V2432

Report Numbers: TRC-95-V005

Rear Impact Full-Scale Crash Testing for Upgrade of FMVSS 301 Test Procedure

Deformable Impactor into Rear of
1996 Suzuki Sidekick
at 80 kph with 70% Right Side Overlap
TRC Test Number: 960314

Prepared by:
Transportation Research Center Inc.
10820 State Route 347
East Liberty, OH 43319

April 11, 1996
Final Report

Prepared for:
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This Final Test Report was prepared for the U.S. Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTRS57-95-C-00011.

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15. Supplemental Notes

16. Abstract

An 80 kph deformable impactor rear crash test with 70% overlap was conducted on a 1996 Suzuki Sidekick at Transportation Research Center Inc. on March 14, 1996. This test was conducted to determine vehicle and occupant response in the rear 70% right side overlap test mode. The test vehicle's weight was 1370 kg. The impactor's velocity was 81.6 kph. The impactor's weight was 1344 kg. The vehicle's maximum crush was 828 millimeters. The ambient temperature was 17° C.

The driver's Head Injury Criteria (HIC) was 389. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 39.5 g. The driver's chest maximum deflection was 3 mm. The driver's left and right femur maximum axial forces were 2168 N and 1664 N, respectively.

The passenger's HIC was 569. The passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 39.7 g. The passenger's chest maximum deflection was 7 mm. The passenger's left and right femur maximum axial forces were 2409 N and 1759 N, respectively.

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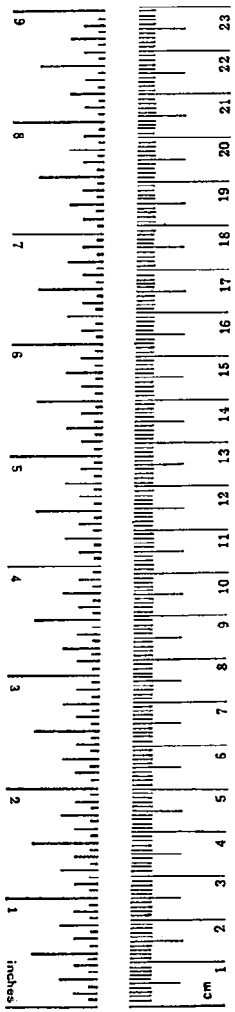
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

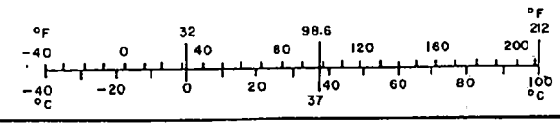
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2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

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



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
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 80 kph rear impact with 70% right side overlap test mode. The test was performed on a 1996 Suzuki Sidekick 2-door multipurpose passenger vehicle (mpv).

Test Procedure

This test was conducted per Contract No. DTRS57-95-C-00011, Technical Task Directive No. 1, "Rear Impact Full-Scale Crash Testing for Upgrade of FMVSS 301 Test Procedure."

The test vehicle was instrumented with nine (9) accelerometers to measure longitudinal axis accelerations.

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 a three-point unibelt.

The deformable impactor was instrumented with five (5) force load cells to measure longitudinal axis forces on the barrier face. The deformable barrier face was positioned 229 mm from ground level.

The impactor's specified velocity range was 80.1 to 81.8 kph.

Both dummies were instrumented with head center of gravity and Position 1, 2, and 3 accelerometers to measure longitudinal, lateral, and vertical accelerations; neck upper and lower 6-axis load cells to measure longitudinal, lateral, and vertical force and moments; chest and pelvis accelerometers to measure longitudinal, lateral, and vertical axis accelerations; and with left and right femur load cells to measure axial forces. Each Part 572 E dummy's instrumentation also included a chest potentiometer to measure longitudinal deflection. The driver dummy's lap and shoulder belt were each instrumented with a load cell.

The seventy-six (76) 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 thirteen (13) high-speed motion picture cameras.

The vehicle and occupant data are summarized in Section 2.0. The FMVSS 301 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

Rear Deformable Barrier Impact Test Summary

Test Results Summary

This 80 kph rear crash test with 70% right side overlap was conducted at TRC on March 14, 1996.

The test vehicle, a 1996 Suzuki Sidekick 2-door mpv, was equipped with airbags and three-point unibelts at the driver's and right front passenger's seating positions. The vehicle's test weight was 1370 kg. The vehicle's maximum static crush was 828 mm.

The driver's HIC was 389. The driver's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 39.5 g. The driver's chest maximum deflection was 3 mm. The driver's left and right femur maximum compressive forces were 2168 N and 1664 N, respectively.

The right front passenger's HIC was 569. The right front passenger's chest maximum resultant acceleration with three (3) milliseconds minimum duration was 39.7 g. The right front passenger's chest maximum deflection was 7 mm. The right front passenger's left and right femur maximum compressive forces were 2409 N and 1759 N, respectively.

A large amount of fuel system spillage occurred at impact and continued for the next thirty minutes immediately following the impact. The static rollover test was not conducted.

Data Acquisition Explanations

The following data channels recorded a questionable data spike at 190 milliseconds:

NEKZF2 - right front passenger upper neck Z-axis axial force load cell

NEKYM2 - right front passenger upper neck moment about Y-axis load cell

NKLXF2 - right front passenger lower neck X-axis shear force load cell

NKLYF2 - right front passenger lower neck Y-axis shear force load cell

NKLZF2 - right front passenger lower neck Z-axis axial force load cell

NKLXM2 - right front passenger lower neck moment about X-axis load cell

NKLYM2 - right front passenger lower neck moment about Y-axis load cell

NKLZM2 - right front passenger lower neck moment about Z-axis load cell

LFMF2 - right front passenger left femur Z-axis axial force load cell

RFMF2 - right front passenger left femur Z-axis axial force load cell

The rear package shelf X-axis accelerometer, TCRXG, exceeded the data channel's full scale limit at 12 milliseconds.

Table 1 Crash Test Summary

Test type:	80 kph rear impact with 70% right side overlap
Test date:	03/14/96
Test time:	1407
Ambient temperature at impact area:	17° C
Vehicle year/make/ model/body style:	1996/Suzuki/Sidekick/2-door mpv
Vehicle test weight:	1370 kg
Impact angle[1]:	180°
Impact velocity[2]:	
Primary:	81.6 kph
Secondary[3]:	81.6 kph
Maximum static crush:	828 mm
Number of cameras:	
High-speed:	13
Door opening data:	
Left-front:	Difficult
Right-front:	Difficult

[1] With respect to tow track centerline.
[2] Speed trap measurement (± .08 kph accuracy)
[3] The secondary light trap failed.

Table 1 Crash Test Summary, Cont'd.

Dummies:	Driver #35	Passenger #34
Type:	Part 572 E	Part 572 E
Location:	Left front	Right front
Restraint:	Airbag/3-point unibelt	3-point unibelt
Number of data channels:	30	30
Front seat data:		
Seat track failure:	None	None
Seat back failure:	Seat back deformed	Seat back deformed
Visible dummy contact points:		
Head:	Head restraint and rear seat back	Head restraint and rear seat back
Chest:	None	None
Abdomen:	None	None
Left knee:	Steering wheel	None
Right knee:	Steering wheel	None

Table 2 Test Vehicle Information

Vehicle year/make/ model/body style:	1996/Suzuki/Sidekick/2-door mpv			
Color:	White			
VIN:	2S3TA02COT6400106			
Engine data:				
Placement:	Lateral/transverse			
Cylinders:	4			
Displacement:	1.6 liters			
Transmission data:	_5_speed,	_X_manual,	__automatic,	__overdrive
Final drive:	__fwd,	__rwd,	_X_4wd	
Date vehicle received:	02/29/96			
Odometer reading:	72			
Dealer's name and address:	Columbus Auto Group, Inc. DBA Eastside Suzuki Inc. 5880 Scarborough Blvd. Columbust, OH 43232-4746			

Accessories:

Power steering	Yes	Automatic transmission	No
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	No
Radio	No	Anti-skid brake	No
Clock	No	Rear window defroster	No
Power door locks	No		

Certification data from vehicle's label:

Vehicle manufactured by:		CAMI-Automotive, Inc.
Date of manufacture:		07/95
VIN:		2S3TA02COT6400106
GVWR:		1499 kg
GAWR:	Front:	710 kg
	Rear:	900 kg

Table 2 Test Vehicle Information, Cont'd.

Size of tires on vehicle:	P205/75R15
Spare tire:	P205/75R15
Type of front seats:	Bucket

Tire & capacity data from vehicle's label:

Recommended tire size:	P205/75R15
Recommended cold tire pressure:	
Front:	160 kPa
Rear:	160 kPa
Designated Seating Capacity:	
Front	NA
Rear	NA
Total	NA
Vehicle Capacity Weight:	NA

Test vehicle attitudes:

Delivered attitude:	LF: 767 mm	RF: 770 mm	LR: 791 mm	RR: 790 mm
Pre-test attitude:	LF: 732 mm	RF: 736 mm	LR: 777 mm	RR: 769 mm
Post-test attitude:	LF: 731 mm	RF: 753 mm	LR: 839 mm	RR: 1032 mm

Table 2 Test Vehicle Information, Cont'd.

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

Right front	303	kg	Right rear	253	kg
Left front	298	kg	Left rear	251	kg
Total front weight	601	kg	(54.4% of total vehicle weight)		
Total rear weight	504	kg	(45.6% of total vehicle weight)		
Total delivered weight	1105	kg			

Calculation of test vehicle's target test weight:

RCLW = Rated Cargo and Luggage Weight

UDW = Unloaded Delivered Weight (1105 kg)

VCW[1] = Vehicle Capacity Weight = NA

DSC = Designated Seating Capacity (NA)

RCLW = VCW - 150 (DSC) = 136

Target test weight = UDW + RCLW[1] + (Number of Hybrid III dummies x 76 kg per dummy)

Target test weight = 1105 + 136 + 152 = 1393 kg

Weight of test vehicle with required dummies and 113 kg of cargo weight:

Right front	383	kg	Right rear	294	kg
Left front	391	kg	Left rear	302	kg
Total front weight	774	kg	(56.5% of total vehicle weight)		
Total rear weight	596	kg	(43.5% of total vehicle weight)		
Total test weight	1370	kg	(2.0% over target test weight)		

Weight of ballast secured in vehicle cargo area: 0

Components removed to meet target test weight: None

CG rearward of front wheel centerline: 957 mm

Vehicle Wheelbase: 2200 mm

[1] From vehicle's tire load label.

Table 3 Post-Impact Data

Test number:	960314
Test date:	03/14/96
Test time:	1407
Test type:	80 kph rear impact with 70% right side overlap
Impact angle:	180°
Ambient temperature at impact area:	17° C
Temperature in occupant compartment:	20° C

Impact velocity:

Primary:	81.6 kph
Secondary	81.6 kph
Specified range:	78.5 to 81.5 kph

Distance from vehicle to barrier:

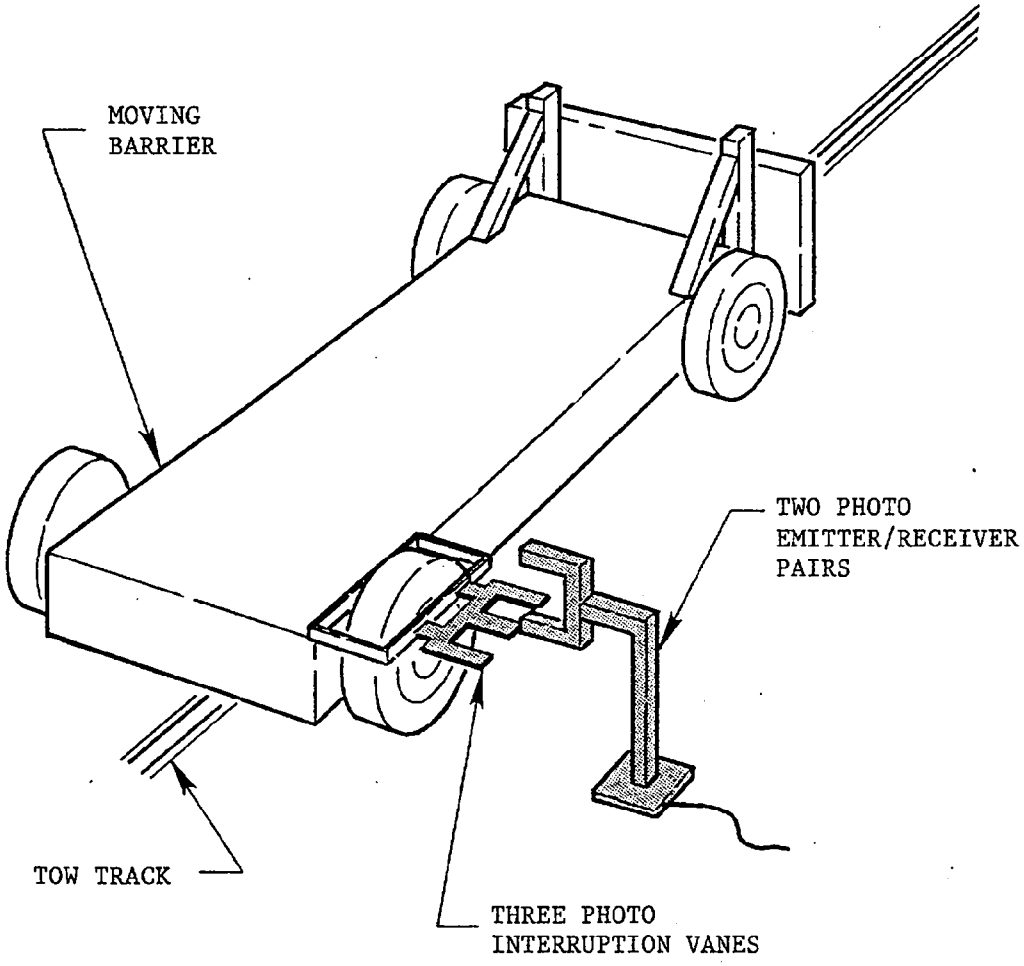
Entering velocity trap:	356 mm
Exiting velocity trap:	51 mm

Test vehicle static crush:

Overall length of test vehicle:

Pre-test:	L:	3510 mm	C:	3558 mm	R:	3512 mm
Post-test:	L:	3285 mm	C:	3002 mm	R:	2668 mm
Total crush:	L:	225 mm	C	556 mm	R:	844 mm
Average crush:	542 mm					

Figure 1 Impact Velocity Measurement System

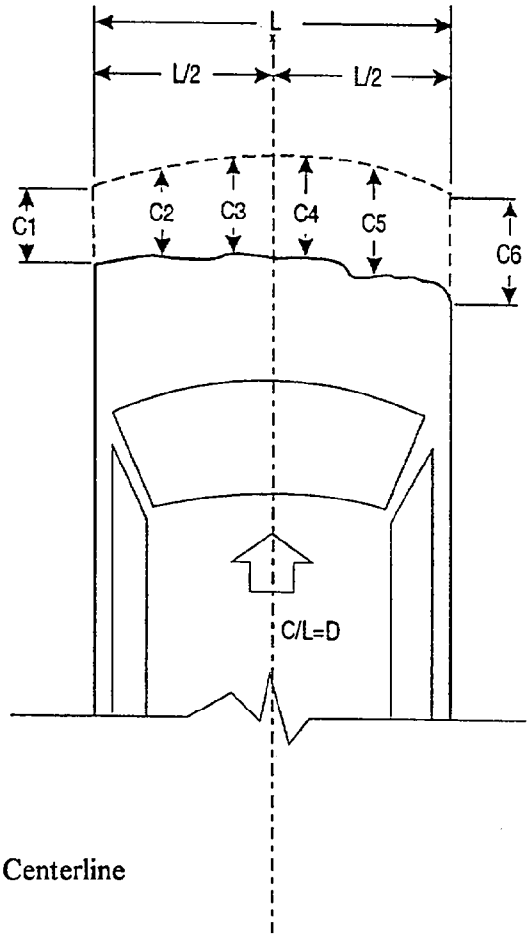


The final vane clears the final emitter/receiver pair 51 millimeters before impact.

The vanes have 305-millimeter spacing.

Figure 2 Accident Investigation Division Data

Test date:	03/14/96
Vehicle year/make/ model/body style:	1996/Suzuki/Sidekick/2-door mpv
VIN:	2S3TA02COT6400106
Build date:	07/95
Test weight:	1370 kg
Vehicle wheelbase:	2200 mm
Maximum width:	1630 mm
Front overhang:	676 mm



Collision Deformation

Classification (CDC) Code: 06BDEW5

Crush depth measurements:	C1: 221 mm
	C2: 358 mm
	C3: 463 mm
	C4: 596 mm
	C5: 718 mm
	C6: 828 mm
Midpoint of damage:	D: Vehicle Longitudinal Centerline
Length of damaged region:	L: 1524 mm

Section 3.0

FMVSS 301 Data

Table 4 Dummy Injury Criteria

Maximum Acceleration

	Head				Chest		
	X	Y	Z	R	X	Y	Z
Driver	54.1 g	15.4 g	-40.8 g	61.0 g	40.3 g	7.5 g	-8.7 g
Passenger	77.8 g	16.0 g	-35.1 g	82.9 g	75.0 g	7.6 g	16.6 g

Maximum Femur Compressive Force

	Left Femur	Right Femur
Driver	2168 N	1664 N
Passenger	2409 N	1759 N

Head Injury Criteria[1]

	HIC	Time t_1	Time t_2
Driver	389	78.7 ms	104.6 ms
Passenger	569	72.1 ms	90.2 ms

Head Maximum Resultant Acceleration[2]

	Acceleration	Time t_1	Time t_2
Driver	60.4 g	89.4 ms	92.6 ms
Passenger	79.0 g	81.4 ms	84.4 ms

Chest Maximum Resultant Acceleration[2]

	Acceleration	Time t_1	Time t_2
Driver	39.5 g	64.0 ms	68.4 ms
Passenger	39.7 g	45.2 ms	48.1 ms

Maximum Chest Deflection

Driver	3 mm
Passenger	7 mm

[1] As defined in FMVSS No. 208

[2] Defined as equal to or exceeding 0.003 sec. duration

Table 5 Fuel System Data

Vehicle year/make/model/body style:	1996/Suzuki/Sidekick/2-door mpv
Fuel system capacity:	42.0 (from owner's manual)
Usable capacity:	41.6 liters (furnished by COTR)
Test volume range:	38.3 liters to 39.1 liters (92-94% of usable)
Actual test volume:	38.7 liters (with entire fuel system filled)
Test fluid type:	Stoddard solvent
Specific gravity:	0.764
Kinematic viscosity:	0.99 centistoke
Test fluid color:	purple
Type of fuel pump:	electric
Does the electric fuel pump operate with ignition switch "on" and the engine not operating.	No
Details of fuel system:	The fuel tank is located behind the rear axle. The fuel filler neck is located on the right side. The fuel lines run along the right side to the front.

Table 6 FMVSS 301 Post-Impact Test Data

Test date: 03/14/96

Vehicle year/make/model/body style: 1996/Suzuki/Sidekick/2-door mpv

Test requirements:

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

Test vehicle impact type:

____ Frontal (48 kph)

____ Oblique (48 kph) with __° barrier face first contacting (driver's/passenger's) side

__X__ Rear moving barrier (80 kph)

____ Lateral moving barrier (32 kph)

Fuel system fluid spillage measurements:

		Test Results	Maximum Allowable
1.	From impact until vehicle motion ceases	See Note[1]	28 g
2.	5-Minute period after vehicle motion ceases	2674 g	140 g
3.	Next 25 minutes after 5-minute period	7349 g	28 g/1 min

Fuel system fluid spillage location(s): Fuel tank

[1] A large amount of fuel system fluid occurred from the time of impact until motion ceased.

Section 4.0

Vehicle, Moving Deformable Barrier, Occupant, and Camera Measurements

Figure 3 Pre-test and Post-test Measurement Points

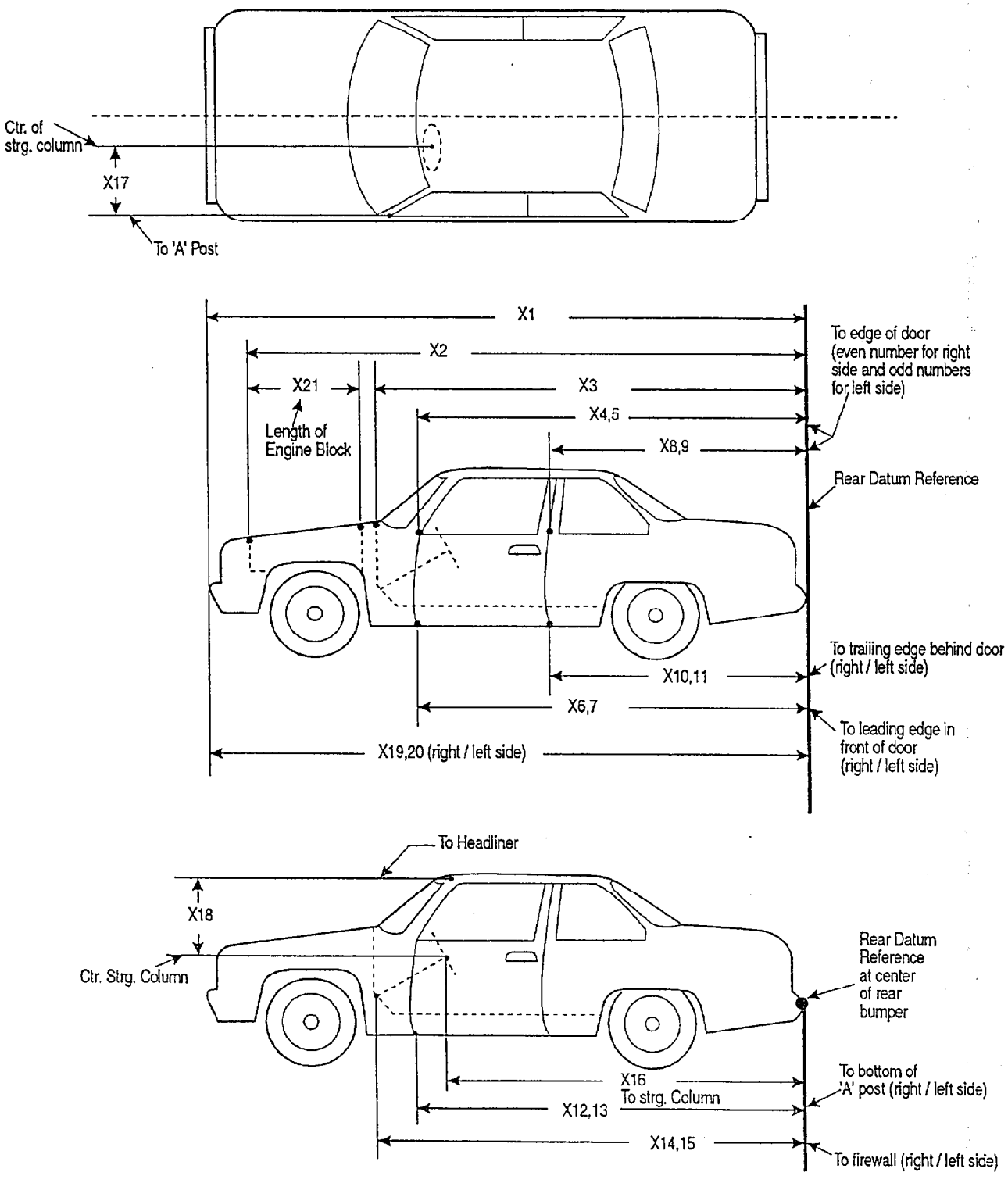


Table 7 Impacted Vehicle Measurements

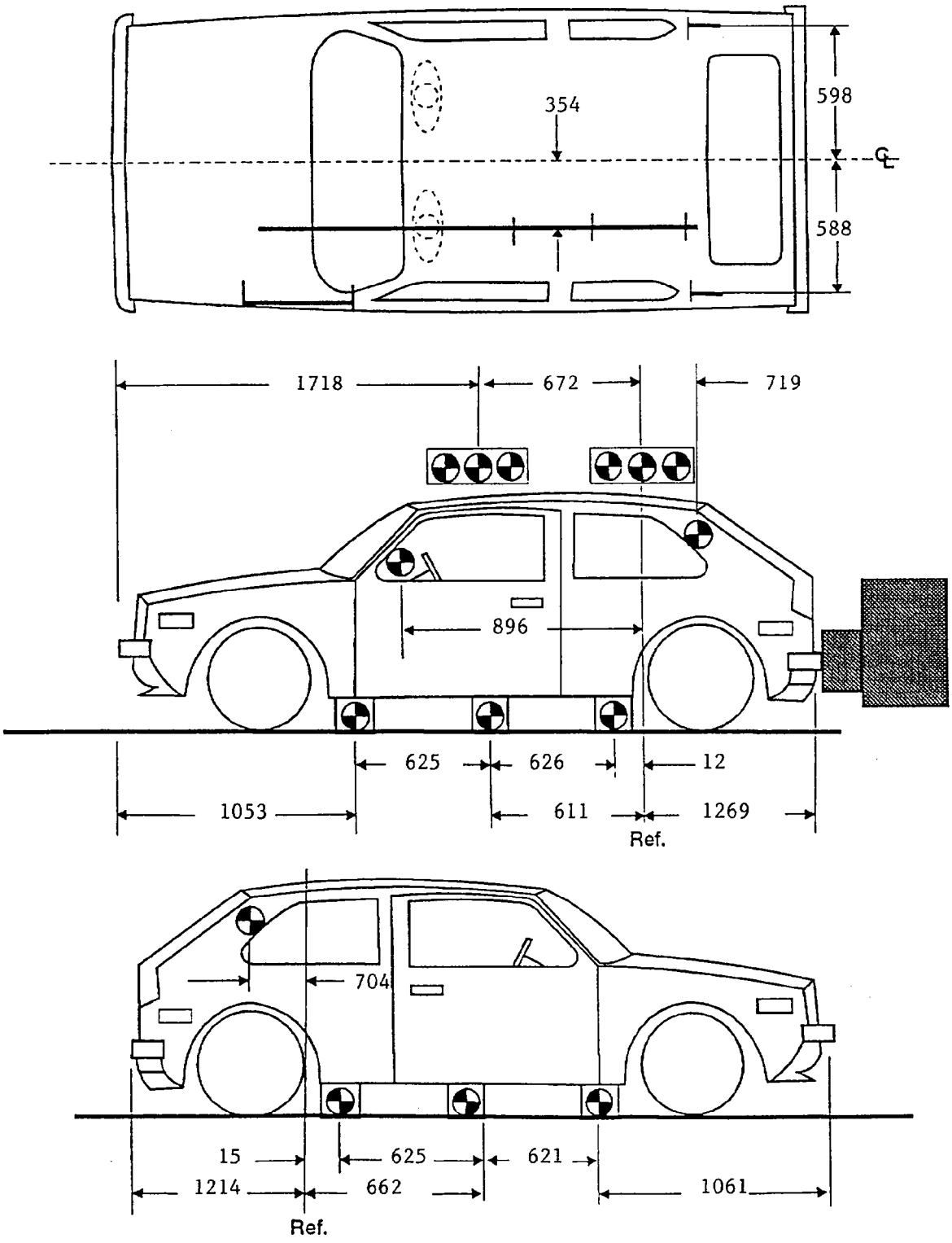
Vehicle year/make/model/body style: 1996/Suzuki/Sidekick/2-door mpv Test Number: 960314

No.	Type of measurement	Pre-test	Post-test	Diff.
X1	Total length of vehicle at centerline	3558 mm	3002 mm	556 mm
X2	Rear surface of vehicle to front of engine block	503 mm	517 mm	-14 mm
X3	Rear surface of vehicle to firewall	1037 mm	1043 mm	-6 mm
X4	Rear surface of vehicle to upper leading edge of right door	1224 mm	1215 mm	9 mm
X5	Rear surface of vehicle to upper leading edge of left door	1221 mm	1220 mm	1 mm
X6	Rear surface of vehicle to lower leading edge of right door	1248 mm	1247 mm	1 mm
X7	Rear surface of vehicle to lower leading edge of left door	1242 mm	1250 mm	-8 mm
X8	Rear surface of vehicle to upper trailing edge of right door	2373 mm	2359 mm	14 mm
X9	Rear surface of vehicle to upper trailing edge of left door	2369 mm	2365 mm	4 mm
X10	Rear surface of vehicle o lower trailing edge of right door	2287 mm	2283 mm	4 mm
X11	Rear surface of vehicle to lower trailing edge of left door	2282 mm	2282 mm	0 mm
X12	Rear surface of vehicle to bottom of "A" post on right side	1255 mm	1265 mm	-10 mm
X13	Rear surface of vehicle to bottom of "A" post on left side	1259 mm	1260 mm	-1 mm
X14	Rear surface of vehicle to firewall - right side	992 mm	993 mm	-1 mm
X15	Rear surface of vehicle to firewall - left side	991 mm	989 mm	2 mm
X16	Rear surface of vehicle to steering wheel center	1615 mm	1615 mm	0 mm
X17	Center of steering column to "A" post	231 mm	231 mm	0 mm
X18	Center of steering column to headliner	522 mm	531 mm	-9 mm
X19	Rear surface of vehicle to right side of front bumper	3512 mm	2668 mm	844 mm
X20	Rear surface of vehicle to left side of front bumper	3510 mm	3285 mm	225 mm
X21	Length of engine block	420 mm	420 mm	0 mm

Table 8 Vehicle Measurements

No.	Description of Measurement	Pre-Test	Post-Test	Difference
X1	Total Length of Vehicle at Centerline	3558	3002	556
X2	Front Surface of Vehicle to Bottom of "A" Post of Right Side	1255	1265	-10
X3	Front Surface of Vehicle to Bottom of "A" Post of Left Side	1259	1260	-1
X4	Front Surface of Vehicle to Right Side of Rear Bumper	3512	2668	844
X5	Front Surface of Vehicle to Left Side of Rear Bumper	3510	3285	225
X6	Right Front Sill to Ground Plane	244	303	-59
X7	Left Front Sill to Ground Plane	246	294	-48
X8	Right Rear Sill to Ground Plane	273	355	-82
X9	Left Rear Sill to Ground Plane	277	347	-70
X10	Wheelbase of Vehicle - Left Side	2200	2122	78
X11	Width of Vehicle at Maximum Width Point	1630	1738	-108
X12	Front Surface of Vehicle to Engine Target	503	517	-14
X13	Front Surface of Vehicle to Compartment Target	1718	1702	16
X14	Front Surface of Vehicle to Rear Bumper Target	3478	2944	534
X15	Wheelbase of Vehicle - Right Side	2200	1888	312

Figure 4 Vehicle Target Locations



(Dimensions in Millimeters)

Table 9 Test Vehicle Rear Profile Data

X-axis measurements referenced to a plane 430 millimeters forward of the front bumper support brackets. Y-axis measurements are left and right of the original vehicle centerline. Y-axis measurements (6 points) should divide the width of the car and be clearly indicated on the form. Z-axis (height) measurements are from the ground.

Pre-Test Profile

		Vehicle Left			Vehicle Right		
		pt. 1	pt. 2	pt. 3	pt. 4	pt. 5	pt. 6
Bottom of rear bumper	X	3904	3922	3922	3924	3920	3891
	Y	751	455	150	141	480	748
	Z	467	468	462	458	470	462
Top of rear bumper	X	3915	3951	3946	3954	3953	3924
	Y	764	455	148	148	453	752
	Z	644	633	633	633	640	644
Center of trunk	X	3824	3826	3839	3821	3837	3831
	Y	648	456	221	174	423	626
	Z	864	860	845	880	864	869

Post-Test Profile

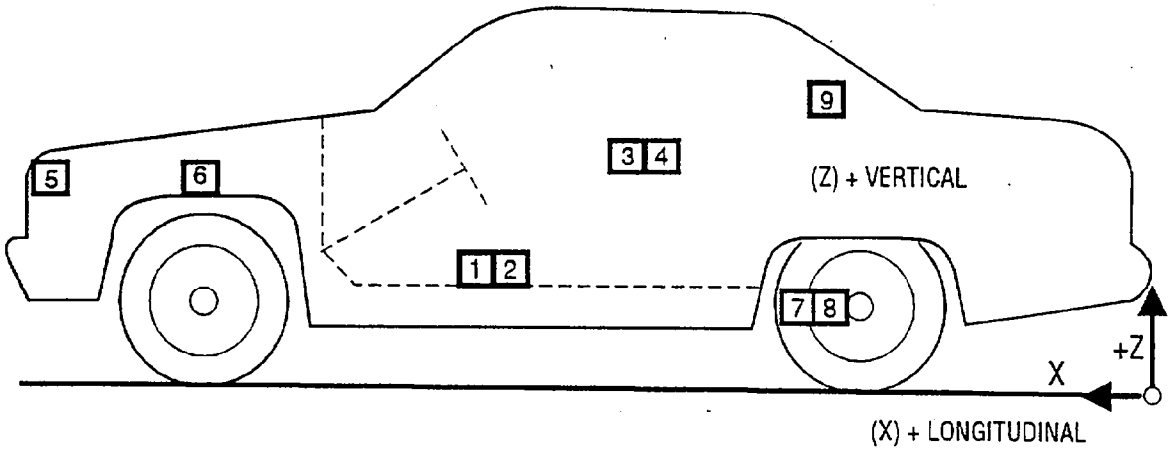
		Vehicle Left			Vehicle Right		
		pt. 1	pt. 2	pt. 3	pt. 4	pt. 5	pt. 6
Bottom of rear bumper	X	3704	3549	3435	3357	3199	3065
	Y	740	448	150	140	480	720
	Z	410	453	482	493	538	580
Top of rear bumper	X	3694	3593	3483	3358	3235	3096
	Y	760	450	145	150	455	753
	Z	595	621	653	677	700	748
Center of trunk	X	3629	3530	3408	3383	3346	3359
	Y	584	383	185	205	430	627
	Z	756	837	962	951	776	702

Table 9 Test Vehicle Rear Profile Data, Cont'd.

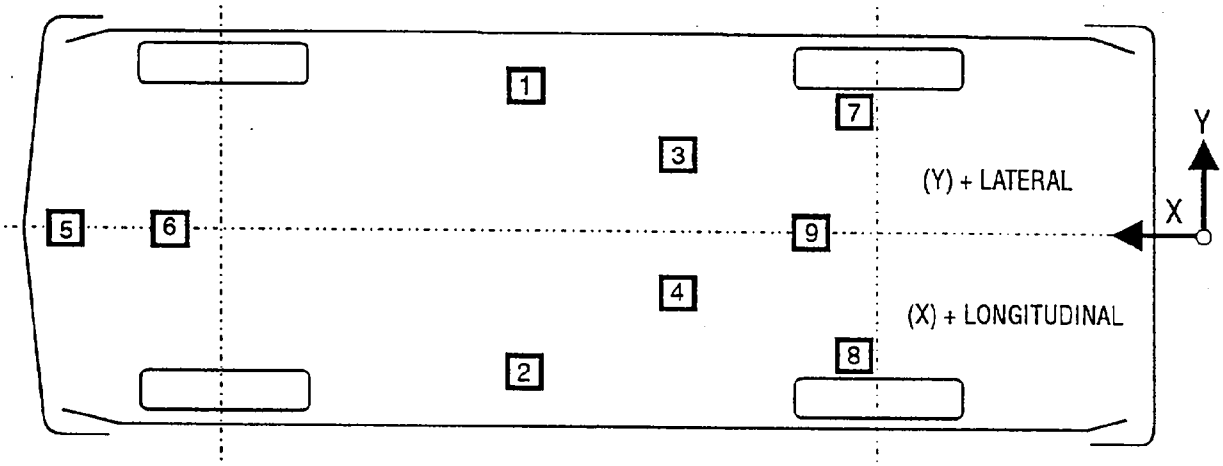
		Change					
		Vehicle Left			Vehicle Right		
		pt. 1	pt. 2	pt. 3	pt. 4	pt. 5	pt. 6
Bottom of rear bumper	X	200	373	487	567	721	826
	Y	-11	-7	0	1	0	28
	Z	-57	-15	20	35	68	118
Top of rear bumper	X	221	358	463	596	718	828
	Y	-4	-5	-3	-2	-2	-1
	Z	-49	-12	20	44	60	104
Center of trunk	X	195	296	431	438	491	472
	Y	-64	-73	-36	31	7	1
	Z	-108	-23	117	71	88	167

+X: Rearward from a reference plane 430 mm forward of the vehicle front bumper
+Y: Left from vehicle longitudinal centerline
+Z: Up from ground

Figure 5 Vehicle Accelerometer Mounting Locations



SIDE VIEW



BOTTOM VIEW

Table 10 Pre- and Post-Test Position of Vehicle Accelerometer Mounting Locations

Accelerometer Description		X, Y, Z Location[1]		
		X	Y	Z
Left front seat outboard mounting rail	Pre	1863 mm	615 mm	438 mm
	Post	1855 mm	615 mm	440 mm
	Change	8 mm	0 mm	2 mm
Right front seat outboard mounting rail	Pre	1852 mm	-615 mm	435 mm
	Post	1841 mm	-615 mm	450 mm
	Change	11 mm	0 mm	15 mm
Left front seat back (mid-point of seat)	Pre	2307 mm	354 mm	980 mm
	Post	2230 mm	354 mm	1150 mm
	Change	77 mm	0 mm	170 mm
Right front seat back (mid-point of seat)	Pre	2308 mm	-354 mm	987 mm
	Post	2200 mm	-354 mm	1100 mm
	Change	108 mm	0 mm	113 mm
Radiator support	Pre	280 mm	-50 mm	878 mm
	Post	270 mm	-50 mm	895 mm
	Change	10 mm	0 mm	17 mm
Top of engine	Pre	607 mm	-12 mm	865 mm
	Post	616 mm	-12 mm	960 mm
	Change	-9 mm	0 mm	95 mm
Left rear wheel axle	Pre	2830 mm	360 mm	320 mm
	Post	2750 mm	395 mm	276 mm
	Change	80 mm	35 mm	-44 mm
Right rear wheel axle	Pre	2836 mm	-395 mm	320 mm
	Post	2640 mm	-395 mm	231 mm
	Change	196 mm	0 mm	-89 mm
Rear package shelf (top of rear seat back)	Pre	3250 mm	0 mm	675 mm
	Post	2797 mm	20 mm	744 mm
	Change	453 mm	20 mm	69 mm

[1] Reference Point: X - vertical plane at front bumper
Y - vehicle centerline
Z - ground

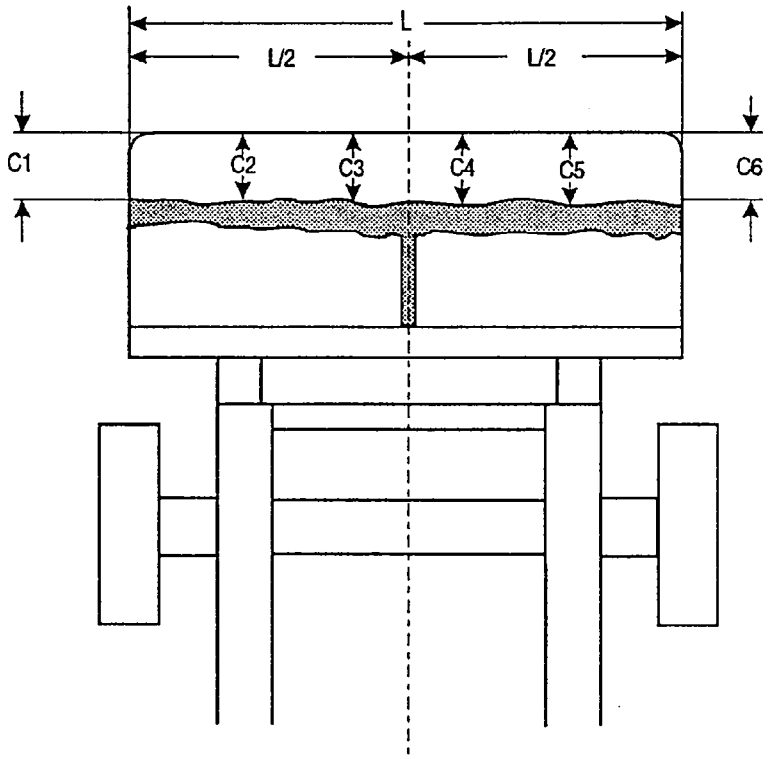
Table 11 Moving Deformable Barrier Face Static Crush

Zero distance at barrier centerline[1]

Location	Height	813	711	610	508	406	305	203	102	0	102	203	305	406	508	610	711	813
Pre-test profile (distance in millimeters from reference plane[2])																		
Top of face	762	330	335	328	330	330	330	328	326	330	330	331	330	328	327	329	330	330
Mid-face	508	331	331	328	330	330	330	329	326	329	330	329	325	327	326	329	330	330
Bumper	381	248	229	228	229	227	228	226	226	228	228	227	224	225	226	228	228	244
Post-test profile (distance in millimeters from reference plane[2])																		
Top of face	762	533	514	500	492	480	464	442	432	433	445	396	358	336	334	334	330	331
Mid-face	508	624	556	549	530	499	475	452	439	404	372	352	329	326	327	327	324	324
Bumper	381	549	495	473	452	428	401	384	386	335	307	282	257	226	197	172	145	142
Static crush (mm)																		
Top of face	762	203	179	172	162	150	134	114	106	103	115	65	28	8	7	5	0	1
Mid-face	508	293	225	221	200	169	145	123	113	75	42	23	4	-1	1	-2	-6	-6
Bumper	381	301	266	245	223	201	173	158	160	107	79	55	33	1	-29	-56	-83	-102

[1] Column readings are left to right across barrier face from left to right.
[2] Reference plane is the rear surface of the deformable barrier face.
All measurements are in millimeters.

Figure 6 Moving Deformable Barrier Face Crush



Notes: L is pre-test length of contact surface.
C1 through C6 are spaced equally apart.
CL is moving barrier centerline.

	Pre-test	Post-test	Crush
L	1676 mm		
C1	248 mm	549 mm	301 mm
C2	229 mm	452 mm	223 mm
C3	226 mm	384 mm	158 mm
C4	227 mm	282 mm	55 mm
C5	226 mm	197 mm	-29 mm
C6	244 mm	142 mm	-102 mm
CL	228 mm	335 mm	107 mm

Figure 7 Dummy Measurement Locations for Front Seat Occupants

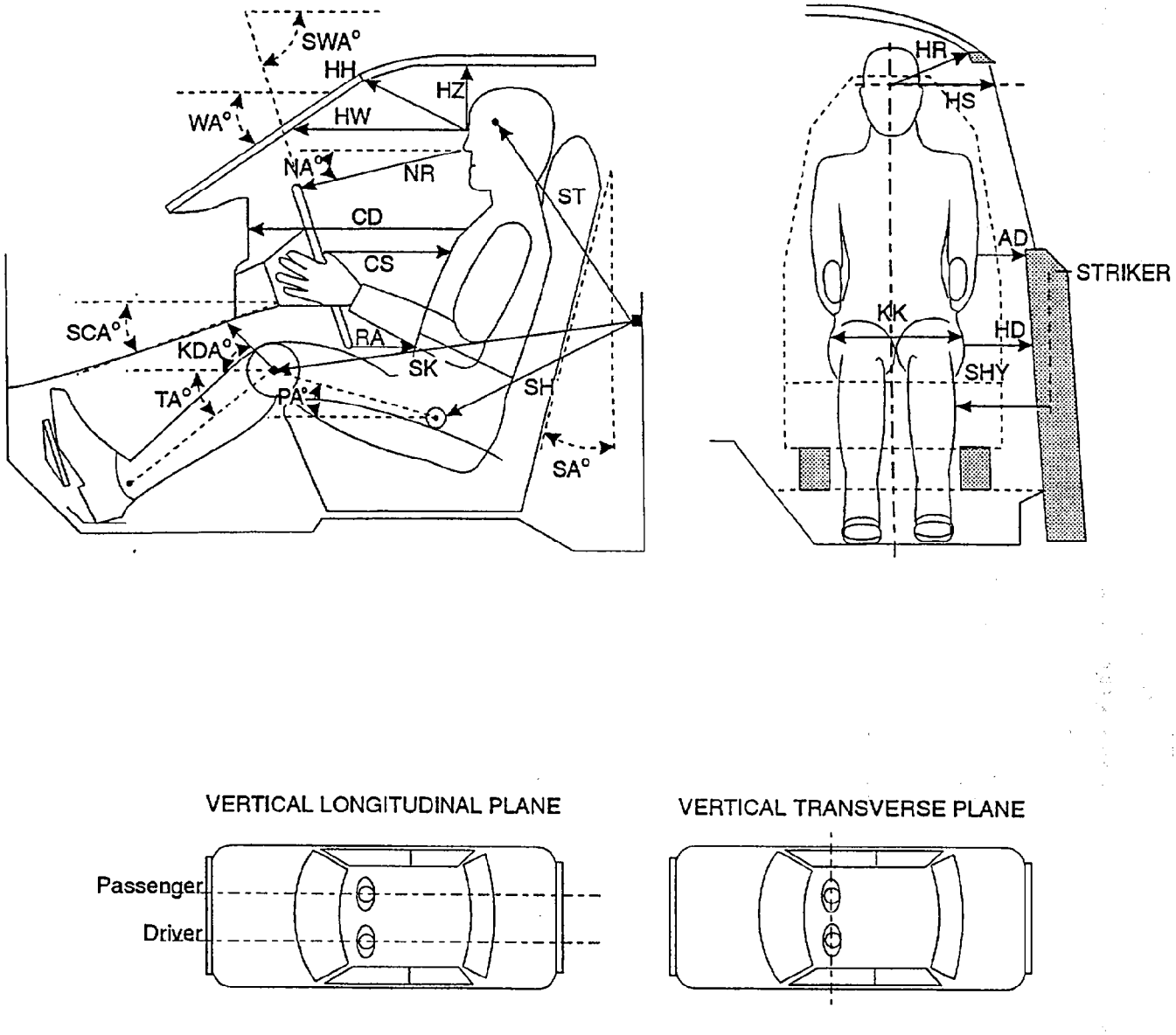
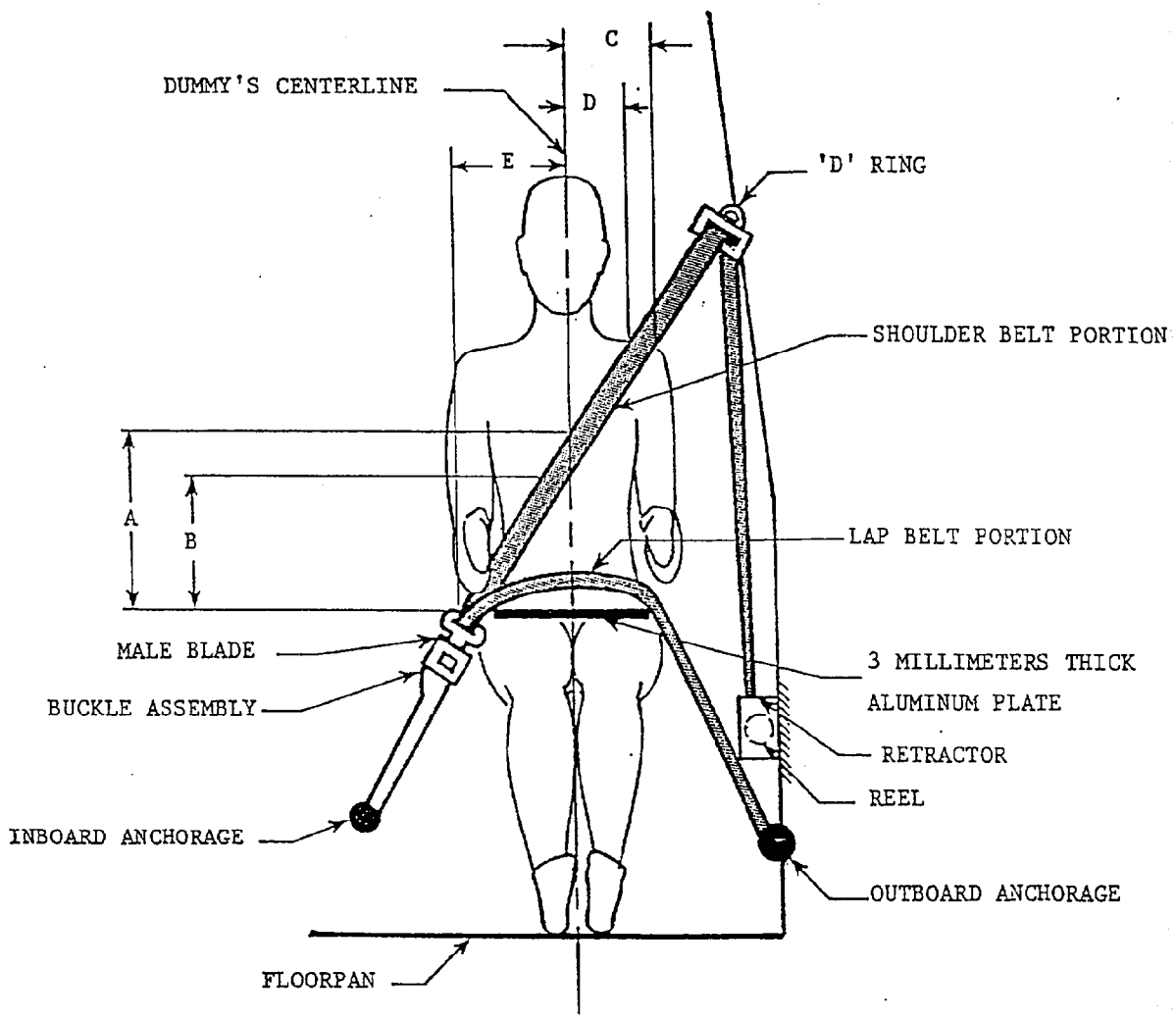


Table 12 Dummy Measurement Data For Front Seat Occupants

Designation	Type of Measurement	Driver (Serial #35)	Passenger (Serial #34)
WA	Windshield angle	45°	NA
SWA	Steering wheel angle	60°	NA
SCA	Steering column angle	30°	NA
SA	Seat back angle	21°	21°
HZ	Head to roof	248 mm	262 mm
HH	Head to header	544 mm	528 mm
HW	Head to windshield	654 mm	647 mm
HR	Head to side header	218 mm	235 mm
NR	Nose to rim	481 mm	NA
NA	Nose to rim angle	14°	NA
CD	Chest to dash	578 mm	574 mm
CS	Steering wheel to chest	376 mm	NA
RA	Rim to abdomen	215 mm	NA
KDL	Left knee to dash	162 mm	165 mm
KDR	Right knee to dash	163 mm	170 mm
KDA	Outboard knee to dash angle	29°	44°
PA	Pelvic angle	21°	24°
TA	Tibial angle	42°	38°
KK	Knee to knee	304 mm	270 mm
ST[1]	Striker to head	573 mm	585 mm
	Striker to head angle	-78°	-75°
SK[1]	Striker to knee	645 mm	685 mm
	Striker to knee angle	3°	0°
SH[1]	Striker to H-point	255 mm	285 mm
	Striker to H-point angle	20°	11°
SHY	Striker to H-point (Y dir.)	174 mm	170 mm
HS	Head to side window	254 mm	255 mm
HD	H-point to door	117 mm	125 mm
AD	Arm to door	55 mm	68 mm

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

Figure 8 Seat Belt Positioning Data



		Driver	Passenger
A	Top surface of aluminum plate to belt upper edge	418 mm	361 mm
B	Top surface of aluminum plate to belt lower edge	364 mm	275 mm
C	Dummy centerline to outer edge of belt at chest flesh top	78 mm	129 mm
D	Dummy centerline to inner edge of belt at chest flesh top	18 mm	68 mm
E	Dummy centerline to intersection of upper torso belt and lap belt	252 mm	255 mm

Figure 9 Camera Positions

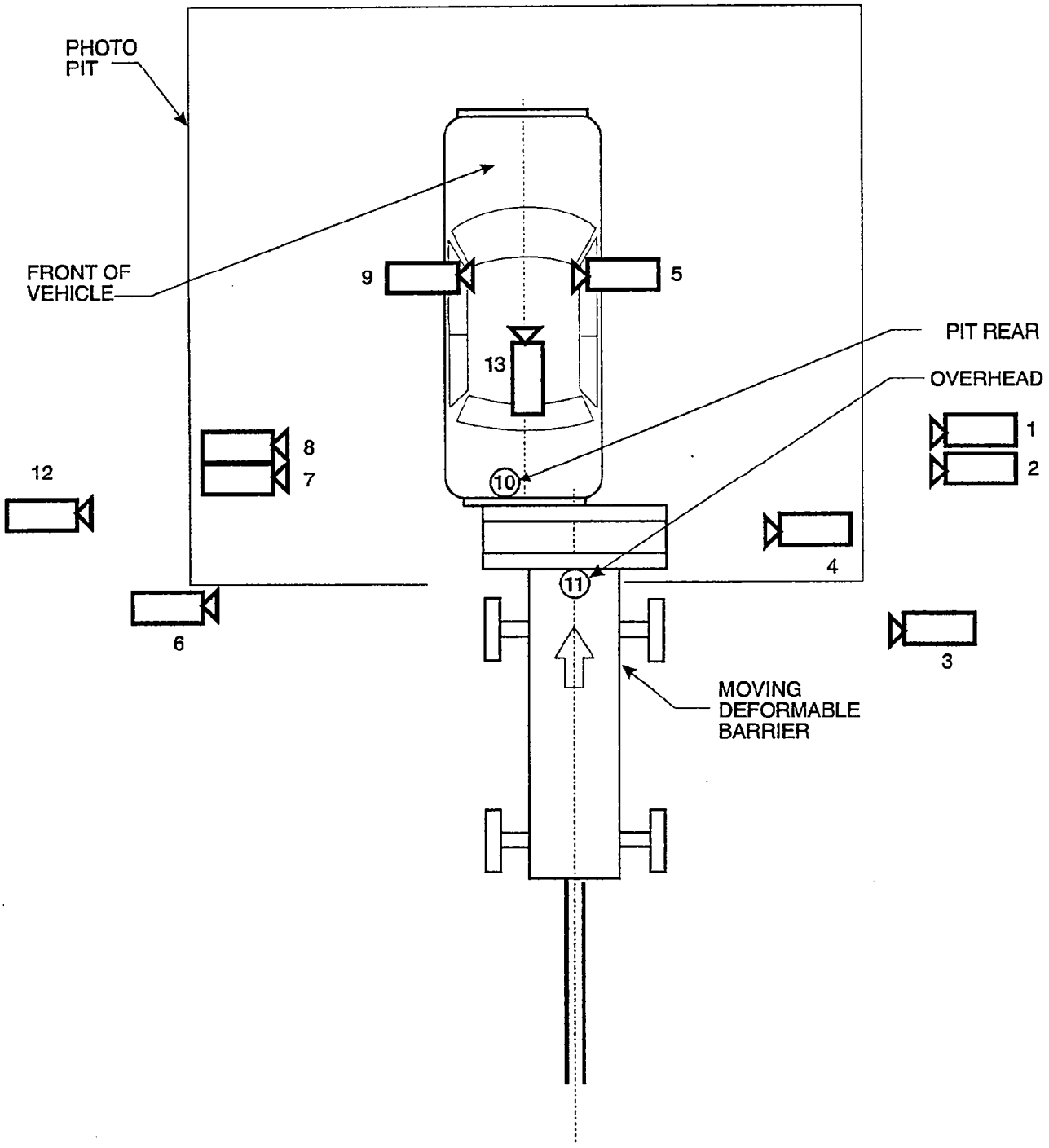


Table 13 Motion Picture Camera Locations

Vehicle year/make/model/body style: 1996/Suzuki/Sidekick/2-door mpv

Test number: 960314

Camera Number	View	Camera Positions[1] X	Y	Z	Angle of Inclination[2]	Angle of Rotation[3]	Camera Lens	Film Speed
1	Right side vehicle	7,772 mm	6,934 mm	838 mm	0°	0°	25 mm	995 frames/s
2	Right side overall	813 mm	6,274 mm	1,092 mm	0°	0°	13 mm	1000 frames/s
3	Right MDB	-1,372 mm	10,236 mm	914 mm	0°	0°	25 mm	1000 frames/s
4	Right close-up	305 mm	4,877 mm	1,092 mm	-3°	0°	17 mm	998 frames/s
5	Right front passenger onboard	NA	NA	NA	NA	NA	8 mm	995 frames/s
6	Left side MDB	-787 mm	-10,160 mm	838 mm	0°	0°	25 mm	995 frames/s
7	Left side close-up	432 mm	-7,442 mm	991 mm	-3°	0°	17 mm	1005 frames/s
8	Left side vehicle	2,565 mm	-11,227 mm	1,168 mm	-2°	0°	25 mm	998 frames/s
9	Driver onboard	NA	NA	NA	NA	NA	8 mm	1005 frames/s
10	Underbody vehicle	NA	NA	NA	90°	0°	17 mm	1000 frames/s
11	Overhead	0 mm	0 mm	10,668 mm	90°	0°	13 mm	998 frames/s
12	Left side overall	1,041 mm	-12,675 mm	1,092 mm	0°	0°	13 mm	NA[4] frames/s
13	Seat back view	0 mm	0 mm	10,668 mm	NA	NA	35 mm	815 frames/s

[1] +X: Forward from impact point MDB face
+Y: Rightward from monorail centerline
+Z: Upward from ground level

[2] +Angle of Inclination: Camera lens (upward from horizontal)

[3] +Angle of Rotation: Camera lens toward barrier from line perpendicular to monorail centerline

