

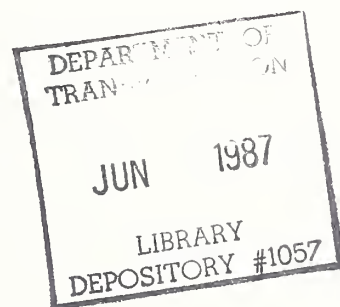
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1987
Department
of Transportation
Federal Highway
Administration



DOT HS 807 093
Test Report

October 1986

CRASH III MODEL IMPROVEMENTS MRB-To-Car Side Impact Test of A 90° Moving Rigid Barrier To A 1981 Chevrolet Citation Test Speed 35.2 mph



The United States Government does not endorse products or manufacturers. Trade or manufacturers' names appear only because they are considered essential to the object of this report.

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4. Title and Subtitle CRASH III MODEL IMPROVEMENTS MRB-To-Car Side Impact Test of A 90° Moving Rigid Barrier To A 1981 Chevrolet Citation Test Speed 35.2 mph				5. Report Date OCTOBER 1986	
				6. Performing Organization Code	
7. Author(s) N. A. El-Habash, Project Engineer, TRCO				8. Performing Organization Report No. 861015	
9. Performing Organization Name and Address Vehicle Research and Test Center St. Rt. 33, Logan County East Liberty, Ohio 43319				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. DTNH 22-85-C-08123	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh Street, S.W. Washington, DC 20590				13. Type of Report and Period Covered TEST REPORT Oct. - Dec. 1986	
				14. Sponsoring Agency Code	
15. Supplementary Notes This test was conducted as part of VRTC Project No. 85-0001 Side Impact Protection In Production Vehicles					
16. Abstract This test report documents one of a series of four crash tests to measure side crush in various vehicle models. Testing was conducted on a 1981 Chevrolet Citation 4-door Hatchback at the TRCO Crash Test Facility, East Liberty, Ohio. The test vehicle was impacted on the left side perpendicular by a Moving Rigid Barrier (MRB). The test date was October 15, 1986. Vehicle was impacted perpendicular on the left side at 35.2 mph, the ambient temperature was 49°F and the time was 1118.					
17. Key Words Occupant Response Moving Barrier Crash Testing			18. Distribution Statement Available from: National Technical Information Service Springfield, Virginia 22161		
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 51	22. Price		

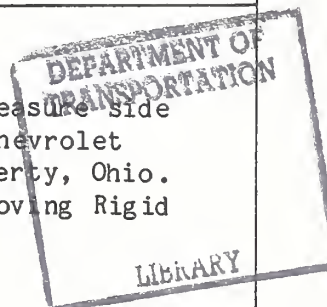


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SECTION 1.0
PURPOSE AND INTRODUCTION

PURPOSE

The main purpose of this test was to obtain side crush measurements for improvement of computer simulation models in one of a fleet of vehicles. The vehicle was tested using conditions not currently contained in a Federal Motor Vehicle Safety Standard.

INTRODUCTION

A stationary 1981 Chevrolet Citation 4-Door Hatchback was impacted on the left side by a Moving Rigid Barrier (MRB) on October 15, 1986.

The MRB was to be towed into the stationary Chevrolet Citation at 35.28 mph, and the intended contact point of the MRB longitudinal centerline was to be -11.4 inches (rearward) from the center of gravity of the Chevrolet Citation. The angle of the MRB was 90⁰ counter clockwise with respect to the longitudinal axis of the struck vehicle. The actual test speed was 35.2 mph and the actual contact point was -11.1 inches (rearward) from the center of gravity of the Chevrolet Citation.

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains data required by R & D. Appendix A contains pre-test and post-test vehicle photographs. Appendix B contains Data Plots.

SECTION 2.0

GENERAL TEST AND VEHICLE PARAMETER DATA

The following data sheets describe the General Test and Vehicle Parameter Data.

TEST VEHICLE INFORMATION

VEHICLE MANUFACTURER: General Motors Corp.

MAKE/MODEL: Chevrolet Citation

VIN: 1G1AX685XB6296978

BODY STYLE: 4-Door Hatchback

MODEL YEAR: 1981

NHTSA NO.: R & D

COLOR: Light Blue

ENGINE DATA: TYPE: Transverse

CYLINDERS: 4

DISPLACEMENT: 2500cc

TRANSMISSION DATA: 4 Speed Manual

DATE VEHICLE RECEIVED: 10/10/86

ODOMETER READING: 74

DEALER'S NAME AND ADDRESS: NA

ACCESSORIES:

POWER STEERING	Yes	AUTOMATIC TRANSMISSION	No
POWER BRAKES	No	AUTOMATIC SPEED CONTROL	No
POWER SEATS	No	TILTING STEERING WHEEL	No
POWER WINDOWS	No	TELESCOPING STEERING WHEEL	No
TINTED GLASS	No	AIR CONDITIONING	No
RADIO	Yes	ANTI-SKID BRAKE	No
CLOCK	No	REAR WINDOW DEFROSTER	No
OTHER			

REMARKS:

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

DATA FROM CERTIFICATION LABEL ON LEFT DOOR FACE OR "B" POST:

VEHICLE MANUFACTURED BY: General Motors Corp.

DATE OF MANUFACTURE: 06/81

GVWR: 3463 LBS.,

GAWR: FRONT 1841 LBS., REAR 1622 LBS.

*Vehicle was previously perpared.

VEHICLE TIRE DATA

RECOMMENDED COLD TIRE PRESSURE: FRONT 30 psi; REAR 30 psi

TIRES ON VEHICLE (MFGR. & LINE, SIZE): Goodyear Viva P185/80R13

BIAS PLY, BELTED, OR RADIAL: Radial

PLY RATING: 4

IS SPARE TIRE "SPACE SAVER"? Yes

IS SPARE TIRE STANDARD EQUIPMENT? Yes

WEIGHT OF TEST VEHICLE AS RECEIVED FROM DEALER (WITH NO FLUIDS):

RIGHT FRONT	780	LBS.	RIGHT REAR	373	LBS.
LEFT FRONT	790	LBS.	LEFT REAR	412	LBS.
TOTAL FRONT WEIGHT	1570	LBS.	(66.7 % OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	785	LBS.	(33.3 % OF TOTAL VEHICLE WEIGHT)		
TOTAL DELIVERED WEIGHT	2355	LBS.			

WEIGHT OF TEST VEHICLE AFTER PREPARATION:

RIGHT FRONT	777	LBS.	RIGHT REAR	454	LBS.
LEFT FRONT	785	LBS.	LEFT REAR	404	LBS.
TOTAL FRONT WEIGHT	1562	LBS.	(64.6 % OF TOTAL VEHICLE WEIGHT)		
TOTAL REAR WEIGHT	858	LBS.	(35.4 % OF TOTAL VEHICLE WEIGHT)		
TOTAL TEST WEIGHT	2420	LBS.			

WEIGHT OF BALLAST SECURED IN VEHICLE TRUNK AREA: 0 LBS.

TEST FLUID DATA

TEST FLUID TYPE: PURPLE STODDARD SOLVENT 2; SPEC. GRAVITY: 0.764

KINEMATIC VISCOSITY: 0.99 CENTISTOKES

"USEABLE" CAPACITY*: NA GALLONS ACTUAL

TEST VOLUME: 0.0 GALLONS

FUEL SYSTEM CAPACITY (DATA FROM OWNERS MANUAL): NA GALLONS

DETAILS OF FUEL SYSTEM: DNA

ELECTRIC FUEL PUMP: DNA

FUEL INJECTION: DNA

DOES ELECTRIC FUEL PUMP OPERATE WITH IGNITION SWITCH "ON" AND THE ENGINE NOT OPERATING? DNA

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL ON DOOR, POST, GLOVEBOX, ETC.

VEHICLE LOAD (UP TO CAPACITY): FRONT 30 psi; REAR 30 psi

RECOMMENDED TIRE SIZE: P185/80R13 LOAD RANGE X B, C,

VEHICLE CAPACITY: TYPES OF SEATS: Front - Bench
Rear - Bench

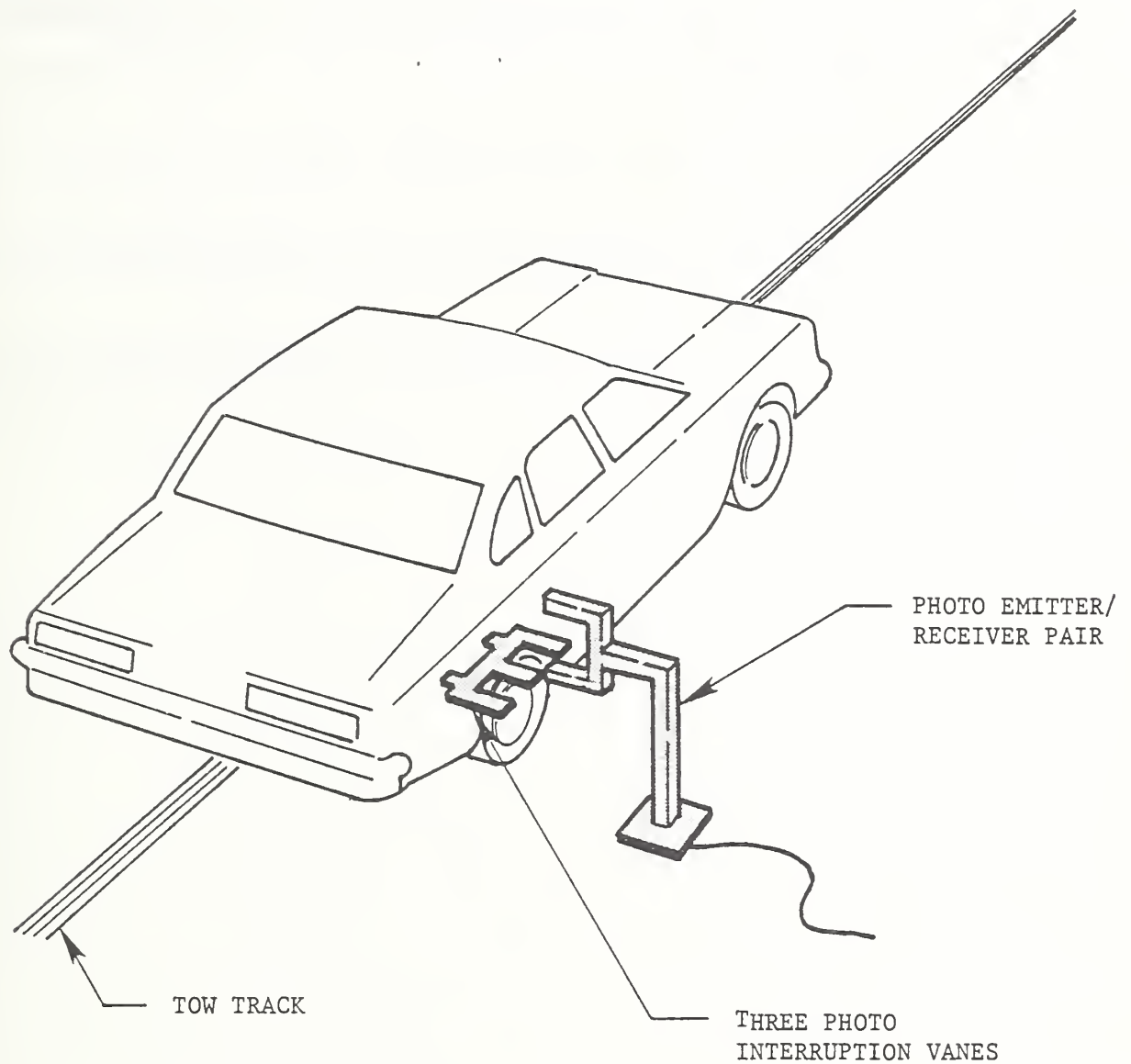
NUMBER OF OCCUPANTS (DESIGNATED SEATING CAPACITY): 2 FRONT

CARGO LOAD DNA LBS. 3 REAR
5 TOTAL

TOTAL DNA LBS.

*WITH ENTIRE FUEL SYSTEM FILLED WITH FUEL TANK THROUGH CARBURETOR BOWL.

IMPACT VELOCITY MEASUREMENT SYSTEM



The final vane clears emitter/receiver two inches before impact.

The vanes have one foot spacing.

TEST ANOMALIES

BCGZG Data loss between approximately 11 msec and 45 msec due to unknown cause.

BCGXG data loss due to unknown cause.

BCGYG data loss between approximately 15 msec and 60 msec due to unknown cause.

BRCYG data loss between approximately 15 msec and 42 msec due to unknown cause.

SECTION 3.0
DATA REQUIRED BY R&D

The following pages are included in this section:

Vehicle was impacted perpendicular on the left side at a high speed.

1. Vehicle crush data
2. Vehicle accelerometer location and data summary
3. High speed camera information
4. Transducer information

VEHICLE WAS IMPACTED PERPENDICULAR ON LEFT SIDE AT A HIGH SPEED

Test Condition

Test Number: 861015

Date of Test = October 15, 1986

Wind Velocity 4-8/297 W.

Time of Test = 1118

Ambient Temperature at Impact Area: 49°F

Subject Vehicle Data

	<u>Actual</u>	<u>Intended</u>
Vehicle Test Weight (Lbs.)	2420	2420
MRB Test Weight (Lbs.)	3168	3168
MRB Velocity (MPH)*	35.2	35.3
Impact Point (Inches)**	-11.1	-11.4

Vehicle Attitude (All dimensions in inches):

Delivered Attitude:	RF 27.1	;LF 27.1	;RR 27.1	;LR 27.0
Pre-Test Attitude:	RF 26.8	;LF 26.9	;RR 26.8	;LR 26.6
Post-Test Attitude:	RF 26.1	;LF 26.0	;RR 25.4	;LR 25.8

Vehicle dimension (All in inches):

***Center of Gravity = 37.4	, wheel base = 105.8
Width Car = 68.9	, length car = 177.0
Width Roof = 49.5	, track width = 58.3
Front overhang = 35.6	, rear overhang = 37.3

* As measured over final one foot of travel.

** As measured + is forward of the center of gravity of the test vehicles.

As measured - is rearward of the center of gravity of the test vehicles.

*** Rearward of front wheel centerline.

National Accident Sampling System — Continuous Sampling Subsystem: Vehicle Data

FIELD MEASUREMENTS

NCI

Complete When Applicable	
End Damage	Side Damage
Undeformed end width _____ Corner shift: A1 _____ A2 _____ End shift at frame (CDC) (check one) <4 inches _____ ≥4 inches <u> X </u>	Bowing: B1 _____ X1 <u> 2 </u> B2 _____ X2 <u> 1.6 </u> Bowing constant $\frac{X1 + X2}{2} = \underline{\quad 1.8 \quad}$

Note: Measure C1 to C6 from Driver to Passenger side in Front or Rear impacts—
 Rear to Front in Side impacts.

Specific Impact Number	Plane* of C-Measurements	Direct Damage		Field L**	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	±D
		Width** (CDC)	Max*** Crush								
	Maximum Crush				0.0	16.5	16.0	16.5	9.0	0.0	
	Freespace				0.0	0.8	0.8	0.8	0.8	0.0	
	Net Maximum Crush				0.0	15.7	15.2	15.7	8.2	0.0	
	Sill Crush				---	13.0	13.7	12.6	---	---	
	Sill Freespace				---	5.5	5.5	5.5	---	---	
	Net Sill Crush				---	7.5	8.2	7.1	---	---	
	Bowing				1.8	1.8	1.8	1.8	1.8	1.8	
	Net Crush			100	1.8	17.5	17.0	17.5	10.0	1.8	-9.5

*Identify the plane at which the C-measurements are taken (e.g., at bumper, above bumper, at sill, above sill, at beltline, etc.) or label adjustments (e.g., free space).

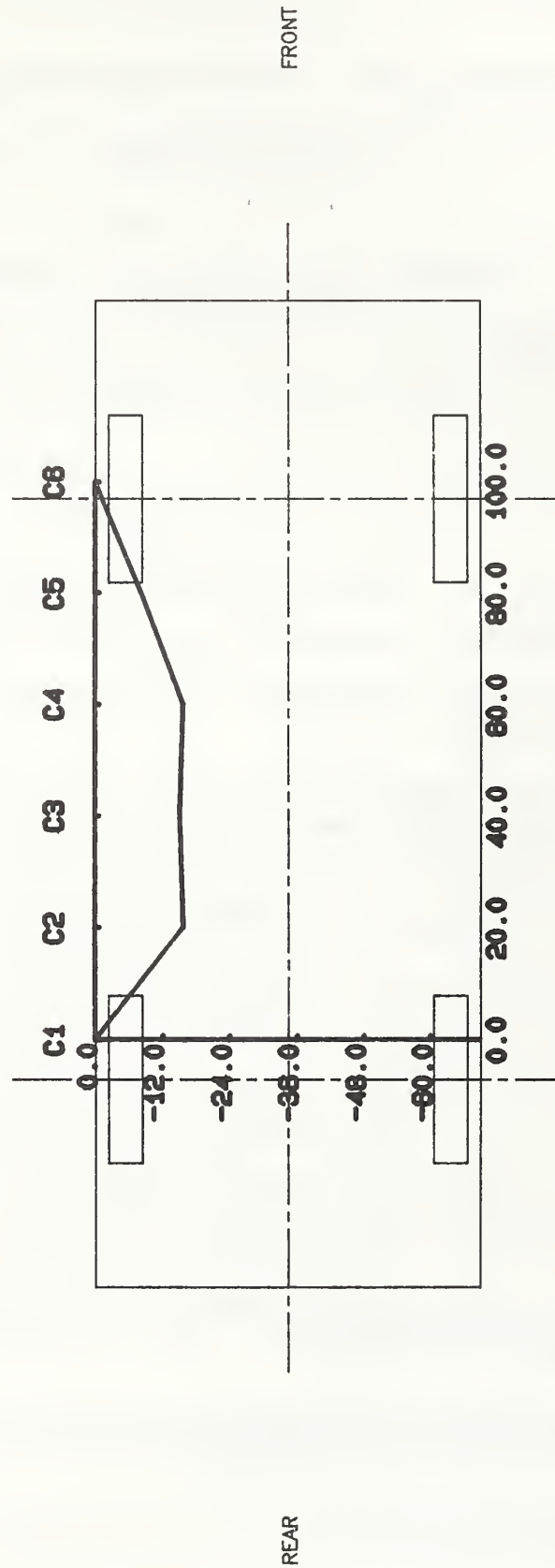
Free space value is defined as the distance between the baseline and the original body contour taken at the individual C locations. This may include the following: bumper lead, bumper taper, side protrusion, side taper, etc. Record the value for each C-measurement and maximum crush.

