

DOT Ø 478

**NEW VEHICLE ASSESSMENT FOR
SIDE IMPACT PROTECTION**

**CAR-TO-CAR SIDE IMPACT TESTING
19° CRABBED SIDE IMPACTOR TO
1982 VOLKSWAGEN RABBIT
2-DOOR HATCHBACK
AT 53.38 MPH**

Prepared by:

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**TEST REPORT
JANUARY 1983**

Prepared for:

**U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
400 SEVENTH STREET, S.W.
WASHINGTON, D.C. 20590**



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Approved by Rod Garm

Date 2-3-83

Report Accepted by:

Contract Technical Manager
Office of Vehicle Safety Compliance

Date

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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
acres	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons	0.9	metric ton	t
	(2000 lb)			
VOLUME				
tsp	teaspoons	5	milliliters	mL
Tbsp	tablespoons	15	milliliters	mL
in ³	cubic inches	16	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	degrees Fahrenheit	5/9 (after subtracting 32)	degrees Celsius	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares	2.5	acres	
	(10 000 m ²)			
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton	1.1	short tons	
	(1000 kg)			
VOLUME				
mL	milliliters	0.03	fluid ounces	fl oz
mL	milliliters	0.06	cubic inches	in ³
L	liters	2.1	pints	pt
L	liters	1.06	quarts	qt
L	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	degrees Celsius	9/5 (then add 32)	degrees Fahrenheit	°F



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1.0 PURPOSE AND TEST INTRODUCTION

1.1 PURPOSE

The purpose of the test is to obtain the necessary data to determine the degree of protection which a specific vehicle provides for the occupant during a side impact collision. The vehicle was tested using test parameters which are not currently contained in a FMVSS to obtain research and vehicle rating baseline data.

1.2 INTRODUCTION

This deformable moving barrier-to-stationary vehicle crash test as conducted at the Dynamic Science side impact facility on November 19, 1982. The 19 degree side impactor was accelerated to a test speed of 53.38 mph and allowed to impact the left side of a stationary 1982 Volkswagen Rabbit, such that the left front corner of the side impactor contacted the target vehicle 35 inches forward of the midpoint of the centerline of the front and rear wheels. This test simulated a two vehicle moving, 60 degree impact with the side impactor moving at 40 mph and the target vehicle moving at 20 mph.

Section 2 contains general test and vehicle parameter data. Section 3 contains occupant and vehicle response data. Appendix A contains pre-test and post-test vehicle and dummy photographs. Appendix B contains Calcomp plots. Appendix C contains dummy certification data.

2.0 GENERAL TEST AND VEHICLE PARAMETER DATA

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

GENERAL TEST AND VEHICLE PARAMETER DATA

PRE-IMPACT DATA

Make/Model: Volkswagen Rabbit
 Body Style: 2-Door Hatchback Model Year 1982
 NHTSA No.: NA DSI No. 1299 Color: Light Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Volkswagen of America
 Date of Manufacture: 7/82; VIN: 1VWAB0175CV108502
 GVWR: 2822 lb; GAWR: Front = 1609 lb; Rear = 1275 lb

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL

Vehicle Capacity: FRONT REAR RECOMMENDED LOAD RANGE:
 Tire Pressure: 27 psi 27 psi TIRE SIZE: Standard
 Type of Seats: Bucket P155/80513
 Designated Seating: 2 Front 2 Rear 4 Total
 Cargo load = 185 lb Is Spare Tire: Space Saver? No
 TOTAL = 785 lb Standard Equipment? Yes
 Engine: 4 cylinder transverse mount, 105 cu. in. Displacement
 Transmission: 4 Speed Manual Front Wheel Drive
 Date Vehicle Received by Laboratory: 10/26/82; Odometer 800
 Dealer Name & Address: Phil Winslow VW Inc., 730 No. Circle
Drive, Colorado Springs, Colorado

WEIGHT (LB) OF TEST VEHICLE AS RECEIVED (WITH MAX. FLUIDS) = UDW

Right Front = 628 lb Right Rear = 359 lb
 Left Front = 617 lb Left Rear = 352 lb
 TOTAL FRONT WEIGHT = 1245 lb (64 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 711 lb (36 % of Total Vehicle Weight)
 TOTAL DELV. WEIGHT = 1956 lb

TARGET WEIGHT = UDW + Cargo Load + 328 lbs Dummies = 2469 lb

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 0 LB CARGO:

Right Front = 650 lb Right Rear = 510 lb
 Left Front = 700 lb Left Rear = 601 lb
 TOTAL FRONT WEIGHT = 1350 lb (55 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1111 lb (45 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 2461 lb

Weight of ballast secured in vehicle trunk area = 0 lb

VEHICLE ATTITUDE: (inches)

Delivered Attitude: RF 28-1/2 LF 28-1/2 RR 28-1/2 LR 28-1/2
 Test Attitude: RF 28-3/8 LF 27-3/4 RR 26-1/4 LR 25-1/2

REMARKS: _____

GENERAL TEST AND VEHICLE PARAMETER DATA (CONT)

POST-IMPACT DATA

Type of Test: Side (60°) Impact
 Date of Test: 11/19/82 Time: 1620 Temperature 63 °F
 Required Impact Velocity Range: 51.9 to 53.9 mph
 Impact Velocity: Primary = 53.38 mph Secondary = 53.38 mph
 Temperature in Occupant Compartment: 72 °F
 Windshield Moulding Temperature: 63 °F

Distance from the vehicle's front bumper to barrier face entering the vehicle velocity measurement device is 5.0 feet and distance exiting the vehicle velocity measurement device is 1.0 foot.

VEHICLE REBOUND AND CRUSH (in.)

Vehicle Width:	Pre-test = A	<u>60.6</u>	B	<u>60.8</u>	C	<u>62.4</u>
	Post-test = A	<u>51.7</u>	B	<u>36.3</u>	C	<u>51.6</u>
	Crush = A	<u>8.9</u>	B	<u>24.5</u>	C	<u>10.8</u>

19 Degree Crabbed Side Impactor Weight 3008 pounds.

VISIBLE DUMMY CONTACT POINTS

	<u>Driver (122)</u>	<u>Passenger (SID 7)</u>
Head	<u>Side Impactor Face</u>	<u>Window Sill</u>
Chest	<u>Left Front Door</u>	<u>Left 1/4 Panel</u>
Abdomen	<u>Left Front Door</u>	<u>Left 1/4 Panel</u>
Left Knee	<u>Left Front Door</u>	<u>Left 1/4 Panel</u>
Right Knee	<u>Left Knee</u>	<u>Left Knee</u>

DOOR OPENING

<u>Front</u>		<u>Rear</u>	
<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>
<u>Tools</u>	<u>Tools</u>	<u>NA</u>	<u>NA</u>
<u>Required</u>	<u>Required</u>		

SEAT MOVEMENT

Seat Back Failure	<u>Yes</u>	
Seat Shift (in.)	<u>NA</u>	<u>NA</u>

GLAZING DAMAGE

Backlight/Windshield Windshield cracked, no backlight damage.
Left side windows shattered.

OTHER NOTABLE IMPACT EFFECTS: Vehicle crush to approximate vehicle centerline at B-pillar. Rear axle damaged. Door sill deformed upward and separated 42 inches aft of DOR. Door hinges separated from A-post. A-post split open at DOR. Roof buckled at B-pillar.

3.0 DATA REQUIRED BY OAR AND R&D

This section of the report contains all data required by OAR and R&D. This includes test conditions, dummy position measurements, dummy injury criteria values, pre- and post-test vehicle measurements, accelerometer locations and data summary, and the photoinstrumentation camera location and specification summary. Also contained in this section are the dummy damage data sheets and a "Test Anomalies and Loss of Data Channels" summary.

Pertinent photographs are presented in Appendix A. Calcomp plots of dummy and vehicle accelerometer data are presented in Appendix B.

POST SIDE IMPACT DATA SHEET

POST-IMPACT DATA

Type of Test: Side (60°) Impact Left (Driver's) Side
Date of Test: 11/19/82 Time: 1620 Temperature 63 °F
NHTSA No.: R&D VIN: 1VWAB0175CV108502
Required Impact Velocity Range: 52.4 to 53.4 mph
Impact Velocity: Primary = 53.38 mph Secondary = 53.38 mph
Vehicle Static Crush: Amount of Crush = 24.5 inches on left side
Crush Details: Vehicle crush to approximate vehicle
centerline at B-pillar. Rear axle damaged. Door sill deformed
upward and separated 42 inches aft of DOR. Door hinges sepa-
rated from A-post. A-post split open at DOR. Roof buckled at
B-pillar.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

PRE-IMPACT DATA

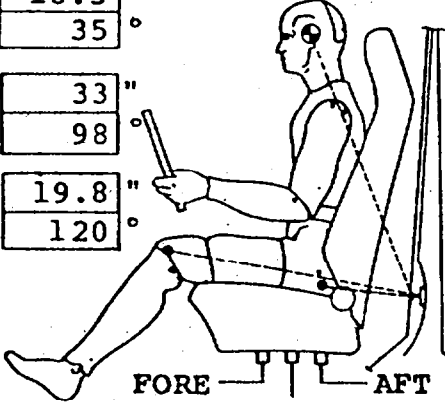
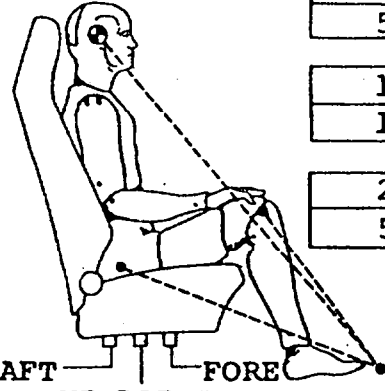
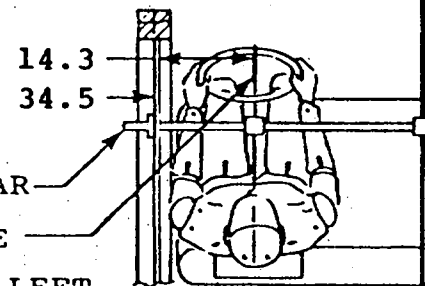
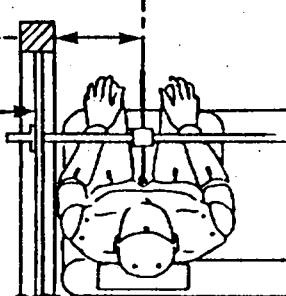
Make/Model: Volkswagen Rabbit
 Body Style: 2-Door Hatchback Model Year: 1982
 NHTSA No. R&D DSI No. 1299 Color: Light Blue

DATA FROM CERTIFICATION LABEL

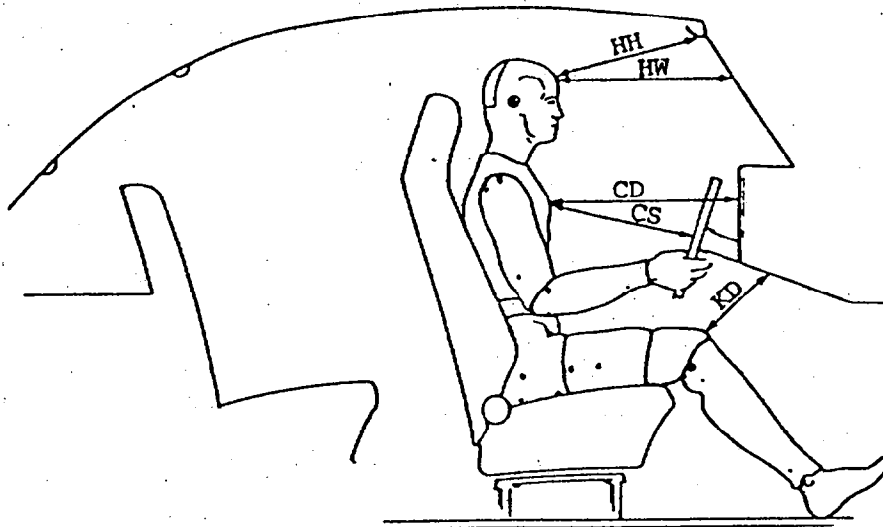
Vehicle Manufacturer: Volkswagen of America
 Date of Manufacture: 7/82; VIN: 1VWAB0175CV108502
 GVWR: 2822 lb; GAWR: Front = 1609 lb; Rear = 1275 lb

POST-IMPACT DATA

Type of Test: Side (60°) Impact
 Date of Test: 11/19/82 Time: 1620 Temperature 63 °F
 Required Impact Velocity Range: 52.4 to 53.4 mph
 Impact Velocity: Primary = 53.38 mph Secondary = 53.38 mph
 Seat Type: Bucket Adjuster Type: None
 Bucket Seat Type Back: Not adjustable, high back
 Technicians: M. Rodack, K. Lowe

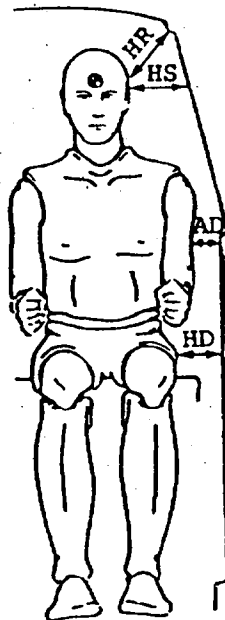
DRIVER DUMMY# 1 2 2 HEAD TARGET 18.5 " KNEE JOINT 33 " APPROXIMATE "H" POINT 19.8 " 35 ° 98 ° 120 °  FORE MIDPOINT AFT	PASSENGER DUMMY # SID 7 47 " HEAD TARGET 17 " KNEE JOINT 22 " APPROXIMATE "H" POINT 55 ° 14 ° 50 °  AFT MIDPOINT FORE
DOOR * 14.3 GLASS HEIGHT 34.5 LATERAL BAR ADJUSTABLE POINTER LEFT FRONT DOOR  DRIVER DUMMY # 1 2 2	15.3 DOOR GLASS HEIGHT 33 LEFT SIDE OF CAR  PASSENGER DUMMY # SID 7

*Door glass height is equal on the right and left side of vehicle.



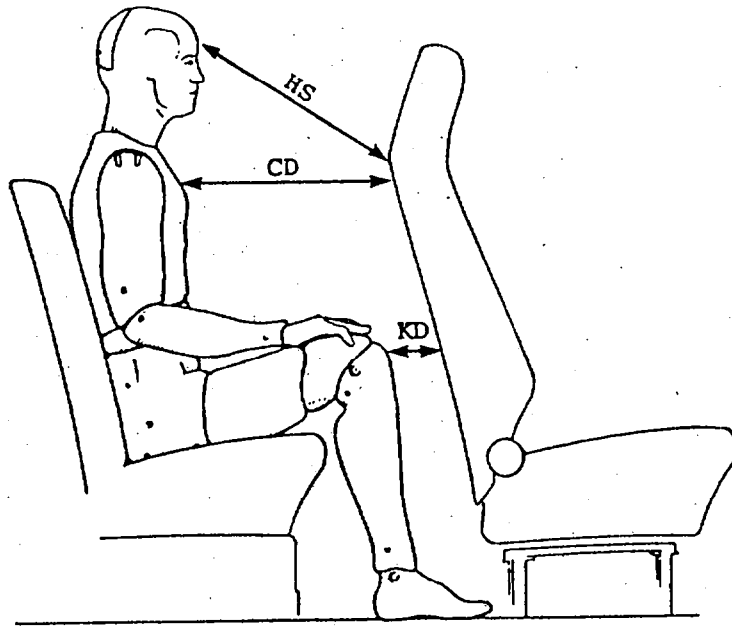
301

HH = 17.0 INCHES
 HW = 24.0 INCHES
 CD = 20.0 INCHES
 CS = 11.5 INCHES
 KD = 3.0 INCHES/3.0 INCHES

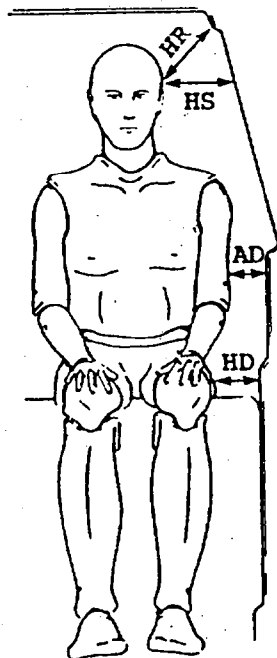


HR = 8.0 INCHES
 HS = 9.3 INCHES
 AC = 3.4 INCHES
 HD = 6.0 INCHES

DRIVER CLEARANCE DIMENSIONS.



HS = 25.4 INCHES
CD = 18.5 INCHES
KD = 5.2 INCHES/5.0 INCHES



HR = 6.5 INCHES
HS = 8.0 INCHES
AD = 4.5 INCHES
HD = 6.1 INCHES

REAR PASSENGER CLEARANCE DIMENSIONS.

SIDE IMPACT DUMMY RESPONSE SUMMARY

TEST NO. 3144-2 TEST DATE 11/19/82

TEST CONFIGURATION:

Target Vehicle 1982 VW Rabbit Speed 0.0 mph
 Bullet Vehicle 19° Crabbed Side Impactor Speed 53.38 mph
 Impact Location 35 inches forward of midpoint of centerline of front and rear wheels Angle 60°
 Dummy Model HSRI 122 (Driver)

HEAD RESPONSE:

	Positive Peak (G)	ms	Negative Peak (G)	ms
Longitudinal	60.4	148	212.7	76
Lateral	103.9	54	76.8	120
Vertical	137.5	62	35.0	154
Resultant	233.4	76	-	-
HIC	3270.0 Between 48.9 and 80.0 ms.			

CHEST RESPONSE:

DEFLECTION (IN.): LRDY NA

Location	Pk A (G @ ms)		3ms Clip (G)	SI	ΔV_y (MPH)	Impact Time (ms)
	+	-				
Upper Thorax						
Longitudinal	70.9 @ 148	70.8 @ 40	-	-	-	-
Lateral (P)	273.2 @ 42	131.4 @ 58	-218.2	-	43.6	26
Lateral (R)	242.5 @ 42	166.1 @ 58	-214.2	-	44.0	26
Vertical	113.2 @ 59	53.2 @ 157	-	-	-	-
Resultant	276.1 @ 42	-	222.0	6348	-	-
Resultant (R)	245.6 @ 42	-	218.0	5907	-	-
Lower Thorax						
Longitudinal	129.6 @ 35	100.1 @ 40	-	-	-	-
Lateral (P)	176.9 @ 39	125.7 @ 58	146.4	-	47.8	25
Lateral (R)†	150.5 @ 40	95.1 @ 58	137.8	-	45.4	24
Vertical	164.2 @ 39	146.9 @ 59	-	-	-	-
Resultant	244.6 @ 40	-	148.6	4924	-	-
Resultant (R)	234.9 @ 40	-	144.4	NA	-	-
Left Upper Rib						
Lateral (P)	214.4 @ 36	47.4 @ 62	185.4	-	44.7	22
Lateral (R)	213.0 @ 36	31.4 @ 62	183.7	-	42.0	24
Left Lower Rib						
Lateral (P)	226.3 @ 37	15.4 @ 169	190.0	-	44.8	26
Lateral (R)	249.8 @ 36	12.1 @ 169	197.5	-	41.5	26

†Sensor damaged approximately 125 ms.

SIDE IMPACT DUMMY RESPONSE SUMMARY (Continued)

PELVIS RESPONSE

	Positive		Negative	
	<u>Peak (G)</u>	<u>ms</u>	<u>Peak (G)</u>	<u>ms</u>
Longitudinal	36.6	49	116.7	34
Lateral	189.9	29	31.4	49
Vertical	28.2	114	286.8	34
Resultant	345.3	34	3 ms clip = 186.9 G	
ΔV_y <u>42.5</u> mph	SI	<u>5768</u>	Contact Time	<u>20</u> ms

COMMENTS: Driver thorax lateral accelerometer was damaged during the test event.
Slight cracking was also noted near the rib attachment points of the leather back-
ing plate.

SIDE IMPACT DUMMY RESPONSE SUMMARY

TEST NO. 3144-2 TEST DATE 11/19/82

TEST CONFIGURATION:

Target Vehicle	<u>1982 VW Rabbit</u>	Speed	<u>0.0 mph</u>
Bullet Vehicle	<u>19° Crabbed Side Impactor</u>	Speed	<u>53.38 mph</u>
Impact Location	<u>35 inches forward of midpoint of centerline of front and rear wheels</u>		
		Angle	<u>60°</u>
Dummy Model	<u>SID 7 (LR Passenger)</u>		

HEAD RESPONSE:

	Positive Peak (G)	ms	Negative Peak (G)	ms
Longitudinal	57.0	169	79.5	72
Lateral	118.7	70	26.3	61
Vertical	86.5	65	132.9	75
Resultant	149.2	72	-	-
HIC	2720.0 Between 63.1 and 80.4 ms.			

CHEST RESPONSE:

DEFLECTION (IN.): LRDY NA

Location	Pk A (G @ ms)		3ms Clip (G)	SI	ΔV_y (MPH)	Impact Time (ms)
	+	-				
Upper Thorax						
Longitudinal	73.0 @ 59	116.7 @ 64	-	-	-	-
Lateral (P)	287.6 @ 66	77.7 @ 92	220.5	-	43.4	50
Lateral (R)	283.1 @ 65	60.2 @ 59	176.3	-	37.9	50
Vertical	77.8 @ 67	66.0 @ 92	-	-	-	-
Resultant	305.9 @ 66	-	250.0	7250	-	-
Resultant (R)	301.0 @ 66	-	193.3	5918	-	-
Lower Thorax						
Longitudinal	84.8 @ 70	118.1 @ 64	-	-	-	-
Lateral (P)	244.7 @ 65	76.8 @ 75	186.8	-	47.1	50
Lateral (R)	233.0 @ 59	56.0 @ 76	188.6	-	52.3	50
Vertical	77.7 @ 58	73.8 @ 74	-	-	-	-
Resultant	272.4 @ 64	-	207.1	5790	-	-
Resultant (R)	259.5 @ 59	-	207.5	6488	-	-
Left Upper Rib						
Lateral (P)	275.5 @ 58	76.9 @ 79	213.5	-	45.4	48
Lateral (R)	171.5 @ 59	62.6 @ 79	140.2	-	39.0	48
Left Lower Rib						
Lateral (P)	247.1 @ 60	32.4 @ 95	200.4	-	46.1	55
Lateral (R)	229.7 @ 60	26.5 @ 95	179.1	-	43.3	54

SIDE IMPACT DUMMY RESPONSE SUMMARY (Continued)

PELVIS RESPONSE

	Positive Peak (G)	ms	Negative Peak (G)	ms
Longitudinal	78.6	47	83.0	51
Lateral	231.8	52	194.8	39
Vertical	134.1	58	140.3	59
Resultant	256.3	51	3 ms clip = 231.1 G	
ΔV_y	46.7	mph	SI	7783
		Contact Time	34	ms

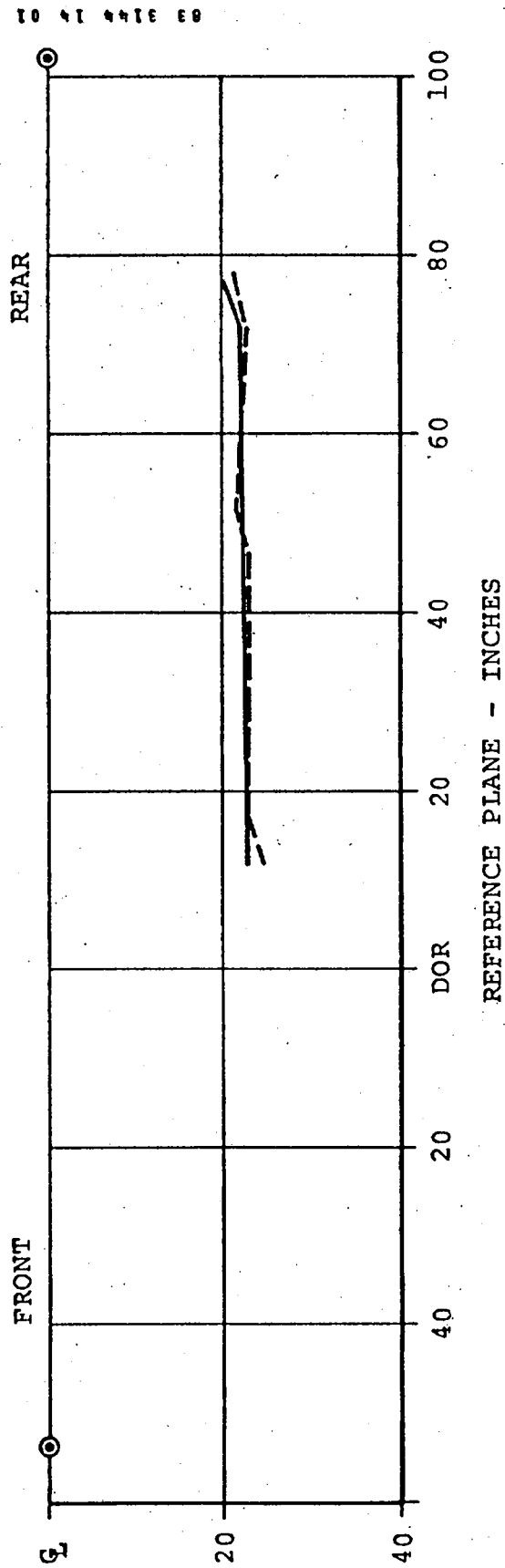
COMMENTS: No Sensor failures occurred during the test. Post-test inspection of the dummy revealed a broken knee casting and a bend in the small outer diameter shaft of the heim joint. Repairs will be made prior to conduct of next test.

TEST VEHICLE EXTERIOR PROFILES AND STATIC CRUSH

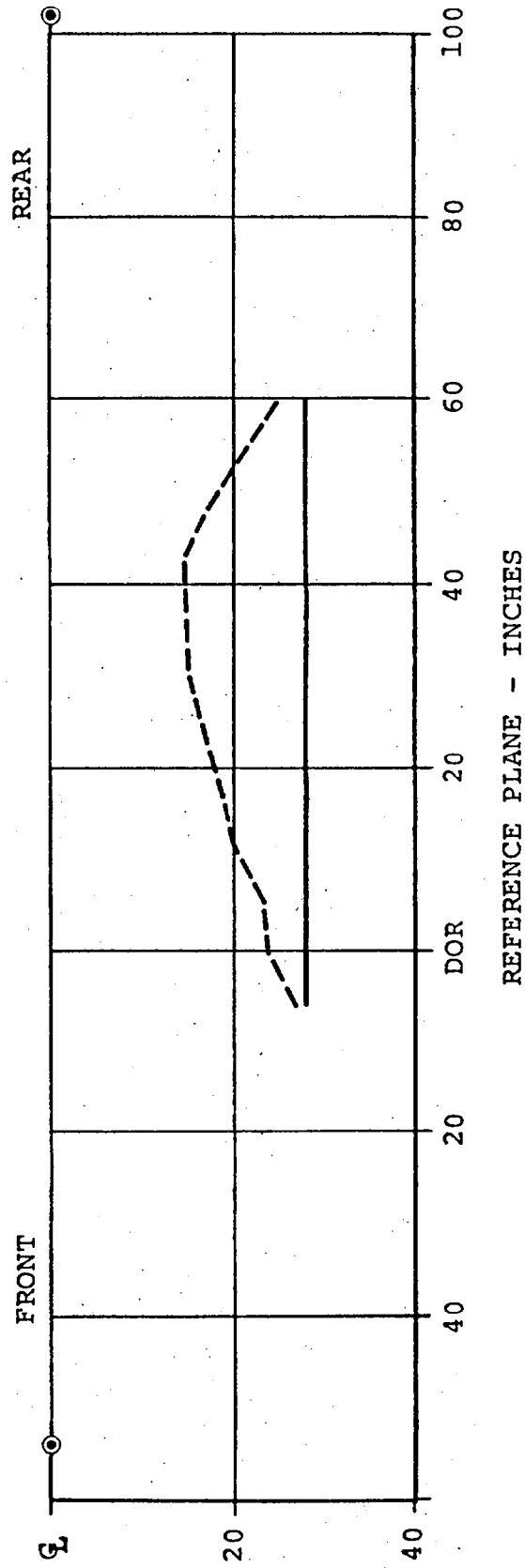
R.P.* Height		Zero Distance Starting at DOR (IN.)																							
Location	(in.)	30	24	18	12	6	0	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96		
Pre-test Profile (Distance from R.P. - in.)																									
Axle Height		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
DOR		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Door Center	10.3	8.8	8.4	9.7	9.8	9.8	9.7	9.7	9.7	9.6	9.6	9.6	9.6	9.7	9.8	9.8	9.9	8.8	8.3	8.6	11.2	11.9	14.5		
Window Sill	X	X	X	X	12.2	11.8	11.8	12.4	12.4	12.3	12.3	12.4	12.5	12.4	12.4	12.4	12.5	12.6	12.8	14.6	13.4	13.9	15.6		
Window Top	X	X	X	X	X	X	X	X	17.1	17.6	17.7	17.8	18.0	18.2	18.1	18.0	18.0	17.9	18.3	21.3	X	X	X		
Post-test Profile (Distance From R.P. - in.)																									
Axle Height		X	X	X	X	X	X	13.2	16.2	17.3	19.8	21.8	23.5	25.2	25.0	25.5	23.0	19.2	15.6	X	X	16.2	X		
DOR		X	X	X	X	X	X	10.7	18.6	X	27.5	31.7	33.2	33.2	34.1	33.2	30.7	24.2	22.2	X	X	X	X		
Door Center	12.7	11.4	10.7	11.8	10.9	16.9	26.0	22.0	22.0	29.5	30.3	30.7	31.5	31.2	31.4	28.1	24.8	19.6	16.8	13.2	15.5	12.5	14.9		
Window Sill	X	X	X	X	12.0	11.7	13.0	19.9	16.6	22.0	27.5	28.6	29.5	29.2	28.6	26.6	22.8	19.2	17.6	15.2	15.0	13.7	15.5		
Window Top	X	X	X	X	X	X	X	X	16.5	17.6	17.6	17.6	18.0	18.1	17.9	18.2	18.1	18.0	17.9	18.4	X	X	X		
Post-test Static Crush (in.)																									
Axle Height		X	X	X	X	X	X	1.0	4.2	5.3	7.9	9.9	11.6	13.3	13.0	13.2	10.8	6.9	3.4	X	X	0.2	X		
DOR		X	X	X	X	X	X	1.0	8.9	X	18.0	22.2	23.7	23.7	24.5	23.6	21.1	14.6	11.6	X	X	X	X		
Door Center	2.4	2.6	2.3	2.1	1.1	7.1	16.3	12.3	19.9	20.7	21.1	21.8	21.4	21.6	18.3	14.9	10.8	8.5	4.6	4.3	0.6	0.4			
Window Sill	X	X	X	-0.2	-0.1	1.2	7.5	4.2	9.7	15.2	16.2	17.0	16.8	16.2	14.2	10.3	6.6	4.8	0.6	1.6	-0.2	-0.1			
Window Top	X	X	X	X	X	X	X	X	-0.6	0.0	-0.1	-0.2	0.0	-0.1	-0.2	-0.2	0.1	0.1	-0.4	X	X	X	X		

*Zero plane set up 40 inches from rear bumper centerline and 40 inches from front bumper centerline. This plane was set up parallel to the vehicle centerline.

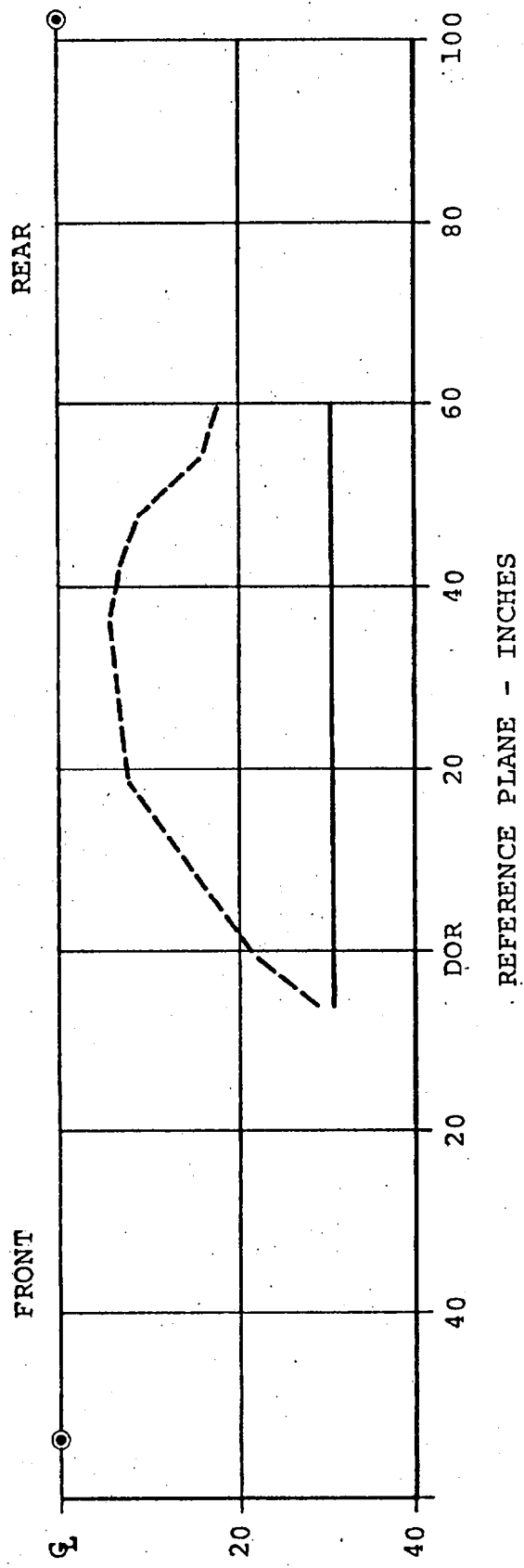
*Zero plane set up 40 inches from rear bumper centerline and 40 inches from front bumper centerline. This plane was set up parallel to the vehicle centerline.



