

V 1995

48/24 KPH 90° DRIVER'S SIDE IMPACT
(MOVING DEFORMABLE BARRIER)
1991 GEO TRACKER 4X4

PREPARED BY:
TRANSPORTATION RESEARCH CENTER INC.
10820 STATE ROUTE 347
EAST LIBERTY, OHIO 43319

FINAL REPORT
OCTOBER - DECEMBER 1993

PREPARED FOR:
VEHICLE RESEARCH AND TEST CENTER
P.O. BOX 37
EAST LIBERTY, OH 43319

NOTICE

Transportation Research Center Inc. does not endorse or certify products of manufacturers. The manufacturer's name appears solely to identify the test article. Transportation Research Center Inc. assumes no liability for the report or use thereof. It is responsible for the facts and the accuracy of the data presented herein. This report does not constitute a standard, specification, or regulation.

This publication is distributed by the U. S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
--------	---------------	-------------	---------	--------

LENGTH

in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km

AREA

m ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha

MASS (weight)

oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t

VOLUME

tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³

TEMPERATURE (exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
----	------------------------	----------------------------	---------------------	----

Approximate Conversions from Metric Measures

When You Know	Multiply by	To Find	Symbol
---------------	-------------	---------	--------

LENGTH

millimeters	0.04	inches	in
centimeters	0.4	inches	in
meters	3.3	feet	ft
meters	1.1	yards	yd
kilometers	0.6	miles	mi

AREA

square centimeters	0.16	square inches	in ²
square meters	1.2	square yards	yd ²
square kilometers	0.4	square miles	mi ²
hectares (10,000 m ²)	2.5	acres	

MASS (weight)

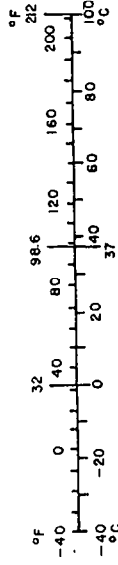
grams	0.035	ounces	oz
kilograms	2.2	pounds	lb
tonnes (1000 kg)	1.1	short tons	

VOLUME

milliliters	0.03	fluid ounces	fl oz
liters	2.1	pints	pt
liters	1.05	quarts	qt
liters	0.26	gallons	gal
cubic meters	35	cubic feet	ft ³
cubic meters	1.3	cubic yards	yd ³

TEMPERATURE (exact)

°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F
----	---------------------	-------------------	------------------------	----



*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. C13.10286.

1. Report No. 931026	2. Government Accession No.	3. Recipient's Catalog No. VRTC-83-0304															
4. Title and Subtitle 48/24 KPH 90° DRIVER'S SIDE IMPACT (MOVING DEFORMABLE BARRIER) 1991 GEO TRACKER 4X4		5. Report Date NOVEMBER 1993															
		6. Performing Organization Code															
7. Author(s) K. W. Looker, Project Engineer, TRC		8. Performing Organization Report No. 931026															
9. Performing Organization Name and Address National Highway Traffic Safety Admin. Vehicle Research and Test Center P. O. BOX 37 East Liberty, OH 43319		10. Work Unit No. (TRAIS)															
		11. Contract or Grant No. DTNH22-88-C-07292															
12. Sponsoring Agency Name and Address U. S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh St., S.W. Washington, DC 20590		13. Type of Report and Period Covered FINAL REPORT OCT. - DEC. 1993															
		14. Sponsoring agency Code DOT/NHTSA/VRTC															
15. Supplemental Notes																	
16. Abstract This 48/24 kph 90° driver's side impact test was conducted at Transportation Research Center Inc. on October 26, 1993. The test vehicle was a 1991 Geo Tracker 4X4. This test was conducted to aid in the development of extending the test procedure for FMVSS No. 214, "Side Impact Protection - Passenger Cars," to include light trucks and vans. The deformable barrier face was raised 178 millimeters above its standard height specified in the FMVSS No. 214 Laboratory Test Procedure and its test weight was 1625 kilograms. Energy absorbing padding (762 mm of Arcel 512, 2.5 pcf) was placed on the inside surface of the driver's door panel aligned with the driver dummy's pelvis and thorax. The impact velocity of the moving deformable barrier was 54.2 kph. The moving deformable barrier struck the vehicle 936 millimeters forward of the subject vehicle's wheelbase mid-point. Results for the driver SID are: <table border="0"> <tr> <td></td> <td style="text-align: center;"><u>DRIVER SID</u></td> </tr> <tr> <td>Left upper rib acceleration</td> <td style="text-align: center;">55.3 g's</td> </tr> <tr> <td>Left lower rib acceleration</td> <td style="text-align: center;">58.4 g's</td> </tr> <tr> <td>Upper spine acceleration</td> <td style="text-align: center;">78.1 g's</td> </tr> <tr> <td>Lower spine acceleration</td> <td style="text-align: center;">101.1 g's</td> </tr> <tr> <td>Thoracic Trauma Index (TTI)</td> <td style="text-align: center;">80</td> </tr> <tr> <td>Pelvic acceleration</td> <td style="text-align: center;">111.1 g's</td> </tr> </table>					<u>DRIVER SID</u>	Left upper rib acceleration	55.3 g's	Left lower rib acceleration	58.4 g's	Upper spine acceleration	78.1 g's	Lower spine acceleration	101.1 g's	Thoracic Trauma Index (TTI)	80	Pelvic acceleration	111.1 g's
	<u>DRIVER SID</u>																
Left upper rib acceleration	55.3 g's																
Left lower rib acceleration	58.4 g's																
Upper spine acceleration	78.1 g's																
Lower spine acceleration	101.1 g's																
Thoracic Trauma Index (TTI)	80																
Pelvic acceleration	111.1 g's																
17. Key Words 48/24 kph 90° Driver's Side Impact Light Trucks and Vans 1991 Geo Tracker 4X4		18. Distribution Statement															
19. Security Classif. (of this report) UNCLASSIFIED	20. Security Classif. (of this page) UNCLASSIFIED	21. No. of Pages	22. Price														

TABLE OF CONTENTS

<u>Section</u>	<u>Title</u>	<u>Page</u>
1.0	PURPOSE AND TEST PROCEDURE	1-1
2.0	SIDE IMPACT TEST SUMMARY	2-1
3.0	FMVSS 214 DATA	3-1
4.0	FMVSS 301 DATA	4-1
5.0	VEHICLE, OCCUPANT, & CAMERA MEASUREMENTS	5-1
APPENDIX A	PHOTOGRAPHS	A-1
APPENDIX B	DATA PLOTS	B-1
APPENDIX C	DUMMY CALIBRATION INFORMATION	C-1
APPENDIX D	MISCELLANEOUS TEST INFORMATION	D-1

LIST OF TABLES

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1	CRASH TEST SUMMARY	2-4
2	TEST VEHICLE INFORMATION	2-5
3	POST-IMPACT DATA	2-8
4	TEST CONDITIONS	2-9
5	VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY	2-12
6	MOVING DEFORMABLE BARRIER ACCELEROMETER LOCATIONS AND DATA SUMMARY	2-15
7	VEHICLE EXTERIOR PROFILES AND STATIC CRUSH	2-16
8	MOVING DEFORMABLE BARRIER FACE STATIC CRUSH	2-24
9	DUMMY DATA SUMMARY	3-2
10	POST-IMPACT DUMMY/VEHICLE DATA	3-5
11	FUEL SYSTEM DATA	4-2
12	FMVSS 301 POST-IMPACT TEST DATA	4-3
13	CAMERA INFORMATION	5-6

LIST OF FIGURES

<u>NUMBER</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1	IMPACT VELOCITY MEASUREMENT SYSTEM	2-10
2	VEHICLE ACCELEROMETER PLACEMENT	2-11
3	MOVING DEFORMABLE BARRIER ACCELEROMETER PLACEMENT	2-14
4	VEHICLE EXTERIOR STATIC CRUSH PROFILES	2-17
5	PRE-TEST AND POST-TEST MEASUREMENTS	2-22
6	MOVING DEFORMABLE BARRIER FACE CRUSH	2-23
7	FMVSS 301 STATIC ROLLOVER TEST DATA	4-4
8	DUMMY AND SEAT POSITIONING DATA	5-2
9	DUMMY LONGITUDINAL CLEARANCE MEASUREMENTS	5-3
10	DUMMY LATERAL CLEARANCE MEASUREMENTS	5-4
11	CAMERA POSITIONS	5-5

LIST OF PHOTOGRAPHS

<u>Title</u>	<u>Figure</u>
PRE-TEST FRONT - VIEW 1	A-1
PRE-TEST FRONT - VIEW 2	A-2
POST-TEST FRONT VIEW	A-3
POST-TEST LEFT FRONT VIEW	A-4
PRE-TEST LEFT SIDE VIEW	A-5
POST-TEST LEFT SIDE - VIEW 1	A-6
POST-TEST LEFT SIDE - VIEW 2	A-7
PRE-TEST REAR - VIEW 1	A-8
PRE-TEST REAR - VIEW 2	A-9
POST-TEST REAR VIEW	A-10
POST-TEST LEFT REAR VIEW	A-11
PRE-TEST RIGHT SIDE VIEW	A-12
POST-TEST RIGHT SIDE VIEW	A-13
PRE-TEST OVERHEAD VIEW	A-14
PRE-TEST OVERHEAD CLOSE-UP VIEW	A-15
PRE-TEST FUEL FILLER CAP VIEW	A-16
POST-TEST FUEL FILLER CAP VIEW	A-17
PRE-TEST DRIVER DUMMY POSITION VIEW	A-18
POST-TEST DRIVER DUMMY POSITION - VIEW 1	A-19
POST-TEST DRIVER DUMMY POSITION - VIEW 2	A-20
PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1	A-21
PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2	A-22
PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 3	A-23
PRE-TEST DOOR PADDING - VIEW 1	A-24
PRE-TEST DOOR PADDING - VIEW 2	A-25
POST-TEST DRIVER DUMMY HEAD CONTACT VIEW	A-26
POST-TEST DRIVER DUMMY CONTACT VIEW	A-27
POST-TEST BALLAST LOCATION VIEW	A-28
PRE-TEST VEHICLE IMPACTOR FACE - FRONT VIEW	A-29
PRE-TEST VEHICLE IMPACTOR FACE - RIGHT SIDE VIEW	A-30
POST-TEST VEHICLE IMPACTOR FACE - RIGHT SIDE VIEW	A-31
PRE-TEST VEHICLE IMPACTOR FACE - LEFT SIDE VIEW	A-32

LIST OF PHOTOGRAPHS, CONT'D.

<u>Title</u>	<u>Figure</u>
POST-TEST VEHICLE IMPACTOR FACE - LEFT SIDE VIEW	A-33
POST-TEST VEHICLE IMPACTOR FACE - TOP VIEW	A-34
POST-TEST VEHICLE ON STATIC ROLLOVER DEVICE	A-35
POST-TEST FUEL LEAKAGE LOCATION	A-36

SECTION 1.0

PURPOSE AND TEST PROCEDURE

PURPOSE

This 48/24 kph 90° driver's side impact test was conducted for Vehicle Research and Test Center by Transportation Research Center Inc. (TRC). The purpose of this test was to aid in the development of extending the test procedure for FMVSS 214, "Side Impact Protection - Passenger Cars," to include the testing of light trucks and vans.

TEST PROCEDURE

This test was conducted using NHTSA's Office of Vehicle Safety Compliance (OVSC) Laboratory Test Procedure No. TP-214D-02 as a guideline. Data was obtained relative to FMVSS 214, "Side Impact Protection - Passenger Cars," and FMVSS 301, "Fuel System Integrity," performance.

The test vehicle was instrumented with ten (10) accelerometers oriented to measure longitudinal, lateral, and vertical axis accelerations. The test vehicle was positioned so that its longitudinal centerline was at an angle of 63° to the tow cable system.

The test vehicle contained one (1) Part 572 F side impact adult male anthropomorphic test device (dummy). The dummy was positioned in the left front outboard seating position according to the dummy placement procedure specified as an attachment to the Laboratory Test Procedure. The dummy was instrumented with head, pelvis, upper spine, and lower spine accelerometers oriented to measure longitudinal, lateral, and vertical axis accelerations. Upper rib and lower rib accelerometers were oriented to measure lateral axis accelerations. The dummy was restrained by a 3-point unbelt. Energy absorbing padding (762 mm of Arcel 512, 2.5 pcf) was placed on the inside surface of the driver's door panel aligned with the driver dummy's pelvis and thorax.

The moving deformable barrier was instrumented with five (5) accelerometers oriented to measure longitudinal, lateral, and vertical axis accelerations. The moving barrier was crabbed clockwise at a 27° angle to the tow cable system and its deformable barrier face was raised 178 mm above the standard barrier face height specified in the Laboratory Test Procedure. The bottom most edge of the deformable barrier face was 457 mm above the ground level. The moving deformable barrier's weight was 1625 kg and its specified velocity range was 53.1 to 54.7 kph.

The subject vehicle was monitored for fuel leakage immediately after the impact event and during a 360° post-impact static rollover test.

The thirty-three (33) data channels were multiplexed and recorded on a 14-track tape deck. The data was digitally sampled at 12500 samples per second and processed per Section 12.0 of the Laboratory Test Procedure.

The crash event was recorded by one (1) real-time panning motion picture camera and eight(8) high-speed motion picture cameras operating at approximately 1000 frames per second.

The vehicle and occupant data are summarized in Section 2.0. The FMVSS 214 data are presented in Section 3.0. The FMVSS 301 data are presented in Section 4.0. The vehicle, occupant, and camera measurements are presented in Section 5.0. Appendix A contains the still photographic prints. Appendix B contains the dummy and vehicle data plots. Appendix C contains the dummy calibration data. Appendix D contains miscellaneous test information.

SECTION 2.0

SIDE IMPACT TEST SUMMARY

TEST RESULTS SUMMARY

This 48/24 kph 90° driver's side impact test was conducted at TRC on October 26, 1993.

The test vehicle, a 1991 GEO Tracker 4X4, was equipped with a 1.6-liter, inline engine, manual transmission, and power brakes. One Part 572 F dummy were seated in the left front outboard seating position. The vehicle's test weight was 1292 kilograms. The moving deformable barrier's impact speed was 54.2 kph. The vehicle's maximum static crush was 395 millimeters.

The driver dummy's Thoracic Trauma Index (TTI(d)) and Head Injury Criteria (HIC) were 80 and 681, respectively. Maximum pelvis lateral acceleration was 111.1 g (see DATA AQUISITION EXPLANATIONS).

The moving barrier's leading edge of contact was 936 mm forward of the subject vehicle's wheelbase mid-point.

The door on the struck side of the test vehicle did not separate from the vehicle's main body at the hinges or latch. The door on the opposite side did not open during the crash event.

DATA ACQUISITION EXPLANATIONS

The driver dummy's X-axis pelvis acceleration data channel, PEVXG1, stopped recording data after 60 milliseconds because the accelerometer's cable was pinched by vehicle crush. This anomaly also affected the computation of the driver dummy's resultant pelvis acceleration.

The driver dummy's Y-axis pelvis acceleration data channel, PEVYG1, stopped recording data after 60 milliseconds because the accelerometer's cable was pinched by vehicle crush. This anomaly also affected the computation of the driver dummy's resultant pelvis acceleration.

The driver dummy's X-axis head acceleration data channel, HEDXG1, stopped recording data after 59 milliseconds because the accelerometer's cable was pinched by vehicle crush. This anomaly also affected the computation of the driver dummy's resultant head acceleration and 36 millisecond HIC.

The driver dummy's Z-axis upper spine acceleration data channel, TOLZG1, stopped recording data after 50 milliseconds because the accelerometer's cable was pinched by vehicle crush. This anomaly also affected the computation of the driver dummy's resultant upper spine acceleration.

The driver dummy's Y-axis left upper thorax rib acceleration data channel, LURYG1, stopped recording data after 51 milliseconds because the accelerometer's cable was pinched by vehicle crush.

The driver dummy's Y-axis redundant left lower thorax rib acceleration data channel, LLRYGA, stopped recording data after 45 milliseconds because the accelerometer's cable was pinched by vehicle crush.

The vehicle's left front door centerline Y-axis acceleration data channel, LFDYG1, did not return to zero after the impact event.

TABLE 1 CRASH TEST SUMMARY

TEST TYPE: Moving Deformable Barrier Left Side Impact

TEST DATE: 10/26/93 TEST TIME: 1430 AMBIENT TEMP. (°C): 19

VEHICLE: 1991 GEO Tracker 4X4

VEHICLE TEST WEIGHT (KG): 1292

MOVING BARRIER TEST WEIGHT (KG): 1625

IMPACT ANGLE¹ (DEG): 270

IMPACT VELOCITY² (KPH): PRIMARY = NA³ SECONDARY = 54.2

DUMMIES:

DRIVER #903

TYPE: PART 572 F

LOCATION: LEFT FRONT

RESTRAINT: 3-POINT UNIBELT

NUMBER OF DATA CHANNELS: 33

NUMBER OF CAMERAS: HIGH-SPEED 8 REAL-TIME 1

¹Measured clockwise from struck vehicle's front longitudinal centerline.

²Speed trap measurement ($\pm$.08 kph accuracy)

³The primary speed trap failed.

TABLE 2 TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: Cami Automotive Inc.

MAKE/MODEL/BODY STYLE: GEO/TRACKER 4X4/ 2-Door Multipurpose Passenger Vehicle

MODEL YEAR: 1991

VIN: 2CNBJ18U8M6901399

COLOR: Black

ENGINE DATA: TYPE: inline CYLINDERS: 4 DISPLACEMENT: 1.6 liters

TRANSMISSION DATA: 5 SPEED, X MANUAL, ___ AUTOMATIC, ___ FWD, ___ RWD, X 4WD

DATE VEHICLE RECEIVED: 10/20/93

ODOMETER READING: 39589

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING	No	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	Yes	ANTI-SKID BRAKE	No
CLOCK	Yes	REAR WINDOW DEFROSTER	No
OTHER	None		

REMARKS:

- 1.IS THE VEHICLE STOCK THROUGHOUT? Yes
- 2.DOES VEHICLE SHOW EVIDENCE OF PRIOR ACCIDENT HISTORY? No
- 3.DOES VEHICLE SHOW ANY SIGNIFICANT CORROSION? No
- 4.CONDITION OF THE FRONT/REAR BUMPER AND FRAME: Good

CERTIFICATION DATA FROM VEHICLE'S LABEL:

VEHICLE MANUFACTURED BY: Cami Automotive Inc.

DATE OF MANUFACTURE: 08/90

VIN: 2CNBJ18U8M6901399

GVWR: 3197 LBS.

GAWR: FRONT: 1455 LBS., REAR: 1985 LBS.

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

TIRES ON VEHICLE (MFR., LINE, SIZE): BF Goodrich, Trailmaker, P205/75R15

TIRE PRESSURE WITH MAXIMUM CAPACITY VEHICLE LOAD: FRONT: 241 kpa
REAR: 241 kpa

SPARE TIRE (MFR., LINE, SIZE): BF Goodrich, Trailmaker, P205/75R15

TYPE OF SEATS: FRONT: Bucket
REAR: Bench

TYPE OF FRONT SEAT BACKS: Manually adjustable

MAXIMUM WIDTH: 1630 MM

WHEELBASE: 2210 MM

LOCATION OF "RECOMMENDED TIRE PRESSURE" LABEL:

The label was located on the driver's side B-pillar.

DATA FROM VEHICLE'S "RECOMMENDED TIRE PRESSURE" LABEL:

RECOMMENDED TIRE SIZE: P205/75R15

RECOMMENDED COLD TIRE PRESSURE: FRONT: 23 psi; REAR: 23 psi

DESIGNATED SEATING CAPACITY: 2 FRONT 2 REAR 4 TOTAL

VEHICLE CAPACITY WEIGHT: 800 LBS

TEST VEHICLE ATTITUDE (ALL MEASUREMENTS ARE IN MILLIMETERS):

DELIVERED ATTITUDE: LF 703; RF 707; LR 798; RR 806

PRE-TEST ATTITUDE: LF 756; RF 756; LR 762; RR 766

POST-TEST ATTITUDE: LF 715 RF 765 LR 734 RR 750

TABLE 2 TEST VEHICLE INFORMATION, CONT'D.

WEIGHT OF TEST VEHICLE AS RECEIVED (WITH MAXIMUM FLUIDS):

RIGHT FRONT	280 KG	RIGHT REAR	241 KG
LEFT FRONT	281 KG	LEFT REAR	242 KG
TOTAL FRONT WEIGHT	561 KG	(53.7% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	483 KG	(46.3% OF TOTAL VEHICLE WEIGHT)	
TOTAL DELIVERED WEIGHT 1044 KG			
TARGET TEST WEIGHT ¹ = 1293 KG			

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 169 KG OF CARGO WEIGHT:

RIGHT FRONT	323 KG	RIGHT REAR	315 KG
LEFT FRONT	335 KG	LEFT REAR	319 KG
TOTAL FRONT WEIGHT	658 KG	(50.9% OF TOTAL VEHICLE WEIGHT)	
TOTAL REAR WEIGHT	634 KG	(49.1% OF TOTAL VEHICLE WEIGHT)	
TOTAL TEST WEIGHT	1292 KG	(0.1% UNDER TARGET TEST WEIGHT)	

WEIGHT OF BALLAST SECURED IN VEHICLE CARGO AREA: 73 KG

COMPONENTS REMOVED TO MEET TARGET TEST WEIGHT: None

CG = 1085 MM REARWARD OF FRONT WHEEL CENTERLINE

¹Provided by VRTC to match test performed on May 25, 1993.

TABLE 3 POST-IMPACT DATA

TEST NUMBER: 931026

TEST DATE: 10/26/93

TEST TIME: 1430

TEST TYPE: Moving Deformable Barrier Left Side Impact

IMPACT ANGLE¹ (DEG): 270

AMBIENT TEMPERATURE AT IMPACT AREA: 19° C

TEMPERATURE IN OCCUPANT COMPARTMENT: 22° C

IMPACT VELOCITY: PRIMARY = 54.4 KPH
SECONDARY = 54.3 KPH
(SPECIFIED RANGE = 53.1 TO 54.7 KPH)

DISTANCE FROM VEHICLE TO BARRIER: ENTERING VELOCITY TRAP = 356 MM

EXITING VELOCITY TRAP = 51 MM

¹Measured clockwise from struck vehicle's front longitudinal centerline.

TABLE 4 TEST CONDITIONS

TEST NUMBER: 931026
DATE OF TEST: 10/26/93
TIME OF TEST: 1430
WIND VELOCITY: NA
HUMIDITY: NA
AMBIENT TEMPERATURE AT IMPACT AREA: 19° C
TEMPERATURE IN OCCUPANT COMPARTMENT: 22° C

VEHICLE DATA

	<u>ACTUAL</u>	<u>INTENDED</u>
SUBJECT VEHICLE TEST WEIGHT (KG):	1292	1293
MOVING DEFORMABLE BARRIER TEST WEIGHT (KG):	1625	1633
MOVING DEFORMABLE BARRIER VELOCITY (KPH) ¹ :	54.2	53.9
IMPACT POINT (MM) ² :	936	940

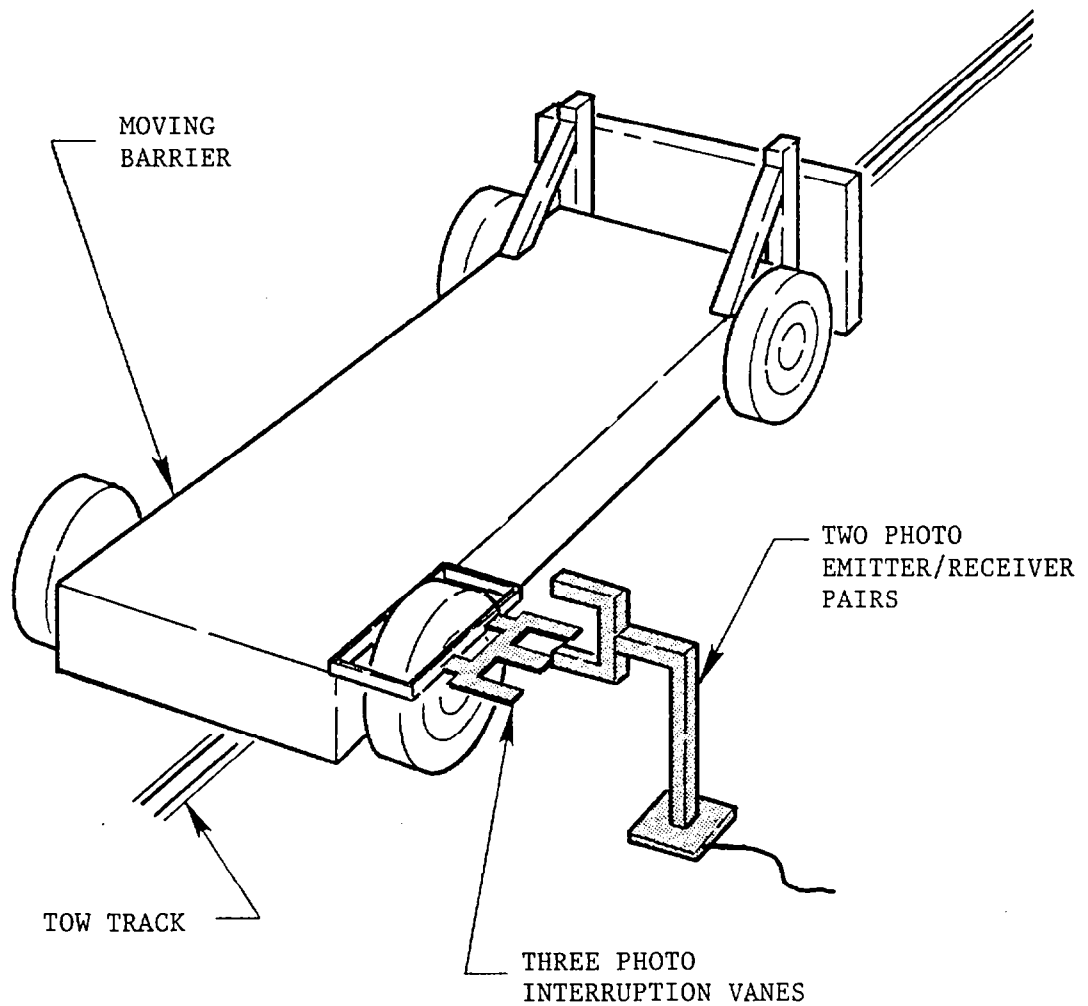
DUMMY INFORMATION

	<u>DRIVER</u>
TYPE:	SID
SERIAL NO.:	903
INSTRUMENTATION:	
HEAD ACCELEROMETERS:	3
UPPER SPINE ACCELEROMETERS:	4
UPPER RIB ACCELEROMETERS:	2
LOWER RIB ACCELEROMETERS:	2
LOWER SPINE ACCELEROMETERS:	4
PELVIS ACCELEROMETERS:	3
RESTRAINT SYSTEM:	3-POINT UNIBELT

¹As measured over final 305 mm of travel.

²As measured forward of the subject vehicle's wheelbase mid-point.

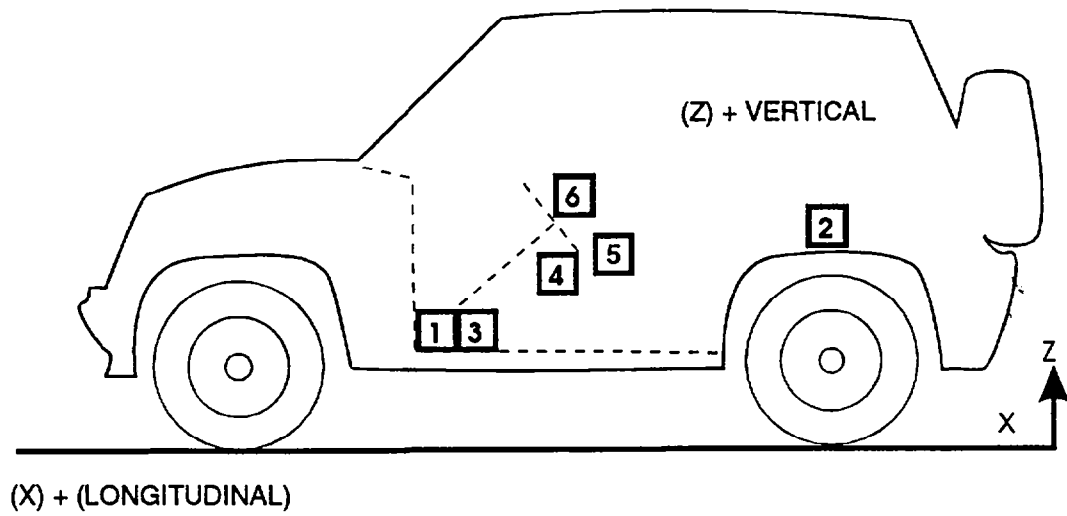
FIGURE 1 IMPACT VELOCITY MEASUREMENT SYSTEM



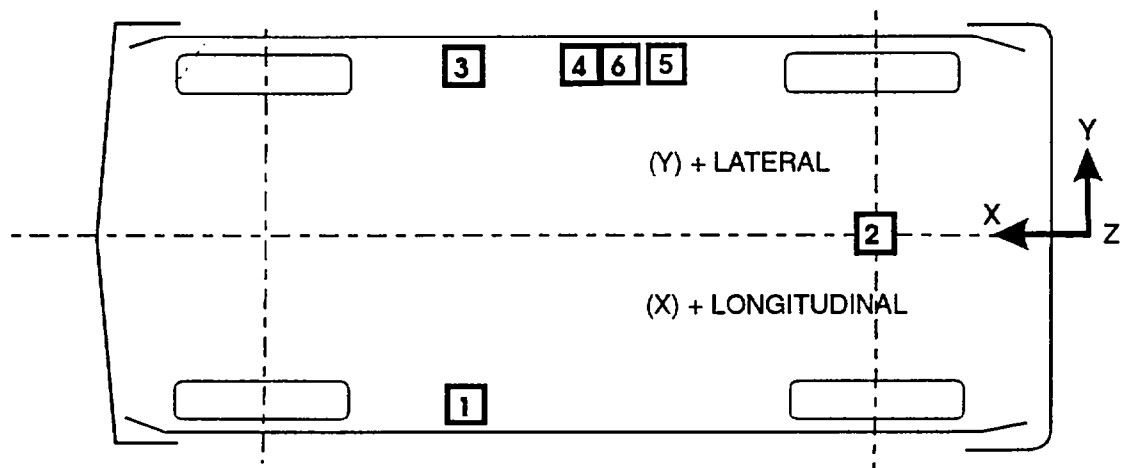
The final vane clears the final emitter/receiver pair 51 millimeters before impact.

The vanes have 305-millimeter spacing.

FIGURE 2 VEHICLE ACCELEROMETER PLACEMENT



SIDE VIEW



BOTTOM VIEW

TABLE 5

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 931026

No. LOCATION	X*	Y*	Z*	POSITIVE		NEGATIVE	
				DIRECTION	MAX G MSEC	DIRECTION	MAX G MSEC
1 RIGHT FRONT SILL	1966	-621	371				
LONGITUDINAL				11.4	50.7	10.0	10.2
LATERAL				2.4	173.7	20.3	63.1
VERTICAL				5.2	79.1	7.3	54.8
RESULTANT				20.6	50.2		
2 REAR FLOORPAN	714	0	582				
OVER AXLE							
LONGITUDINAL				3.8	23.3	7.8	3.6
LATERAL				6.3	104.8	23.8	61.6
VERTICAL				22.4	64.9	21.2	44.9
RESULTANT				29.1	63.7		
3 LEFT FRONT SILL	2010	660	361				
LATERAL				27.9	11.4	68.8	6.5
4 LEFT FRONT DOOR	1875	676	702				
CENTERLINE ¹							
LATERAL				39.4	21.8	182.7	10.9

TABLE 5

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY CONTINUED

TEST NUMBER 931026

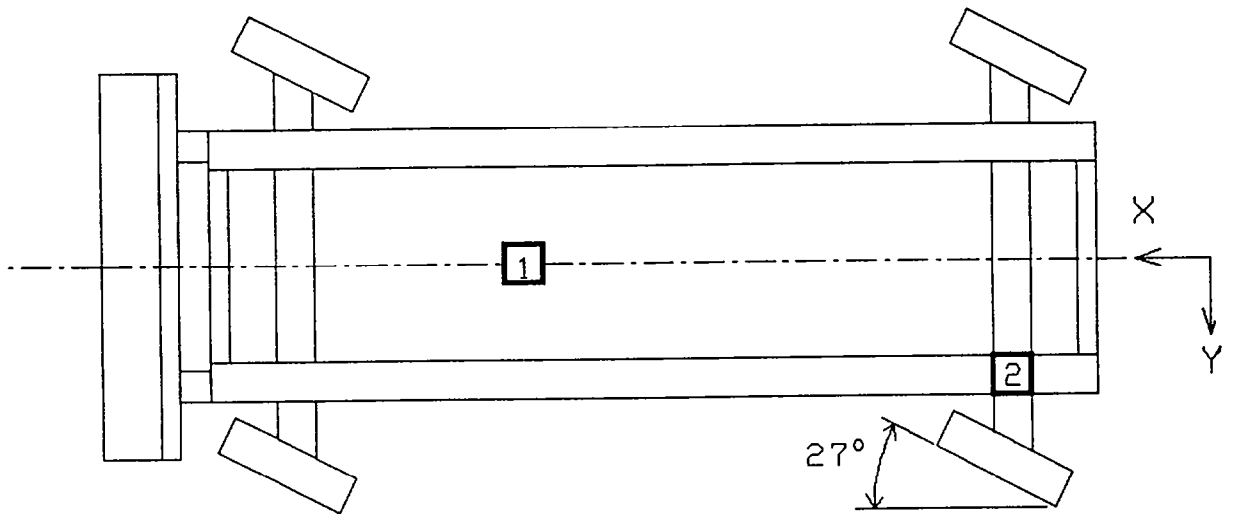
No. LOCATION	X*	Y*	Z*	POSITIVE		NEGATIVE	
				DIRECTION	MAX G MSEC	DIRECTION	MAX G MSEC
5 LEFT FRONT DOOR MID-REAR LATERAL	1407	676	713	58.2	12.6	131.3	6.4
6 LEFT FRONT DOOR UPPER CENTERLINE LATERAL	1857	683	967	53.2	86.7	98.7	15.6

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN MILLIMETERS.

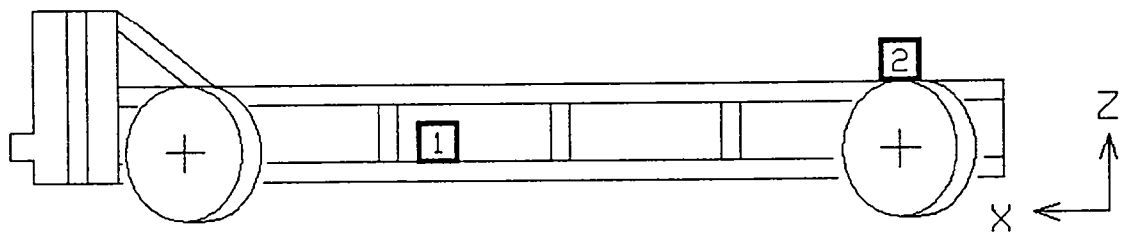
REFERENCE: X: + FORWARD FROM REAR BUMPER
Y: + LEFTWARD FROM VEHICLE CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

1 See DATA ACQUISITION EXPLANATIONS

FIGURE 3 MOVING DEFORMABLE BARRIER ACCELEROMETER PLACEMENT



TOP VIEW



SIDE VIEW

TABLE 6

MOVING BARRIER ACCELEROMETER LOCATIONS AND DATA SUMMARY

TEST NUMBER 931026

No. LOCATION	X*	Y*	Z*	POSITIVE		NEGATIVE	
				DIRECTION	MAX G MSEC	DIRECTION	MAX G MSEC
1 CENTER OF GRAVITY	1940	0	314				
LONGITUDINAL				1.3	128.0	12.7	27.4
LATERAL				8.1	37.8	1.1	289.1
VERTICAL				7.4	127.7	5.8	80.9
RESULTANT				15.1	39.0		
2 LEFT FRAME RAIL	385	633	624				
OVER REAR AXLE							
LONGITUDINAL				2.3	117.7	16.9	27.0
LATERAL				2.3	118.0	3.6	31.0

* ALL MEASUREMENTS OF ACCELEROMETER LOCATIONS ARE IN MILLIMETERS.

REFERENCE: X: + FORWARD FROM REAR POINT OF FRAME
Y: + LEFTWARD FROM BARRIER CENTERLINE
Z: + UPWARD FROM GROUND LEVEL

TABLE 7 VEHICLE EXTERIOR PROFILES AND STATIC CRUSH
ZERO DISTANCE AT PROJECTED IMPACT POINT¹

LOCATION	HEIGHT (DELIVERED) (PRE-TEST)	HEIGHT	-152	0	152	305	457	610	762	914	1067	1219	1372	1524	1676	182
PRE-TEST PROFILE (DISTANCE IN MILLIMETERS FROM REFERENCE PLANE ²)																
Axle height	318	325	X	X	X	441	456	454	456	457	459	455	455	447	X	X
H-point	688	662	X	X	409	429	434	435	434	437	439	435	437	435	X	X
Mid-door	726	707	X	X	410	429	434	434	433	437	440	434	439	435	X	X
Window sill	968	947	496	482	480	468	459	466	457	458	462	456	459	456	460	46
Window top	1598	1562	X	X	X	X	X	X	X	674	671	670	671	664	671	67
POST-TEST PROFILE (DISTANCE IN MILLIMETERS FROM REFERENCE PLANE ²)																
Axle height	318	325	X	X	X	691	655	664	663	663	666	669	679	633	X	X
H-point	688	662	X	X	711	747	800	812	815	817	820	819	826	830	X	X
Mid-door	726	707	X	X	685	726	780	794	793	805	807	809	809	829	X	X
Window sill	968	947	558	574	622	685	699	713	709	715	723	724	736	755	804	79
Window top	1598	1562	X	X	X	X	X	X	X	774	779	785	784	762	774	80
STATIC CRUSH (MM)																
Axle height	318	325	X	X	X	250	199	210	207	206	207	214	224	186	X	X
H-point	688	662	X	X	302	318	366	377	381	380	381	384	389	395	339	X
Mid-door	726	707	X	X	275	297	346	360	360	368	367	375	370	394	359	X
Window sill	968	947	62	92	142	217	240	247	252	257	261	268	277	299	344	33
Window top	1598	1562	X	X	X	X	X	X	X	100	108	115	113	98	103	13

¹Projected impact point is 940 mm forward of the driver's side wheelbase mid-point.

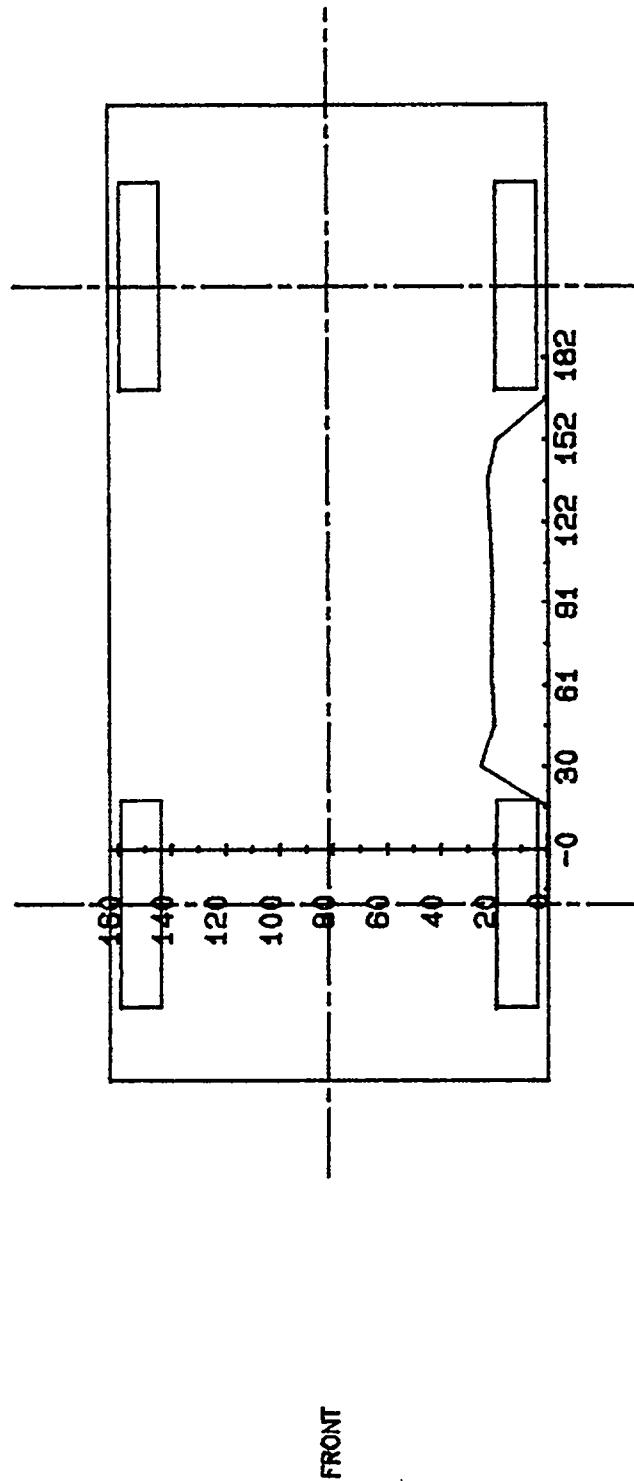
²Reference plane is parallel to and 1219mm from vehicle's longitudinal centerline.

Column readings are front to rear from left to right.

All measurements are in millimeters.

FIGURE 4

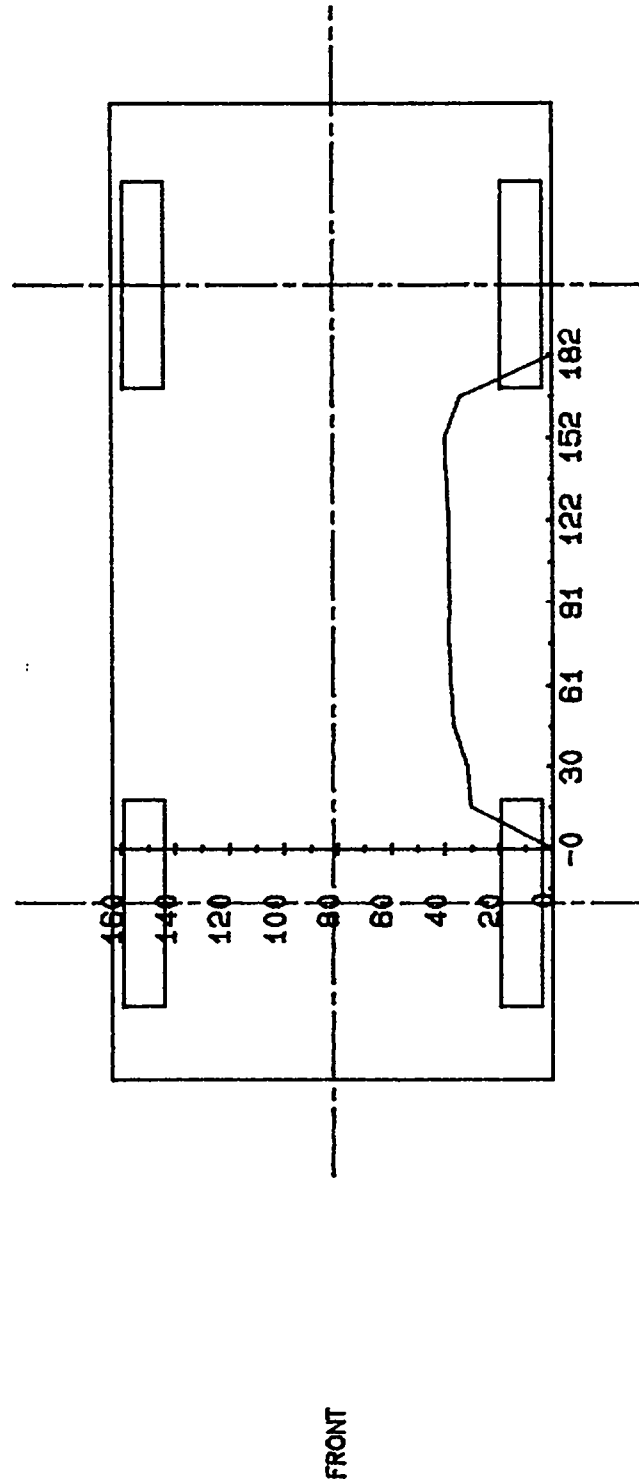
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS AXLE HEIGHT WHICH IS 31.8 CM. ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT

FIGURE 4, CONT'D.

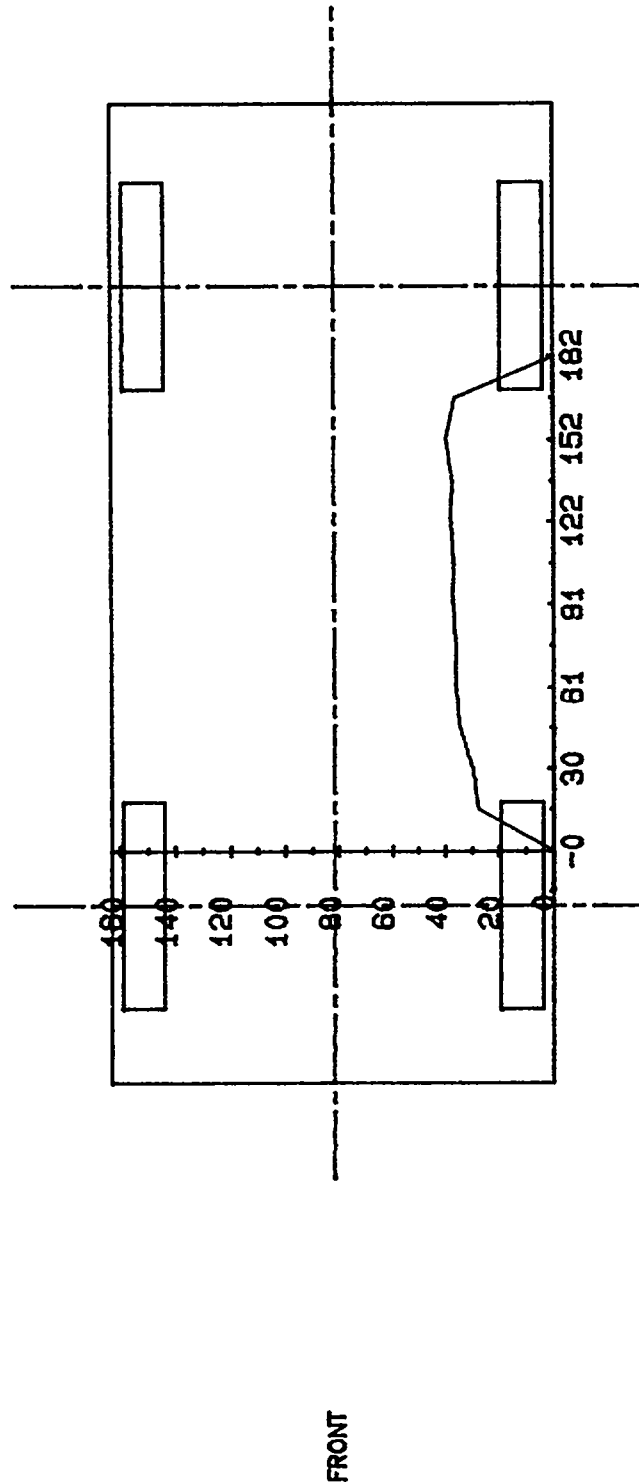
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS H-POINT HEIGHT WHICH IS 68.8 CM. ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT

FIGURE 4, CONT'D.

