

Report Number NCAP-TRC-01-002

New Car Assessment Program (NCAP)

Frontal Barrier Impact Test

Volvo Gothenburg Sweden

2001 Volvo S80

NHTSA Number: VO0001

TRC Test Number: 001019

Prepared By:

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Final Report

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16. Abstract  A 56 km/h (35 mph) frontal load cell barrier impact test was conducted on a 2001 Volvo S80, NHTSA No. VO0001, at Transportation Research Center Inc. on October 19, 2000. This test was conducted in accordance with Office of Crashworthiness Standards NCAPTP090196 for the determination of vehicle crashworthiness. The barrier impact velocity was 35.1 km/h. The vehicle's maximum static crush was 521 millimeters. The ambient temperature was 21° C.  The driver's Head Injury Criteria (HIC) was 401. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 43.9 g. The driver's maximum chest deflection was 39 millimeters. The driver's left and right femur maximum axial forces were 2738 N and 2486 N, respectively.  The passenger's HIC was 282. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 44.7 g. The passenger's maximum chest deflection was 37 millimeters. The passenger's left and right femur maximum axial forces were 1176 N and 4680 N, respectively.			
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Section 1.0

Purpose and Test Procedure

## Purpose

This 56 km/h (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 Inc.).

The purpose of this test was to obtain vehicle crashworthiness and occupant restraint system performance data for the subject vehicle, a 2001 Volvo S80, NHTSA Number VO0001, at an impact speed in excess of the current 48 km/h (30 mph) FMVSS 208, 212, 219, and 301 requirements.

## Test Procedure

This 56 km/h (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 belt forces and potentiometers to measure shoulder belt stretch. The vehicle impacted a frontal load cell barrier instrumented with thirty-six (36) barrier face load cells. The vehicle's specified impact velocity range was 55.5 to 57.1 km/h.

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 second use of the driver dummy and the second use of the passenger dummy following dummy calibration.

Both dummies were instrumented with head, chest, and pelvis, accelerometers to measure longitudinal, lateral, and vertical accelerations, with redundant accelerometers in the head and chest, 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 133 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 16 high-speed motion picture cameras. The pre- and post-test conditions were recorded by one (1) real-time motion picture camera.

The vehicle, occupant, and load cell barrier 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, vehicle, and load cell barrier data plots. Appendix C contains the dummy certification data. Appendix D contains miscellaneous test information. Appendix E contains Restraint System Instructions from the owner's manual.

Section 2.0

Frontal Barrier Impact Test Summary

## Test Results Summary

This frontal load cell barrier test was conducted by TRC Inc. on October 19, 2000.

The test vehicle, a 2001 Volvo S80, sedan, NHTSA Number VO0001, was equipped with a 2.9-liter transverse engine, automatic transmission, power steering, and power brakes. The vehicle's test weight was 1818.9 kg. The vehicle's impact speed was 56.3 km/h. The vehicle sustained 521 mm of static crush during the impact.

The driver's 36 millisecond Head Injury Criteria (HIC) was 401. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 43.9 g. The driver's maximum chest deflection was 39 mm. The driver's left and right femur maximum compressive axial forces were 2738 N and 2486 N, respectively.

The right front passenger's 36 millisecond HIC was 282. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 44.7 g. The passenger's maximum chest deflection was 37 mm. The passenger's left and right femur maximum compressive axial forces were 1176 N and 4680 N, respectively.

There was 100% windshield periphery retention.

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's head Z-axis acceleration redundant data channel, HEDZR1, recorded a questionable data spike at approximately 16 milliseconds. This affected the calculated redundant head resultant acceleration.

Numerous electronic data spikes occurred on load cell data channels in the driver and passenger dummies. The larger magnitude spikes occurred at approximately 37, 55, 73, 110, and 138 milliseconds. The values reported in Table 7 Hybrid III Data Summary exclude the electronic spikes. At least one of the spikes was high enough to exceed either the minimum or maximum value on the following data channels:

- NEKYF1, driver neck Y-axis shear force
- NEKZF1, driver neck Z-axis axial force
- NEKXM1, driver neck moment about X-axis
- NEKZM1, driver neck moment about Z-axis
- TBLZF1, driver left upper tibia Z-axis force
- TBRXM1, driver right upper tibia X-axis moment
- ANRZF1, driver right lower tibia Z-axis force
- NEKXF2, passenger neck X-axis shear force
- NEKYF2, passenger neck Y-axis shear force
- NEKZF2, passenger neck Z-axis axial force
- NEKXM2, passenger neck moment about X-axis
- NEKZM2, passenger neck moment about Z-axis
- TBLZF2, passenger left upper tibia Z-axis force
- TBLXM2, passenger left upper tibia moment about X-axis
- TBLYM2, passenger left upper tibia moment about Y-axis
- ANLZF2, passenger left lower tibia Z-axis force
- TBRZF2, passenger right upper tibia Z-axis force
- ANRZF2, passenger right lower tibia Z-axis force
- ANRYM2, passenger right lower tibia moment about Y-axis

The passenger dummy's calculated Y-axis moment about the occipital condyle, NEKOM2, was also affected.

The driver and passenger shoulder belt extension data channels, SBED1 and SBED2, respectively, recorded questionable data throughout the event.

The vehicle's instrument panel X-axis acceleration data channel, DPCXG1, went open and recorded no valid data after approximately 72 milliseconds.

The following barrier load cell channels did not fully return to the zero level following impact: BA3F, BA5F, BA6F, BA8F, BB1F, BB2F, BB3F, BB5F, BC2F, BC7F, BC8F, BD2F, BD3F, BD6F, and BD7F. This affected group totals for the barrier load cell.

Table 1 Crash Test Summary

NHTSA number:	VO0001	
Test type:	Frontal load cell barrier	
Test date:	10/19/00	
Test time:	1158	
Ambient temperature:	21° C	
Vehicle year/make/ model/body style:	2001/Volvo/S80/Sedan	
Vehicle test weight:	1818.9 kg	
Impact angle <sup>1</sup> :	0°	
Impact velocity <sup>2</sup> :	Primary	= 56.4 km/h
	Secondary	= 56.4 km/h
Maximum static crush:	521 mm	
Average rebound:	1112 mm	
Dummies:	Driver #142	Passenger #192
Type:	Part 572E	Part 572E
Location:	Left front	Right front
Restraint:	3-point unbelt with pre-tensioning and load-limiting devices/airbag	3-point unbelt with pre-tensioning and load-limiting devices/airbag
Number of data channels:	43	43
Number of cameras:	High-speed	16
	Real-time	1

<sup>1</sup> With respect to tow track centerline.

<sup>2</sup> Speed trap measurement (± .08 km/h accuracy)

Table 2 Test Vehicle Information

Vehicle year/make/  
model/body style: 2001/Volvo/S80/Sedan

Color: 443 Moondust Met

VIN: YV1TS94D411161174

NHTSA number: VO0001

Engine data:

    Placement: Transverse

    Cylinders: 6

    Displacement 2.9 liters

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

Date vehicle received: 10/11/2000

Odometer reading: 44

Dealer's name and address: Segna Motor Inc.  
2265 W. Dublin-Grandville Road  
Columbus, Ohio 43085

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	No
Tinted glass	Yes	Air conditioning	Yes
Radio	Yes	Anti-skid brake	Yes
Clock	Yes	Rear window defroster	Yes
Other	None		

Certification data from vehicle's label:

Vehicle manufactured by: Volvo Gothenburg Sweden

Date of manufacture: 07-01-2000

VIN: YV1TS94D411161174

GVWR: 4608 lbs (N/A kg)

GAWR: Front: 2491 lbs (N/A kg)

        Rear: 2293 lbs (N/A kg)

Table 2 Test Vehicle Information, Cont'd.

Size of tires: 215/55R16  
Tire pressure with maximum capacity vehicle load:  
Front: 51 psi  
Rear: 51 psi  
Spare tire: T125/80R17  
Type of front seats: Bucket

Tire & capacity data from vehicle's label:

Recommended tire size: 215/55R16  
Recommended cold tire pressure:  
Front: 39 psi  
Rear: 39 psi

Designated seating capacity:

Front 2  
Mid N/A  
Rear 3  
Total 5

Vehicle capacity weight: 890 lbs (N/A kg)

Test vehicle attitude:

Delivered attitude: LF 706 mm; RF 707 mm; LR 710 mm; RR 708 mm  
Fully loaded attitude: LF 684 mm; RF 684 mm; LR 680 mm; RR 675 mm  
Pre-test attitude: LF 682 mm; RF 684 mm; LR 671 mm; RR 672 mm  
Post-test attitude: LF 682 mm; RF 723 mm; LR 650 mm; RR 685 mm

Table 2 Test Vehicle Information Cont'd

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

Right front	463.6 kg	Right rear	334.3 kg
Left front	490.8 kg	Left rear	324.3 kg
Total front weight	954.4 kg	(59.2% of total vehicle weight)	
Total rear weight	658.6 kg	(40.8% of total vehicle weight)	
Total delivered weight	1613.0 kg		

Calculation of test vehicle's target test weight:

RCLW<sup>1</sup> = Rated cargo and luggage weight

GVWR = Gross Vehicle Weight Rating (2090 kg)

UDW = Unloaded delivered weight (1613.0 kg)

VCW = Vehicle capacity weight = 403.7 kg (from label)

DSC = Designated seating capacity (5)

RCLW<sup>1</sup> = VCW - 68 (DSC) = 403.7 - 68(5) = 63.7 kg

Target test weight = UDW + RCLW<sup>1</sup> + (Number of Hybrid III dummies x 76 kg/dummy)

Target test weight = 1613.0 + 63.7 + 151.5 = 1828 kg

Target test weight range = 1818.9 kg - 1823.5 kg

Weight of test vehicle with required dummies and 54.6 kg of cargo weight:

Right front	503.3 kg	Right rear	400.5 kg
Left front	519.6 kg	Left rear	395.5 kg
Total front weight	1022.9 kg	(56.2% % of total vehicle weight)	
Total rear weight	796.0 kg	(43.8% % of total vehicle weight)	
Total test weight	1818.9 kg	(0.5% under target test weight)	

Weight of ballast secured in vehicle: None

Components removed to meet target test weight: Rear fascia, rear door panels, door glass, muffler, trunk lid and seal, rear door glass and seal, and rear interior trim.

CG rearward of front wheel centerline: 1219 mm

<sup>1</sup> 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: 001019  
NHTSA number: VO0001  
Test date: 10/19/00  
Test time: 1158  
Test type: Frontal load cell barrier  
Impact angle: 0°  
Ambient temperature at impact area: 21° C  
Temperature in occupant compartment: 22° C  
Impact velocity:  
    Primary 56.4 km/h  
    Secondary 56.4 km/h  
    Specified range 55.5 to 57.1 km/h

Distance from vehicle to barrier:  
    Entering velocity trap 661 mm  
    Exiting velocity trap 51 mm

Test vehicle static crush:

Overall length of test vehicle:

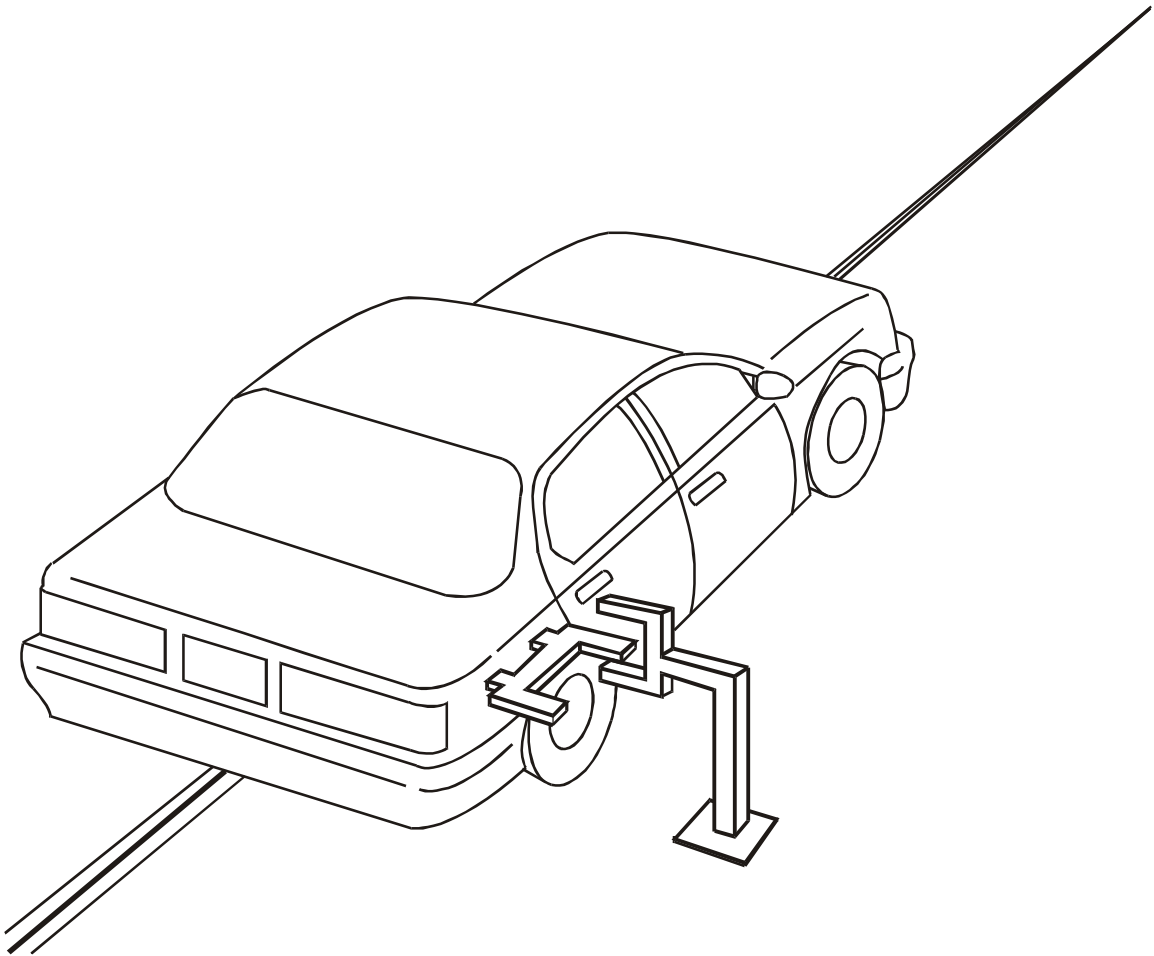
Pre-test: L 5040 mm; C 5190 mm; R 5035 mm  
Post-test: L 4628 mm; C 4673 mm; R 4642 mm  
Total crush: L 412 mm; C 517 mm; R 393 mm  
Average crush: 441 mm

Test vehicle rebound from flat barrier:

Distance from test vehicle to barrier:

Post-test: L 1173 mm; C 1092 mm; R 1072 mm  
Average rebound 1112 mm

Figure 1 Impact Velocity Measurement System



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

The vanes have 610-millimeter spacing.

Figure 2 Accident Investigation Division Data  
for 56 km/h (35 mph) Frontal Barrier Impact

NHTSA number: VO0001  
 Test date: 10/19/00  
 Vehicle year/make/  
 model/body style: 2001/Volvo/S80/Sedan  
 Vehicle size category: Midsize  
 VIN: YV1TS94D411161174  
 Build date: 07/00  
 Test weight: 1818.9 kg  
 Vehicle wheelbase: 2782 mm  
 Maximum width: 1830 mm  
 Front overhang: 948 mm

Collision Deformation  
 Classification (CDC) code: 12FDEW3

Crush depth  
 measurements:

C1	=	412 mm
C2	=	507 mm
C3	=	521 mm
C4	=	512 mm
C5	=	499 mm
C6	=	393 mm

Midpoint of damage: D: Vehicle Longitudinal Centerline

Length of damaged region: L: 1524 mm

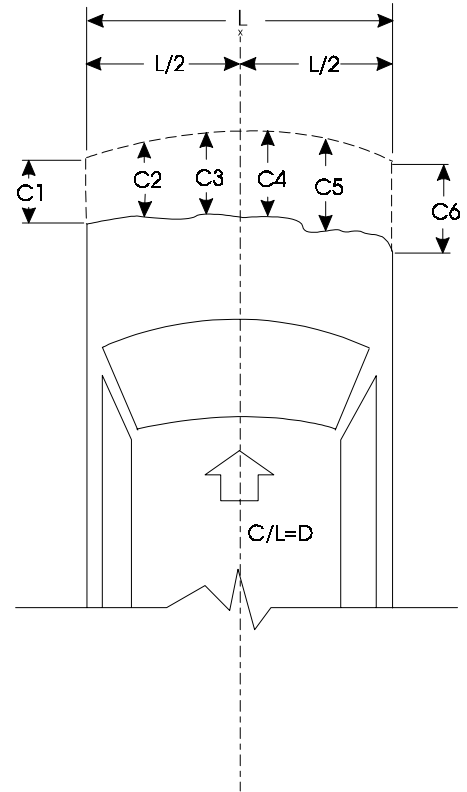
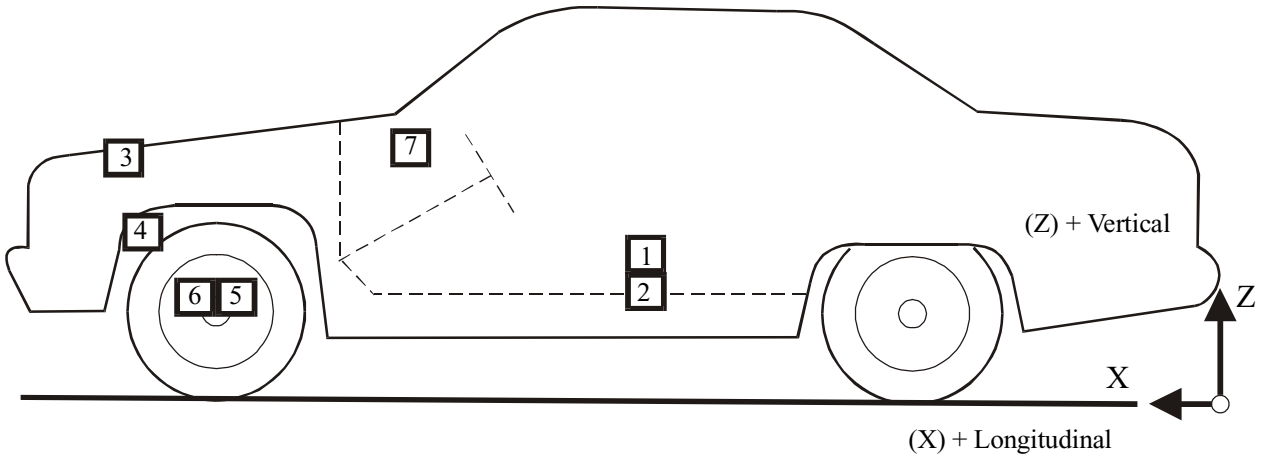
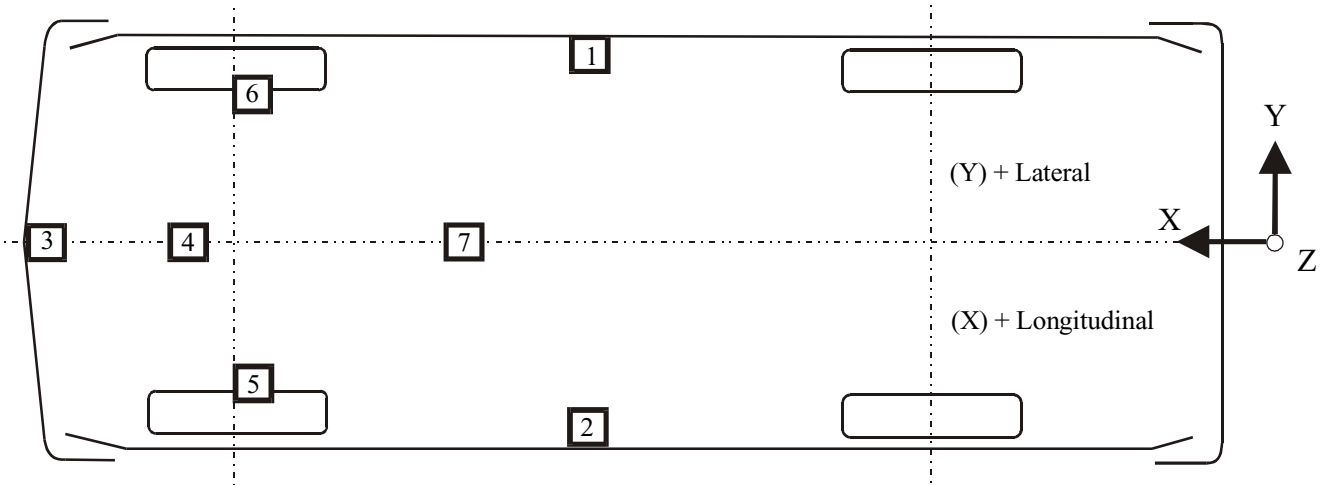


Figure 3 Vehicle Accelerometer Placement



Side View



Bottom View

Table 4 Vehicle Accelerometer Locations and Data Summary

TEST NUMBER: 001019						POSITIVE			NEGATIVE
No. LOCATION	X	Y	Z			DIRECTION			DIRECTION
1 LEFT REAR SEAT CROSSMEMBER LONGITUDINAL REDUNDANT	PRE 2230 mm	425 mm	NA						
	POST 2225 mm	425 mm	NA	2.3 g	@ 128.0 ms	38.8 g	@ 49.9 ms		
				1.6 g	@ 141.2 ms	39.5 g	@ 49.7 ms		
2 RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL REDUNDANT	PRE 2240 mm	-500 mm	NA						
	POST 2252 mm	-500 mm	NA	1.6 g	@ 135.4 ms	37.8 g	@ 43.1 ms		
				4.1 g	@ 127.4 ms	37.8 g	@ 42.2 ms		
3 ENGINE TOP LONGITUDINAL	PRE 4540 mm	-75 mm	NA						
	POST 4275 mm	-120 mm	NA	50.6 g	@ 46.6 ms	126.0 g	@ 30.1 ms		
4 ENGINE BOTTOM LONGITUDINAL	PRE 4435 mm	60 mm	NA						
	POST 4295 mm	85 mm	NA	40.8 g	@ 41.3 ms	129.0 g	@ 31.8 ms		
5 RIGHT BRAKE CALIPER LONGITUDINAL	PRE 4340 mm	-680 mm	NA						
	POST 4280 mm	-750 mm	NA	21.2 g	@ 65.8 ms	77.5 g	@ 30.8 ms		

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

TEST NUMBER: 001019	X	Y	Z	POSITIVE DIRECTION	NEGATIVE DIRECTION
No. LOCATION					
6 LEFT BRAKE CALIPER	PRE 4335 mm	680 mm	NA		
	POST 4320 mm	705 mm	NA		
LONGITUDINAL				23.9 g @ 56.3 ms	83.8 g @ 40.2 ms
7 INSTRUMENT PANEL CENTER	PRE 3740 mm	0 mm	NA		
	POST 3760 mm	0 mm	NA		
LONGITUDINAL <sup>1</sup>				----- g @ ----- ms	----- g @ ----- ms

DIMENSION MEASUREMENTS SIGN CONVENTION:

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

SEE REPORT SIGN CONVENTION IN APPENDIX D FOR DATA CHANNEL SIGN CONVENTION.

<sup>1</sup>See DATA ACQUISITION EXPLANATIONS

Table 5 Post-Impact Dummy/Vehicle Data

Visible Dummy Contact Points:

	<u>Driver #142</u>	<u>Passenger #192</u>
Head	Airbag/headrest	Airbag/headrest
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	Easy
Rear	Easy	Easy

Seat Movement:

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

Glazing Damage: Entire windshield cracked.

Other Notable Impact Effects: None

Table 6 FMVSS 208 Data Summary

Vehicle year/make/  
model/body style: 2001/Volvo/S80/Sedan  
Vehicle NHTSA number: VO0001  
Test date: 10/19/00

	Driver Dummy #142		Passenger Dummy #192	
<u>Maximum Accelerations:</u>				
Head X-axis	-47.8	g	-41.3	g
Head Y-axis	-5.9	g	-5.9	g
Head Z-axis	22.3	g	14.8	g
Head resultant	49.2	g	41.7	g
Chest X-axis	-45.6	g	-46.1	g
Chest Y-axis	-7.0	g	-6.6	g
Chest Z-axis	-12.1	g	12.5	g
Chest resultant <sup>1</sup>	43.9	g	44.7	g
Chest resultant time interval <sup>1</sup>	.054 - .057	sec	.074 - .077	sec
<u>Head Injury Criteria (HIC) Values:</u>				
HIC <sup>2</sup>	401		282	
HIC starting time	.049	sec	.059	sec
HIC ending time	.085	sec	.095	sec
Average head resultant acceleration during HIC time interval	41.5	g	36.1	g
<u>Maximum Chest Deflections:</u>				
Chest X-axis	-38.6	mm	-37.3	mm
Maximum chest deflection time	.056	sec	.055	sec
<u>Maximum Compressive Femur Forces:</u>				
Left femur	2738	N	1176	N
Right femur	2486	N	4680	N
<u>Maximum Seat Belt Forces:</u>				
Lap belt	7249	N	6731	N
Shoulder belt	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.)

<sup>1</sup> 0.003 Sec. Minimum duration.

<sup>2</sup> The maximum HIC time interval is 36 milliseconds.

Table 7 Hybrid III Data Summary

Vehicle year/make/  
model/body style: 2001/Volvo/S80/Sedan  
 Vehicle NHTSA number: VO0001  
 Test date: 10/19/00

Driver	Passenger
Dummy #142	Dummy #192

Maximum Forces:

Neck X-axis shear force	601 N	779 N <sup>1</sup>
Neck Y-axis shear force	-97 N <sup>1</sup>	-109.2 N <sup>1</sup>
Neck Z-axis axial force	1686 N <sup>1</sup>	1457 N <sup>1</sup>

Maximum Moments:

Neck moment about X-axis	-15.7 N·m <sup>1</sup>	17.4 N·m <sup>1</sup>
Neck moment about Y-axis	57.0 N·m	39.3 N·m
Neck moment about Z-axis	9.1 N·m <sup>1</sup>	14.0 N·m <sup>1</sup>
Neck moment about Y-axis at occipital condyle	46.3 N·m	46.7 N·m <sup>1</sup>

Maximum Accelerations:

Pelvis X-axis	-64.3 g	-65.0 g
Pelvis Y-axis	16.1 g	10.9 g
Pelvis Z-axis	-26.3 g	-24.2 g
Pelvis resultant	66.9 g	66.0 g

<sup>1</sup> See Data Acquisition Explanations

Table 7 Hybrid III Data Summary, Cont'd.

Vehicle year/make/  
model/body style: 2001/Volvo/S80/Sedan  
Vehicle NHTSA number: VO0001  
Test date: 10/19/00

	Driver Dummy #142	Passenger Dummy #192
Left upper tibia Z-axis force	-1586.9 N·m <sup>1</sup>	-4311.3 N·m <sup>1</sup>
Left upper tibia moment about X-axis	78.4 N·m	64.3 N·m <sup>1</sup>
Left upper tibia moment about Y-axis	-114.3 N·m	-186.9 N·m <sup>1</sup>
Right upper tibia Z-axis force	-3741.5 N·m	-2956.0 N·m <sup>1</sup>
Right upper tibia moment about X-axis	-36.7 N·m <sup>1</sup>	-38.0 N·m
Right upper tibia moment about Y-axis	-169.9 N·m	-147.0 N·m
Left lower tibia Z-axis force	-5477.8 N	-5843.8 N <sup>1</sup>
Left lower tibia moment about Y-axis	-127.4 N·m	64.9 N·m
Left lower tibia moment about X-axis	-18.3 N	32.3 N
Right lower tibia Z-axis force	-2213.8 N <sup>1</sup>	-3829.1 N <sup>1</sup>
Right lower tibia moment about Y-axis	84.1 N·m	55.6 N·m <sup>1</sup>
Right lower tibia moment about X-axis	62.6 N·m	-52.3 N·m
Left foot X-axis acceleration at heel	-69.1 g	-136.0 g
Left foot Z-axis acceleration at heel	-93.6 g	-125.3 g
Left foot Z-axis acceleration at toe	-150.3 g	-147.1 g
Right foot X-axis acceleration at heel	-246.7 g	-46.4 g
Right foot Z-axis acceleration at heel	-188.0 g	-69.6 g
Right foot Z-axis acceleration at toe	-649.8 g	-60.2 g

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

<sup>1</sup> See Data Acquisition Explanations

## 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.

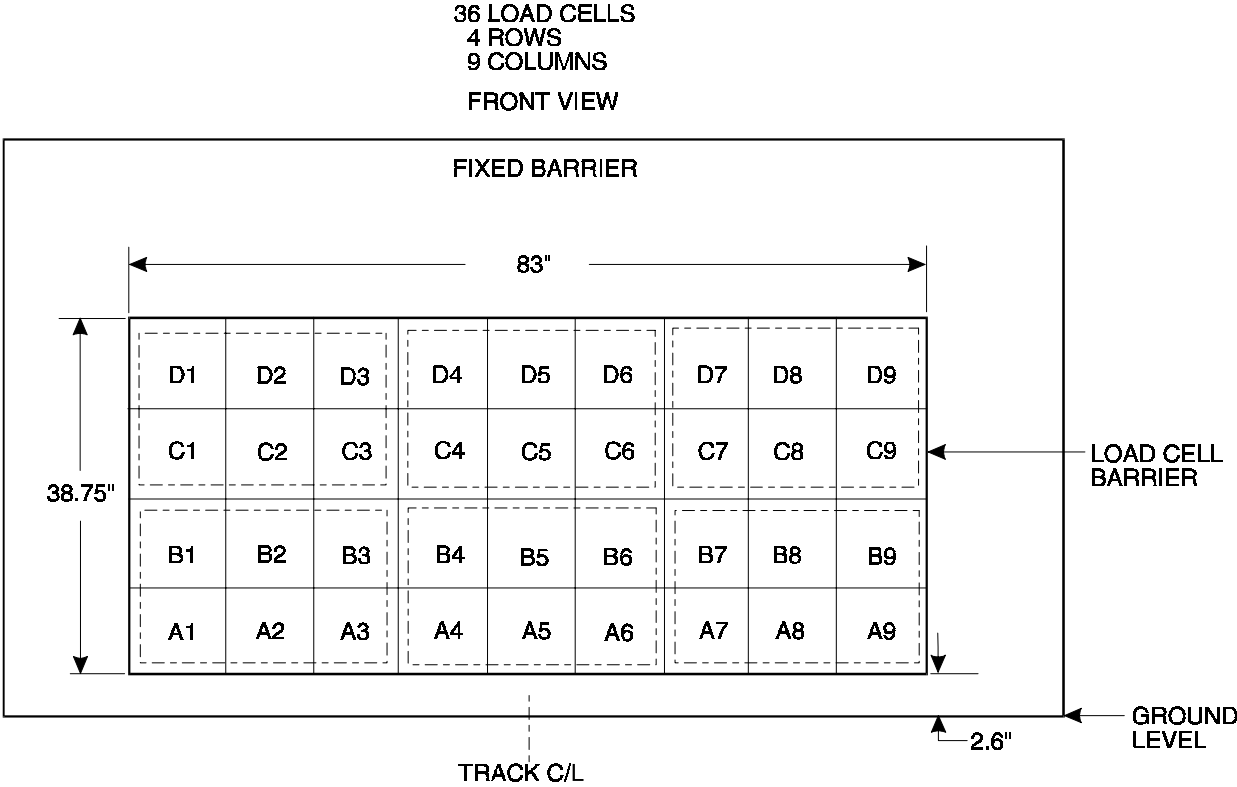
Table 8 Seat Belt Performance Assessment Test Data

	Driver	Passenger
<u>Belt length data:</u>		
Belt length from trim panel exit to bolt hole anchor point for continuous webbing systems.	N/A mm	N/A mm
Shoulder belt length as measured on Part 572 dummy.	N/A mm	N/A mm
Lap belt length as measured on Part 572 dummy.	N/A mm	N/A mm
<u>Shoulder belt spool-off length:</u>		
As determined by film analysis	N/A mm <sup>1</sup>	N/A mm <sup>1</sup>
As determined mechanically	N/A mm	N/A mm
As determined electronically	N/A mm	N/A mm
<u>Belt stretch length:</u>		
As measured mechanically	N/A mm/m	N/A mm/m
As measured electronically	6.7 <sup>2</sup> mm/m	2.0 <sup>2</sup> mm/m
<u>Retractor lock-up time:</u>		
As determined by shoulder belt spool-off in film	N/A ms <sup>1</sup>	N/A ms <sup>1</sup>

<sup>1</sup> Belt and retractor information could not be determined from film.

<sup>2</sup> See Data Acquisition Explanations

Figure 4 Load Cell Barrier Configuration



- Group 1: A1 through B3
- Group 2: A4 through B6
- Group 3: A7 through B9
- Group 4: C1 through D3
- Group 5: C4 through D6
- Group 6: C7 through D9

Table 9 Load Cell Barrier Data Summary

Location	Positive direction				Negative direction			
Total group 1 <sup>1</sup>	1.7	kN	@	1.9 ms	118.1	kN	@	34.2 ms
Total group 2 <sup>1</sup>	0.1	kN	@	150.8 ms	300.4	kN	@	31.9 ms
Total group 3 <sup>1</sup>	2.4	kN	@	2.2 ms	188.7	kN	@	29.4 ms
Total group 4 <sup>1</sup>	2.6	kN	@	4.0 ms	84.2	kN	@	31.0 ms
Total group 5 <sup>1</sup>	0.2	kN	@	147.5 ms	54.4	kN	@	30.6 ms
Total group 6 <sup>1</sup>	0.9	kN	@	182.7 ms	43.9	kN	@	32.4 ms
Total load cell force <sup>1</sup>	0.2	kN	@	151.4 ms	766.8	kN	@	31.0 ms

Tension is positive  
 Compression is negative

<sup>1</sup> See Data Acquisition Explanations

Section 3.0

FMVSS 212, 219 (partial), and 301 Data

Figure 5 FMVSS 212 Test Data

Details of windshield mounting such as retention method, trim type, etc.: Adhesive seal; plastic trim

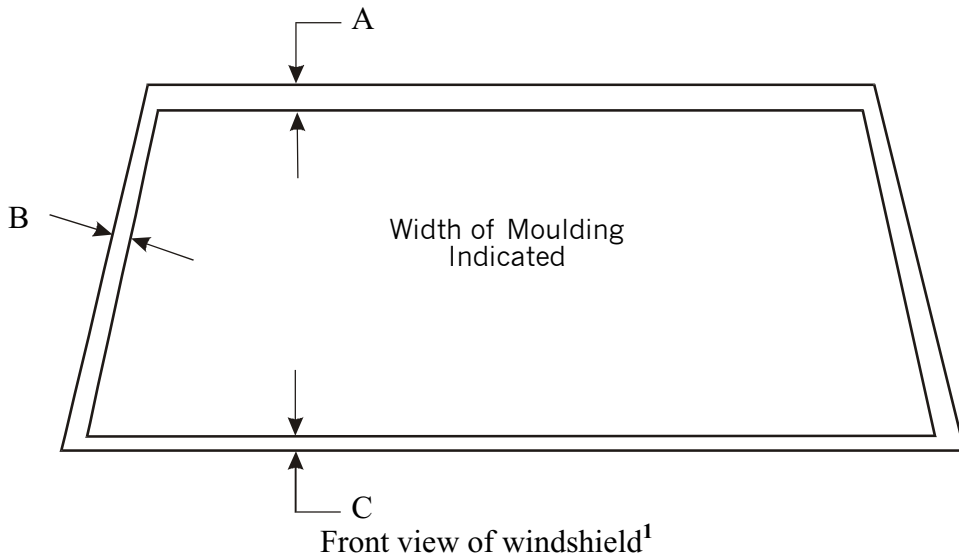
FMVSS 212 requirements: The post-test periphery retention amount must be at least 75% of the pre-test periphery measurement for vehicles NOT equipped with automatic restraints, and 50% for each side of windshield for vehicles equipped with automatic restraint systems for front occupants.

Windshield periphery measurements:

	<u>Pre-test</u>	<u>Post-test</u>	<u>Percent retention</u>
Right side	2240 mm	2240 mm	100
Left side	2240 mm	2240 mm	100
Total	4480 mm	4480 mm	100

Pre-test windshield mounting material temperature: N/A

- A = 20 mm
- B = 10 mm
- C = 10 mm



Loss of windshield retention lengths: None

<sup>1</sup> Indicate areas of loss of retention, if any, on windshield diagram.

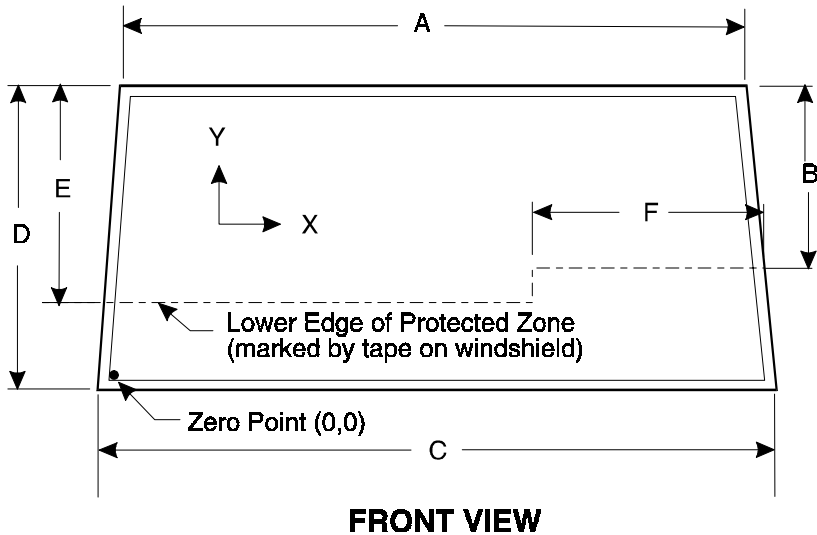
Figure 6 FMVSS 219 Test Data

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 = 1244 mm
- B = 470 mm
- C = 1651 mm
- D = 800 mm
- E = 740 mm
- F = 555 mm



Method of adhering protected zone template to windshield: N/A

Areas of windshield template penetration greater than 6 mm: N/A

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 10 Fuel System Data

Vehicle year/make/ model/body style:	2001/Volvo/S80/Sedan
NHTSA number:	VO0001
Fuel system capacity:	21.1 gallons (from owner's manual)
Usable capacity:	21.1 gallons (furnished by COTR)
Test volume range:	19.4 gallons to 19.8 gallons (92-94% of usable)
Actual test volume:	19.8 gallons (with entire fuel system filled)
Test fluid type:	Stoddard
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.	No
Details of fuel system:	Fuel tank under rear seat area. Filler neck routed in right rear wheel well area. Fuel filler cap attached to neck. Fuel line is run under right side floorpan.

Table 11 FMVSS 301 Post-Impact Test Data

NHTSA number: VO0001  
Test date: 10/19/00  
Vehicle year/make/  
model/body style: 2001/Volvo/S80/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 (56 km/h)
- Oblique (48 km/h) with \_\_\_° barrier face first contacting \_\_\_ (driver/pass.) side
- Rear moving barrier (48 km/h)
- Lateral moving barrier (32 km/h)

Fuel system fluid spillage measurements:

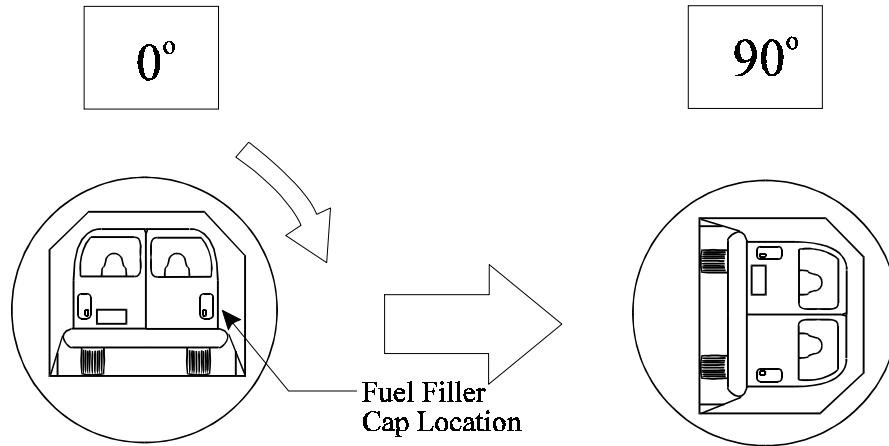
	<u>Test Results</u>	<u>Maximum Allowable</u>
1. From impact until vehicle motion ceases	0 g	28 g
2. 5-minute period after vehicle motion ceases	0 g	142 g
3. Next 25 minutes after 5-minute period	0 g	28 g/min

Fuel system fluid spillage location(s): None

Figure 7 FMVSS 301 Static Rollover Test Data

NHTSA number: VO0001

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

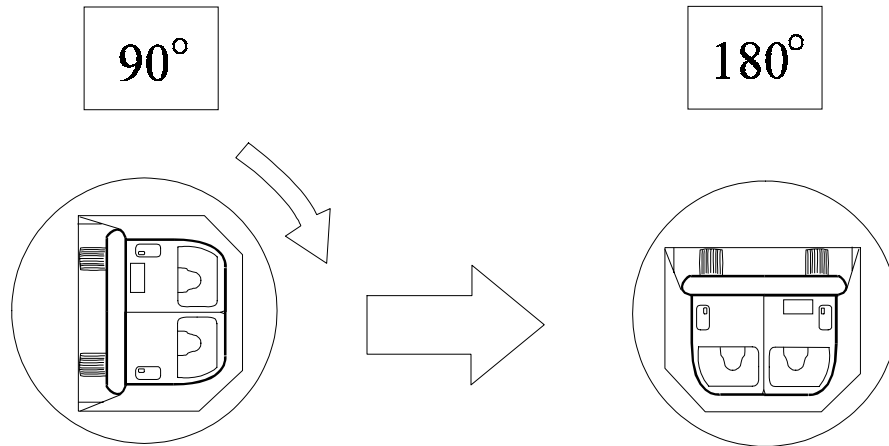
Fuel system fluid spillage measurements:

	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 7 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

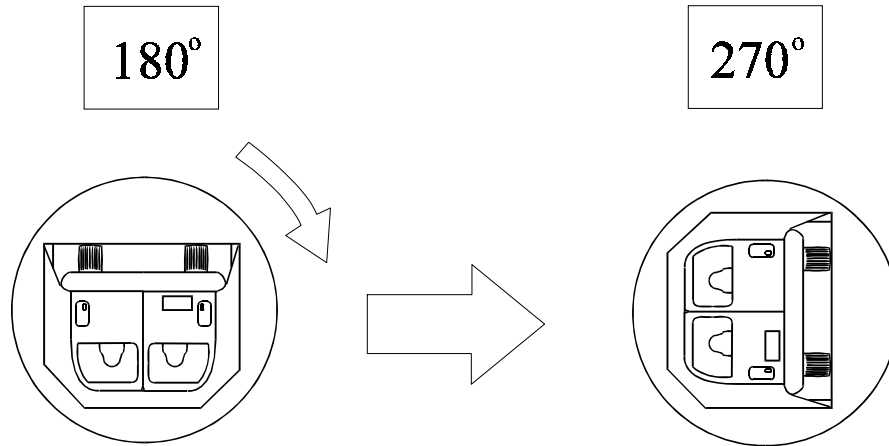
Fuel system fluid spillage measurements:

<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 7 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

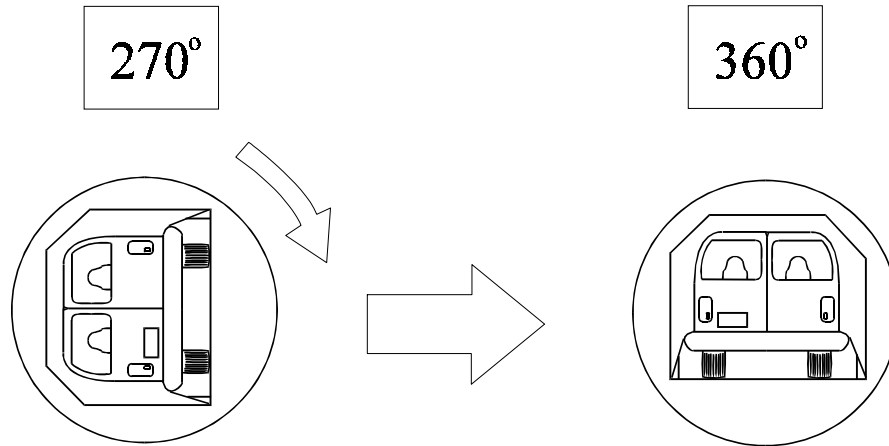
Fuel system fluid spillage measurements:

<u>180° to 270° rotation</u>	<u>Test Results</u>	<u>Maximum Allowable</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 7 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 8 Dummy Measurement Locations for Front Seat Occupants

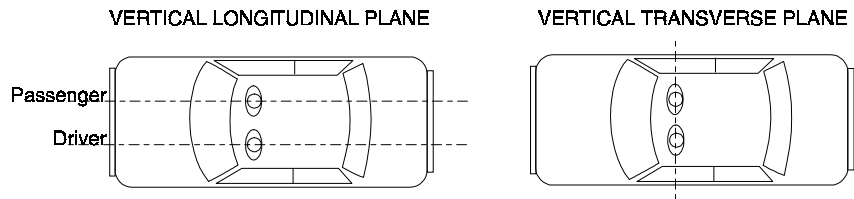
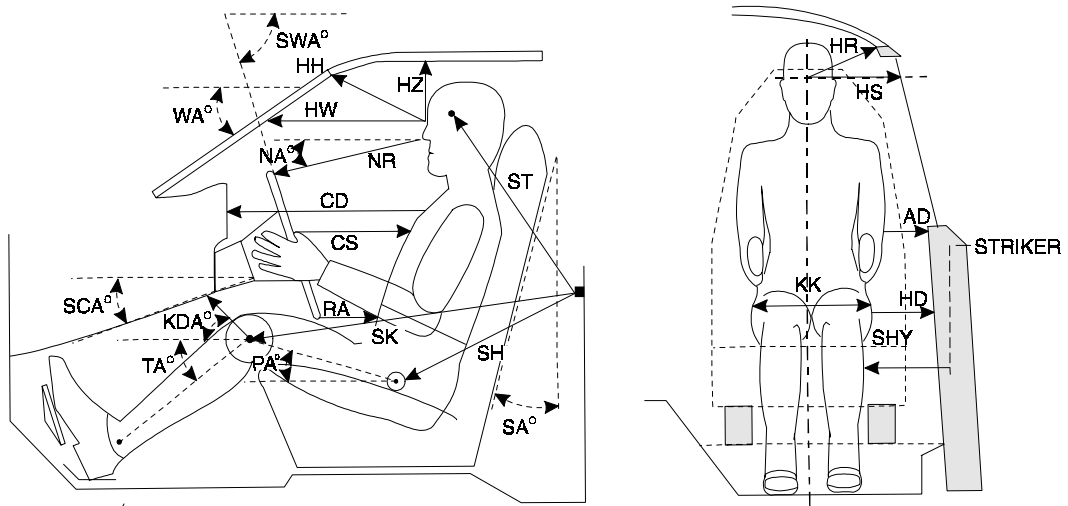


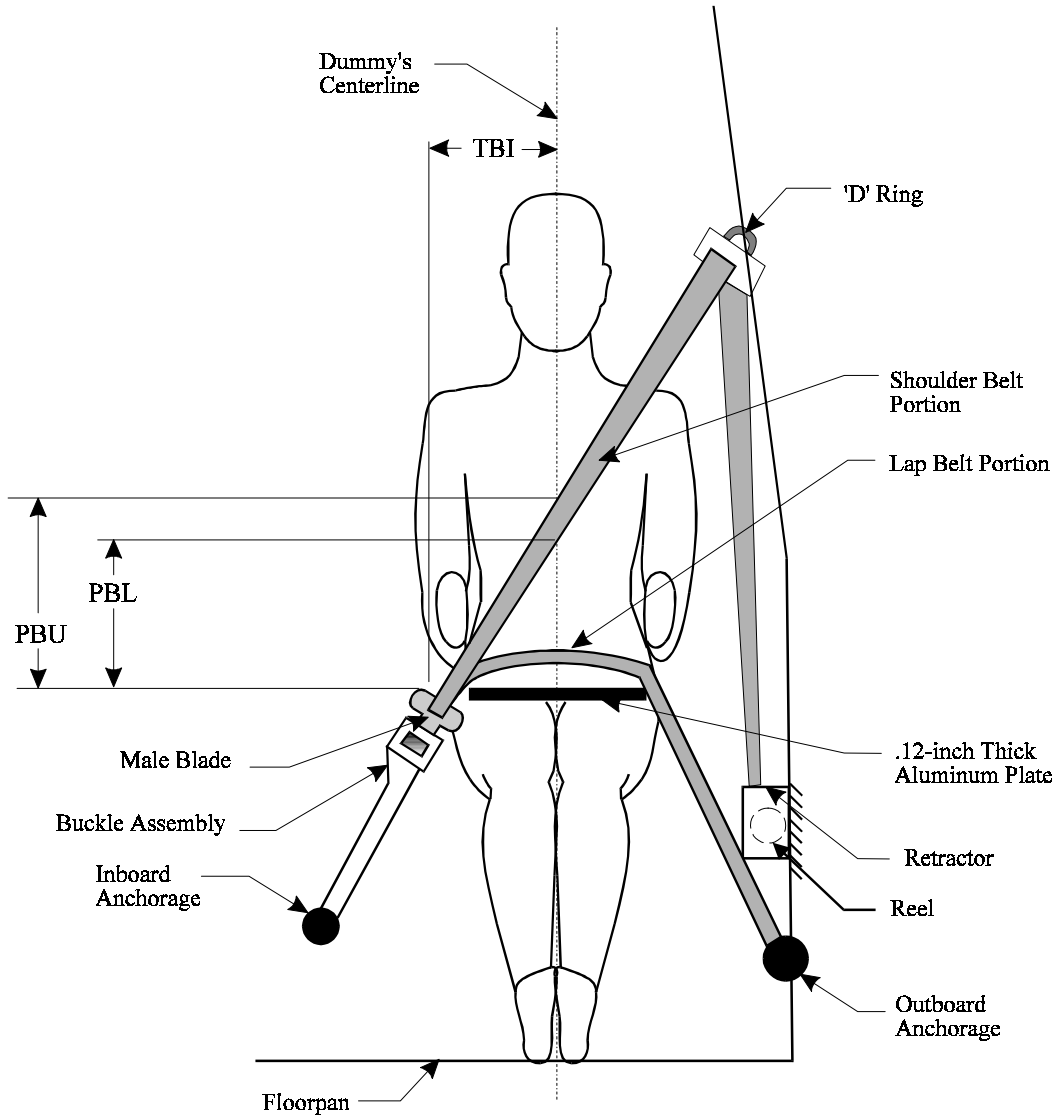
Table 12 Dummy Measurement Data For Front Seat Occupants

Designation	Type of Measurement	Driver (Serial # 142)	Passenger (Serial # 192)
WA	Windshield angle	25.9°	25.9°
SWA	Steering wheel angle	25°	NA
SCA	Steering column angle	65.0°	NA
SA	Seat back angle	19°	19°
HZ	Head to roof	205 mm	192 mm
HH	Head to header	347 mm	337 mm
HW	Head to windshield	650 mm	637 mm
HR	Head to side header	245 mm	235 mm
NR	Nose to rim	380 mm	NA
NA	Nose to rim angle	10.4°	NA
CD	Chest to dash	530 mm	630 mm
CS	Steering wheel to chest	300 mm	NA
RA	Rim to abdomen	182 mm	NA
KDL	Left knee to dash	177 mm	175 mm
KDR	Right knee to dash	160 mm	173 mm
KDA	Outboard knee to dash angle	25.2°	21.5°
PA	Pelvic angle	24°	24.2°
TA	Tibial angle	48.6°	48°
KK	Knee to knee	329 mm	270 mm
ST <sup>1</sup>	Striker to head	436 mm	429 mm
	Striker to head angle	-79.3°	-73.9°
SK <sup>1</sup>	Striker to knee	580 mm	609 mm
	Striker to knee angle	7.1°	10.6°
SH <sup>1</sup>	Striker to H-point	315 mm	307 mm
	Striker to H-point angle	43.8°	50.8°
SHY	Striker to H-point (Y dir.)	250 mm	285 mm
HS	Head to side window	346 mm	346 mm
HD	H-point to door	148 mm	157 mm
AD	Arm to door	137 mm	75 mm

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

<sup>1</sup> A negative angle indicates the measurement point was above the striker.

Figure 9 Seat Belt Positioning Data



	Driver	Passenger
PBU - Top surface of aluminum plate to belt upper edge	340 mm	330 mm
PBL - Top surface of aluminum plate to belt lower edge	254 mm	318 mm
TBI - Dummy centerline to intersection of upper torso belt and lap belt	260 mm	260 mm

Figure 10 Camera Positions

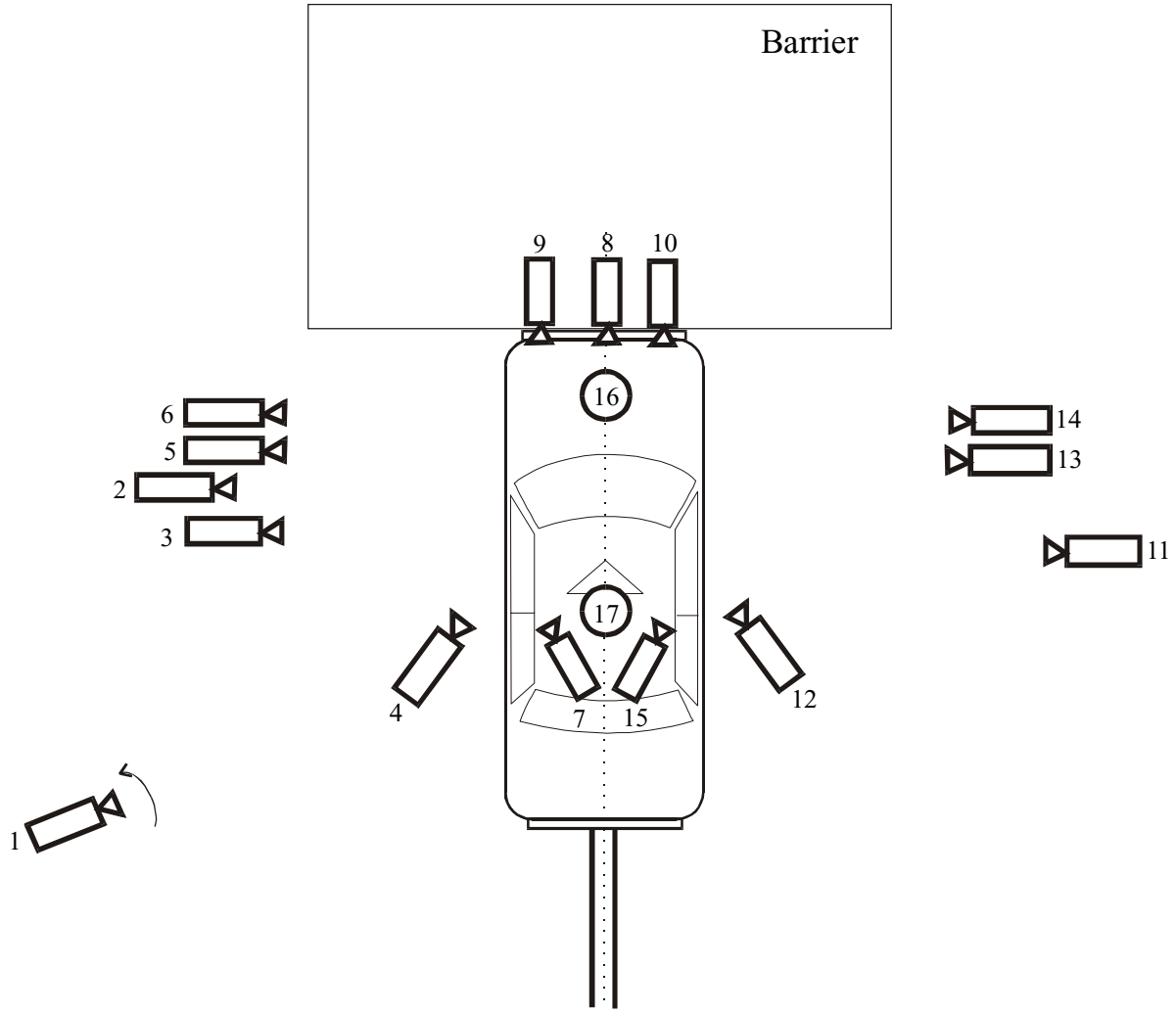


Table 13 Motion Picture Camera Locations

Test Number: 001019

Vehicle Year/Make/Model/Body Style: 2001/Volvo/S80/Sedan

Camera Number	View	Camera Positions <sup>1</sup>			Angle <sup>2</sup>	Film Plane to Head Target	Lens	Film Speed
		X	Y	Z				
1	Real-time panning	N/A	N/A	N/A	N/A	16 mm	24 frames/s	
2	Column movement - upper	-2134 mm	7925 mm	2667 mm	N/A	25 mm	622 frames/s	
3	Column movement - lower	-2134 mm	7925 mm	1651 mm	N/A	25 mm	1000 frames/s	
4	Dummy angled view	-3785 mm	2438 mm	2032 mm	N/A	25 mm	950 frames/s	
5	Left medium tight	-1346 mm	7010 mm	1524 mm	N/A	25 mm	1005 frames/s	
6	Left windshield intrusion	-660 mm	7010 mm	1295 mm	N/A	50 mm	995 frames/s	
7	Driver seat belt movement	N/A	N/A	N/A	N/A	8 mm	995 frames/s	
8	Windshield - barrier center	-25 mm	0 mm	2565 mm	N/A	8.5 mm	995 frames/s	
9	Driver - barrier view	-76 mm	4394 mm	2489 mm	N/A	17 mm	995 frames/s	
10	Passenger - barrier view	-76 mm	-4470 mm	2489 mm	N/A	17 mm	997 frames/s	
11	Right side overall	-2565 mm	-8357 mm	965 mm	N/A	13 mm	1002 frames/s	
12	Passenger angled view	-3785 mm	-2438 mm	2134 mm	N/A	25 mm	997 frames/s	
13	Right medium tight	-1524 mm	-6401 mm	1245 mm	N/A	25 mm	1007 frames/s	
14	Right windshield intrusion	-1041 mm	-6401 mm	1143 mm	N/A	50 mm	1000 frames/s	
15	Passenger seat belt movement	N/A	N/A	N/A	N/A	8 mm	992 frames/s	
16	Crush & fluid spillage - front pit	N/A	N/A	N/A	N/A	13 mm	1000 frames/s	
17	Fluid spillage - rear pit	N/A	N/A	N/A	N/A	13 mm	1000 frames/s	

<sup>1</sup> +X = Film plane forward of barrier face  
+Y = Film plane to left of monorail centerline  
+Z = Film plane above ground level  
<sup>2</sup> +Angle = Film plane angled upward from horizontal plane

Figure 11 Vehicle Target Locations

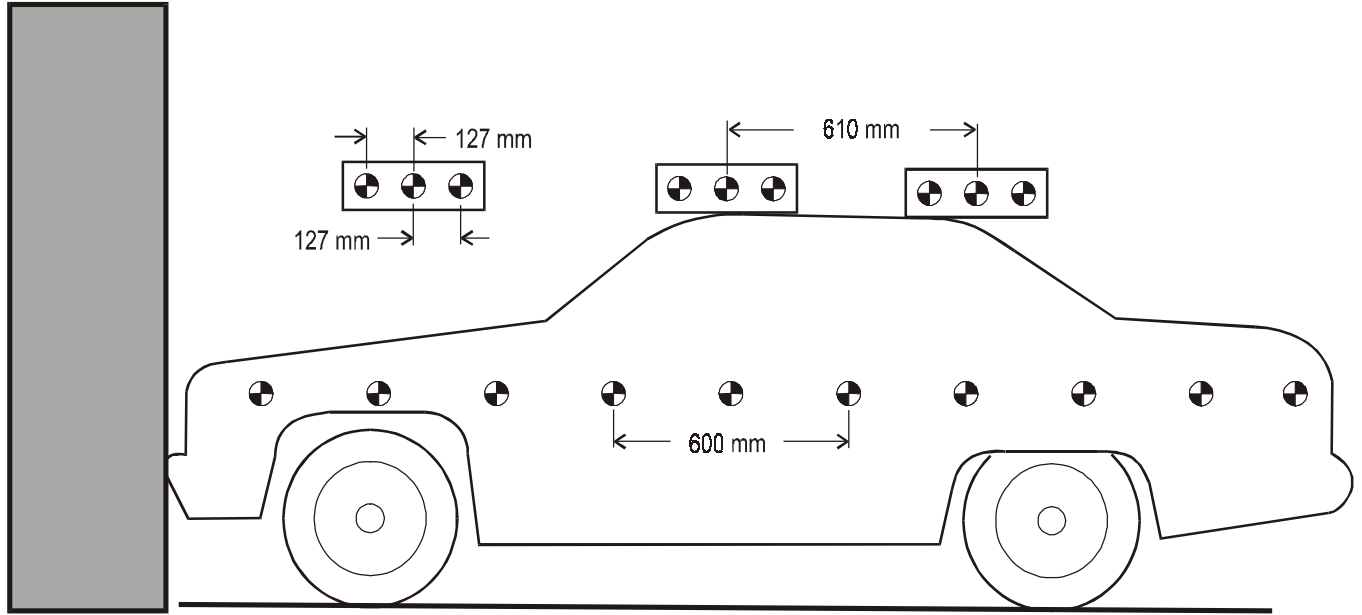


Figure 12 Pre-Test And Post-Test Measurement Points

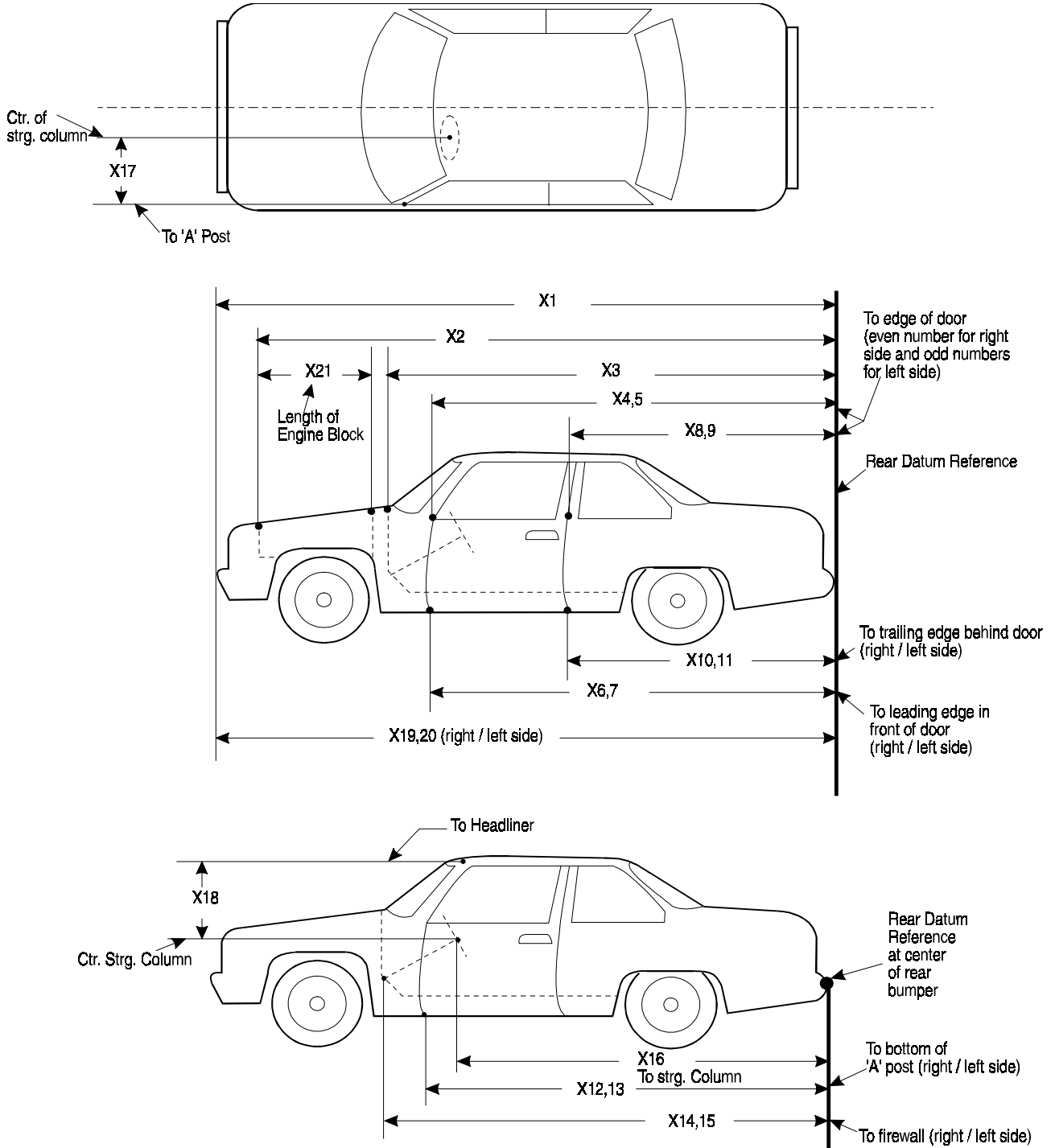


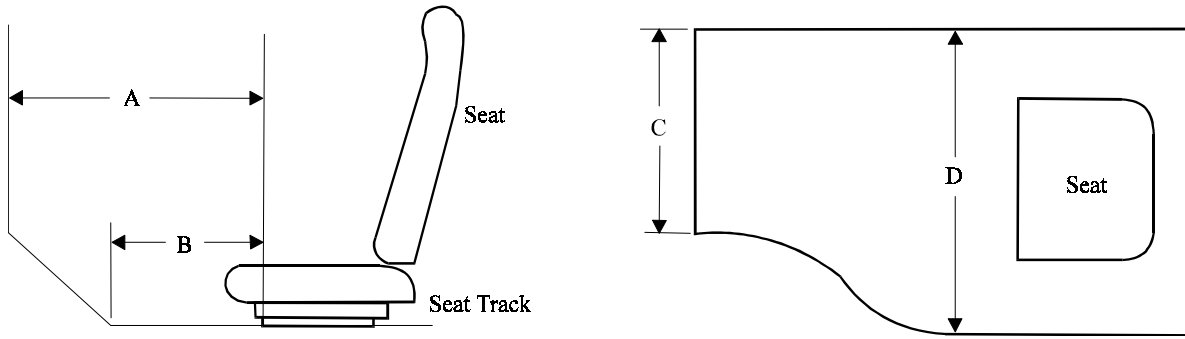
Table 14 Impacted Vehicle Measurements

Test number: 001019

Vehicle year/make/model/body style: 2001/Volvo/S80/Sedan

No.	Type of measurement	Pre-Test	Post-Test	Difference
X1	Total Length of Veh. at Centerline	5190	4673	517
X2	Rear Surface of Veh. to Front of Engine Block	4570	4310	260
X3	Rear Surface of Veh. to Firewall	4155	4078	77
X4	Rear Surface of Veh. to Upper Leading Edge of Right Door	3678	3672	6
X5	Rear Surface of Veh. to Upper Leading Edge of Left Door	3673	3670	3
X6	Rear Surface of Veh. to Lower Leading Edge of Right Door	3677	3663	14
X7	Rear Surface of Veh. to Lower Leading Edge of Left Door	3680	3662	18
X8	Rear Surface of Veh. to Upper Trailing Edge of Right Door	2645	2638	7
X9	Rear Surface of Veh. to Upper Trailing Edge of Left Door	2640	2634	6
X10	Rear Surface of Veh. to Lower Trailing Edge of Right Door	2676	2657	19
X11	Rear Surface of Veh. to Lower Trailing Edge of Left Door	2675	2657	18
X12	Rear Surface of Veh. to Bottom of " A " Post on Right Side	3655	3650	5
X13	Rear Surface of Veh. to Bottom of " A " Post on Left Side	3655	3644	11
X14	Rear Surface of Veh. to Firewall--Right Side	4090	4000	90
X15	Rear Surface of Vehicle to Firewall --Left Side	4085	4005	80
X16	Rear Surface of Veh. to Steering Wheel Center	3255	3265	-10
X17	Center of Steering Column to " A " Post	345	321	24
X18	Center of Steering Column to Headliner	476	455	21
X19	Rear Surface of Veh. to Right Side of Front Bumper	5035	4642	393
X20	Rear Surface of Veh. to Left Side of Front Bumper	5040	4628	412
X21	Length of Engine Block	450	450	0

Figure 13 Vehicle Intrusion Measurements  
Static Footwell Deformation



**Driver's Side**

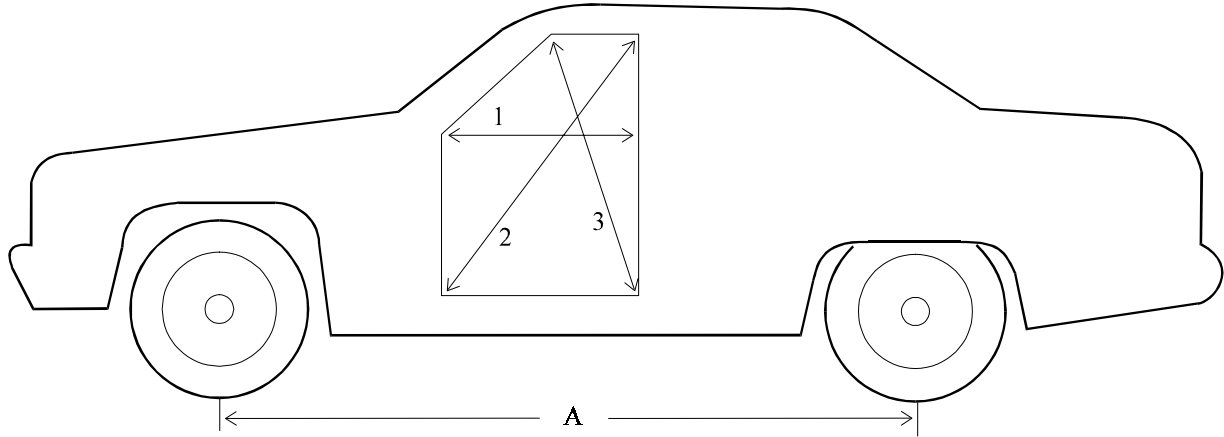
Measurement	Pre-Test	Post-Test	Difference
A	645 mm	543 mm	102 mm
B	514 mm	461 mm	53 mm
C	416 mm	419 mm	-3 mm
D	430 mm	430 mm	0 mm

**Passenger's Side**

Measurement	Pre-Test	Post-Test	Difference
A	625 mm	604 mm	21 mm
B	505 mm	580 mm	-75 mm
C	416 mm	420 mm	-4 mm
D	425 mm	394 mm	31 mm

Figure 14 Vehicle Intrusion Measurements

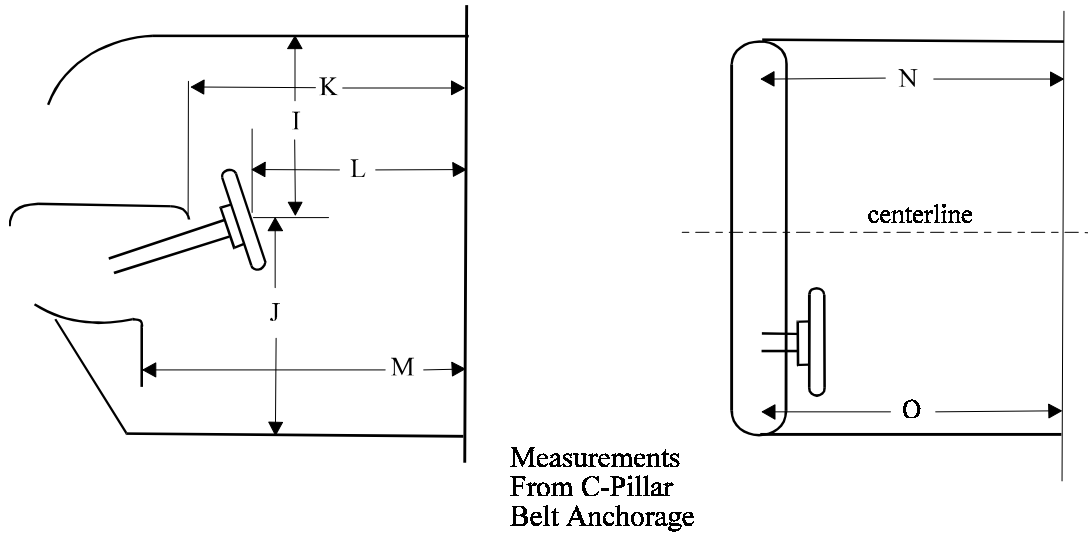
Door Opening Width



Units (mm)	Left			Right		
Measurement	1	2	3	1	2	3
Pre-Test	991 mm	1505 mm	992 mm	885 mm	1475 mm	885 mm
Post-Test	995 mm	1503 mm	984 mm	971 mm	1487 mm	898 mm
Difference	-4 mm	2 mm	8 mm	-86 mm	-12 mm	-13 mm

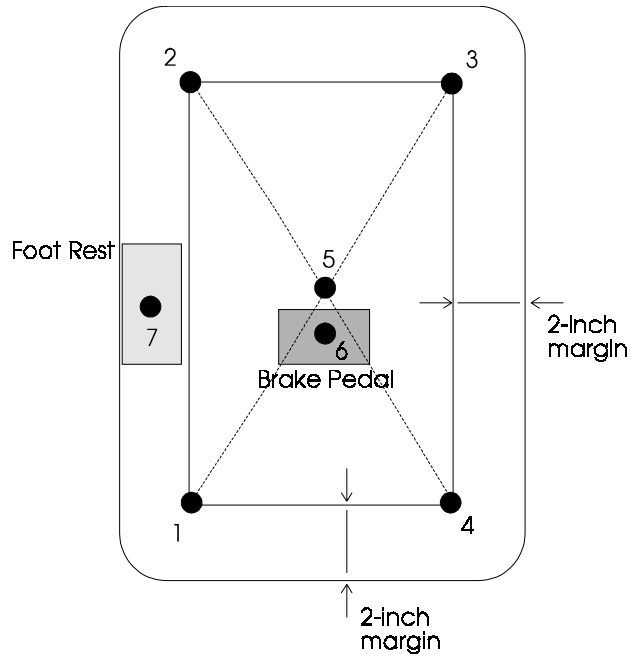
Units (mm)	A = Wheelbase Left	A = Wheelbase Right
Pre-Test	2782 mm	2782 mm
Post-Test	2730 mm	2677 mm
Difference	52 mm	105 mm

Figure 15 Vehicle Intrusion Measurements  
Static Passenger Compartment Intrusion



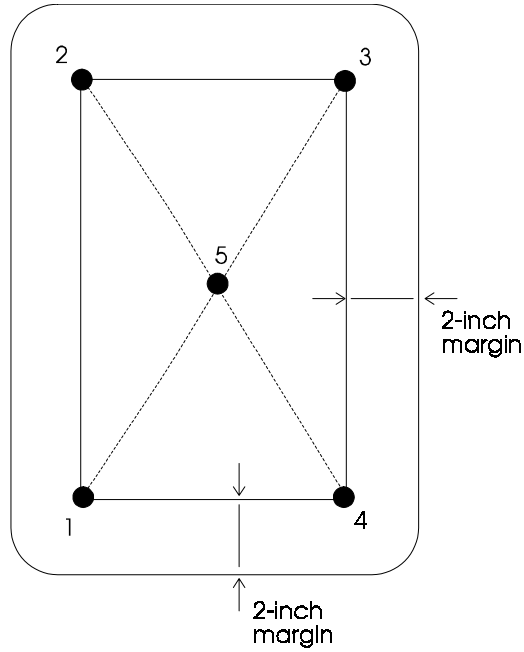
Measurement	Pre-Test	Post-Test	Difference
I	480 mm	435 mm	45 mm
J	590 mm	565 mm	25 mm
K (driver's side)	2115 mm	2115 mm	0 mm
L	1890 mm	1878 mm	12 mm
M (driver's side)	2140 mm	2135 mm	5 mm
N	2057 mm	2055 mm	2 mm
O	2025 mm	2010 mm	15 mm
Passenger's side	2195 mm	2175 mm	20 mm
Passenger's side	2082 mm	2088 mm	-6 mm

Figure 16 Driver Toeboard Measurements



Driver Side		X	Z
1	Pre-Test	990 mm	280 mm
	Post-Test	995 mm	104 mm
	Crush	-5 mm	176 mm
2	Pre-Test	1570 mm	476 mm
	Post-Test	1516 mm	460 mm
	Crush	54 mm	16 mm
3	Pre-Test	1620 mm	373 mm
	Post-Test	1510 mm	376 mm
	Crush	110 mm	-3 mm
4	Pre-Test	1005 mm	220 mm
	Post-Test	999 mm	192 mm
	Crush	6 mm	28 mm
5	Pre-Test	1344 mm	230 mm
	Post-Test	1312 mm	123 mm
	Crush	32 mm	107 mm
6	Pre-Test	1505 mm	404 mm
	Post-Test	1450 mm	400 mm
	Crush	55 mm	4 mm
7	Pre-Test	1500 mm	351 mm
	Post-Test	1460 mm	332 mm
	Crush	40 mm	19 mm

Figure 17 Passenger Toeboard Measurements



Passenger Side			
		X	Z
1	Pre-Test	1020 mm	275 mm
	Post-Test	1011 mm	207 mm
	Crush	9 mm	68 mm
2	Pre-Test	1623 mm	405 mm
	Post-Test	1574 mm	406 mm
	Crush	49 mm	-1 mm
3	Pre-Test	1547 mm	442 mm
	Post-Test	1529 mm	540 mm
	Crush	18 mm	-98 mm
4	Pre-Test	1012 mm	225 mm
	Post-Test	1017 mm	225 mm
	Crush	-5 mm	0 mm
5	Pre-Test	1327 mm	228 mm
	Post-Test	1317 mm	197 mm
	Crush	10 mm	31 mm

Appendix A

Photographs

Appendix B

Data Plots

Appendix C

Dummy Certification Data

Pre-Test Certification Data

Driver Dummy S/N: 142

Pre-Test Certification Data

Passenger Dummy S/N: 192

Appendix D

Miscellaneous Test Information

Dummy Instrument Calibrations  
Driver Dummy #142

	Serial Number	Model Number	Manufacturer	Calibration Date	
				Last	Due
Head X-axis accelerometer	J27523	7264	Endevco	09/19/00	03/19/01
Head X-axis accelerometer-redundant	J35562	7264	Endevco	09/13/00	03/13/01
Head Y-axis accelerometer	J29023	7264	Endevco	09/19/00	03/19/01
Head Y-axis accelerometer-redundant	J27461	7264	Endevco	09/19/00	03/19/01
Head Z-axis accelerometer	J29006	7264	Endevco	09/19/00	03/19/01
Head Z-axis accelerometer-redundant	J27457	7264	Endevco	09/19/00	03/19/01
Chest X-axis accelerometer	J27466	7264	Endevco	09/20/00	03/20/01
Chest X-axis accelerometer-redundant	AAL32	7264	Endevco	09/13/00	03/13/01
Chest Y-axis accelerometer	J27470	7264	Endevco	09/20/00	03/20/01
Chest Y-axis accelerometer-redundant	AGT82	7264	Endevco	09/13/00	03/13/01
Chest Z-axis accelerometer	J27509	7264	Endevco	09/20/00	03/20/01
Chest Z-axis accelerometer-redundant	AGR67	7264	Endevco	09/13/00	03/13/01
Left femur force load cell	0257	2121	Denton	09/20/00	03/20/01
Right femur force load cell	0258	2121	Denton	09/20/00	03/20/01
Neck X-axis force load cell	260-FX	IF-205	First Tech.	08/30/00	03/02/01
Neck Y-axis force load cell	260-FY	IF-205	First Tech.	08/30/00	03/02/01
Neck Z-axis force load cell	260-FZ	IF-205	First Tech.	08/30/00	03/02/01
Neck Moment about X-axis load cell	260-MX	IF-205	First Tech.	08/30/00	03/02/01
Neck Moment about Y-axis load cell	260-MY	IF-205	First Tech.	08/30/00	03/02/01
Neck Moment about Z-axis load cell	260-MZ	IF-205	First Tech.	08/30/00	03/02/01
Pelvis X-axis accelerometer	AAKA1	7264	Endevco	09/13/00	03/13/01
Pelvis Y-axis accelerometer	ADAL2	7264	Endevco	09/13/00	03/13/01
Pelvis Z-axis accelerometer	AAKA2	7264	Endevco	09/13/00	03/13/01
Chest deflection potentiometer	142	14CB1-2981	Servo	10/11/00	04/11/01
Lap belt force load cell	612	3419	Lebow	04/14/00	10/14/00
Shoulder belt force load cell	571	3419	Lebow	06/05/00	12/05/00

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	107-MX	3292	Denton	09/21/00	03/21/01
Left upper tibia moment about Y-axis load cell	107-MY	3292	Denton	09/21/00	03/21/01
Left upper tibia Z-axis Force load cell	107-FZ	3292	Denton	09/21/00	03/21/01
Right upper tibia moment about X-axis load cell	108-MX	3292	Denton	09/21/00	03/21/01
Right upper tibia moment about Y-axis load cell	108-MY	3292	Denton	09/21/00	03/21/01
Right upper tibia Z-axis Force load cell	108-FZ	3292	Denton	09/21/00	03/21/01
Left Lower tibia moment about X-axis load cell	137-MX	3093	Denton	09/21/00	03/21/01
Left Lower tibia Z-axis force load cell	137-FZ	3093	Denton	09/21/00	03/21/01
Left Lower tibia moment about Y-axis load cell	137-MY	3093	Denton	09/21/00	03/21/01
Right Lower tibia moment about X-axis load cell	136-MX	3093	Denton	09/21/00	03/21/01
Right Lower tibia Z-axis force load cell	136-FZ	3093	Denton	09/21/00	03/21/01
Right Lower tibia moment about Y-axis load cell	136-MY	3093	Denton	09/21/00	03/21/01
Left foot heel X-axis accelerometer	AJ507	7264	Endevco	10/11/00	04/21/01
Left foot heel Z-axis accelerometer	J19925	7264	Endevco	10/11/00	04/21/01
Left foot toe Z-axis accelerometer	J35564	7264	Endevco	09/13/00	03/13/01
Right foot heel X-axis accelerometer	J14232	7264	Endevco	10/11/00	04/21/01
Right foot heel Z-axis accelerometer	AJ4R3	7264	Endevco	10/11/00	04/21/01
Right foot toe Z-axis accelerometer	J17988	7264	Endevco	10/01/00	04/01/01

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

	Serial Number	Model Number	Manufacturer	Calibration Date	
				Last	Due
Head X-axis accelerometer	AFW91	7264	Endevco	09/13/00	03/13/01
Head X-axis accelerometer-redundant	AGRY2	7264	Endevco	09/13/00	03/13/01
Head Y-axis accelerometer	AAKB3	7264	Endevco	09/11/00	03/13/01
Head Y-axis accelerometer-redundant	ACCP9	7264	Endevco	09/11/00	03/13/01
Head Z-axis accelerometer	AGRP4	7264	Endevco	09/13/00	03/13/01
Head Z-axis accelerometer-redundant	AGMY3	7264	Endevco	09/13/00	03/13/01
Chest X-axis accelerometer	AAKE2	7264	Endevco	09/13/00	03/13/01
Chest X-axis accelerometer-redundant	AF9Y3	7264	Endevco	09/13/00	03/13/01
Chest Y-axis accelerometer	AGAG0	7264	Endevco	09/13/00	03/13/01
Chest Y-axis accelerometer-redundant	AF973	7264	Endevco	09/13/00	03/13/01
Chest Z-axis accelerometer	AAJY4	7264	Endevco	09/11/00	03/11/01
Chest Z-axis accelerometer-redundant	AGN47	7264	Endevco	09/13/00	03/13/01
Left femur force load cell	0263	2121	Denton	09/20/00	03/20/01
Right femur force load cell	0264	2121	Denton	09/20/00	03/20/01
Neck X-axis force load cell	261	IF-205	First Tech.	08/31/00	03/03/01
Neck Y-axis force load cell	261	IF-205	First Tech.	08/31/00	03/03/01
Neck Z-axis force load cell	261	IF-205	First Tech.	08/31/00	03/03/01
Neck Moment about X-axis load cell	261	IF-205	First Tech.	08/31/00	03/03/01
Neck Moment about Y-axis load cell	261	IF-205	First Tech.	08/31/00	03/03/01
Neck Moment about Z-axis load cell	261	IF-205	First Tech.	08/31/00	03/03/01
Pelvis X-axis accelerometer	AALG2	7264	Endevco	09/13/00	03/20/01
Pelvis Y-axis accelerometer	AGN98	7264	Endevco	09/11/00	03/11/01
Pelvis Z-axis accelerometer	AC9P8	7264	Endevco	09/13/00	03/13/01
Chest deflection potentiometer	87313-96	14CB1-2981	Servo	10/12/00	04/12/01
Lap belt force load cell	134	3419	Lebow	04/14/00	10/14/00
Shoulder belt force load cell	610	3419	Celesco	06/06/00	12/06/00

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	110-MX	3292	Denton	09/20/00	03/20/01
Left upper tibia moment about Y-axis load cell	110-MY	3292	Denton	09/20/00	03/20/01
Left upper tibia Z-axis Force load cell	110-FZ	3292	Denton	09/20/00	03/20/01
Right upper tibia moment about X-axis load cell	111-MX	3292	Denton	09/20/00	03/20/01
Right upper tibia moment about Y-axis load cell	111-MY	3292	Denton	09/20/00	03/20/01
Right upper tibia Z-axis Force load cell	111-FZ	3292	Denton	09/20/00	03/20/01
Left Lower tibia X-axis moment about X-axis load cell	139-MX	3093	Denton	09/20/00	03/20/01
Left Lower tibia Z-axis force load cell	139-FZ	3093	Denton	09/20/00	03/20/01
Left Lower tibia moment about Y-axis load cell	139-MY	3093	Denton	09/20/00	03/20/01
Right Lower tibia X-axis moment about X-axis load cell	142-MX	3093	Denton	09/20/00	03/20/01
Right Lower tibia Z-axis force load cell	142-FZ	3093	Denton	09/20/00	03/20/01
Right Lower tibia moment about Y-axis load cell	142-MY	3093	Denton	09/20/00	03/20/01
Left foot X-axis accelerometer	J19873	7264	Endevco	10/11/00	04/11/01
Left foot heel Z-axis accelerometer	J19236	7264	Endevco	10/11/00	04/11/01
Left foot toe Z-axis accelerometer	J23772	7264	Endevco	10/11/00	04/11/01
Right foot X-axis accelerometer	J23918	7264	Endevco	10/11/00	04/11/01
Right foot heel Z-axis accelerometer	EH75J	7264	Endevco	10/11/00	04/11/01
Right foot toe Z-axis accelerometer	FJ66J	7264	Endevco	10/11/00	04/11/01

Vehicle and Calibration Laboratory Instrument Calibrations

Vehicle Accelerometers

	Serial Number	Model Number	Manufacturer	Calibration Date	
				Last	Due
Left rear seat crossmember X-axis	J3616	7264	Endevco	08/07/00	02/07/01
Left rear seat crossmember X-axis redundant	J34531	7264	Endevco	10/04/00	04/04/01
Right rear seat crossmember X-axis	J36141	7264	Endevco	08/07/00	02/07/01
Right rear seat Crossmember X-axis redundant	J30364	7264	Endevco	09/13/00	03/13/01
Engine top X-axis	J21941	7264	Endevco	10/04/00	04/04/01
Engine bottom X-axis	A34FJ	7264	Endevco	09/22/00	03/22/01
Right brake caliper X-axis	J27684	7264	Endevco	10/03/00	04/03/01
Left brake caliper X-axis	J25527	7264	Endevco	05/31/00	12/01/00
Instrument panel center X-axis	J36270	7264	Endevco	07/14/00	01/14/01

Calibration Laboratory Instruments

	Serial Number	Model Number	Manufacturer	Calibration Date	
				Last	Due
Neck bending pendulum accelerometer	CB27	7232	Endevco	04/28/00	10/28/00
Neck bending rotary potentiometer	9439EG (Beta3)	6657S-1-102	Bourns	04/28/00	10/28/00
Neck bending rotary potentiometer	9618EL (Theta3)	6657S-1-102	Bourns	04/28/00	10/28/00
Thorax/Hybrid III femur pendulum accelerometer	CC64	7232	Endevco	04/28/00	10/28/00
Hybrid III femur pendulum accelerometer	CB35	7232	Endevco	04/28/00	10/28/00
Hip flexion torque transducer	940	2110-5K	Eaton	10/21/99	10/21/00
Hybrid III femur pendulum accelerometer	0218	6209-2038	JDK	04/05/00	10/05/00

Sign Convention  
SAE J211 Sign Convention  
(used for NHTSA format data diskettes)

Accelerometers:

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

Potentiometers:

+Chest longitudinal deflection: Outward  
+Chest lateral deflection: Rightward  
+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 rearward, chest forward  
+Y force: Head leftward, chest rightward  
+Z force: Head pulled upward (tension on neck), chest downward  
+X moment: Left ear rotating toward left shoulder  
+Y moment: Chin rotating toward chest  
+Z moment: Chin rotating toward left shoulder

Tibia load cells:

+X force: Ankle forward, knee rearward  
+Y force: Ankle rightward, knee leftward  
+Z force: Ankle downward, femur upward (tension)  
+X moment: Ankle leftward, holding knee in place  
+Y moment: Ankle forward, bottom of knee clevis 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

Type:   HIII   S/N:   142   Mfr:   Humanoid   Test Date:   10/19/00    
 Proj./Seg. No.:   20000262-0100   Test Eng.   G. Watters  

Item	Pre-Use
<b>Head:</b>	
Head Skin Condition	X
<b>Neck:</b>	
Rubber Condition	X
<b>Arms and Hands:</b>	
Skin Condition	X
<b>Thorax:</b>	
Jacket Condition	X
Rib Damping Material and Stiffeners Condition	X
Chest Pot Arm and Ball Movement	X
<b>Pelvis:</b>	
Illioc Crest Bone	X
Flesh Condition	X
Range of Motion Bumpers and Leg Cavity	X
<b>Legs and Feet:</b>	
Knee Skins, Inserts, and Castings Condition	X
Leg Skin Condition and Position	X
Foot Condition	X

Notes:   No damage to report.  

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Inspection Completed By:   J. Clarridge   Date:   10/19/00

Type:   HIII   S/N:   192   Mfr:   Alderson   Test Date:   10/19/00    
 Proj./Seg. No.:   20000262-0100   Test Eng.   G. Watters  

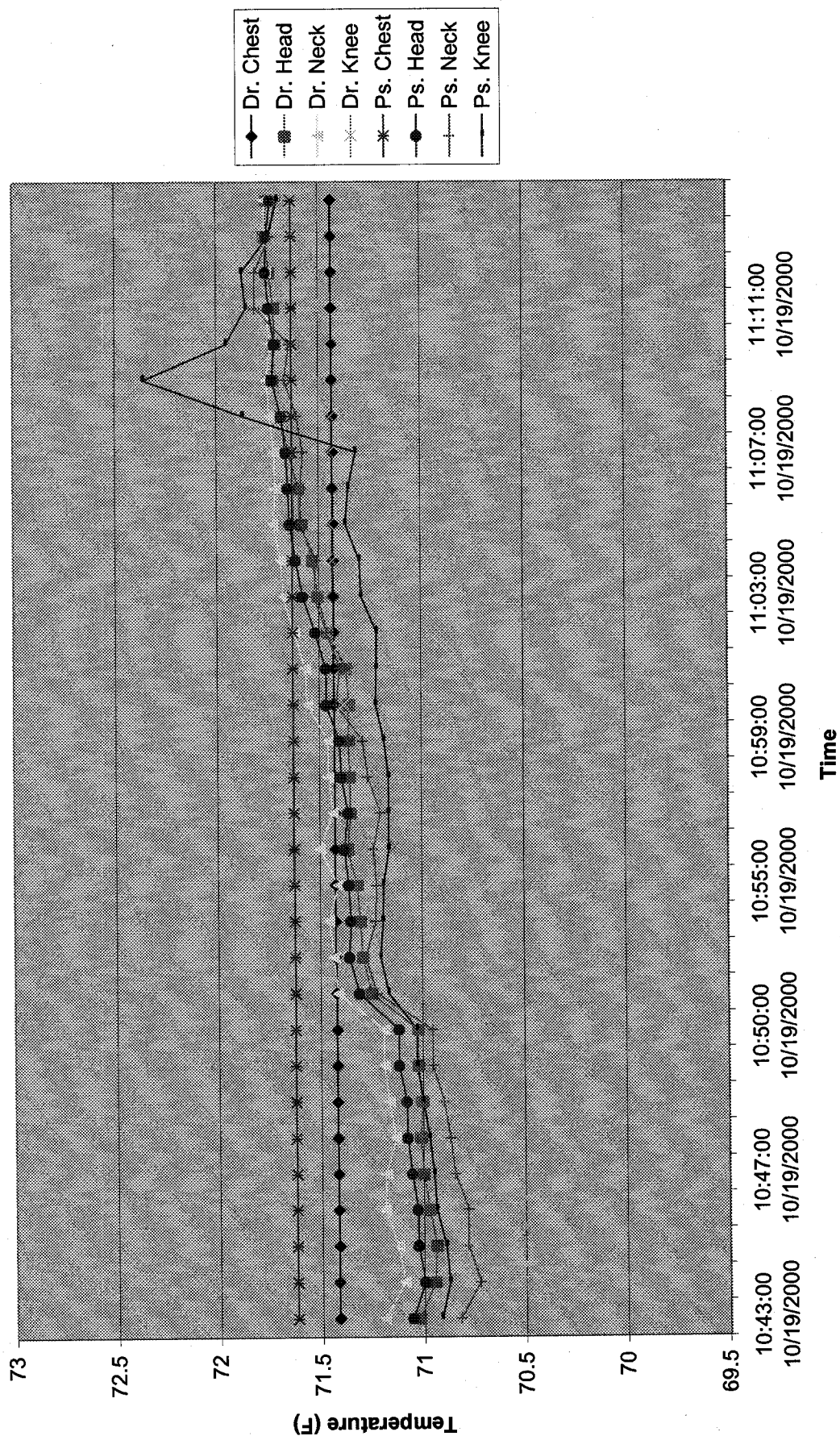
Item	Pre-Use
<b>Head:</b>	
Head Skin Condition	X
<b>Neck:</b>	
Rubber Condition	X
<b>Arms and Hands:</b>	
Skin Condition	X
<b>Thorax:</b>	
Jacket Condition	X
Rib Damping Material and Stiffeners Condition	X
Chest Pot Arm and Ball Movement	X
<b>Pelvis:</b>	
Illioc Crest Bone	X
Flesh Condition	X
Range of Motion Bumpers and Leg Cavity	X
<b>Legs and Feet:</b>	
Knee Skins, Inserts, and Castings Condition	X
Leg Skin Condition and Position	X
Foot Condition	X

Notes:   Replaced left ankle pin which worked its way loose from the ankle.  

  No other damage to report.  

Inspection Completed By:   J. Clarridge   Date:   10/19/00

Temperature Data - NHTSA NCAP Veh. No. VO0001



Appendix E

Restraint System Instructions From Owner's Manual



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

001019

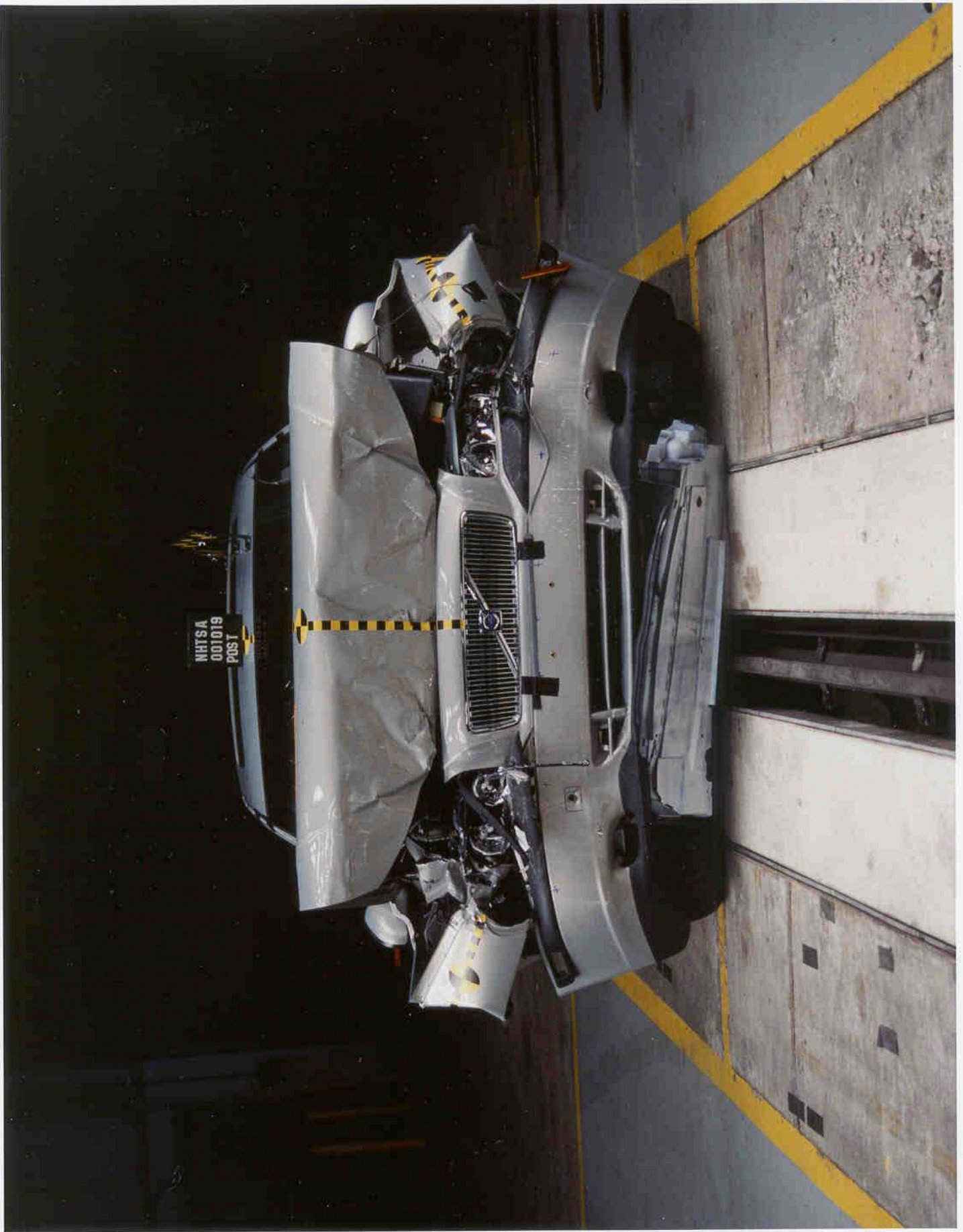


Figure A-2 Post-Test Front View  
A-3

001019

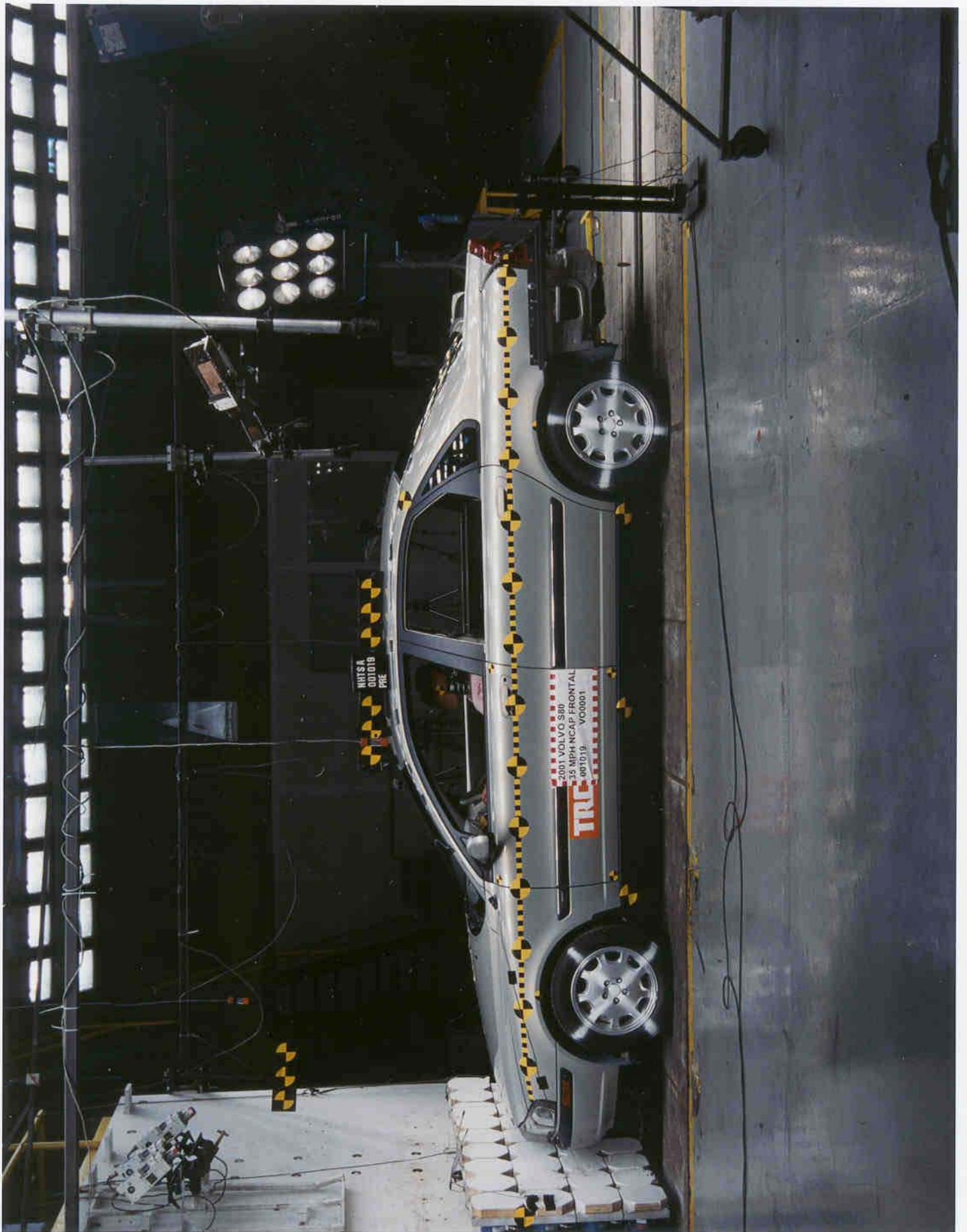


Figure A-3 Pre-Test Left Side View  
A-4

001019



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

001019



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

001019



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

001019

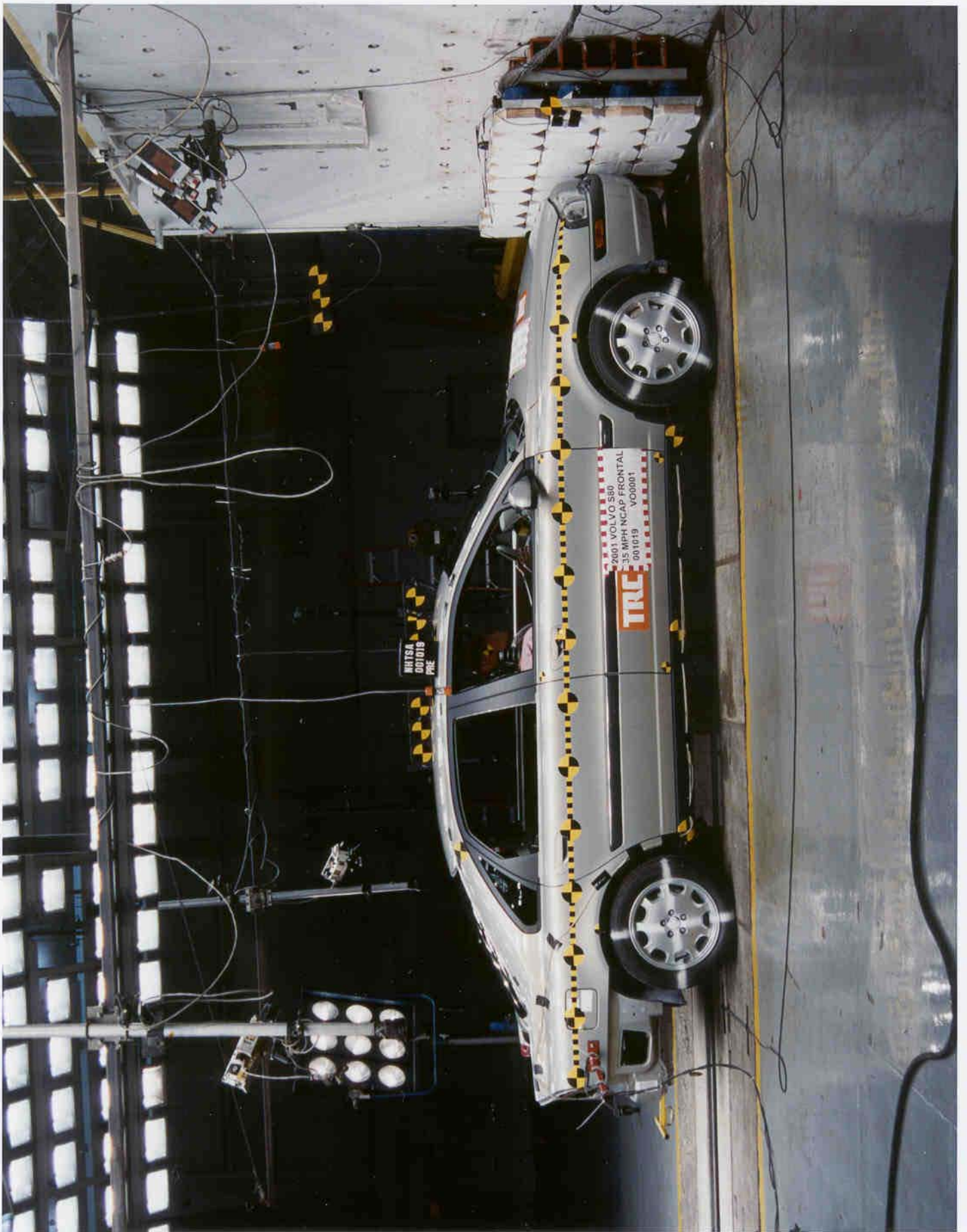


Figure A-7 Pre-Test Right Side View  
A-8

001019

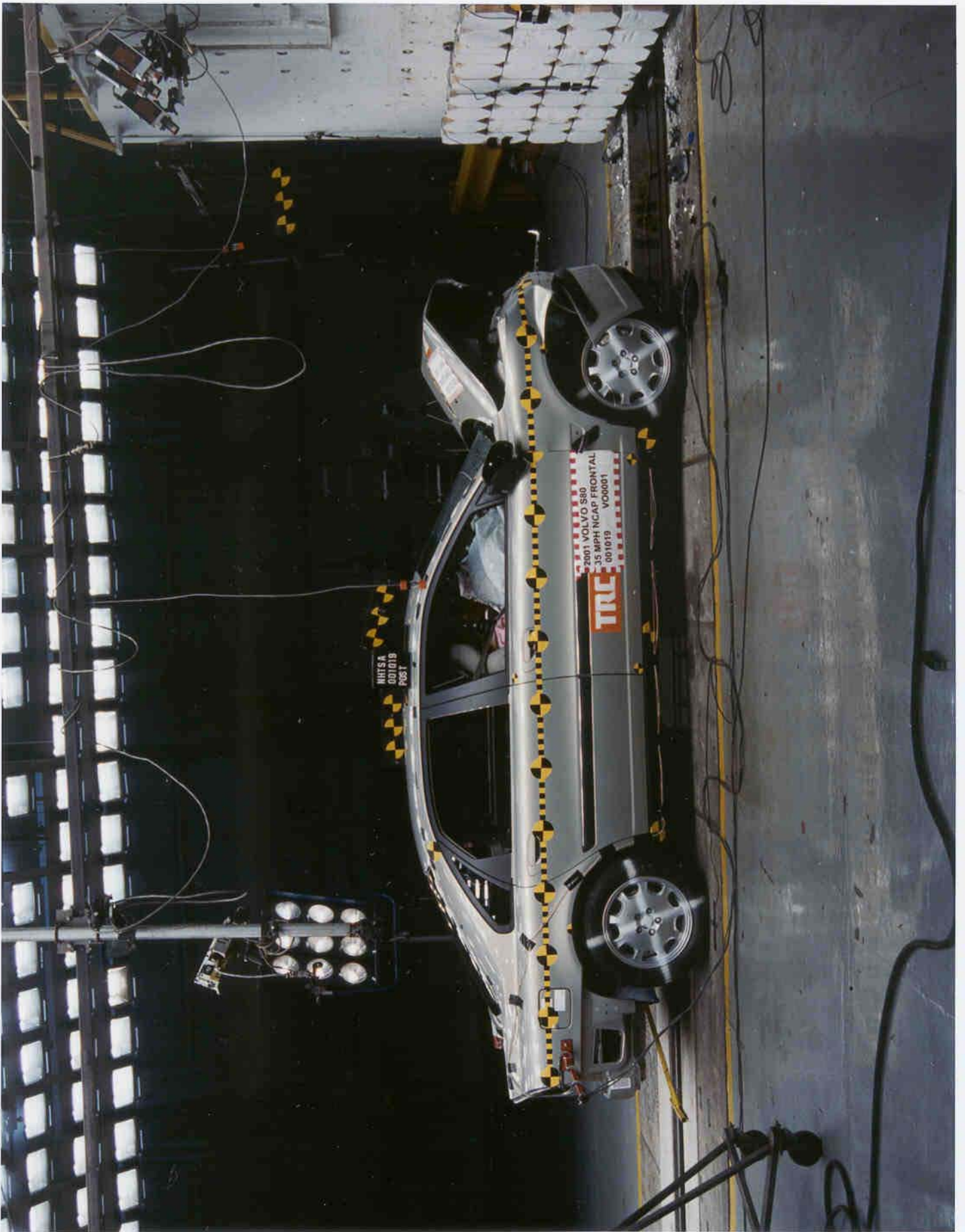


Figure A-8 Post-Test Right Side View  
A-9

001019



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

001019



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

A-11

001019



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

001019



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

001019

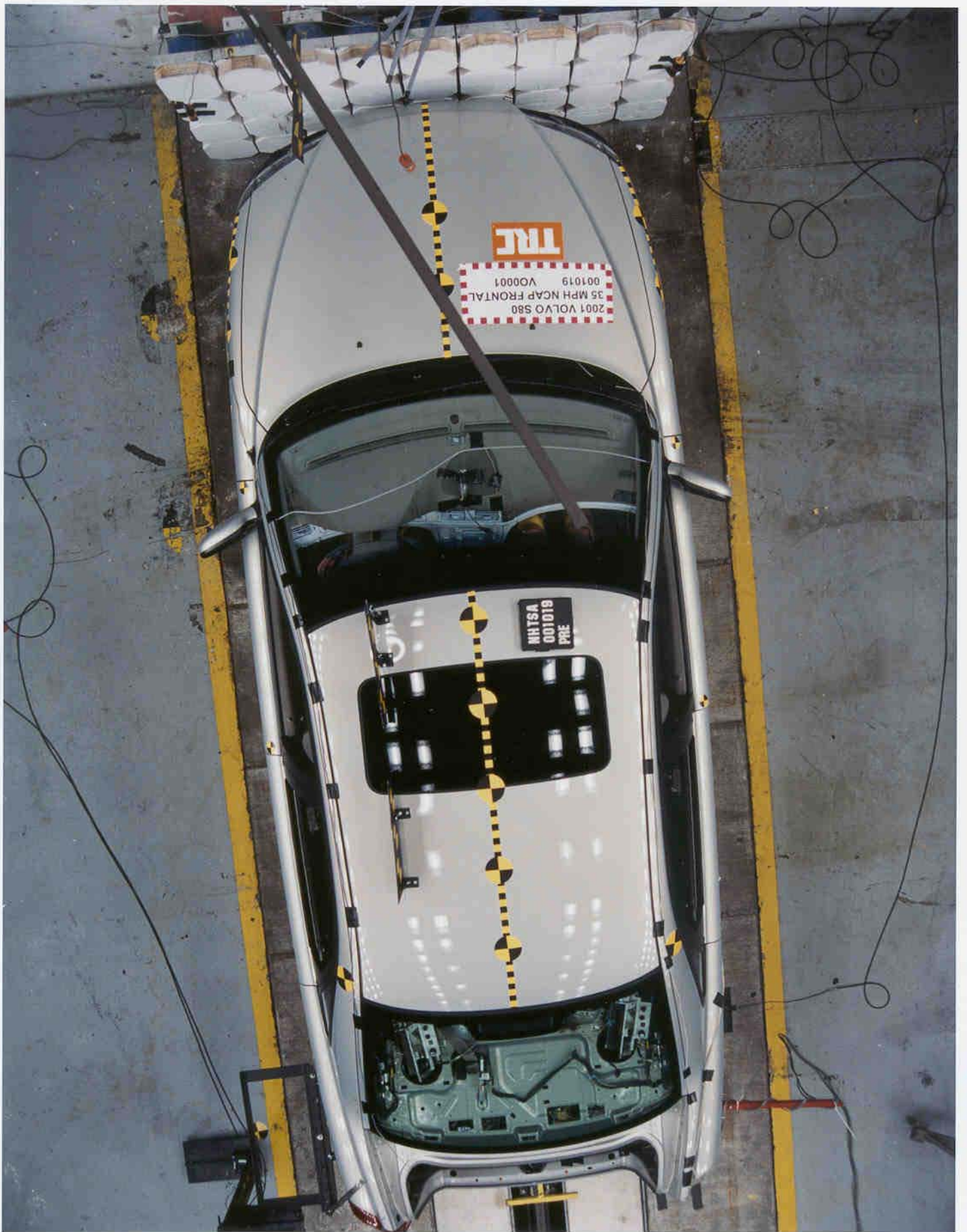


Figure A-13 Pre-Test Overhead View  
A-14

001019

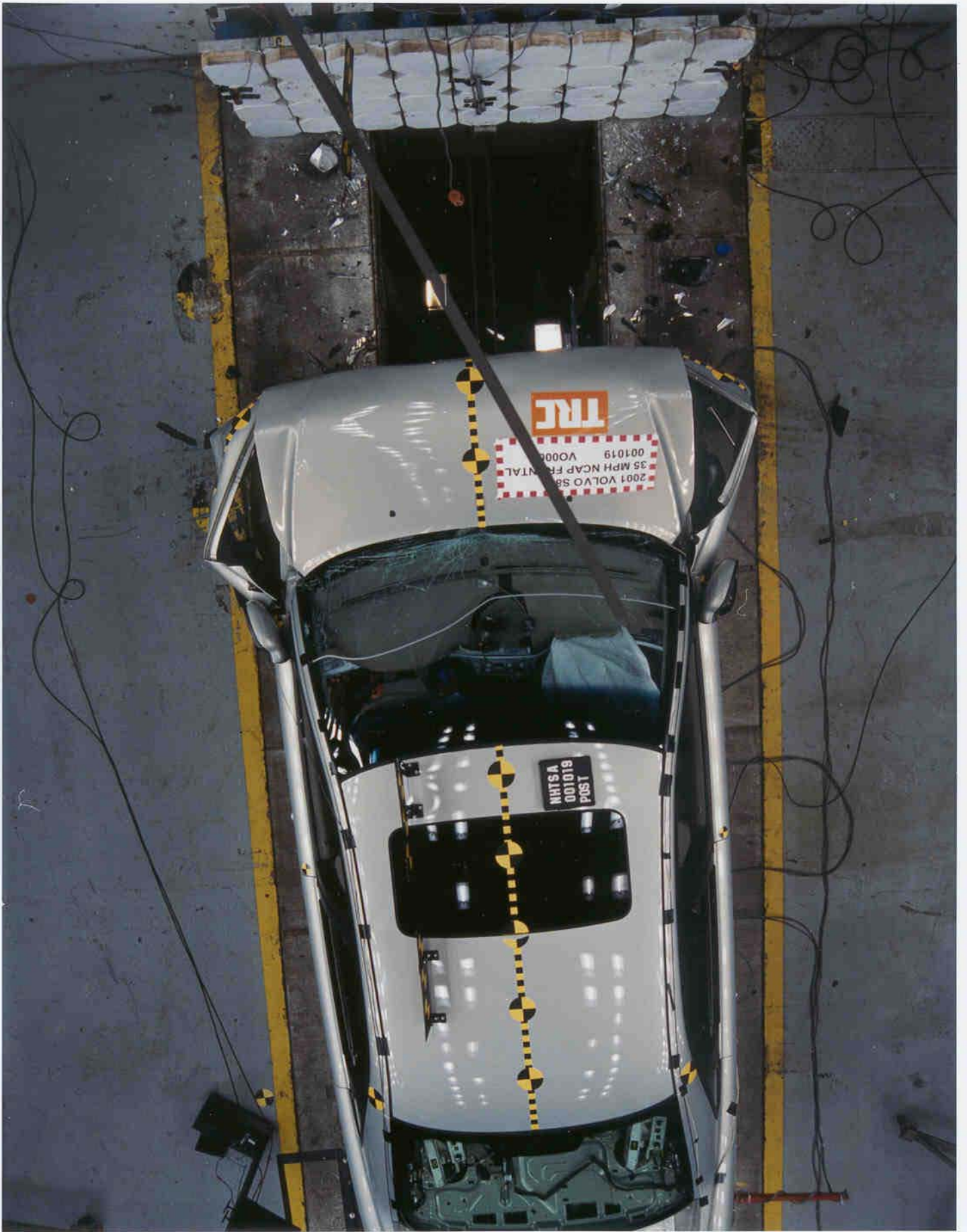


Figure A-14 Post-Test Overhead View  
A-15

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Figure A-15 Pre-Test Windshield View