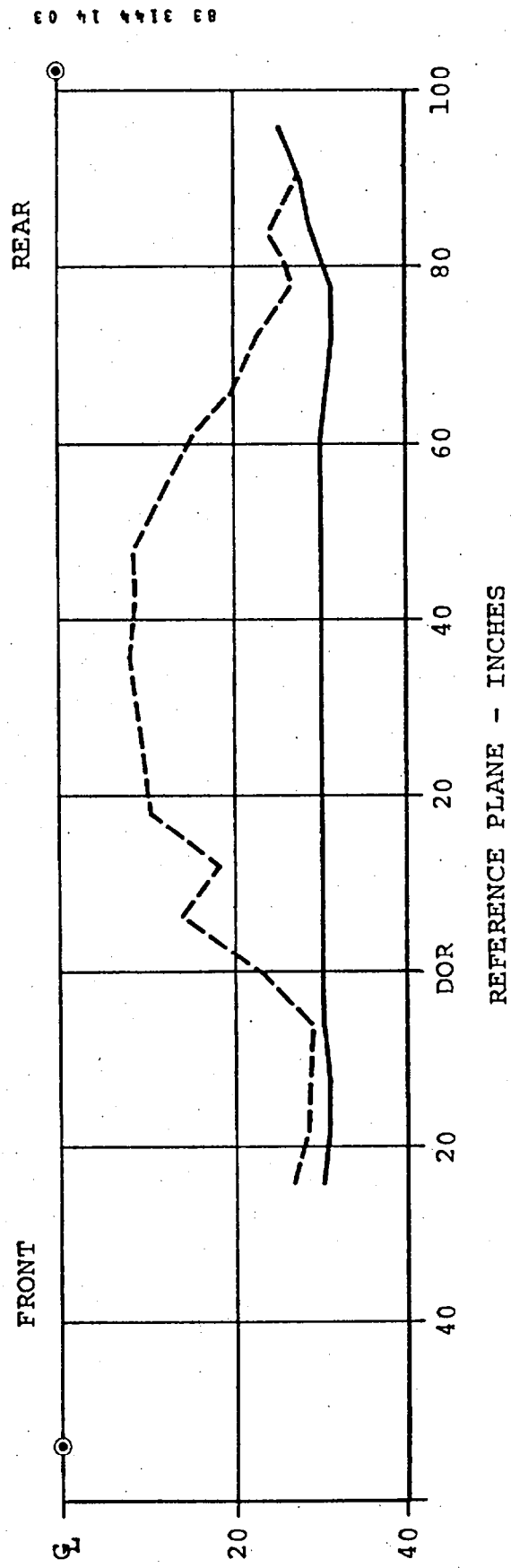
EXTERIOR VEHICLE PROFILE AND STATIC CRUSH MEASUREMENTS - WINDOW TOP LEVEL - 19 DEGREE
CRABBED SIDE IMPACTOR TO 1982 VOLKSWAGEN RABBIT - 53.38 MPH.



EXTERIOR VEHICLE PROFILE AND STATIC CRUSH MEASUREMENTS - AXLE HEIGHT 19 DEGREE
CRABBED SIDE IMPACTOR TO 1982 VOLKSWAGEN RABBIT - 53.38 MPH.

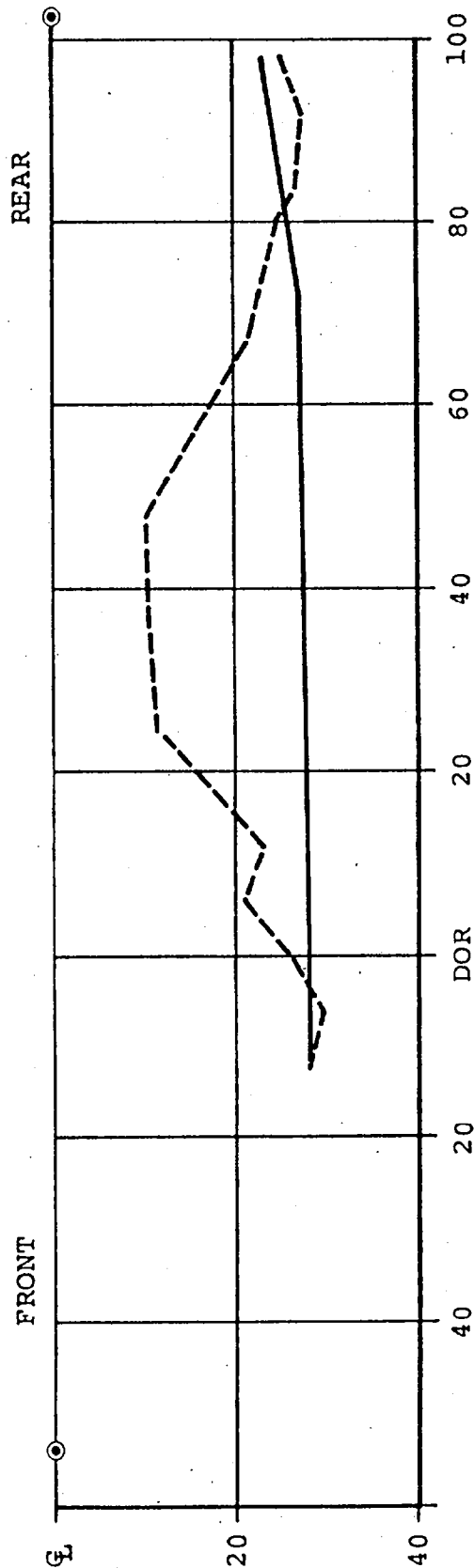


EXTERIOR VEHICLE PROFILE AND STATIC CRUSH MEASUREMENTS - DOR HEIGHT 19 DEGREE CRABBED
SIDE IMPACTOR TO 1982 VOLKSWAGEN RABBIT - 53.38 MPH.



EXTERIOR VEHICLE PROFILE AND STATIC CRUSH MEASUREMENTS - MID DOOR HEIGHT 19 DEGREE
 CRABBED SIDE IMPACTOR TO 1982 VOLKSWAGEN RABBIT - 53.38 MPH.

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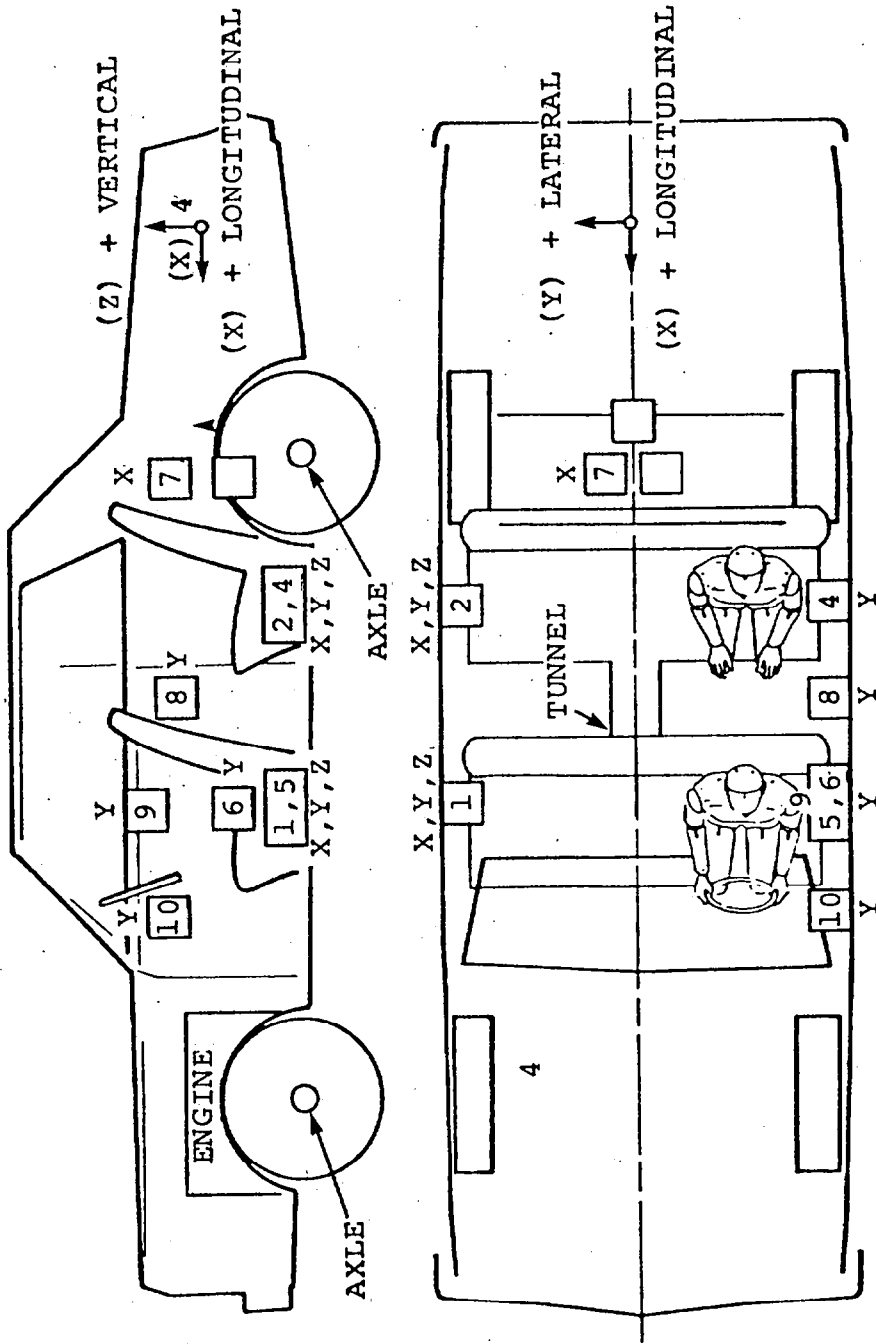
REFERENCE PLANE - INCHES

EXTERIOR VEHICLE PROFILE AND STATIC CRUSH MEASUREMENTS - WINDOW SILL LEVEL - 19 DEGREE CRABBED SIDE IMPACTOR TO 1982 VOLKSWAGEN RABBIT - 53.38 MPH.

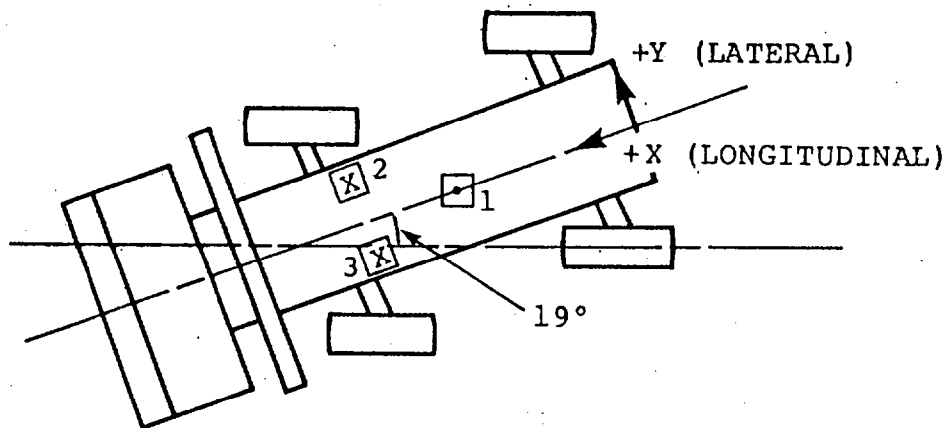
TEST VEHICLE ACCELEROMETER LOCATIONS AND PHYSICAL COORDINATES

No.	Description of Location	X*	Y*	Z*	Positive		Negative	
					G	MS	G	MS
1	Right sill next to front seat							
	(Longitudinal)	83.3	24.0	10.5	2.8	12	9.9	59
	(Lateral)	$\Delta V = 12.9$ mph			24.1	33	6.9	138
	(Vertical)				20.4	32	17.2	68
2	Right sill next to rear seat							
	(Longitudinal)	62.4	24.0	10.5	3.0	12	9.9	59
	(Lateral)	$\Delta V = 17.2$ mph			28.9	56	3.5	114
	(Vertical)				9.2	75	12.2	45
3	Deck over rear axle							
	(Longitudinal)	32.0	0.0	10.0	5.1	133	24.6	59
	(Lateral)	$\Delta V = 23.7$ mph			38.8	58	3.3	113
	(Vertical)				15.9	44	15.9	76
4	Left sill next to rear seat							
	(Lateral)	61.8	-24.0	10.5	56.3	40	61.6	78
					$(\Delta V = 12.4$ mph)			
5	Left sill next to front seat							
	(Lateral)	83.3	-24.0	10.5	60.1	39	91.1	48
					$(\Delta V = 11.9$ mph)			
6	Left front door centerline							
	(Lateral)	80.3	-26.0	24.0	135.6	14	189.8	27
					$(\Delta V = 22.2$ mph)			
7	Right rear compartment							
	(Longitudinal)	32.0	13.0	12.5	4.2	176	12.6	69
8	Midrear of left front door							
	(Lateral)	61.0	-26.0	24.5	132.9	18	38.9	46
					$(\Delta V = 23.0$ mph)			
9	Upper left front door centerline							
	(Lateral)	81.6	-26.0	33.0	188.5	20	104.9	35
					$(\Delta V = 40.6$ mph)			
10	Midfront of left front door							
	(Lateral)	100.8	-26.0	23.5	129.2	3	110.0	24
		$(\text{Artery severed during test})$						

*Reference Plane: X - rear bumper, Y - vehicle centerline,
Z - ground



VEHICLE ACCELEROMETER LOCATIONS AND PHYSICAL COORDINATES



83 3144 14 07

No.	Description of Location	X*	Y*	Z*	Positive		Negative	
					G	MS	G	MS
1	Center of gravity	76.0	0.0	13.3				
	(Longitudinal)	$\Delta V = -19.3$ mph			2.4	114	16.6	61
	(Lateral)	$\Delta V = 1.12$ mph			3.0	10	6.5	83
	(Vertical)	$\Delta V = 1.9$ mph			27.4	100	35.5	89
2	Left side frame	67.5	213.0	14.0				
	(Longitudinal)	$\Delta V = 22.2$ mph			1.8	165	18.9	60
3	Right side frame	67.5	23.0	14.0				
	(Longitudinal)	$\Delta V = 16.0$ mph			1.3	217	15.0	52
Forward of rear frame of side impactor, right of vehicle center-line.								

SUMMARY OF CAMERA LOCATIONS AND DESCRIPTIONS

Loc. No.	Location	Field of View	Camera Angle	Lens Size	Frame Rate	Timing Speed	Serial Number	Impact Dist-X	Center-line Dist-Y	Camera Height
1	Right side of side impactor ground base	Left side of test vehicle, parallel to side impactor face	0°	25 mm	400 fps	100 Hz	M9	264 in.	450 in	60 in.
2	Right of side impactor ground base	Left side of test vehicle, parallel to target vehicle	0°	25 mm	360 fps	100 Hz	M3	516 in.	330 in.	56.5 in.
3	Right of side impactor ground base	Left side of test vehicle perpendicular to target vehicle side	0°	17 mm	415 fps	100 Hz	LC 326	84 in.	798 in.	51.5 in.
4	Overhead ground base	Impact area	90°	10 mm	300 fps	100 Hz	M7	60 in.	48.5 in.	360 in.
5	Driver on-board front	Front view of driver/door contact	0°	8 mm	729 fps	100 Hz	11	-	-	-
6	Left rear passenger on-board right side	Side view of left rear occupant	0°	8 mm	967 fps	100 Hz	8	-	-	-
7	Driver on-board right side	Side view of driver occupant	0°	8 mm	980 fps	100 Hz	12	-	-	-
8	Left rear passenger on-board (rear)	Rear view of dummy/door contact	0°	8 mm	862 fps	100 Hz	10	-	-	-
9	Right side of side impactor ground base	Real-time event (panning)	NA	Var	24 fps	NA	Scoopic	-	-	-

TEST ANOMALIES AND LOSS OF DATA CHANNEL SUMMARY

The side impactor contacted the Volkswagen Rabbit 2.5 inches aft of the desired impact point. Pre-test checkout tow of the side impactor revealed a three inch drift to the left 25 feet post release of the guidance system. Two inches of this drift was recorded during the last ten feet of free wheeling distance. The test tow indicated that vehicle tracking is not the cause of the less than optimal impact accuracy. It is suspected that normal technician activity immediately prior to test initiation resulted in a slight undetected forward displacement of the vehicle. During future testing, a plumb bob will be suspended from the front bumper centerline over a precisely placed ground target. Any vehicle displacement prior to testing can then be detected and corrected.

The following impact related events resulted in the loss of post-test calibration data: (1) off-board RSCM breakaway cable disconnected due to vehicle movement and (2) impact distorted the rear wheel well into the junction box damaging the calibration cable connector.

Two data sensors were damaged during the test; one sensor installed in the driver dummy (HSRI 122) and one vehicle sensor. The lumbar lateral accelerometer cable was pulled out of the connector in the umbilical cable bundle. The cable attached to the 2000 G accelerometer mounted at the forward mid-door position was severed approximately one foot from the sensor. It is likely that the cable was severed when the door hinge separated from the A-pillar.

TEST LOG OF ANTHROPOMORPHIC TEST DEVICE

Contractor: Dynamic Science, Inc.
 Contract Title: Car-to-Car Side Impact Testing
 Contract No.: DTNH22-81-C-07113 T.O. 5
 Contract Technical Manager: W. T. Hollowell
 ATD Mfr.: HSRI
 ATD Serial No.: Thorax 122/Body 8 Date Submitted:

Test Date	Test No.	Test Description*	$\Delta V, \dagger$ mph	$\angle \bullet \bullet$ deg.	Location and Description of Damage (if any)	Project Engineer
10/27/82	3144-00	Initial Inspection	-	-	Skin on pelvis and legs is loose. Adominal sack is damaged.	<i>Richard P. Puchner</i>
11/19/82	3144-2	Left front position, Side Impact to VW Rabbit 60° Side Impact Two Car Moving Simula- tion	53.38	300	Rib ballast on right side dented, slight cracking in leather backing. Displacement transducer installed for remaining tests.	<i>Richard P. Puchner</i>

*Describe, as: Pendulum Impact Simulator, sled wall, car door, restraint, etc. If vehicle test, indicate position of ATD in vehicle.
 †If a sled test. If a vehicle test, the closing speed between vehicles immediately before impact.
 ••Head-on impact is defined as zero degrees. Other angles of impact measured counterclockwise from zero degrees.

TEST LOG OF ANTHROPOMORPHIC TEST DEVICE

Contractor: Dynamic Science, Inc.
 Contract Title: Car-to-Car Side Impact Testing
 Contract No.: DTNH22-81-C-07113 T.O. 5
 Contract Technical Manager: W. T. Hollowell
 ATD Mfr.: ARL
 ATD Serial No.: SID 7/174
 Date Submitted:

Test Date	Test No.	Test Description*	ΔV , [†] mph	< ** deg.	Location and Description of Damage (if any)	Project Engineer
10/27/82	3144-00	Initial Inspection	-	-	Head skin indicates SN 175, Pelvis indicates SN 174. Abdominal sack damaged, shelf and outer skin torn.	<i>Michael J. Rockach</i>
11/19/82	3144-2	Left rear position, Side Impact to VW Rabbit 60° Side Impact two car moving simula- tion	53.38	300	Left knee casting broken, damper heim joint bent, rib ballast on right side dented. Rib displacement transducer installed for remaining tests.	<i>Michael J. Rockach</i>

*Describe, as: Pendulum Impact Simulator, sled wall, car door, restraint, etc. If vehicle test, indicate position of ATD in vehicle.
[†]If a sled test, the closing speed between vehicles immediately before impact.
 **Head-on impact is defined as zero degrees. Other angles of impact measured counterclockwise from zero degrees.

APPENDIX A
PERTINENT PHOTOGRAPHS



FIGURE A-1. PRE-TEST FRONT VIEW OF VW RABBIT - 19° CRABBED
SIDE IMPACTOR TO 1982 VW RABBIT - 53.38 MPH.



FIGURE A-2. PRE-TEST REAR VIEW OF VW RABBIT - 19° CRABBED
SIDE IMPACTOR TO 1982 VW RABBIT - 53.38 MPH.



FIGURE A-3. PRE-TEST LEFT SIDE VIEW OF VW RABBIT - 19° CRABBED SIDE IMPACTOR TO 1982 VW RABBIT - 53.38 MPH.



FIGURE A-4. POST-TEST LEFT SIDE VIEW OF VW RABBIT - 19° CRABBED SIDE IMPACTOR TO 1982 VW RABBIT - 53.38 MPH.



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FIGURE A-5. PRE-TEST LEFT SIDE FRONTAL OBLIQUE OF VW RABBIT.



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FIGURE A-6. POST-TEST LEFT SIDE FRONTAL OBLIQUE OF VW RABBIT.

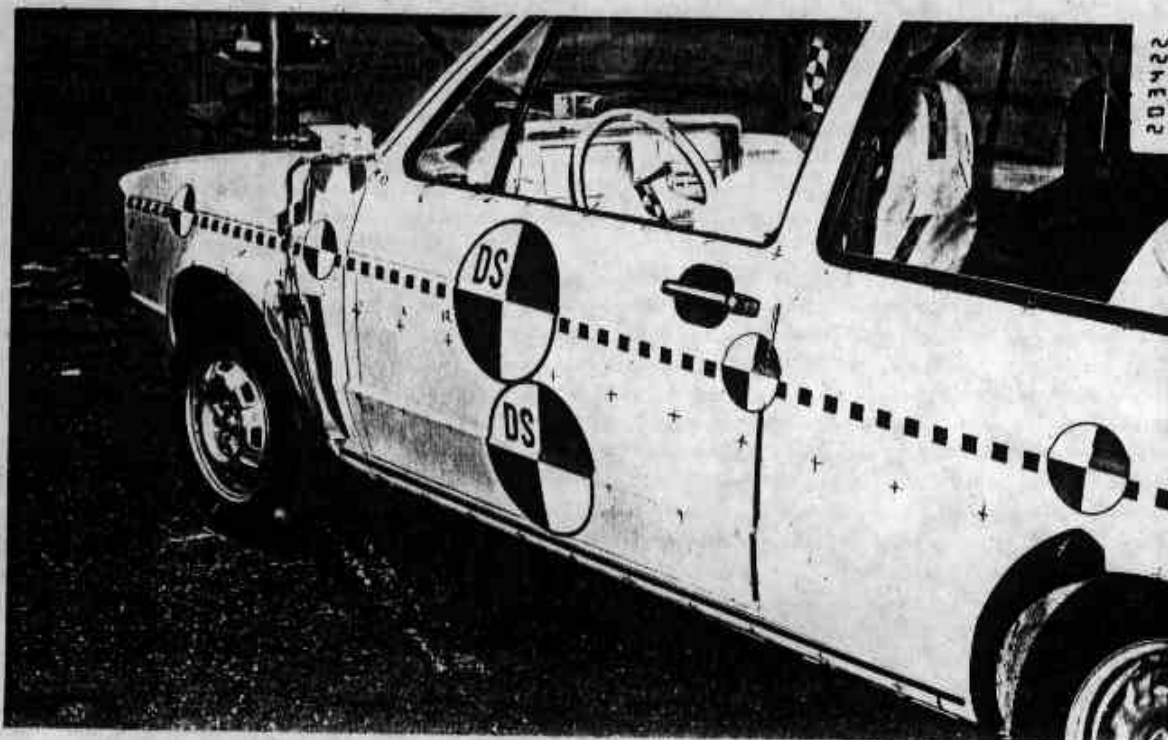


FIGURE A-7. PRE-TEST LEFT SIDE REAR OBLIQUE OF VW RABBIT.



FIGURE A-8. POST-TEST LEFT SIDE OF REAR OBLIQUE OF VW RABBIT.

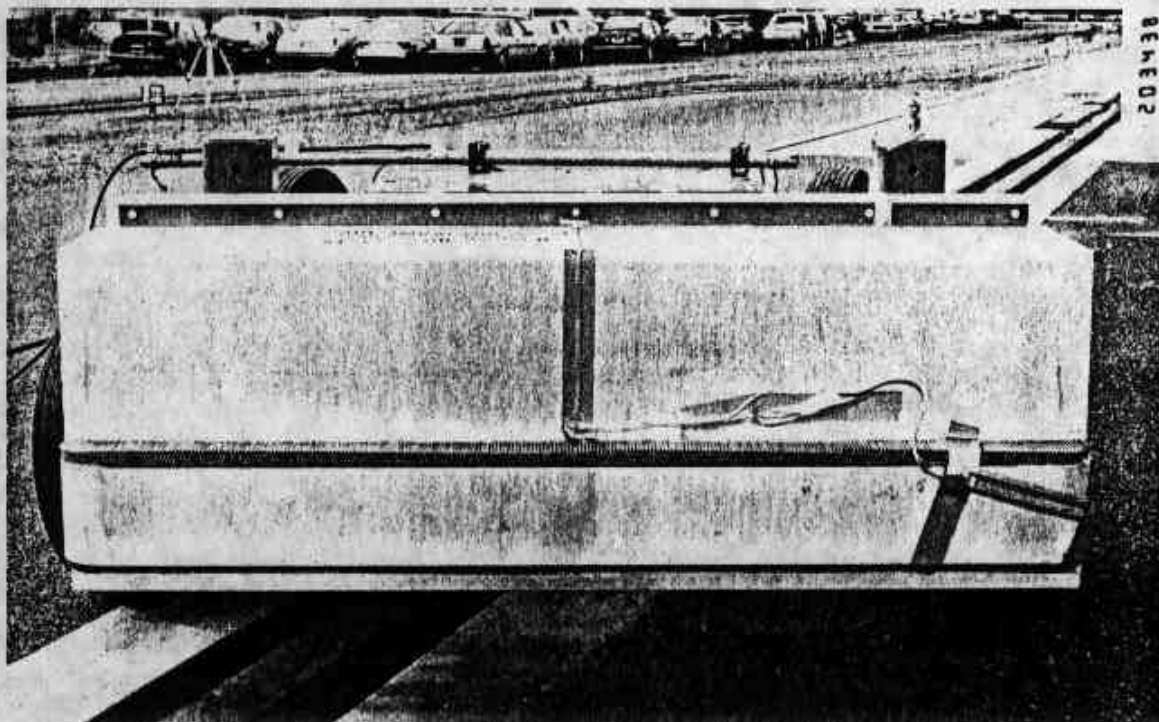


FIGURE A-9. PRE-TEST FRONTAL VIEW OF BARRIER FACE.

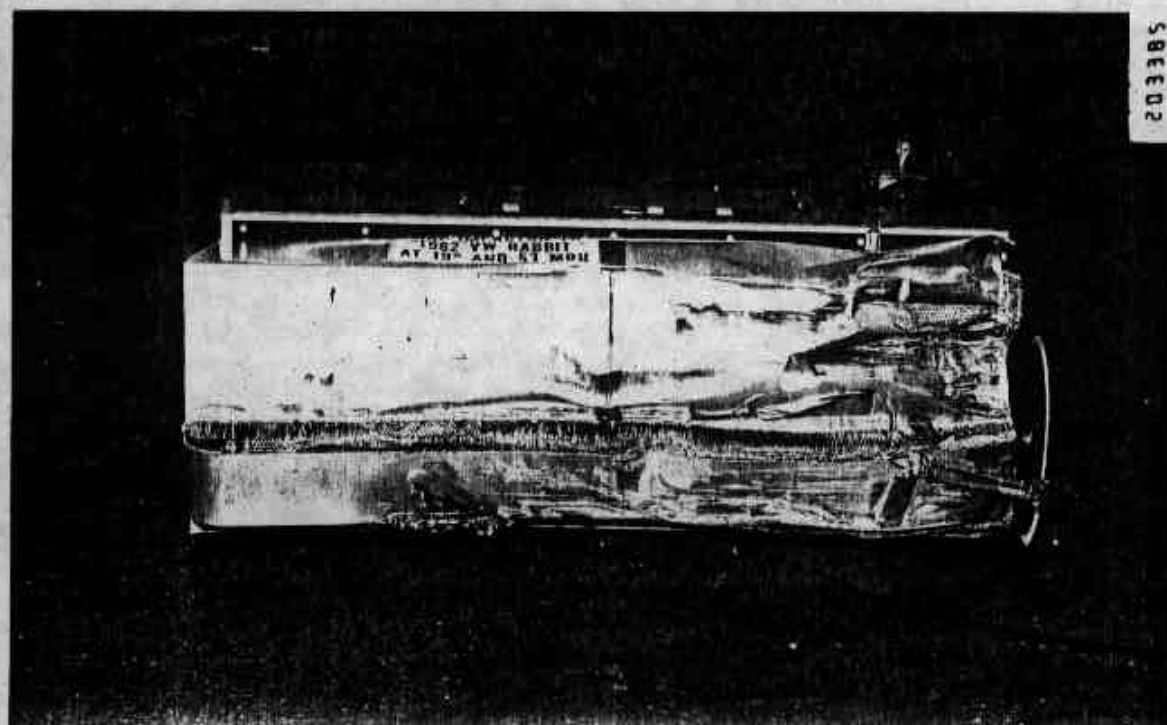


FIGURE A-10. POST-TEST FRONTAL VIEW OF BARRIER FACE.

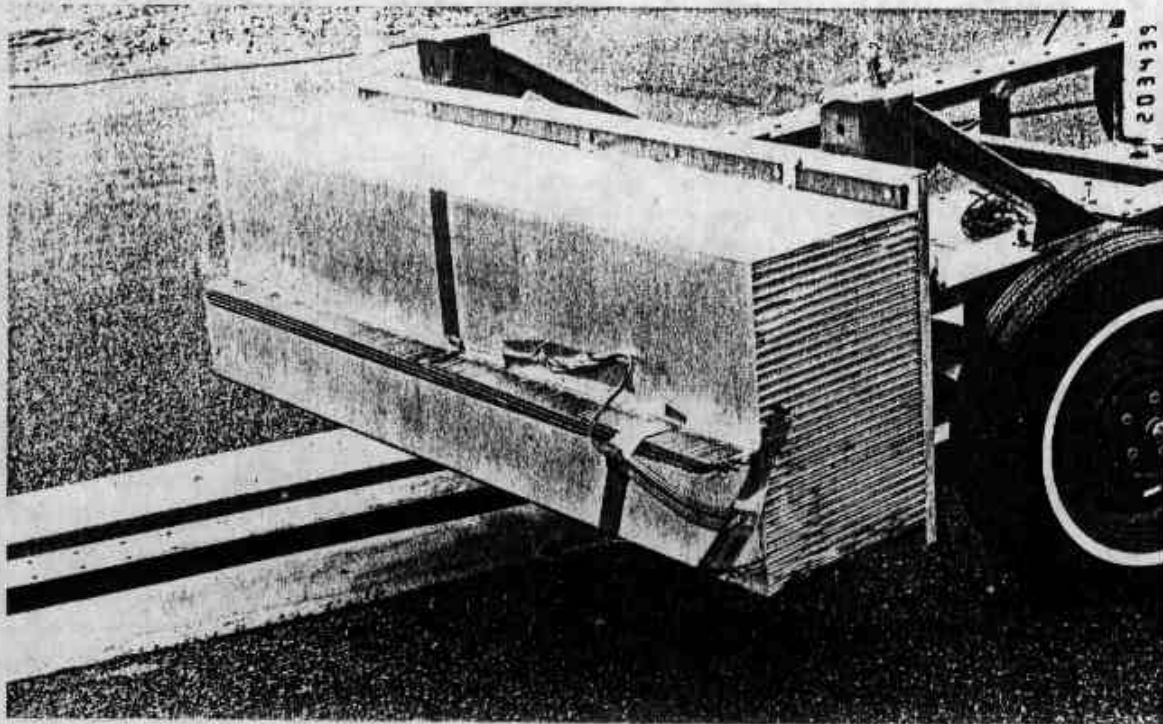


FIGURE A-11. PRE-TEST LEFT SIDE VIEW OF BARRIER FACE.

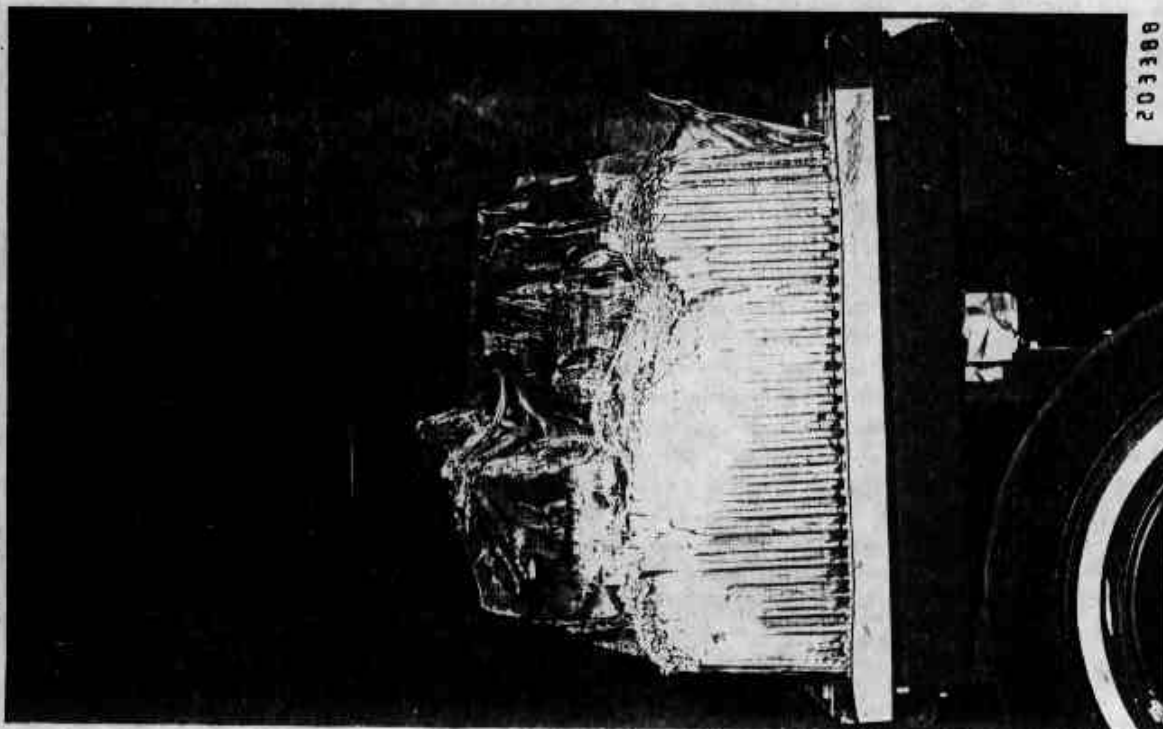


FIGURE A-12. POST-TEST LEFT SIDE VIEW OF BARRIER FACE.

