

TRC

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Report Numbers: TRC-96-V004

Full-Scale Frontal Impact Crash Testing
for Assessment of Protective Capability
of Down-Loaded Airbag Inflators

V2546

1996 Chevrolet Cavalier
into Frontal Load Cell Barrier
NHTSA No. RT107
TRC Test Number 960930

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December 15, 1996

Final Report

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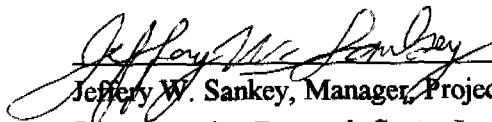


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16 Abstract A 1996 Chevrolet Cavalier 4-door sedan, NHTSA No RT107, was impacted into a frontal load cell barrier at Transportation Research Center Inc on September 30, 1996 This test was conducted to determine vehicle and occupant response in the frontal load cell barrier test mode with down-loaded driver and passenger airbag inflators The vehicle's velocity was 56.2 kph The vehicle's test weight was 1456 kg The vehicle's maximum crush was 539 millimeters The ambient temperature was 22° C The driver's Head Injury Criteria (HIC) was 746 The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 58.7 g The driver's chest maximum deflection was 30 mm the driver's left and right femur maximum axial forces were 5463 N and 7141 N, respectively The passenger's Head Injury Criteria (HIC) was 669 The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 77.1 g The passenger's chest maximum deflection was 22 mm The passenger's left and right femur maximum axial forces were 6509 N and 8142 N, respectively		
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

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

1 in = 2.54 (exact). For other exact conversions and more detailed tables, see NBS Monograph 161, 1986. Units of Weights and Measures, Price \$2.25. SD Catalog No. C13.10.286.

Approximate Conversions from Metric Measures

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

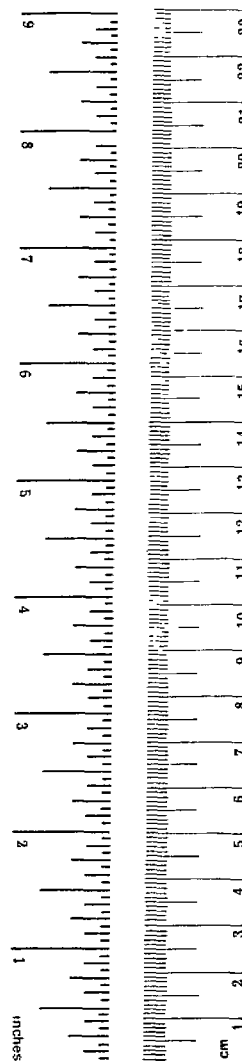
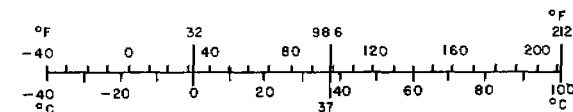


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Section 1 0

Purpose and Test Procedure

Purpose

This crash test was conducted to determine vehicle and occupant response in the 56 kph frontal load cell barrier impact with down-loaded airbag inflators. The test was performed on a 1996 Chevrolet Cavalier 4-door sedan.

Test Procedure

This test was conducted per Contract No. DTRS57-95-C-00011, Technical Task Directive No. 2, "Airbag Assessment Program."

The test vehicle's original airbag assemblies were replaced with modified airbag assemblies that contained 20% down-loaded inflators.

The test vehicle was instrumented with seven (7) accelerometers to measure longitudinal axis accelerations and two (2) accelerometers to measure vertical axis acceleration

The test vehicle contained two (2) Part 572 E 50th percentile adult male anthropomorphic test devices (dummies). The dummies were positioned in the front outboard designated seating positions according to the dummy placement procedure specified in Appendix C of the Laboratory Test Procedure TP-208-09. Each dummy was restrained by an airbag

The load cell barrier has thirty-six (36) load cells to measure longitudinal axis forces

The vehicle's specified velocity range was 55.5 to 57.1 kph

Both dummies were instrumented with head and chest center of gravity accelerometers to measure longitudinal, lateral, and vertical accelerations; neck upper 6-axis load cells to measure longitudinal, lateral, and vertical forces and moments, left and right femur load cells to measure axial forces; and with upper and lower tibia load cells to measure upper and lower tibia moment about the X- and Y-axis and lower tibia Z-axis forces. Each Part 572 E dummy's instrumentation also included a chest potentiometer to measure longitudinal deflection.

The ninety-five (95) data channels were digitally sampled at 12,500 samples per second and processed per Sections 11.13 through 11.15 of the Laboratory Test Procedure TP-208-09

The crash event was recorded by fourteen (14) high-speed motion picture cameras and one real-time camera.

The vehicle and occupant data are summarized in Section 2.0. The FMVSS 208 data are presented in Section 3.0. The vehicle, occupant, and camera measurements are presented in Section 4.0. Appendix A contains the still photographic prints. Appendix B contains the dummy and vehicle data plots. Appendix C contains the dummy calibration information. Appendix D contains miscellaneous test information.

Section 2.0

Frontal Load Cell Barrier Impact Test Summary

Test Results Summary

This 56 kph frontal load cell barrier crash test was conducted at TRC on September 30, 1996.

The test vehicle, a 1996 Chevrolet Cavalier 4-door sedan, was equipped with airbags at the driver's and right front passenger's seating positions. The vehicle's test weight was 1456 kg. The vehicle's maximum static crush was 539 mm. The vehicle's test speed was 56.2 kph.

The driver's Head Injury Criteria (HIC) was 746. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 58.7 g. The driver's chest maximum deflection was 30 mm. The driver's left and right femur maximum compressive forces were 5463 N and 7141 N, respectively.

The right front passenger's HIC was 669. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 77.1 g. The right front passenger's chest maximum deflection was 22 mm. The right front passenger's left and right femur maximum compressive forces were 6509 N and 8142 N, respectively.

Data Acquisition Explanations

The driver neck moment about Z axis, NEKZM1, recorded a data spike at 78 milliseconds.

The passenger neck Y-axis shear force, NEKYF2, recorded a data spike at 78 milliseconds.

The passenger neck Z-axis axial force, NEKZF2, recorded a data spike at 78 milliseconds.

The passenger neck moment about X axis, NEKXM2, recorded a data spike at 78 milliseconds.

The passenger neck moment about Z axis, NEKZM2, recorded a data spike at 78 milliseconds.

The left brake caliper X-axis accelerometer, BCLXG1, data failed to return to zero

Table 1 Crash Test Summary

Test type:	Frontal load cell barrier
Test date:	09/30/96
Test time:	1533
Ambient temperature at impact area.	22° C
Vehicle year/make/ model/body style:	1996/Chevrolet/Cavalier/4-door sedan
Vehicle test weight:	1456 kg
Impact angle ¹ :	0°
Impact velocity ² .	
Primary:	56.2 kph
Secondary	56.2 kph
Maximum static crush:	539 mm
Number of cameras	
High-speed:	14
Real-time	1
Door opening data	
Left-front:	Easy
Right-front:	Easy
Left rear:	Easy
Right rear.	Easy

¹ With respect to tow track centerline

² Speed trap measurement ($\pm$ 0.8 kph accuracy)

Table 1 Crash Test Summary, Cont'd

Dummies:	<u>Driver #142</u>	<u>Passenger #192</u>
Type:	Part 572 E	Part 572 E
Location:	Left front	Right front
Restraint:	Airbag	Airbag
Number of data channels:	25	25
Front seat data:		
Seat track failure:	None	None
Seat back failure	None	None
Visible dummy contact points:		
Head:	Airbag and sun visor/head restraint	Airbag and sun visor/head restraint
Chest:	Airbag	Airbag
Abdomen.	None	None
Left knee:	Instrument panel	Instrument panel
Right knee:	Instrument panel	Instrument panel

Table 2 Test Vehicle Information

Vehicle year/make/
model/body style: 1996/Chevrolet/Cavalier/4-door sedan

Color: White

VIN: 1G1JC5246T7288815

Engine data:

Placement: Transverse

Cylinders: 4

Displacement: 2.2 liters

Transmission data: 3 speed, manual, X automatic, overdrive

Final drive: X fwd, rwd, 4wd

Date vehicle received: 9/23/96

Odometer reading: 167

Dealer's name
and address: LeRoy Motors, Inc
7000 W Main Rd
LeRoy, NY 14482

Accessories:

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

Certification data from vehicle's label

Vehicle manufactured by: General Motors Corporation

Date of manufacture: 06/96

VIN: 1G1JC5246T7288815

GVWR: 1655 kg.

GAWR: Front: 906 kg

Rear: 749 kg

Table 2. Test Vehicle Information, Cont'd.

Size of tires on vehicle: P195/65R15
Spare tire: Temporary T115/70D14
Type of front seats: Bucket

Tire and capacity data from vehicle's label:

Recommended tire size: P195/65R15

Recommended cold tire pressure:

Front: 210 kPa

Rear: 210 kPa

Designated Seating Capacity:

Front 2

Rear 3

Total 5

Vehicle Capacity Weight 882 lbs.

Test vehicle attitudes:

Delivered attitude	LF: 688 mm	RF: 694 mm	LR: 707 mm	RR: 707 mm
Pre-Test attitude	LF: 673 mm	RF: 678 mm	LR: 662 mm	RR: 662 mm
Post-Test attitude	LF: 679 mm	RF: 659 mm	LR: 671 mm	RR: 654 mm

Table 2 Test Vehicle Information, Cont'd.

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

Right front	399	kg	Right rear	219	kg
Left front	411	kg	Left rear	224	kg
Total front weight	810	kg	(64.6% of total vehicle weight)		
Total rear weight	443	kg	(35.4% of total vehicle weight)		
Total delivered weight	1253	kg			

Calculation of test vehicle's target test weight:

RCLW = Rated Cargo and Luggage Weight

UDW = Unloaded Delivered Weight (1253 kg)

VCW¹ = Vehicle Capacity Weight = 400 kg

DSC = Designated Seating Capacity (5)

RCLW = VCW - 68 (DSC) = 400 - 68 (5) = 60 kg

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

Target test weight = 1253 + 60 + 152 = 1465 kg

Weight of test vehicle with required dummies and 51 kg of cargo weight:

Right front	432	kg	Right rear	289	kg
Left front	438	kg	Left rear	297	kg
Total front weight	870	kg	(59.7% of total vehicle weight)		
Total rear weight	586	kg	(40.3% of total vehicle weight)		
Total test weight	1456	kg	(0.6% under target test weight)		

Weight of ballast secured in vehicle cargo area: 12 kg

Components removed to meet target test weight: Trunk lid

CG rearward of front wheel centerline 1063 mm

Vehicle Wheelbase: 2642 mm

¹ From vehicle's tire load label

Table 3 Post-Impact Data

Test number: 960930
Test date: 09/30/96
Test time: 1533
Test type: Frontal Load Cell Barrier
Impact angle: 0°
Ambient temperature
at impact area: 22° C
Temperature in
occupant compartment: 22° C
Impact velocity:
Primary: 56.2 kph
Secondary: 56.2 kph
Specified range: 55.5 to 57.1 kph

Distance from vehicle to impactor.

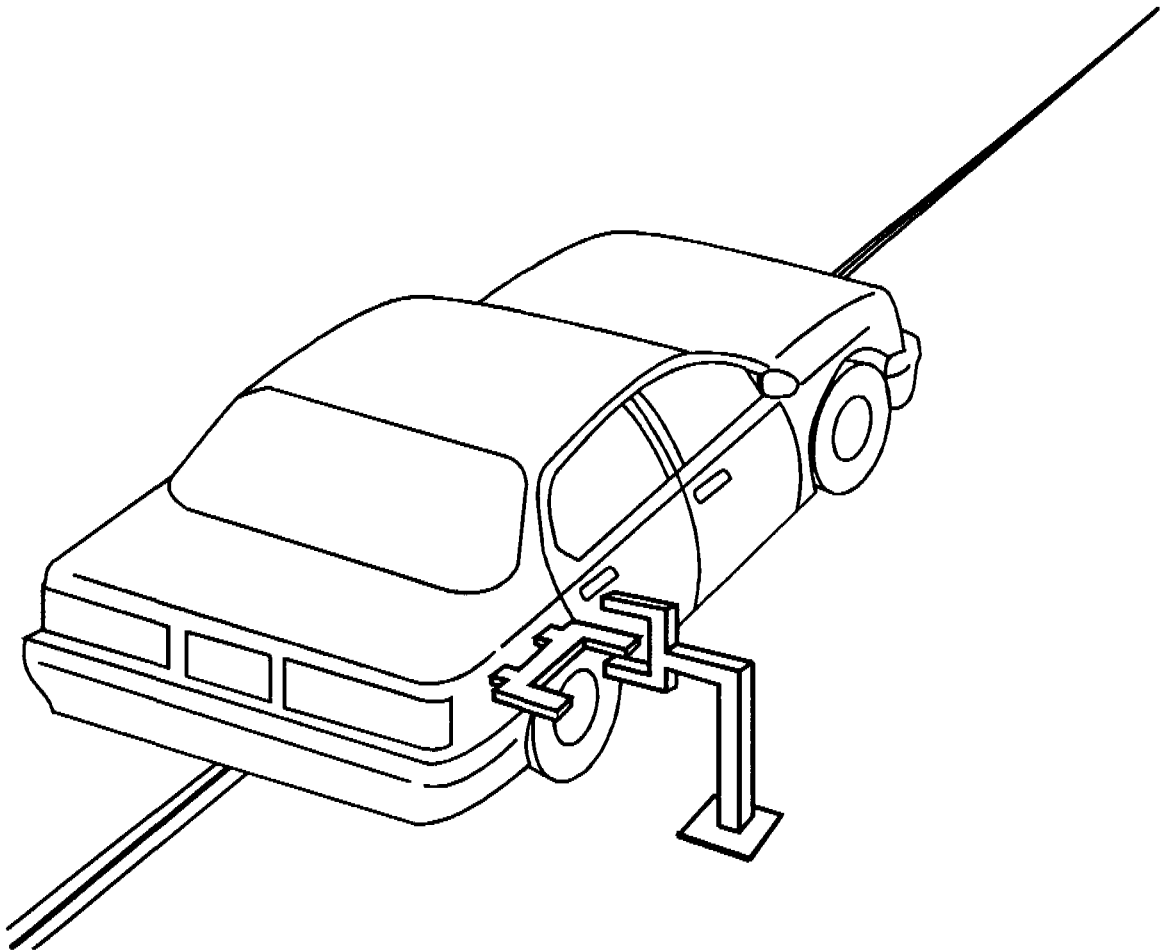
Entering velocity trap: 356 mm
Exiting velocity trap: 51 mm

Test vehicle static crush:

Overall length of test vehicle

Pre-test:	L: 4320 mm	C: 4579 mm	R: 4333 mm
Post-test	L: 3910 mm	C: 4040 mm	R: 4010 mm
Total crush:	L: 410 mm	C: 539 mm	R: 323 mm
Average crush:	424 mm		

Figure 1 Impact Velocity Measurement System



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

The vanes have 305-millimeter spacing

Figure 2 Accident Investigation Division Data

Test date: 09/30/96
 Vehicle year/make/model/body style: 1996/Chevrolet/Cavalier/4-door sedan
 VIN: 1G1JC5246T7288815
 Build date: 06/96
 Test weight: 1456 kg
 Vehicle wheelbase: 2642 mm
 Maximum width: 1715 mm
 Front overhang: 970 mm

Collision Deformation

Classification (CDC) Code: 12FDEW3

Crush depth measurements:

C1	410 mm
C2	491 mm
C3	520 mm
C4	525 mm
C5	483 mm
C6	323 mm

Midpoint of damage D Vehicle Longitudinal Centerline

Length of damaged region: L. 1525 mm

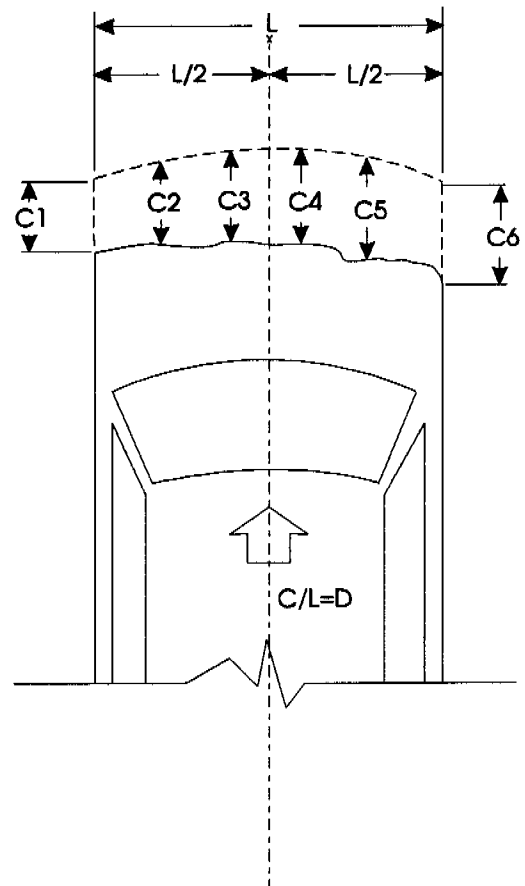
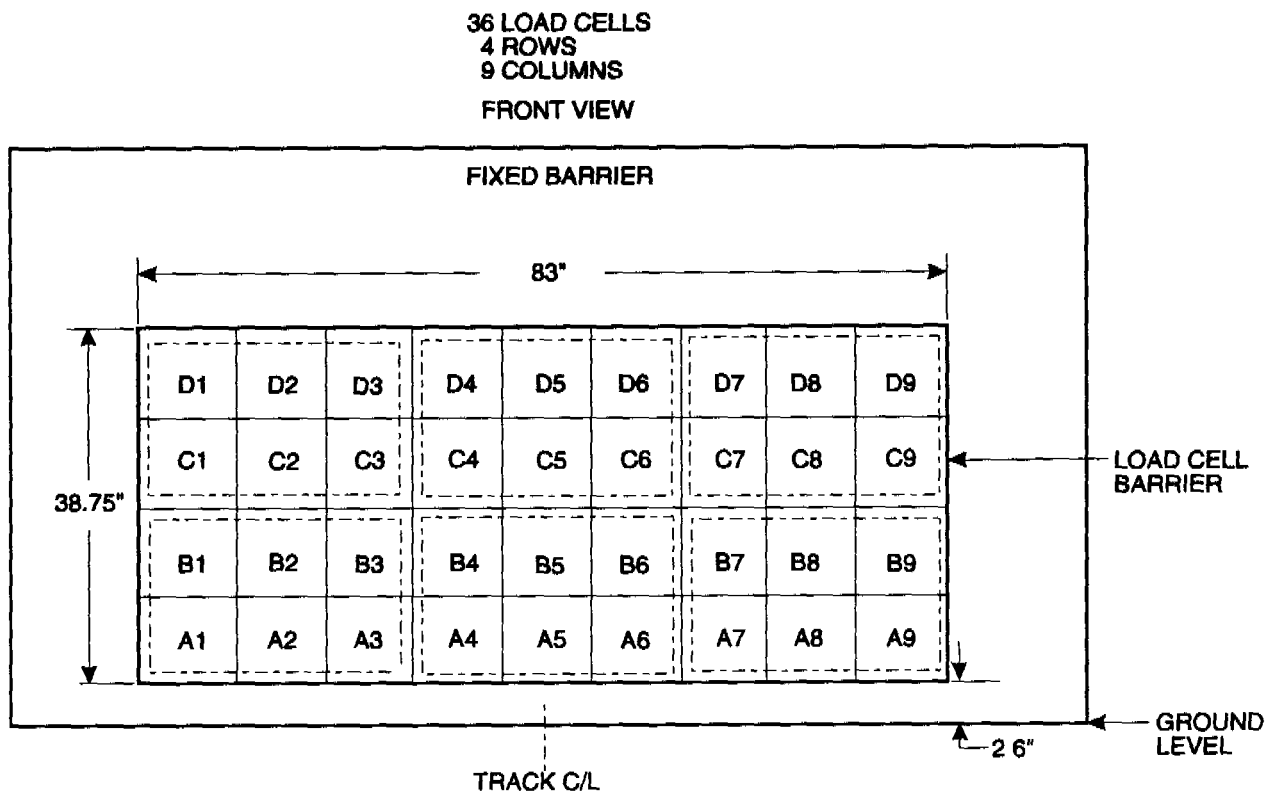


Figure 3 Load Cell Barrier Configuration



- 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 4 Load Cell Barrier Data Summary

Location	Positive direction	Negative direction
Total group 1	4.0 kN @ 6.1 ms	88.0 kN @ 20.5 ms
Total group 2	0.1 kN @ 165.6 ms	245.8 kN @ 37.5 ms
Total group 3	2.9 kN @ 5.7 ms	118.9 kN @ 37.4 ms
Total group 4	0.4 kN @ 4.6 ms	58.4 kN @ 34.3 ms
Total group 5	0.1 kN @ 4.6 ms	55.4 kN @ 37.5 ms
Total group 6	1.1 kN @ 16.2 ms	49.5 kN @ 31.8 ms
Total load cell force	0.0 kN @ 169.8 ms	585.6 kN @ 36.7 ms

Tension is positive
Compression is negative

Section 3 0

FMVSS 208 Data

Table 5 Dummy Injury Criteria

Maximum Acceleration

	Head				Chest		
	X	Y	Z	R	X	Y	Z
Driver	-62.8 g	-12.3 g	25.4 g	64.5 g	-60.0 g	-5.0 g	-20.2 g
Passenger	-54.6 g	27.9 g	-79.0 g	91.2 g	-76.8 g	9.5 g	-74.9 g

Maximum Femur Compressive Force

	Left Femur	Right Femur
Driver	5463 N	7141 N
Passenger	6509 N	8142 N

Head Injury Criteria¹

	HIC	Time t ₁	Time t ₂
Driver	746	62.1 ms	98.1 ms
Passenger	669	69.8 ms	105.8 ms

Chest Maximum Resultant Acceleration²

	Acceleration	Time t ₁	Time t ₂
Driver	58.7 g	77.3 ms	80.3 ms
Passenger	77.1 g	71.5 ms	74.9 ms

Maximum Chest Deflection

Driver	30 mm
Passenger	22 mm

¹ As defined in FMVSS No. 208

² Defined as equal to or exceeding 0.003 sec duration

Section 4.0

Vehicle, Occupant, and Camera Measurements

Figure 4 Pre-test and Post-test Measurement Points

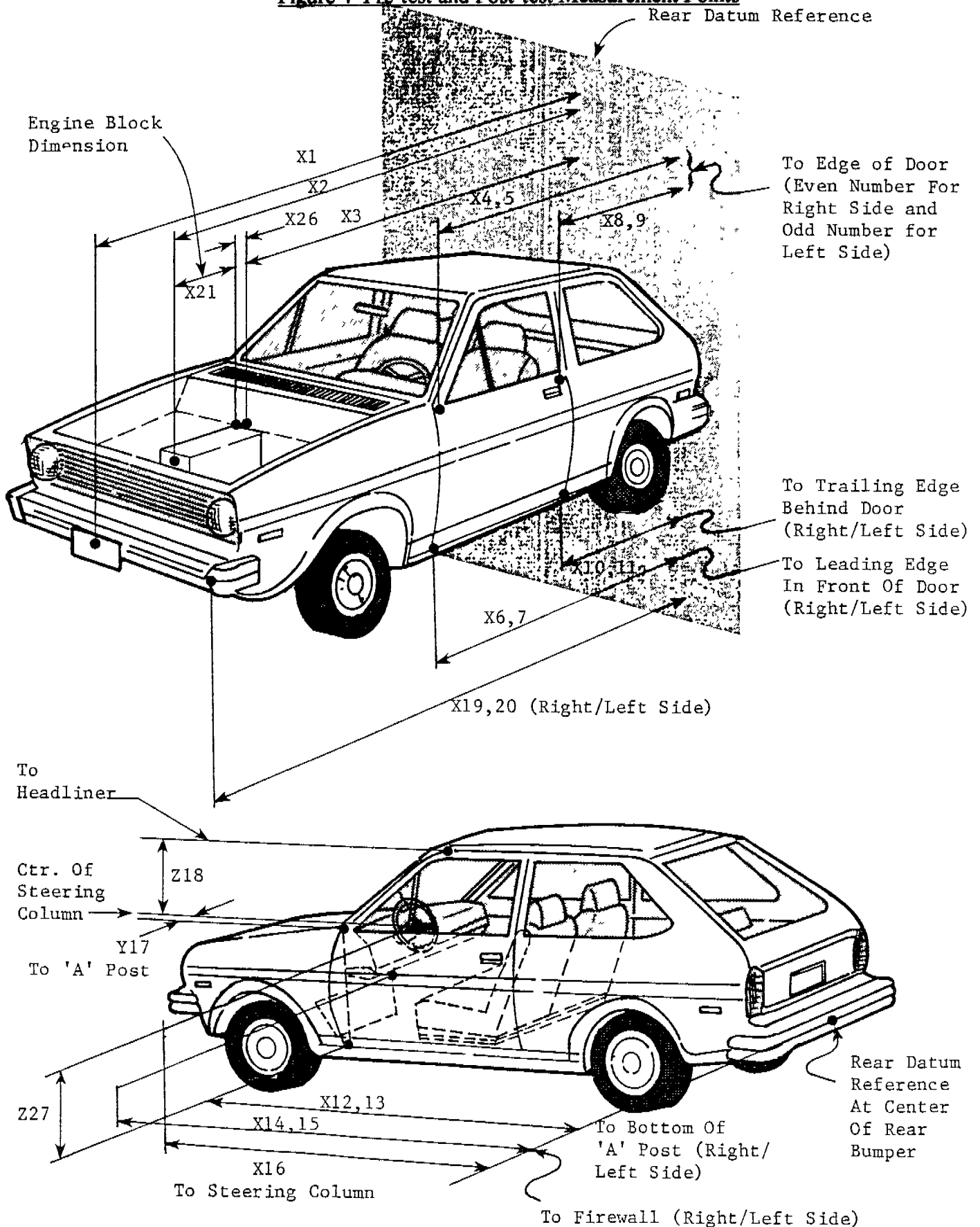


Figure 4 Pre-test and Post-test Measurement Points, Cont'd.

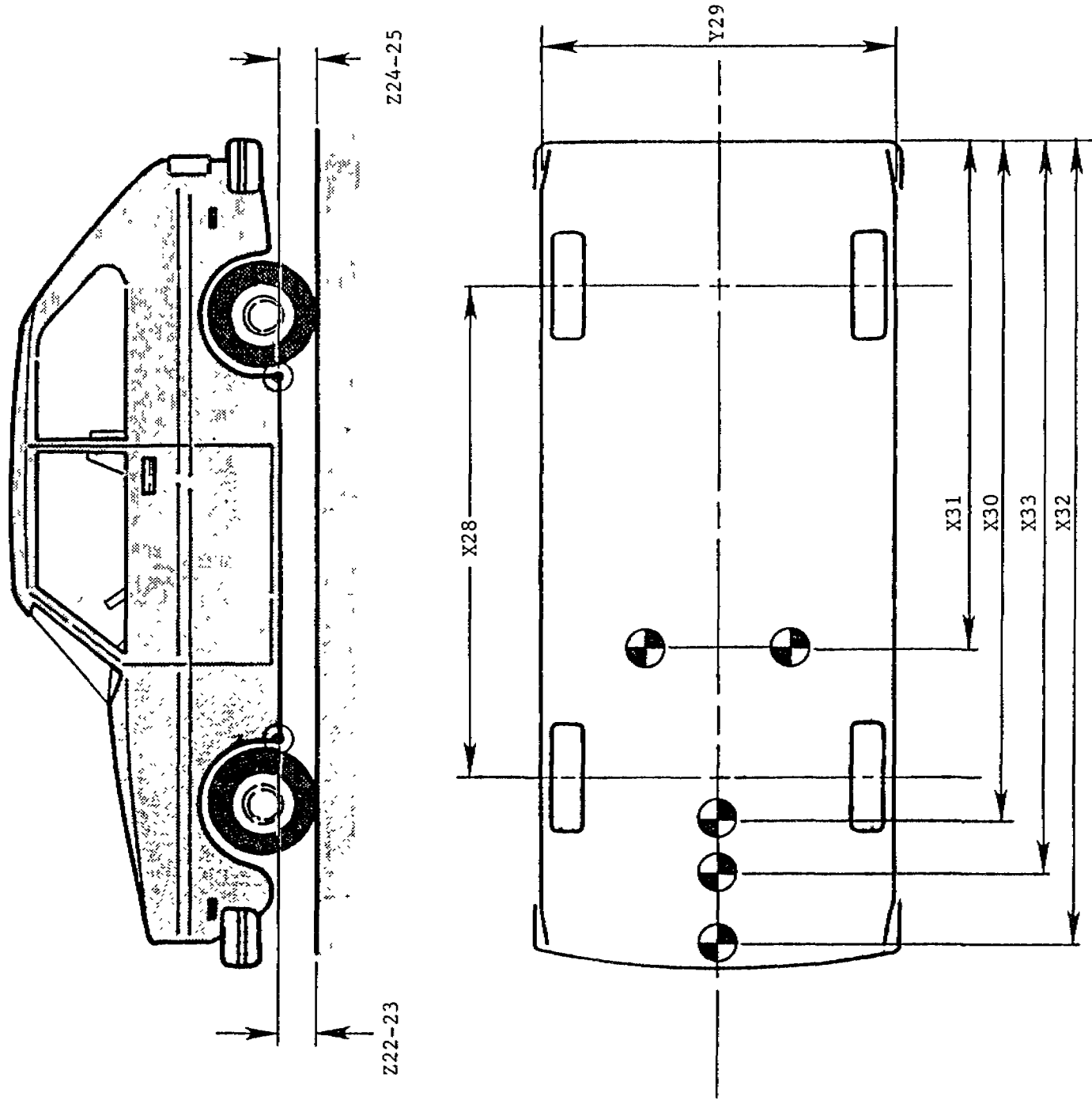


Table 6 Vehicle Measurements

Vehicle year/make/model/body style: 1996/Chevrolet/Cavalier/4-door sedan

Test Number 960930

No	Type of measurement	Pre-test	Post-test	Difference
X1	Total length of vehicle at centerline	4579 mm	4040 mm	539 mm
X2	Rear surface of vehicle to front of engine block	3844 mm	3629 mm	215 mm
X3	Rear surface of vehicle to firewall	3439 mm	3306 mm	133 mm
X4	Rear surface of vehicle to upper leading edge of right door	3094 mm	3091 mm	3 mm
X5	Rear surface of vehicle to upper leading edge of left door	3084 mm	3092 mm	-8 mm
X6	Rear surface of vehicle to lower leading edge of right door	3078 mm	3065 mm	13 mm
X7	Rear surface of vehicle to lower leading edge of left door	3090 mm	3083 mm	7 mm
X8	Rear surface of vehicle to upper trailing edge of right door	2052 mm	2059 mm	-7 mm
X9	Rear surface of vehicle to upper trailing edge of left door	2045 mm	2058 mm	-13 mm
X10	Rear surface of vehicle to lower trailing edge of right door	2045 mm	2033 mm	12 mm
X11	Rear surface of vehicle to lower trailing edge of left door	2050 mm	2049 mm	1 mm
X12	Rear surface of vehicle to bottom of "A" post on right side	3045 mm	3054 mm	-9 mm
X13	Rear surface of vehicle to bottom of "A" post on left side	3041 mm	3064 mm	-23 mm
X14	Rear surface of vehicle to firewall - right side	3434 mm	3276 mm	158 mm
X15	Rear surface of vehicle to firewall - left side	3442 mm	3456 mm	-14 mm
X16	Rear surface of vehicle to steering wheel center	2651 mm	2719 mm	-68 mm
X17	Center of steering column to "A" post	287 mm	288 mm	-1 mm
X18	Center of steering column to headliner	440 mm	375 mm	65 mm
X19	Rear surface of vehicle to right side of front bumper	4333 mm	4010 mm	323 mm
X20	Rear surface of vehicle to left side of front bumper	4320 mm	3910 mm	410 mm
X21	Length of engine block	440 mm	440 mm	0 mm

Table 6 Vehicle Measurements, Cont'd.

Vehicle year/make/model/body style: 1996/Chevrolet/Cavalier/4-door sedan

Test Number. 960930

No	Type of measurement	Pre-test	Post-test	Difference
X22	Right front sill to ground plane	212 mm	203 mm	9 mm
X23	Left front sill to ground plane	214 mm	210 mm	4 mm
X24	Right rear sill to ground plane	198 mm	256 mm	-58 mm
X25	Left rear sill to ground plane	192 mm	250 mm	-58 mm
X26	Firewall to engine or transaxle	230 mm	180 mm	50 mm
X27	Vertical dimension from door sill to centerline of steering column	550 mm	600 mm	-50 mm
X28	Wheelbase of vehicle	2642 mm	2525 mm	117 mm
X29	Width of vehicle at maximum width point	1715 mm	NA mm	NA mm
X30	Rear surface of vehicle to engine target	3844 mm	3629 mm	215 mm
X31	Rear surface of vehicle to compartment target	NA mm	NA mm	NA mm
X32	Rear surface of vehicle to bumper target	4523 mm	3948 mm	575 mm
X33	Rear surface of vehicle to frame crossmember	3439 mm	3306 mm	133 mm

Figure 5 Vehicle Target Locations

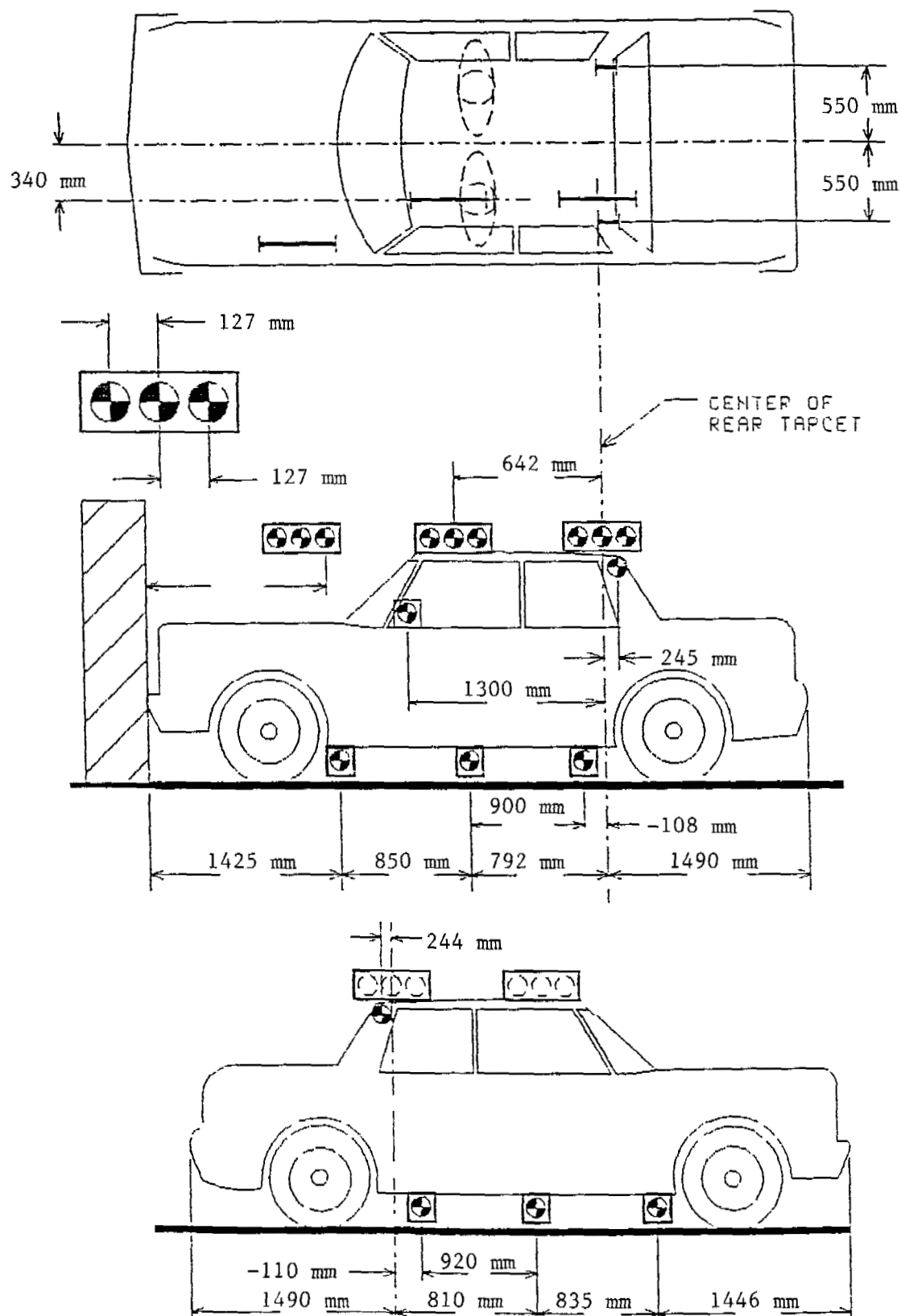
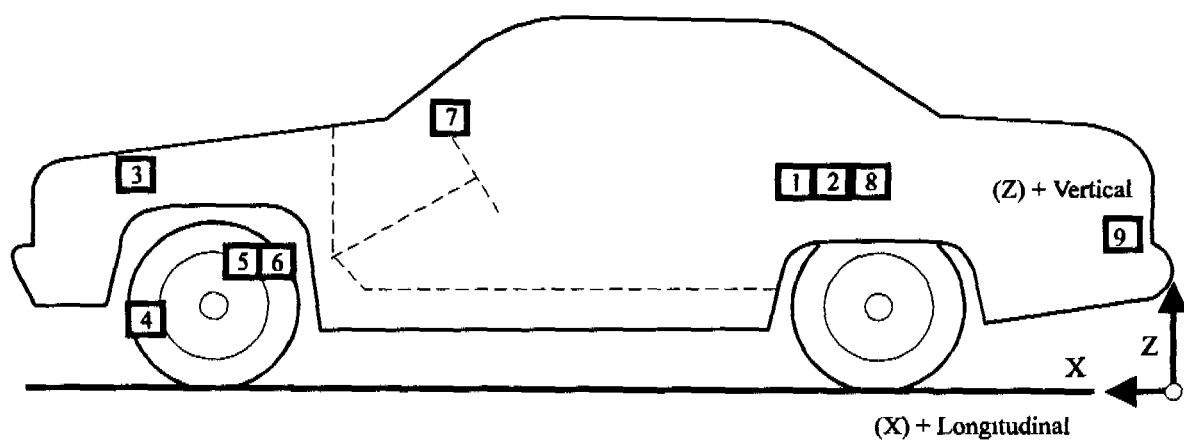
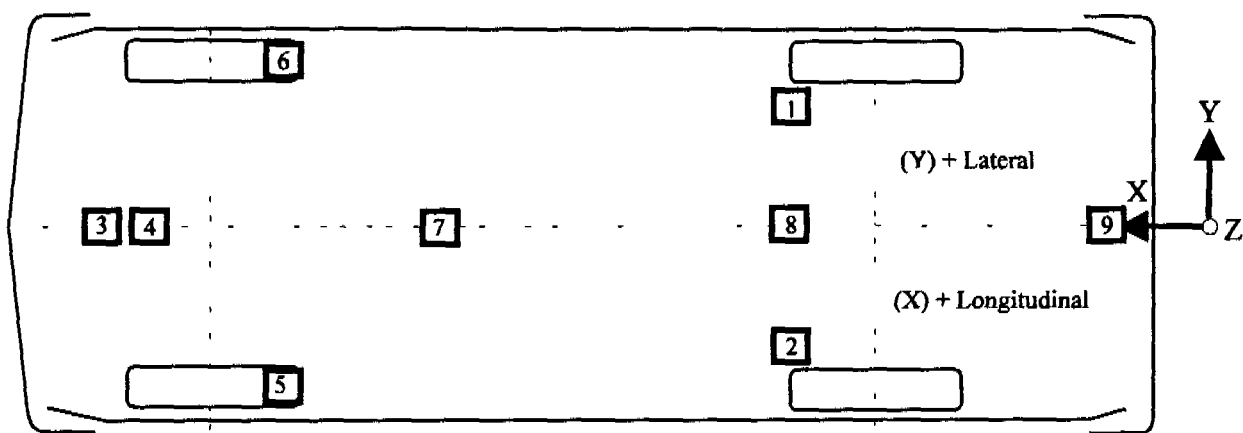


Figure 6 Vehicle Accelerometer Locations



Side View



Bottom View

Table 7 Vehicle Accelerometer Locations and Data Summary

TEST NUMBER: 960930 No. LOCATION	X	Y	Z	POSITIVE DIRECTION		NEGATIVE DIRECTION	
1 LEFT REAR SEAT CROSSMEMBER LONGITUDINAL	1862 mm	695 mm	305 mm	1.9 g	@ 114.2 ms	38.5 g	@ 45.8 ms
2 RIGHT REAR SEAT CROSSMEMBER LONGITUDINAL	1862 mm	-695 mm	305 mm	2.0 g	@ 109.9 ms	38.5 g	@ 45.2 ms
3 ENGINE TOP LONGITUDINAL	3803 mm	-220 mm	778 mm	31.3 g	@ 44.6 ms	123.0 g	@ 36.1 ms
4 ENGINE BOTTOM LONGITUDINAL	3785 mm	-95 mm	145 mm	22.5 g	@ 44.9 ms	102.6 g	@ 33.7 ms
5 RIGHT BRAKE CALIPER LONGITUDINAL	3700 mm	-641 mm	314 mm	29.6 g	@ 65.2 ms	116.7 g	@ 46.6 ms
6 LEFT BRAKE CALIPER LONGITUDINAL ¹	3700 mm	641 mm	314 mm	---	---	---	---
7 INSTRUMENT PANEL CENTER LONGITUDINAL	3019 mm	0 mm	850 mm	95.8 g	@ 28.7 ms	116.0 g	@ 46.8 ms
8 REAR SEAT CROSSMEMBER CENTER VERTICAL	1910 mm	0 mm	236 mm	14.2 g	@ 45.8 ms	23.8 g	@ 52.2 ms

Table 7 Vehicle Accelerometer Locations and Data Summary, Cont'd.

TEST NUMBER: 960930 No. LOCATION	X	Y	Z	POSITIVE DIRECTION	NEGATIVE DIRECTION
9 VEHICLE REAR CENTER VERTICAL	254 mm	0 mm	463 mm	6.4 g @ 49.1 ms	7.2 g @ 26.5 ms

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

¹See DATA ACQUISITION EXPLANATIONS

Figure 7 Dummy Measurement Locations for Front Seat Occupants

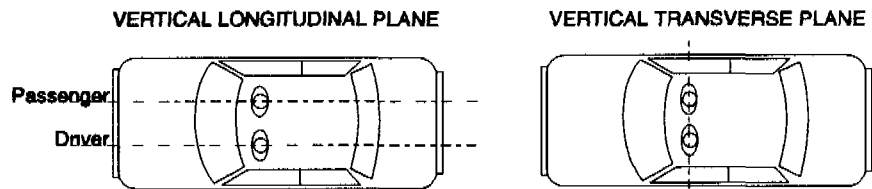
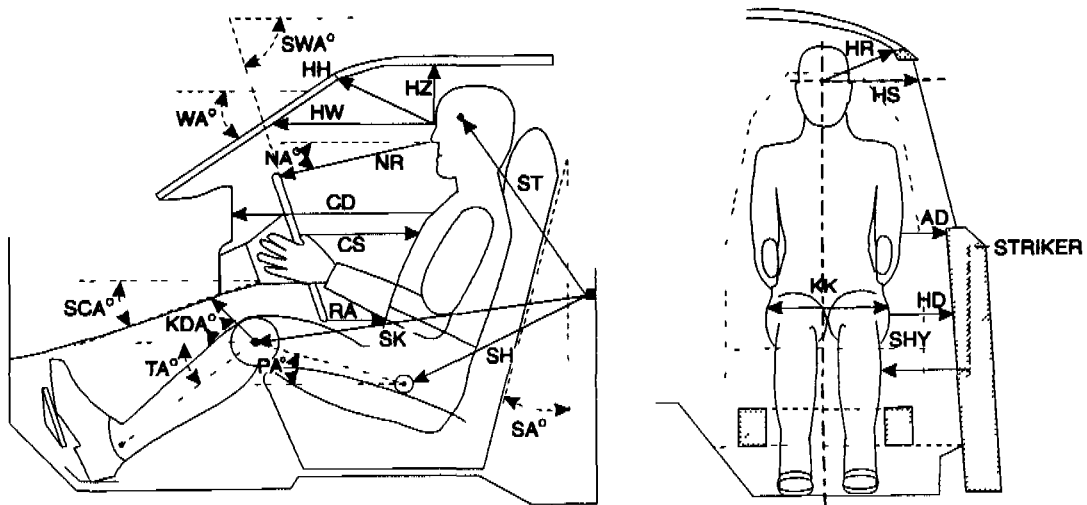


Table 8 Dummy Measurement Data For Front Seat Occupants

Designation	Type of Measurement	Driver (Serial #142)	Passenger (Serial #192)
WA	Windshield angle	26°	26°
SWA	Steering wheel angle	70°	NA
SCA	Steering column angle	20°	NA
SA	Seat back angle	25°	25°
HZ	Head to roof	178 mm	174 mm
HH	Head to header	300 mm	293 mm
HW	Head to windshield	537 mm	537 mm
HR	Head to side header	191 mm	171 mm
NR	Nose to rim	375 mm	NA
NA	Nose to rim angle	12°	NA
CD	Chest to dash	508 mm	463 mm
CS	Steering wheel to chest	291 mm	NA
RA	Rim to abdomen	191 mm	NA
KDL	Left knee to dash	163 mm	116 mm
KDR	Right knee to dash	166 mm	144 mm
KDA	Outboard knee to dash angle	28°	22°
PA	Pelvic angle	22 5°	24°
TA	Tibial angle	40°	44°
KK	Knee to knee	325 mm	262 mm
ST ¹	Striker to head	534 mm	527 mm
	Striker to head angle	-84°	-85°
SK ¹	Striker to knee	577 mm	565 mm
	Striker to knee angle	3°	0°
SH ¹	Striker to H-point	237 mm	229 mm
	Striker to H-point angle	32°	32°
SHY	Striker to H-point (Y dir.)	244 mm	270 mm
HS	Head to side window	308 mm	302 mm
HD	H-point to door	120 mm	141 mm
AD	Arm to door	127 mm	138 mm

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

Figure 8 Camera Positions

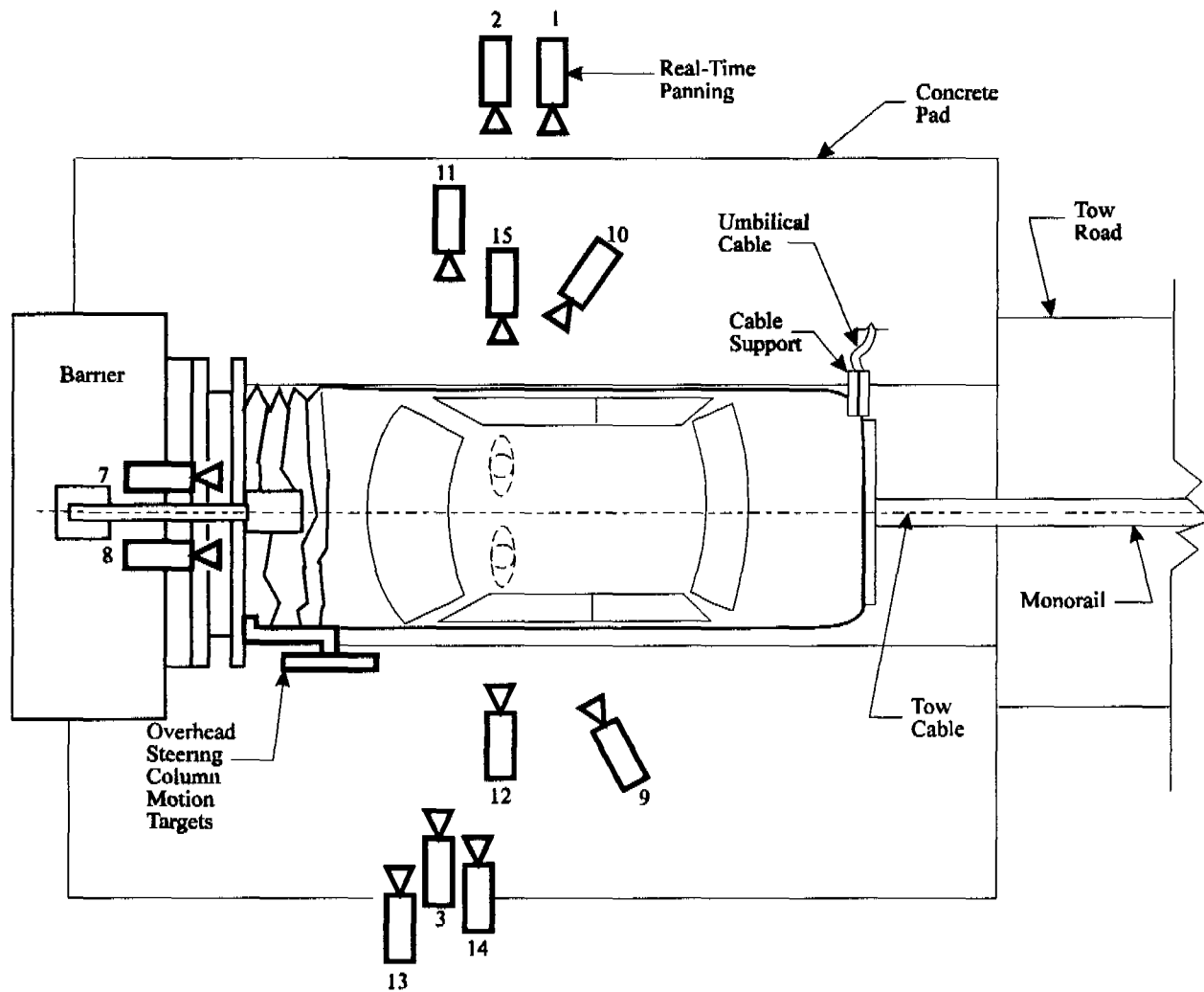


Diagram illustrating a vehicle impact test setup. The setup includes a vehicle (car) positioned on a test track, impacting a barrier. The barrier is labeled "Barrier" and "Barrier Face Extension Above Load Cell Assembly". A "Load Cell Assembly" is shown below the barrier. A "Photographic Target" is shown on the car. Two cameras, labeled "8,7" and "4", are positioned above the barrier. Two cameras, labeled "5" and "6", are positioned below the car. The car has several targets on its side and roof.

Table 9 Motion Picture Camera Locations

Vehicle year/make/model/body style: 1996/Chevrolet/Cavalier/4-door sedan

Test number: 960930

Camera Number	View	Camera Positions			Type of Camera	Camera		Film	
		X	Y	Z		Lens		Speed	
1	Real-time panning	NA	NA	NA	Bolex	16	mm	24	frames/s
2	Right wide	2286	7010	1206	Stalex	13	mm	810	frames/s
3	Left wide	2438	-6706	1156	Photosonic	13	mm	810	frames/s
4	Barrier - wide	546	0	2134	Photosonic	8.5	mm	808	frames/s
5	Pit - engine	1067	0	-2616	Photosonic	13	mm	992	frames/s
6	Pit - tank	2591	0	-2794	Photosonic	13	mm	1000	frames/s
7	Barrier - passenger	533	305	2184	Photosonic	17	mm	800	frames/s
8	Barrier - Driver	508	-305	2146	Photosonic	17	mm	810	frames/s
9	Left angle	3200	-1829	2273	Photosonic	25	mm	948	frames/s
10	Right angle	3353	2134	2375	Photosonic	25	mm	810	frames/s
11	Right medium tight	1524	6248	1327	Hycam	25	mm	833	frames/s
12	Left medium tight	1981	-6401	1308	Hycam	25	mm	800	frames/s
13	Left steering column lower	3048	-7620	1626	Photosonic	25	mm	798	frames/s
14	left steering column upper	3048	-7315	2597	Photosonic	25	mm	805	frames/s
15	Right passenger perpendicular	1829	7315	1143	Fastex	50	mm	805	frames/s