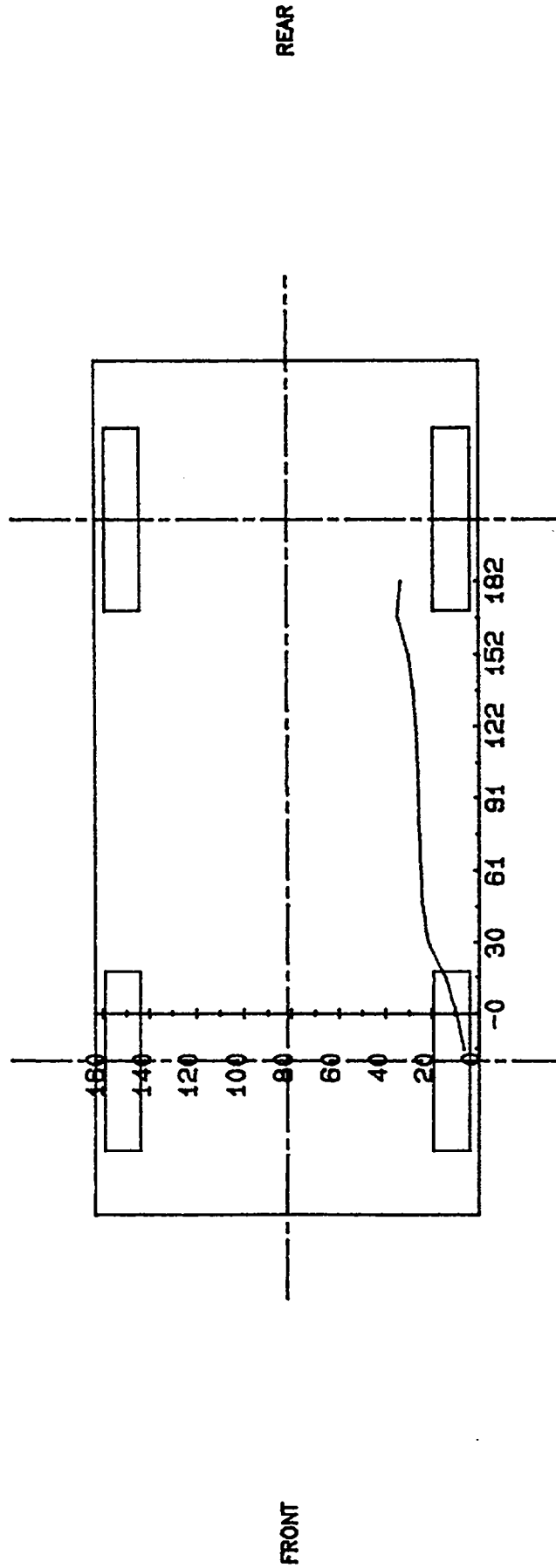
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS MID DOOR HEIGHT WHICH IS 72.6 CM. ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT

FIGURE 4, CONT'D.

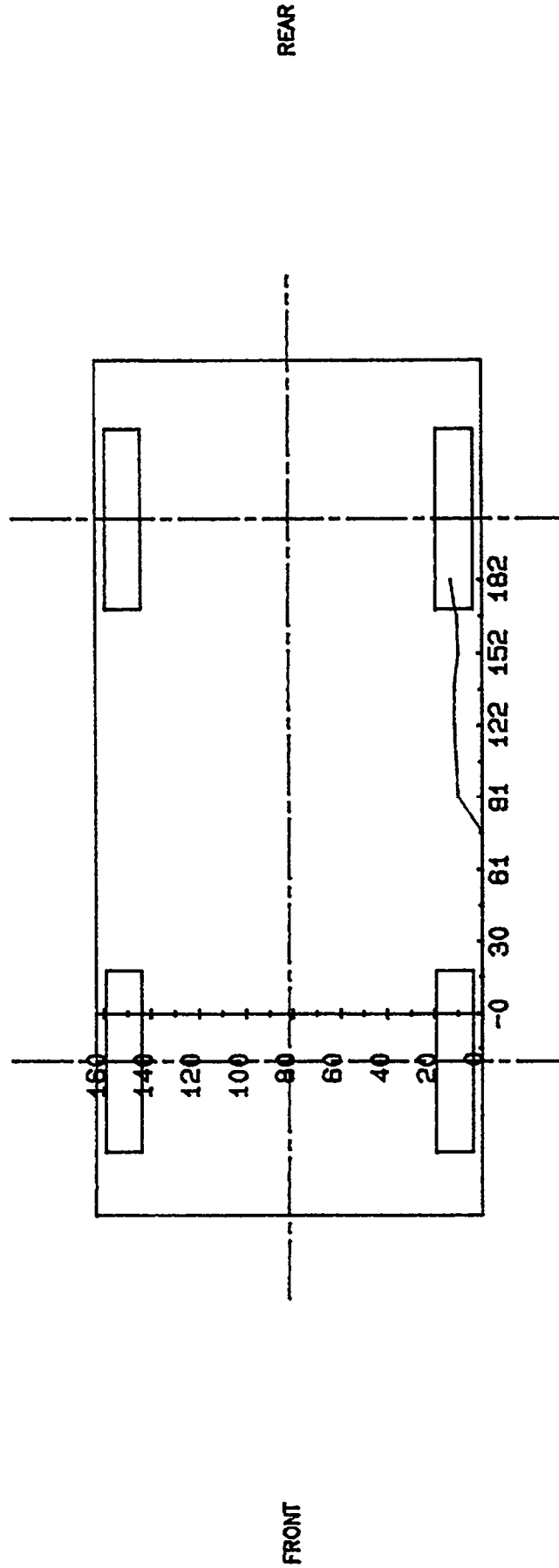
VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS WINDOW SILL HEIGHT WHICH IS 96.8 CM. ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT

FIGURE 4, CONT'D.

VEHICLE EXTERIOR STATIC CRUSH PROFILE



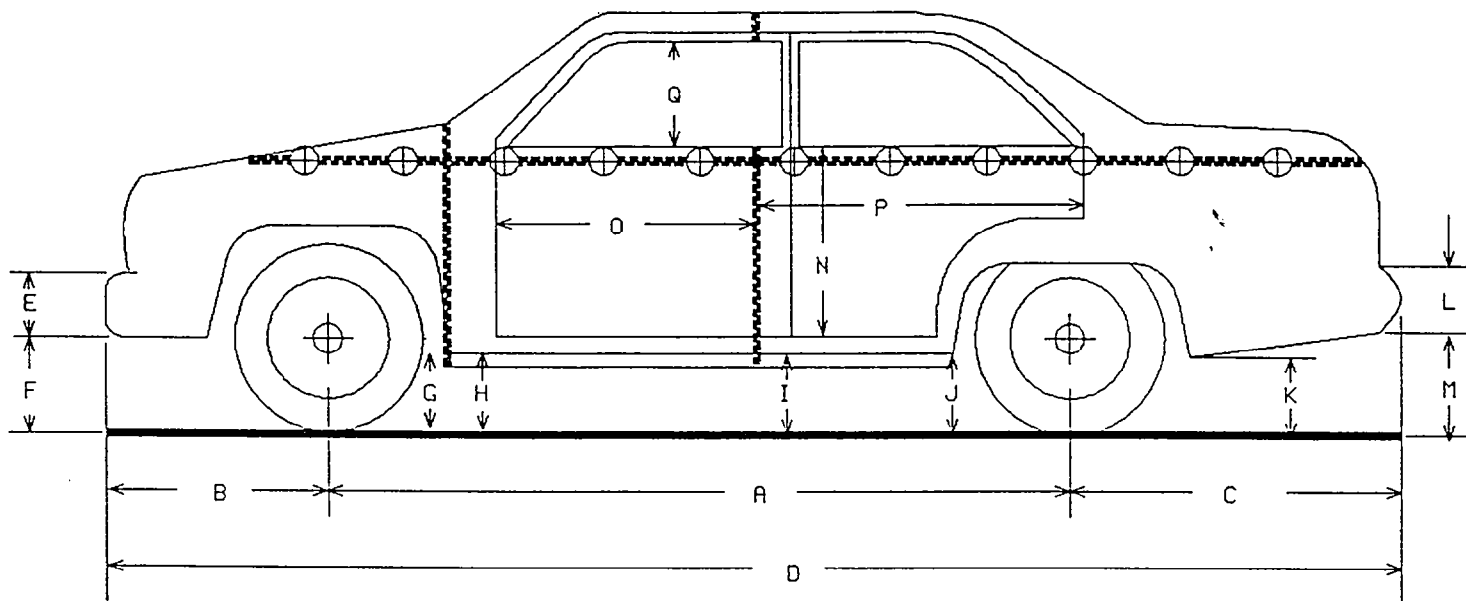
PROFILE LEVEL EQUALS WINDOW TOP HEIGHT WHICH IS 159.8 CM. ABOVE GROUND LEVEL
(0,0) EQUALS PROJECTED IMPACT POINT

FIGURE 5 PRE-TEST AND POST-TEST MEASUREMENTS

VEHICLE: 1991 GEO Tracker 4X4

VIN: 2CNBJ18U8M6901399

TEST DATE: 10/26/93

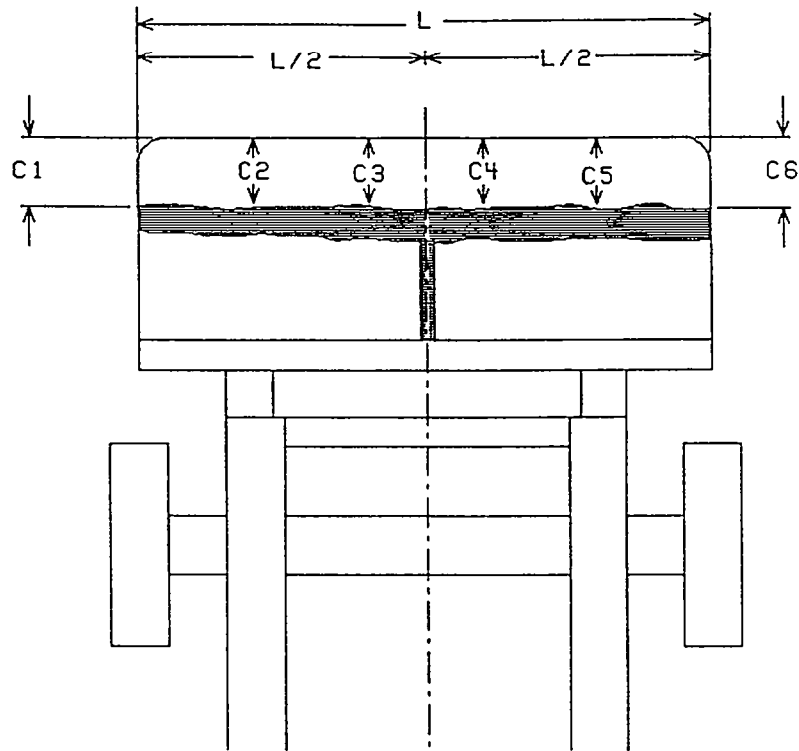


LEFT SIDE VIEW

	PRE-TEST	POST-TEST	CHANGE		PRE-TEST	POST-TEST	CHANGE
A	2210	2205	5	J	310	394	-84
B	653	631	22	K	328	584	-256
C	665	660	5	L	77	77	0
D	3528	3496	32	M	568	579	-11
E	85	85	0	N	NA	NA	NA
F	503	534	-31	O	475	473	2
G	318	329	-11	P	NA	NA	NA
H	282	394	-112	Q	491	481	10
I	310	403	-93				

All distance 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 vehicle centerline.
 All measurements are in millimeters.

	PRE-TEST	POST-TEST	CRUSH
L	1630		
	<i>ACTUAL WIDTH is 1676</i>		
C1	90	C1 197	C1 107
C2	75	C2 103	C2 28
C3	73	C3 91	C3 18
C4	73	C4 82	C4 9
C5	69	C5 83	C5 14
C6	93	C6 102	C6 9
CL	74	CL 81	CL 7

TABLE 8 MOVING DEFORMABLE BARRIER FACE STATIC CRUSH
ZERO DISTANCE AT BARRIER CENTERLINE¹

LOCATION	HEIGHT	813	711	610	508	406	305	203	102	0	102	203	305	406	508	610	711	8
PRE-TEST PROFILE (DISTANCE IN MILLIMETERS FROM REFERENCE PLANE ²)																		
Top of face	991	178	179	177	176	178	180	175	176	177	178	174	175	175	173	183	173	1
Mid-face	737	177	177	177	177	177	179	174	175	173	177	174	173	175	171	179	174	1
Bumper	610	90	74	74	75	75	75	73	75	74	75	73	73	73	69	72	71	

POST-TEST PROFILE (DISTANCE IN MILLIMETERS FROM REFERENCE PLANE²)

2	Top of face	991	184	168	173	166	167	168	172	168	172	168	170	177	176	207	218	254	2
3	Mid-face	737	227	207	188	177	177	175	173	175	177	173	173	172	170	175	180	184	2
4	Bumper	610	197	157	128	103	97	90	91	85	81	80	82	75	74	83	85	84	1

STATIC CRUSH (MM)

Top of face	991	6	-11	-4	-10	-11	-12	-3	-8	-5	-10	-4	2	1	34	35	81	
Mid-face	737	50	30	11	0	0	-4	-1	0	4	-4	-1	-1	-5	4	1	10	
Bumper	610	107	83	54	28	22	15	18	10	7	5	9	2	1	14	13	13	

¹Column readings are left to right across barrier face from left to right.

²Reference plane is 610mm forward of the rear surface of the deformable barrier face.

All measurements are in millimeters.

SECTION 3.0

FMVSS 214 DATA

TABLE 9

DUMMY DATA SUMMARY

TEST NUMBER 931026

DRIVER DUMMY

SN: 903

POSITIVE DIRECTION MAX	MSEC	NEGATIVE DIRECTION MAX	MSEC
------------------------------	------	------------------------------	------

HEAD

LONGITUDINAL ¹	4.9	35.2	16.7	50.2
LATERAL	19.7	63.3	38.9	49.0
VERTICAL	5.3	24.5	96.2	59.9
RESULTANT ¹	---	---		
HIC ¹	681	FROM 48.2 TO 84.2		

UPPER SPINE

LONGITUDINAL	16.9	62.5	27.9	55.6
LATERAL (P)	30.8	55.0	78.1	36.3
LATERAL (R)	32.6	55.0	74.1	36.3
VERTICAL ¹	10.2	20.6	24.3	50.6
RESULTANT ¹ (P)	79.9	36.2		
RESULTANT ¹ (R)	76.0	36.3		

TABLE 9

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 931026

	DRIVER DUMMY			
	SN: 903			
	POSITIVE		NEGATIVE	
	DIRECTION		DIRECTION	
	MAX	MSEC	MAX	MSEC
LOWER SPINE				
LONGITUDINAL	13.7	48.1	18.7	55.0
LATERAL (P)	33.1	55.0	101.1	30.0
LATERAL (R)	33.6	54.4	99.4	30.0
VERTICAL	20.6	35.0	16.0	76.9
RESULTANT (P)	102.5	30.0		
RESULTANT (R)	100.8	30.0		
LEFT UPPER THORAX RIB				
LATERAL (P) ¹	7.8	50.6	55.3	36.2
LATERAL (R)	17.6	77.5	54.6	35.6
LEFT LOWER THORAX RIB				
LATERAL (P)	19.1	77.5	58.4	24.4
LATERAL (R) ¹	0.2	7.5	60.4	24.4
	TTI(d) (P) 80			
	TTI(d) (R) 79			

TABLE 9

DUMMY DATA SUMMARY CONTINUED

TEST NUMBER 931026

DRIVER DUMMY
SN: 903
POSITIVE DIRECTION MAX MSEC
NEGATIVE DIRECTION MAX MSEC

PELVIS					
LONGITUDINAL ¹	11.1	53.8	31.2	35.0	
LATERAL ¹	47.0	60.0	111.1	28.1	
VERTICAL	16.8	27.5	14.0	68.1	
RESULTANT ¹	112.4	28.1			

POSITIVE DIRECTION	NEGATIVE DIRECTION
LONGITUDINAL: FORWARD	LONGITUDINAL: REARWARD
LATERAL: LEFTWARD	LATERAL: RIGHTWARD
VERTICAL: UPWARD	VERTICAL: DOWNWARD

NOTES:

- (P) Primary Sensor
- (R) Redundant Sensor

¹ See DATA ACQUISITION EXPLANATIONS

TABLE 10 POST-IMPACT DUMMY/VEHICLE DATA

VISIBLE DUMMY CONTACT POINTS:

	DRIVER #903	PASSENGER
HEAD	<u>Barrier face top</u>	<u>NA</u>
CHEST	<u>Door padding</u>	<u>NA</u>
ABDOMEN	<u>Door padding</u>	<u>NA</u>
LEFT KNEE	<u>Door padding</u>	<u>NA</u>
RIGHT KNEE	<u>Left knee</u>	<u>NA</u>

DOOR OPENING:

	LEFT	RIGHT
FRONT	<u>Tools required</u>	<u>Easy</u>
REAR	<u>NA</u>	<u>NA</u>

SEAT MOVEMENT:

	SEAT BACK FAILURE	SEAT SHIFT
FRONT	<u>None</u>	<u>None</u>
REAR	<u>NA</u>	<u>NA</u>

GLAZING DAMAGE:

The driver's door glass was broken out.

The entire windshield was cracked.

OTHER NOTABLE IMPACT EFFECTS:

None

DUMMY KINEMATIC SUMMARY

Upon impact, the driver dummy translated to the left and impacted the driver's door panel. The dummy's head and upper body rotated toward the left. The dummy's head passed through the broken out door glass opening and contacted the top of the deformable barrier face. The dummy rebounded and its head and upper body rotated toward the right. The dummy was restrained by the three-point unbelt. The dummy then rotated rearward into the seat back and turned to the right. The dummy rotated forward and turned to the left before coming to rest, sitting in the driver seat, facing forward, leaning to the right, and restrained by the three-point unbelt.

SECTION 4.0

FMVSS 301 DATA

TABLE 11 FUEL SYSTEM DATA

MAKE/MODEL:	GEO/Tracker 4X4
USABLE CAPACITY:	41.9 LITERS (FURNISHED BY COTR)
TEST VOLUME RANGE:	38.5 LITERS TO 39.4 LITERS (92-94% OF USABLE)
ACTUAL TEST VOLUME:	39.0 LITERS (WITH ENTIRE FUEL SYSTEM FILLED)
TEST FLUID TYPE:	STODDARD SOLVENT
SPECIFIC GRAVITY:	0.764
KINEMATIC VISCOSITY:	0.99 CENTISTOKES
TEST FLUID COLOR:	PURPLE
ELECTRIC FUEL PUMP:	Yes
FUEL INJECTION:	Yes
DOES ELECTRIC FUEL PUMP OPERATE WITH IGNITION SWITCH "ON" AND THE ENGINE NOT OPERATING?	No

TABLE 12 FMVSS 301 POST-IMPACT TEST DATA

TEST DATE: 10/26/93

VEHICLE MAKE/MODEL/BODY STYLE: GEO/Tracker 4X4/2-Door Multipurpose Passenger Vehicle

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 (____ KPH)
- ☐ OBLIQUE (48 KPH) WITH ____° BARRIER FACE
FIRST CONTACTING ____ (DRIVER/PASS.) SIDE.
- ☐ REAR MOVING BARRIER (48 KPH)
- ☐ LATERAL MOVING BARRIER (32 KPH)
- ☒ OTHER - 214 48/24 KPH LEFT SIDE IMPACT

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

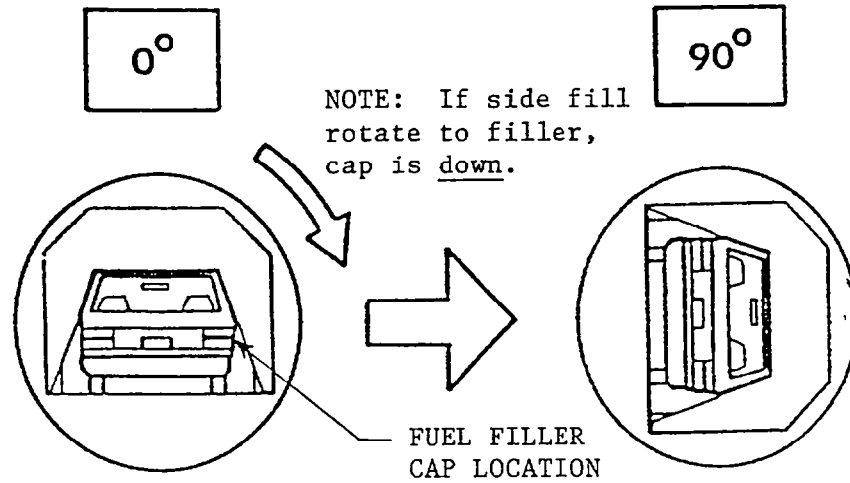
	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FROM IMPACT UNTIL VEHICLE MOTION CEASES - - -	0 G	28 G
2. 5 MINUTE PERIOD AFTER VEHICLE MOTION CEASES -	0 G	142 G
3. NEXT 25 MINUTES AFTER 5 MINUTE PERIOD - - - -	0 G	28 G/MN

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 7 FMVSS 301 STATIC ROLLOVER TEST DATA

TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

TIME REQ. FOR MACHINE TO ROTATE 90° = 2 minutes, 00 seconds

FMVSS 301 POSITION HOLD TIME = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

NEXT WHOLE MINUTE INTERVAL - - - - = 7 minutes

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

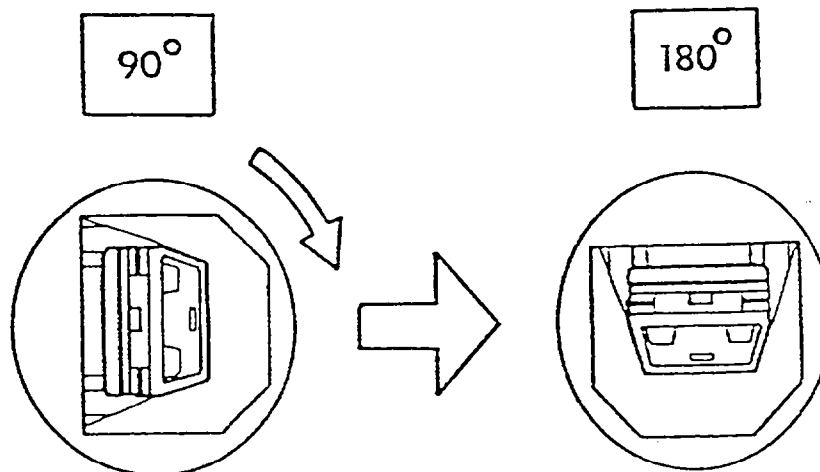
<u>0° TO 90° ROTATION (FUEL FILLER CAP DOWN)</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	Trace	142 G
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 G	28 G
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 G	28 G

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

Fuel filler cap.

FIGURE 7 FMVSS 301 STATIC ROLLOVER TEST DATA, CONT'D.

TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

TIME REQ. FOR MACHINE TO ROTATE 90° = 2 minutes, 00 seconds

FMVSS 301 POSITION HOLD TIME = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

NEXT WHOLE MINUTE INTERVAL - - - - = 14 minutes

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

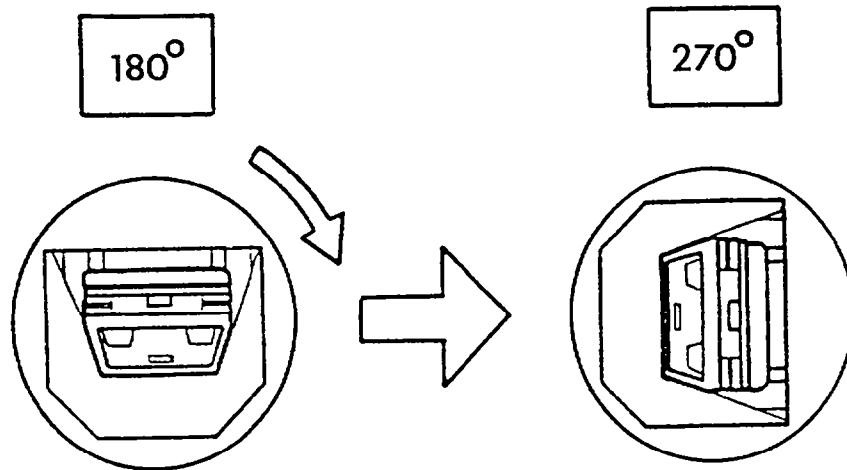
<u>90° TO 180° ROTATION</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 G	142 G
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 G	28 G
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 G	28 G

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 7 FMVSS 301 STATIC ROLLOVER TEST DATA, CONT'D.

TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

TIME REQ. FOR MACHINE TO ROTATE 90° = 2 minutes, 00 seconds

FMVSS 301 POSITION HOLD TIME = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

NEXT WHOLE MINUTE INTERVAL - - - - = 21 minutes

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

180° TO 270° ROTATION

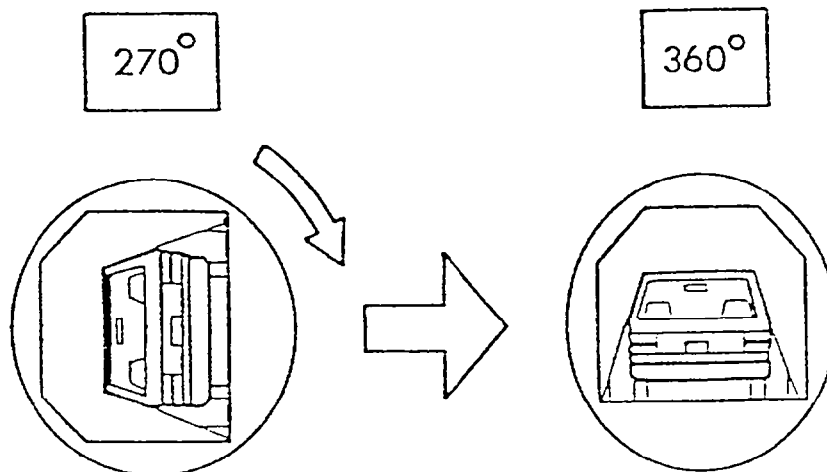
	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 G	142 G
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 G	28 G
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 G	28 G

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

FIGURE 7 FMVSS 301 STATIC ROLLOVER TEST DATA, CONT'D.

TEST PHASE



STATIC ROLLOVER MACHINE ROTATION TIME INFORMATION: (Spec. Range = 1-3 min.)

TIME REQ. FOR MACHINE TO ROTATE 90° = 2 minutes, 00 seconds

FMVSS 301 POSITION HOLD TIME = 5 minutes, 00 seconds

TOTAL - - - - - = 7 minutes, 00 seconds

NEXT WHOLE MINUTE INTERVAL - - - - = 28 minutes

FUEL SYSTEM FLUID SPILLAGE MEASUREMENTS:

<u>270° TO 360° ROTATION</u>	<u>TEST RESULTS</u>	<u>MAXIMUM ALLOWABLE</u>
1. FIRST 5 MINUTES FROM ONSET OF ROTATION - - - - -	0 G	142 G
2. 6TH MINUTE FROM ONSET OF ROTATION - - - - -	0 G	28 G
3. 7TH MINUTE FROM ONSET OF ROTATION - - - - -	0 G	28 G

FUEL SYSTEM FLUID SPILLAGE LOCATION(S):

None

SECTION 5.0

VEHICLE, OCCUPANT, AND CAMERA MEASUREMENTS

FIGURE 8 DUMMY AND SEAT POSITIONING DATA

MAKE/MODEL/BODY STYLE: GEO/Tracker 4X4/2-Door MPV

SEAT TYPE: X Bench
 Bucket
 Split bench

ADJUSTER TYPE: X Manual
 Power
 Non-adjustable

SEAT BACK TYPE: X Non-adjustable
 Adjustable reclining

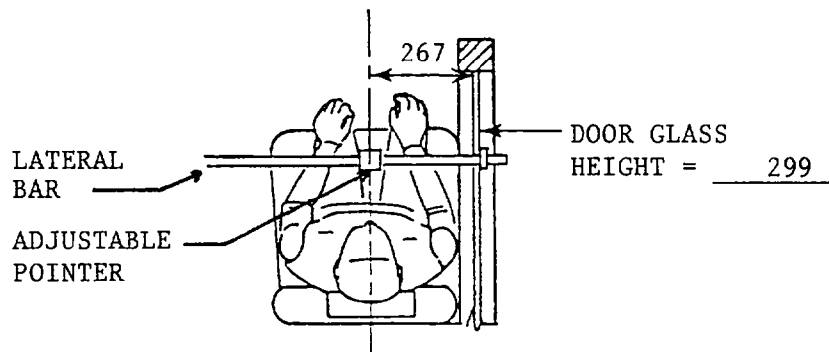
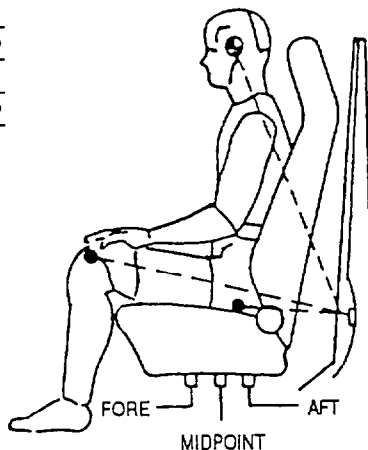
TECHNICIANS:
 1. S. Ericksen
 2. J. Walters
 3. P. Cummins

POSITIONING DATE: 10/26/93

TIME: 1105 TEMPERATURE: 21° C

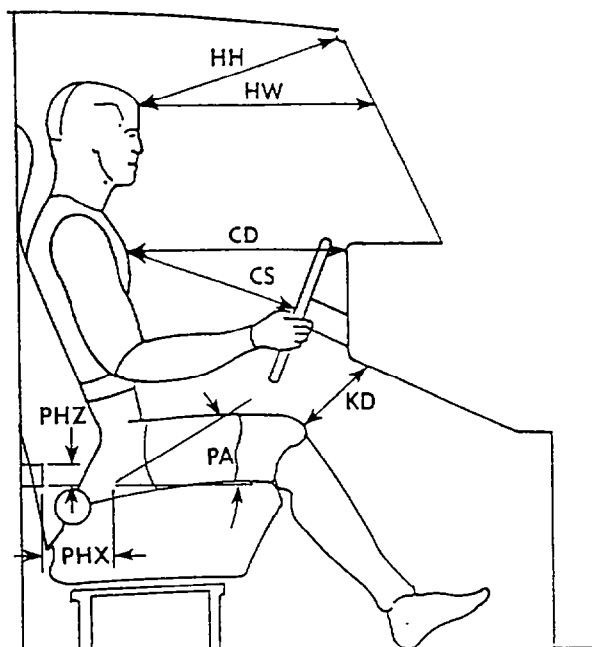
DRIVER DUMMY¹ # 903 TYPE: SID

HEAD	<u>615</u>
TARGET	<u>8°</u>
KNEE	<u>659</u>
JOINT	<u>87°</u>
APPROX- IMATE	<u>273</u> <u>98°</u>
"H" POINT	



¹Driver dummy measurements are referenced to top of front door striker.
 All angles are referenced to vertical.
 All distance measurements are in millimeters.

FIGURE 9 DUMMY LONGITUDINAL CLEARANCE MEASUREMENTS



HH	504
HW	664
CD	575
CS ¹	351
KDL ²	141
KDR ²	135
PA	25
PHX	272
PHZ	51

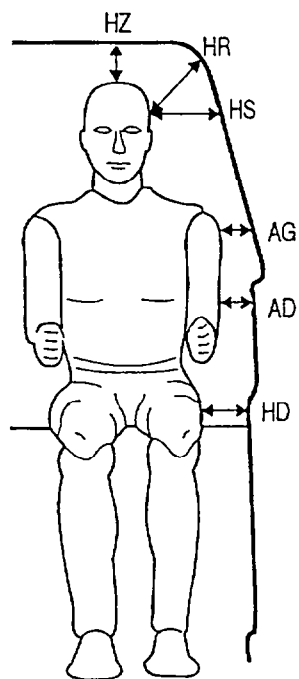
¹Measured to center of steering wheel hub.

²Measured parallel to vehicle's longitudinal axis.

All distance measurements are in millimeters.

All angle measurements are in degrees.

FIGURE 10 DUMMY LATERAL CLEARANCE MEASUREMENTS



<u>Driver</u>	
HR	167
HS	190
AD ¹	3
HD ¹	73
HZ	137

¹Measured to energy absorbing padding.

All distance measurements are in millimeters.

FIGURE 11 CAMERA POSITIONS

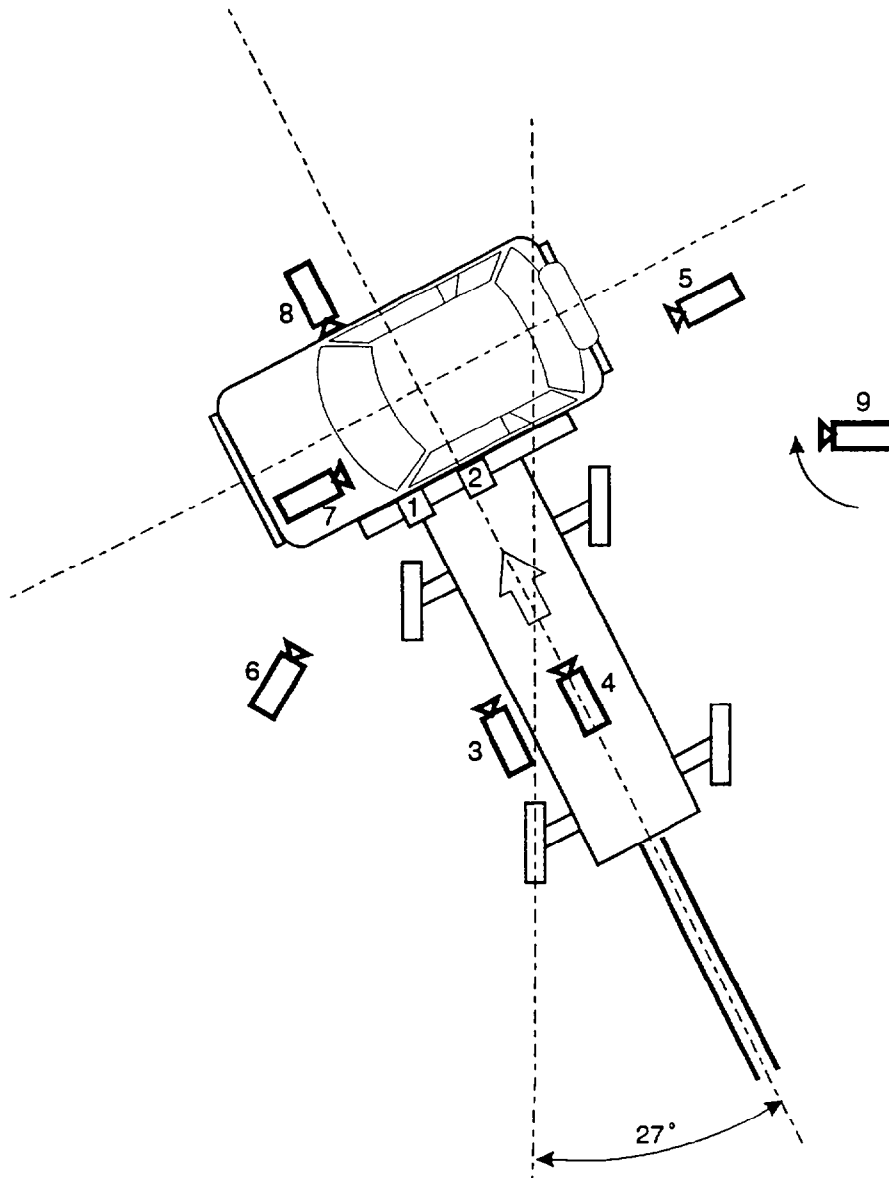


TABLE 13 CAMERA INFORMATION

TEST NO. 931026

VEHICLE: 1991 GEO Tracker 4X4

CAMERA NO.	VIEW	CAMERA POSITIONS (CM) ¹			ANGLE ² (DEG)	LENS (MM)	FILM SPEED (FPS)
		X	Y	Z			
1	Overhead overall	0	0	1085	-90	8.5	995
2	Overhead close-up	-66	0	1085	-90	25	475
3	Onboard barrier side	NA	NA	NA	NA	25	930
4	Onboard barrier center	NA	NA	NA	NA	13	998
5	Right side	422	-770	85	0	13	798
6	Left side	-335	263	92	0	25	965
7	Onboard vehicle front	NA	NA	NA	NA	8	998
8	Onboard vehicle side-front	NA	NA	NA	NA	8	1000
9	Real-time panning	NA	NA	NA	NA	16	24

¹ +X = Film plane forward of impact point on target vehicle's struck side

+Y = Film plane leftward of impact point on target vehicle's struck side

+Z = Film plane above ground level

² +Angle = Film plane angled upward from horizontal plane.