**Measure and document on the vehicle diagram the beginning or end of the direct damage width and field L (e.g., side damage with respect to undamaged axle.)

***Measure and document on the vehicle diagram the location of the maximum crush.

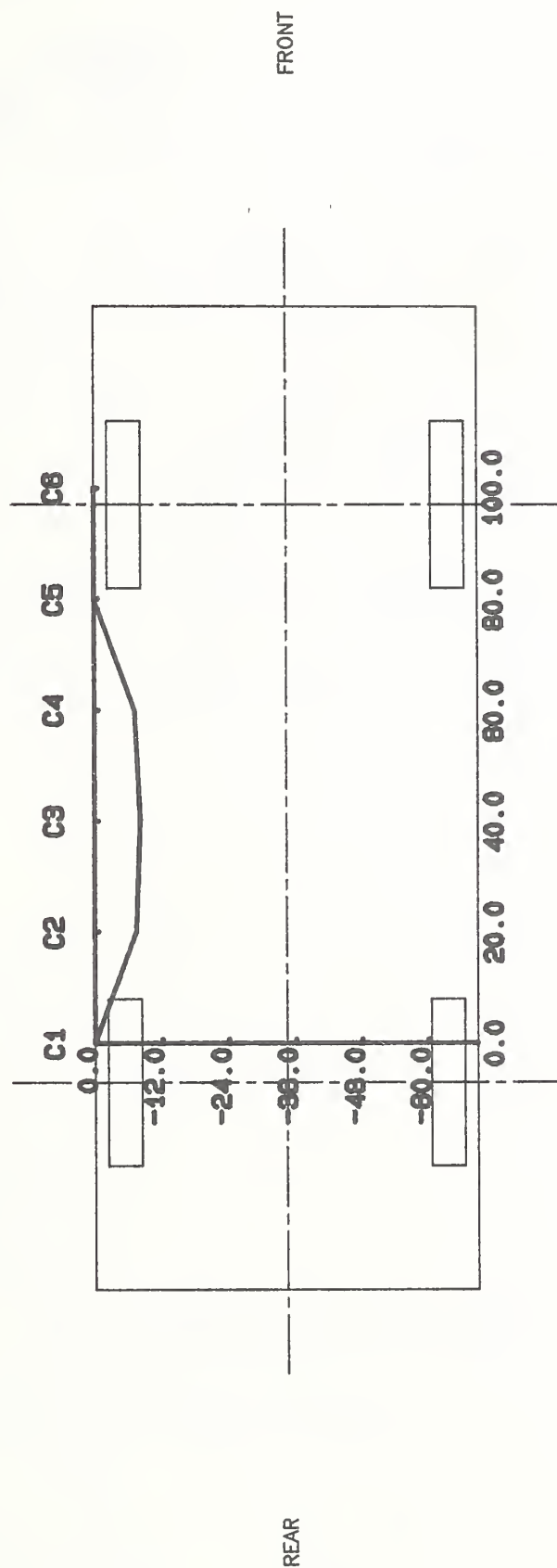
Note: Use as many lines/columns as necessary to describe each damage profile.

VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS MID-BUMPER HEIGHT WHICH IS 17.0" ABOVE GROUND LEVEL
 THE CENTER OF THE CRUSH IS -9.5 " FROM THE CENTER OF GRAVITY
 SCALE FACTOR EQUALS 0.033

VEHICLE EXTERIOR STATIC CRUSH PROFILE



PROFILE LEVEL EQUALS SILL EDGE HEIGHT WHICH IS 29.0 " ABOVE GROUND LEVEL
 THE CENTER OF THE CRUSH IS -9.5 " FROM THE CENTER OF GRAVITY
 SCALE FACTOR EQUALS 0.033

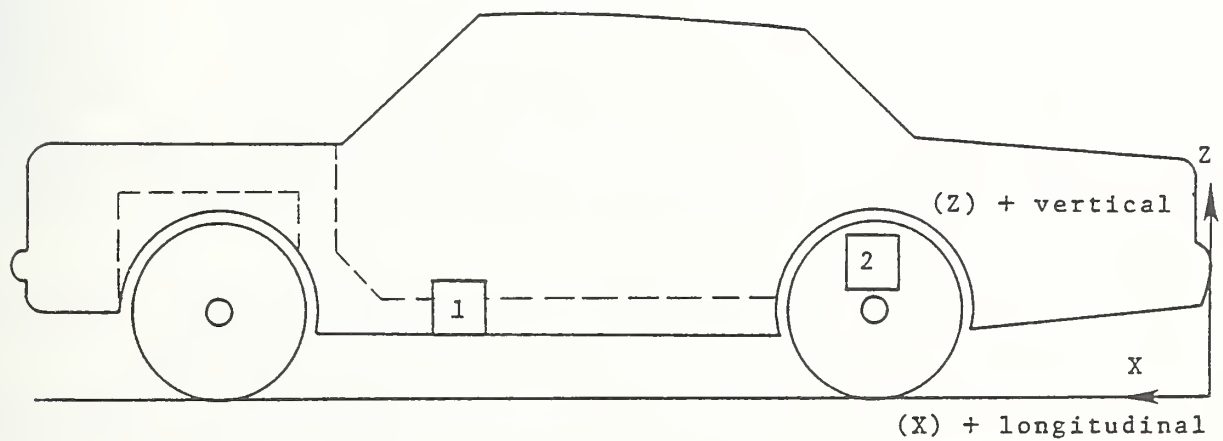
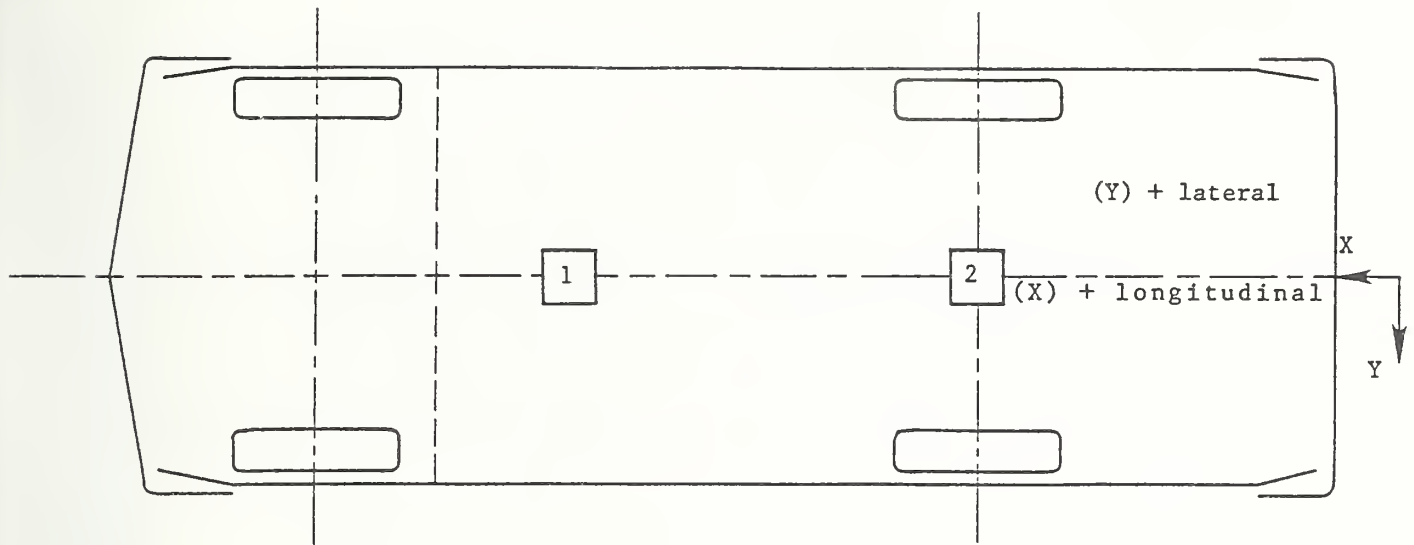
VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

NO.	LOCATION	X*	Y*	Z*	POSITIVE	TIME	NEGATIVE	TIME
					DIRECTION		DIRECTION	
					MAX	(msec)	MAX	(msec)
					(g)		(g)	
1	CENTER OF GRAVITY	-35.1	0.0	16.1				
	(LONGITUDINAL)				10.47	19.25	8.27	41.38
	(LATERAL)	V = -21.1 mph @ 128.0 msec			4.45	115.75	38.95	36.38
	(VERTICAL)				18.74	24.75	18.10	36.88
	(RESULTANT)					43.04 @	36.50	
2	REAR DECK OVER AXLE	-92.1	0.0	20.8				
	(LONGITUDINAL)				6.24	22.00	12.59	90.63
	(LATERAL)	V = -23.3 mph @ 128.0 msec			1.82	159.13	24.29	13.88
	(VERTICAL)							
	(RESULTANT)							

* Reference: X - Front Axle (+ Forward), Y - Vehicle Centerline (+ To Left),
Z - Ground Level (+ Up)

All measurements of accelerometer locations in inches.

VEHICLE ACCELEROMETER LOCATIONS



YAW RATE GYRO LOCATION AND DATA SUMMARY

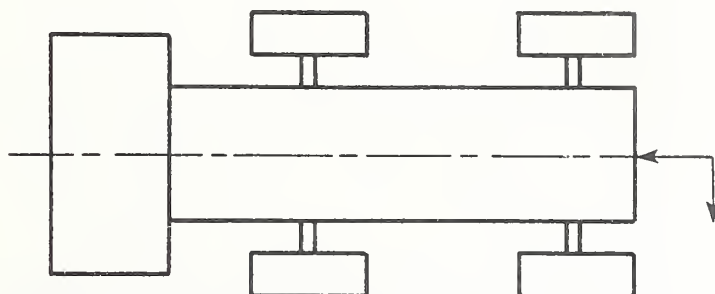
LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
				MAX (deg/sec)	TIME (msec)	MAX (deg/sec)	TIME (msec)
YAW RATE GYRO	-106.5	-15.6	24.3	113.18	127.50	138.69	38.25

*Reference: X - Front Axle (+ Forward), Y - Vehicle Centerline (+ To Left),
Z - Ground Level (+ Up)

All measurements of rate gyro in inches.

Yaw rotation is positive when measured counterclockwise as viewed from above.

MOVING BARRIER ACCELEROMETER LOCATIONS AND DATA SUMMARY



NO.	LOCATION	X*	Y*	Z*	POSITIVE DIRECTION		NEGATIVE DIRECTION	
					MAX (g)	TIME (msec)	MAX (g)	TIME (msec)
1	CENTER OF GRAVITY	76.0	0.0	12.0				
	LONGITUDINAL	V = -19.3 mph @ 128.00 msec			---	---	---	---
	(LATERAL)				---	---	---	---
	(VERTICAL)				---	---	---	---
	(RESULTANT)					---	---	---
2	REAR FRAME MEMBER	19.3	18.9	13.5				
	(LONGITUDINAL)	V = -16.9 mph @ 128.00 msec			0.30	130.00	16.76	16.88
	(LATERAL)				---	---	---	---

*Reference: X - Rear most point of frame (+ Forward), Y - Barrier Centerline (+ To left), Z - Ground level (+ Up)

All measurements of accelerometer locations in inches.

γ See TEST ANOMALIES

CAMERA INFORMATION

CAMERA NO.	LOCATION	TYPE	LENS (mm)	SPEED (fps)	PURPOSE OF CAMERA DATA
1	R. Panning	Kodak	25	24	Real Time Panning
2	Overhead wide	Photosonic 1B	8	850	Vehicle Dynamics
3	Overhead tight	Photosonic 1B	25	1001	Close-up of Impact Point
4	Onboard MRB	Photosonic 1B	13	1000	Close-up of Impact Point

NON-GOVERNMENT FURNISHED TRANSDUCER INFORMATION

PARAMETER BEING MEASURED	TYPE OF TRANSDUCER	MODEL NUMBER	SERIAL NUMBER	MFGR.	DATE OF LAST CALIBRATION	SENSITIVITY	DESIRED FULL SCALE (ENGR. UNITS)
BCGXG	Accel	7264-2000	BF09J	Endevco	6/25/86	.3362	100 G
BCGYG	Accel	7264-2000	BD45J	Endevco	5/07/86	.2957	100 G
BCGZG	Accel	7264-2000	BE42J	Endevco	6/25/86	.4150	100 G
BRCYG	Accel	7264-2000	BH46J	Endevco	8/12/86	.3025	100 G
BRCXG	Accel	7264-2000	BL01J	Endevco	5/07/86	.2986	100 G

All struck vehicle accelerometers were Government Furnished Equipment and were 7264 Accelerometers.

APPENDIX A

PHOTOGRAPHS

VEHICLE WAS IMPACTED PERPENDICULAR ON THE LEFT SIDE AT A HIGH SPEED.

<u>Figure</u>	<u>Page</u>
A-1. PRE-TEST FRONT VIEW	A-2
A-2. POST-TEST FRONT VIEW	A-2
A-3. PRE-TEST PASSENGER SIDE VIEW	A-3
A-4. POST-TEST PASSENGER SIDE VIEW	A-3
A-5. PRE-TEST REAR VIEW	A-4
A-6. POST-TEST REAR VIEW	A-4
A-7. PRE-TEST DRIVER SIDE VIEW	A-5
A-8. POST-TEST DRIVER SIDE VIEW	A-5
A-9. PRE-TEST DRIVER FRONT THREE-QUARTER VIEW	A-6
A-10. POST-TEST DRIVER FRONT THREE-QUARTER VIEW	A-6
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A-12. POST-TEST DRIVER REAR THREE-QUARTER VIEW	A-7
A-13. PRE-TEST OVERHEAD VIEW	A-8
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A-18. POST-TEST BARRIER AND VEHICLE VIEW	A-10
A-19. POST-TEST DRIVER SIDE CLOSEUP VIEW	A-11
A-20. POST-TEST FRONT DRIVER DOOR VIEW	A-11