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960930

Appendix A

Photographs

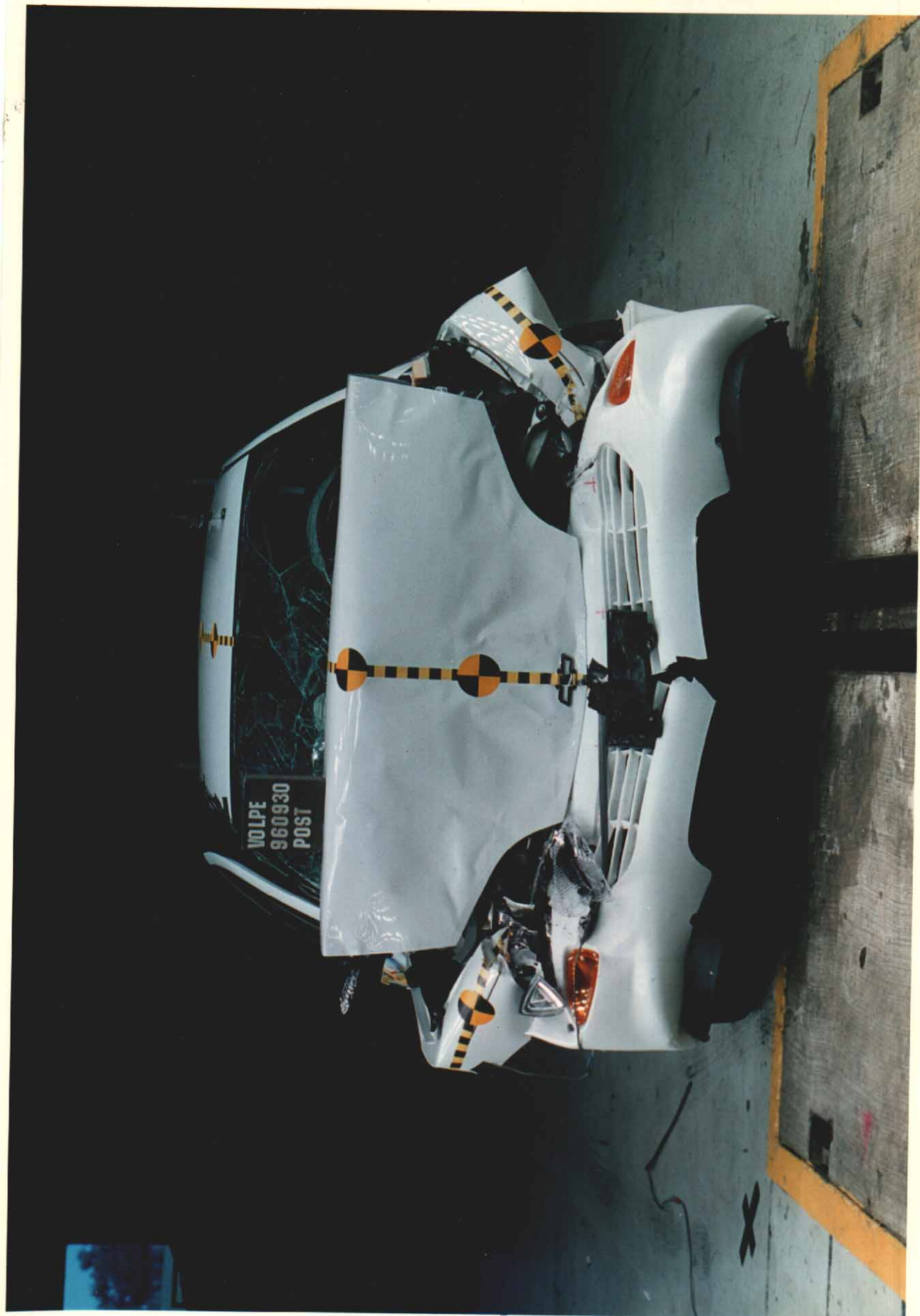


Figure A-2 Post-Test Front View

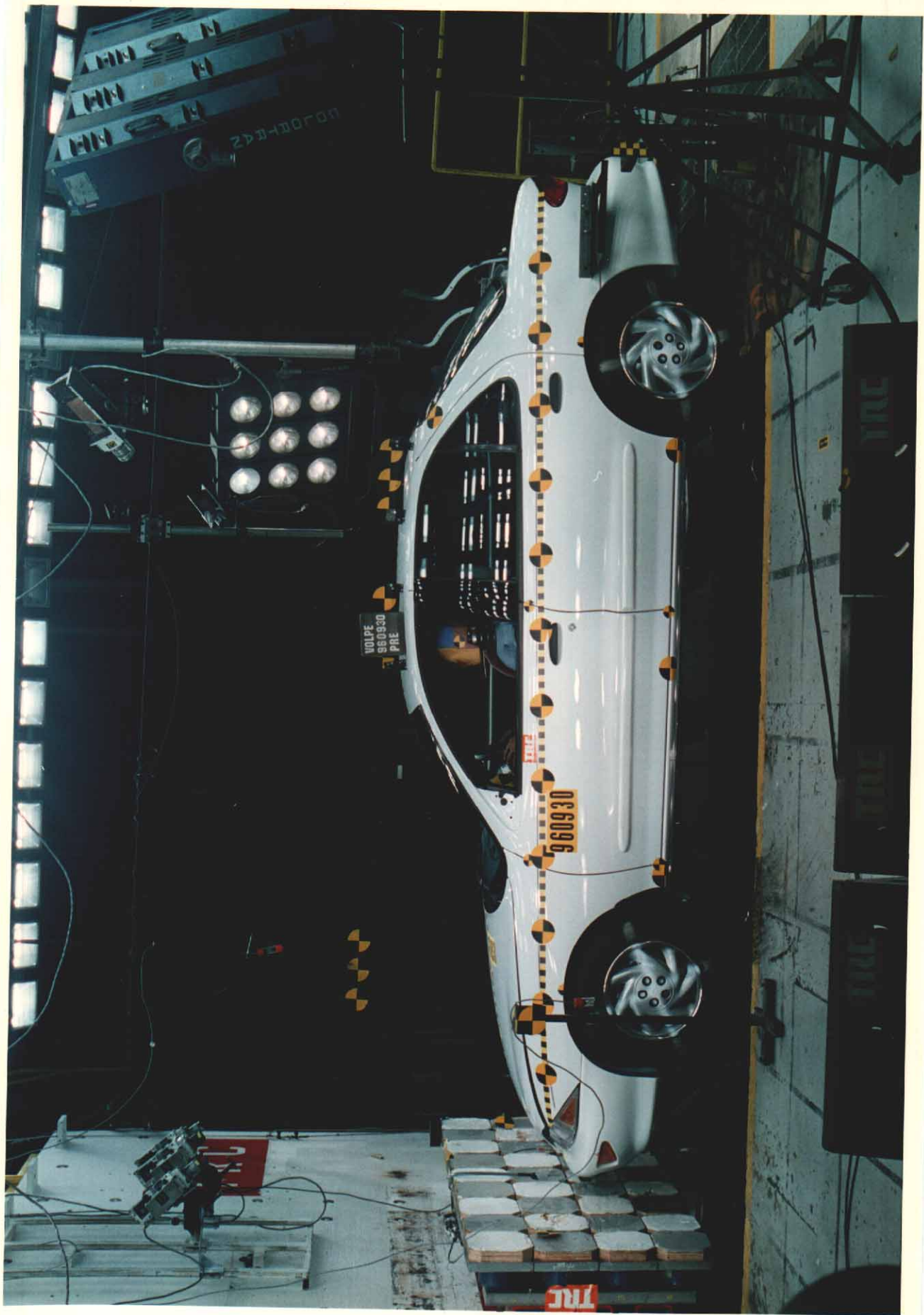


Figure A-3 Pre-Test Left Side View

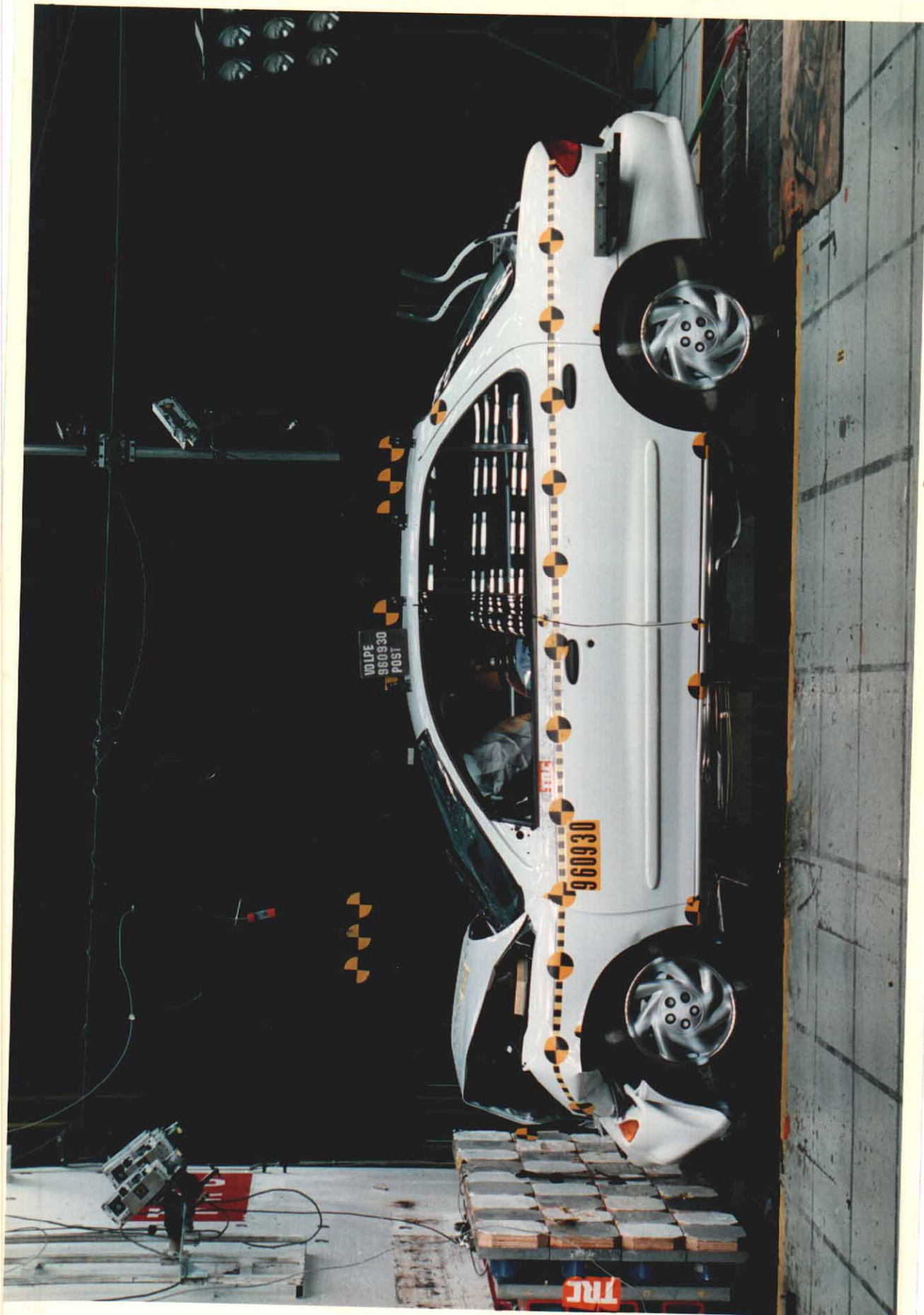


Figure A-4 Post-Test Left Side View

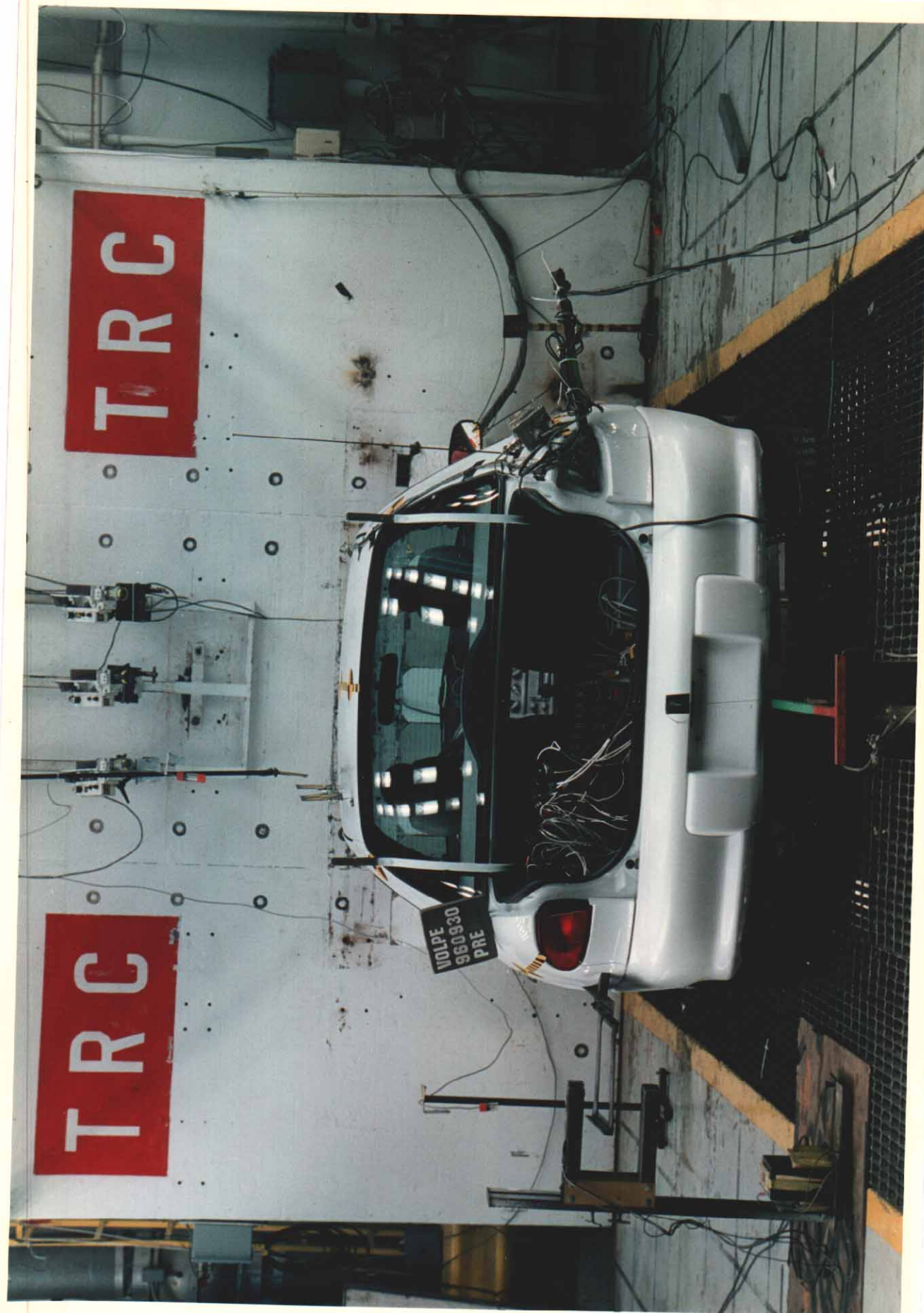


Figure A-5 Pre-Test Rear View



Figure A-6 Post-Test Rear View

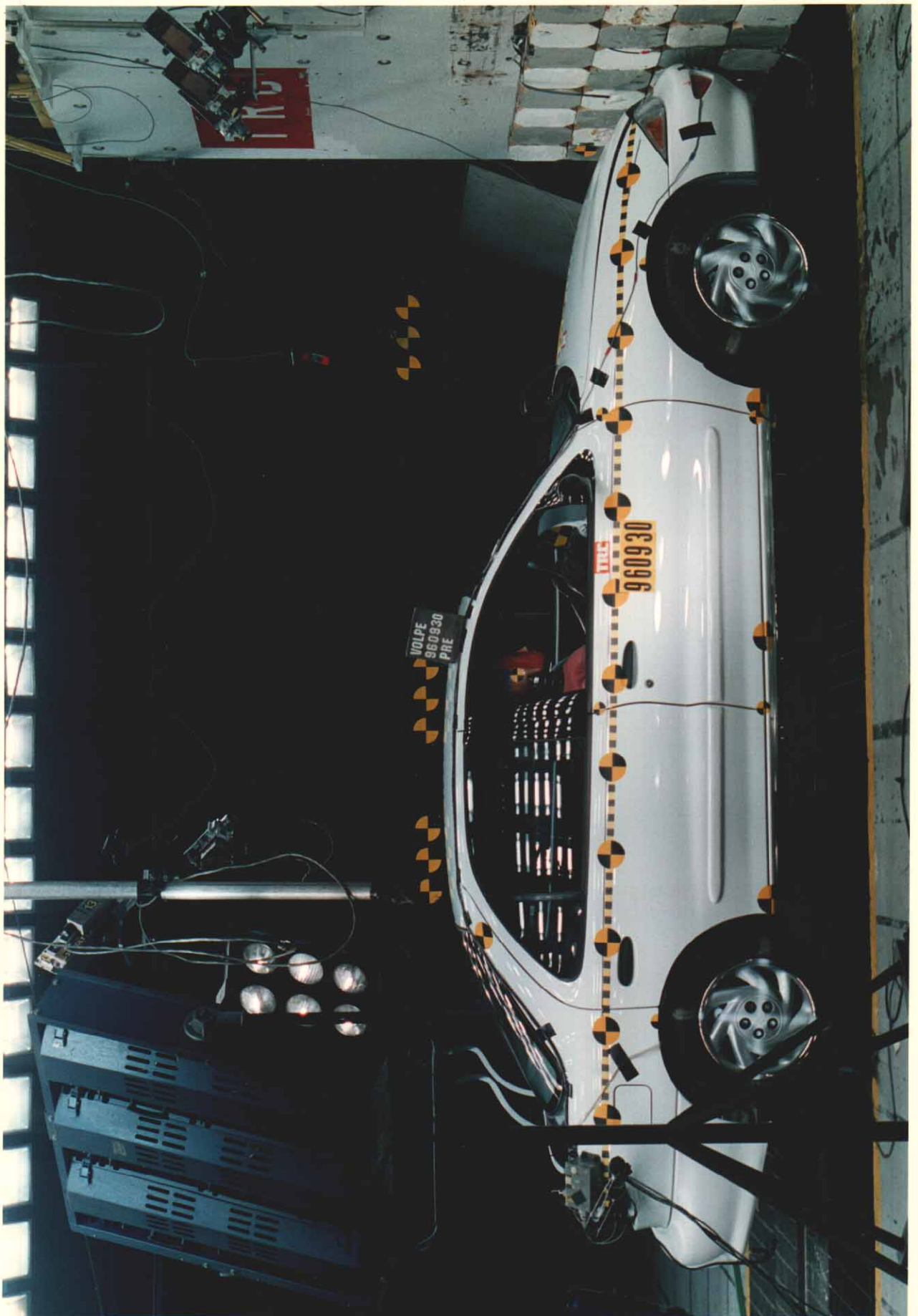


Figure A-7 Pre-Test Right Side View

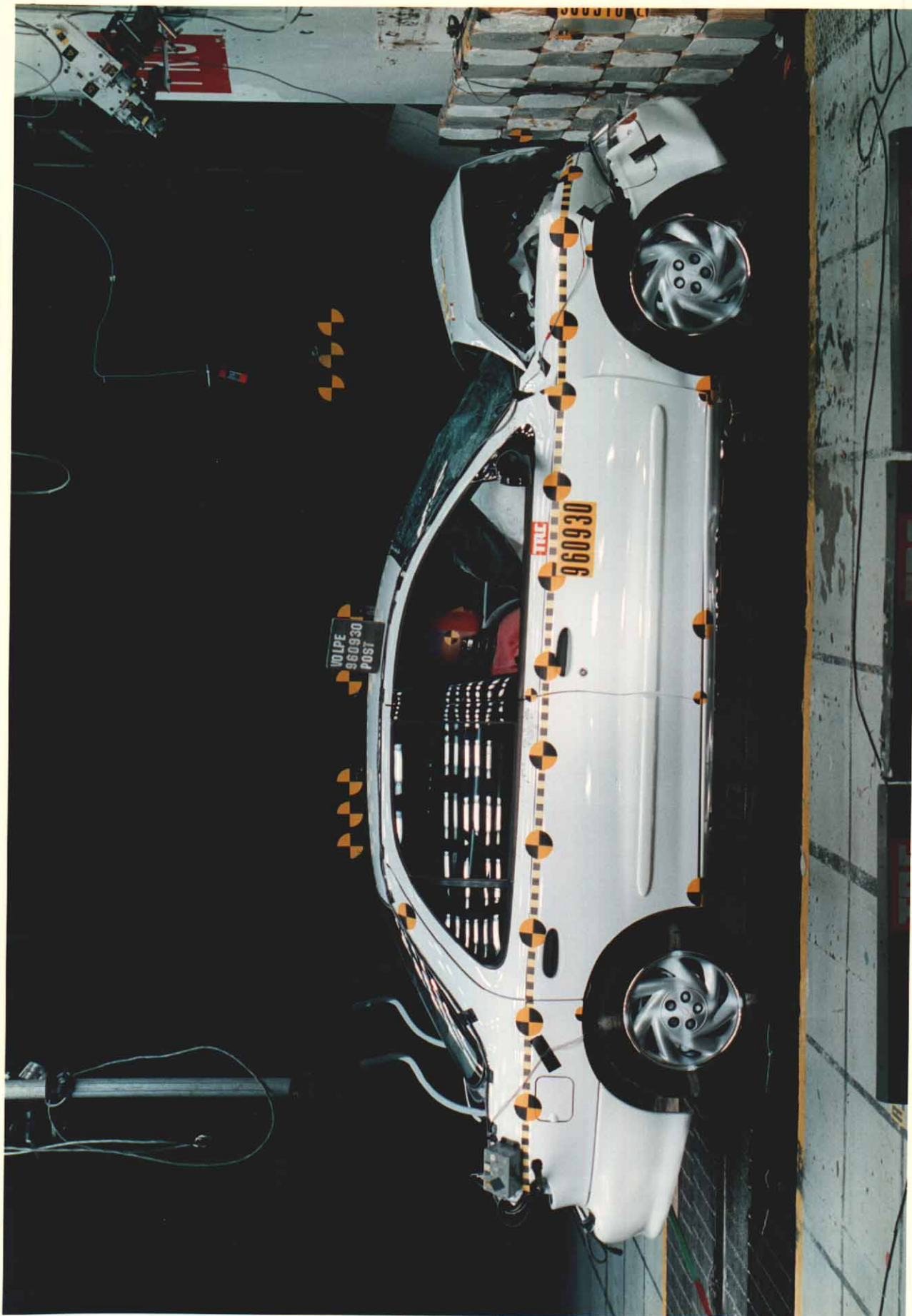


Figure A-8 Post-Test Right Side View



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

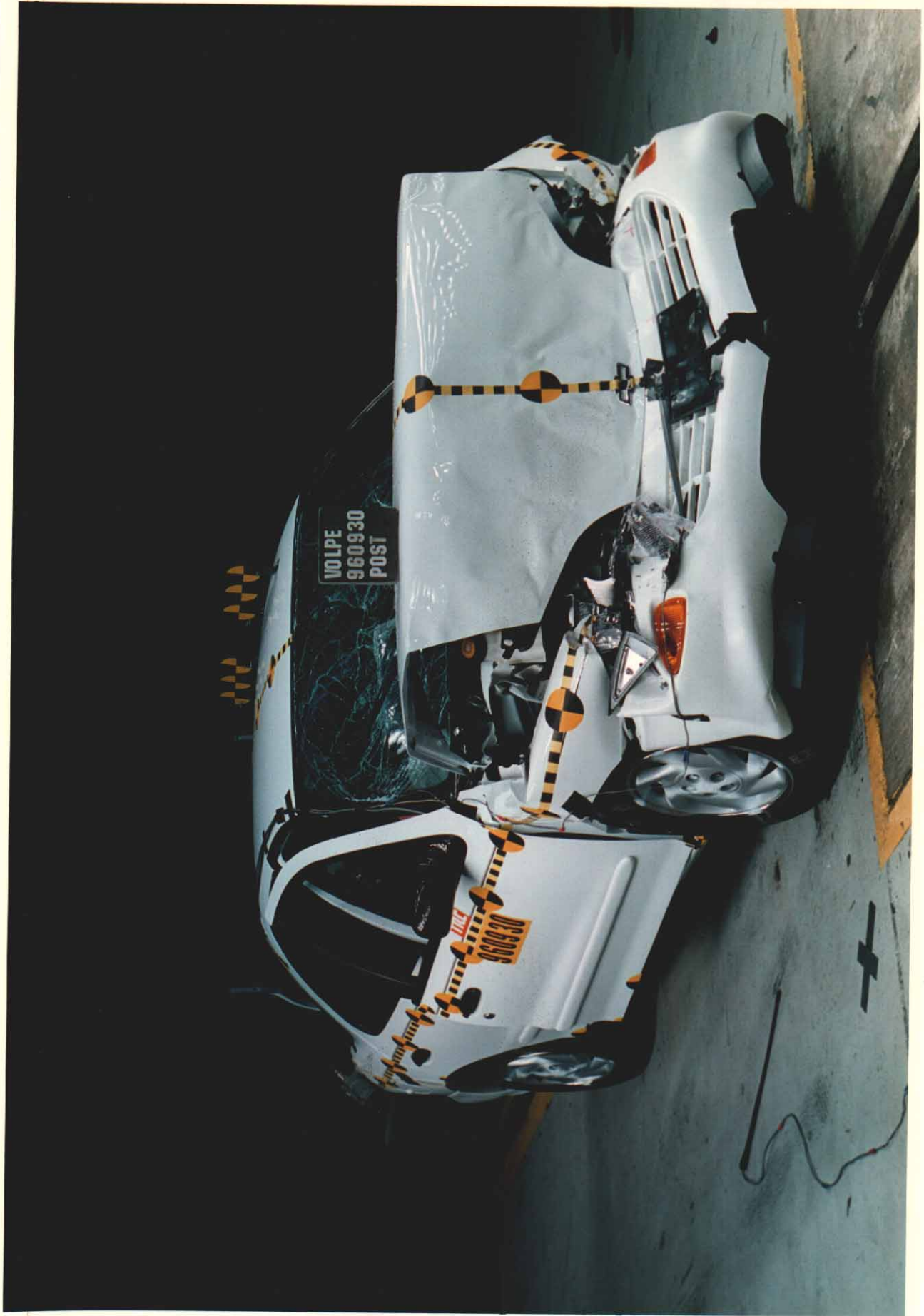


Figure A-10 Post-Test Right Front Three-Quarter View



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



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

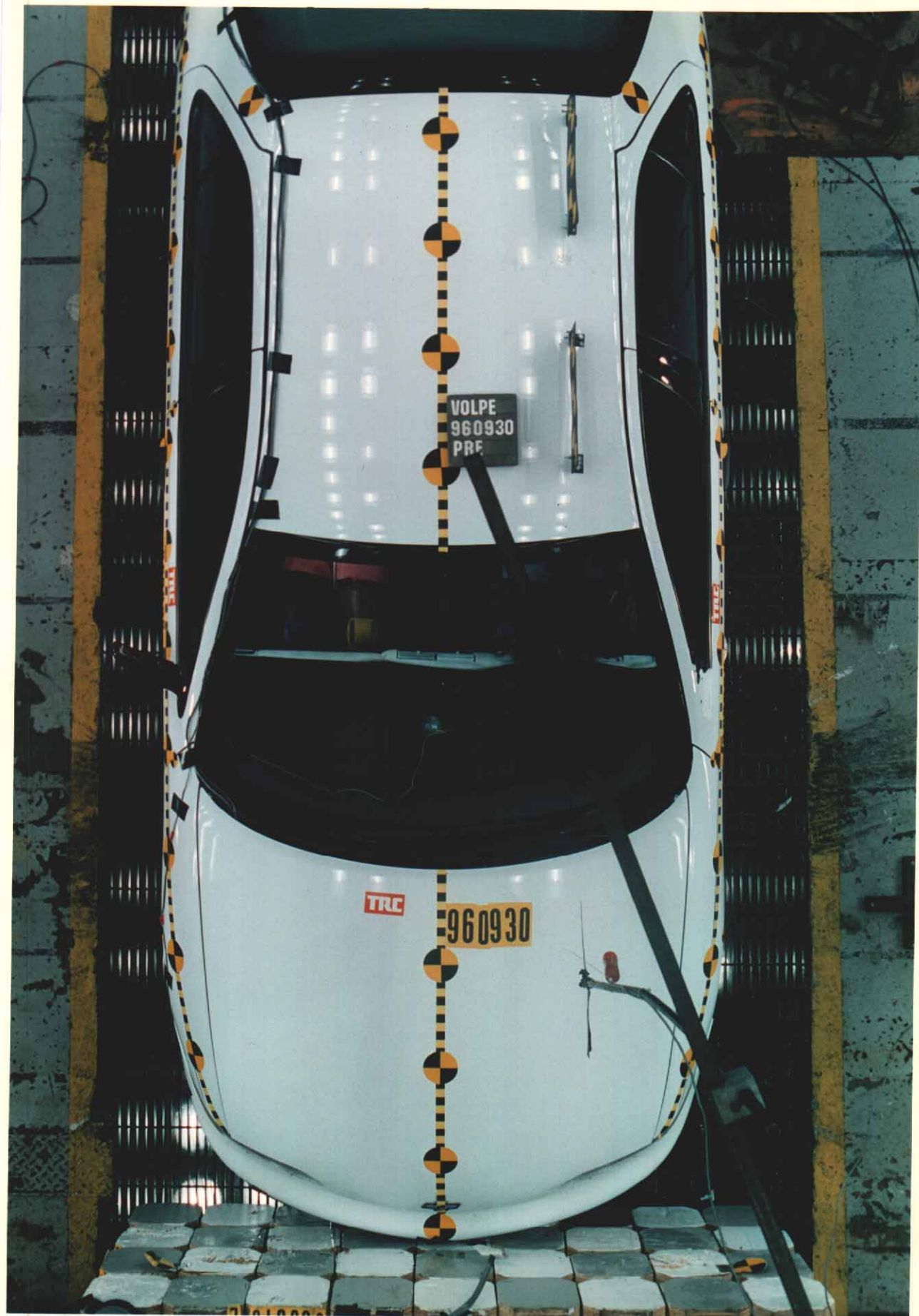


Figure A-13 Pre-Test Overhead View



Figure A-14 Pre-Test Windshield View



Figure A-15 Post-Test Windshield View

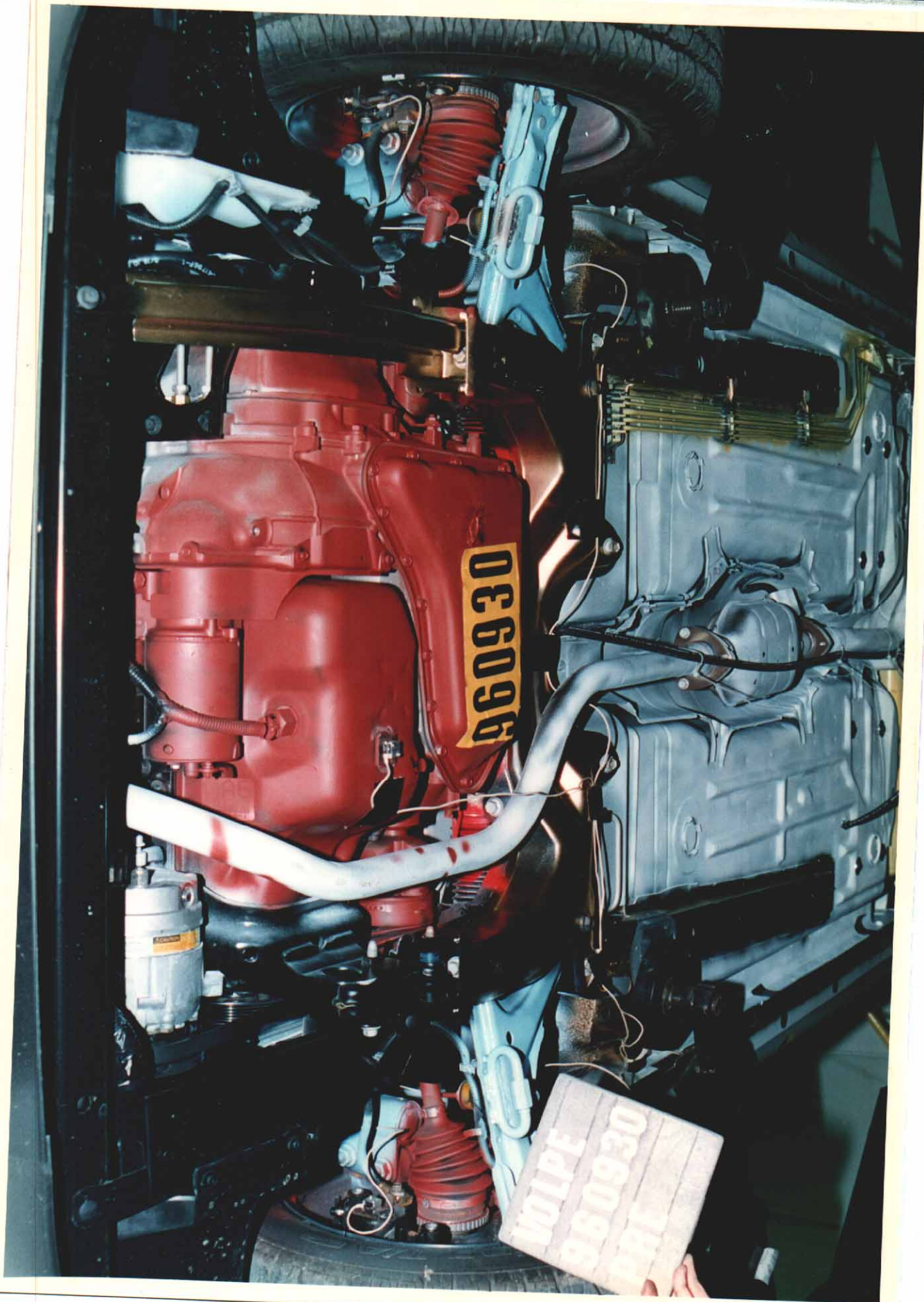


Figure A-17 Pre-Test Front Underbody - View 1

A-18

960930

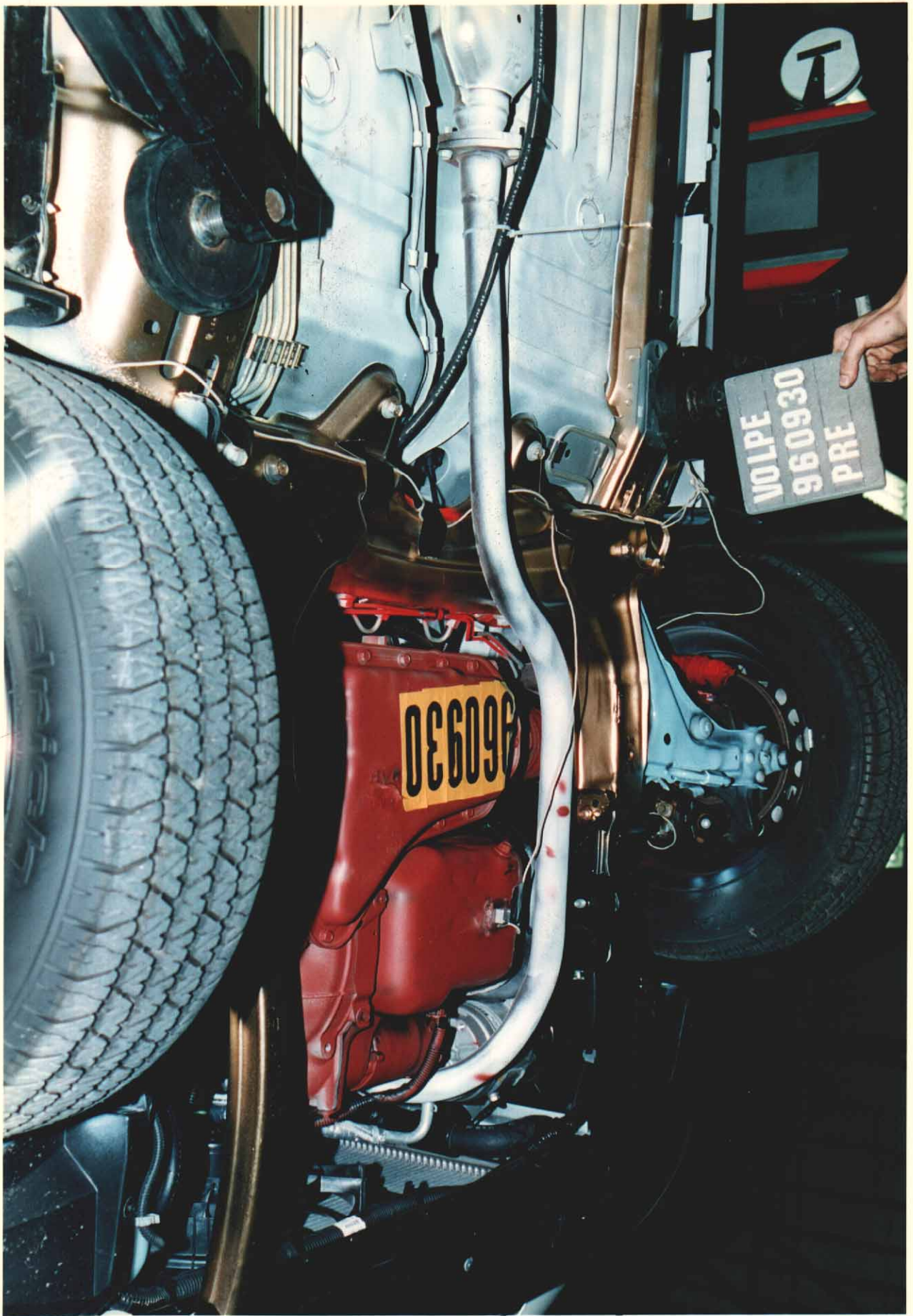


Figure A-18 Pre-Test Front Underbody - View 2



Figure A-19 Pre-Test Front Underbody - View 3

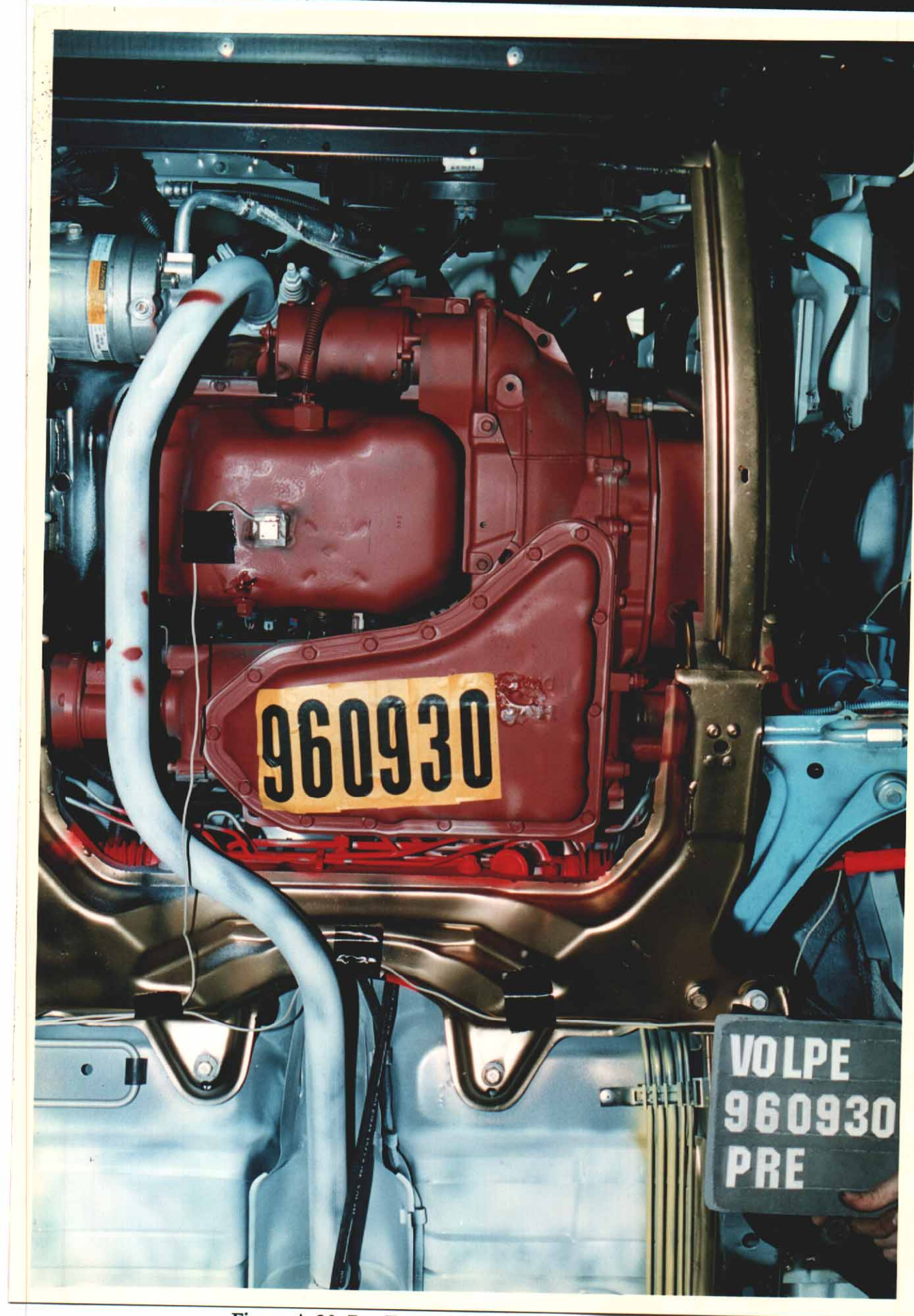


Figure A-20 Pre-Test Front Underbody - View 4

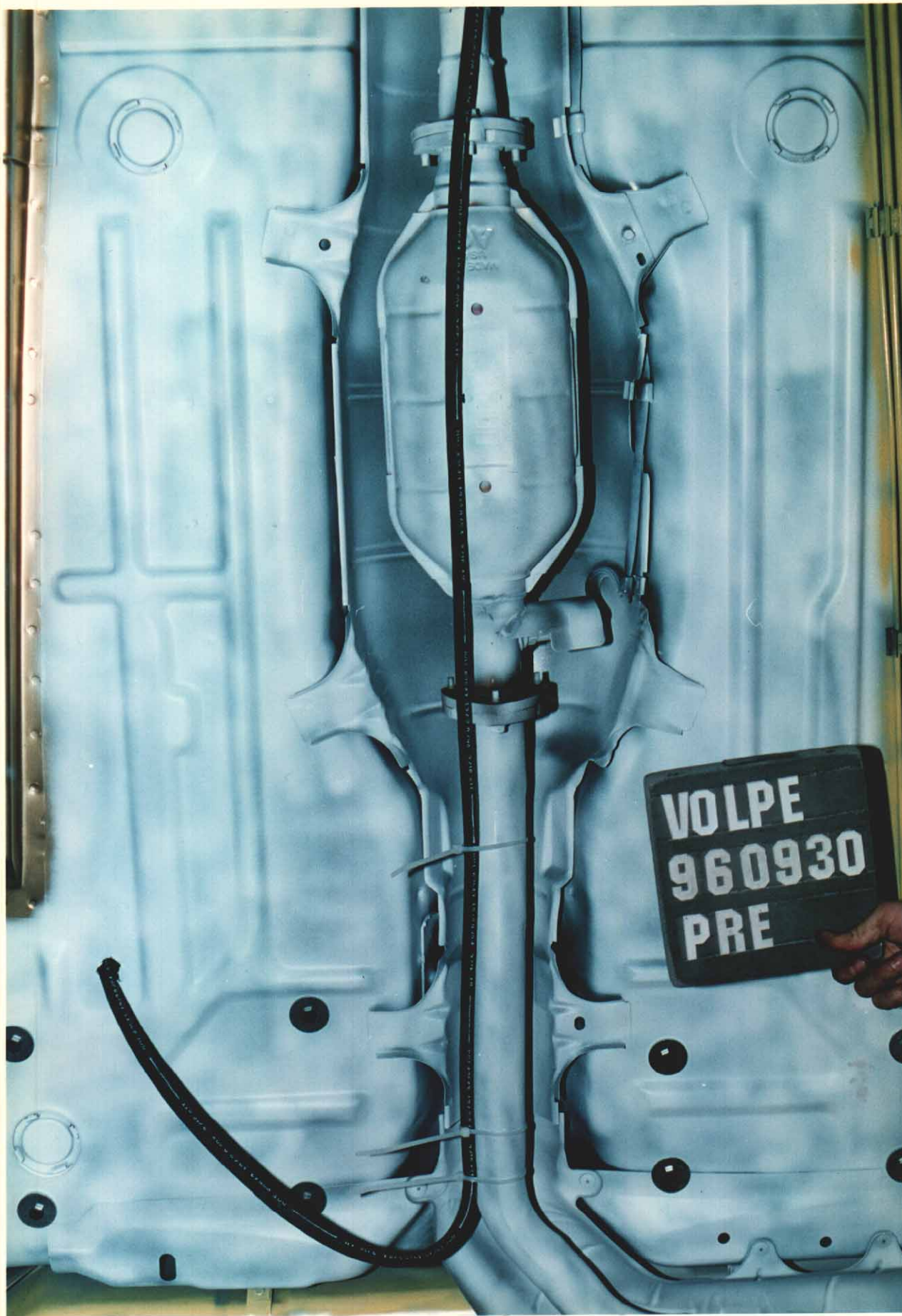


Figure A-21 Pre-Test Mid Underbody View



Figure A-22 Pre-Test Driver Dummy Position View



Figure A-23 Post-Test Driver Dummy Position View



Figure A-24 Pre-Test Passenger Dummy Position View



Figure A-25 Post-Test Passenger Dummy Position View

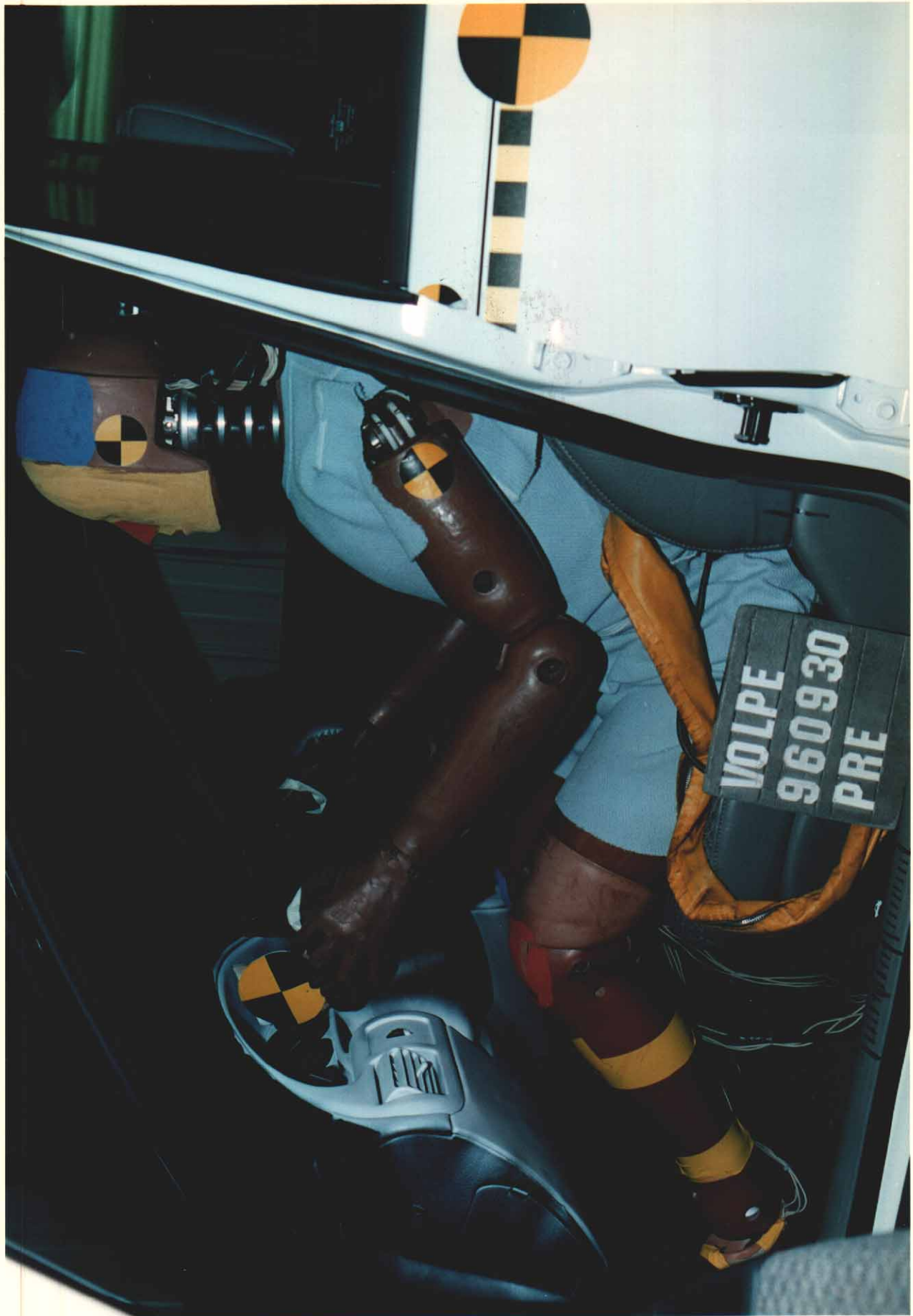


Figure A-26 Pre-Test Driver Dummy & Vehicle Interior - View 1



Figure A-27 Post-Test Driver Dummy & Vehicle Interior - View 1

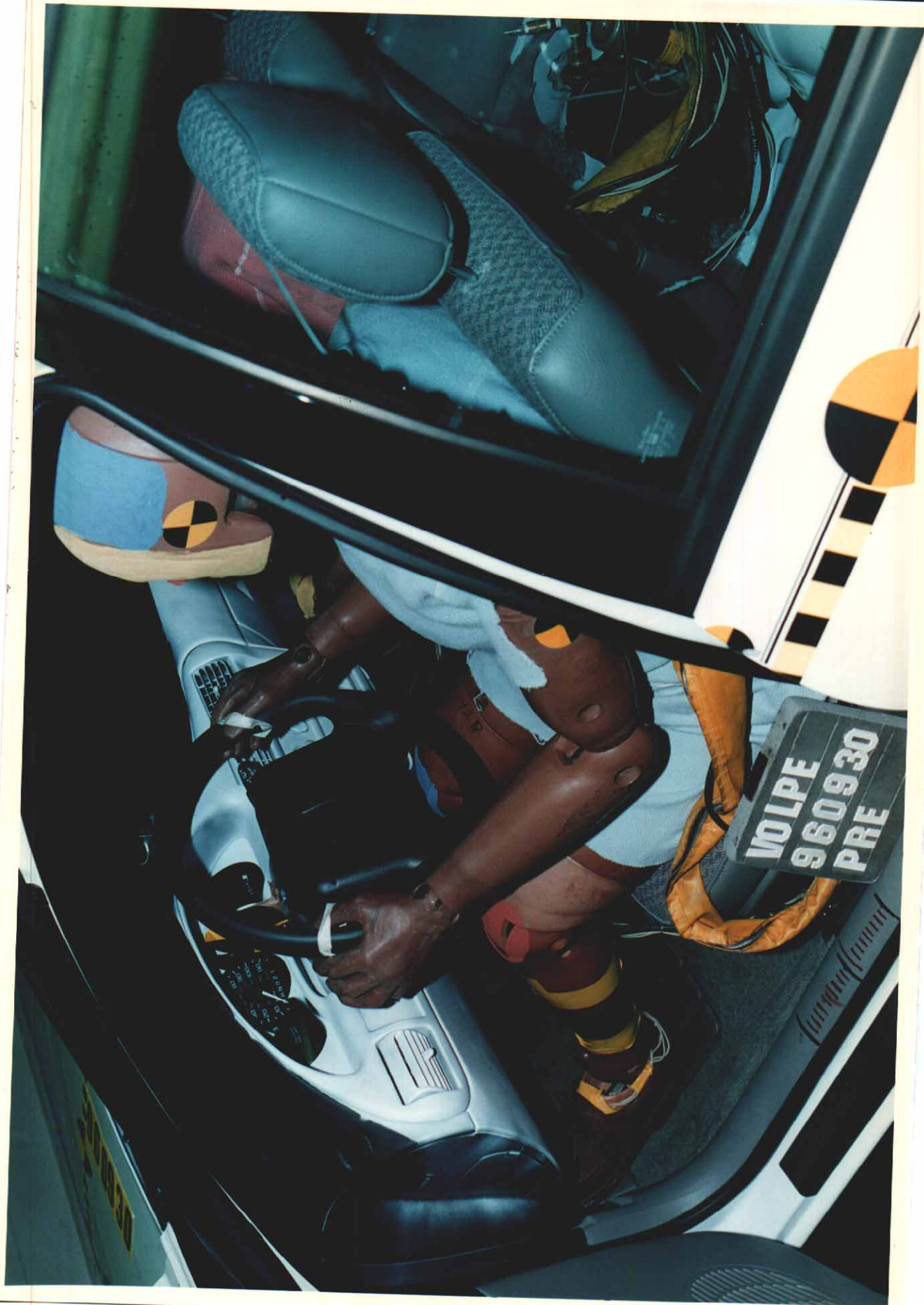


Figure A-28 Pre-Test Driver Dummy & Vehicle Interior - View 2



Figure A-29 Post-Test Driver Dummy & Vehicle Interior - View 2



Figure A-30 Pre-Test Driver Dummy & Vehicle Interior - View 3



Figure A-31 Post-Test Driver Dummy & Vehicle Interior - View 3



Figure A-32 Pre-Test Passenger Dummy & Vehicle Interior - View 1



Figure A-33 Post-Test Passenger Dummy & Vehicle Interior - View 1



Figure A-34 Pre-Test Passenger Dummy & Vehicle Interior - View 2



Figure A-35 Post-Test Passenger Dummy & Vehicle Interior - View 2



Figure A-36 Pre-Test Passenger Dummy & Vehicle Interior - View 3



Figure A-37 Post-Test Passenger Dummy & Vehicle Interior - View 3



Figure A-38 Post-Test Driver Dummy Head Contact - View 1



Figure A-39 Post-Test Driver Dummy Head Contact - View 2



Figure A-40 Post-Test Driver Dummy Head Contact - View 3

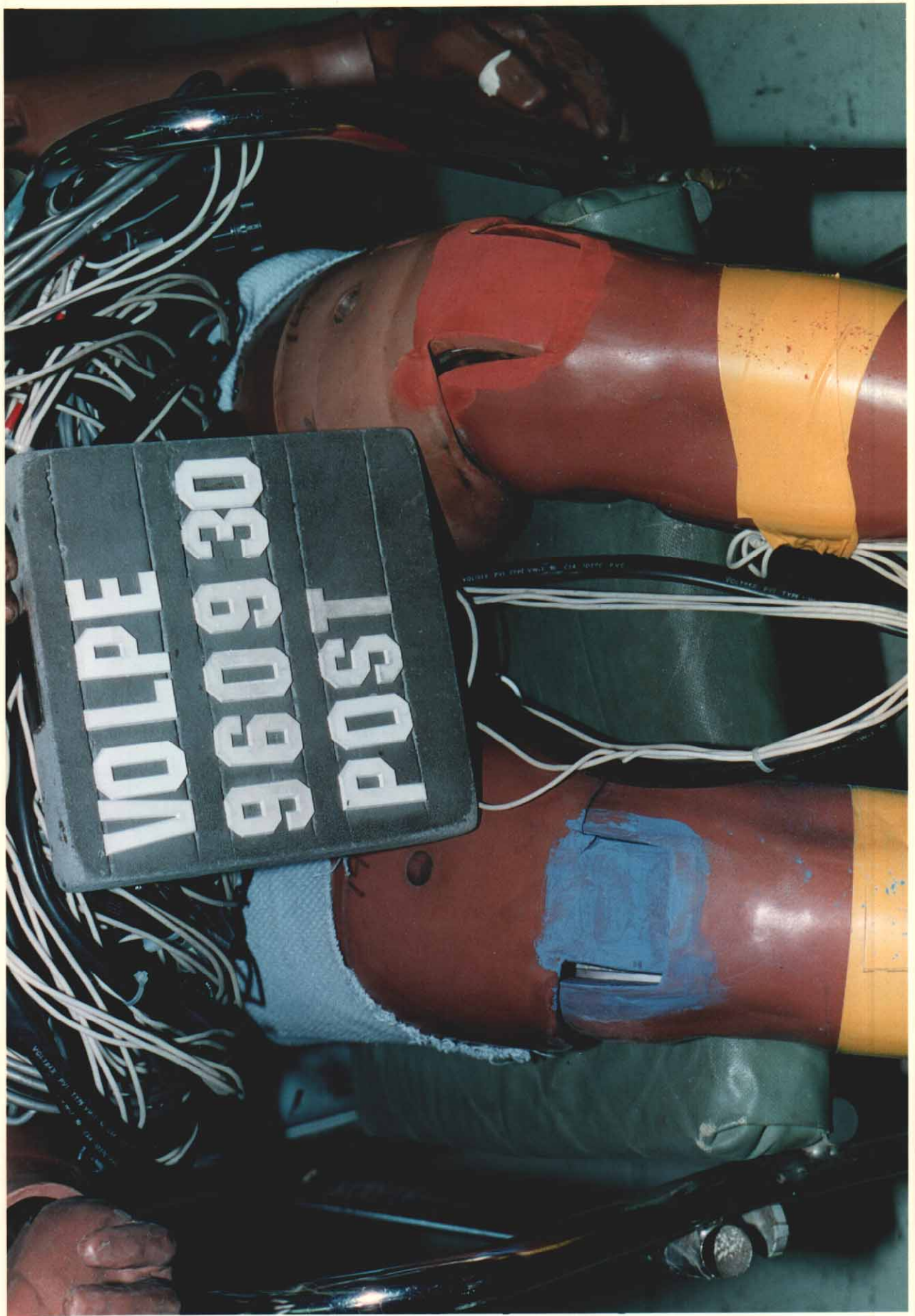


Figure A-41 Post-Test Driver Dummy Knee Contact - View 1



Figure A-42 Post-Test Driver Dummy Knee Contact - View 2



Figure A-43 Post-Test Passenger Dummy Head Contact - View 1



Figure A-44 Post-Test Passenger Dummy Head Contact - View 2

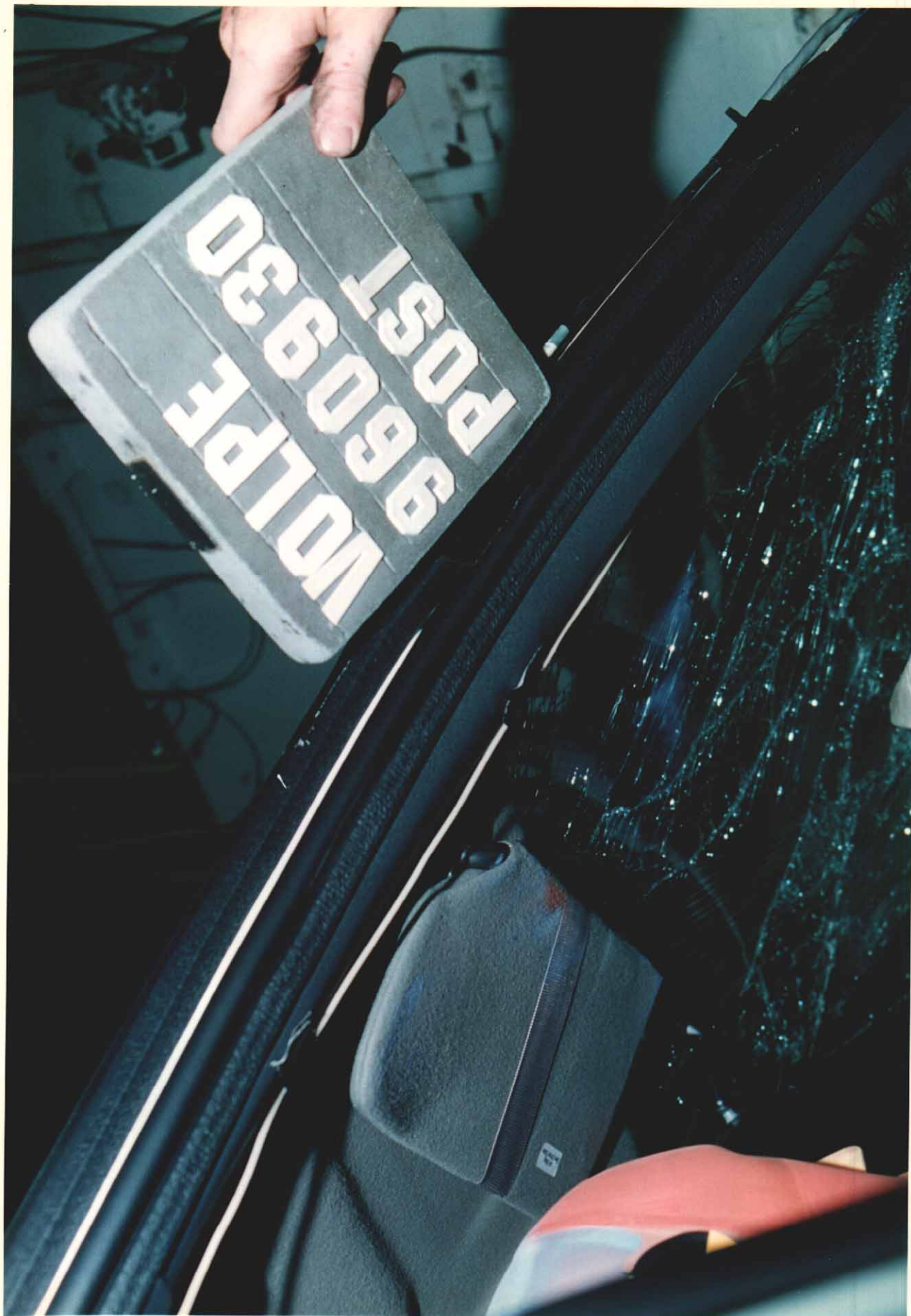


Figure A-45 Post-Test Passenger Dummy Head Contact - View 3



Figure A-46. Post-Test Passenger Dummy Knee Contact - View 1



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



Figure A-48 Pre-Test Vehicle Certification Label View



Figure A-49 Pre-Test Vehicle Recommended Tire Pressure Label View



Figure A-50 Pre-Test Ballast Location View

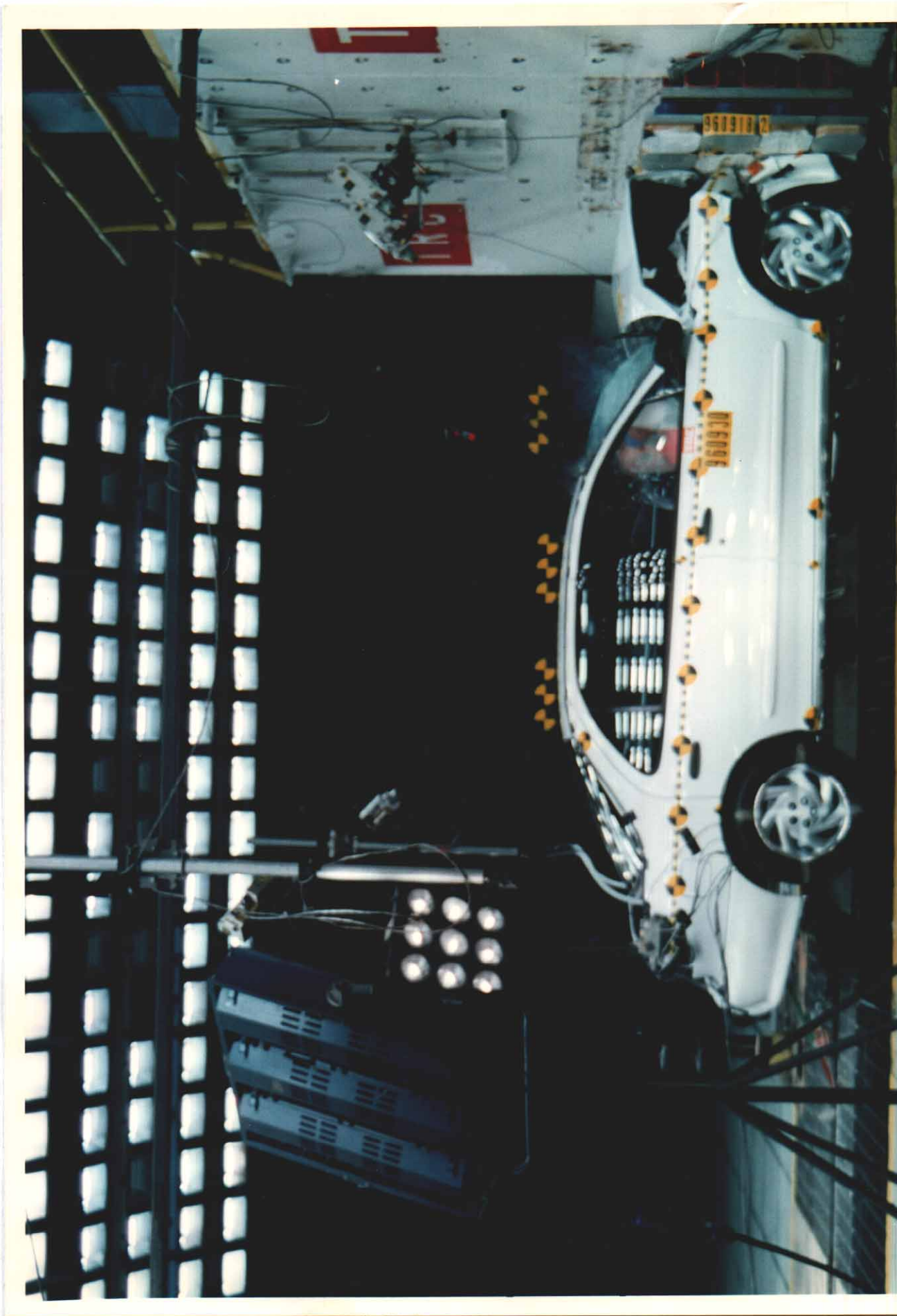


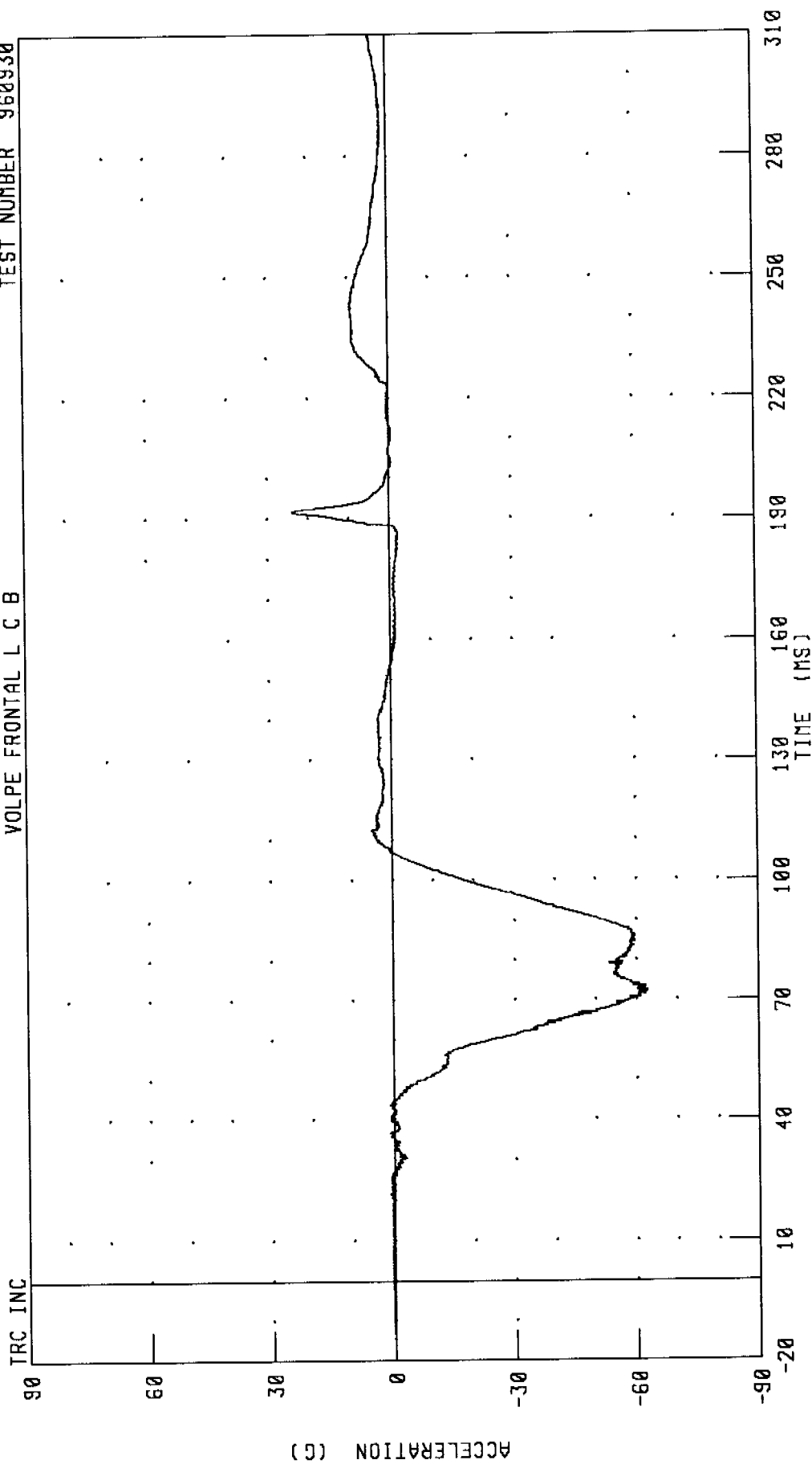
Figure A-51 Impact Event

Appendix B

Data Plots

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER HEAD X-AXIS ACCELERATION
 VOLPE FRONTAL L C B

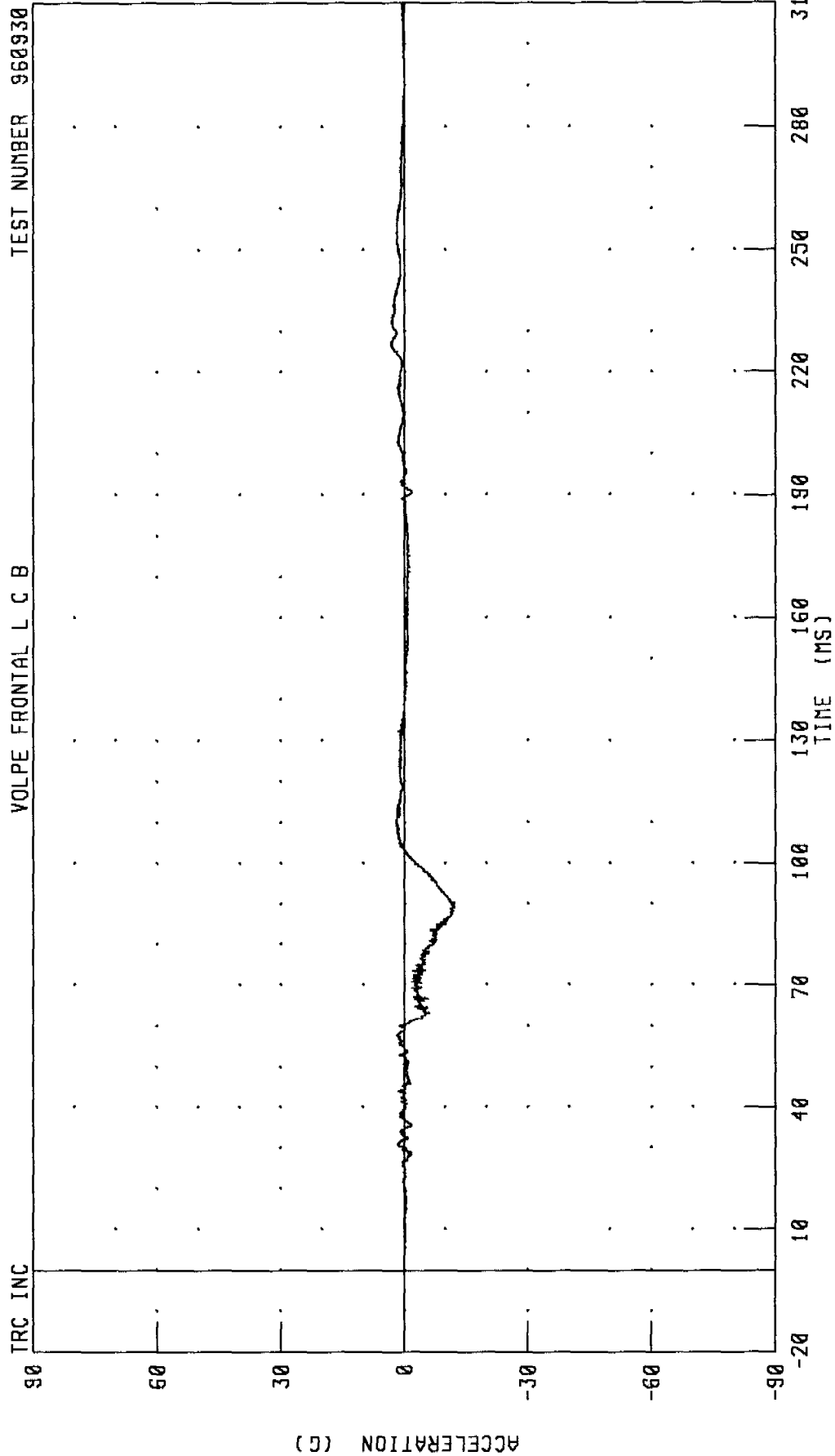
TEST NUMBER 960930



PEAK DATA 23 90 G @ 191 68 MS, -62 83 G @ 72 00 MS

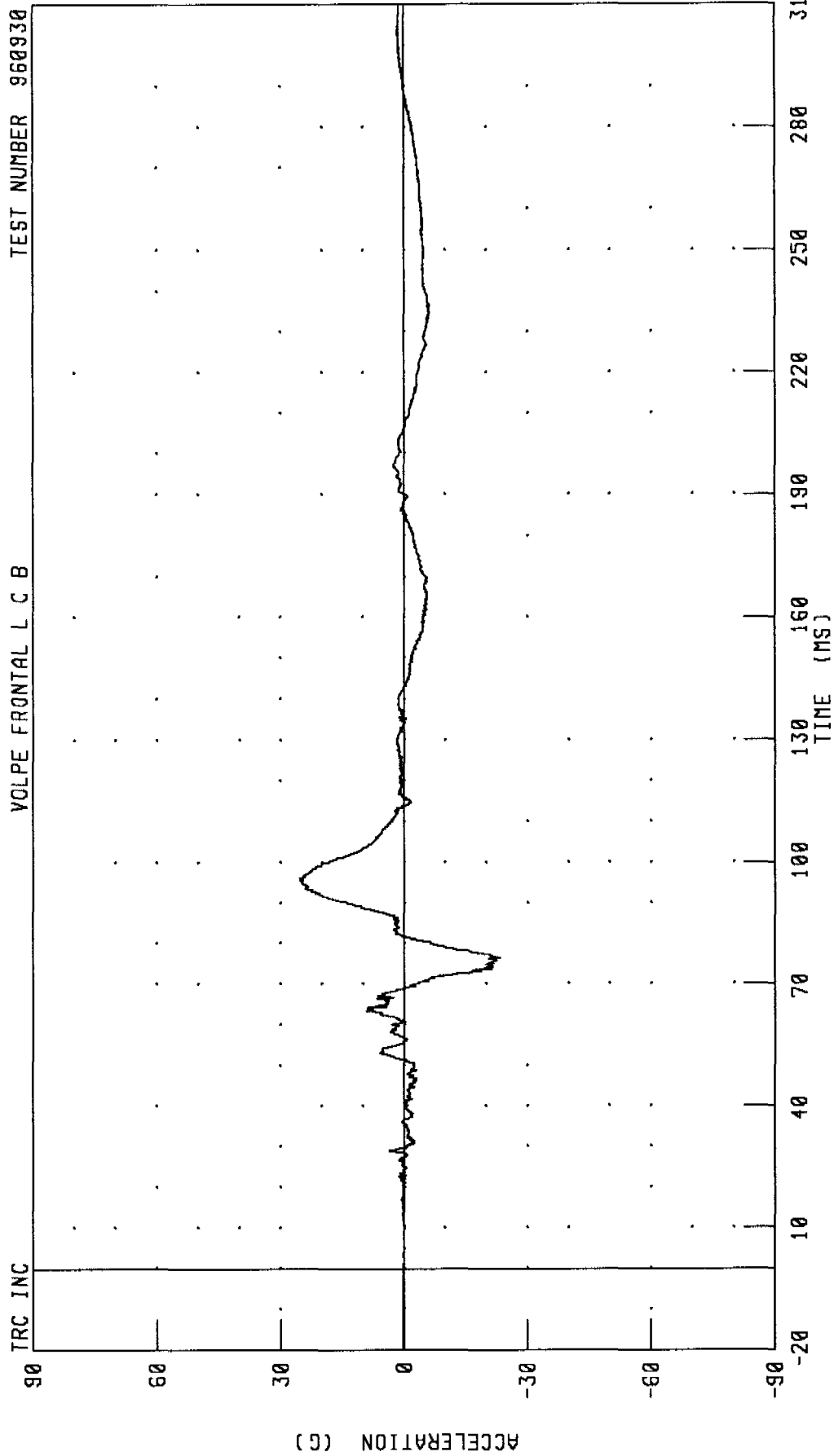
CHANNEL HEDXG1 FILTER CH CLASS 1000

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER HEAD Y-AXIS ACCELERATION



CHANNEL HEDYGI FILTER CH CLASS 1000 PEAK DATA 3 29 G @ 226 40 MS, -12 27 G @ 89 04 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER HEAD Z-AXIS ACCELERATION



CHANNEL HEDZG1 FILTER CH CLASS 1000

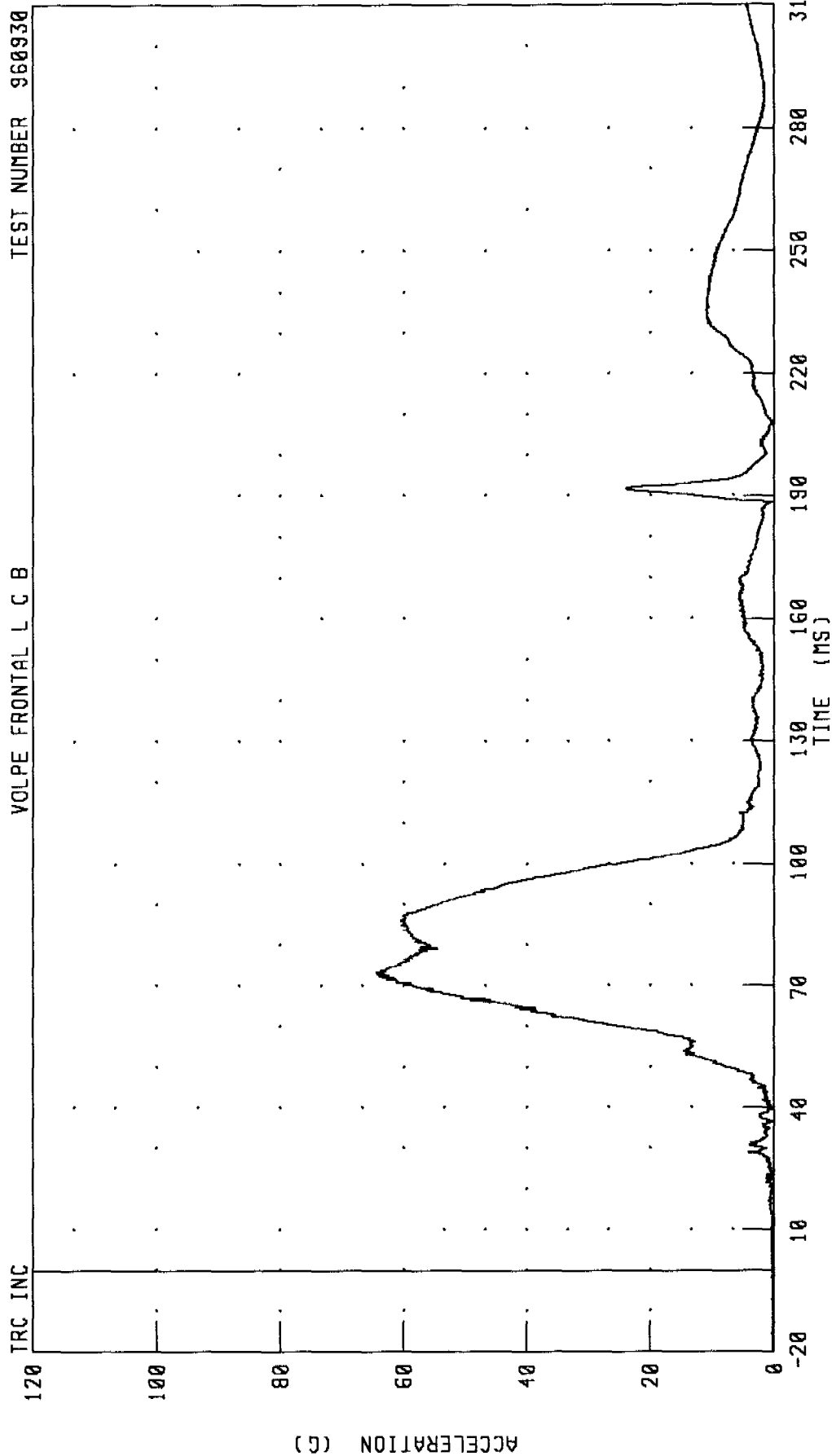
PEAK DATA 25 39 G @ 95 60 MS, -23 43 G @ 76 40 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER HEAD RESULTANT ACCELERATION

TEST NUMBER 960930

VOLPE FRONTAL L C B

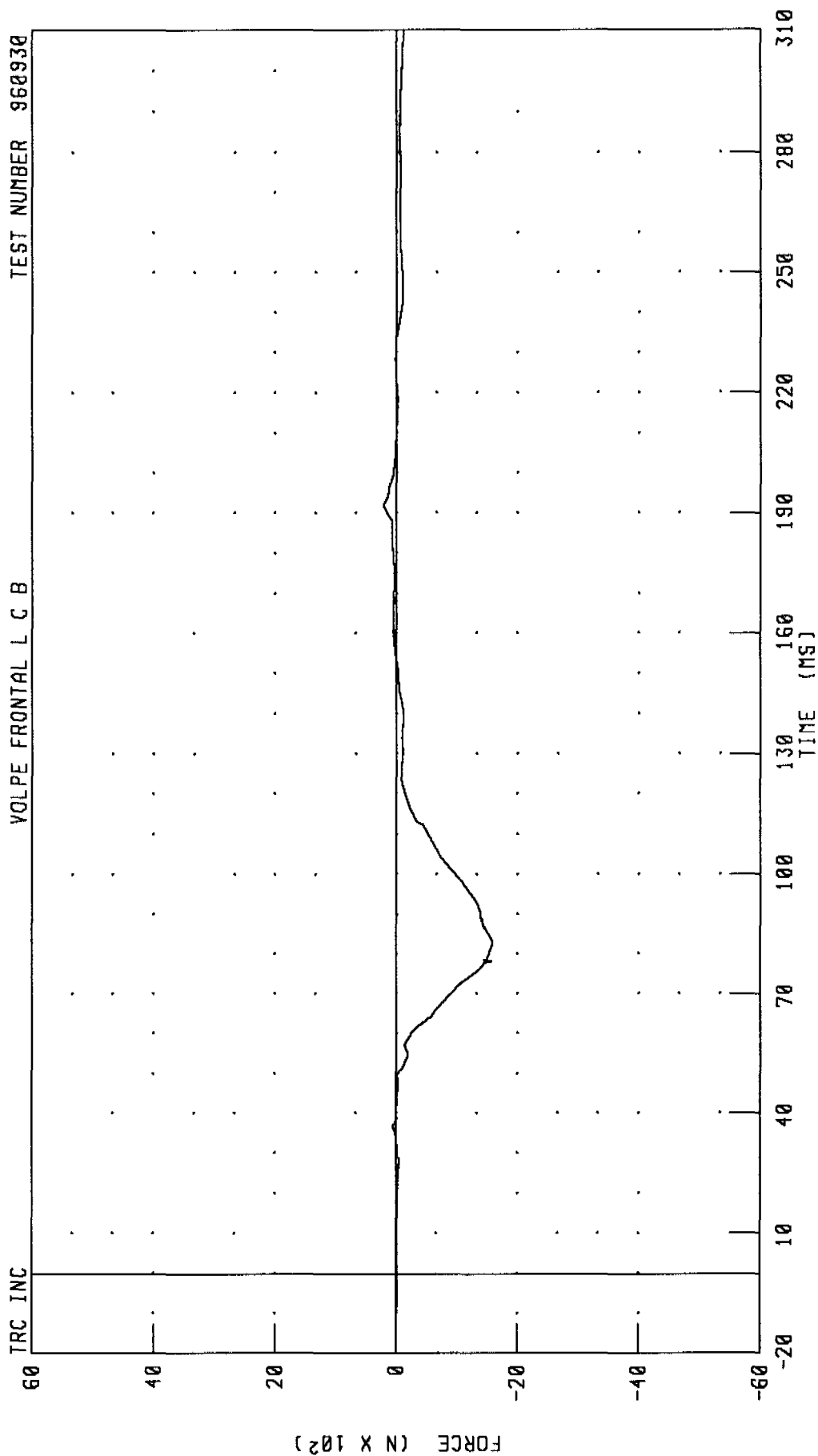
TRC INC



CHANNEL HEDRG1 FILTER CH CLASS 1000

PEAK DATA 64 50 G @ 73 36 MS, 0 06 G @ 23 12 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER NECK X-AXIS SHEAR FORCE



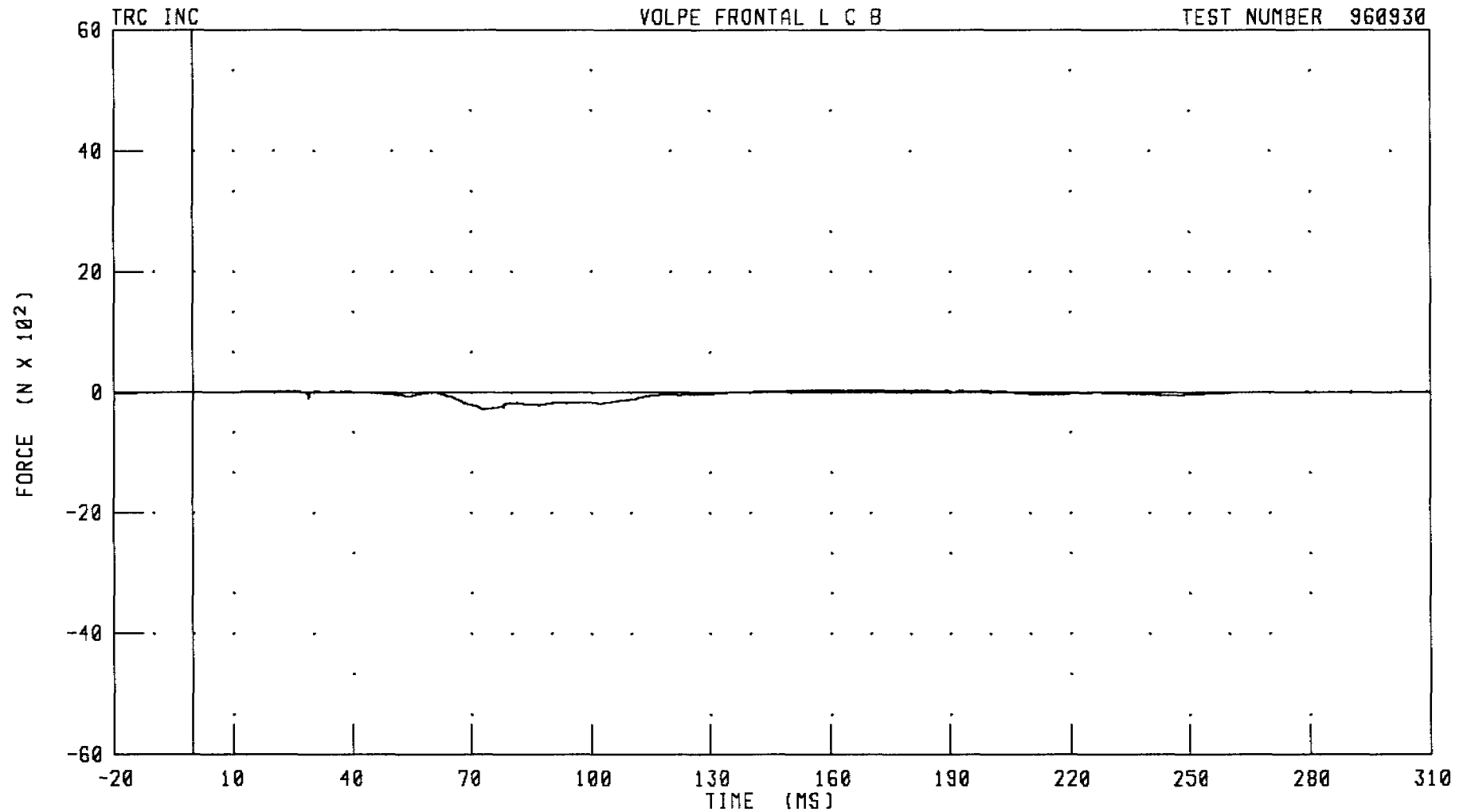
PEAK DATA 212 62 N @ 191 92 MS, -1587 16 N @ 82 32 MS

CHANNEL NEKXF1 FILTER CH CLASS 1000

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER NECK Y-AXIS SHEAR FORCE

VOLPE FRONTAL L C B

TEST NUMBER 960930

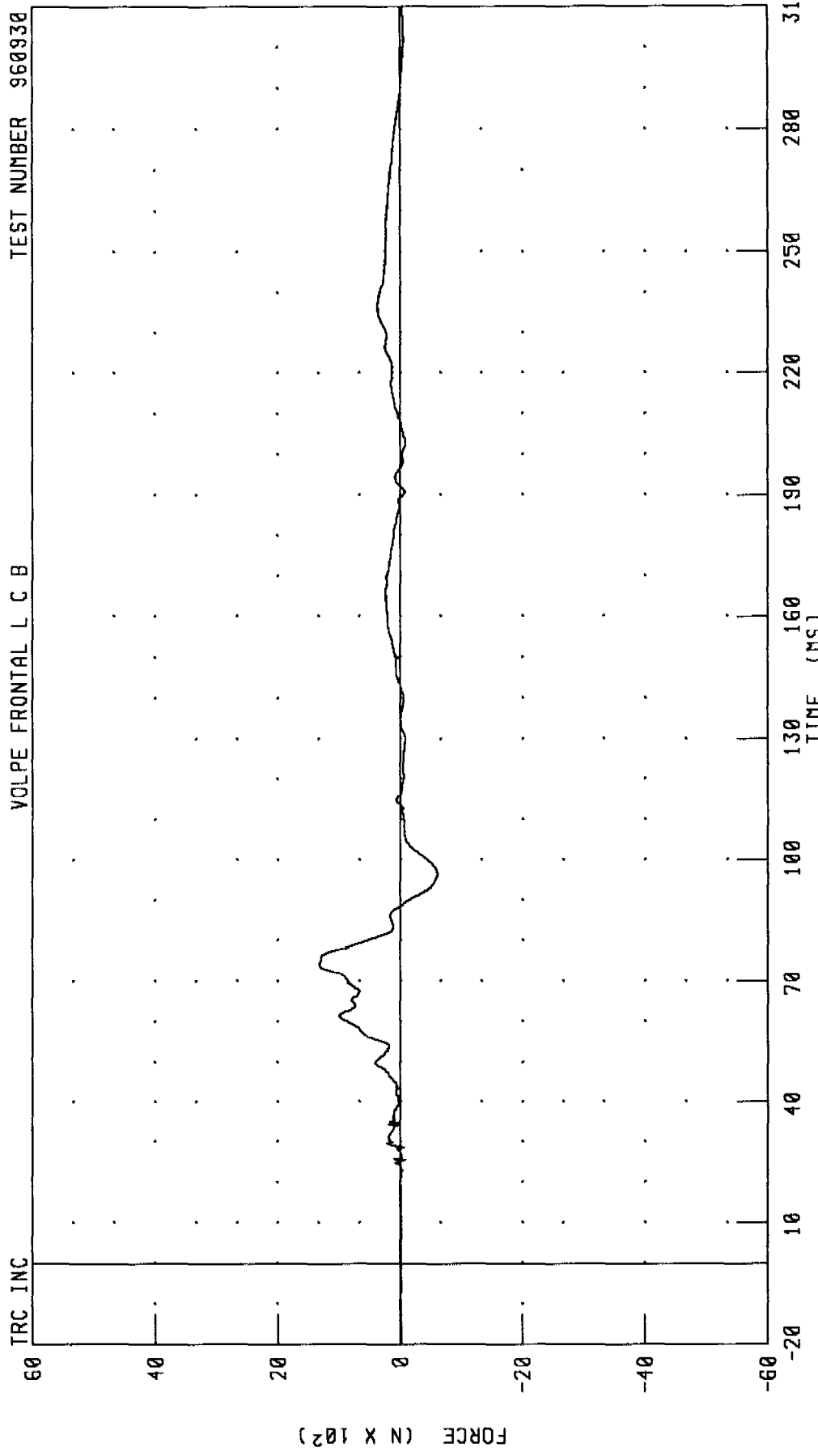


CHANNEL NEKYF1 FILTER CH CLASS 1000

B-7

960930

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER NECK Z-AXIS AXIAL FORCE



CHANNEL NEKZF1 FILTER CH CLASS 1000

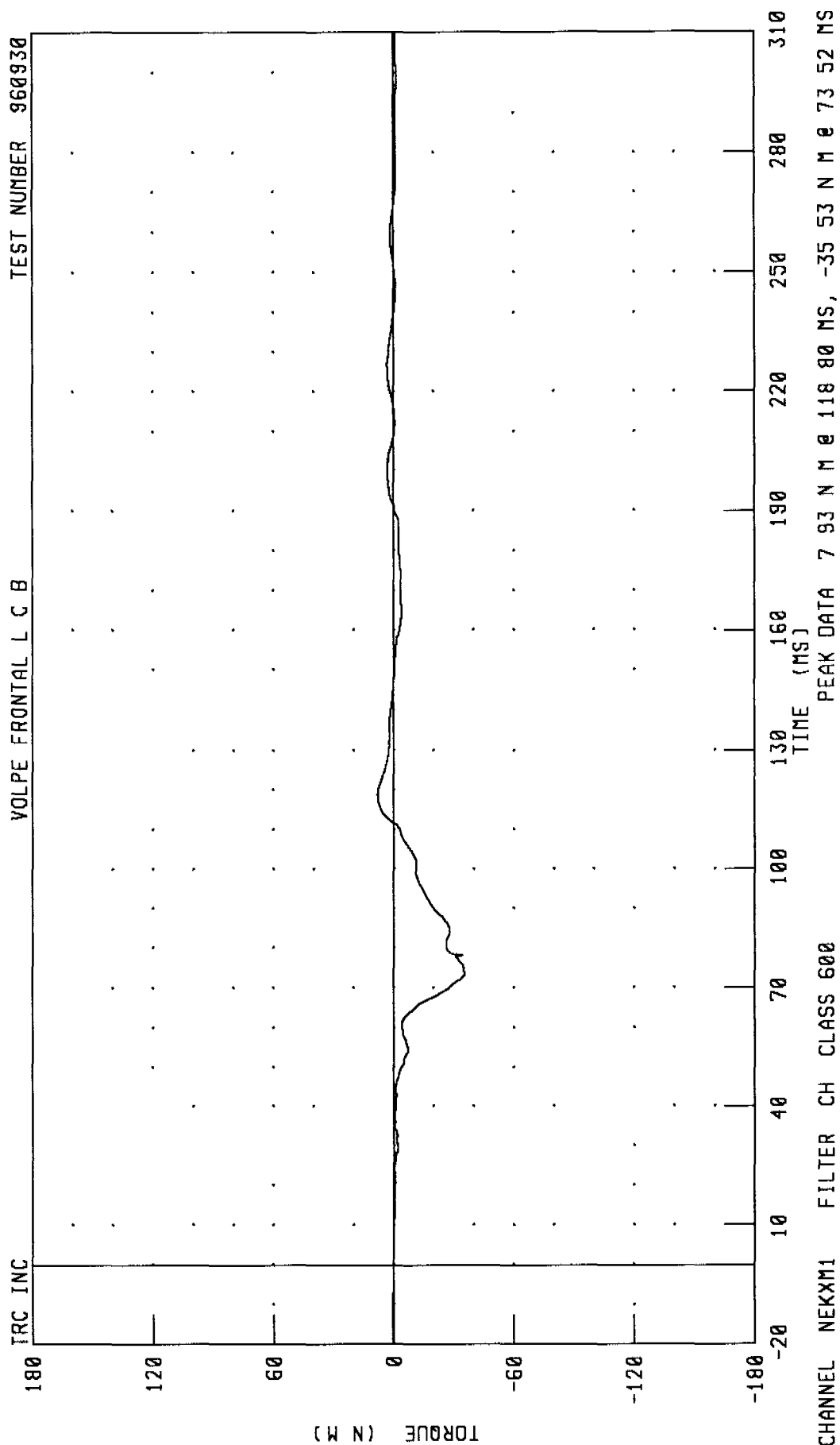
PEAK DATA 1326 63 N @ 74 40 MS, -609 81 N @ 96 16 MS

TEST NUMBER 960930

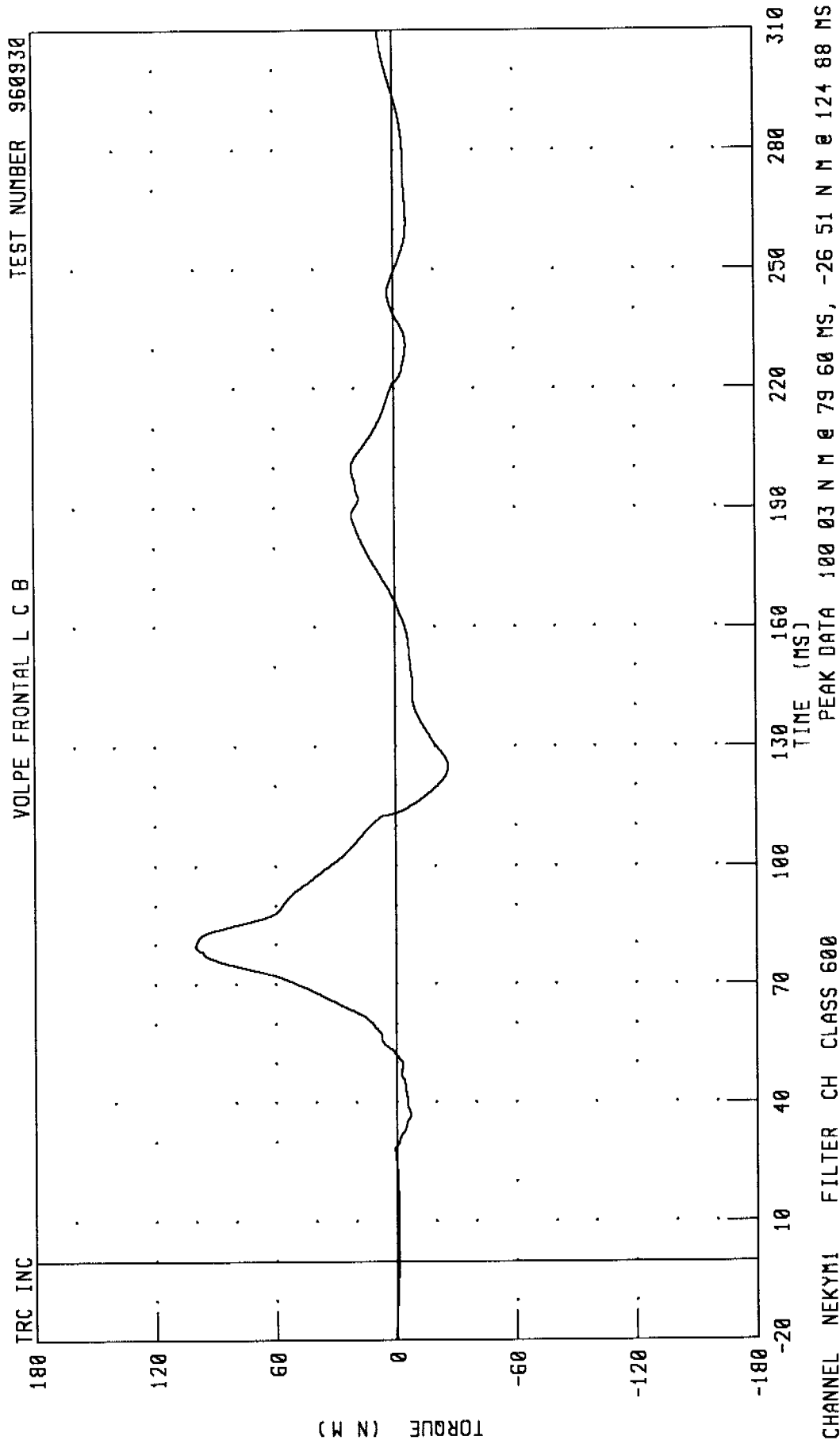
VOLPE FRONTAL L C B

TRC INC

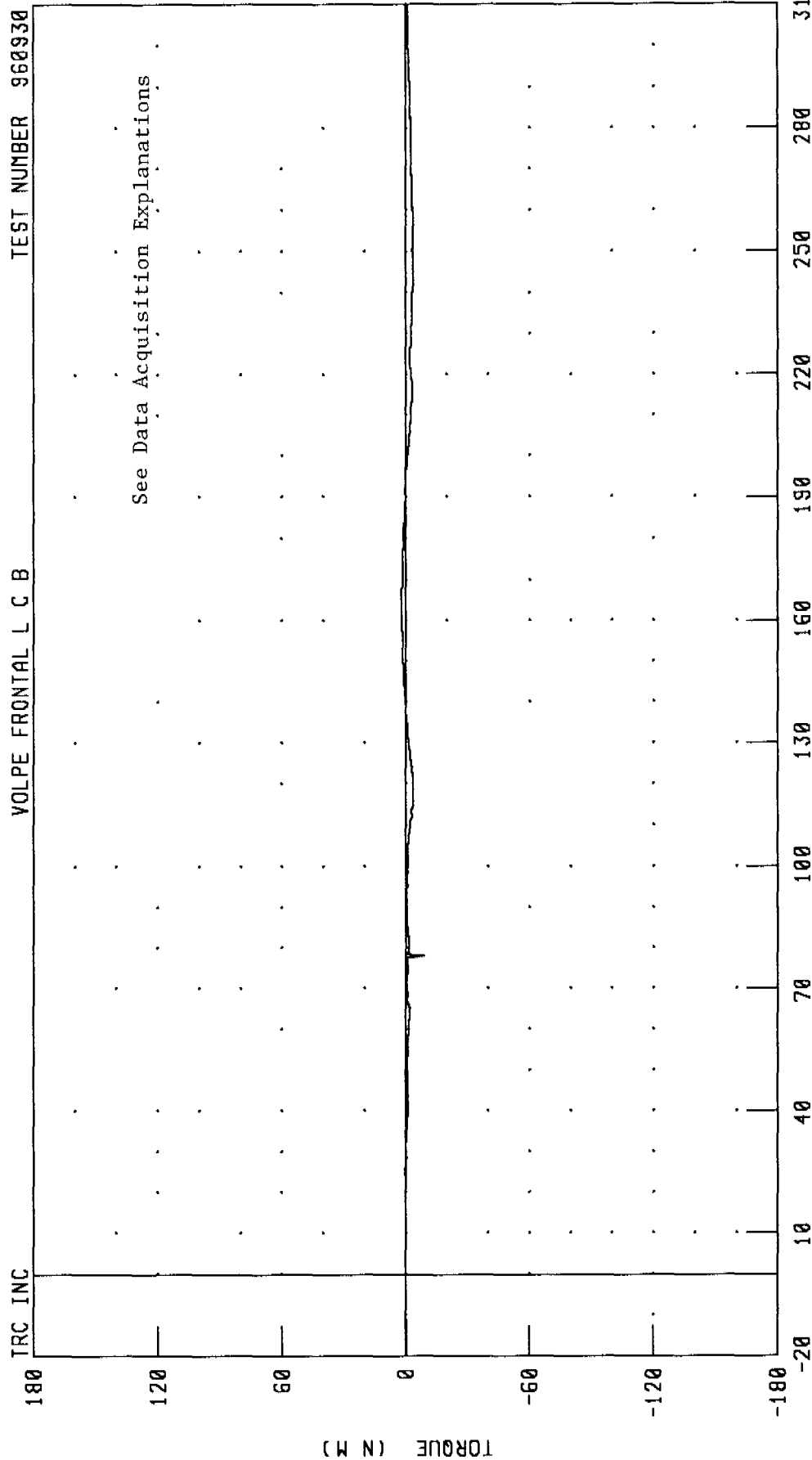
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER NECK MOMENT ABOUT X AXIS



1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER NECK MOMENT ABOUT Y AXIS



1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER NECK MOMENT ABOUT Z AXIS

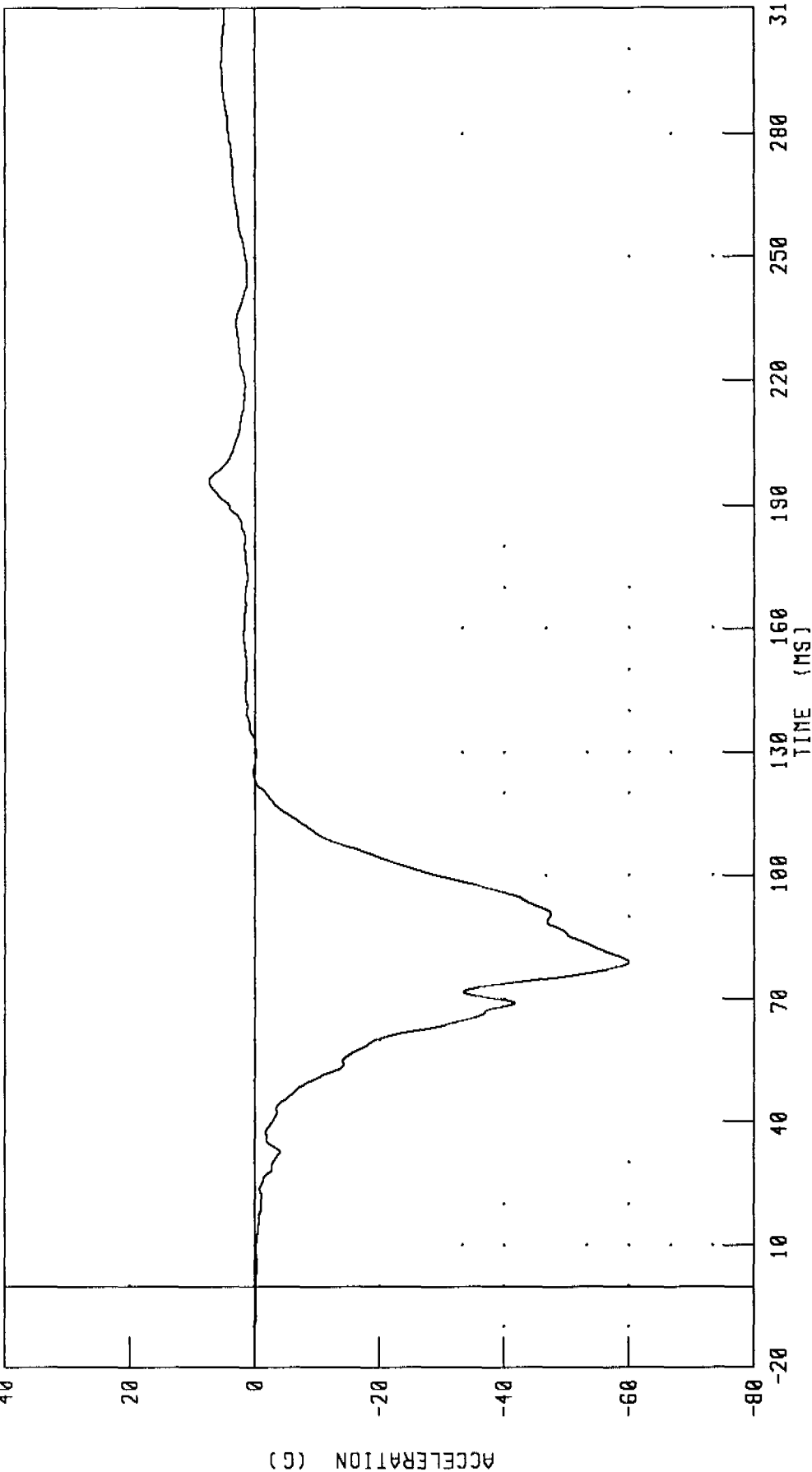


CHANNEL NEKZM1 FILTER CH CLASS 600

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER CHEST X-AXIS ACCELERATION
 VOLPE FRONTAL L C B

TEST NUMBER 960930

TRC INC

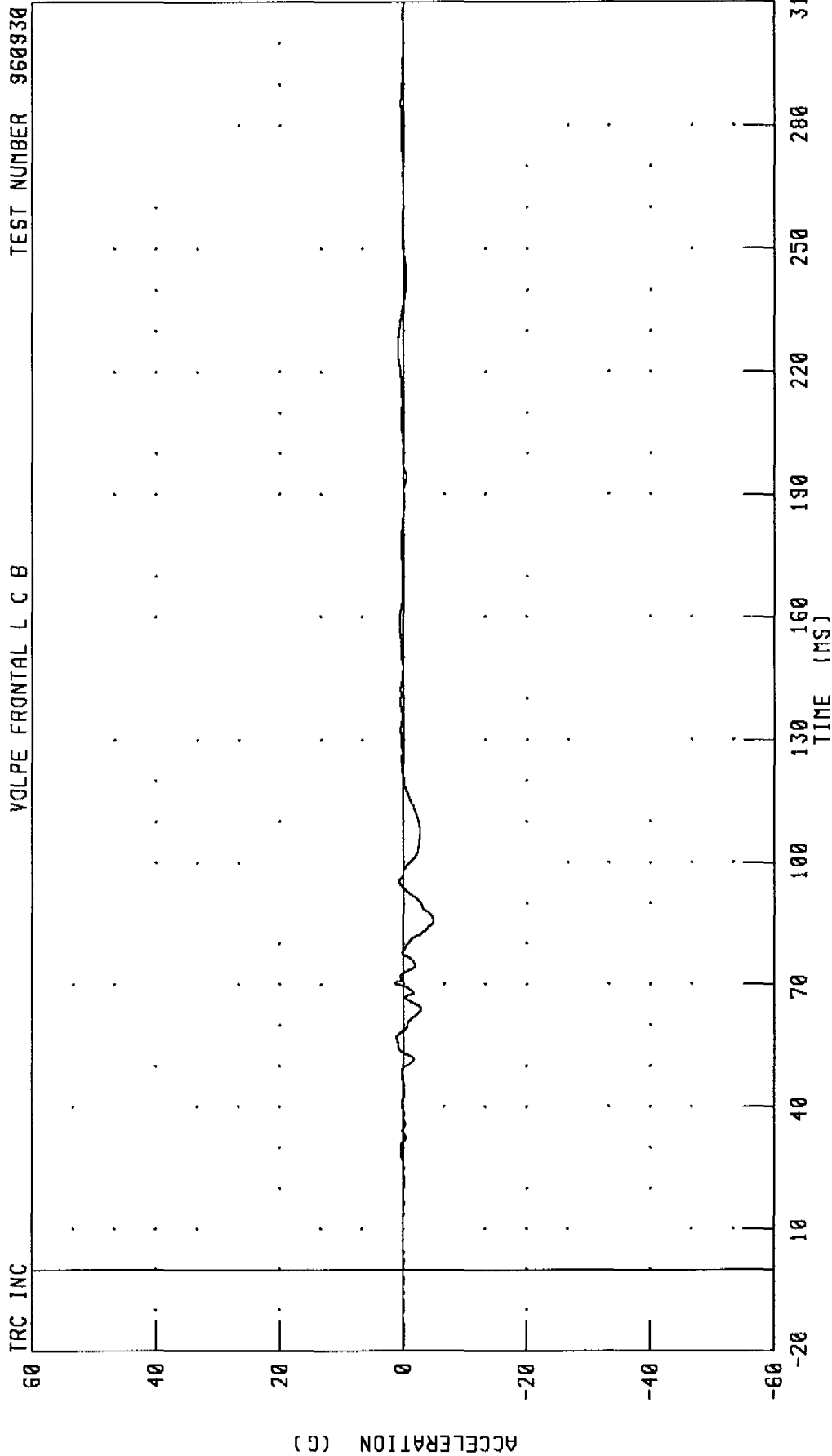


CHANNEL CSTXG1 FILTER CH CLASS 180

PEAK DATA 7 32 G @ 195 92 MS, -60 03 G @ 78 88 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER CHEST Y-AXIS ACCELERATION
 VOLPE FRONTAL L C B

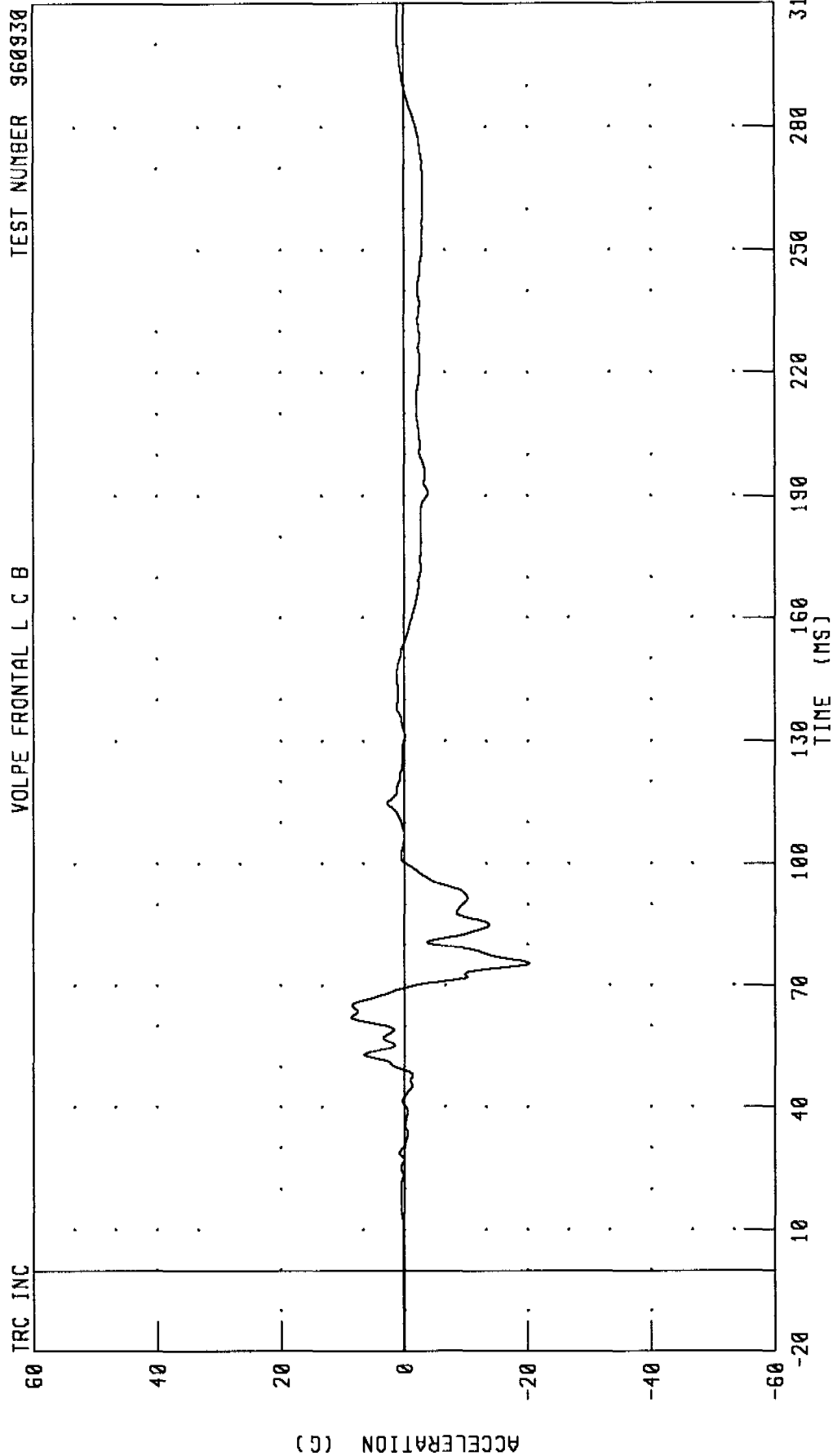
TEST NUMBER 960930



CHANNEL CSTYG1 FILTER CH CLASS 180

PEAK DATA 1 43 G @ 70 32 MS, -4 96 G @ 85 76 MS

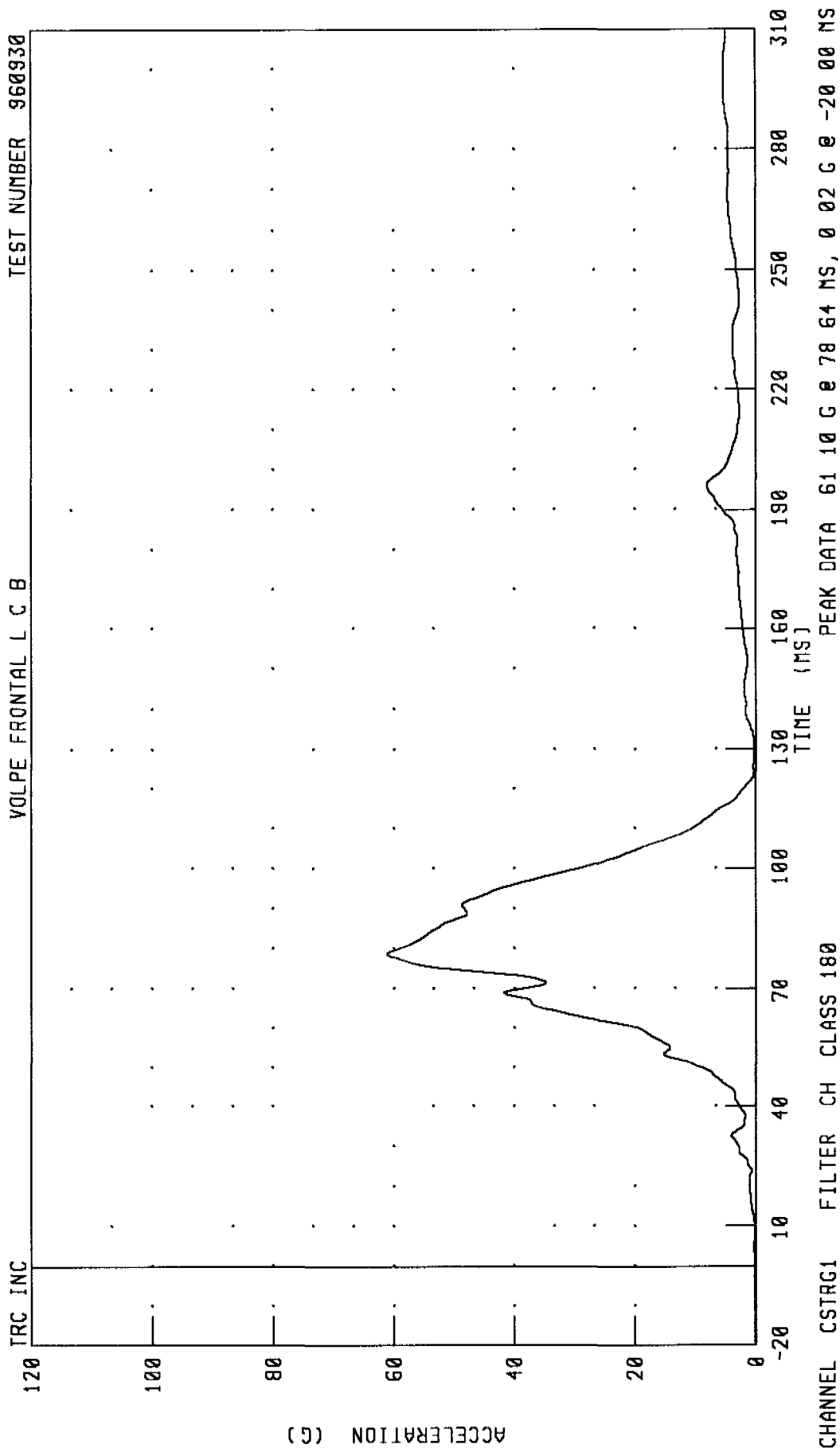
1986 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER CHEST Z-AXIS ACCELERATION
 VOLPE FRONTAL L C B



CHANNEL CSTZG1 FILTER CH CLASS 180

PEAK DATA 8 59 G @ 62 24 MS, -20 25 G @ 75 52 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER CHEST RESULTANT ACCELERATION

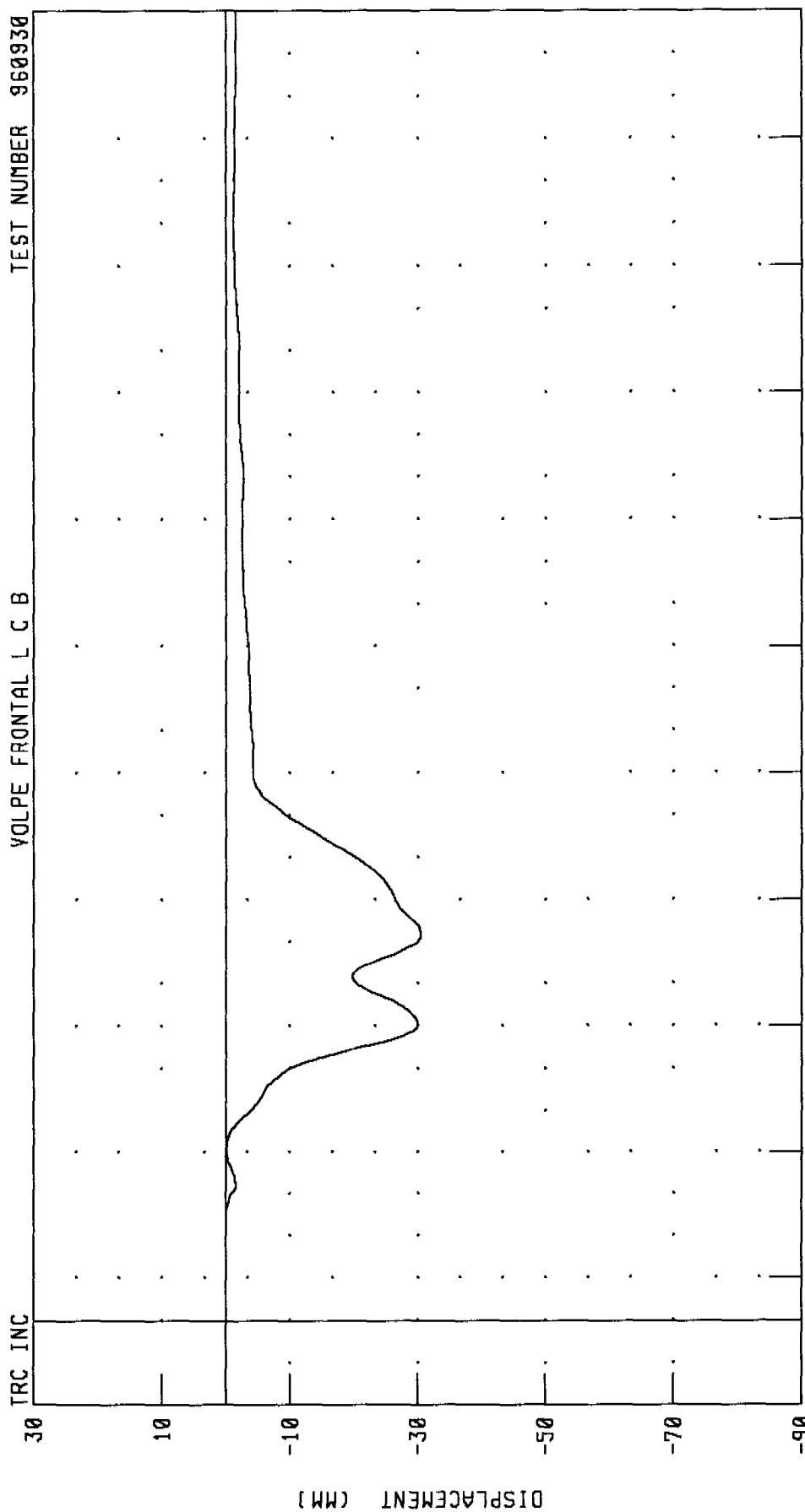


1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER

DRIVER CHEST DEFLECTION

VOLPE FRONTAL L C B

TEST NUMBER 960930



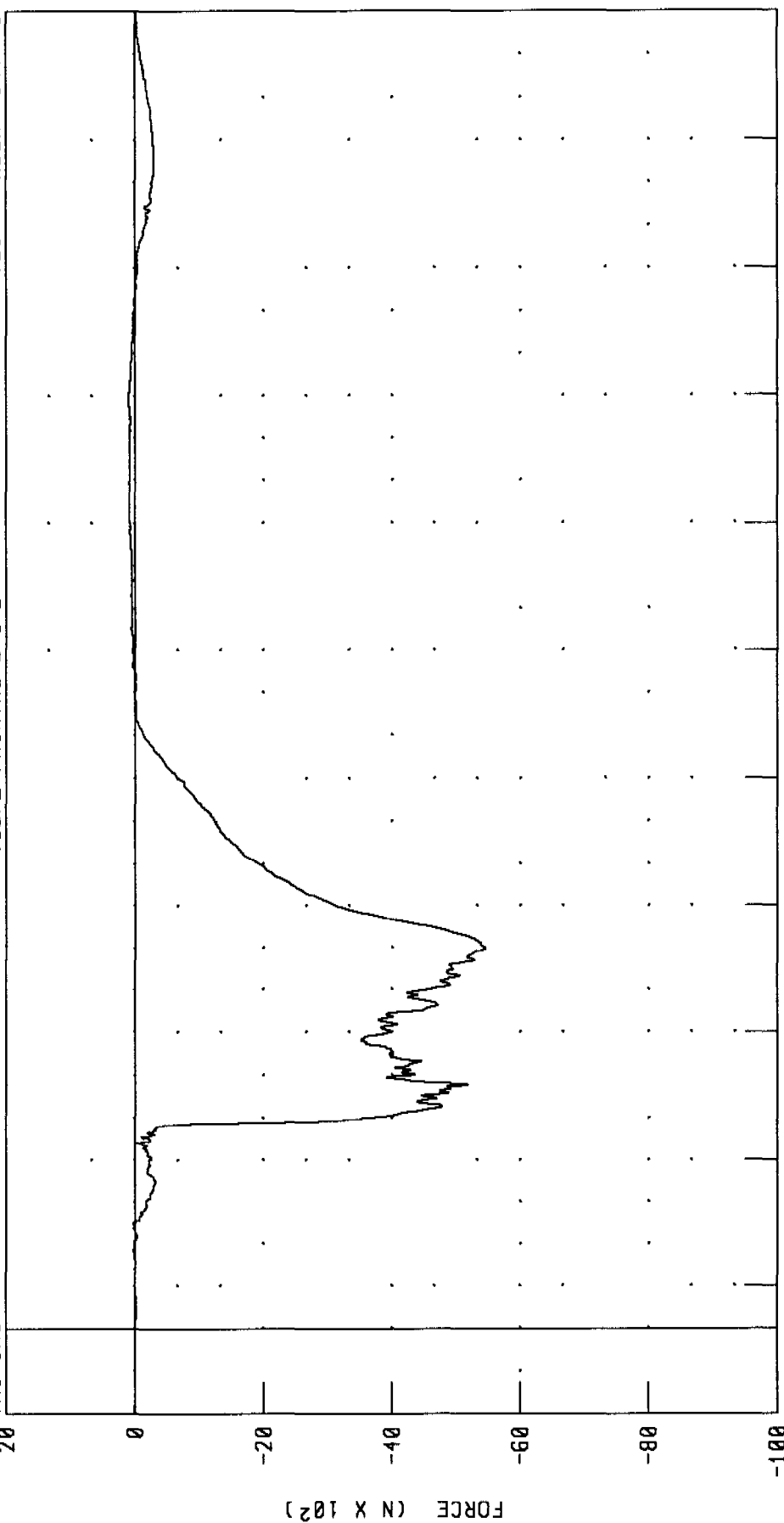
CHANNEL CSTXD1 FILTER CH CLASS 180

PEAK DATA 0 04 MM @ 24 40 MS, -30 56 MM @ 91 76 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER LEFT FEMUR FORCE
 VOLPE FRONTAL L C B

TEST NUMBER 960930

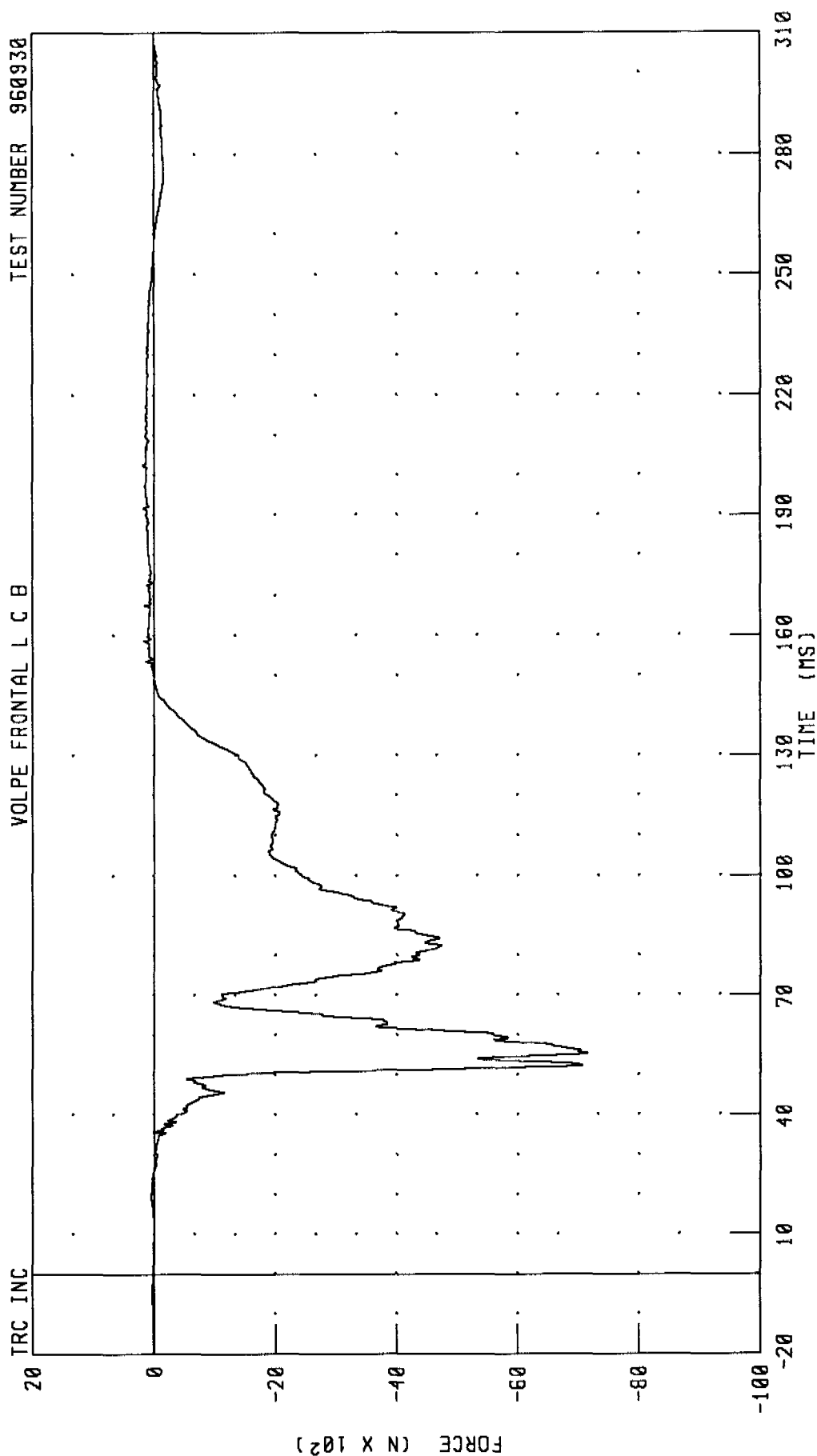
TRC INC



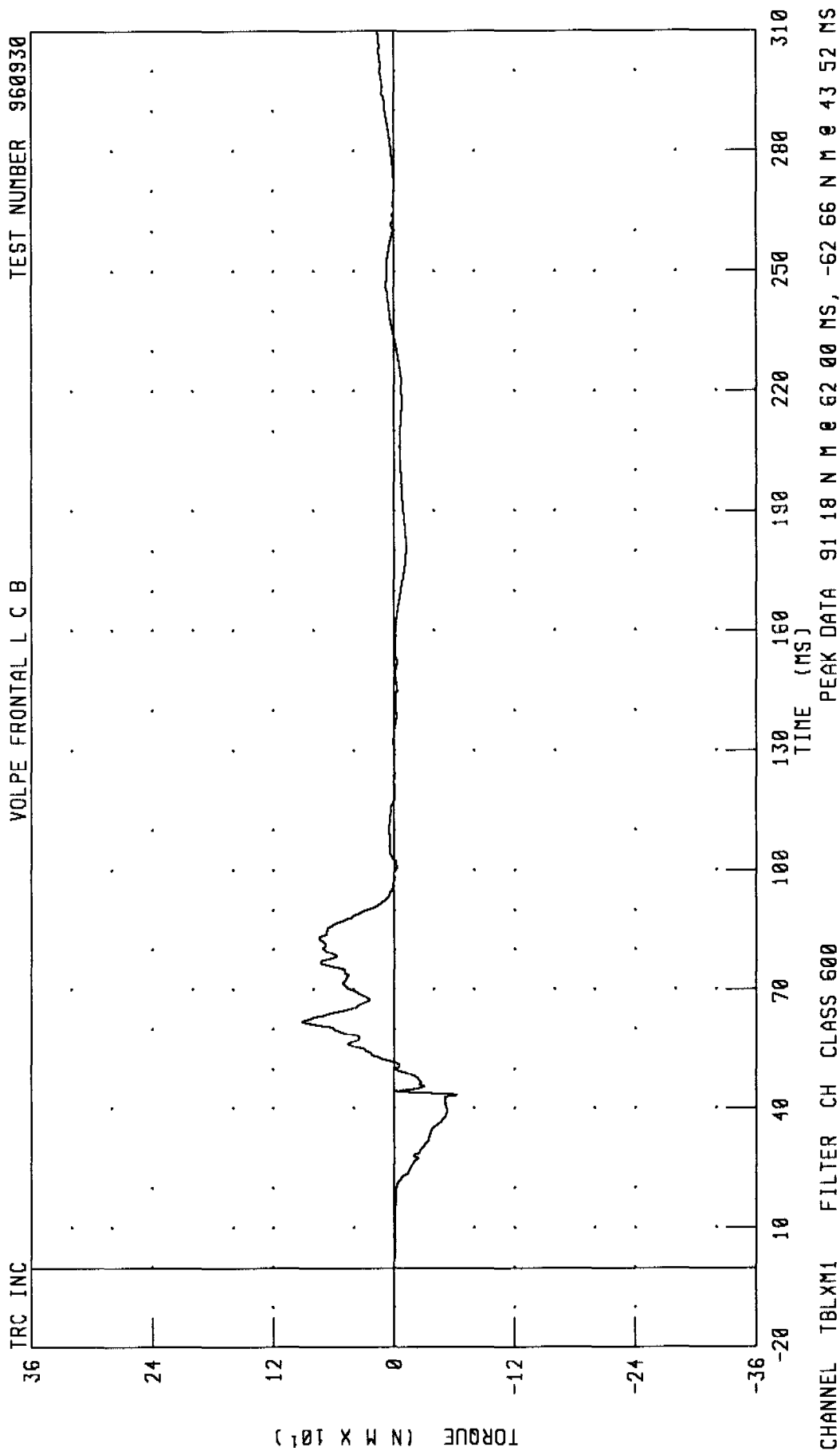
CHANNEL LFMFI FILTER CH CLASS 600

PEAK DATA 97 46 N @ 220 56 MS, -5462 80 N @ 89 84 MS

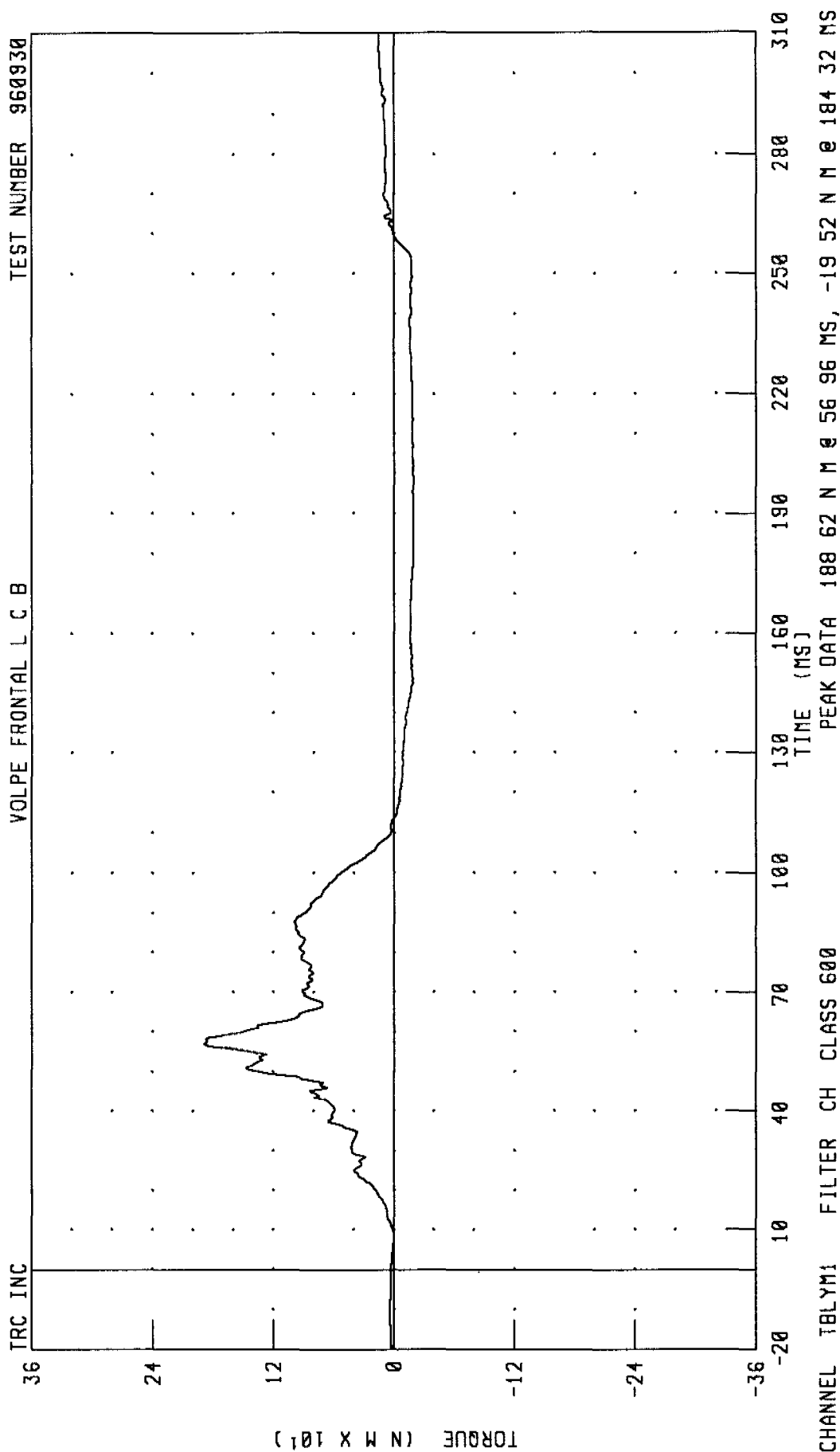
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER RIGHT FEMUR FORCE