APPENDIX A

PHOTOGRAPHS



Figure A-1 PRE-TEST FRONT - VIEW 1

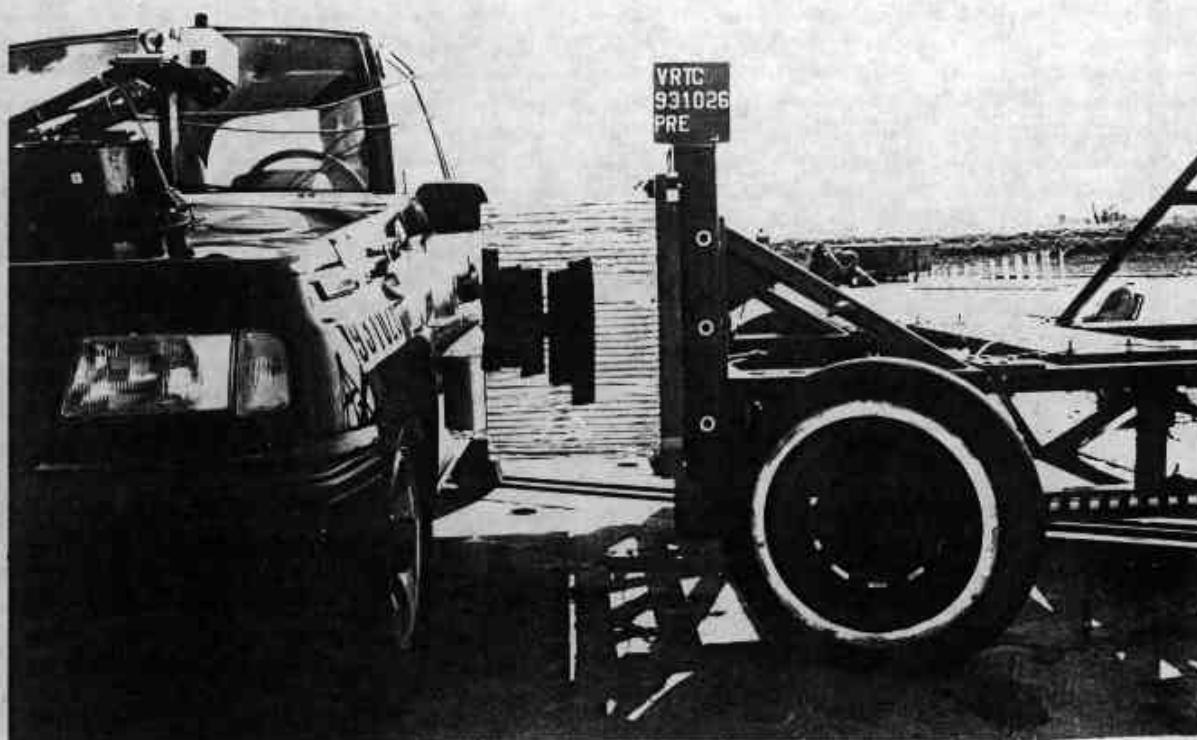


Figure A-2 PRE-TEST FRONT - VIEW 2



Figure A-3 POST-TEST FRONT VIEW



Figure A-4 POST-TEST LEFT FRONT VIEW

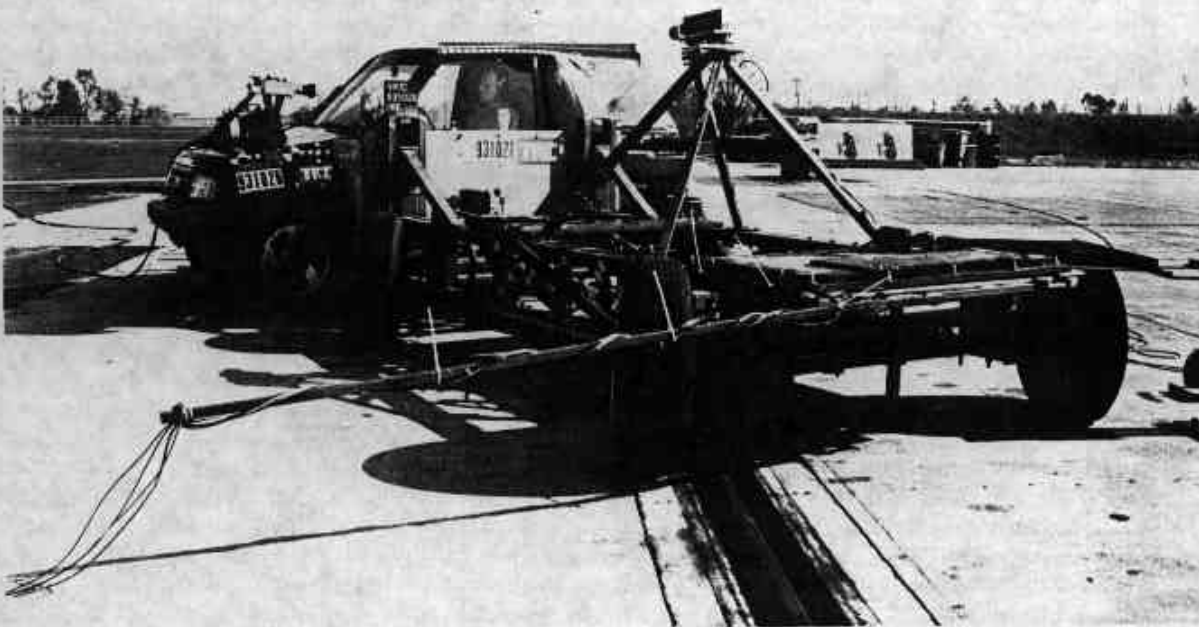


Figure A-5 PRE-TEST LEFT SIDE VIEW

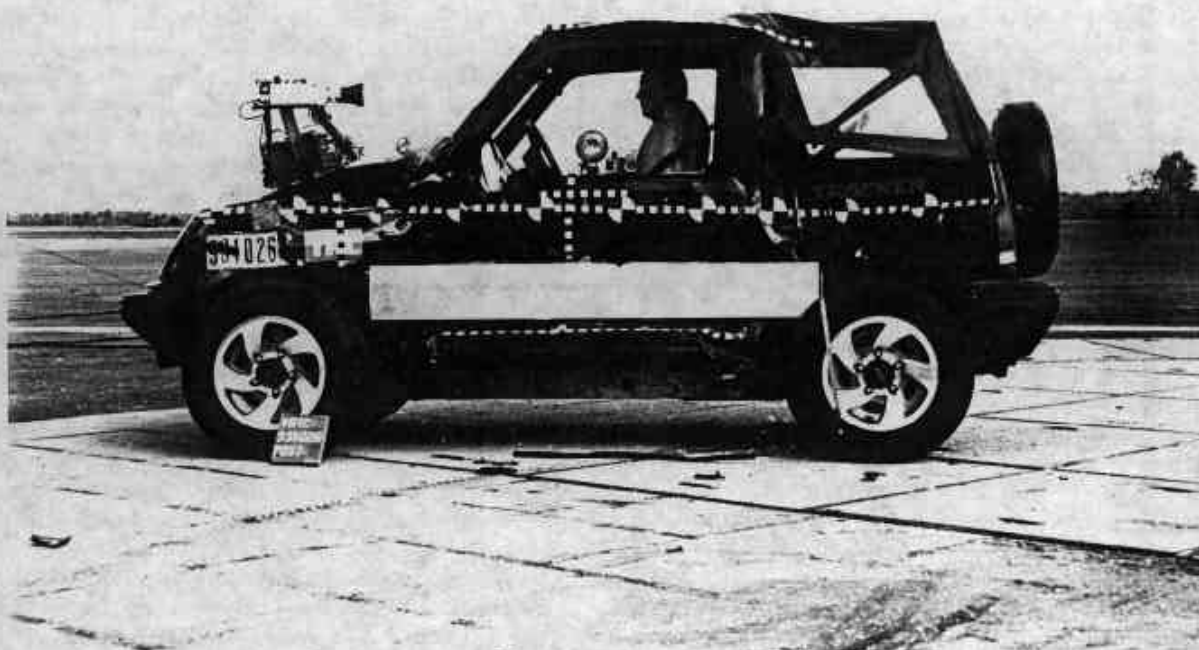


Figure A-6 POST-TEST LEFT SIDE - VIEW 1

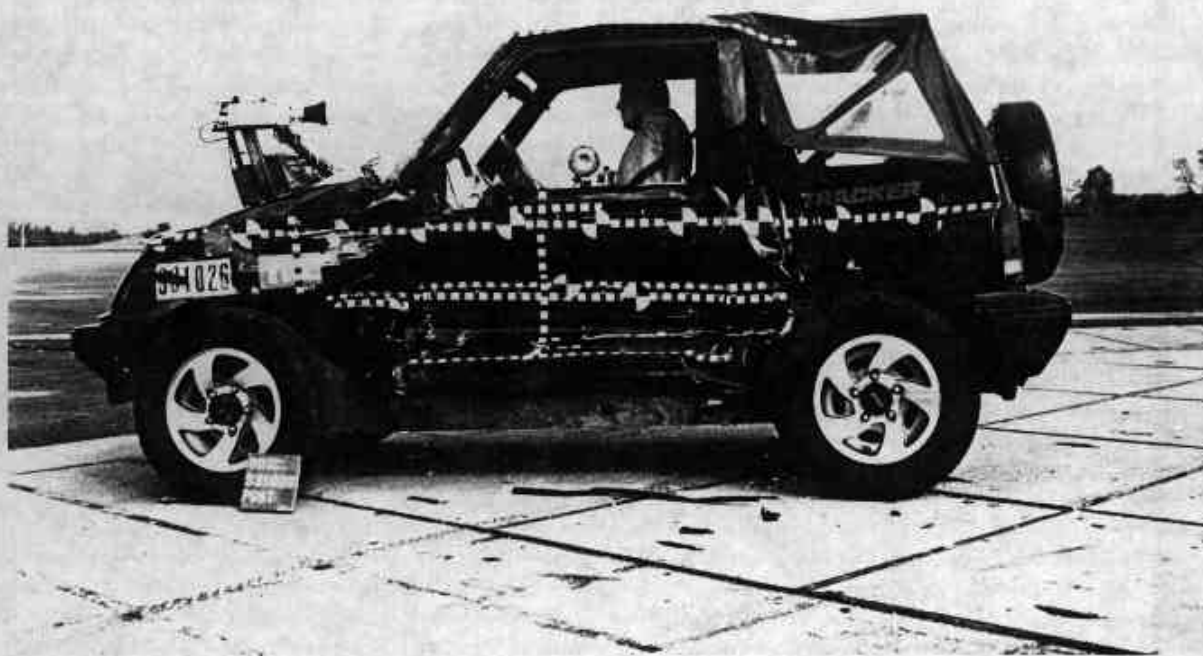


Figure A-7 POST-TEST LEFT SIDE - VIEW 2

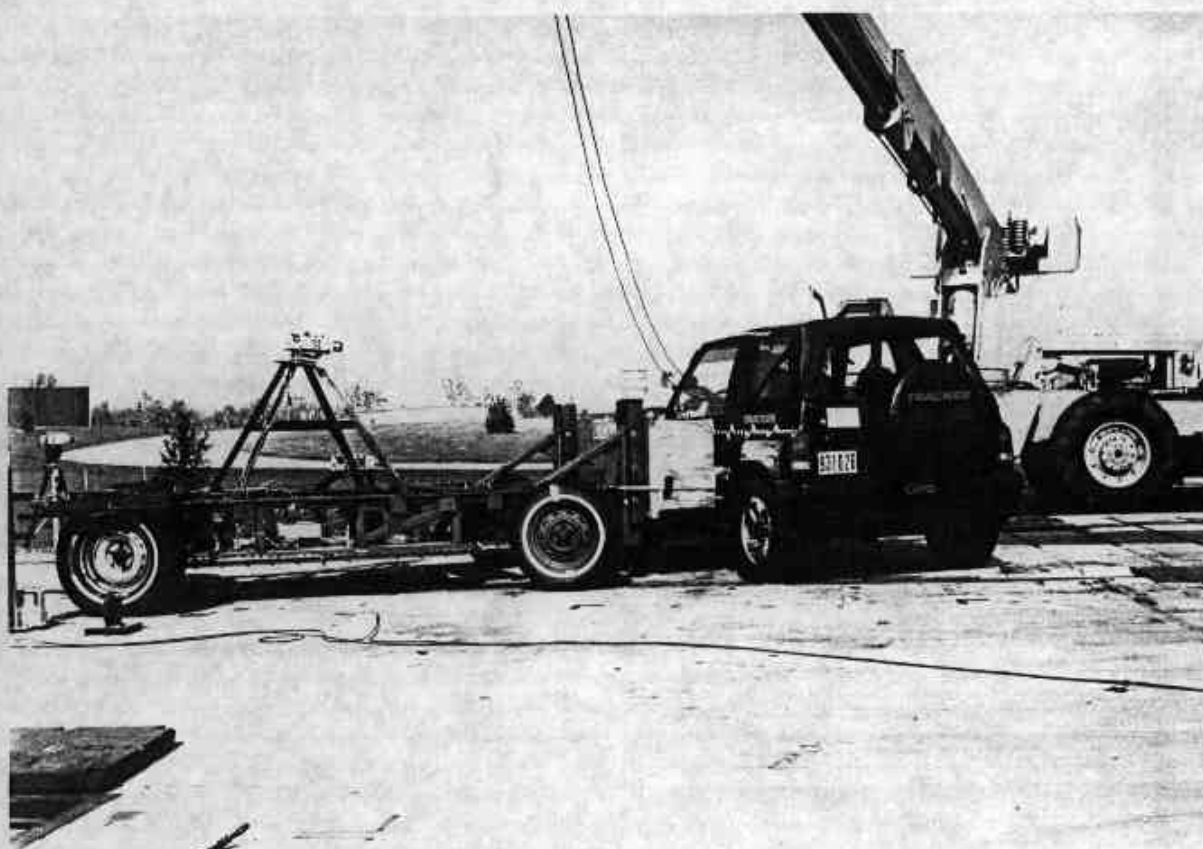


Figure A-8 PRE-TEST REAR - VIEW 1



Figure A-9 PRE-TEST REAR - VIEW 2



Figure A-10 POST-TEST REAR VIEW

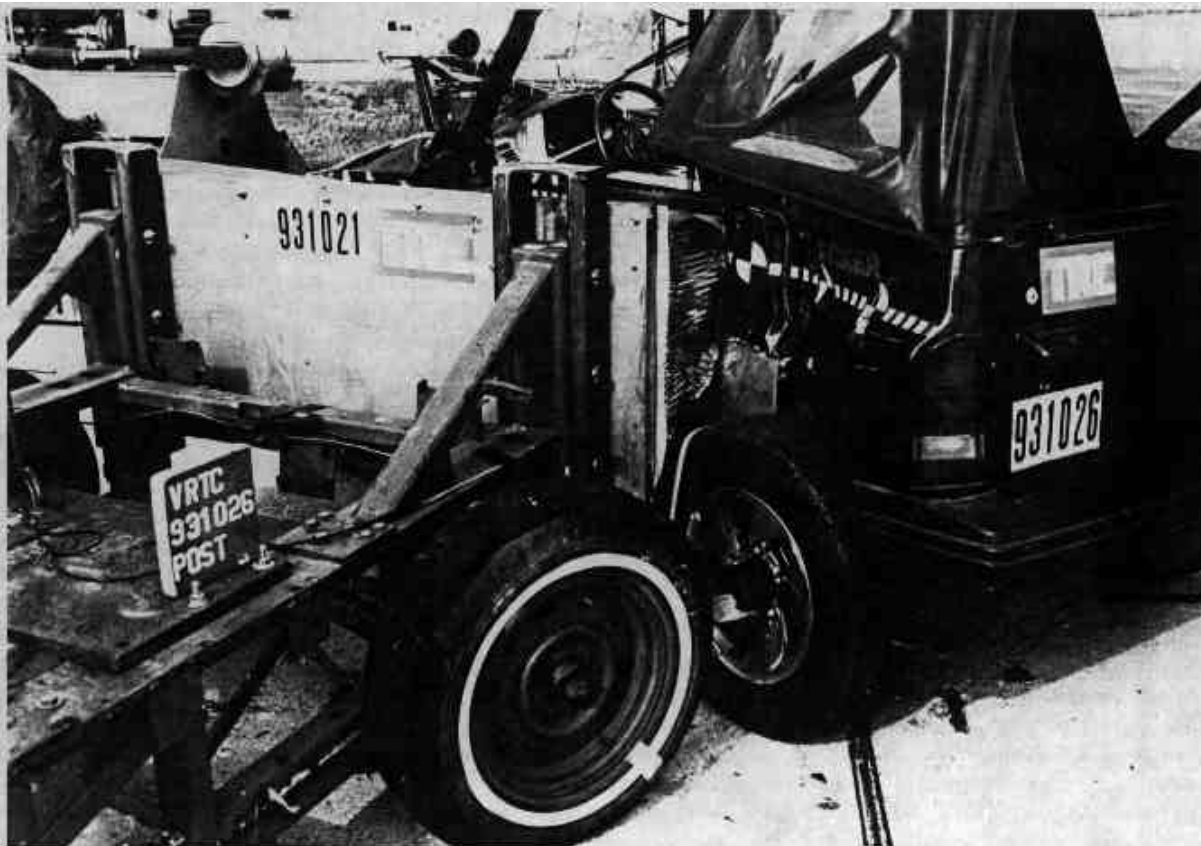


Figure A-11 POST-TEST LEFT REAR VIEW

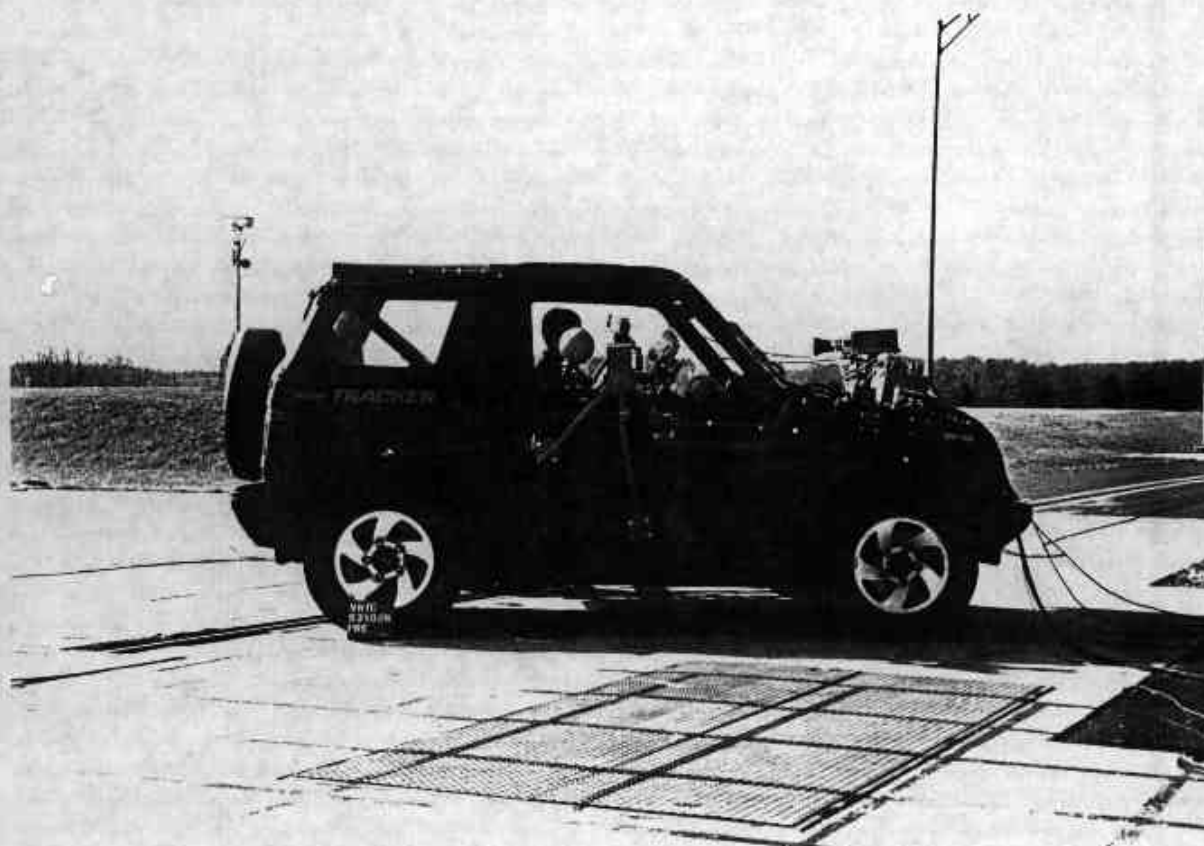


Figure A-12 PRE-TEST RIGHT SIDE VIEW



Figure A-13 POST-TEST RIGHT SIDE VIEW

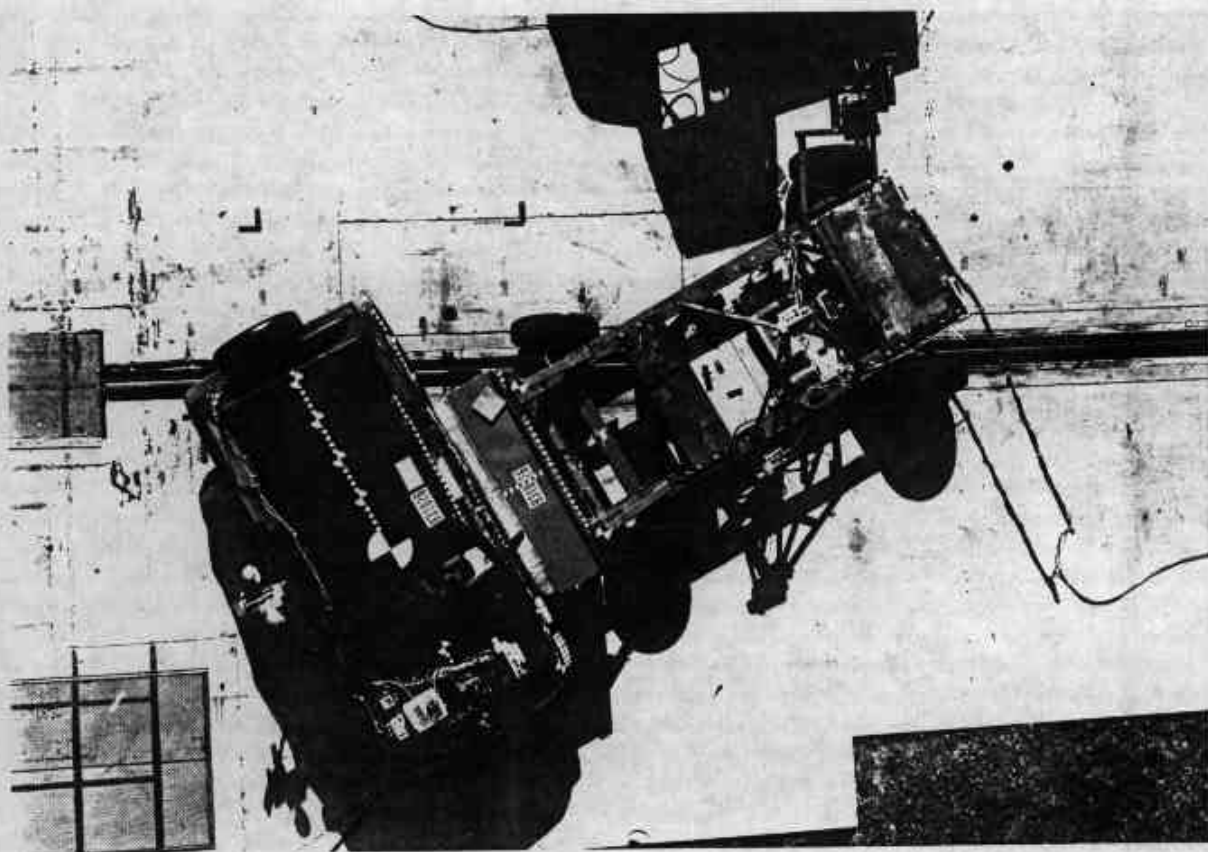


Figure A-14 PRE-TEST OVERHEAD VIEW

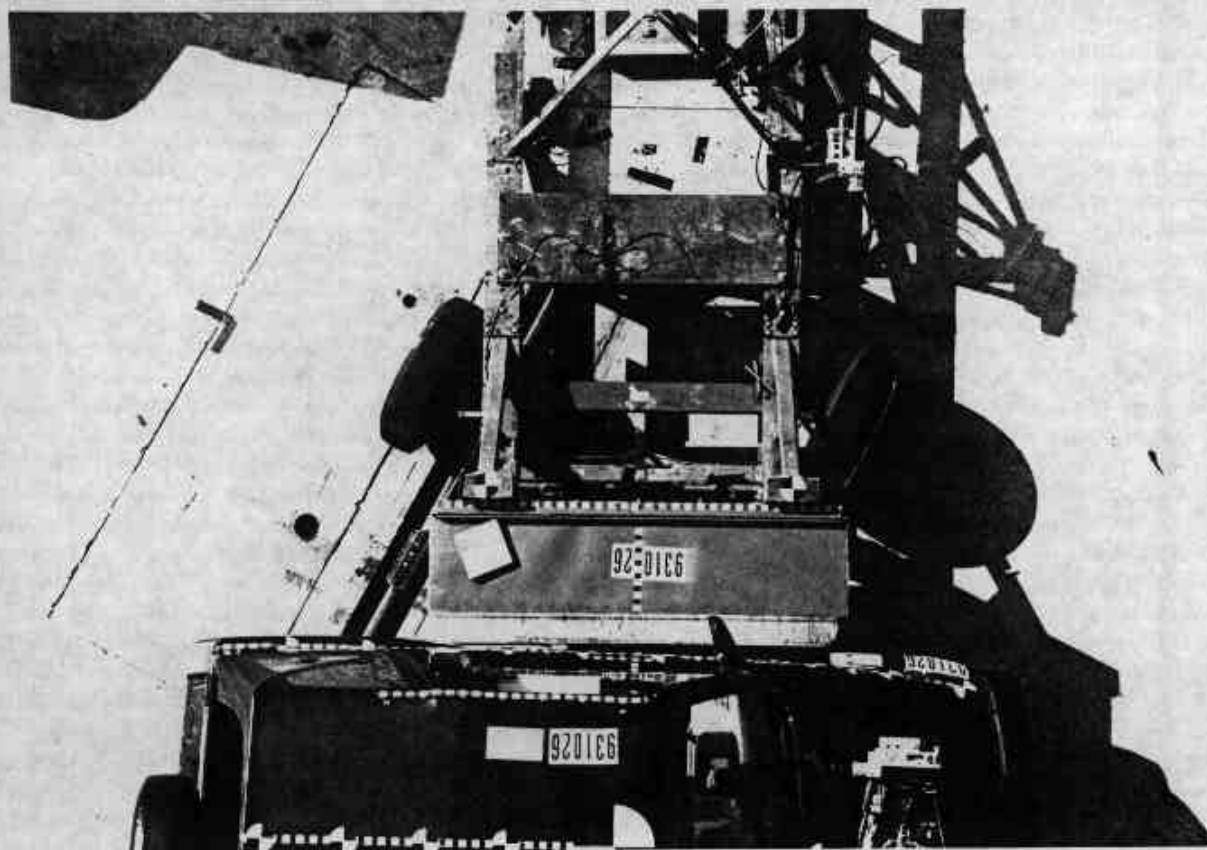


Figure A-15 PRE-TEST OVERHEAD CLOSE-UP VIEW



Figure A-16 PRE-TEST FUEL FILLER CAP VIEW



Figure A-17 POST-TEST FUEL FILLER CAP VIEW



Figure A-18 PRE-TEST DRIVER DUMMY POSITION VIEW



Figure A-19 POST-TEST DRIVER DUMMY POSITION - VIEW 1



Figure A-20 POST-TEST DRIVER DUMMY POSITION - VIEW 2

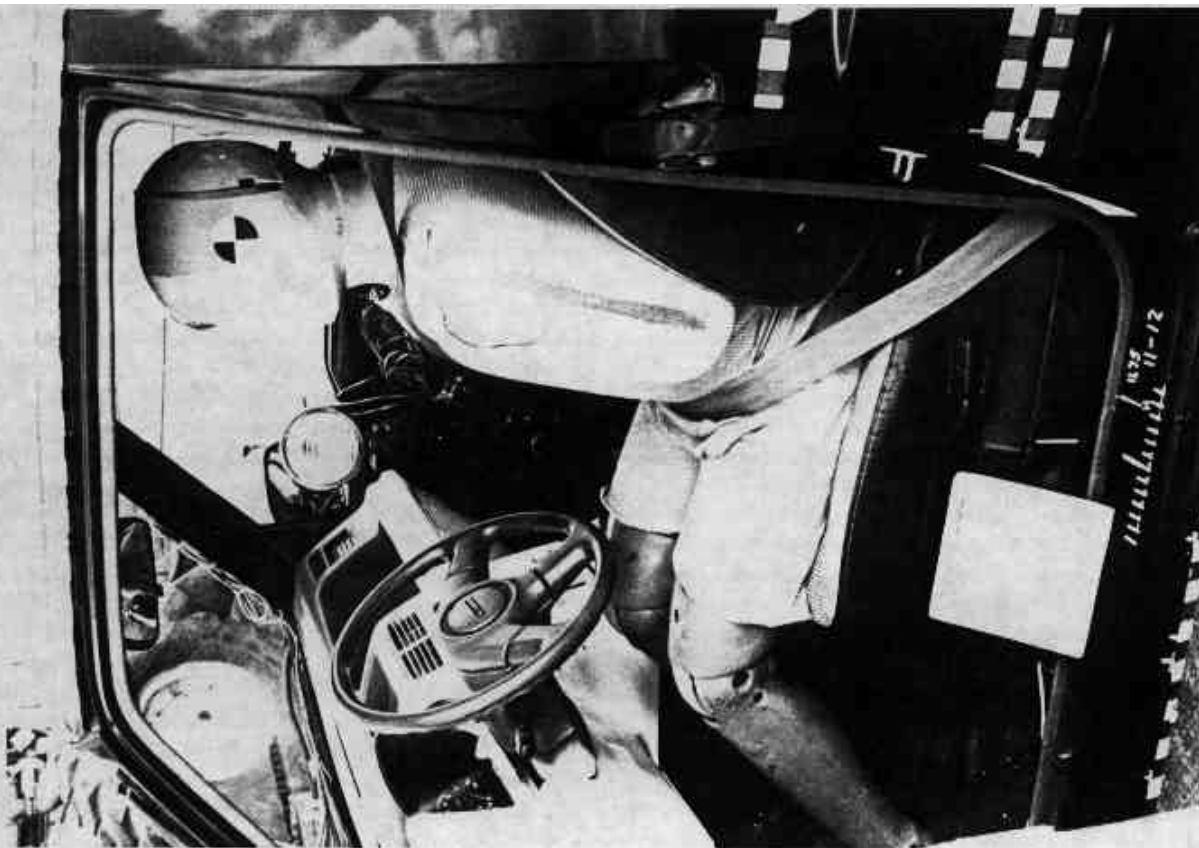


Figure A-21 PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 1



Figure A-22 PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 2

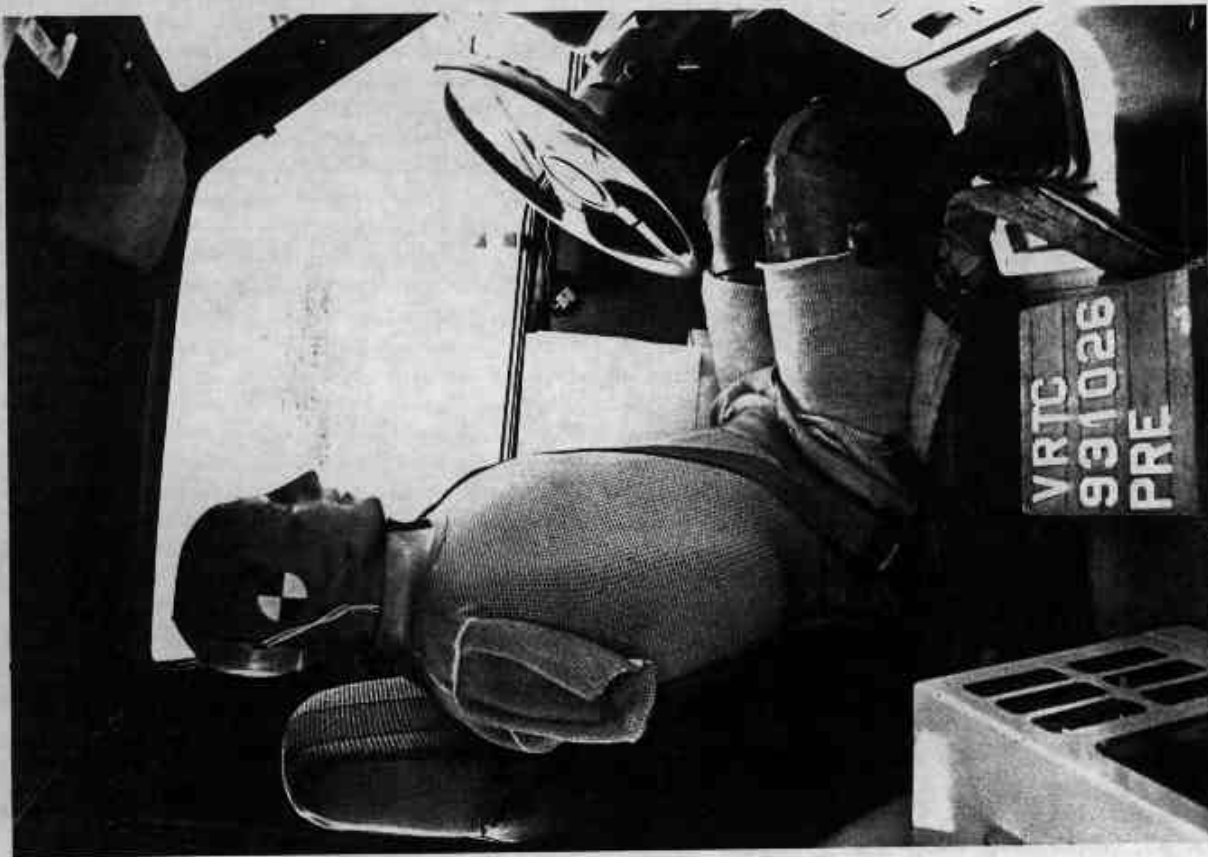


Figure A-23 PRE-TEST DRIVER DUMMY & VEHICLE INTERIOR - VIEW 3

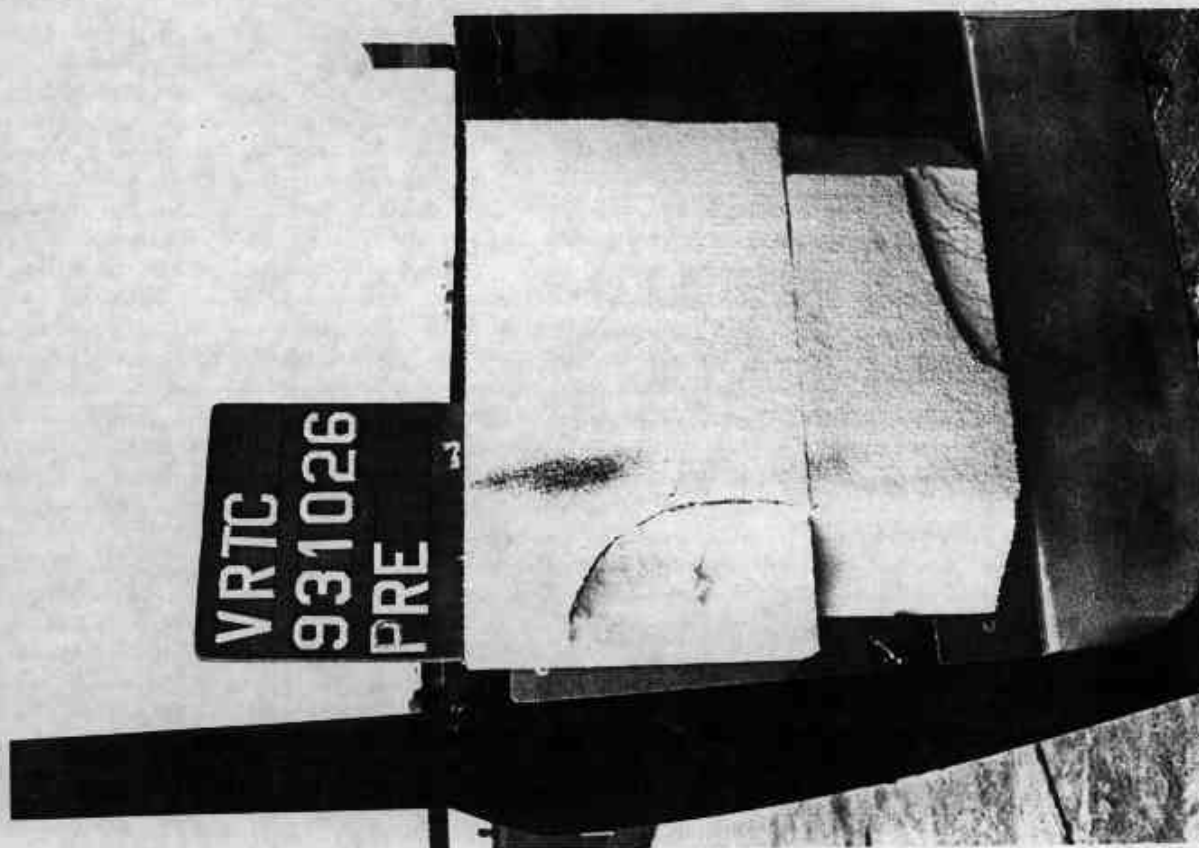


Figure A-24 PRE-TEST DOOR PADDING - VIEW 1

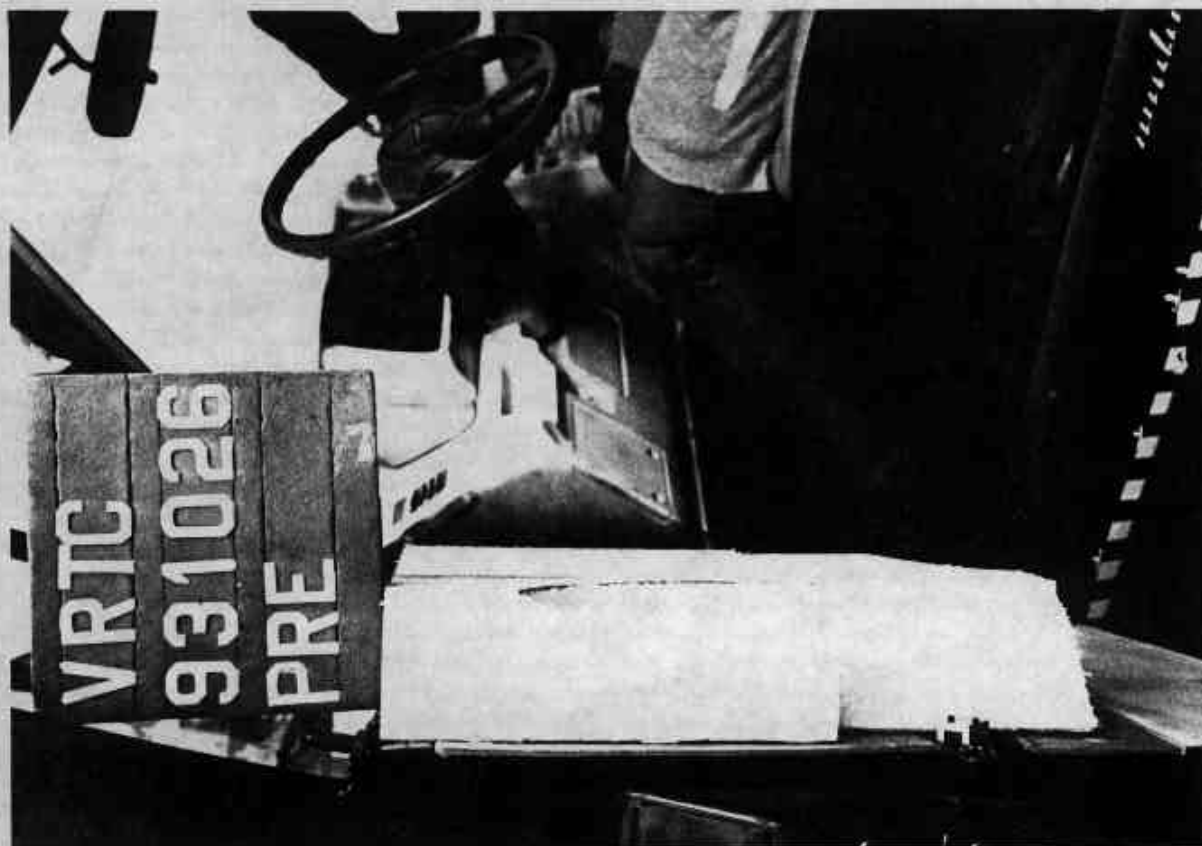


Figure A-25 PRE-TEST DOOR PADDING - VIEW 2



Figure A-26 POST-TEST DRIVER DUMMY HEAD CONTACT VIEW



Figure A-27 POST-TEST DRIVER DUMMY CONTACT VIEW

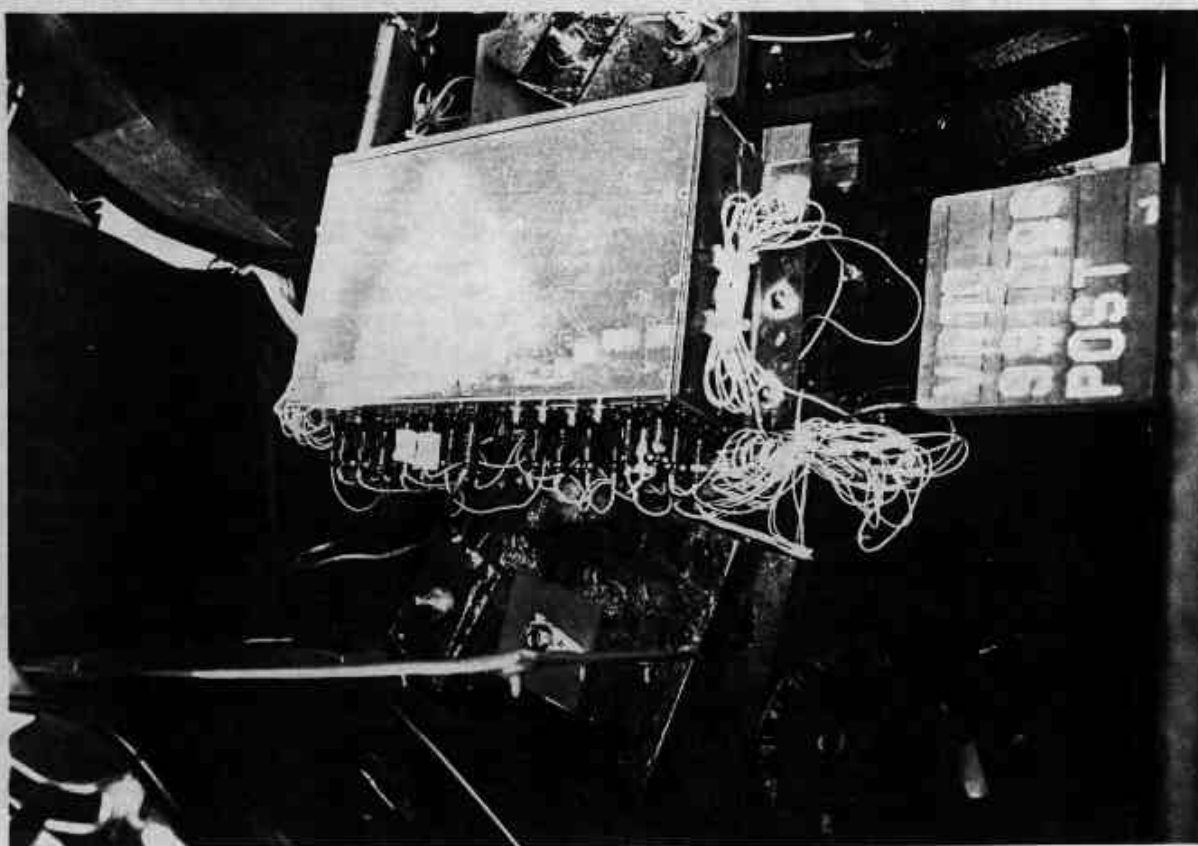


Figure A-28 POST-TEST BALLAST LOCATION VIEW

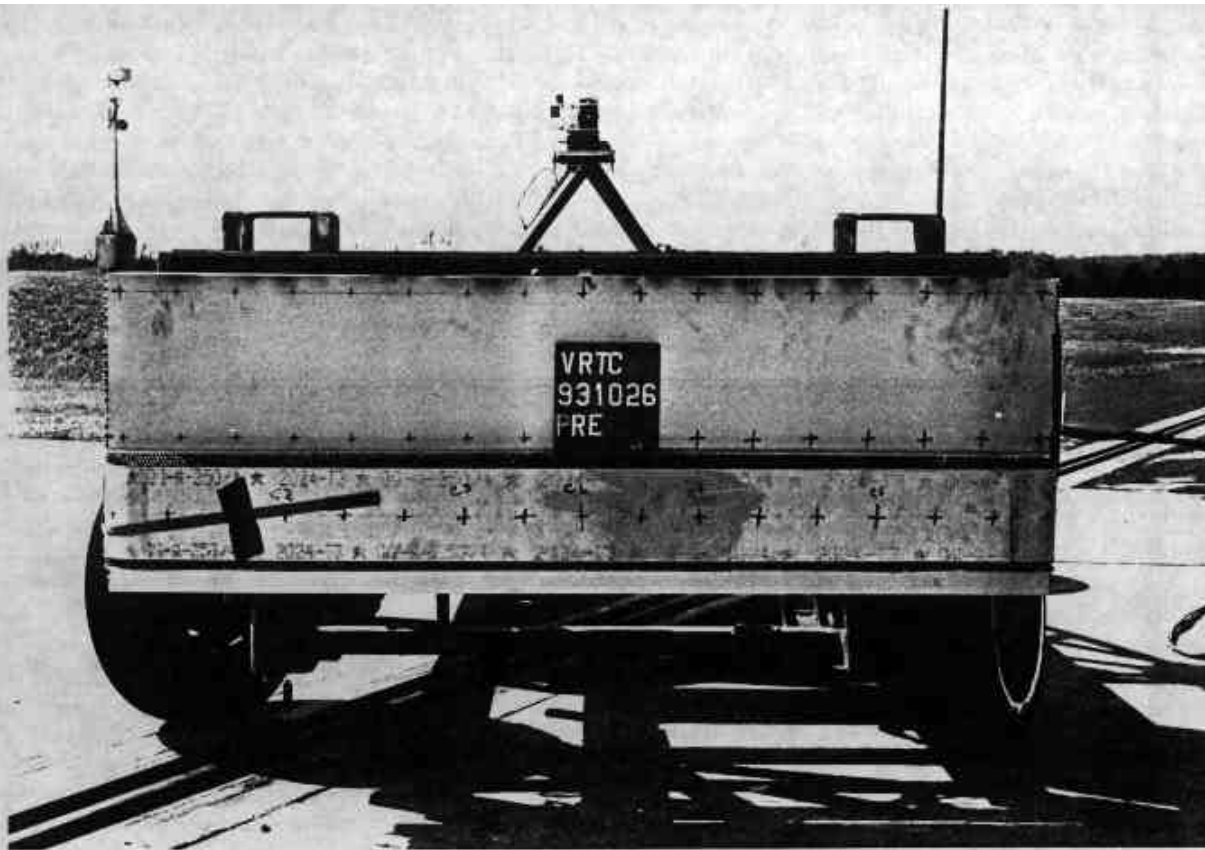


Figure A-29 PRE-TEST VEHICLE IMPACTOR FACE - FRONT VIEW

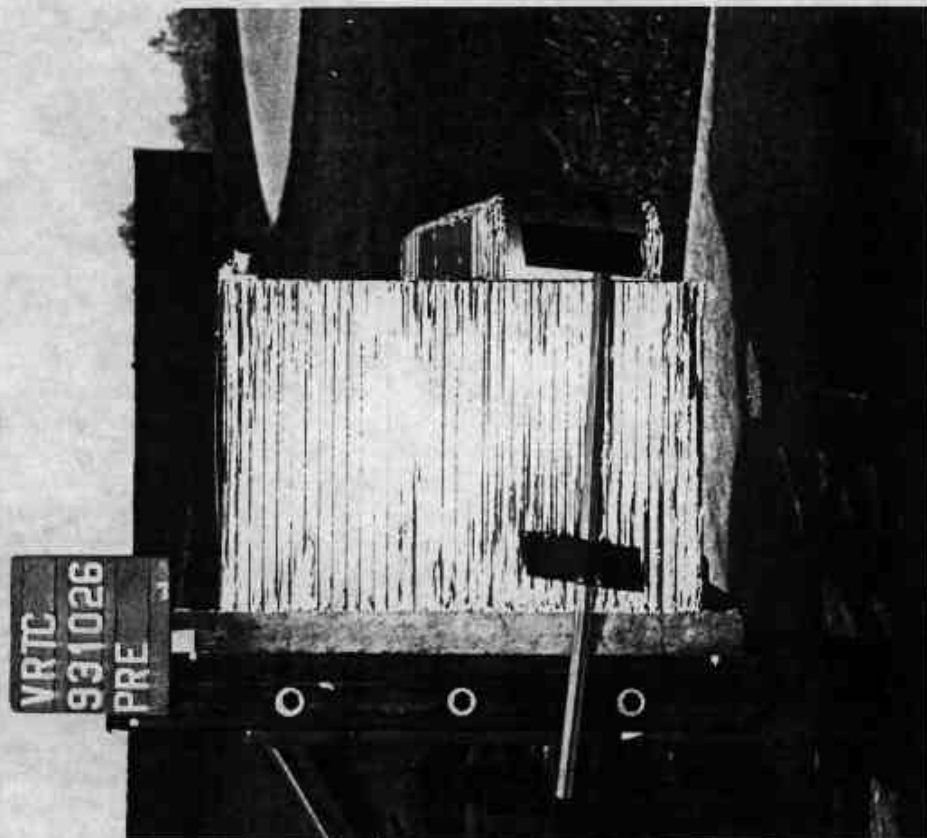


Figure A-30 PRE-TEST VEHICLE IMPACTOR FACE - RIGHT SIDE VIEW



Figure A-31 POST-TEST VEHICLE IMPACTOR FACE - RIGHT SIDE VIEW

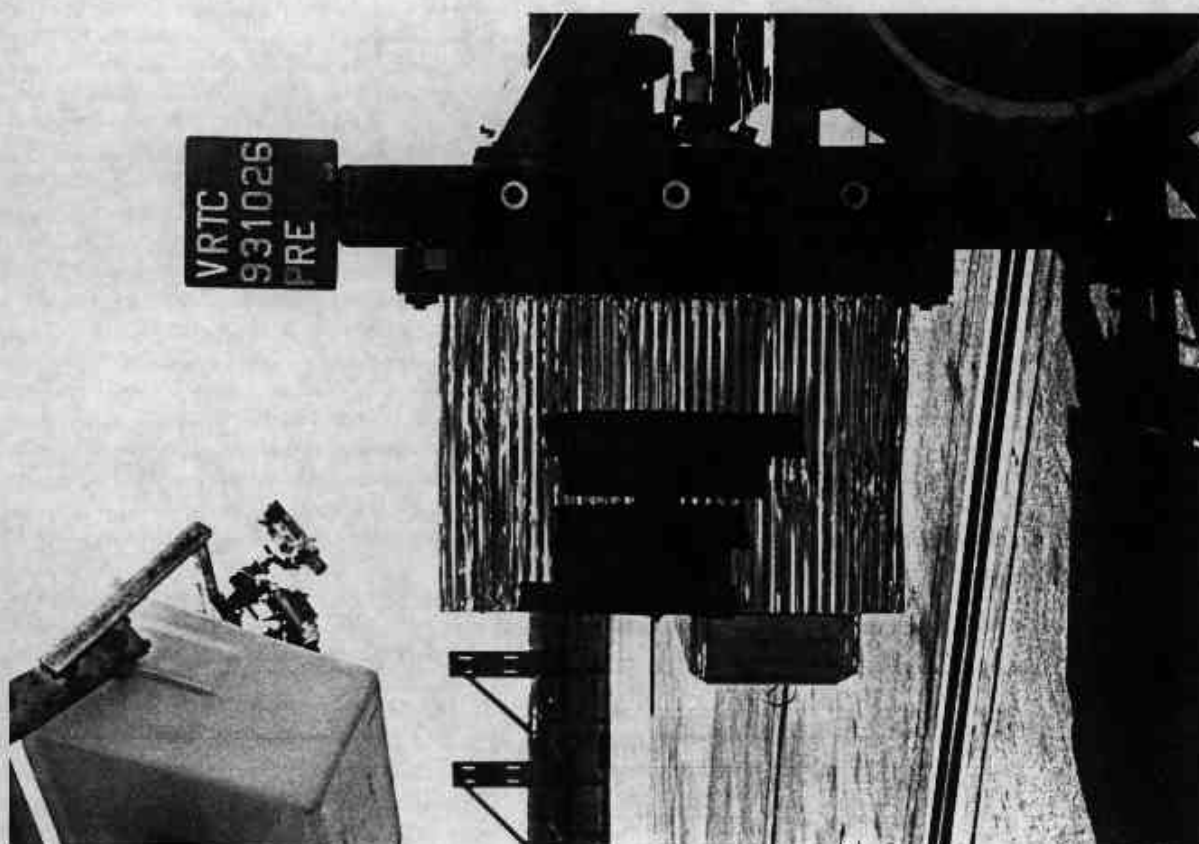


Figure A-32 PRE-TEST VEHICLE IMPACTOR FACE - LEFT SIDE VIEW

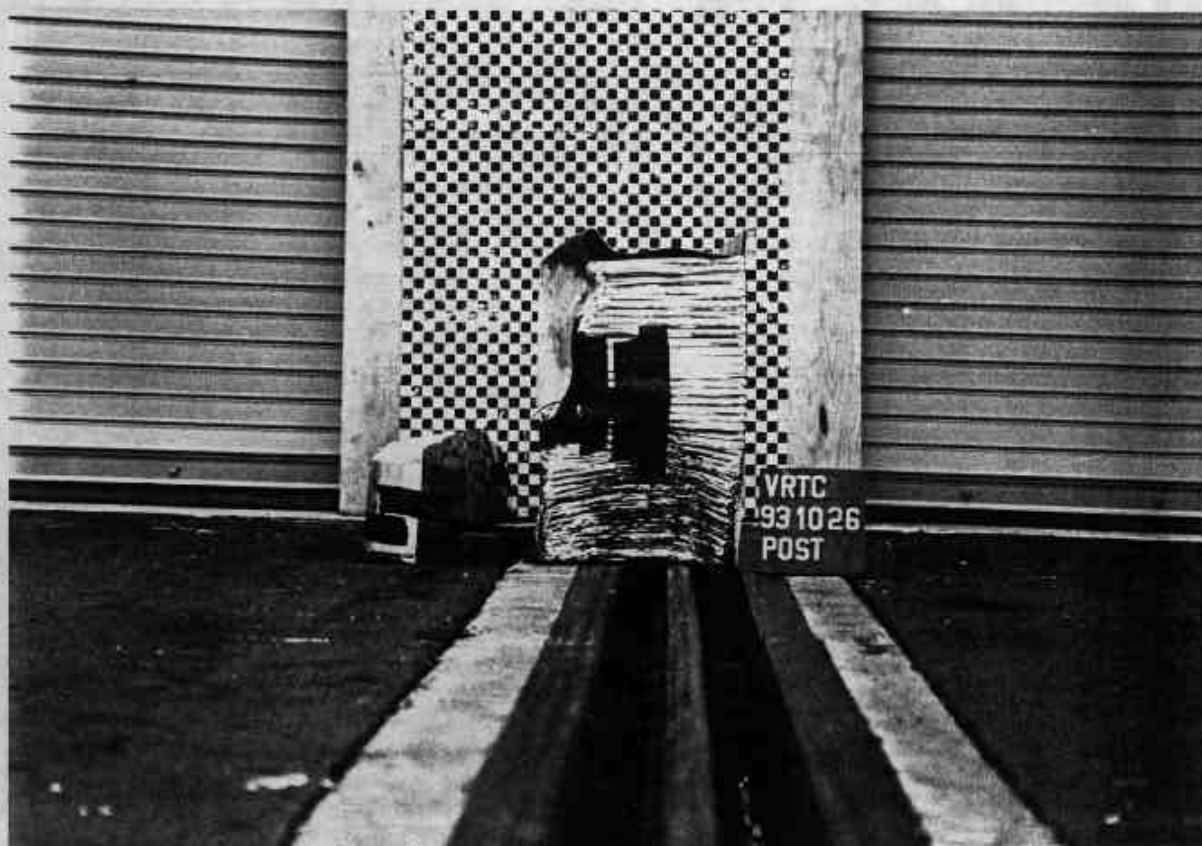


Figure A-33 POST-TEST VEHICLE IMPACTOR FACE - LEFT SIDE VIEW

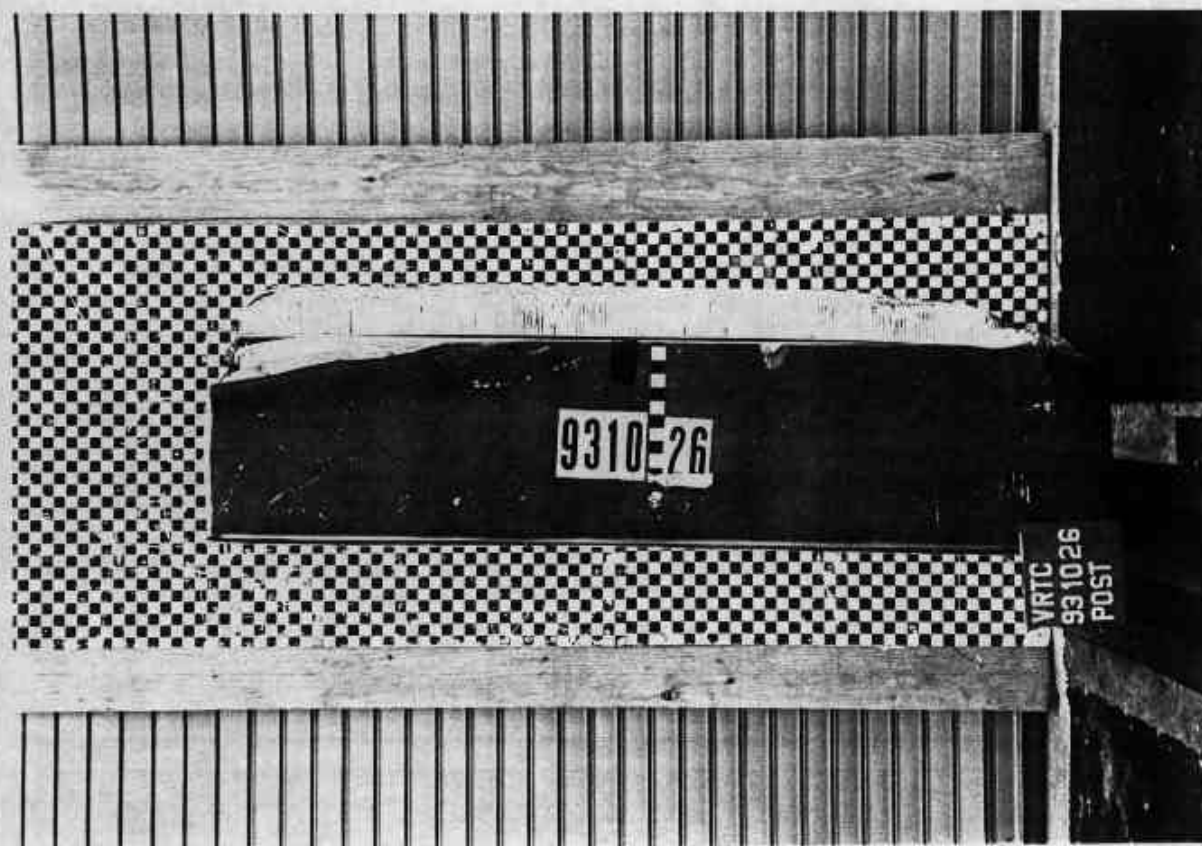


Figure A-34 POST-TEST VEHICLE IMPACTOR FACE - TOP VIEW

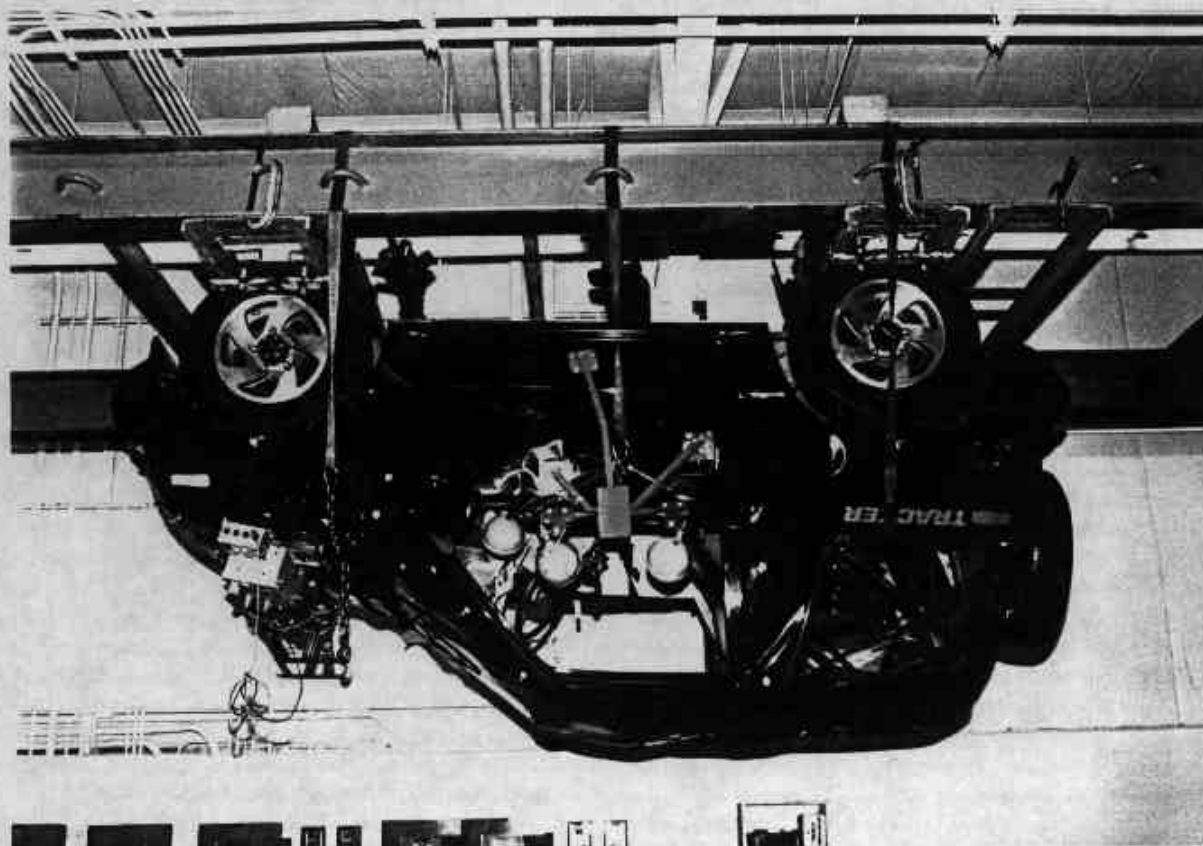


Figure A-35 POST-TEST VEHICLE ON STATIC ROLLOVER DEVICE

