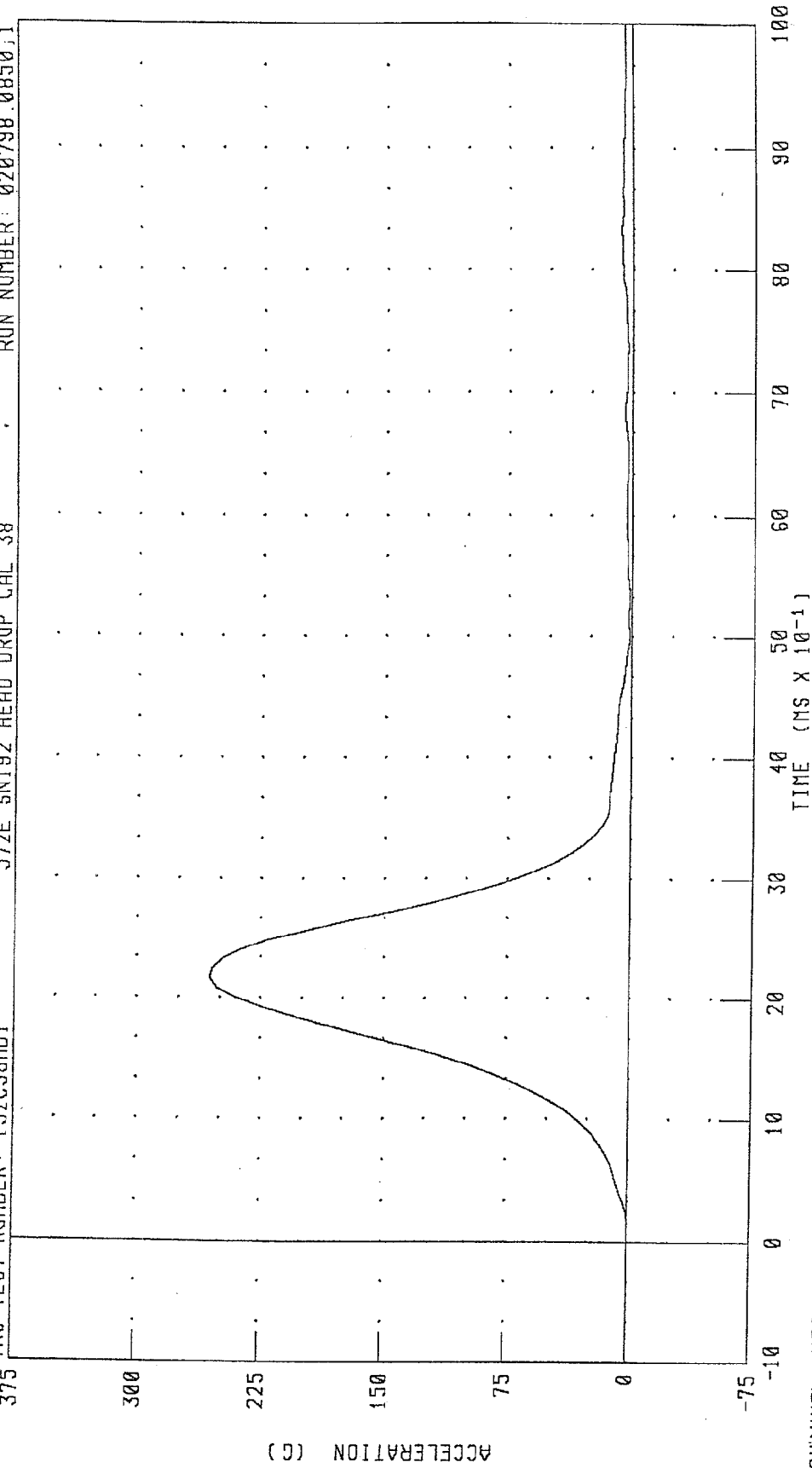
PART 572-E HYBRID III HEAD CALIBRATION

HEAD RESULTANT ACCELERATION

TRC TEST NUMBER: 192C38HD1

572E 5N192 HEAD DROP CAL 38

RUN NUMBER: 020798.0850,1



CHANNEL: HEDRG FILTER: CH. CLASS 1000

PEAK DATA: 256.17 G @ 2.16 MS; 0.04 G @ -0.40 MS

TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 192C38NF7 572E SN192 NECK FLEXION CAL38

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	37.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	7.06 M/S
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	23.24 G
	20 MS	17.60 - 22.60 G	22.46 G
	30 MS	12.50 - 18.50 G	16.45 G
MAX PENDULUM G		29 G MAX	23.44 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	16.37 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	38.32 MS
D PLANE	MAX	64 - 78 DEG.	71.89 DEG.
ROTATION	TIME	57 - 64 MS	58.24 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88.2 - 108.5 NM	100.32 NM
	TIME	47 - 58 MS	51.20 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	114.48 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	100.96 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN

By Calt

RUN NUMBER: 020998.1129;1

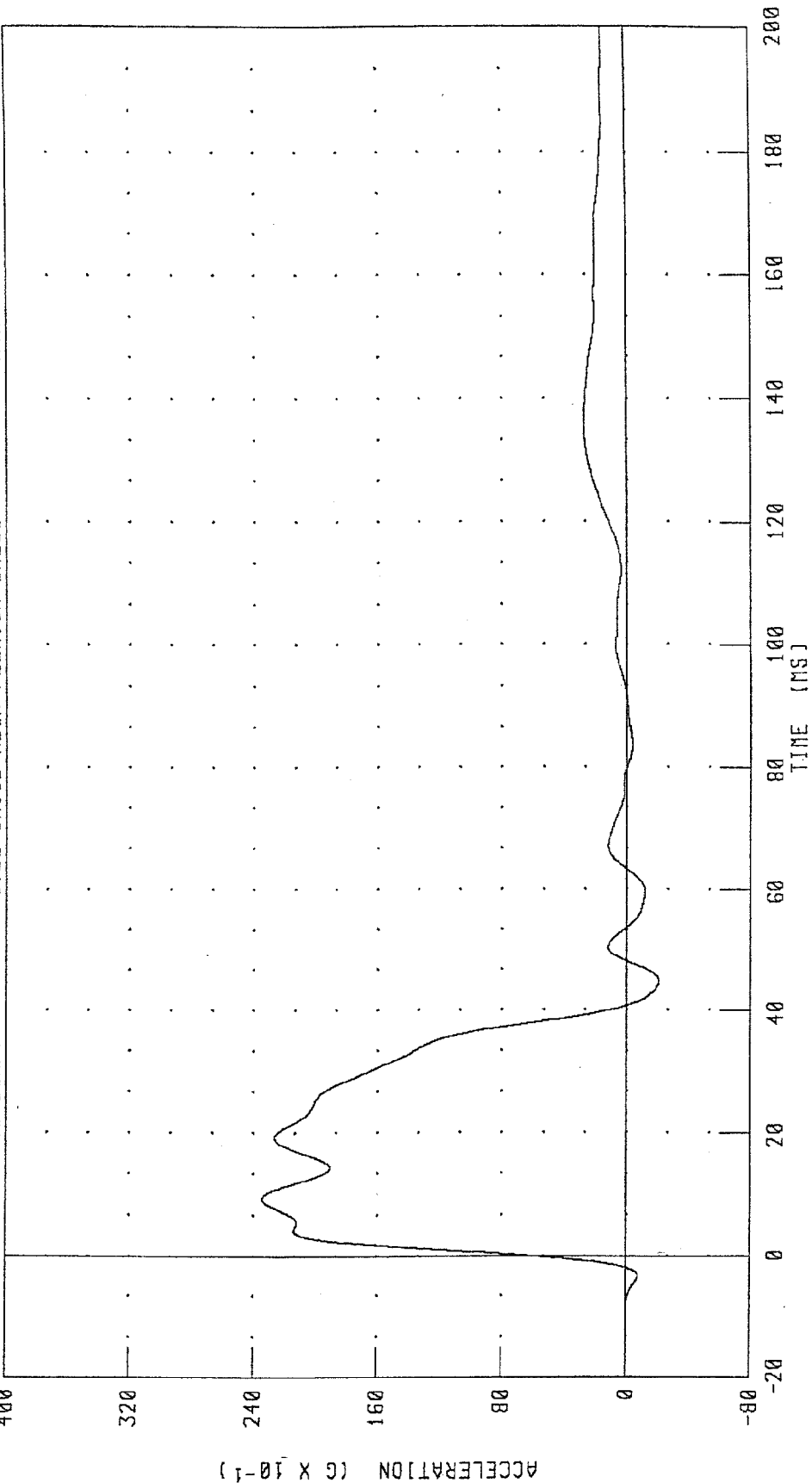
PART 572-E HYBRID III NECK FLEXION CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 192C38NF7

572E SN192 NECK FLEXION CAL38

RUN NUMBER: 020990.1130.1



CHANNEL: PENXG FILTER: CH. CLASS 60

PEAK DATA: 23.45 G @ 9.28 MS; -2.08 G @ 44.72 MS

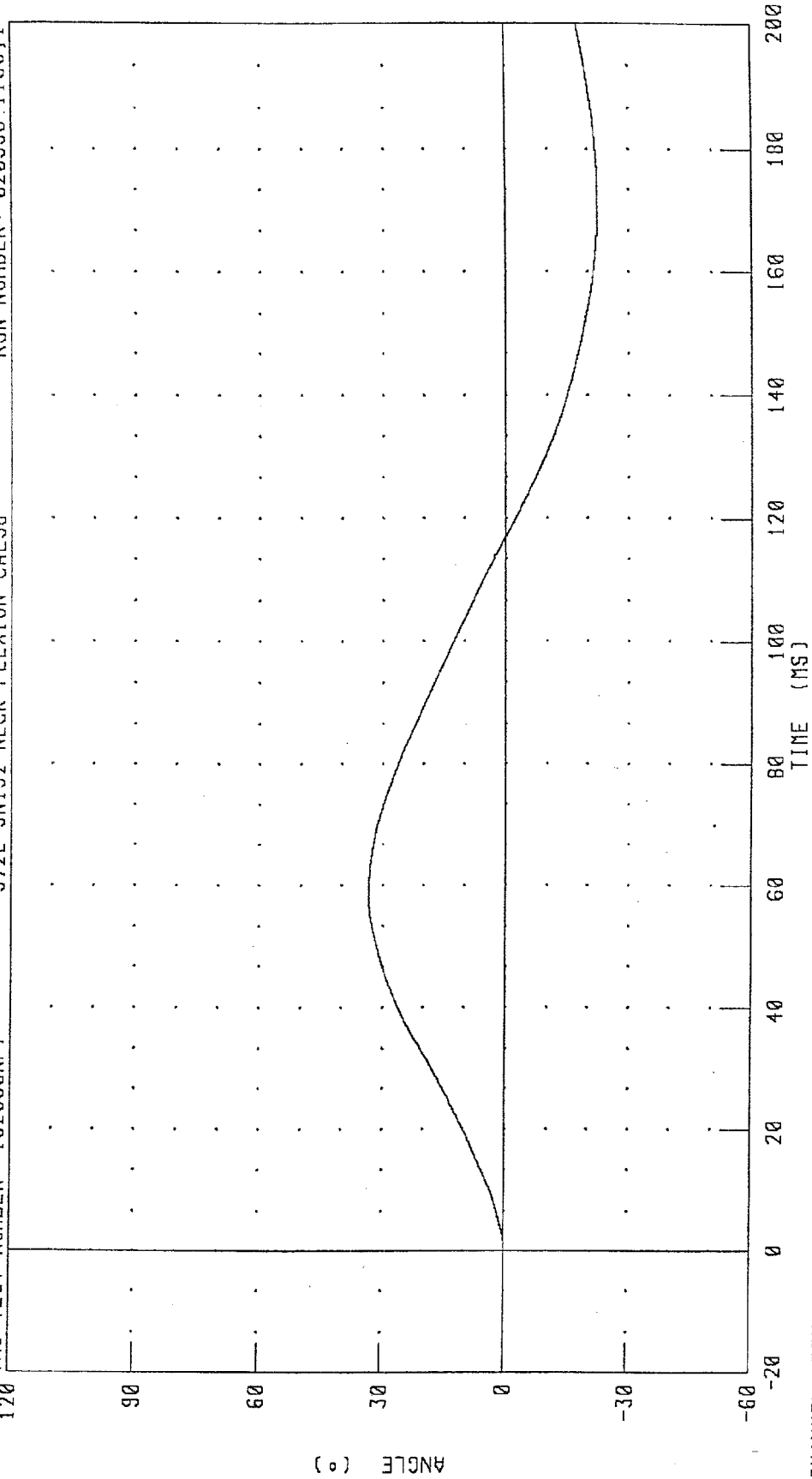
PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

IRC TEST NUMBER: 192C38NF7

572E SN192 NECK FLEXION CAL38

RUN NUMBER: 020998.1130;1

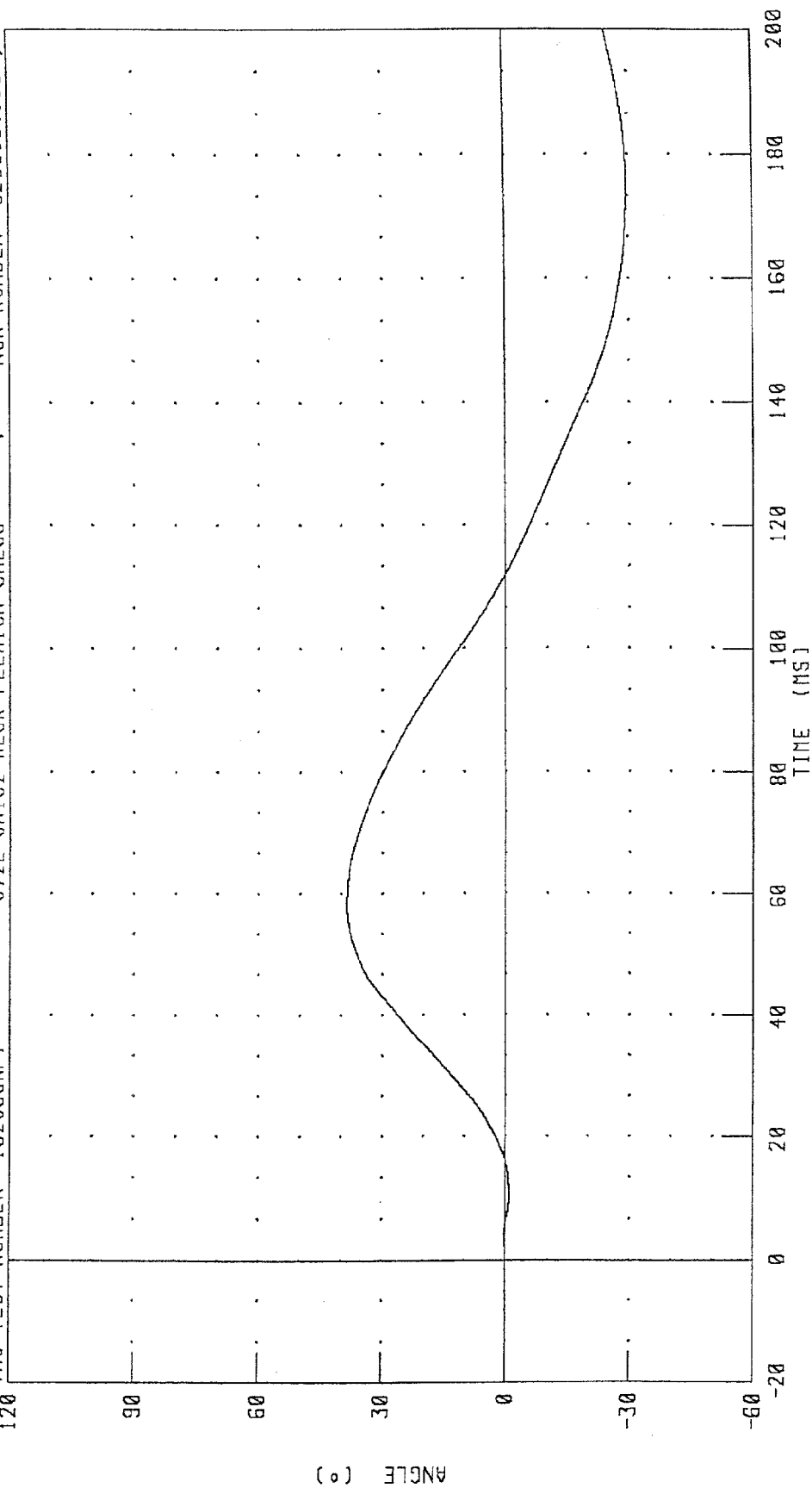


CHANNEL: BETA FILTER: CH. CLASS 60

PEAK DATA: 33.32 ° @ 58.64 MS; -22.39 ° @ 170.88 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION
 ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 192C38NF7 572E SN192 NECK FLEXION CAL38 RUN NUMBER: 020998.1130;1



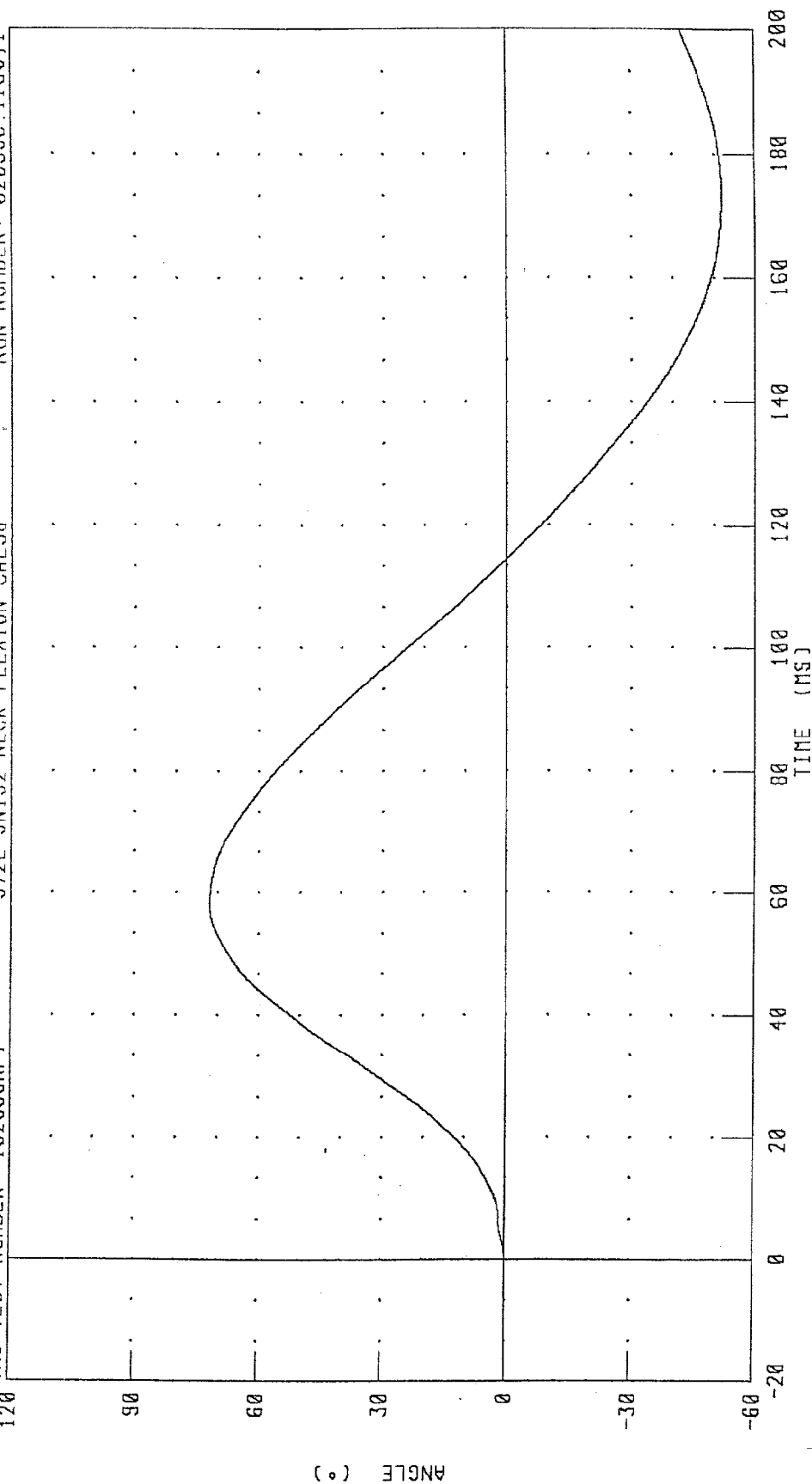
CHANNEL: THETA FILTER: CH. CLASS 60

PEAK DATA: 38.58 ° @ 57.84 MS; -29.68 ° @ 175.20 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION

IRC TEST NUMBER: 192C38NF7 572E SN192 NECK FLEXION CAL38 RUN NUMBER: 020998.1130;1



CHANNEL: TOTAL FILTER: CH. CLASS 60 PEAK DATA: 71.89 ° @ 58.24 MS; -52.01 ° @ 173.60 MS

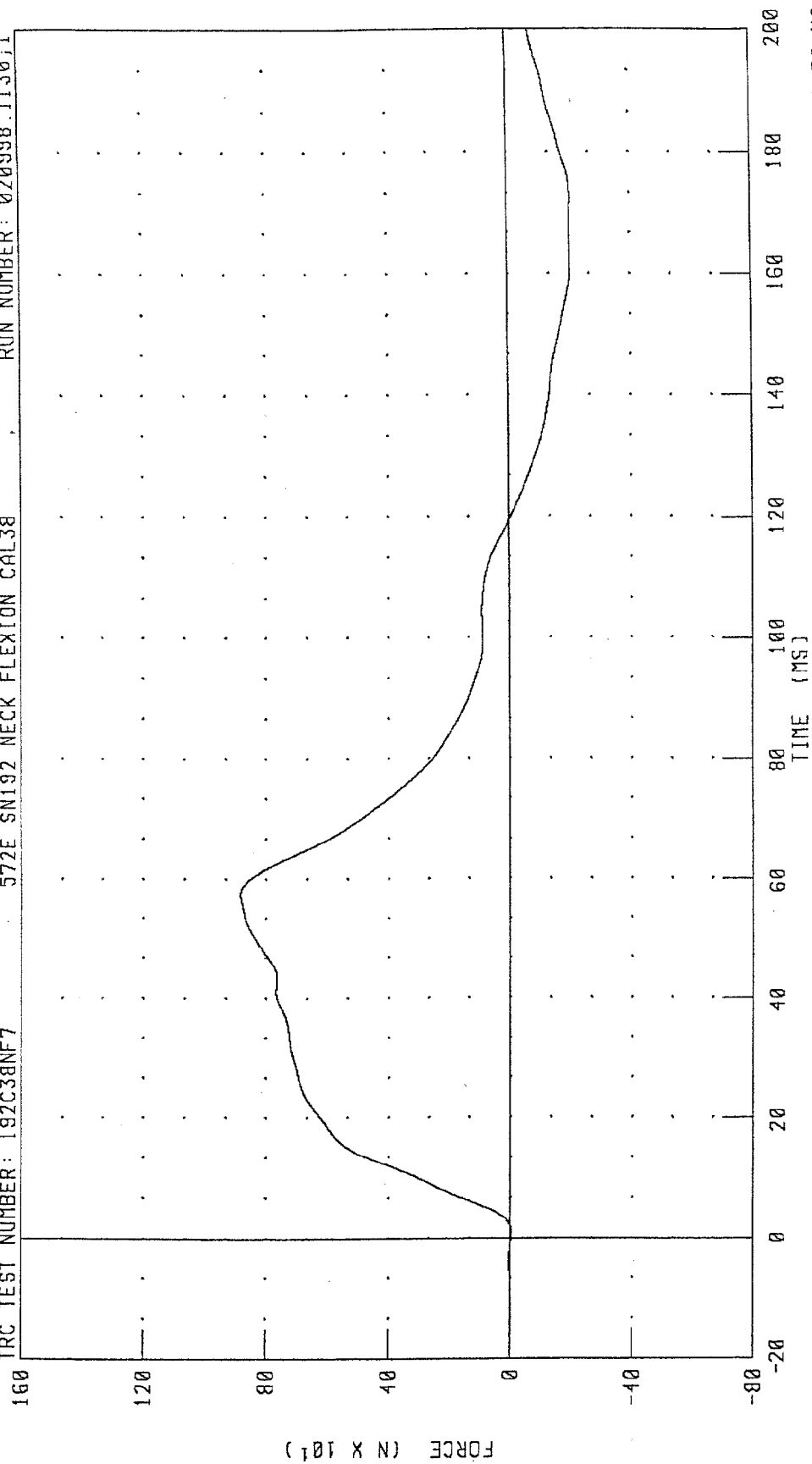
PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 192C3BNF7

572E SN192 NECK FLEXION CAL38

RUN NUMBER: 020998.1130;1



PEAK DATA: 883.78 N @ 57.28 MS; -204.54 N @ 172.56 MS

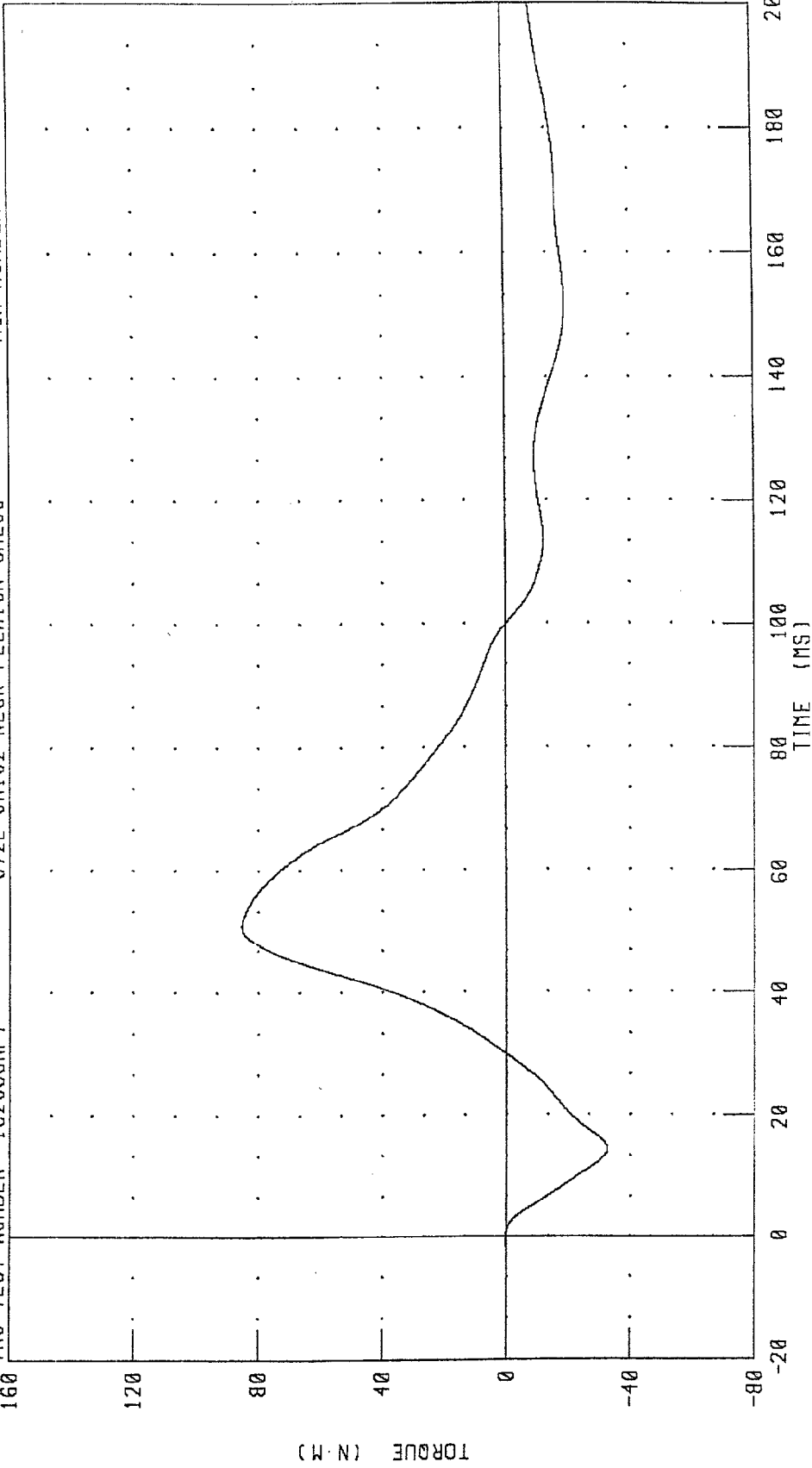
FILTER: CH. CLASS 60

CHANNEL: NEKXF

PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER: 192C38NF7 572E SN192 NECK FLEXION CAL38 RUN NUMBER: 020998.1130;1



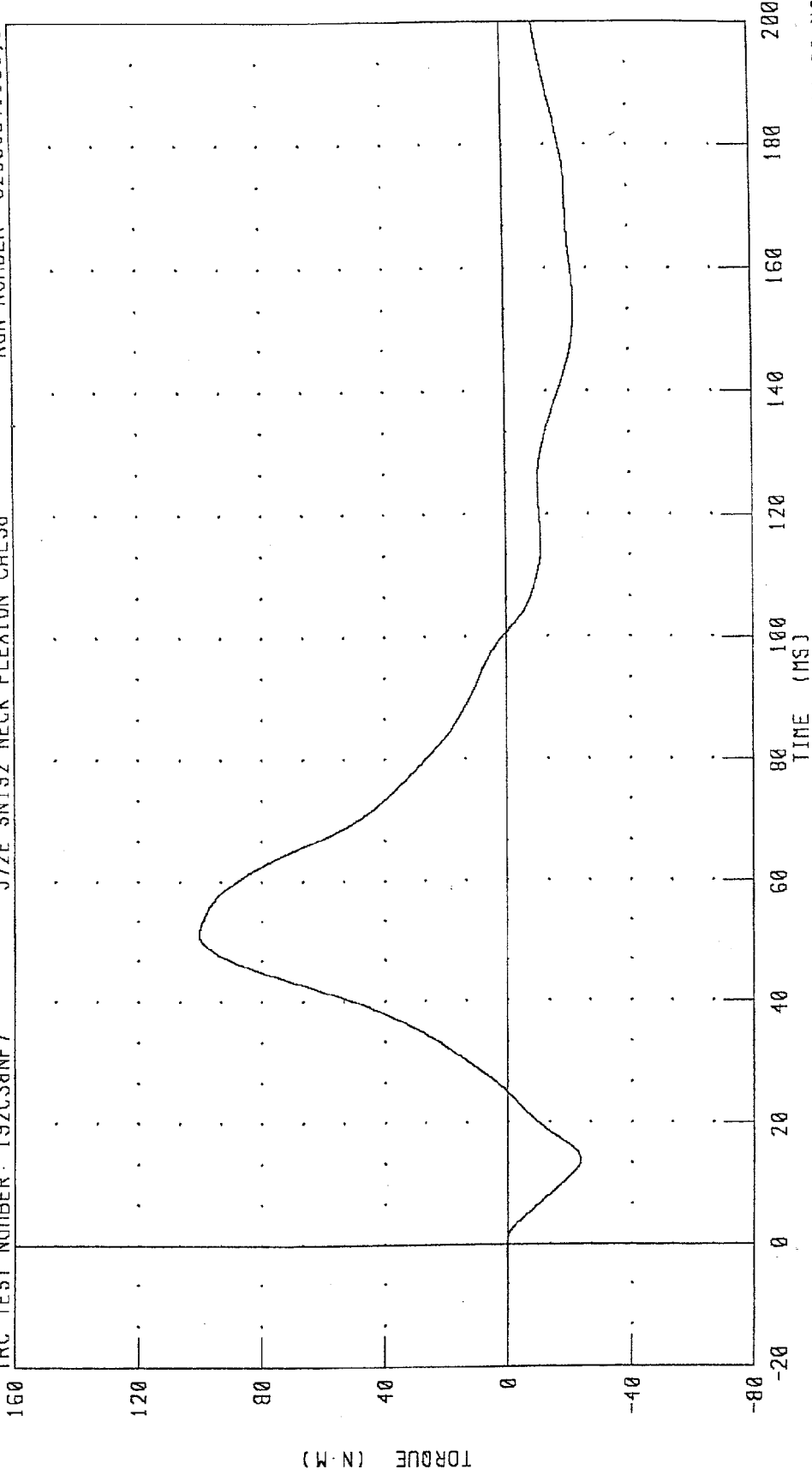
PEAK DATA: 85.25 N·M @ 50.96 MS; -32.49 N·M @ 14.48 MS

CHANNEL: NEKYM FILTER: CH. CLASS 60

PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 192C38NF7 572E SN192 NECK FLEXION CAL38 RUN NUMBER: 020998.1130;1



PEAK DATA: 100.32 N.M @ 51.20 MS; -23.41 N.M @ 14.00 MS

CHANNEL: NEKOM FILTER: CH. CLASS 60

TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 192C38NE1 572E SN192 NECK EXT. CAL38

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6 - 22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	37.0 %
IMPACT VELOCITY		5.95 - 6.19 M/S	6.00 M/S
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.70 G
	20 MS	14.00 - 19.00 G	17.01 G
	30 MS	11.00 - 16.00 G	14.65 G
MAX PENDULUM G		22 G MAX	18.08 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	14.60 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	40.64 MS
D PLANE	MAX	81 - 106 DEG.	95.34 DEG.
ROTATION	TIME	72 - 82 MS	77.52 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-80.0/-52.9 NM	-67.33 NM
	TIME	65 - 79 MS	71.84 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	155.92 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	142.64 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN By Cult

RUN NUMBER: 020998.1226;1

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 192C38NE1

572E SN192 NECK EXT. CAL38

RUN NUMBER: 020998.1227;1

400

320

240

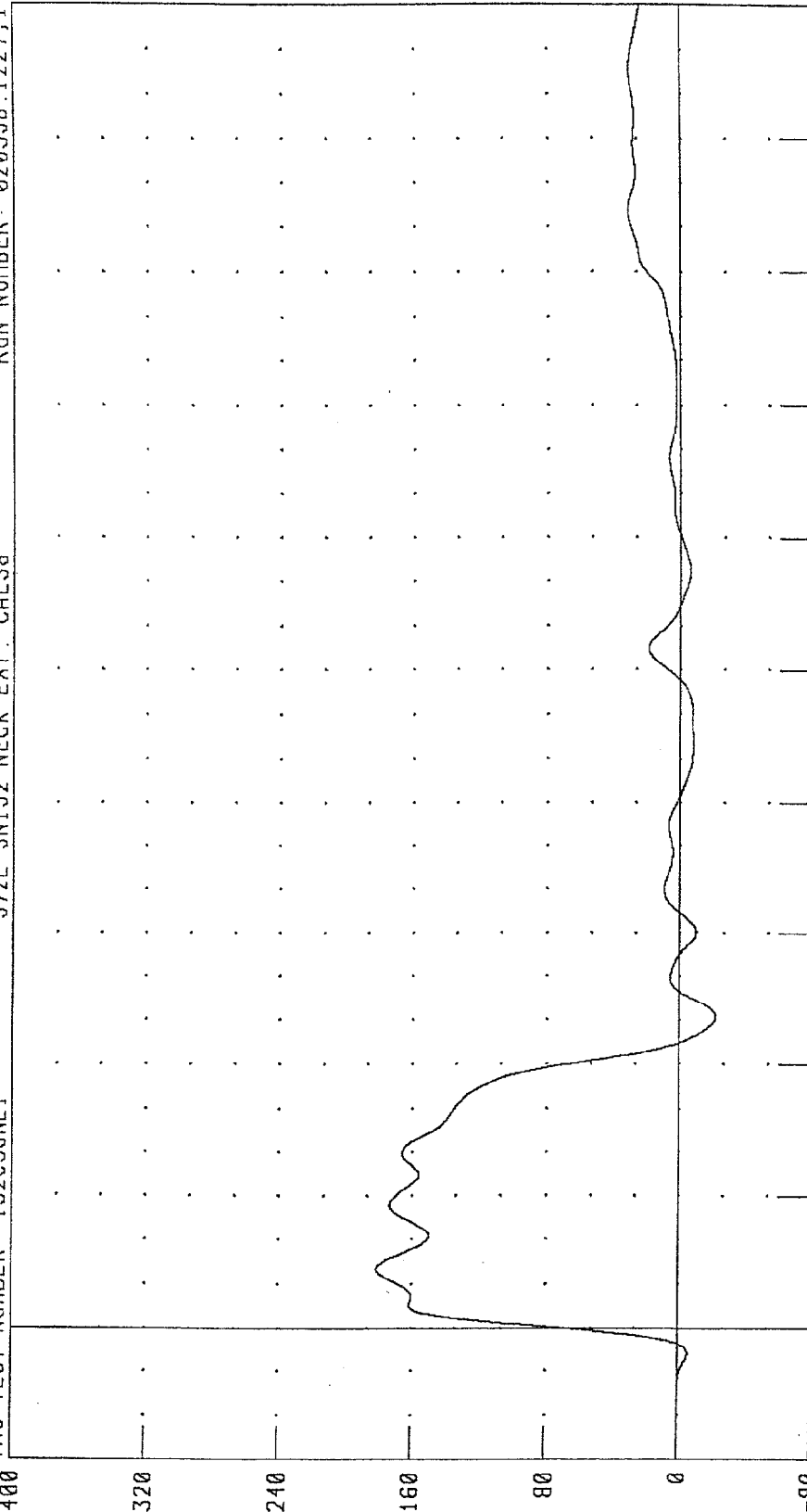
160

80

0

-80

ACCELERATION (G X 10⁻¹)



CHANNEL: PENXC FILTER: CH. CLASS 60

PEAK DATA: 18.09 G @ 8.88 MS; -2.18 G @ 47.20 MS

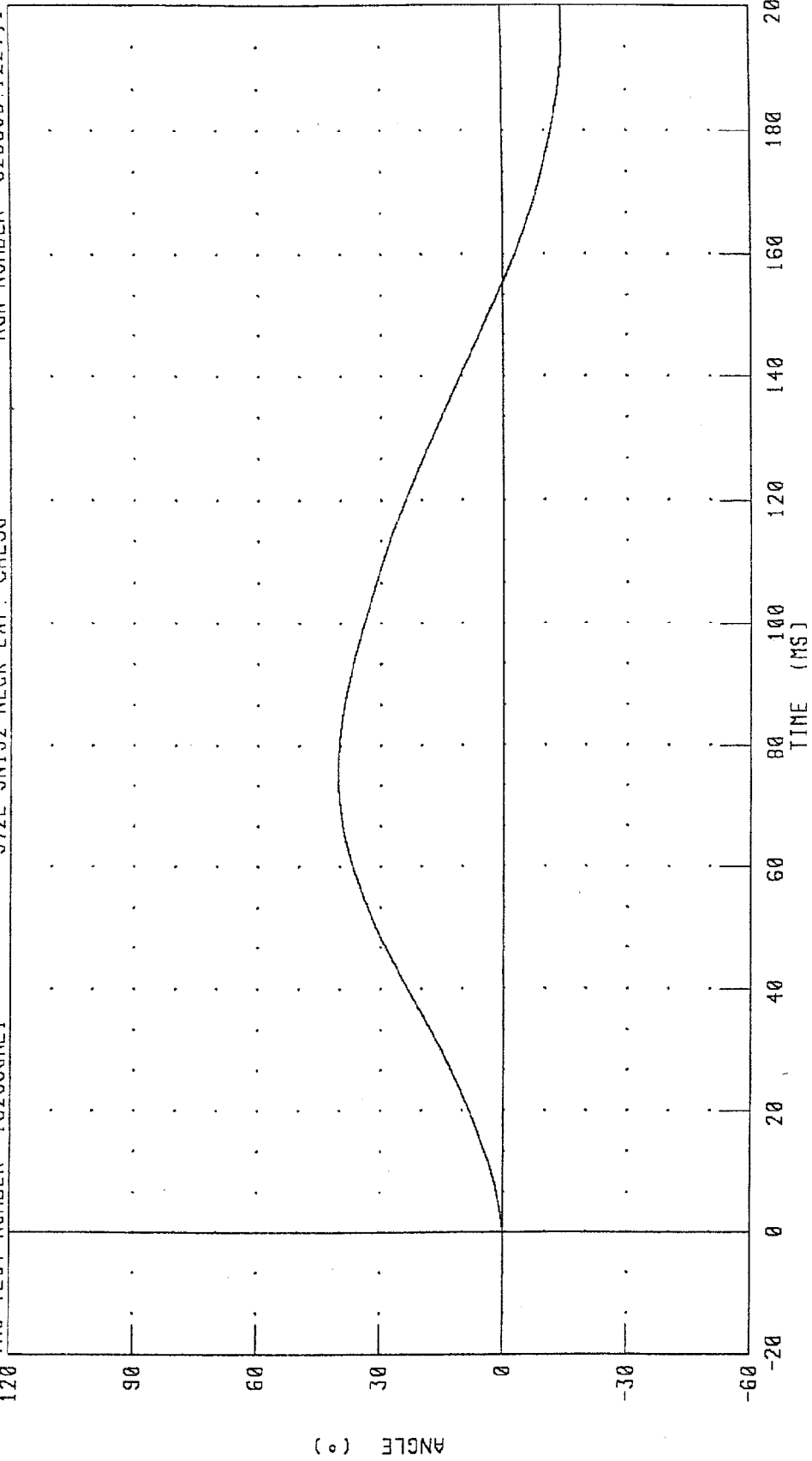
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 192C38NE1

572E SN192 NECK EXT. CAL38

RUN NUMBER: 020998.1227,1



CHANNEL: BETA

FILTER: CH. CLASS 60

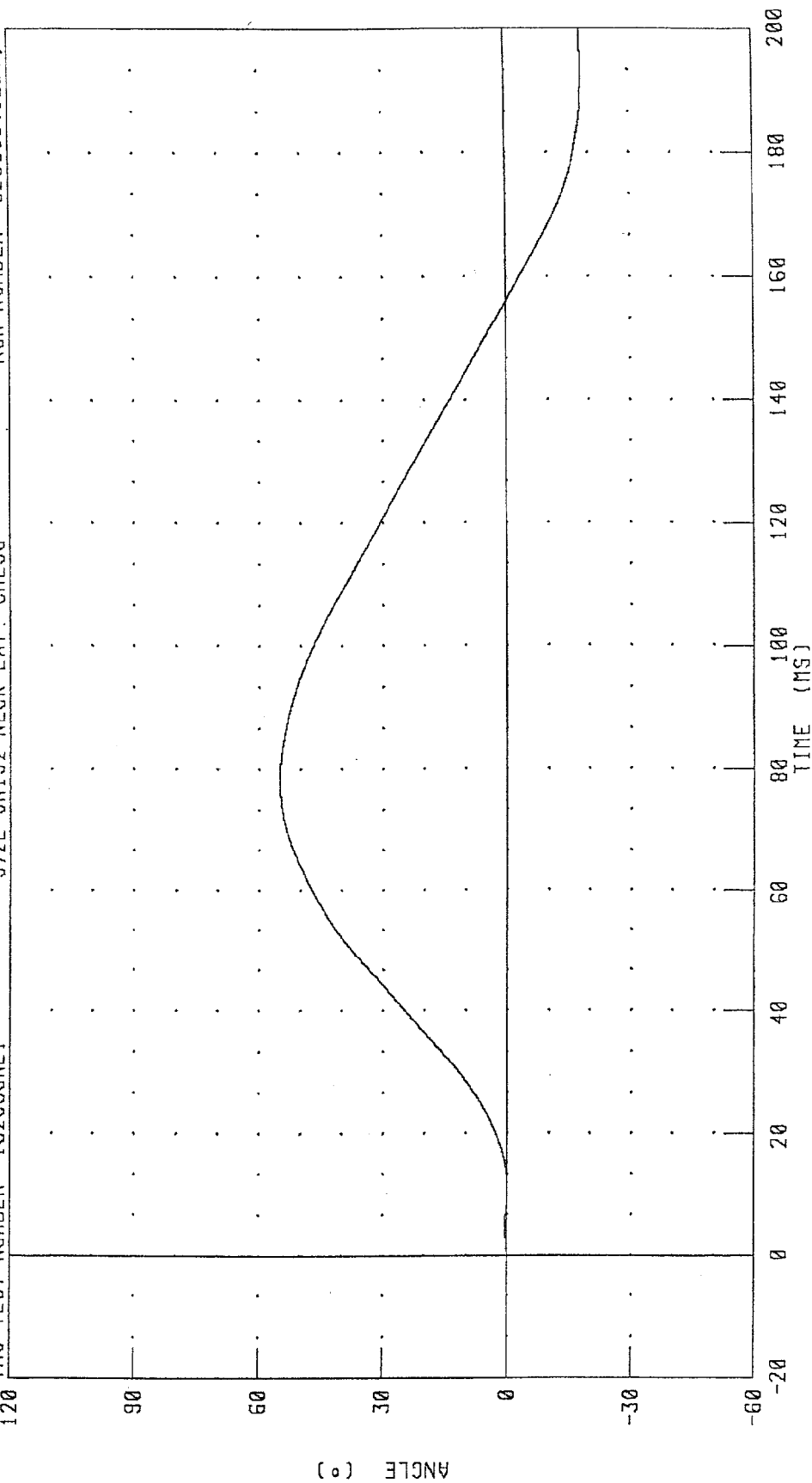
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 192C38NE1