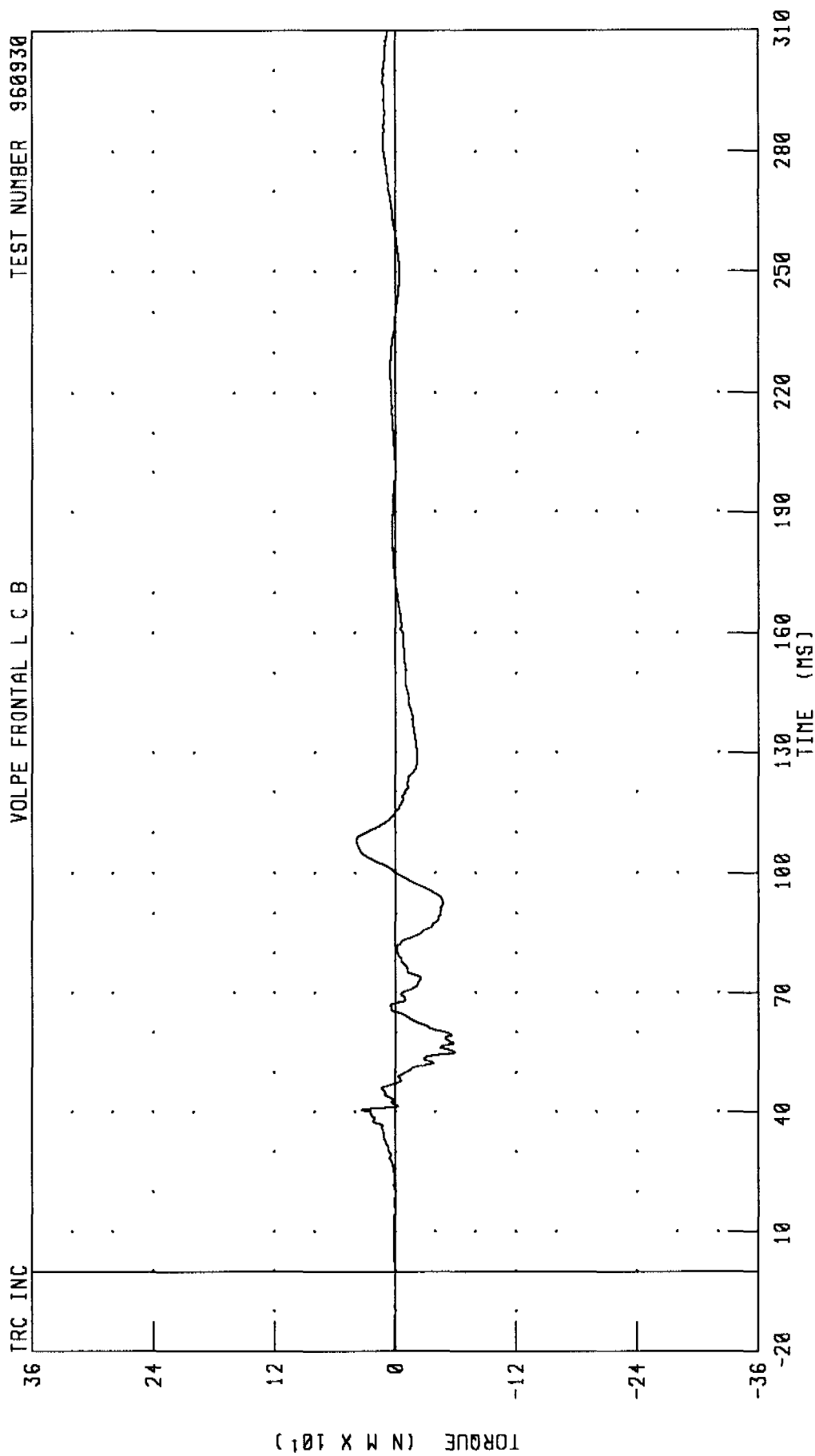
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER LEFT UPPER TIBIA MOMENT ABOUT X AXIS



1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER LEFT UPPER TIBIA MOMENT ABOUT Y AXIS



1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER RIGHT UPPER TIBIA MOMENT ABOUT X AXIS



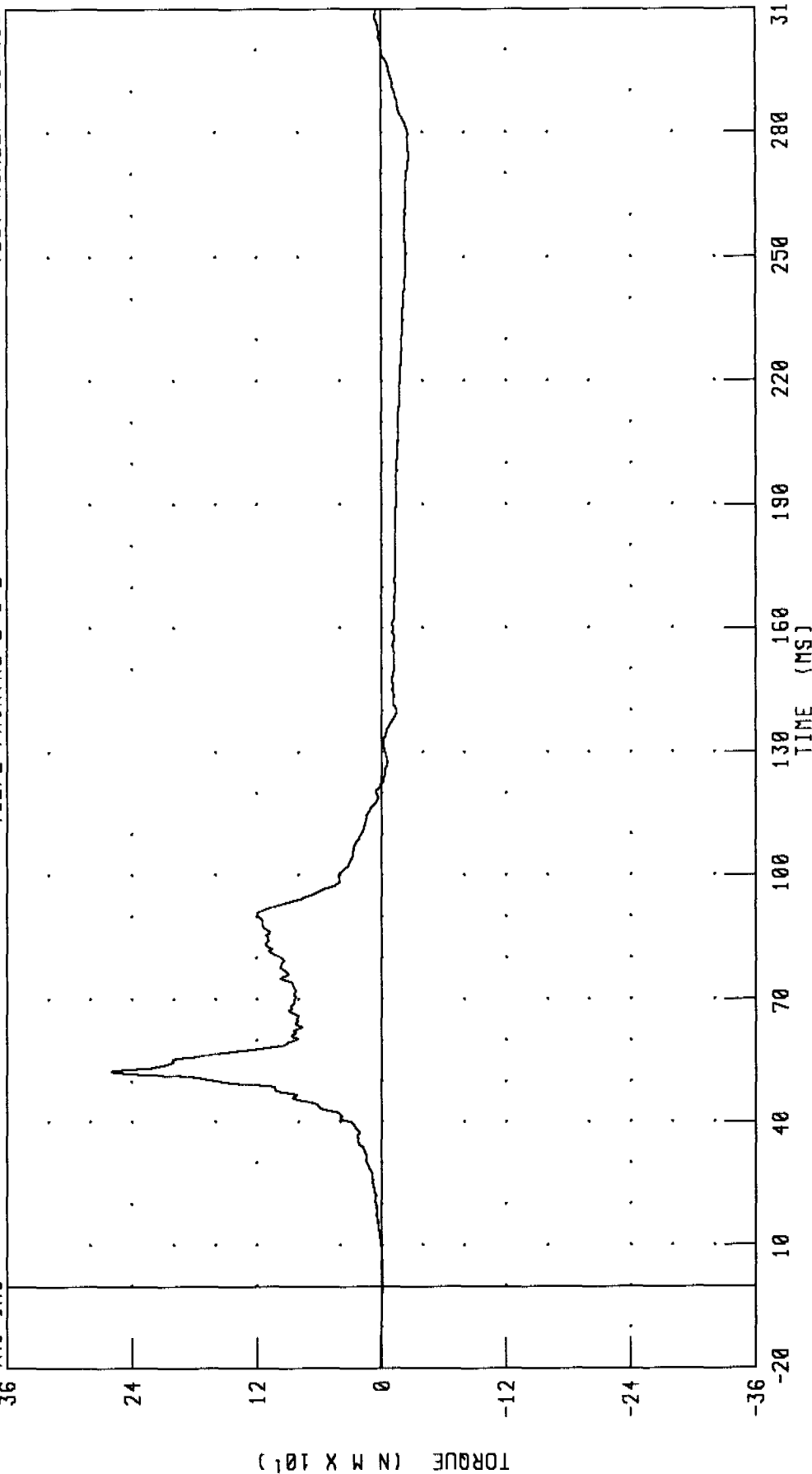
CHANNEL TBRXM1 FILTER CH CLASS 600

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER RIGHT UPPER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



CHANNEL TBVM1 FILTER CH CLASS 600

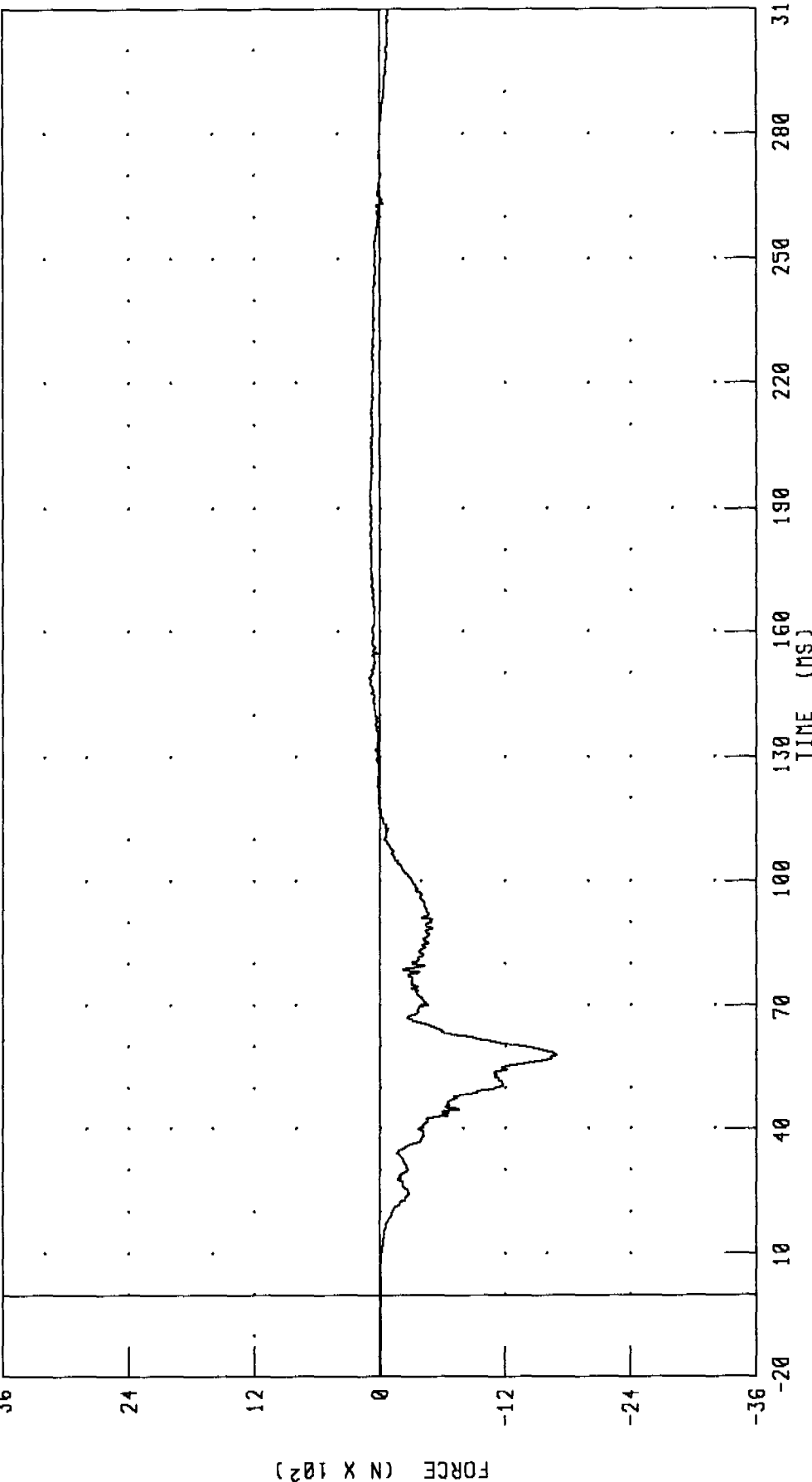
PEAK DATA 259 89 N M @ 52 48 MS, -26 14 N M @ 274 16 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER LEFT LOWER TIBIA X-AXIS FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



CHANNEL ANLXF1 FILTER CH CLASS 600

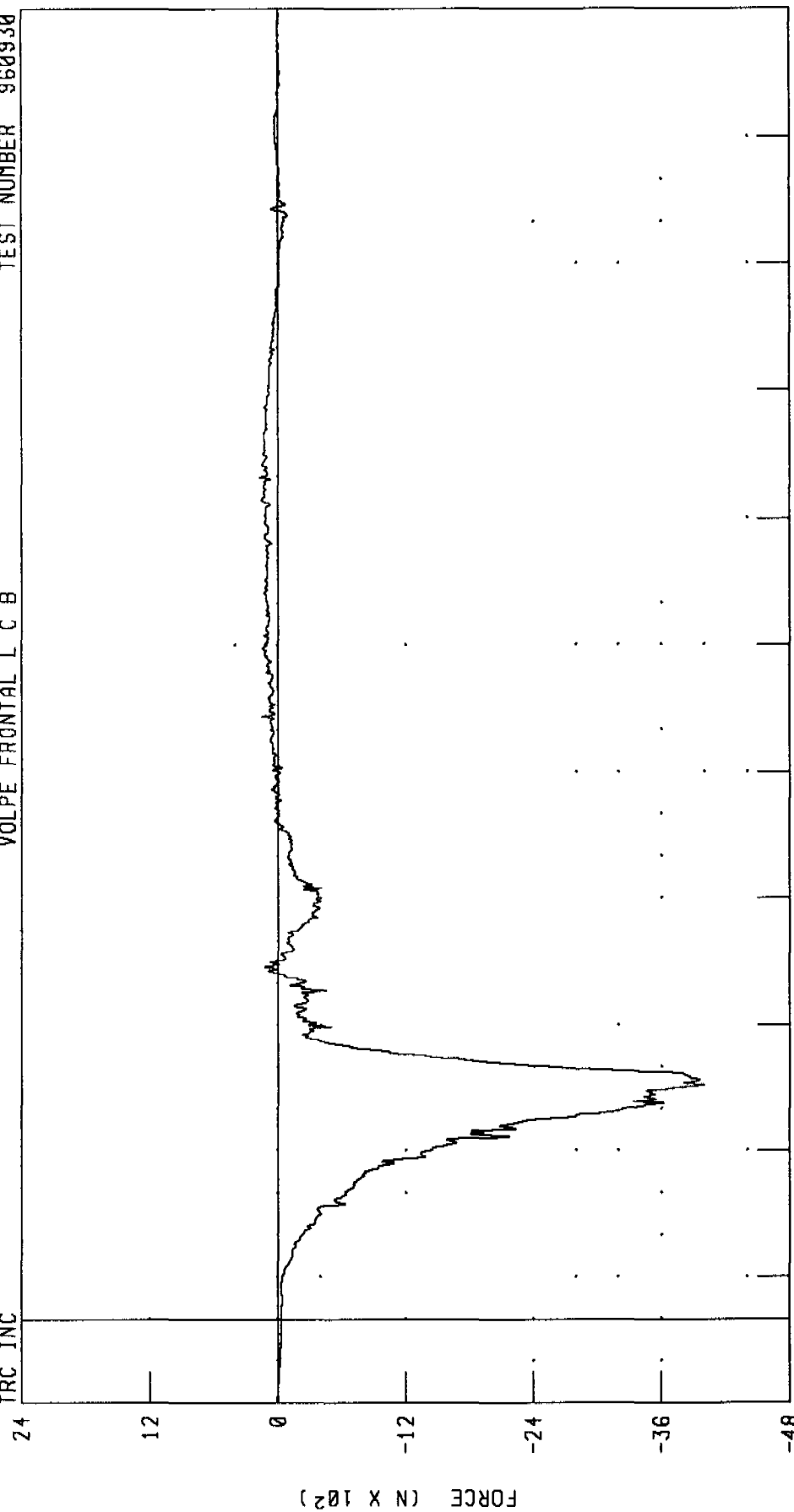
PEAK DATA 100 12 N @ 148 72 MS, -1696 81 N @ 58 00 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER LEFT LOWER TIBIA Z-AXIS FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC

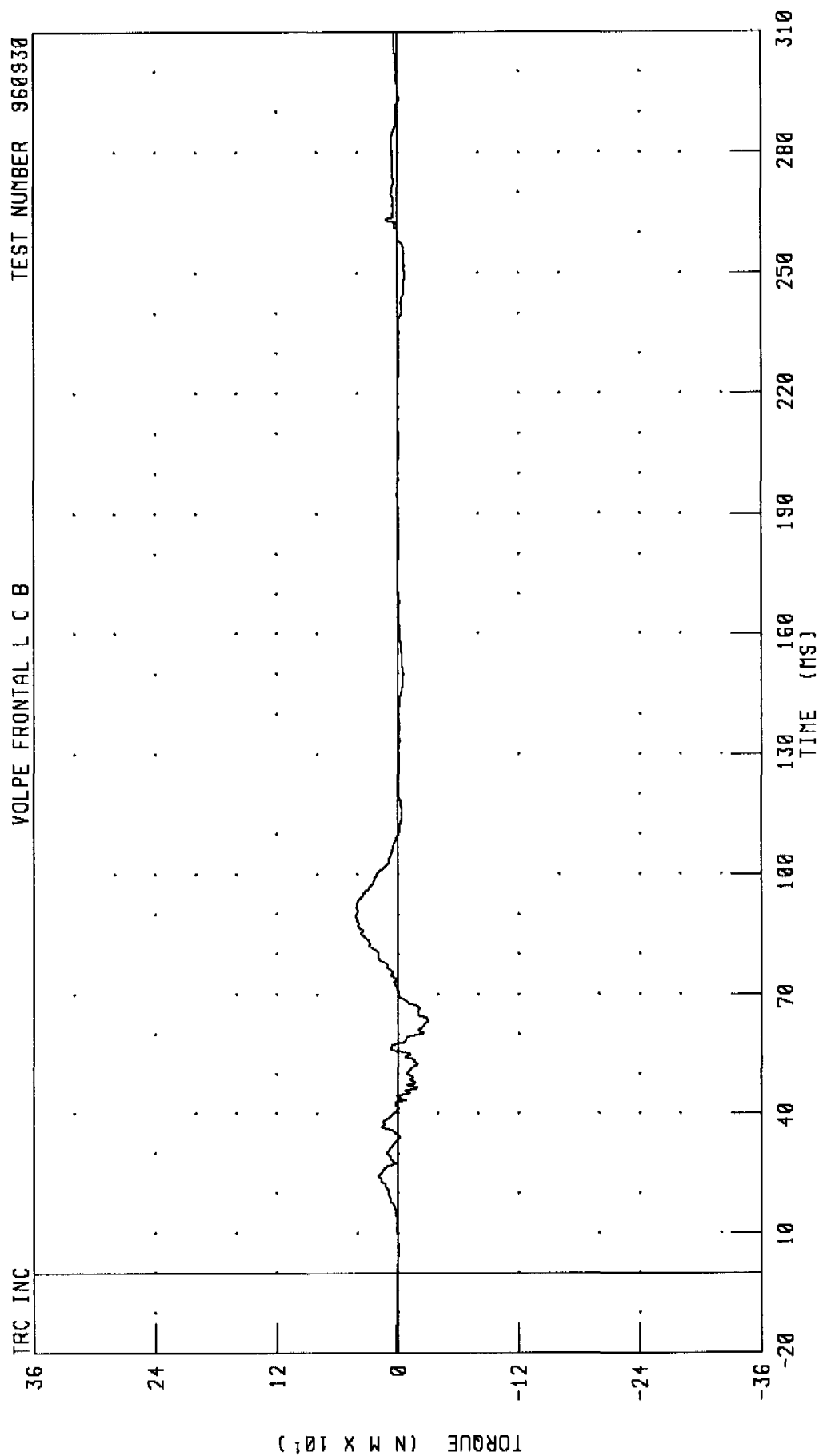


TIME (MS)

CHANNEL ANLZF1 FILTER CH CLASS 600

PEAK DATA 175 99 N @ 200 00 MS, -3989 90 N @ 55 60 MS

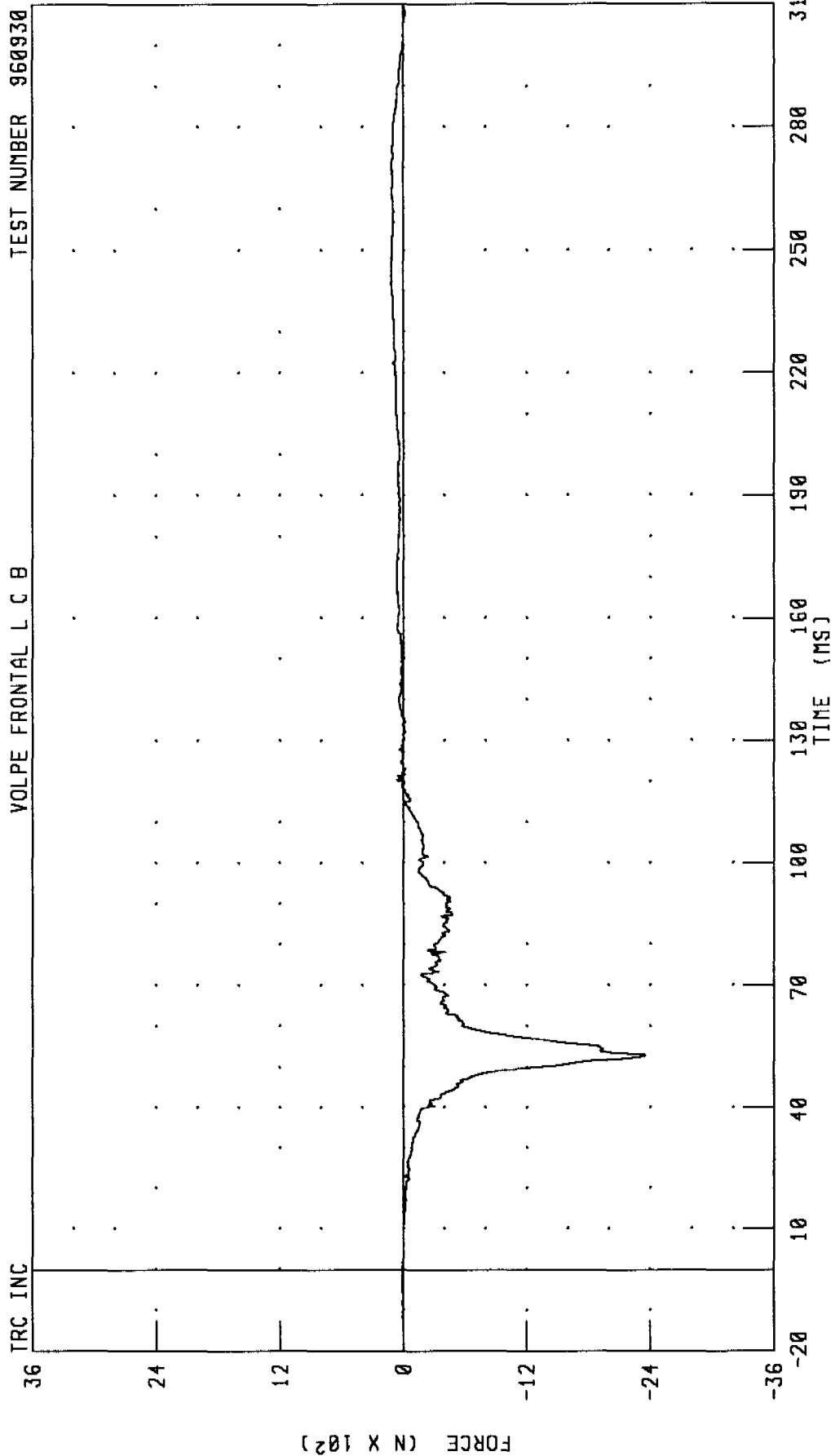
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER LEFT LOWER TIBIA MOMENT ABOUT Y AXIS



CHANNEL ANLYM1 FILTER CH CLASS 600

PEAK DATA 41 62 N M @ 89 76 MS, -30 49 N M @ 63 44 MS

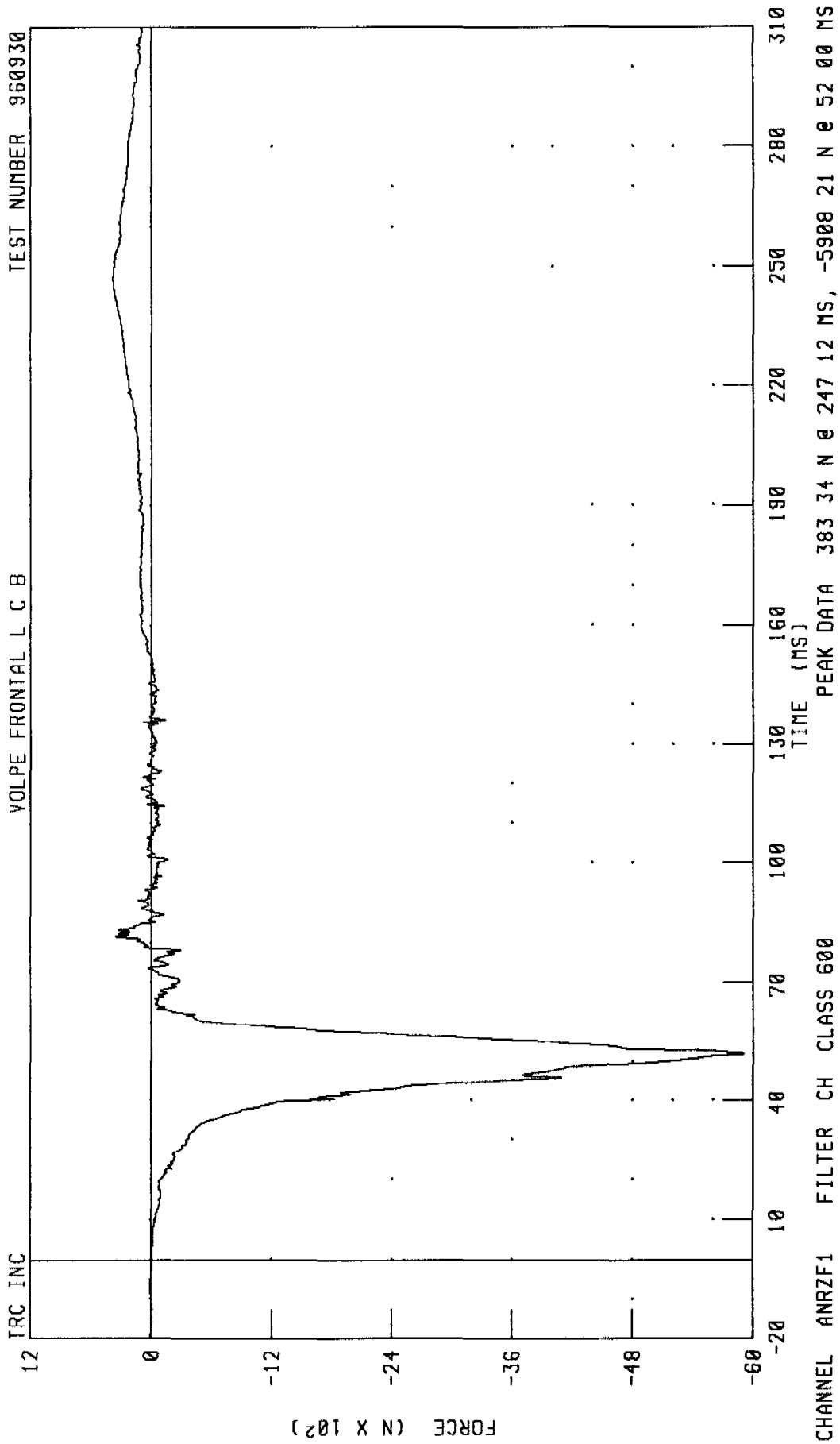
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER RIGHT LOWER TIBIA X-AXIS FORCE



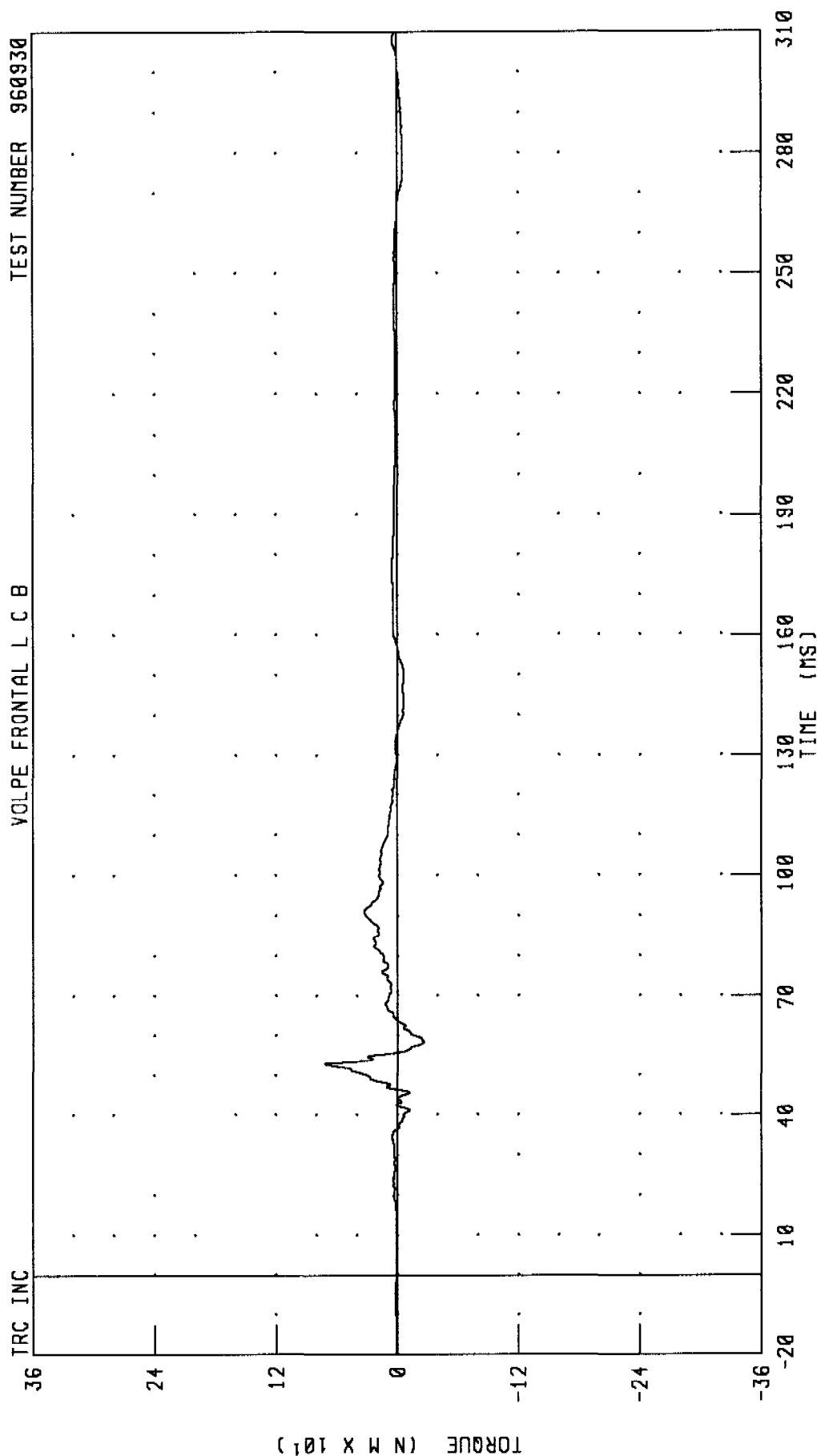
CHANNEL ANRXF1 FILTER CH CLASS 600

PEAK DATA 119 34 N @ 242 00 MS, -2350 63 N @ 52 88 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 DRIVER RIGHT LOWER TIBIA Z-AXIS FORCE



1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
DRIVER RIGHT LOWER TIBIA MOMENT ABOUT Y AXIS



CHANNEL ANRYM1 FILTER CH CLASS 600

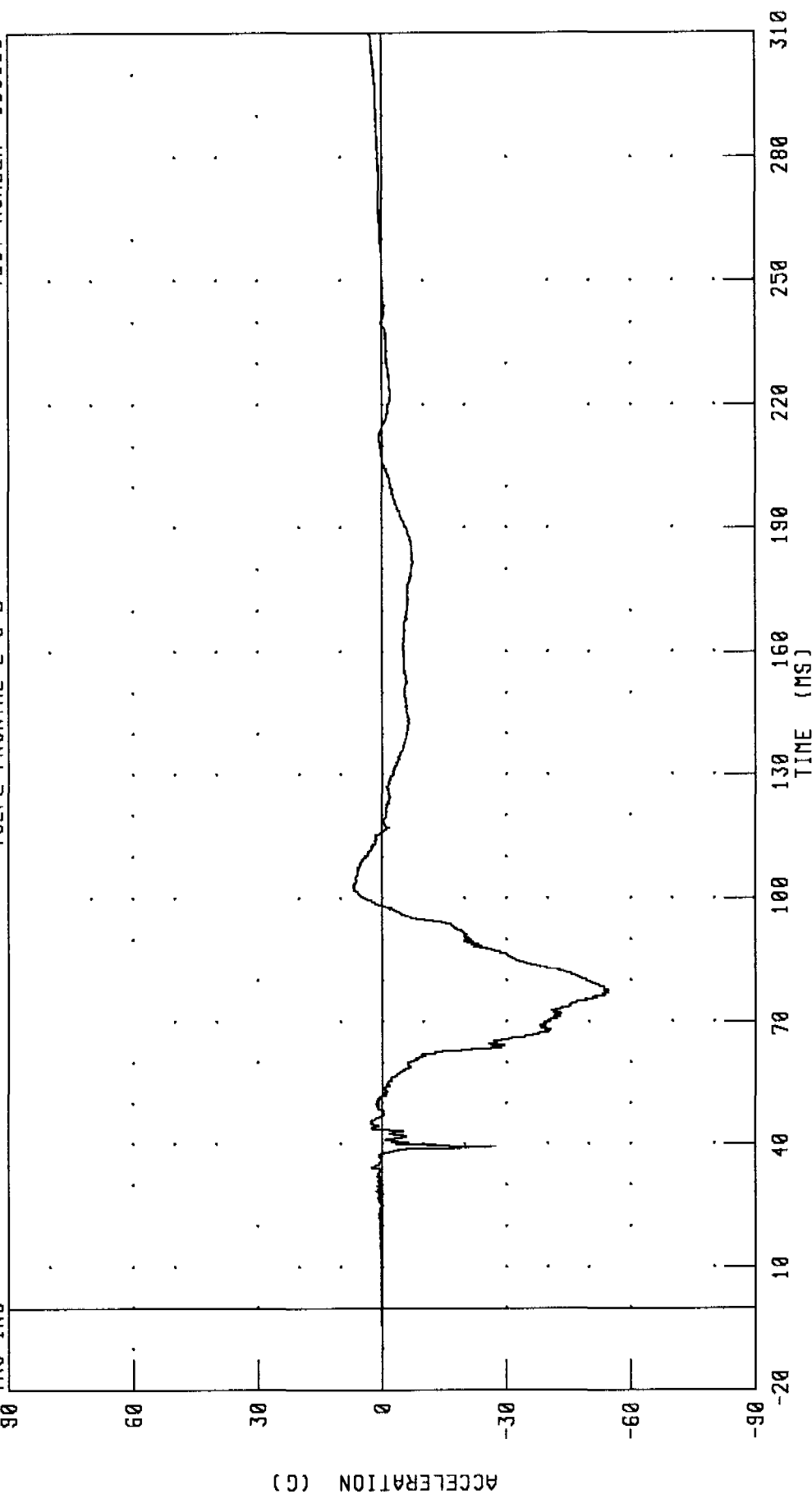
PEAK DATA 72 15 N M @ 52 88 MS, -26 03 N M @ 58 40 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER HEAD X-AXIS ACCELERATION

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



CHANNEL HEDXC2 FILTER CH CLASS 1000

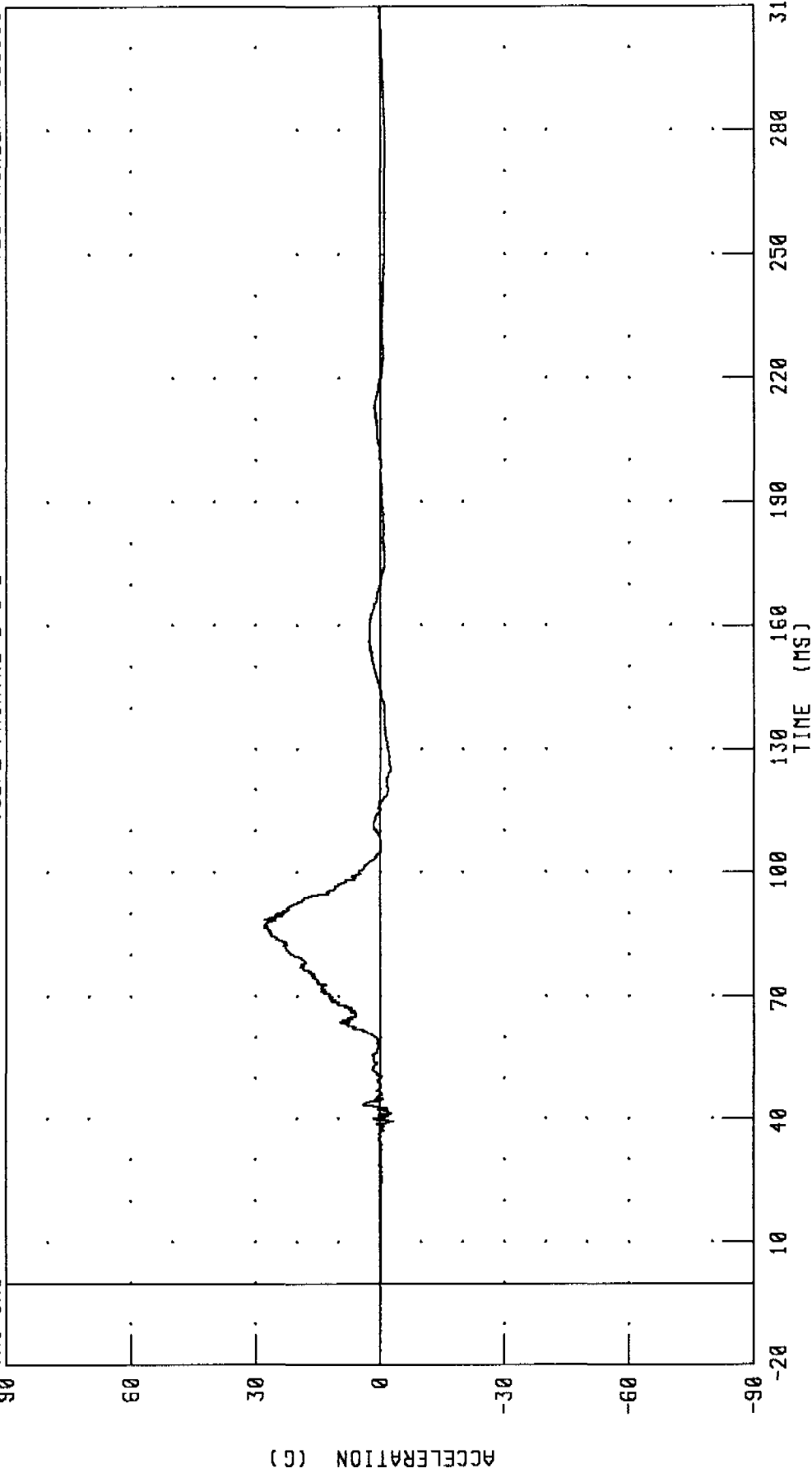
PEAK DATA 6 76 G @ 102 00 MS, -54 64 G @ 77 12 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER HEAD Y-AXIS ACCELERATION

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



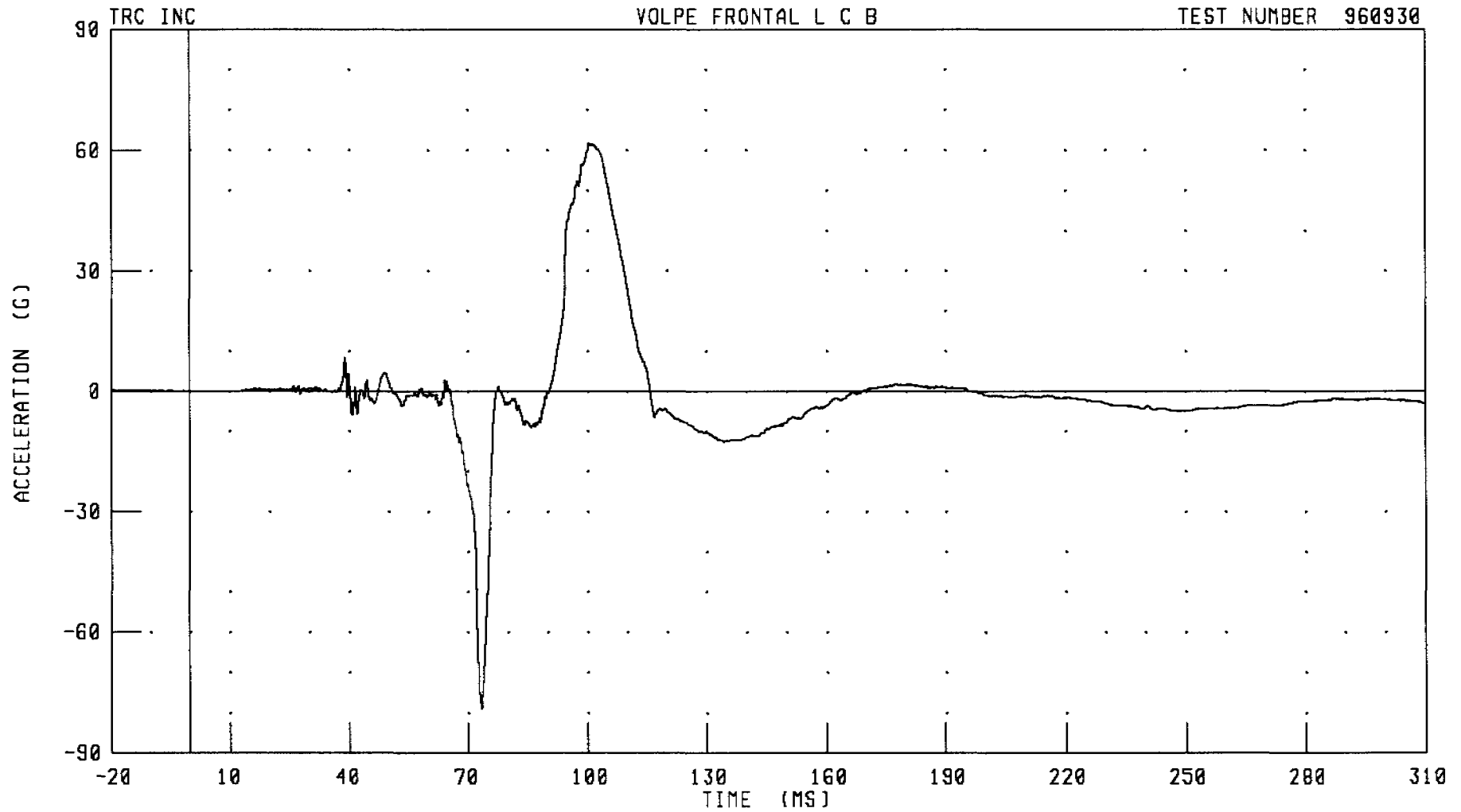
CHANNEL HEDYG2 FILTER CH CLASS 1000

PEAK DATA 27 86 G @ 86 56 MS, -3 28 G @ 39 52 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER HEAD Z-AXIS ACCELERATION

VOLPE FRONTAL L C B

TEST NUMBER 960930



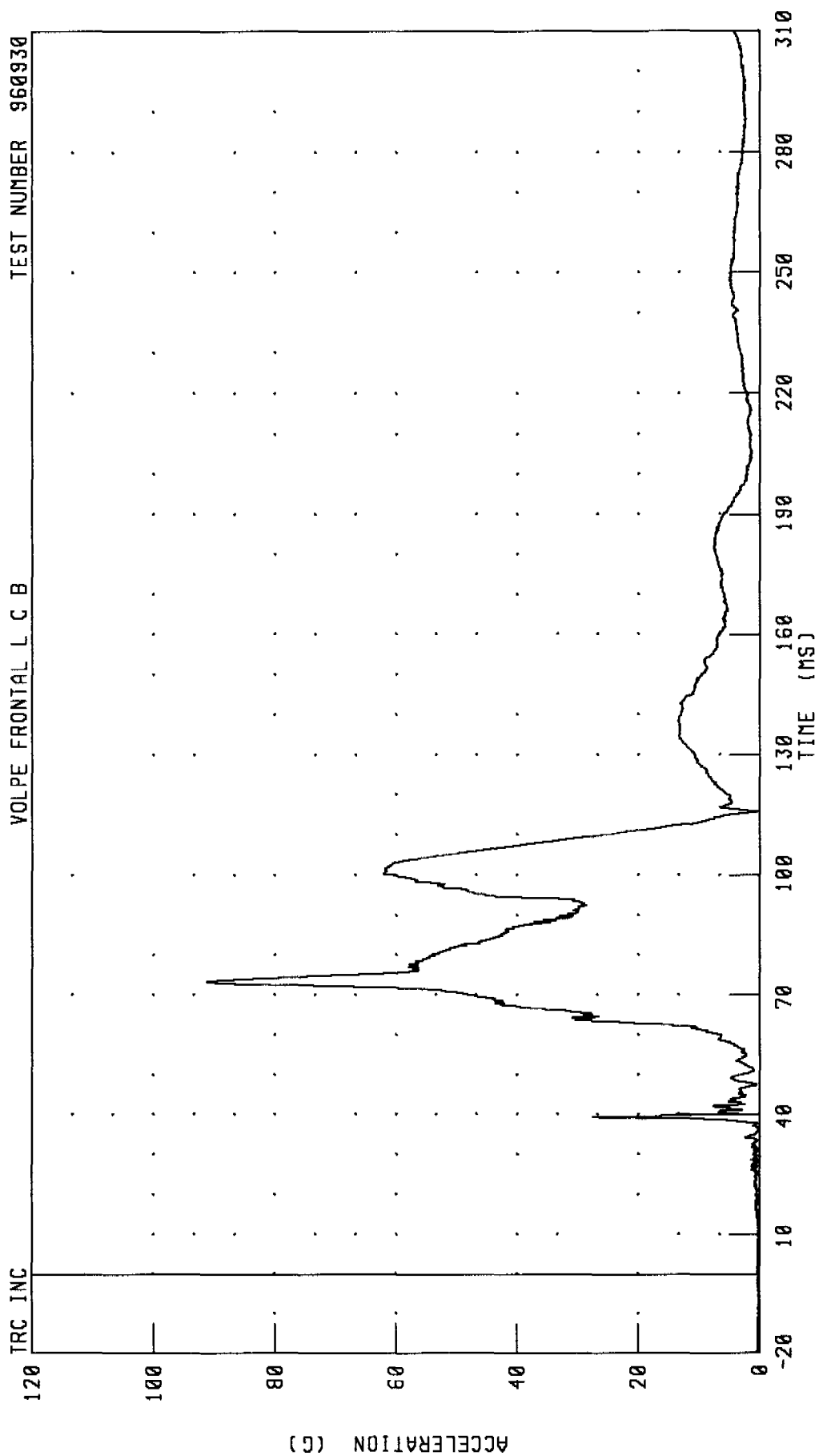
CHANNEL HEDZG2 FILTER CH CLASS 1000

PEAK DATA 61.69 G @ 100.32 MS, -80.95 G @ 73.36 MS

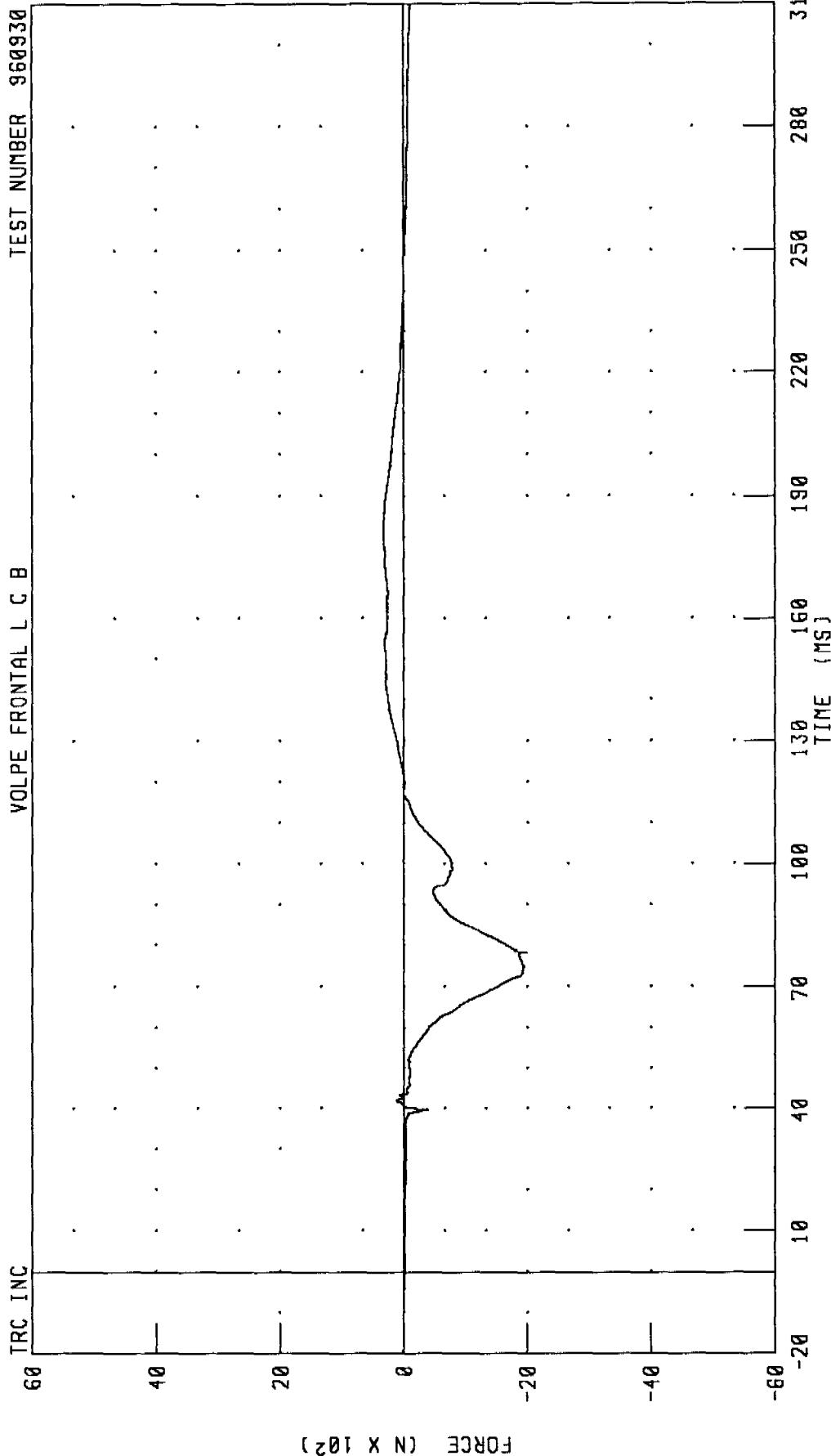
B-31

056096

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER HEAD RESULTANT ACCELERATION

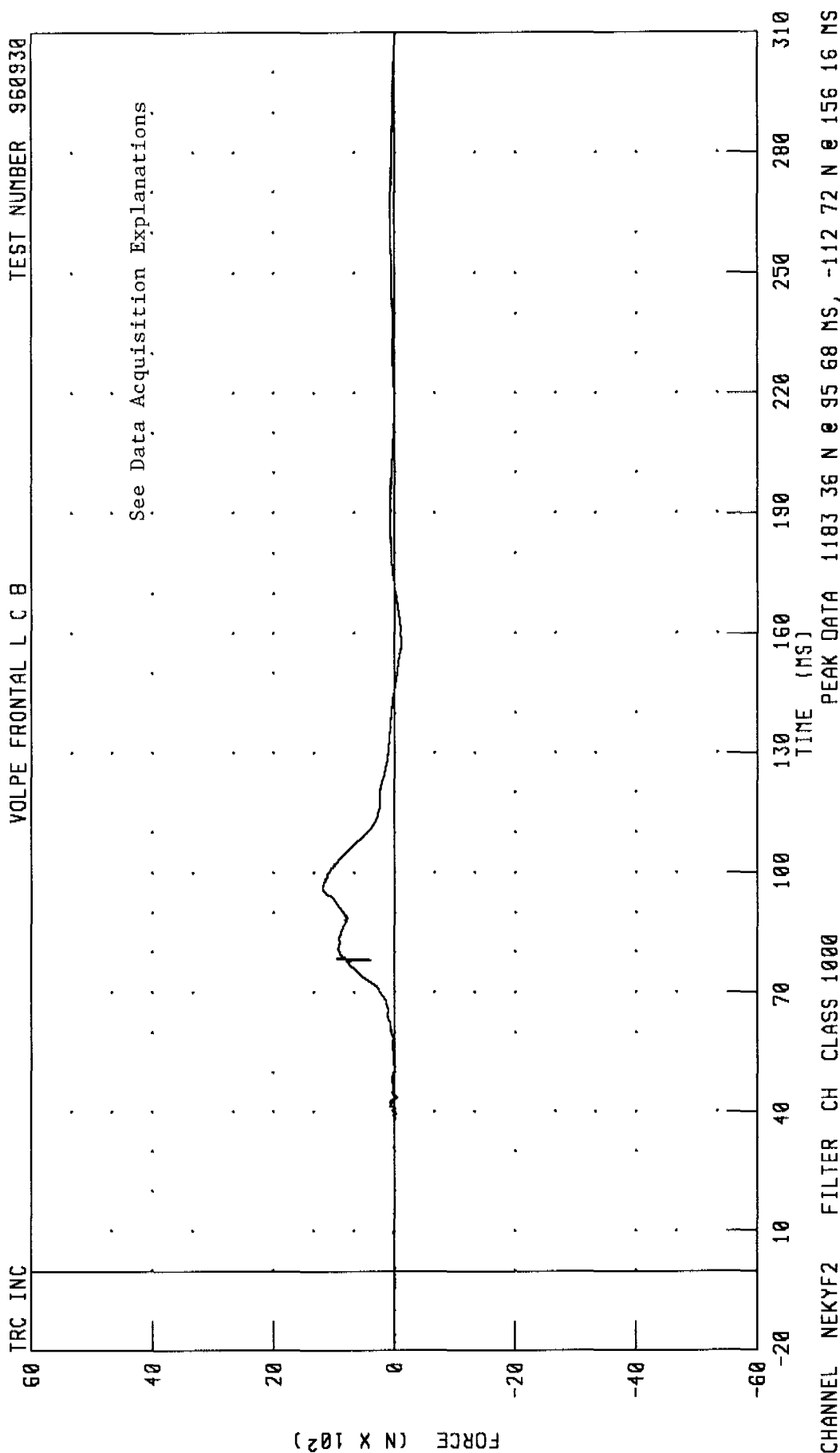


1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK X-AXIS SHEAR FORCE

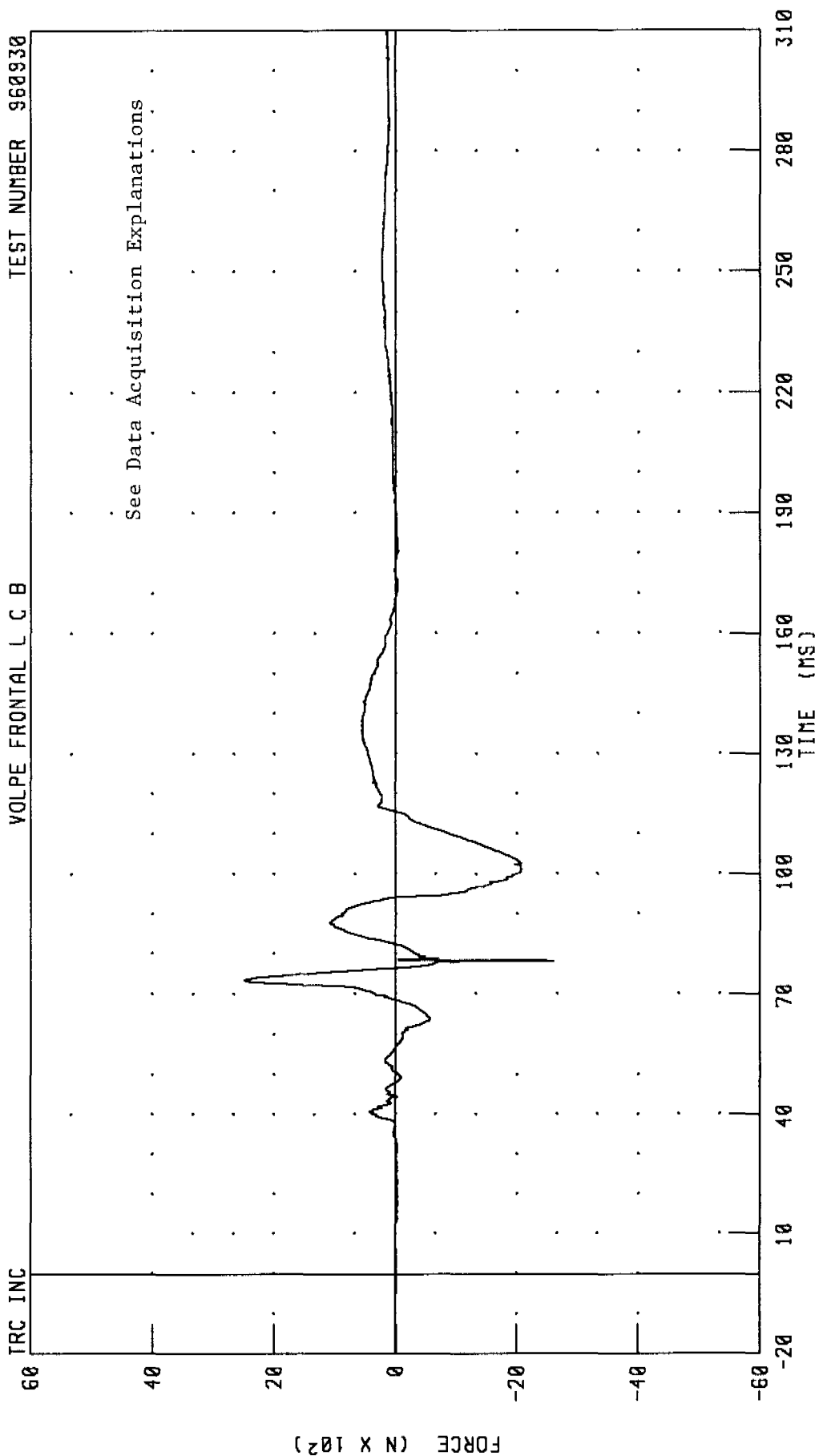


CHANNEL NEKXF2 FILTER CH CLASS 1000

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK Y-AXIS SHEAR FORCE

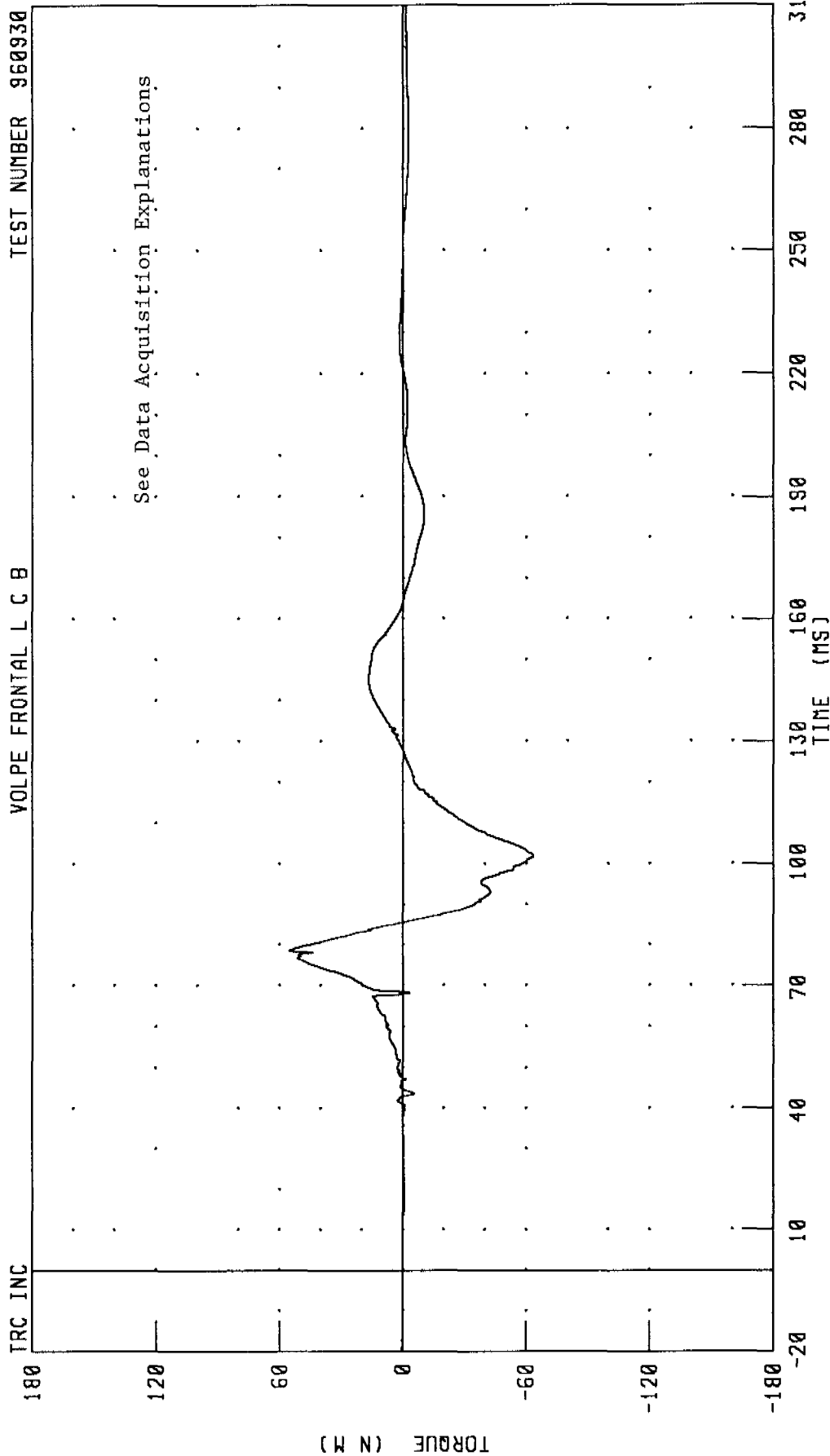


1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK Z-AXIS AXIAL FORCE



CHANNEL NEKZF2 FILTER CH CLASS 1000

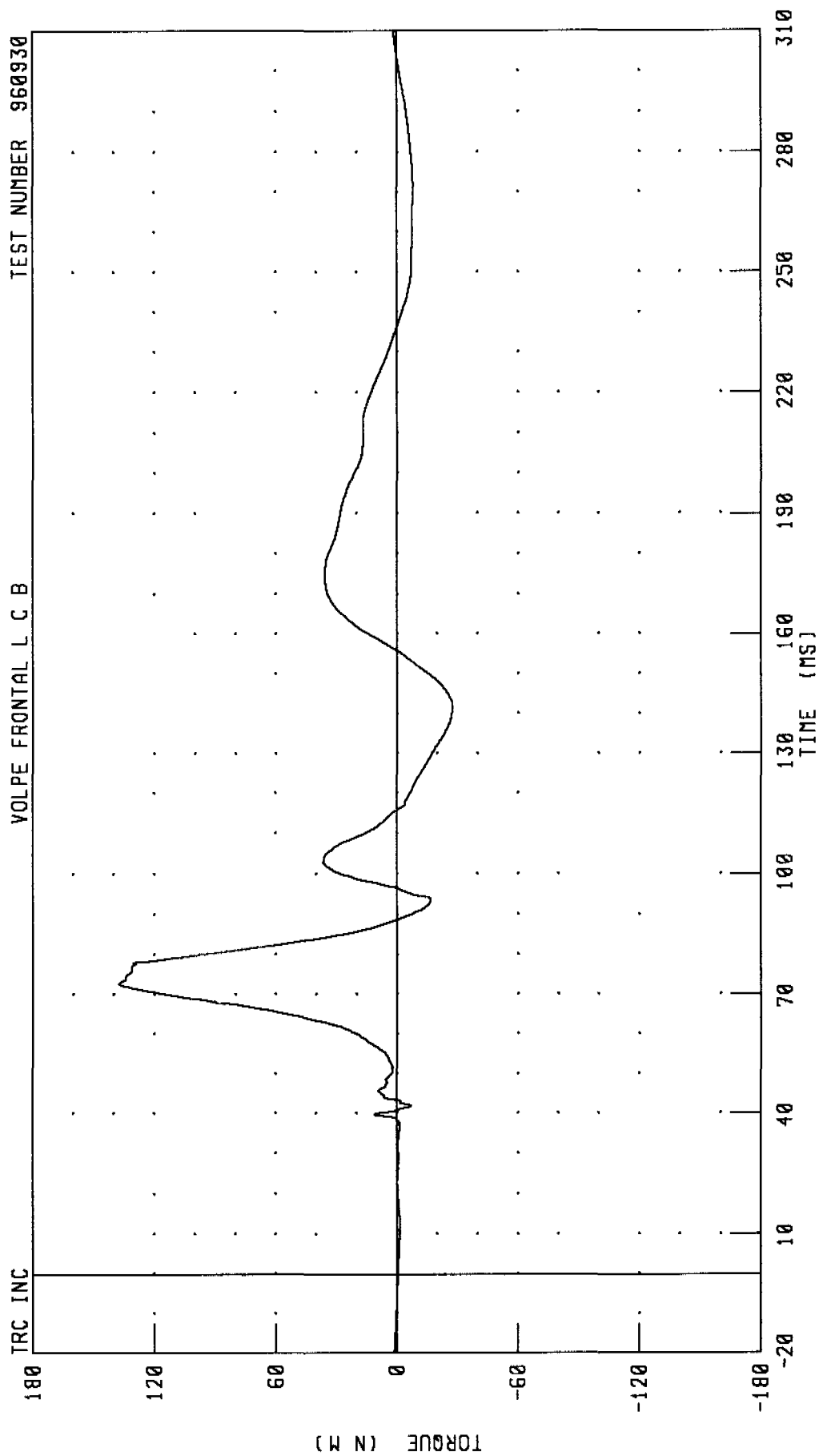
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK MOMENT ABOUT X AXIS



CHANNEL NEKXM2 FILTER CH CLASS 600

PEAK DATA 55 49 N M @ 78 64 MS, -63 67 N M @ 102 08 MS

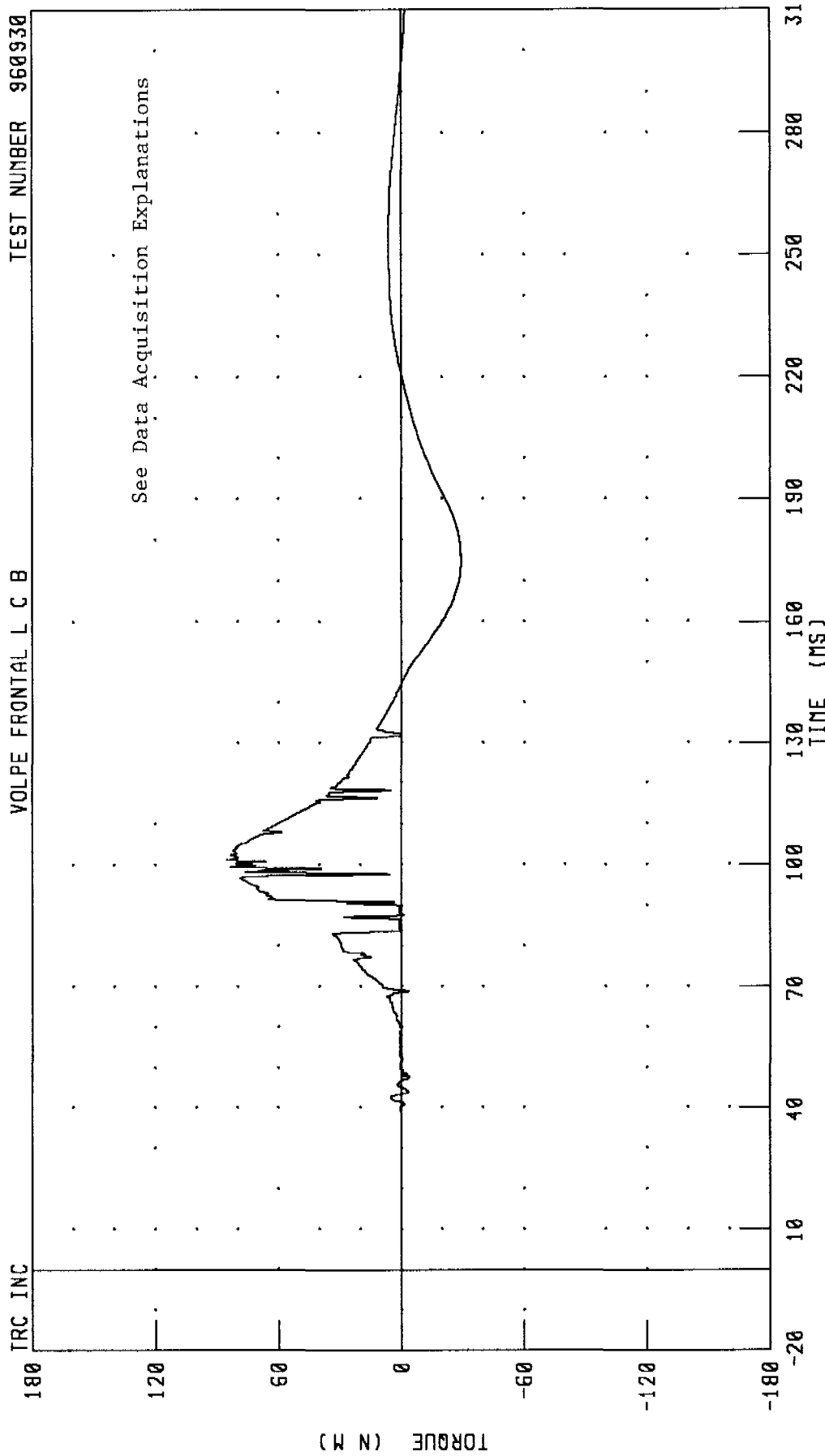
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK MOMENT ABOUT Y AXIS



CHANNEL NEYM2 FILTER CH CLASS 600

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER NECK MOMENT ABOUT Z AXIS

VOLPE FRONTAL L C B TEST NUMBER 960930



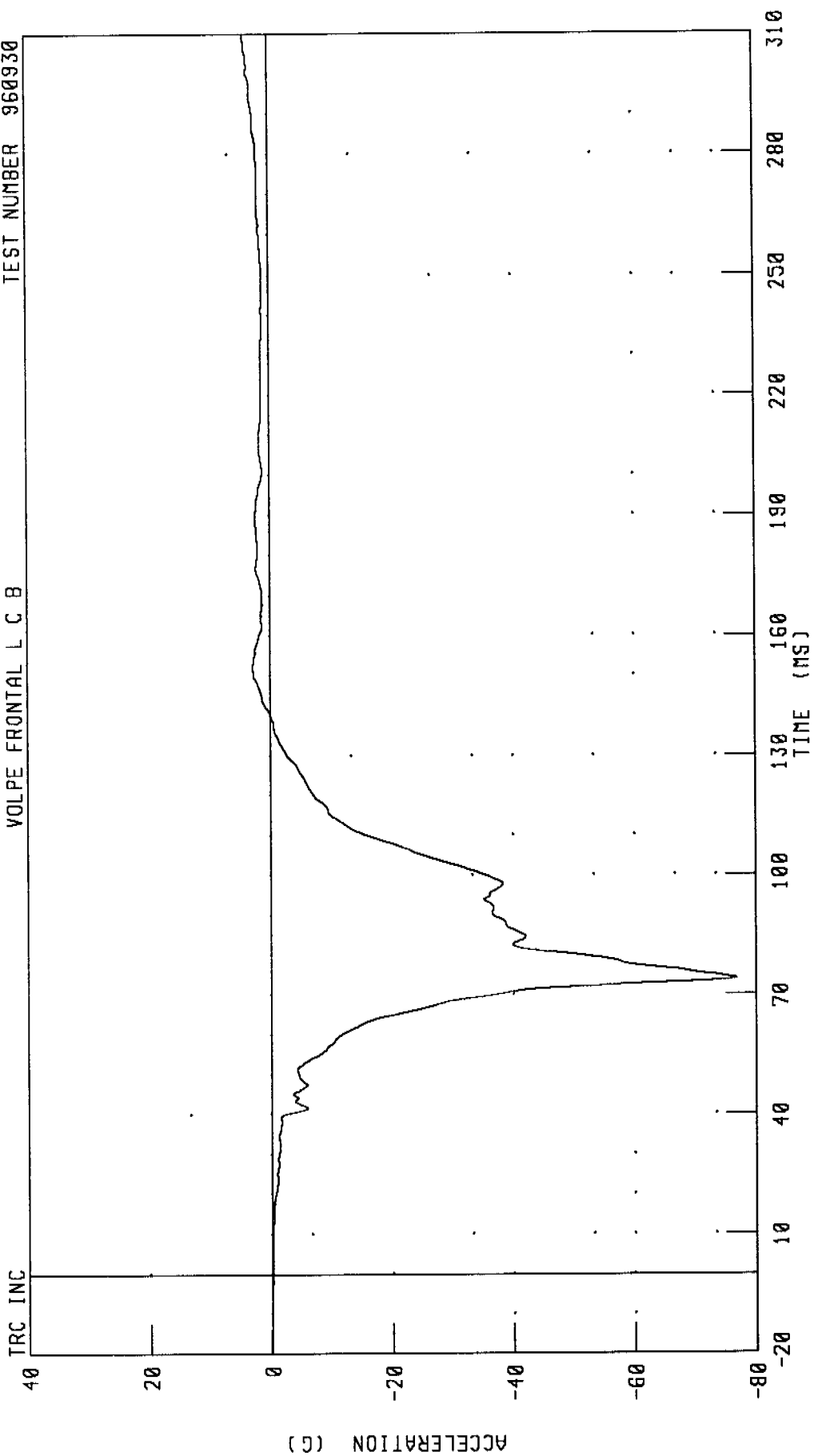
See Data Acquisition Explanations

CHANNEL NEKZM2 FILTER CH CLASS 600

PEAK DATA 85 42 N M @ 101 20 MS, -29 59 N M @ 173 52 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER CHEST X-AXIS ACCELERATION
VOLPE FRONTAL L C B

TEST NUMBER 960930



CHANNEL CSTXG2 FILTER CH CLASS 180

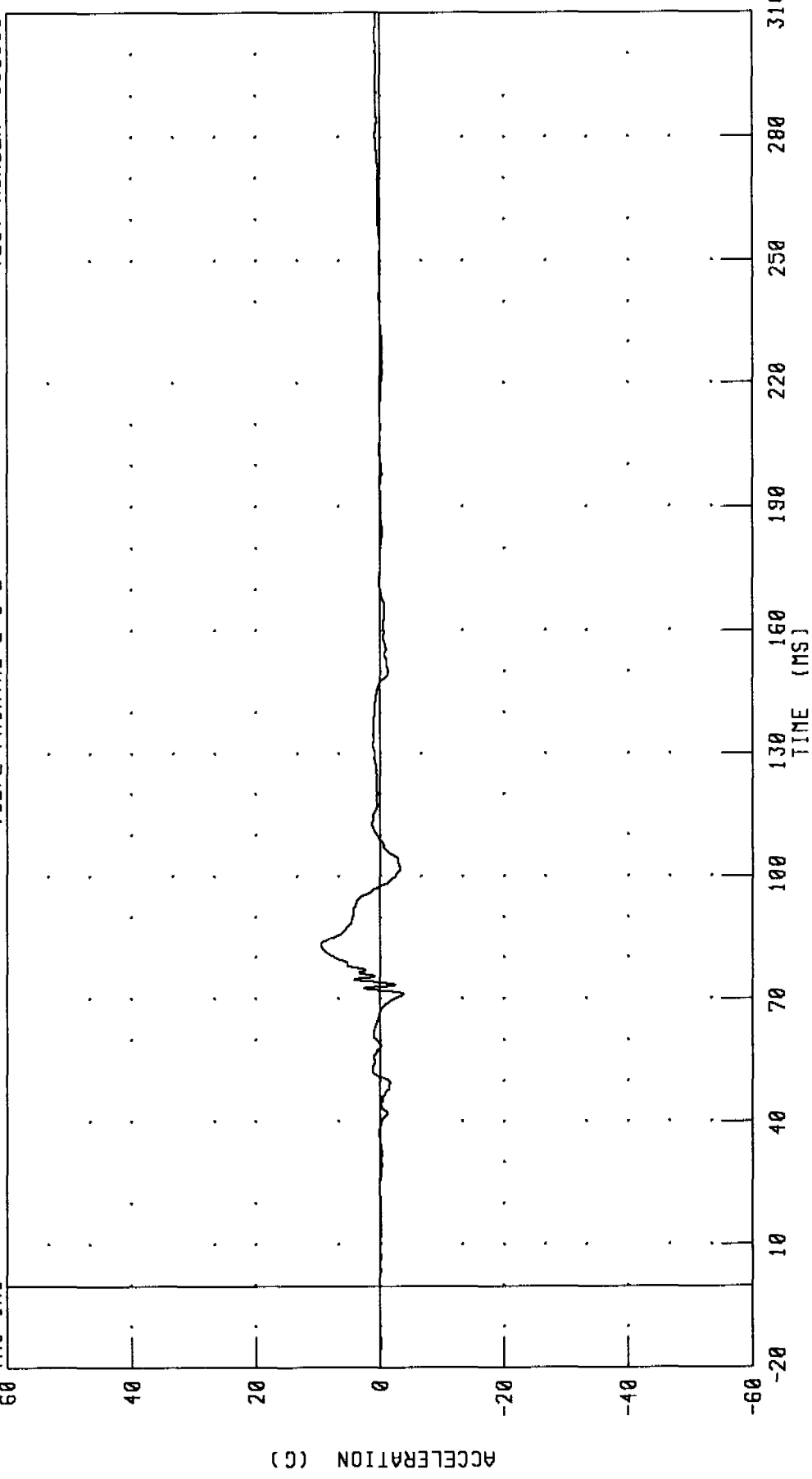
PEAK DATA 4 02 G @ 309 52 MS, -76 77 G @ 74 00 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER CHEST Y-AXIS ACCELERATION

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC

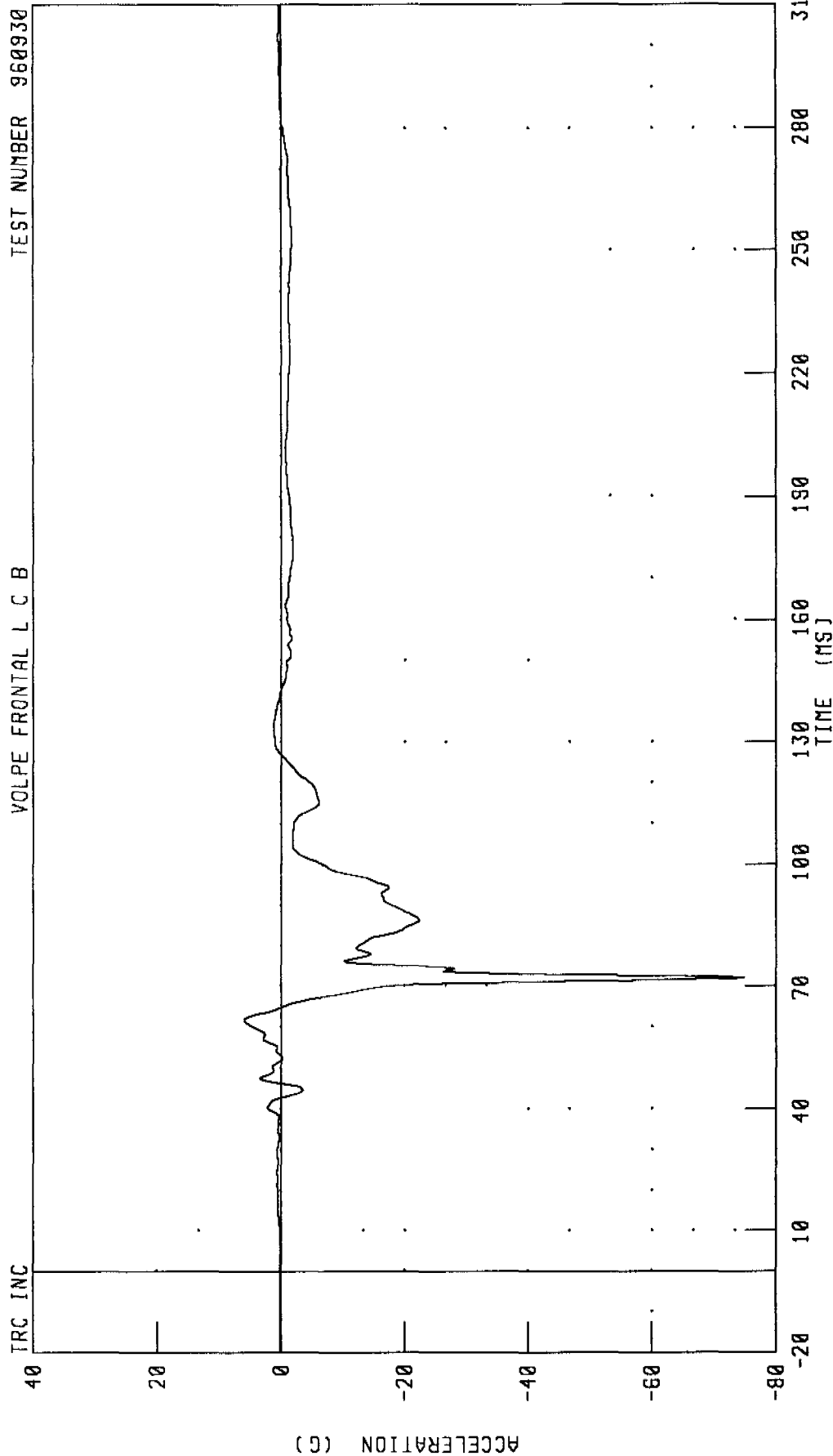


CHANNEL CSTYG2 FILTER CH CLASS 180

PEAK DATA 9 53 G @ 83 36 MS, -3 80 G @ 71 28 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER CHEST Z-AXIS ACCELERATION
VOLPE FRONTAL L C B

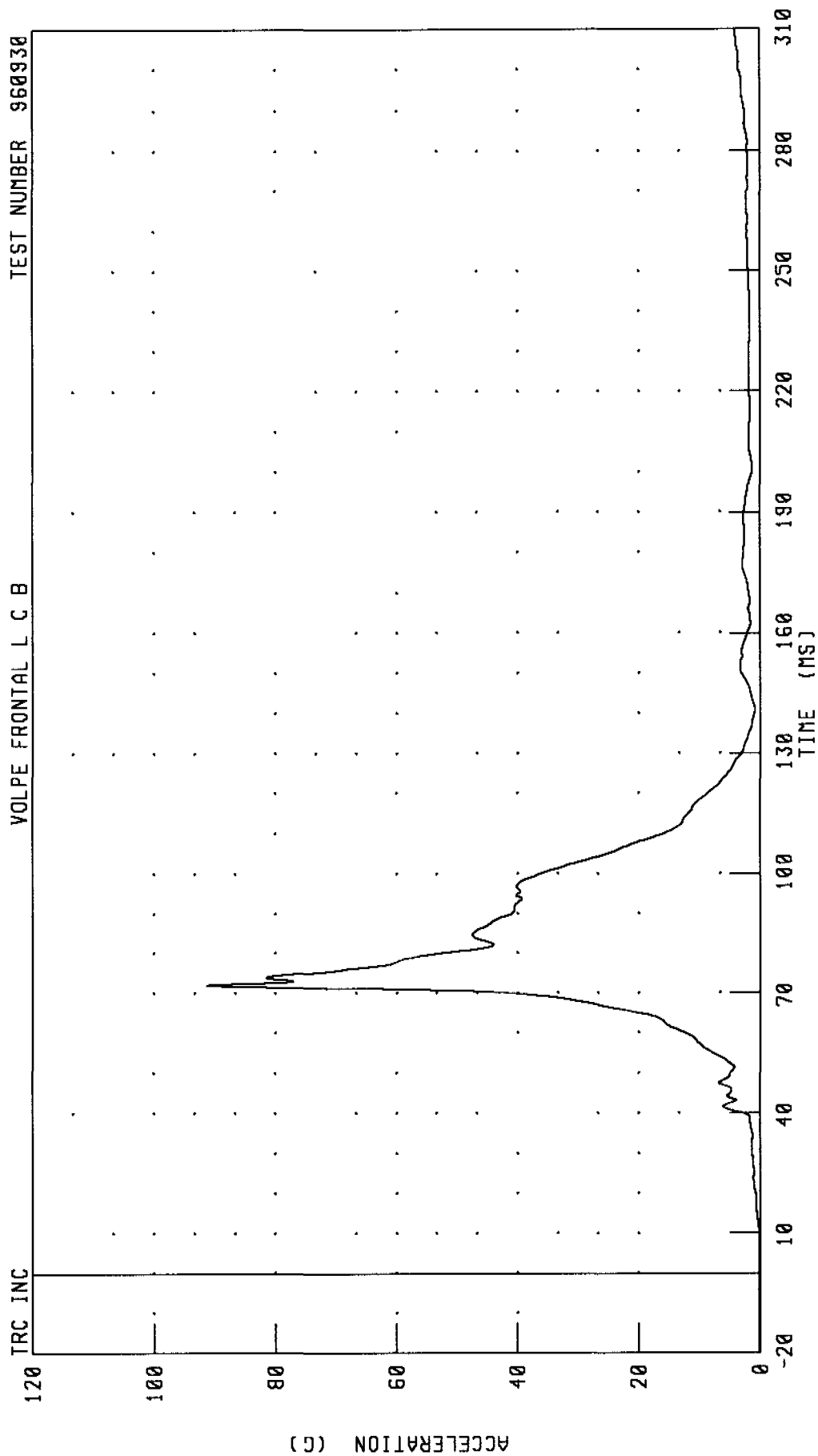
TEST NUMBER 960930



CHANNEL CSTZG2 FILTER CH CLASS 180

PEAK DATA 5 99 G @ 61 68 MS, -74 87 G @ 72 00 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER CHEST RESULTANT ACCELERATION

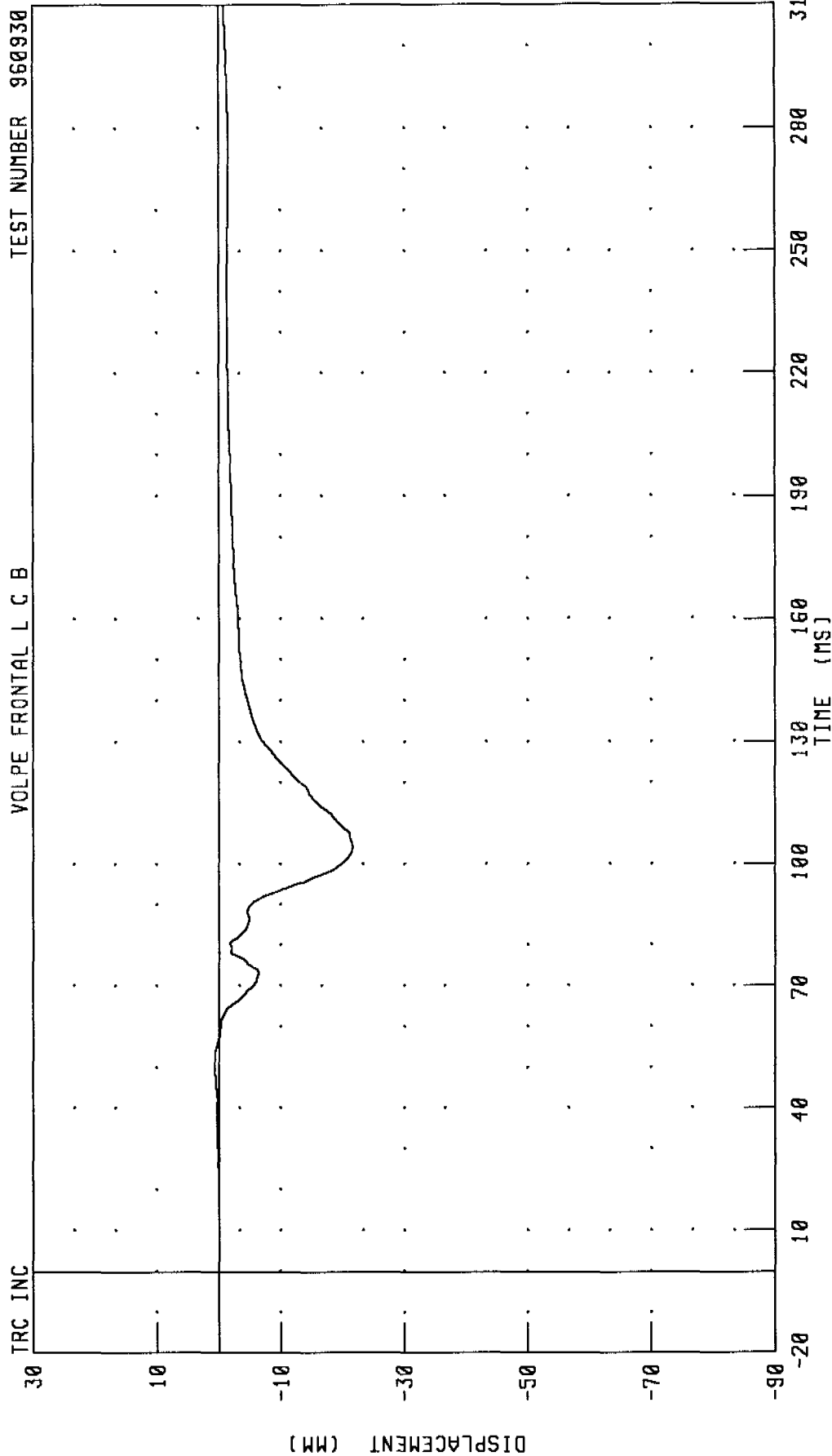


CHANNEL CSTRG2 FILTER CH CLASS 180

PEAK DATA 91 35 G @ 72 08 MS, 0 02 G @ -20 00 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER CHEST DEFLECTION
VOLPE FRONTAL L C B

TEST NUMBER 960930

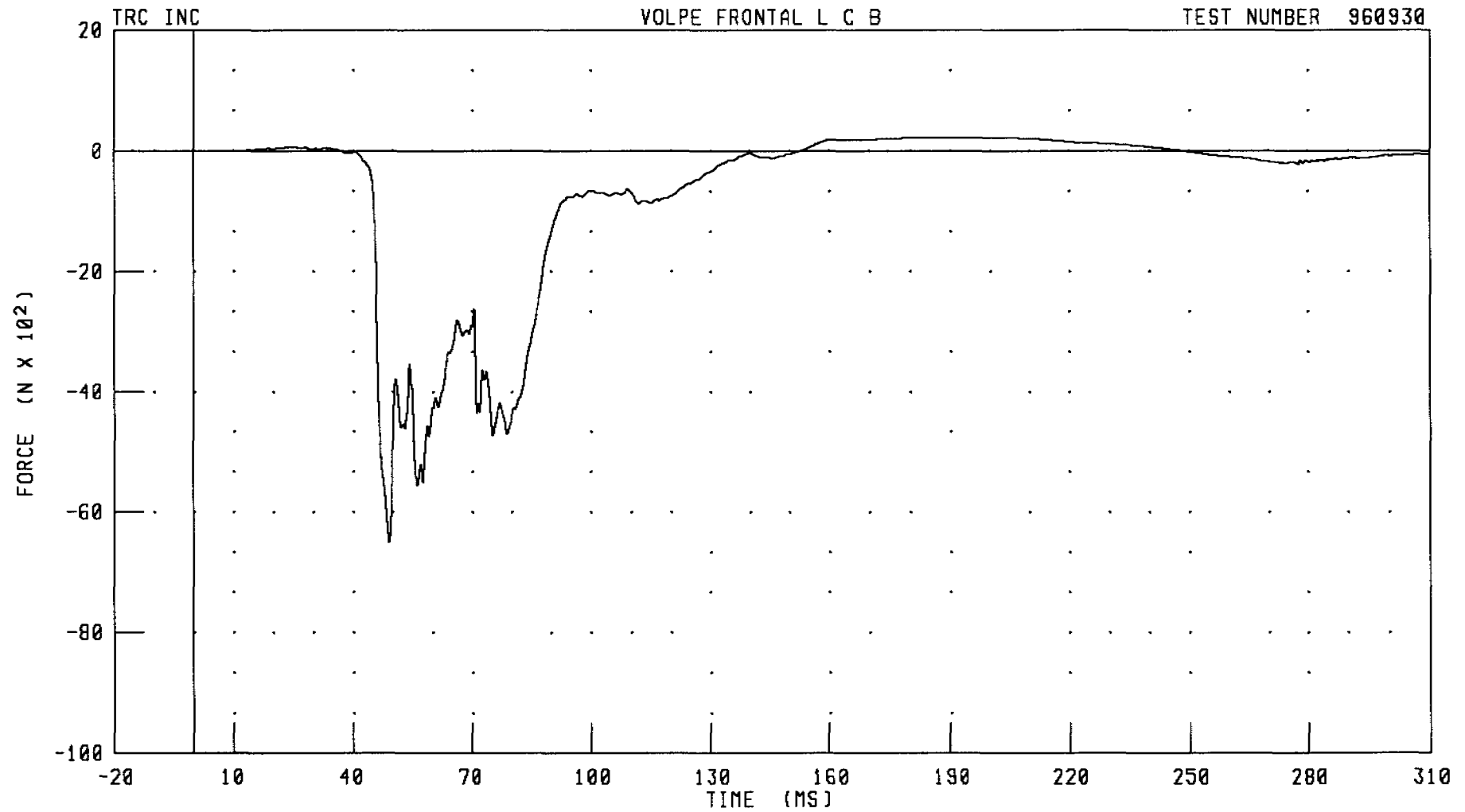


CHANNEL CSTXD2 FILTER CH CLASS 180

PEAK DATA 0 64 MM @ 51 84 MS, -21 62 MM @ 104 32 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER LEFT FEMUR FORCE
VOLPE FRONTAL L C B