[4] Camera did not run during test

Appendix A

Photographs

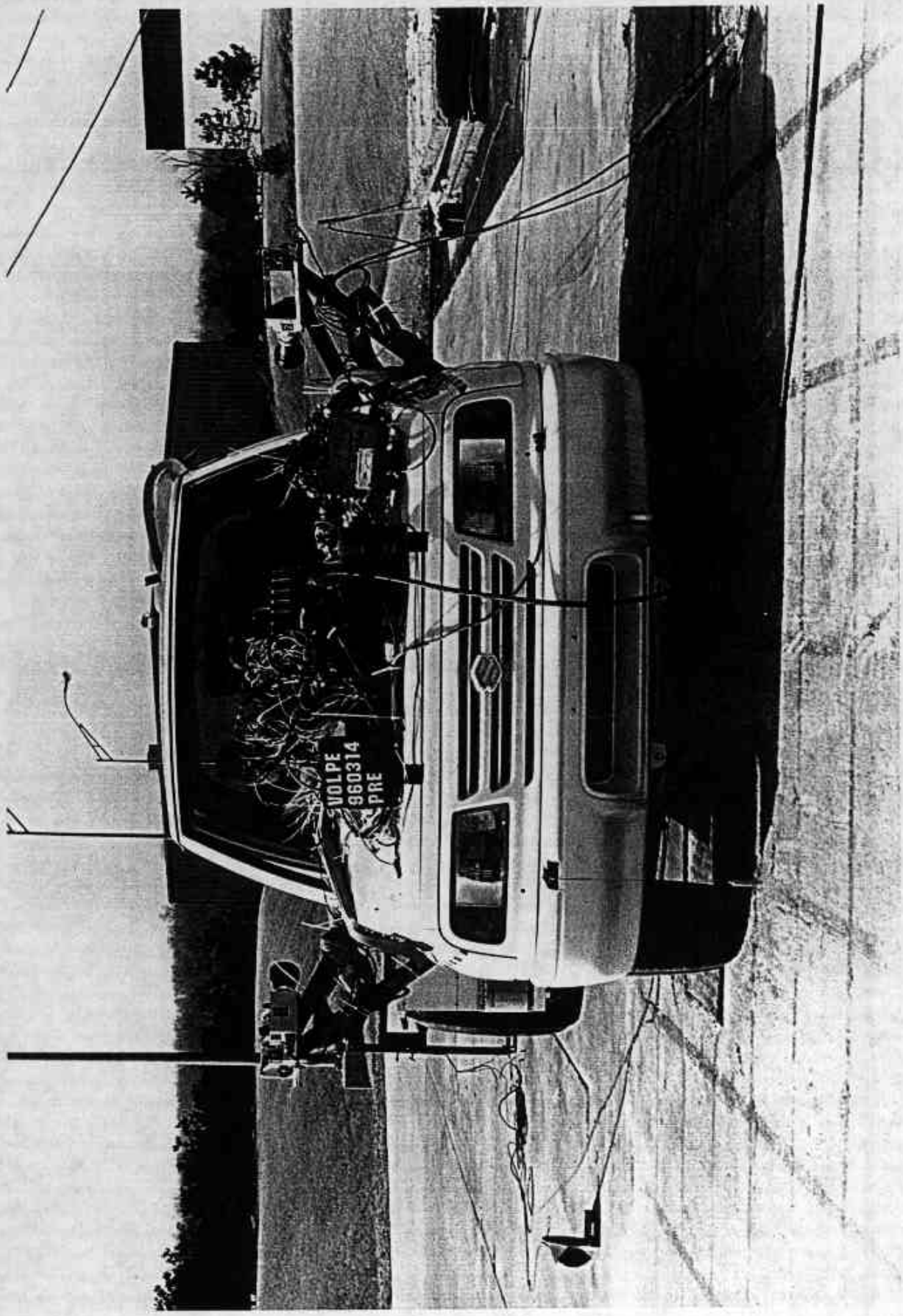


Figure A-1 Pre-Test Front View

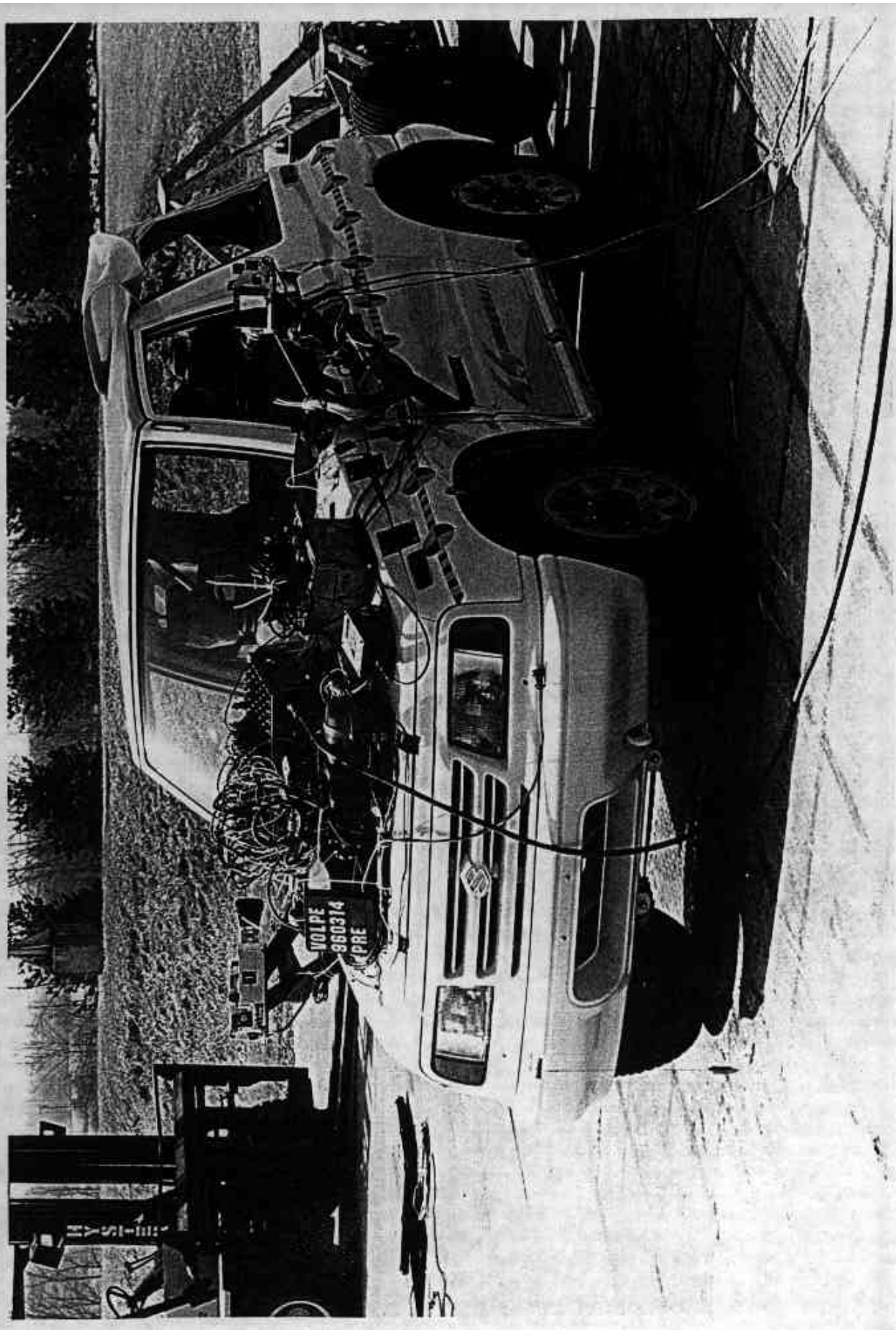


Figure A-2 Pre-Test Left Front Three-Quarter View

Figure A-3 Post-Test Left Front Three-Quarter View

Figure A-4 Pre-Test Left Side View

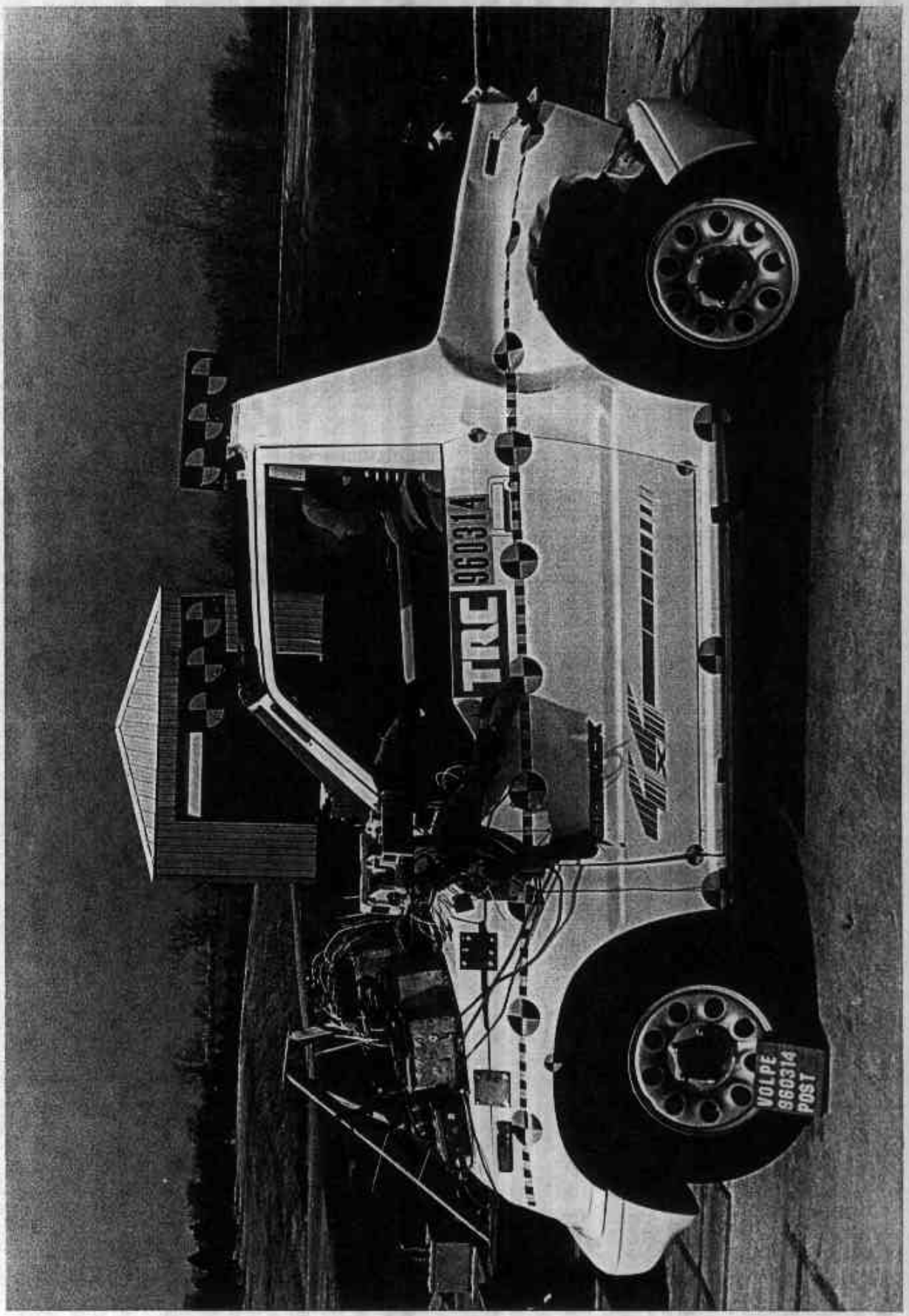


Figure A-5 Post-Test Left Side View

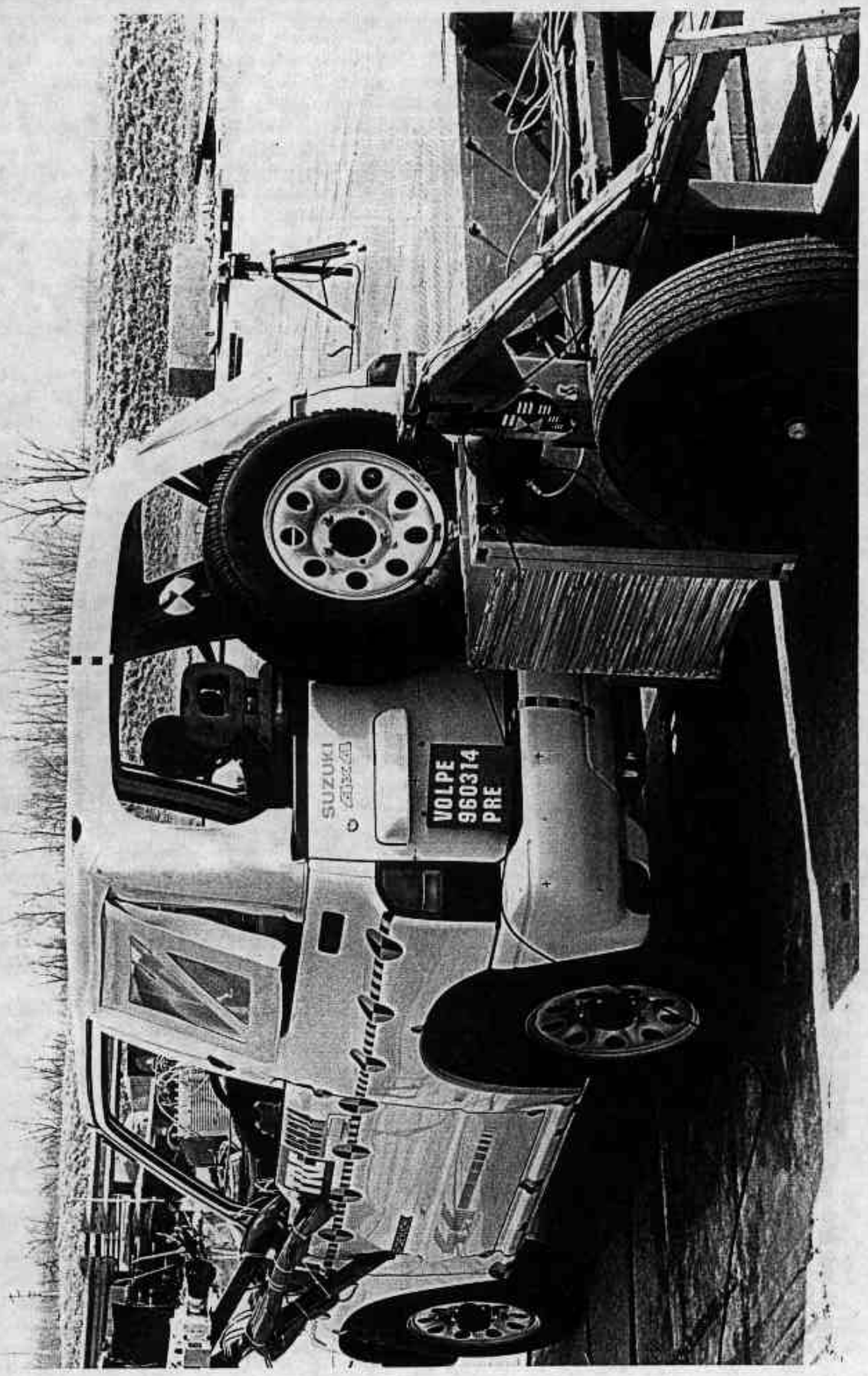


Figure A-6 Pre-Test Left Rear Three-Quarter View

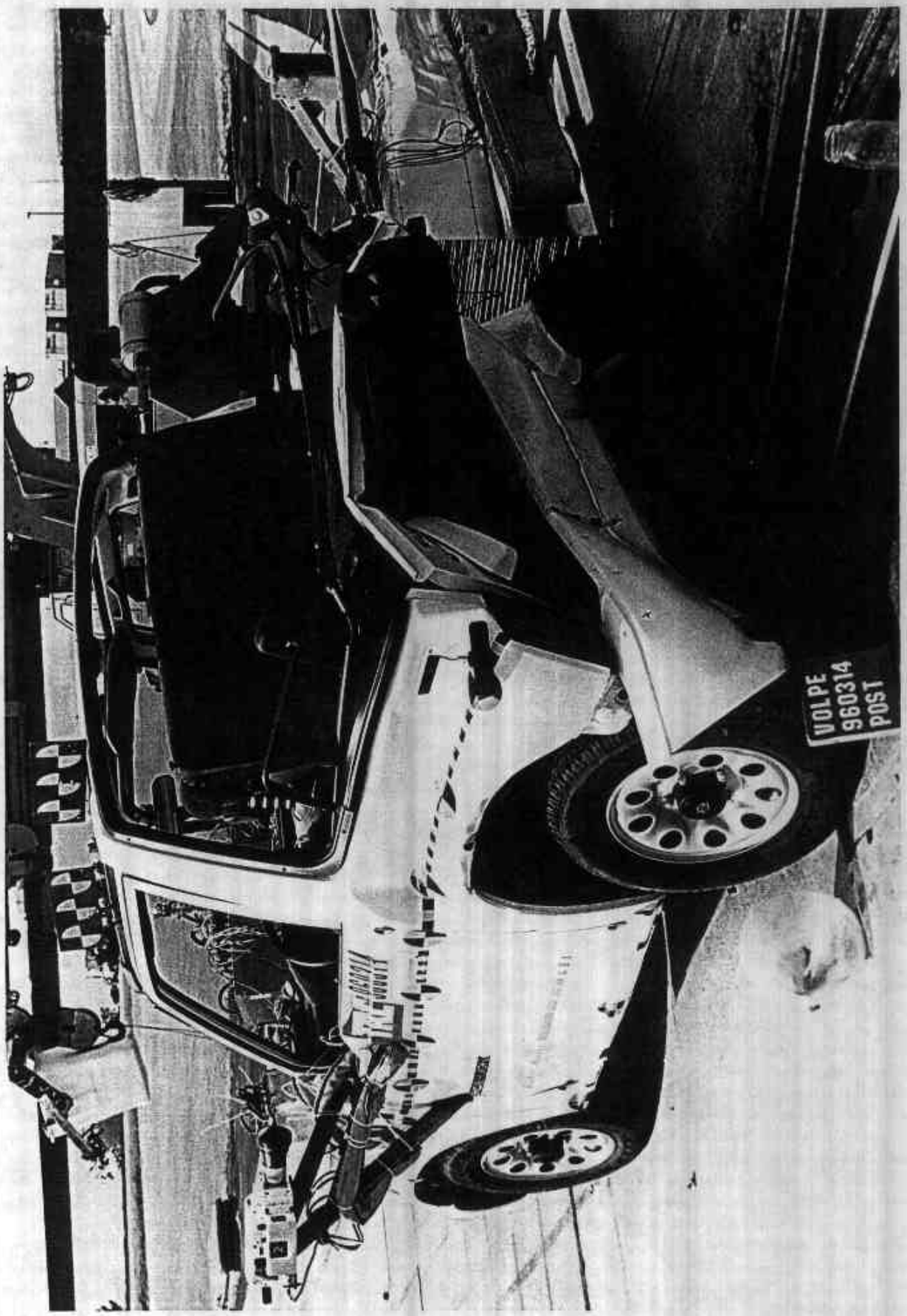


Figure A-7 Post-Test Left Rear Three-Quarter View

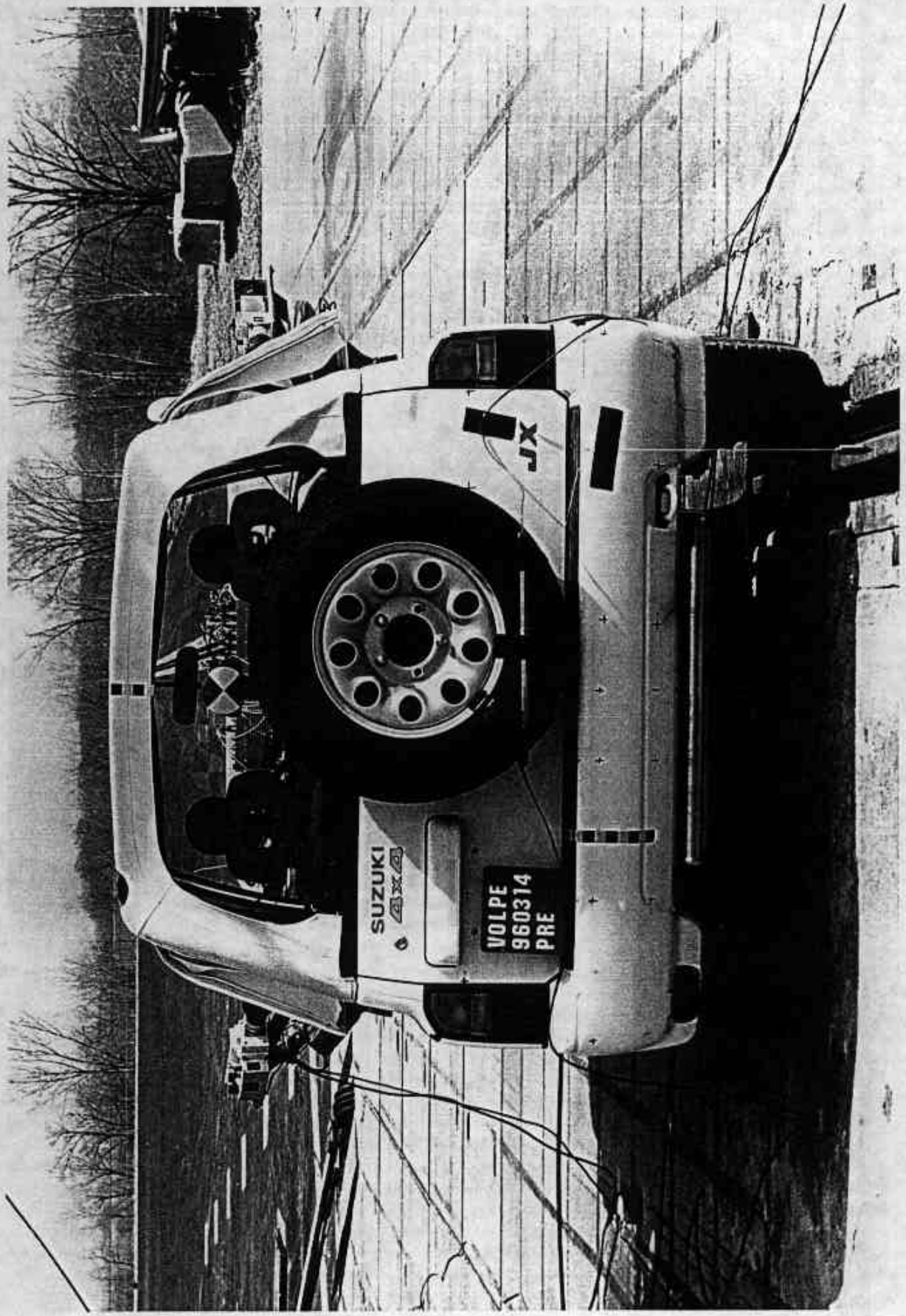


Figure A-8 Pre-Test Rear View

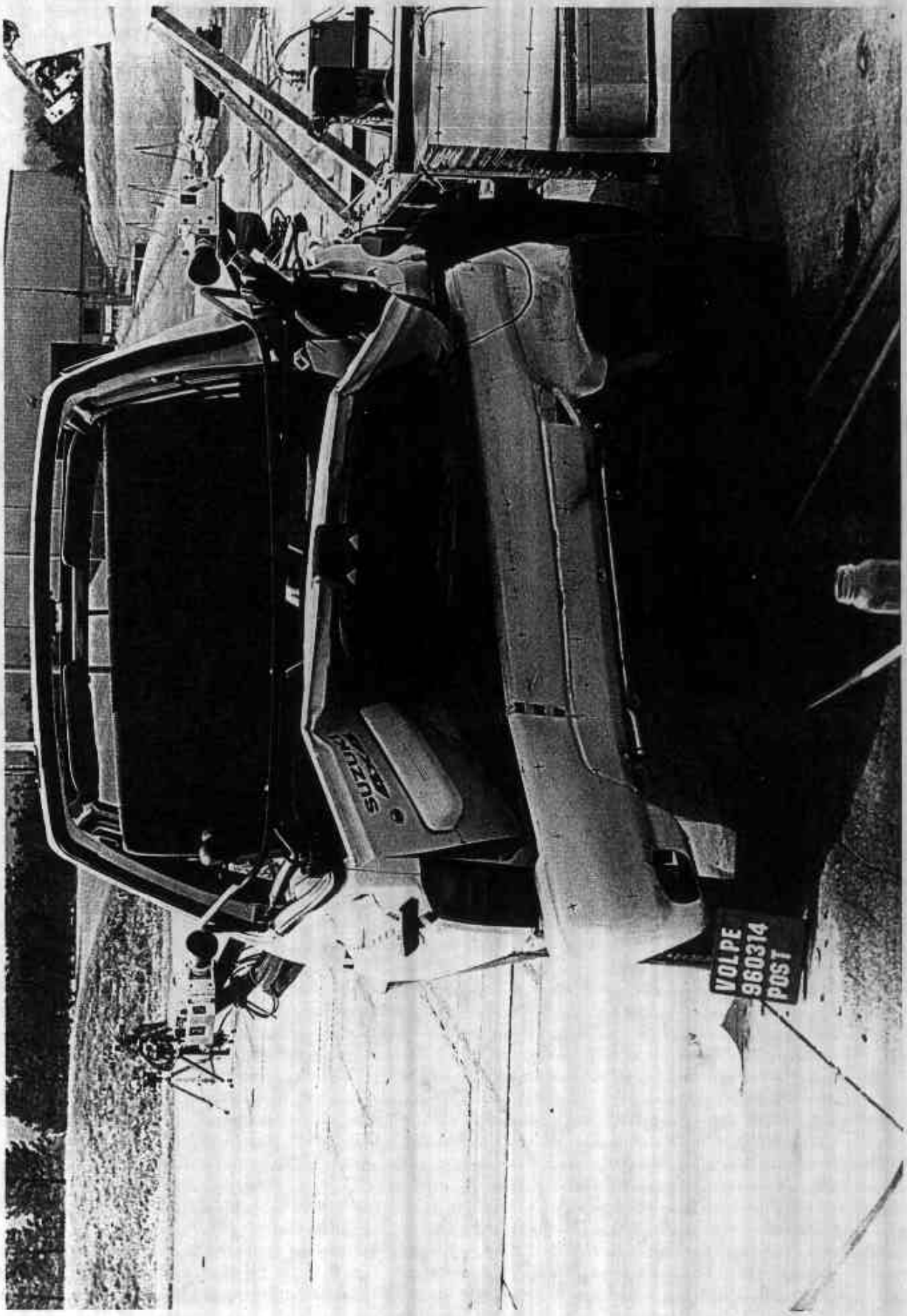


Figure A-9 Post-Test Rear View

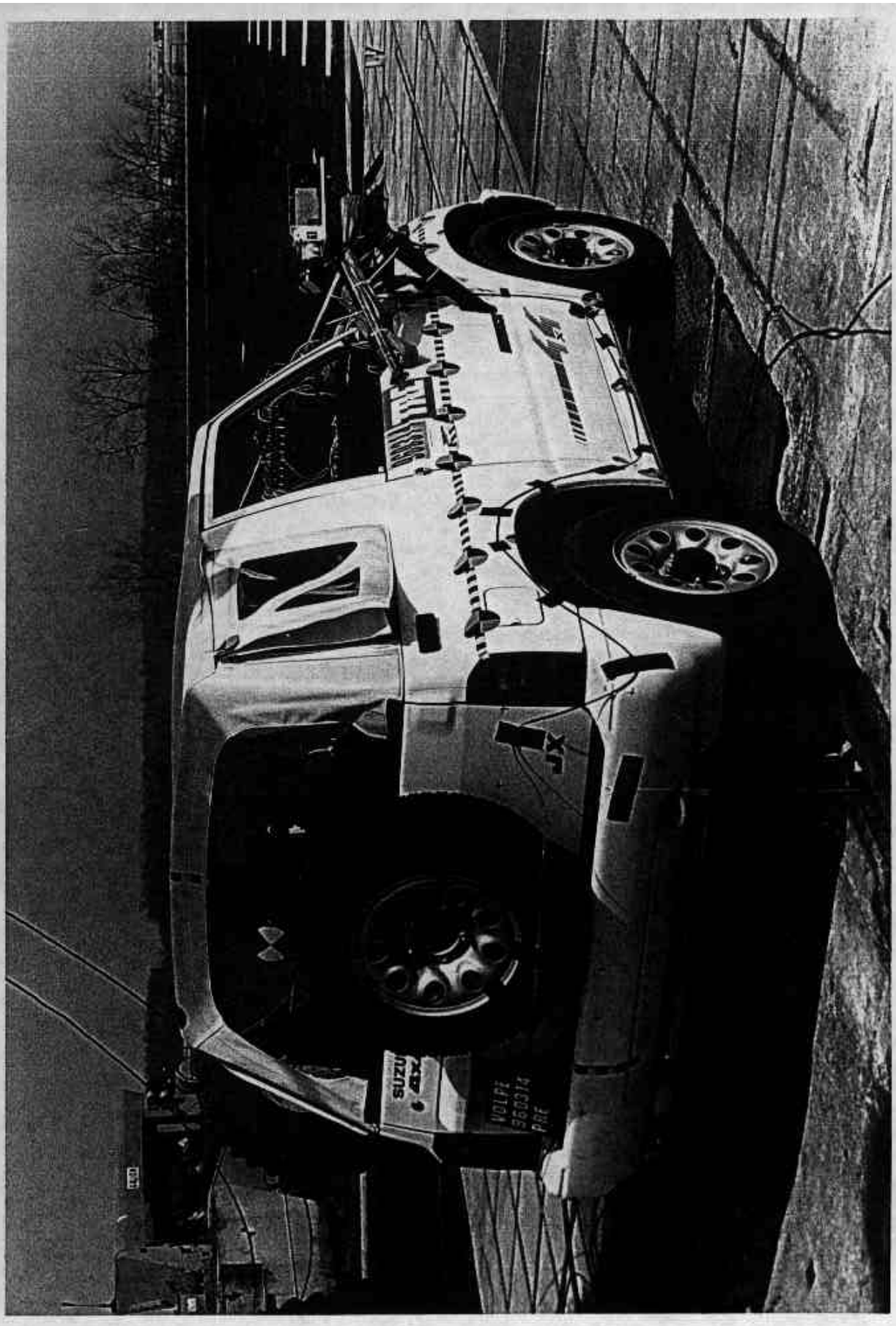


Figure A-10 Pre-Test Right Rear Three-Quarter View

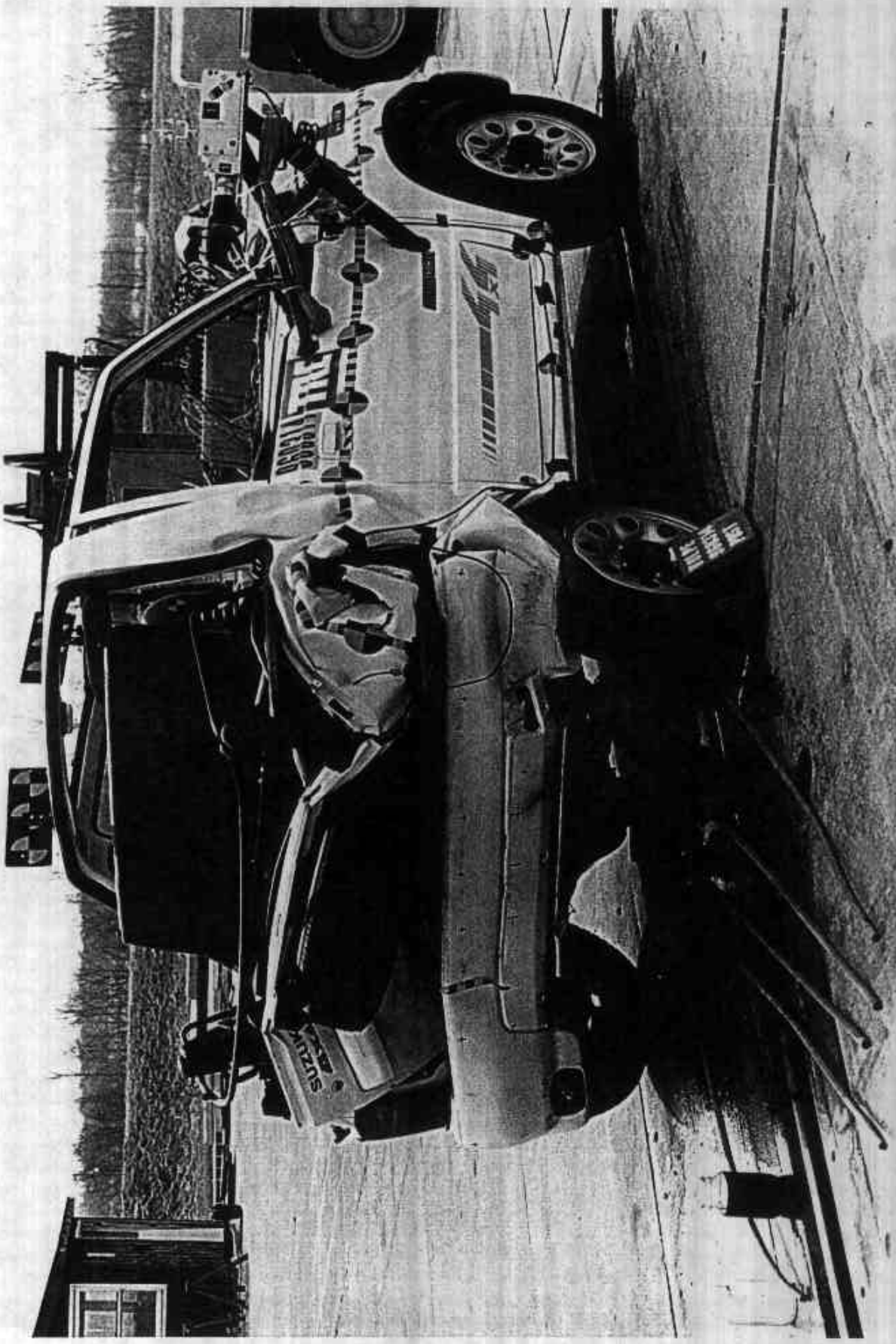


Figure A-11 Post-Test Right Rear Three-Quarter View

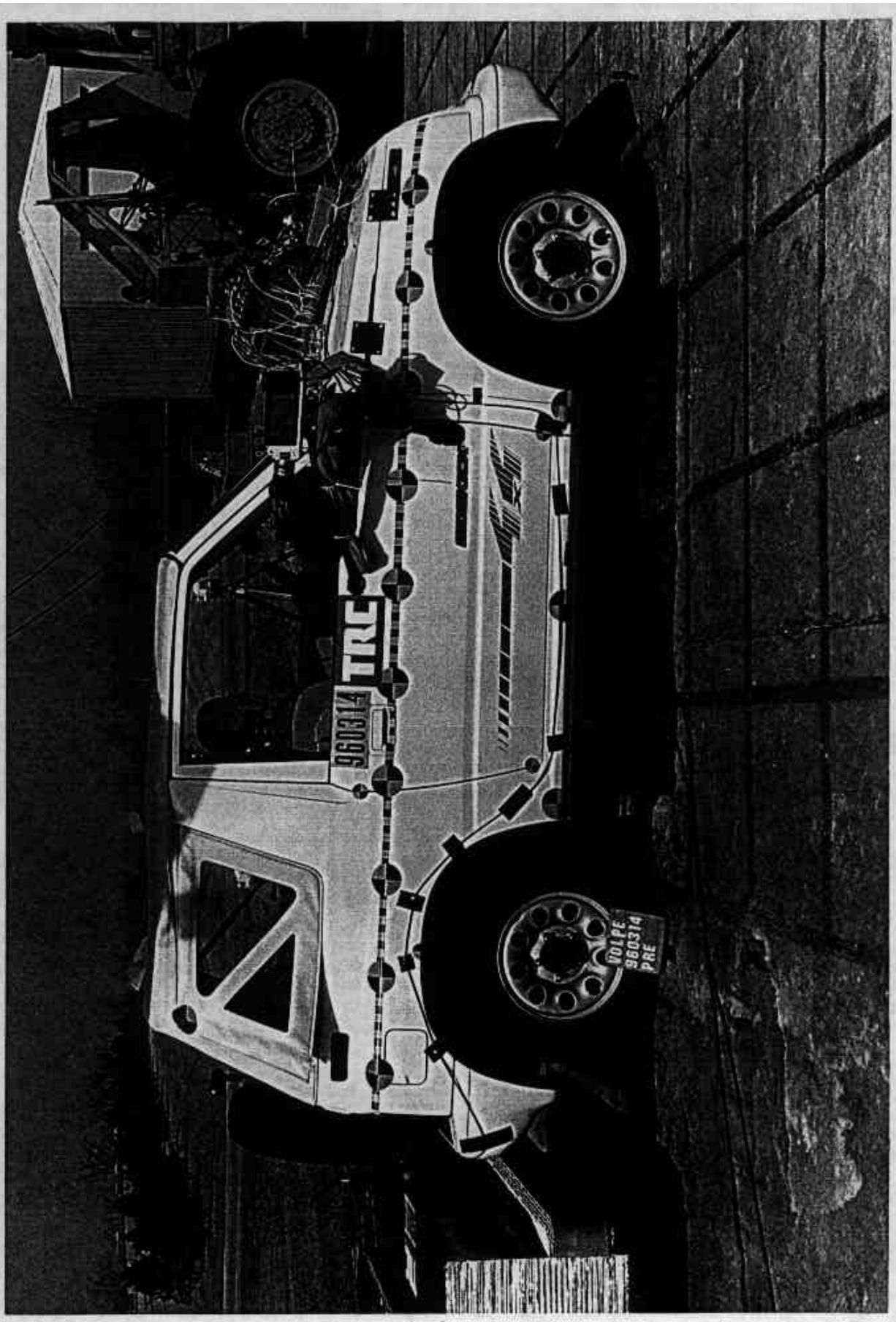


Figure A-12 Pre-Test Right Side View

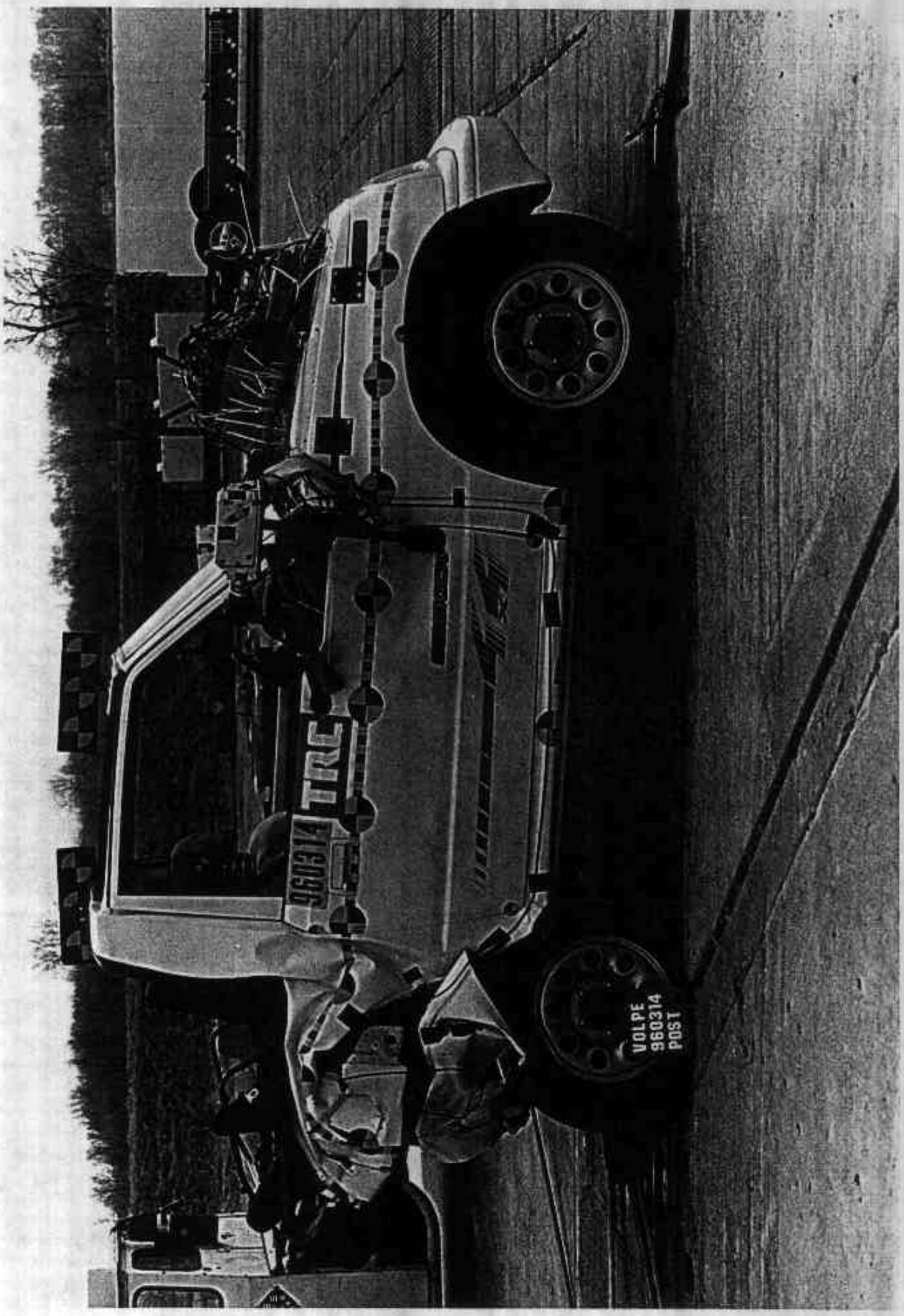


Figure A-13 Post-Test Right Side View

Figure A-14 Pre-Test Right Front Three-Quarter View

Figure A-15 Post-Test Right Front Three-Quarter View

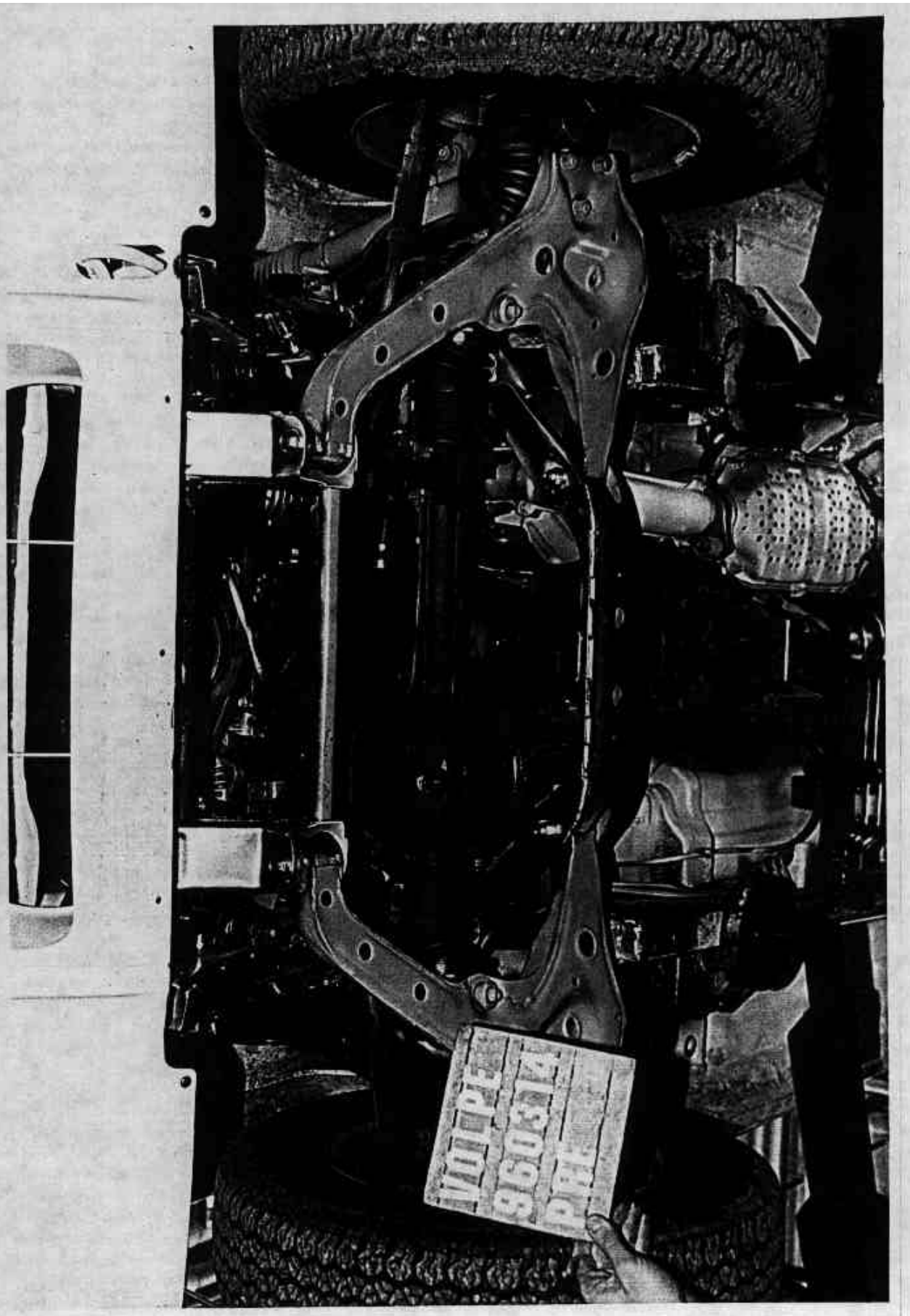


Figure A-16 Pre-Test Front Underbody View

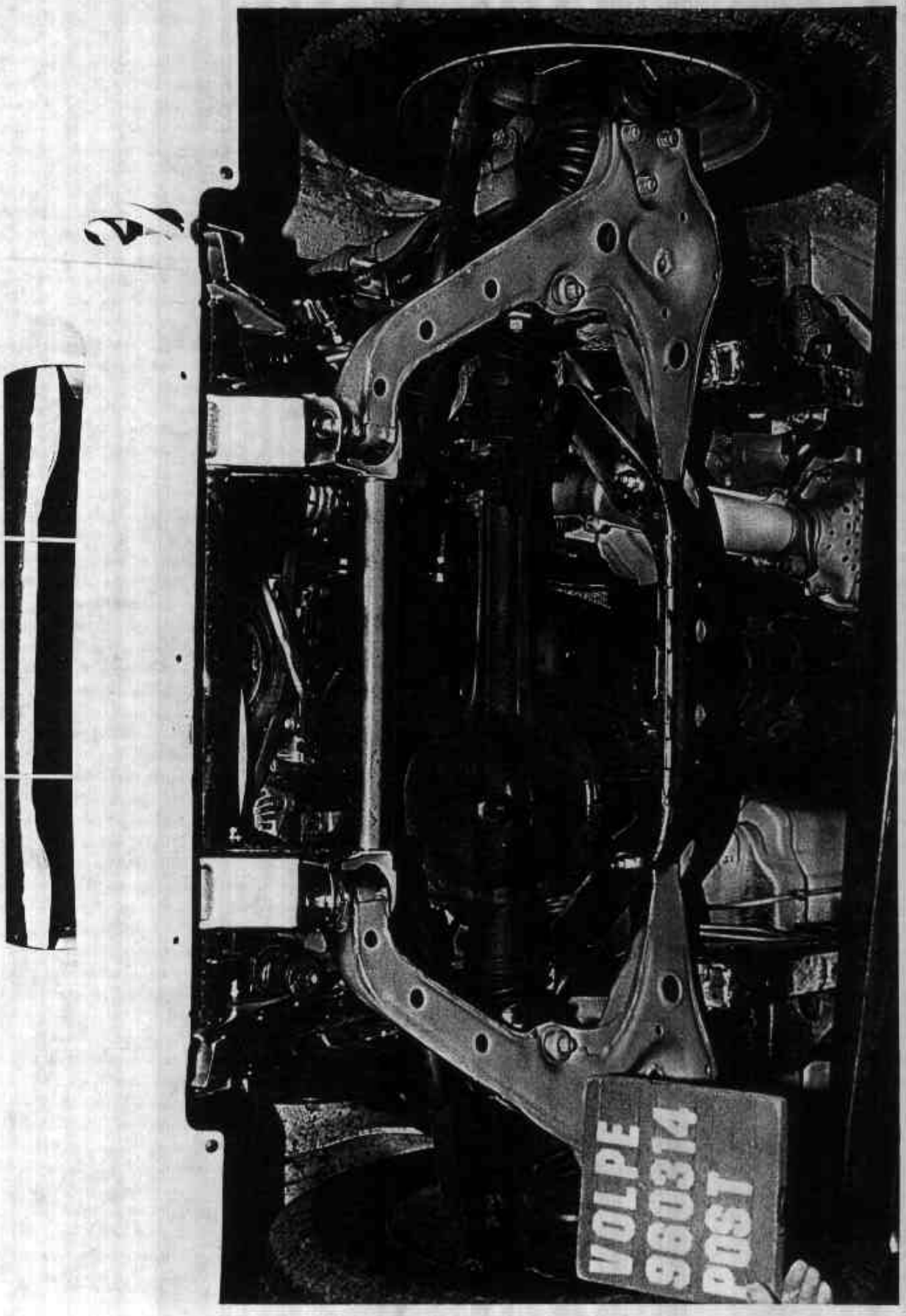


Figure A-17 Post-Test Front Underbody View

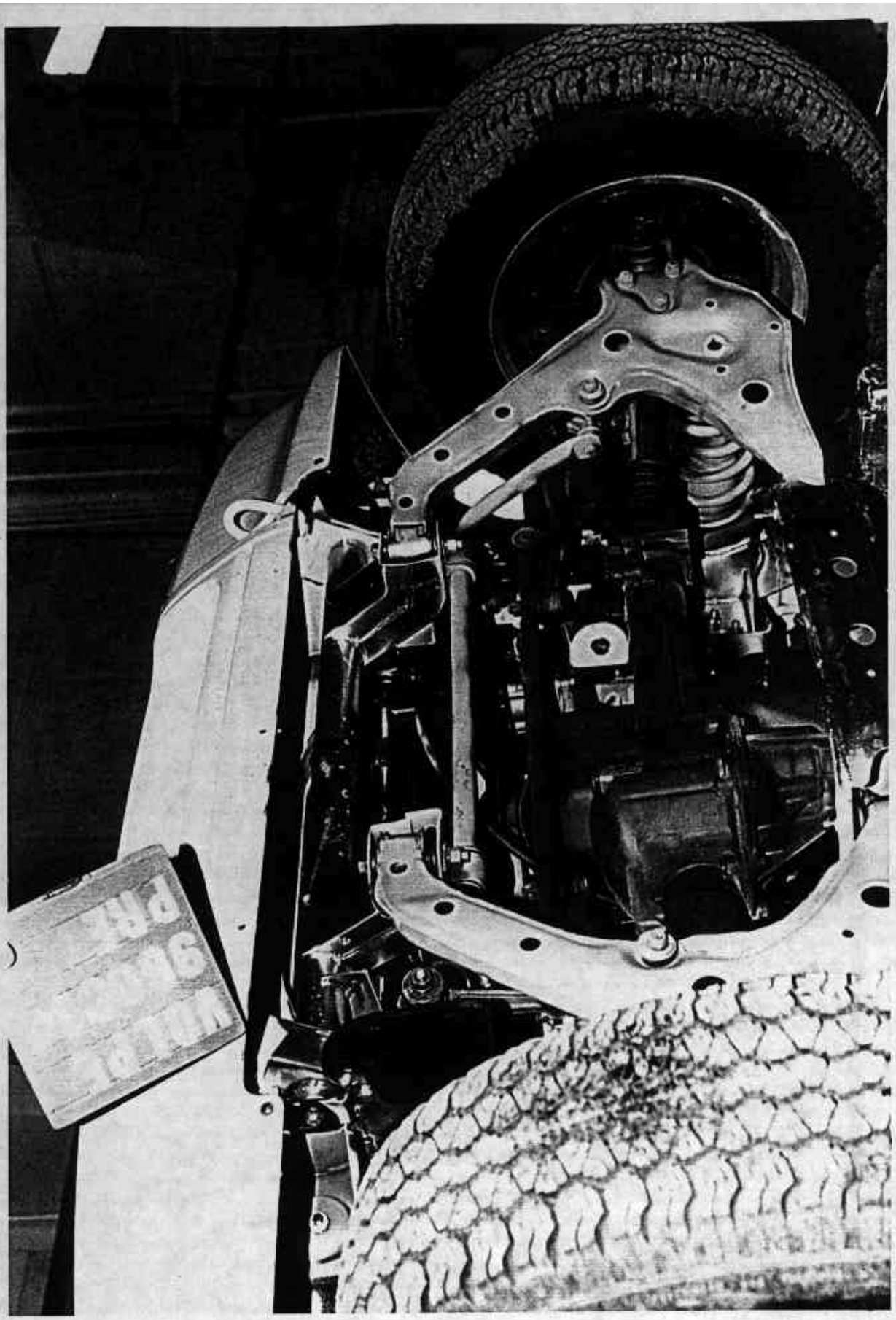


Figure A-18 Pre-Test Right Front Underbody View

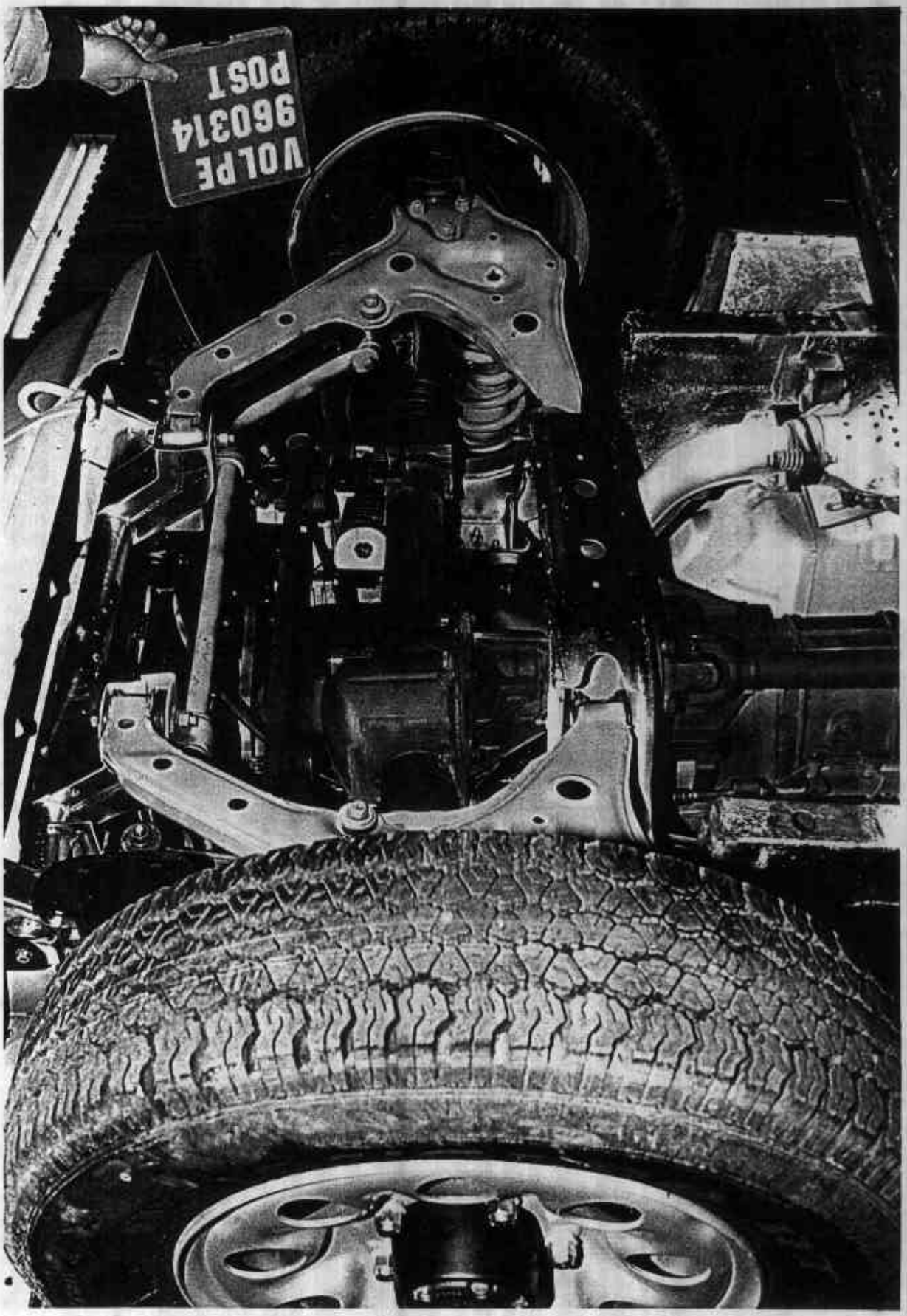


Figure A-19 Post-Test Right Front Underbody View

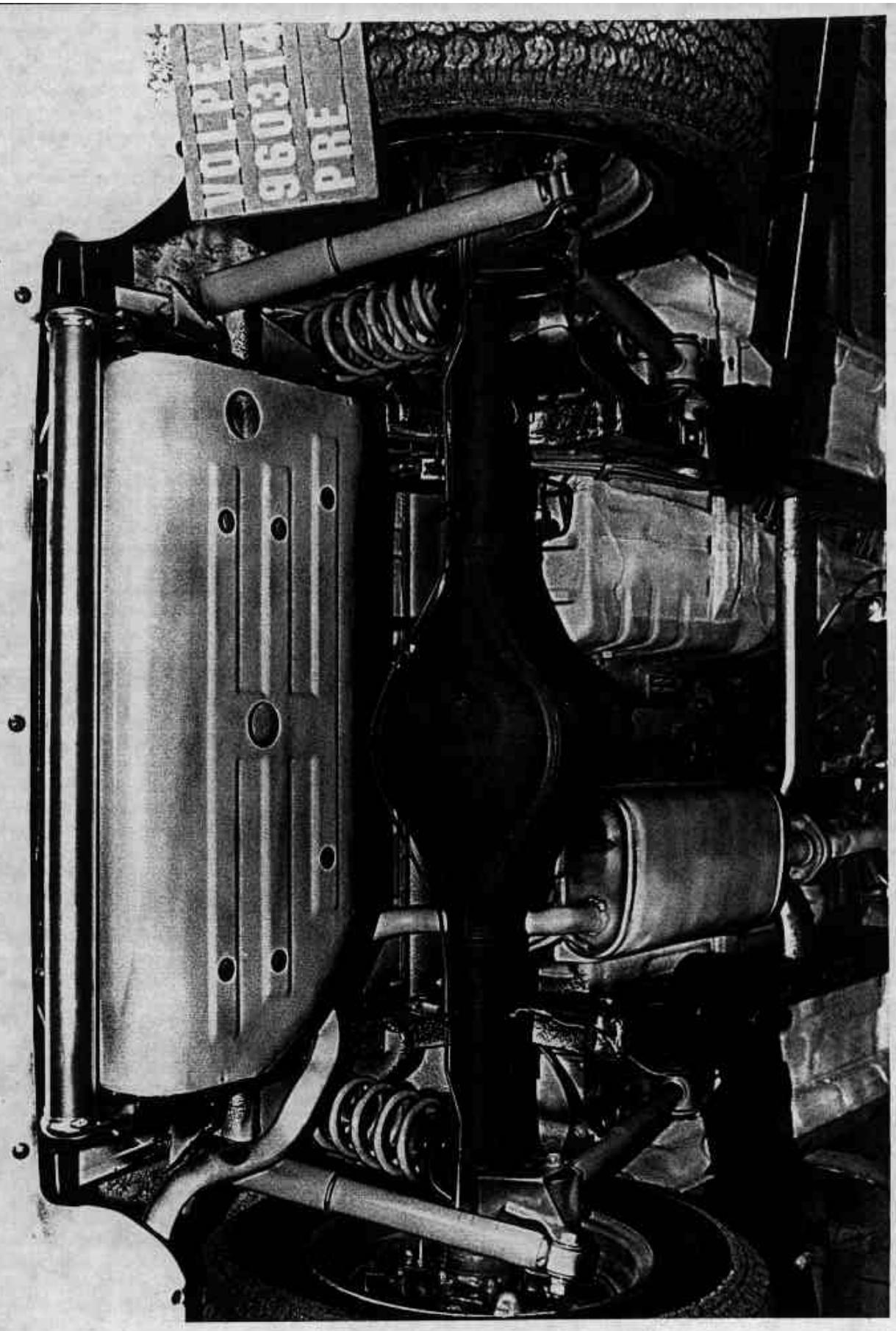


Figure A-20 Pre-Test Rear Underbody View

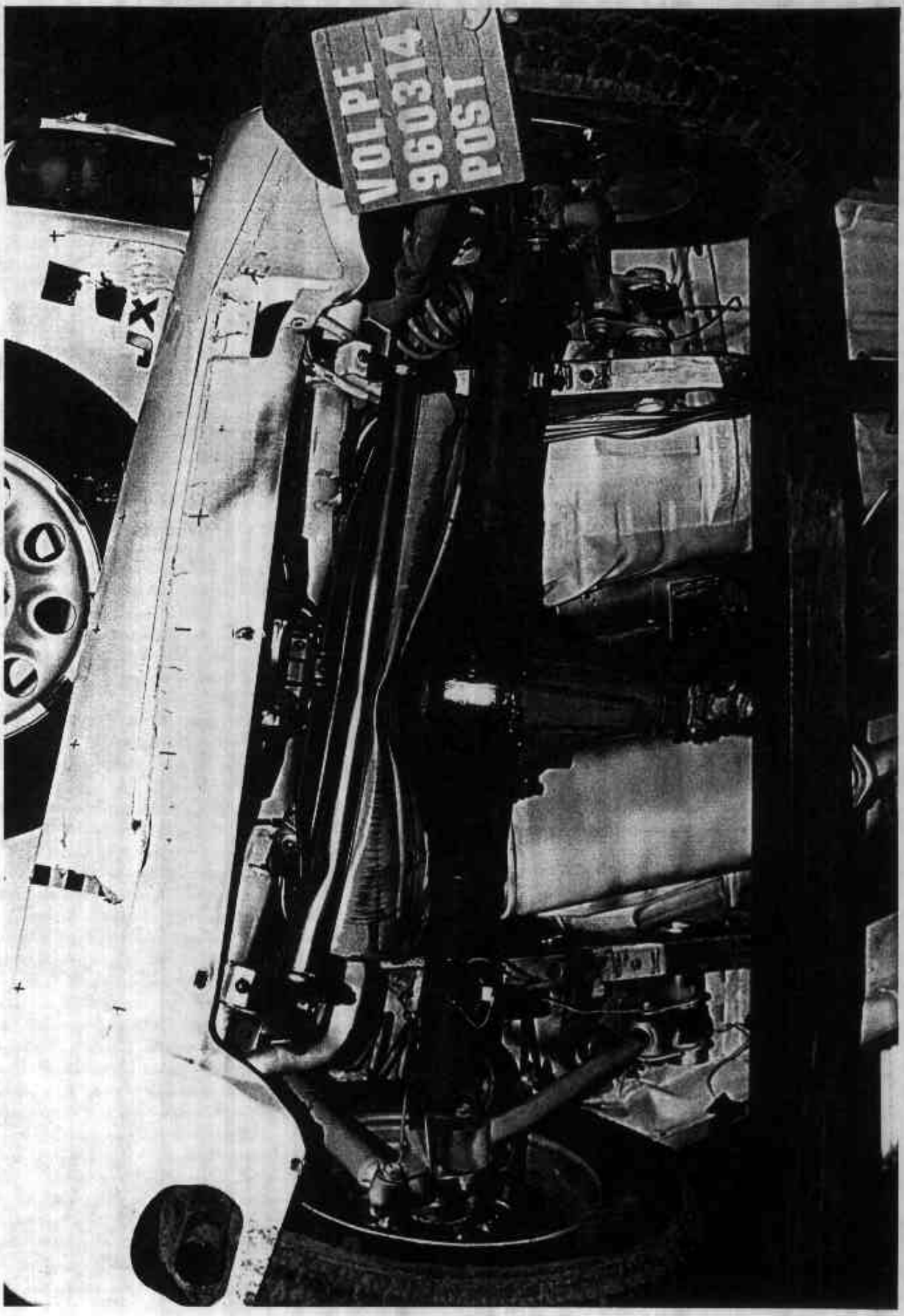


Figure A-21 Post-Test Rear Underbody View

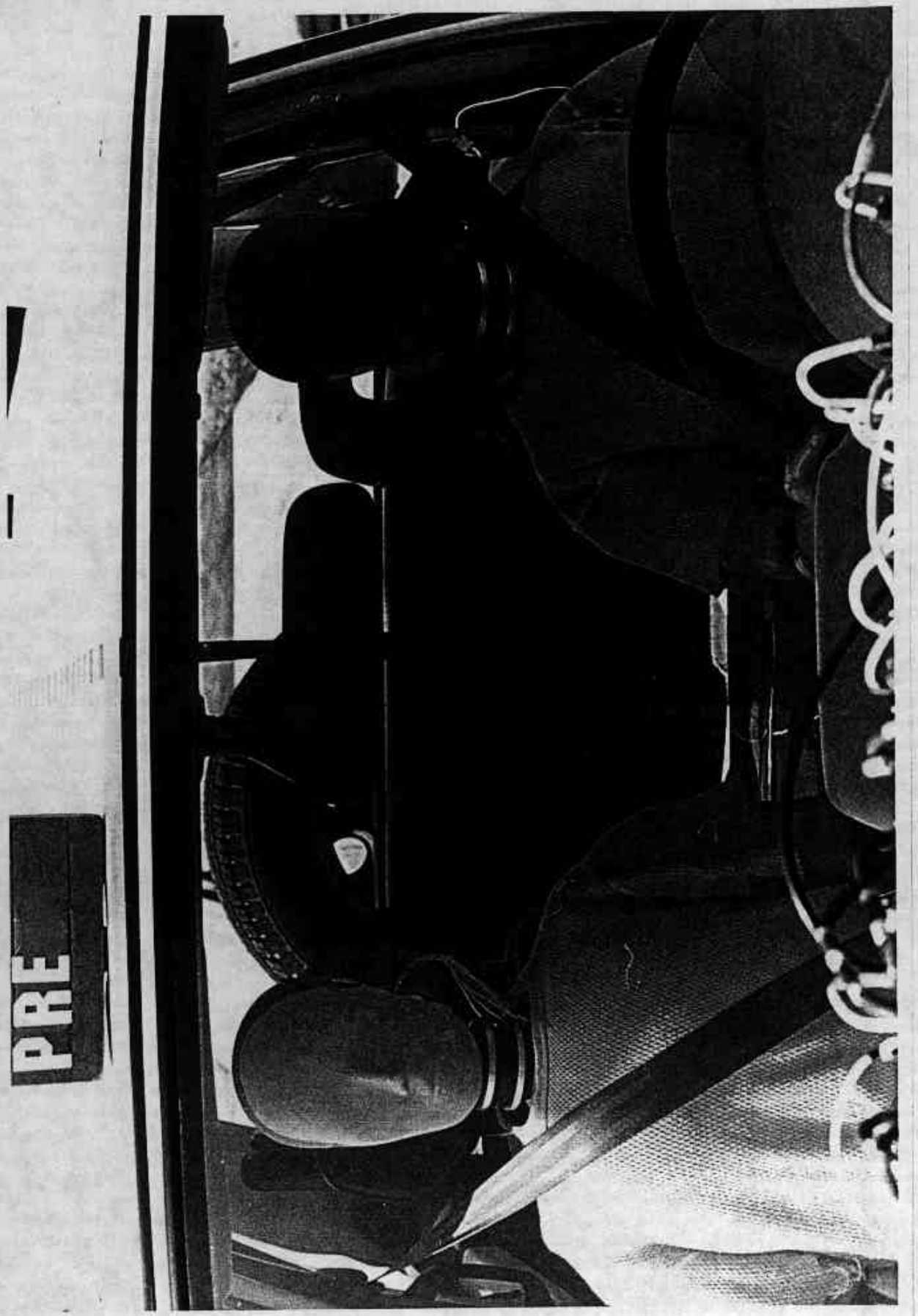


Figure A-22 Pre-Test Windshield View

Figure A-23 Post-Test Windshield View

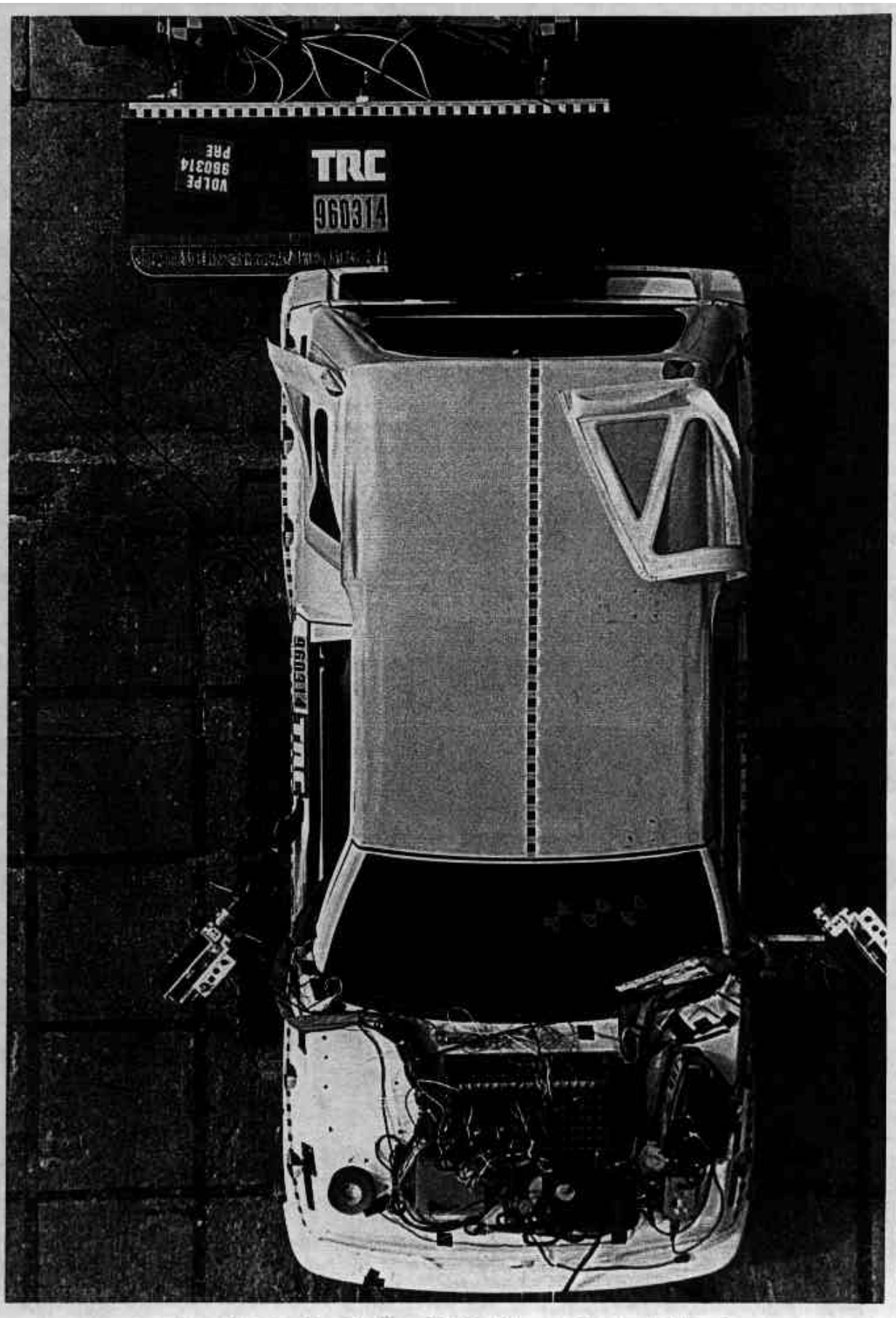


Figure A-24 Pre-Test Barrier to Vehicle Alignment Overhead - View 1

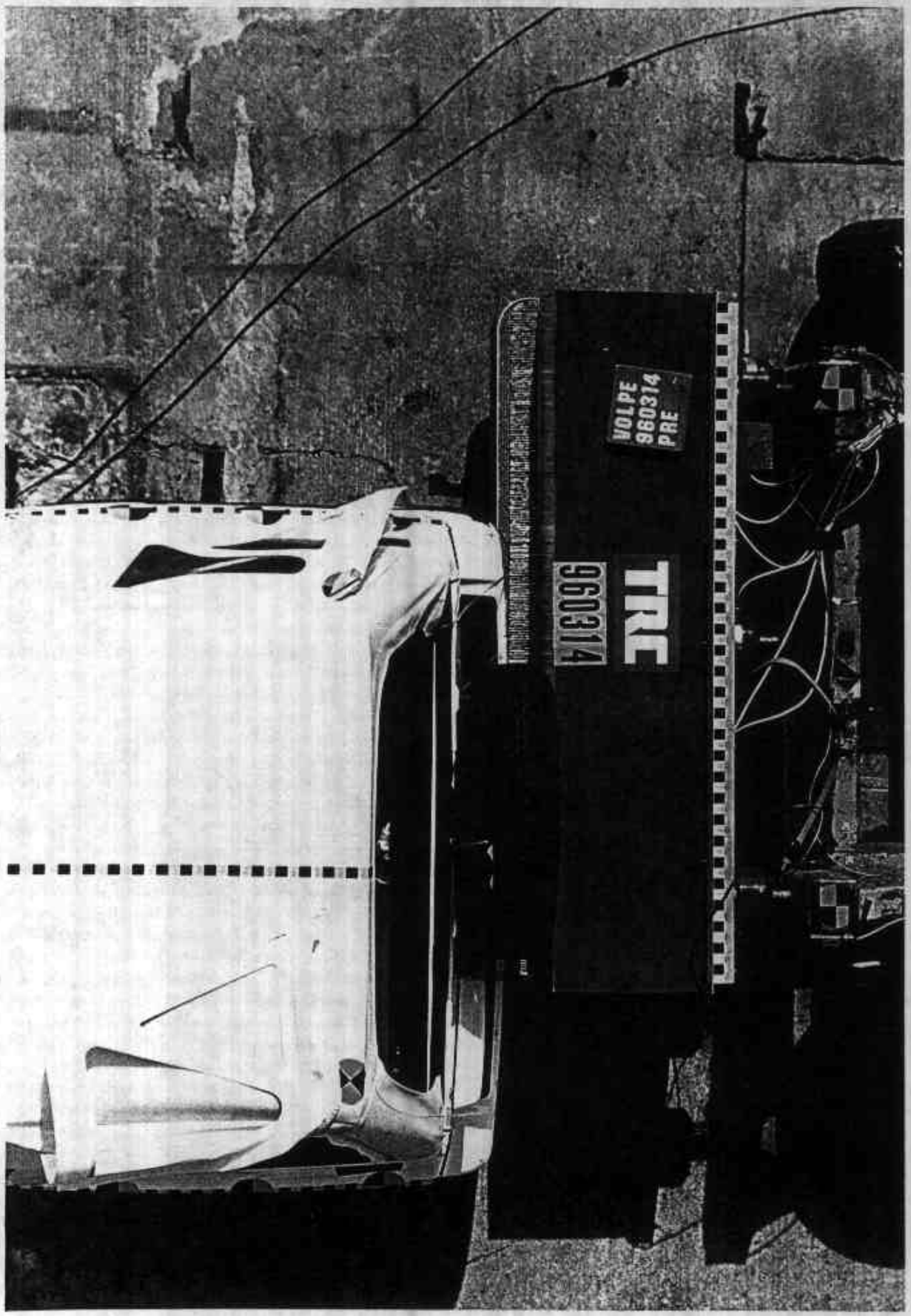


Figure A-25 Pre-Test Barrier to Vehicle Alignment Overhead - View 2

Figure A-26 Pre-Test Driver Dummy Position View

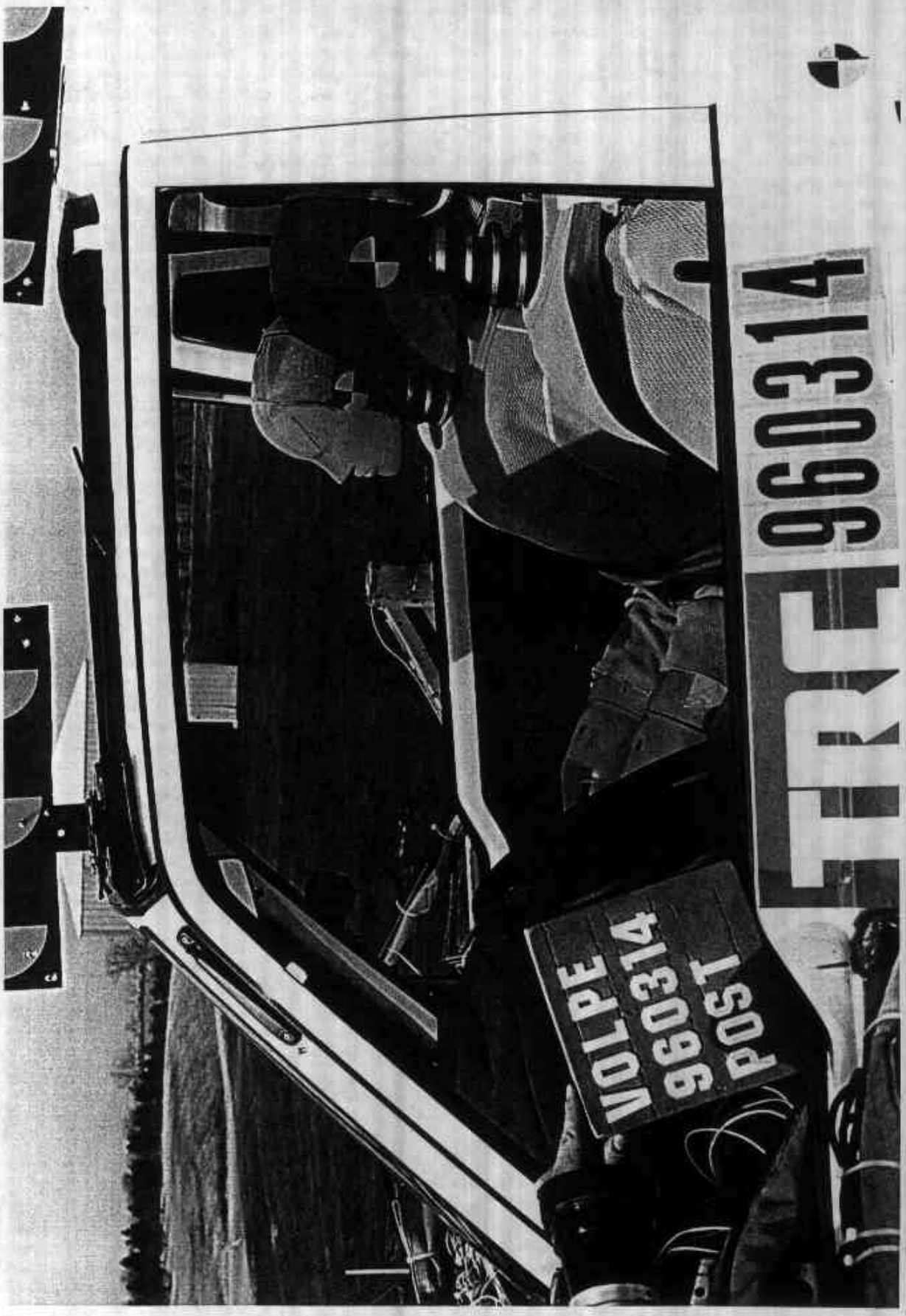


Figure A-27 Post-Test Driver Dummy Position View

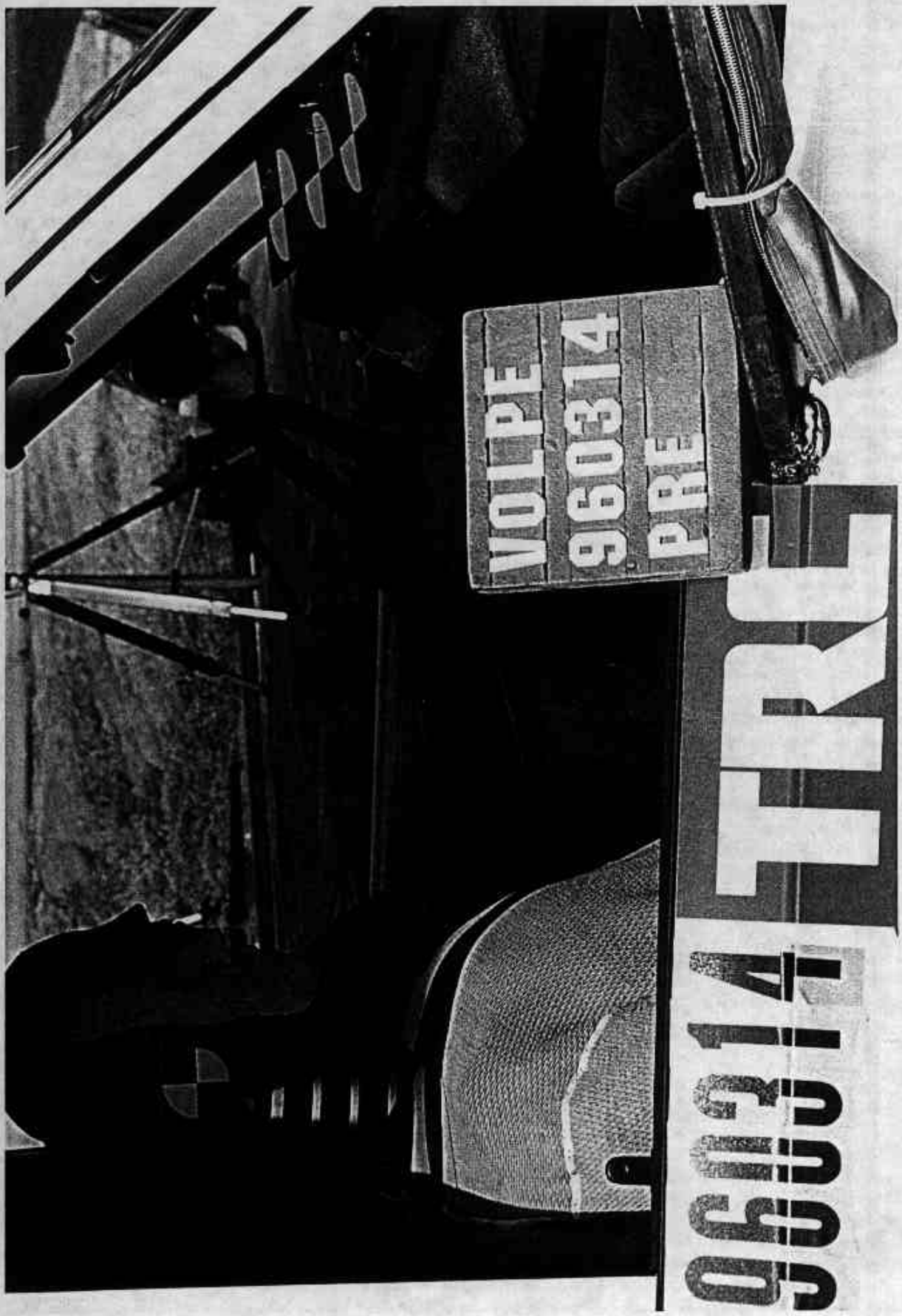


Figure A-28 Pre-Test Passenger Dummy Position View

Figure A-29 Post-Test Passenger Dummy Position View

Figure A-30 Pre-Test Driver Dummy & Vehicle Interior - View 1

Figure A-31 Post-Test Driver Dummy & Vehicle Interior - View 1

Figure A-32 Pre-Test Driver Dummy & Vehicle Interior - View 2

Figure A-33 Post-Test Driver Dummy & Vehicle Interior - View 2

Figure A-34 Pre-Test Passenger Dummy & Vehicle Interior - View 1

Figure A-35 Post-Test Passenger Dummy & Vehicle Interior - View 1

Figure A-36 Pre-Test Passenger Dummy & Vehicle Interior - View 2

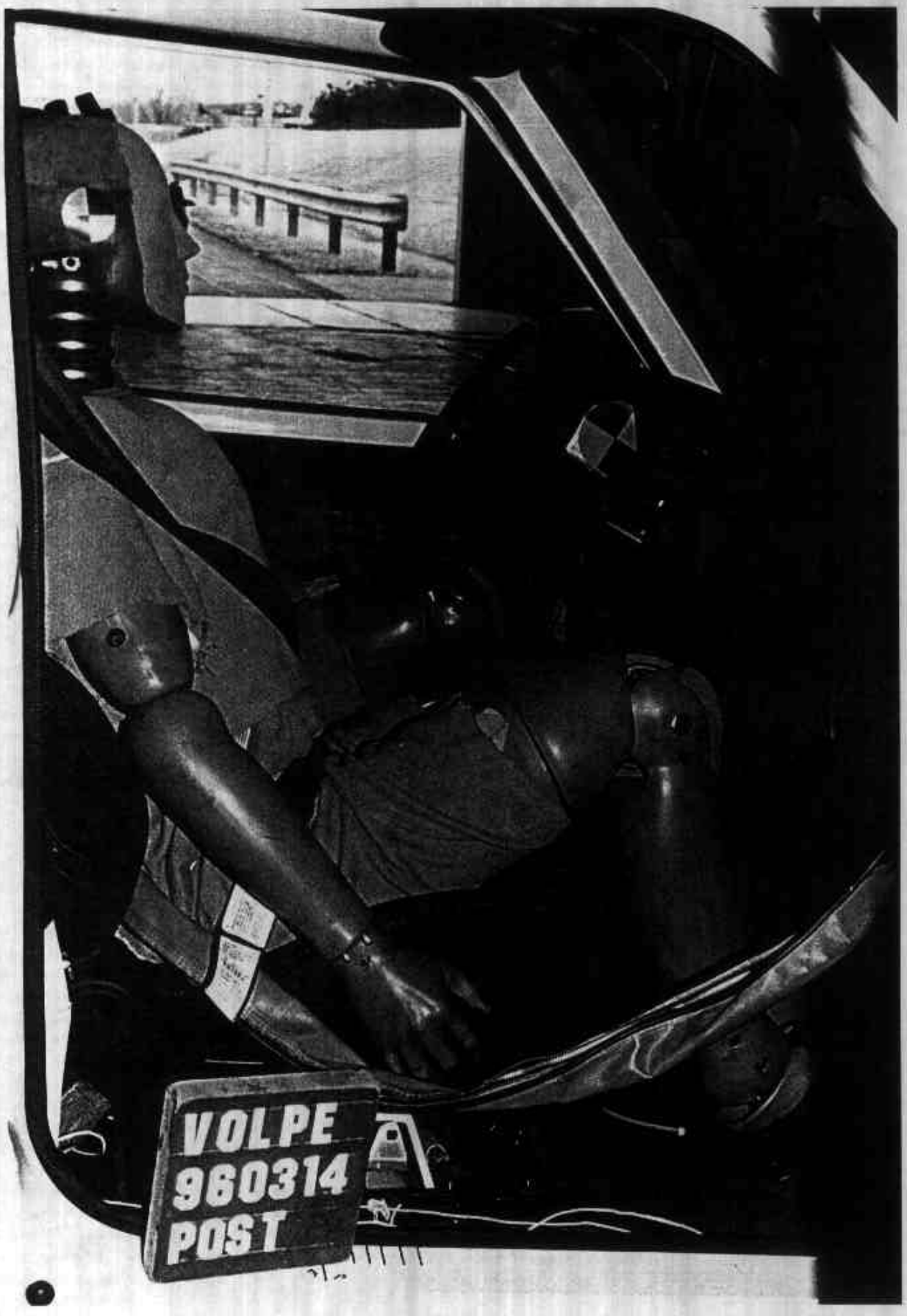


Figure A-37 Post-Test Passenger Dummy & Vehicle Interior - View 2

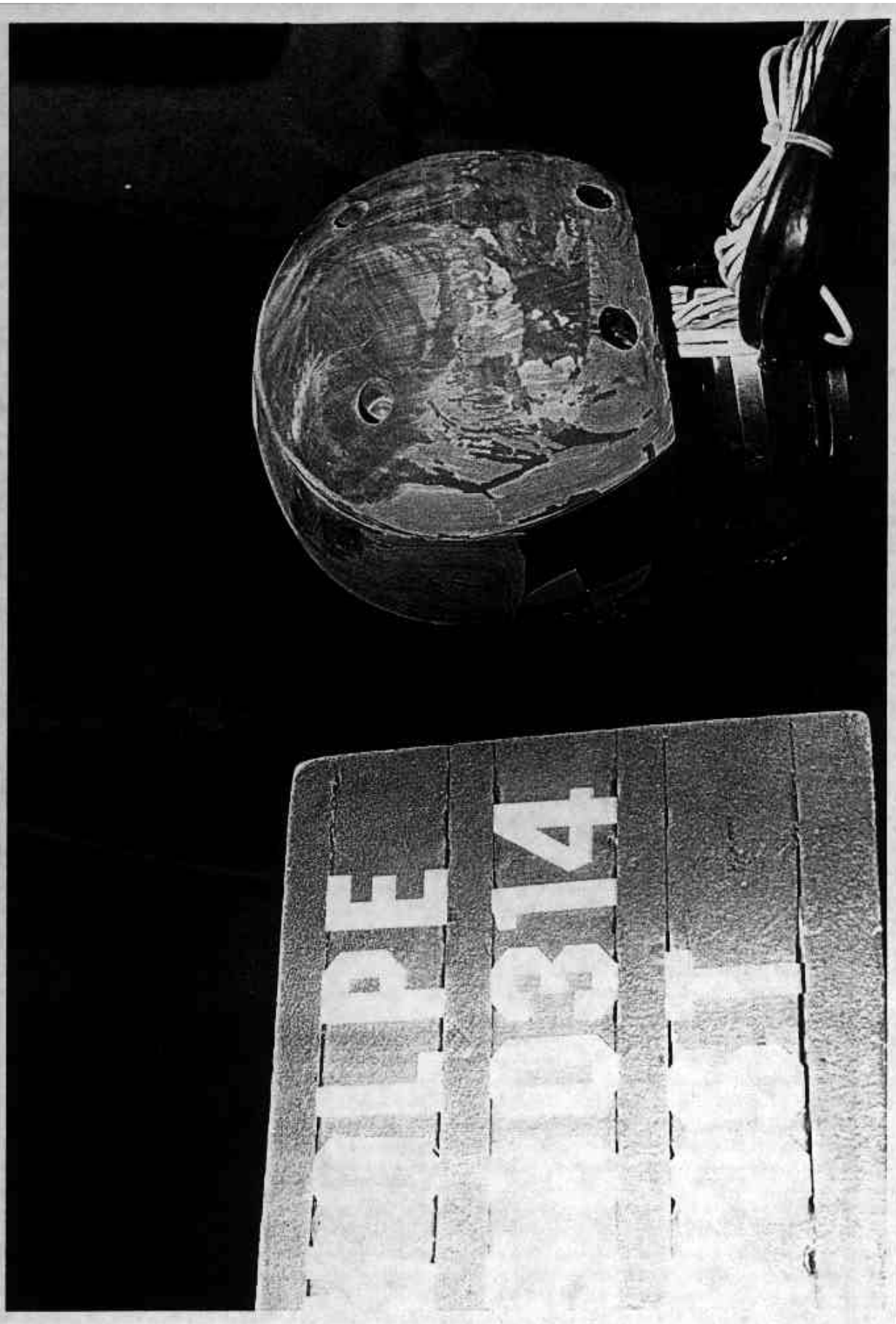


Figure A-38 Post-Test Driver Dummy Head Contact - View 1

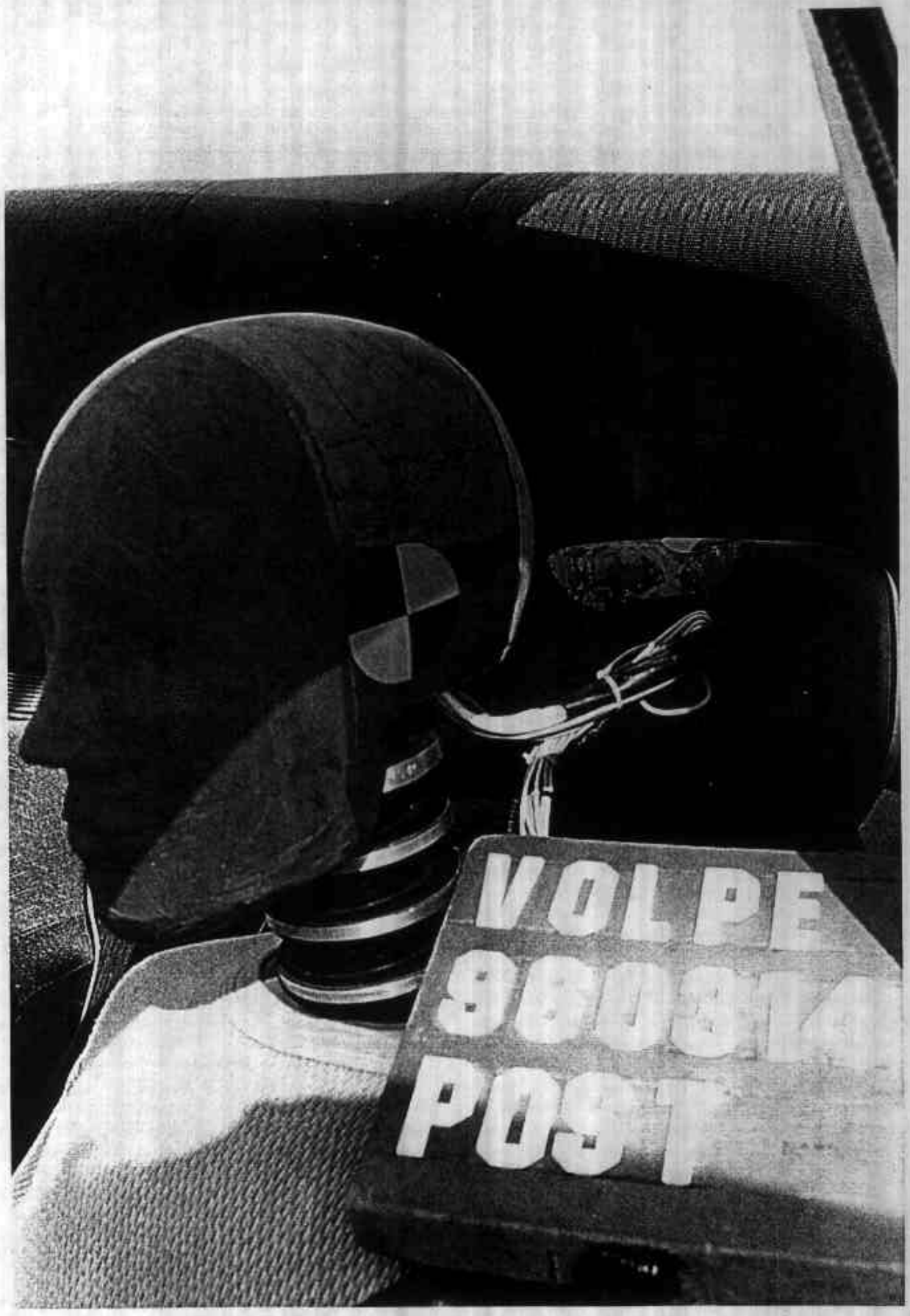


Figure A-39 Post-Test Driver Dummy Head Contact - View 2

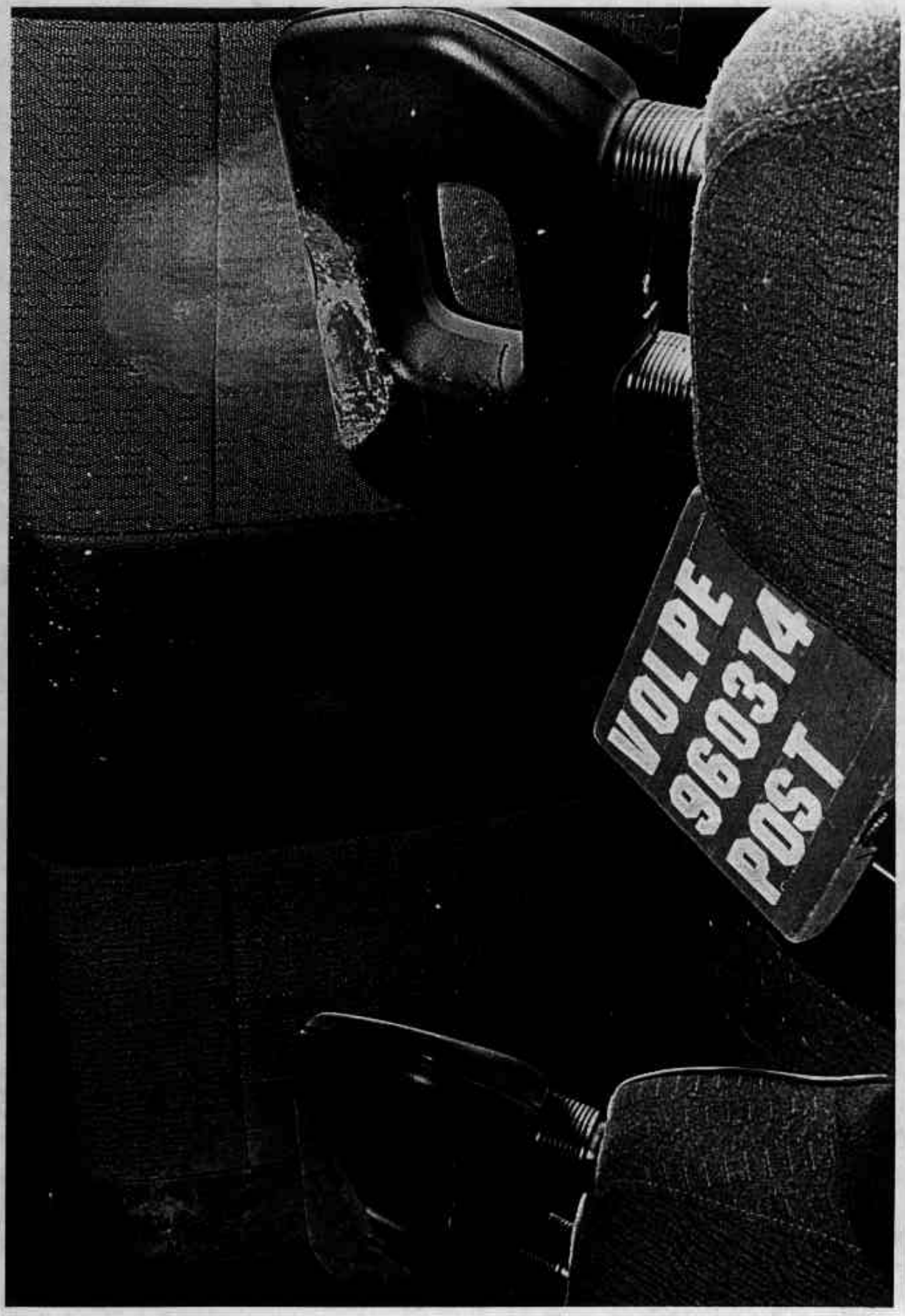


Figure A-40 Post-Test Driver Dummy Head Contact - View 3

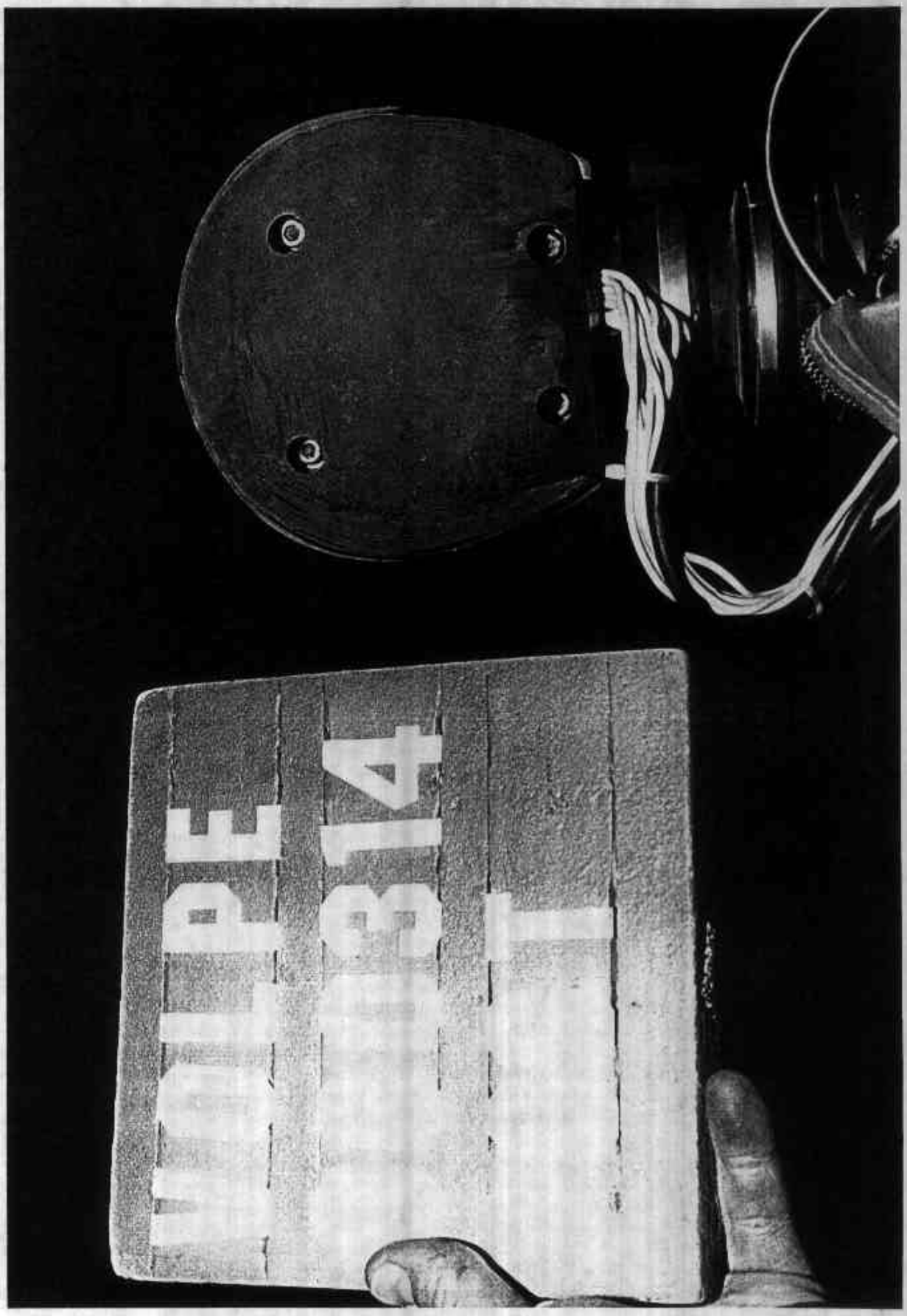


Figure A-41 Post-Test Passenger Dummy Head Contact - View 1

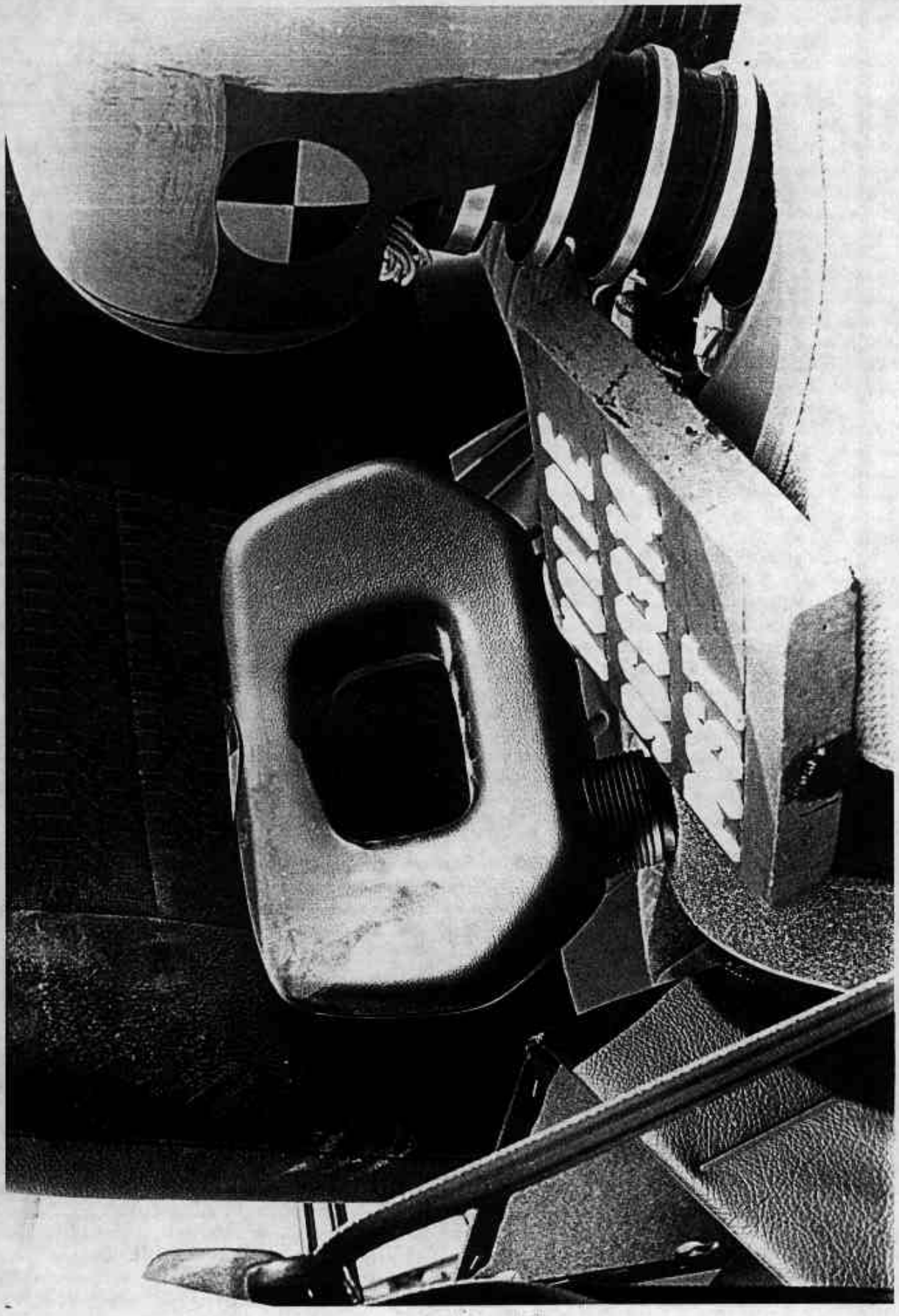


Figure A-42 Post-Test Passenger Dummy Head Contact - View 2

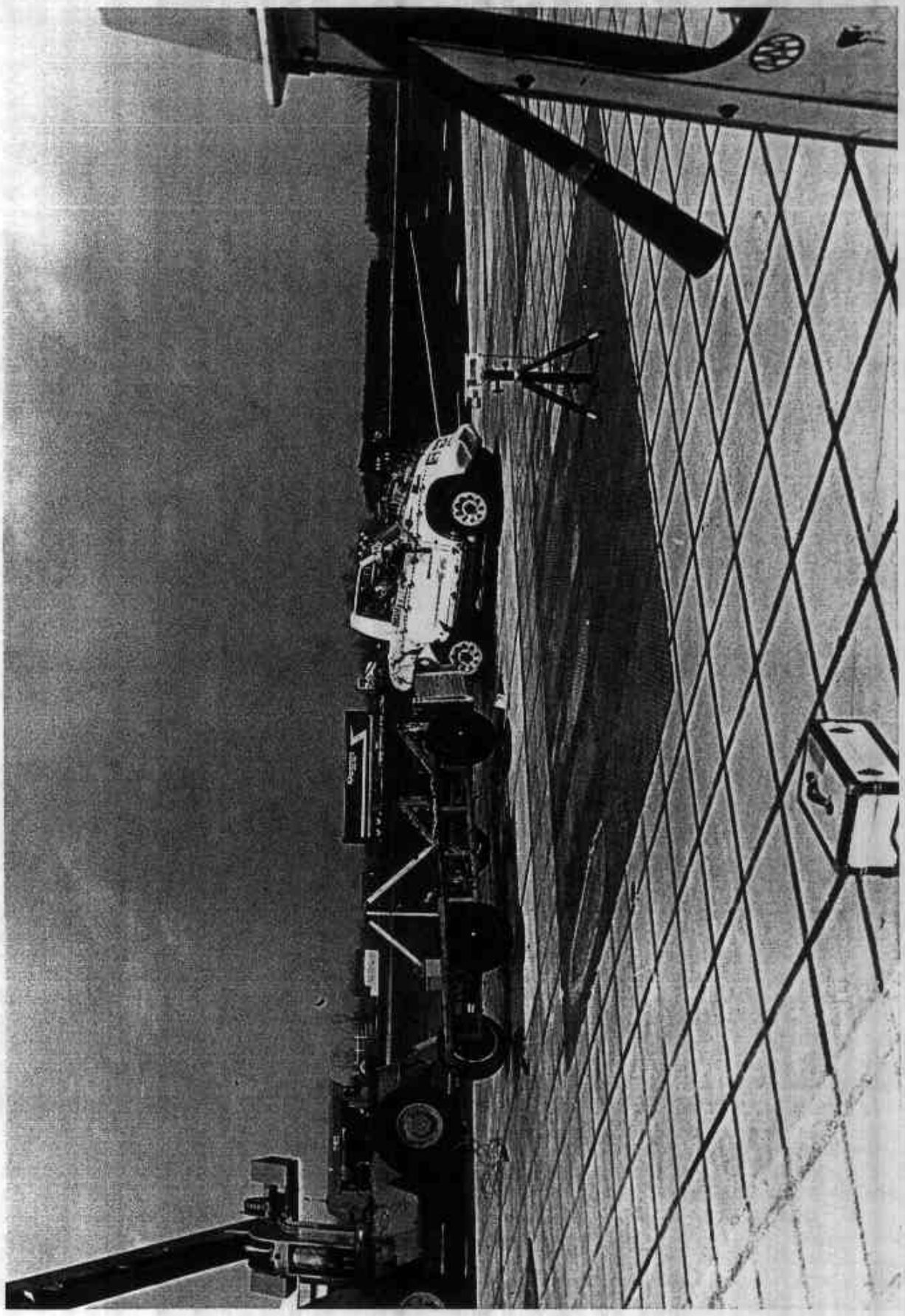


Figure A-43 Impact Event

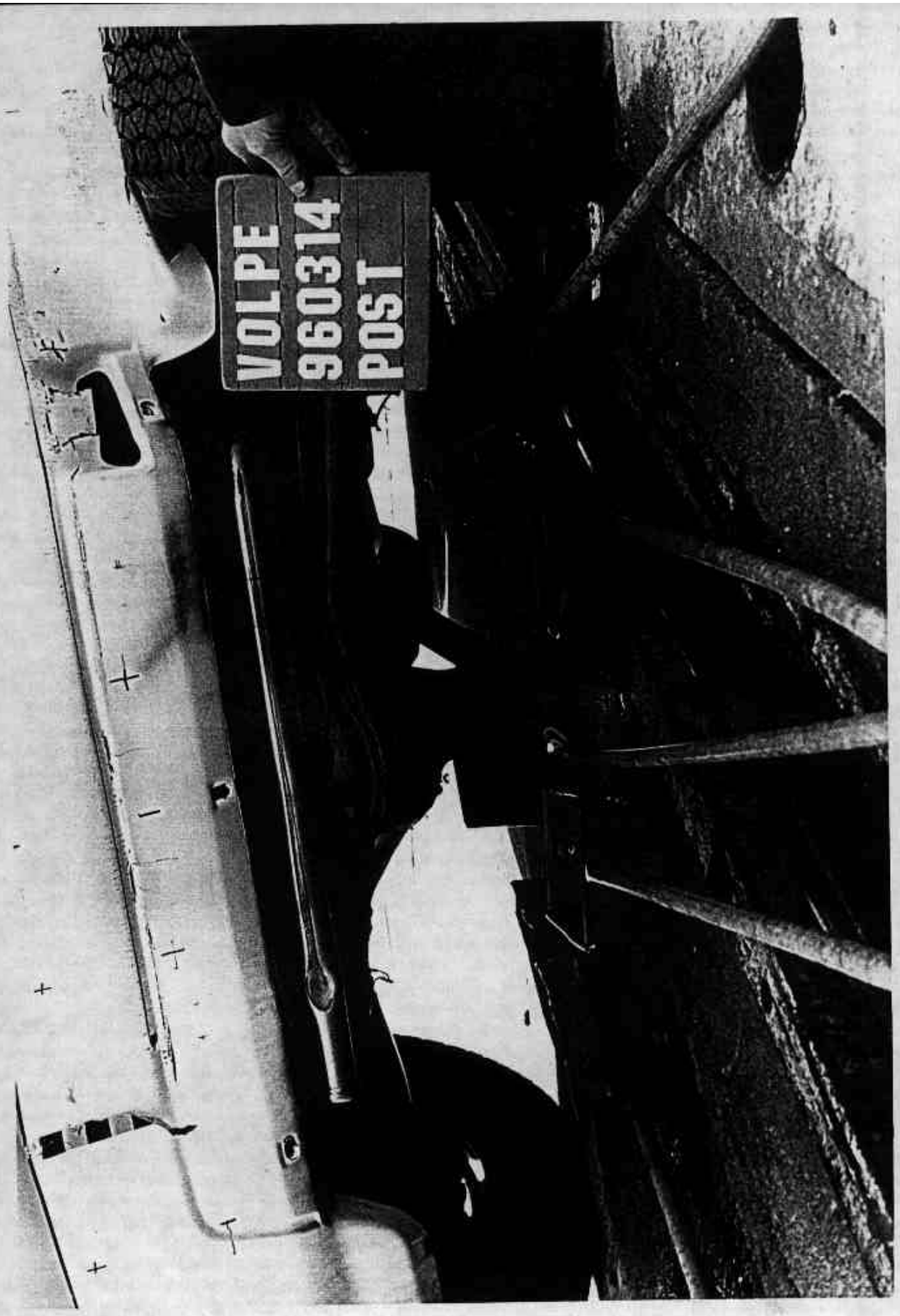


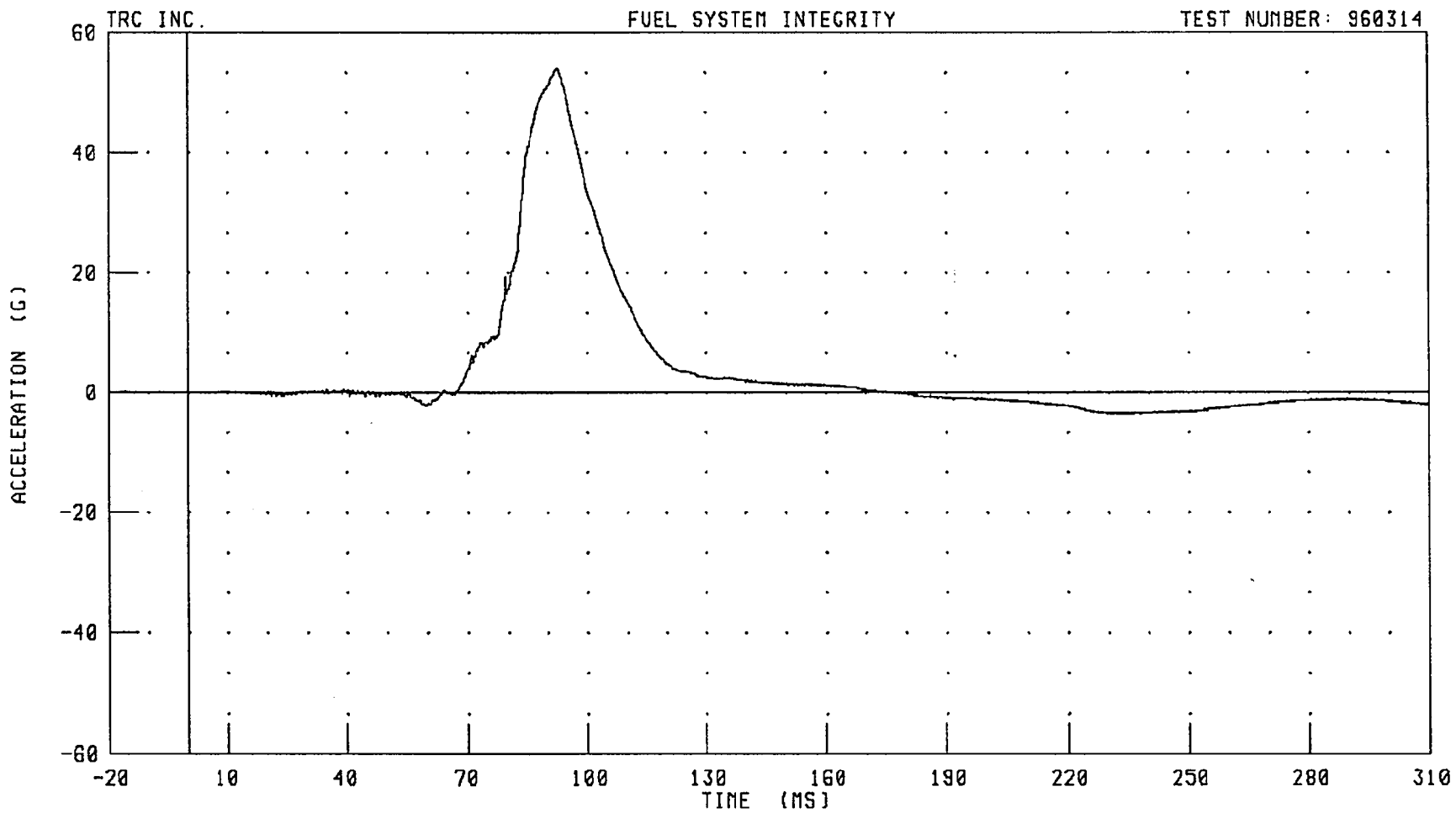
Figure A-44 Post-Test Vehicle Fuel System Fluid Spillage

Appendix B

Data Plots

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER HEAD X-AXIS ACCELERATION

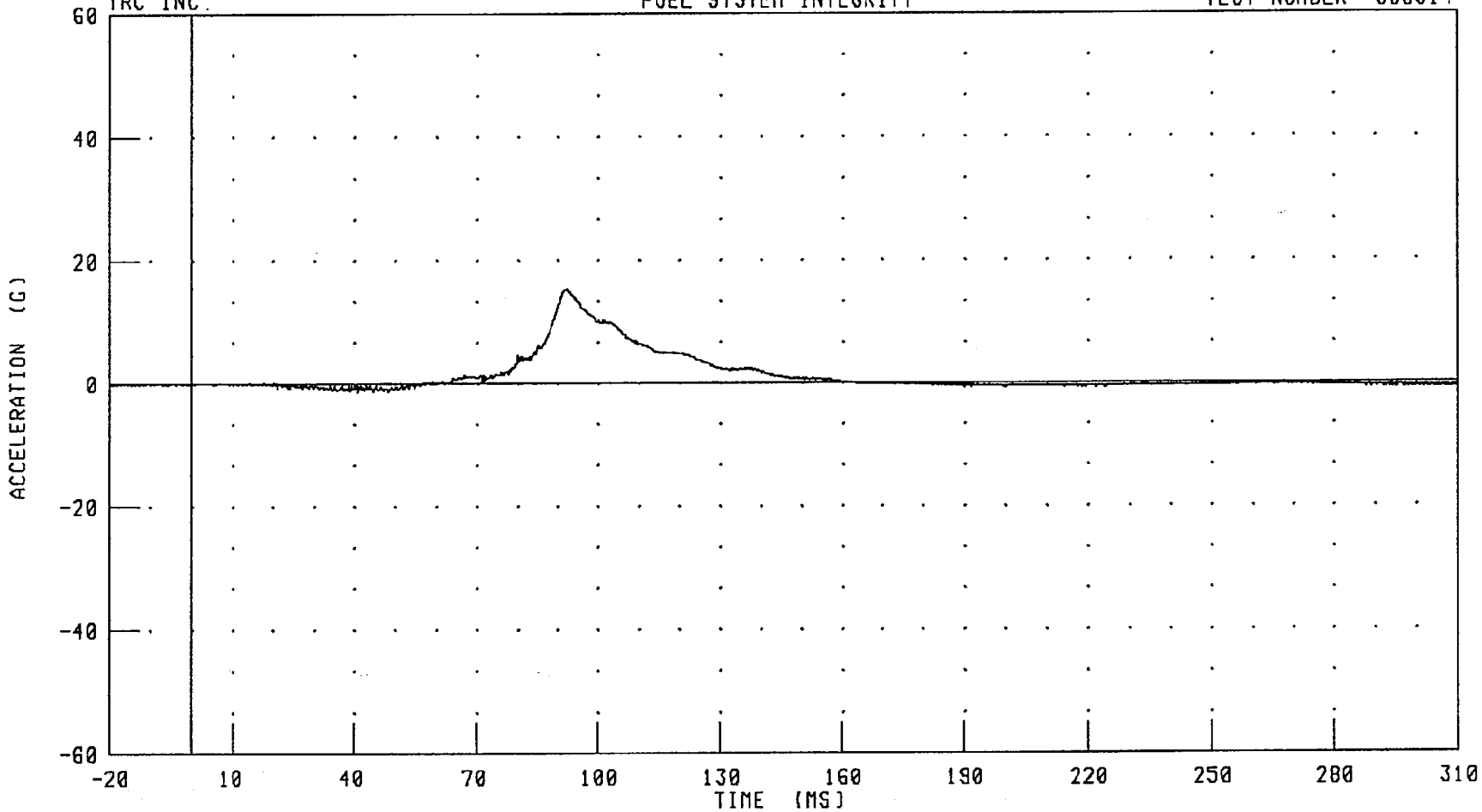


960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER HEAD Y-AXIS ACCELERATION