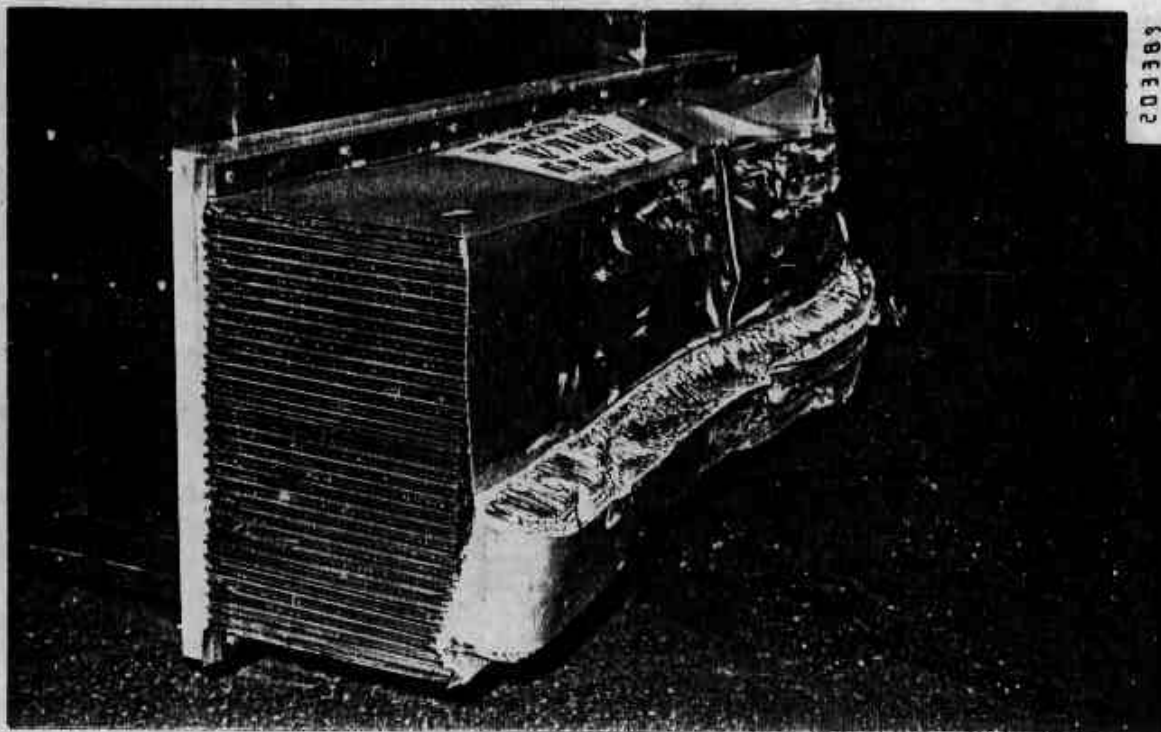


FIGURE A-13. POST-TEST RIGHT SIDE VIEW OF BARRIER FACE.

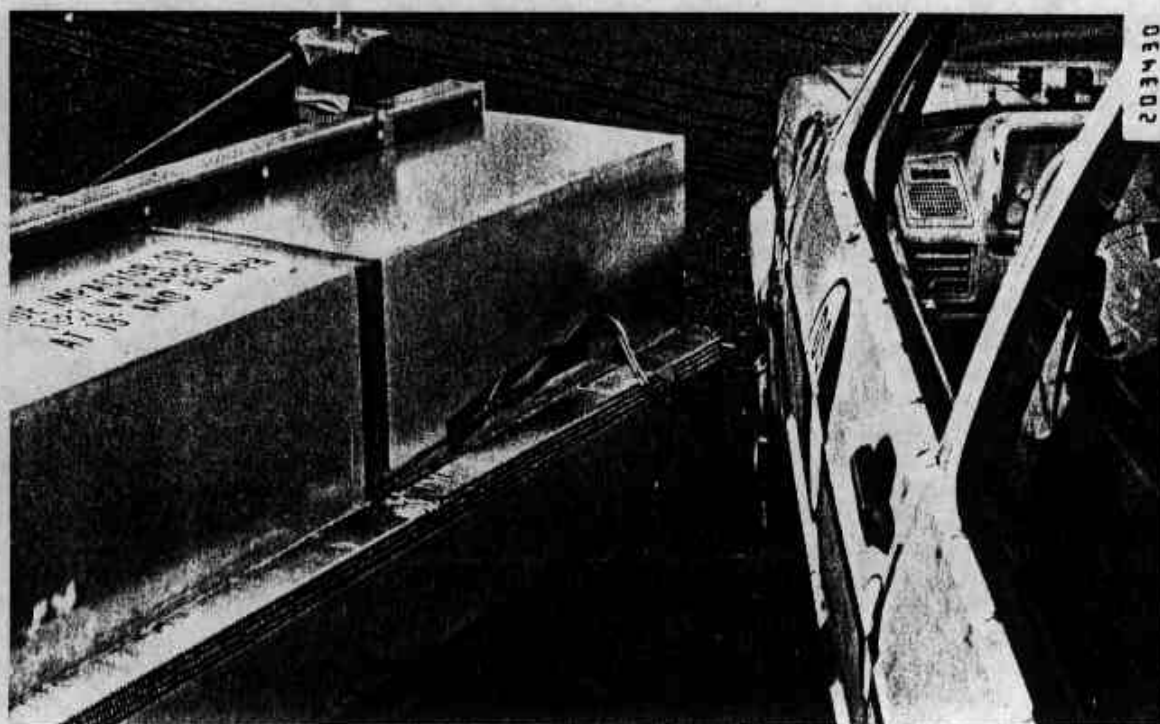


FIGURE A-14a. PRE-TEST SIDE IMPACTOR/VW RABBIT MATCHUP.

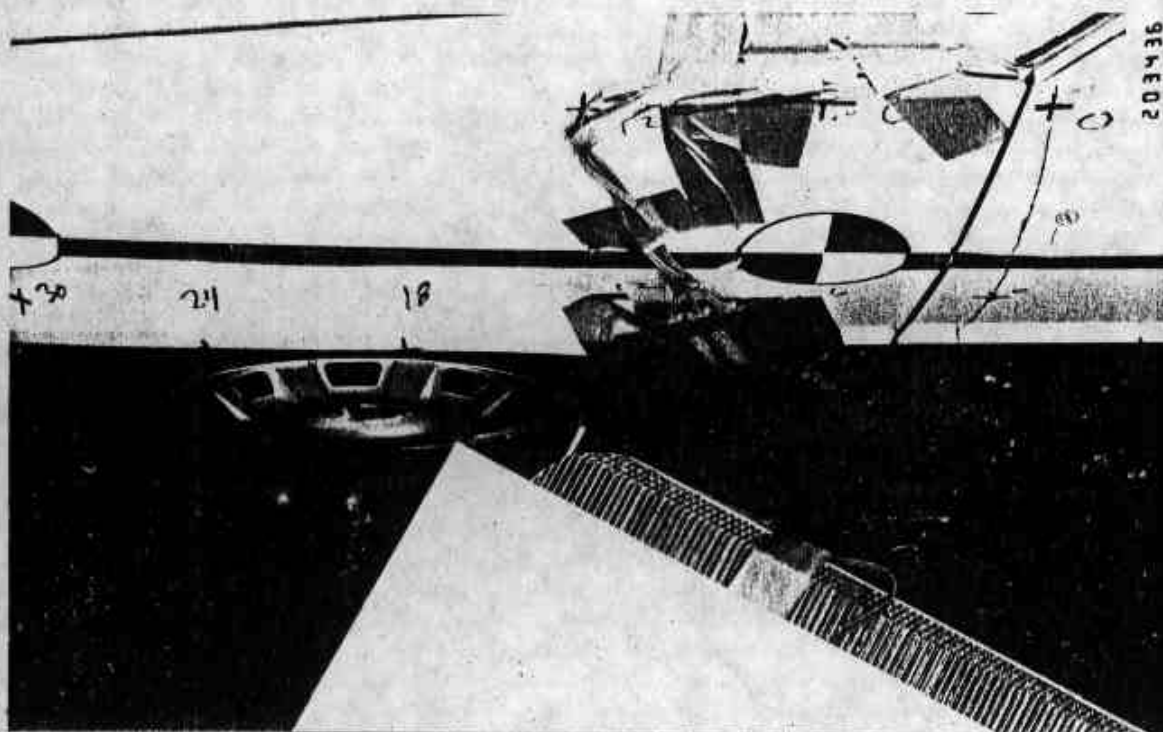


FIGURE A-14b. PRE-TEST IMPACTOR/VW RABBIT MATCHUP.

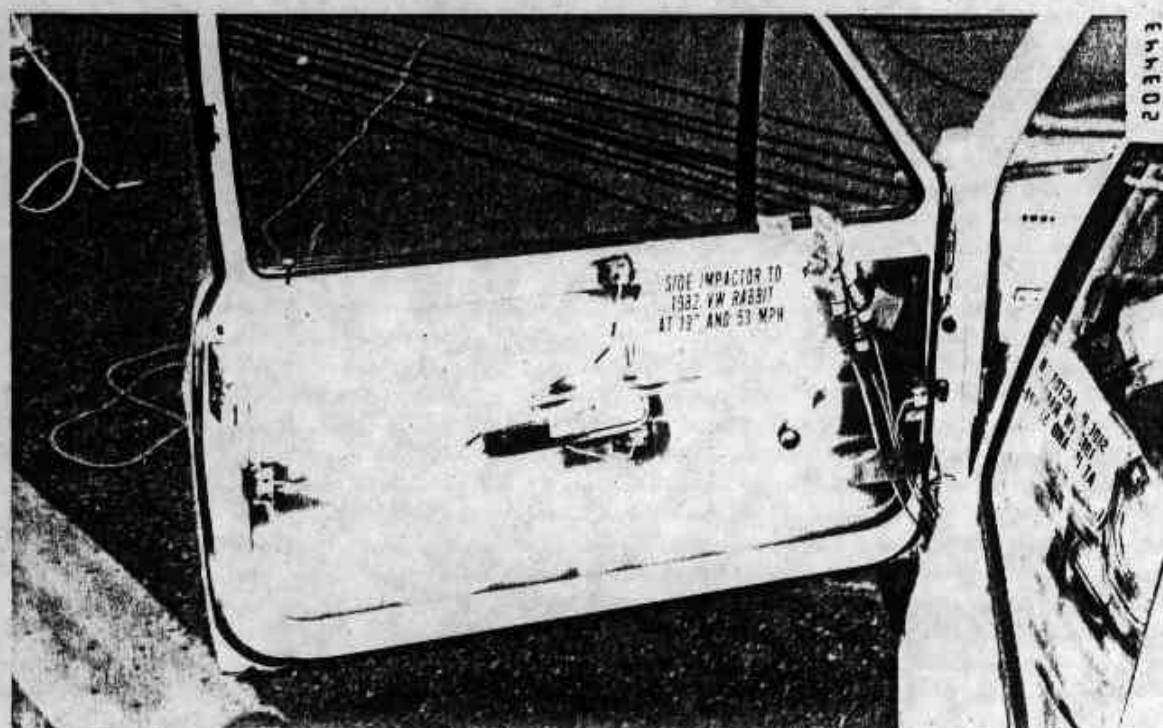


FIGURE A-15. PRE-TEST VW DOOR ACCELEROMETER LOCATIONS.

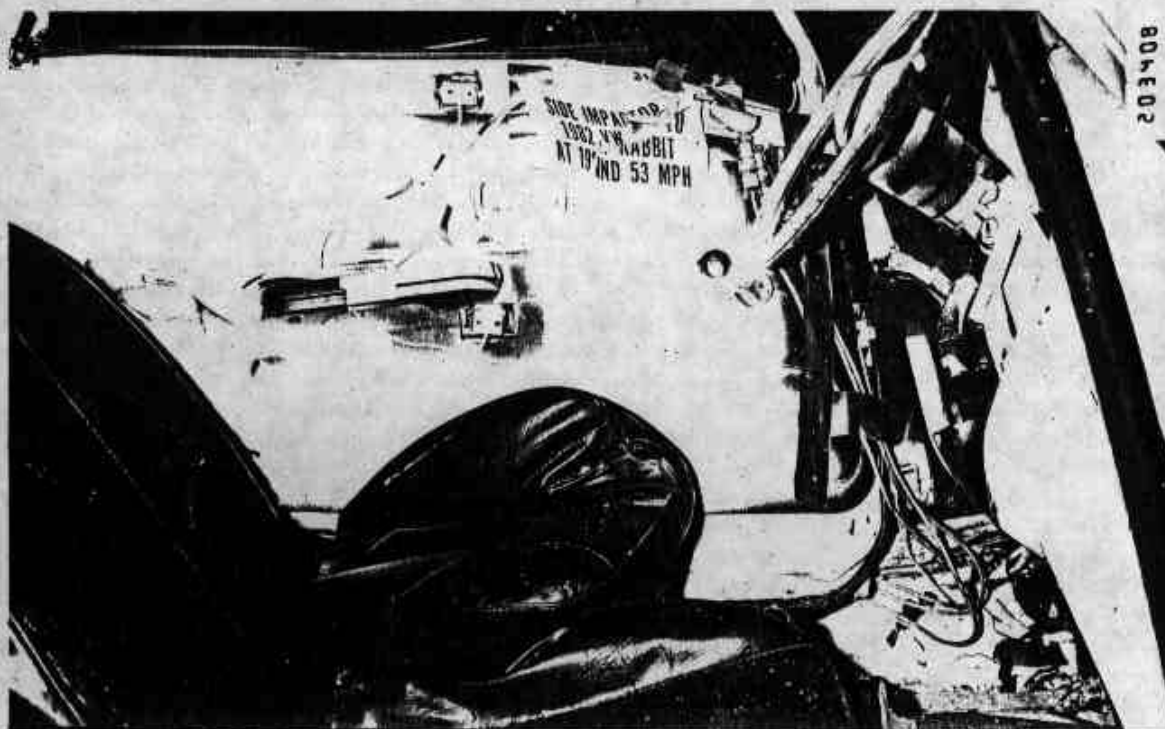


FIGURE A-16a. VW RABBIT POST-TEST INTERIOR DEFORMATION.

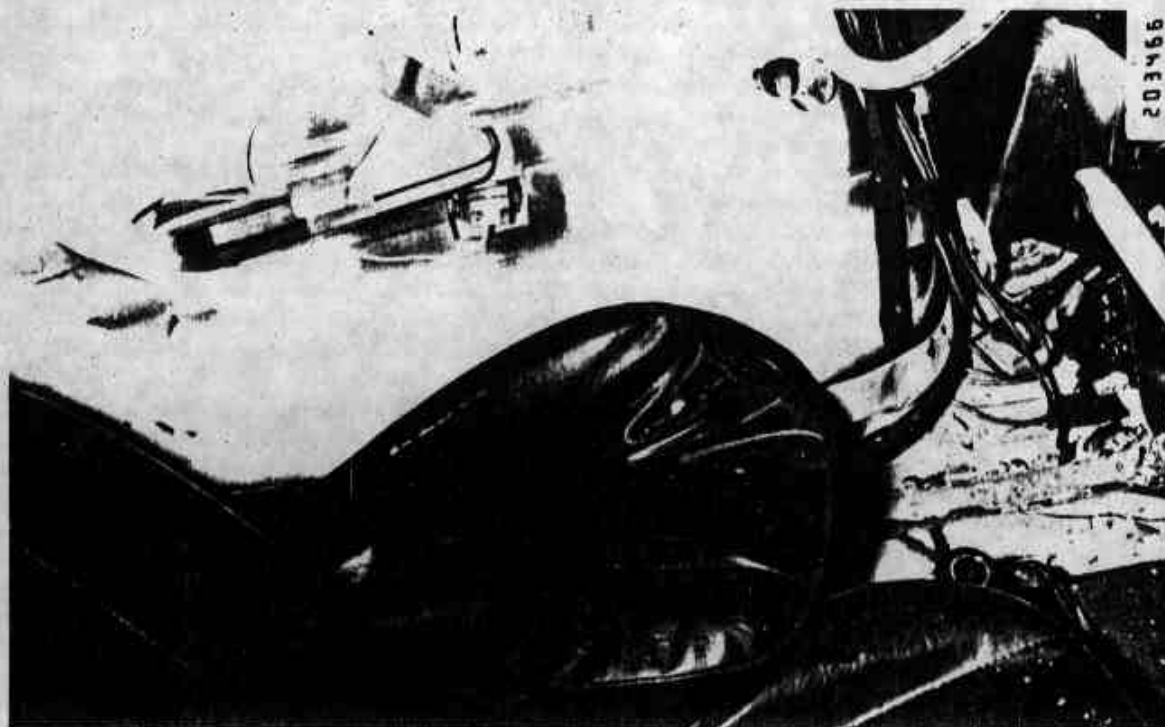


FIGURE A-16b. VW RABBIT POST-TEST INTERIOR DEFORMATION.

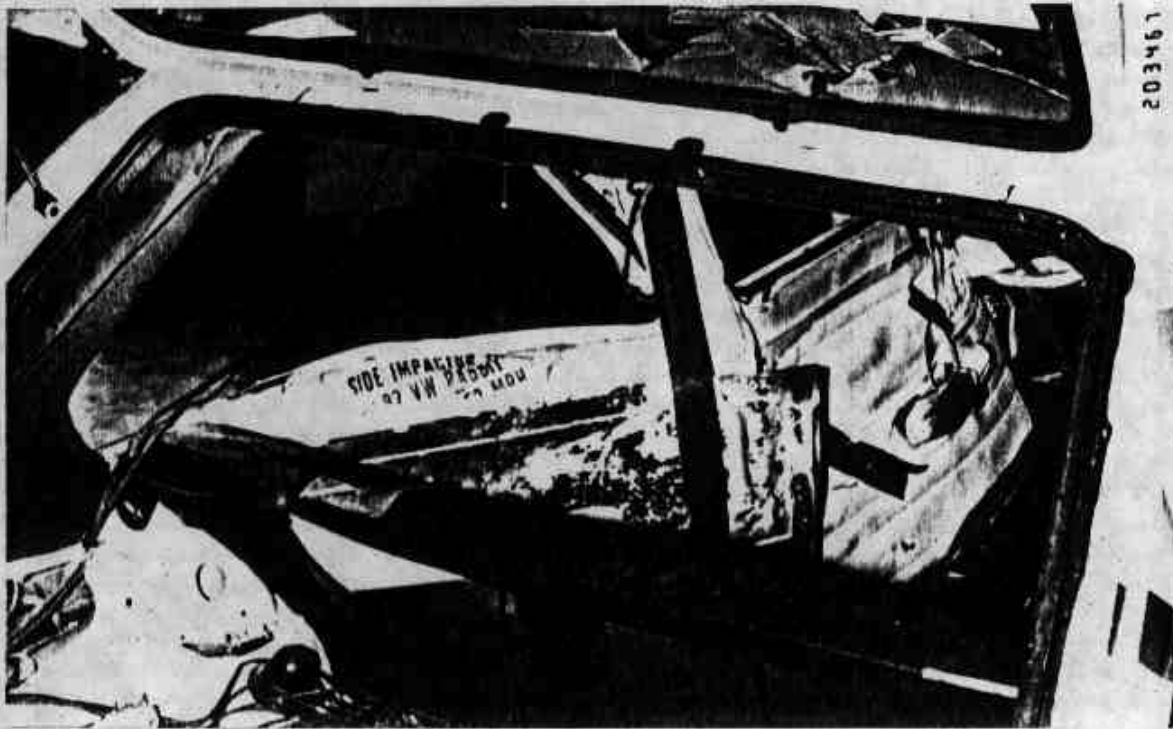


FIGURE A-16c. VW RABBIT POST-TEST INTERIOR DEFORMATION.

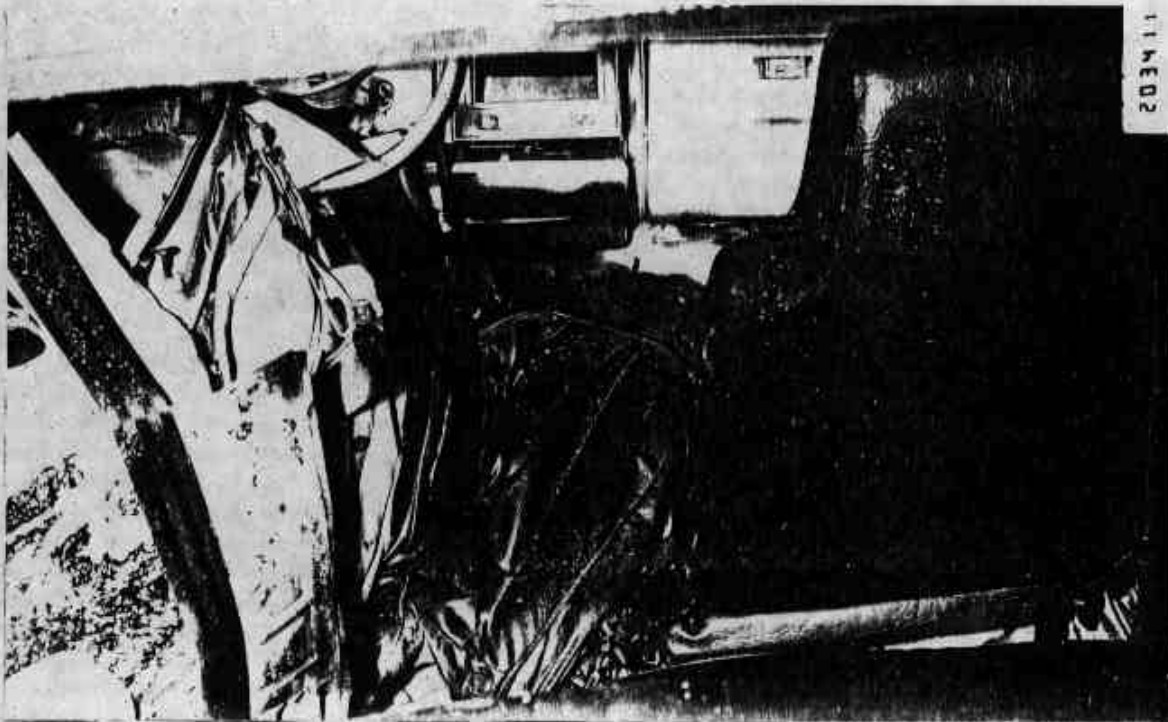


FIGURE A-16d. VW RABBIT POST-TEST INTERIOR DEFORMATION.



FIGURE A-17a. PRE-TEST DRIVER DUMMY POSITION.



FIGURE A-17b. PRE-TEST DRIVER DUMMY POSITION.

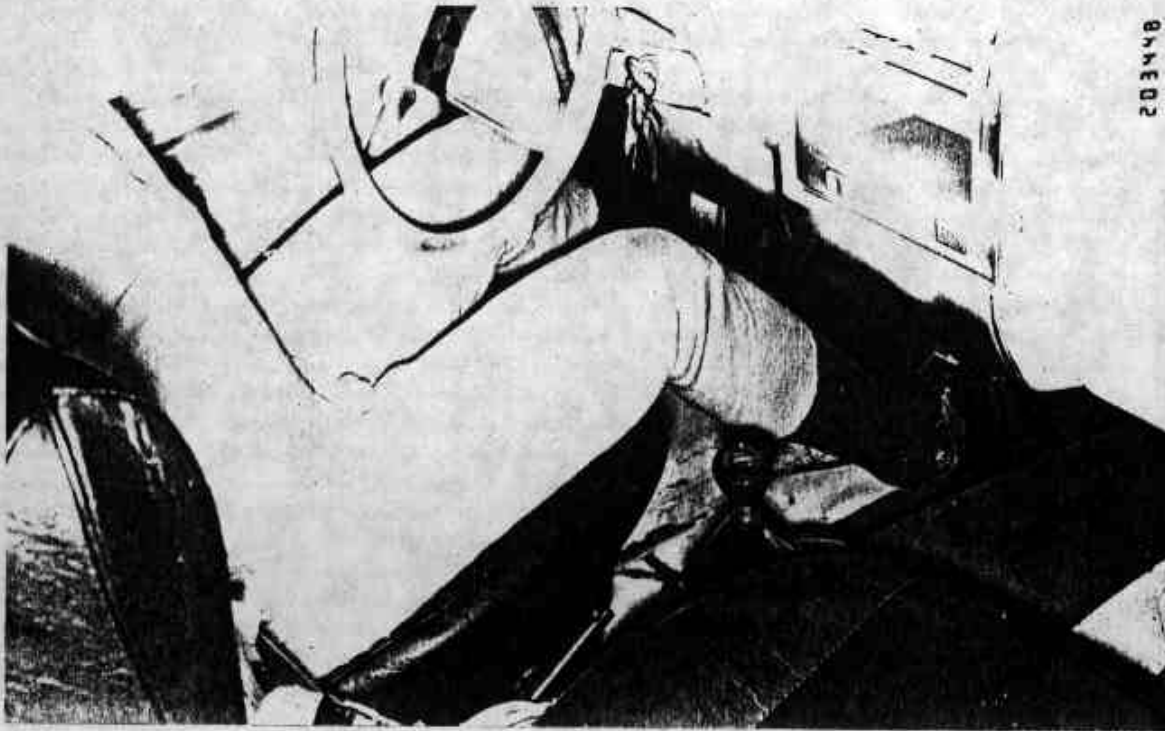


FIGURE A-17c. PRE-TEST DRIVER DUMMY POSITION.



FIGURE A-18a. POST-TEST DRIVER DUMMY POSITION.

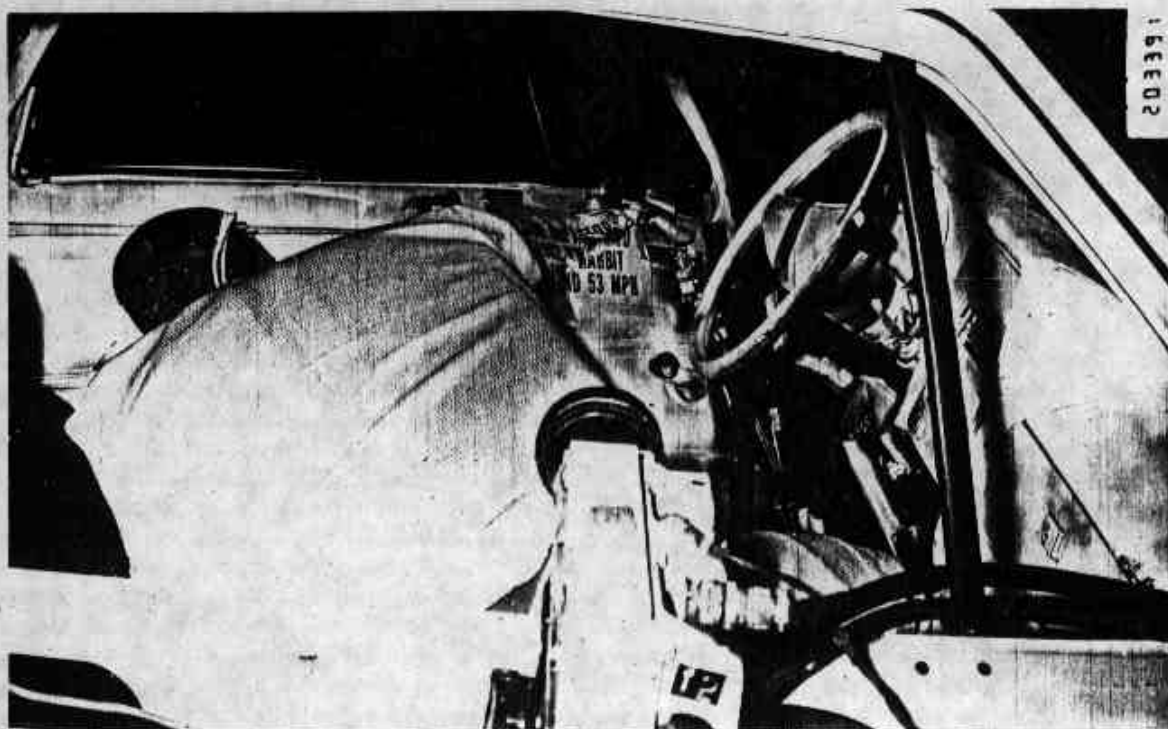


FIGURE A-18b. POST-TEST DRIVER DUMMY POSITION.

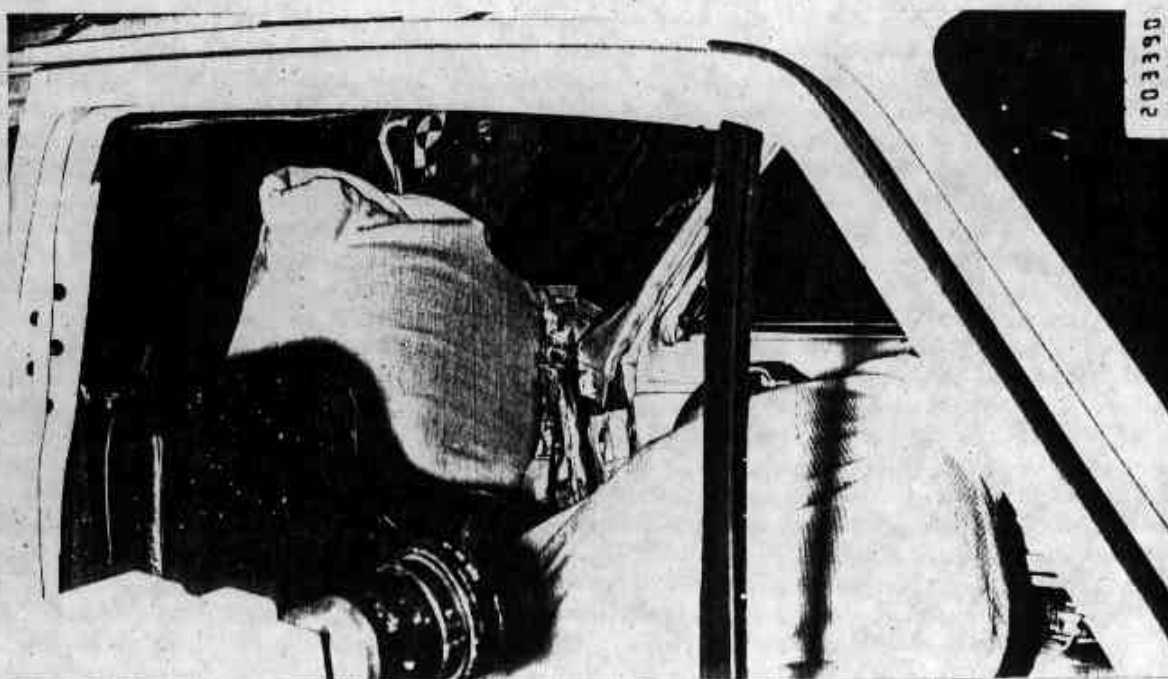


FIGURE A-18c. POST-TEST DRIVER DUMMY POSITION.

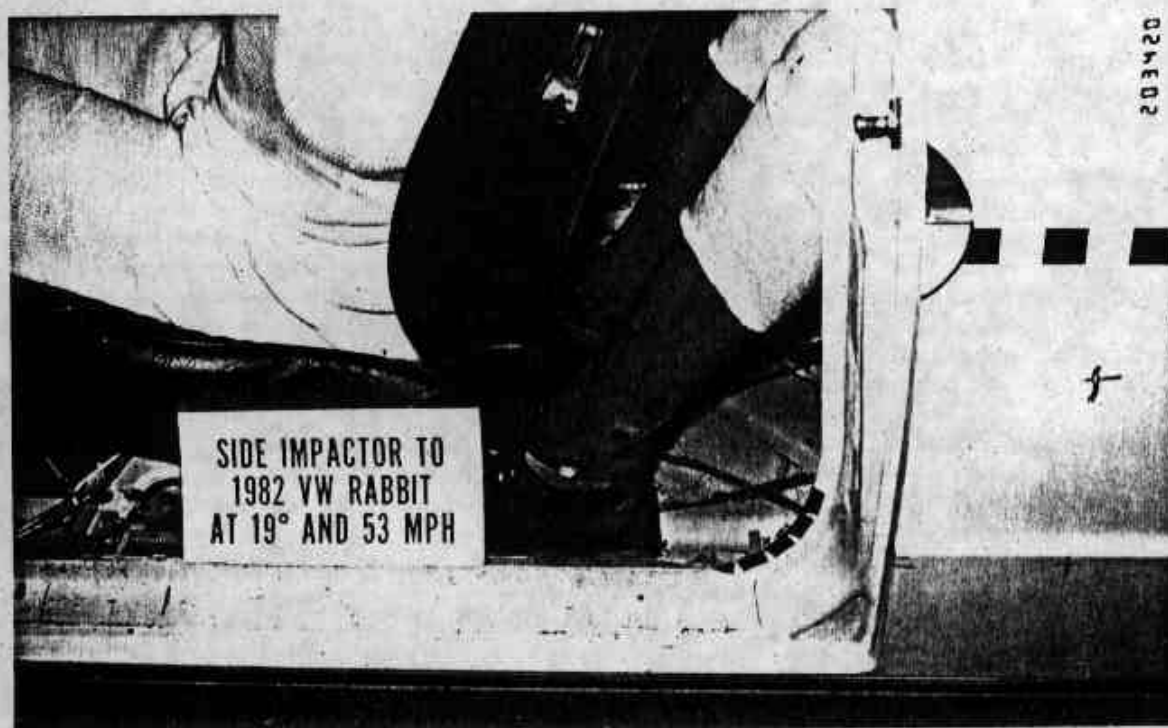


FIGURE A-19a. PRE-TEST REAR PASSENGER DUMMY POSITION.