TEST NUMBER 960930



CHANNEL LFMF2 FILTER CH CLASS 600

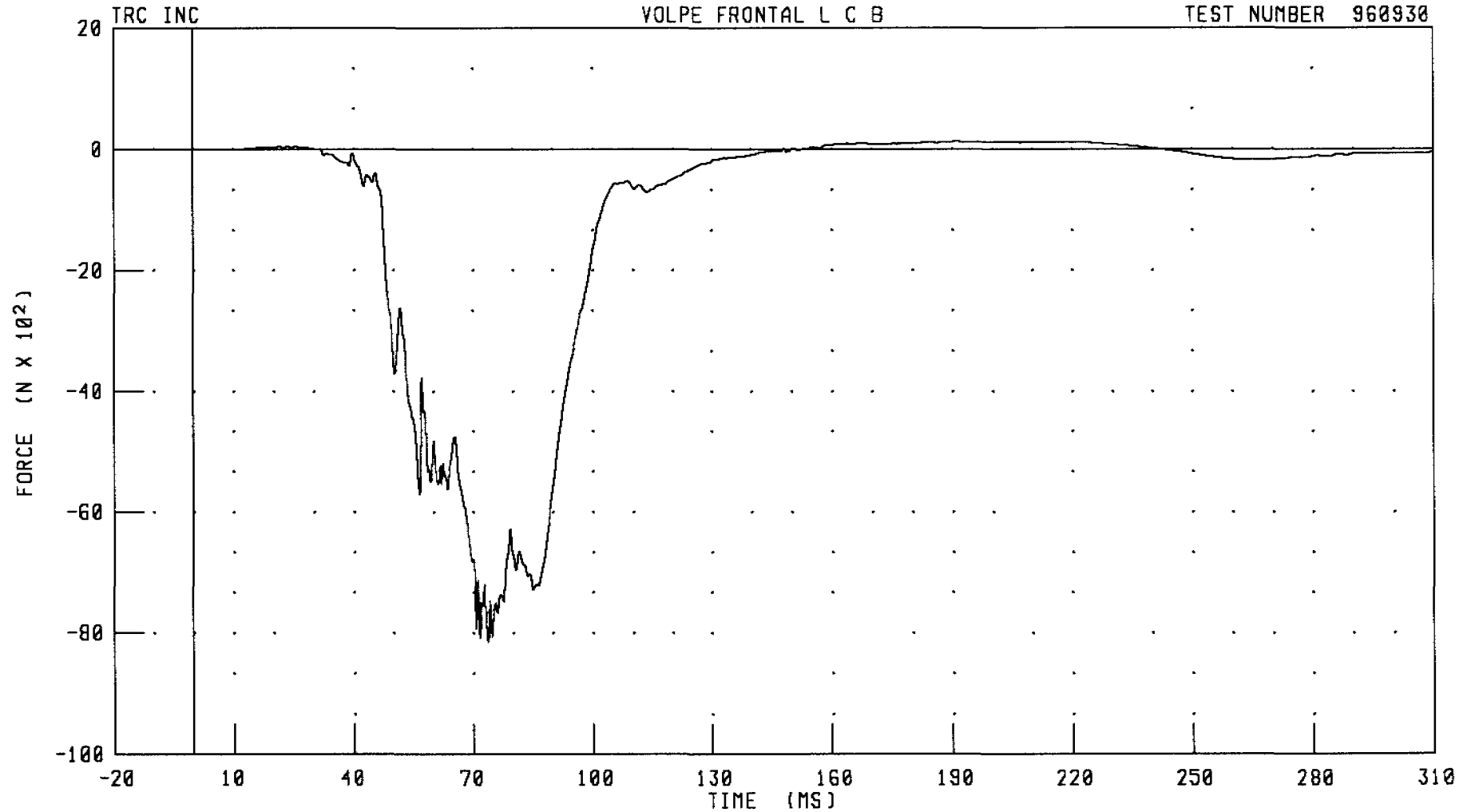
PEAK DATA 225 76 N @ 188 40 MS, -6509 17 N @ 49 04 MS

B-44

960930

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER RIGHT FEMUR FORCE
VOLPE FRONTAL L C B

TEST NUMBER 960930



CHANNEL RFMF2 FILTER CH CLASS 600

PEAK DATA 126 63 N @ 191 44 MS, -8142 45 N @ 73 76 MS

B-45

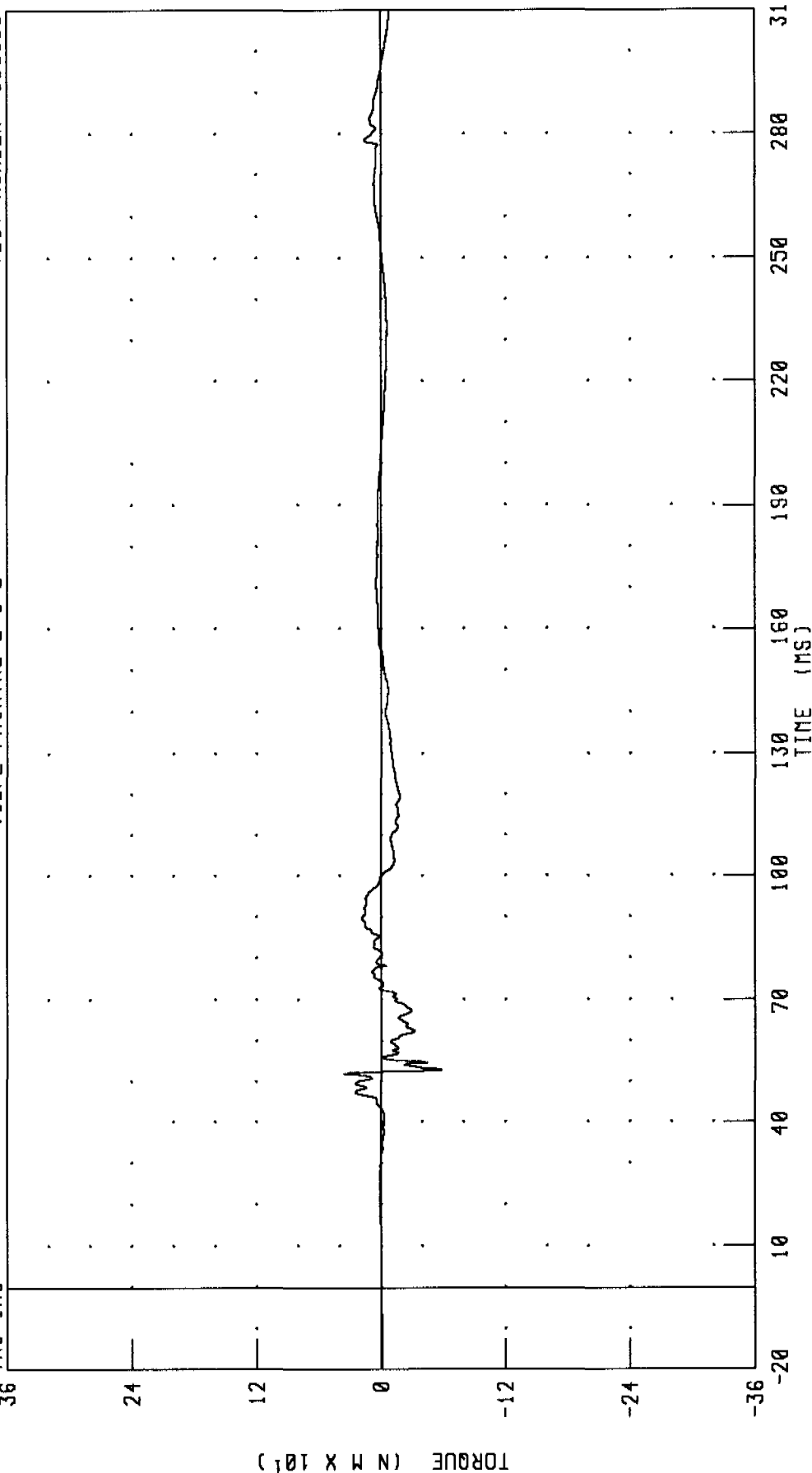
960930

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER LEFT UPPER TIBIA MOMENT ABOUT X AXIS

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



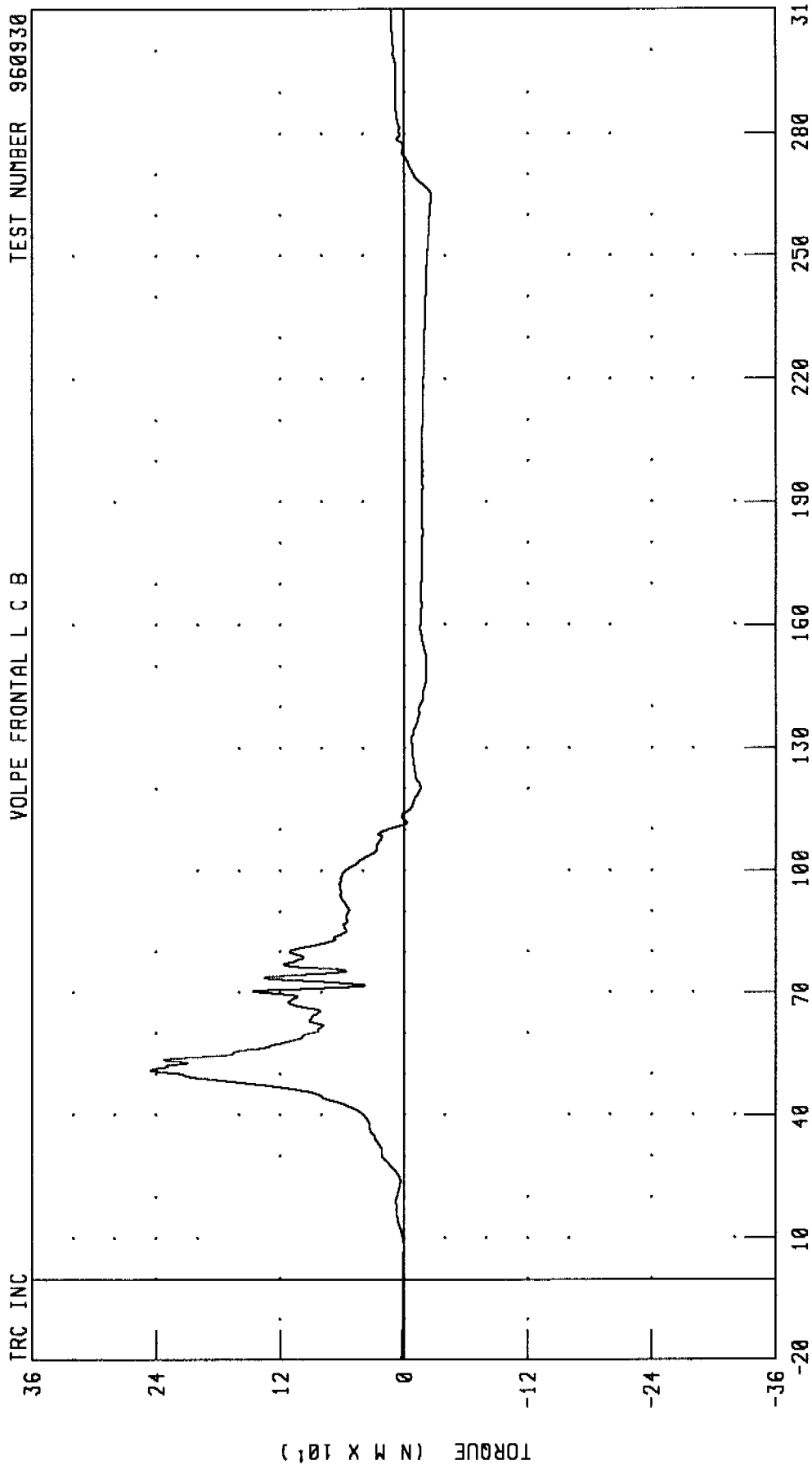
CHANNEL TBLXM2 FILTER CH CLASS 600

PEAK DATA 36 71 N M @ 51 92 MS, -57 52 N M @ 52 88 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER LEFT UPPER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER 960930

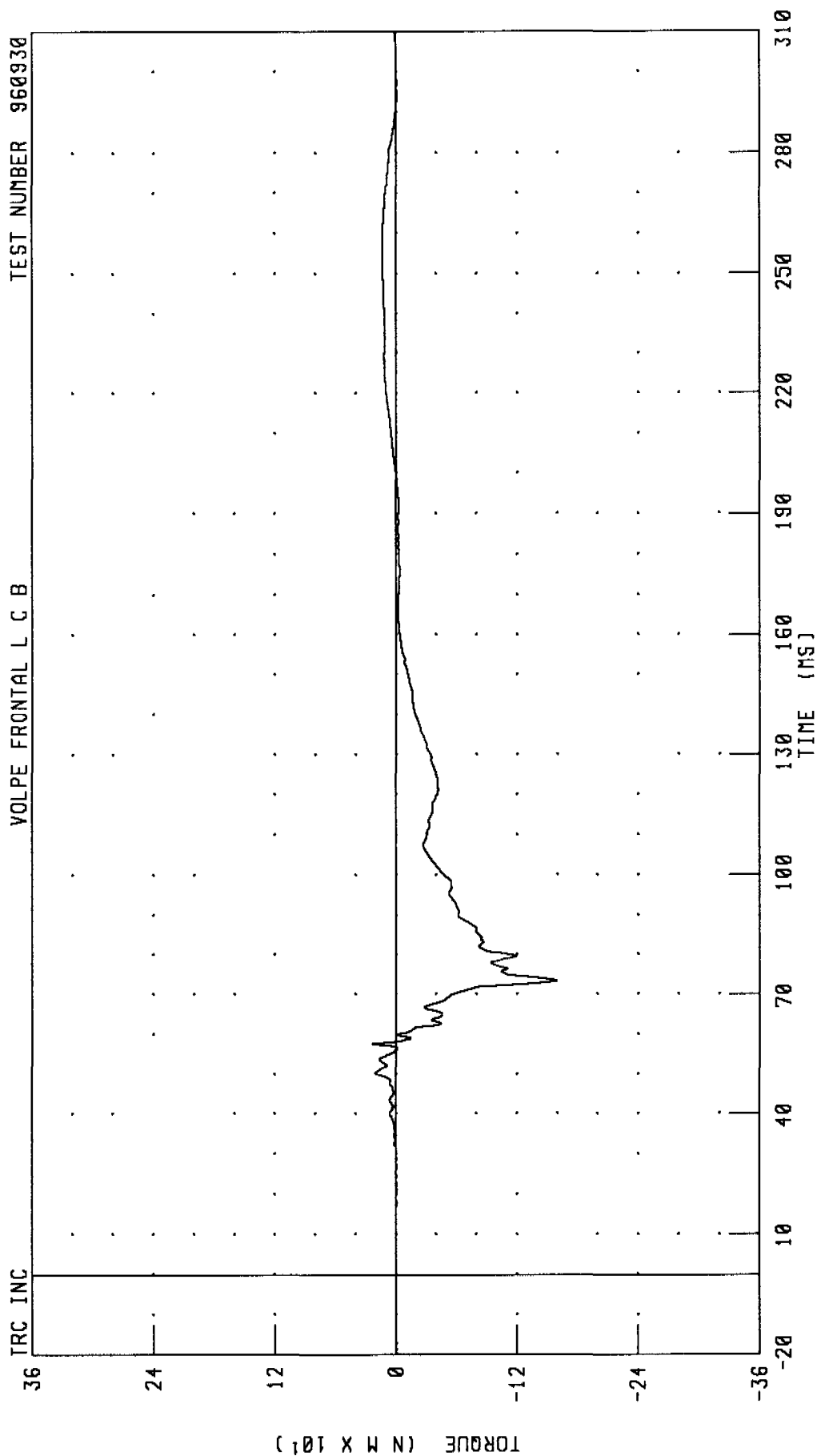
VOLPE FRONTAL L C B



CHANNEL TBLYM2 FILTER CH CLASS 600

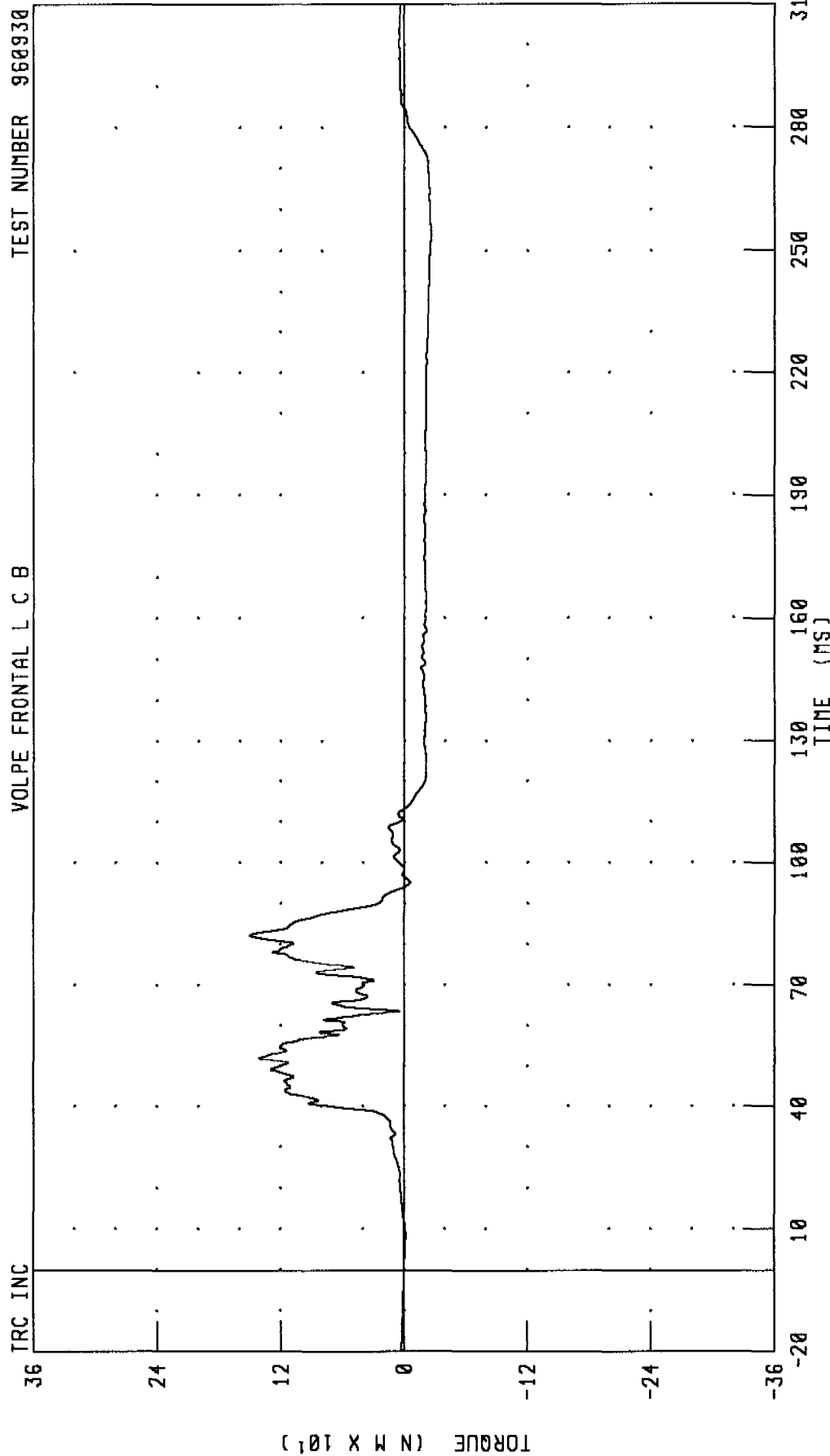
PEAK DATA 245 96 N M @ 50 96 MS, -26 46 N M @ 264 72 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER RIGHT UPPER TIBIA MOMENT ABOUT X AXIS



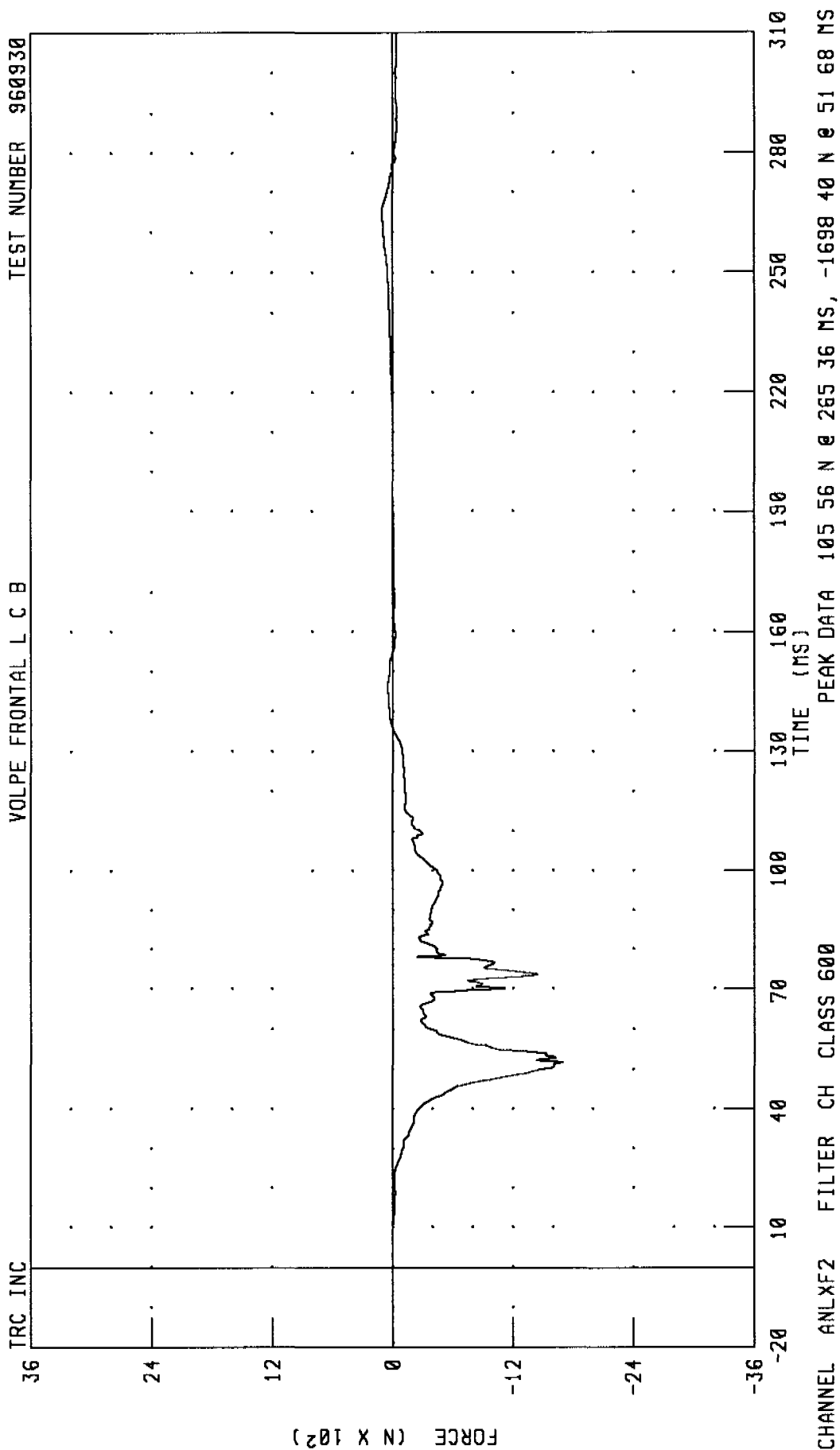
CHANNEL TBRXM2 FILTER CH CLASS 600

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER RIGHT UPPER TIBIA MOMENT ABOUT Y AXIS

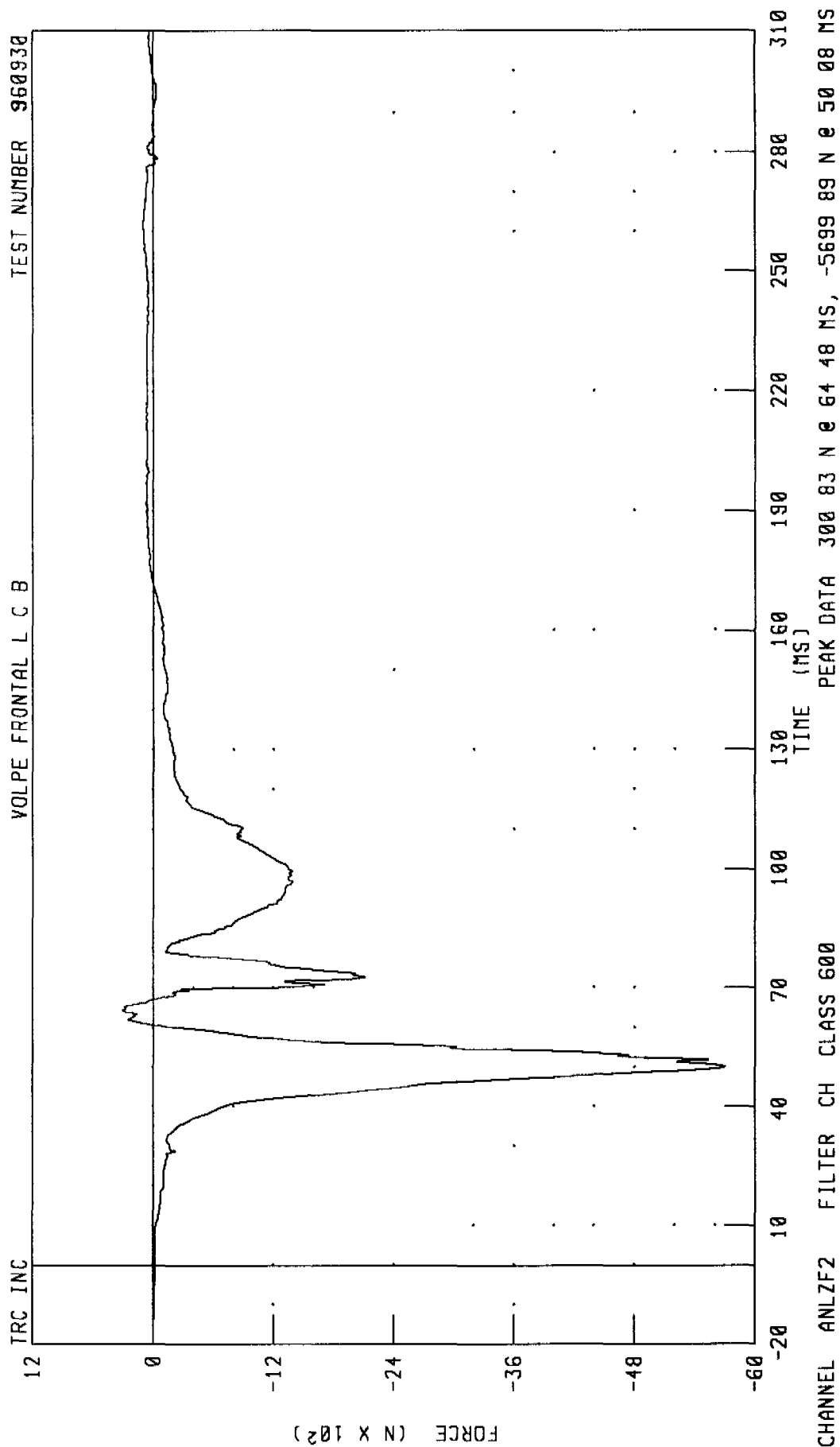


CHANNEL TBRYM2 FILTER CH CLASS 600

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER LEFT LOWER TIBIA X-AXIS FORCE



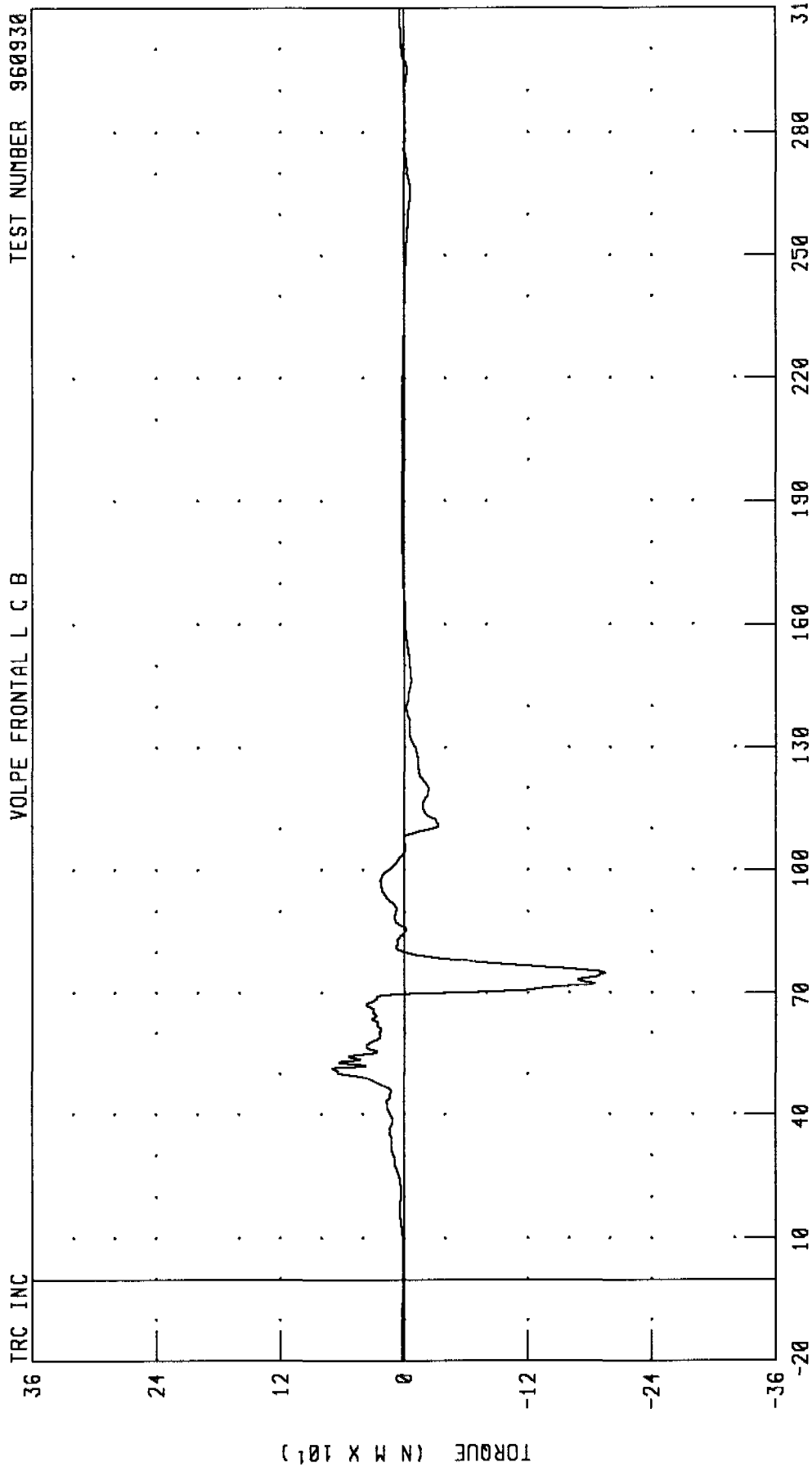
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER LEFT LOWER TIBIA Z-AXIS FORCE



1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER LEFT LOWER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER 960930

VOLPE FRONTAL L C B



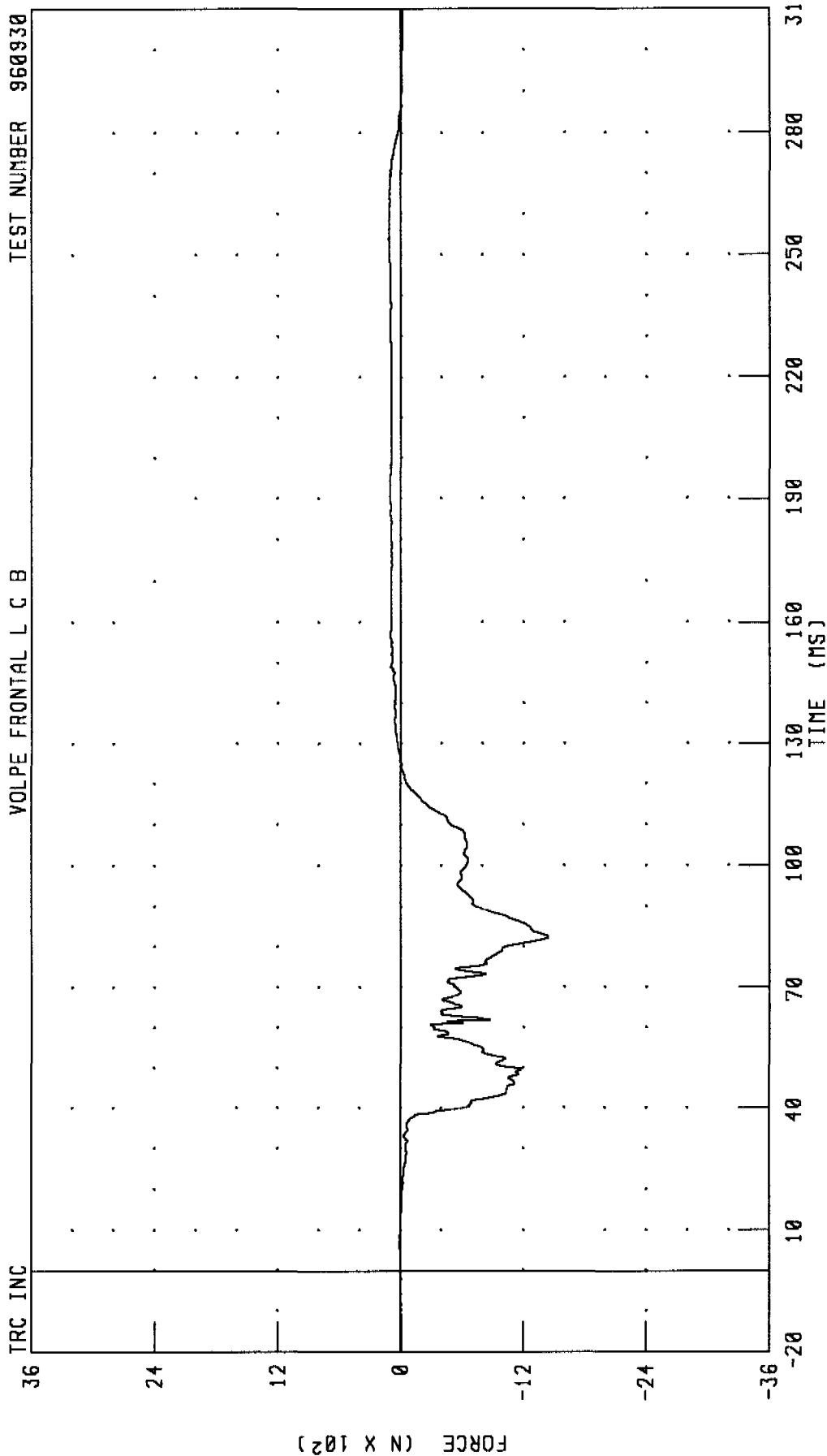
CHANNEL ANLYM2 FILTER CH CLASS 600

PEAK DATA 69 85 N M @ 51 36 MS, -194 74 N M @ 75 12 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER RIGHT LOWER TIBIA X-AXIS FORCE

TEST NUMBER 960930

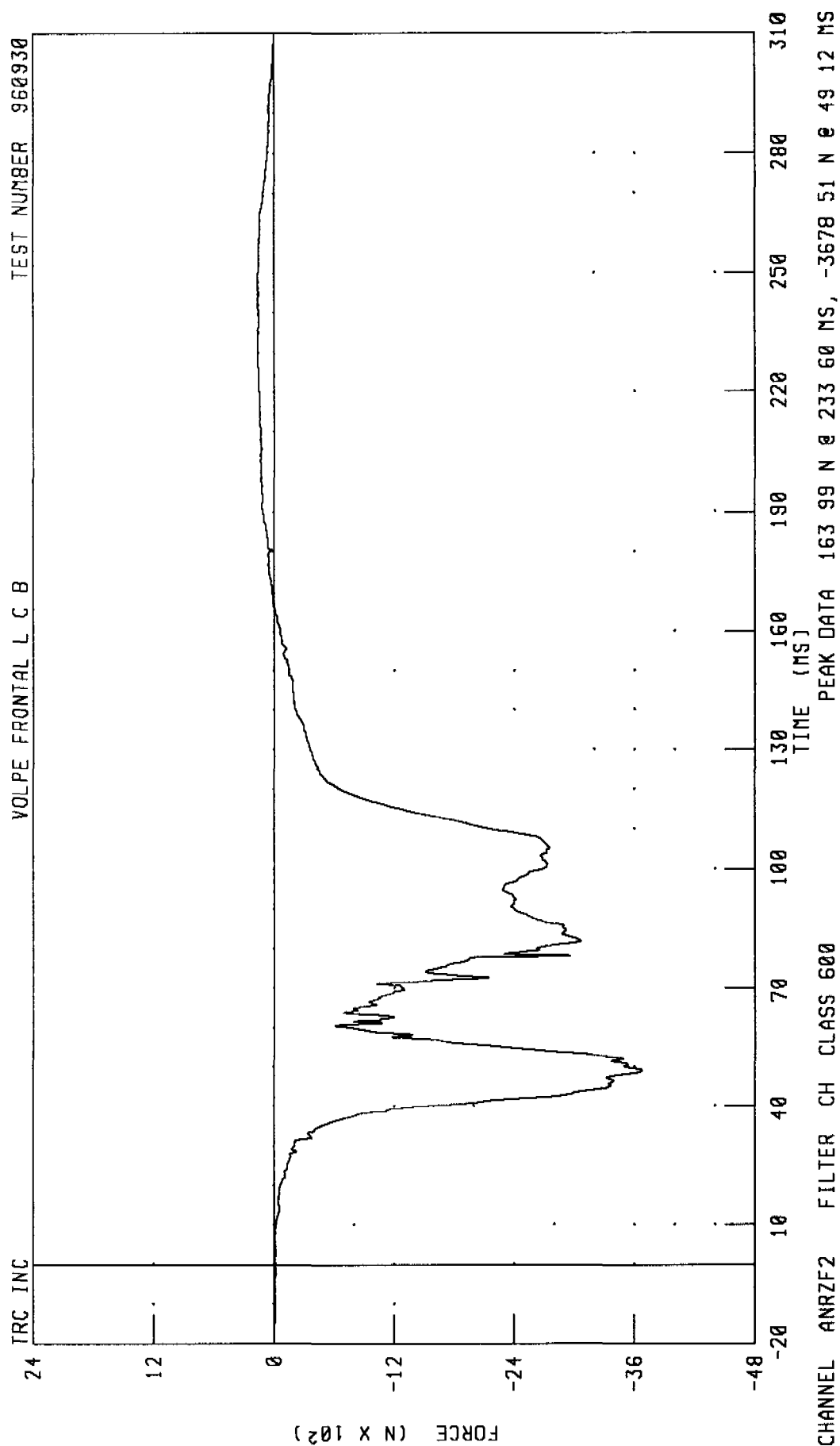
VOLPE FRONTAL L C B



CHANNEL ANRXP2 FILTER CH CLASS 600

PEAK DATA 117 58 N @ 254 00 MS, -1446 44 N @ 82 40 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER RIGHT LOWER TIBIA Z-AXIS FORCE

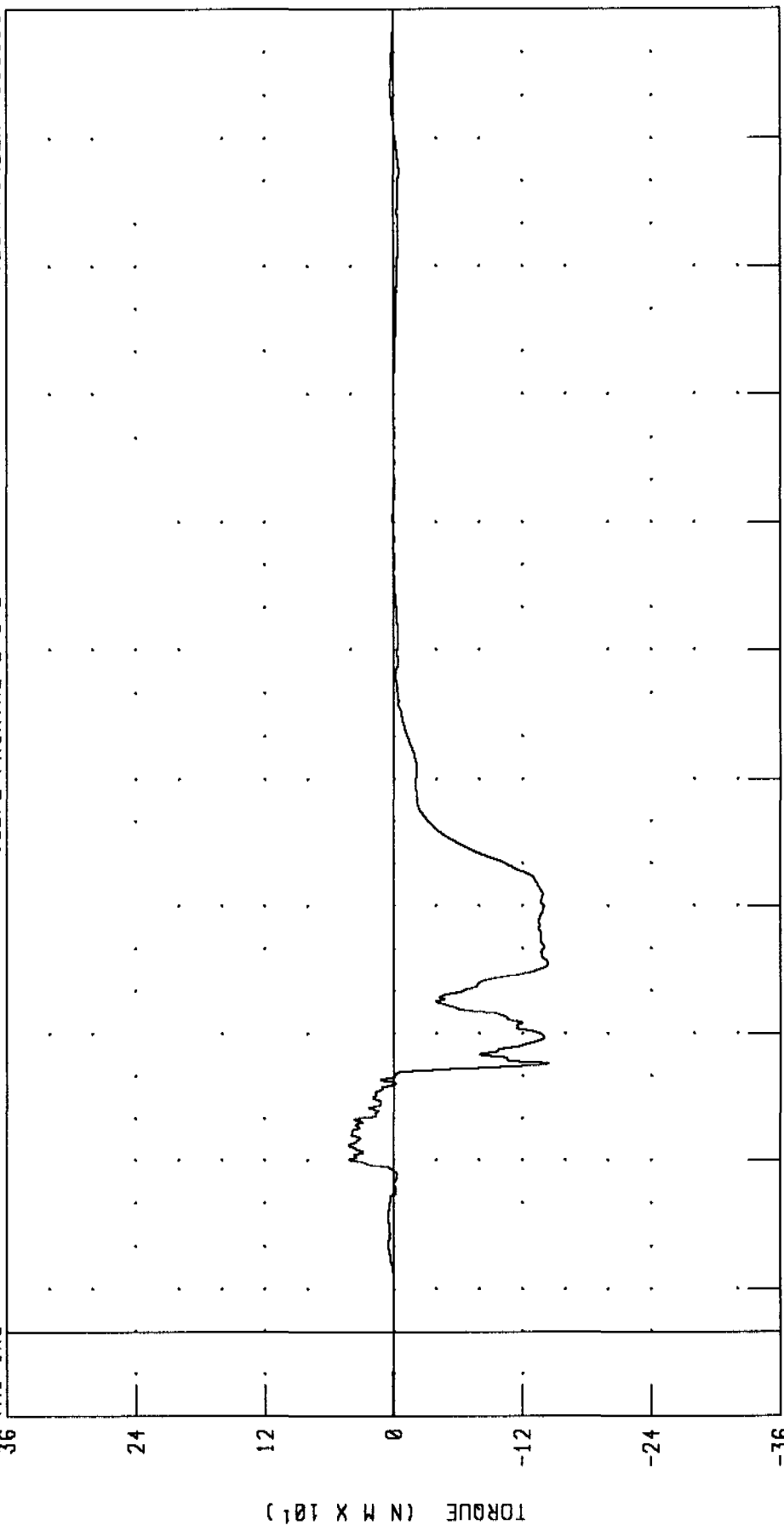


1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
PASSENGER RIGHT LOWER TIBIA MOMENT ABOUT Y AXIS

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC

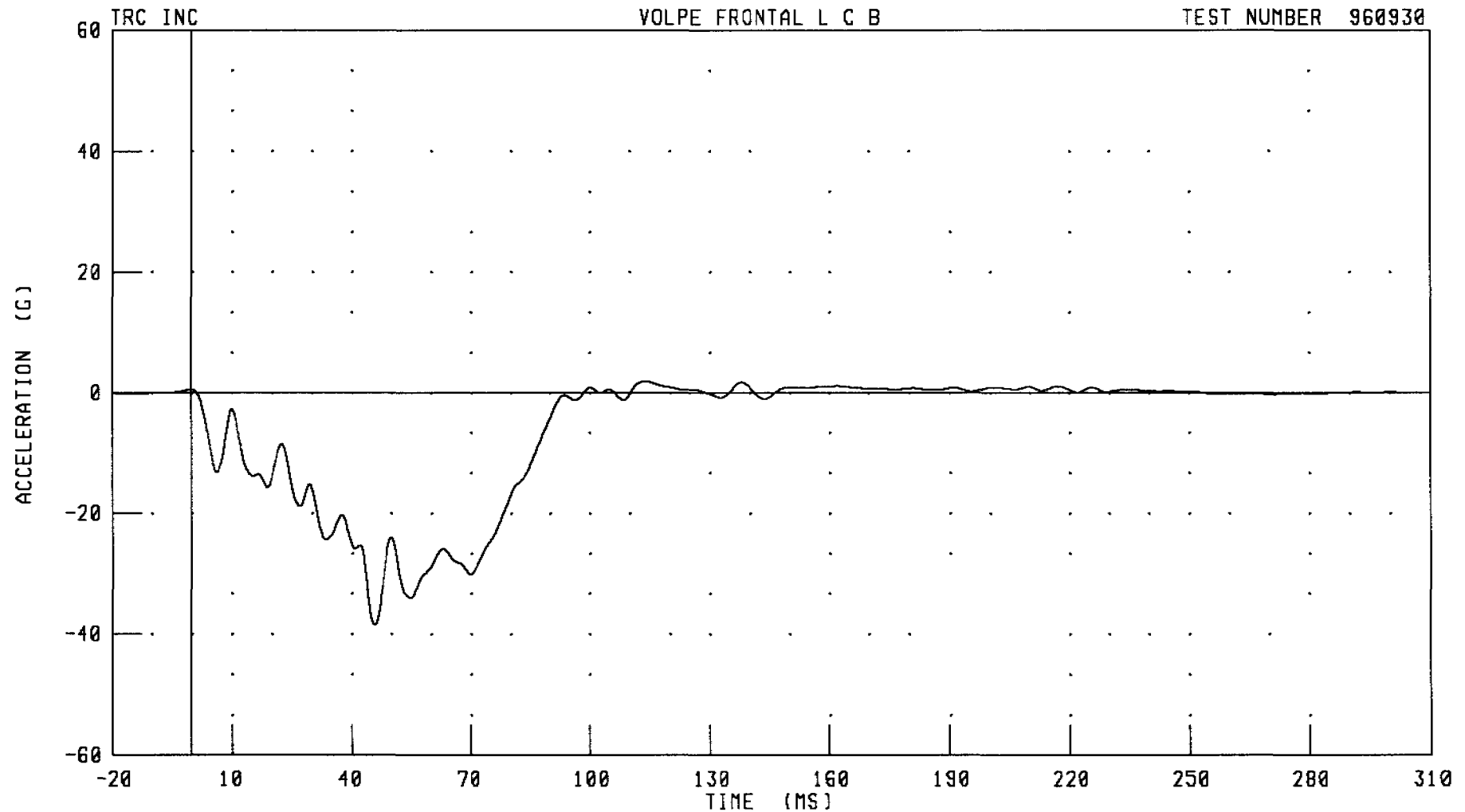


CHANNEL ANR2M2 FILTER CH CLASS 600

PEAK DATA 42 04 N M @ 43 60 MS, -144 32 N M @ 62 96 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LEFT REAR SEAT X-AXIS ACCELERATION
VOLPE FRONTAL L C B

TEST NUMBER 960930



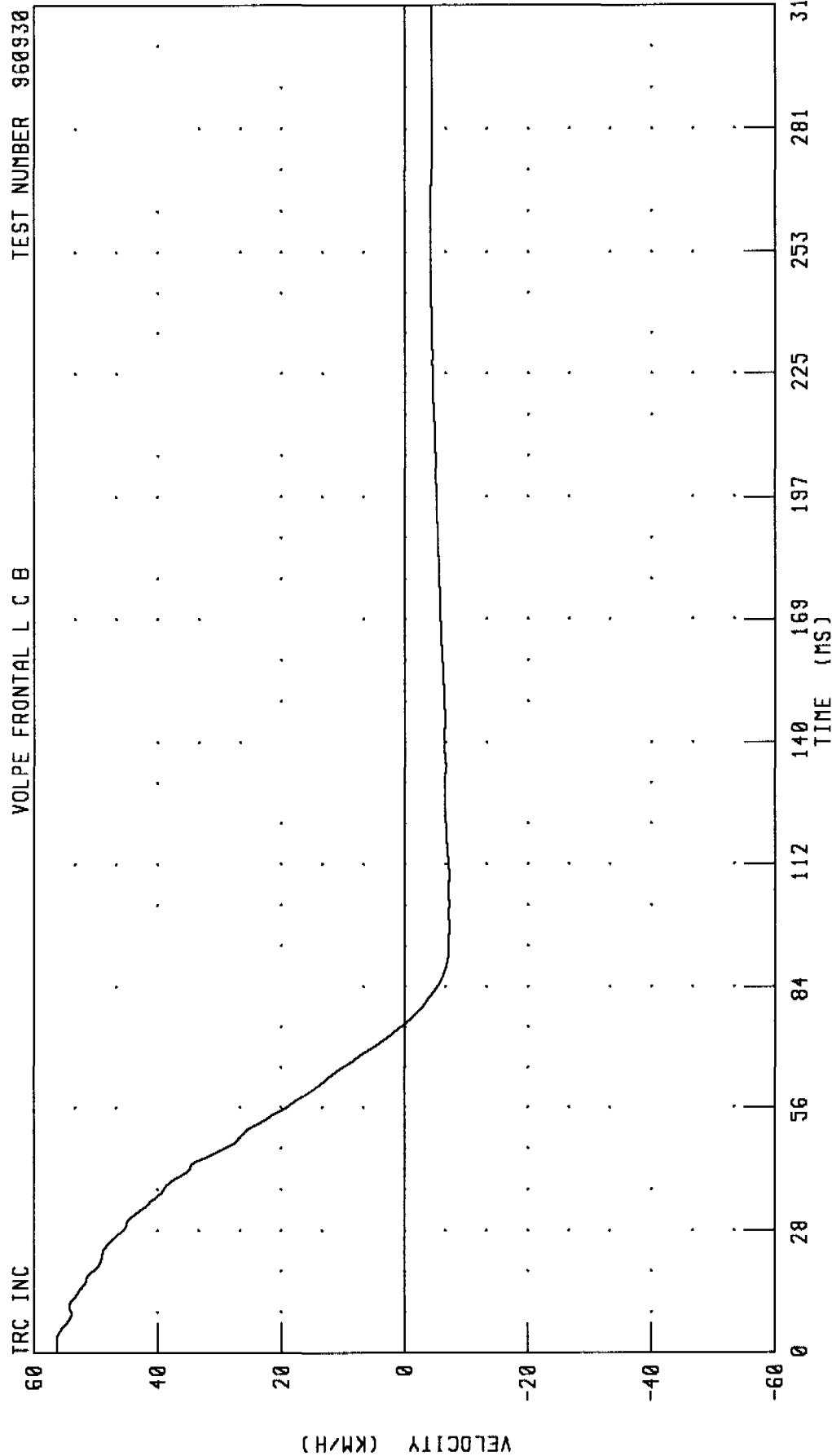
CHANNEL TLRXG1 FILTER CH CLASS 60

PEAK DATA 1 88 G @ 114 16 MS, -38 50 G @ 45 76 MS

B-56

056096

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LEFT REAR SEAT X-AXIS VELOCITY



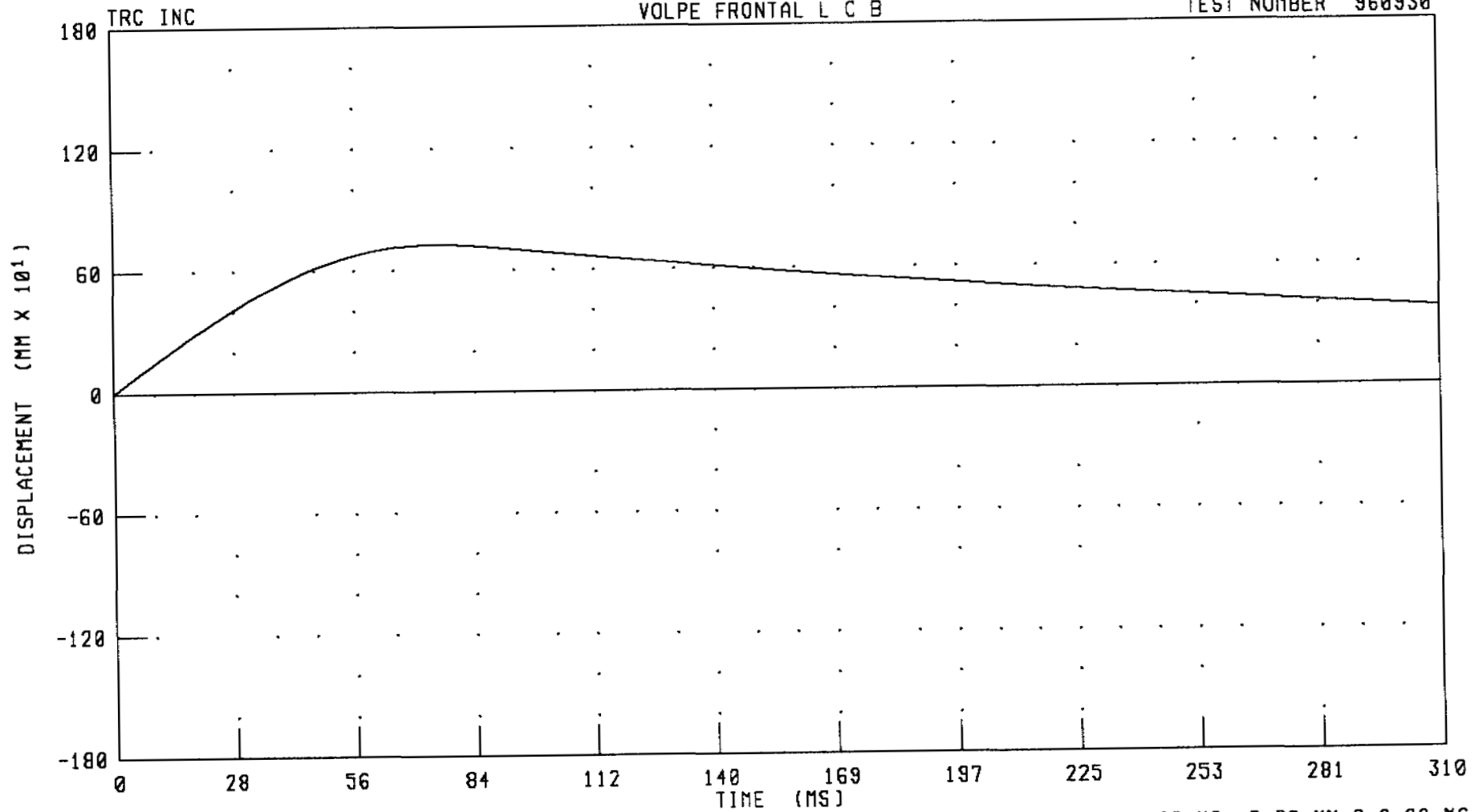
CHANNEL TLRXV1 FILTER CH CLASS 180

PEAK DATA 56 21 KM/H @ 2 40 MS, -7 30 KM/H @ 110 16 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LEFT REAR SEAT X-AXIS DISPLACEMENT

VOLPE FRONTAL L C B

TEST NUMBER 960930



CHANNEL TLRXD1 FILTER CH CLASS 180

PEAK DATA 726 63 MM @ 76 00 MS, 0 00 MM @ 0 00 MS

B-58

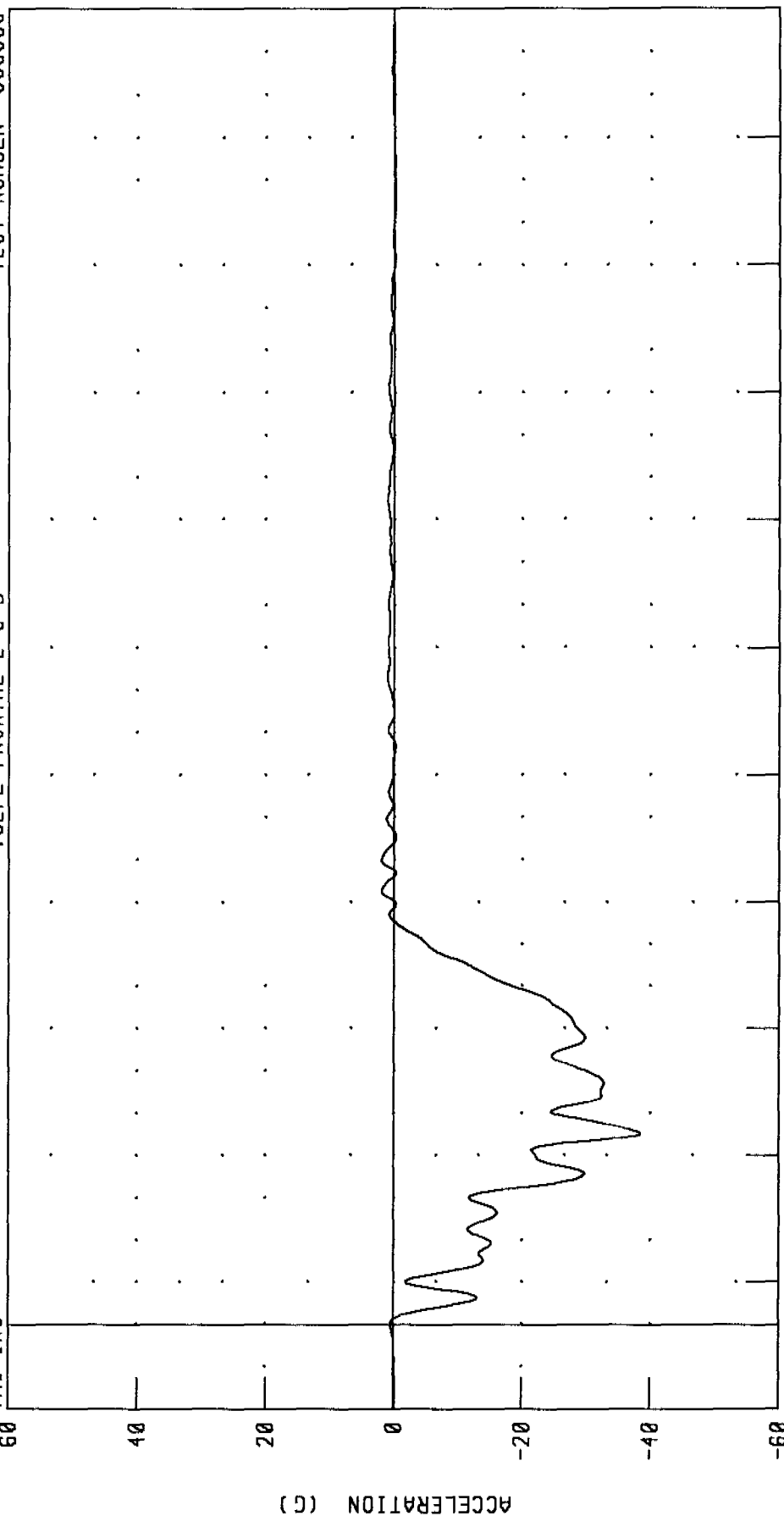
060930

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
RIGHT REAR SEAT X-AXIS ACCELERATION

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



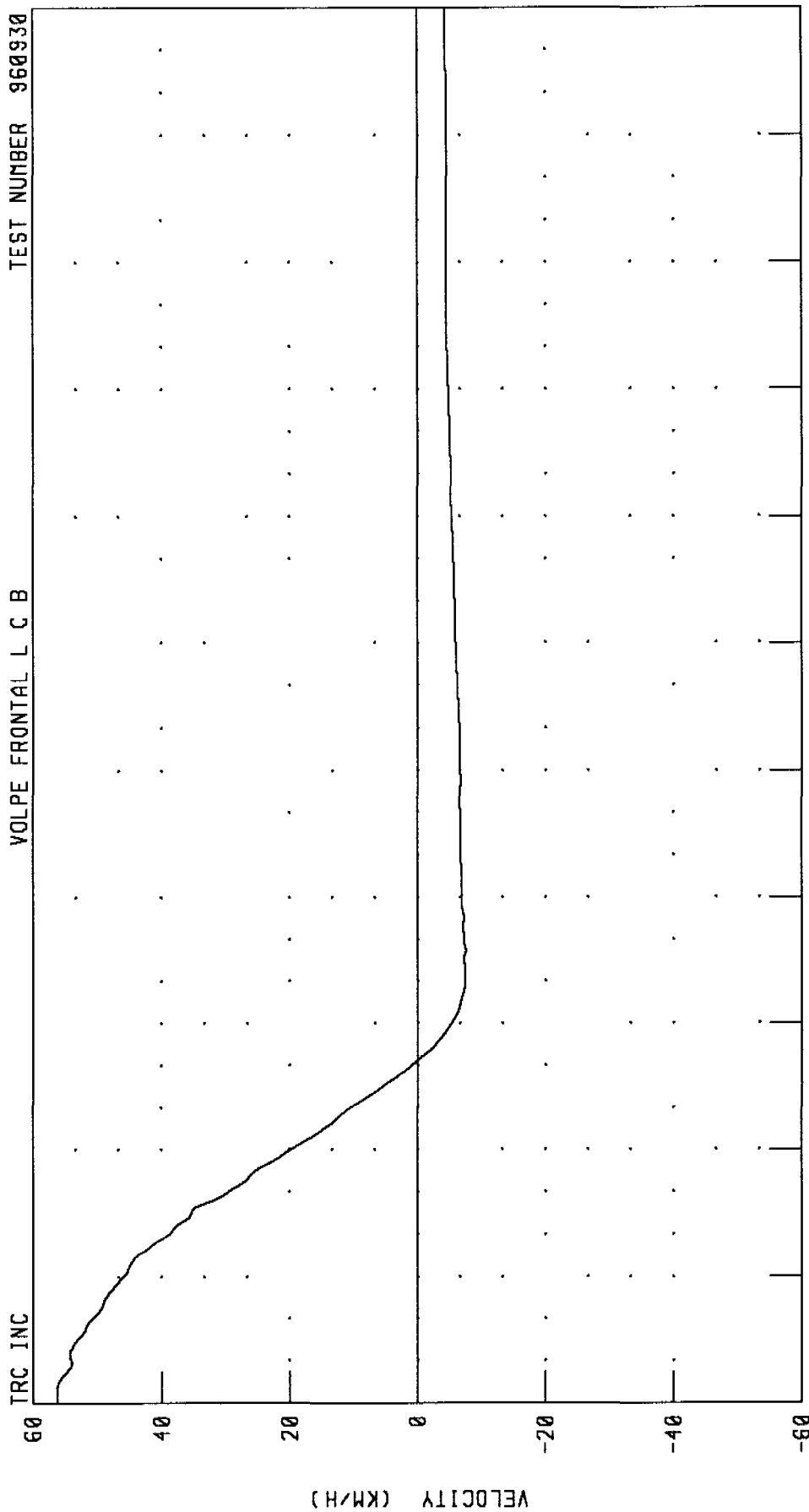
CHANNEL TRRXG1 FILTER CH CLASS 60

PEAK DATA 1 98 G @ 109 92 MS, -38 46 G @ 45 20 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER

RIGHT REAR SEAT X-AXIS VELOCITY

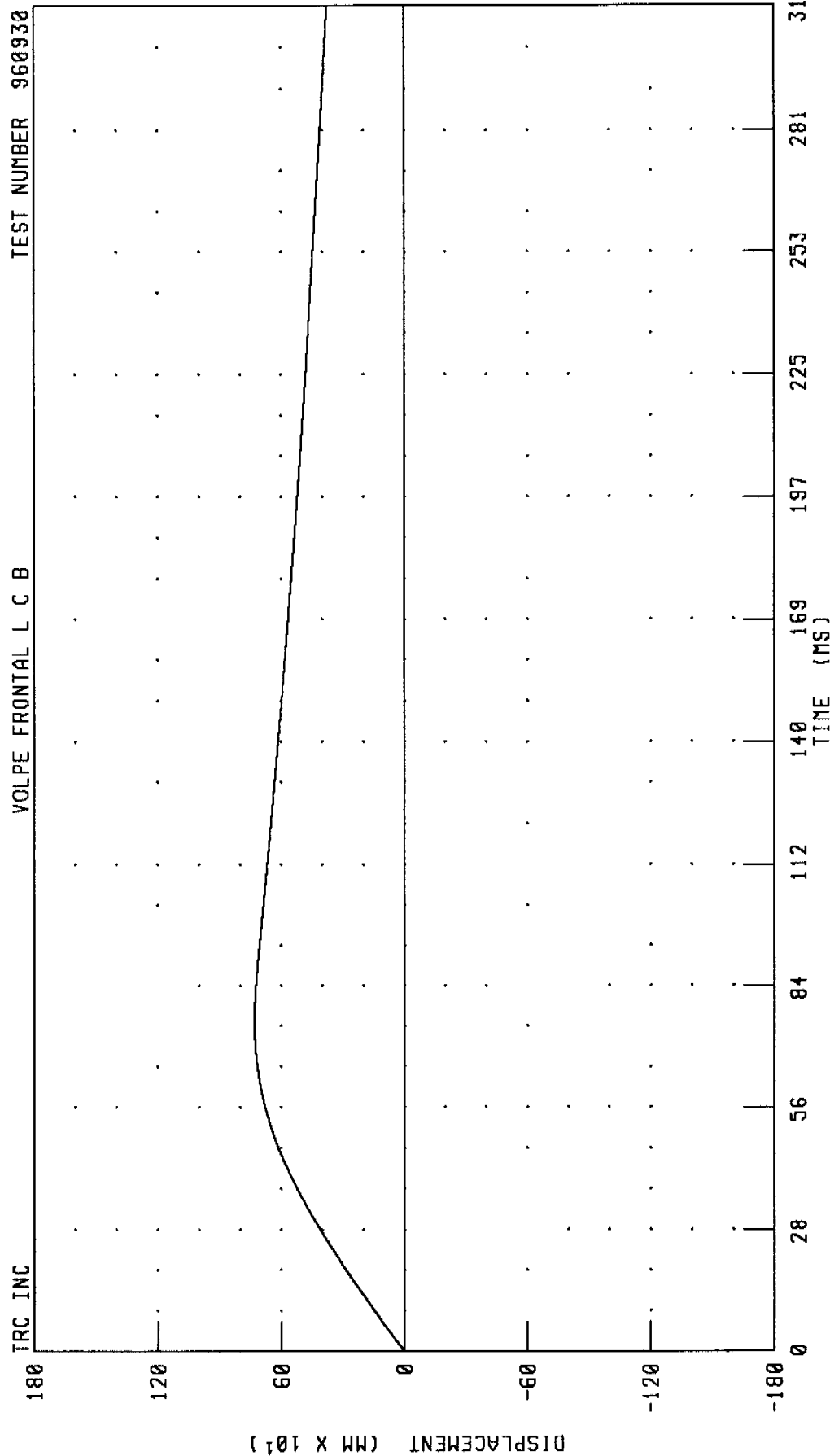
VOLPE FRONTAL L C B TEST NUMBER 960930



CHANNEL TRRXV1 FILTER CH CLASS 180

PEAK DATA 56 21 KM/H @ 2 56 MS, -7 55 KM/H @ 100 96 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
RIGHT REAR SEAT X-AXIS DISPLACEMENT



CHANNEL TRRX01 FILTER CH CLASS 180

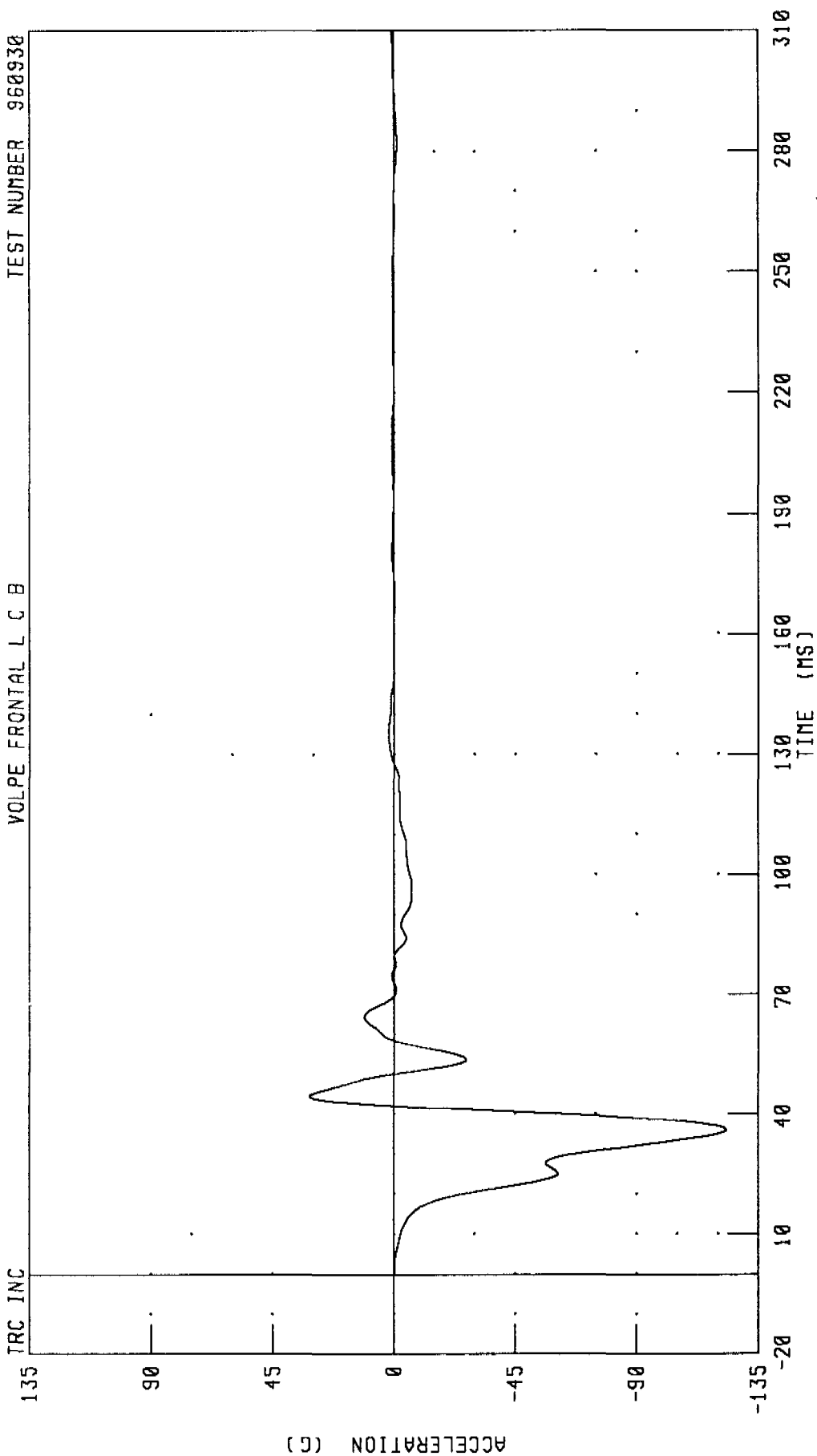
PEAK DATA 731 42 MM @ 76 40 MS, 0 00 MM @ 0 00 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
ENGINE TOP X-AXIS ACCELERATION

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC

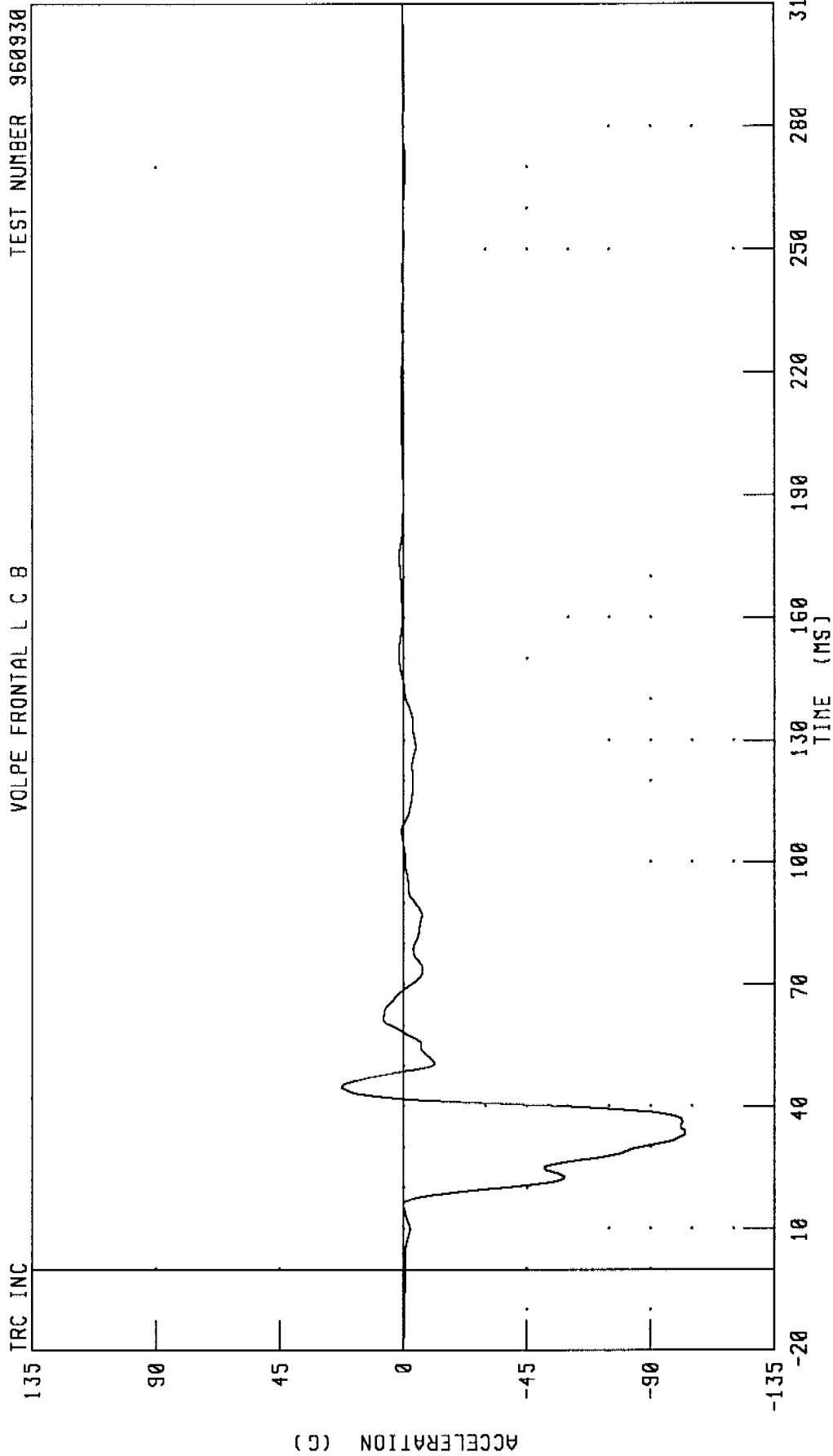


CHANNEL ENGCG1 FILTER CH CLASS 60

PEAK DATA 31 29 G @ 44 56 MS, -123 00 G @ 36 08 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 ENGINE BOTTOM X-AXIS ACCELERATION
 VOLPE FRONTAL L C B

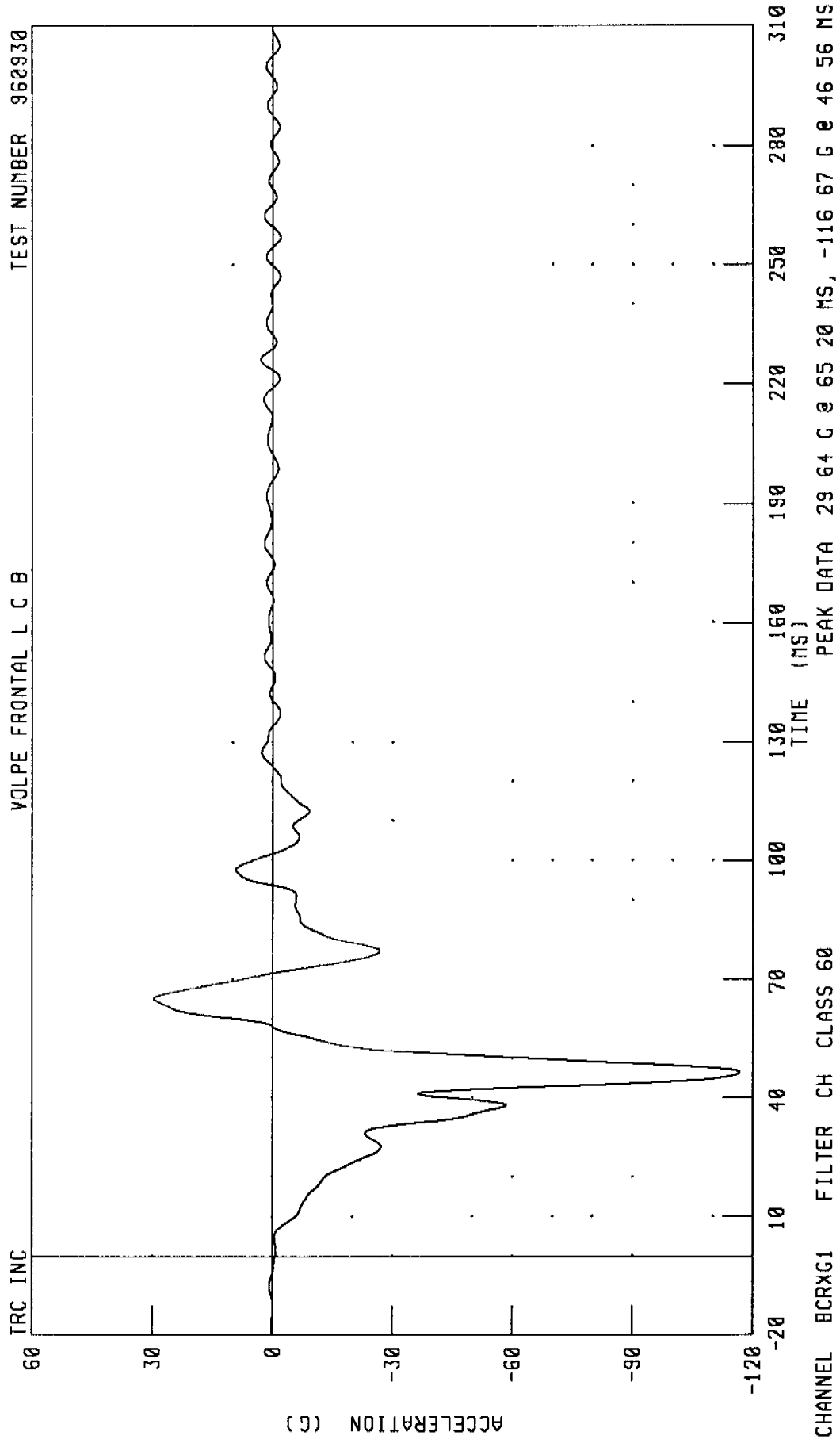
TEST NUMBER 960930



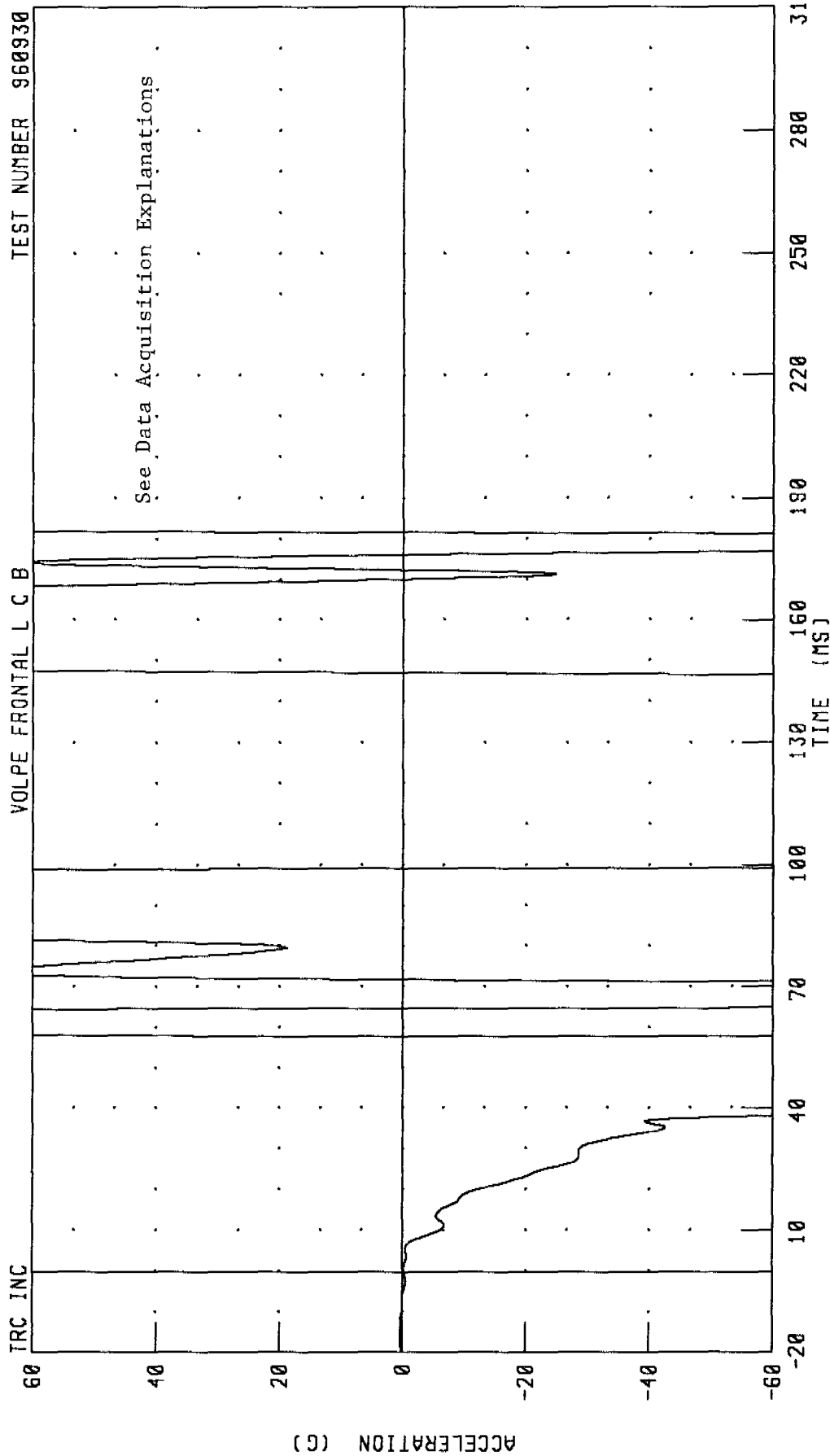
CHANNEL ENGCG2 FILTER CH CLASS 60

PEAK DATA 22 46 G @ 44 88 MS, -102 57 G @ 33 68 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 RIGHT BRAKE CALIPER X-AXIS ACCELERATION



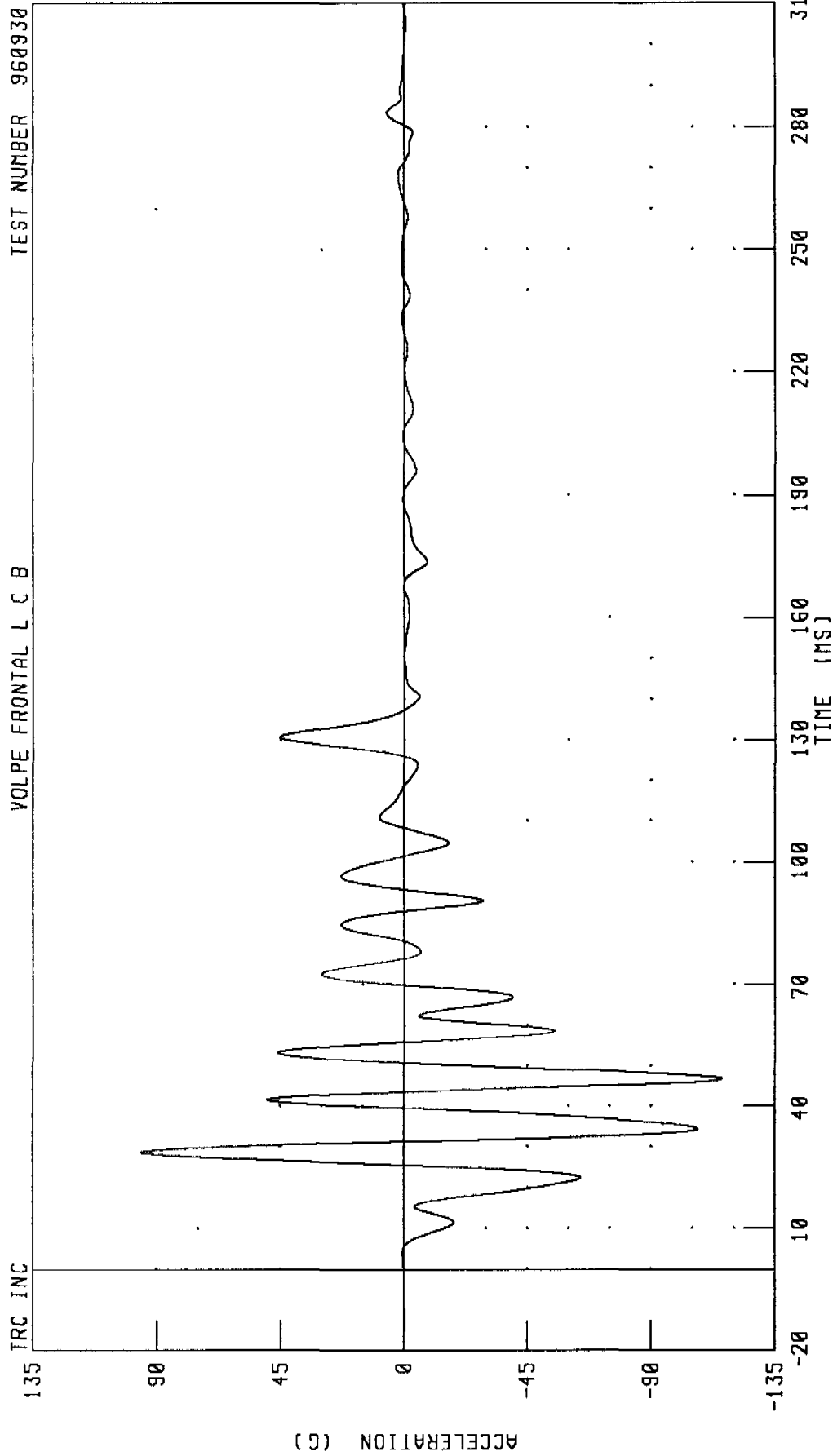
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LEFT BRAKE CALIPER X-AXIS ACCELERATION



CHANNEL BCLXG1 FILTER CH CLASS 60

PEAK DATA 1037 71 G @ 156 08 MS, -1068 17 G @ 53 04 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
INSTRUMENT PANEL CENTER X-AXIS ACCELERATION



CHANNEL DPCXG1 FILTER CH CLASS 60

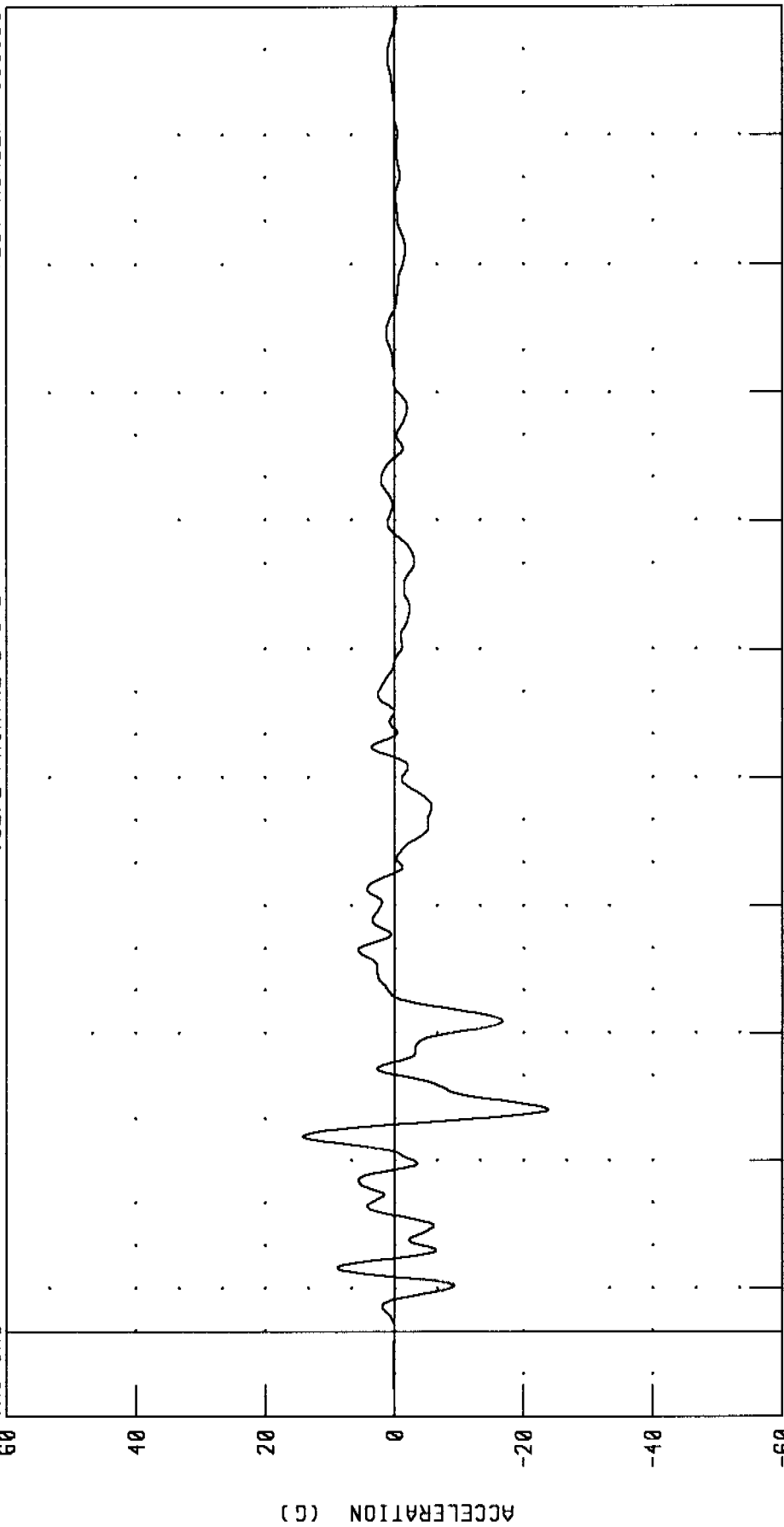
PEAK DATA 95 82 G @ 28 72 MS, -115 99 G @ 46 80 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 REAR SEAT CENTER Z-AXIS ACCELERATION

TEST NUMBER 960930

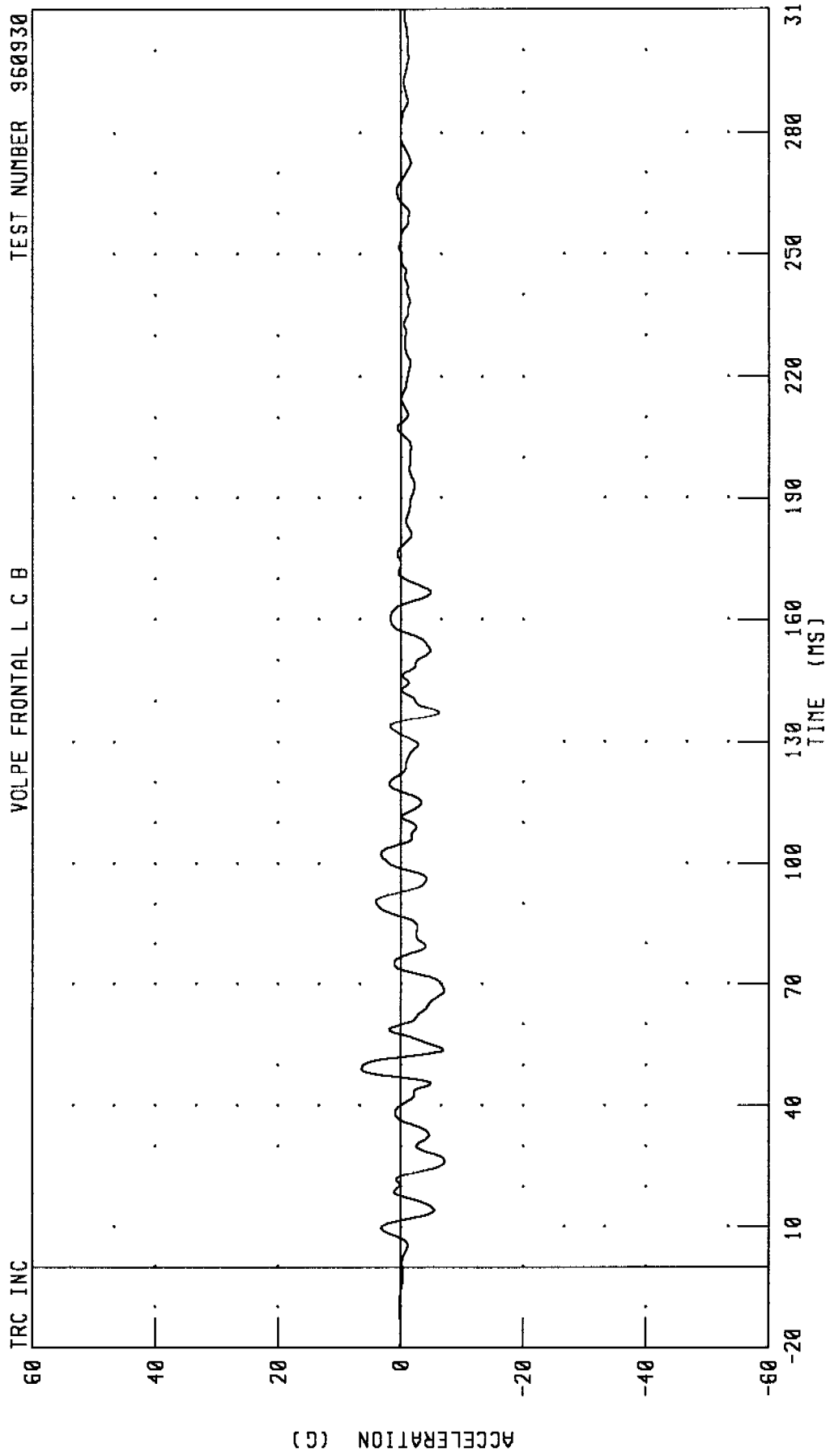
VOLPE FRONTAL L C B

TRC INC



CHANNEL TCRZG1 FILTER CH CLASS 60
 TIME (MS) 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310
 PEAK DATA 14 15 G @ 45 84 MS, -23 82 G @ 52 16 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 REAR VEHICLE CENTERLINE Z-AXIS ACCELERATION