A-16

001019



Figure A-16 Post-Test Windshield - View 1

A-17

001019

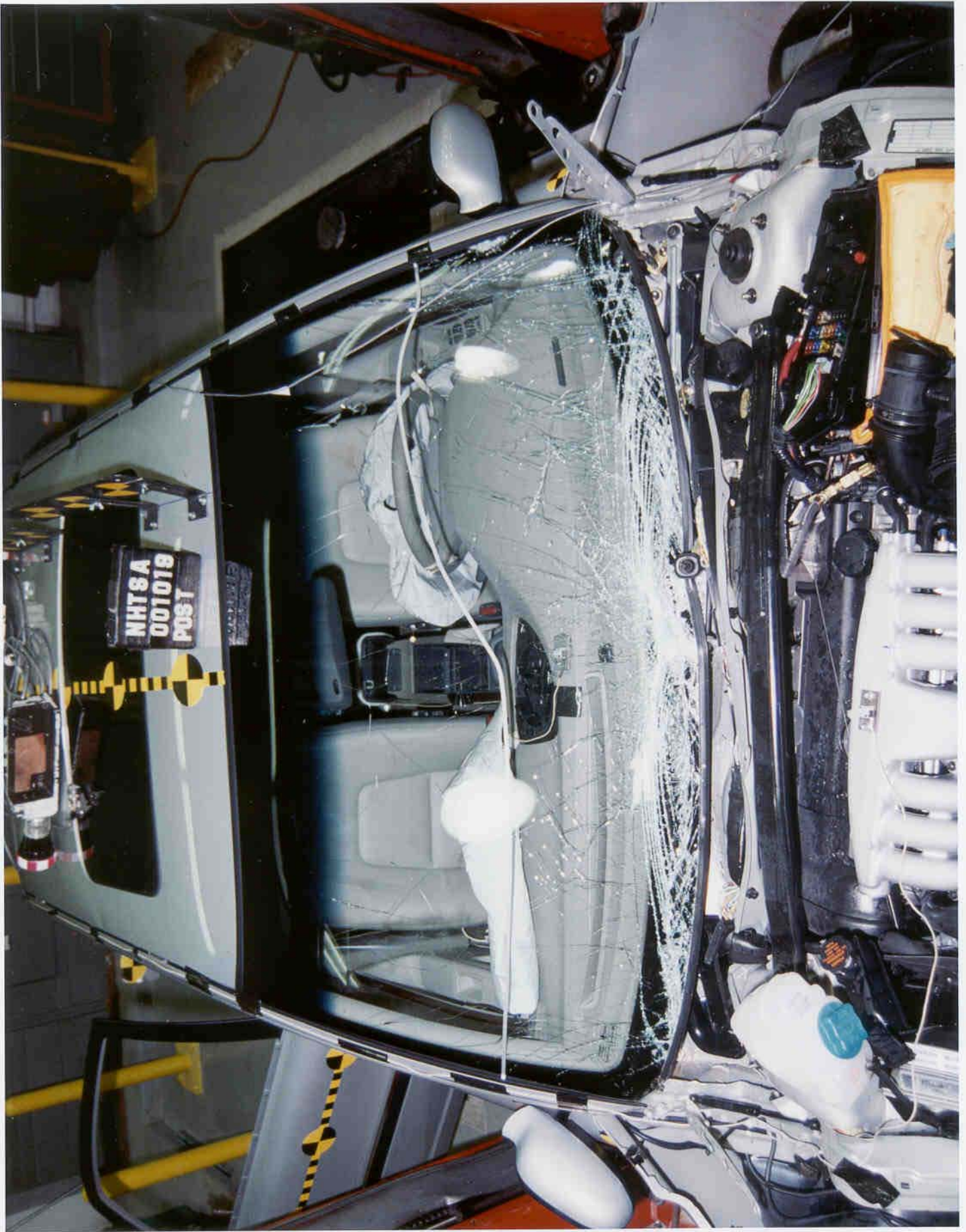


Figure A-17 Post-Test Windshield - View 2

A-18

001019

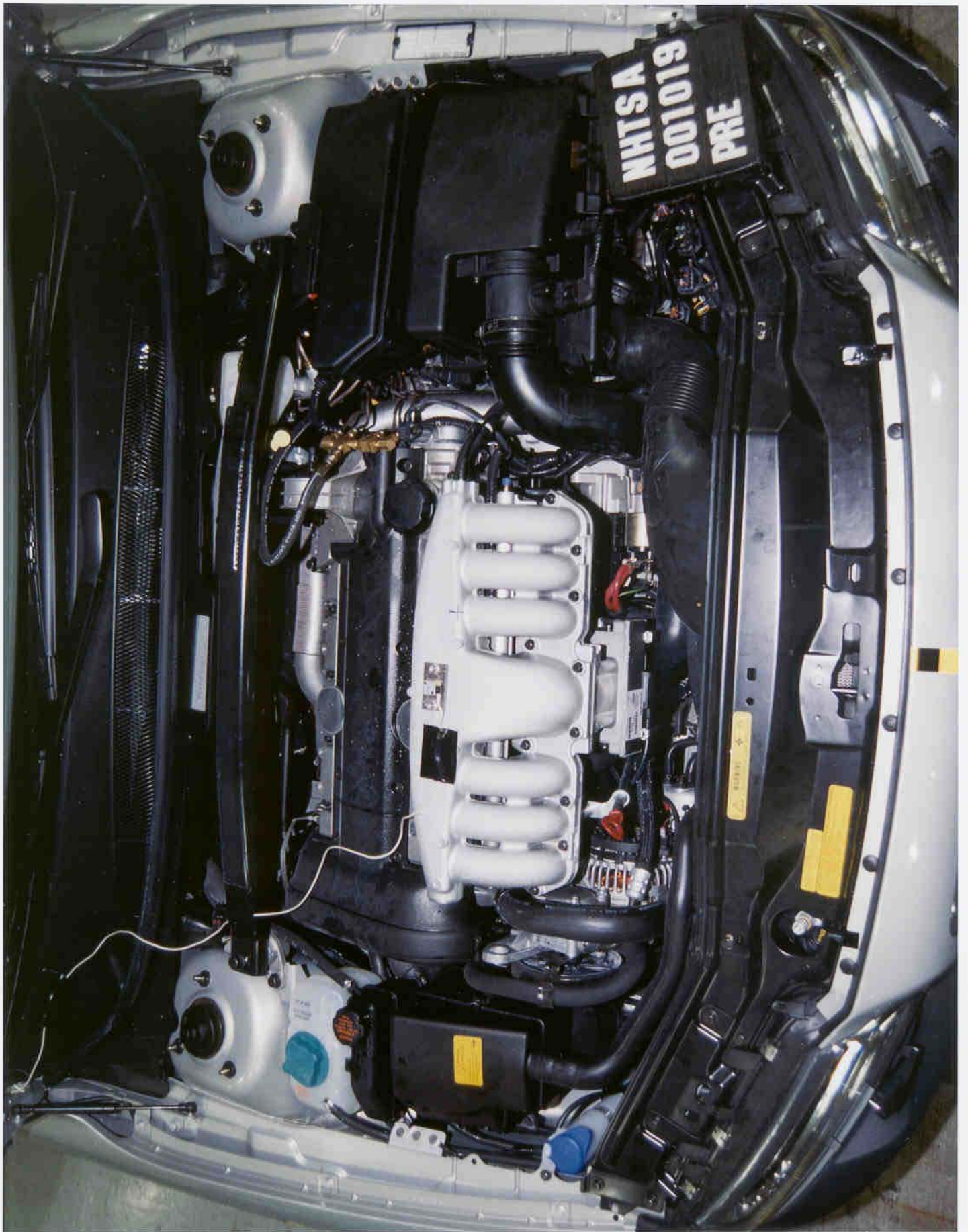


Figure A-18 Pre-Test Engine Compartment View  
A-19

001019

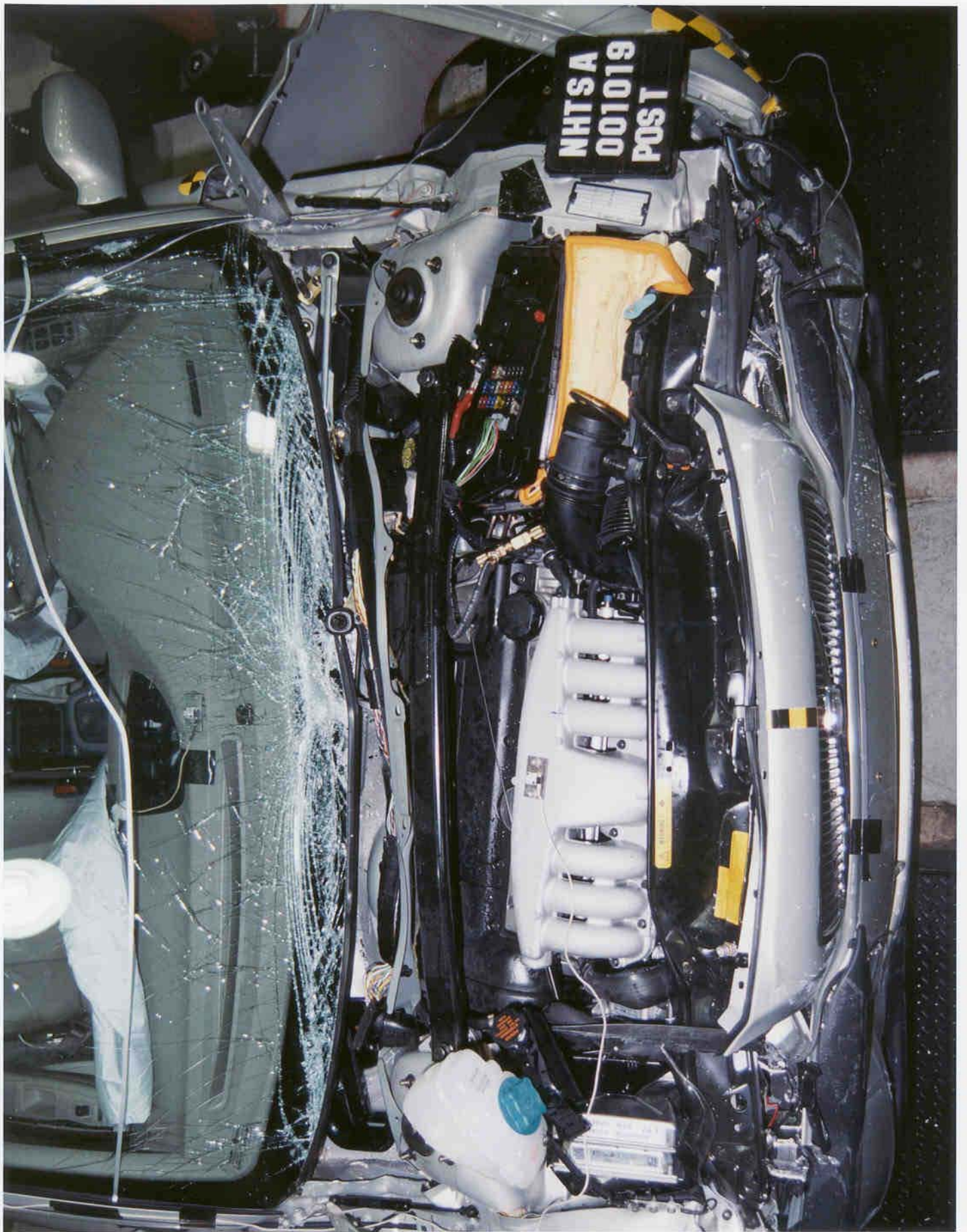


Figure A-19 Post-Test Engine Compartment View  
A-20

001019



Figure A-20 Pre-Test Fuel Filler Cap View  
A-21

001019

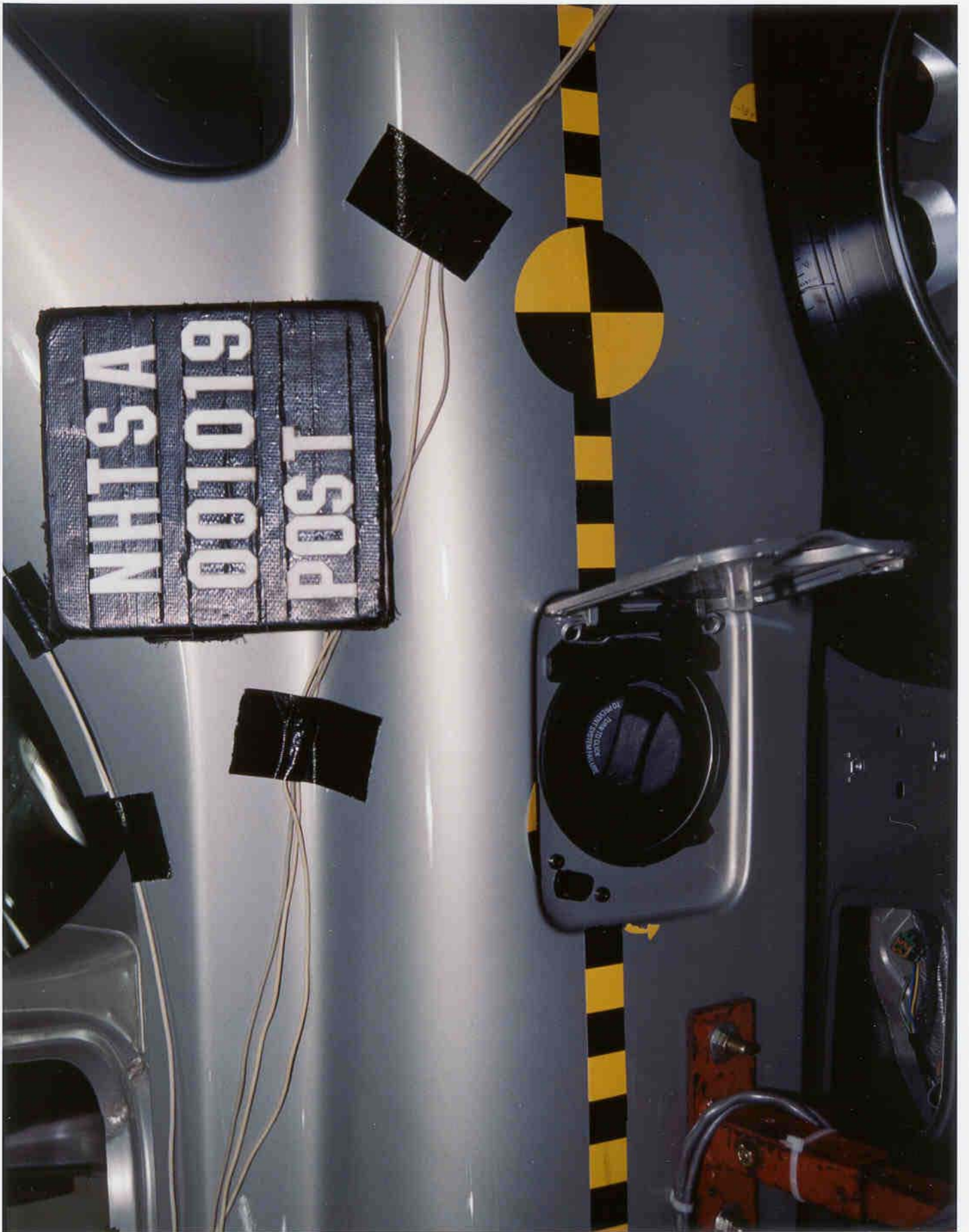


Figure A-21 Post-Test Fuel Filler Cap View  
A-22

001019

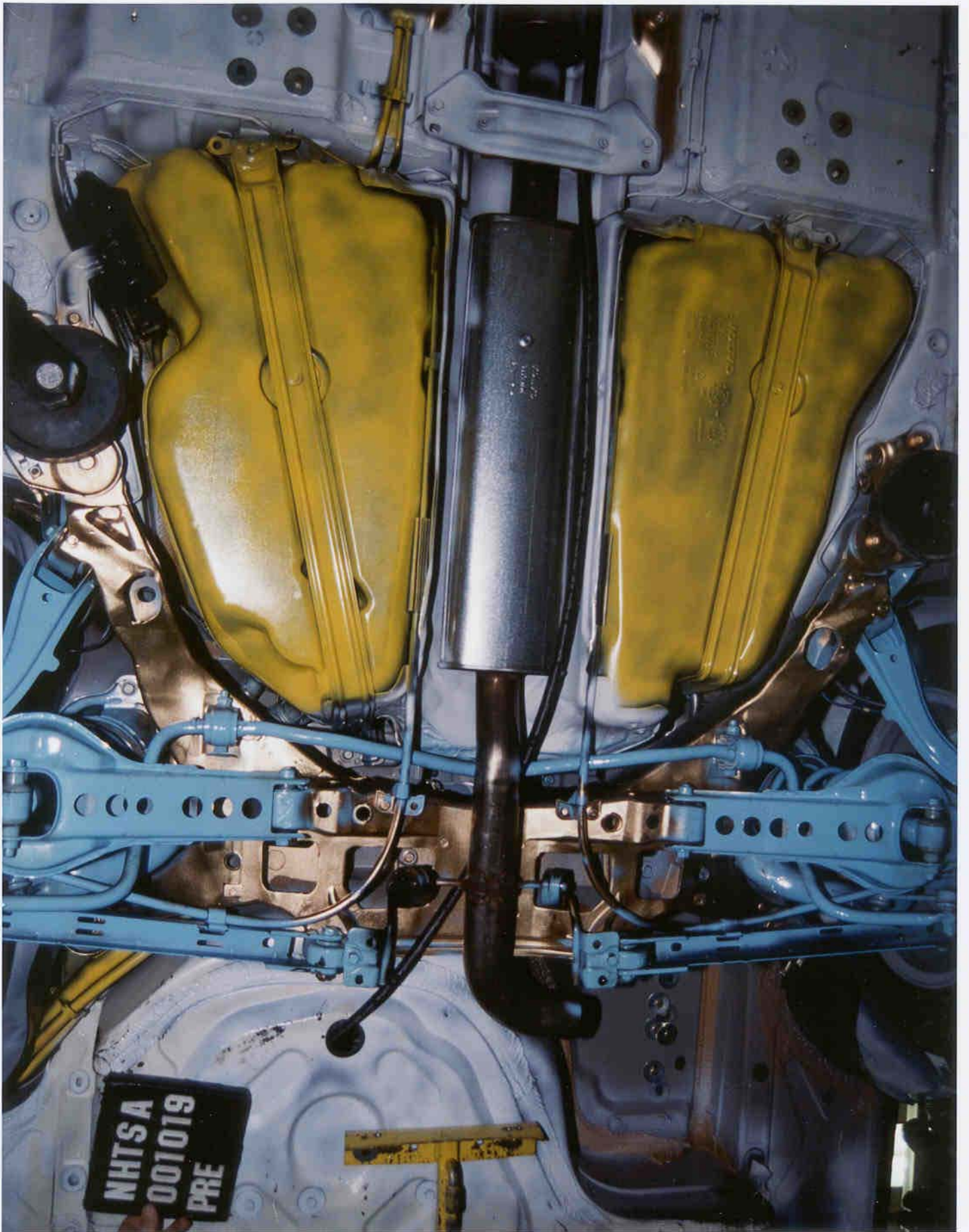


Figure A-22 Pre-Test Fuel Tank View  
A-23

001019

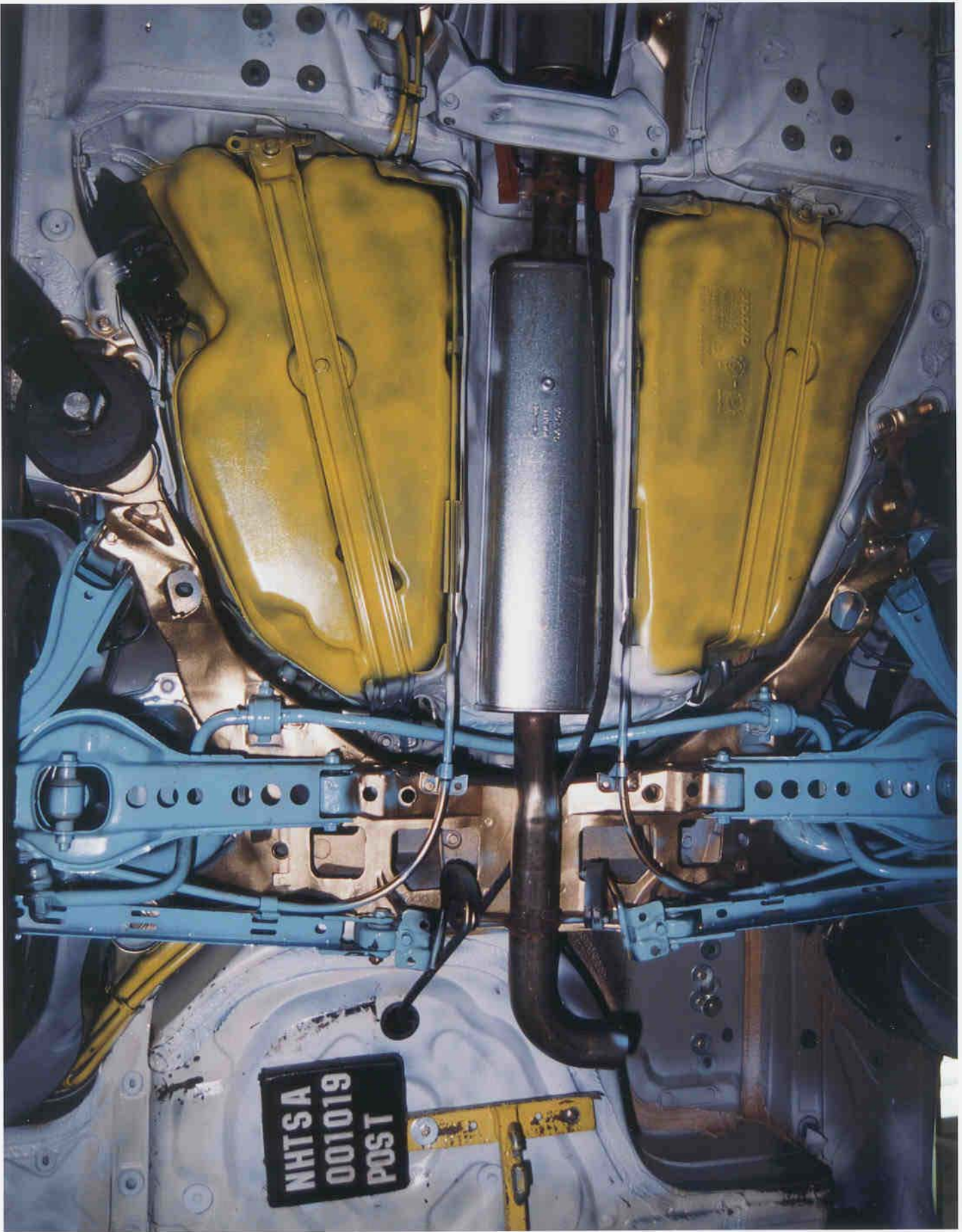


Figure A-23 Post-Test Fuel Tank View  
A-24

001019

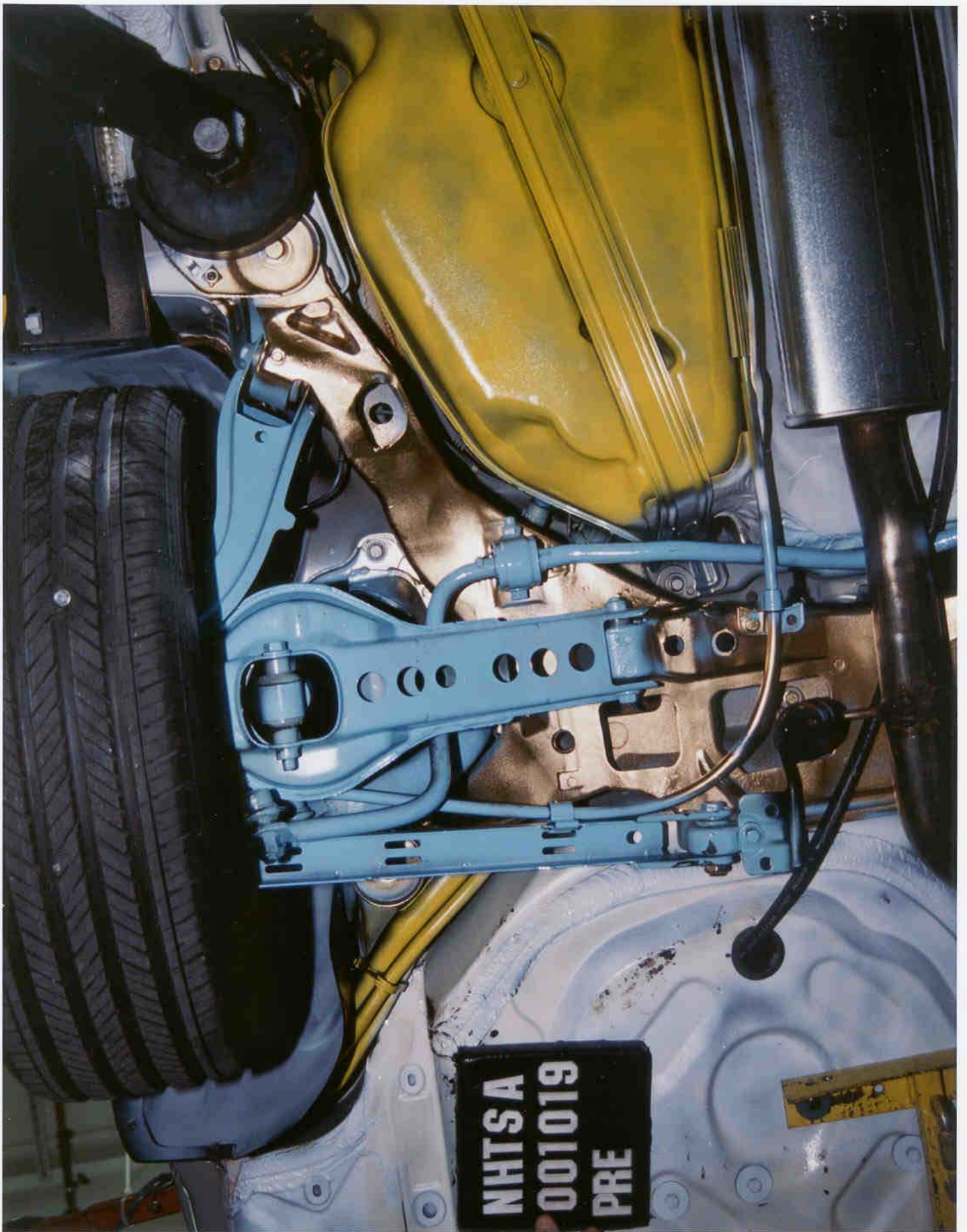


Figure A-24 Pre-Test Fuel Filler Neck View  
A-25

001019

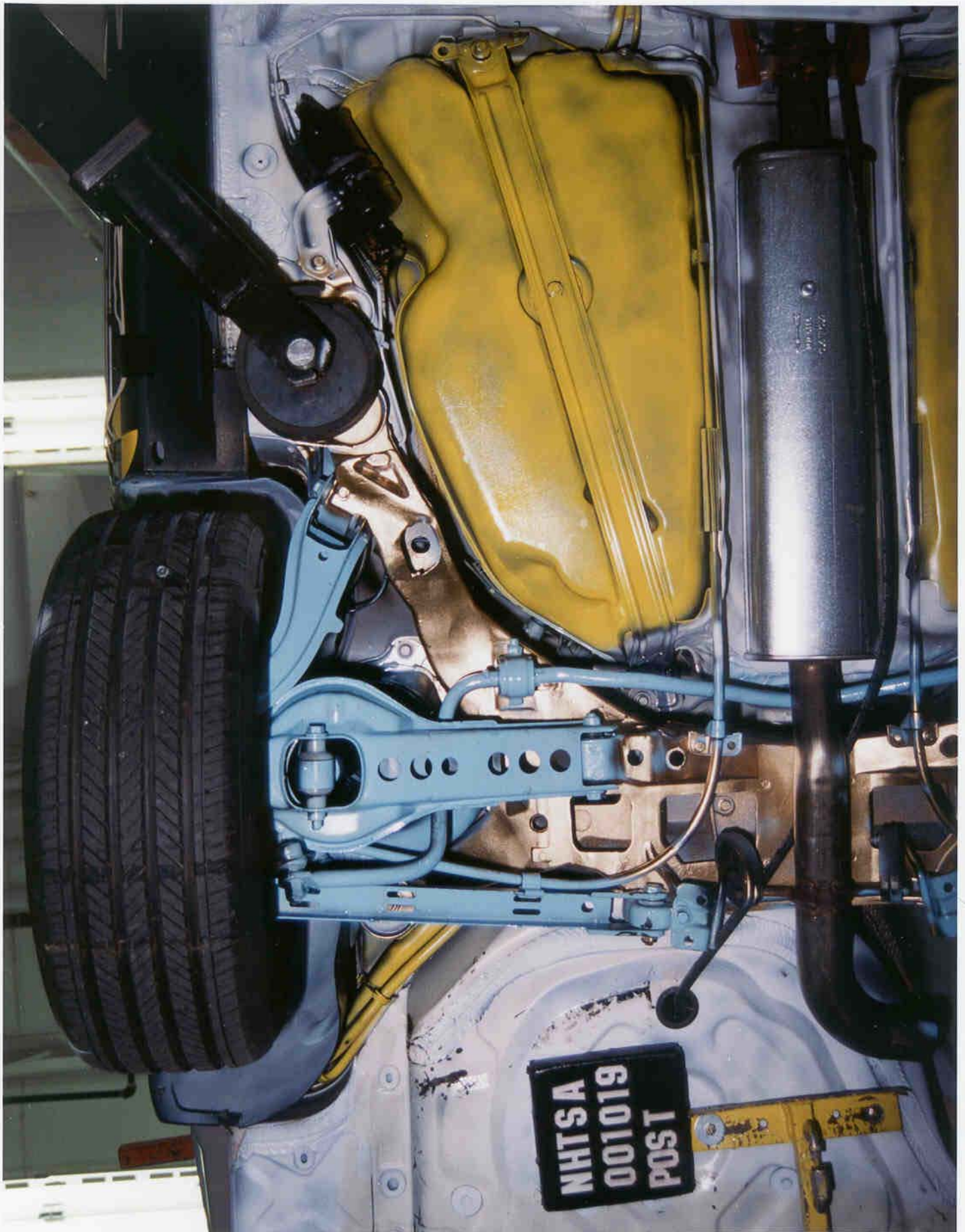


Figure A-25 Post-Test Fuel Filler Neck View

A-26

001019



Figure A-26 Pre-Test Front Underbody View

A-27

001019

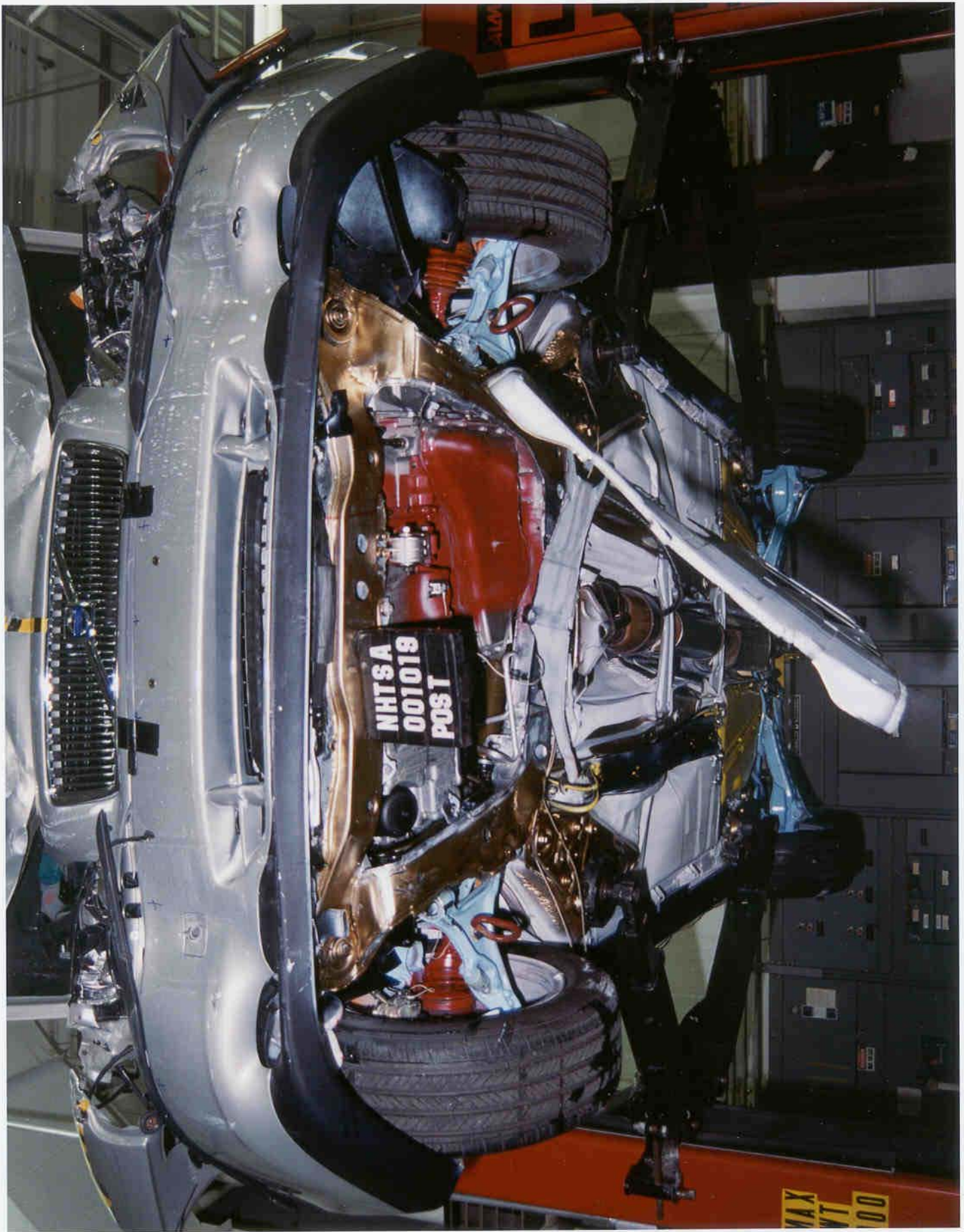


Figure A-27 Post-Test Front Underbody View  
A-28

001019

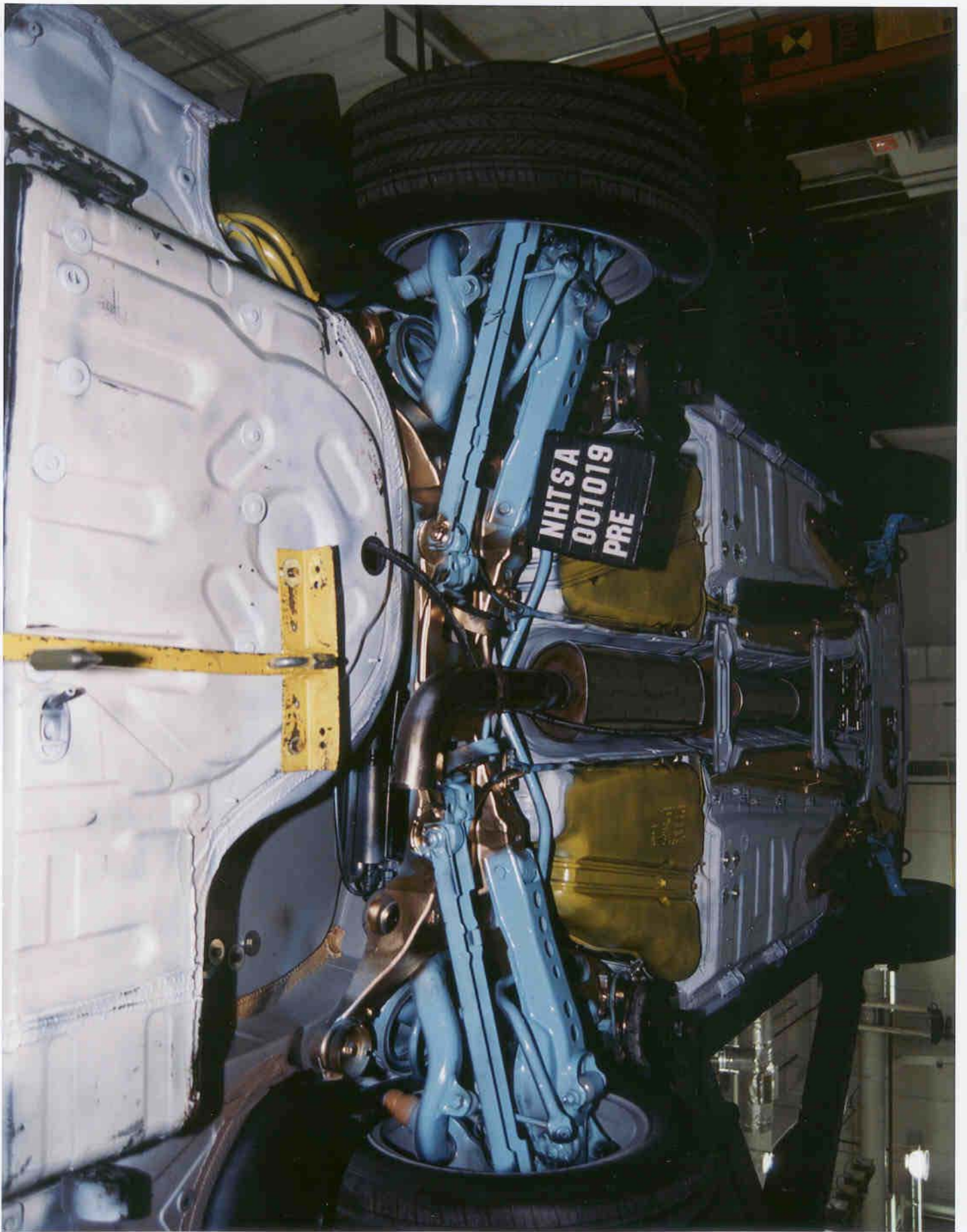


Figure A-28 Pre-Test Rear Underbody View

A-29

001019

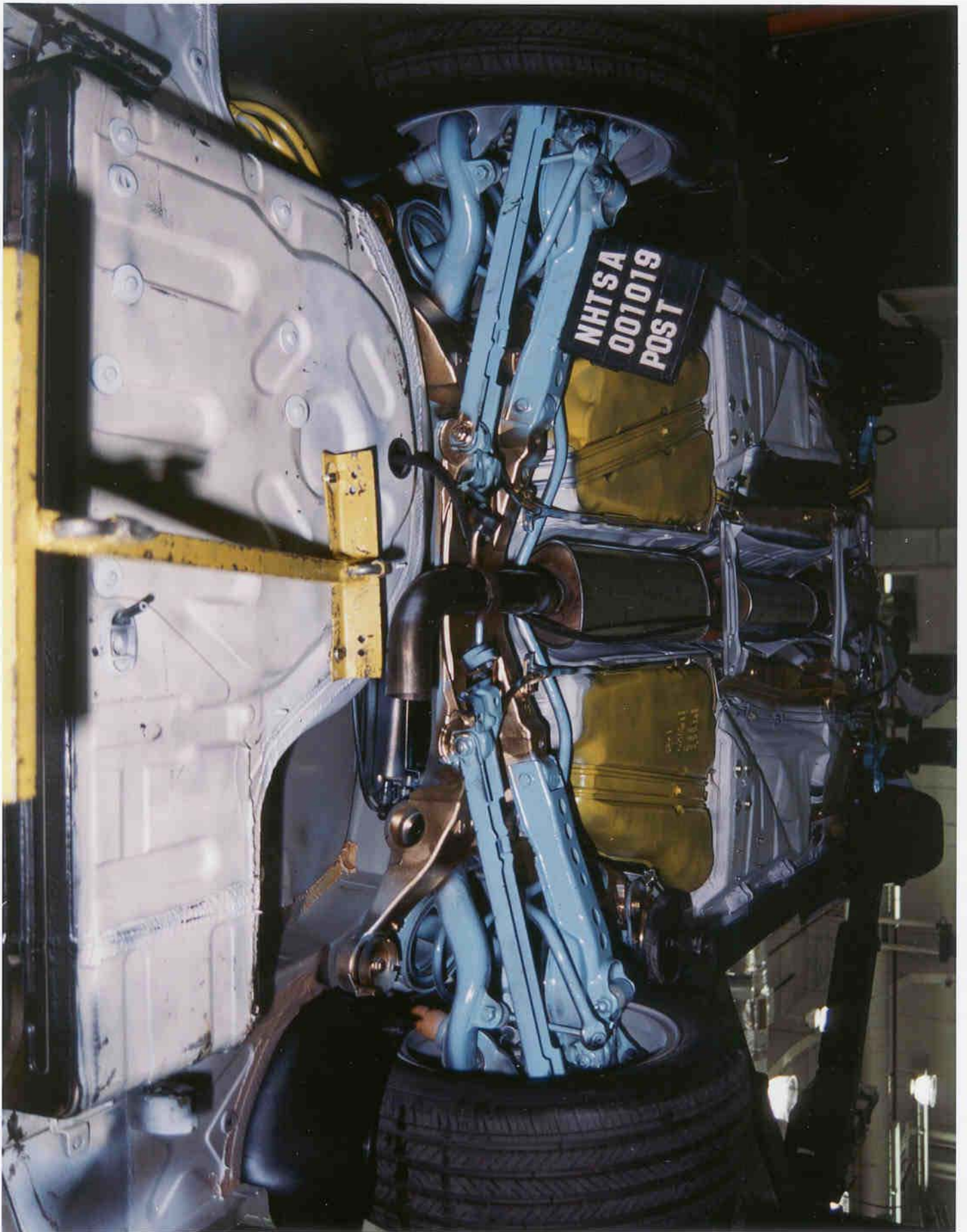


Figure A-29 Post-Test Rear Underbody View  
A-30

001019



Figure A-30 Pre-Test Driver and Passenger Dummies Position View

A-31

001019



Figure A-31 Post-Test Driver and Passenger Dummies Position View

A-32

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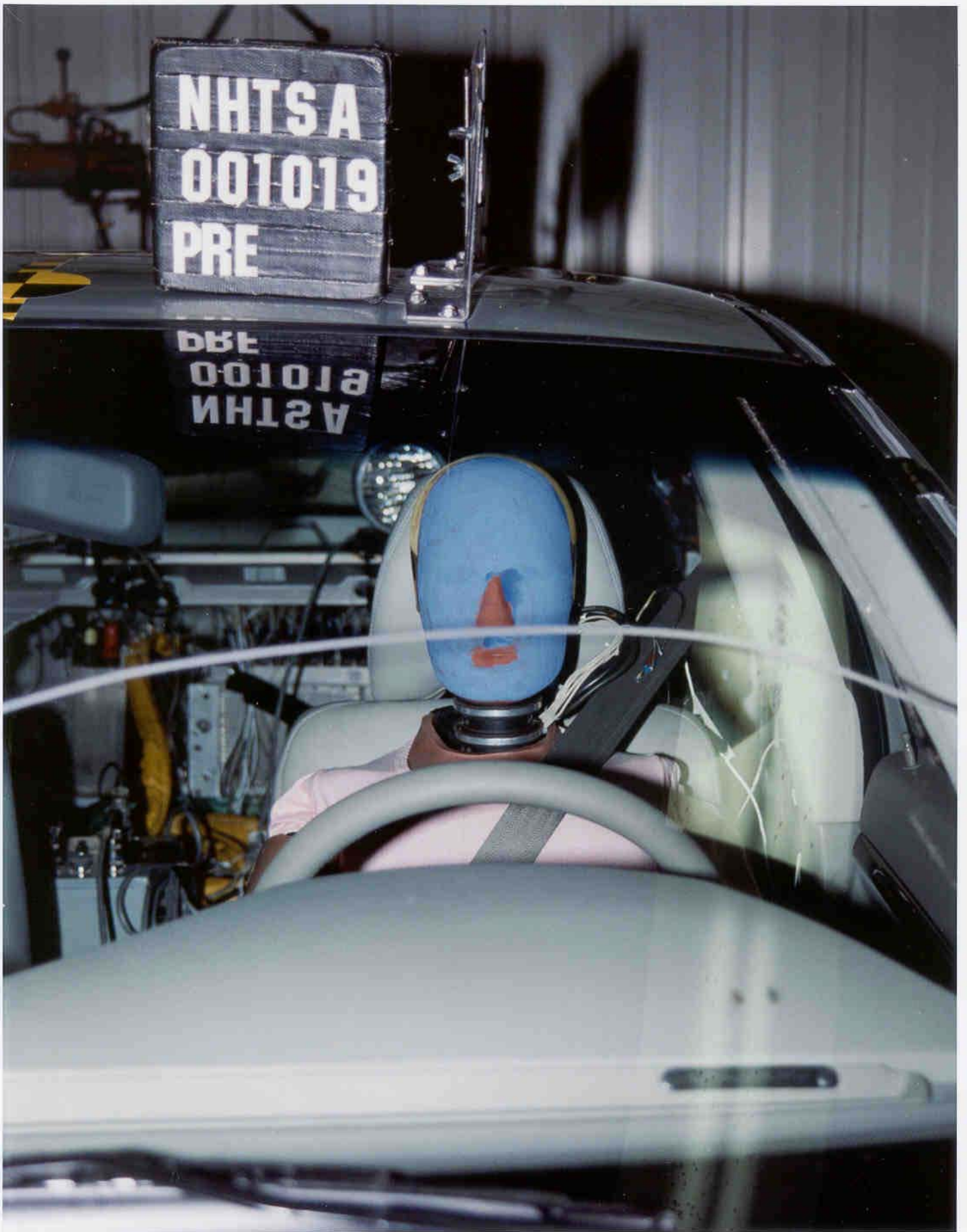


Figure A-32 Pre-Test Driver Dummy Position - View 1

A-33

001019

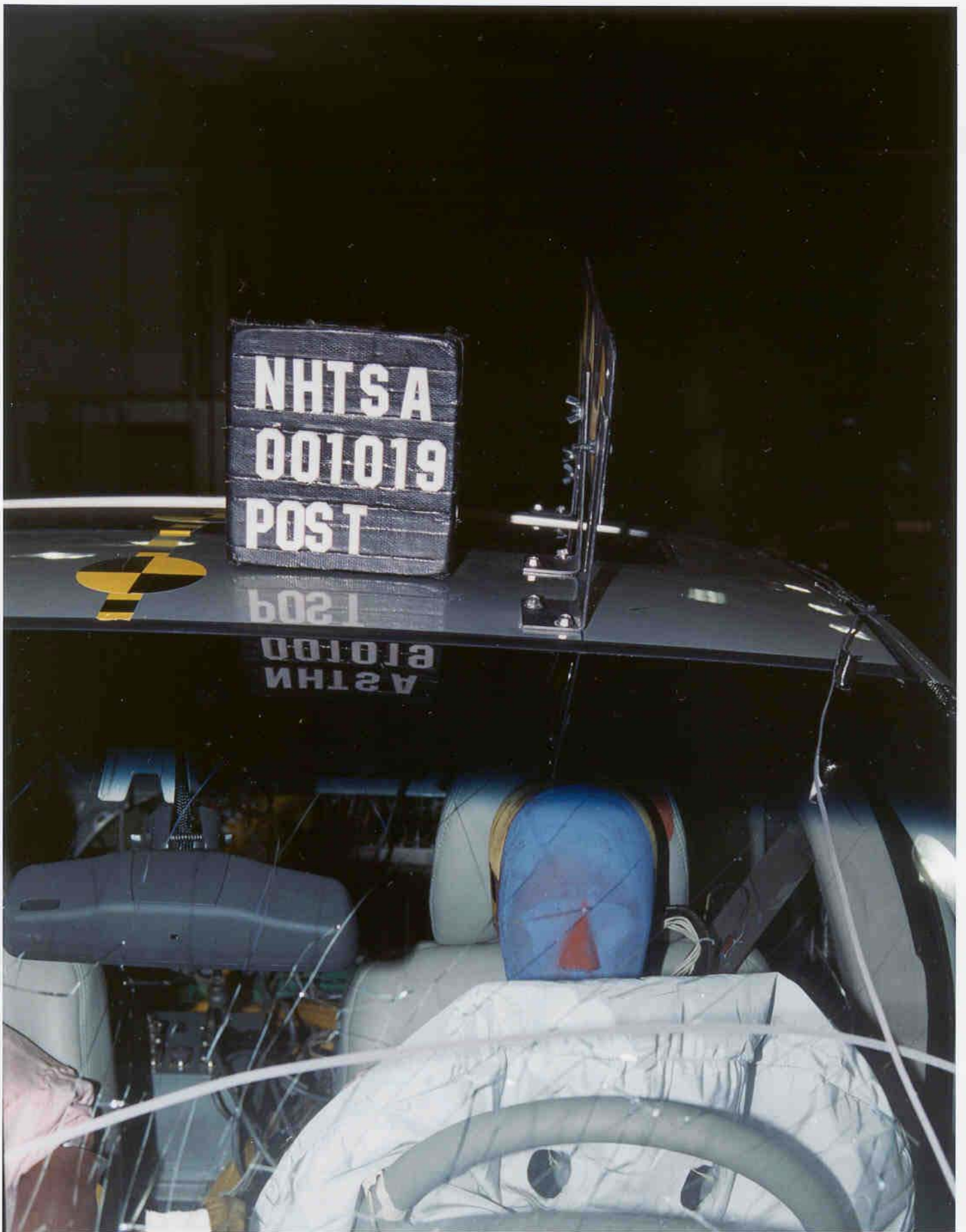


Figure A-33 Post-Test Driver Dummy Position - View 1  
A-34

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Figure A-34 Pre-Test Driver Dummy Position - View 2  
A-35

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Figure A-35 Post-Test Driver Dummy Position - View 2  
A-36

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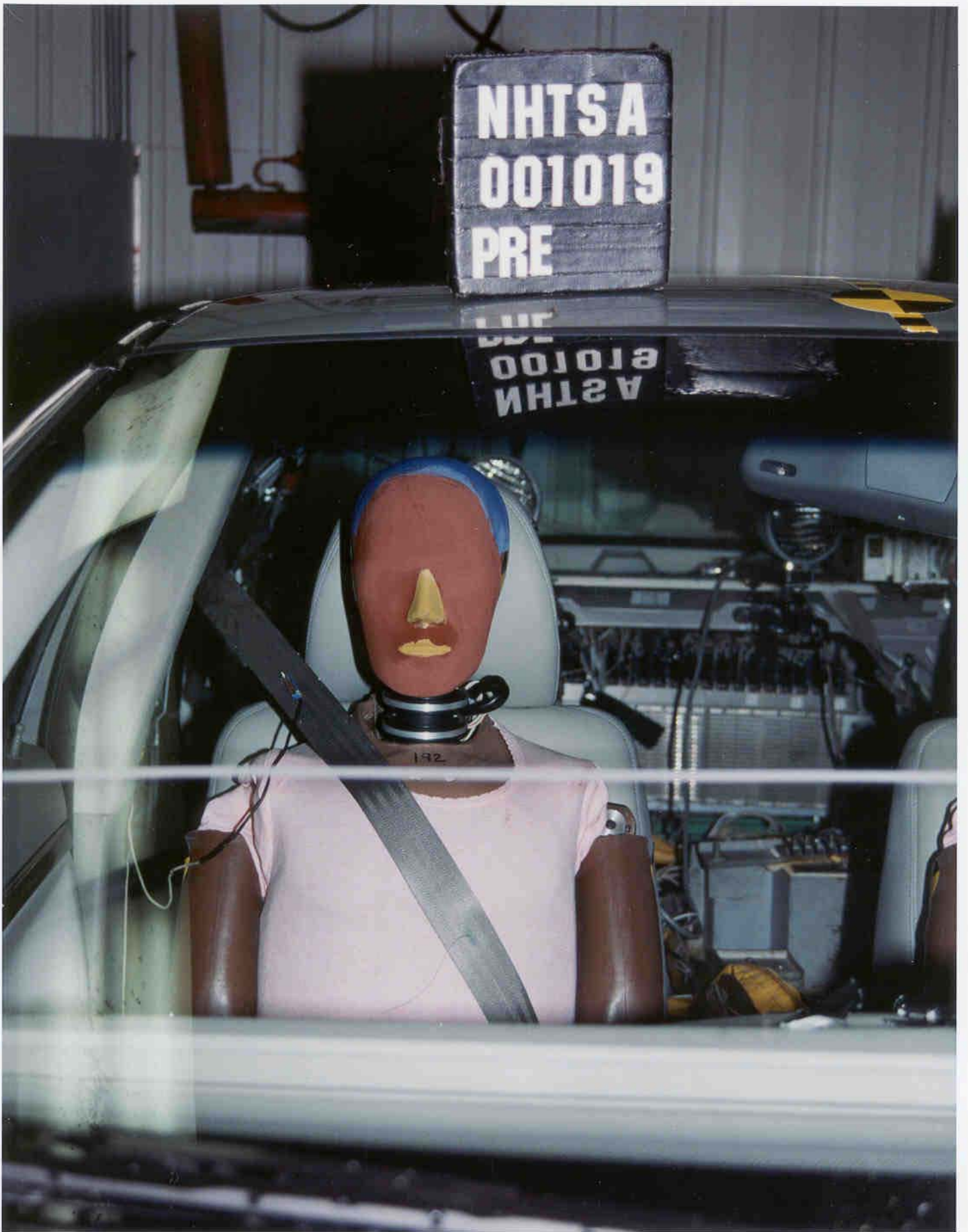


Figure A-36 Pre-Test Passenger Dummy Position - View 1  
A-37

001019

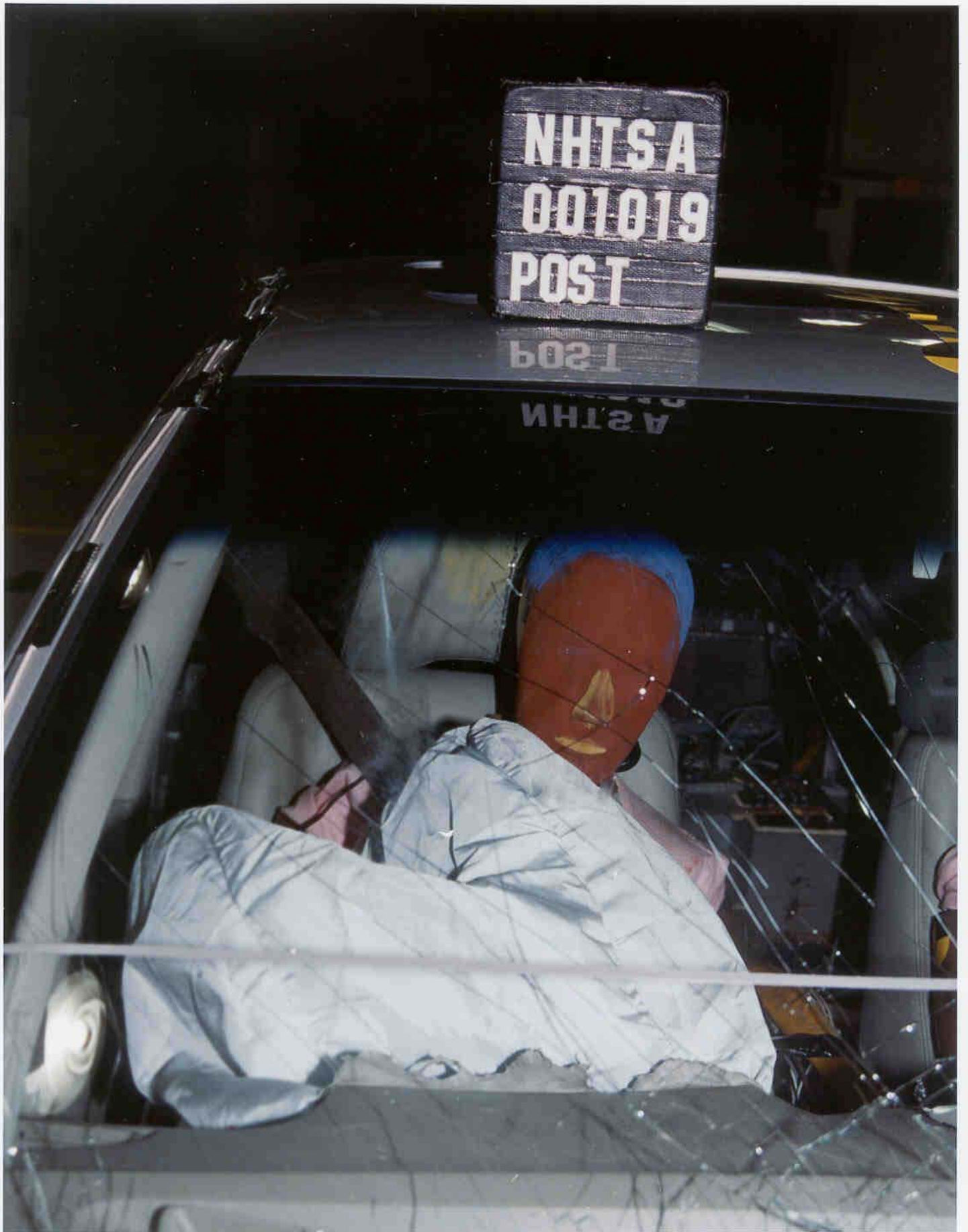


Figure A-37 Post-Test Passenger Dummy Position - View 1  
A-38

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Figure A-38 Pre-Test Passenger Dummy Position - View 2  
A-39

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Figure A-39 Post-Test Passenger Dummy Position - View 2

A-40

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Figure A-40 Pre-Test Driver Dummy and Vehicle Interior - View 1

A-41

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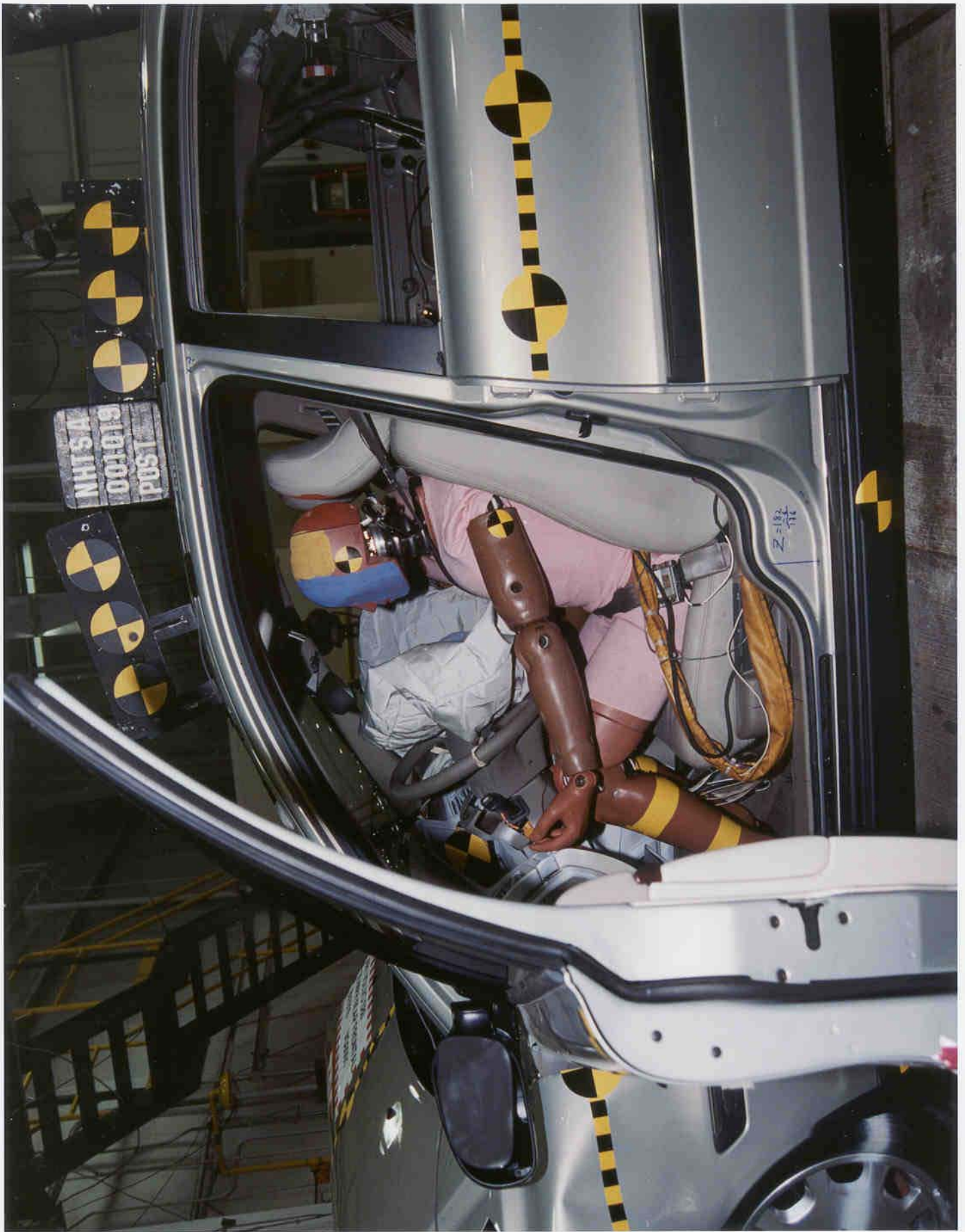


Figure A-41 Post-Test Driver Dummy and Vehicle Interior - View 1

A-42

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Figure A-42 Pre-Test Driver Dummy and Vehicle Interior - View 2

A-43

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Figure A-43 Post-Test Driver Dummy and Vehicle Interior - View 2

A-44

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Figure A-44 Pre-Test Passenger Dummy and Vehicle Interior - View 1

A-45

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Figure A-45 Post-Test Passenger Dummy and Vehicle Interior - View 1

A-46

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Figure A-46 Pre-Test Passenger Dummy and Vehicle Interior - View 2

A-47

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Figure A-47 Post-Test Passenger Dummy and Vehicle Interior - View 2

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Figure A-48 Post-Test Driver Dummy Overall View  
A-49

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Figure A-49 Post-Test Driver Dummy Head Contact - View 1  
A-50

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Figure A-50 Post-Test Driver Dummy Head Contact - View 2  
A-51

001019

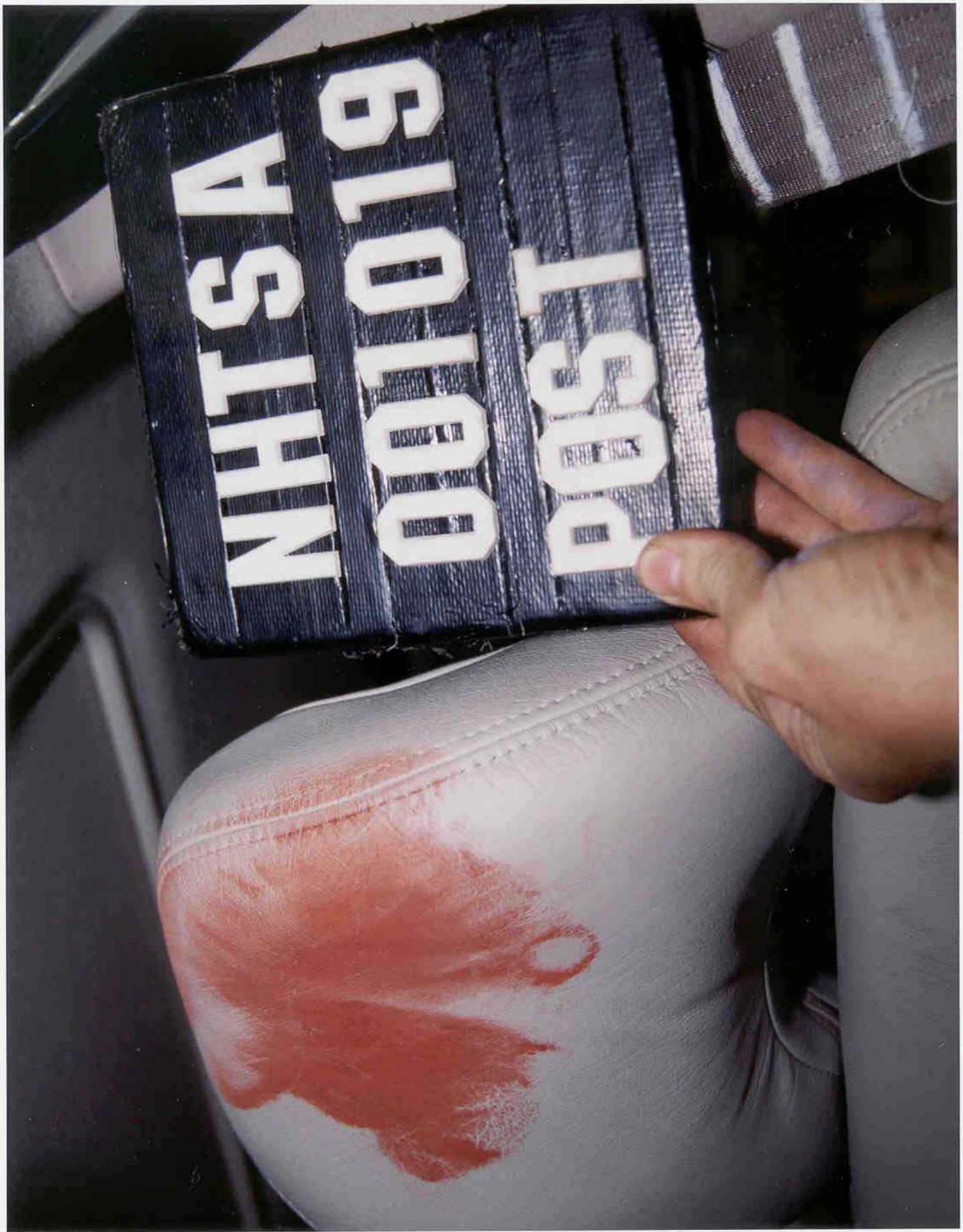


Figure A-51 Post-Test Driver Dummy Head Contact - View 3

A-52

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Figure A-52 Post-Test Driver Dummy Knee Contact - View 1  
A-53

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Figure A-53 Post-Test Driver Dummy Knee Contact - View 2  
A-54

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Figure A-54 Post-Test Passenger Dummy Overall View  
A-55

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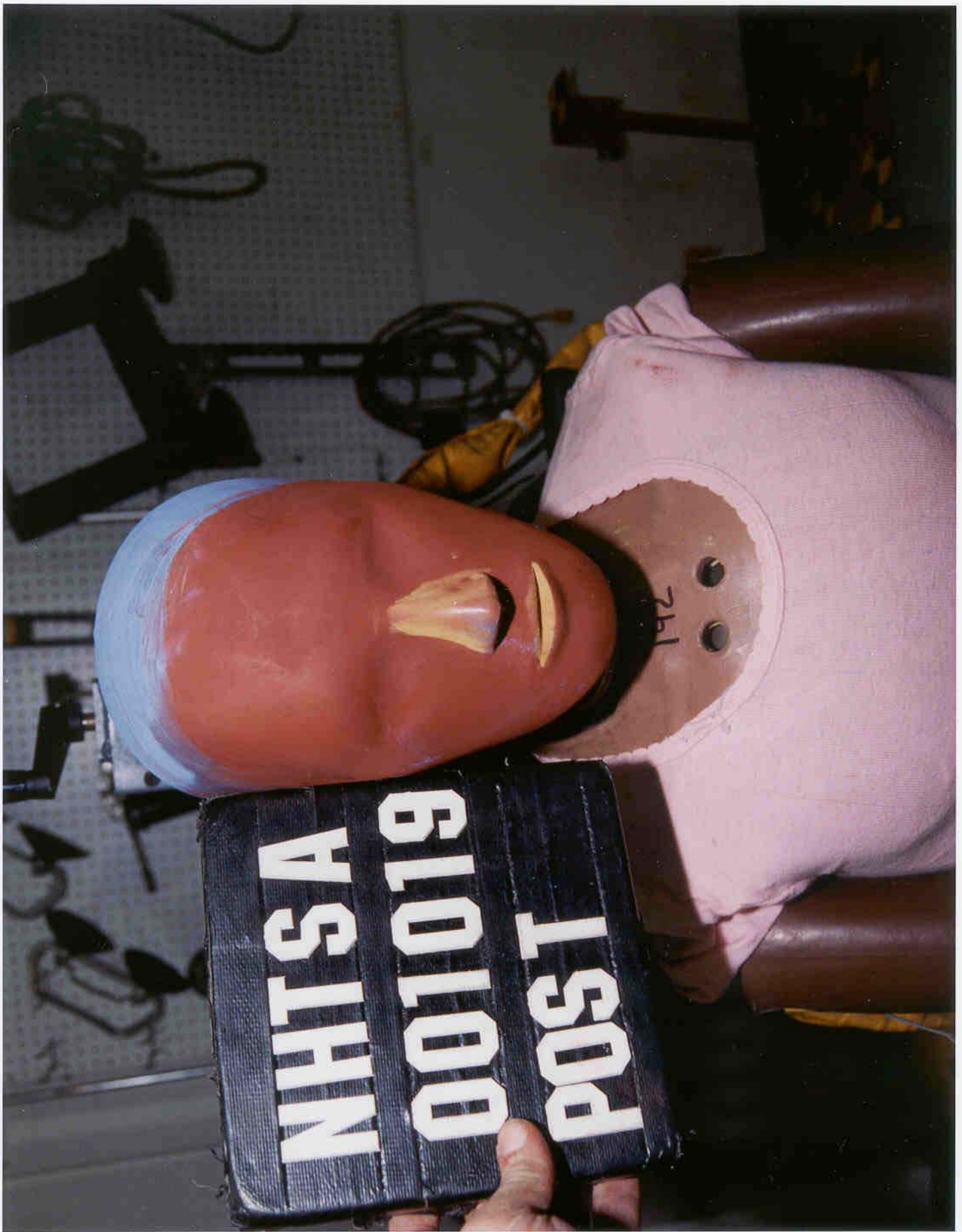


Figure A-55 Post-Test Passenger Dummy Head Contact - View 1

A-56

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Figure A-56 Post-Test Passenger Dummy Head Contact - View 2

A-57

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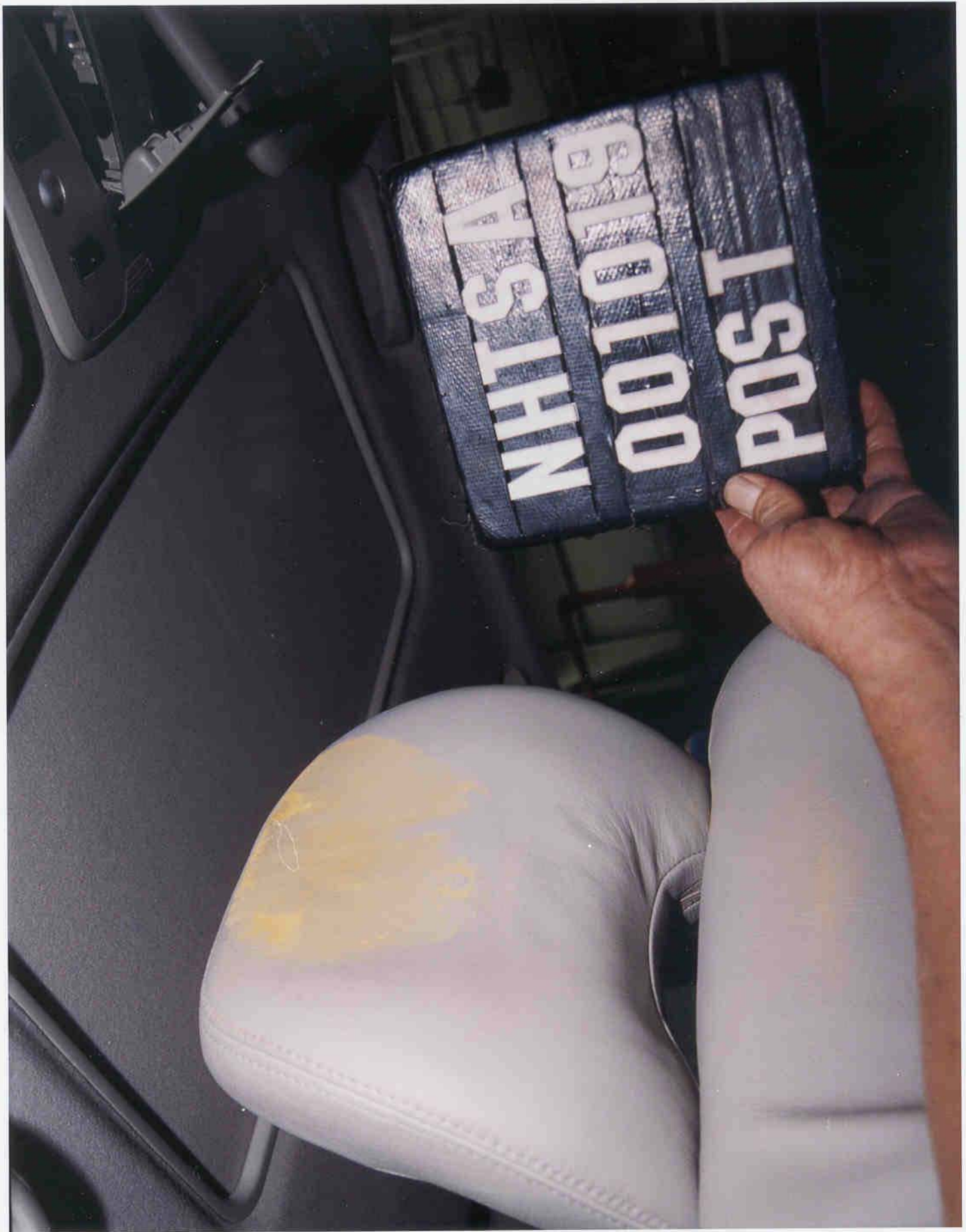


Figure A-57 Post-Test Passenger Dummy Head Contact - View 3

A-58

001019

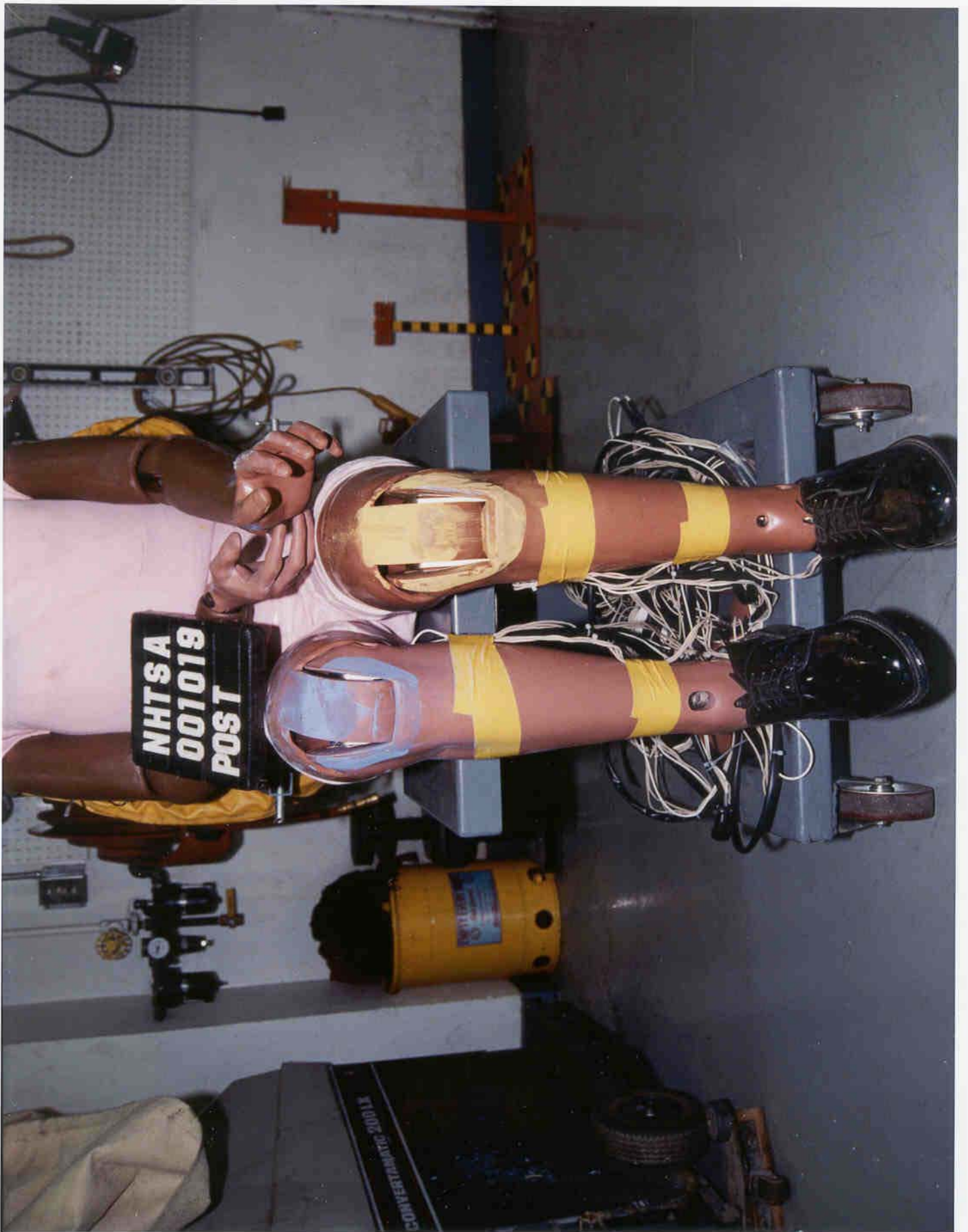


Figure A-58 Post-Test Passenger Dummy Knee Contact - View 1

A-59

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Figure A-59 Post-Test Passenger Dummy Knee Contact - View 2

A-60

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Figure A-60 Pre-Test Vehicle Certification Label View



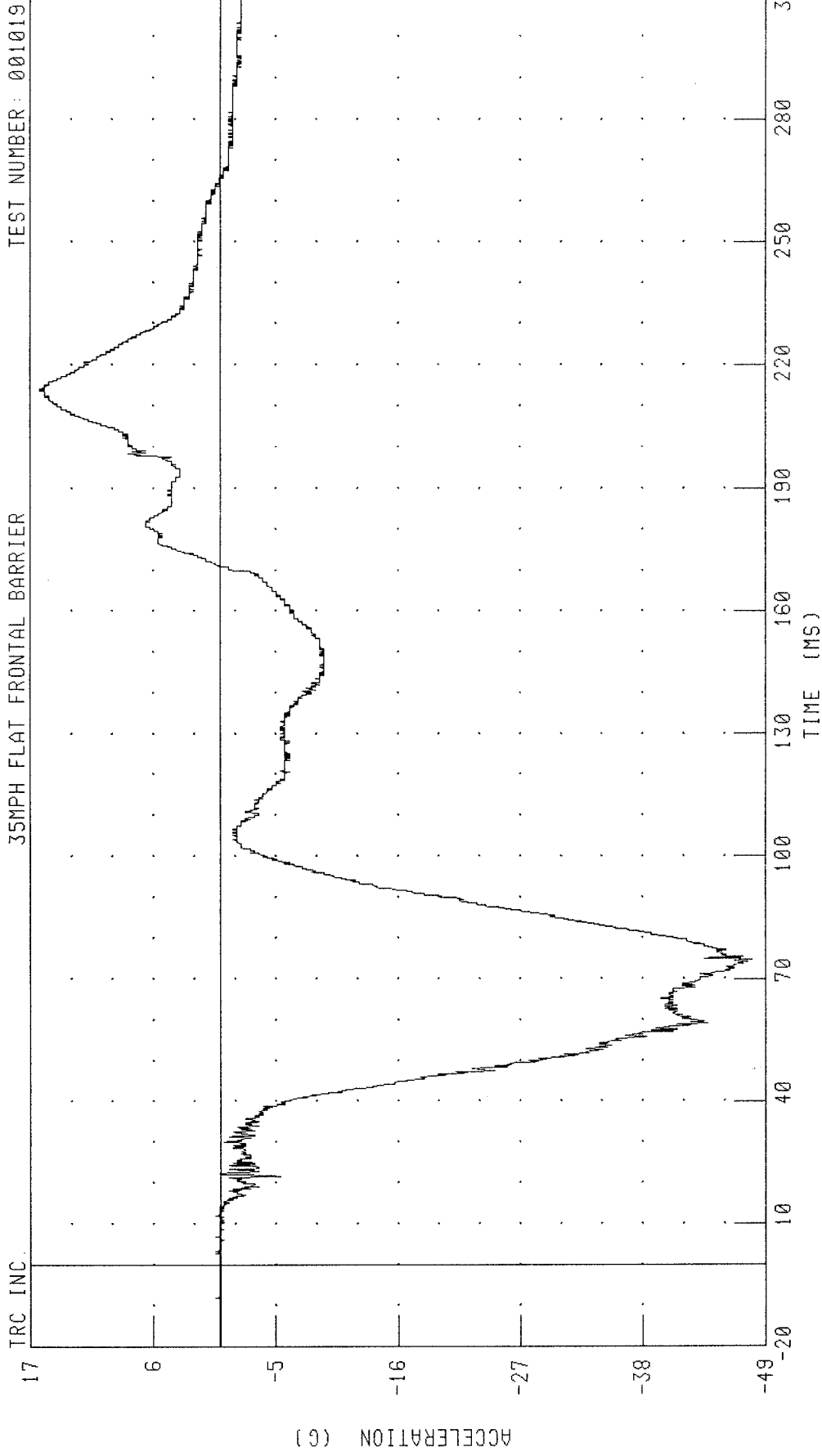
Figure A-61 Pre-Test Vehicle Tire Load Label View  
 A-62

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Figure A-62 Post-Test Vehicle On Static Rollover Device View

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER HEAD X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

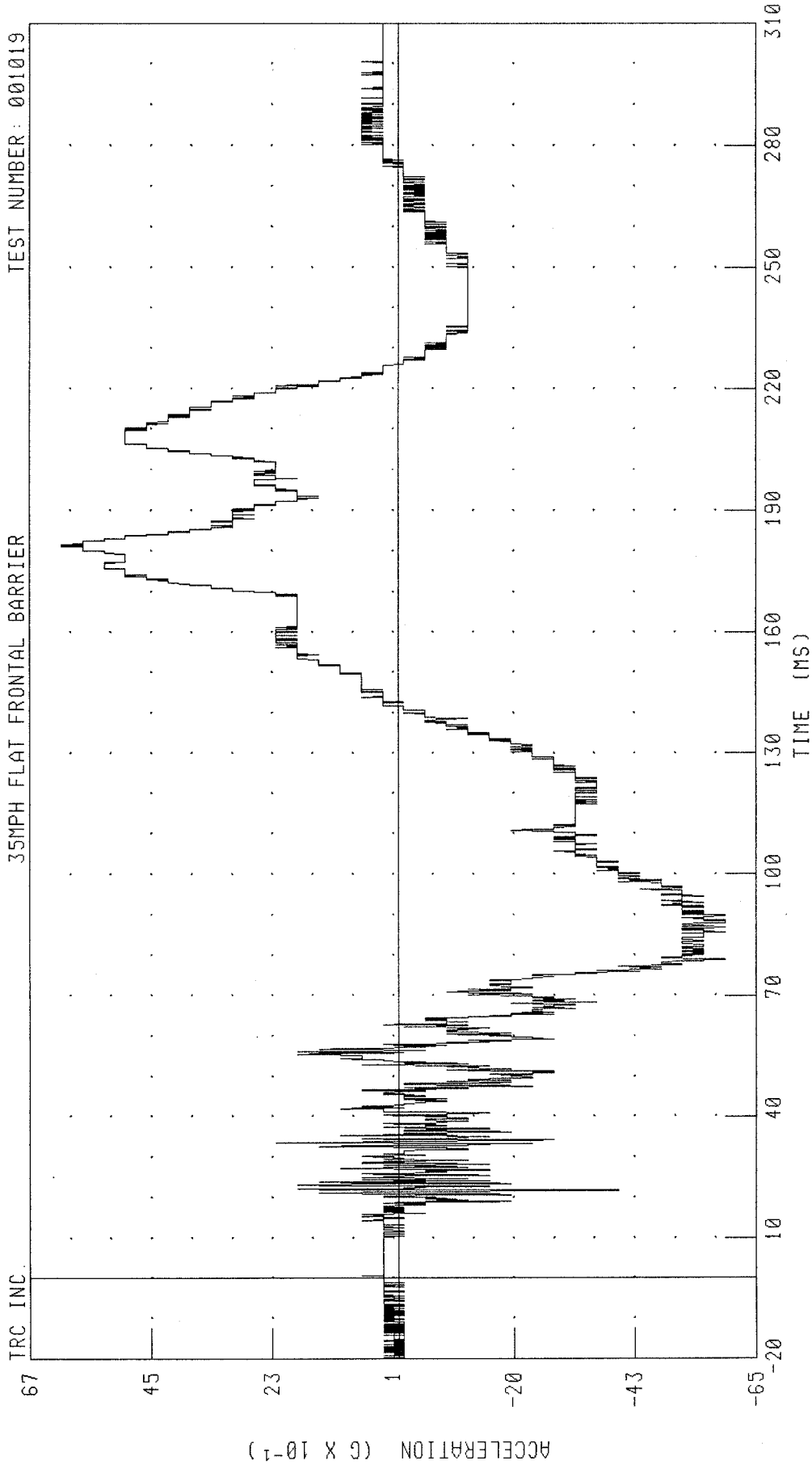


CHANNEL: HEDXC1 FILTER: CH. CLASS 1000 PEAK DATA: 16.14 G @ 213.60 MS, -47.81 G @ 74.72 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER HEAD Y-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

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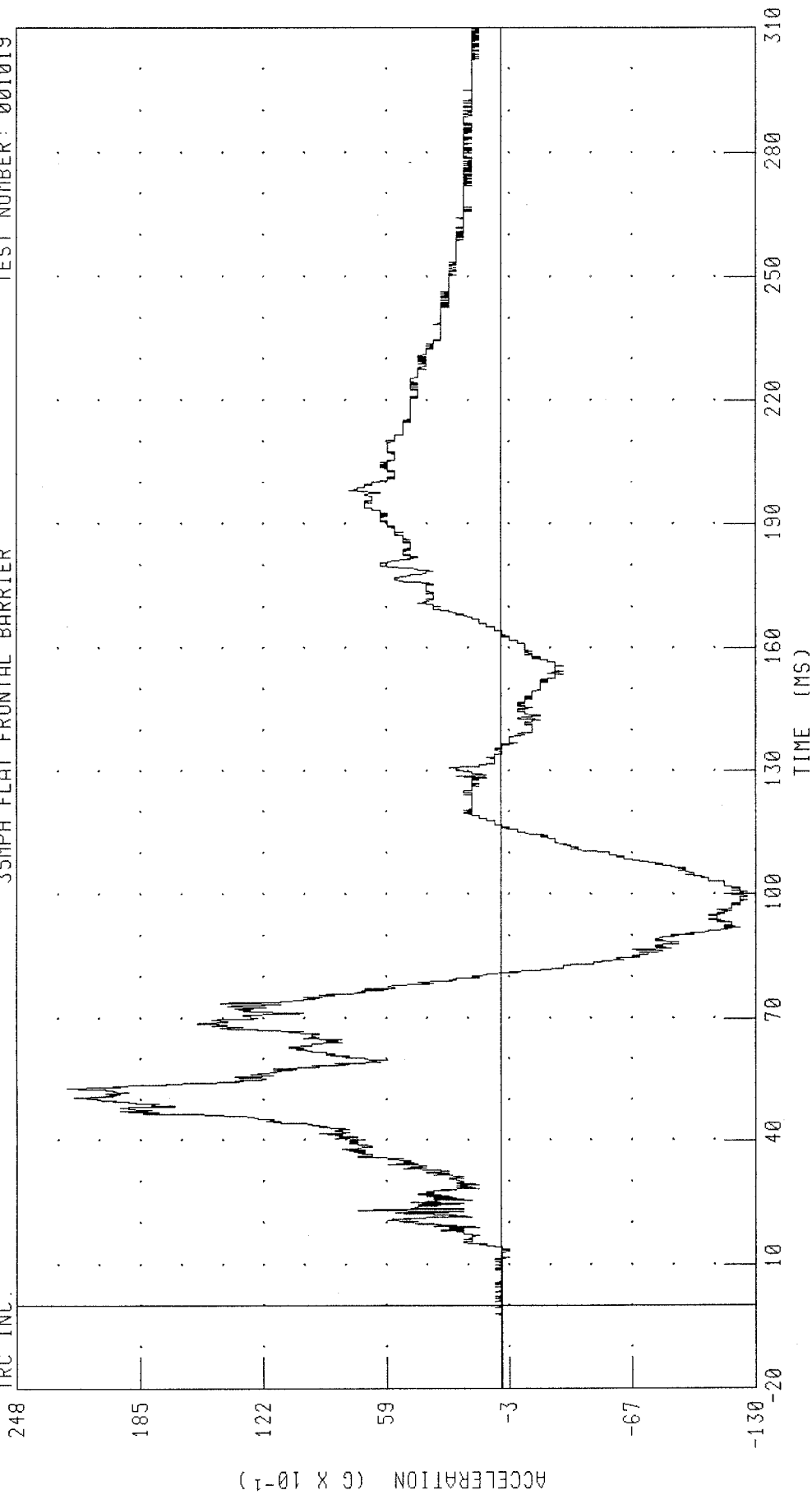
PEAK DATA: 6.13 G @ 181.20 MS; -5.95 G @ 78.88 MS

CHANNEL: HEDYG1 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER HEAD Z-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

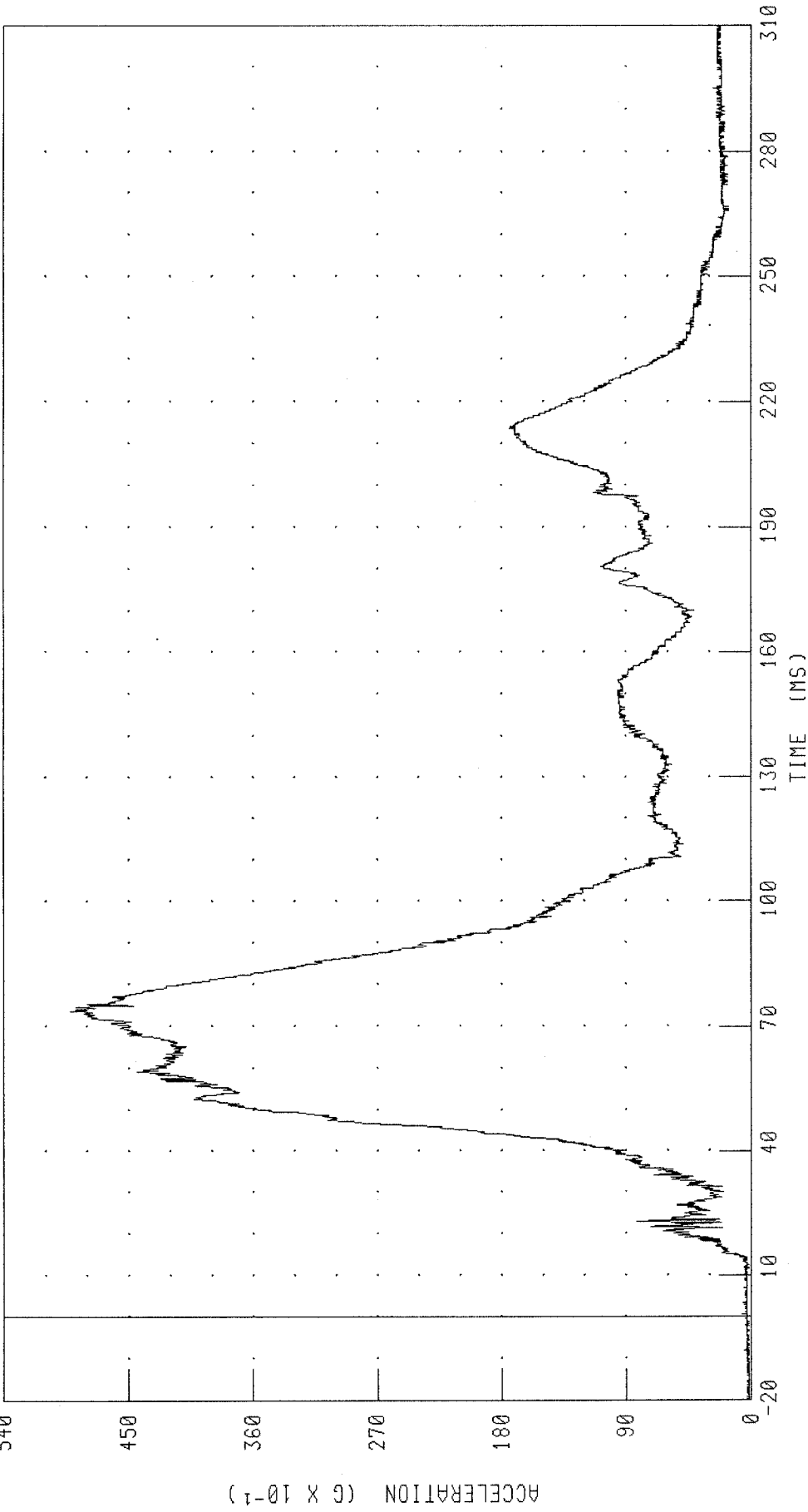


CHANNEL: HEDZG1 FILTER: CH. CLASS 1000 PEAK DATA: 22.26 G @ 52.88 MS; -12.57 G @ 98.48 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER HEAD RESULTANT ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

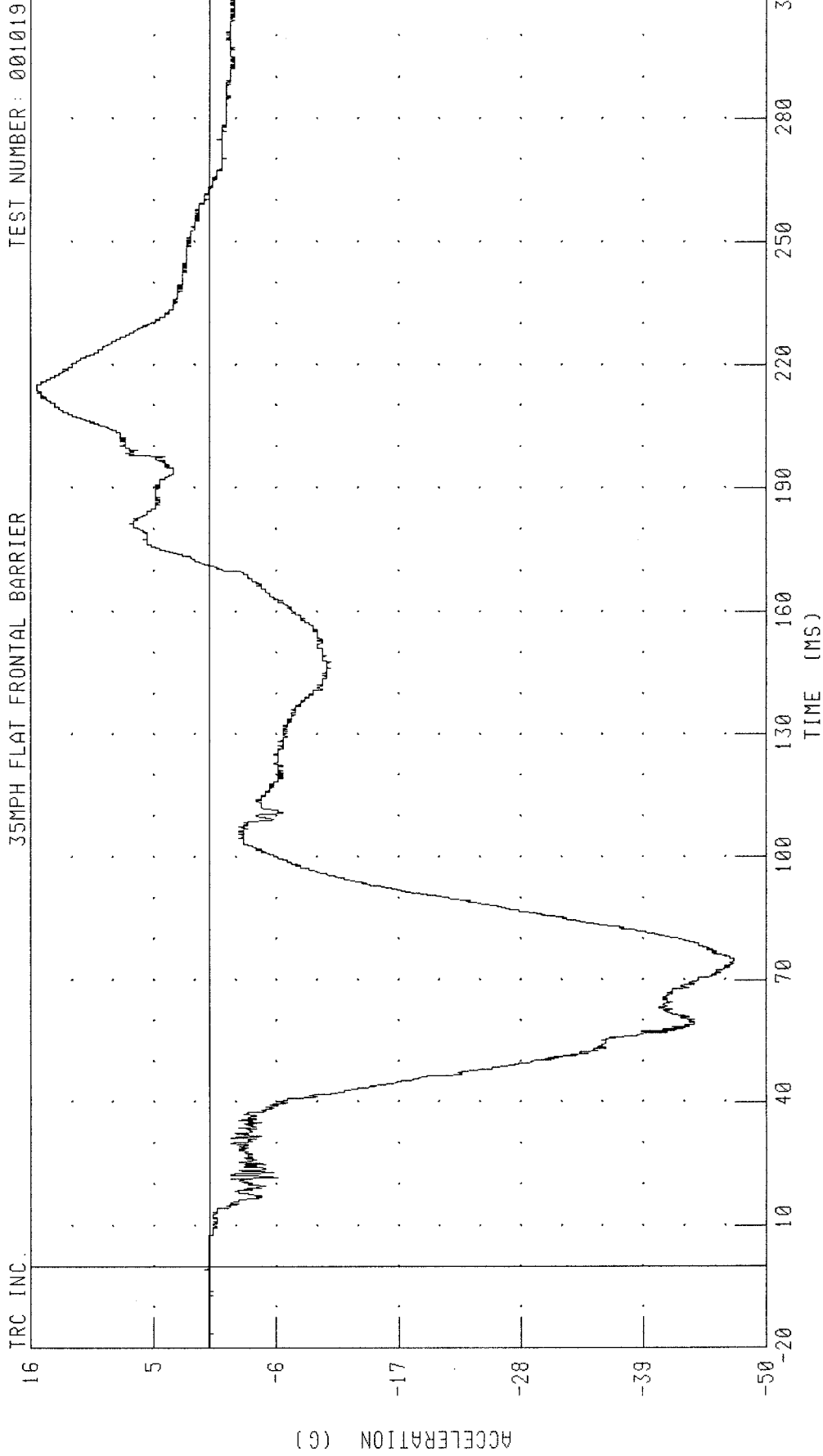
TRC INC.



PEAK DATA: 49.21 G @ 73.76 MS; 0.13 G @ -19.92 MS

CHANNEL: HEDRG1 FILTER: CH. CLASS 1000

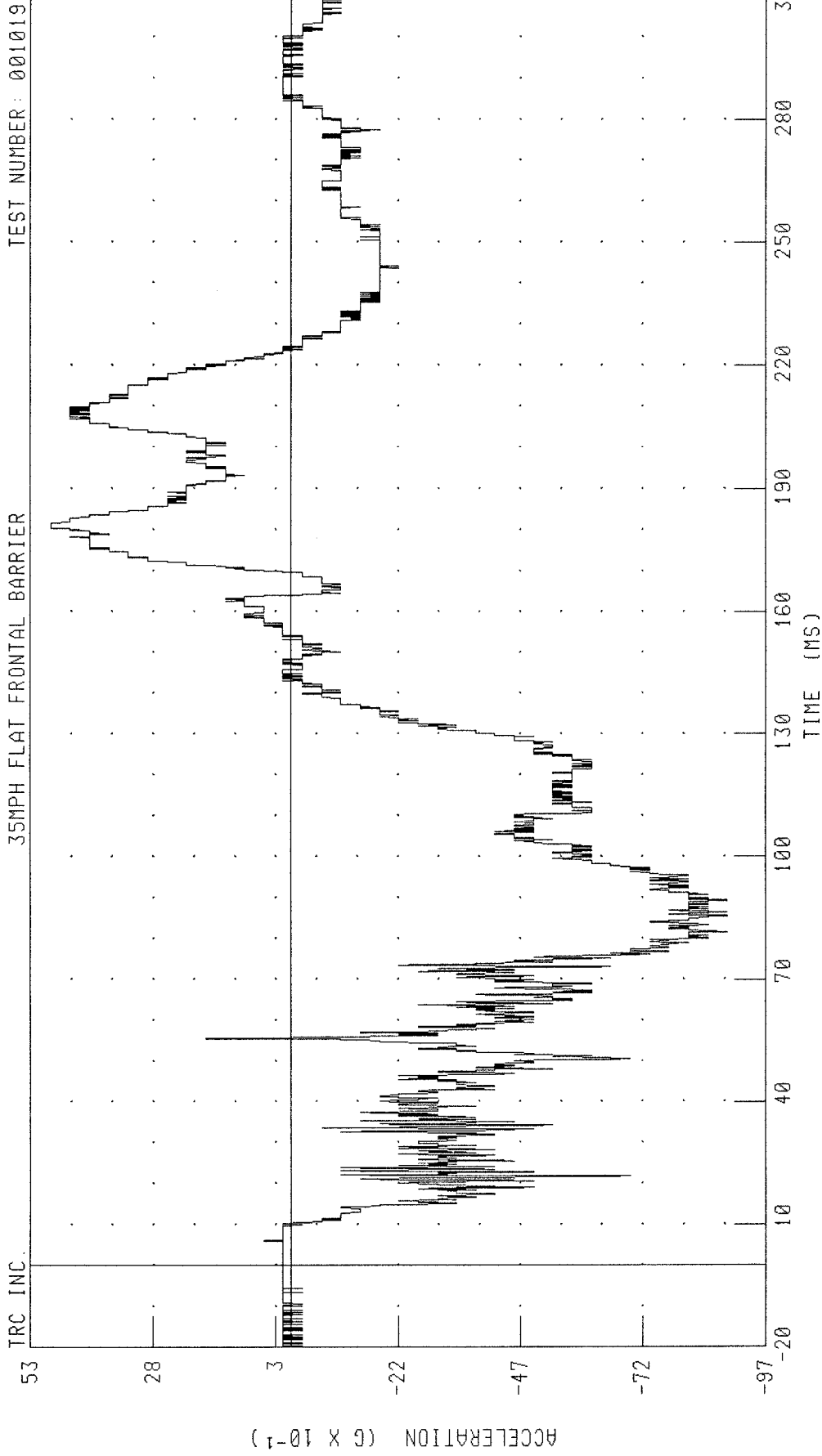
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER HEAD X-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER



CHANNEL: HEDXR1 FILTER: CH. CLASS 1000

PEAK DATA: 15.45 G @ 213.20 MS, -47.10 G @ 73.84 MS

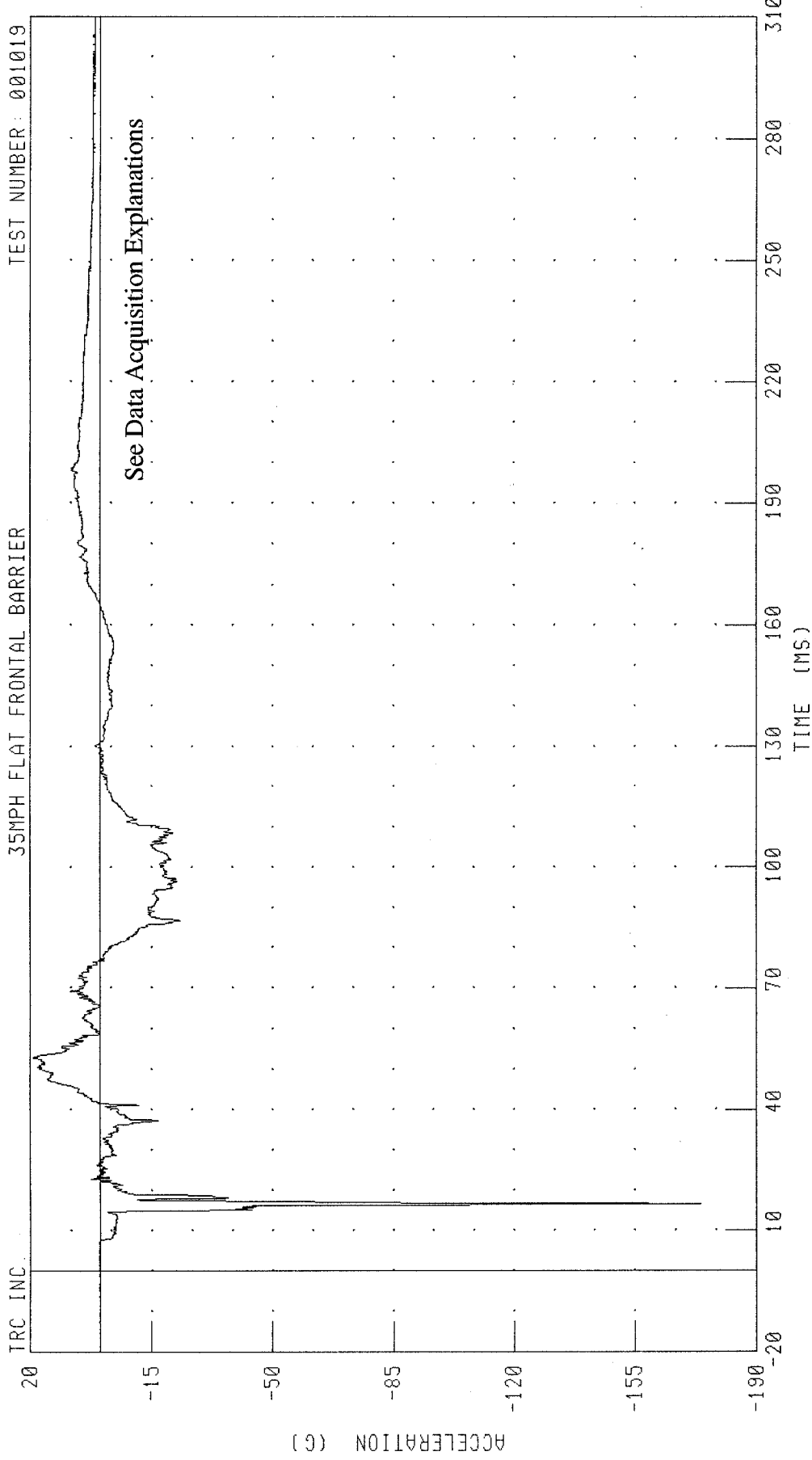
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER HEAD Y-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER



CHANNEL: HEDYR1 FILTER: CH. CLASS 1000 PEAK DATA: 4.89 G @ 180.48 MS; -8.92 G @ 81.68 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER HEAD Z-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

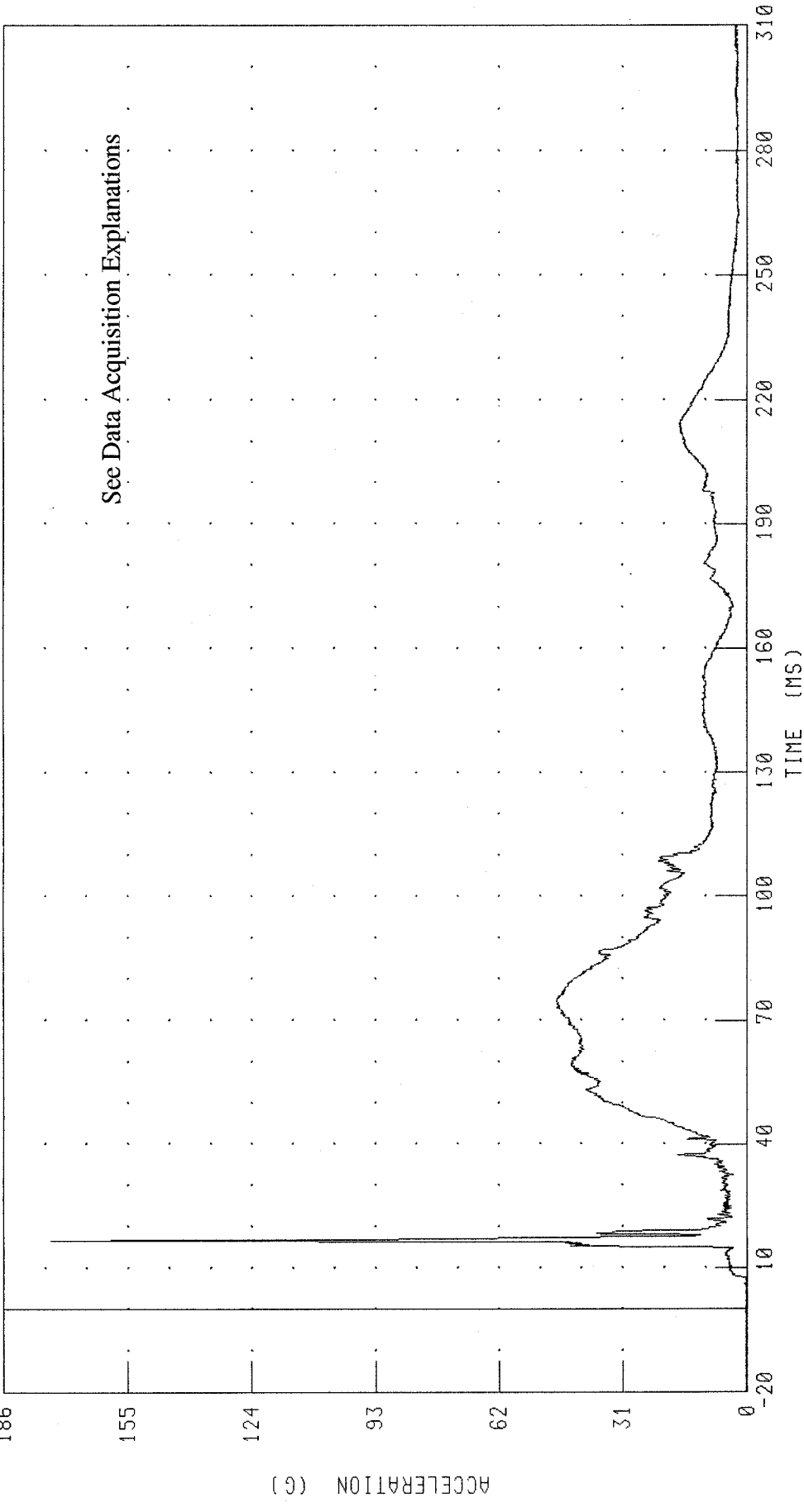


CHANNEL: HEDZR1 FILTER: CH. CLASS 1000 PEAK DATA: 19.08 G @ 52.96 MS; -174.13 G @ 16.64 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER HEAD RESULTANT ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

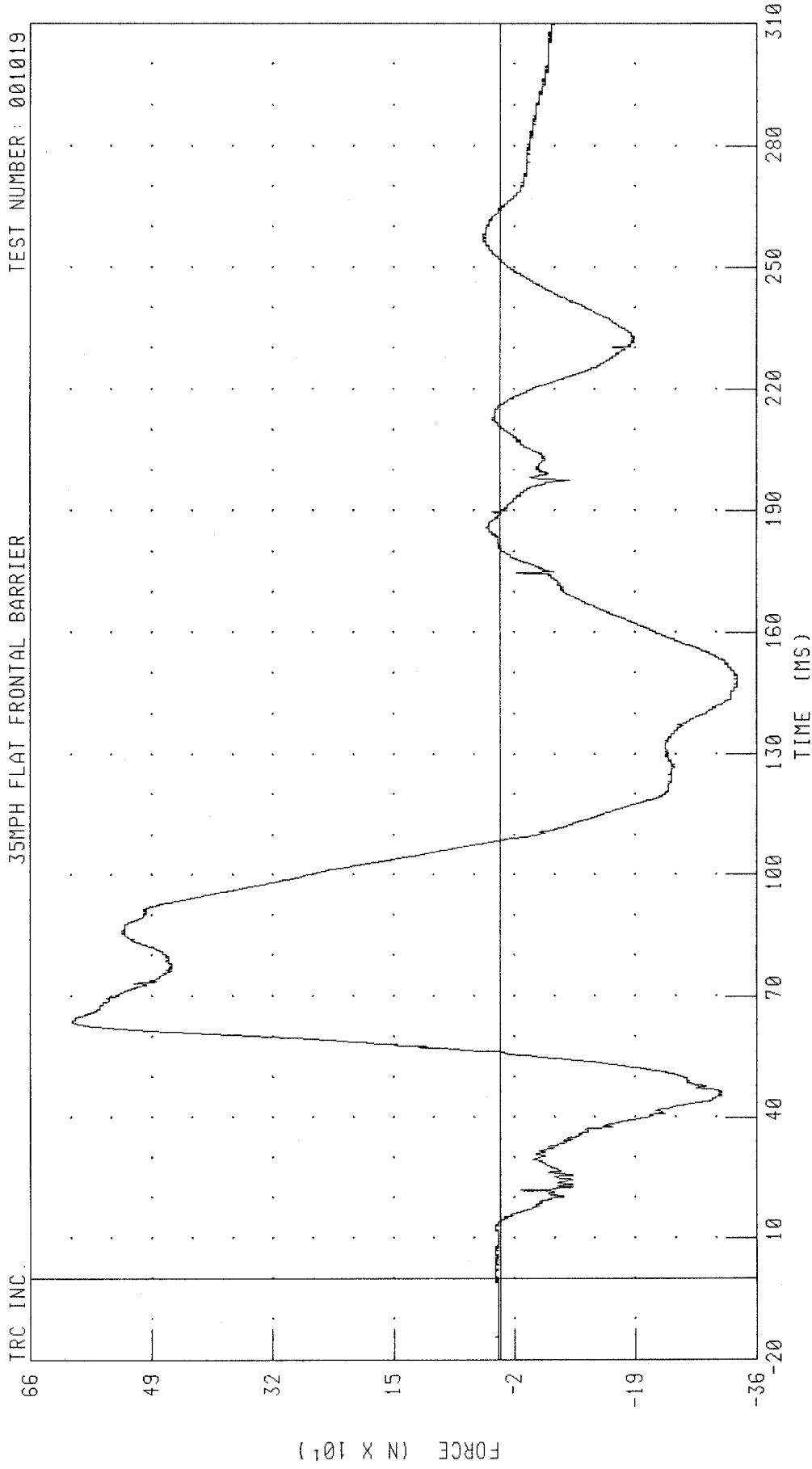


See Data Acquisition Explanations

CHANNEL: HEDR1 FILTER: CH. CLASS 1000 PEAK DATA: 174.23 G @ 16.64 MS; 0.20 G @ -20.00 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER NECK X-AXIS SHEAR FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

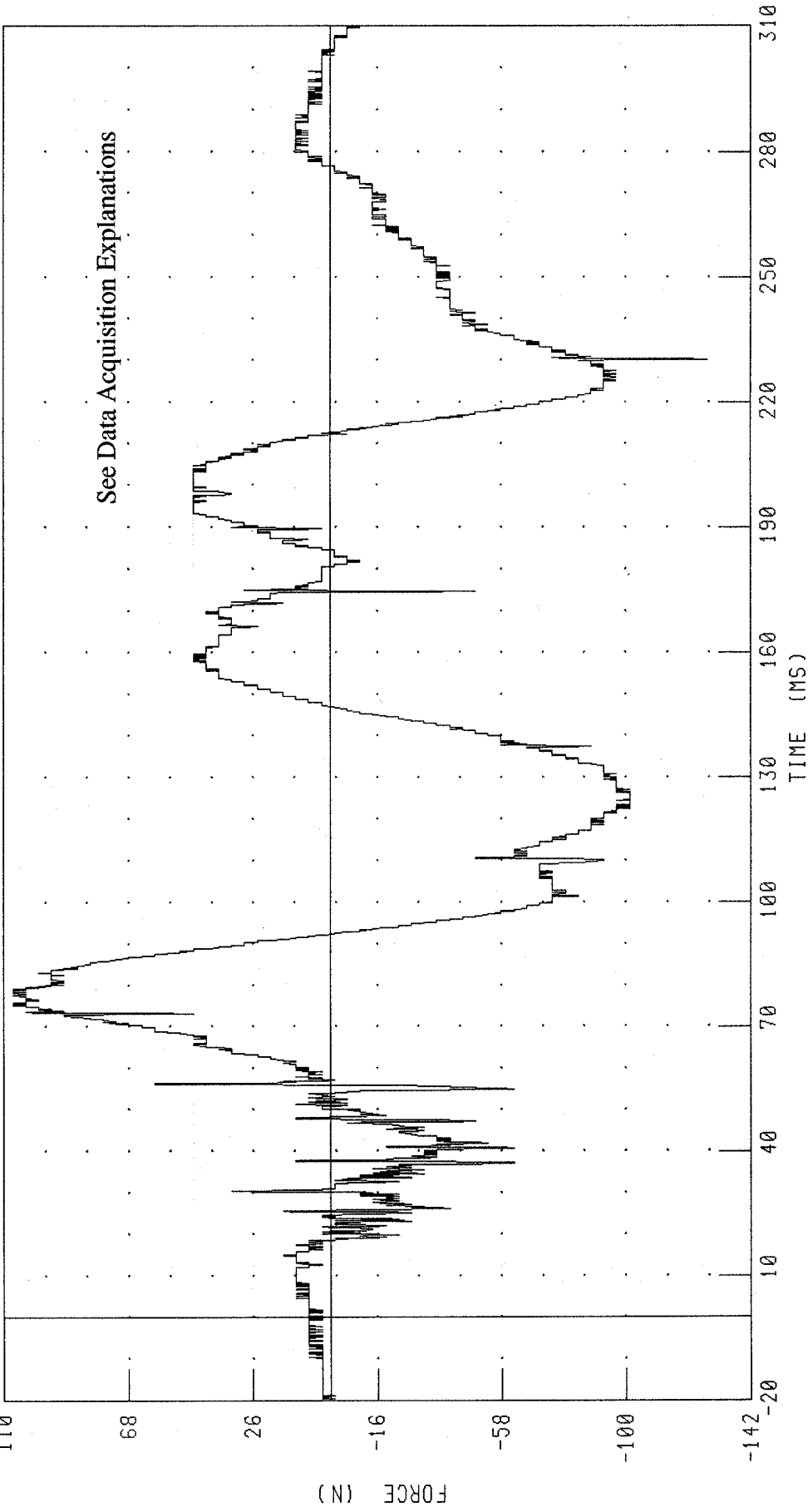


CHANNEL: NEKXF1 FILTER: CH. CLASS 1000 PEAK DATA: 601.21 N @ 63.44 MS; -332.34 N @ 146.56 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER NECK Y-AXIS SHEAR FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

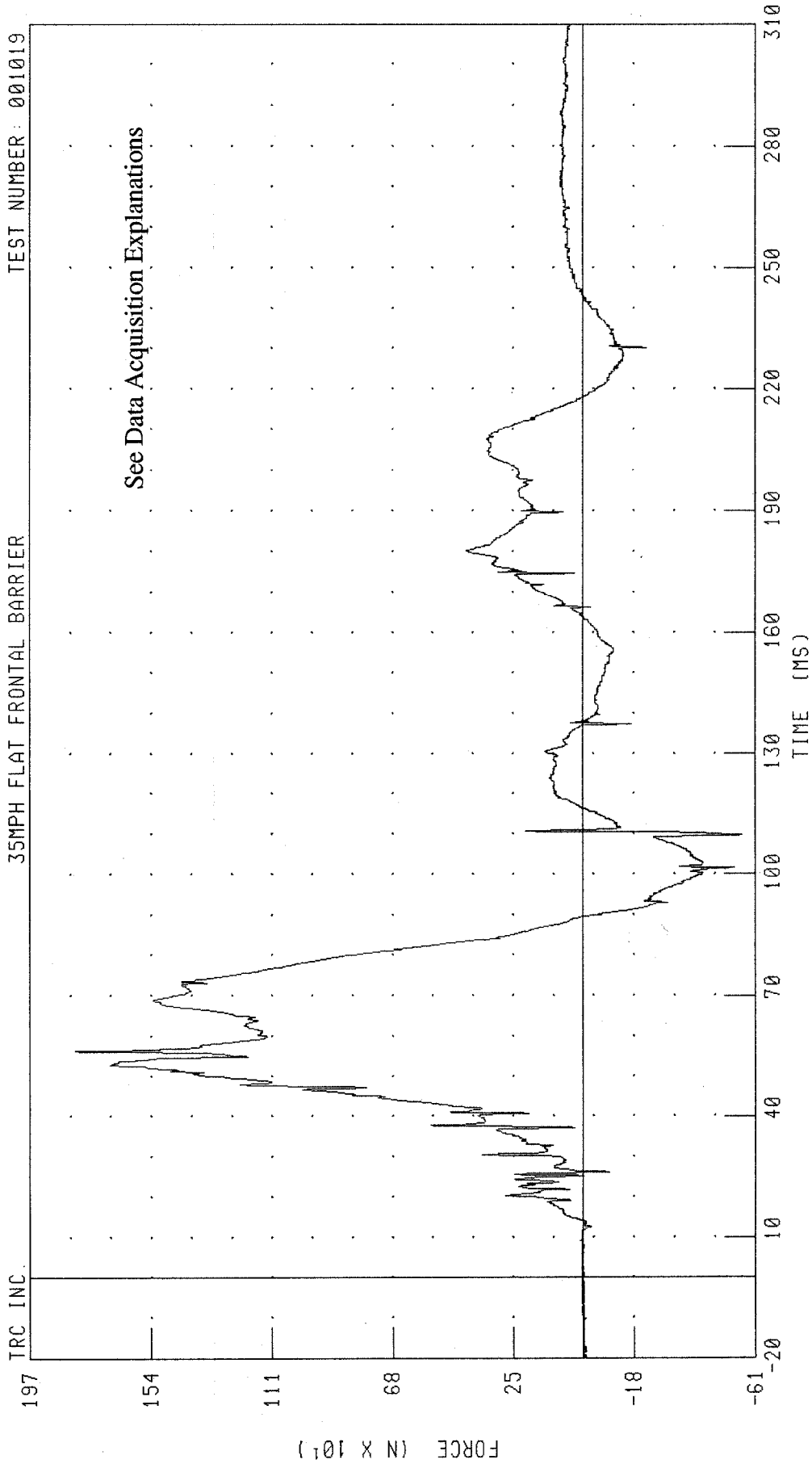


PEAK DATA: 107.02 N @ 75.28 MS; -127.39 N @ 230.24 MS

CHANNEL: NEKYF1 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER NECK Z-AXIS AXIAL FORCE  
35MPH FLAT FRONTAL BARRIER

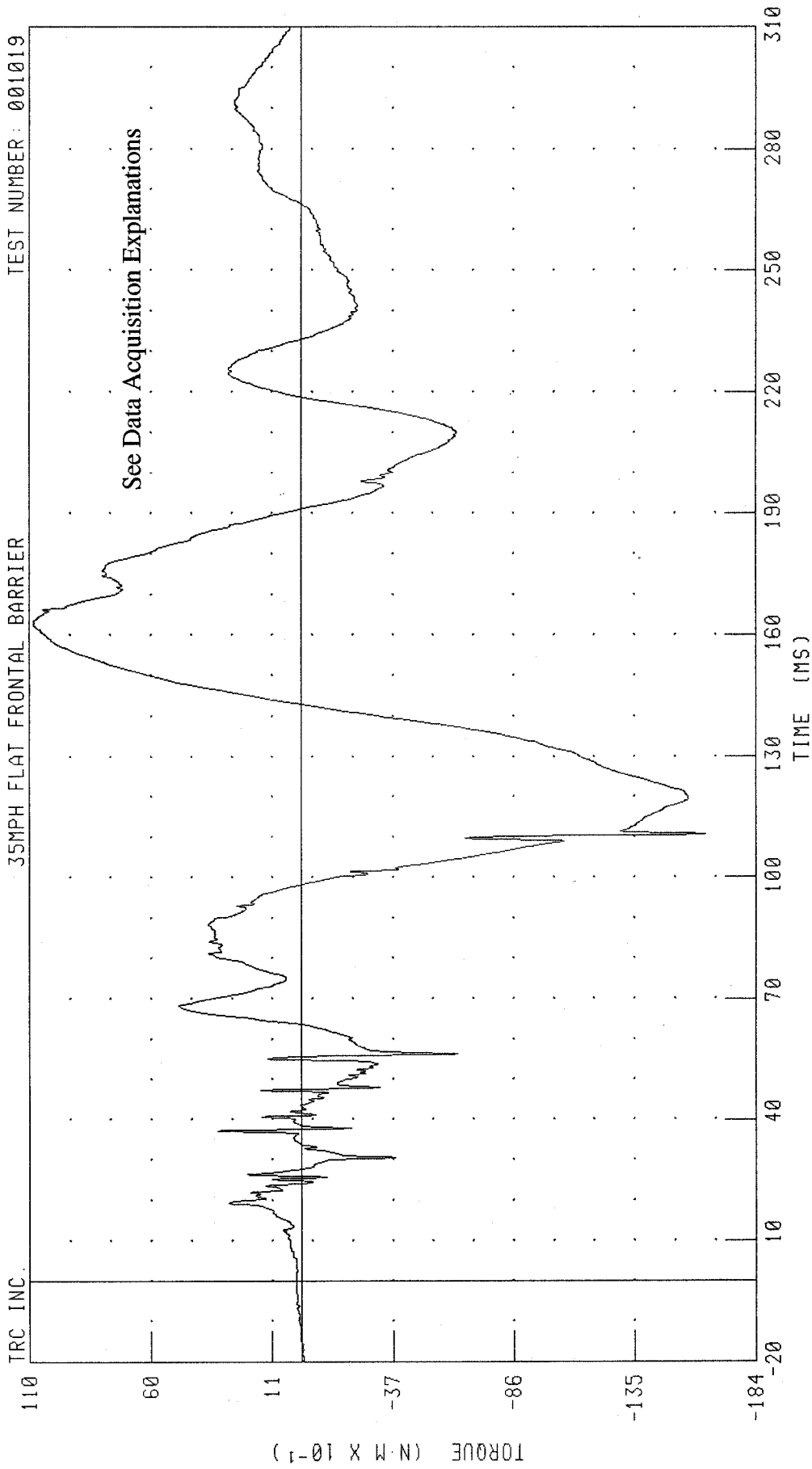
TEST NUMBER: 001019



CHANNEL: NEKZF1 FILTER: CH. CLASS 1000

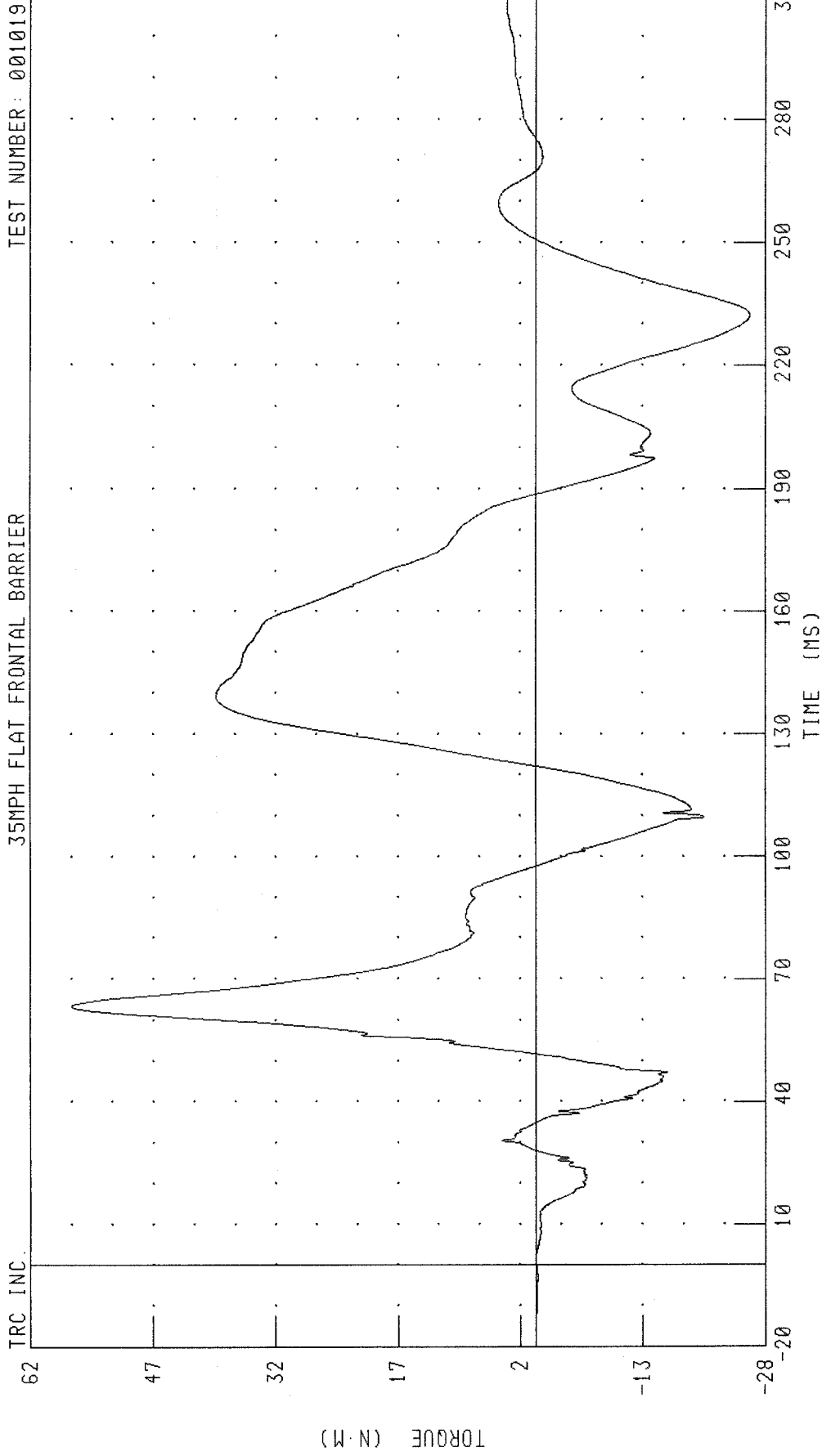
PEAK DATA: 1809.38 N @ 56.32 MS; -562.81 N @ 109.68 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER NECK MOMENT ABOUT X AXIS  
35MPH FLAT FRONTAL BARRIER



CHANNEL: NEKX11 FILTER: CH. CLASS 600  
PEAK DATA: 10.84 N·M @ 162.56 MS; -16.38 N·M @ 110.80 MS

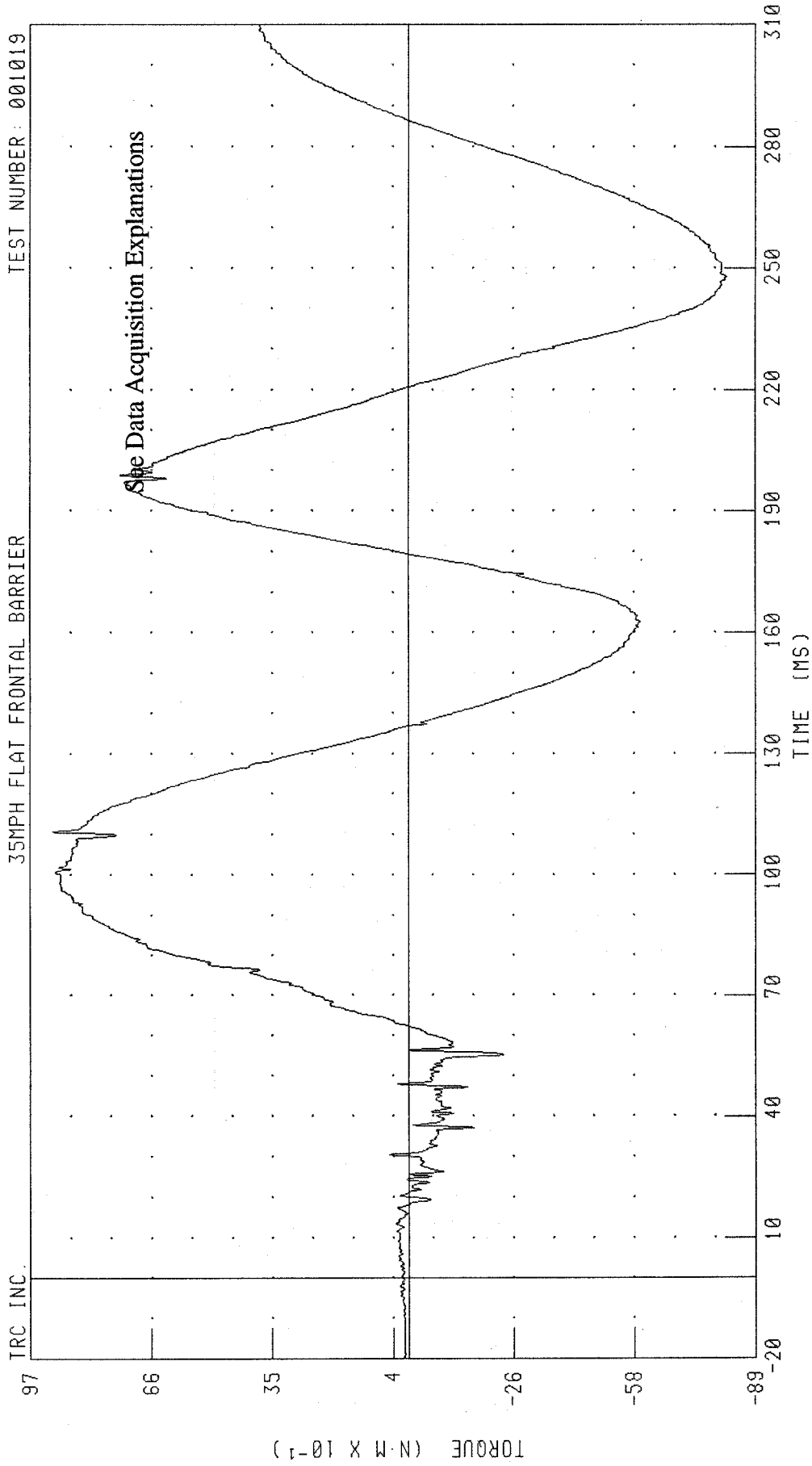
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER NECK MOMENT ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER



CHANNEL: NEKYM1 FILTER: CH. CLASS 600 PEAK DATA: 56.98 N·M @ 63.44 MS, -26.09 N·M @ 232.24 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER NECK MOMENT ABOUT Z AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

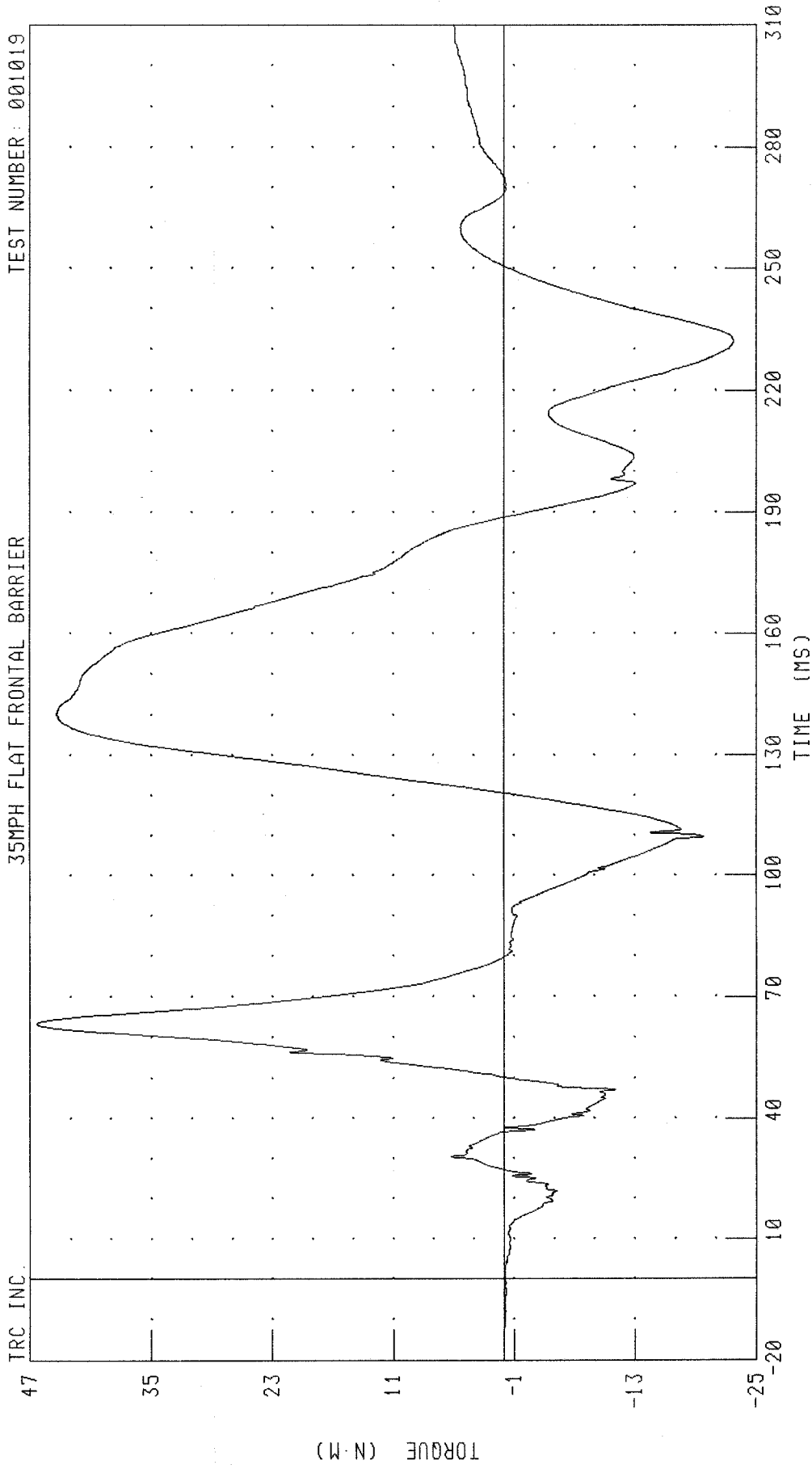


CHANNEL: NEKZM1 FILTER: CH. CLASS 600

PEAK DATA: 9.13 N·M @ 110.72 MS; -8.16 N·M @ 248.00 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER NECK MOMENT OCCIPITAL CONDYLE ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER

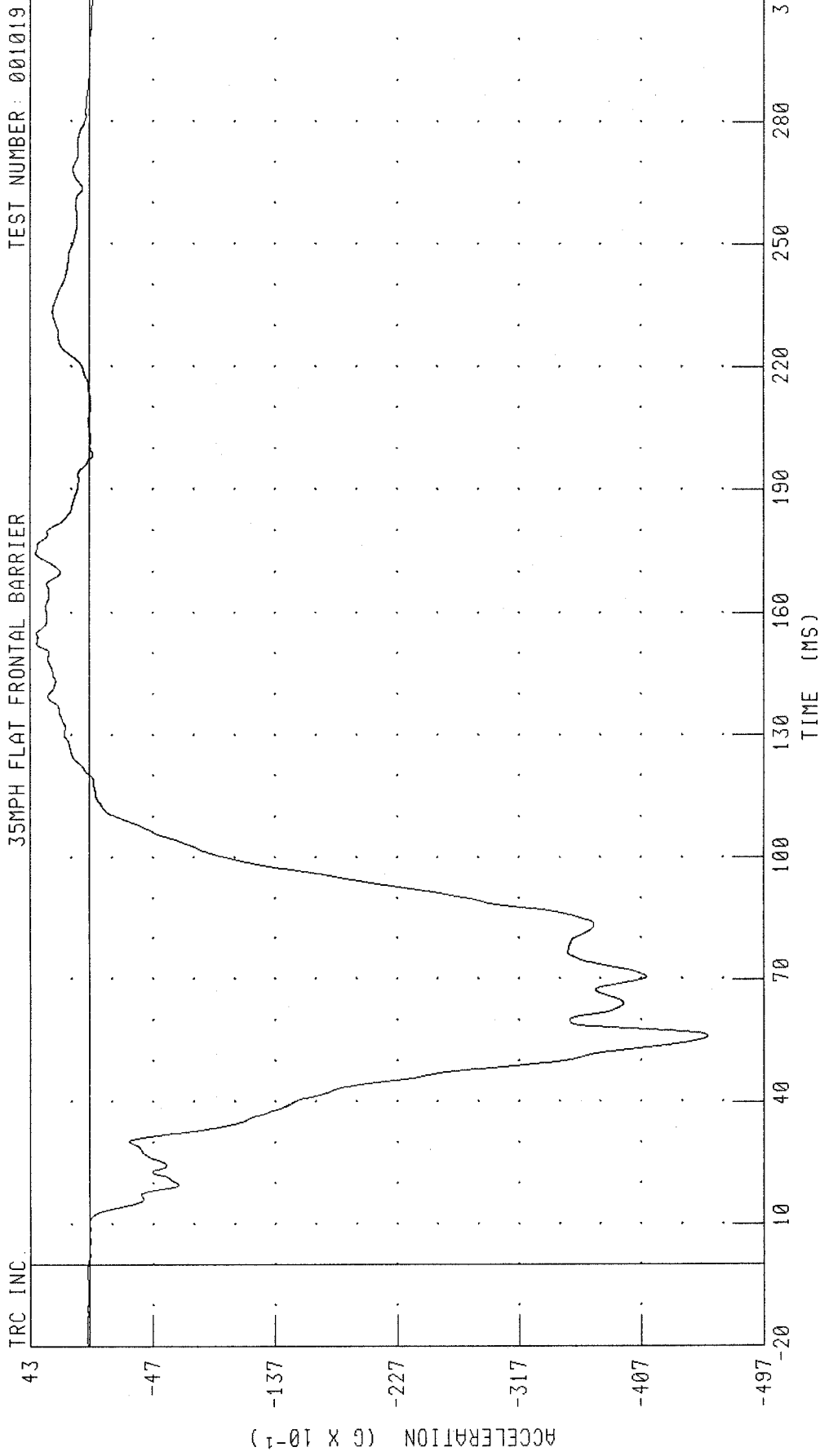
TEST NUMBER: 001019



PEAK DATA: 46.32 N·M @ 63.44 MS, -22.75 N·M @ 232.24 MS

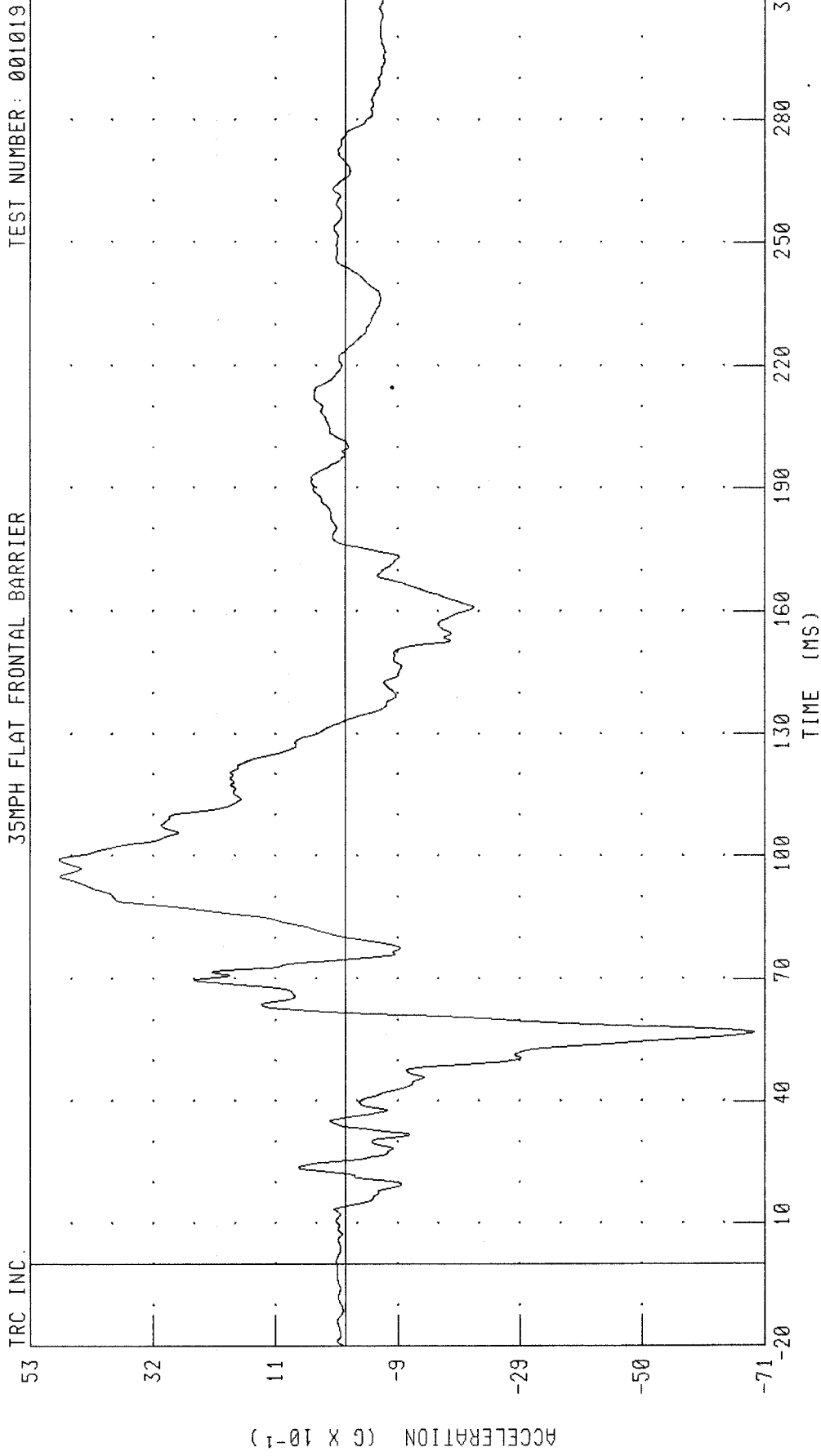
CHANNEL: NEKOM1 FILTER: CH. CLASS 600

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER CHEST X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER



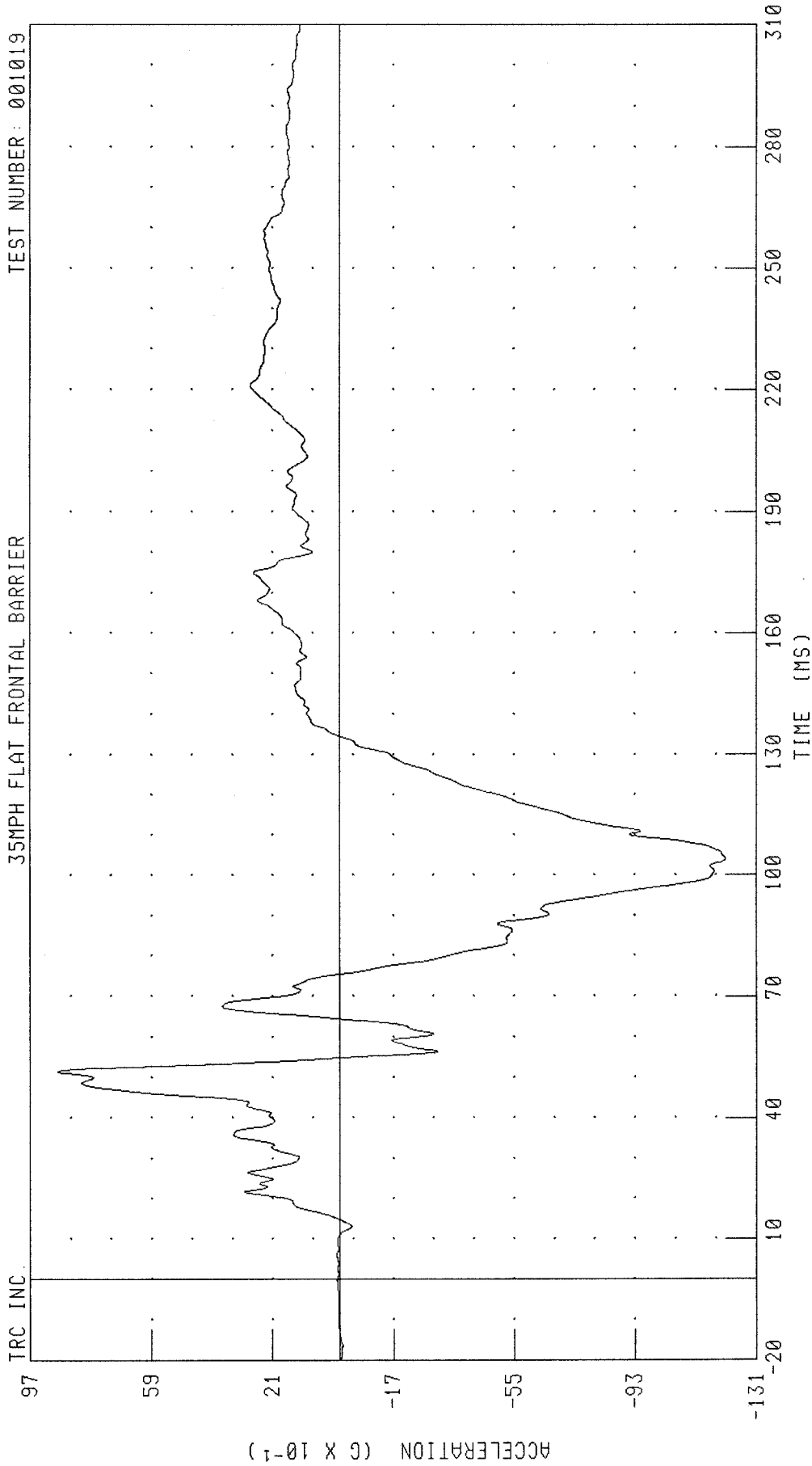
CHANNEL: CSTXC1 FILTER: CH. CLASS 180 PEAK DATA: 3.91 G @ 174.56 MS; -45.59 G @ 56.08 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER CHEST Y-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER



CHANNEL: CSTYC1 FILTER: CH. CLASS 180 PEAK DATA: 4.91 G @ 99.04 MS; -7.03 G @ 56.96 MS

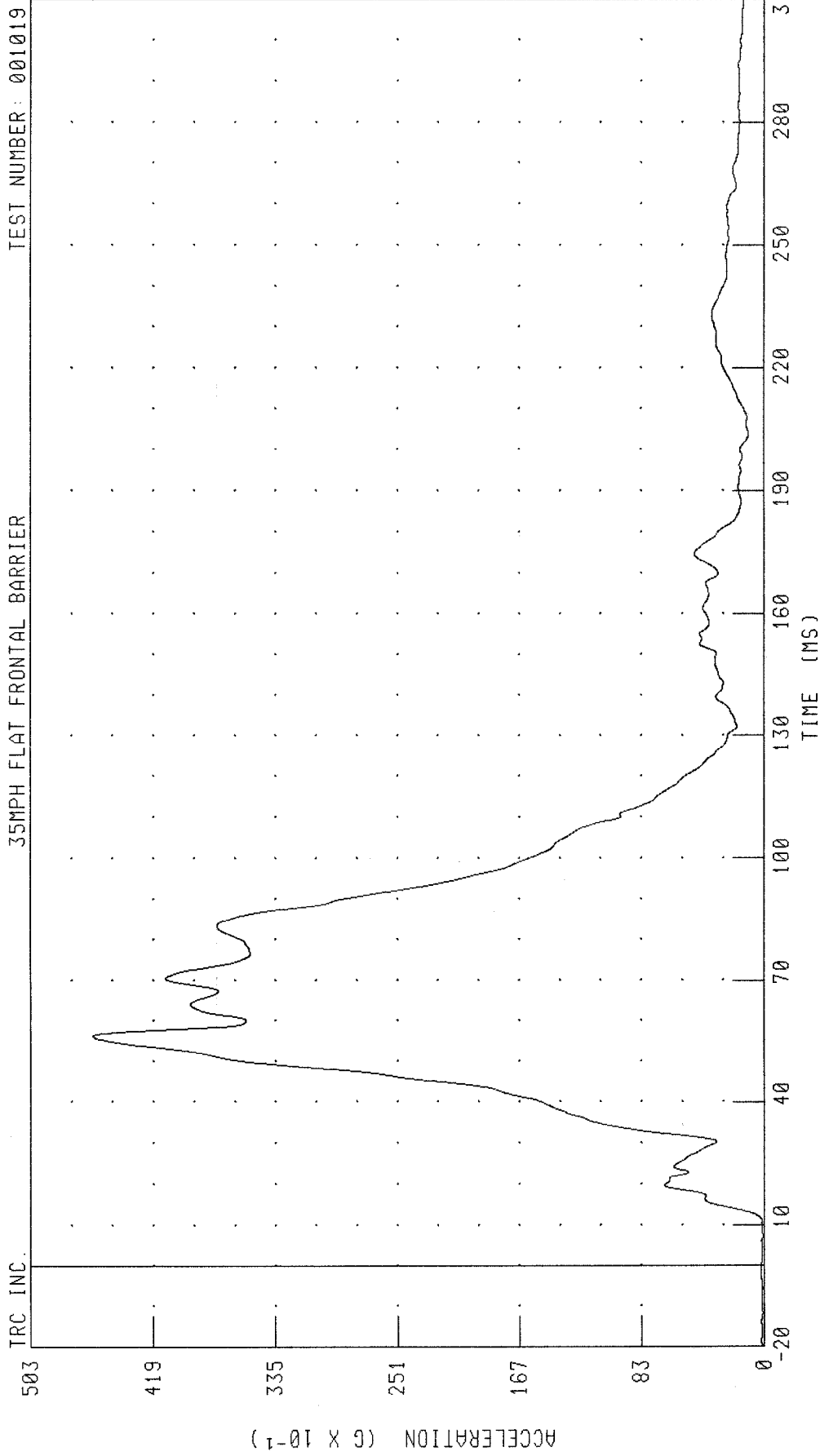
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER CHEST Z-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER



CHANNEL: CSTZG1 FILTER: CH. CLASS 180

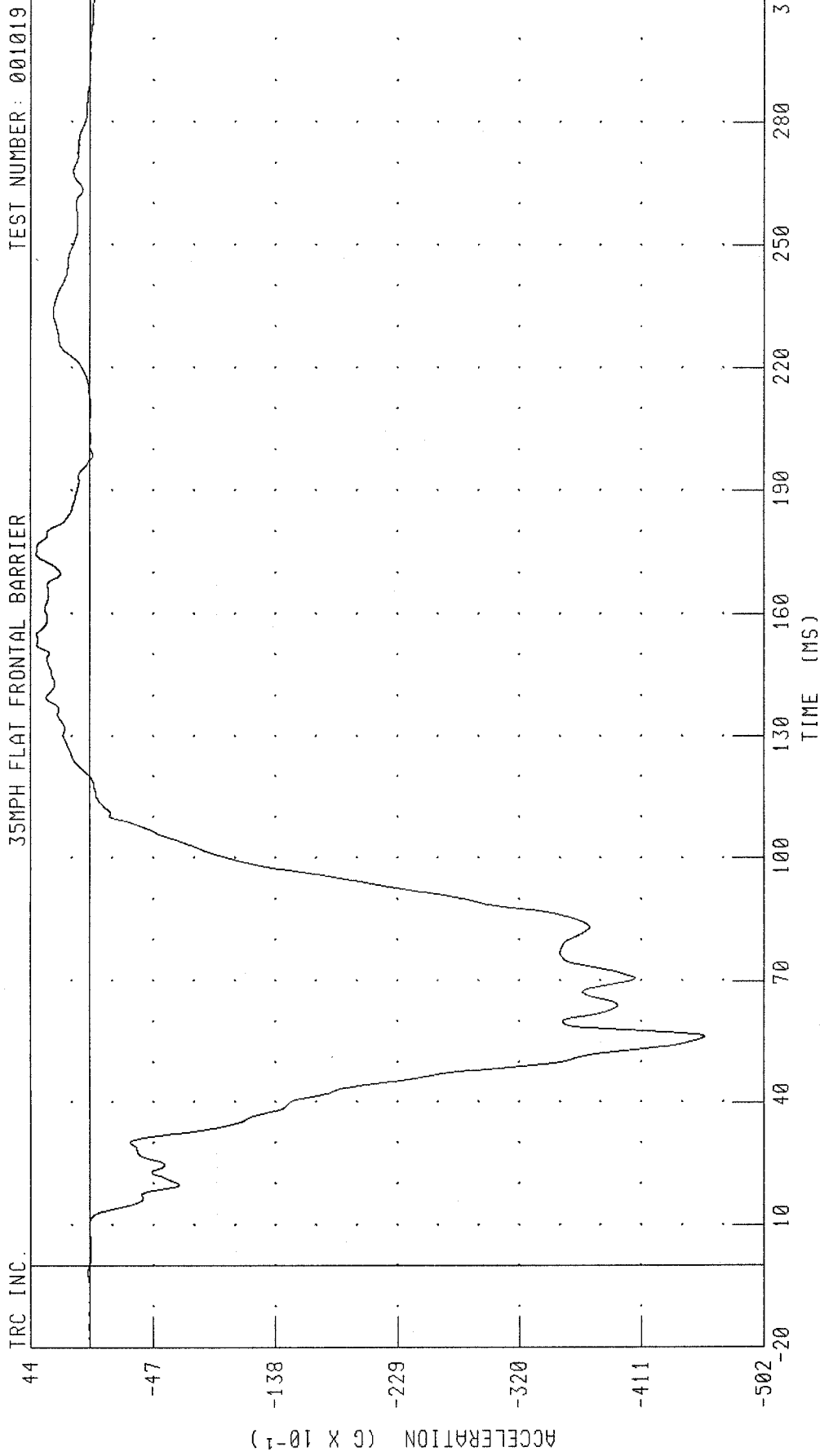
PEAK DATA: 8.85 G @ 51.52 MS; -12.13 G @ 104.08 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER CHEST RESULTANT ACCELERATION  
35MPH FLAT FRONTAL BARRIER



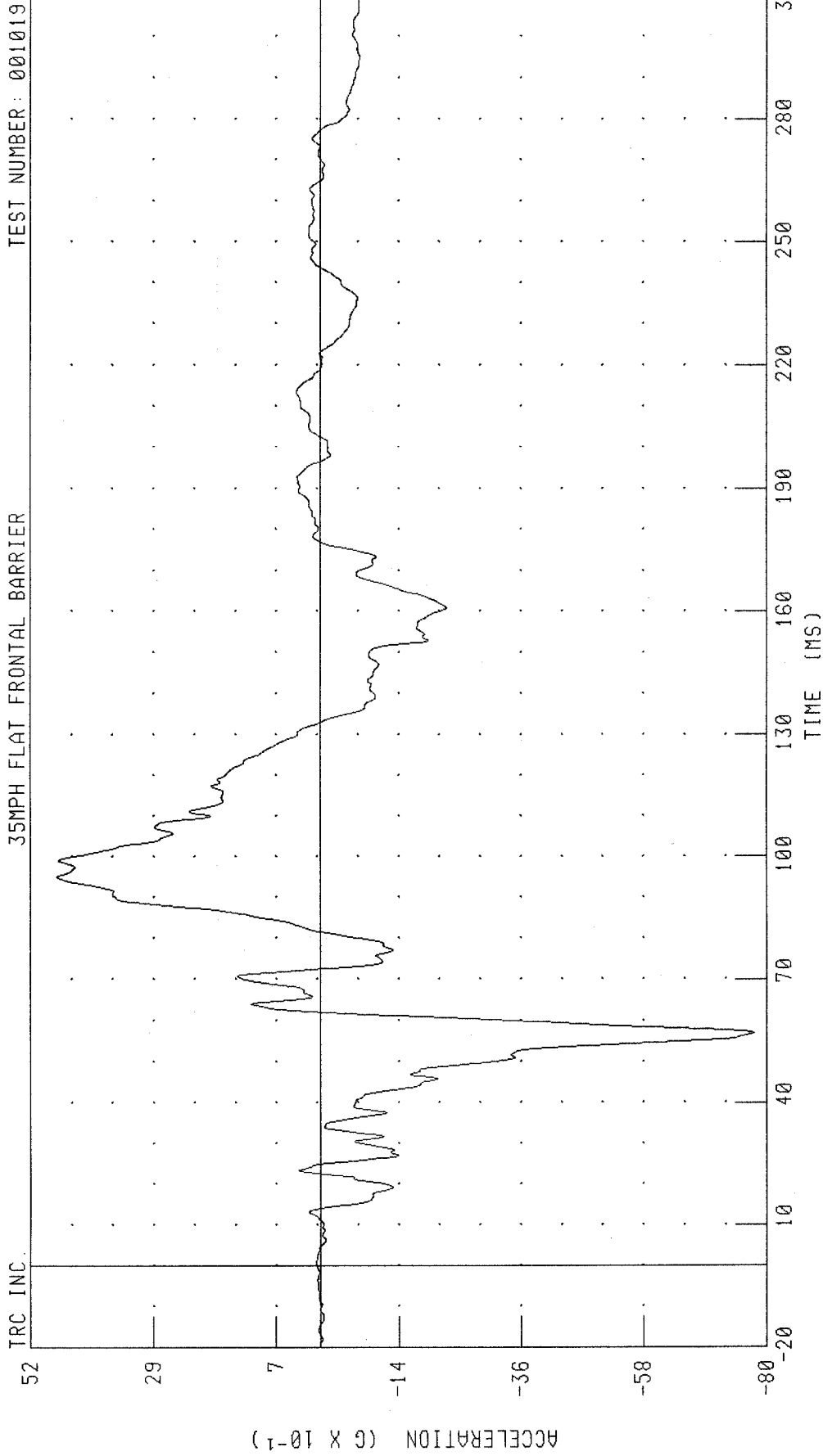
CHANNEL: CSTRG1 FILTER: CH. CLASS 180  
PEAK DATA: 46.15 G @ 56.24 MS; 0.01 G @ -20.00 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER CHEST X-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER



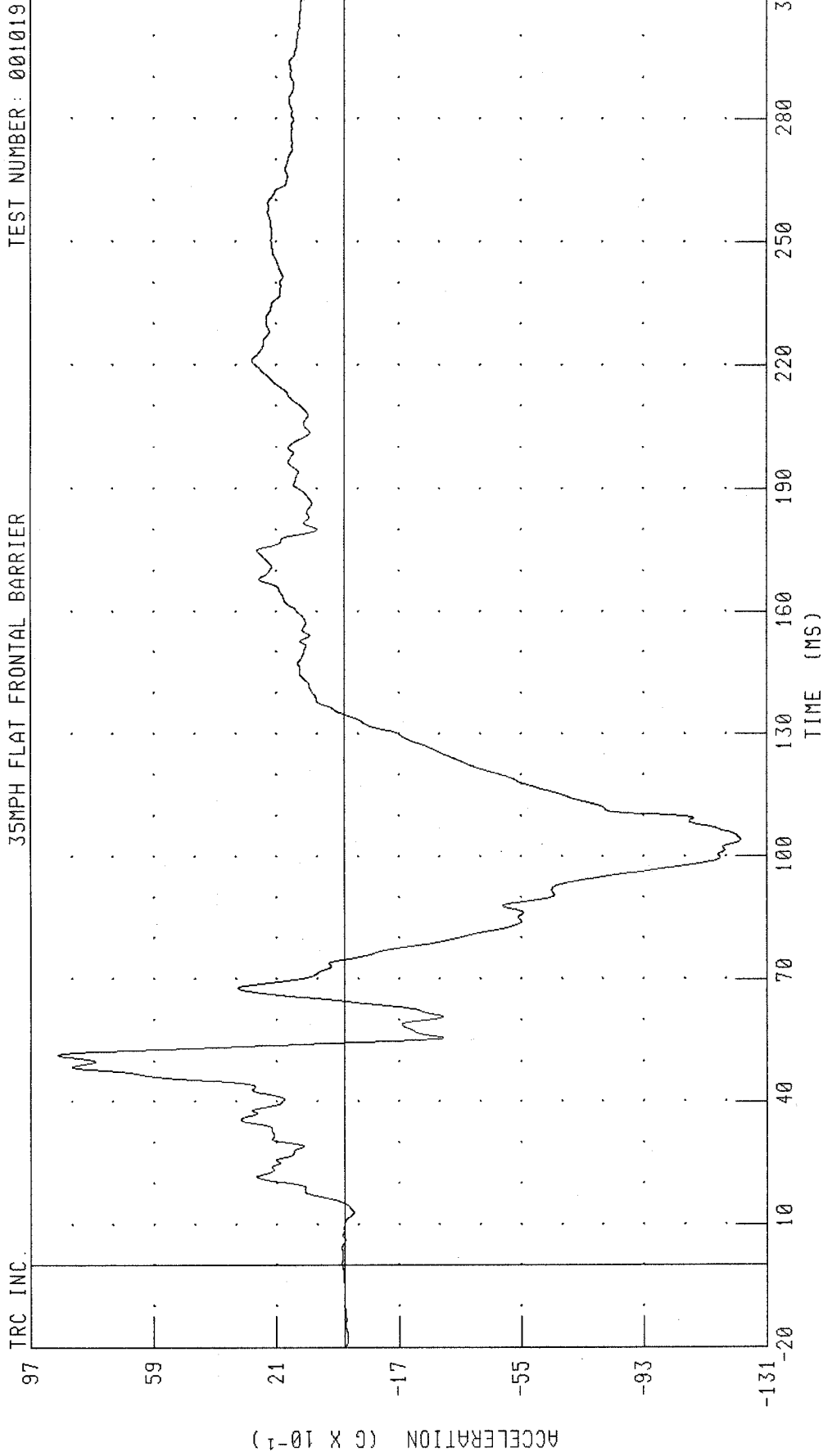
CHANNEL: CSTXR1 FILTER: CH. CLASS 180 PEAK DATA: 4.01 G @ 174.64 MS; -45.80 G @ 56.32 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER CHEST Y-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER



CHANNEL: CSTYR1 FILTER: CH. CLASS 180 PEAK DATA: 4.73 G @ 95.04 MS, -7.77 G @ 56.96 MS

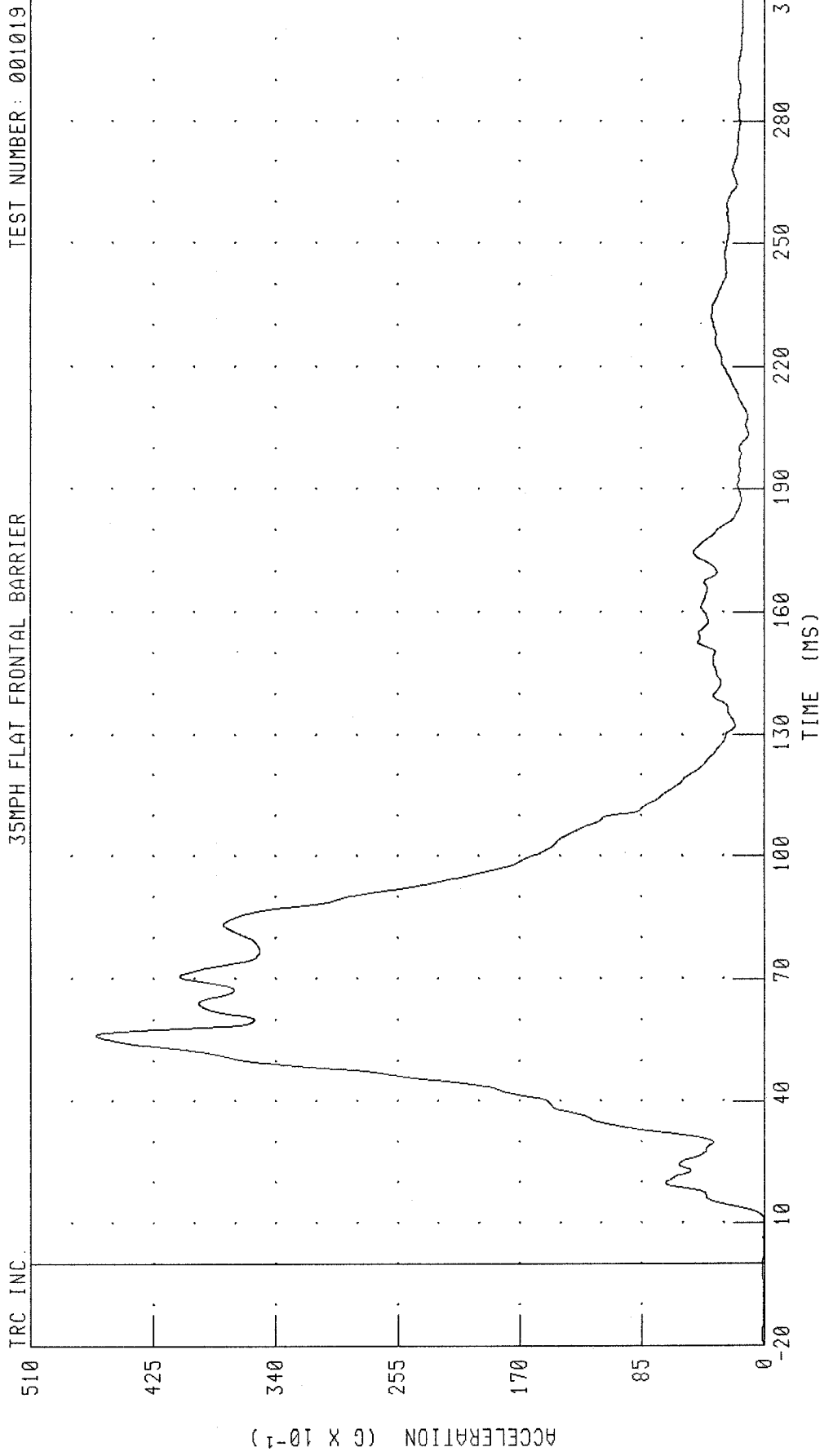
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER CHEST Z-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER



PEAK DATA: 8.86 G @ 51.52 MS, -12.29 G @ 104.24 MS

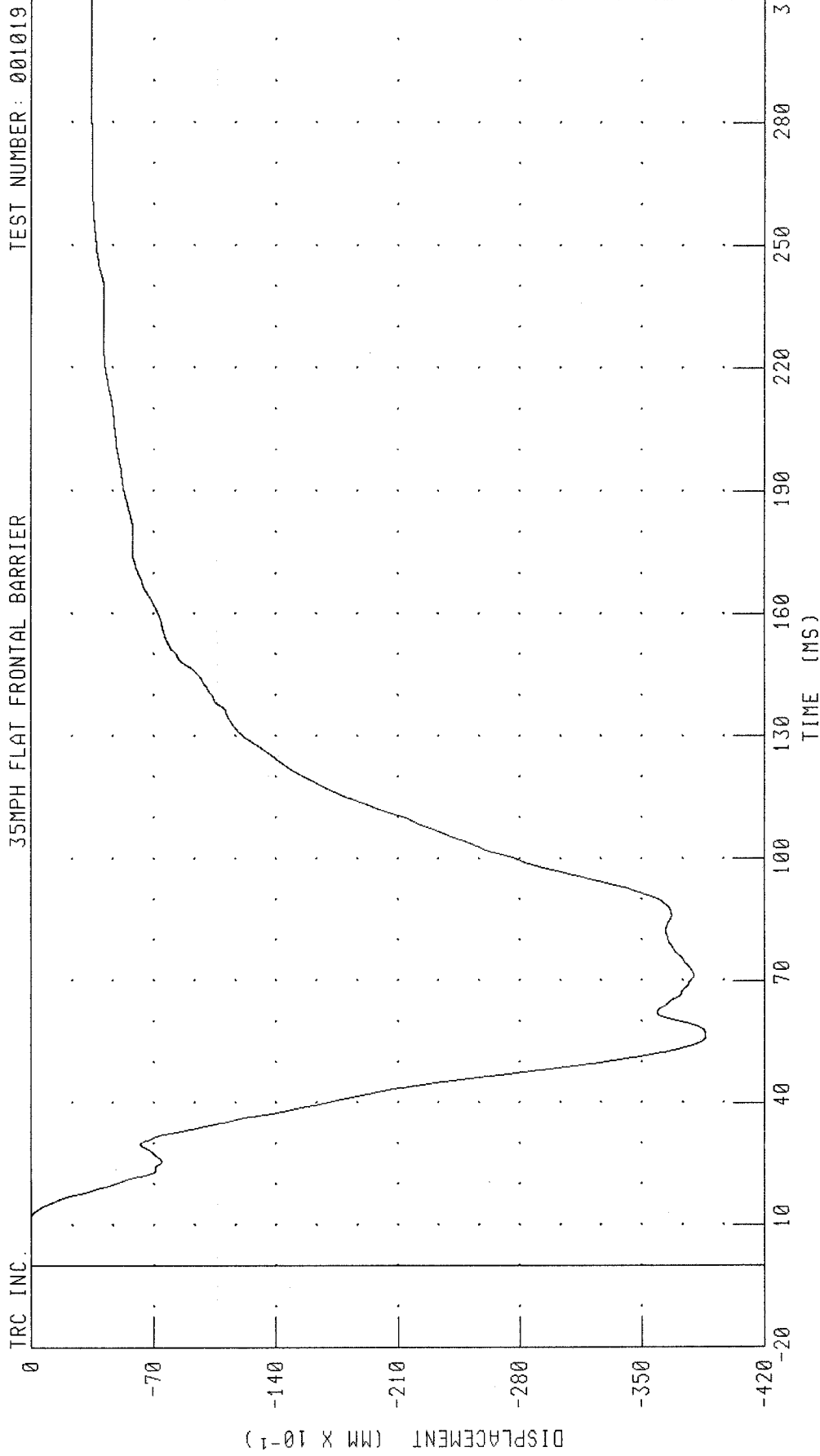
CHANNEL: CSTZR1 FILTER: CH. CLASS 180

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER CHEST RESULTANT ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER



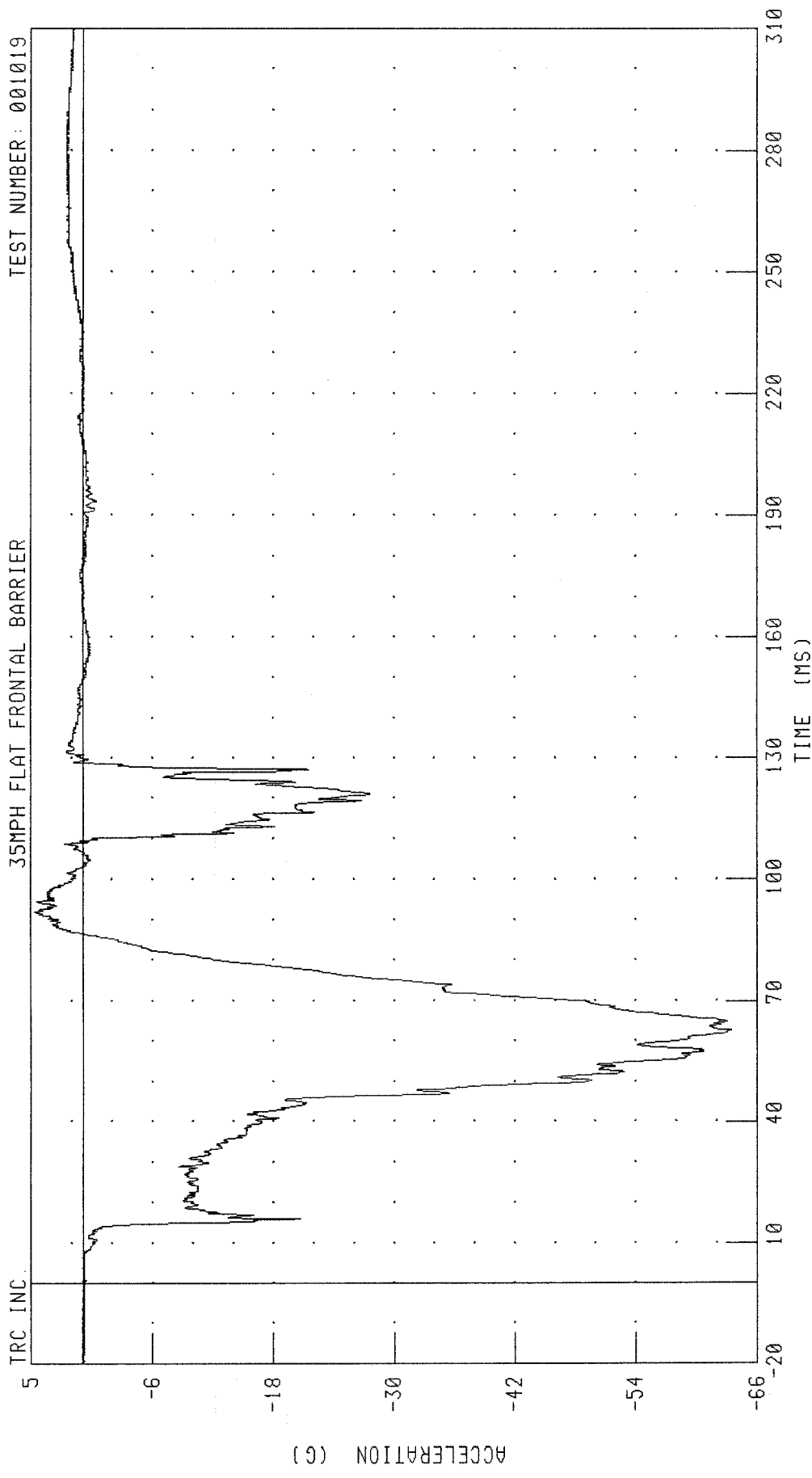
CHANNEL: CSTRR1 FILTER: CH. CLASS 180  
PEAK DATA: 46.50 G @ 56.32 MS; 0.01 G @ -20.00 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER CHEST DEFLECTION  
35MPH FLAT FRONTAL BARRIER



CHANNEL: CSTXD1 FILTER: CH. CLASS 180  
PEAK DATA: 0.01 MM @ 11.76 MS, -38.64 MM @ 56.16 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER PELVIS X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

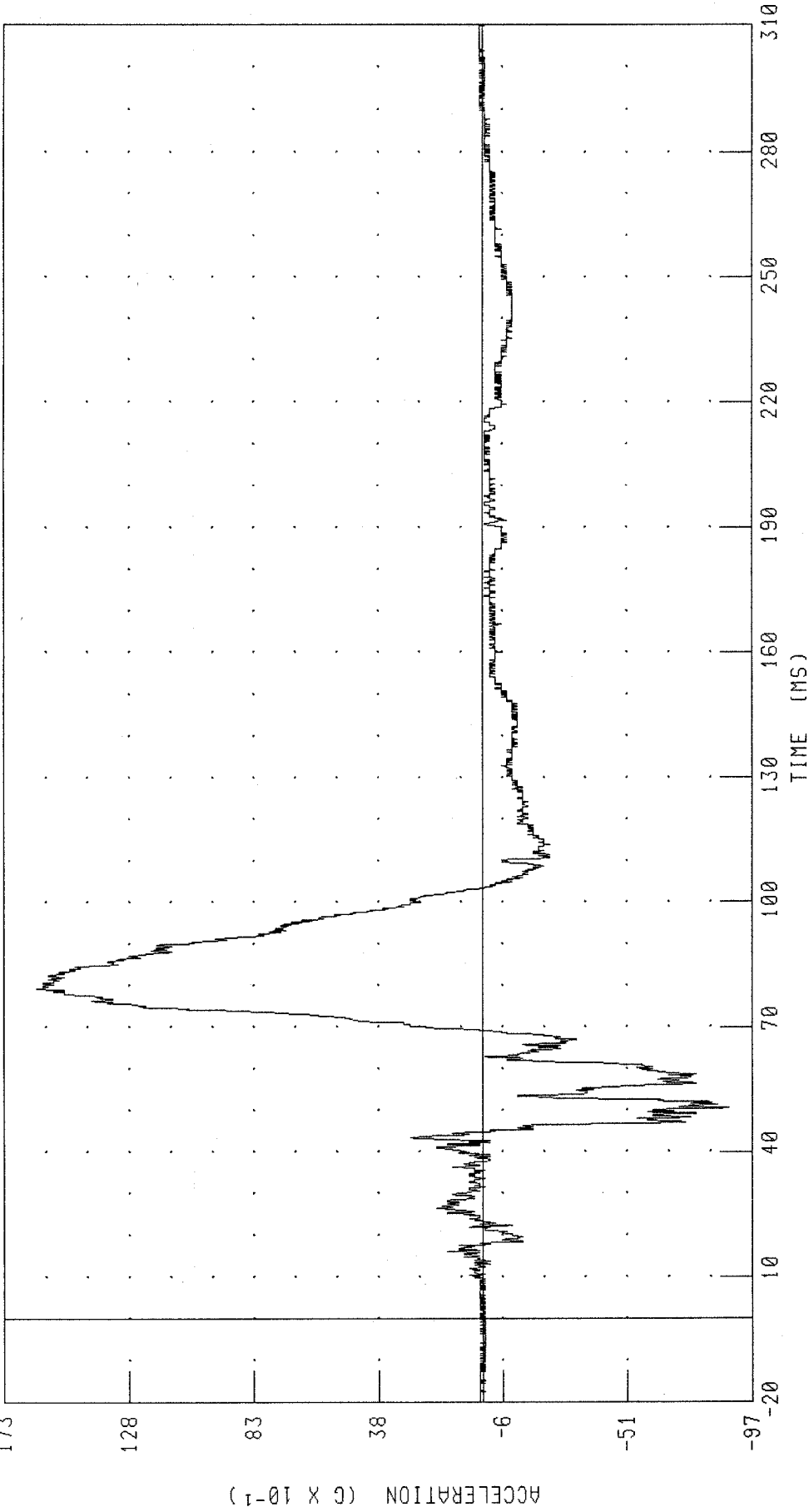


CHANNEL: PEYXG1 FILTER: CH. CLASS 1000 PEAK DATA: 4.82 G @ 92.00 MS; -64.27 G @ 62.56 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER PELVIS Y-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

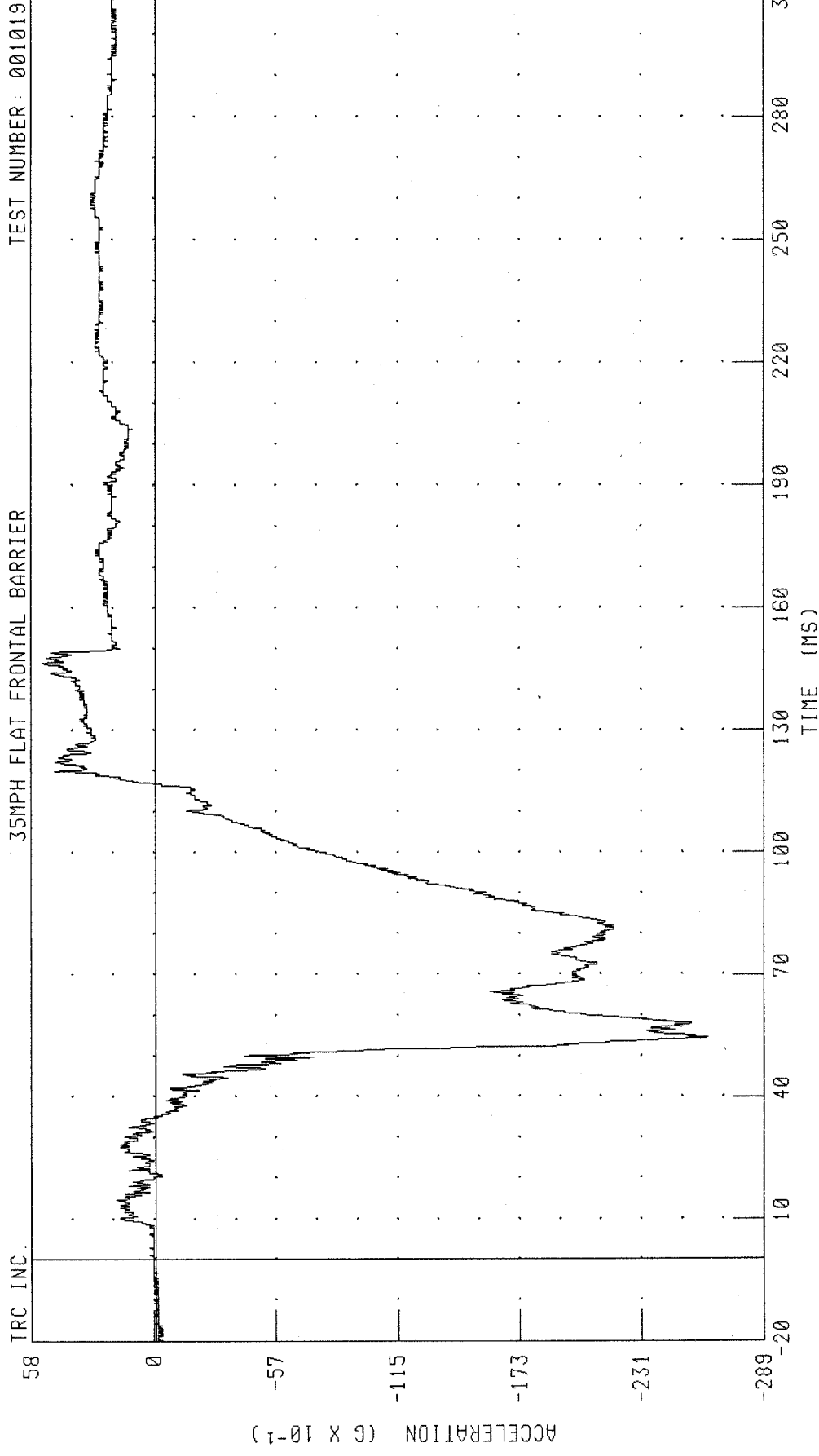
TEST NUMBER: 001019

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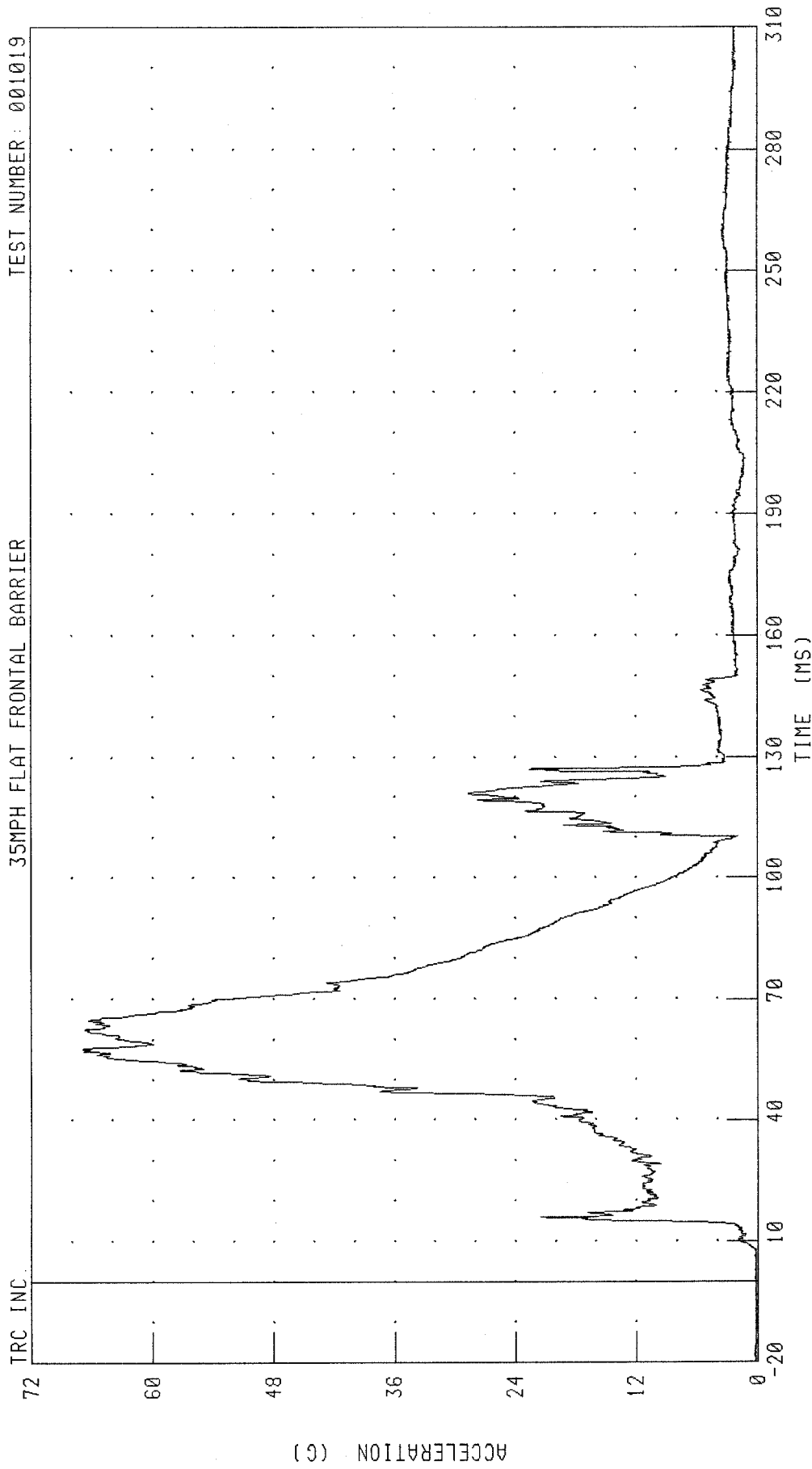
CHANNEL: PEVYG1 FILTER: CH. CLASS 1000 PEAK DATA: 16.11 G @ 79.28 MS; -8.85 G @ 50.48 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER PELVIS Z-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER



CHANNEL: PEVZG1 FILTER: CH. CLASS 1000 PEAK DATA: 5.39 G @ 146.48 MS; -26.26 G @ 54.56 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER PELVIS RESULTANT ACCELERATION  
35MPH FLAT FRONTAL BARRIER



TRC INC.

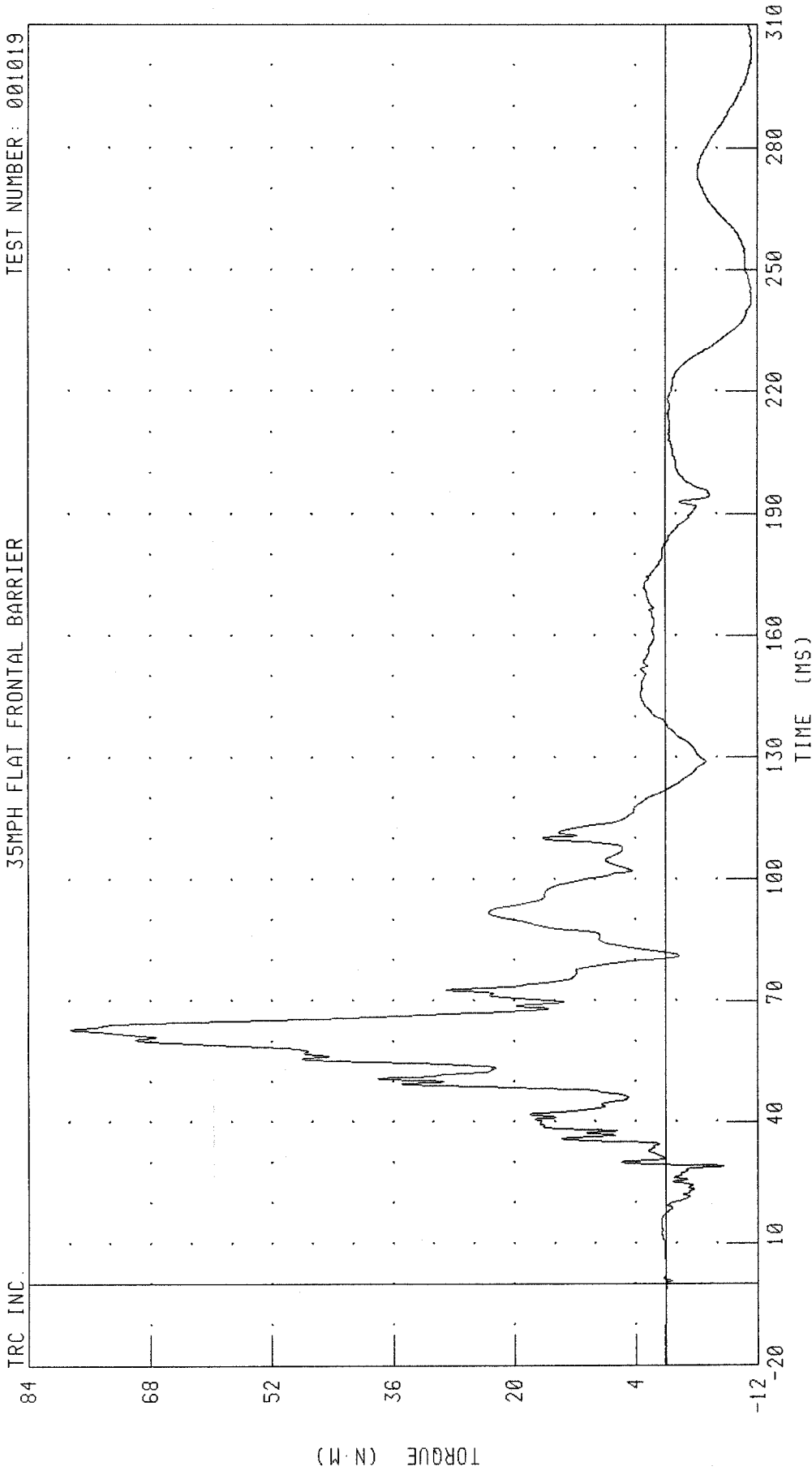
TEST NUMBER: 001019

CHANNEL: PEVRG1 FILTER: CH. CLASS 1000

PEAK DATA: 66.93 G @ 57.76 MS; 0.13 G @ -15.36 MS

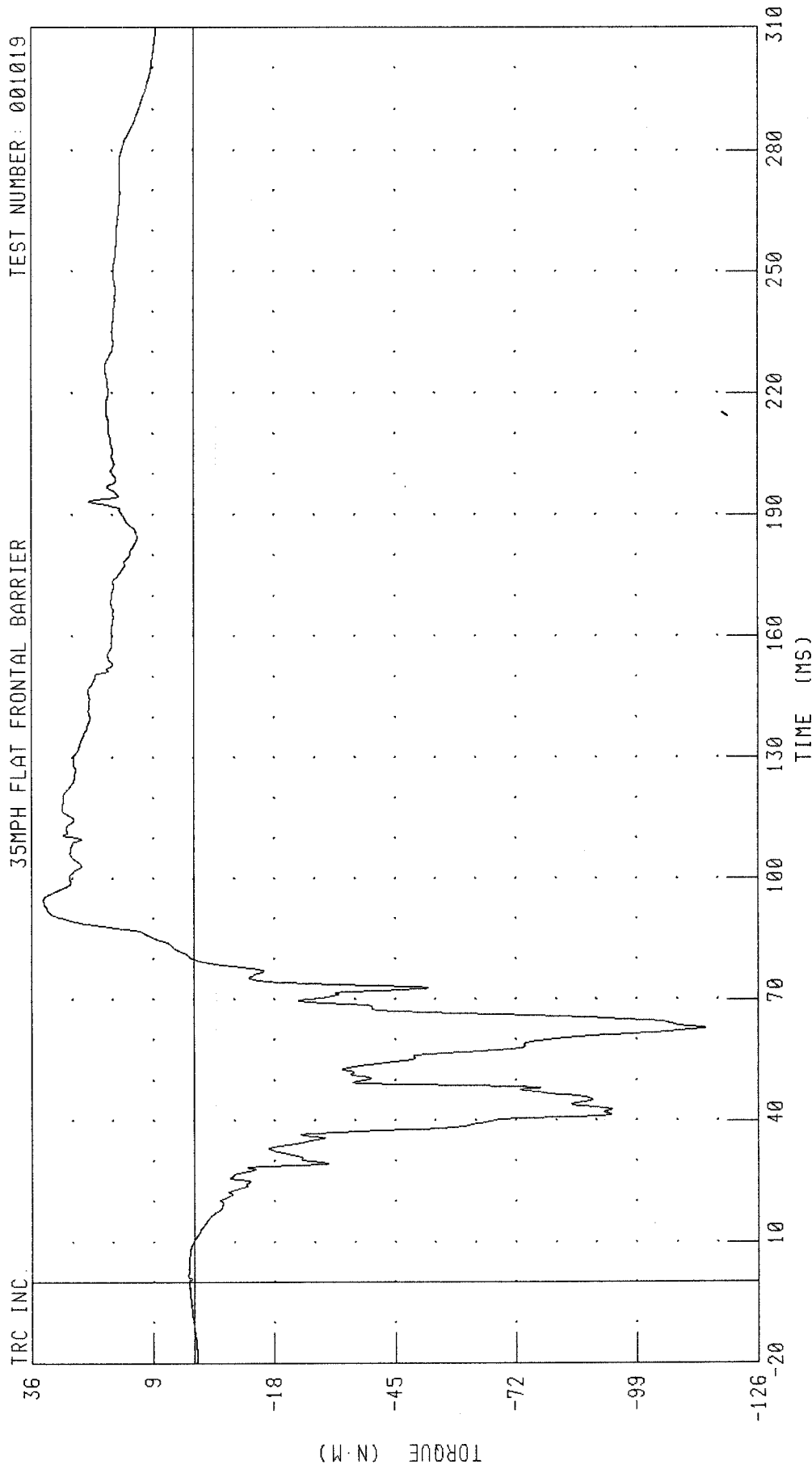
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LEFT UPPER TIBIA MOMENT ABOUT X AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



CHANNEL: TBLXM1 FILTER: CH. CLASS 600 PEAK DATA: 78.41 N·M @ 63.04 MS; -11.25 N·M @ 302.72 MS

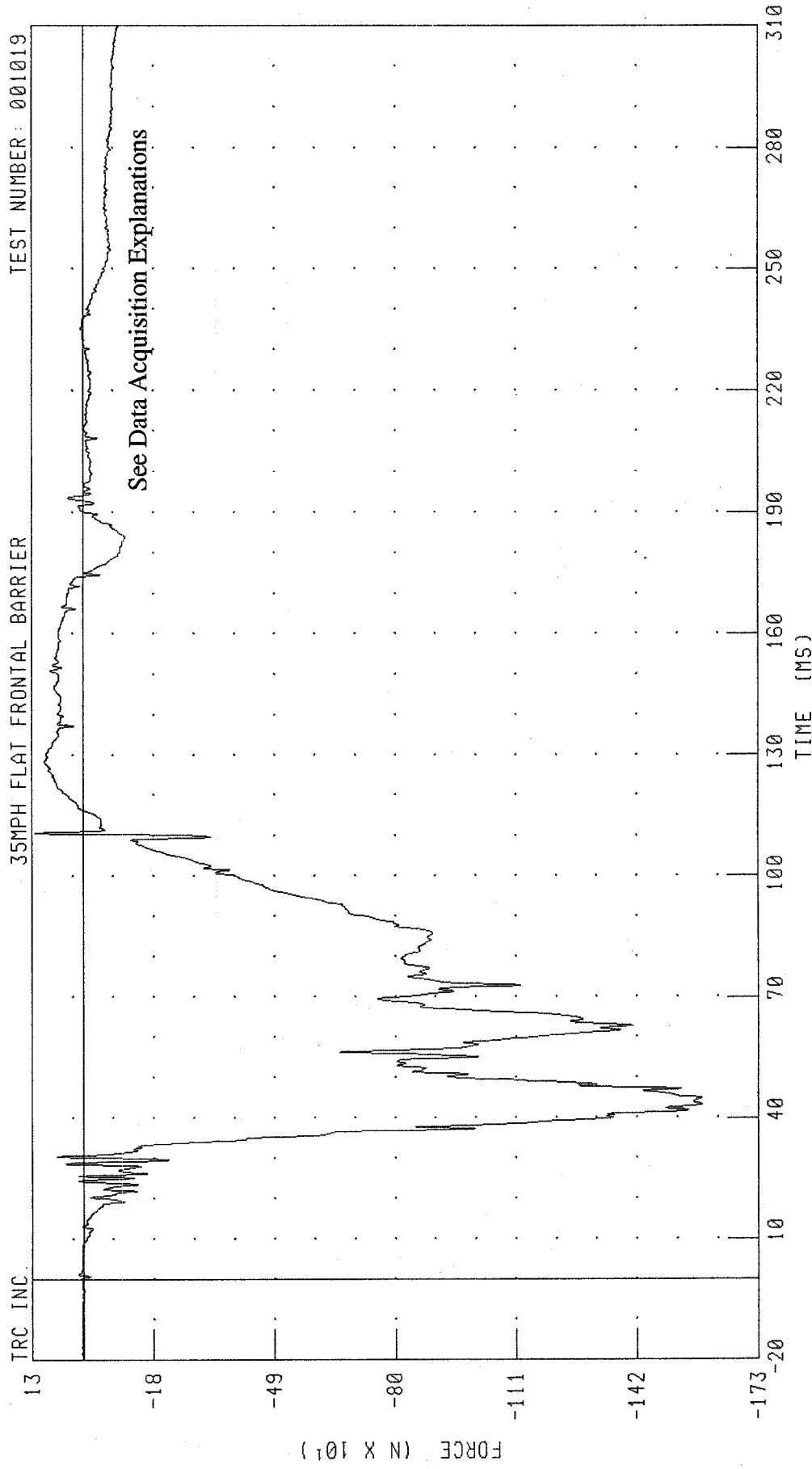
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LEFT UPPER TIBIA MOMENT ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER



CHANNEL: TBLYM1 FILTER: CH. CLASS 600  
PEAK DATA: 33.47 N·M @ 94.40 MS; -114.30 N·M @ 62.88 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LEFT UPPER TIBIA Z-AXIS FORCE  
35MPH FLAT FRONTAL BARRIER

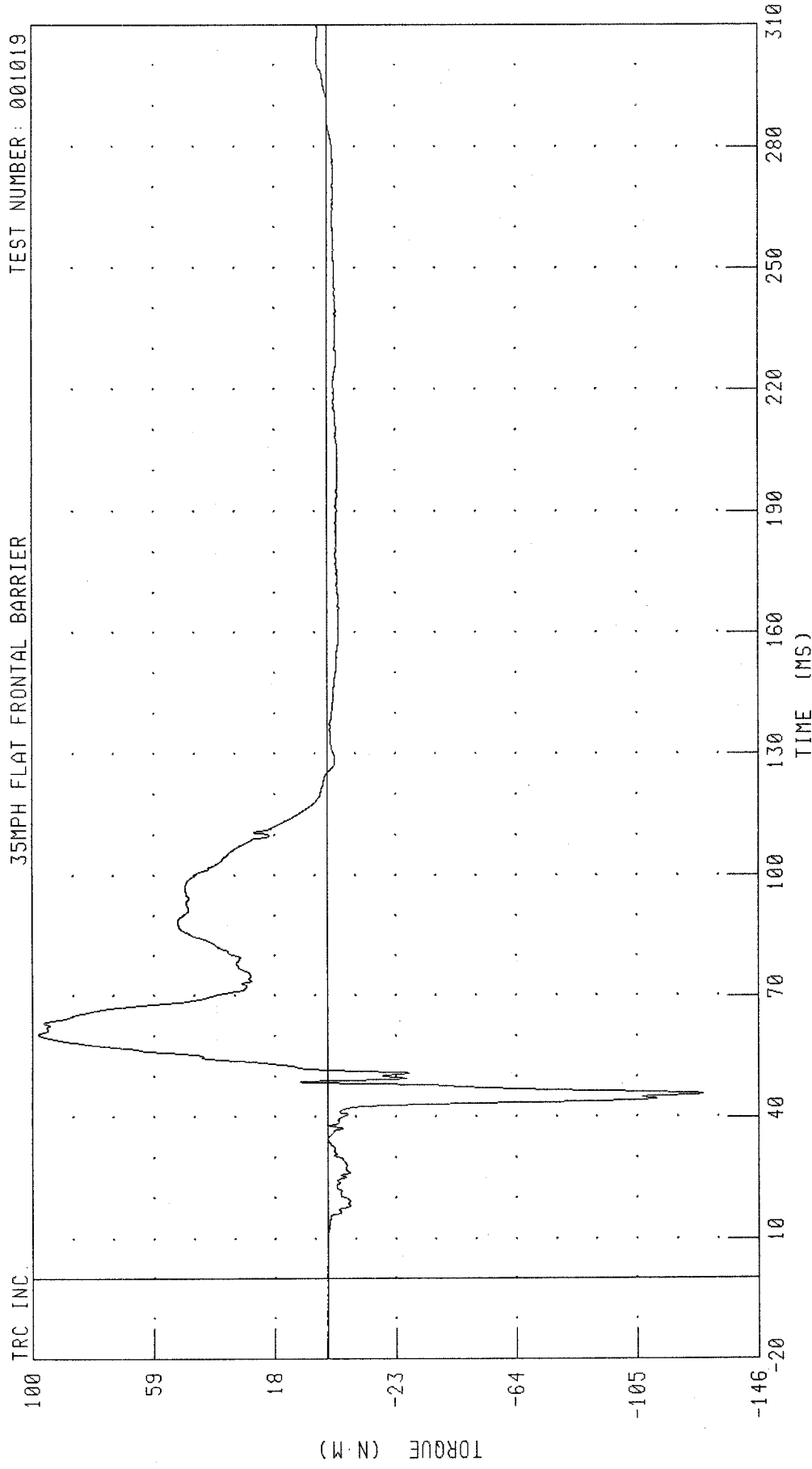
TEST NUMBER: 001019



CHANNEL: TBLZF1 FILTER: CH. CLASS 600  
PEAK DATA: 123.06 N @ 110.80 MS; -1586.94 N @ 43.36 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LEFT LOWER TIBIA MOMENT ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER

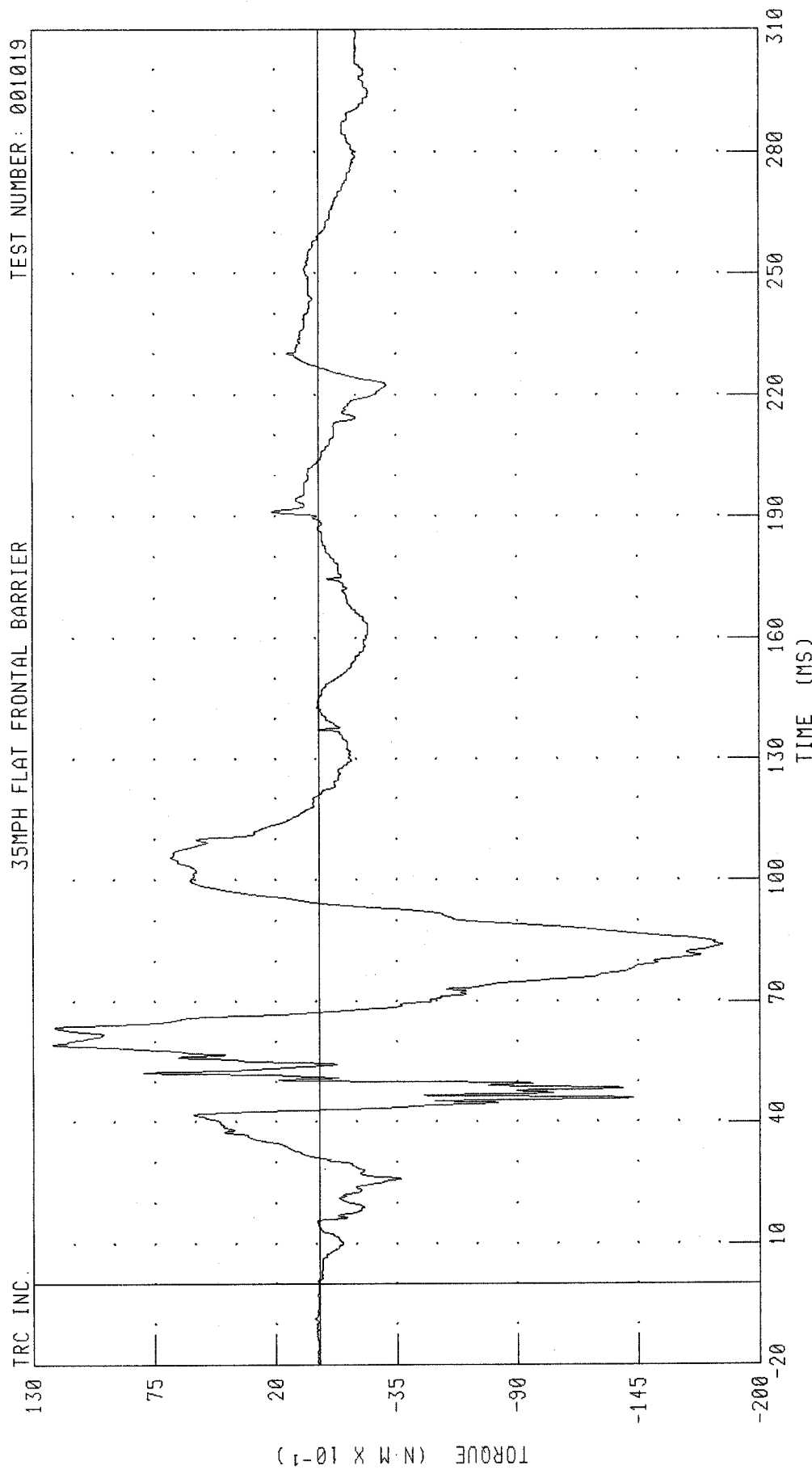
TEST NUMBER: 001019



CHANNEL: ANLYM1 FILTER: CH. CLASS 600 PEAK DATA: 98.04 N·M @ 60.40 MS; -127.35 N·M @ 45.76 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LEFT LOWER TIBIA MOMENT ABOUT X AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

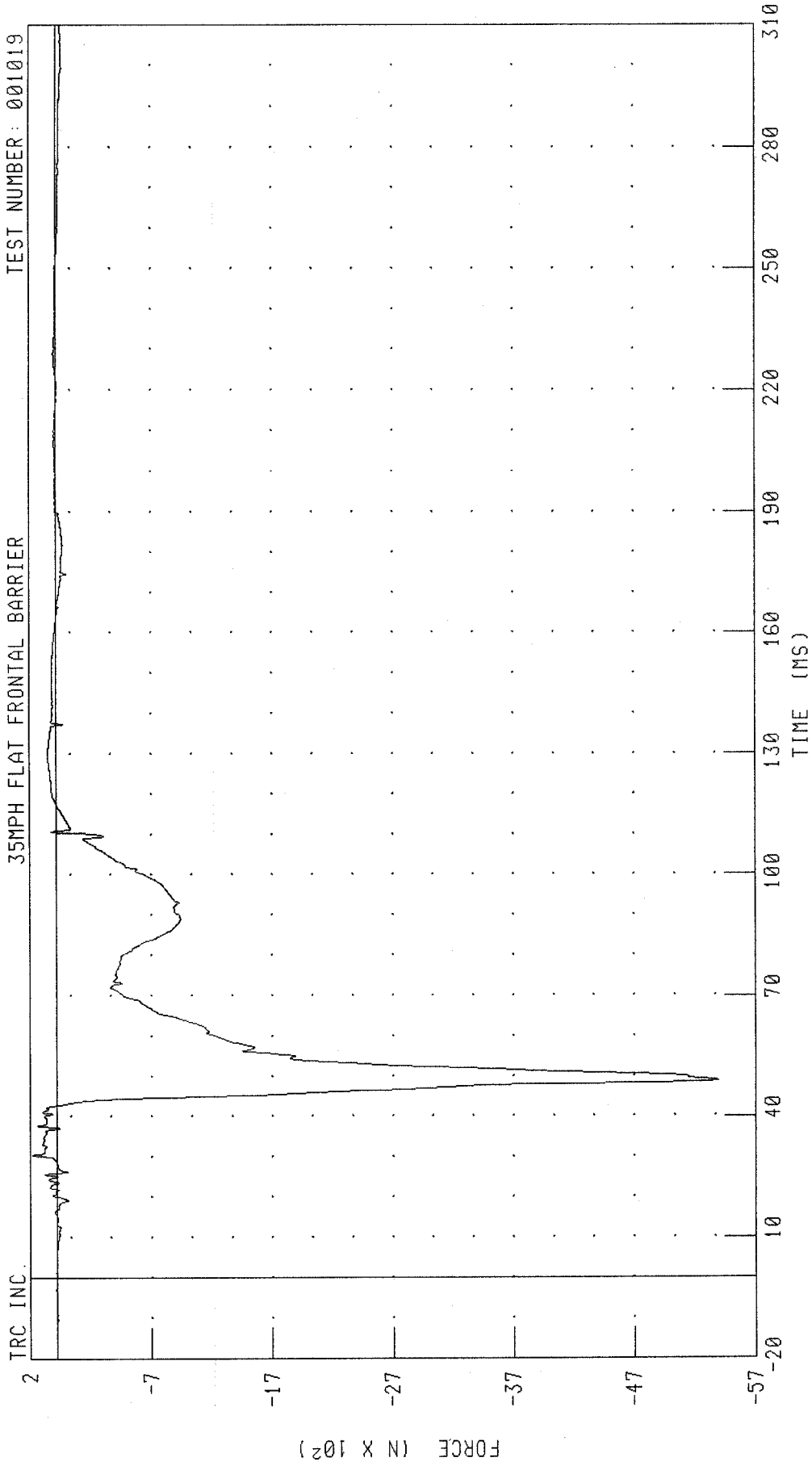


CHANNEL: ANLXM1 FILTER: CH. CLASS 600 PEAK DATA: 12.11 N·M @ 59.36 MS; -18.34 N·M @ 83.92 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LEFT LOWER TIBIA Z-AXIS FORCE  
35MPH FLAT FRONTAL BARRIER

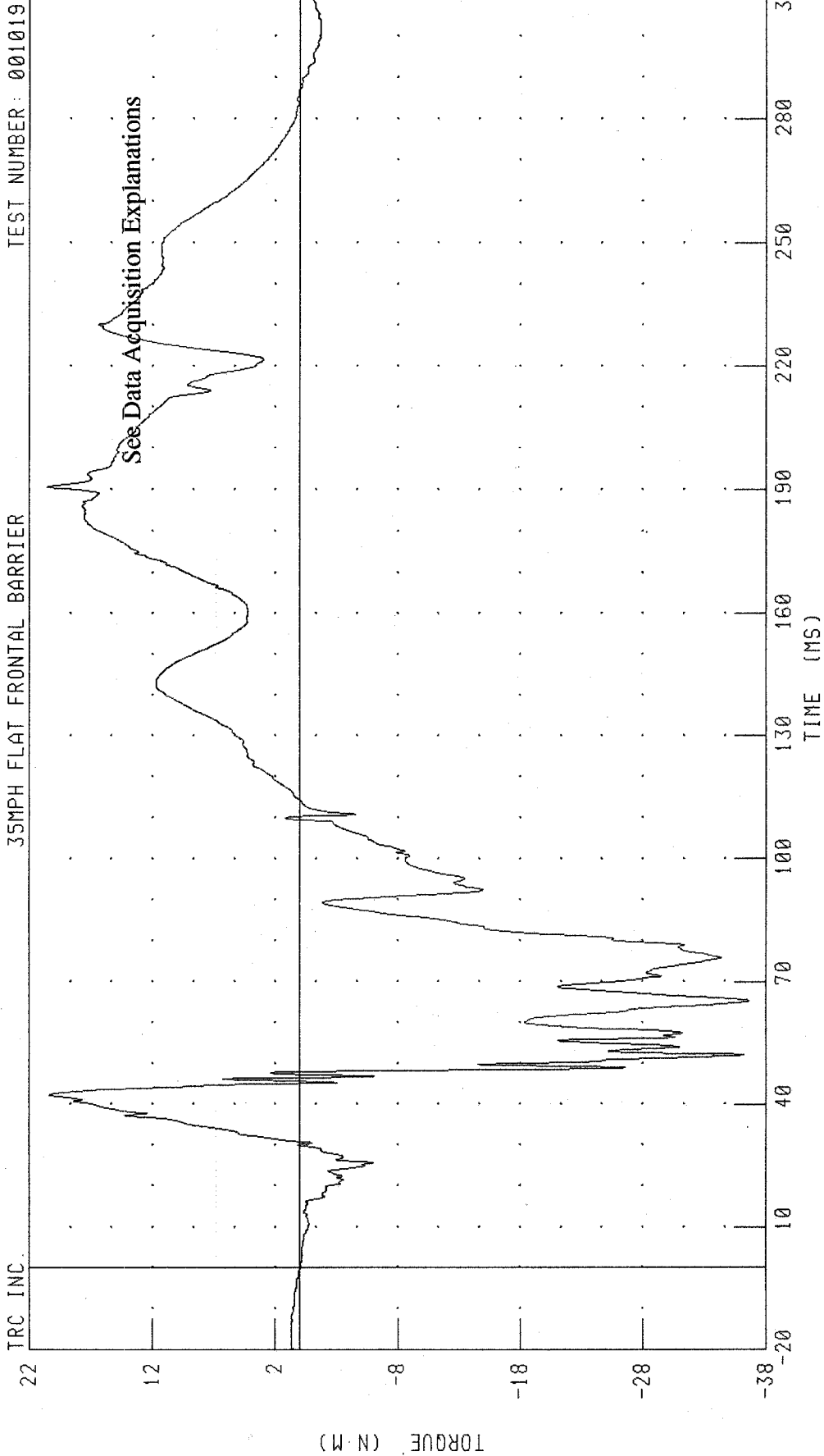
TEST NUMBER: 001019

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CHANNEL: ANLZF1 FILTER: CH. CLASS 600 PEAK DATA: 202.35 N @ 30.48 MS, -5477.76 N @ 48.80 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER RIGHT UPPER TIBIA MOMENT ABOUT X AXIS  
35MPH FLAT FRONTAL BARRIER

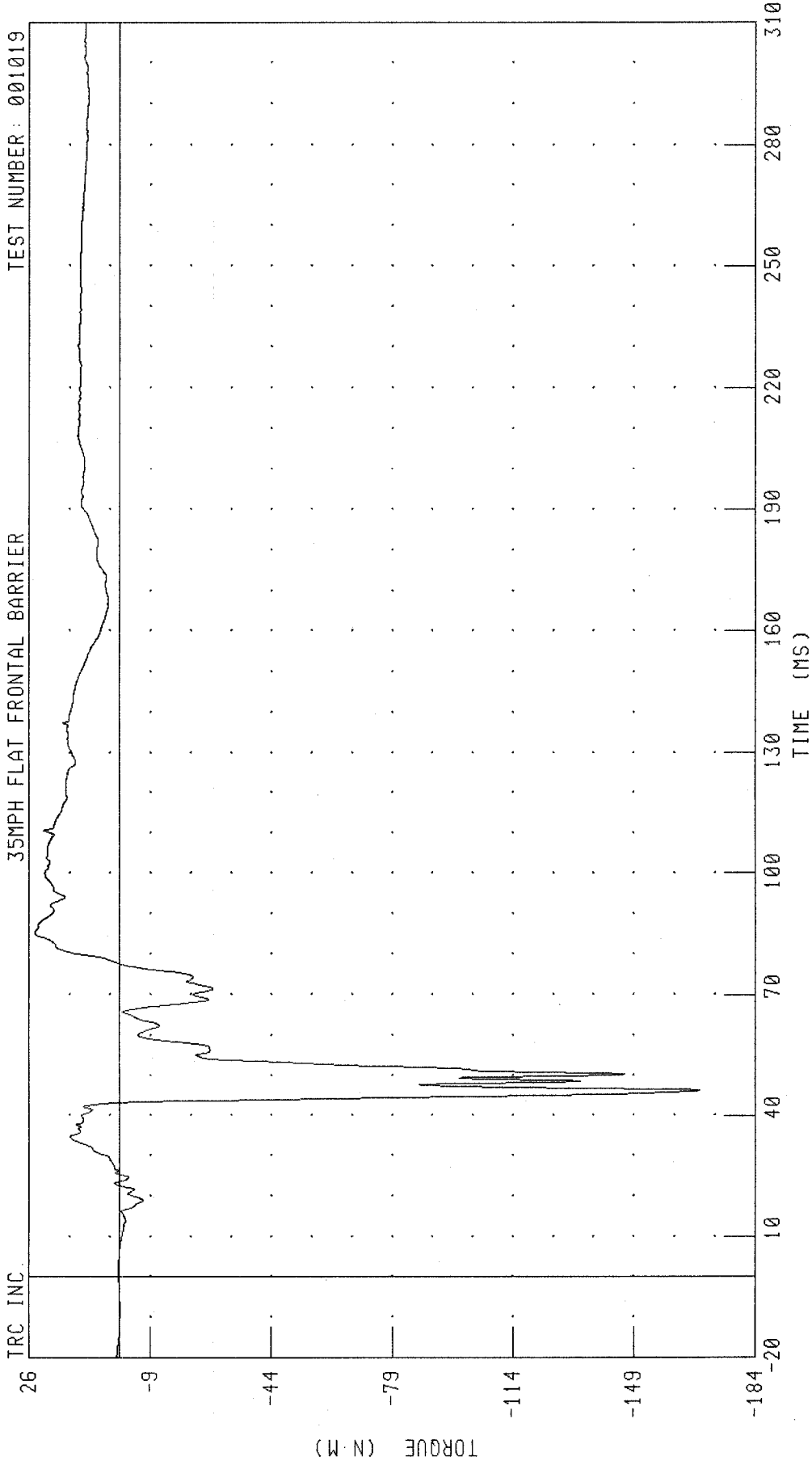


CHANNEL: TBRXM1 FILTER: CH. CLASS 600 PEAK DATA: 20.55 N.M @ 190.64 MS; -36.68 N.M @ 65.28 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER RIGHT UPPER TIBIA MOMENT ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

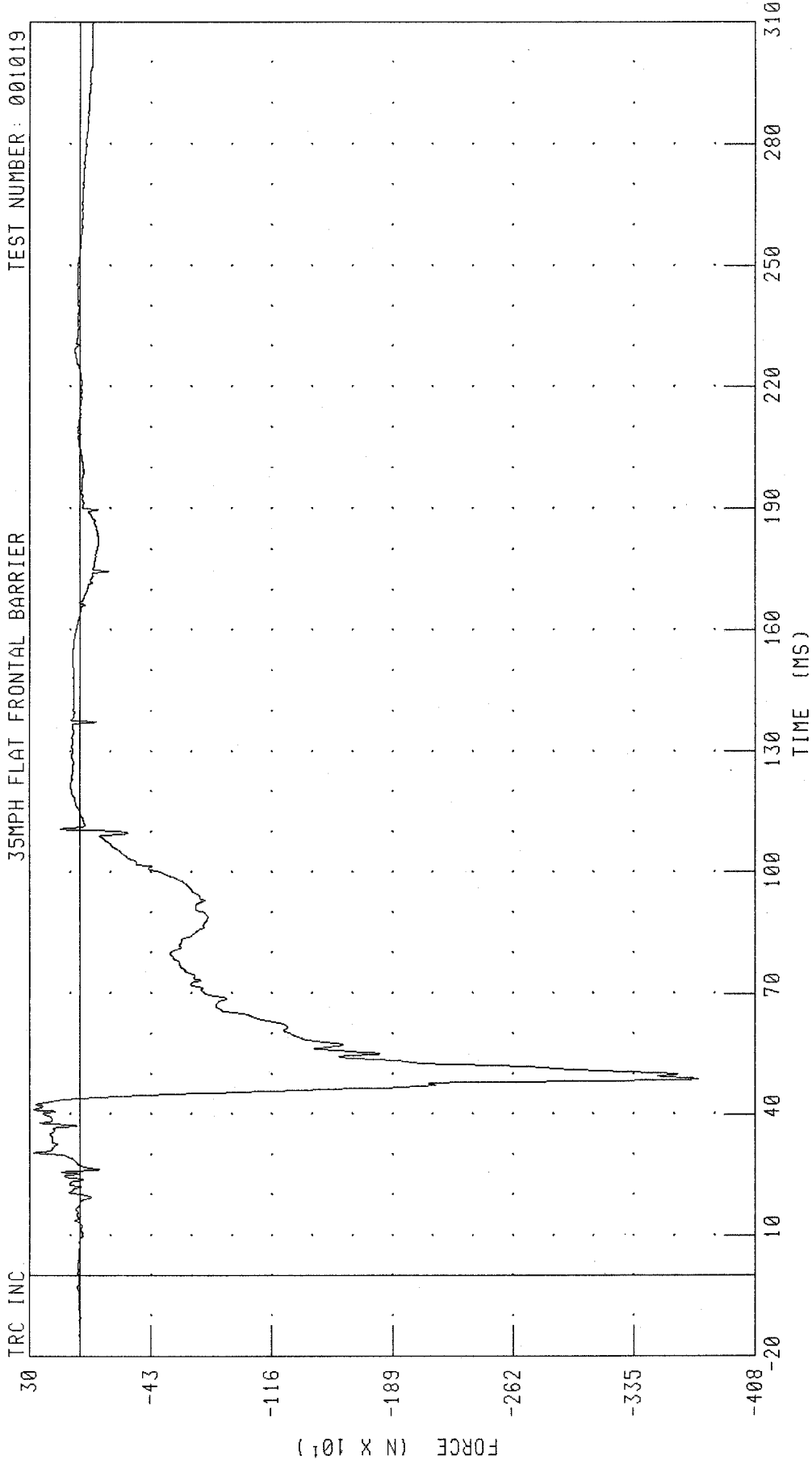


PEAK DATA: 24.26 N·M @ 85.20 MS; -167.92 N·M @ 46.24 MS

CHANNEL: TBRYM1 FILTER: CH. CLASS 600

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER RIGHT UPPER TIBIA Z-AXIS FORCE  
35MPH FLAT FRONTAL BARRIER

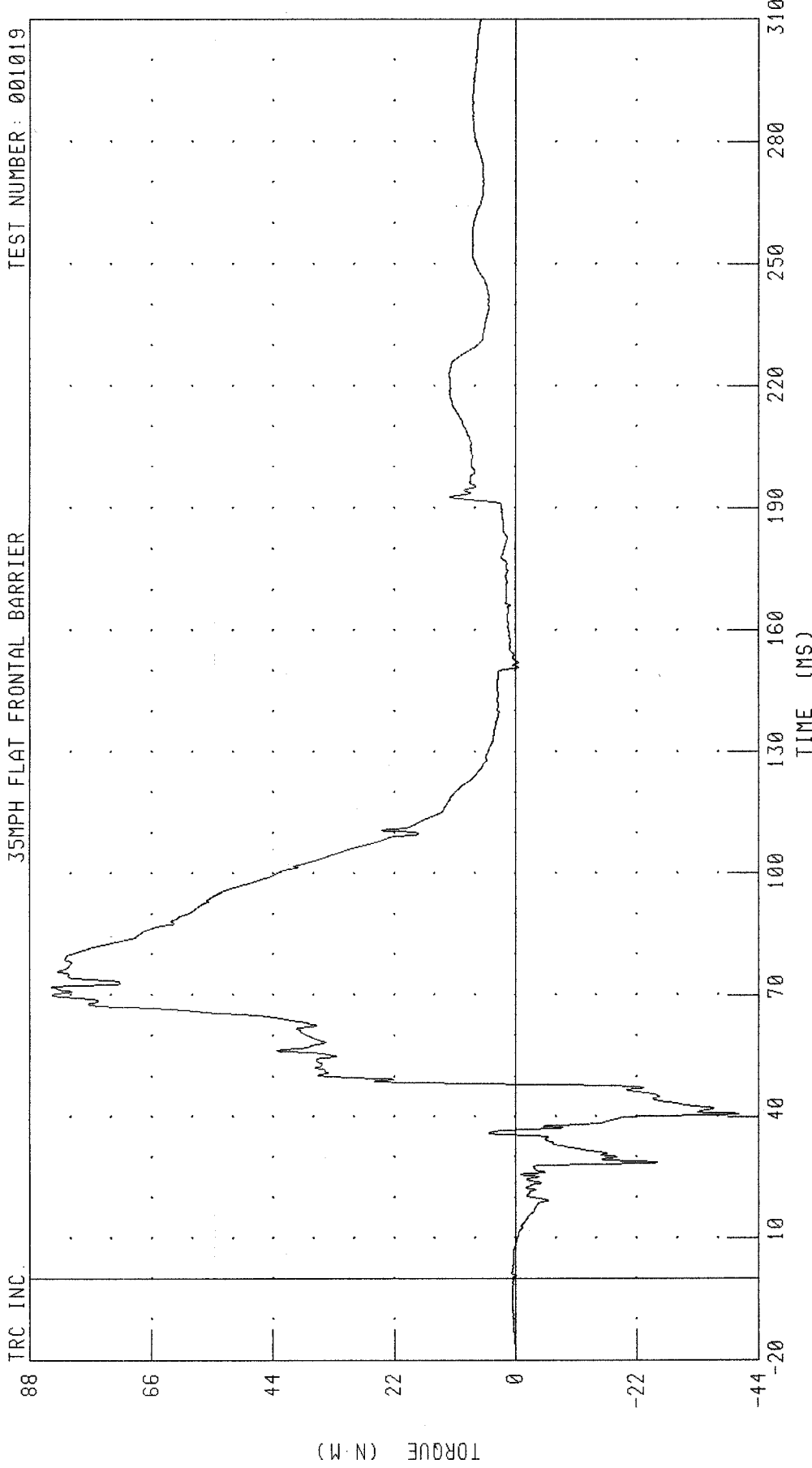
TEST NUMBER: 001019



CHANNEL: TBRZF1 FILTER: CH. CLASS 600 PEAK DATA: 275.46 N @ 30.56 MS; -3741.53 N @ 48.80 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER RIGHT LOWER TIBIA MOMENT ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



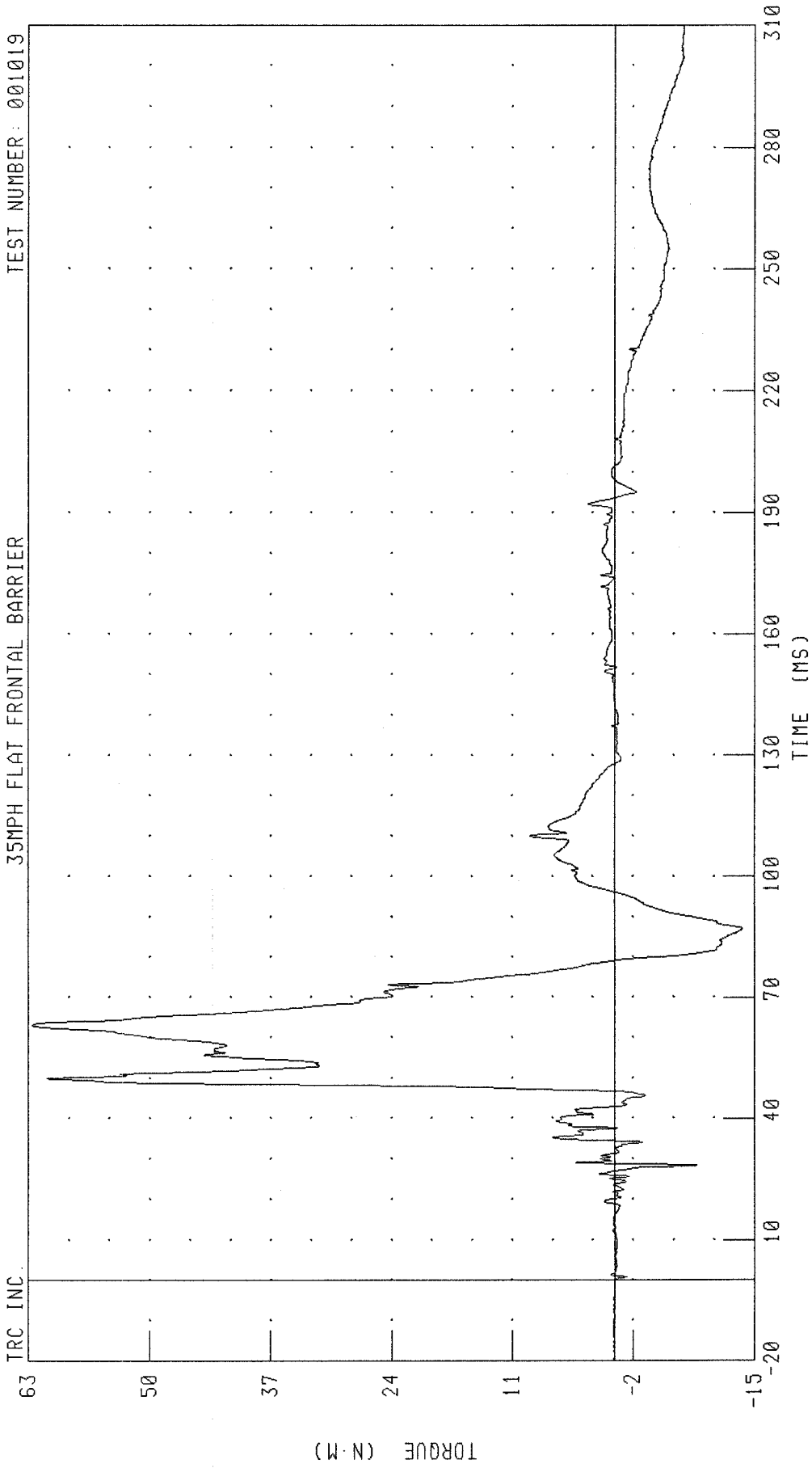
CHANNEL: ANRYM1 FILTER: CH. CLASS 600

PEAK DATA: 84.13 N·M @ 72.08 MS; -40.46 N·M @ 40.64 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER RIGHT LOWER TIBIA MOMENT ABOUT X AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.



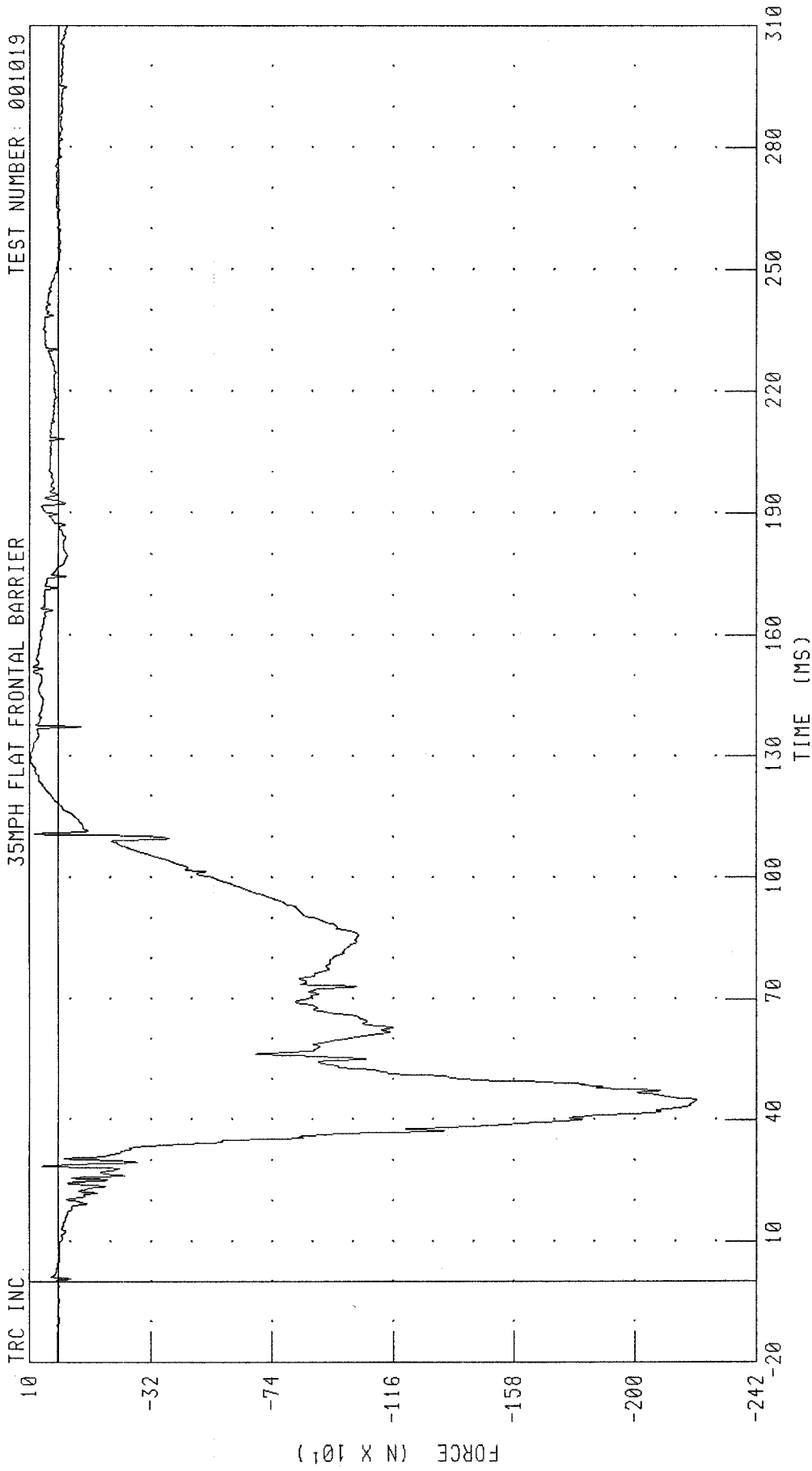
CHANNEL: ANRXM1 FILTER: CH. CLASS 600

PEAK DATA: 62.56 N.M @ 63.04 MS; -13.65 N.M @ 87.04 MS

TORQUE (N.M)

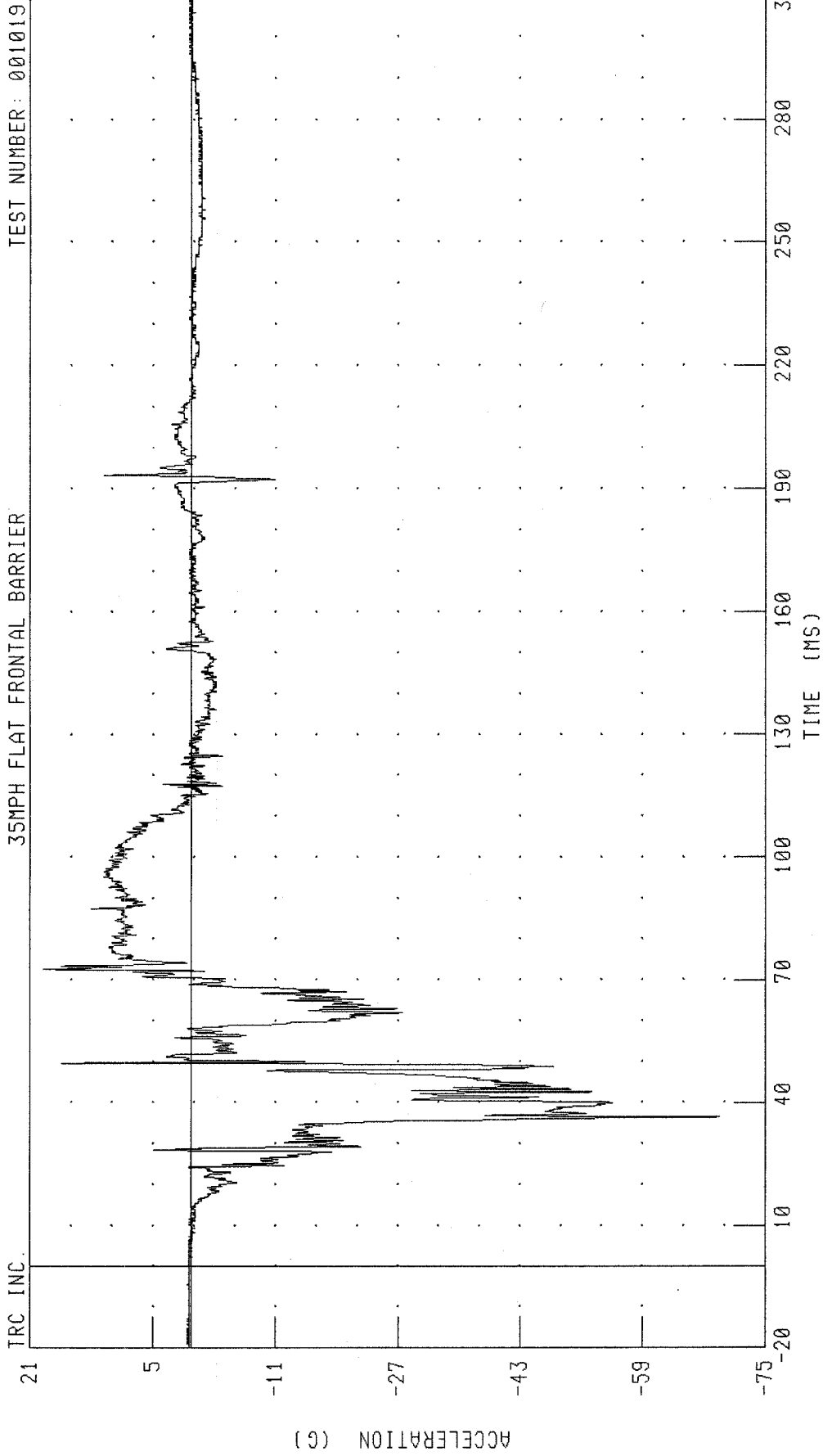
TIME (MS)

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER RIGHT LOWER TIBIA Z-AXIS FORCE  
35MPH FLAT FRONTAL BARRIER



CHANNEL: ANRZF1 FILTER: CH. CLASS 600

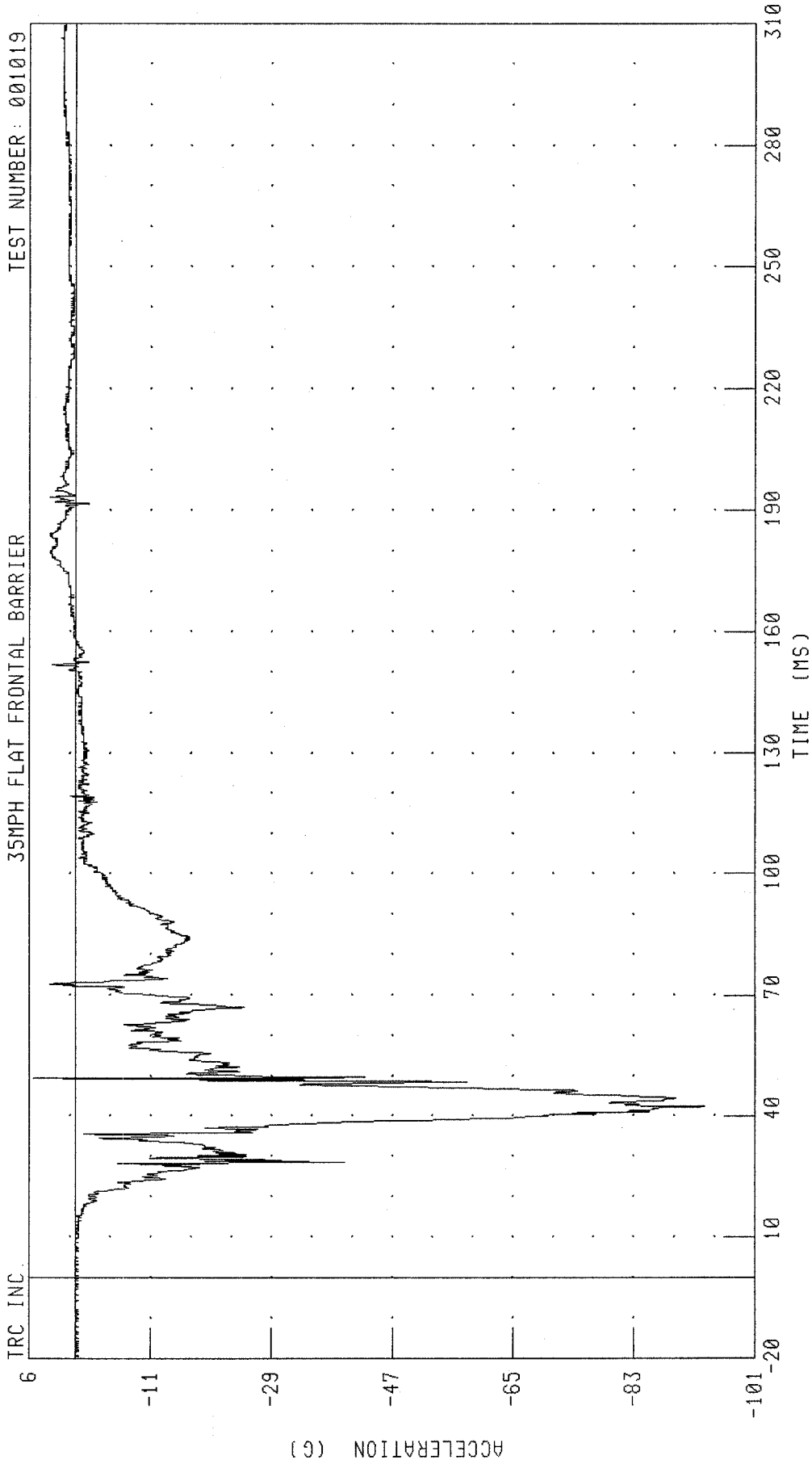
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LEFT FOOT X-AXIS ACCELERATION AT HEEL  
35MPH FLAT FRONTAL BARRIER



CHANNEL: FLHXG1 FILTER: CH. CLASS 1000 PEAK DATA: 19.22 G @ 72.56 MS; -69.08 G @ 36.48 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LEFT FOOT Z-AXIS ACCELERATION AT HEEL  
35MPH FLAT FRONTAL BARRIER

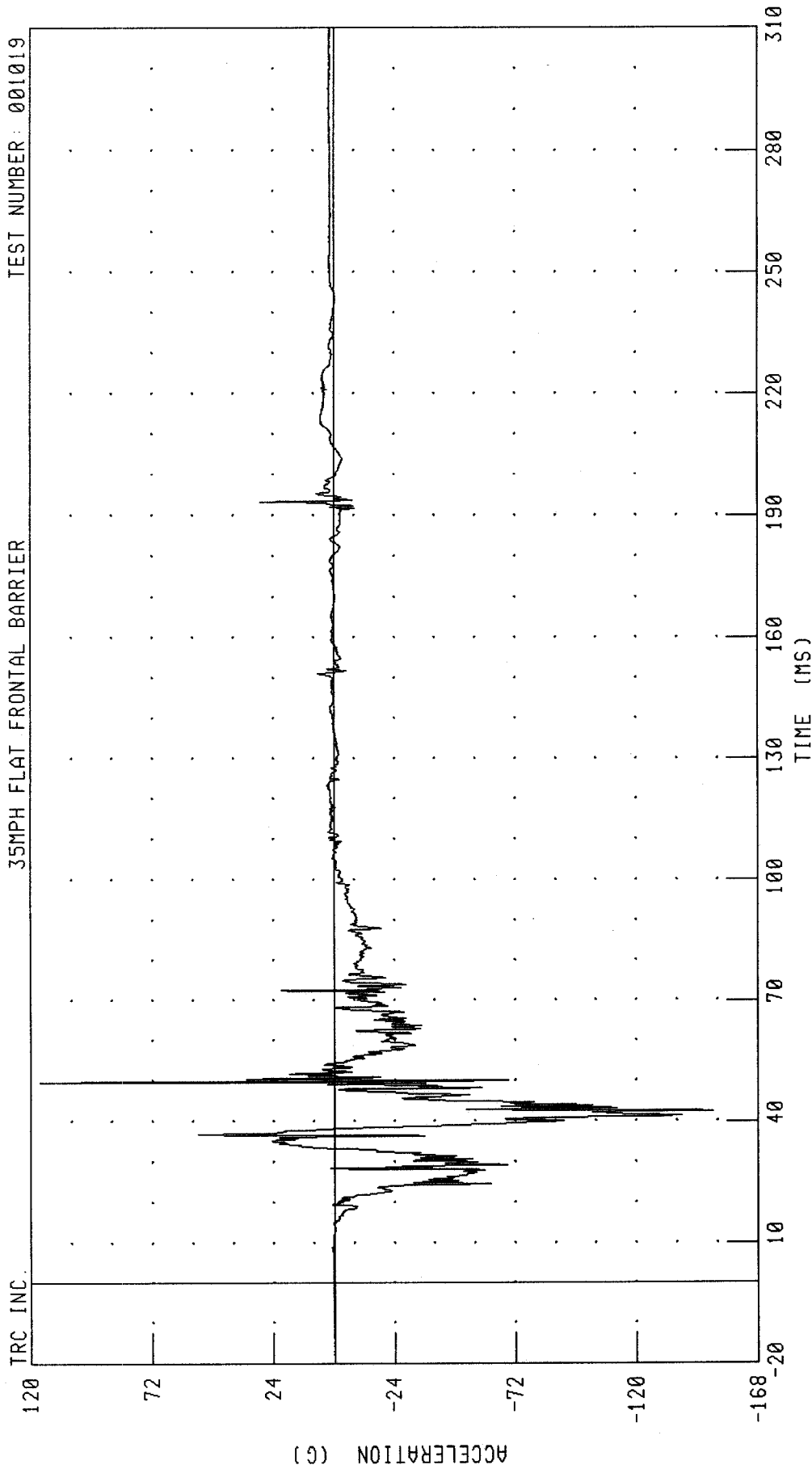
TEST NUMBER: 001019



CHANNEL: FLHZG1 FILTER: CH. CLASS 1000 PEAK DATA: 6.29 G @ 49.44 MS; -93.63 G @ 42.40 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LEFT FOOT Z-AXIS ACCELERATION AT TOE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



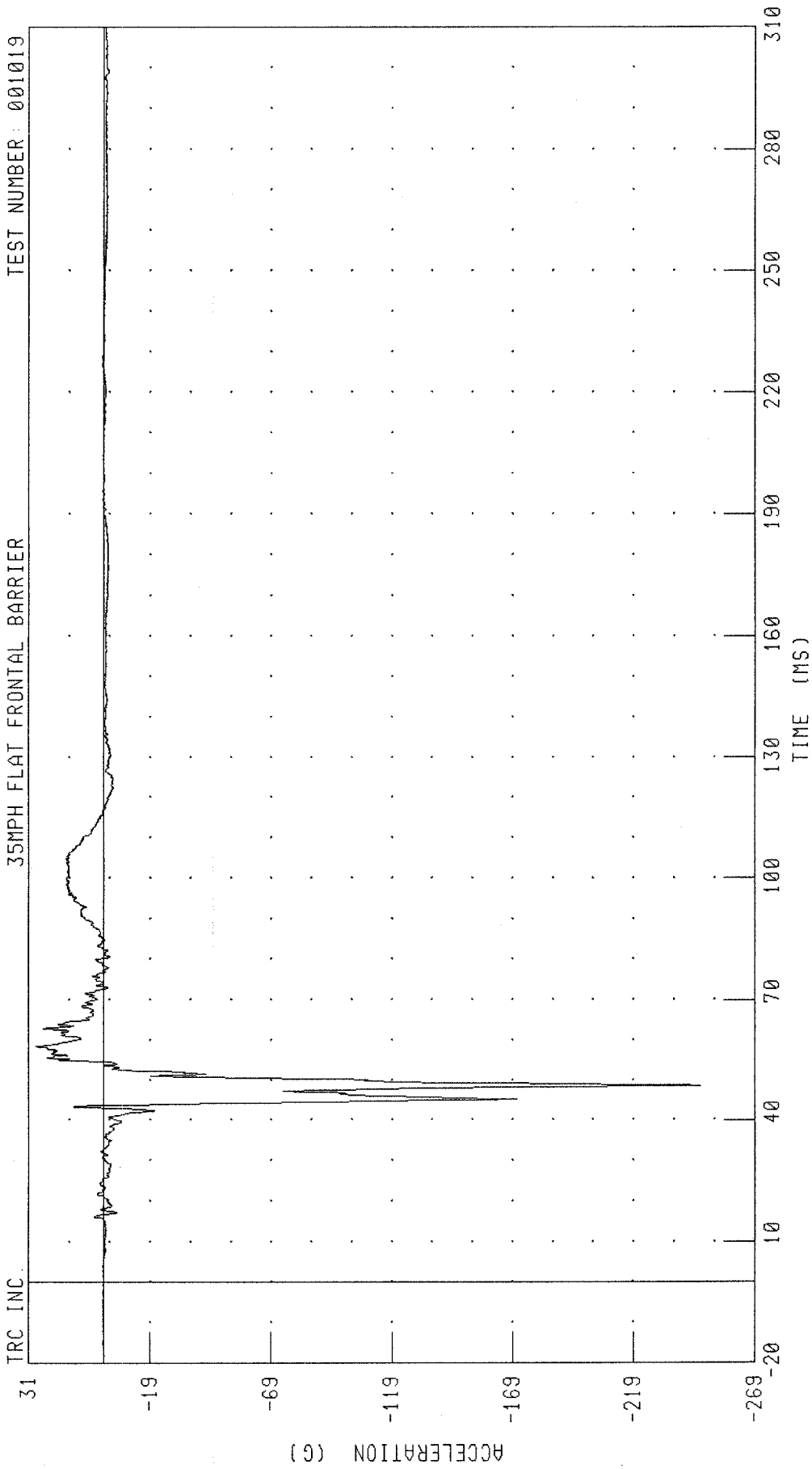
PEAK DATA: 116.48 G @ 49.68 MS; -150.33 G @ 42.56 MS

CHANNEL: FLTZG1 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER RIGHT FOOT X-AXIS ACCELERATION AT HEEL  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

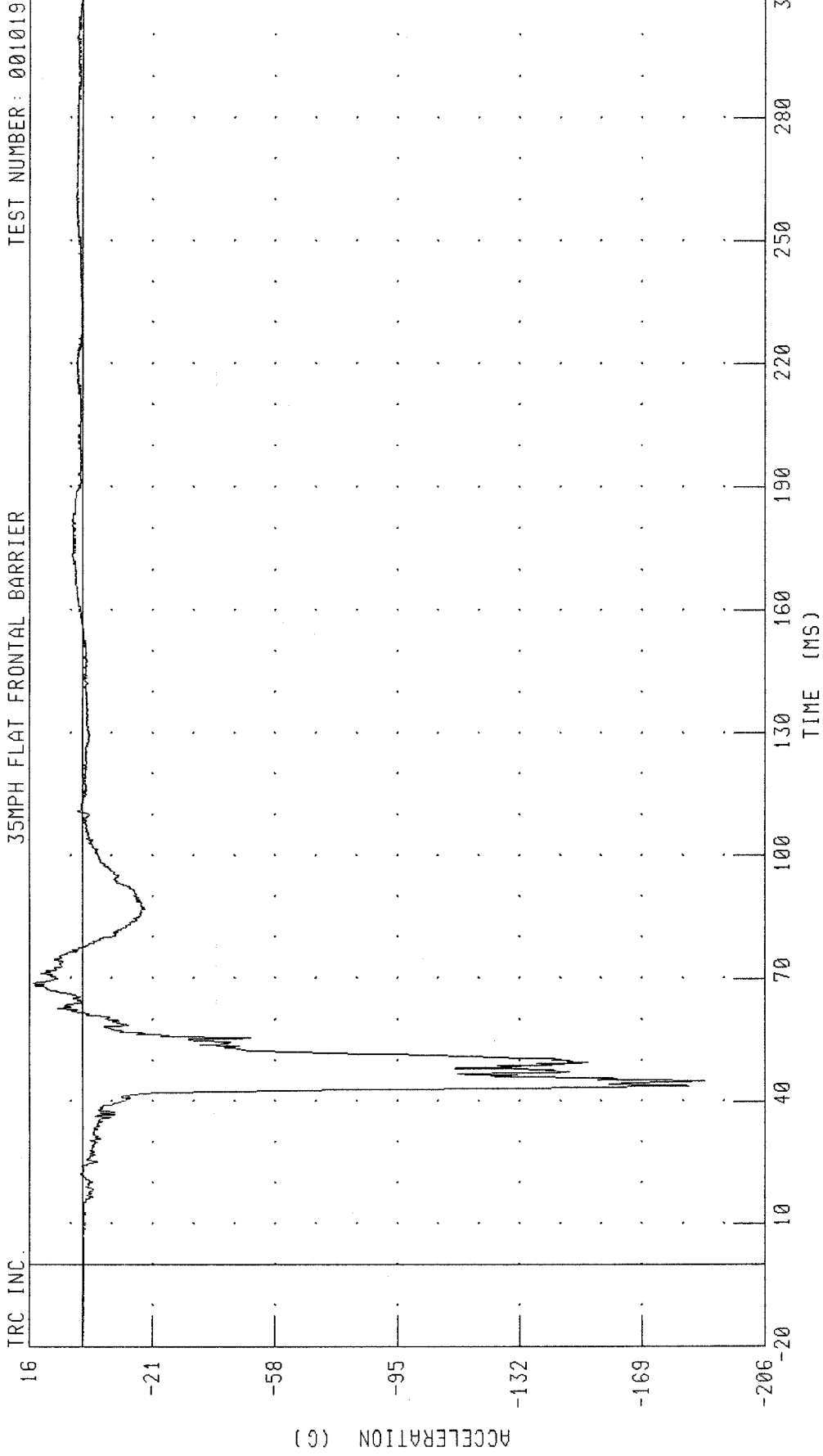
TRC INC.



CHANNEL: FRHXG1 FILTER: CH. CLASS 1000

PEAK DATA: 28.32 G @ 58.40 MS, -246.74 G @ 48.64 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER RIGHT FOOT Z-AXIS ACCELERATION AT HEEL  
35MPH FLAT FRONTAL BARRIER

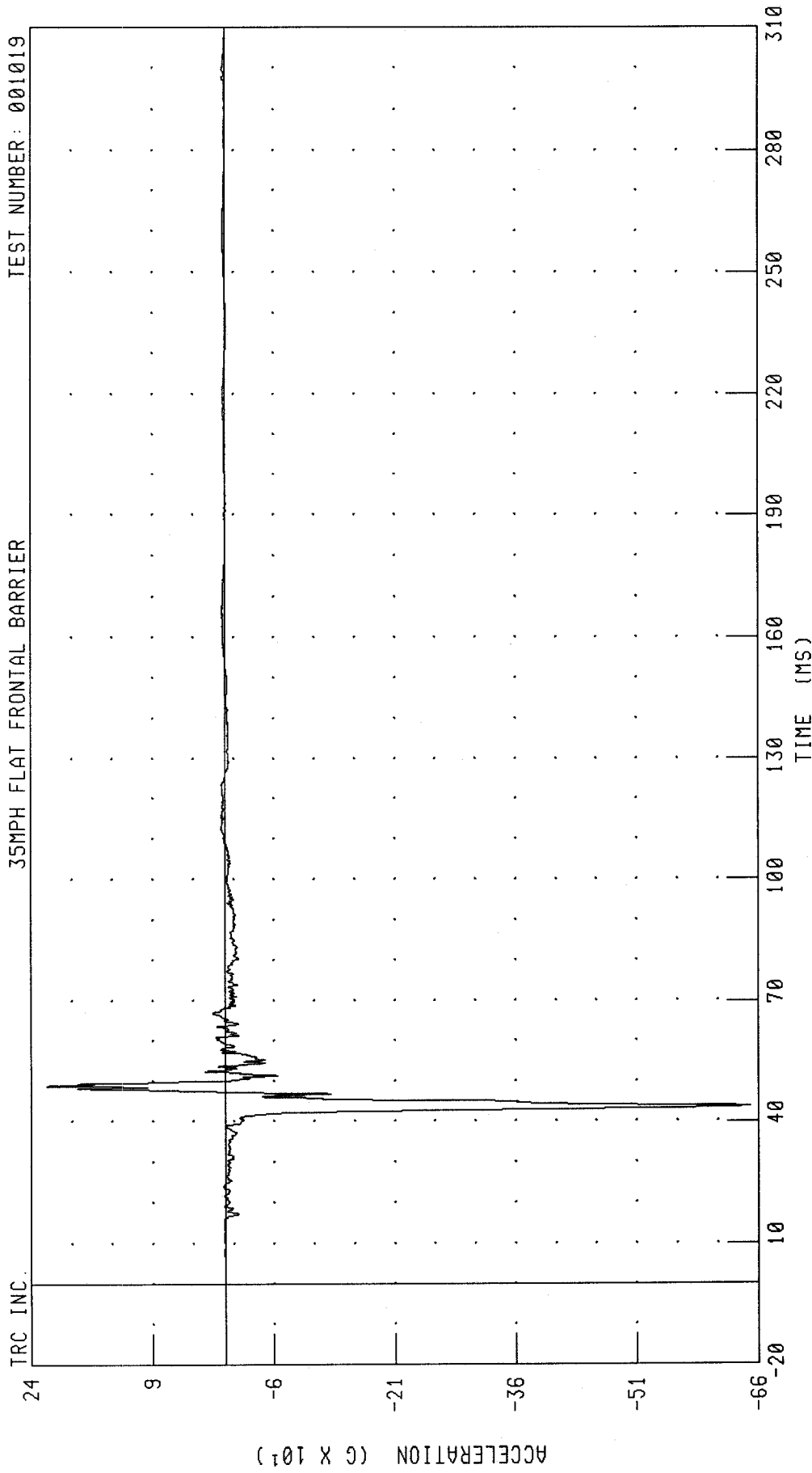


CHANNEL: FRHZC1 FILTER: CH. CLASS 1000

PEAK DATA: 14.92 G @ 68.80 MS; -187.96 G @ 44.96 MS

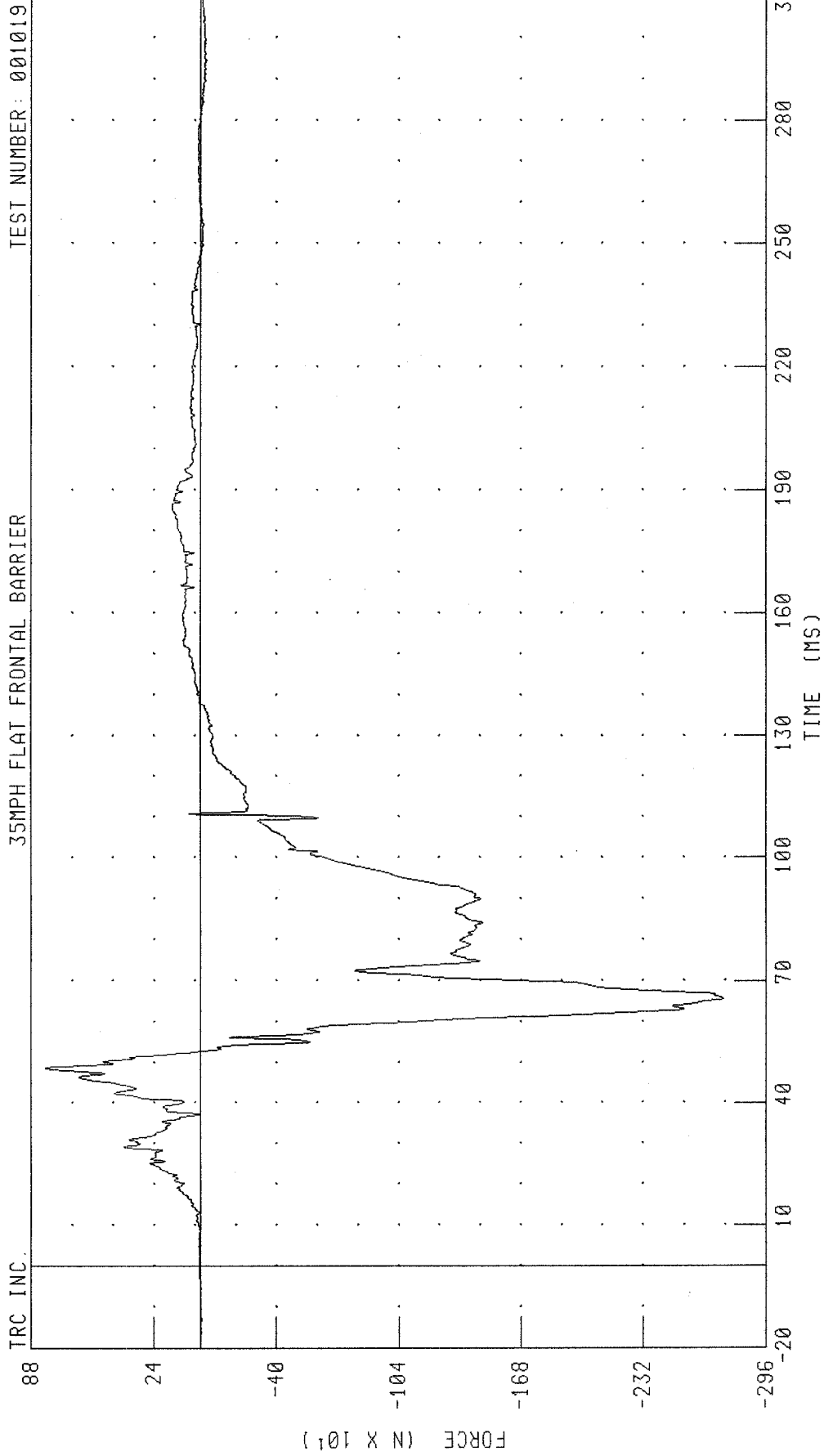
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER RIGHT FOOT Z-AXIS ACCELERATION AT TOE  
35MPH FLAT FRONTAL BARRIER

TRC INC. TEST NUMBER: 001019



CHANNEL: FRTZG1 FILTER: CH. CLASS 1000 PEAK DATA: 221.57 G @ 48.88 MS; -649.84 G @ 43.76 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LEFT FEMUR FORCE  
35MPH FLAT FRONTAL BARRIER

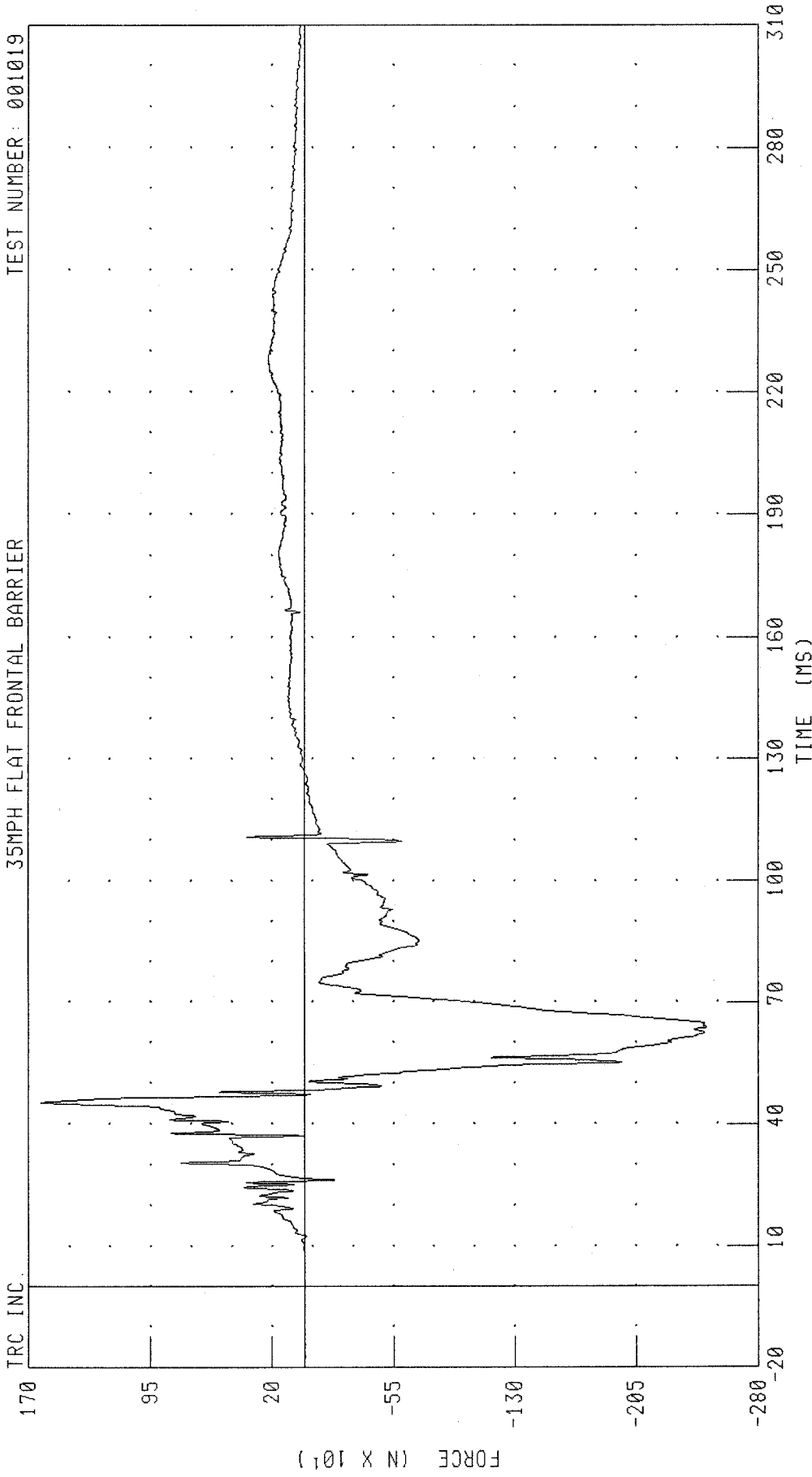


CHANNEL: LFMZF1 FILTER: CH. CLASS 600 PEAK DATA: 807.35 N @ 48.72 MS; -2737.70 N @ 65.52 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER RIGHT FEMUR FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

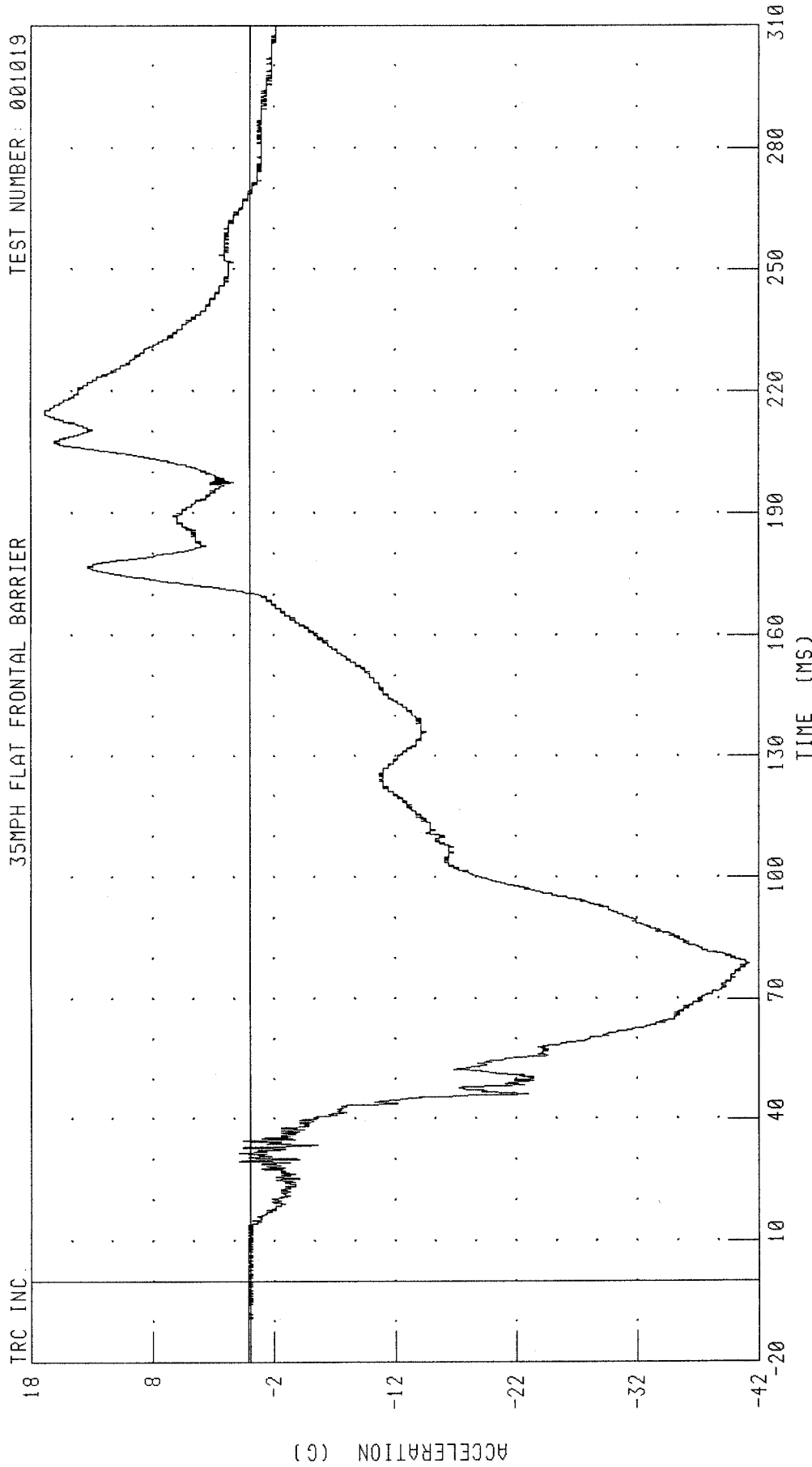
TRC INC.



CHANNEL: RFMZFI FILTER: CH. CLASS 600 PEAK DATA: 1623.92 N @ 45.28 MS; -2486.13 N @ 63.76 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER HEAD X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

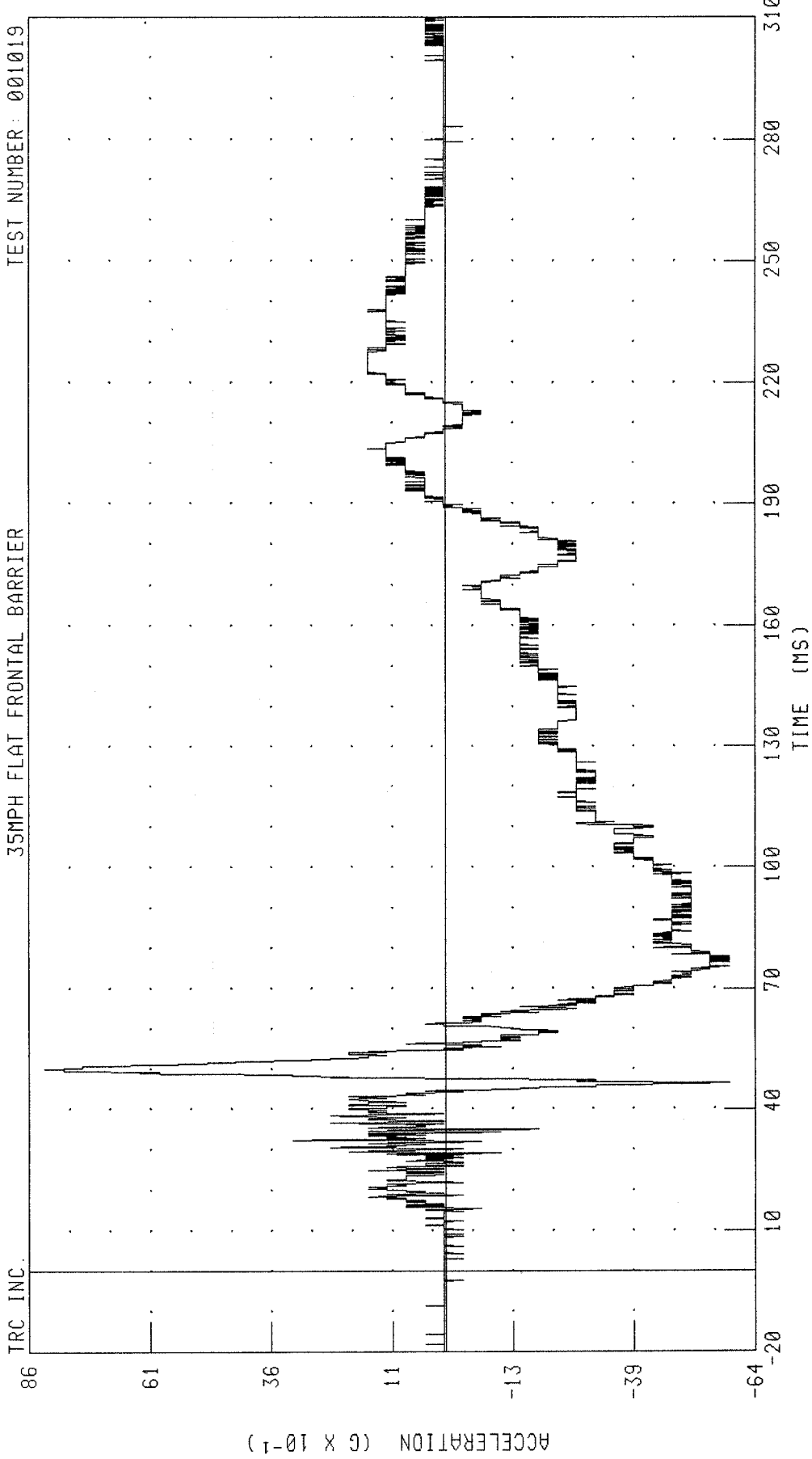


CHANNEL: HEDXG2 FILTER: CH. CLASS 1000

PEAK DATA: 16.82 G @ 214.08 MS; -41.26 G @ 78.72 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER HEAD Y-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



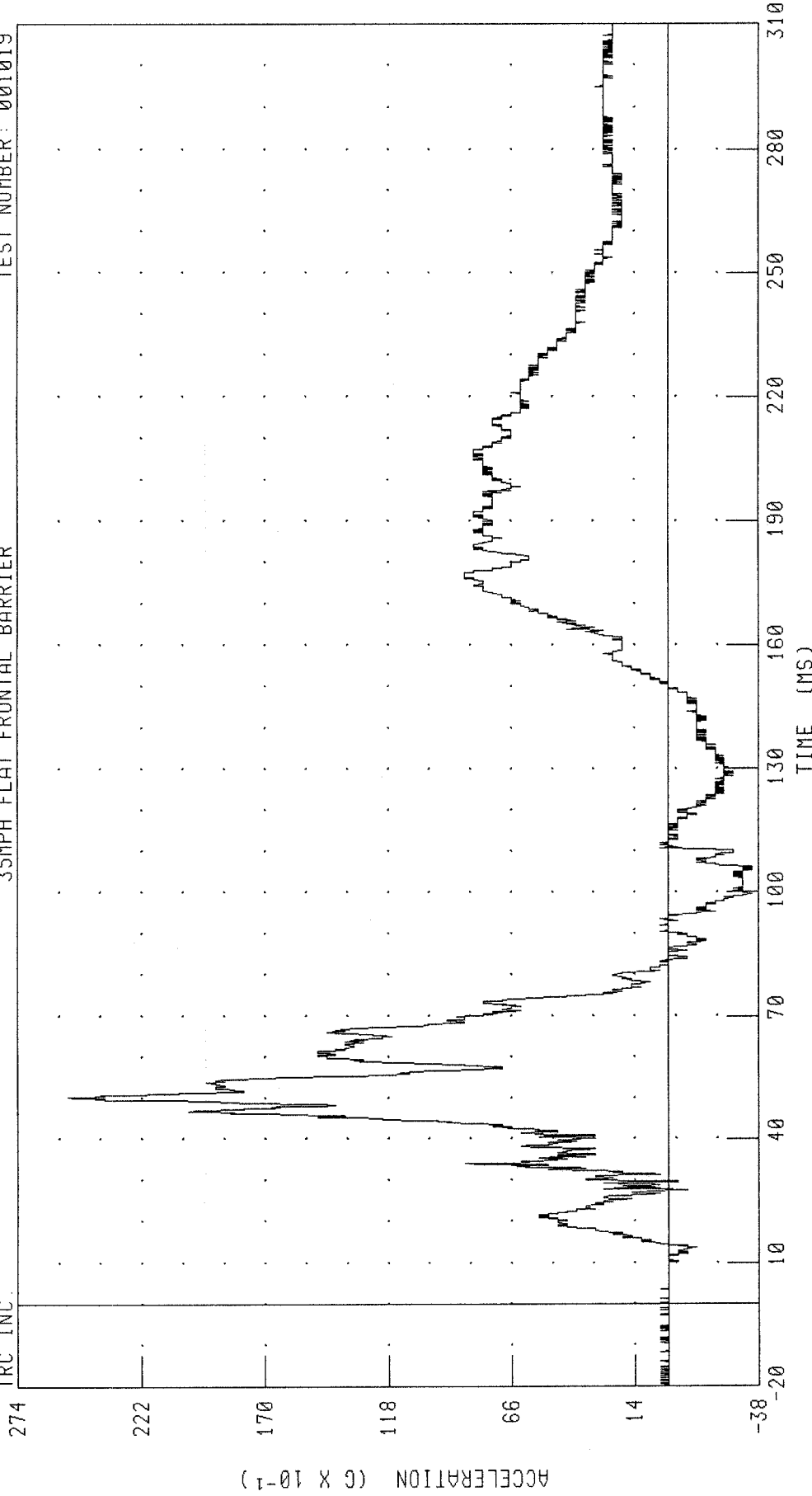
CHANNEL: HEDYC2 FILTER: CH. CLASS 1000

PEAK DATA: 8.29 G @ 50.08 MS; -5.87 G @ 46.48 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER HEAD Z-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

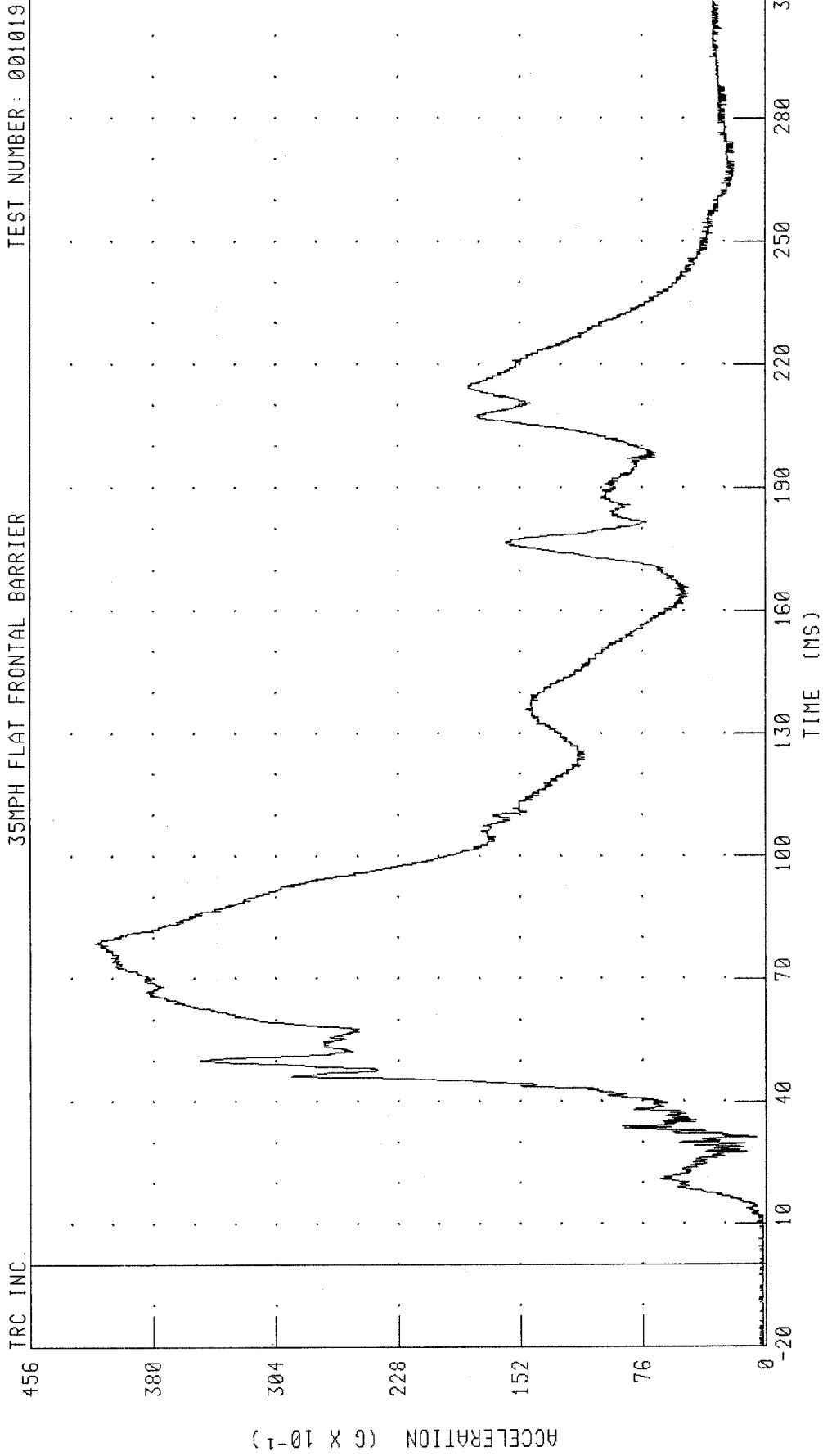
TRC. INC.