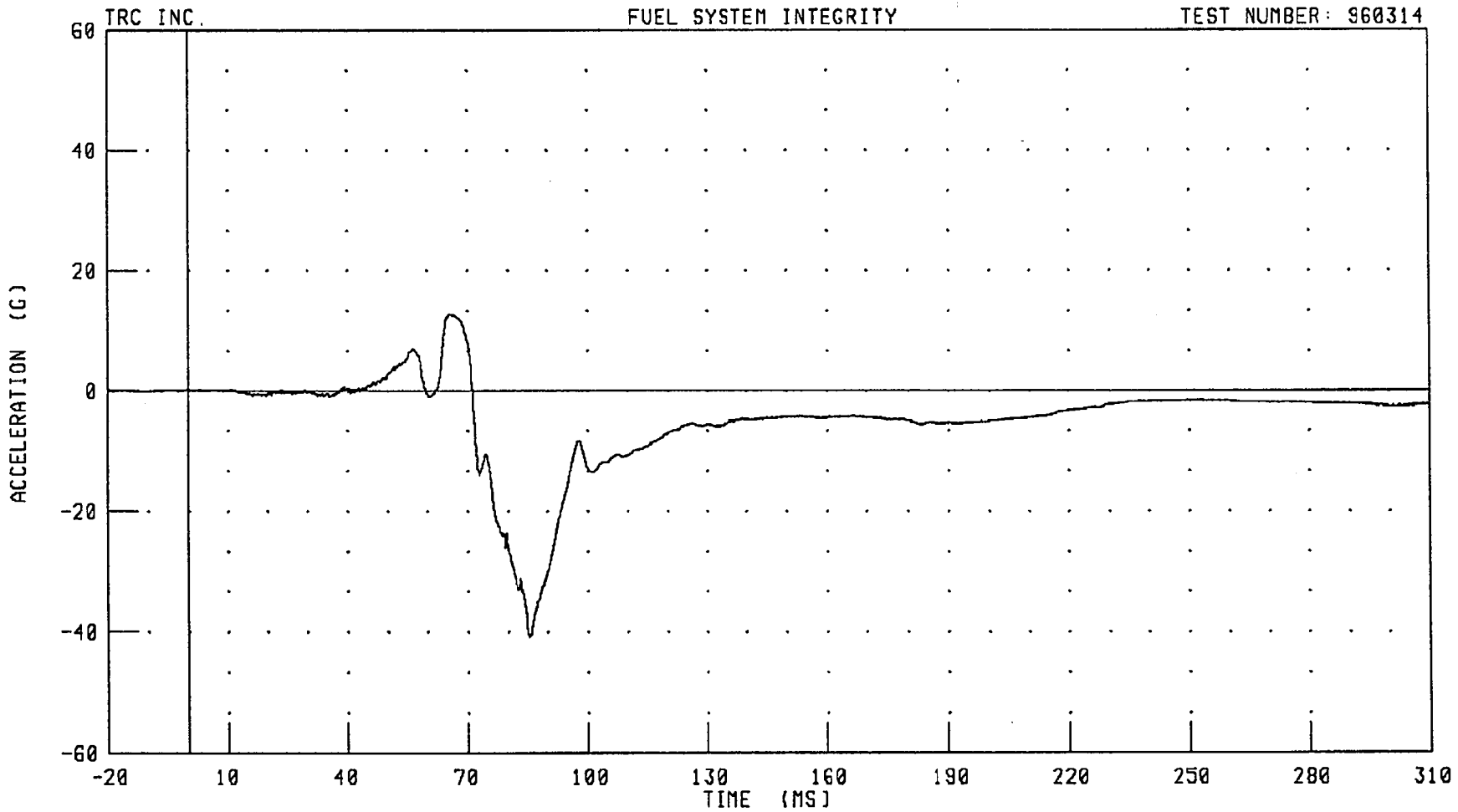
TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



CHANNEL: HEDYG1 FILTER: CH. CLASS 1000 PEAK DATA: 15.37 G @ 92.24 MS; -1.54 G @ 40.80 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER HEAD Z-AXIS ACCELERATION



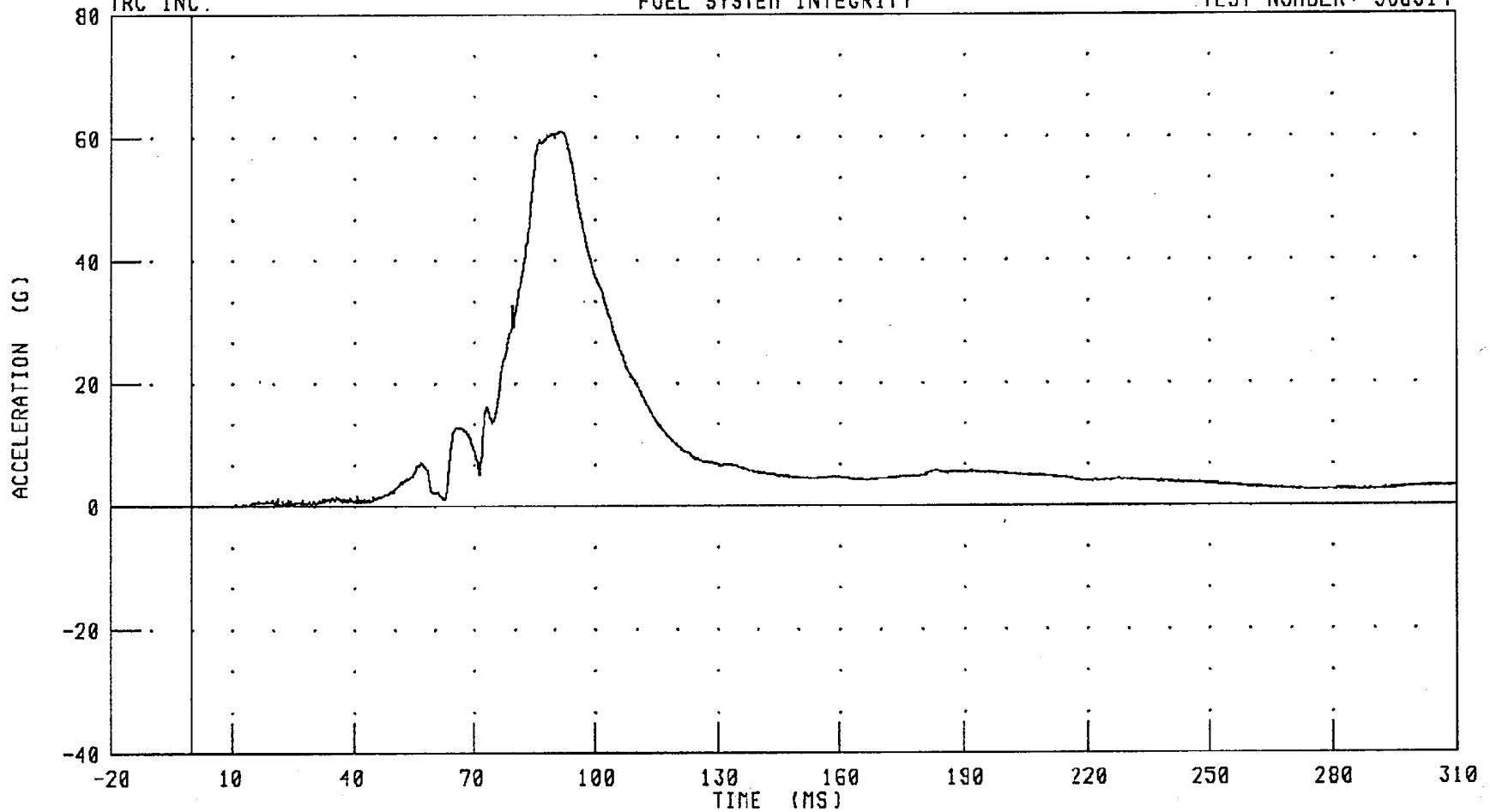
CHANNEL: HEDZG1 FILTER: CH. CLASS 1000 PEAK DATA: 12.63 G @ 65.44 MS; -40.79 G @ 85.52 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER HEAD RESULTANT ACCELERATION

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314

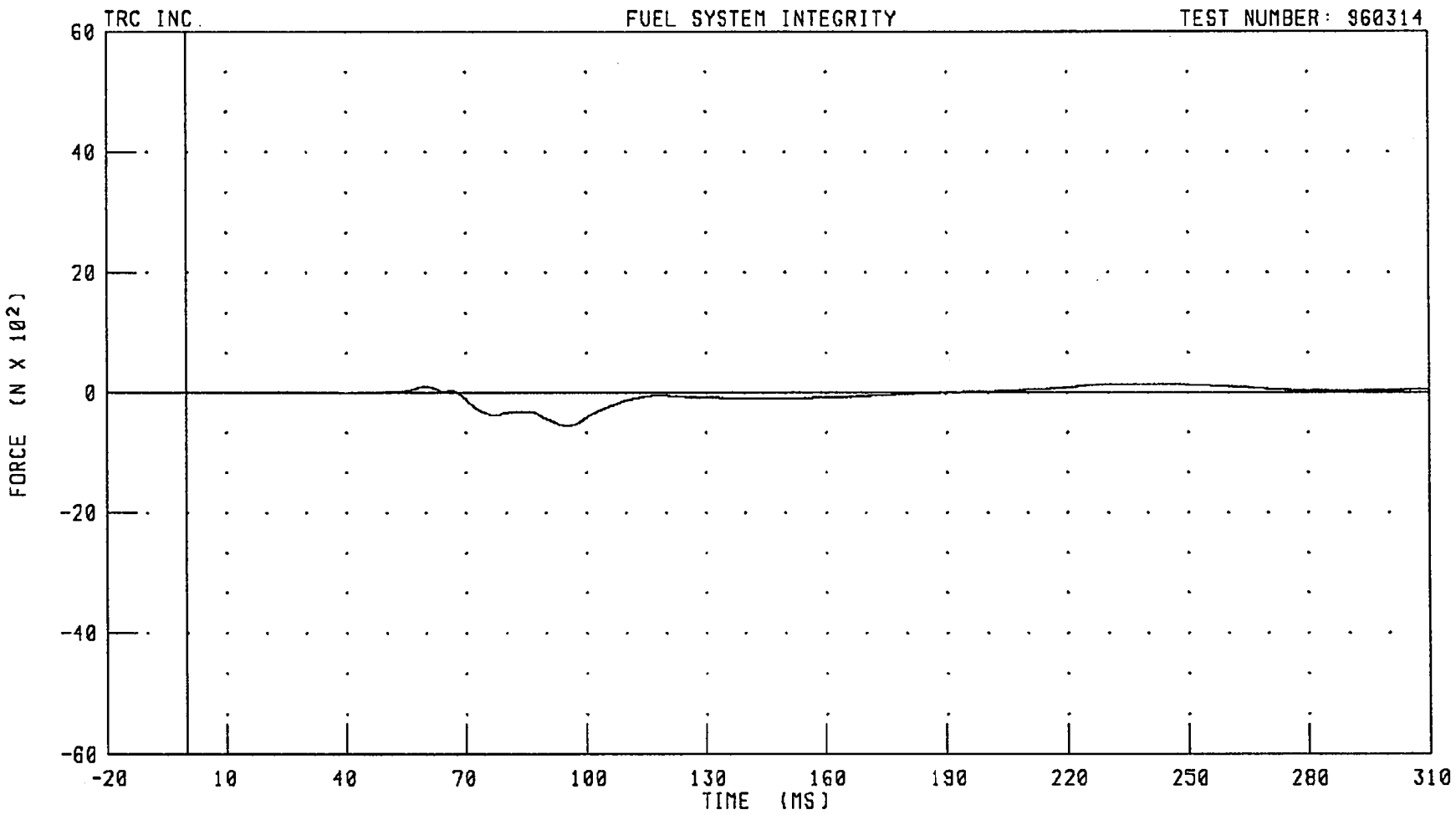


CHANNEL: HEDRG1 FILTER: CH. CLASS 1000 PEAK DATA: 60.98 G @ 91.76 MS; 0.09 G @ -19.68 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER UPPER NECK X-AXIS SHEAR FORCE

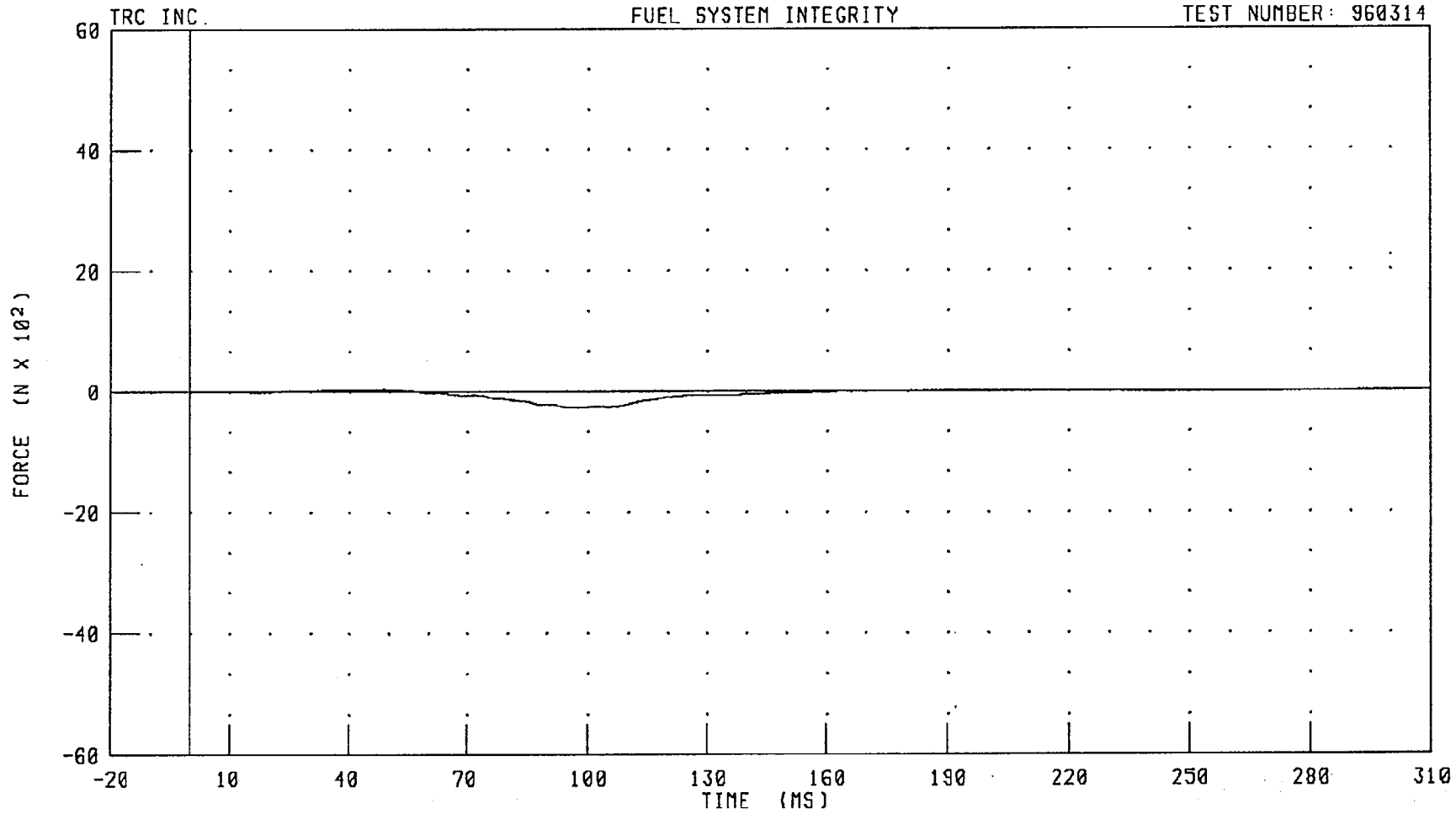


CHANNEL: NEKXF1 FILTER: CH. CLASS 1000 PEAK DATA: 138.62 N @ 231.04 MS; -556.74 N @ 94.64 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER UPPER NECK Y-AXIS SHEAR FORCE

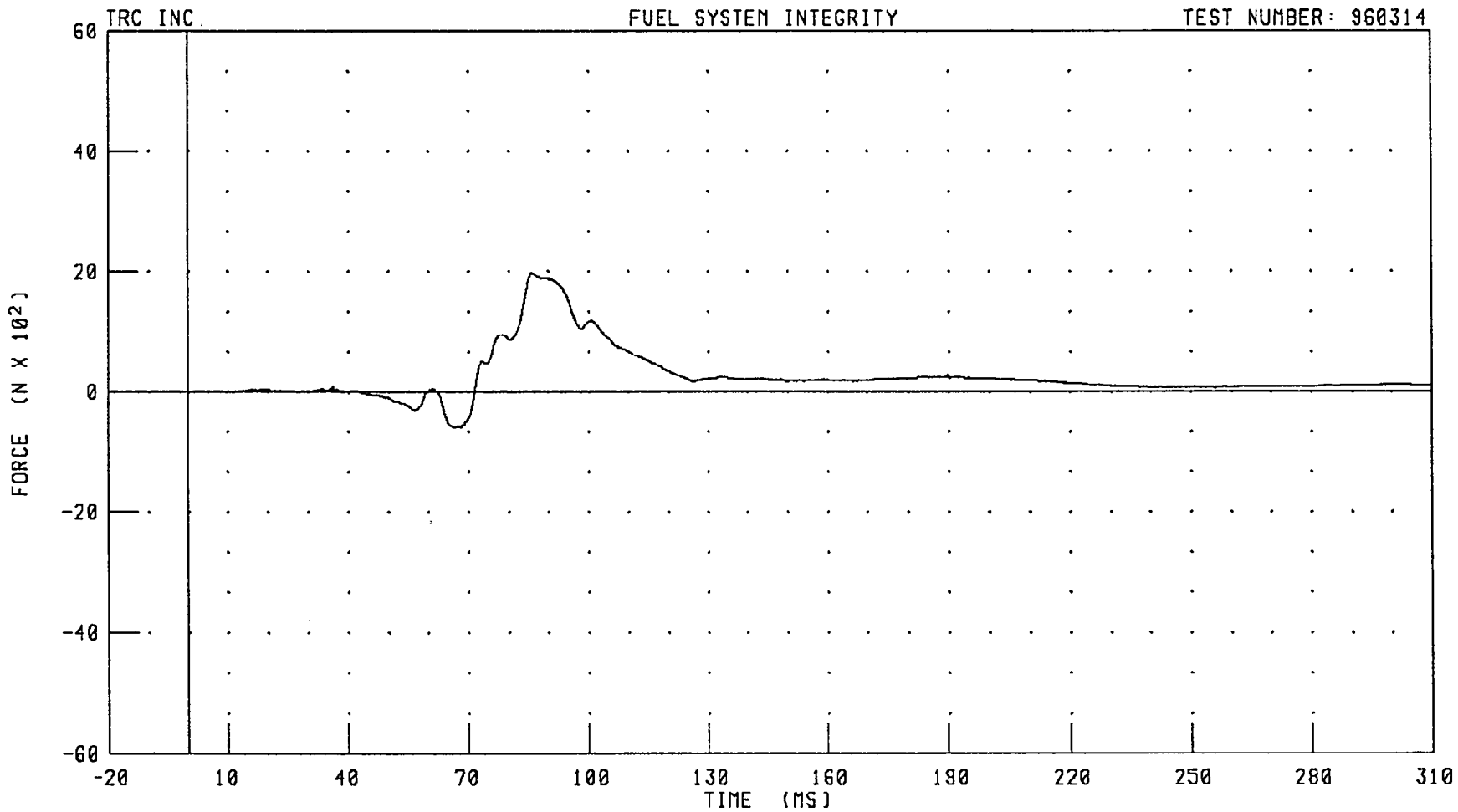


CHANNEL: NEKYF1 FILTER: CH. CLASS 1000

PEAK DATA: 47.31 N @ 48.72 MS; -274.30 N @ 95.28 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
DRIVER UPPER NECK Z-AXIS AXIAL FORCE



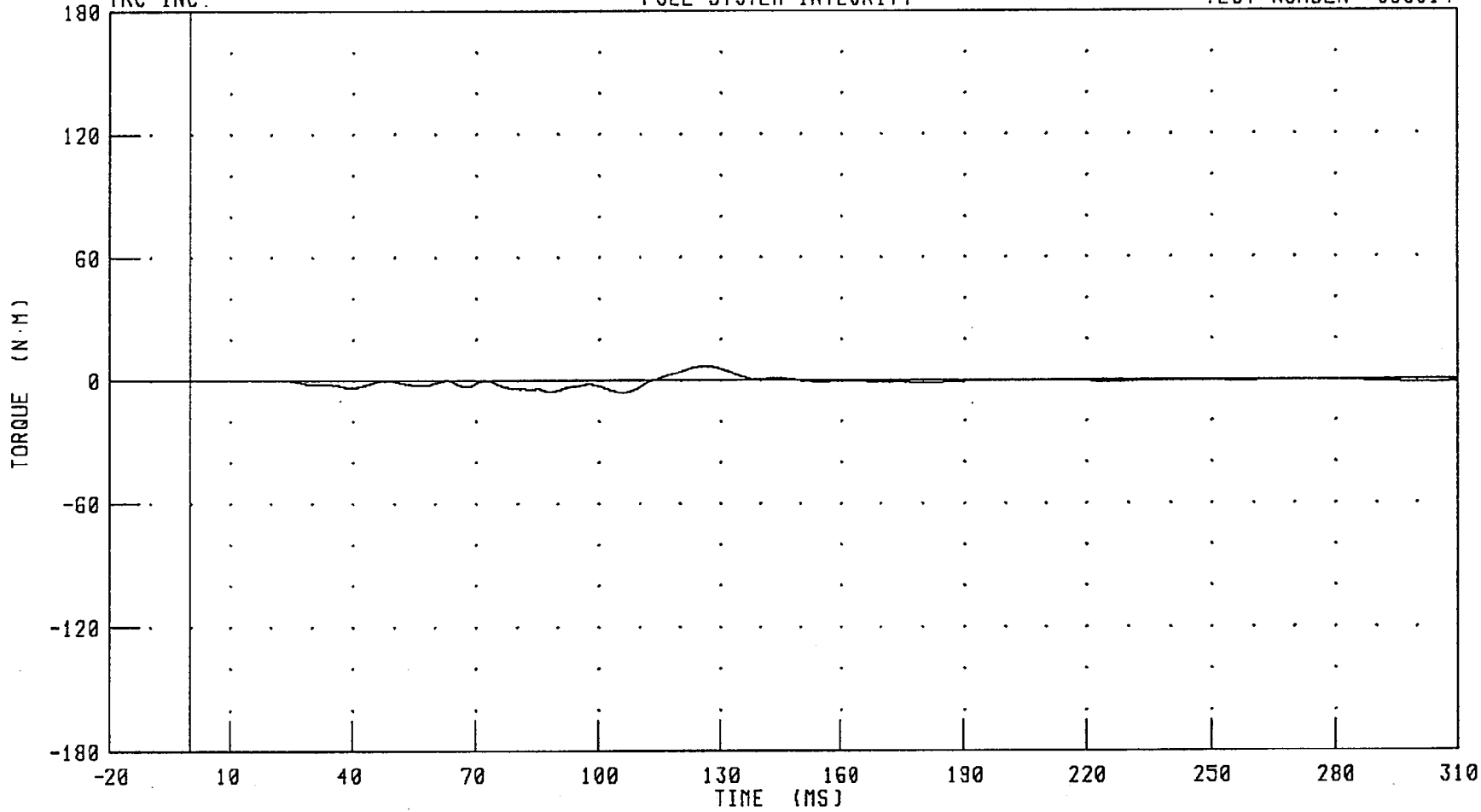
CHANNEL: NEKZF1 FILTER: CH. CLASS 1000 PEAK DATA: 1980.00 N @ 86.08 MS; -606.68 N @ 66.56 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

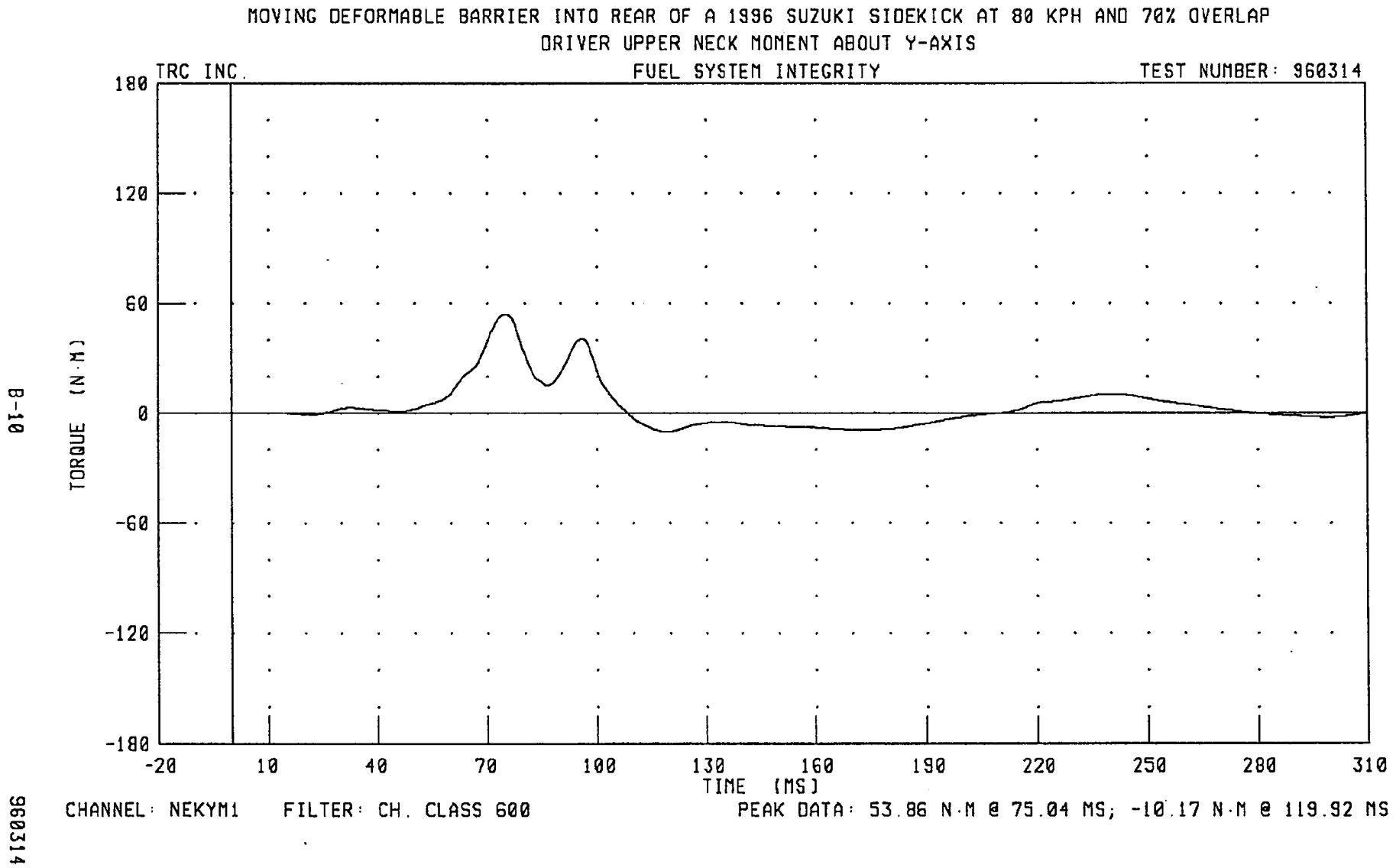
DRIVER UPPER NECK MOMENT ABOUT X-AXIS

TRC INC. FUEL SYSTEN INTEGRITY TEST NUMBER: 960314



CHANNEL: NEKXM1 FILTER: CH. CLASS 600 PEAK DATA: 6.65 N·M @ 125.84 MS; -5.98 N·M @ 105.60 MS

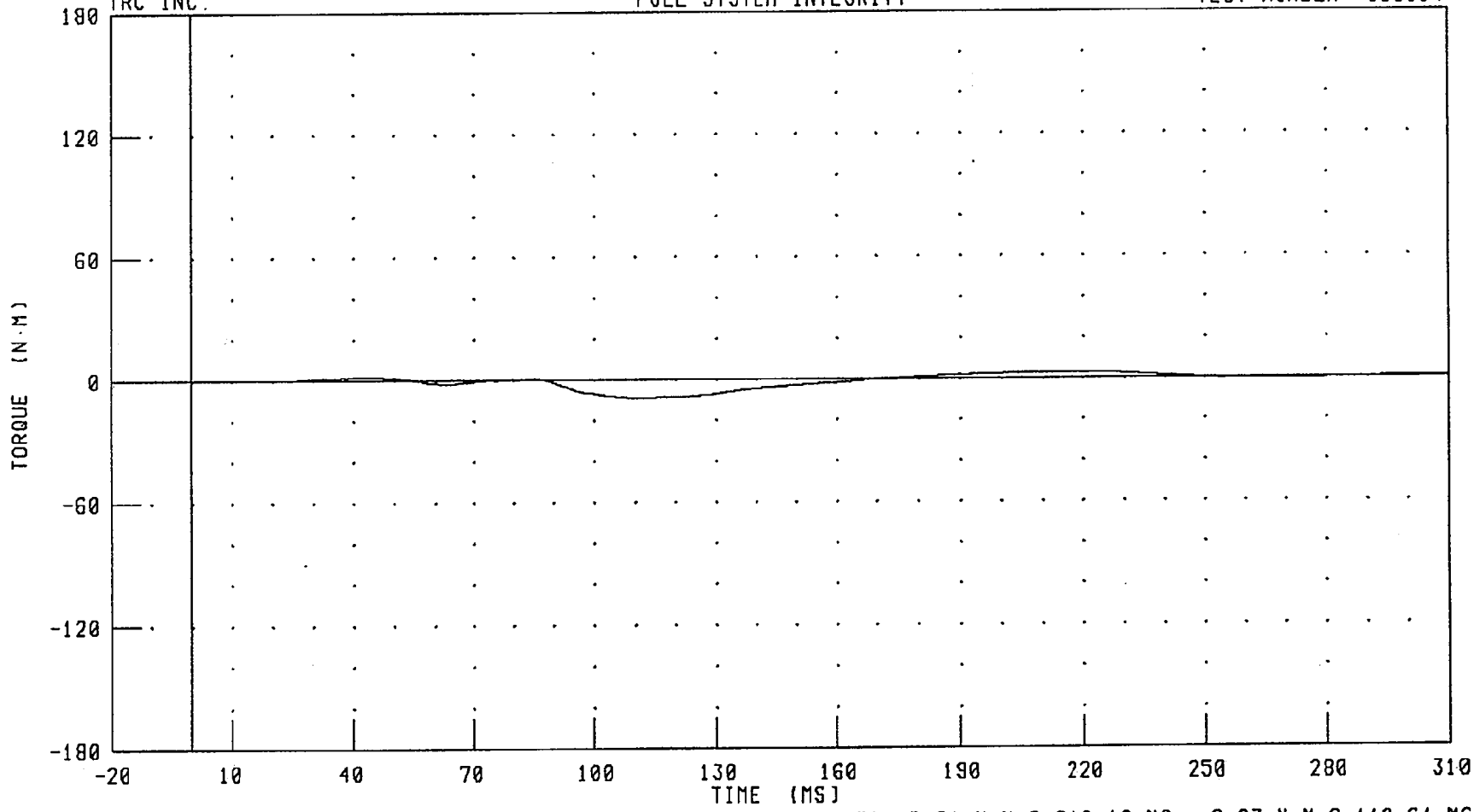
960314


MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
DRIVER UPPER NECK MOMENT ABOUT Y-AXIS
TRC INC.
FUEL SYSTEM INTEGRITY
TEST NUMBER: 960314
180
120
60
0
-60
-120
-180
TORQUE (N·M)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: NEKYM1
FILTER: CH. CLASS 600
PEAK DATA: 53.86 N·M @ 75.04 MS; -10.17 N·M @ 119.92 MS

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER UPPER NECK MOMENT ABOUT Z-AXIS

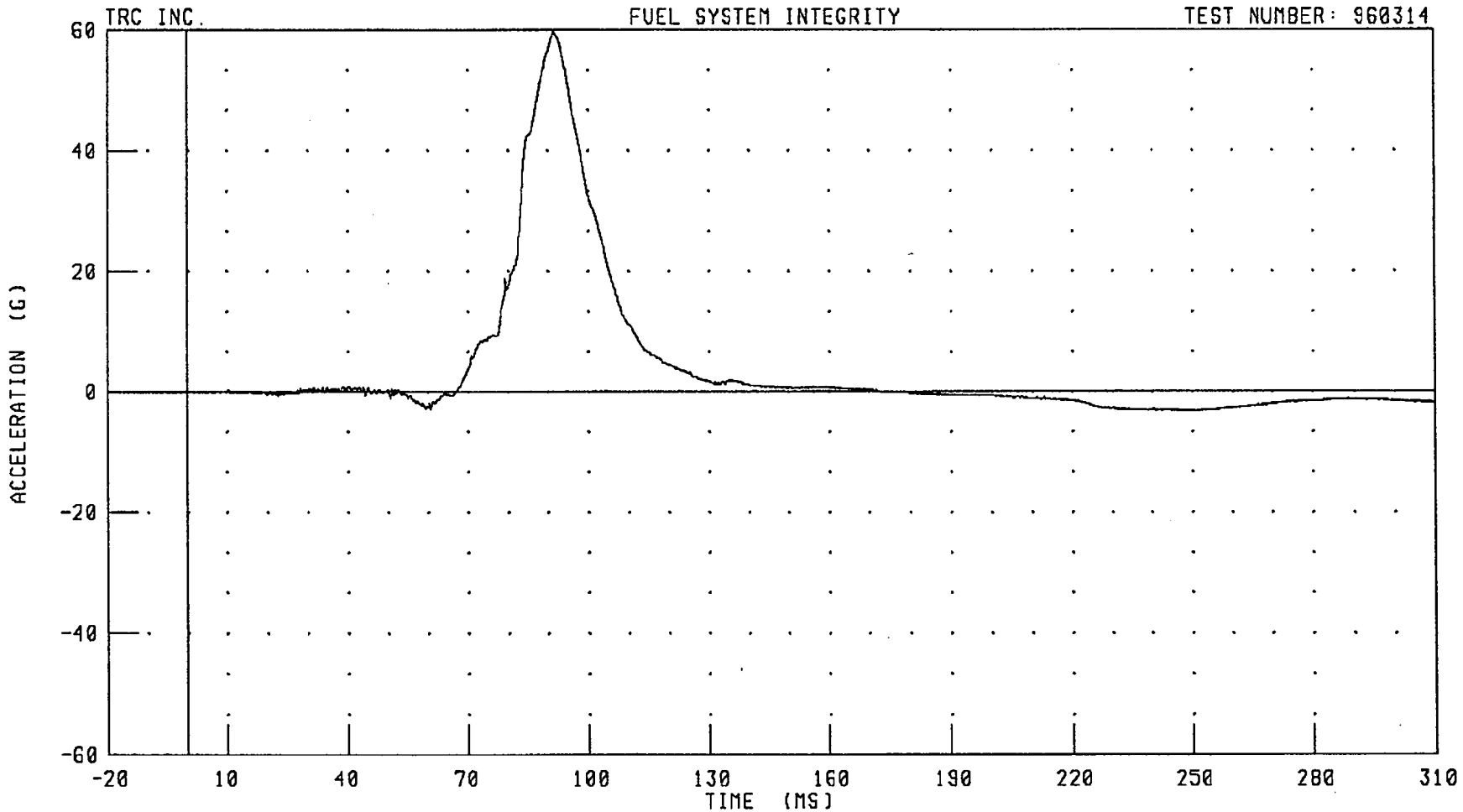
TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



CHANNEL: NEKZM1 FILTER: CH. CLASS 600 PEAK DATA: 2.81 N-M @ 218.16 MS; -9.23 N-M @ 110.64 MS

960314

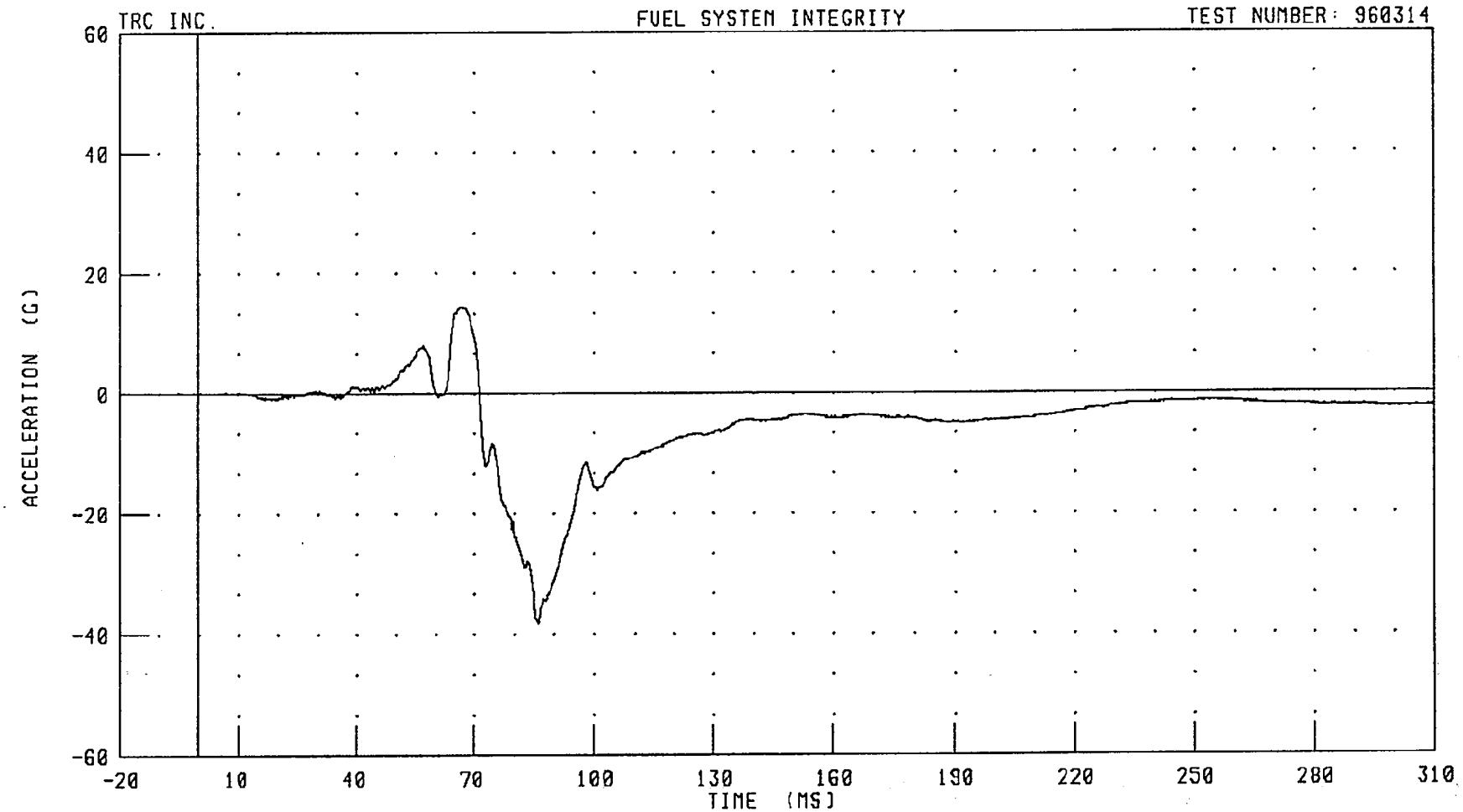
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
DRIVER HEAD POSITION 1 X-AXIS ACCELERATION



CHANNEL: HD1XG1 FILTER: CH. CLASS 1000 PEAK DATA: 59.56 G @ 91.52 MS; -3.26 G @ 238.88 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
DRIVER HEAD POSITION 1 Z-AXIS ACCELERATION



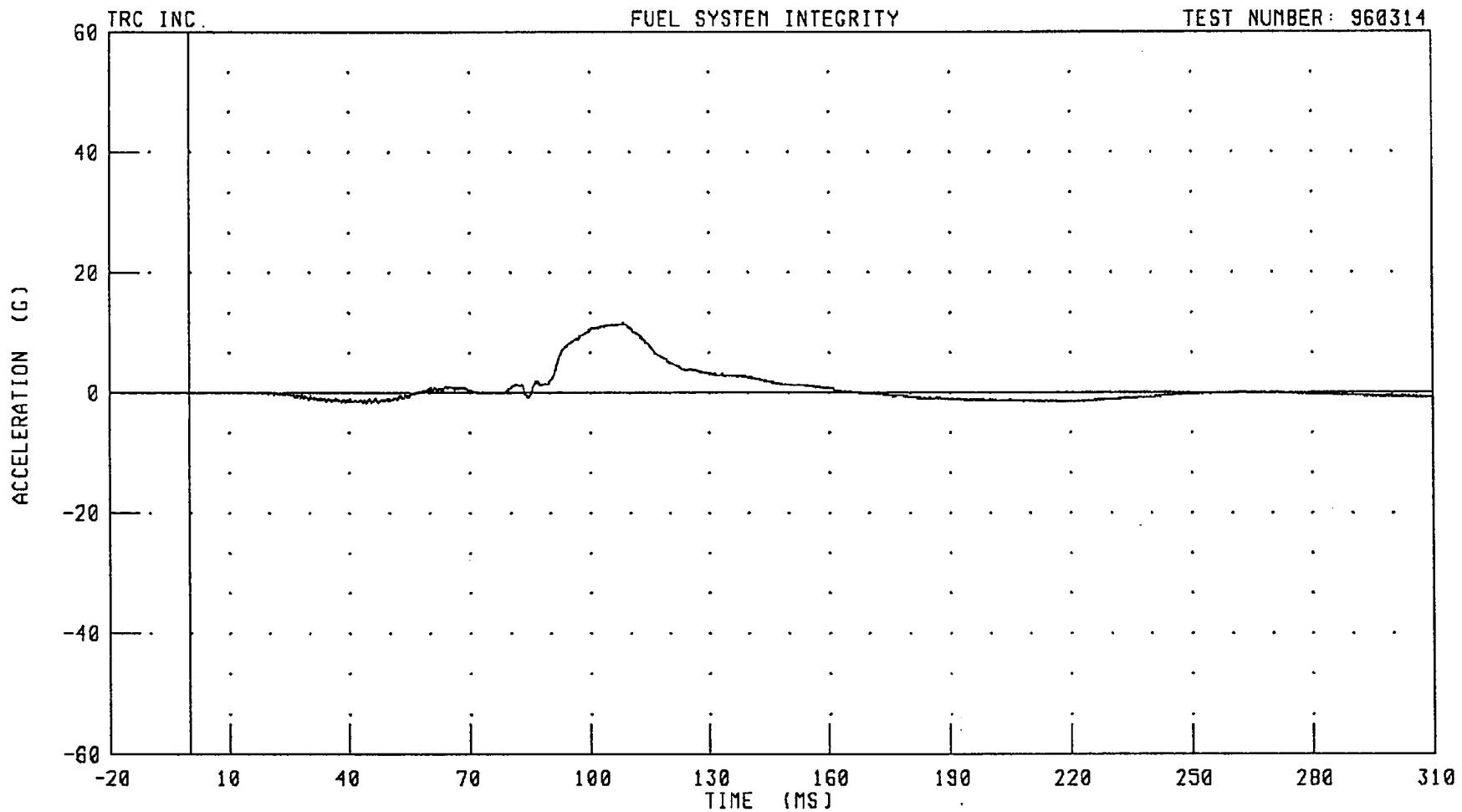
CHANNEL: HD1ZG1 FILTER: CH. CLASS 1000

PEAK DATA: 14.42 G @ 66.48 MS; -38.34 G @ 86.00 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER HEAD POSITION 2 Y-AXIS ACCELERATION



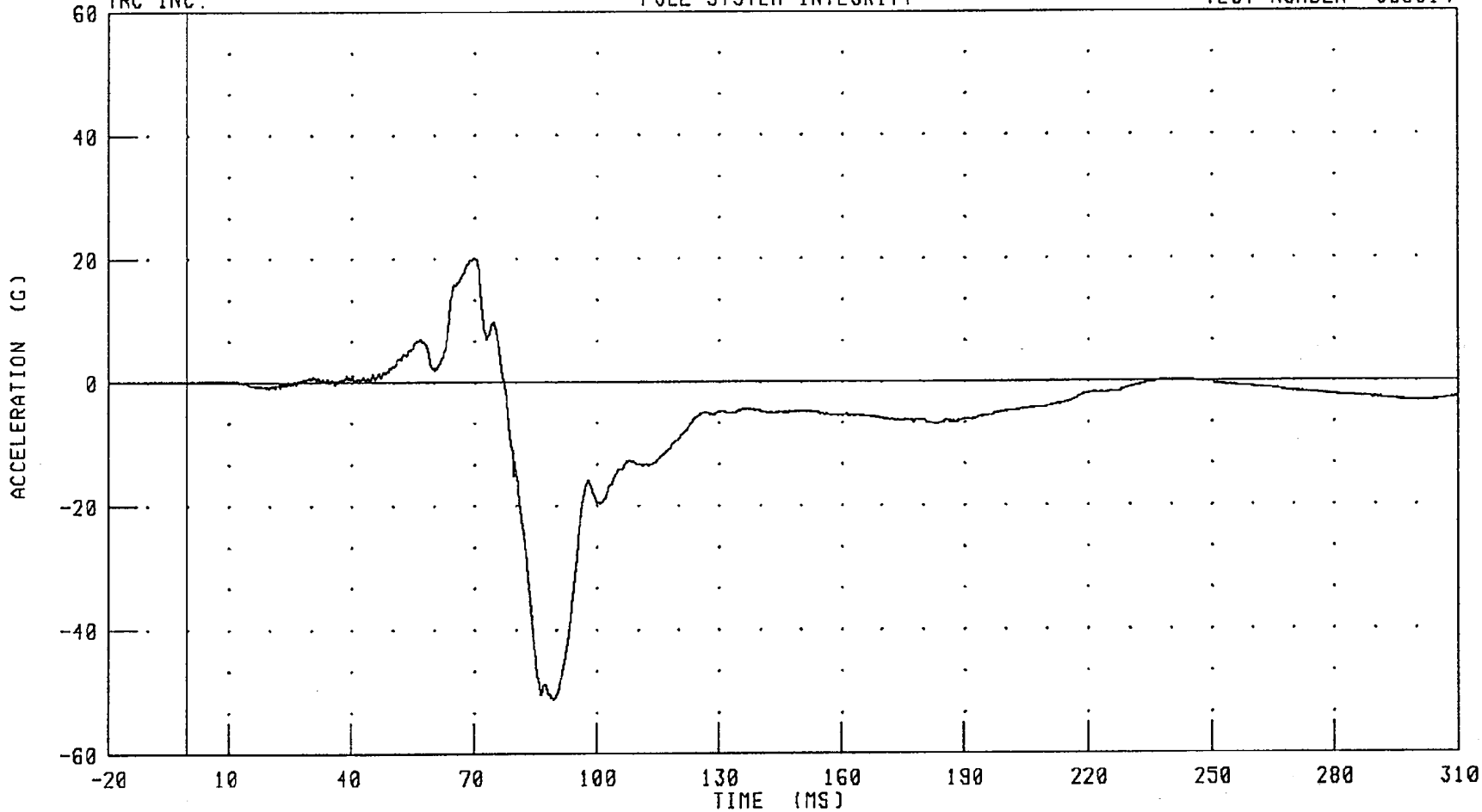
CHANNEL: H02YG1 FILTER: CH. CLASS 1000 PEAK DATA: 11.62 G @ 108.00 MS; -1.75 G @ 38.24 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER HEAD POSITION 2 Z-AXIS ACCELERATION

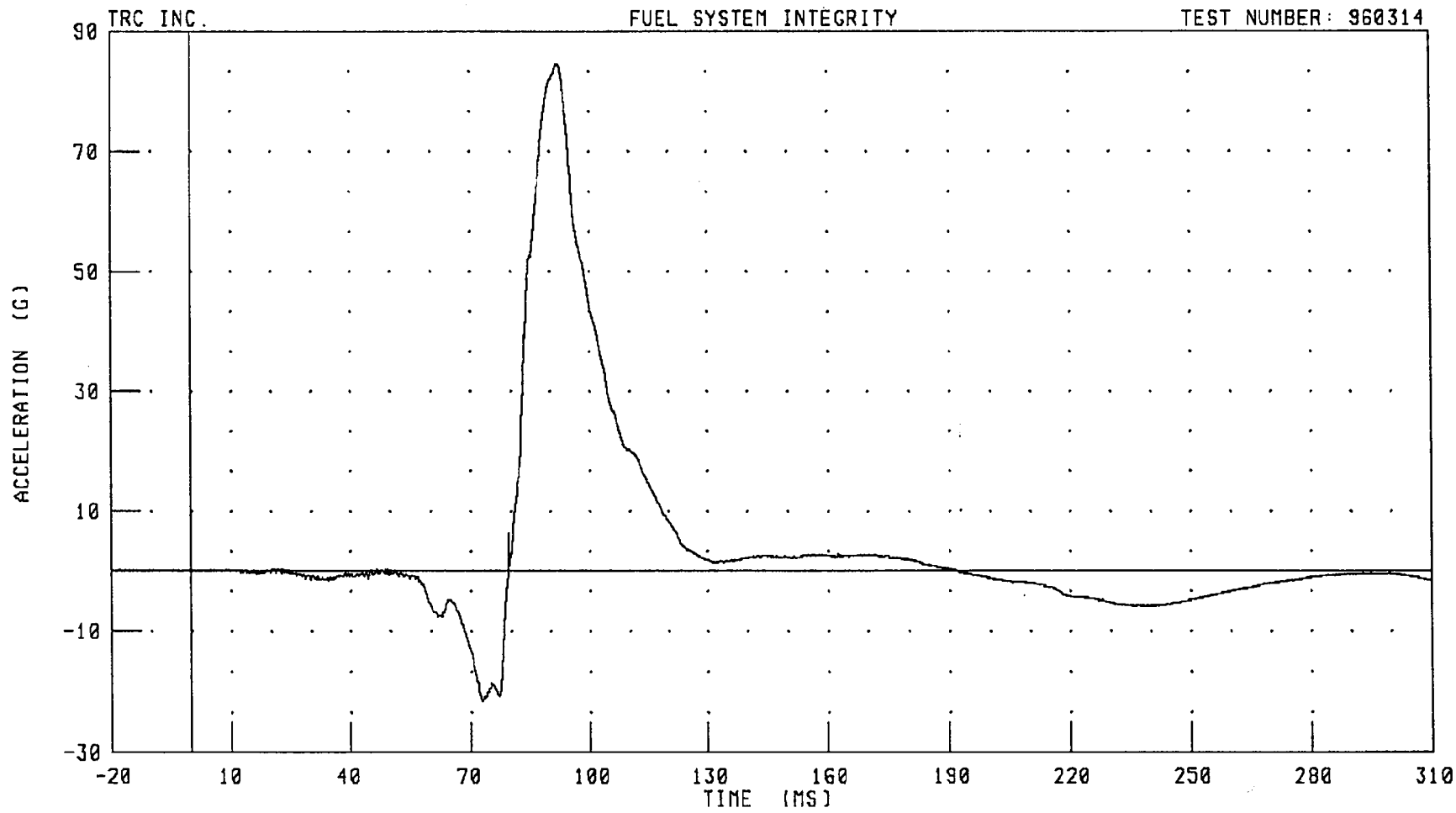
TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



CHANNEL: HD2ZG1 FILTER: CH. CLASS 1000 PEAK DATA: 20.18 G @ 69.76 MS; -51.30 G @ 89.20 MS

960314

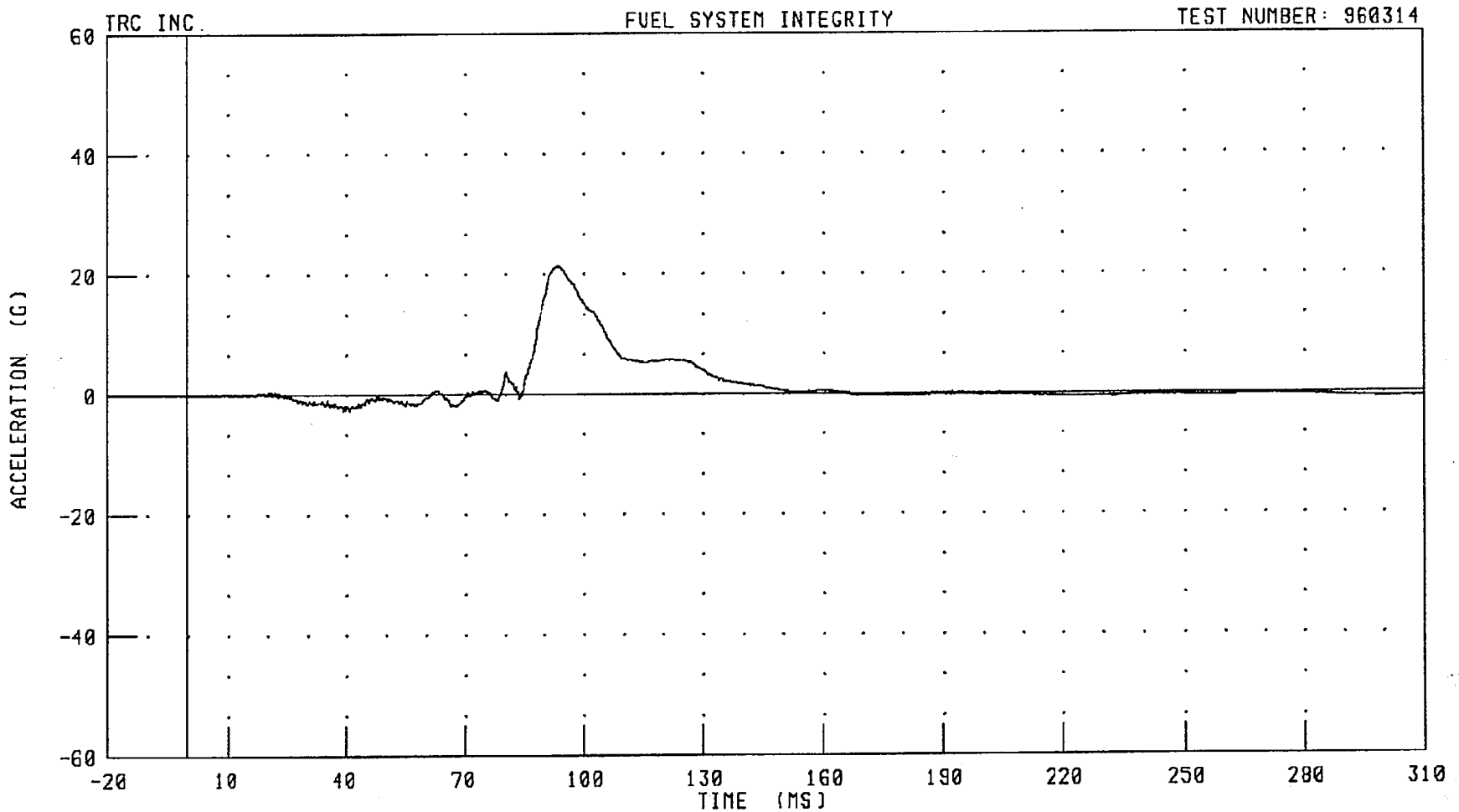
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
DRIVER HEAD POSITION 3 X-AXIS ACCELERATION



CHANNEL: HD3XG1 FILTER: CH. CLASS 1000 PEAK DATA: 84.61 G @ 91.92 MS; -21.56 G @ 72.72 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
DRIVER HEAD POSITION 3 Y-AXIS ACCELERATION



CHANNEL: HD3YG1 FILTER: CH. CLASS 1000

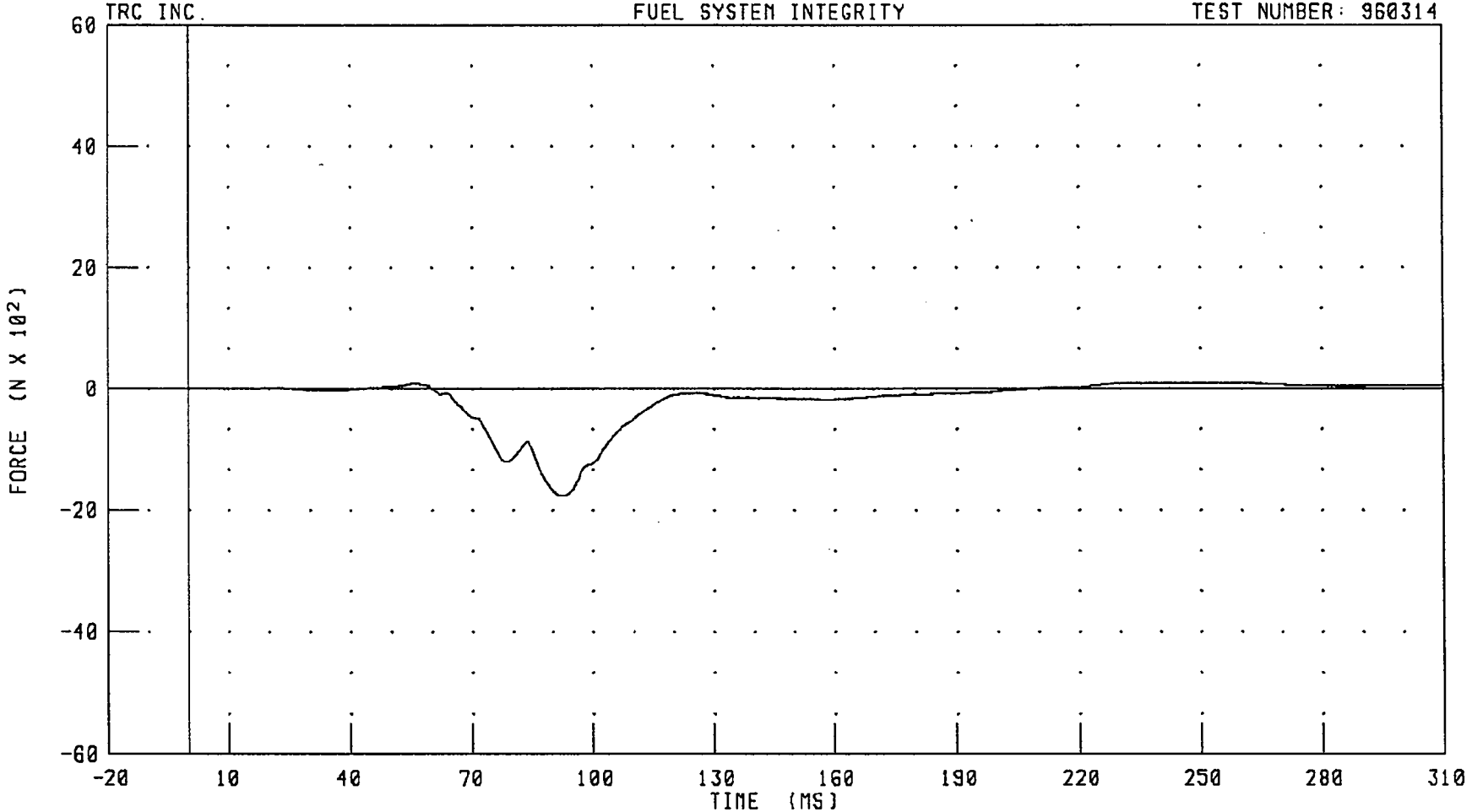
PEAK DATA: 21.60 G @ 93.60 MS; -2.65 G @ 39.28 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER LOWER NECK X-AXIS SHEAR FORCE

TRC INC. FUEL SYSTEN INTEGRITY TEST NUMBER: 960314



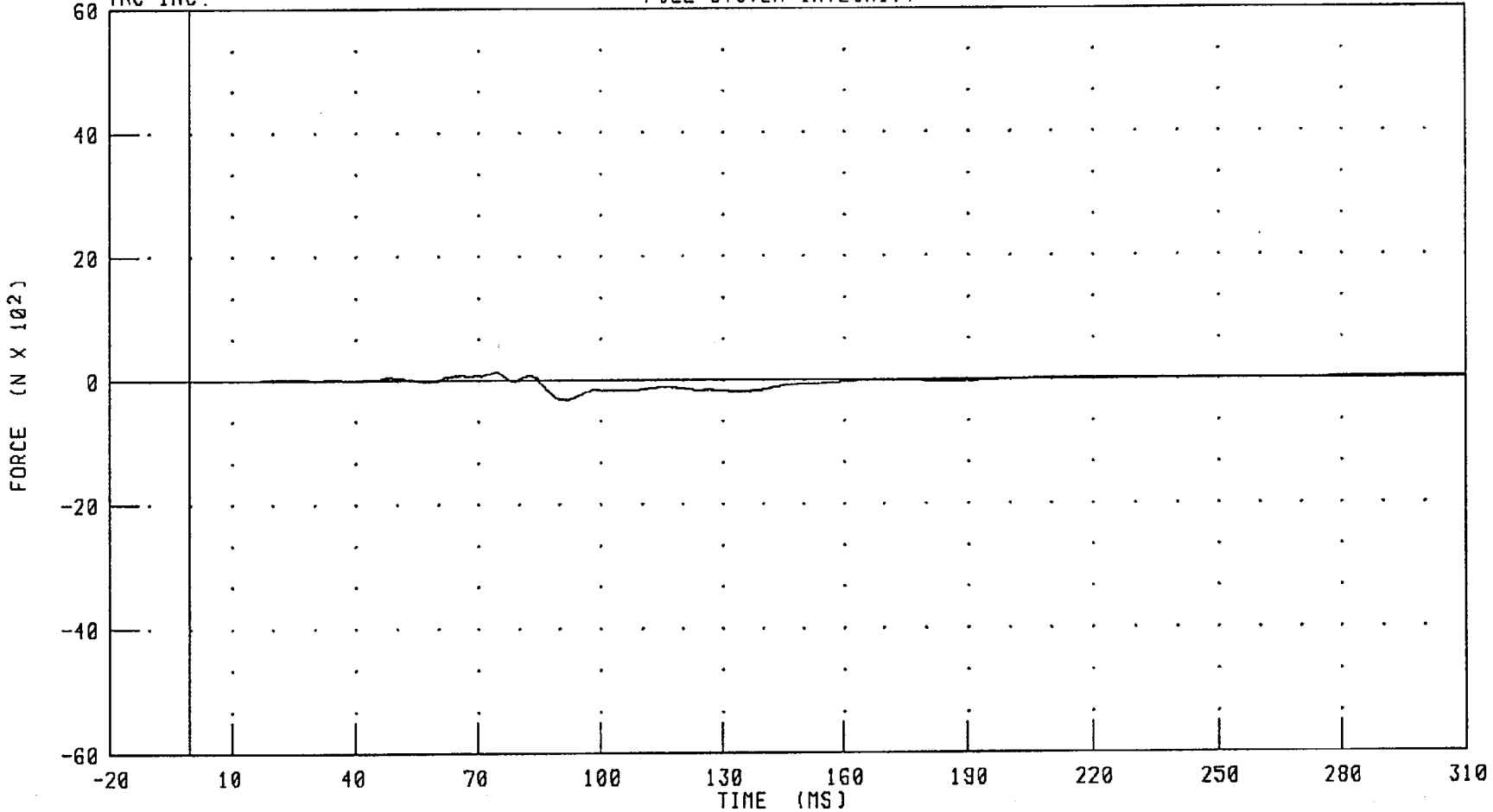
CHANNEL: NKLXF1 FILTER: CH. CLASS 1000 PEAK DATA: 91.07 N @ 237.12 MS; -1768.20 N @ 92.08 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER LOWER NECK Y-AXIS SHEAR FORCE

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314

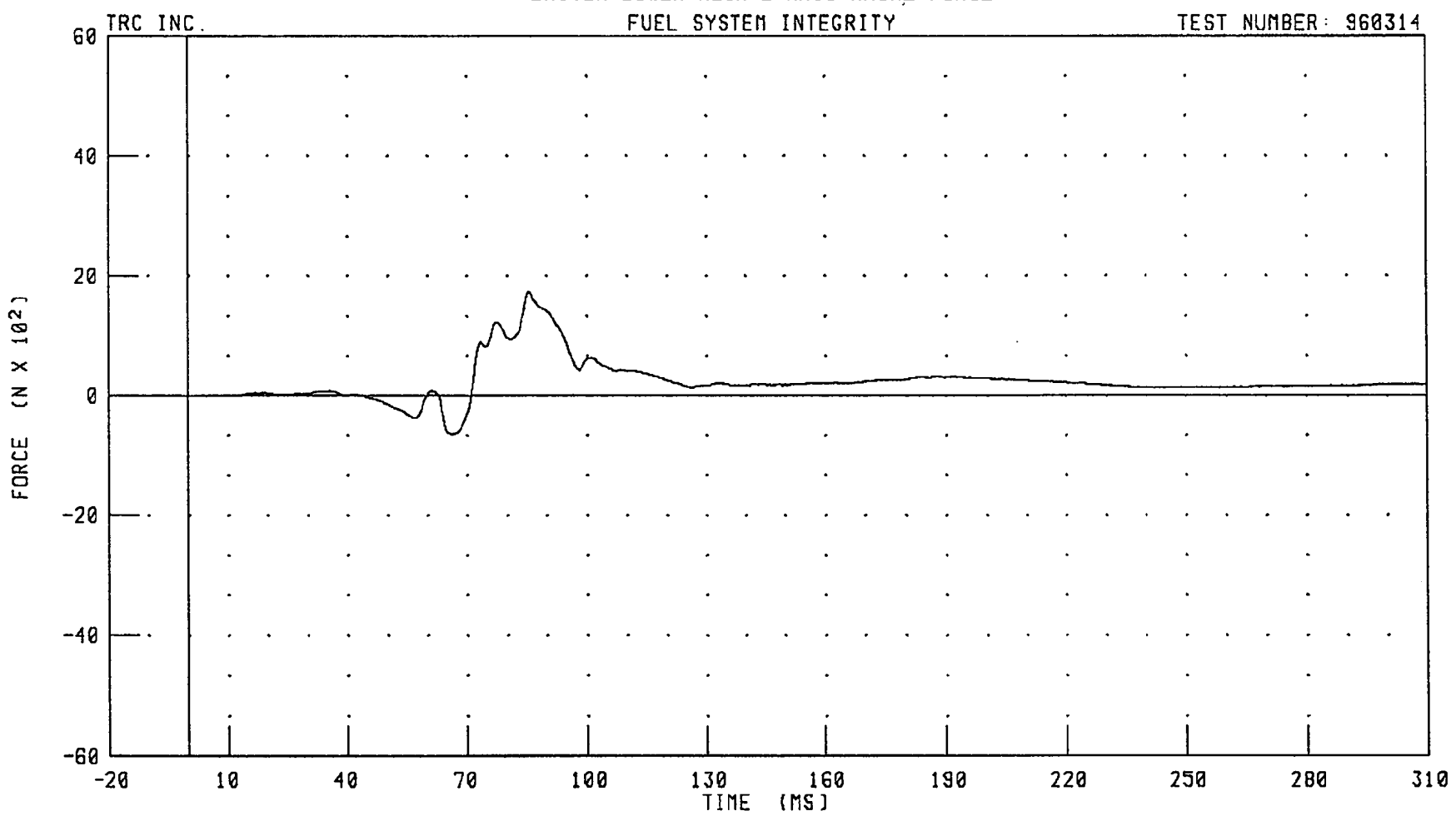


CHANNEL: NKLYF1 FILTER: CH. CLASS 1000 PEAK DATA: 136.84 N @ 74.24 MS; -312.89 N @ 91.60 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER LOWER NECK Z-AXIS AXIAL FORCE



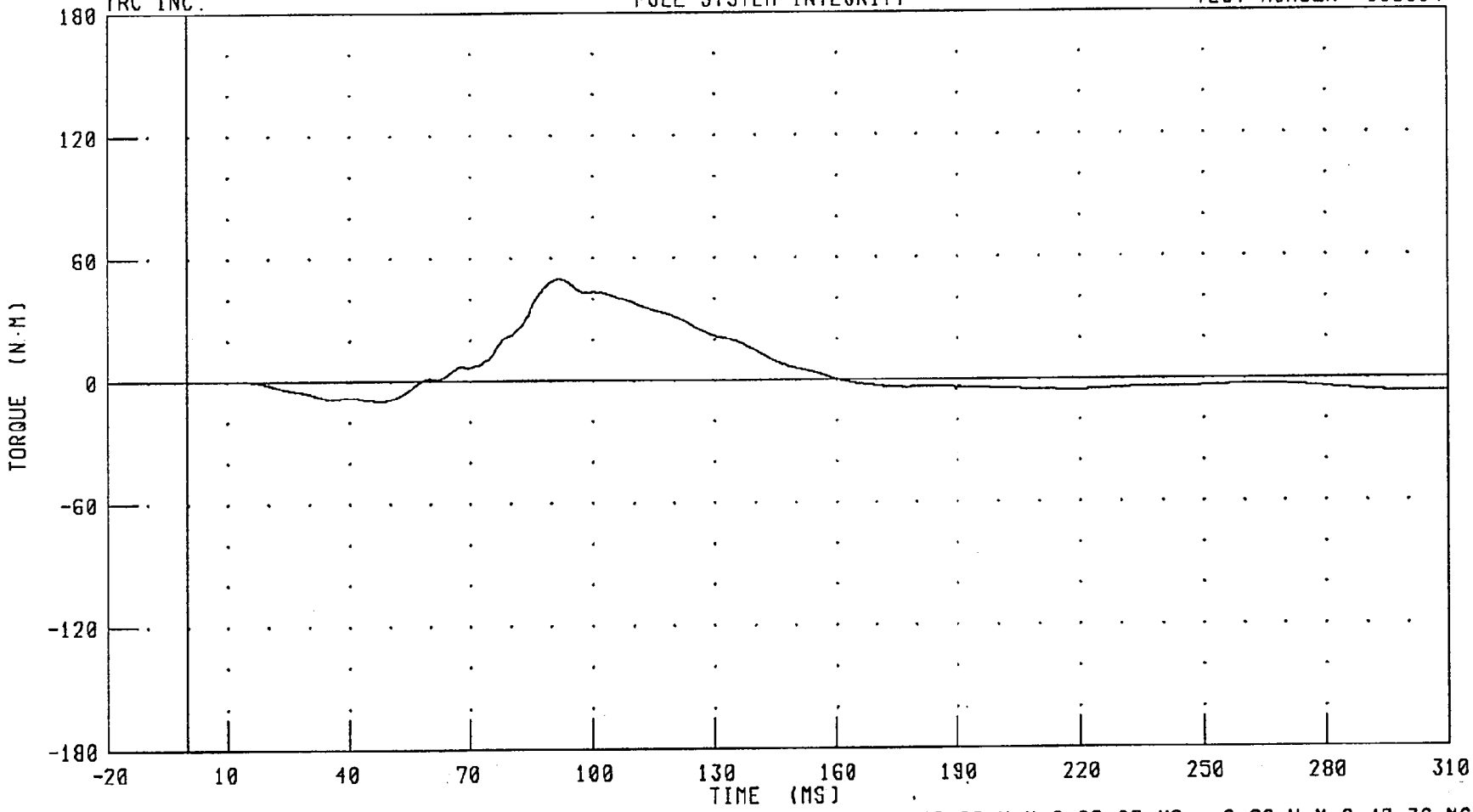
CHANNEL: NKLZF1 FILTER: CH. CLASS 1000 PEAK DATA: 1728.80 N @ 85.68 MS; -654.83 N @ 66.32 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER LOWER NECK MOMENT ABOUT X-AXIS

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



CHANNEL: NKLXM1 FILTER: CH. CLASS 600

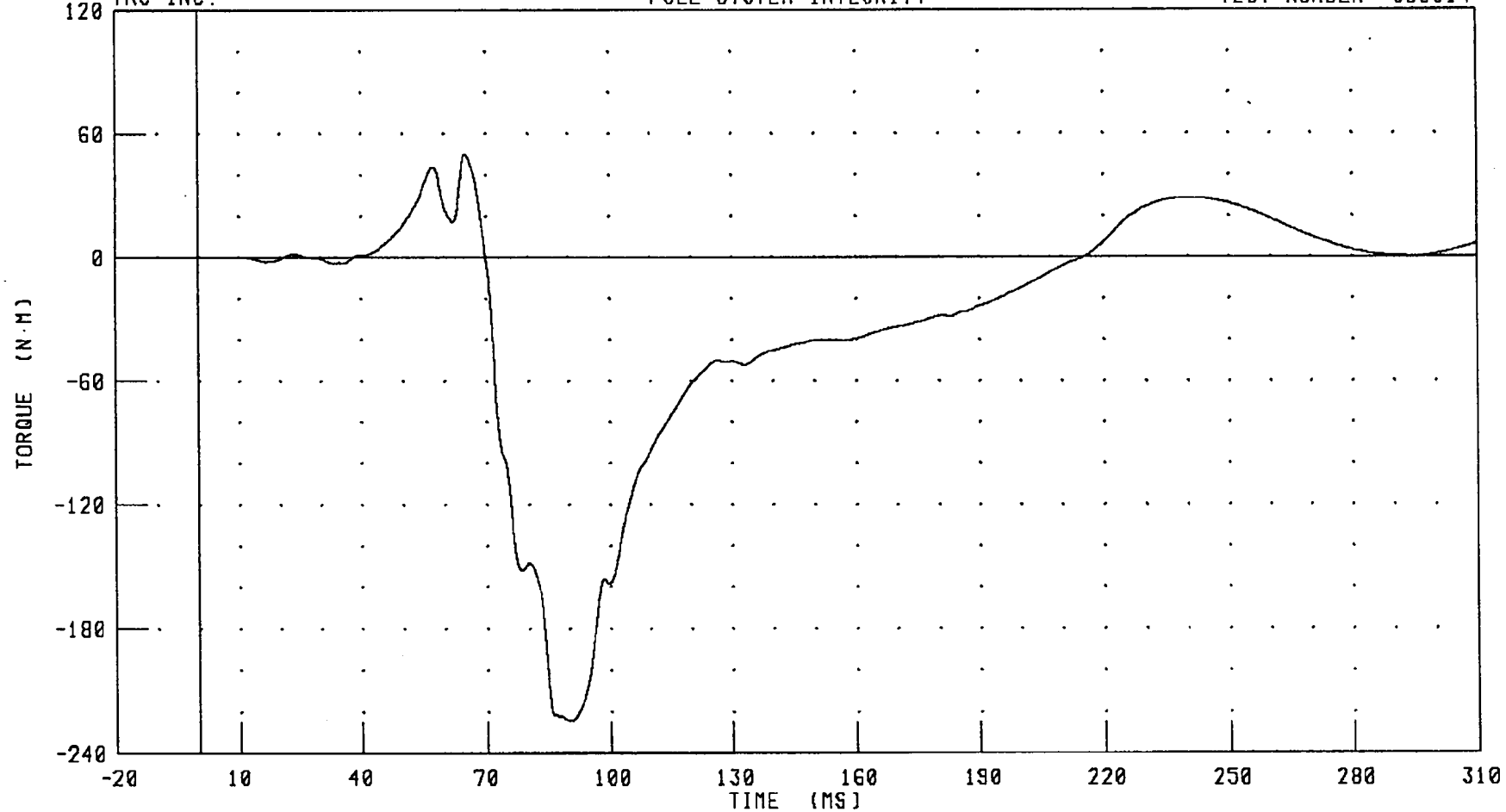
PEAK DATA: 49.68 N·M @ 92.08 MS; -9.68 N·M @ 47.36 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER LOWER NECK MOMENT ABOUT Y-AXIS

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314

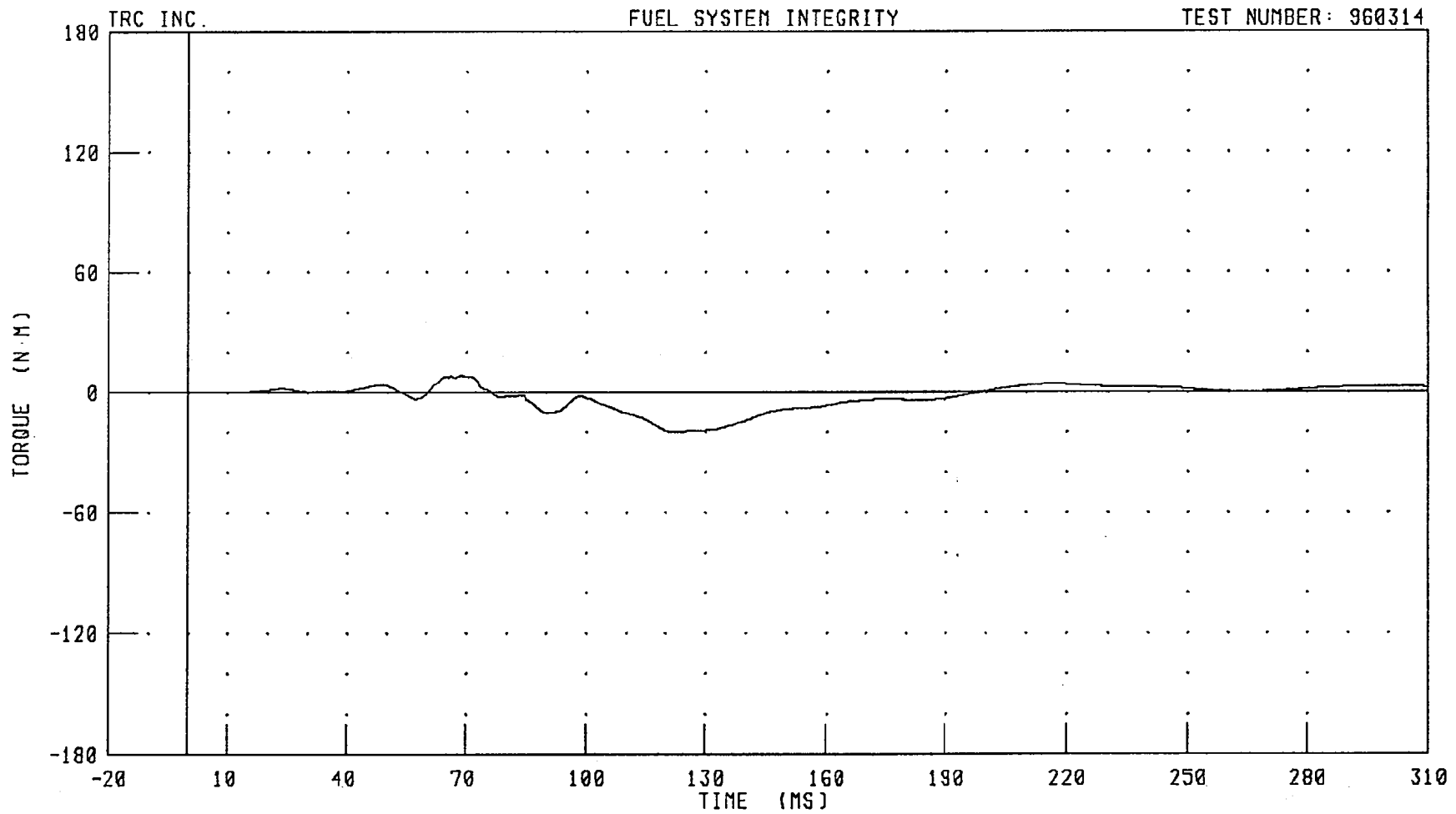


CHANNEL: NKLYM1 FILTER: CH. CLASS 600 PEAK DATA: 49.99 N·M @ 65.04 MS; -224.40 N·M @ 89.92 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER LOWER NECK MOMENT ABOUT Z-AXIS



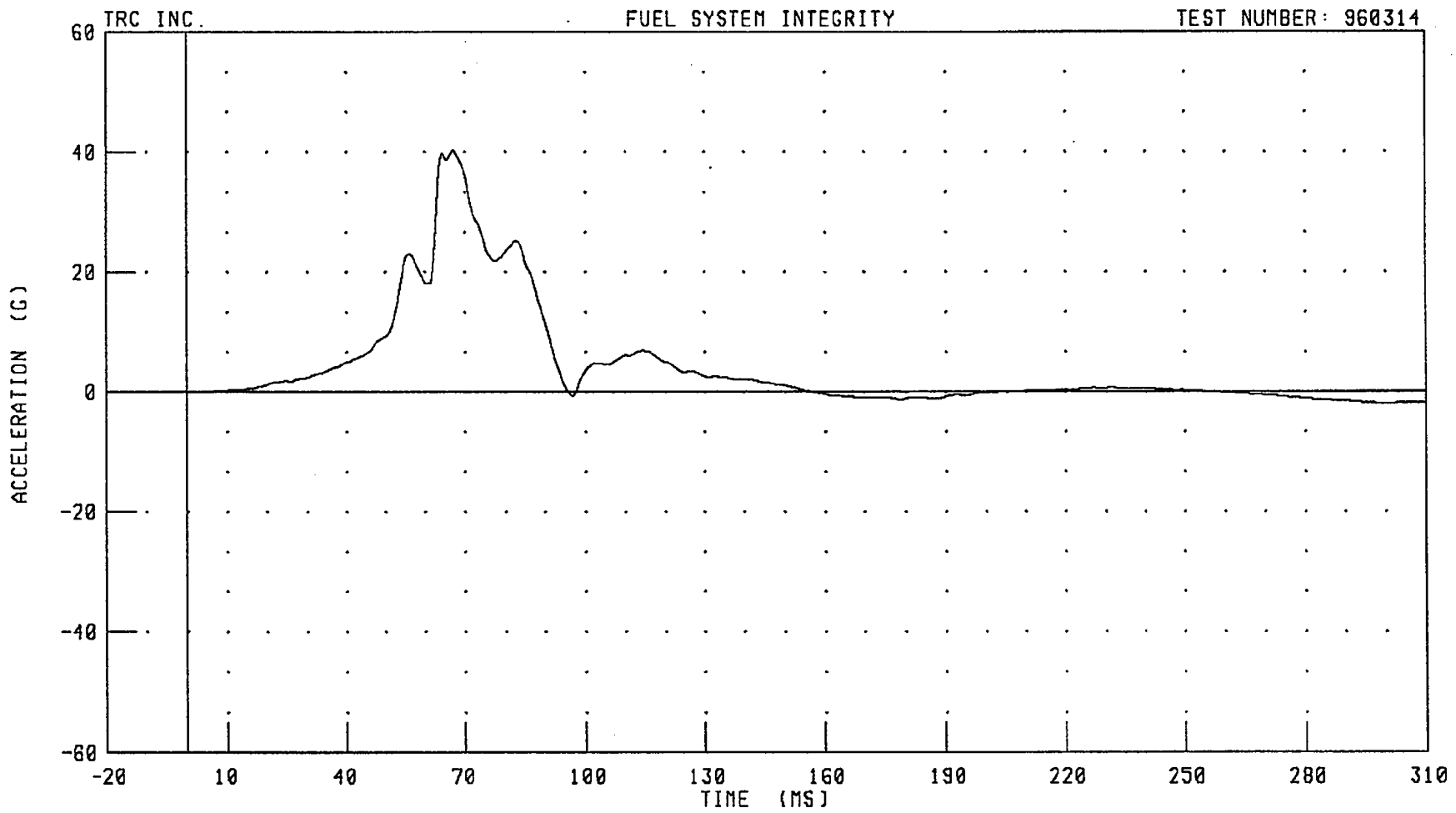
CHANNEL: NKLZM1 FILTER: CH. CLASS 600

PEAK DATA: 8.38 N-M @ 68.88 MS; -19.95 N-M @ 122.88 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER CHEST X-AXIS ACCELERATION



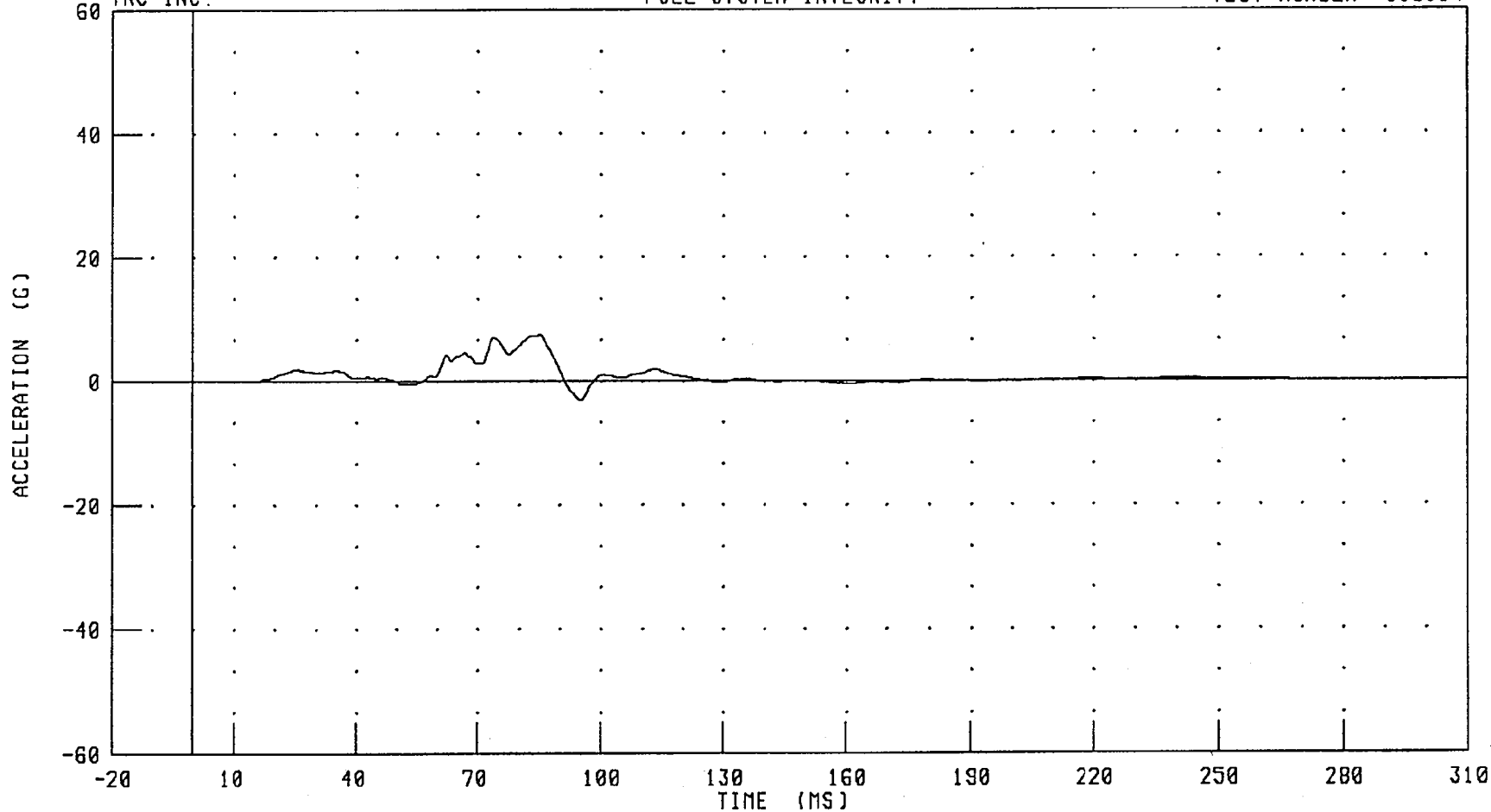
CHANNEL: CSTXG1 FILTER: CH. CLASS 180 PEAK DATA: 40.29 G @ 67.28 MS; -2.01 G @ 299.44 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER CHEST Y-AXIS ACCELERATION