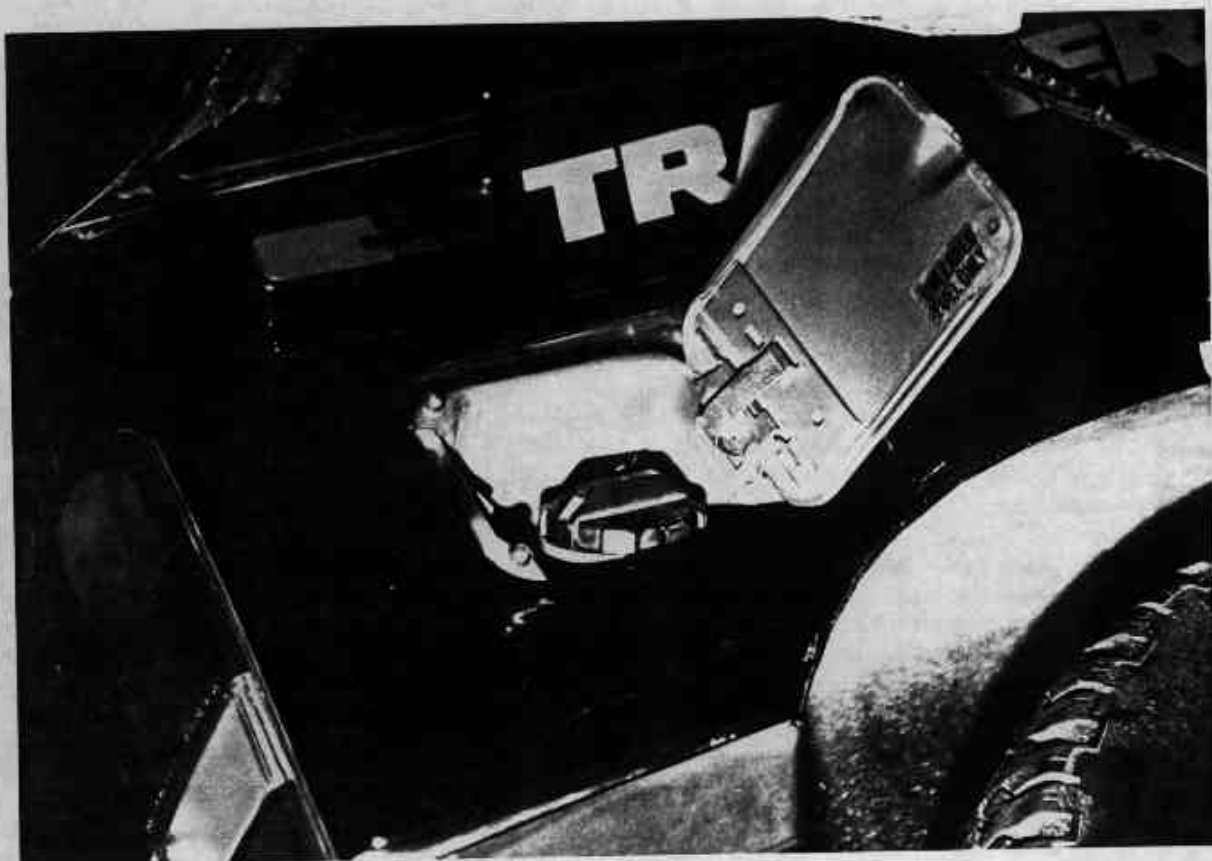


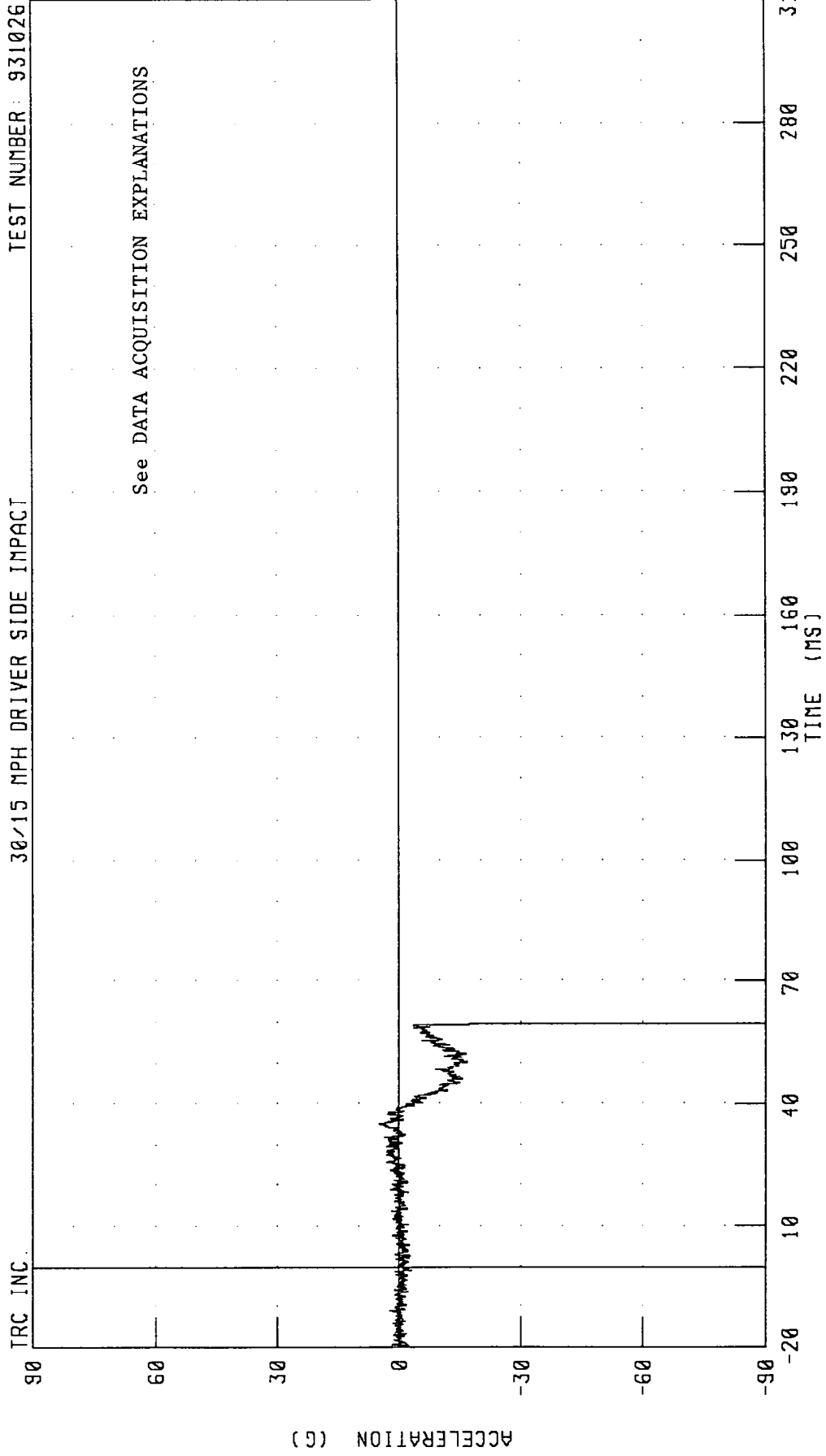
Figure A-36 POST-TEST FUEL LEAKAGE LOCATION

APPENDIX B

DATA PLOTS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER HEAD X-AXIS ACCELERATION
30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



CHANNEL: HEDXG1 FILTER: CH. CLASS 1000

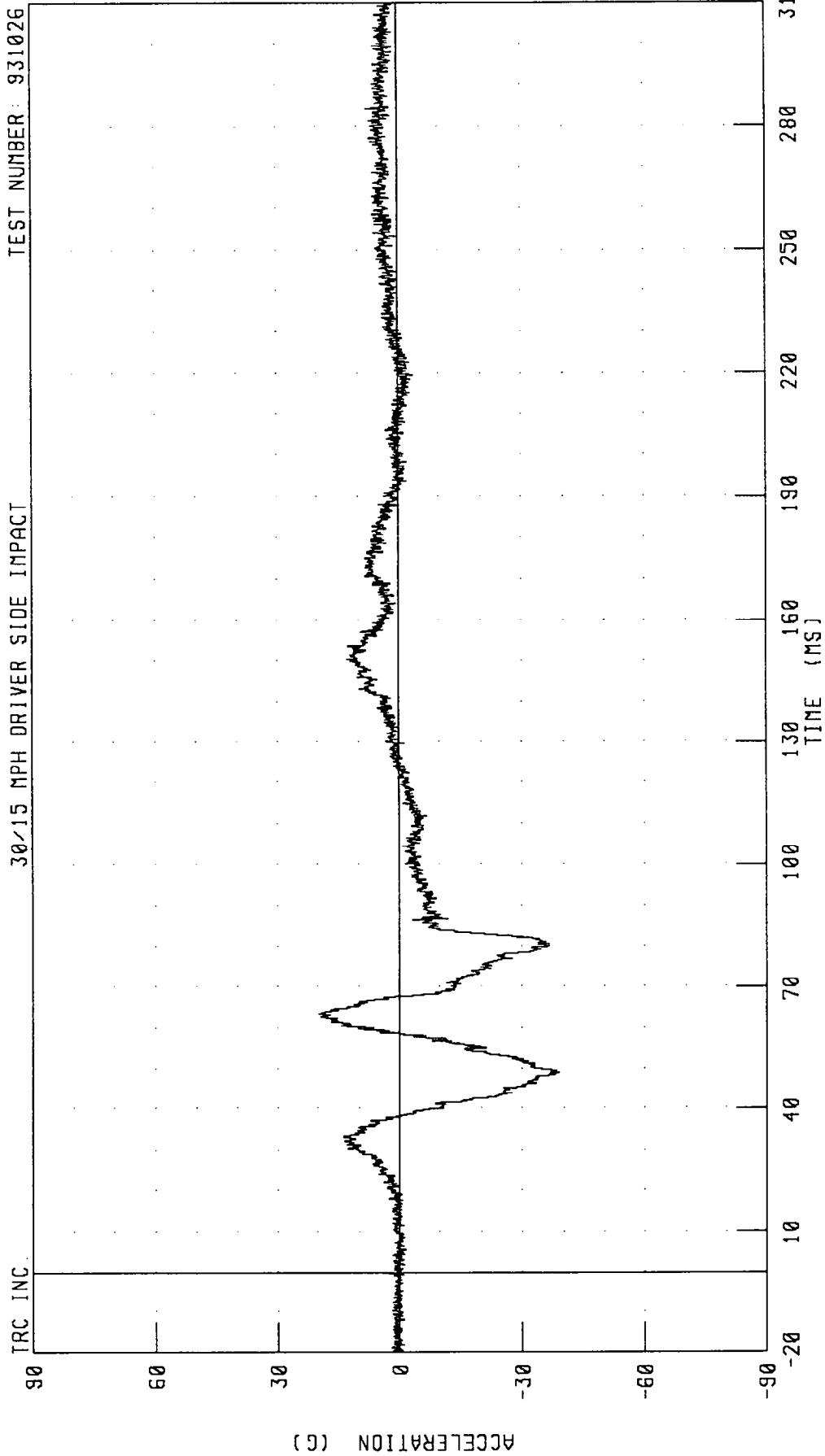
PEAK DATA: 4.89 G @ 35.20 MS; -414.35 G @ 250.88 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

DRIVER HEAD Y-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



CHANNEL: HEDYG1 FILTER: CH. CLASS 1000

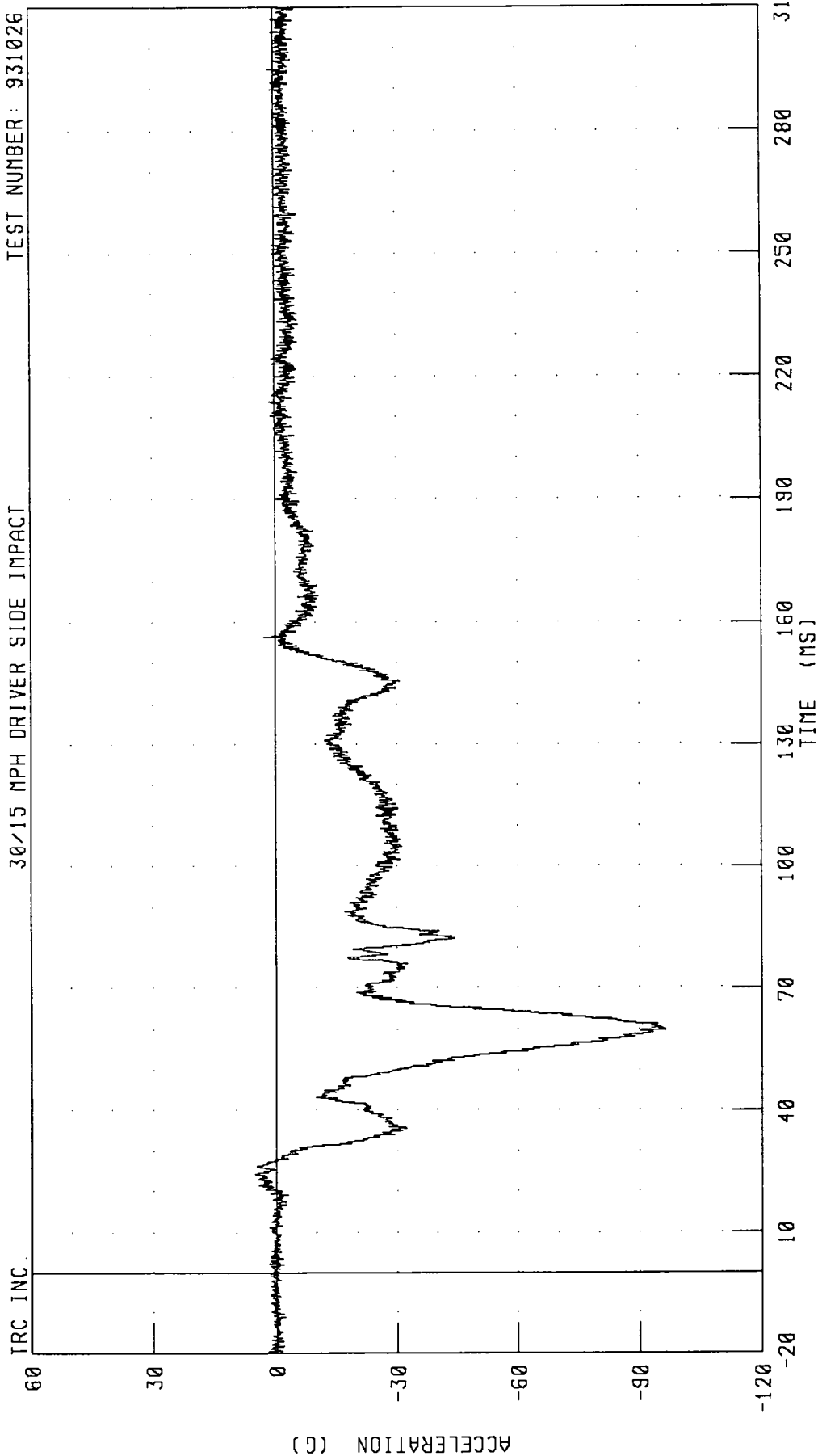
PEAK DATA: 19.74 G @ 63.28 MS, -38.95 G @ 49.04 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

DRIVER HEAD Z-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



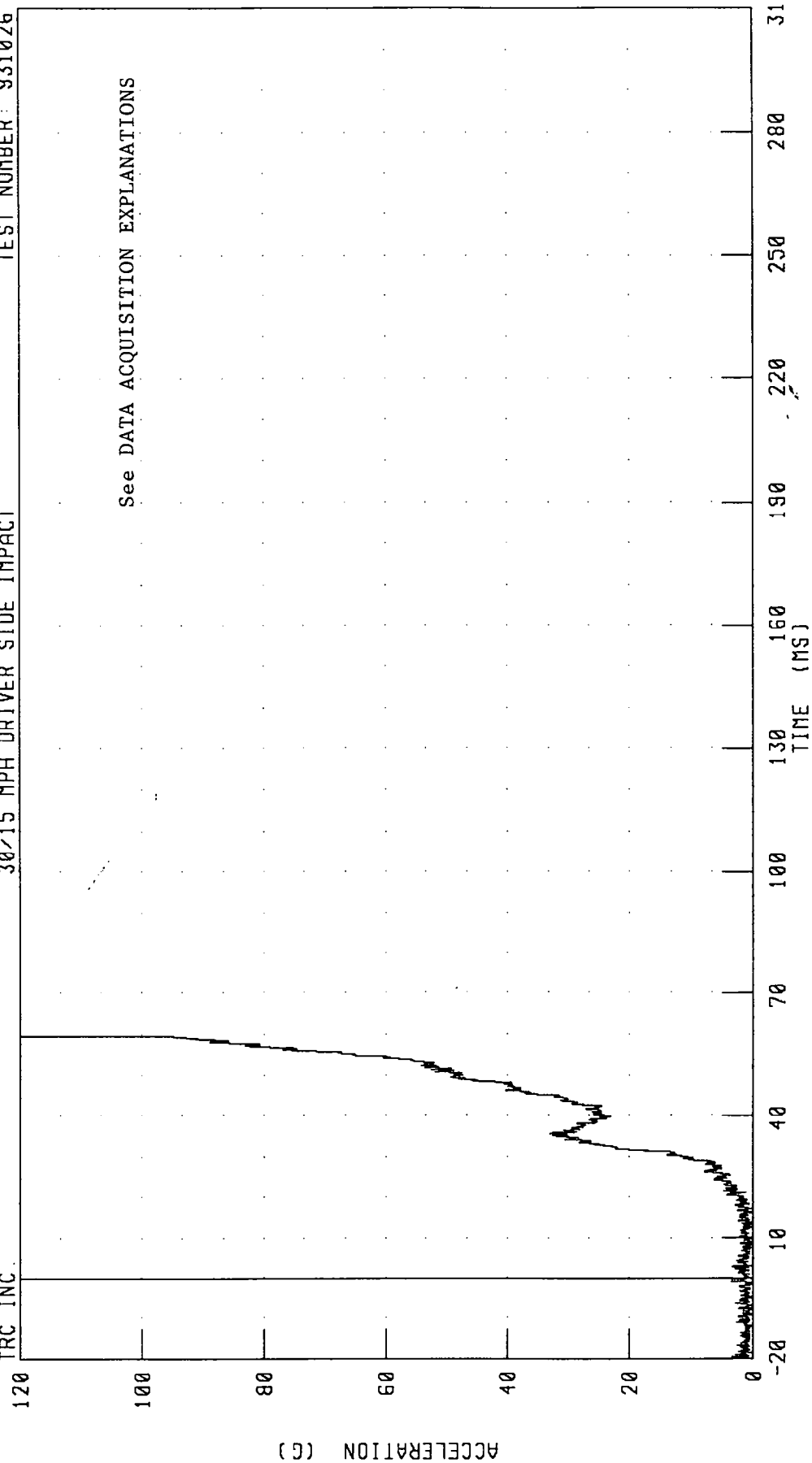
CHANNEL: HEDZG1 FILTER: CH CLASS 1000

PEAK DATA: 5.26 G @ 24.48 MS, -96.19 G @ 59.92 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER HEAD RESULTANT ACCELERATION
30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

TRC INC.



See DATA ACQUISITION EXPLANATIONS

CHANNEL: HEDRG1 FILTER: CH. CLASS 1000

PEAK DATA: 414.42 G @ 259.60 MS; 0.18 G @ 12.48 MS

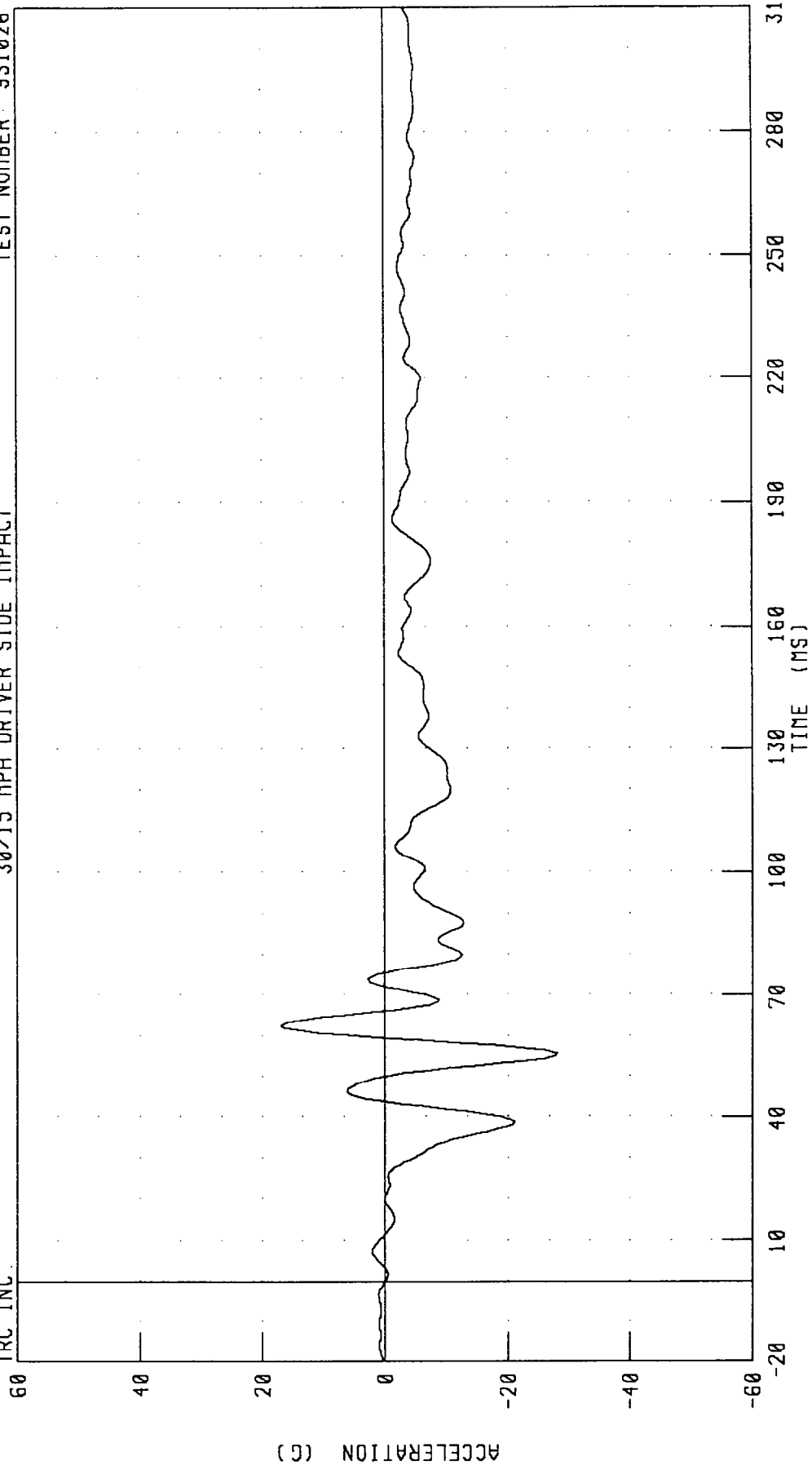
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

DRIVER UPPER SPINE X-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

TRC INC.



CHANNEL: T01XG1 FILTER: FIR 100

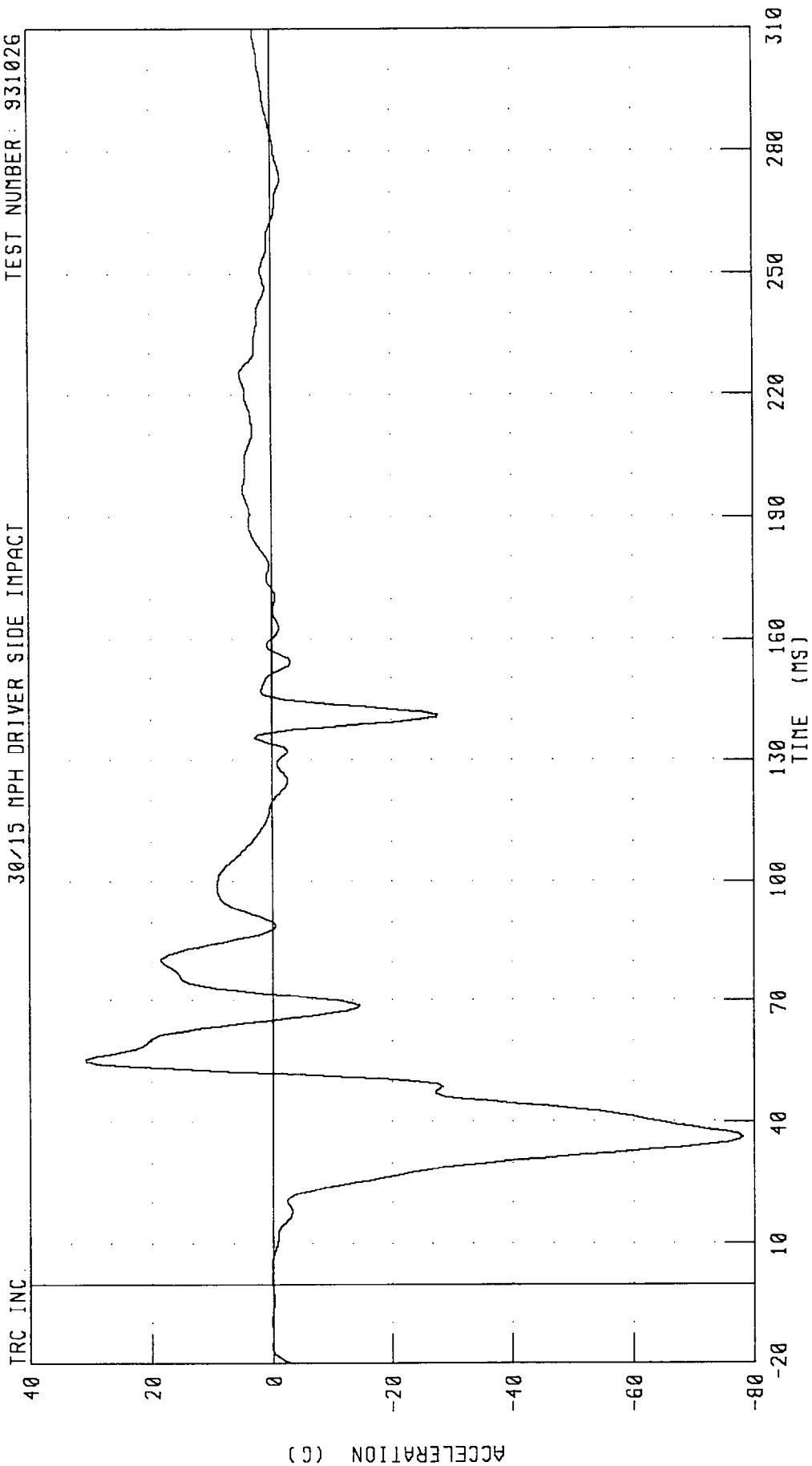
PEAK DATA: 16.90 G @ 62.50 MS; -27.85 G @ 55.63 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

DRIVER UPPER SPINE Y-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



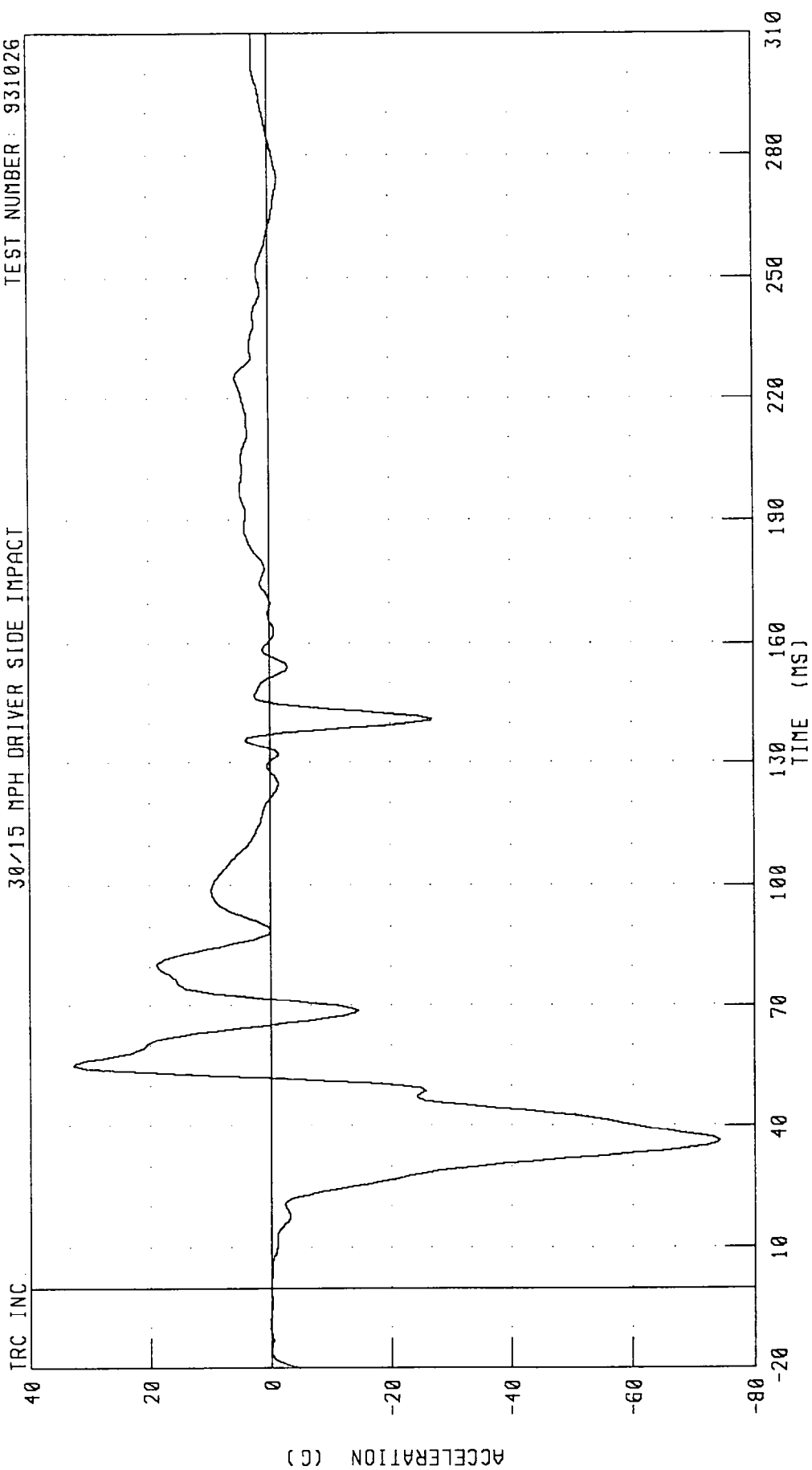
CHANNEL: T01YG1 FILTER: FIR 100

PEAK DATA: 30.77 G @ 55.00 MS; -78.12 G @ 36.25 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER UPPER SPINE Y-AXIS REDUNDANT ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



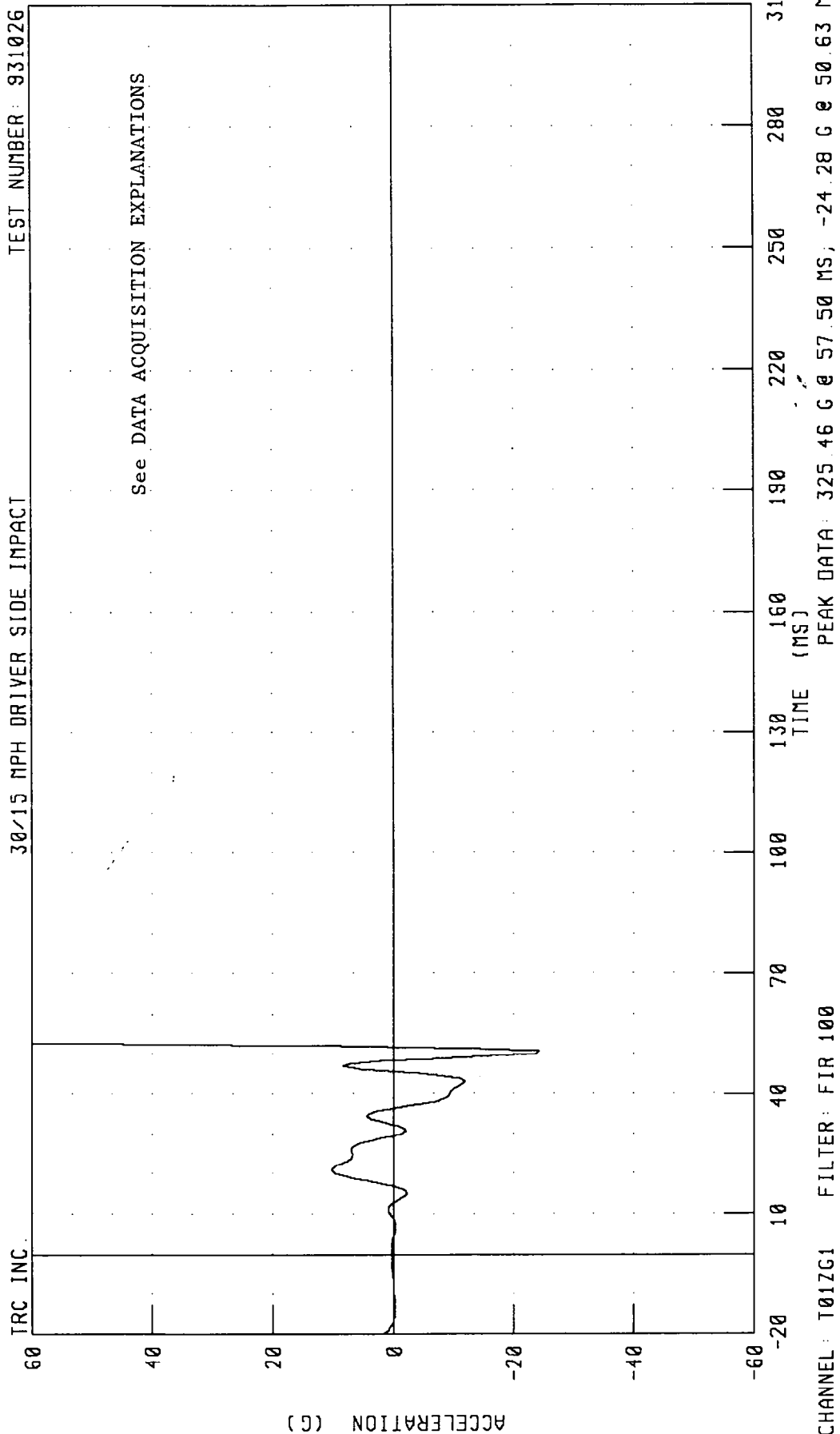
CHANNEL: T01YGA FILTER: FIR 100

PEAK DATA: 32.65 G @ 55.00 MS; -74.13 G @ 36.25 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER UPPER SPINE Z-AXIS ACCELERATION

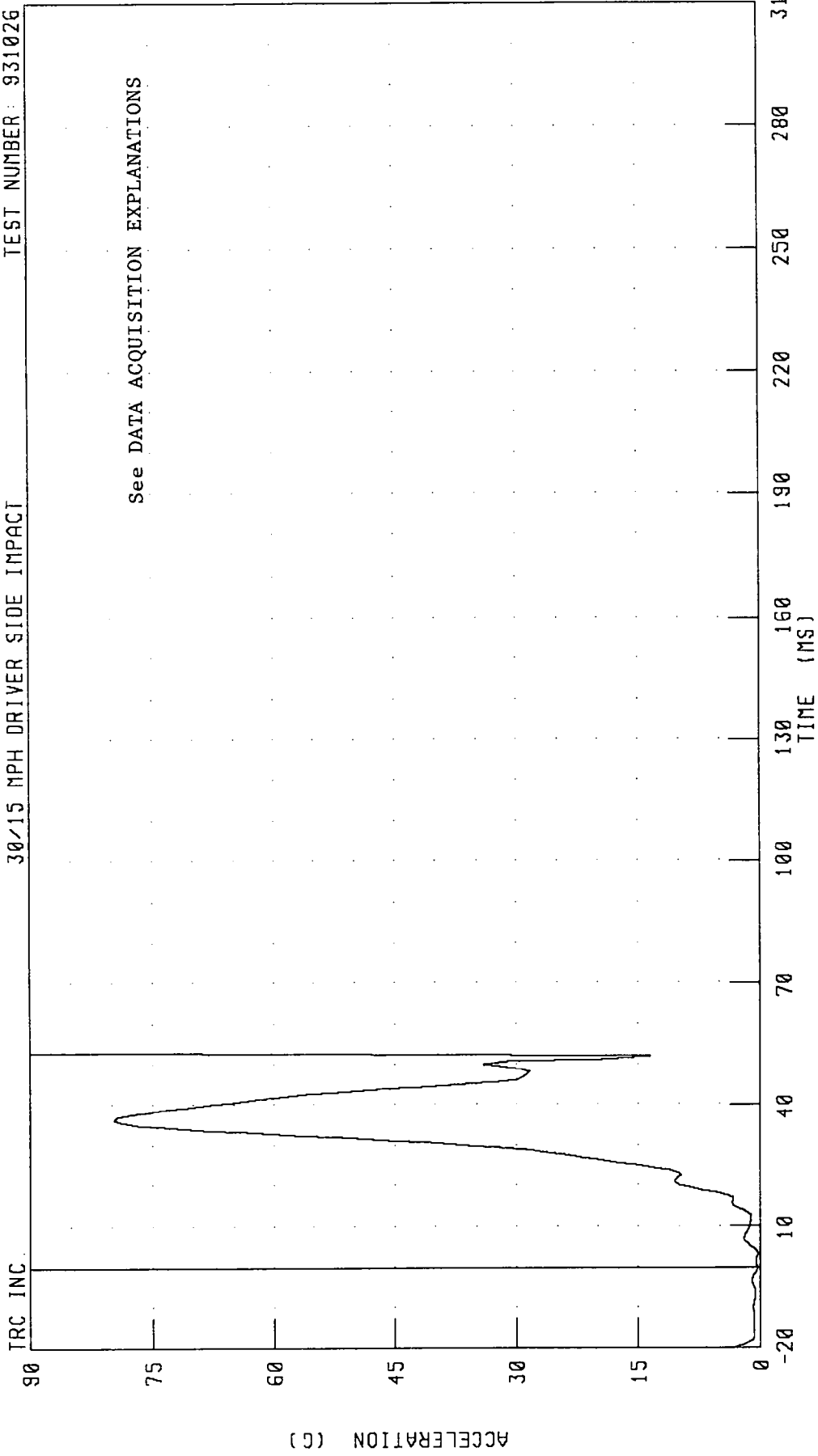
TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER UPPER SPINE RESULTANT ACCELERATION
30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



CHANNEL: T01RG1 FILTER: FIR 100

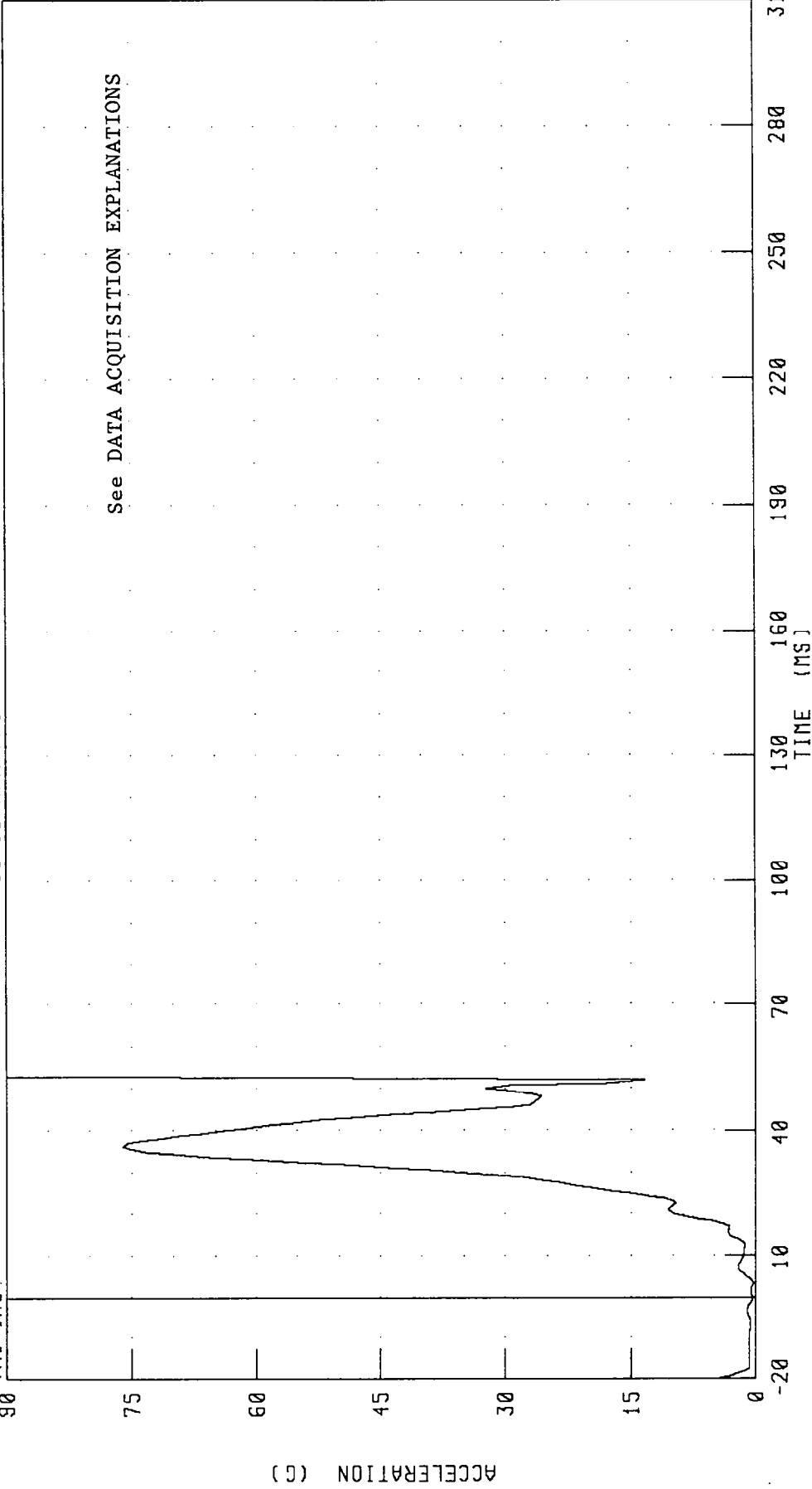
PEAK DATA: 326.87 G @ 57.50 MS, 0.29 G @ 3.13 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER UPPER SPINE RESULTANT REDUNDANT ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT

TRC INC.