FIGURE A-19b. PRE-TEST LEFT REAR PASSENGER DUMMY POSITION.



FIGURE A-19c. PRE-TEST LEFT REAR PASSENGER DUMMY POSITION.

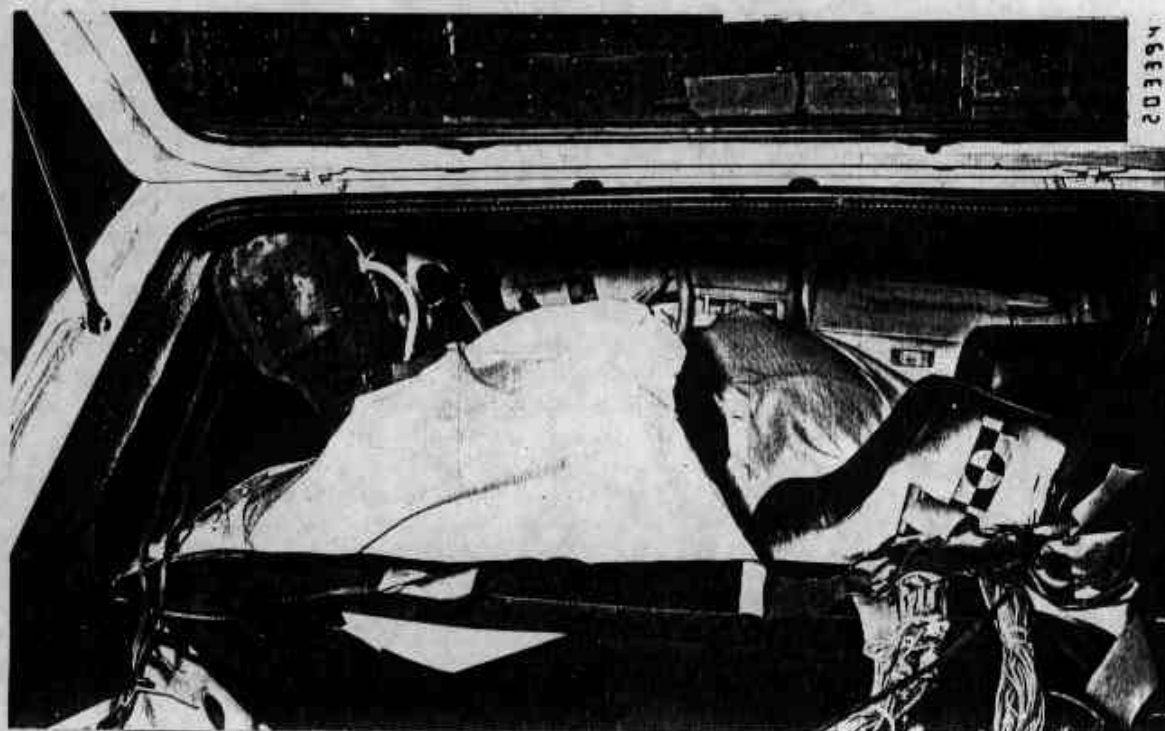


FIGURE A-20a. POST-TEST LEFT REAR PASSENGER DUMMY POSITION.

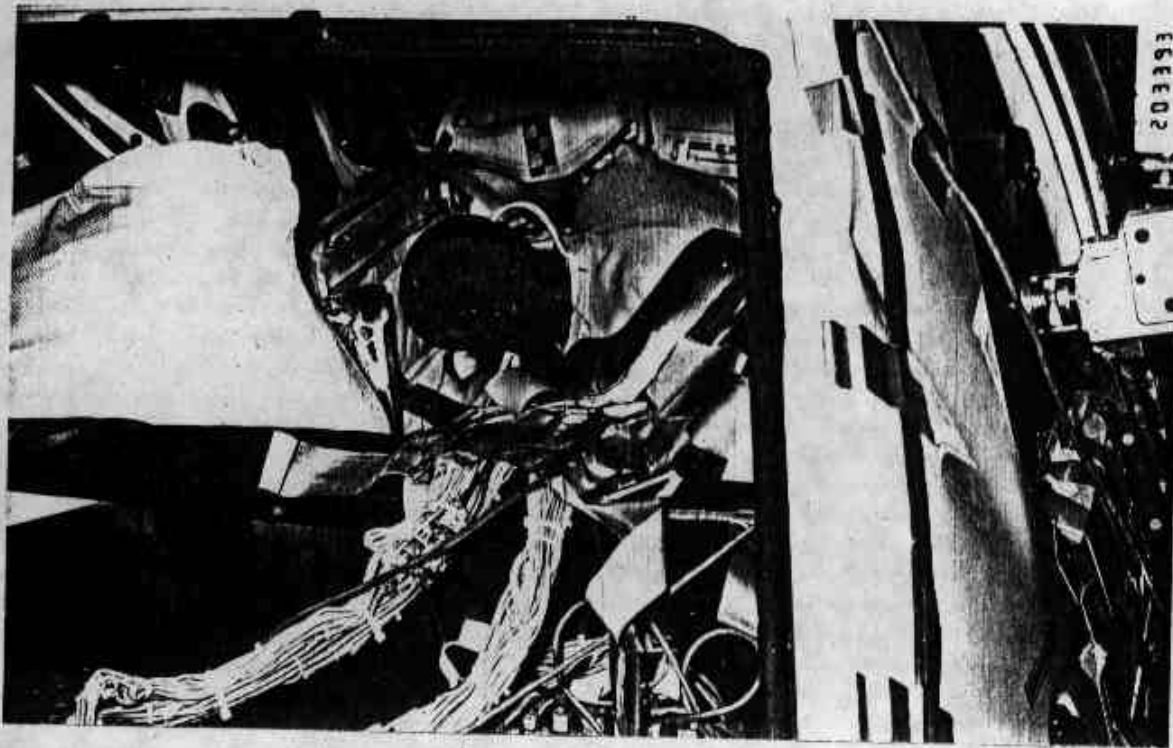


FIGURE A-20b. POST-TEST LEFT REAR PASSENGER DUMMY POSITION.

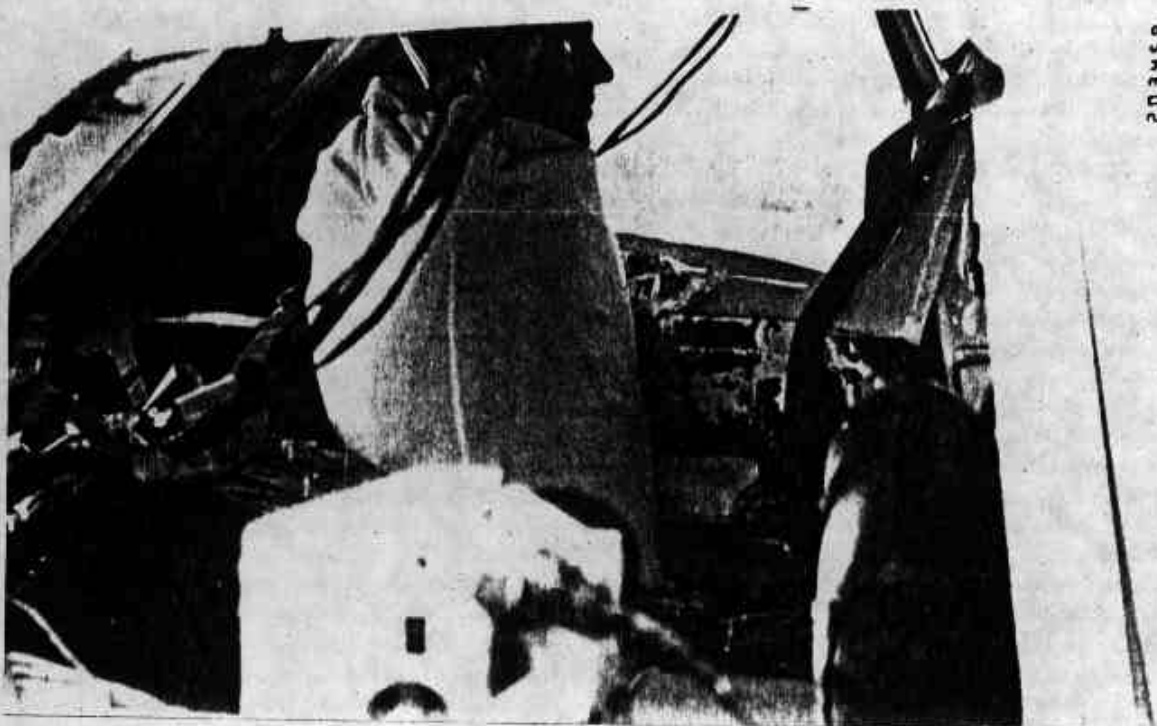
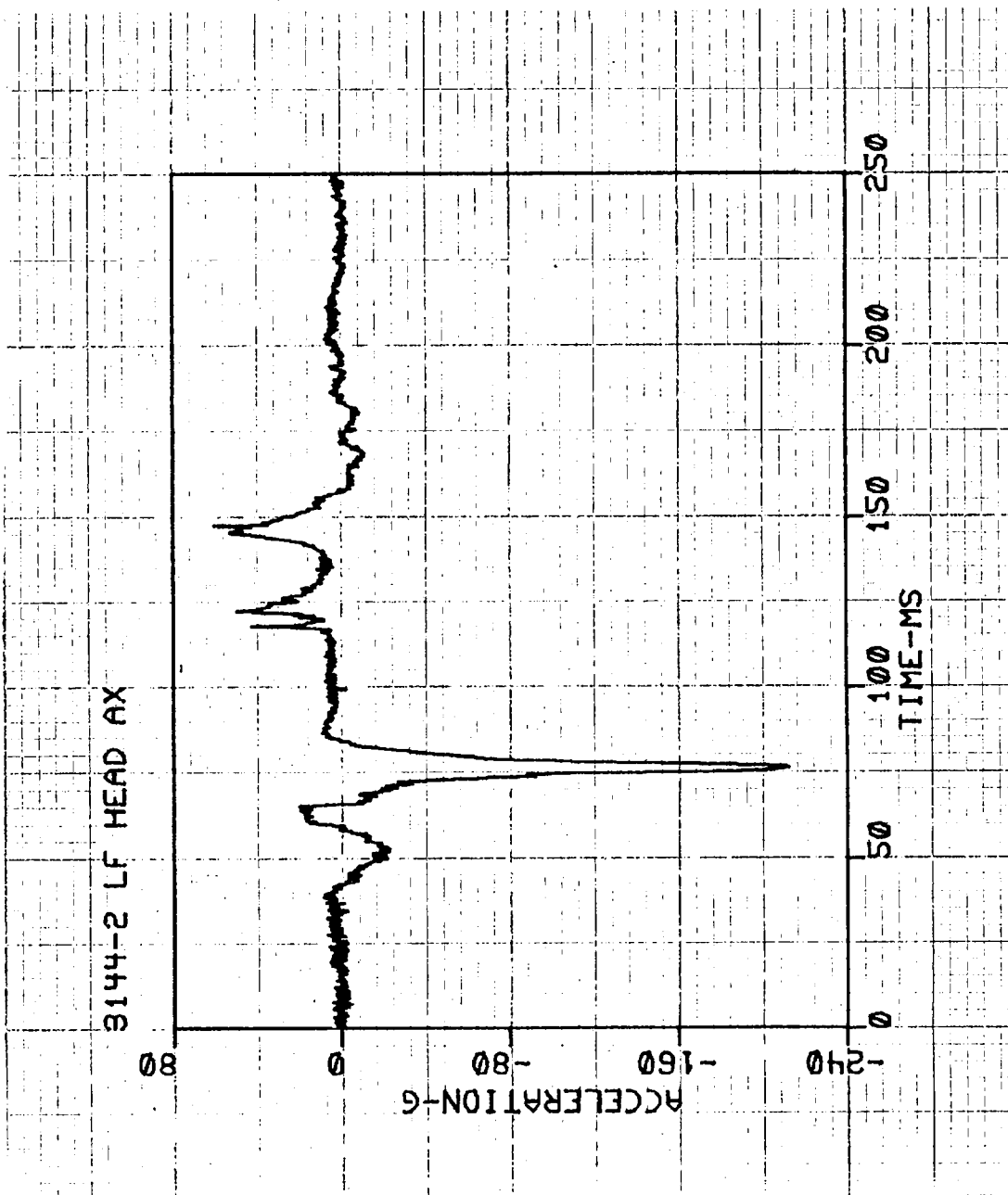
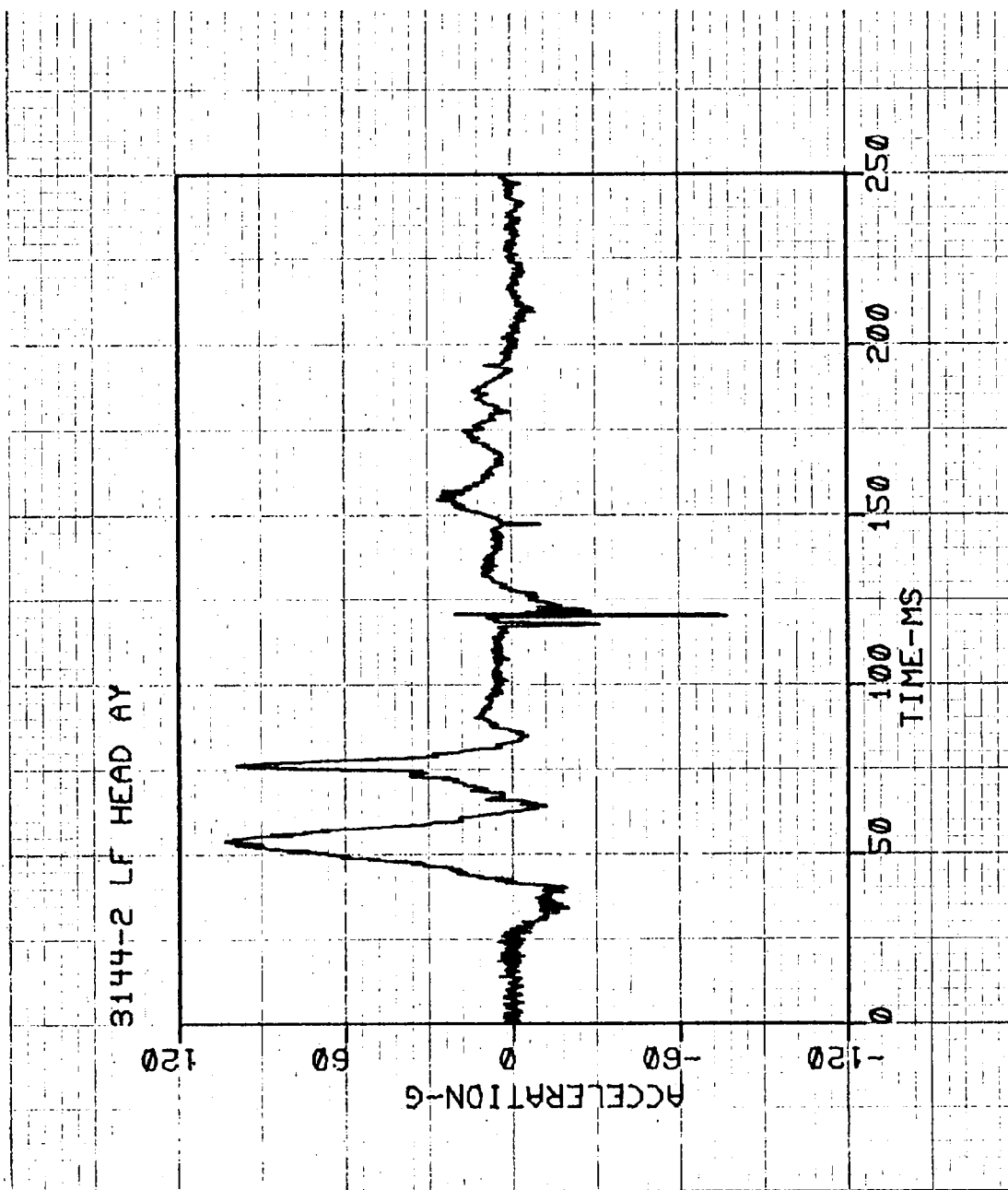
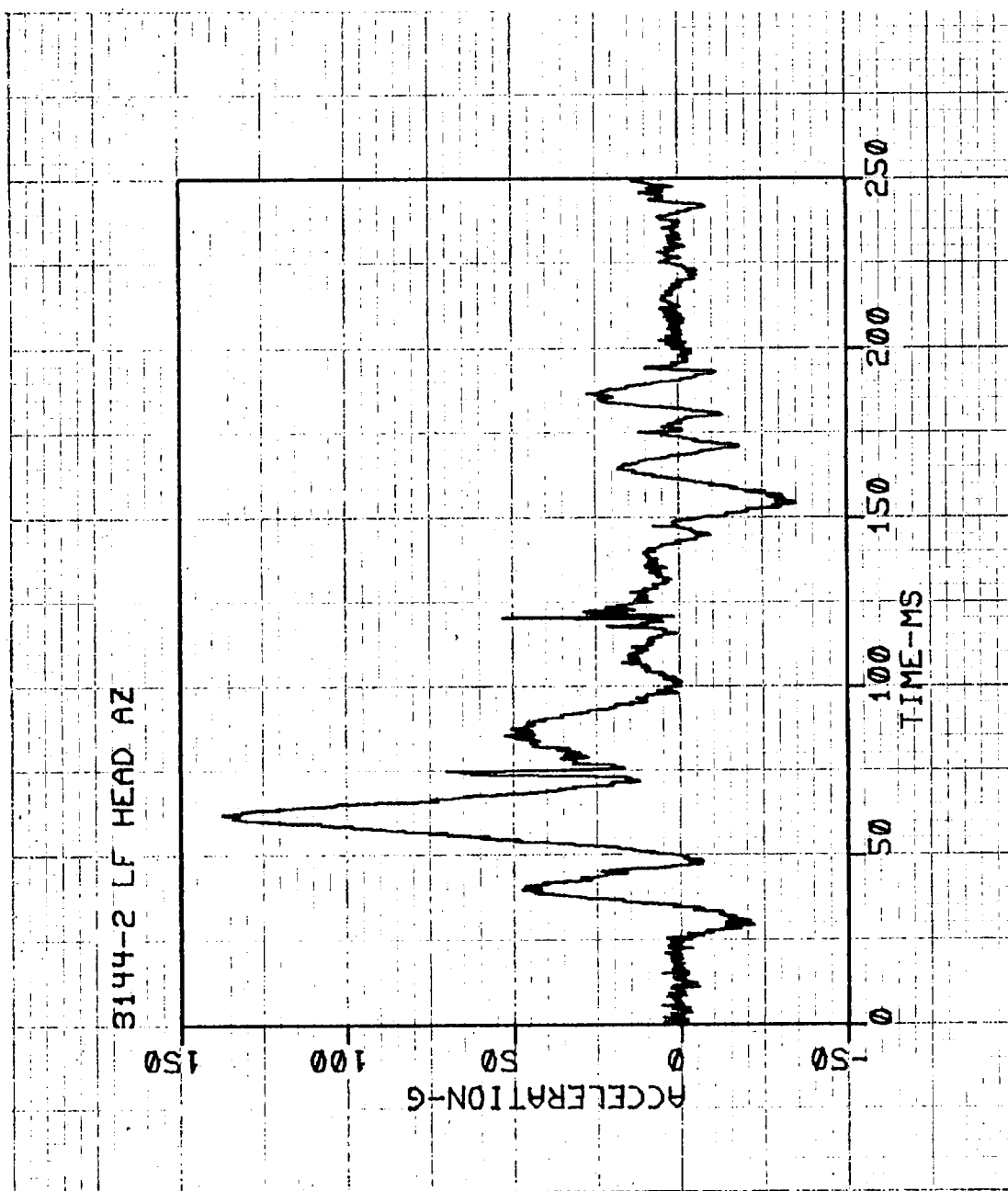


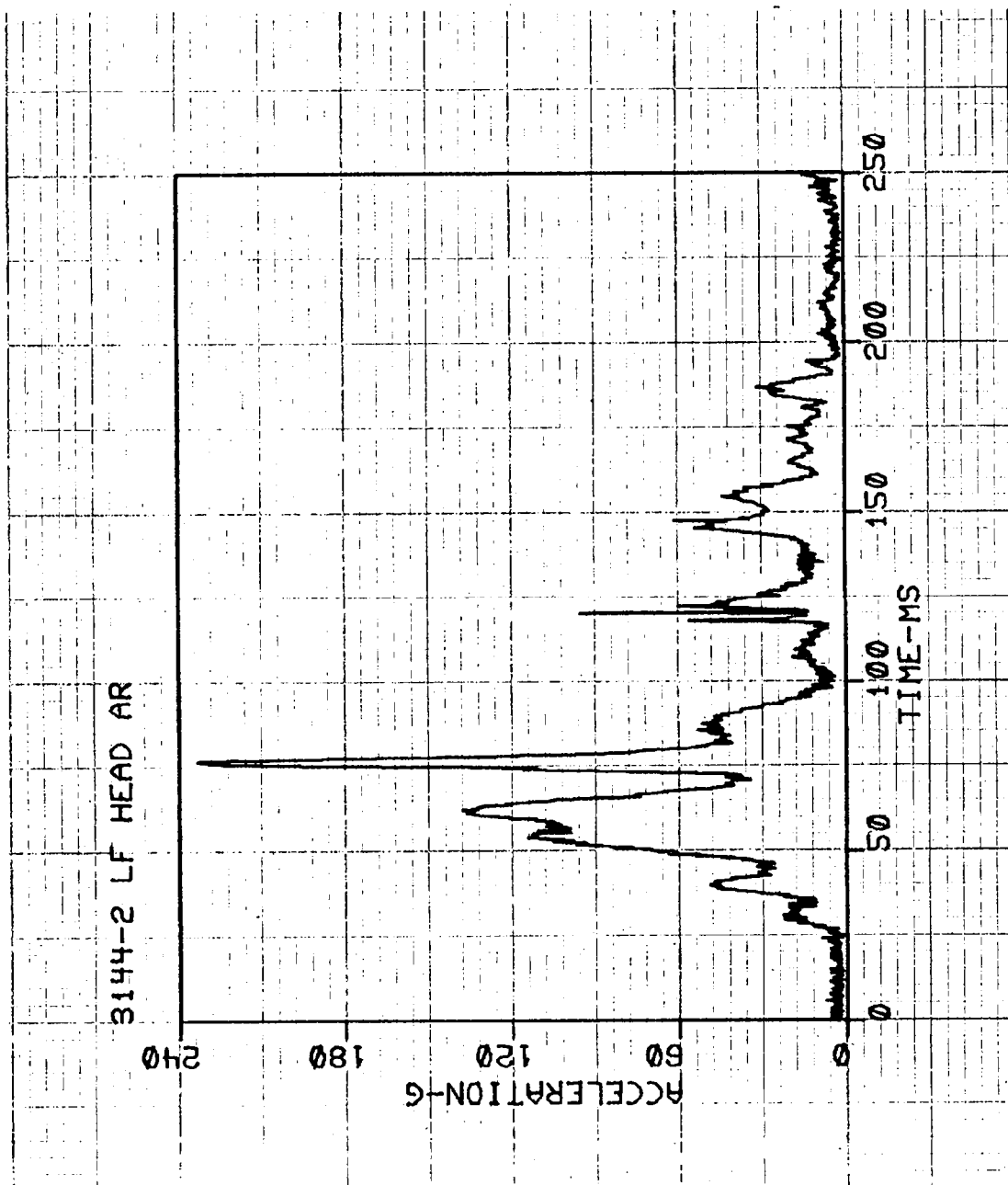
FIGURE A-20c. POST-TEST LEFT PASSENGER DUMMY POSITION.

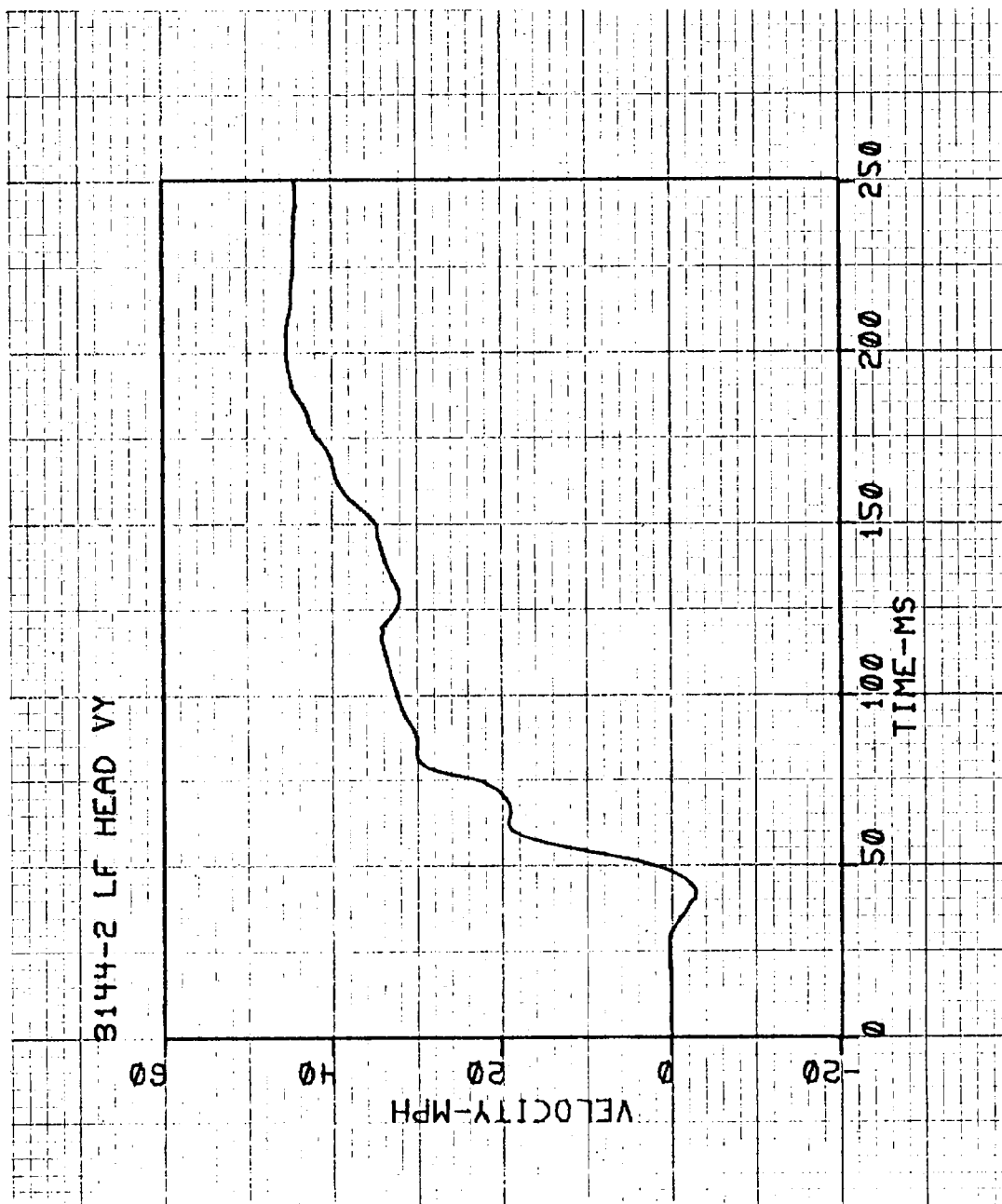
APPENDIX B
CALCOMP PLOTS FOR
19° CRABBED SIDE IMPACTOR
TO 1982 VOLKSWAGEN RABBIT
AT 53.38 MPH