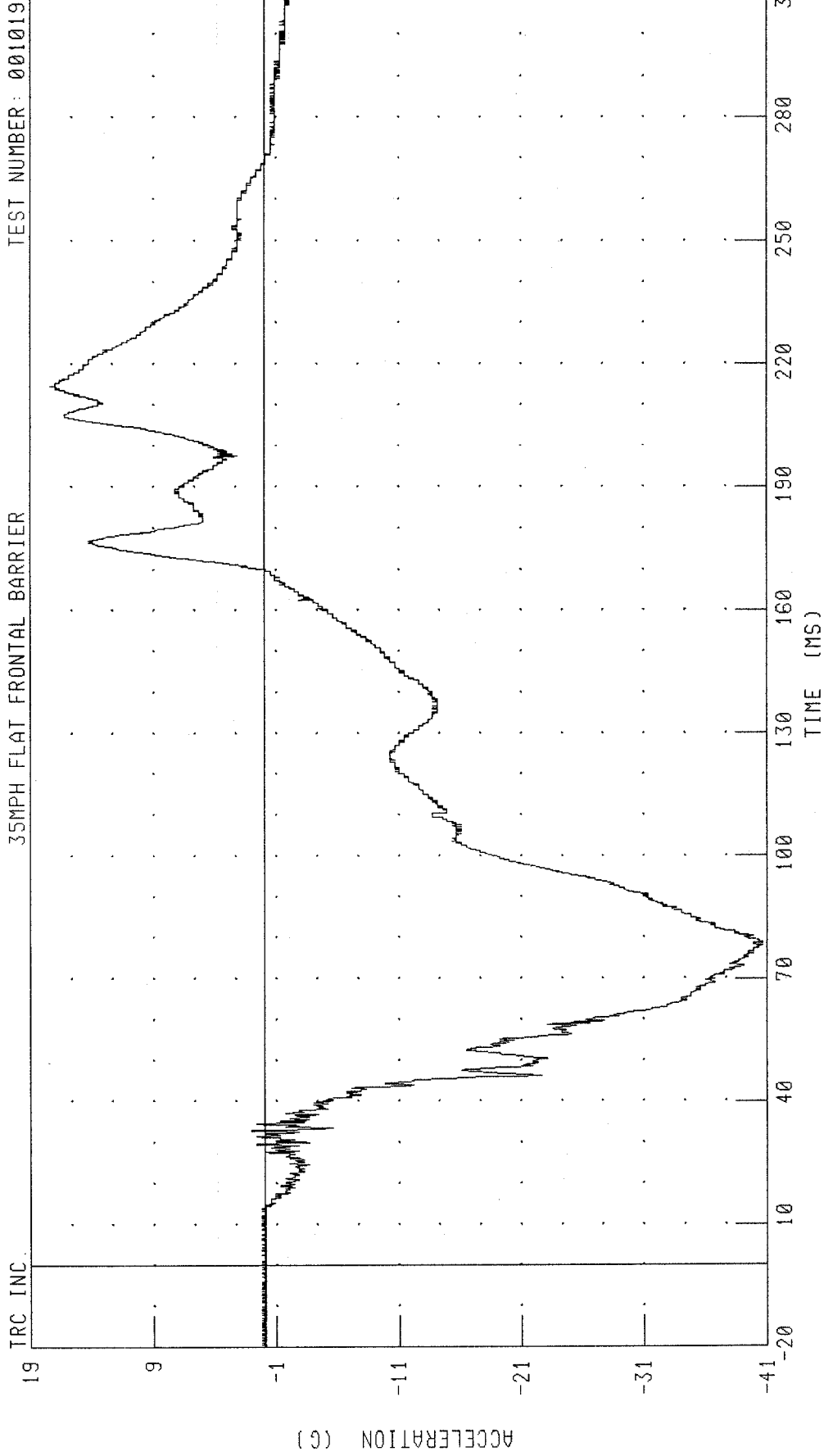
PEAK DATA: 25.32 G @ 50.24 MS; -3.54 G @ 99.52 MS

CHANNEL: HEDZG2 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER HEAD RESULTANT ACCELERATION  
35MPH FLAT FRONTAL BARRIER



2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER HEAD X-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER

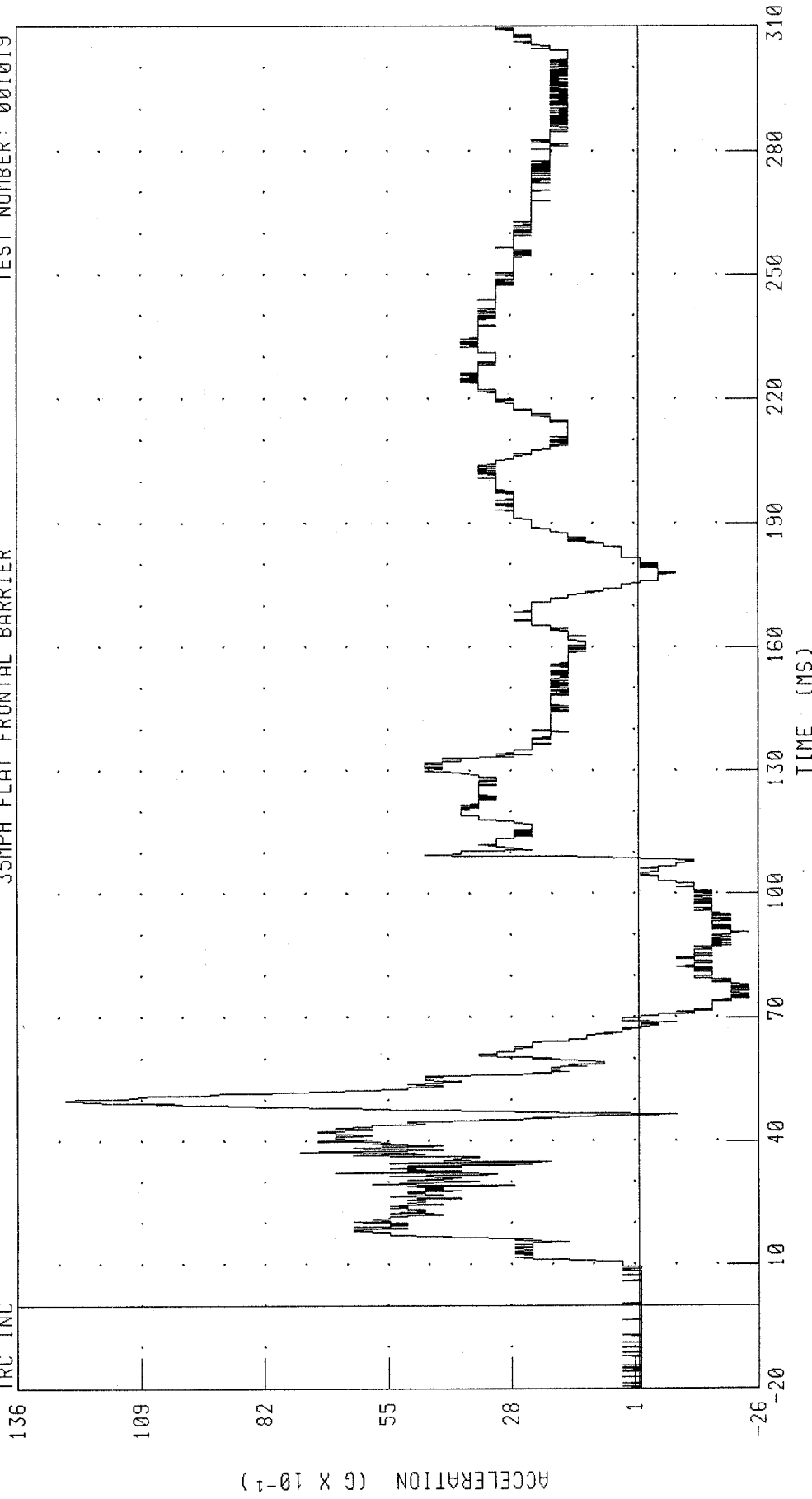


CHANNEL: HEDXR2 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER HEAD Y-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.



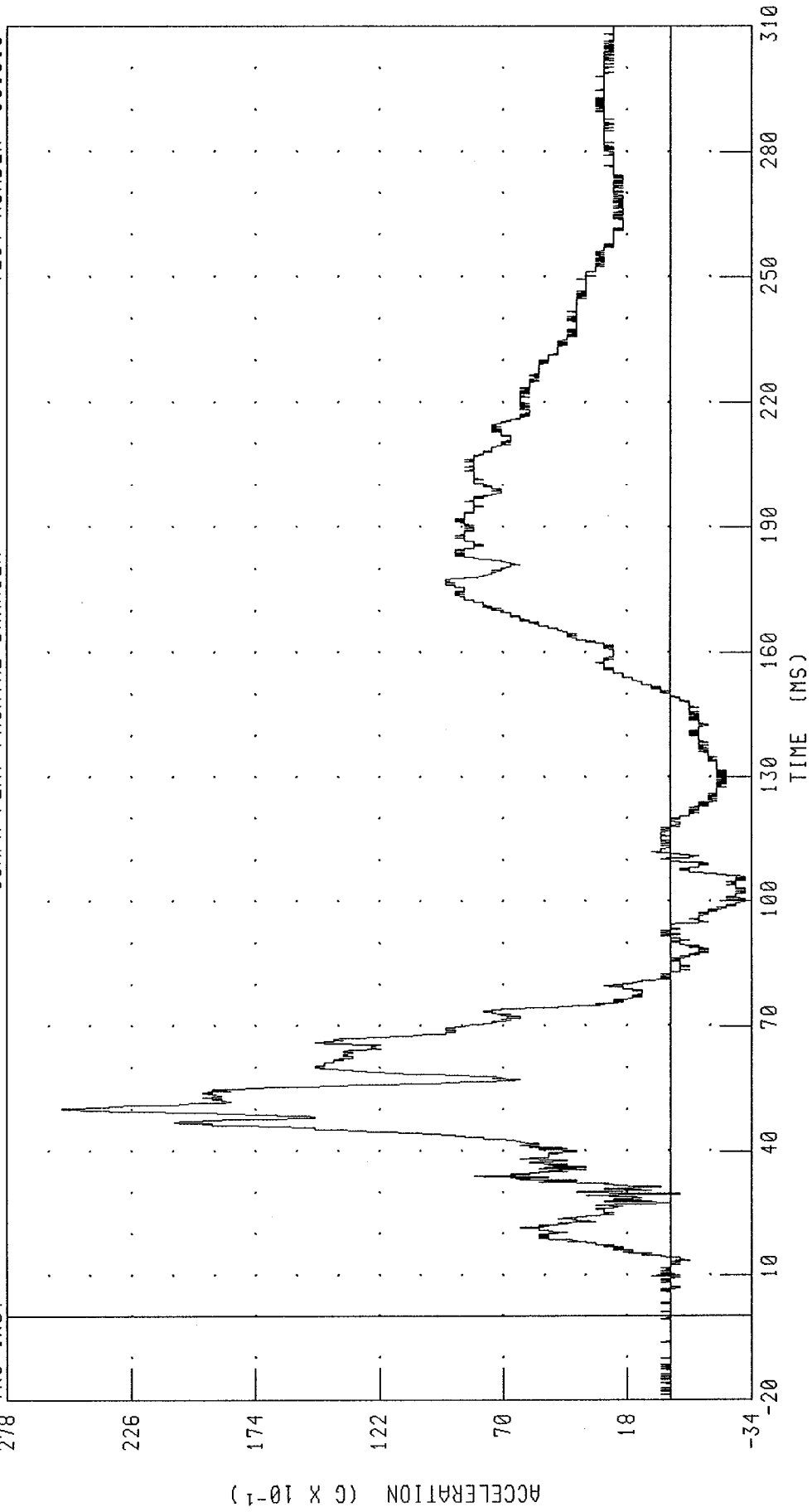
CHANNEL: HEDYR2 FILTER: CH. CLASS 1000

PEAK DATA: 12.56 G @ 49.92 MS; -2.40 G @ 74.80 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER HEAD Z-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

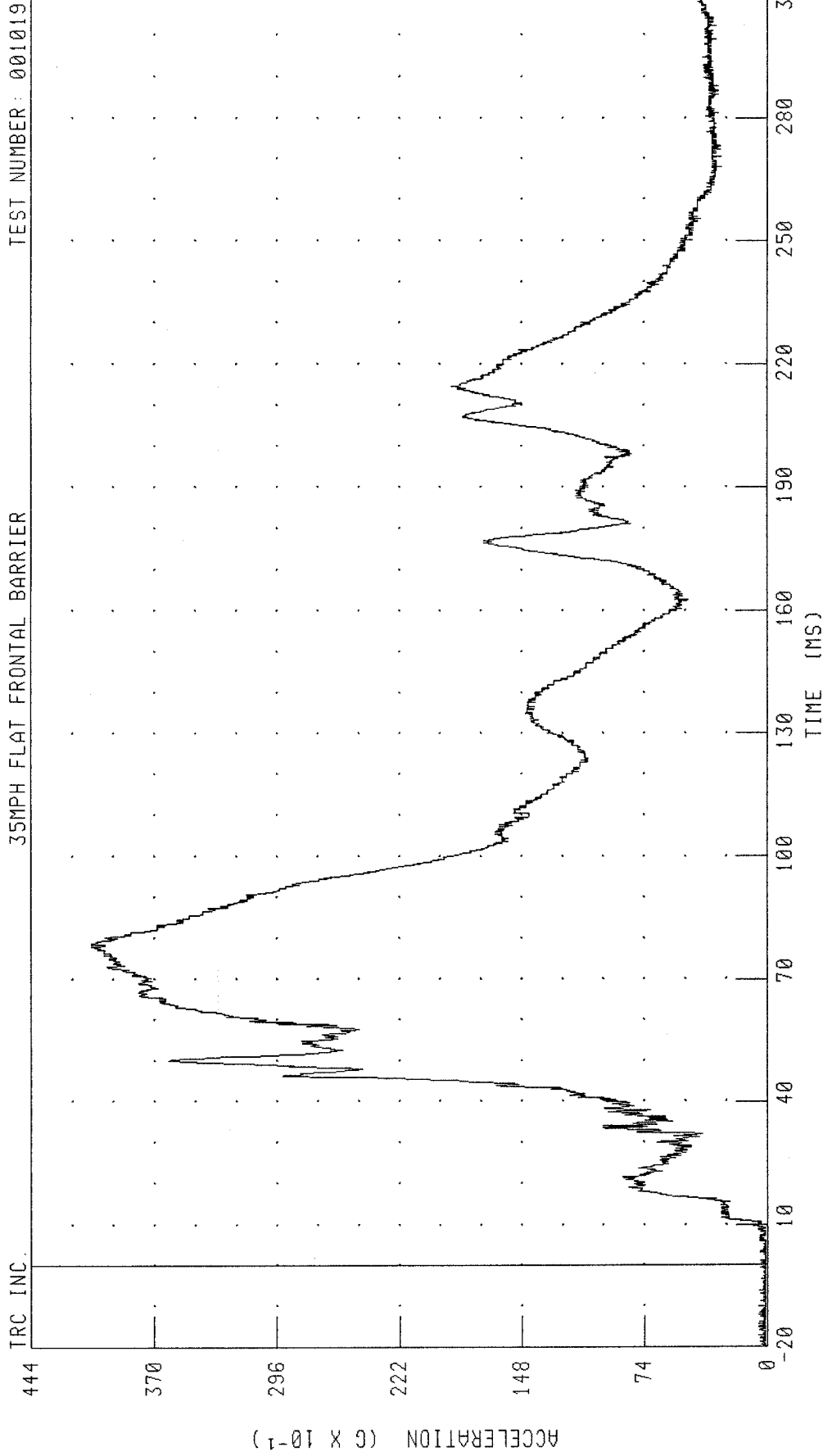
TRC INC.



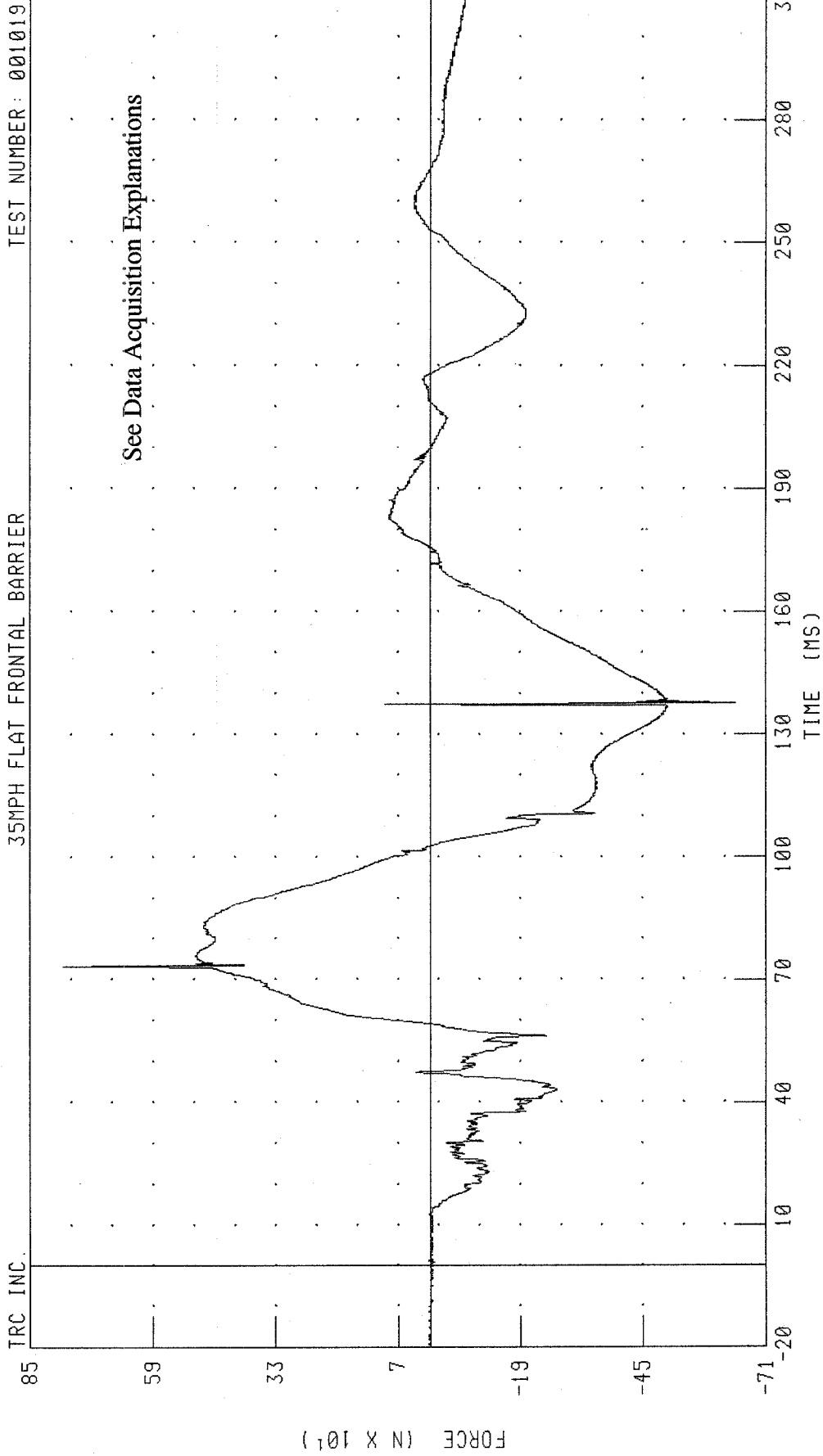
PEAK DATA: 25.50 G @ 50.16 MS; -3.15 G @ 99.76 MS

CHANNEL: HEDZR2 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER HEAD RESULTANT ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER



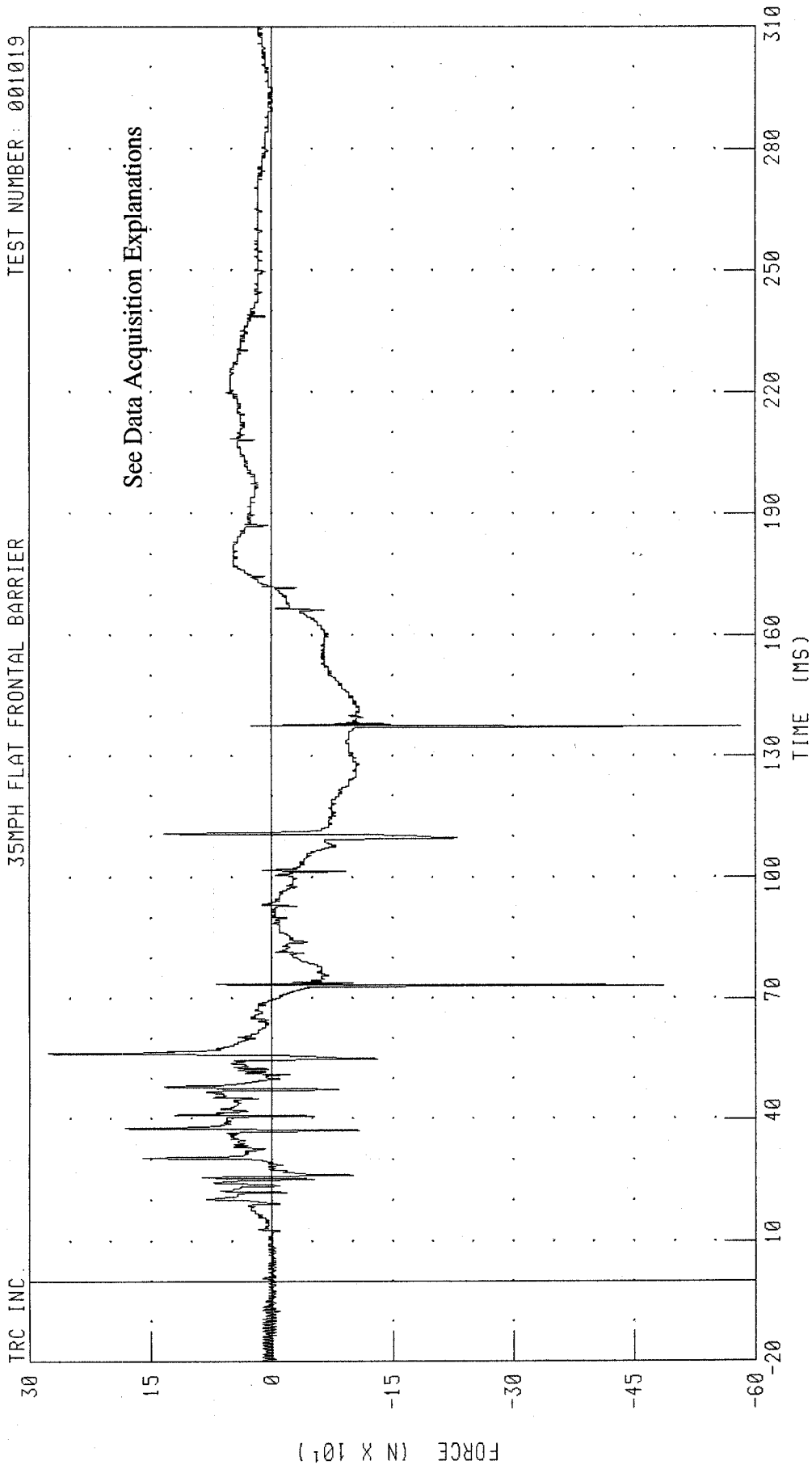
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER NECK X-AXIS SHEAR FORCE  
35MPH FLAT FRONTAL BARRIER



CHANNEL: NEKXF2 FILTER: CH. CLASS 1000 PEAK DATA: 779.24 N @ 73.28 MS; -645.61 N @ 137.76 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER NECK Y-AXIS SHEAR FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

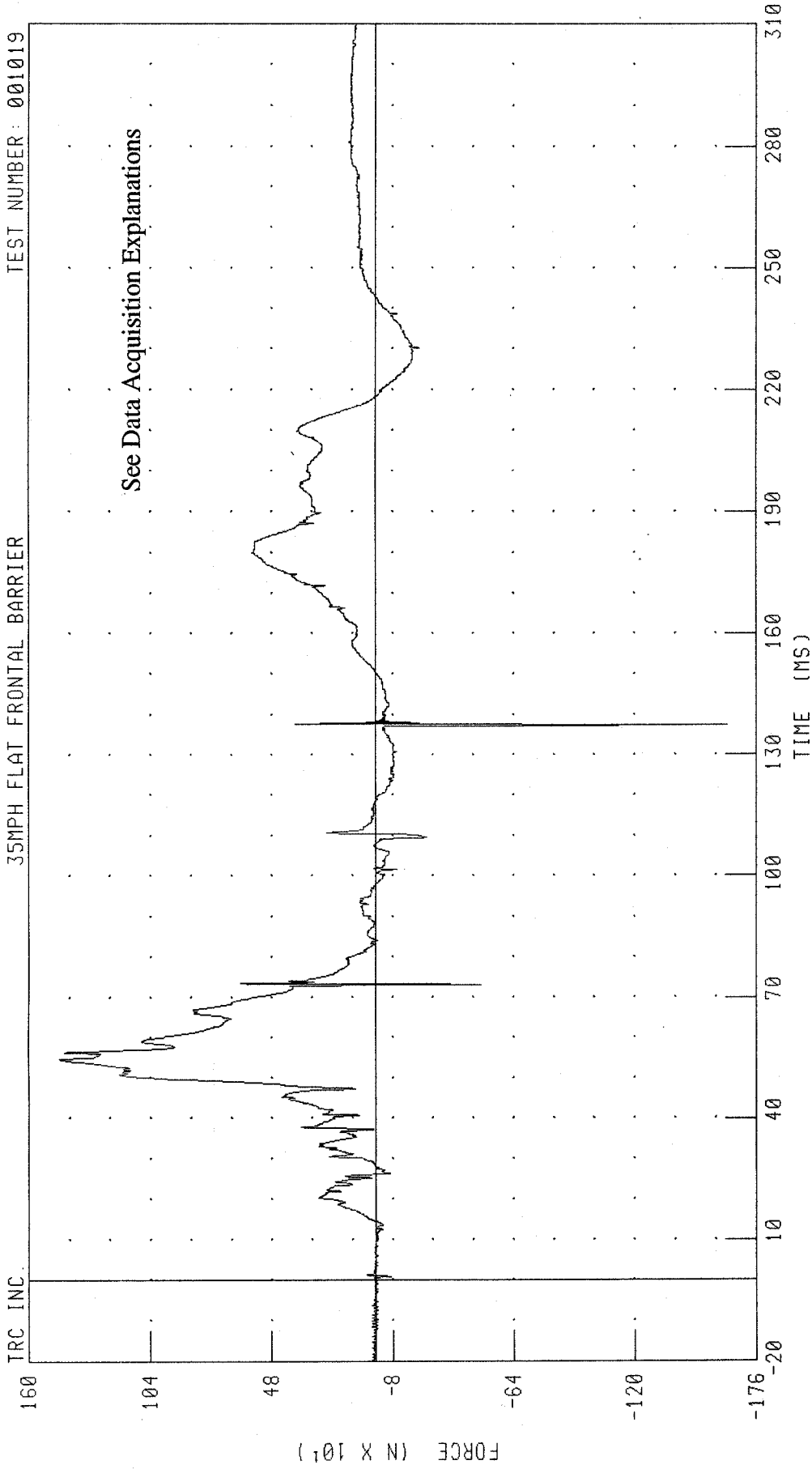


PEAK DATA: 277.50 N @ 56.32 MS, -582.89 N @ 137.44 MS

CHANNEL: NEKYF2 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER NECK Z-AXIS AXIAL FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

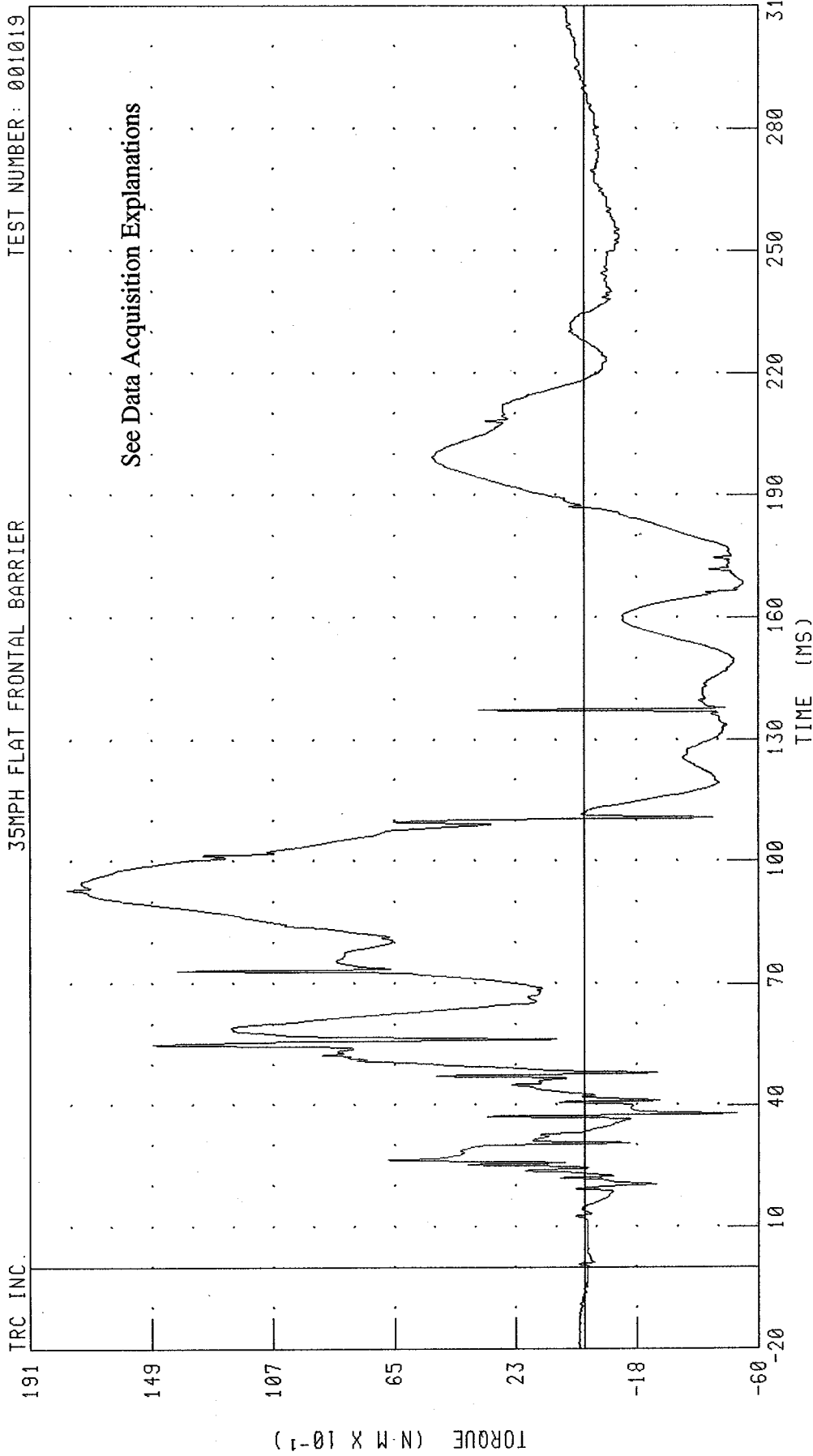


CHANNEL: NEKZF2 FILTER: CH. CLASS 1000

PEAK DATA: 1456.90 N @ 54.56 MS; -1625.78 N @ 137.44 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER NECK MOMENT ABOUT X AXIS  
35MPH FLAT FRONTAL BARRIER

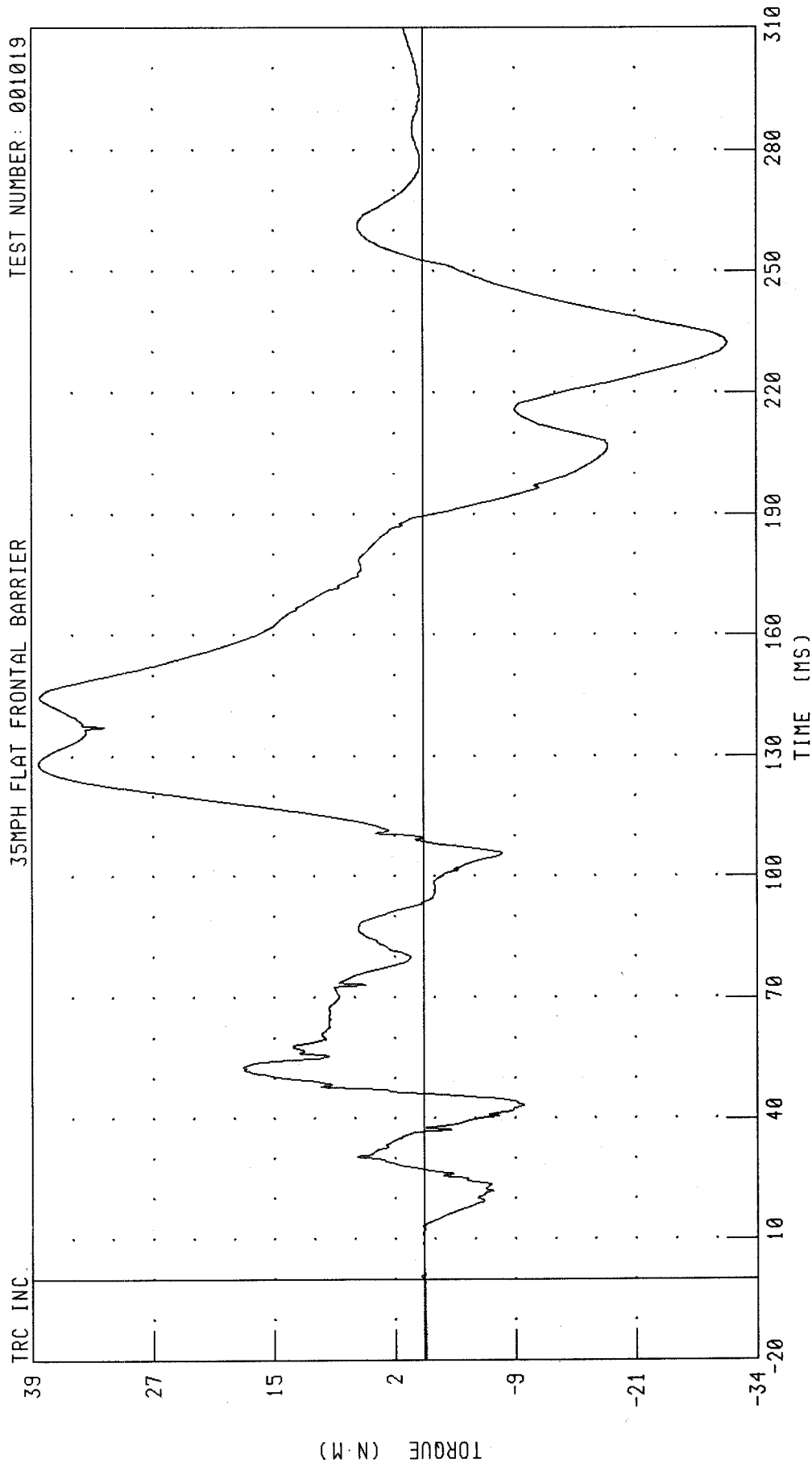
TEST NUMBER: 001019



CHANNEL: NEKX12 FILTER: CH. CLASS 600 PEAK DATA: 17.94 N·M @ 93.04 MS; -5.47 N·M @ 168.80 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER NECK MOMENT ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

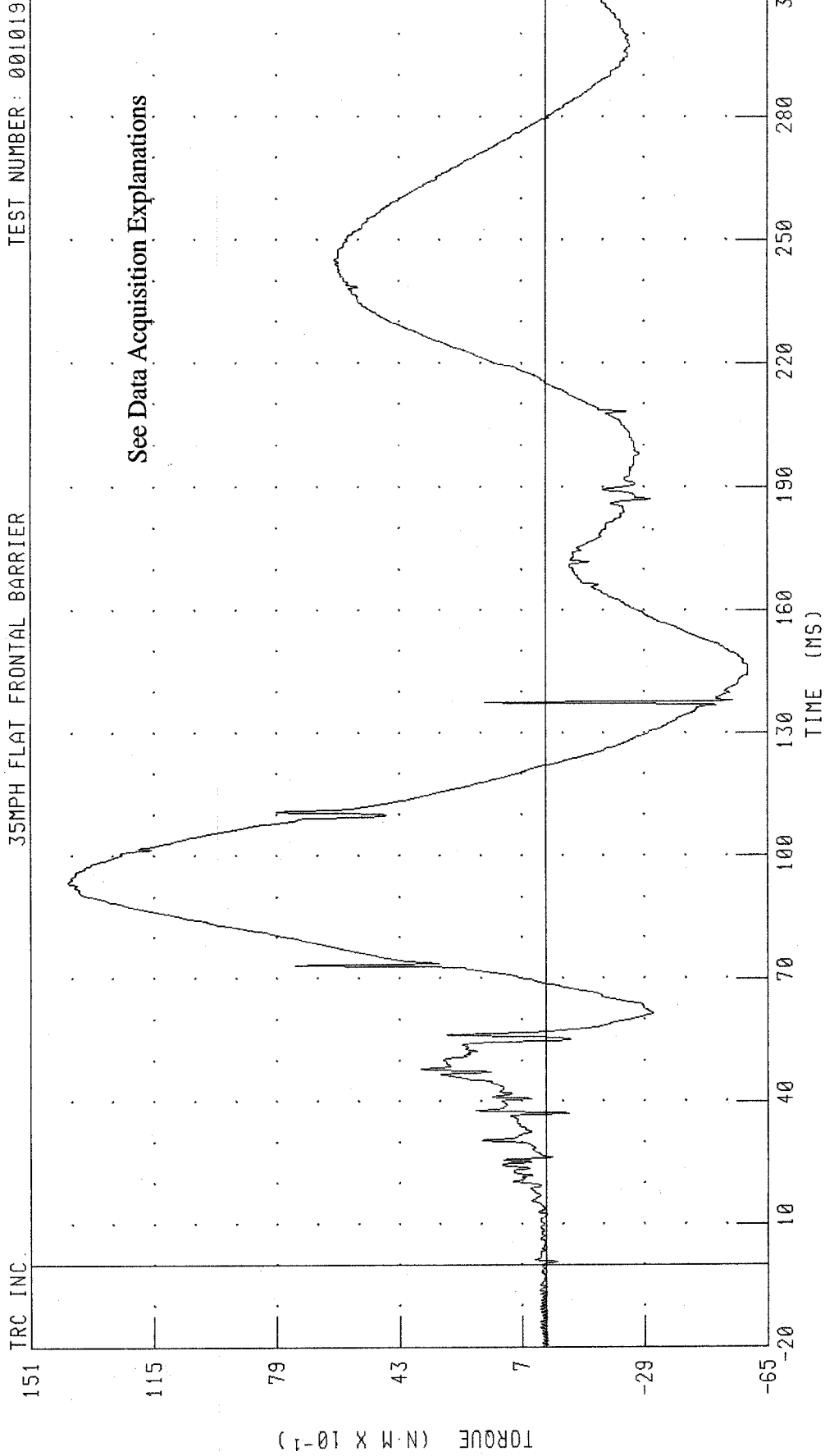


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CHANNEL: NEKYM2 FILTER: CH. CLASS 600

001019

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER NECK MOMENT ABOUT Z AXIS  
35MPH FLAT FRONTAL BARRIER



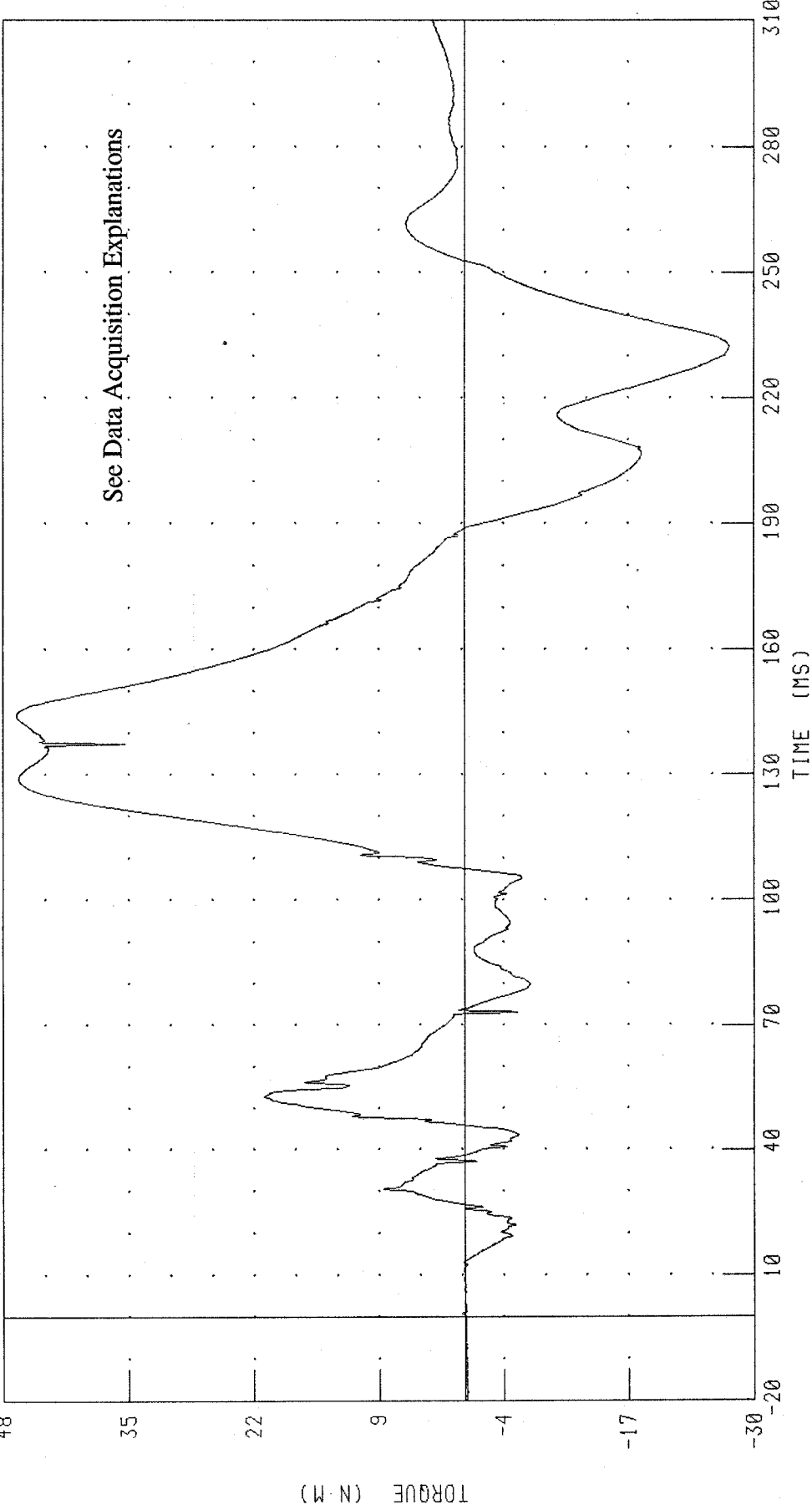
PEAK DATA: 14.02 N·M @ 93.52 MS; -5.93 N·M @ 146.40 MS

CHANNEL: NEKZM2 FILTER: CH. CLASS 600

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER NECK MOMENT OCCIPITAL CONDYLE ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

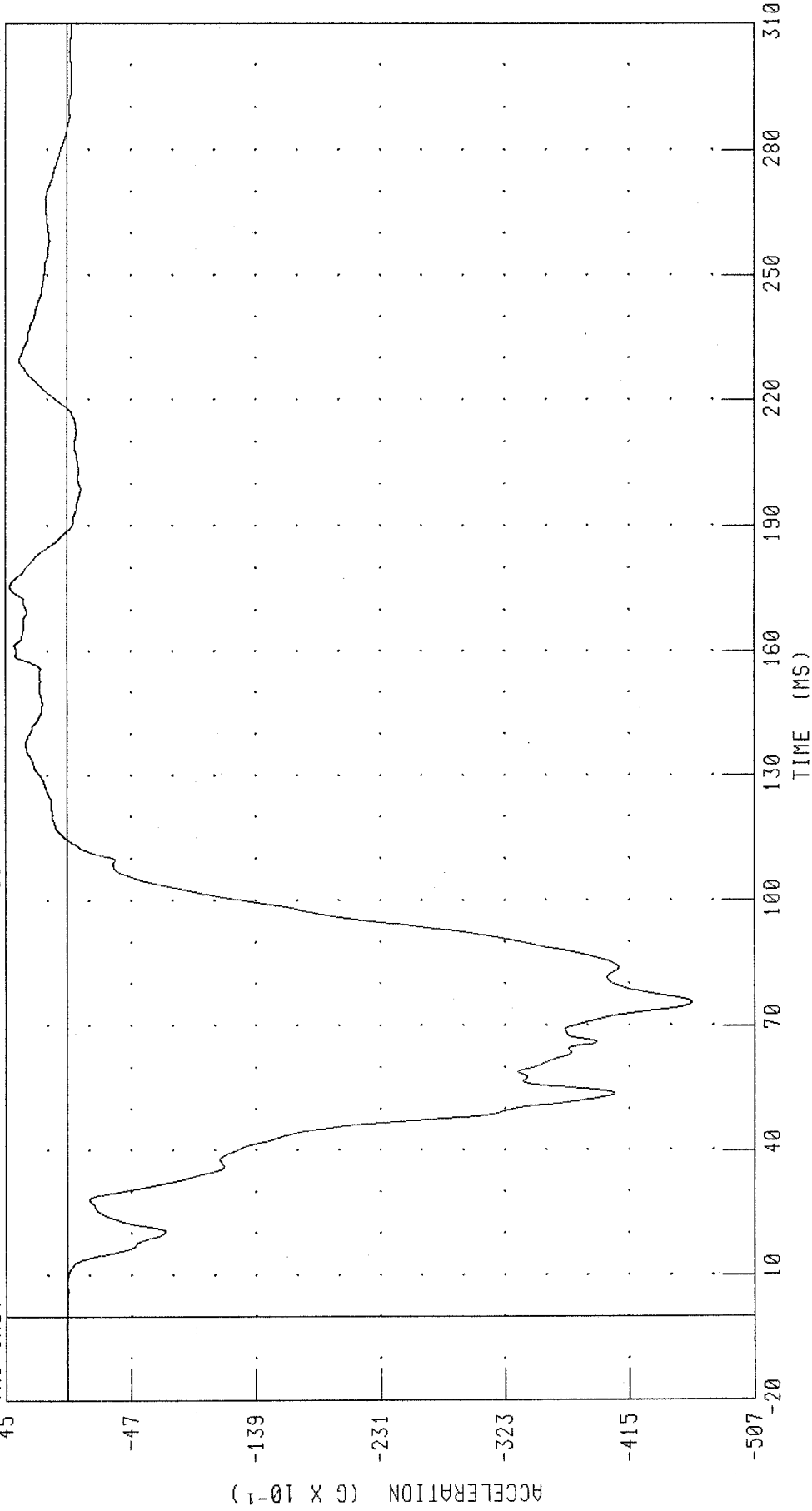


CHANNEL: NEK0M2 FILTER: CH. CLASS 600  
PEAK DATA: 46.65 N·m @ 144.32 MS; -27.46 N·m @ 232.32 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER CHEST X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

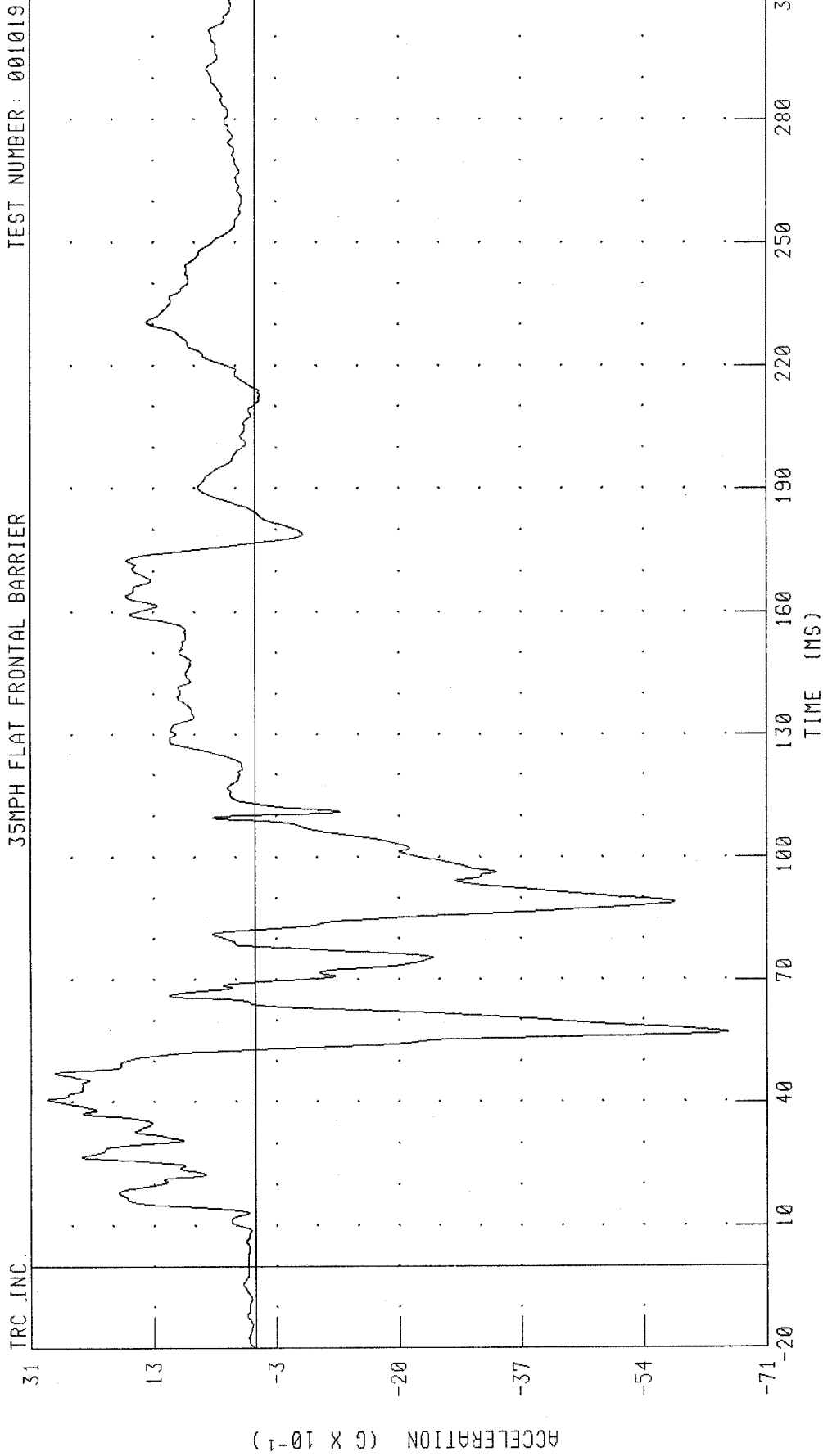
TRC INC.



PEAK DATA: 4.17 G @ 175.76 MS, -46.09 G @ 75.60 MS

CHANNEL: CSTXC2 FILTER: CH. CLASS 180

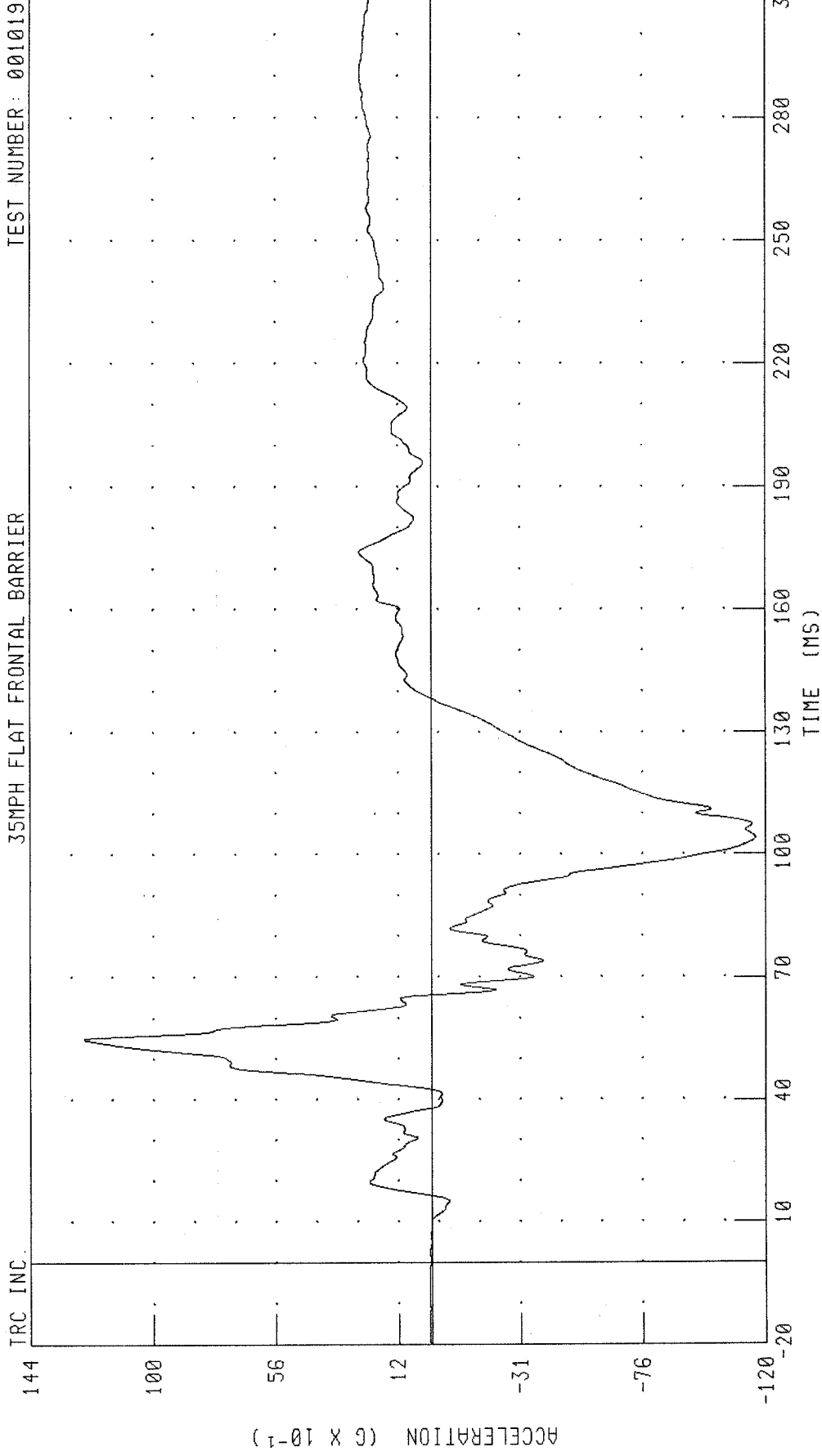
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER CHEST Y-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER



PEAK DATA: 2.87 G @ 40.64 MS; -6.57 G @ 57.04 MS

CHANNEL: CSTYG2 FILTER: CH. CLASS 180

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER CHEST Z-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

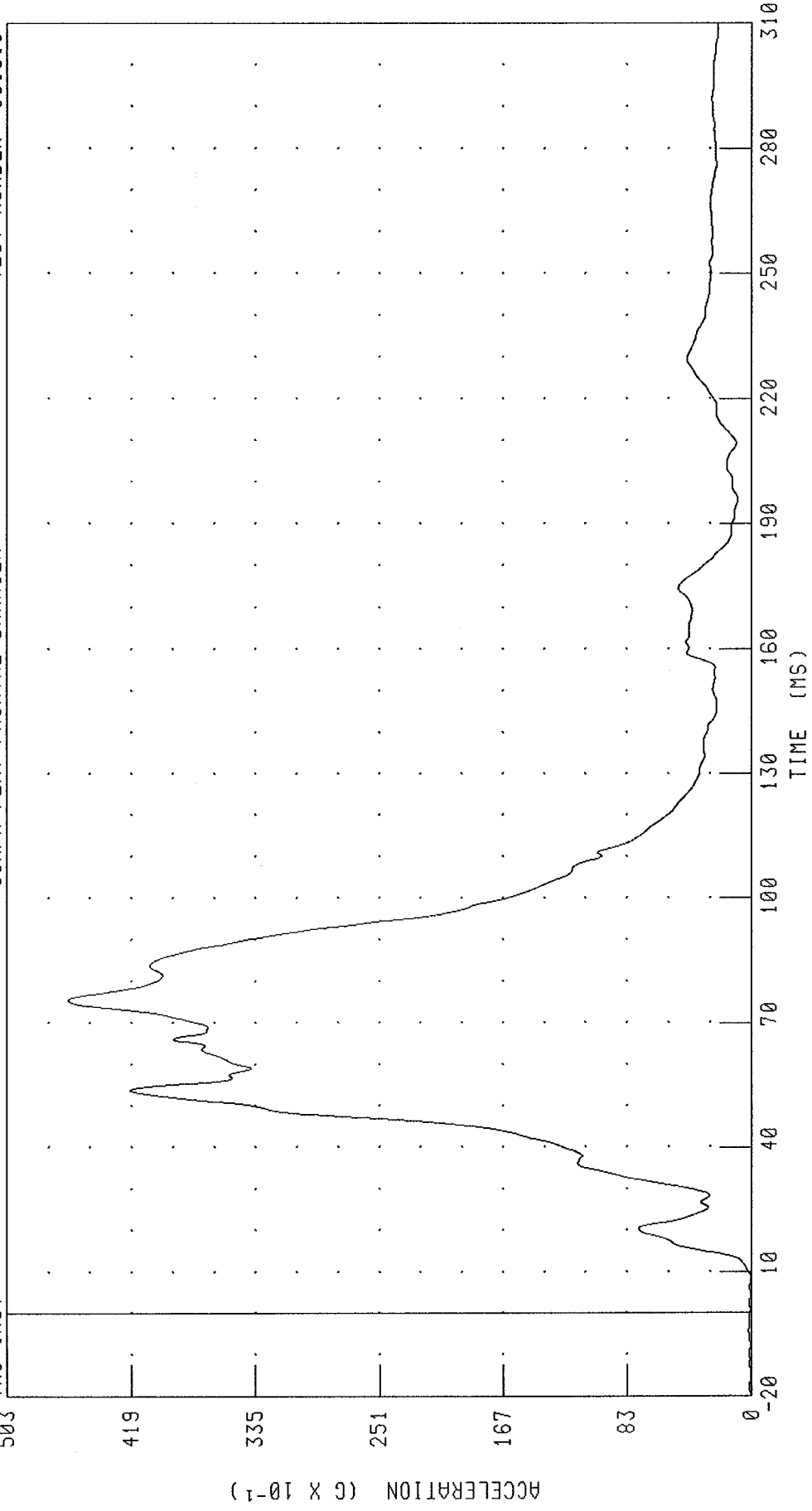


CHANNEL: CSTZG2 FILTER: CH. CLASS 180 PEAK DATA: 12.49 G @ 54.96 MS, -11.65 G @ 104.00 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER CHEST RESULTANT ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

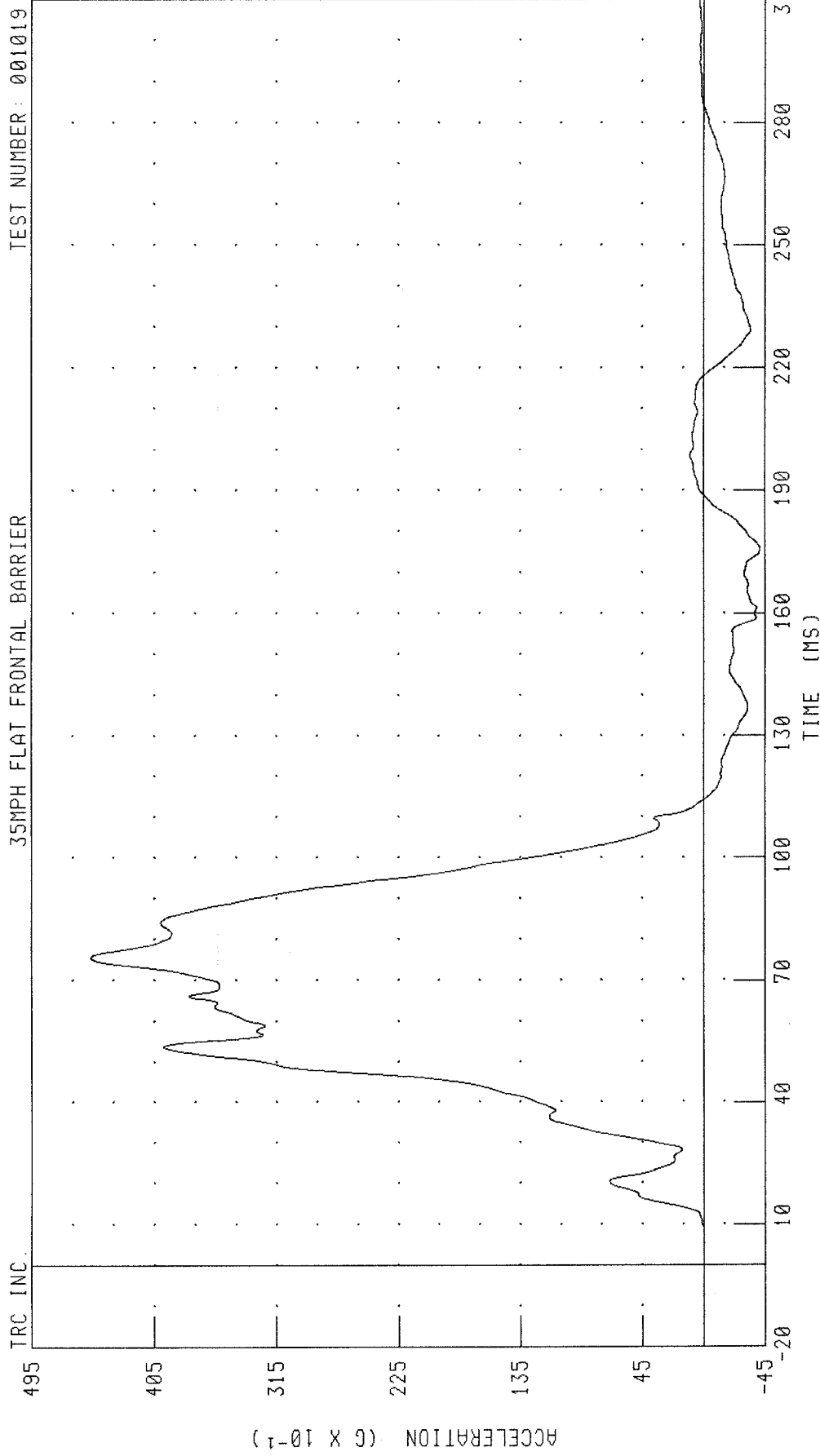


ACCELERATION (G X 10<sup>-1</sup>)

TIME (MS)

CHANNEL: CSTR02 FILTER: CH. CLASS 180 PEAK DATA: 46.28 G @ 75.60 MS; 0.01 G @ -20.00 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER CHEST X-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER



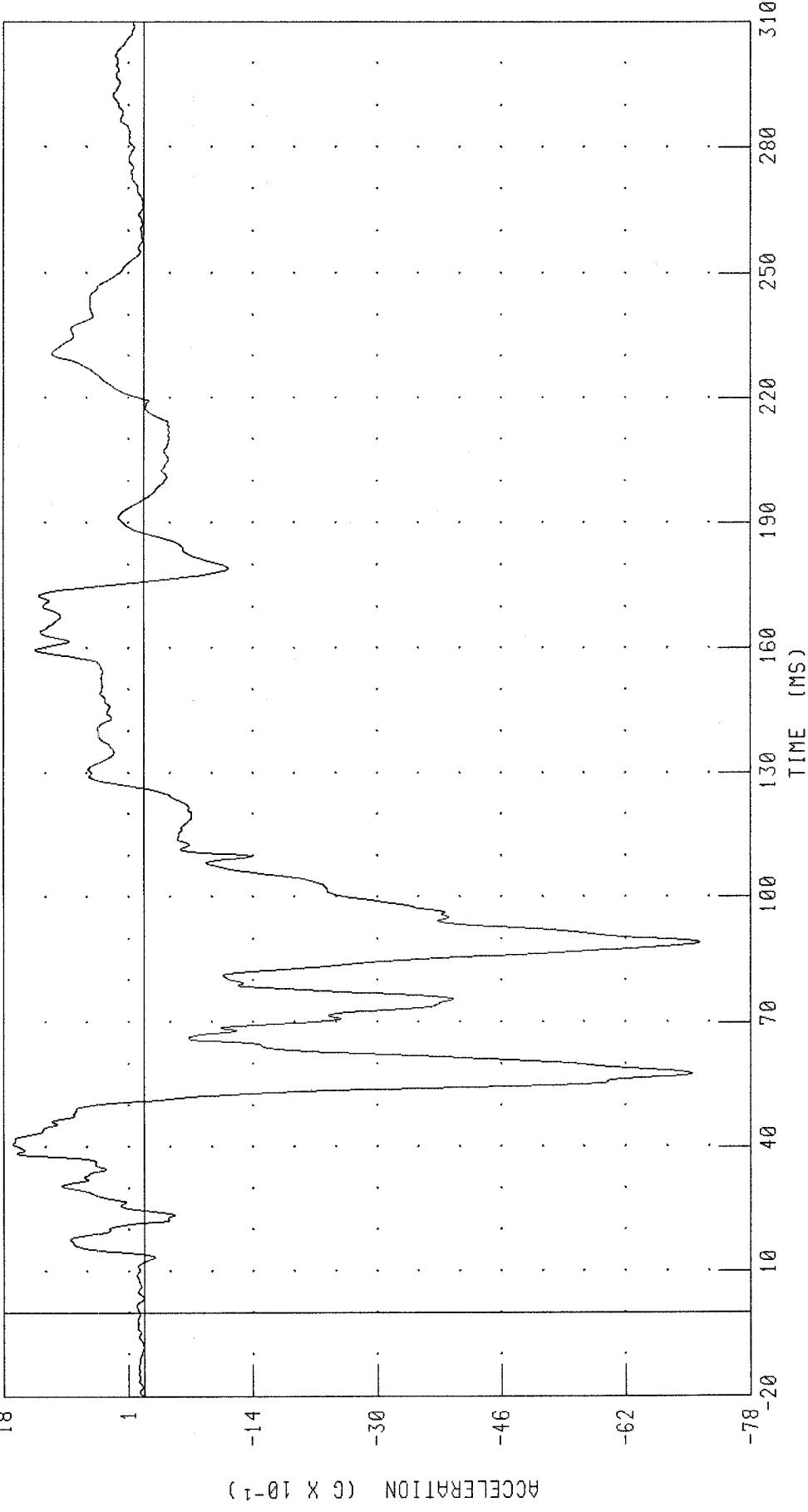
TEST NUMBER: 001019

CHANNEL: CSTXR2 FILTER: CH. CLASS 180 PEAK DATA: 45.17 G @ 75.68 MS; -4.12 G @ 175.84 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER CHEST Y-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

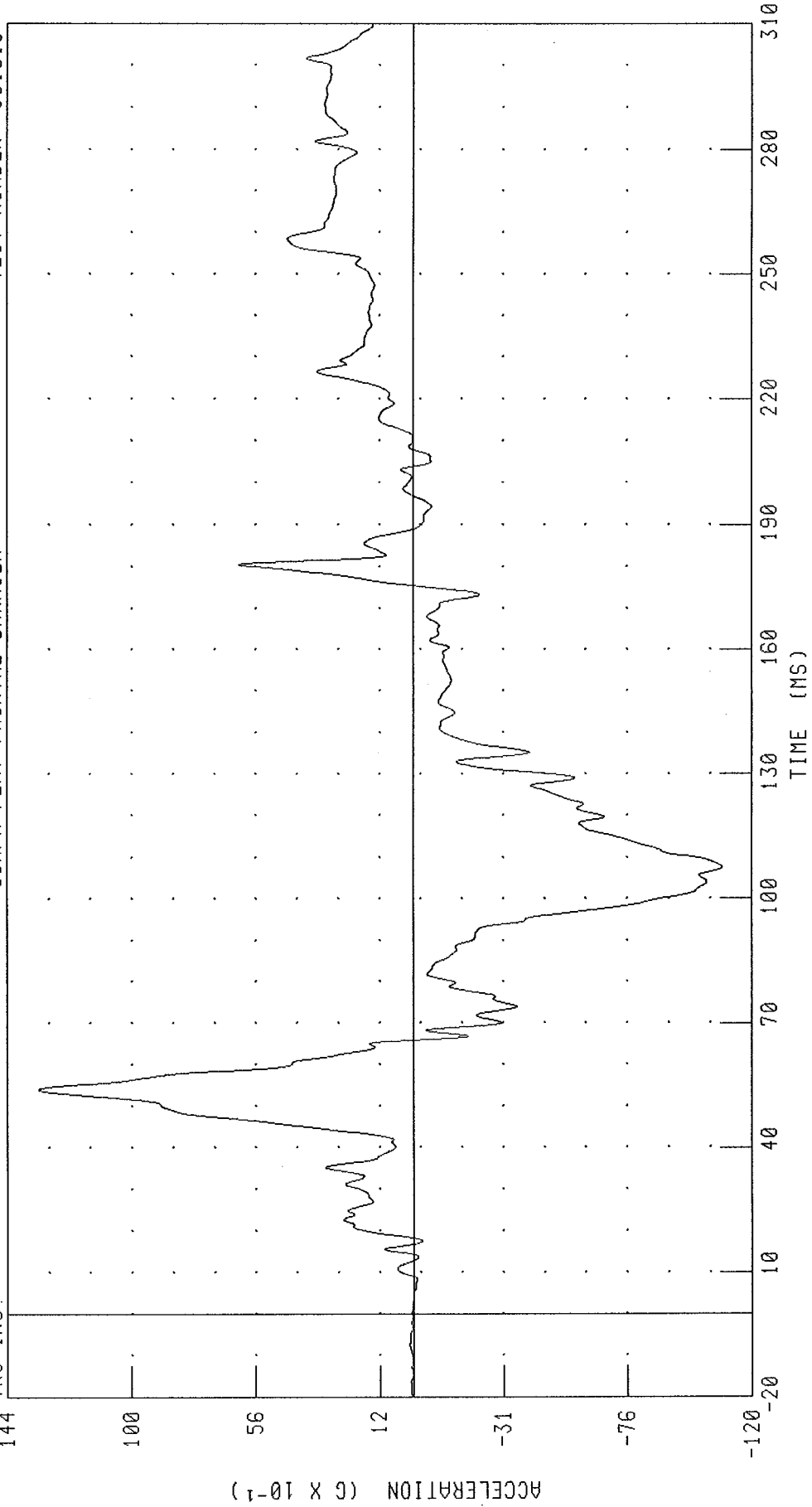


CHANNEL: CSTYR2 FILTER: CH. CLASS 180 PEAK DATA: 1.69 G @ 40.72 MS; -7.15 G @ 89.20 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER CHEST Z-AXIS ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER

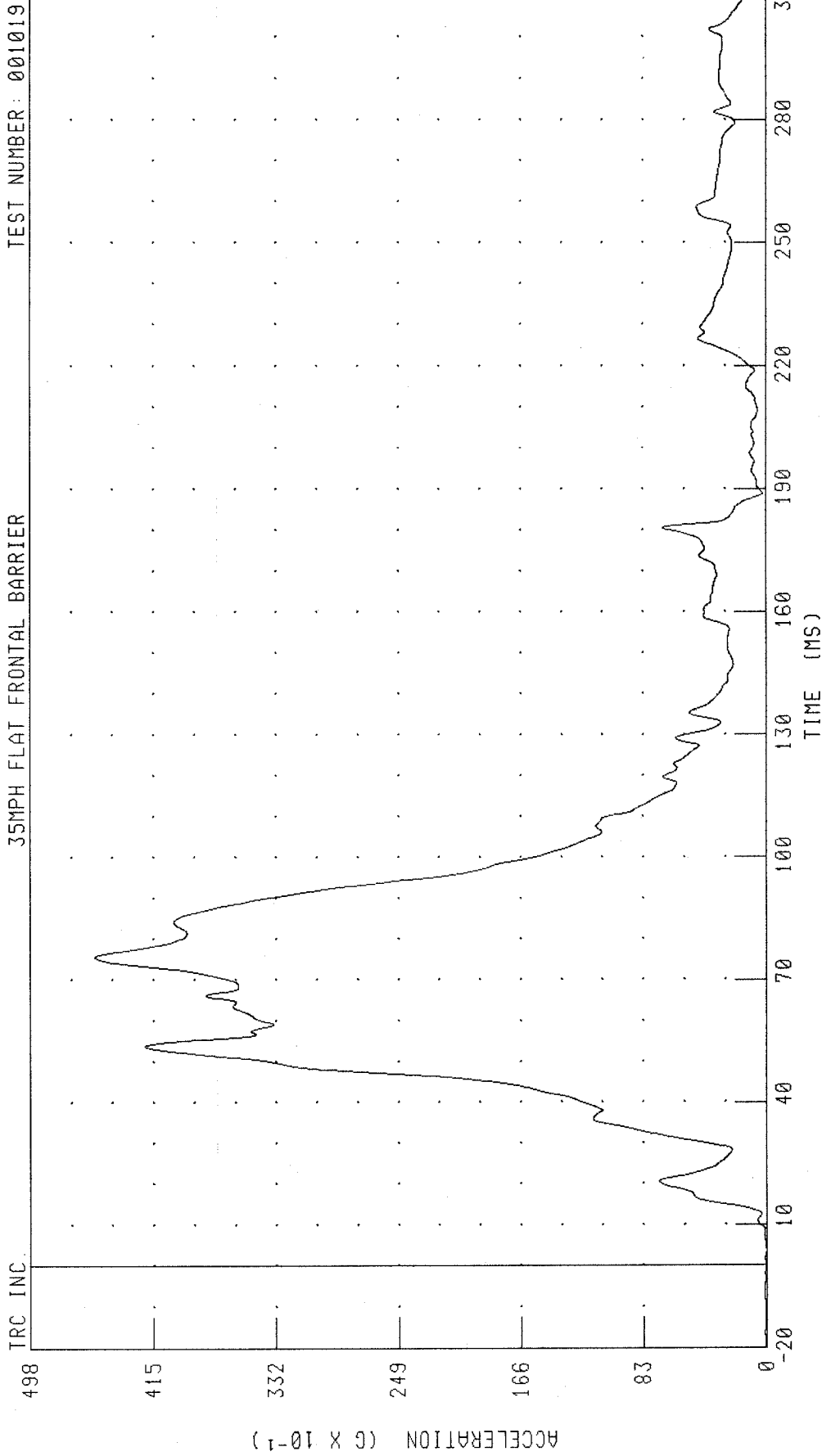
TEST NUMBER: 001019

TRC INC.



CHANNEL: CSTZR2 FILTER: CH. CLASS 180 PEAK DATA: 13.29 G @ 54.08 MS; -10.97 G @ 107.68 MS

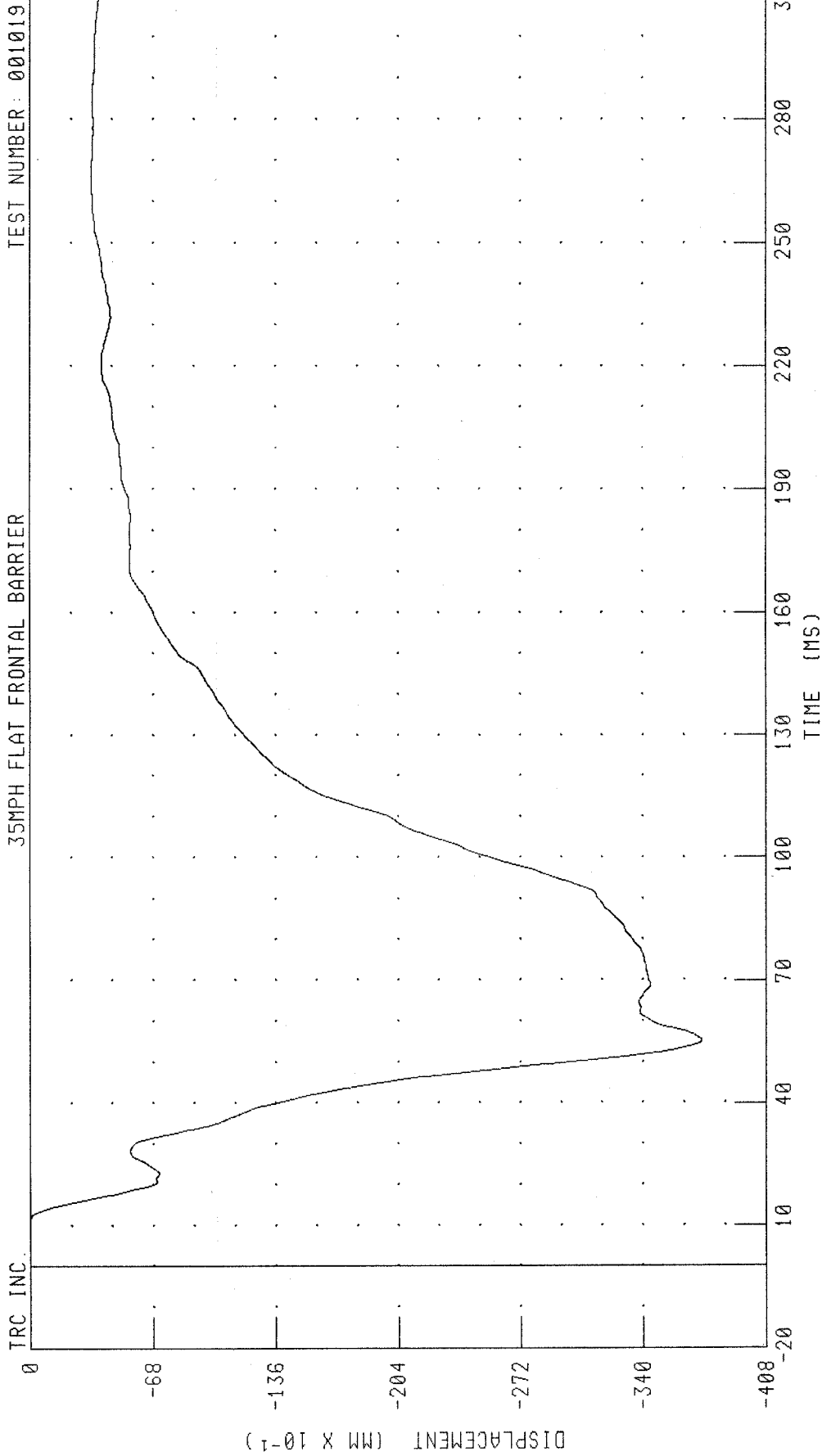
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER CHEST RESULTANT ACCELERATION - REDUNDANT  
35MPH FLAT FRONTAL BARRIER



PEAK DATA: 45.44 G @ 75.60 MS; 0.01 G @ -20.00 MS

CHANNEL: CSTRR2 FILTER: CH. CLASS 180

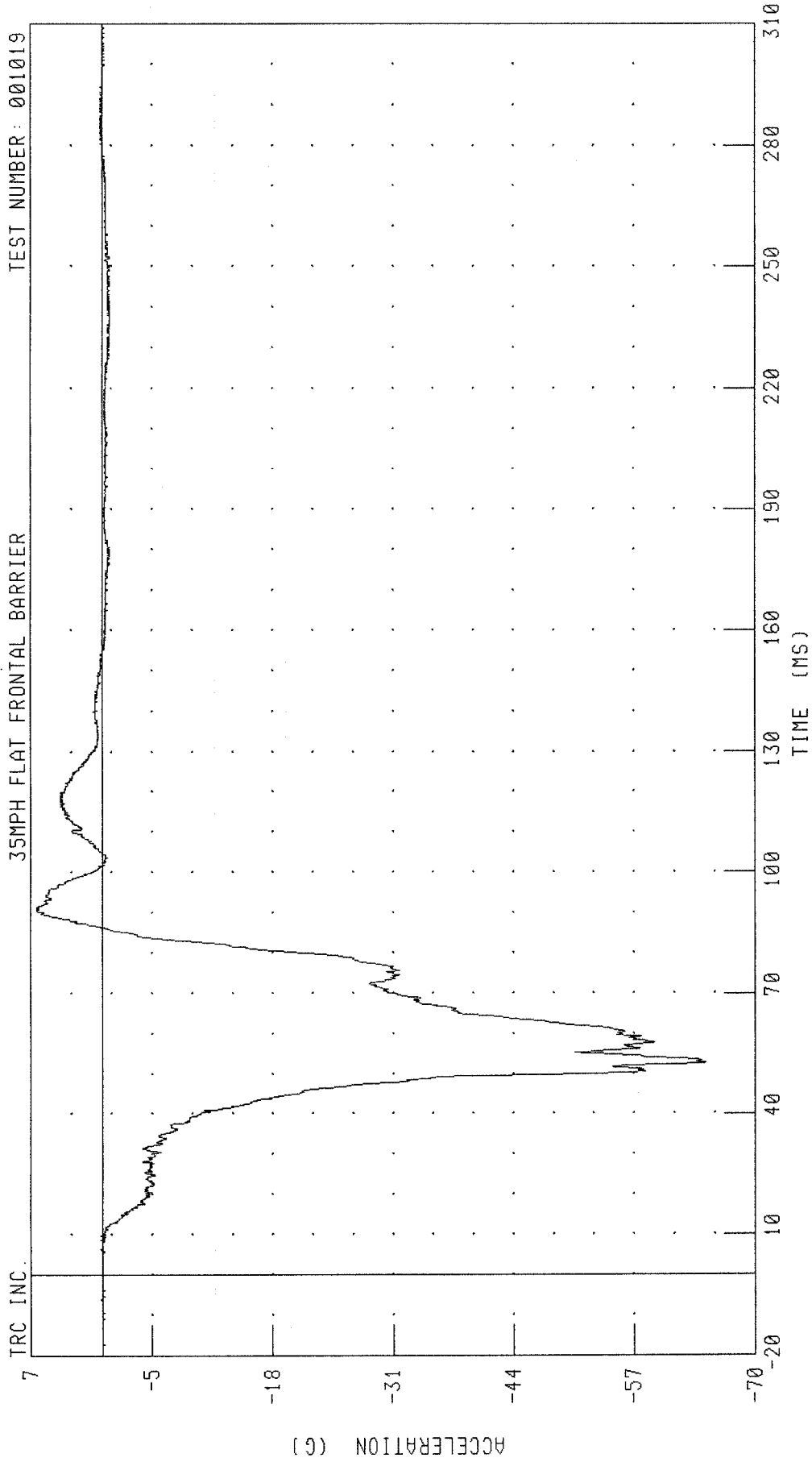
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER CHEST DEFLECTION  
35MPH FLAT FRONTAL BARRIER



CHANNEL: CSTXD2 FILTER: CH. CLASS 180 PEAK DATA: 0.01 MM @ 11.44 MS; -37.26 MM @ 55.20 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER PELVIS X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



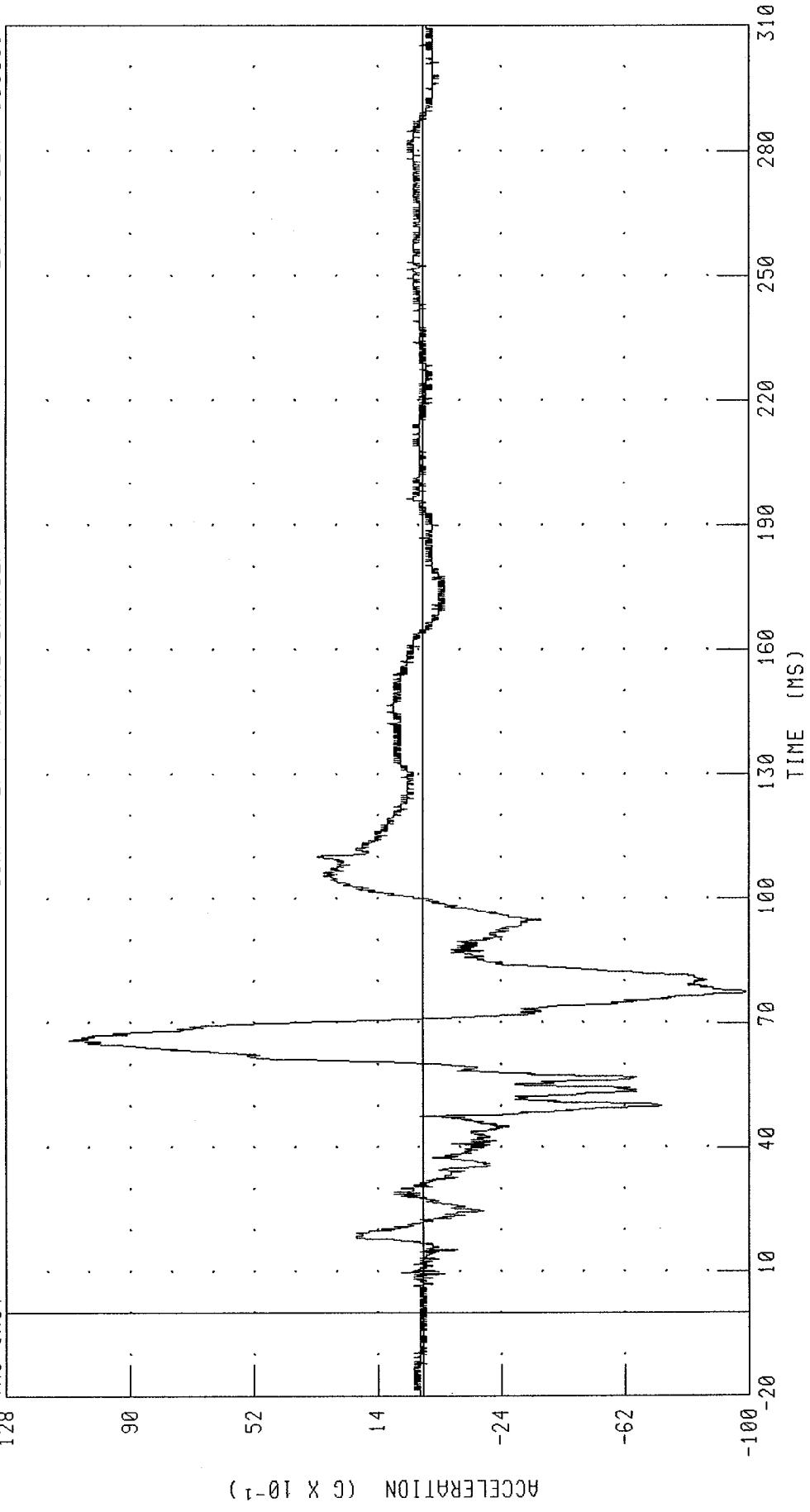
PEAK DATA: 7.06 G @ 90.40 MS; -64.98 G @ 52.80 MS

CHANNEL: PEVXC2 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER PELVIS Y-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

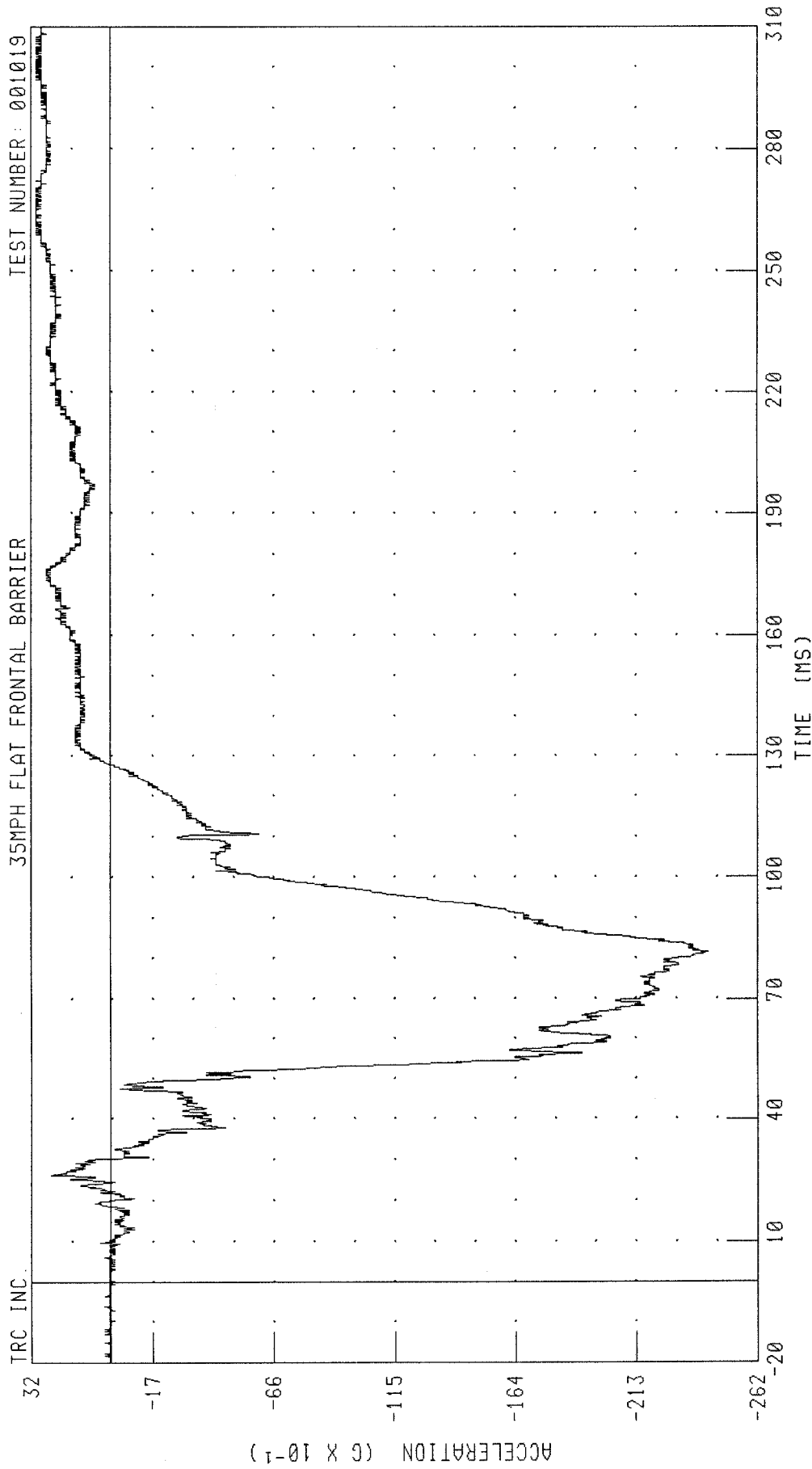


ACCELERATION (G X 10<sup>-1</sup>)

TIME (MS)

CHANNEL: PEVY02 FILTER: CH. CLASS 1000 PEAK DATA: 10.89 G @ 65.84 MS; -9.89 G @ 77.20 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER PELVIS Z-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

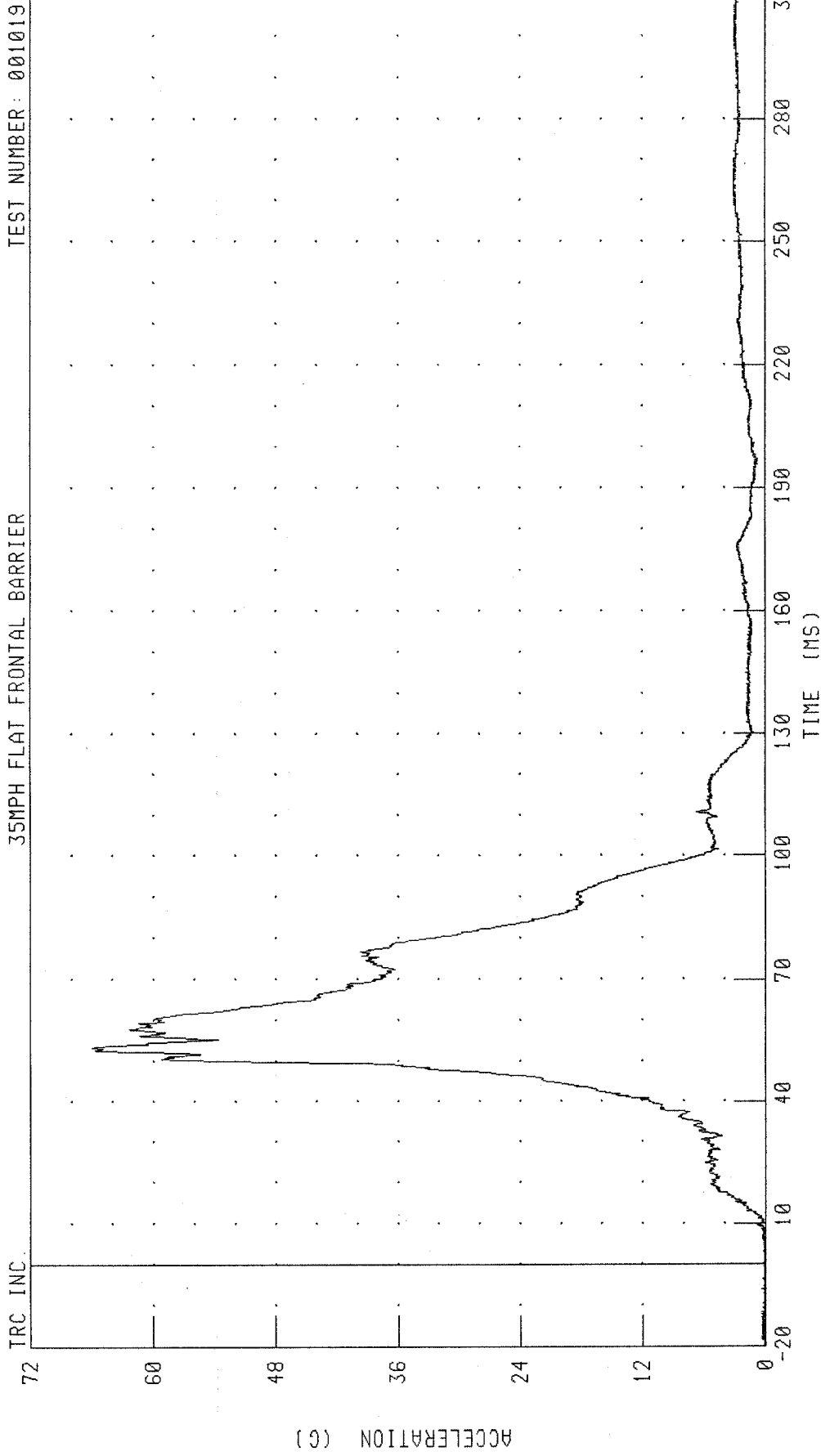


TEST NUMBER: 001019

PEAK DATA: 2.99 G @ 258.88 MS; -24.20 G @ 81.44 MS

CHANNEL: PEVZG2 FILTER: CH. CLASS 1000

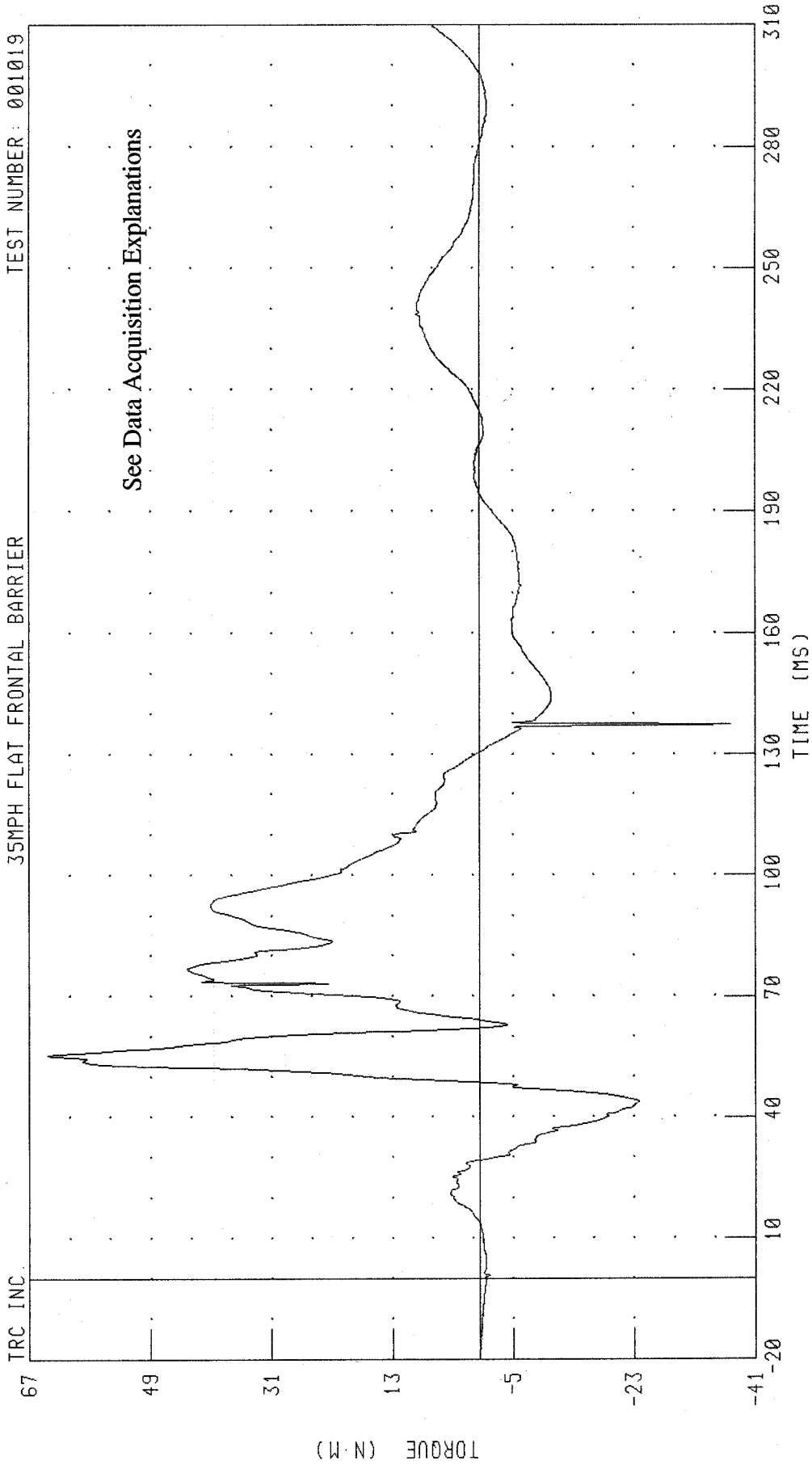
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER PELVIS RESULTANT ACCELERATION  
35MPH FLAT FRONTAL BARRIER



CHANNEL: PEVRC2 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LEFT UPPER TIBIA MOMENT ABOUT X AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

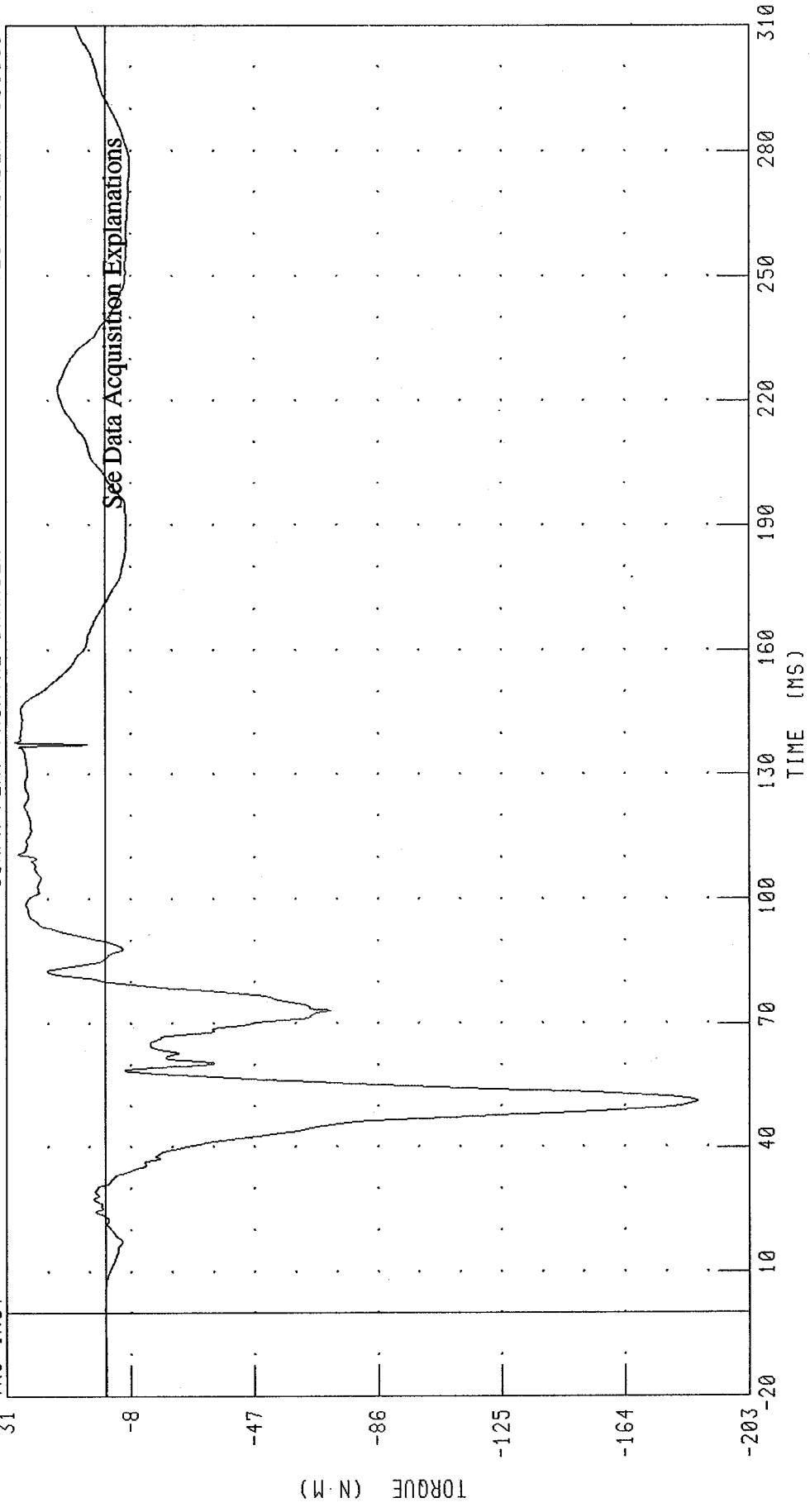


CHANNEL: TBLX12 FILTER: CH. CLASS 600 PEAK DATA: 64.27 N·M @ 55.36 MS; -37.28 N·M @ 137.36 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LEFT UPPER TIBIA MOMENT ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

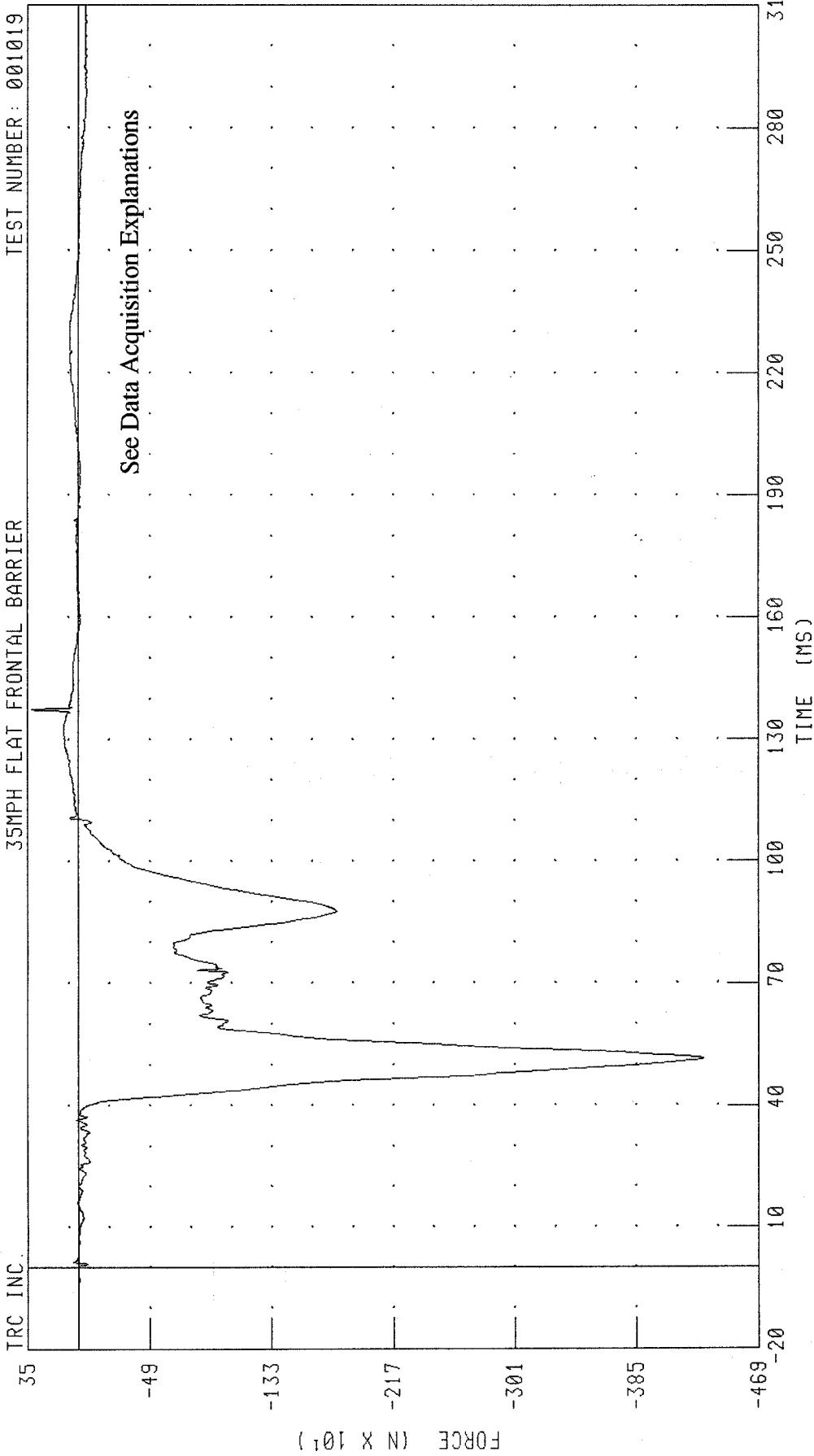


PEAK DATA: 28.40 N·M @ 137.84 MS; -186.92 N·M @ 51.12 MS

CHANNEL: TBLYM2 FILTER: CH. CLASS 600

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LEFT UPPER TIBIA Z-AXIS FORCE  
35MPH FLAT FRONTAL BARRIER

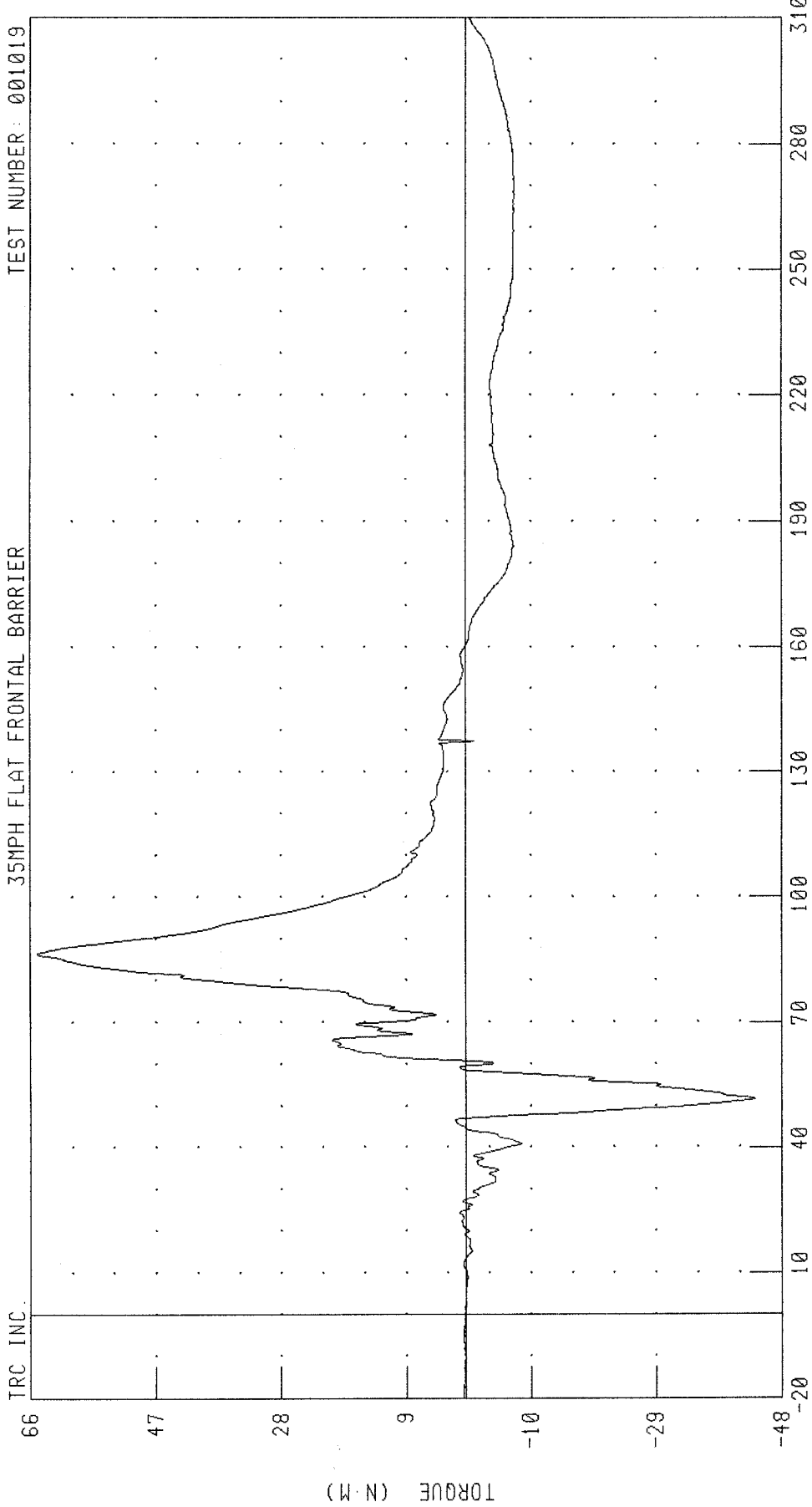
TEST NUMBER: 001019



CHANNEL: TBLZF2 FILTER: CH. CLASS 600 PEAK DATA: 322.71 N @ 137.36 MS; -4311.34 N @ 51.60 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LEFT LOWER TIBIA MOMENT ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

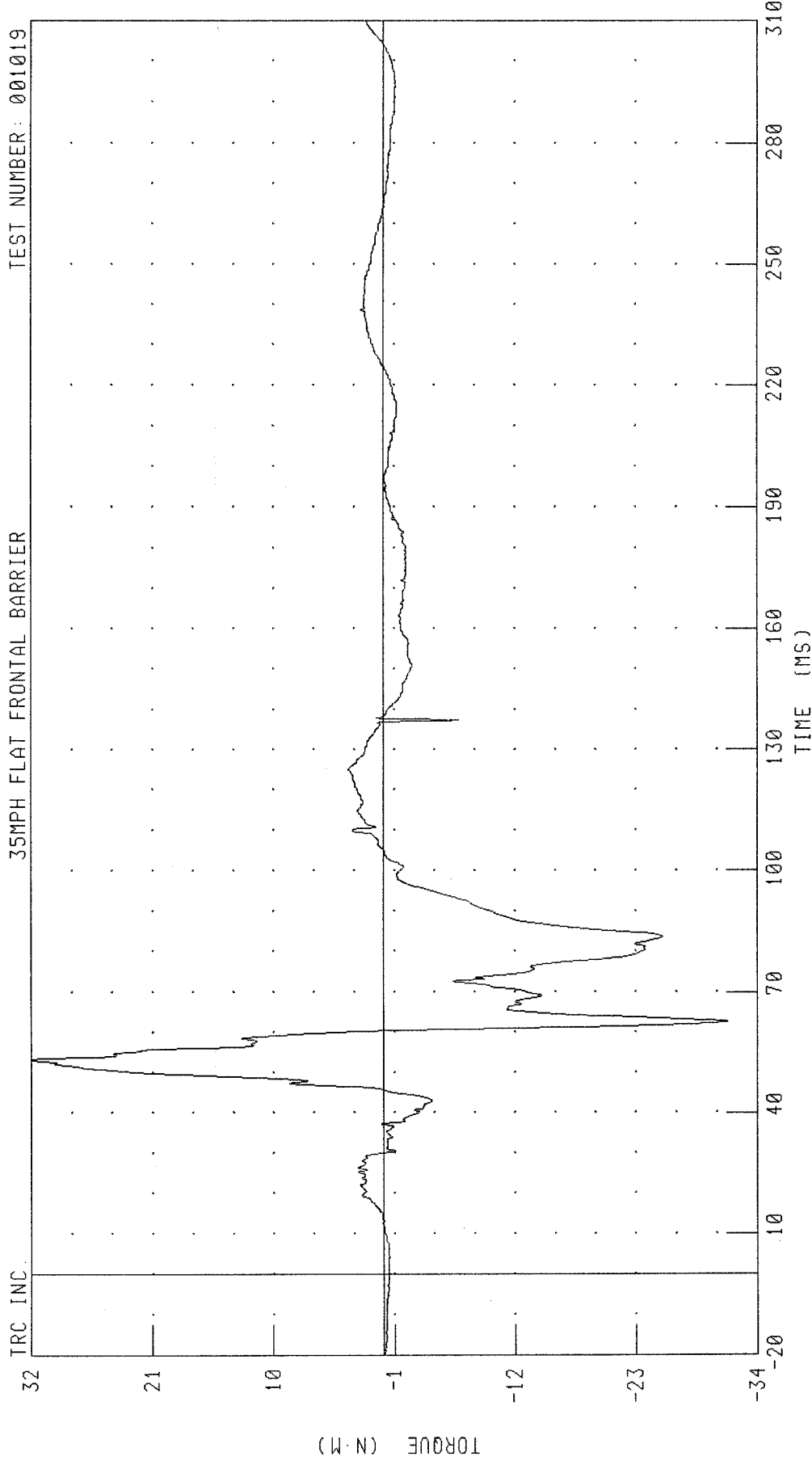


CHANNEL: ANLYM2 FILTER: CH. CLASS 600

PEAK DATA: 64.93 N.M @ 86.40 MS; -43.93 N.M @ 51.68 MS

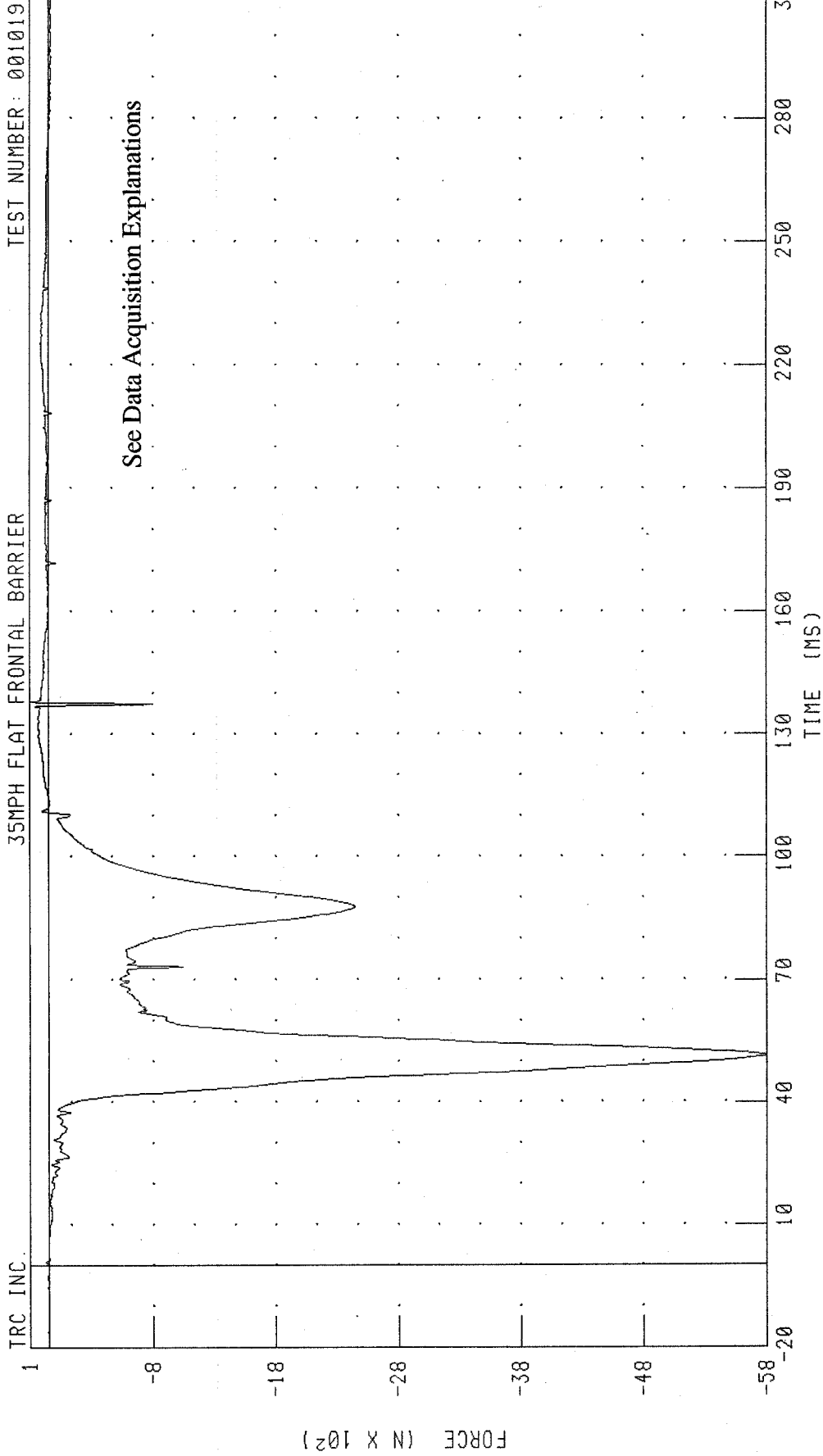
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LEFT LOWER TIBIA MOMENT ABOUT X AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER : 001019



CHANNEL : ANLXM2 FILTER : CH. CLASS 600  
PEAK DATA : 32.29 N·M @ 53.28 MS; -31.32 N·M @ 62.64 MS

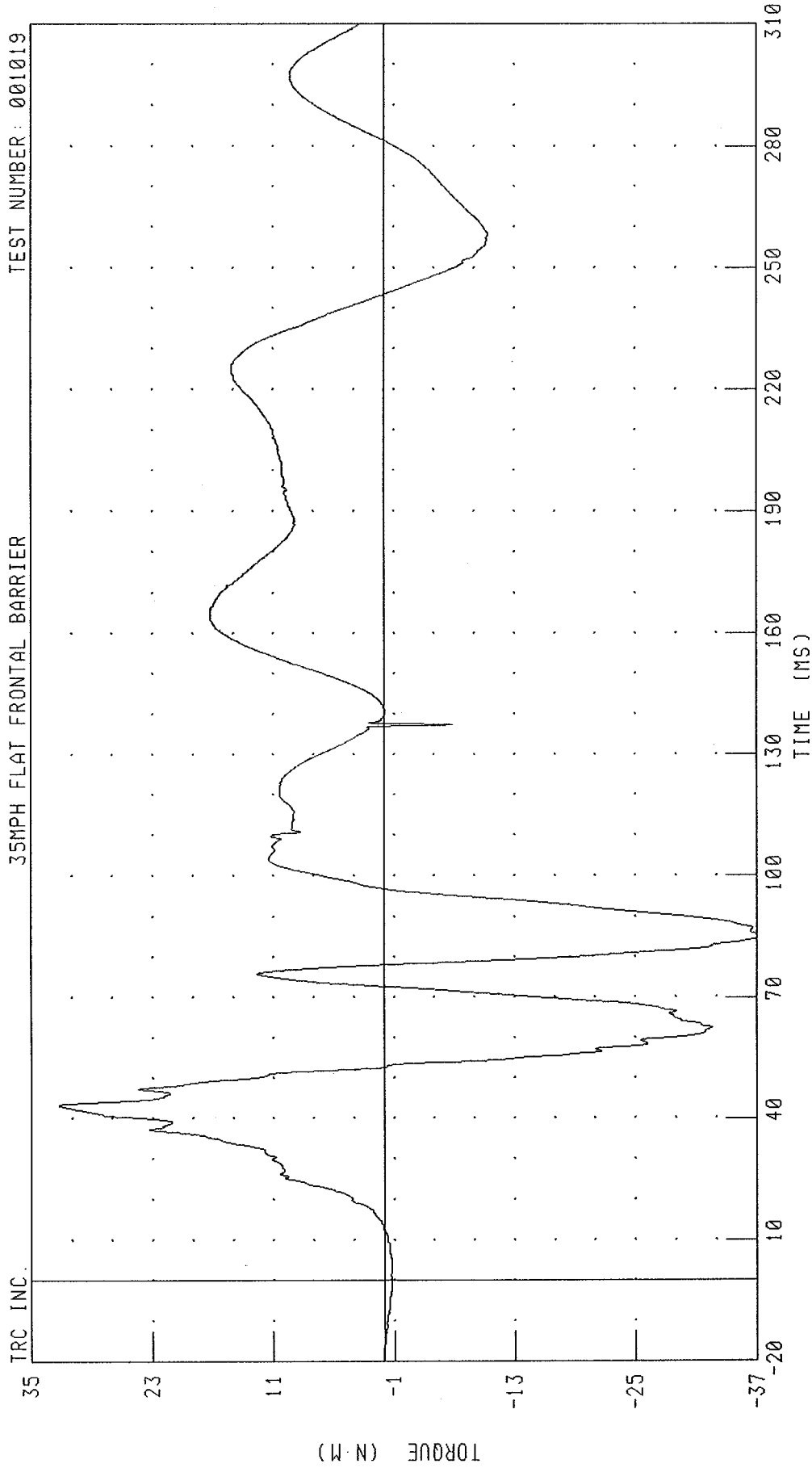
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LEFT LOWER TIBIA Z-AXIS FORCE  
35MPH FLAT FRONTAL BARRIER



CHANNEL: ANLZF2 FILTER: CH. CLASS 600 PEAK DATA: 142.80 N @ 137.84 MS, -5843.79 N @ 51.36 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER RIGHT UPPER TIBIA MOMENT ABOUT X AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



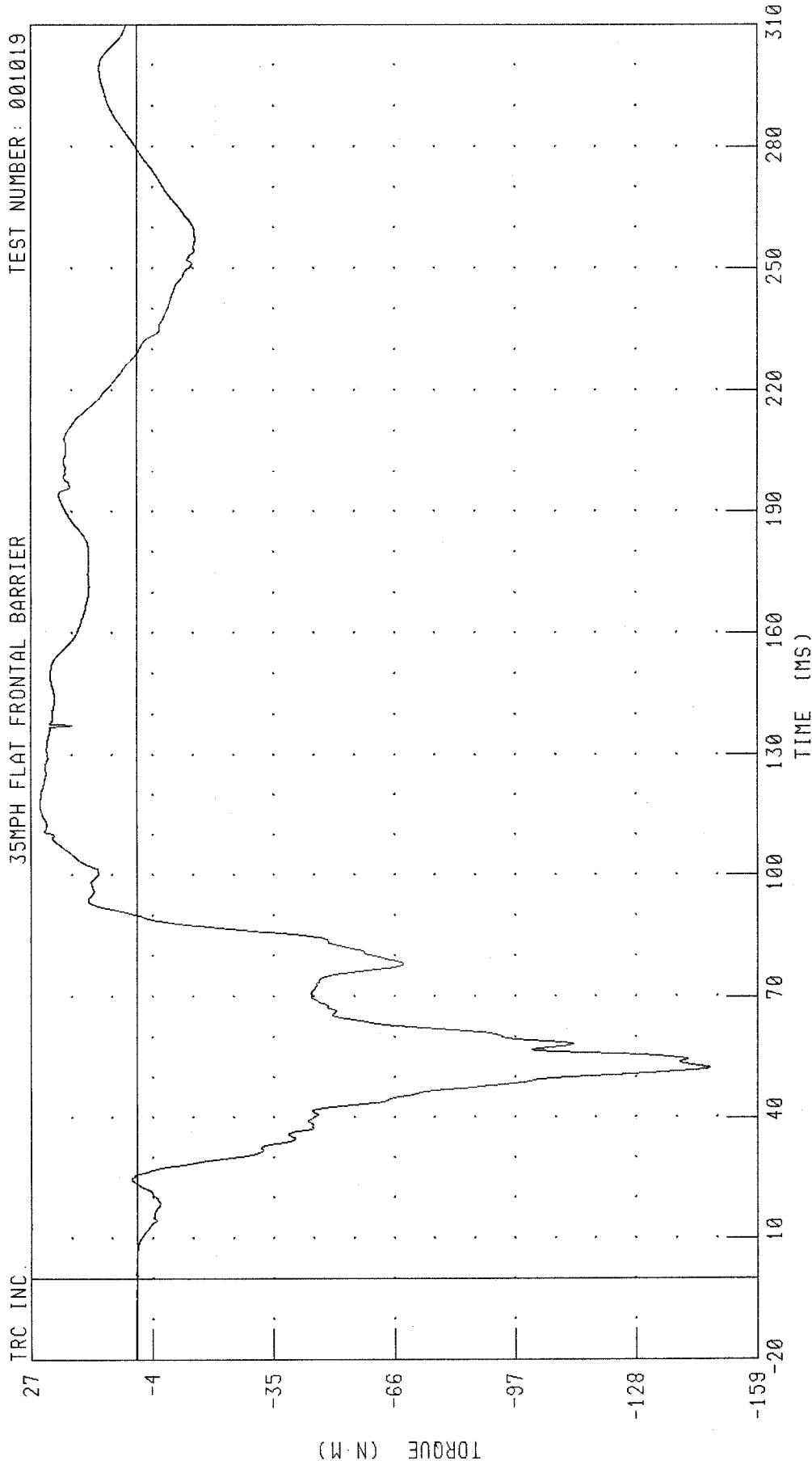
TRC INC.

PEAK DATA: 32.28 N·M @ 43.36 MS; -37.98 N·M @ 84.96 MS

CHANNEL: TBRXM2 FILTER: CH. CLASS 600

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER RIGHT UPPER TIBIA MOMENT ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



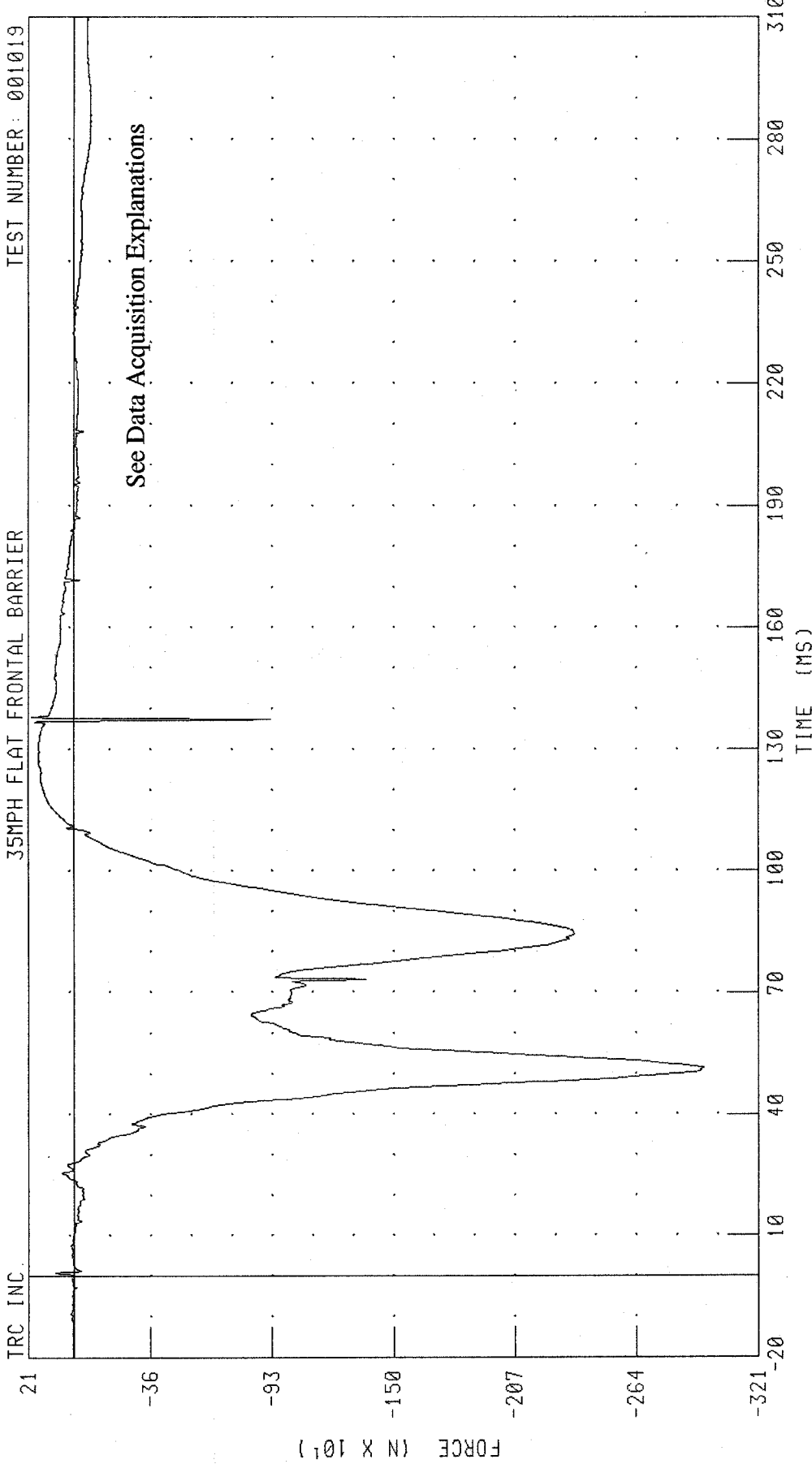
TRC INC.