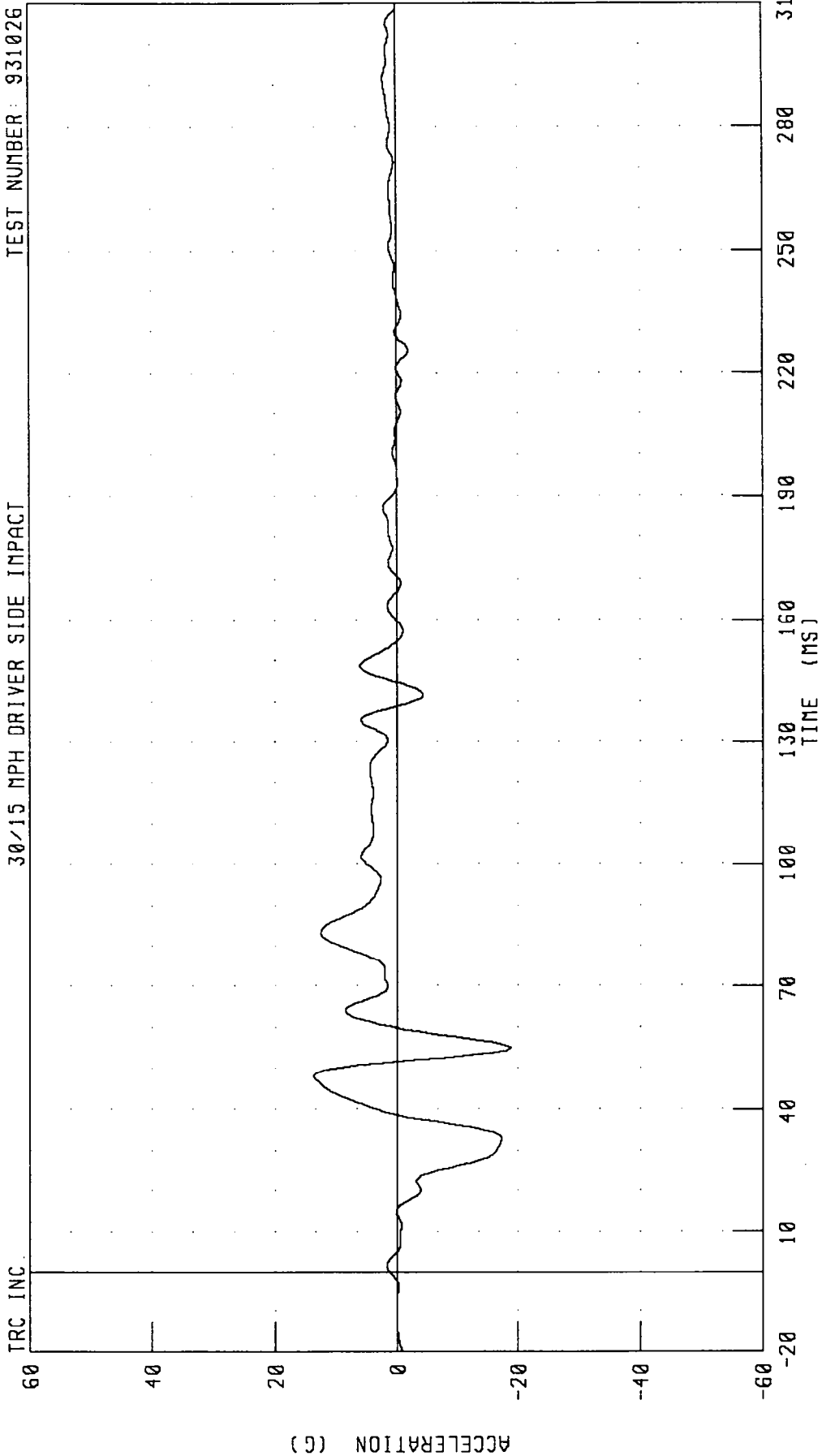
See DATA ACQUISITION EXPLANATIONS

CHANNEL: T01RGA FILTER: FIR 100

PEAK DATA: 326.92 G @ 57.50 MS; 0.27 G @ 3.13 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER LOWER SPINE X-AXIS ACCELERATION
30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



CHANNEL: T12XG1 FILTER: FIR 100

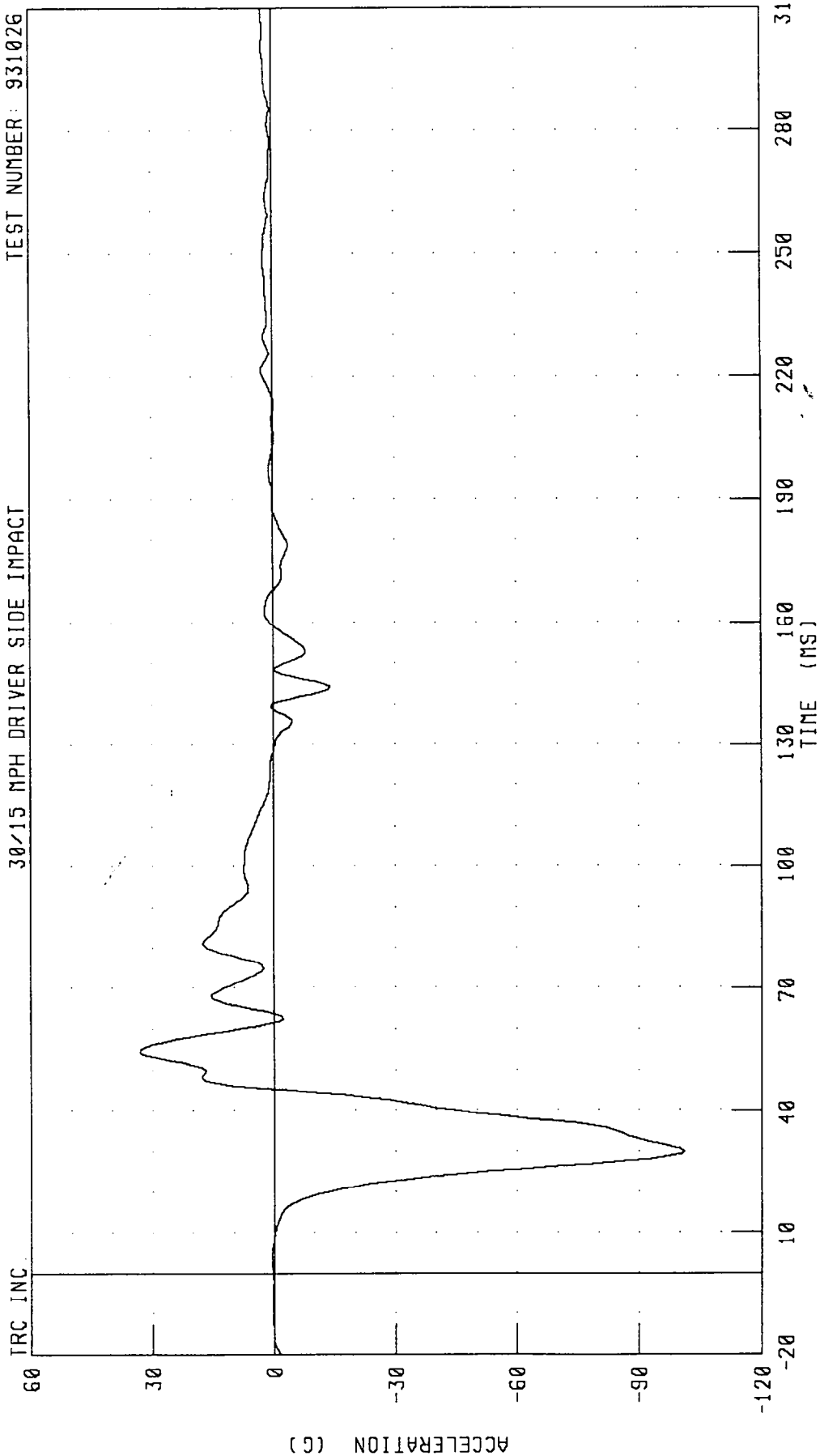
PEAK DATA: 13.67 G @ 48.13 MS, -18.74 G @ 55.00 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

DRIVER LOWER SPINE Y-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

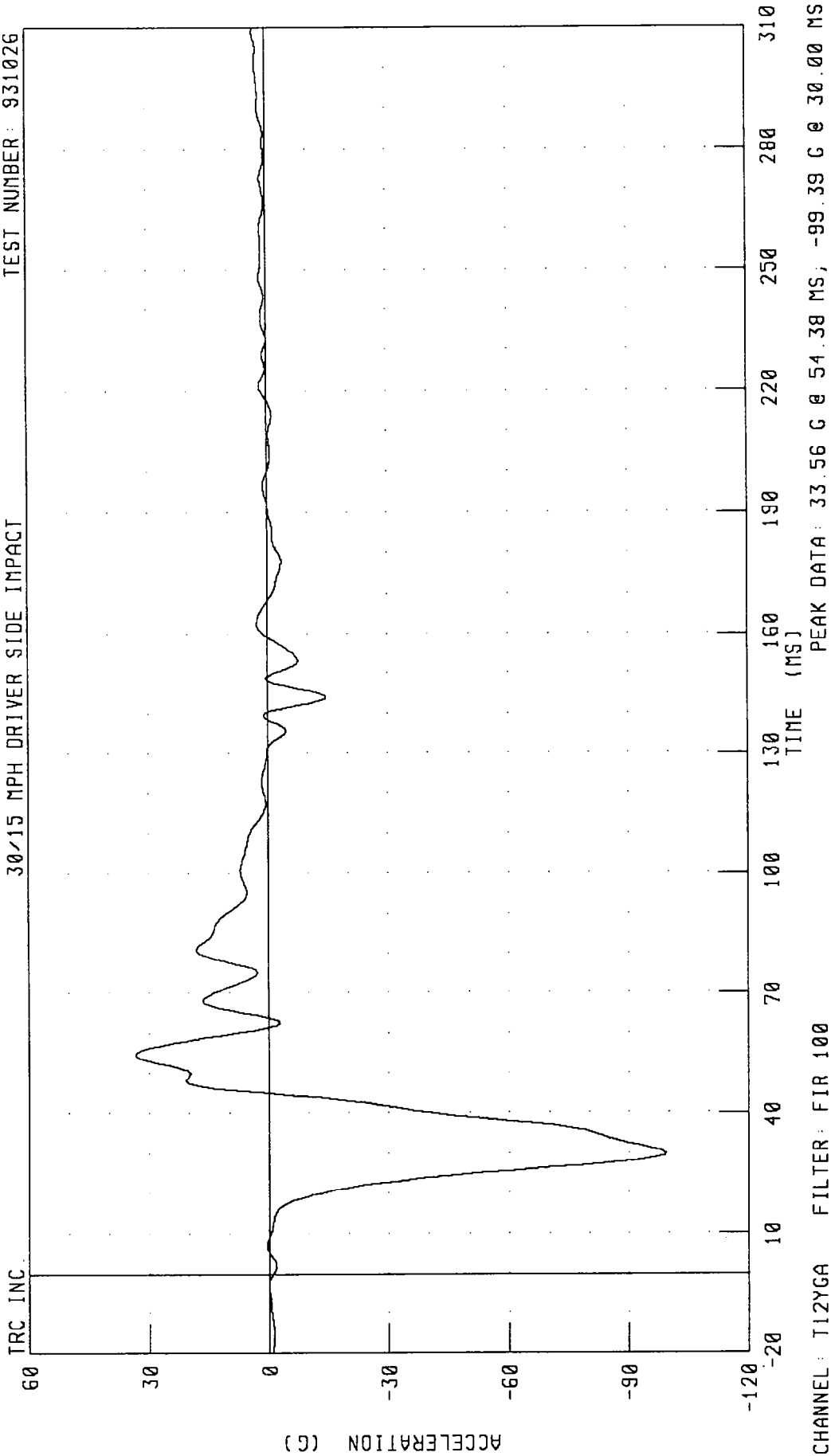


CHANNEL: T12YG1 FILTER: FIR 100

PEAK DATA: 33.09 G @ 55.00 MS, -101.15 G @ 30.00 MS

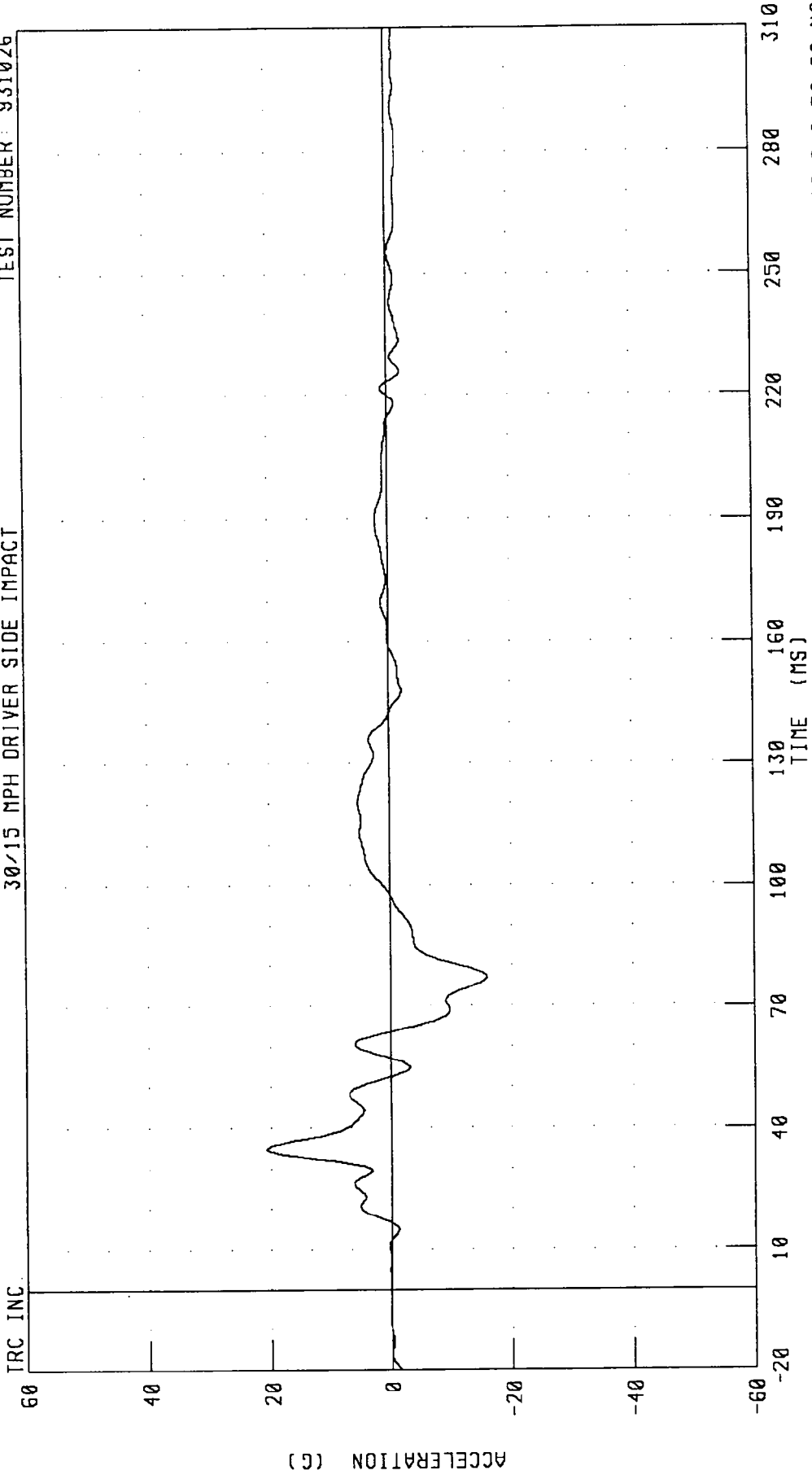
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER LOWER SPINE Y-AXIS REDUNDANT ACCELERATION
30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER LOWER SPINE Z-AXIS ACCELERATION
30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



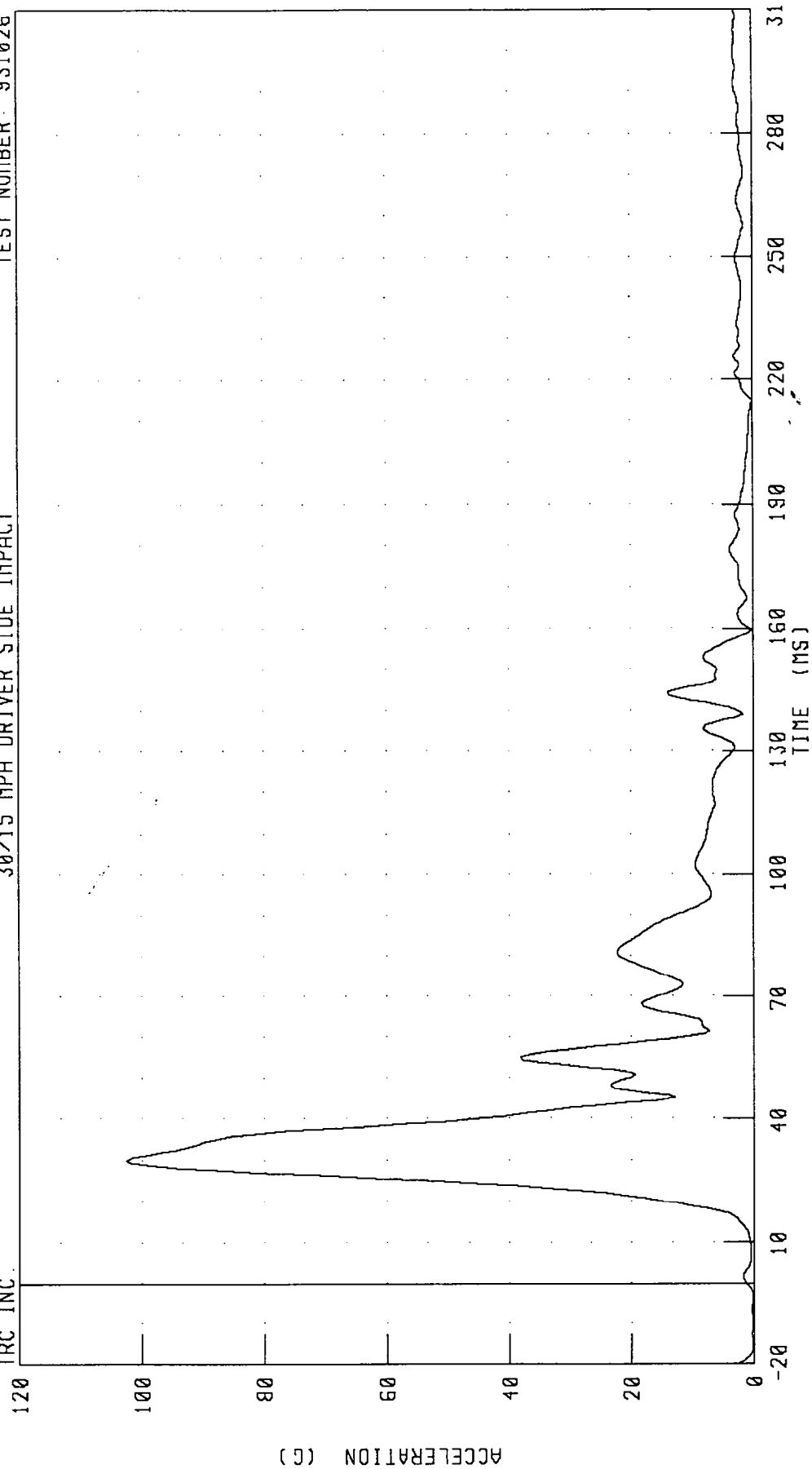
CHANNEL: T12ZG1 FILTER: FIR 100 PEAK DATA: 20.63 G @ 35.00 MS; -15.99 G @ 76.88 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER LOWER SPINE RESULTANT ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT

TRC INC.



CHANNEL: T12RG1 FILTER: FIR 100

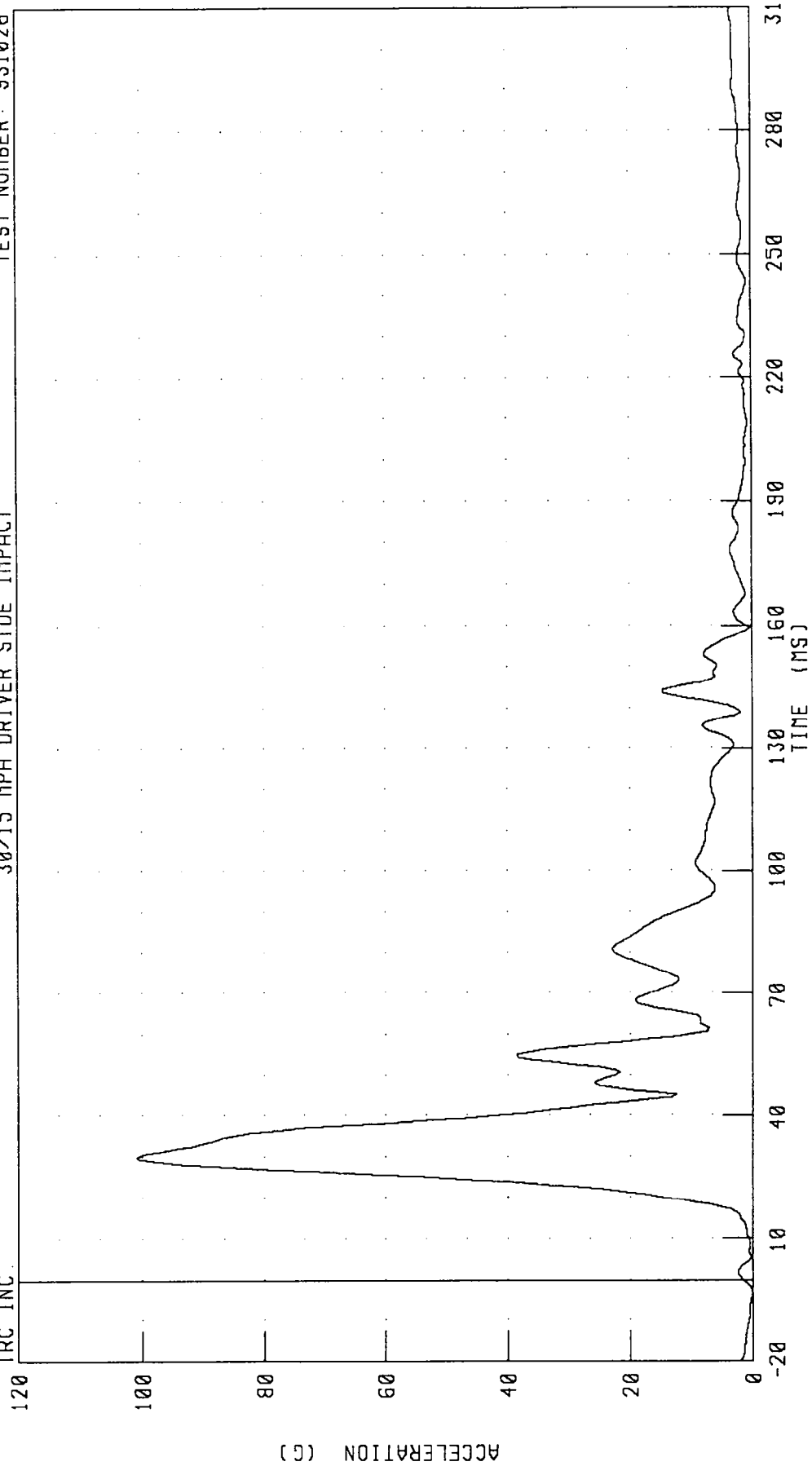
PEAK DATA: 102.52 G @ 30.00 MS, 0.18 G @ 215.00 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER LOWER SPINE RESULTANT REDUNDANT ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT

TRC INC.



CHANNEL: T12RGA FILTER: FIR 100

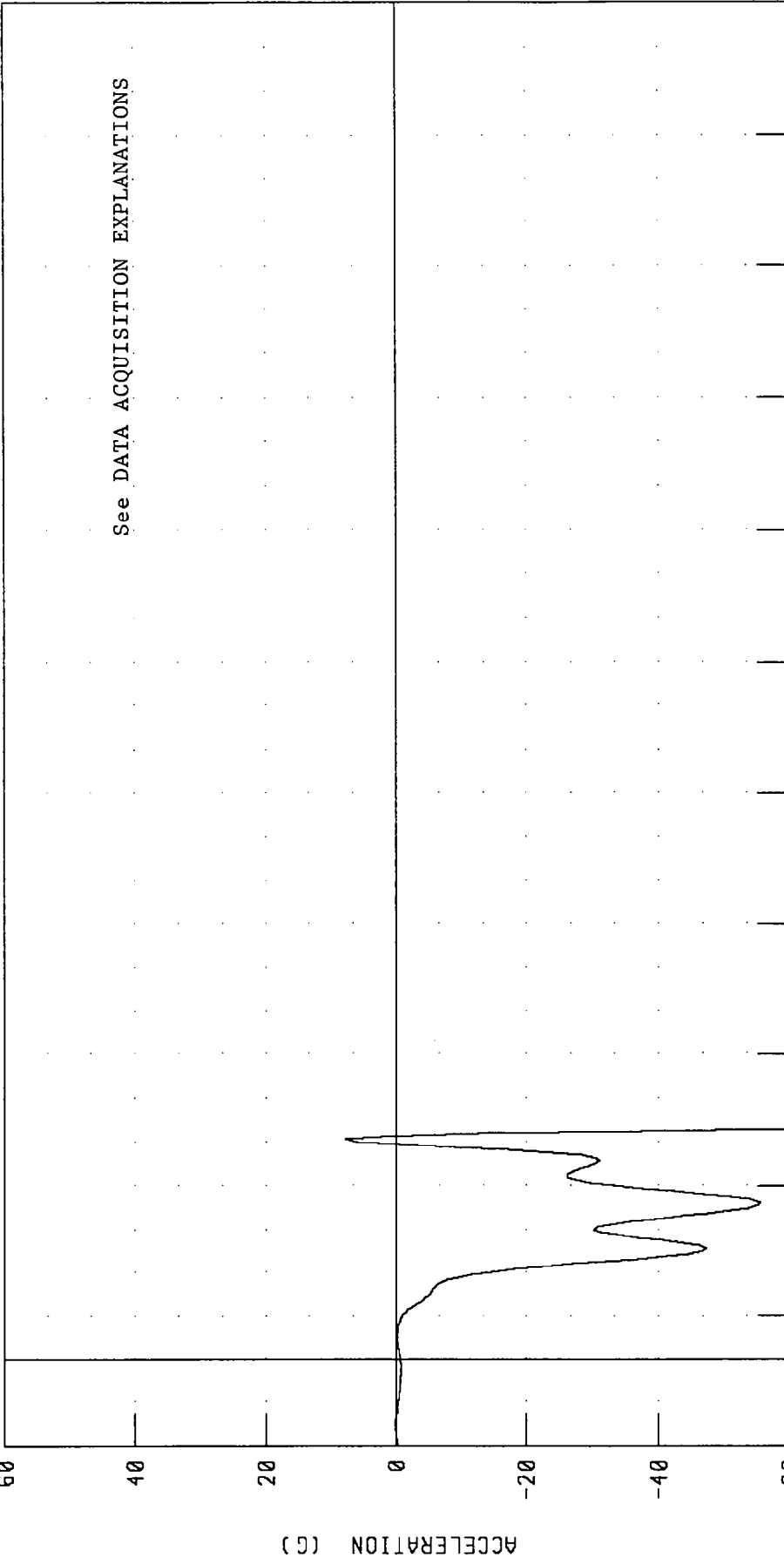
PEAK DATA: 100.79 G @ 30.00 MS; 0.21 G @ -2.50 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
 DRIVER LEFT UPPER THORAX RIB Y-AXIS ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT

TRC INC.



See DATA ACQUISITION EXPLANATIONS

CHANNEL: LURYG1 FILTER: FIR 100

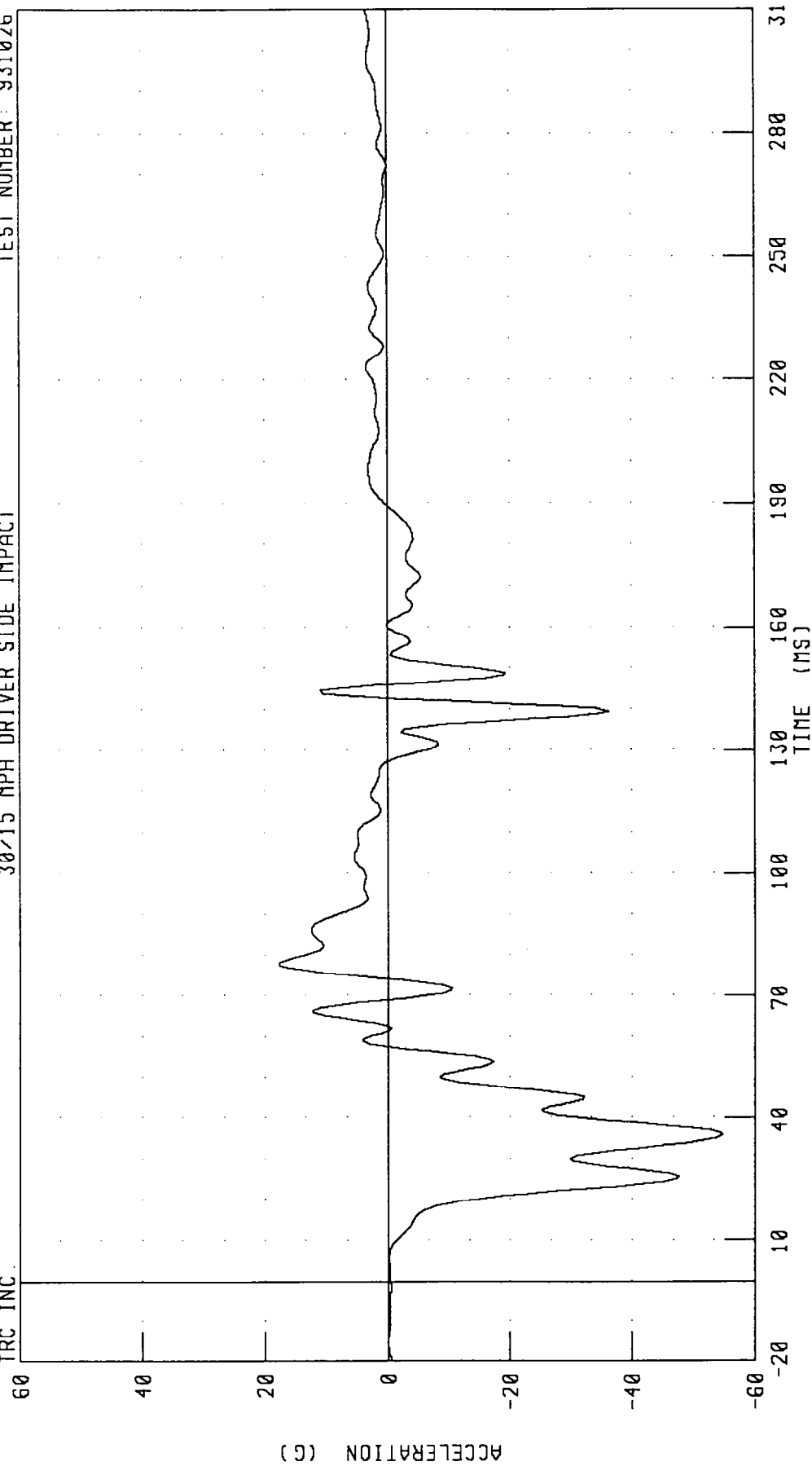
PEAK DATA: 7.81 G @ 50.63 MS; -439.79 G @ 81.25 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER LEFT UPPER THORAX RIB Y-AXIS REDUNDANT ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

TRC INC.



CHANNEL: LURYGA FILTER: FIR 100

PEAK DATA: 17.61 G @ 77.50 MS, -54.64 G @ 35.63 MS

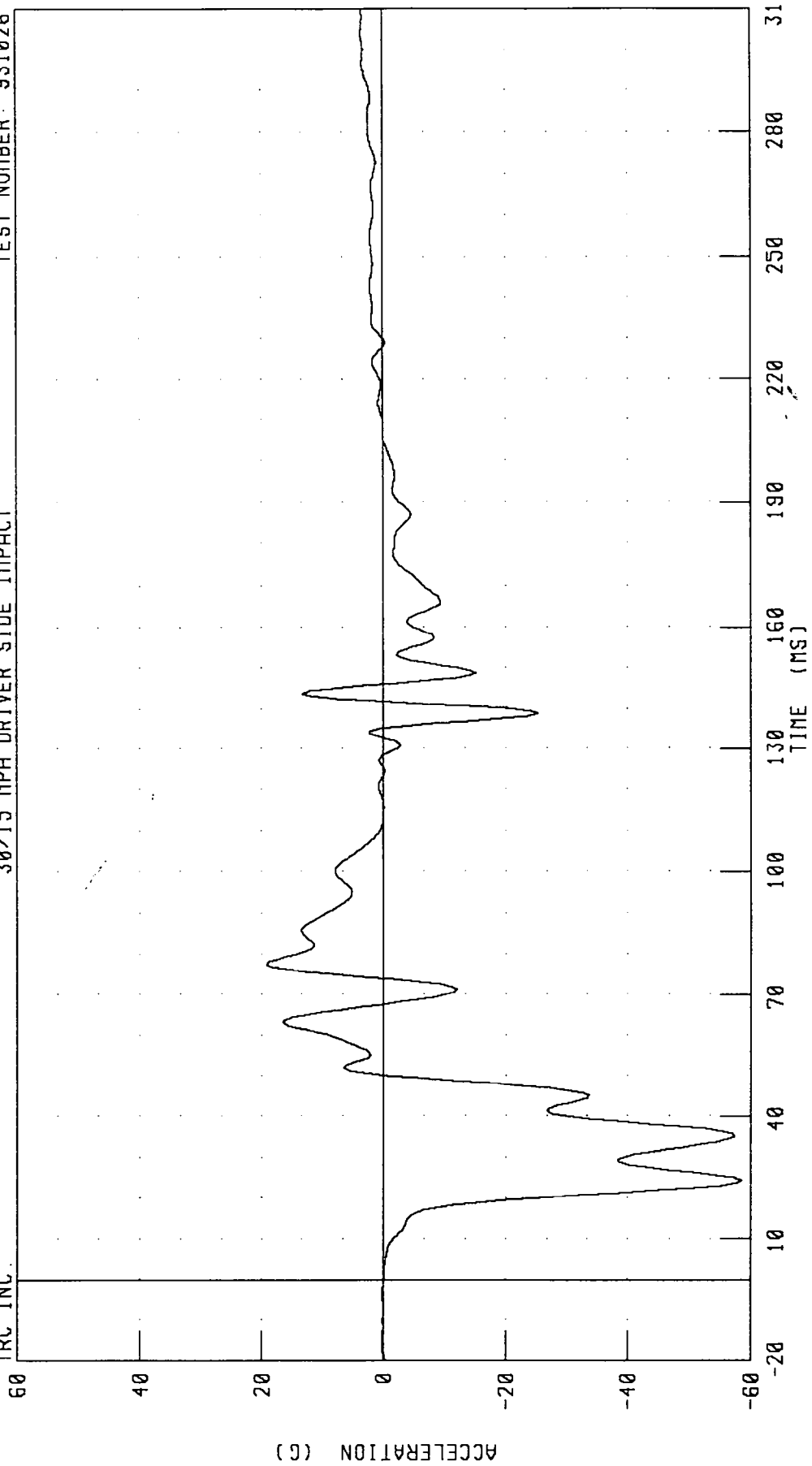
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

DRIVER LEFT LOWER THORAX RIB Y-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

TRC INC.