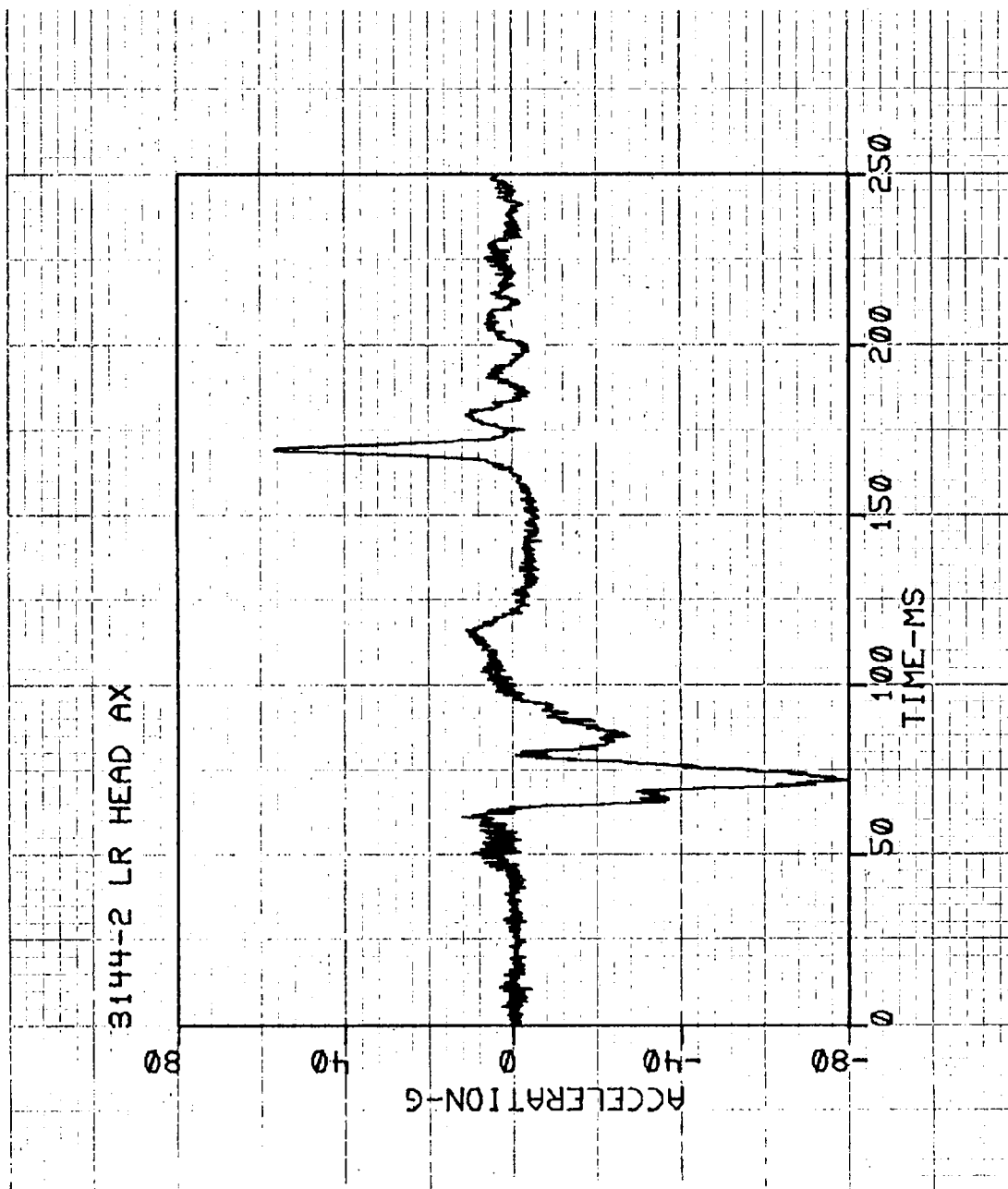


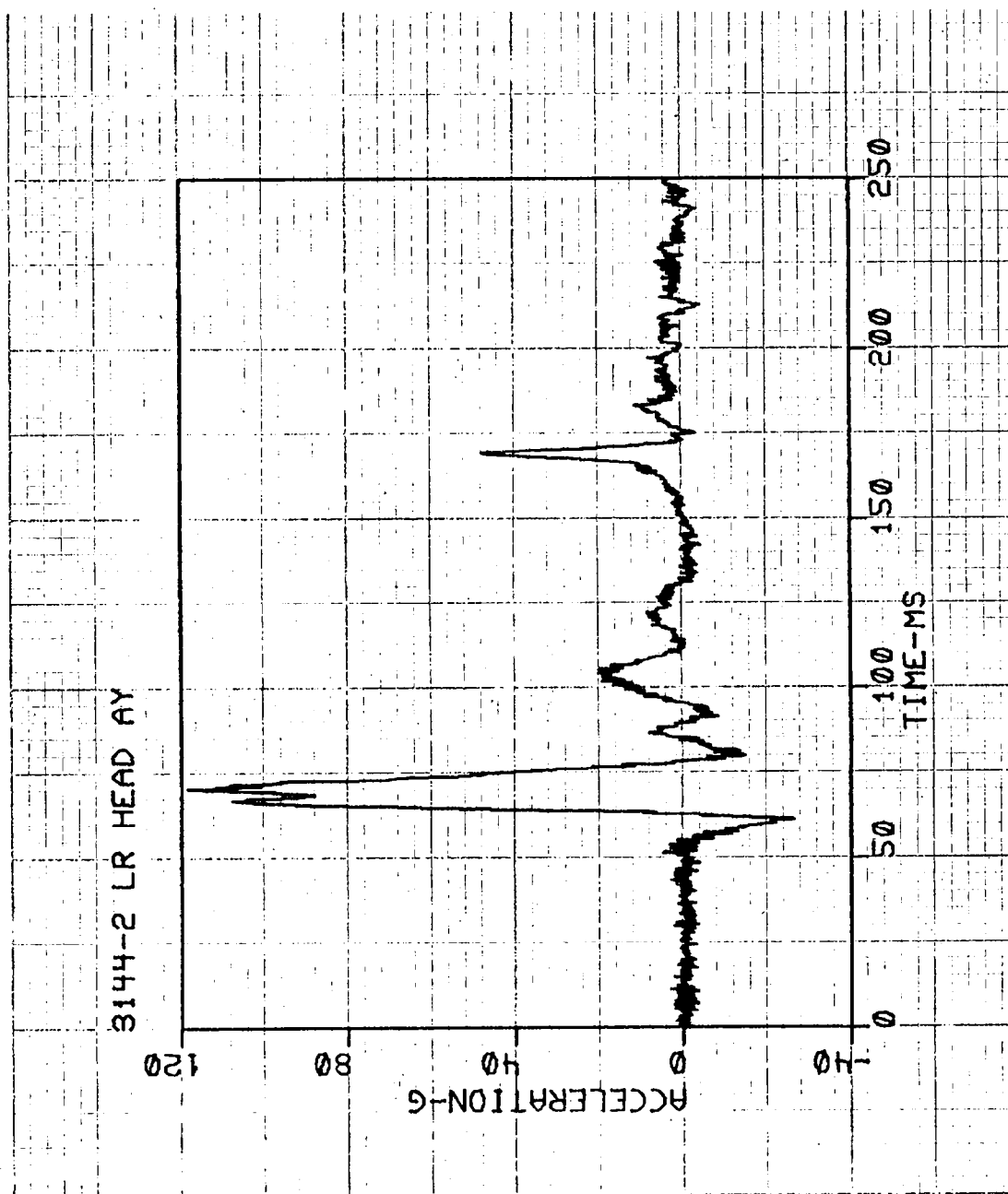


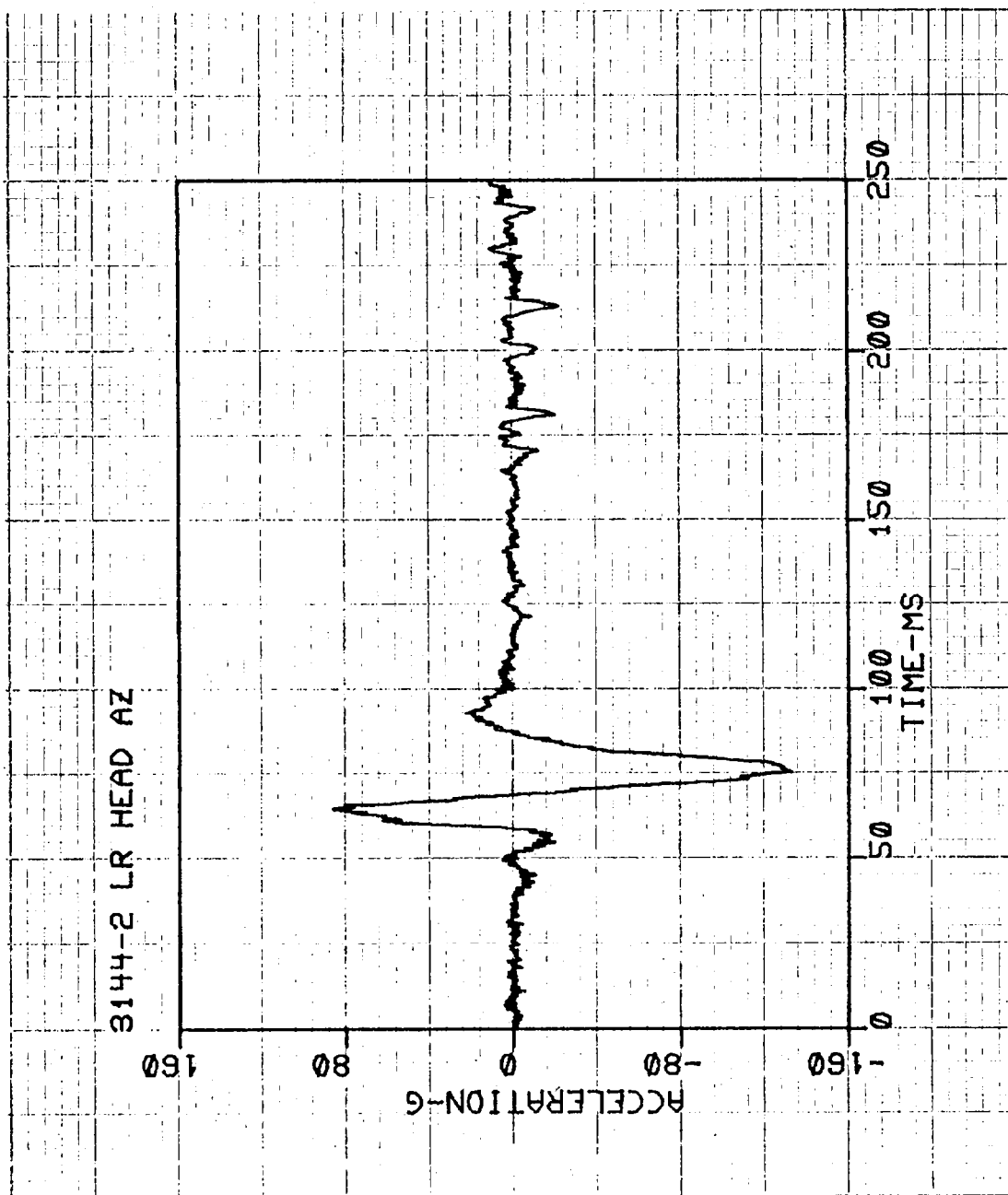


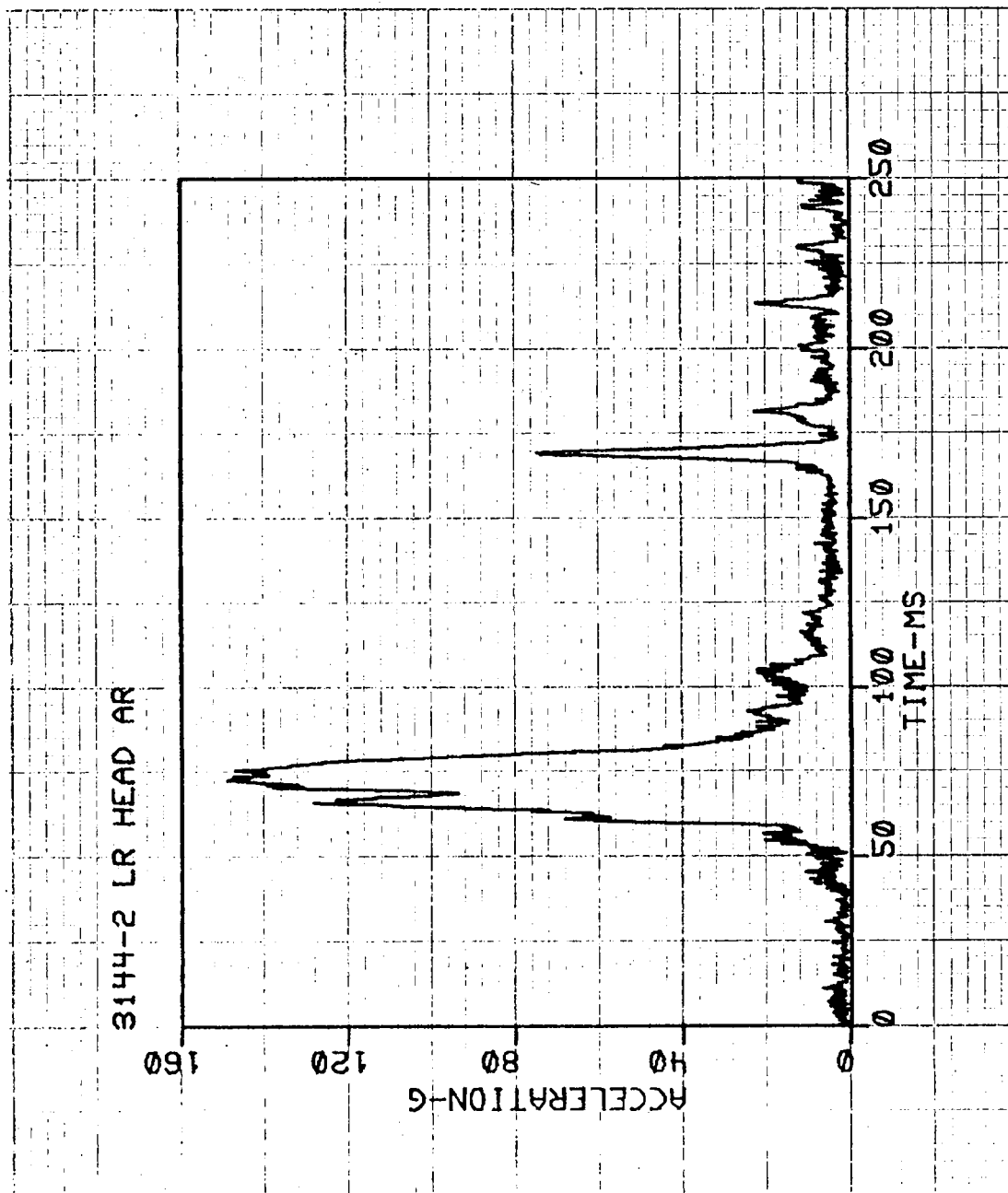


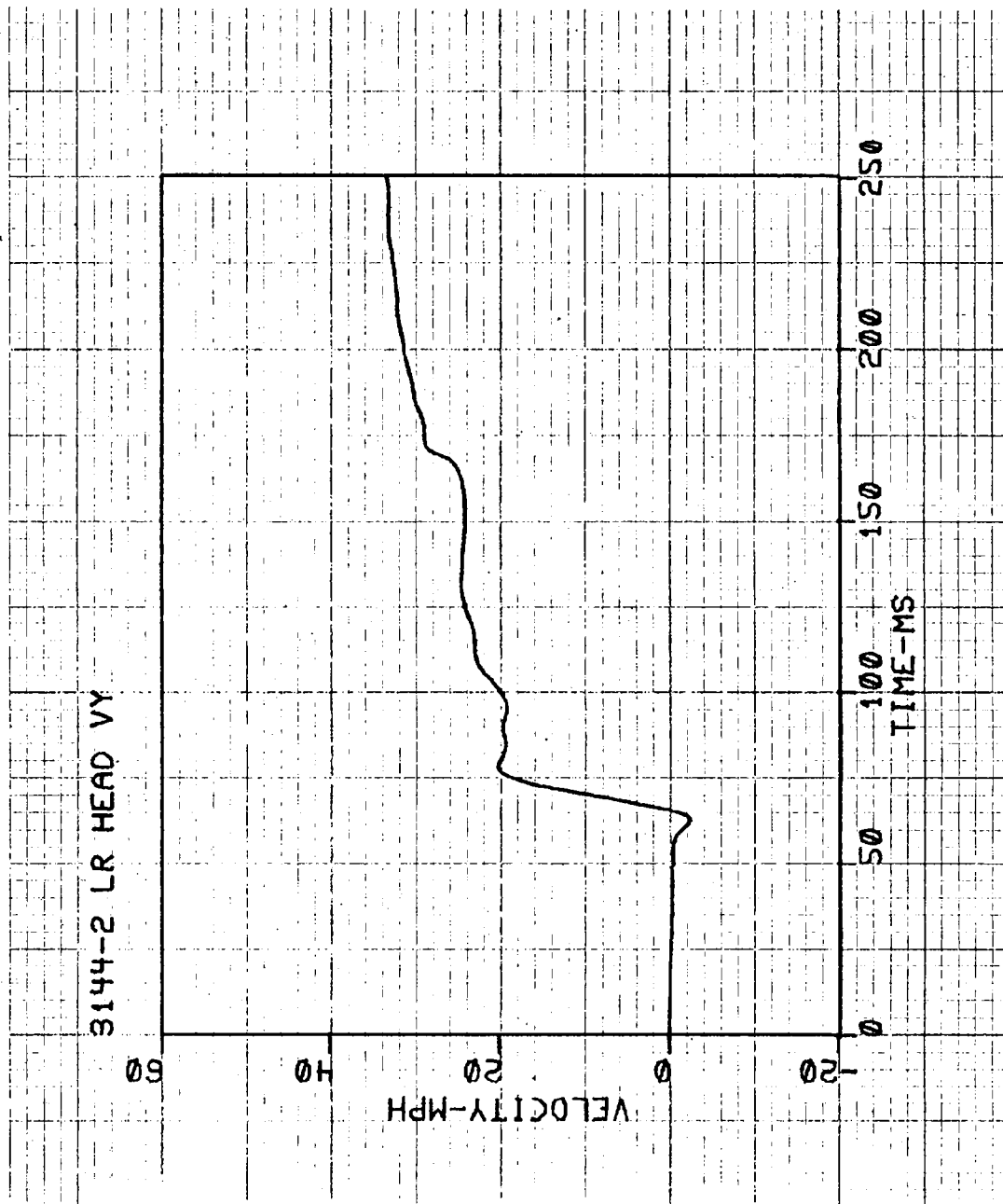


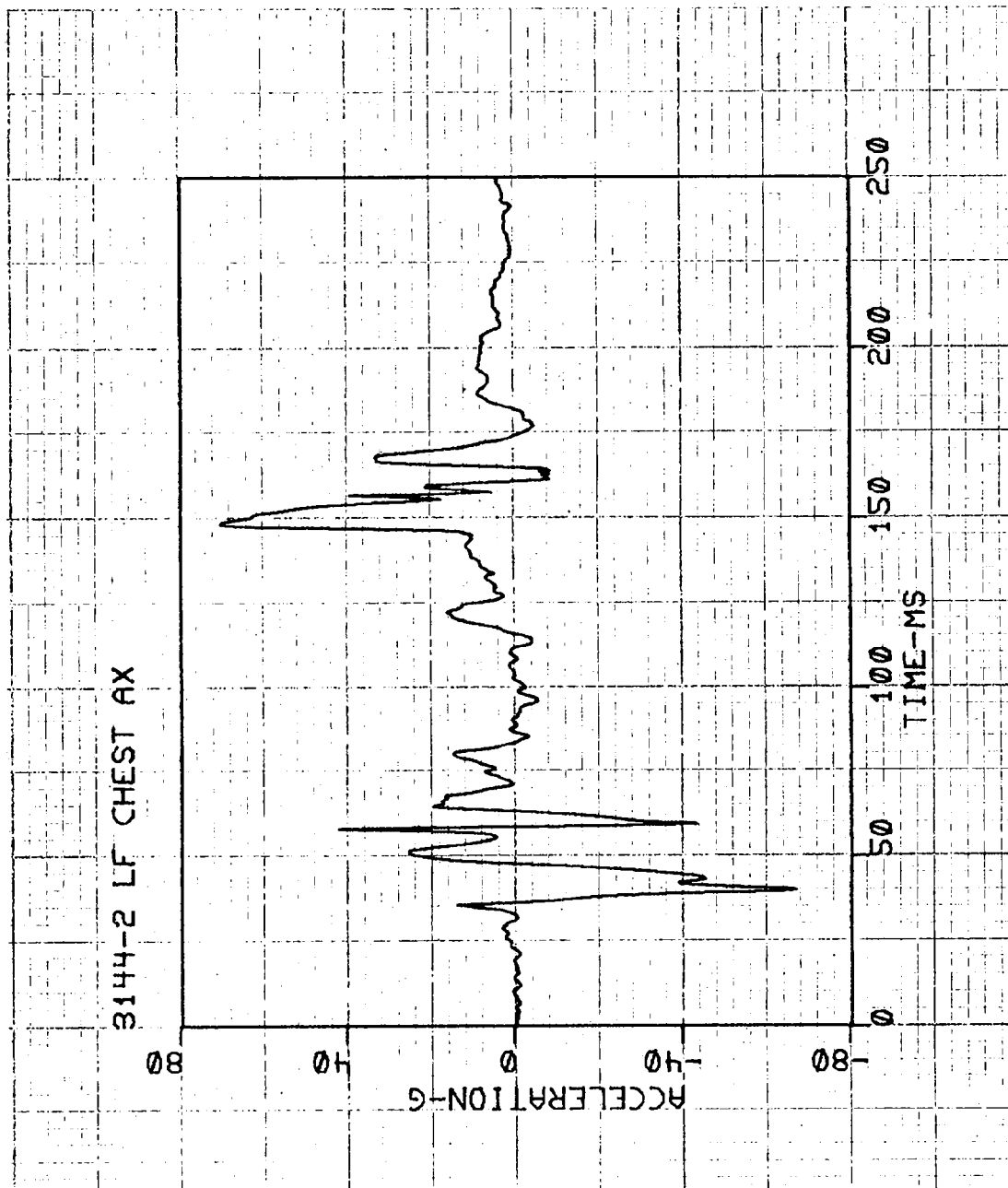


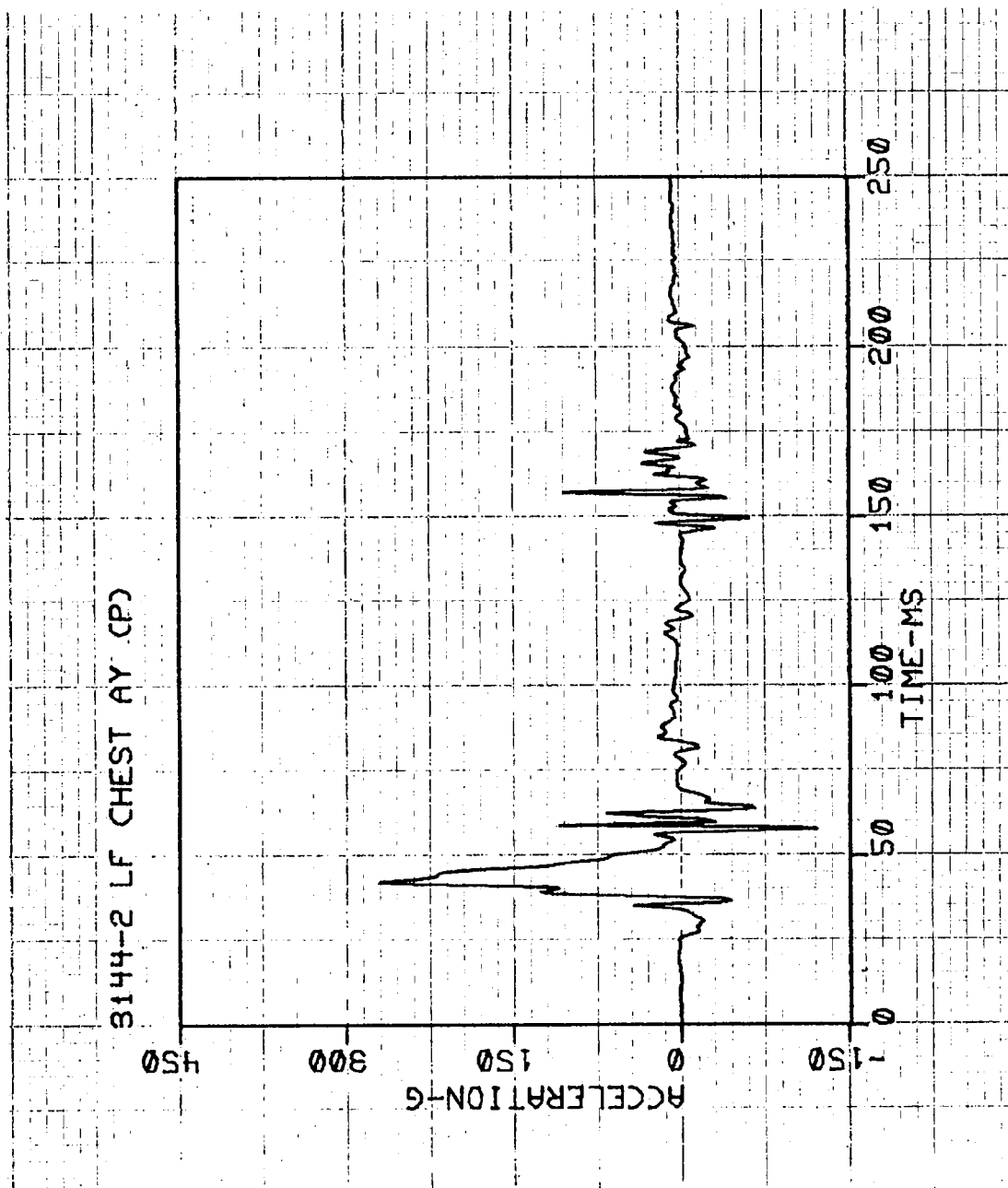


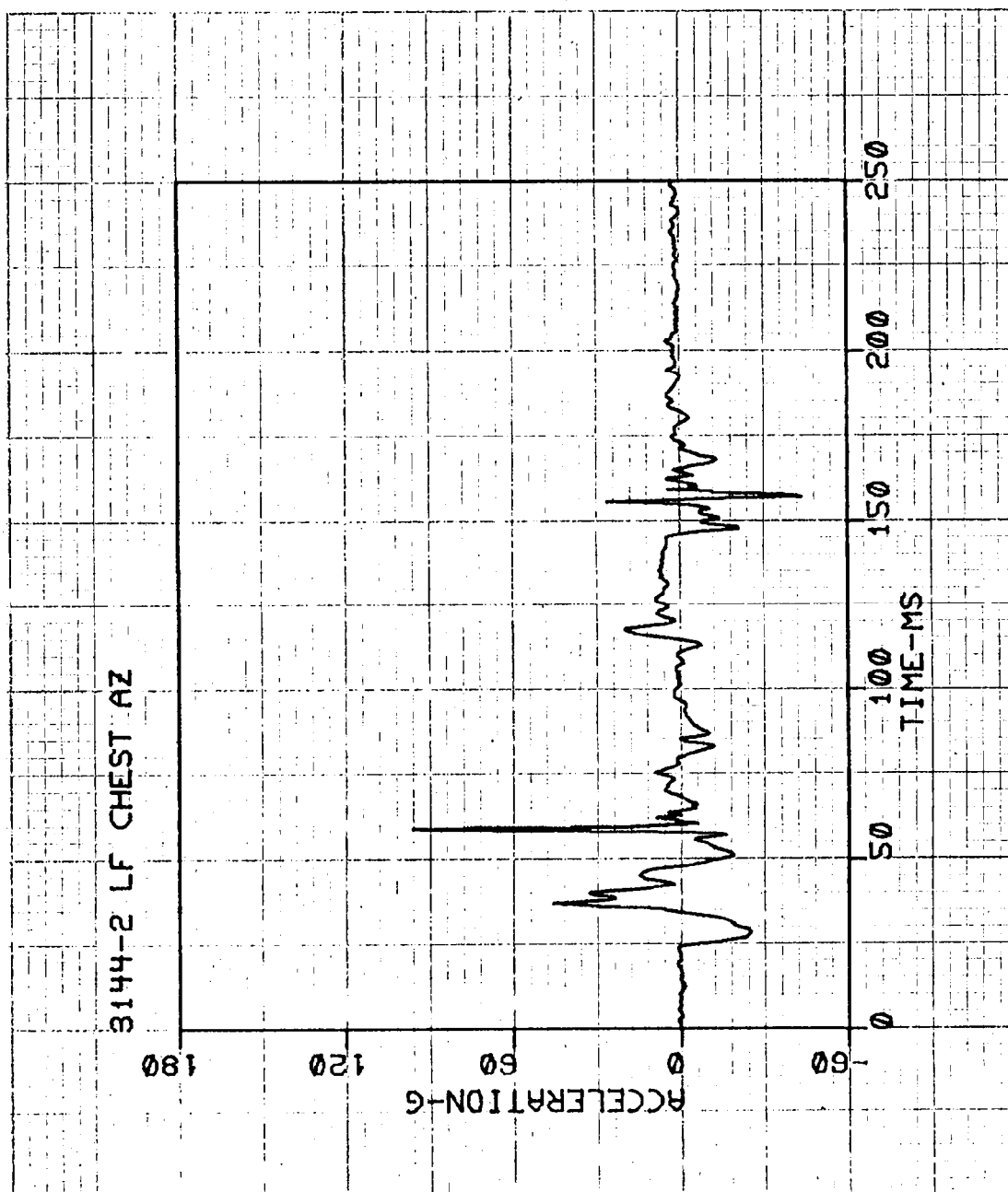


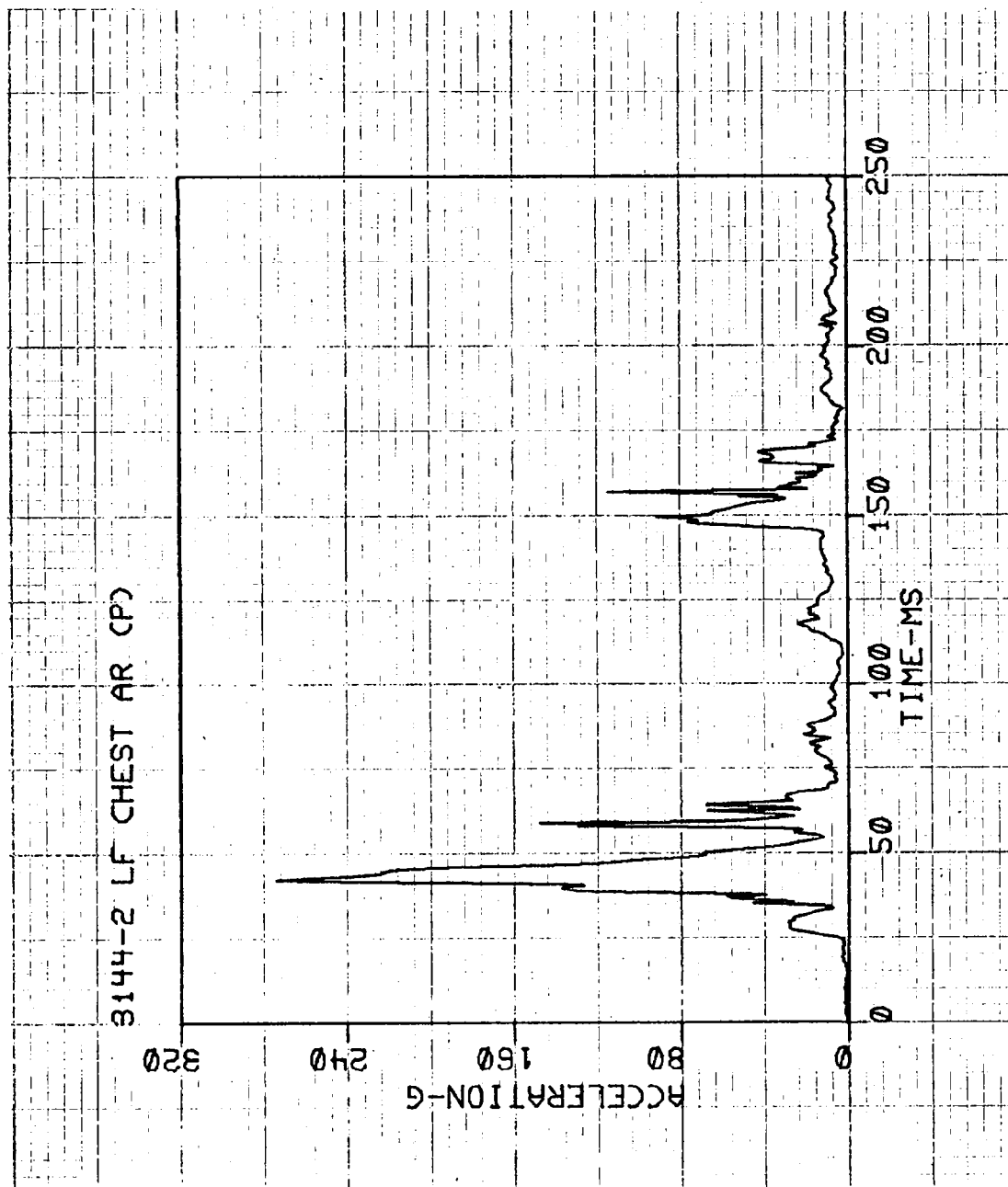