CHANNEL ROKZG1 FILTER CH CLASS 60

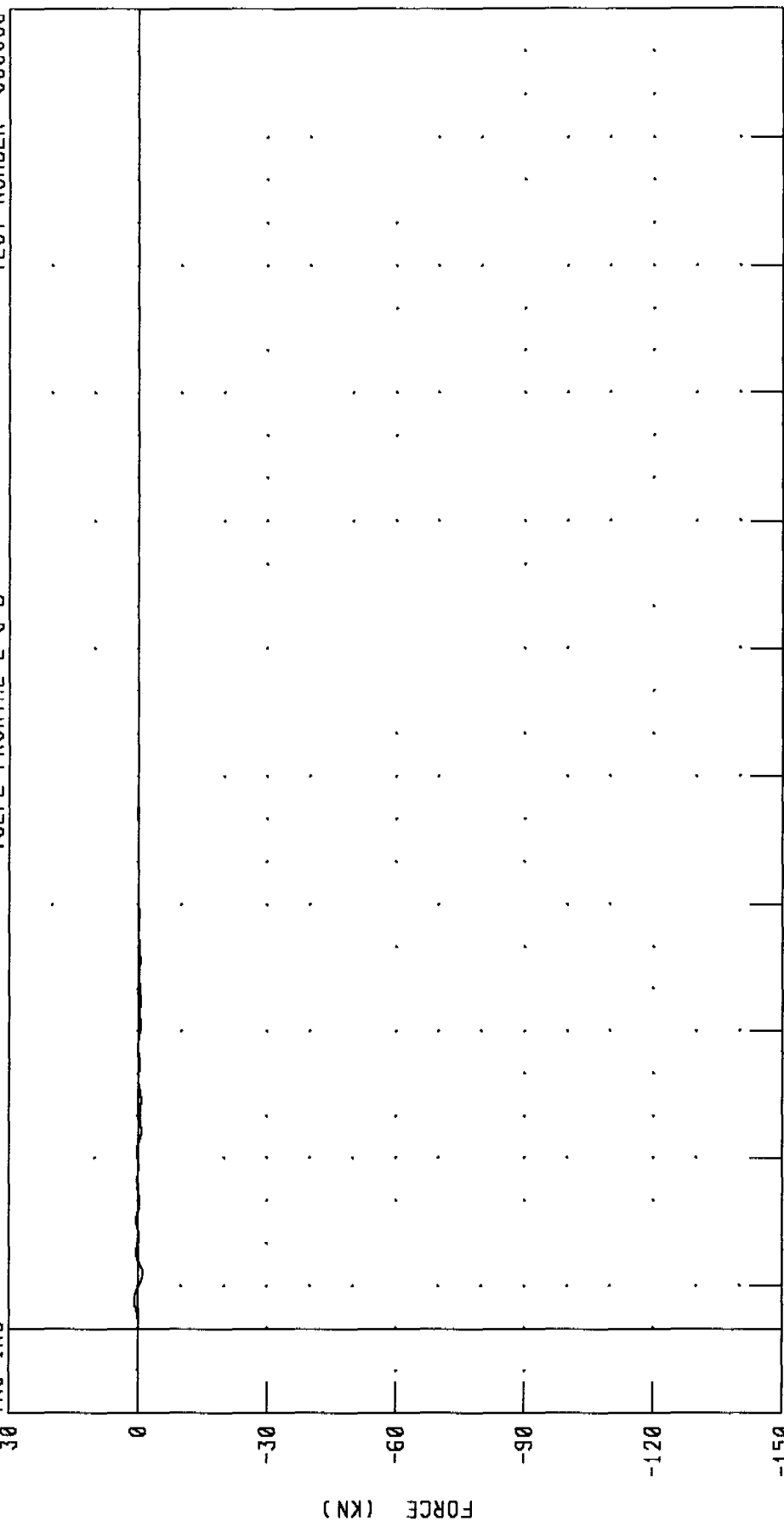
PEAK DATA 6 38 G @ 49 12 MS, -7 20 G @ 26 48 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A1 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC

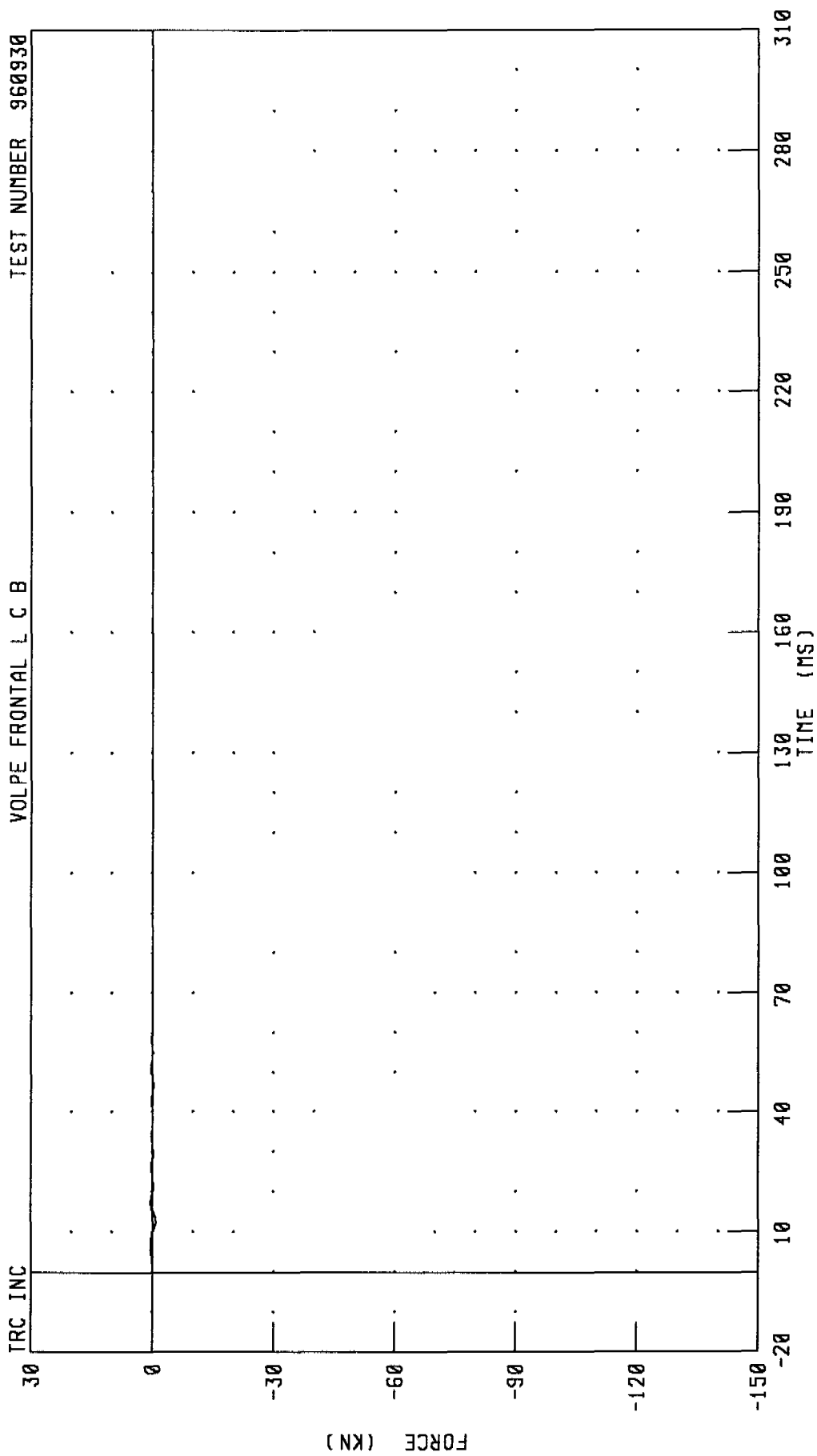


CHANNEL BA1F FILTER CH CLASS 60

TIME (MS)

PEAK DATA 0 78 KN @ 6 96 MS, -1 10 KN @ 12 80 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A2 FORCE



PEAK DATA 0 49 KN @ 6 72 MS, -0 84 KN @ 12 88 MS

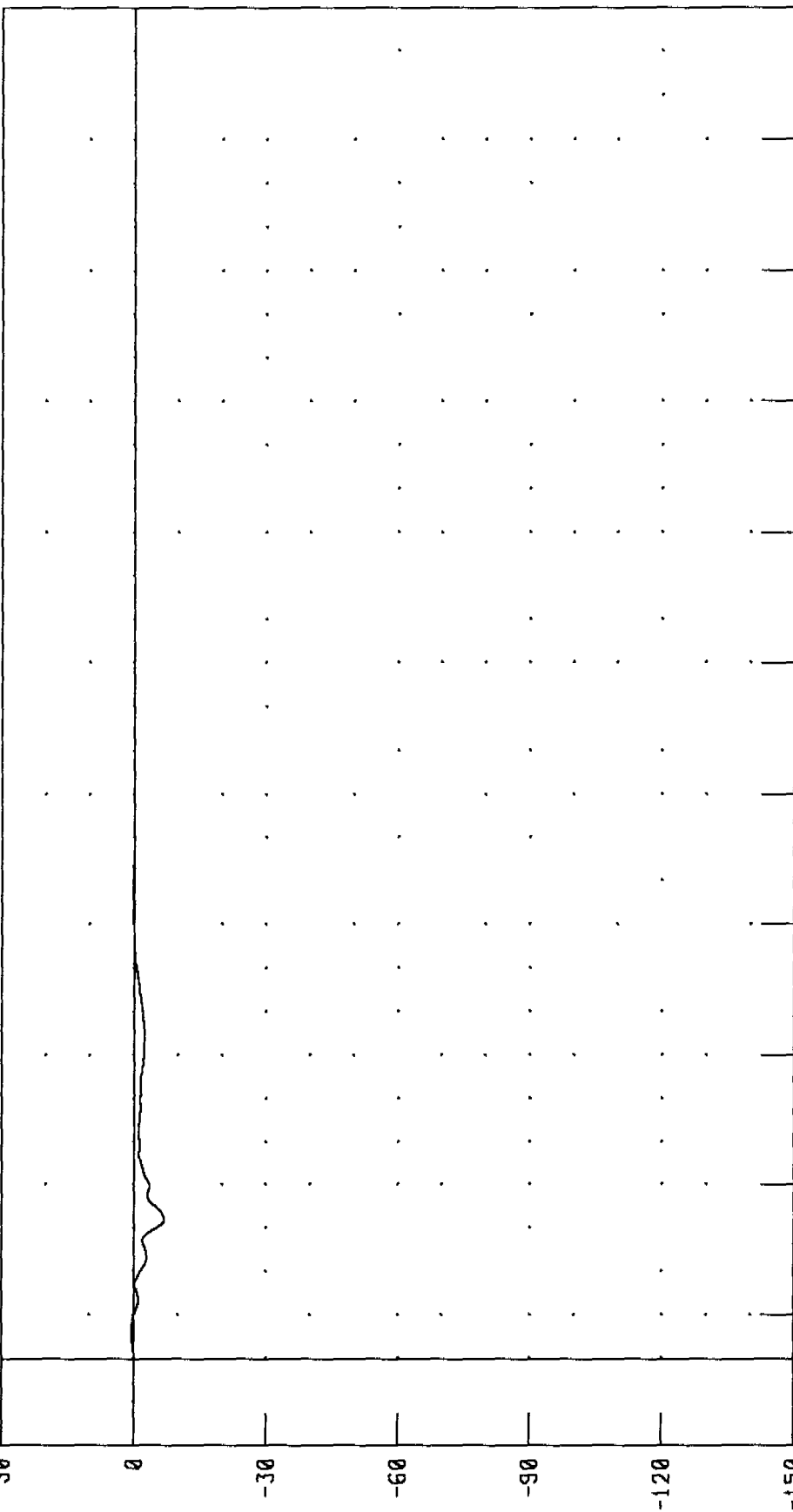
CHANNEL 8A2F FILTER CH CLASS 60

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A3 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

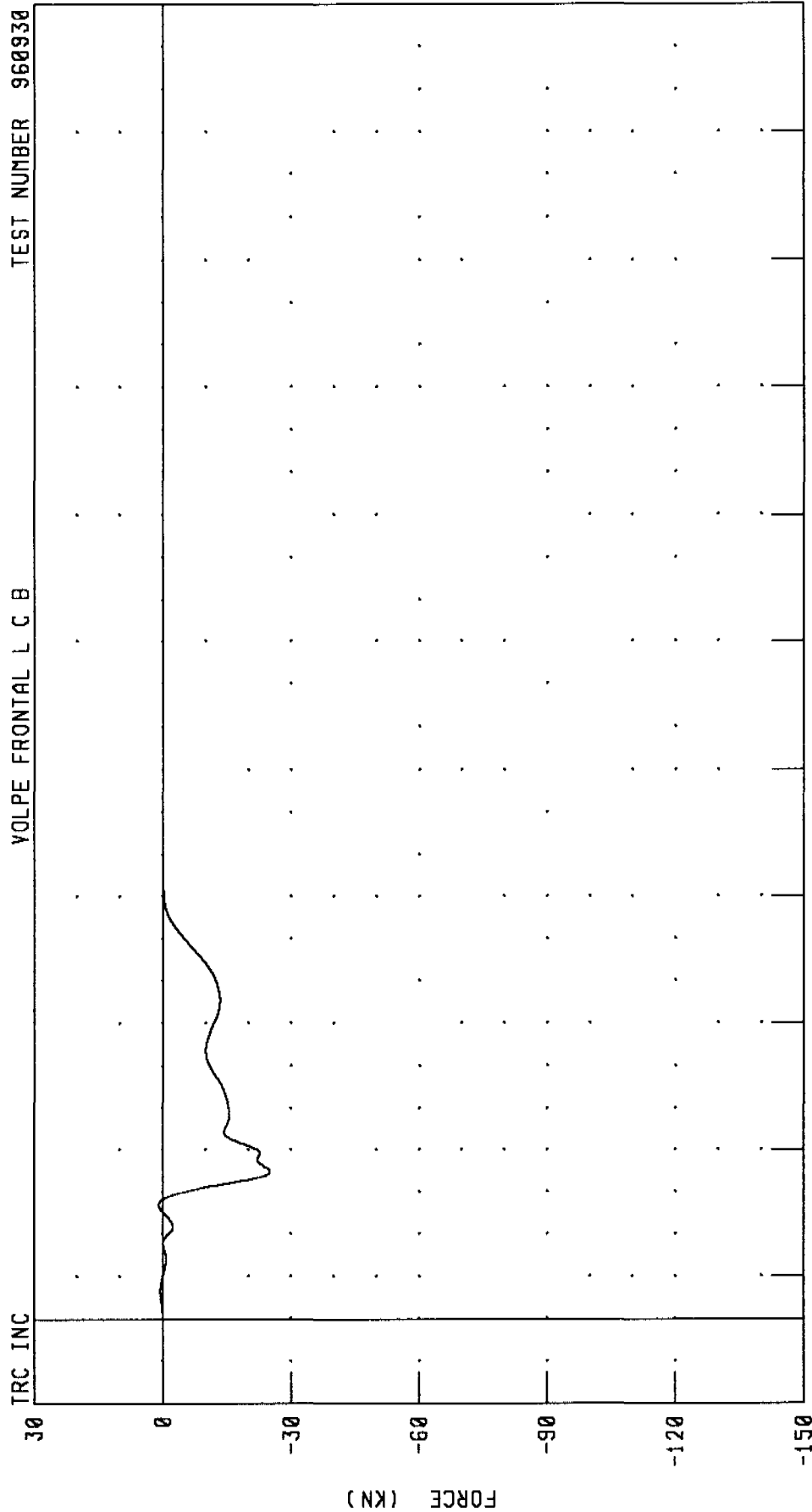
TRC INC



CHANNEL BA3F FILTER CH CLASS 60

PEAK DATA 0 55 KN @ 6 16 MS, -6 90 KN @ 32 08 MS

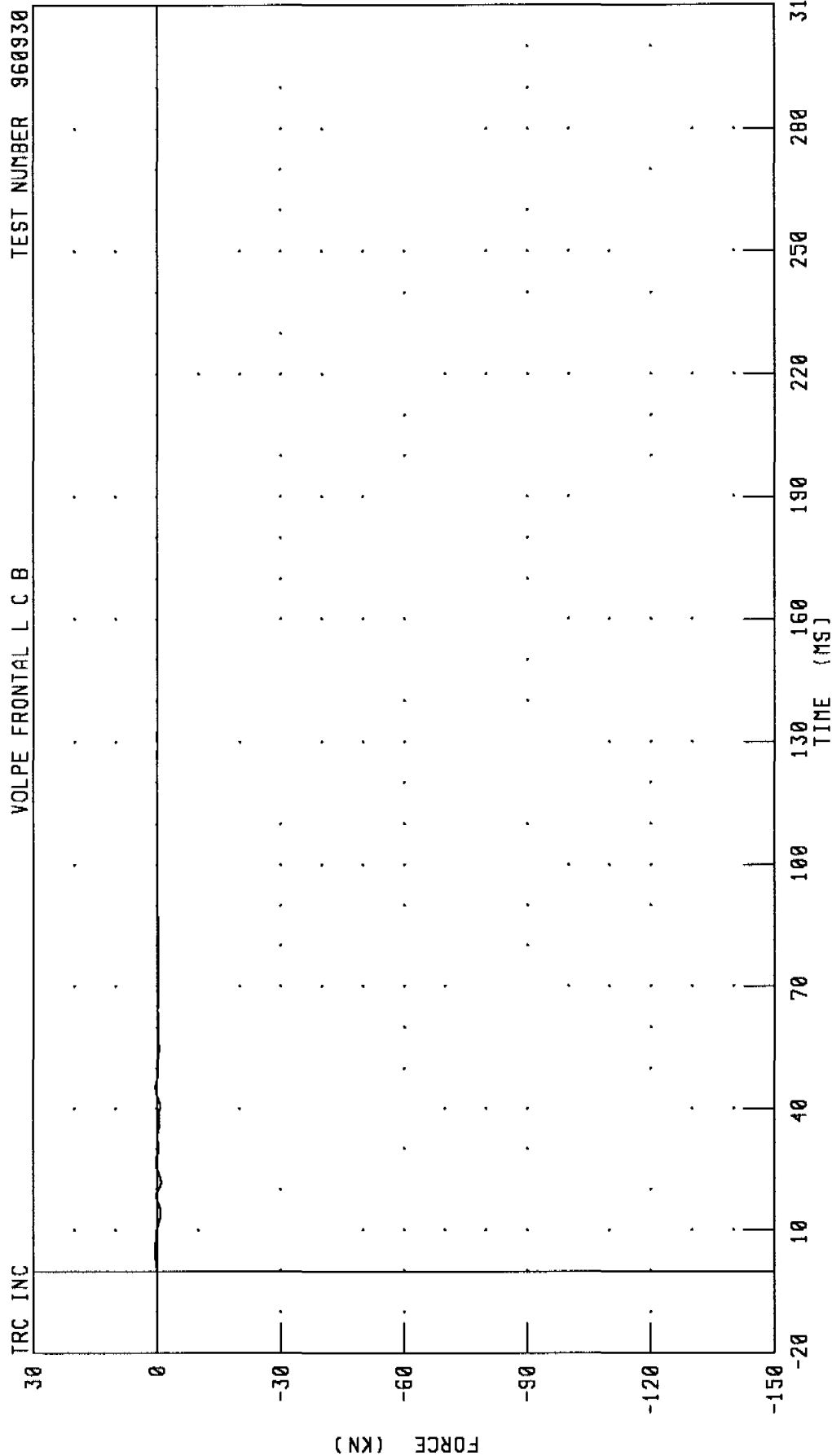
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A4 FORCE



CHANNEL BA4F FILTER CH CLASS 60

PEAK DATA 0 97 KN @ 26 96 MS, -25 04 KN @ 34 80 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A5 FORCE



CHANNEL BASF FILTER CH CLASS 60

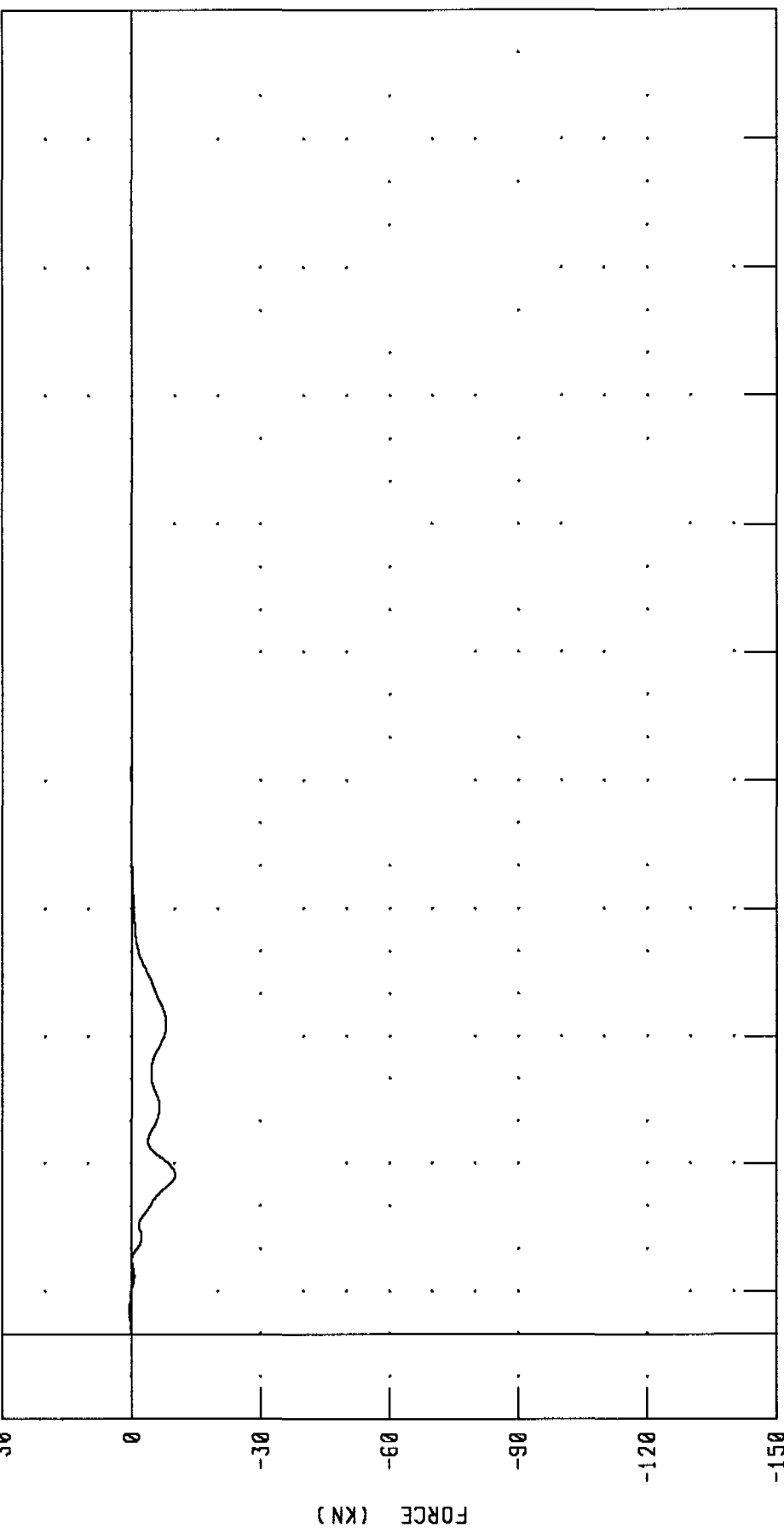
PEAK DATA 0 44 KN @ 4 64 MS, -0 95 KN @ 21 84 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A6 FORCE

TEST NUMBER 960930

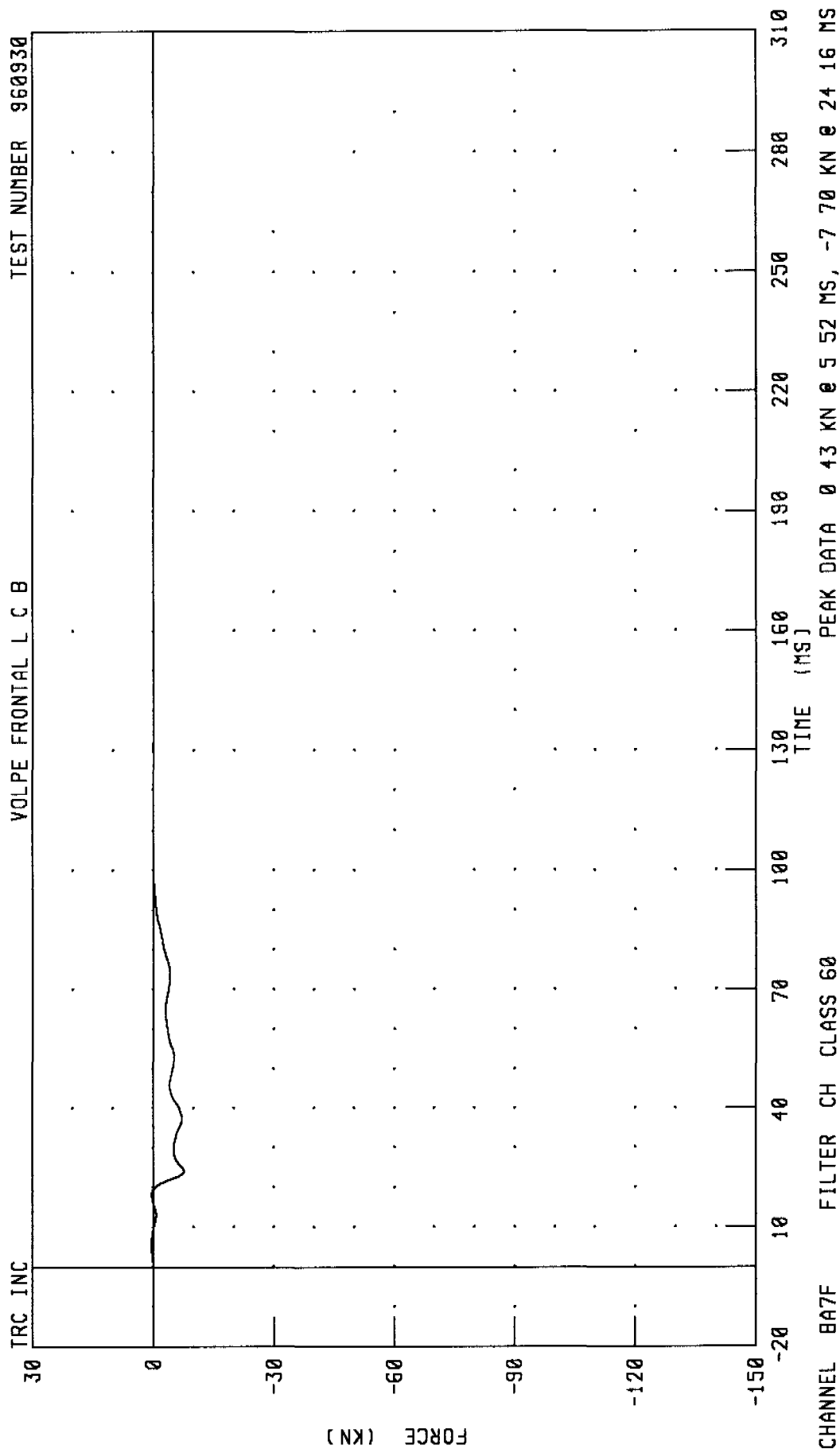
VOLPE FRONTAL L C B

TRC INC



CHANNEL BA6F FILTER CH CLASS 60 PEAK DATA 0 44 KN @ 5 12 MS, -10 22 KN @ 37 36 MS

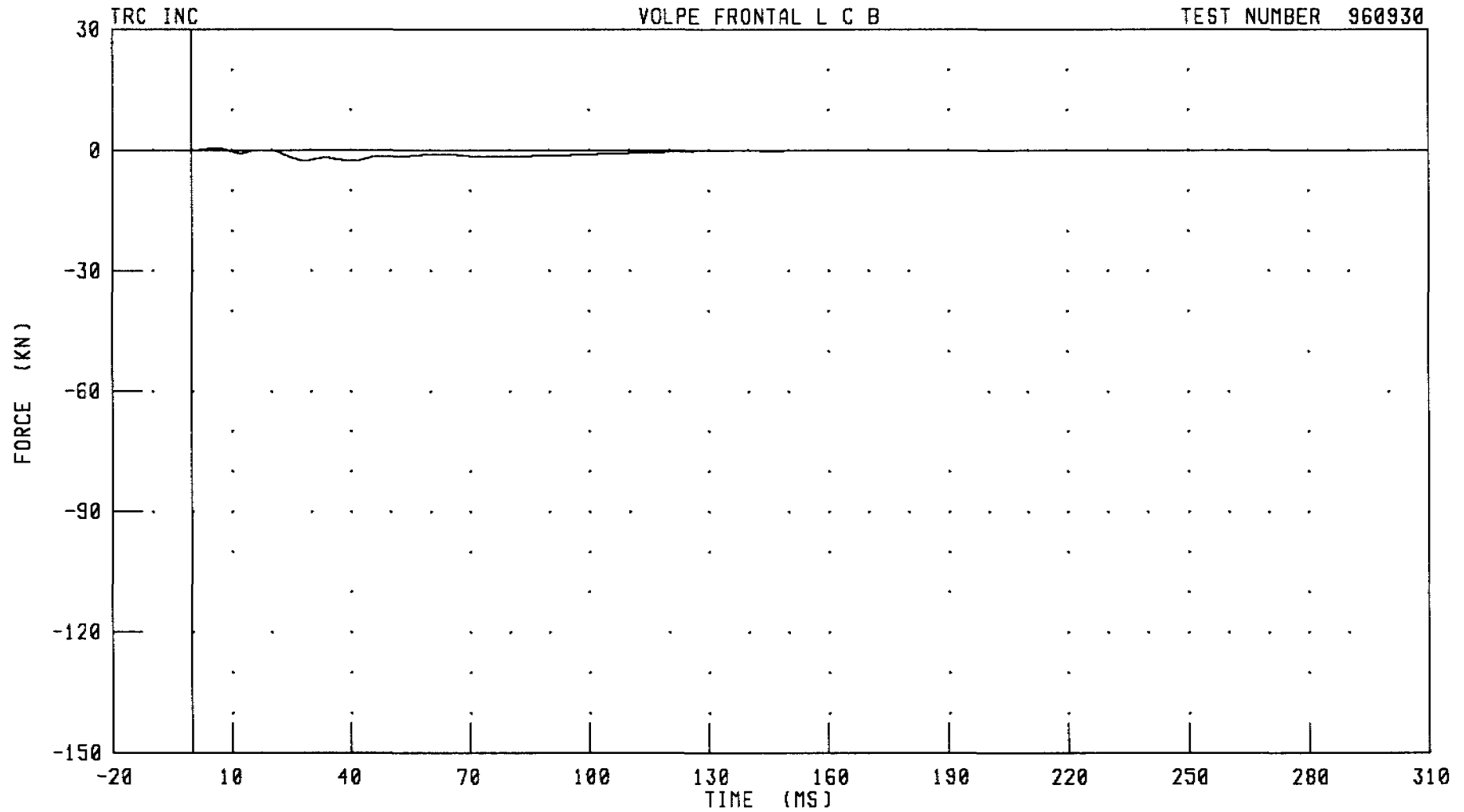
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A7 FORCE



1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A8 FORCE

VOLPE FRONTAL L C B

TEST NUMBER 960930



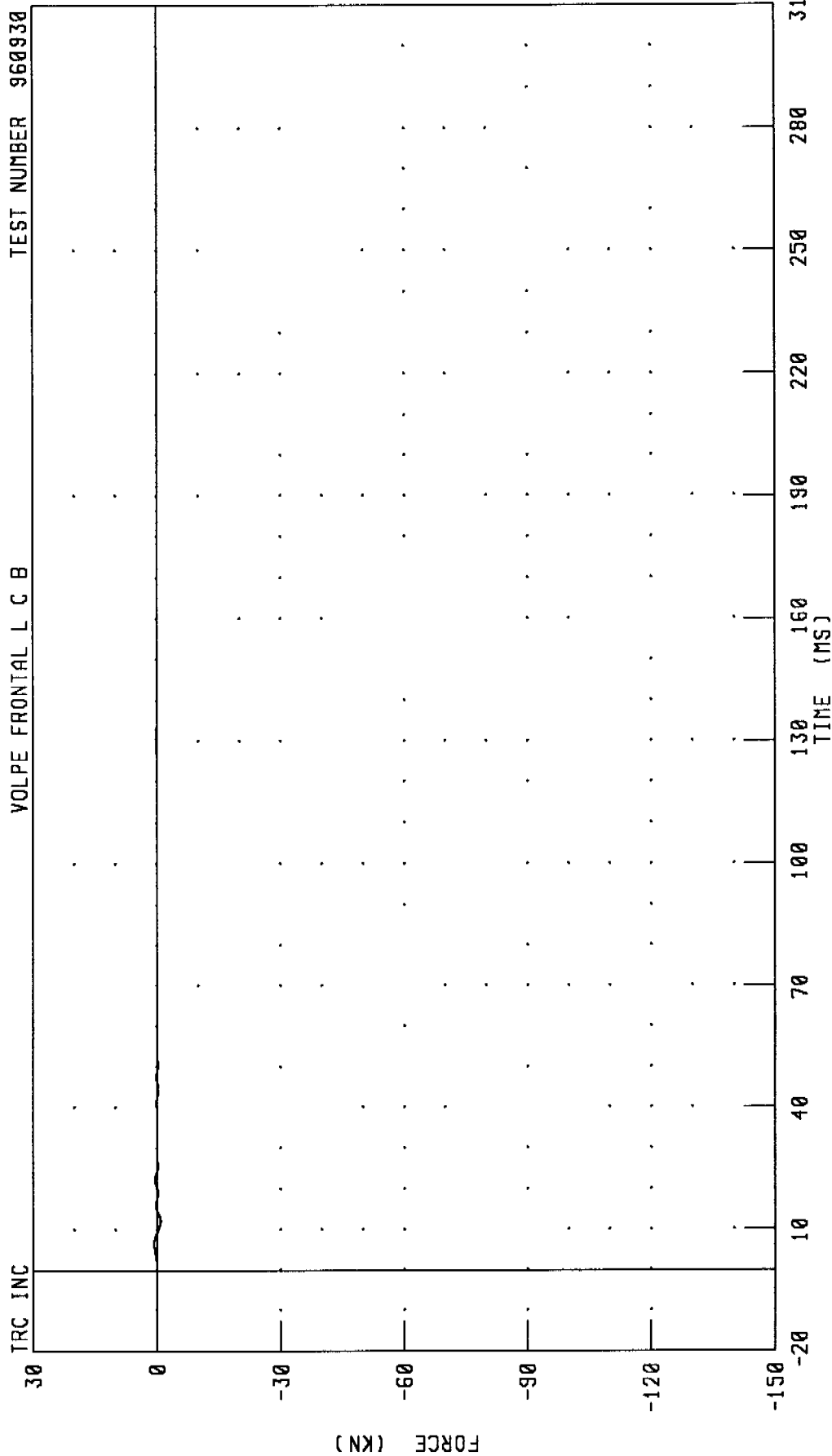
CHANNEL BA8F FILTER CH CLASS 60

PEAK DATA 0 49 KN @ 6 08 MS, -2 60 KN @ 40 72 MS

B-76

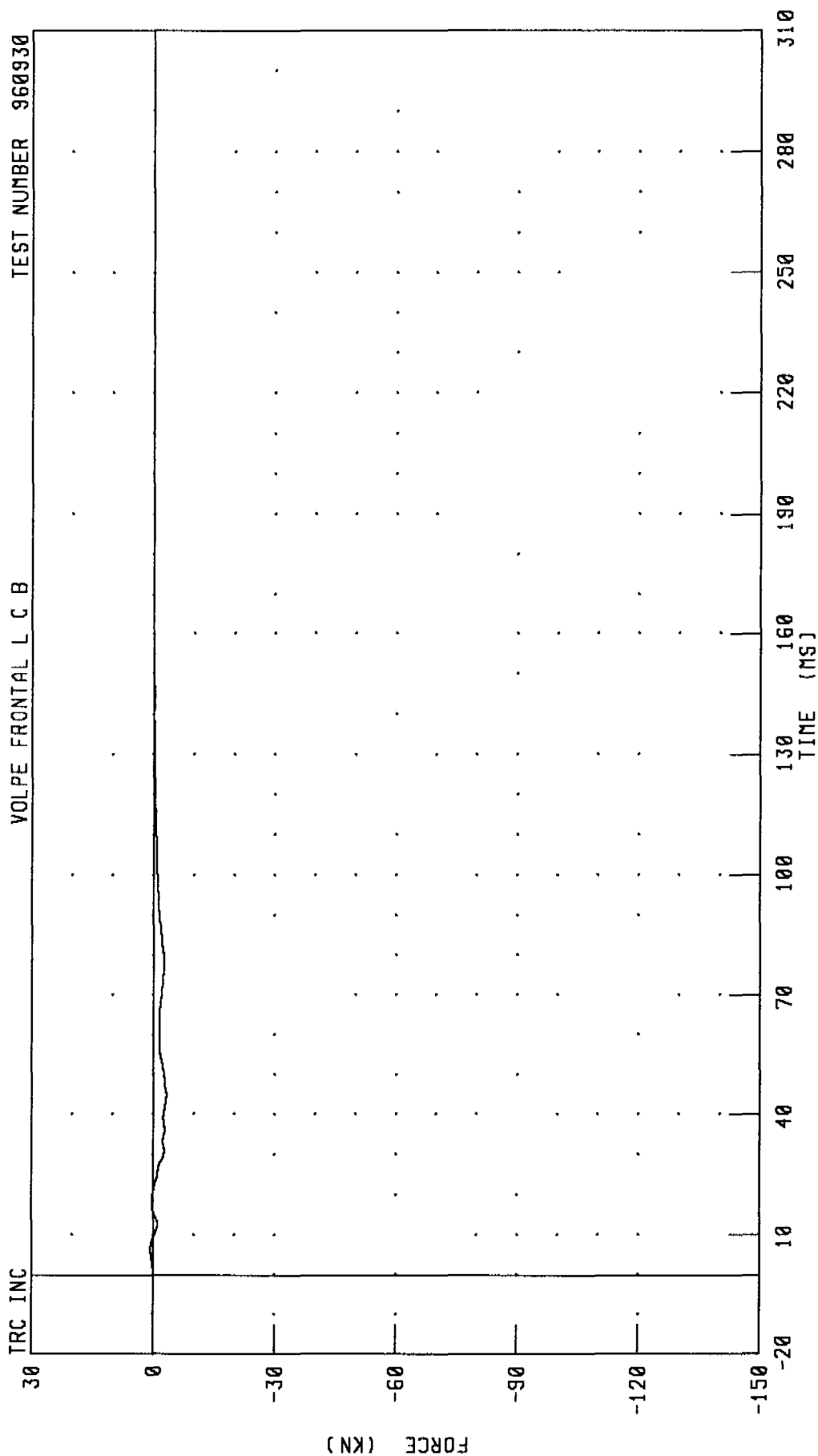
960930

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION A9 FORCE



CHANNEL B9F FILTER CH CLASS 60

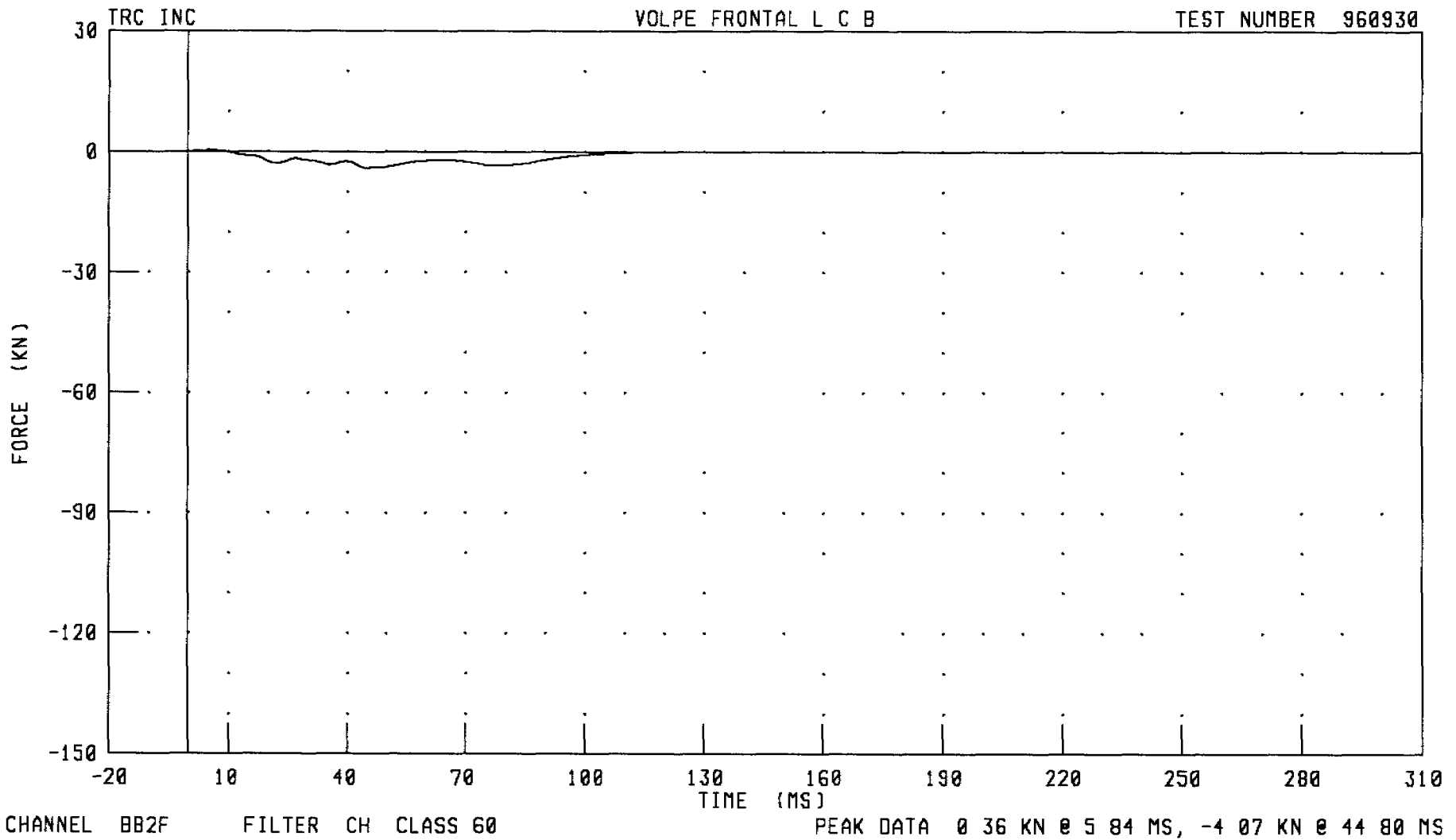
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B1 FORCE



CHANNEL BB1F FILTER CH CLASS 60

PEAK DATA 0 65 KN @ 6 48 MS, -3 25 KN @ 44 80 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B2 FORCE

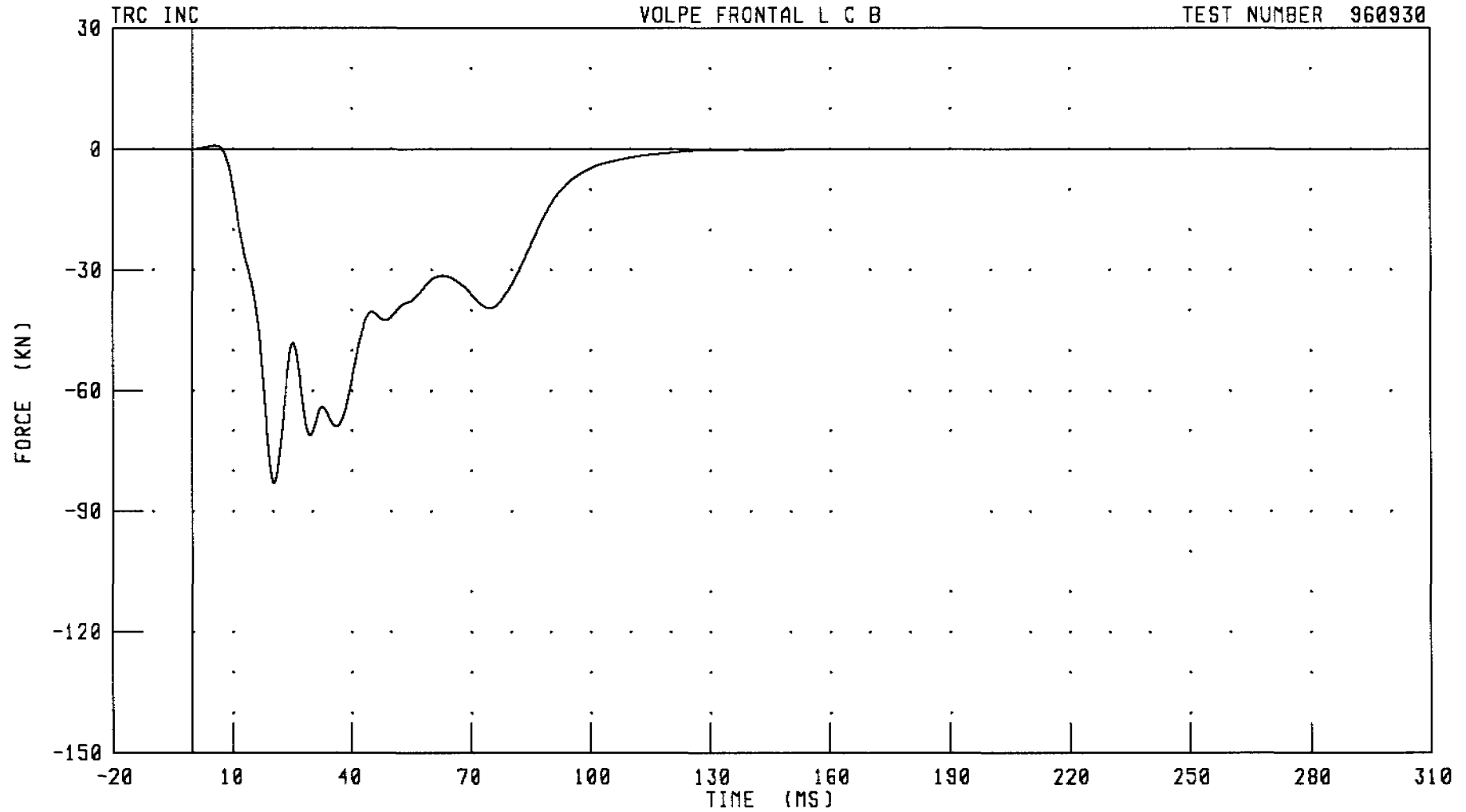


056096

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B3 FORCE

VOLPE FRONTAL L C B

TEST NUMBER 960930



CHANNEL BB3F FILTER CH CLASS 60

PEAK DATA 0 86 KN @ 5 52 MS, -83 03 KN @ 20 24 MS

08-B

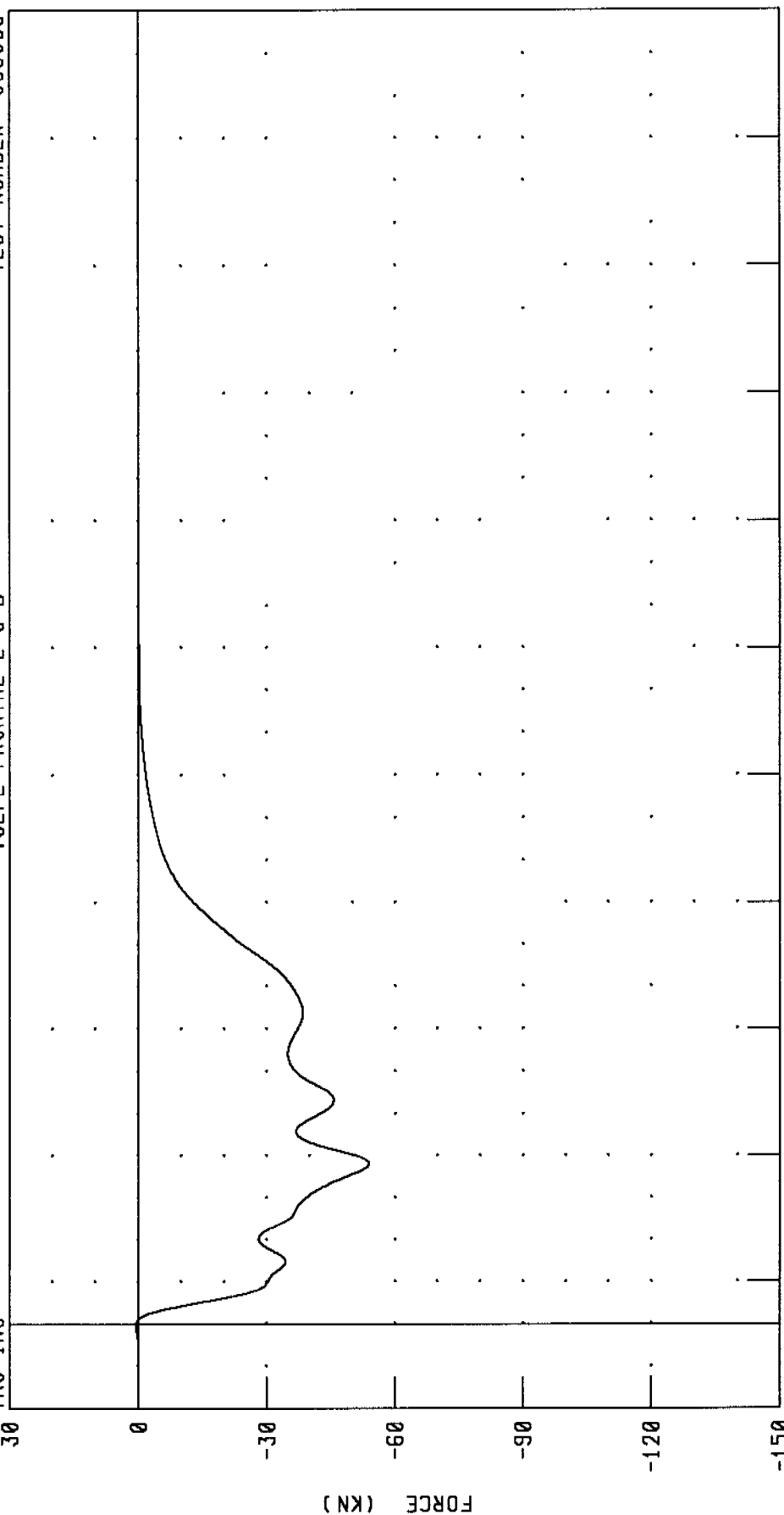
05096

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B4 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

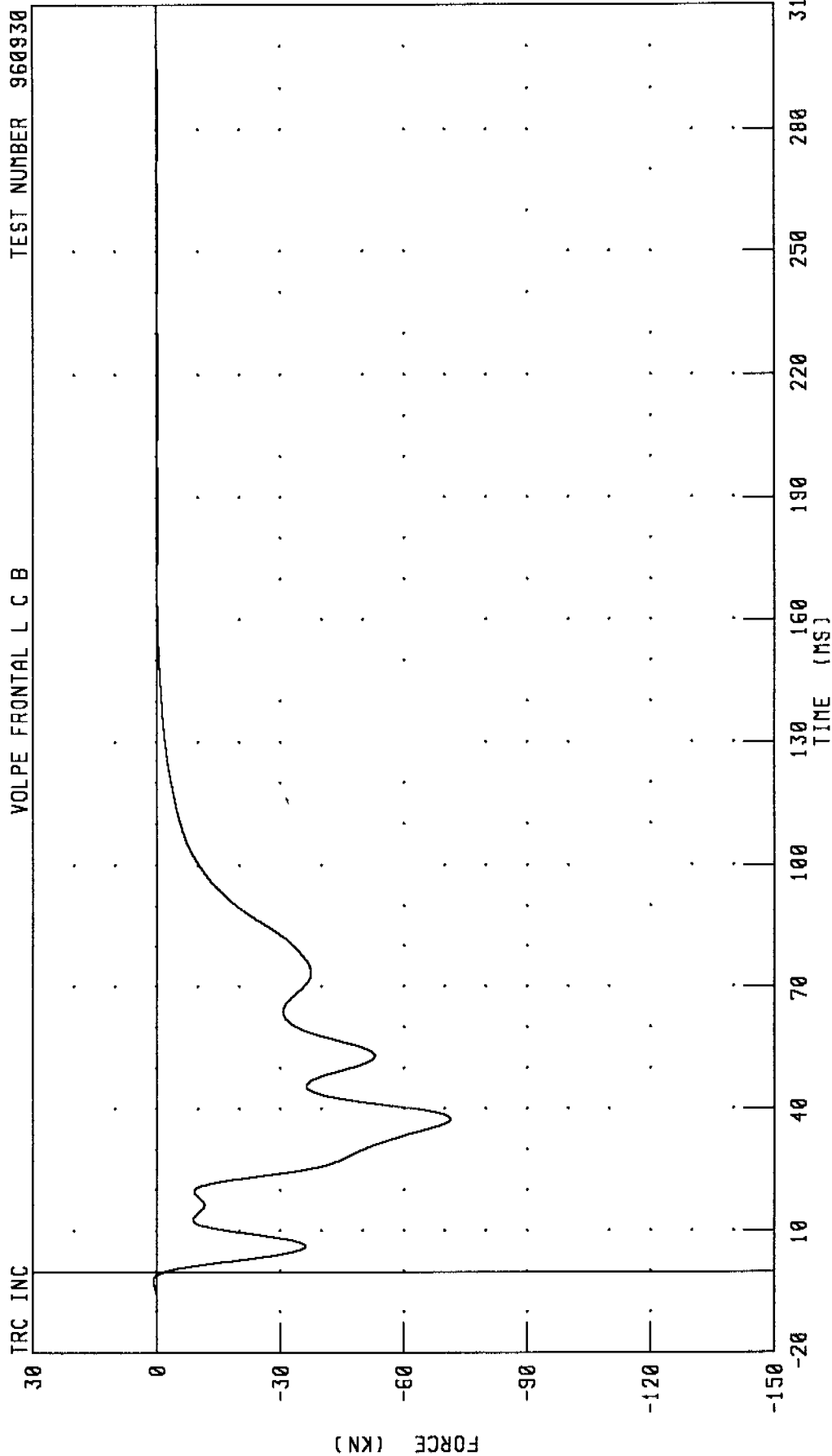
TRC INC



CHANNEL BB4F FILTER CH CLASS 60

PEAK DATA 0 54 KN @ -0 48 MS, -53 94 KN @ 38 08 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B5 FORCE



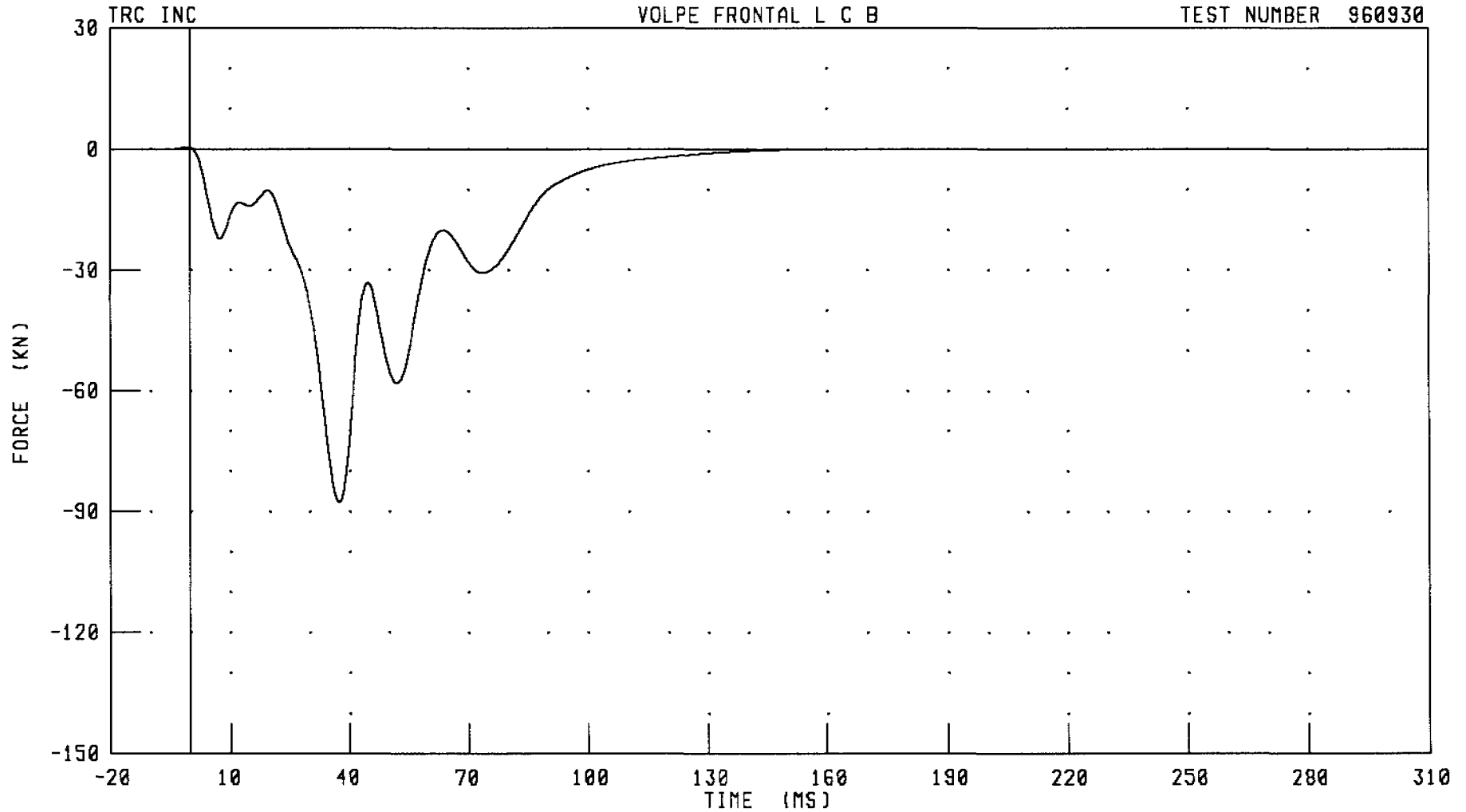
CHANNEL BBSF FILTER CH CLASS 60

PEAK DATA 0 84 KN @ -2 32 MS, -71 42 KN @ 37 52 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B6 FORCE

VOLPE FRONTAL L C B

TEST NUMBER 960930



CHANNEL BB6F FILTER CH CLASS 60

PEAK DATA 0 53 KN @ -0 72 MS, -87 78 KN @ 37 44 MS

B-83

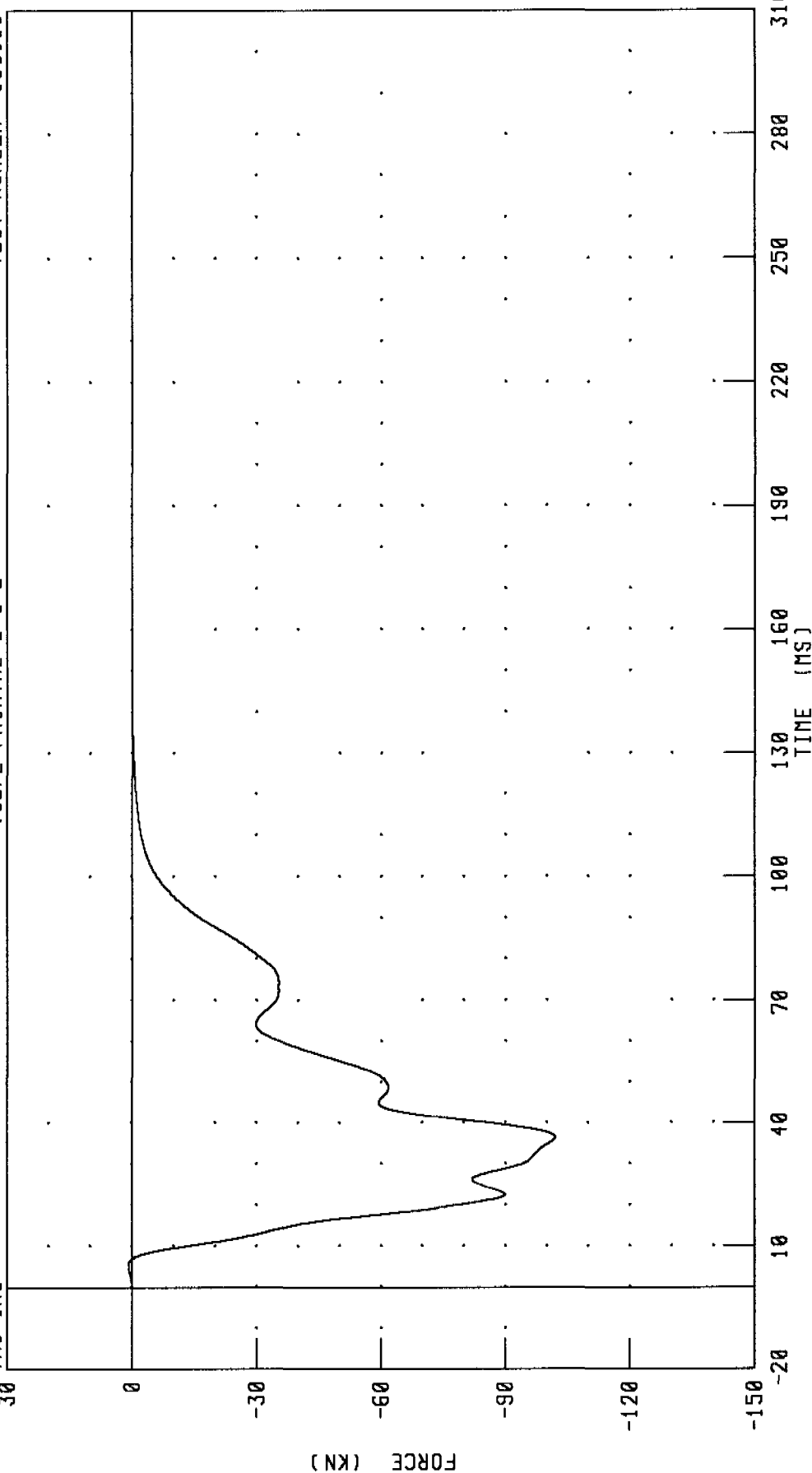
056096

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B7 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

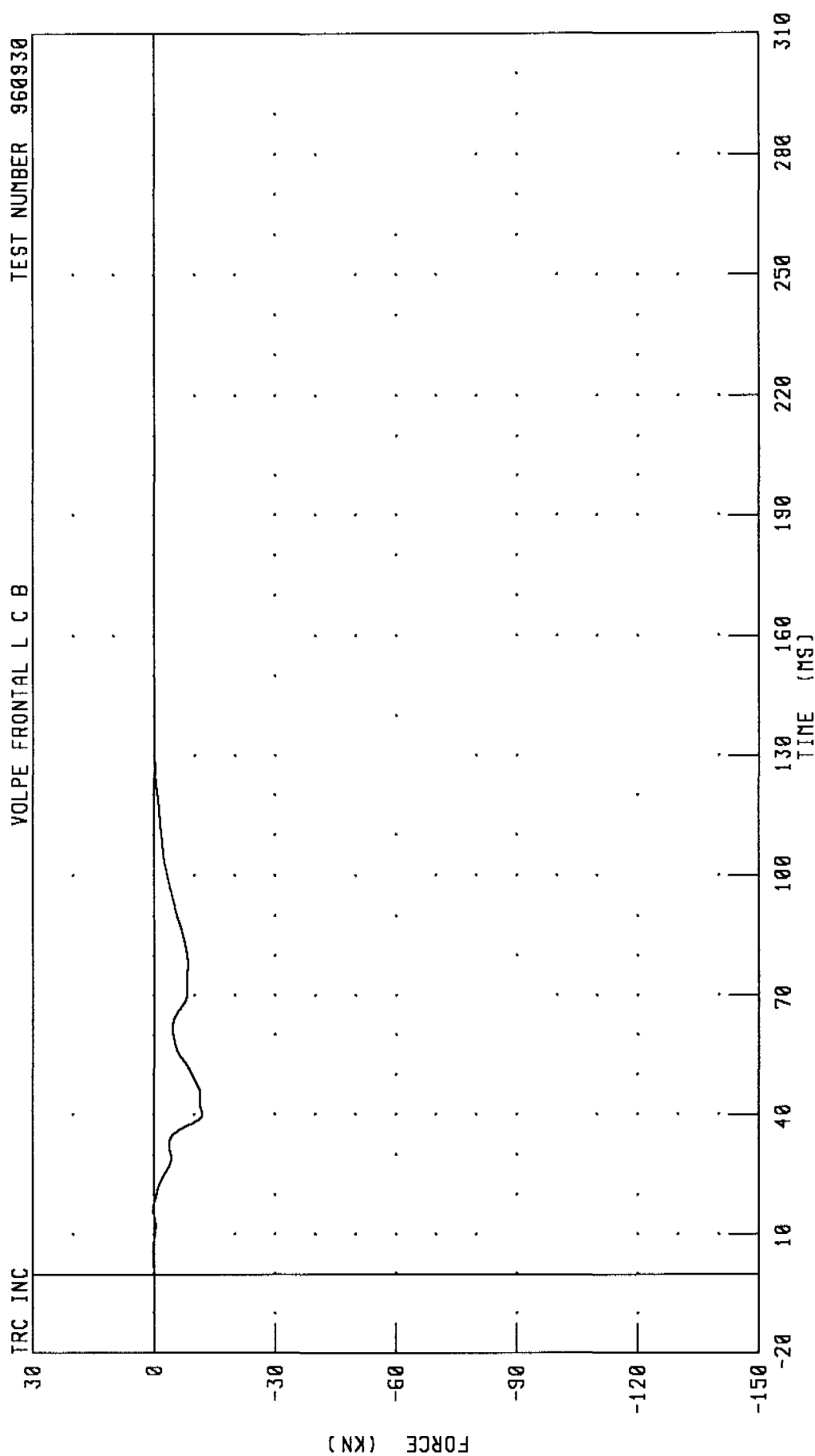
TRC INC



CHANNEL BB7F FILTER CH CLASS 60

PEAK DATA 0 83 KN @ 5 20 MS, -102 06 KN @ 36 48 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B8 FORCE



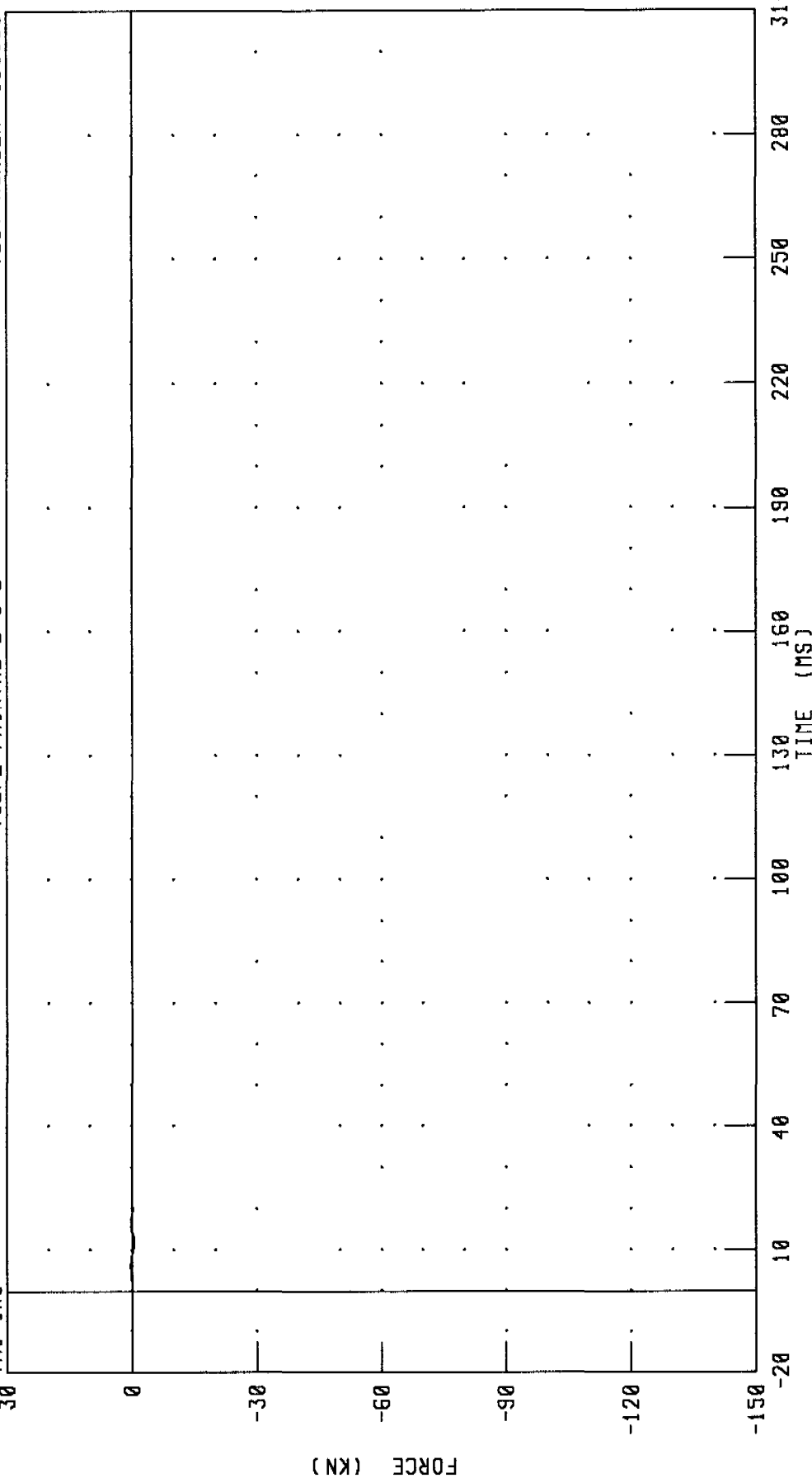
CHANNEL 888F FILTER CH CLASS 60 PEAK DATA 0 29 KN @ 5 52 MS, -12 10 KN @ 40 16 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION B9 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



CHANNEL B9F FILTER CH CLASS 60

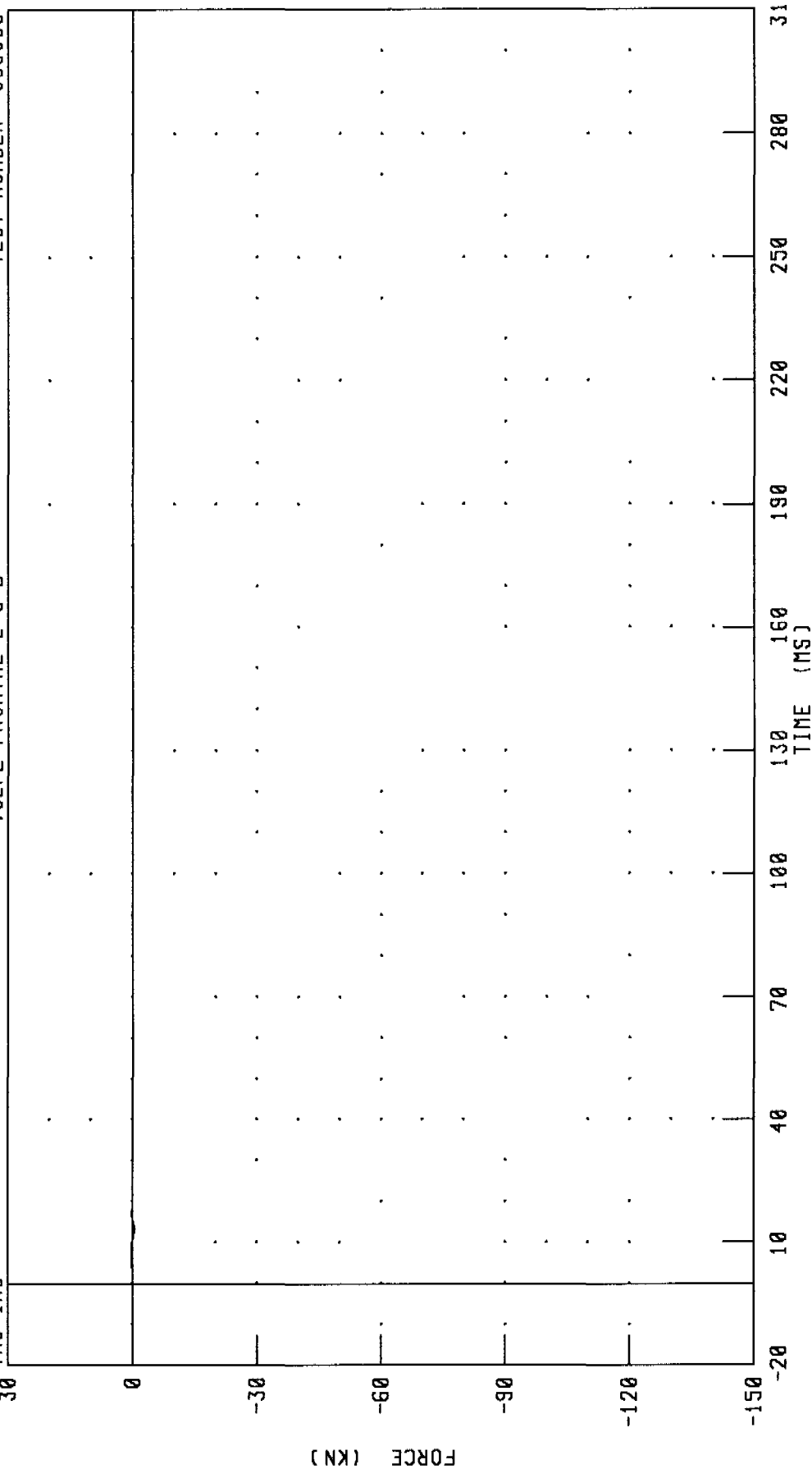
PEAK DATA 0 35 KN @ 6 32 MS, -0 65 KN @ 12 08 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C1 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

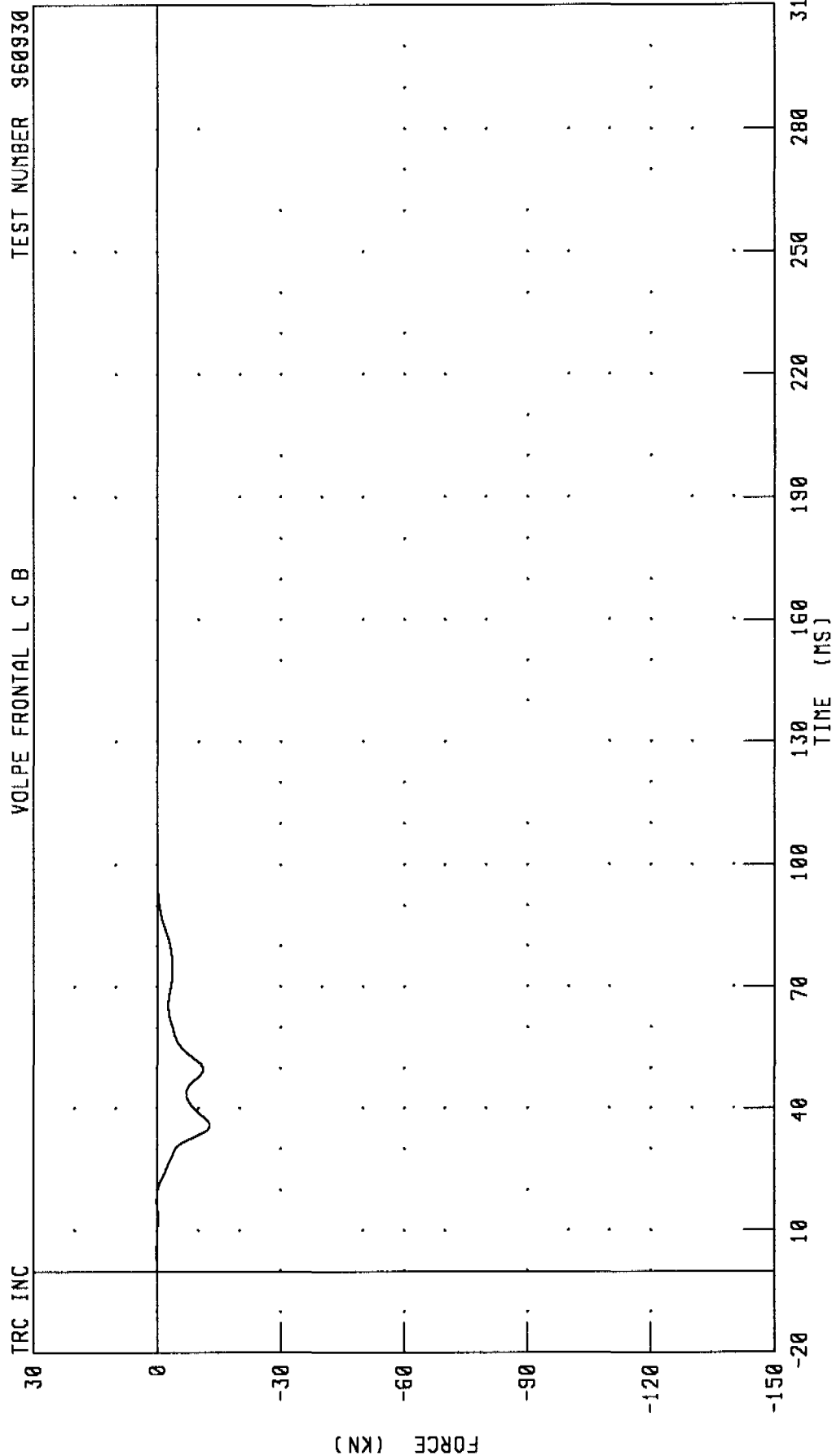
TRC INC



CHANNEL BC1F FILTER CH CLASS 60

PEAK DATA 0 19 KN @ 7 60 MS, -0 51 KN @ 13 20 MS

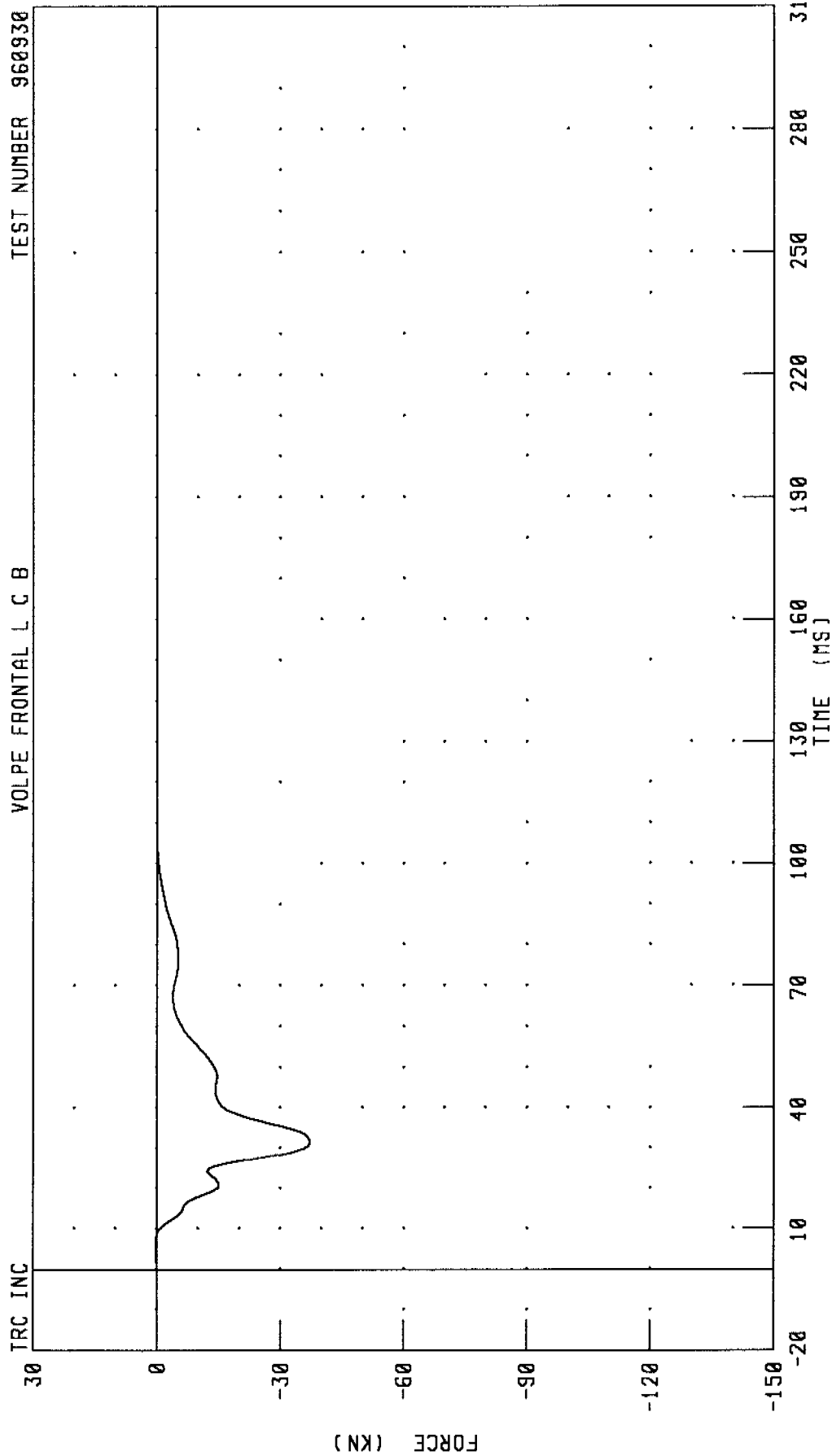
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C2 FORCE



CHANNEL BC2F FILTER CH CLASS 60

PEAK DATA 0 13 KN @ 4 32 MS, -12 75 KN @ 35 92 MS

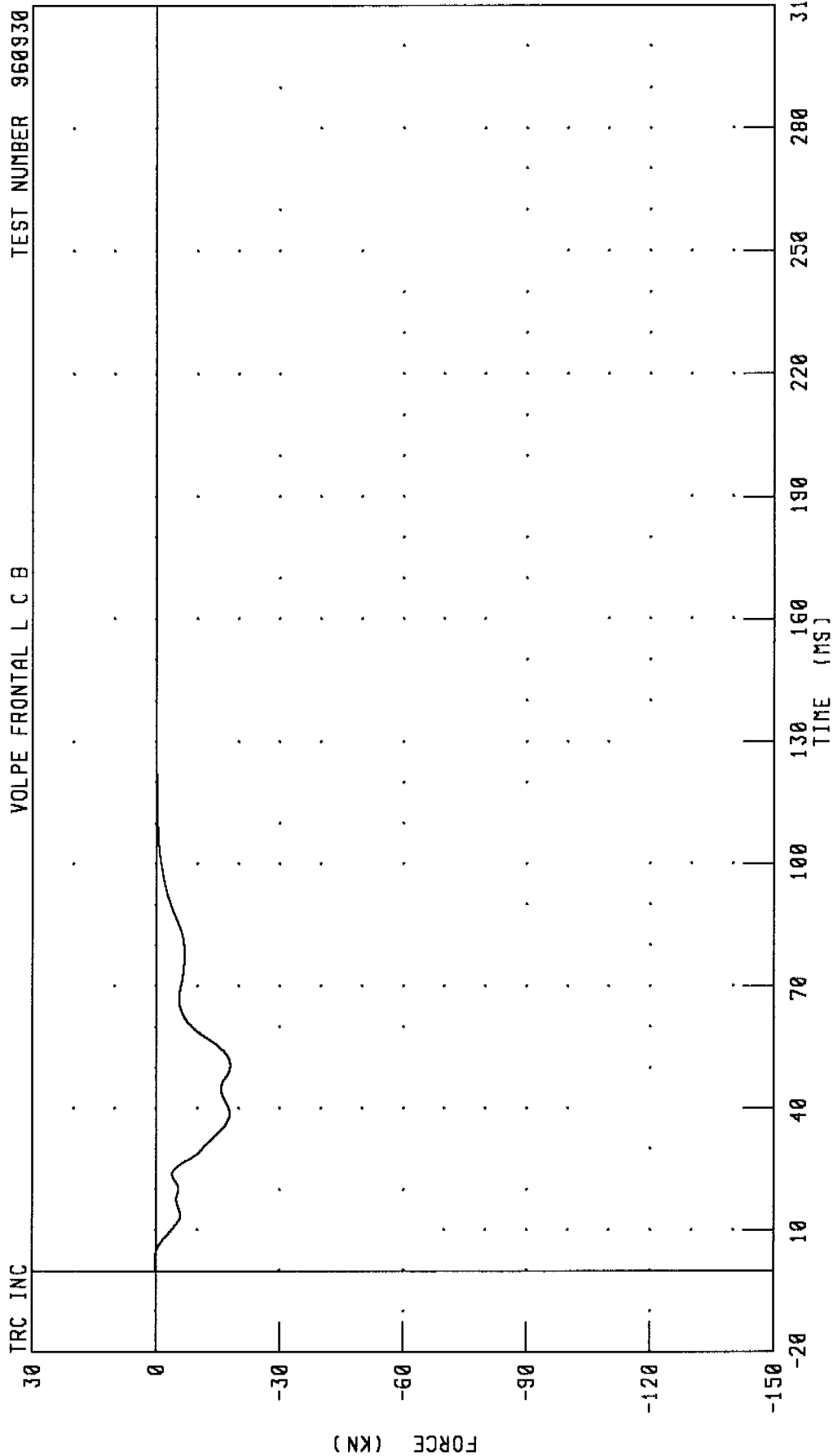
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C3 FORCE



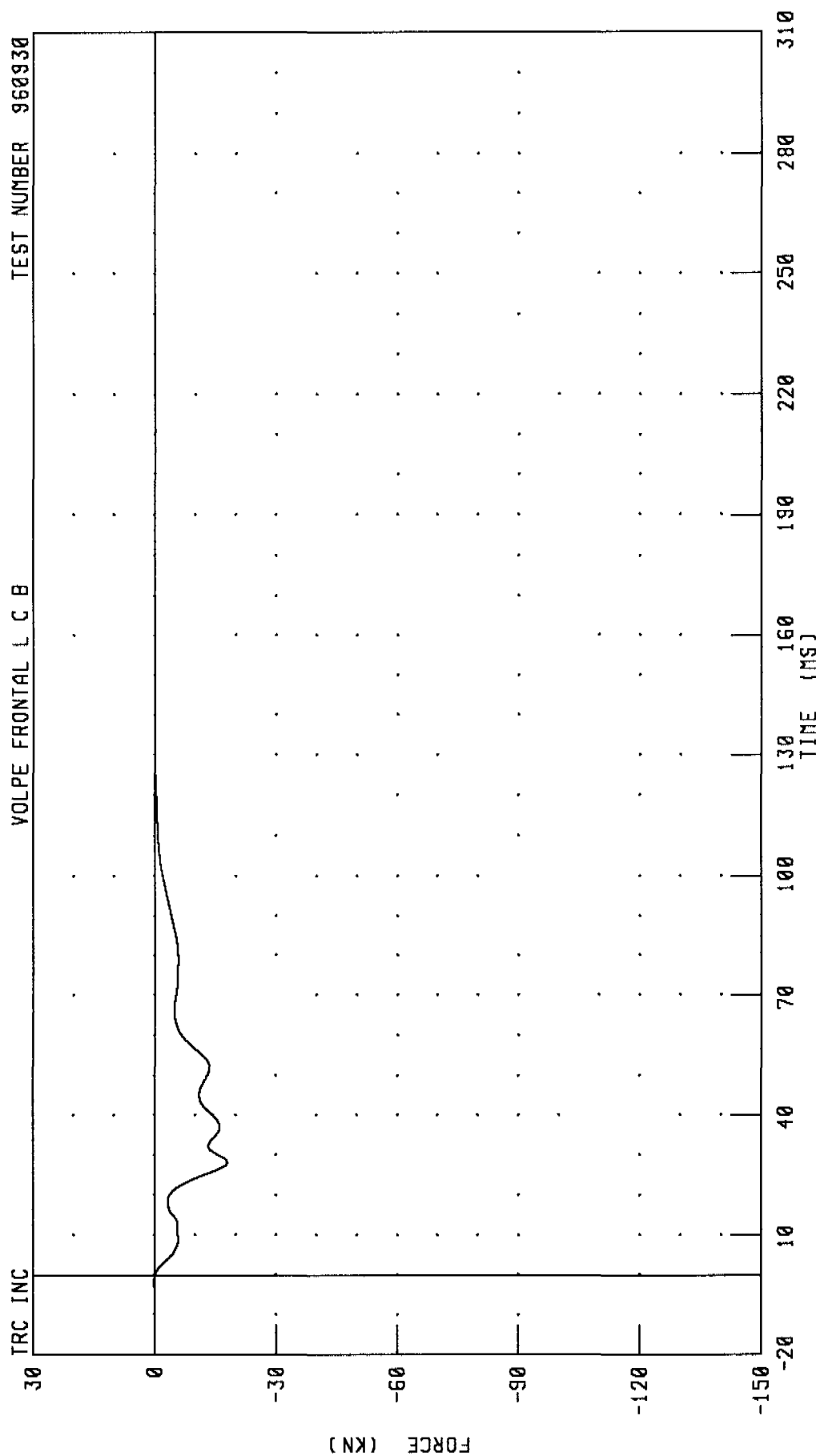
CHANNEL BC3F FILTER CH CLASS 60

PEAK DATA 0 21 KN @ 5 52 MS, -37 11 KN @ 31 52 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C4 FORCE



1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C5 FORCE



PEAK DATA 0 11 KN @ -1 76 MS, -18 00 KN @ 28 16 MS

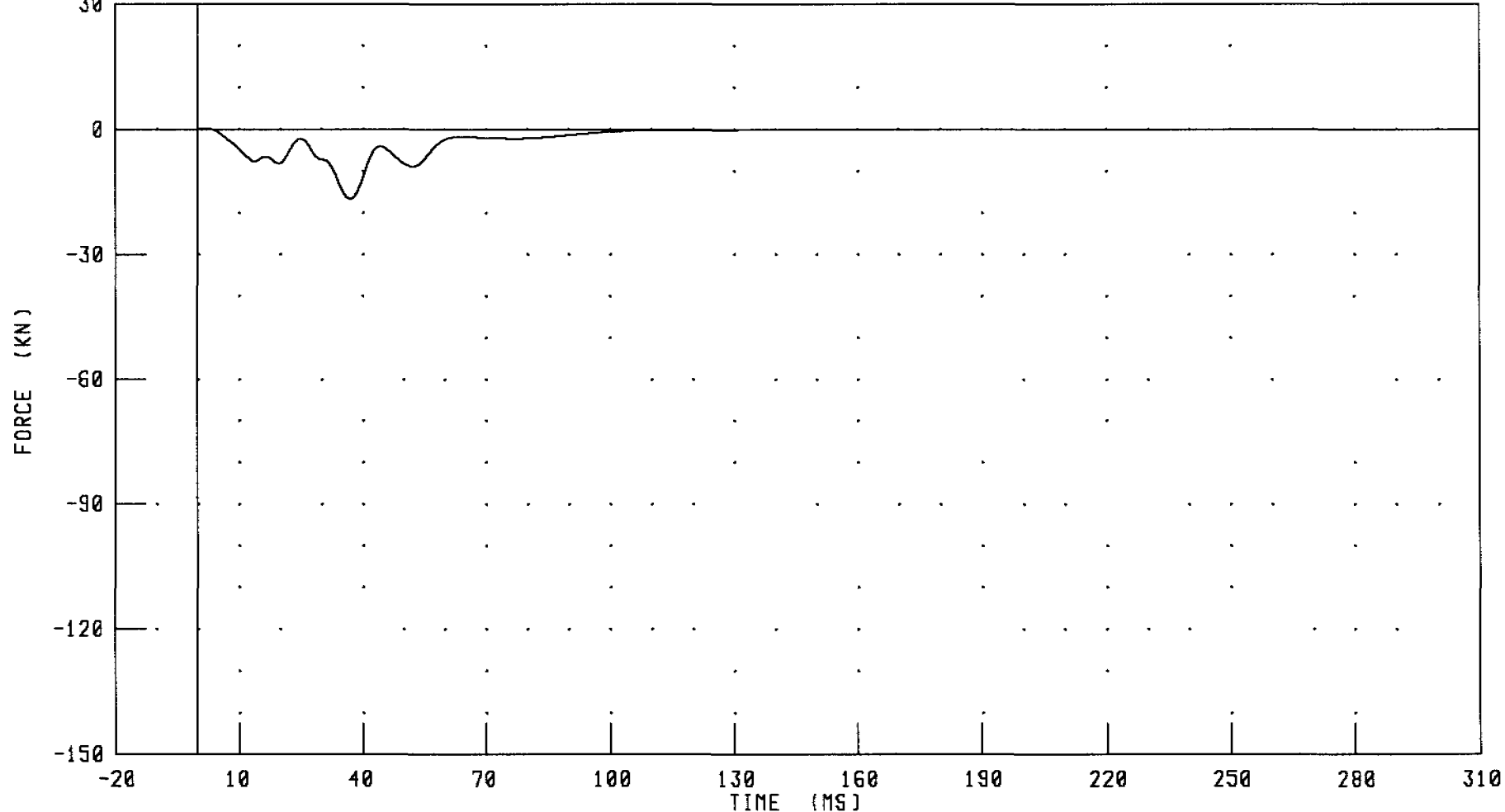
CHANNEL BC5F FILTER CH CLASS 60

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C6 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



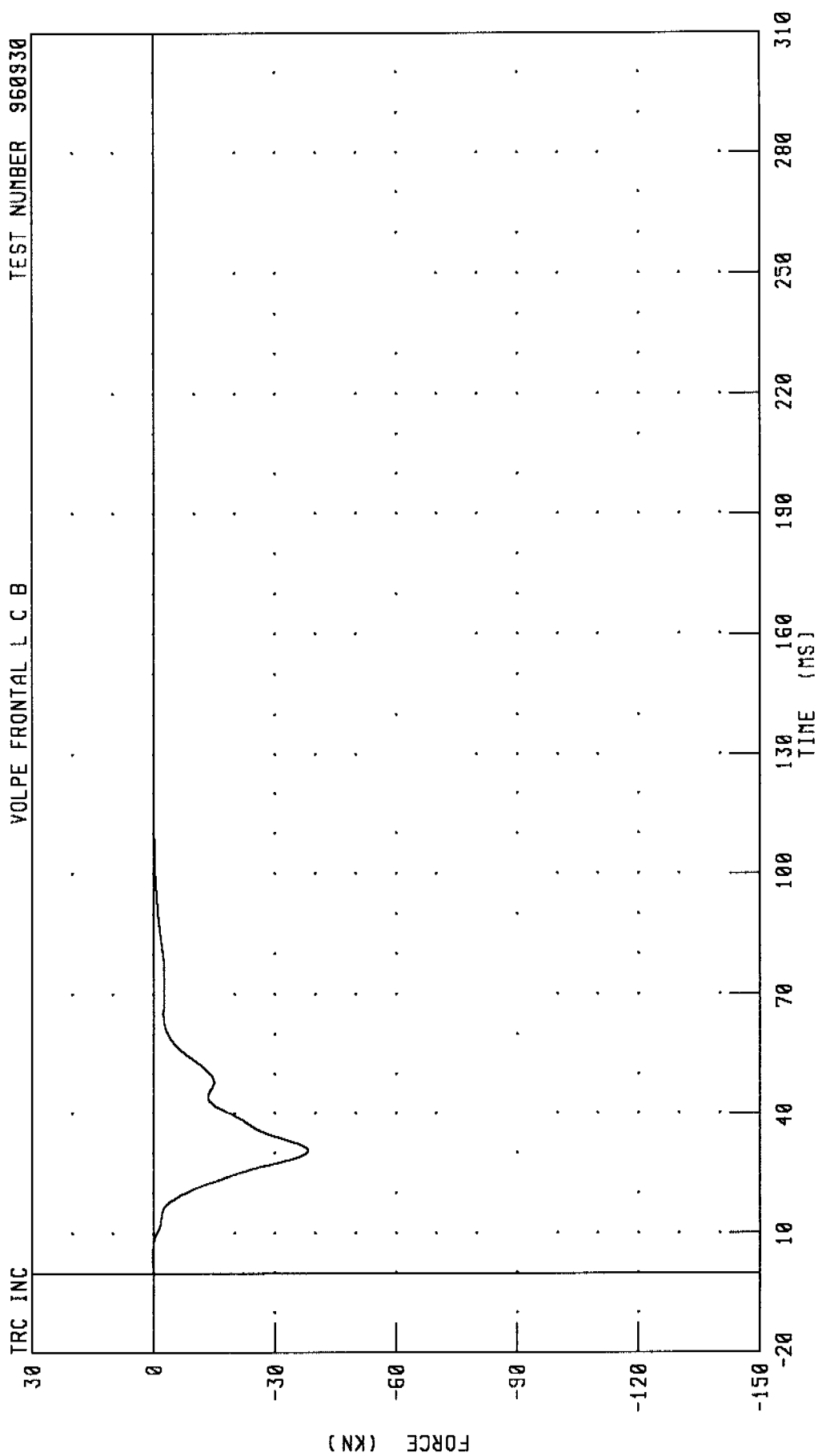
PEAK DATA 0 20 KN @ 2 08 MS, -16 68 KN @ 36 96 MS