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314

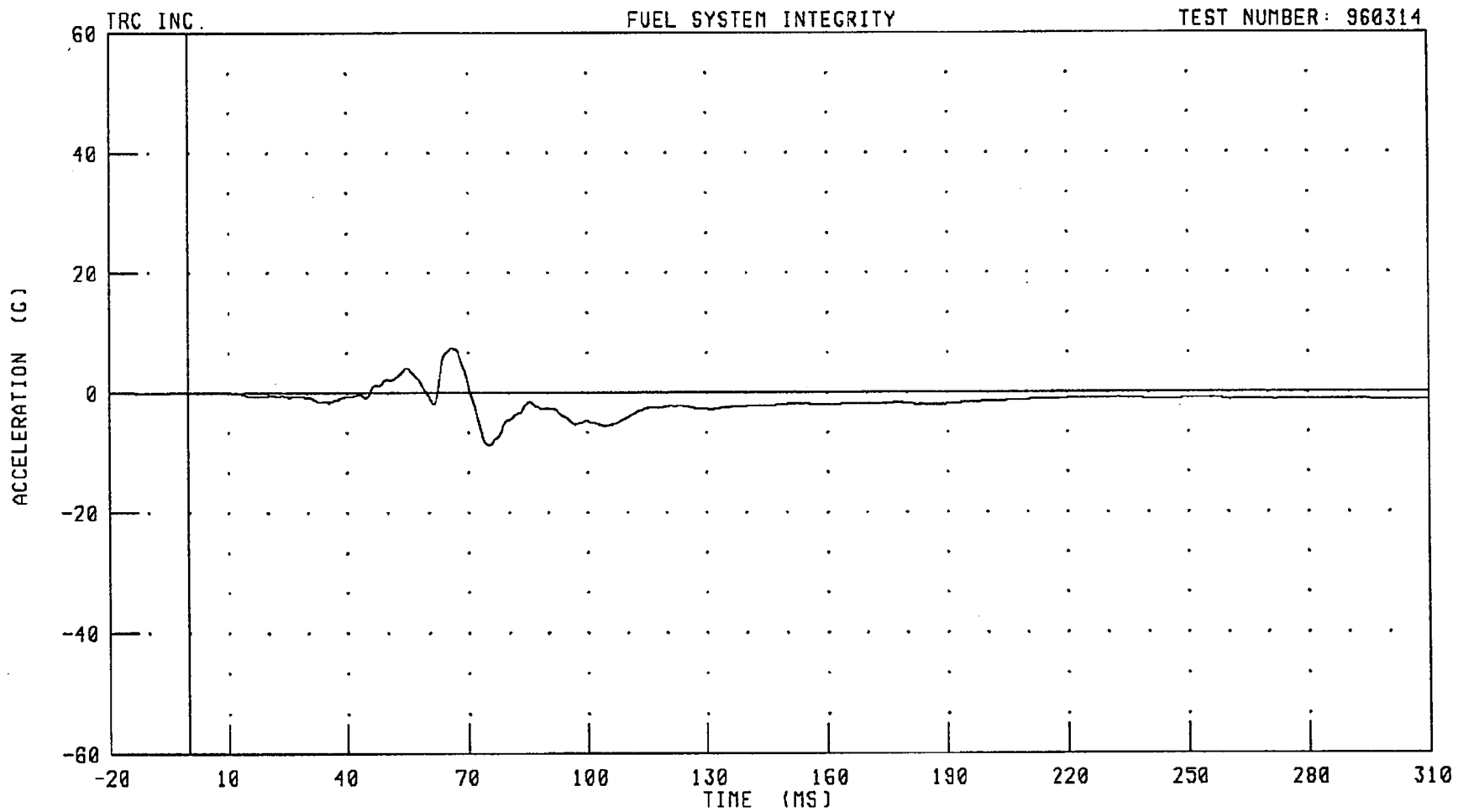


CHANNEL: CSTYG1 FILTER: CH. CLASS 180 PEAK DATA: 7.47 G @ 85.12 MS; -3.04 G @ 95.04 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER CHEST Z-AXIS ACCELERATION

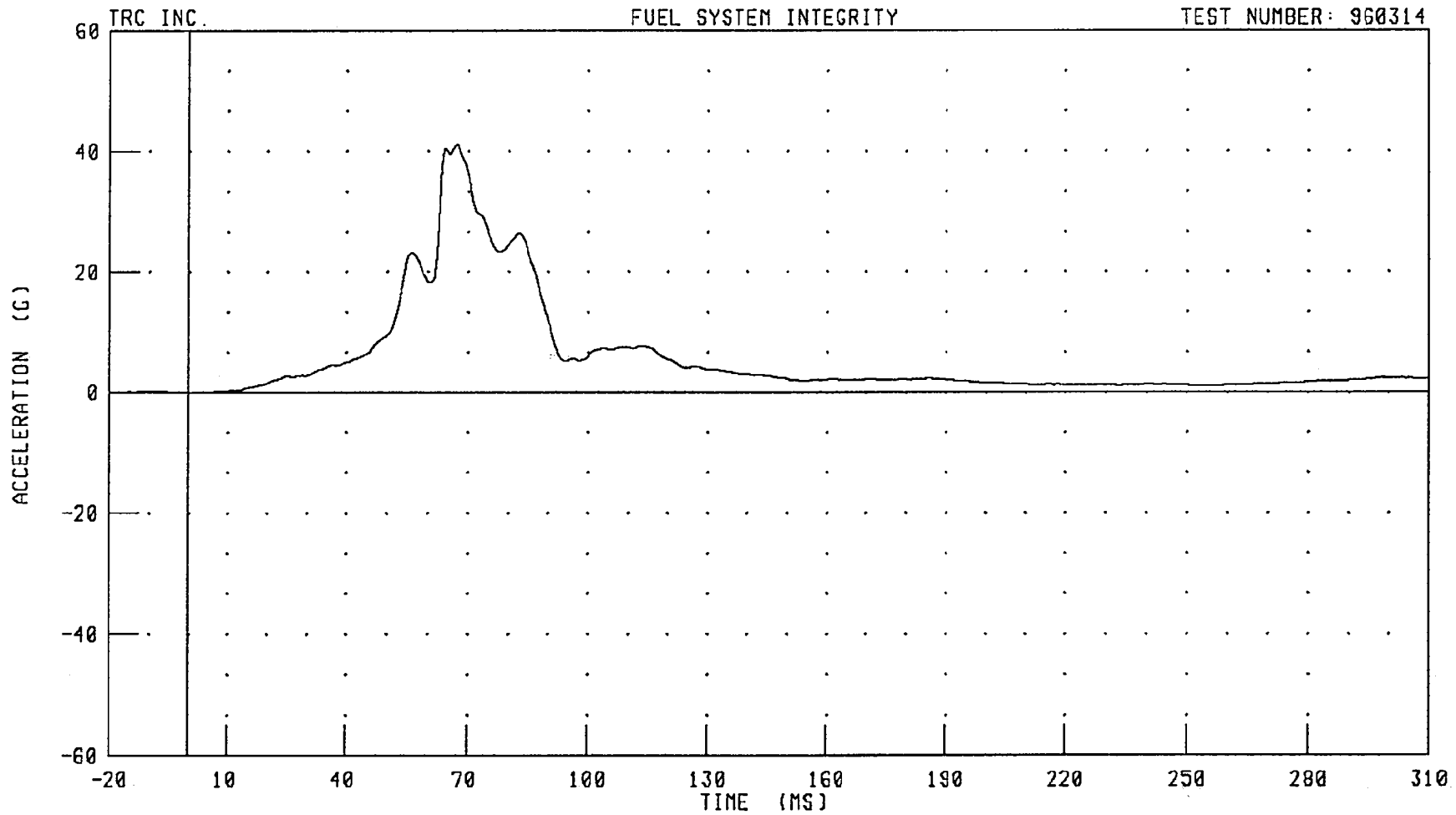


CHANNEL: CSTZG1 FILTER: CH. CLASS 180 PEAK DATA: 7.44 G @ 66.00 MS; -8.72 G @ 75.36 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER CHEST RESULTANT ACCELERATION



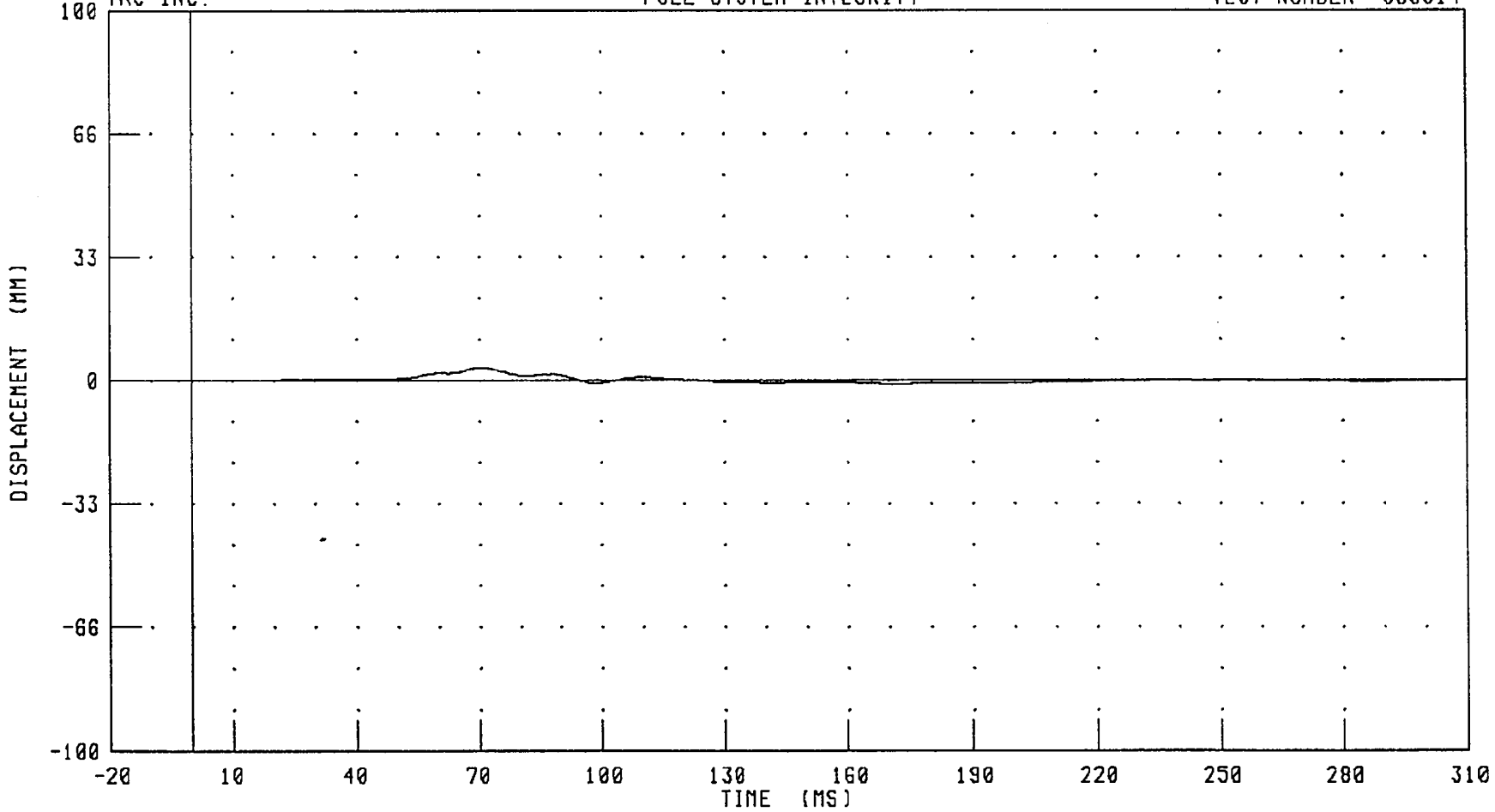
CHANNEL: CSTRG1 FILTER: CH. CLASS 180 PEAK DATA: 41.14 G @ 67.20 MS; 0.00 G @ -20.00 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER CHEST DEFLECTION

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314

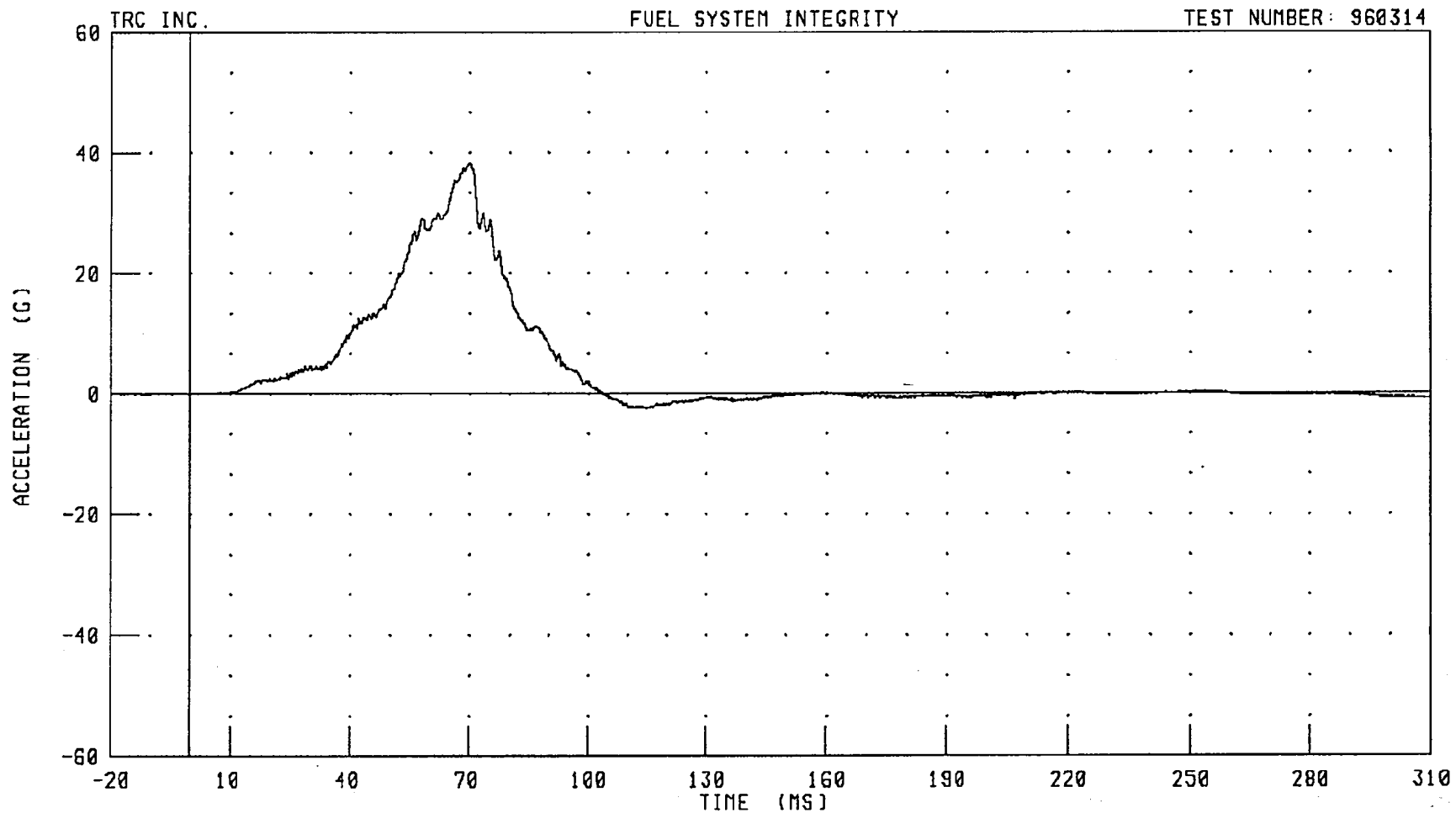


CHANNEL: CSTXD1 FILTER: CH. CLASS 180 PEAK DATA: 3.40 MM @ 69.60 MS; -1.00 MM @ 169.20 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER PELVIS X-AXIS ACCELERATION



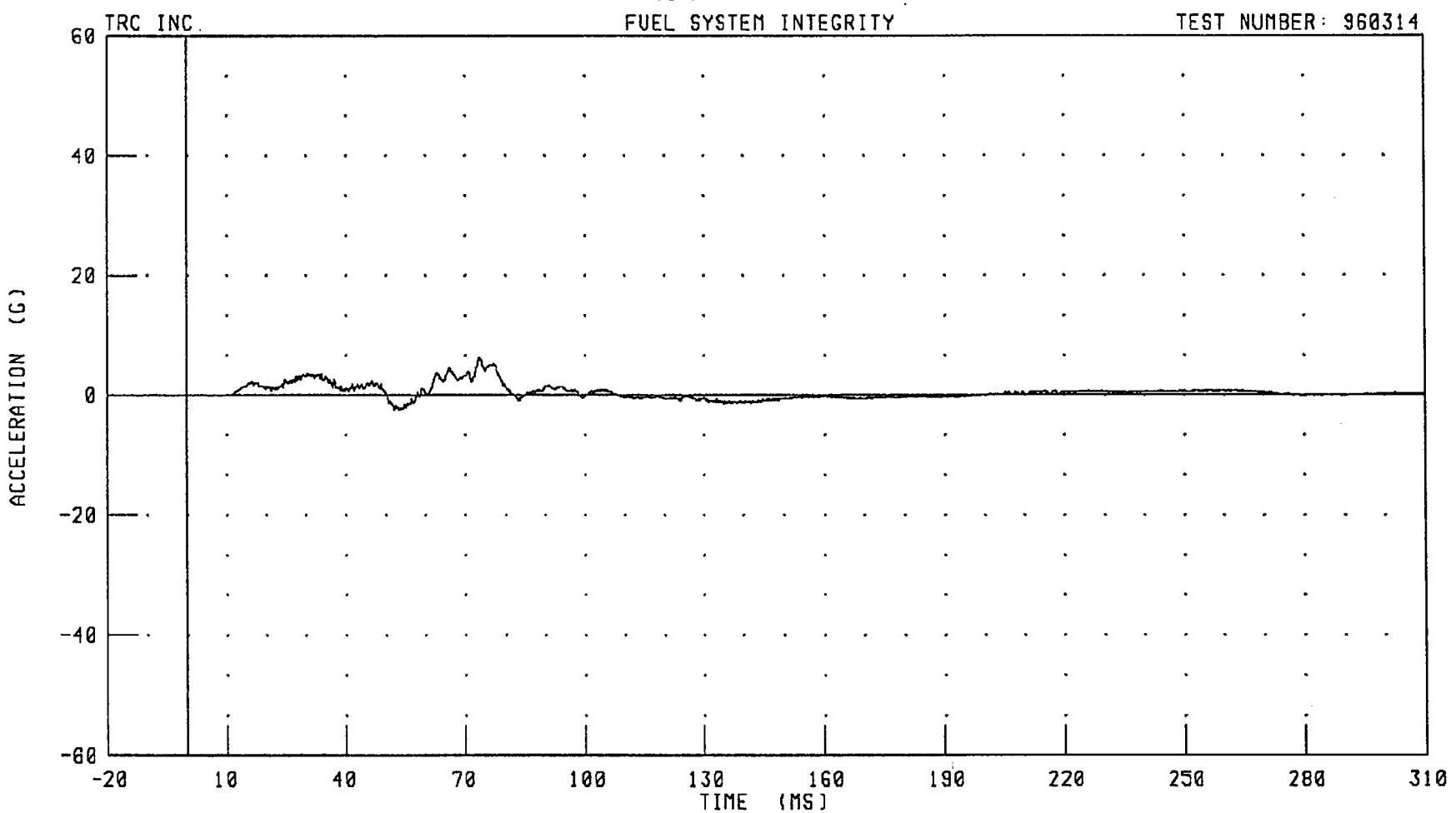
CHANNEL: PEVXG1 FILTER: CH. CLASS 1000

PEAK DATA: 38.22 G @ 70.08 MS; -2.54 G @ 114.80 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER PELVIS Y-AXIS ACCELERATION

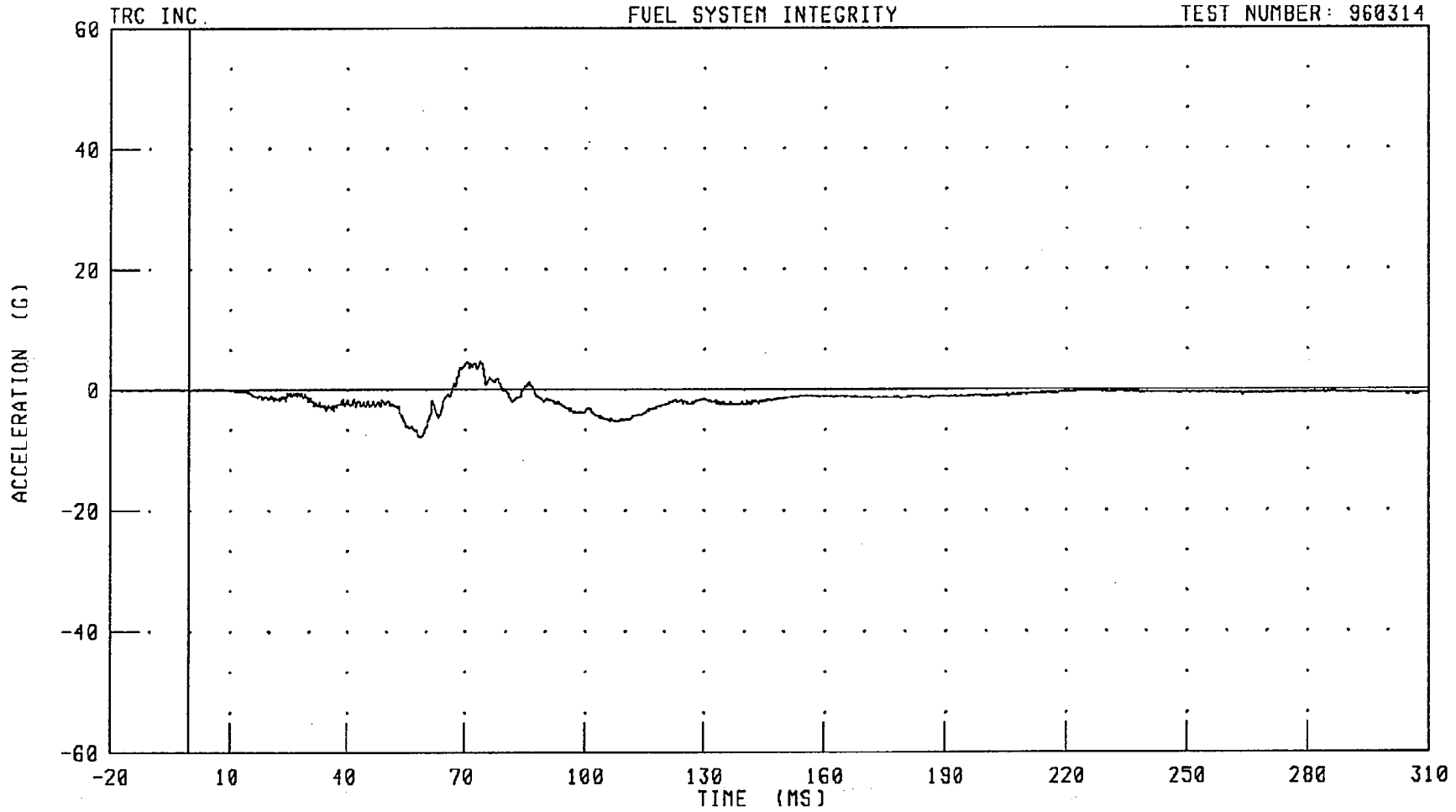


CHANNEL: PEVYG1 FILTER: CH. CLASS 1000 PEAK DATA: 6.32 G @ 73.60 MS; -2.51 G @ 52.08 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER PELVIS Z-AXIS ACCELERATION

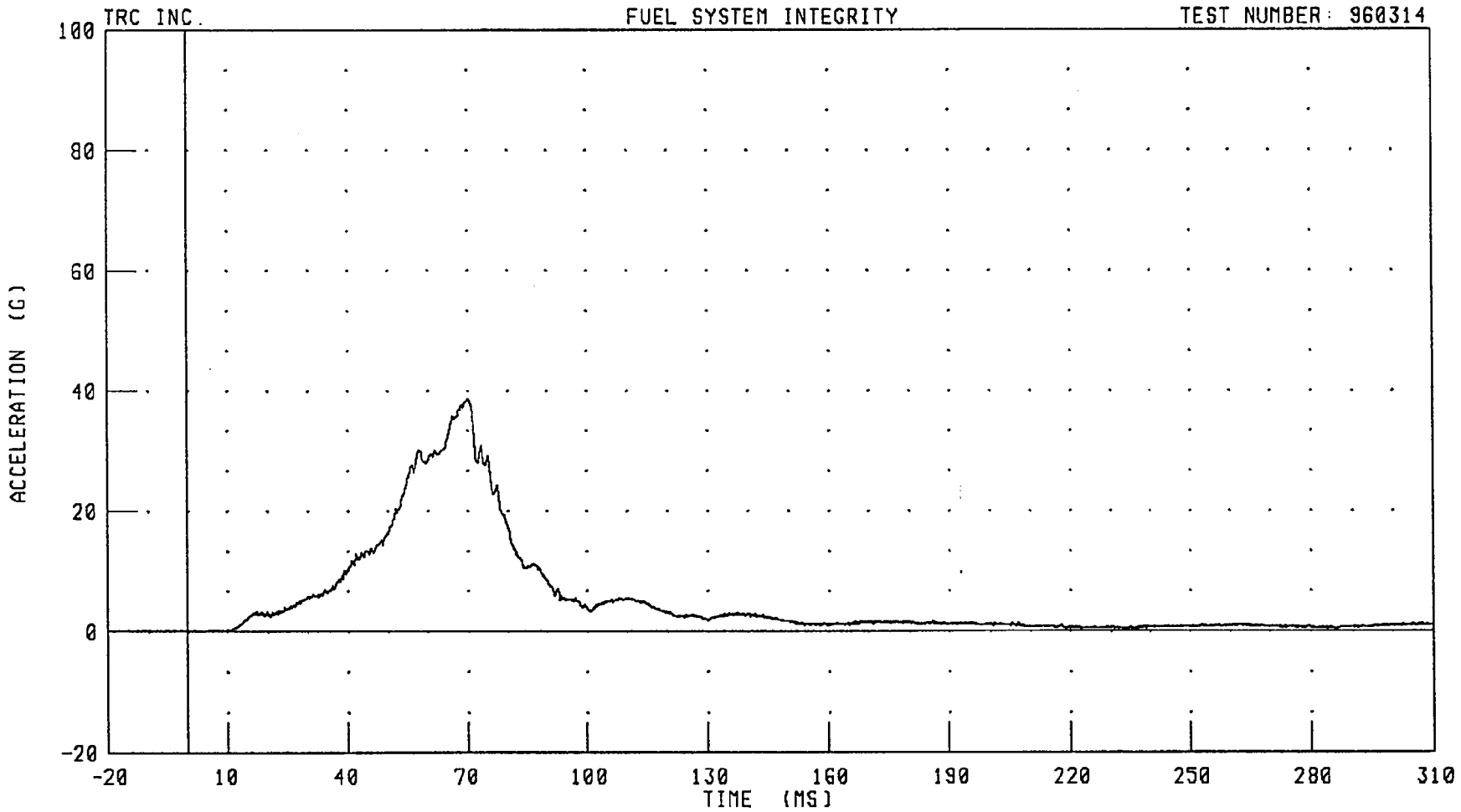


CHANNEL: PEVZG1 FILTER: CH. CLASS 1000 PEAK DATA: 4.76 G @ 73.84 MS; -7.99 G @ 58.56 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER PELVIS RESULTANT ACCELERATION



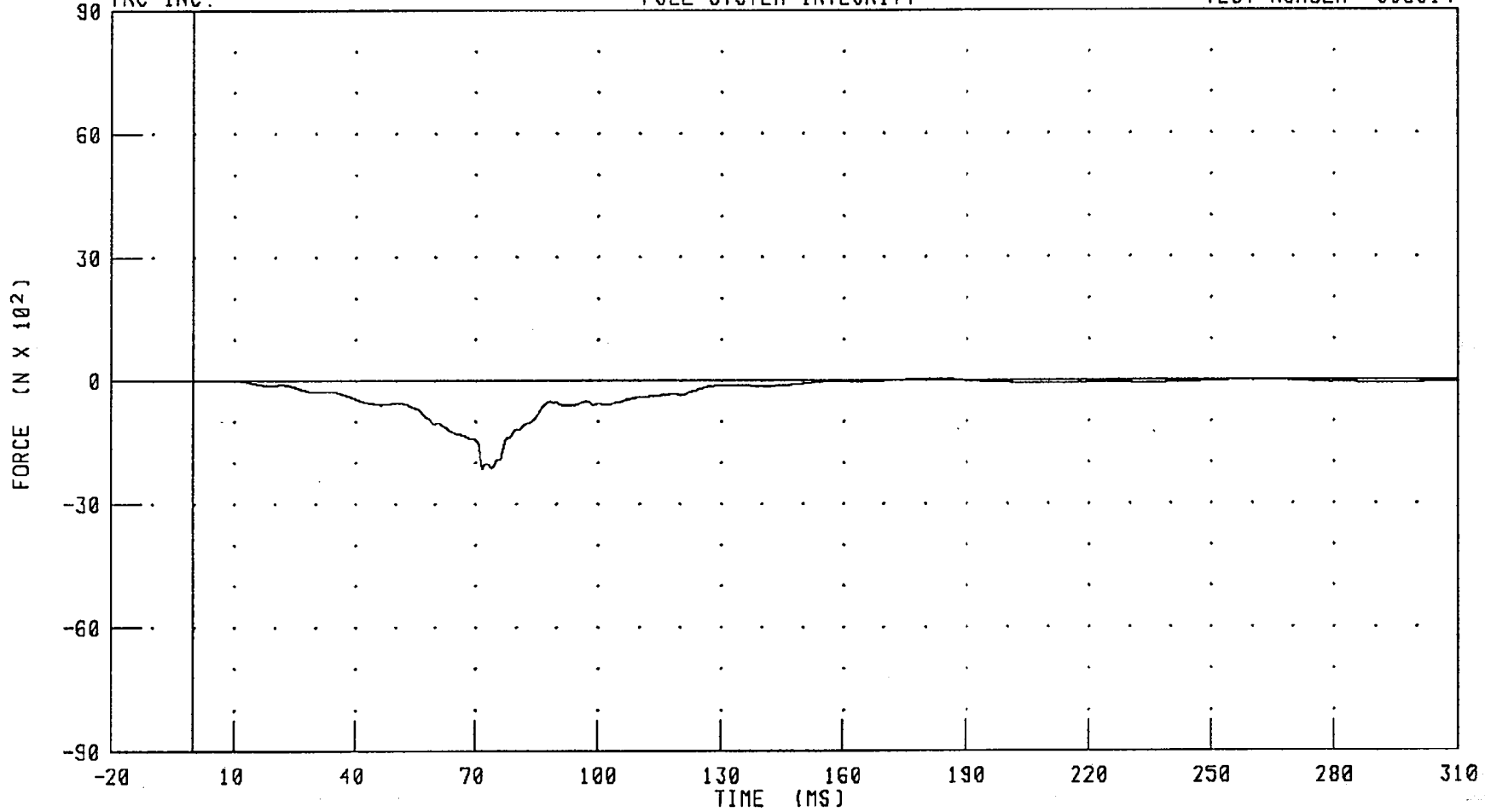
CHANNEL: PEVRG1 FILTER: CH. CLASS 1000 PEAK DATA: 38.58 G @ 70.08 MS; 0.07 G @ -20.00 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER LEFT FEMUR FORCE

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314

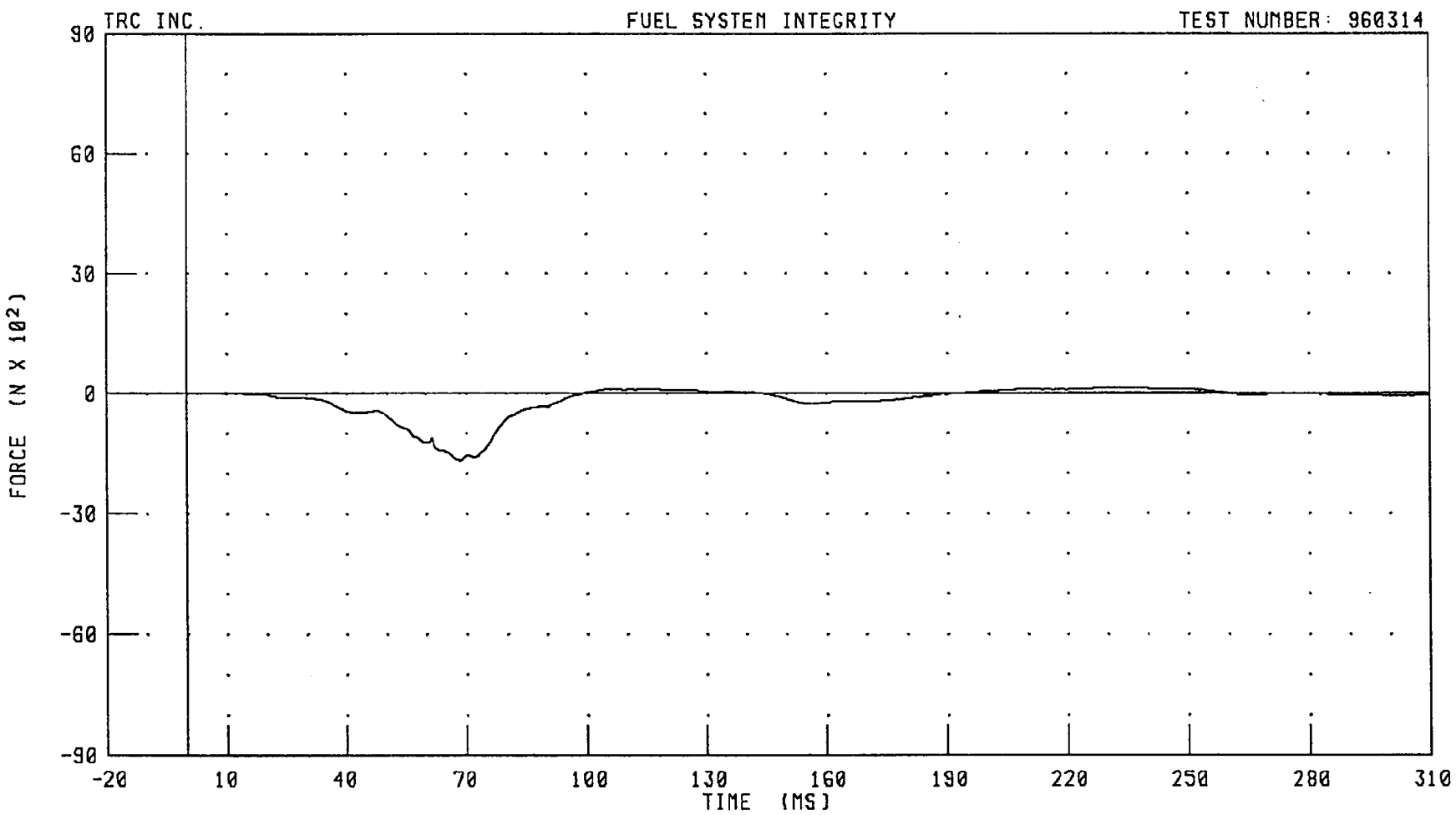


CHANNEL: LFMF1 FILTER: CH. CLASS 600 PEAK DATA: 32.98 N @ 180.96 MS; -2167.88 N @ 71.84 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

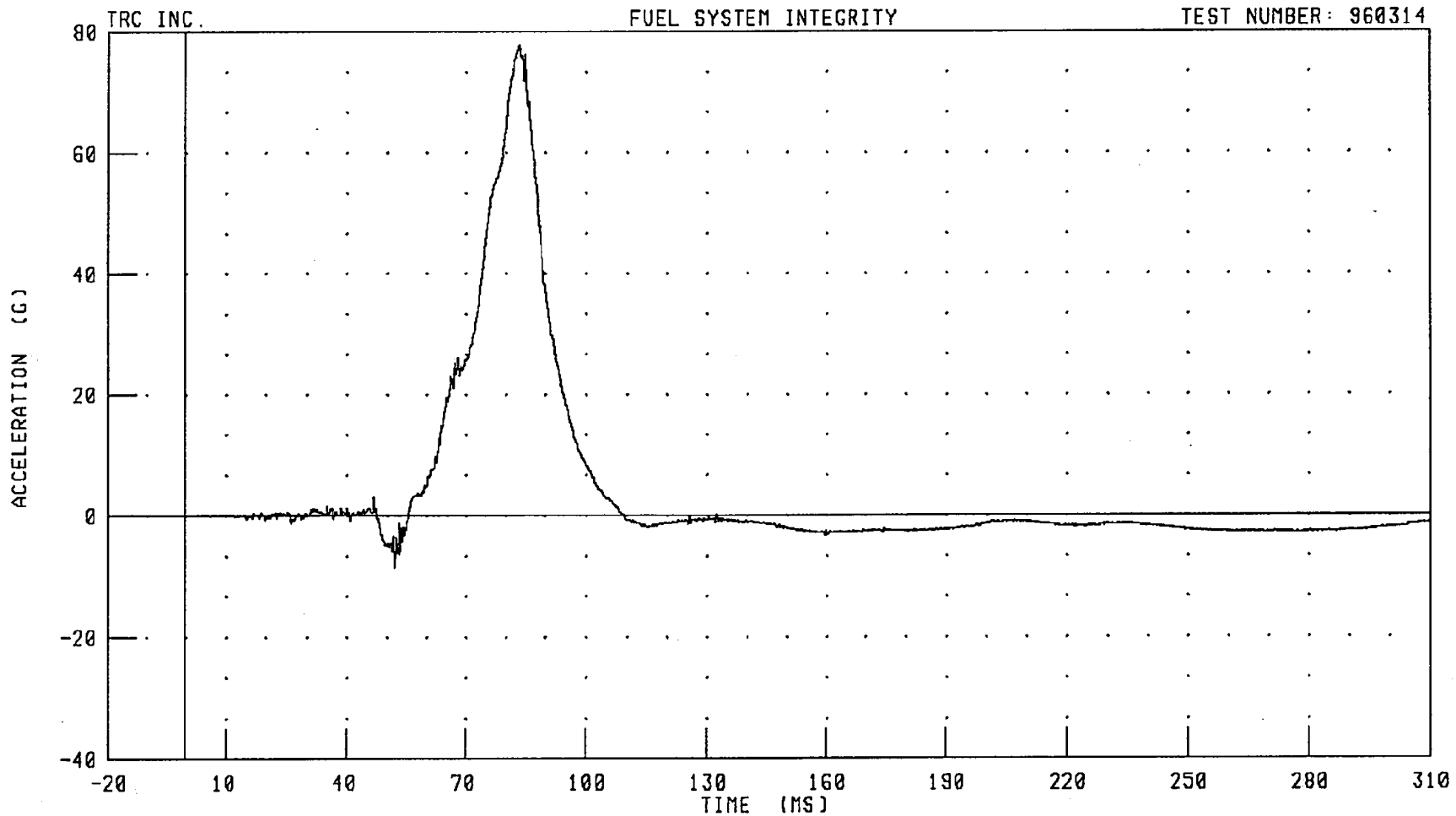
DRIVER RIGHT FEMUR FORCE



CHANNEL: RFMF1 FILTER: CH. CLASS 600 PEAK DATA: 136.61 N @ 236.72 MS; -1663.54 N @ 68.48 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER HEAD X-AXIS ACCELERATION

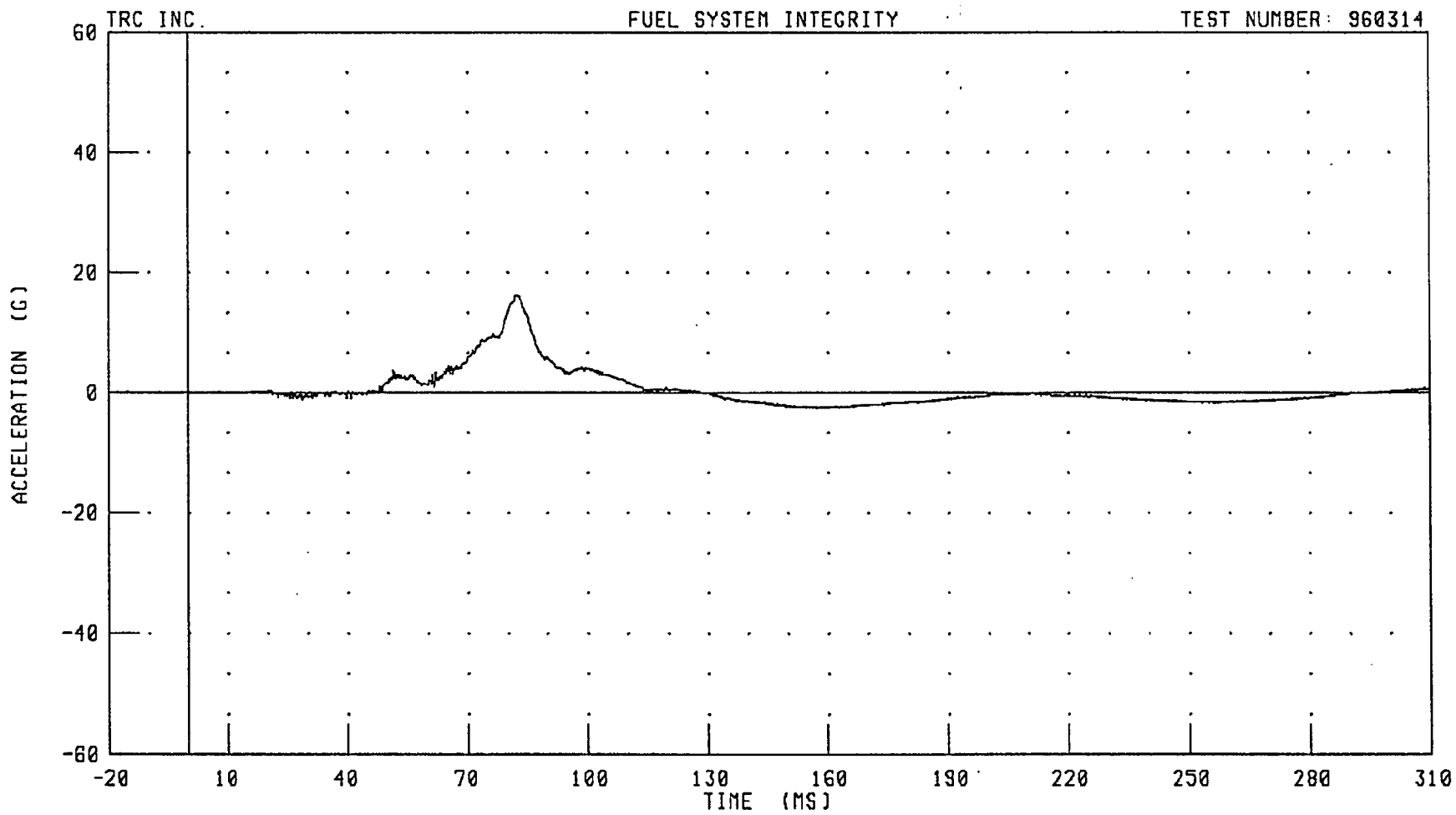


CHANNEL: HEDXG2 FILTER: CH. CLASS 1000 PEAK DATA: 77.77 G @ 83.36 MS; -8.60 G @ 52.00 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

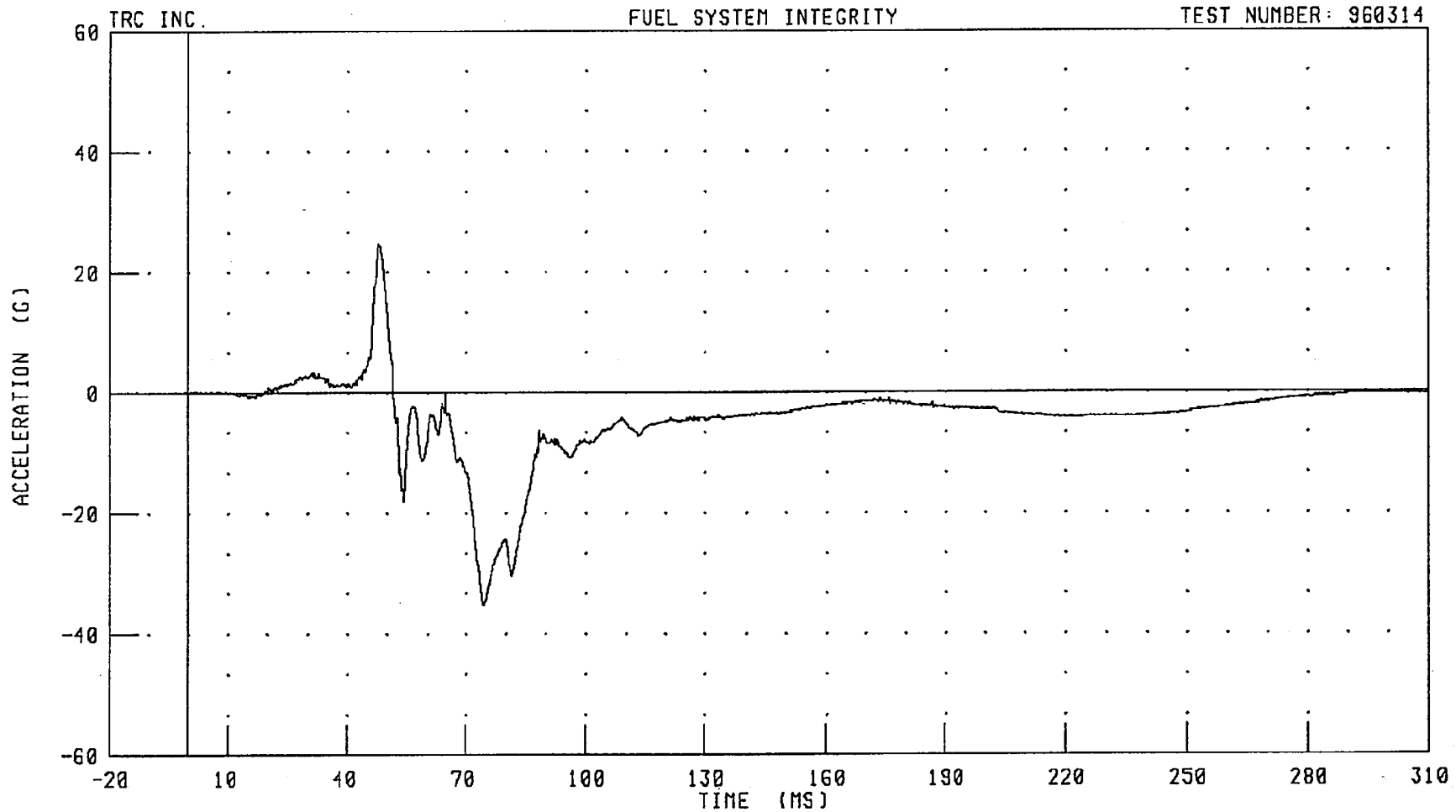
RIGHT FRONT PASSENGER HEAD Y-AXIS ACCELERATION



CHANNEL: HEDYG2 FILTER: CH. CLASS 1000 PEAK DATA: 16.04 G @ 82.00 MS; -2.54 G @ 154.72 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER HEAD Z-AXIS ACCELERATION

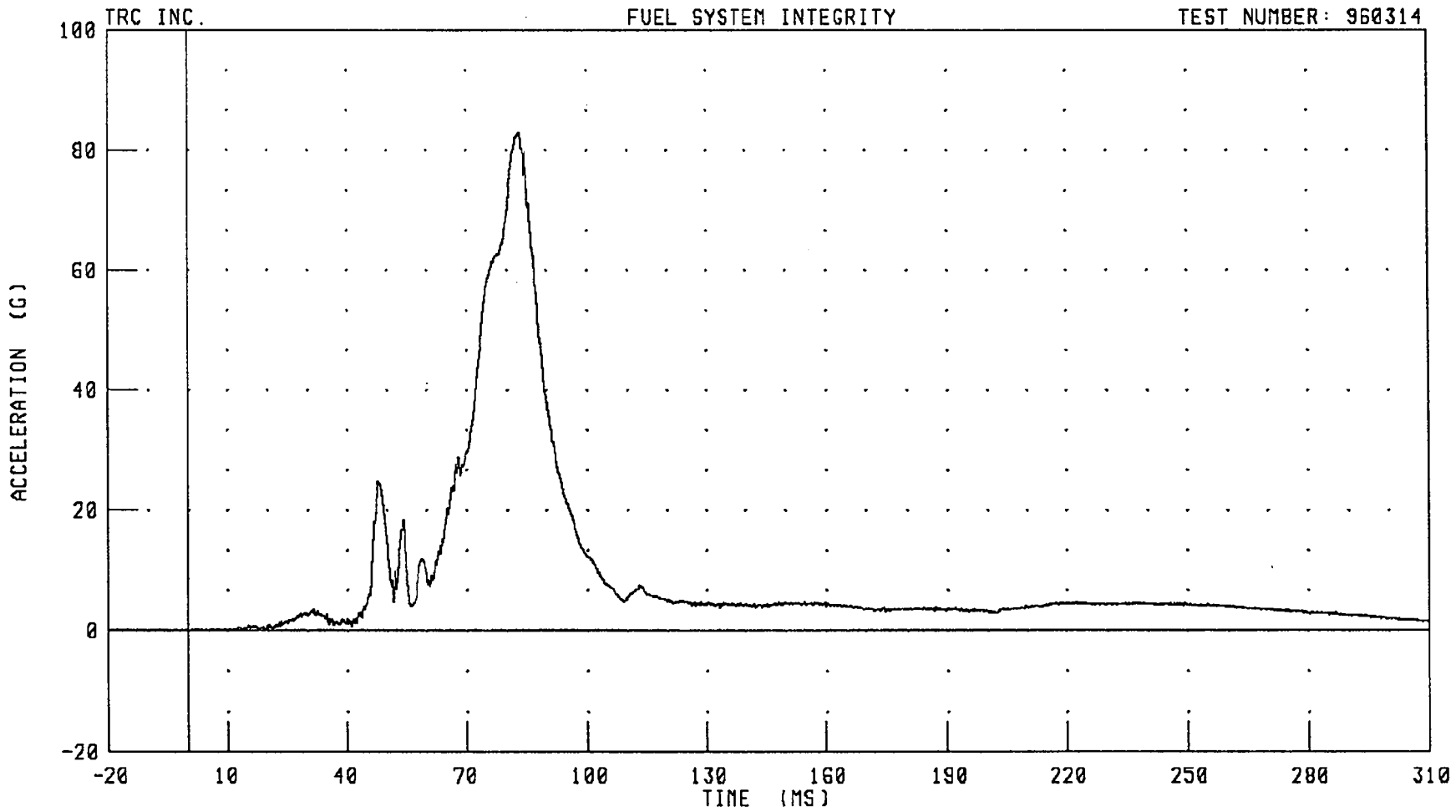


CHANNEL: HEDZG2 FILTER: CH. CLASS 1000 PEAK DATA: 24.76 G @ 47.76 MS; -35.13 G @ 74.40 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

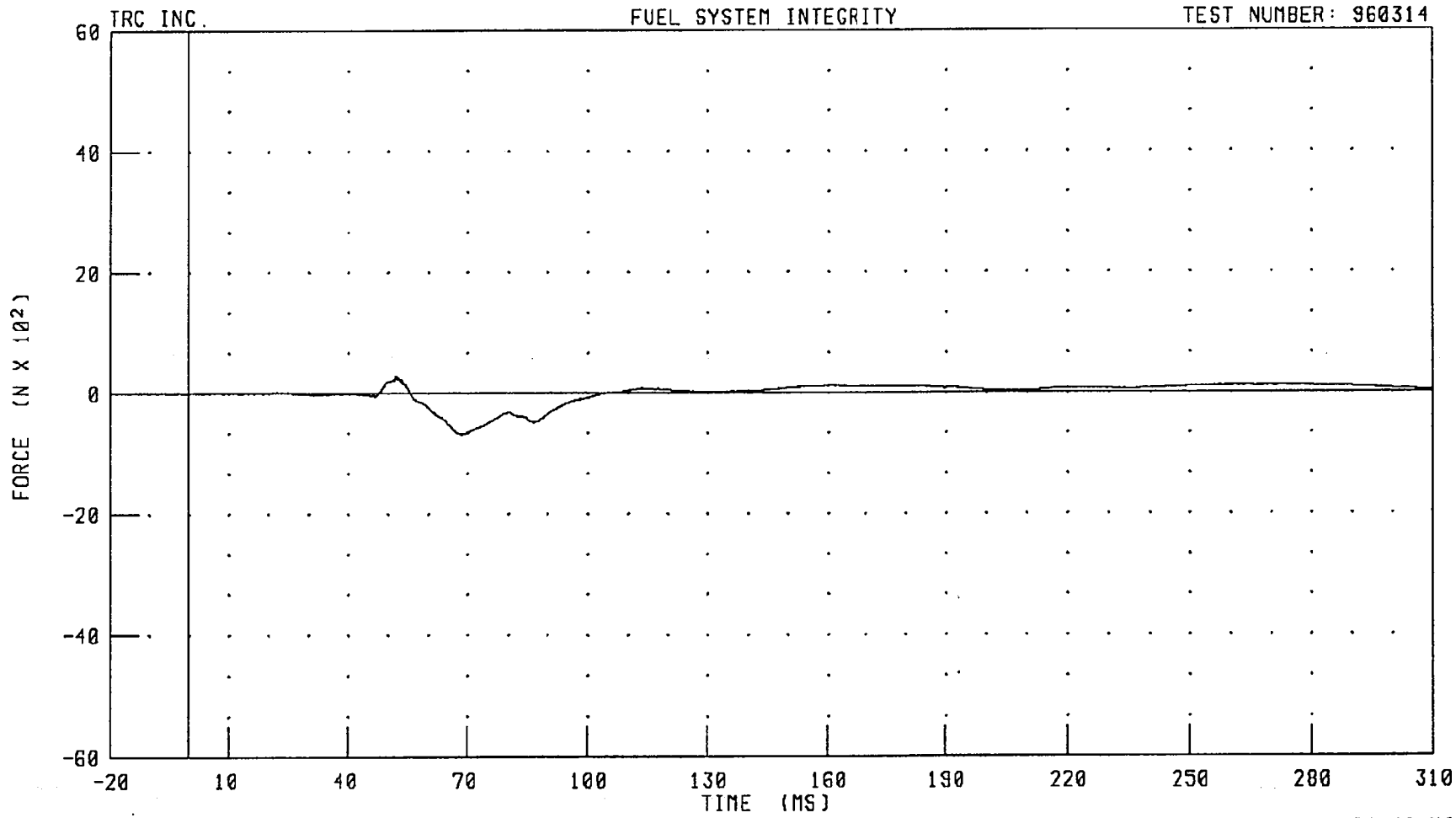
RIGHT FRONT PASSENGER HEAD RESULTANT ACCELERATION



CHANNEL: HEDRG2 FILTER: CH. CLASS 1000 PEAK DATA: 82.89 G @ 83.28 MS; 0.02 G @ -20.00 MS

960314

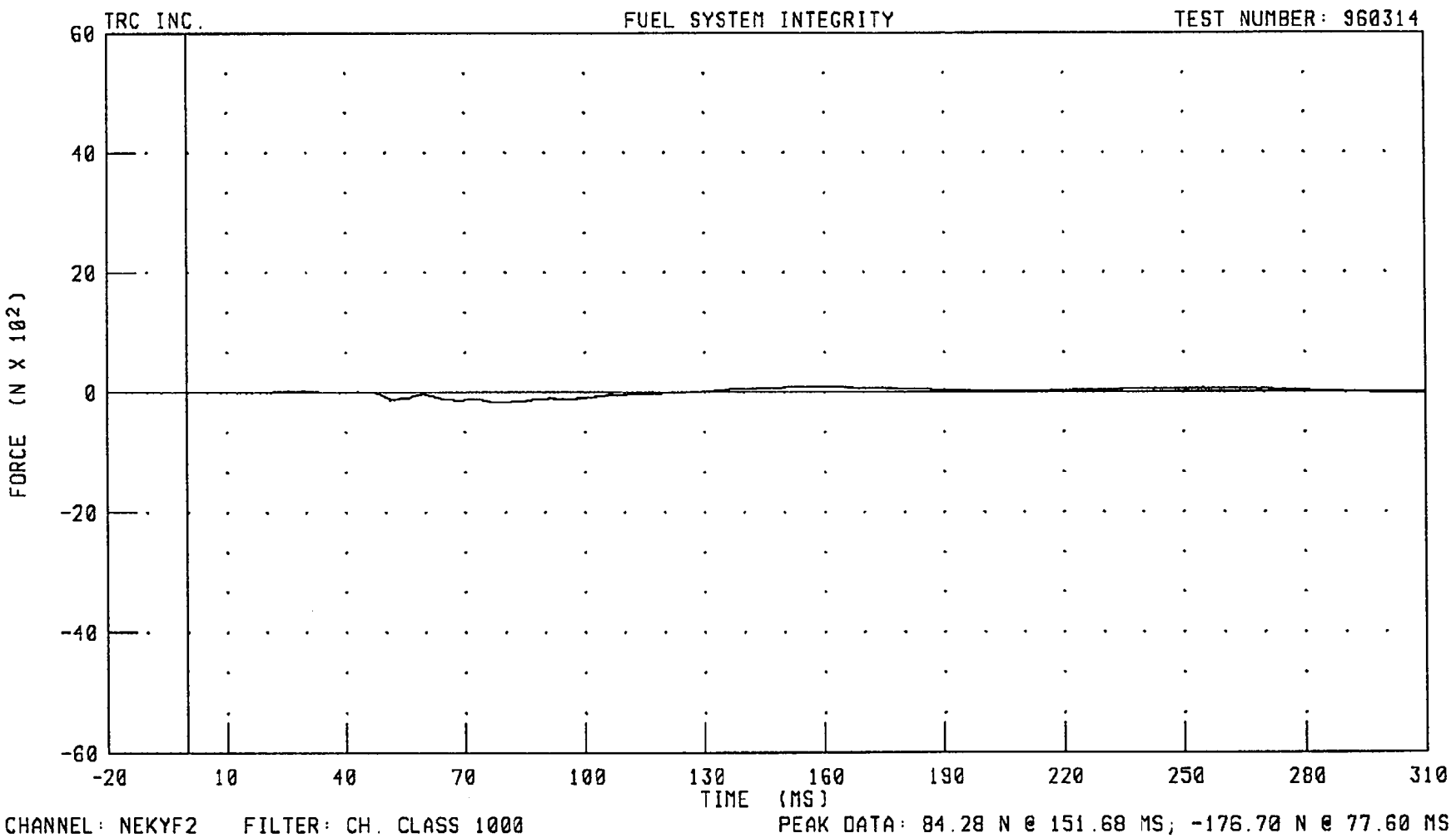
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER UPPER NECK X-AXIS SHEAR FORCE



CHANNEL: NEKXF2 FILTER: CH. CLASS 1000
PEAK DATA: 294.40 N @ 51.92 MS; -687.34 N @ 68.40 MS

960314

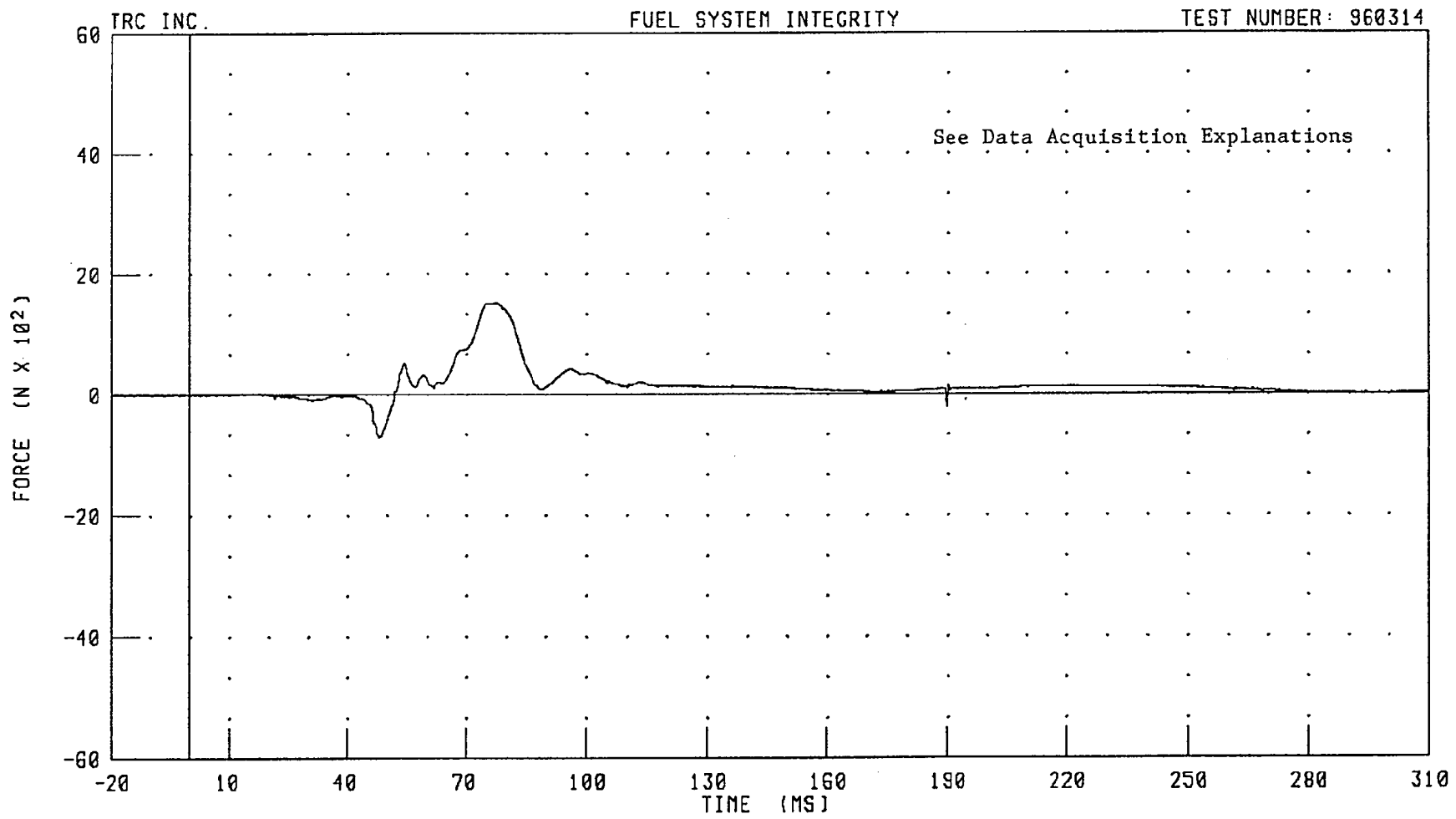
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER UPPER NECK Y-AXIS SHEAR FORCE



CHANNEL: NEKYF2 FILTER: CH. CLASS 1000
PEAK DATA: 84.28 N @ 151.68 MS; -176.70 N @ 77.60 MS

960314

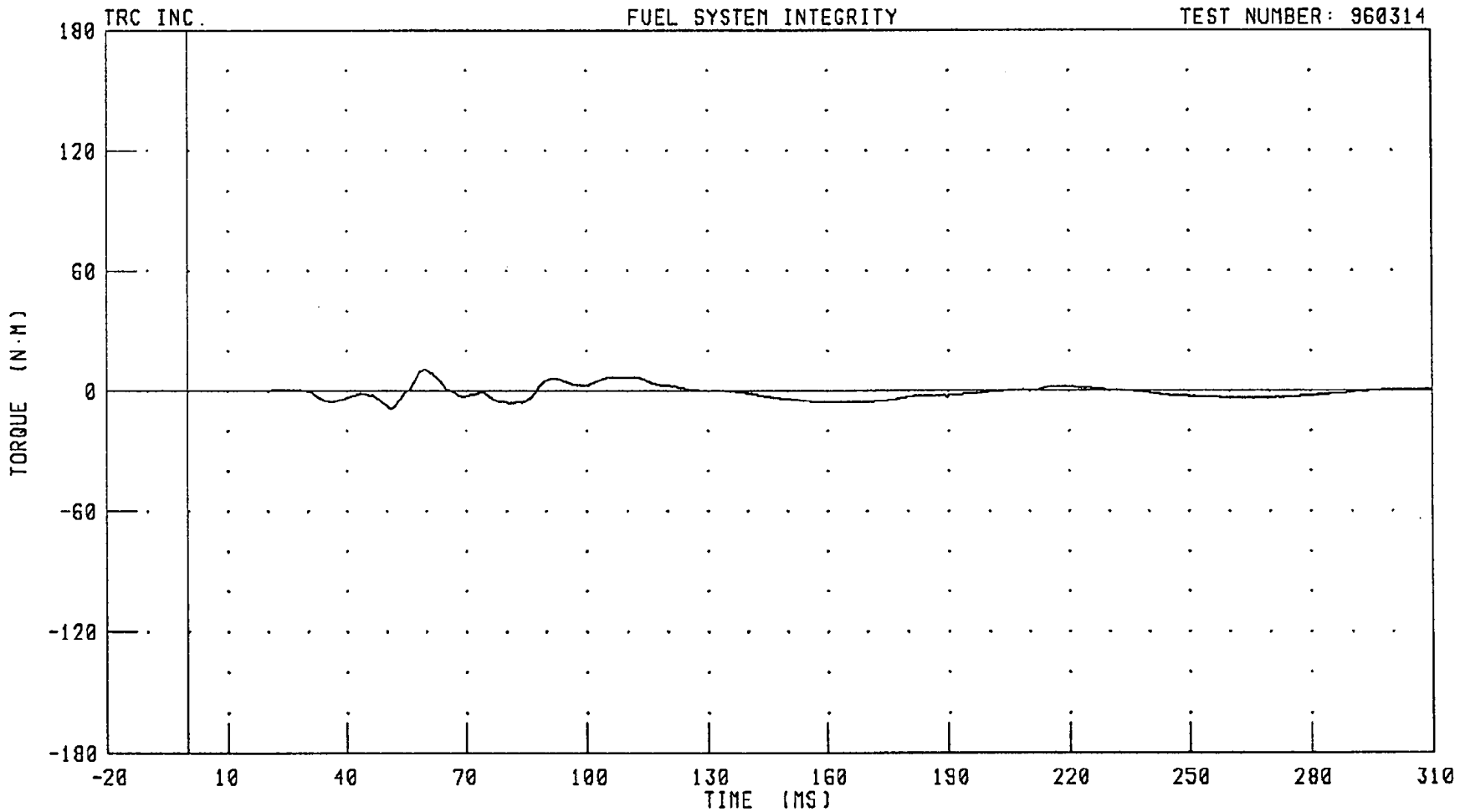
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER UPPER NECK Z-AXIS AXIAL FORCE



CHANNEL: NEKZF2 FILTER: CH. CLASS 1000 PEAK DATA: 1520.56 N @ 77.04 MS; -704.46 N @ 48.00 MS

960314

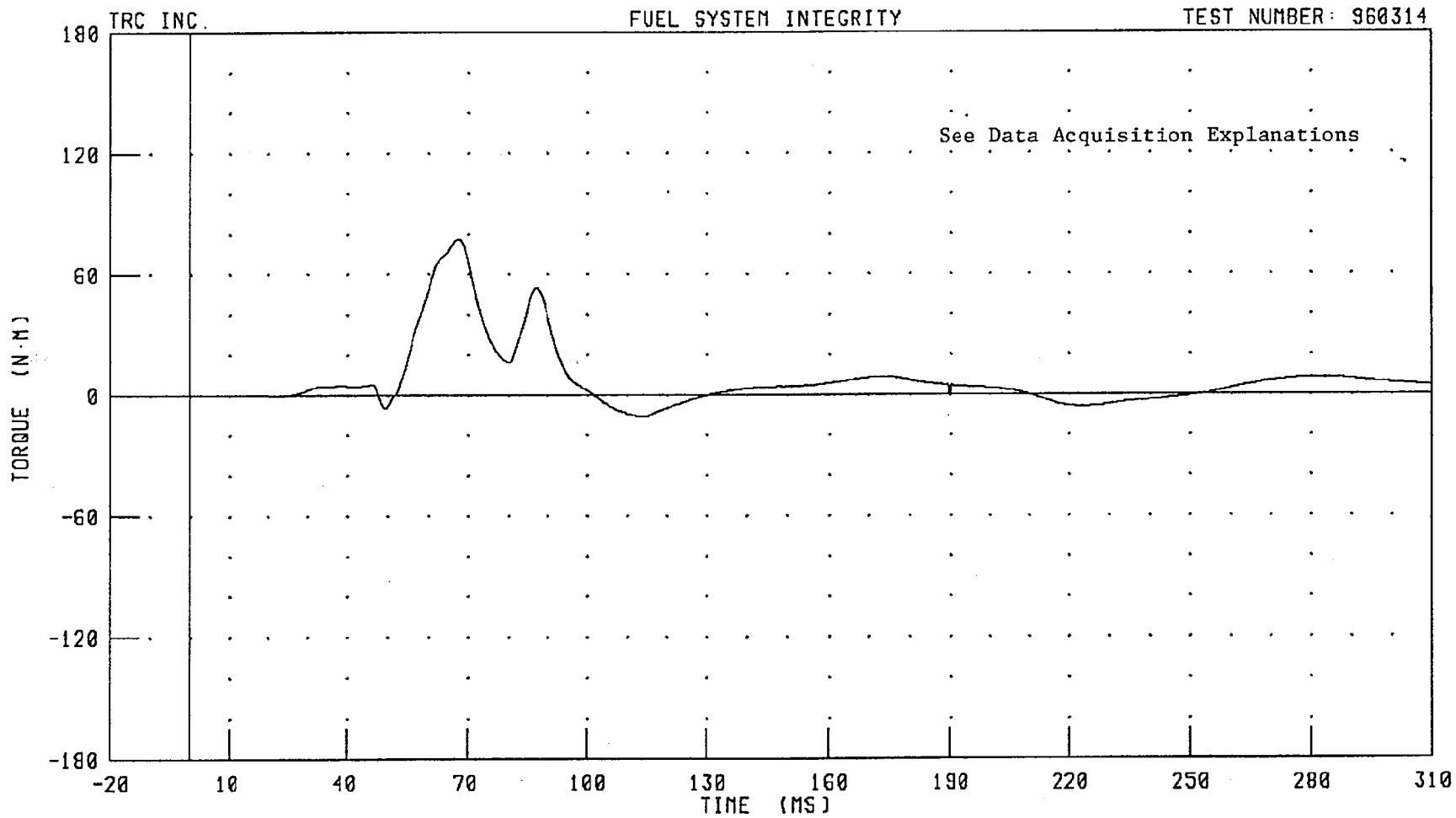
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER UPPER NECK MOMENT ABOUT X-AXIS



CHANNEL: NEKXM2 FILTER: CH. CLASS 600 PEAK DATA: 10.50 N-M @ 59.76 MS; -8.85 N-M @ 51.20 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER UPPER NECK MOMENT ABOUT Y-AXIS

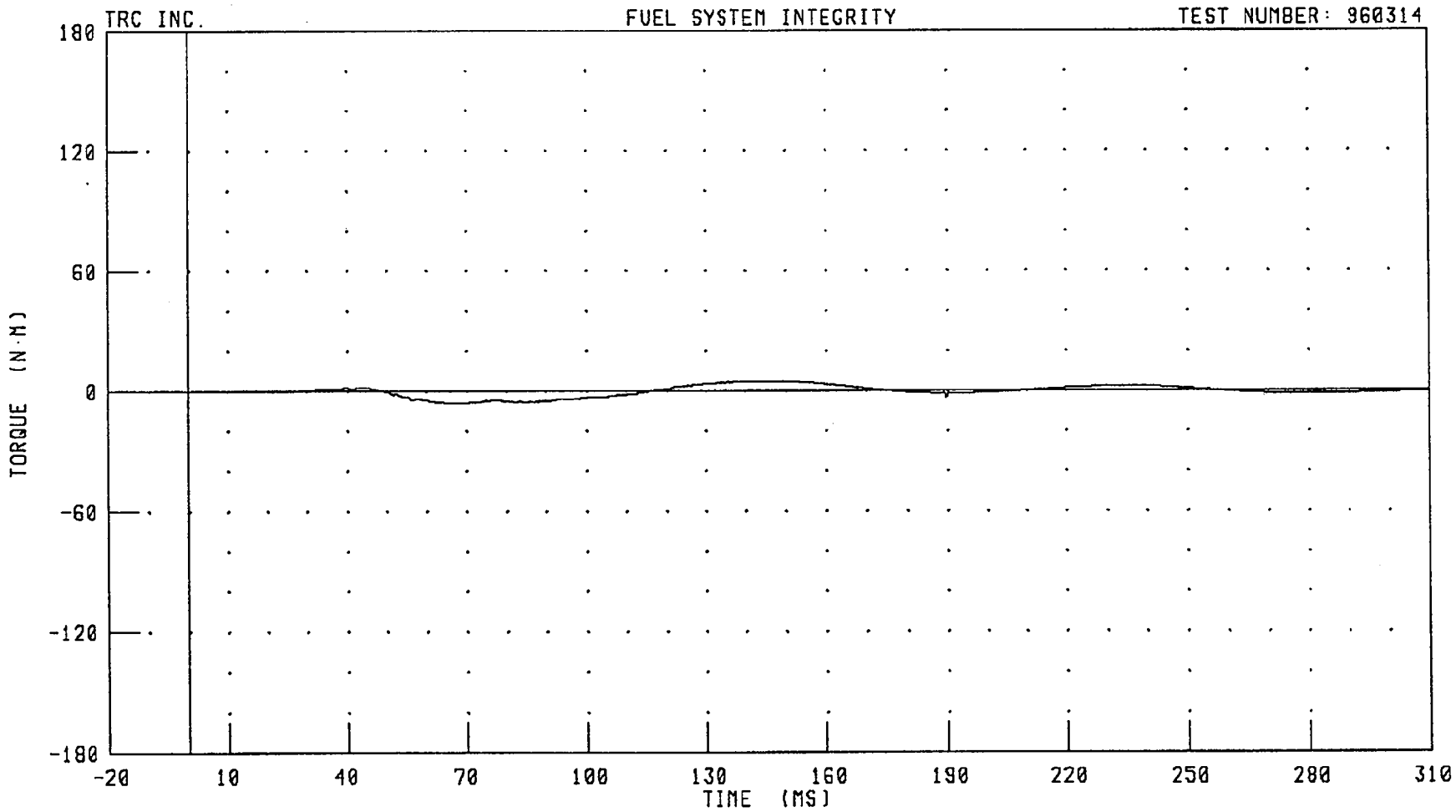


CHANNEL: NEKYM2 FILTER: CH. CLASS 600 PEAK DATA: 77.45 N-M @ 67.68 MS; -10.82 N-M @ 114.08 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

RIGHT FRONT PASSENGER UPPER NECK MOMENT ABOUT Z-AXIS

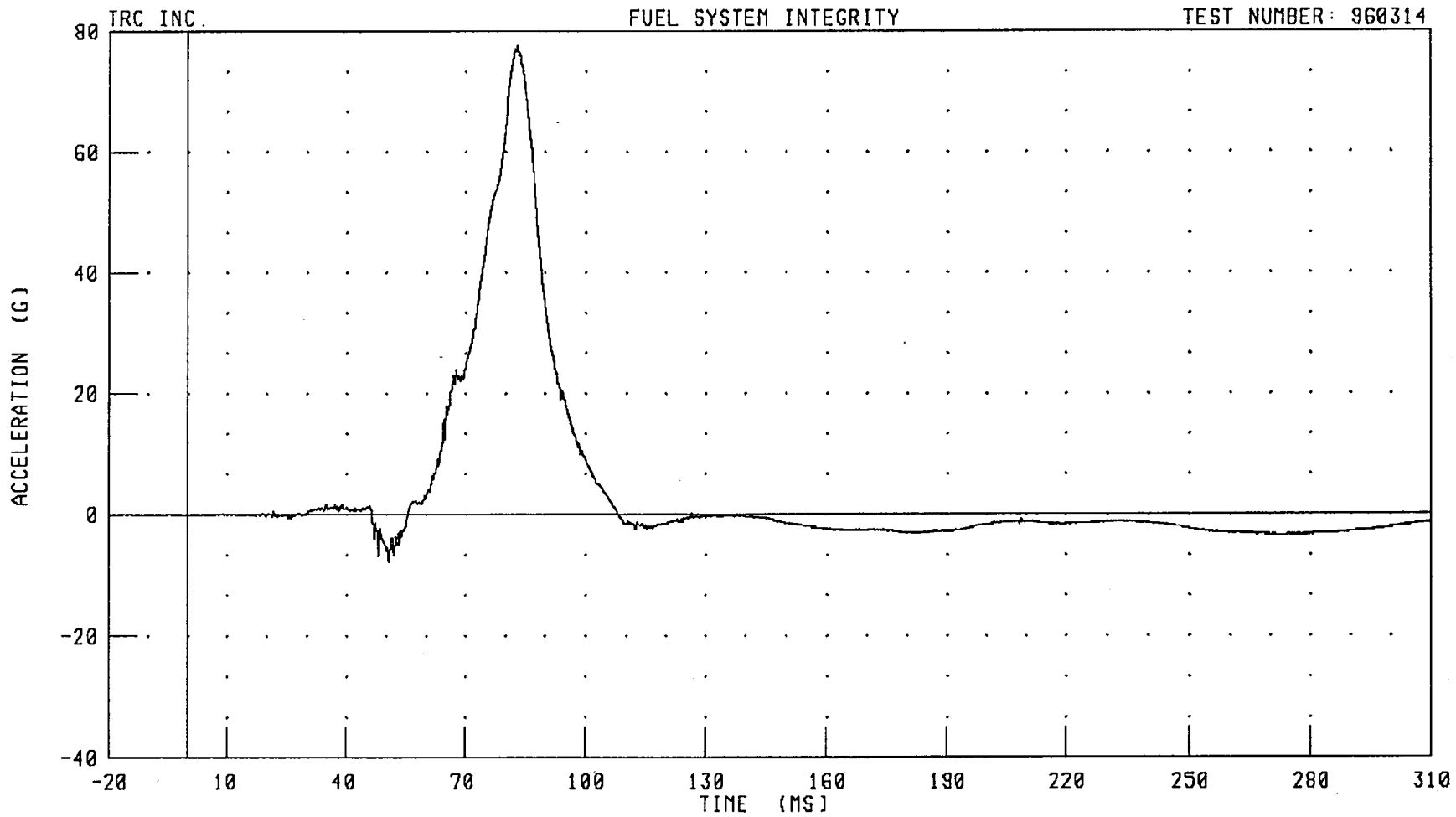


CHANNEL: NEKZM2 FILTER: CH. CLASS 600

PEAK DATA: 4.81 N·M @ 145.44 MS; -6.06 N·M @ 66.00 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER HEAD POSITION 1 X-AXIS ACCELERATION

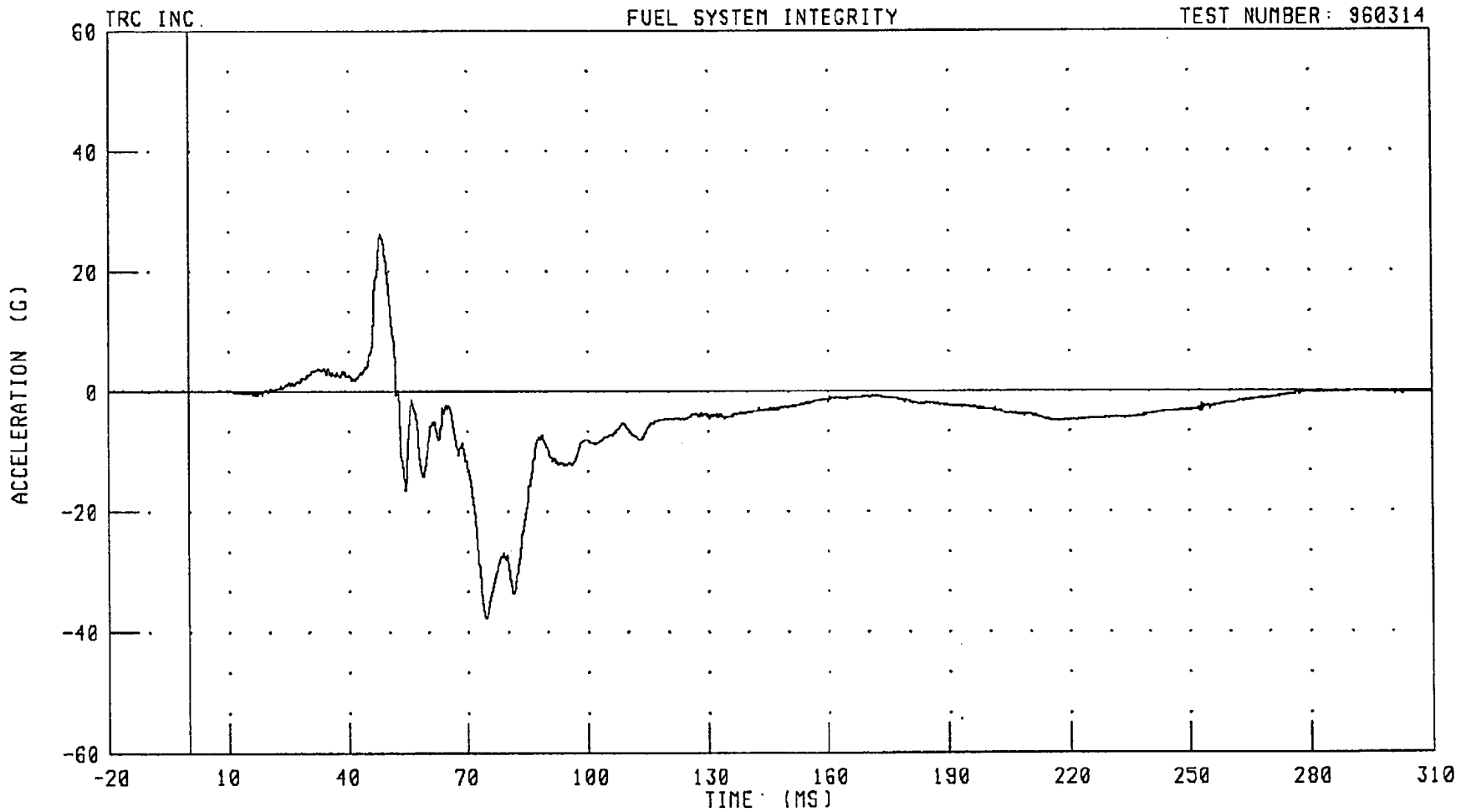


CHANNEL: HD1XG2 FILTER: CH. CLASS 1000 PEAK DATA: 77.50 G @ 83.04 MS; -7.77 G @ 50.64 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

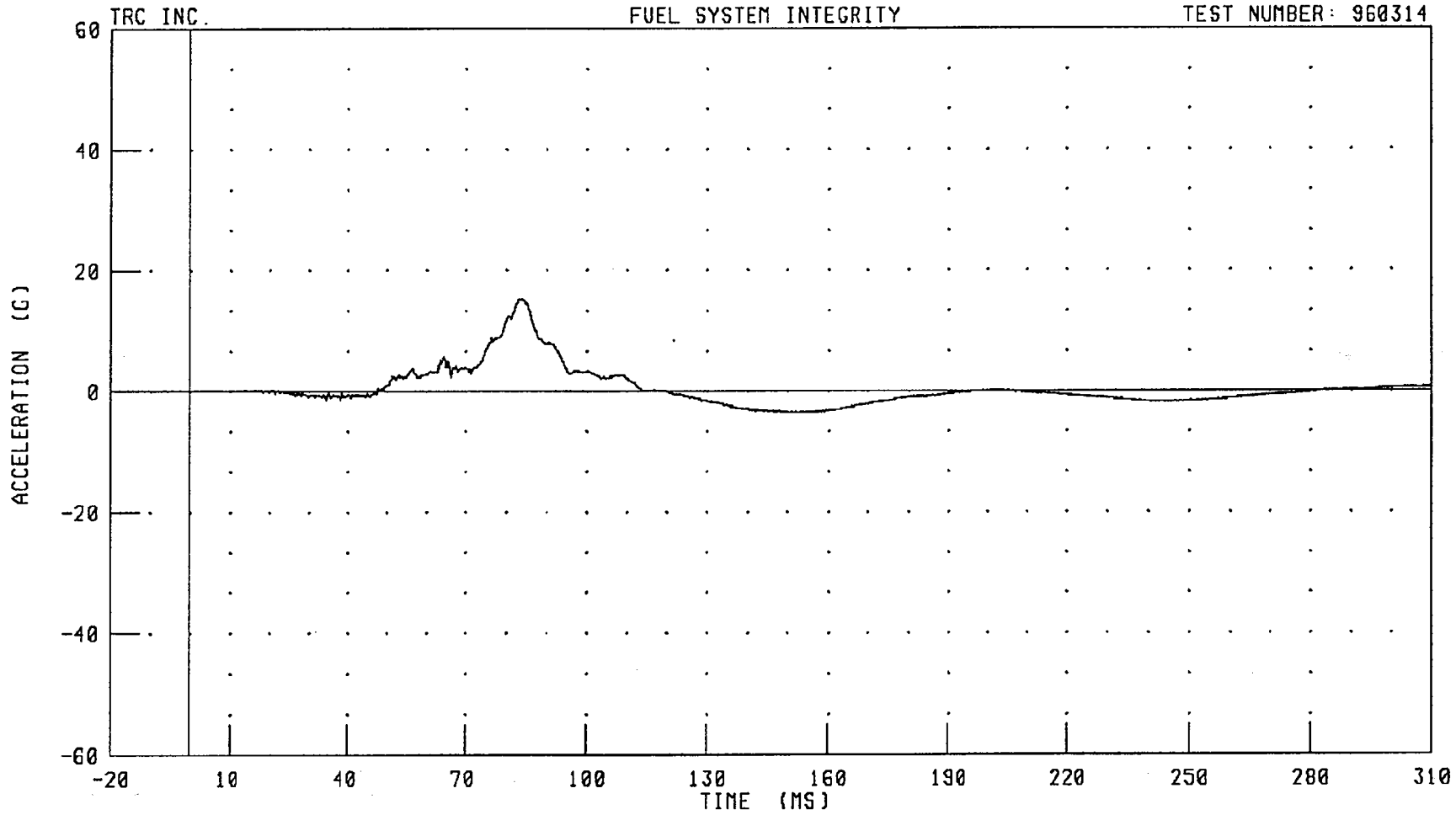
RIGHT FRONT PASSENGER HEAD POSITION 1 Z-AXIS ACCELERATION



CHANNEL: HD1ZG2 FILTER: CH. CLASS 1000 PEAK DATA: 26.18 G @ 47.92 MS; -37.81 G @ 74.56 MS

960314

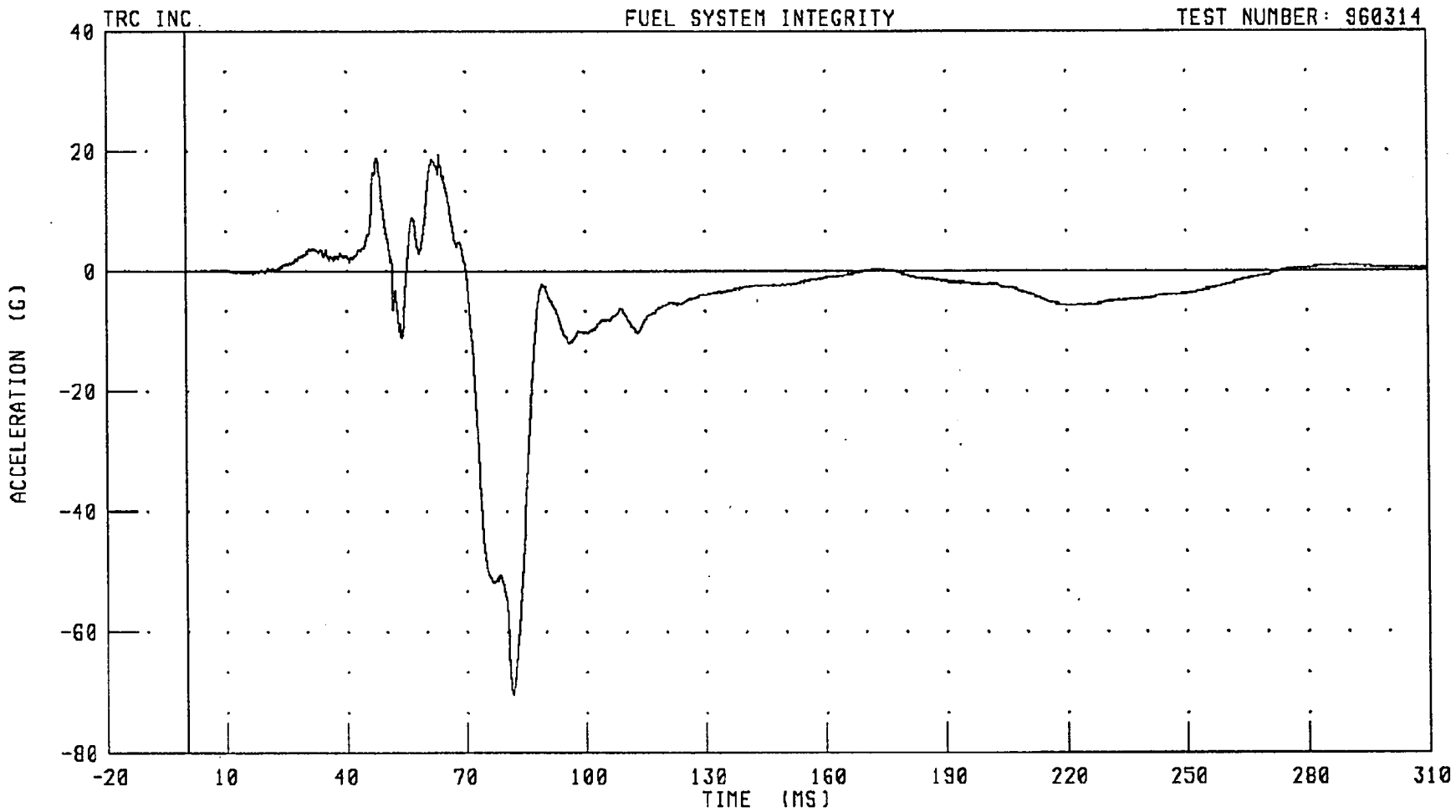
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER HEAD POSITION 2 Y-AXIS ACCELERATION