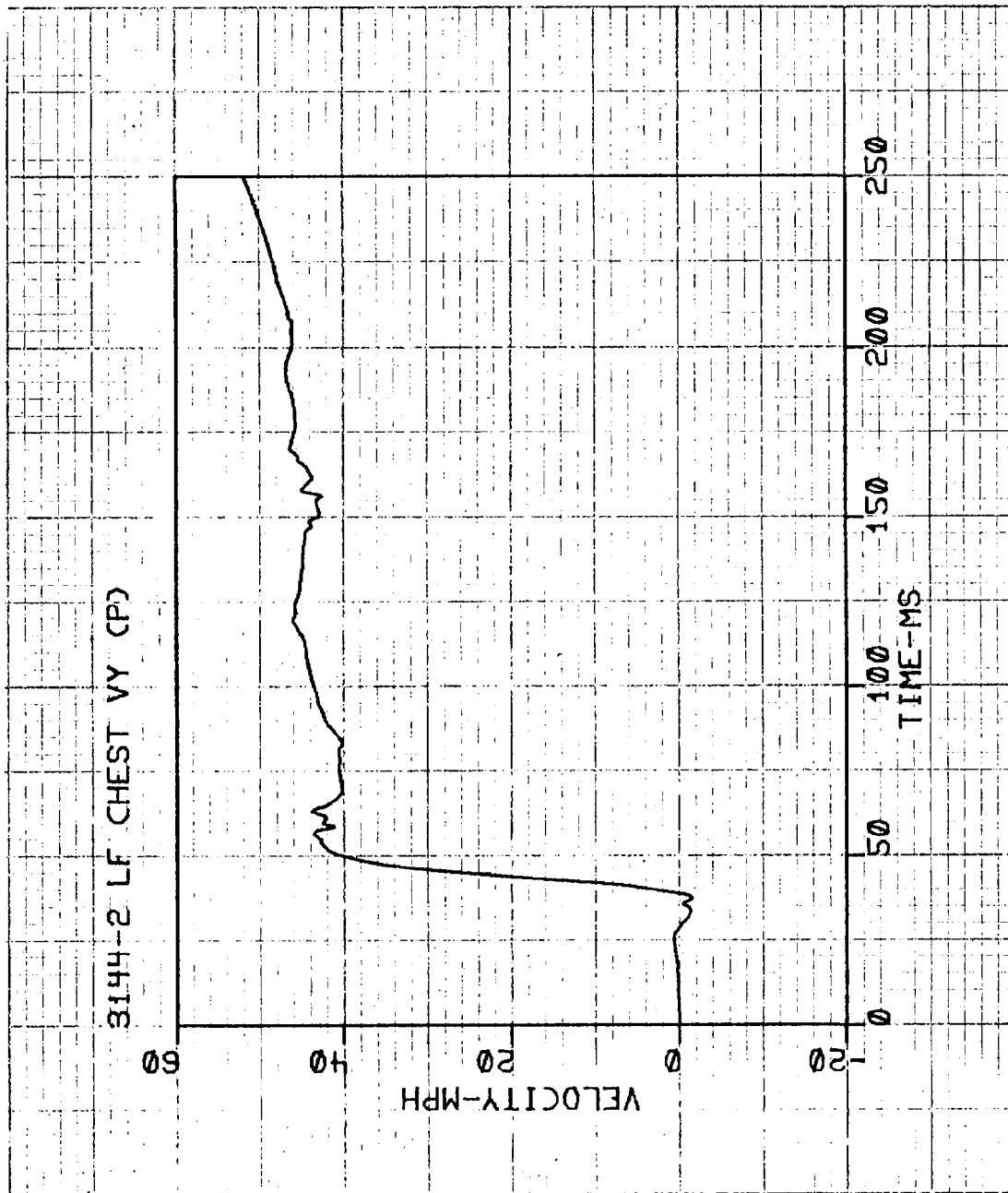


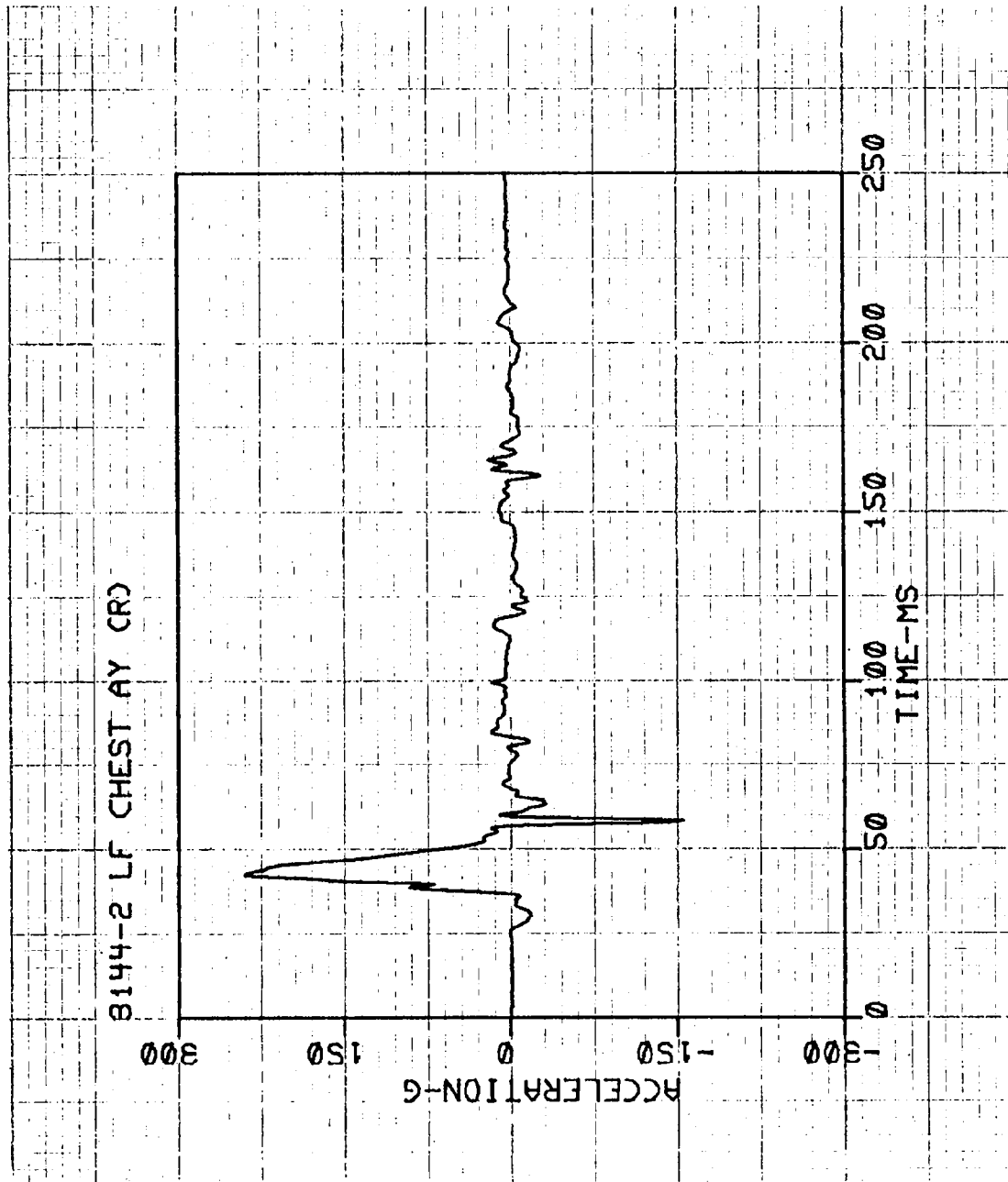


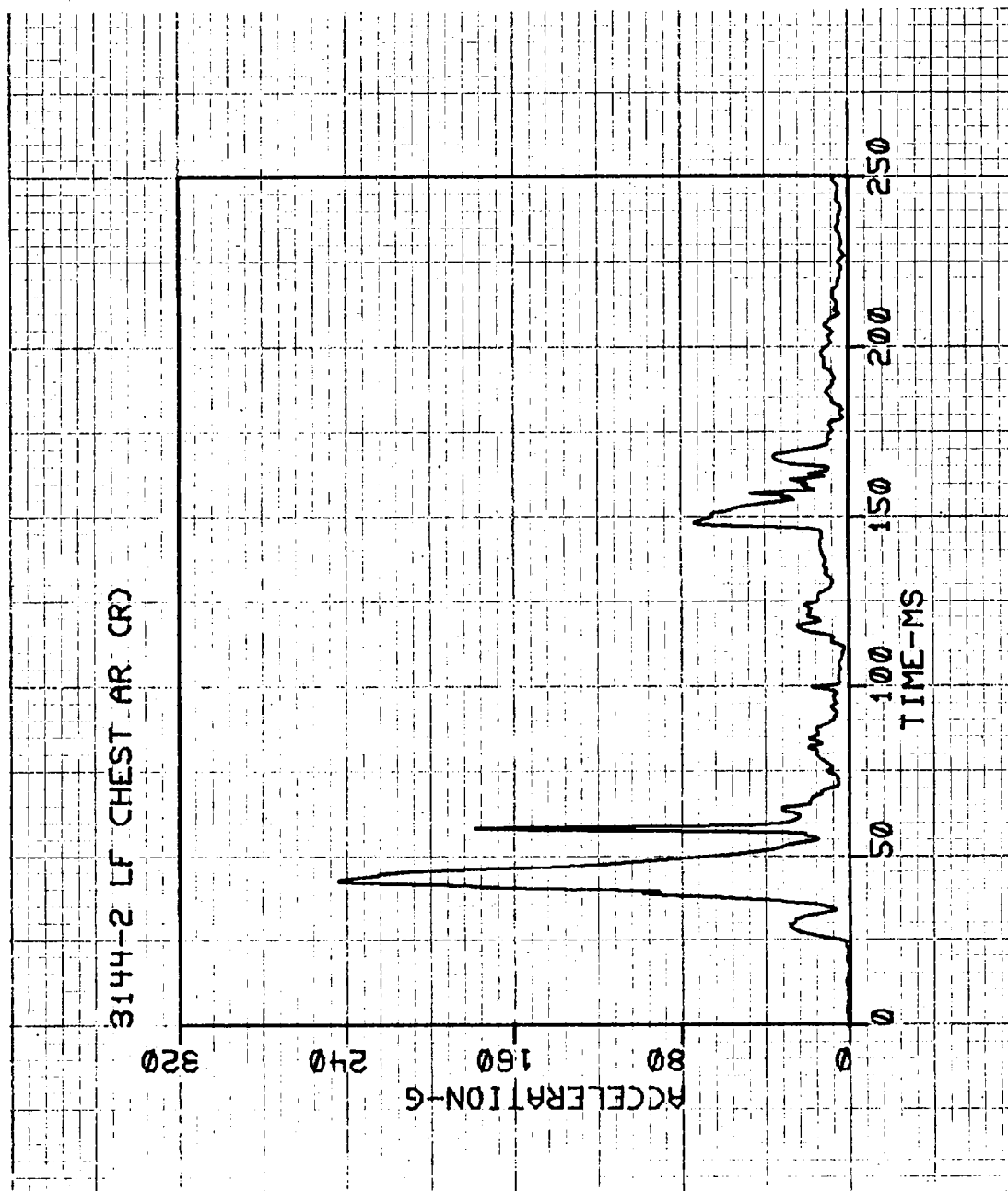


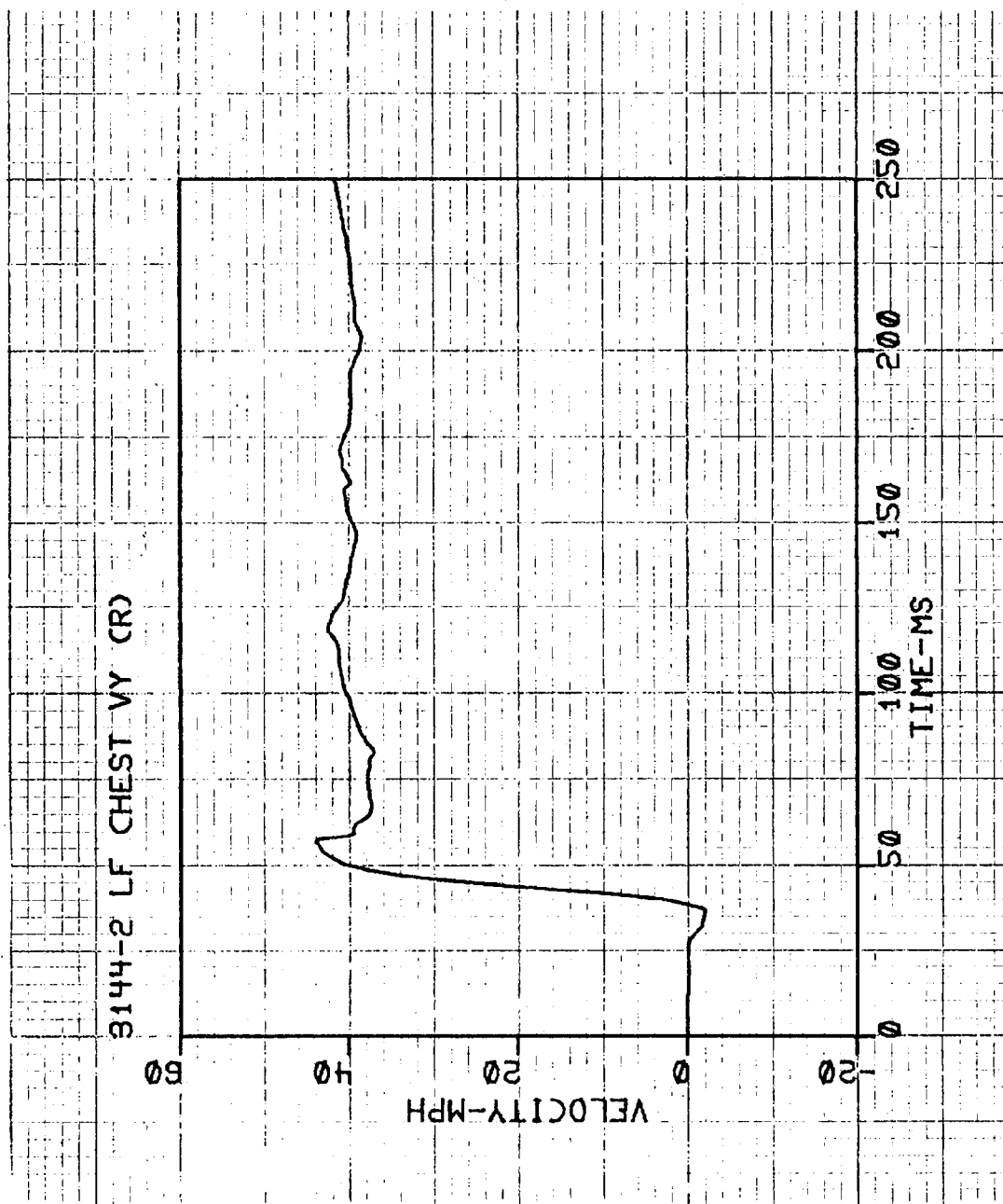


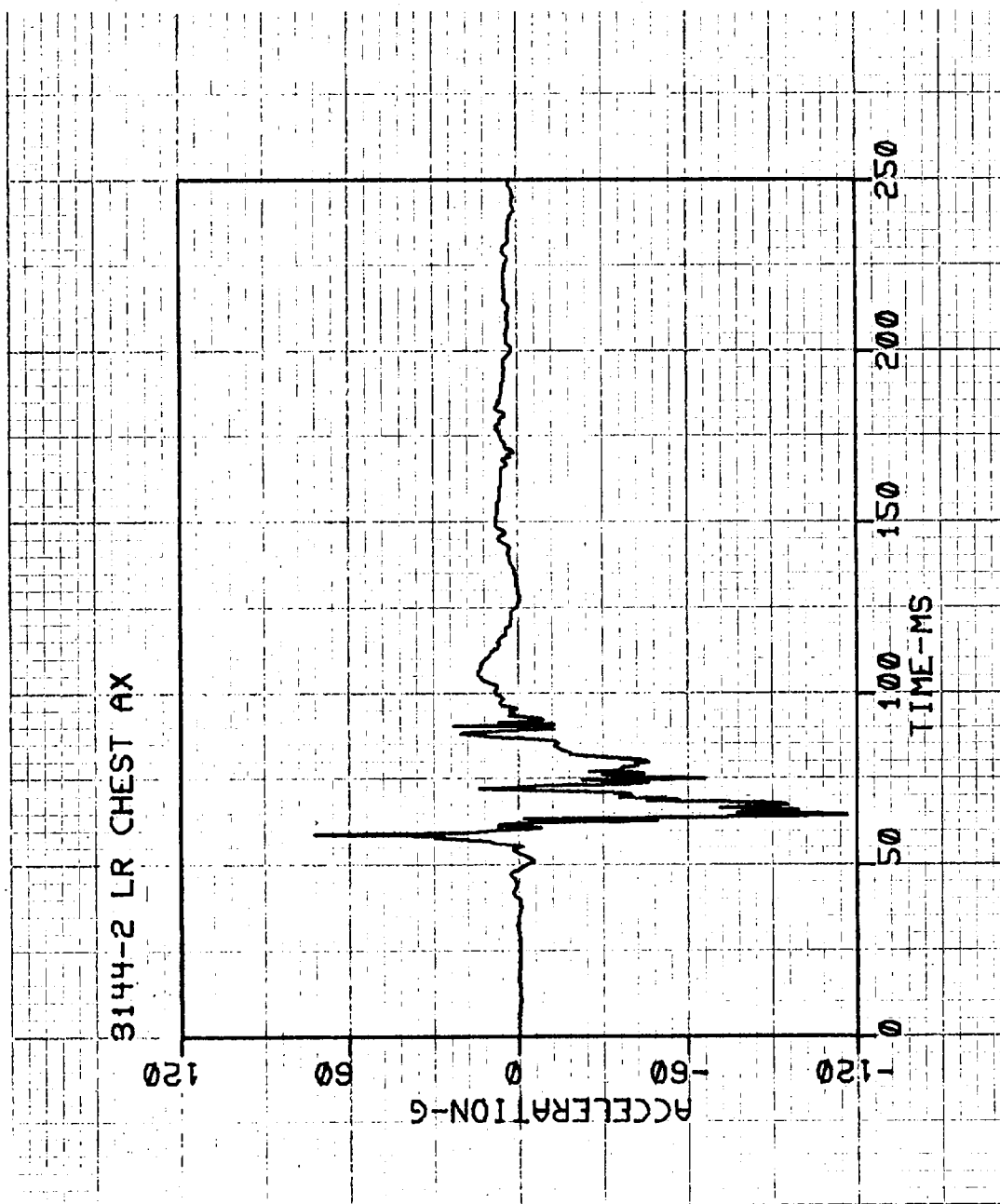


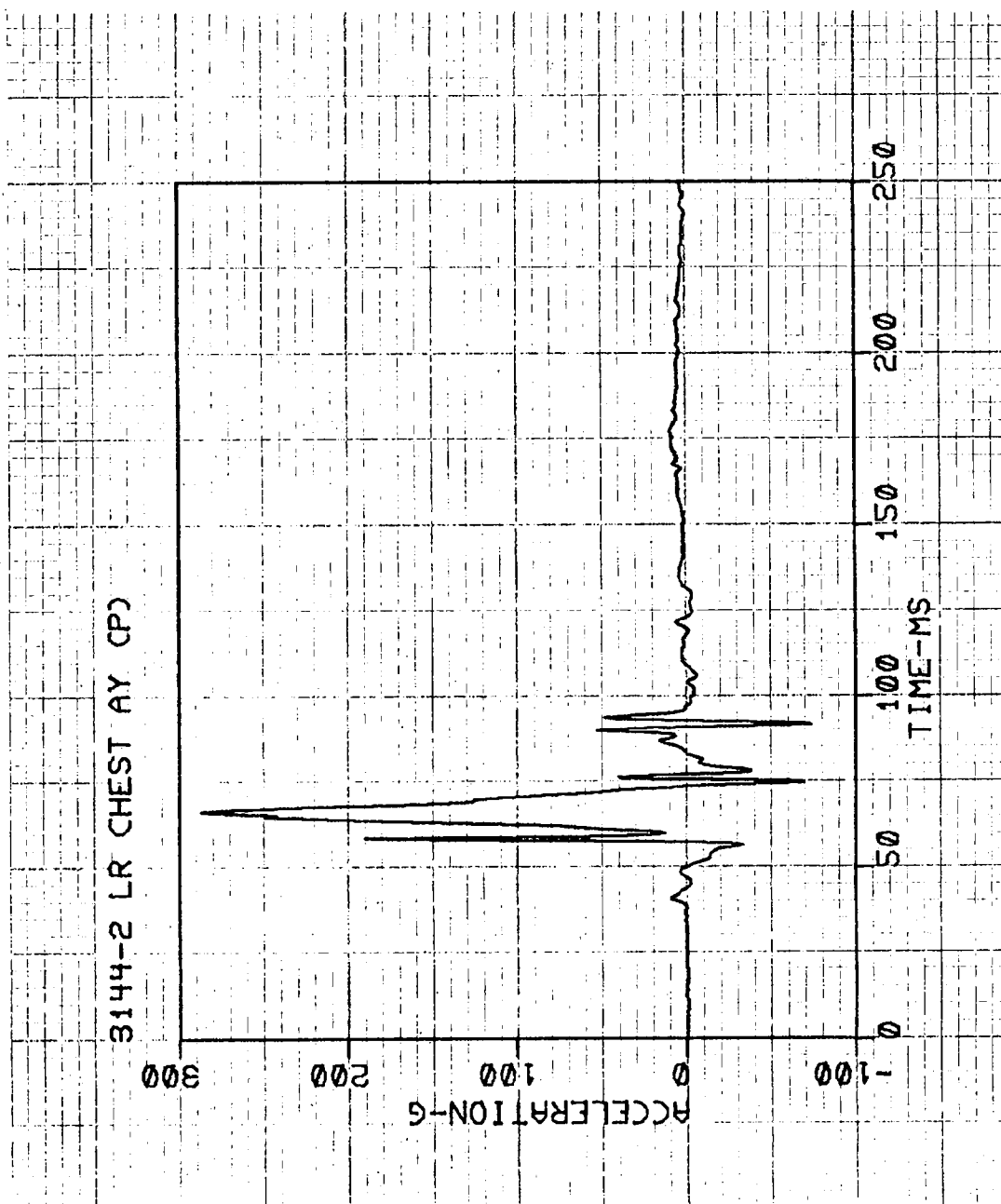


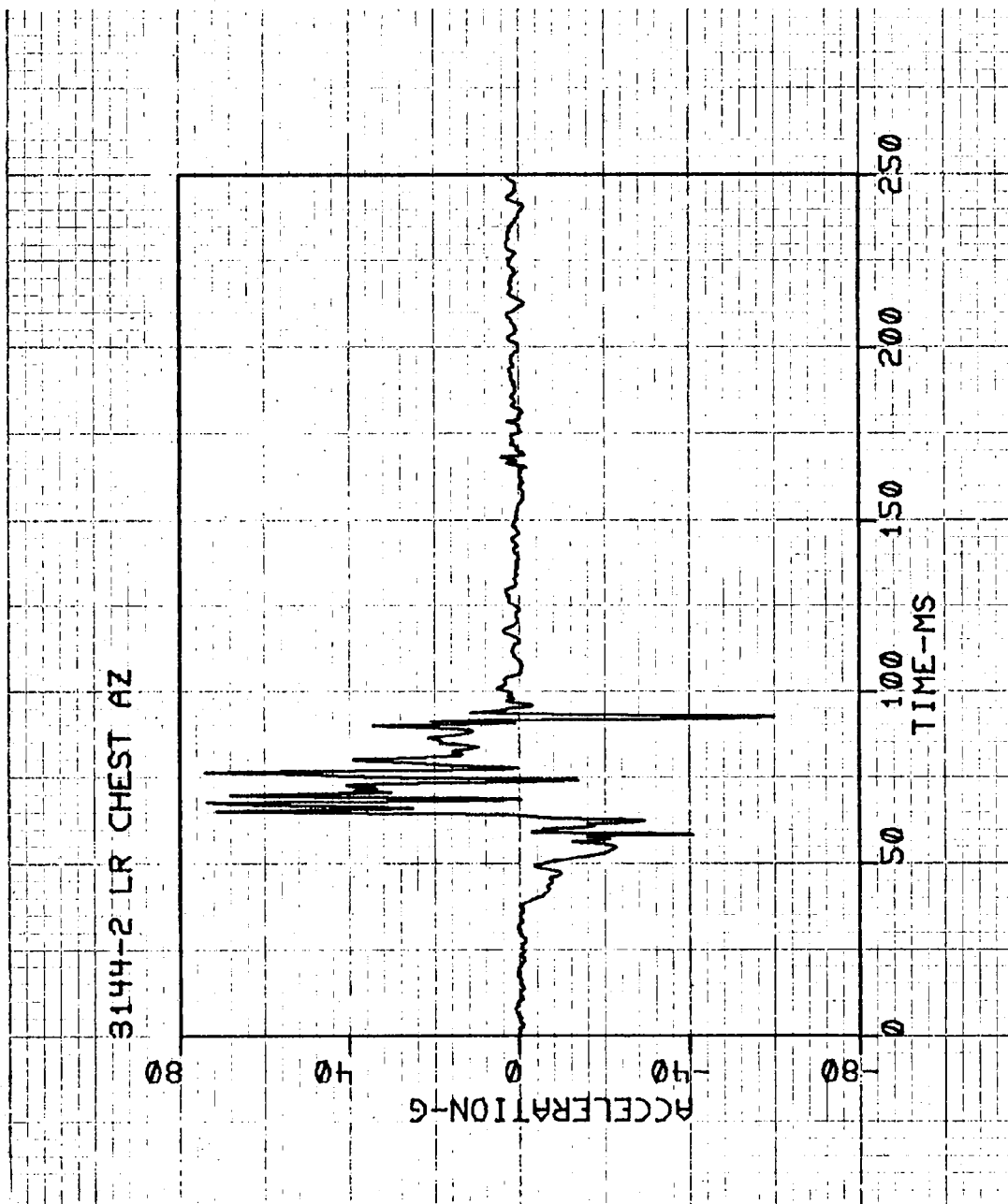


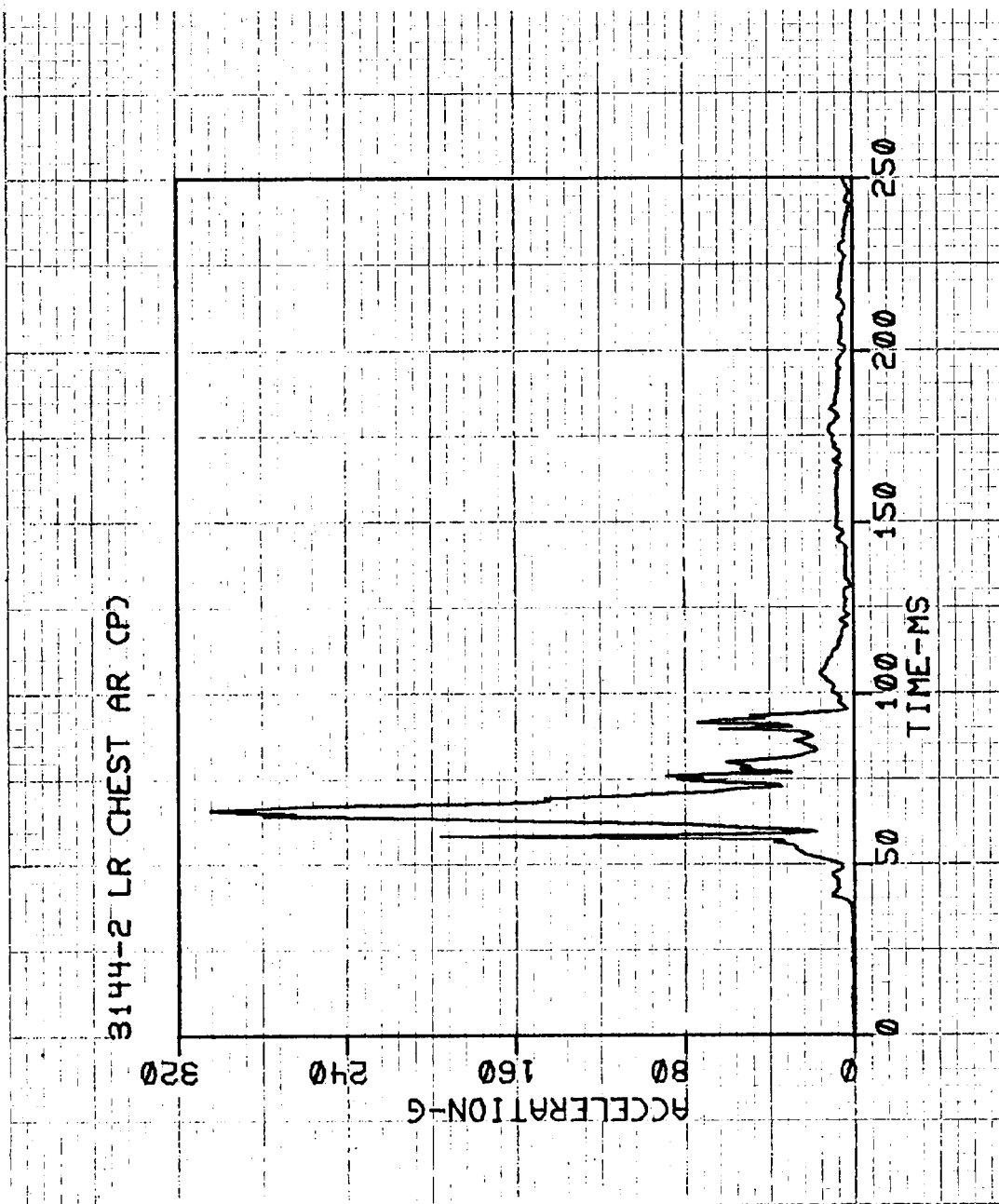


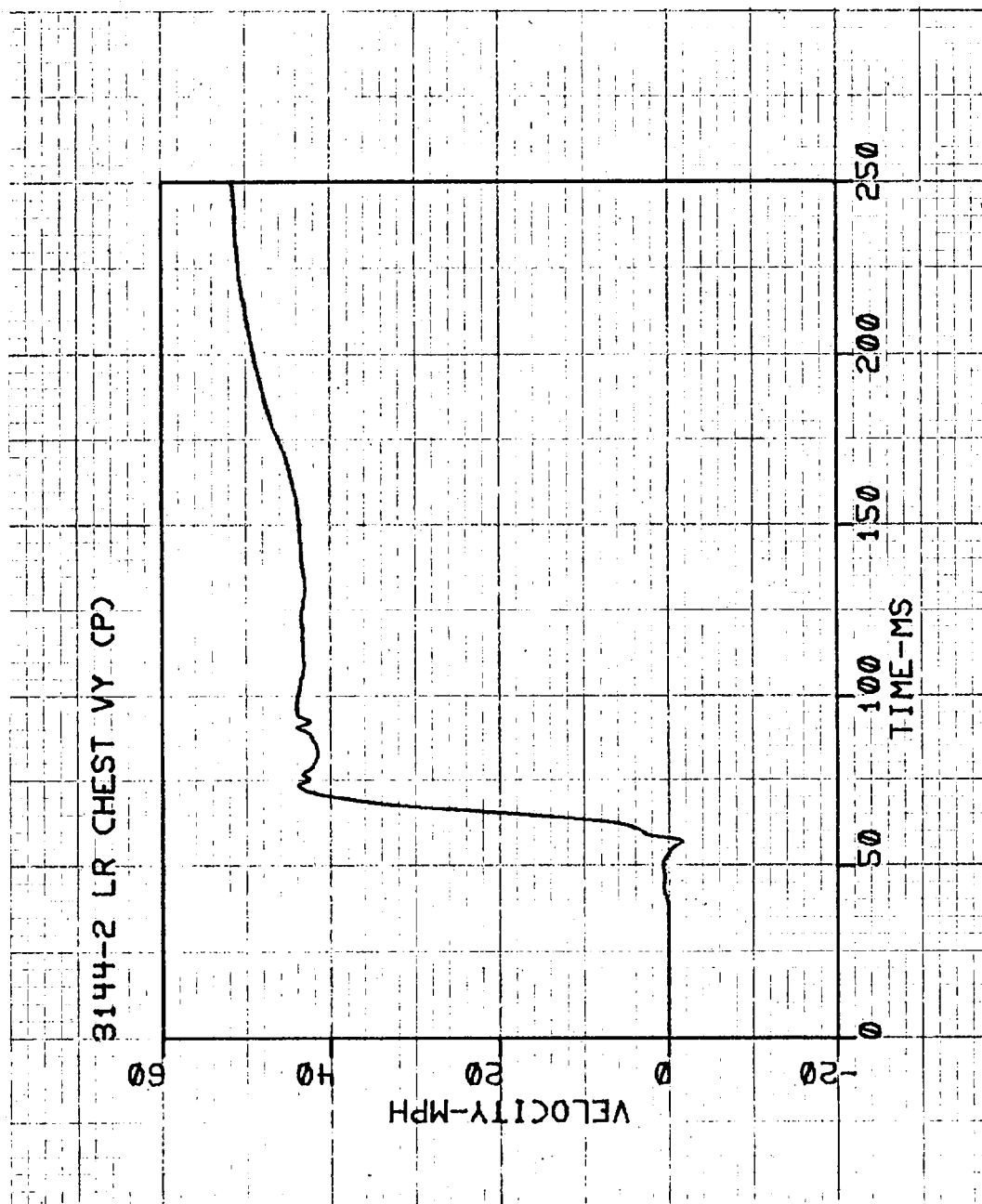


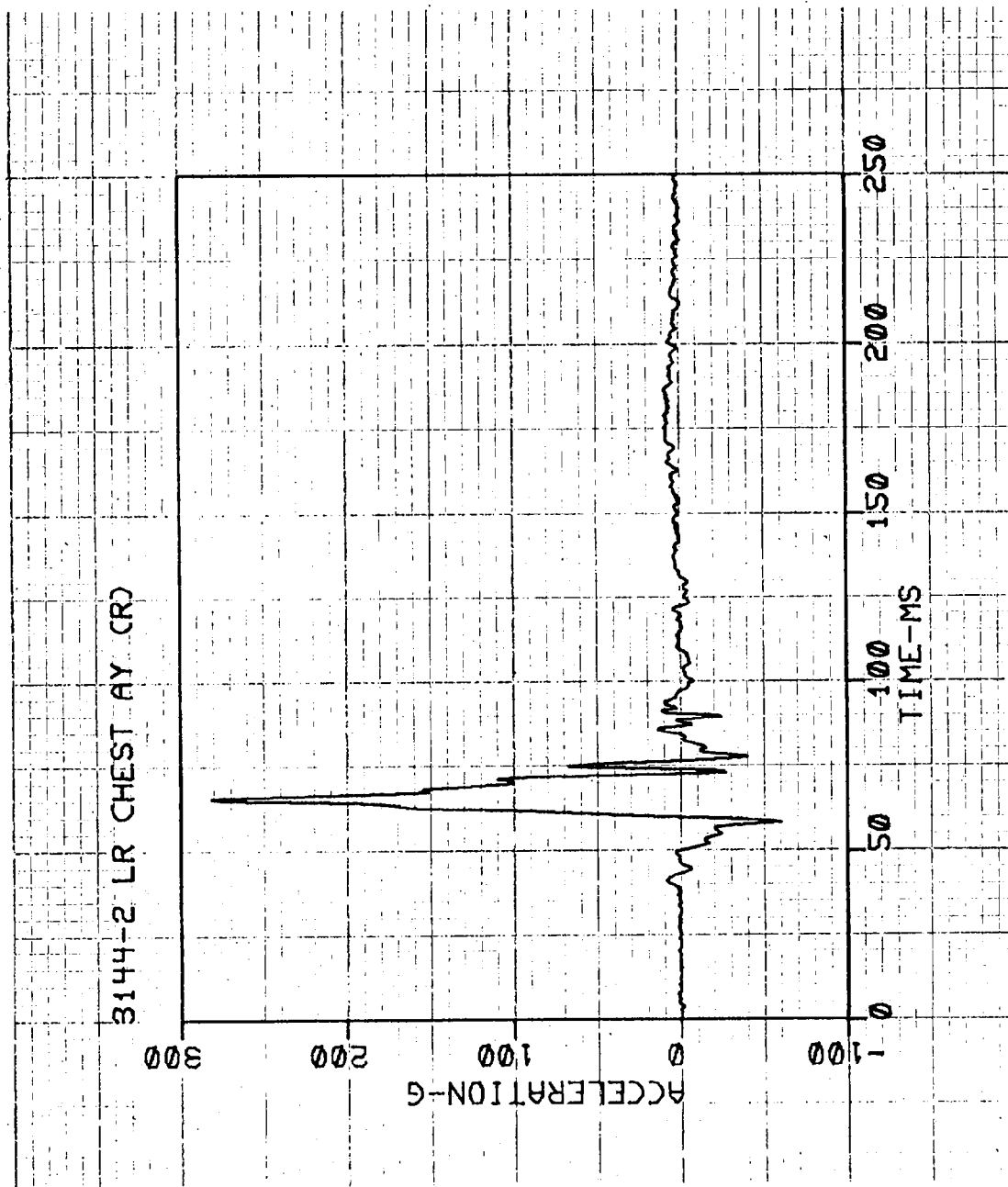