CHANNEL BC6F FILTER CH CLASS 60

B-92

960930

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C7 FORCE

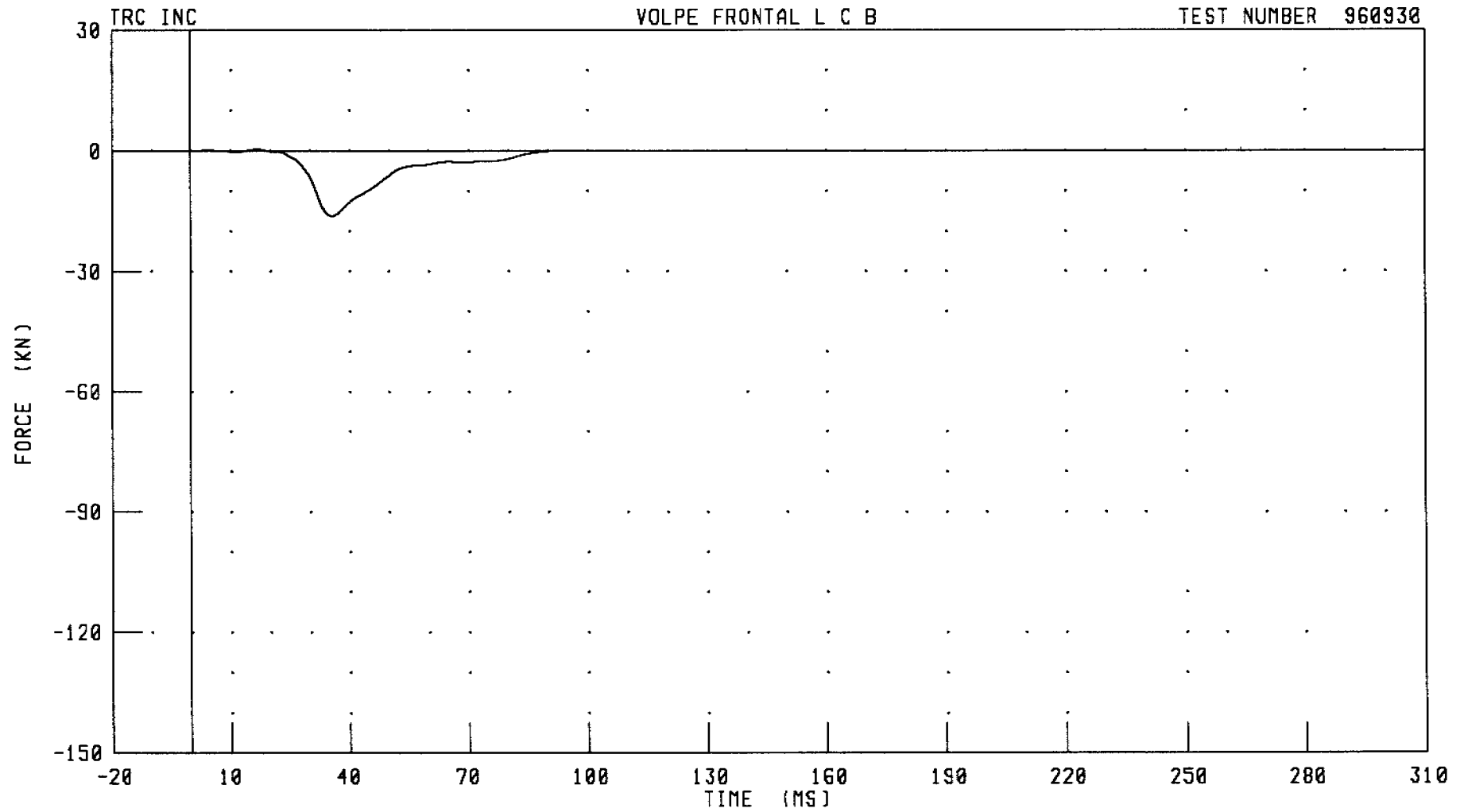


CHANNEL BC7F FILTER CH CLASS 60

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C8 FORCE

VOLPE FRONTAL L C B

TEST NUMBER 960930



CHANNEL BC8F FILTER CH CLASS 60

PEAK DATA 0 41 KN @ 16 72 MS, -16 25 KN @ 35 68 MS

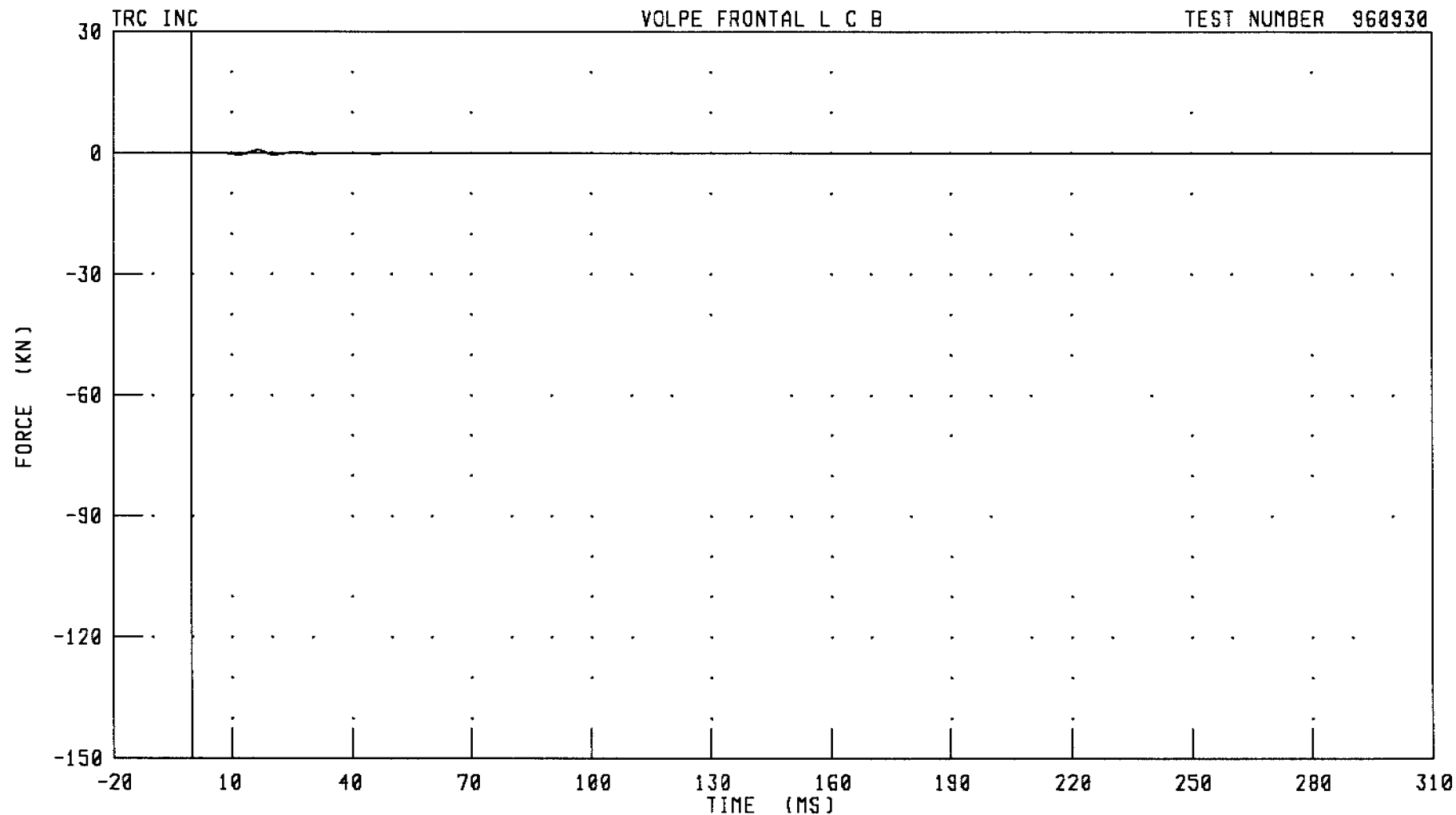
B-94

960930

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION C9 FORCE

VOLPE FRONTAL L C B

TEST NUMBER 960930



CHANNEL BC9F FILTER CH CLASS 60

PEAK DATA 0.65 KN @ 16.72 MS, -0.49 KN @ 20.72 MS

56-B

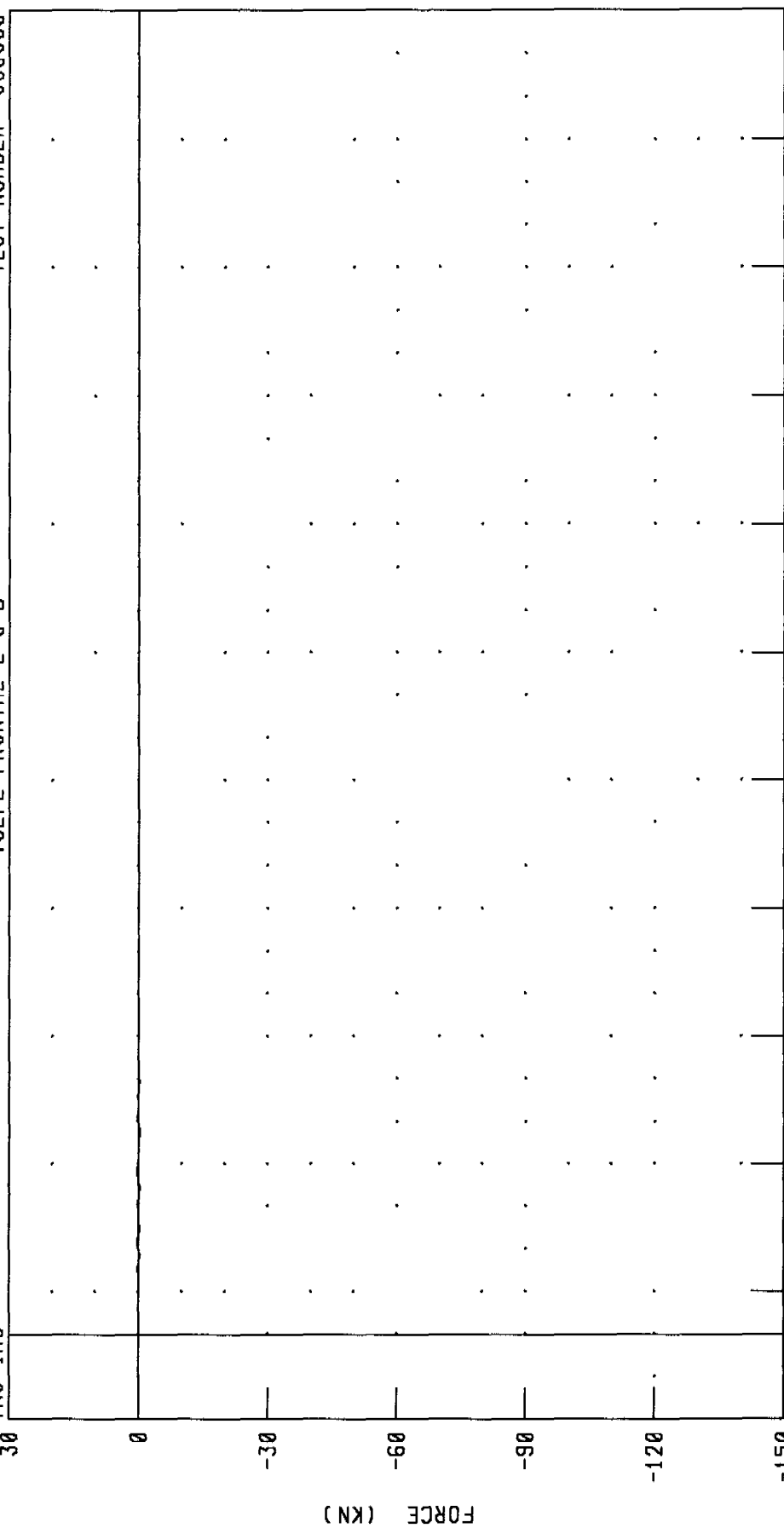
960930

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D1 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

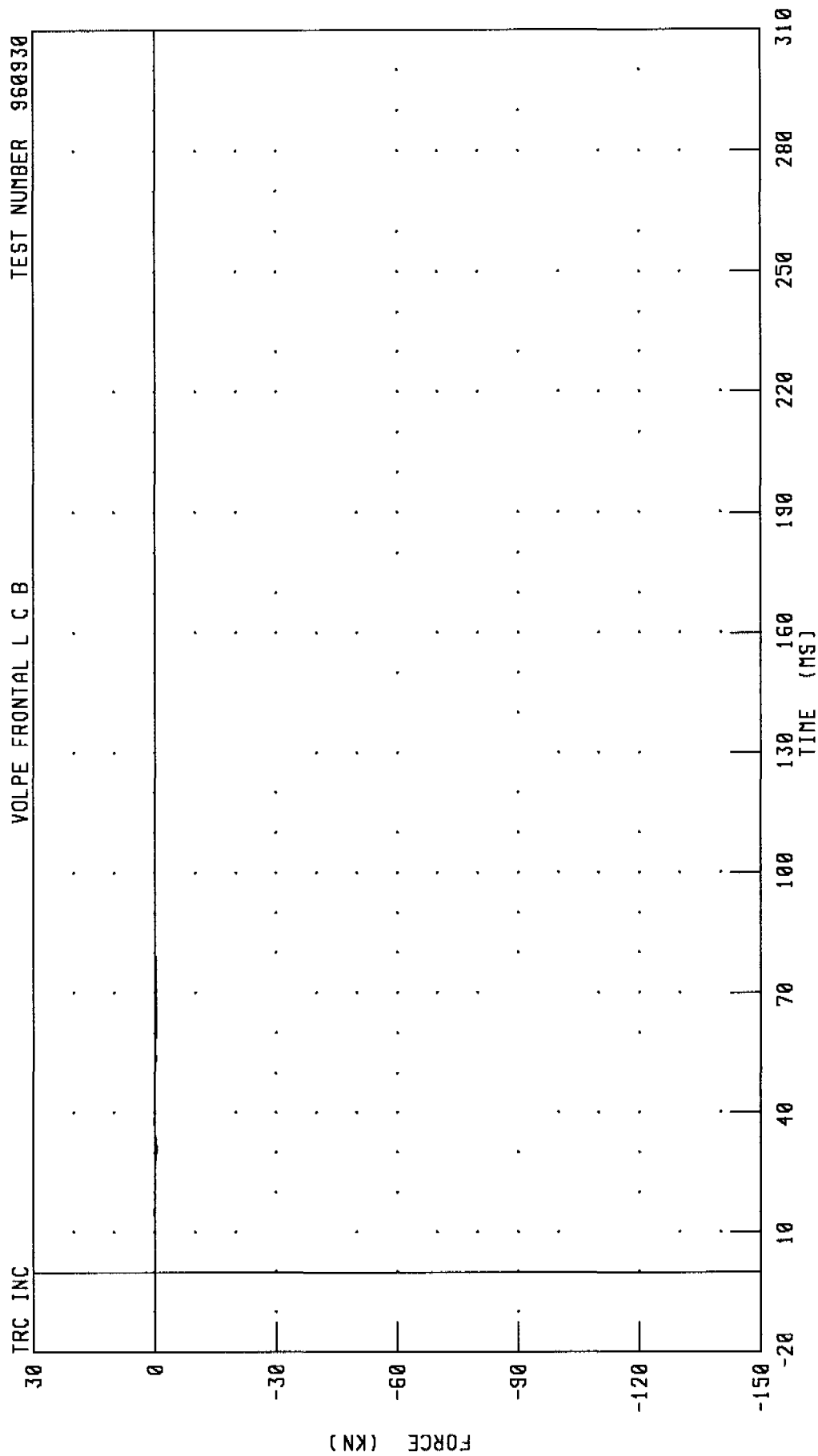
TRC INC



CHANNEL BD1F FILTER CH CLASS 60

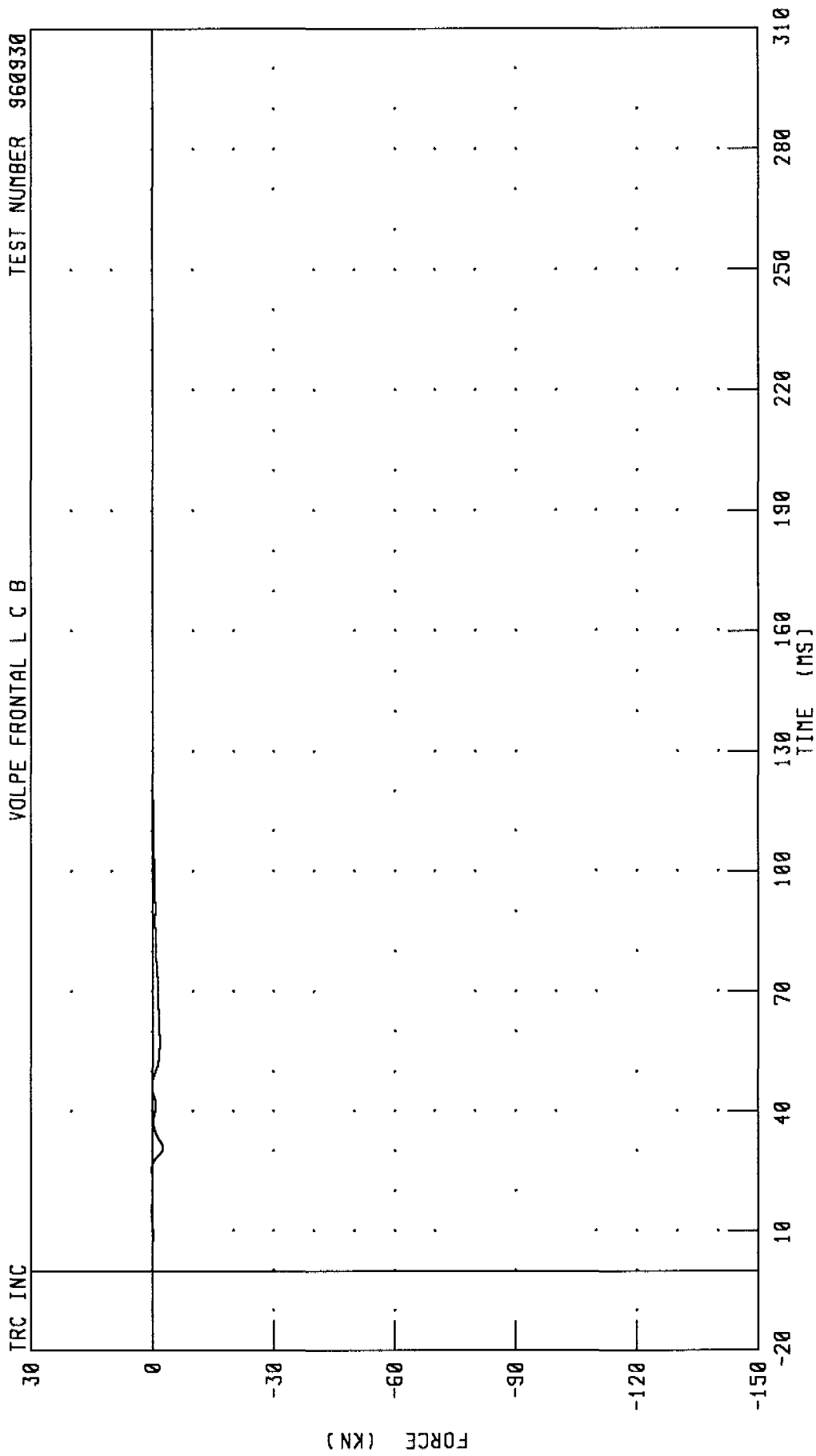
PEAK DATA 0 14 KN @ 21 60 MS, -0 25 KN @ 24 80 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D2 FORCE



CHANNEL BD2F FILTER CH CLASS 60 PEAK DATA 0 11 KN @ 15 12 MS, -0 48 KN @ 31 12 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D3 FORCE



CHANNEL B03F FILTER CH CLASS 60

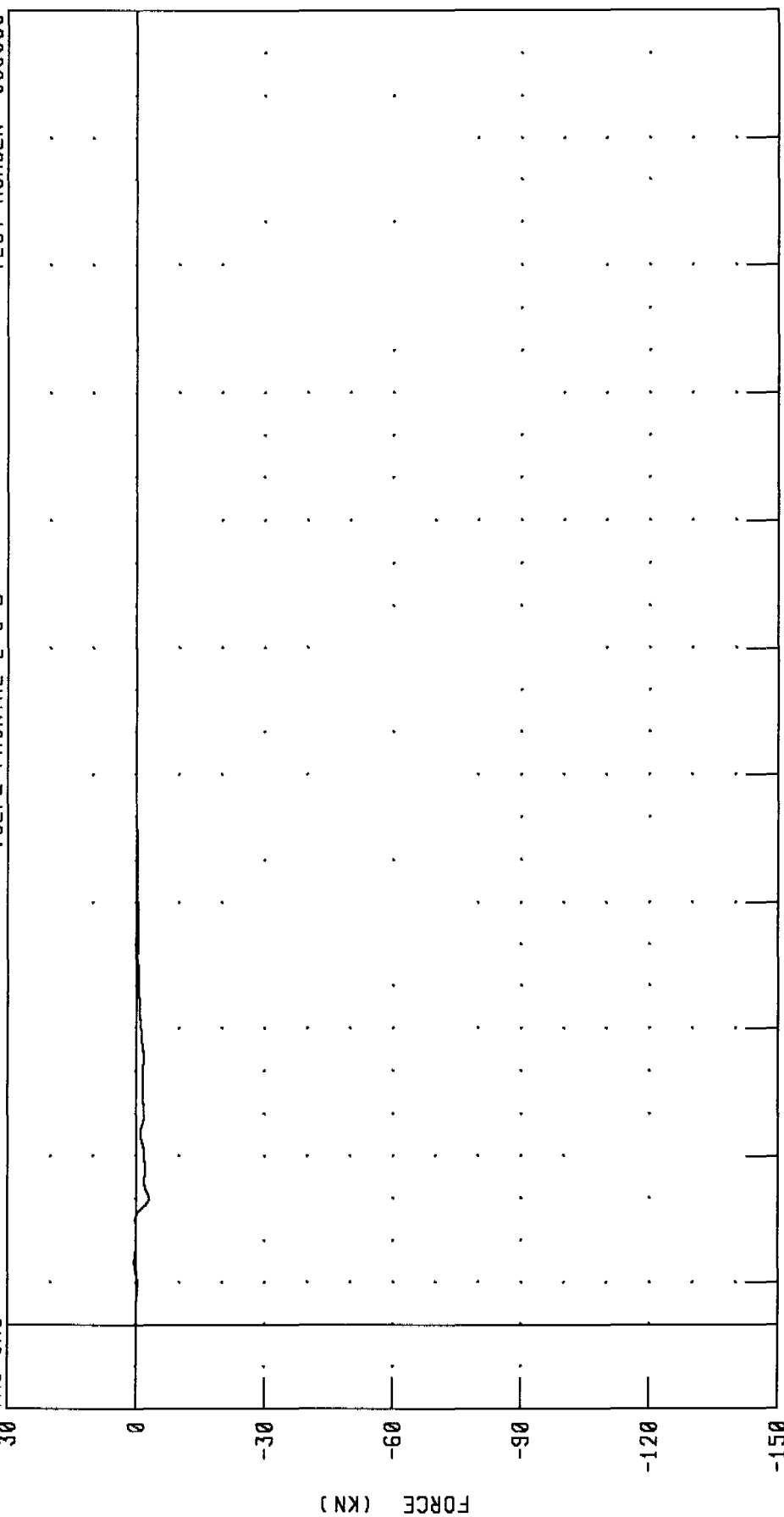
PEAK DATA 0 26 KN @ 14 80 MS, -2 71 KN @ 30 88 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D4 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



CHANNEL 804F FILTER CH CLASS 60

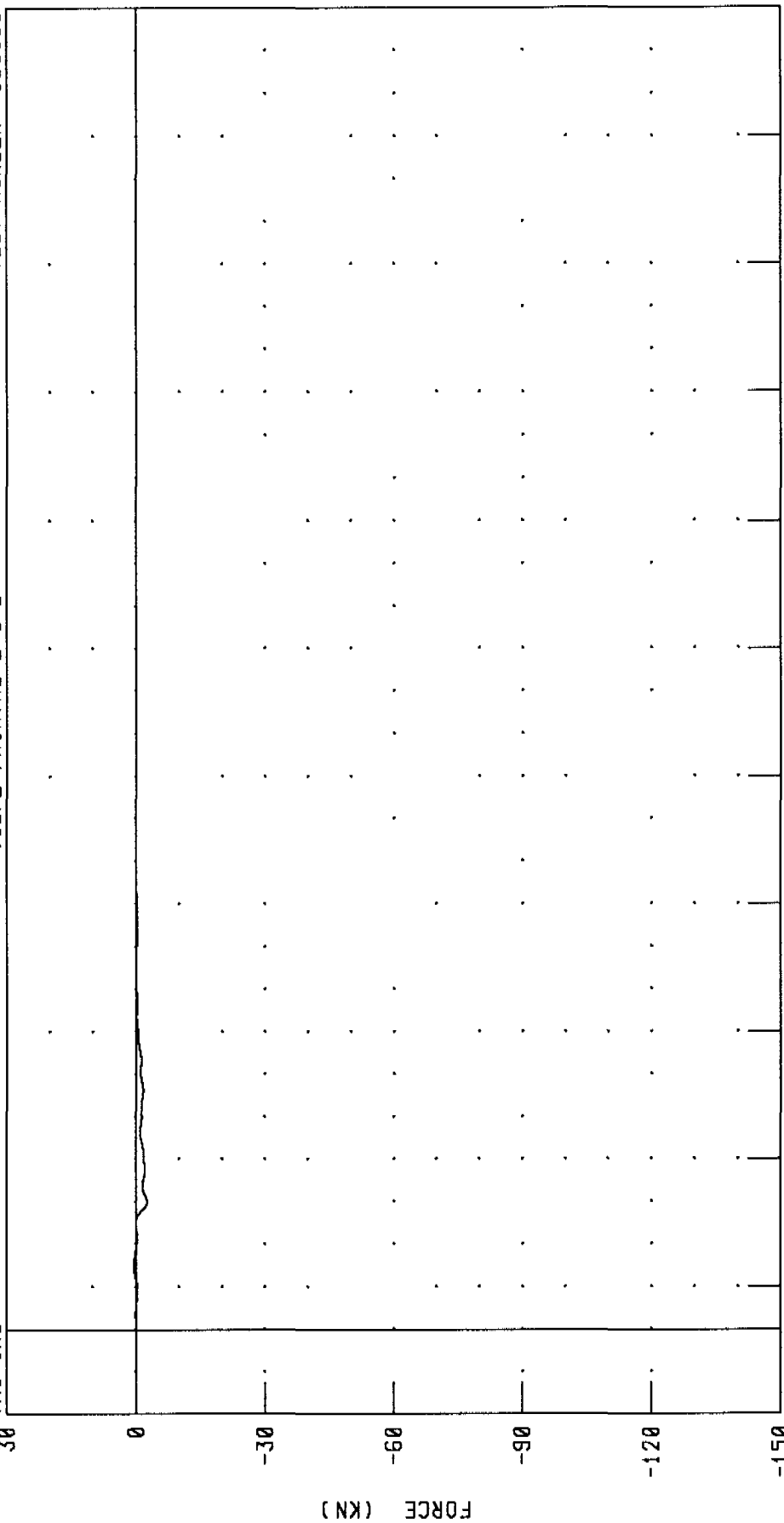
PEAK DATA 0 34 KN @ 14 80 MS, -3 01 KN @ 30 00 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D5 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



CHANNEL BD5F FILTER CH CLASS 60

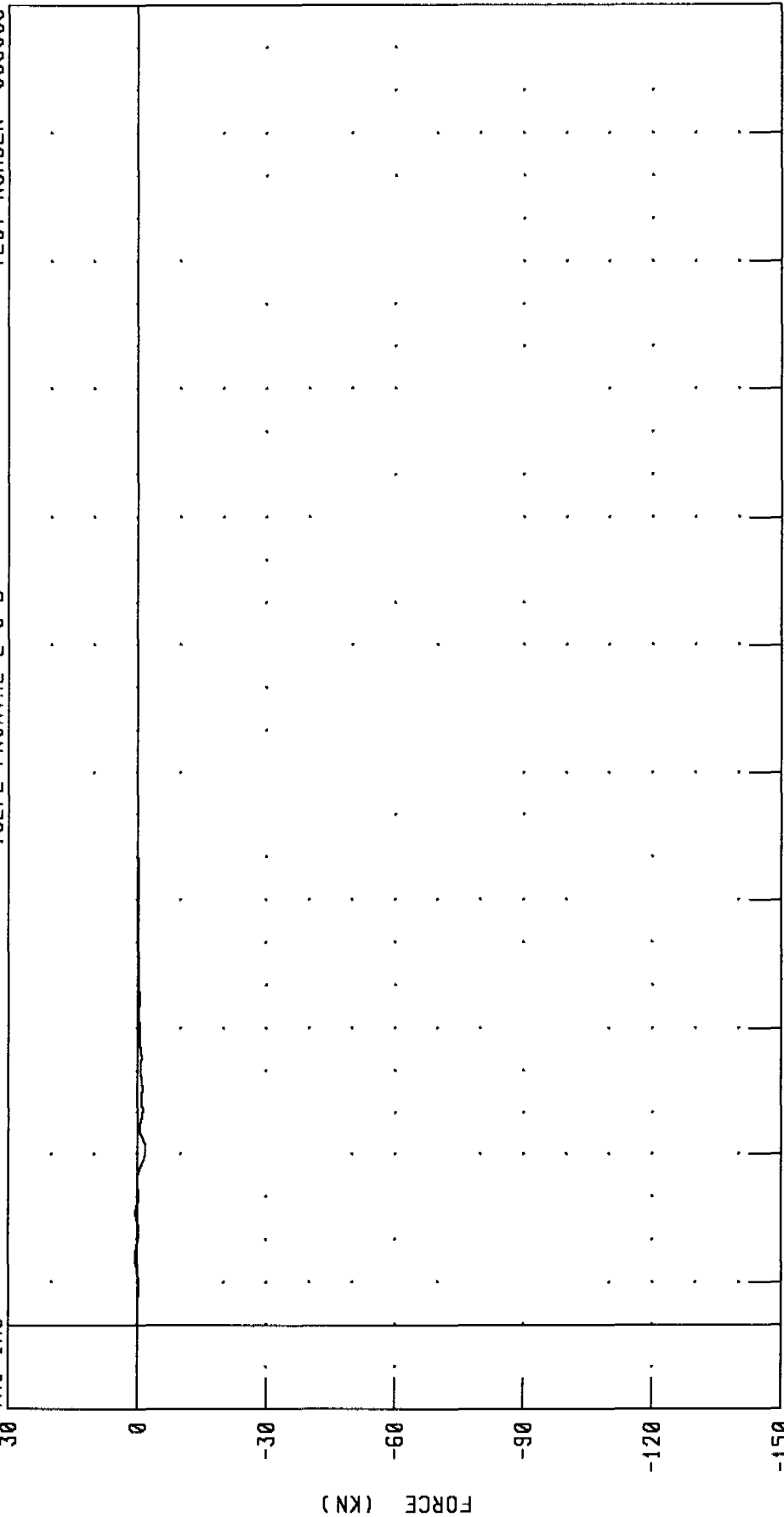
PEAK DATA 0 47 KN @ 15 12 MS, -2 55 KN @ 30 00 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D6 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

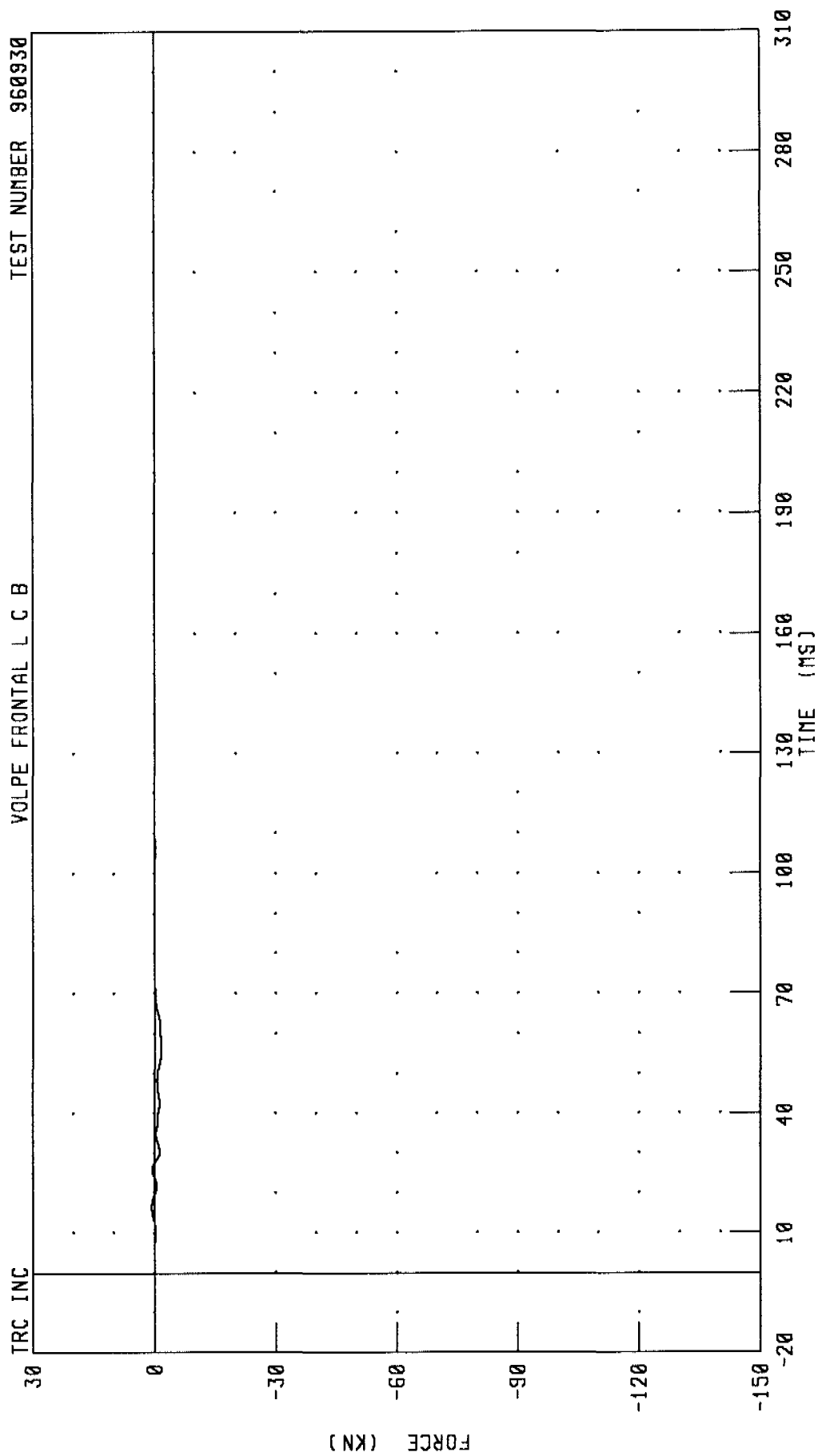
TRC INC



CHANNEL B06F FILTER CH CLASS 60

PEAK DATA 0 46 KN @ 15 68 MS, -1 86 KN @ 41 36 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D7 FORCE



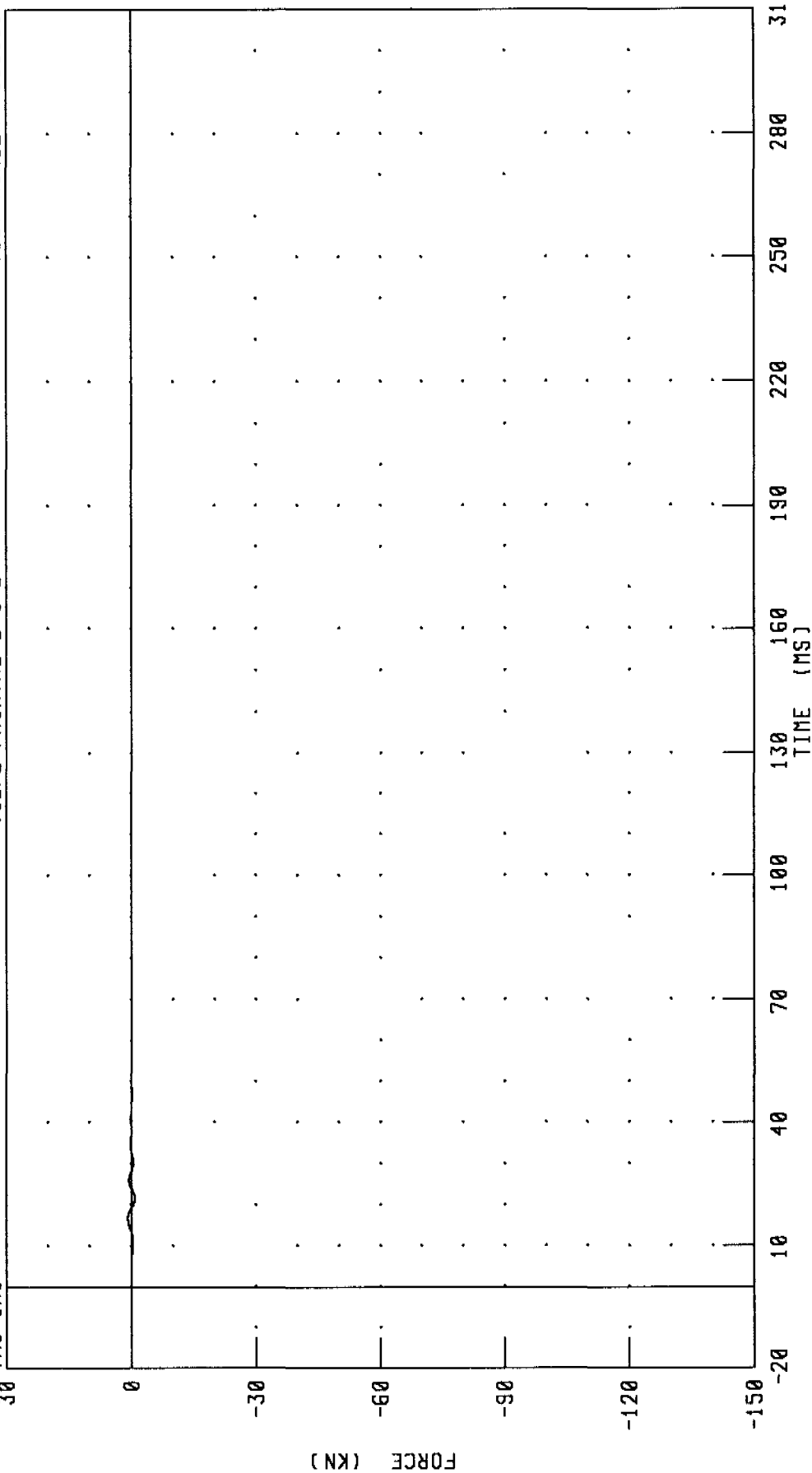
CHANNEL 807F FILTER CH CLASS 60 PEAK DATA 0 64 KN @ 16 24 MS, -1 59 KN @ 56 48 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D8 FORCE

TEST NUMBER 960930

VOLPE FRONTAL L C B

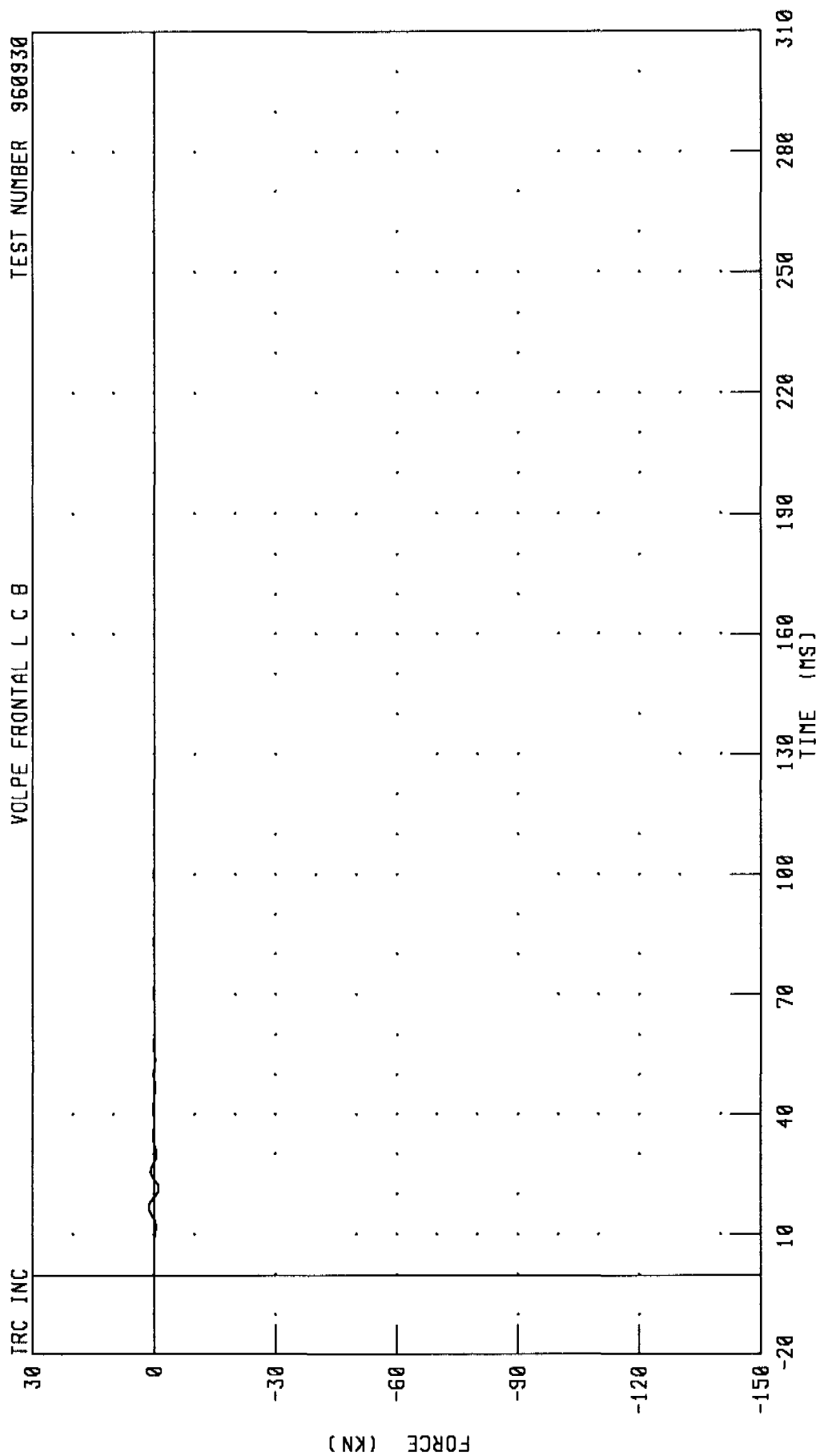
TRC INC



CHANNEL B08F FILTER CH CLASS 60

PEAK DATA 0 87 KN @ 16 64 MS, -0 91 KN @ 21 76 MS

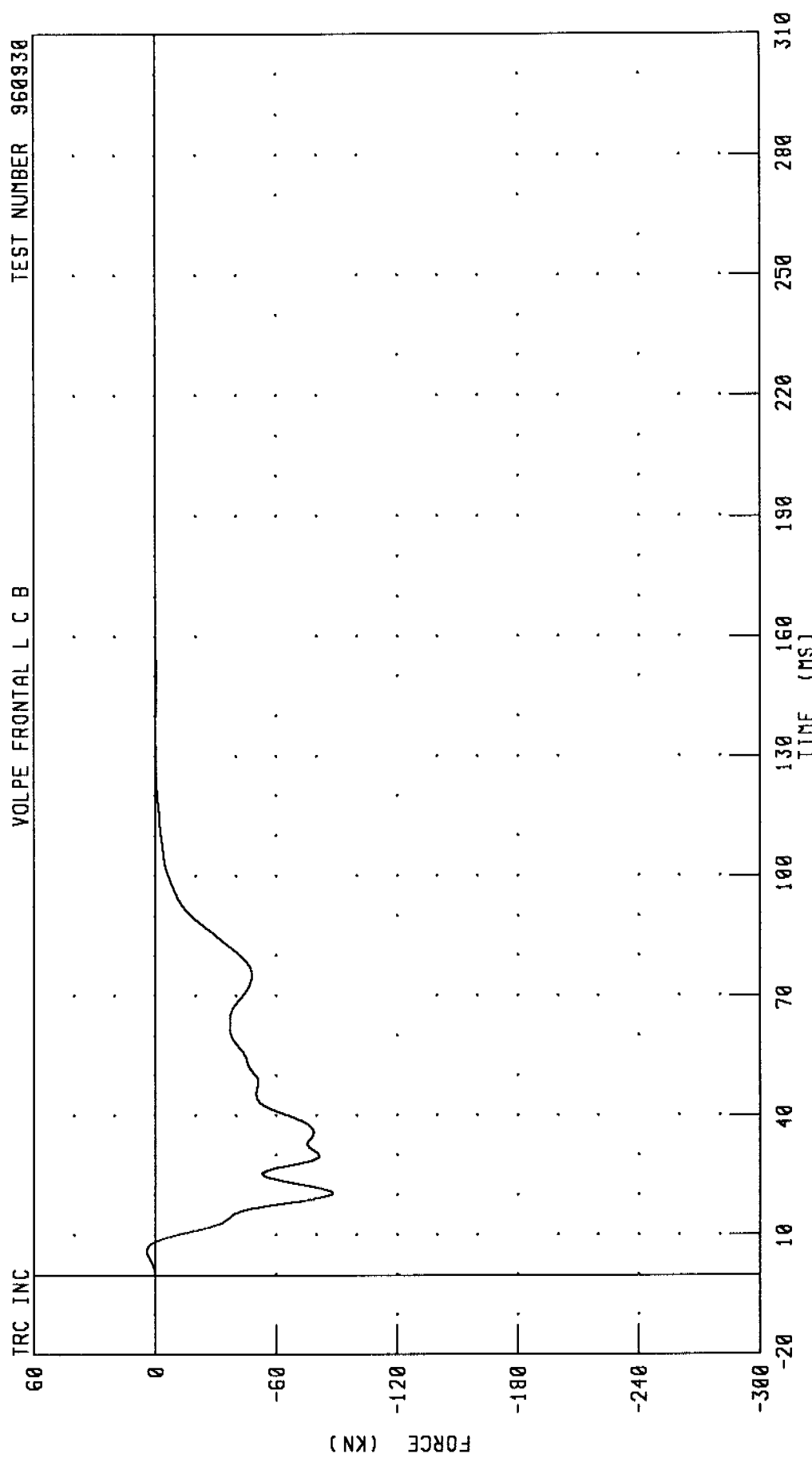
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER POSITION D9 FORCE



PEAK DATA 1 24 KN @ 16 80 MS, -1 14 KN @ 21 44 MS

CHANNEL B09F FILTER CH CLASS 60

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 LOAD CELL BARRIER GROUP # 1 FORCE TOTAL



TRC INC VOLPE FRONTAL L C B TEST NUMBER 960930

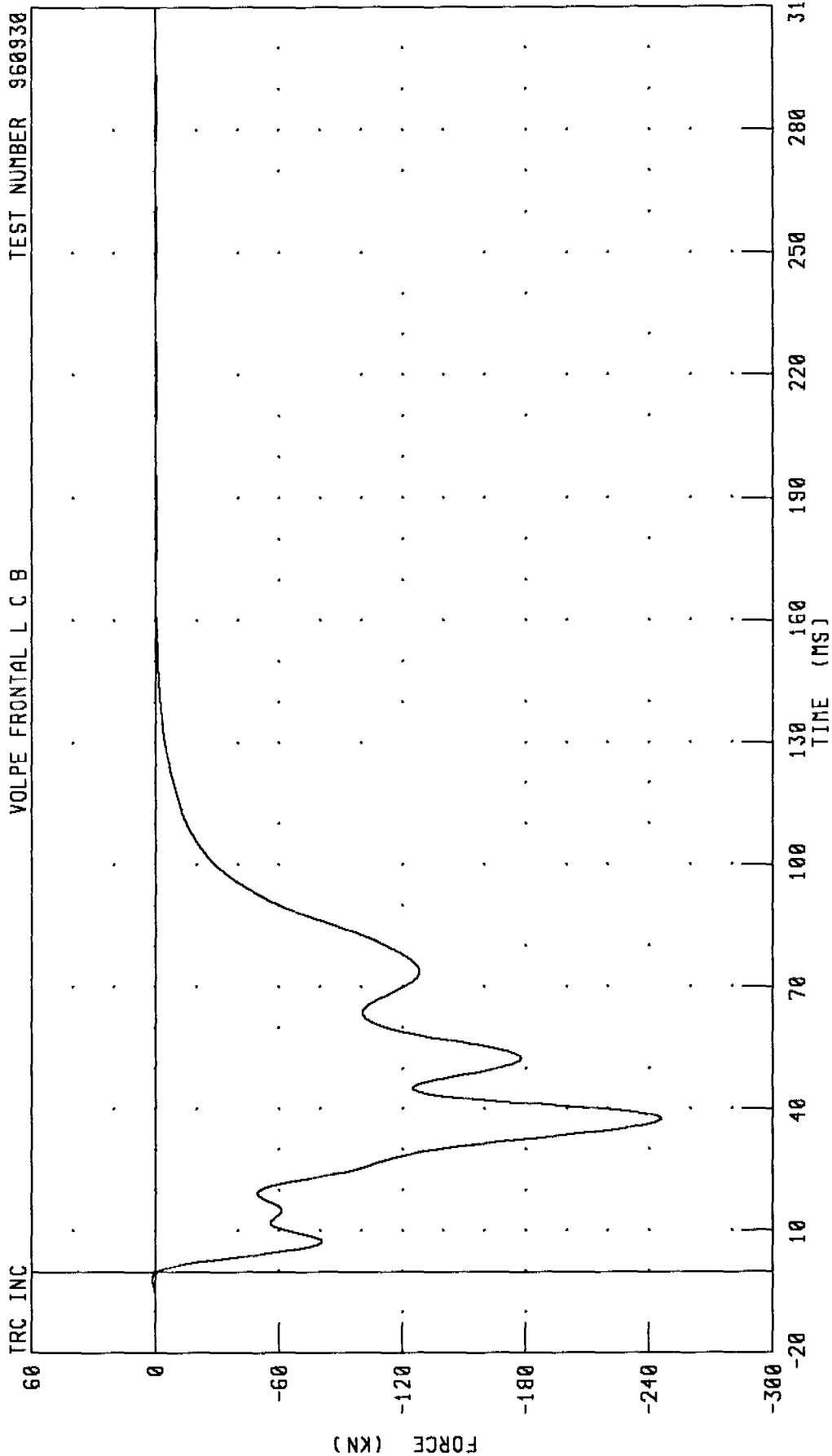
CHANNEL LCBGIF FILTER CH CLASS 60

PEAK DATA 4 02 KN @ 6 08 MS, -88 05 KN @ 20 48 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 LOAD CELL BARRIER GROUP # 2 FORCE TOTAL

TEST NUMBER 960930

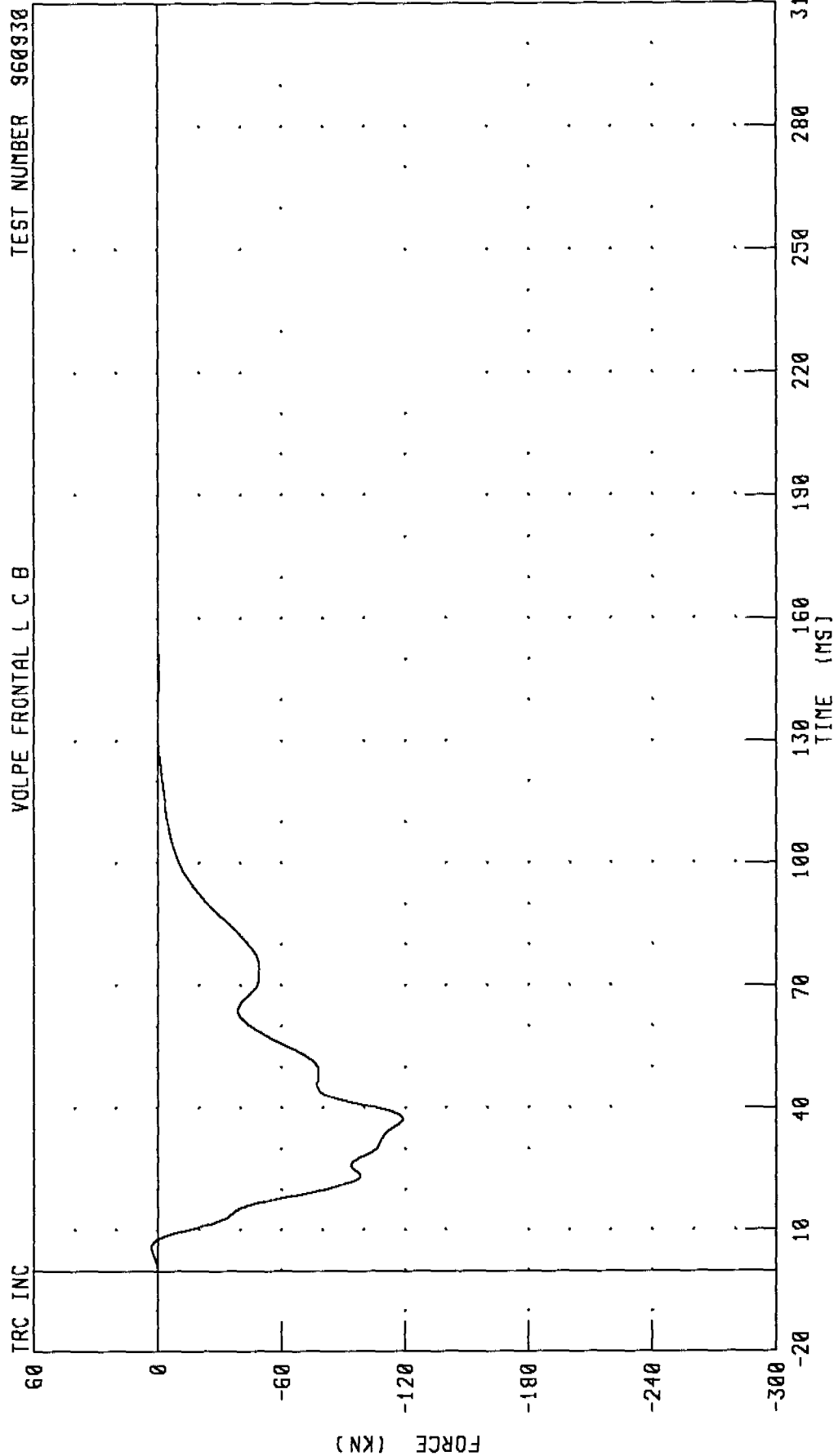
VOLPE FRONTAL L C B



CHANNEL LCBG2F FILTER CH CLASS 60

PEAK DATA 1 47 KN @ -1 76 MS, -245 81 KN @ 37 52 MS

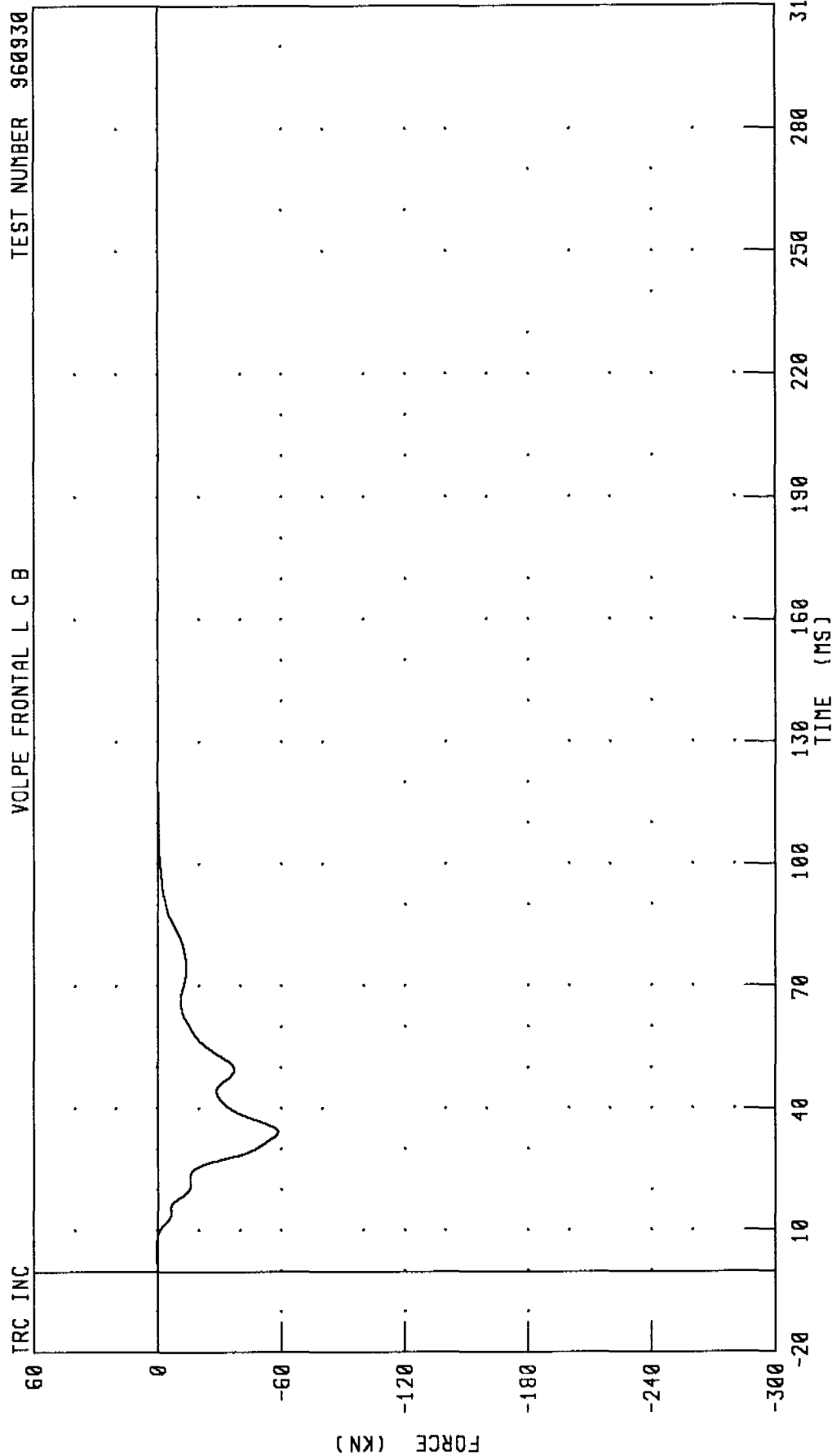
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER GROUP # 3 FORCE TOTAL



CHANNEL LCBG3F FILTER CH CLASS 60

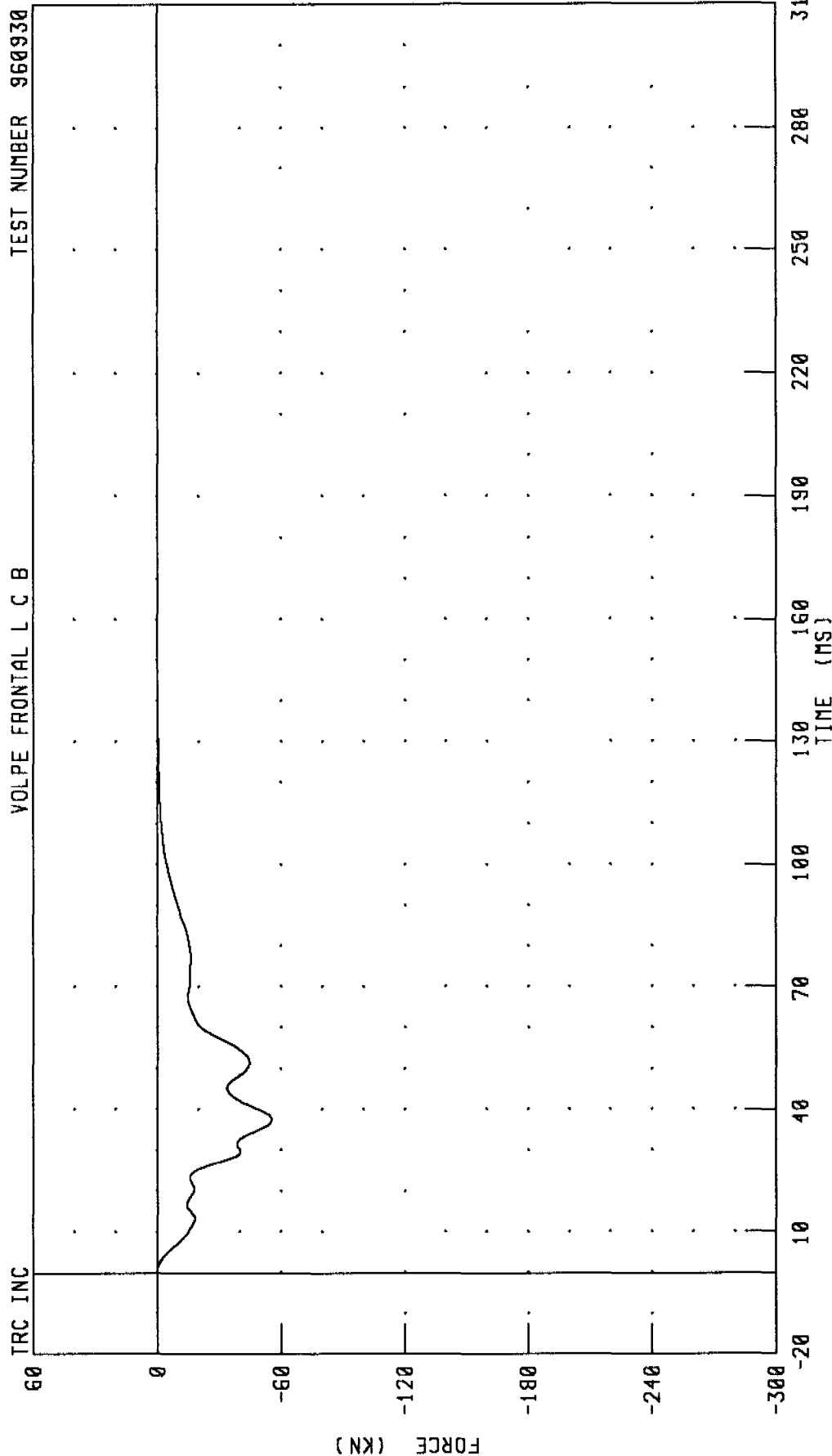
PEAK DATA 2 94 KN @ 5 68 MS, -118 87 KN @ 37 36 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER GROUP # 4 FORCE TOTAL



CHANNEL LCBG4F FILTER CH CLASS 60

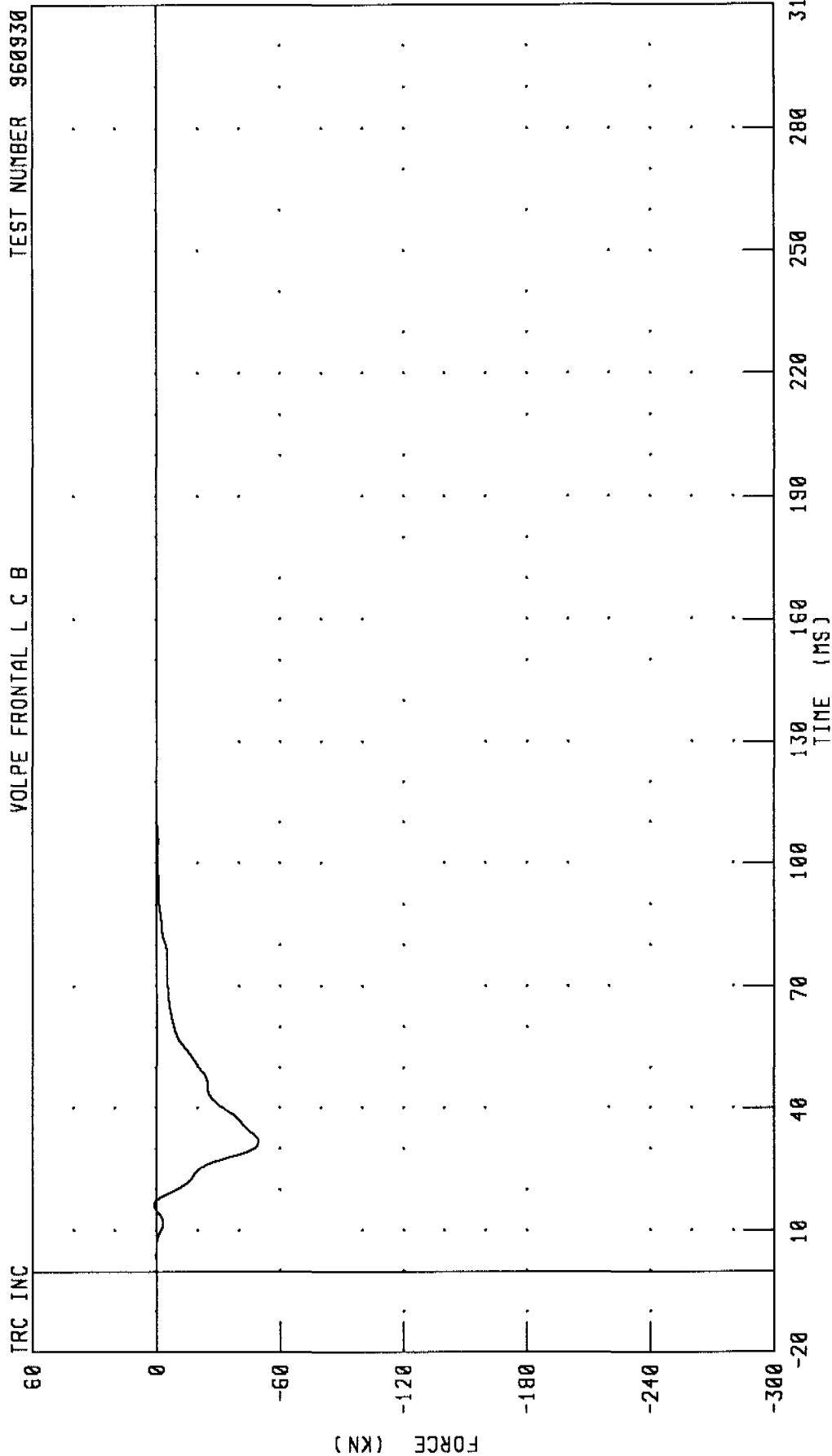
1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER GROUP # 5 FORCE TOTAL



CHANNEL LCBG5F FILTER CH CLASS 60

PEAK DATA 0 14 KN @ -0 96 MS, -55 37 KN @ 37 52 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
LOAD CELL BARRIER GROUP # 6 FORCE TOTAL

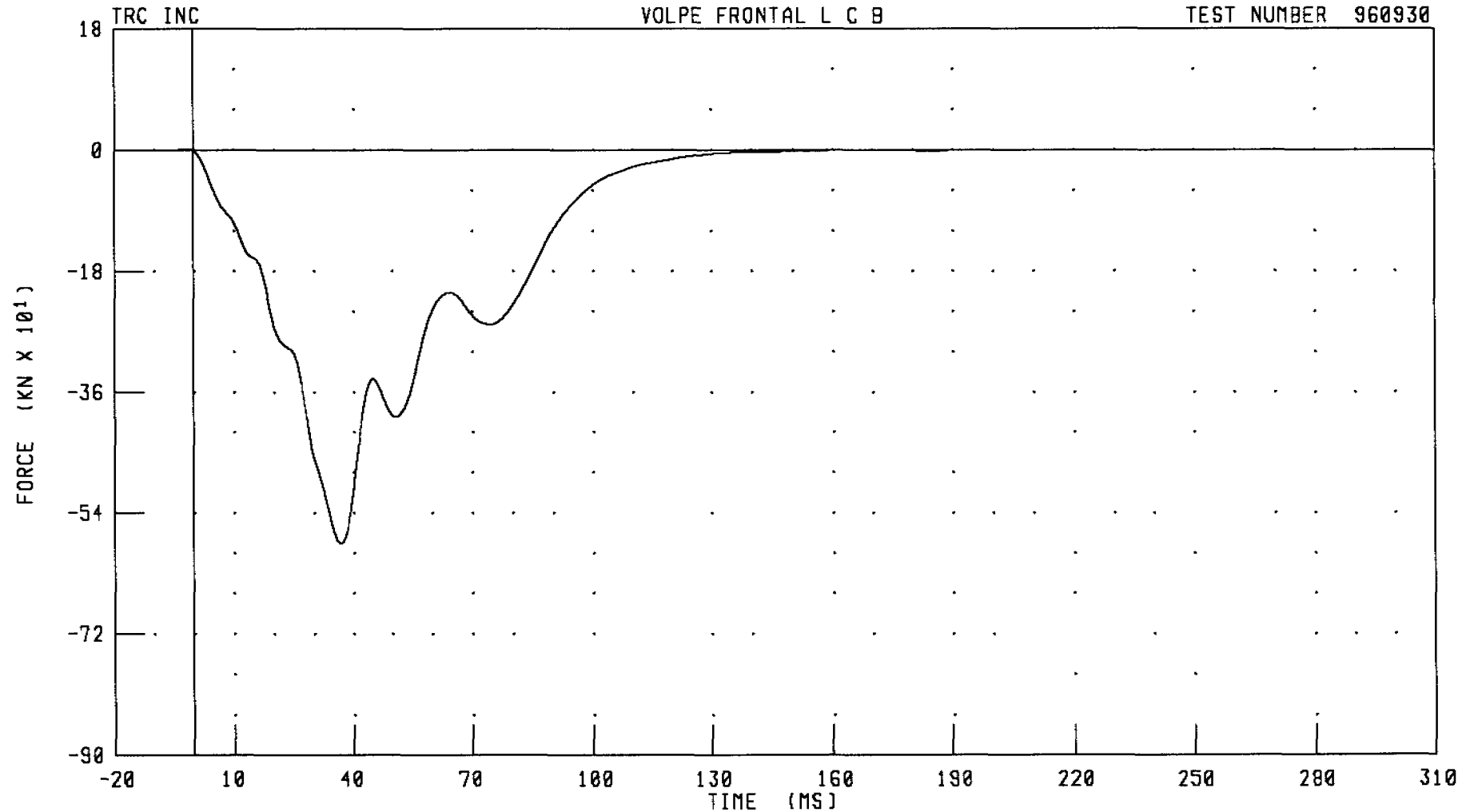


CHANNEL LCBG6F FILTER CH CLASS 60

PEAK DATA 1 12 KN @ 16 24 MS, -49 52 KN @ 31 84 MS

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
TOTAL LOAD CELL BARRIER FORCE
VOLPE FRONTAL L C B

TEST NUMBER 960930



CHANNEL LCBGT FILTER CH CLASS 60

PEAK DATA 1 35 KN @ -1 76 MS, -585 63 KN @ 36 72 MS

B-111

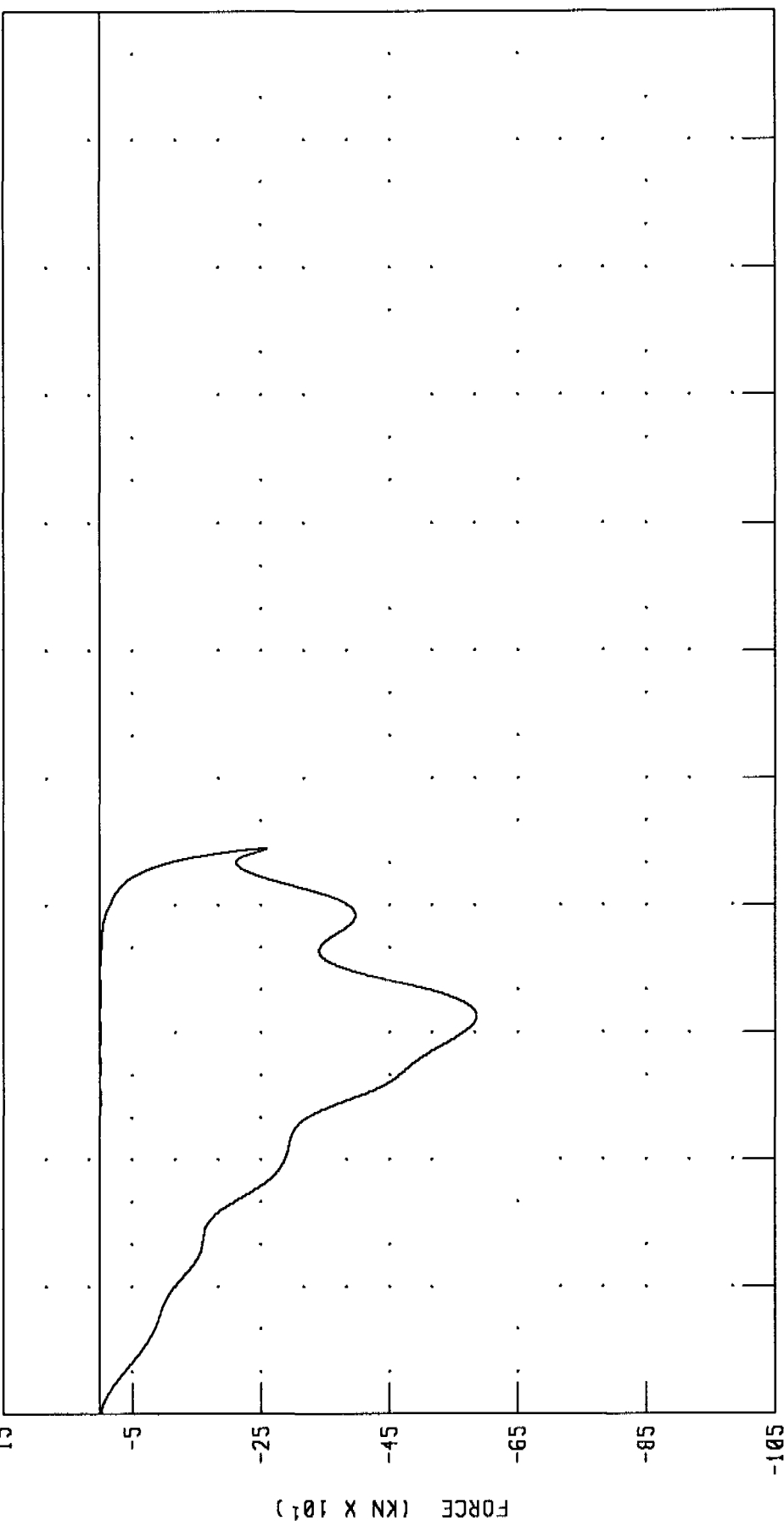
056096

1996 CHEVROLET CAVALIER INTO FRONTAL LOAD CELL BARRIER
 TOTAL LOAD CELL BARRIER FORCE VS AVERAGE VEHICLE X-AXIS DISPLACEMENT

TEST NUMBER 960930

VOLPE FRONTAL L C B

TRC INC



CHANNEL OTHXD LCBGT
 FILTER CH CLASS 180
 CH CLASS 60

DISPLACEMENT (MM X 10¹)

PEAK DATA 729 02 MM @ 76 16 MS, 0 00 NM @ 0 00 MS
 0 03 KN @ 169 76 MS, -585 63 KN @ 36 72 MS

Appendix C

Dummy Calibration Information

Pre-Test Calibration

Serial Number 142

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III EXTERNAL DIMENSIONS

SN 142 HUMANOID

3-SEPT-96

TRC INC.

TEST NO: 142C34ED1

572E SN142 EXT.DIMENSION CAL34

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	986. MM
WAIST CIRCUMFERENCE (Z)	836 - 866 MM	848. MM
CHEST DEPTH (O)	213 - 229 MM	221. MM
H-POINT HEIGHT (C)	84 - 89 MM	84. MM
H-POINT FROM SEATBACK (D)	135 - 140 MM	137. MM
SKULL CAP TO BACKLINE (H)	41 - 46 MM	43. MM
TOTAL SITTING HEIGHT (A)	879 - 889 MM	879. MM
THIGH CLEARANCE (F)	140 - 155 MM	145. MM
BUTTOCK KNEE LENGTH (K)	579 - 605 MM	602. MM
BUTTOCK POPLITEAL LENGTH (N)	452 - 478 MM	470. MM
POPLITEAL HEIGHT (L)	429 - 455 MM	445. MM
KNEE PIVOT HEIGHT (M)	485 - 500 MM	488. MM
FOOT LENGTH (P)	252 - 267 MM	257. MM
FOOT BREADTH (W)	91 - 107 MM	97. MM
SHOULDER PIVOT FROM BACKLINE (E)	84 - 94 MM	91. MM
SHOULDER BREADTH (V)	422 - 437 MM	429. 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	345. MM
BACK OF ELBOW TO WRIST PIVOT (G)	290 - 305 MM	292. MM

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Richard Le Van

RUN NUMBER: 101196.1221

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III

03-SEP-96

TRC INC.

TEST NO: 142C34HD1

572E SN142 HEAD DROP CAL 34

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	63.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	260.60 G
PEAK LATERAL ACCELERATION	15 G MAX	-1.35 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN

Richard LeVan

RUN NUMBER: 090396.0847;1

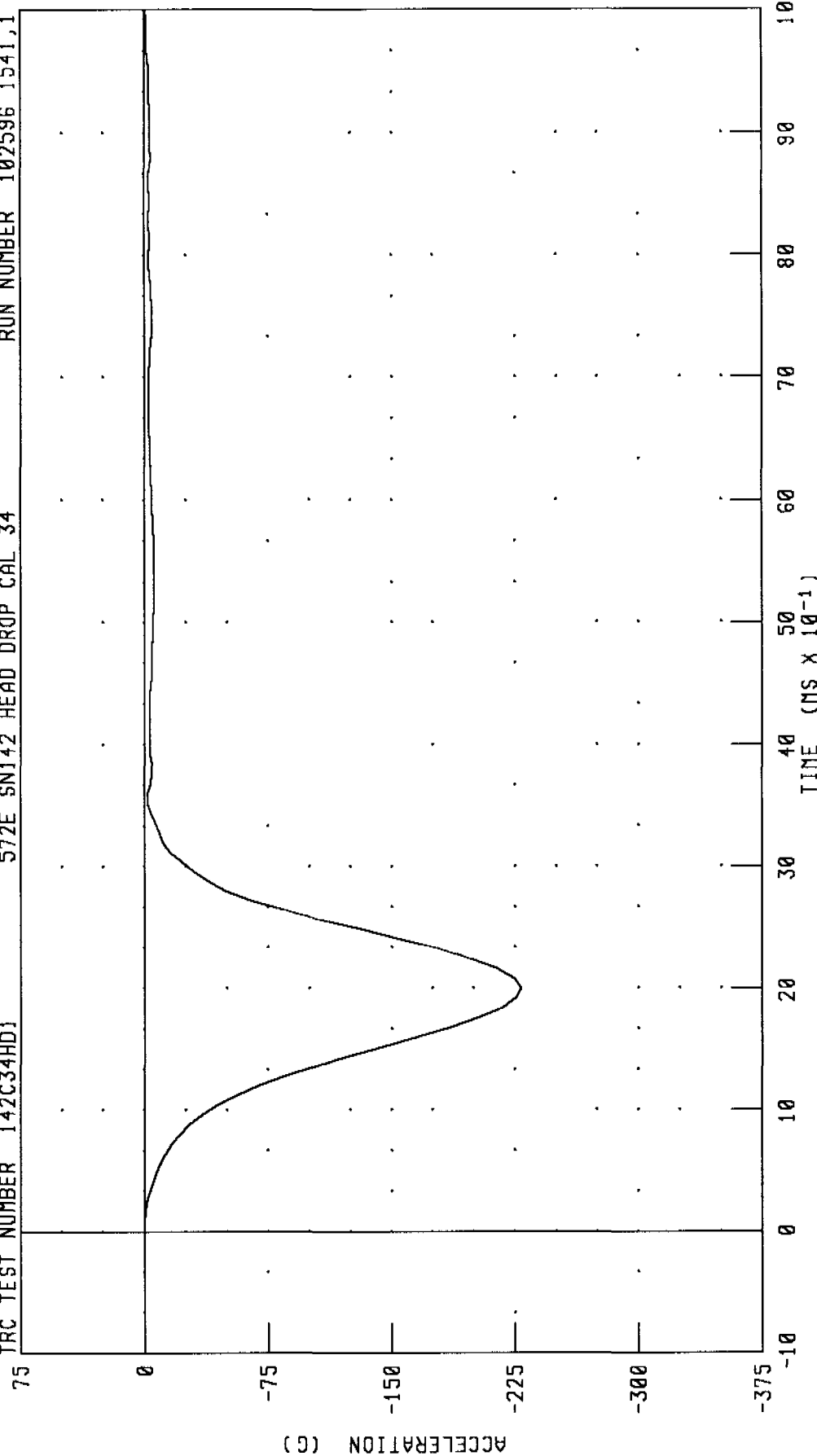
PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION X AXIS

TRC TEST NUMBER 142C34HD1

572E SN142 HEAD DROP CAL 34

RUN NUMBER 102596 1541,1



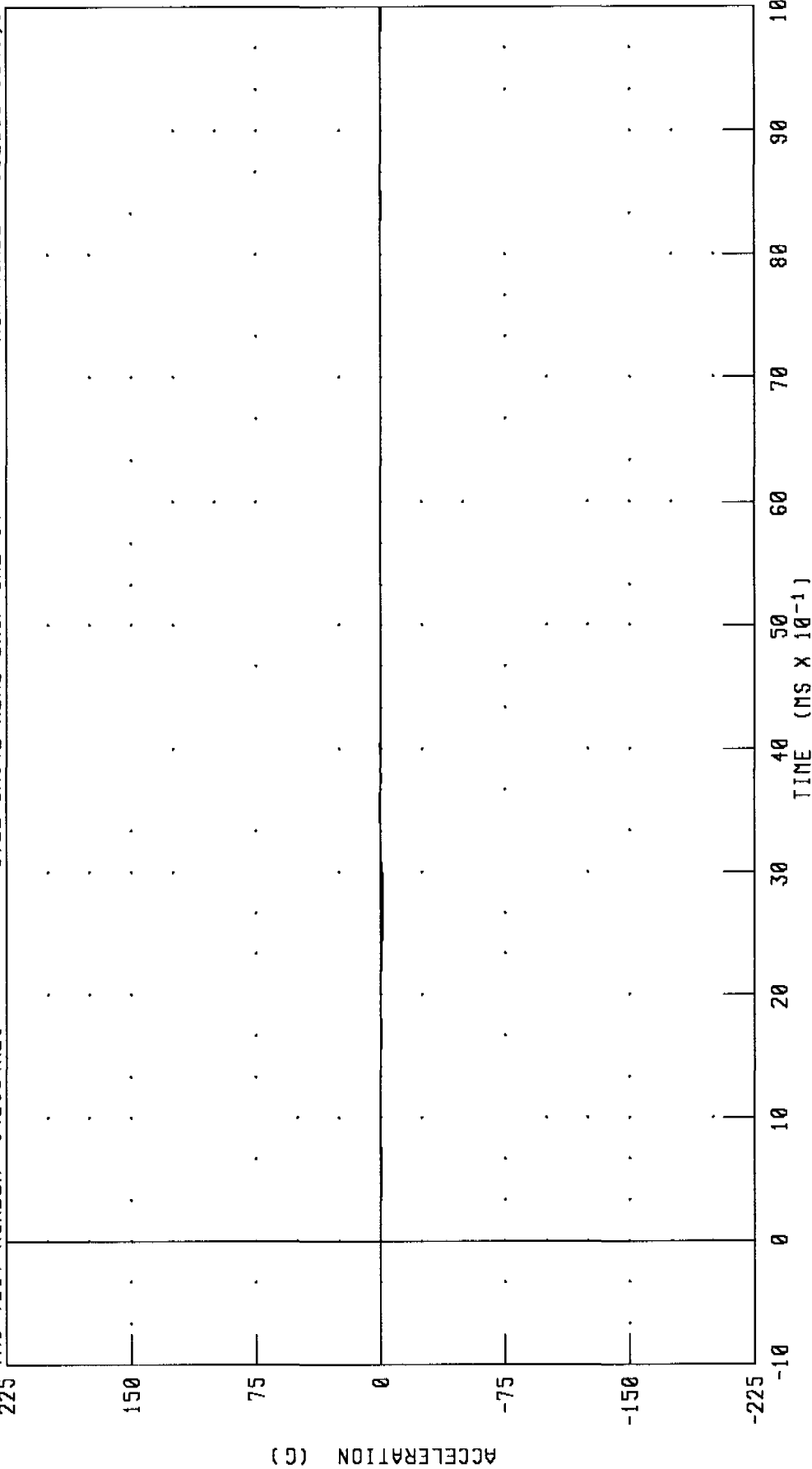
CHANNEL HEDXG FILTER CH CLASS 1000

PEAK DATA 0 02 G 0 00 MS, -228 81 G 0 2 00 MS

PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Y AXIS

TRC TEST NUMBER 142C34HD1 572E SN142 HEAD DROP CAL 34 RUN NUMBER 102596 1541,1



CHANNEL HEDYG FILTER CH CLASS 1000

PEAK DATA 0 77 G @ 3 52 MS, -1 36 G @ 2 64 MS

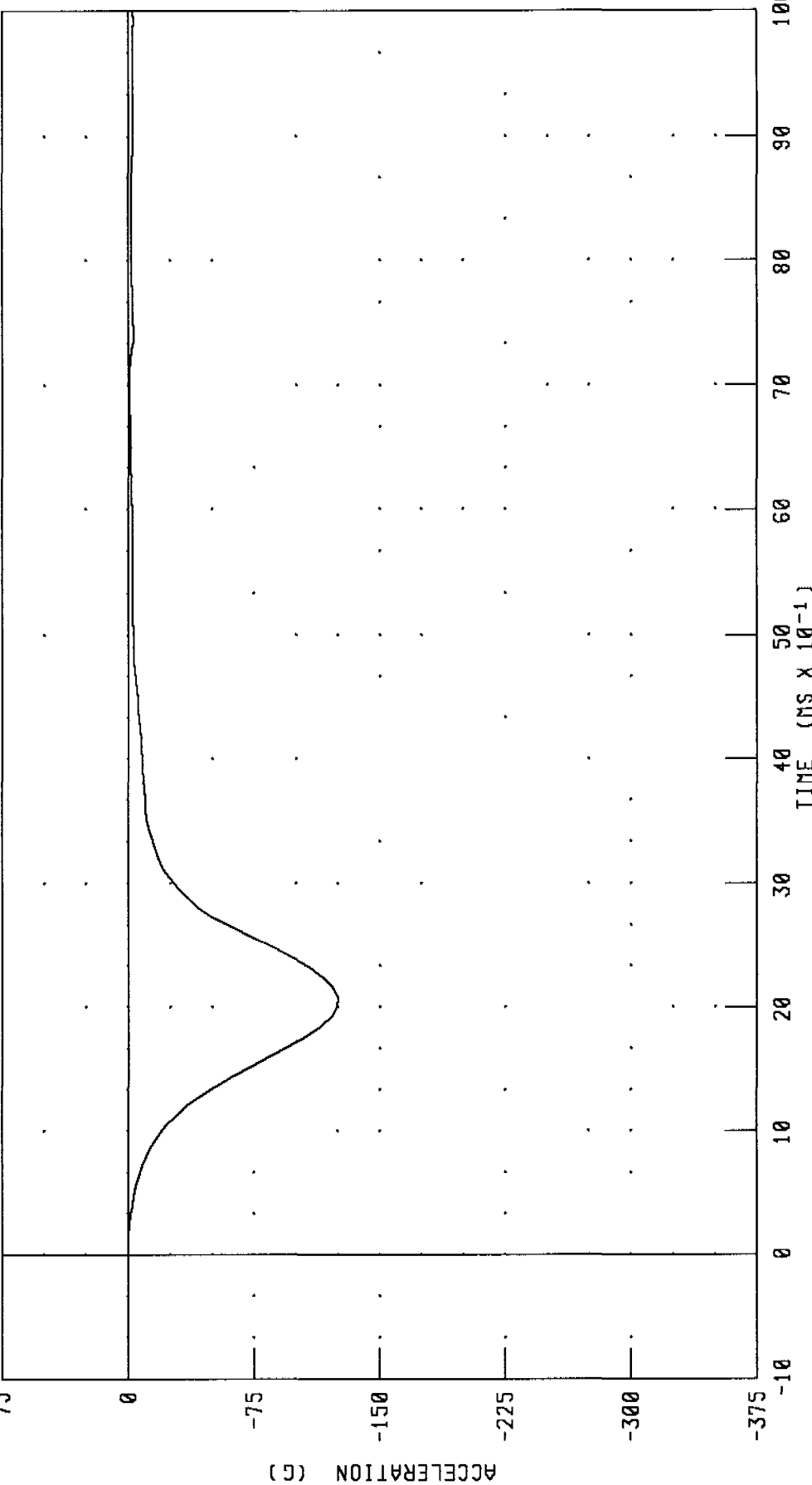
PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION Z AXIS

TRC TEST NUMBER 142C34HD1

572E SN142 HEAD DROP CAL 34

RUN NUMBER 102596 1541,1



CHANNEL HEDZG FILTER CH CLASS 1000

PEAK DATA 0 05 G 0 00 MS, -125 15 G 0 2 00 MS

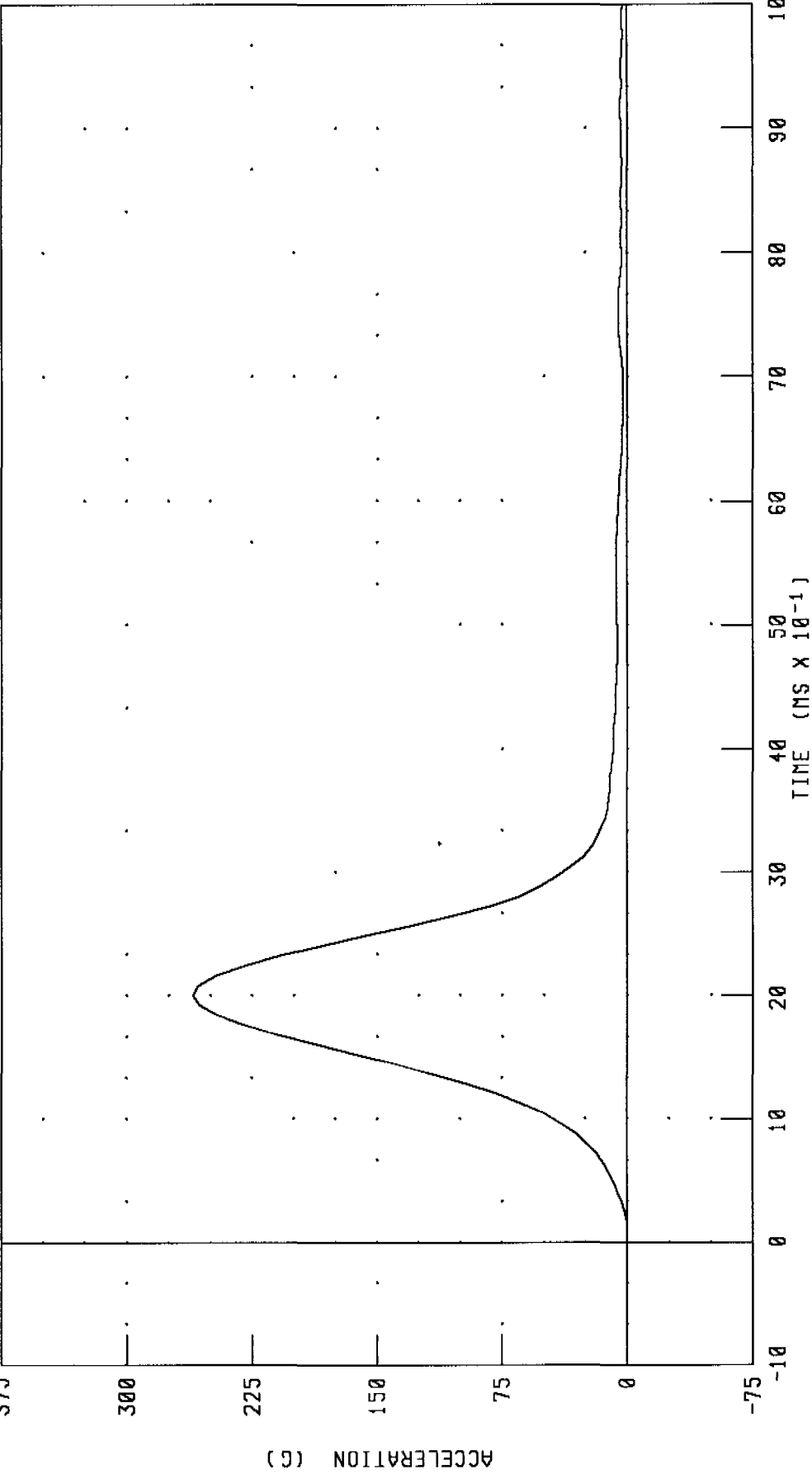
PART 572-E HYBRID III HEAD CALIBRATION

HEAD RESULTANT ACCELERATION

TRC TEST NUMBER 142C34HD1

572E SN142 HEAD DROP CAL 34

RUN NUMBER 102596 1541,1



CHANNEL HEADRG FILTER CH CLASS 1000

PEAK DATA 260 61 G @ 2 00 MS, 0 15 G @ -0 48 MS

TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

HYBRID III

04-SEP-96

TRC INC. TEST NO: 142C34NF1 572E SN? NECK FLEXION CAL34

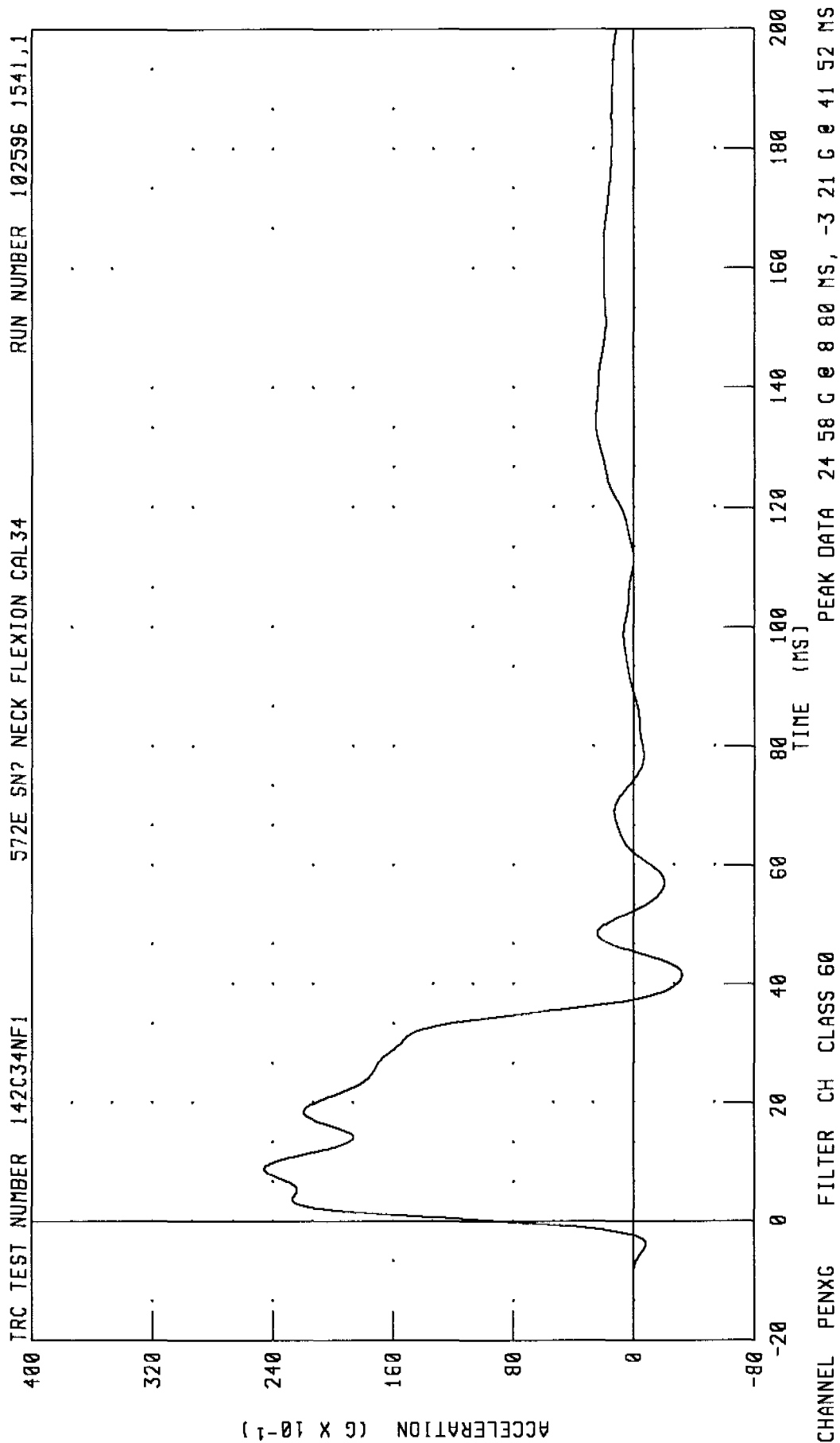
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	64.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	6.93 M/S
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	23.93 G
	20 MS	17.60 - 22.60 G	21.17 G
	30 MS	12.50 - 18.50 G	15.51 G
MAX PENDULUM G		29 G MAX	24.58 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	15.48 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	35.60 MS
D PLANE	MAX	64 - 78 DEG.	73.88 DEG.
ROTATION	TIME	57 - 64 MS	58.00 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88.2 - 108.5 NM	95.39 NM
	TIME	47 - 58 MS	48.64 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	115.12 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	101.12 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN Richard L. Lee