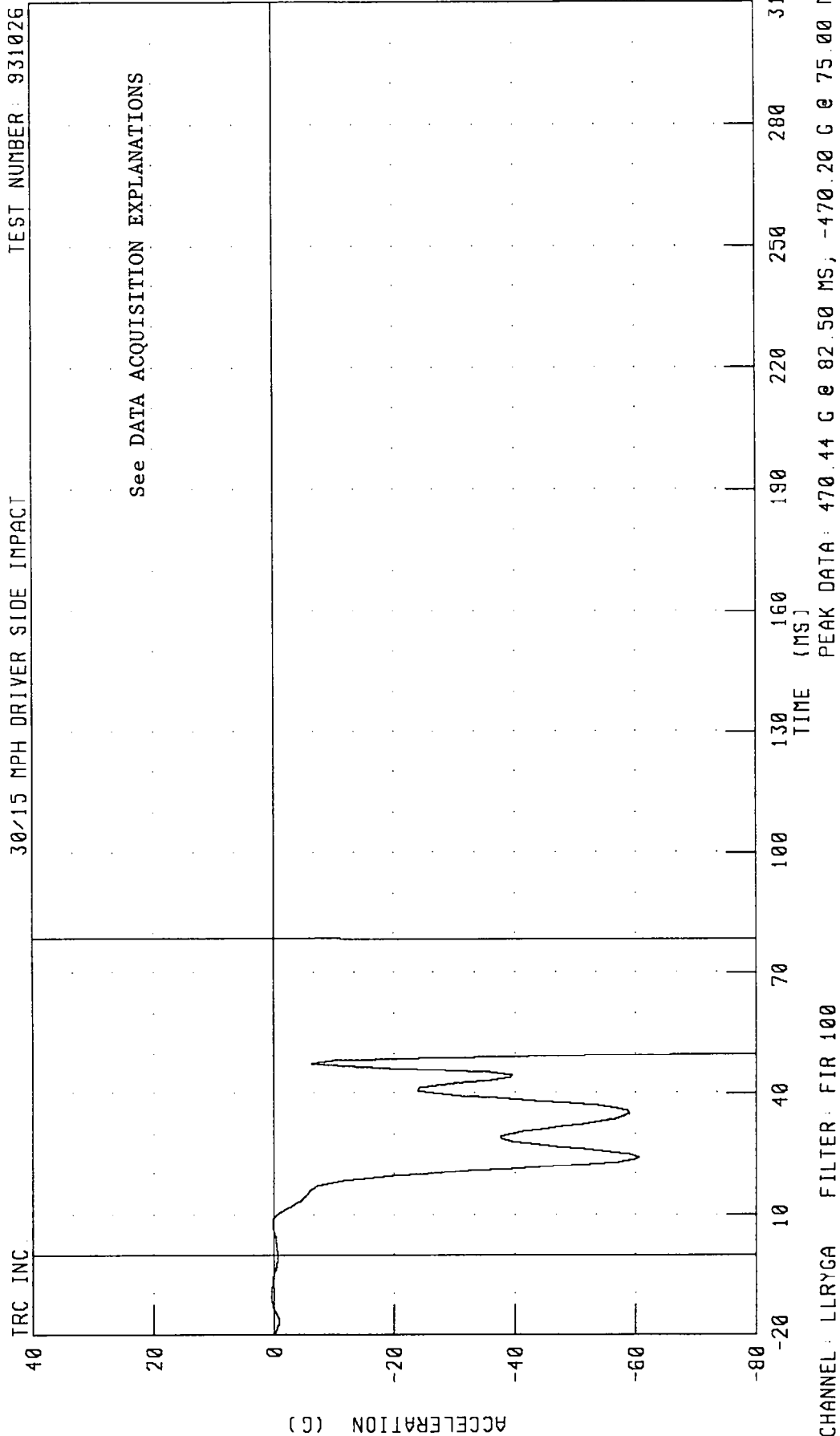
CHANNEL: LRLRG1 FILTER: FIR 100

PEAK DATA: 19.10 G @ 77.50 MS, -58.43 G @ 24.38 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER LEFT LOWER THORAX RIB Y-AXIS REDUNDANT ACCELERATION

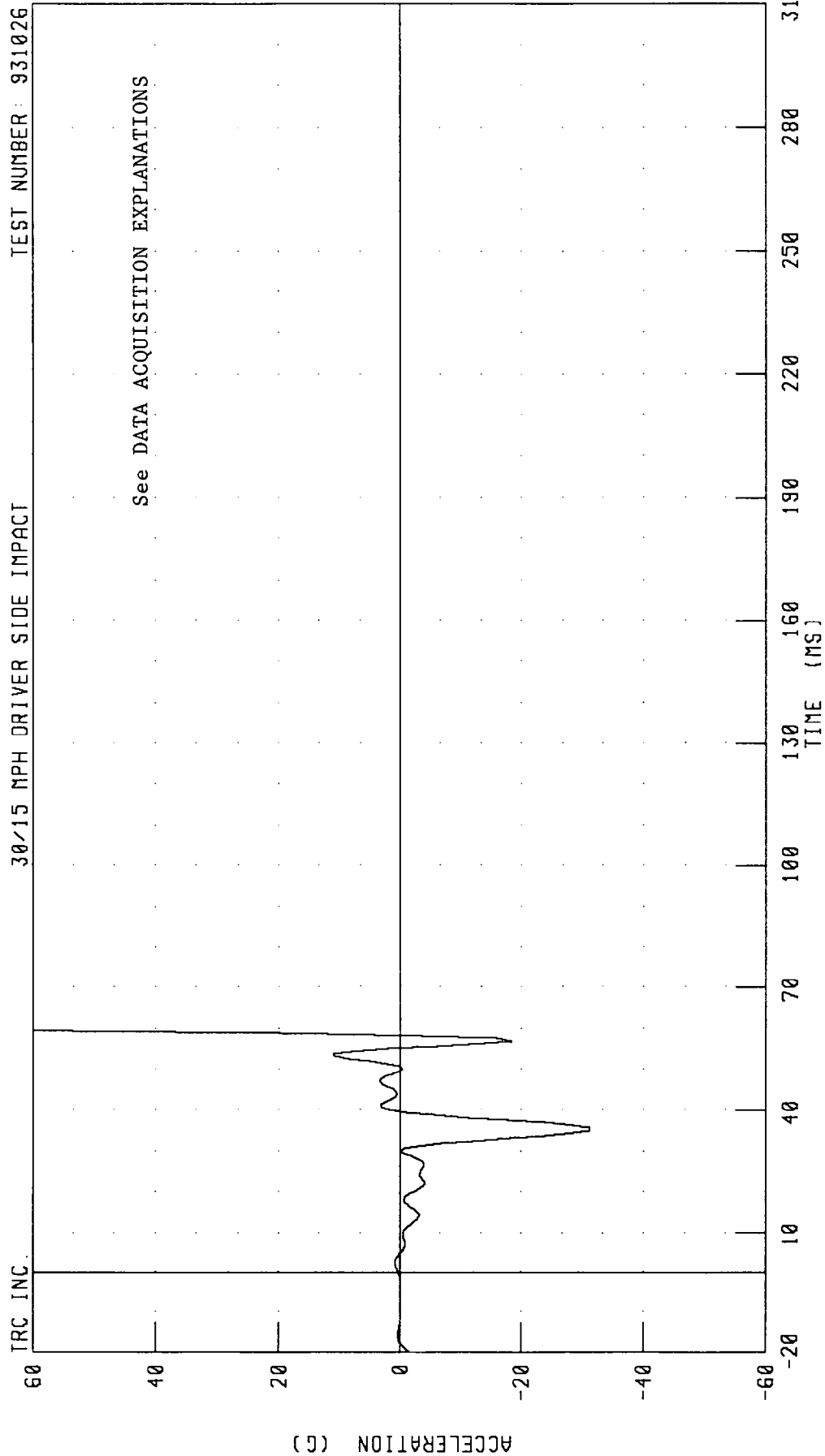
TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT



MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
 DRIVER PELVIS X-AXIS ACCELERATION
 30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



CHANNEL: PEVXG1 FILTER: FIR 100

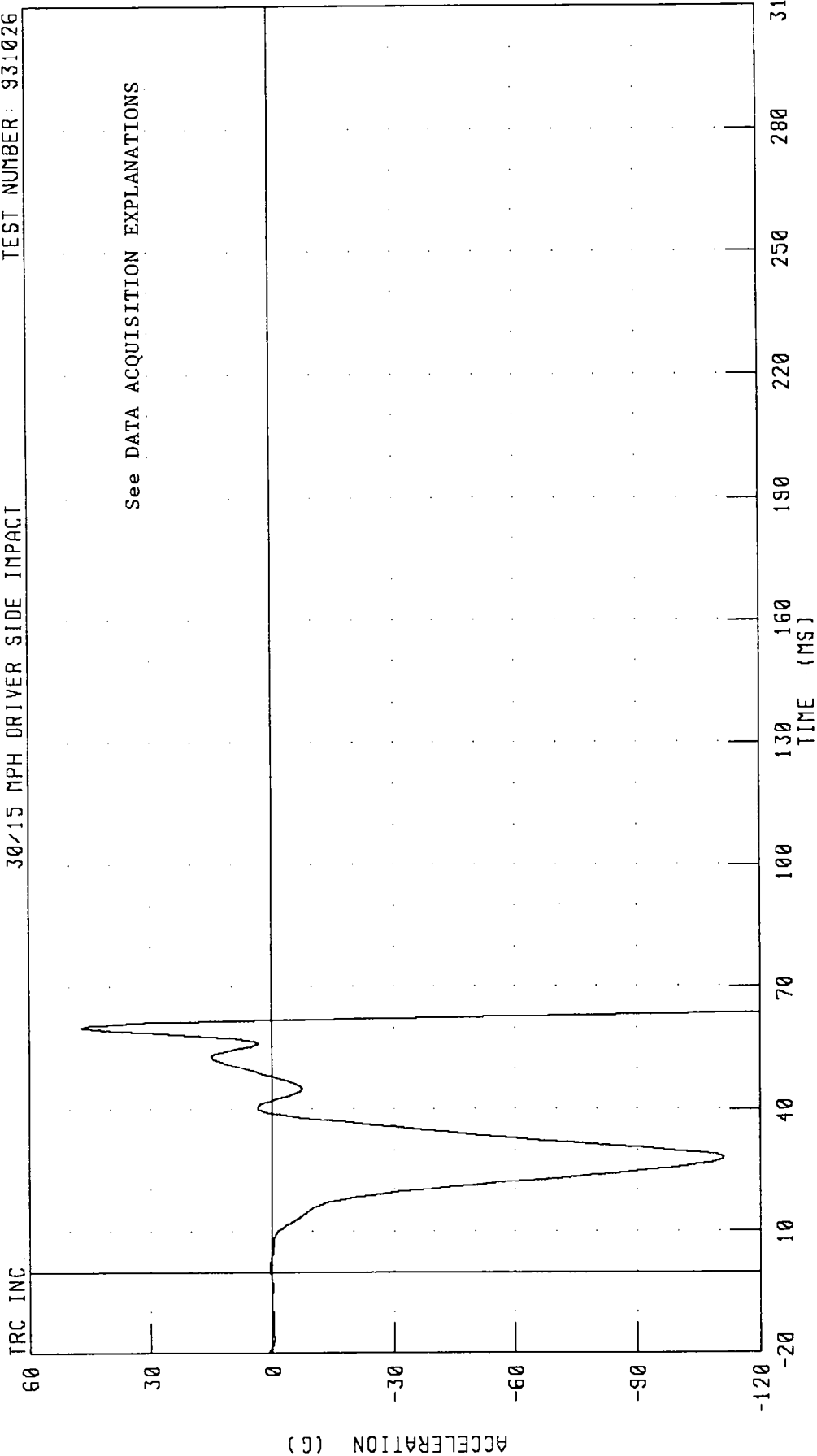
PEAK DATA: 273.02 G @ 63.75 MS, -31.18 G @ 35.00 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

DRIVER PELVIS Y-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

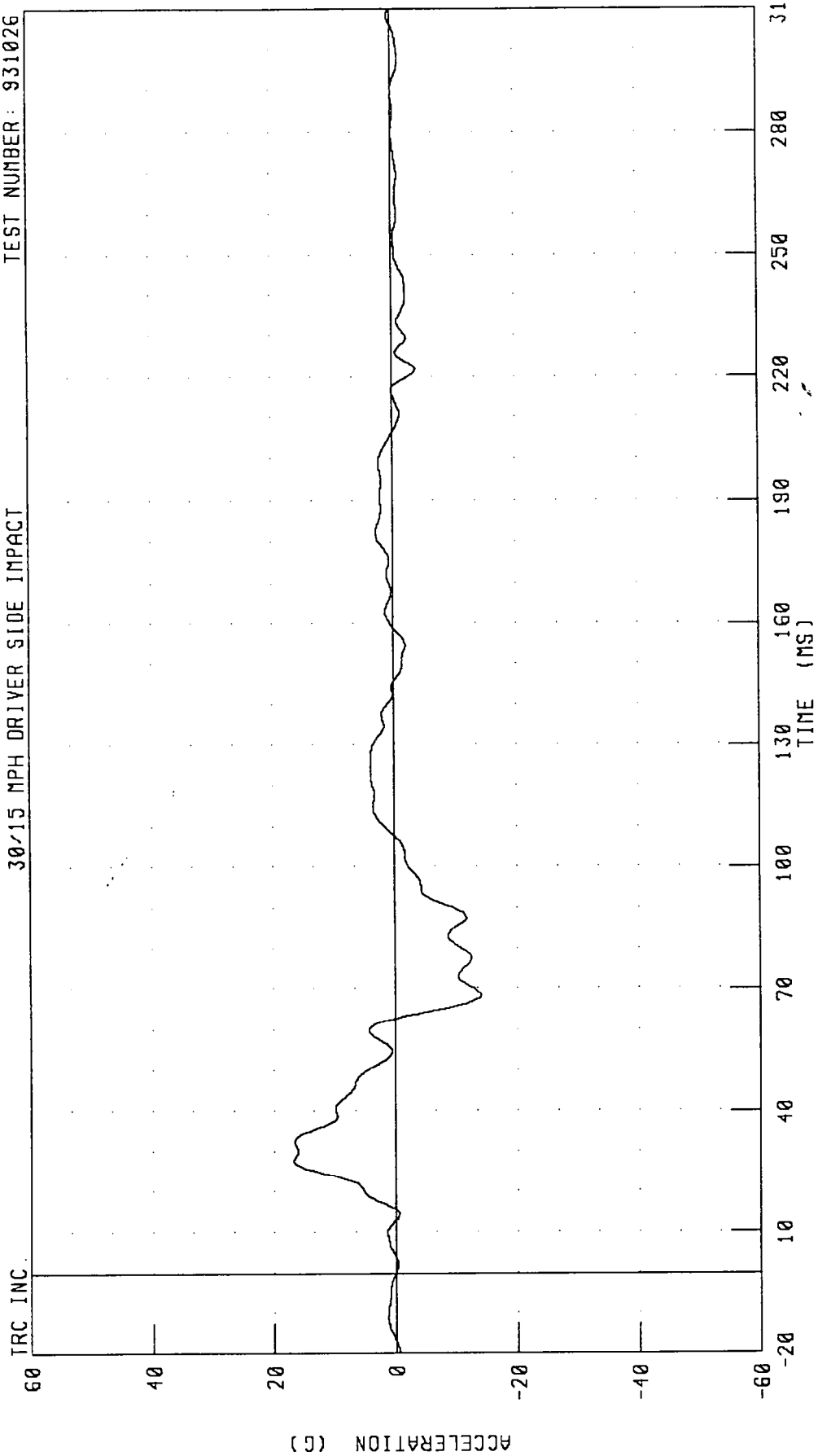


CHANNEL: PEVYG1 FILTER: FIR 100

PEAK DATA: 46.97 G @ 60.00 MS, -271.40 G @ 66.87 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
DRIVER PELVIS 2-AXIS ACCELERATION
30-15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



CHANNEL: PEVZG1 FILTER: FIR 100

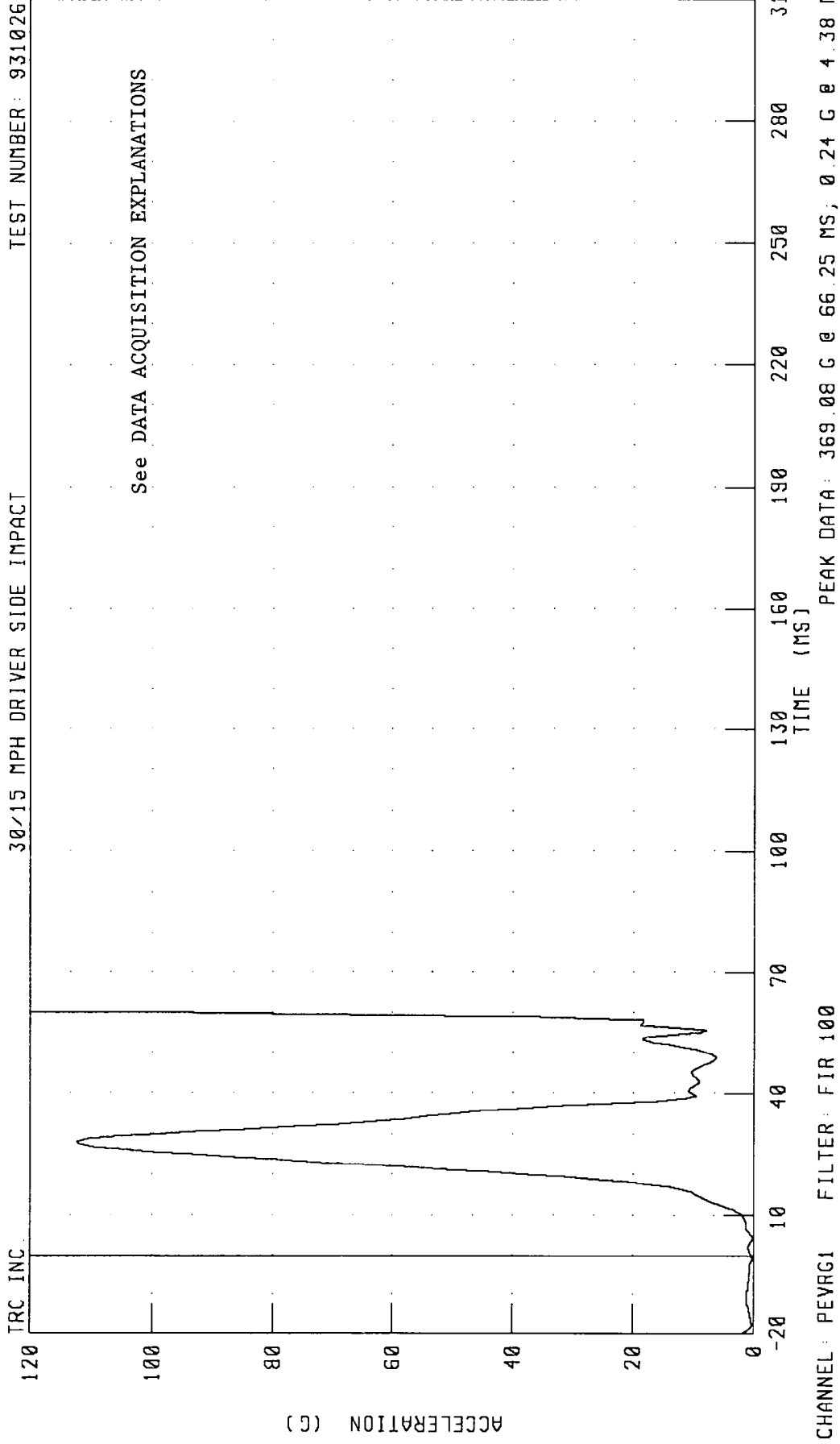
PEAK DATA: 16.75 G @ 27.50 MS; -14.00 G @ 68.13 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

DRIVER PELVIS RESULTANT ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



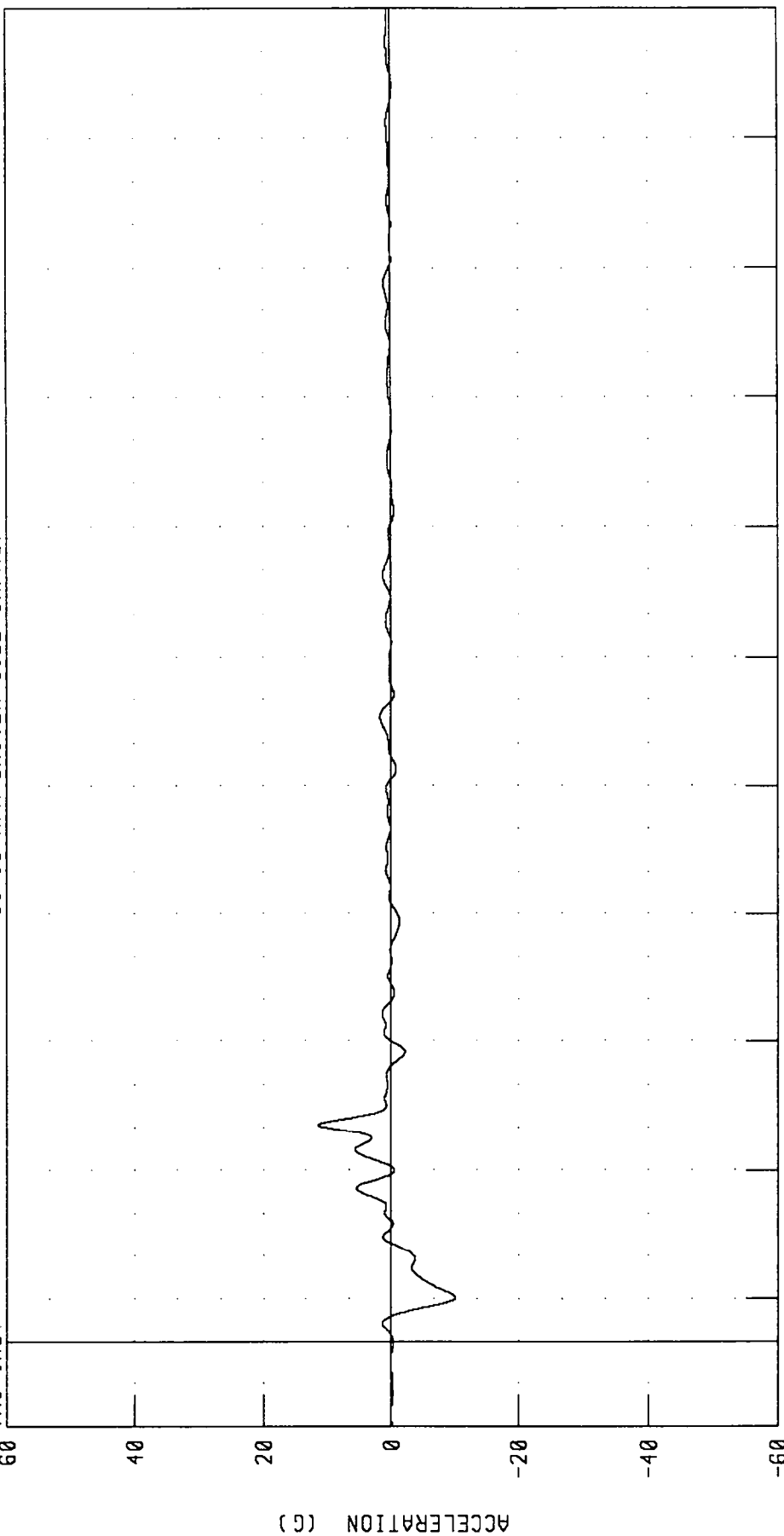
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

VEHICLE RIGHT FRONT SILL X-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

TRC INC.



TIME (MS)

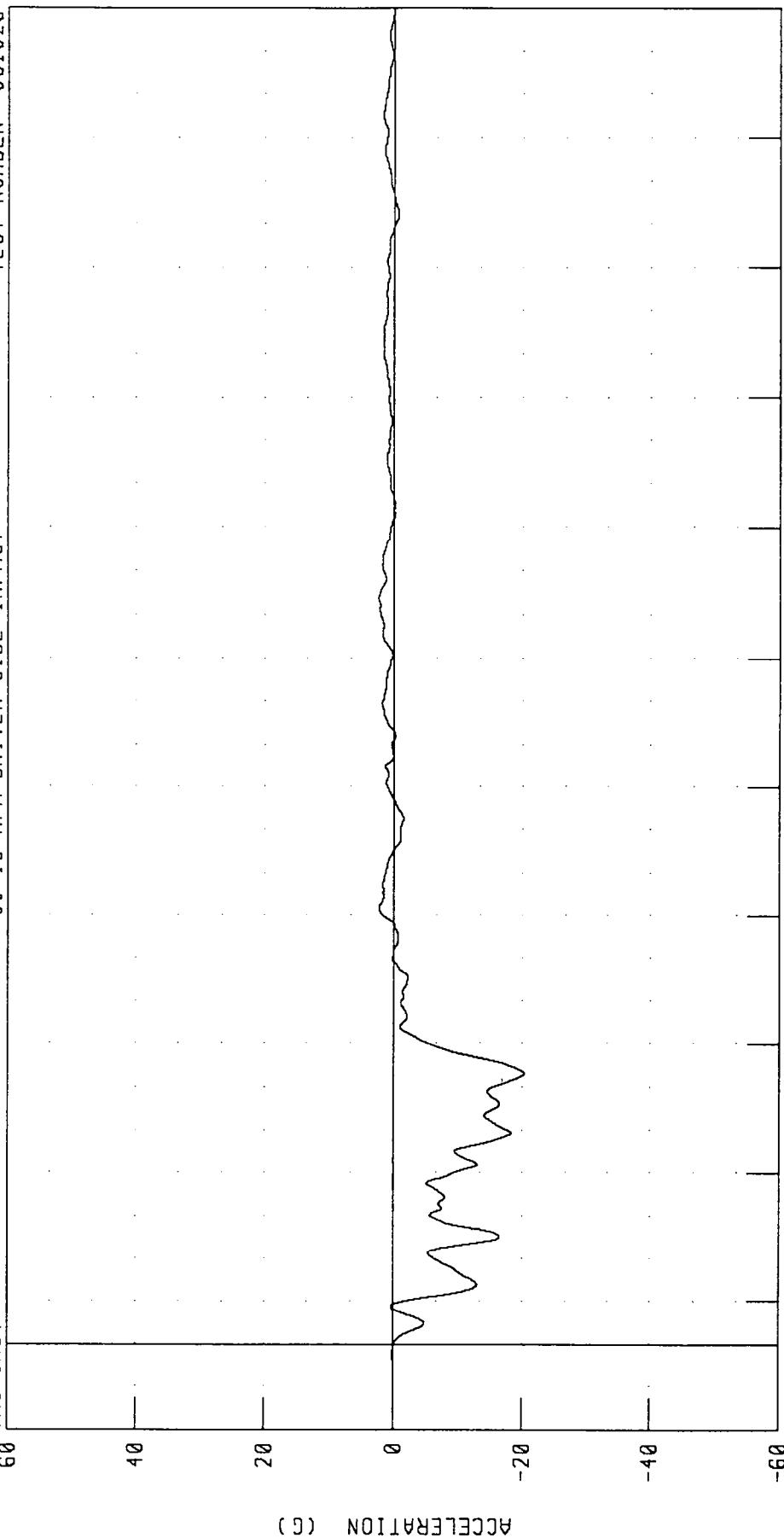
CHANNEL: RFSXG1 FILTER: CH CLASS 60

PEAK DATA: 11.37 G @ 50.72 MS; -10.02 G @ 10.24 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
VEHICLE RIGHT FRONT SILL Y-AXIS ACCELERATION
30-15 MPH DRIVER SIDE IMPACT

TEST NUMBER 931026

TRC INC.



CHANNEL: RFSYG1 FILTER: CH. CLASS 60

TIME (MS)

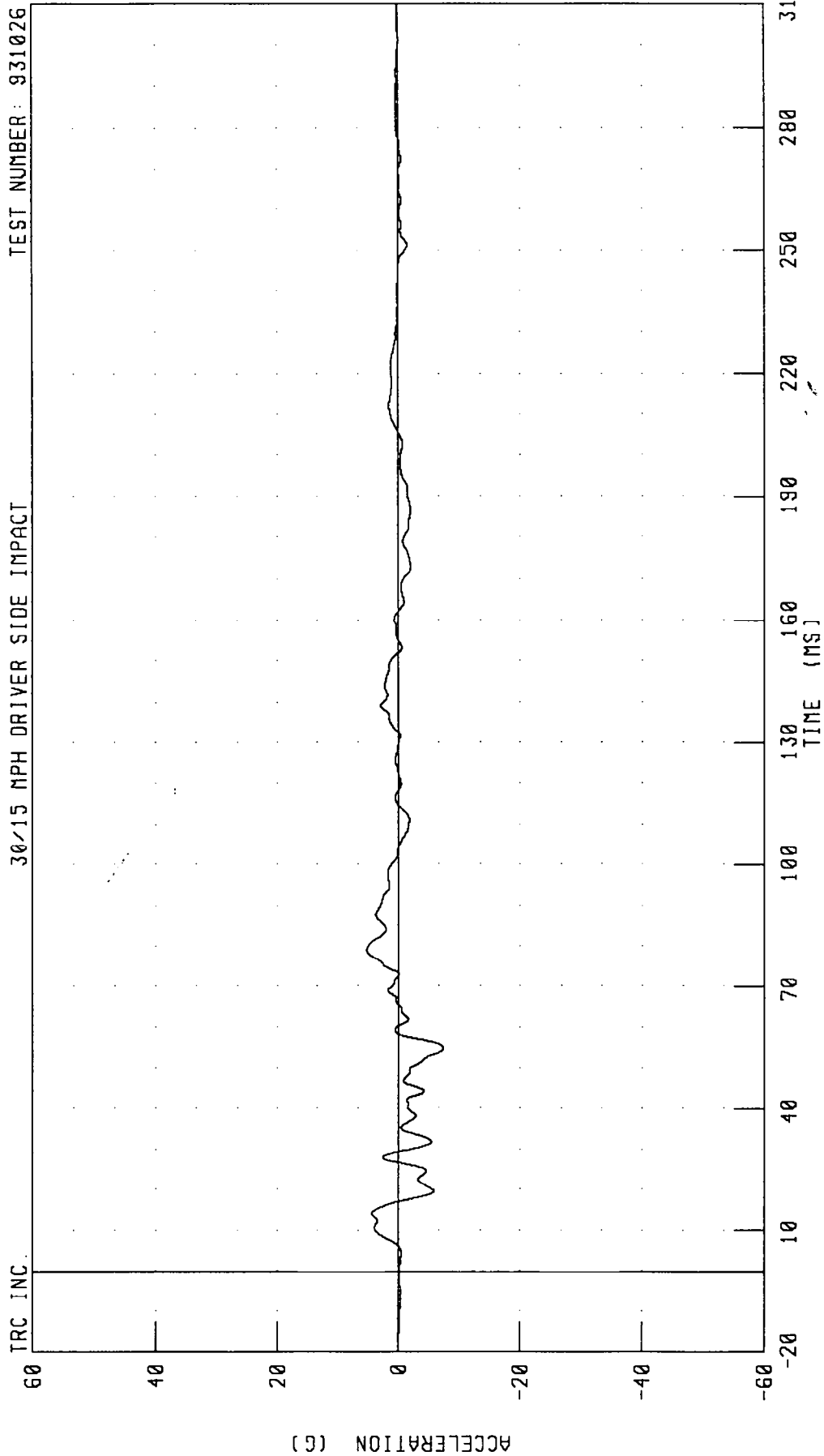
PEAK DATA: 2.37 G @ 173.68 MS, -20.26 G @ 63.12 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

VEHICLE RIGHT FRONT SILL Z-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



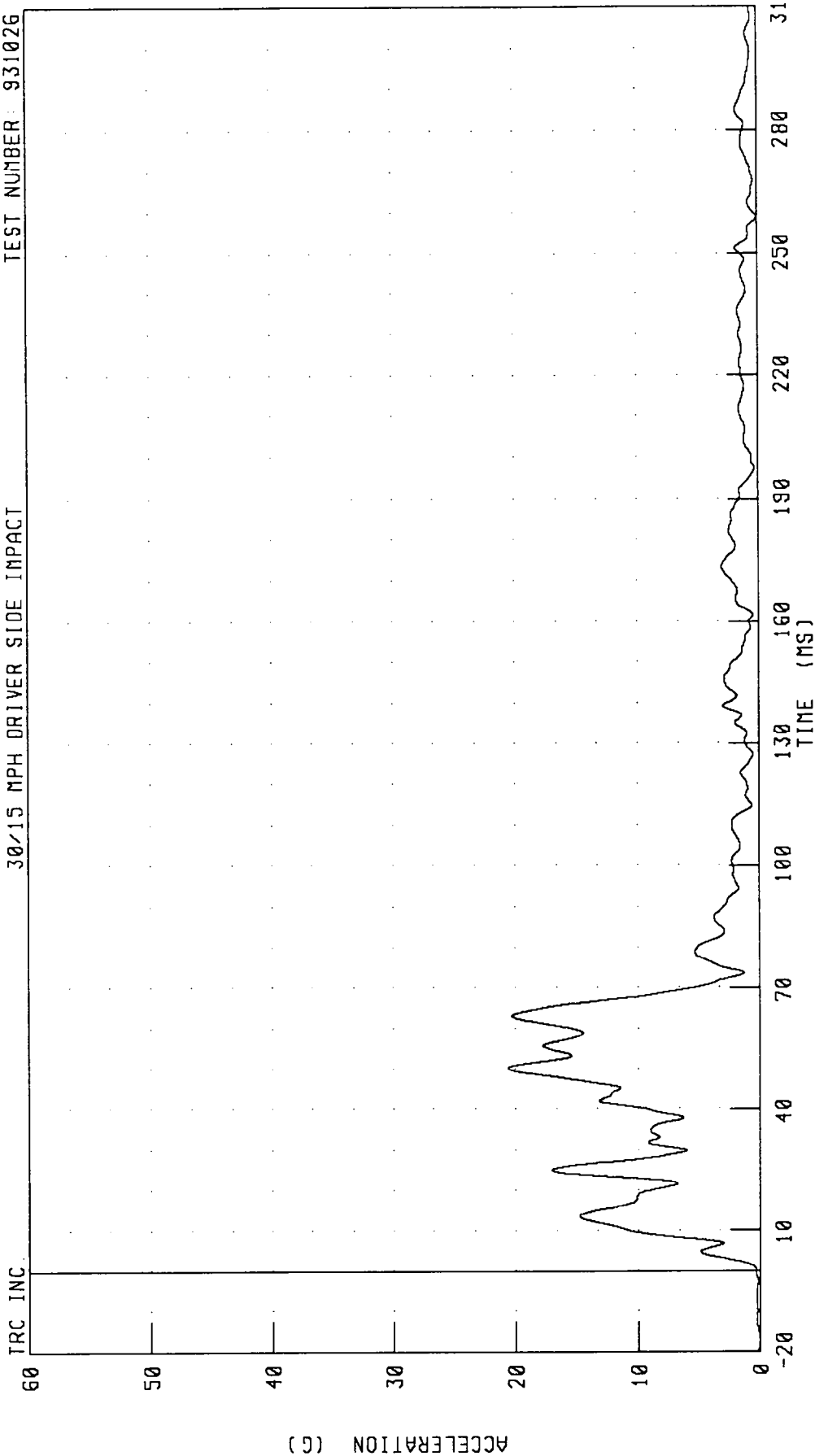
CHANNEL: RFSZG1 FILTER: CH CLASS 60

PEAK DATA: 5.20 G @ 79.12 MS; -7.28 G @ 54.80 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
VEHICLE RIGHT FRONT FRONT SILL RESULTANT ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT



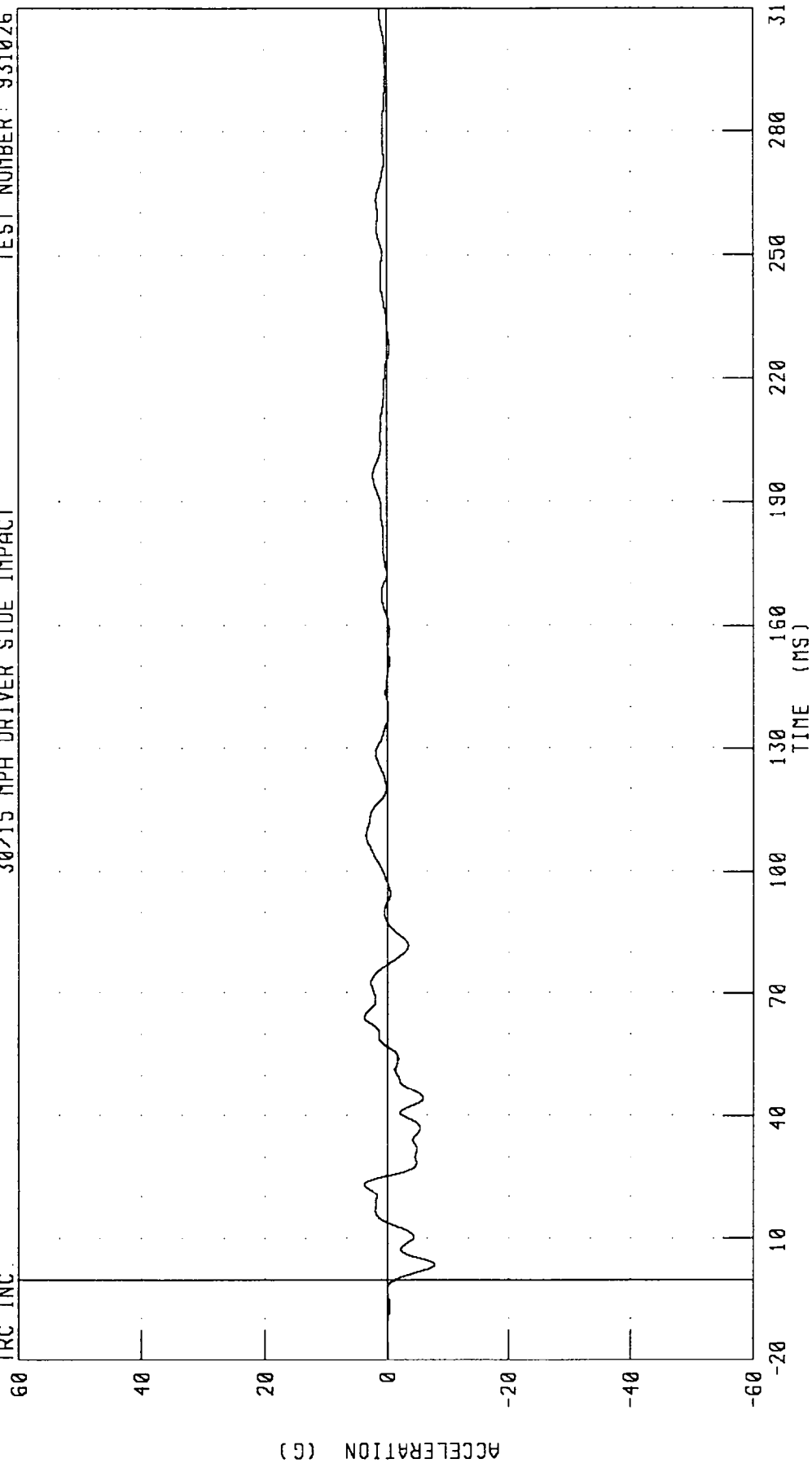
CHANNEL: RFSRG1 FILTER: CH CLASS 60

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
REAR FLOORPAN OVER REAR AXLE X-AXIS ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT

TRC INC.



PEAK DATA: 3.76 G @ 23.28 MS; -7.84 G @ 3.60 MS

CHANNEL: RDKXG1 FILTER: CH. CLASS 60

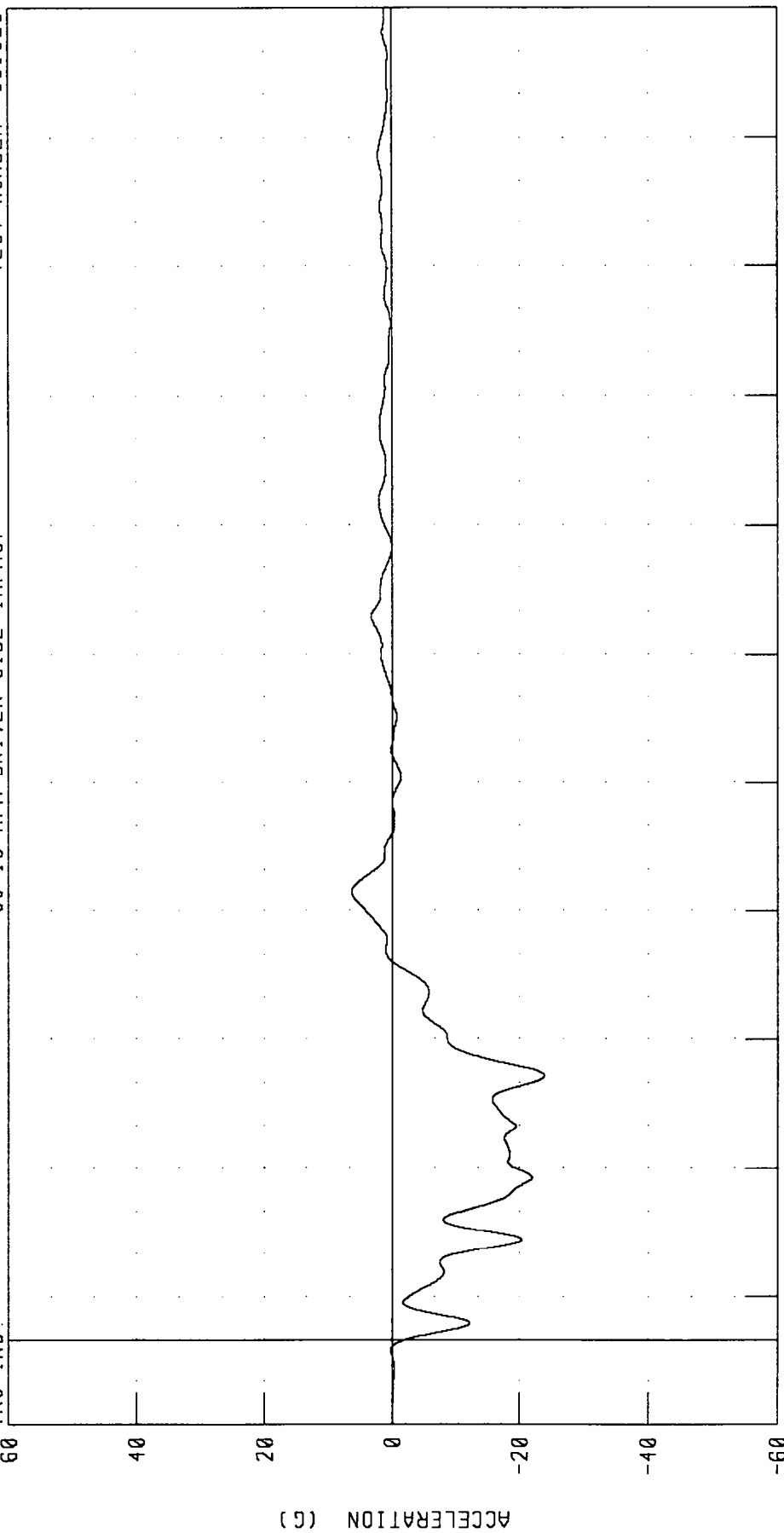
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

REAR FLOORPAN OVER REAR AXLE Y-AXIS ACCELERATION

30-15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

TRC INC.



CHANNEL: RDKY61 FILTER: CH CLASS 60

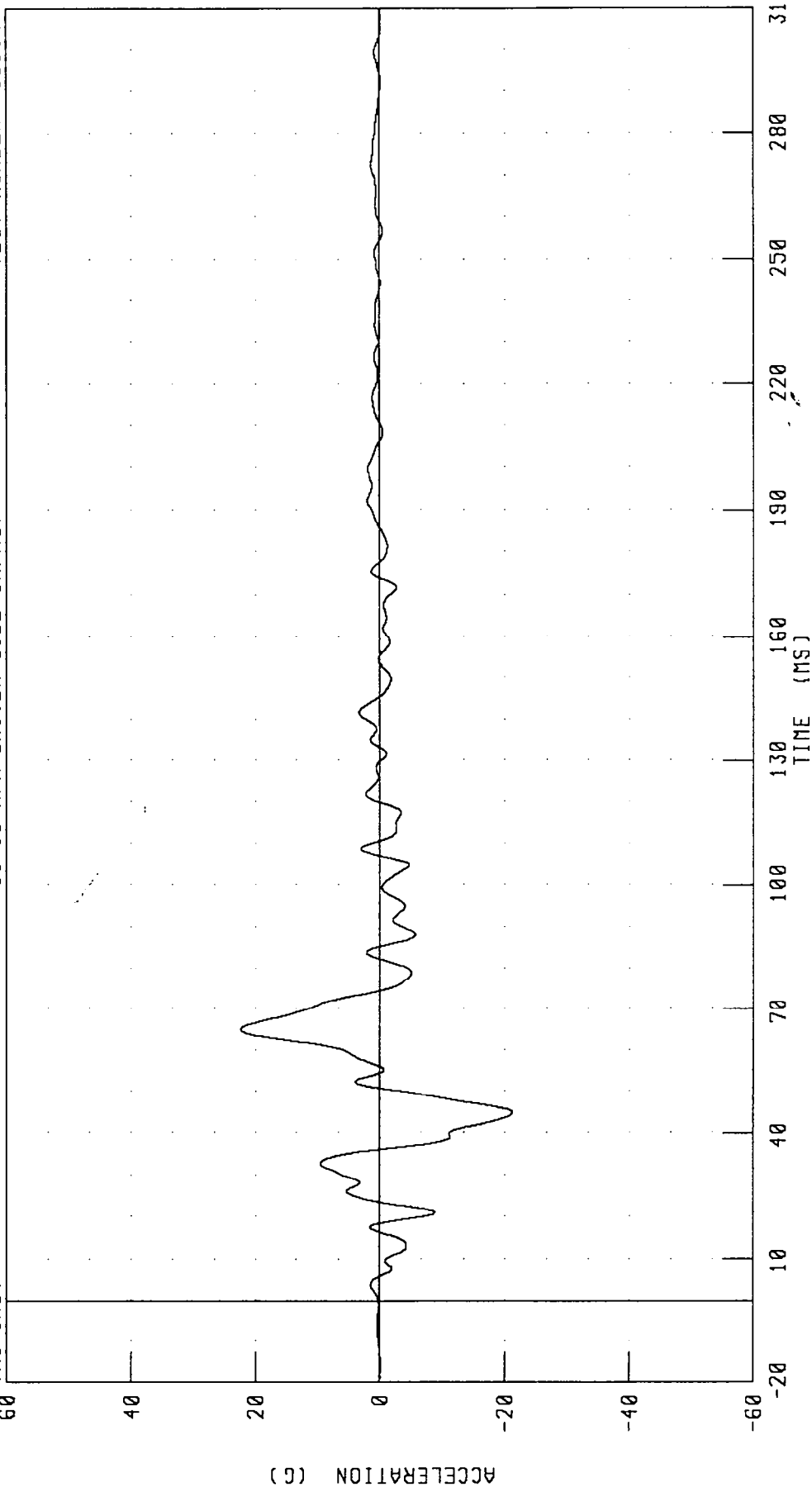
PEAK DATA: 6.29 G @ 104.80 MS, -23.78 G @ 61.60 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
REAR FLOORPAN OVER REAR AXLE Z-AXIS ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT

TRC INC.