Figure A-1. PRE-TEST FRONT VIEW



Figure A-2. POST-TEST FRONT VIEW
A-2

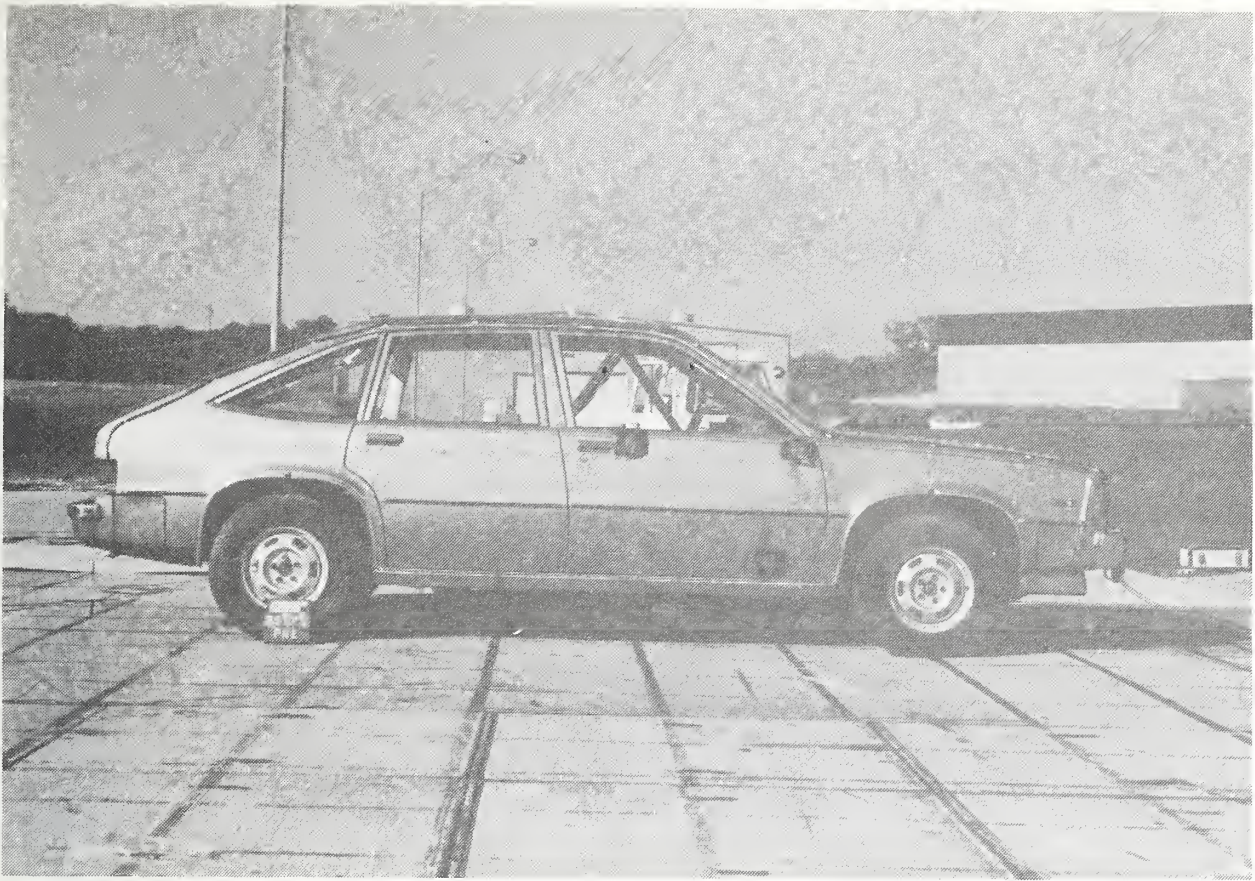


Figure A-3. PRE-TEST PASSENGER SIDE VIEW



Figure A-4. POST-TEST PASSENGER SIDE VIEW
A-3



Figure A-5. PRE-TEST REAR VIEW



Figure A-6. POST-TEST REAR VIEW



Figure A-7. PRE-TEST DRIVER SIDE VIEW



Figure A-8. POST-TEST DRIVER SIDE VIEW
A-5



Figure A-9. PRE-TEST DRIVER FRONT THREE-QUARTER VIEW

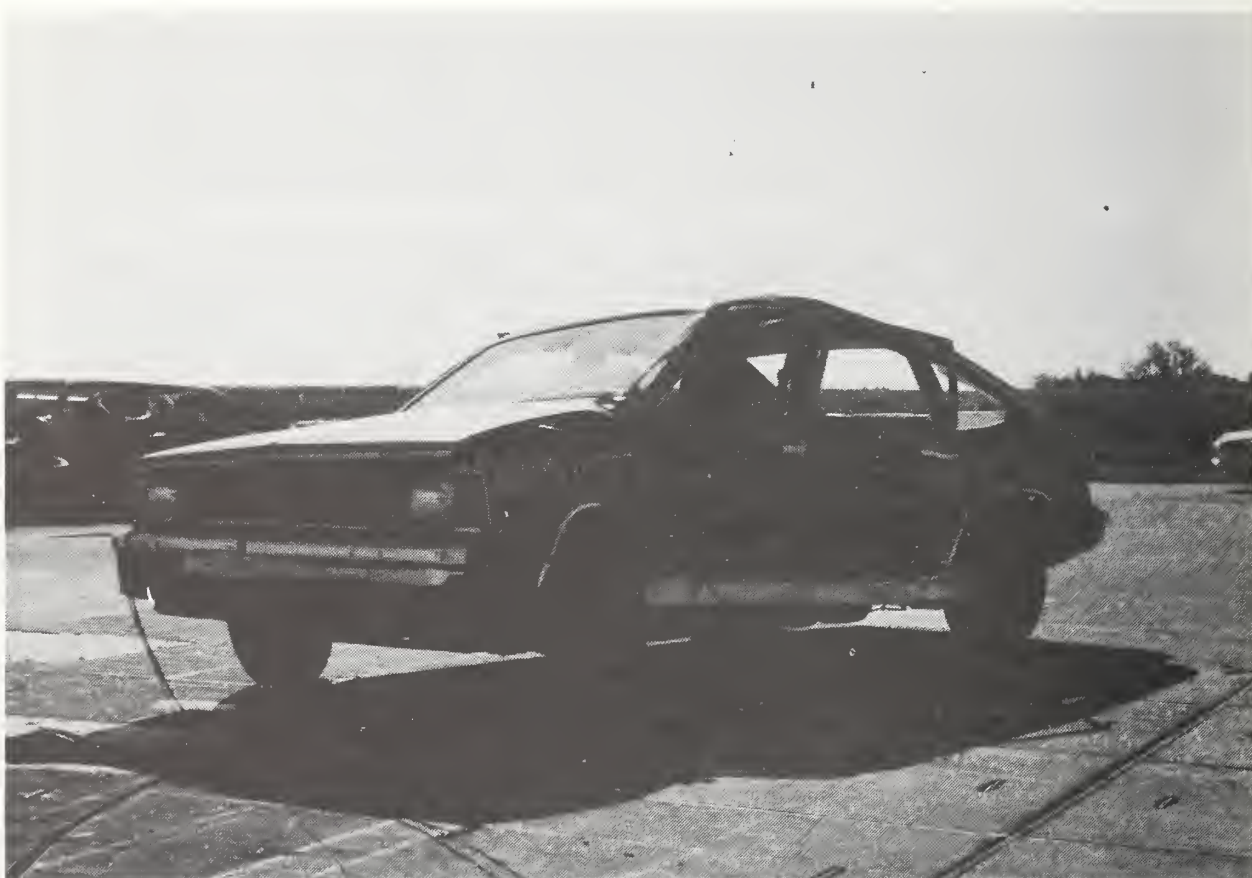


Figure A-10. POST-TEST DRIVER FRONT THREE-QUARTER VIEW



Figure A-11. PRE-TEST DRIVER REAR THREE-QUARTER VIEW



Figure A-12. POST-TEST DRIVER REAR THREE-QUARTER VIEW
A-7

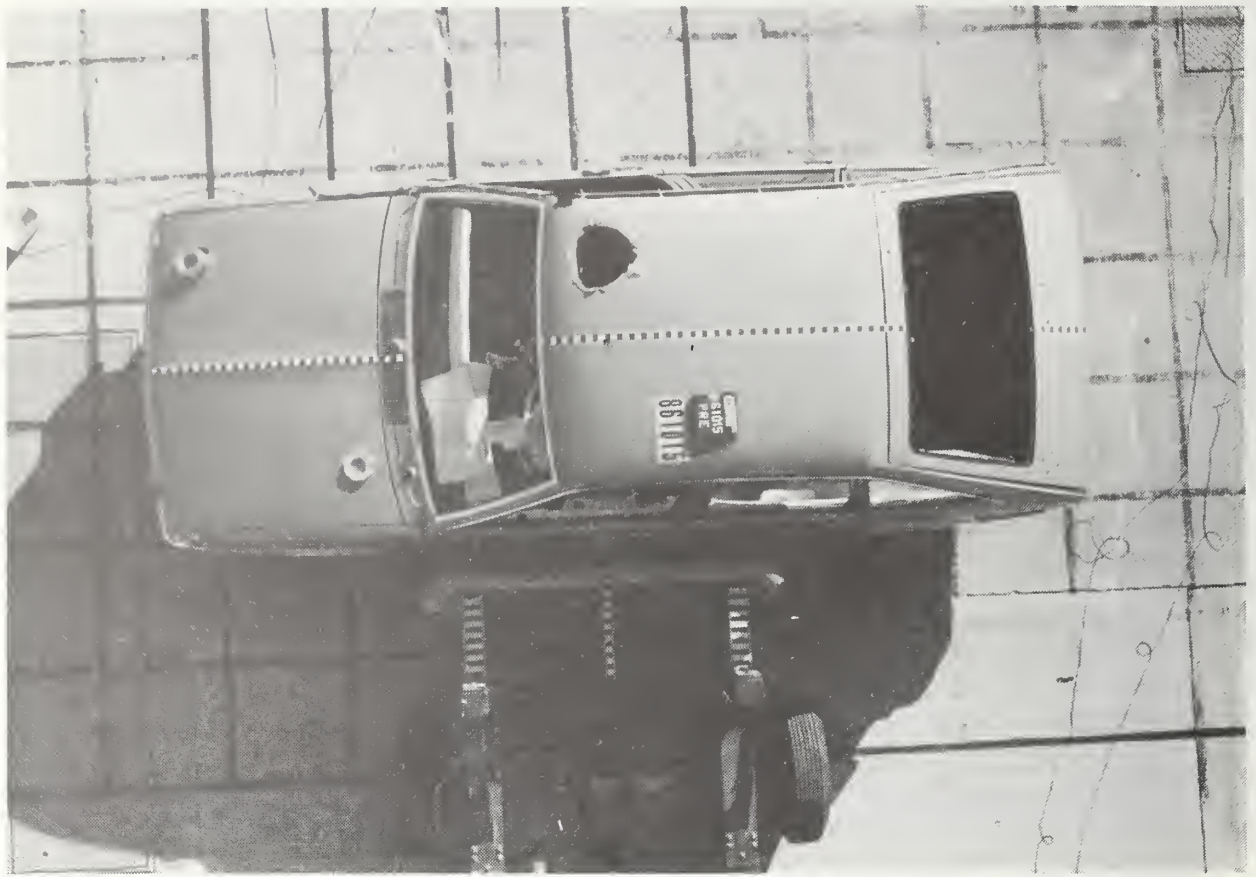


Figure A-13. PRE-TEST OVERHEAD VIEW

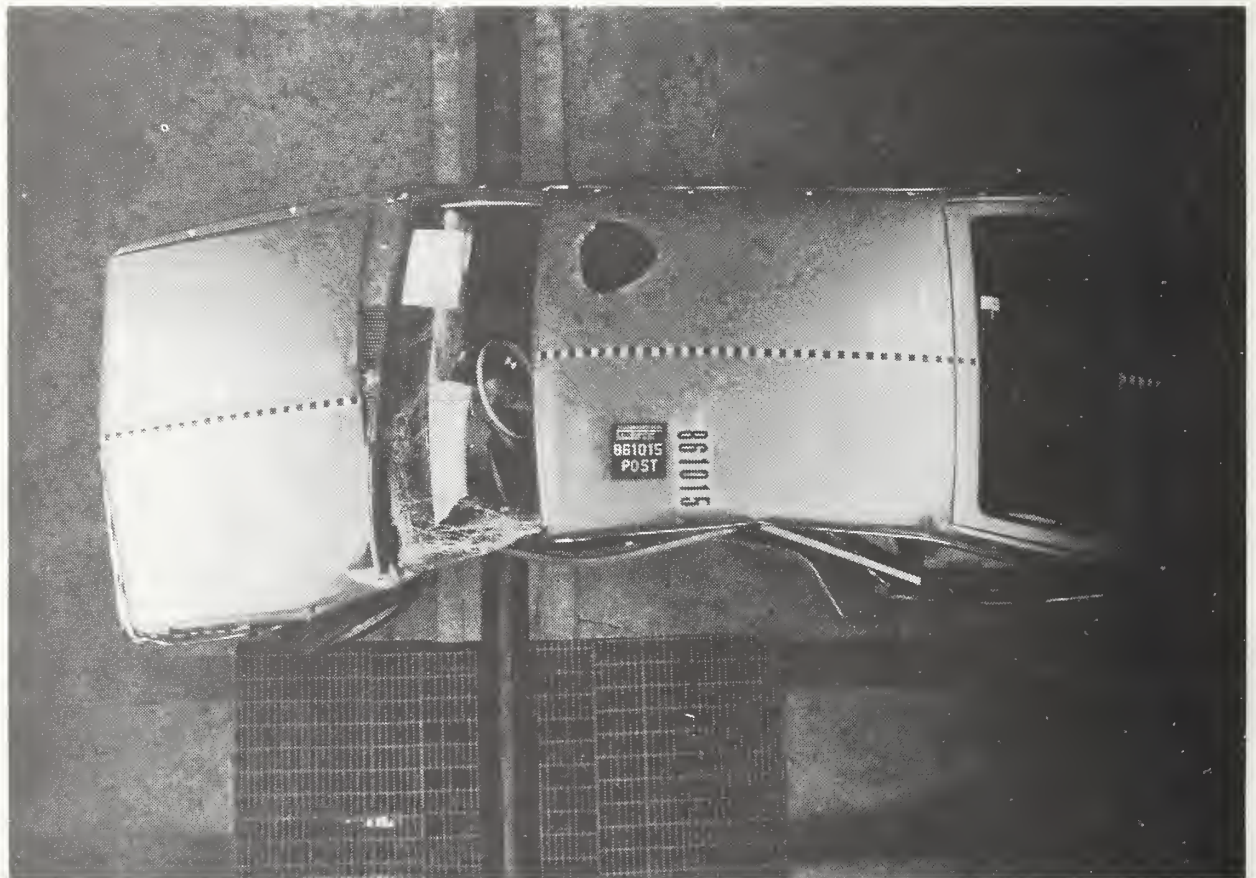


Figure A-14. POST-TEST OVERHEAD VIEW
A-8