RUN NUMBER: 090496.1006;1

PART 572-E HYBRID III NECK FLEXION CALIBRATION
 PENDULUM DECELERATION



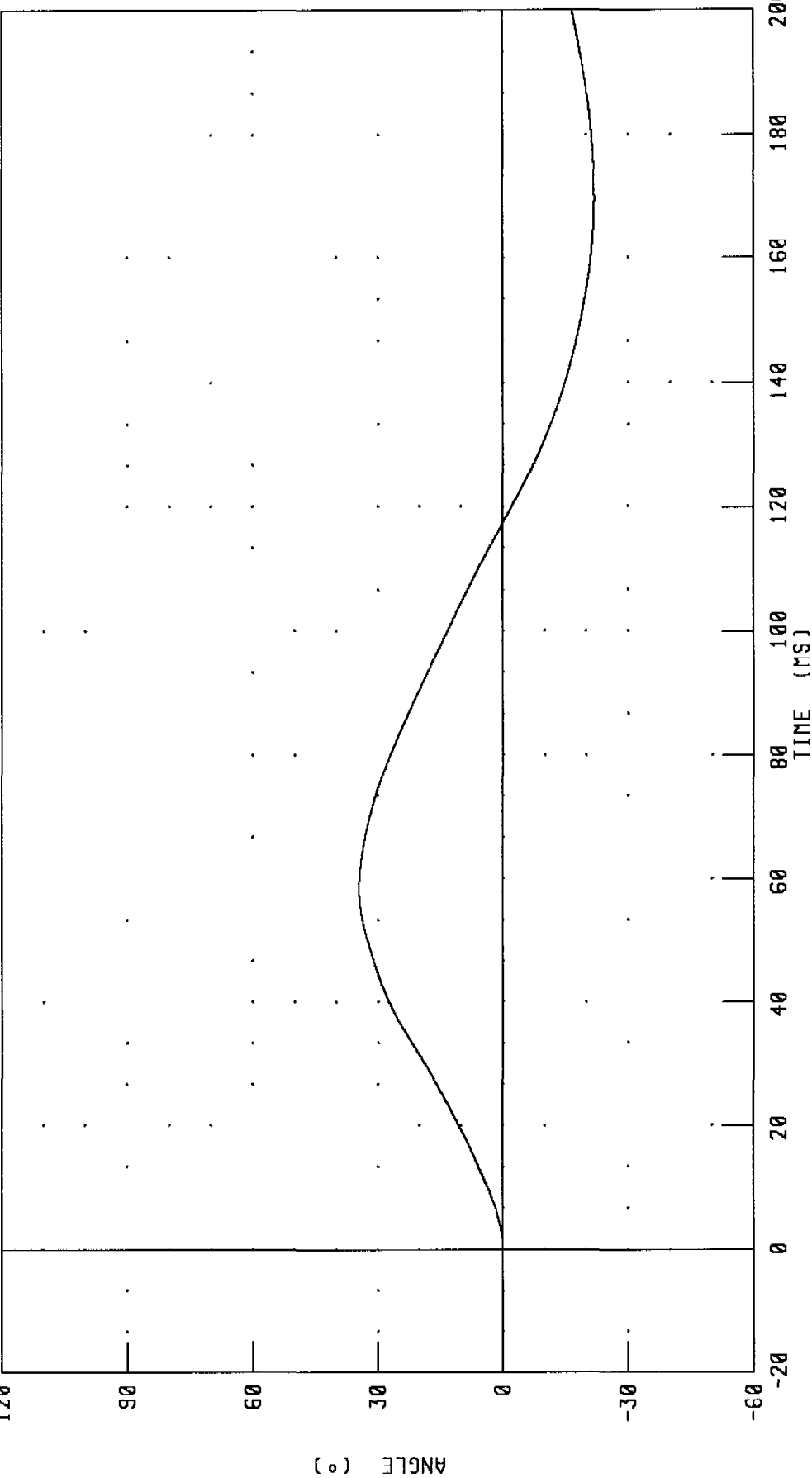
PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER 142C34NF1

572E SN? NECK FLEXION CAL34

RUN NUMBER 102596 1541,1



CHANNEL BETA FILTER CH CLASS 60

PEAK DATA 34 52 @ 58 40 MS, -21 93 @ 169 68 MS

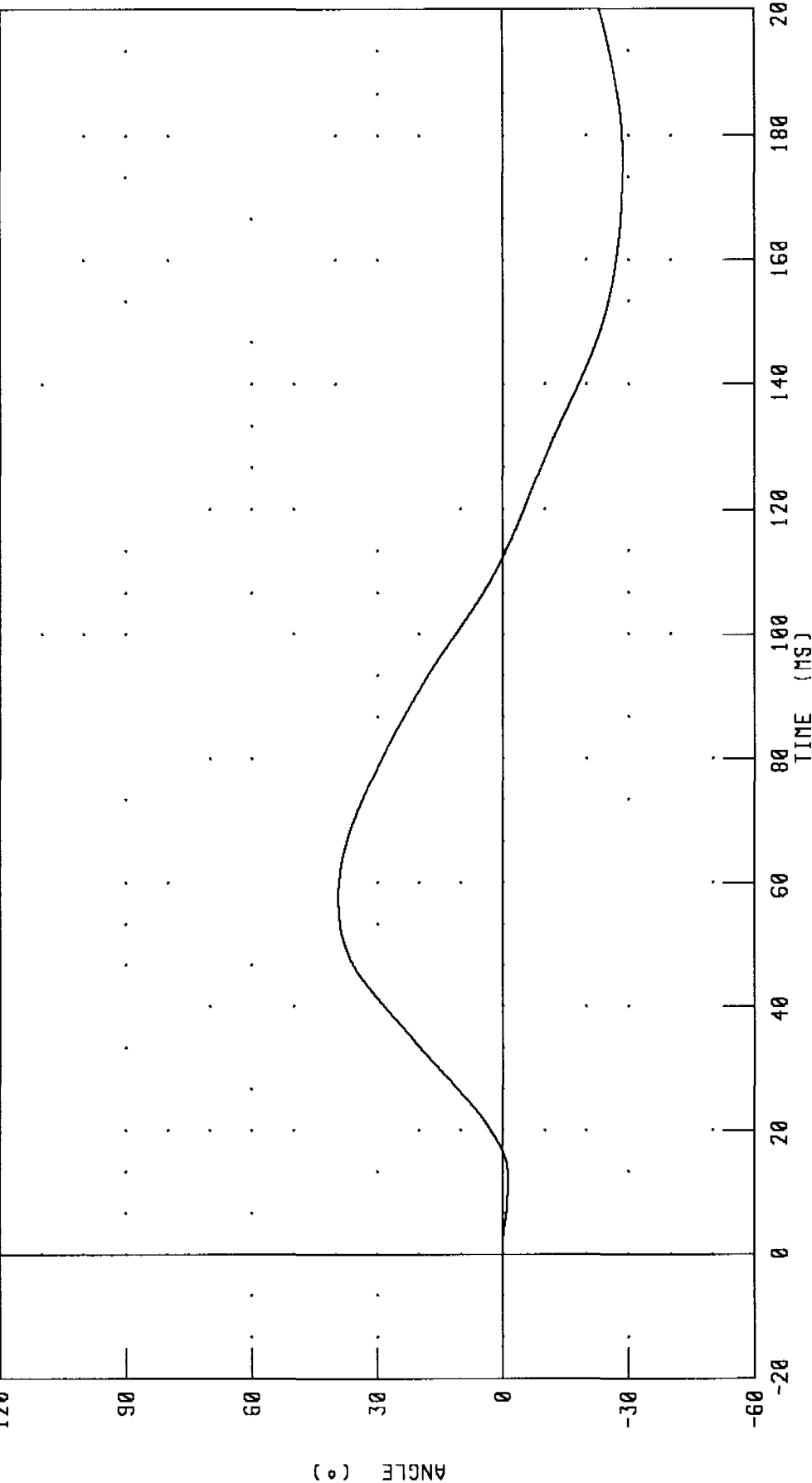
PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER 142C34NF1

572E SN? NECK FLEXION CAL34

RUN NUMBER 102596 1541,1



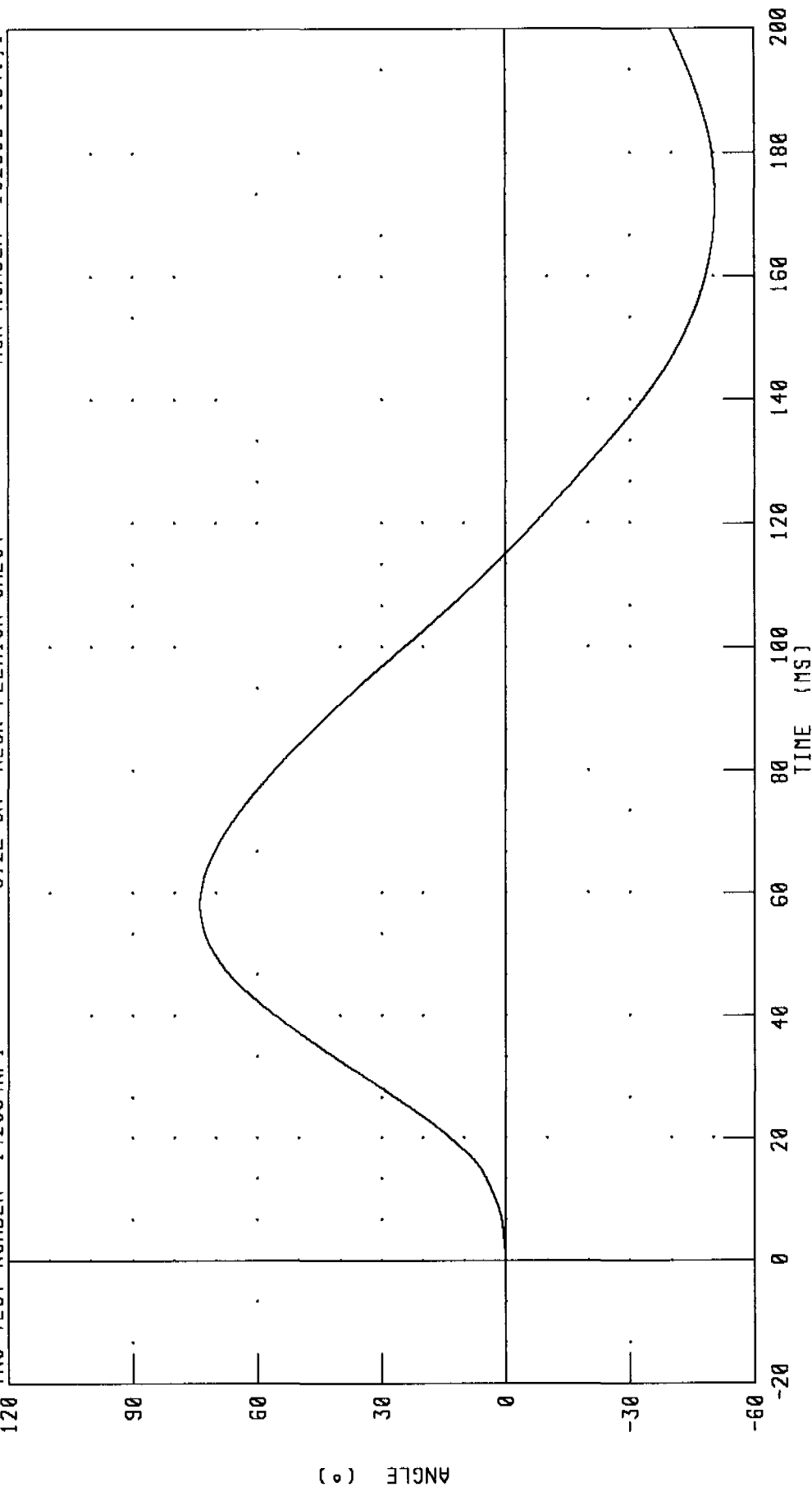
CHANNEL THETA FILTER CH CLASS 60

PEAK DATA 39 37 ° @ 57 76 MS, -28 63 ° @ 175 12 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER 142C34NF1 572E SN? NECK FLEXION CAL34 RUN NUMBER 102596 1541,1



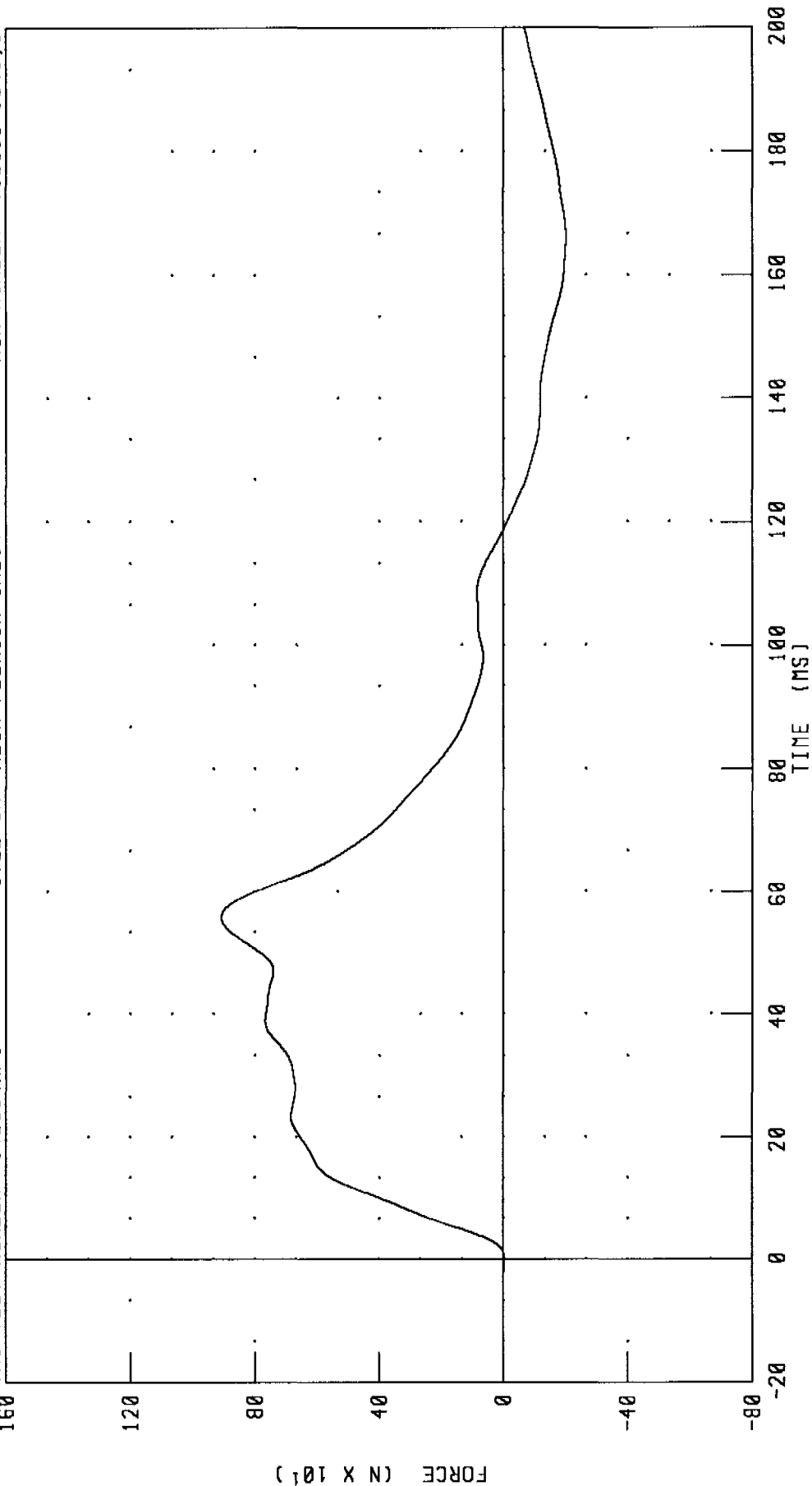
CHANNEL TOTAL FILTER CH CLASS 60

PEAK DATA 73 89 ° @ 58 00 MS, -50 47 ° @ 172 24 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER 142C34NF1 572E SN? NECK FLEXION CAL34 RUN NUMBER 102596 1541,1

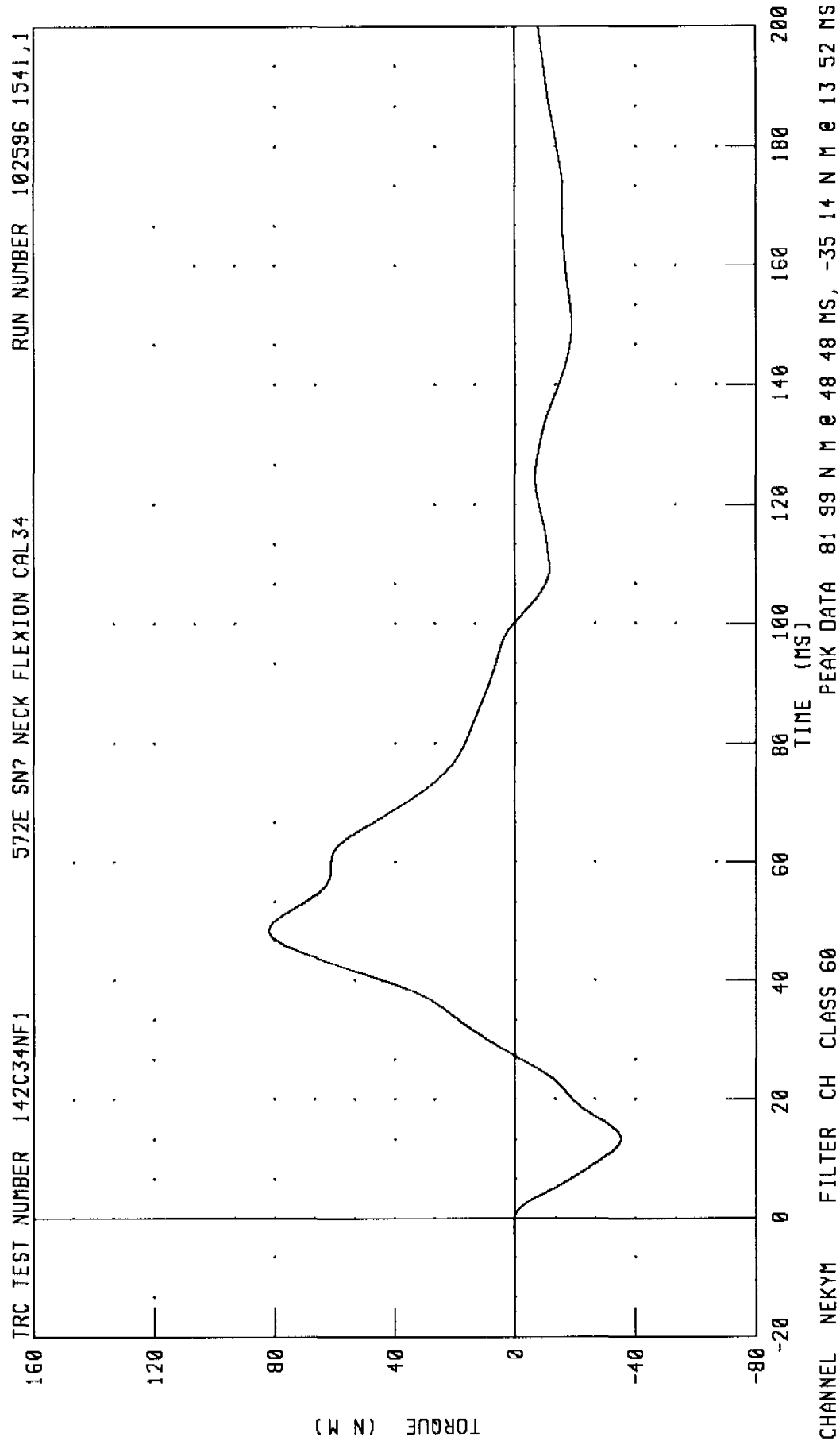


CHANNEL NEKXF FILTER CH CLASS 60

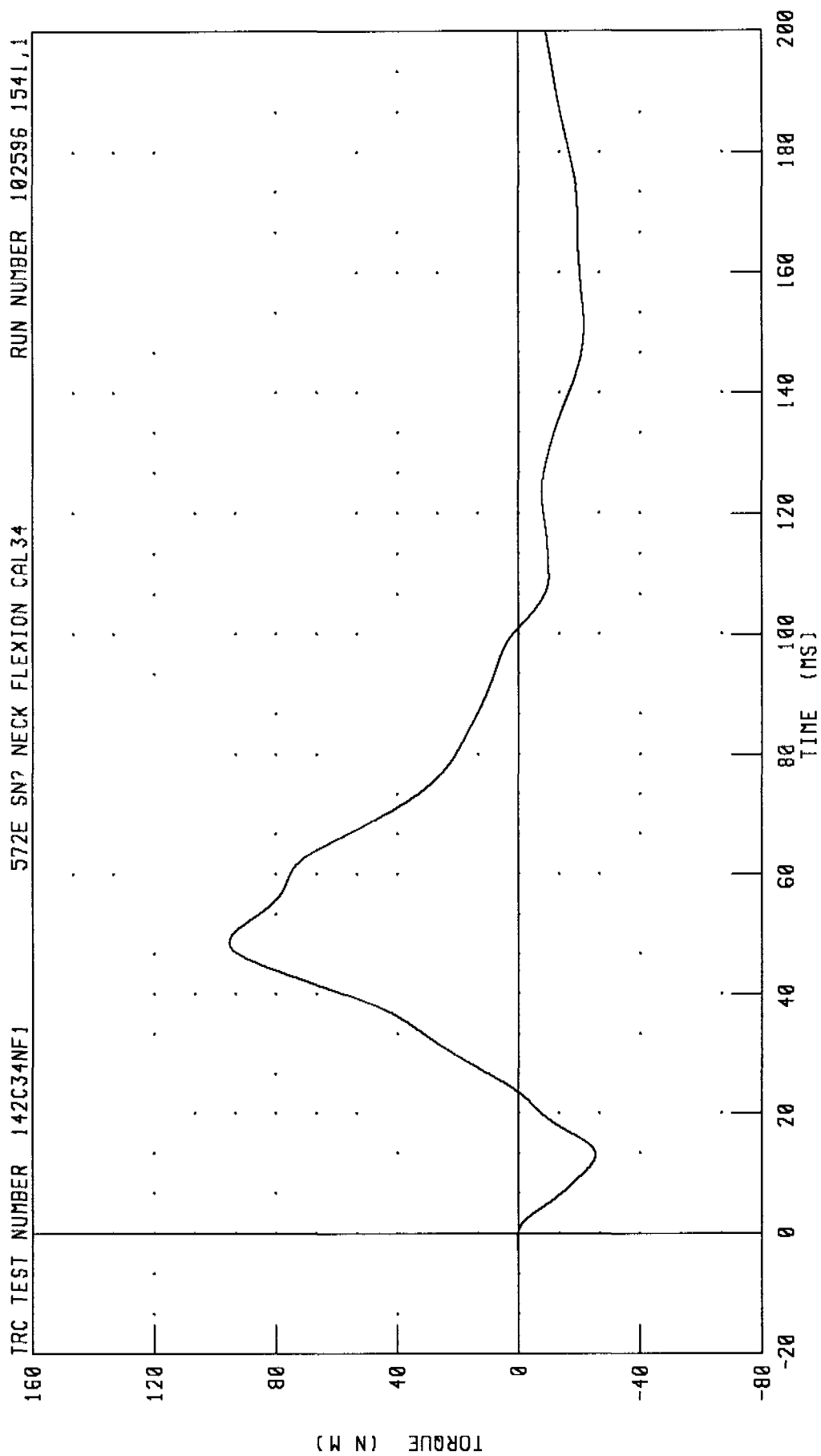
PEAK DATA 908 64 N e 55 76 MS, -201 64 N e 166 08 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT Y AXIS



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



CHANNEL NEKOM FILTER CH CLASS 60 PEAK DATA 95 39 N M @ 48 64 MS, -25 35 N M @ 13 04 MS

TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

HYBRID III

04-SEP-96

TRC INC. TEST NO: 142C34NE1 572E SN142 NECK EXT. CAL34

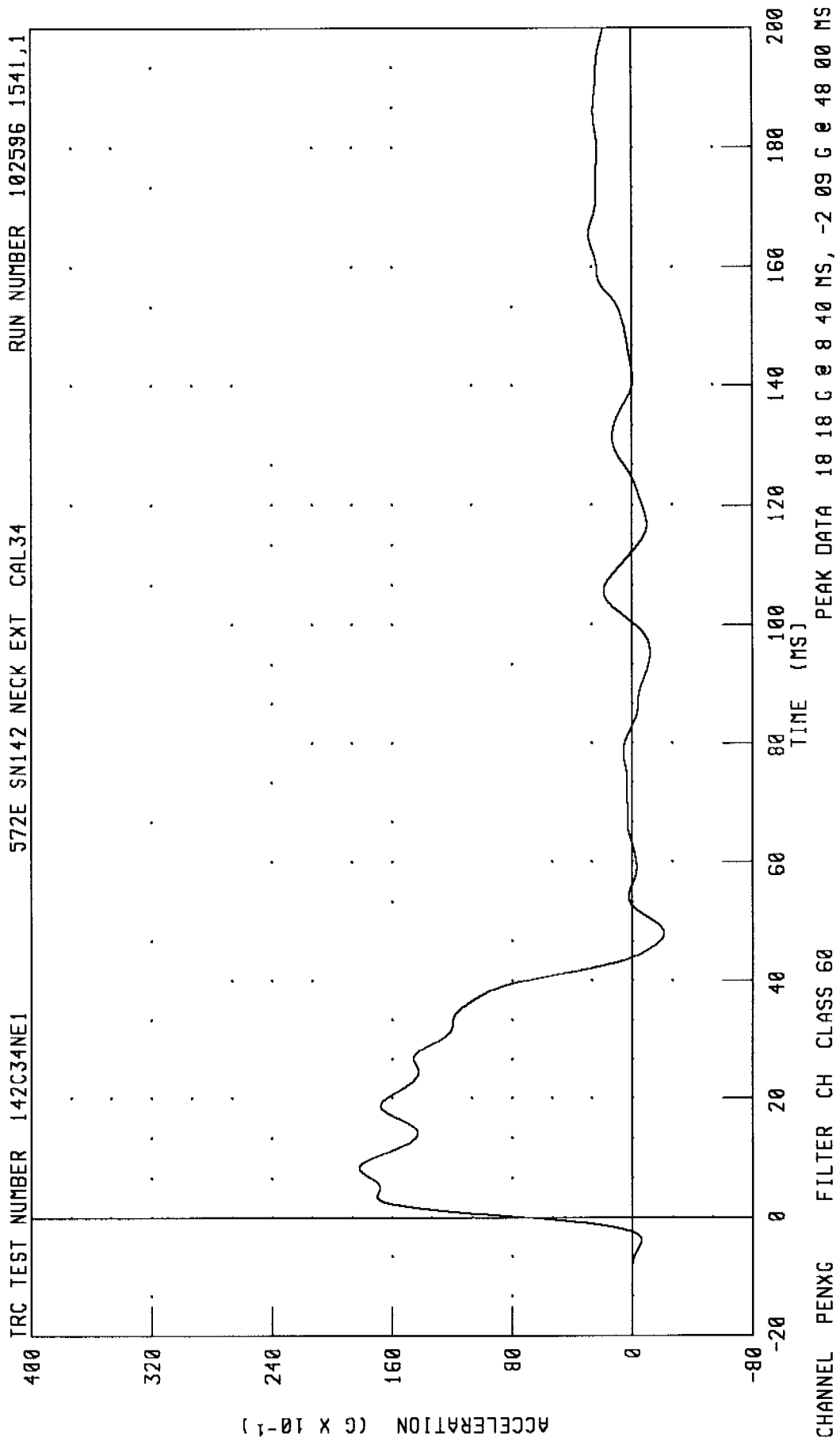
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6 - 22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	64.0 %
IMPACT VELOCITY		5.95 - 6.19 M/S	6.05 M/S
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.33 G
	20 MS	14.00 - 19.00 G	16.36 G
	30 MS	11.00 - 16.00 G	12.75 G
MAX PENDULUM G		22 G MAX	18.17 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	12.70 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	40.96 MS
D PLANE	MAX	81 - 106 DEG.	95.88 DEG.
ROTATION	TIME	72 - 82 MS	74.48 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-80.0/-52.9 NM	-71.01 NM
	TIME	65 - 79 MS	70.00 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	152.64 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	136.08 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN Richard L. Van

RUN NUMBER: 090496.1034;1

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
 PENDULUM DECELERATION



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER 142C34NE1 572E SN142 NECK EXT CAL34 RUN NUMBER 102596 1541,1

120

90

60

30

0

-30

-60

ANGLE (°)

TIME (MS)

80

100

120

140

160

180

200

200

180

160

140

120

100

80

60

40

20

0

-20

-40

-60

-80

-100

-120

-140

-160

-180

-200

-220

-240

-260

-280

-300

-320

-340

-360

-380

-400

-420

-440

-460

-480

-500

-520

-540

-560

-580

-600

-620

-640

-660

-680

-700

-720

-740

-760

-780

-800

-820

-840

-860

-880

-900

-920

-940

-960

-980

-1000

-1020

-1040

-1060

-1080

-1100

-1120

-1140

-1160

-1180

-1200

-1220

-1240

-1260

-1280

-1300

-1320

-1340

-1360

-1380

-1400

-1420

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-1460

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-1500

-1520

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-1560

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-1600

-1620

-1640

-1660

-1680

-1700

-1720

-1740

-1760

-1780

-1800

-1820

-1840

-1860

-1880

-1900

-1920

-1940

-1960

-1980

-2000

-2020

-2040

-2060

-2080

-2100

-2120

-2140

-2160

-2180

-2200

-2220

-2240

-2260

-2280

-2300

-2320

-2340

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-3100

-3120

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-3180

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-3920

-3940

-3960

-3980

-4000

-4020

-4040

-4060

-4080

-4100

-4120

-4140

-4160

-4180

-4200

-4220

-4240

-4260

-4280

-4300

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-5000

-5020

-5040

-5060

-5080

-5100

-5120

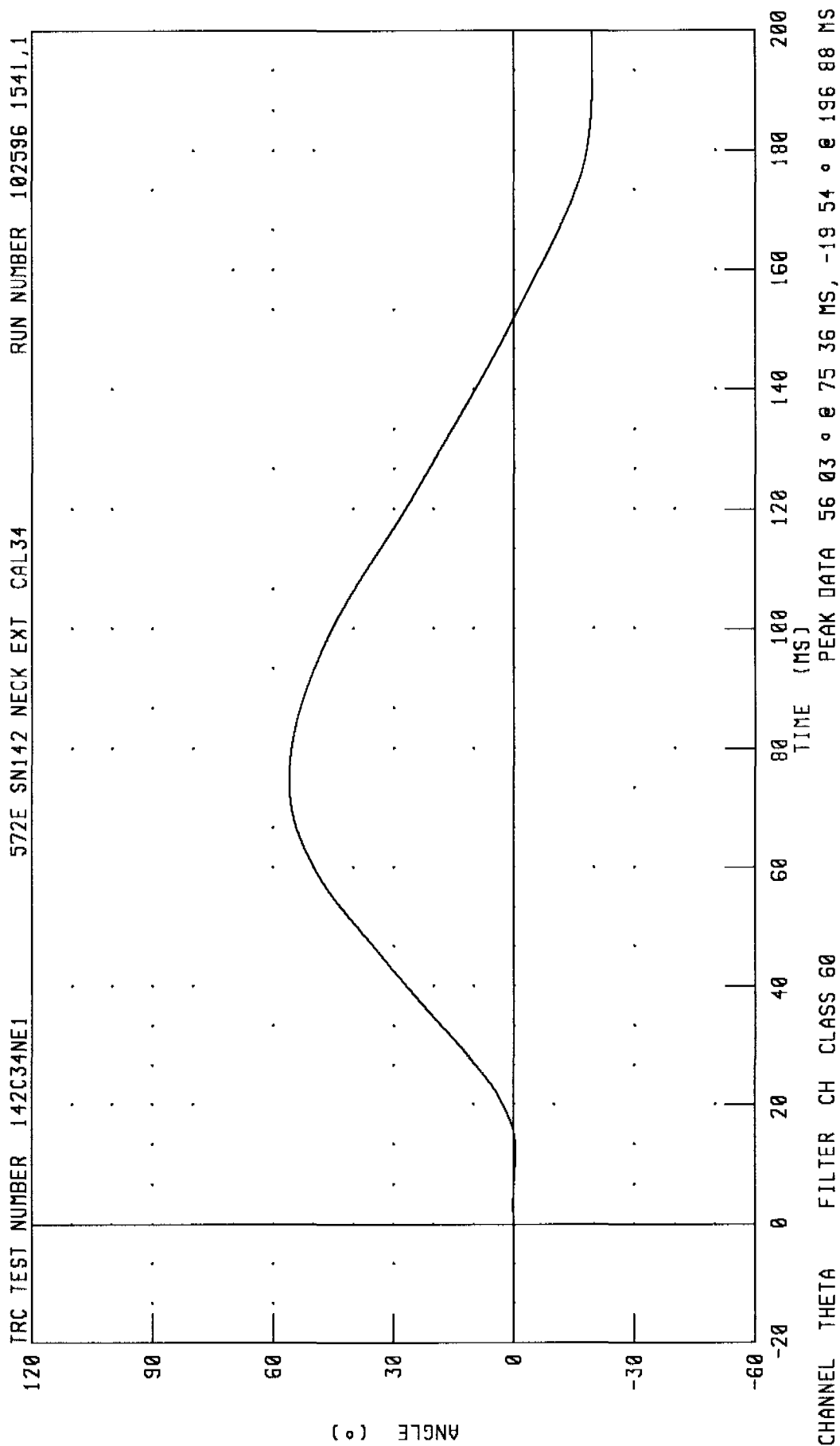
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-5160

-5180

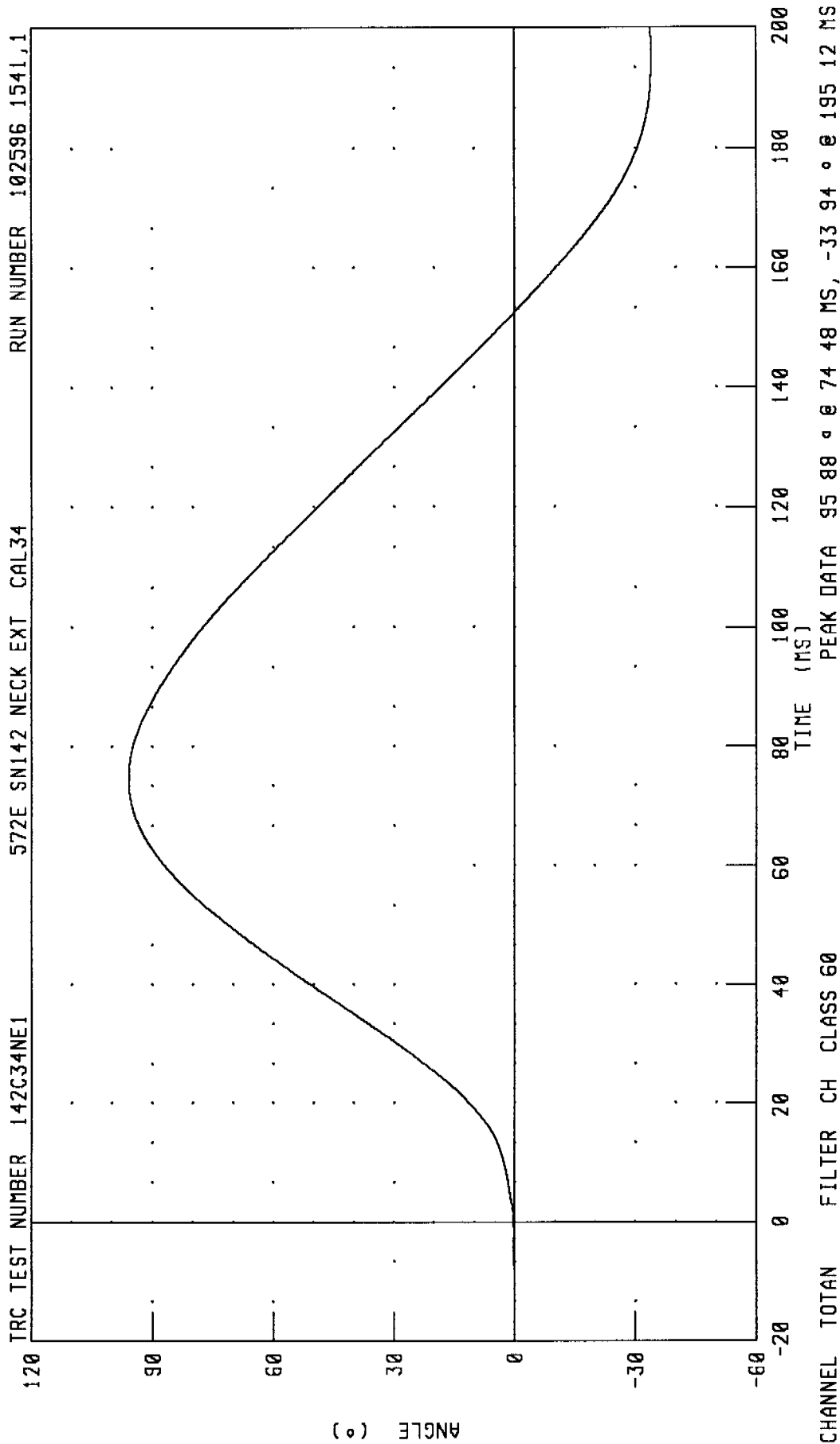
-5200

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



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION



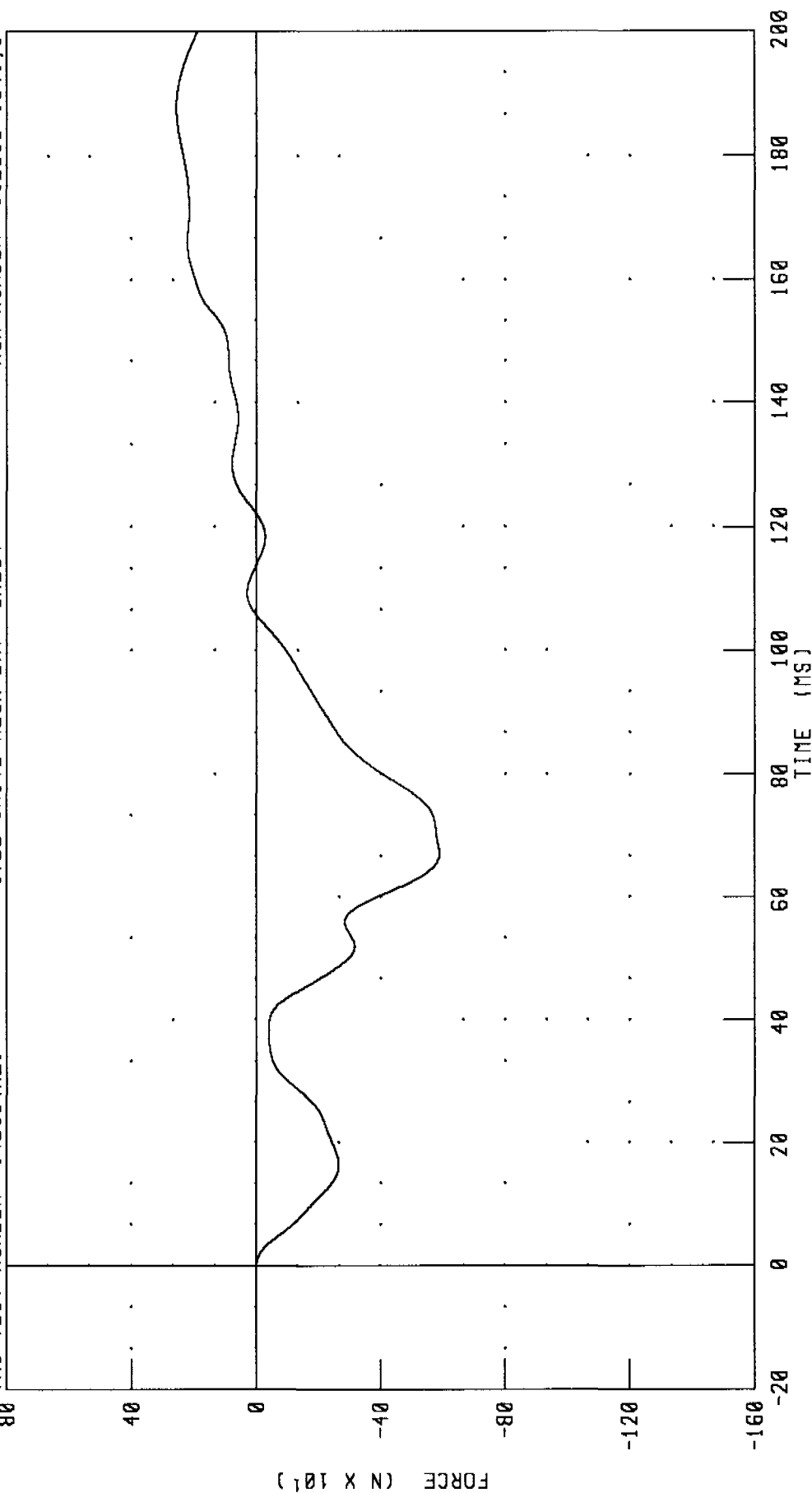
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER 142C34NE1

572E SN142 NECK EXT CAL34

RUN NUMBER 102596 1541,1



CHANNEL NEKXF FILTER CH CLASS 60

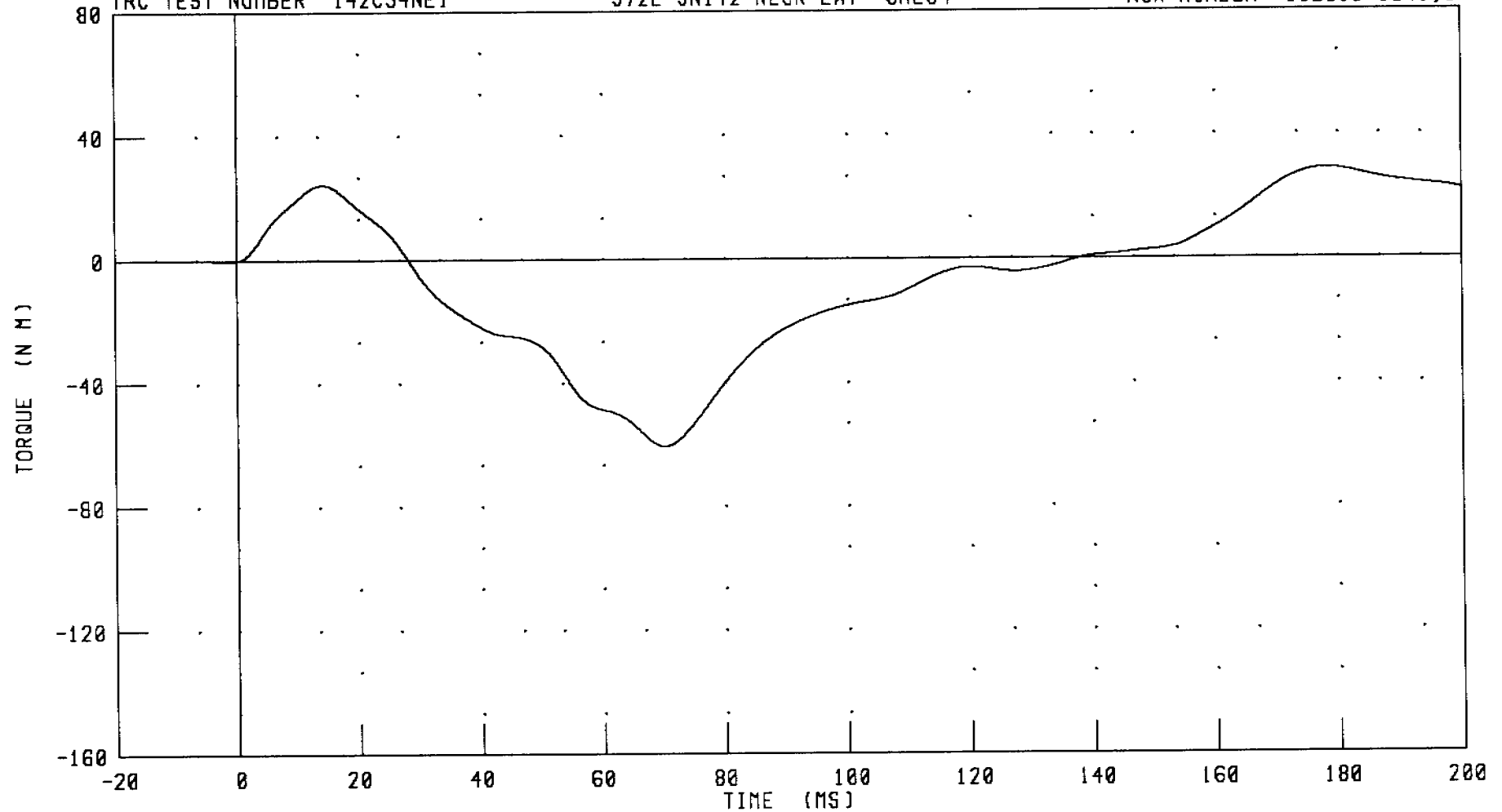
PEAK DATA 256 19 N @ 187 76 MS, -588 94 N @ 67 12 MS

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

TRC TEST NUMBER 142C34NE1

572E SN142 NECK EXT CAL34

RUN NUMBER 102596 1541,1



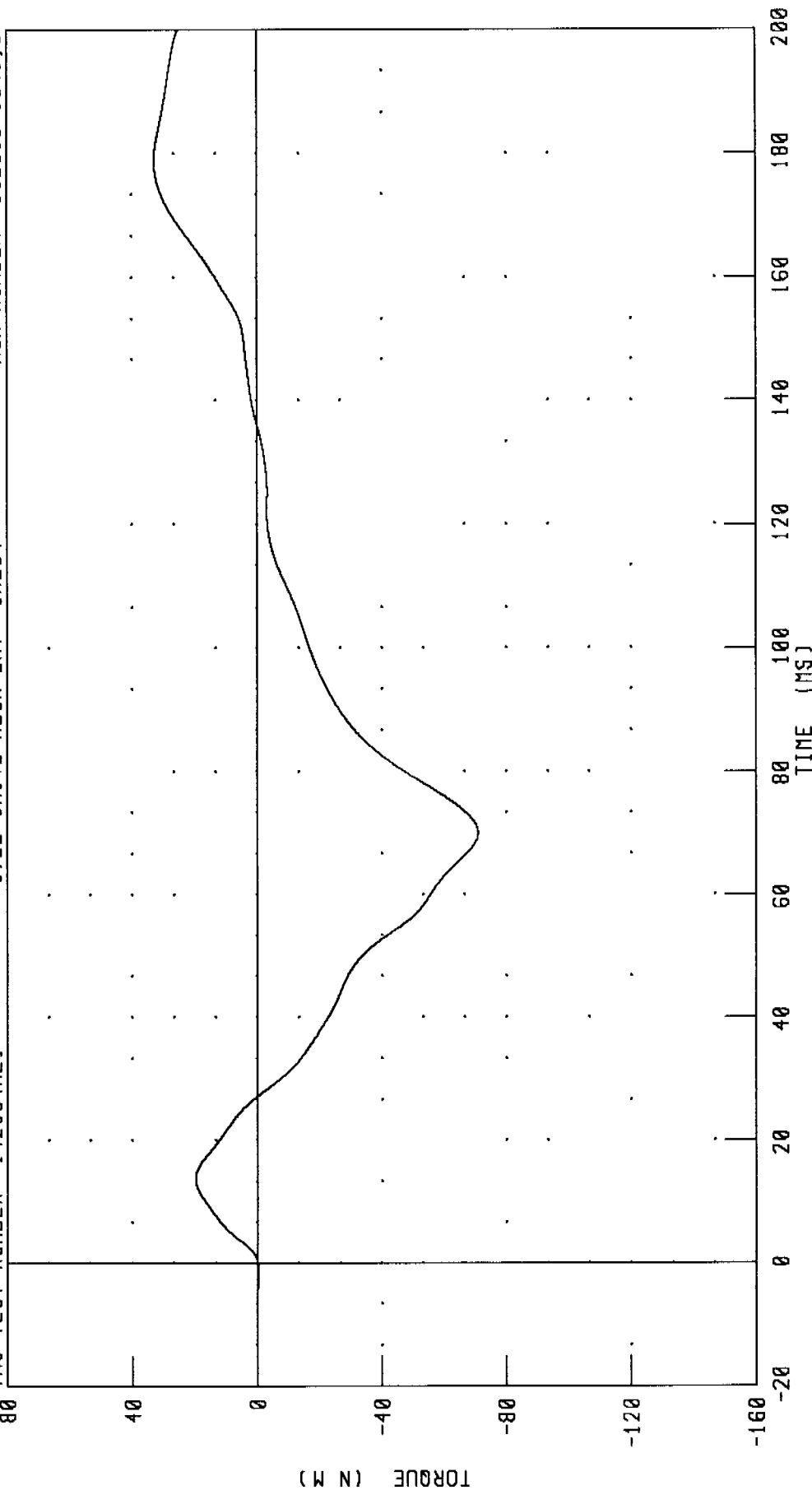
CHANNEL NEKYM FILTER CH CLASS 60

PEAK DATA 28 83 N M @ 178 40 MS, -60 69 N M @ 70 08 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER 142C34NE1 572E SN142 NECK EXT CAL34 RUN NUMBER 102596 1541,1



CHANNEL NEKOM FILTER CH CLASS 60

PEAK DATA 32 89 N M @ 178 80 MS, -71 01 N M @ 70 00 MS

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III

04-SEP-96

TRC INC.

TEST NO: 142C34TH2

572E SN 142 H.S.THORAX CAL 34

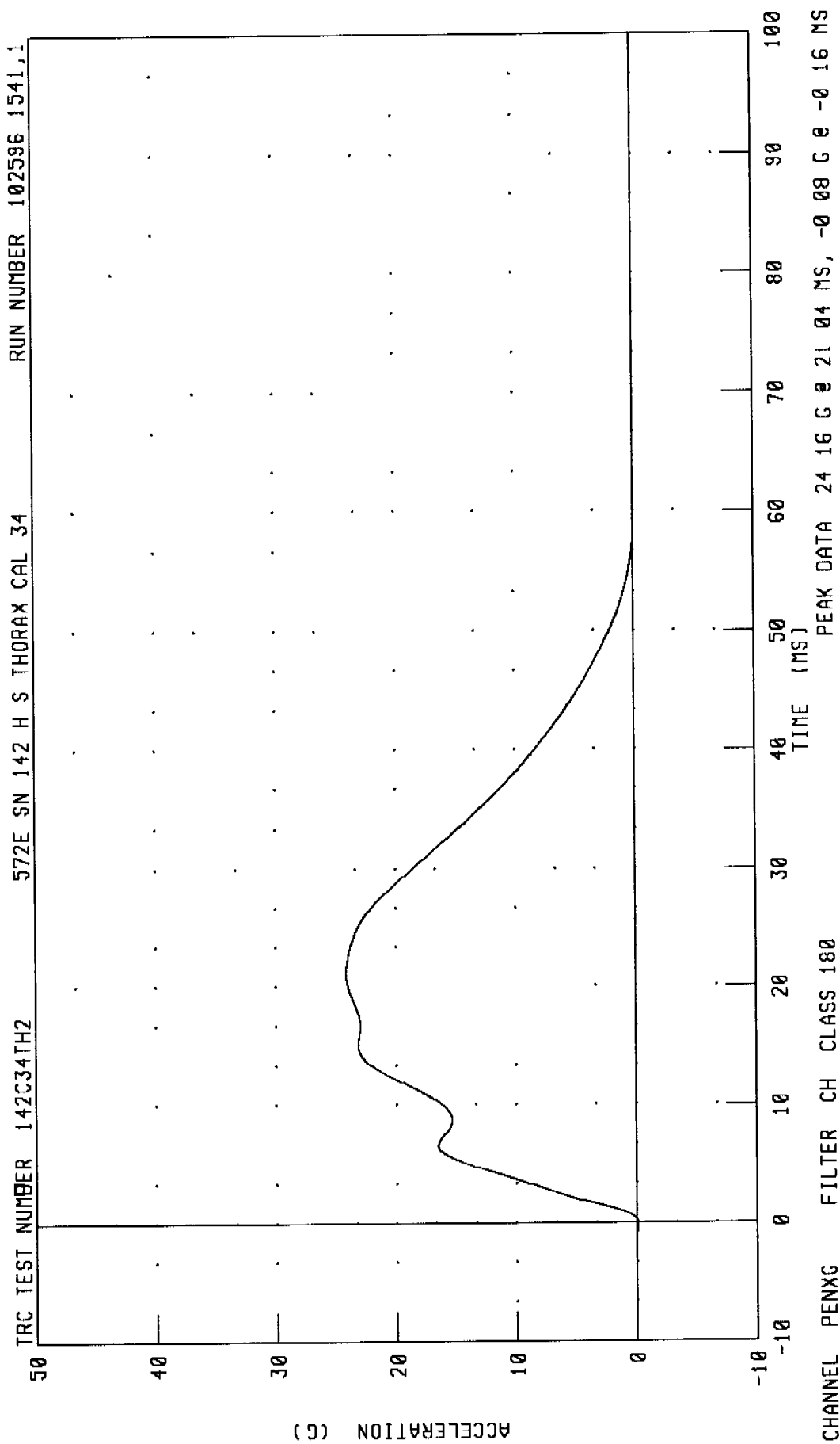
TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY	10 - 70 %	64.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.62 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	71.3 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5533. N
INTERNAL HYSTERESIS	69% - 85%	71.1%

TEST MEETS SPECIFICATIONS

TECHNICIAN Richard Le Van

RUN NUMBER: 090496.1555;1

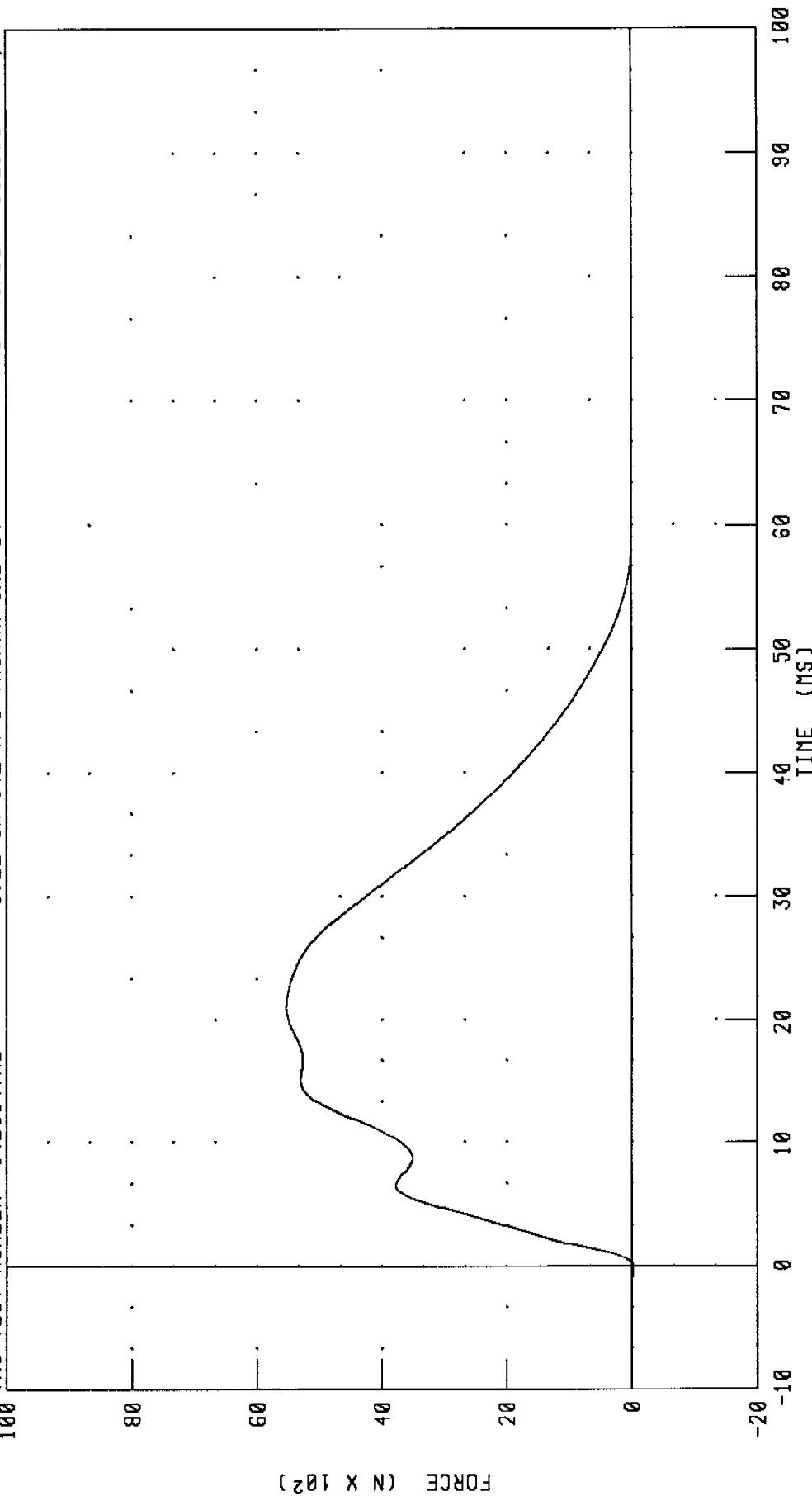
PART 572-E HYBRID III THORAX CALIBRATION
 PENDULUM DECELERATION



PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM FORCE

TRC TEST NUMBER 142C34TH2 572E SN 142 H S THORAX CAL 34 RUN NUMBER 102596 1541,1



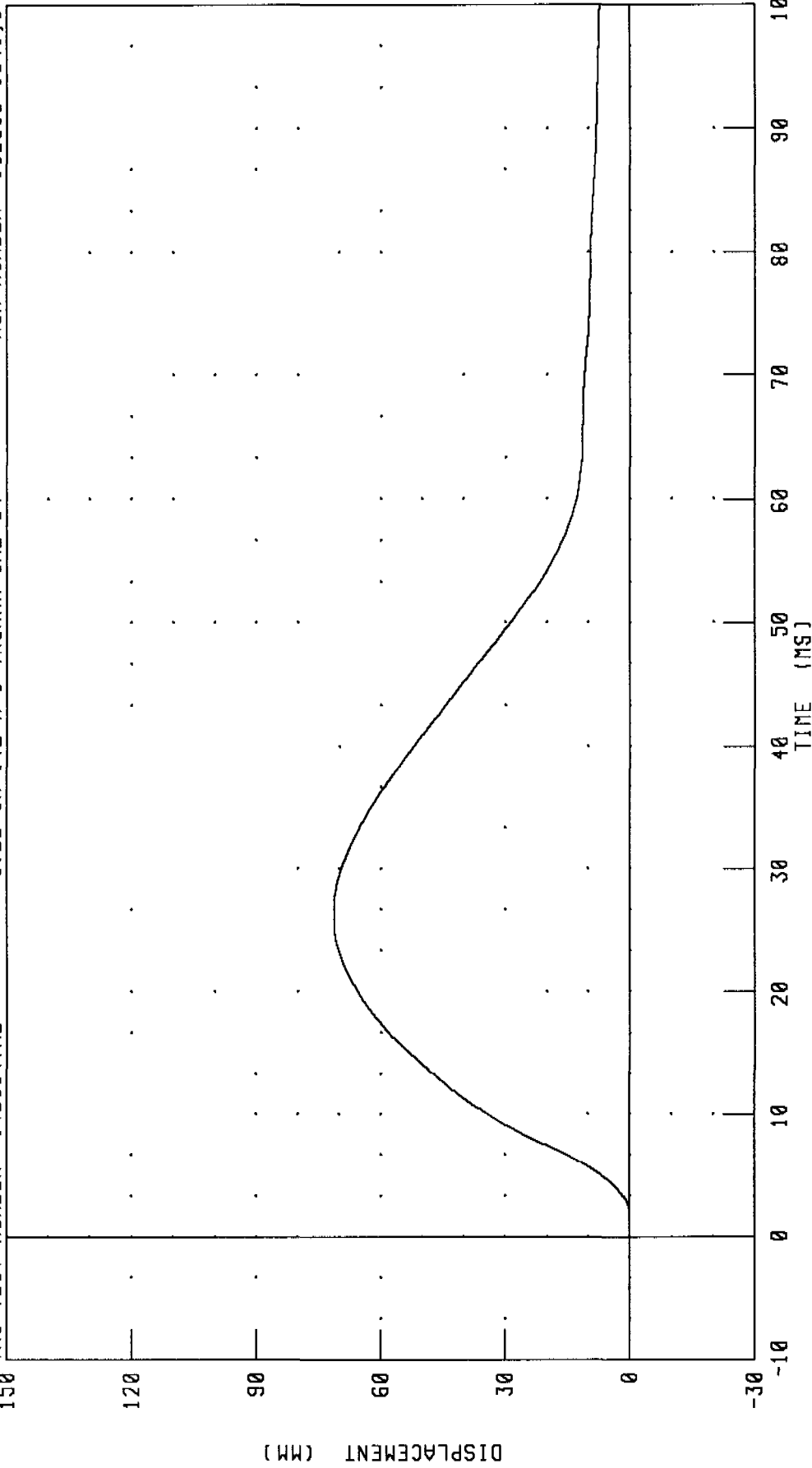
CHANNEL PENXF FILTER CH CLASS 180

PEAK DATA 5533 67 N @ 21 04 MS, -19 08 N @ -0 16 MS

PART 572-E HYBRID III THORAX CALIBRATION

STERNUM DISPLACEMENT

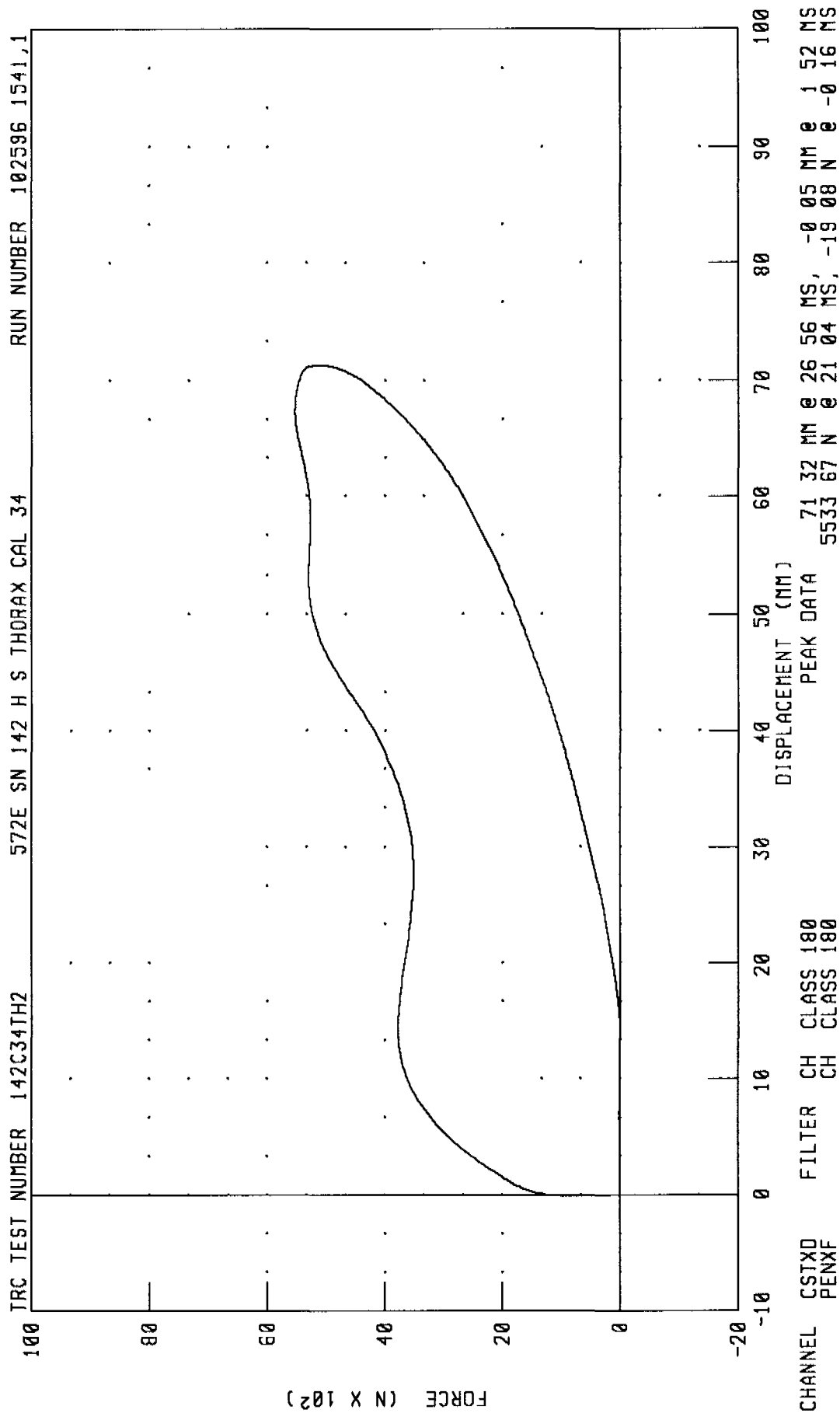
IRC TEST NUMBER 142C34TH2 572E SN 142 H S THORAX CAL 34 RUN NUMBER 102596 1541,1



CHANNEL CSTXD FILTER CH CLASS 180

PEAK DATA 71 32 MM @ 26 56 MS, -0 05 MM @ 1 52 MS

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



TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III

03-SEP-96

TRC INC.

TEST NO: 142C34RK1

572E SN142 RIGHT KNEE CAL 34

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	62.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.12 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5157.7 N

TEST MEETS SPECIFICATIONS

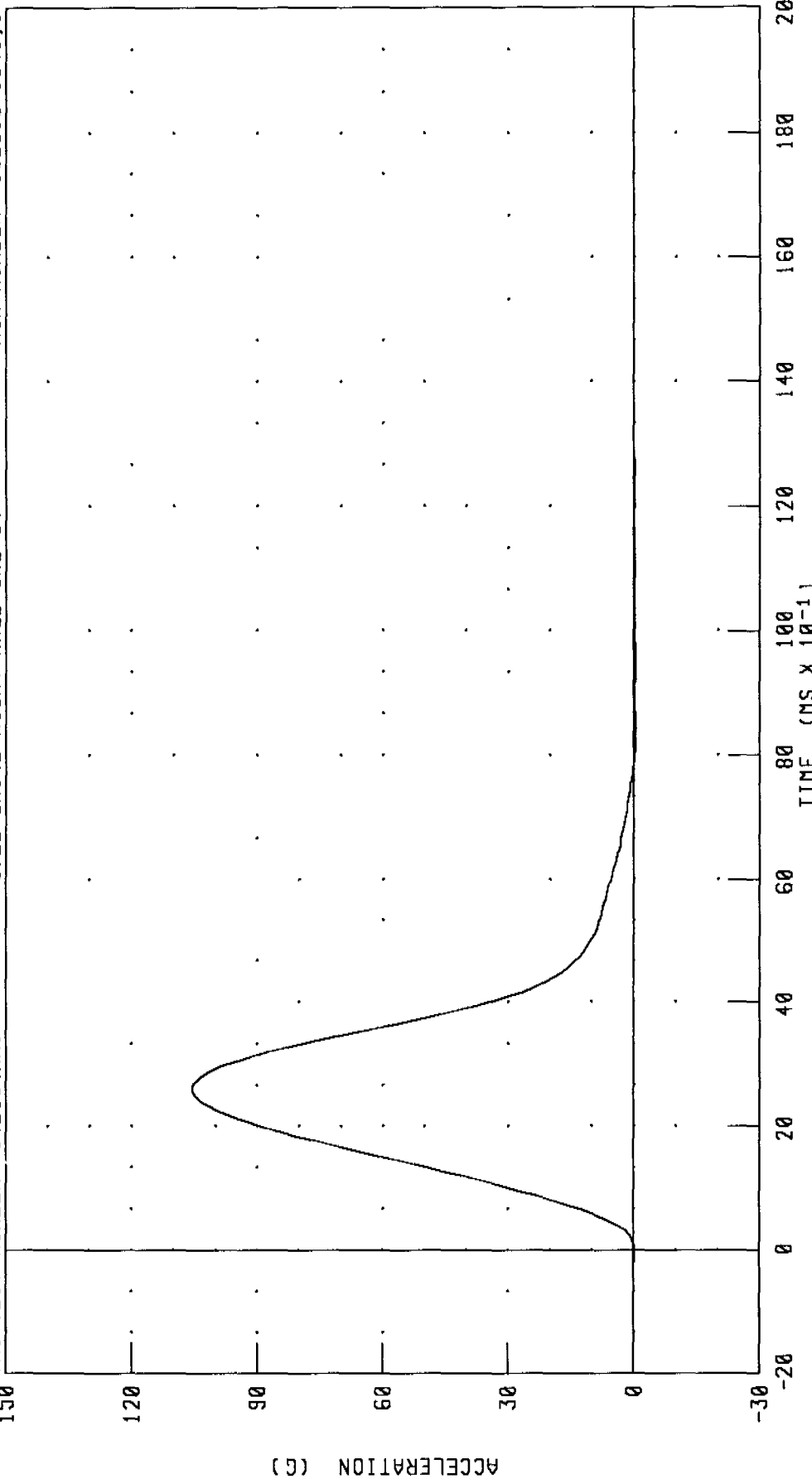
TECHNICIAN

Richard Le Van

RUN NUMBER: 090396.1324;1

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

TRC TEST NUMBER 142C34RK1 572E SN142 RIGHT KNEE CAL 34 RUN NUMBER 102596 1541,1



CHANNEL PENXG FILTER CH CLASS 600

PEAK DATA 105 41 G @ 2 56 MS, -0 41 G @ 9 52 MS

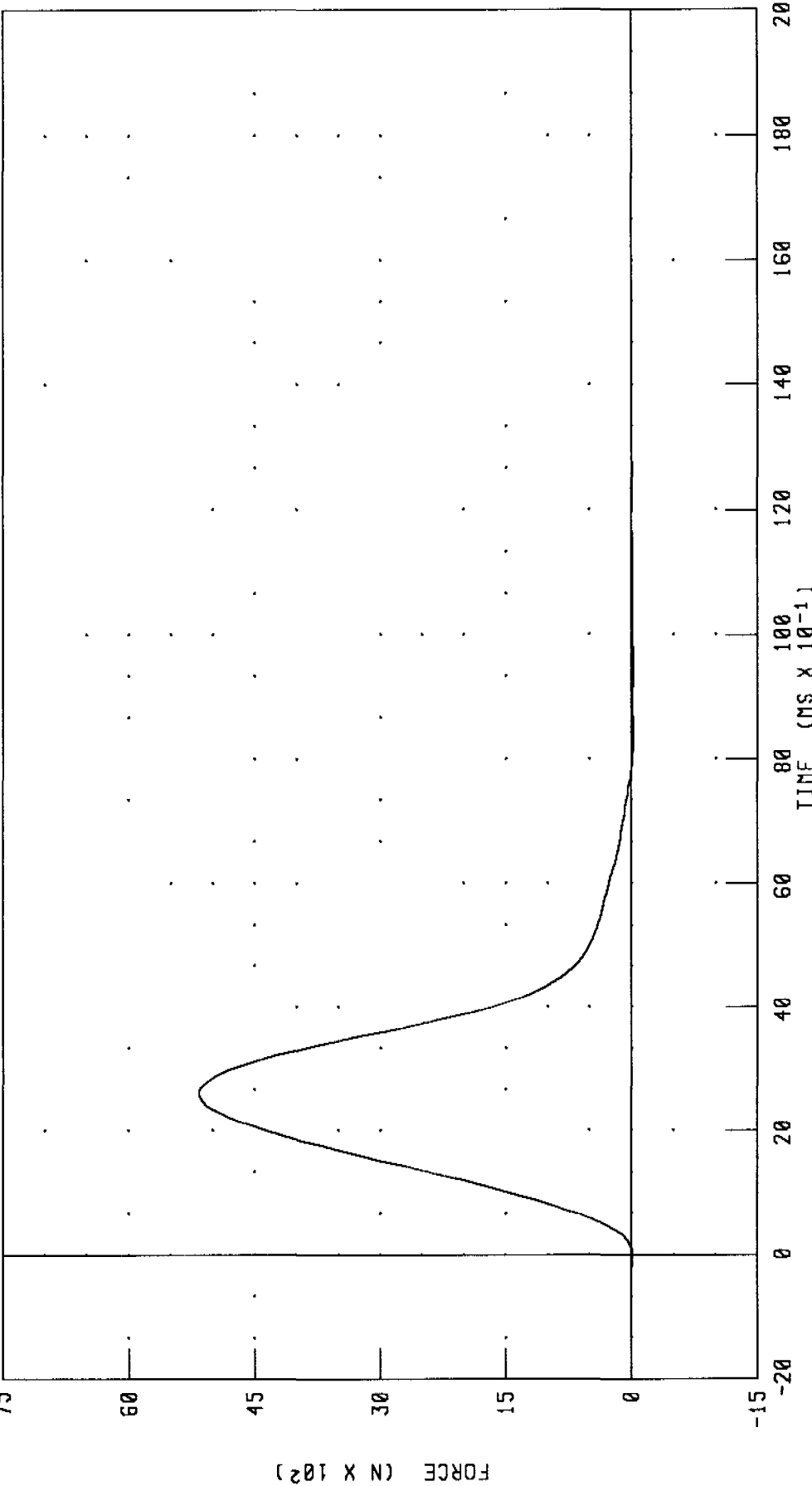
PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND)

TRC TEST NUMBER 142C34RK1

572E SN142 RIGHT KNEE CAL 34

RUN NUMBER 102596 1541,1



CHANNEL PENXF FILTER CH CLASS 600

PEAK DATA 5157 72 N @ 2 56 MS, -19 97 N @ 9 52 MS

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

HYBRID III

03-SEP-96

TRC INC.

TEST NO: 142C34LK1

572E SN142 LEFT KNEE CAL 34

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	62.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.12 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5208.6 N

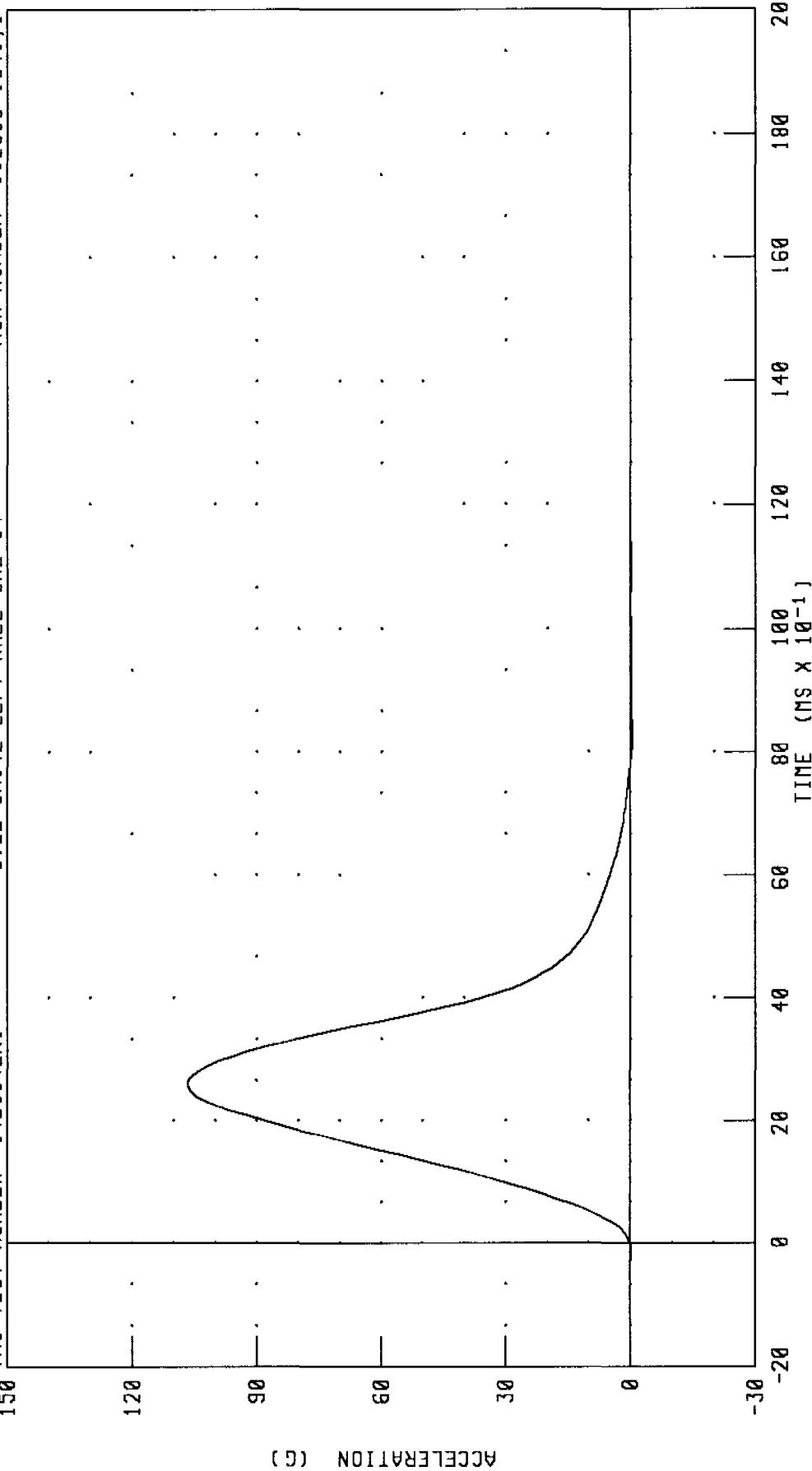
TEST MEETS SPECIFICATIONS

TECHNICIAN Richard L. Lora

RUN NUMBER: 090396.1321;1

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

TRC TEST NUMBER 142C34LK1 572E SN142 LEFT KNEE CAL 34 RUN NUMBER 102596 1541,1



CHANNEL PENXC FILTER CH CLASS 600

PEAK DATA 106 46 G @ 2 56 MS, -0 42 G @ 8 24 MS

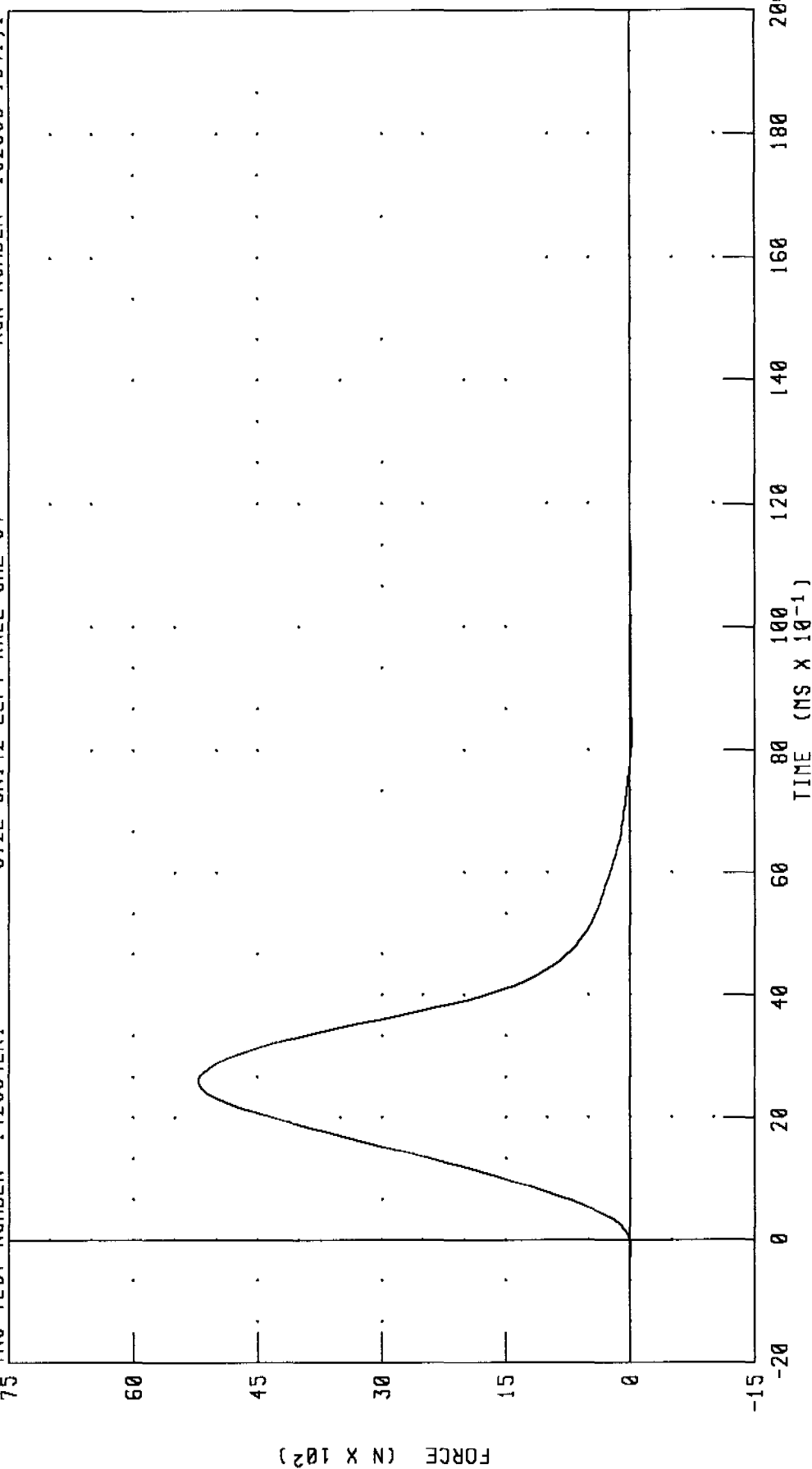
PART 572-E HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND)

TRC TEST NUMBER 142C34LK1

572E SN142 LEFT KNEE CAL 34

RUN NUMBER 102596 1541,1



CHANNEL PENXF FILTER CH CLASS 600

PEAK DATA 5208 69 N @ 2 56 MS, -20 54 N @ 8 24 MS

Pre-Test Calibration

Serial Number 192

TRANSPORTATION RESEARCH CENTER INC.

HYBRID III EXTERNAL DIMENSIONS

SN 192 ALDERSON

3-SEPT-96

TRC INC.

TEST NO: 192C33ED1

572E SN192 EXT.DIMENSION CAL33

TEST PARAMETER	(DIMEN.)	SPECIFICATION	TEST RESULTS
LOCATION FOR CHEST CIRCUMFERENCE (AA)		429 - 434 MM	432. MM
LOCATION FOR WAIST CIRCUMFERENCE (BB)		226 - 231 MM	229. MM
CHEST CIRCUMFERENCE	(Y)	970 -1001 MM	980. MM
WAIST CIRCUMFERENCE	(Z)	836 - 866 MM	851. MM
CHEST DEPTH	(O)	213 - 229 MM	218. MM
H-POINT HEIGHT	(C)	84 - 89 MM	84. MM
H-POINT FROM SEATBACK	(D)	135 - 140 MM	135. 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	150. MM
BUTTOCK KNEE LENGTH	(K)	579 - 605 MM	597. MM
BUTTOCK POPLITEAL LENGTH	(N)	452 - 478 MM	470. MM
POPLITEAL HEIGHT	(L)	429 - 455 MM	447. MM
KNEE PIVOT HEIGHT	(M)	485 - 500 MM	493. MM
FOOT LENGTH	(P)	252 - 267 MM	259. 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	429. MM
SHOULDER PIVOT HEIGHT	(B)	506 - 521 MM	516. MM
ELBOW REST HEIGHT	(J)	191 - 211 MM	211. MM
SHOULDER-ELBOW LENGTH	(I)	330 - 345 MM	345. MM
BACK OF ELBOW TO WRIST PIVOT	(G)	290 - 305 MM	290. MM

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Richard L. Van

RUN NUMBER: 101196.1225

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

HYBRID III

04-SEP-96

TRC INC.