572E SN192 NECK EXT. CAL38

RUN NUMBER: 020998.1227,1



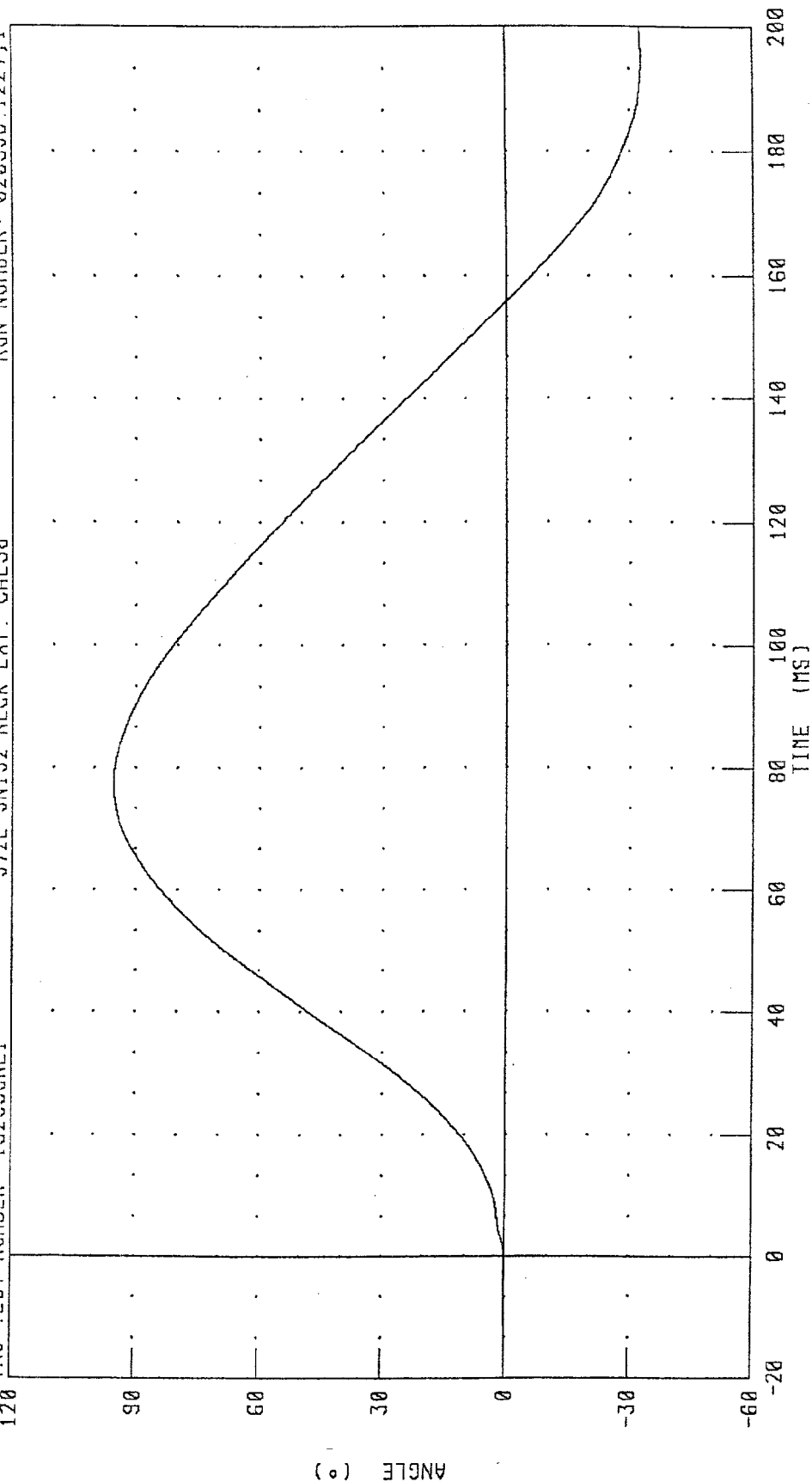
PEAK DATA: 54.97 ° @ 78.32 MS; -18.42 ° @ 193.52 MS

CHANNEL: THETA FILTER: CH. CLASS 60

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 192C38NE1 572E SN192 NECK EXT. CAL38 RUN NUMBER: 020998.1227,1



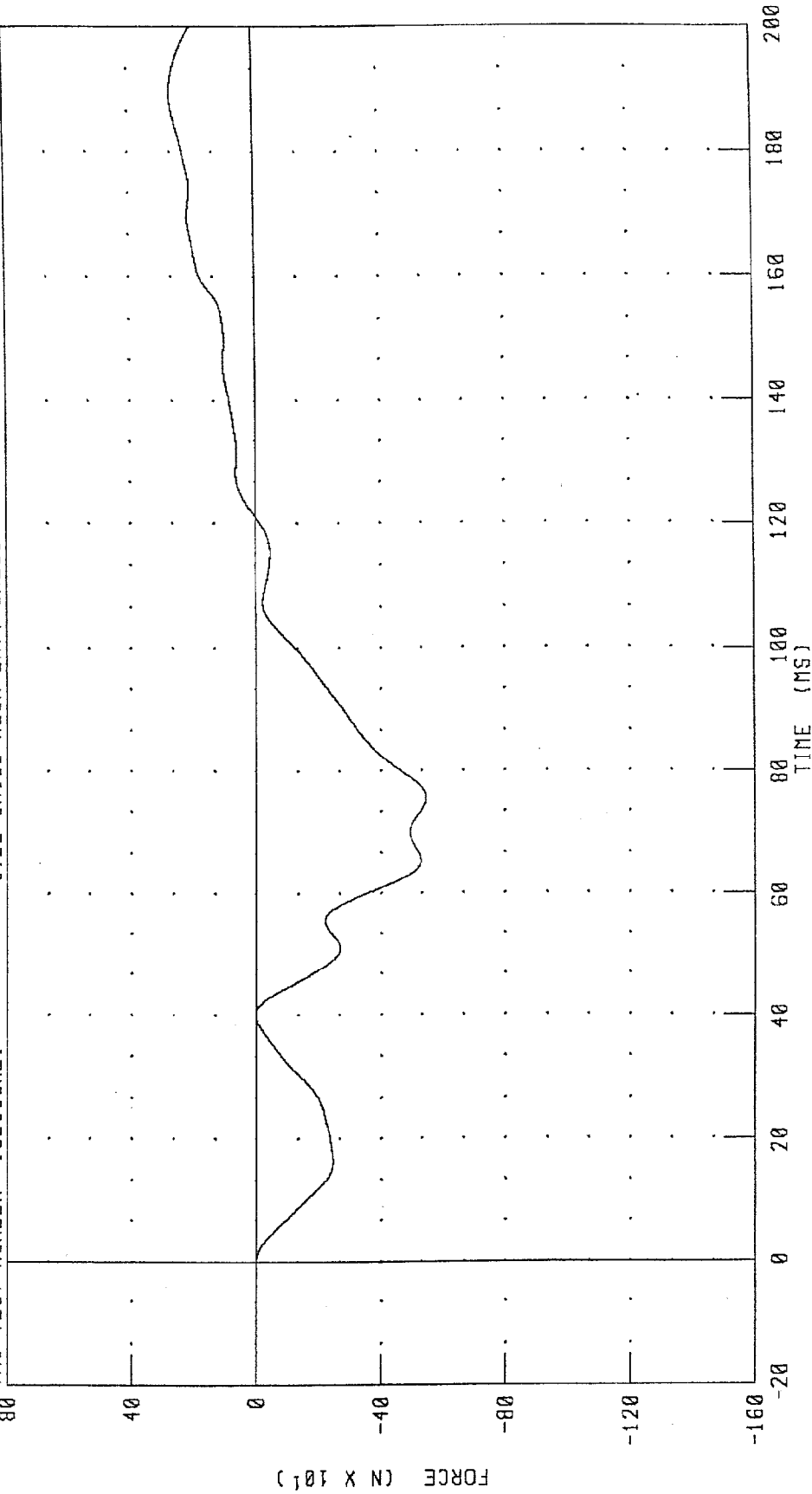
PEAK DATA: 95.35 ° @ 77.52 MS; -32.90 ° @ 194.72 MS

CHANNEL: TOTAL FILTER: CH. CLASS 60

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 192C38NE1 572E SN192 NECK EXT. CAL38 RUN NUMBER: 020998.1227;1

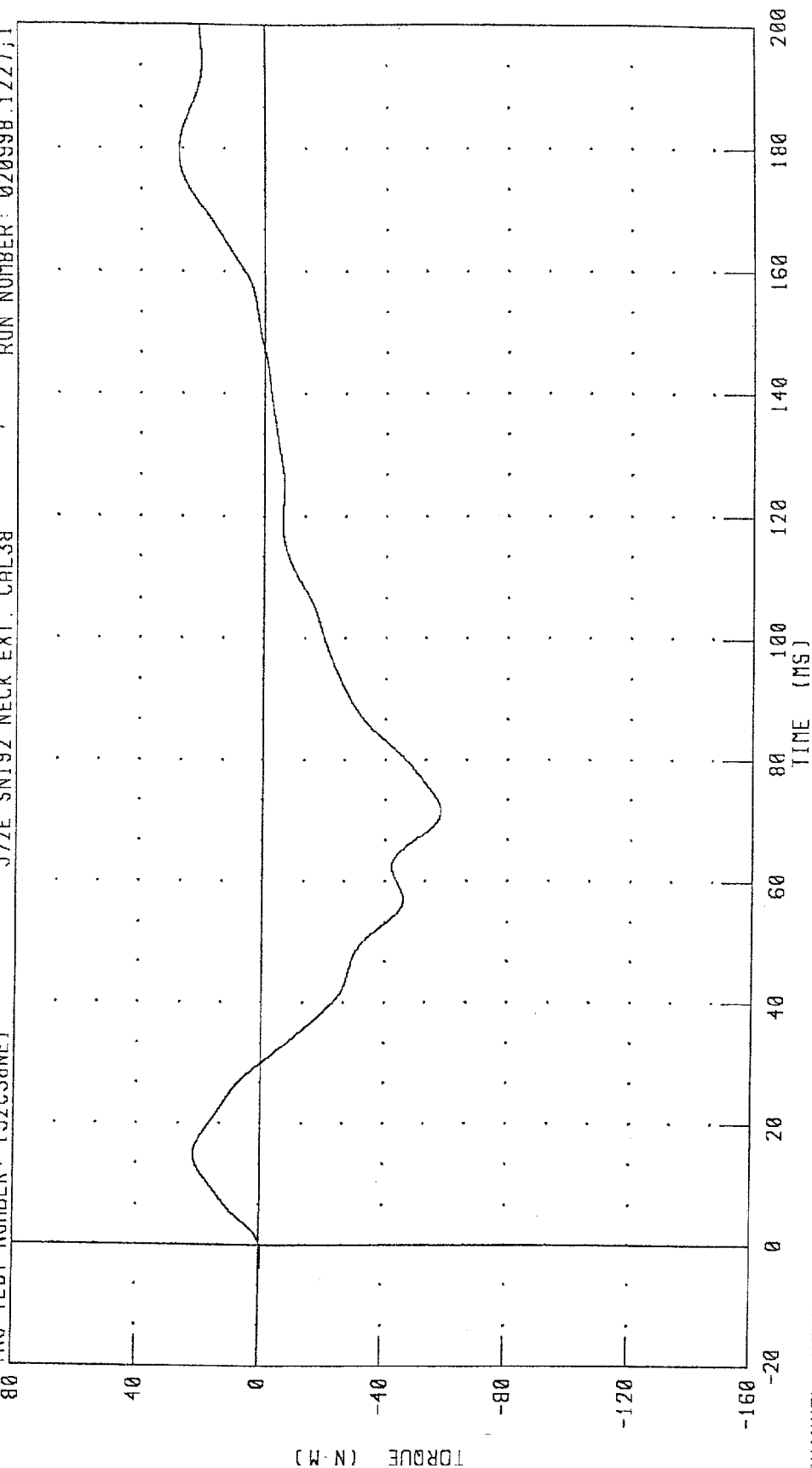


CHANNEL: NEKXF FILTER: CH. CLASS 60 PEAK DATA: 263.82 N @ 189.44 MS; -546.96 N @ 75.52 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER: 192C38NE1 572E SN192 NECK EXT. CAL38 RUN NUMBER: 020998.1227,1



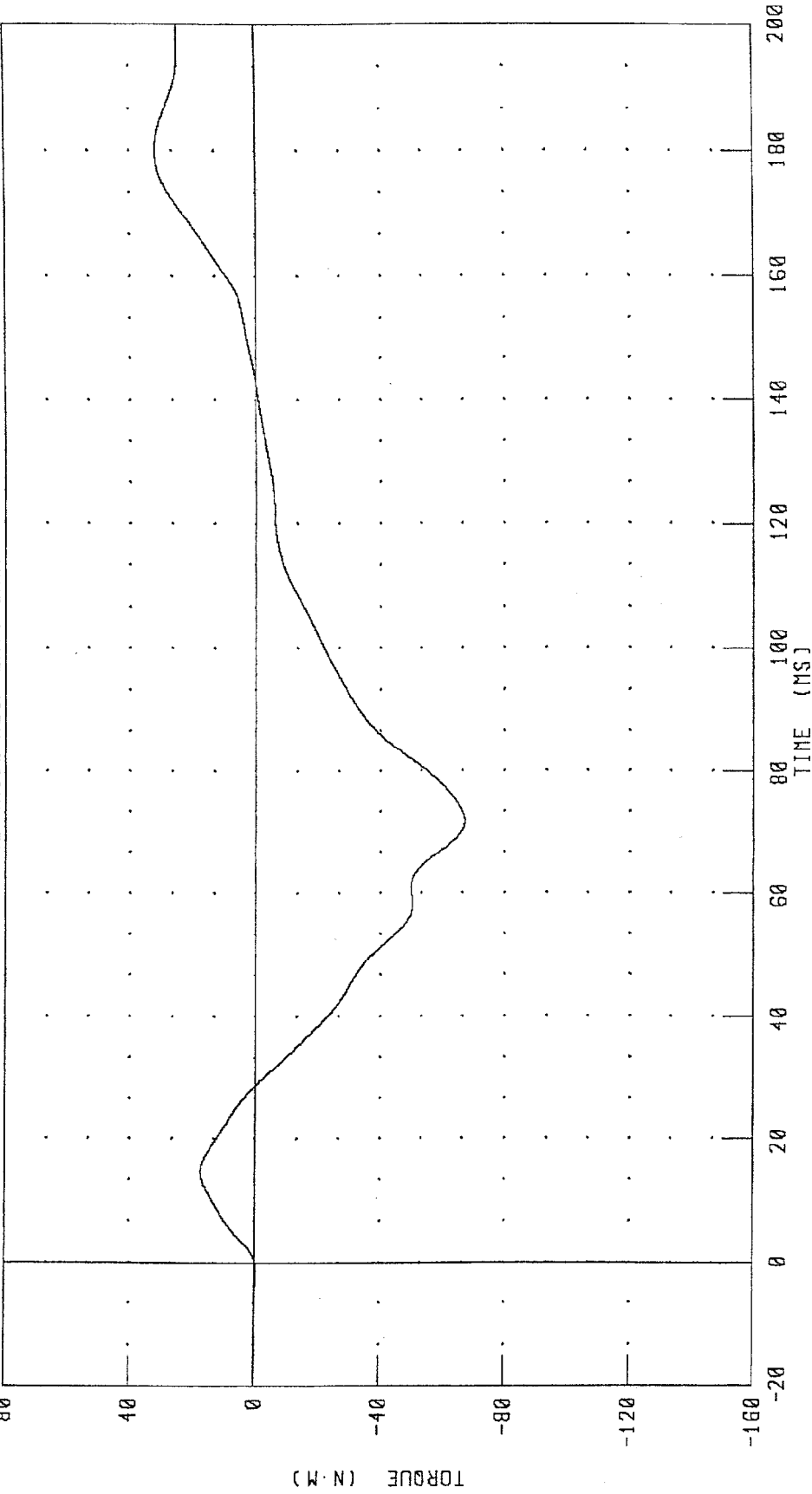
CHANNEL: NEKYM FILTER: CH. CLASS 60

PEAK DATA: 27.76 N-M @ 179.52 MS; -58.34 N-M @ 71.52 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 192C38NE1 572E SN192 NECK EXT. CAL38 RUN NUMBER: 020998.1227.1



CHANNEL: NEKOM FILTER: CH. CLASS 60

PEAK DATA: 31.78 N·M @ 180.08 MS; -67.33 N·M @ 71.84 MS

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III 50th

09-FEB-98

TRC INC.

TEST NO: 192C38TH2

572E SN192 H.S.THORAX CAL38

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.65 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	67.4 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5814. N
INTERNAL HYSTERESIS	69% - 85%	72.1%

TEST MEETS SPECIFICATIONS

TECHNICIAN

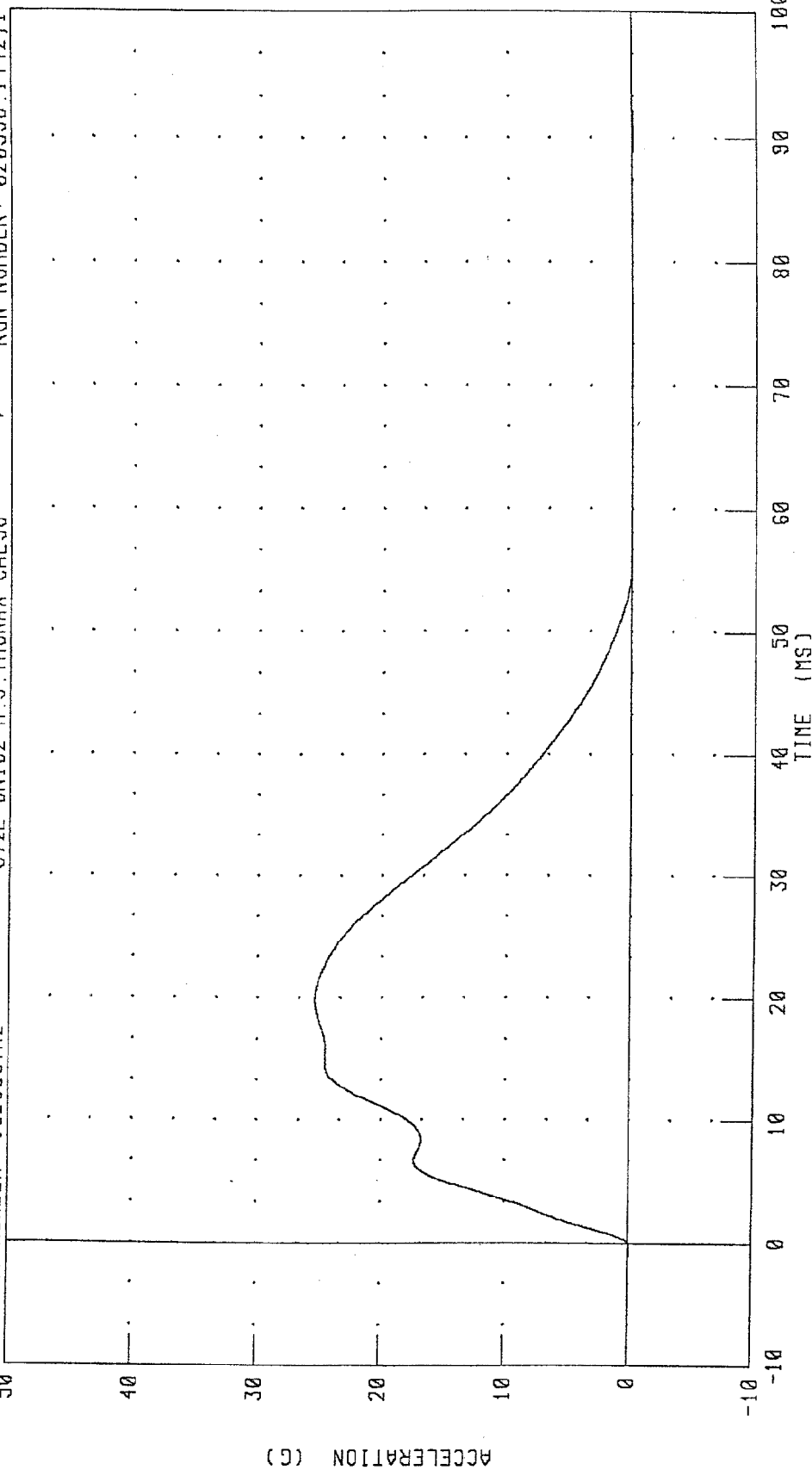
By Calt

RUN NUMBER: 020998.1442;1

PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 192C38TH2 572E SN192 H.S. THORAX CAL38 RUN NUMBER: 020998.1442,1