CHANNEL: TBRYM2 FILTER: CH: CLASS 600

PEAK DATA: 24.82 N·M @ 117.44 MS; -146.99 N·M @ 52.40 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER RIGHT UPPER TIBIA Z-AXIS FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

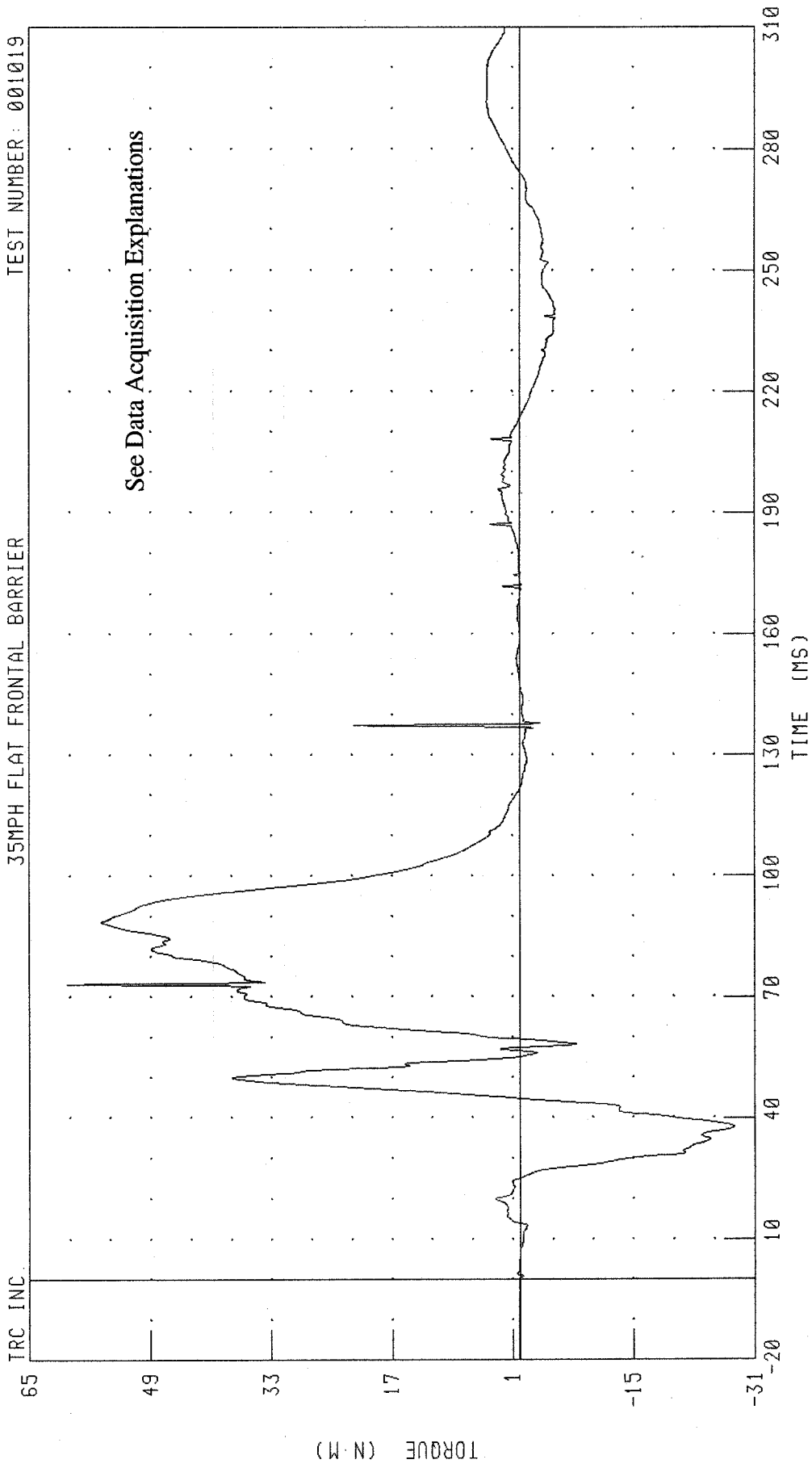


PEAK DATA: 197.73 N @ 137.92 MS; -2956.01 N @ 51.44 MS

CHANNEL: TBRZF2 FILTER: CH. CLASS 600

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER RIGHT LOWER TIBIA MOMENT ABOUT Y AXIS  
35MPH FLAT FRONTAL BARRIER

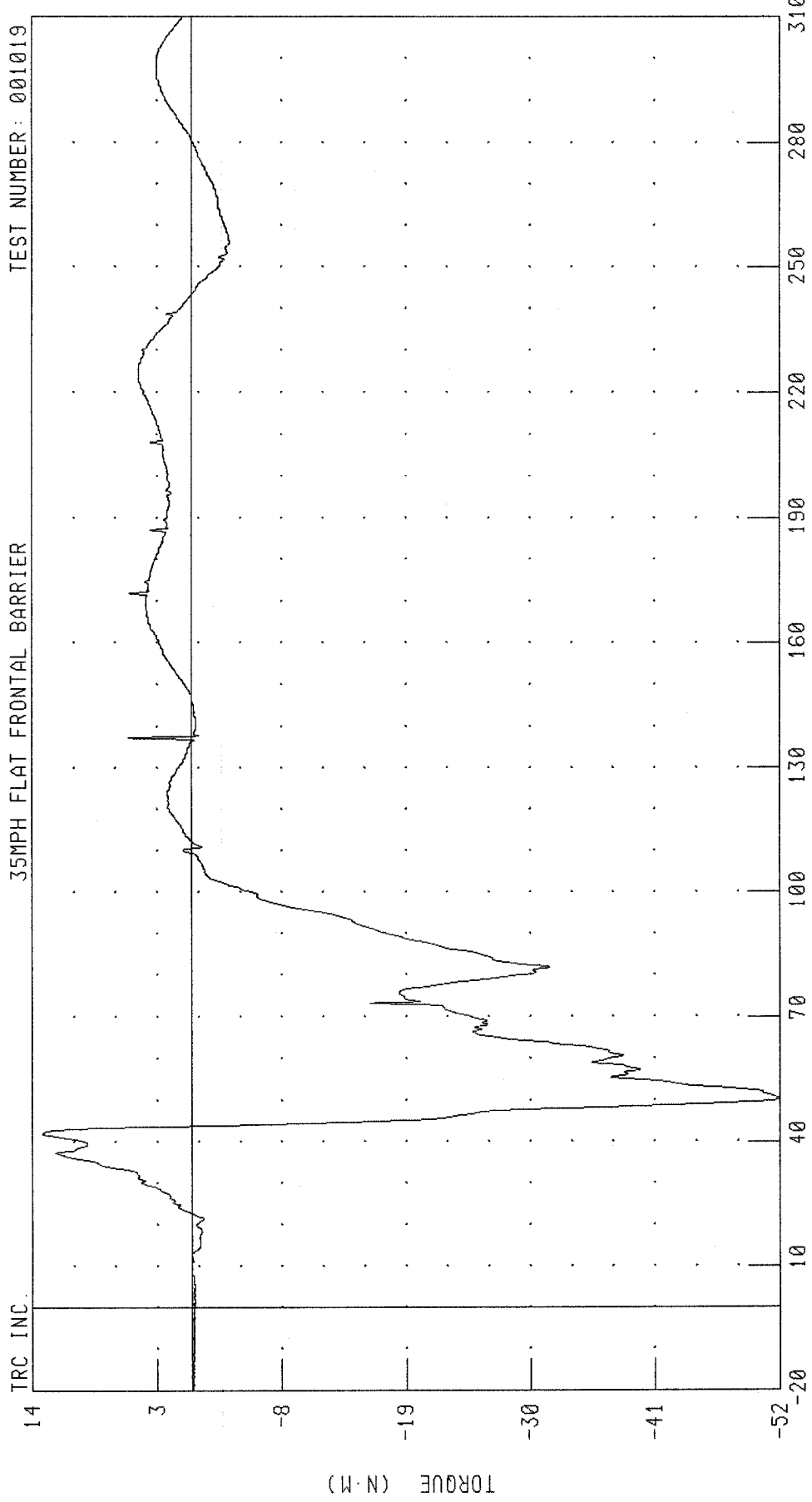
TEST NUMBER: 001019



CHANNEL: ANRYM2 FILTER: CH. CLASS 600 PEAK DATA: 60.08 N.M @ 73.28 MS, -28.29 N.M @ 37.68 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER RIGHT LOWER TIBIA MOMENT ABOUT X AXIS  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



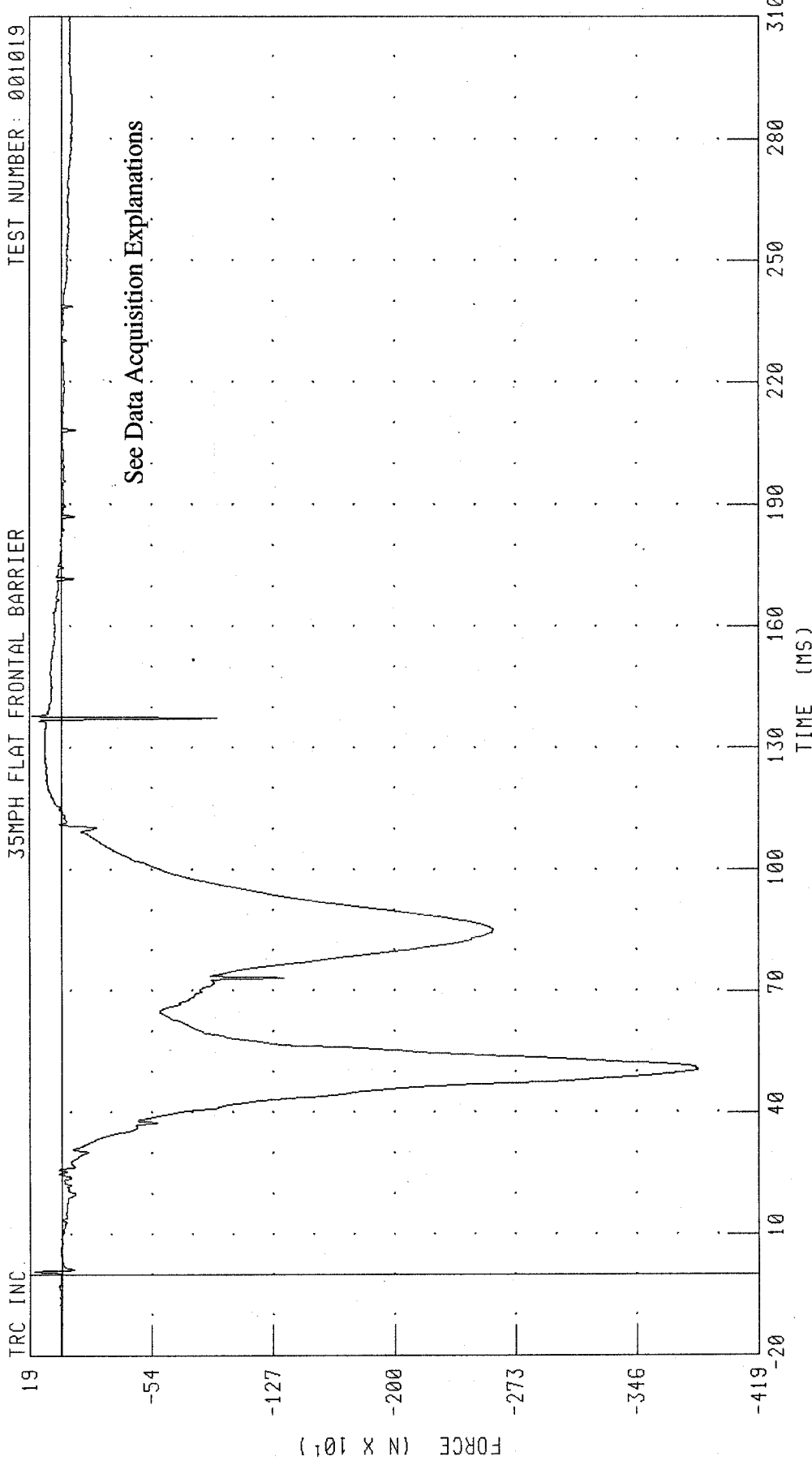
TRC INC.

CHANNEL: ANRXM2 FILTER: CH. CLASS 600

PEAK DATA: 13.11 N·M @ 42.16 MS; -52.25 N·M @ 50.32 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER RIGHT LOWER TIBIA Z-AXIS FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

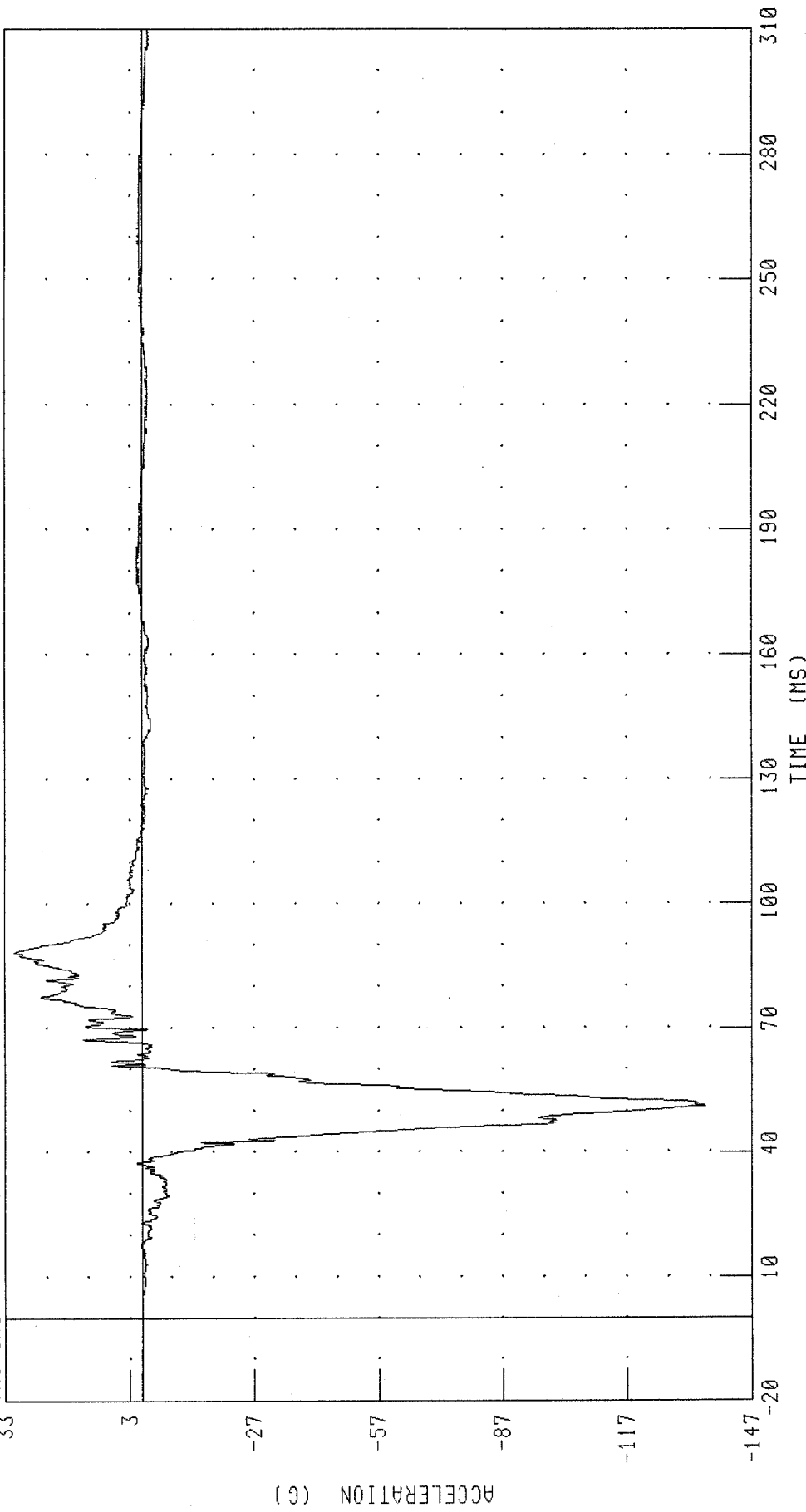


CHANNEL: ANRZF2 FILTER: CH. CLASS 600 PEAK DATA: 178.54 N @ 137.84 MS; -3829.08 N @ 50.56 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LEFT FOOT X-AXIS ACCELERATION AT HEEL  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

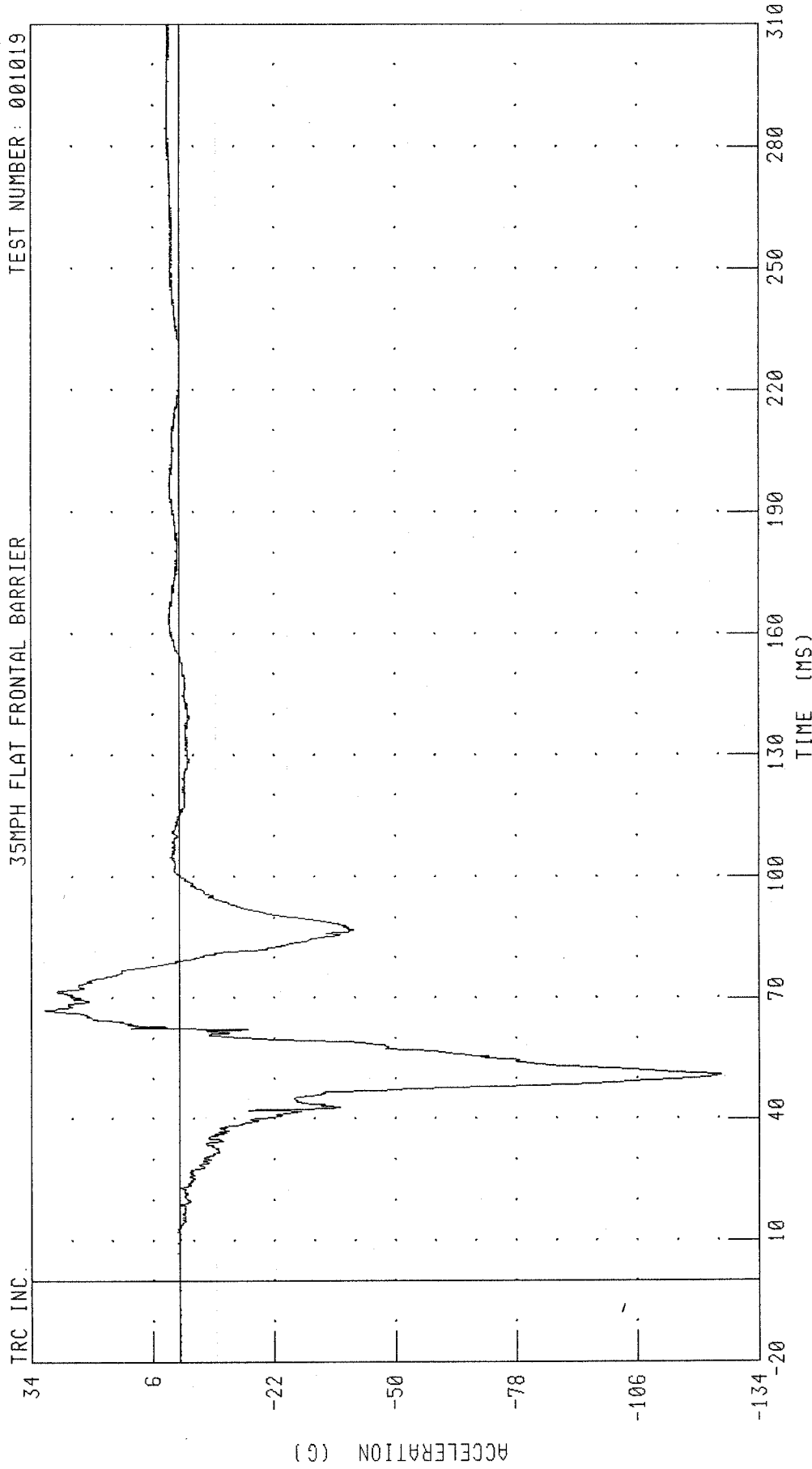


PEAK DATA: 30.75 G @ 88.16 MS; -135.95 G @ 51.20 MS

CHANNEL: FLHXC2 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LEFT FOOT Z-AXIS ACCELERATION AT HEEL  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

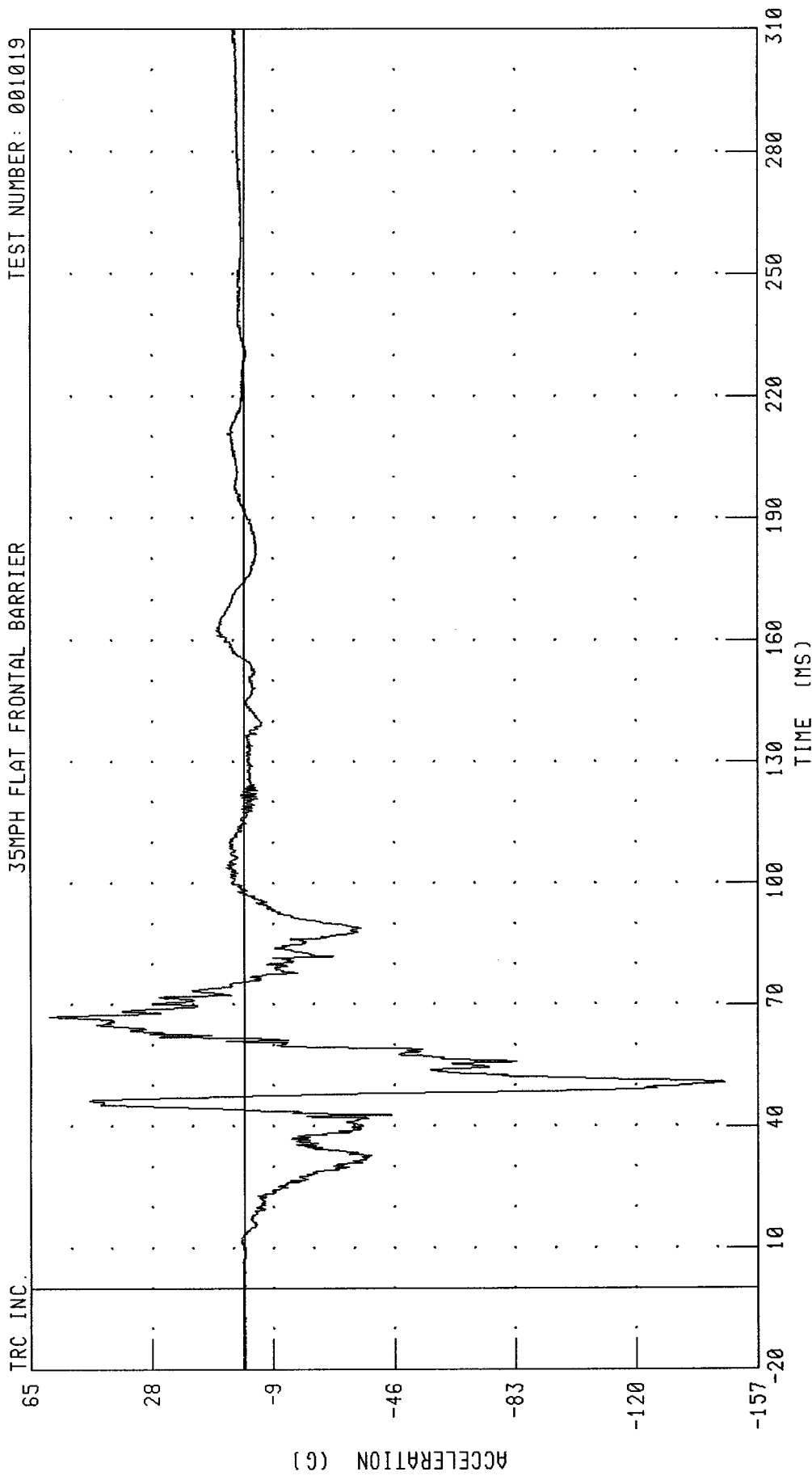


CHANNEL: FLHZG2 FILTER: CH. CLASS 1000

PEAK DATA: 30.92 G @ 66.96 MS; -125.29 G @ 50.80 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LEFT FOOT Z-AXIS ACCELERATION AT TOE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

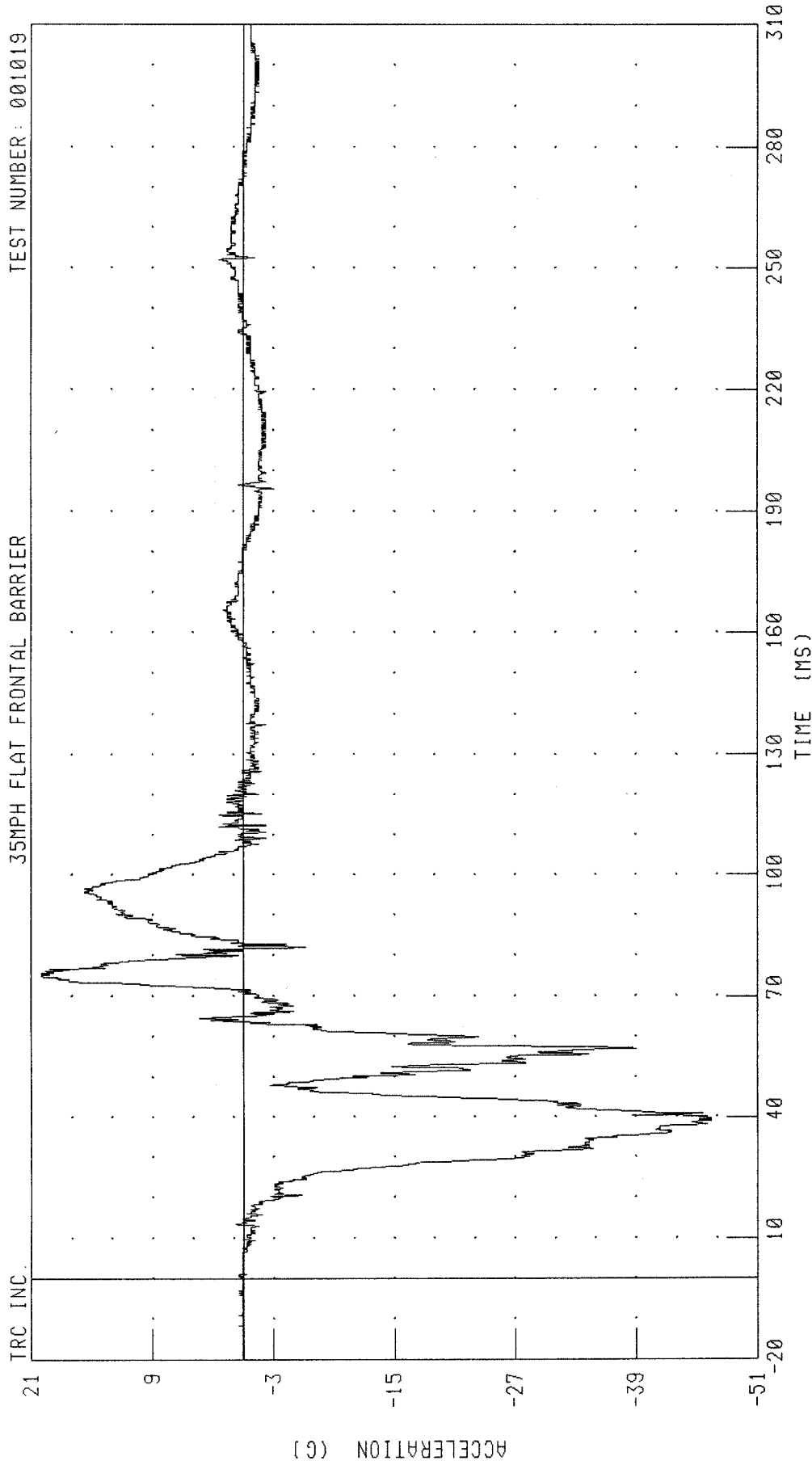


CHANNEL: FLTZG2 FILTER: CH. CLASS 1000

PEAK DATA: 59.48 G @ 67.04 MS, -147.07 G @ 50.64 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER RIGHT FOOT X-AXIS ACCELERATION AT HEEL  
35MPH FLAT FRONTAL BARRIER

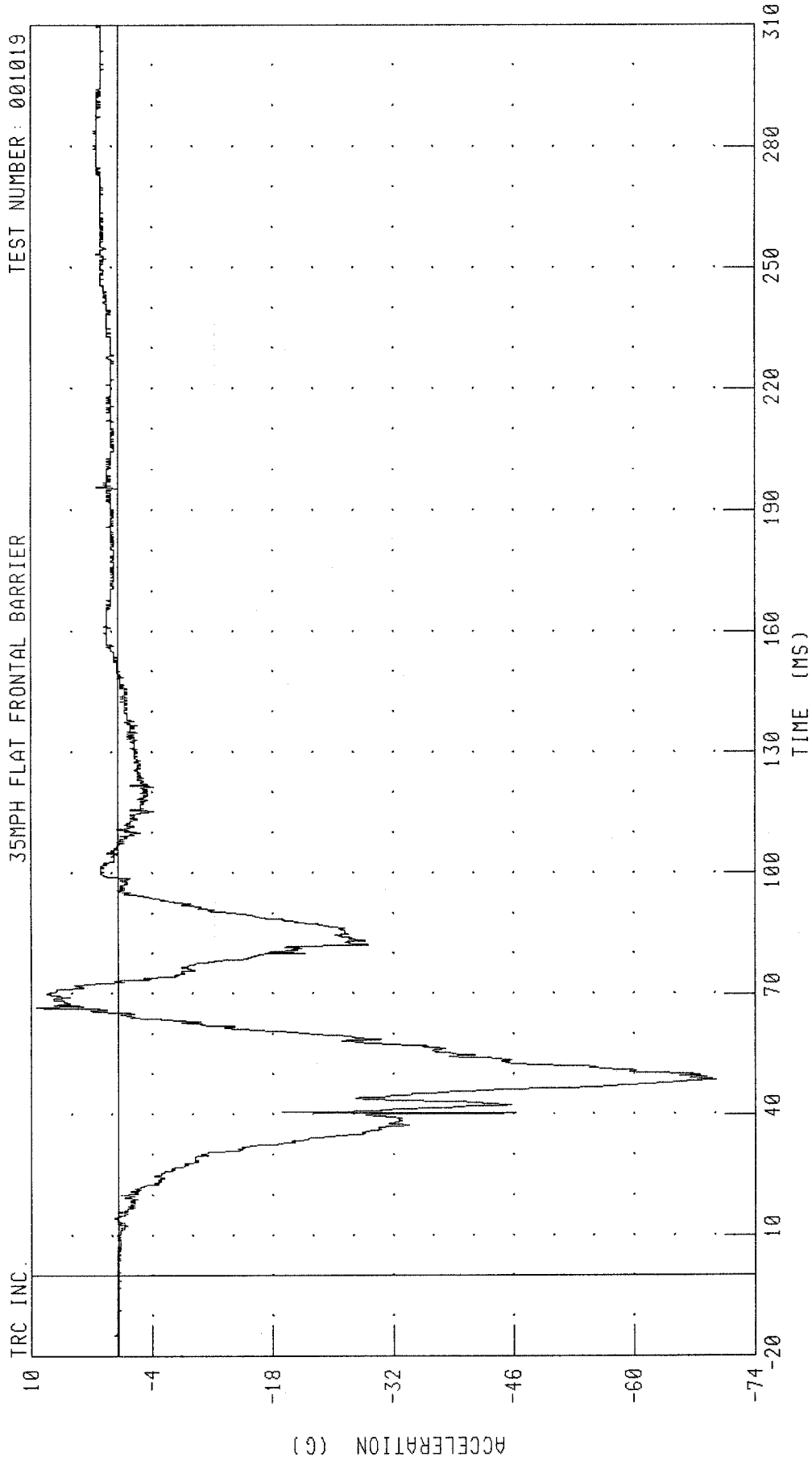
TEST NUMBER: 001019



CHANNEL: FRHXG2 FILTER: CH. CLASS 1000  
PEAK DATA: 20.00 G @ 74.88 MS; -46.43 G @ 38.96 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER RIGHT FOOT Z-AXIS ACCELERATION AT HEEL  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

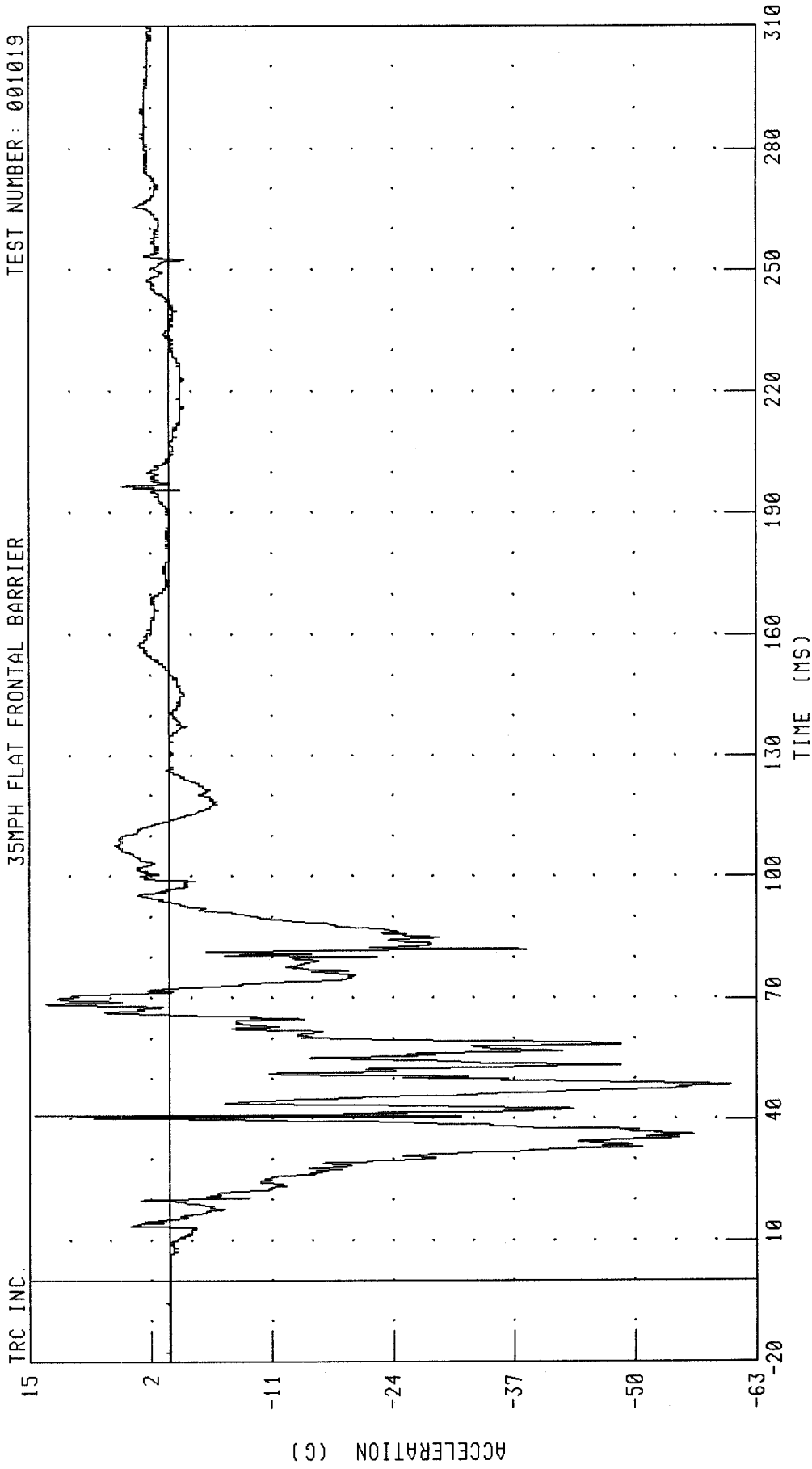


PEAK DATA: 9.38 G @ 66.48 MS; -69.55 G @ 48.64 MS

CHANNEL: FRHZG2 FILTER: CH. CLASS 1000

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER RIGHT FOOT Z-AXIS ACCELERATION AT TOE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

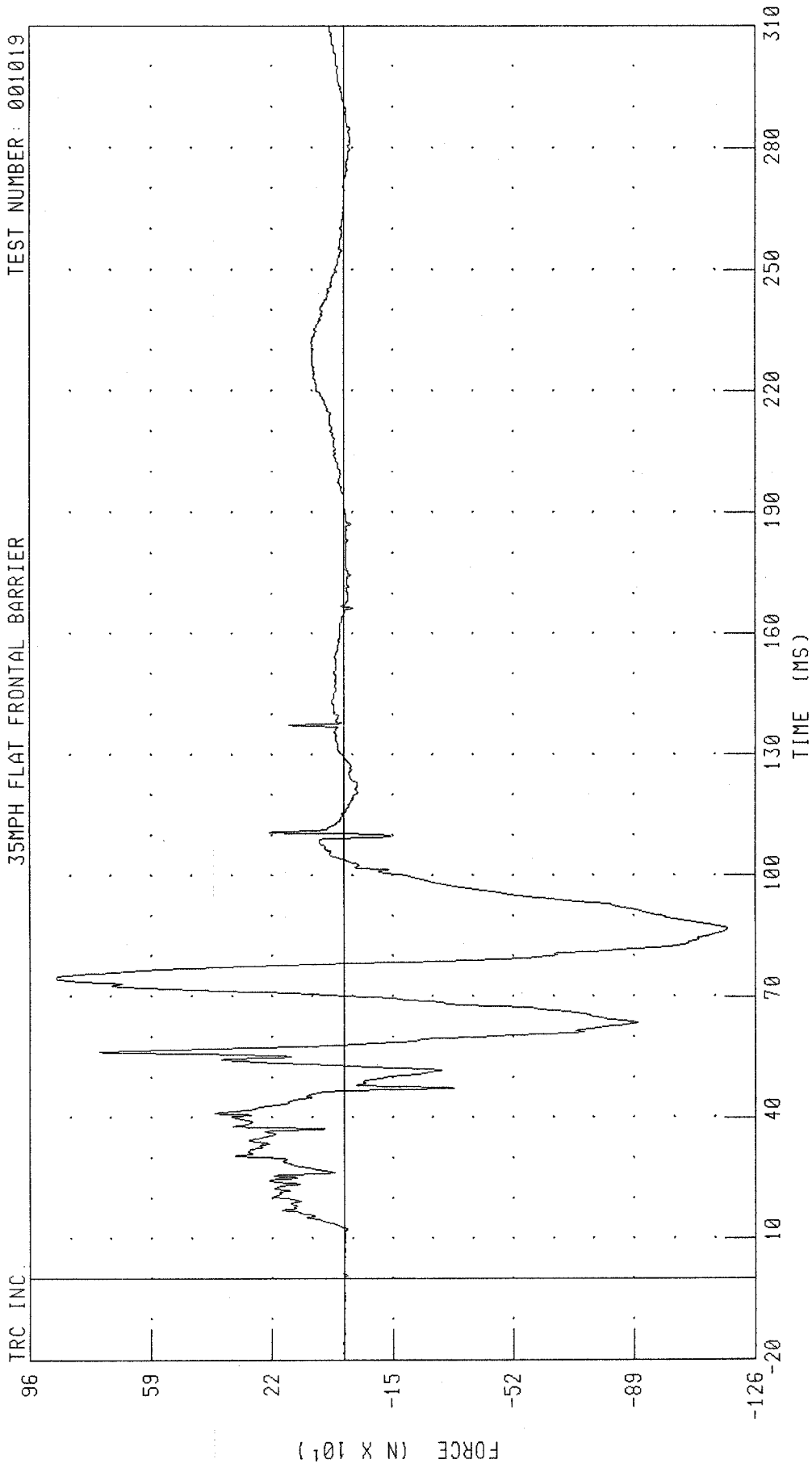


CHANNEL: FRTZG2 FILTER: CH. CLASS 1000

PEAK DATA: 14.45 G @ 40.80 MS; -60.23 G @ 48.48 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LEFT FEMUR FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



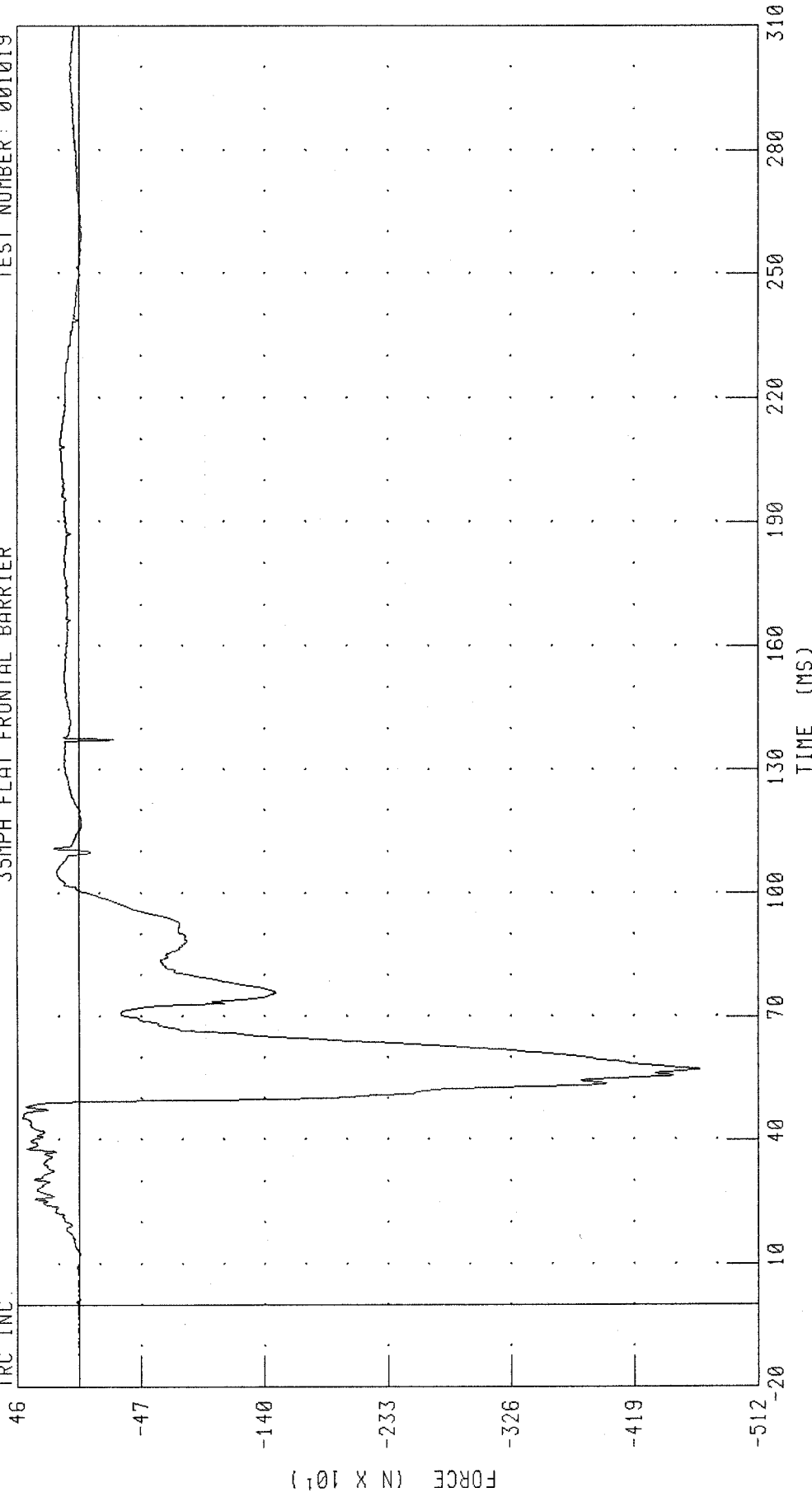
CHANNEL: LFMZF2 FILTER: CH. CLASS 600

PEAK DATA: 879.10 N @ 74.48 MS, -1175.95 N @ 86.72 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER RIGHT FEMUR FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

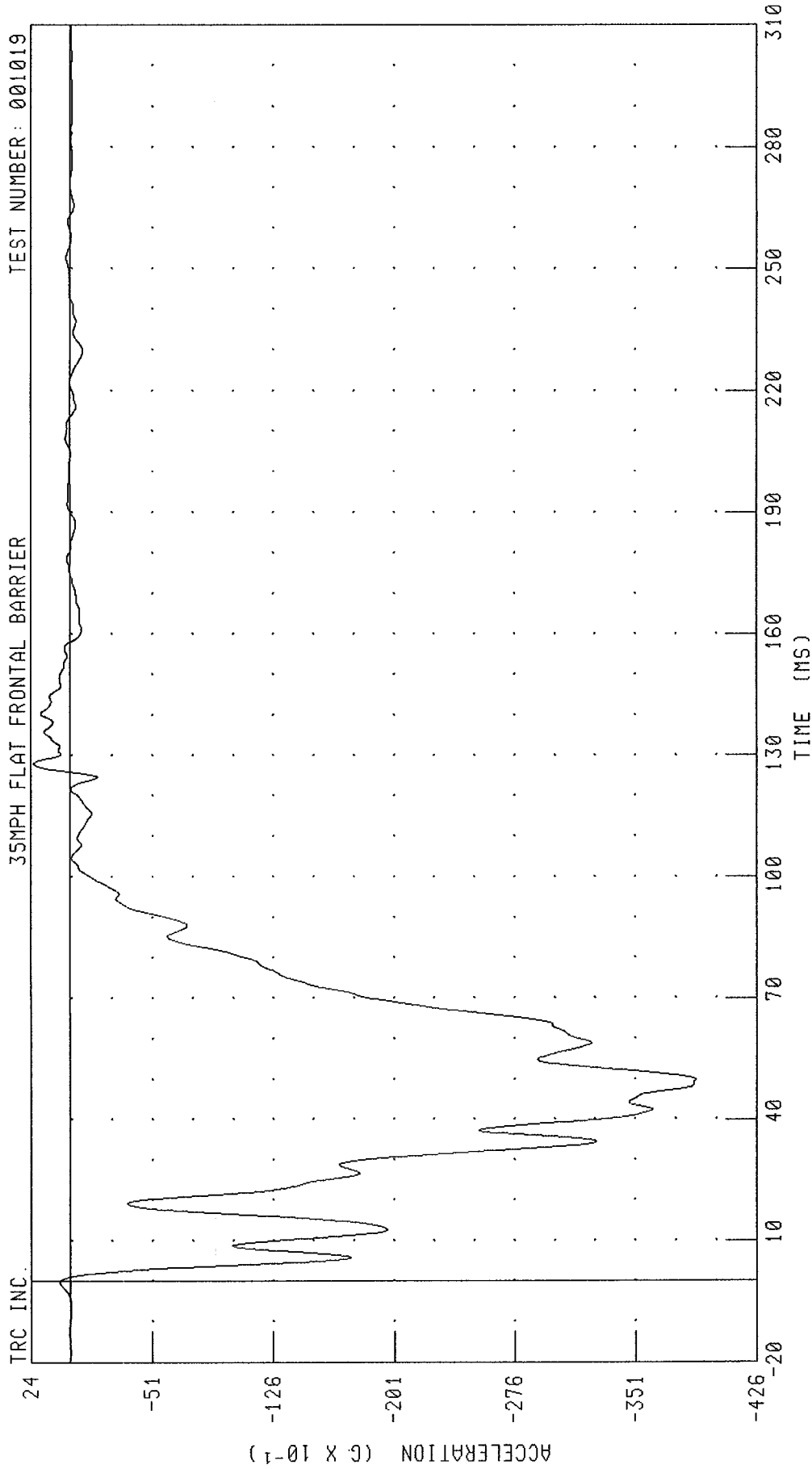


PEAK DATA: 423.20 N @ 45.44 MS; -4679.89 N @ 57.04 MS

CHANNEL: RFMF2 FILTER: CH. CLASS 600

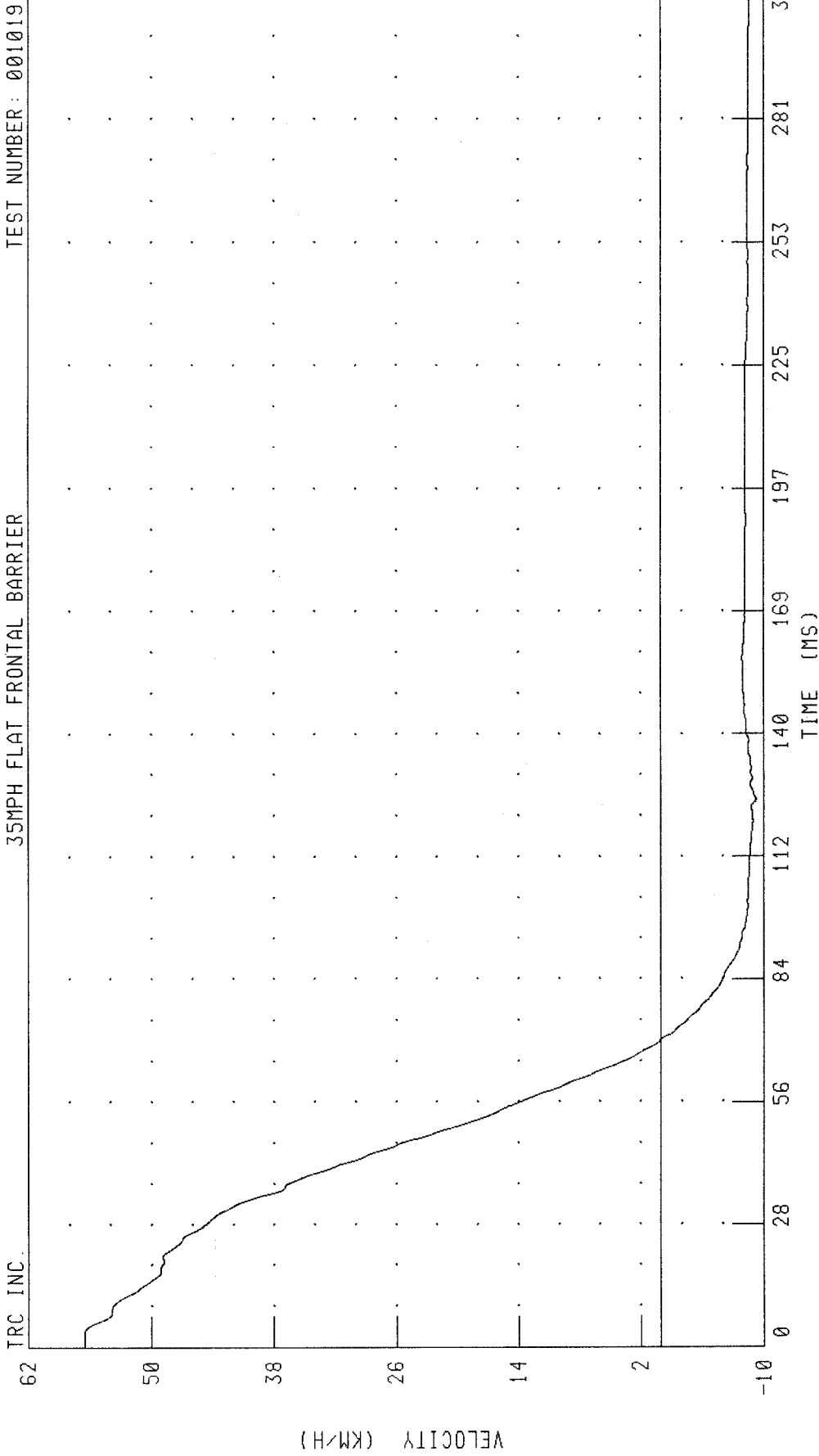
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LEFT REAR SEAT X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



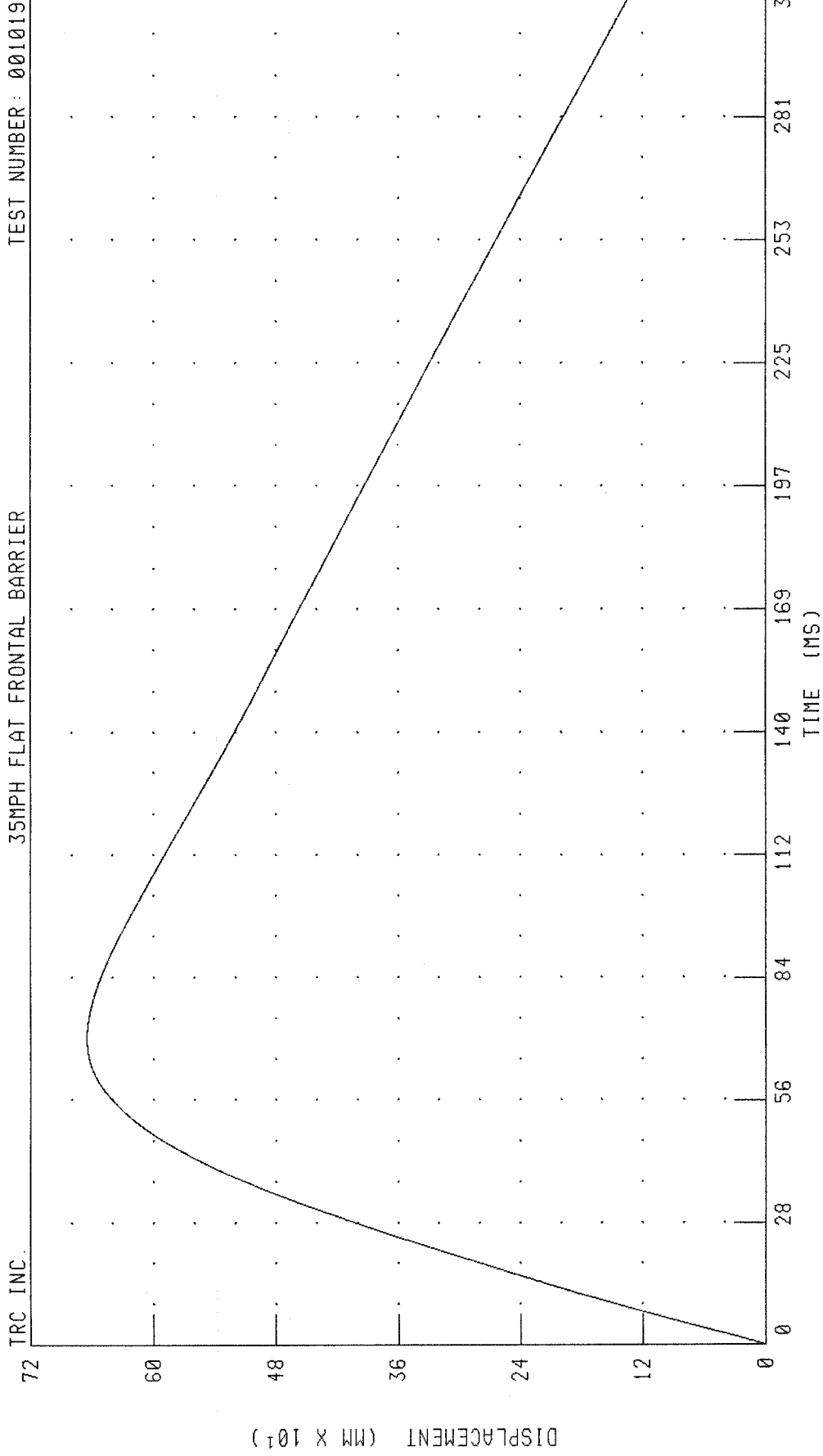
CHANNEL: TLRXG1 FILTER: CH. CLASS 60 PEAK DATA: 2.26 G @ 128.00 MS; -38.85 G @ 49.92 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LEFT REAR SEAT X-AXIS VELOCITY  
35MPH FLAT FRONTAL BARRIER



CHANNEL: TLRXV1 FILTER: CH. CLASS 180 PEAK DATA: 56.51 KM/H @ 3.36 MS; -9.26 KM/H @ 125.76 MS

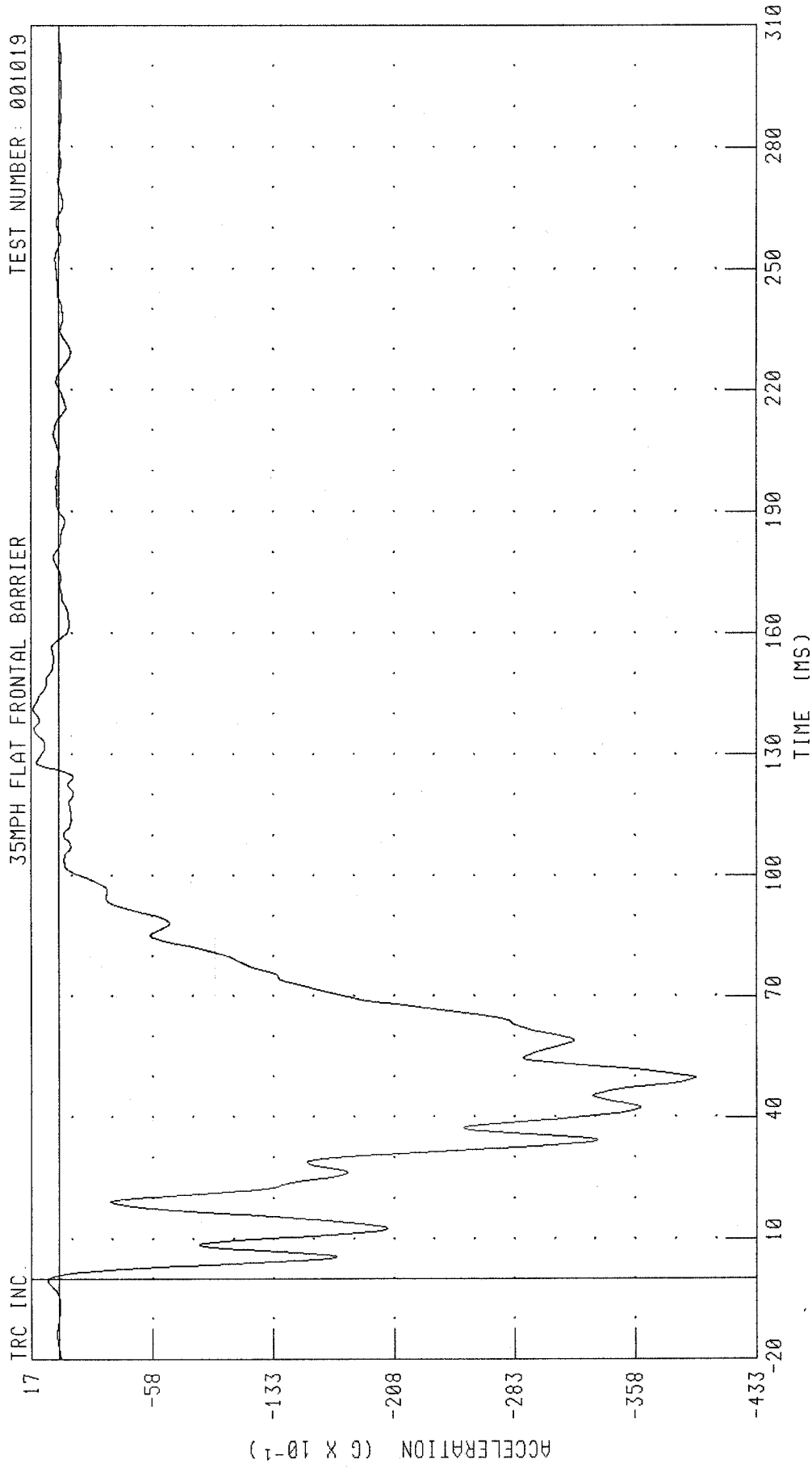
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LEFT REAR SEAT X-AXIS DISPLACEMENT  
35MPH FLAT FRONTAL BARRIER



CHANNEL: TLRXD1 FILTER: CH. CLASS 180

PEAK DATA: 665.09 MM @ 70.80 MS; 0.00 MM @ 0.00 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LEFT REAR SEAT REDUNDANT X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

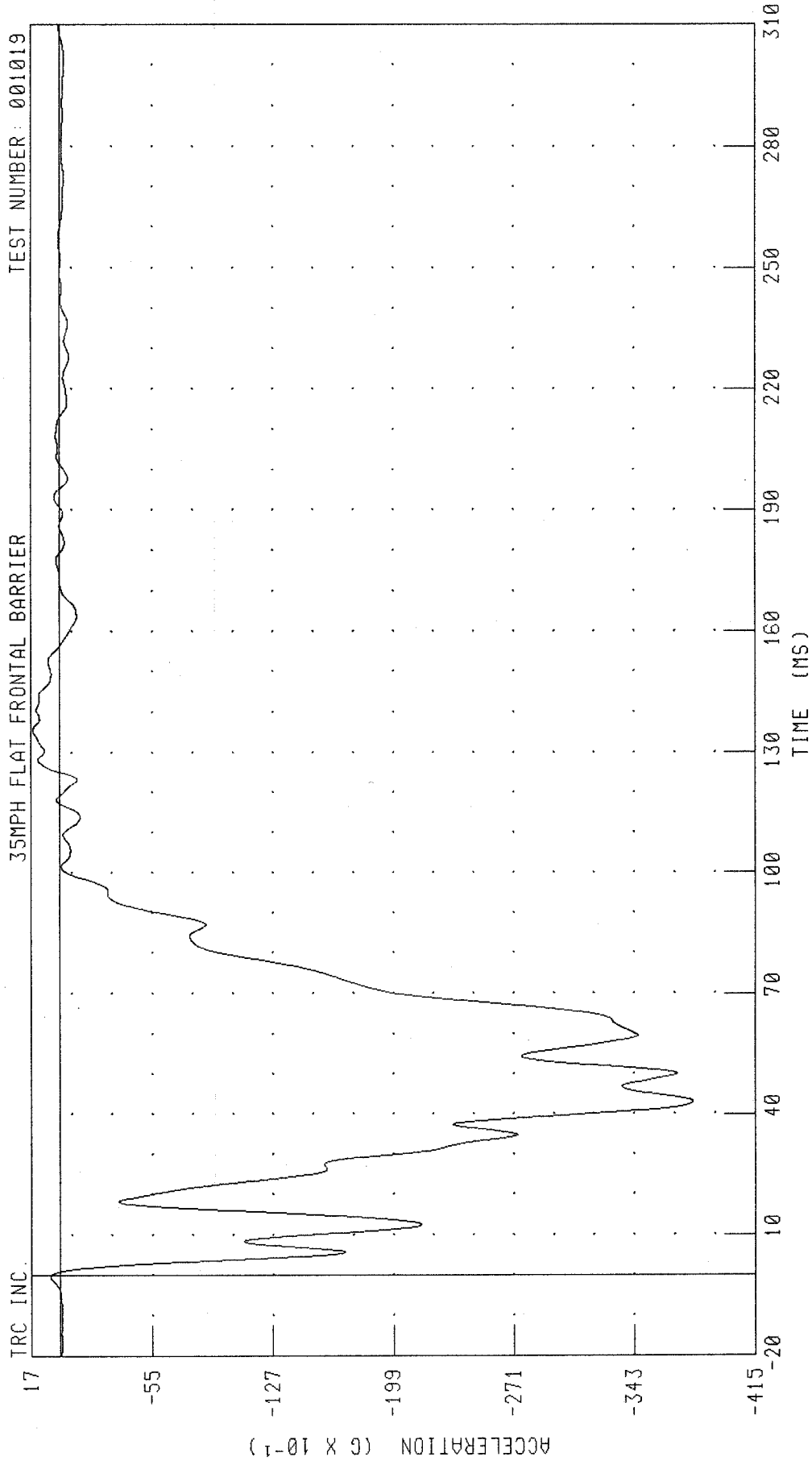


CHANNEL: TLRXGA FILTER: CH. CLASS 60

PEAK DATA: 1.61 G @ 141.20 MS; -39.54 G @ 49.68 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
RIGHT REAR SEAT X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

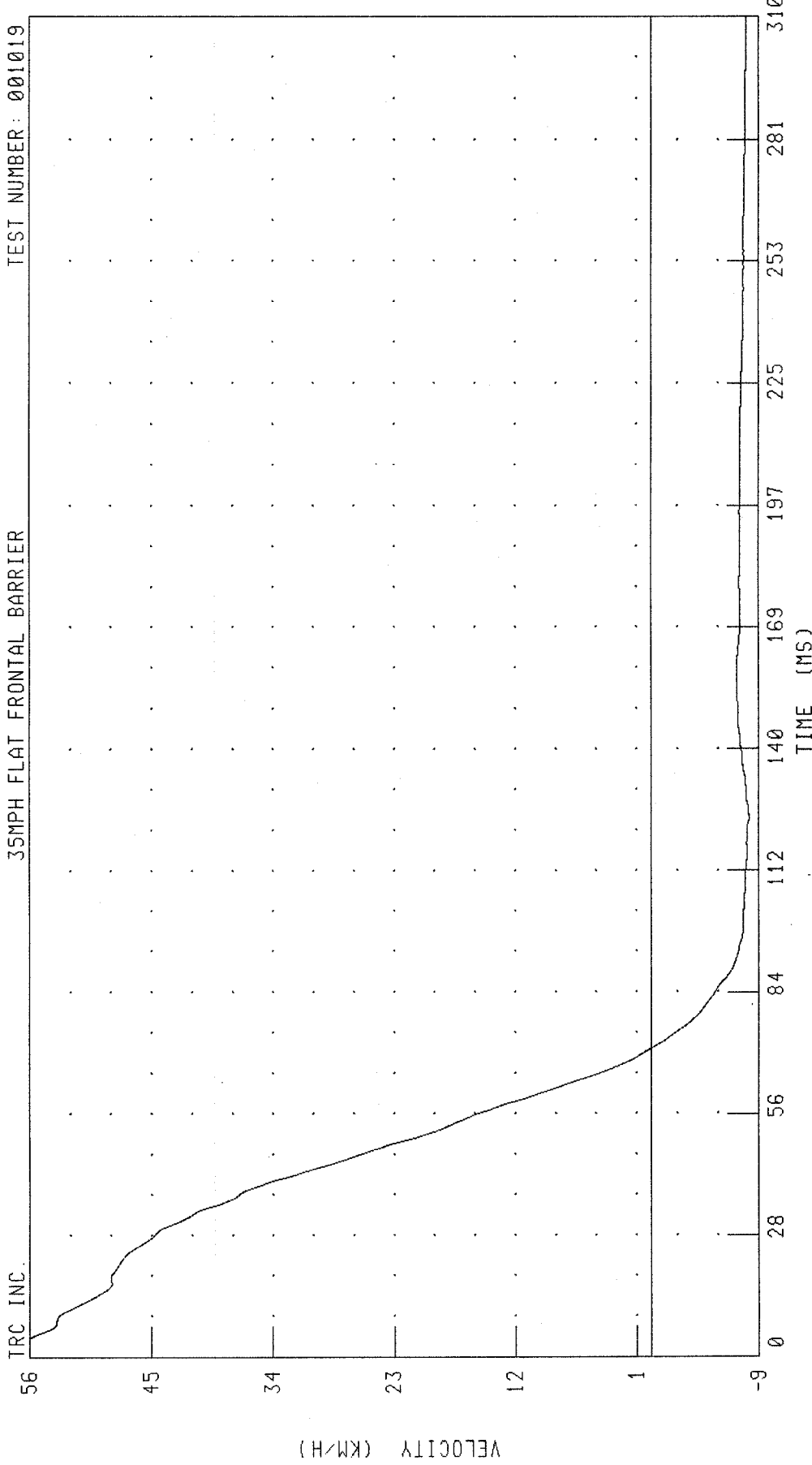


CHANNEL: TRRXG1 FILTER: CH. CLASS 60

PEAK DATA: 1.62 G @ 135.44 MS, -37.80 G @ 43.12 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
RIGHT REAR SEAT X-AXIS VELOCITY  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

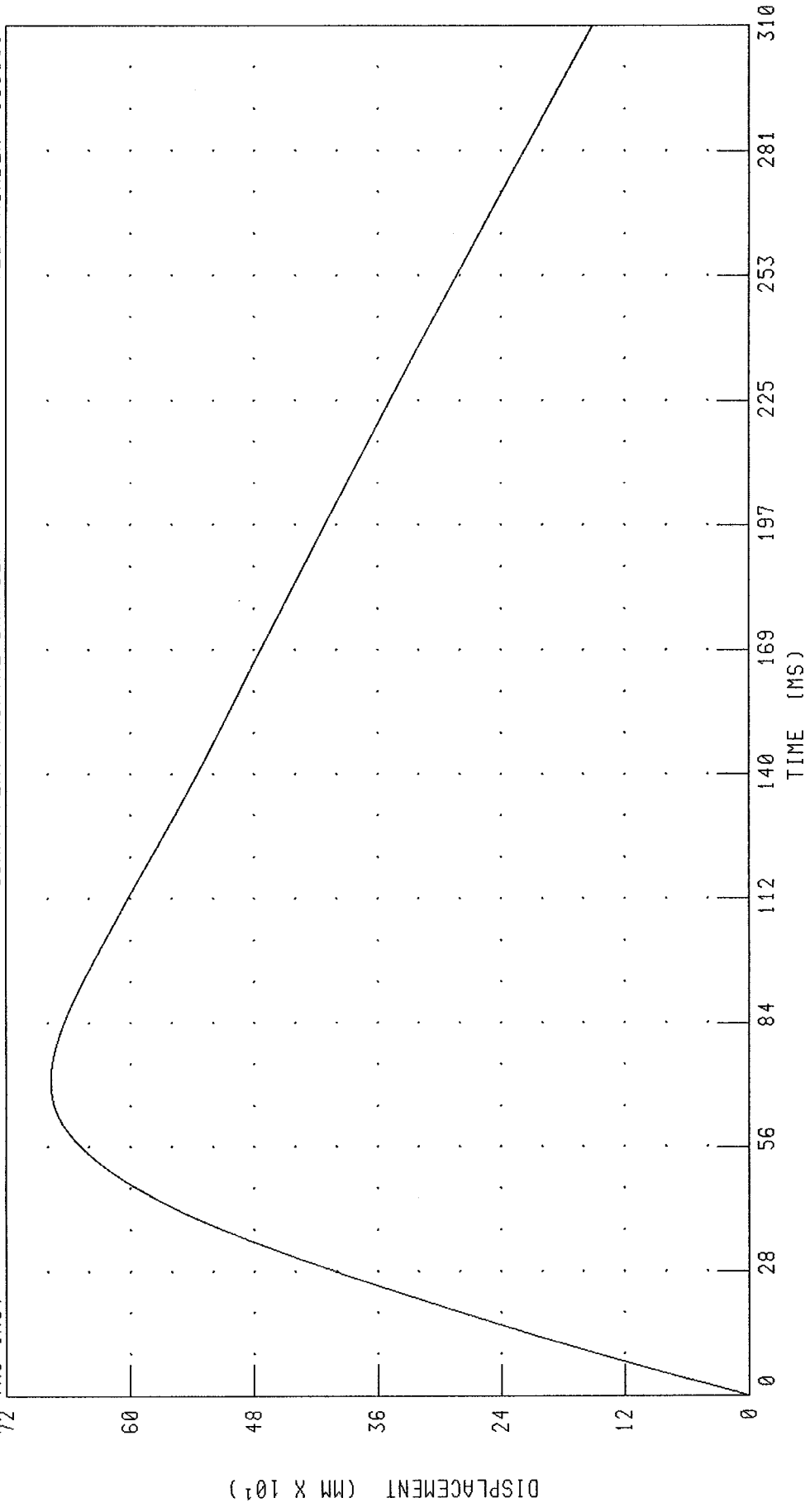


CHANNEL: TRRXV1 FILTER: CH. CLASS 180 PEAK DATA: 56.51 KM/H @ 3.12 MS, -8.85 KM/H @ 125.12 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
RIGHT REAR SEAT X-AXIS DISPLACEMENT  
35MPH FLAT FRONTAL BARRIER

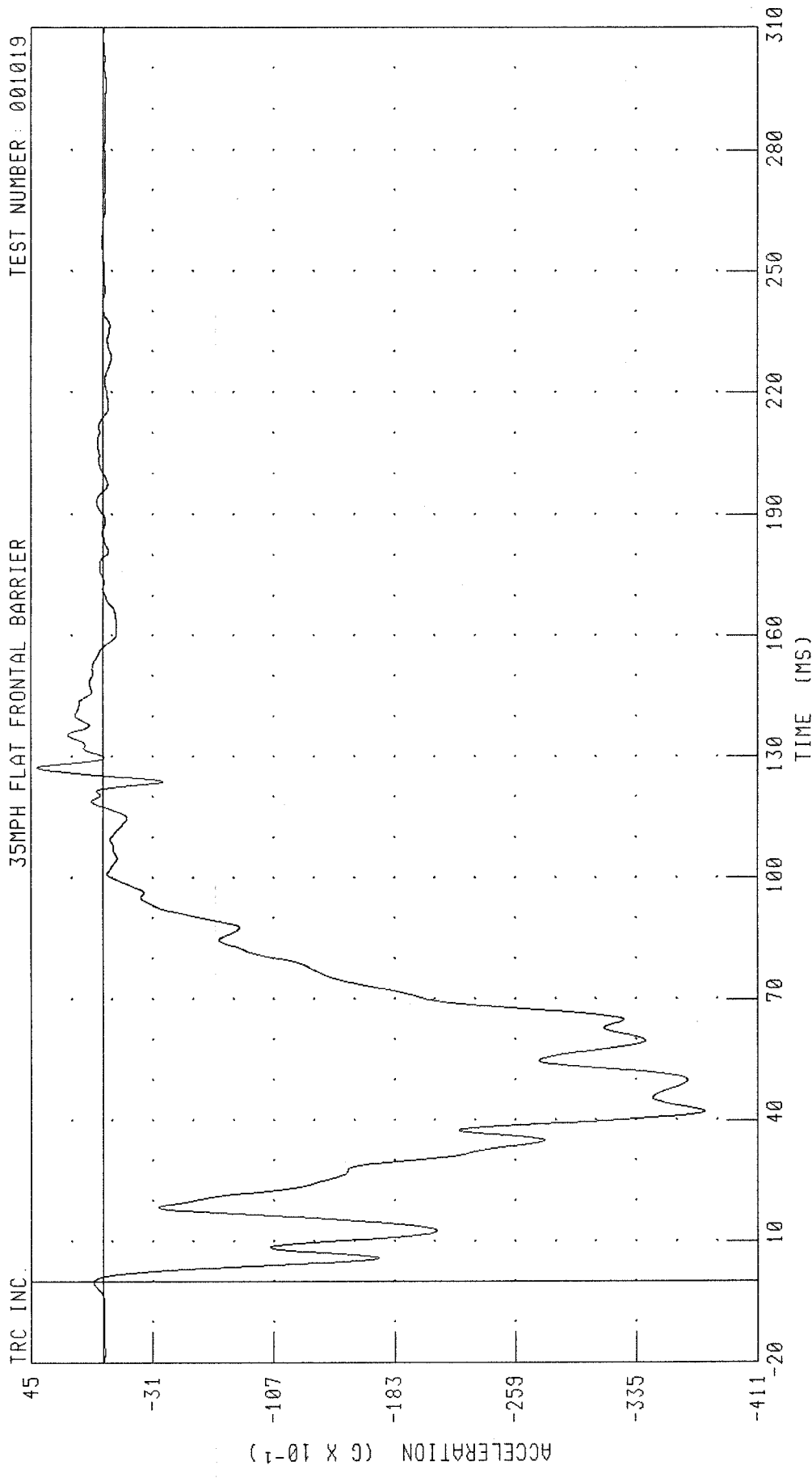
TEST NUMBER: 001019

TRC INC.



CHANNEL: TRRXD1 FILTER: CH. CLASS 180 PEAK DATA: 676.85 MM @ 71.44 MS; 0.00 MM @ 0.00 MS

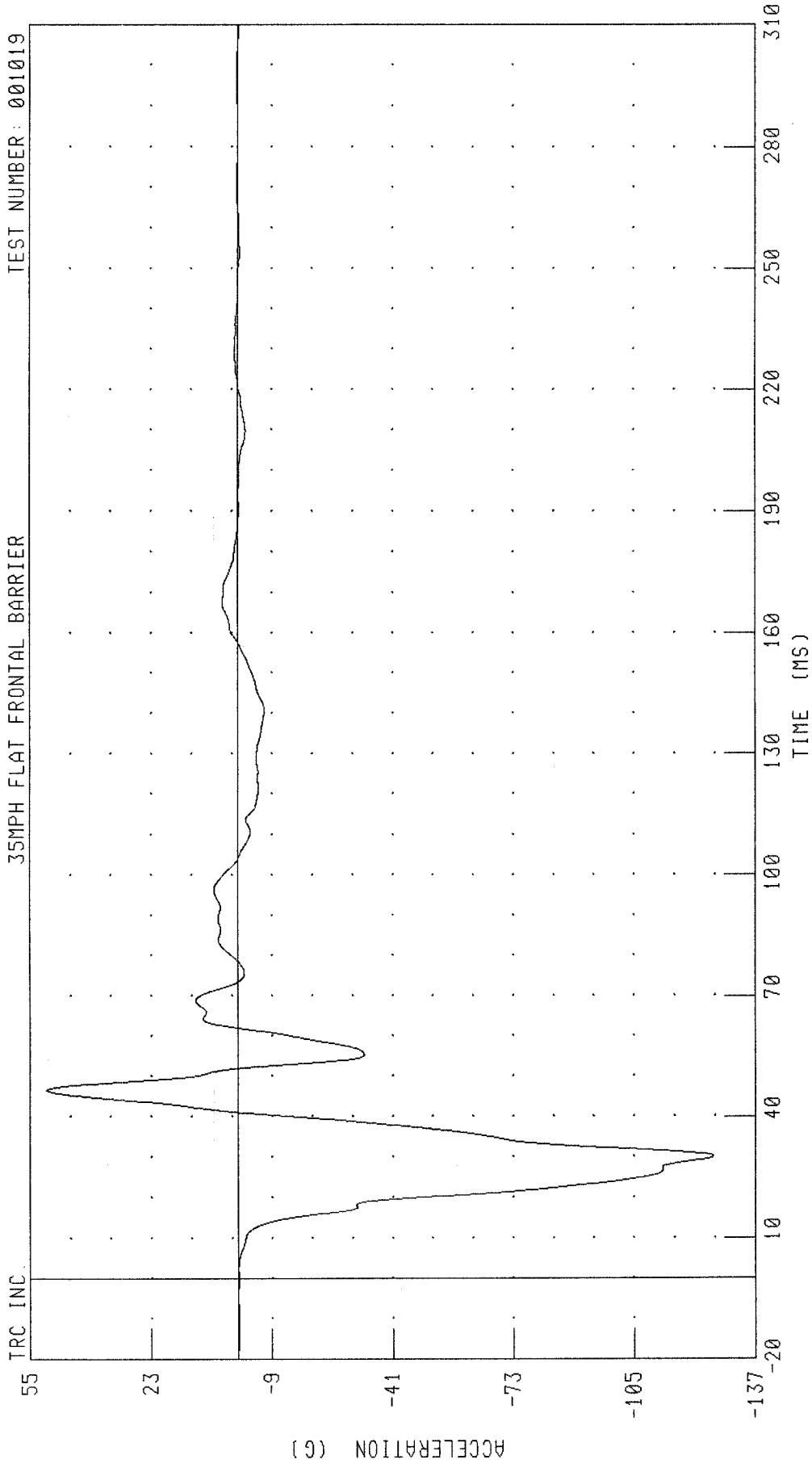
2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
RIGHT REAR SEAT REDUNDANT X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER



CHANNEL: TRRXGA FILTER: CH. CLASS 60 PEAK DATA: 4.11 G @ 127.36 MS; -37.81 G @ 42.24 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
ENGINE TOP X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

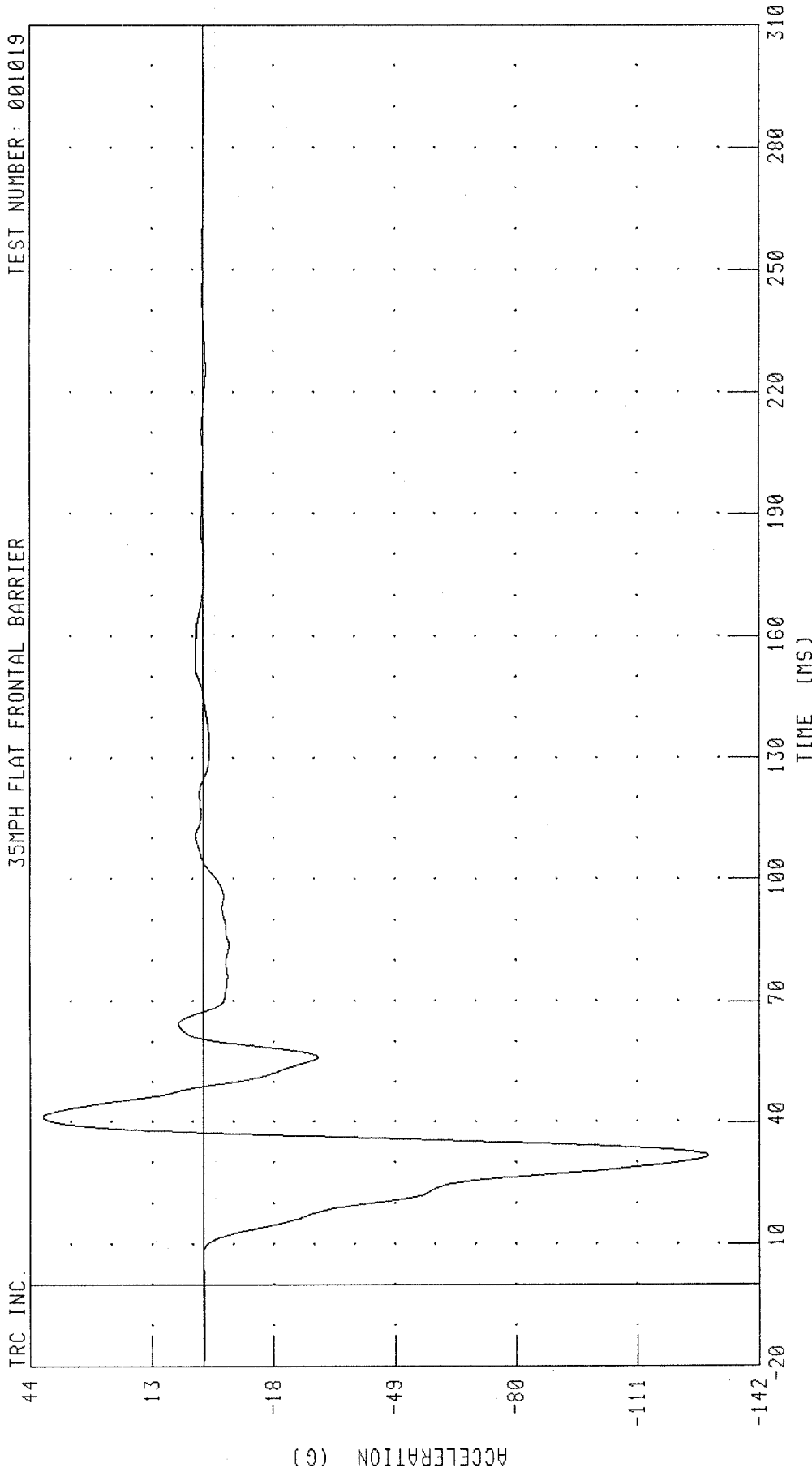
TEST NUMBER: 001019



CHANNEL: ENGXC1 FILTER: CH. CLASS 60 PEAK DATA: 50.64 G @ 46.64 MS; -125.96 G @ 30.08 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
ENGINE BOTTOM X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

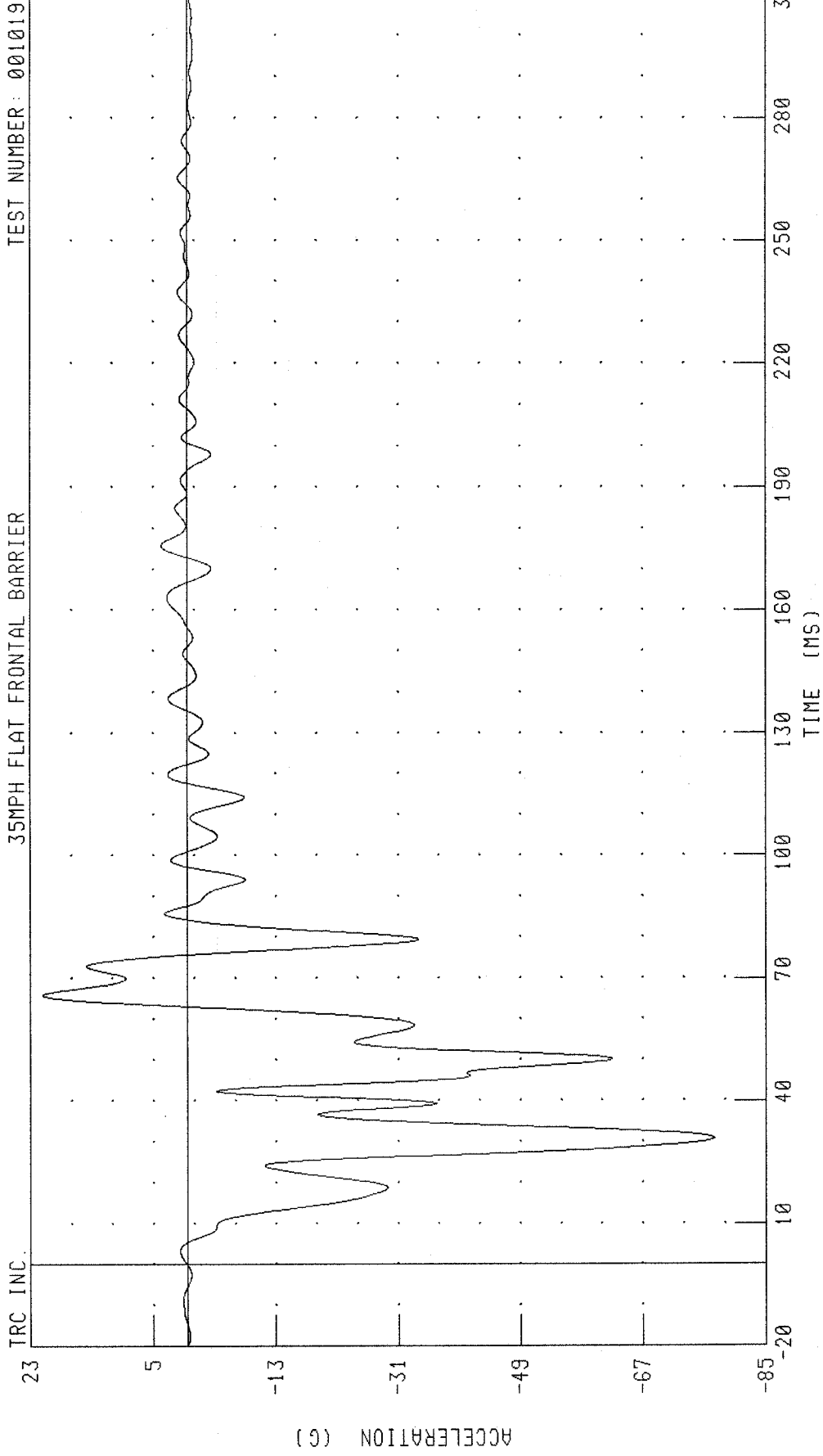


CHANNEL: ENCXC2 FILTER: CH. CLASS 60

PEAK DATA: 40.78 G @ 41.28 MS; -129.02 G @ 31.76 MS

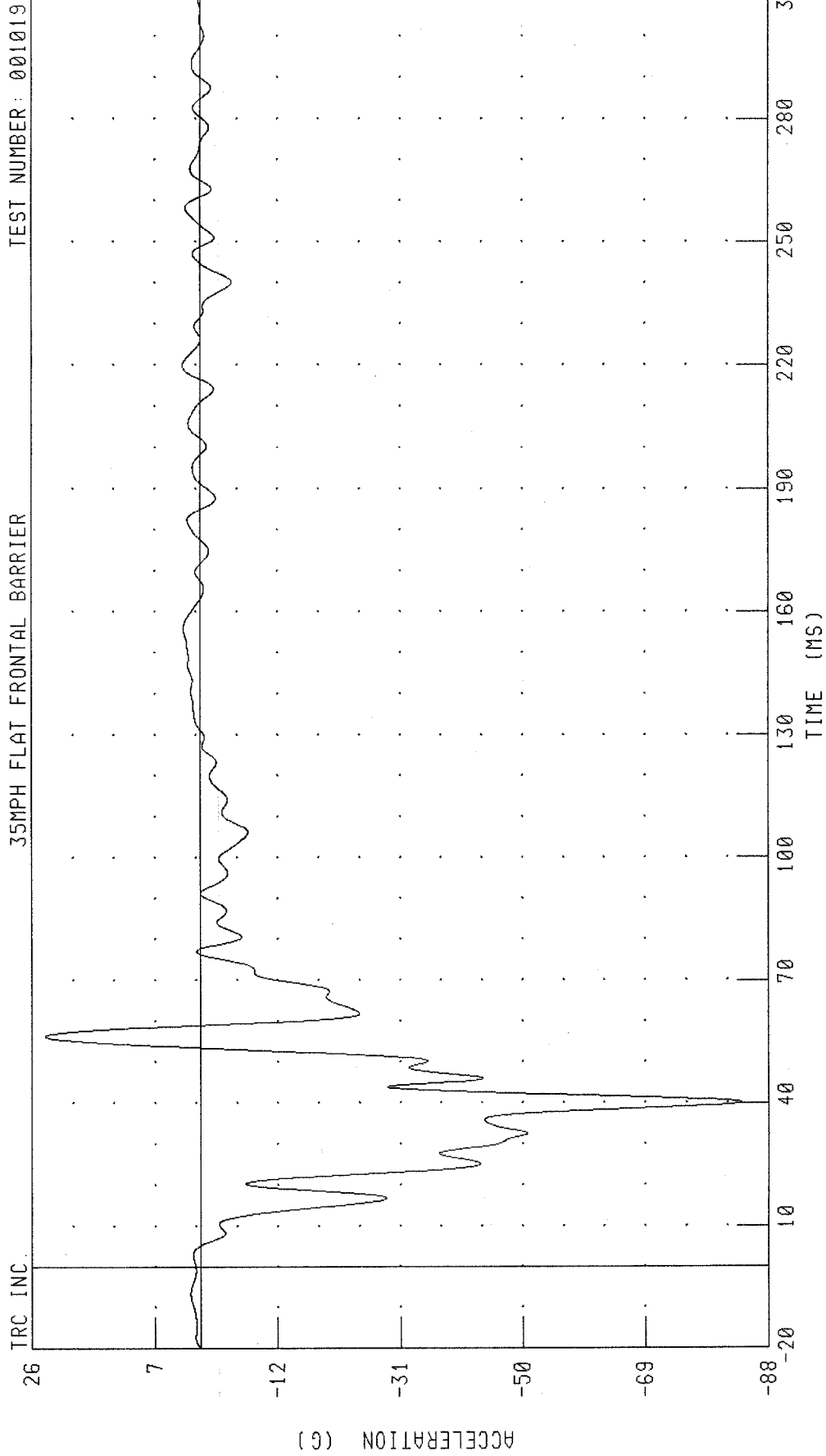
001019

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
RIGHT BRAKE CALIPER X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER



CHANNEL: BCRXG1 FILTER: CH. CLASS 60 PEAK DATA: 21.21 G @ 65.84 MS; -77.51 G @ 30.80 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LEFT BRAKE CALIPER X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER



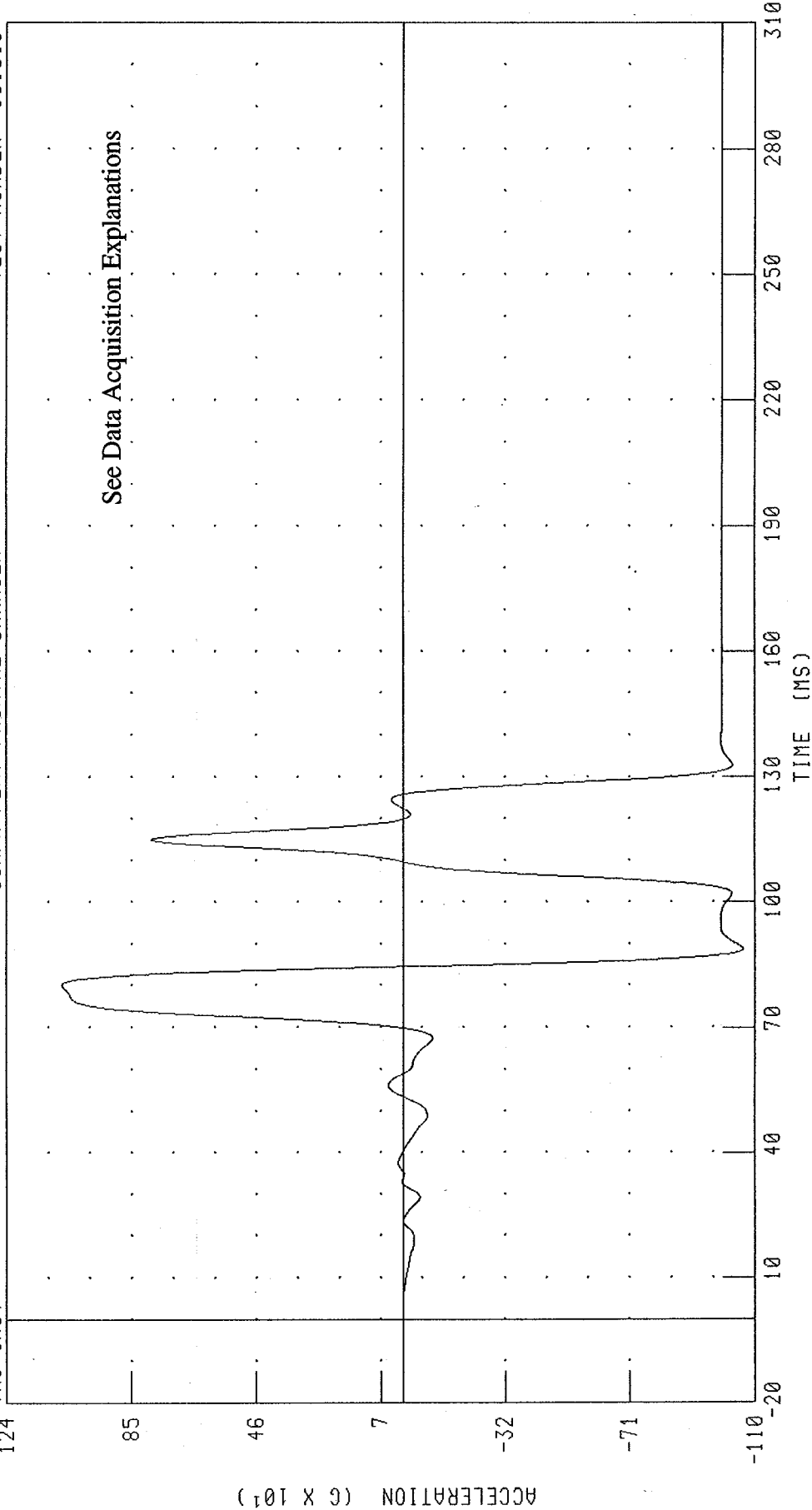
CHANNEL: BCLXG1 FILTER: CH. CLASS 60

PEAK DATA: 23.94 G @ 56.32 MS, -83.78 G @ 40.16 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
INSTRUMENT PANEL CENTER X-AXIS ACCELERATION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

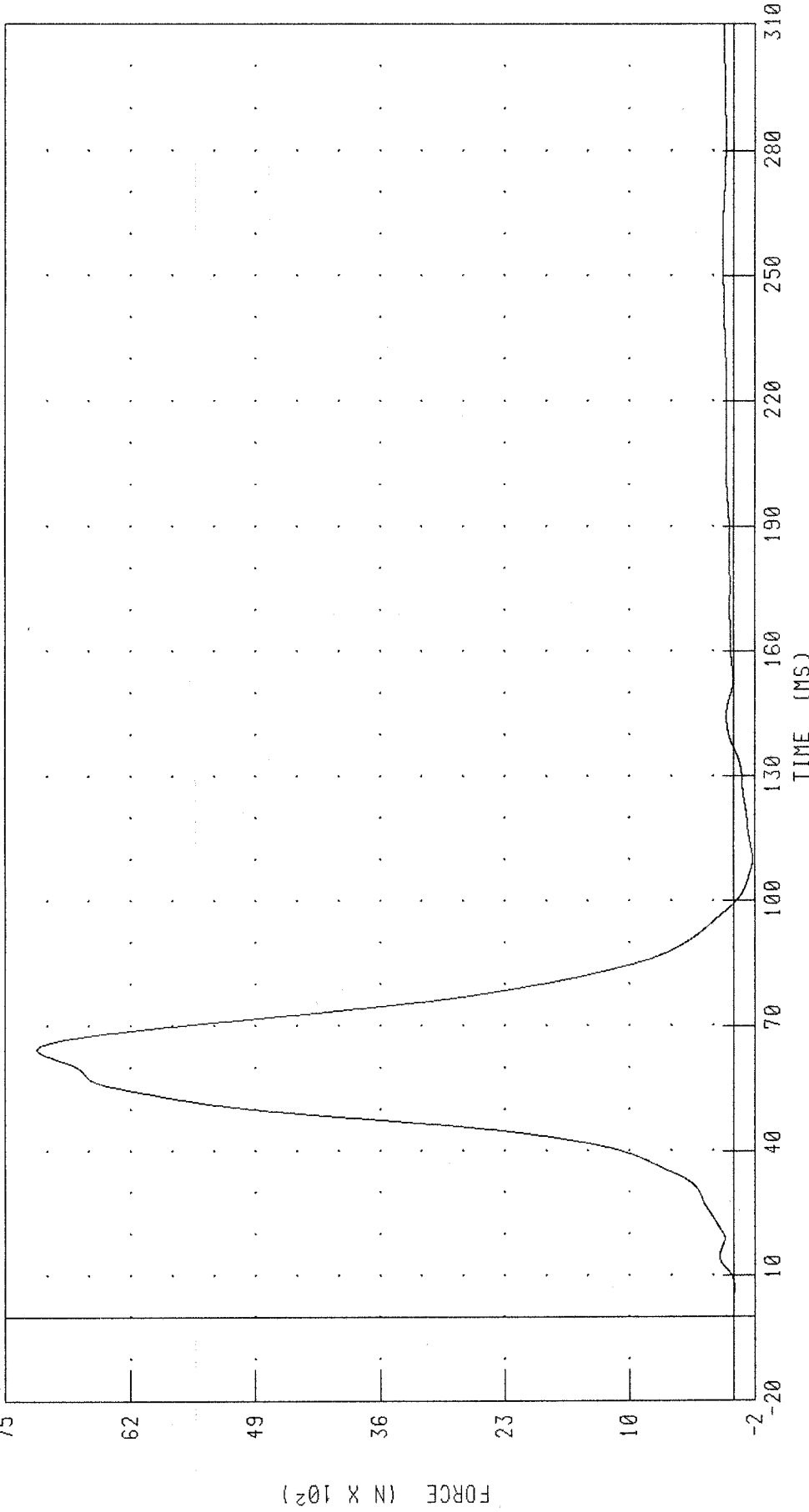


CHANNEL: DPCXG1 FILTER: CH. CLASS 60 PEAK DATA: 1067.47 G @ 80.08 MS; -1063.87 G @ 88.72 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER LAP BELT OUTBOARD FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.



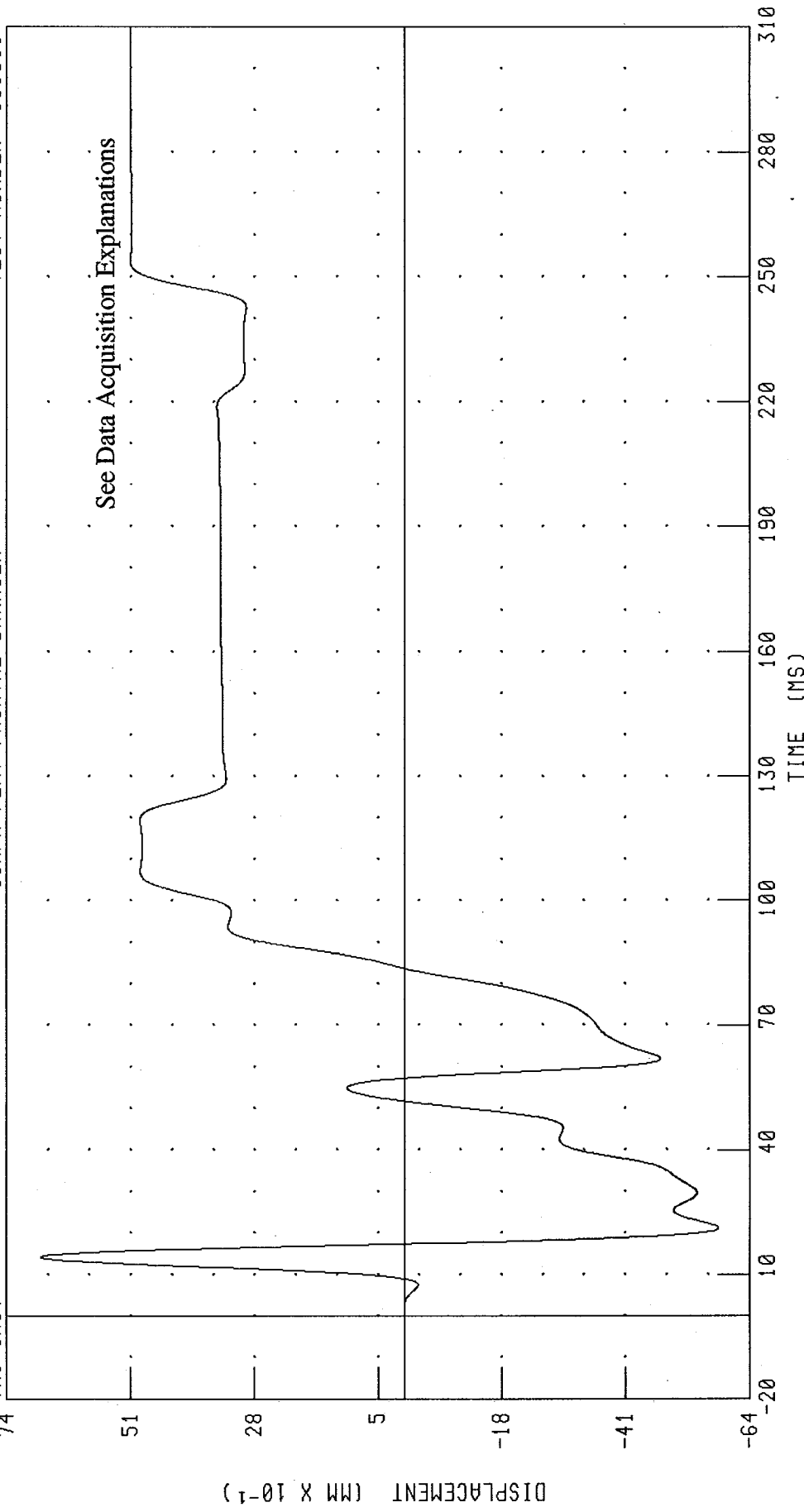
PEAK DATA: 7248.90 N @ 64.40 MS; -201.86 N @ 110.16 MS

CHANNEL: LBOF1 FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
DRIVER SEAT BELT EXTENSION  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

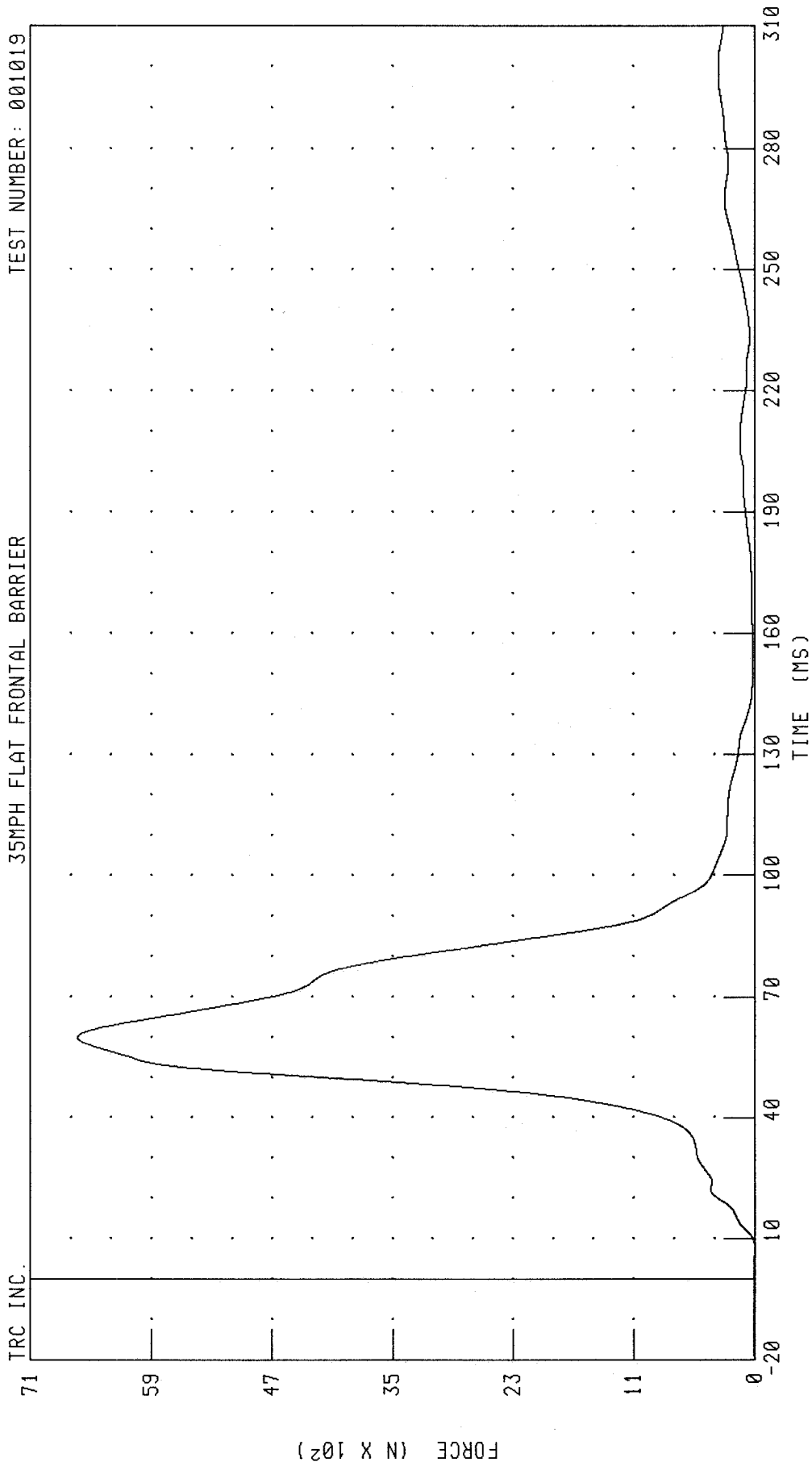
TRC INC.



CHANNEL: SBED1 FILTER: CH. CLASS 60  
PEAK DATA: 6.76 MM @ 14.16 MS; -5.83 MM @ 21.12 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER LAP BELT OUTBOARD FORCE  
35MPH FLAT FRONTAL BARRIER

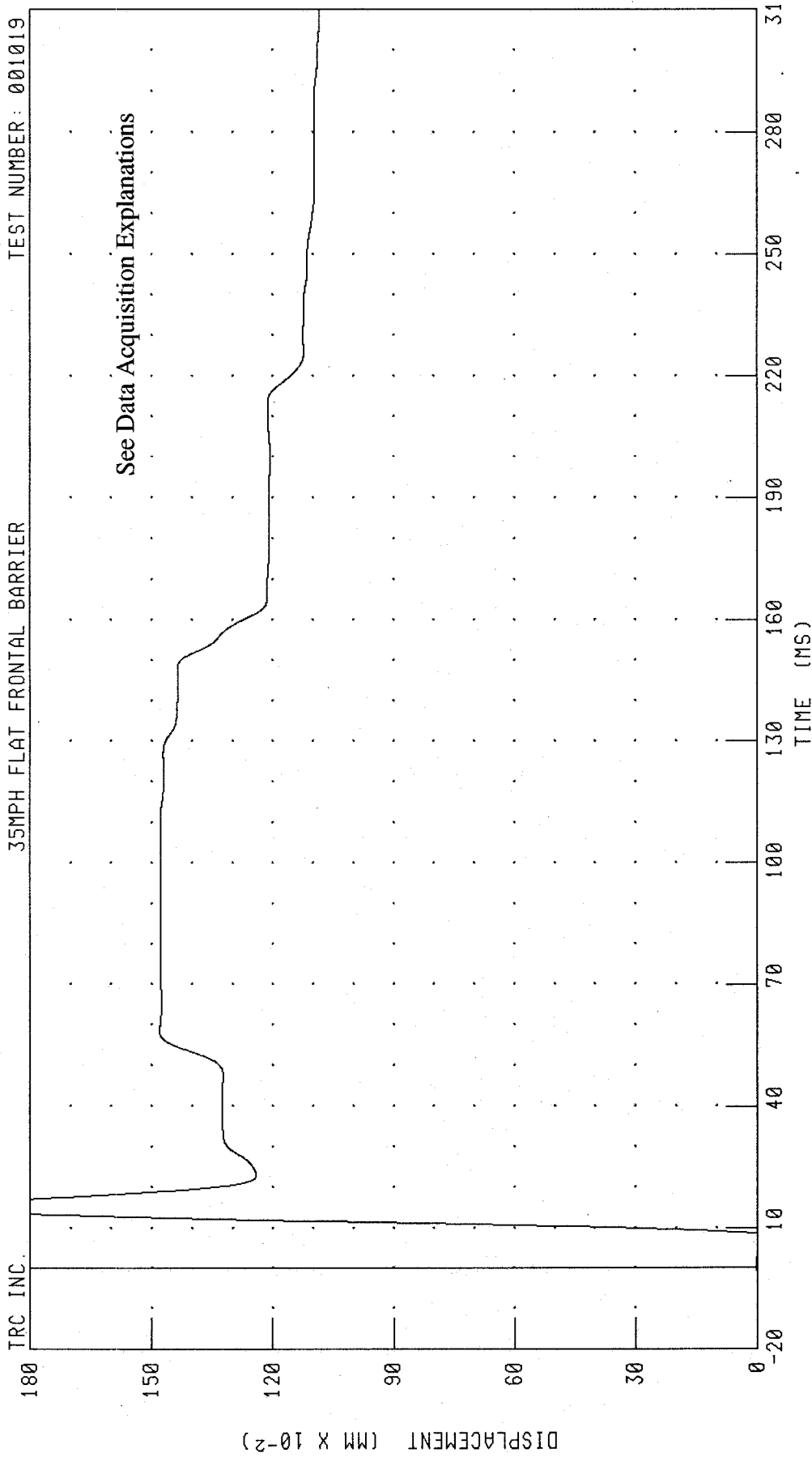
TEST NUMBER: 001019



TRC INC. CHANNEL: LBOF2 FILTER: CH. CLASS 60 PEAK DATA: 6731.12 N @ 60.00 MS; -1.29 N @ 7.68 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
PASSENGER SEAT BELT EXTENSION  
35MPH FLAT FRONTAL BARRIER

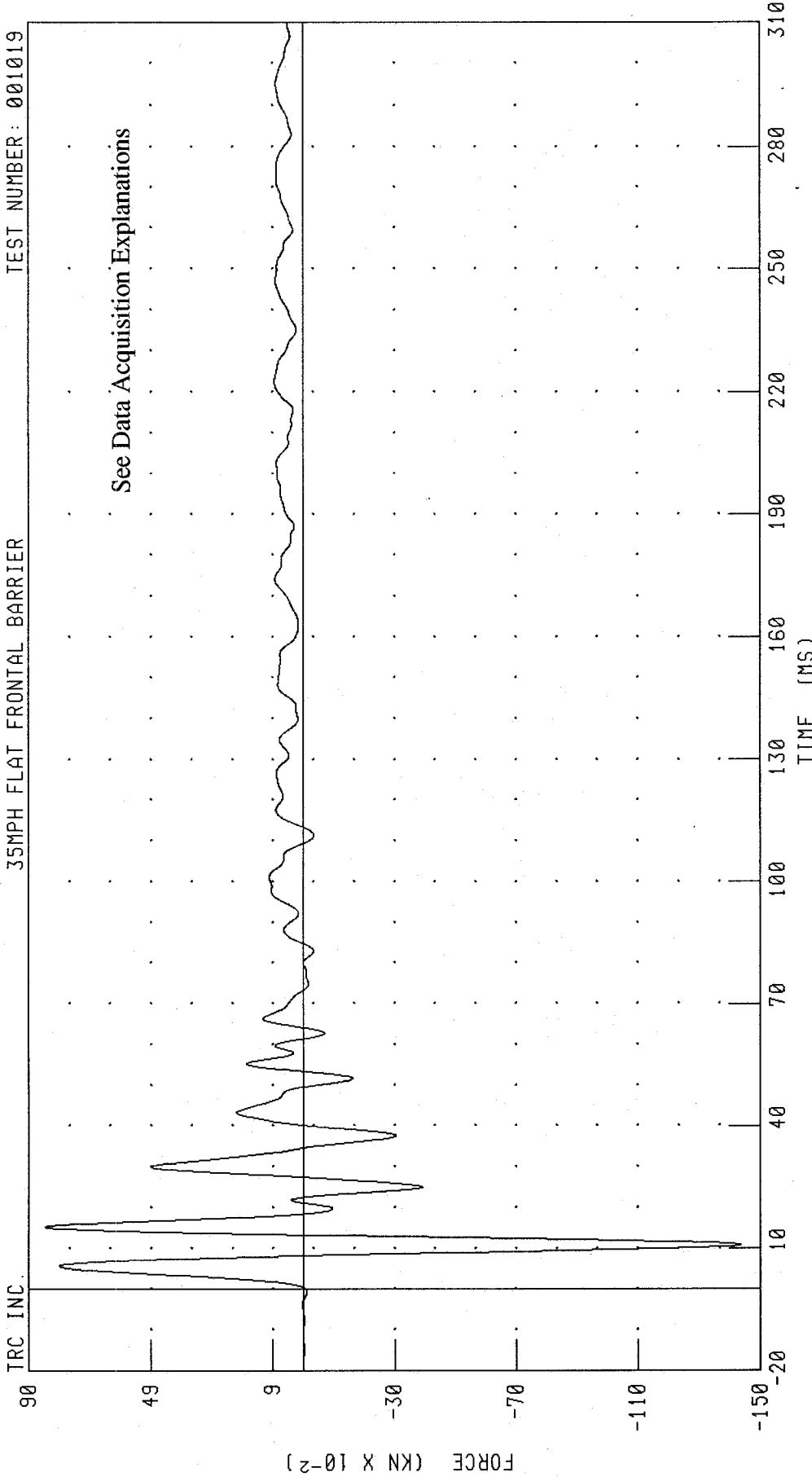
TEST NUMBER: 001019



CHANNEL: SBED2 FILTER: CH. CLASS 60 PEAK DATA: 1.99 MM @ 15.12 MS; -0.06 MM @ 7.12 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION A1 FORCE  
35MPH FLAT FRONTAL BARRIER

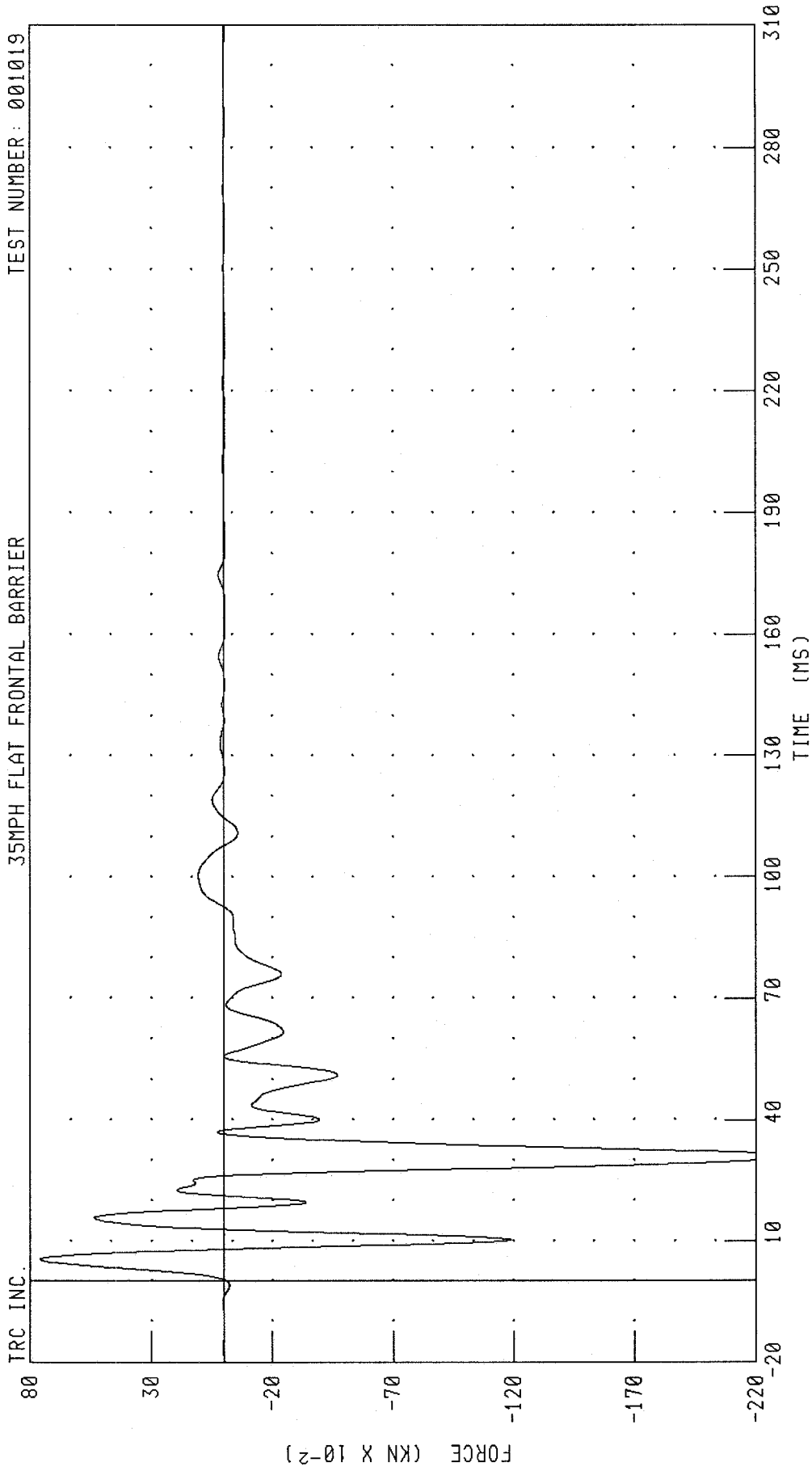
TEST NUMBER: 001019



CHANNEL: BA1F FILTER: CH. CLASS 60 PEAK DATA: 0.85 KN @ 15.28 MS; -1.44 KN @ 10.88 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION A2 FORCE  
35MPH FLAT FRONTAL BARRIER

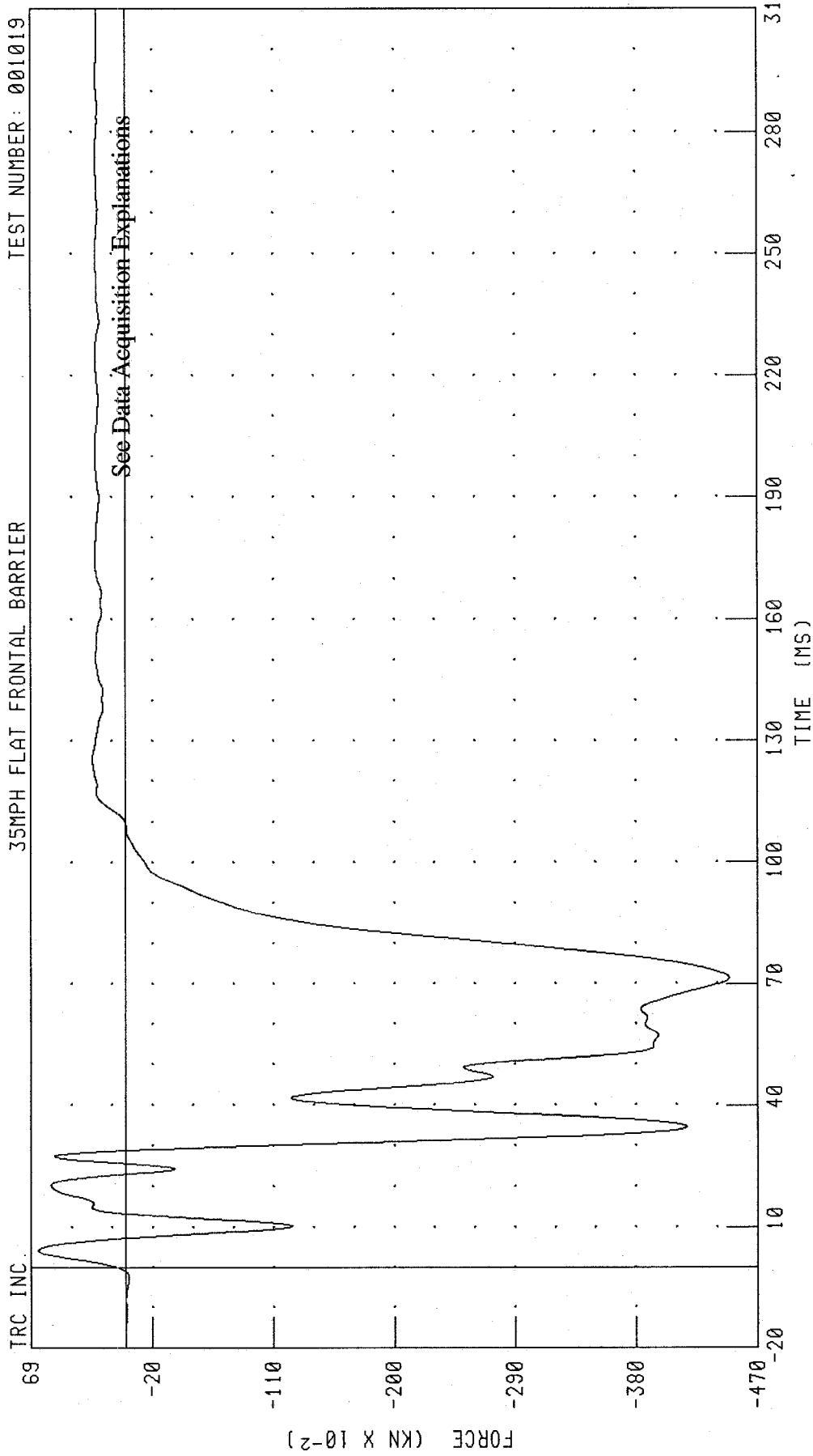
TEST NUMBER: 001019



TRC INC. CHANNEL: BA2F FILTER: CH. CLASS 60  
PEAK DATA: 0.76 KN @ 5.36 MS; -2.40 KN @ 30.96 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION A3 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

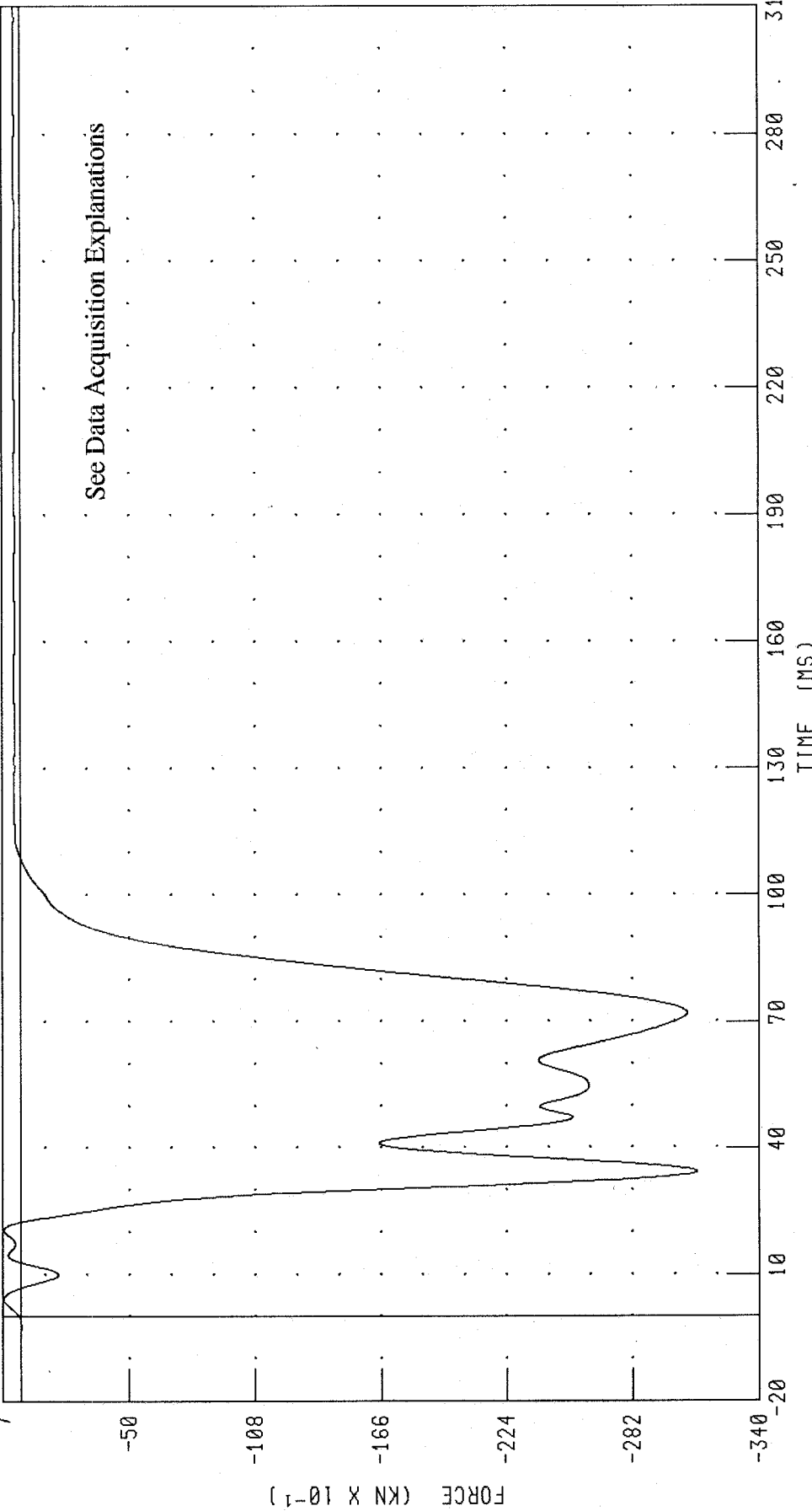


CHANNEL: BA3F FILTER: CH. CLASS 60 PEAK DATA: 0.65 KN @ 4.16 MS; -4.49 KN @ 71.44 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION A4 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

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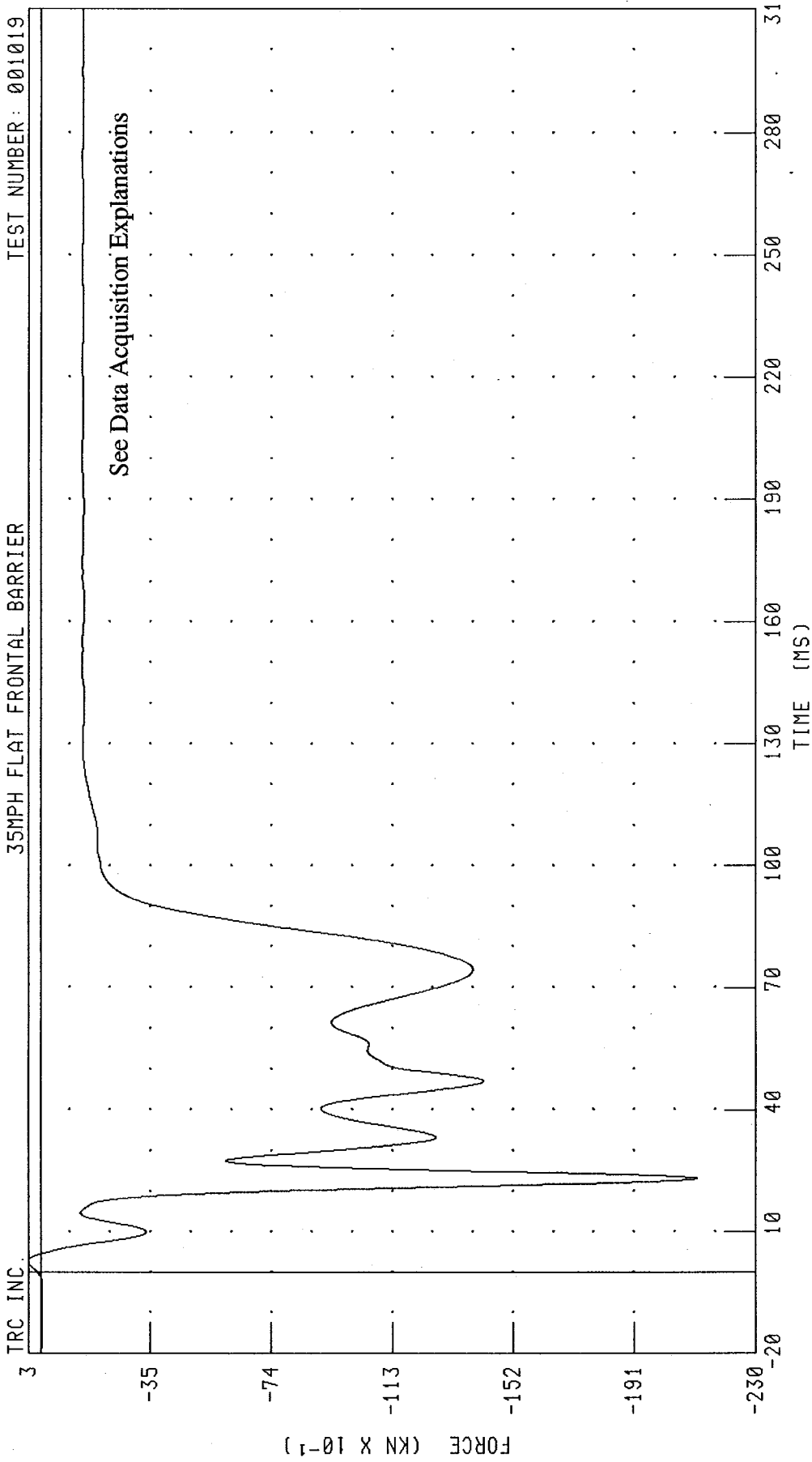


PEAK DATA: 0.77 KN @ 4.08 MS; -31.17 KN @ 34.32 MS

CHANNEL: BA4F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION A5 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

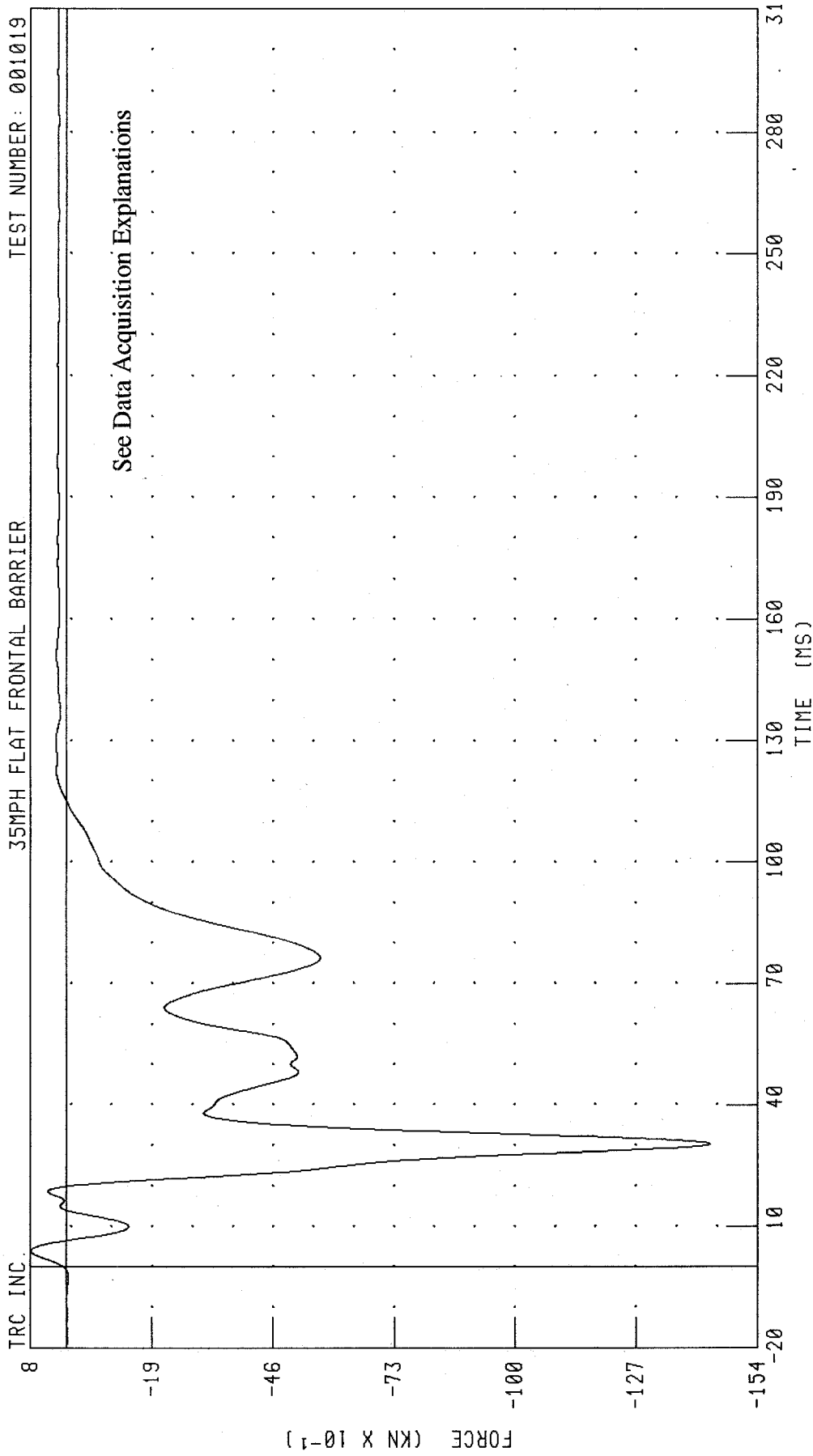


CHANNEL: BA5F FILTER: CH. CLASS 60

PEAK DATA: 0.45 KN @ 2.72 MS, -21.13 KN @ 23.20 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION A6 FORCE  
35MPH FLAT FRONTAL BARRIER

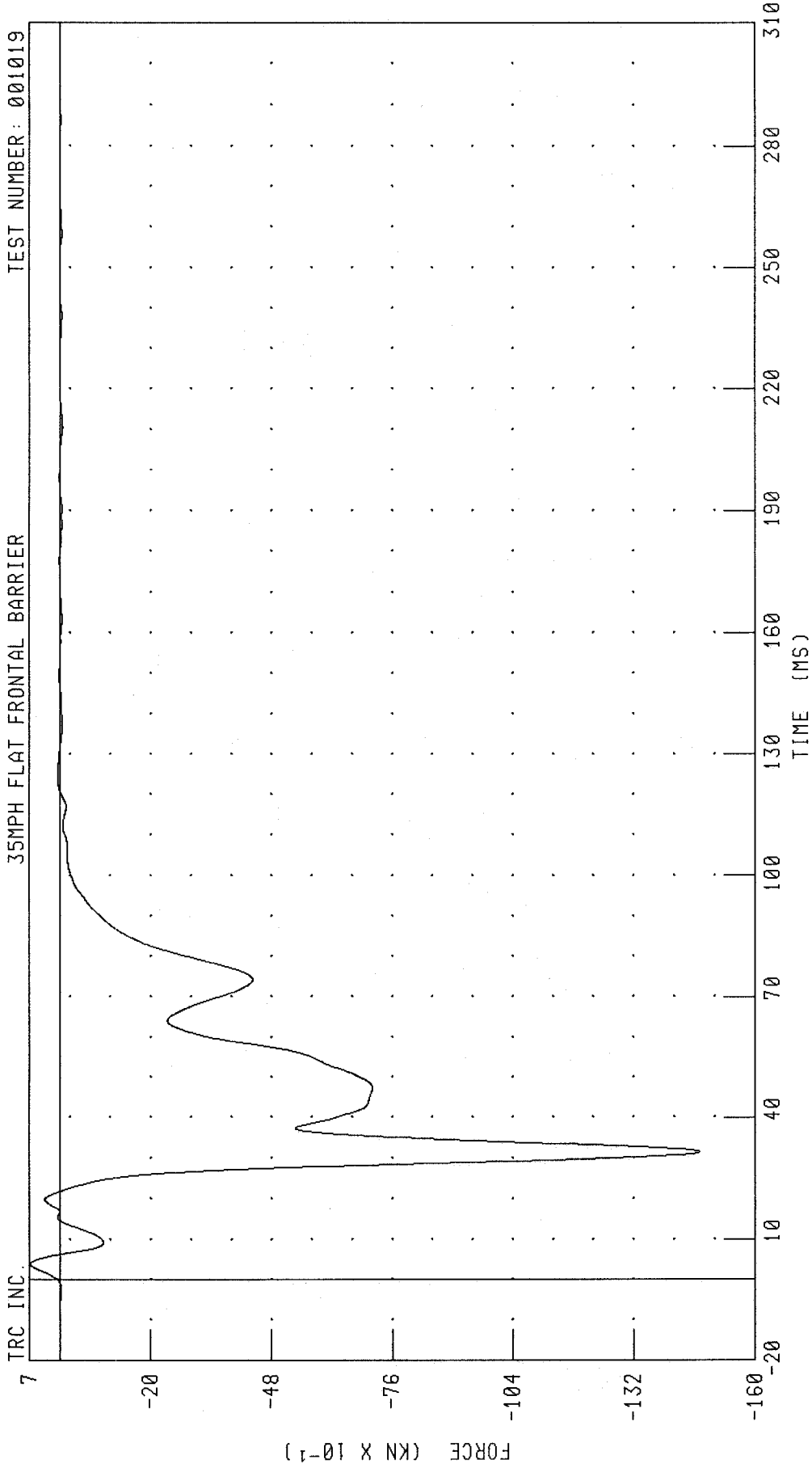
TEST NUMBER: 001019



CHANNEL: BA6F FILTER: CH. CLASS 60 PEAK DATA: 0.79 KN @ 3.84 MS; -14.34 KN @ 30.32 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION A7 FORCE  
35MPH FLAT FRONTAL BARRIER

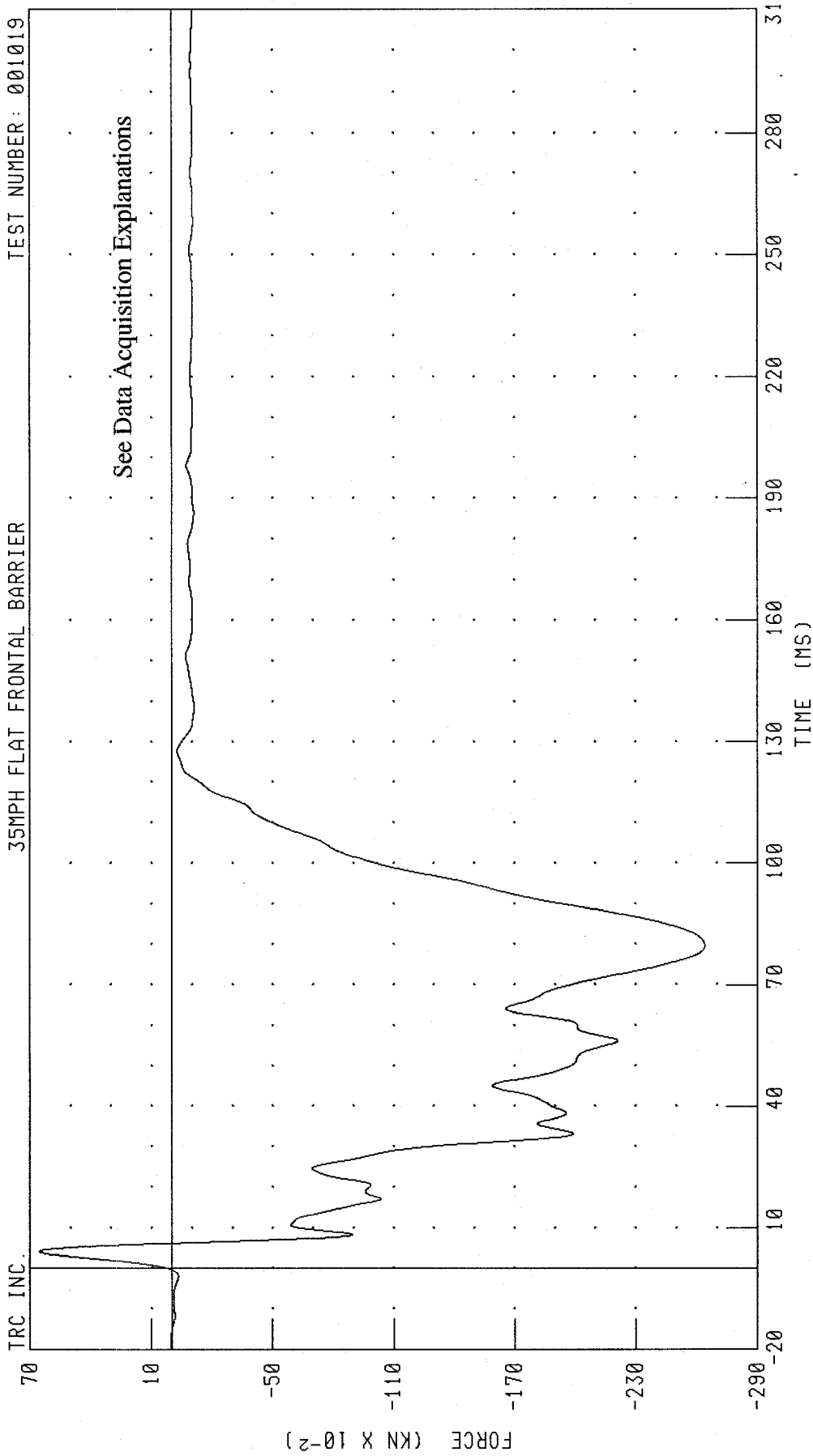
TEST NUMBER: 001019



CHANNEL: BA7F FILTER: CH. CLASS 60 PEAK DATA: 0.68 KN @ 3.92 MS; -14.82 KN @ 31.52 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION A8 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

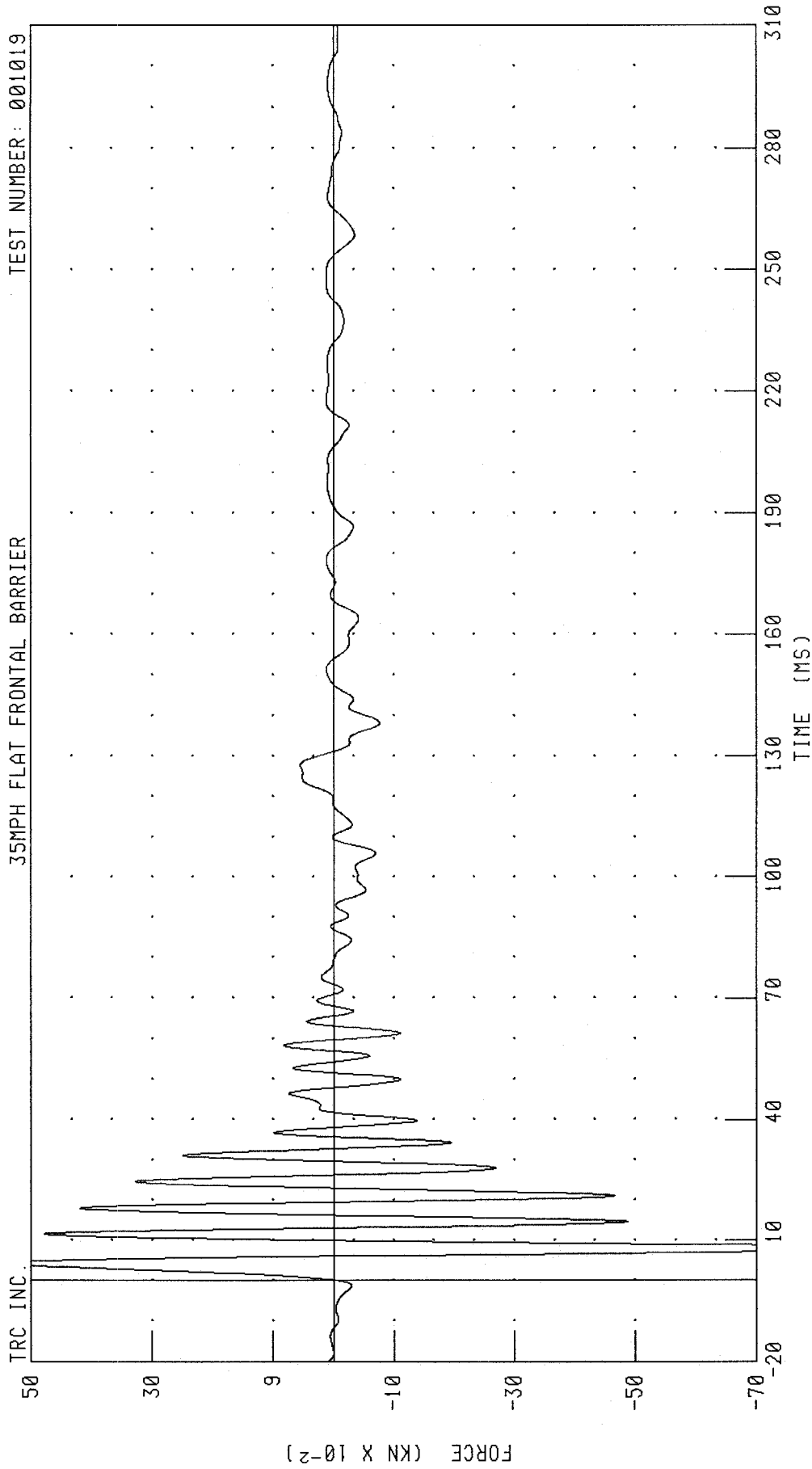


See Data Acquisition Explanations

PEAK DATA: 0.65 KN @ 4.16 MS; -2.64 KN @ 79.68 MS

CHANNEL: BA8F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION A9 FORCE  
35MPH FLAT FRONTAL BARRIER



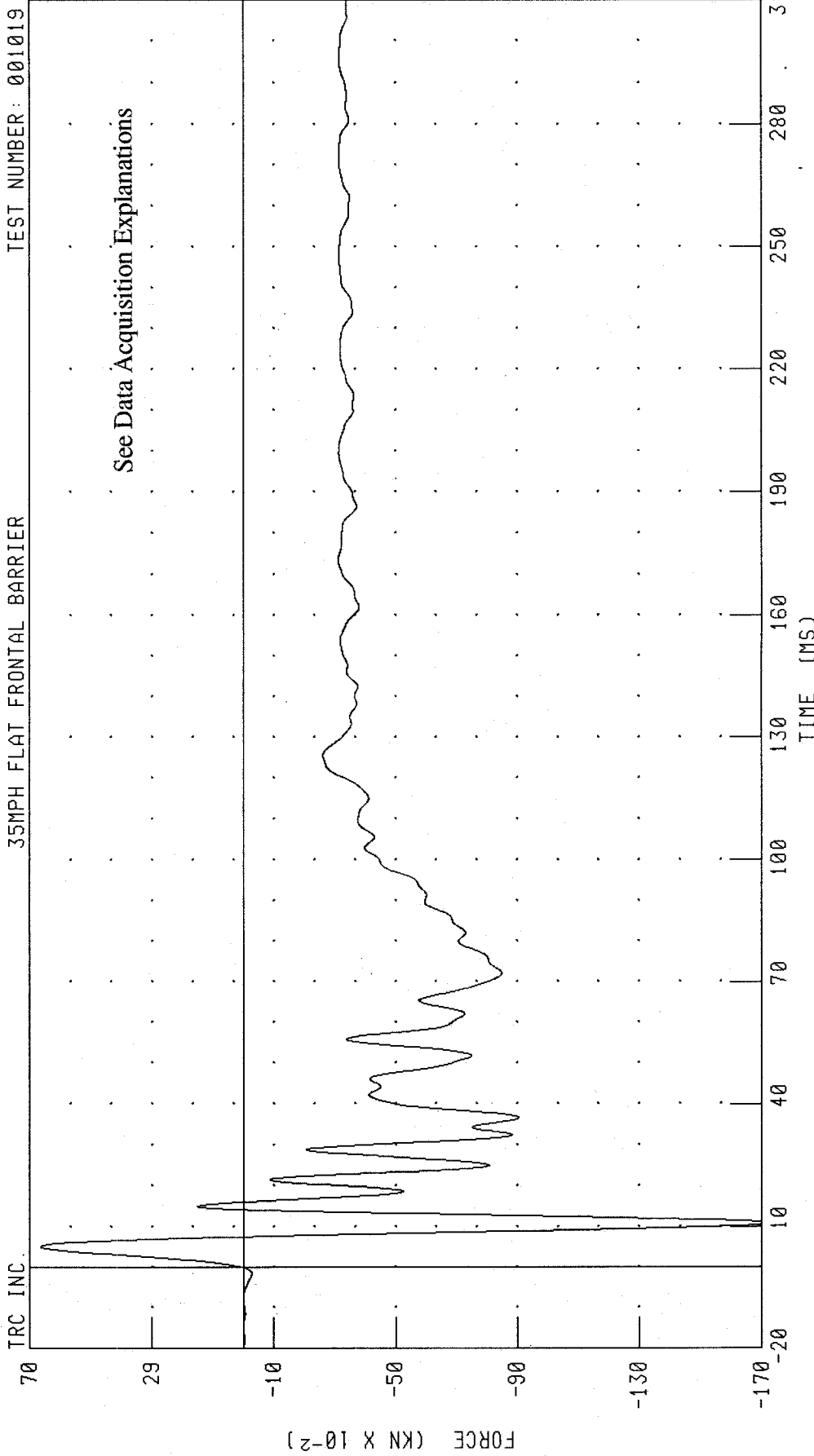
CHANNEL: BA9F FILTER: CH. CLASS 60

PEAK DATA: 0.54 KN @ 4.24 MS; -1.01 KN @ 7.92 MS

001019

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION B1 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

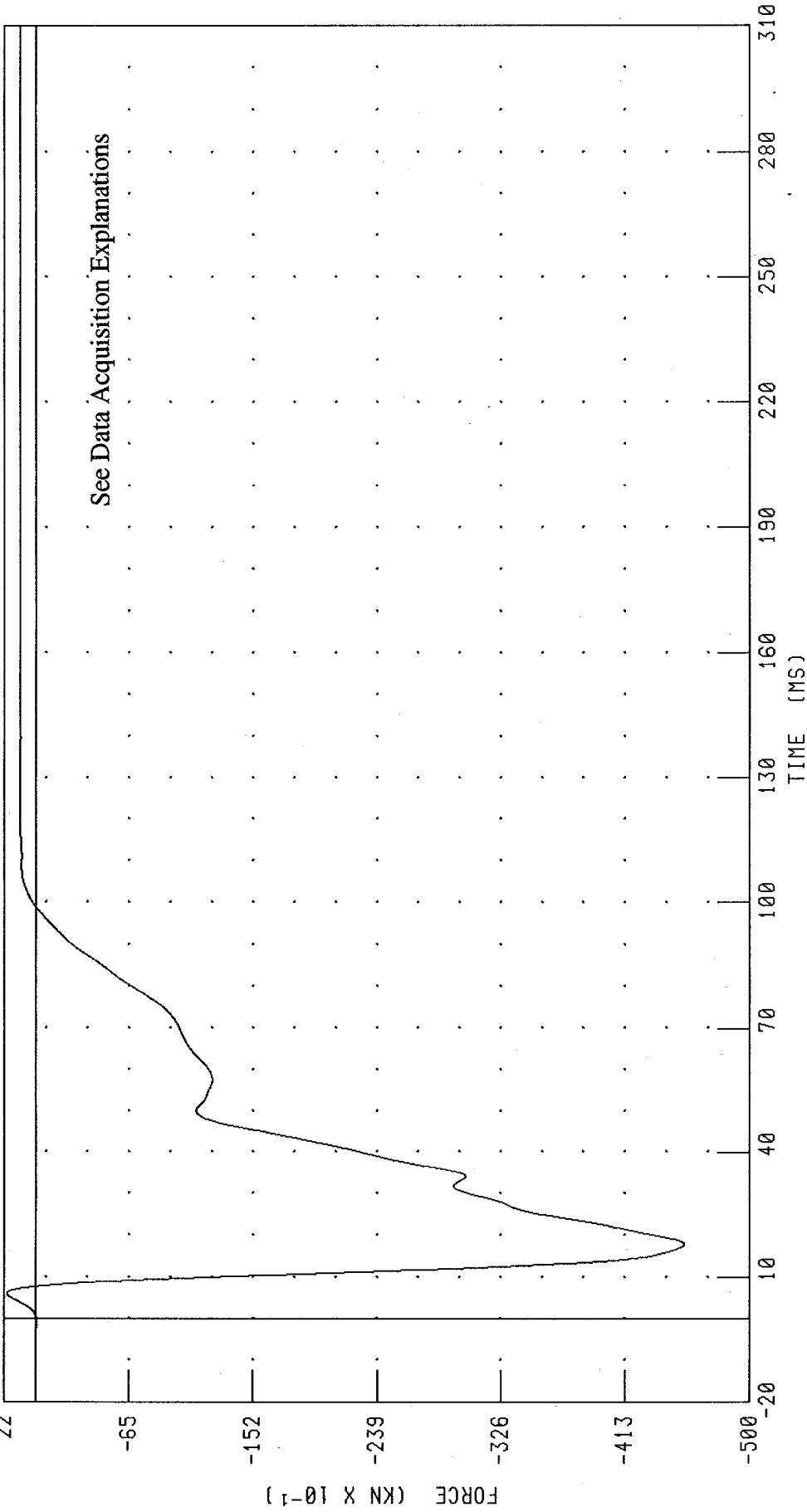


CHANNEL: BB1F FILTER: CH. CLASS 60 PEAK DATA: 0.66 KN @ 5.12 MS; -1.74 KN @ 10.80 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION B2 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.