CHANNEL: HD2YG2 FILTER: CH. CLASS 1000 PEAK DATA: 15.24 G @ 83.04 MS; -3.60 G @ 146.96 MS

960314

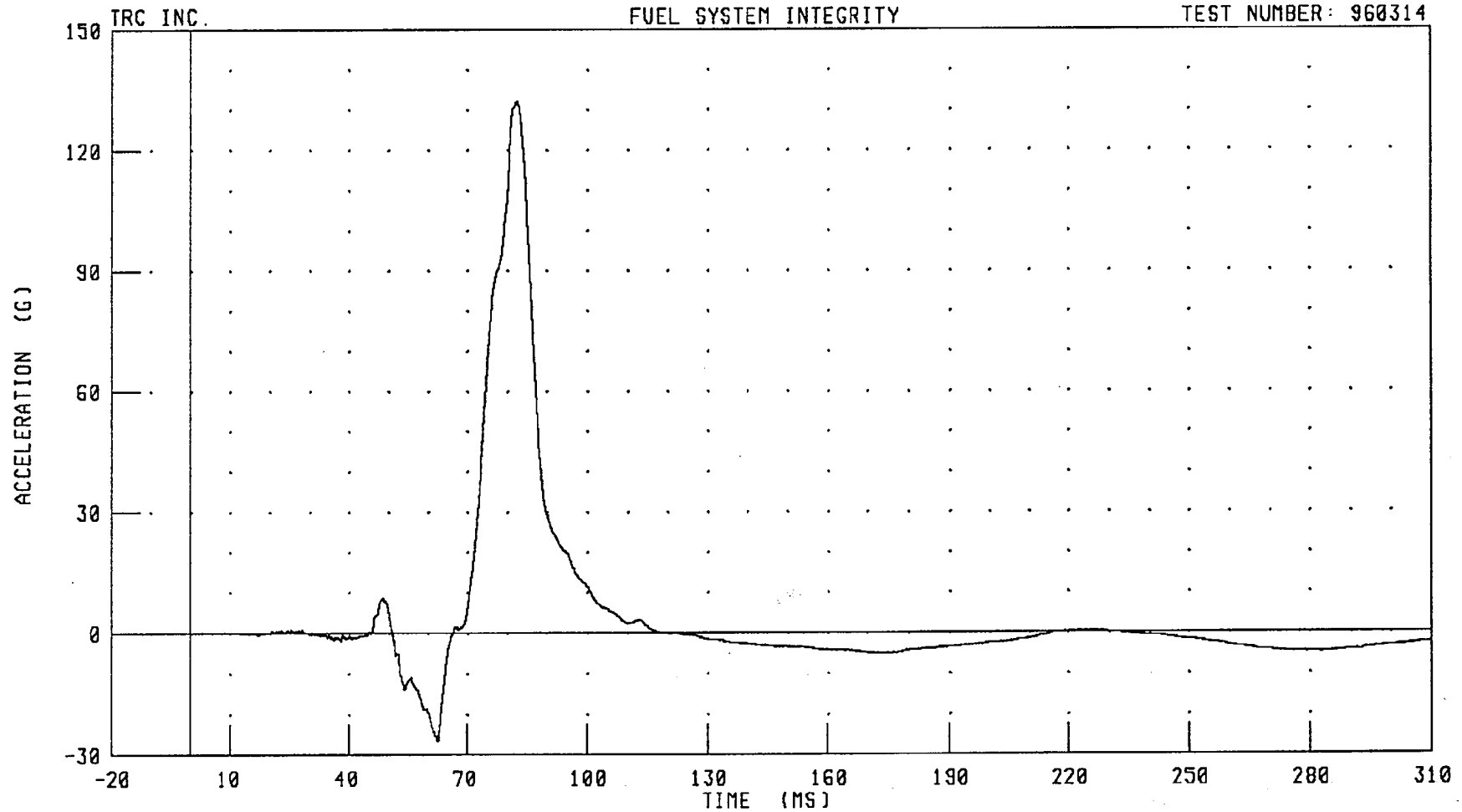
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER HEAD POSITION 2 Z-AXIS ACCELERATION



CHANNEL: HD2ZG2 FILTER: CH. CLASS 1000 PEAK DATA: 19.40 G @ 63.52 MS; -70.46 G @ 81.60 MS

960314

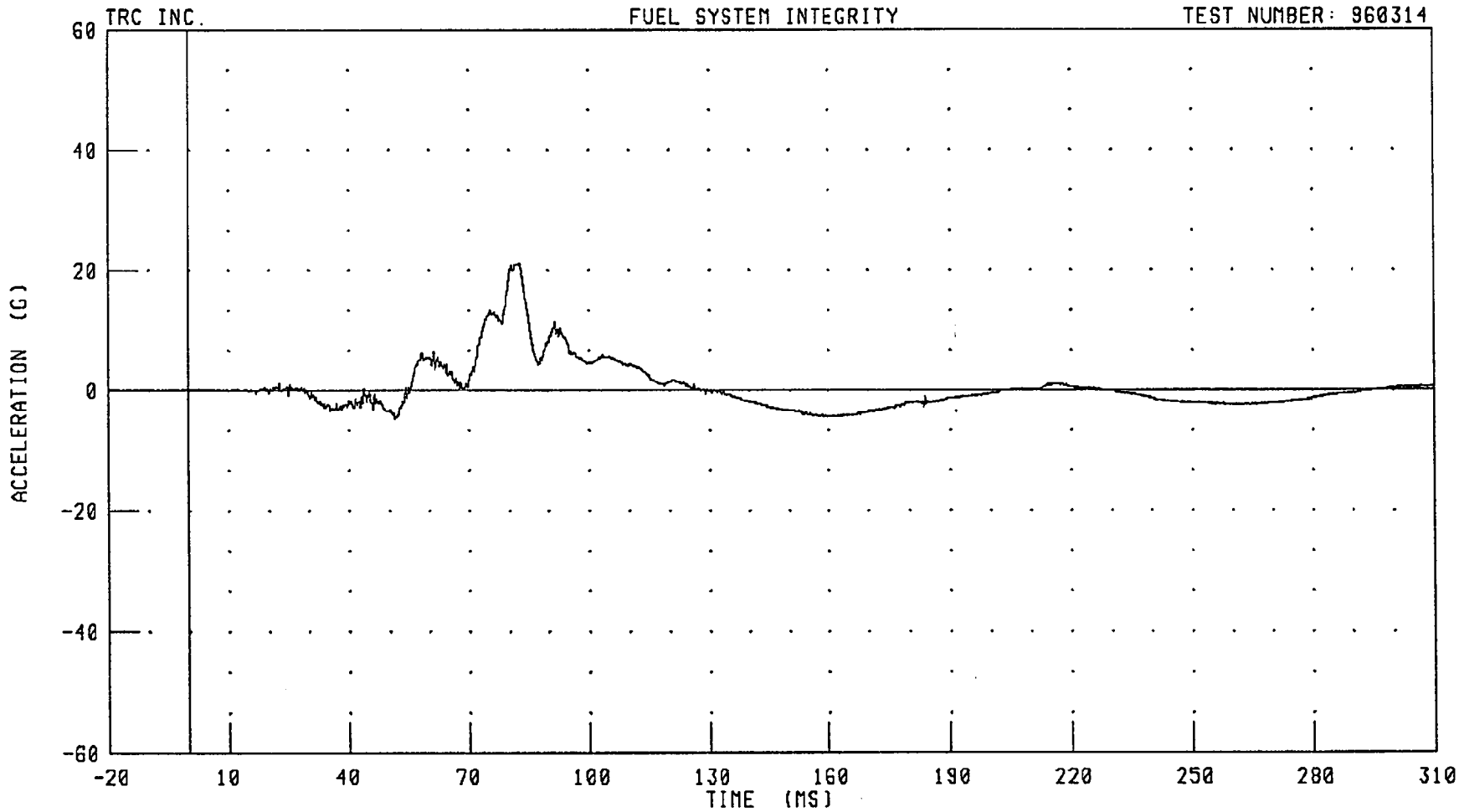
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER HEAD POSITION 3 X-AXIS ACCELERATION



CHANNEL: H03XG2 FILTER: CH. CLASS 1000 PEAK DATA: 132.06 G @ 82.40 MS; -26.62 G @ 62.56 MS

960314

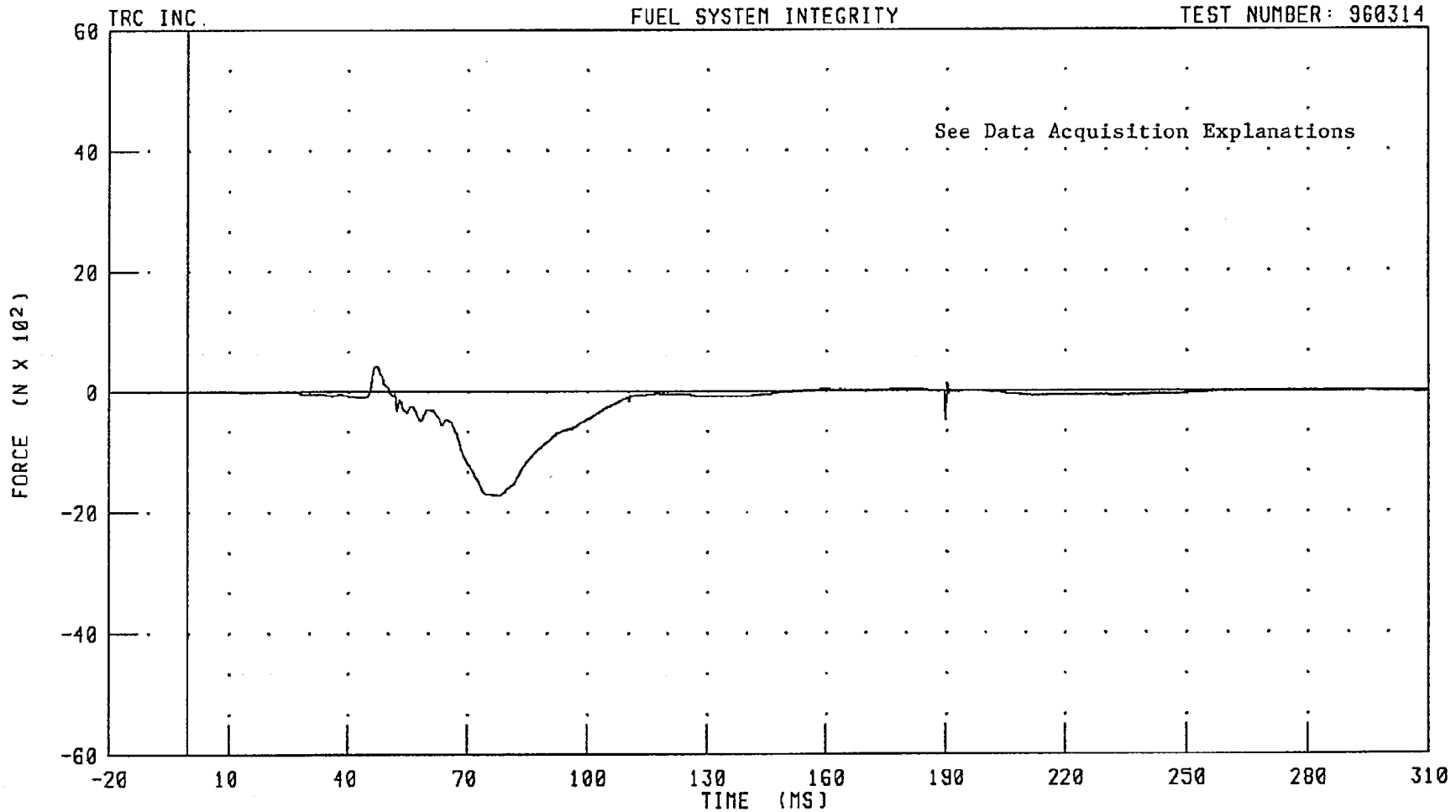
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER HEAD POSITION 3 Y-AXIS ACCELERATION



CHANNEL: HD3YG2 FILTER: CH. CLASS 1000 PEAK DATA: 21.17 G @ 83.04 MS; -4.75 G @ 51.28 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER LOWER NECK X-AXIS SHEAR FORCE

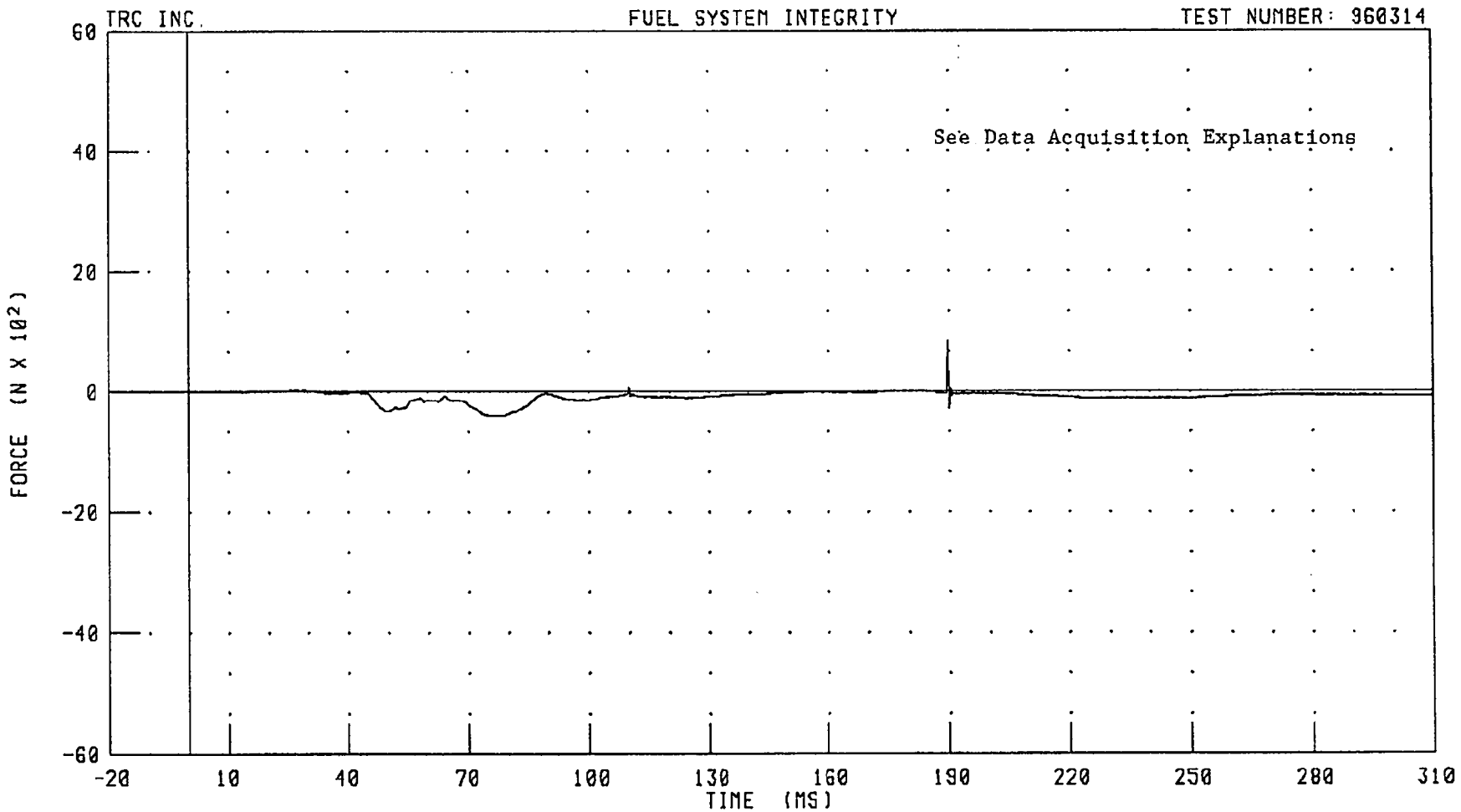


CHANNEL: NKLXF2 FILTER: CH. CLASS 1000 PEAK DATA: 432.15 N @ 47.28 MS; -1725.15 N @ 77.84 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

RIGHT FRONT PASSENGER LOWER NECK Y-AXIS SHEAR FORCE

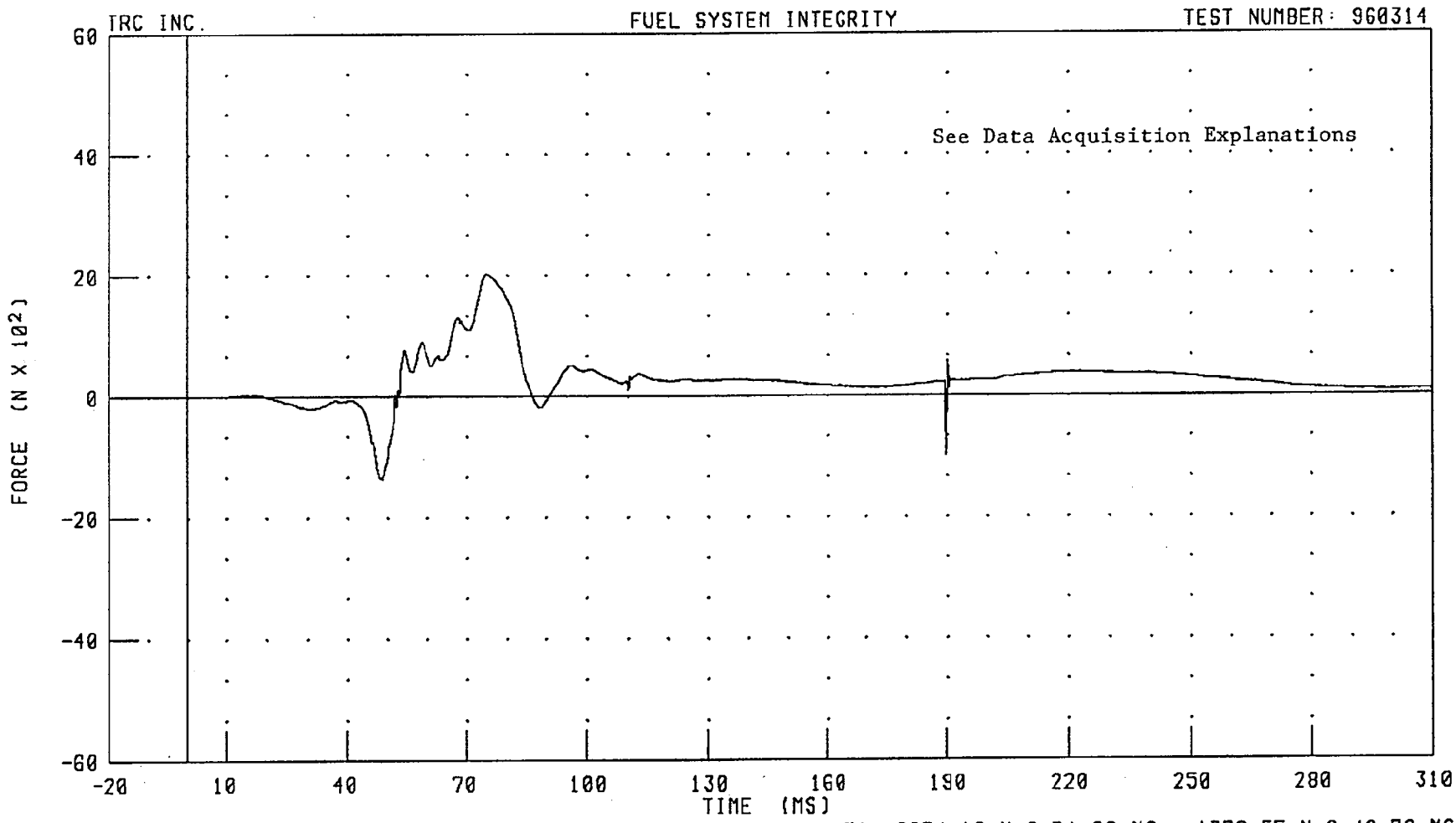


CHANNEL: NKLYF2 FILTER: CH. CLASS 1000 PEAK DATA: 855.13 N @ 189.84 MS; -403.94 N @ 75.44 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

RIGHT FRONT PASSENGER LOWER NECK Z-AXIS AXIAL FORCE

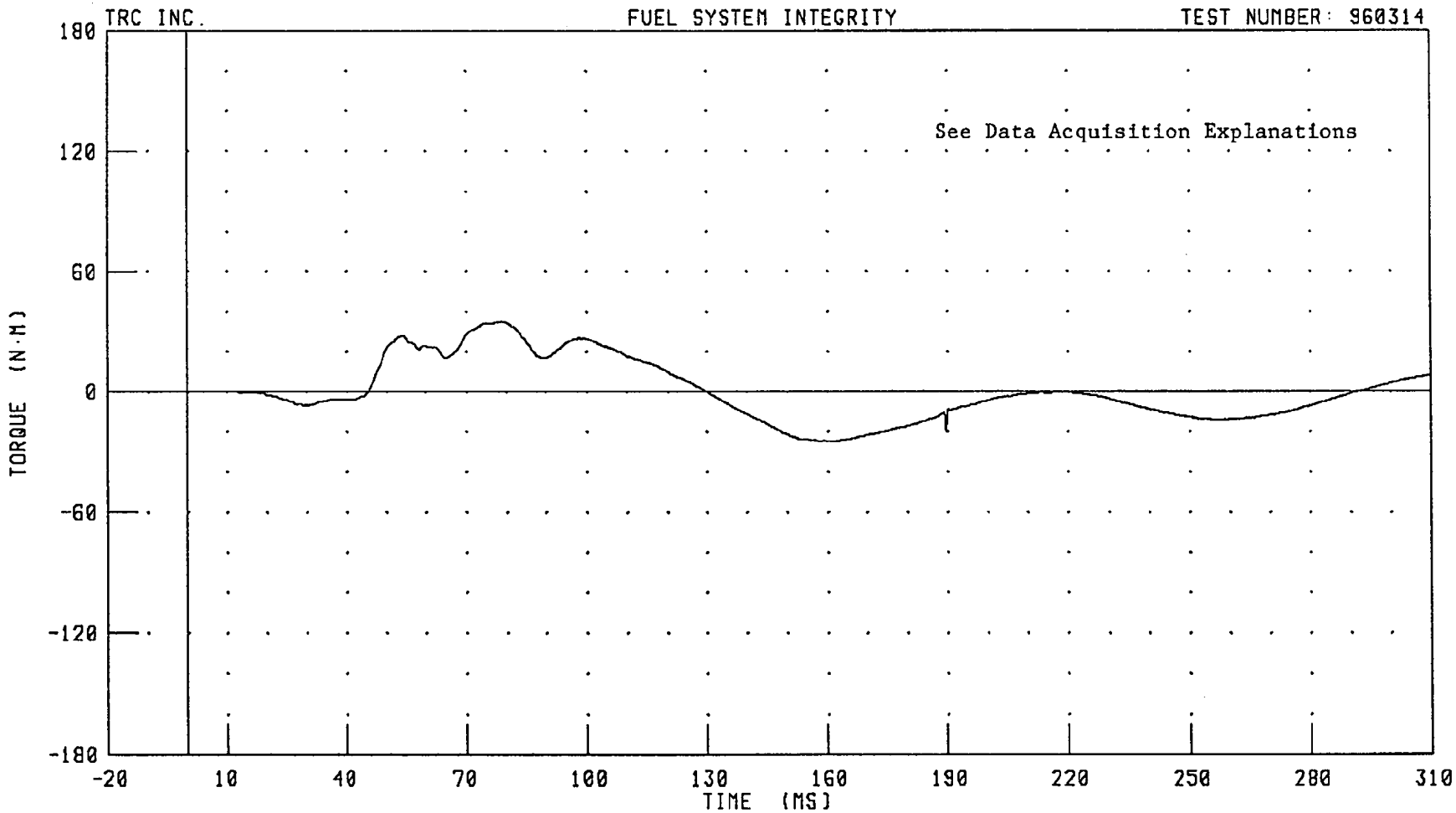


CHANNEL: NKLZF2 FILTER: CH. CLASS 1000

PEAK DATA: 2034.18 N @ 74.96 MS; -1370.55 N @ 48.72 MS

960314

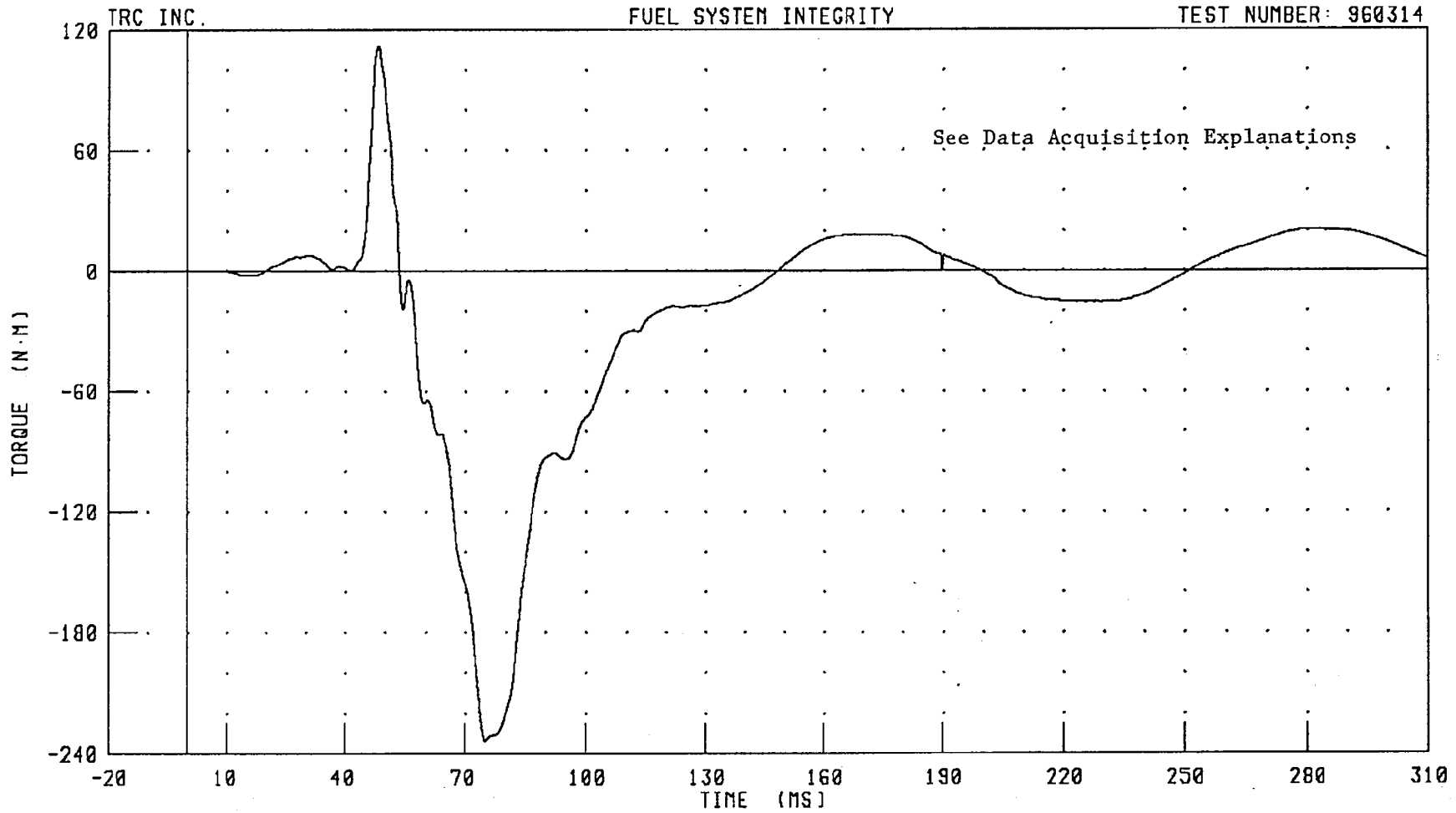
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER LOWER NECK MOMENT ABOUT X-AXIS



CHANNEL: NKLXM2 FILTER: CH. CLASS 600 PEAK DATA: 35.19 N·M @ 78.96 MS; -24.80 N·M @ 158.64 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER LOWER NECK MOMENT ABOUT Y-AXIS

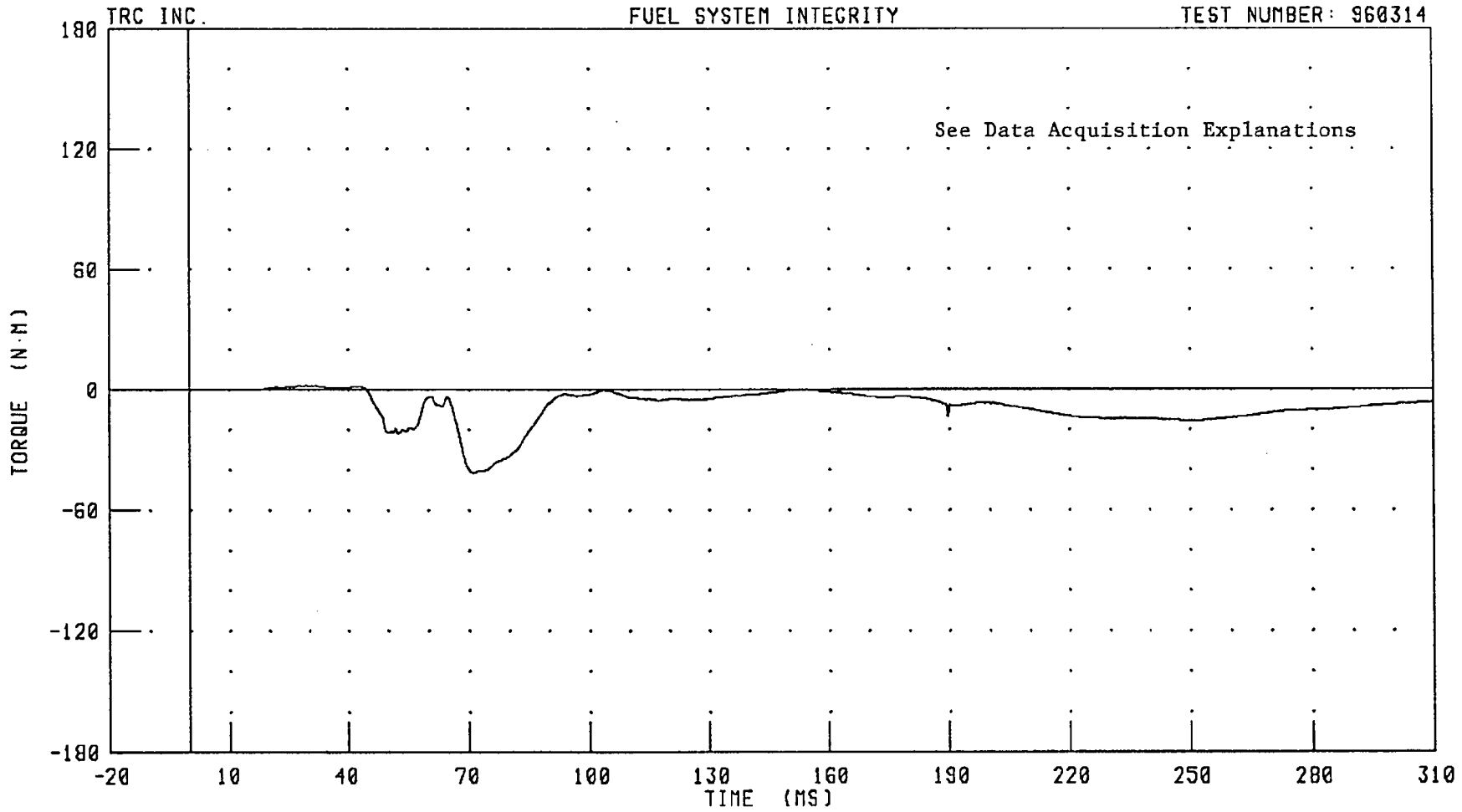


CHANNEL: NKLYM2 FILTER: CH. CLASS 600

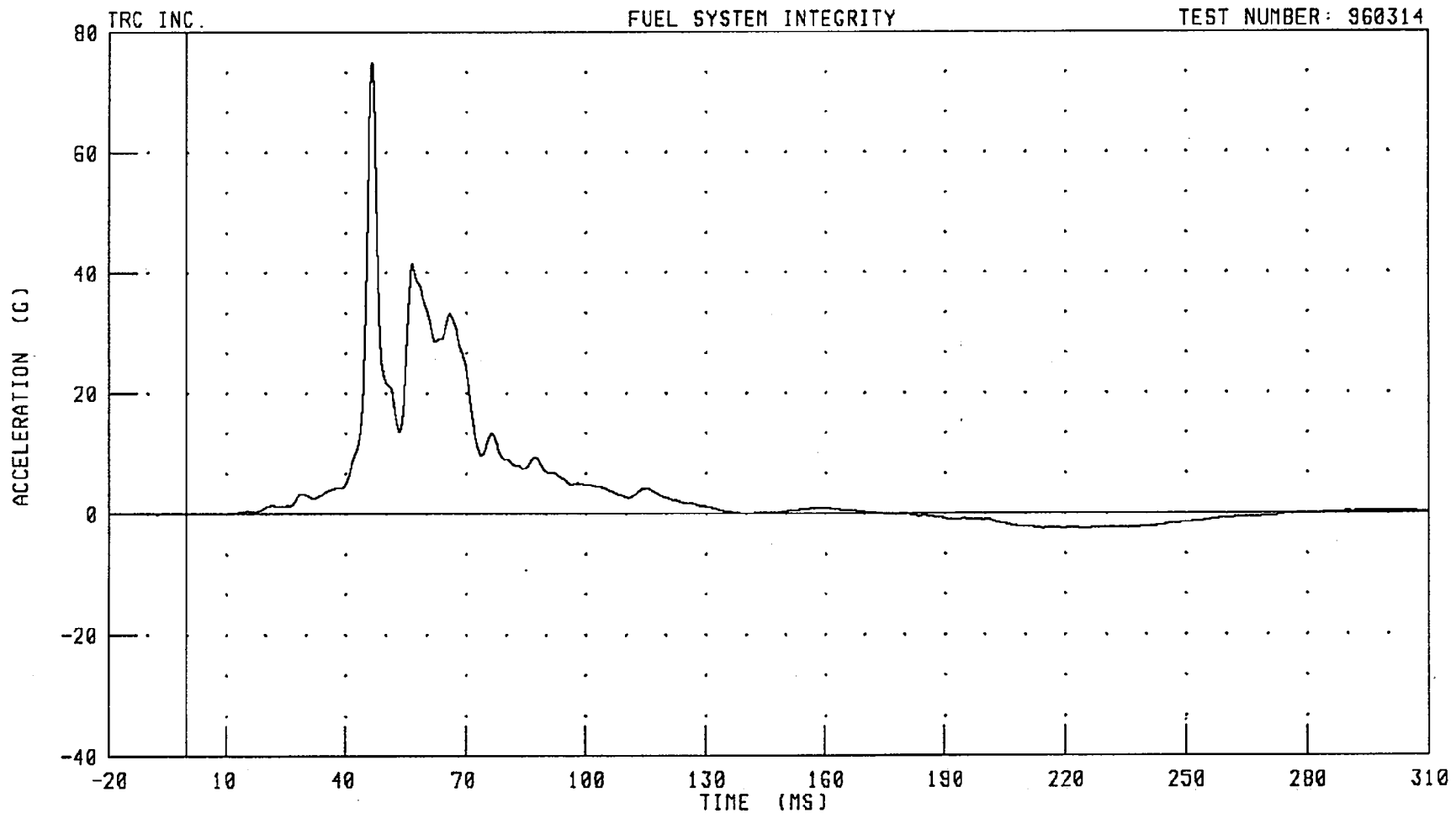
PEAK DATA: 111.99 N·M @ 48.40 MS; -233.72 N·M @ 74.96 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER LOWER NECK MOMENT ABOUT Z-AXIS



MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER CHEST X-AXIS ACCELERATION

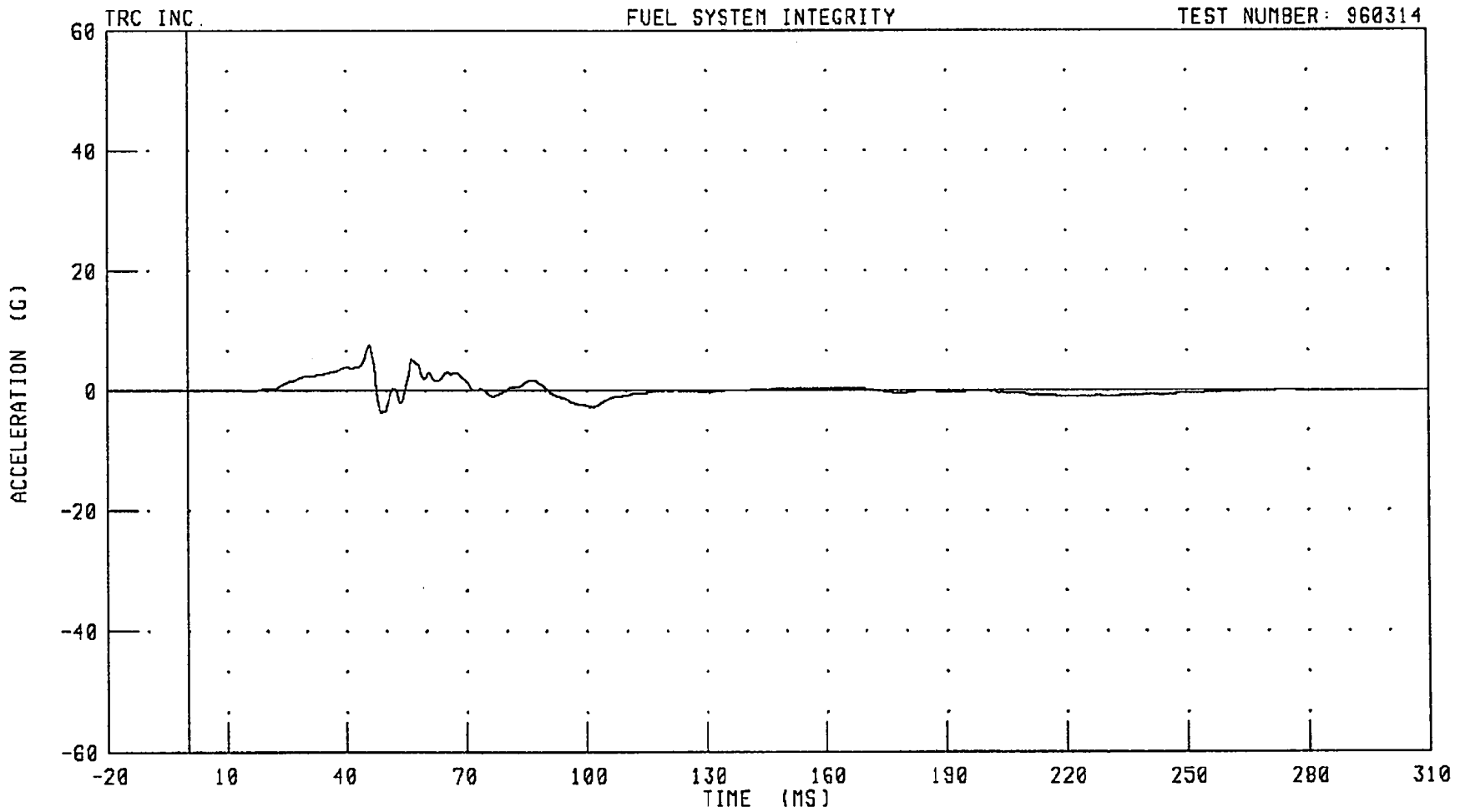


CHANNEL: CSTXG2 FILTER: CH. CLASS 180 PEAK DATA: 74.95 G @ 46.64 MS; -2.47 G @ 214.32 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

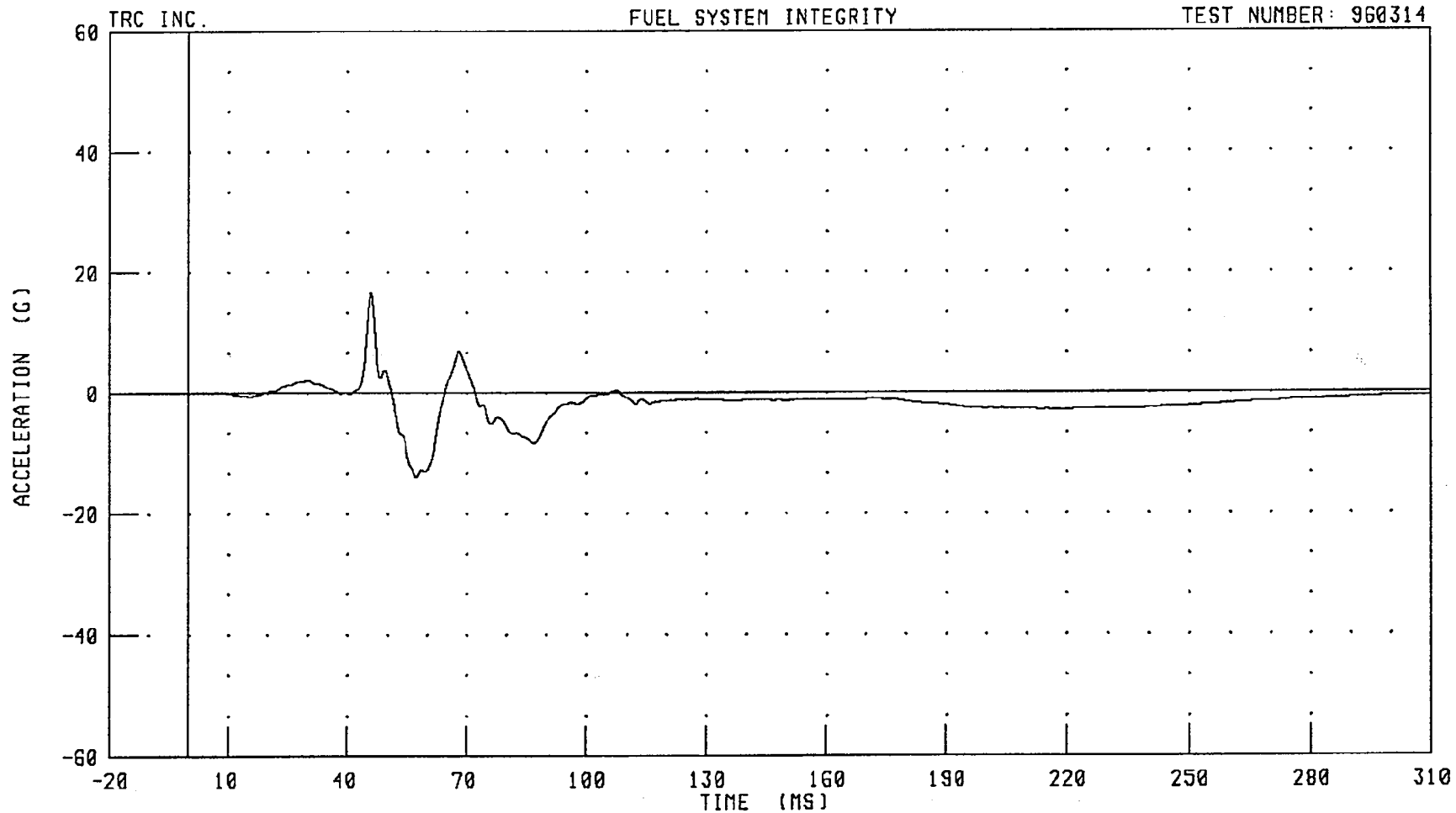
RIGHT FRONT PASSENGER CHEST Y-AXIS ACCELERATION



CHANNEL: CSTYG2 FILTER: CH. CLASS 180 PEAK DATA: 7.63 G @ 45.92 MS; -3.79 G @ 48.80 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
RIGHT FRONT PASSENGER CHEST Z-AXIS ACCELERATION

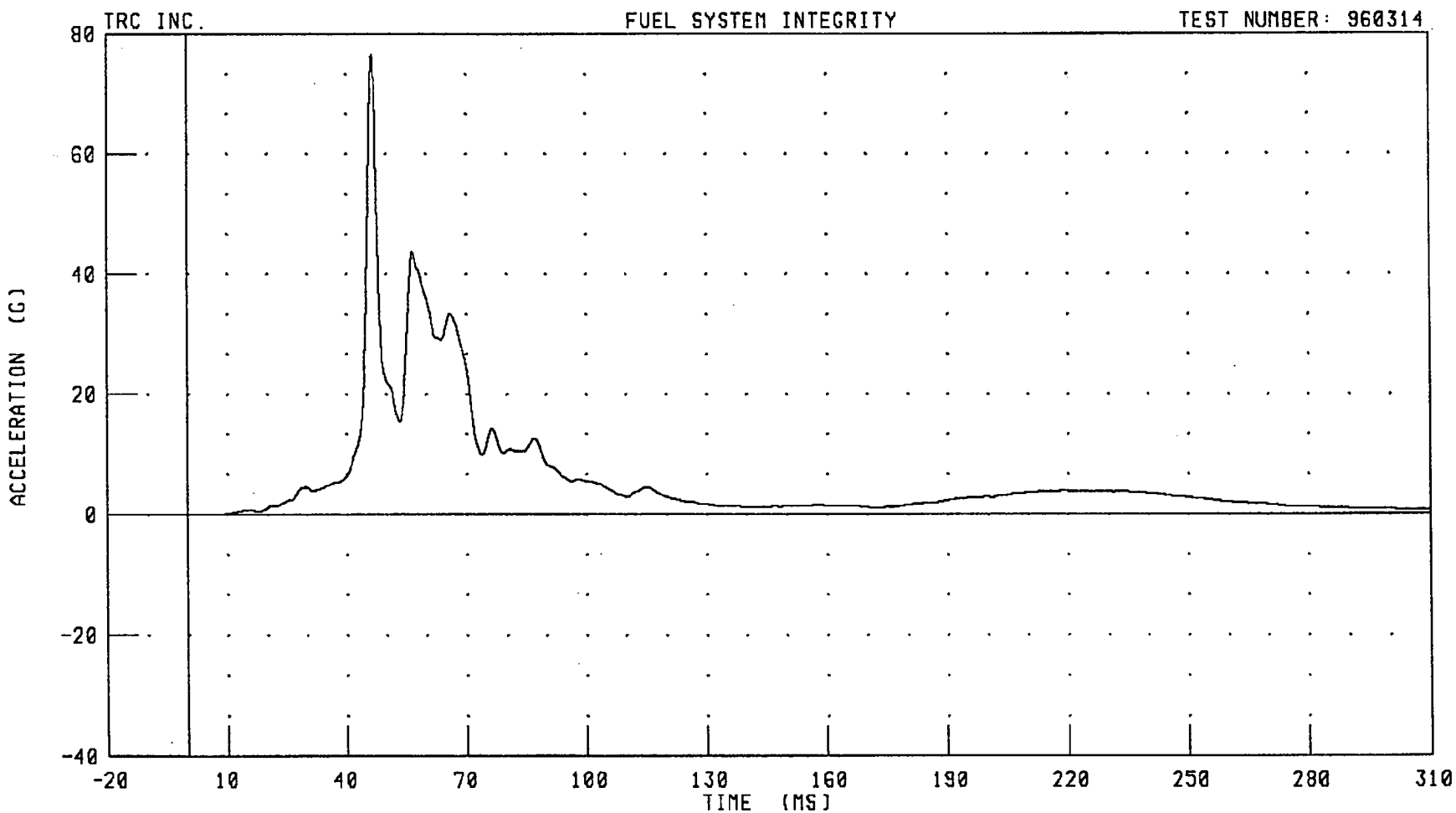


CHANNEL: CSTZG2 FILTER: CH. CLASS 180 PEAK DATA: 16.58 G @ 46.00 MS; -14.07 G @ 57.28 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

RIGHT FRONT PASSENGER CHEST RESULTANT ACCELERATION



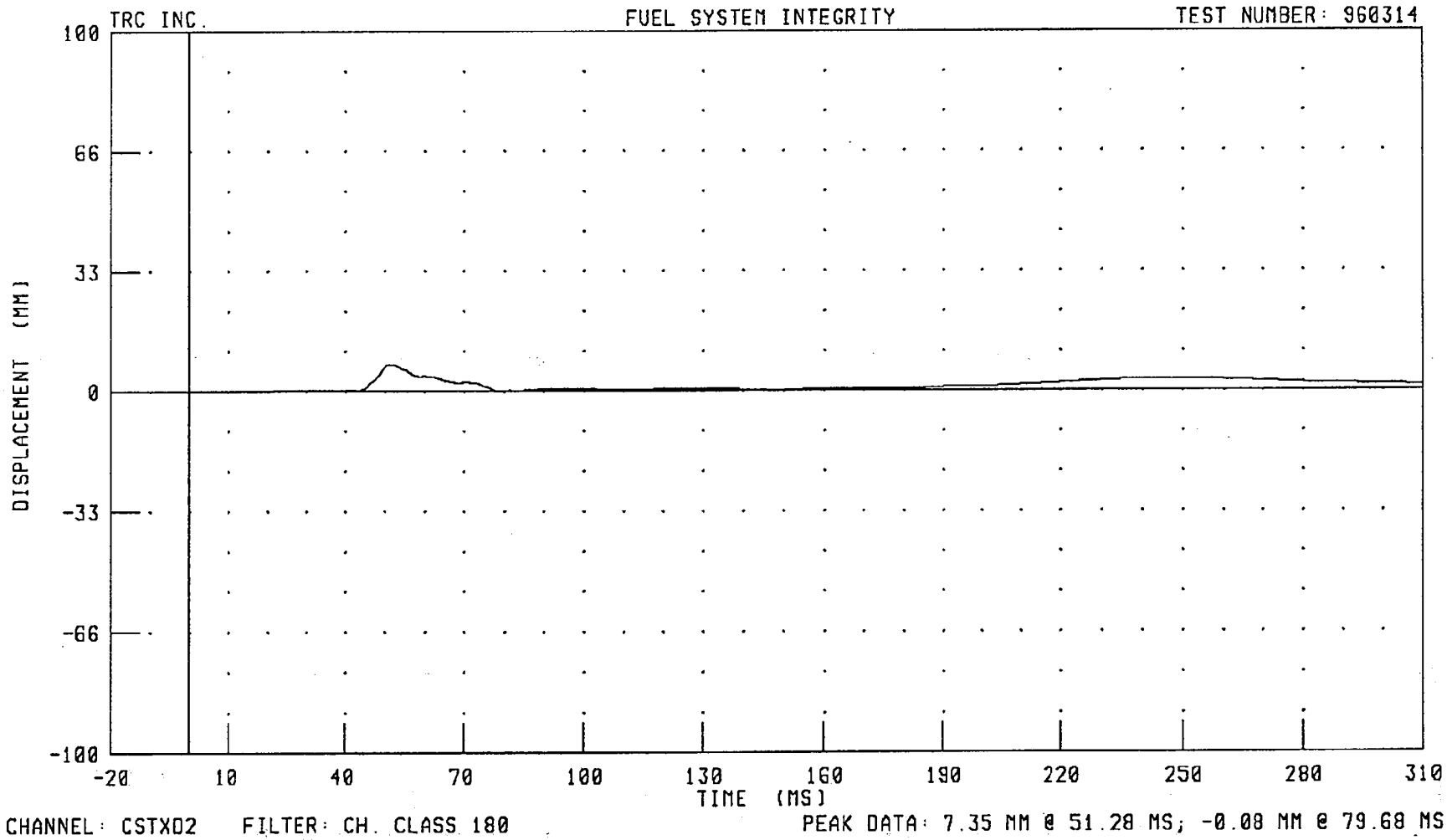
CHANNEL: CSTRG2 FILTER: CH. CLASS 180 PEAK DATA: 76.49 G @ 46.56 MS; 0.00 G @ -3.92 MS

B-80

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

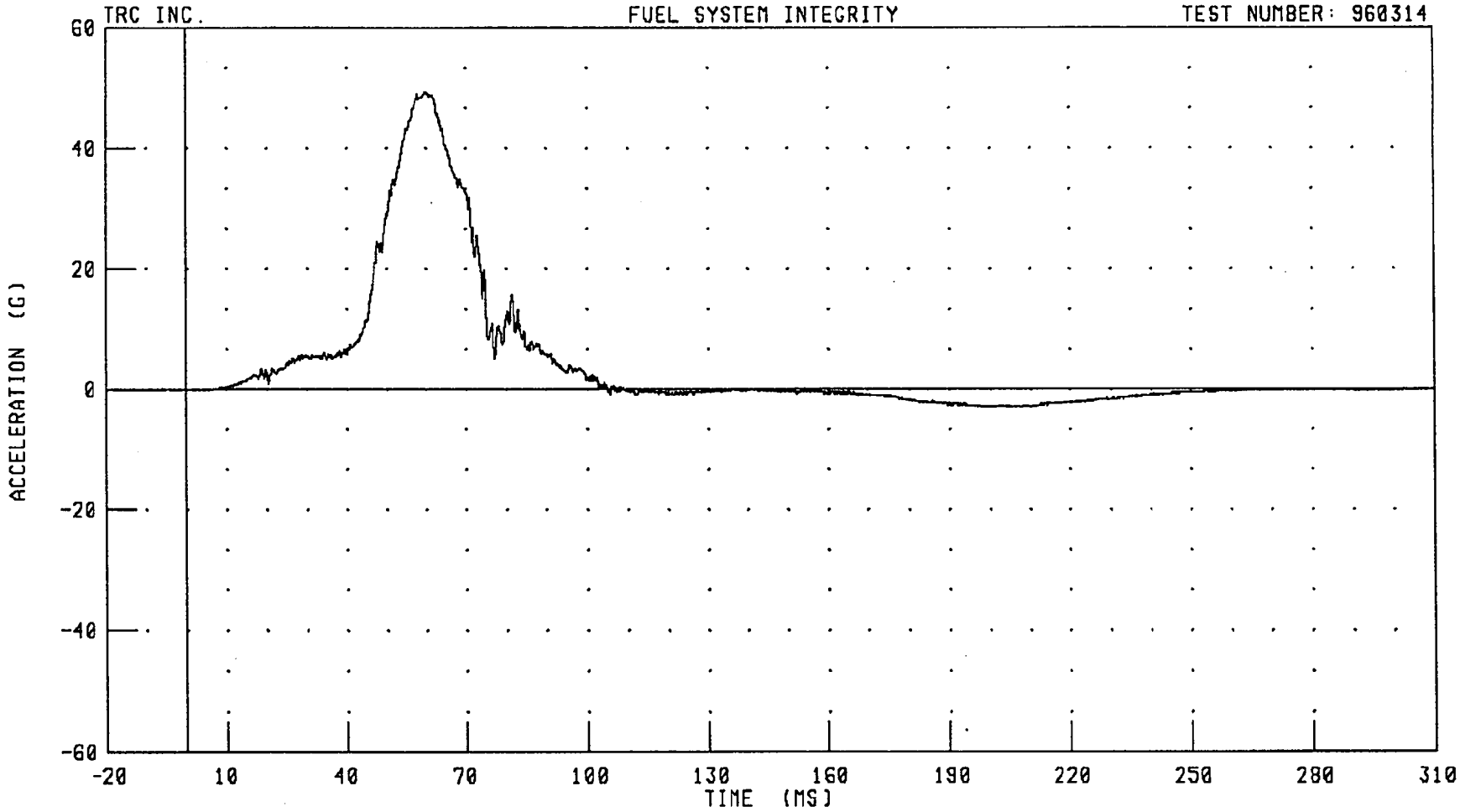
RIGHT FRONT PASSENGER CHEST DEFLECTION



960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

RIGHT FRONT PASSENGER PELVIS X-AXIS ACCELERATION

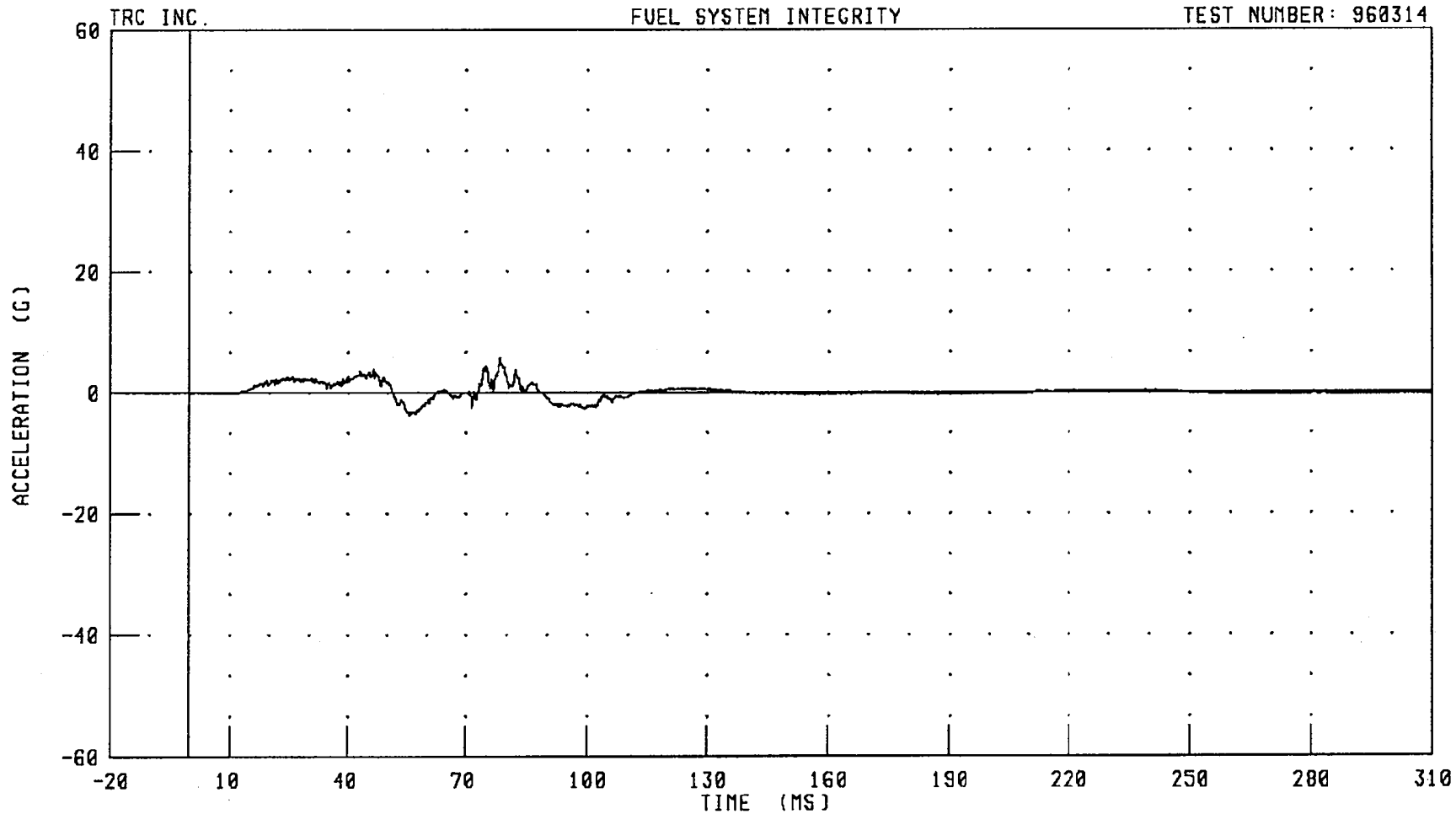


CHANNEL: PEVXG2 FILTER: CH. CLASS 1000 PEAK DATA: 49.32 G @ 59.92 MS; -3.07 G @ 204.40 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

RIGHT FRONT PASSENGER PELVIS Y-AXIS ACCELERATION



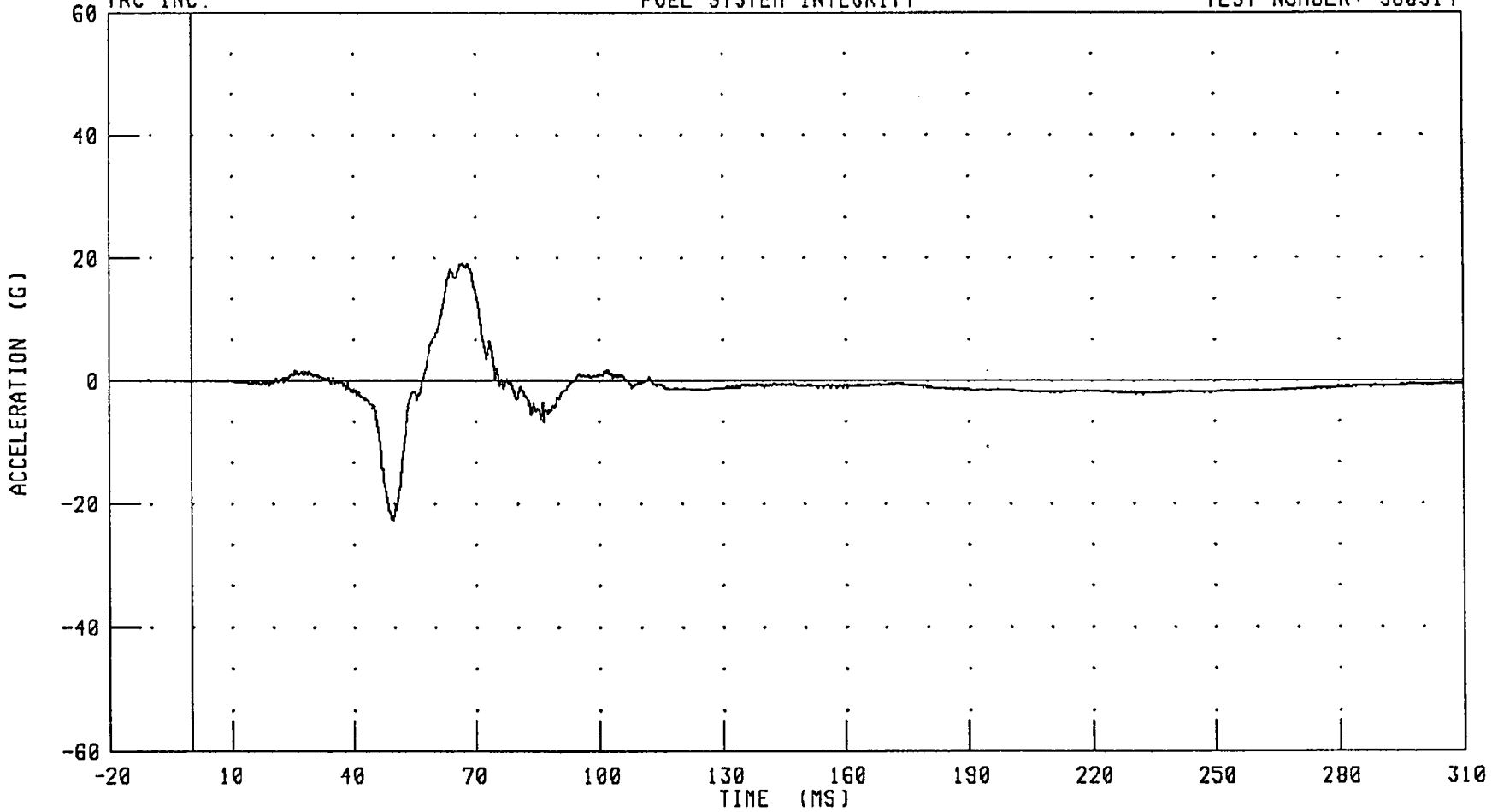
CHANNEL: PEVYG2 FILTER: CH. CLASS 1000 PEAK DATA: 5.69 G @ 78.48 MS; -3.81 G @ 55.52 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

RIGHT FRONT PASSENGER PELVIS Z-AXIS ACCELERATION

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314

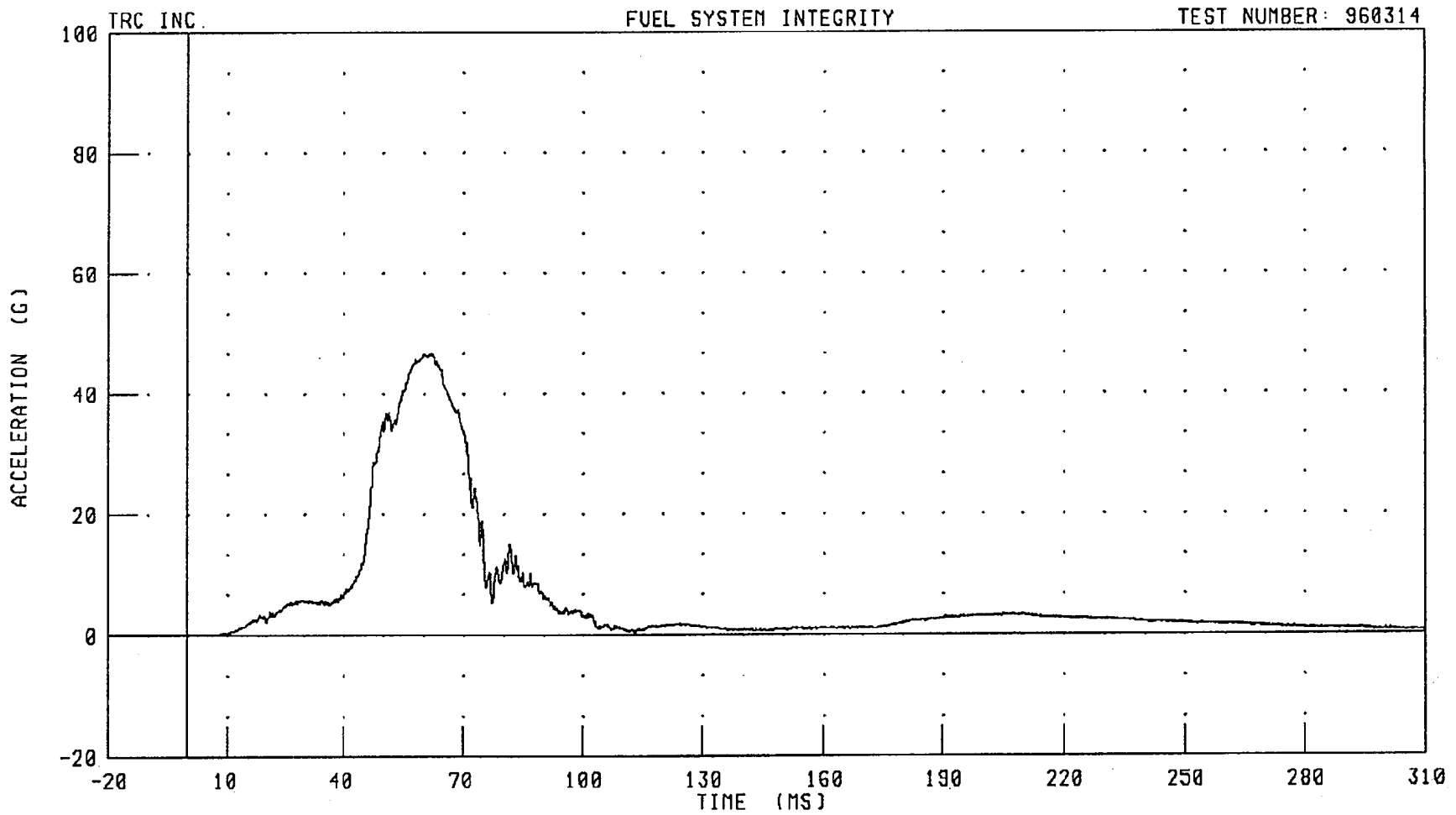


CHANNEL: PEVZG2 FILTER: CH. CLASS 1000 PEAK DATA: 19.15 G @ 66.88 MS; -22.93 G @ 49.84 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

RIGHT FRONT PASSENGER PELVIS RESULTANT ACCELERATION



CHANNEL: PEVRG2 FILTER: CH. CLASS 1000

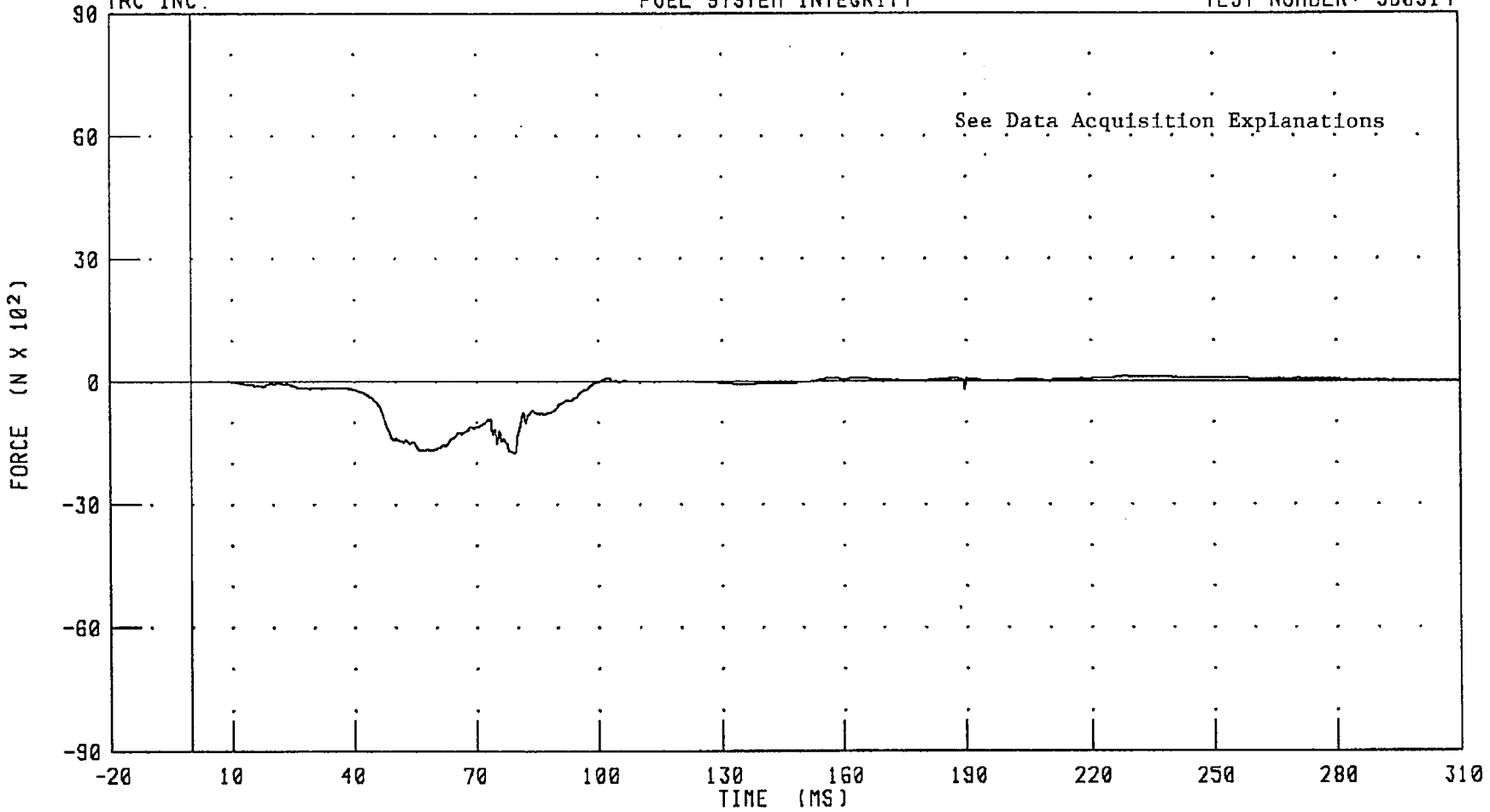
PEAK DATA: 46.76 G @ 61.84 MS; 0.11 G @ -20.00 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

RIGHT FRONT PASSENGER RIGHT FEMUR FORCE

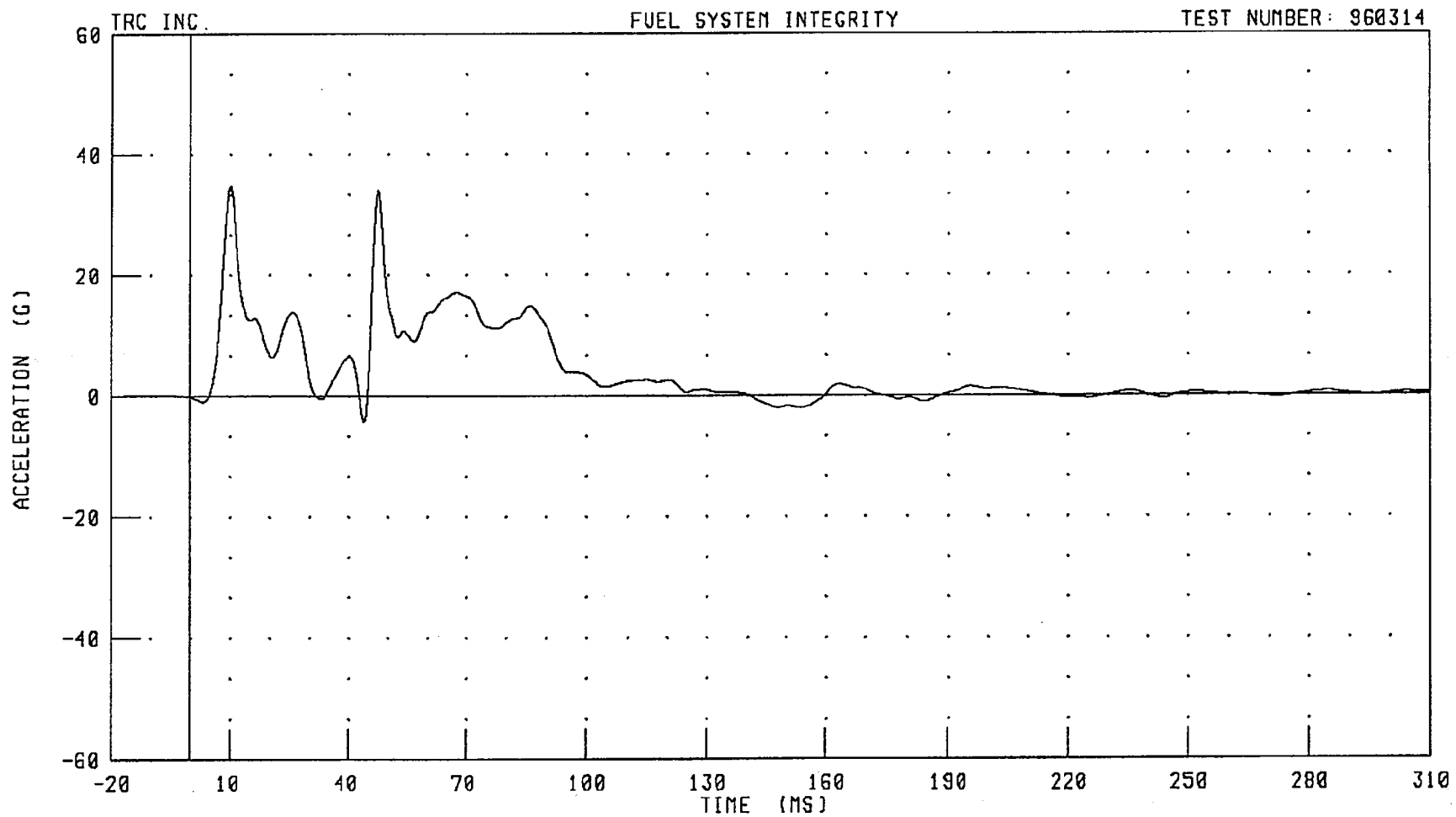
TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



CHANNEL: RFMF2 FILTER: CH. CLASS 600 PEAK DATA: 125.61 N @ 228.72 MS; -1758.60 N @ 79.52 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
FRONT SEAT OUTBOARD MOUNTING RAIL X-AXIS ACCELERATION



CHANNEL: TLFXG1 FILTER: CH. CLASS 60

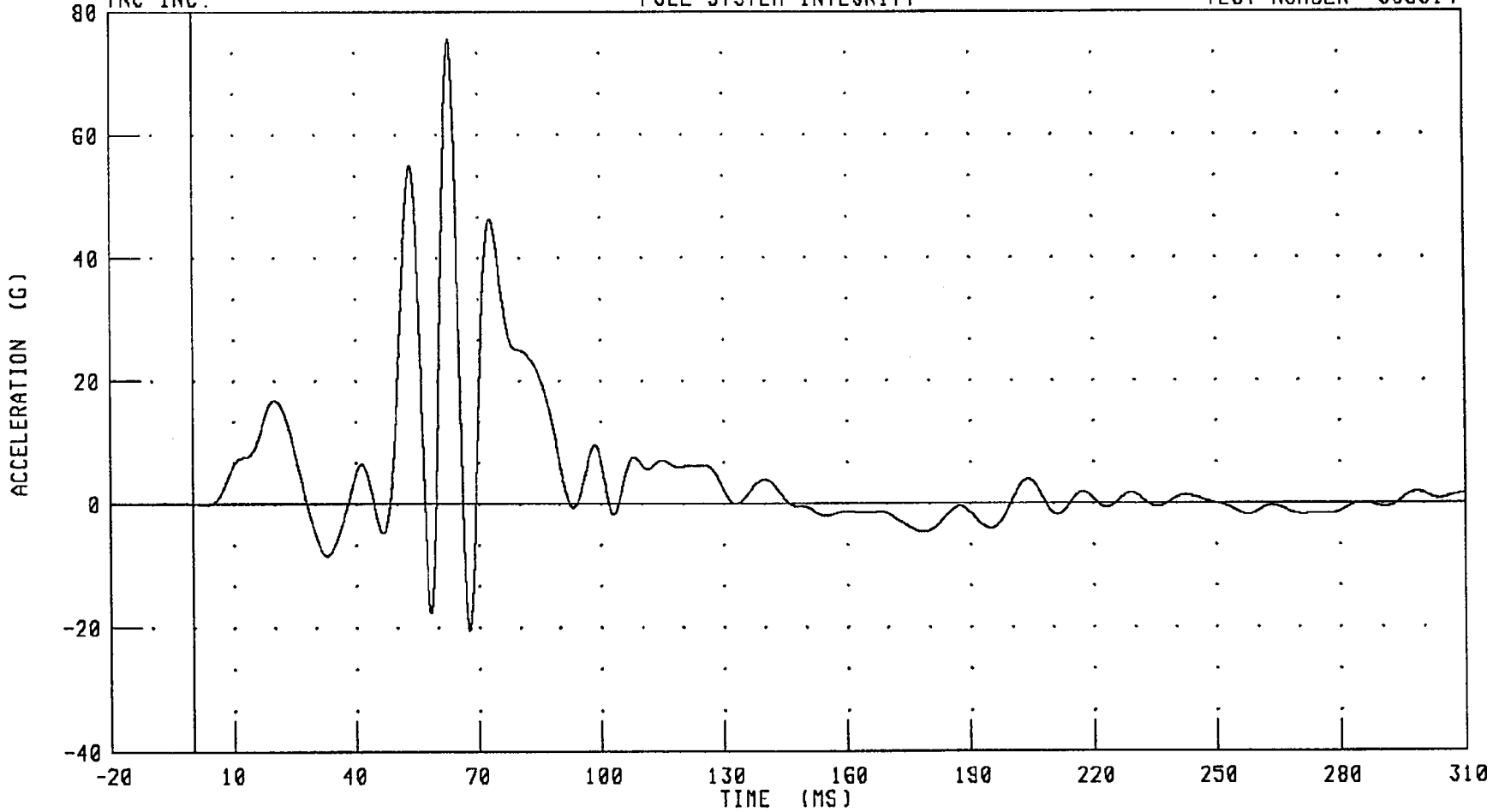
PEAK DATA: 34.70 G @ 10.08 MS; -4.21 G @ 44.00 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

FRONT SEAT BACK MID X-AXIS ACCELERATION

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



CHANNEL: TLFXG2 FILTER: CH. CLASS 60 PEAK DATA: 75.63 G @ 62.96 MS; -20.44 G @ 67.76 MS

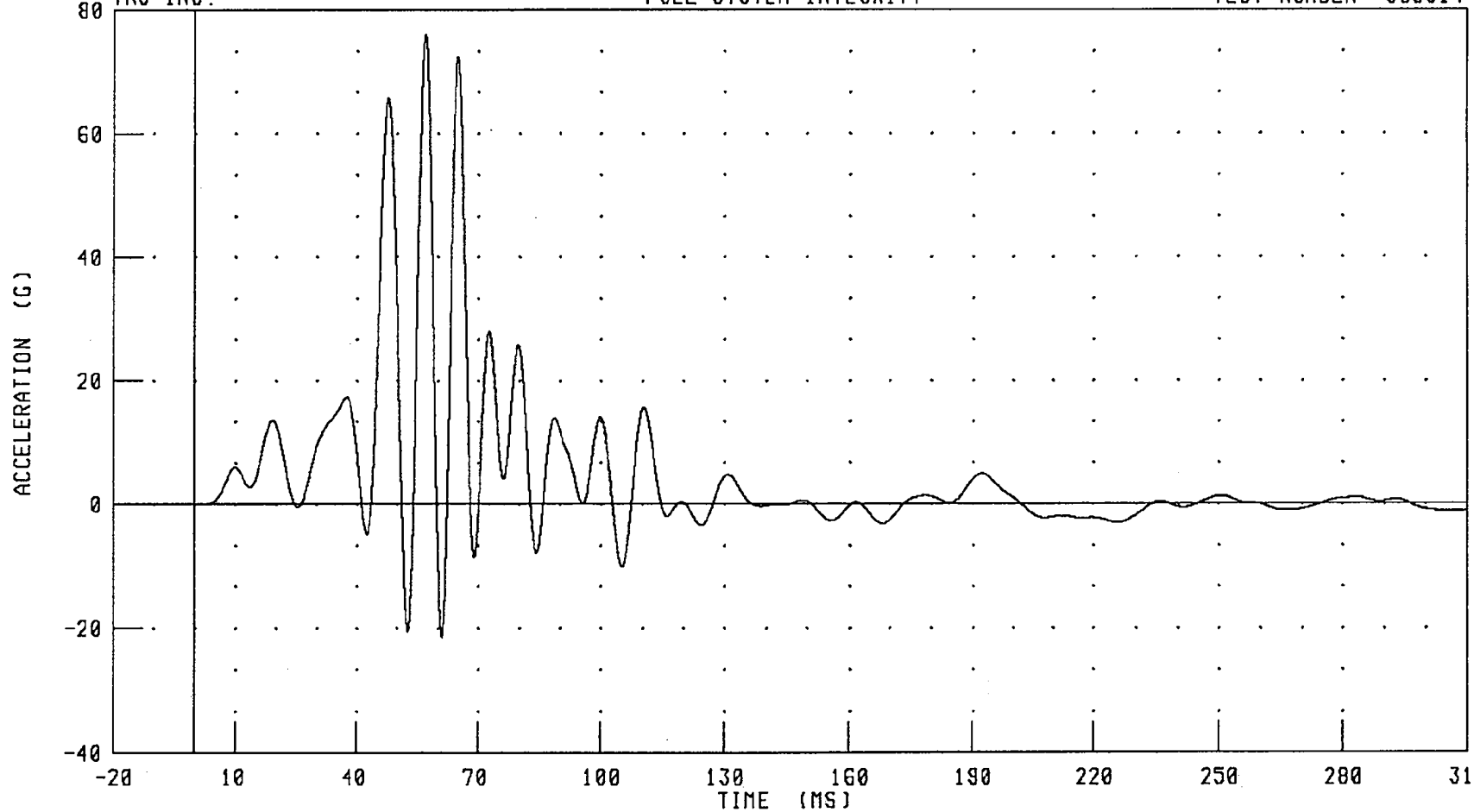
8-70

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

FRONT SEAT BACK MID X-AXIS ACCELERATION

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



CHANNEL: TRFXG2 FILTER: CH. CLASS 60 PEAK DATA: 75.98 G @ 56.96 MS; -21.43 G @ 61.04 MS

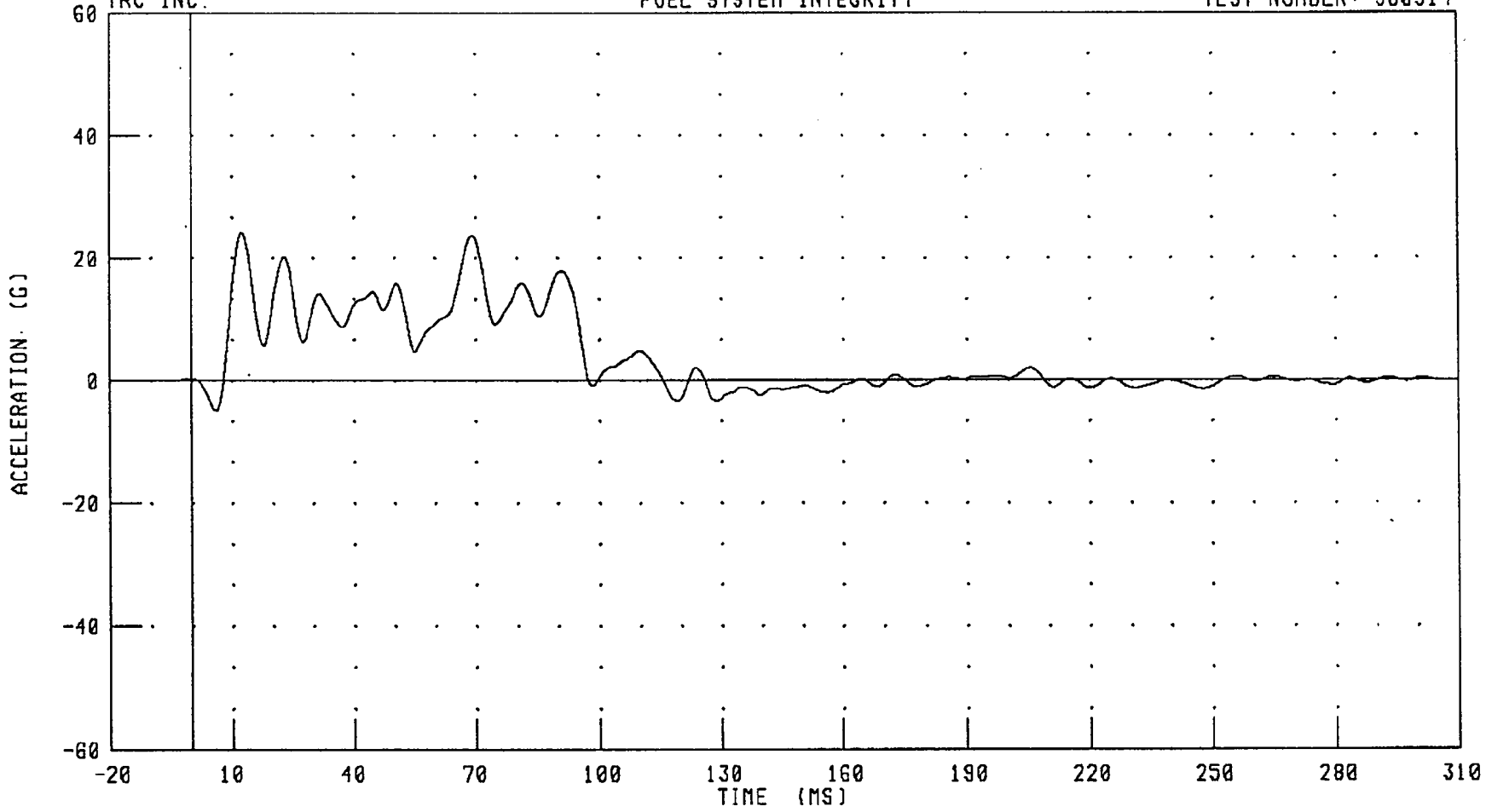
B-71

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

RADIATOR SUPPORT X-AXIS ACCELERATION

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314

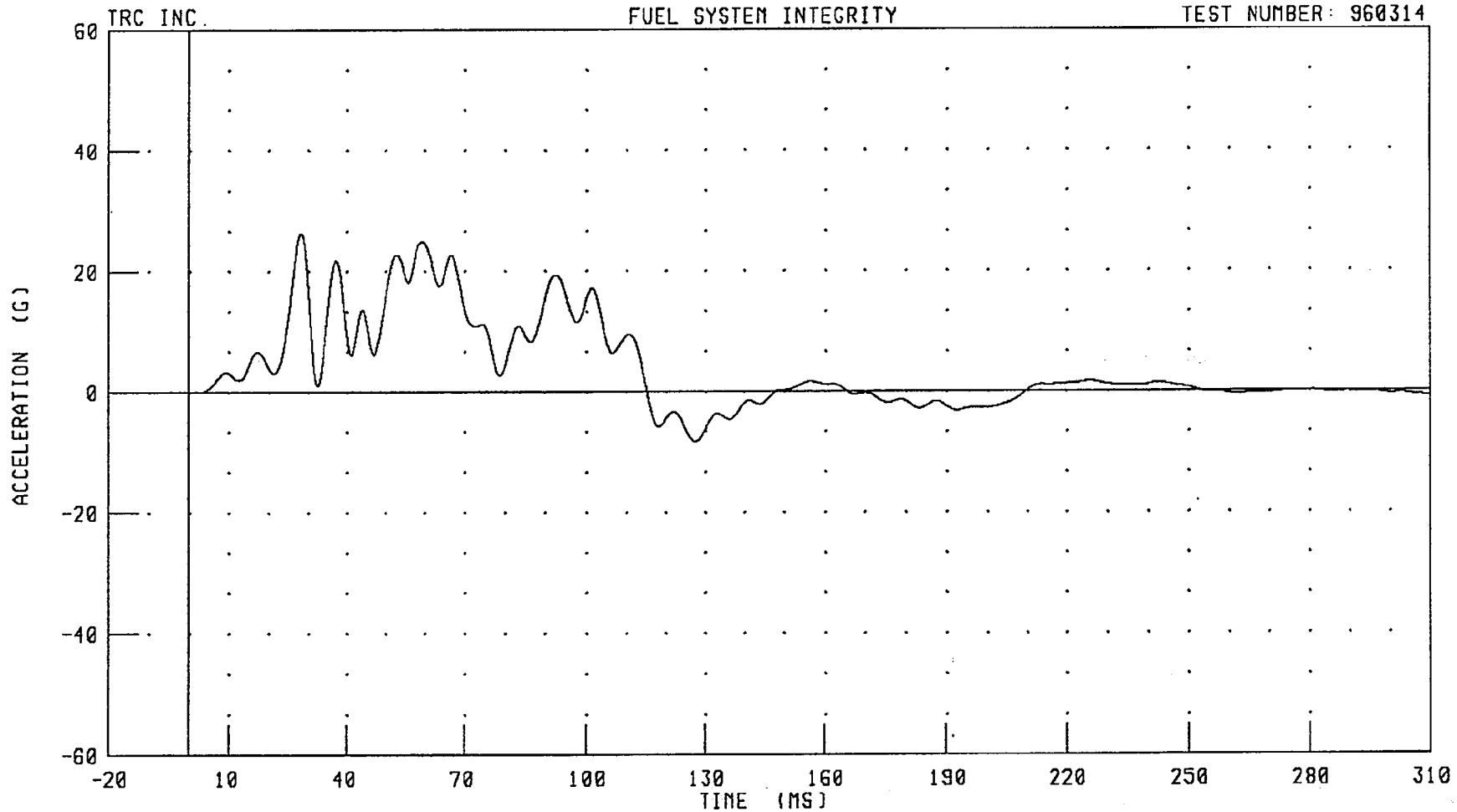


CHANNEL: FFCXG FILTER: CH. CLASS 60 PEAK DATA: 24.28 G @ 12.40 MS; -4.91 G @ 6.08 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