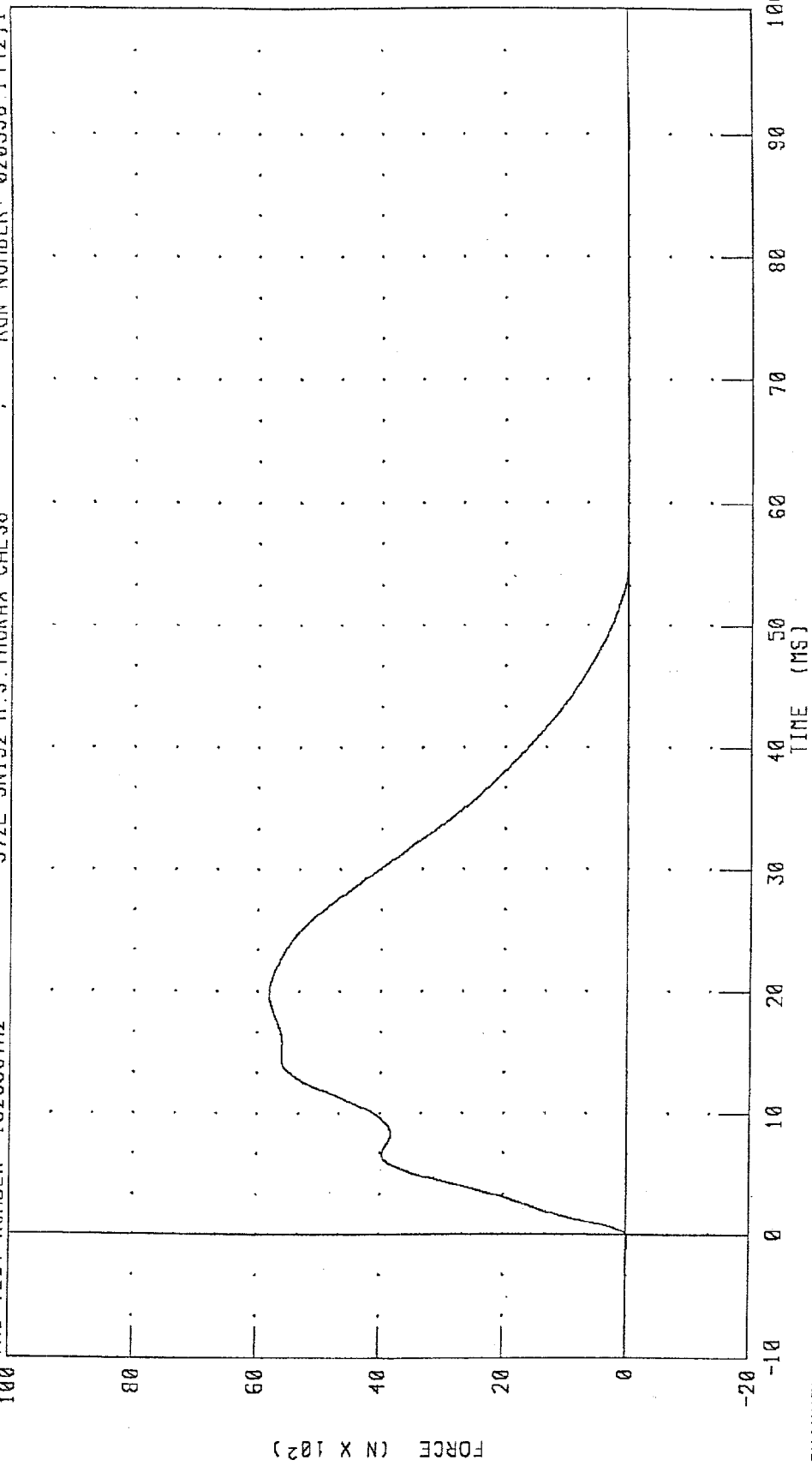


CHANNEL: PENXG FILTER: CH. CLASS 180 PEAK DATA: 25.38 G @ 19.84 MS; -0.07 G @ -0.48 MS

PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM FORCE

TRC TEST NUMBER: 192C38TH2 572E SN192 H.S. THORAX CAL38 RUN NUMBER: 020998 1442,1

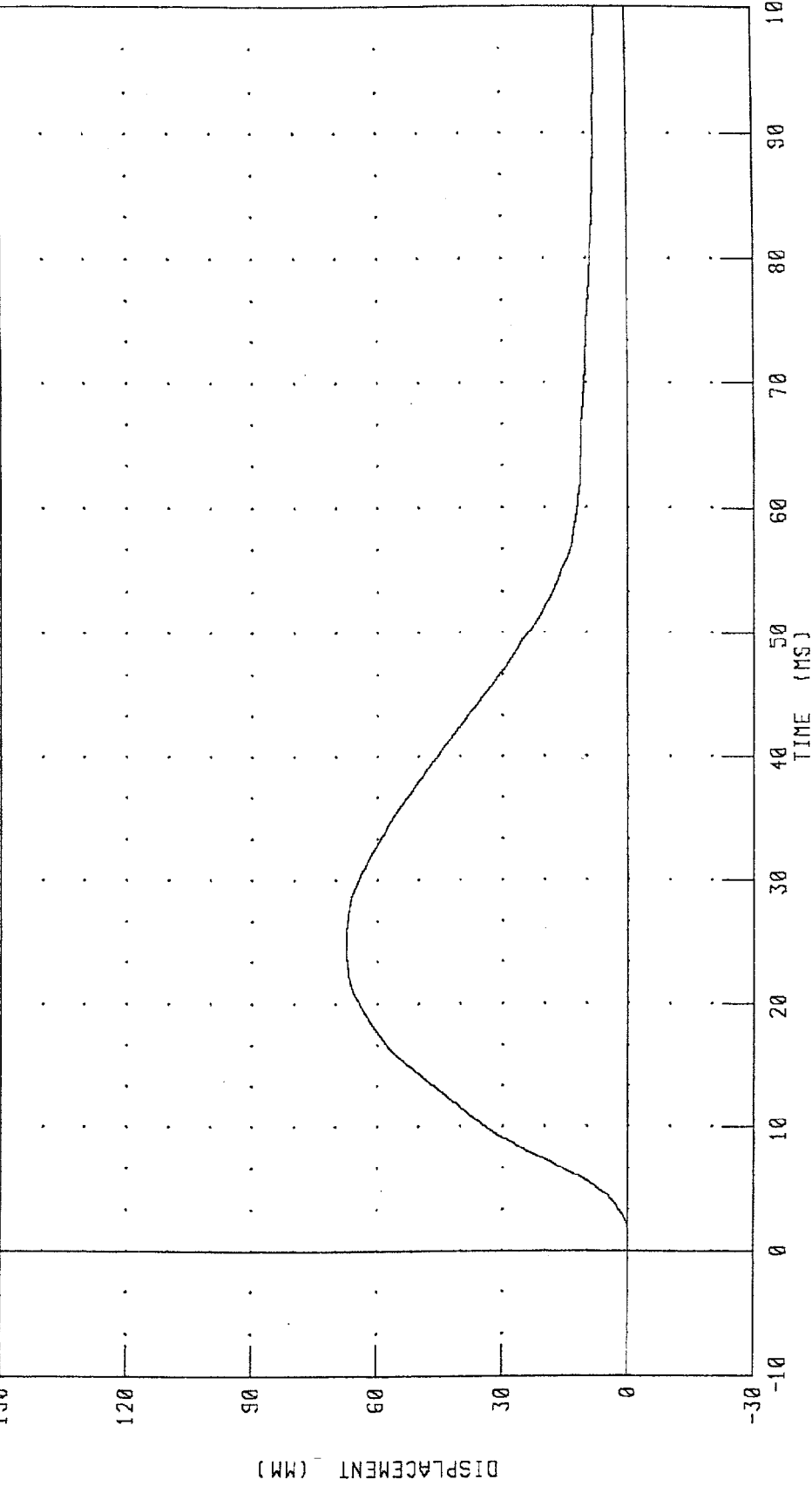


CHANNEL: PENXF FILTER: CH. CLASS 180 PEAK DATA: 5814.99 N @ 19.84 MS, -17.04 N @ -0.48 MS

PART 572-E HYBRID III THORAX CALIBRATION

STERNUM DISPLACEMENT

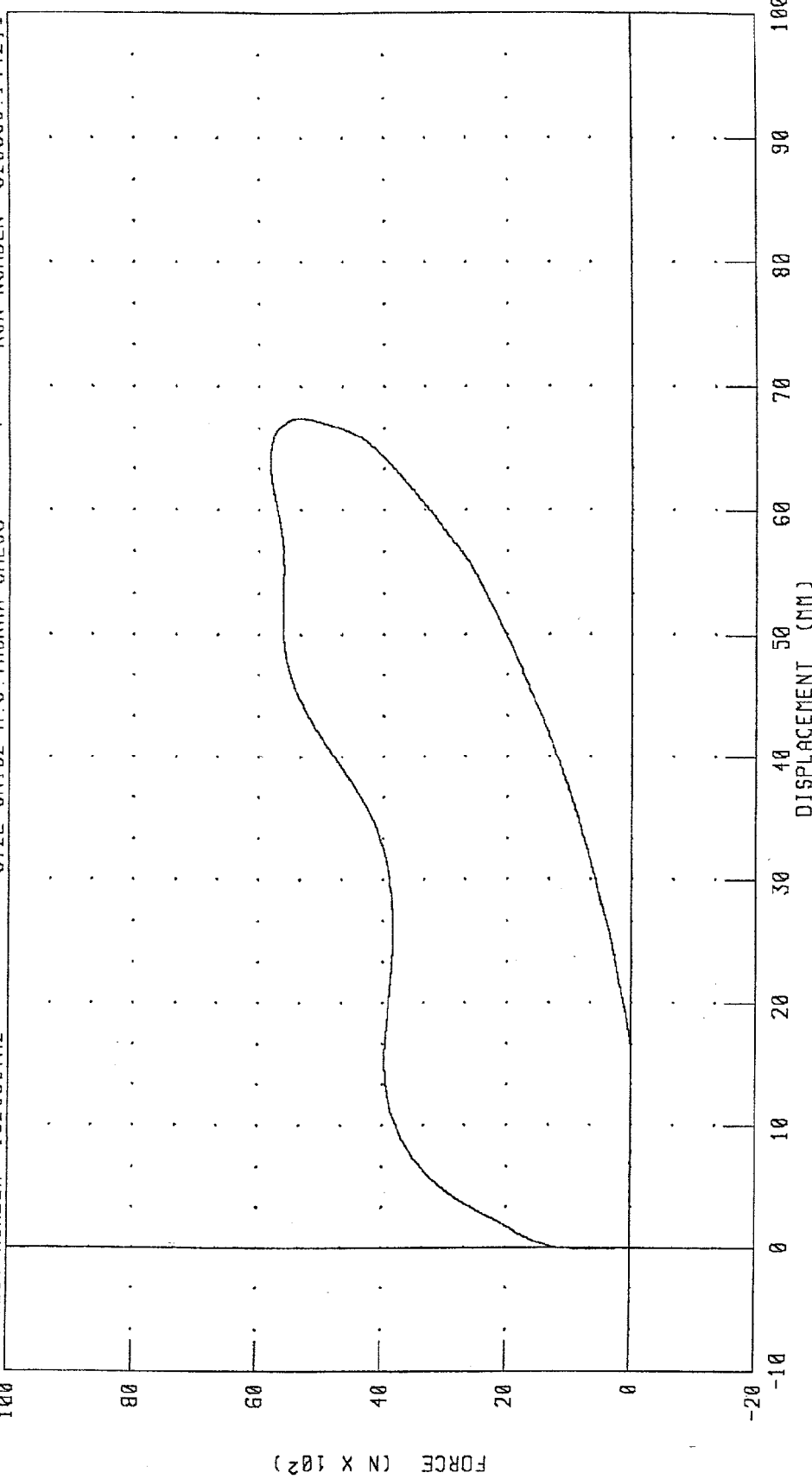
TRC TEST NUMBER: 192C38TH2 572E SN192 H.S. THORAX CAL38 RUN NUMBER: 020998.1442;1



CHANNEL: CSTXD FILTER: CH. CLASS 180 PEAK DATA: 67.48 MM @ 24.72 MS; -0.05 MM @ 1.20 NS

PART 572-E HYBRID III THORAX CALIBRATION
CHEST DISPLACEMENT VS PENDULUM FORCE

TRC TEST NUMBER: 192C38TH2 572E SN192 H.S. THORAX CAL38 RUN NUMBER: 020998.1442;1



CHANNEL: CSTXD FILTER: CH. CLASS 180
PENXF CH. CLASS 180
PEAK DATA: 67.48 MM @ 24.72 MS; -0.05 MM @ 1.20 MS
5814.99 N @ 19.84 MS; -17.04 N @ -0.48 MS

TRANSPORTATION RESEARCH CENTER INC.

RIGHT HIP JOINT FEMUR FLEXION TEST

HYBRID III PART 572E

07-FEB-98

TRC INC.

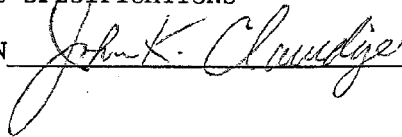
TEST NO: 192C38HR1

RIGHT HIP FLEX 0 DEGREES

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
ROTATION RATE	5 - 10 deg/sec	YES
TORQUE @ 30 deg ROTATION	<= 94.9 Nm	76.6 Nm
ROTATION @ 203.4 Nm TORQUE	40 - 50 deg.	44.3 deg.

TEST MEETS SPECIFICATIONS

TECHNICIAN

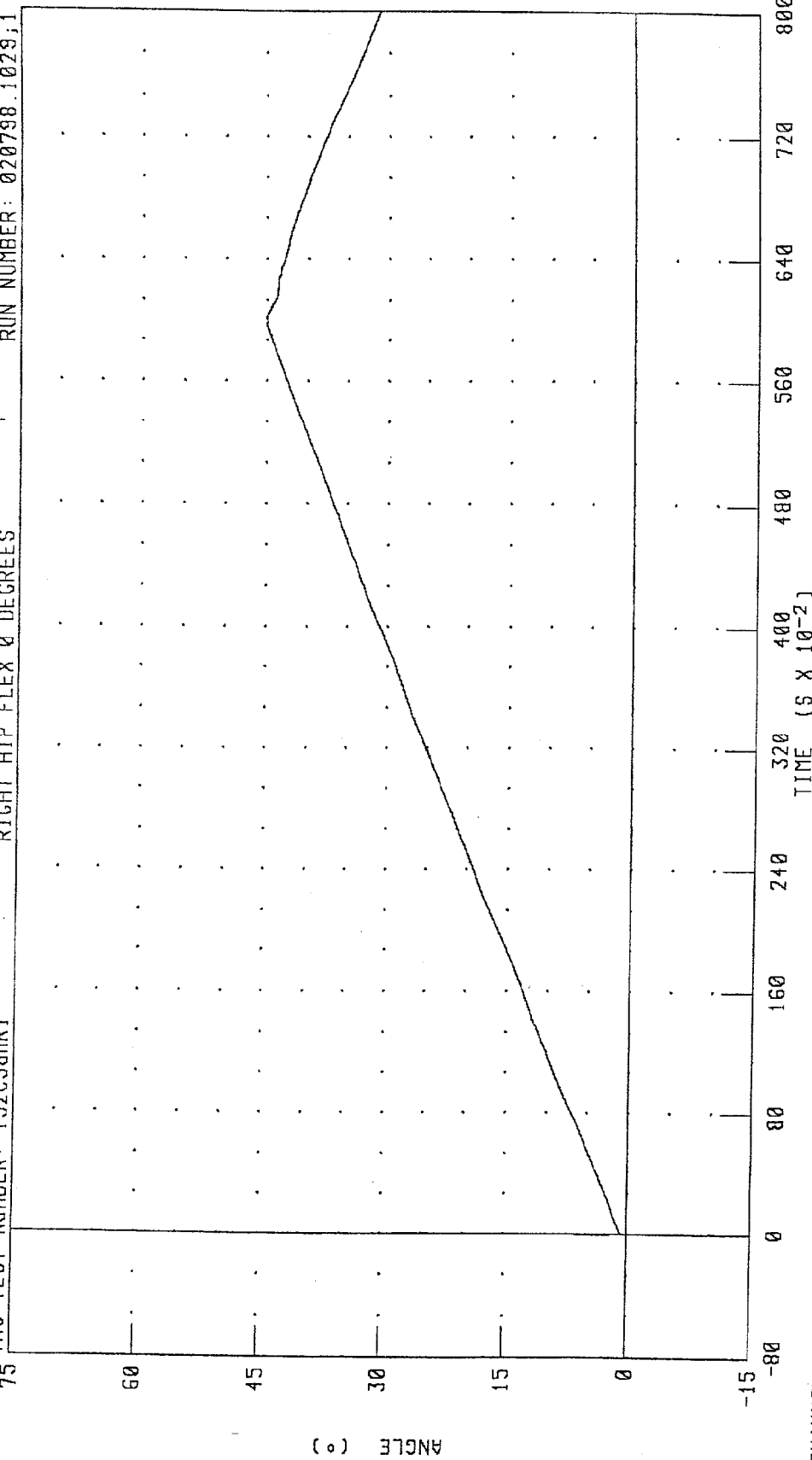


RUN NUMBER: 020798.1028;1

HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

RIGHT HIP FLEXION ROTATION

TRC TEST NUMBER: 192C38HR1 RIGHT HIP FLEX 0 DEGREES RUN NUMBER: 020798.1029;1



PEAK DATA: 45.10 ° @ 5.98 S; 0.00 ° @ 0.00 S

CHANNEL: RHPXD FILTER: CH. CLASS 60

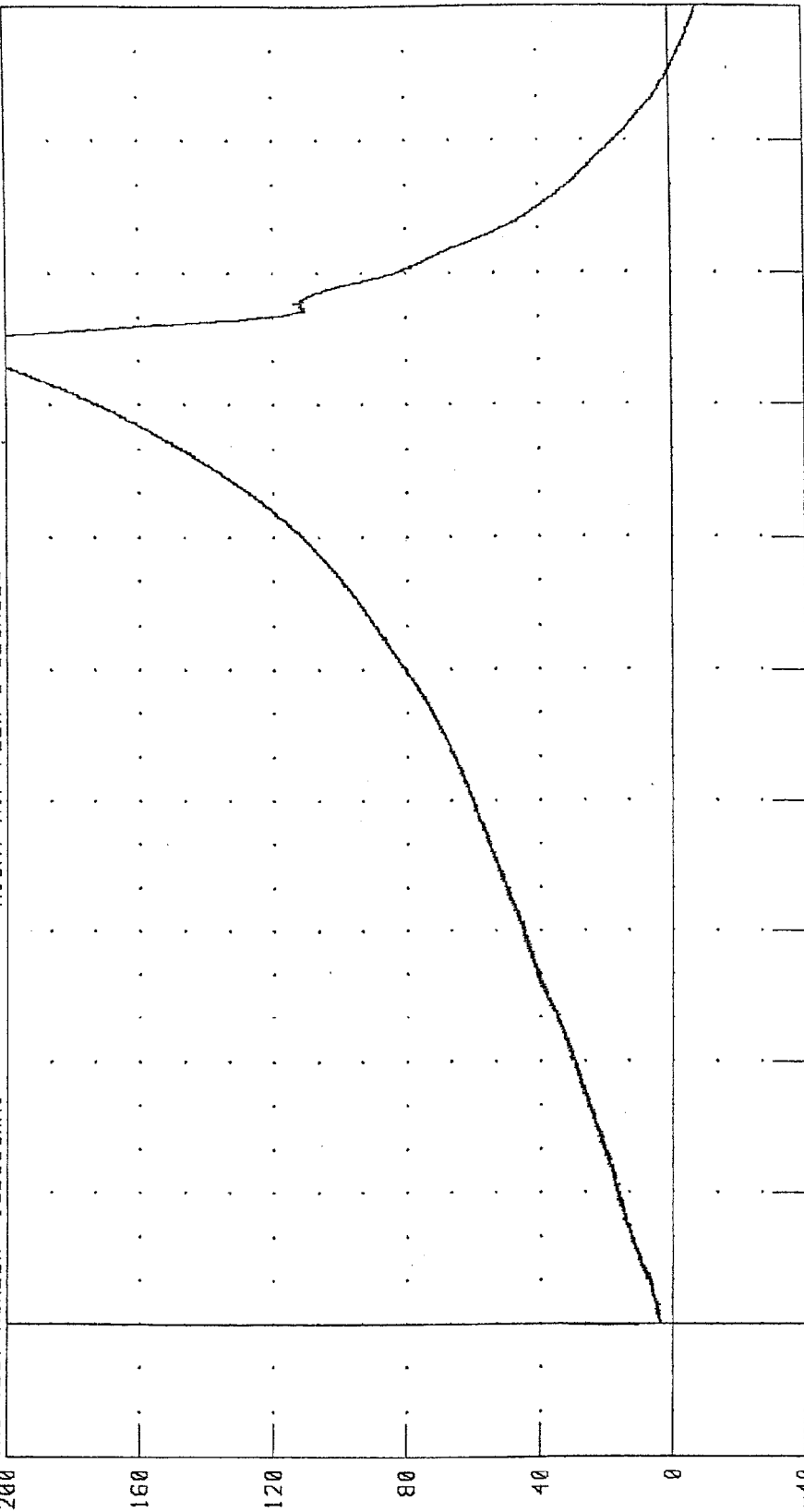
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

RIGHT HIP FLEXION MOMENT

RIGHT HIP FLEX 0 DEGREES

TRC TEST NUMBER: 192C38HR1

RUN NUMBER: 020798.1029.1



TIME (S X 10⁻²)