PEAK DATA: 2.02 KN @ 6.00 MS; -45.48 KN @ 17.92 MS

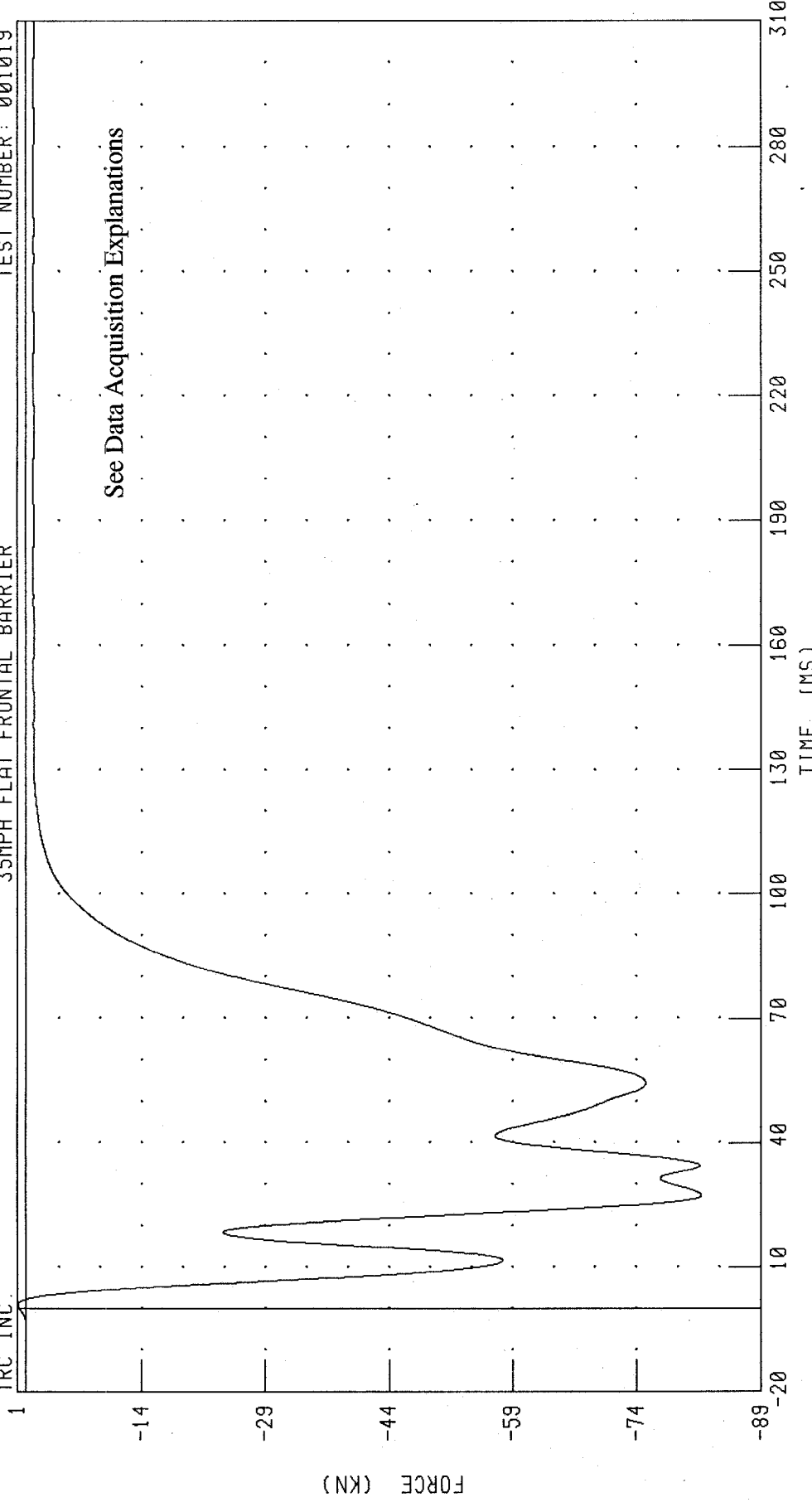
CHANNEL: BB2F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION B3 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

See Data Acquisition Explanations

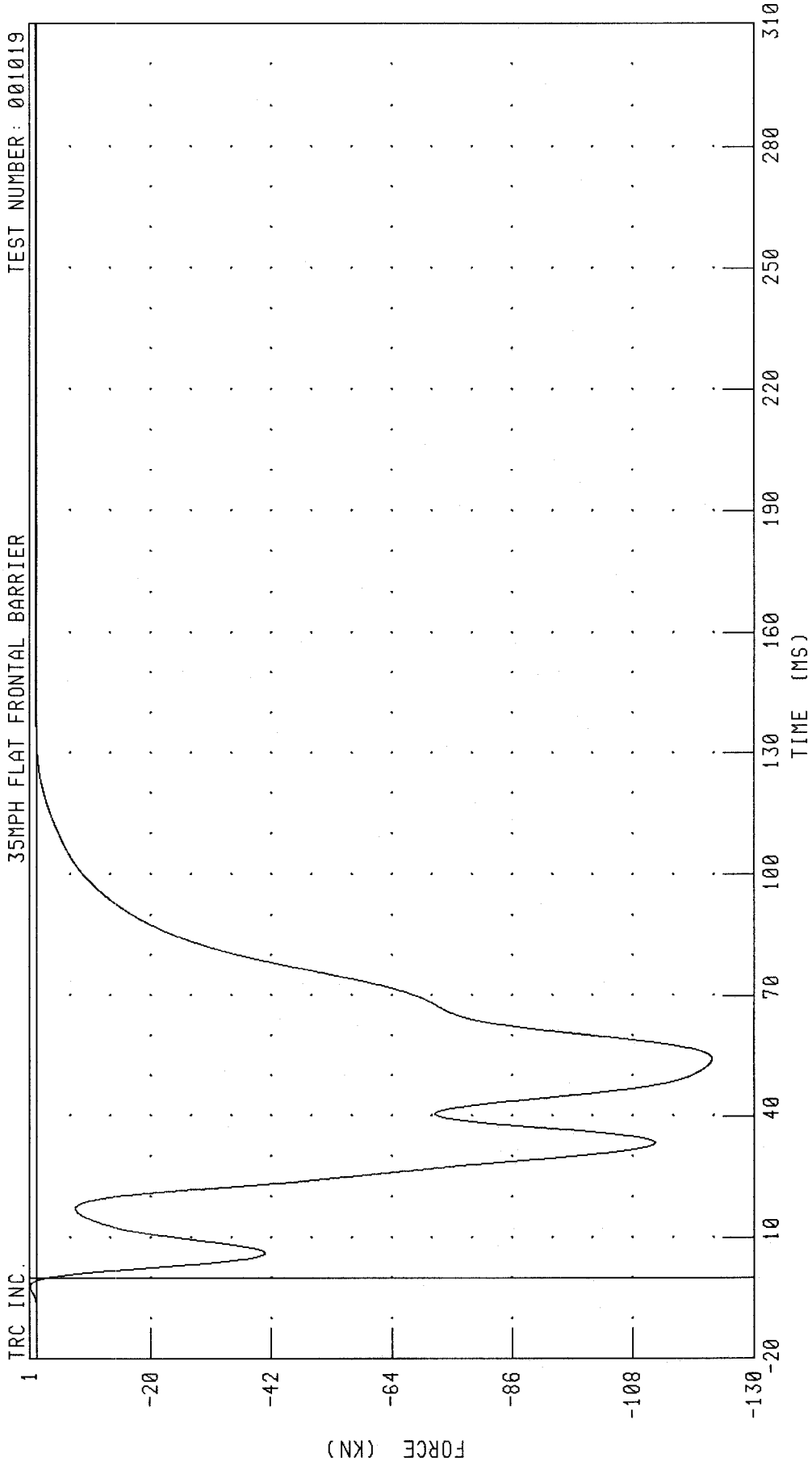


PEAK DATA: 0.97 KN @ 0.88 MS; -81.81 KN @ 27.36 MS

CHANNEL: BB3F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION B4 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

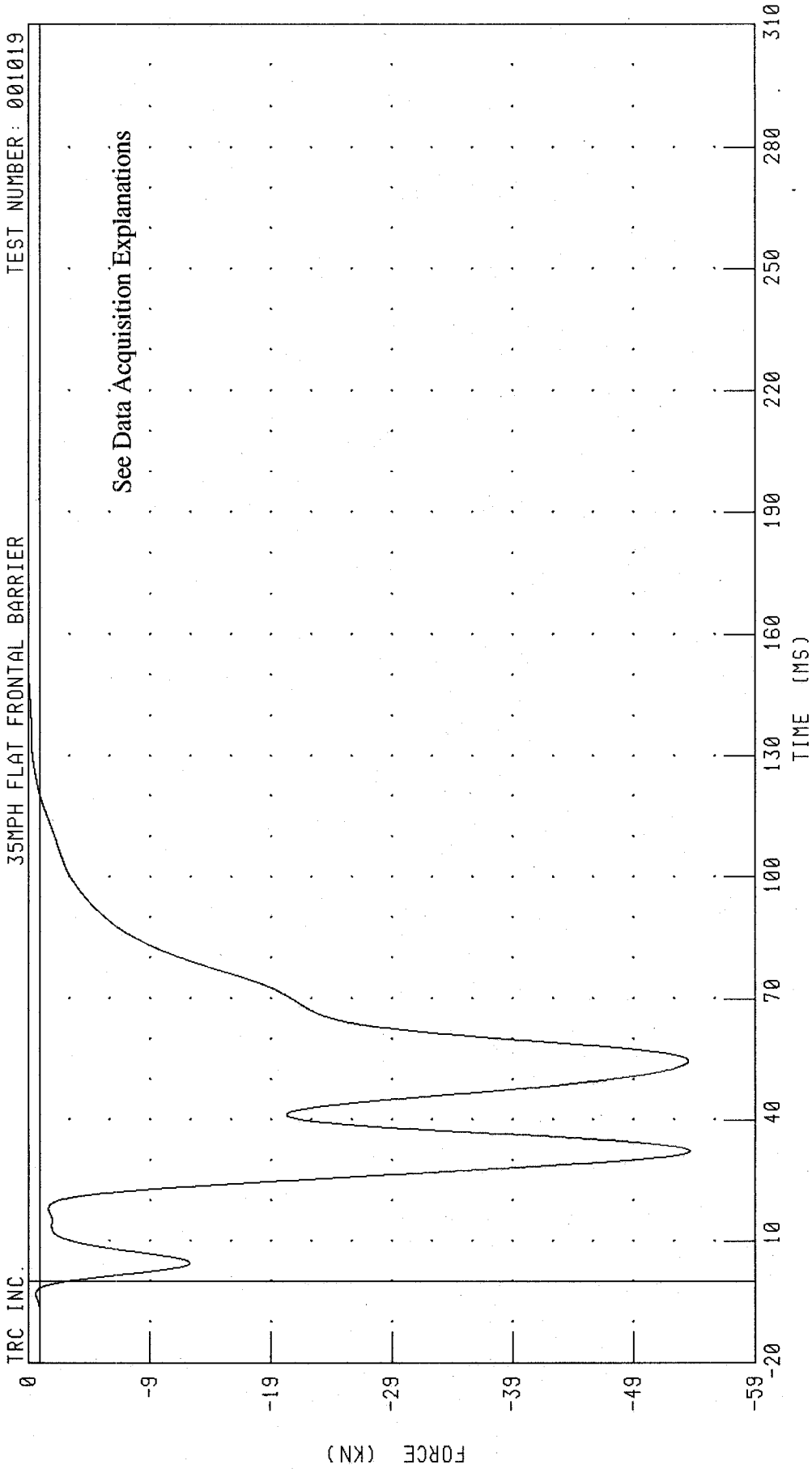


1 TRC INC.

CHANNEL: BB4F FILTER: CH. CLASS 60  
PEAK DATA: 1.12 KN @ -2.08 MS; -123.18 KN @ 54.16 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION B5 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

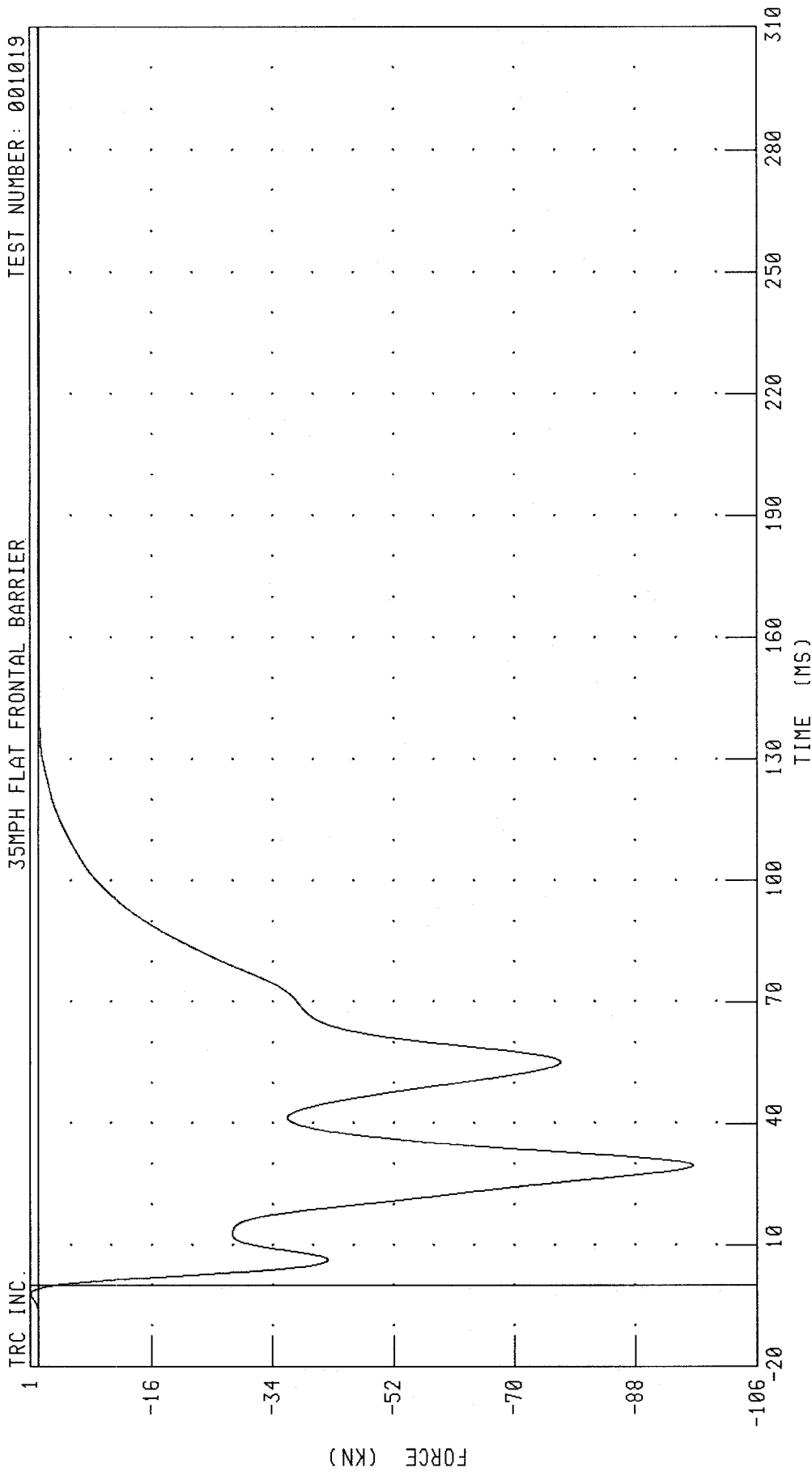


See Data Acquisition Explanations

CHANNEL: BB5F FILTER: CH. CLASS 60  
PEAK DATA: 0.90 KN @ 150.48 MS; -53.76 KN @ 32.32 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION B6 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

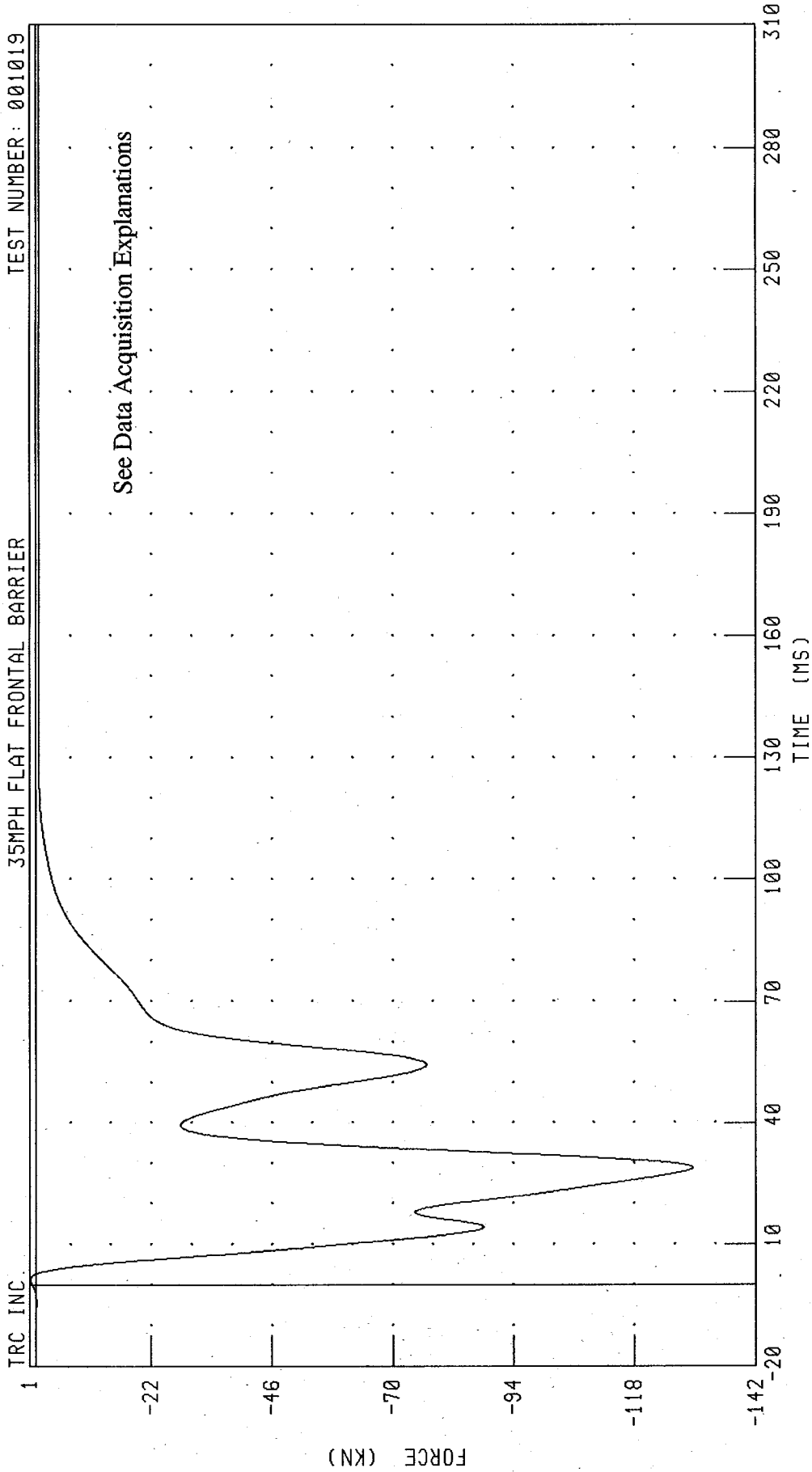


CHANNEL: BB6F FILTER: CH. CLASS 60

PEAK DATA: 1.13 KN @ -2.24 MS; -97.31 KN @ 29.68 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION B7 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



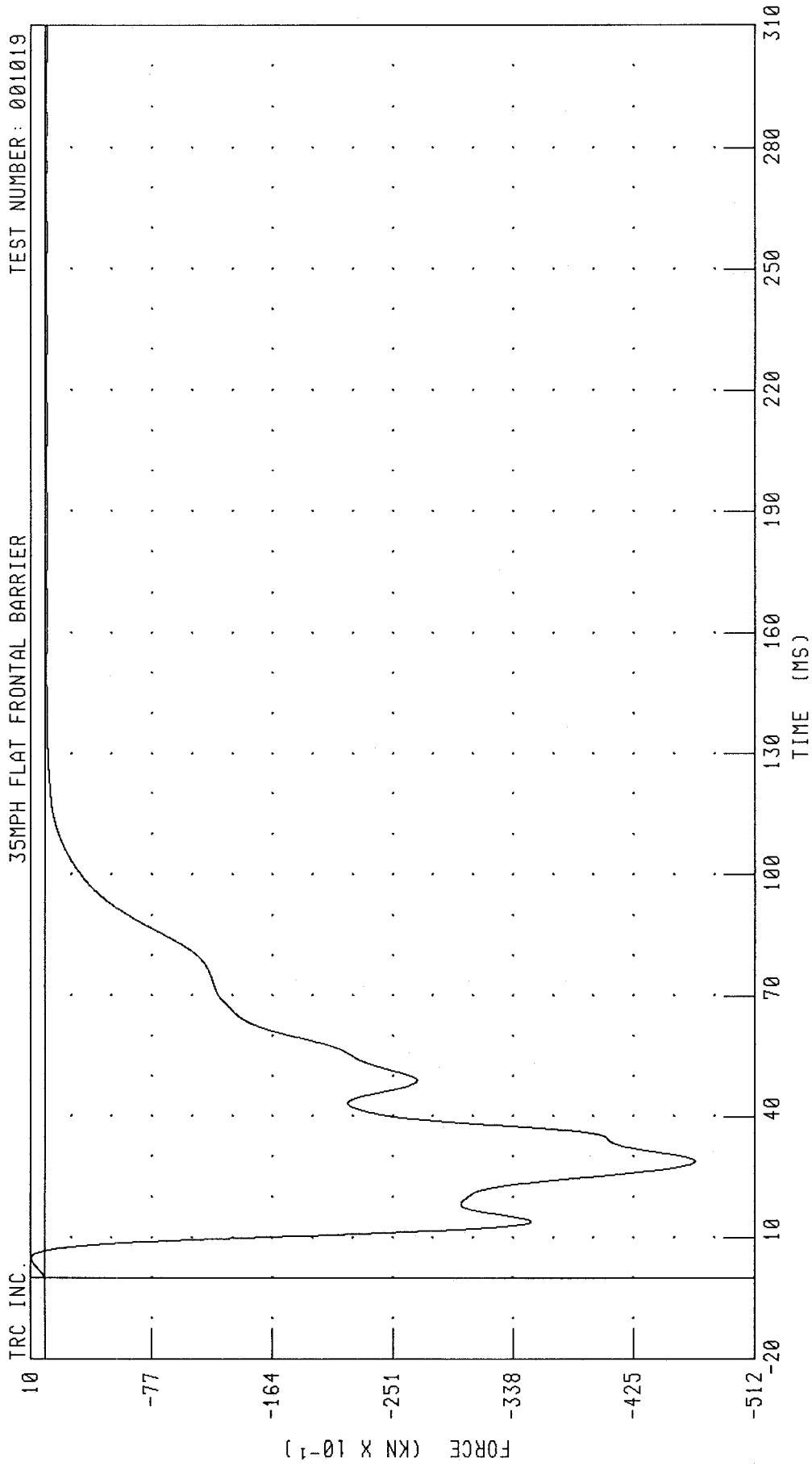
See Data Acquisition Explanations

PEAK DATA: 1.10 KN @ 1.28 MS; -130.41 KN @ 28.88 MS

CHANNEL: BB7F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION B8 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



TRC INC.

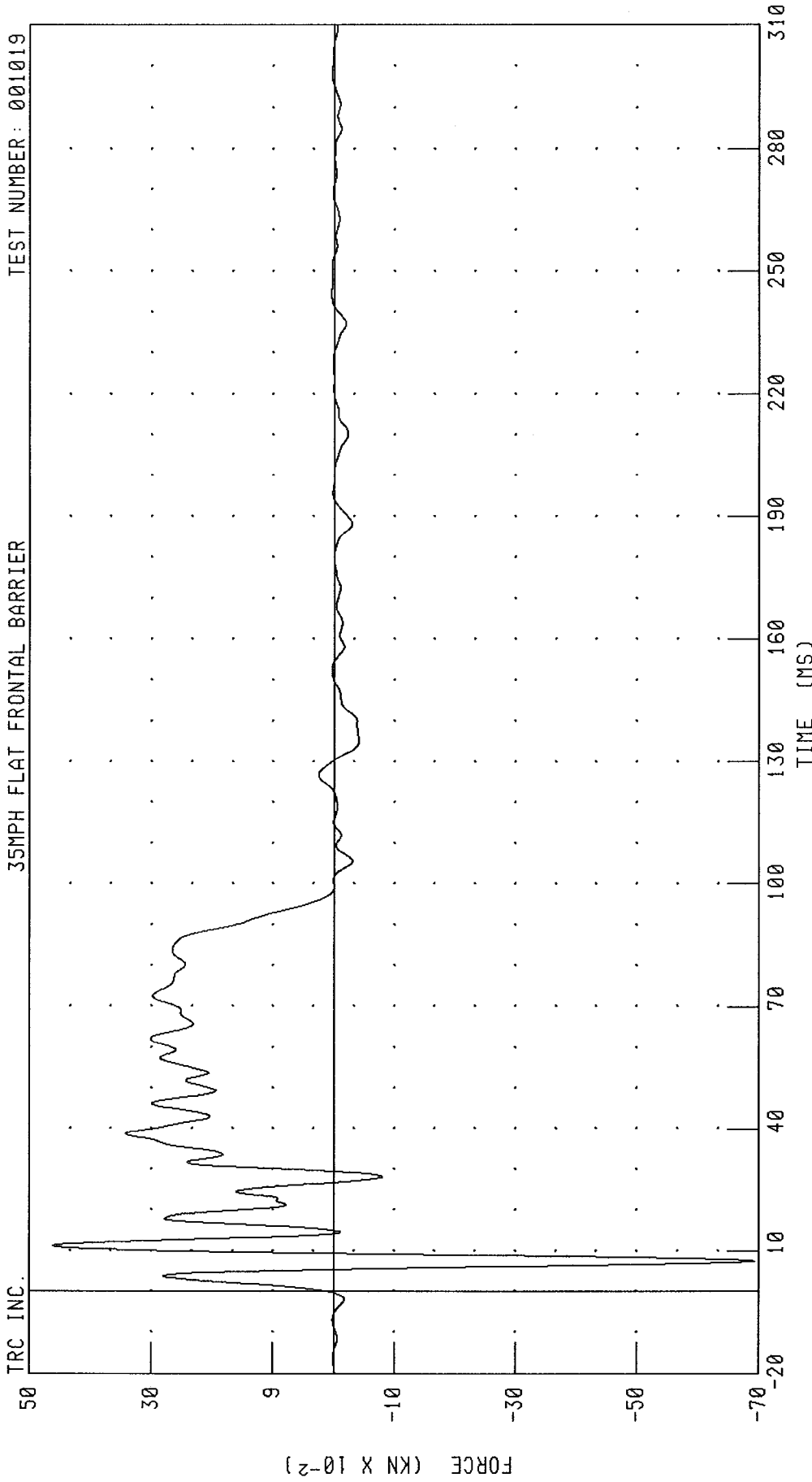
CHANNEL: BB8F

FILTER: CH. CLASS 60

PEAK DATA: 0.96 KN @ 4.80 MS; -46.92 KN @ 28.88 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION B9 FORCE  
35MPH FLAT FRONTAL BARRIER

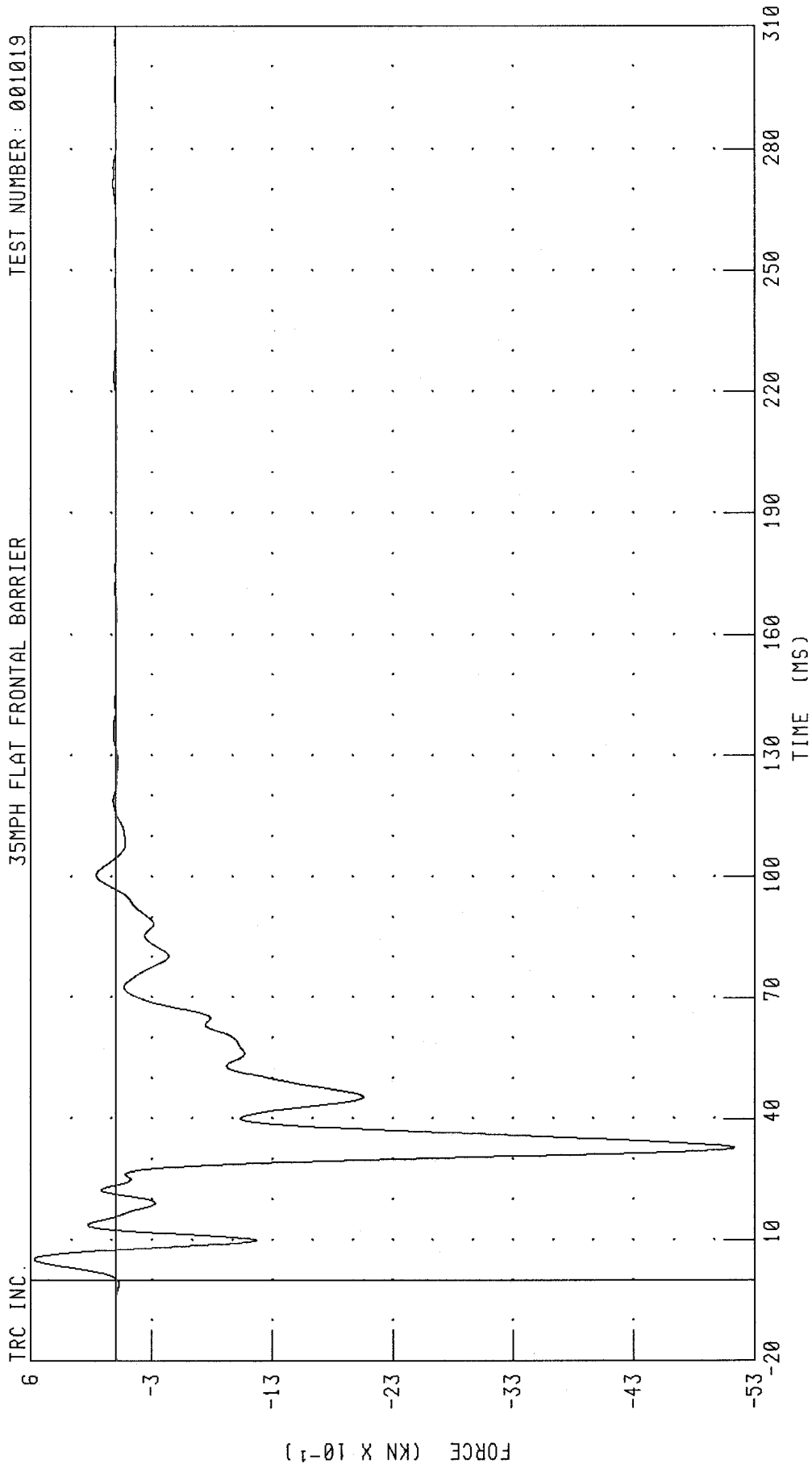
TEST NUMBER: 001019



CHANNEL: BB9F FILTER: CH. CLASS 60 PEAK DATA: 0.46 KN @ 11.20 MS; -0.69 KN @ 7.52 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION C1 FORCE  
35MPH FLAT FRONTAL BARRIER

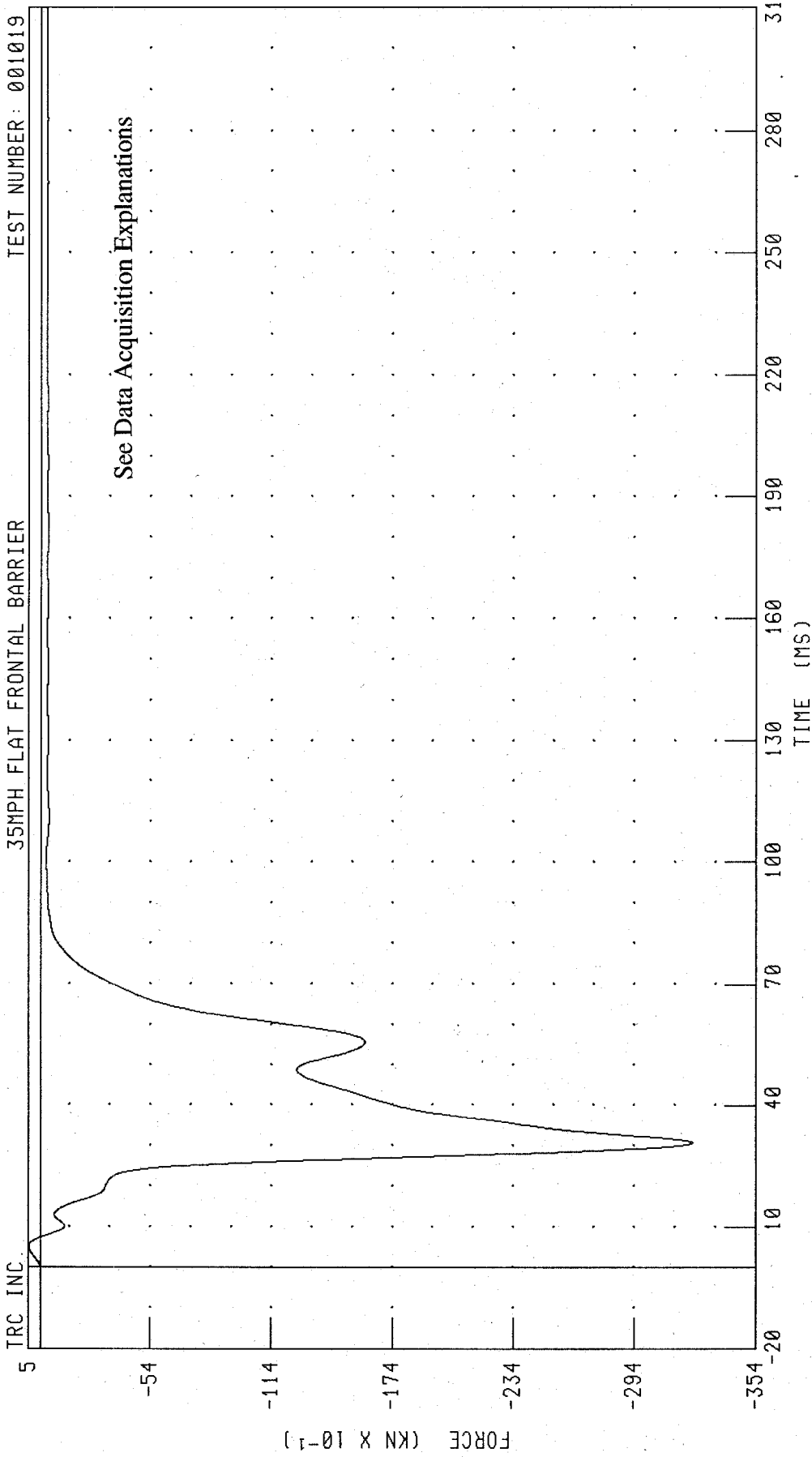
TEST NUMBER: 001019



TRC INC. CHANNEL: BC1F FILTER: CH. CLASS 60  
PEAK DATA: 0.67 KN @ 5.20 MS; -5.13 KN @ 32.88 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION C2 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

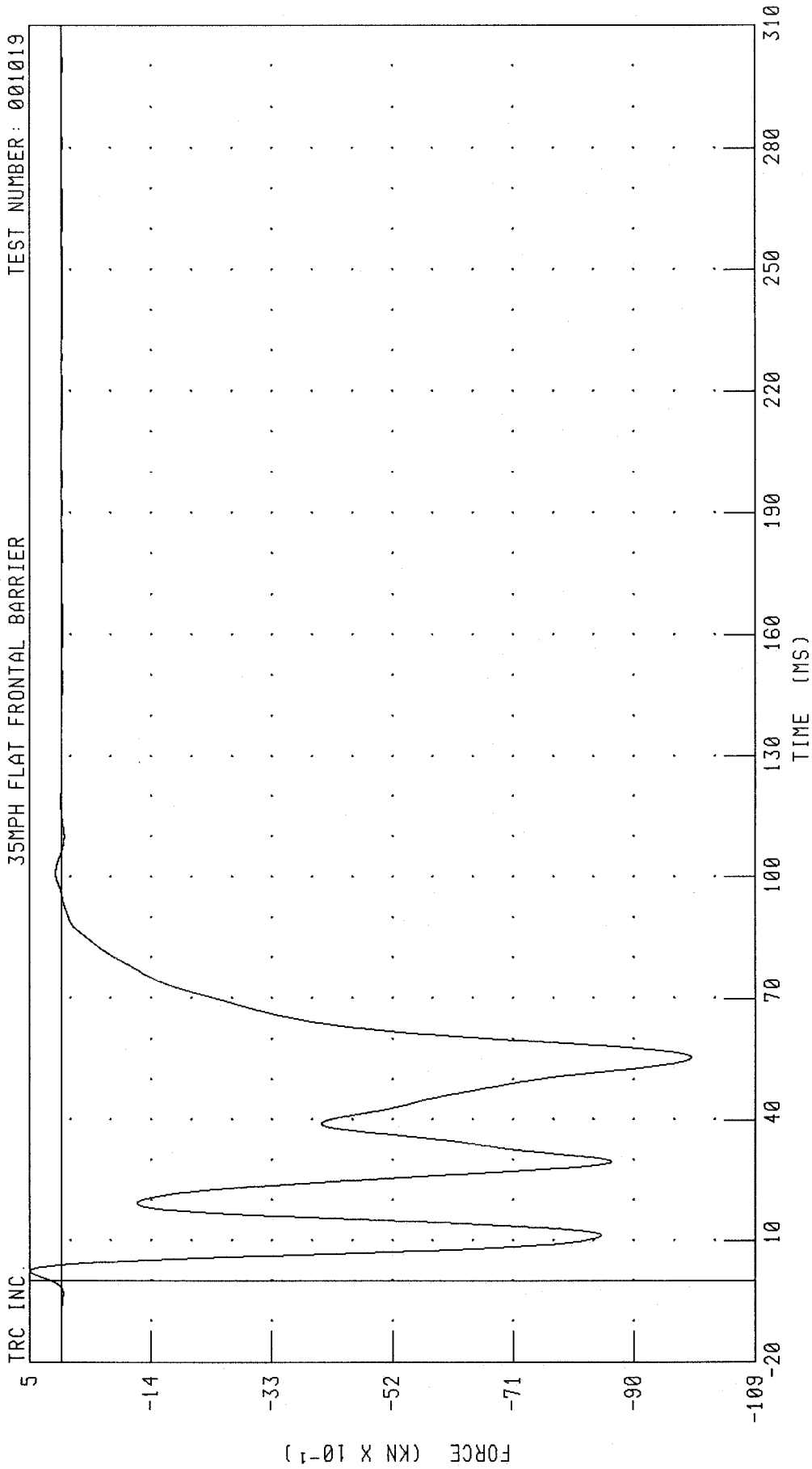


See Data Acquisition Explanations

CHANNEL: BC2F FILTER: CH. CLASS 60 PEAK DATA: 0.58 KN @ 4.96 MS; -32.32 KN @ 30.72 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION C3 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

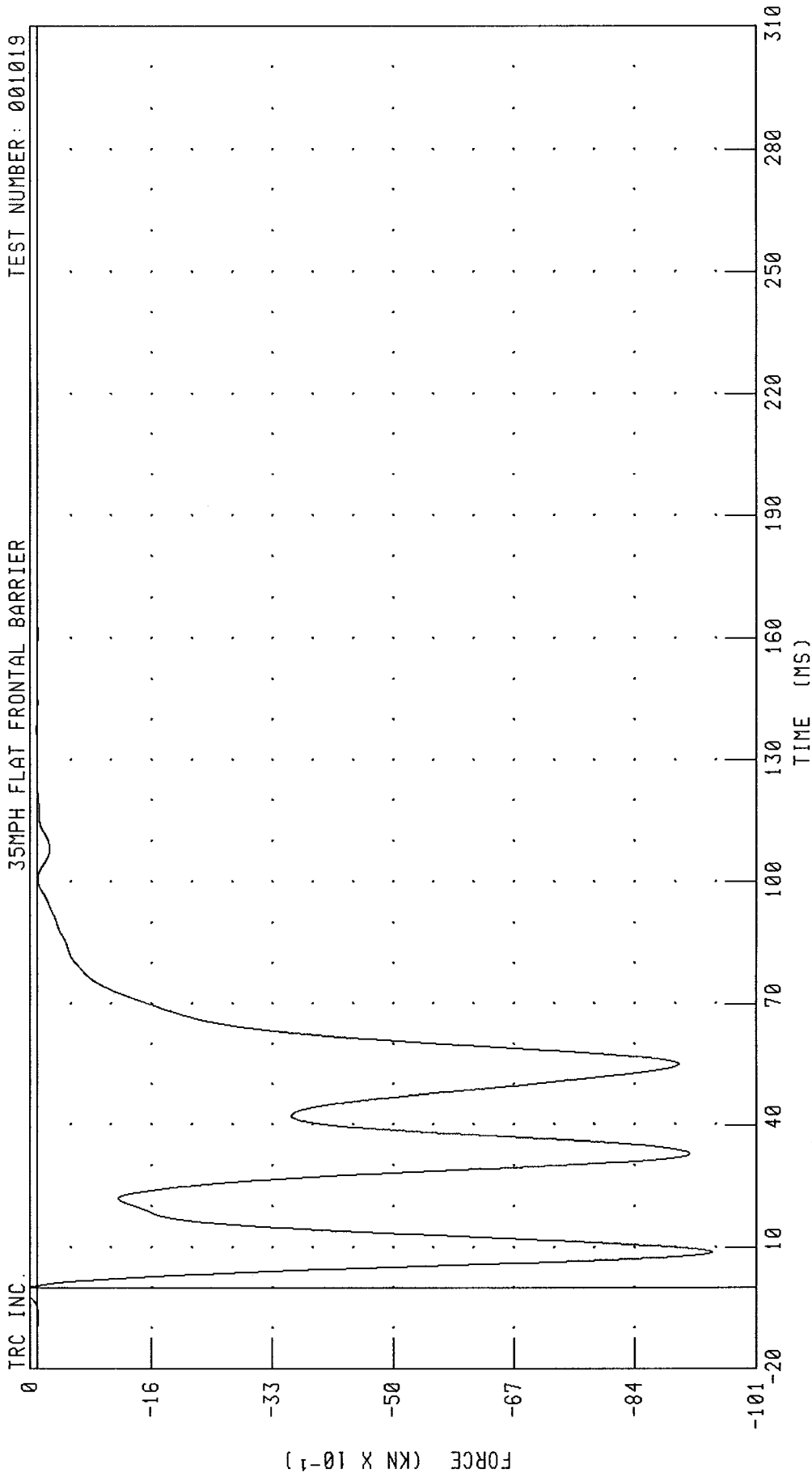


CHANNEL: BC3F FILTER: CH. CLASS 60

PEAK DATA: 0.50 KN @ 2.32 MS; -9.90 KN @ 55.44 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
 LOAD CELL BARRIER POSITION C4 FORCE  
 35MPH FLAT FRONTAL BARRIER

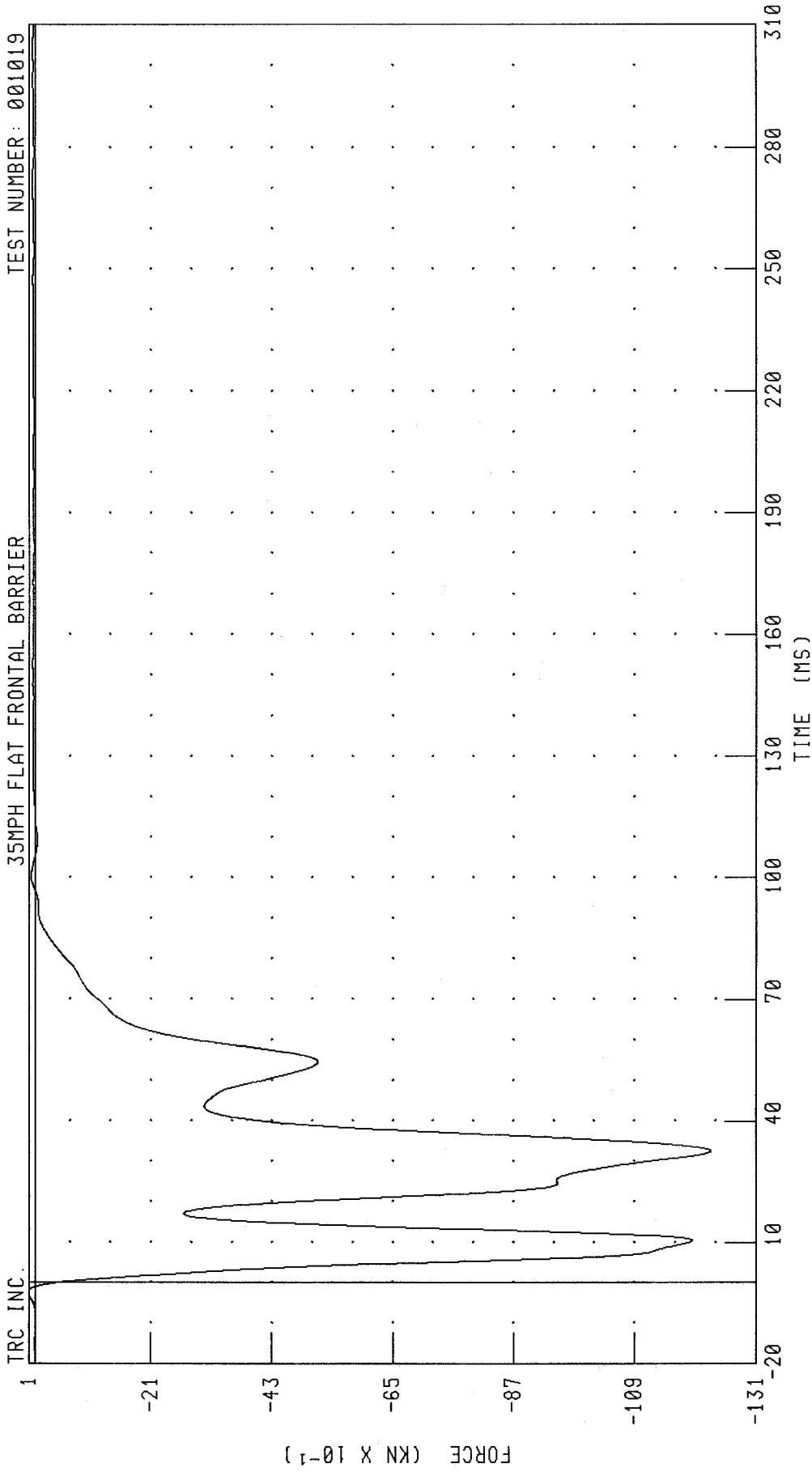
TEST NUMBER: 001019



PEAK DATA: 0.16 KN @ -0.88 MS; -9.48 KN @ 8.80 MS

CHANNEL: BC4F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION C5 FORCE  
35MPH FLAT FRONTAL BARRIER

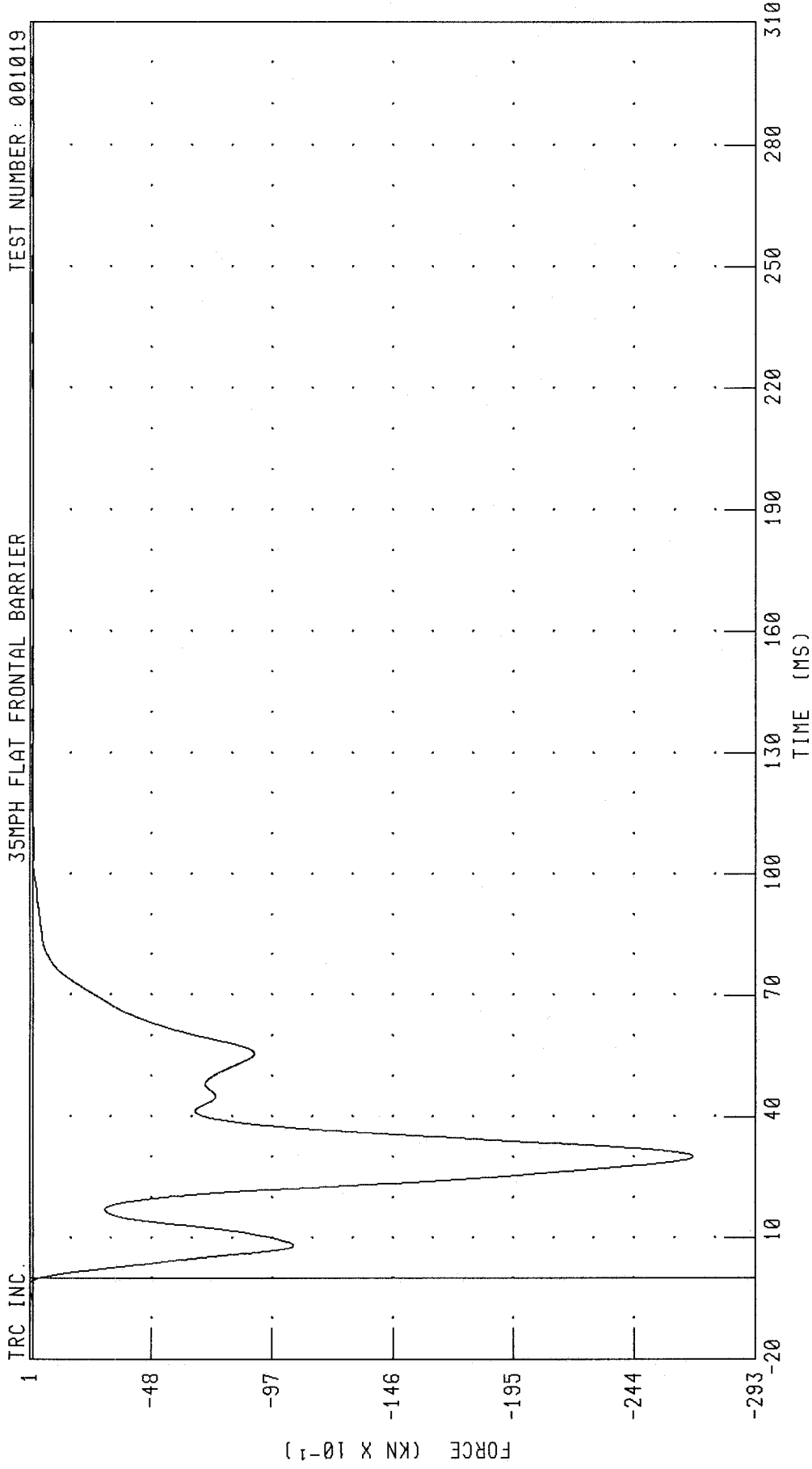


CHANNEL: BC5F FILTER: CH. CLASS 60

PEAK DATA: 0.13 KN @ -2.48 MS; -12.29 KN @ 32.56 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION C6 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

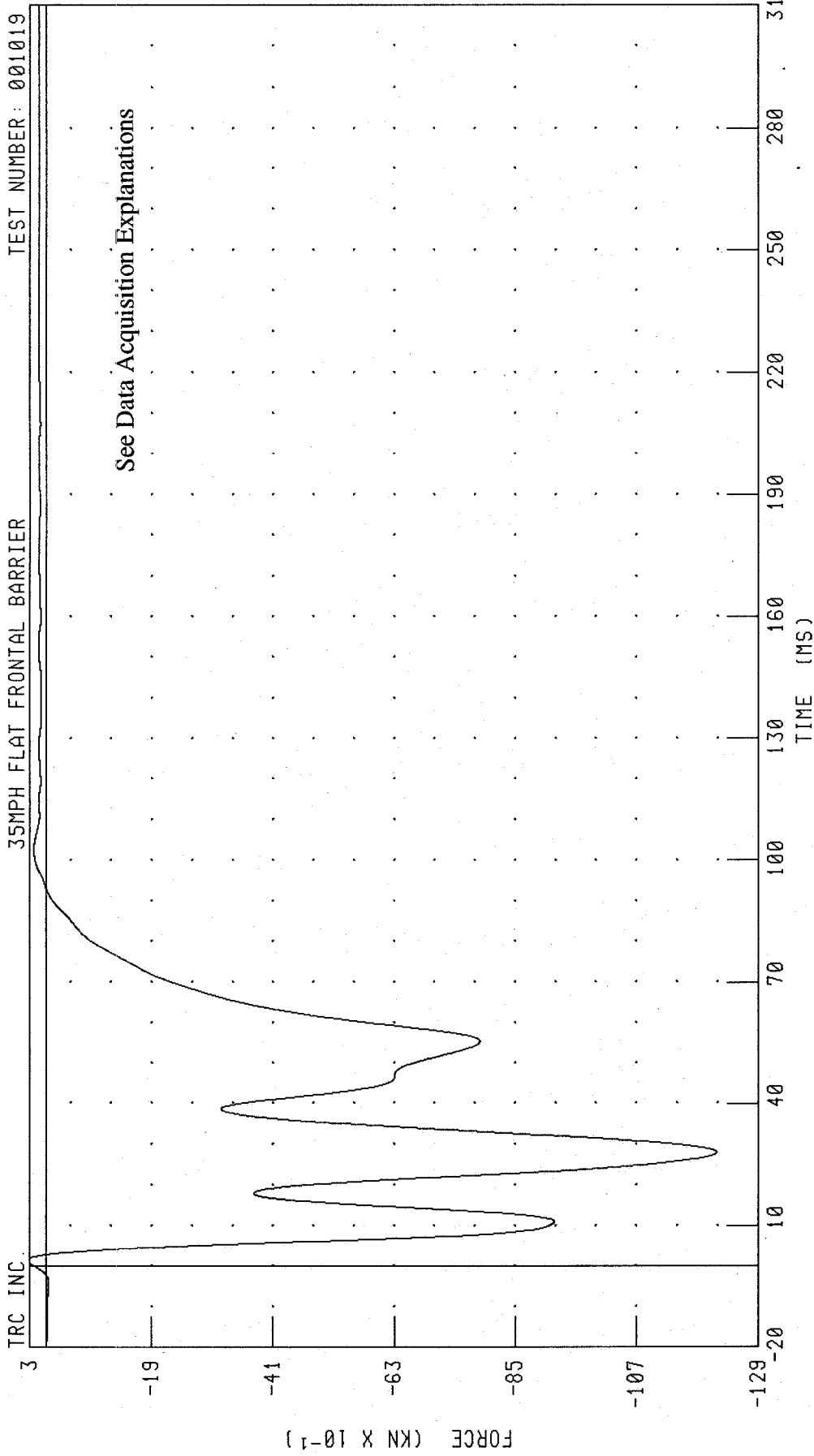


PEAK DATA: 0.17 KN @ -2.08 MS; -26.78 KN @ 30.16 MS

CHANNEL: BC6F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION C7 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



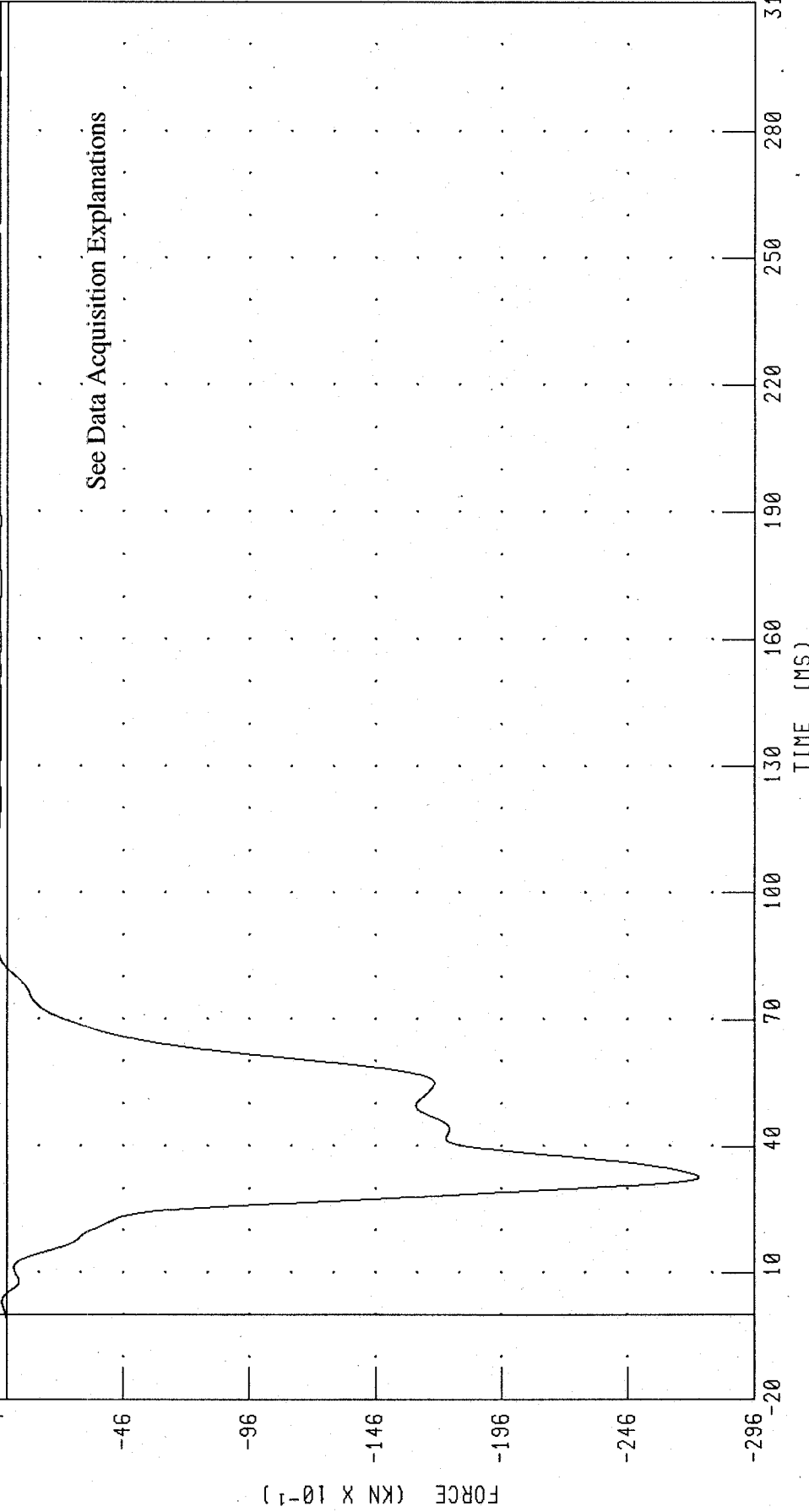
PEAK DATA: 0.35 KN @ 1.44 MS; -12.16 KN @ 28.08 MS

CHANNEL: BC7F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION C8 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

4 TRC INC.

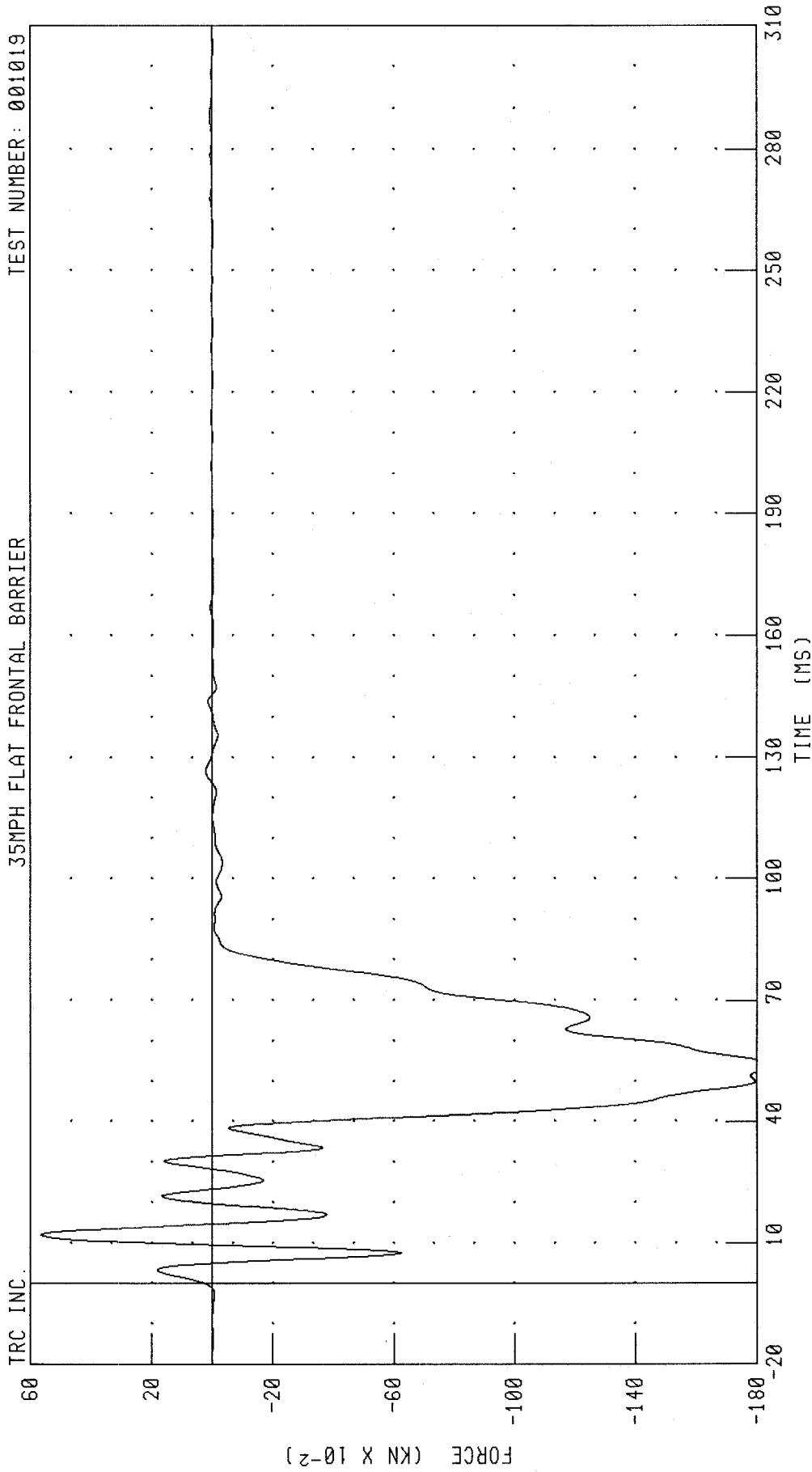


PEAK DATA: 0.38 KN @ 88.64 MS; -27.42 KN @ 32.72 MS

CHANNEL: BC8F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION C9 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



TRC INC.

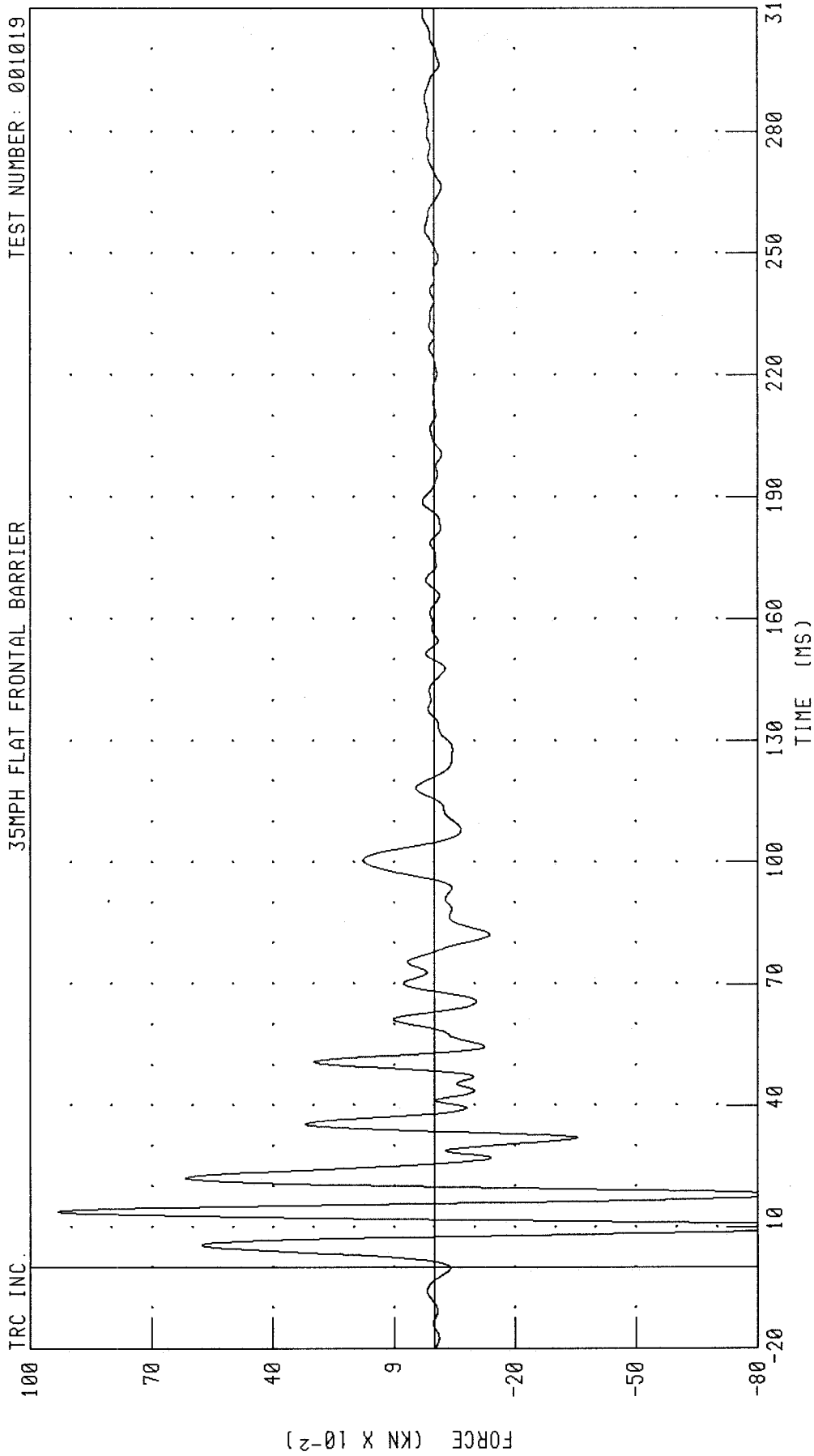
CHANNEL: BC9F

FILTER: CH. CLASS 60

PEAK DATA: 0.57 KN @ 12.08 MS; -1.87 KN @ 53.92 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION D1 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



TRC INC.

100

70

40

9

-20

-50

-80

-20

10

40

70

100

130

160

190

220

250

280

310

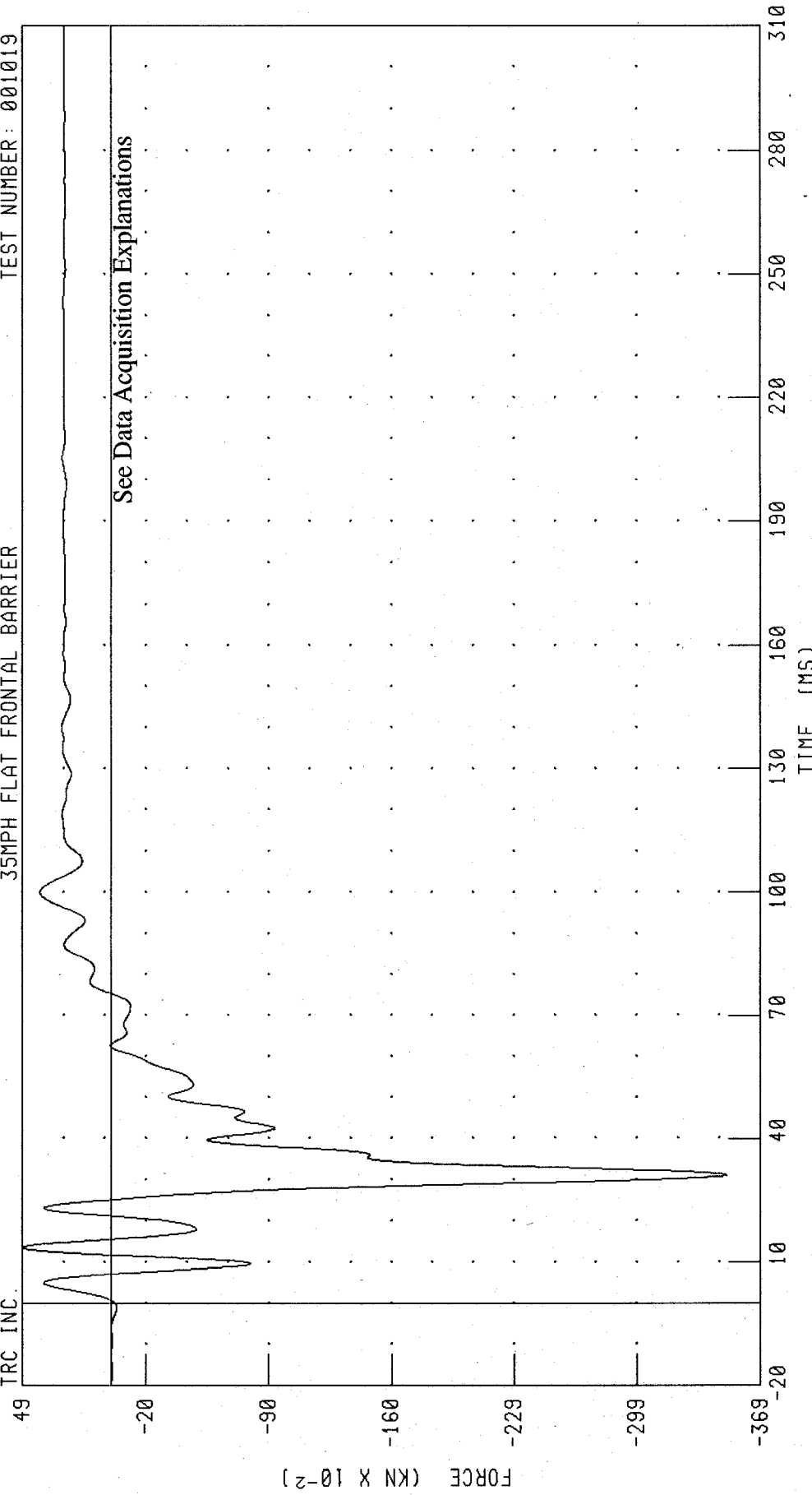
TIME (MS)

CHANNEL: BD1F FILTER: CH. CLASS 60 PEAK DATA: 0.93 KN @ 13.76 MS; -1.15 KN @ 9.92 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION D2 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

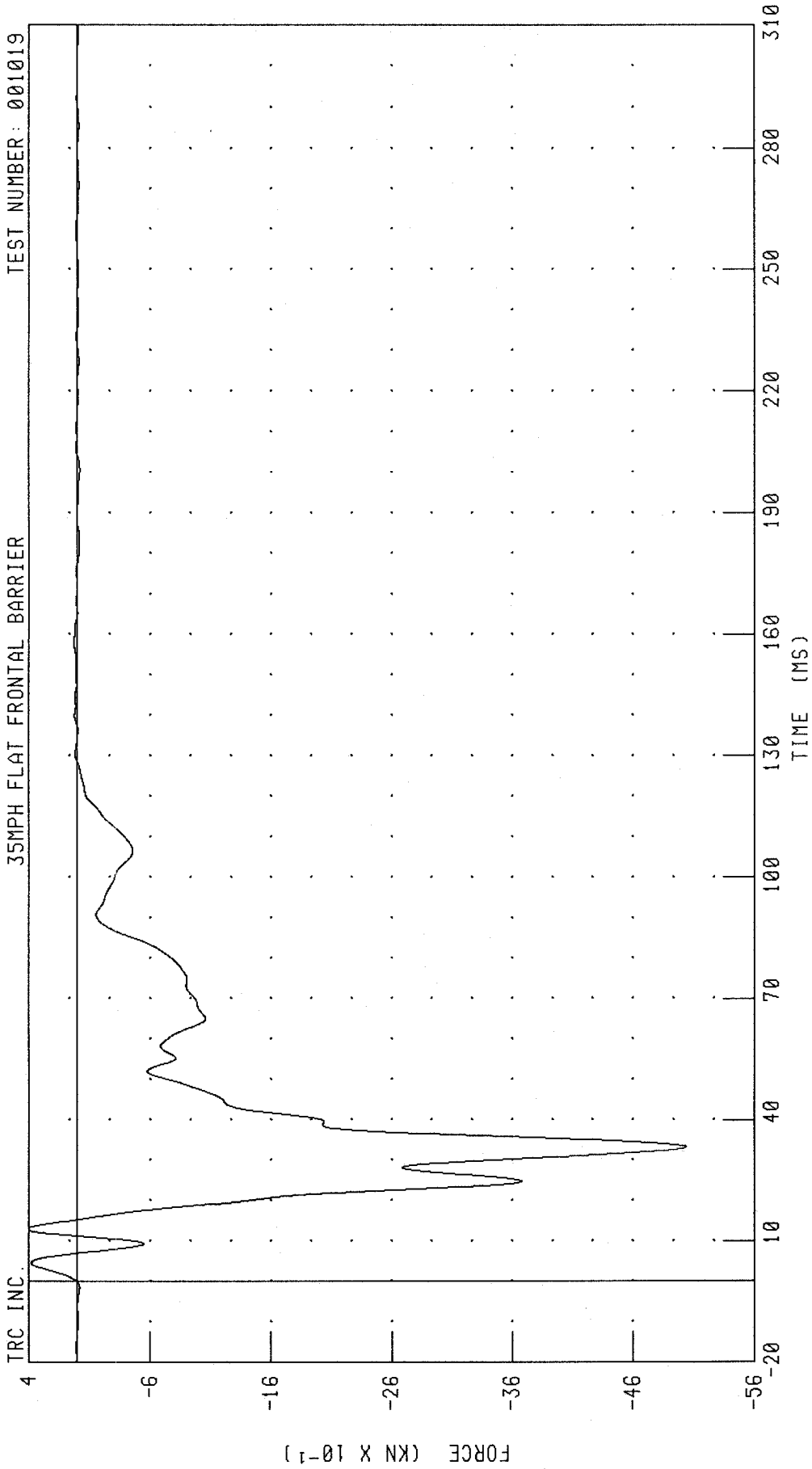
TRC INC.



CHANNEL: BD2F FILTER: CH. CLASS 60 PEAK DATA: 0.50 KN @ 13.52 MS, -3.51 KN @ 31.12 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION D3 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

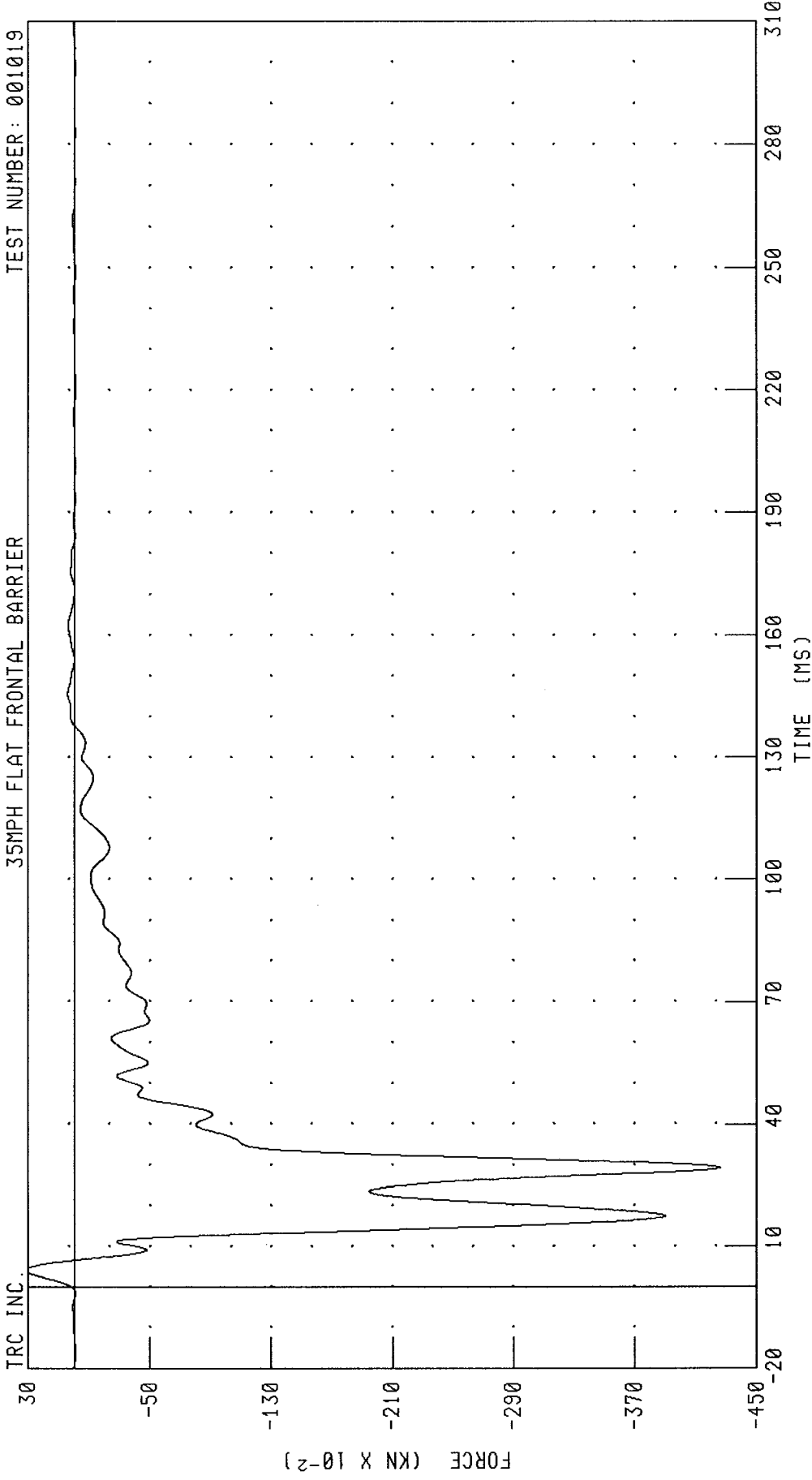


PEAK DATA: 0.43 KN @ 12.88 MS; -5.04 KN @ 33.20 MS

CHANNEL: BD3F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION D4 FORCE  
35MPH FLAT FRONTAL BARRIER

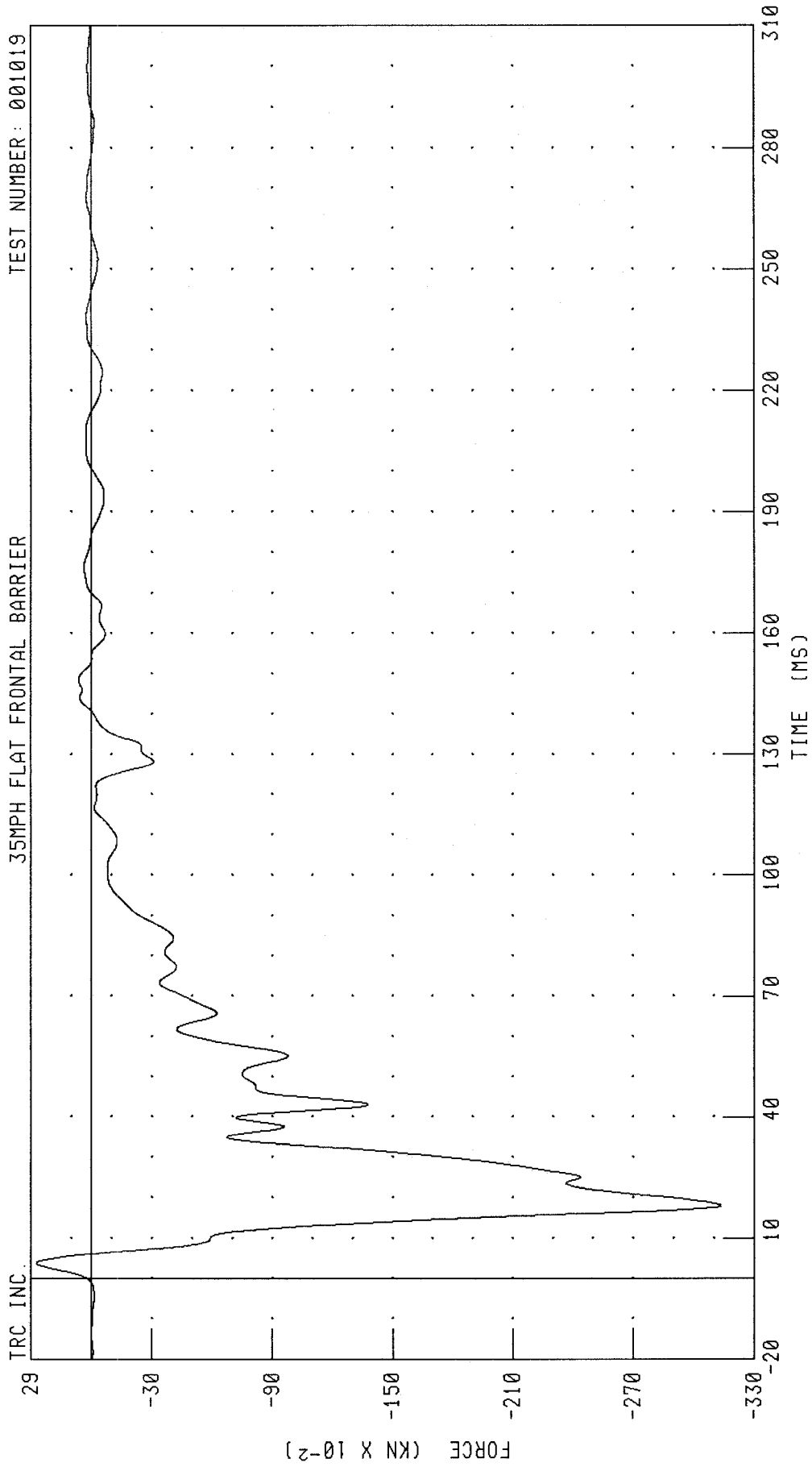
TEST NUMBER: 001019



CHANNEL: BD4F FILTER: CH. CLASS 60 PEAK DATA: 0.33 KN @ 4.08 MS; -4.26 KN @ 29.36 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION D5 FORCE  
35MPH FLAT FRONTAL BARRIER

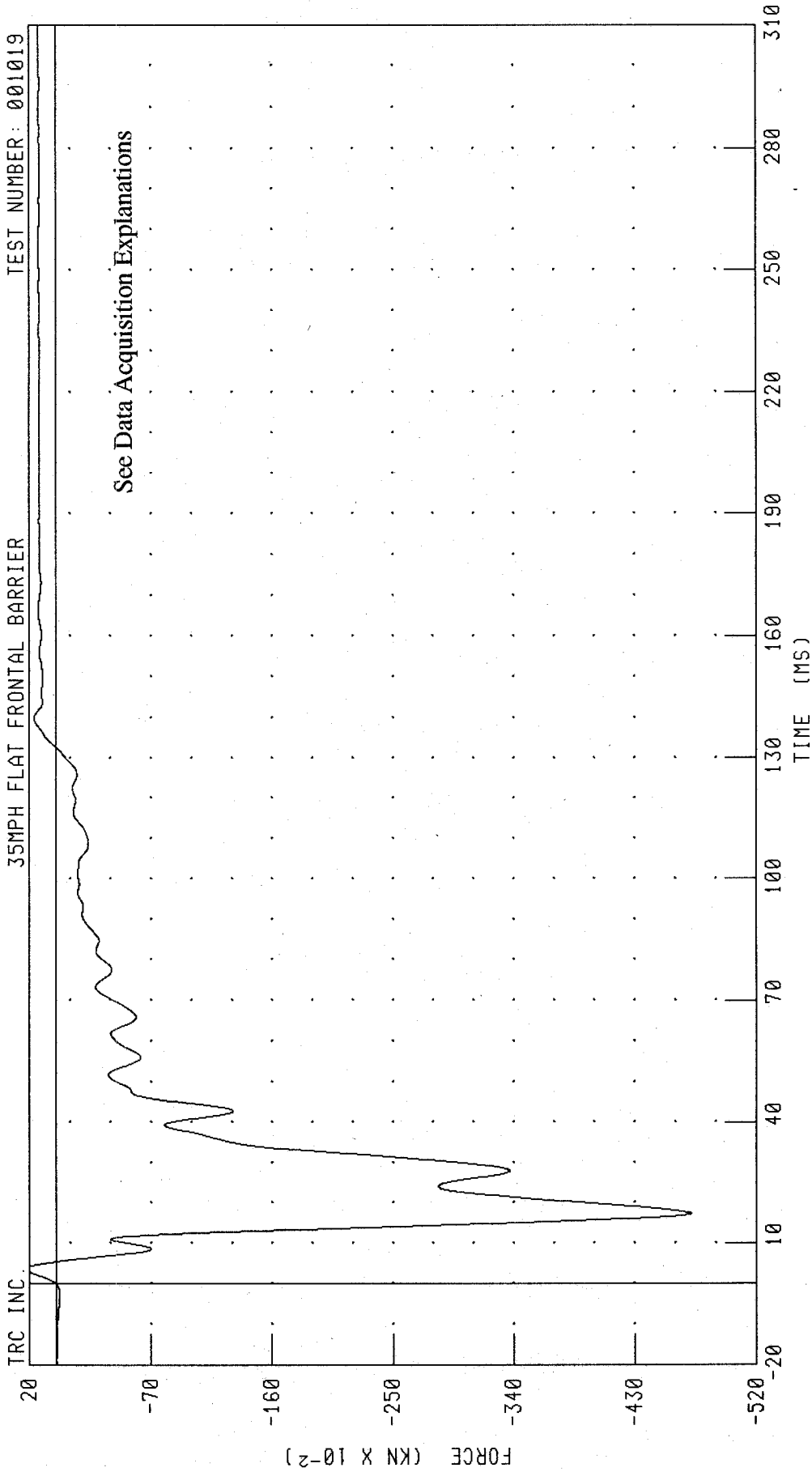
TEST NUMBER: 001019



TRC INC. CHANNEL: BD5F FILTER: CH. CLASS 60  
PEAK DATA: 0.27 KN @ 3.76 MS; -3.13 KN @ 18.08 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION D6 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



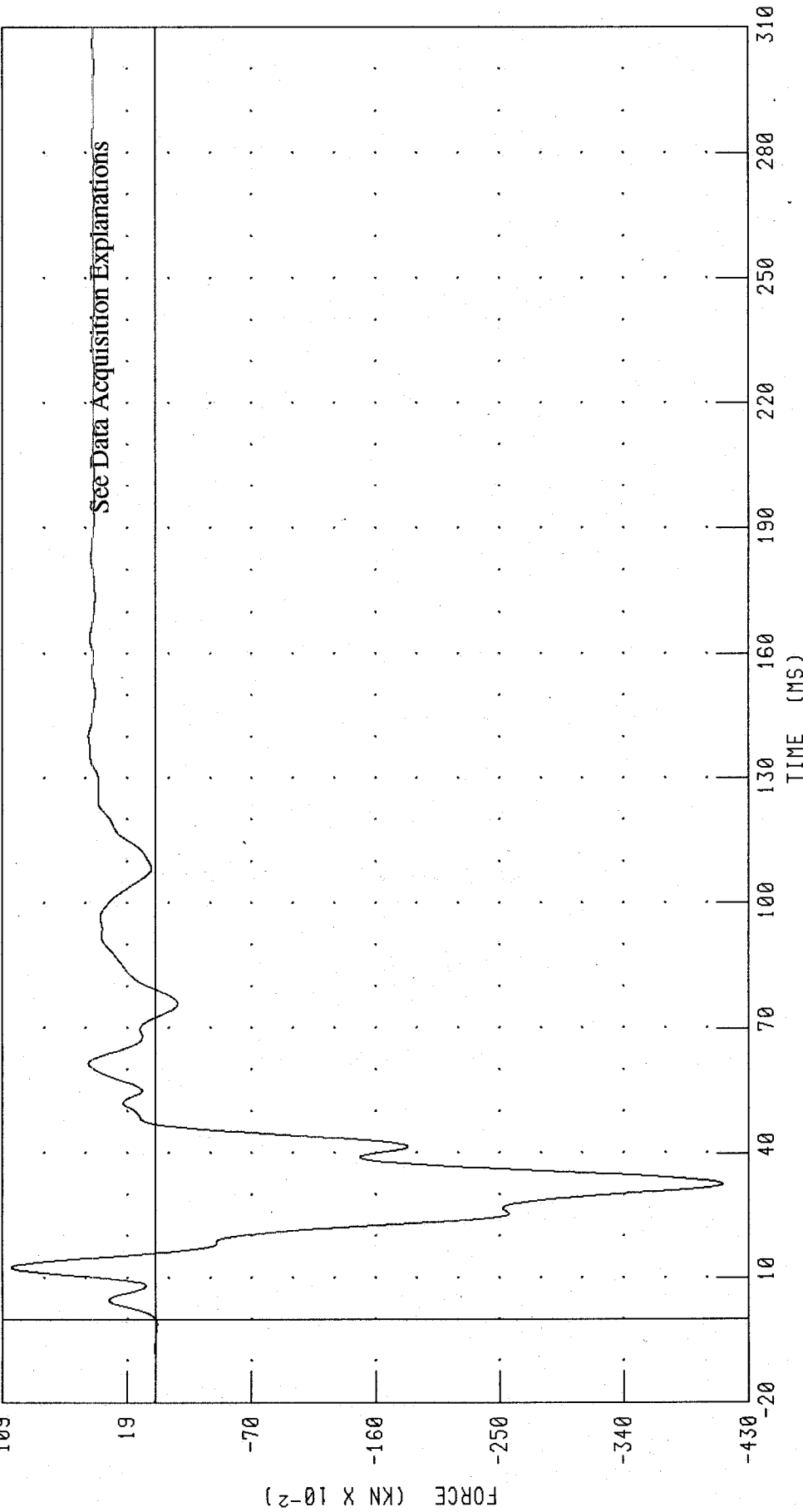
See Data Acquisition Explanations

CHANNEL: BD6F FILTER: CH. CLASS 60 PEAK DATA: 0.23 KN @ 3.52 MS; -4.72 KN @ 17.28 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION D7 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

TRC INC.

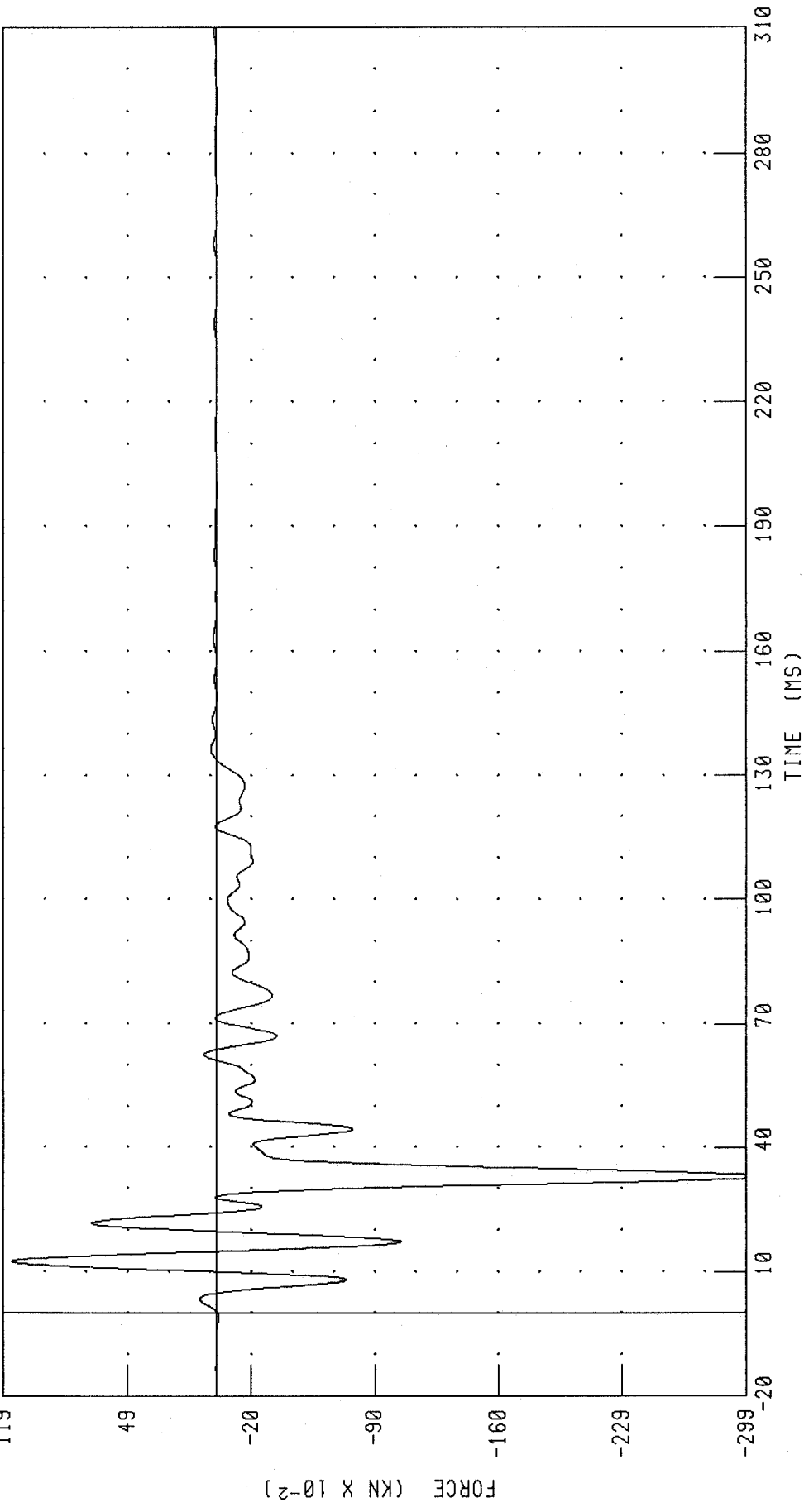


CHANNEL: BD7F FILTER: CH. CLASS 60 PEAK DATA: 1.04 KN @ 12.48 MS, -4.12 KN @ 32.64 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION D8 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

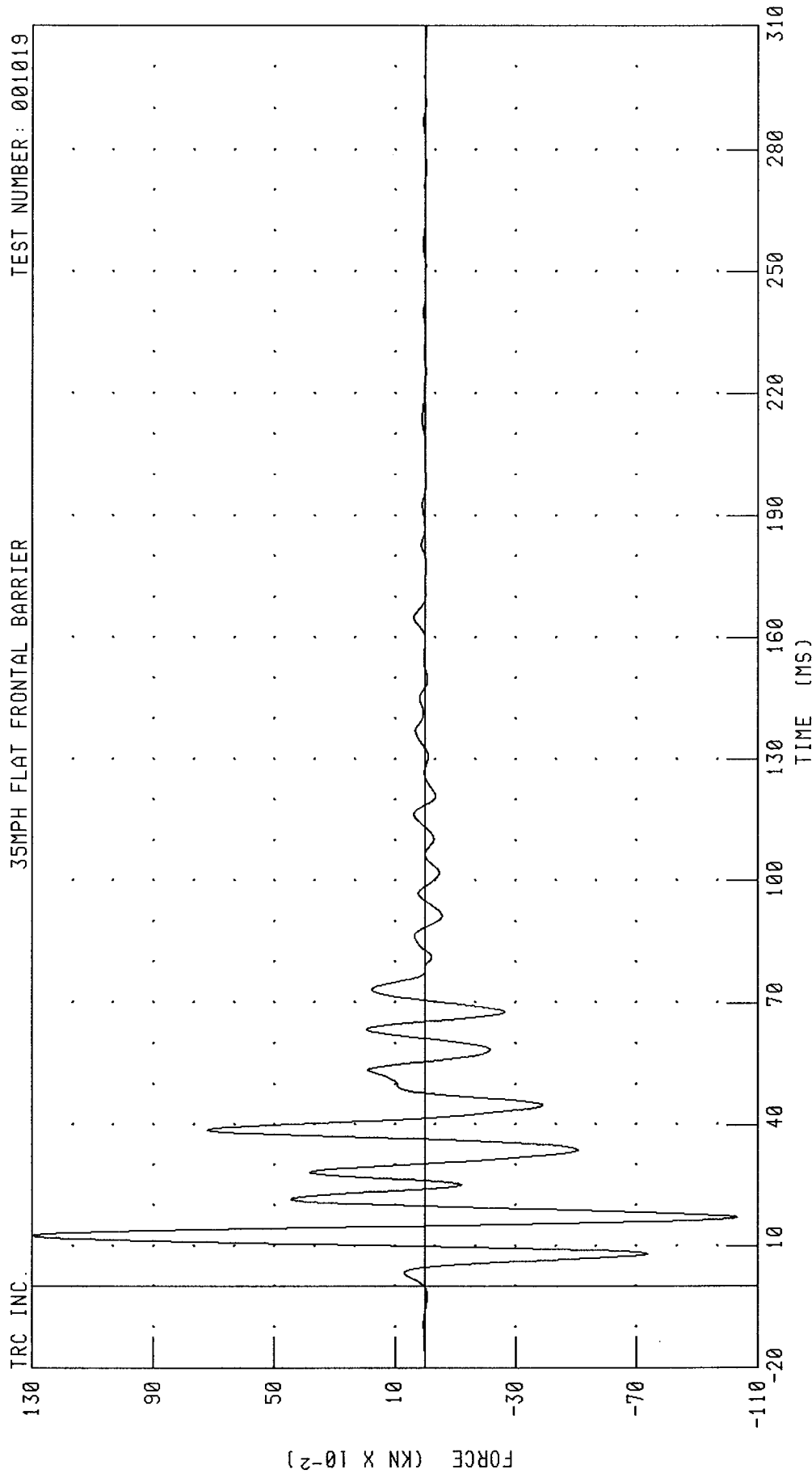
TRC INC.



CHANNEL: BD8F FILTER: CH. CLASS 60 PEAK DATA: 1.15 KN @ 12.48 MS; -3.08 KN @ 32.88 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER POSITION D9 FORCE  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

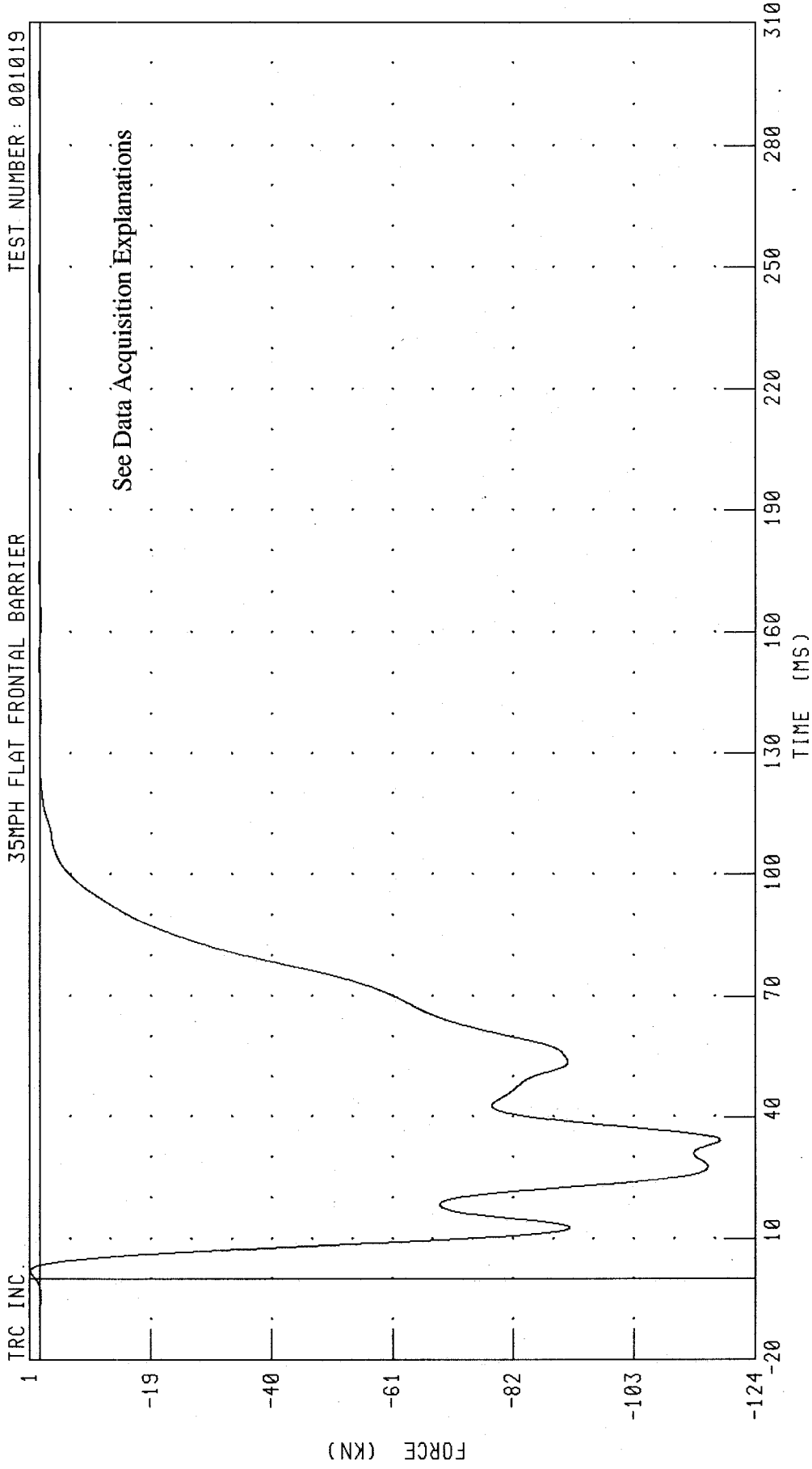


PEAK DATA: 1.30 KN @ 12.56 MS; -1.03 KN @ 17.12 MS

CHANNEL: BD9F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER GROUP # 1 FORCE TOTAL  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019



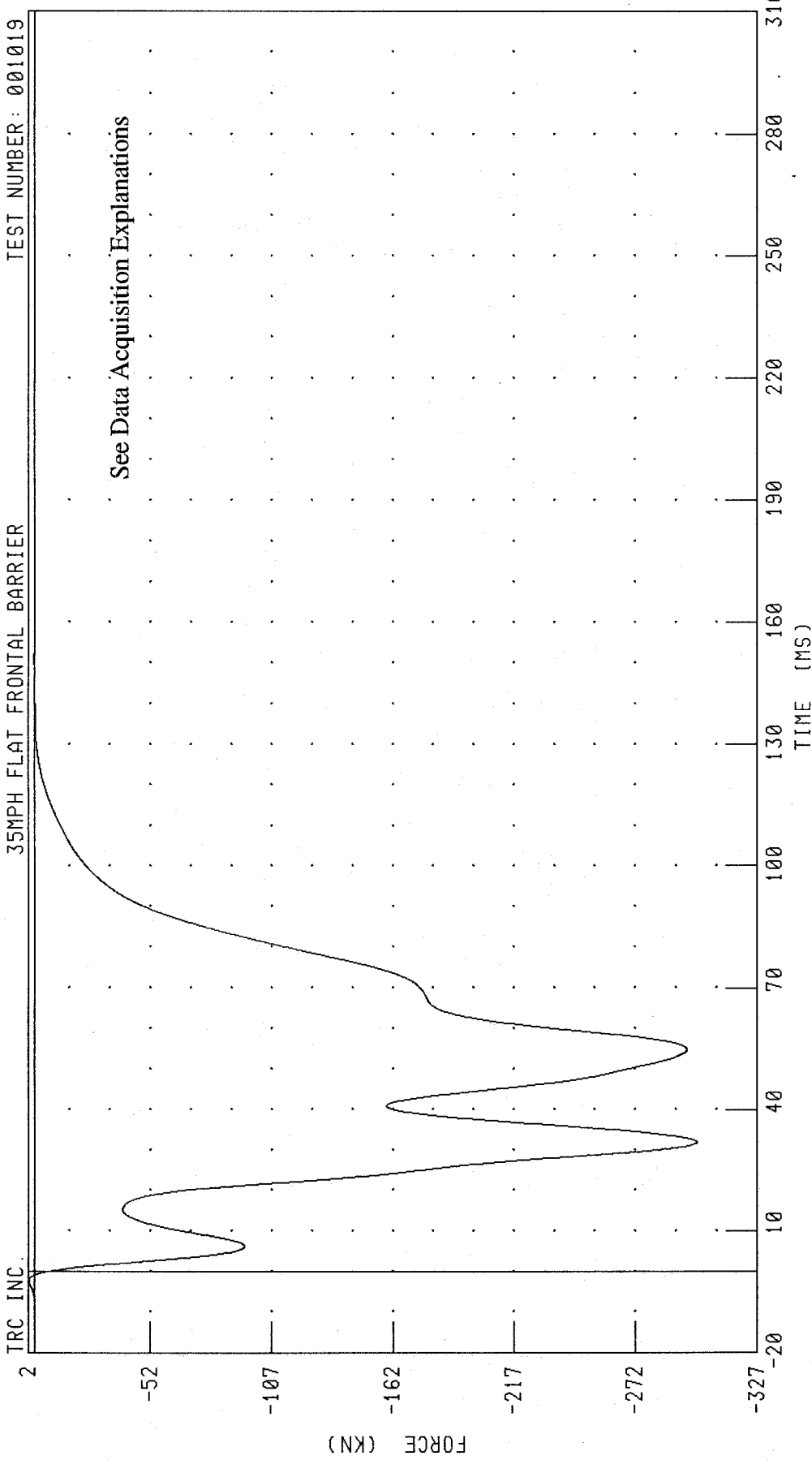
See Data Acquisition Explanations

PEAK DATA: 1.70 KN @ 1.92 MS; -118.09 KN @ 34.16 MS

CHANNEL: LCBG1F FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER GROUP # 2 FORCE TOTAL  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

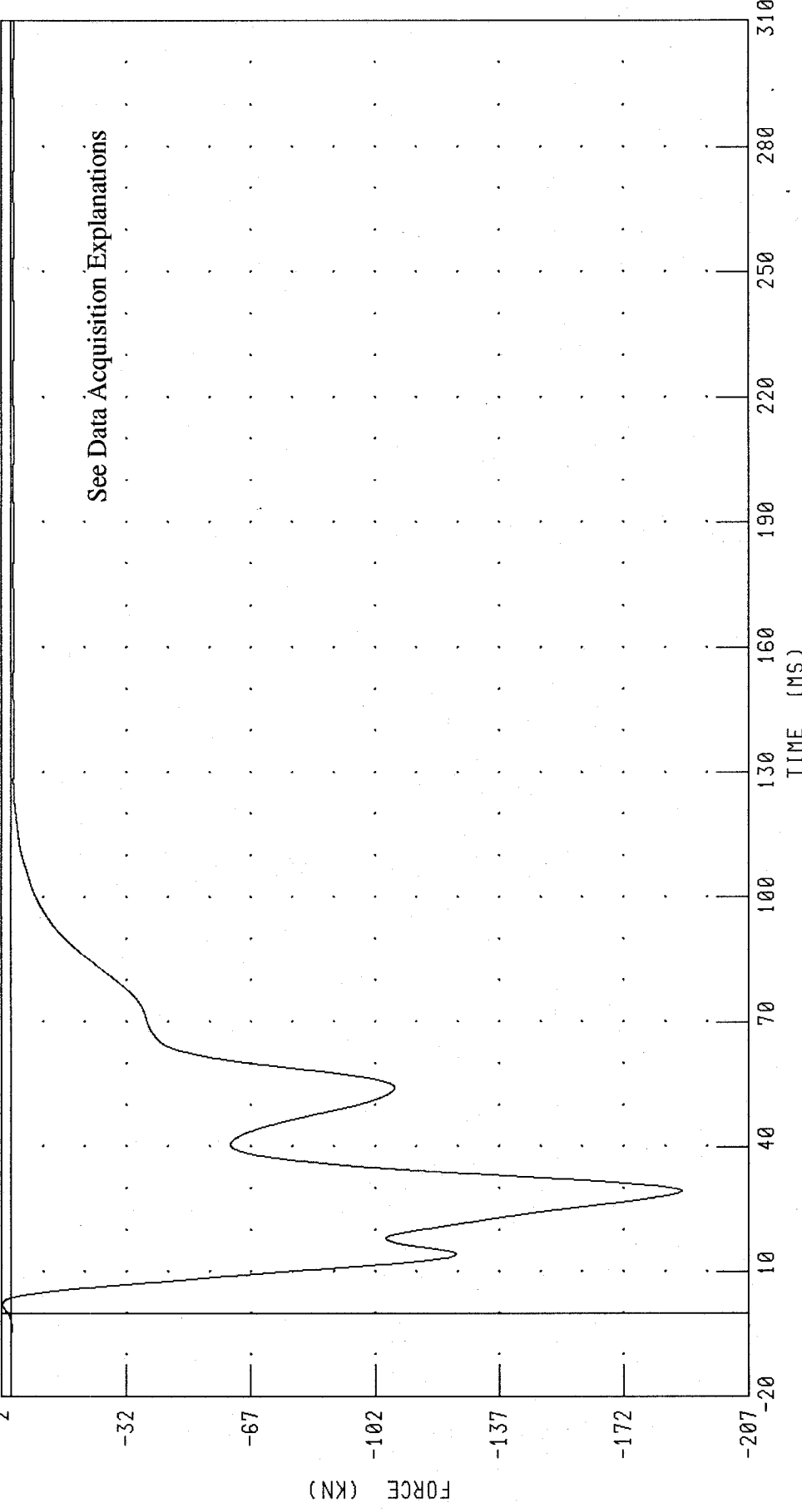


CHANNEL: LCBG2F FILTER: CH. CLASS 60  
PEAK DATA: 2.36 KN @ -2.32 MS; -300.44 KN @ 31.92 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER GROUP # 3 FORCE TOTAL  
35MPH FLAT FRONTAL BARRIER

TEST NUMBER: 001019

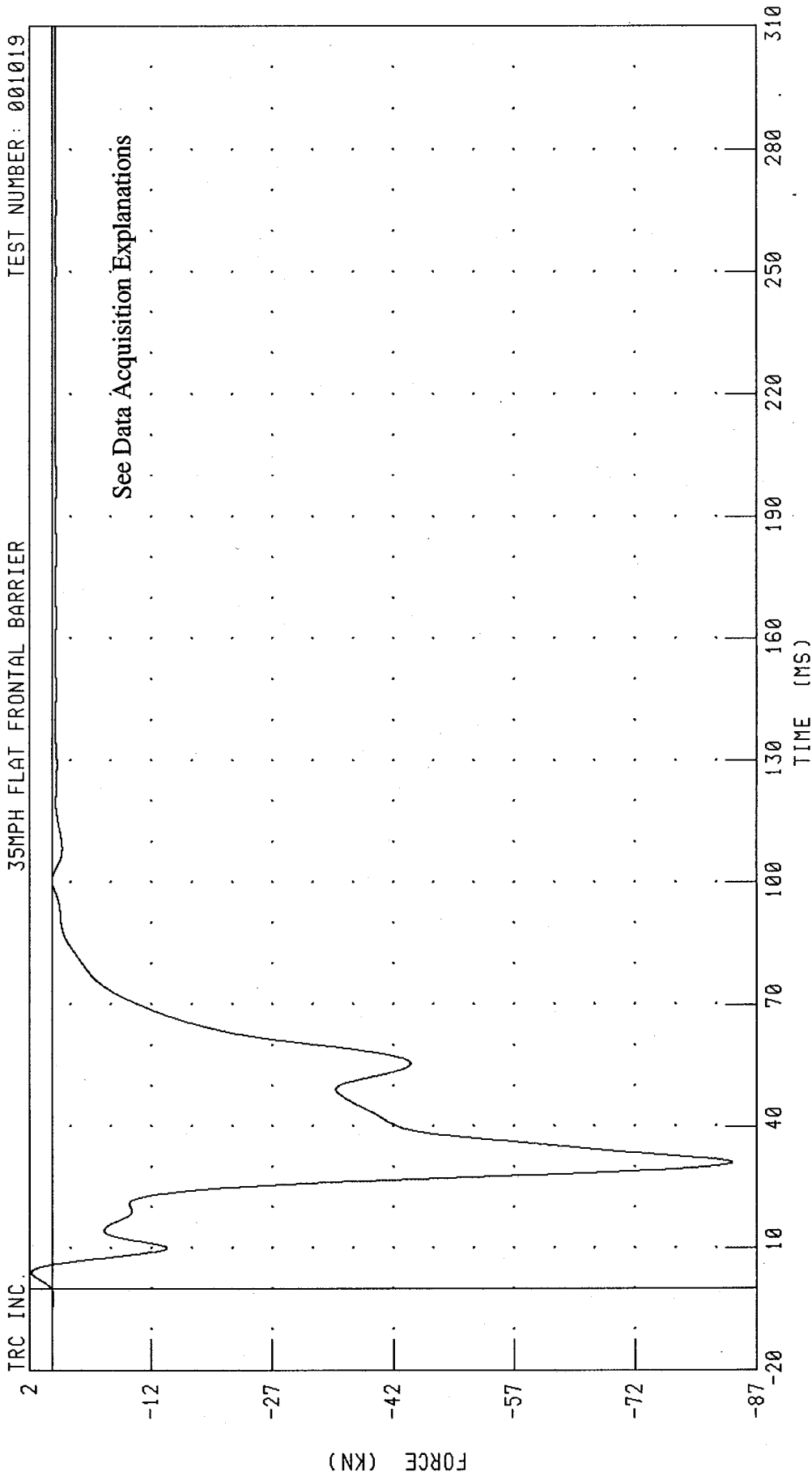
2 TRC INC.