ENGINE TOP X-AXIS ACCELERATION

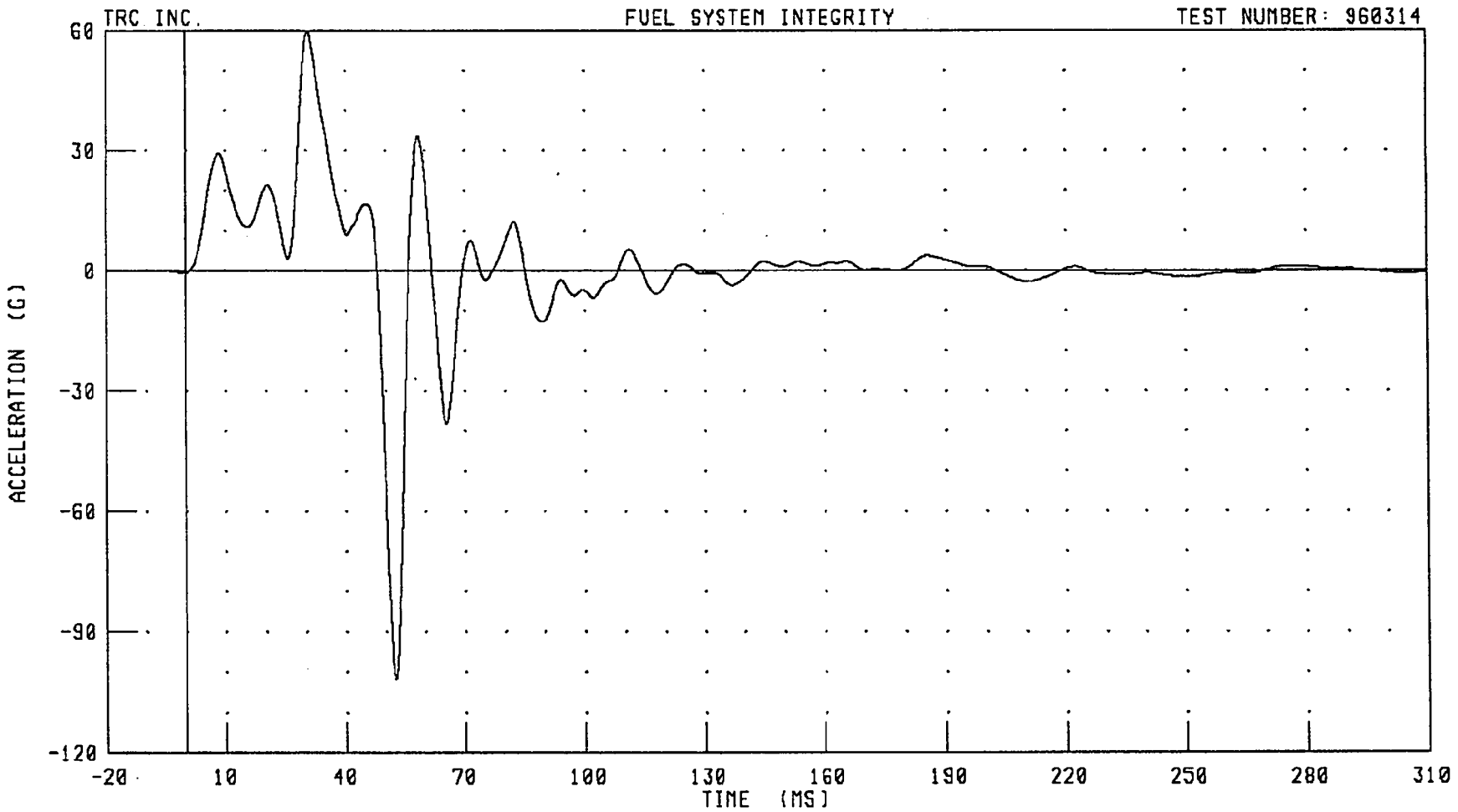


CHANNEL: ENGXG FILTER: CH. CLASS 60 PEAK DATA: 26.33 G @ 28.16 MS; -8.29 G @ 127.44 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

REAR WHEEL AXLE X-AXIS ACCELERATION

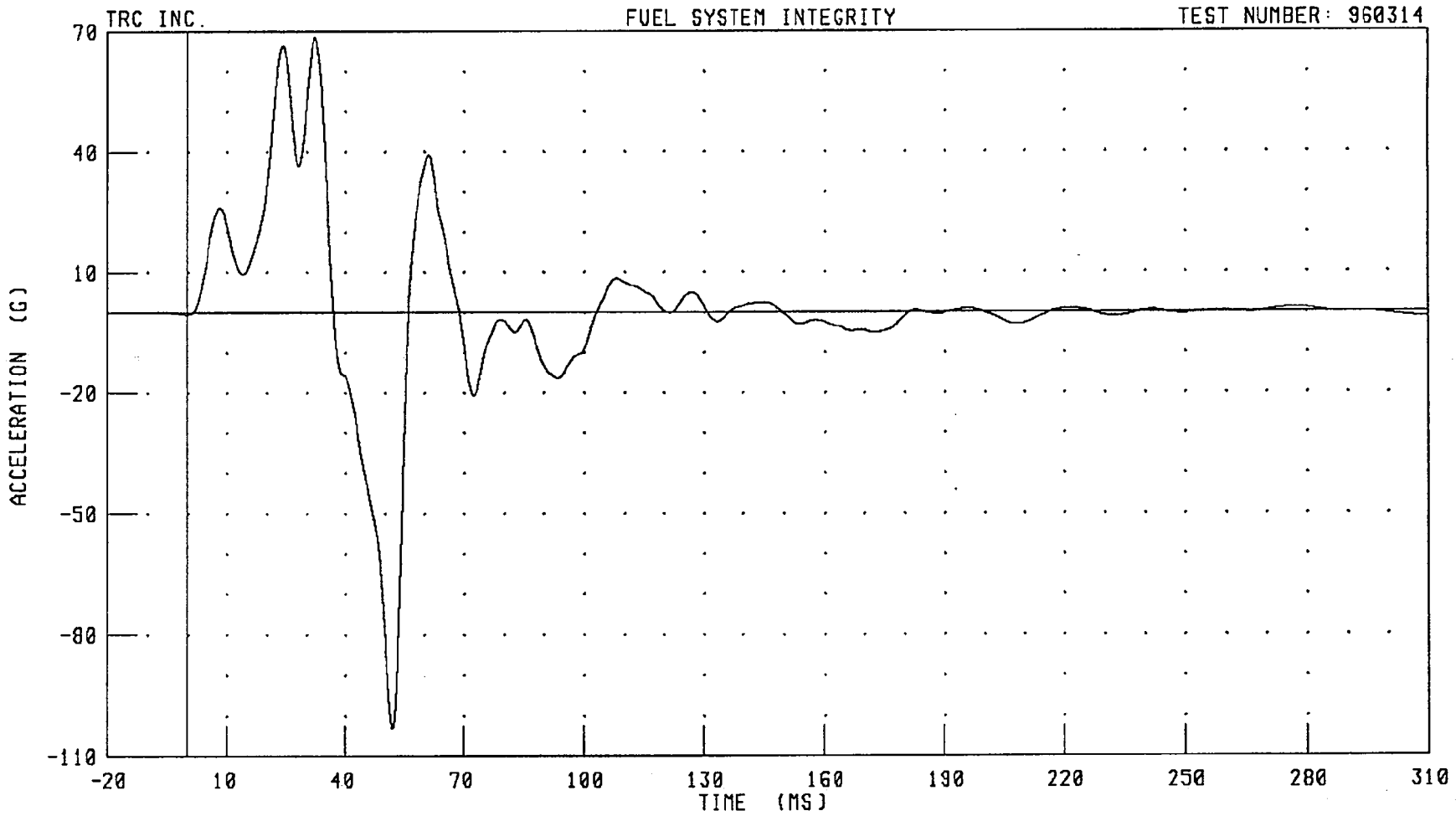


CHANNEL: RAXXG1 FILTER: CH. CLASS 60 PEAK DATA: 59.65 G @ 30.72 MS; -101.96 G @ 52.40 MS

960314

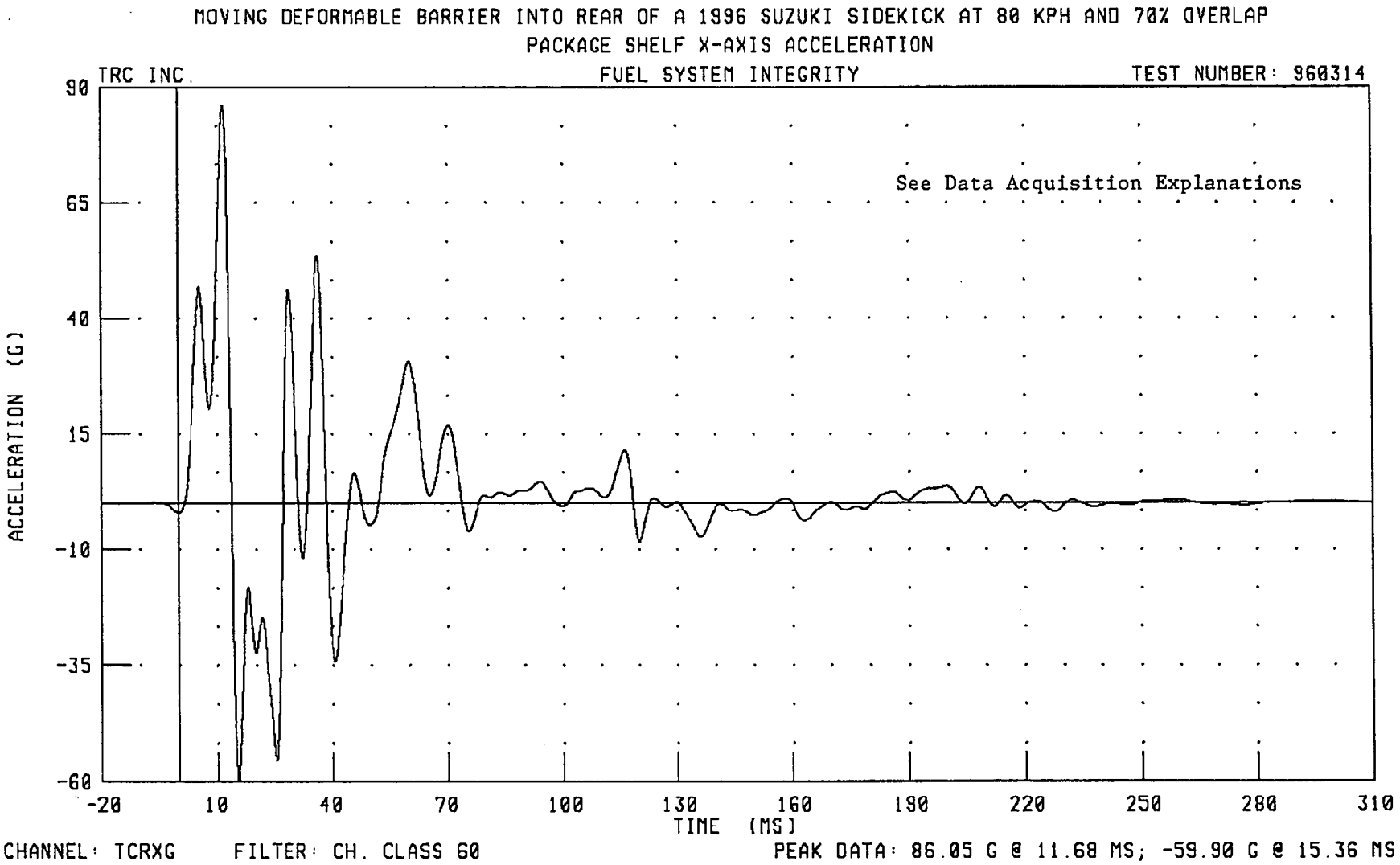
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

REAR WHEEL AXLE X-AXIS ACCELERATION



CHANNEL: RAXXG2 FILTER: CH. CLASS 60 PEAK DATA: 68.38 G @ 32.32 MS; -103.02 G @ 51.92 MS

960314

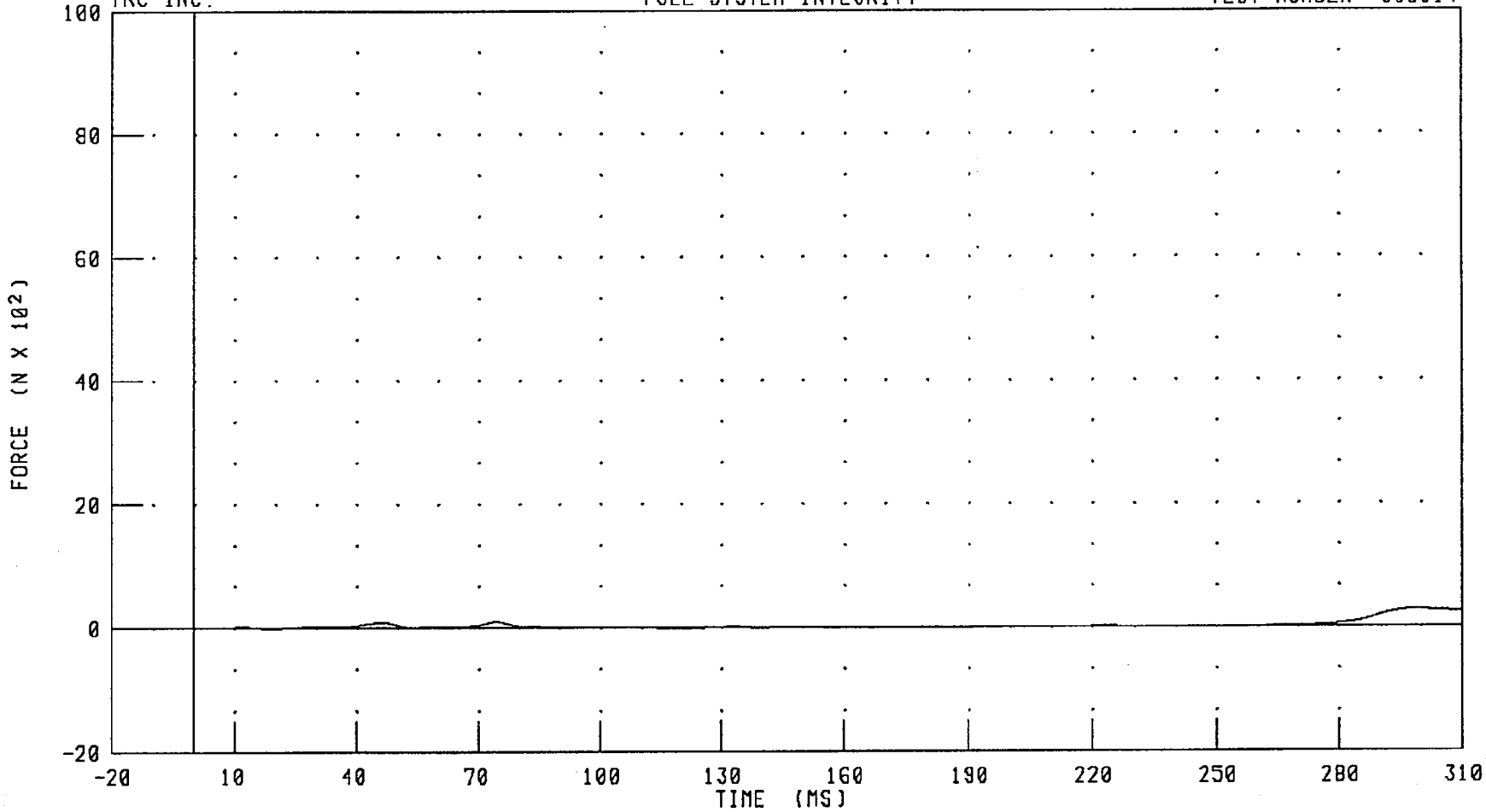

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
PACKAGE SHELF X-AXIS ACCELERATION
TRC INC.
FUEL SYSTEM INTEGRITY
TEST NUMBER: 960314
See Data Acquisition Explanations
ACCELERATION (G)
90
65
40
15
-10
-35
-60
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: TCRXG
FILTER: CH. CLASS 60
PEAK DATA: 86.05 G @ 11.68 MS; -59.90 G @ 15.36 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER SHOULDER BELT FORCE

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



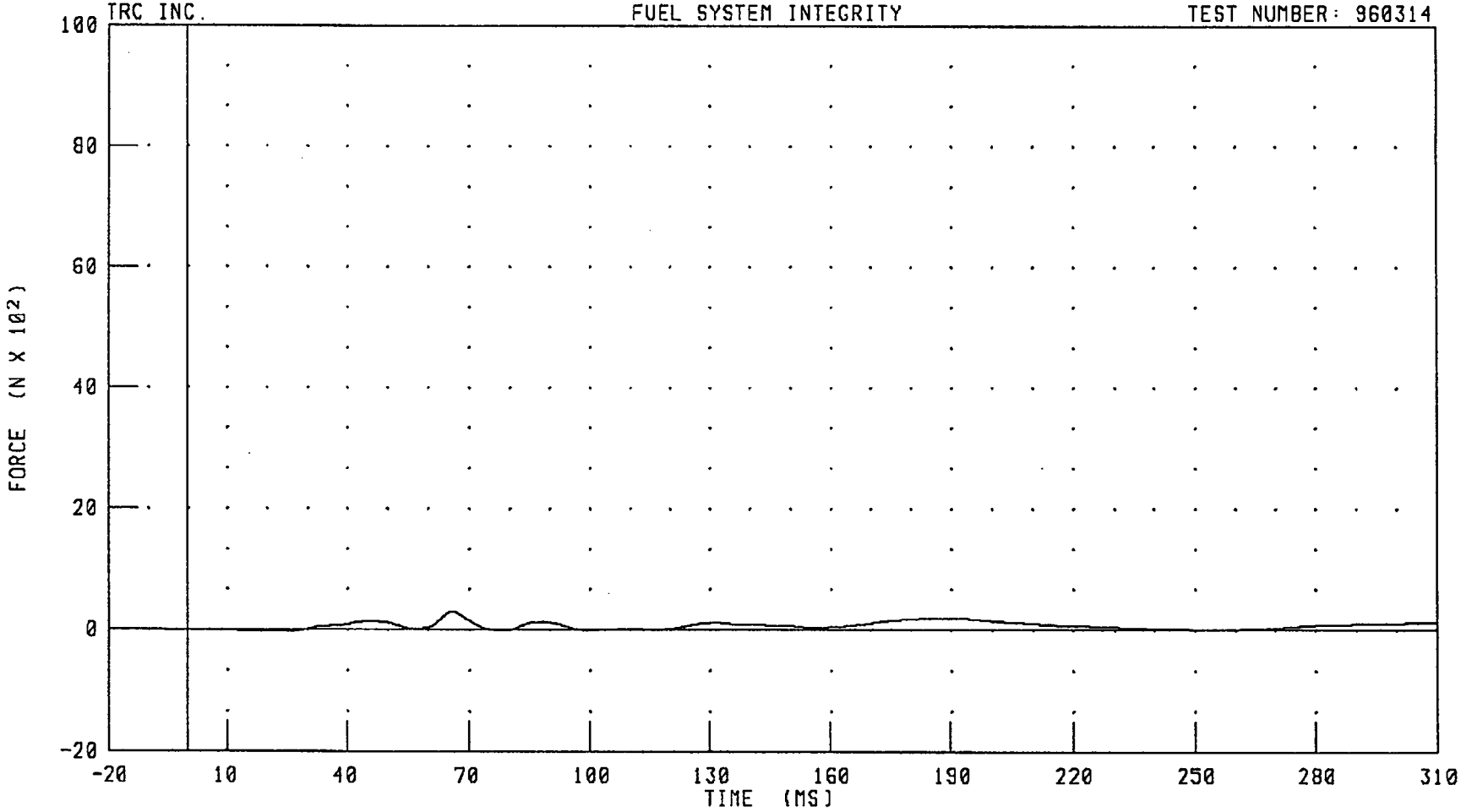
CHANNEL: SHBF1 FILTER: CH. CLASS 60 PEAK DATA: 278.63 N @ 298.88 MS; -19.80 N @ 163.04 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

DRIVER LAP BELT OUTBOARD FORCE

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



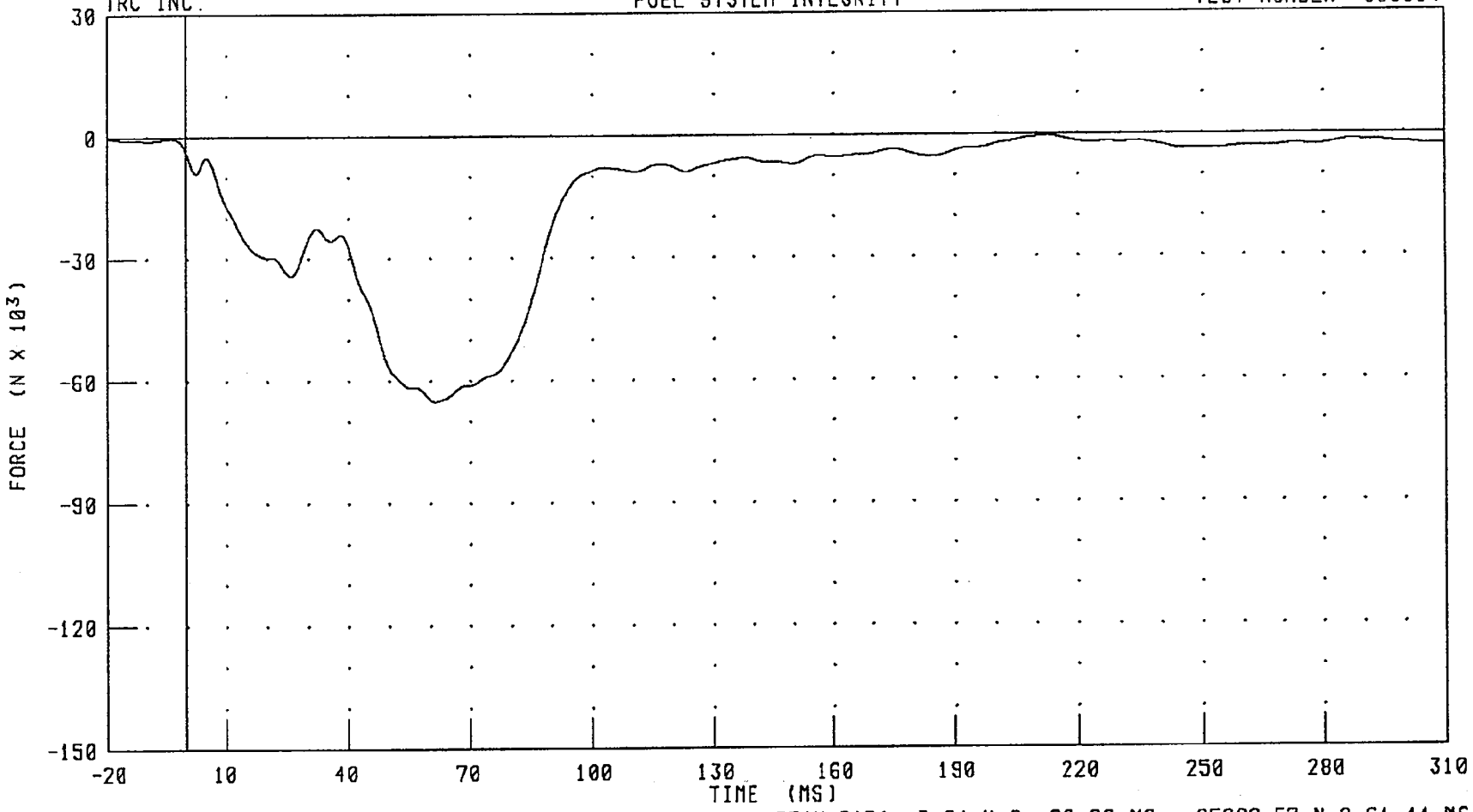
CHANNEL: LBOF1 FILTER: CH. CLASS 60 PEAK DATA: 297.95 N @ 65.92 MS; -34.81 N @ 23.76 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

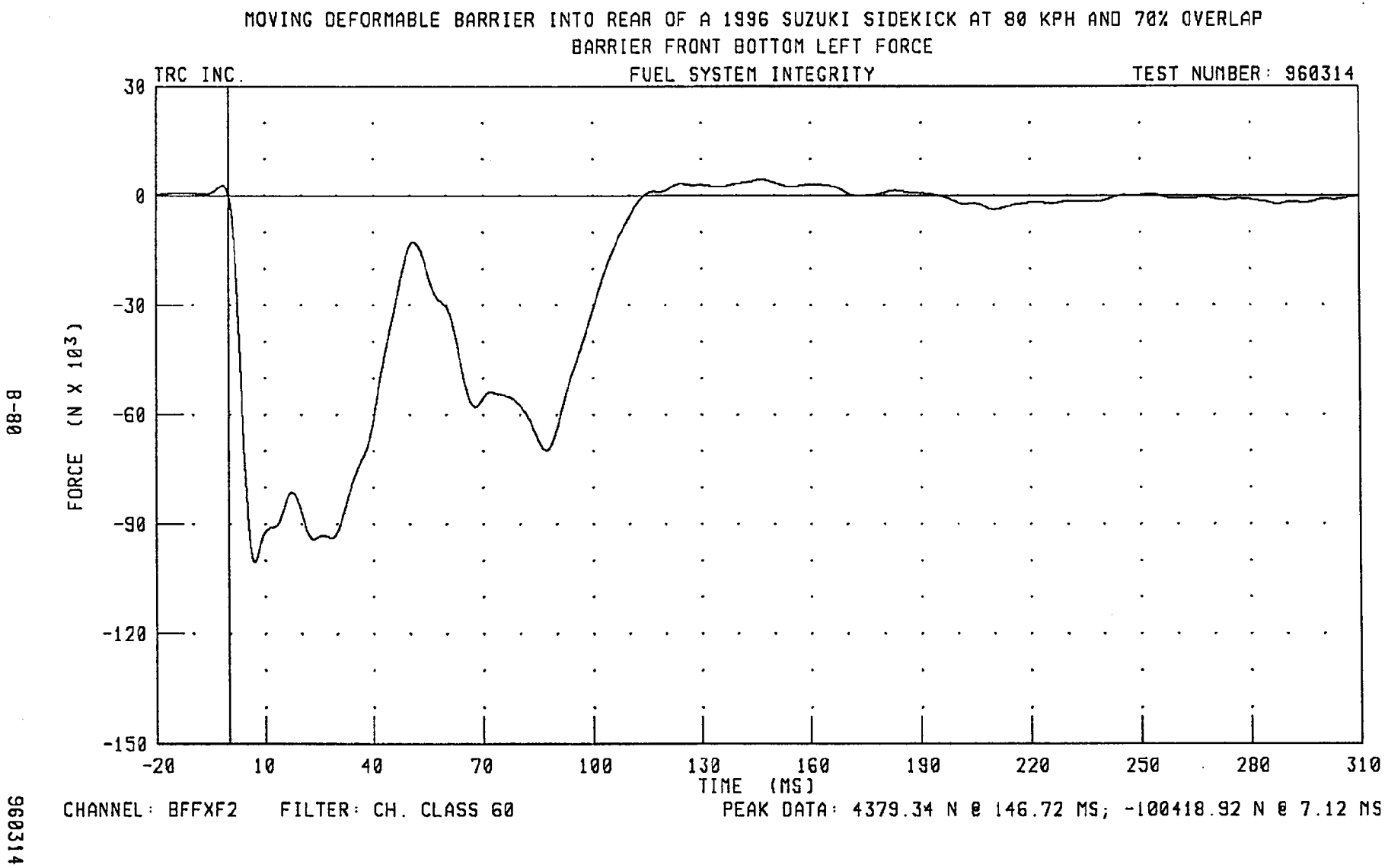
BARRIER FRONT TOP LEFT FORCE

TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



CHANNEL: BFFXF1 FILTER: CH. CLASS 60 PEAK DATA: 3.24 N @ -20.00 MS; -65208.57 N @ 61.44 MS

960314

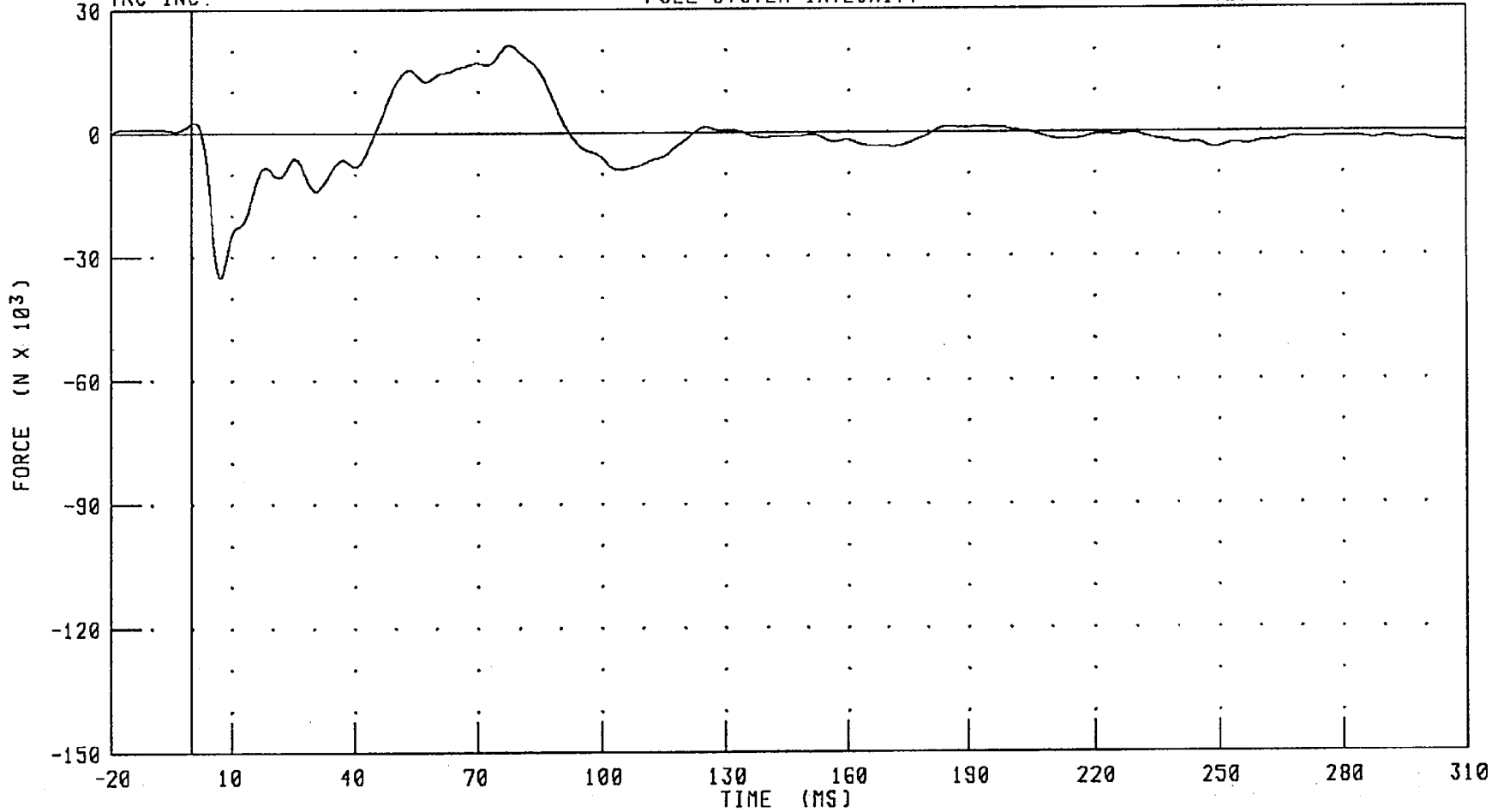

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
BARRIER FRONT BOTTOM LEFT FORCE
TRC INC.
FUEL SYSTEM INTEGRITY
TEST NUMBER: 960314
30
0
-30
-60
-90
-120
-150
FORCE (N X 10³)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: BFFXF2
FILTER: CH. CLASS 60
PEAK DATA: 4379.34 N @ 146.72 MS; -100418.92 N @ 7.12 MS

960314

MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

BARRIER FRONT BOTTOM RIGHT FORCE

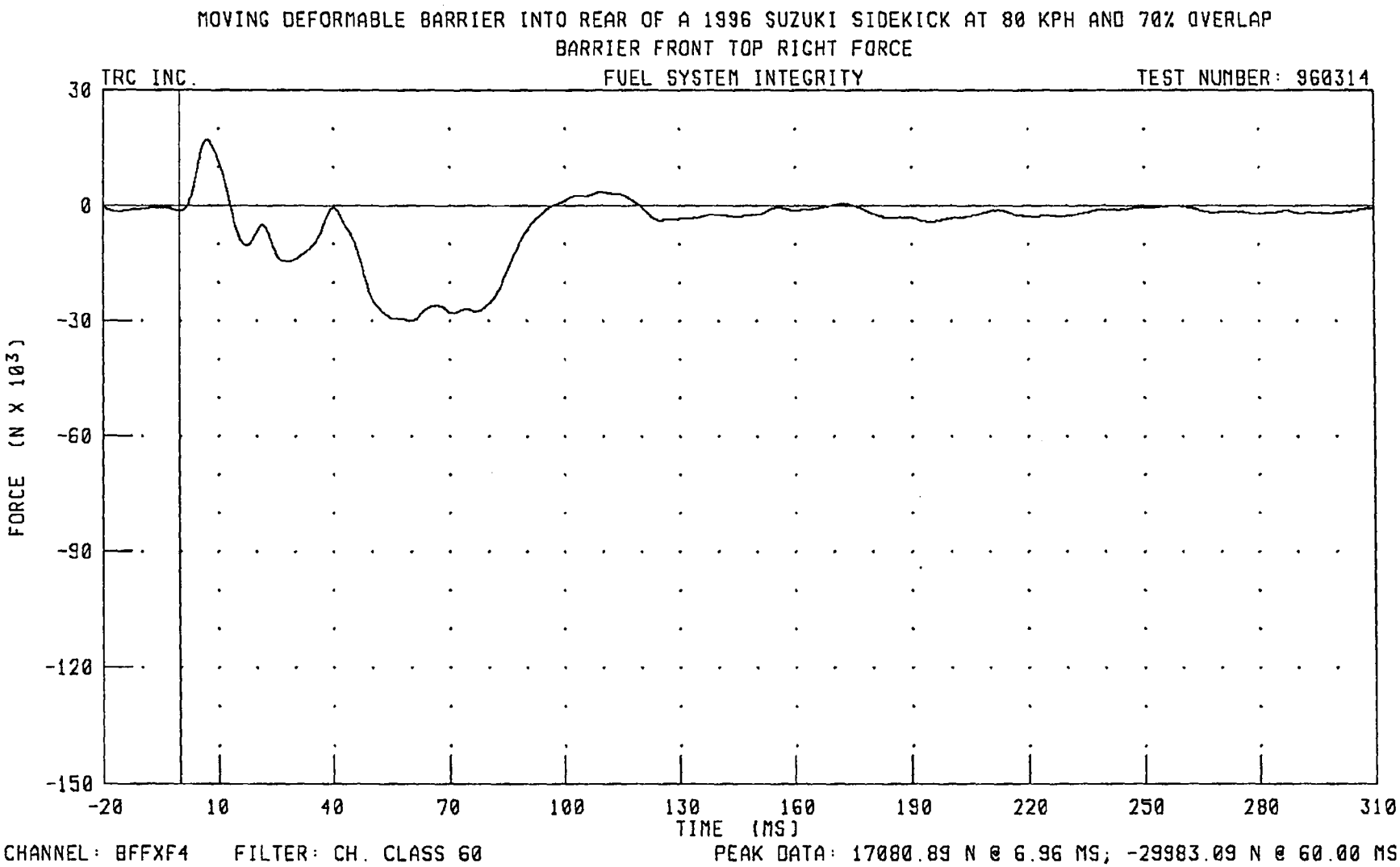
TRC INC. FUEL SYSTEM INTEGRITY TEST NUMBER: 960314



CHANNEL: BFFXF3 FILTER: CH. CLASS 60 PEAK DATA: 21205.73 N @ 77.52 MS; -35212.18 N @ 7.20 MS

18-8

960314


MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP
BARRIER FRONT TOP RIGHT FORCE
TRC INC.
FUEL SYSTEM INTEGRITY
TEST NUMBER: 960314
30
0
-30
-60
-90
-120
-150
FORCE (N X 10³)
-20
10
40
70
100
130
160
190
220
250
280
310
TIME (MS)
CHANNEL: BFFXF4
FILTER: CH. CLASS 60
PEAK DATA: 17080.89 N @ 6.96 MS; -29983.09 N @ 60.00 MS

960314

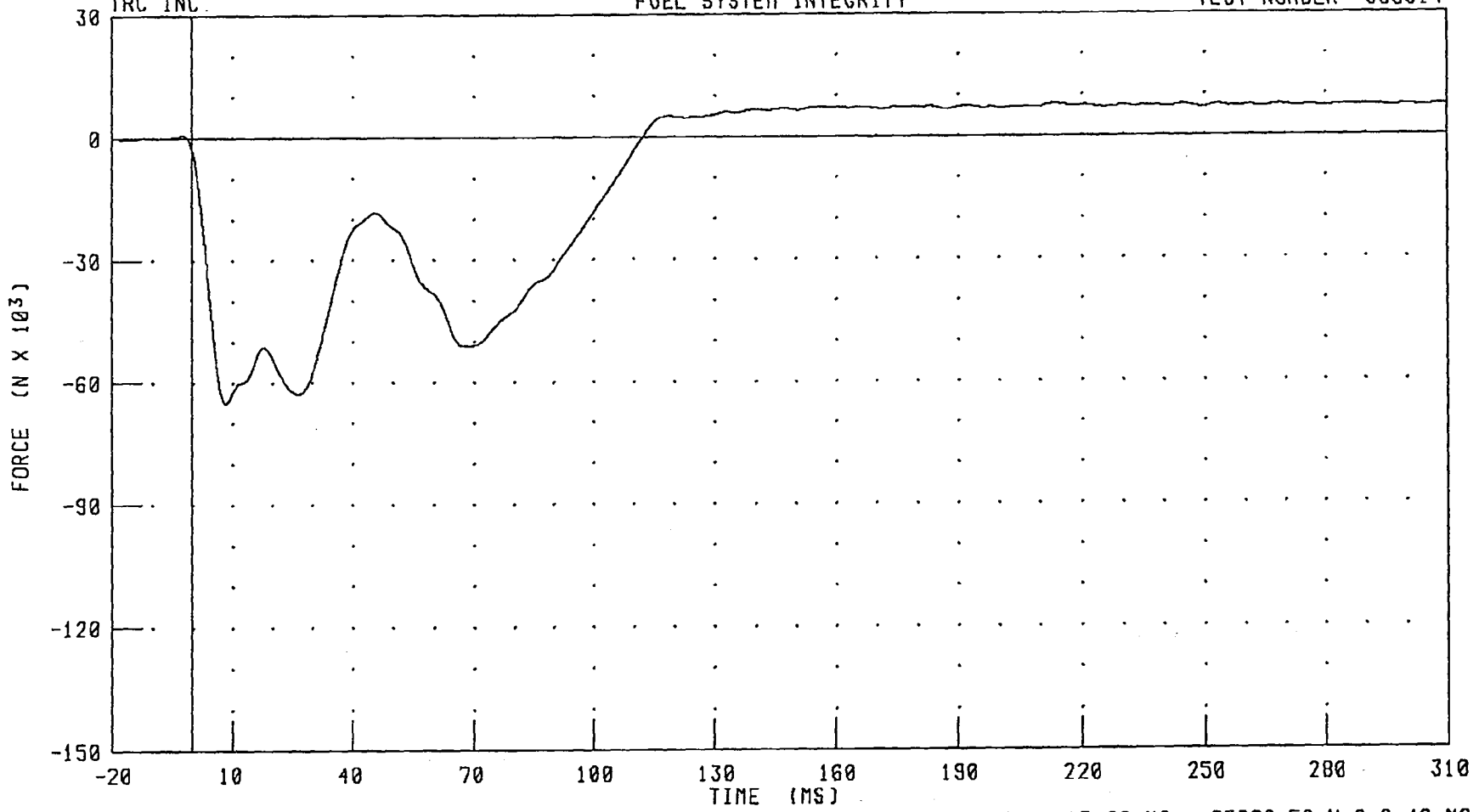
MOVING DEFORMABLE BARRIER INTO REAR OF A 1996 SUZUKI SIDEKICK AT 80 KPH AND 70% OVERLAP

BARRIER FRONT CENTER FORCE

FUEL SYSTEM INTEGRITY

TRC INC.

TEST NUMBER: 960314



CHANNEL: BFFXF5 FILTER: CH. CLASS 60

PEAK DATA: 7794.82 N @ 213.68 MS; -65202.52 N @ 8.40 MS

960314

Appendix C

Dummy Calibration Information

Pre-Test Calibration

Serial Number 35

TRANSPORTATION RESEARCH CENTER INC.
HYBRID III EXTERNAL DIMENSIONS
35 VECTOR 11-JUL-95

TRC INC. TEST NO: 35C1ED1 572E SN35 EXT.DIMENSION CAL01

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	988. MM
WAIST CIRCUMFERENCE (Z)	836 - 866 MM	848. MM
CHEST DEPTH (O)	213 - 229 MM	218. MM
H-POINT HEIGHT (C)	84 - 89 MM	86. MM
H-POINT FROM SEATBACK (D)	135 - 140 MM	137. MM
SKULL CAP TO BACKLINE (H)	41 - 46 MM	43. MM
TOTAL SITTING HEIGHT (A)	879 - 889 MM	886. MM
THIGH CLEARANCE (F)	140 - 155 MM	152. MM
BUTTOCK KNEE LENGTH (K)	579 - 605 MM	602. MM
BUTTOCK POPLITEAL LENGTH (N)	452 - 478 MM	475. MM
POPLITEAL HEIGHT (L)	429 - 455 MM	442. MM
KNEE PIVOT HEIGHT (M)	485 - 500 MM	500. MM
FOOT LENGTH (P)	252 - 267 MM	254. MM
FOOT BREADTH (W)	91 - 107 MM	94. MM
SHOULDER PIVOT FROM BACKLINE (E)	84 - 94 MM	91. MM
SHOULDER BREADTH (V)	422 - 437 MM	427. MM
SHOULDER PIVOT HEIGHT (B)	506 - 521 MM	511. MM
ELBOW REST HEIGHT (J)	191 - 211 MM	203. MM
SHOULDER-ELBOW LENGTH (I)	330 - 345 MM	343. MM
BACK OF ELBOW TO WRIST PIVOT (G)	290 - 305 MM	297. MM

DUMMY MEETS SPECIFICATIONS

TECHNICIAN Richard LeVan RUN NUMBER: 071295.1437

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

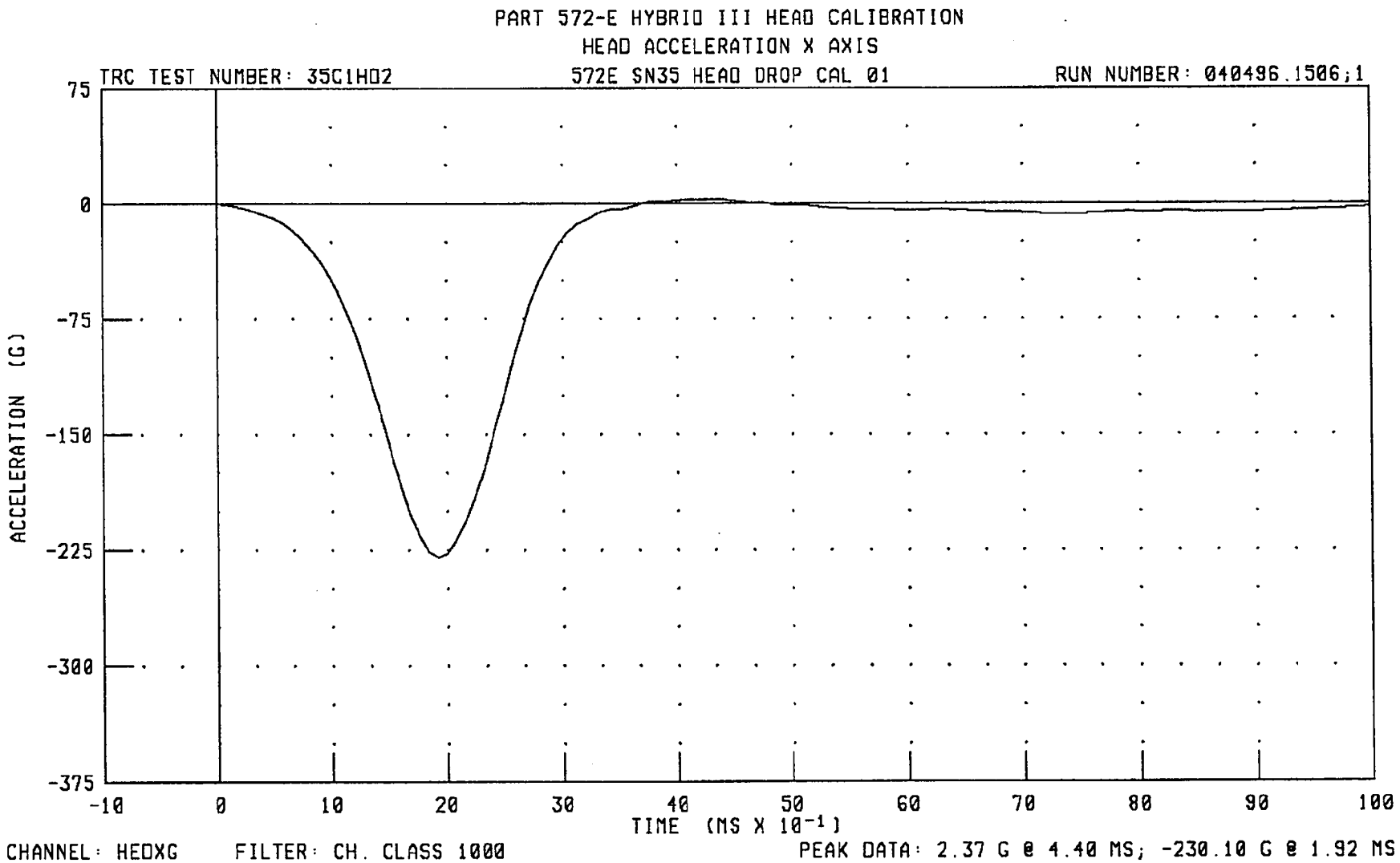
HYBRID III 09-NOV-95

TRC INC. TEST NO: 35C1HD2 572E SN35 HEAD DROP CAL 01

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	30.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	262.44 G
PEAK LATERAL ACCELERATION	15 G MAX	-9.03 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

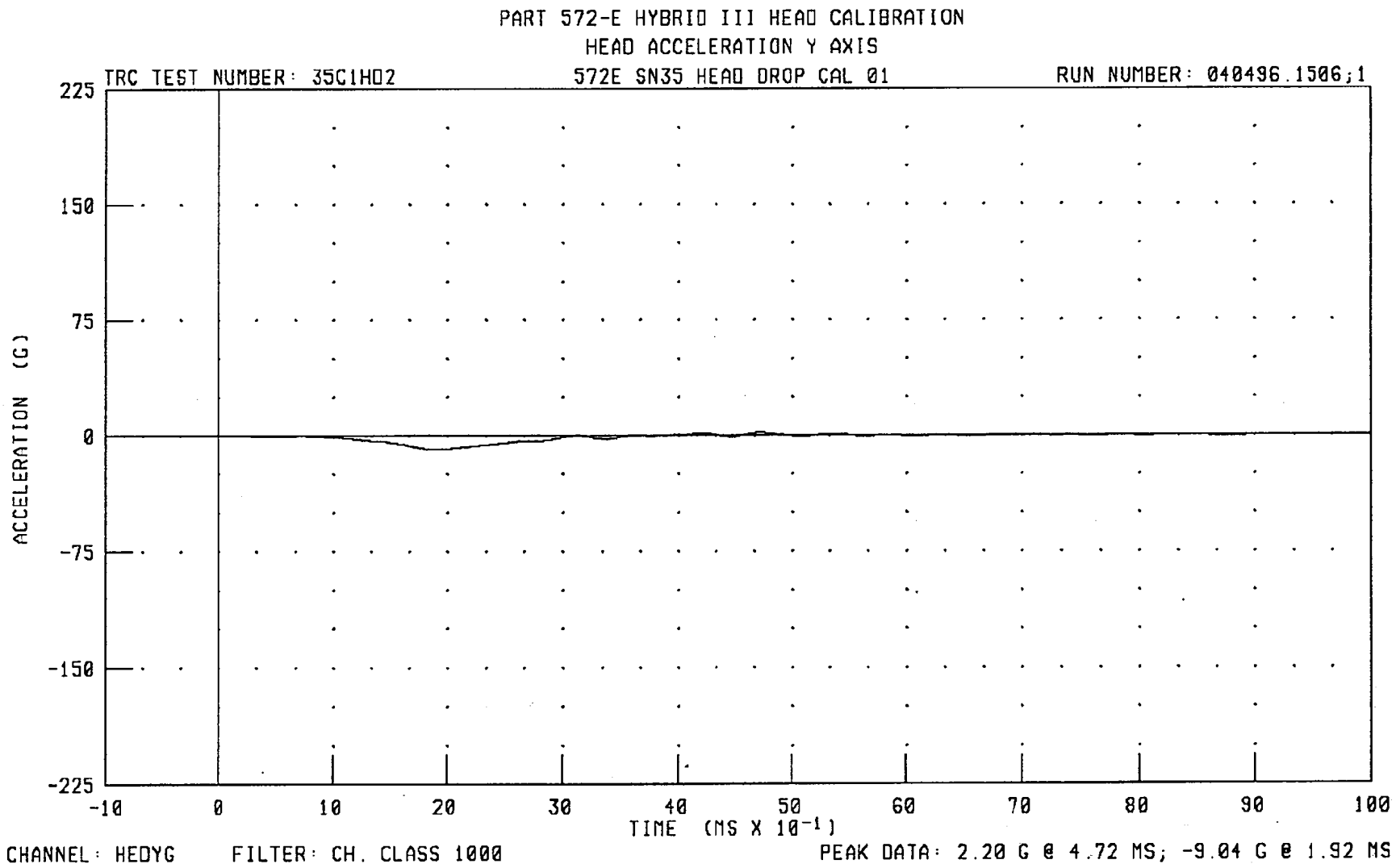
TEST MEETS SPECIFICATIONS

TECHNICIAN Richard LeVon RUN NUMBER: 110995.1358;1


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION X AXIS
TRC TEST NUMBER: 35C1H02
572E SN35 HEAD DROP CAL 01
RUN NUMBER: 040496.1506;1
75
0
-75
-150
-225
-300
-375
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10-1)
CHANNEL: HEDXG
FILTER: CH. CLASS 1000
PEAK DATA: 2.37 G @ 4.40 MS; -230.10 G @ 1.92 MS

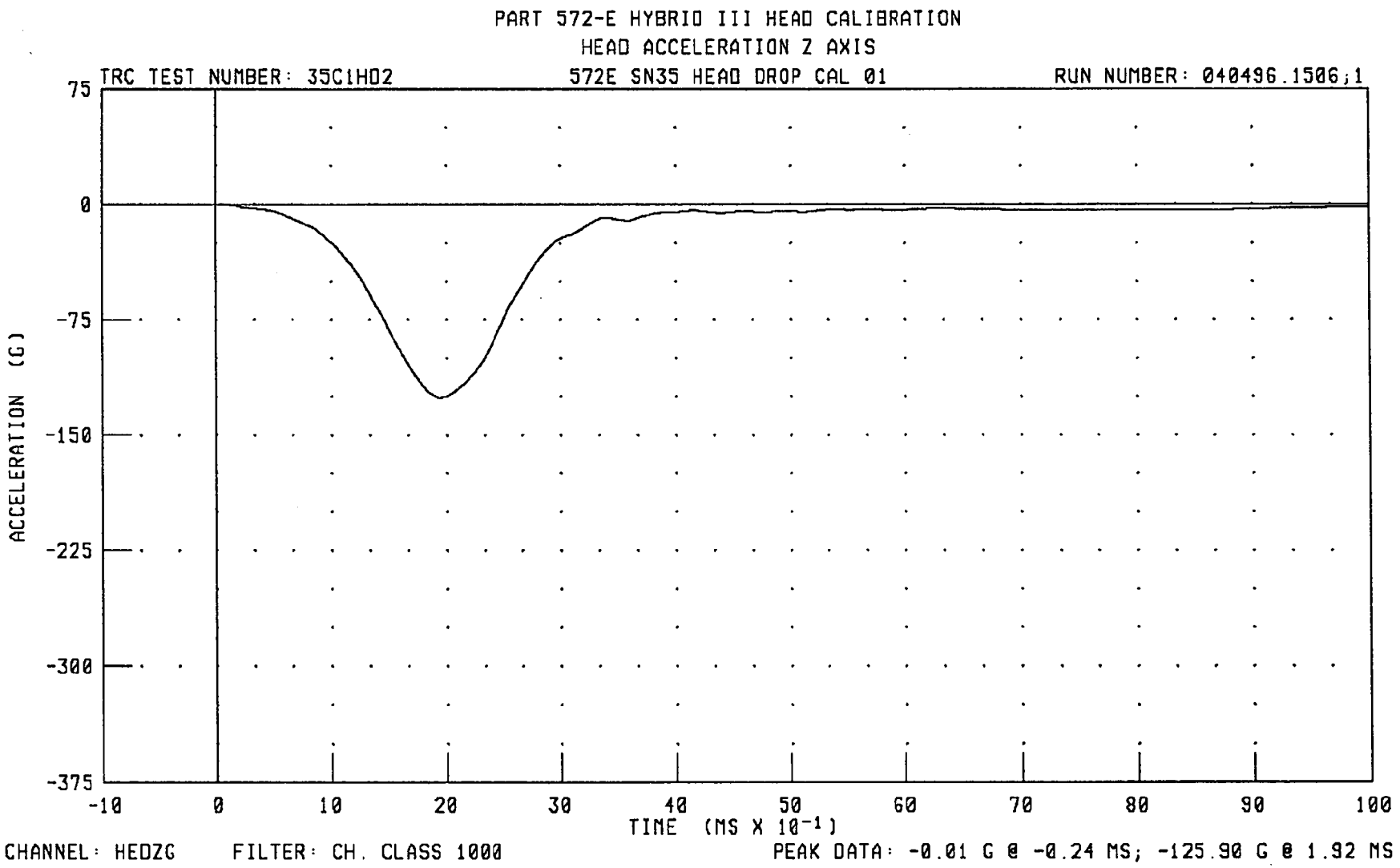
C-5

9601314


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS
TRC TEST NUMBER: 35C1H02
572E SN35 HEAD DROP CAL 01
RUN NUMBER: 040496.1506;1
225
150
75
0
-75
-150
-225
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10⁻¹)
CHANNEL: HEDYG
FILTER: CH. CLASS 1000
PEAK DATA: 2.20 G @ 4.72 MS; -9.04 G @ 1.92 MS

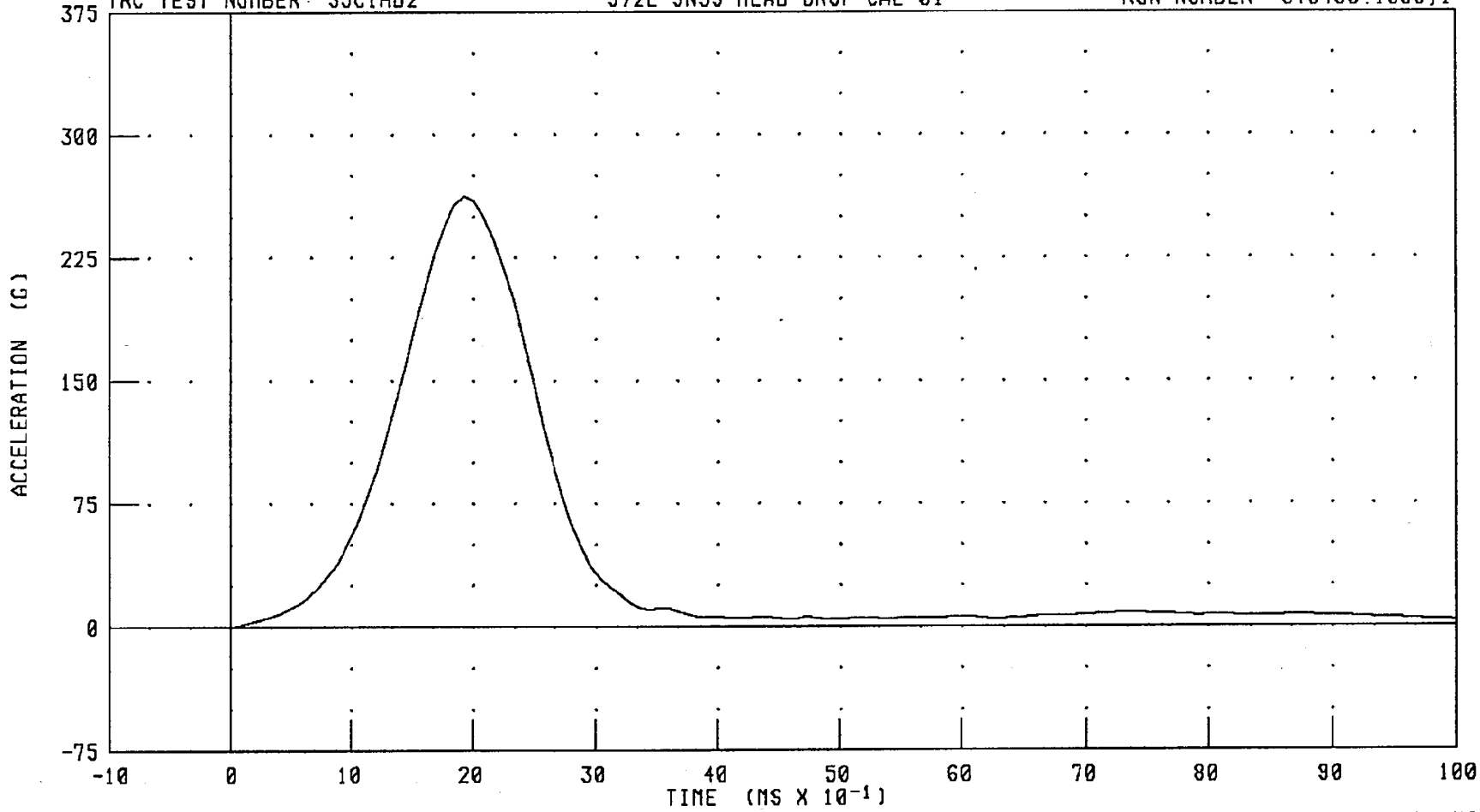
C-6

960314


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Z AXIS
TRC TEST NUMBER: 35C1H02
572E SN35 HEAD DROP CAL 01
RUN NUMBER: 040496.1506;1
75
0
-75
-150
-225
-300
-375
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10⁻¹)
CHANNEL: HEDZG
FILTER: CH. CLASS 1000
PEAK DATA: -0.01 G @ -0.24 MS; -125.90 G @ 1.92 MS

PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION

TRC TEST NUMBER: 35C1H02 572E SN35 HEAD DROP CAL 01 RUN NUMBER: 040496.1506;1



CHANNEL: HEDRG FILTER: CH. CLASS 1000 PEAK DATA: 262.45 G @ 1.92 MS; 0.02 G @ -0.32 MS

960314

TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

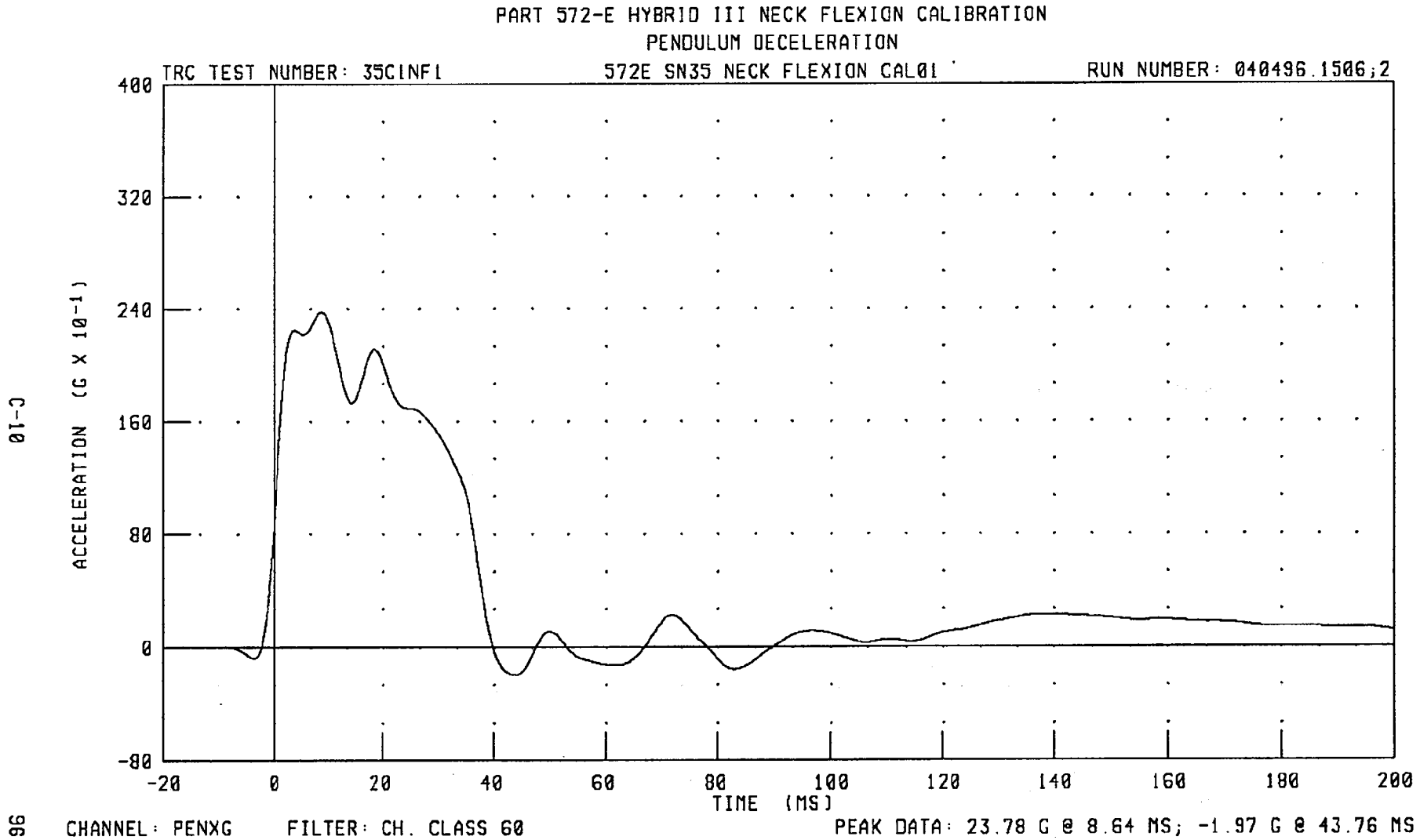
HYBRID III 11-JUL-95

TRC INC. TEST NO: 35C1NF1 572E SN35 NECK FLEXION CAL01

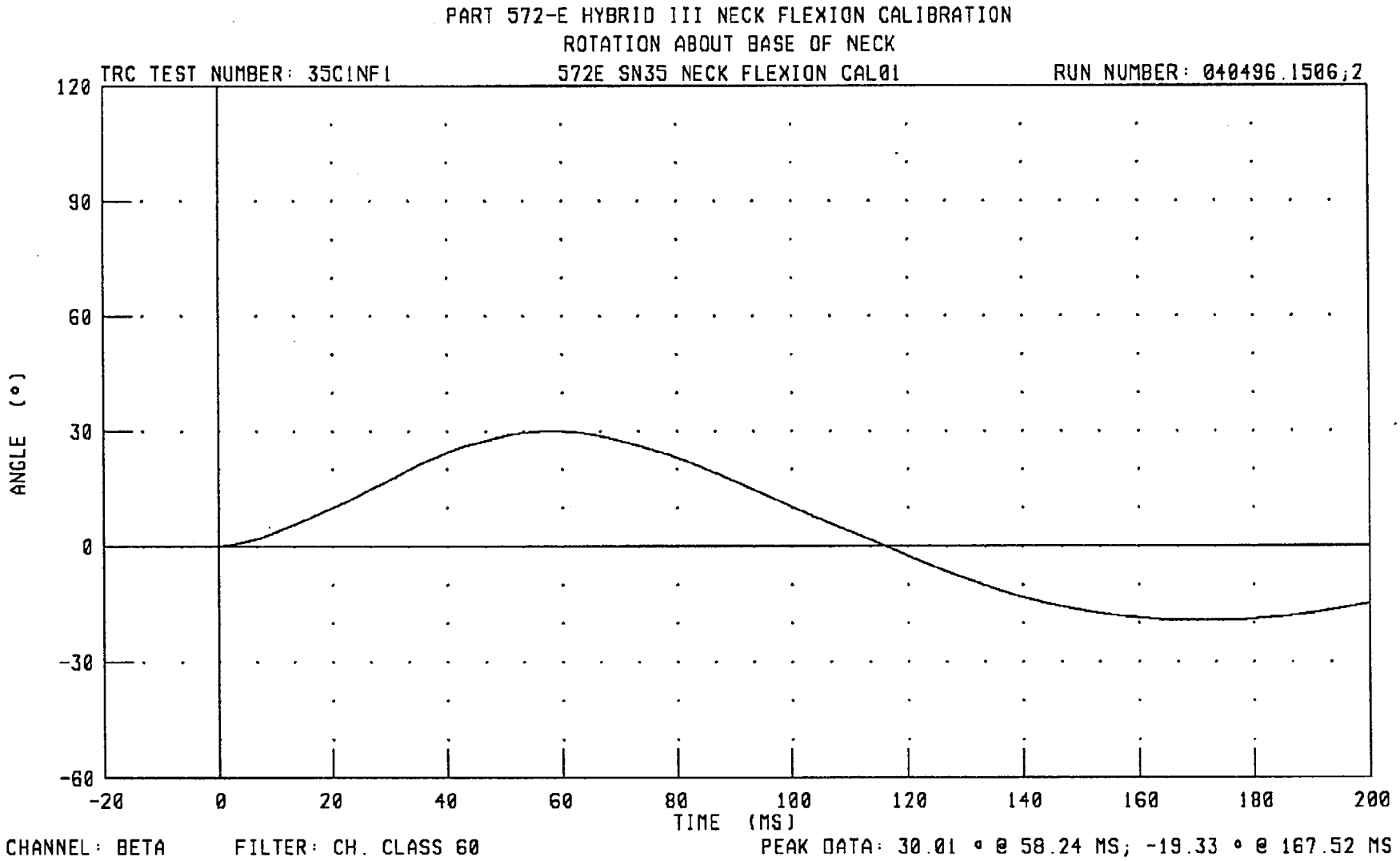
TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY		10 - 70 %	63.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	6.99 M/S
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	22.98 G
	20 MS	17.60 - 22.60 G	20.12 G
	30 MS	12.50 - 18.50 G	15.08 G
MAX PENDULUM G		29 G MAX	23.77 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	15.03 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	37.36 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	70.37 DEG.
	TIME	57 - 64 MS	58.00 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88.2 - 108.5 NM	96.89 NM
	TIME	47 - 58 MS	50.00 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	114.48 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	99.60 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN Richard LeVon RUN NUMBER: 071195.0843;2

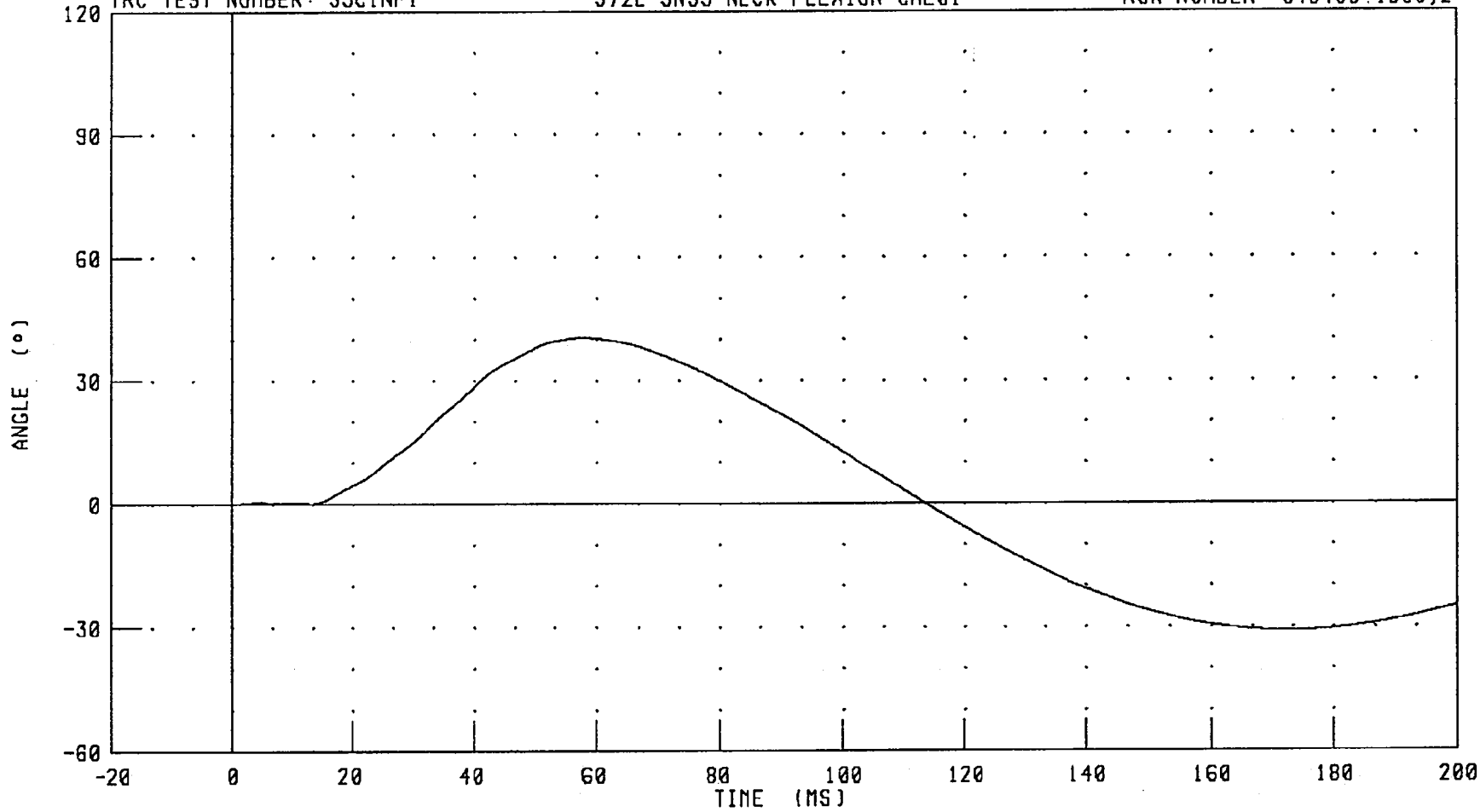

PART 572-E HYBRID III NECK FLEXION CALIBRATION
PENDULUM DECELERATION
TRC TEST NUMBER: 35CINF1
572E SN35 NECK FLEXION CAL01
RUN NUMBER: 040496.1506;2
ACCELERATION (G X 10-1)
400
320
240
160
80
0
-80
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: PENXG
FILTER: CH. CLASS 60
PEAK DATA: 23.78 G @ 8.64 MS; -1.97 G @ 43.76 MS

960314


PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT BASE OF NECK
TRC TEST NUMBER: 35CINF1
572E SN35 NECK FLEXION CAL01
RUN NUMBER: 040496.1506;2
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: BETA
FILTER: CH. CLASS 60
PEAK DATA: 30.01 ° @ 58.24 MS; -19.33 ° @ 167.52 MS

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

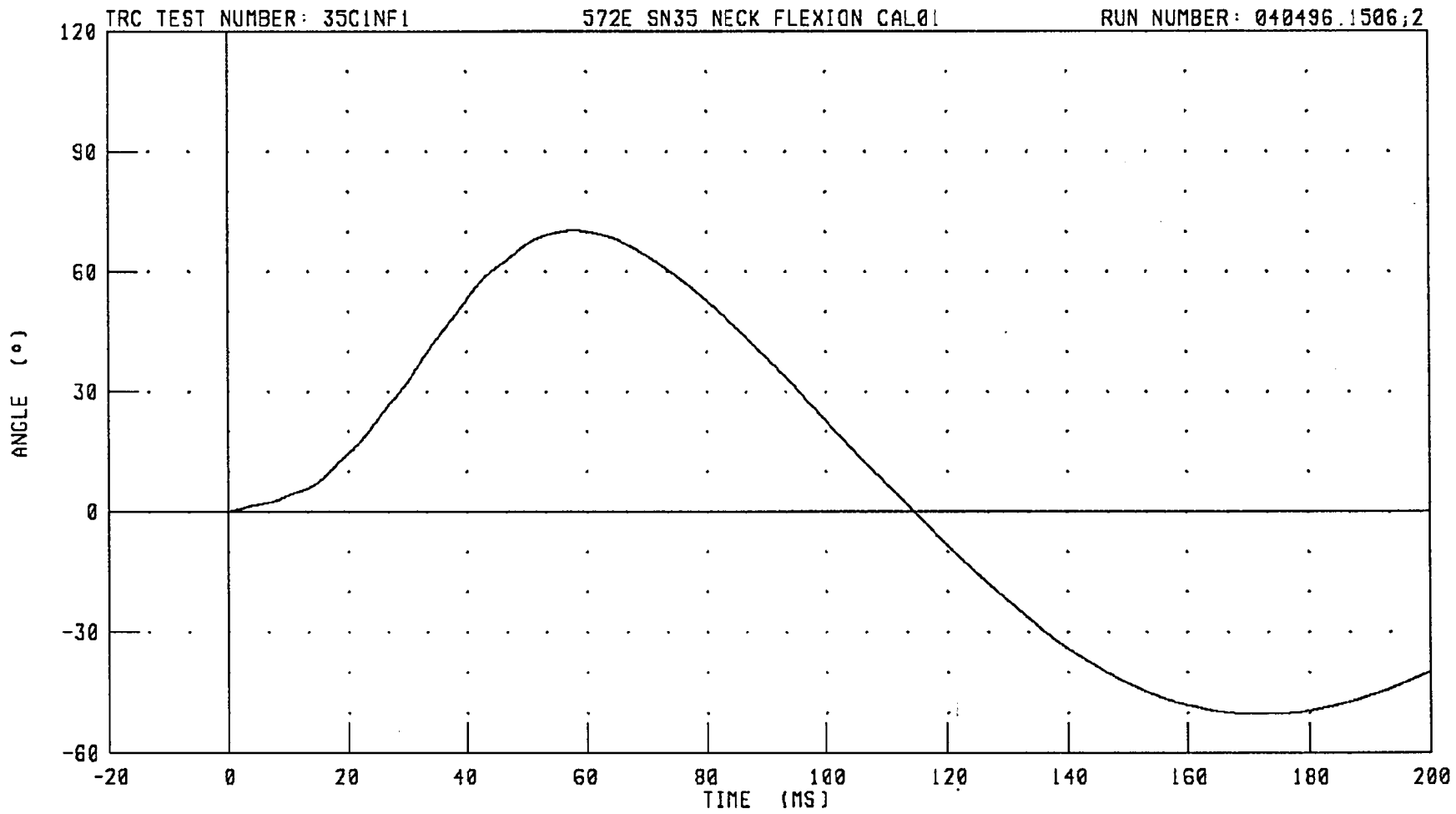
TRC TEST NUMBER: 35C1NF1 572E SN35 NECK FLEXION CAL01 RUN NUMBER: 040496.1506;2



CHANNEL: THETA FILTER: CH. CLASS 60 PEAK DATA: 40.37 ° @ 57.76 MS; -30.85 ° @ 169.84 MS

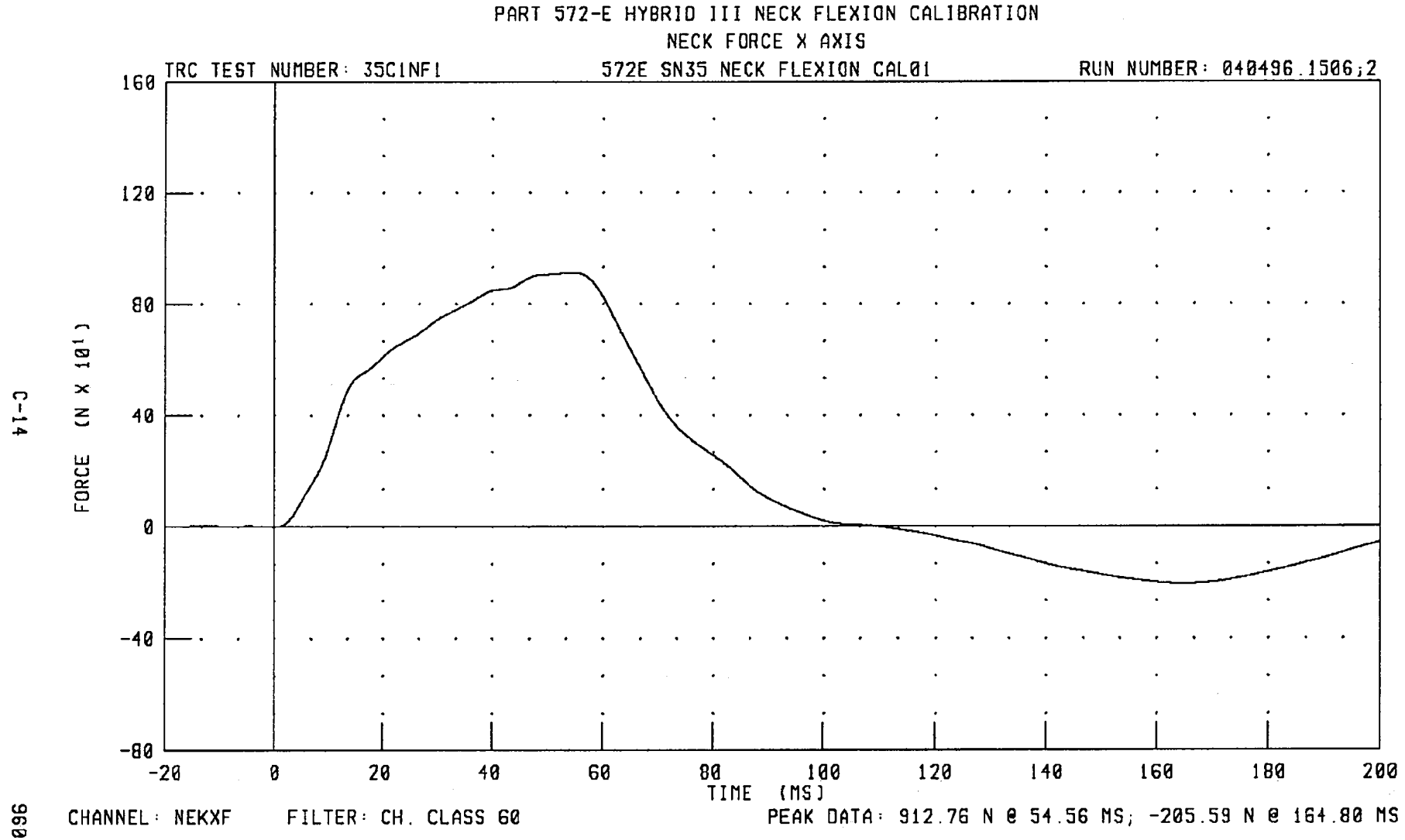
960314

PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL ROTATION

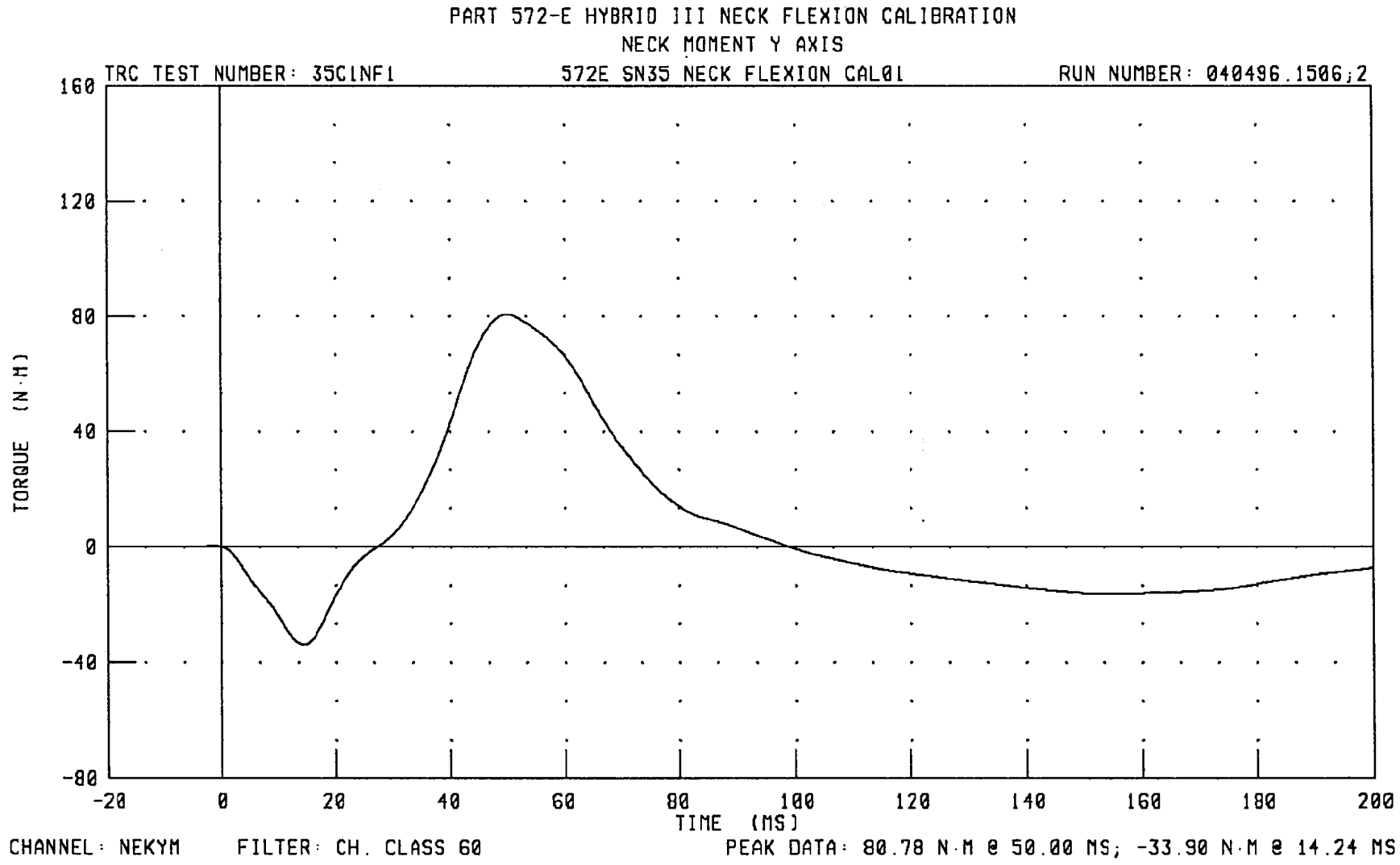


CHANNEL: TOTAN FILTER: CH. CLASS 60 PEAK DATA: 70.38 ° @ 58.00 MS; -50.17 ° @ 169.52 MS

960314

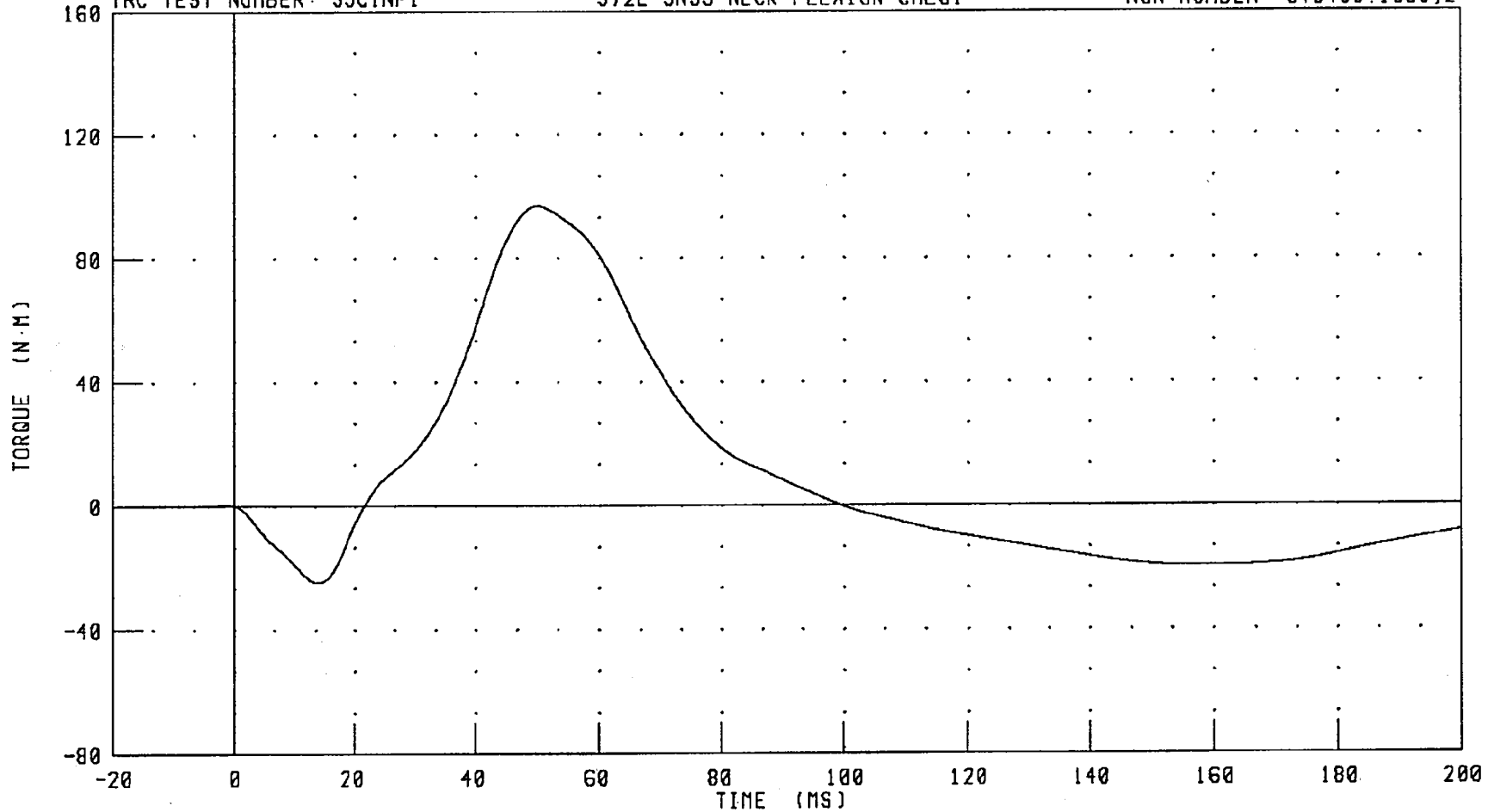

PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK FORCE X AXIS
TRC TEST NUMBER: 35C1NF1
572E SN35 NECK FLEXION CAL01
RUN NUMBER: 040496.1506;2
160
120
80
40
0
-40
-80
FORCE (N X 10¹)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKXF
FILTER: CH. CLASS 60
PEAK DATA: 912.76 N @ 54.56 MS; -205.59 N @ 164.80 MS

960314


PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK MOMENT Y AXIS
TRC TEST NUMBER: 35C1NF1
572E SN35 NECK FLEXION CAL01
RUN NUMBER: 040496.1506;2
160
120
80
40
0
-40
-80
TORQUE (N·M)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKYM
FILTER: CH. CLASS 60
PEAK DATA: 80.78 N·M @ 50.00 MS; -33.90 N·M @ 14.24 MS