CHANNEL: RHPYM FILTER: CH. CLASS 60

PEAK DATA: 220.89 N-M @ 5.97 S; -33.03 N-M @ 9.99 S

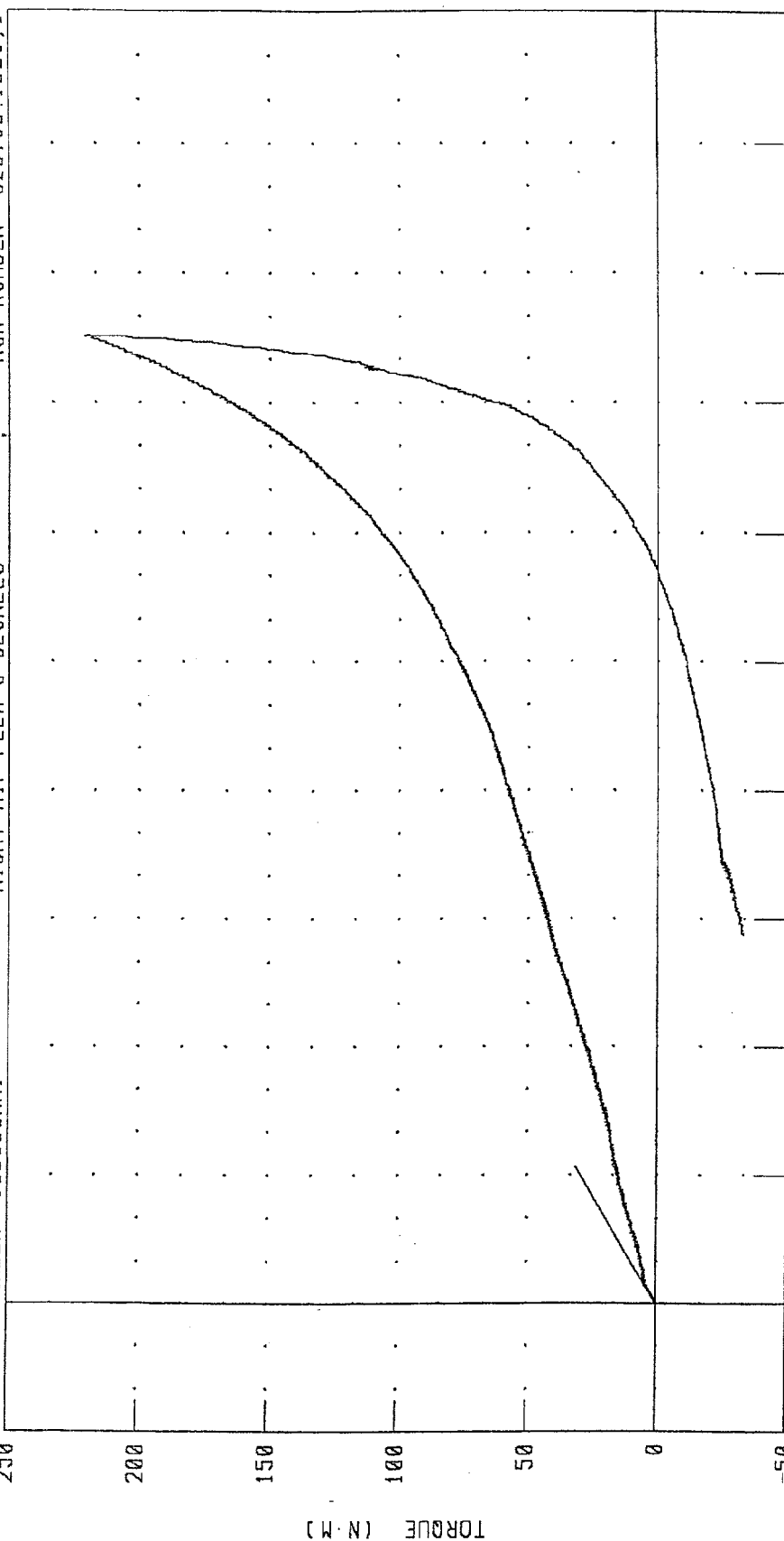
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

RIGHT HIP FLEXION MOMENT VS ROTATION ANGLE

TRC TEST NUMBER: 192C38HR1

RIGHT HIP FLEX 0 DEGREES

RUN NUMBER: 020798.1029;1



CHANNEL: RHPX0
RHPYM

FILTER: CH: CLASS 60
CH: CLASS 60

ANGLE (° x 10⁻¹)

PEAK DATA: 45.10 ° @ 5.98 S;
220.89 N·M @ 5.97 S;

0.00 ° @ 0.00 S
-33.03 N·M @ 9.99 S

TRANSPORTATION RESEARCH CENTER INC.

LEFT HIP JOINT FEMUR FLEXION TEST

HYBRID III PART 572E

07-FEB-98

TRC INC.

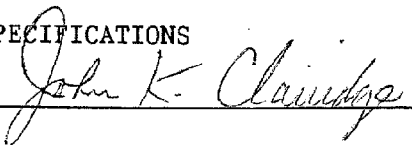
TEST NO: 192C38HL1

LEFT HIP FLEX 0 DEGREES

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
ROTATION RATE	5 - 10 deg/sec	YES
TORQUE @ 30 deg ROTATION	<= 94.9 Nm	76.8 Nm
ROTATION @ 203.4 Nm TORQUE	40 - 50 deg.	41.5 deg.

TEST MEETS SPECIFICATIONS

TECHNICIAN



RUN NUMBER: 020798.1040;2

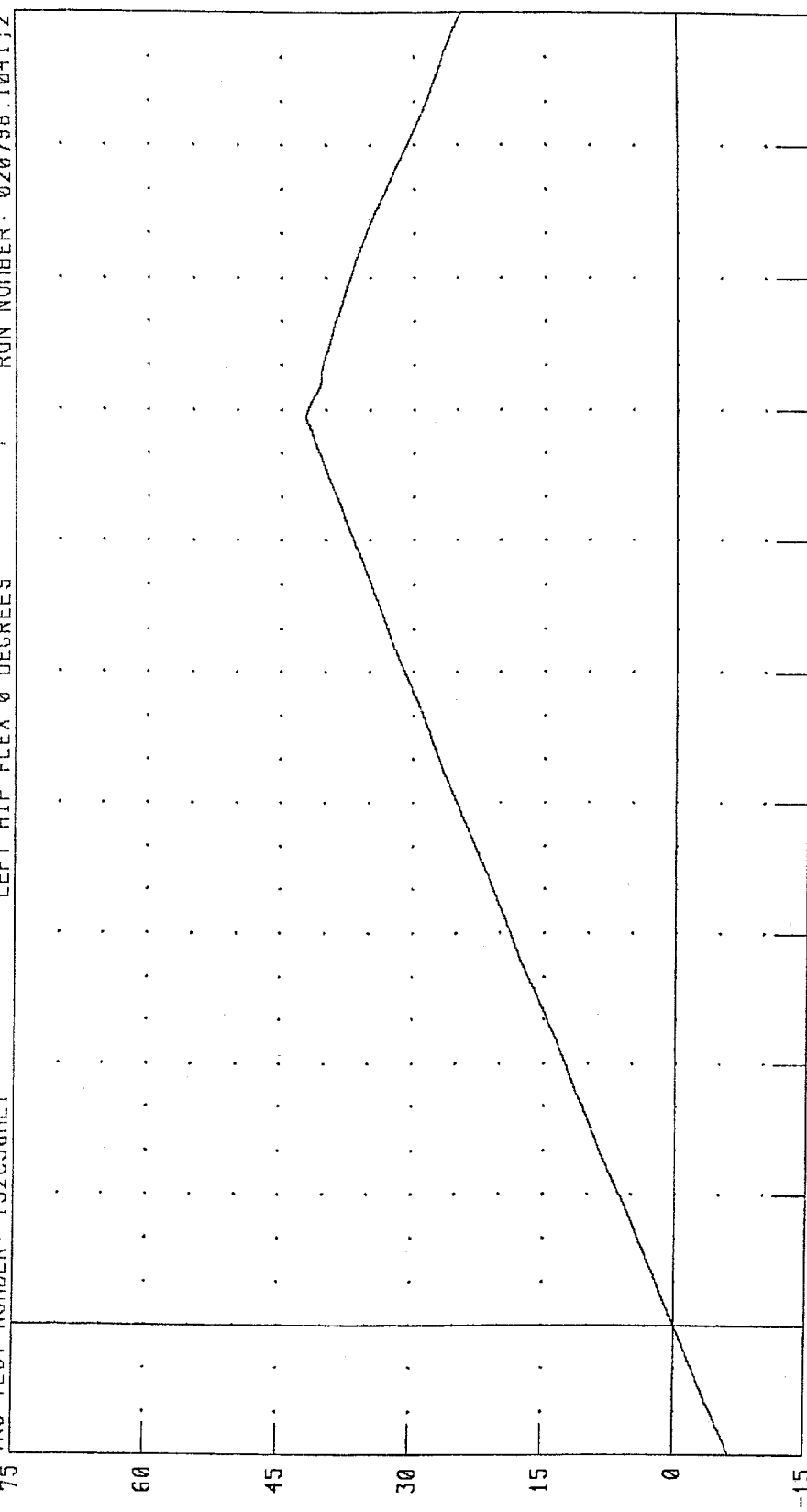
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

LEFT HIP FLEXION ROTATION

TRC TEST NUMBER: 192C38HL1

LEFT HIP FLEX 0 DEGREES

RUN NUMBER: 020798.1041,2



PEAK DATA: 42.19 ° @ 5.55 S; -8.10 ° @ -0.83 S

CHANNEL: LHPXD FILTER: CH. CLASS 60

ANGLE (°)

C-77

980219

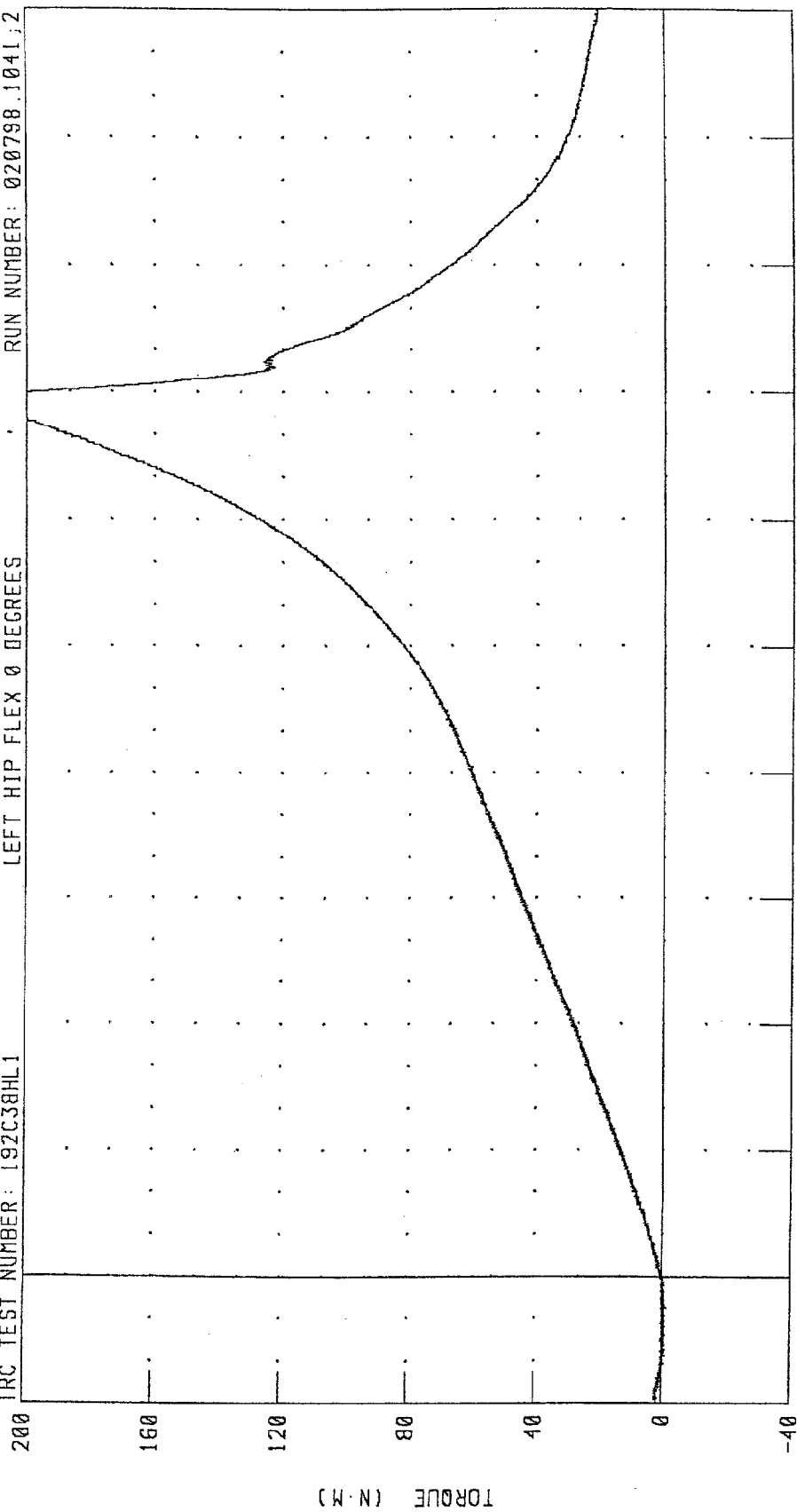
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

LEFT HIP FLEXION MOMENT

LEFT HIP FLEX 0 DEGREES

TRC TEST NUMBER: 192C38HL1

RUN NUMBER: 020798.1041,2



CHANNEL: LHPYM FILTER: CH. CLASS 60

PEAK DATA: 219.10 N·M @ 5.54 S; -4.58 N·M @ -0.83 S

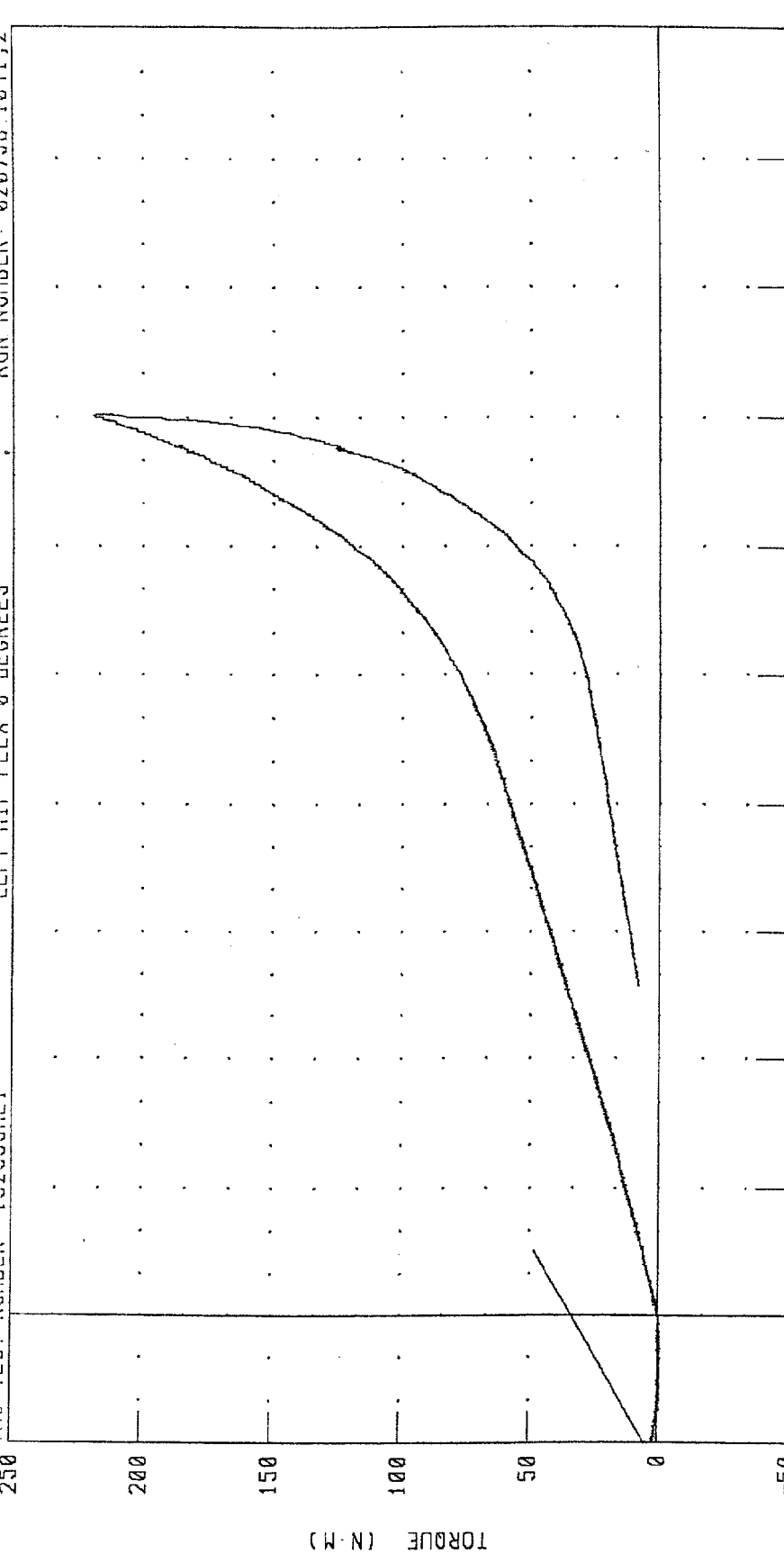
HYBRID III HIP FLEXION VERIFICATION - 0 DEGREES

LEFT HIP FLEXION MOMENT VS ROTATION ANGLE

TRC TEST NUMBER: 192C38HL1

LEFT HIP FLEX 0 DEGREES

RUN NUMBER: 020798.1041,2



CHANNEL: LHPXD
LHPYM

FILTER: CH. CLASS 60
CH. CLASS 60

ANGLE (° X 10⁻¹)

PEAK DATA: 42.19 ° @ 5.55 S;
219.10 N.M @ 5.54 S;

-8.10 ° @ -0.83 S;
-4.58 N.M @ -0.83 S

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

TRC INC.

TEST NO: 192C38RK1

572E SN192 RIGHT KNEE CAL 38

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.11 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5651.1 N

TEST MEETS SPECIFICATIONS

TECHNICIAN

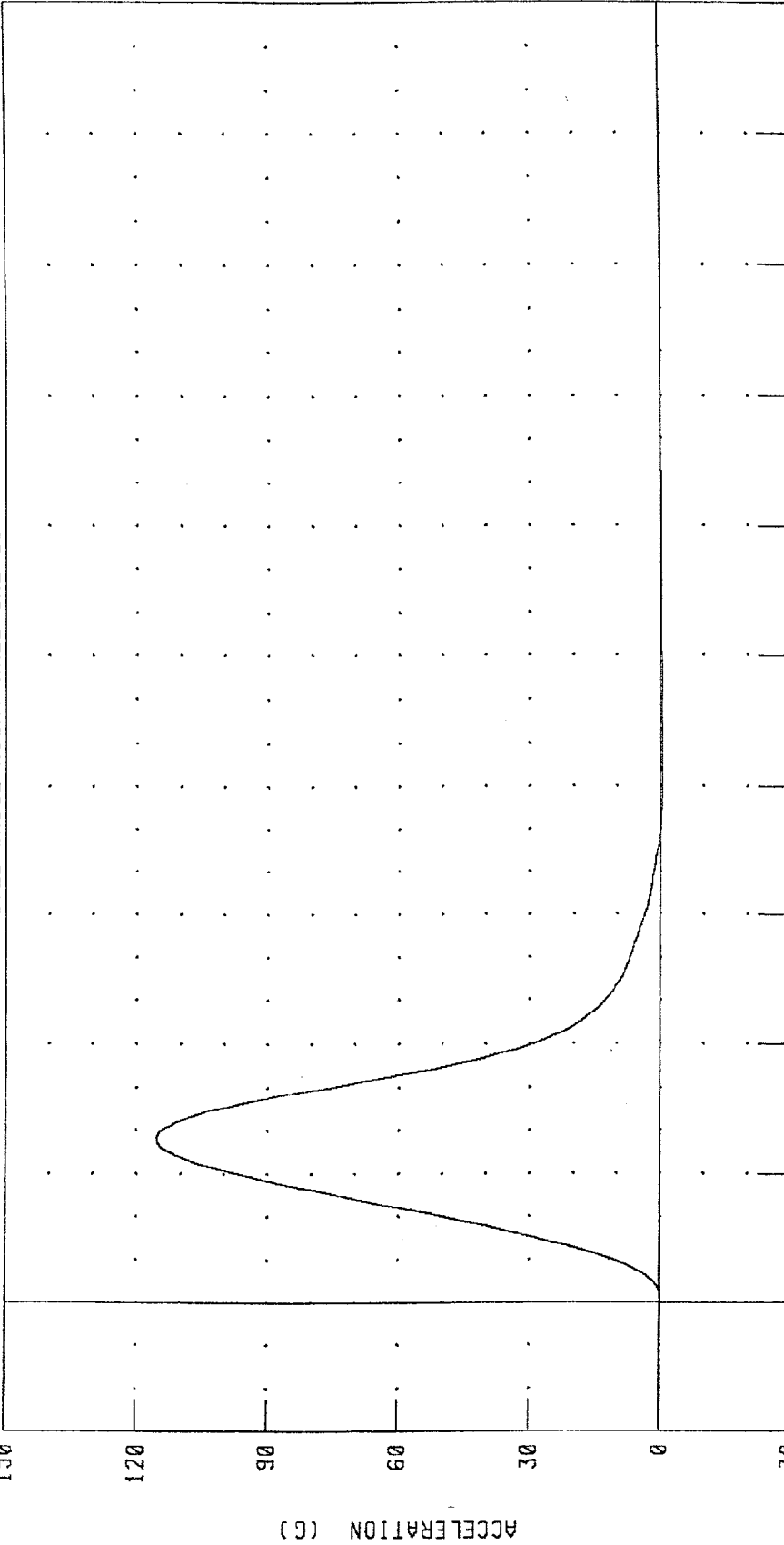
John K. Clavidge

RUN NUMBER: 020798.0924;1

PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 192C38RK1 572E SN192 RIGHT KNEE CAL 38 RUN NUMBER: 020798.0925;1