CHANNEL: LCBG3F FILTER: CH. CLASS 60 PEAK DATA: 2.37 KN @ 2.16 MS; -188.70 KN @ 29.36 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER GROUP # 4 FORCE TOTAL  
35MPH FLAT FRONTAL BARRIER

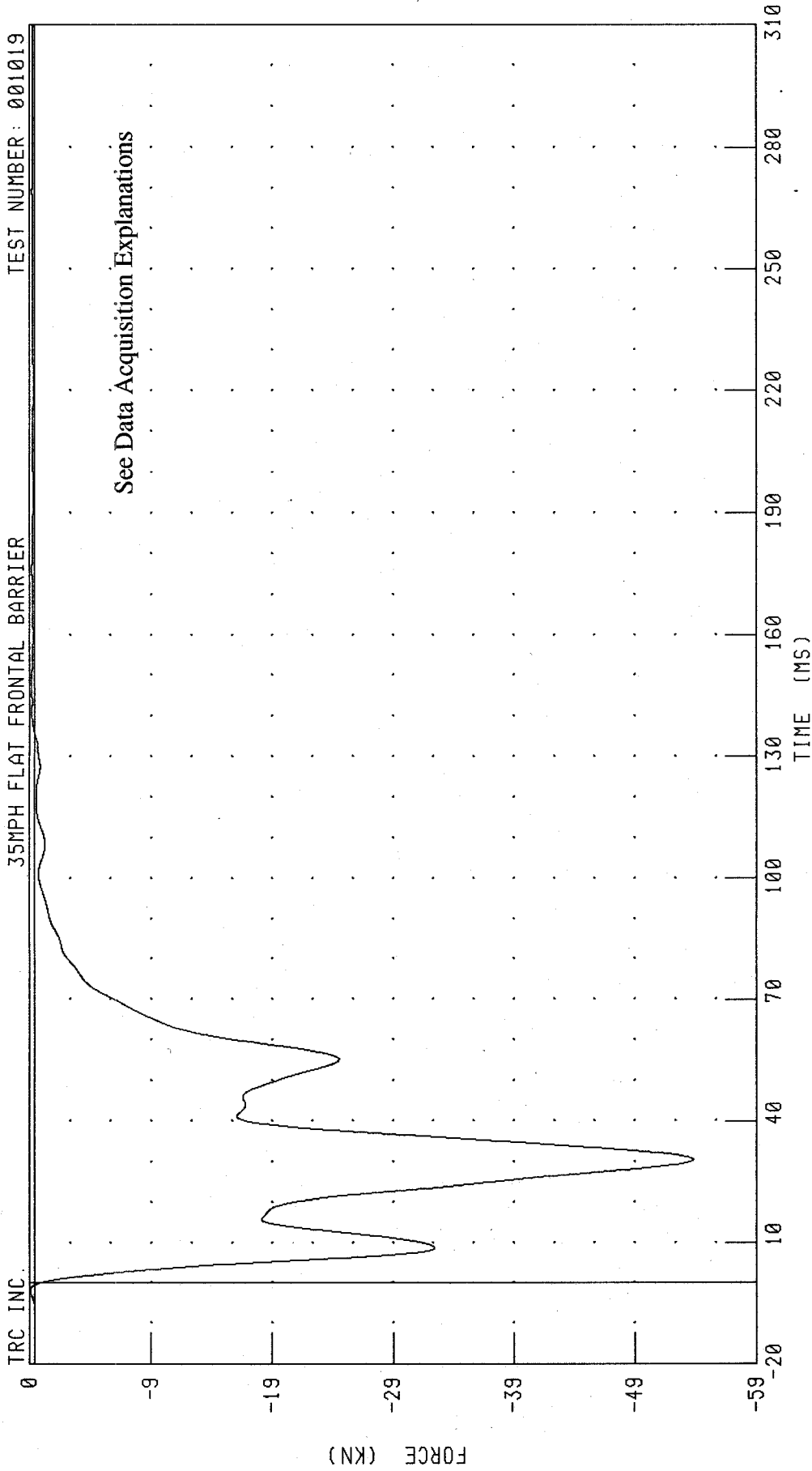
TEST NUMBER: 001019



CHANNEL: LCBC4F FILTER: CH. CLASS 60 PEAK DATA: 2.62 KN @ 4.00 MS; -84.21 KN @ 31.04 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER GROUP # 5 FORCE TOTAL  
35MPH FLAT FRONTAL BARRIER

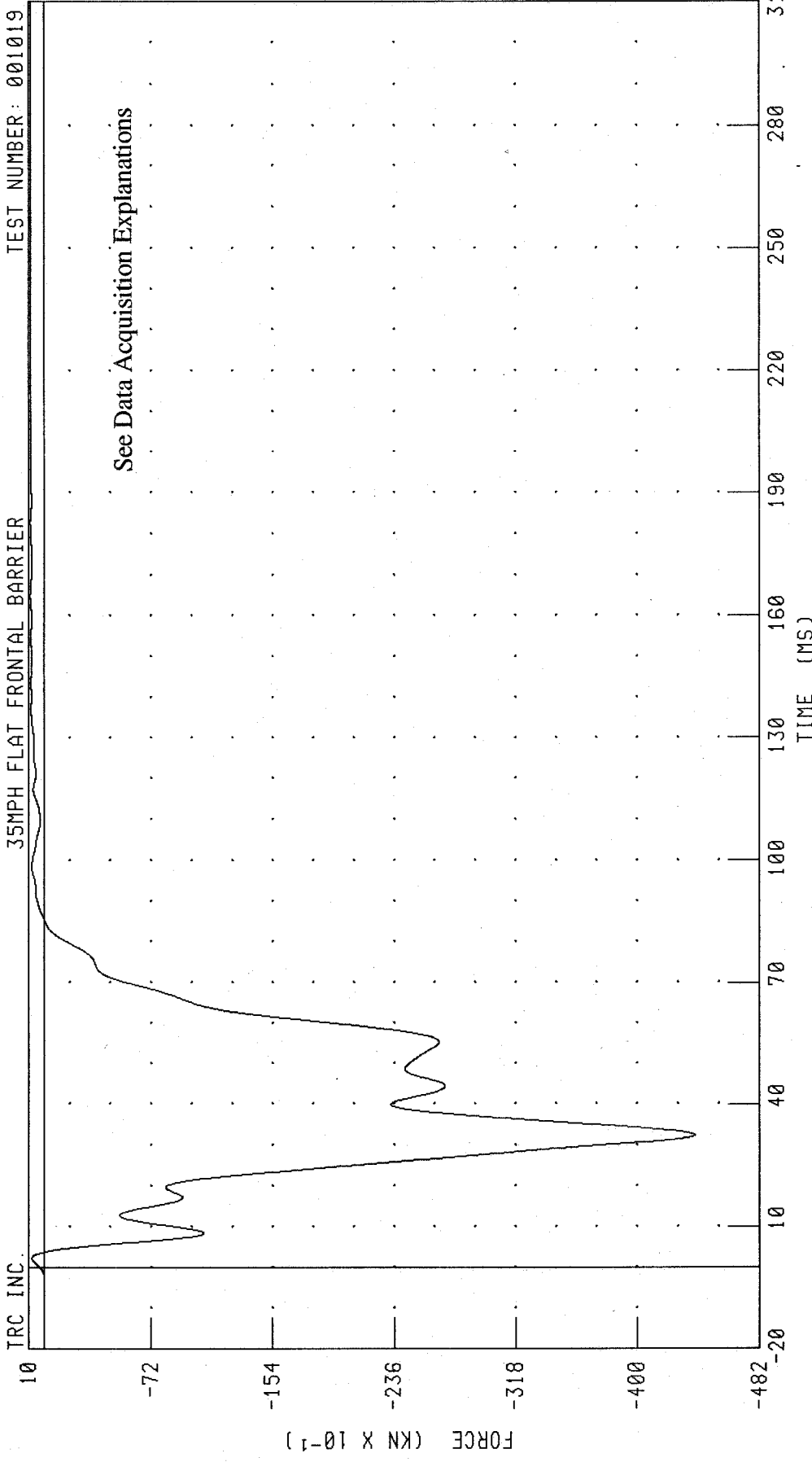
TEST NUMBER: 001019



TRC INC. CHANNEL: LCBC5F FILTER: CH. CLASS 60  
PEAK DATA: 0.37 KN @ -2.00 MS; -54.41 KN @ 30.56 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
LOAD CELL BARRIER GROUP # 6 FORCE TOTAL  
35MPH FLAT FRONTAL BARRIER

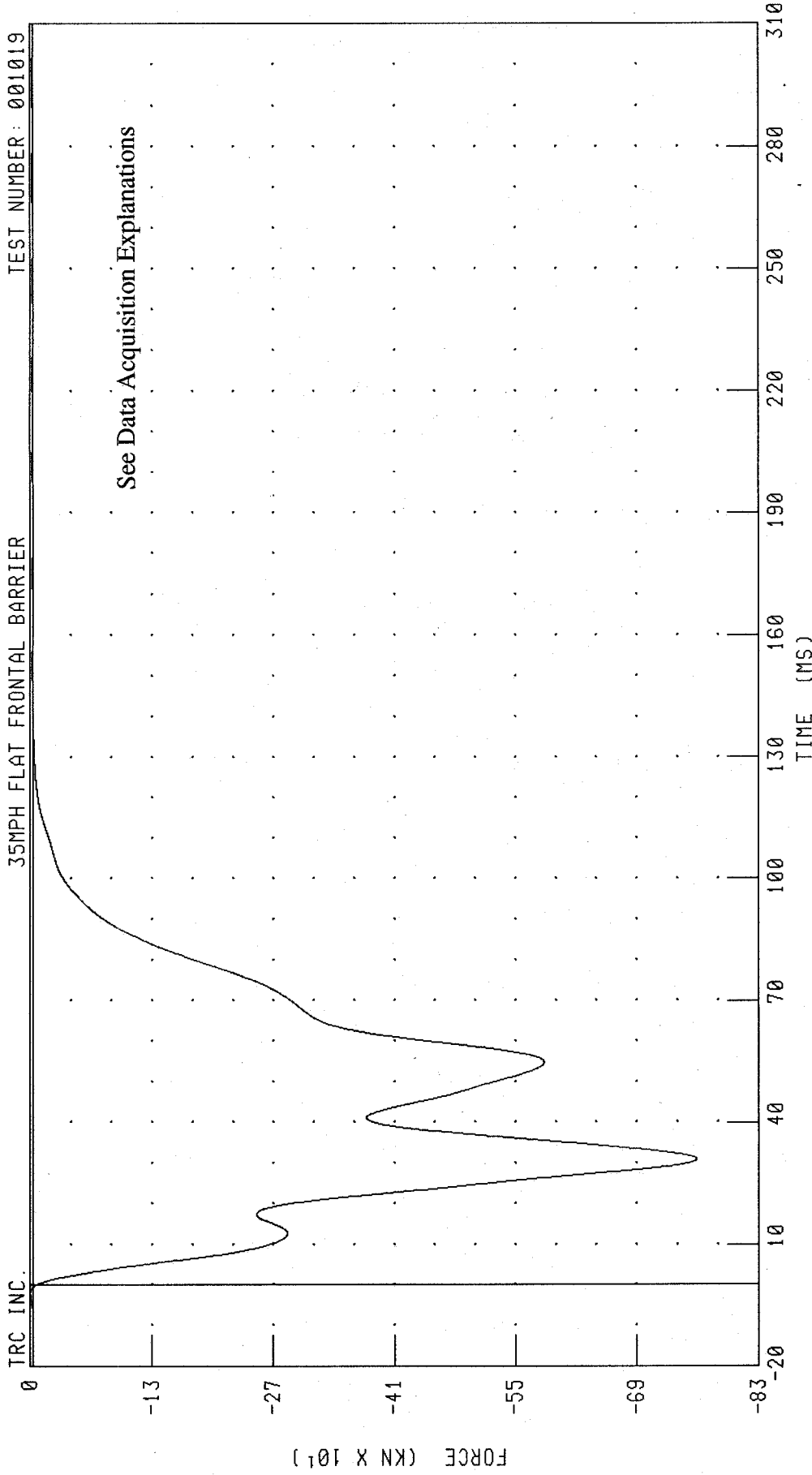
TEST NUMBER: 001019



CHANNEL: LCBG6F FILTER: CH. CLASS 60 PEAK DATA: 0.91 KN @ 182.72 MS; -43.89 KN @ 32.40 MS

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
TOTAL LOAD CELL BARRIER FORCE  
35MPH FLAT FRONTAL BARRIER

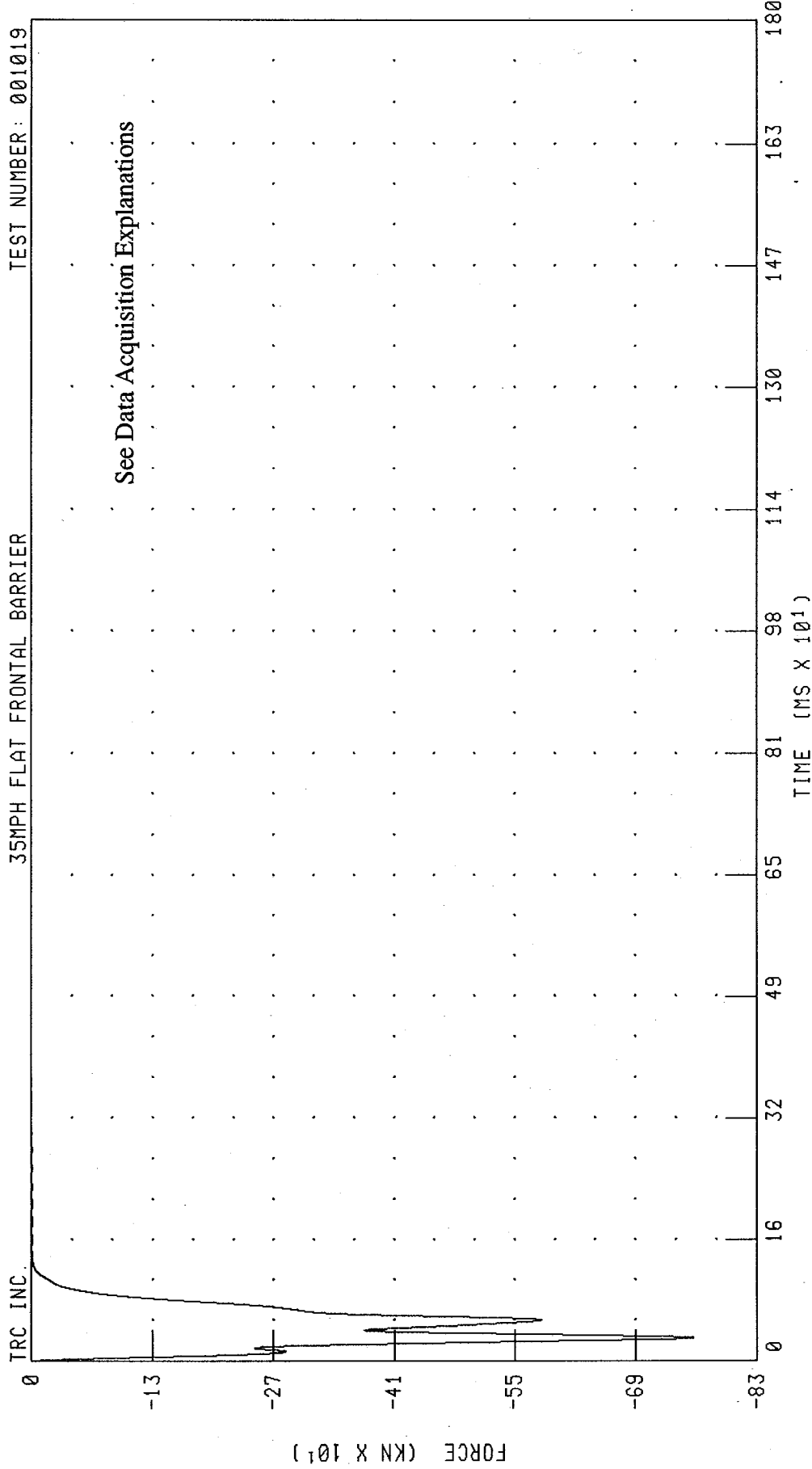
TRC INC. TEST NUMBER: 001019



PEAK DATA: 2.48 KN @ -2.08 MS; -766.82 KN @ 30.96 MS

CHANNEL: LCBGT FILTER: CH. CLASS 60

2001 VOLVO S80 INTO FRONTAL LOAD CELL BARRIER  
 TOTAL LOAD CELL BARRIER FORCE VS AVERAGE VEHICLE X-AXIS DISPLACEMENT  
 35MPH FLAT FRONTAL BARRIER TEST NUMBER: 001019



CHANNEL: LCBGT FILTER: CH. CLASS 60 PEAK DATA: 0.21 KN @ 151.44 MS; -766.82 KN @ 30.96 MS

TRANSPORTATION RESEARCH CENTER INC.  
HYBRID III EXTERNAL DIMENSIONS

142

17-OCT-00

TRC INC. TEST NO: 142C44ED1 572E SN142 EXT.DIMENTION CAL44

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	996. MM
WAIST CIRCUMFERENCE (Z)	836 - 866 MM	856. MM
CHEST DEPTH (O)	213 - 229 MM	224. 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	886. MM
THIGH CLEARANCE (F)	140 - 155 MM	150. MM
BUTTOCK KNEE LENGTH (K)	579 - 605 MM	602. MM
BUTTOCK POPLITEAL LENGTH (N)	452 - 478 MM	467. MM
POPLITEAL HEIGHT (L)	429 - 455 MM	450. MM
KNEE PIVOT HEIGHT (M)	485 - 500 MM	485. MM
FOOT LENGTH (P)	252 - 267 MM	254. MM
FOOT BREADTH (W)	91 - 107 MM	102. 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	338. MM
BACK OF ELBOW TO WRIST PIVOT (G)	290 - 305 MM	297. MM

572E SN142 EXT.DIMENTION CAL44  
DUMMY MEETS SPECIFICATIONS  
TECHNICIAN 

RUN NUMBER: 101700.1558

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III 50th

17-OCT-00

TRC INC.

TEST NO: 142C44HD1

572E SN144 HEAD DROP CAL 42

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	262.84 G
PEAK LATERAL ACCELERATION	15 G MAX	9.34 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN

*Dustin Walker*

RUN NUMBER: 101700.1330;1

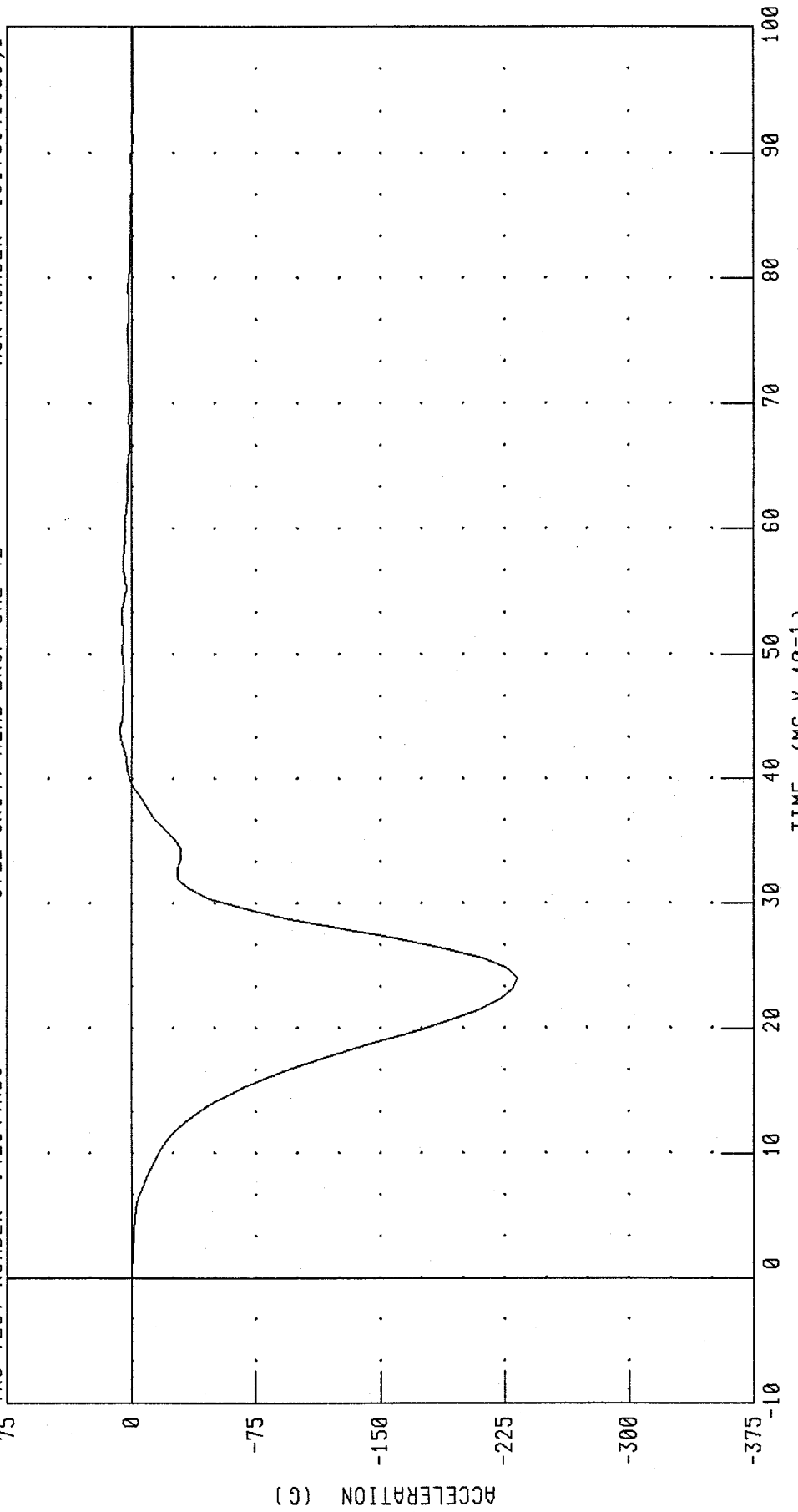
PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION X AXIS

572E SN144 HEAD DROP CAL 42

RUN NUMBER: 101700.1330;1

TRC TEST NUMBER: 142C44HD1



TIME (MS X 10<sup>-1</sup>)

CHANNEL: HEDXC FILTER: CH. CLASS 1000

PEAK DATA: 6.99 G @ 4.40 MS; -232.67 G @ 2.40 MS

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

TRC TEST NUMBER: 142C44HD1      RUN NUMBER: 101700.1330;1

572E SN144 HEAD DROP CAL 42

225

150

75

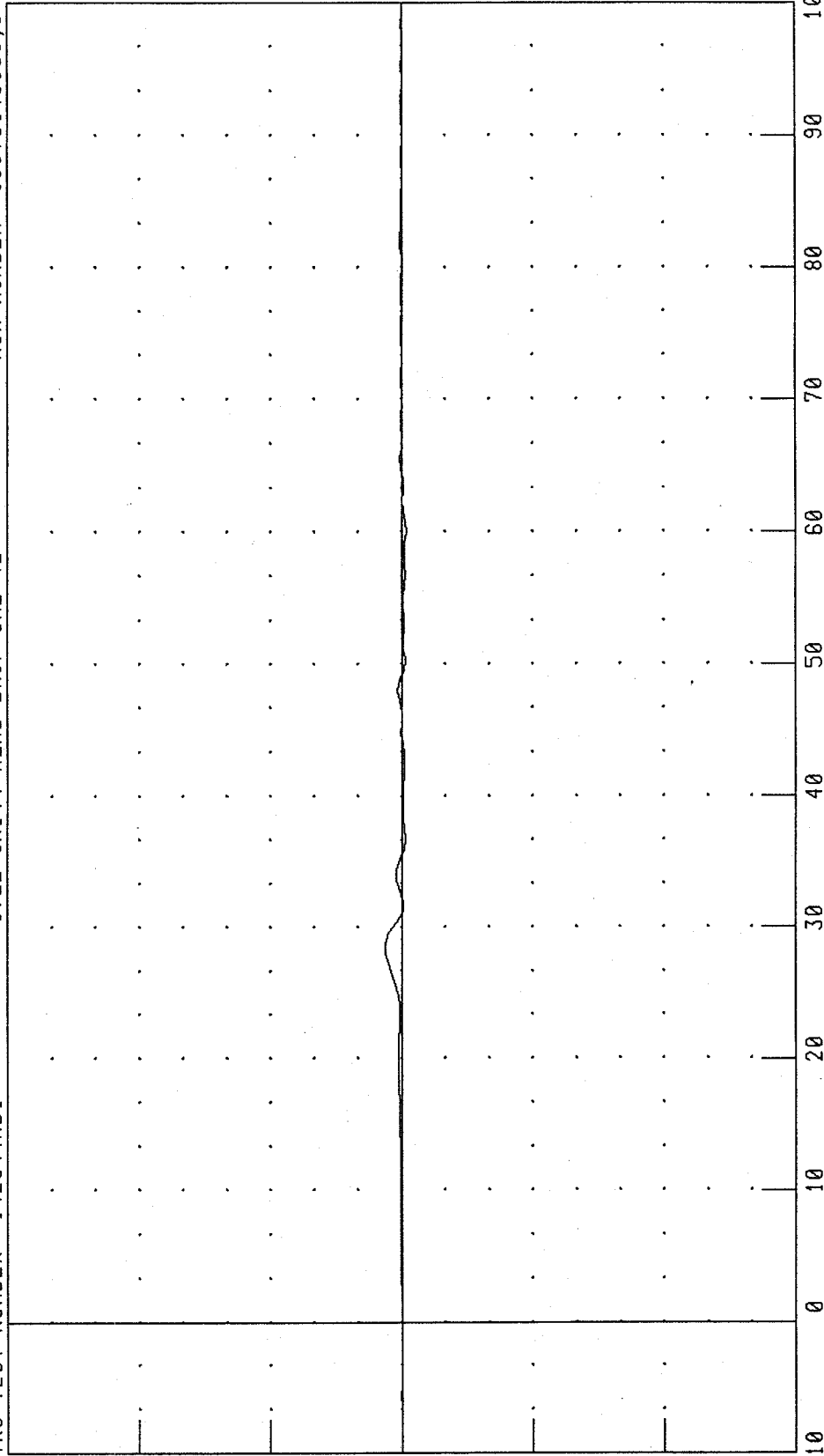
0

-75

-150

-225

ACCELERATION (G)



TIME (MS X 10<sup>-1</sup>)

CHANNEL: HEDYG      FILTER: CH. CLASS 1000

PEAK DATA: 9.35 G @ 2.88 MS; -2.55 G @ 6.00 MS

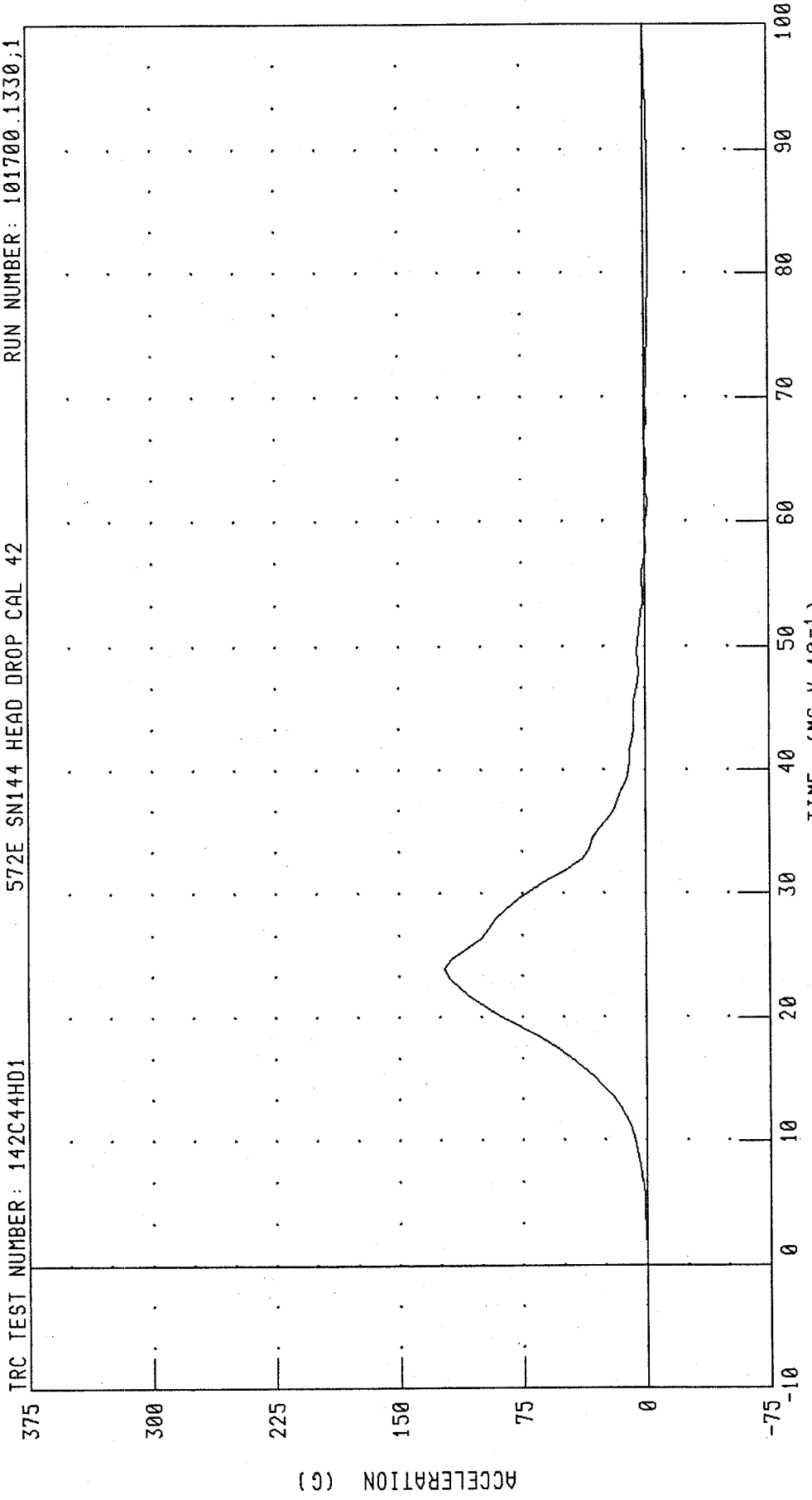
PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Z AXIS

572E SN144 HEAD DROP CAL 42

RUN NUMBER: 101700.1330;1

TRC TEST NUMBER: 142C44HD1



CHANNEL: HEDZG FILTER: CH. CLASS 1000 PEAK DATA: 122.28 G @ 2.40 MS; -2.88 G @ 8.56 MS

PART 572-E HYBRID III HEAD CALIBRATION

HEAD RESULTANT ACCELERATION

572E SN144 HEAD DROP CAL 42

RUN NUMBER: 101700.1330;1

TRC TEST NUMBER: 142C44HD1

375

300

225

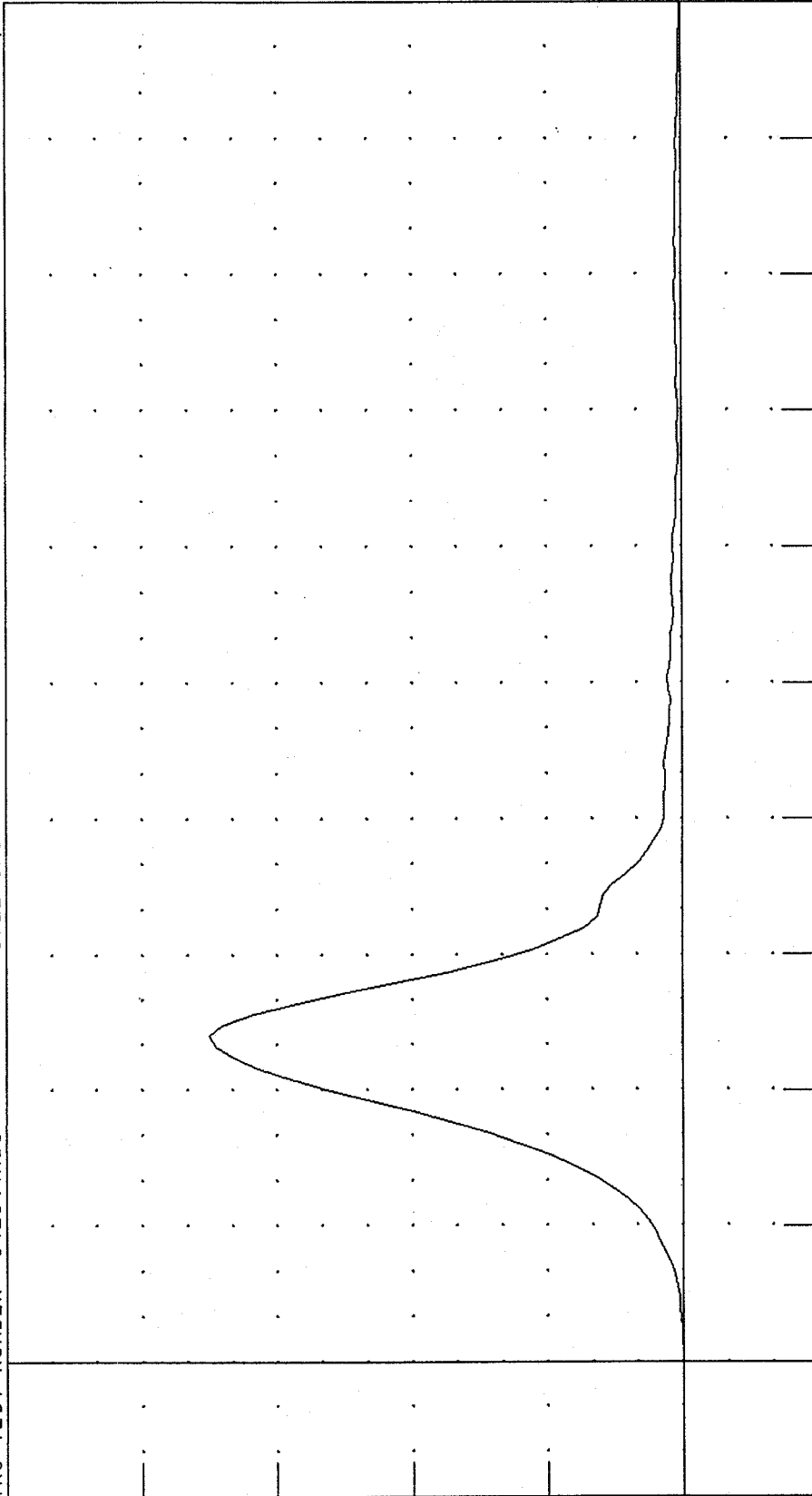
150

75

0

-75

ACCELERATION (G)



TIME (MS X 10<sup>-1</sup>)

100

90

80

70

60

50

40

30

20

10

0

CHANNEL: HEDRC

FILTER: CH. CLASS 1000

PEAK DATA: 262.85 G @ 2.40 MS; 0.01 G @ -0.72 MS

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III 50th

17-OCT-00

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 142C44NF1 572E SN142 NECK FLEXION CAL44

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6-22.2 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
IMPACT VELOCITY	6.89 - 7.13 M/S	6.96 M/S
PENDULUM DECELERATION	10 MS   22.50 - 27.50 G	22.59 G
	20 MS   17.60 - 22.60 G	21.25 G
	30 MS   12.50 - 18.50 G	17.90 G
MAX PENDULUM G	29 G MAX	22.96 G
MAX PENDULUM G ABOVE 30 MS	29 G MAX	17.84 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G	34 - 42 MS	38.40 MS
D PLANE	MAX   64 - 78 DEG.	70.93 DEG.
ROTATION	TIME   57 - 64 MS	60.72 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX   88.2 - 108.5 NM	97.84 NM
	TIME   47 - 58 MS	52.96 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO	113 - 128 MS	117.36 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO	97 - 107 MS	99.20 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN Dustin Walker

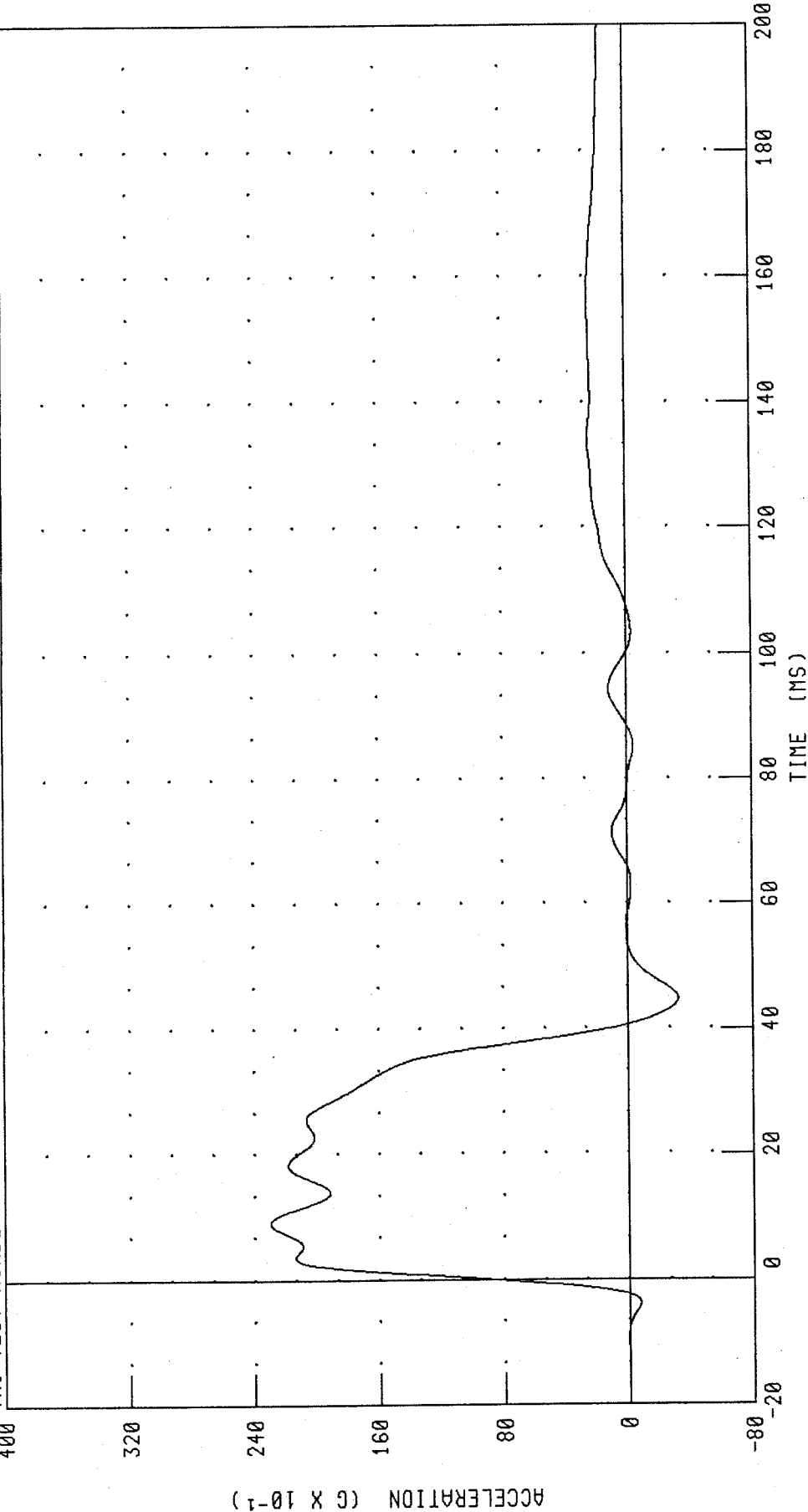
RUN NUMBER: 101700.1412;1

PART 572-E HYBRID III NECK FLEXION CALIBRATION  
PENDULUM DECELERATION

TRC TEST NUMBER: 142C44NF1

572E SN142 NECK FLEXION CAL44

RUN NUMBER: 101700.1412;1



CHANNEL: PENXG FILTER: CH. CLASS 60

PEAK DATA: 22.97 C @ 9.04 MS; -3.24 G @ 44.80 MS

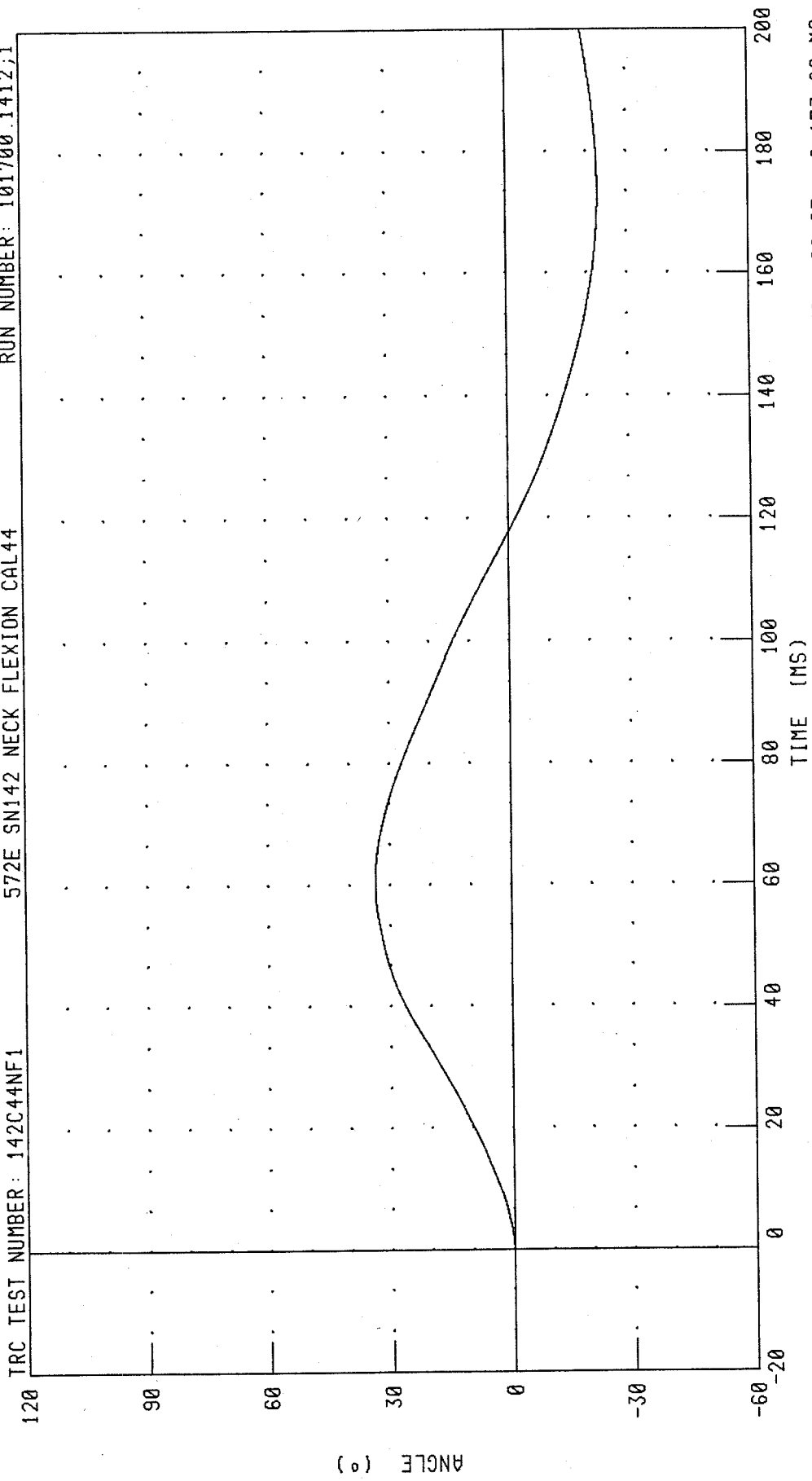
PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

572E SN142 NECK FLEXION CAL44

RUN NUMBER: 101700.1412.1

TRC TEST NUMBER: 142C44NF1



PEAK DATA: 33.54 ° @ 59.84 MS; -22.87 ° @ 173.28 MS

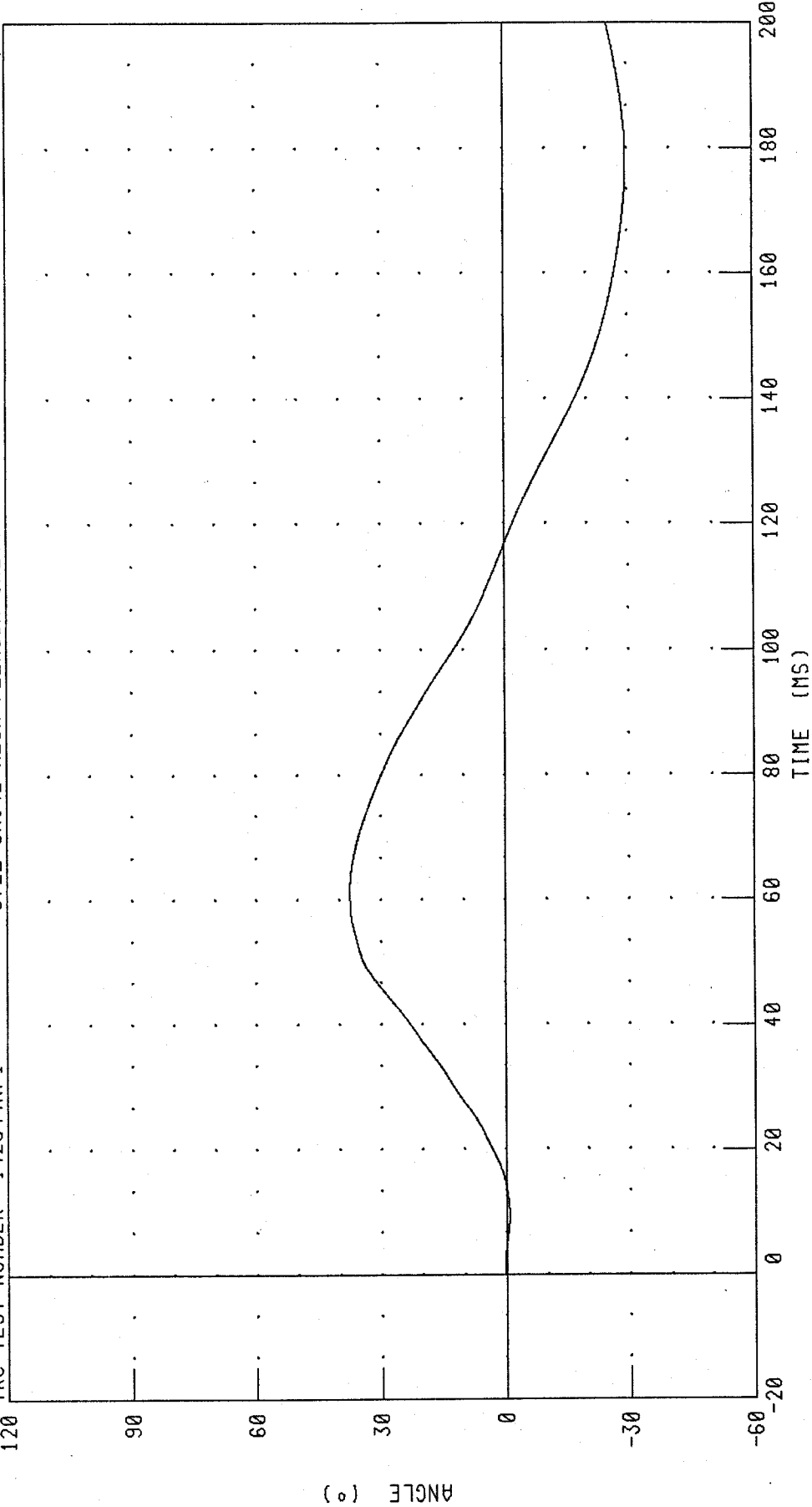
CHANNEL: BETA FILTER: CH. CLASS 60

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

TRC TEST NUMBER: 142C44NF1

572E SN142 NECK FLEXION CAL44

RUN NUMBER: 101700.1412;1



CHANNEL: THETA FILTER: CH. CLASS 60

PEAK DATA: 37.42 ° @ 61.60 MS; -29.63 ° @ 178.56 MS

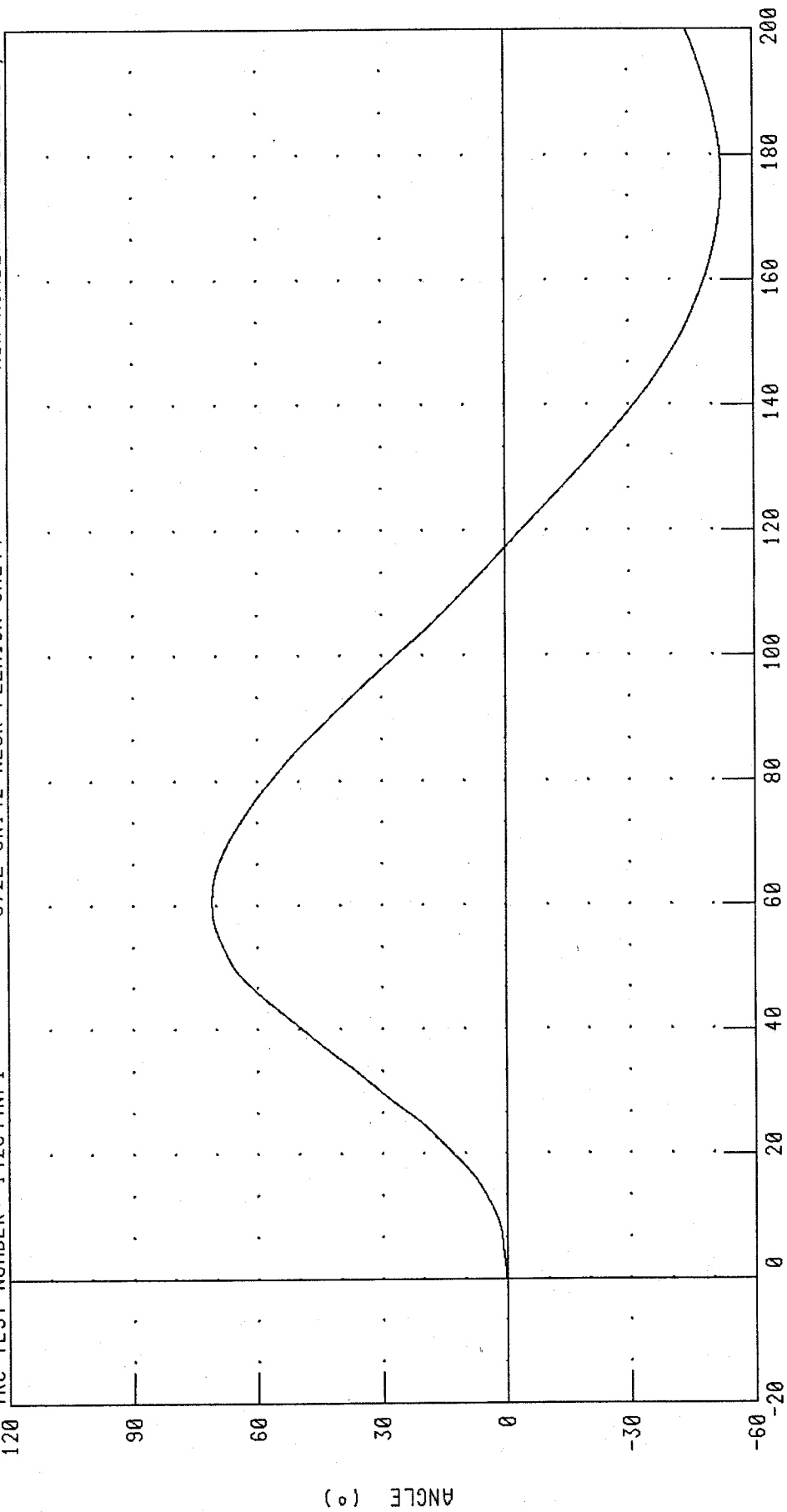
PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 142C44NF1

572E SN142 NECK FLEXION CAL44

RUN NUMBER: 101700.1412;1



CHANNEL: TOTAN FILTER: CH. CLASS 60

PEAK DATA: 70.93 ° @ 60.72 MS; -52.42 ° @ 175.44 MS

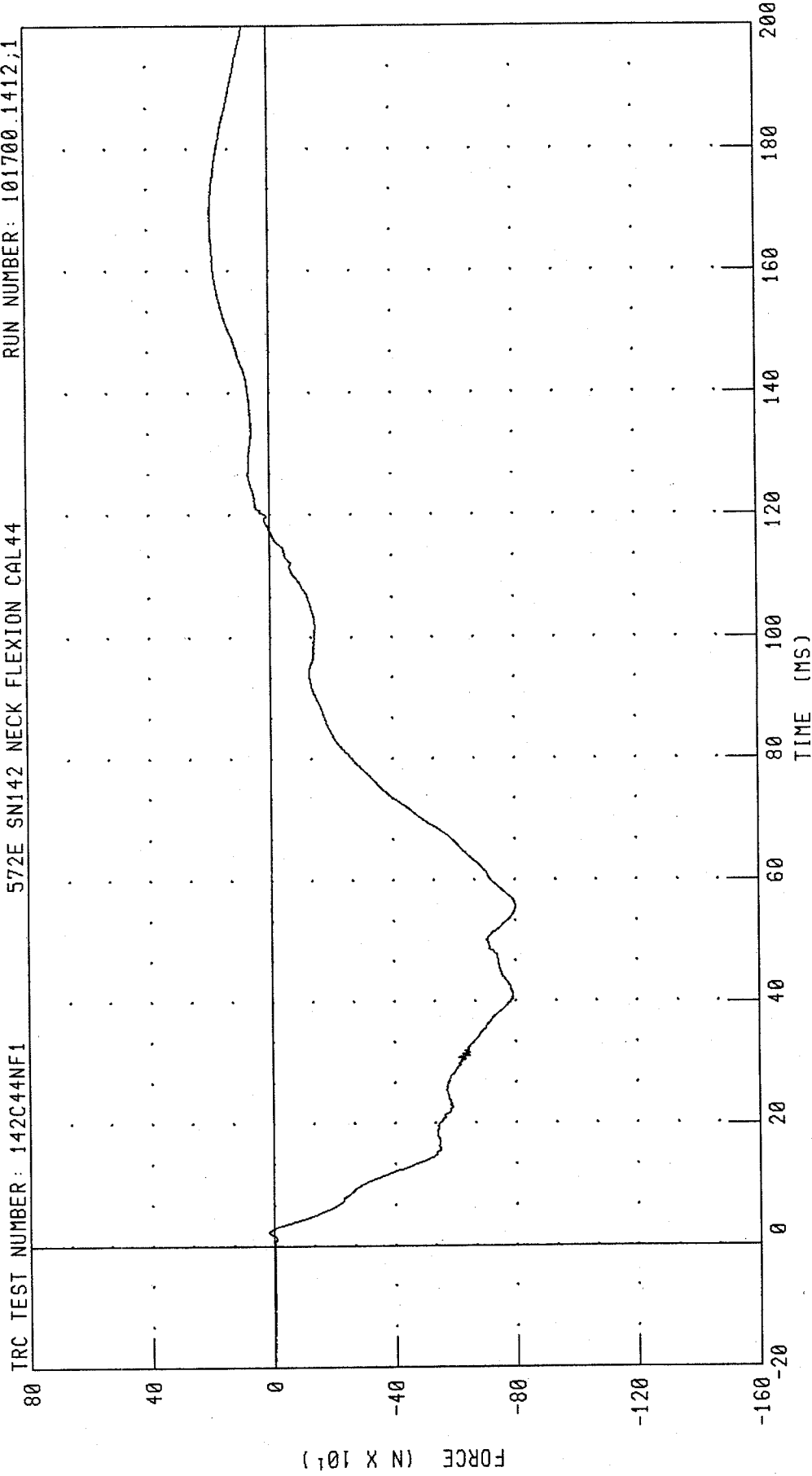
PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

RUN NUMBER: 101700.1412;1

572E SN142 NECK FLEXION CAL44

TRC TEST NUMBER: 142C44NF1

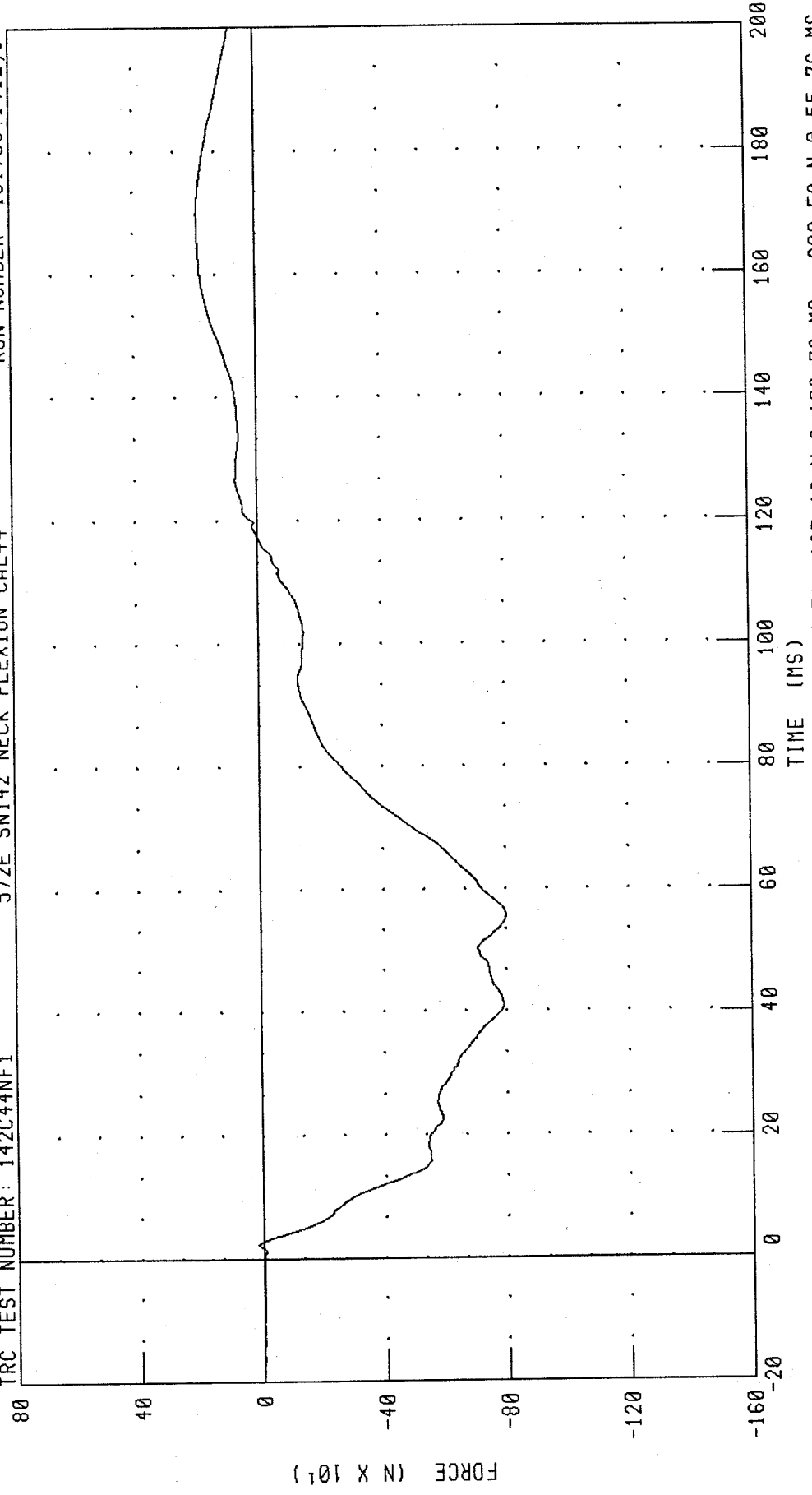


PEAK DATA: 193.54 N @ 169.84 MS; -801.27 N @ 55.76 MS

CHANNEL: NEKXF FILTER: CH. CLASS 1000

PART 572-E HYBRID III NECK FLEXION CALIBRATION  
 NECK FORCE X AXIS FILTERED FOR USE IN OCCIPITAL MOMENT CALCULATION

TRC TEST NUMBER: 142C44NF1      572E SN142 NECK FLEXION CAL44      RUN NUMBER: 101700.1412;1



PEAK DATA: 193.18 N @ 169.76 MS; -800.50 N @ 55.76 MS

CHANNEL: NEKXFC      FILTER: CH. CLASS 600

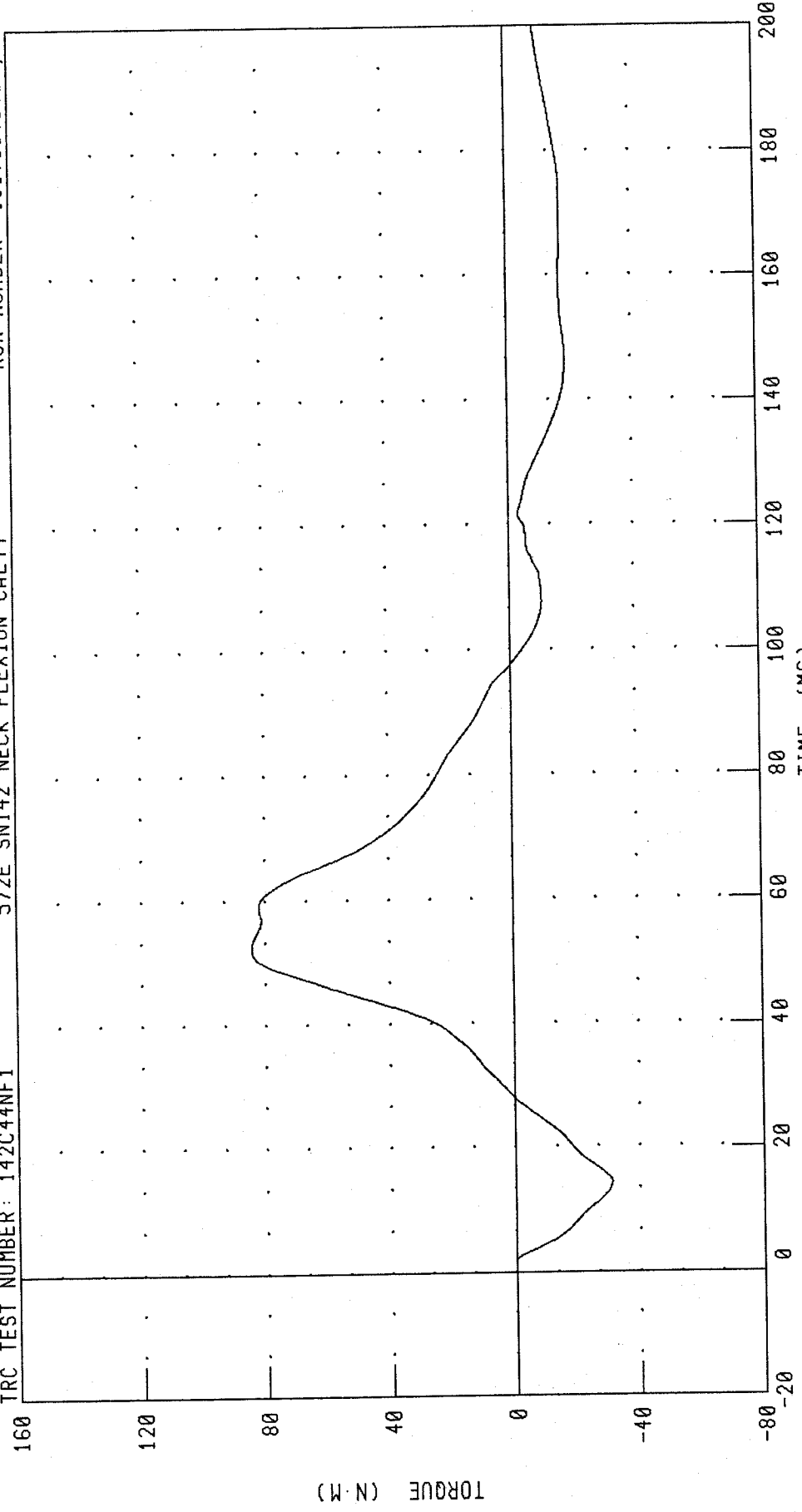
PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT Y AXIS

RUN NUMBER: 101700.1412;1

572E SNI42 NECK FLEXION CAL44

TRC TEST NUMBER: 142C44NF1



PEAK DATA: 84.35 N·M @ 51.84 MS; -31.09 N·M @ 14.32 MS

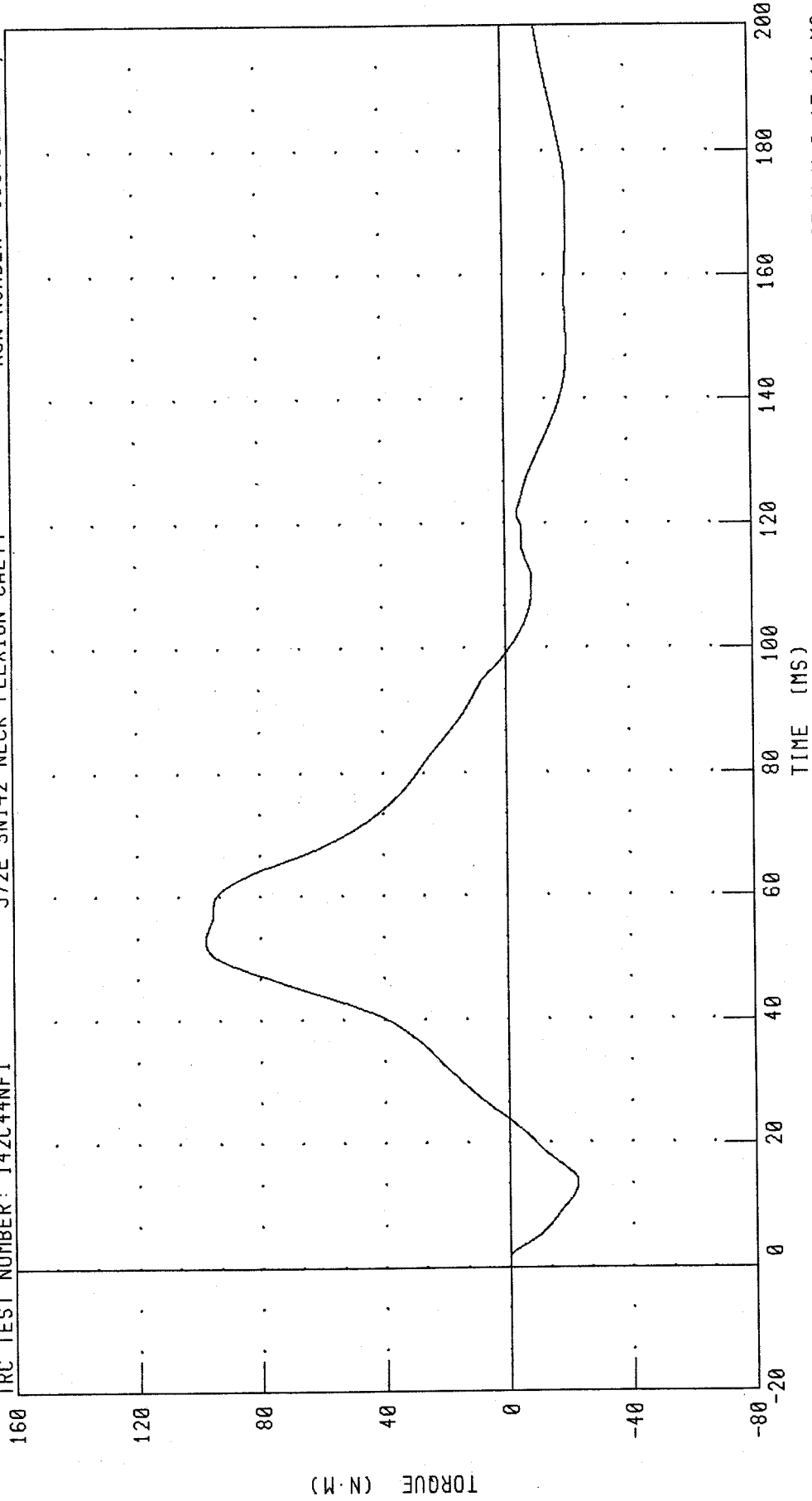
CHANNEL: NEKYM FILTER: CH. CLASS 600

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

TRC TEST NUMBER: 142C44NF1

572E SN142 NECK FLEXION CAL44

RUN NUMBER: 101700.1412;1



CHANNEL: NEKOM FILTER: CH. CLASS 600

PEAK DATA: 97.84 N.M @ 52.96 MS; -22.23 N.M @ 13.44 MS

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III 50th

17-OCT-00

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 142C44NE1 572E SN142 NECK EXT CAL44

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6 - 22.2 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
IMPACT VELOCITY	5.95 - 6.19 M/S	6.05 M/S
PENDULUM DECELERATION	10 MS   17.20 - 21.20 G	18.32 G
	20 MS   14.00 - 19.00 G	16.67 G
	30 MS   11.00 - 16.00 G	14.30 G
MAX PENDULUM G	22 G MAX	18.63 G
MAX PENDULUM G ABOVE 30 MS	22 G MAX	14.38 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G	38 - 46 MS	42.24 MS
D PLANE	MAX   81 - 106 DEG.	94.78 DEG.
ROTATION	TIME   72 - 82 MS	77.20 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN   -80.0/-52.9 NM	-72.17 NM
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO	TIME   65 - 79 MS	73.52 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO	147 - 174 MS	154.72 MS
	120 - 148 MS	140.08 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN

*Dustin Walker*

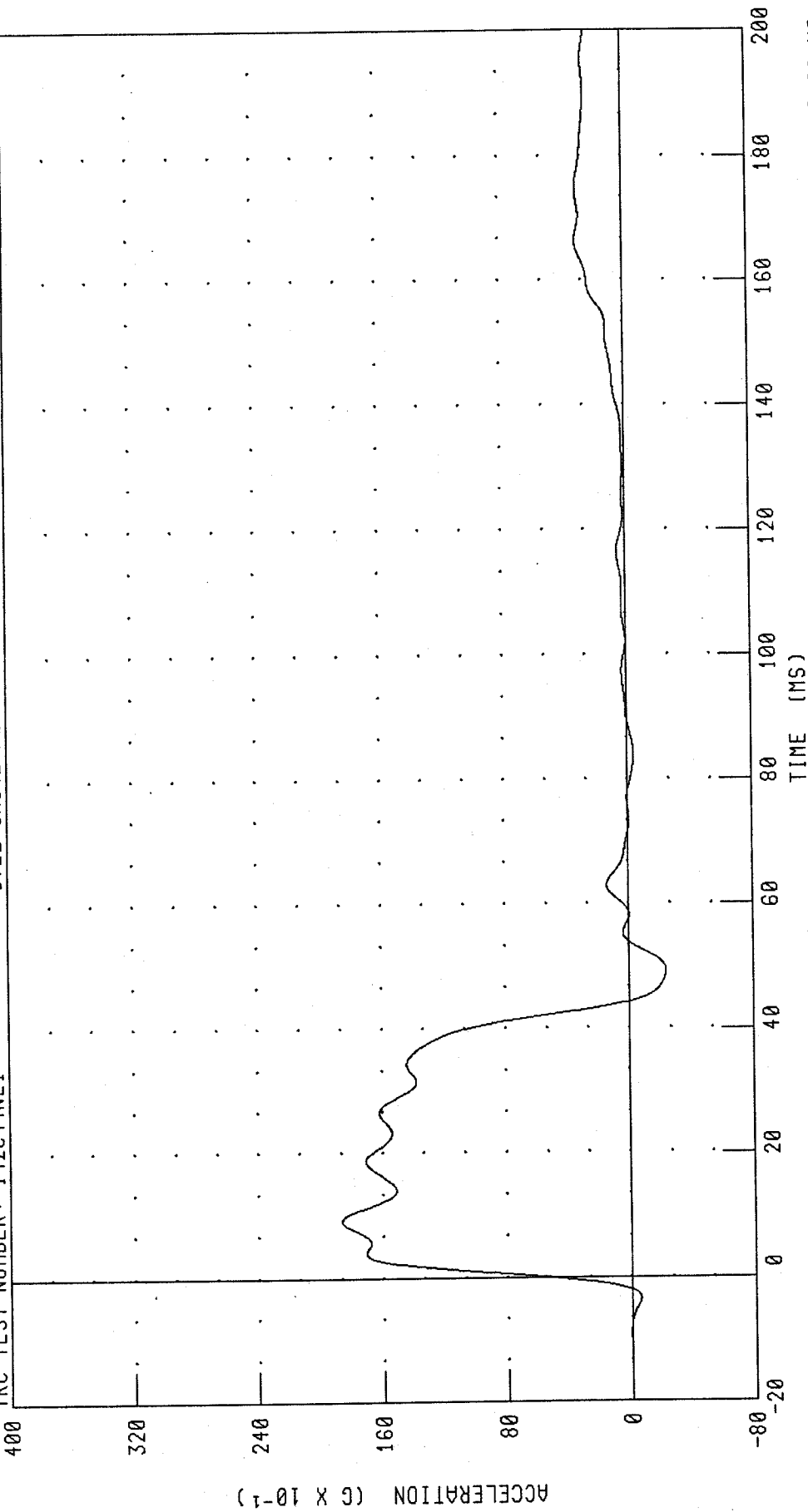
RUN NUMBER: 101700.1437;1

PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
PENDULUM DECELERATION

TRC TEST NUMBER: 142C44NE1

572E SN142 NECK EXT CAL44

RUN NUMBER: 101700.1438;1



PEAK DATA: 18.63 C @ 9.20 MS; -2.41 C @ 49.28 MS

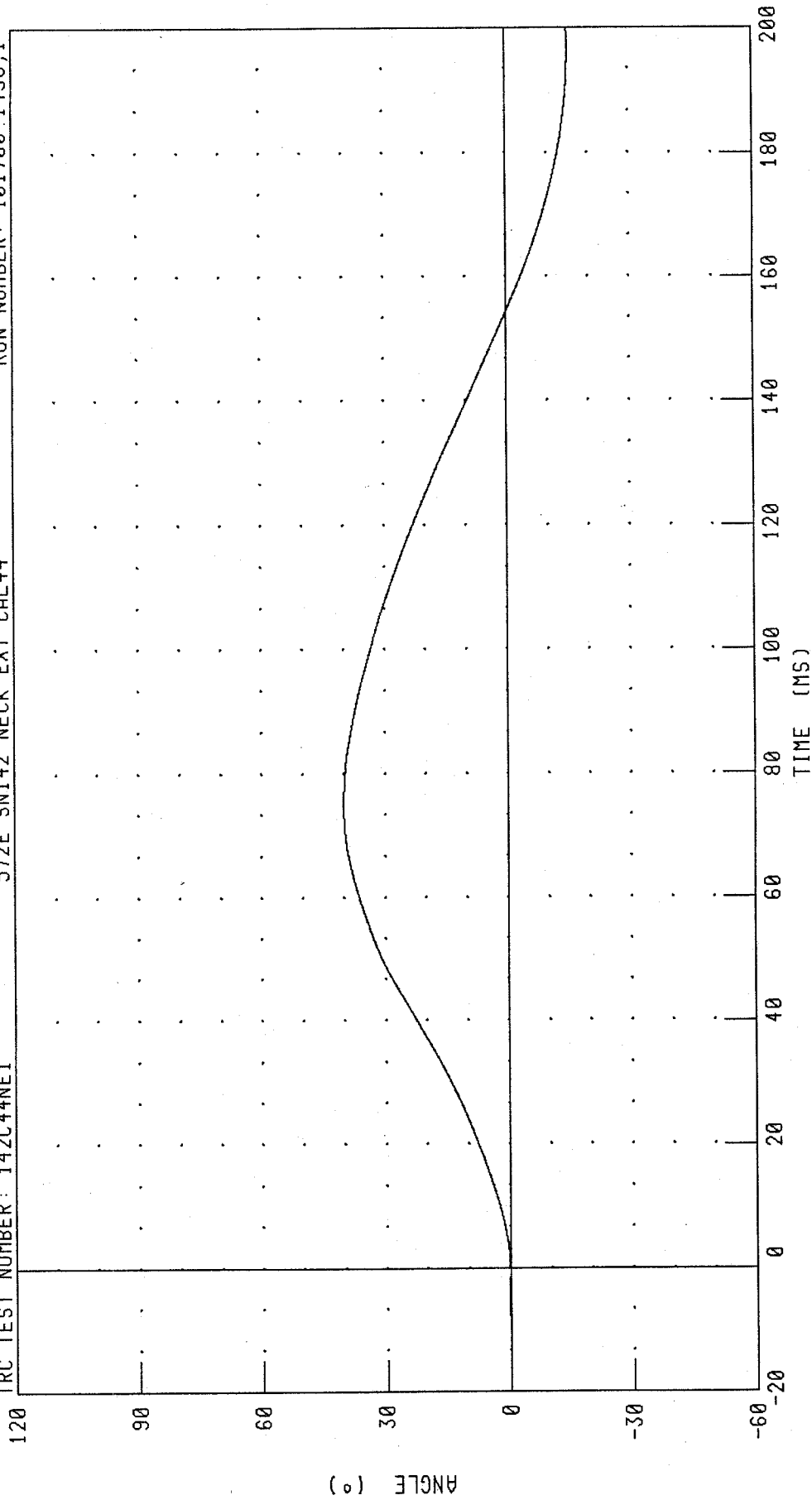
CHANNEL: PENXG FILTER: CH. CLASS 60

PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 142C44NE1

572E SN142 NECK EXT CAL44

RUN NUMBER: 101700.1438;1



PEAK DATA: 39.98 ° @ 75.04 MS; -15.25 ° @ 196.88 MS

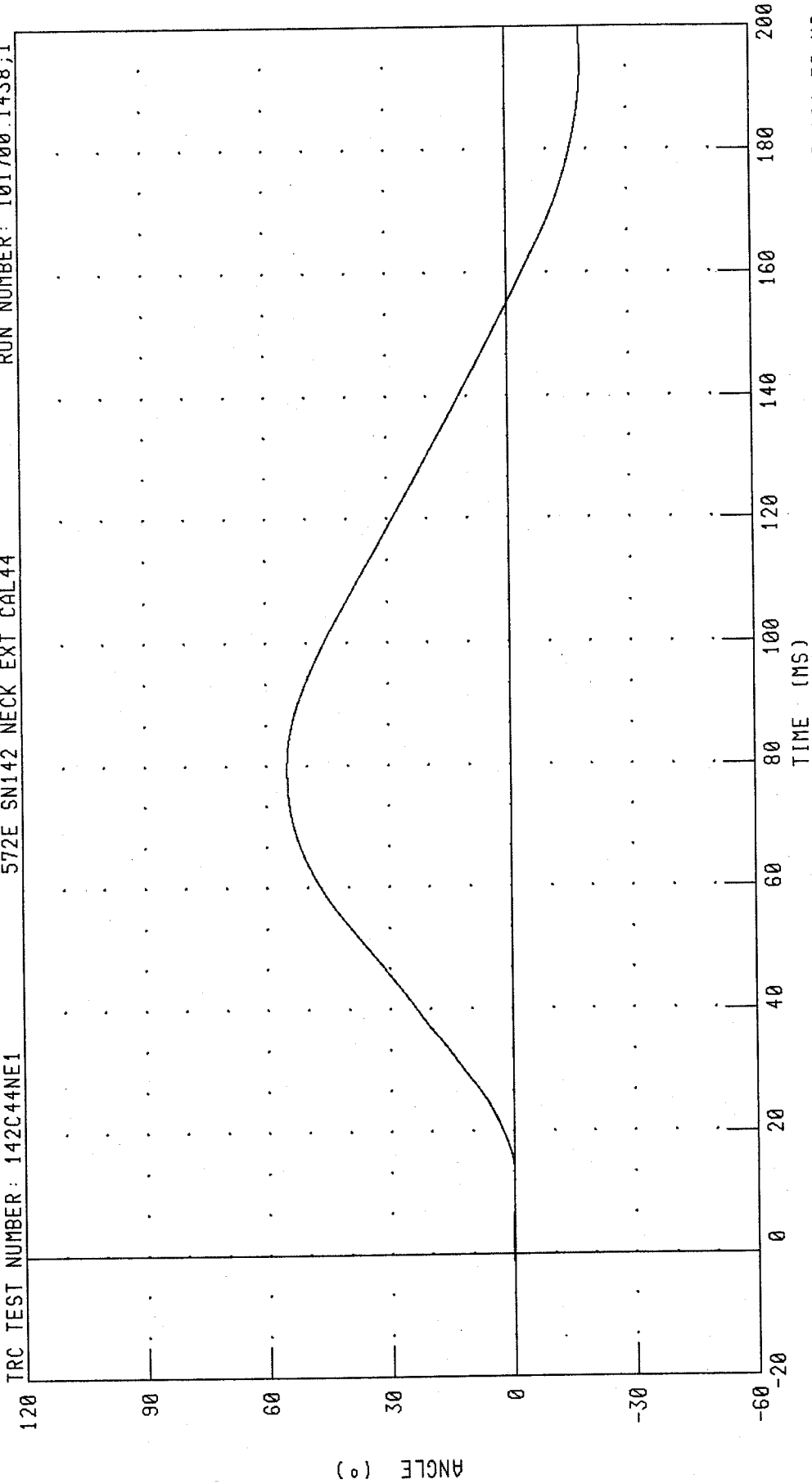
CHANNEL: BETA FILTER: CH. CLASS 60

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

TRC TEST NUMBER: 142C44NE1

572E SN142 NECK EXT CAL44

RUN NUMBER: 101700.1438;1



CHANNEL: THETA FILTER: CH. CLASS 60

PEAK DATA: 54.92 ° @ 79.52 MS; -18.56 ° @ 194.32 MS

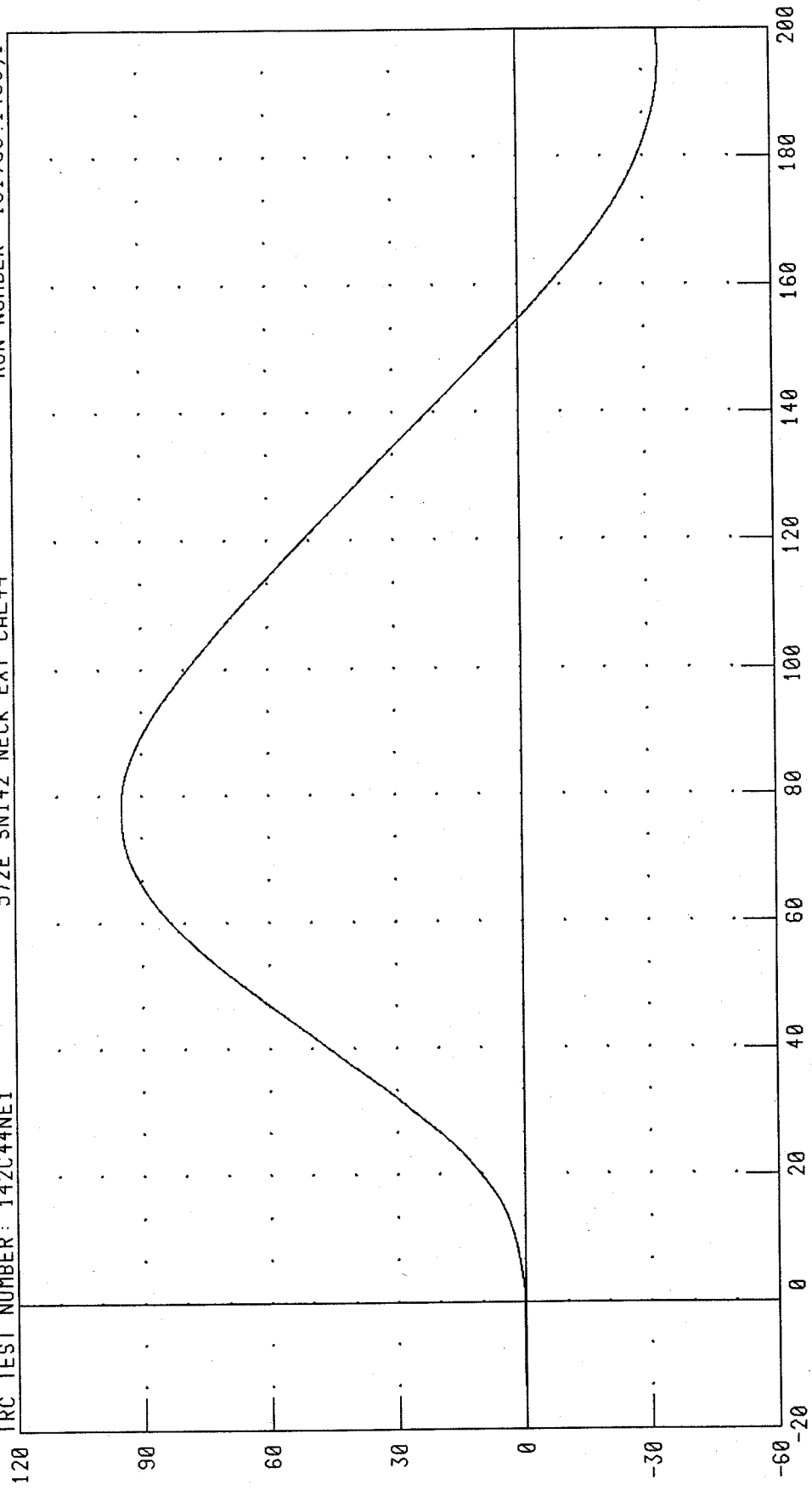
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 142C44NE1

572E SNI42 NECK EXT CAL44

RUN NUMBER: 101700.1438;1



CHANNEL: TOTAN FILTER: CH. CLASS 60

PEAK DATA: 94.78 ° @ 77.20 MS, -33.78 ° @ 195.60 MS

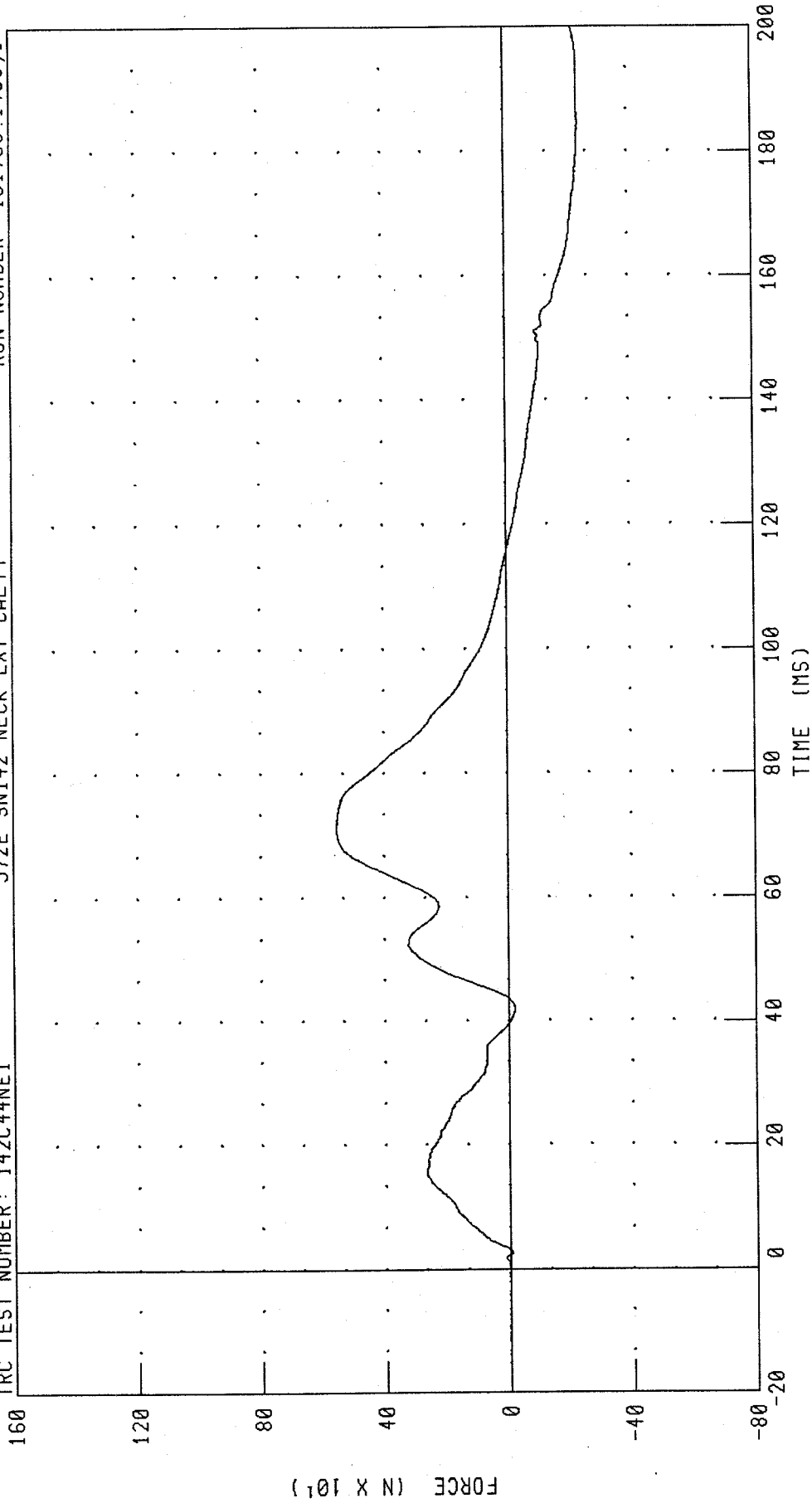
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

RUN NUMBER: 101700.1438;1

TRC TEST NUMBER: 142C44NE1

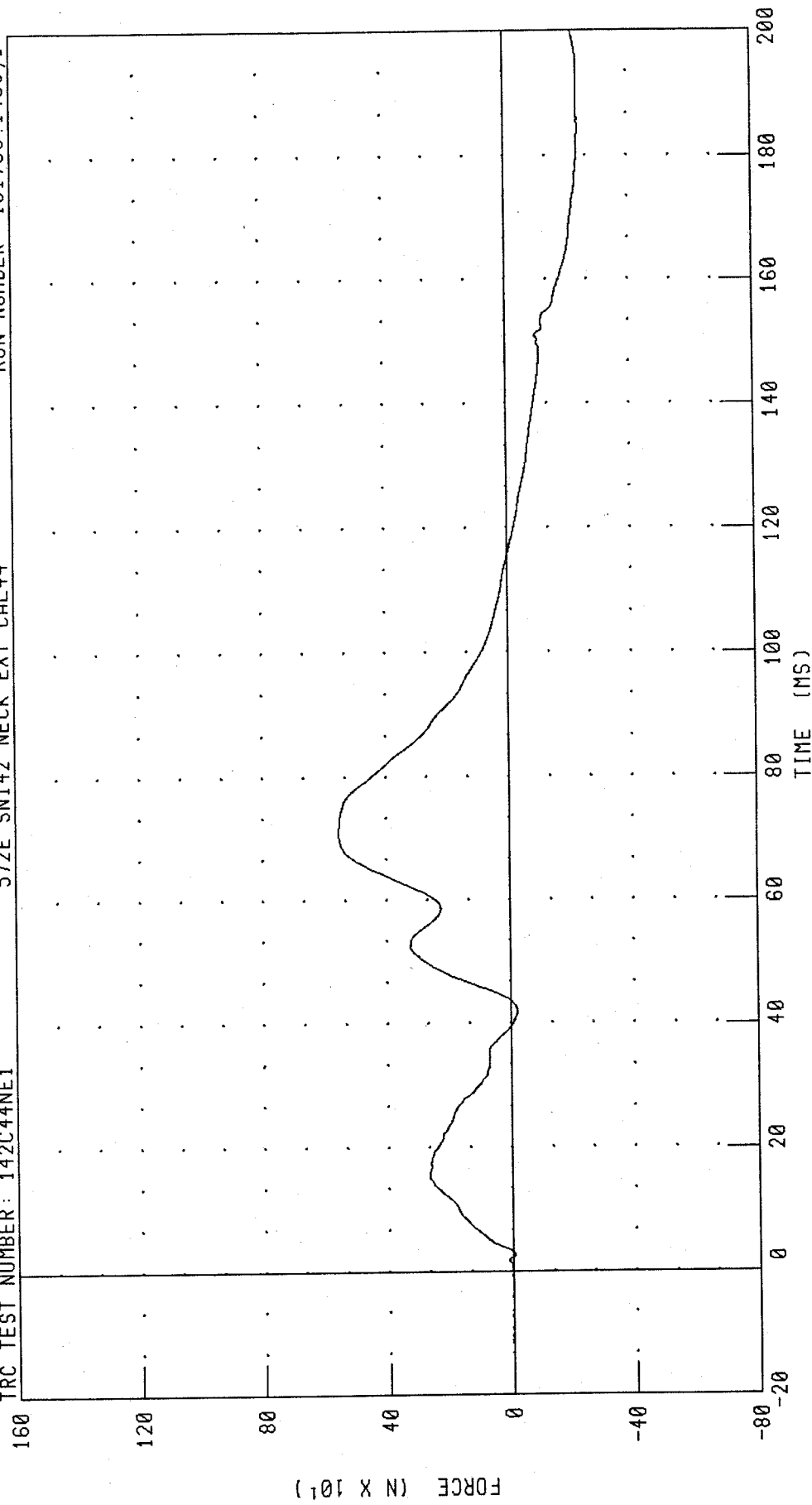
572E SN142 NECK EXT CAL44



PEAK DATA: 553.96 N @ 71.36 MS; -241.07 N @ 183.60 MS

CHANNEL: NEKXF FILTER: CH. CLASS 1000

PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
NECK FORCE X AXIS FILTERED FOR USE IN OCCIPITAL MOMENT CALCULATION  
TRC TEST NUMBER: 142C44NE1 572E SNI42 NECK EXT CAL44 RUN NUMBER: 101700.1438,1



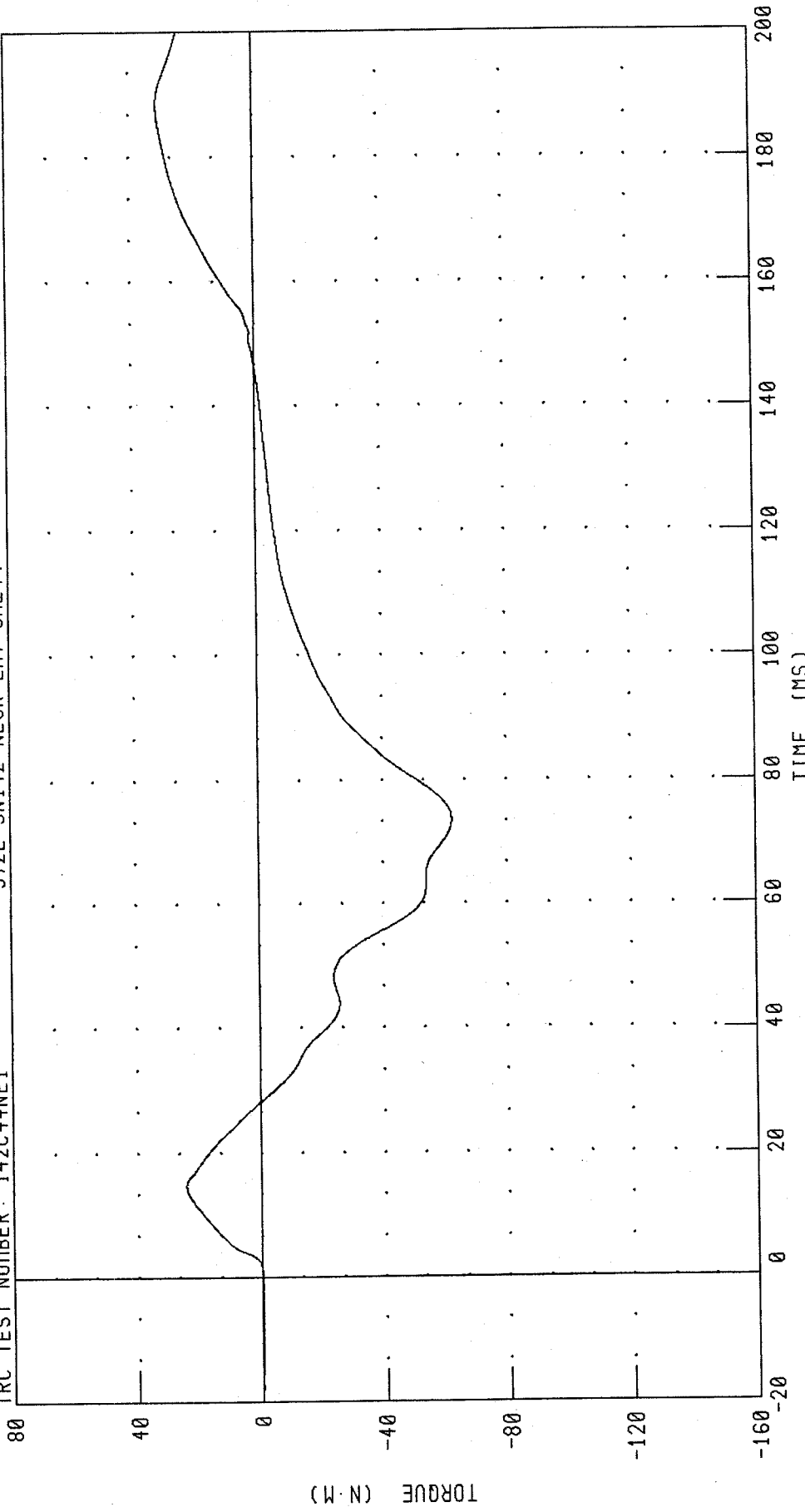
CHANNEL: NEKXFC FILTER: CH. CLASS 600  
PEAK DATA: 553.67 N @ 71.36 MS; -240.41 N @ 183.68 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
NECK MOMENT Y AXIS

TRC TEST NUMBER: 142C44NE1

572E SN142 NECK EXT CAL44

RUN NUMBER: 101700.1438;1



PEAK DATA: 31.21 N·M @ 188.16 MS; -62.39 N·M @ 73.60 MS

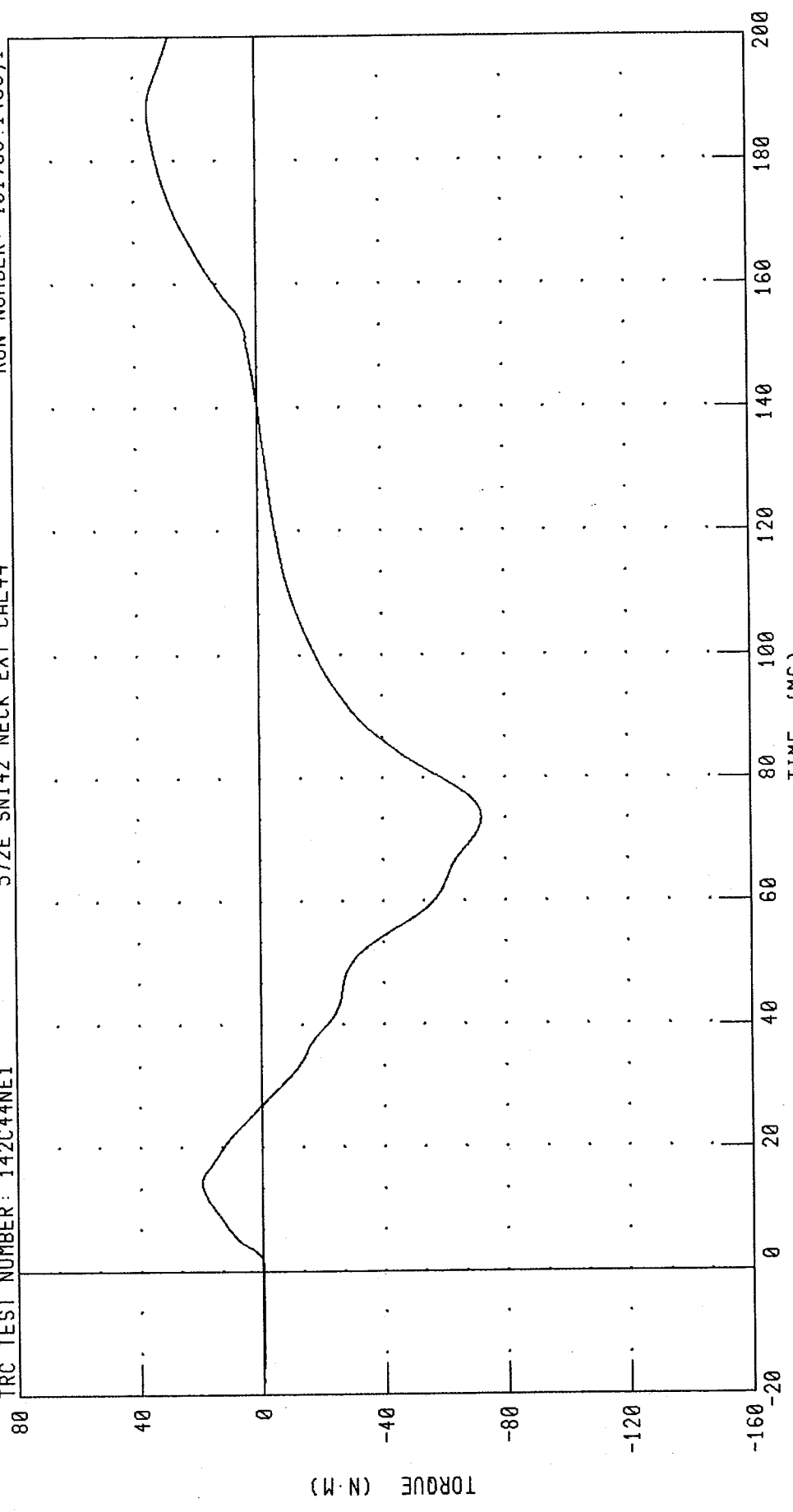
CHANNEL: NEKYM FILTER: CH. CLASS 600

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

TRC TEST NUMBER: 142C44NE1

572E SNI42 NECK EXT CAL44

RUN NUMBER: 101700.1438;1



PEAK DATA: 35.45 N·M @ 188.32 MS; -72.17 N·M @ 73.52 MS

CHANNEL: NEKOM FILTER: CH. CLASS 600

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III 50th

17-OCT-00

TRC INC.

TEST NO: 142C44TH1

572E SN142 H.S.THORAX CAL44

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.6-22.2 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.59 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	66.6 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5666. N
INTERNAL HYSTERESIS	69% - 85%	75.2%

TEST MEETS SPECIFICATIONS

TECHNICIAN

Dustin Walker

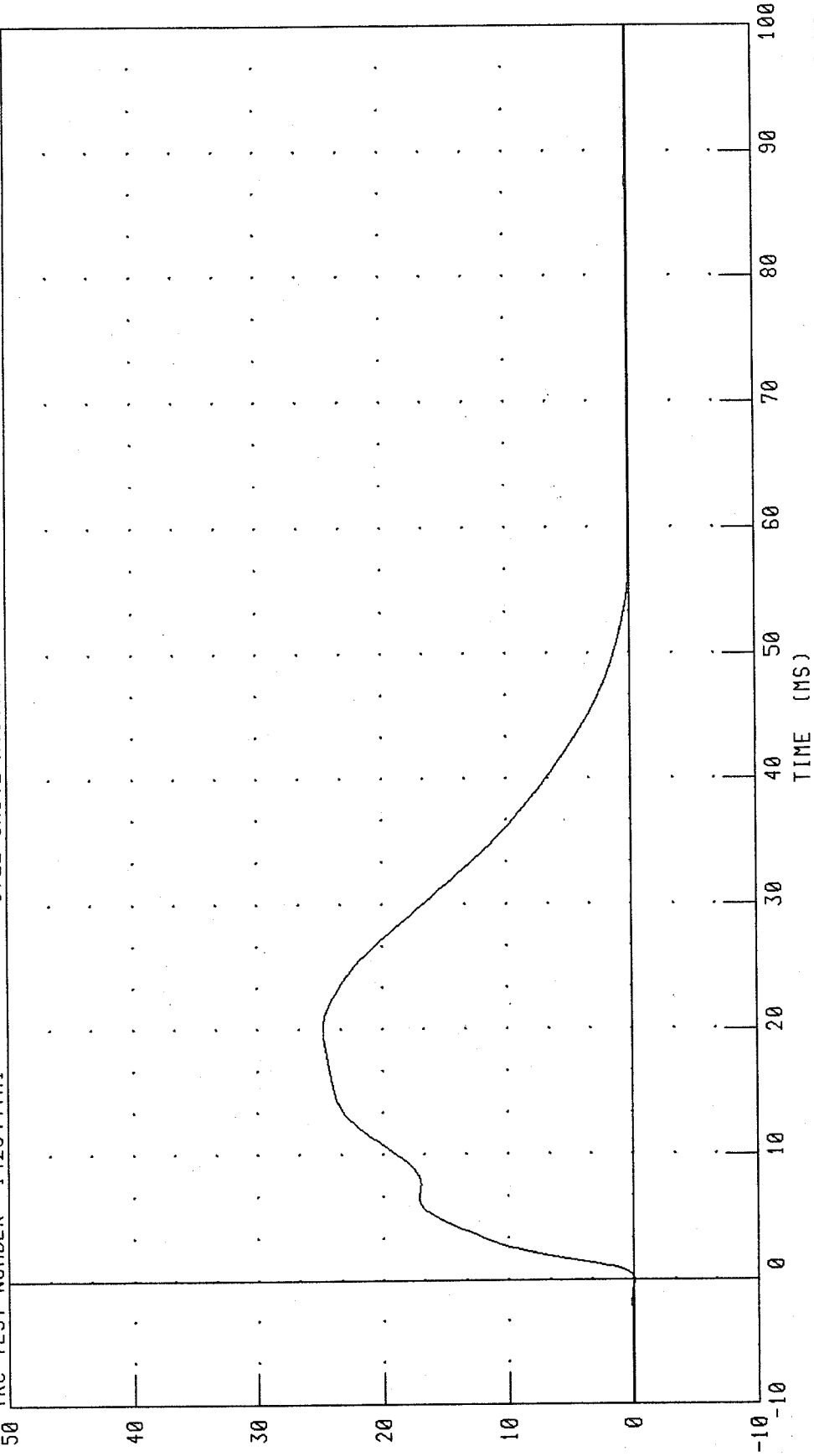
RUN NUMBER: 101700.0902;1

PART 572-E HYBRID III THORAX CALIBRATION  
PENDULUM DECELERATION

TRC TEST NUMBER: 142C44TH1

572E SN142 H.S. THORAX CAL44

RUN NUMBER: 101700.0902.1

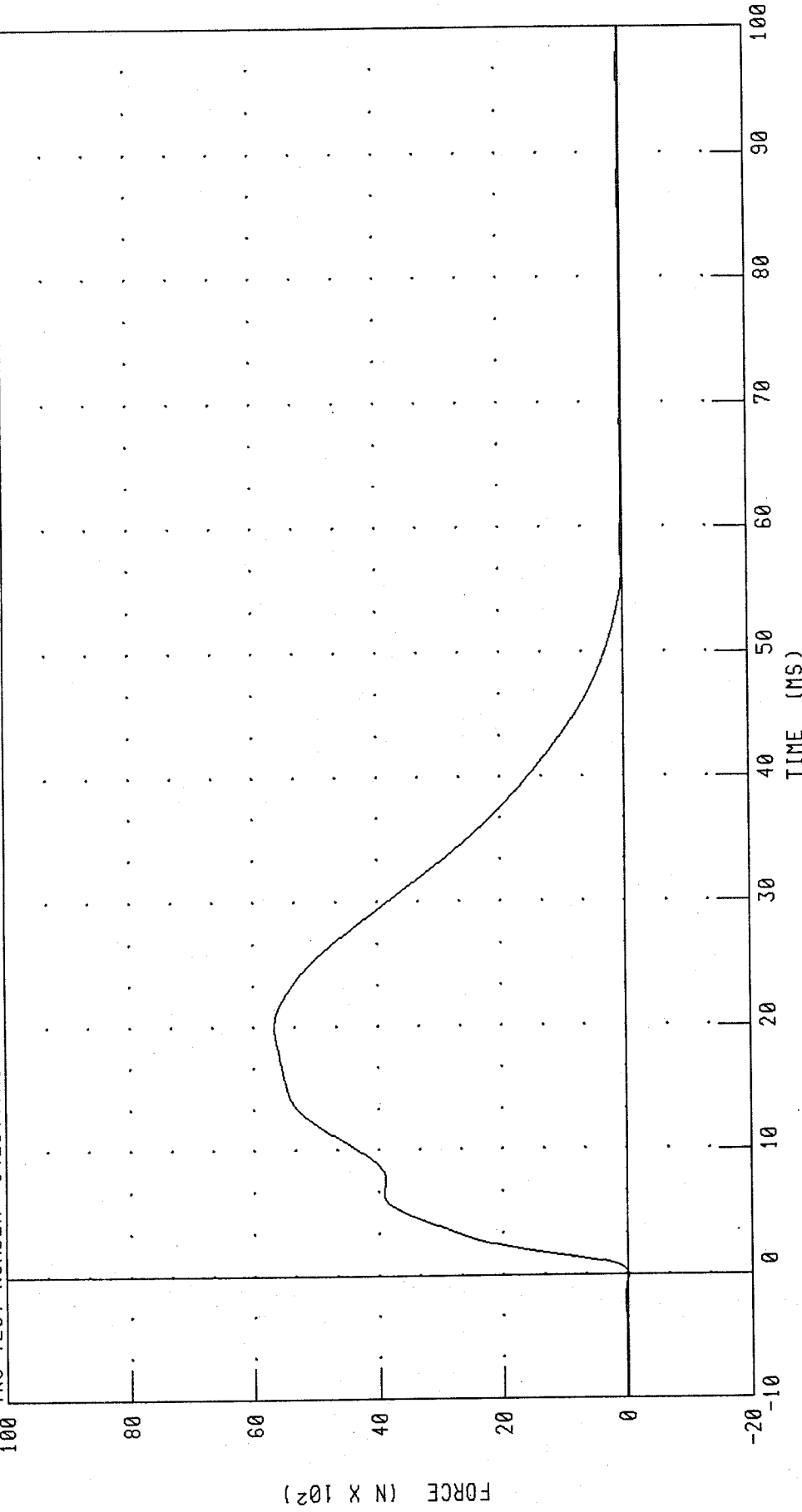


CHANNEL: PENXC FILTER: CH. CLASS 180

PEAK DATA: 24.73 G @ 20.00 MS; -0.08 G @ -0.08 MS

PART 572-E HYBRID III THORAX CALIBRATION  
PENDULUM FORCE

TRC TEST NUMBER: 142C44TH1      572E SN142 H.S. THORAX CAL44      RUN NUMBER: 101700.0902;1



CHANNEL: PENXF      FILTER: CH. CLASS 180      PEAK DATA: 5666.05 N @ 20.00 MS; -18.11 N @ -0.08 MS

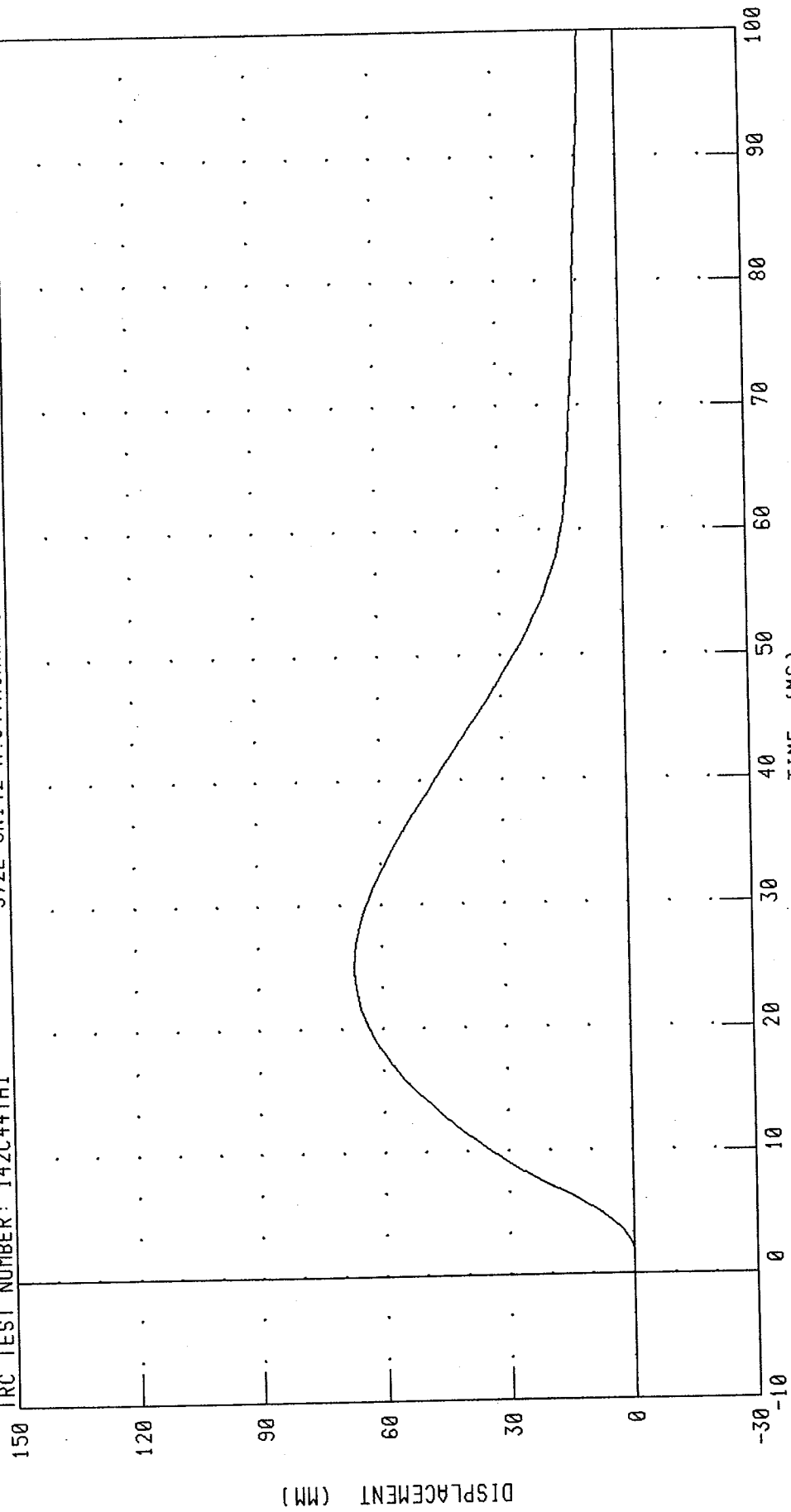
PART 572-E HYBRID III THORAX CALIBRATION

STERNUM DISPLACEMENT

RUN NUMBER: 101700.0902;1

572E SN142 H.S.THORAX CAL44

TRC TEST NUMBER: 142C44TH1



PEAK DATA: 66.66 MM @ 24.88 MS; -0.07 MM @ 1.44 MS

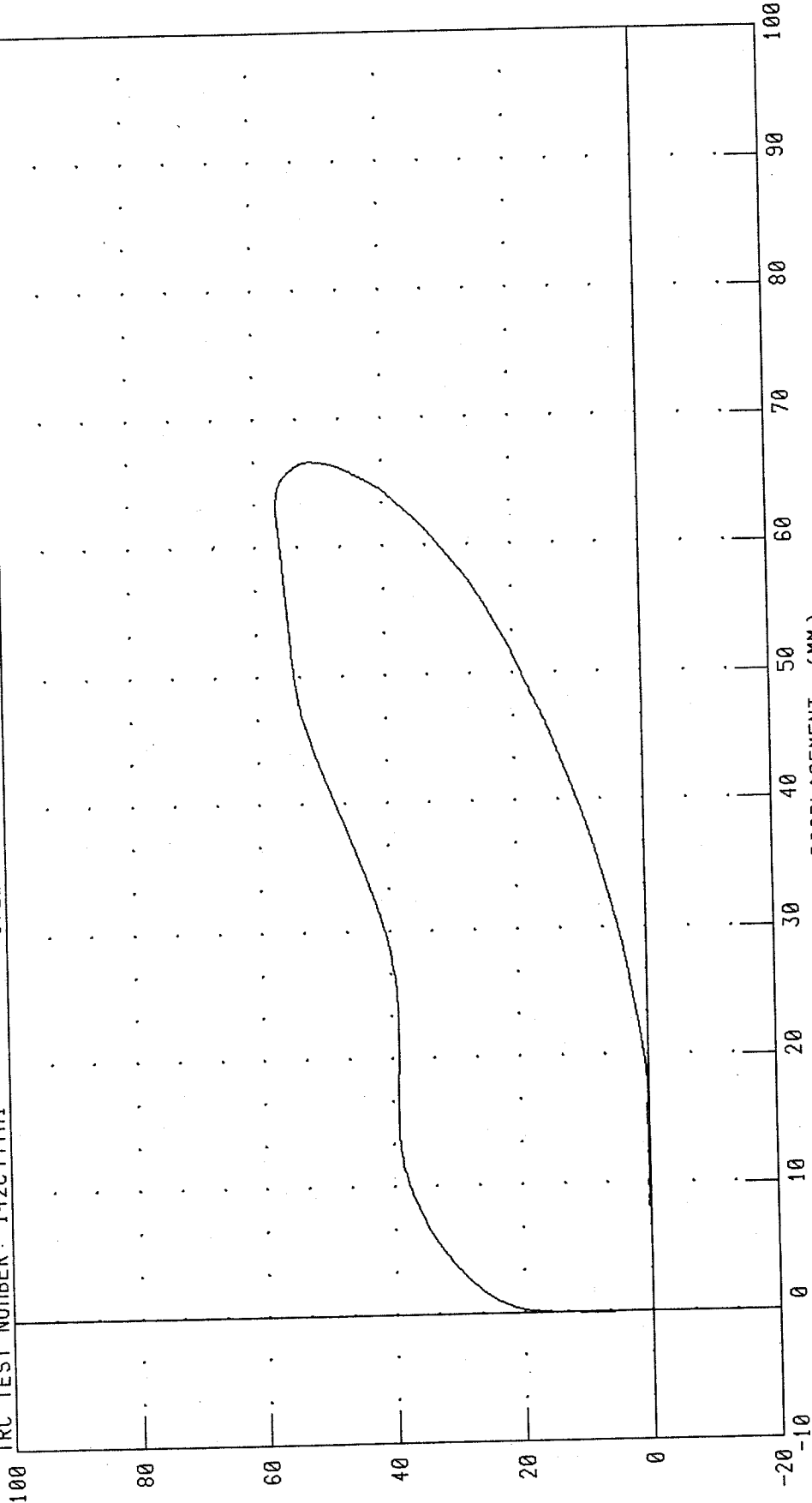
CHANNEL: CSTXD FILTER: CH. CLASS 180

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

RUN NUMBER: 101700.0902;1

TRC TEST NUMBER: 142C44TH1

572E SN142 H.S. THORAX CAL44



PEAK DATA: 66.66 MM @ 24.88 MS; -0.07 MM @ 1.44 MS  
5666.05 N @ 20.00 MS; -18.11 N @ -0.08 MS

CHANNEL: CSTXD  
PENXF  
FILTER: CH: CLASS 180  
CH: CLASS 180

FORCE (N X 10<sup>2</sup>)

DISPLACEMENT (MM)

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

HYBRID III 50th

17-OCT-00

TRC INC.

TEST NO: 142C44LK1

572E SN142 LEFT KNEE CAL 44

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.09 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5771.7 N

TEST MEETS SPECIFICATIONS

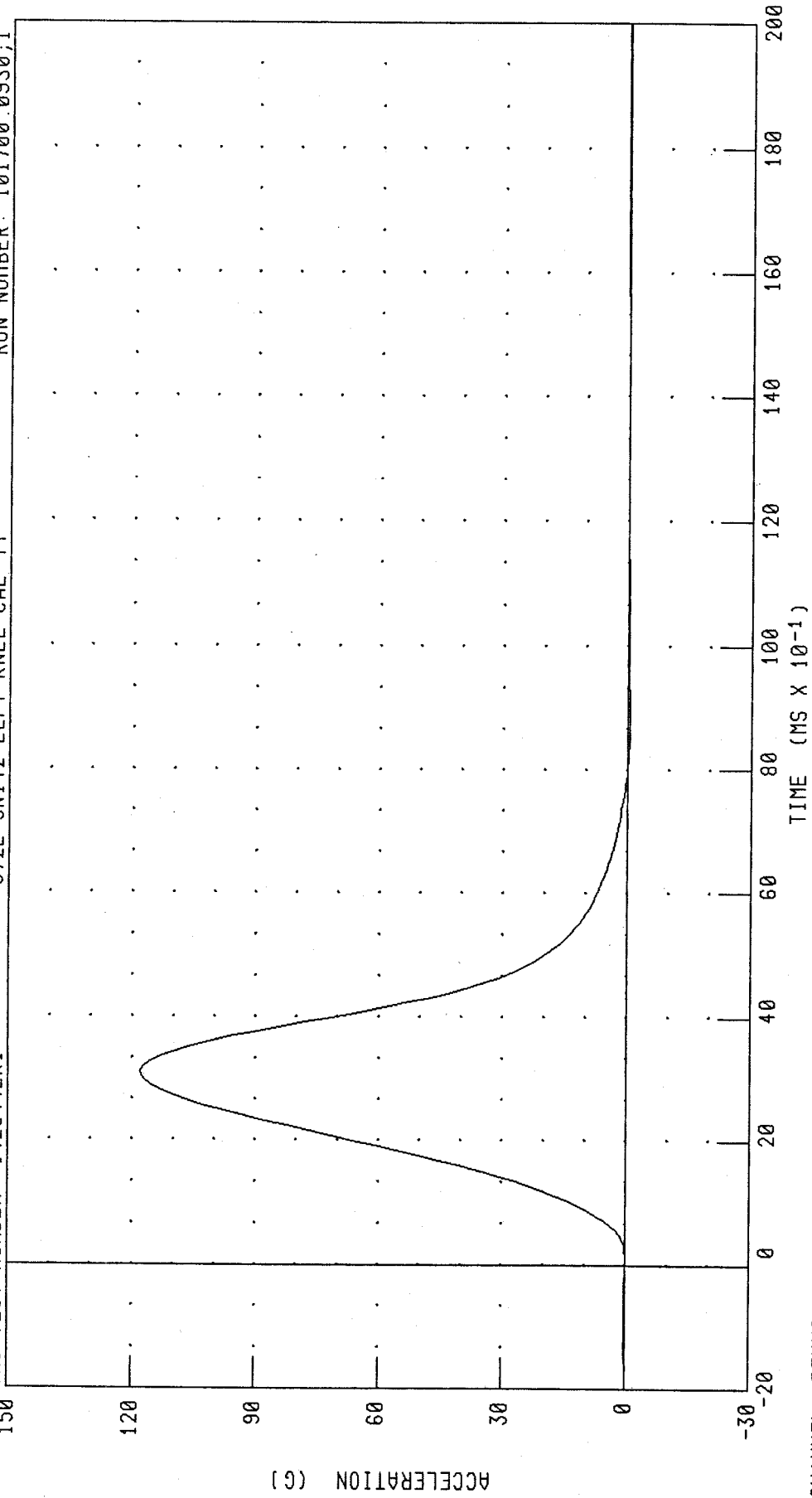
TECHNICIAN

*Dustin Wallon*

RUN NUMBER: 101700.0930;1

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

TRC TEST NUMBER: 142C44LK1      572E SN142 LEFT KNEE CAL 44      RUN NUMBER: 101700 0930;1



CHANNEL: PENXC      FILTER: CH. CLASS 600      PEAK DATA: 117.96 G @ 3.12 MS; -0.55 G @ 8.72 MS

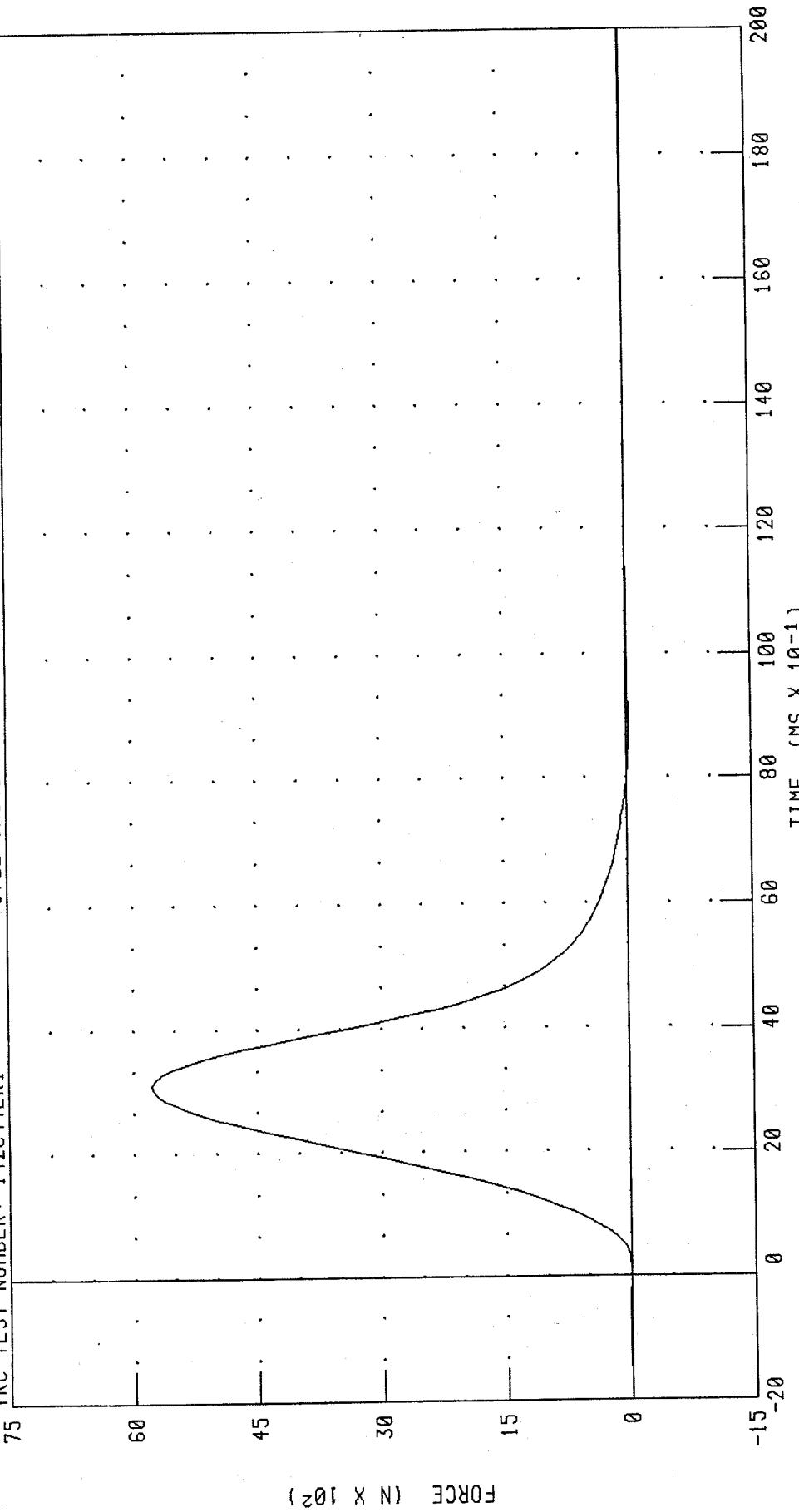
PART 572-E HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

TRC TEST NUMBER: 142C44LK1

572E SN142 LEFT KNEE CAL 44

RUN NUMBER: 101700.0930;1



CHANNEL: PENXF FILTER: CH. CLASS 600

PEAK DATA: 5771.79 N @ 3.12 MS; -26.91 N @ 8.72 MS

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III 50th

17-OCT-00

TRC INC.

TEST NO: 142C44RK1

572E SN142 RIGHT KNEE CAL 44

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.09 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5050.9 N

TEST MEETS SPECIFICATIONS

TECHNICIAN

*Dustin Walker*

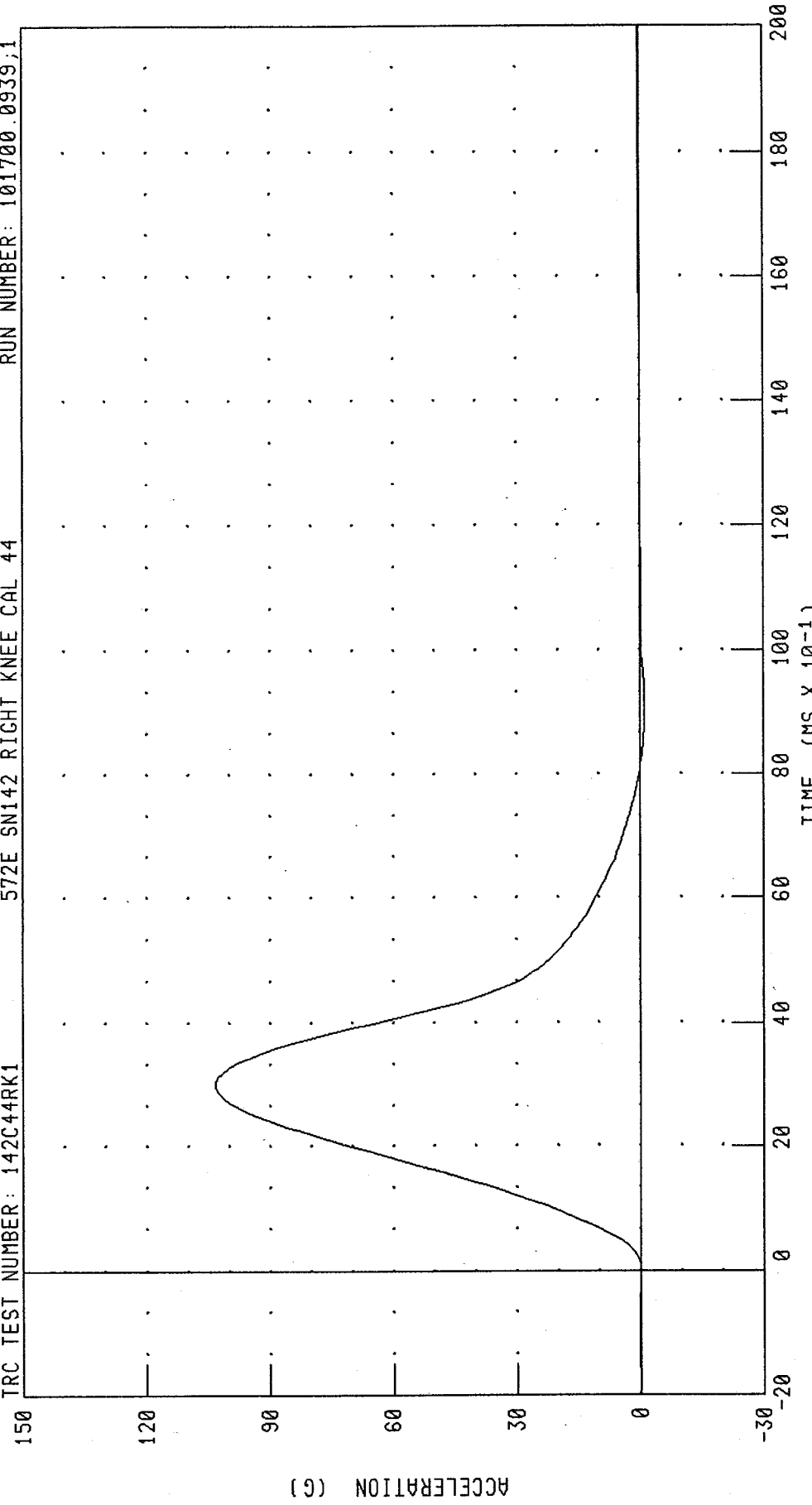
RUN NUMBER: 101700.0939;1

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

TRC TEST NUMBER: 142C44RK1

572E SN142 RIGHT KNEE CAL 44

RUN NUMBER: 101700.0939,1



CHANNEL: PENXC FILTER: CH. CLASS 600 PEAK DATA: 103.23 G @ 3.04 MS; -1.17 G @ 9.20 MS

PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

572E SN142 RIGHT KNEE CAL 44

RUN NUMBER: 101700 0939,1

TRC TEST NUMBER: 142C44RK1

75

60

45

30

15

0

-15

200

180

160

140

120

100

80

60

40

20

0

FORCE (N X 10<sup>2</sup>)

TIME (MS X 10<sup>-1</sup>)

CHANNEL: PENXF

FILTER: CH. CLASS 600

PEAK DATA: 5050.93 N @ 3.04 MS; -57.16 N @ 9.20 MS

TRANSPORTATION RESEARCH CENTER INC.  
HYBRID III EXTERNAL DIMENSIONS

192

17-OCT-00

TRC INC. TEST NO: 192C43ED1 572E SN192 EXT.DIMENTION CAL43

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	991. MM
WAIST CIRCUMFERENCE (Z)	836 - 866 MM	838. MM
CHEST DEPTH (O)	213 - 229 MM	229. 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	889. MM
THIGH CLEARANCE (F)	140 - 155 MM	152. MM
BUTTOCK KNEE LENGTH (K)	579 - 605 MM	584. MM
BUTTOCK POPLITEAL LENGTH (N)	452 - 478 MM	457. MM
POPLITEAL HEIGHT (L)	429 - 455 MM	432. MM
KNEE PIVOT HEIGHT (M)	485 - 500 MM	485. MM
FOOT LENGTH (P)	252 - 267 MM	254. MM
FOOT BREADTH (W)	91 - 107 MM	102. MM
SHOULDER PIVOT FROM BACKLINE (E)	84 - 94 MM	84. MM
SHOULDER BREADTH (V)	422 - 437 MM	432. MM
SHOULDER PIVOT HEIGHT (B)	506 - 521 MM	508. MM
ELBOW REST HEIGHT (J)	191 - 211 MM	203. MM
SHOULDER-ELBOW LENGTH (I)	330 - 345 MM	330. MM
BACK OF ELBOW TO WRIST PIVOT (G)	290 - 305 MM	297. MM

572E SN192 EXT.DIMENTION CAL43

DUMMY MEETS SPECIFICATIONS

TECHNICIAN 

RUN NUMBER: 101700.1602

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III 50th

17-OCT-00

TRC INC.