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

TRC TEST NUMBER: 35C1NF1 572E SN35 NECK FLEXION CAL01 RUN NUMBER: 040496.1506;2



CHANNEL: NEKOM FILTER: CH. CLASS 60 PEAK DATA: 96.89 N-M @ 50.00 MS; -24.77 N-M @ 13.84 MS

960314

TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

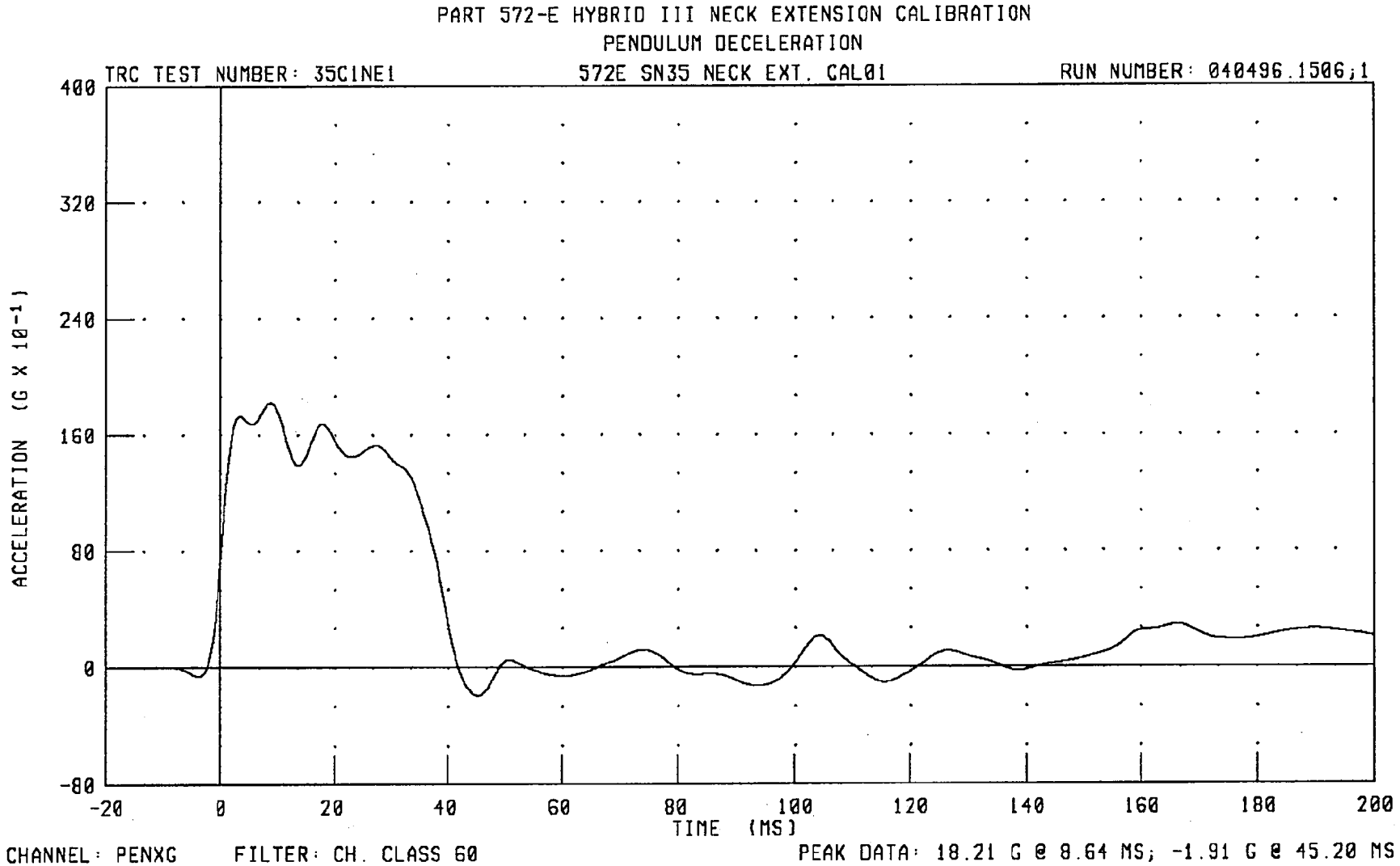
HYBRID III 11-JUL-95

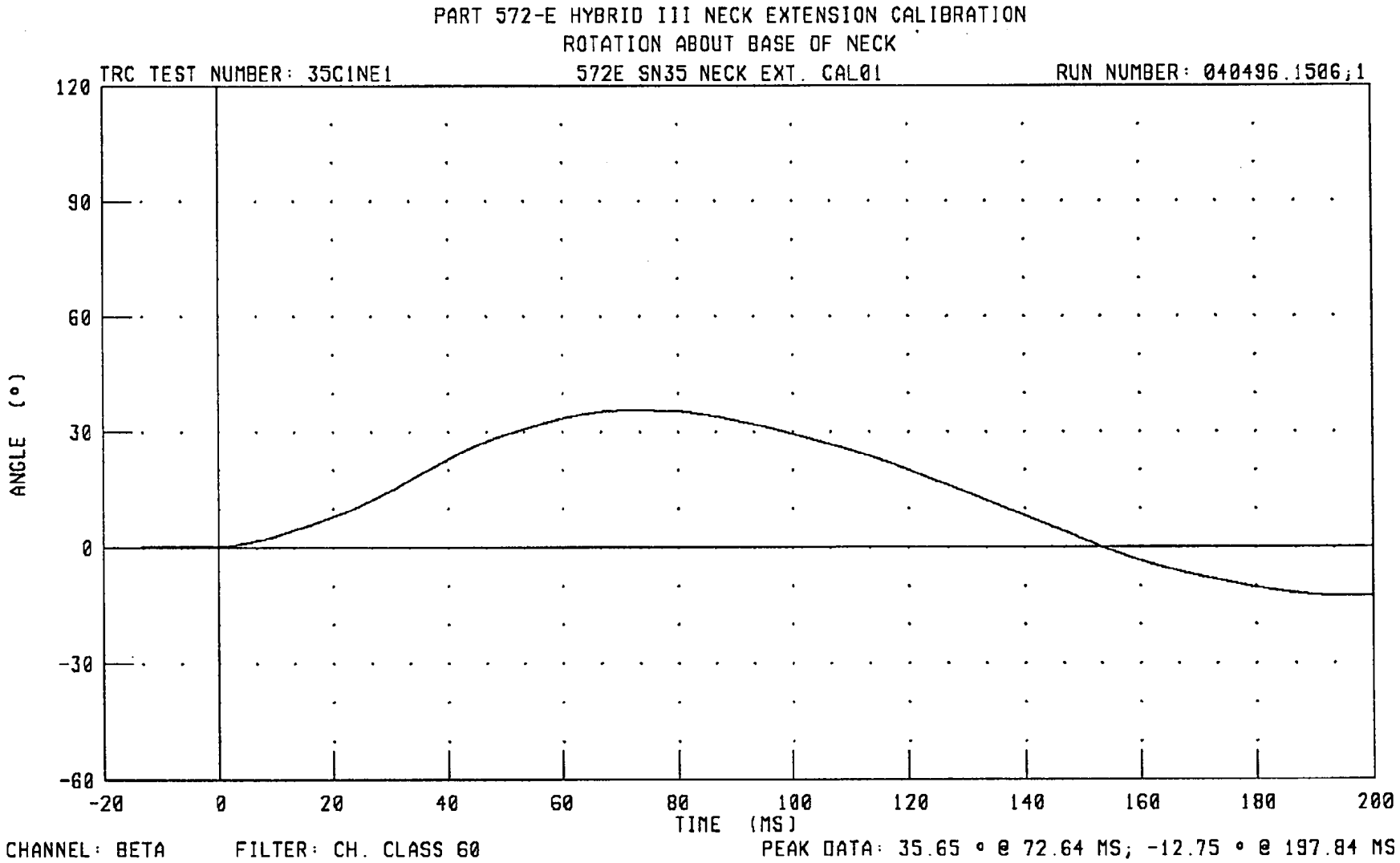
TRC INC. TEST NO: 35C1NE1 572E SN35 NECK EXT. CAL01

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6 - 22.2 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY		10 - 70 %	63.0 %
IMPACT VELOCITY		5.95 - 6.19 M/S	6.00 M/S
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	17.48 G
	20 MS	14.00 - 19.00 G	15.59 G
	30 MS	11.00 - 16.00 G	14.31 G
MAX PENDULUM G		22 G MAX	18.20 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	14.27 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	39.04 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	96.12 DEG.
	TIME	72 - 82 MS	74.08 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-80.0/-52.9 NM	-65.59 NM
	TIME	65 - 79 MS	69.76 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	156.00 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	134.80 MS

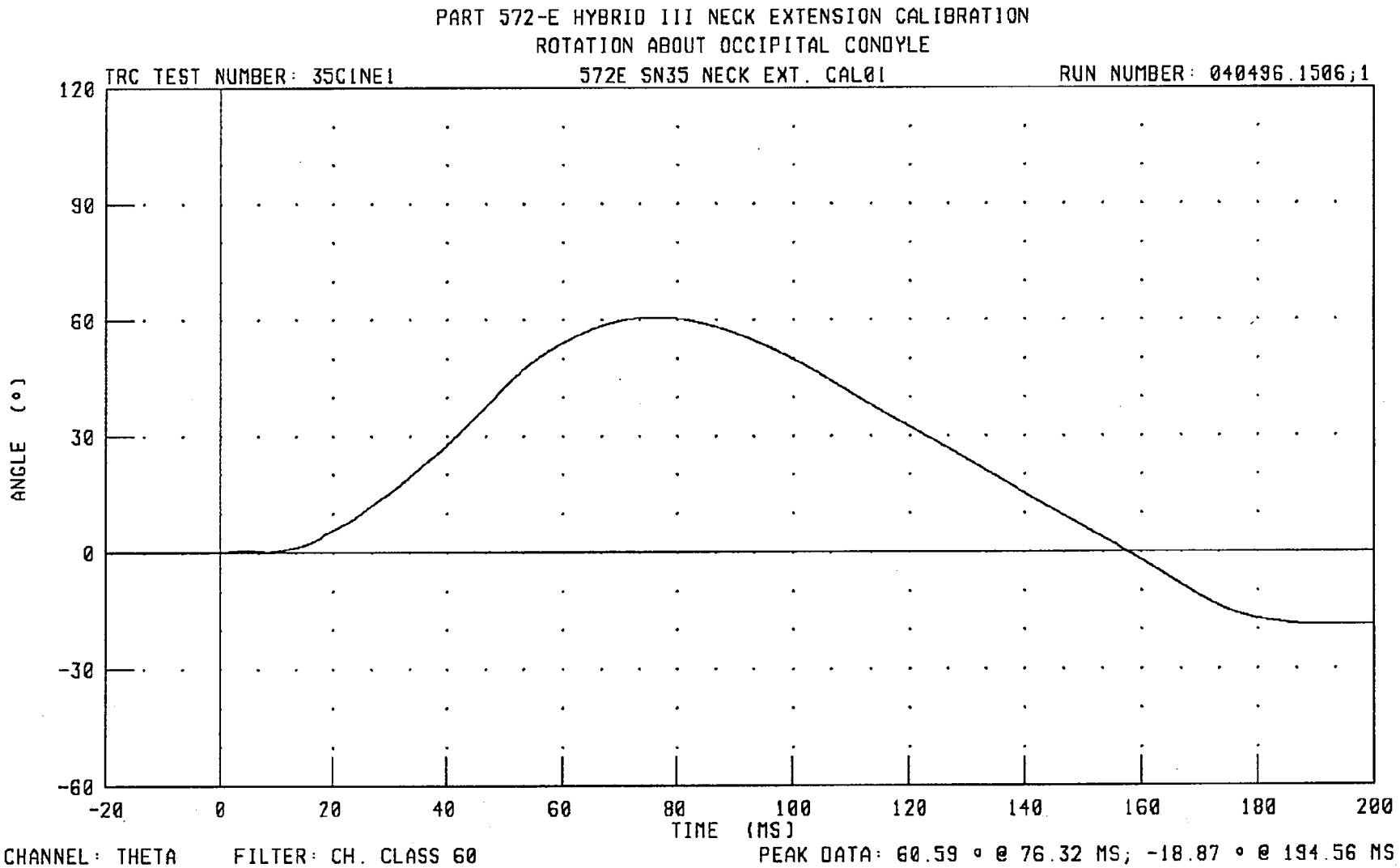
TEST MEETS SPECIFICATIONS

TECHNICIAN Richard LeVan RUN NUMBER: 071195.0855;1


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
PENDULUM DECELERATION
TRC TEST NUMBER: 35C1NE1
572E SN35 NECK EXT. CAL01
RUN NUMBER: 040496.1506;1
ACCELERATION (G X 10-1)
400
320
240
160
80
0
-80
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: PENXG
FILTER: CH. CLASS 60
PEAK DATA: 18.21 G @ 8.64 MS; -1.91 G @ 45.20 MS


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT BASE OF NECK
TRC TEST NUMBER: 35C1NE1
572E SN35 NECK EXT. CAL01
RUN NUMBER: 040496.1506;1
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: BETA
FILTER: CH. CLASS 60
PEAK DATA: 35.65 ° @ 72.64 MS; -12.75 ° @ 197.84 MS

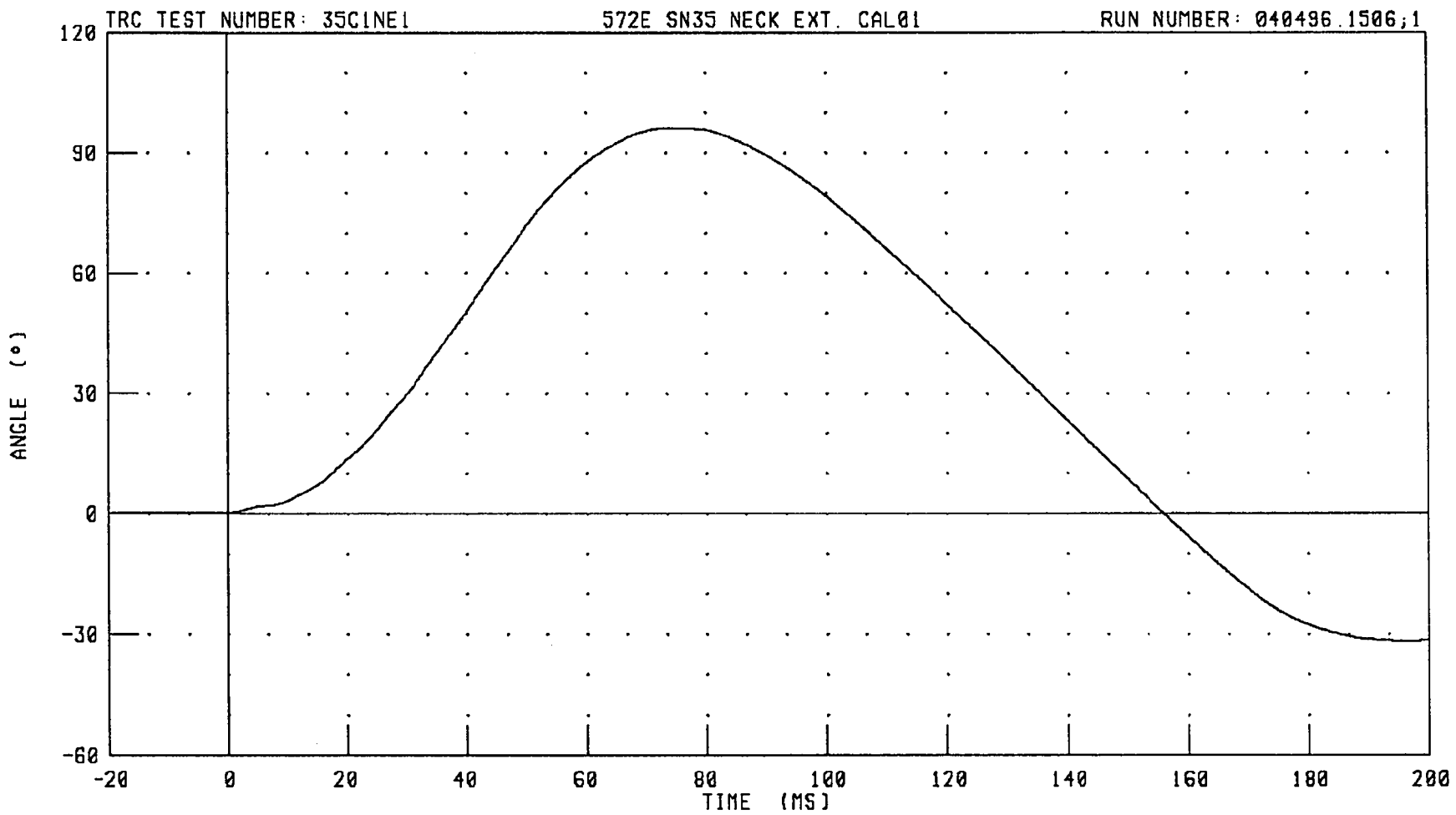
960314


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE
TRC TEST NUMBER: 35CINE1
572E SN35 NECK EXT. CAL01
RUN NUMBER: 040496.1506;1
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: THETA
FILTER: CH. CLASS 60
PEAK DATA: 60.59 ° @ 76.32 MS; -18.87 ° @ 194.56 MS

960314

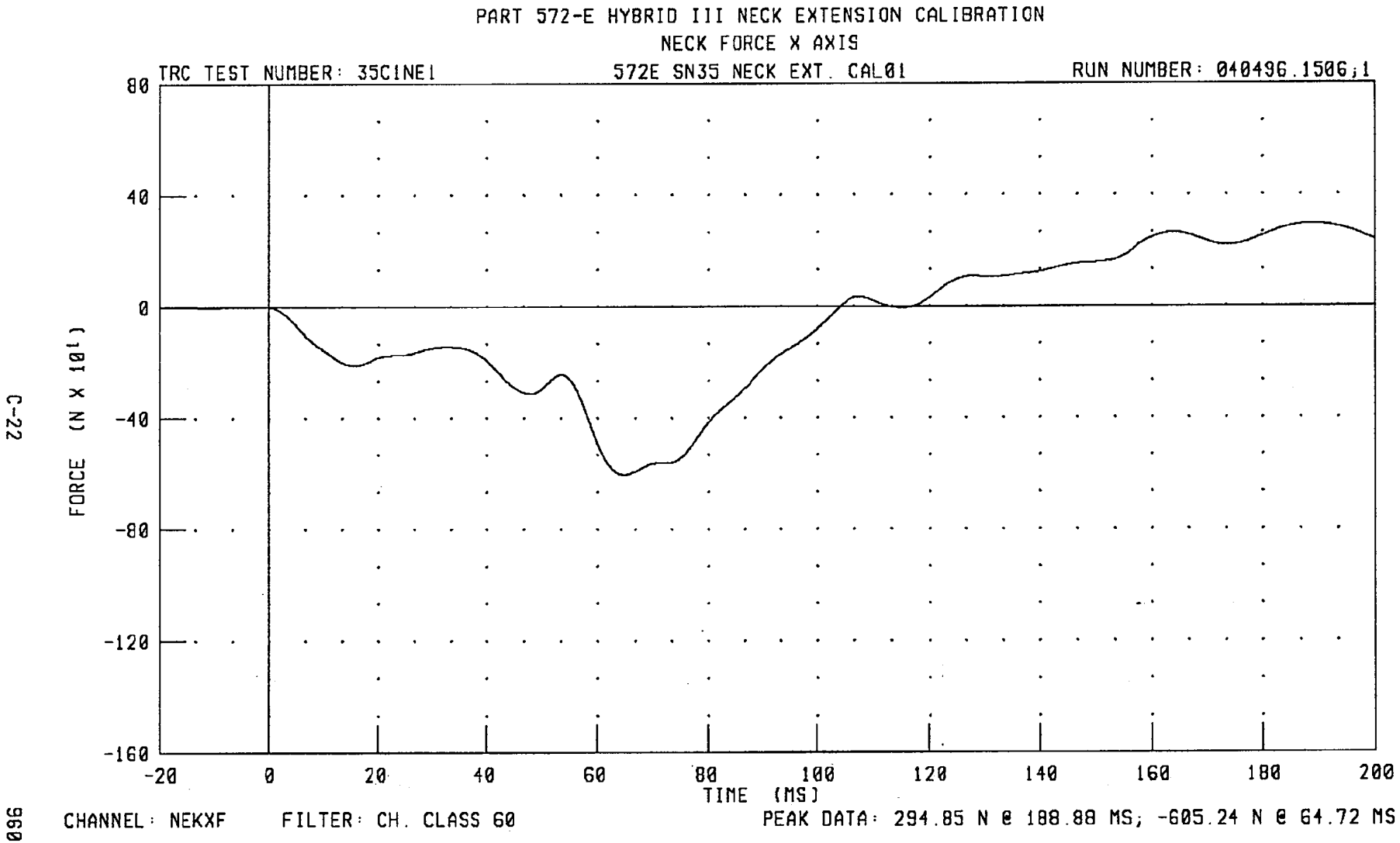
PART 572-E HYBRID III NECK EXTENSION CALIBRATION

TOTAL ROTATION

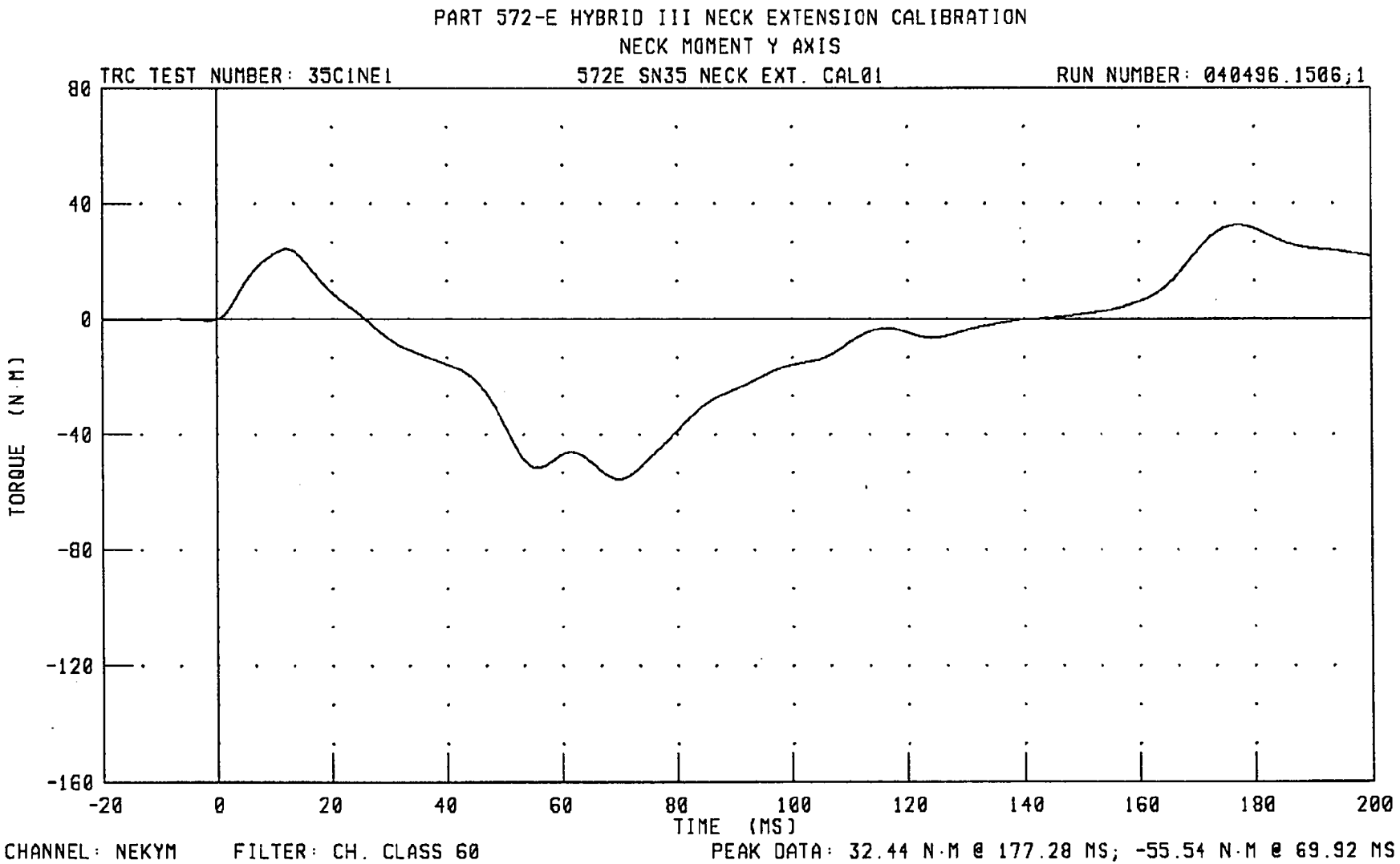


CHANNEL: TOTAN FILTER: CH. CLASS 60 PEAK DATA: 96.13 ° @ 74.08 MS; -31.61 ° @ 195.20 MS

960314

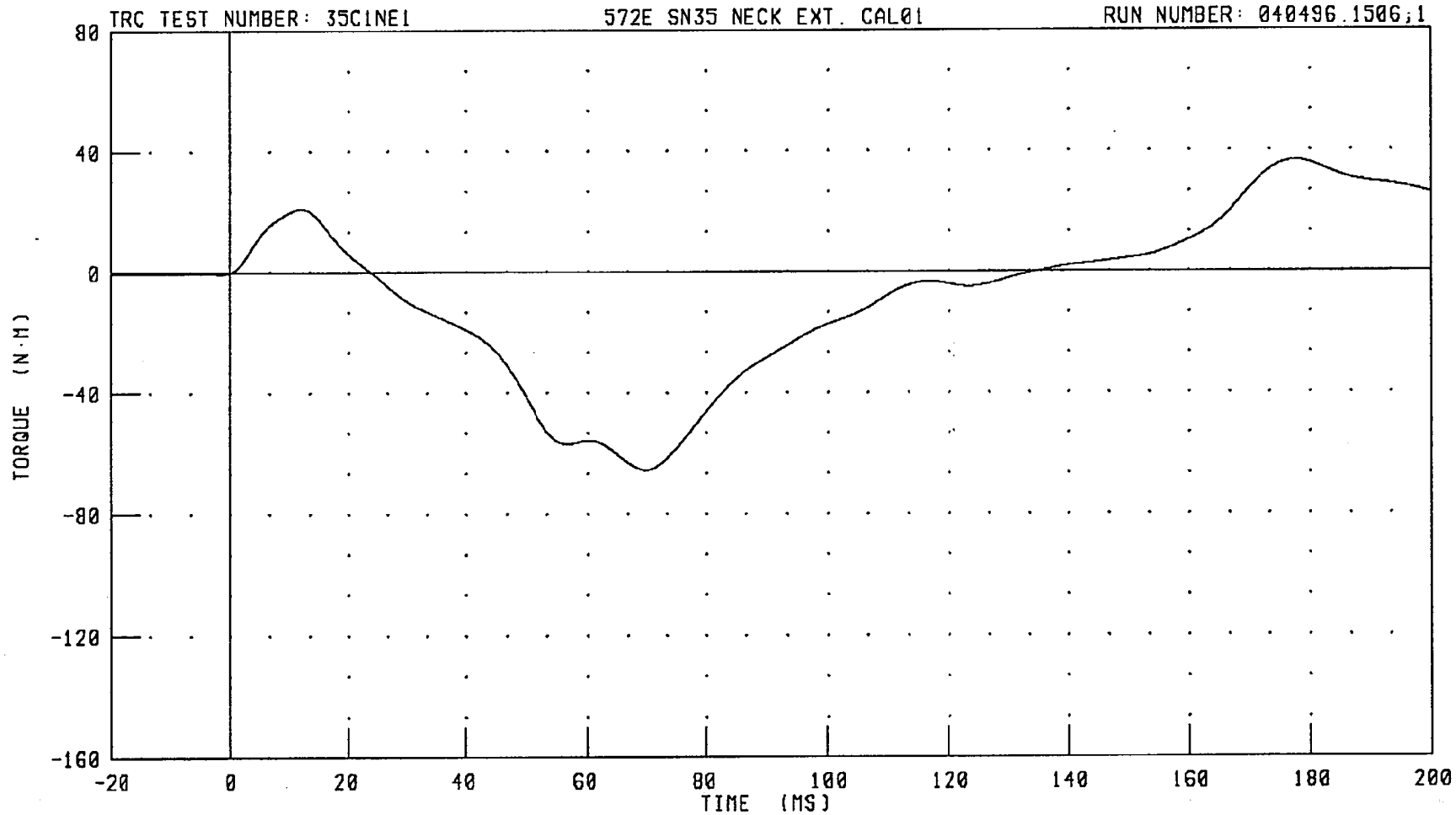

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK FORCE X AXIS
TRC TEST NUMBER: 35CINE1
572E SN35 NECK EXT. CAL01
RUN NUMBER: 040496.1506;1
80
40
0
-40
-80
-120
-160
FORCE (N X 10¹)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKXF
FILTER: CH. CLASS 60
PEAK DATA: 294.85 N @ 188.88 MS; -605.24 N @ 64.72 MS

960314


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK MOMENT Y AXIS
TRC TEST NUMBER: 35C1NE1
572E SN35 NECK EXT. CAL01
RUN NUMBER: 040496.1506;1
80
40
0
-40
-80
-120
-160
TORQUE (N-M)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKYM
FILTER: CH. CLASS 60
PEAK DATA: 32.44 N-M @ 177.28 MS; -55.54 N-M @ 69.92 MS

960314

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



960314

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

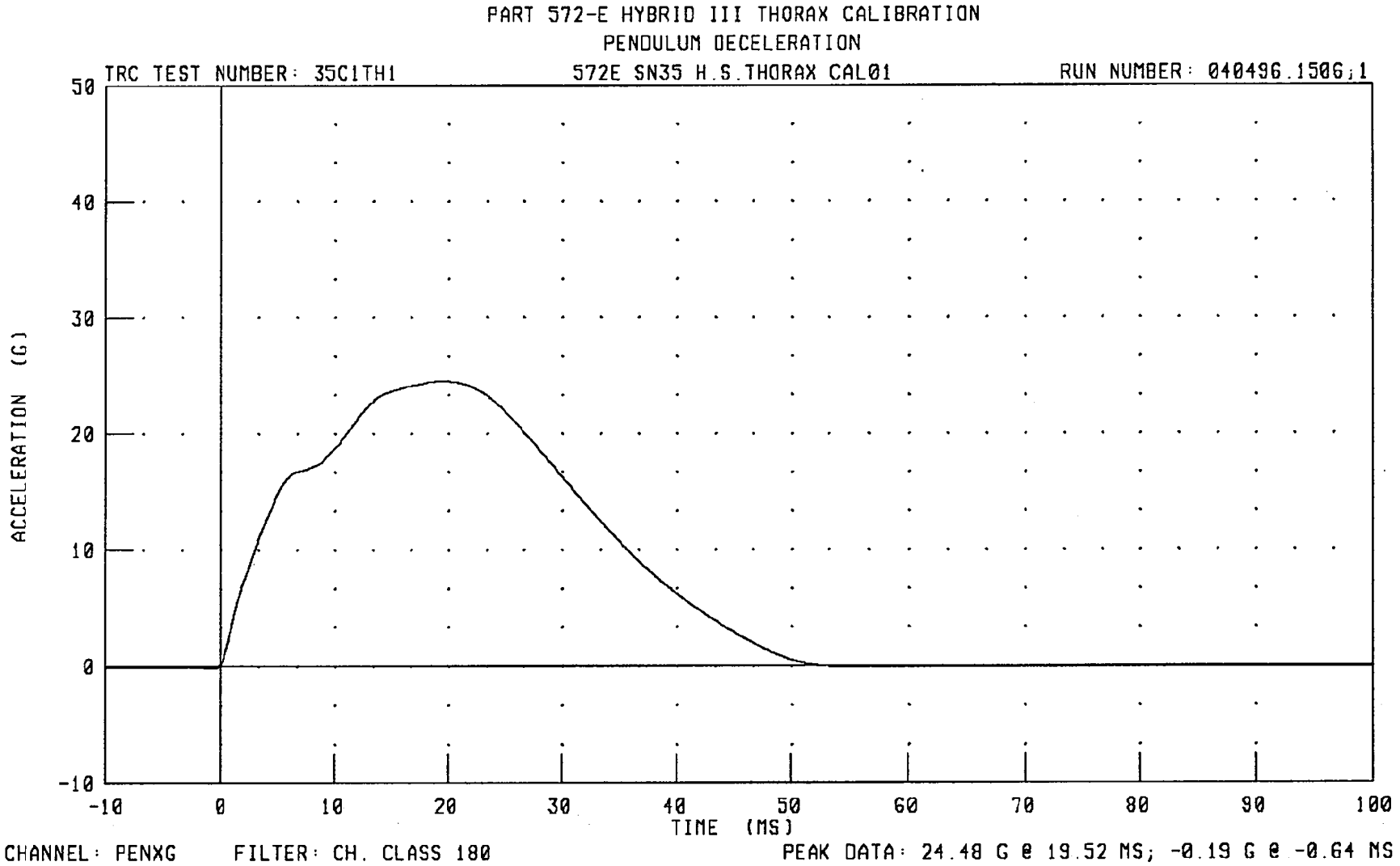
HYBRID III 11-JUL-95

TRC INC. TEST NO: 35C1TH1 572E SN35 H.S.THORAX CAL01

TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6-22.2 DEG. C	21.4 DEG. C
RELATIVE HUMIDITY	10 - 70 %	63.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.62 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	66.7 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5608. N
INTERNAL HYSTERESIS	69% - 85%	73.6%

TEST MEETS SPECIFICATIONS

TECHNICIAN Richard LeVan RUN NUMBER: 071195.1433;1

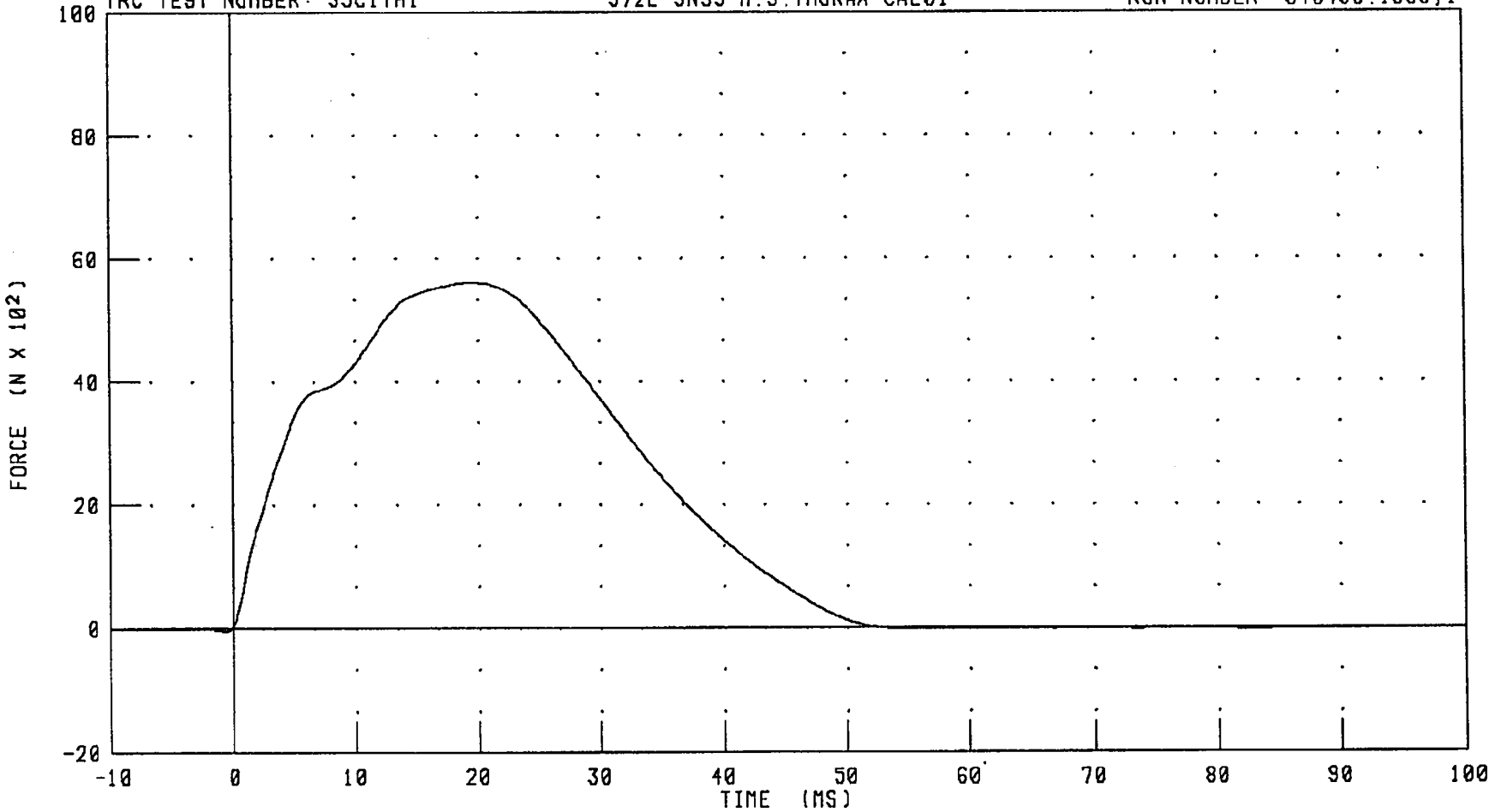

PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM DECELERATION
TRC TEST NUMBER: 35C1TH1
572E SN35 H.S.THORAX CAL01
RUN NUMBER: 040496.1506;1
ACCELERATION (G)
50
40
30
20
10
0
-10
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS)
CHANNEL: PENXG
FILTER: CH. CLASS 180
PEAK DATA: 24.48 G @ 19.52 MS; -0.19 G @ -0.64 MS

960314

PART 572-E HYBRID III THORAX CALIBRATION

PENDULUM FORCE

TRC TEST NUMBER: 35C1TH1 572E SN35 H.S.THORAX CAL01 RUN NUMBER: 040496.1506;1

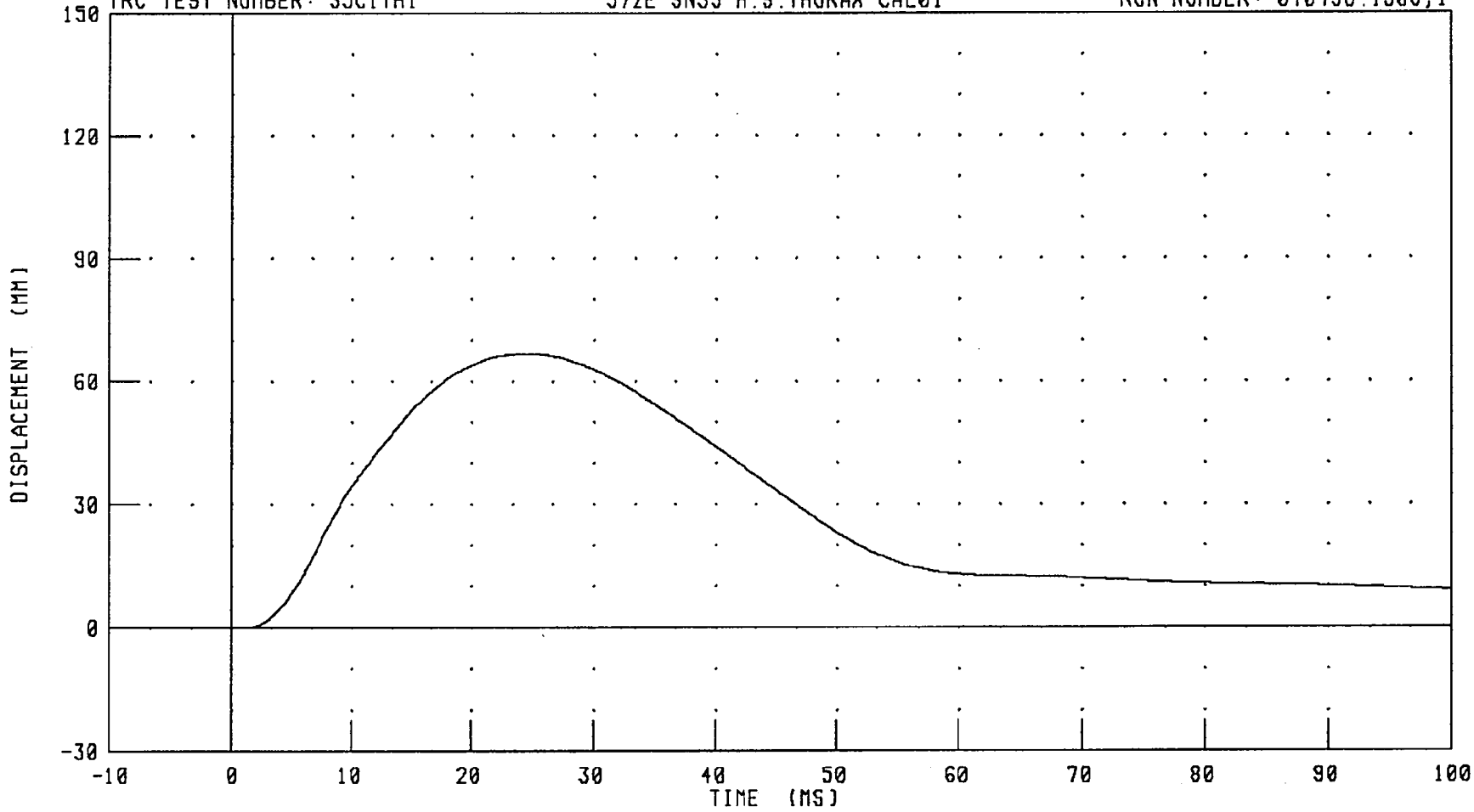


CHANNEL: PENXF FILTER: CH. CLASS 180 PEAK DATA: 5608.25 N @ 19.52 MS; -42.97 N @ -0.64 MS

960314

PART 572-E HYBRID III THORAX CALIBRATION
STERNUM DISPLACEMENT

TRC TEST NUMBER: 35C1TH1 572E SN35 H.S.THORAX CAL01 RUN NUMBER: 040496.1506;1

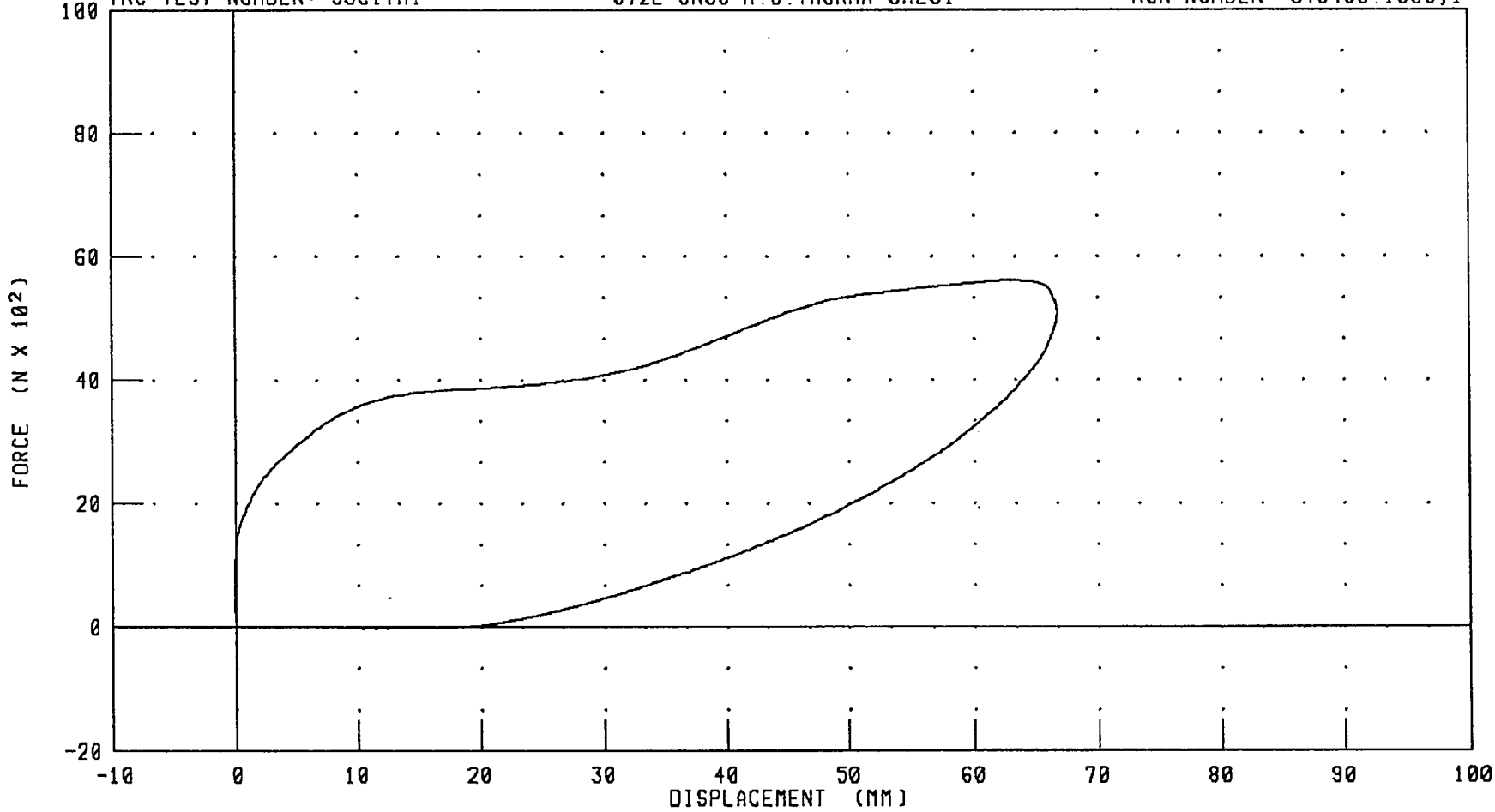


CHANNEL: CSTXD FILTER: CH. CLASS 180 PEAK DATA: 66.71 MM @ 24.64 MS; -0.05 MM @ 0.96 MS

960314

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

TRC TEST NUMBER: 35C1TH1 572E SN35 H.S.THORAX CAL01 RUN NUMBER: 040496.1506;1



CHANNEL: CSTXD FILTER: CH. CLASS 180 PEAK DATA: 66.71 MM @ 24.64 MS; -0.05 MM @ 0.96 MS
PENXF CH. CLASS 180 5608.25 N @ 19.52 MS; -42.97 N @ -0.64 MS

960314

TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

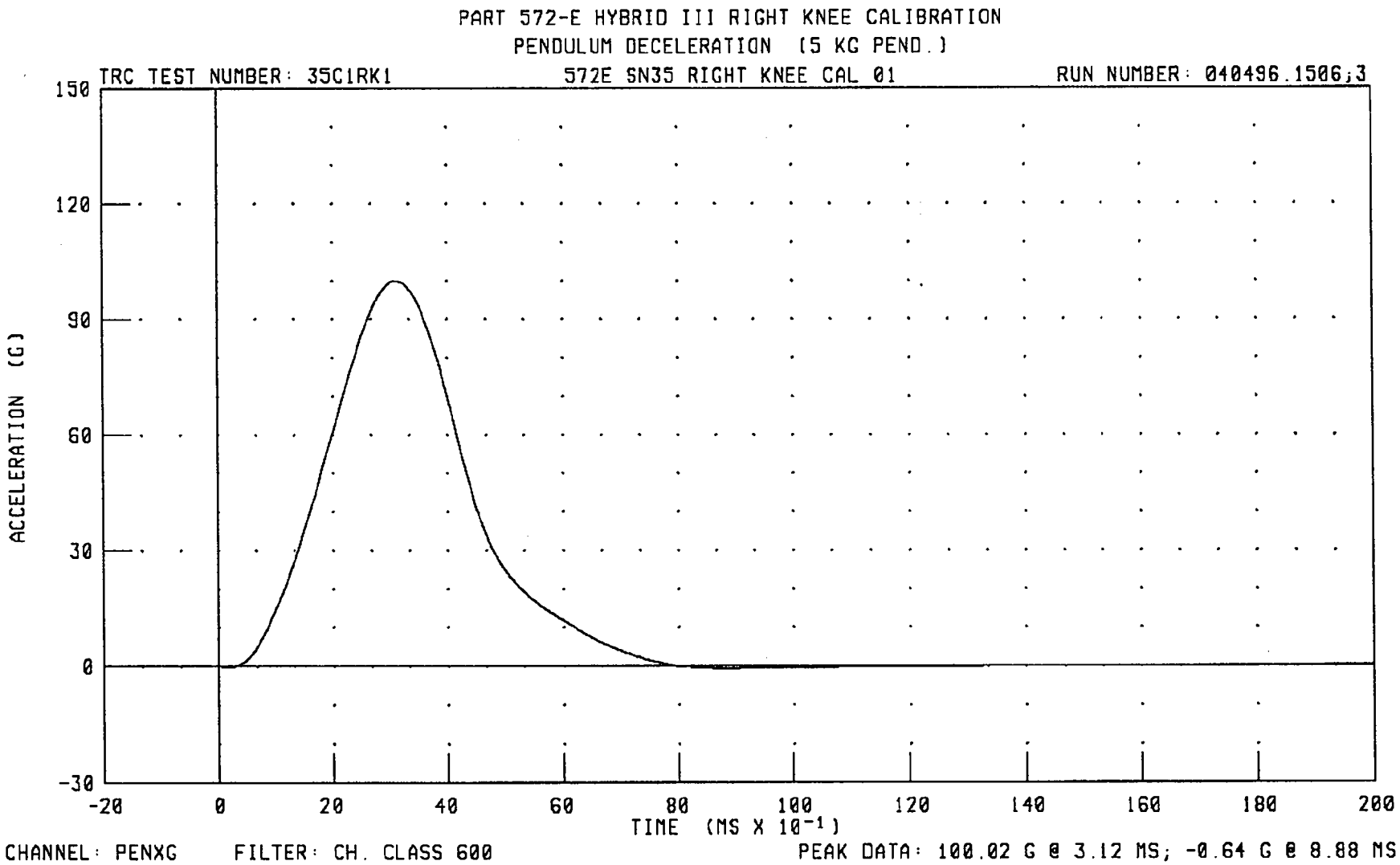
HYBRID III 11-JUL-95

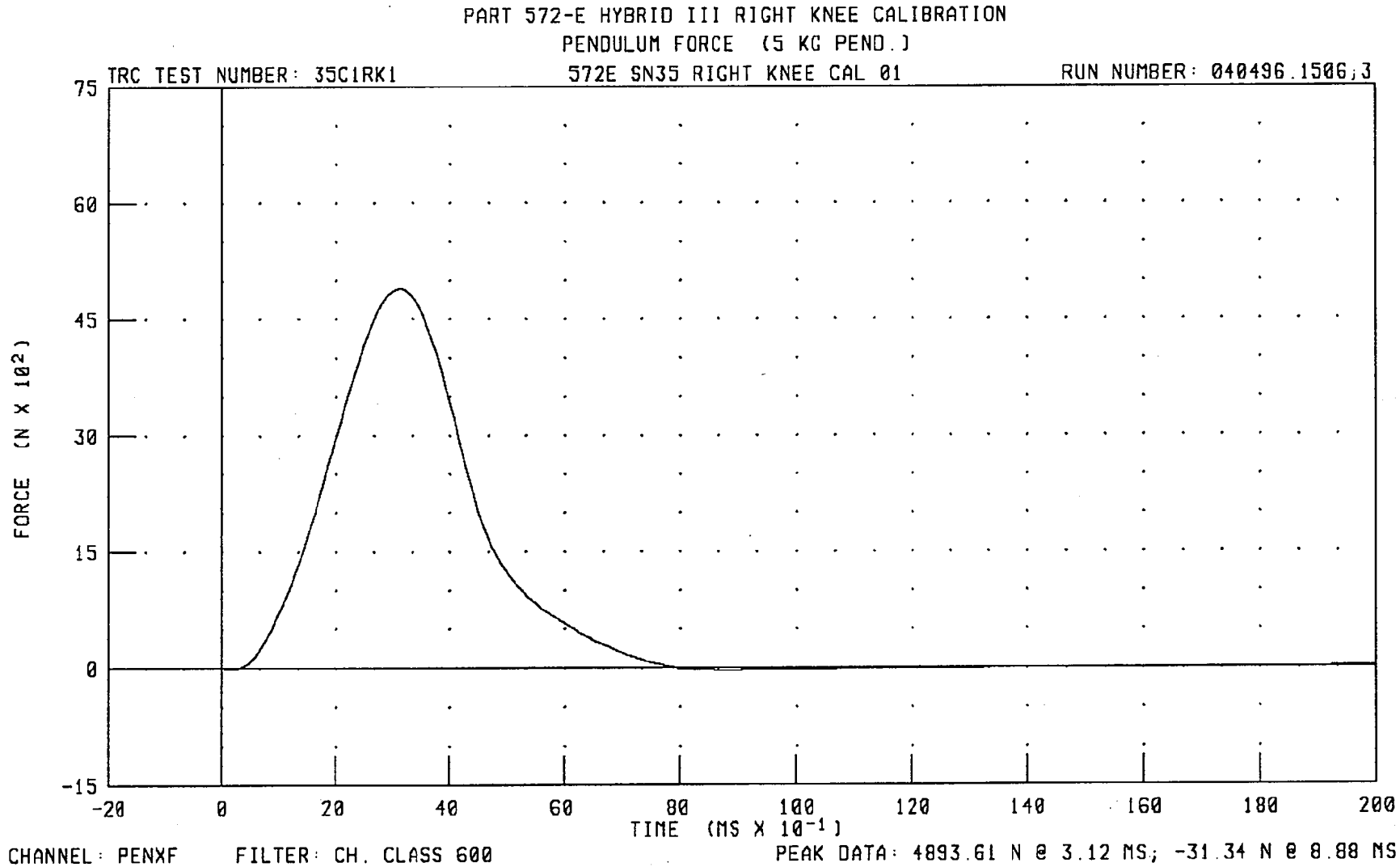
TRC INC. TEST NO: 35C1RK1 572E SN35 RIGHT KNEE CAL 01

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	63.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.10 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	4893.6 N

TEST MEETS SPECIFICATIONS

TECHNICIAN Richard LeVan RUN NUMBER: 071195.1336;3


PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)
TRC TEST NUMBER: 35C1RK1
572E SN35 RIGHT KNEE CAL 01
RUN NUMBER: 040496.1506;3
ACCELERATION (G)
150
120
90
60
30
0
-30
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXG
FILTER: CH. CLASS 600
PEAK DATA: 100.02 G @ 3.12 MS; -0.64 G @ 8.88 MS


PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM FORCE (5 KG PEND.)
TRC TEST NUMBER: 35C1RK1
572E SN35 RIGHT KNEE CAL 01
RUN NUMBER: 040496.1506;3
75
60
45
30
15
0
-15
FORCE (N X 10²)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXF
FILTER: CH. CLASS 600
PEAK DATA: 4893.61 N @ 3.12 MS; -31.34 N @ 8.88 MS

960314

TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

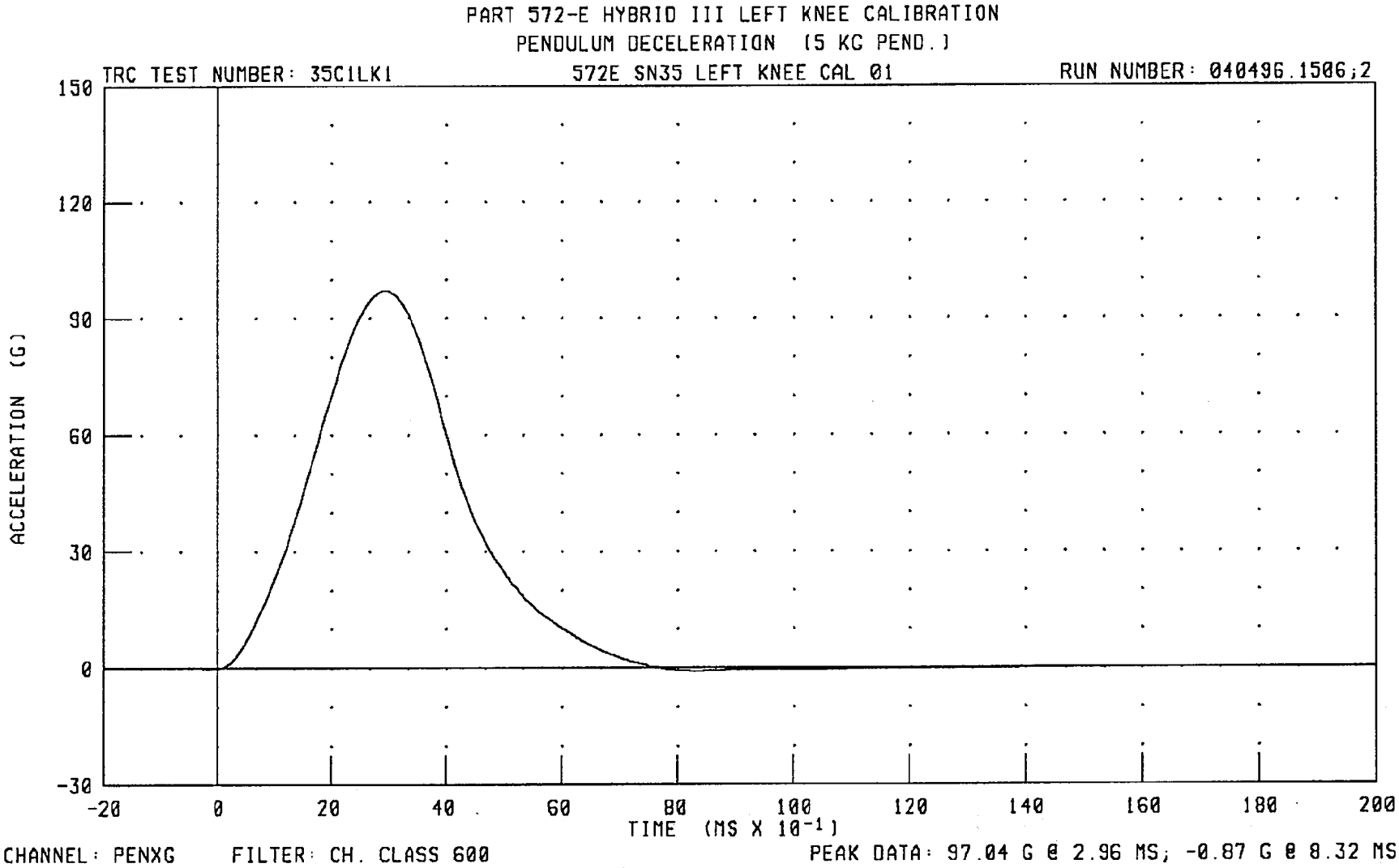
HYBRID III 11-JUL-95

TRC INC. TEST NO: 35C1LK1 572E SN35 LEFT KNEE CAL 01

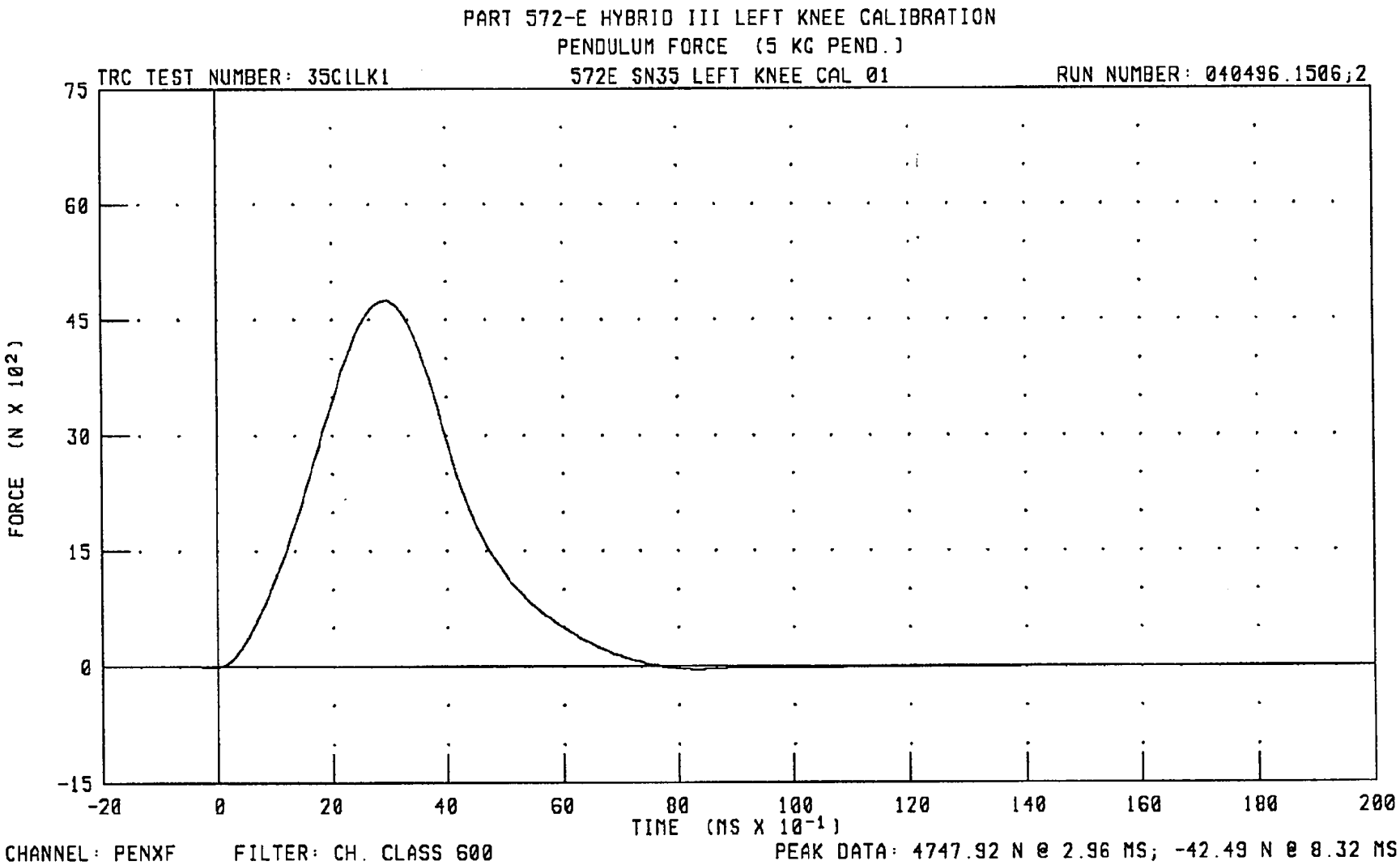
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	63.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.11 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	4747.9 N

TEST MEETS SPECIFICATIONS

TECHNICIAN _____ RUN NUMBER: 071195.1251;2


PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)
TRC TEST NUMBER: 35C1LK1
572E SN35 LEFT KNEE CAL 01
RUN NUMBER: 040496.1506;2
ACCELERATION (G)
150
120
90
60
30
0
-30
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10-1)
CHANNEL: PENXG
FILTER: CH. CLASS 600
PEAK DATA: 97.04 G @ 2.96 MS; -0.87 G @ 8.32 MS

960314


PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM FORCE (5 KG PEND.)
TRC TEST NUMBER: 35C1LK1
572E SN35 LEFT KNEE CAL 01
RUN NUMBER: 040496.1506;2
FORCE (N X 10²)
75
60
45
30
15
0
-15
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXF
FILTER: CH. CLASS 600
PEAK DATA: 4747.92 N @ 2.96 MS; -42.49 N @ 8.32 MS

960314

Pre-Test Calibration

Serial Number 34

TRANSPORTATION RESEARCH CENTER INC.
HYBRID III EXTERNAL DIMENSIONS
34 VECTOR

11-JUL-95

TRC INC. TEST NO: 34C1ED1 572E SN34 EXT.DIMENSION CAL01

TEST PARAMETER	(DIMEN.)	SPECIFICATION	TEST RESULTS
LOCATION FOR CHEST CIRCUMFERENCE	(AA)	429 - 434 MM	432. MM
LOCATION FOR WAIST CIRCUMFERENCE	(BB)	226 - 231 MM	229. MM
CHEST CIRCUMFERENCE	(Y)	970 -1001 MM	991. MM
WAIST CIRCUMFERENCE	(Z)	836 - 866 MM	856. MM
CHEST DEPTH	(O)	213 - 229 MM	218. MM
H-POINT HEIGHT	(C)	84 - 89 MM	86. MM
H-POINT FROM SEATBACK	(D)	135 - 140 MM	137. MM
SKULL CAP TO BACKLINE	(H)	41 - 46 MM	43. MM
TOTAL SITTING HEIGHT	(A)	879 - 889 MM	884. MM
THIGH CLEARANCE	(F)	140 - 155 MM	155. MM
BUTTOCK KNEE LENGTH	(K)	579 - 605 MM	602. MM
BUTTOCK POPLITEAL LENGTH	(N)	452 - 478 MM	472. MM
POPLITEAL HEIGHT	(L)	429 - 455 MM	439. MM
KNEE PIVOT HEIGHT	(M)	485 - 500 MM	498. MM
FOOT LENGTH	(P)	252 - 267 MM	254. 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	427. MM
SHOULDER PIVOT HEIGHT	(B)	506 - 521 MM	513. MM
ELBOW REST HEIGHT	(J)	191 - 211 MM	208. MM
SHOULDER-ELBOW LENGTH	(I)	330 - 345 MM	335. MM
BACK OF ELBOW TO WRIST PIVOT	(G)	290 - 305 MM	295. MM

DUMMY MEETS SPECIFICATIONS
TECHNICIAN Richard Le Lan

RUN NUMBER: 071295.1424

TRANSPORTATION RESEARCH CENTER INC.

HEAD DROP TEST

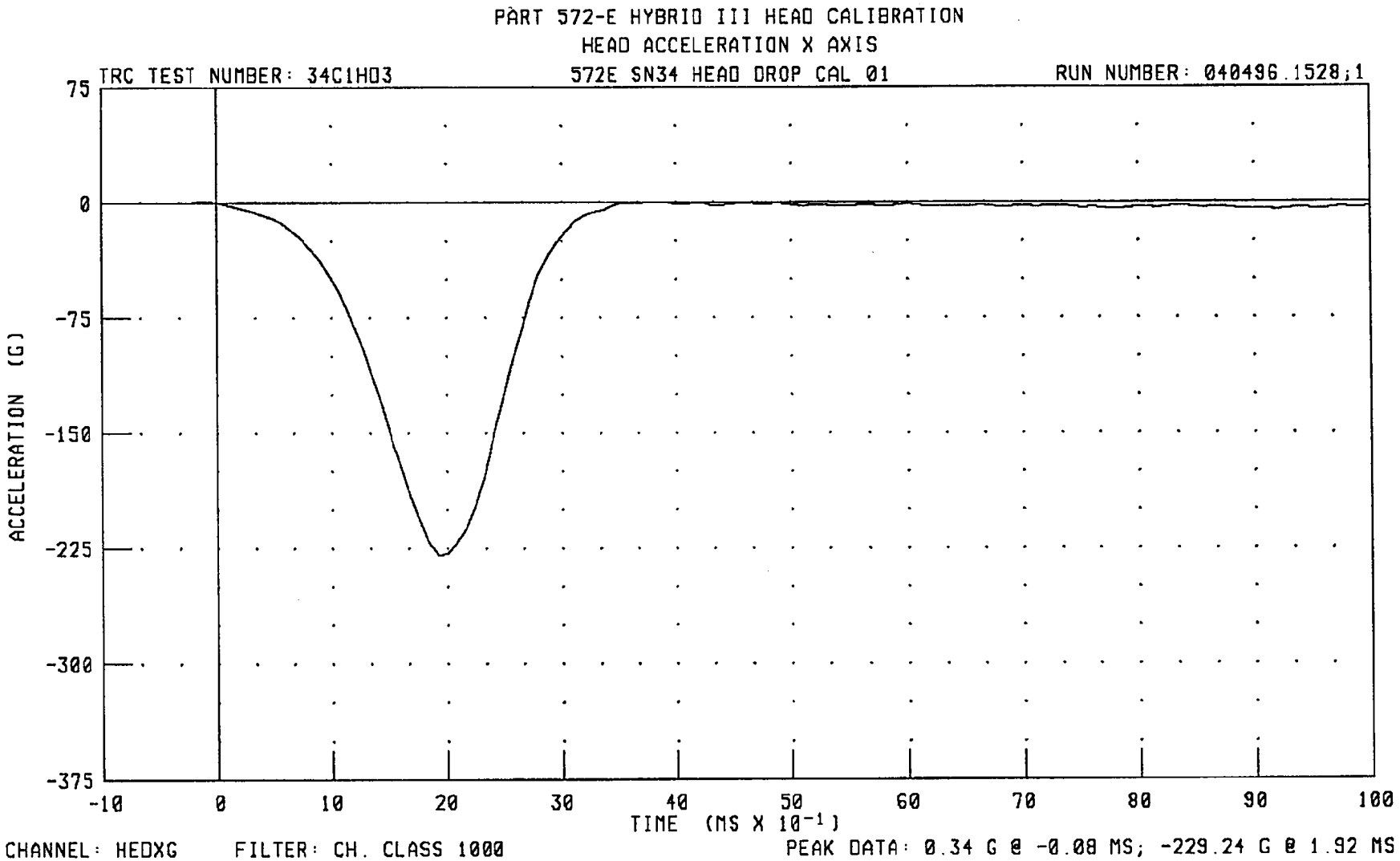
HYBRID III 06-MAR-96

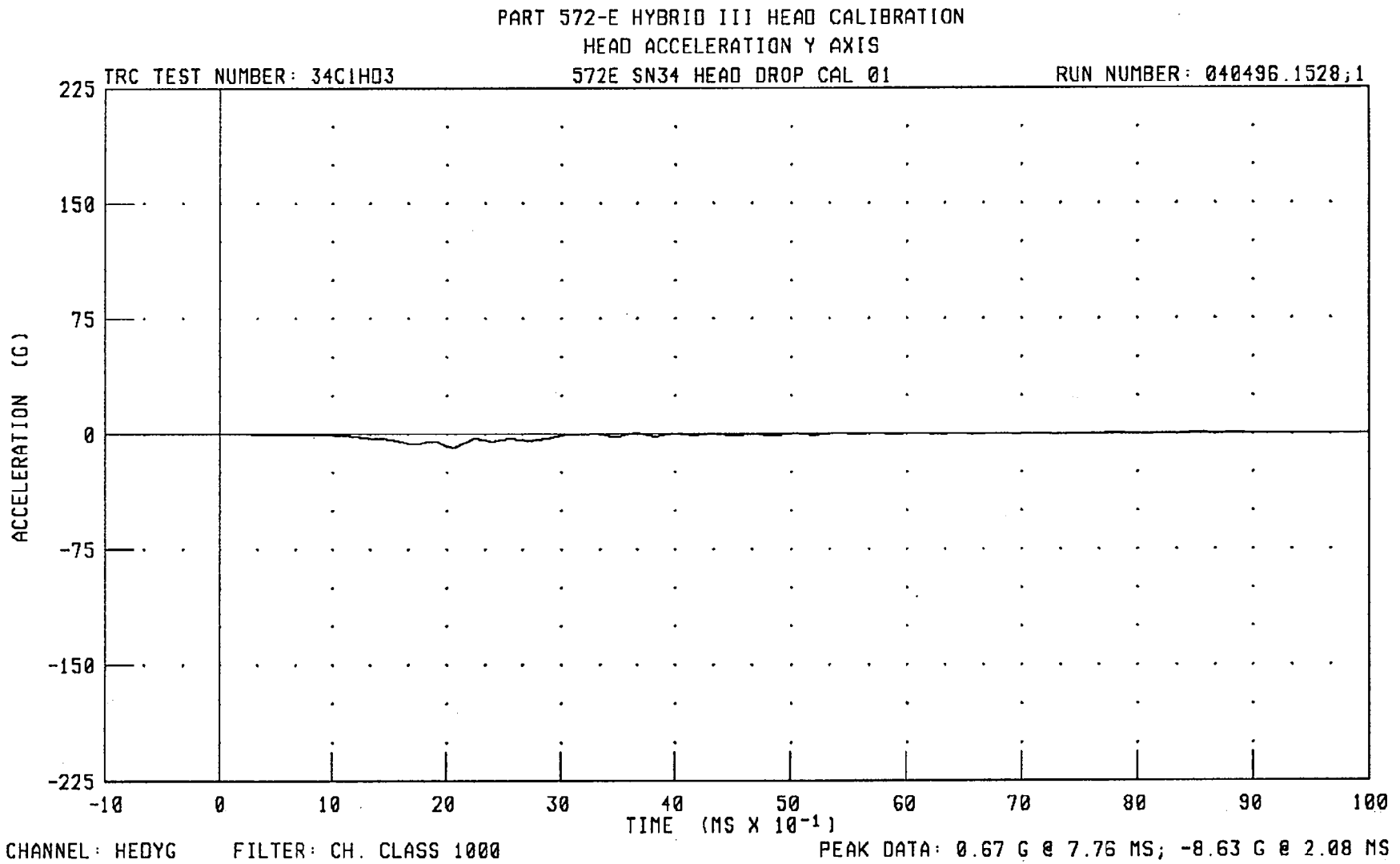
TRC INC. TEST NO: 34C1HD3 572E SN34 HEAD DROP CAL 01

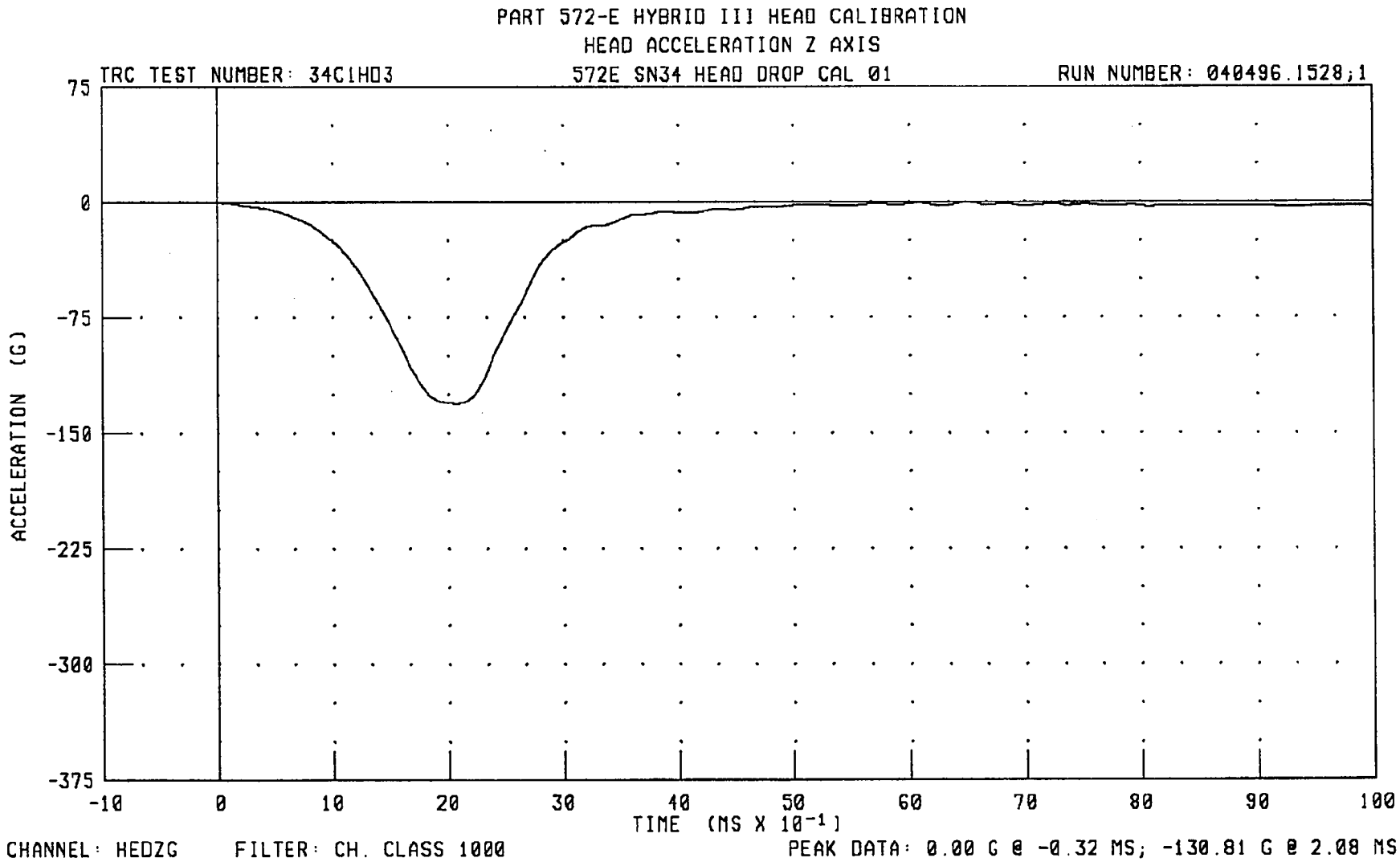
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	39.0 %
PEAK RESULTANT ACCELERATION	225 - 275 G	263.60 G
PEAK LATERAL ACCELERATION	15 G MAX	-8.63 G
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN Richard Lefan RUN NUMBER: 030696.1057;1

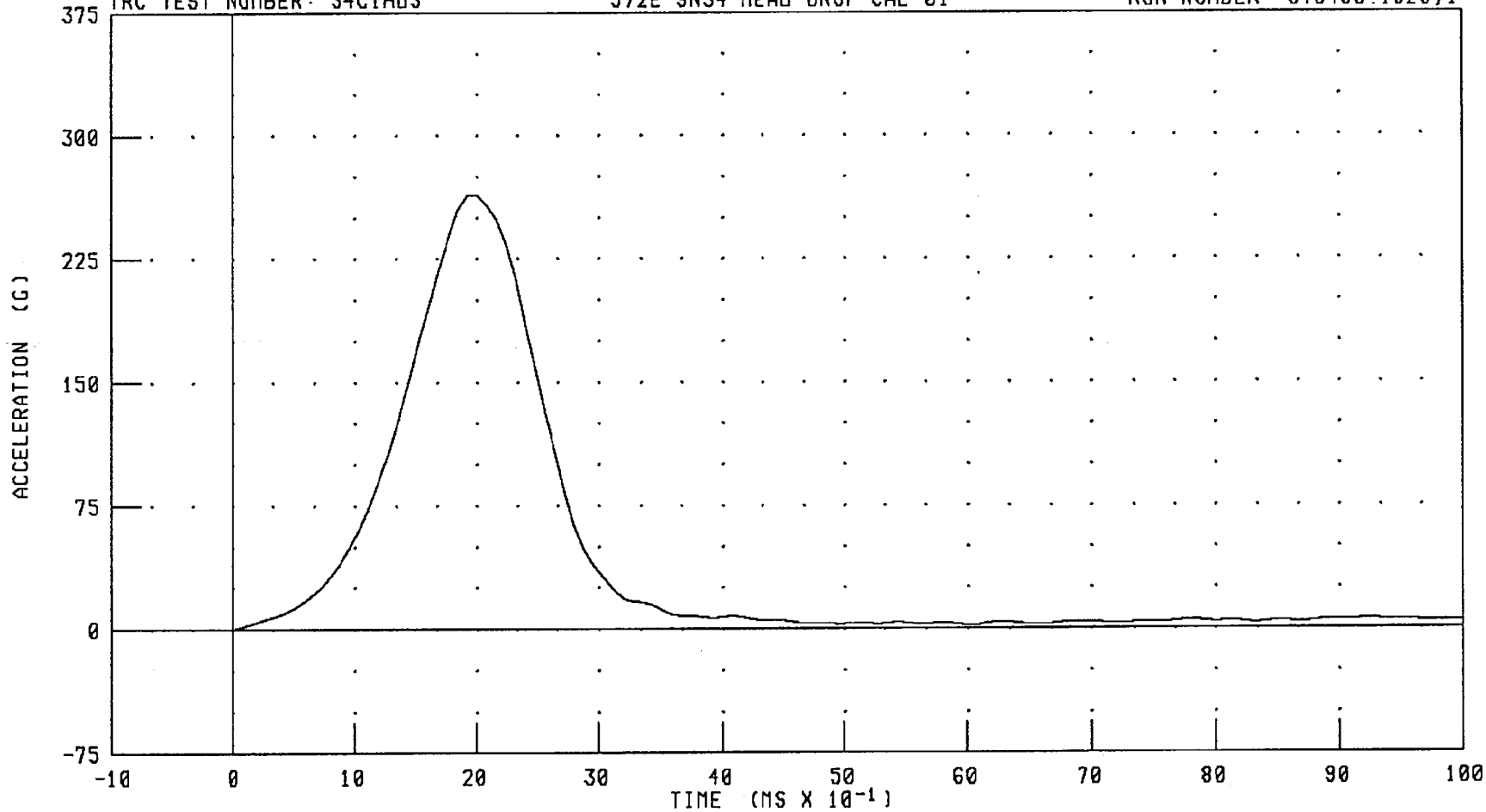

PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION X AXIS
TRC TEST NUMBER: 34C1H03
572E SN34 HEAD DROP CAL 01
RUN NUMBER: 040496.1528;1
75
0
-75
-150
-225
-300
-375
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10-1)
CHANNEL: HEDXG
FILTER: CH. CLASS 1000
PEAK DATA: 0.34 G @ -0.08 MS; -229.24 G @ 1.92 MS


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Y AXIS
TRC TEST NUMBER: 34C1H03
572E SN34 HEAD DROP CAL 01
RUN NUMBER: 040496.1528;1
225
150
75
0
-75
-150
-225
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10-1)
CHANNEL: HEDYG
FILTER: CH. CLASS 1000
PEAK DATA: 0.67 G @ 7.76 MS; -8.63 G @ 2.08 MS


PART 572-E HYBRID III HEAD CALIBRATION
HEAD ACCELERATION Z AXIS
TRC TEST NUMBER: 34C1HD3
572E SN34 HEAD DROP CAL 01
RUN NUMBER: 040496.1528;1
75
0
-75
-150
-225
-300
-375
ACCELERATION (G)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS X 10-1)
CHANNEL: HEDZG
FILTER: CH. CLASS 1000
PEAK DATA: 0.00 G @ -0.32 MS; -130.81 G @ 2.08 MS

PART 572-E HYBRID III HEAD CALIBRATION
HEAD RESULTANT ACCELERATION

TRC TEST NUMBER: 34C1H03 572E SN34 HEAD DROP CAL 01 RUN NUMBER: 040496.1528;1



CHANNEL: HEDRG FILTER: CH. CLASS 1000 PEAK DATA: 263.61 G @ 2.00 MS; 0.02 G @ -0.24 MS

960314

TRANSPORTATION RESEARCH CENTER INC.