CHANNEL: PENXG FILTER: CH. CLASS 600
 TIME (MS X 10⁻¹)
 PEAK DATA: 115.50 G @ 2.56 MS; -0.48 G @ 8.64 MS

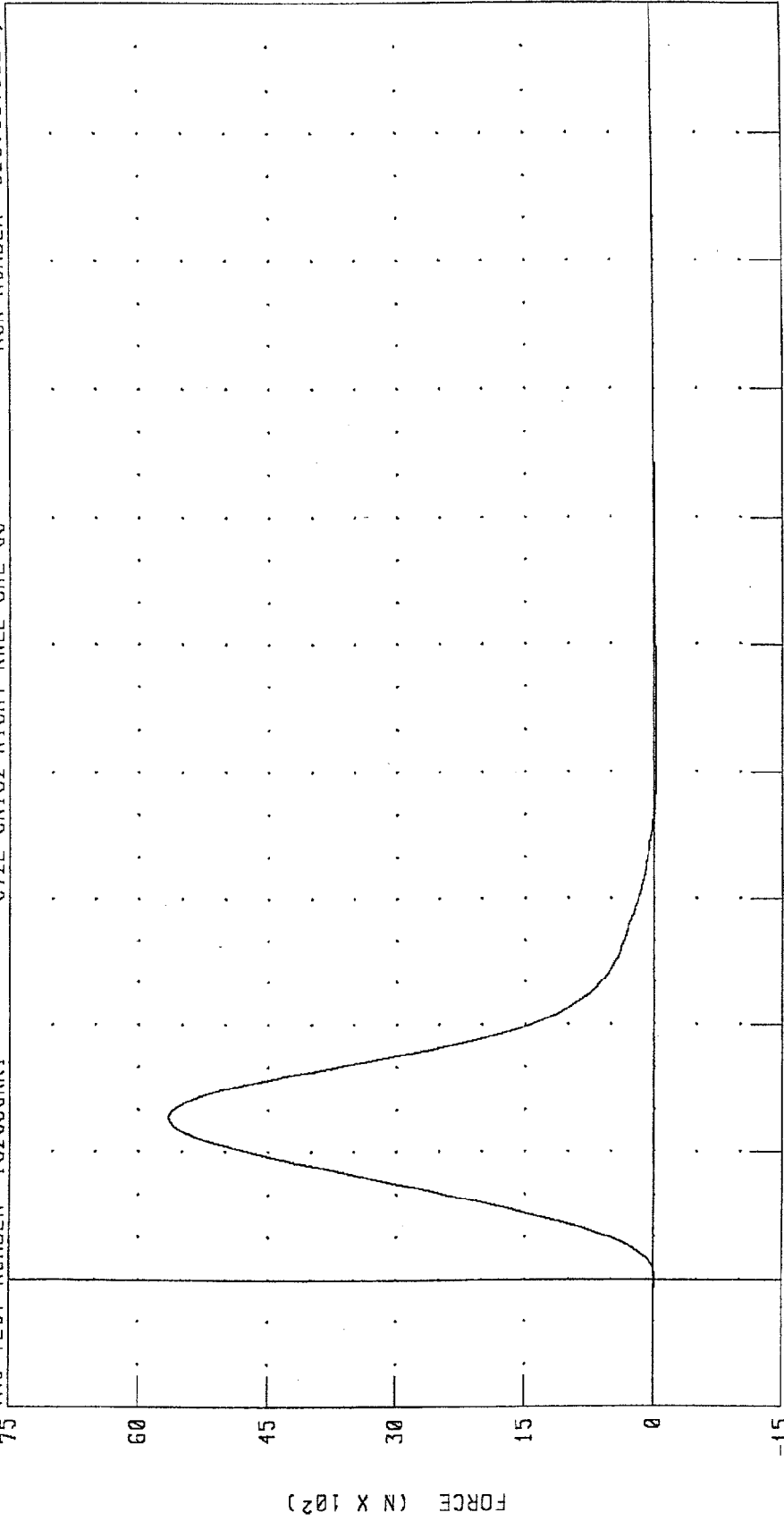
PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

572E SN192 RIGHT KNEE CAL 38

TRC TEST NUMBER: 192C38RK1

RUN NUMBER: 020798.0925,1



CHANNEL: PENXF FILTER: CH. CLASS 600
 TIME (MS X 10⁻¹)
 PEAK DATA: 5651.14 N @ 2.56 MS; -23.26 N @ 8.64 MS

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

TRC INC.

TEST NO: 192C38LK1

572E SN192 LEFT KNEE CAL 38

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	37.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.11 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5473.9 N

TEST MEETS SPECIFICATIONS

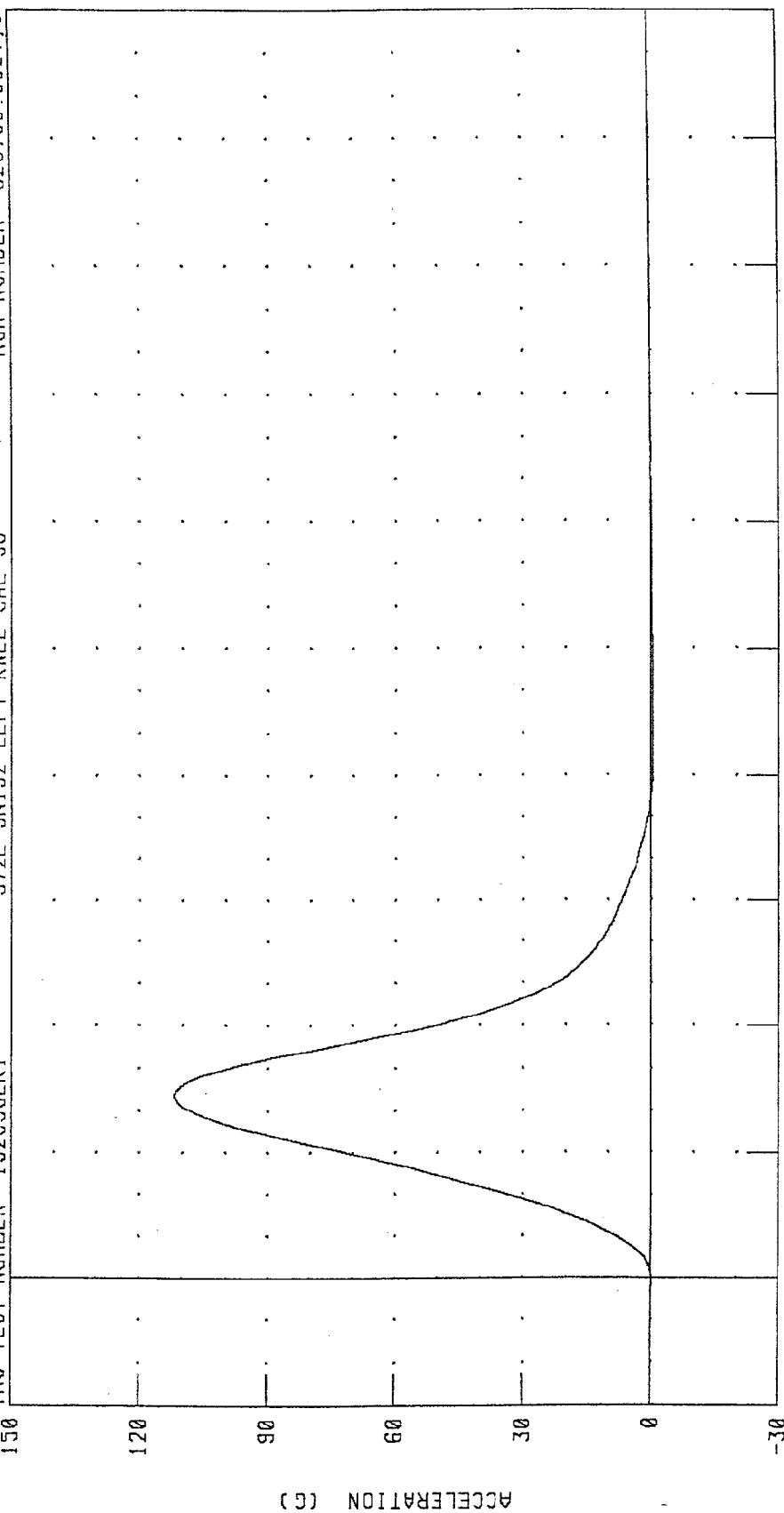
TECHNICIAN

John K. Clavitz

RUN NUMBER: 020798.0920;1

PART 572-E HYBRID III LEFT KNEE CALIBRATION
 PENDULUM DECELERATION (5 KG PEND.)

TRC TEST NUMBER: 192C38LK1 572E SN192 LEFT KNEE CAL 38 RUN NUMBER: 020798.0927;1



CHANNEL: PENXG FILTER: CH. CLASS 600 PEAK DATA: 111.88 G @ 2.88 MS; -0.56 G @ 8.40 MS

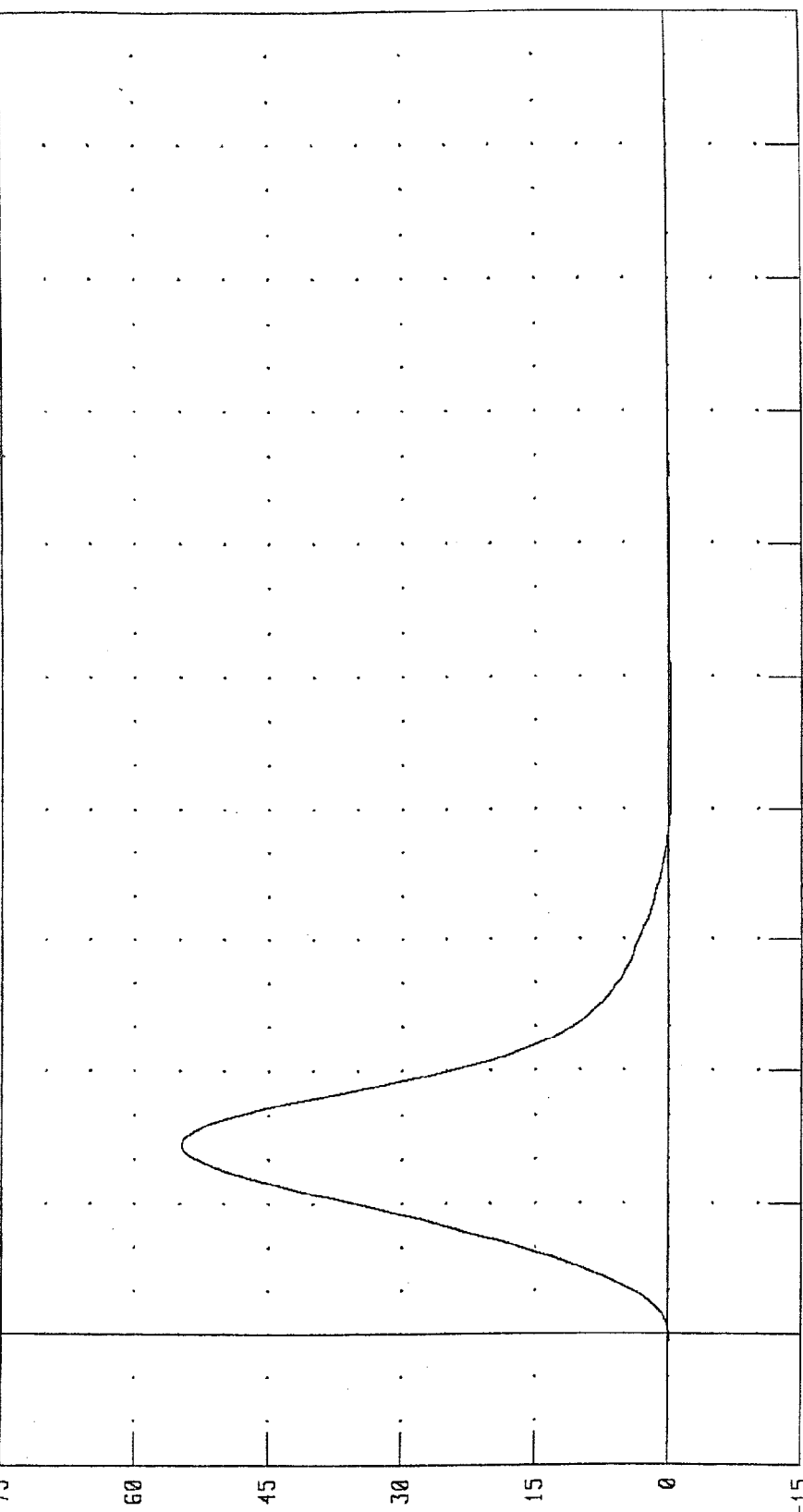
PART 572-E HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

TRC TEST NUMBER: 192C38LK1

572E SN192 LEFT KNEE CAL 38

RUN NUMBER: 020798.0927;1



CHANNEL: PENXF FILTER: CH. CLASS 600

TIME (MS X 10⁻¹)

PEAK DATA: 5473.93 N @ 2.88 MS; -27.50 N @ 8.40 MS

Appendix D

Miscellaneous Test Information

Dummy Instrument Calibrations
Driver Dummy #142

	Serial Number	Model Number	Manufacturer	Calibration Date	
				Last	Due
Head X-axis accelerometer	ACC63	7264	Endevco	01/05/98	07/05/98
Head X-axis accelerometer-redundant	AC8L5	7264	Endevco	01/05/98	07/05/98
Head Y-axis accelerometer	ACC02	7264	Endevco	01/05/98	07/05/98
Head Y-axis accelerometer-redundant	ACCR7	7264	Endevco	01/05/98	07/05/98
Head Z-axis accelerometer	ACCF3	7264	Endevco	01/05/98	07/05/98
Head Z-axis accelerometer-redundant	A68JJ	7264	Endevco	01/05/98	07/05/98
Chest X-axis accelerometer	ACC14	7264	Endevco	01/05/98	07/05/98
Chest X-axis accelerometer-redundant	A65JJ	7264	Endevco	01/05/98	07/05/98
Chest Y-axis accelerometer	ACCR0	7264	Endevco	01/05/98	07/05/98
Chest Y-axis accelerometer-redundant	FH14J	7264	Endevco	01/05/98	07/05/98
Chest Z-axis accelerometer	ACCT5	7264	Endevco	01/05/98	07/05/98
Chest Z-axis accelerometer-redundant	AC745	7264	Endevco	01/05/98	07/05/98
Left femur force load cell	257	2121	Denton	01/05/98	07/05/98
Right femur force load cell	258	2121	Denton	01/05/98	07/05/98
Neck X-axis force load cell ¹	441	1716	Denton	10/01/97	04/01/98
Neck Y-axis force load cell ¹	441	1716	Denton	10/01/97	04/01/98
Neck Z-axis force load cell ¹	441	1716	Denton	10/01/97	04/01/98
Neck Moment about X-axis load cell ¹	441	1716	Denton	10/01/97	04/01/98
Neck Moment about Y-axis load cell ¹	441	1716	Denton	10/01/97	04/01/98
Neck Moment about Z-axis load cell ¹	441	1716	Denton	10/01/97	04/01/98
Pelvis X-axis accelerometer	CY63H	7264	Endevco	01/05/98	07/05/98
Pelvis Y-axis accelerometer	AMWA9	7264	Endevco	01/05/98	07/05/98
Pelvis Z-axis accelerometer	ANA55	7264	Endevco	01/05/98	07/05/98
Chest deflection potentiometer	142	14CB1-2981	Servo	01/05/98	07/05/98
Lap belt force load cell	236	3419	Lebow	01/02/98	07/02/98

Dummy Instrument Calibrations, Cont'd.
Driver Dummy #142

	Serial Number	Model Number	Manufacturer	Calibration Date	
				Last	Due
Left upper tibia moment about X-axis load cell	023-MX	1583	Denton	09/26/97	03/26/98
Left upper tibia moment about Y-axis load cell	023-MY	1583	Denton	09/26/97	03/26/98
Right upper tibia moment about X-axis load cell	040-MX	1583	Denton	09/26/97	03/26/98
Right upper tibia moment about Y-axis load cell	040-MY	1583	Denton	09/26/97	03/26/98
Left Lower tibia X-axis force load cell	019-FY	1584	Denton	09/26/97	03/26/98
Left Lower tibia Z-axis force load cell	019-FZ	1584	Denton	09/26/97	03/26/98
Left Lower tibia moment about Y-axis load cell	019-MX	1584	Denton	09/26/97	03/26/98
Right Lower tibia X-axis force load cell	034-FY	1584	Denton	09/26/97	03/26/98
Right Lower tibia Z-axis force load cell	034-FZ	1584	Denton	09/26/97	03/26/98
Right Lower tibia moment about Y-axis load cell	034-MX	1584	Denton	09/26/97	03/26/98
Left foot X-axis accelerometer	APA01	7264	Endevco	01/05/98	07/05/98
Left foot heel Z-axis accelerometer	J14136	7264	Endevco	01/05/98	07/05/98
Left foot toe Z-axis accelerometer	DW58JC	7264	Endevco	01/05/98	07/05/98
Right foot X-axis accelerometer	10088	7264	Endevco	01/05/98	07/05/98
Right foot heel Z-axis accelerometer	10089	7264	Endevco	01/05/98	07/05/98
Right foot toe Z-axis accelerometer	10087	7264	Endevco	01/05/98	07/05/98

Dummy Instrument Calibrations, Cont'd.
Driver Dummy #142

	Serial	Model	Manufacturer	Calibration Date	
	Number	Number		Last	Due
Left knee left sensor	045	1587	Denton	09/26/97	03/26/98
Left knee right sensor	045	1587	Denton	09/26/97	03/26/98
Right knee left sensor	037	1587	Denton	09/26/97	03/26/98
Right knee right sensor	037	1587	Denton	09/26/97	03/26/98

Dummy Instrument Calibrations, Cont'd.
Passenger Dummy #192

	Serial Number	Model Number	Manufacturer	Calibration Date	
				Last	Due
Head X-axis accelerometer	AAL54	7264	Endevco	01/05/98	07/05/98
Head X-axis accelerometer-redundant	AJ8J7	7264	Endevco	01/05/98	07/05/98
Head Y-axis accelerometer	AAMP6	7264	Endevco	01/05/98	07/05/98
Head Y-axis accelerometer-redundant	J15391	7264	Endevco	01/05/98	07/05/98
Head Z-axis accelerometer	ACB35	7264	Endevco	01/05/98	07/05/98
Head Z-axis accelerometer-redundant	AC8W6	7264	Endevco	01/05/98	07/05/98
Chest X-axis accelerometer	ACCD0	7264	Endevco	01/05/98	07/05/98
Chest X-axis accelerometer-redundant	A79GJ	7264	Endevco	01/05/98	07/05/98
Chest Y-axis accelerometer	ACC82	7264	Endevco	01/05/98	07/05/98
Chest Y-axis accelerometer-redundant	AGR69	7264	Endevco	01/05/98	07/05/98
Chest Z-axis accelerometer	ACC59	7264	Endevco	01/05/98	07/05/98
Chest Z-axis accelerometer-redundant	AAL82	7264	Endevco	01/05/98	07/05/98
Left femur force load cell	263	2121	Denton	01/05/98	07/05/98
Right femur force load cell	264	2121	Denton	01/05/98	07/05/98
Neck X-axis force load cell	445	1716	Denton	10/01/97	04/01/98
Neck Y-axis force load cell	445	1716	Denton	10/01/97	04/01/98
Neck Z-axis force load cell	445	1716	Denton	10/01/97	04/01/98
Neck Moment about X-axis load cell	445	1716	Denton	10/01/97	04/01/98
Neck Moment about Y-axis load cell	445	1716	Denton	10/01/97	04/01/98
Neck Moment about Z-axis load cell	445	1716	Denton	10/01/97	04/01/98
Pelvis X-axis accelerometer	AJ694	7264	Endevco	01/05/98	07/05/98
Pelvis Y-axis accelerometer	J15376	7264	Endevco	01/05/98	07/05/98
Pelvis Z-axis accelerometer	AJ788	7264	Endevco	01/05/98	07/05/98
Chest deflection potentiometer	87313-96	14CB1-2981	Vernitech	01/05/98	07/05/98
Lap belt force load cell	143	3419	Lebow	01/02/98	07/02/98

Dummy Instrument Calibrations, Cont'd.
Passenger Dummy #192

	Serial Number	Model Number	Manufacturer	Calibration Date	
				Last	Due
Left upper tibia moment about X-axis load cell	039-MX	1583	Denton	09/26/97	03/26/98
Left upper tibia moment about Y-axis load cell	039-MY	1583	Denton	09/26/97	03/26/98
Right upper tibia moment about X-axis load cell	036-MX	1583	Denton	09/26/97	03/26/98
Right upper tibia moment about Y-axis load cell	036-MY	1583	Denton	09/26/97	03/26/98
Left Lower tibia X-axis force load cell	033-FY	1584	Denton	09/26/97	03/26/98
Left Lower tibia Z-axis force load cell	033-FZ	1584	Denton	09/26/97	03/26/98
Left Lower tibia moment about Y-axis load cell	033-MX	1584	Denton	09/26/97	03/26/98
Right Lower tibia X-axis force load cell	040-FY	1584	Denton	09/26/97	03/26/98
Right Lower tibia Z-axis force load cell	040-FZ	1584	Denton	09/26/97	03/26/98
Right Lower tibia moment about Y-axis load cell	040-MX	1584	Denton	09/26/97	03/26/98
Left foot X-axis accelerometer	10073	7264	Endevco	01/05/98	07/05/98
Left foot heel Z-axis accelerometer	10263	7264	Endevco	01/05/98	07/05/98
Left foot toe Z-axis accelerometer	10101	7264	Endevco	01/05/98	07/05/98
Right foot X-axis accelerometer	APYT4	7264	Endevco	01/05/98	07/05/98
Right foot heel Z-axis accelerometer	AP0R8	7264	Endevco	01/05/98	07/05/98
Right foot toe Z-axis accelerometer	10076	7264	Endevco	01/05/98	07/05/98

Dummy Instrument Calibrations, Cont'd.
Passenger Dummy #192

	Serial	Model	Manufacturer	Calibration Date	
	Number	Number		Last	Due
Left knee left sensor	036	1587	Denton	09/26/97	03/26/98
Left knee right sensor	036	1587	Denton	09/26/97	03/26/98
Right knee left sensor	043	1587	Denton	09/26/97	03/26/98
Right knee right sensor	043	1587	Denton	09/26/97	03/26/98