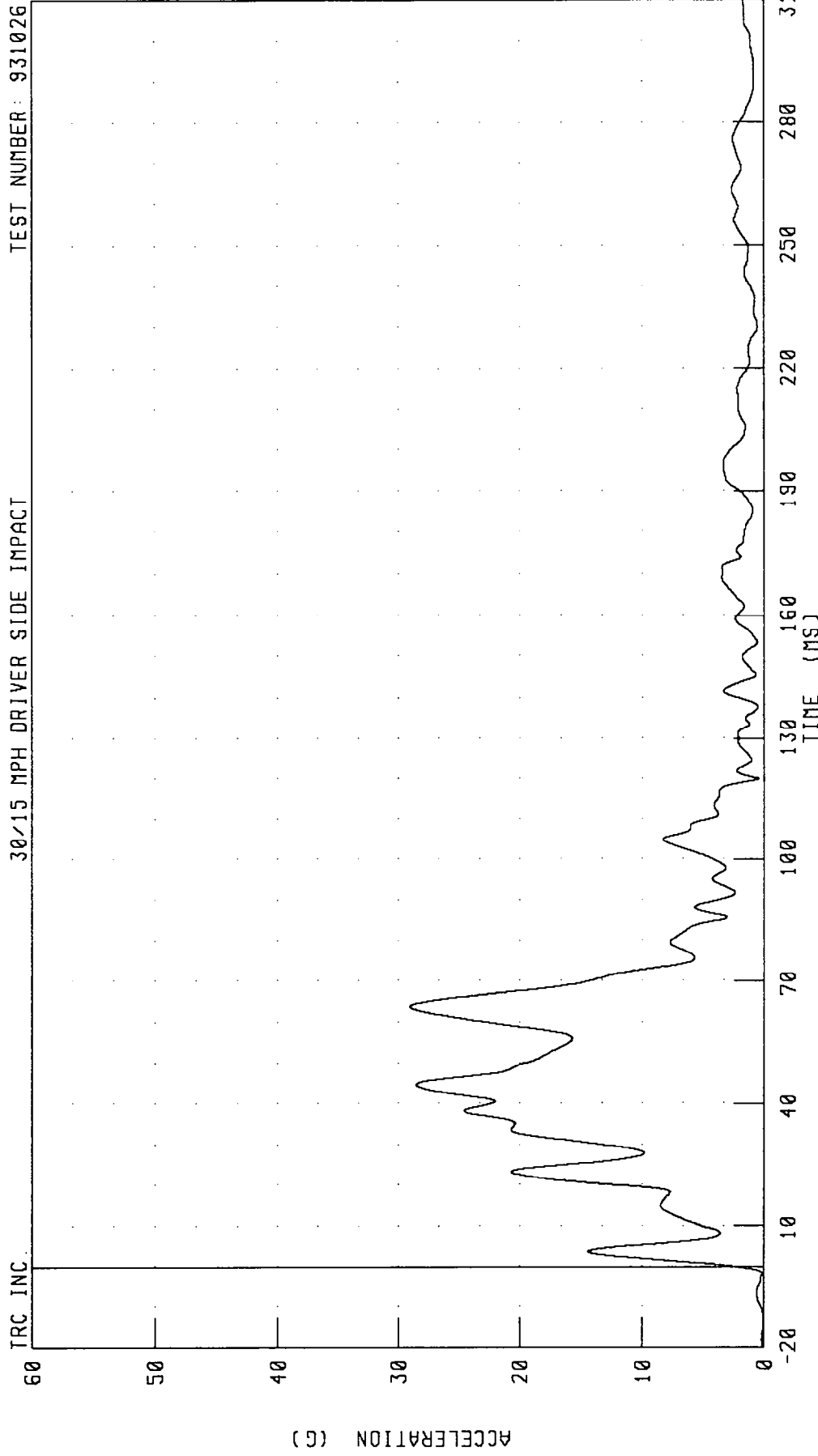
CHANNEL: RDKZG1 FILTER: CH CLASS 60

PEAK DATA: 22.38 G @ 64.88 MS, -21.20 G @ 44.88 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
REAR FLOORPAN OVER REAR AXLE RESULTANT ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT



CHANNEL: RDKRG1 FILTER: CH. CLASS 60

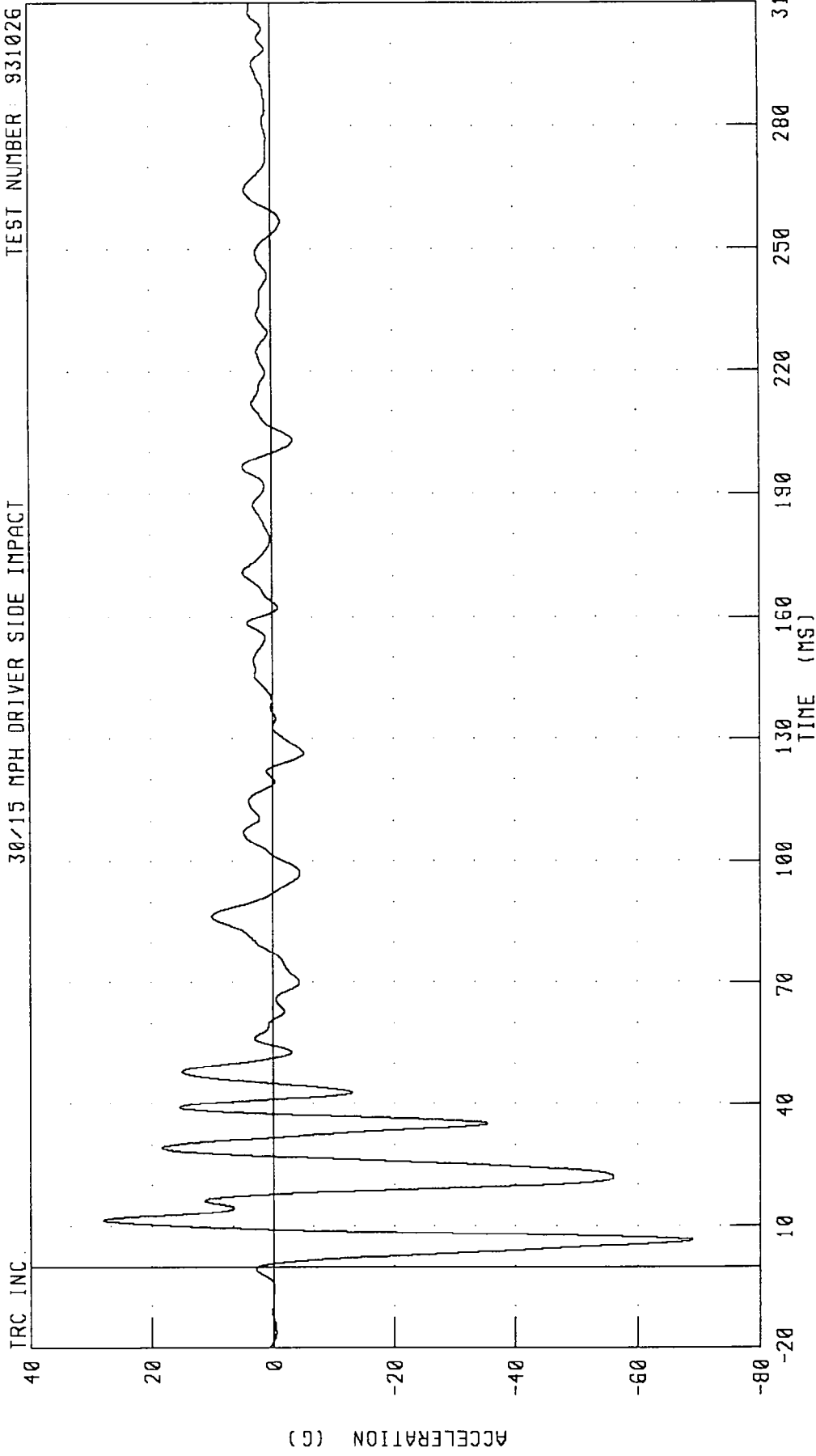
PEAK DATA: 29.07 G @ 63.68 MS; 0.12 G @ -13.44 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

LEFT FRONT SILL Y-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026



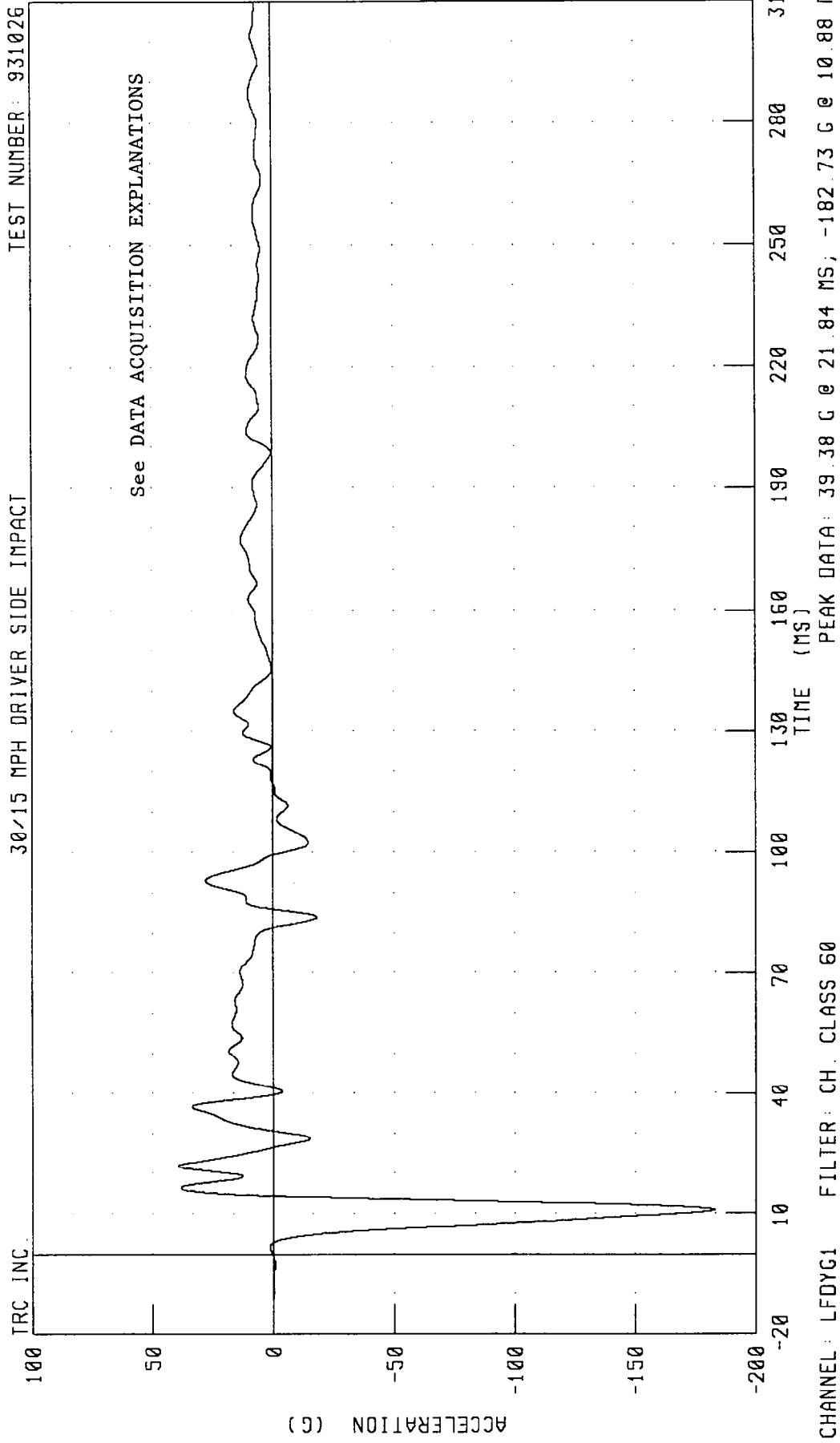
CHANNEL: LFSYG1 FILTER: CH. CLASS 60

PEAK DATA: 27.90 G @ 11.44 MS, -68.81 G @ 6.48 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
LEFT FRONT DOOR CENTERLINE Y-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

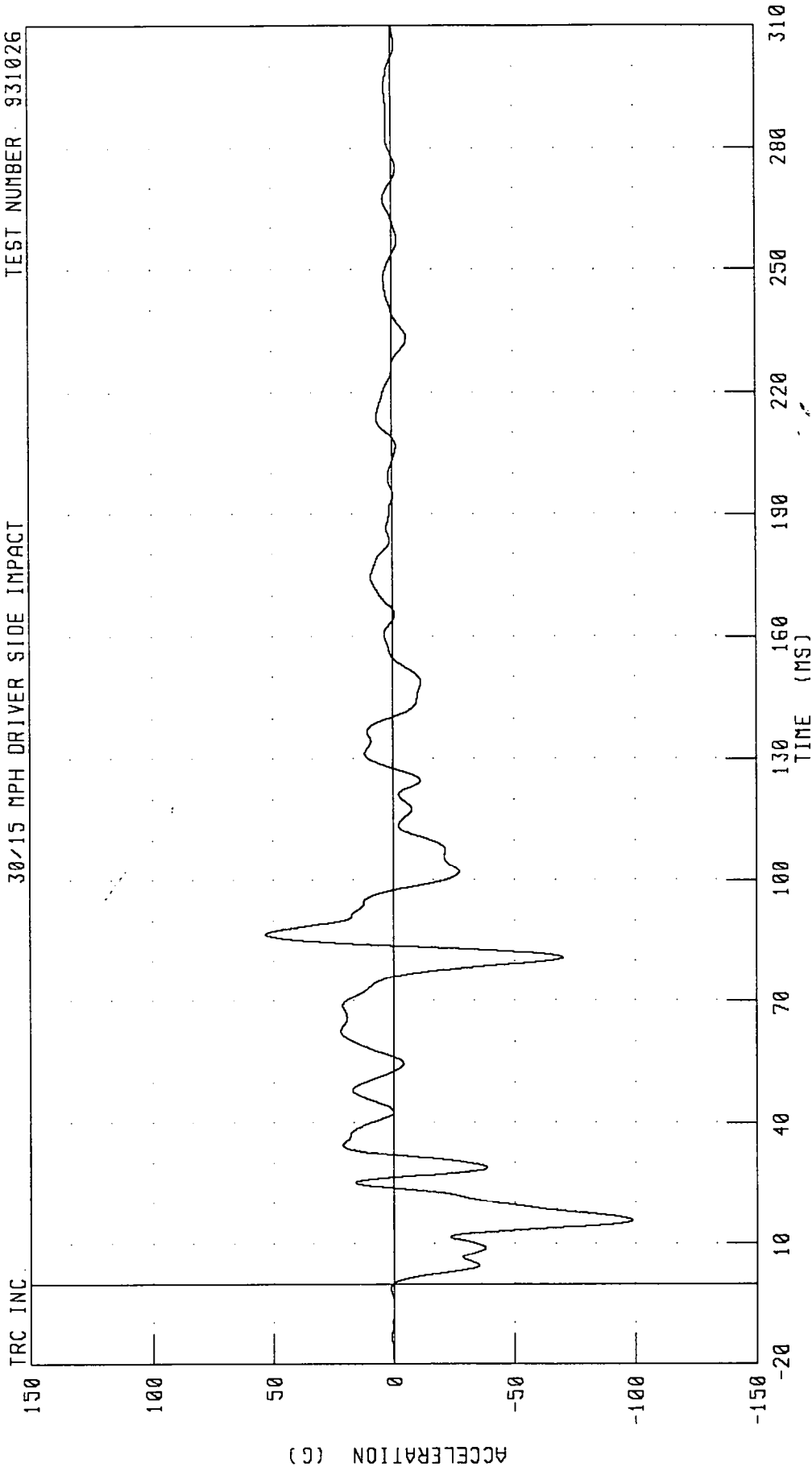


CHANNEL: LFDYG1 FILTER: CH. CLASS 60

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
LEFT FRONT DOOR UPPER CENTERLINE Y-AXIS ACCELERATION

TEST NUMBER 931026

30/15 MPH DRIVER SIDE IMPACT



CHANNEL: LFDY02 FILTER: CH. CLASS 60

PEAK DATA: 53.18 G @ 86.72 MS; -98.67 G @ 15.60 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
LEFT FRONT DOOR MID-REAR Y-AXIS ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT

TRC INC.

150

100

50

ACCELERATION (G)

-50

-100

-150

TIME (MS)

130 160 190 220 250 280 310

PEAK DATA: 58.17 G @ 12.64 MS, -131.33 G @ 6.40 MS

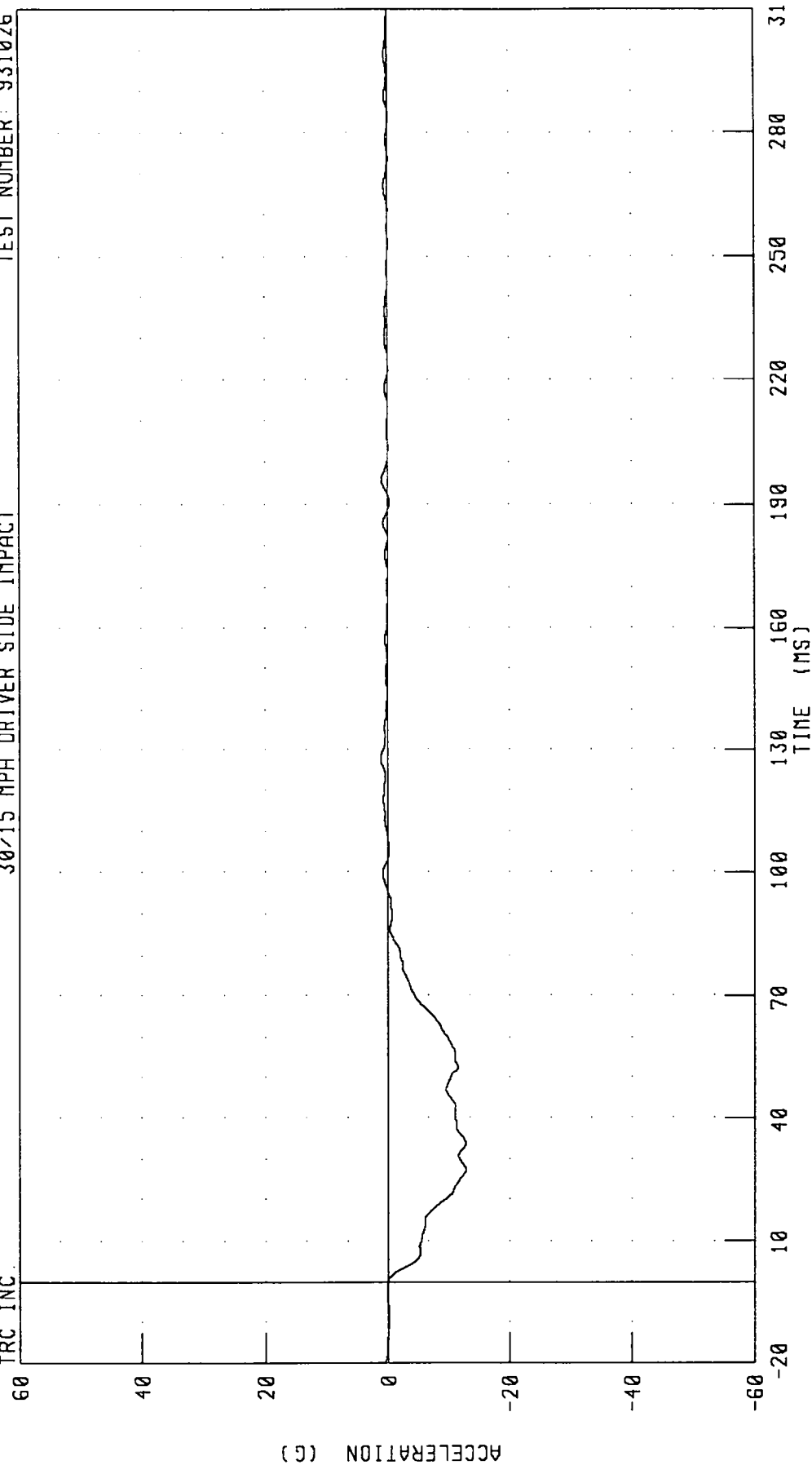
CHANNEL: LFDY63 FILTER: CH. CLASS 60

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
BARRIER CENTER OF GRAVITY X-AXIS ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT

TRC INC.



CHANNEL: BCGXG FILTER: CH. CLASS 60

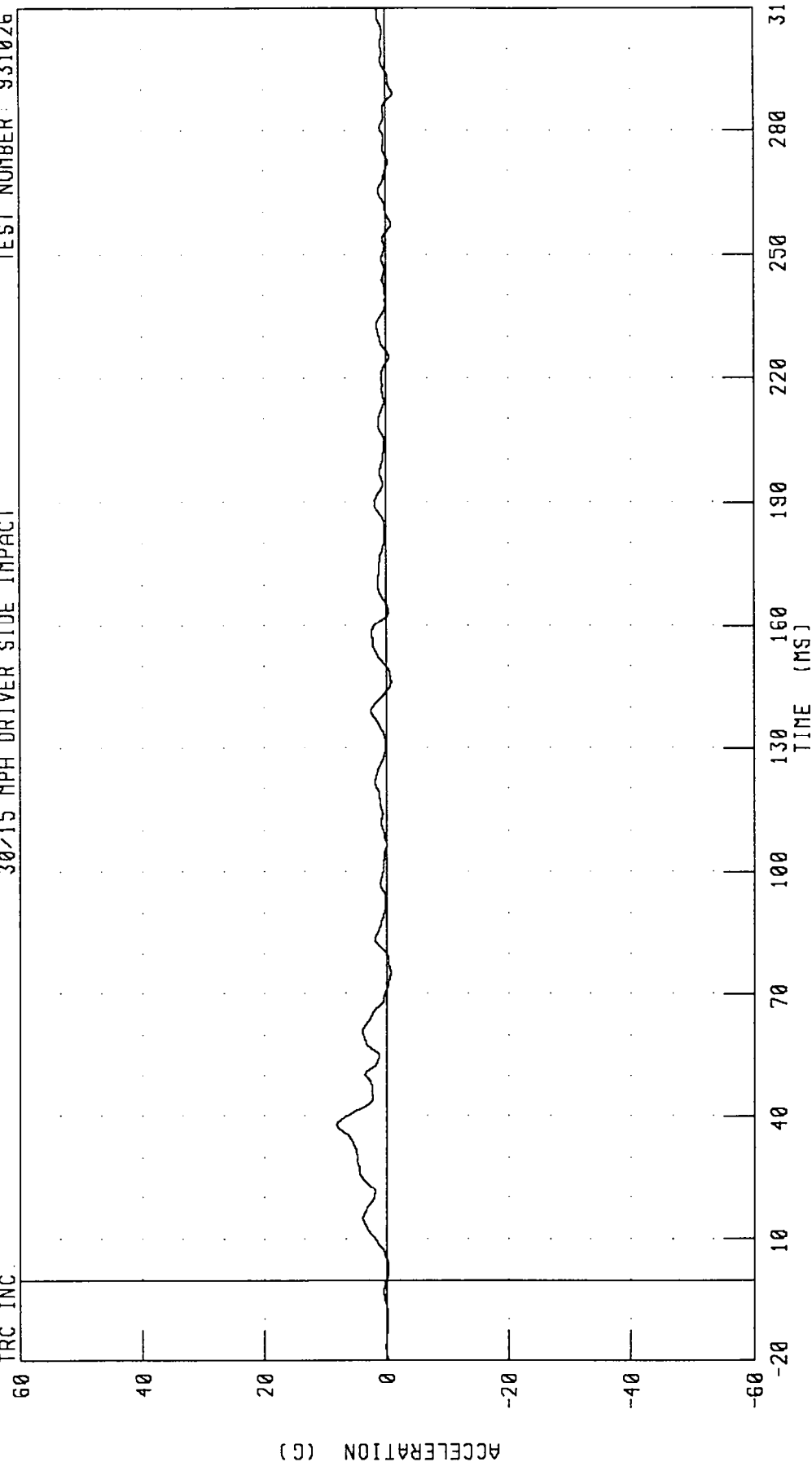
PEAK DATA: 1.26 G @ 128.00 MS; -12.72 G @ 27.44 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
BARRIER CENTER OF GRAVITY Y-AXIS ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT

TRC INC.



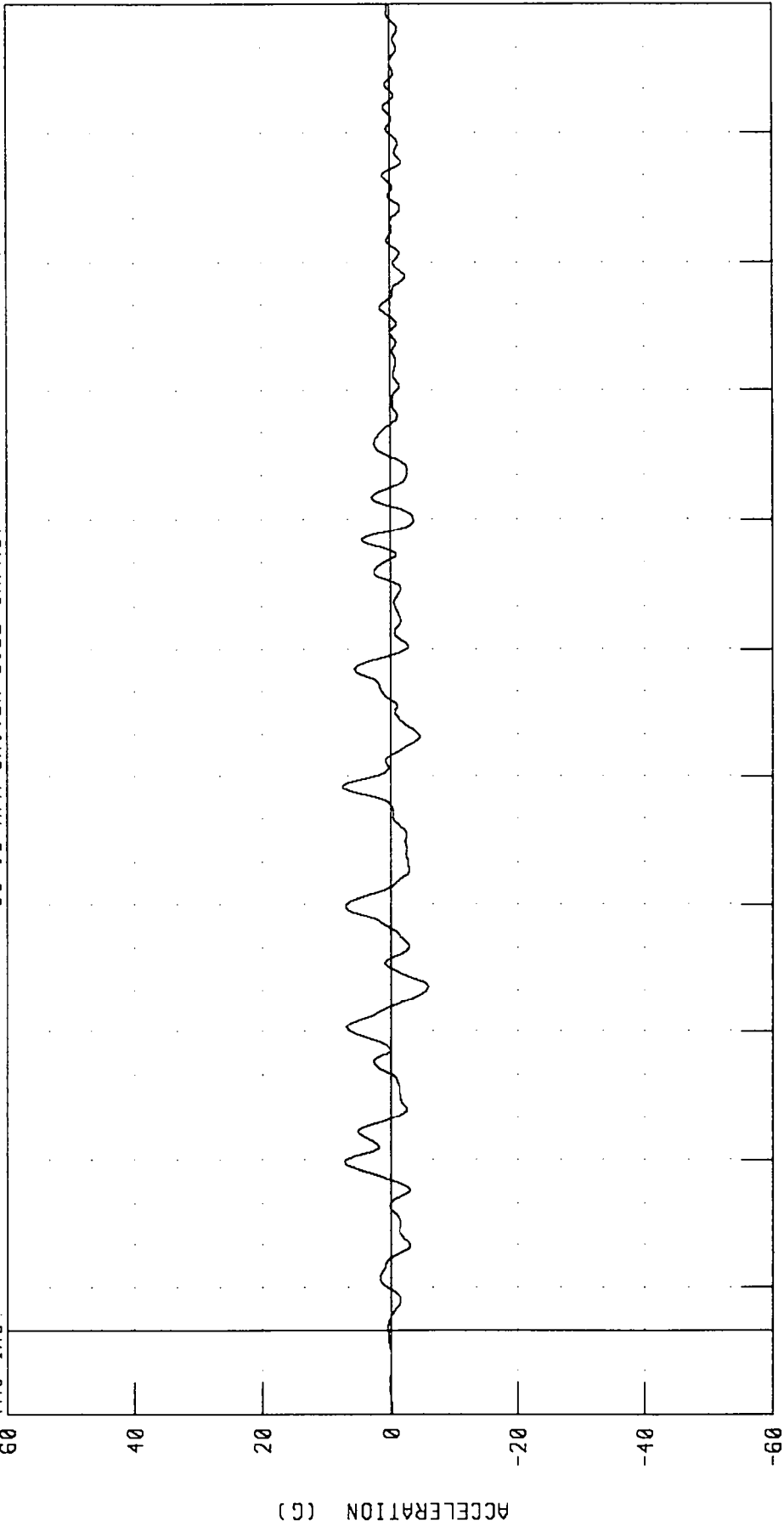
PEAK DATA: 8.08 G @ 37.84 MS, -1.11 G @ 289.12 MS

CHANNEL: BCGYG FILTER: CH. CLASS 60

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
BARRIER CENTER OF GRAVITY Z-AXIS ACCELERATION
30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER 931026

TRC INC



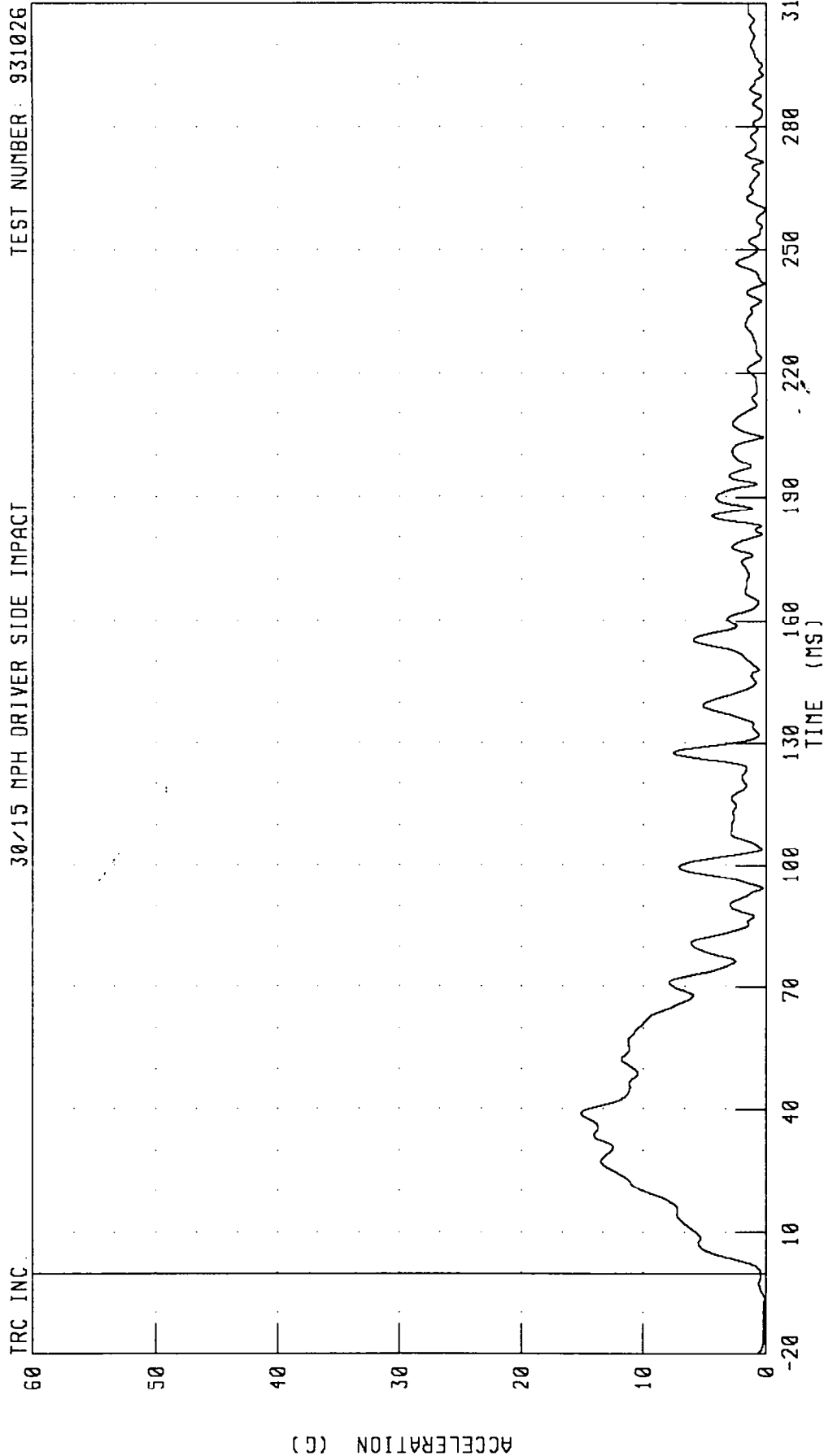
CHANNEL: BCGZG FILTER: CH. CLASS 60 PEAK DATA: 7.44 G @ 127.68 MS; -5.83 G @ 80.88 MS

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
BARRIER CENTER OF GRAVITY RESULTANT ACCELERATION

TEST NUMBER: 931026

30/15 MPH DRIVER SIDE IMPACT

TRC INC.



PEAK DATA: 15.11 G @ 39.04 MS; 0.12 G @ -6.24 MS

FILTER: CH. CLASS 60

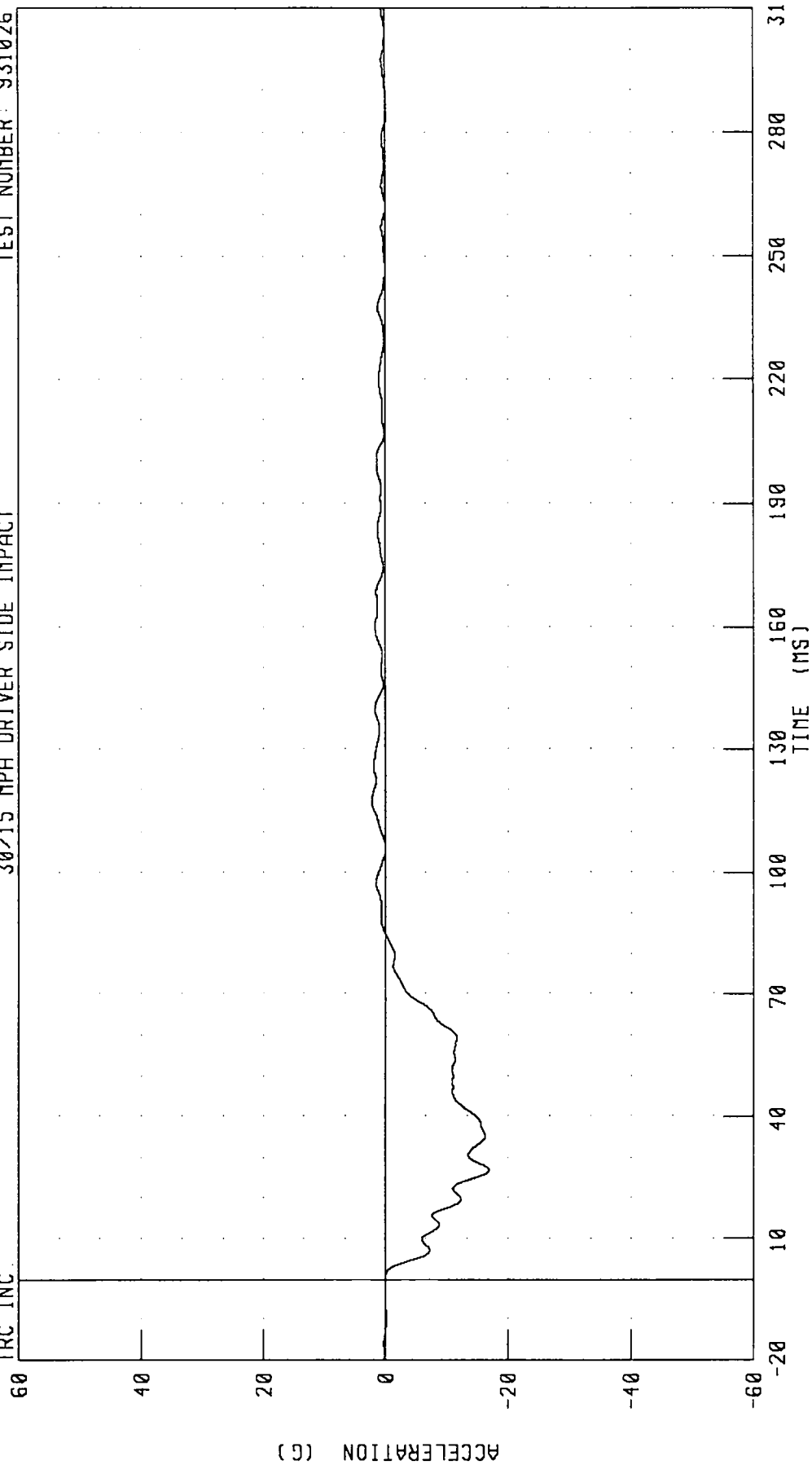
CHANNEL: BCGRC

MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER
BARRIER LEFT FRAME RAIL X-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

TRC INC.



CHANNEL: BSRXC FILTER: CH. CLASS 60

PEAK DATA: 2.27 G @ 117.68 MS; -16.88 G @ 27.04 MS

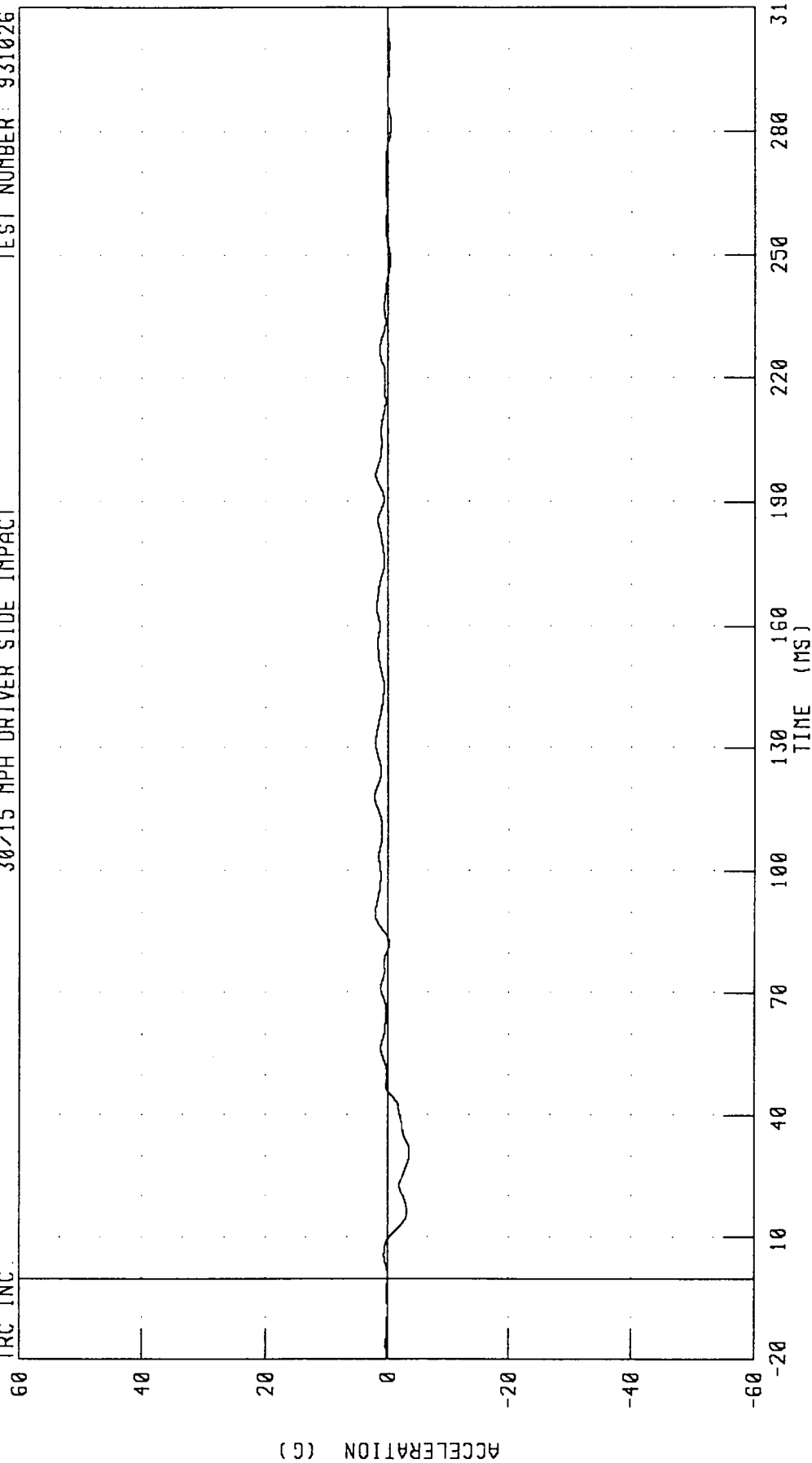
MOVING DEFORMABLE BARRIER INTO LEFT SIDE OF 1991 GEO TRACKER

BARRIER LEFT FRAME RAIL Y-AXIS ACCELERATION

30/15 MPH DRIVER SIDE IMPACT

TEST NUMBER: 931026

TRC INC.



CHANNEL: BSRYG FILTER: CH. CLASS 60

PEAK DATA: 2.26 G @ 118.00 MS; -3.62 G @ 31.04 MS

APPENDIX C

DUMMY CALIBRATION INFORMATION

PRE-TEST CALIBRATION

DRIVER DUMMY S/N 903

TRANSPORTATION RESEARCH CENTER INC.
 SIDE IMPACT DUMMY
 EXTERNAL DIMENSIONS
 LEFT SIDE CONFIGURATION
 SN 903 FIRST TECH

15-OCT-93

TRC TEST NO: ED90316 572F SN903 EXT.DIMENSION CAL16

DIMENSIONS WITH CHEST JACKET INSTALLED			
SYMB	DESCRIPTION	SPECIFICATION	TEST RESULTS
	TEMPERATURE		20.6 DEG. C
	RELATIVE HUMIDITY		44.0 %
SH	SEATED HEIGHT	889 - 909 MM	894.1 MM
HP	HIP PIVOT HEIGHT	99 MM REF.	99.1 MM
KH	KNEE PIVOT FROM BACKLINE	511 - 526 MM	523.2 MM
KV	KNEE PIVOT FROM FLOOR	490 - 506 MM	490.2 MM
HW	HIP WIDTH	356 - 391 MM	378.5 MM
DIMENSIONS WITH CHEST JACKET REMOVED			
SYMB	DESCRIPTION	SPECIFICATION	TEST RESULTS
RH	RIB HEIGHT	501 - 520 MM	513.1 MM
RD	RIB FROM BACKLINE	229 - 241 MM	236.2 MM
RW-1	TOP RIB WIDTH FROM C/L	165. - 180 MM	167.6 MM
RW-2	BOTTOM RIB WIDTH FROM C/L	165 - 180 MM	167.6 MM
	DIFFERENCE BETWEEN TOP & BOTTOM RIB WIDTH FROM C/L	≤ 2.5 MM	0.0 MM

DUMMY MEETS SPECIFICATIONS

TECHNICIAN

Pete Fout

TRANSPORTATION RESEARCH CENTER INC.

THORACIC SHOCK ABSORBER TESTS

SIDE IMPACT DUMMY

15-Oct-93

TRC

572F SN903 DAMPER TEST CAL16

TEST NOS. DP90316A,DP90316B,DP90316C

TEST PARAMETER		SPECIFICATION	TEST RESULTS
TEMPERATURE		18.9 - 25.5 C	20.6 DEG. C
RELATIVE HUMIDITY		10 - 70 %	44.0 %
VELOCITY	FORCE	838 - 1125 N	957 N
3.06 M/S	DISPLACEMENT	31.2 - 35.2 MM	31.7 MM
VELOCITY	FORCE	1733 - 2100 N	1846 N
4.28 M/S	DISPLACEMENT	32.7 - 37.2 MM	34.7 MM
VELOCITY	FORCE	3743 - 4448 N	4432 N
6.10 M/S	DISPLACEMENT	34.4 - 39.5 MM	36.5 MM

DAMPER SETTING = 5.5

TEST MEETS SPECIFICATIONS

TECHNICIAN

Pete Font

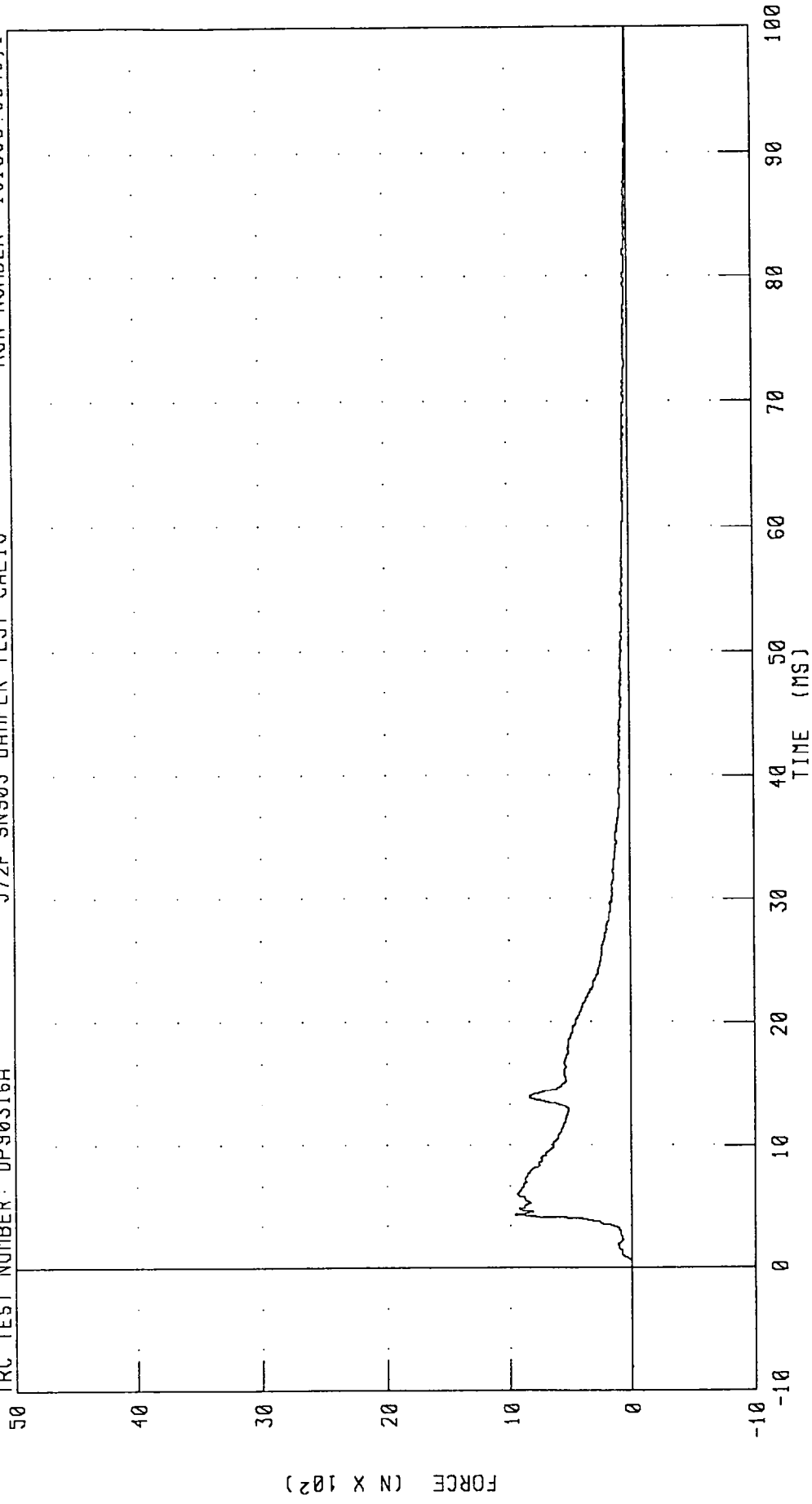
PART 572-F S.I.D. THORACIC SHOCK ABSORBER CALIBRATION (3.0 M/SEC)

SHOCK ABSORBER RESISTIVE FORCE

TRC TEST NUMBER: DP90316A

572F SN903 DAMPER TEST CAL16

RUN NUMBER: 101593.0840.1



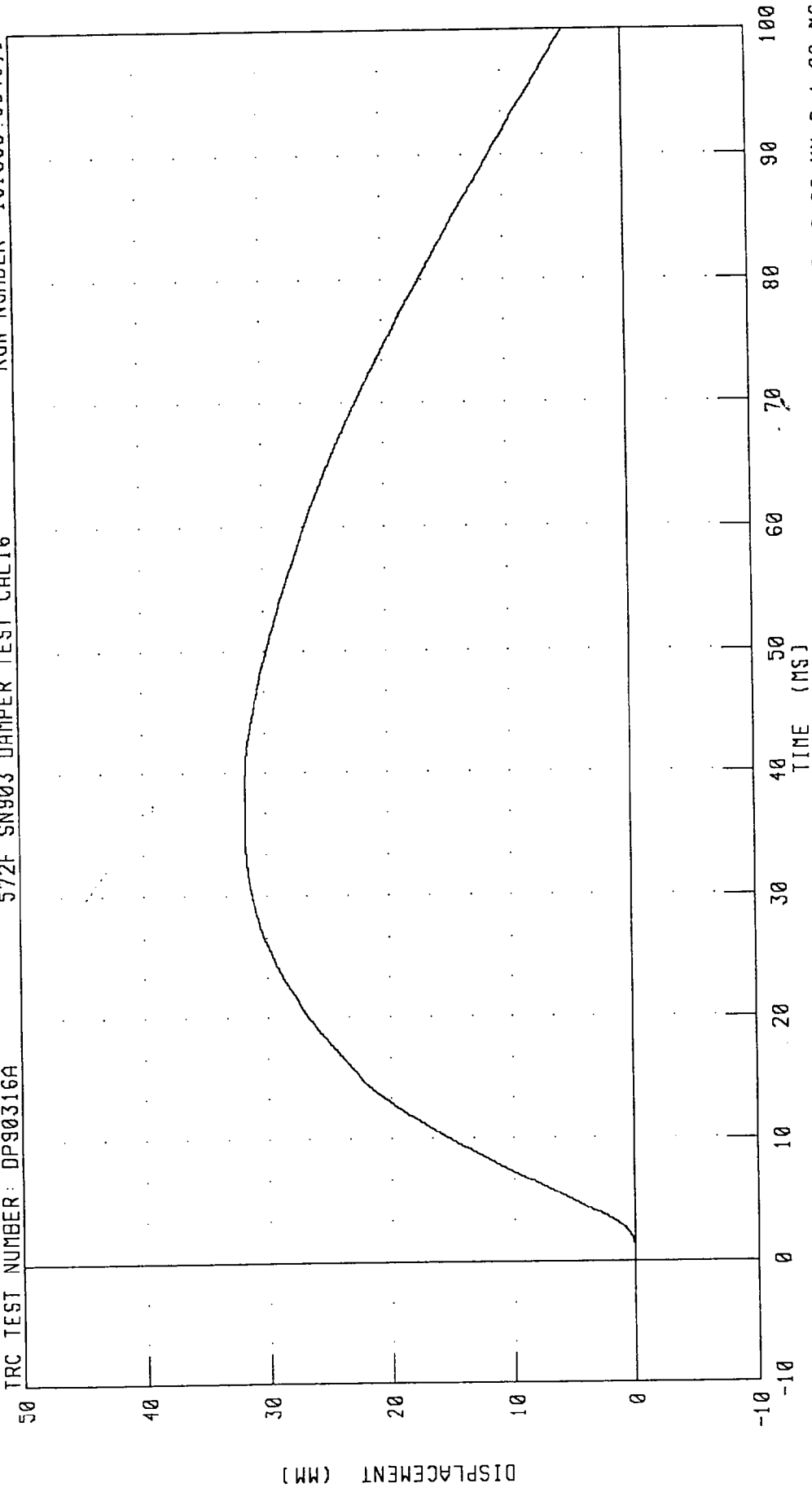
CHANNEL: DAMPF FILTER: CH. CLASS 1000

PEAK DATA: 957.39 N @ 4.25 MS; -1.96 N @ -8.13 MS

PART 572-F S.I.D. THORACIC SHOCK ABSORBER CALIBRATION (3.0 M/SEC)