TEST NO: 192C43HD1

572E SN192 HEAD DROP CAL 43

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	255.28 G
PEAK LATERAL ACCELERATION	15 G MAX	4.88 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN

*J.P.C. Mills*

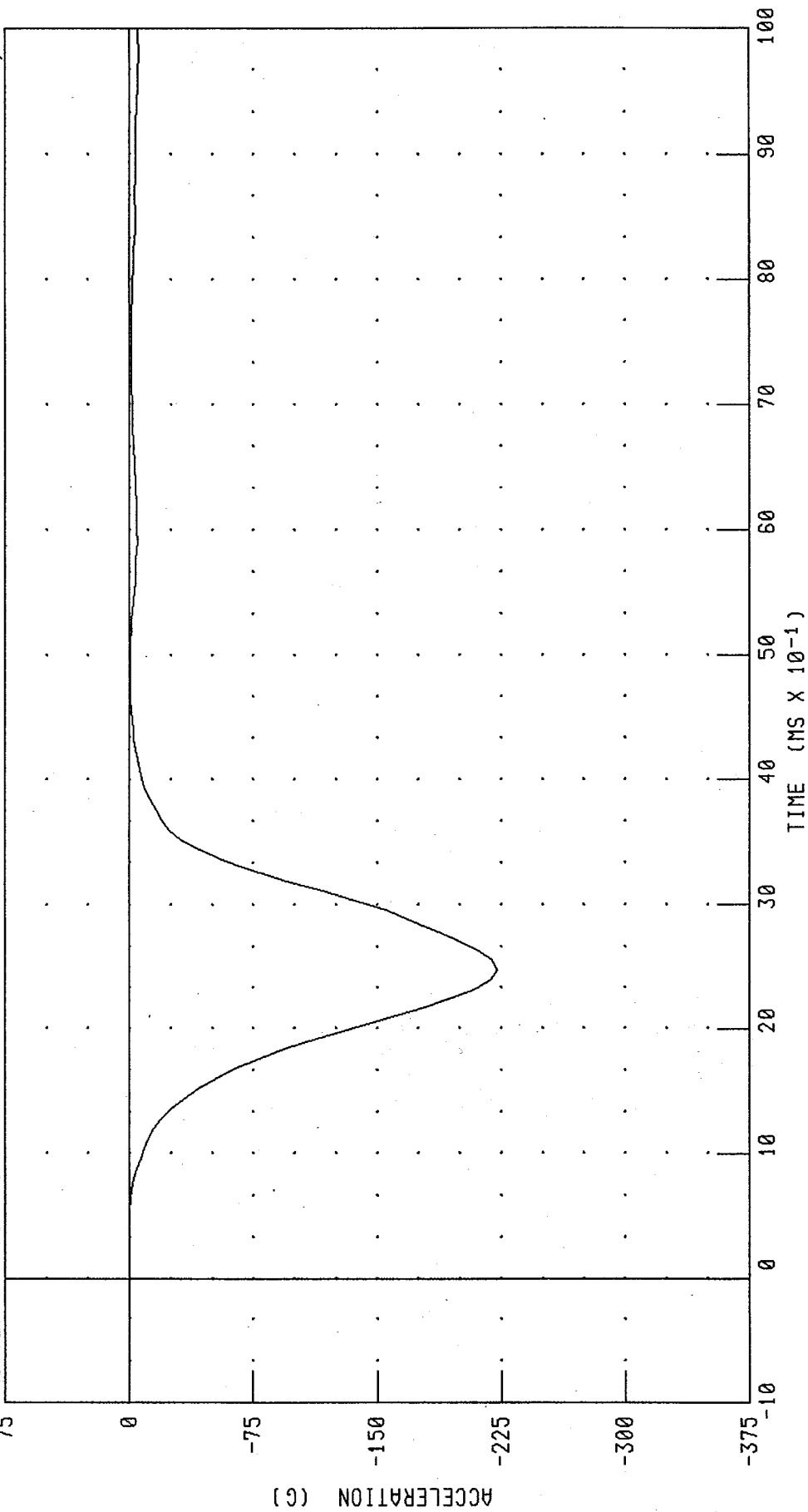
RUN NUMBER: 101700.0921;1

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

TRC TEST NUMBER: 192C43HD1

572E SN192 HEAD DROP CAL 43

RUN NUMBER: 101700.0921,1



CHANNEL: HEDXC FILTER: CH. CLASS 1000

PEAK DATA: 0.00 G @ -0.40 MS; -222.37 G @ 2.48 MS

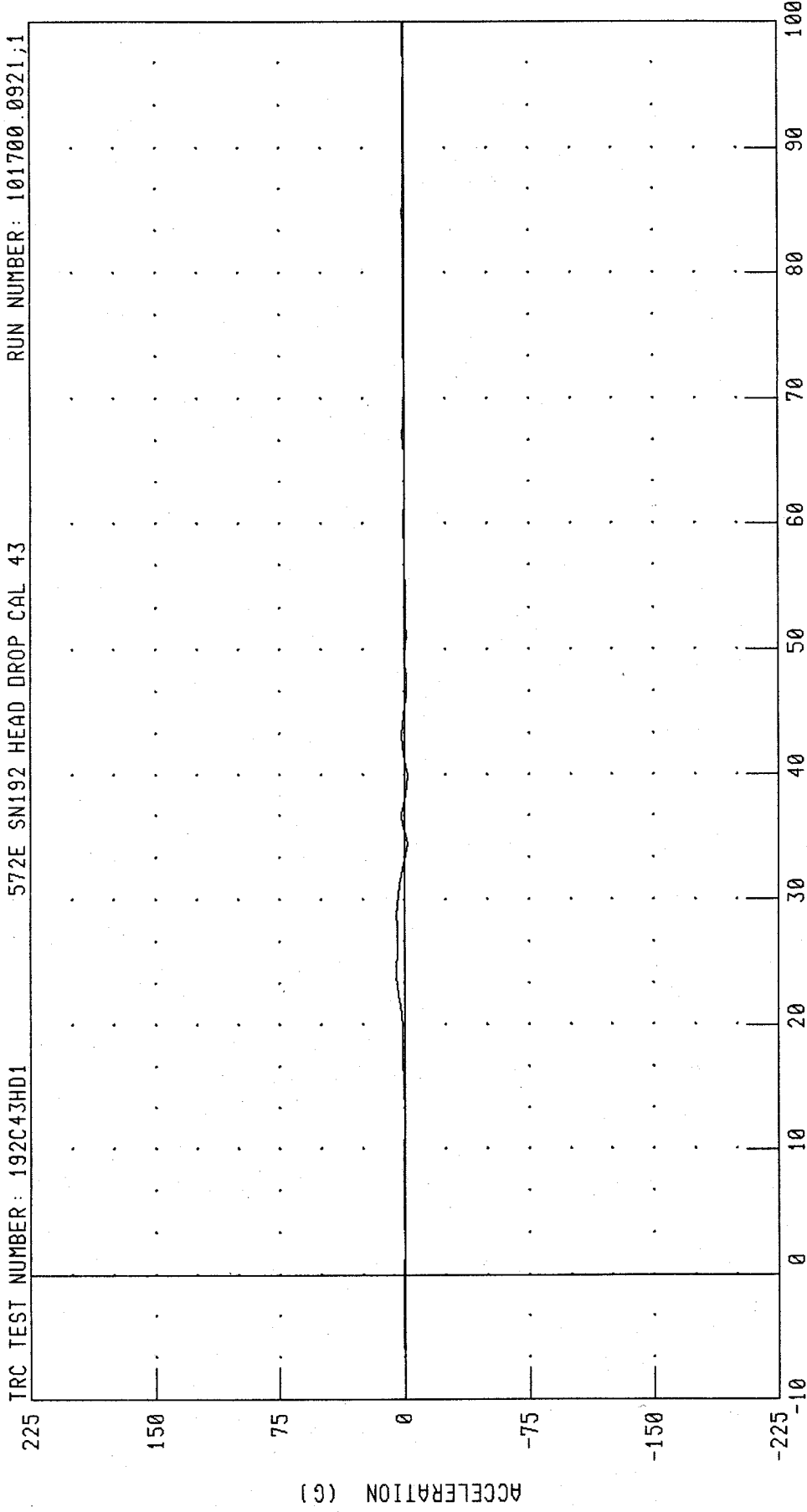
PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Y AXIS

TRC TEST NUMBER: 192C43HD1

572E SN192 HEAD DROP CAL 43

RUN NUMBER: 101700.0921;1



CHANNEL: HEDYC FILTER: CH. CLASS 1000

PEAK DATA: 4.89 G @ 2.40 MS; -2.13 G @ 3.44 MS

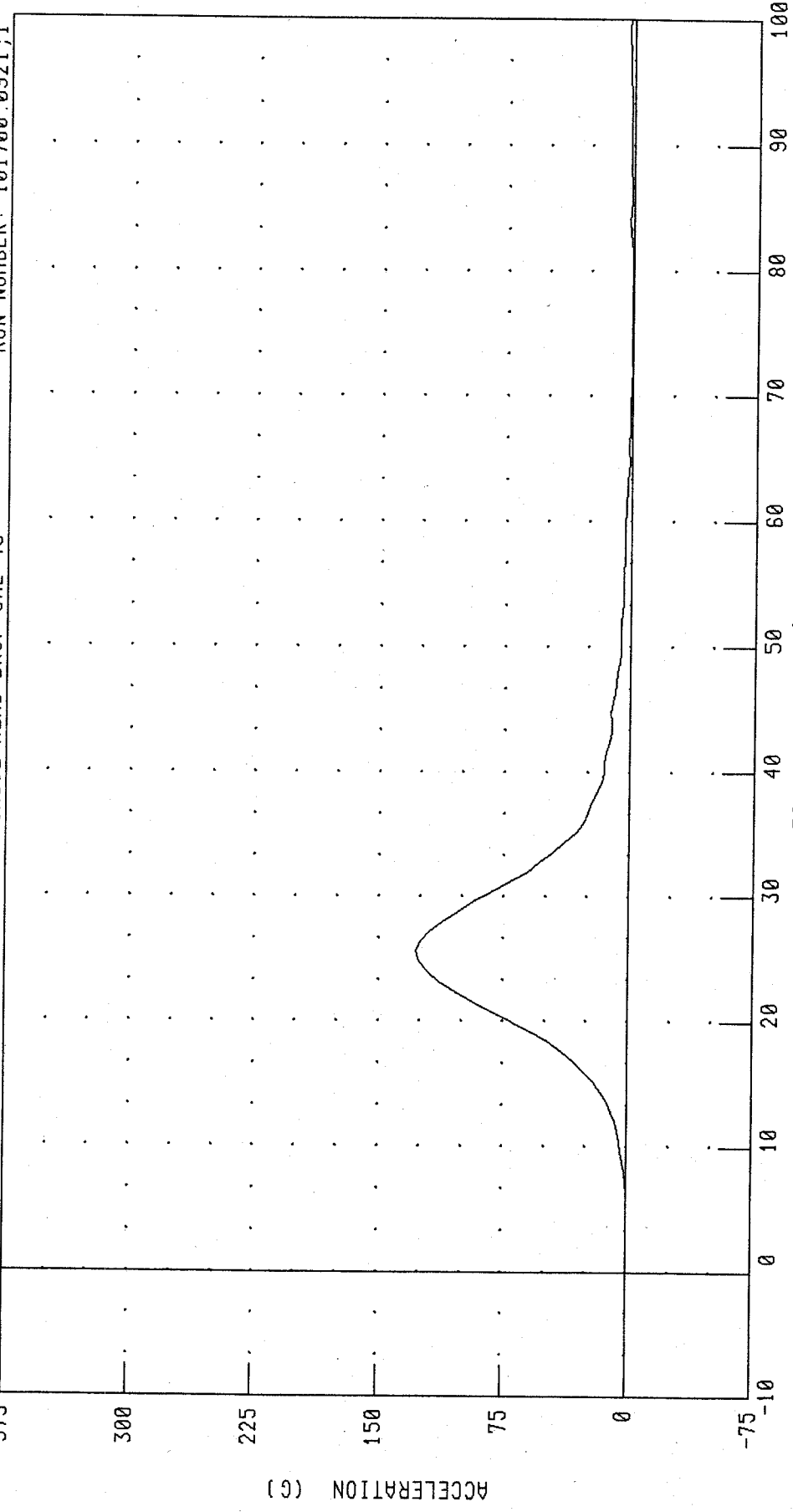
PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Z AXIS

572E SN192 HEAD DROP CAL 43

TRC TEST NUMBER: 192C43HD1

RUN NUMBER: 101700.0921,1



TIME (MS X 10<sup>-1</sup>)

PEAK DATA: 127.39 G @ 2.56 MS; -0.05 G @ -0.64 MS

FILTER: CH. CLASS 1000

CHANNEL: HEDZG

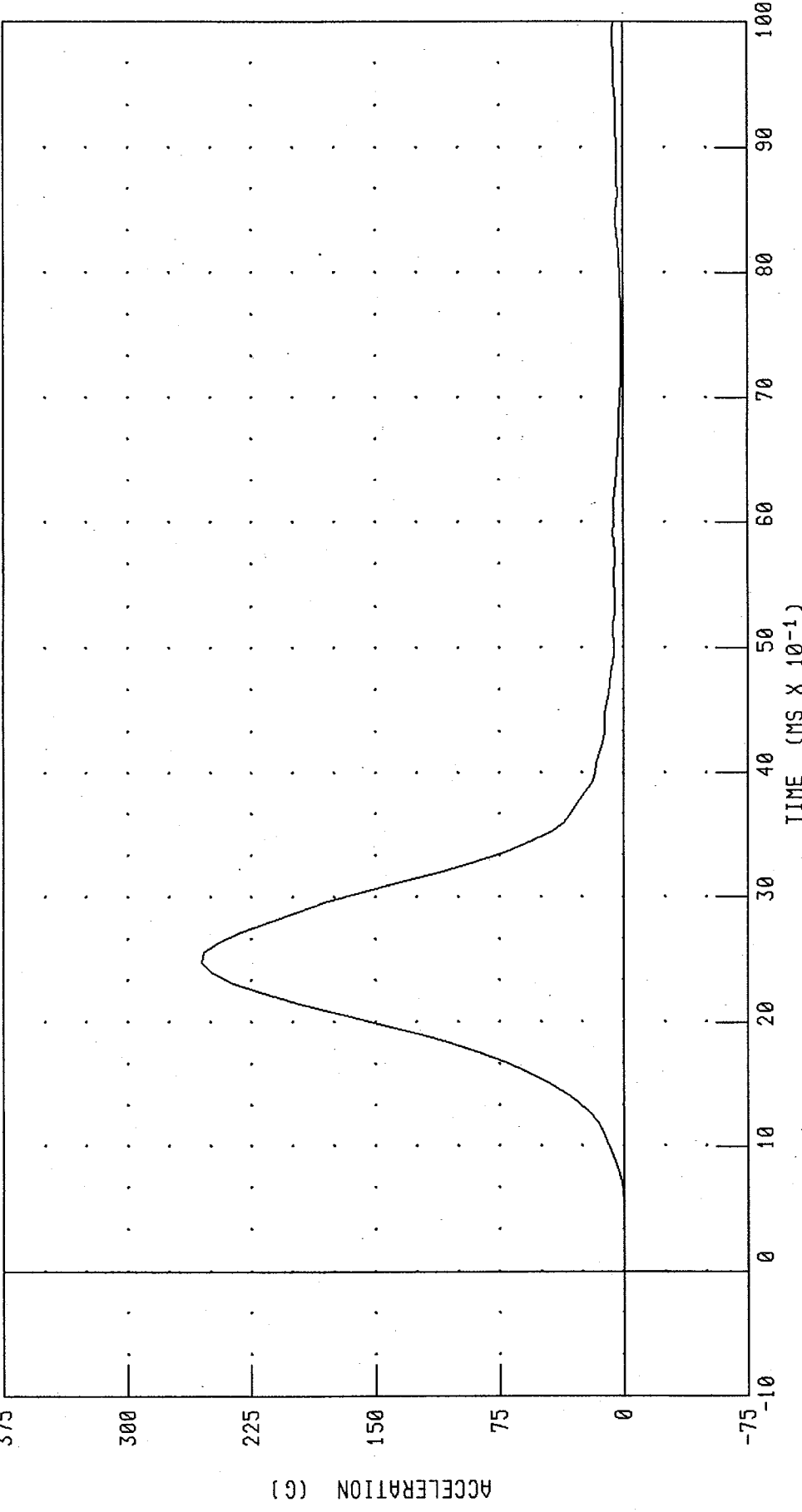
ACCELERATION (G)

PART 572-E HYBRID III HEAD CALIBRATION  
HEAD RESULTANT ACCELERATION

TRC TEST NUMBER: 192C43HD1

572E SN192 HEAD DROP CAL 43

RUN NUMBER: 101700.0921;1



CHANNEL: HEDRC FILTER: CH. CLASS 1000 PEAK DATA: 255.28 G @ 2.48 MS; 0.03 G @ 0.16 MS

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III 50th

17-OCT-00

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 192C43NF1 572E SN192 NECK FLEXION CAL43

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6-22.2 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
IMPACT VELOCITY	6.89 - 7.13 M/S	7.12 M/S
PENDULUM DECELERATION	10 MS   22.50 - 27.50 G	22.52 G
	20 MS   17.60 - 22.60 G	21.55 G
	30 MS   12.50 - 18.50 G	17.85 G
MAX PENDULUM G	29 G MAX	22.62 G
MAX PENDULUM G ABOVE 30 MS	29 G MAX	17.79 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G	34 - 42 MS	41.04 MS
D PLANE	MAX   64 - 78 DEG.	67.49 DEG.
ROTATION	TIME   57 - 64 MS	58.64 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX   88.2 - 108.5 NM	95.91 NM
	TIME   47 - 58 MS	53.44 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO	113 - 128 MS	114.08 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO	97 - 107 MS	99.52 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN *[Signature]*

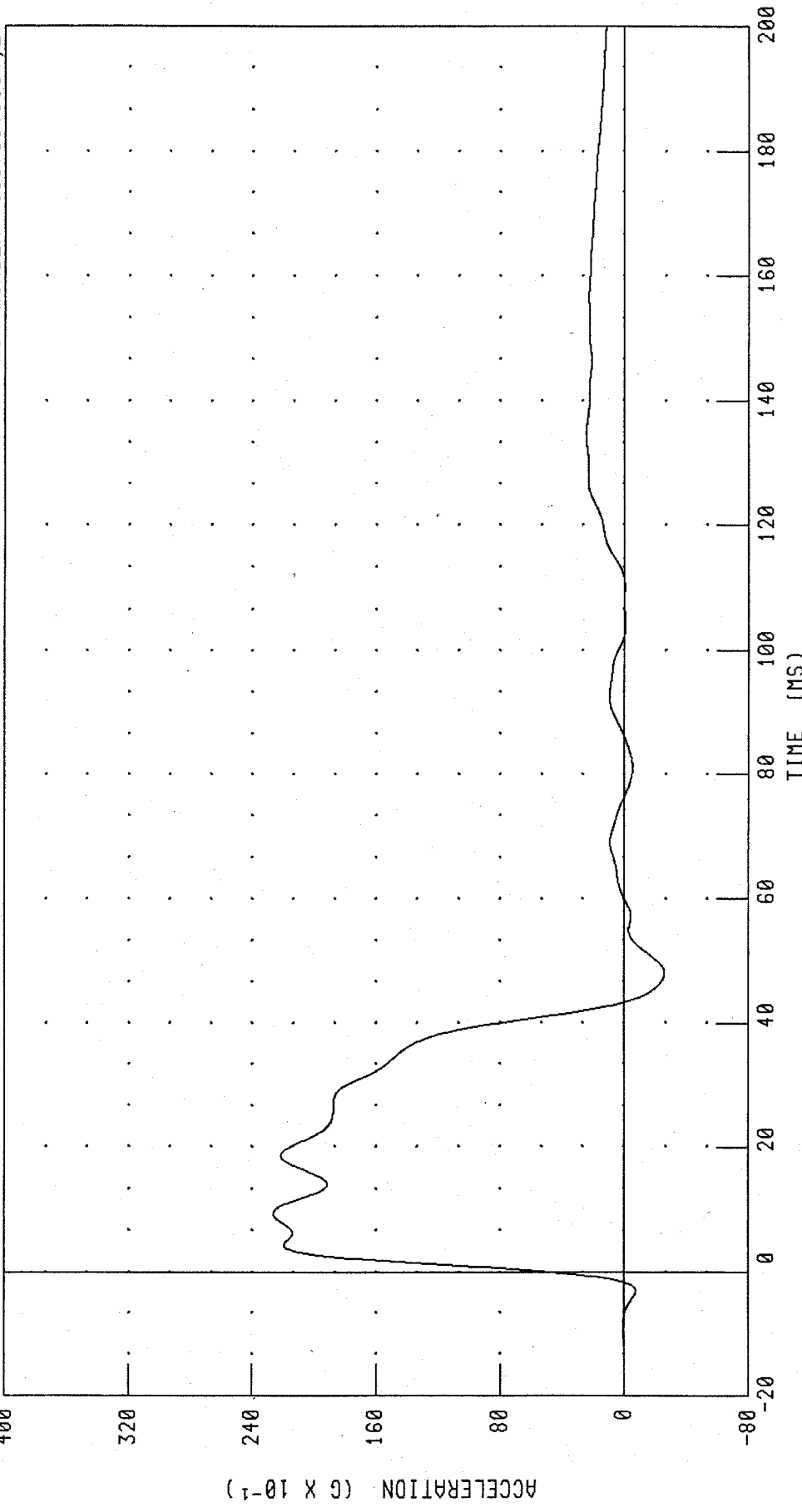
RUN NUMBER: 101700.1054;2

PART 572-E HYBRID III NECK FLEXION CALIBRATION  
PENDULUM DECELERATION

TRC TEST NUMBER: 192C43NF1

572E SN192 NECK FLEXION CAL43

RUN NUMBER: 101700.1054;2



PEAK DATA: 22.63 G @ 9.44 MS; -2.61 G @ 48.00 MS

CHANNEL: PENXG FILTER: CH. CLASS 60

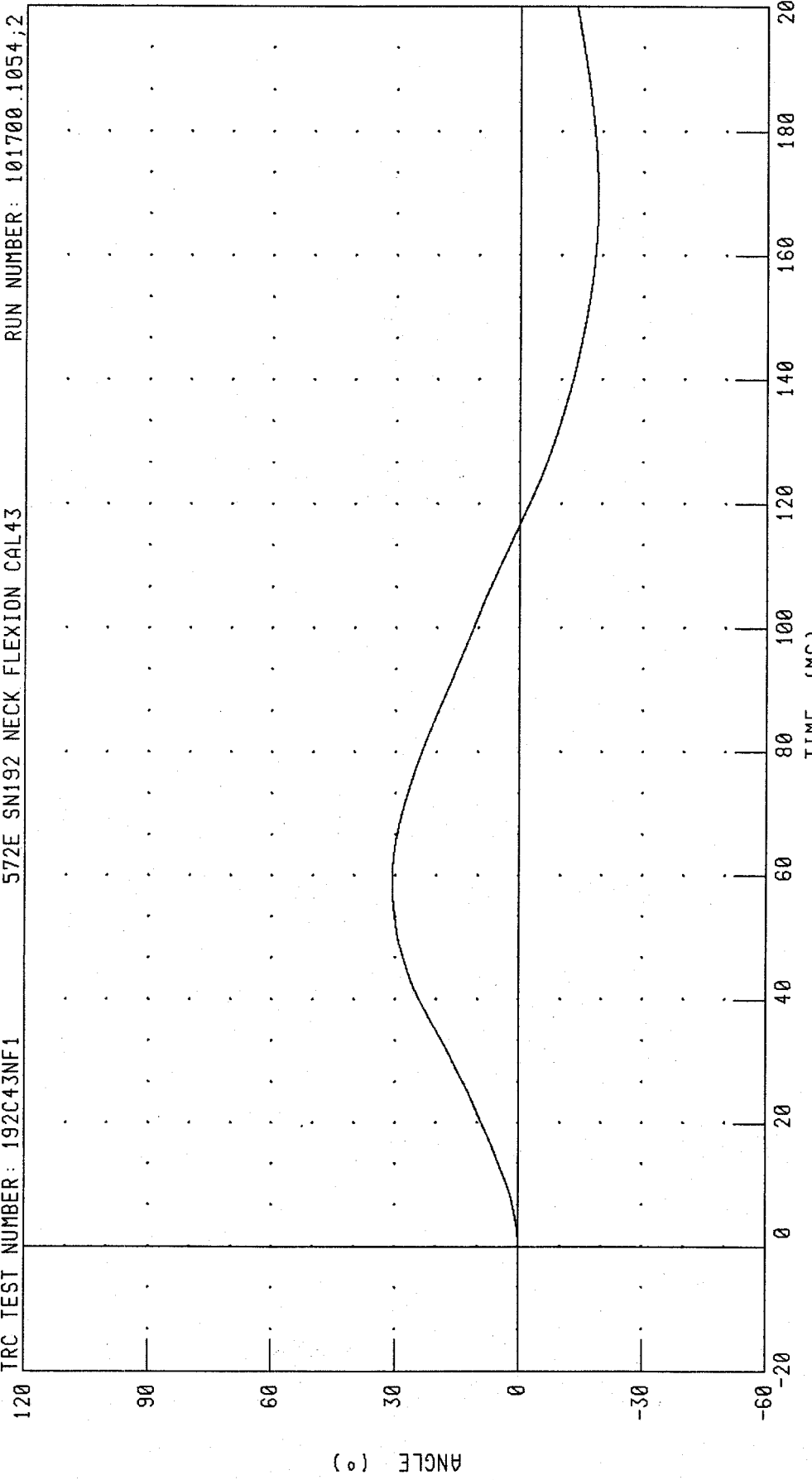
PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 192C43NF1

572E SN192 NECK FLEXION CAL43

RUN NUMBER: 101700.1054;2



CHANNEL: BETA FILTER: CH. CLASS 60

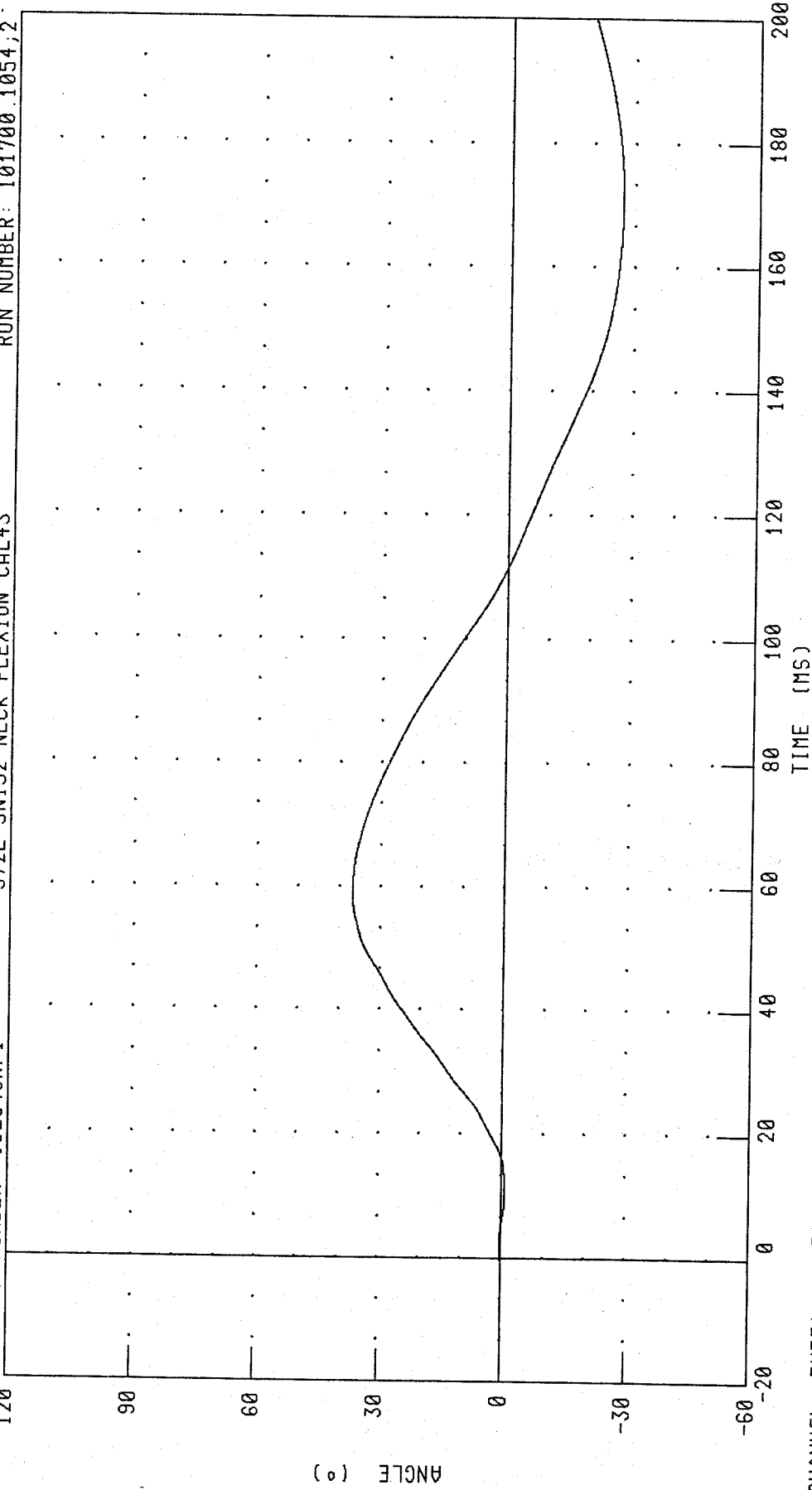
PEAK DATA: 30.72 ° @ 58.72 MS; -18.89 ° @ 168.88 MS

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

TRC TEST NUMBER: 192C43NF1

572E SN192 NECK FLEXION CAL43

RUN NUMBER: 101700.1054,2



CHANNEL: THETA FILTER: CH. CLASS 60

PEAK DATA: 36.77 ° @ 58.56 MS; -27.04 ° @ 171.20 MS

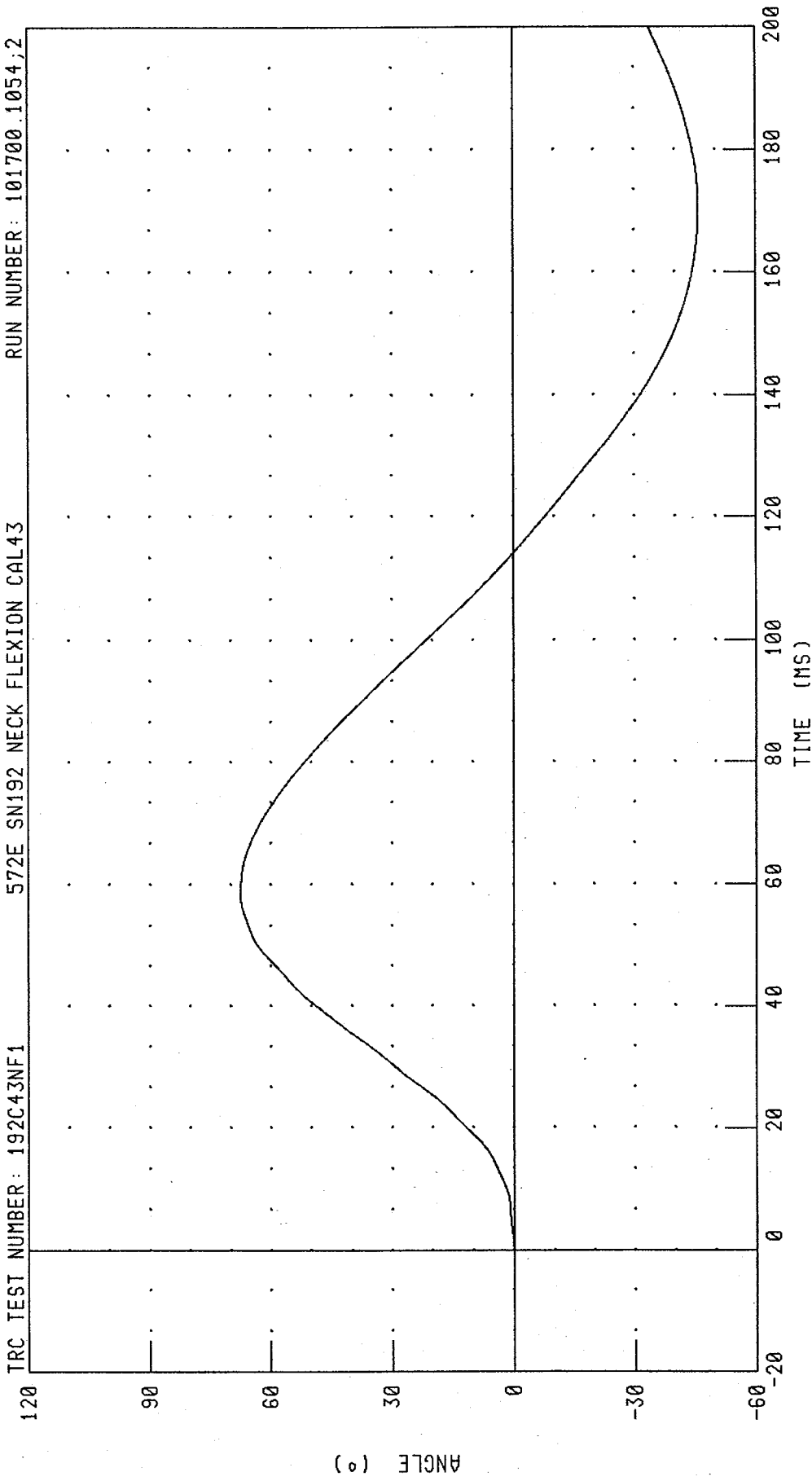
PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER: 192C43NF1

572E SN192 NECK FLEXION CAL43

RUN NUMBER: 101700.1054;2



CHANNEL: TOTAL FILTER: CH. CLASS 60

PEAK DATA: 67.49 ° @ 58.64 MS; -45.91 ° @ 169.92 MS

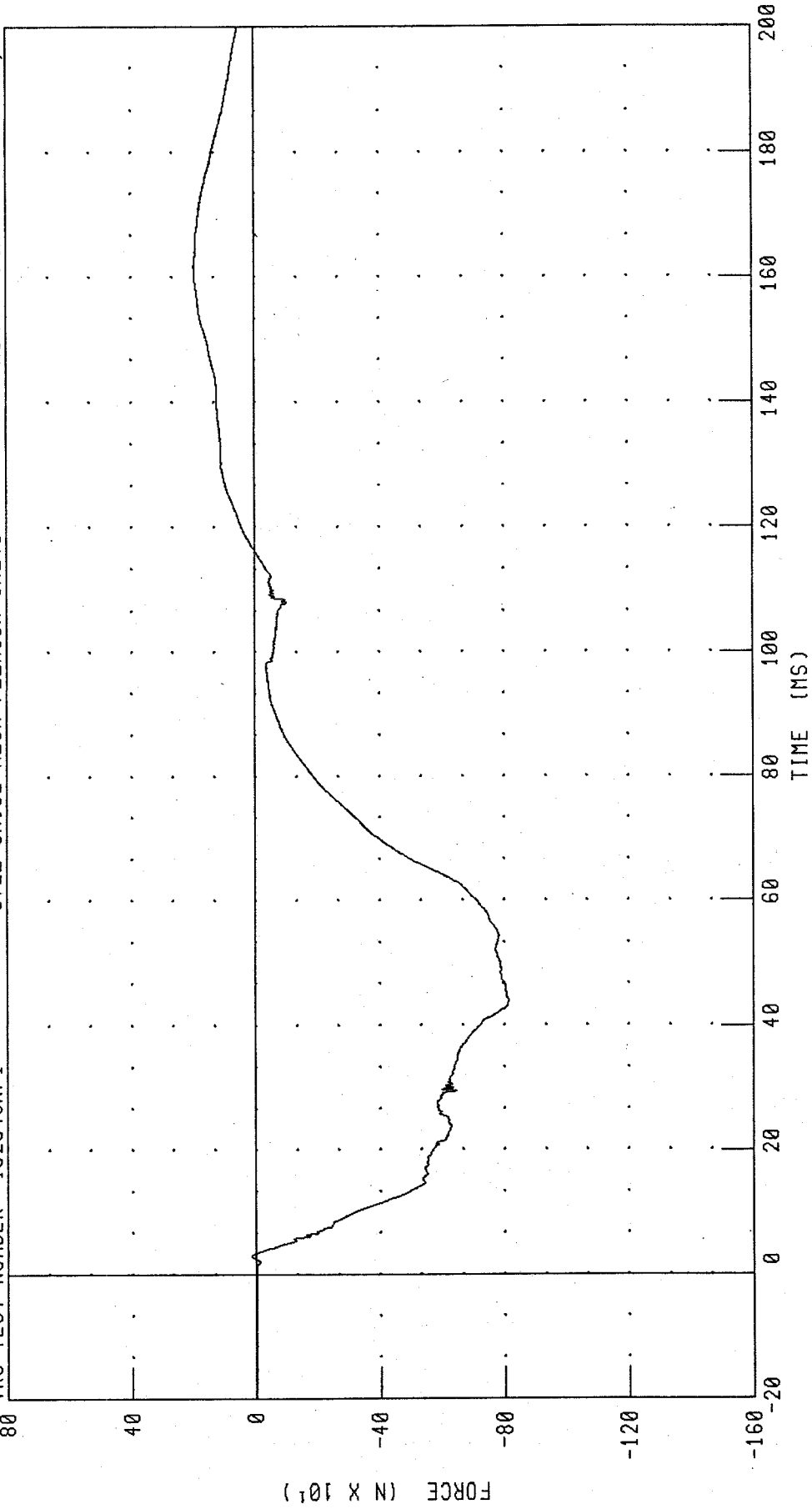
PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER: 192C43NF1

572E SN192 NECK FLEXION CAL43

RUN NUMBER: 101700.1054;2



CHANNEL: NEKXF FILTER: CH. CLASS 1000

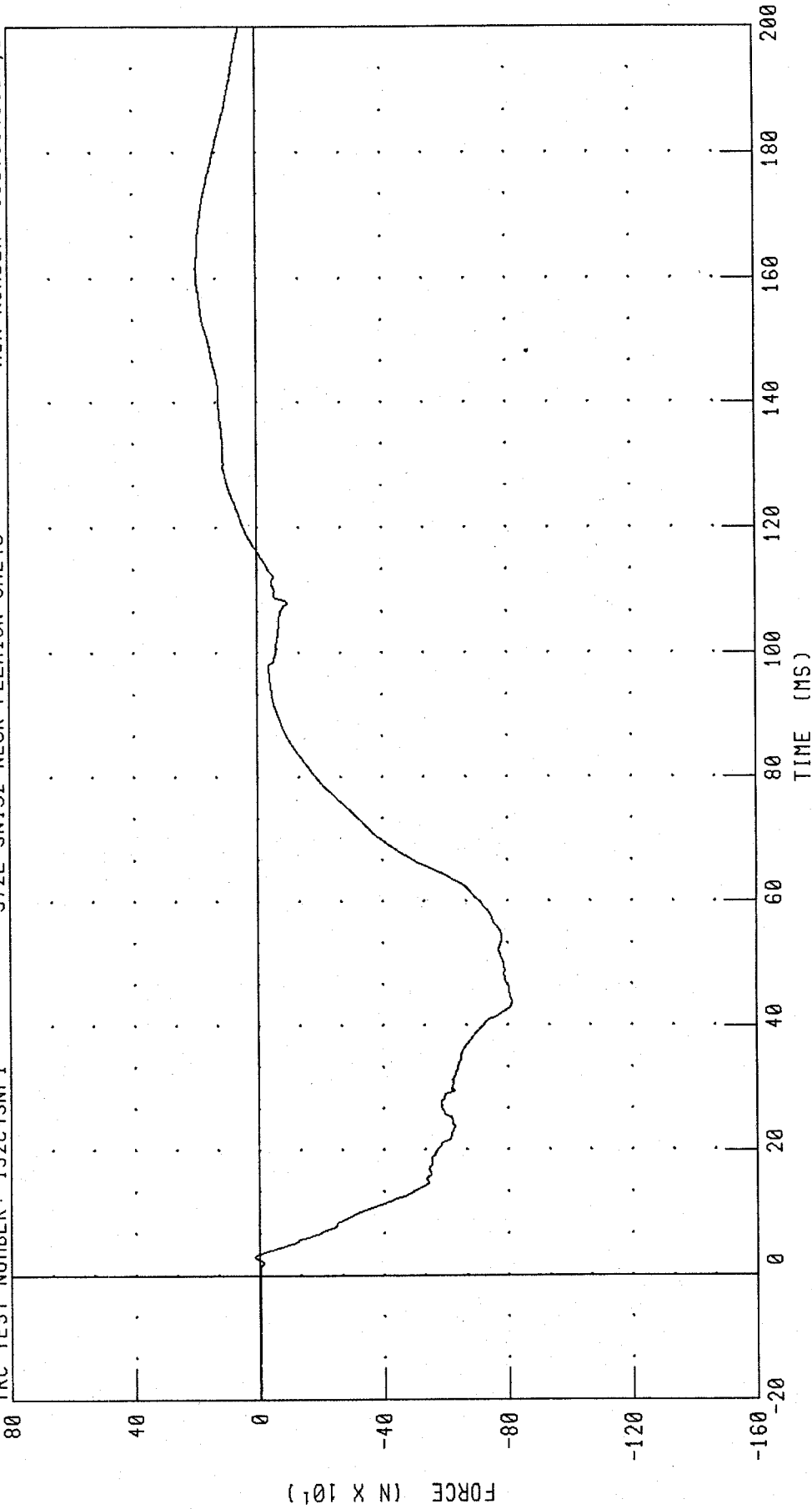
PEAK DATA: 196.70 N @ 161.60 MS; -814.68 N @ 44.00 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION  
NECK FORCE X AXIS FILTERED FOR USE IN OCCIPITAL MOMENT CALCULATION

TRC TEST NUMBER: 192C43NF1

572E SN192 NECK FLEXION CAL43

RUN NUMBER: 101700.1054;2



CHANNEL: NEKXFC FILTER: CH. CLASS 600

PEAK DATA: 196.35 N @ 161.60 MS; -814.41 N @ 44.00 MS

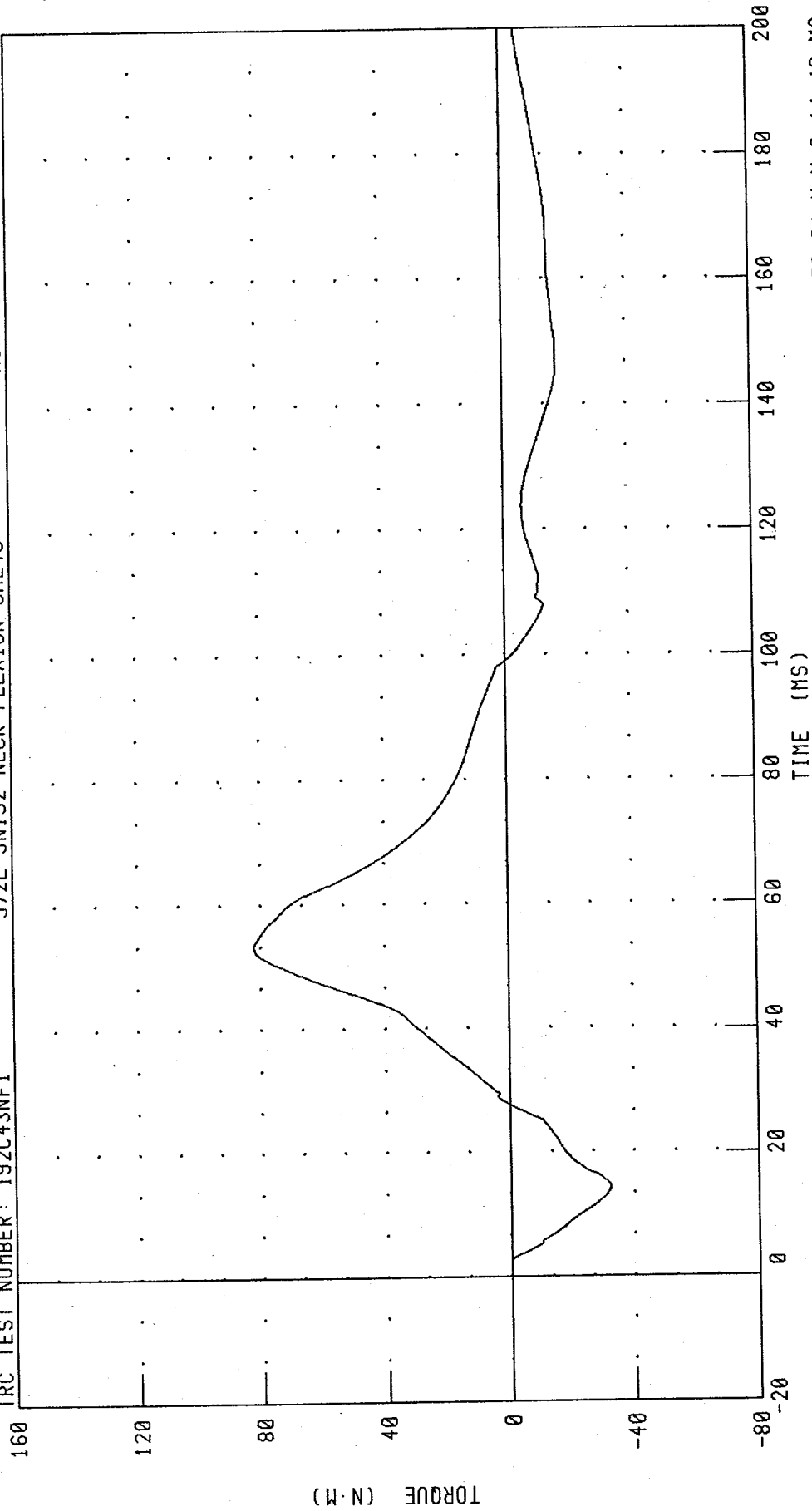
PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT Y AXIS

RUN NUMBER: 101700.1054;2

TRC TEST NUMBER: 192C43NF1

572E SN192 NECK FLEXION CAL43



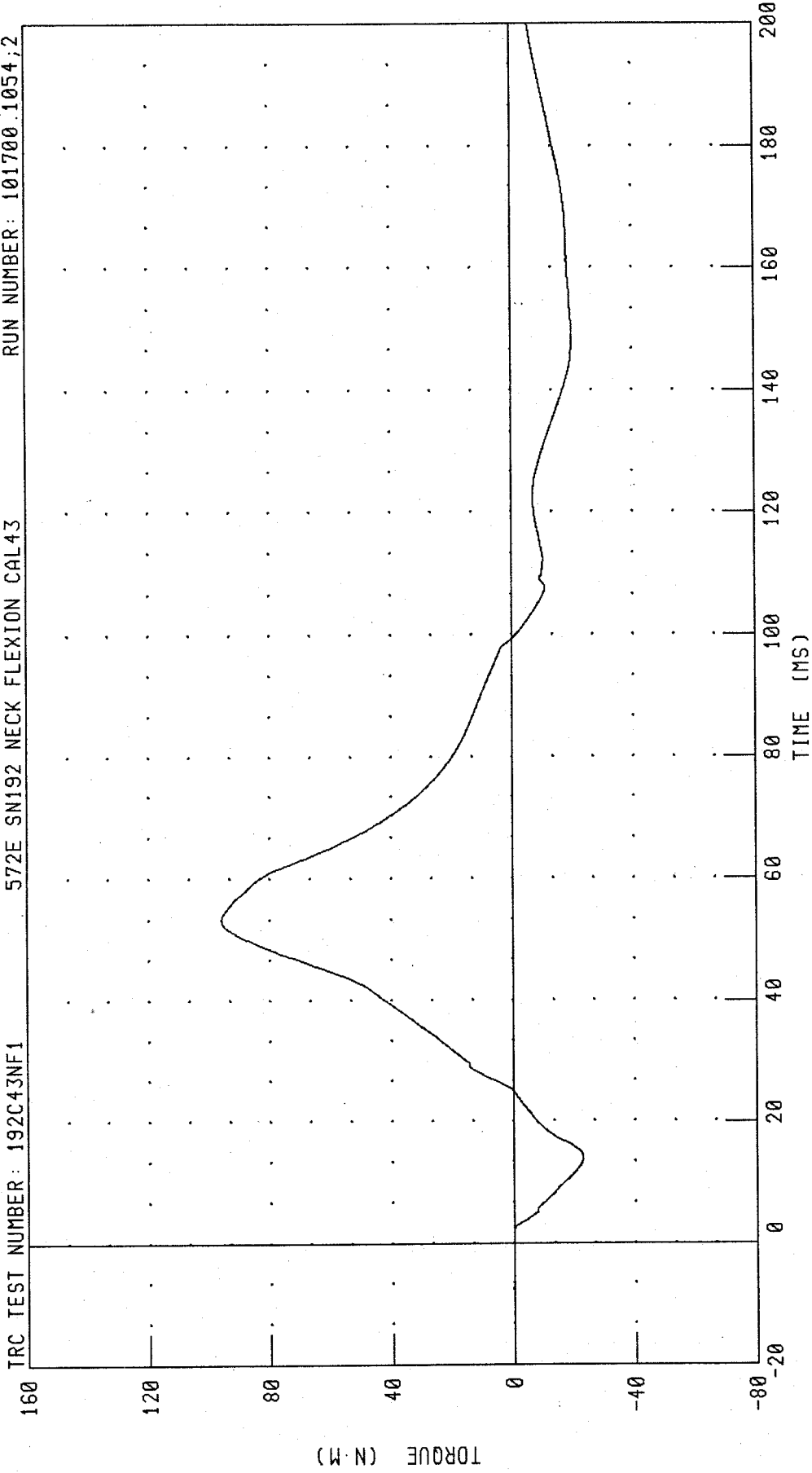
PEAK DATA: 82.06 N·M @ 53.44 MS; -32.24 N·M @ 14.48 MS

CHANNEL: NEKYM FILTER: CH. CLASS 600

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

TRC TEST NUMBER: 192C43NF1      RUN NUMBER: 101700.1054;2

572E SN192 NECK FLEXION CAL43



PEAK DATA: 95.91 N.M @ 53.44 MS; -22.87 N.M @ 14.00 MS

CHANNEL: NEKOM      FILTER: CH. CLASS 600

TORQUE (N.M)

TIME (MS)

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III 50th

17-OCT-00

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

TRC INC. TEST NO: 192C43NE1 572E SN192 NECK EXT CAL43

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6 - 22.2 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
IMPACT VELOCITY	5.95 - 6.19 M/S	6.10 M/S
PENDULUM DECELERATION	10 MS   17.20 - 21.20 G	20.18 G
	20 MS   14.00 - 19.00 G	18.13 G
	30 MS   11.00 - 16.00 G	15.57 G
MAX PENDULUM G	22 G MAX	20.40 G
MAX PENDULUM G ABOVE 30 MS	22 G MAX	15.51 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G	38 - 46 MS	38.88 MS
D PLANE	MAX   81 - 106 DEG.	93.76 DEG.
ROTATION	TIME   72 - 82 MS	74.64 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN   -80.0/-52.9 NM	-62.10 NM
	TIME   65 - 79 MS	71.36 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO	147 - 174 MS	153.36 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO	120 - 148 MS	132.72 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN *John C. Mills*

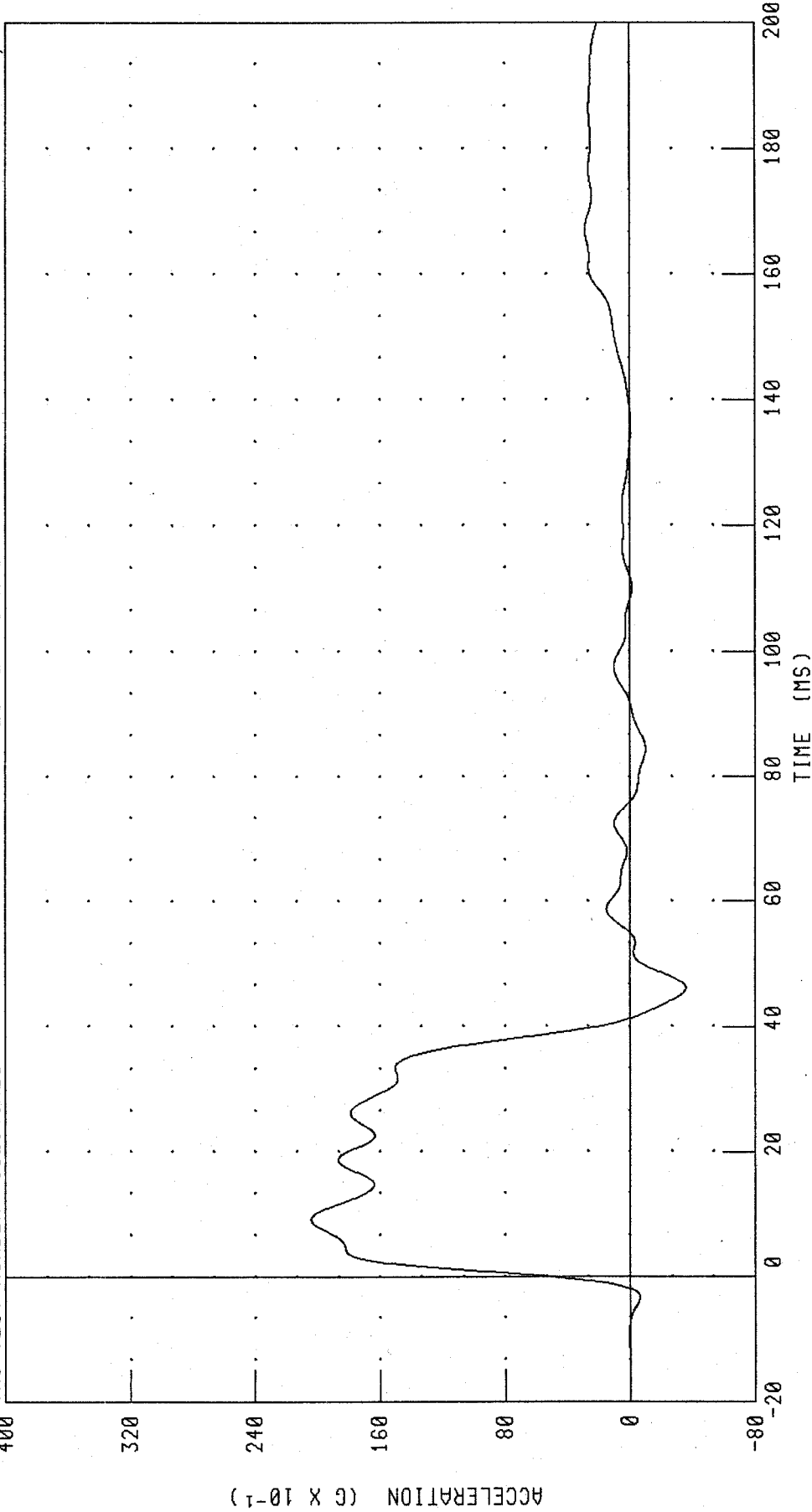
RUN NUMBER: 101700.1125;1

PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
PENDULUM DECELERATION

TRC TEST NUMBER: 192C43NE1

572E SN192 NECK EXT CAL43

RUN NUMBER: 101700.1126;1



CHANNEL: PENXC FILTER: CH. CLASS 60

PEAK DATA: 20.41 G @ 9.20 MS; -3.58 G @ 46.16 MS

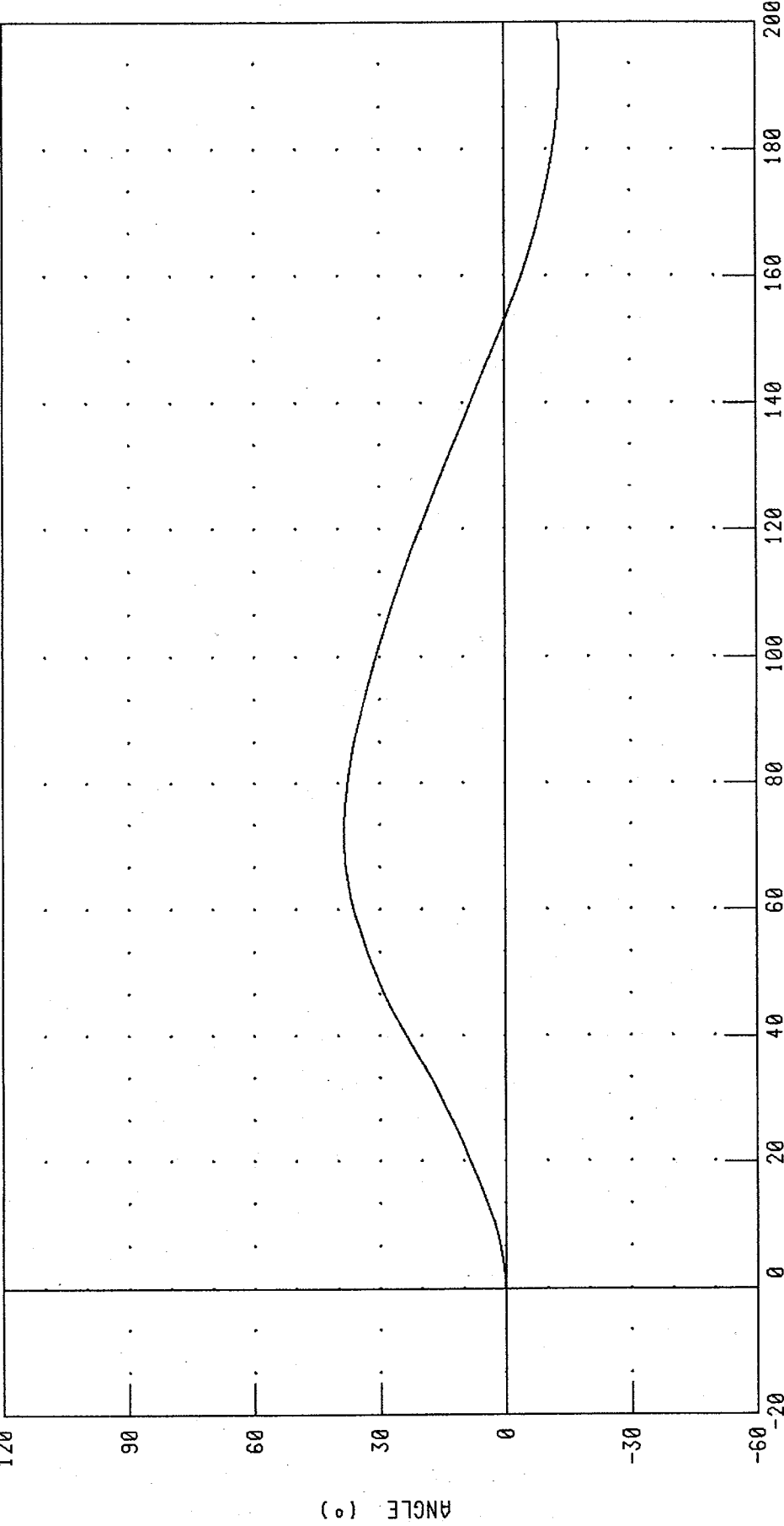
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 192C43NE1

572E SN192 NECK EXT CAL43

RUN NUMBER: 101700.1126;1



PEAK DATA: 38.47 ° @ 72.16 MS; -13.31 ° @ 193.28 MS

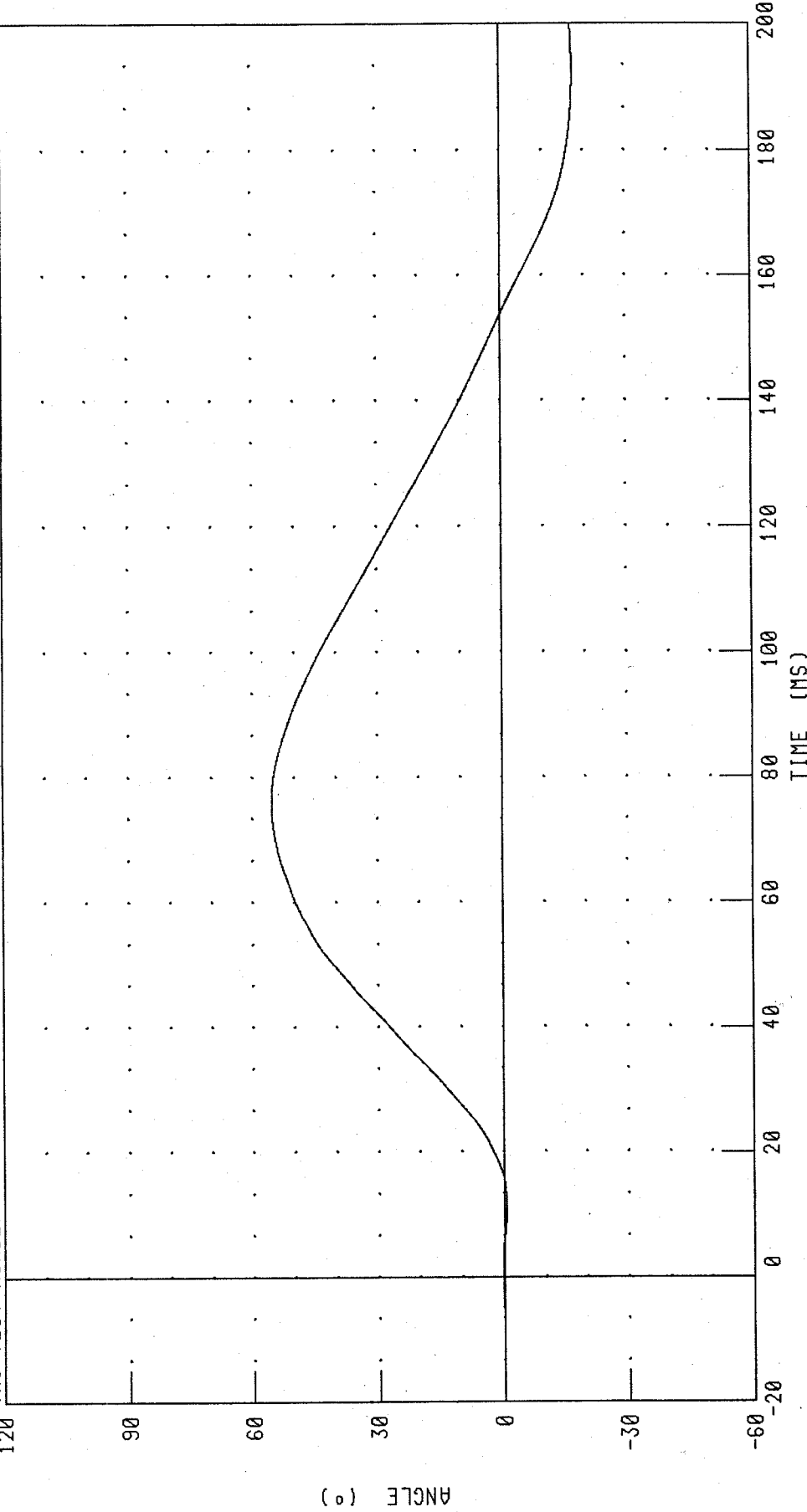
CHANNEL: BETA FILTER: CH. CLASS 60

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

TRC TEST NUMBER: 192C43NE1

572E SN192 NECK EXT CAL43

RUN NUMBER: 101700.1126;1



CHANNEL: THETA FILTER: CH. CLASS 60 PEAK DATA: 55.40 ° @ 75.84 MS; -17.53 ° @ 192.48 MS

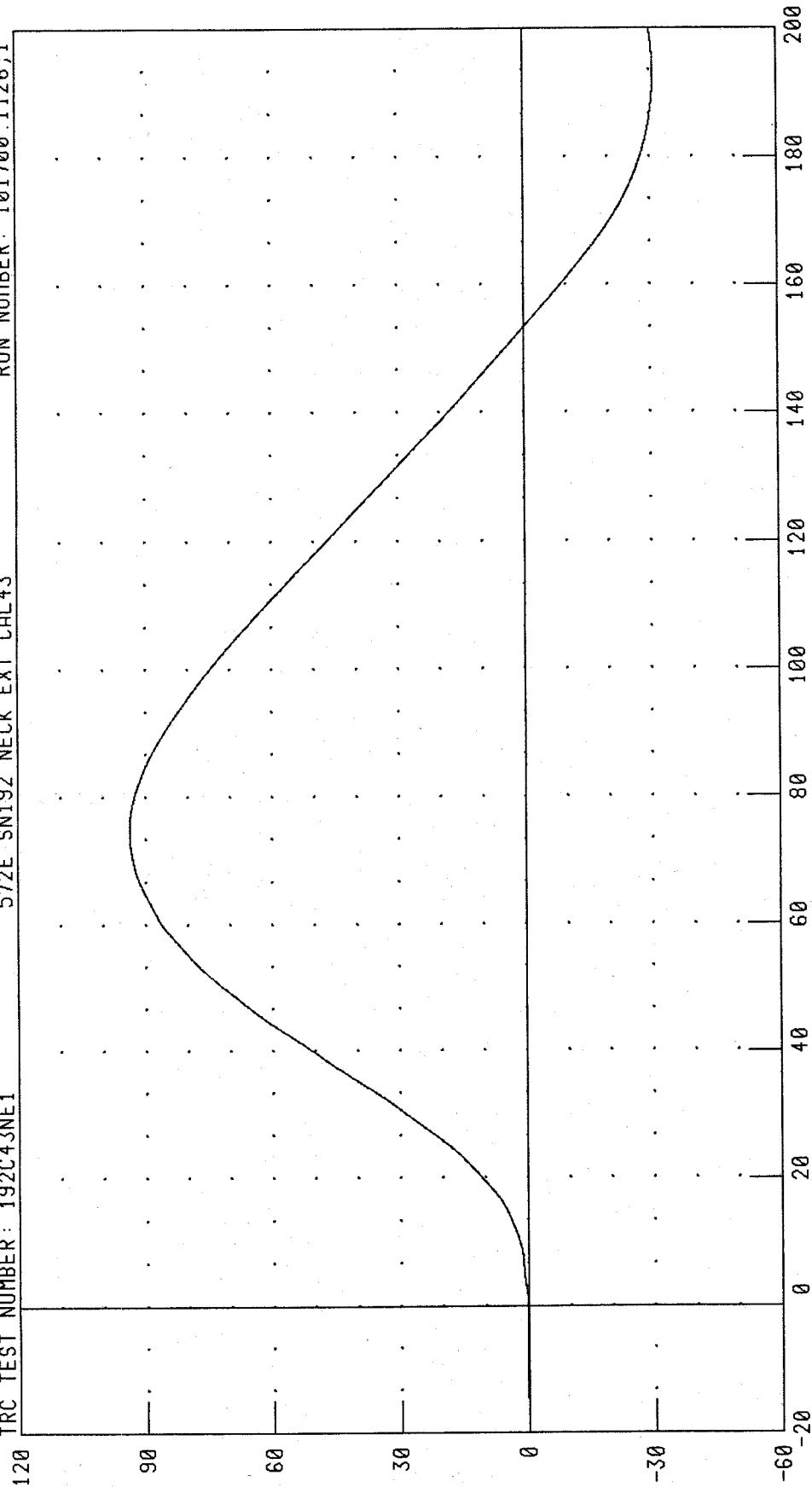
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION

RUN NUMBER: 101700.1126;1

572E SN192 NECK EXT CAL43

TRC TEST NUMBER: 192C43NE1



PEAK DATA: 93.76 ° @ 74.64 MS; -30.84 ° @ 192.96 MS

CHANNEL: TOTAN FILTER: CH. CLASS 60

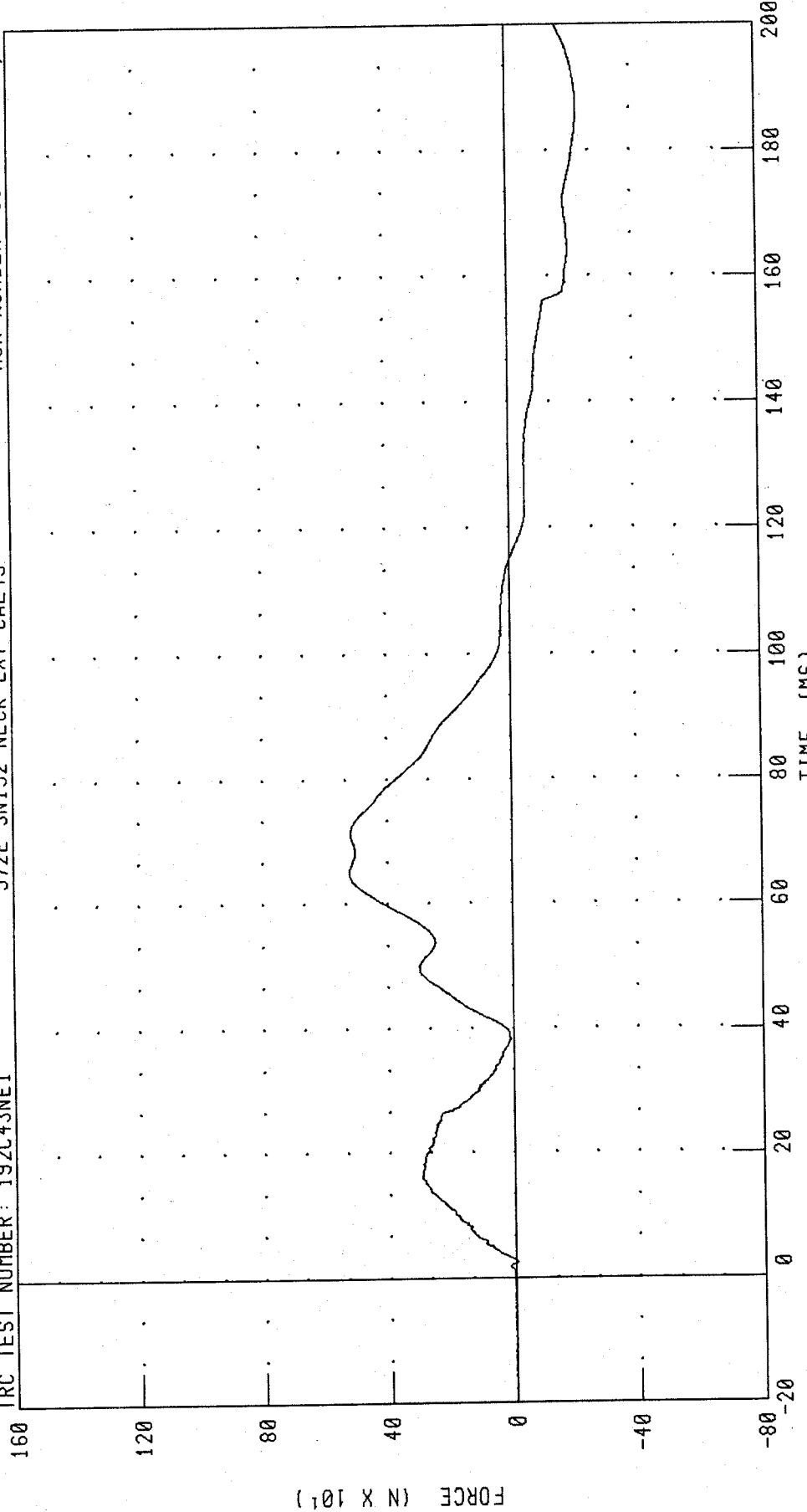
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

RUN NUMBER: 101700.1126;1

572E SN192 NECK EXT CAL 43

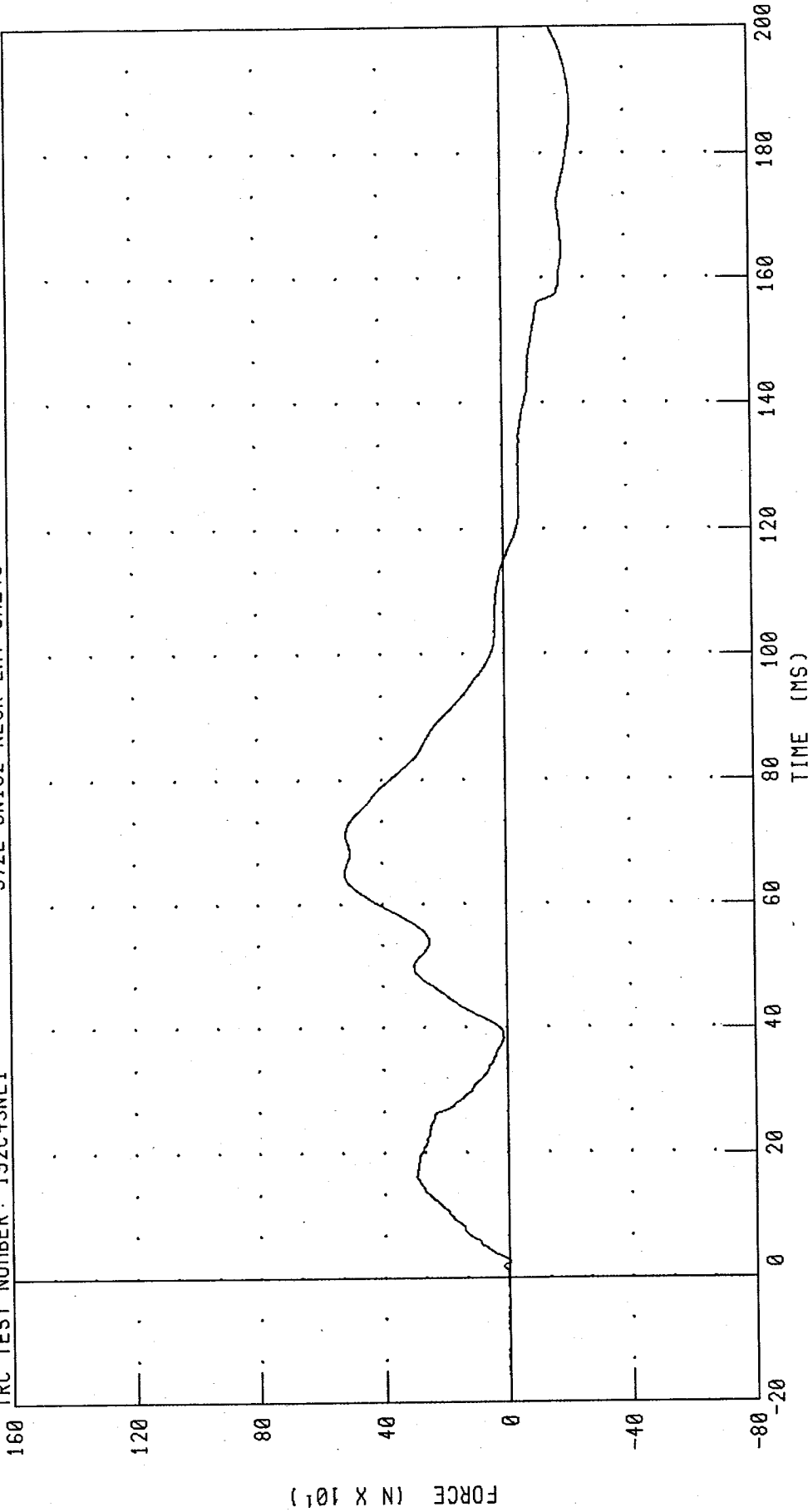
TRC TEST NUMBER: 192C43NE1



PEAK DATA: 521.19 N @ 65.20 MS; -229.16 N @ 186.56 MS

CHANNEL: NEKXF FILTER: CH. CLASS 1000

PART 572-E HYBRID III NECK EXTENSION CALIBRATION  
 NECK FORCE X AXIS FILTERED FOR USE IN OCCIPITAL MOMENT CALCULATION  
 TRC TEST NUMBER: 192C43NE1 572E SN192 NECK EXT CAL43 RUN NUMBER: 101700.1126;1



CHANNEL: NEKXFC FILTER: CH. CLASS 600  
 PEAK DATA: 520.79 N @ 65.12 MS; -228.74 N @ 187.36 MS

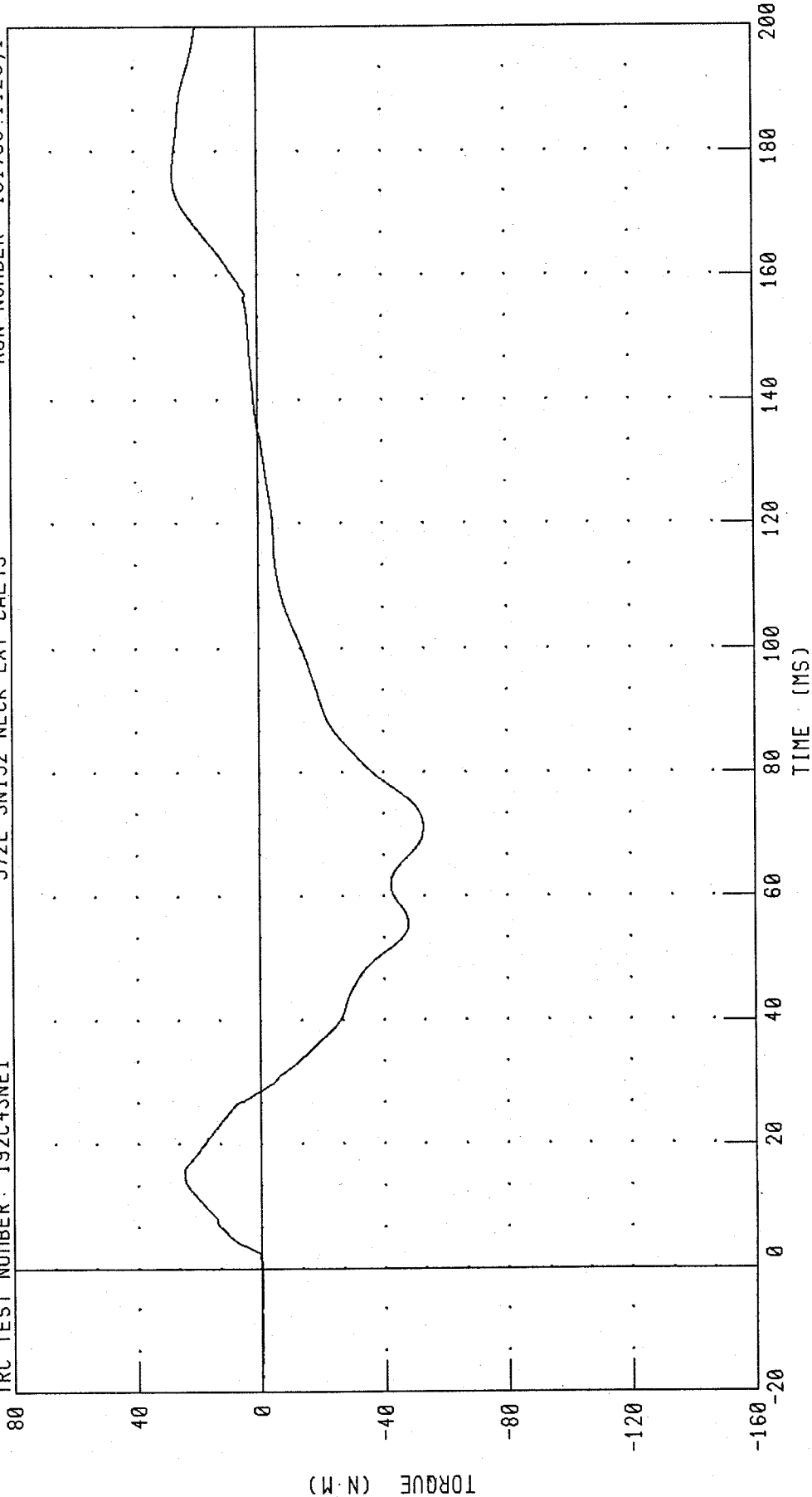
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER: 192C43NE1

572E SN192 NECK EXT CAL43

RUN NUMBER: 101700.1126;1



PEAK DATA: 27.59 N·M @ 176.16 MS; -52.93 N·M @ 71.44 MS

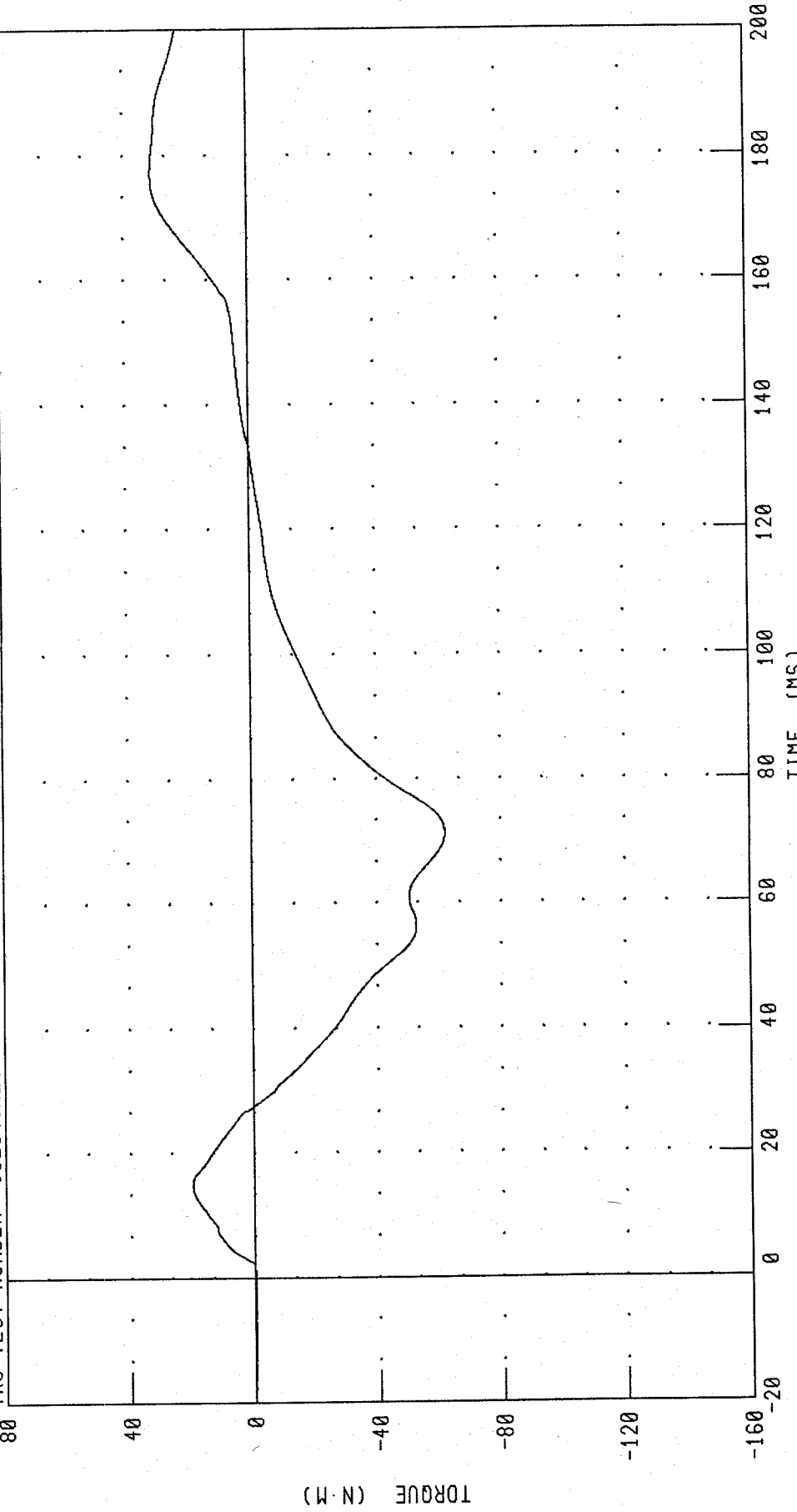
CHANNEL: NEKYM FILTER: CH. CLASS 600

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

TRC TEST NUMBER: 192C43NE1

572E SN192 NECK EXT CAL43

RUN NUMBER: 101700.1126;1



CHANNEL: NEKOM FILTER: CH. CLASS 600  
PEAK DATA: 31.17 N·M @ 176.88 MS; -62.10 N·M @ 71.36 MS

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III 50th

17-OCT-00

TRC INC.

TEST NO: 192C43TH1

572E SN192 H.S.THORAX CAL43

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.6-22.2 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.75 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	67.5 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5537. N
INTERNAL HYSTERESIS	69% - 85%	74.1%

TEST MEETS SPECIFICATIONS

TECHNICIAN

*John C. Mills*

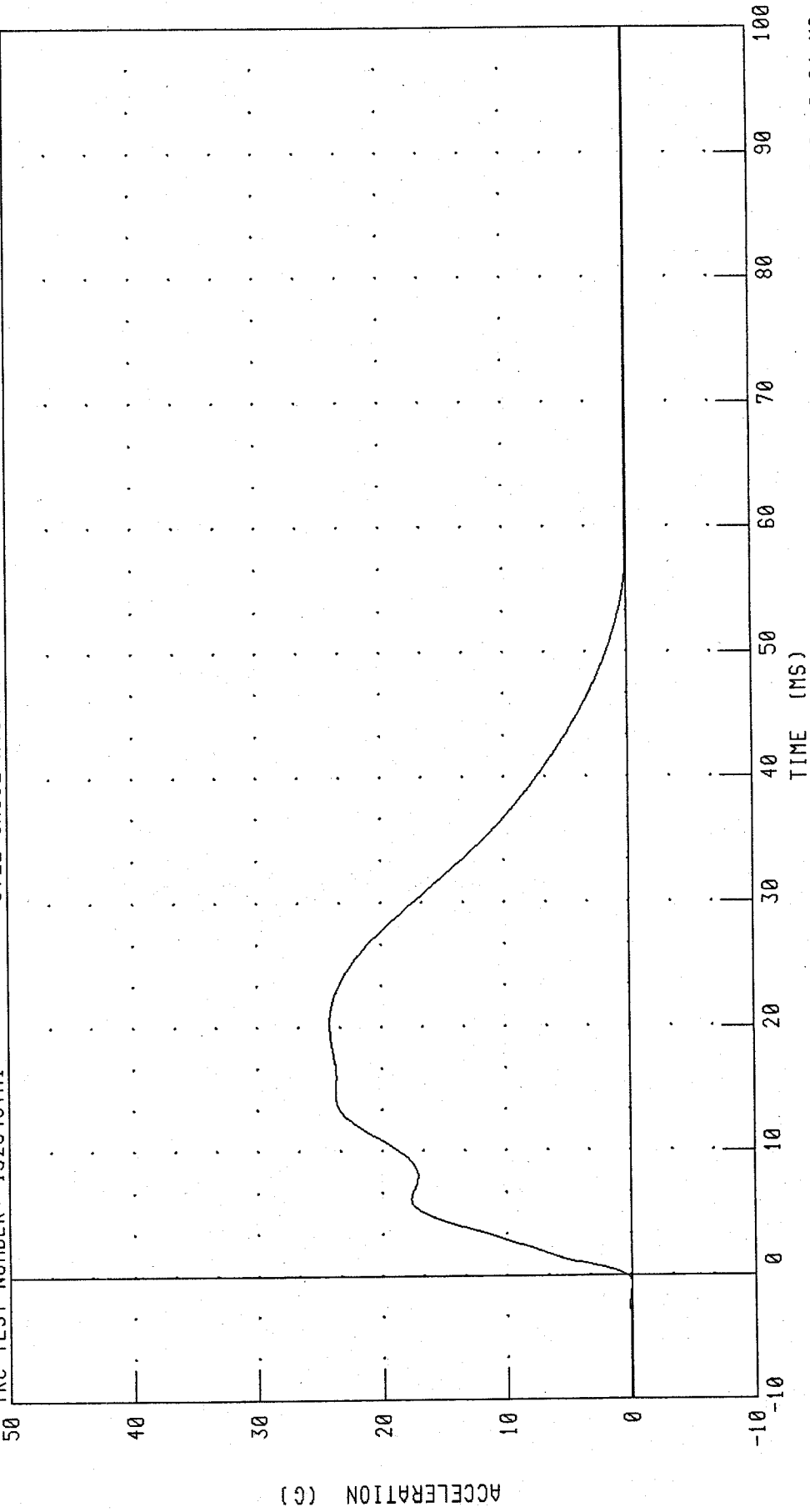
RUN NUMBER: 101700.0802;1

PART 572-E HYBRID III THORAX CALIBRATION  
PENDULUM DECELERATION

TRC TEST NUMBER: 192C43TH1

572E SN192 H.S. THORAX CAL43

RUN NUMBER: 101700.0802;1



CHANNEL: PENXC FILTER: CH. CLASS 180

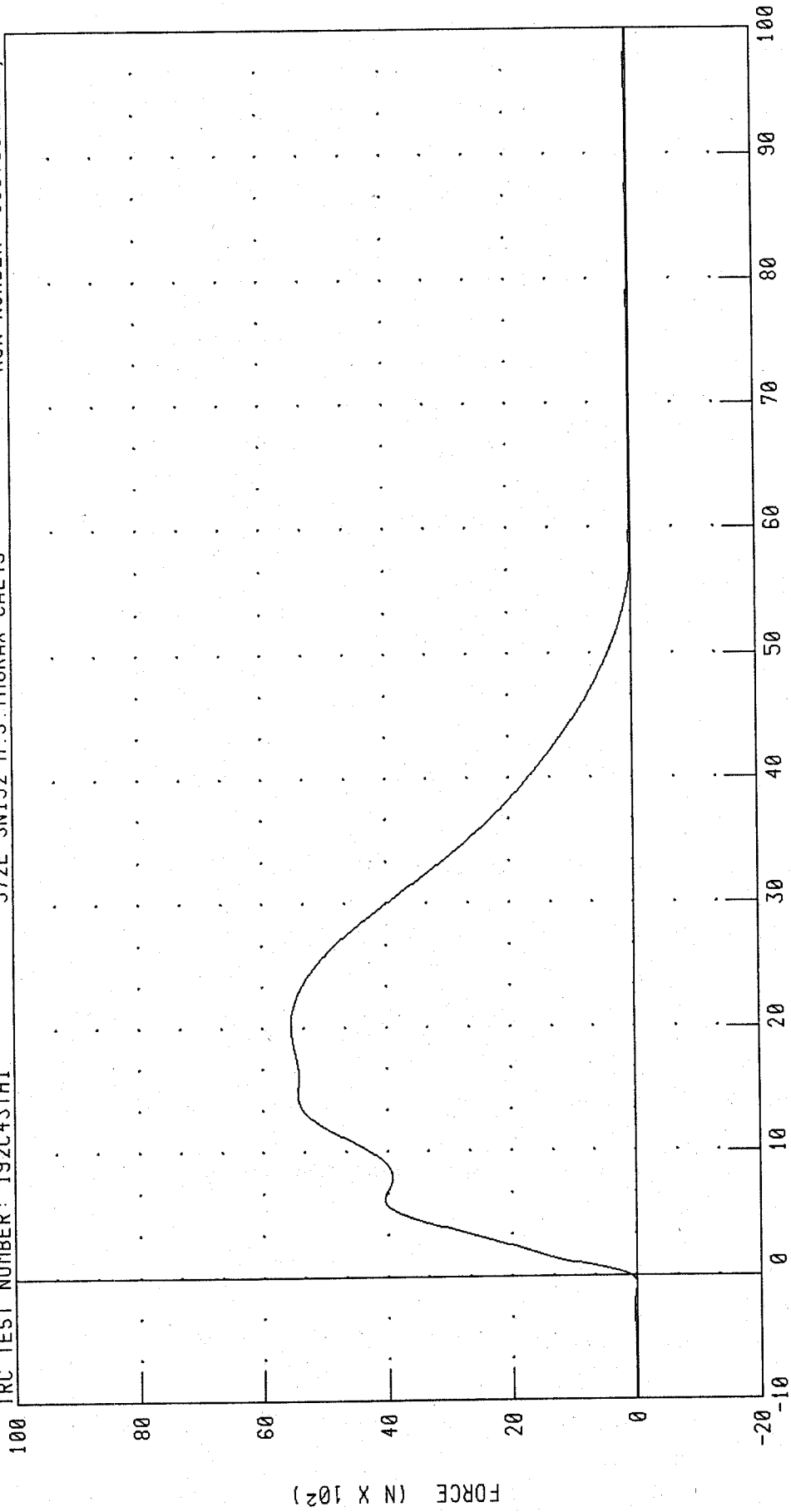
PEAK DATA: 24.17 G @ 20.24 MS, -0.03 G @ -0.64 MS

PART 572-E HYBRID III THORAX CALIBRATION  
PENDULUM FORCE

TRC TEST NUMBER: 192C43TH1

572E SN192 H.S. THORAX CAL43

RUN NUMBER: 101700.0802;1



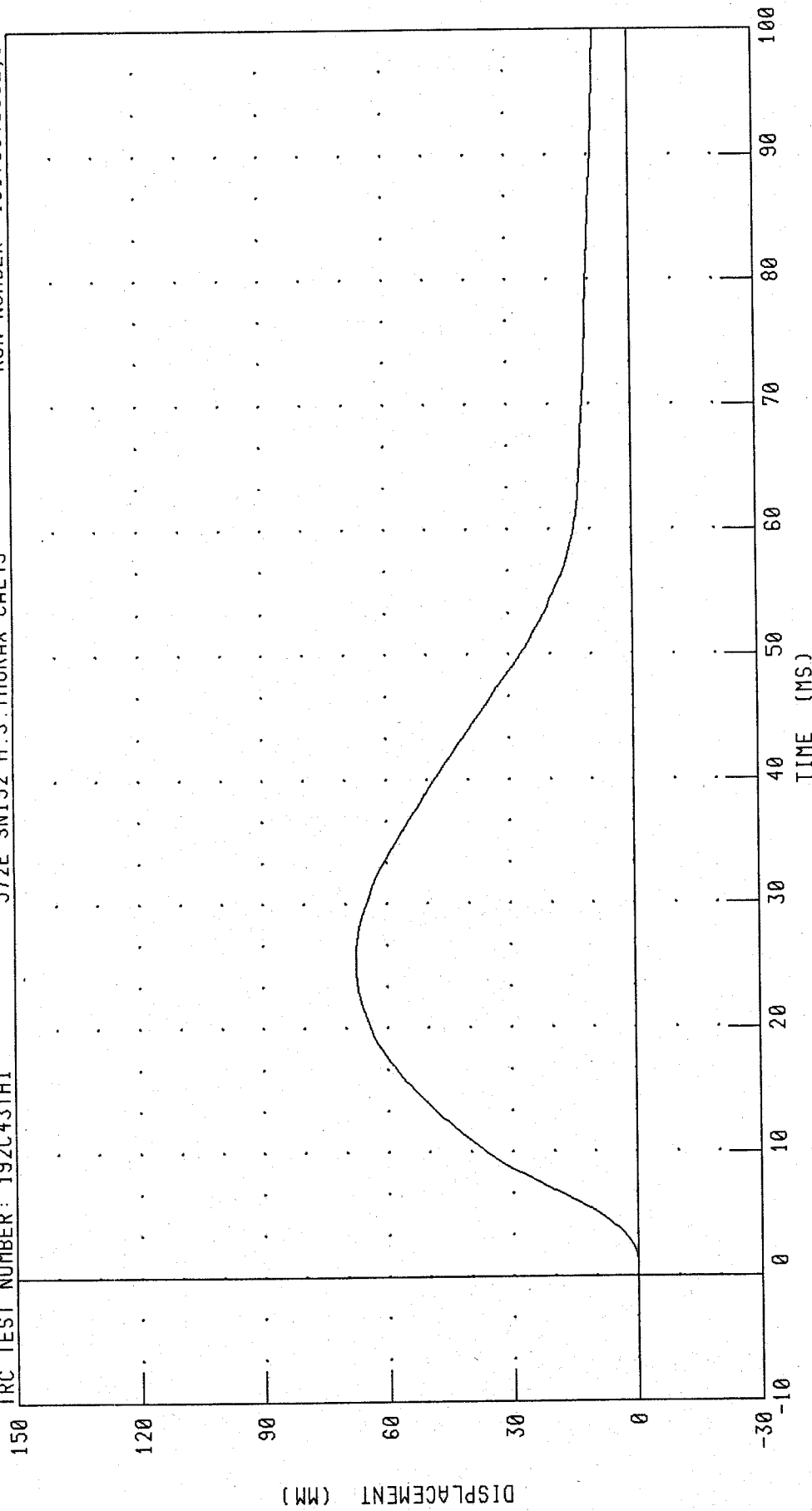
CHANNEL: PENXF FILTER: CH. CLASS 180 PEAK DATA: 5537.82 N @ 20.24 MS; -7.68 N @ -0.64 MS

PART 572-E HYBRID III THORAX CALIBRATION  
STERNUM DISPLACEMENT

TRC TEST NUMBER: 192C43TH1

572E SN192 H.S. THORAX CAL43

RUN NUMBER: 101700.0802;1



CHANNEL: CSTXD FILTER: CH. CLASS 180

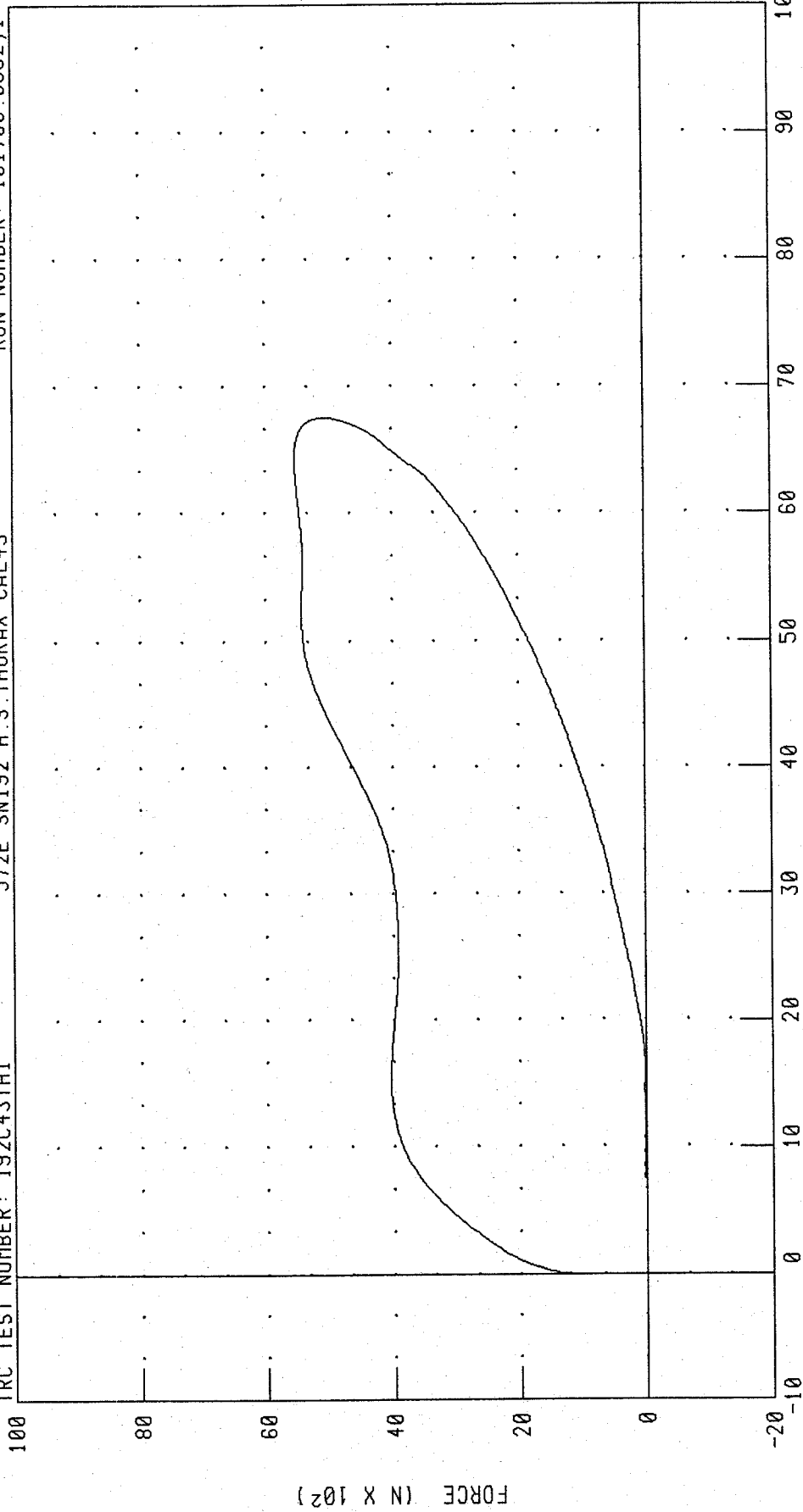
PEAK DATA: 67.56 MM @ 25.52 MS; -0.04 MM @ 0.72 MS

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

TRC TEST NUMBER: 192C43TH1

572E SN192 H.S.THORAX CAL43

RUN NUMBER: 101700.0802;1



DISPLACEMENT (MM)

PEAK DATA: 67.56 MM @ 25.52 MS; -0.04 MM @ 0.72 MS  
5537.82 N @ 20.24 MS; -7.68 N @ -0.64 MS

CHANNEL: CSTXD  
PENXF  
FILTER: CH: CLASS 180  
CH: CLASS 180

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

HYBRID III 50th

17-OCT-00

TRC INC.

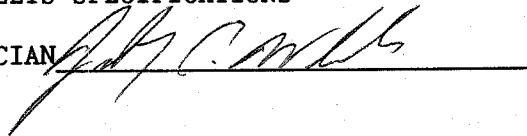
TEST NO: 192C43LK1

572E SN192 LEFT KNEE CAL 42

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.09 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5222.9 N

TEST MEETS SPECIFICATIONS

TECHNICIAN

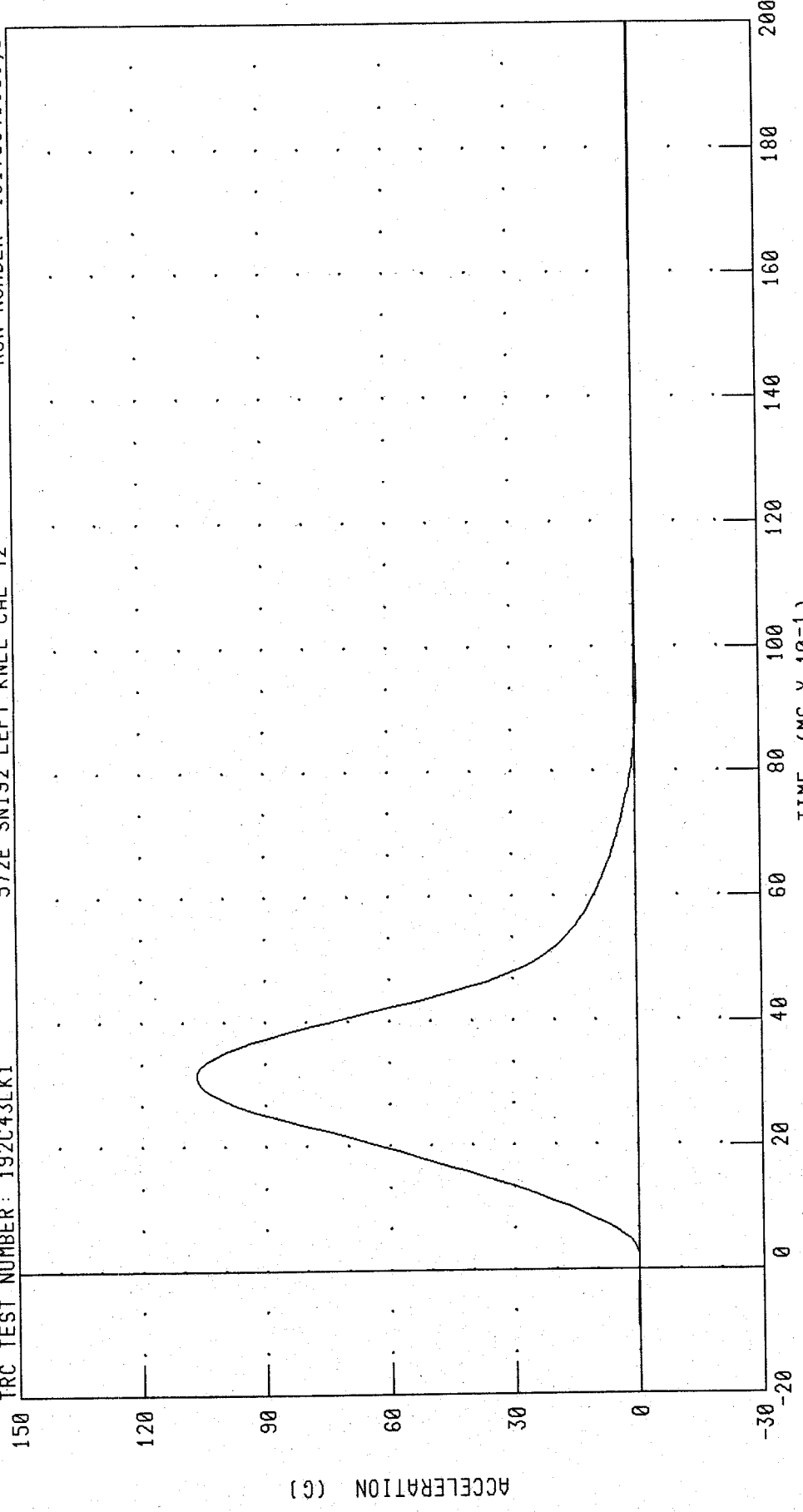


RUN NUMBER: 101700.0832;1

PART 572-E HYBRID III LEFT KNEE CALIBRATION  
PENDULUM DECELERATION (5 KG PEND.)  
572E SN192 LEFT KNEE CAL 42

RUN NUMBER: 101700.0833;1

TRC TEST NUMBER: 192C43LK1



PEAK DATA: 106.75 G @ 3.12 MS; -0.52 G @ 9.44 MS

CHANNEL: PENXC FILTER: CH. CLASS 600

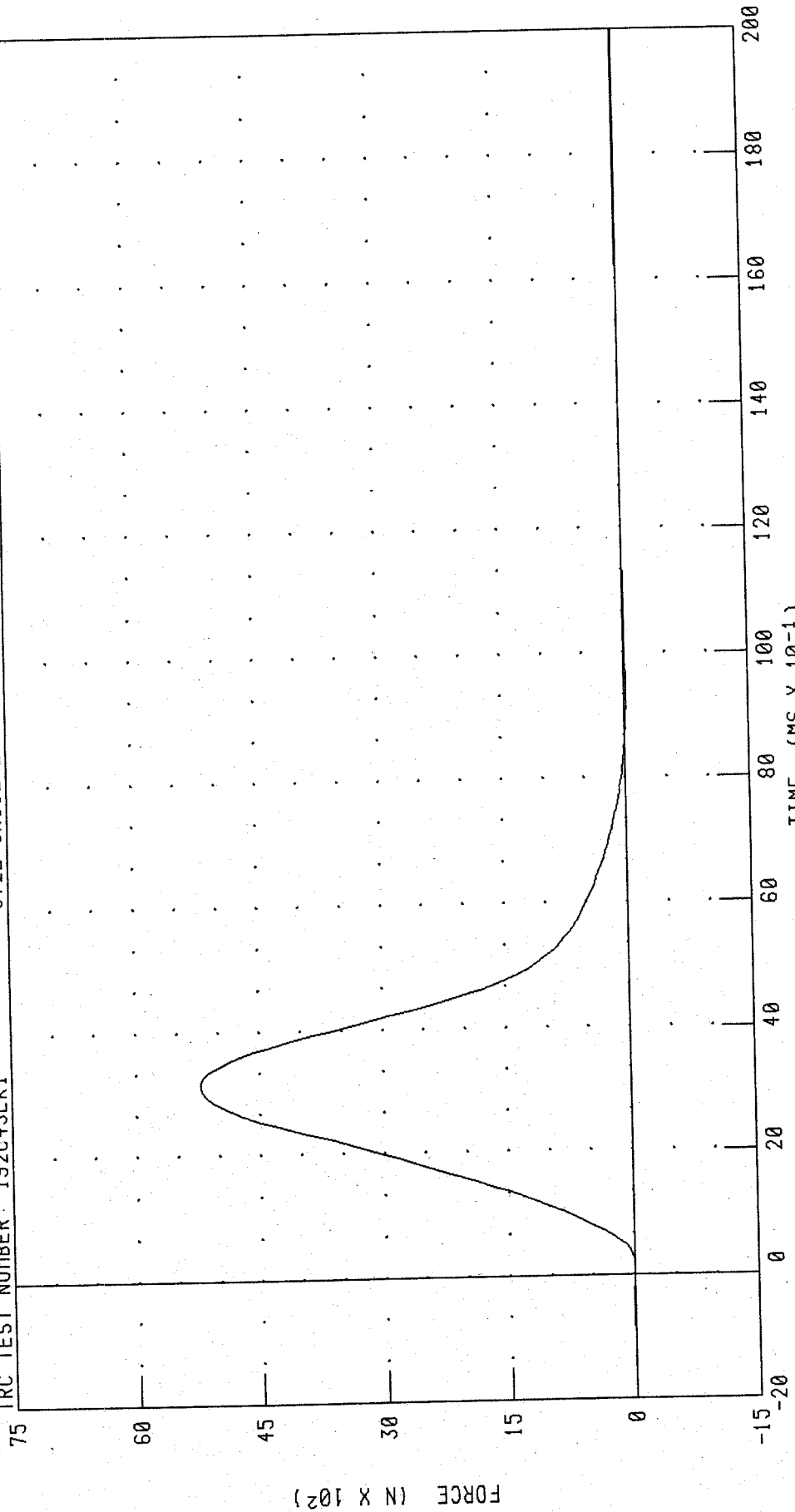
PART 572-E HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

572E SN192 LEFT KNEE CAL 42

RUN NUMBER: 101700.0833;1

TRC TEST NUMBER: 192C43LK1



PEAK DATA: 5222.94 N @ 3.12 MS; -25.61 N @ 9.44 MS

CHANNEL: PENXF FILTER: CH. CLASS 600

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III 50th

17-OCT-00

TRC INC.

TEST NO: 192C43RK1

572E SN192 RIGHT KNEE CAL 43

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	56.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.09 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5211.9 N

TEST MEETS SPECIFICATIONS

TECHNICIAN

*J.C. Mills*

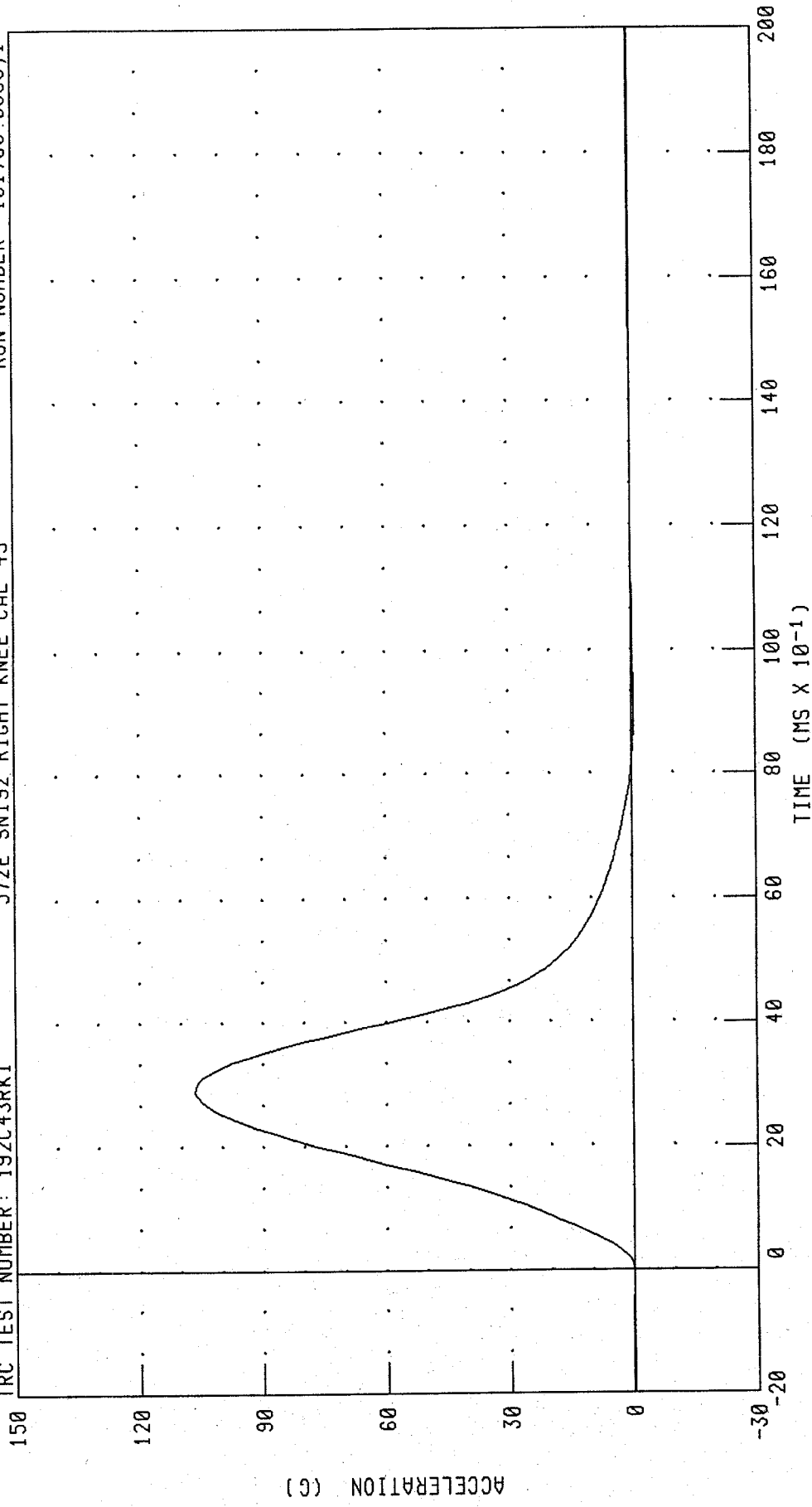
RUN NUMBER: 101700.0832;1

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

TRC TEST NUMBER: 192C43RK1

572E SN192 RIGHT KNEE CAL 43

RUN NUMBER: 101700.0833;1



CHANNEL: PENXC FILTER: CH. CLASS 600 PEAK DATA: 106.52 G @ 2.88 MS; -0.65 G @ 9.20 MS

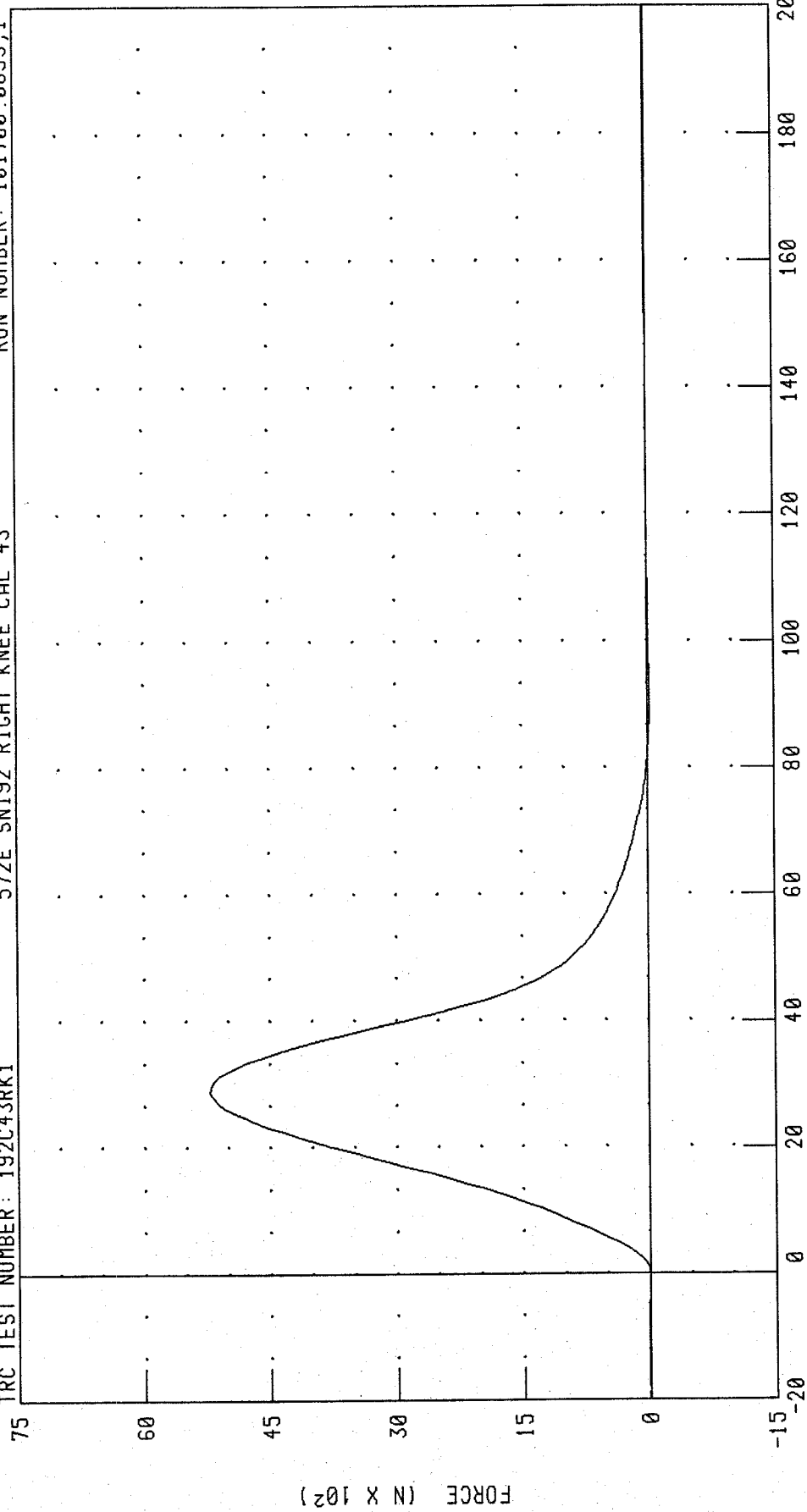
PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND.)

572E SN192 RIGHT KNEE CAL 43

RUN NUMBER: 101700.0833;1

TRC TEST NUMBER: 192C43RK1



PEAK DATA: 5211.92 N @ 2.88 MS; -32.02 N @ 9.20 MS

CHANNEL: PENXF FILTER: CH. CLASS 600

## Chapter 1 - Safety

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

**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."

2	Seat belts
3	Center head restraint
4	Front airbags (SRS)
8	Side impact airbags (SIPS)
9	Volvo Inflatable Curtain (VIC)
10	Whiplash Protection System (WHIPS)
11	Occupant safety
12	Child safety
16	Brake system
17	Anti-lock Brake System (ABS)
18	Stability Traction Control (STC)
18	Dynamic Stability Traction Control (DSTC)

## Seat belts

Always fasten the seat belts before you drive or ride. A chime will sound several times if the driver has not fastened his seat belt.

### To buckle:

Pull the belt out far enough to insert the latch plate into the receptacle until a distinct click 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).

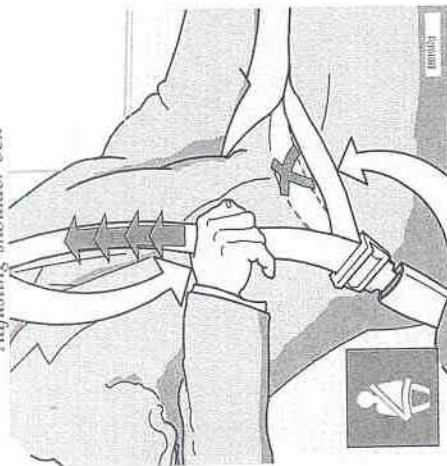
Make sure that the shoulder belt is rolled up into its retractor and that the shoulder and lap belts are taut.

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.

## Seat belts

*Adjusting shoulder belt*



*Lap portion of the belt should sit low*

**Child seats:** Please refer to page 14 for information on securing child seats with the seat belts.



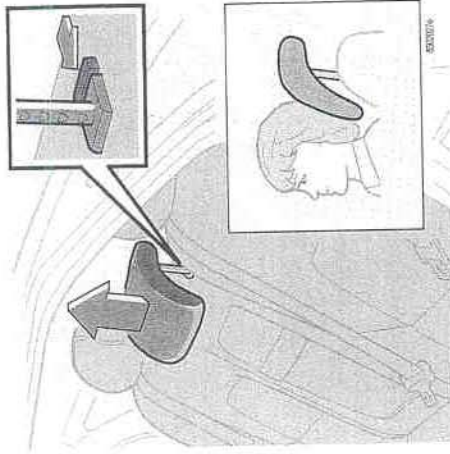
## During pregnancy

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.

## 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.
- 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.
- 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.



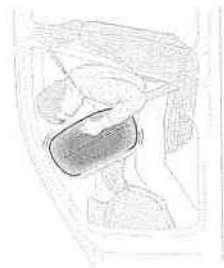
*Adjust head restraint height*

### 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.

The head restraint can be **raised** by pulling straight up or **lowered** by pressing the catch at the base of the left head restraint support and pushing down.

## Front airbags - SRS



*Driver's side airbag - in steering wheel hub*



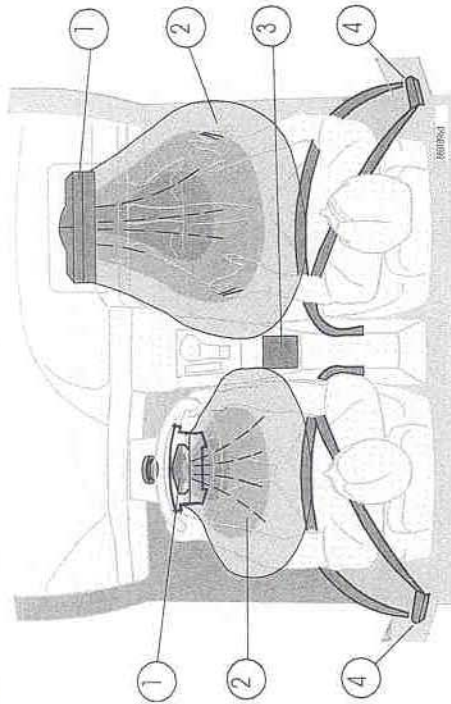
*Passenger's side airbag - above glove compartment*

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) 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. All three rear seat belts are also equipped with tensioners.

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

The airbags are folded and located in the steering wheel hub 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.

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.

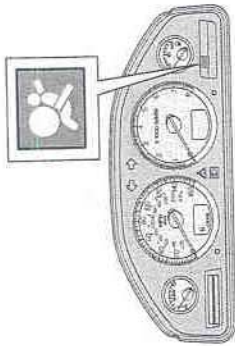


The entire process, including inflation and deflation of the airbags, takes approximately two-tenths of a second.

### **WARNING!**

- 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.
- 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.

## Front airbags - SRS



A self-diagnostic system incorporated in the sensor monitors the SRS. This system does not, however, monitor the Side Impact Protection System (SIPS) airbags. If a fault is detected, the 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 key is turned to positions I, II or III and should go out after 7 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 edge of the left rear door.

There is no maintenance to perform on the SRS yourself. The month and year shown on the decal on the door pillar indicate when you should contact your Volvo retailer for specific servicing or replacement of airbags and seatbelt tensioners. 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 Relations  
 P.O. Box 914  
 Rockleigh, New Jersey 07647-0914  
 800-458-1552

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

## Front airbags - SRS



SRS texts on outside of both sun visors



SRS texts on inside of both sun visors



SRS texts on the passenger's dash



SRS decals 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 occupants under 4 feet 7 inches (140 cm) in height who have outgrown these devices sit in the rear seat with the seat belt 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.

**NOTE: Volvo's dual-threshold air bags** use special sensors that are integrated with the front seat buckles. The point at which the air bag deploys is determined by whether or not the seat belt is being used, as well as the severity of the collision. Collisions can occur where only one of the airbags deploys.

**NOTE: Volvo's dual-stage air bags:** If the impact is less severe, but severe enough to present a clear injury risk, the dual-stage airbags are triggered at just 70% of its total capacity. If the impact is more severe, the dual-stage airbags are triggered with full capacity.

### WARNING!

- Children must never be allowed in the front passenger seat. Volvo recommends that ALL occupants (adults and children) shorter than 4 feet 7 inches (140 cm) be seated in the back seat of any vehicle with a front passenger-side front airbag. See page 14 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 dash. This should only be done by an authorized Volvo service technician.
- Failure to follow these instructions can result in injury to the vehicle occupants.

## Front airbags - SRS

**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. Front 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:**

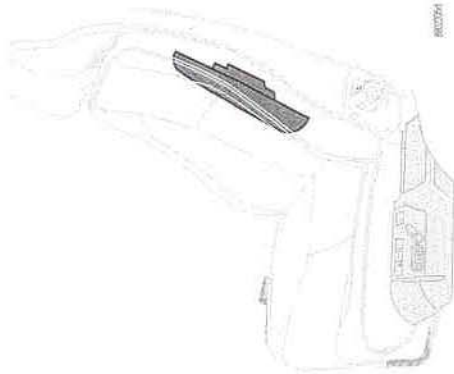
Before attempting to tow the car, use the following procedure to override the shiftlock system to move the gear selector to the neutral position.

- Switch off the ignition for at least 10 minutes and disconnect the battery
- Wait at least one minute
- Insert the key in the ignition and turn it to position II
- Press firmly on the brake pedal.
- Move the gear selector from (P)ark to the (N)eutral 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.

## Side impact airbags (SIPS)



SIPS airbag \*

### 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), wires (2) and gas generators/sensor units (3). 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).

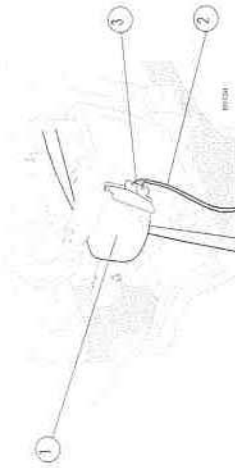
Never try to open or repair any components of the SIPS airbag system. This should be done only by an authorized Volvo service technician.

- In order for the SIPS airbag to provide its best protection, 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.

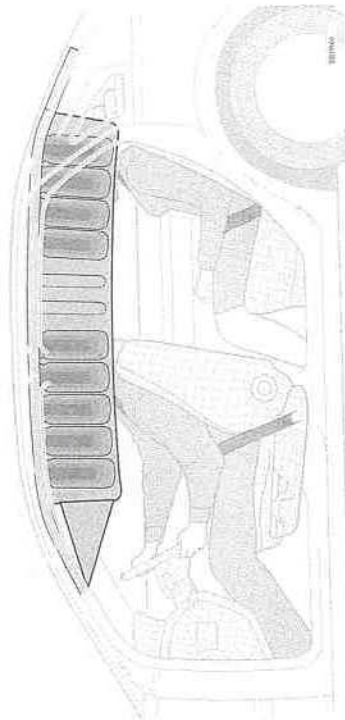


1 - Airbag, 2 - wire, 3 - gas generator/sensor unit

#### 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.

## Volvo Inflatable Curtain (VIC)



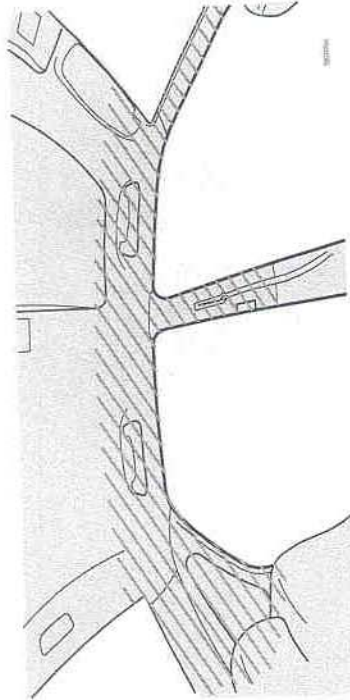
### Volvo Inflatable Curtain (VIC)

This system consists of inflatable curtains located along the sides of the roof liners, stretching from the center of both front side windows to the rear edge of the rear side door windows. It is designed to help protect the heads of the occupant of the front seat and the occupant of the outboard rear seat position in certain side impact collisions.

**NOTE:** IC system deployment occurs only on the side of the vehicle affected by the impact.

In certain side impacts, **BOTH** the Inflatable Curtain (IC) and the Side Impact Airbag System (SIPS-bag) will deploy, whereas, in some cases, **ONLY** the Inflatable Curtain (IC) will deploy. In cases where **BOTH** the IC and the SIPS-bag deploy, deployment will occur simultaneously.

If the inflatable curtain deploys, it remains inflated for approximately 3 seconds.



### WARNING!

- The IC system is a supplement to the Side Impact Protection System. It is not designed to deploy during collisions from the front or rear of the car or in most rollover situations.
- Never try to open or repair any components of the IC system. This should be done only by an authorized Volvo service technician.
- The inflatable curtains are designed to deploy only during certain side-impact collisions, depending on the crash severity, angle, speed and impact. The inflatable curtains are not designed to deploy in all side impact situations.
- In order for the IC to provide its best protection, both front seat occupants and both outboard rear seat occupants should sit in an upright position with the seat belt properly fastened; adults using the seat belt and children using the proper child restraint system. Only adults should sit in the front seats. Children must never be allowed in the front passenger seat. See page 14 for guidelines. Failure to follow these instructions can result in injury to the vehicle occupants in an accident.

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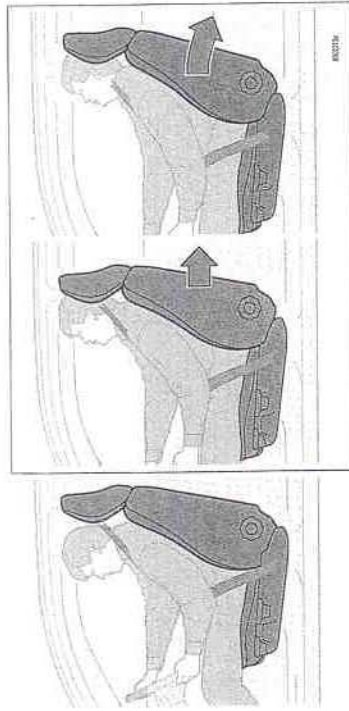
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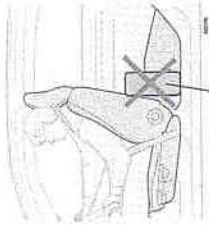
## Whiplash Protection System (WHIPS)



### Whiplash Protection System (WHIPS) - front seats only

The WHIPS system consists of specially designed hinges and brackets on the front seat backrests and head restraints designed to help absorb some of the energy generated in a collision from the rear ("rear-ended").

In the event of a collision of this type, the hinges and brackets of the front seat backrests are designed to change position slightly to allow the backrest/head restraint to help support the occupant's head before moving slightly rearward. This movement helps absorb some of the forces that could result in the whiplash effect.



*Do not wedge boxes, suitcases, etc. behind front seats*

#### **WARNING!**

- Any contact between the front seat backrests and the folded rear seat could impede the function of the WHIPS system. If the rear seat is folded down, the occupied front seats must be adjusted forward so that they do not touch the folded rear seat.
- Boxes, suitcases, etc. wedged behind the front seats (see illustration above) could impede the function of the WHIPS system.
- The WHIPS system is designed to supplement the other safety systems in your car. For this system to function properly, the three-point seat belt must be worn. Please be aware that no system can prevent all possible injuries that may occur in an accident.
- If your car has been involved in a collision, the front seat backrests must be inspected by an authorized Volvo retailer even if the seats appear to be undamaged. Certain components in the WHIPS system may need to be replaced. Do not attempt to service any component in the WHIPS system yourself.
- If the rear seat backrests are folded down, cargo must be secured to prevent it from sliding forward against the front seat backrests in the event of a collision from the rear. This could interfere with the action of the WHIPS system.
- The WHIPS system is designed to function in certain collisions from the rear, depending on the crash severity, angle and speed.
- Occupants in the front seats must never 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.

## Seat belt maintenance

Check periodically that the seat 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

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 202-366-0123 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.

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.

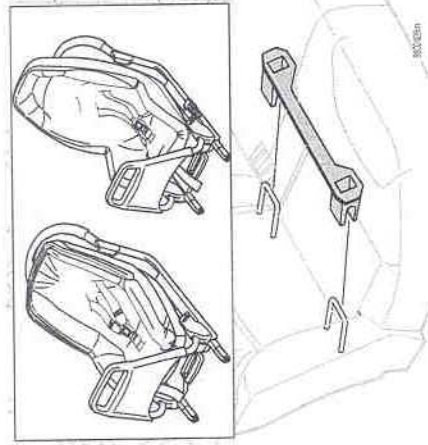
The tips listed below are suggestions to help you cope with the ever changing traffic environment.

- 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 headlights 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.

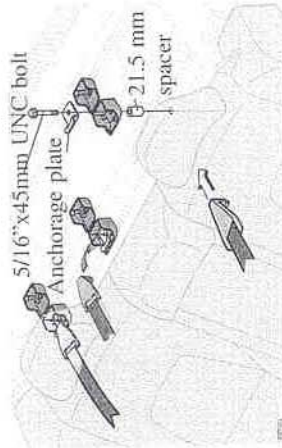
If you believe that your vehicle has a defect which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Volvo Cars of North

## Child safety



### Isofix fasteners and Seat guide

The Isofix fasteners are available as a retailer-installed option in the rear seat on the outboard positions. Consult your Volvo retailer for more information on child safety accessories.



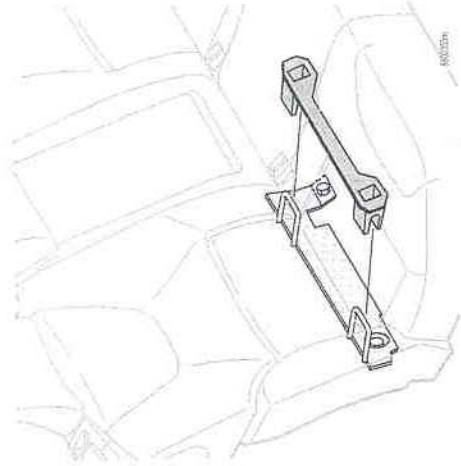
### Child restraint anchorages

Volvo cars are or can be fitted with child restraint top tether anchorages in the rear seat. There are three predrilled anchorage points in the rear window shelf.

### Installing the top tether

The predrilled holes for the child restraint anchorages are underneath the rear window shelf. A slot must be cut in the fabric on the shelf to install the anchorage bracket. This installation should be carried out by an authorized Volvo retailer.

Refer to the child seat manufacturer's instructions for information on securing the child 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



*Integrated booster cushion*

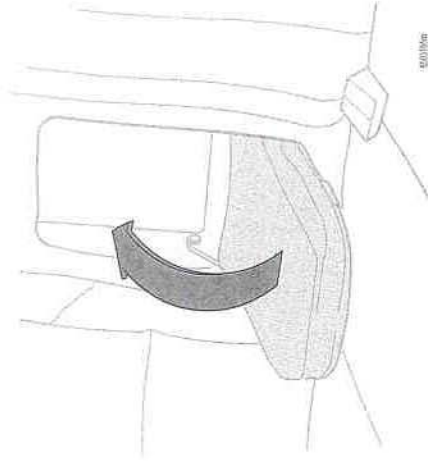
### **Integrated booster cushion (optional)**

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 33 and 80 lbs (15 and 36 kg) and between 38 and 54 in (97 and 137 cm) in height.

The child should be properly seated on the booster cushion (see illustration in left column). 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 manufacturer's instructions on the use of this child restraint system can result in your child striking the vehicle's interior during a sudden stop or crash. In the event of a collision while the integrated booster cushion was occupied, the entire booster cushion and 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.



### **Storing the booster cushion**

Fold the seat up - it will lock automatically to the backrest.

**NOTE:** Please also refer to the instructions on the integrated booster cushion.

## Child safety

### Keeping child seats in place (ALR/ELR\*)

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

#### When attaching the seat belt to a child seat:

- Attach the seat belt to the child seat according to the child seat manufacturer's instructions.
- Pull the seat belt out as far as possible.
- Insert the seat belt latch plate into the buckle (lock) in the usual way.
- Release the seat belt and pull it taut around the child seat. **A sound from the seat belt retractor will be audible at this time and is normal.**

The belt will now be locked in place.

**This function is automatically disabled when the seat belt is unlocked and the belt is fully retracted.**

#### 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.

\* Automatic Locking Retractor/Emergency Locking Retractor

### 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 with a three-point seat belt can help reduce serious injuries during certain types of accidents. Volvo recommends that you 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 passenger-side front 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) - 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 2). A specially designed and tested booster cushion (not available in Canada) for children between the age of 3 and approximately 10 years, weighing 33 - 80 lbs (15 - 36 kg) and 46 - 54" (117 - 137 cm) in height, can be obtained from your Volvo retailer.

**WARNING!**  
Do not use child safety seats or child booster cushions/backrests in the front passenger's seat. We also recommend that children under 4 feet 7 inches (140 cm) in height who have outgrown these devices sit in the rear seat with the seat belt fastened.

**WARNING!**  
Keep vehicle doors and trunk locked and keep keys out of a child's reach. Unsupervised children could lock themselves in an open trunk and risk injury. Children should be taught not to play in vehicles.

**WARNING!**  
On hot days, the temperature in the trunk or vehicle interior can rise very quickly. Exposure of people to these high temperatures for even a short period of time can cause heat-related injury or death. Small children are particularly at risk.