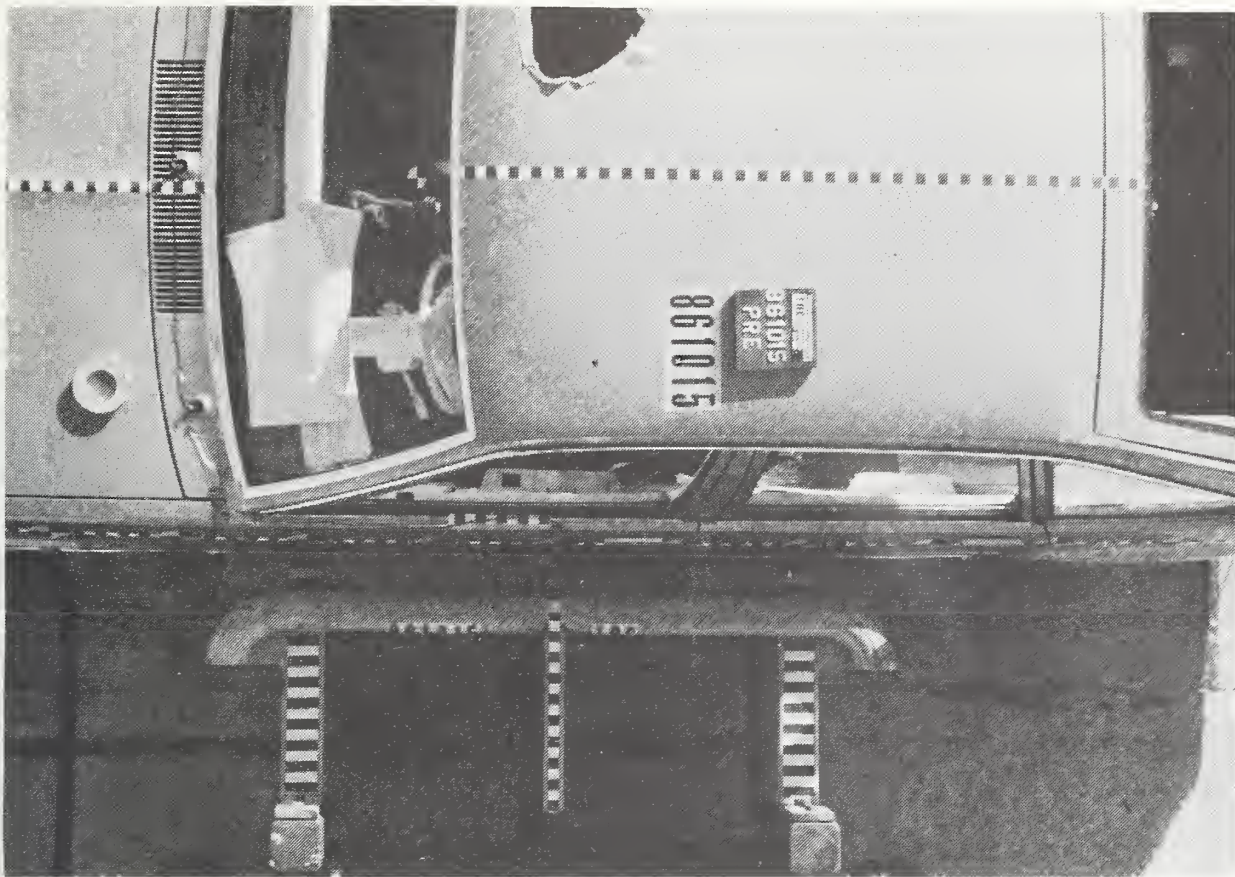


Figure A-15. PRE-TEST OVERHEAD CLOSEUP VIEW

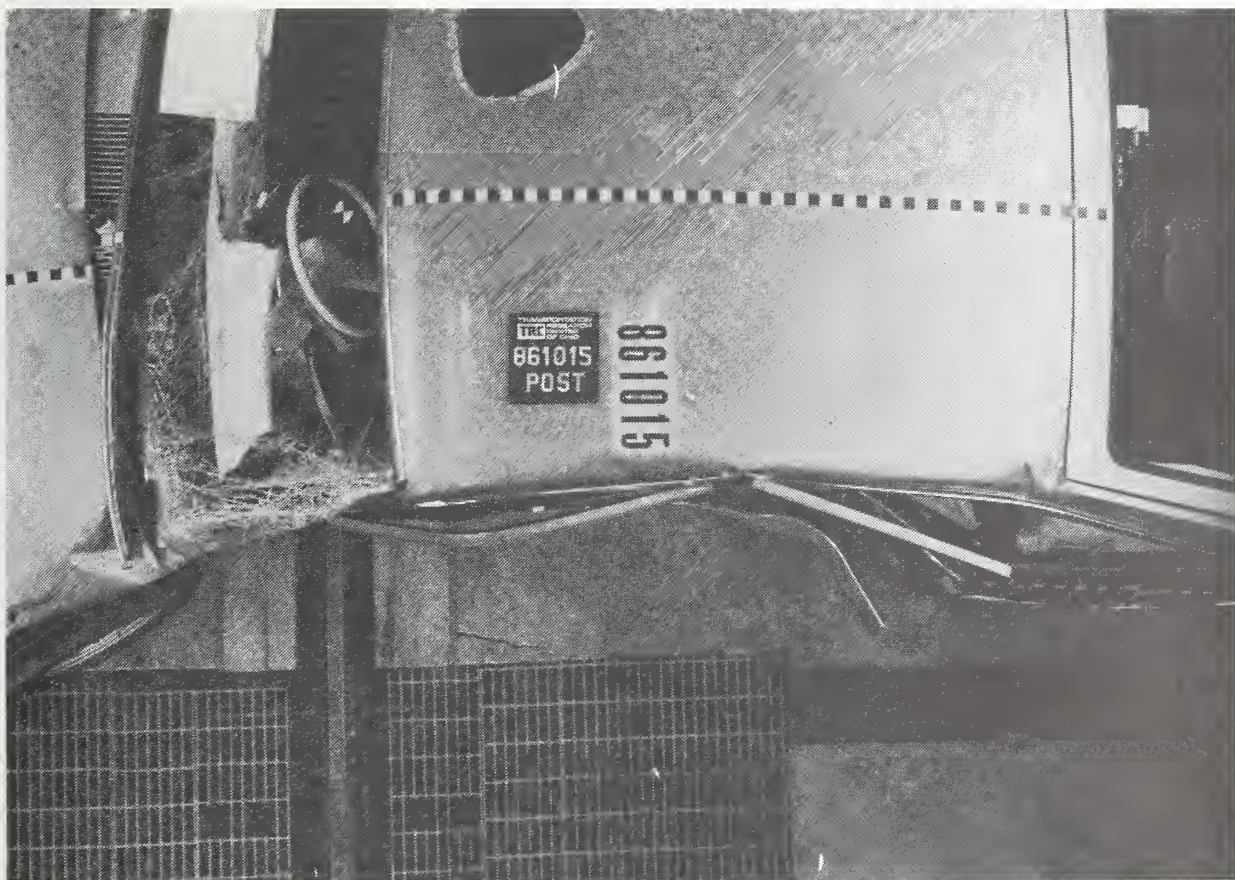


Figure A-16. POST-TEST OVERHEAD CLOSEUP VIEW
A-9

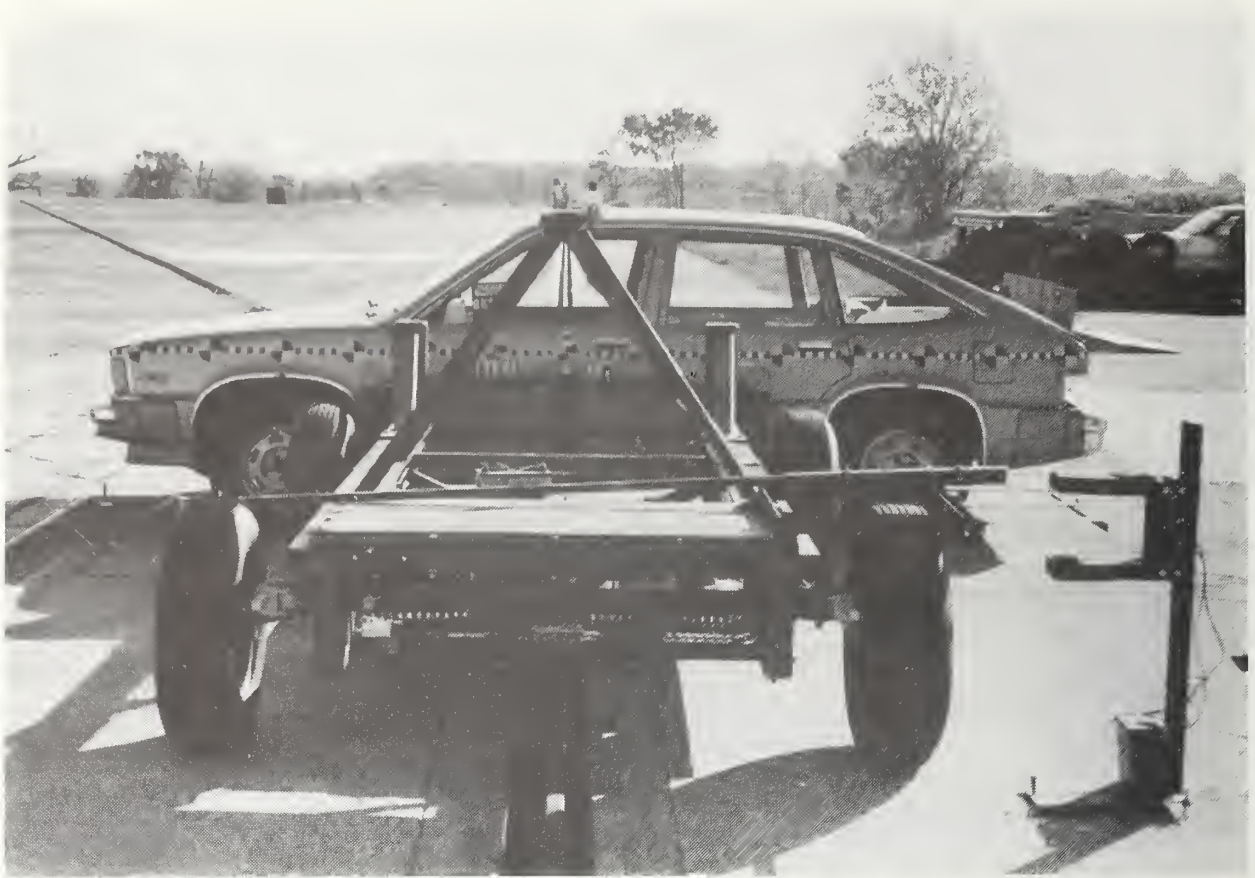


Figure A-17. PRE-TEST BARRIER AND VEHICLE VIEW

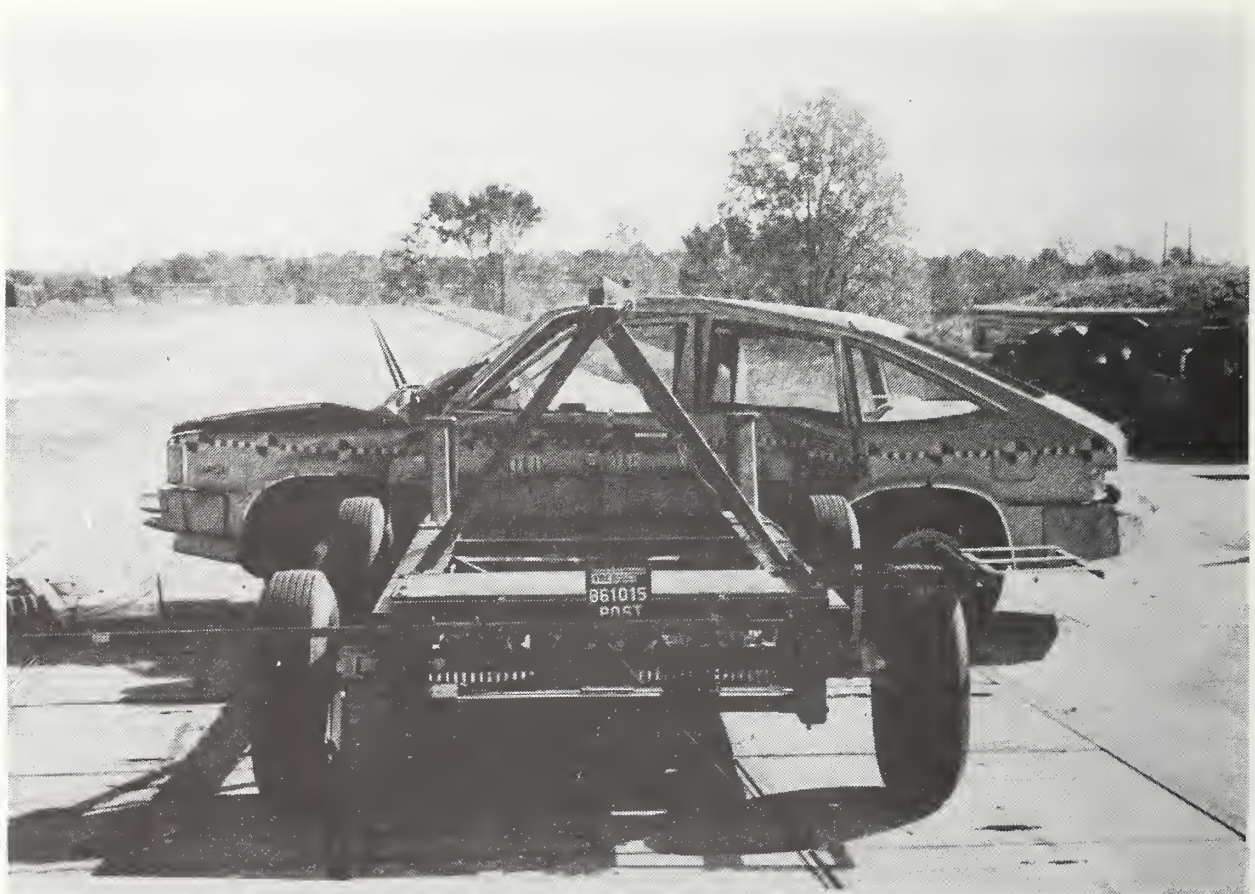


Figure A-18. POST-TEST BARRIER AND VEHICLE VIEW
A-10

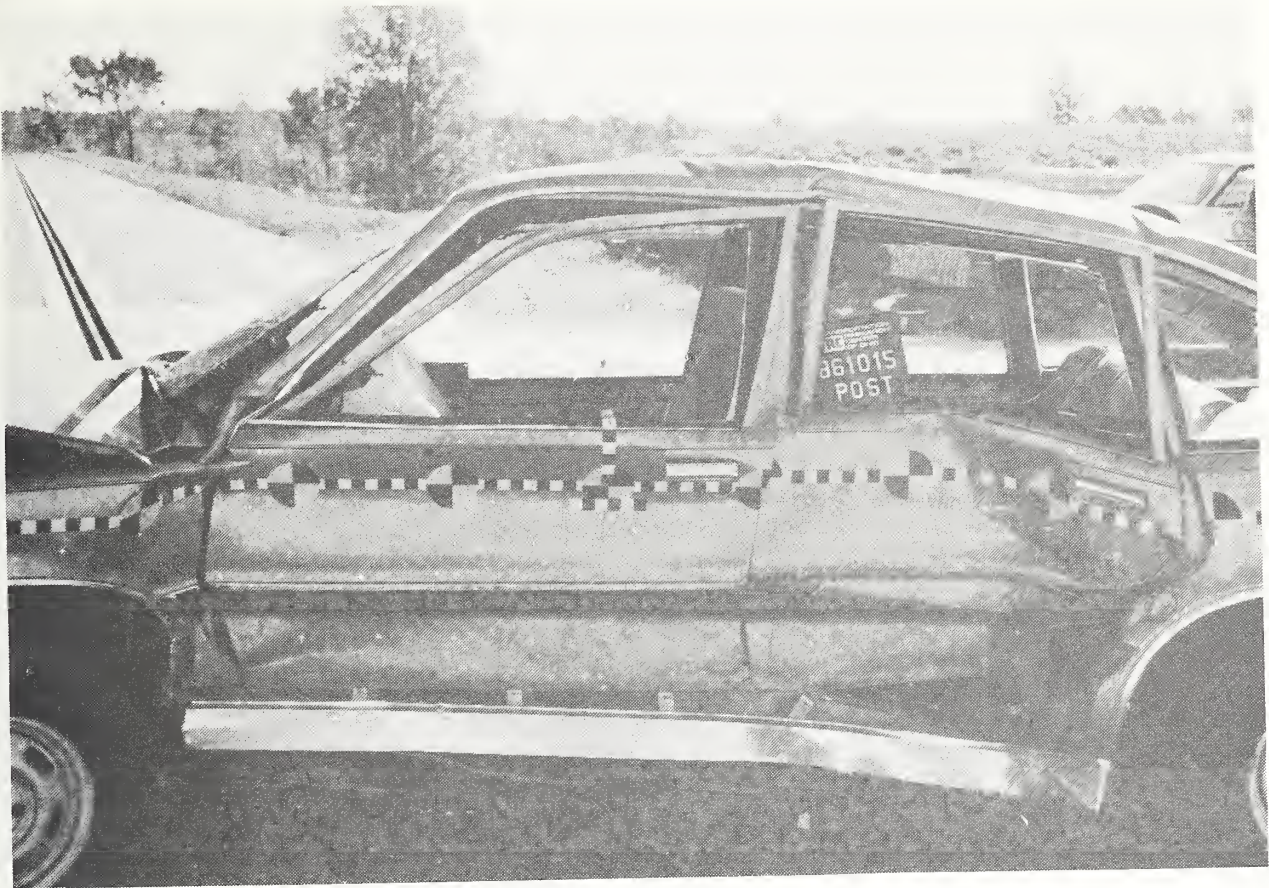


Figure A-19. POST-TEST DRIVER SIDE CLOSEUP VIEW

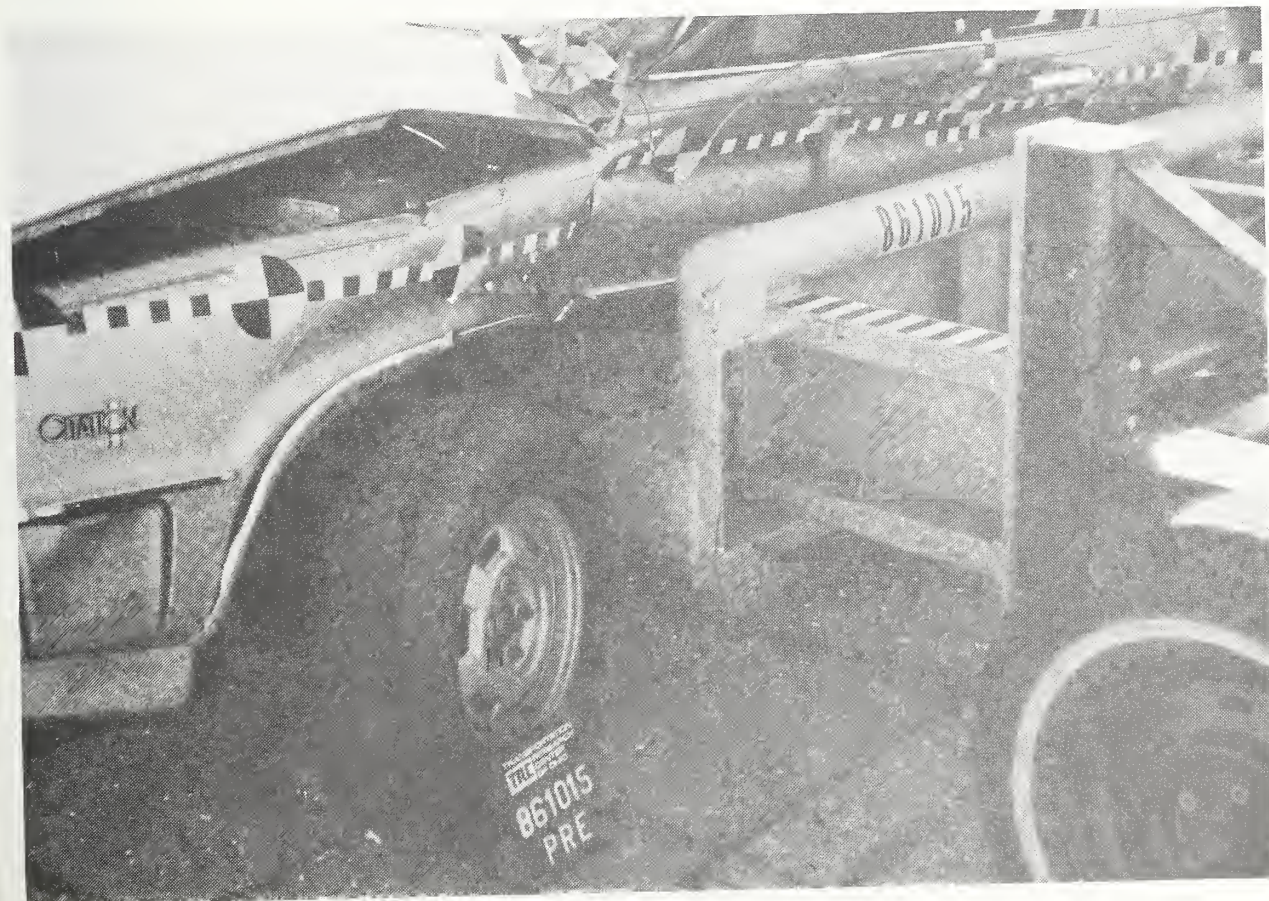


Figure A-20. POST-TEST FRONT DRIVER DOOR VIEW
A-11

APPENDIX B

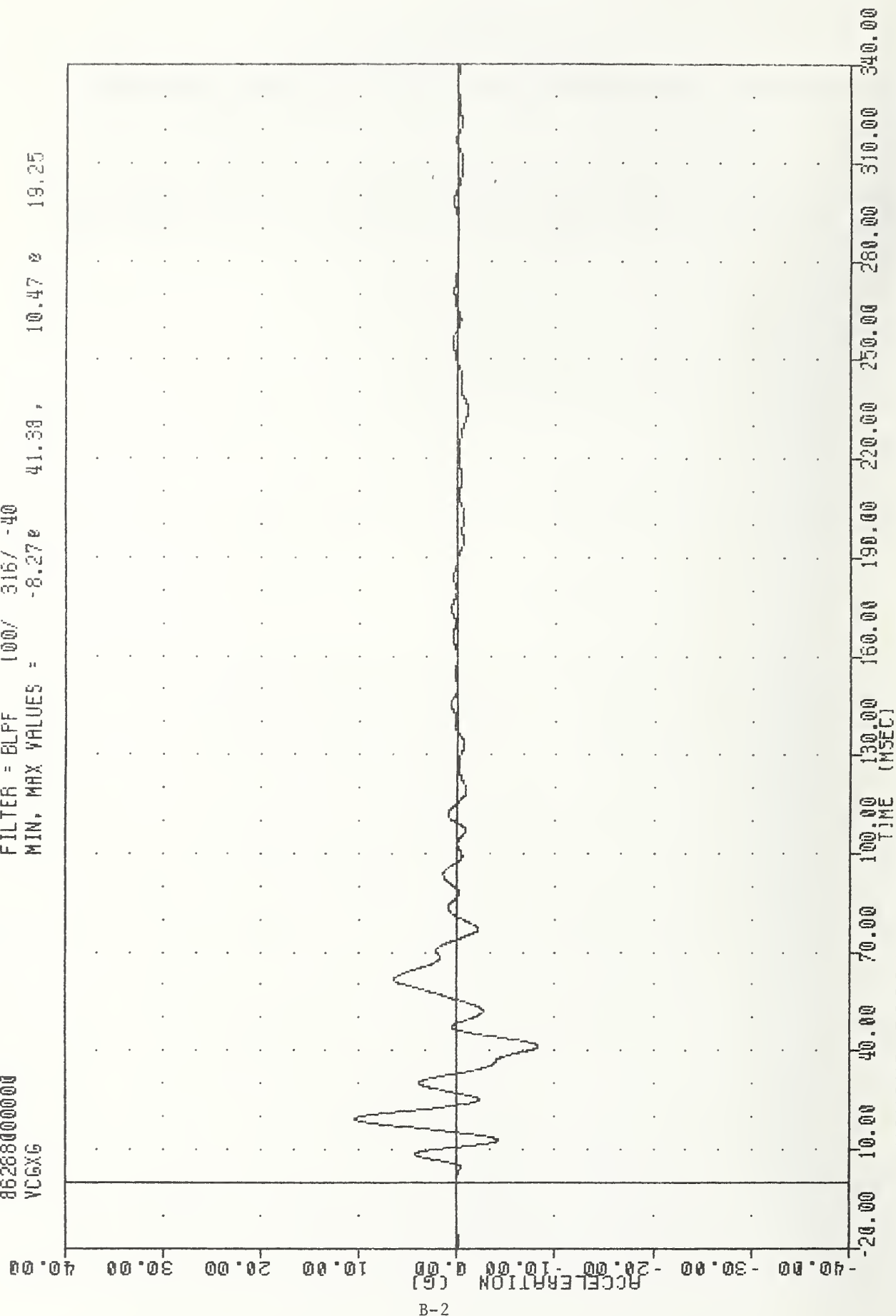
DATA PLOT PRESENTATION

VEHICLE WAS IMPACTED PERPENDICULAR ON THE LEFT SIDE AT A HIGH SPEED.