Vehicle and Calibration Laboratory Instrument Calibrations

Vehicle Accelerometers

	Serial Number	Model Number	Manufacturer	Calibration Date	
				Last	Due
Left rear seat crossmember X-axis	J19954	7264	Endevco	02/16/98	08/16/98
Left rear seat crossmember X-axis redundant	J20261	7264	Endevco	02/06/98	08/06/98
Right rear seat crossmember X-axis	J22047	7264	Endevco	10/23/97	04/23/98
Right rear seat crossmember X-axis redundant	J20009	7264	Endevco	08/15/97	02/15/98
Engine top X-axis	J18895	7264	Endevco	08/20/97	02/20/98
Engine bottom X-axis	96601-Z17	EGE-73BE0QT	Entran	12/09/97	06/09/98
Right brake caliper X-axis	J20288	7264	Endevco	08/15/97	02/15/98
Left brake caliper X-axis	J20266	7264	Endevco	08/15/97	02/15/98
Instrument panel center X-axis	J19253	7264	Endevco	10/15/97	04/15/98

Calibration Laboratory Instruments

	Serial Number	Model Number	Manufacturer	Calibration Date	
				Last	Due
Neck bending pendulum accelerometer	CB27	7232	Endevco	09/18/97	03/18/98
Neck bending rotary potentiometer	6	6657S	Bournes	02/04/98	08/04/98
Neck bending rotary potentiometer	7	6657S	Bournes	02/04/98	08/04/98
Thorax/Hybrid III femur pendulum accelerometer	CC64	7232	Endevco	09/18/97	03/18/98
Hybrid III femur pendulum accelerometer	CB35	7232	Endevco	09/18/97	03/18/98

Sign Convention
NHTSA Data Tape Reference Guide

Accelerometers:

+X: Forward
+Y: Leftward
+Z: Upward

Potentiometers:

+Chest longitudinal deflection: Outward
+Chest lateral deflection: Leftward
+Seat belt displacement: Outward
+Seat belt extension: Elongation
+Knee slider displacement: Distance between femur and tibia
increased (in relation to a seated
dummy)

Load cells:

+Femur force: Tension
+Seat belt force: Tension
+Barrier force: Tension

Neck load cells:

+X force: Head pushed forward
+Y force: Head pushed leftward
+Z force: Head pulled upward (tension on neck)
+X moment: Right ear rotating toward right shoulder
+Y moment: Chin rotating toward chest
+Z moment: Chin rotating toward left shoulder

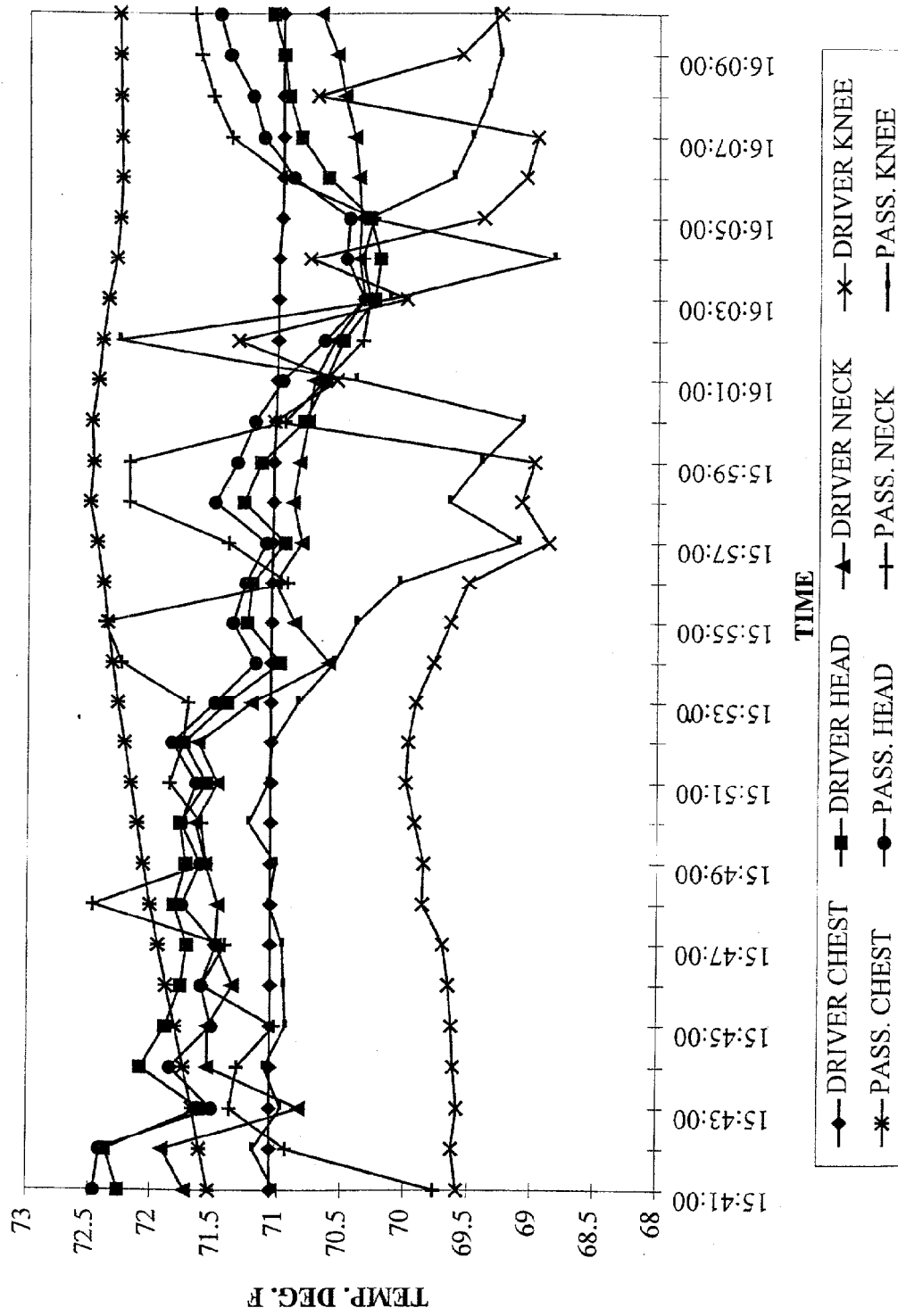
Tibia load cells:

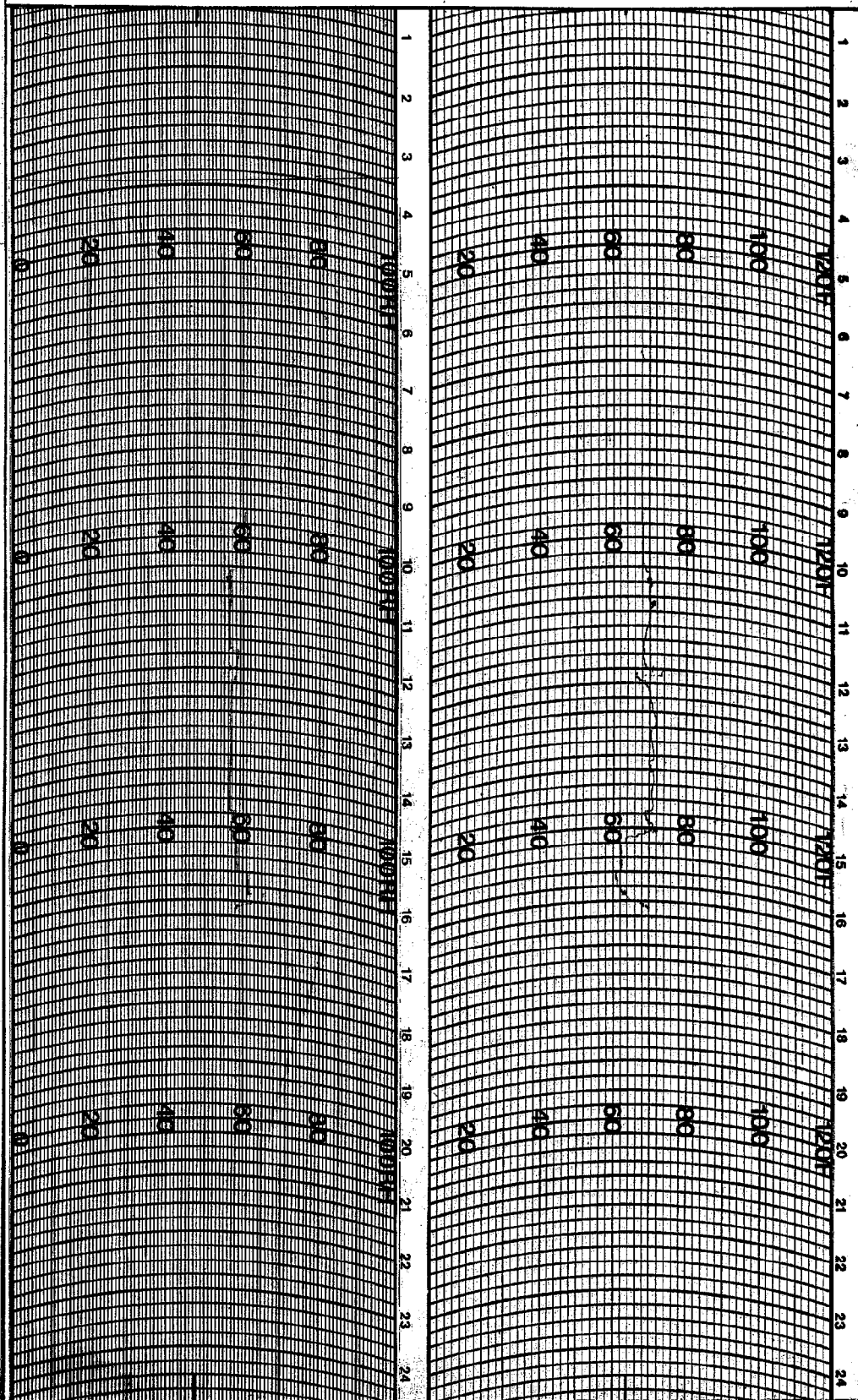
+X force: Tension
+Y force: Tension
+Z force: Tension
+X moment: Bottom of tibia moving leftward
+Y moment: Bottom of tibia moving rearward

Frequency Response Classes
SAE J211 OCT88

<u>Typical Test Measurements</u>	<u>Channel Class</u>
Vehicle Structural Accelerations for use in:	
Total vehicle comparison	60
Collision simulation input	60
Component analysis	600
Integration for velocity or displacement	180
Barrier Face Forces	60
Belt Restraint System Loads	60
Anthropomorphic Test Device	
Head accelerations (linear and angular)	1000
Neck	
Forces	1000
Moments	600
Thorax	
Spine accelerations	180
Rib accelerations	1000
Sternum accelerations	1000
Deflections	180
Lumbar	
Forces	1000
Moments	1000
Pelvis	
Accelerations	1000
Forces	1000
Moments	1000
Femur/Knee/Tibia/Ankle	
Forces	600
Moments	600
Displacements	180
Sled Accelerations	60
Steering Column Loads	600
Head form Accelerations	1000

980219





WEATHER MEASURE
PO BOX 41257
SACRAMENTO, CA 95841
PHONE (916) 481-7565

HYGROTHERMOGRAPH
1 DAY

CHART # C311 D HF
PART # 699123

STATION _____

DATE ON _____

DATE OFF _____

D-12

980219

Appendix E

Restraint System Instructions from Owner's Manual

Occupant safety

Despite our strongest recommendations, and your best intentions, not wearing a seat belt is like believing "It'll never happen to me!". Volvo, the inventor of the three-point seat belt, urges you and all adult occupants of your car to wear seat belts and ensure that children are properly restrained, using an infant, car or booster seat determined by age, weight and height.

Fact: In every state and province, some type of child-restraint legislation has been passed. Additionally, most states and provinces have already made it mandatory for occupants of a car to use seat belts.

So, urging you to "buckle up" is not just our recommendation - legislation in your state or province may mandate seat belt usage. The few seconds it takes to buckle up may one day allow you to say, "It's a good thing I was wearing my seat belt".

Seat belts	2
Volvo SRS	4
Side Impact Protection System - (SIPS) air bag	8
Child safety	9
Occupant safety	14
Reporting Safety Defects	14

 **SEATBELTS**

Seat belts

Seat belts

Always fasten the seat belts before you drive or ride.

Two lights above the rear view mirror will be illuminated for 4-8 seconds after the starting (ignition) key is turned to the driving position. A chime will sound at the same time if the driver has not fastened his seat belt. The rear seats are provided with self-retracting inertia reel belts. The front seats are provided with single roller belts with tensioners.

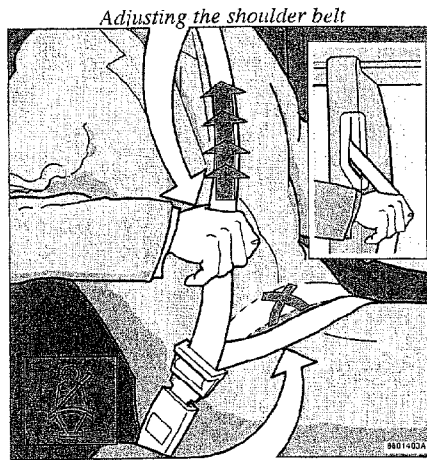
To buckle:

Pull the belt out far enough to insert the latch plate into the receptacle (buckle for rear seats) until a distinct snapping sound is heard. The seat belt retractor is normally "unlocked" and you can move freely, provided that the shoulder belt is not pulled out too far. The retractor will lock up as follows:

- if the belt is pulled out rapidly
- during braking and acceleration
- if the vehicle is leaning excessively
- when driving in turns

For the seat belt to provide maximum protection in the event of an accident, it must be worn correctly. When wearing the seat belt remember:

- The belt should not be twisted or turned.
- The lap belt must be positioned low on the hips (not pressing against the abdomen).
- The shoulder section of the front seat



Lap portion of the seat belt should sit low

belts adjusts automatically to the driver's height.

Make sure that the shoulder belt is rolled up into its retractor and that the shoulder and lap belts are taut.

Before exiting the car, check that the seat belt retracts fully after being unbuckled.

If necessary, guide the belt back into the retractor slot.

NOTE: Legislation in your state or province may mandate seat belt usage.

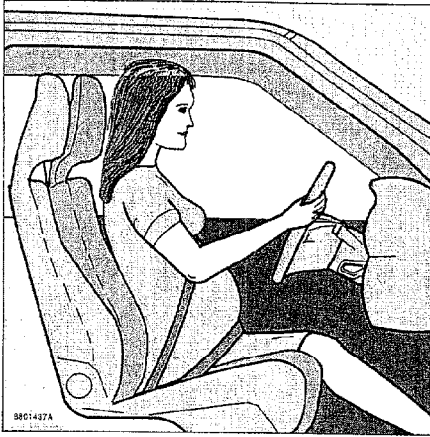
WARNING! Any device used to induce slack into the shoulder belt portion of the three-point belt system will have a detrimental effect on the amount of protection available to you in the event of a collision. The seat back should not be tilted too far back. The shoulder belt must be taut in order to function properly.

Spool-out

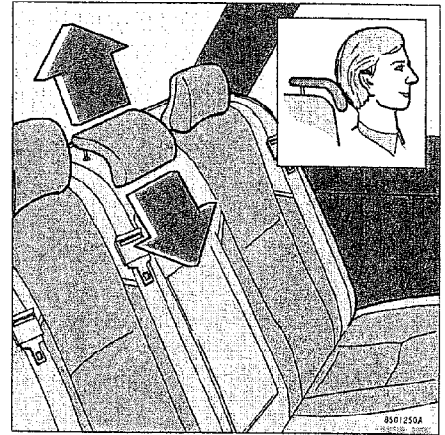
To make child seat installation easier, each seat belt buckle (except for the driver's belt) is equipped with a locking mechanism to help keep the lap section of the seat belt taut. Please refer to page 12 for more information on this function.

WARNING! Do not use child safety seats or child booster cushions/backrests in the front passenger's seat. We also recommend that children who have outgrown these devices sit in the rear seat with the seat belt properly fastened.

Seat belts, Center head restraint



WARNING! Never use a seat belt for more than one occupant. Never wear the shoulder portion of the belt under the arm, behind the back or otherwise out of position. Such use could cause injury in the event of an accident. As the seat belts lose much of their strength when exposed to violent stretching, they should be replaced after any collision, even if they appear to be undamaged. Never repair the belt on your own; have this work done by an authorized Volvo retailer only.



During pregnancy

Pregnant women should always wear seat belts. Remember that the belt should always be positioned in such a way as to avoid any possible pressure on the abdomen. The lap portion of the belt should be located low, as shown in the above illustration.

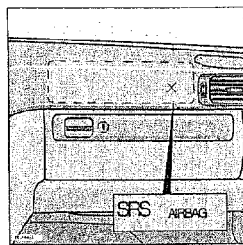
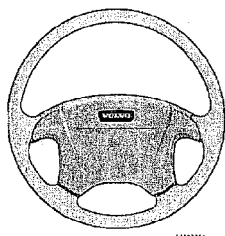
Center head restraint

The center head restraint can be adjusted according to the passenger's height. The restraint should be carefully adjusted to support the occupant's head.

To raise: Pull straight up

To lower: Pull forward and push down

Volvo SRS



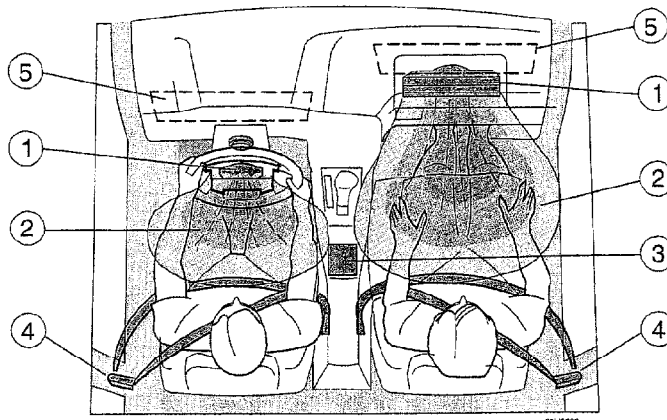
Passenger side SRS hatch

As an enhancement to the three-point seat belt system, your Volvo is equipped with a Supplemental Restraint System (SRS). The Volvo SRS consists of an airbag (2) and knee bolster (5) on both the driver's and passenger's sides and seat belt tensioners in both front door pillars (4). The system is designed to supplement the protection provided by the three-point seat belt system.

The SRS system is indicated by the "SRS" embossed on the steering wheel pad and above the glove compartment, the knee bolsters beneath the steering column and the glove compartment and decals on both sun visors and on the far right side of the dash.

The airbags are folded and located in the center of the steering wheel and above the glove compartment. They are designed to deploy during certain frontal or front-angular collisions, impacts, or decelerations, depending on the crash severity, angle, speed and object impacted. The airbags may also deploy in certain non-frontal collisions where rapid deceleration occurs. Both airbags and seat belt tensioners will deploy, even if the passenger seat is not occupied.

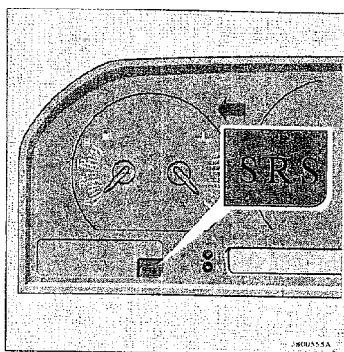
WARNING! As its name implies, SRS is designed to be a SUPPLEMENT to - not a replacement for - the three-point belt system. For maximum protection, wear seat belts at all times. Be aware that no system can prevent all possible injuries that may occur in an accident.



The airbag system includes gas generators (1) surrounded by the airbags (2) and front seat belt tensioners for both of the front seats (4). To deploy the system, the sensor (3) activates the gas generators causing the airbags to be inflated with nitrogen gas. As the movement of the seats' occupants compresses the airbags, some of the gas is expelled at a controlled rate to provide better cushioning. Both seat belt tensioners also deploy, minimizing any seat belt slack.

The entire process, including inflation and deflation of the airbags, takes approximately two-tenths of a second.

WARNING! When installing any optional equipment, make sure that the SRS system is not damaged. Do not attempt to service any component of the SRS yourself. Attempting to do so may result in serious personal injury. If a problem arises, take your car to the nearest authorized Volvo retailer for inspection as soon as possible.



A self-diagnostic system incorporated in the sensor monitors the SRS. This system does not, however, monitor the SIPS airbags. If a fault is detected, the "SRS" warning light will illuminate. The light is included in the warning/indicator light cluster in the instrument panel. Normally, the SRS warning lamp should light up when the ignition is switched on and should go out after 10 seconds or when the engine is started. Check that this light is functioning properly every time the car is started.

The following items are monitored by the self-diagnostic system:

- Sensor unit
- Cable harness
- Gas generator igniters

WARNING!

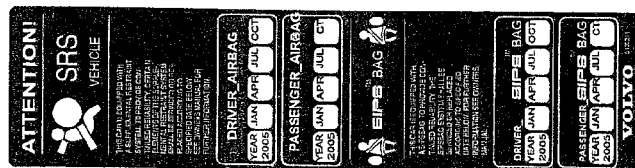
Never drive an SRS equipped car with your hands on the steering wheel pad / airbag housing.

No objects, accessory equipment or stickers may be placed on, attached to or installed near the SRS cover in the center of the steering wheel, the SRS cover above the glove compartment or the area affected by airbag deployment.

If the SRS warning light stays on after the engine has started or if it comes on while you are driving, drive the car to the nearest authorized Volvo retailer for inspection as soon as possible.



The above is a sample of the label found on all seat belts equipped with tensioners, located on the front seat belts near the lower anchorage point.



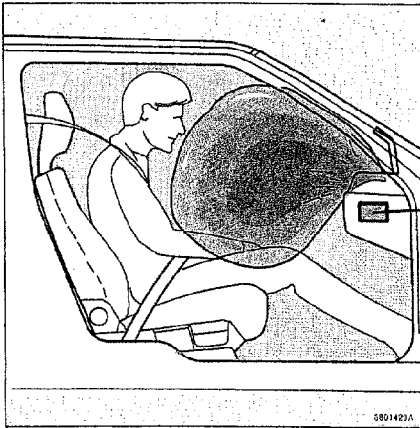
The above is a sample of the decal which can be found on the driver's door pillar.