NECK FLEXION TEST - 6 CHANNEL TRANSDUCER

HYBRID III 11-JUL-95

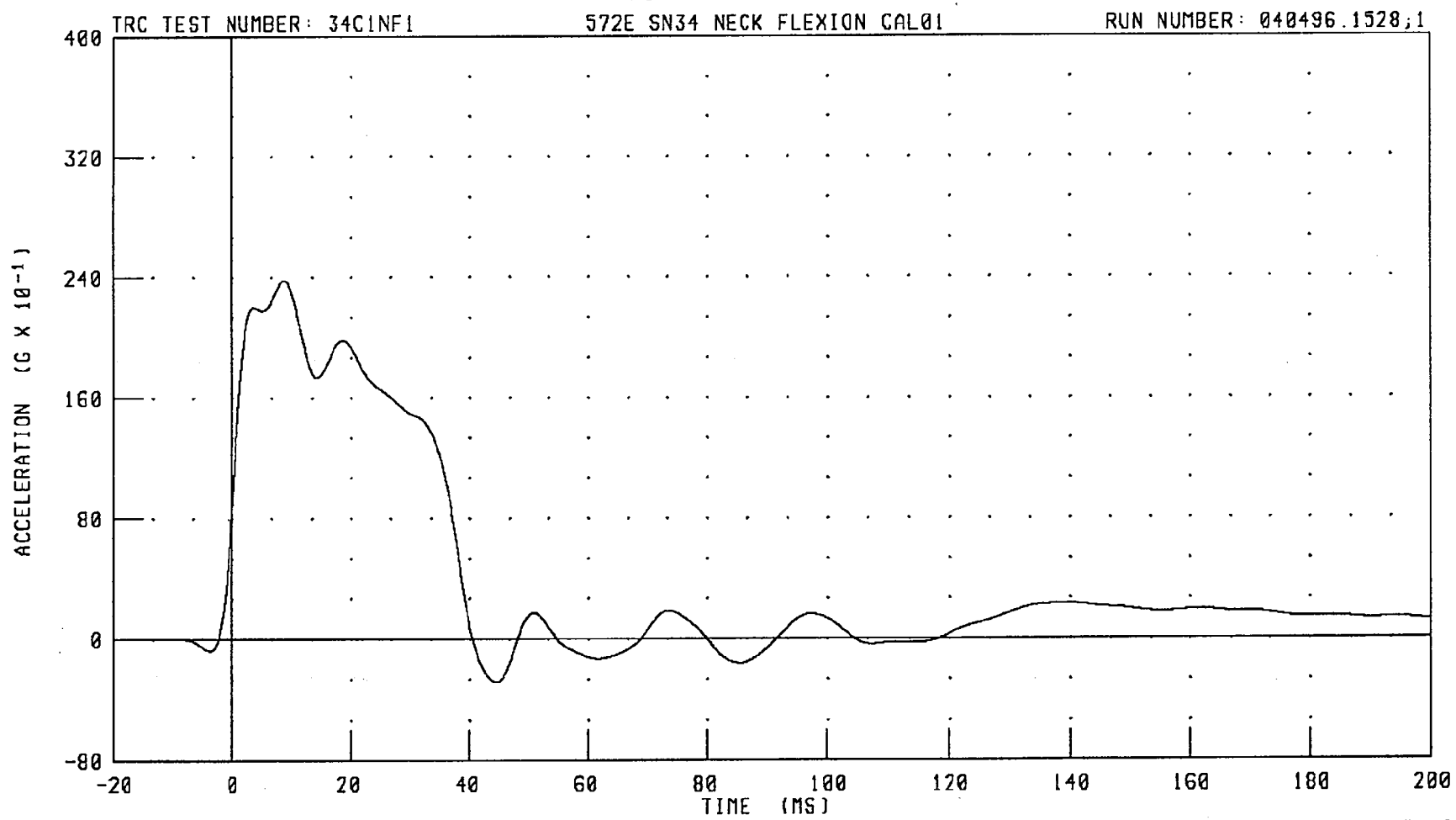
TRC INC. TEST NO: 34C1NF1 572E SN34 NECK FLEXION CAL01

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6-22.2 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY		10 - 70 %	63.0 %
IMPACT VELOCITY		6.89 - 7.13 M/S	6.99 M/S
PENDULUM DECELERATION	10 MS	22.50 - 27.50 G	22.98 G
	20 MS	17.60 - 22.60 G	19.34 G
	30 MS	12.50 - 18.50 G	14.91 G
MAX PENDULUM G		29 G MAX	23.79 G
MAX PENDULUM G ABOVE 30 MS		29 G MAX	14.89 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		34 - 42 MS	38.16 MS
D PLANE ROTATION	MAX	64 - 78 DEG.	72.72 DEG.
	TIME	57 - 64 MS	60.24 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MAX	88.2 - 108.5 NM	90.00 NM
	TIME	47 - 58 MS	51.60 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		113 - 128 MS	117.76 MS
POSITIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		97 - 107 MS	103.44 MS

TEST MEETS SPECIFICATIONS

TECHNICIAN Richard LeVan RUN NUMBER: 071195.1004;1

PART 572-E HYBRID III NECK FLEXION CALIBRATION
PENDULUM DECELERATION

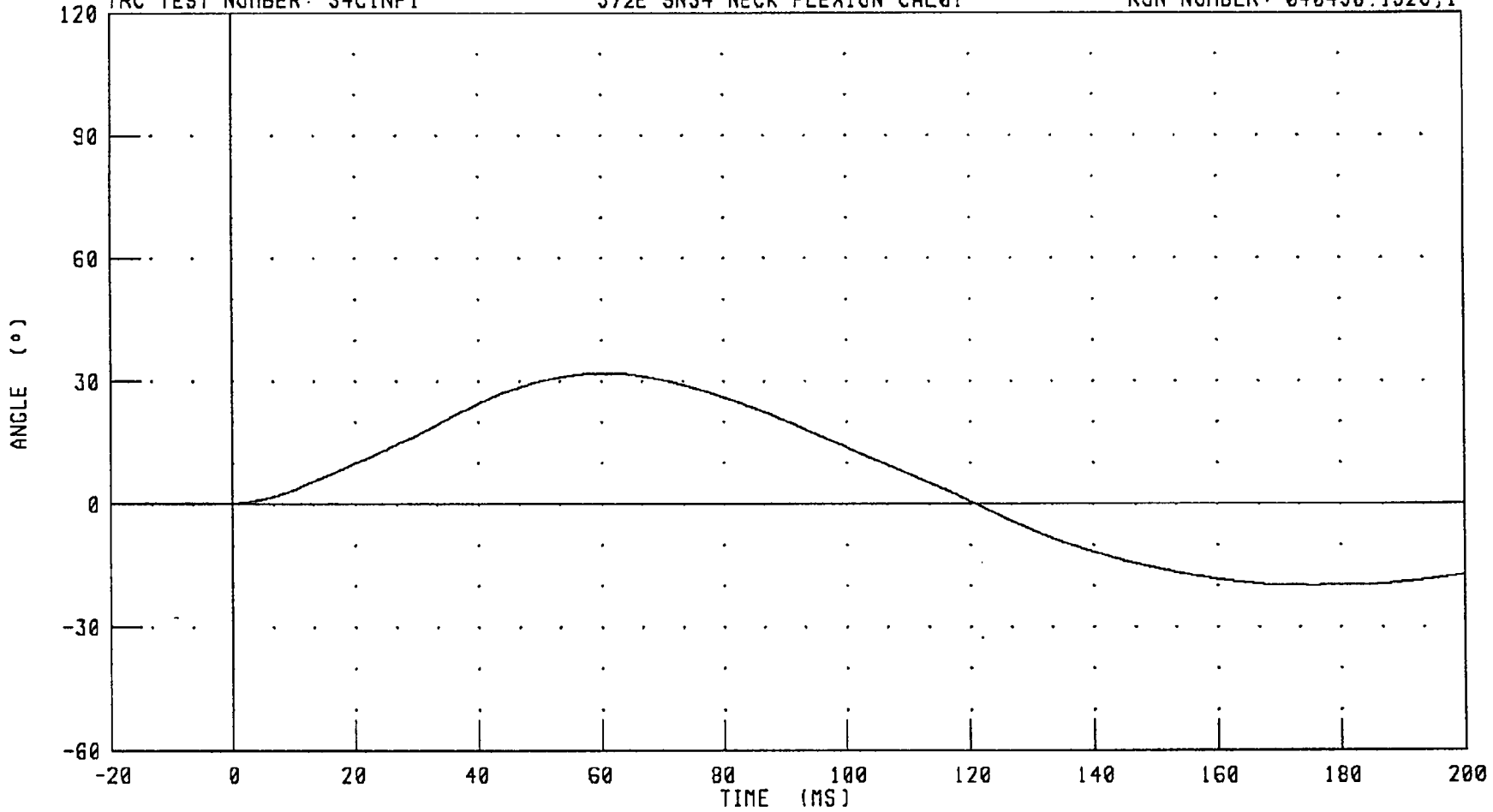


CHANNEL: PENXG FILTER: CH. CLASS 60 PEAK DATA: 23.79 G @ 8.80 MS; -2.85 G @ 44.48 MS

960314

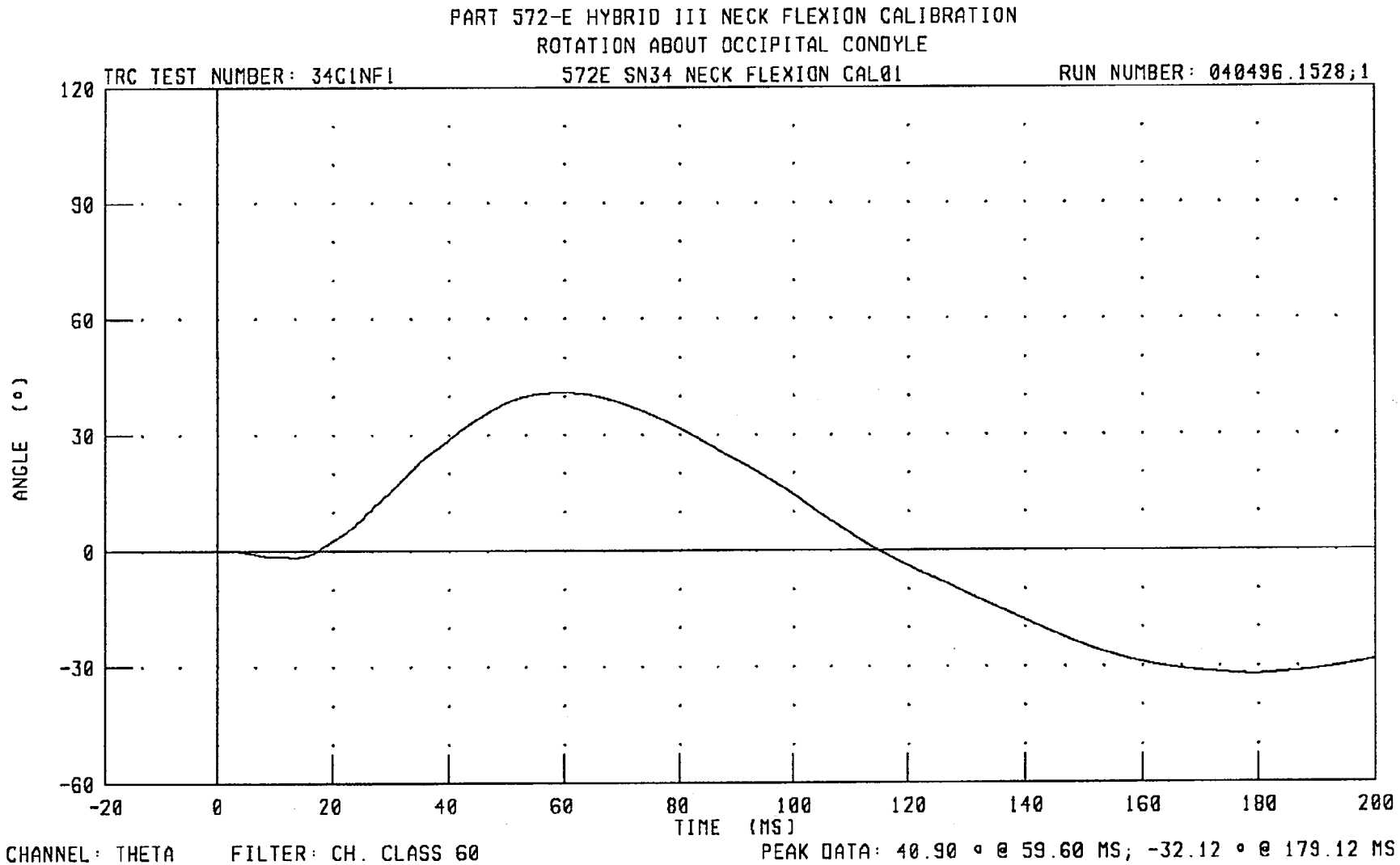
PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT BASE OF NECK

TRC TEST NUMBER: 34C1NF1 572E SN34 NECK FLEXION CAL01 RUN NUMBER: 040496.1528;1

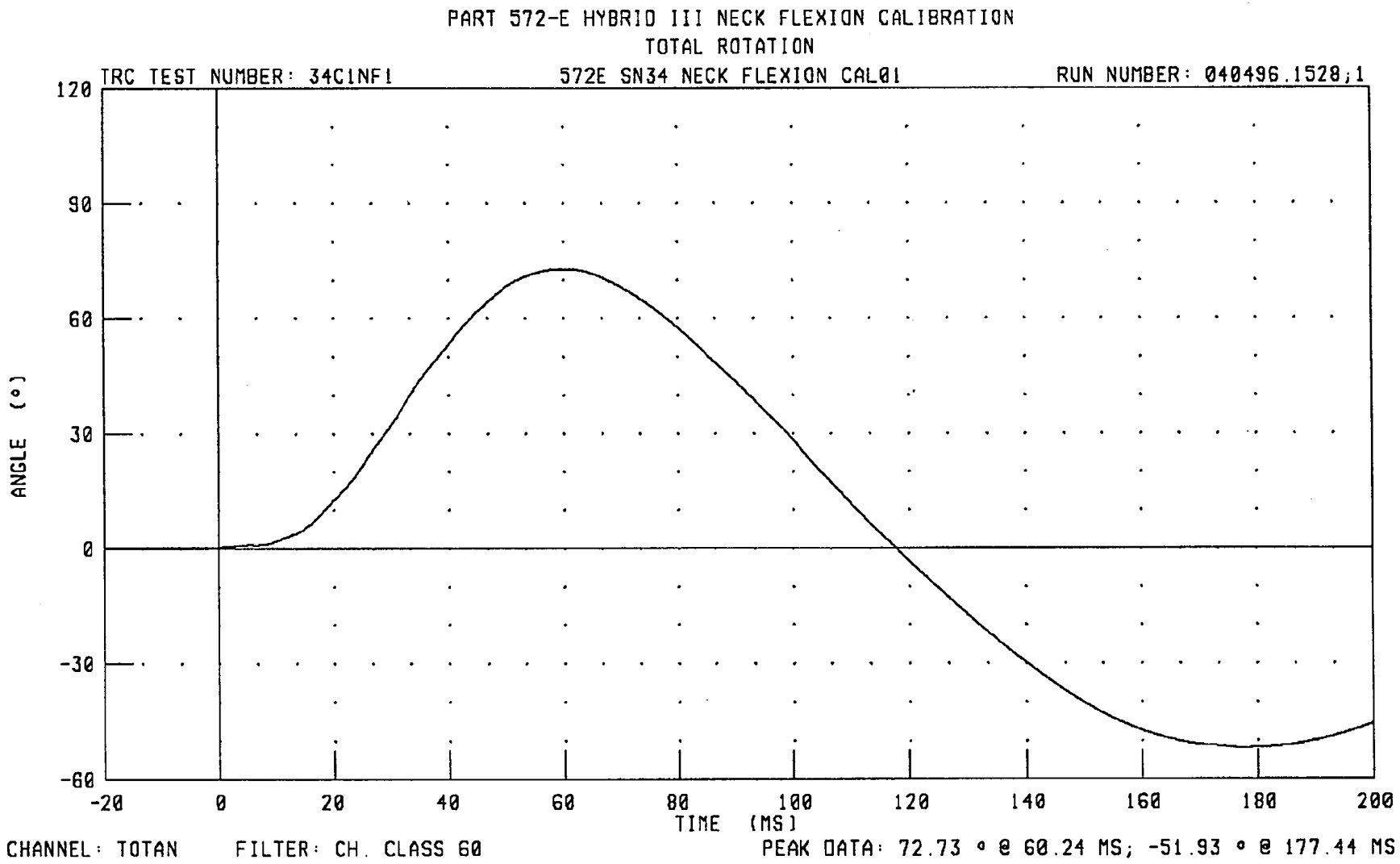


CHANNEL: BETA FILTER: CH. CLASS 60 PEAK DATA: 31.85 ° @ 61.52 MS; -19.92 ° @ 175.76 MS

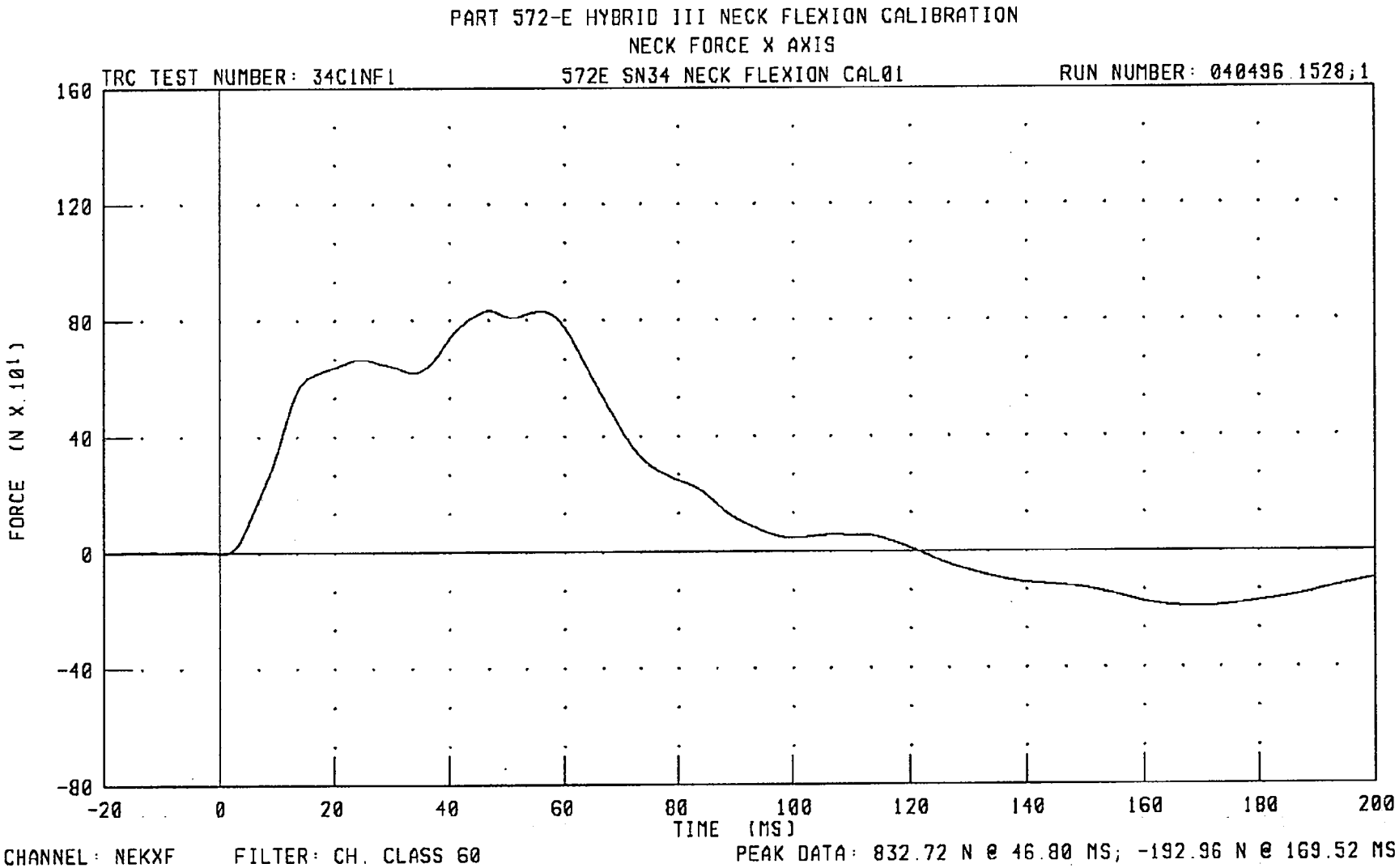
960314


PART 572-E HYBRID III NECK FLEXION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE
TRC TEST NUMBER: 34C1NF1
572E SN34 NECK FLEXION CAL01
RUN NUMBER: 040496.1528;1
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: THETA
FILTER: CH. CLASS 60
PEAK DATA: 40.90 ° @ 59.60 MS; -32.12 ° @ 179.12 MS

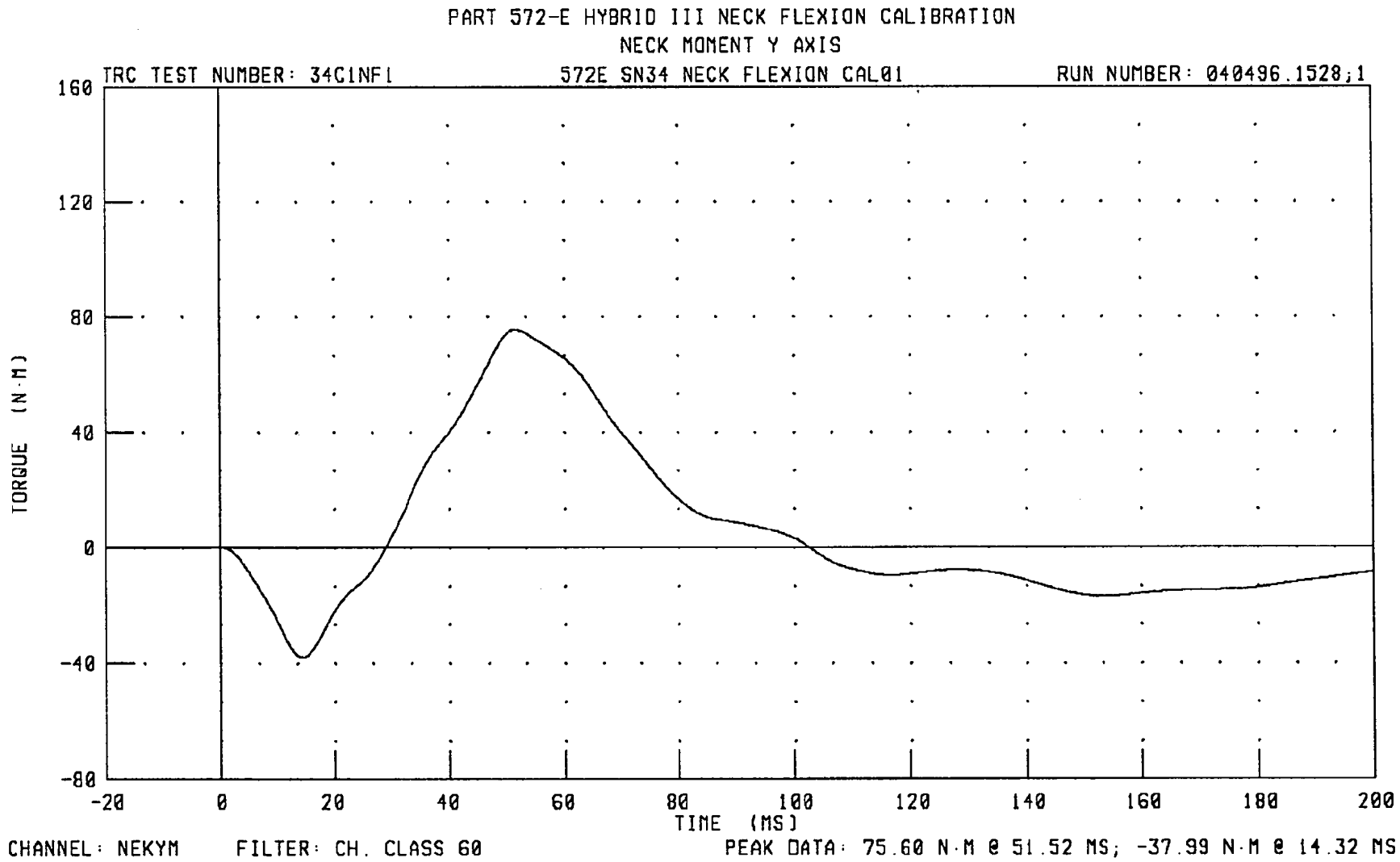
960314


PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL ROTATION
TRC TEST NUMBER: 34C1NF1
572E SN34 NECK FLEXION CAL01
RUN NUMBER: 040496.1528;1
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: TOTAN
FILTER: CH. CLASS 60
PEAK DATA: 72.73 ° @ 60.24 MS; -51.93 ° @ 177.44 MS

960314


PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK FORCE X AXIS
TRC TEST NUMBER: 34C1NF1
572E SN34 NECK FLEXION CAL01
RUN NUMBER: 040496 1528;1
160
120
80
40
0
-40
-80
FORCE (N X 10¹)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKXF
FILTER: CH. CLASS 60
PEAK DATA: 832.72 N @ 46.80 MS; -192.96 N @ 169.52 MS

960314


PART 572-E HYBRID III NECK FLEXION CALIBRATION
NECK MOMENT Y AXIS
TRC TEST NUMBER: 34C1NF1
572E SN34 NECK FLEXION CAL01
RUN NUMBER: 040496.1528;1
160
120
80
40
0
-40
-80
TORQUE (N-M)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKYM
FILTER: CH. CLASS 60
PEAK DATA: 75.60 N-M @ 51.52 MS; -37.99 N-M @ 14.32 MS

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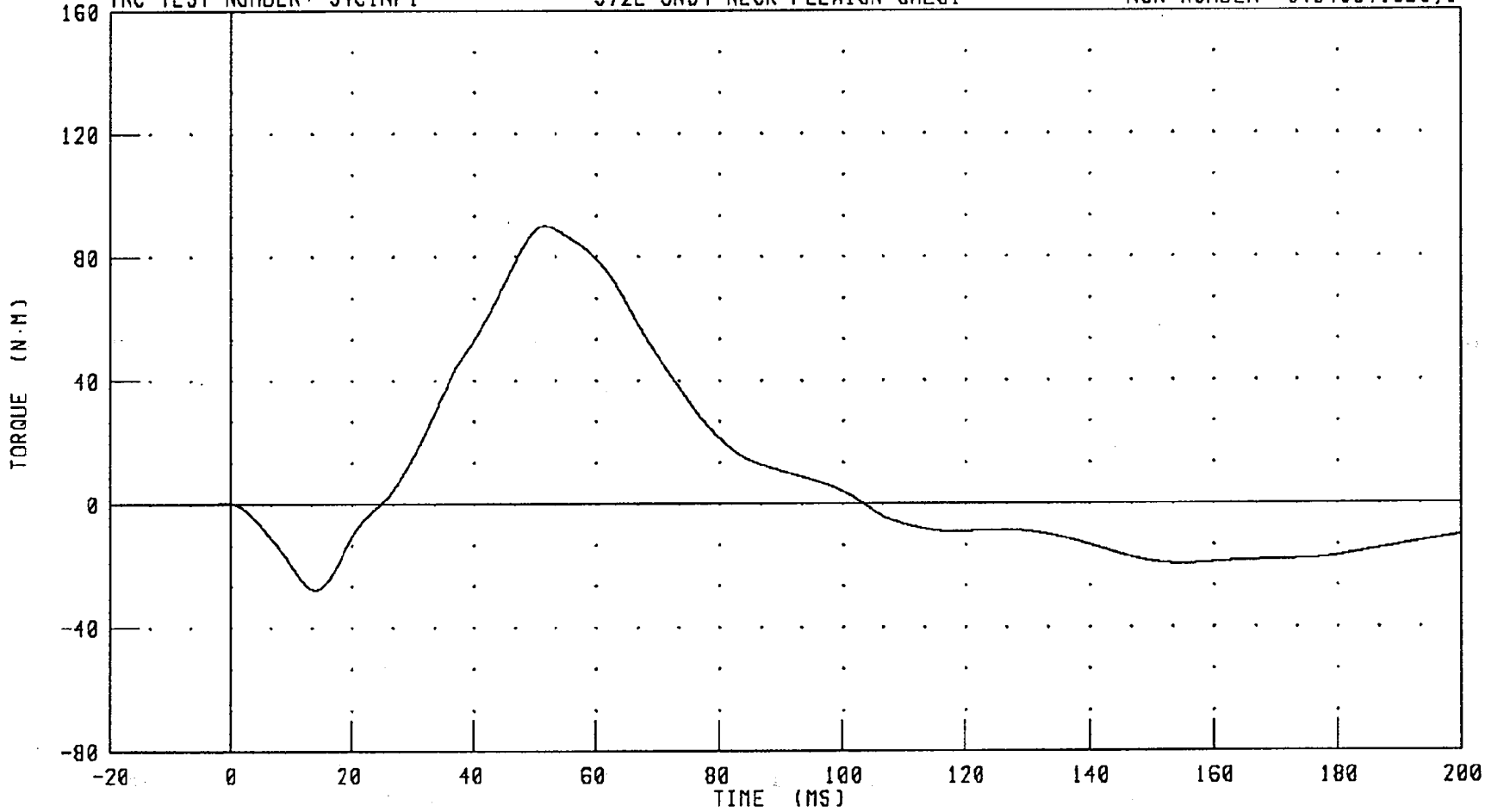
PART 572-E HYBRID III NECK FLEXION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 34C1NF1 572E SN34 NECK FLEXION CAL01 RUN NUMBER: 040496.1528;1



CHANNEL: NEKOM FILTER: CH. CLASS 60 PEAK DATA: 90.00 N·M @ 51.60 MS; -27.68 N·M @ 14.00 MS

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TRANSPORTATION RESEARCH CENTER INC.

NECK EXTENSION TEST - 6 CHANNEL TRANSDUCER

HYBRID III 11-JUL-95

TRC INC. TEST NO: 34C1NE1 572E SN34 NECK EXT. CAL01

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		20.6 - 22.2 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY		10 - 70 %	63.0 %
IMPACT VELOCITY		5.95 - 6.19 M/S	6.05 M/S
PENDULUM DECELERATION	10 MS	17.20 - 21.20 G	18.10 G
	20 MS	14.00 - 19.00 G	16.16 G
	30 MS	11.00 - 16.00 G	12.32 G
MAX PENDULUM G		22 G MAX	18.73 G
MAX PENDULUM G ABOVE 30 MS		22 G MAX	12.28 G
DECELERATION-TIME CURVE DECAY TIME TO 5 G		38 - 46 MS	39.36 MS
D PLANE ROTATION	MAX	81 - 106 DEG.	97.53 DEG.
	TIME	72 - 82 MS	74.80 MS
MOMENT ABOUT OCCIPITAL CONDYLE	MIN	-80.0/-52.9 NM	-71.59 NM
	TIME	65 - 79 MS	69.76 MS
ROTATION ANGLE-TIME CURVE DECAY TIME TO ZERO		147 - 174 MS	154.56 MS
NEGATIVE MOMENT-TIME CURVE DECAY TIME TO ZERO		120 - 148 MS	142.80 MS

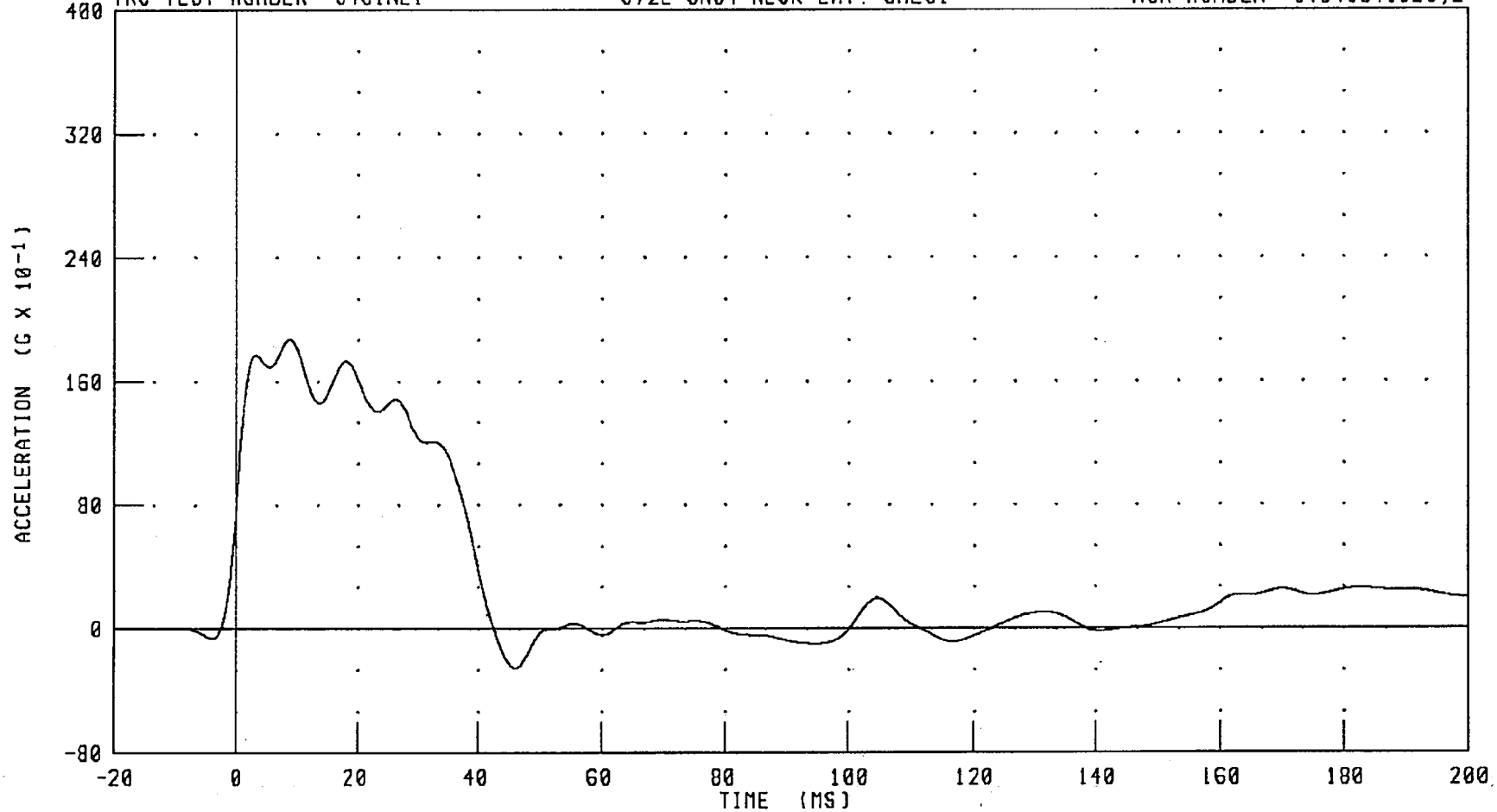
TEST MEETS SPECIFICATIONS

TECHNICIAN Richard LeVan RUN NUMBER: 071195.1058;2

PART 572-E HYBRID III NECK EXTENSION CALIBRATION

PENDULUM DECELERATION

TRC TEST NUMBER: 34C1NE1 572E SN34 NECK EXT. CAL01 RUN NUMBER: 040496.1528;2



CHANNEL: PENXG FILTER: CH. CLASS 60 PEAK DATA: 18.74 G @ 8.80 MS; -2.54 G @ 46.08 MS

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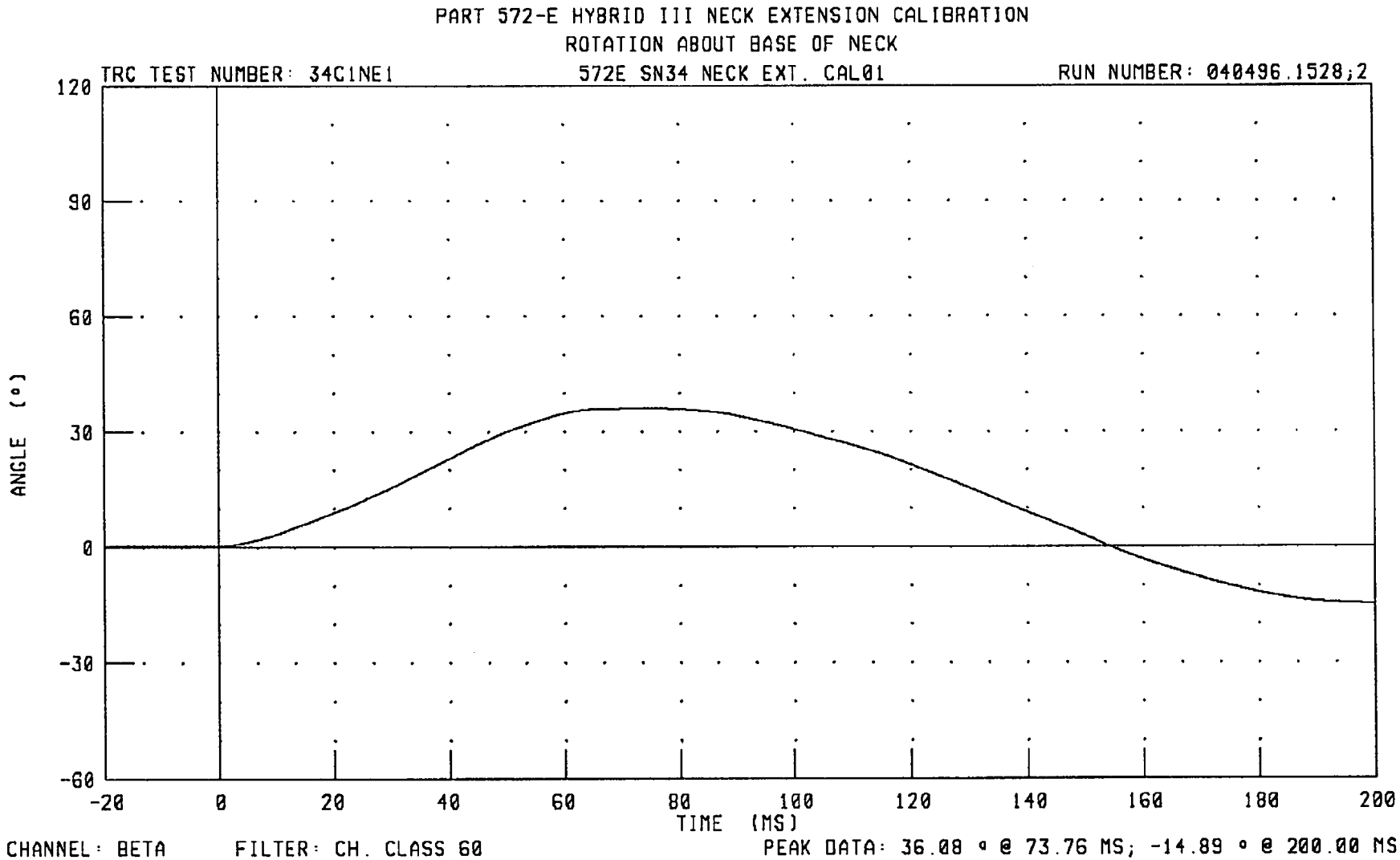
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT BASE OF NECK
TRC TEST NUMBER: 34C1NE1
572E SN34 NECK EXT. CAL01
RUN NUMBER: 040496.1528;2
120
90
60
30
0
-30
-60
ANGLE (°)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: BETA
FILTER: CH. CLASS 60
PEAK DATA: 36.08 ° @ 73.76 MS; -14.89 ° @ 200.00 MS

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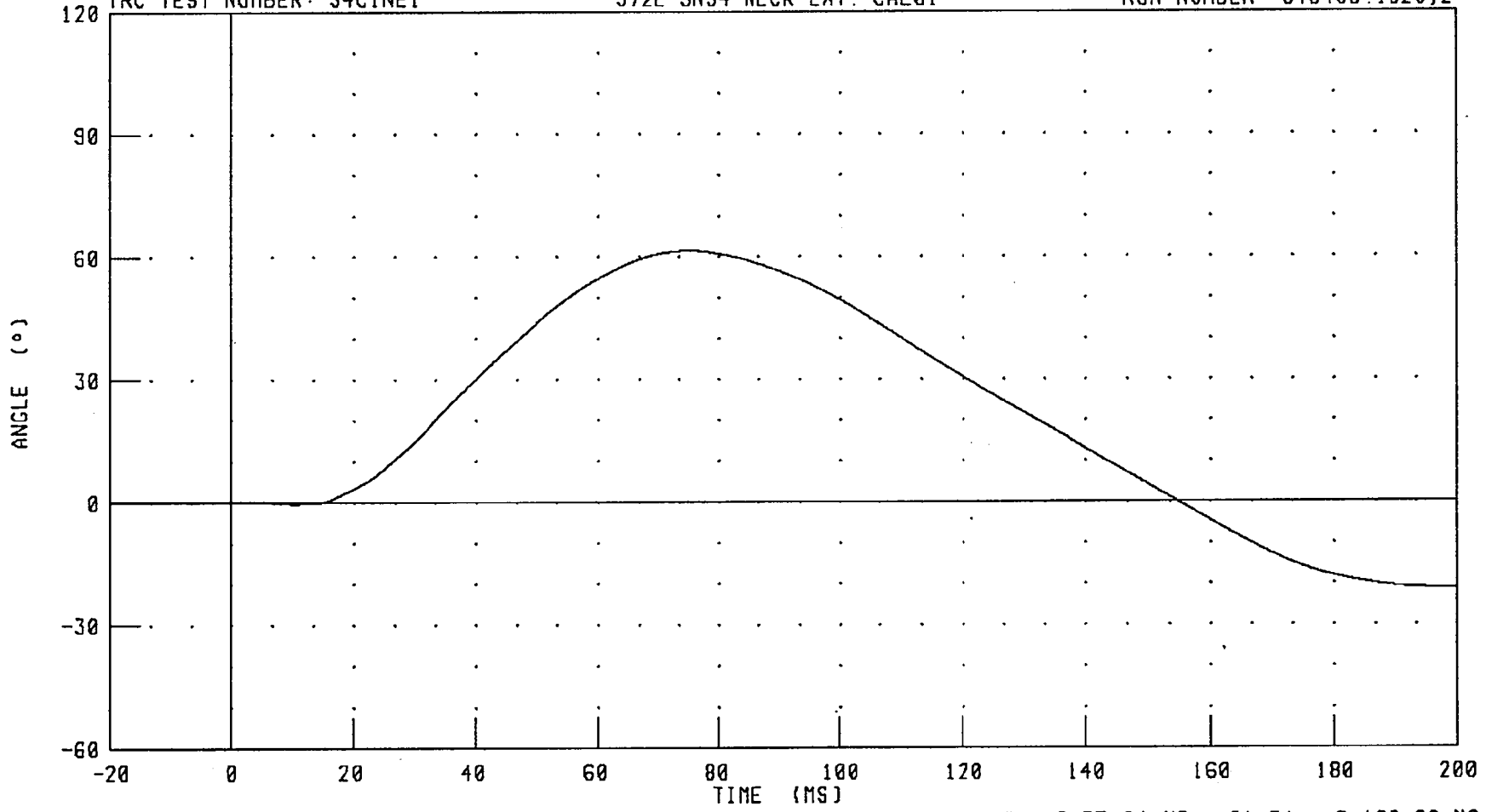
PART 572-E HYBRID III NECK EXTENSION CALIBRATION
ROTATION ABOUT OCCIPITAL CONDYLE

TRC TEST NUMBER: 34C1NE1 572E SN34 NECK EXT. CAL01 RUN NUMBER: 040496.1528;2



CHANNEL: THETA FILTER: CH. CLASS 60 PEAK DATA: 61.46 ° @ 75.04 MS; -21.34 ° @ 198.96 MS

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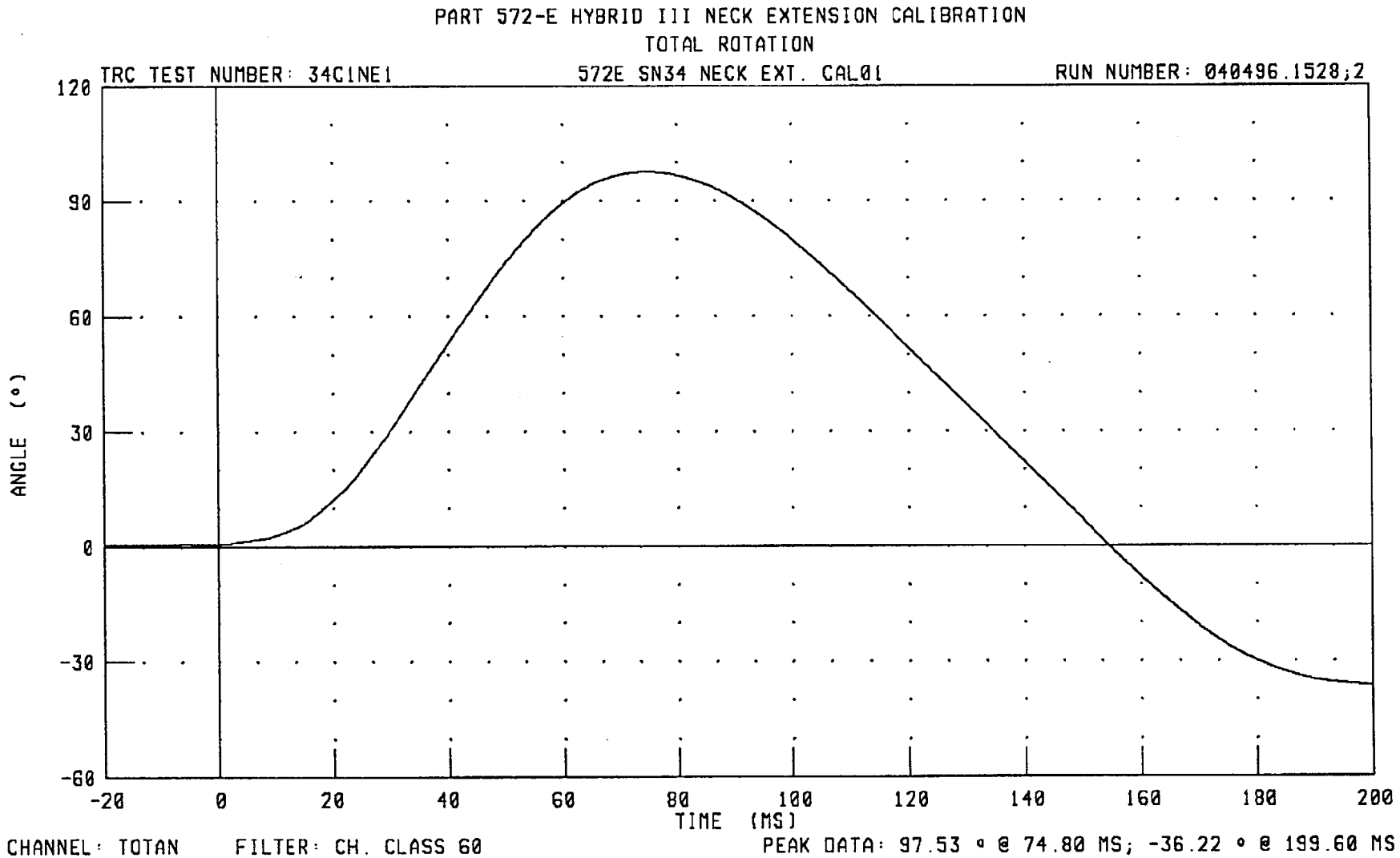
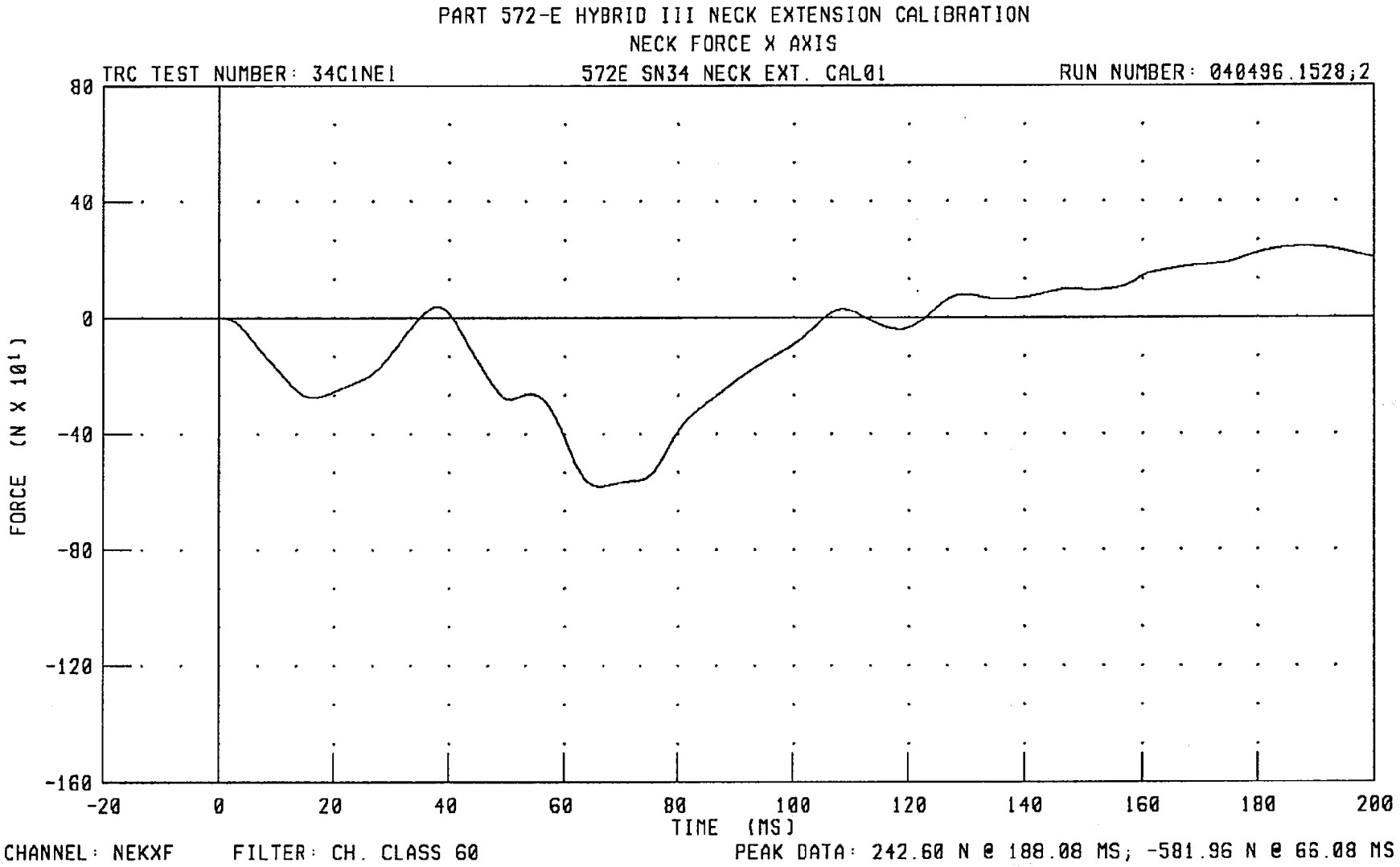

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL ROTATION
TRC TEST NUMBER: 34C1NE1
572E SN34 NECK EXT. CAL01
RUN NUMBER: 040496.1528;2
ANGLE (°)
120
90
60
30
0
-30
-60
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: TOTAN
FILTER: CH. CLASS 60
PEAK DATA: 97.53 ° @ 74.80 MS; -36.22 ° @ 199.60 MS


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK FORCE X AXIS
TRC TEST NUMBER: 34C1NE1
572E SN34 NECK EXT. CAL01
RUN NUMBER: 040496.1528;2
80
40
0
-40
-80
-120
-160
FORCE (N X 10¹)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKXF
FILTER: CH. CLASS 60
PEAK DATA: 242.60 N @ 188.08 MS; -581.96 N @ 66.08 MS

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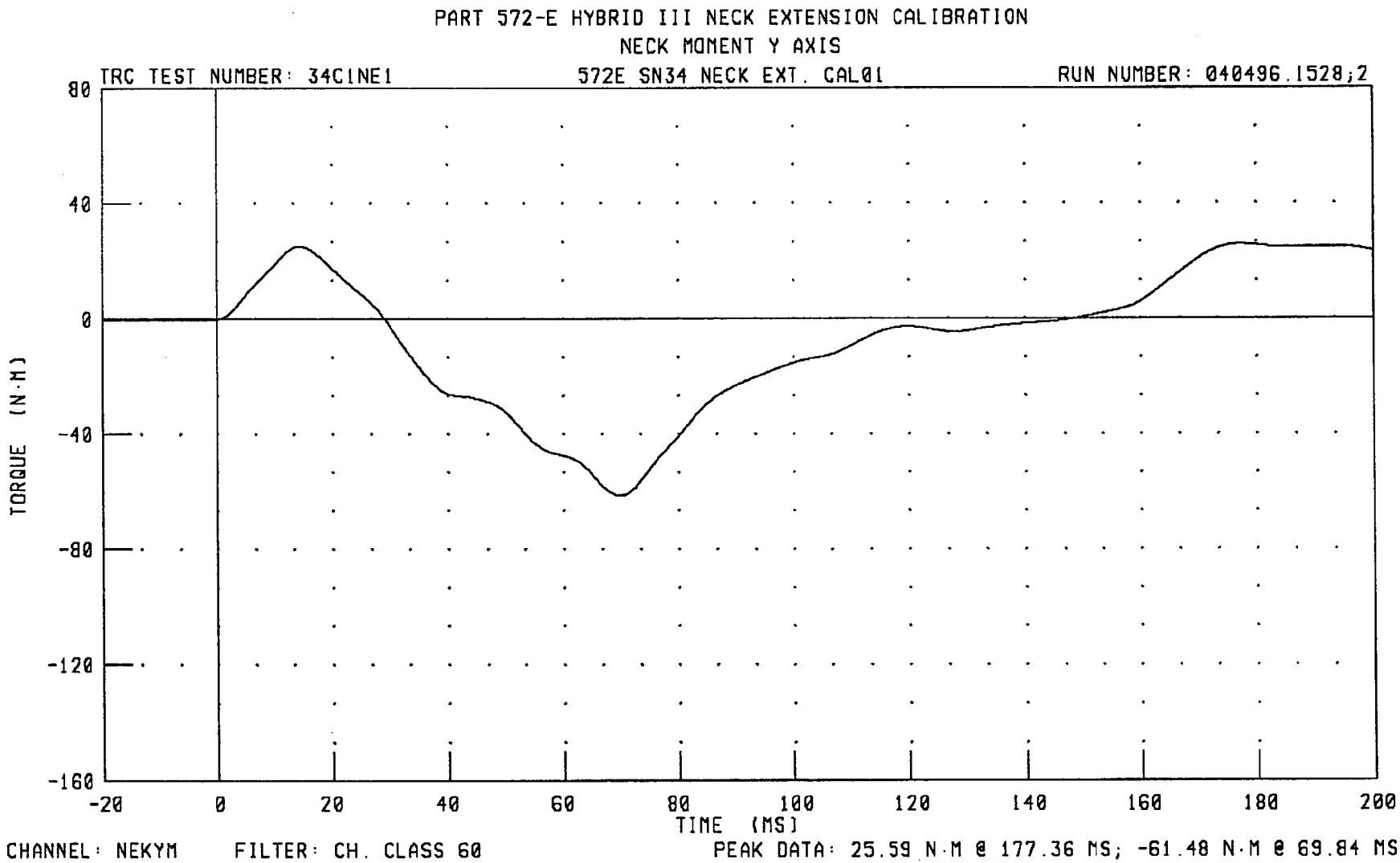
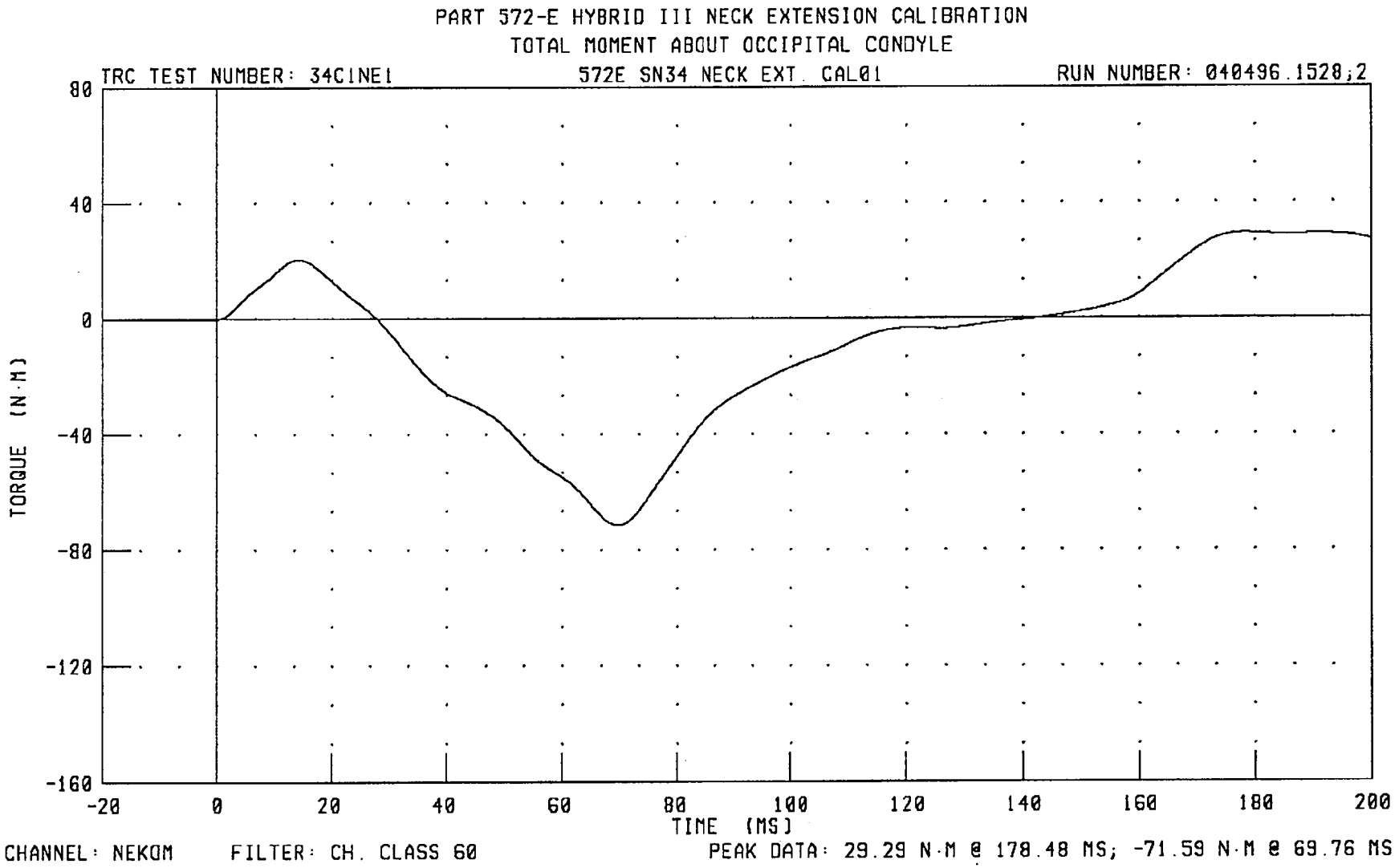

PART 572-E HYBRID III NECK EXTENSION CALIBRATION
NECK MOMENT Y AXIS
TRC TEST NUMBER: 34C1NE1
572E SN34 NECK EXT. CAL01
RUN NUMBER: 040496.1528;2
80
40
0
-40
-80
-120
-160
TORQUE (N-M)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKYM
FILTER: CH. CLASS 60
PEAK DATA: 25.59 N-M @ 177.36 MS; -61.48 N-M @ 69.84 MS


PART 572-E HYBRID III NECK EXTENSION CALIBRATION
TOTAL MOMENT ABOUT OCCIPITAL CONDYLE
TRC TEST NUMBER: 34CINE1
572E SN34 NECK EXT. CAL01
RUN NUMBER: 040496.1528;2
80
40
0
-40
-80
-120
-160
TORQUE (N-M)
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS)
CHANNEL: NEKOM
FILTER: CH. CLASS 60
PEAK DATA: 29.29 N-M @ 178.48 MS; -71.59 N-M @ 69.76 MS

TRANSPORTATION RESEARCH CENTER INC.

THORAX IMPACT TEST

HYBRID III 16-FEB-96

TRC INC. TEST NO: 34C1TH2 572E SN34 H.S.THORAX CAL01

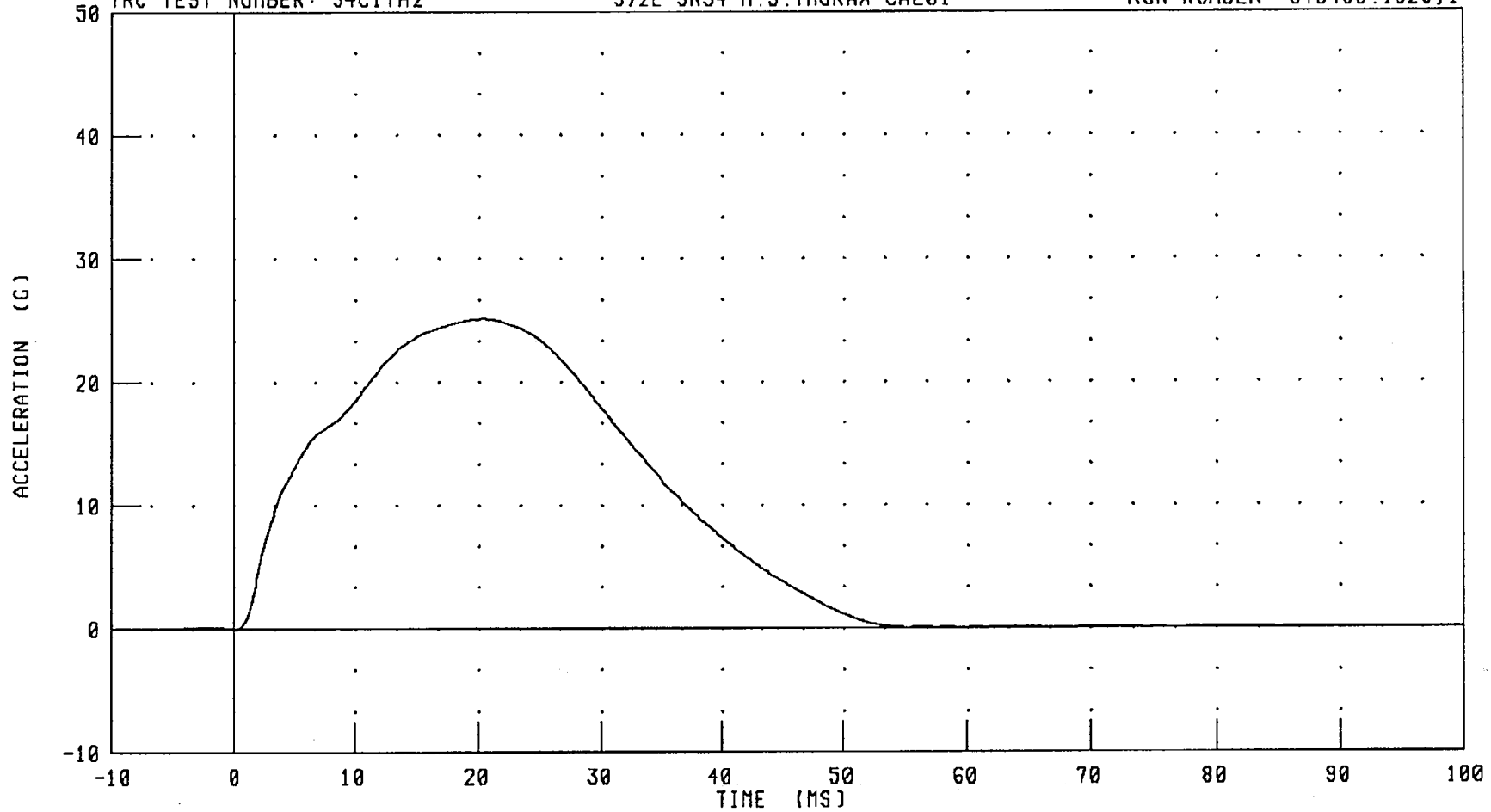
TEST PARAMETER	HIGH SPEED TEST SPECIFICATION	TEST RESULTS
TEMPERATURE	20.6-22.2 DEG. C	20.8 DEG. C
RELATIVE HUMIDITY	10 - 70 %	26.0 %
PENDULUM VELOCITY	6.59 - 6.83 M/S	6.65 M/S
MAXIMUM DEFLECTION	63.5 - 72.6 MM	68.3 MM
MAXIMUM RESISTIVE FORCE	5159 - 5894 N	5757. N
INTERNAL HYSTERESIS	69% - 85%	71.1%

TEST MEETS SPECIFICATIONS

TECHNICIAN Richard LeVan RUN NUMBER: 021696.1507;1

PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM DECELERATION

TRC TEST NUMBER: 34C1TH2 572E SN34 H.S.THORAX CAL01 RUN NUMBER: 040496.1528;1



CHANNEL: PENXG FILTER: CH. CLASS 180 PEAK DATA: 25.13 G @ 20.24 MS; -0.03 G @ 0.08 MS

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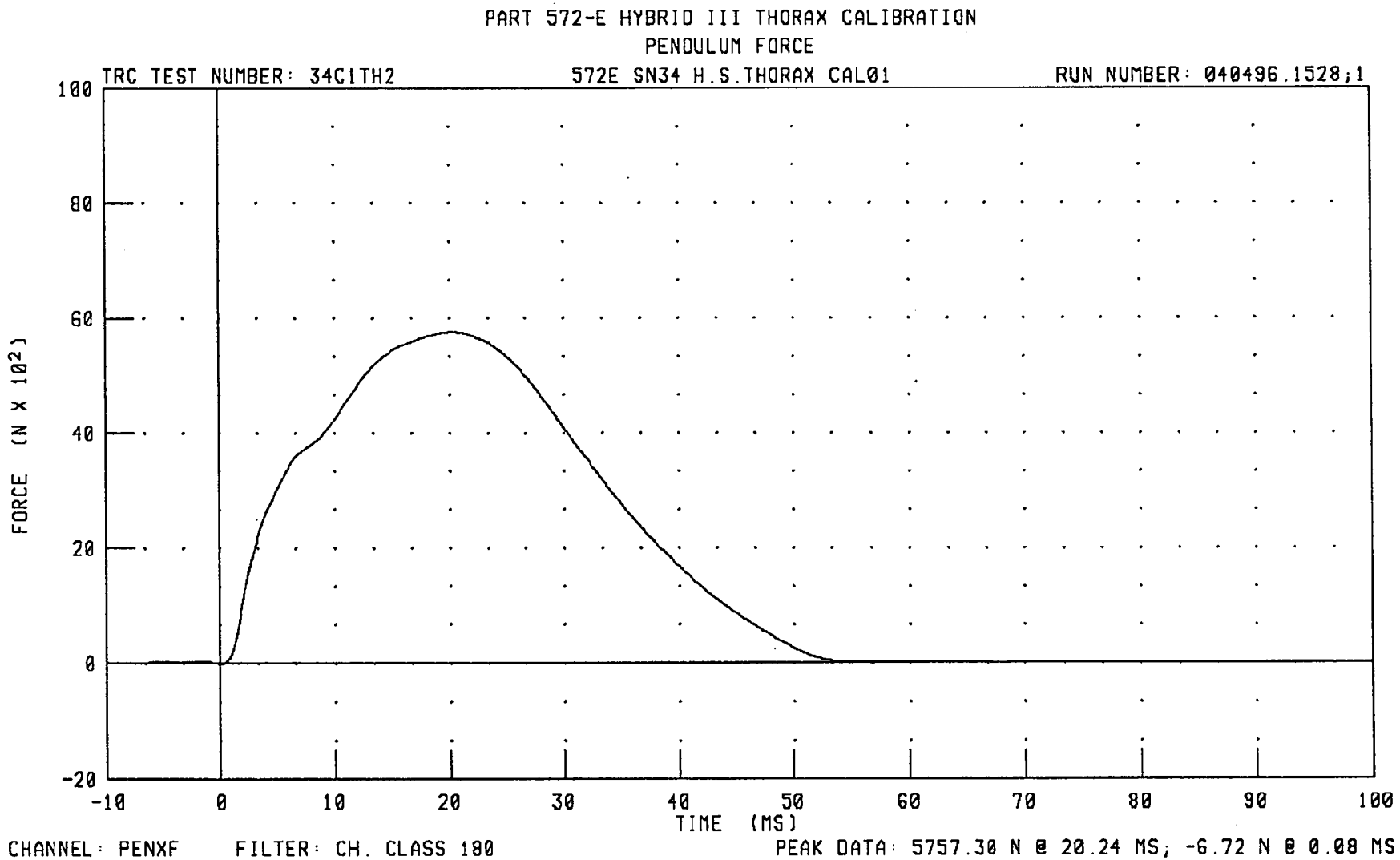
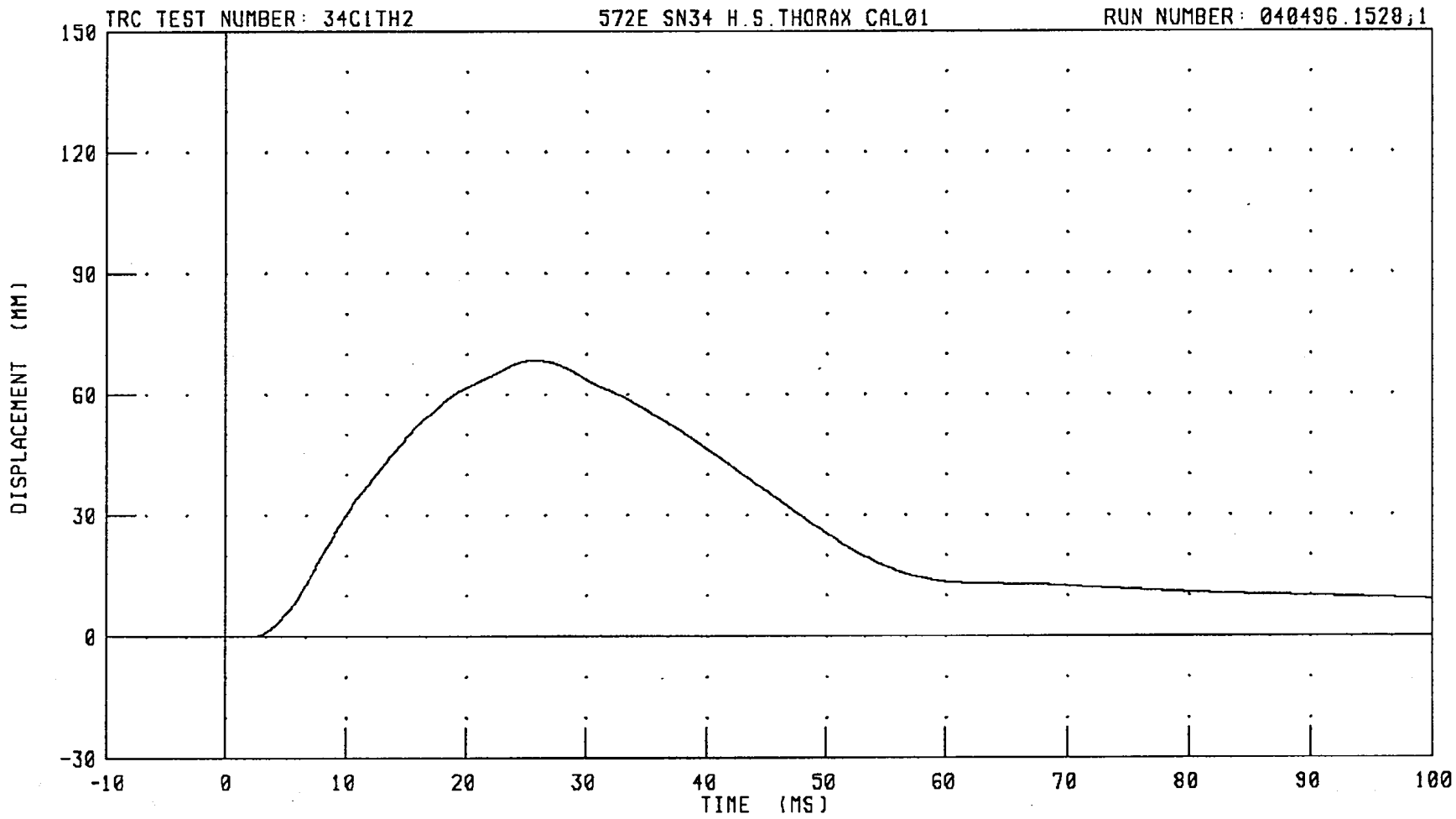

PART 572-E HYBRID III THORAX CALIBRATION
PENDULUM FORCE
TRC TEST NUMBER: 34C1TH2
572E SN34 H.S.THORAX CAL01
RUN NUMBER: 040496.1528;1
100
80
60
40
20
0
-20
FORCE (N X 10²)
-10
0
10
20
30
40
50
60
70
80
90
100
TIME (MS)
CHANNEL: PENXF
FILTER: CH. CLASS 180
PEAK DATA: 5757.30 N @ 20.24 MS; -6.72 N @ 0.08 MS

PART 572-E HYBRID III THORAX CALIBRATION
STERNUM DISPLACEMENT



CHANNEL: CSTXD FILTER: CH. CLASS 180 PEAK DATA: 68.38 MM @ 25.76 MS; -0.04 MM @ -9.68 MS

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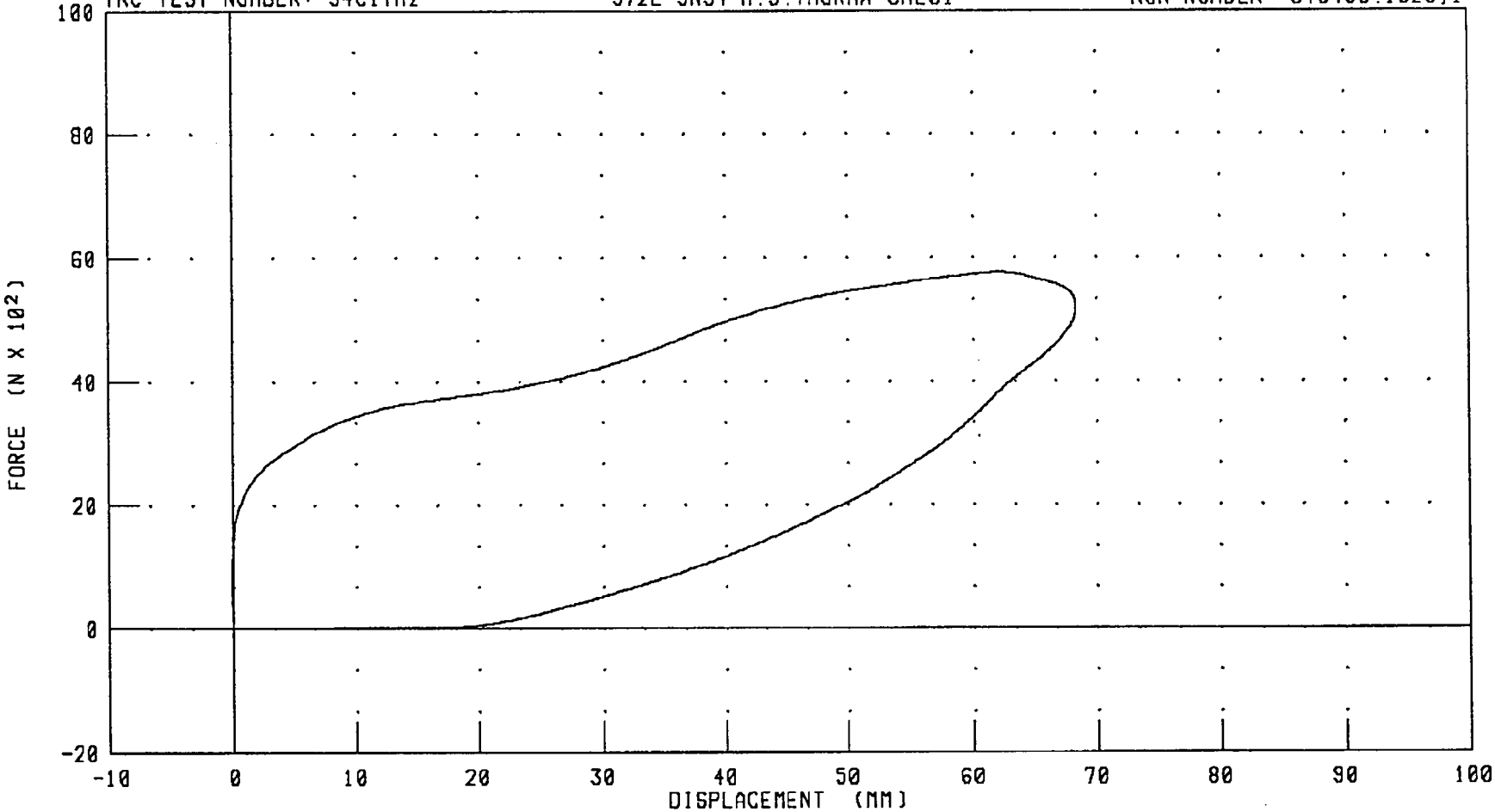
PART 572-E HYBRID III THORAX CALIBRATION
CHEST DISPLACEMENT VS PENDULUM FORCE

TRC TEST NUMBER: 34C1TH2 572E SN34 H.S.THORAX CAL01 RUN NUMBER: 040496.1528;1



CHANNEL: CSTXD FILTER: CH. CLASS 180 PEAK DATA: 68.38 MM @ 25.76 MS; -0.04 MM @ -9.68 MS
PENXF CH. CLASS 180 5757.30 N @ 20.24 MS; -6.72 N @ 0.08 MS

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TRANSPORTATION RESEARCH CENTER INC.

RIGHT KNEE IMPACT TEST

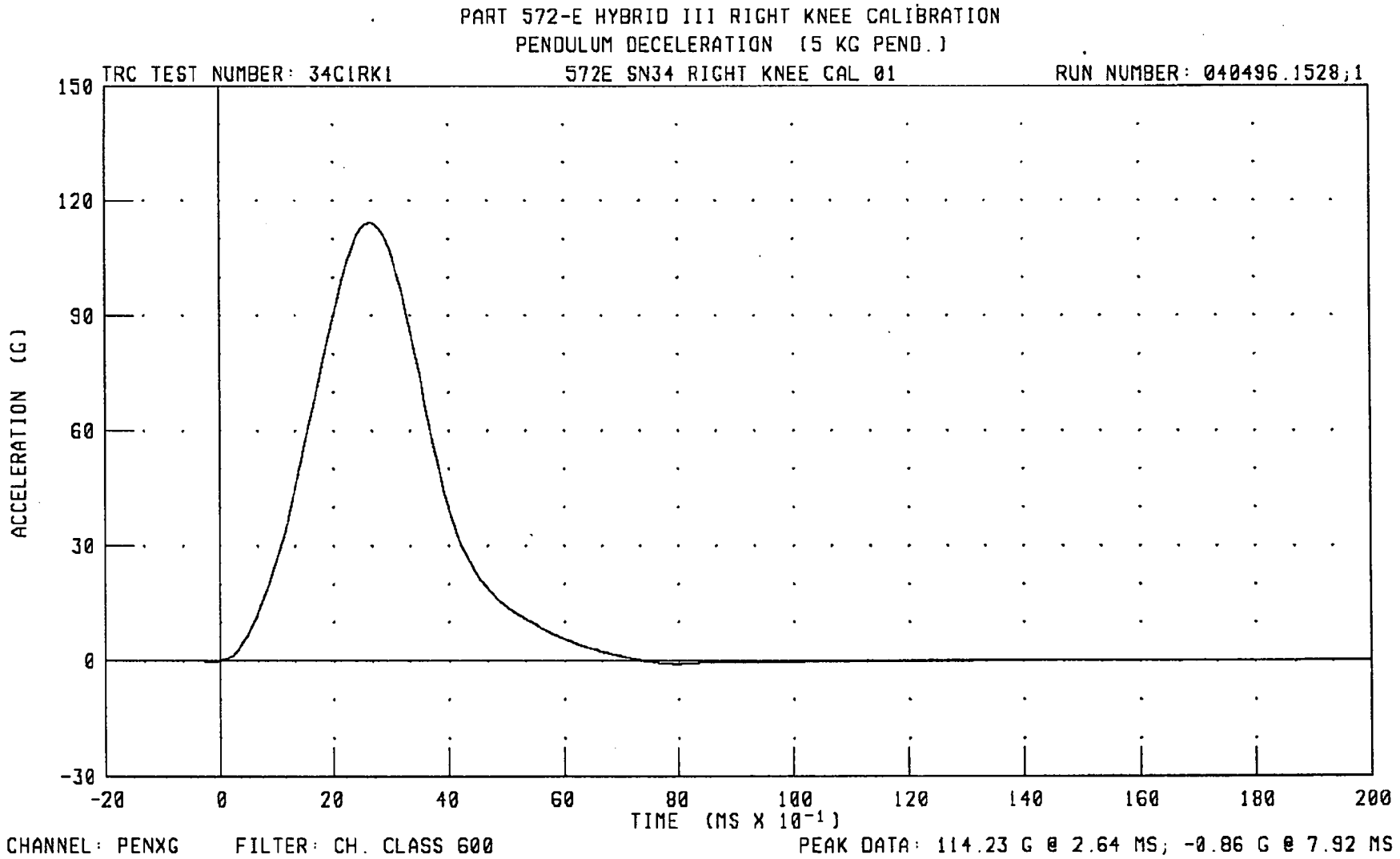
HYBRID III 11-JUL-95

TRC INC. TEST NO: 34C1RK1 572E SN34 RIGHT KNEE CAL 01

TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	63.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.11 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5589.1 N

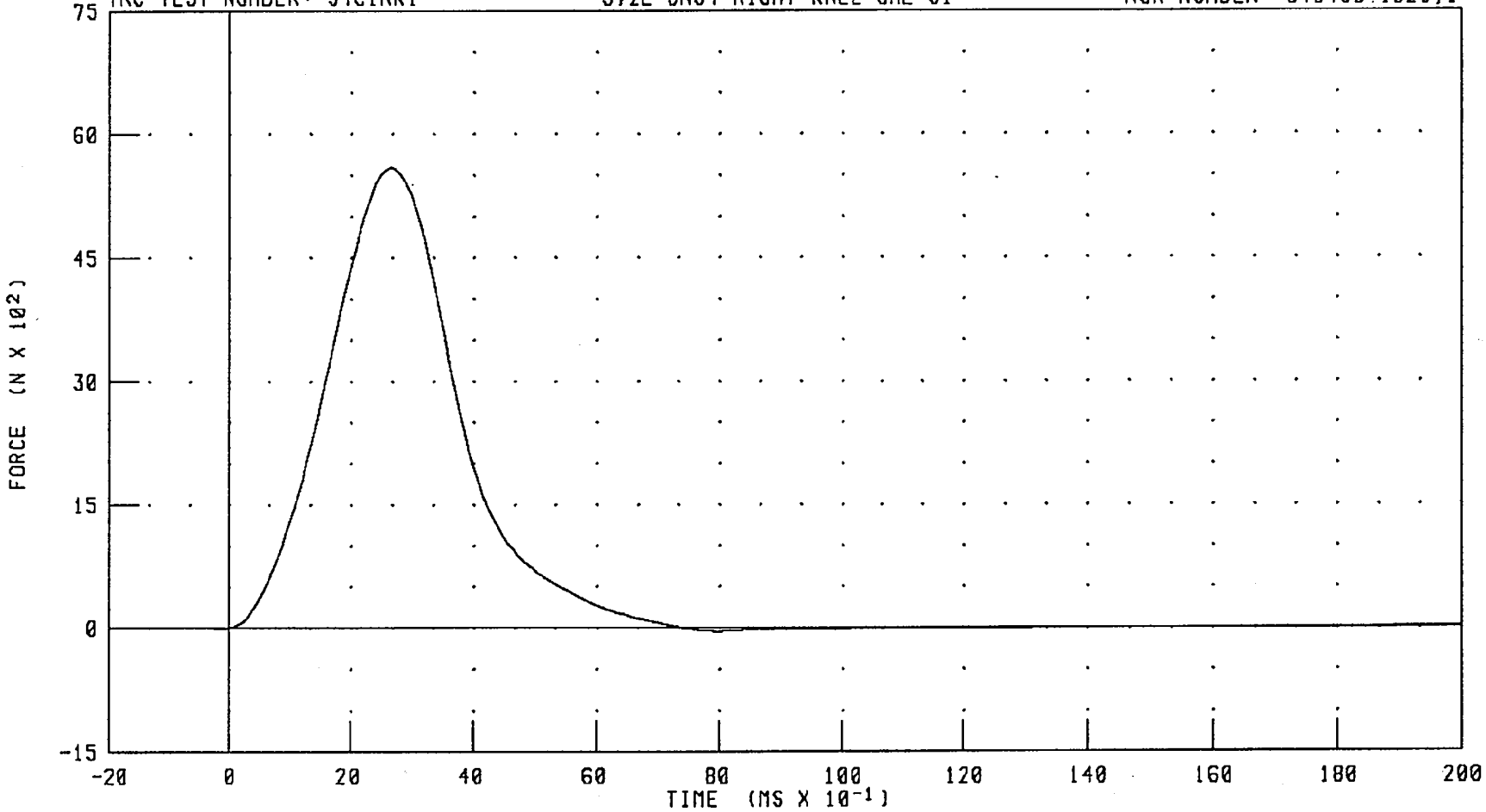
TEST MEETS SPECIFICATIONS

TECHNICIAN Richard LeSueur RUN NUMBER: 071195.1244;1


PART 572-E HYBRID III RIGHT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)
TRC TEST NUMBER: 34C1RK1
572E SN34 RIGHT KNEE CAL 01
RUN NUMBER: 040496.1528;1
ACCELERATION (G)
150
120
90
60
30
0
-30
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXG
FILTER: CH. CLASS 600
PEAK DATA: 114.23 G @ 2.64 MS; -0.86 G @ 7.92 MS

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

TRC TEST NUMBER: 34C1RK1 572E SN34 RIGHT KNEE CAL 01 RUN NUMBER: 040496.1528;1



CHANNEL: PENXF FILTER: CH. CLASS 600 PEAK DATA: 5589.18 N @ 2.64 MS; -42.00 N @ 7.92 MS

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TRANSPORTATION RESEARCH CENTER INC.

LEFT KNEE IMPACT TEST

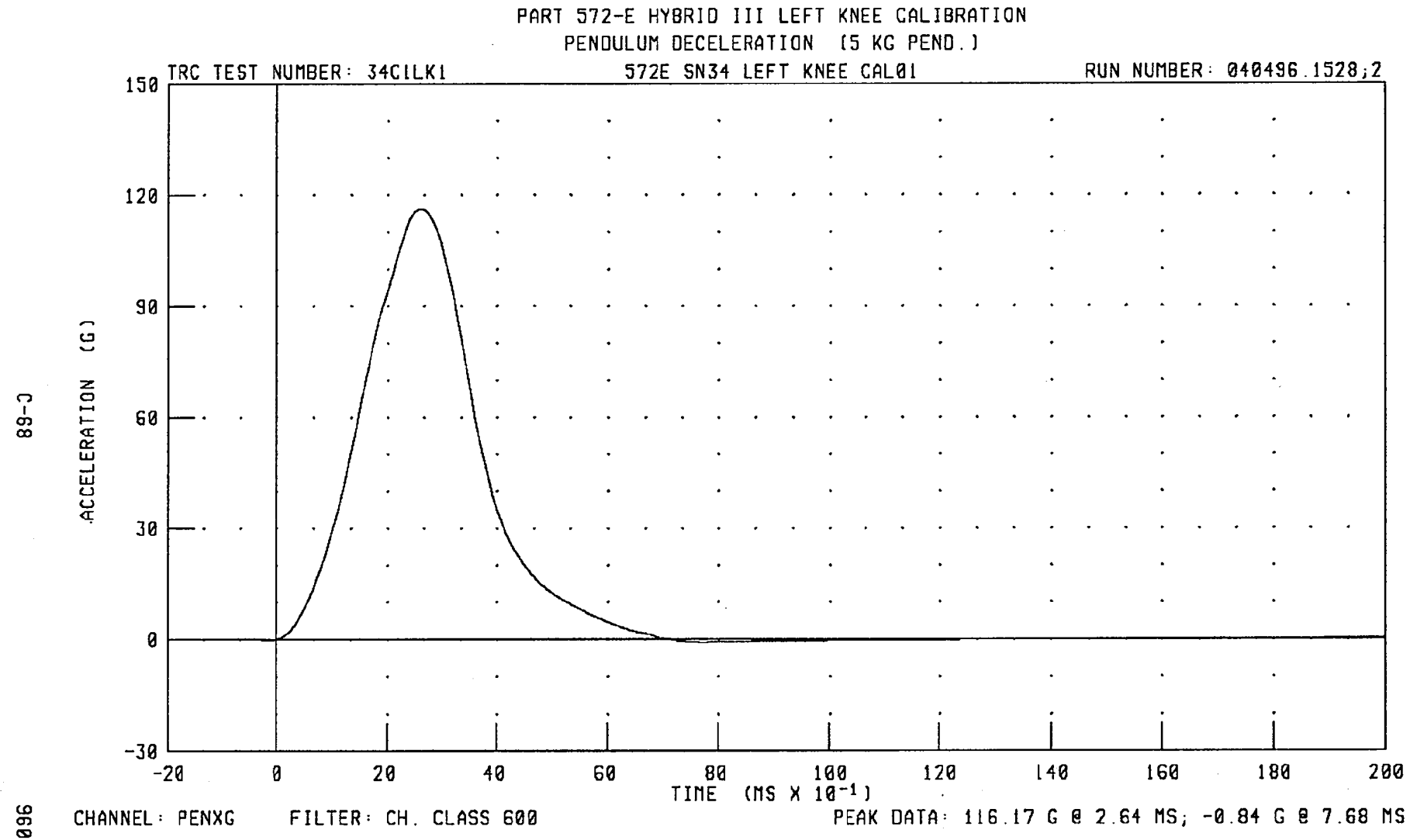
HYBRID III 11-JUL-95

TRC INC. TEST NO: 34C1LK1 572E SN34 LEFT KNEE CAL01

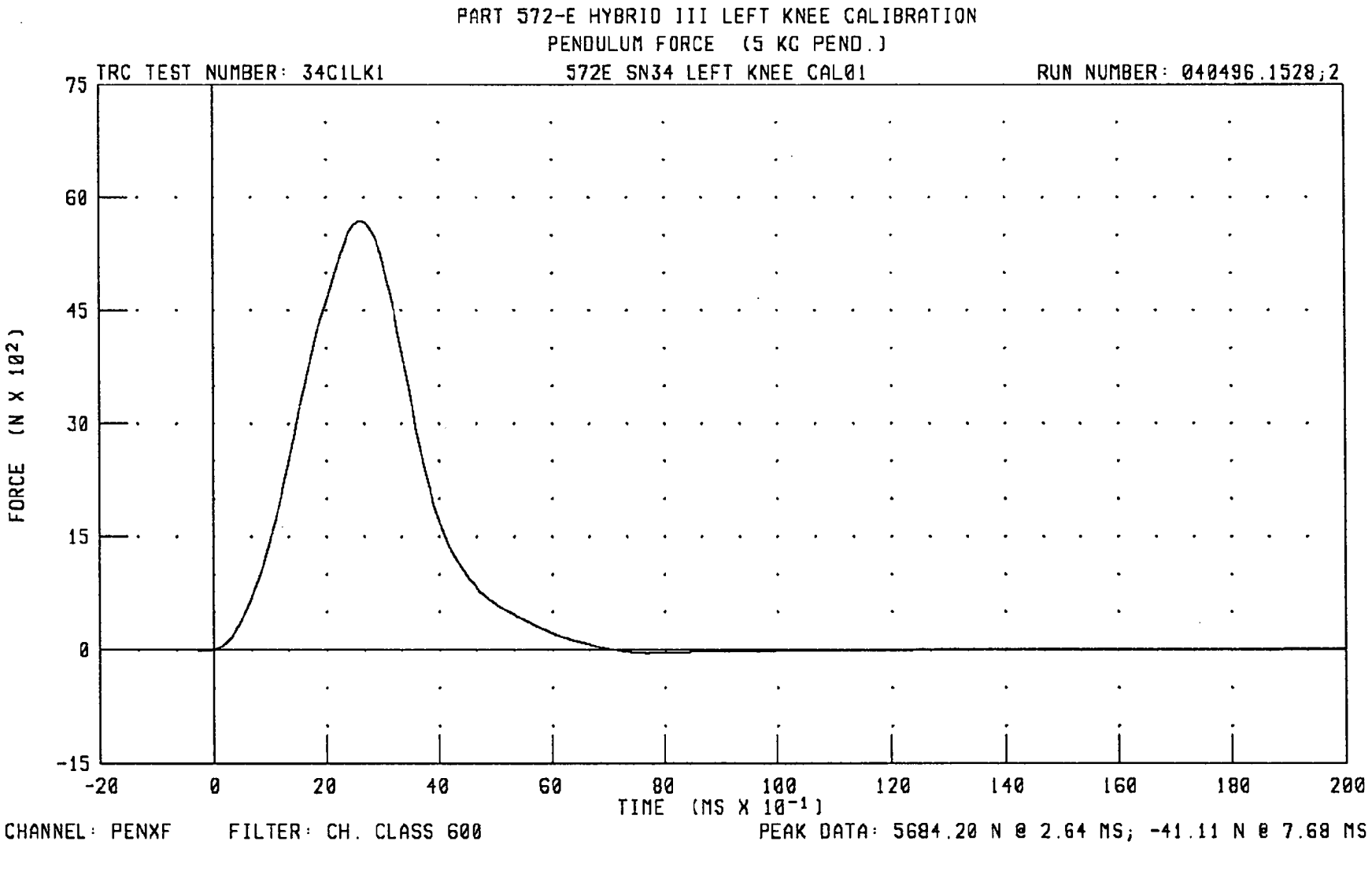
TEST PARAMETER	SPECIFICATION	TEST RESULTS
TEMPERATURE	18.9-25.6 DEG. C	20.6 DEG. C
RELATIVE HUMIDITY	10 - 70 %	63.0 %
PROBE VELOCITY	2.07 - 2.13 M/S	2.10 M/S
PEAK KNEE IMPACT FORCE 5.0 KG PENDULUM	4715 - 5782 N	5684.2 N

TEST MEETS SPECIFICATIONS

TECHNICIAN  RUN NUMBER: 071195.1240;2


PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM DECELERATION (5 KG PEND.)
TRC TEST NUMBER: 34C1LK1
572E SN34 LEFT KNEE CAL01
RUN NUMBER: 040496.1528;2
ACCELERATION (G)
150
120
90
60
30
0
-30
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXG
FILTER: CH. CLASS 600
PEAK DATA: 116.17 G @ 2.64 MS; -0.84 G @ 7.68 MS

960314


PART 572-E HYBRID III LEFT KNEE CALIBRATION
PENDULUM FORCE (5 KG PEND.)
TRC TEST NUMBER: 34C1LK1
572E SN34 LEFT KNEE CAL01
RUN NUMBER: 040496.1528;2
FORCE (N X 10²)
75
60
45
30
15
0
-15
-20
0
20
40
60
80
100
120
140
160
180
200
TIME (MS X 10⁻¹)
CHANNEL: PENXF
FILTER: CH. CLASS 600
PEAK DATA: 5684.20 N @ 2.64 MS; -41.11 N @ 7.68 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
	+Barrier force:	Tension
Neck load cells:	+X force:	Head pushed forward
	+y force:	Head pushed leftward
	+Z force:	Head pulled upward (tension on neck)
	+X moment:	Right ear rotating toward right shoulder
	+Y moment:	Chin rotating toward chest
	+Z moment:	Chin rotating toward left shoulder
Tibia load cells:	+X force:	Tension
	+Y force:	Tension
	+Z force:	Tension
	+X moment:	Bottom of tibia moving leftward
	+Y moment:	Bottom of tibia moving rearward

Frequency Response Classes
SAE J211 OCT88

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