SHOCK ABSORBER DISPLACEMENT

TRC TEST NUMBER: DP90316A 572F SN903 DAMPER TEST CAL16 RUN NUMBER: 101593.0840;1



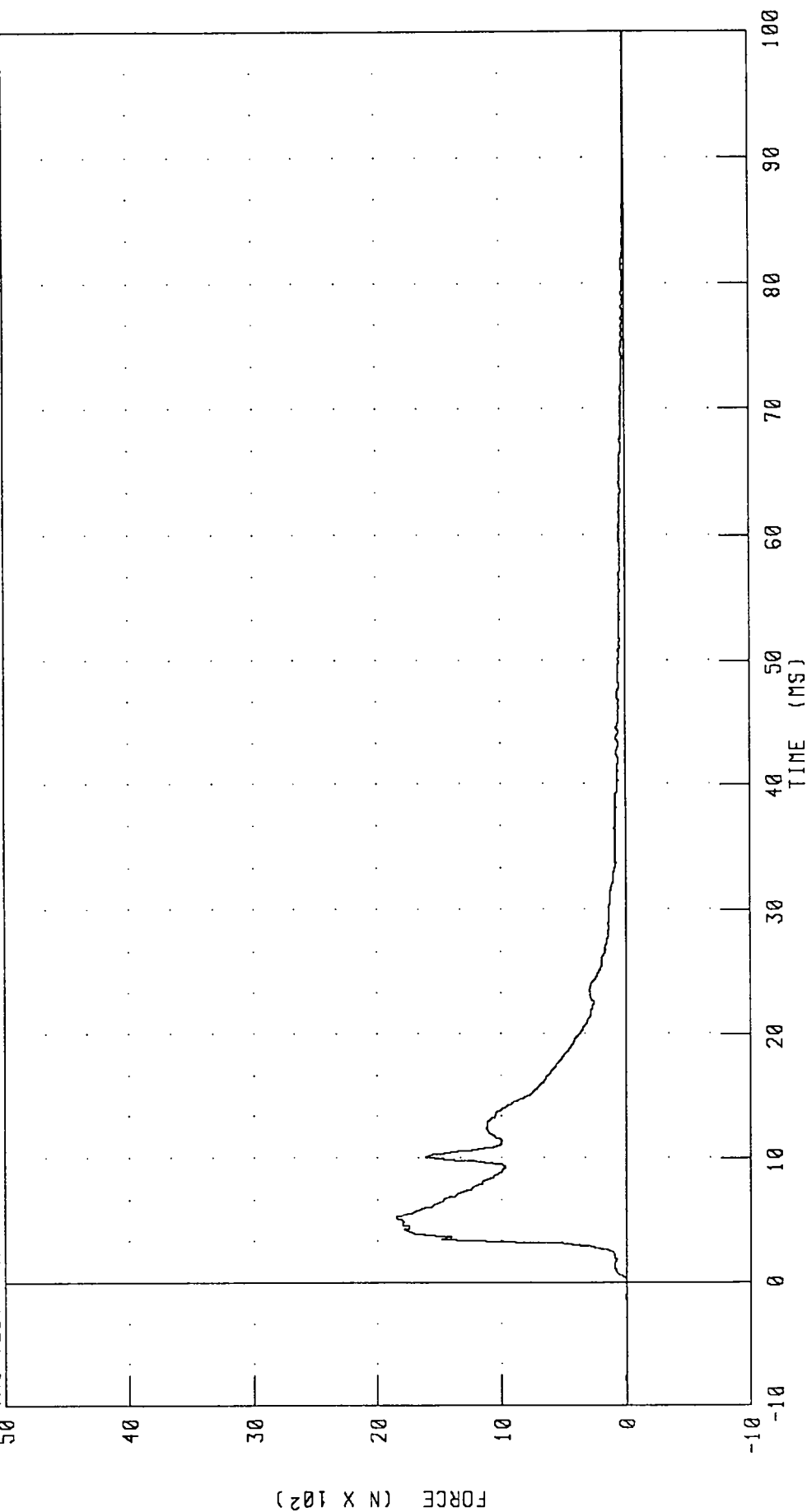
PEAK DATA: 31.73 MM @ 35.50 MS; 0.00 MM @ 1.00 MS

CHANNEL: CSTYD FILTER: CH. CLASS 1000

PART 572-F S.I.D. THORACIC SHOCK ABSORBER CALIBRATION (4.3 M/SEC)

SHOCK ABSORBER RESISTIVE FORCE

TRC TEST NUMBER: DP90316B 572F SN903 DAMPER TEST CAL16 RUN NUMBER: 101593.0842;1



CHANNEL: DAMPF FILTER: CH. CLASS 1000 PEAK DATA: 1846.10 N @ 5.25 MS; -1.43 N @ -7.25 MS

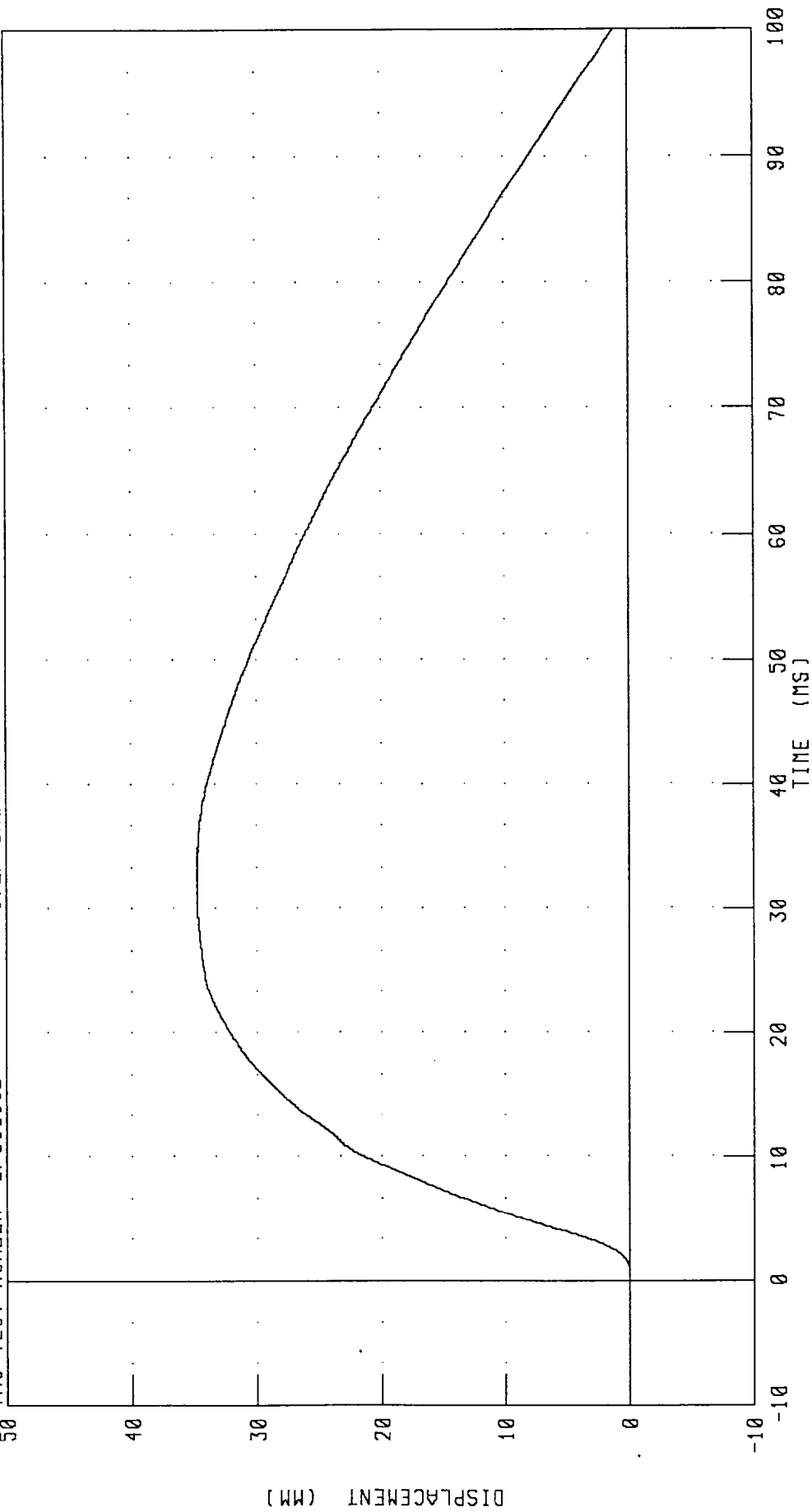
PART 572-F S.I.D. THORACIC SHOCK ABSORBER CALIBRATION (4.3 M/SEC)

SHOCK ABSORBER DISPLACEMENT

TRC TEST NUMBER: DP90316B

572F SN903 DAMPER TEST CAL16

RUN NUMBER: 101593 0842,1



PEAK DATA: 34.73 MM @ 30.13 MS; -0.01 MM @ -4.25 MS

CHANNEL: CSTYD FILTER: CH. CLASS 1000

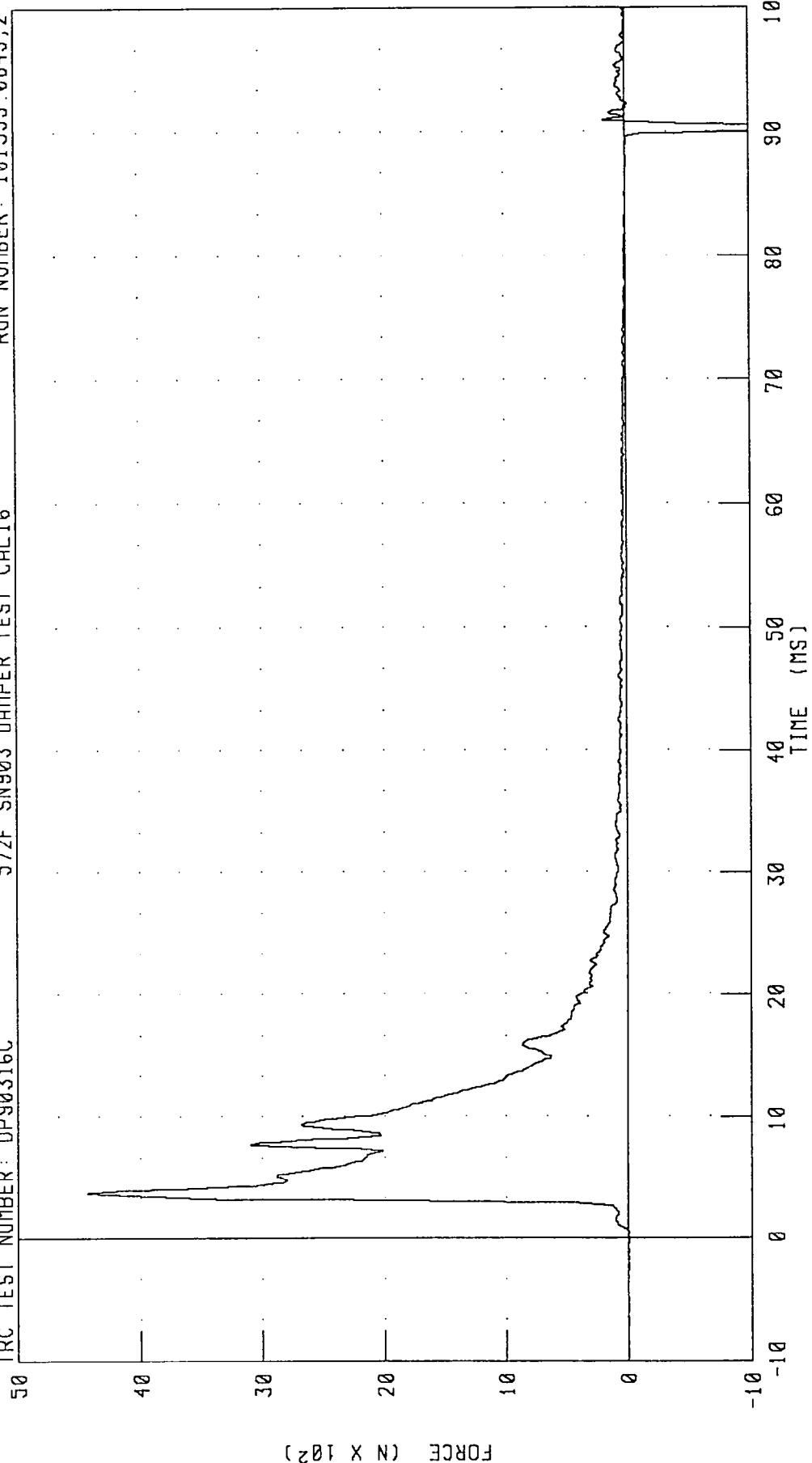
PART 572-F S.I.D. THORACIC SHOCK ABSORBER CALIBRATION (6.1 M/SEC)

SHOCK ABSORBER RESISTIVE FORCE

TRC TEST NUMBER: DP90316C

572F SN903 DAMPER TEST CAL16

RUN NUMBER: 101593.0843;2



CHANNEL: DAMPF FILTER: CH. CLASS 1000

PEAK DATA: 4431.98 N @ 3.75 MS; -1870.16 N @ 90.13 MS

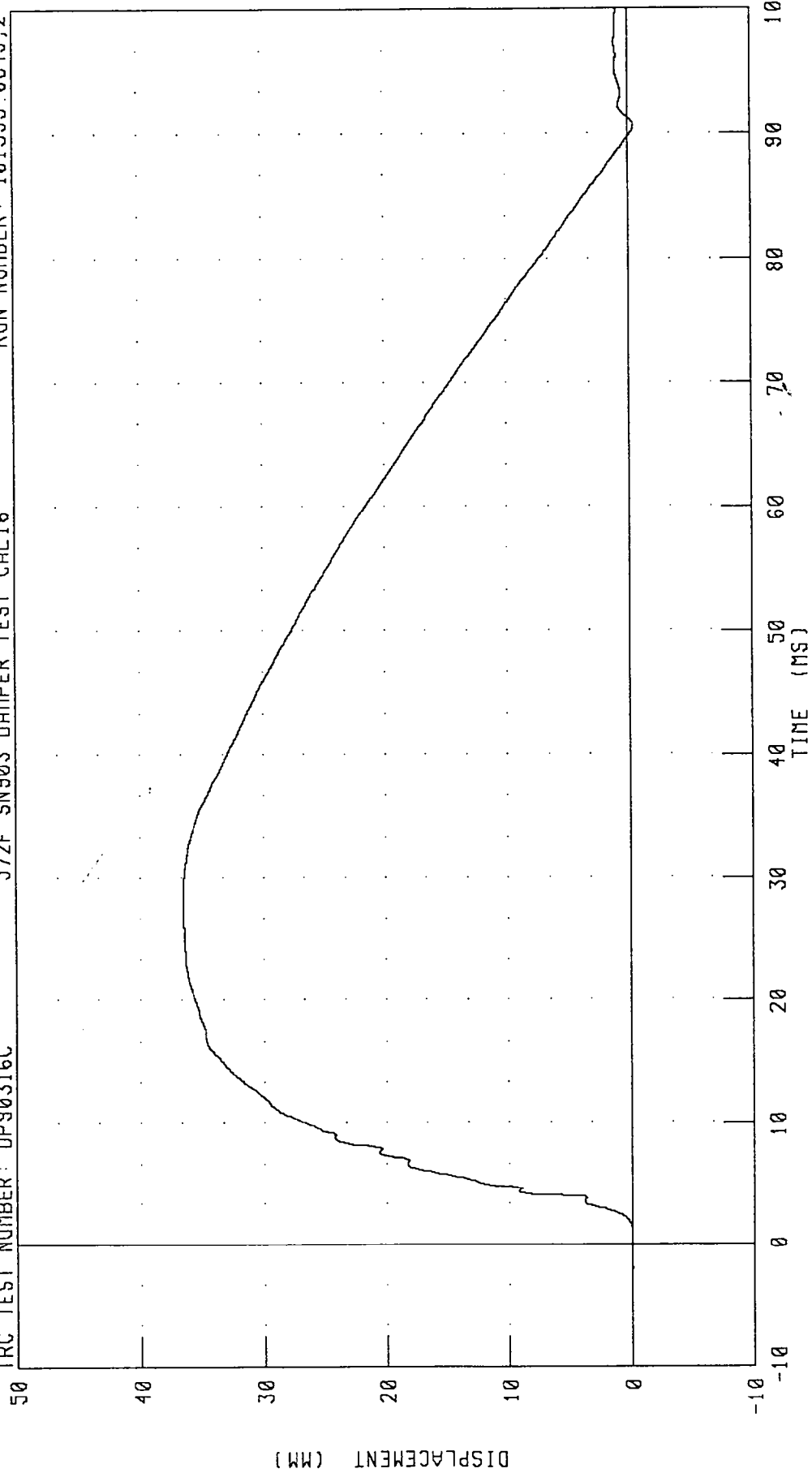
PART 572-F S.I.D. THORACIC SHOCK ABSORBER CALIBRATION (6.1 M/SEC)

SHOCK ABSORBER DISPLACEMENT

TRC TEST NUMBER: DP90316C

572F SN903 DAMPER TEST CAL16

RUN NUMBER: 101593.0843;2



CHANNEL: CSTYD FILTER: CH. CLASS 1000

PEAK DATA: 36.54 MM @ 28.50 MS; -0.43 MM @ 90.63 MS

TRANSPORTATION RESEARCH CENTER INC.

LATERAL THORAX IMPACT TEST

SIDE IMPACT DUMMY

15-Oct-93

LEFT SIDE CONFIGURATION

TRC

ST90316

572F SN903 THORAX IMPACT CAL16

TEST PARAMETER	SPECIFICATION (ABSOLUTE VALUE)	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	21.7 DEG. C
RELATIVE HUMIDITY	10 - 70 %	45.0 %
PISTON VELOCITY	4.21 - 4.32 M/SEC	4.27 M/SEC
PEAK ACCELERATION: UPPER RIB BAR	37 - 46 G	-45.8 G
PEAK ACCELERATION: LOWER RIB BAR	37 - 46 G	-44.9 G
PEAK ACCELERATION: LOWER THORACIC SPINE	15 - 22 G	-21.3 G

TEST MEETS SPECIFICATIONS

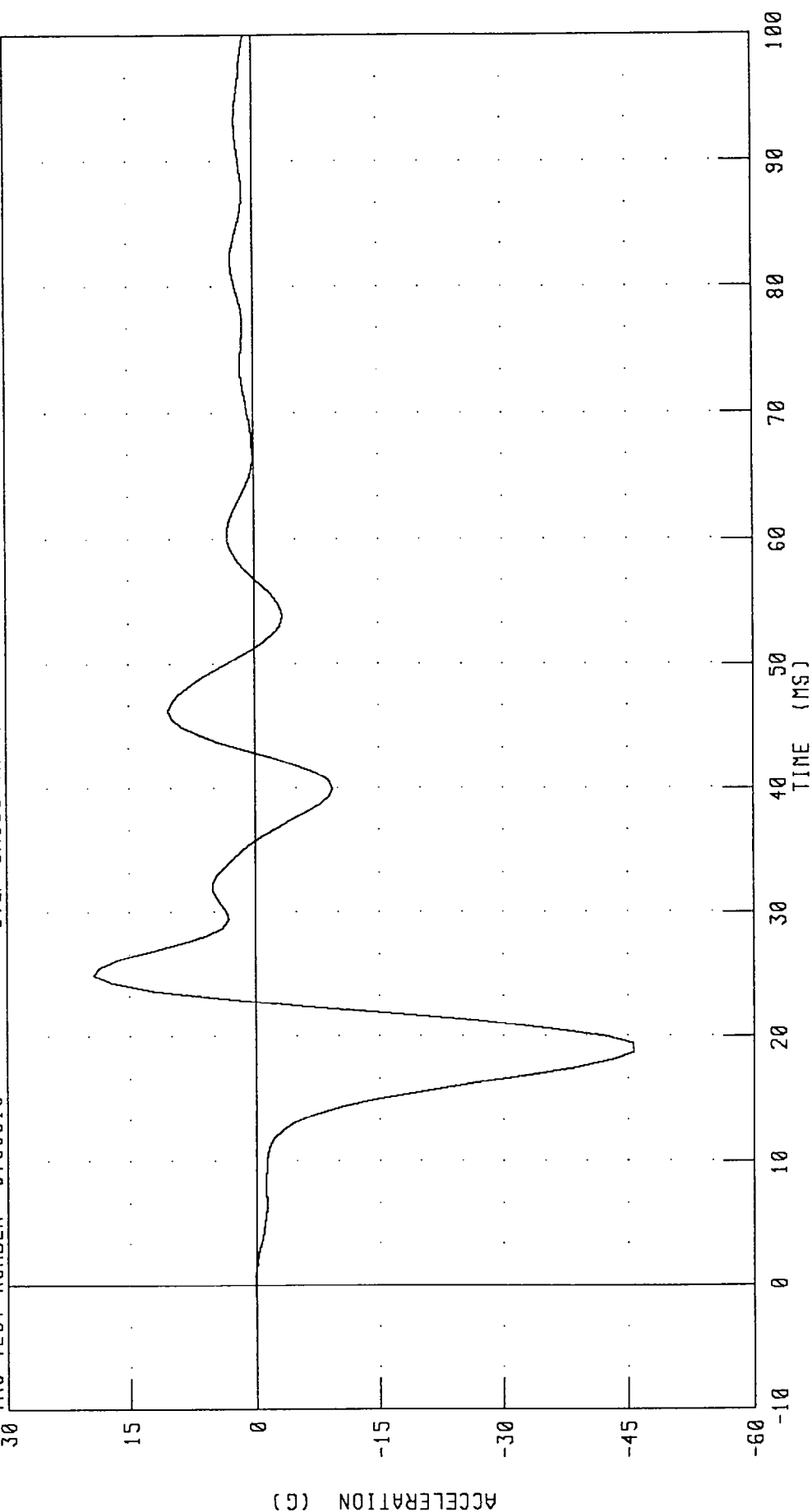
TECHNICIAN

Pete Font

PART 572-F S.I.D. THORAX CALIBRATION - (LEFT SIDE IMPACT)

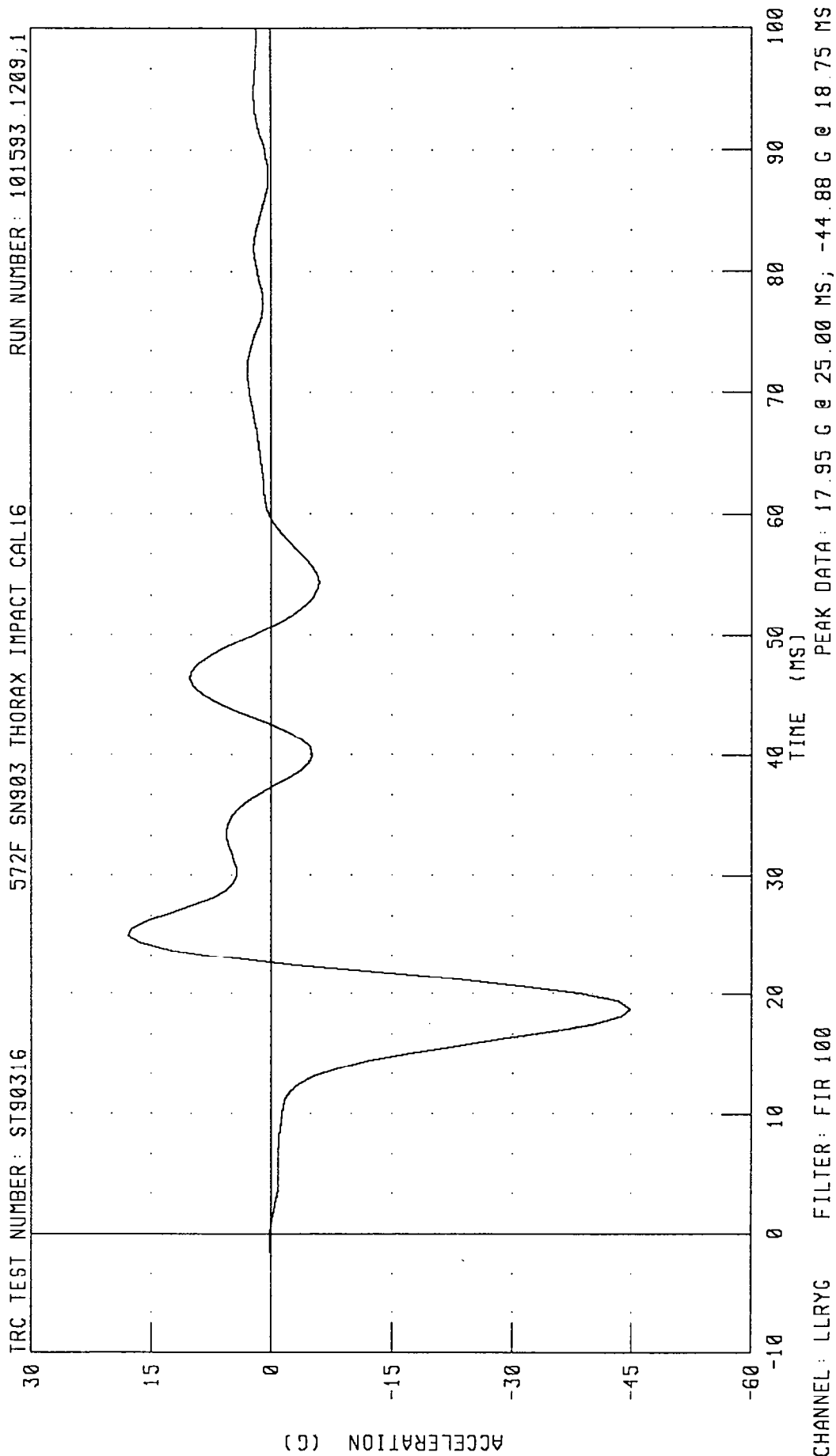
LEFT UPPER RIB ACCELERATION Y AXIS

TRC TEST NUMBER: ST90316 572F SN903 THORAX IMPACT CAL16 RUN NUMBER: 101593.1209,1



CHANNEL: LURYG FILTER: FIR 100 PEAK DATA: 19.36 G @ 25.00 MS; -45.75 G @ 18.75 MS

PART 572-F S.I.D. THORAX CALIBRATION - (LEFT SIDE IMPACT)
LEFT LOWER RIB ACCELERATION Y AXIS



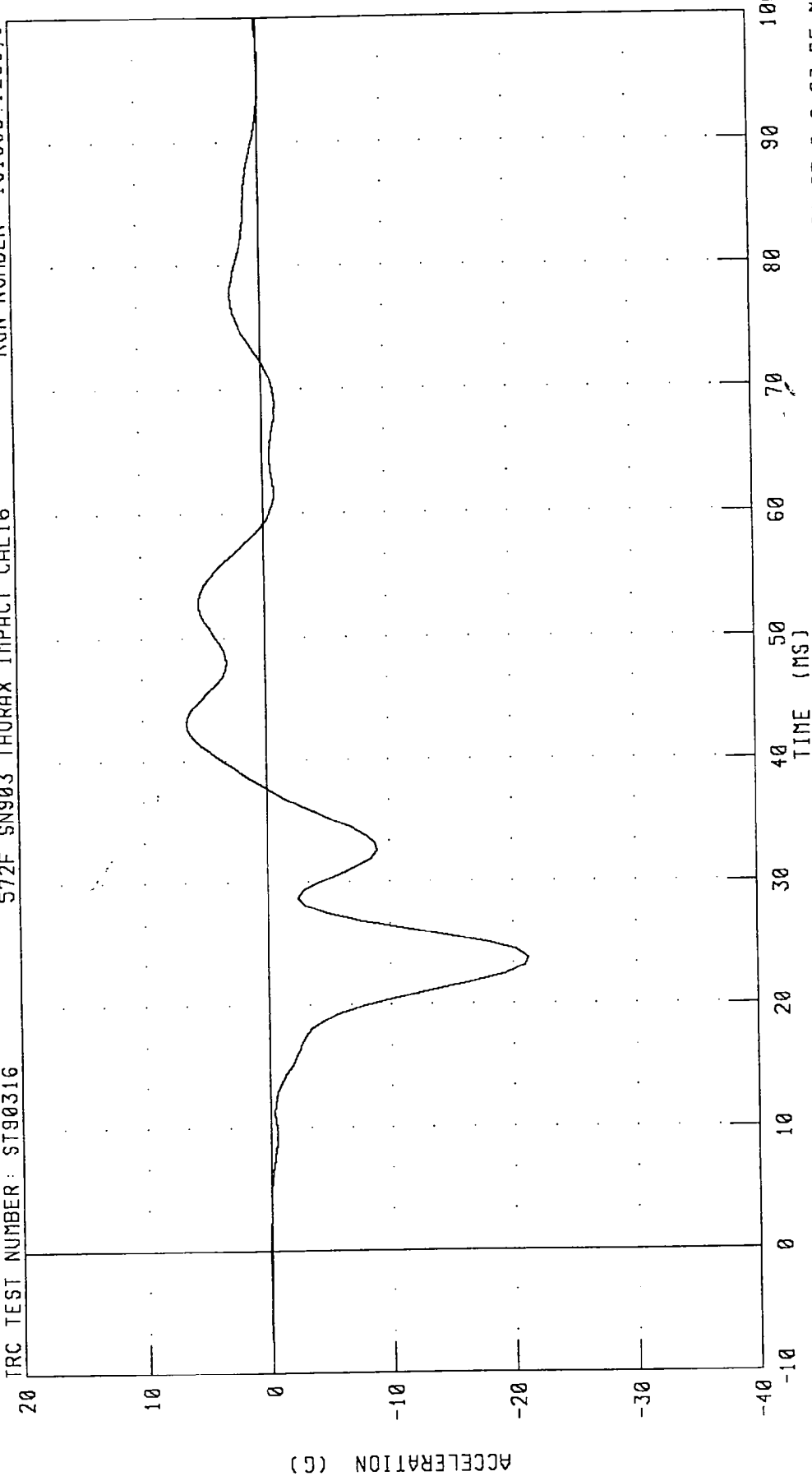
PART 572-F S.I.D. THORAX CALIBRATION - (LEFT SIDE IMPACT)

LOWER SPINE ACCELERATION Y AXIS

RUN NUMBER: 101593.1209,1

TRC TEST NUMBER: ST90316

572F SN903 THORAX IMPACT CAL16



PEAK DATA: 6.43 G @ 43.13 MS; -21.27 G @ 23.75 MS

CHANNEL: T12YG FILTER: FIR 100

TRANSPORTATION RESEARCH CENTER INC.

LATERAL PELVIS IMPACT TEST

SIDE IMPACT DUMMY

15-Oct-93

LEFT SIDE CONFIGURATION

TRC

SP90316

572F SN903 PELVIS IMPACT CAL16

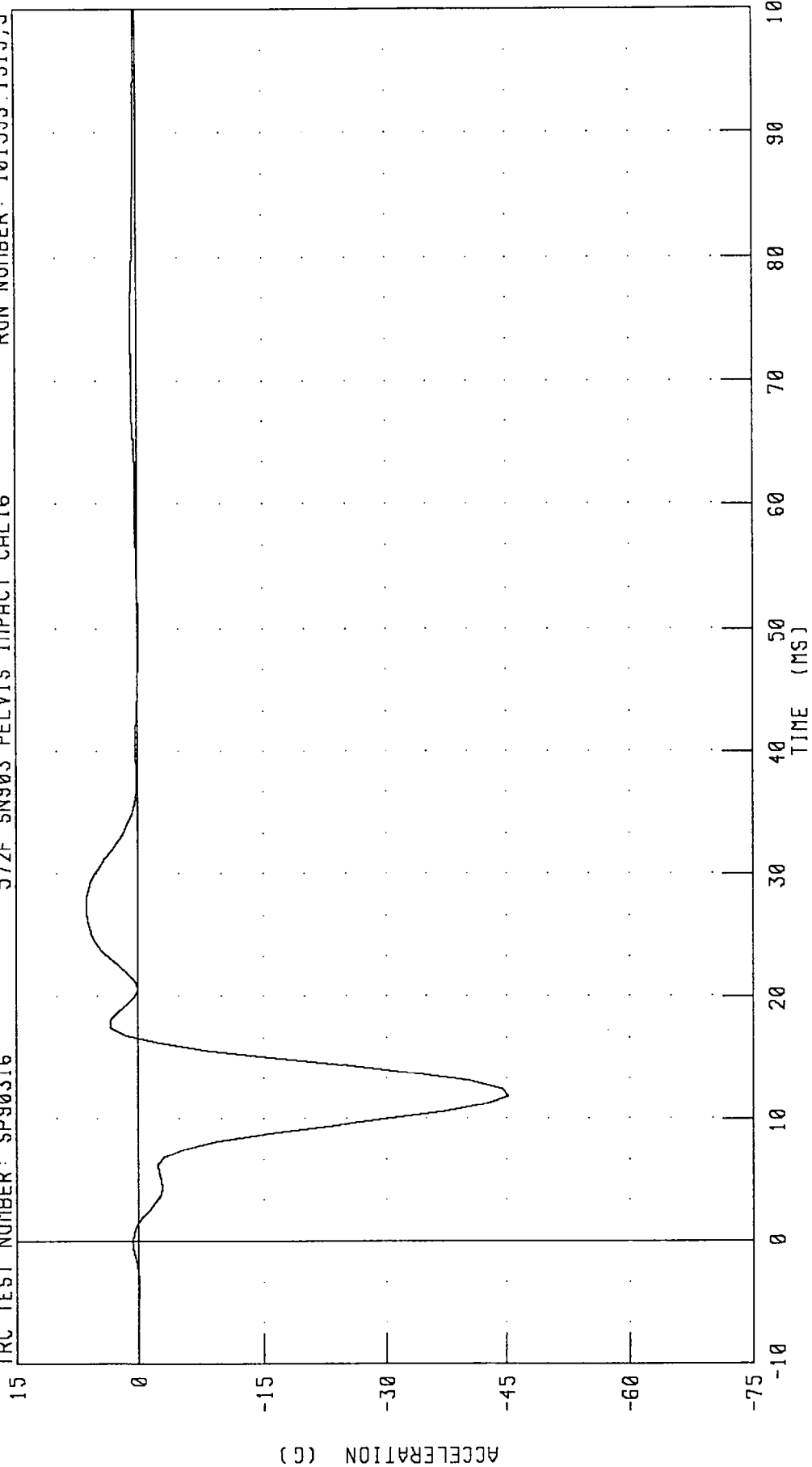
TEST PARAMETER	SPECIFICATION (ABSOLUTE VALUE)	TEST RESULTS
TEMPERATURE	18.9 - 25.5 C	22.2 DEG. C
RELATIVE HUMIDITY	10 - 70 %	45.0 %
PISTON VELOCITY	4.21 - 4.32 M/SEC	4.22 M/SEC
PEAK PELVIC ACCELERATION	40 - 60 G	-45.3 G
TIME ABOVE 20 G LEVEL	3 - 7 MSEC	5.6 MSEC
IS ACCELERATION CURVE UNIMODAL?	YES	YES

TEST MEETS SPECIFICATIONS

TECHNICIAN Rita Fount

PART 572-F S.I.D. PELVIS CALIBRATION - (LEFT SIDE IMPACT)
PELVIS ACCELERATION Y AXIS

TRC TEST NUMBER: SP90316 572F SN903 PELVIS IMPACT CAL16 RUN NUMBER: 101593.1319,3



CHANNEL: PEVYG FILTER: FIR 100

PEAK DATA: 6.33 G @ 27.50 MS; -45.27 G @ 11.88 MS

APPENDIX D

MISCELLANEOUS TEST INFORMATION

DUMMY INSTRUMENTATION PLACEMENT

DUMMY MANUFACTURER & S/N: NHTSA/903

SEATING POSITION: DRIVER

MNEMONIC	LOCATION	AXIS	MFR.	MODEL	S/N	ORIENTATION (+ SENSING)
HEDXG1	HEAD	X	ENDEVCO	7264	DC72J	REAR
HEDYG1	HEAD	Y	ENDEVCO	7264	BF42J	LEFT
HEDZG1	HEAD	Z	ENDEVCO	7264	EH75J	UP
T01XG1	UPPER SPINE	X	ENDEVCO	7264	DE99J	REAR
T01YG1	UPPER SPINE	Y	ENDEVCO	7264	FG43J	LEFT
T01YGA	UPPER SPINE REDUNDANT	Y	ENDEVCO	7264	EJ62J	LEFT
T01ZG1	UPPER SPINE	Z	ENDEVCO	7264	BE02J	UP
T12XG1	LOWER SPINE	X	ENDEVCO	7264	BF65J	FORWARD
T12YG1	LOWER SPINE	Y	ENDEVCO	7264	EJ59J	LEFT
T12YGA	LOWER SPINE REDUNDANT	Y	ENDEVCO	7264	BE24J	LEFT
T12ZG1	LOWER SPINE	Z	ENDEVCO	7264	BH31J	UP
LURYG1	LEFT UPPER RIB	Y	ENDEVCO	7264	EY99J	RIGHT
LURYGA	LEFT UPPER RIB REDUNDANT	Y	ENDEVCO	7264	DC54J	RIGHT
LLRYG1	LEFT LOWER RIB	Y	ENDEVCO	7264	FJ66J	RIGHT
LLRYGA	LEFT LOWER RIB REDUNDANT	Y	ENDEVCO	7264	FC60J	RIGHT
PEVXG1	PELVIS	X	ENDEVCO	7264	FB67J	REAR
PEVYG1	PELVIS	Y	ENDEVCO	7264	DF92J	LEFT
PEVZG1	PELVIS	Z	ENDEVCO	7264	BE50J	UP

VEHICLE INSTRUMENTATION PLACEMENT

MNEMONIC	LOCATION	AXIS	MFR.	MODEL	S/N	ORIENTATION (+ SENSING)
RFSXG1	RIGHT FRONT SILL	X	ENDEVCO	2264	AT38	REAR
RFSYG1	RIGHT FRONT SILL	Y	ENDEVCO	2264	AU31	LEFT
RFSZG1	RIGHT FRONT SILL	Z	ENDEVCO	2264	AG24	DOWN
LFSYG1	LEFT FRONT SILL	Y	ENDEVCO	7264	AJ34	LEFT
LFDYG1	LEFT FRONT DOOR CENTERLINE	Y	ENDEVCO	7264	DG87H	LEFT
LFDYG3	LEFT FRONT DOOR MID-REAR	Y	ENDEVCO	7264	BE04J	LEFT
LFDYG2	LEFT FRONT DOOR UPPER CENTERLINE	Y	ENDEVCO	7264	BR19J	LEFT
RDKXG1	REAR FLOORPAN OVER AXLE	X	ENDEVCO	2264	AS95	REAR
RDKYG1	REAR FLOORPAN OVER AXLE	Y	ENDEVCO	2264	AU09	RIGHT
RDKZG1	REAR FLOORPAN OVER AXLE	Z	ENDEVCO	2264	BA46	UP

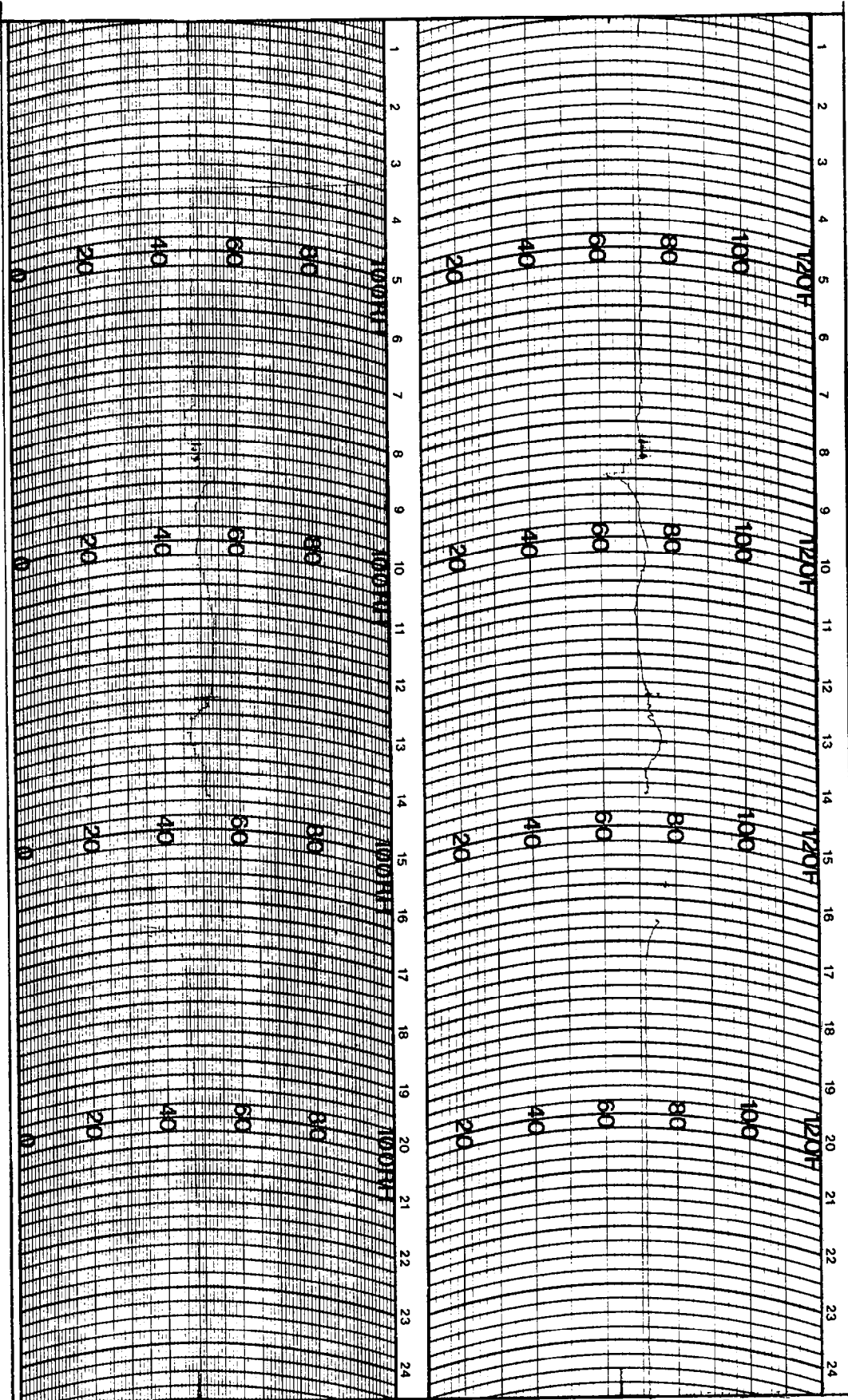
MOVING DEFORMABLE BARRIER INSTRUMENTATION PLACEMENT

MNEMONIC	LOCATION	AXIS	MFR.	MODEL	S/N	ORIENTATION (+ SENSING)
BCGXG	CENTER OF GRAVITY	X	ENDEVCO	2264	AK21	REAR
BCGYG	CENTER OF GRAVITY	Y	ENDEVCO	2264	AY66	RIGHT
BCGZG	CENTER OF GRAVITY	Z	ENDEVCO	2264	AZ67	UP
BSRXG	LEFT FRAME RAIL OVER REAR AXLE	X	ENDEVCO	2264	AY89	REAR
BSRYG	LEFT FRAME RAIL	Y	ENDEVCO	7264	AL42	RIGHT

FREQUENCY RESPONSE CLASSES
NHTSA LABORATORY PROCEDURE TP-214D-01

<u>TYPICAL TEST MEASUREMENTS</u>	<u>CHANNEL CLASS</u>
Vehicle structural acceleration for use in:	
Total vehicle comparison	60
Collision simulation input	60
Component analysis	600
Integration for velocity or displacement	180
Anthropomorphic test device	
Head accelerations (linear and angular)	1000
Thorax	
Spine acceleration	180*
Rib accelerations	180*
Deflections	180
Pelvis	
Accelerations	180*

*The Channel Class 180 data is further processed by subsampling to a 1600 Hz sample rate, removing bias, and filtering with the Finite Impulse Response (FIR100) filter program.



WEATHER MEASURE
P.O. BOX 41257
SACRAMENTO, CA. 95841
PHONE (916) 481-7565

HYGROTHERMOGRAPH
1 DAY

CHART # C311 D HF
PART # 699123

STATION 931026 DATE ON _____ DATE OFF _____

OCCUPANT COMPARTMENT THERMOGRAPH