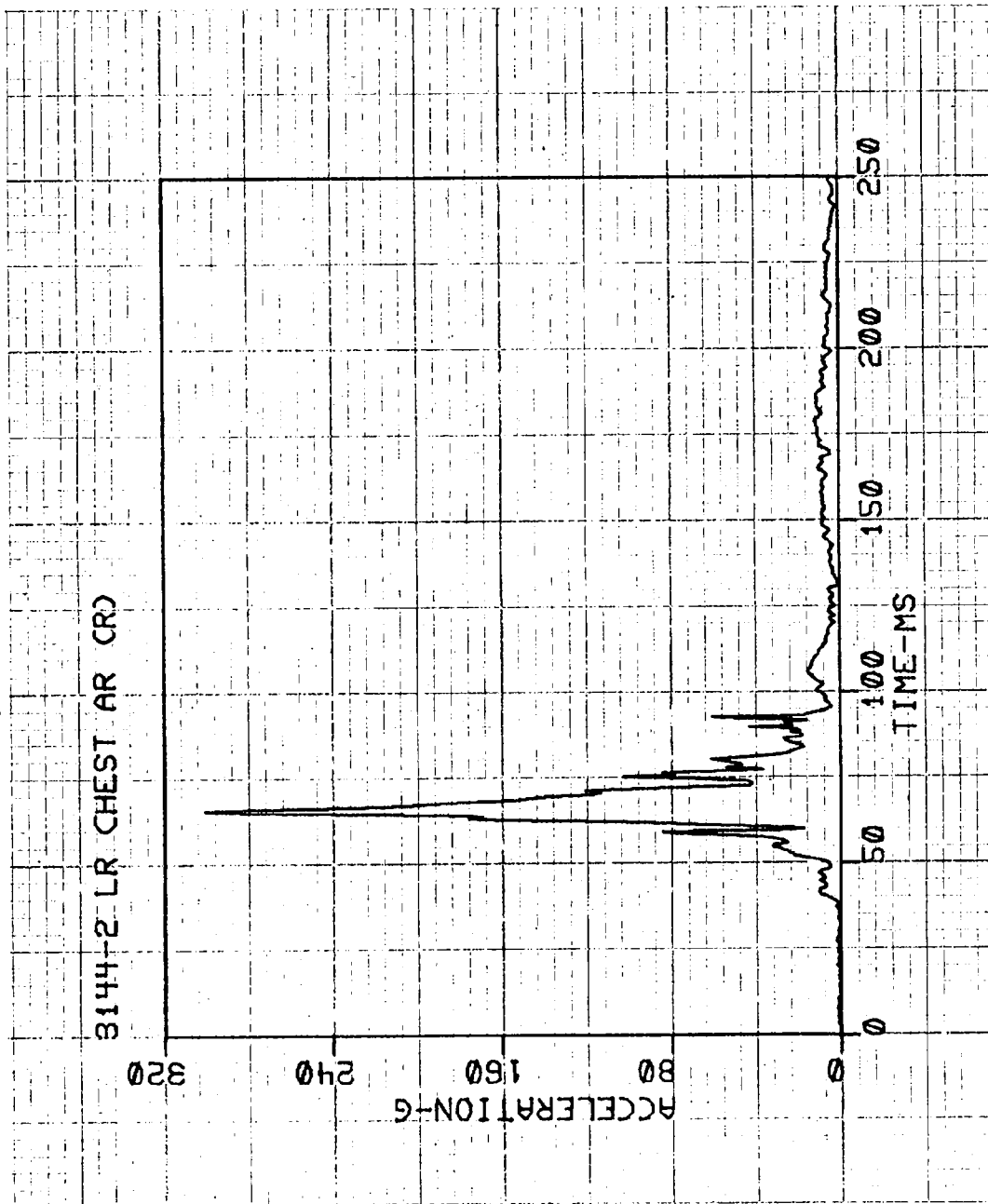


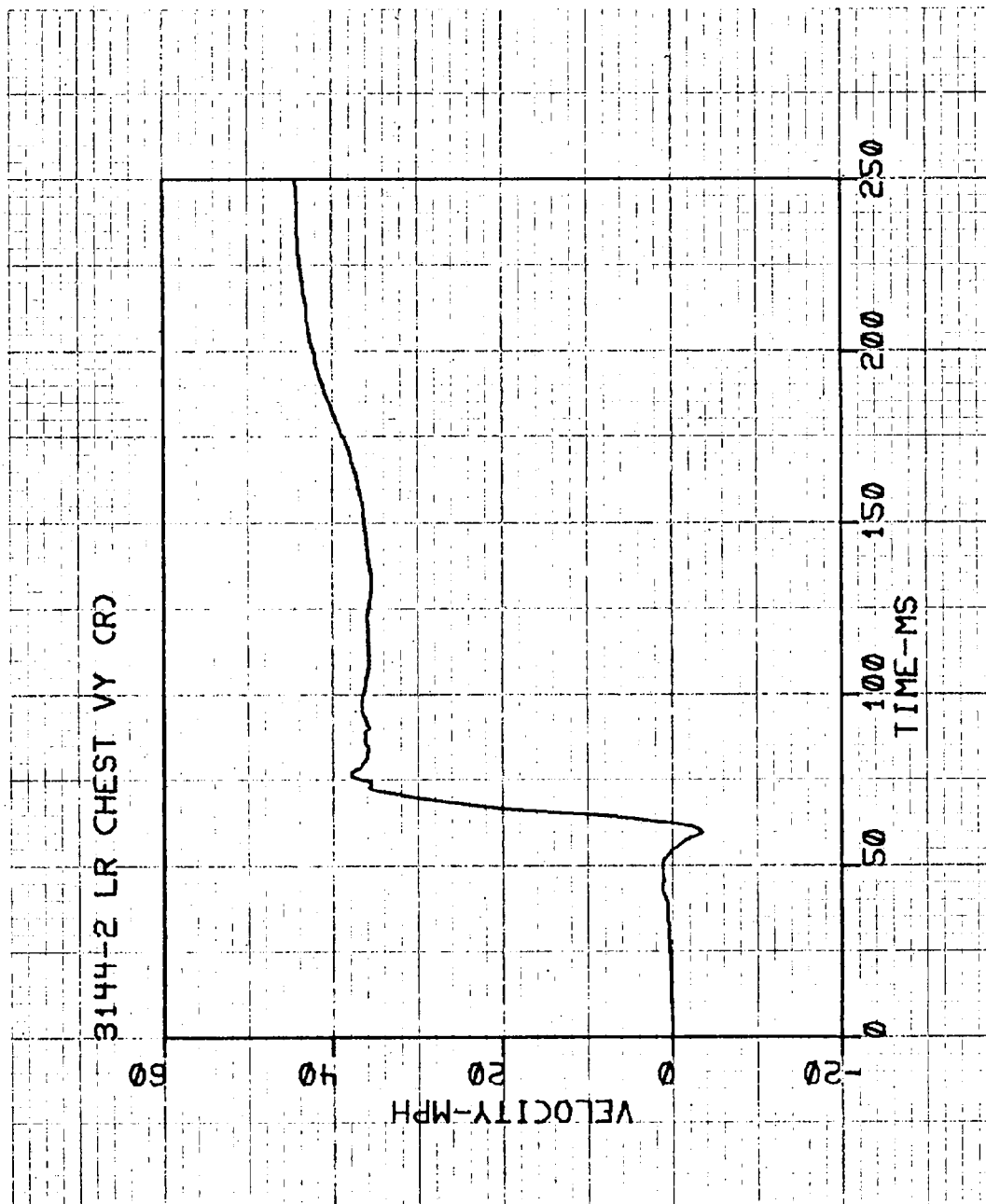


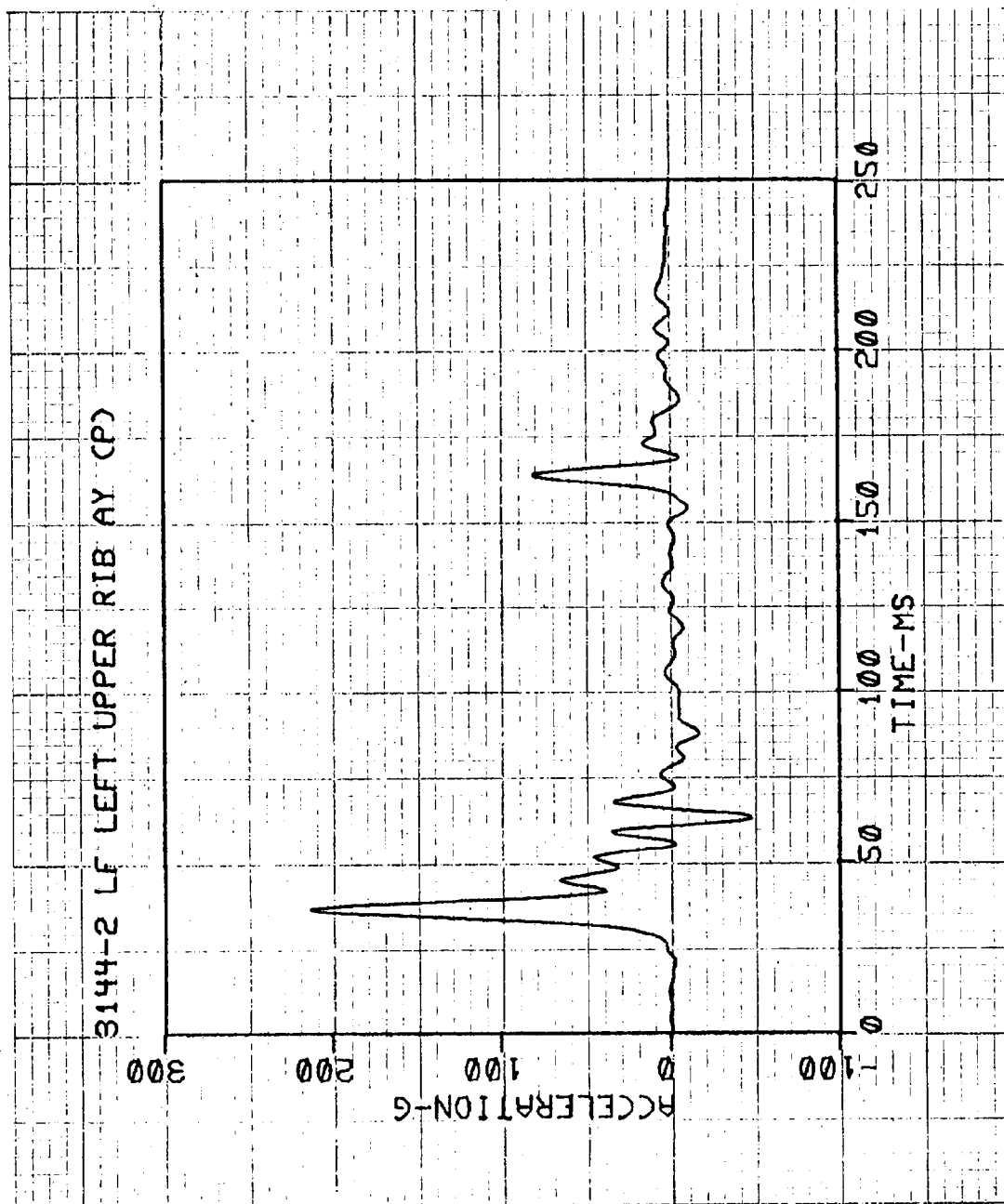


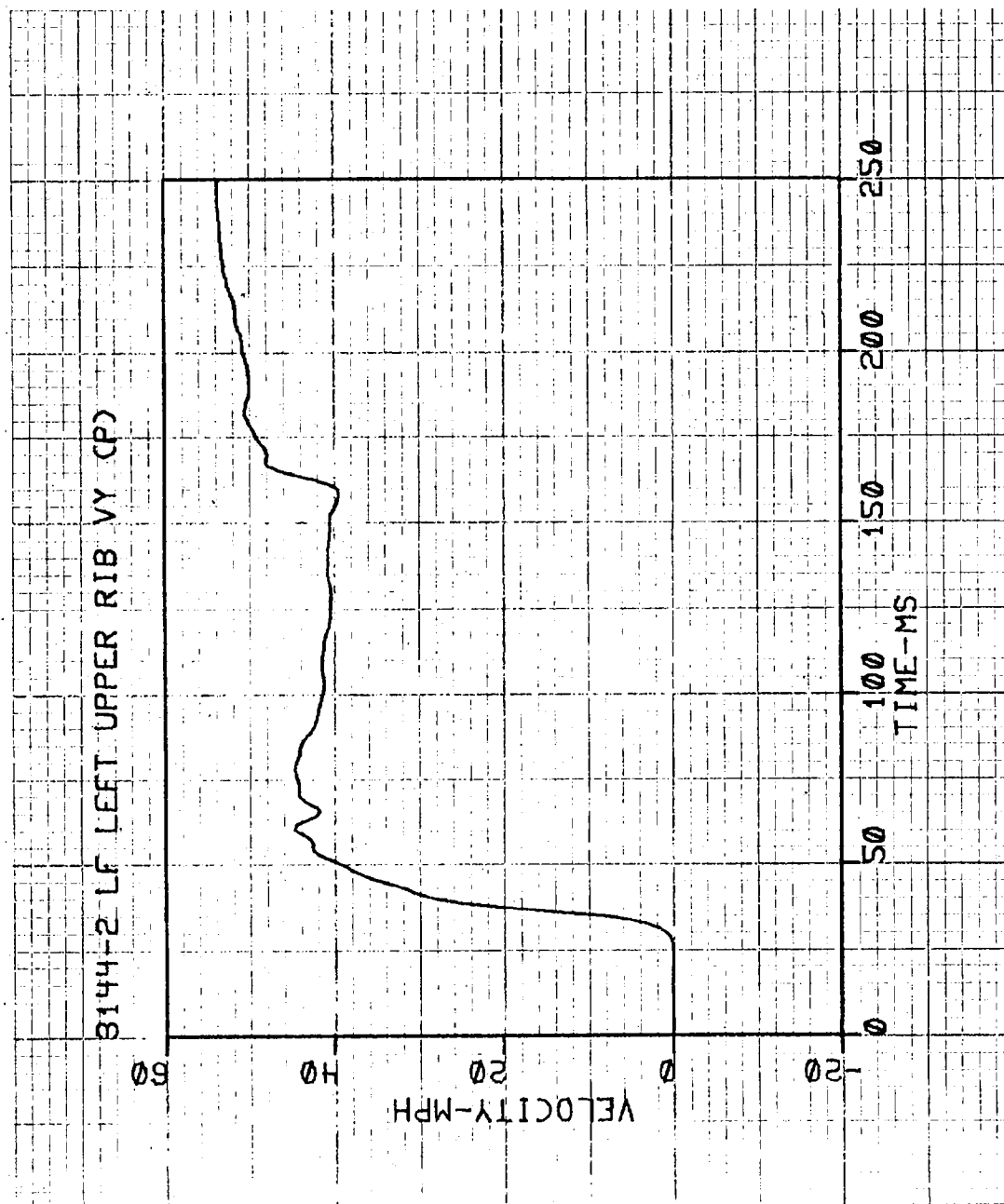


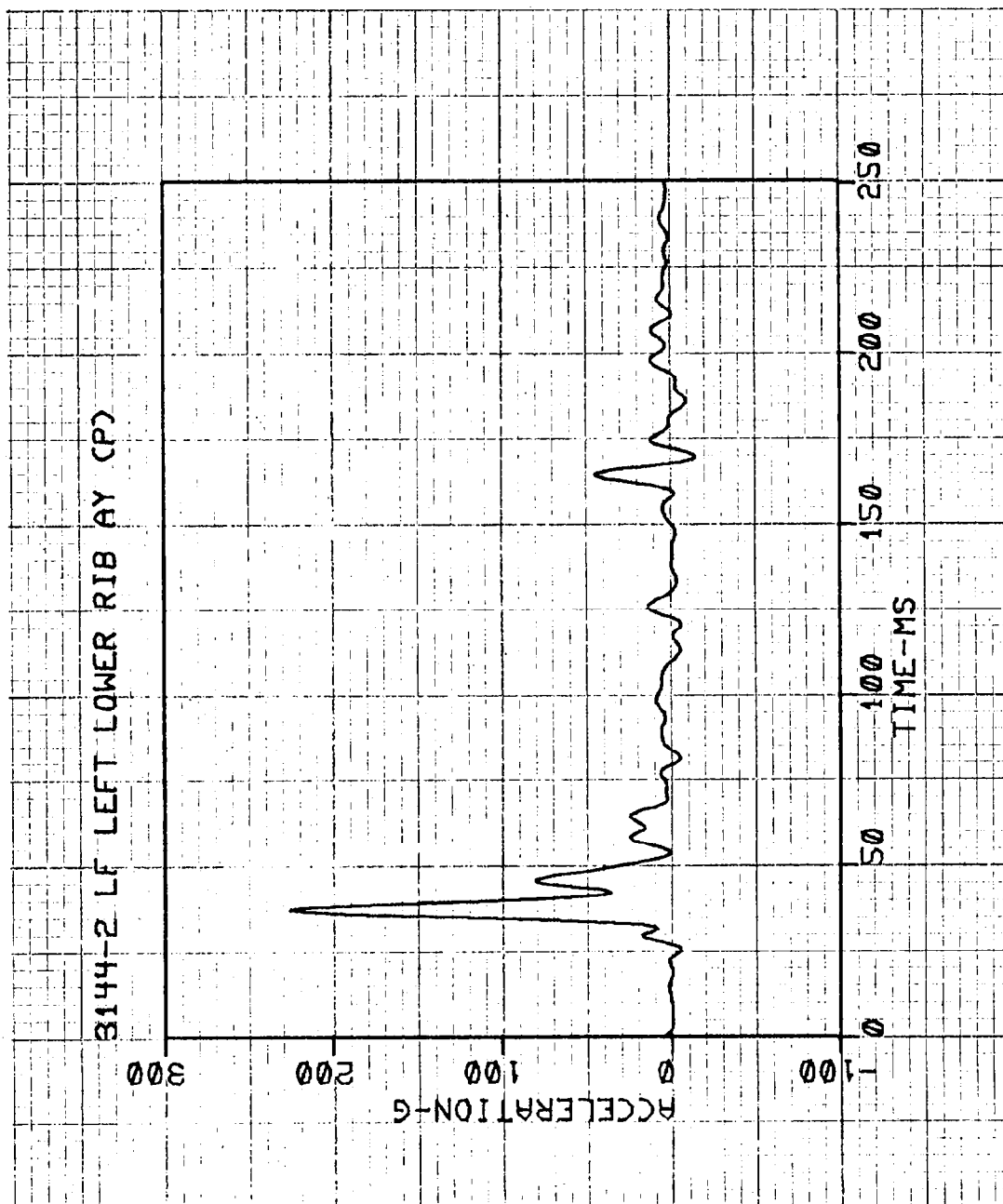


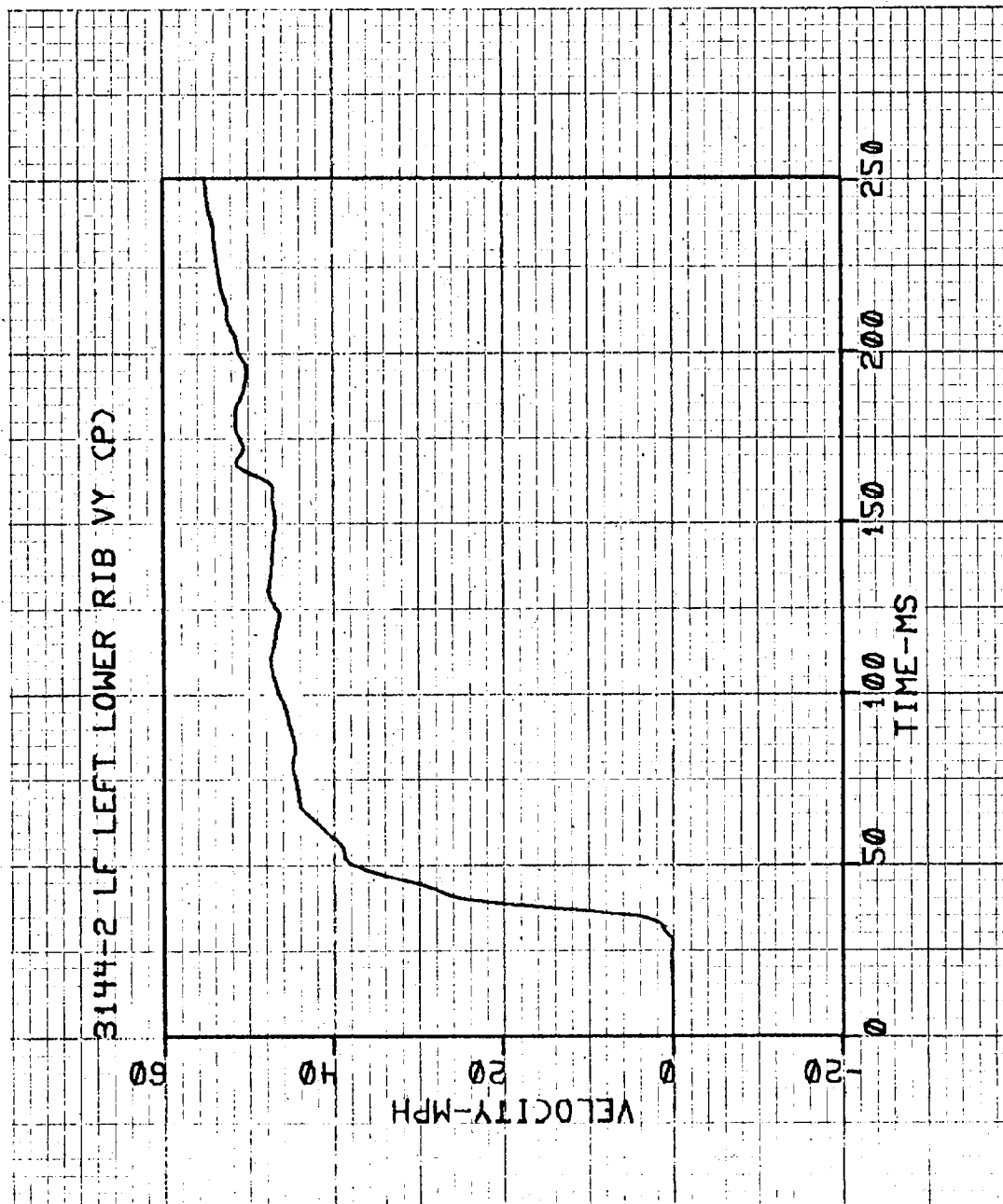


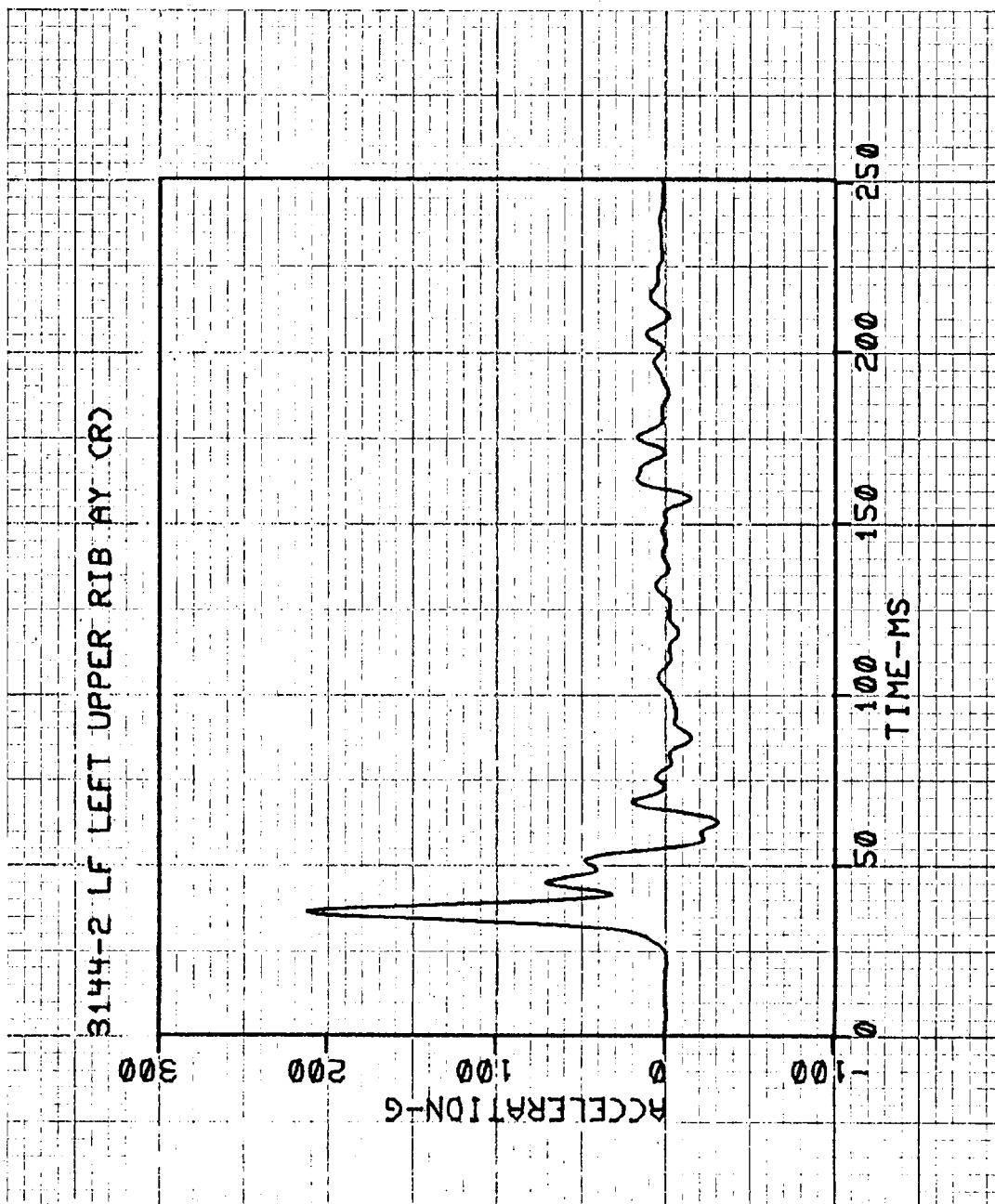


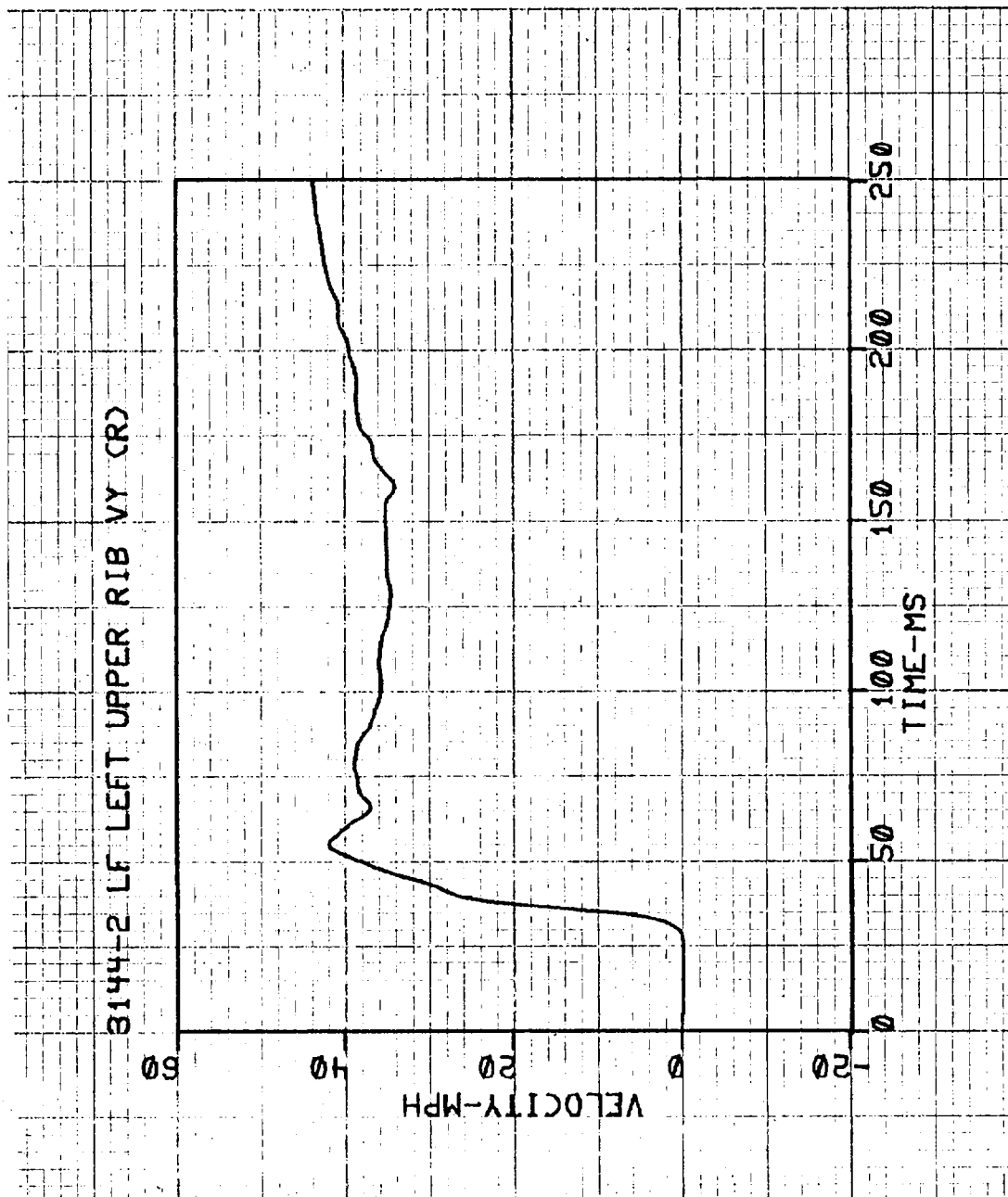


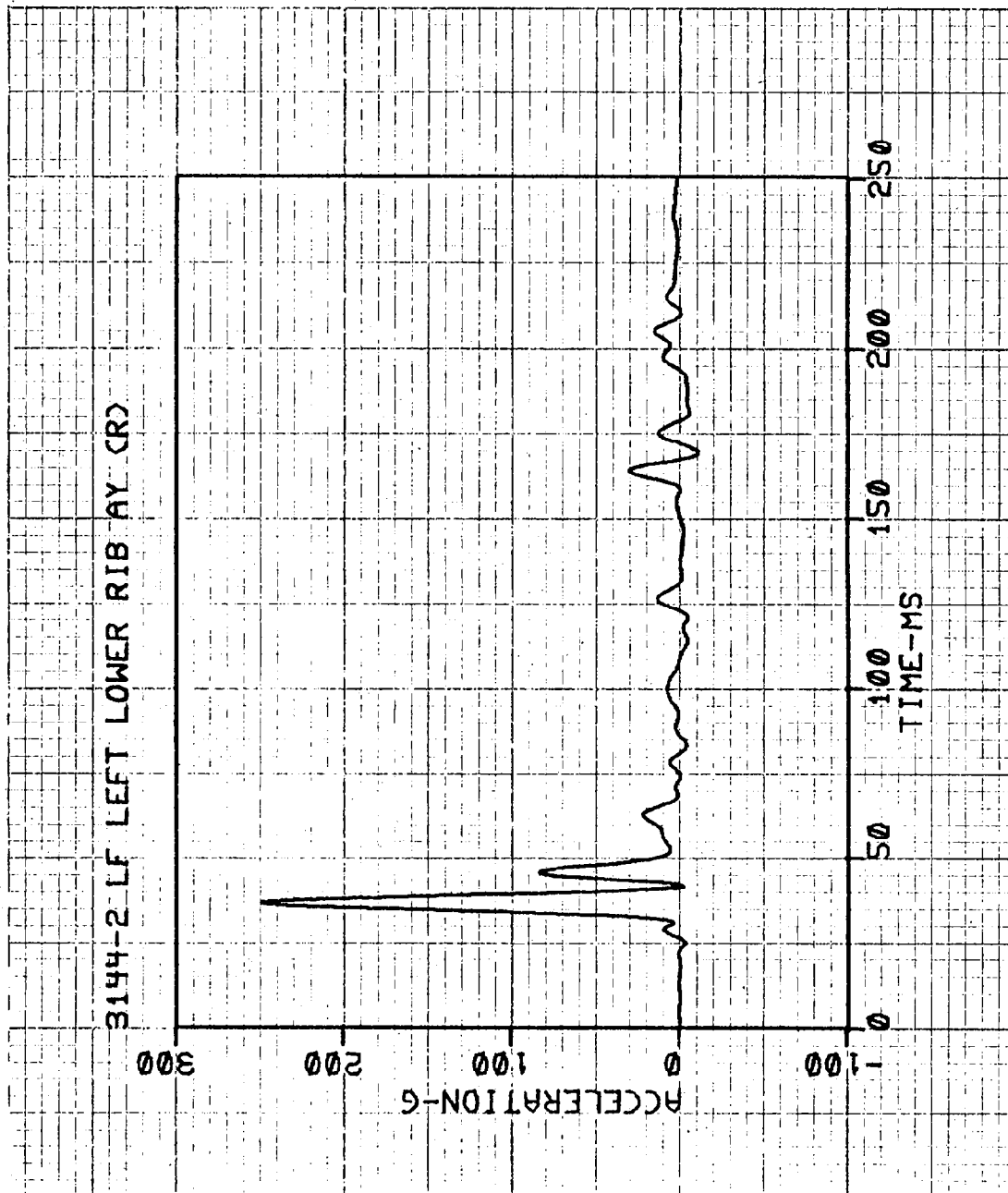