There is no maintenance to perform on the SRS yourself. The only periodic maintenance recommended on the SRS is that the airbag modules and front seat belts (including tensioners) should be replaced every ten years and that the other components in the system (wiring, connectors, etc.) should also be inspected at this time. The SRS decal on your car shows the month and year servicing is due. This service must be performed by an authorized Volvo retailer.

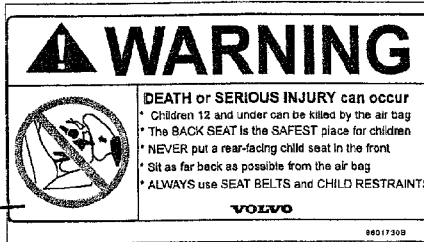
Should you have any questions about the SRS system, please contact your authorized Volvo retailer or Volvo Customer Support:

In the USA:
Volvo Cars of North America
Customer Support
P.O. Box 914
Rockleigh, New Jersey 07647-0914
800-458-1552

In Canada:
Volvo Canada Ltd.
175 Gordon Baker Road
Willowdale, Ontario M2H 2N7
800-663-8255



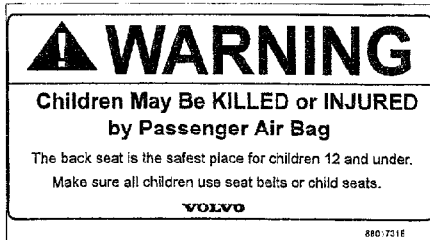
Passenger side air bag



SRS text at far right of instrument panel

WARNING! Do not use child safety seats or child booster cushions/backrests in the front passenger's seat. We also recommend that children who have outgrown these devices sit in the rear seat with the seat belt properly fastened.

NOTE: Deployment of SRS components occurs only one time during an accident. In a collision where deployment occurs, the air bags and seat belt tensioners activate. Some noise occurs and a small amount of powder is released. The release of the powder may appear as smoke-like matter. This is a normal characteristic and does not indicate fire.



SRS texts on inside of both sun visors



SRS texts on outside of both sun visors

WARNING!

- Children must never be allowed in the front passenger seat. Volvo recommends that ALL occupants (adults and children) shorter than four feet seven inches (140 cm) be seated in the back seat of any vehicle with a front passenger side airbag. See page 12 for guidelines.
- Occupants in the front passenger's seat must never sit on the edge of the seat, sit leaning toward the instrument panel or otherwise sit out of position. The occupant's back must be as upright as comfort allows and be against the seat back with the seat belt properly fastened.
- Feet must be on the floor, e.g. not on the dash, seat or out of the window.
- No objects or accessory equipment, e.g. dash covers, may be placed on, attached to or installed near the SRS hatch (the area above the glove compartment) or the area affected by airbag deployment (see illustration).
- There should be no loose articles, e.g. coffee cups, on the floor, seat or dash area.
- Never try to open the SRS cover on the steering wheel or the passenger side SRS hatch. This should only be done by an authorized Volvo service technician.
- Failure to follow these instructions can result in injury to the vehicle occupants in an accident.

NOTE: The information on this page does not pertain to the Side Impact Protection System airbags.

When are the airbags deployed?

The SRS system is designed to deploy during certain frontal or front-angular collisions, impacts, or decelerations, depending on the crash severity, angle, speed and object impacted. The SRS sensor is designed to react to both the impact of the collision and the inertial forces generated by it and to determine if the intensity of the collision is sufficient for the airbags to be deployed.

WARNING! The SRS is designed to help prevent serious injury. Deployment occurs very quickly and with considerable force. During normal deployment and depending on variables such as seating position, one may experience abrasions, bruises, swellings, or other injuries as a result of airbag(s) deployment.

If the airbags have been deployed, we recommend the following:

- Have the car towed to an authorized Volvo retailer. Never drive with the airbags deployed.
- Have an authorized Volvo retailer replace the SRS system components.
- Use only new, Genuine Volvo Parts when replacing SRS components (airbags, seat belts, tensioners, etc.).

When are the airbags NOT deployed?

Not all frontal collisions activate the SRS system. If the collision involves a nonrigid object (e.g., a snow drift or bush), or a rigid, fixed object at a low speed, the SRS system will not necessarily deploy. Airbags do not normally deploy in a side impact collision, in a collision from the rear or in a rollover situation. The amount of damage to the bodywork does not reliably indicate if the airbags should have deployed or not.

Seat belts - the heart of the Volvo safety system

The heart of the Volvo safety system is the **three-point seat belt** (a Volvo invention)! In order for the SRS system to provide the protection intended, seat belts must be worn at all times by everyone in the car.

The SRS system is a supplement to the seat belts.

WARNING! If your car has been subjected to flood conditions (e.g. soaked carpeting/standing water on the floor of the vehicle) or if your car has become flood-damaged in any way, do not attempt to start the vehicle or put the key in the ignition before disconnecting the battery (see below). This may cause airbag deployment which could result in personal injury. Have the car towed to an authorized Volvo retailer for repairs.

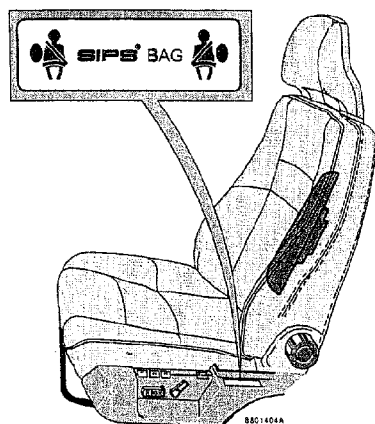
Automatic transmission only:

Before attempting to tow the car, use the following procedure to override the shiftlock system to move the gear selector to the neutral position.

- Disconnect the battery
- Wait at least one minute
- Insert the key in the ignition and turn it to position 1
- Press firmly on the shiftlock override button (located near the base of the gear selector).
- While holding the override button down, move the gear selector from the park position.

WARNING! Never drive with the airbags deployed. The fact that they hang out can impair the steering of your car. Other safety systems can also be damaged. The smoke and dust formed when the airbags are deployed can cause skin and eye irritation in the event of prolonged exposure.

Volvo Side Impact Protection System (SIPS) airbag



SIPS airbag decal *

SIPS airbag (front seats only)

As an enhancement to the structural Side Impact Protection System built into your car, the car is also equipped with Side Impact Protection System (SIPS) airbags. The SIPS airbag system consists of airbag modules built into the sides of both front seat backrests (1), cables (2) from these modules to the mechanical sensor units (3) and gas generators (4). The SIPS airbag system is designed to help increase occupant protection in the event of certain side impact collisions. The SIPS airbags are designed to deploy only during certain side-impact collisions, depending on the crash severity, angle, speed and point of

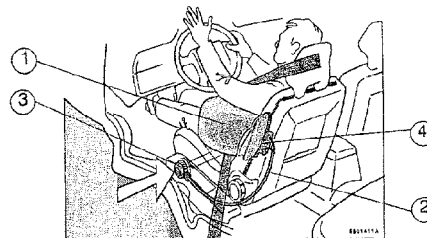
WARNING!

- The SIPS airbag system is a supplement to the Side Impact Protection System and the three-point seat belt system. It is not designed to deploy during collisions from the front or rear of the car or in rollover situations.
- The use of seat covers on the front seats may impede SIPS airbag deployment.
- No objects, accessory equipment or stickers may be placed on, attached to or installed near the SIPS airbag system or in the area affected by SIPS airbag deployment (see illustration to the right above).
- Never try to open or repair any components of the SIPS airbag system. This should only be done by an authorized Volvo service technician.
- For best protection from the SIPS airbag system, both front seat occupants should sit in an upright position with the seat belt properly fastened.

impact. The airbags are not designed to deploy in all side impact situations.

NOTE: SIPS airbag deployment (one airbag) occurs only on the side of the vehicle affected by the impact.

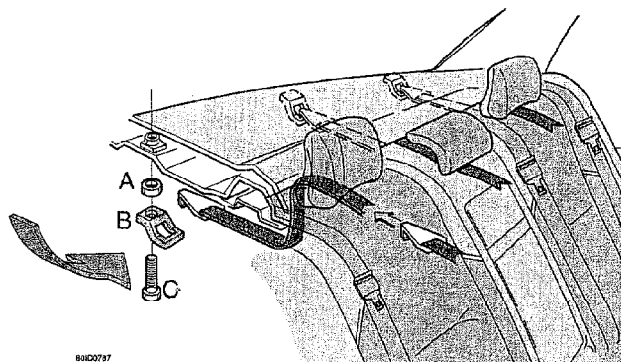
*A SIPS airbag warning decal is also located at the end of the instrument panel on the driver's side of the car.



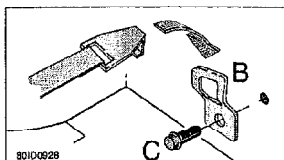
1 - Airbag, 2 - cable, 3 - sensor unit, 4 - gas generator

WARNING!

- Never drive with the airbags deployed. The fact that they hang out can impair the steering of your car. Other safety systems can also be damaged. The smoke and dust formed when the airbags are deployed can cause skin and eye irritation in the event of prolonged exposure.
- If your car has been subjected to flood conditions (e.g. soaked carpeting/standing water on the floor of the vehicle) or if your car has become flood-damaged in any way, do not attempt to start the vehicle or put the key in the ignition before disconnecting the battery. This may cause airbag deployment which could result in personal injury. Have the car towed to an authorized Volvo retailer for repairs.



Sedan



Wagon

Child Restraint Anchorages

Volvo cars can be fitted with Child Restraint Top Tether Anchorages in the rear seat.

Sedans: There are three predrilled anchorage points under the rear window shelf which are not visible from the passenger compartment.

Wagons: The anchorage points are on the rear seat backrest and are hidden by plastic covers. The backrest must be folded down to access the center anchorage point.

In cars designated for Canada, one top tether anchorage set will be in the glove box.

A - 10 mm spacer, B - anchorage plate, C - 5/16" UNC bolt

Installing the top tether

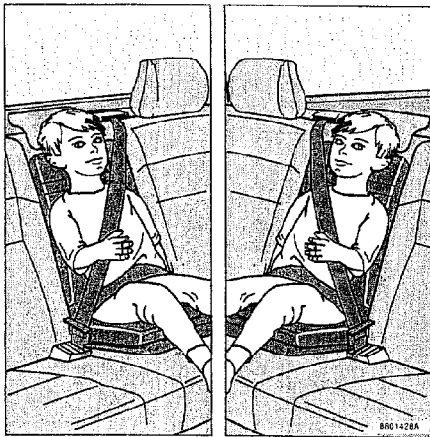
Sedans: The predrilled holes for the child restraint anchorages are underneath the rear window shelf and can be accessed from the trunk or by lowering the rear seat backrests.

Wagons: Remove the plastic cover from the anchorage point you intend to use.

On either model, refer to the child seat manufacturer's instructions for securing the seat.

WARNING! Child Restraint Anchorages are designed to withstand only those loads imposed by correctly fitted Child Restraints. Under no circumstances are they to be used for adult seat belts or harnesses. The anchorages are not able to withstand excessive forces on them in the event of collision if full harness seat belts or adult seat belts are installed to them. An adult who uses a belt anchored in a Child Restraint Anchorage runs a great risk of suffering severe injuries should a collision occur. Do not install rear speakers which would require the removal of the top tether anchors or interfere with the proper use of the top tether strap.

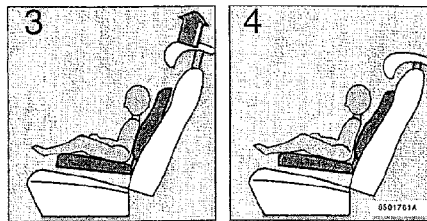
Child safety



1 - Sedan
2 - Wagon
Integrated booster cushion

Integrated booster cushion (optional)

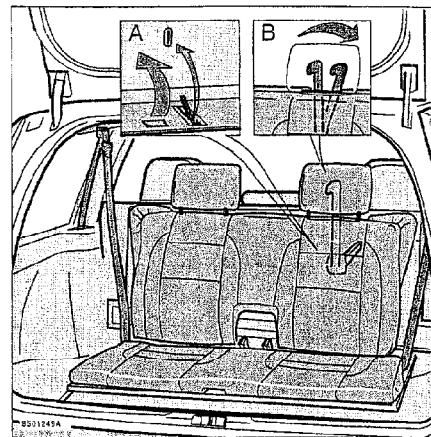
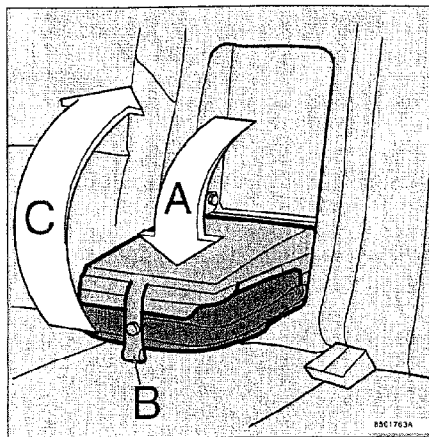
Volvo's own integrated booster cushion has been specially designed to help safeguard a child seated in the center position of the rear seat. When using the integrated booster cushion, the child must be secured with the vehicle's three-point seat belt. The booster cushion is approved for children weighing between 15 and 36 kg (33 and 80 lbs) and between 97 and 137 cm (38 and 54 in) in height. It is not intended for children under 3 years of age.



The child should be properly seated on the booster cushion (see illustrations 1 and 2 in left column). For small children, the booster cushion backrest can be tilted back slightly by raising the center head restraint above the upper edge of the booster cushion backrest (3) and tilting the backrest (4). For taller children, it is essential that the head restraint be adjusted properly to help support the child's head (see page 3).

The hip section of the three-point seat belt must fit snugly across the child's hips, not across the stomach. The shoulder section of the three-point seat belt should be positioned across the chest and shoulder (see illustration). The shoulder belt must never be placed behind the child's back or under the arm.

WARNING! Failure to follow the instructions on this page will increase the risk of your child being injured during a sudden stop or collision. In the event of a collision while the integrated booster cushion was occupied, the entire booster cushion and center seat belt must be replaced. The booster cushion should also be replaced if it is badly worn or damaged in any way. This work should be performed by an authorized Volvo retailer only. The booster cushion should be cleaned while in place in the vehicle if possible. If not, please consult your Volvo retailer.



Auxiliary seat - A-fold up, B-fold down

Storing the booster cushion

To store (fold up):

- Fold down the booster cushion backrest to the seat section (A)
- Snap the backrest snap to the fastener on the seat (B)
- Fold up the booster cushion unit (C)

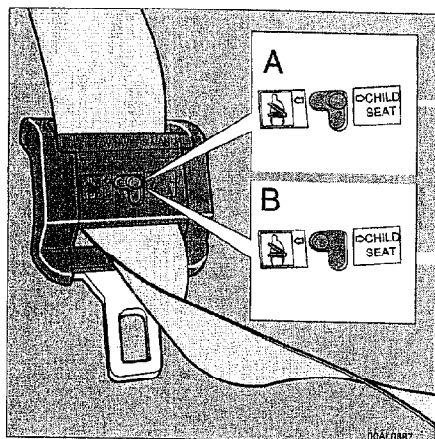
NOTE: The booster cushion must be folded down as one unit. If the backrest is not strapped to the seat section of the cushion, the backrest hinges may lock.

Auxiliary seat (optional)

If all the seats are occupied, a rear-facing auxiliary seat in the cargo area of wagon models can be used. This seat is designed for two children, each weighing between 23 - 40 kg (50 - 88 lbs.) and up to 150 cm (59 inches) in height.

WARNING! Both rear seat backrests must be up when the auxiliary seat is being used. Do not use a booster cushion or child seat in conjunction with the auxiliary seat. The luggage net should be retracted and the child safety lock in the tailgate should be open to allow access to the cargo area.

Child safety



*A-Lap section of belt locked in place,
B-Lap section functions normally*

Keeping child seats in place (spool-out)

To make child seat installation easier, each seat belt buckle (except for the driver's belt) is equipped with a locking mechanism to help keep the lap section of the seat belt taut.

When attaching the seat belt to a child seat:

- Make sure the red lock button is moved to the right (see illustration A above). A coin, etc. can be used to move the button.
- Attach the seat belt to the child seat according to the child seat manufacturer's instructions.
- Pull the lap section of the seat belt taut.

The lap section of the seat belt cannot be loosened as long as the red lock button is in the right position. The lap section of the seat belt can be adjusted when the lock button is in the left position (see illustration B).

NOTE: Before exiting the car, check that the seat belt retracts fully after being unbuckled. If necessary, guide the belt back into the retractor slot. When not in use, the child restraint should be secured with the seat belt to help prevent movement during a sudden stop.

WARNING! Do not use child safety seats or child booster cushions/backrests in the front passenger's seat. We also recommend that children who have outgrown these devices sit in the rear seat with the seat belt properly fastened.

Important!

Why Volvo believes no child should sit in the front seat of a car.

It's quite simple really. A front air bag is a very powerful device designed, by law, to help protect an adult. Because of the size of the air bag and its speed of inflation, a child should never be placed in the front seat, even if he or she is properly belted or strapped into a child safety seat. Volvo has been an innovator in safety for over fifty years, and we'll continue to do our part. But we need your help. Please remember to put your children in the back seat, and buckle them up.

Volvo has some very specific recommendations:

- Always wear your seat belt.
- Air bags are a SUPPLEMENTAL safety device which when used in conjunction with a three-point seat belt can help reduce serious injuries during certain types of severe accidents. Please do not disconnect the air bag system in your vehicle.
- Volvo strongly recommends that ALL children sit in the rear seat of any vehicle and that they be properly restrained.
- A child should NEVER sit in the front passenger seat of any vehicle equipped with a front passenger side airbag.
- Volvo recommends that ALL occupants (adults and children) shorter than four feet seven inches (140 cm) be seated in the back seat of any vehicle with a front passenger side airbag.

Drive safely!

Child safety

Volvo recommends the proper use of restraint systems for all occupants including children. Remember that, regardless of age and size, a child should always be properly restrained in a car.

Restraint systems for children are designed to be secured in the vehicle by lap belts or the lap portion of a lap-shoulder belt. Such child restraint systems can help protect children in cars in the event of an accident only if they are used properly. However, children could be endangered in a crash if the child restraints are not properly secured in the vehicle. Failure to follow the installation instructions for your child restraint can result in your child striking the vehicle's interior in a sudden stop.

Holding a child in your arms is NOT a suitable substitute for a child restraint system. In an accident, a child held in a person's arms can be crushed between the vehicle's interior and an unrestrained person. The child could also be injured by striking the interior, or by being ejected from the vehicle during a sudden maneuver or impact. The same can also happen if the infant or child rides unrestrained on the seat. Other occupants should also be properly restrained to help reduce the chance of injuring or increasing the injury of a child.

All states and provinces have legislation governing how and where children should be carried in a car. Find out the regulations

existing in your state or province. Recent accident statistics have shown that children are safer in rear seating positions than front seating positions when properly restrained. A child restraint system can help protect a child in a vehicle. Here's what to look for when selecting a child restraint system:

- It should have a label certifying that it meets applicable Federal Motor Vehicle Safety Standards (FMVSS 213-80) - or in Canada, CMVSS 213.
- Make sure the child restraint system is approved for the child's height, weight and development - the label required by the standard or regulation, or instructions for infant restraints, typically provide this information.
- **In using any child restraint system, we urge you to look carefully over the instructions that are provided with the restraint. Be sure you understand them and can use the device properly and safely in this vehicle. A misused child restraint system can result in increased injuries for both the infant or child and other occupants in the vehicle.**
- If your child restraint requires a top tether strap, consult your authorized Volvo retailer for top tether anchorage and installation information.

When a child has outgrown the child safety seat, you should use the rear seat with the standard seat belt fastened. The best way to help protect the child here is to place the child

on a cushion so that the seat belt is properly located on the hips (see page 10).

A specially designed and tested booster cushion (not available in Canada) for children between 22.7 - 36 kg (50 - 80 lbs) and 117 - 137 cm (46 - 54") can be obtained from your Volvo retailer.

If necessary, an auxiliary seat for children is available for use in the luggage compartment of station wagon models. This seat is designed for two children, each weighing between 23 - 40 kg (50 - 88 lbs.) and up to 150 cm (59 inches) in height.

WARNING!

- When using the auxiliary seat for children, both sections of the rear seat backrest must be secured in the upright position.
- Do not use a booster cushion or child seat in conjunction with the auxiliary seat.

Occupant safety

Seat belt maintenance

Check periodically that the anchor bolts are secure and that the belts are in good condition. Use water and a mild detergent for cleaning. Check seat belt mechanism function as follows: Attach the seat belt and pull rapidly on the strap.

Volvo Concern for Safety

Safety is the cornerstone for Volvo. Our concern dates back to 1927 when the first Volvo rolled off the production line. Three-point seat belts (a Volvo invention), safety cages, and energy-absorbing impact zones were designed into Volvo cars long before it was fashionable or required by government regulation. We will not compromise our commitment to safety. We continue to seek out new safety features and to refine those already in our cars. You can help. We would appreciate hearing your suggestions about improving automobile safety. We also want to know if you ever have a safety concern with your car. Call us in the U.S. at: 800-458-1552 or in Canada at: 800-663-8255.

Occupant safety

How safely you drive doesn't depend on how old you are but rather on:

- how well you see
- your ability to concentrate
- how quickly you make decisions under stress to avoid an accident.

The tips listed below are suggestions to help you cope with the ever changing traffic environment.

- Never drink and drive.
- If you are taking any medication, consult your physician about its potential effects on your driving abilities.
- Take a driver-retraining course
- Have your eyes checked regularly
- Keep your windshield and headlamps clean.
- Replace wiper blades when they start to leave streaks.
- Take into account the traffic, road, and weather conditions, particularly with regard to stopping distance.

Reporting Safety Defects in the U.S.

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Volvo Cars of North America. If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your retailer, or Volvo Cars of North America. To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in Washington, D.C. area) or write to: NHTSA, U.S. Department of Transportation, Washington D.C. 20590. You can also obtain other information about motor vehicle safety from the Hotline.