Data plots generated from the crash test data are presented on the following pages. All data are recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data were filtered according to SAE J211.

VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86268000000
 VCGXG

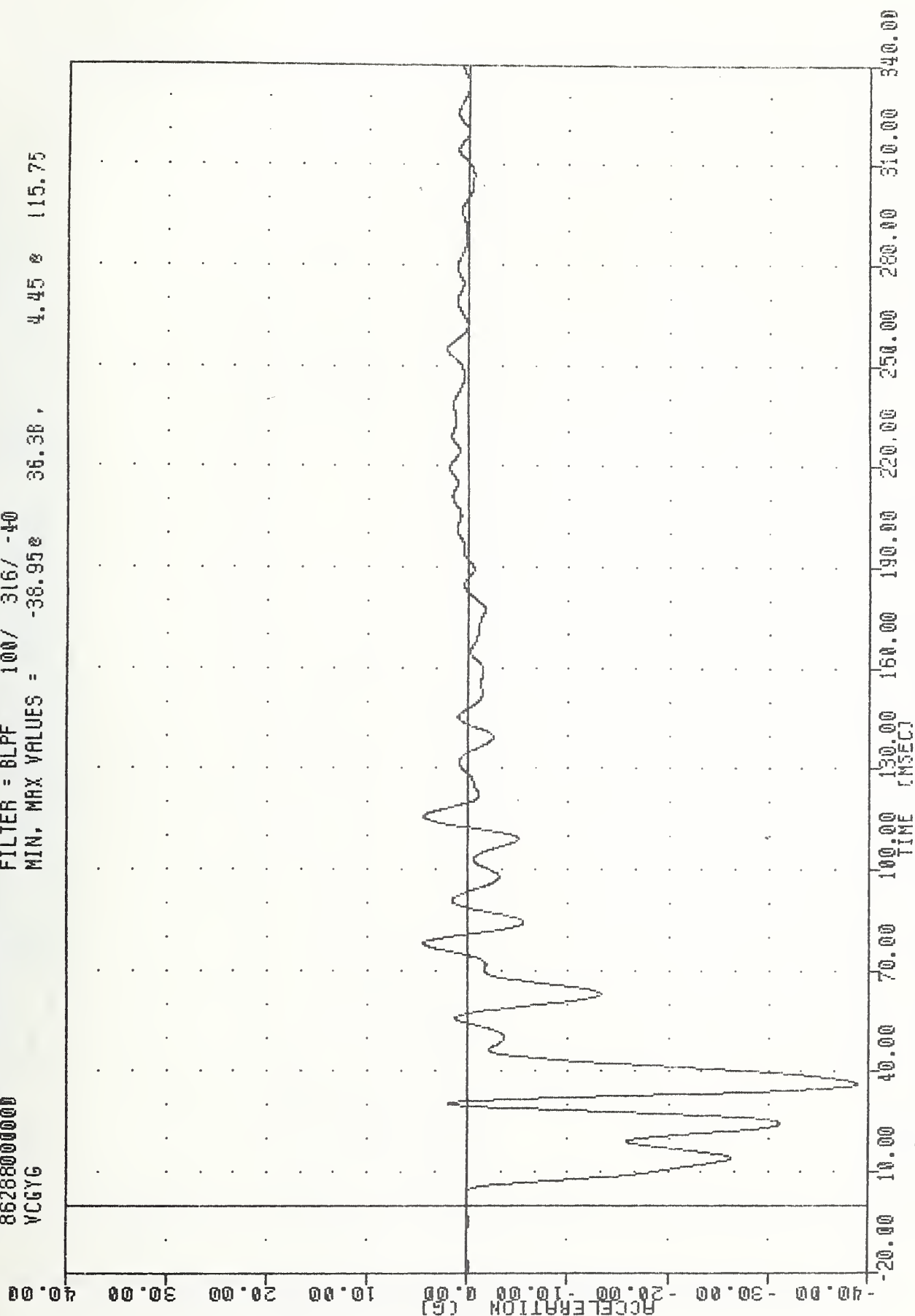
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 MIN, MAX VALUES = -8.27e 41.38 , 10.47 e 19.25



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 VEHICLE CENTER OF GRAVITY ACCELERATION X AXIS

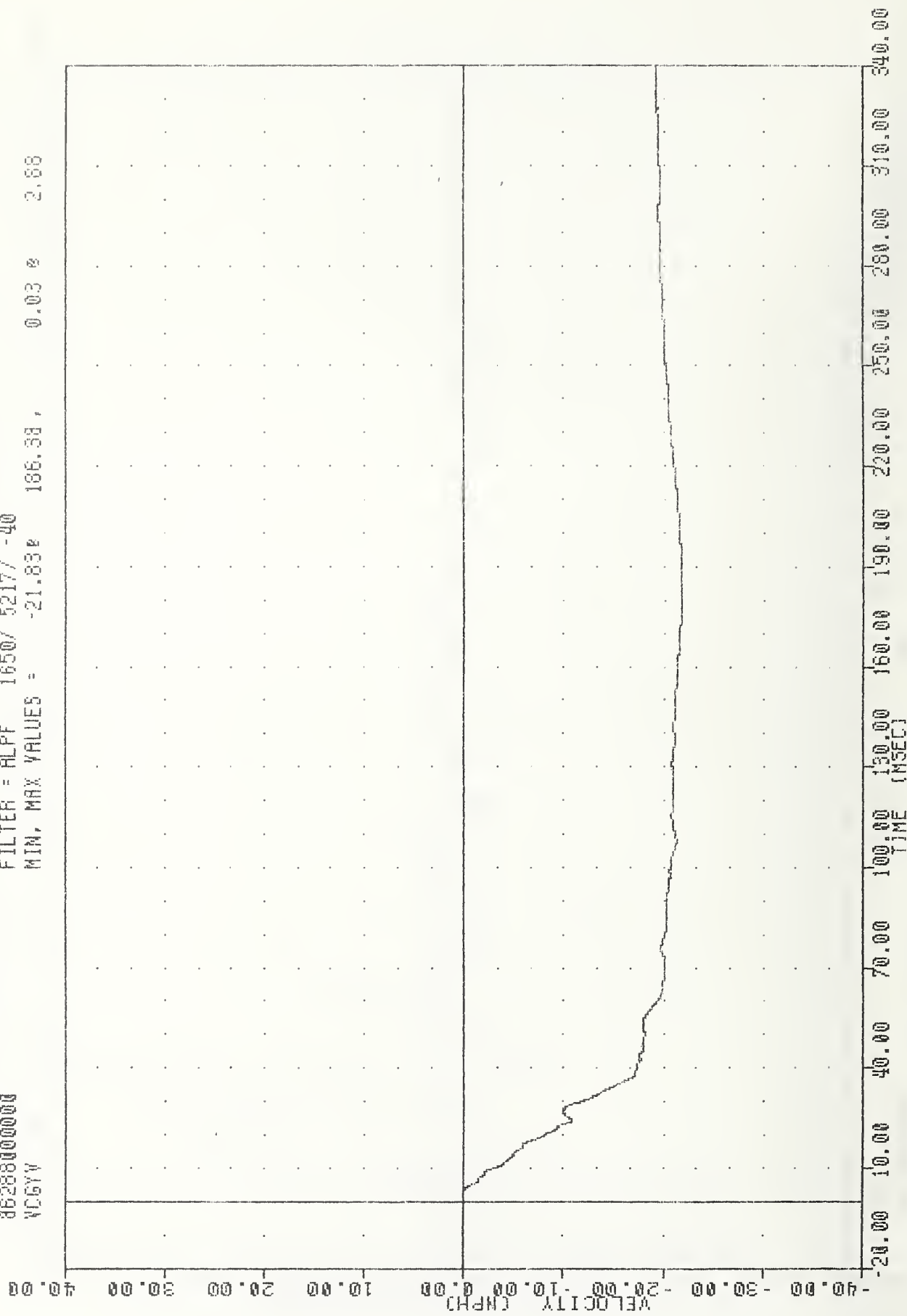
VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 862880000000
 VCCYG

FILTER = 8LPF 100/ 316/ -40
 MIN. MAX VALUES = -38.95 36.38 , 4.45 115.75



VRT
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 VCGYV

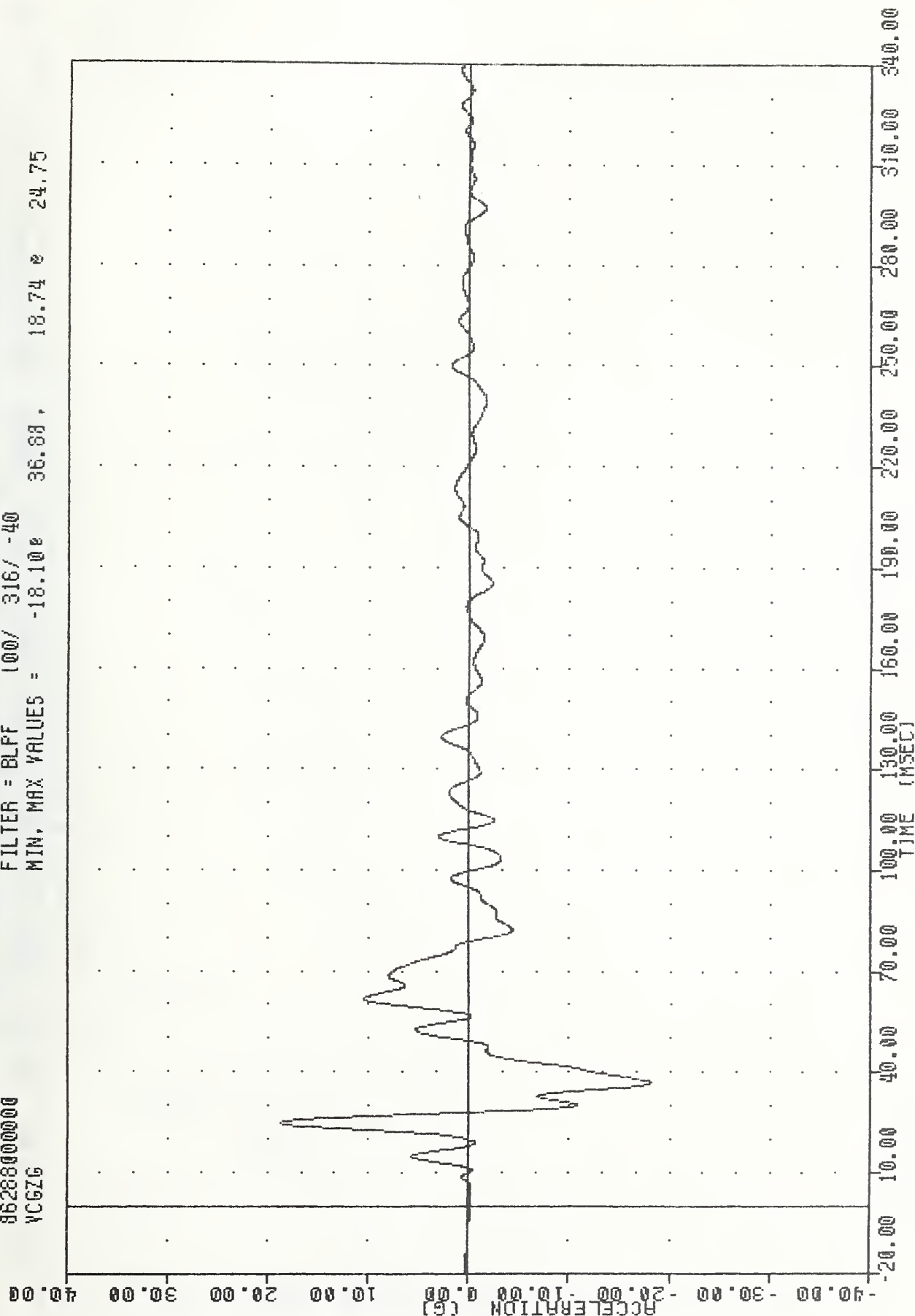
FILTER = ALPF 1650/ 5217/ -40
 MIN, MAX VALUES = -21.83 186.38, 0.03 2.68