TEST NO: 192C33HD1

572E SN192 HEAD DROP CAL 33

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	63.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	263.11 G
PEAK LATERAL ACCELERATION	15 G MAX	-11.90 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN

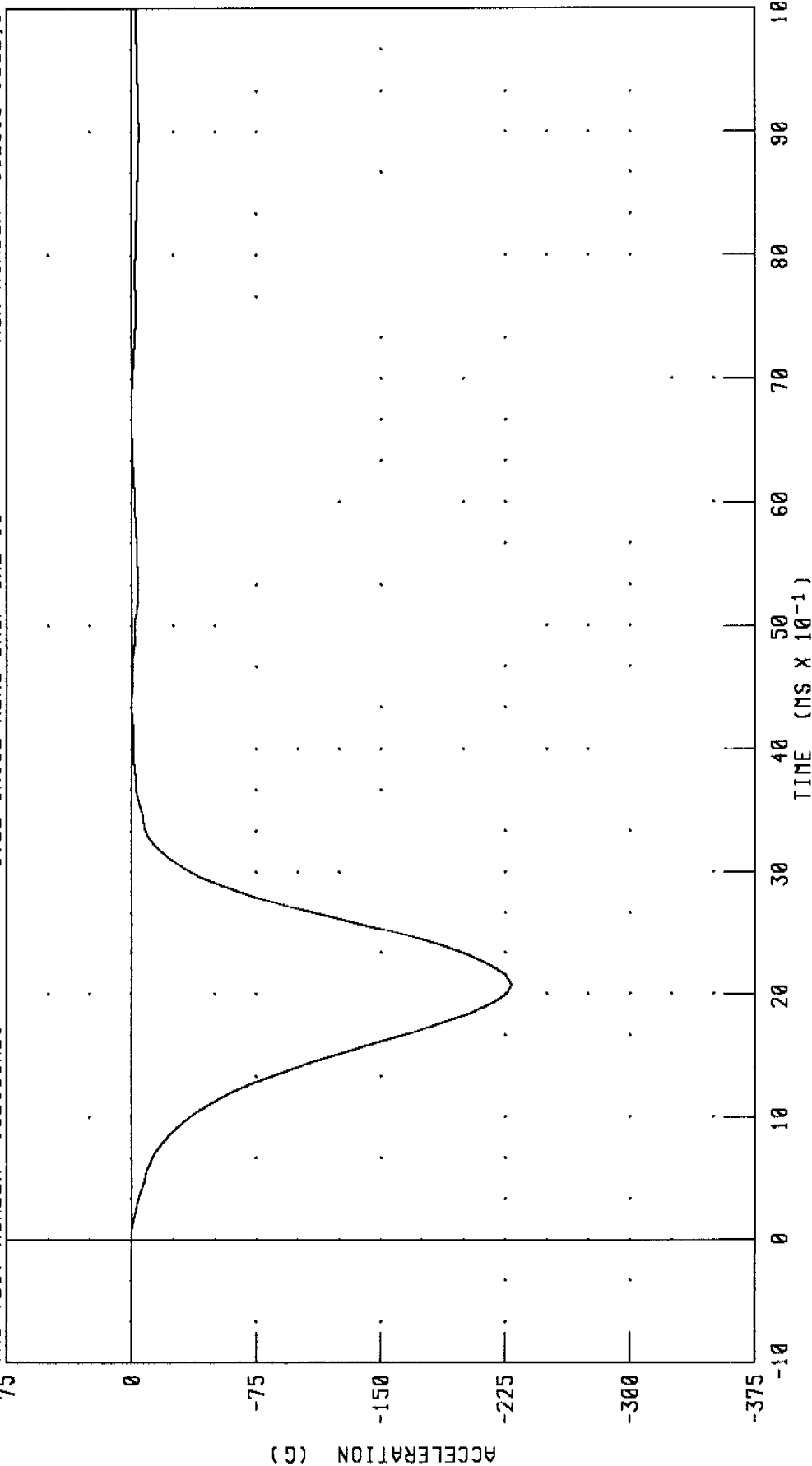
Richard L. Van

RUN NUMBER: 090396.0923;1

PART 572-E HYBRID III HEAD CALIBRATION

HEAD ACCELERATION X AXIS

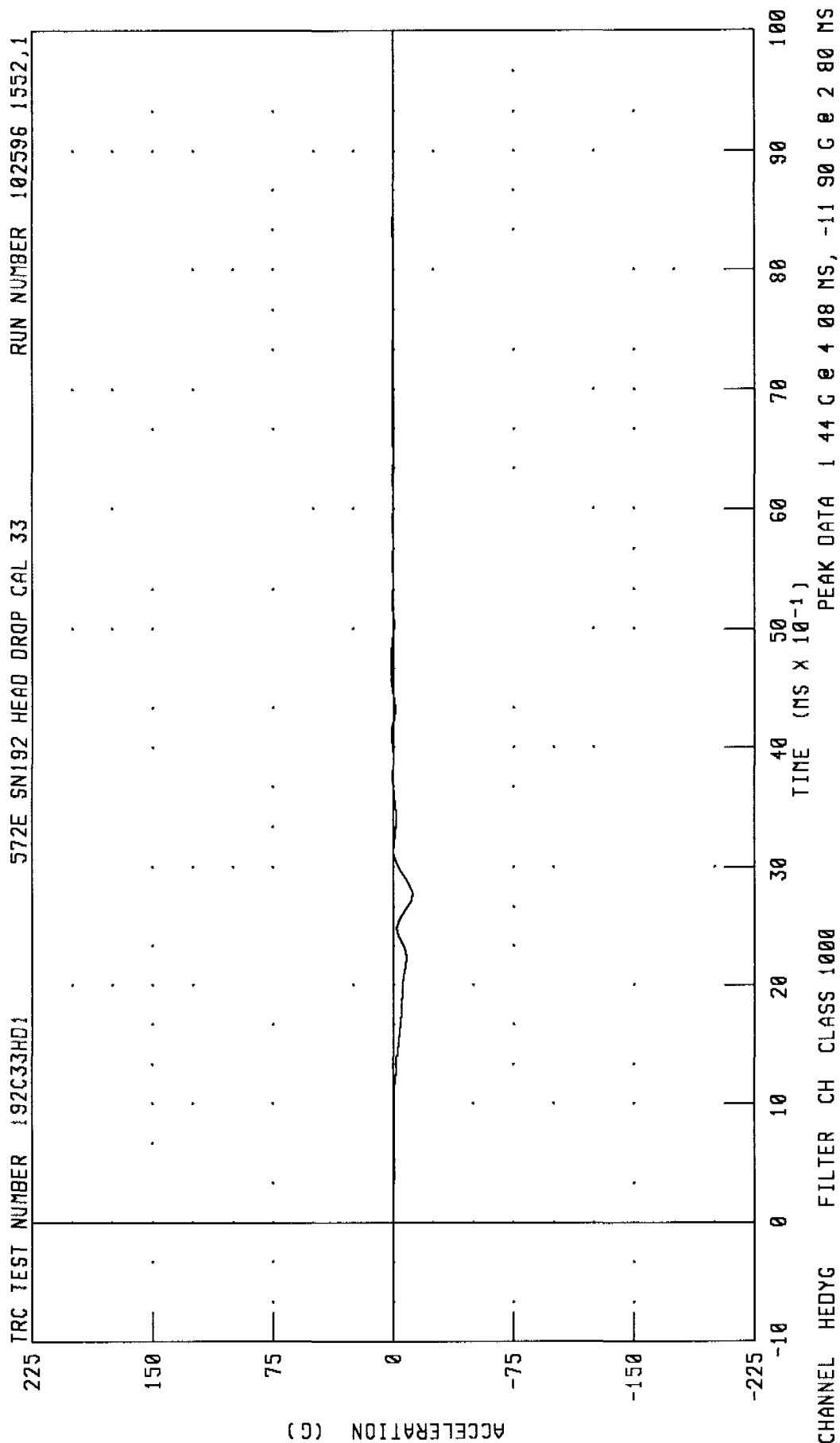
TRC TEST NUMBER 192C33HD1 572E SN192 HEAD DROP CAL 33 RUN NUMBER 102596 1552,1



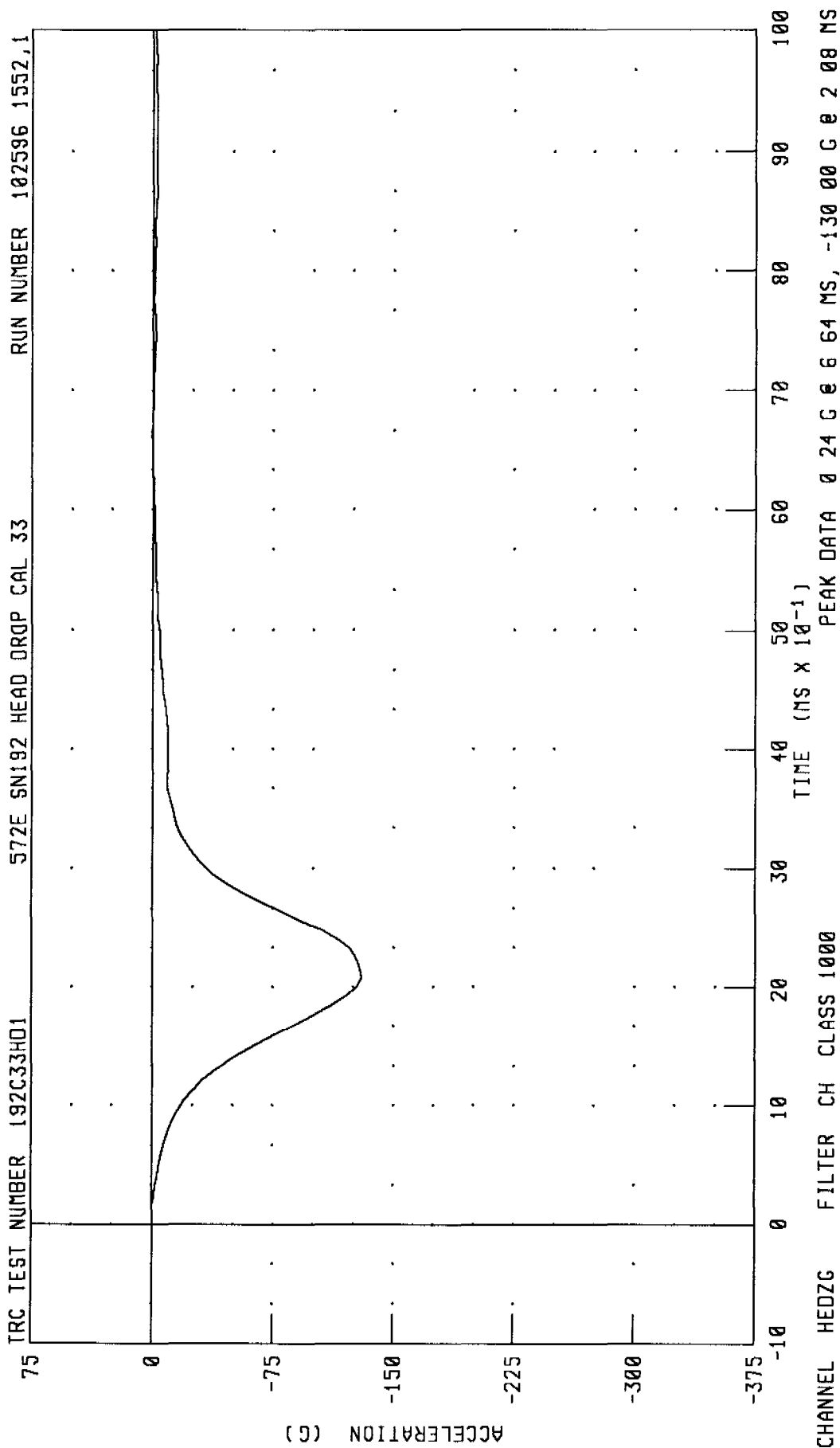
CHANNEL HEDXC FILTER CH CLASS 1000

PEAK DATA 0 20 G 6 64 MS, -228 67 G 2 08 MS

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



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



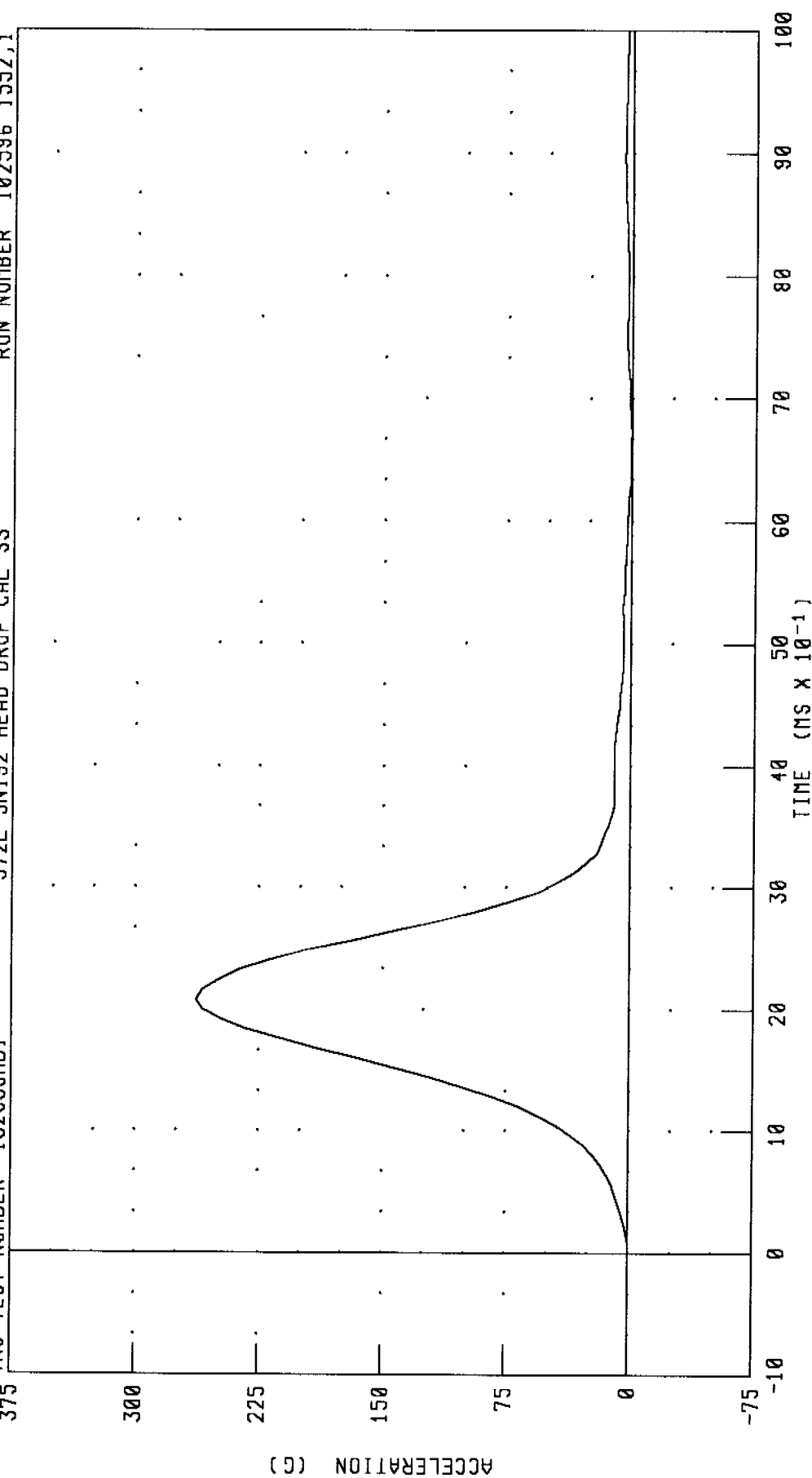
PART 572-E HYBRID III HEAD CALIBRATION

HEAD RESULTANT ACCELERATION

TRC TEST NUMBER 192C33HD1

572E SN192 HEAD DROP CAL 33

RUN NUMBER 102596 1552,1



CHANNEL HEDRG FILTER CH CLASS 1000

PEAK DATA 263 11 G @ 2 08 MS, 0 01 G @ -0 80 MS

TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

HYBRID III

04-SEP-96

TRC INC. TEST NO: 192C33NF4 572E SN192 NECK FLEXION CAL33

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	64.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	6.93 M/S
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	22.97 G
	20 MS	17.60 - 22.60 G	20.26 G
	30 MS	12.50 - 18.50 G	15.35 G
MAX PENDULUM G		29 G MAX	23.78 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	15.30 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	35.92 MS
D PLANE	MAX	64 - 78 DEG.	70.31 DEG.
ROTATION	TIME	57 - 64 MS	58.24 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88.2 - 108.5 NM	100.25 NM
	TIME	47 - 58 MS	48.56 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	114.32 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	98.56 MS

TEST MEETS SPECIFICATIONS

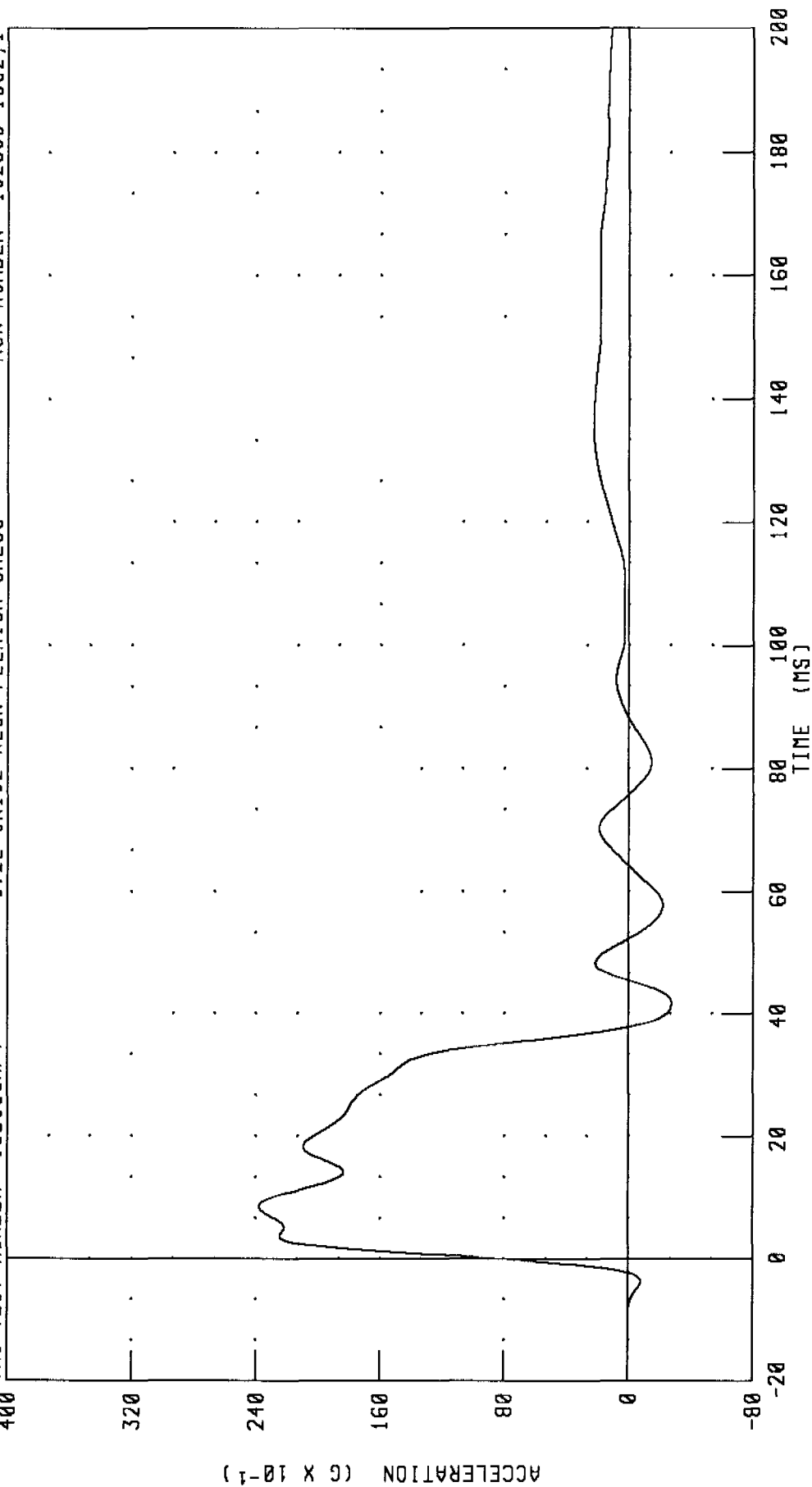
TECHNICIAN Richard L. Van

RUN NUMBER: 090496.0830;1

PART 572-E HYBRID III NECK FLEXION CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER 192C33NF4 572E SN192 NECK FLEXION CAL33 RUN NUMBER 102596 1552,1



CHANNEL PENXG FILTER CH CLASS 60

PEAK DATA 23 79 G @ 8 56 MS, -2 74 G @ 41 60 MS

PART 572-E HYBRID III NECK FLEXION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER 192C33NF4 572E SN192 NECK FLEXION CAL33 RUN NUMBER 102596 1552,1

120

90

60

30

0

-30

-60

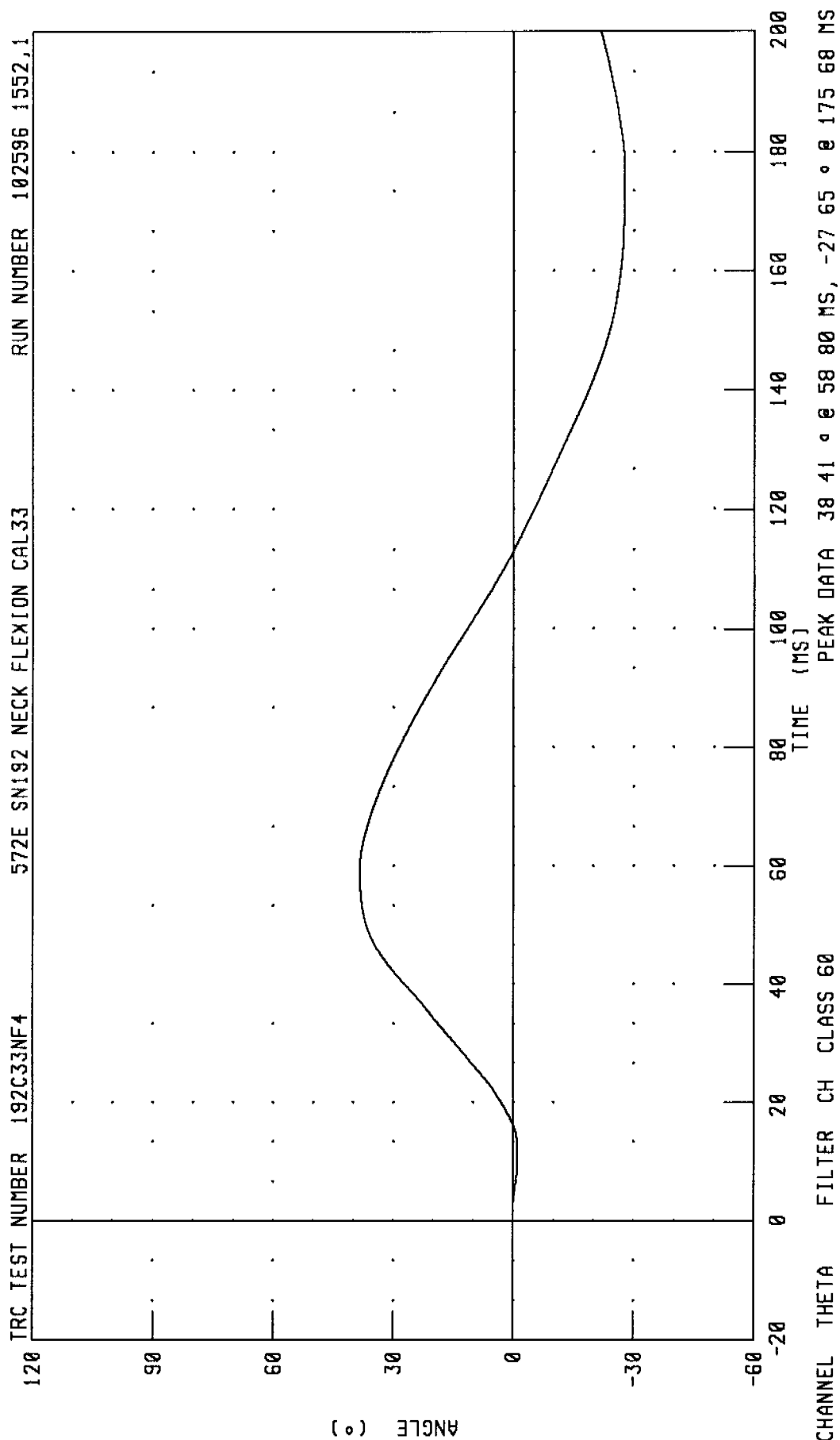
ANGLE (°)

TIME (MS) 80 100 120 140 160 180 200

CHANNEL BETA FILTER CH CLASS 60

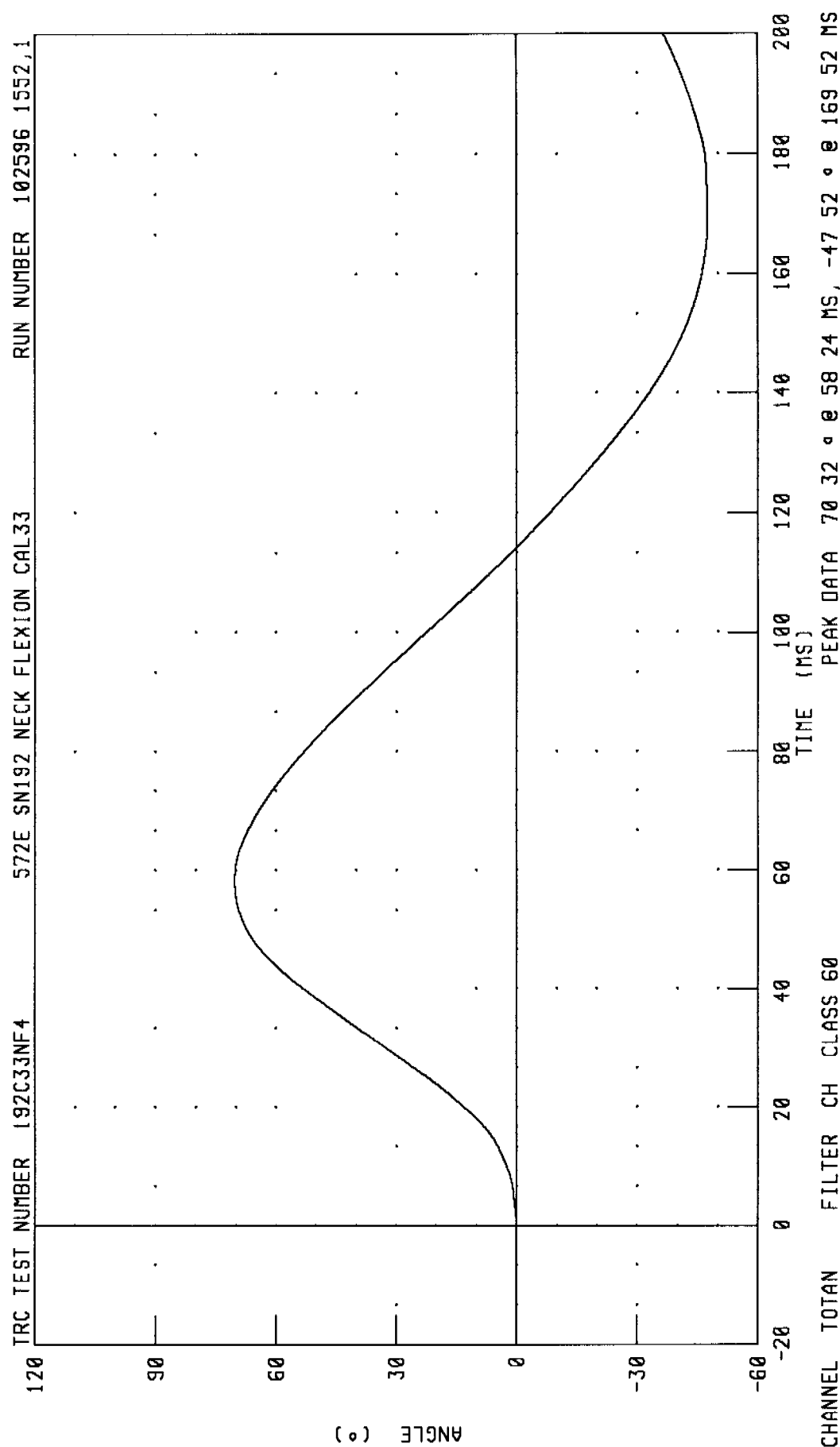
PEAK DATA 31 92 ° @ 57 84 MS, -19 95 ° @ 168 16 MS

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



PART 572-E HYBRID III NECK FLEXION CALIBRATION

TOTAL ROTATION



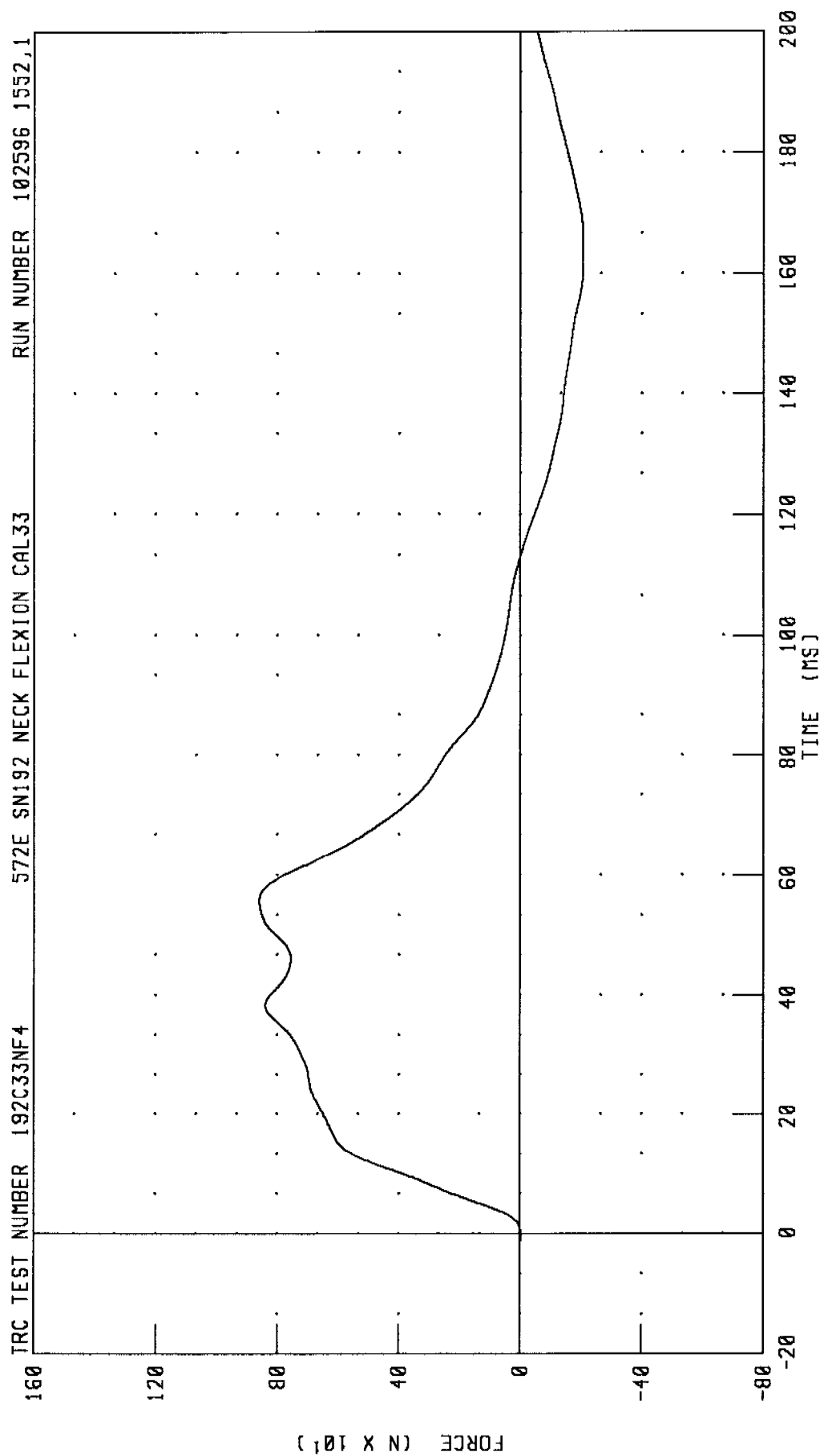
PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK FORCE X AXIS

TRC TEST NUMBER 192C33NF4

572E SN192 NECK FLEXION CAL33

RUN NUMBER 102596 1552,1



CHANNEL NEKXF FILTER CH CLASS 60

PEAK DATA 859 69 N @ 55 60 MS, -206 86 N @ 162 24 MS

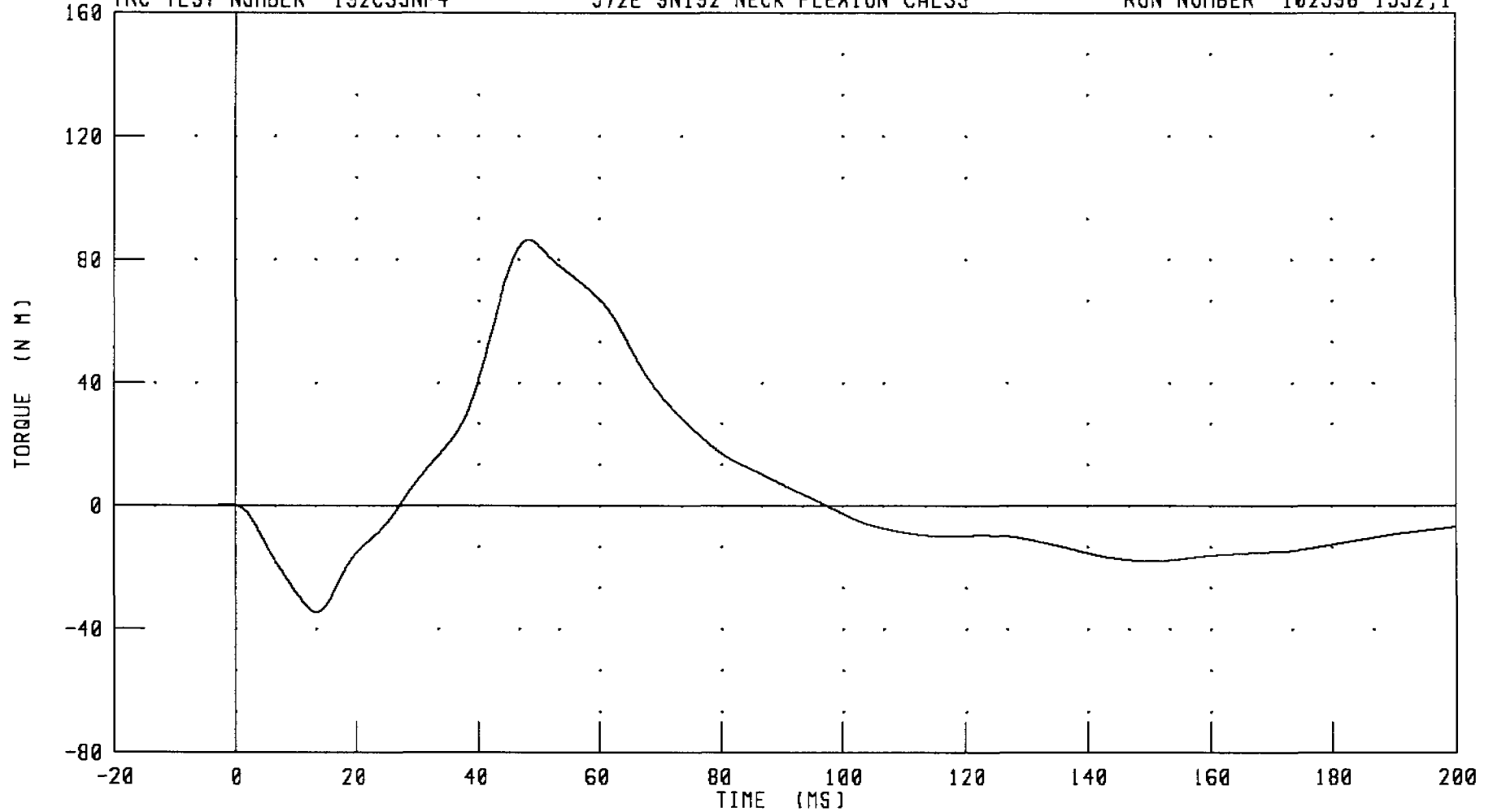
PART 572-E HYBRID III NECK FLEXION CALIBRATION

NECK MOMENT Y AXIS

TRC TEST NUMBER 192C33NF4

572E SN192 NECK FLEXION CAL33

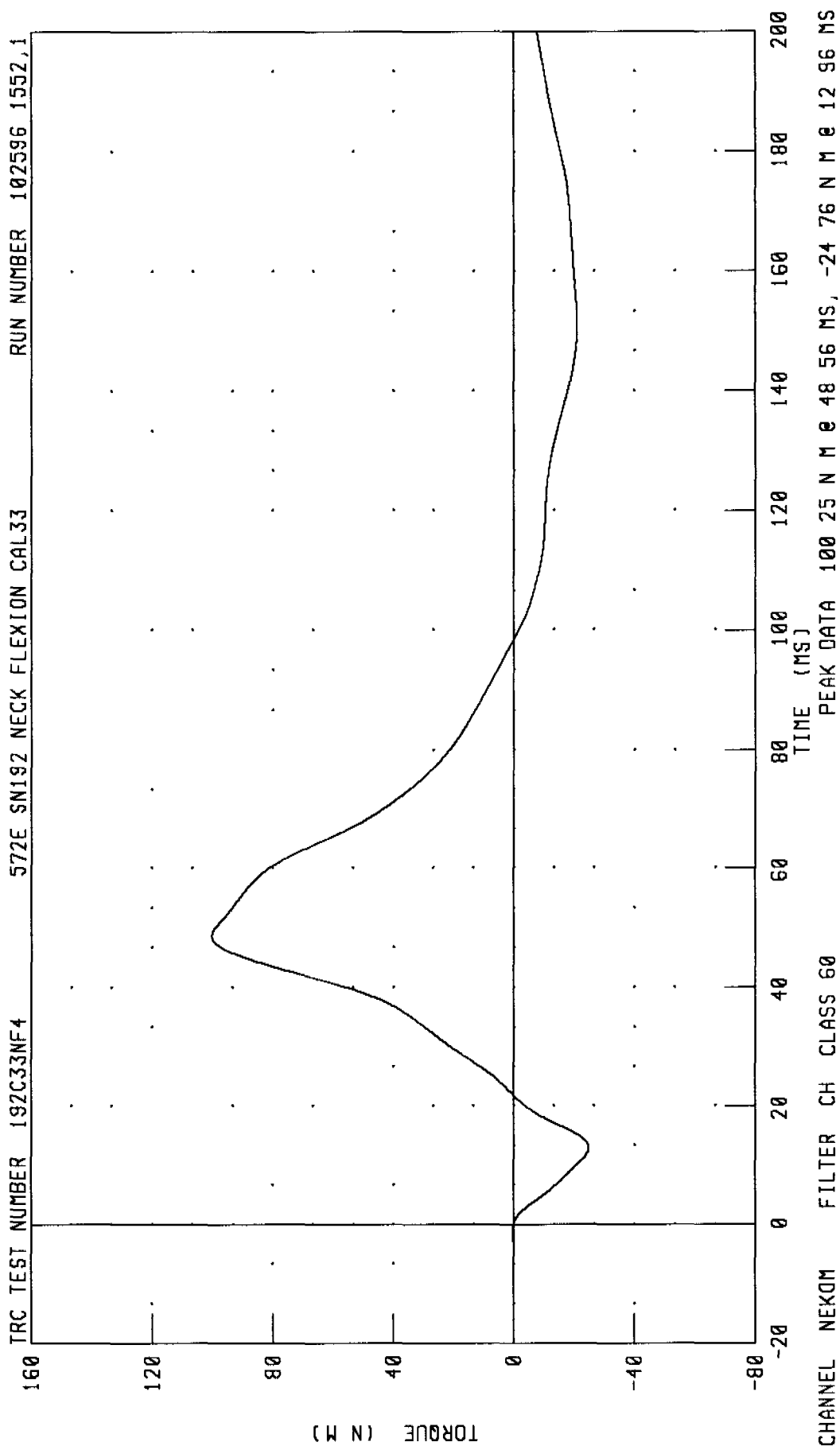
RUN NUMBER 102596 1552,1



CHANNEL NEKYM FILTER CH CLASS 60

PEAK DATA 86 46 N M @ 48 40 MS, -34 51 N M @ 13 44 MS

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



TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

HYBRID III

04-SEP-96

TRC INC. TEST NO: 192C33NE1 572E SN192 NECK EXT. CAL33

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6 - 22.2 DEG. C	21.1 DEG. C
RELATIVE HUMIDITY		10 - 70 %	64.0 %
IMPACT VELOCITY		5.95 - 6.19 M/S	6.05 M/S
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.45 G
	20 MS	14.00 - 19.00 G	16.07 G
	30 MS	11.00 - 16.00 G	13.30 G
MAX PENDULUM G		22 G MAX	17.70 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	13.27 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	40.88 MS
D PLANE	MAX	81 - 106 DEG.	95.36 DEG.
ROTATION	TIME	72 - 82 MS	77.52 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-80.0/-52.9 NM	-62.11 NM
	TIME	65 - 79 MS	71.44 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	157.60 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	138.80 MS

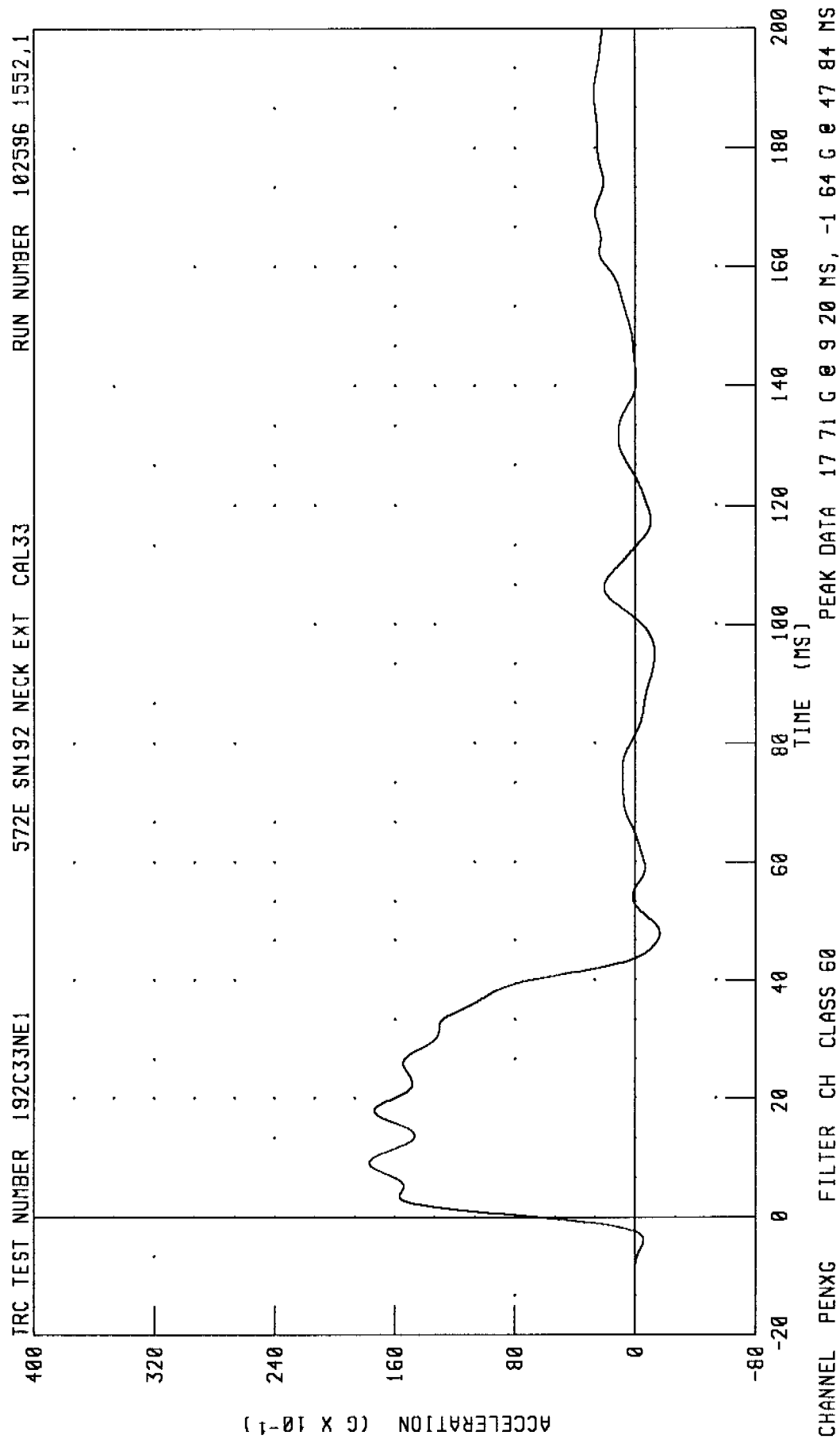
TEST MEETS SPECIFICATIONS

TECHNICIAN Richard L. Van

RUN NUMBER: 090496.0901;1

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

PENDULUM DECELERATION



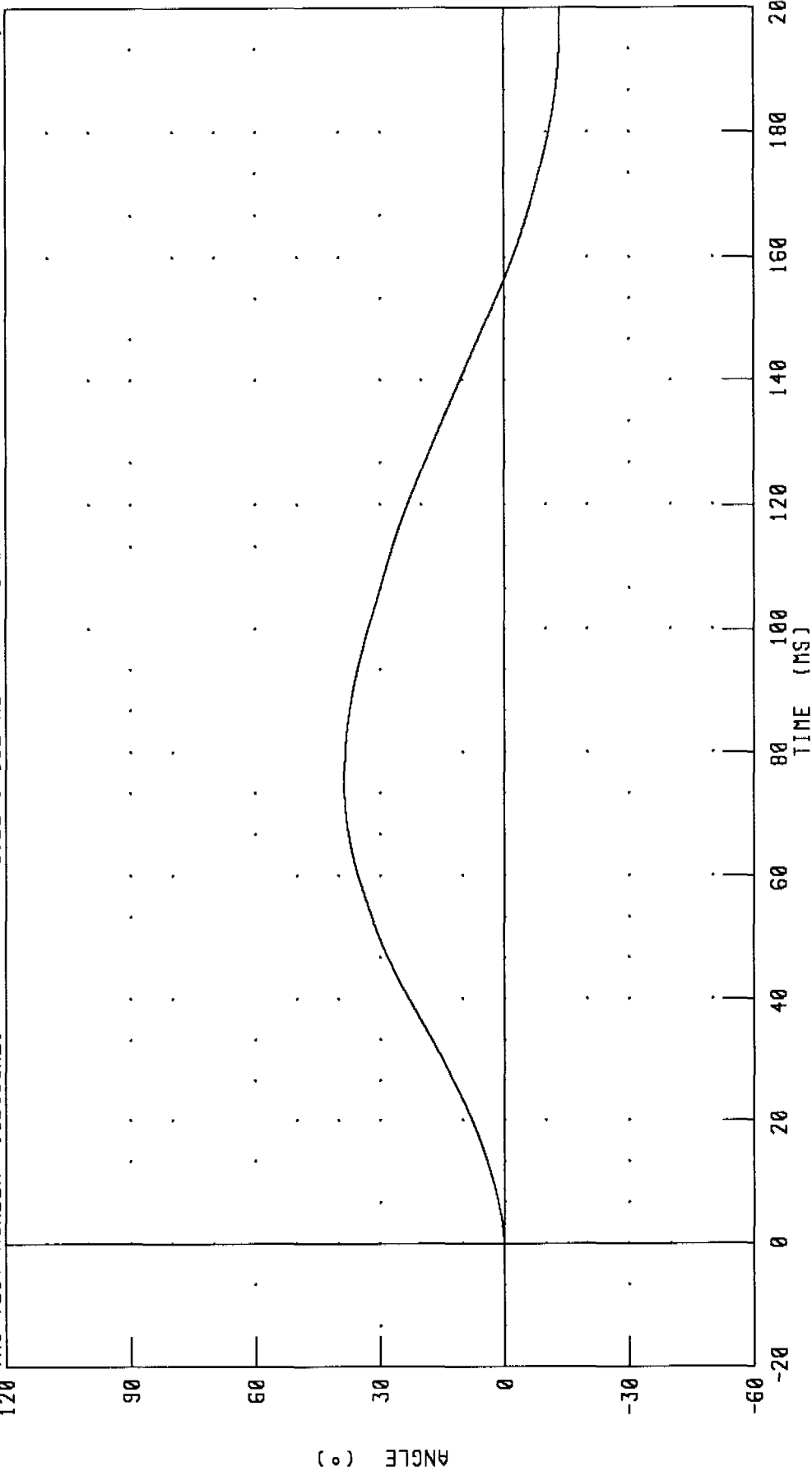
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER 192C33NE1

572E SN192 NECK EXT CAL33

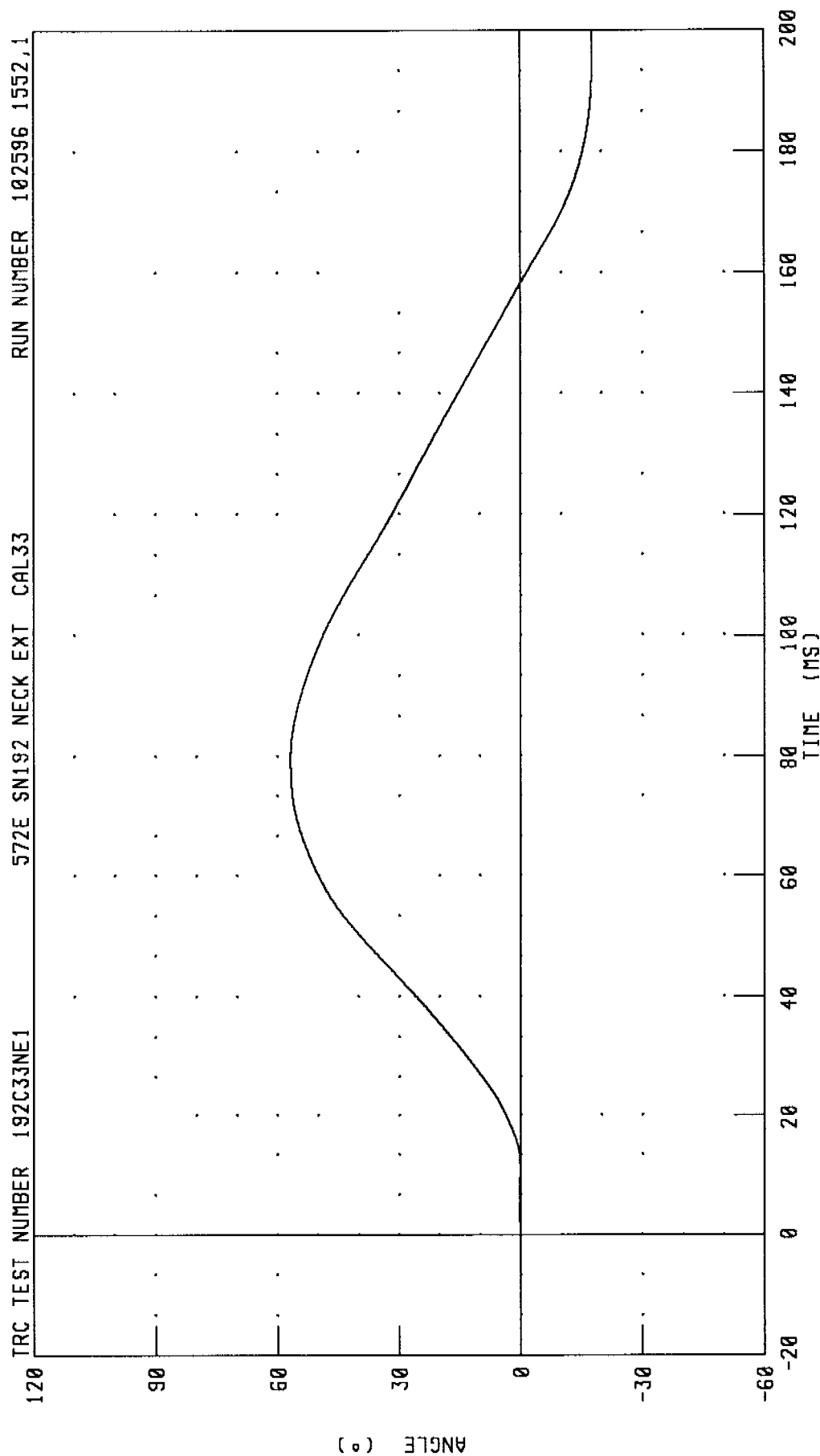
RUN NUMBER 102596 1552,1



CHANNEL BETA FILTER CH CLASS 60

PEAK DATA 38 62 ° @ 75 44 MS, -13 45 ° @ 196 96 MS

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



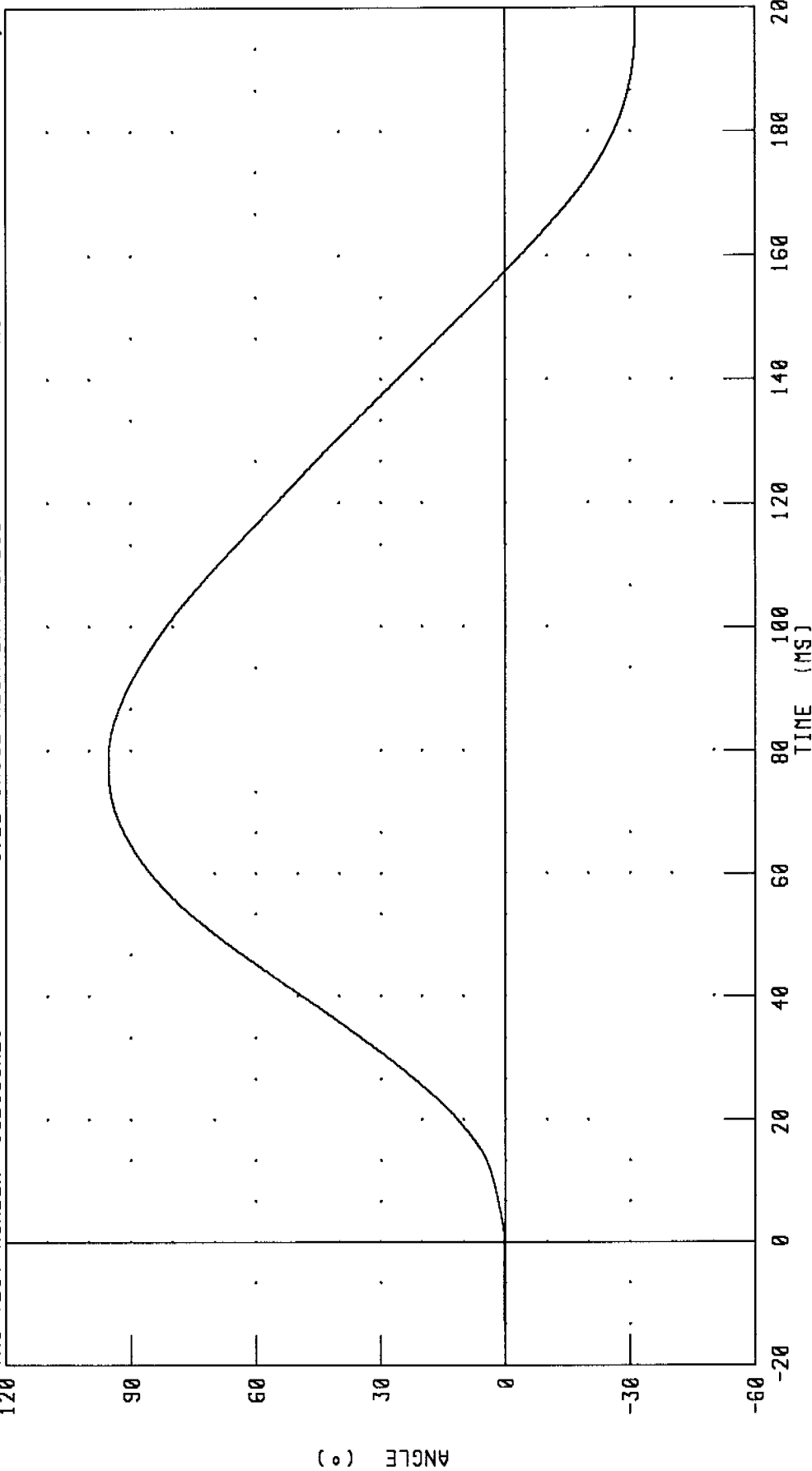
TRC TEST NUMBER 192C33NE1 572E SN192 NECK EXT CAL33 RUN NUMBER 102596 1552,1

CHANNEL THETA FILTER CH CLASS 60 PEAK DATA 56 83 ° @ 79 36 MS, -17 80 ° @ 200 00 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION

TRC TEST NUMBER 192C33NE1 572E SN192 NECK EXT CAL33 RUN NUMBER 102596 1552,1

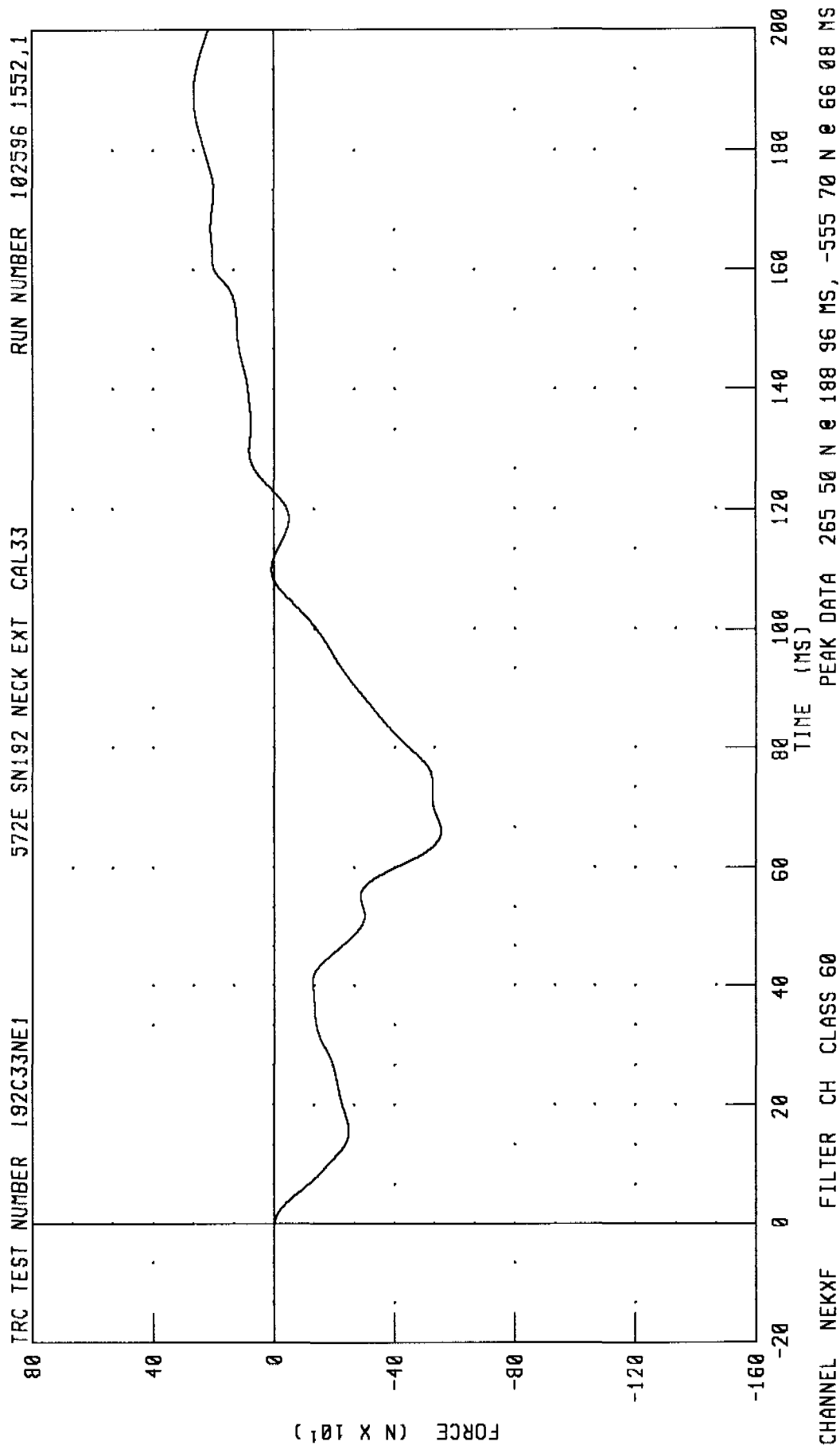


CHANNEL TOTAL FILTER CH CLASS 60

PEAK DATA 95 37 ° @ 77 52 MS, -31 24 ° @ 197 20 MS

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

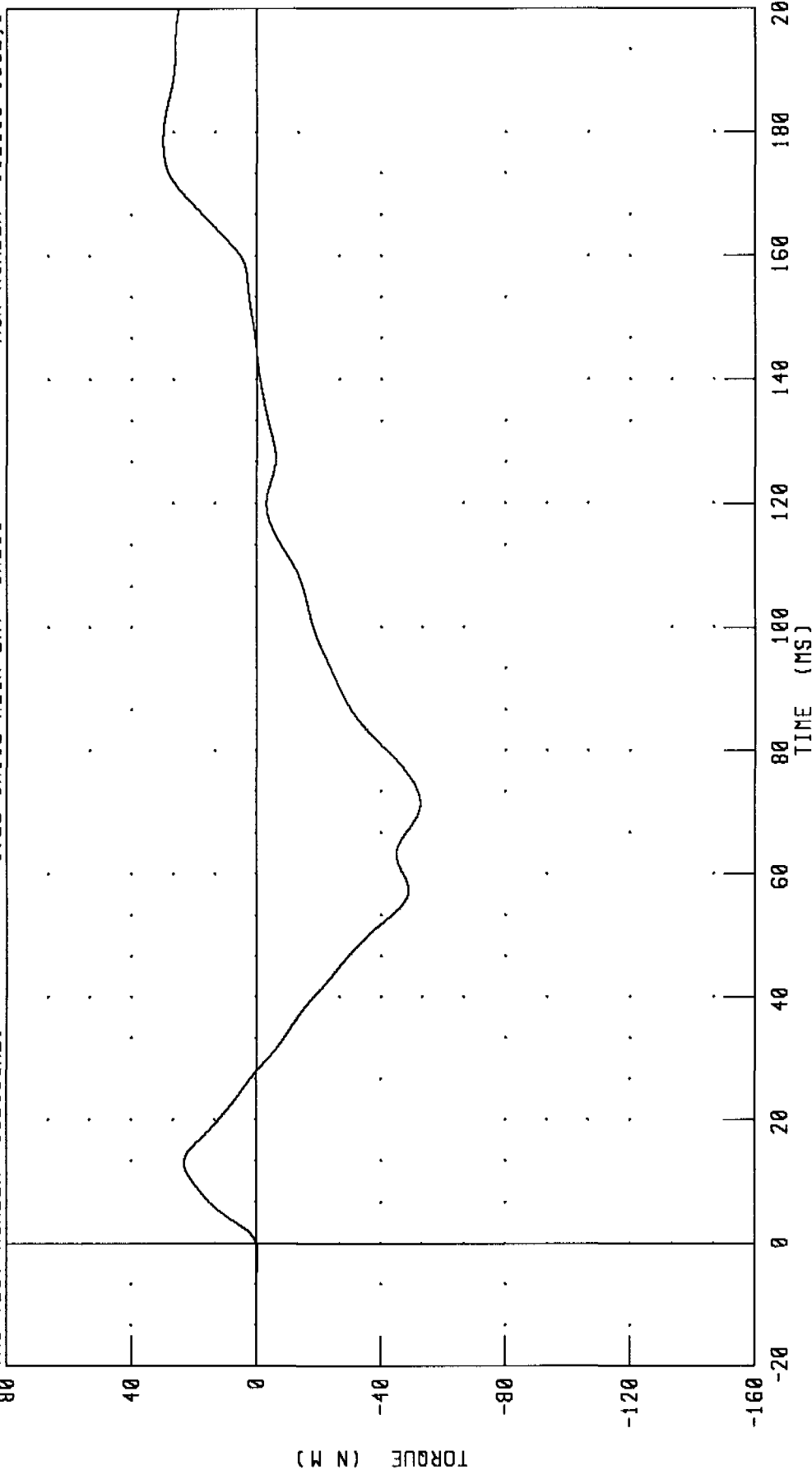
NECK FORCE X AXIS



PART 572-E HYBRID III NECK EXTENSION CALIBRATION

NECK MOMENT Y AXIS

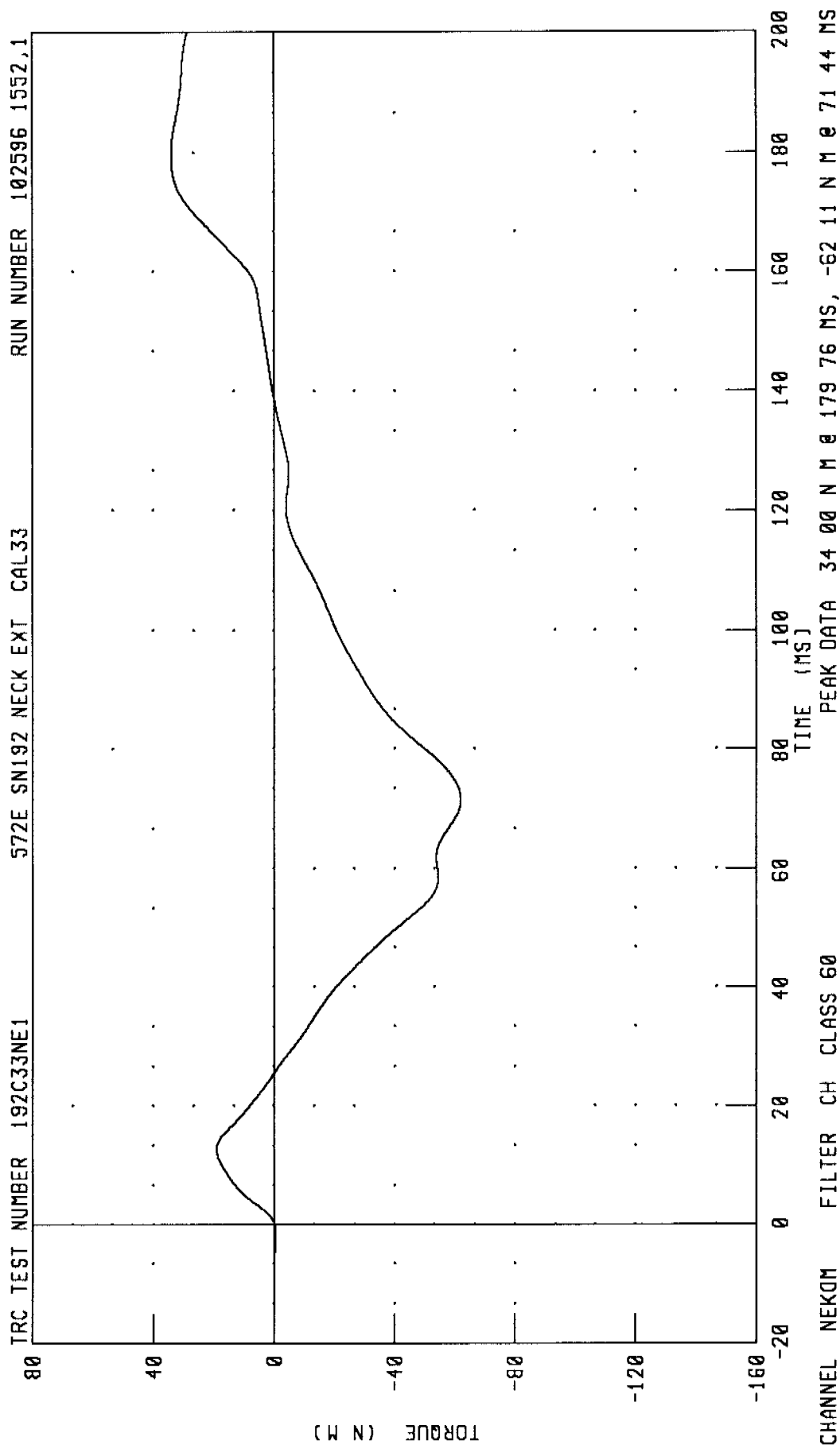
TRC TEST NUMBER 192C33NE1 572E SN192 NECK EXT CAL33 RUN NUMBER 102596 1552,1



CHANNEL NEKYM FILTER CH CLASS 60

PEAK DATA 30 00 N M @ 178 56 MS, -52 74 N M @ 71 44 MS

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



TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III

24-SEP-96

TRC INC.

TEST NO: 192C33TH2

572E SN 192 H.S.THORAX CAL 33

TEST PARAMETER	HIGH SPEED TEST	TEST RESULTS
	SPECIFICATION	
TEMPERATURE	20.6-22.2 DEG. C	20.9 DEG. C
RELATIVE HUMIDITY	10 - 70 %	66.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.65 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	64.1 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5657. N
INTERNAL HYSTERESIS	69% - 85%	73.5%

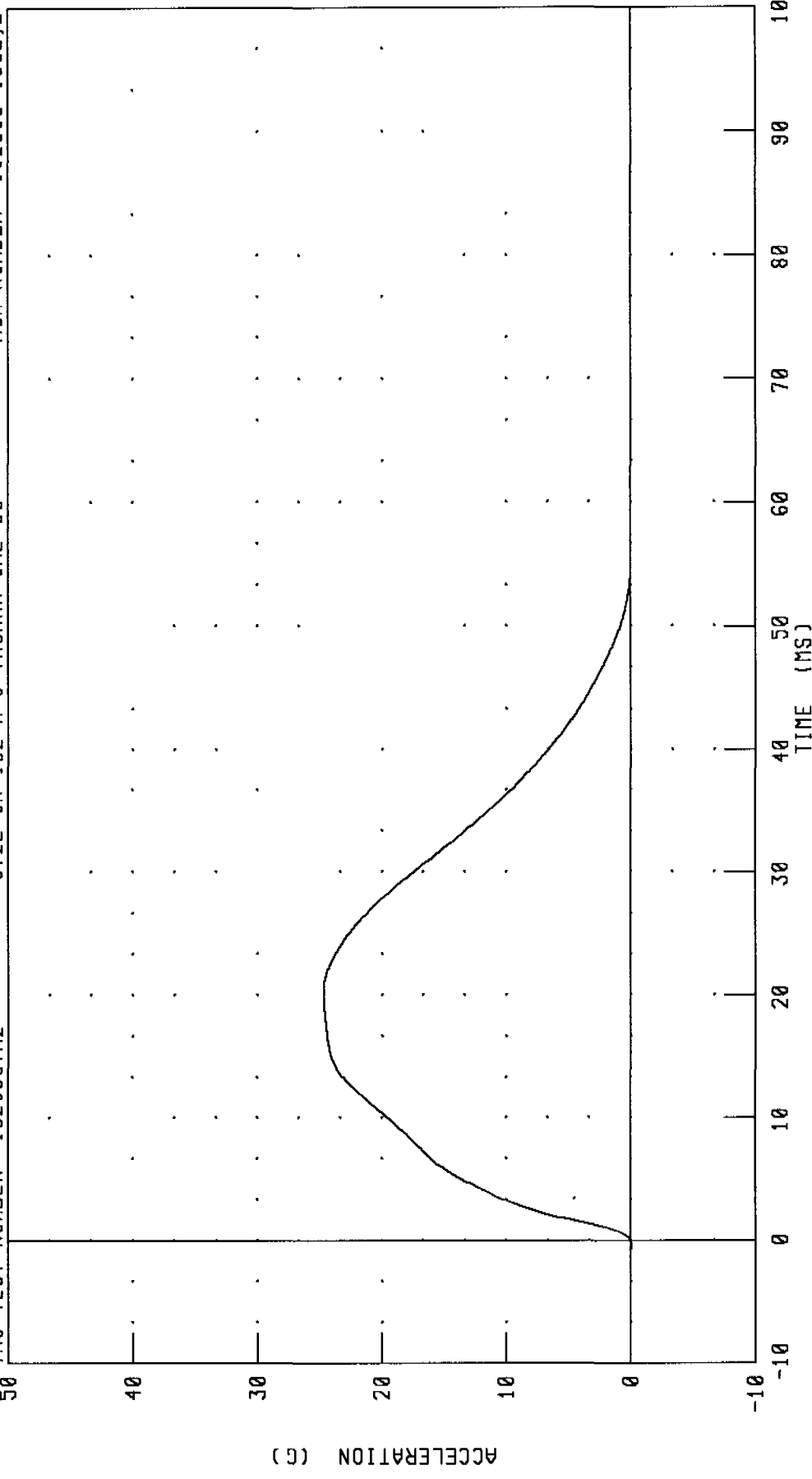
TEST MEETS SPECIFICATIONS

TECHNICIAN Richard L. Van

RUN NUMBER: 092496.1042;2

PART 572-E HYBRID III THORAX CALIBRATION PENDULUM DECELERATION

TRC TEST NUMBER 192C33TH2 572E SN 192 H S THORAX CAL 33 RUN NUMBER 102596 1552,2



CHANNEL PENXG FILTER CH CLASS 180 PEAK DATA 24 70 G 0 20 24 MS, -0 03 G 0 -0 40 MS

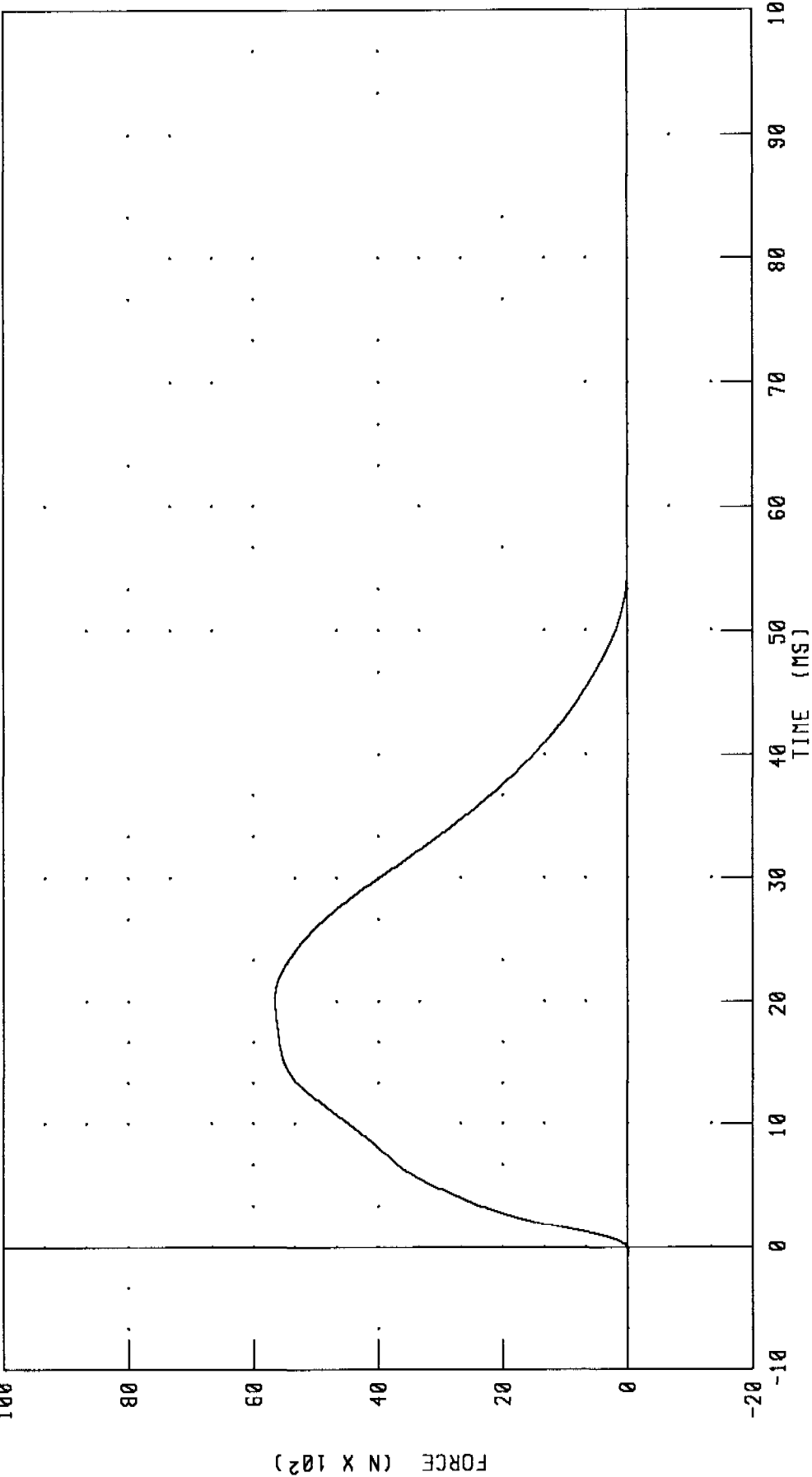
PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM FORCE

TRC TEST NUMBER 192C33TH2

572E SN 192 H S THORAX CAL 33

RUN NUMBER 102596 1552,2



CHANNEL PENXF FILTER CH CLASS 180

PEAK DATA 5657 55 N @ 20 24 MS, -7 14 N @ -0 40 MS

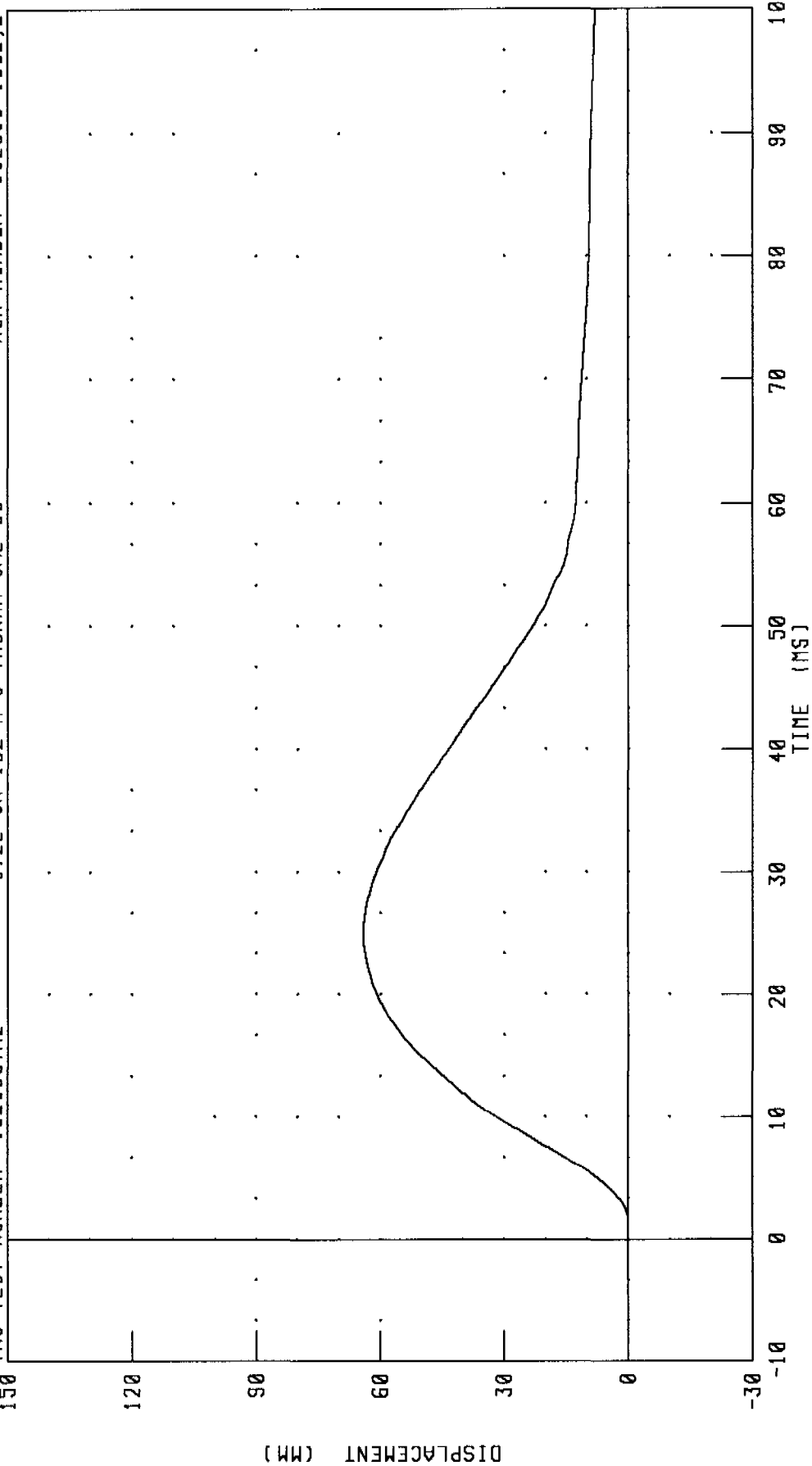
PART 572-E HYBRID III THORAX CALIBRATION

STERNUM DISPLACEMENT

TRC TEST NUMBER 192C33TH2

572E SN 192 H S THORAX CAL 33

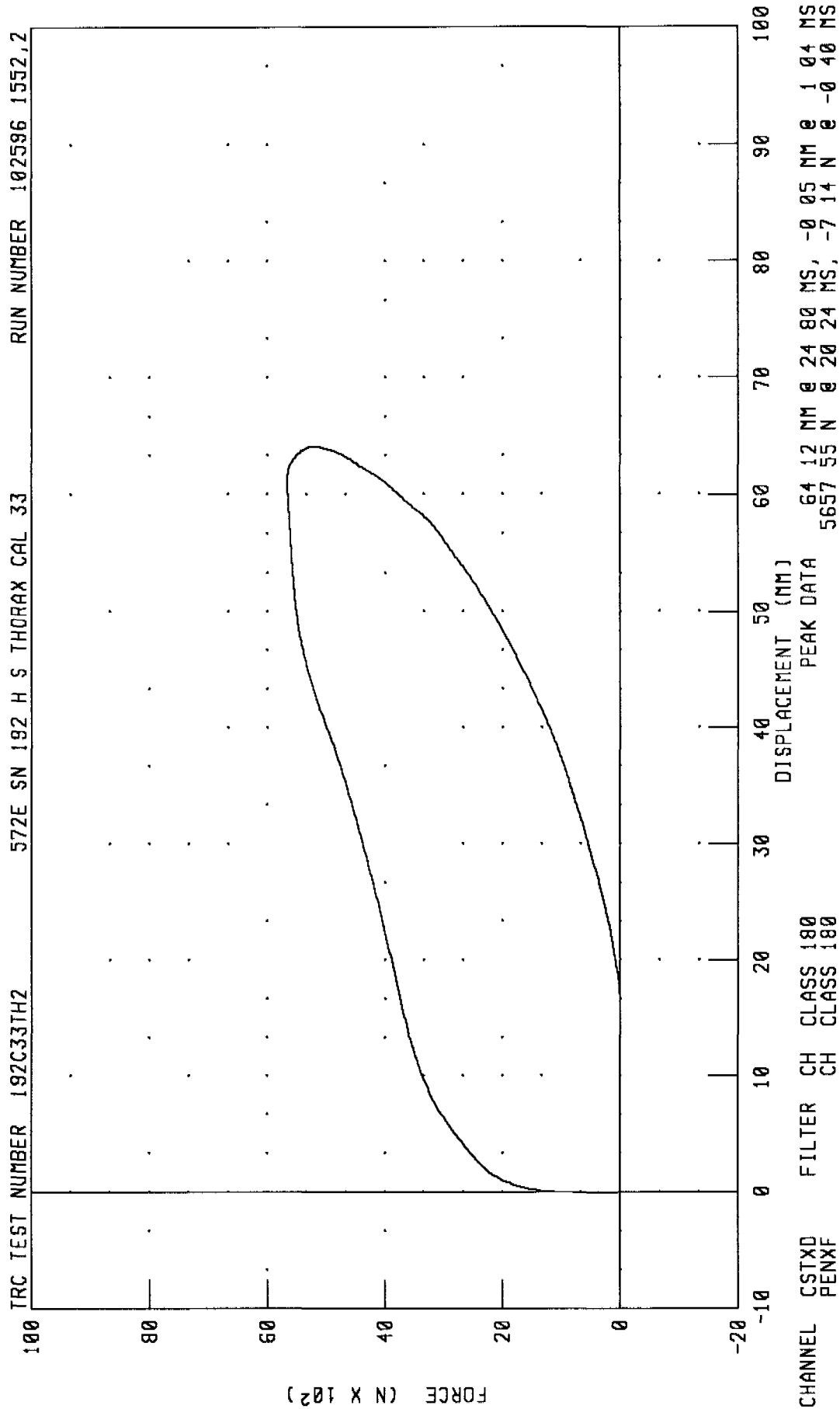
RUN NUMBER 102596 1552,2



CHANNEL CSTXD FILTER CH CLASS 180

PEAK DATA 64 12 MM @ 24 80 MS, -0 05 MM @ 1 04 MS

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



TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

HYBRID III

03-SEP-96

TRC INC.

TEST NO: 192C33RK1

572E SN192 RIGHT KNEE CAL 33

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	62.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.11 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5457.9 N

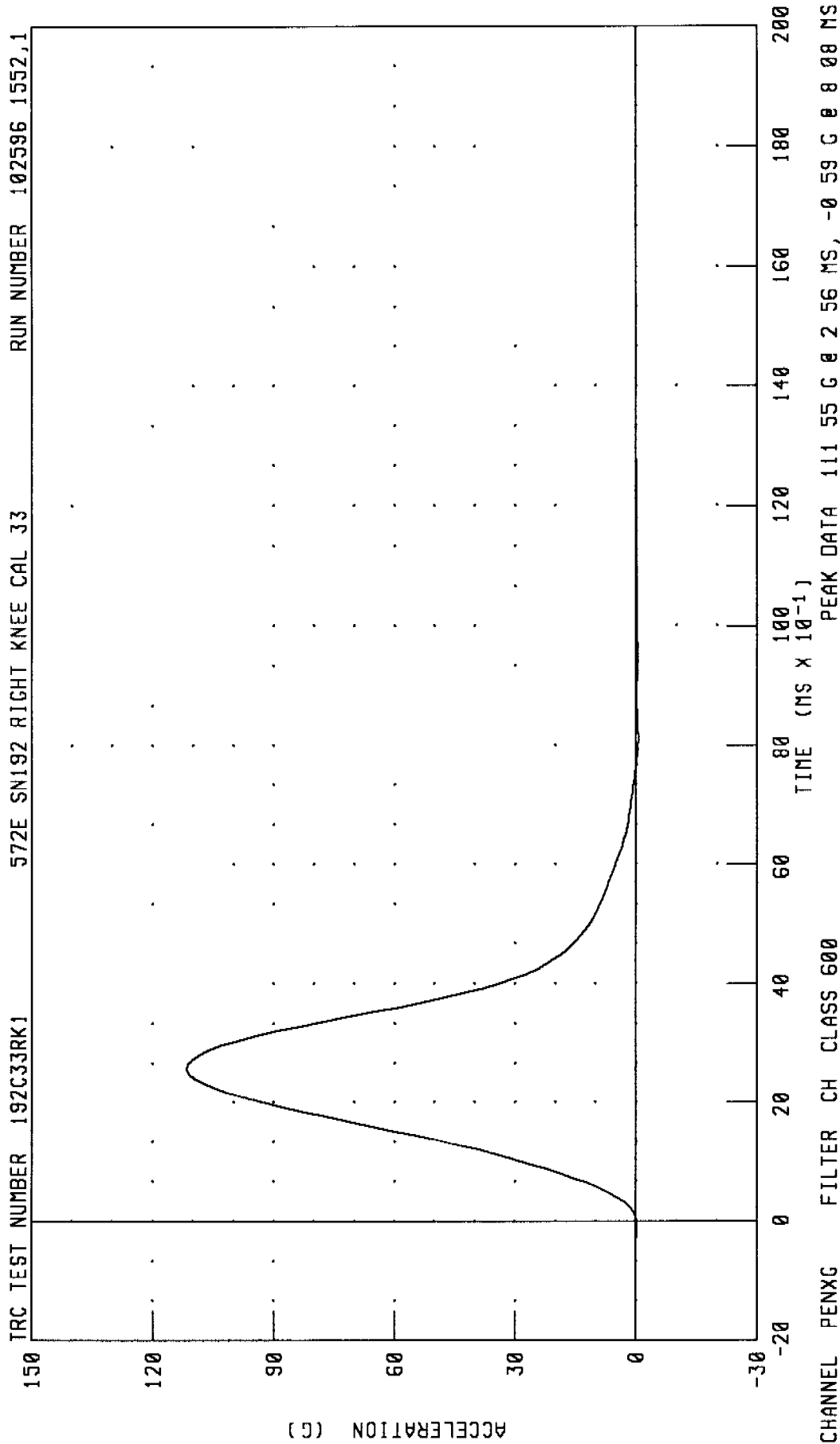
TEST MEETS SPECIFICATIONS

TECHNICIAN

Richard L. Van

RUN NUMBER: 090396.1359;1

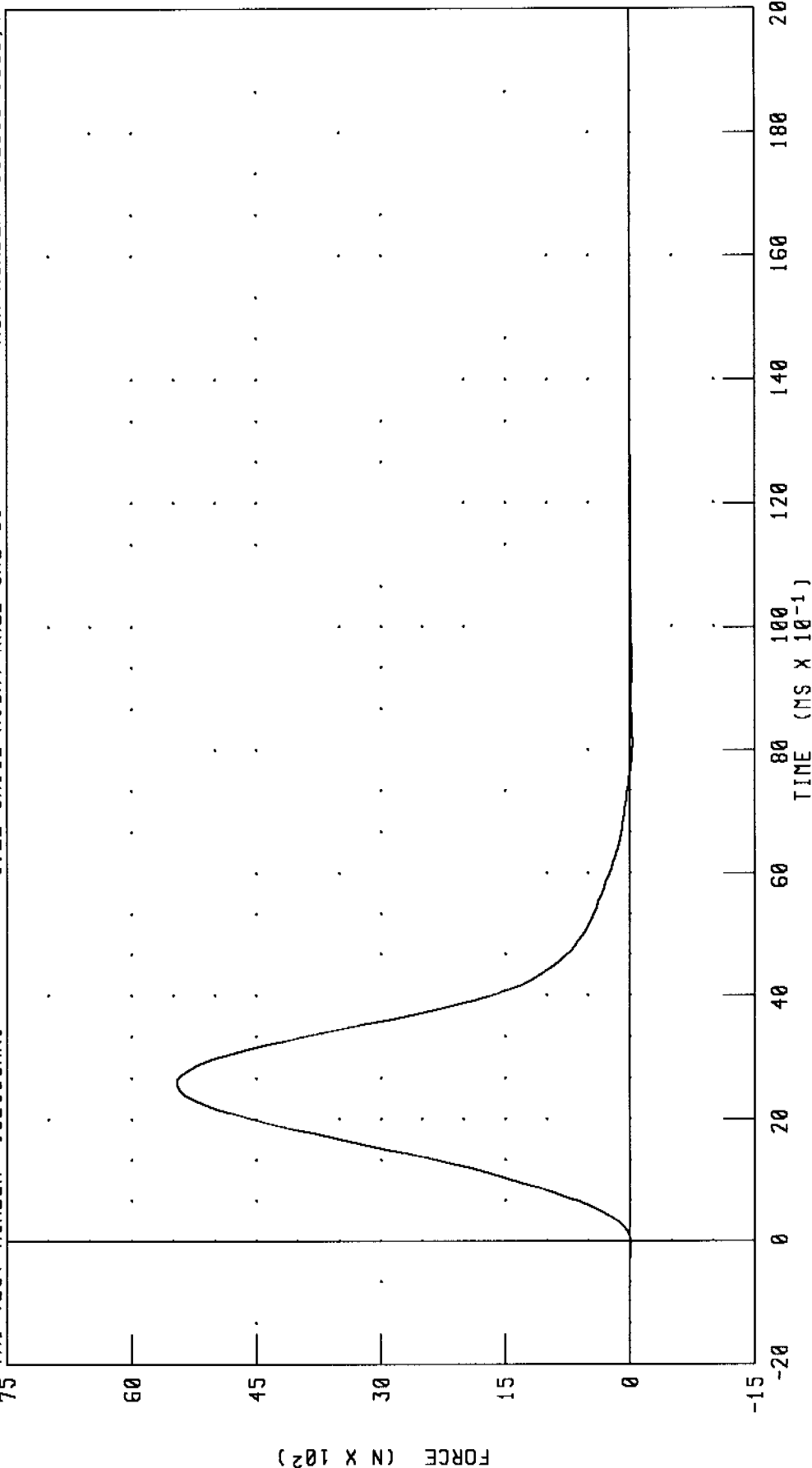
PART 572-E HYBRID III RIGHT KNEE CALIBRATION
 PENDULUM DECELERATION (5 KG PEND)



PART 572-E HYBRID III RIGHT KNEE CALIBRATION

PENDULUM FORCE (5 KG PEND)

TRC TEST NUMBER 192C33RK1 572E SN192 RIGHT KNEE CAL 33 RUN NUMBER 102596 1552,1



CHANNEL PENXF FILTER CH CLASS 600

PEAK DATA 5457 91 N @ 2 56 MS, -28 91 N @ 8 08 MS

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

HYBRID III

03-SEP-96

TRC INC.

TEST NO: 192C33LK1

572E SN192 LEFT KNEE CAL 33

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	62.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.10 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5287.0 N

TEST MEETS SPECIFICATIONS

TECHNICIAN

Richard L. Van

RUN NUMBER: 090396.1355;1

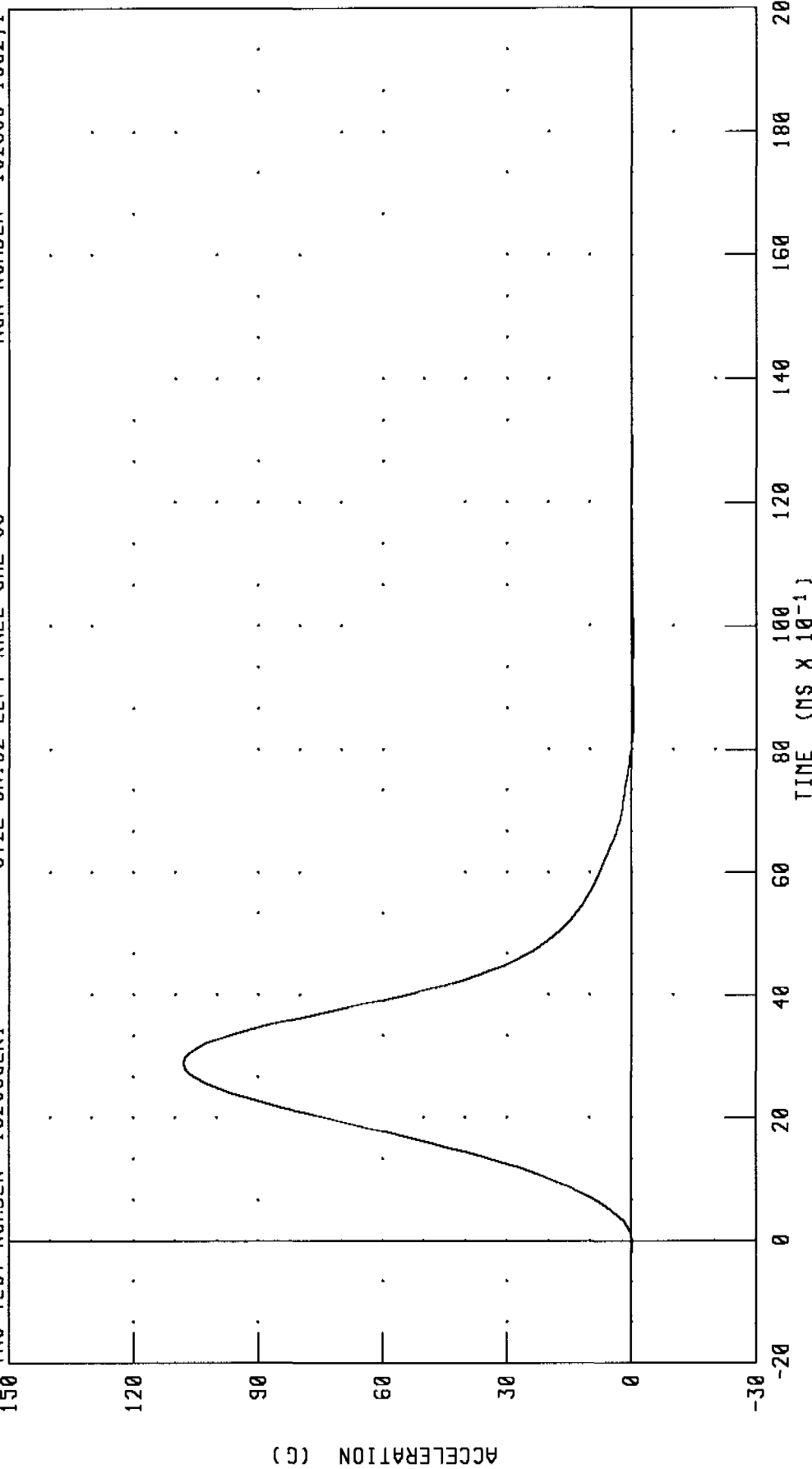
PART 572-E HYBRID III LEFT KNEE CALIBRATION

PENDULUM DECELERATION (5 KG PEND)

TRC TEST NUMBER 192C33LK1

572E SN192 LEFT KNEE CAL 33

RUN NUMBER 102596 1552,1



CHANNEL PENXG FILTER CH CLASS 600

PEAK DATA 108 06 G @ 2 88 MS, -0 52 G @ 8 48 MS

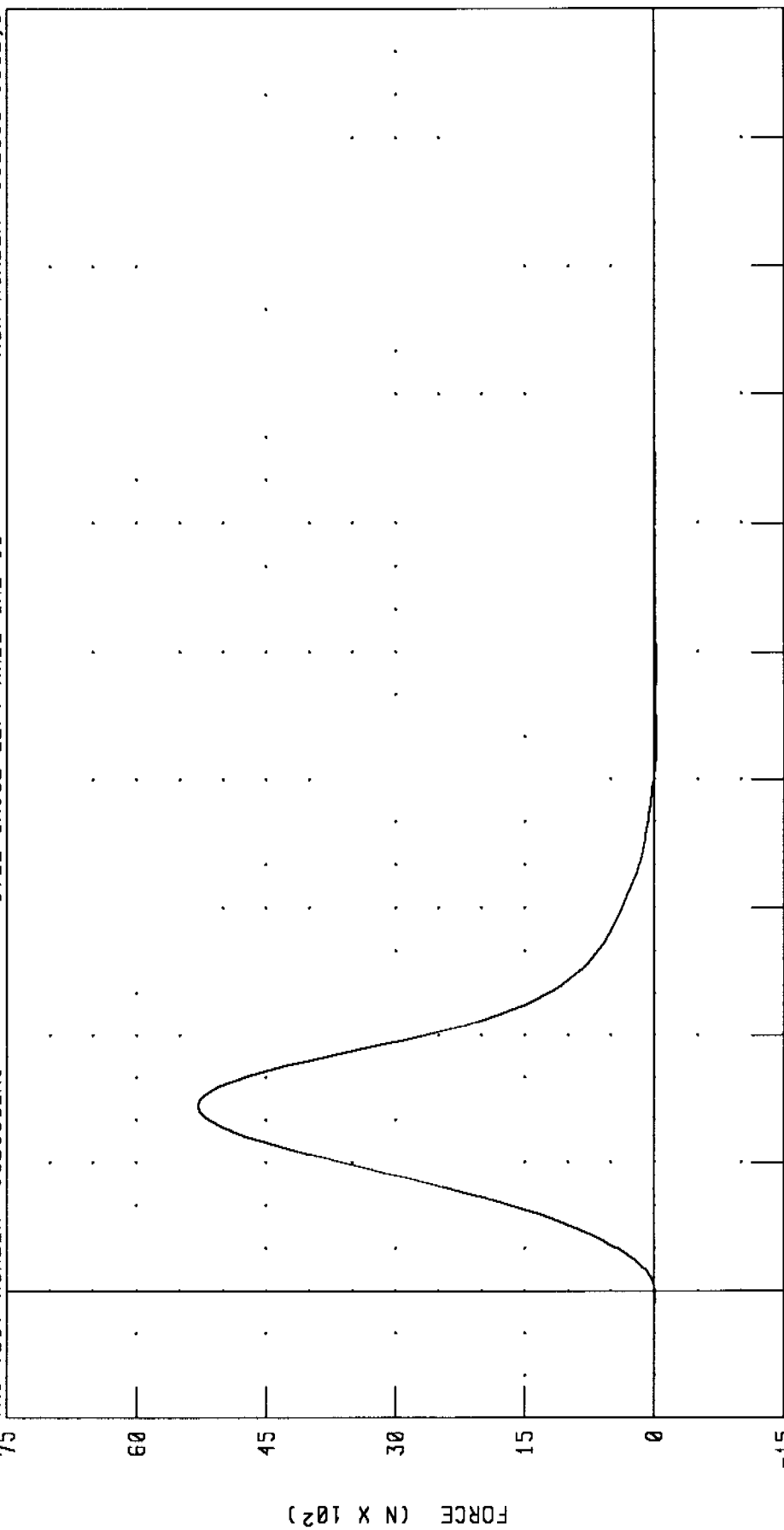
PART 572-E HYBRID III LEFT KNEE CALIBRATION

PENDULUM FORCE (5 KC PEND)

TRC TEST NUMBER 192C33LK1

572E SN192 LEFT KNEE CAL 33

RUN NUMBER 102596 1552,1



TIME (MS X 10⁻¹)

CHANNEL PENXF FILTER CH CLASS 600

PEAK DATA 5287 03 N @ 2 88 MS, -25 30 N @ 8 48 MS

Appendix D

Miscellaneous Test Information

Sign Convention
NHTSA Data Tape Reference Guide

Accelerometers:

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

Potentiometers

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

Load cells:

+Femur force: Tension
+Seat belt force: Tension
+Impactor force: Tension

Neck load cells:

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

Tibia load cells:

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

Frequency Response Classes

SAE J211 OCT88

<u>Typical Test Measurements</u>	<u>Channel Class</u>
Vehicle Structural Accelerations for use in:	
Total vehicle comparison	60
Collision simulation input	60
Component analysis	600
Integration for velocity or displacement	180
Impactor 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



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