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 DELTA V USING VCGYG

VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 YC6Z6

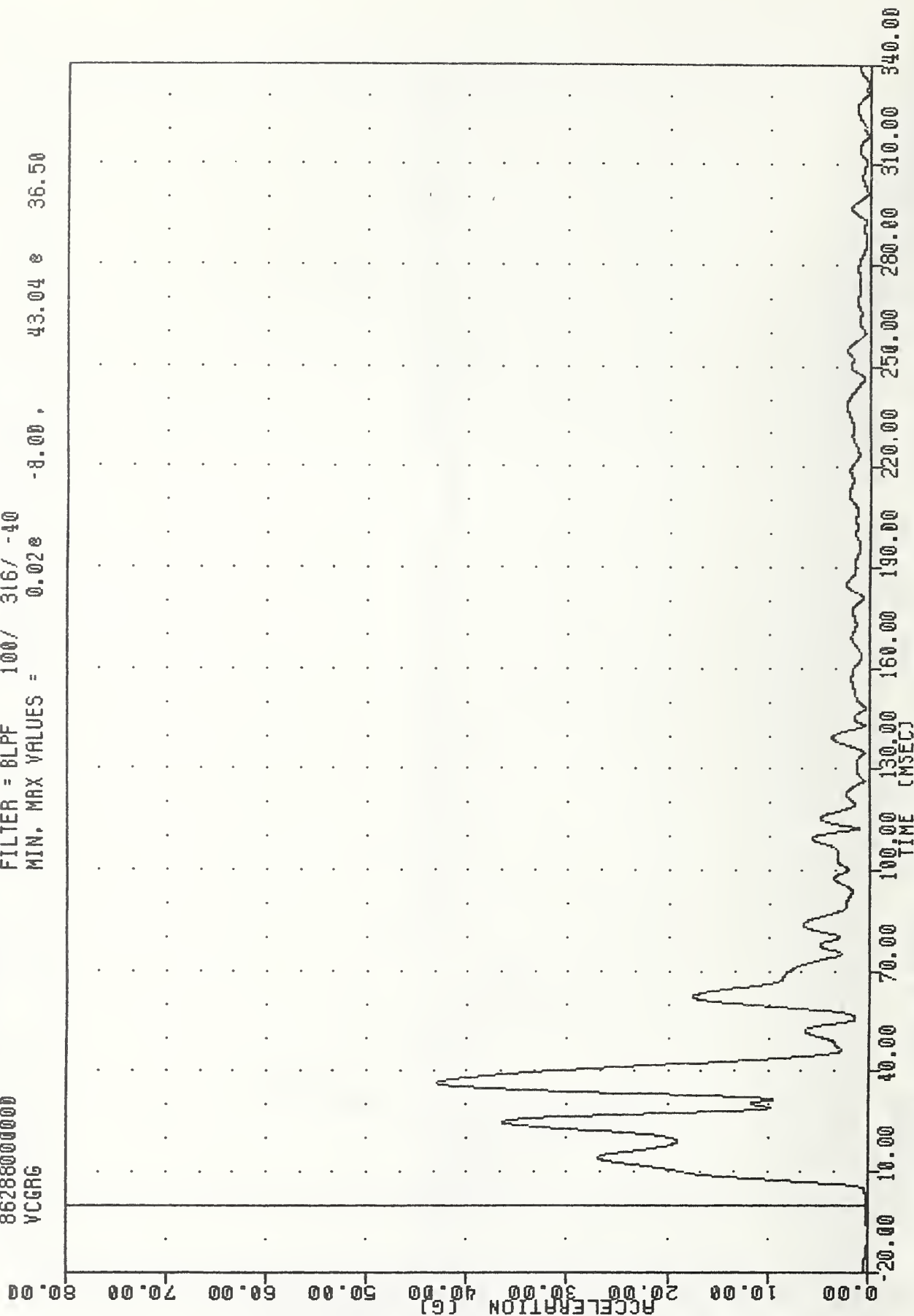
FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -18.10e 36.83, 18.74 e 24.75



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 VEHICLE CENTER OF GRAVITY ACCELERATION Z AXIS

VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 VCCRG

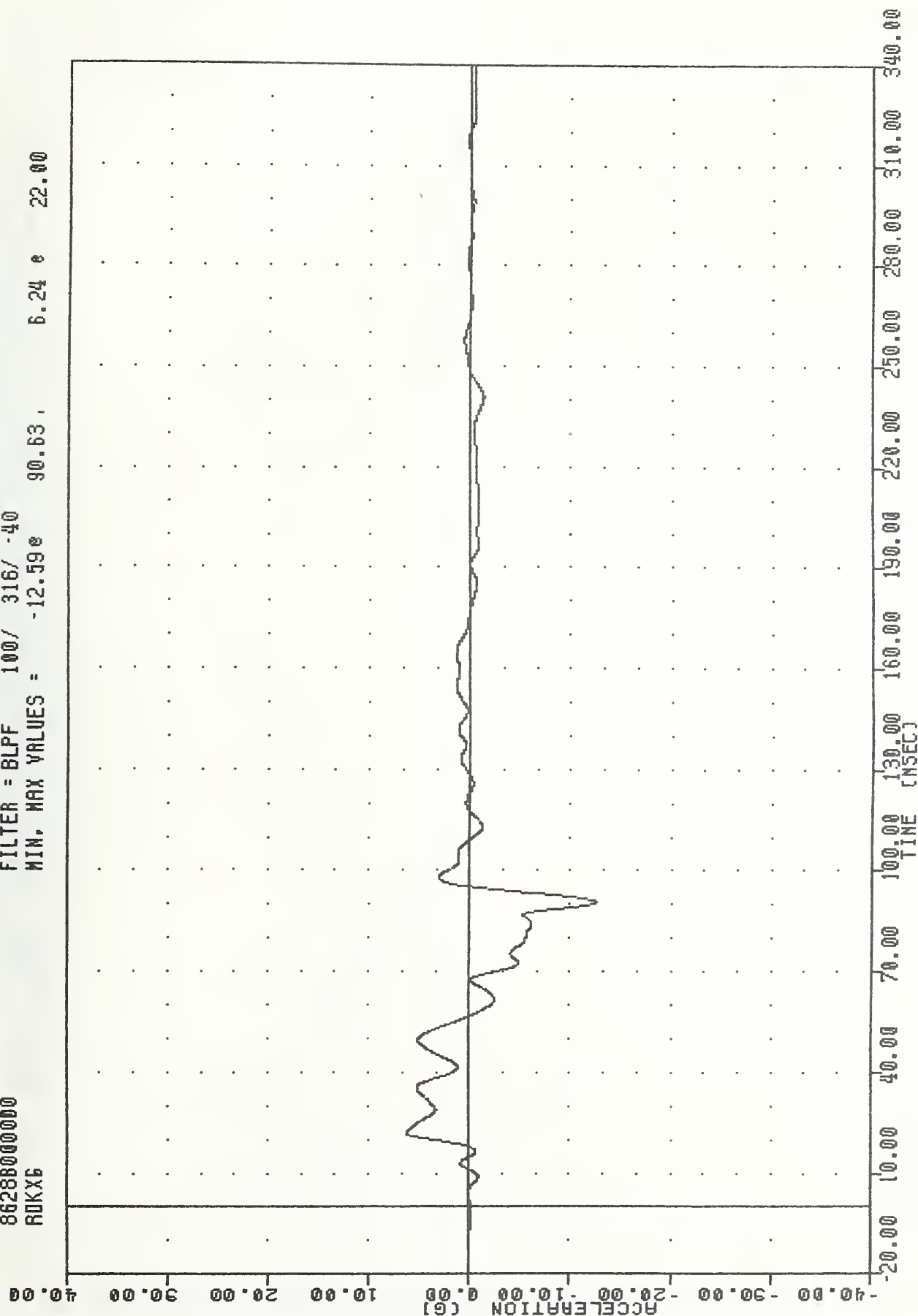
FILTER = 8LPF 100/ 316/ -40
 MIN. MAX VALUES = 0.02e -8.00 , 43.04 e 36.50



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 VEHICLE CENTER OF GRAVITY ACCELERATION RESULTANT

VAT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 ROKX6

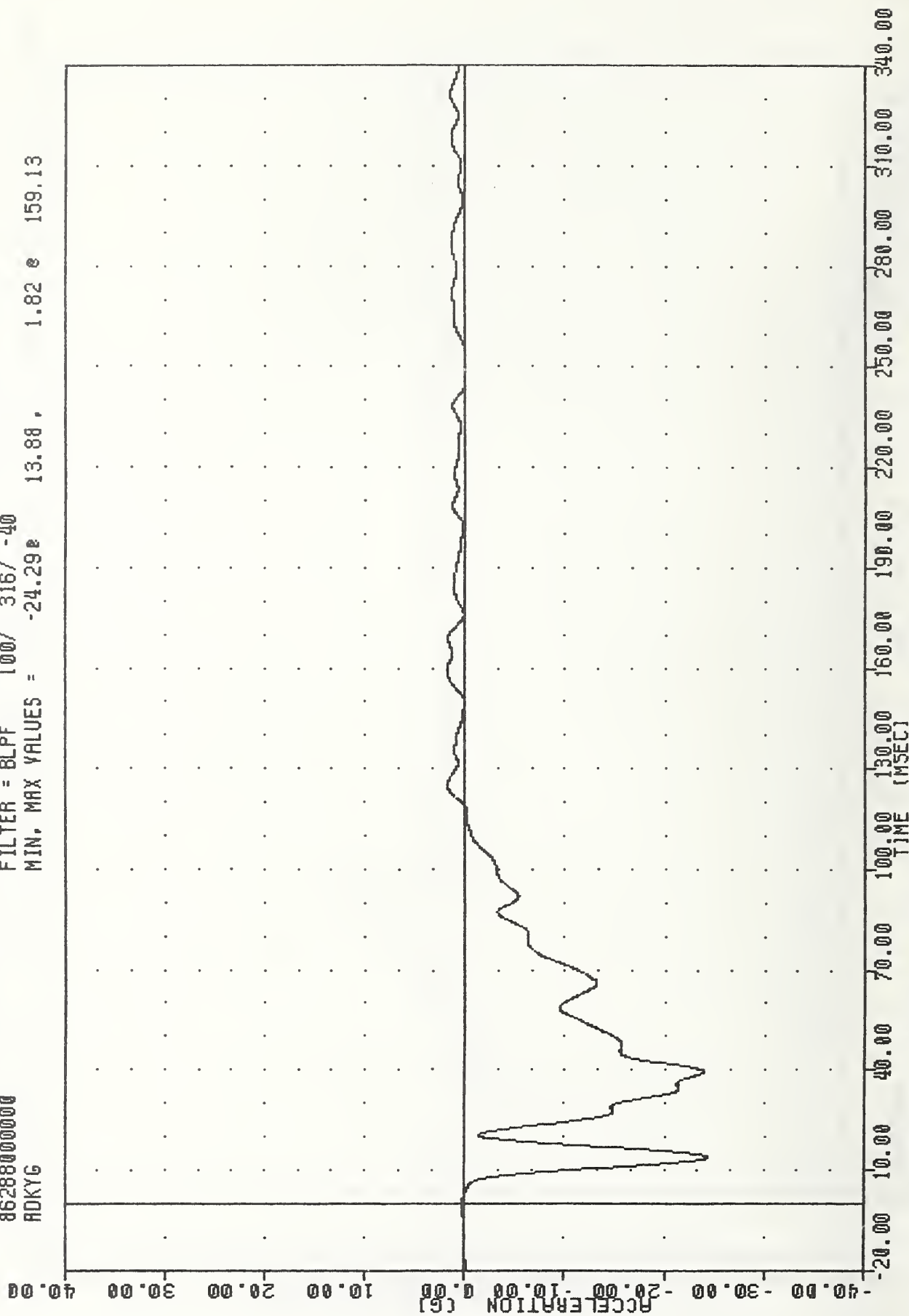
FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -12.59e 90.63, 6.24 e 22.00



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 VEHICLE REAR DECK ACCELERATION X AXIS

VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 ADKYG

FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -24.29 13.88 , 1.82 159.13



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 VEHICLE REAR DECK ACCELERATION Y AXIS

VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 RDKYV

FILTER = ALPF 1650/ 5217/ -40
 MIN, MAX VALUES = -23.658 115.00, 0.03 8 -0.25

40.00

30.00

20.00

10.00

0.00

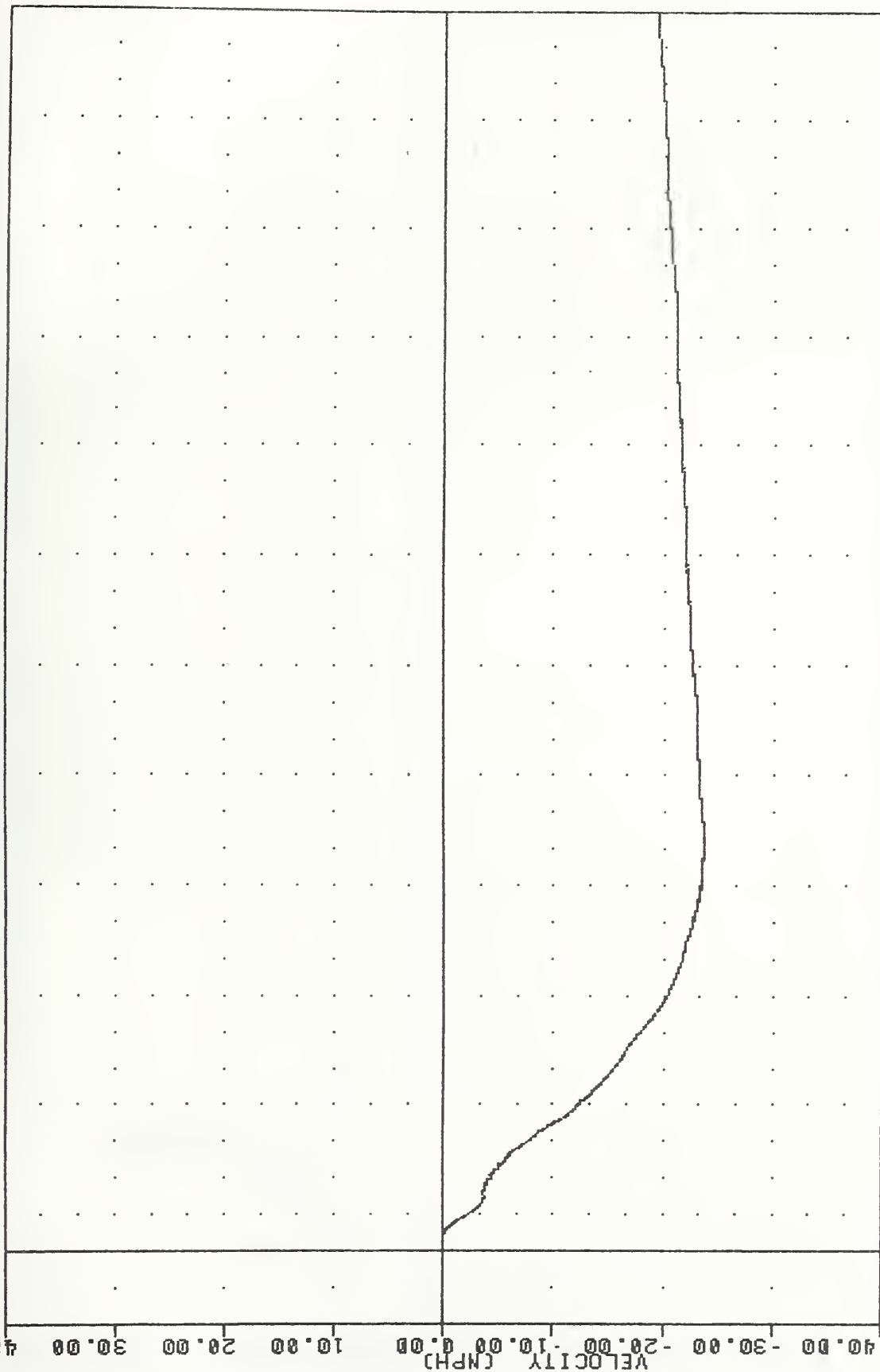
-10.00

-20.00

-30.00

-40.00

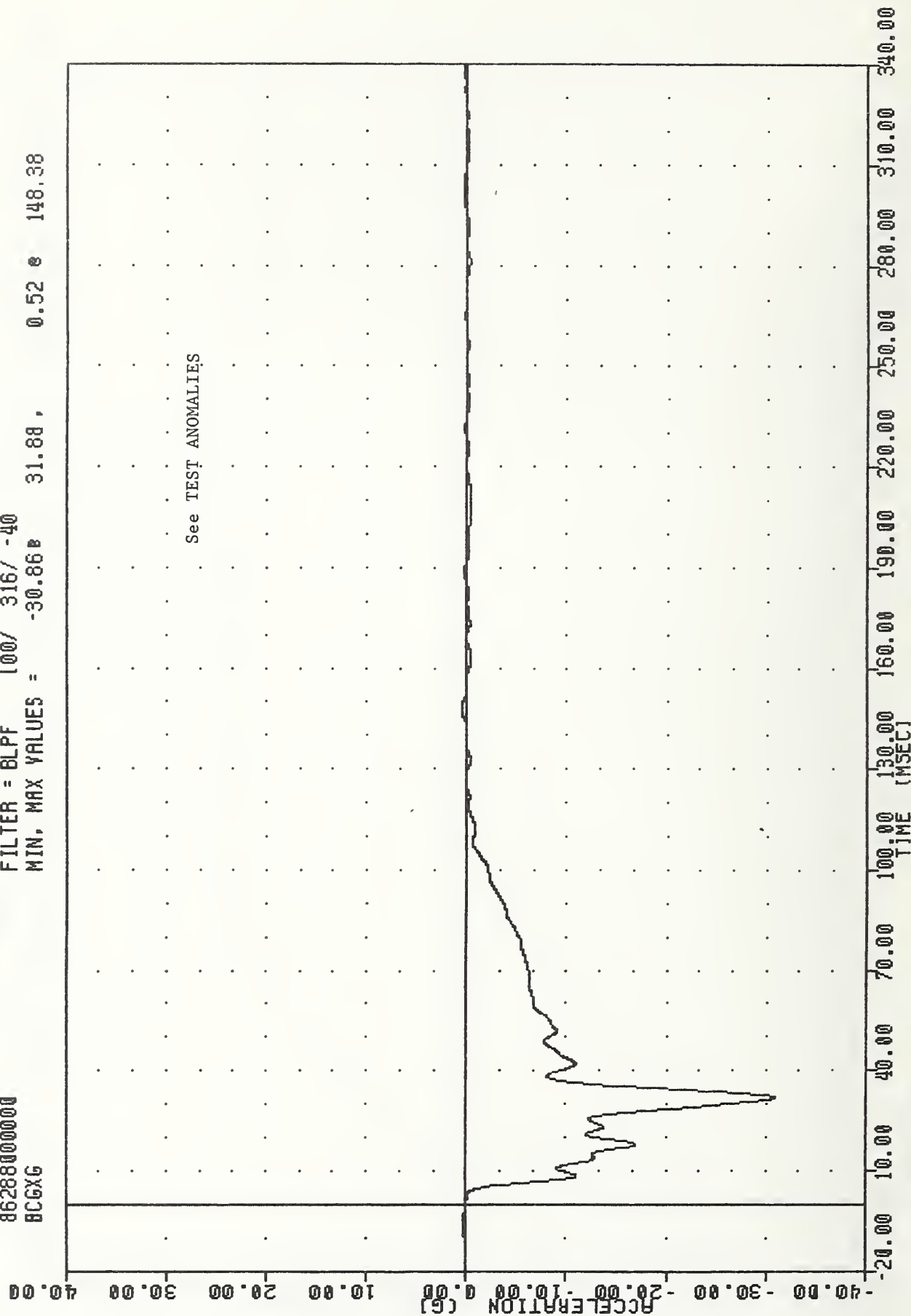
B-9



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 DELTA V USING RDKY6

VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 BCGXG

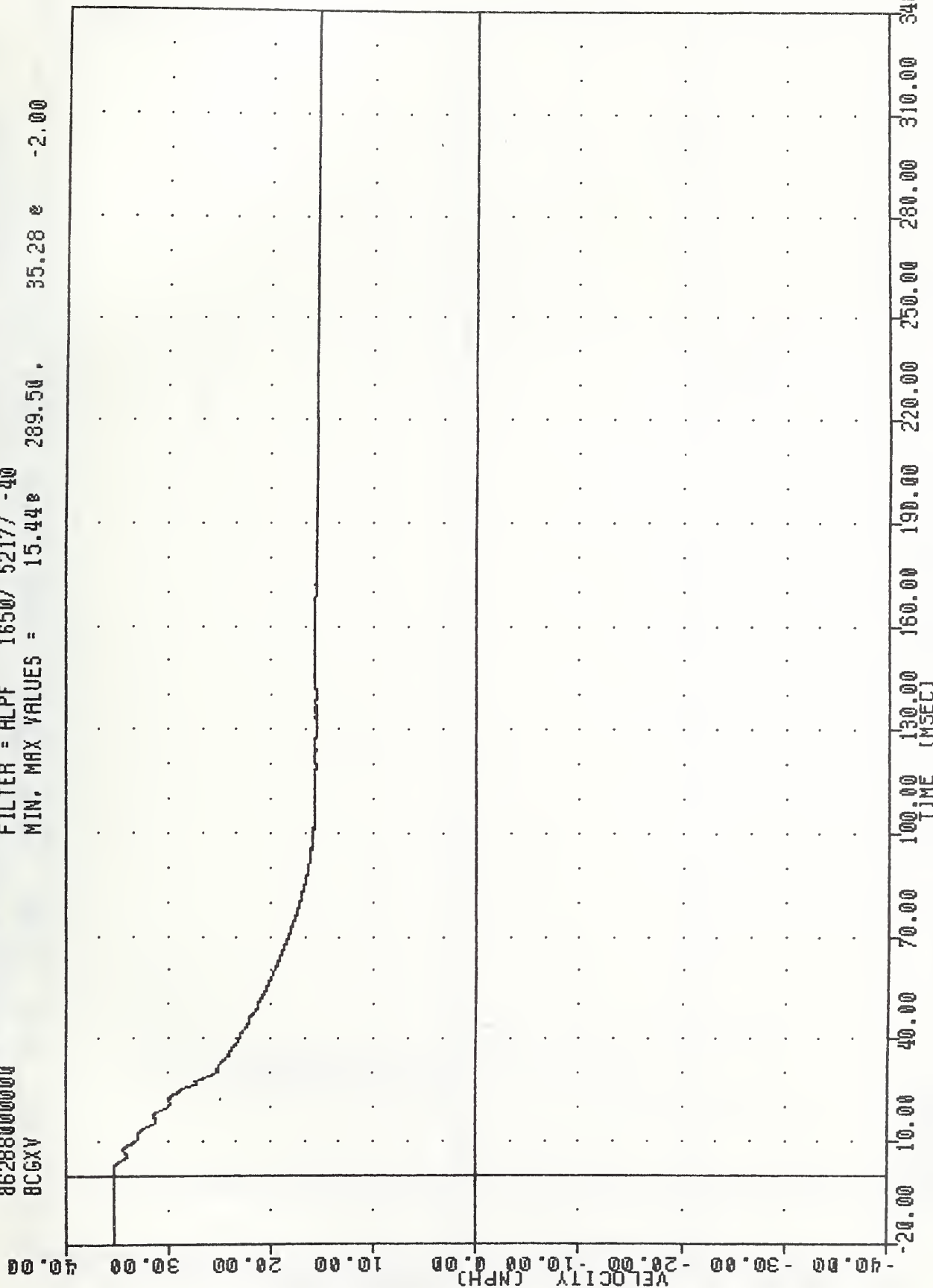
FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -30.86 31.88 , 0.52 148.38



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 MOVING BARRIER CENTER OF GRAVITY ACCELERATION X AXIS

VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 BCGXV

FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = 15.44e 289.50 , 35.28 e -2.00

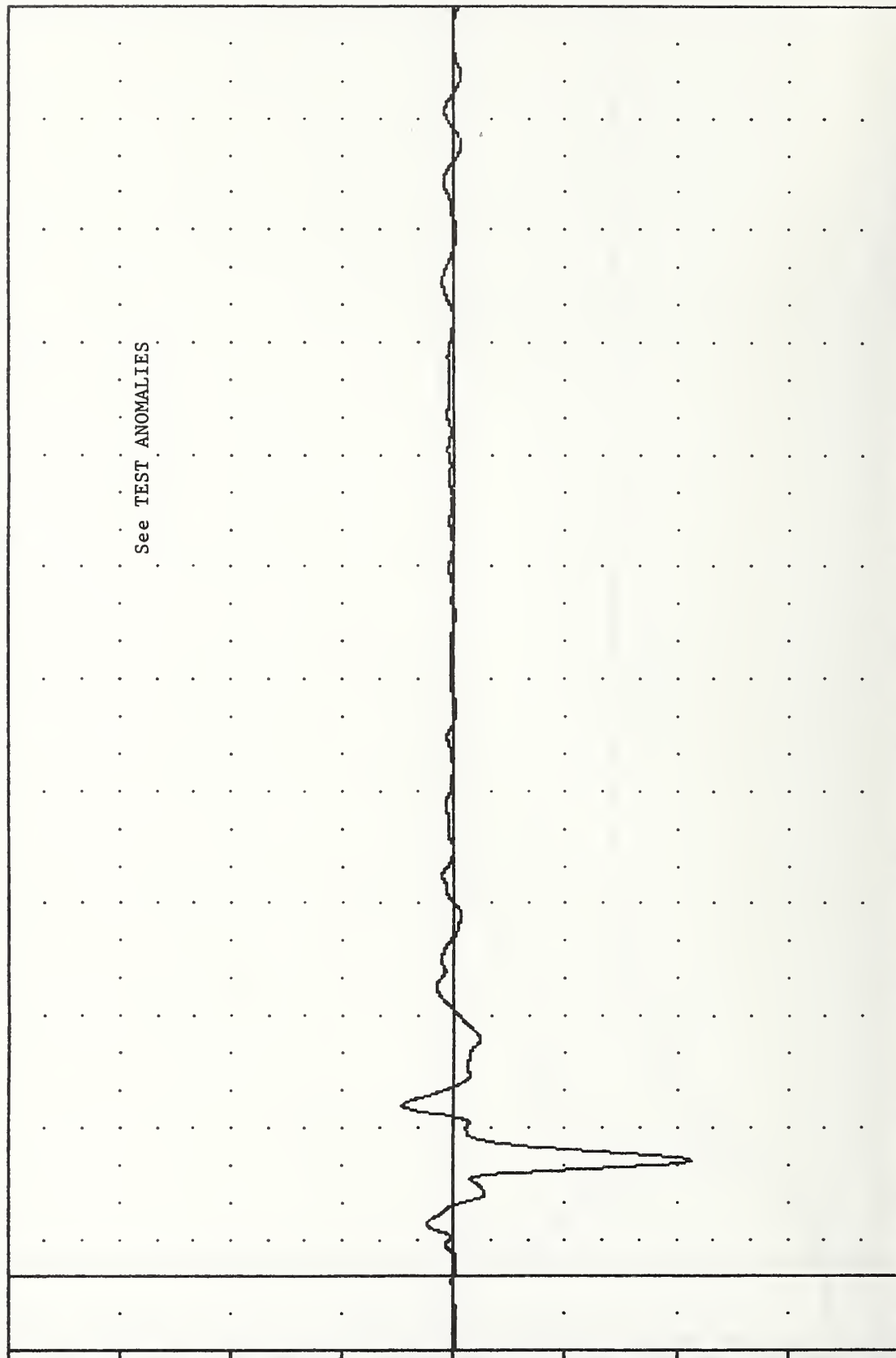


MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 DELTA V USING BCGXG

VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 862880000000
 BCGY6

FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -21.28e 31.13, 4.62 e 46.00

ACCELERATION (G)

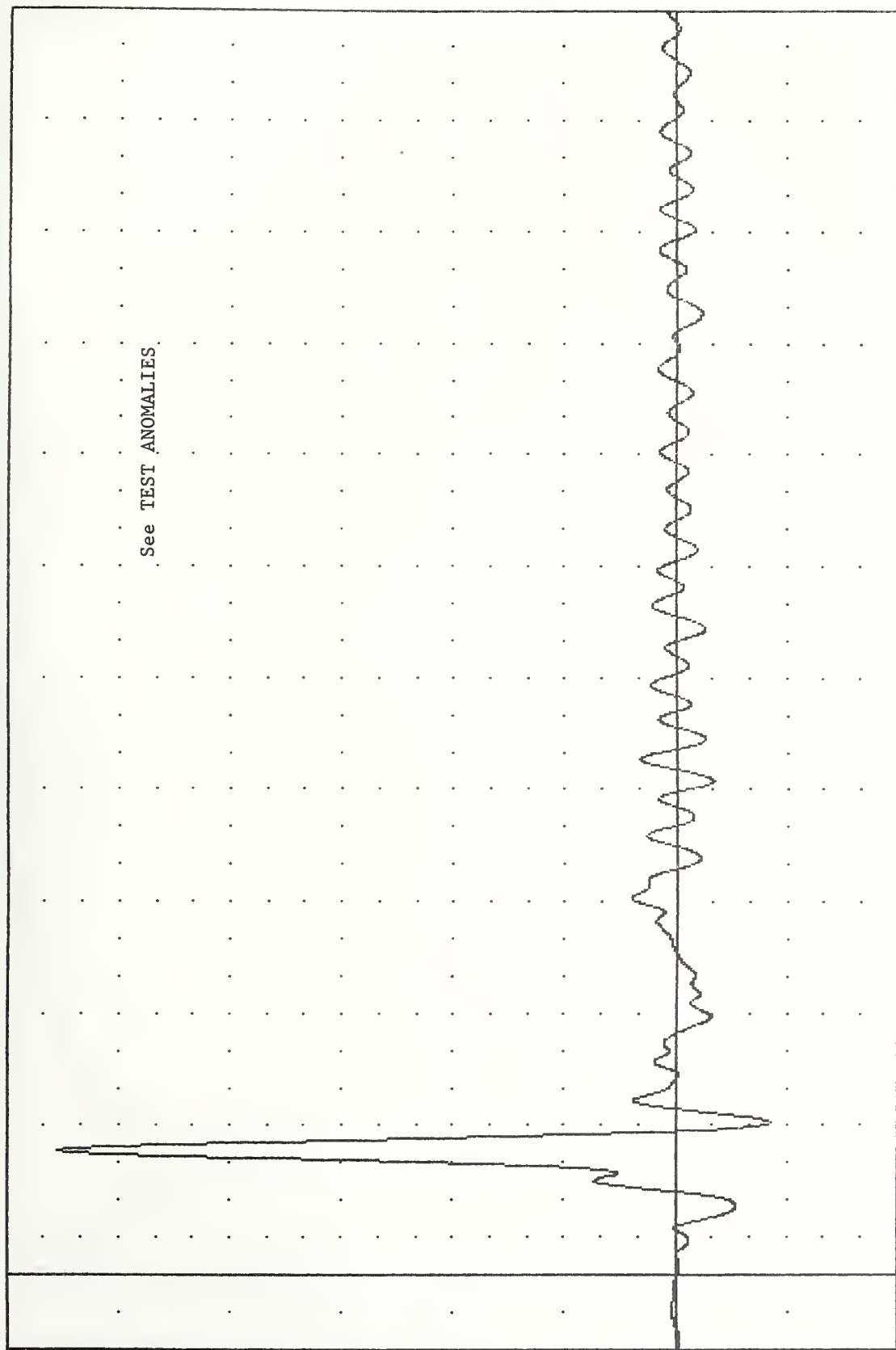


MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 MOVING BARRIER CENTER OF GRAVITY ACCELERATION Y AXIS

VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 BCGZG

FILTER = 6LPF 100/ 316/ -40
 MIN. MAX VALUES = -8.51e 40.75 , 55.44 e 33.38

ACCELERATION (G)

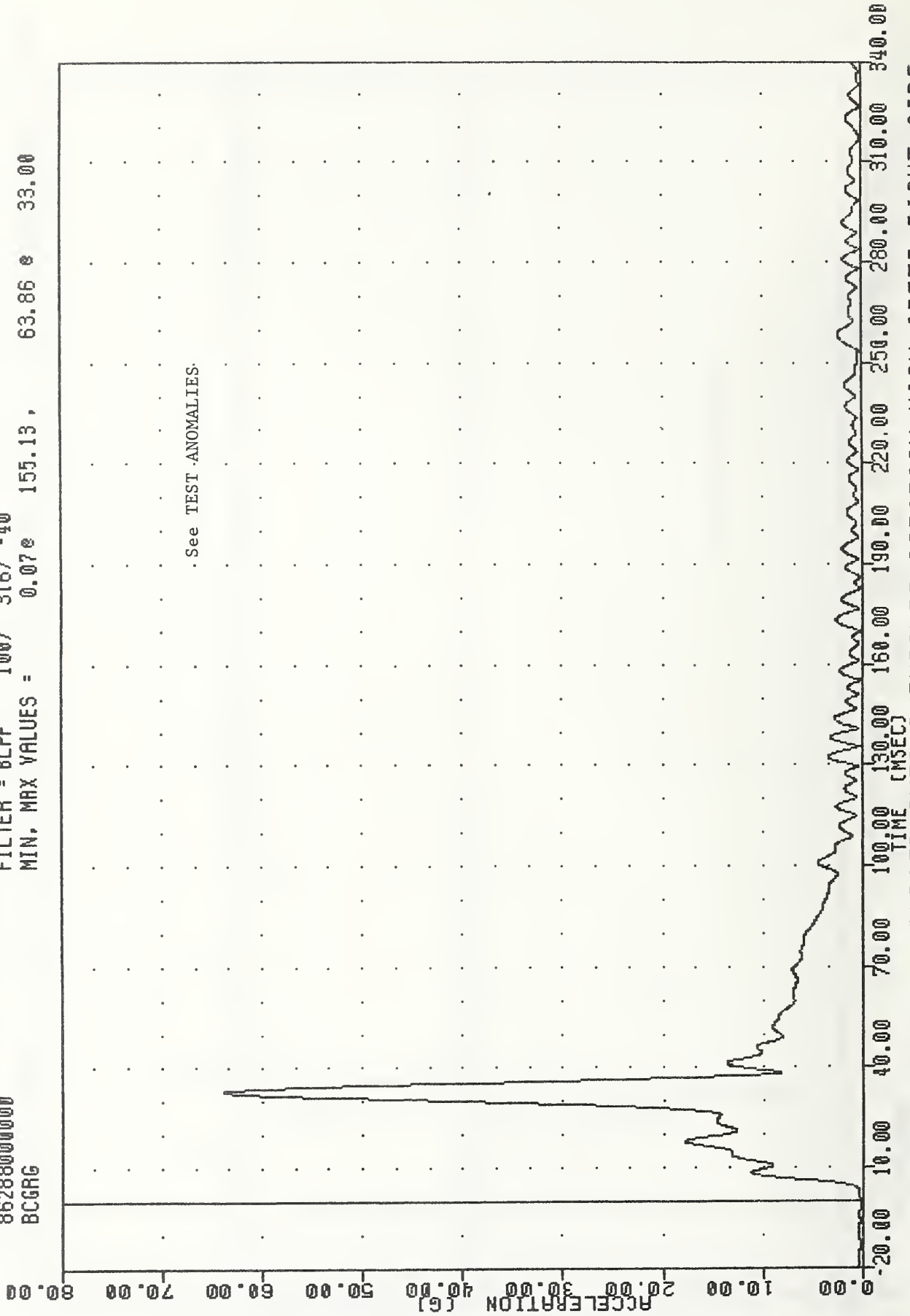


TIME (MSEC)

MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 MOVING BARRIER CENTER OF GRAVITY ACCELERATION Z AXIS

VRT , 861015
CRASH 3 MODEL IMPROVEMENTS
86288000000
BCGRG

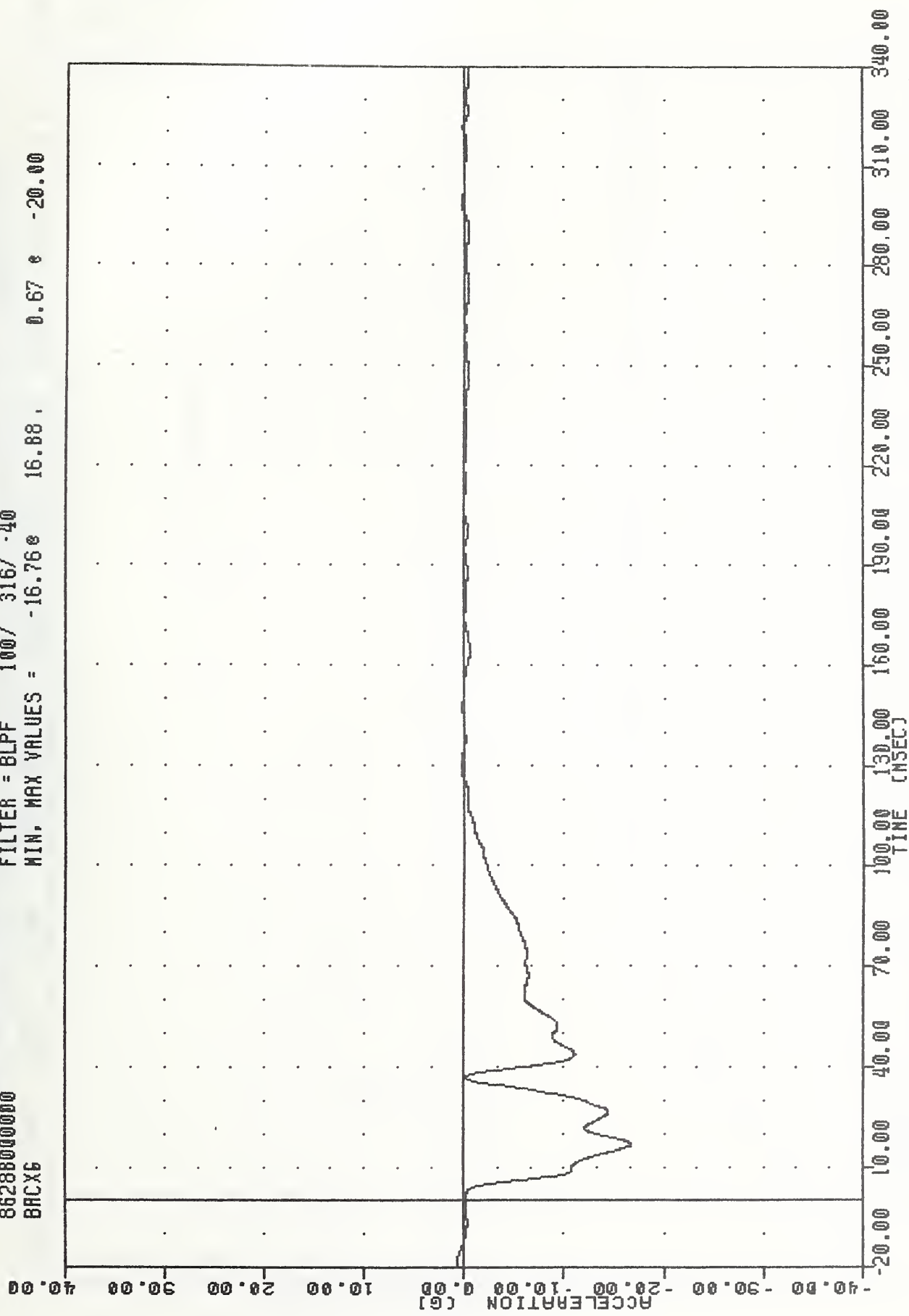
FILTER = 8LPF 100/ 316/ -40
MIN, MAX VALUES = 0.07e 155.13 , 63.86 e 33.00



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
MOVING BARRIER CENTER OF GRAVITY ACCELERATION RESULTANT

VAT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 BRCX6

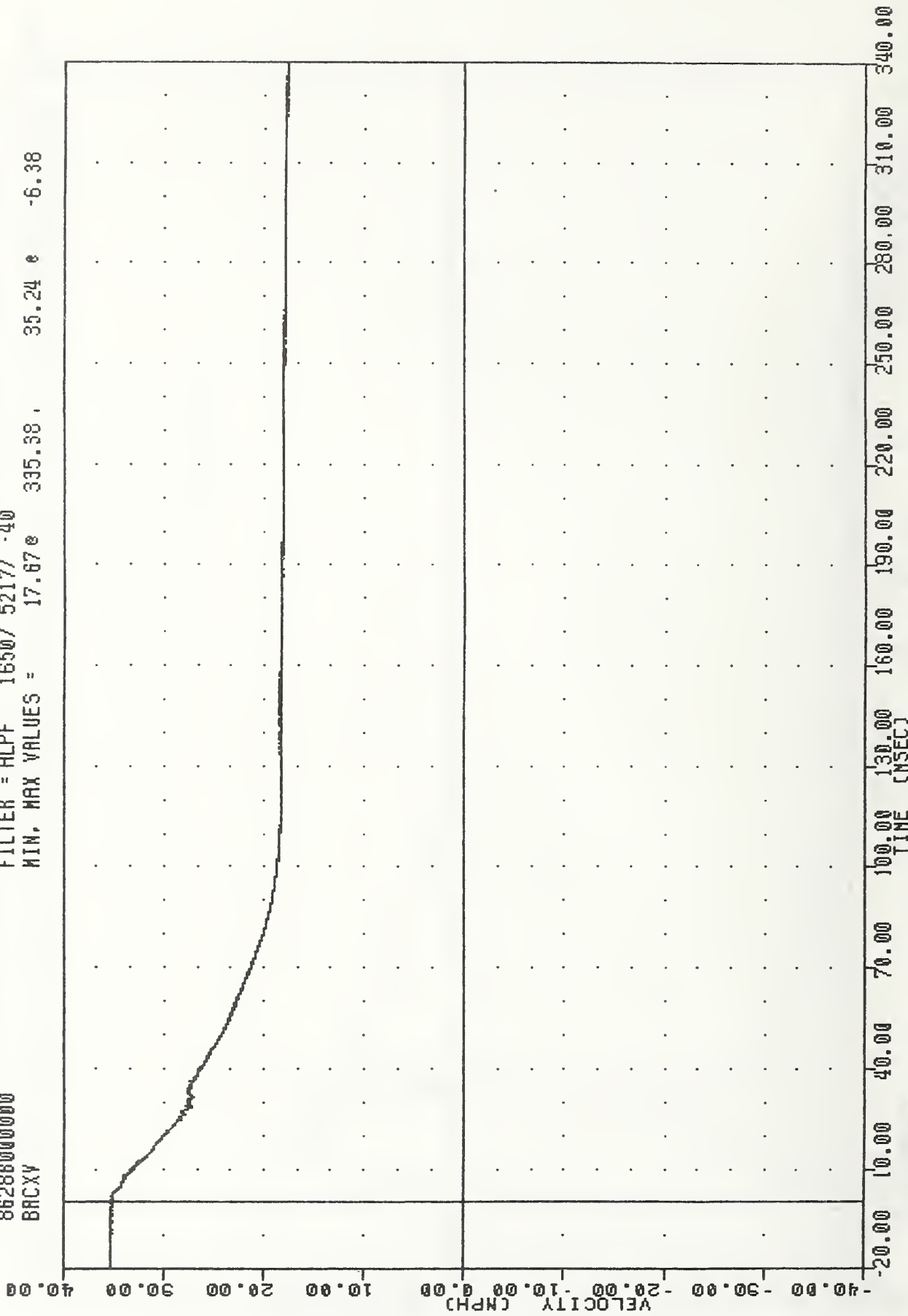
FILTER = BLPF 100/ 316/ -40
 MIN, MAX VALUES = -16.76 16.88 , 0.67 e -20.00



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 MOVING BARRIER REAR CROSSMEMBER ACCELERATION X AXIS

VRT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86286000000
 BRXV

FILTER = ALPF 1650/ 5217/ -40
 MIN. MAX VALUES = 17.67 335.38 , 35.24 -6.38

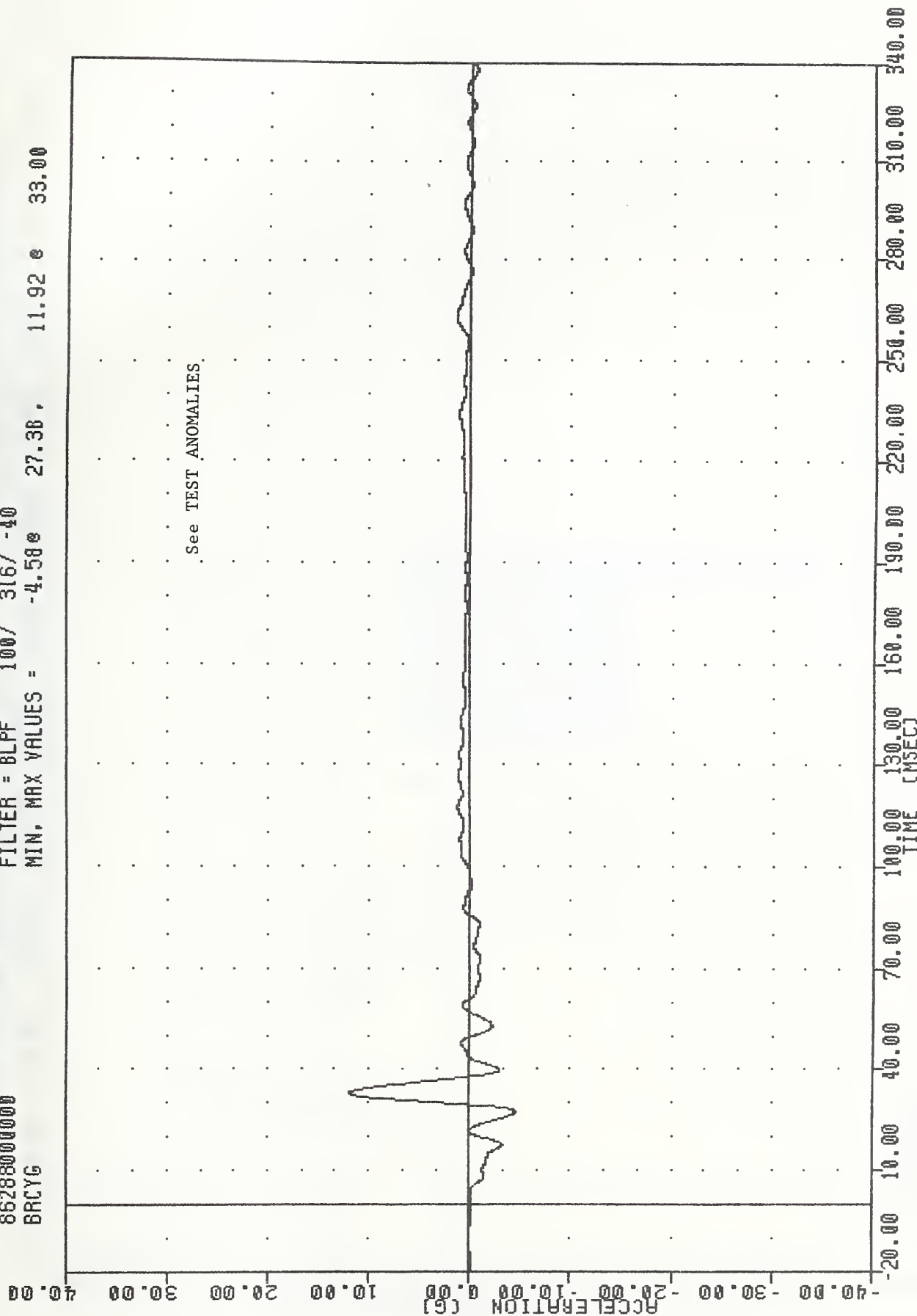


MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 DELTA V USING BRXG

VRT
CRASH 3 MODEL IMPROVEMENTS
86288000000
BRCYG

861015

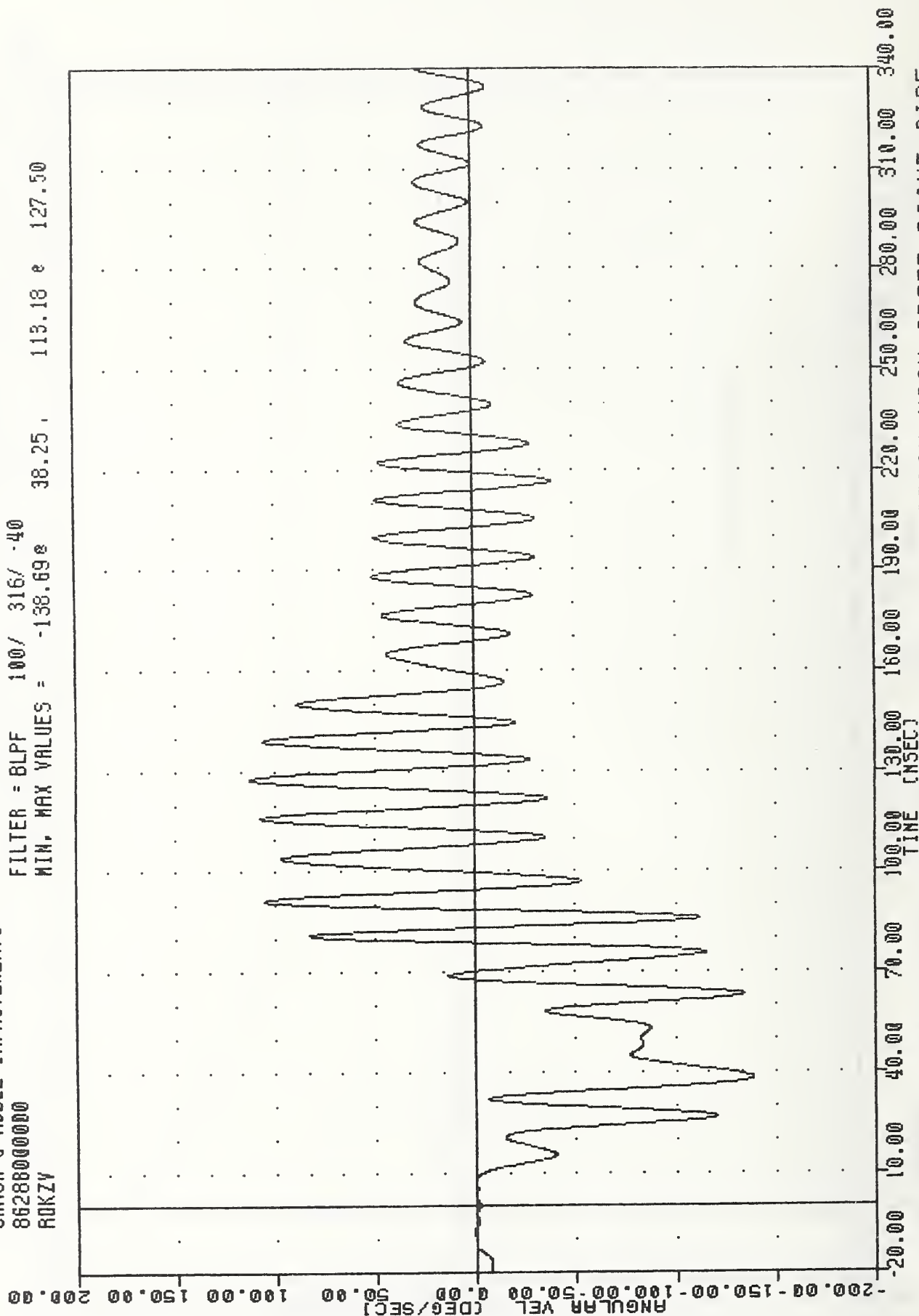
FILTER = BLPF 100/ 316/ -40
MIN, MAX VALUES = -4.58e 27.36, 11.92 e 33.00



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
MOVING BARRIER REAR CROSSMEMBER ACCELERATION Y AXIS

VAT , 861015
 CRASH 3 MODEL IMPROVEMENTS
 86288000000
 ROKZV

FILTER = BLPF 100/ 316/ -40
 MIN. MAX VALUES = -138.69 38.25 , 113.18 e 127.50



MOVING RIGID BARRIER INTO CHEVROLET CITATION HIGH-SPEED RIGHT SIDE
 VEHICLE YAW RATE

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