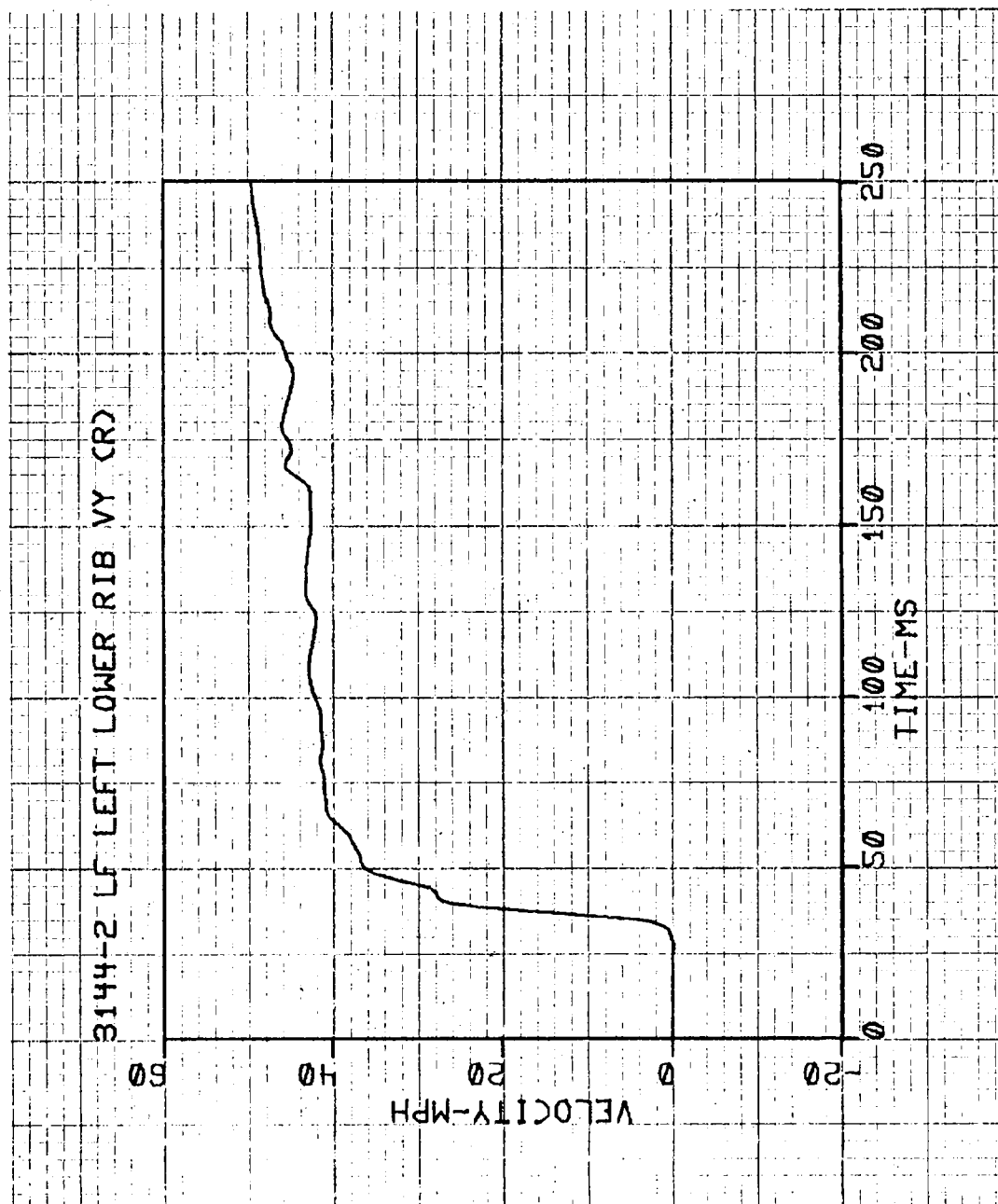


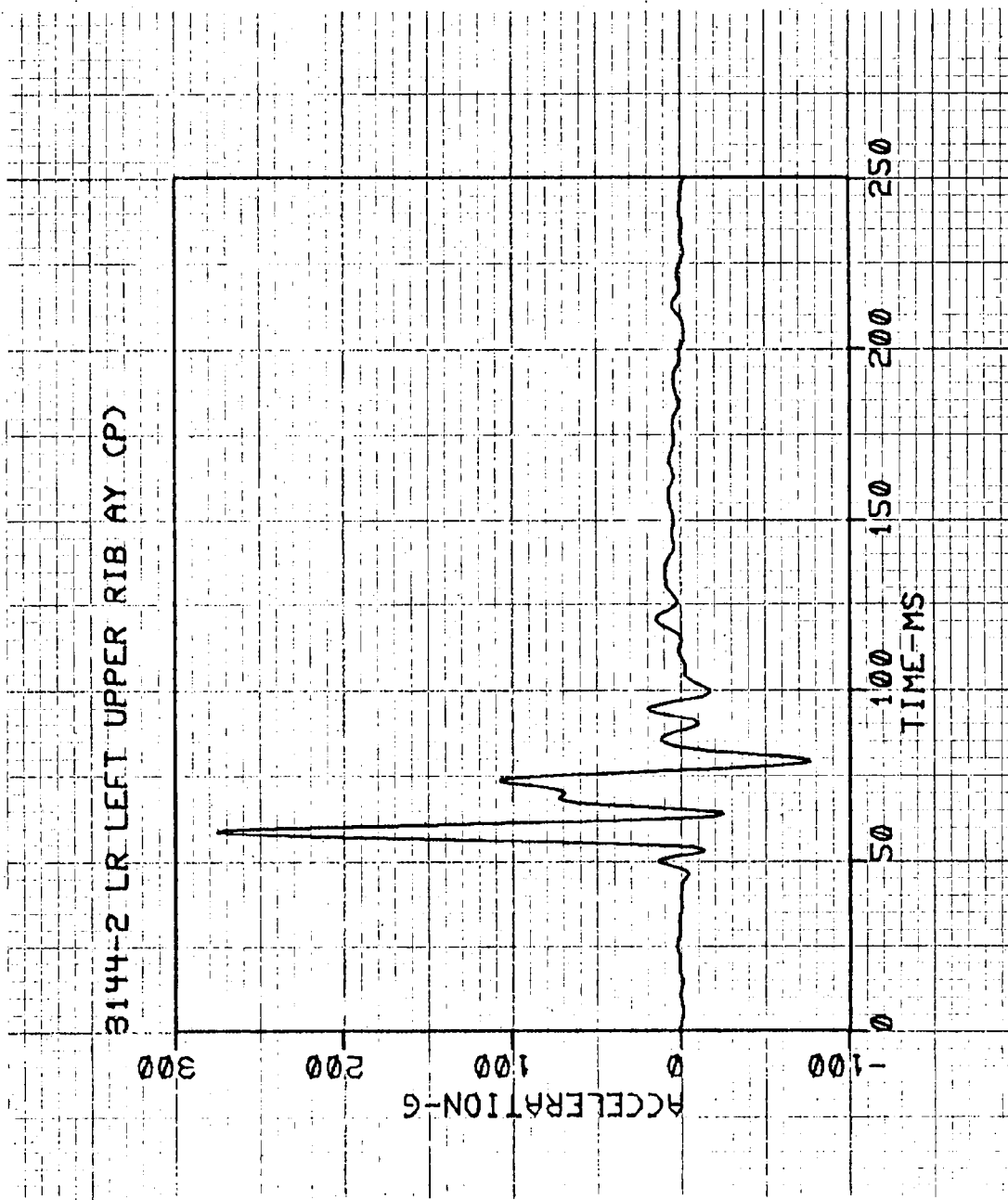


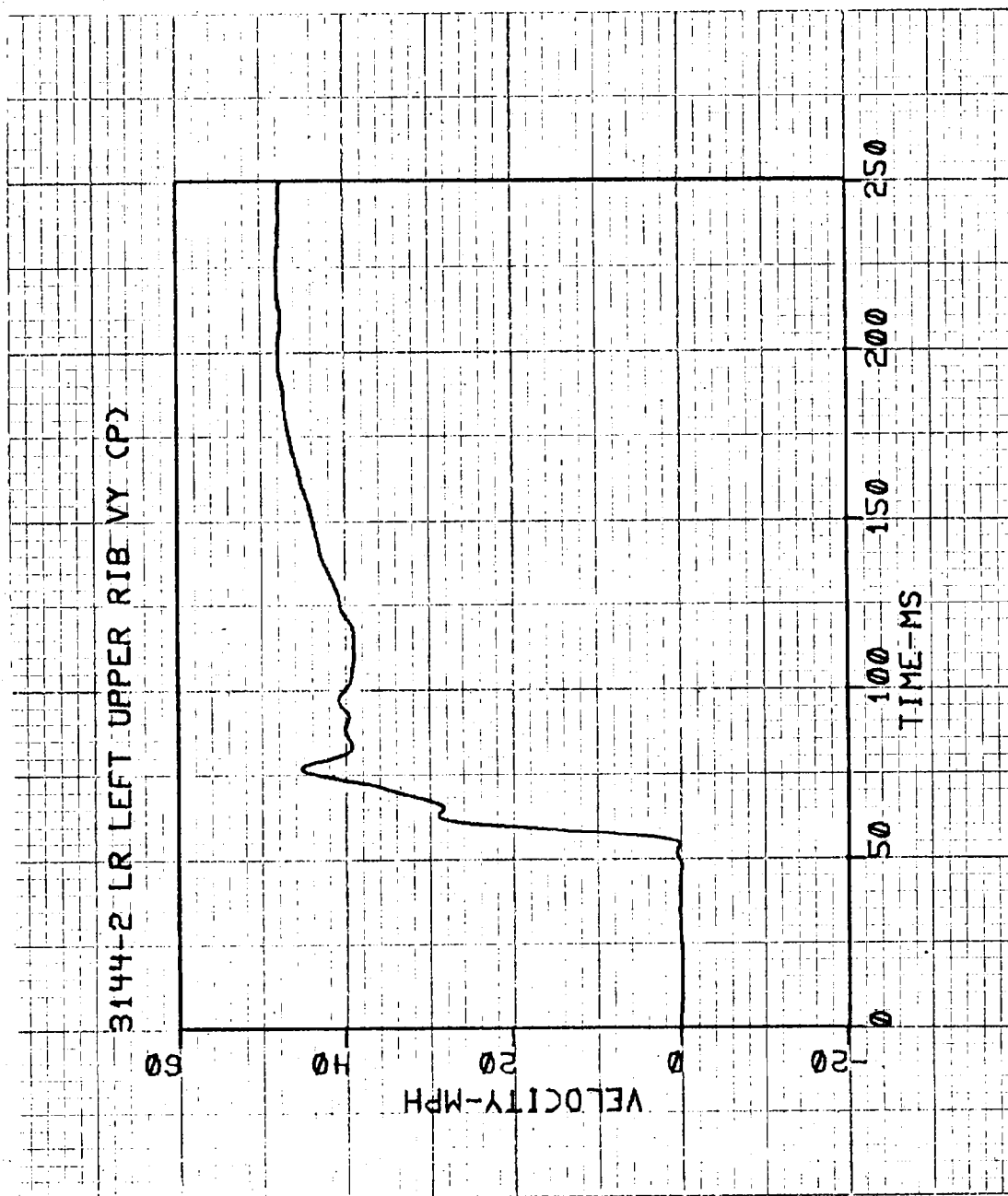


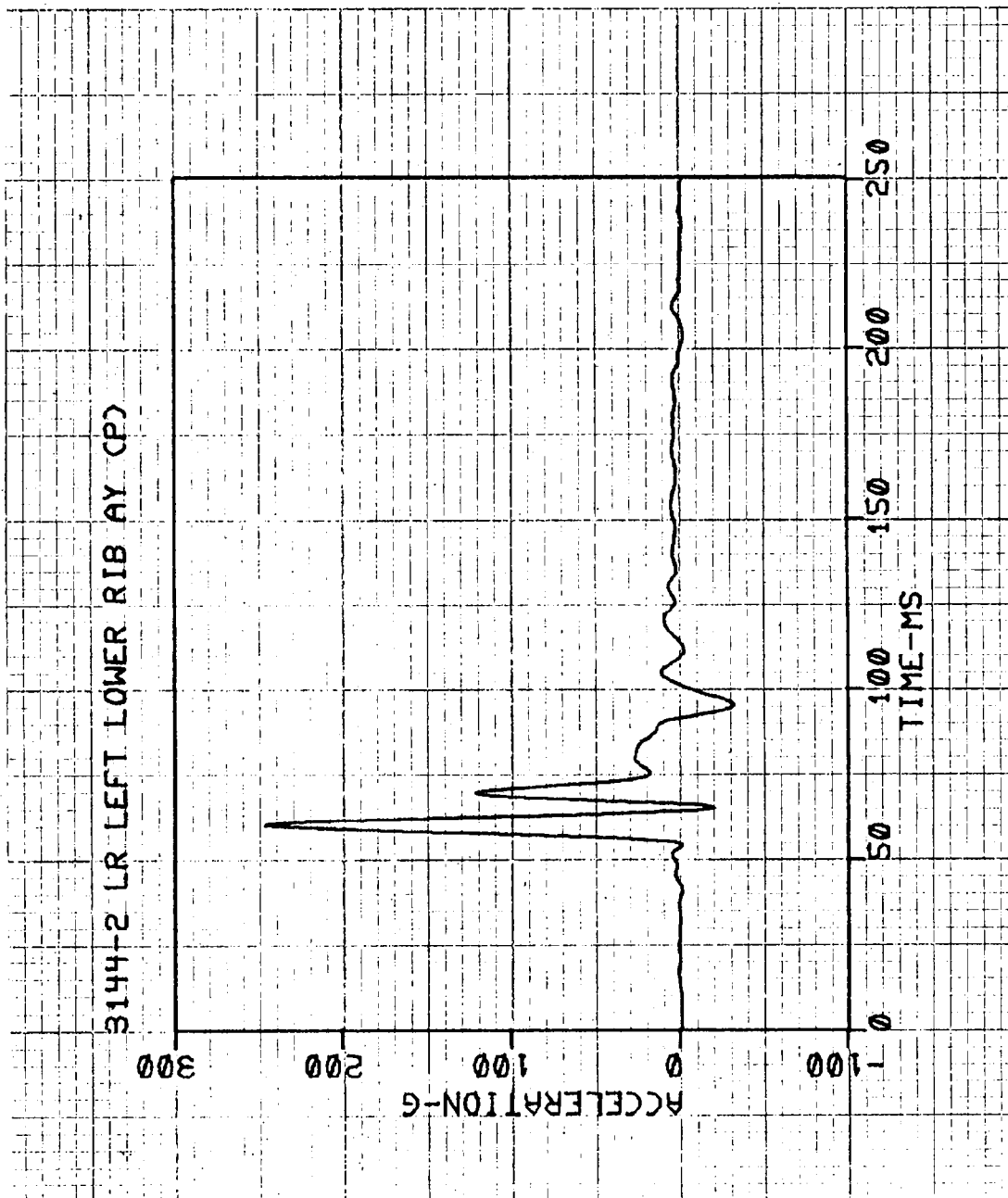


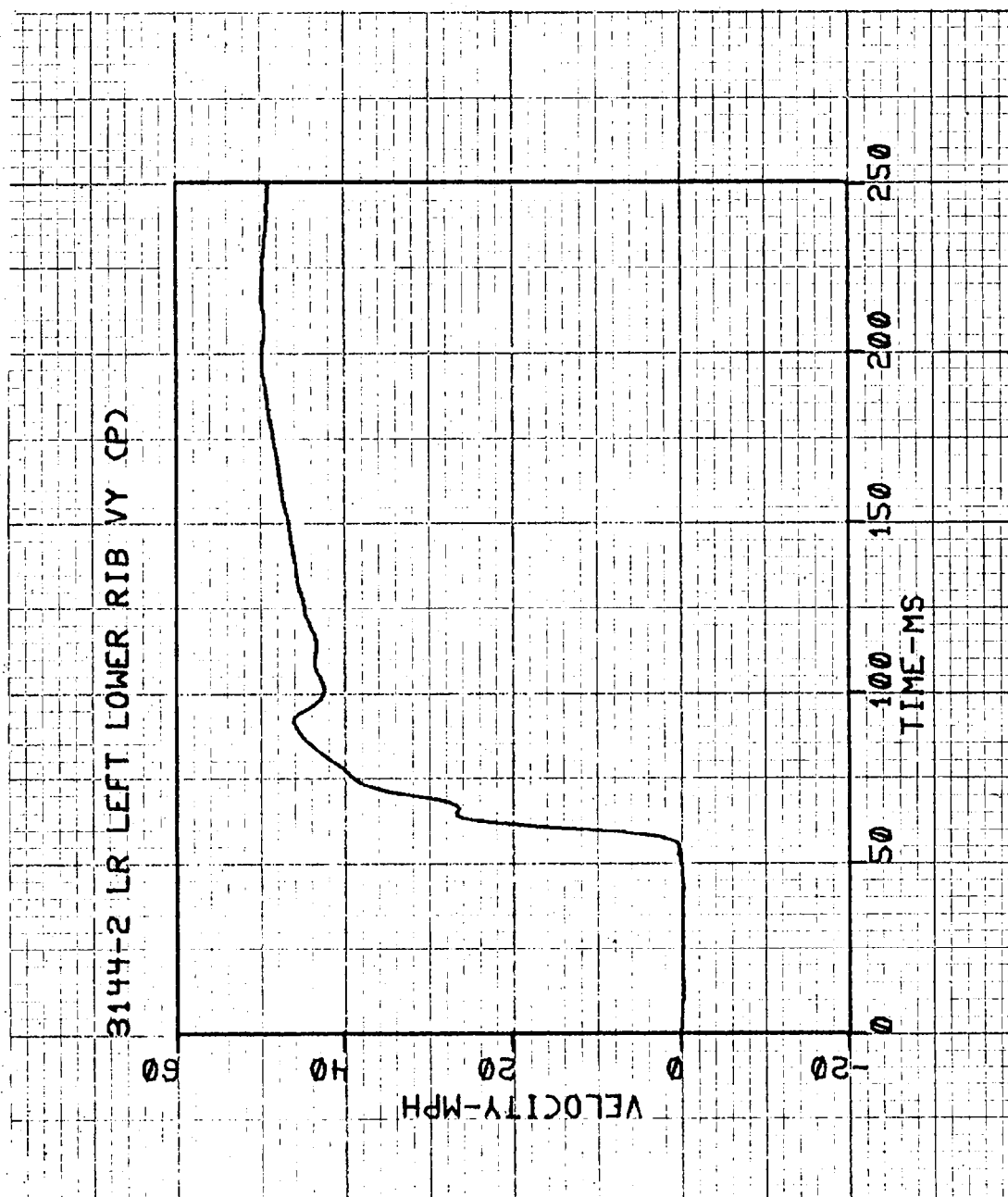


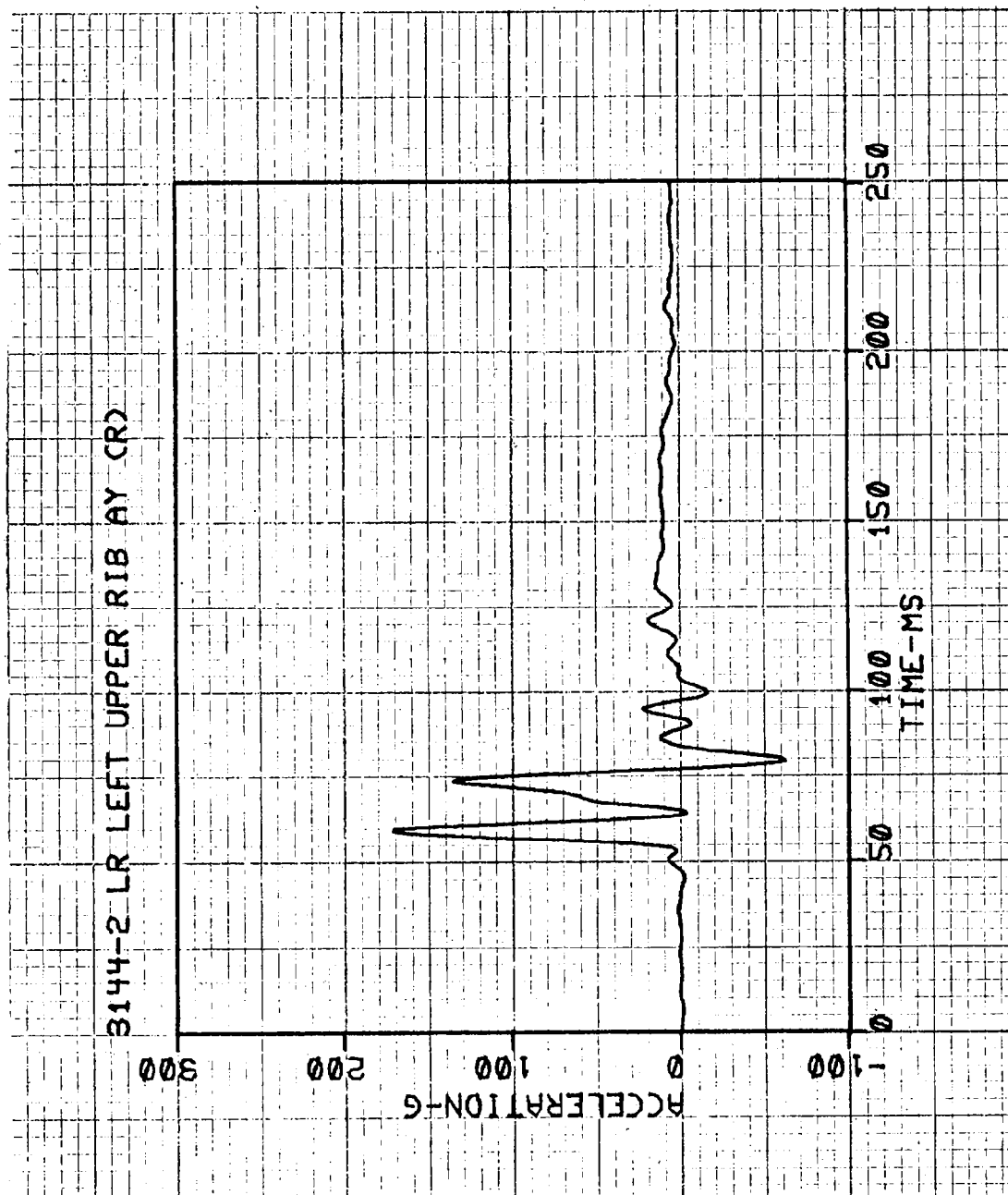


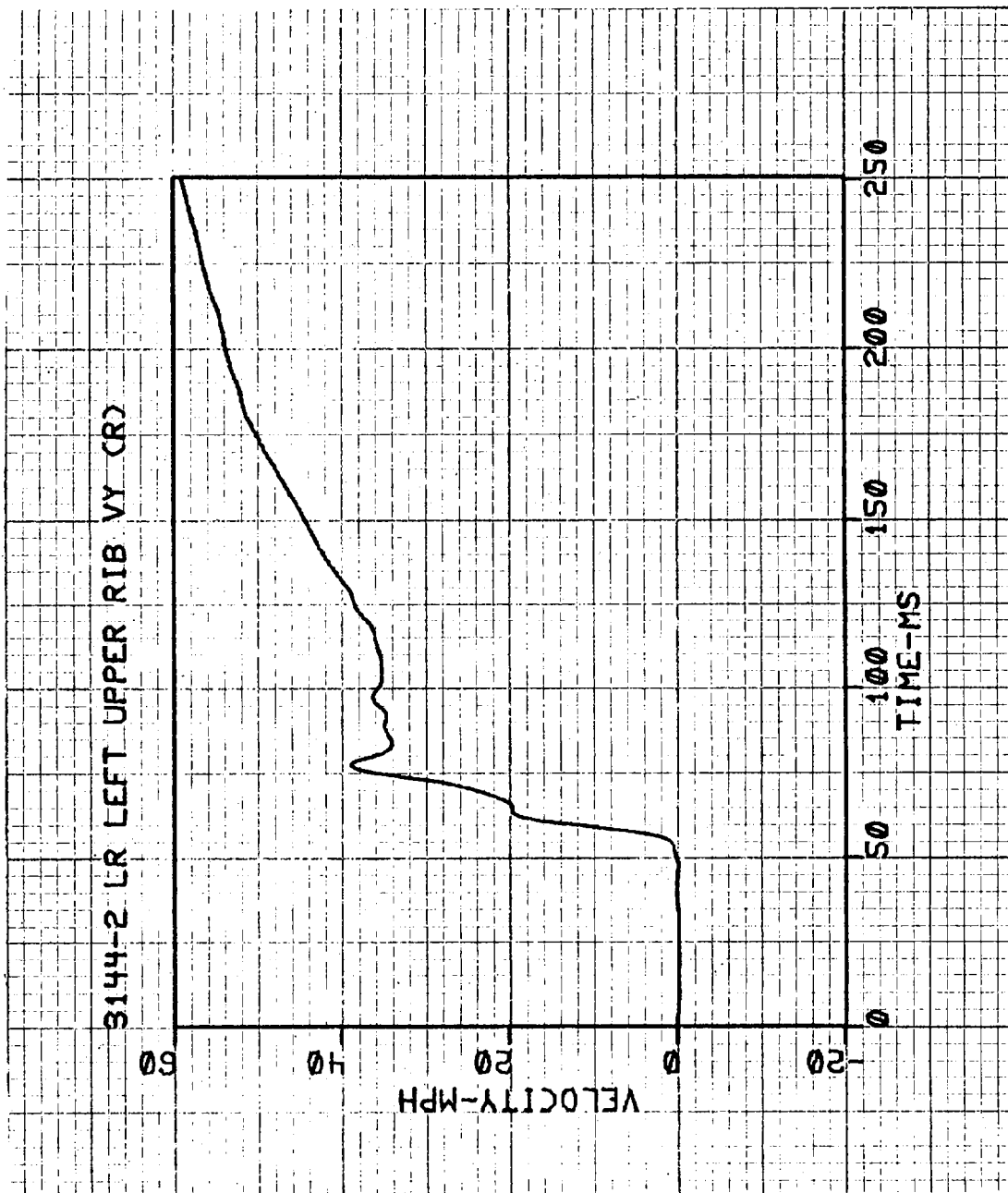


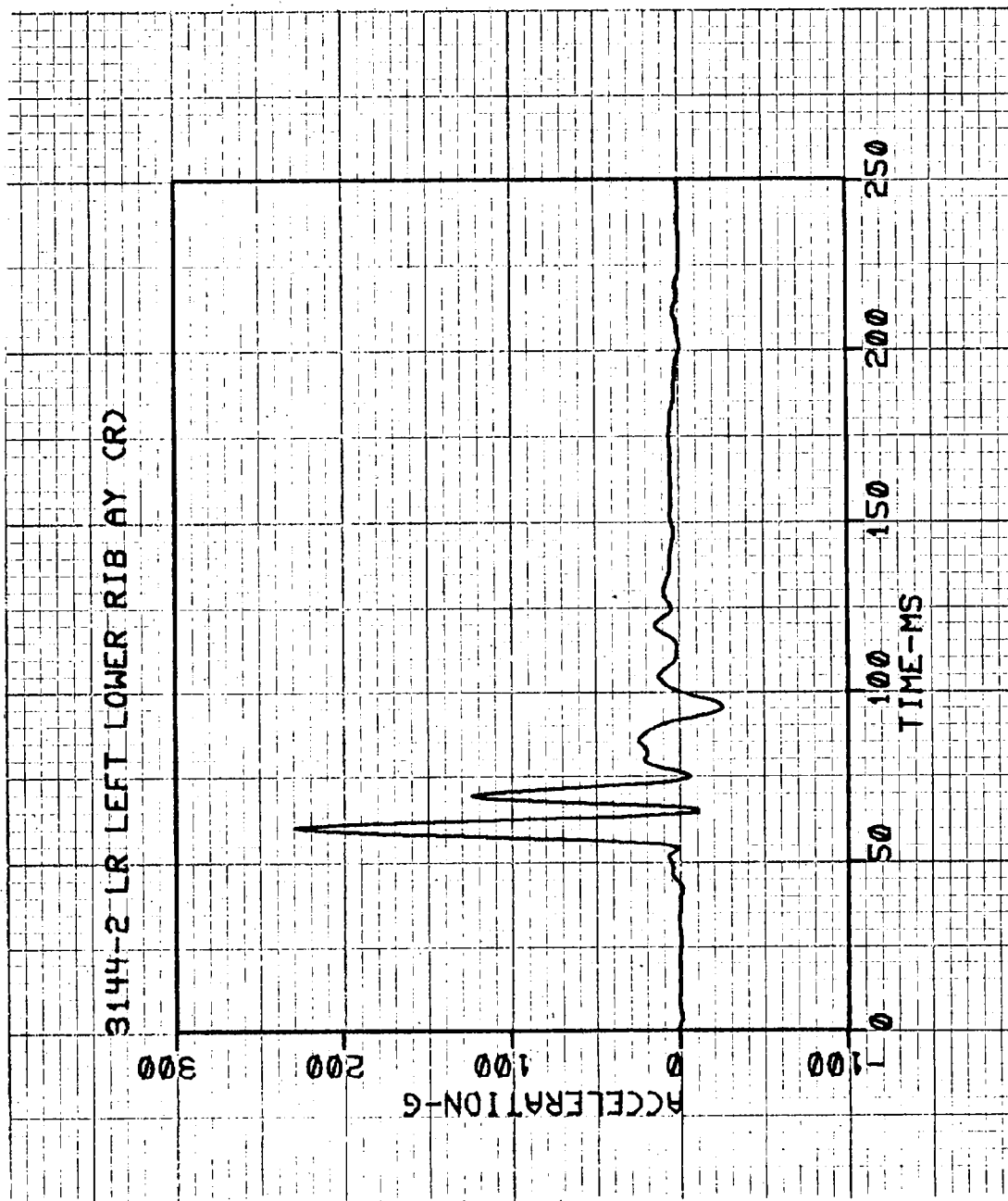


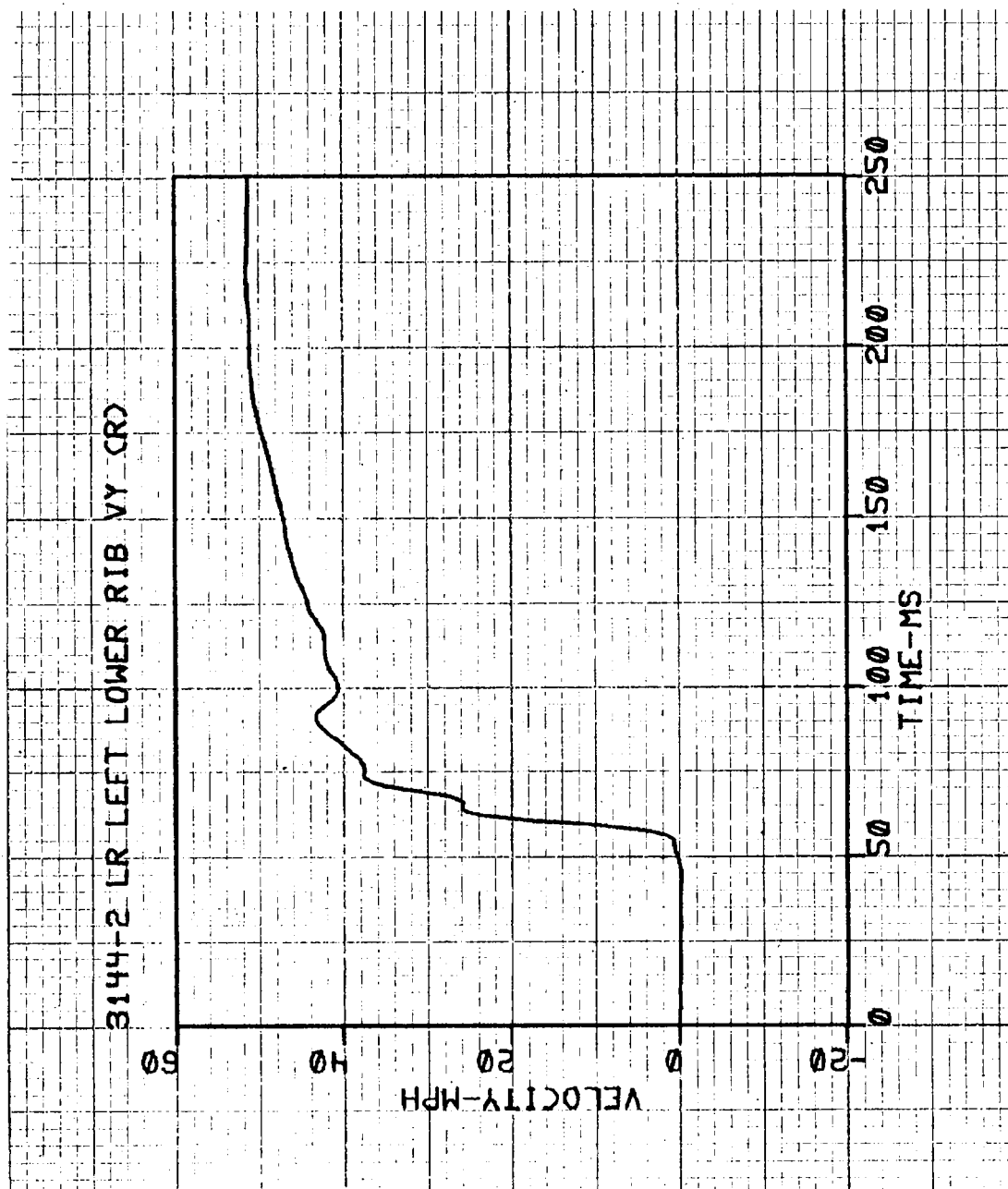


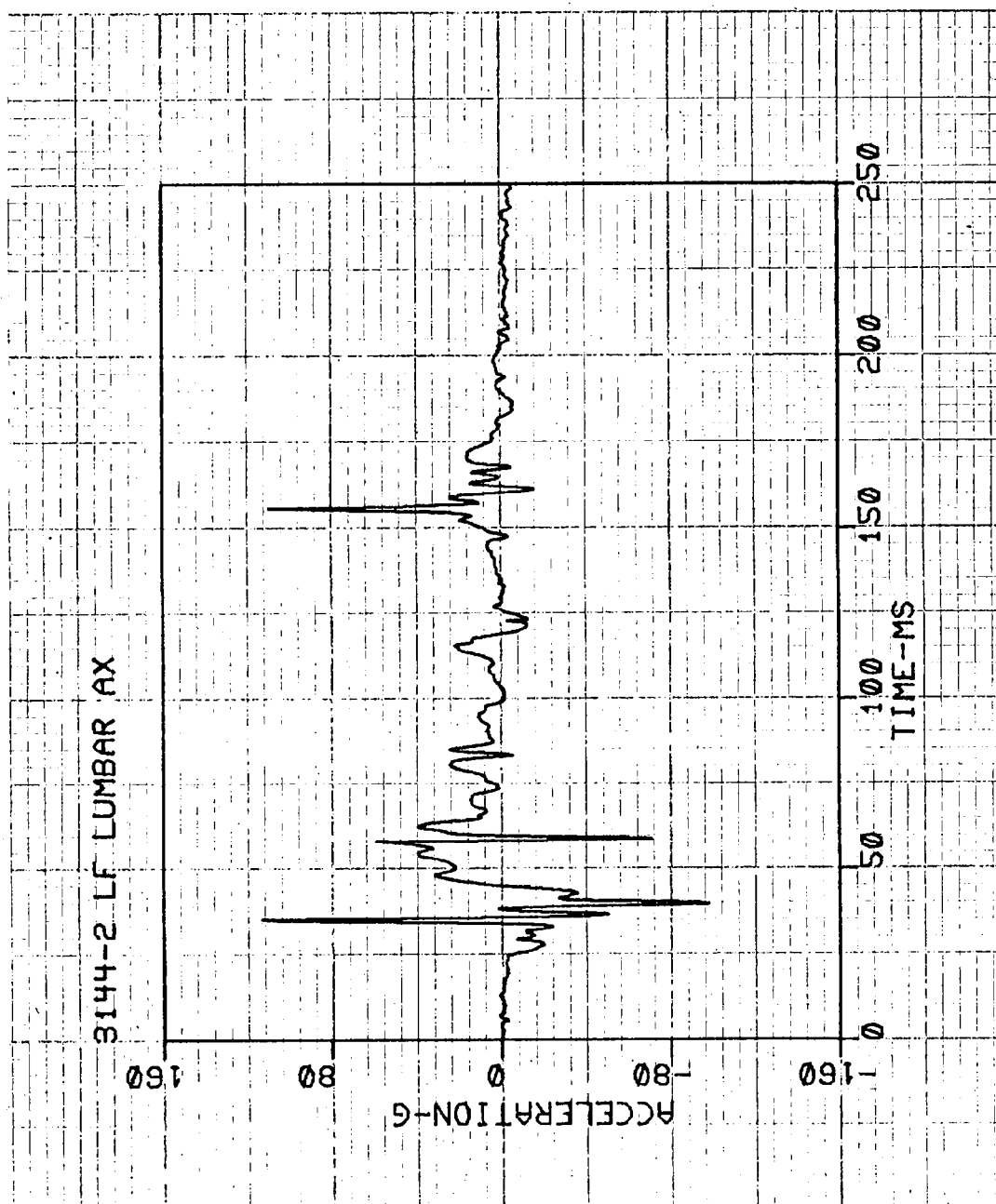


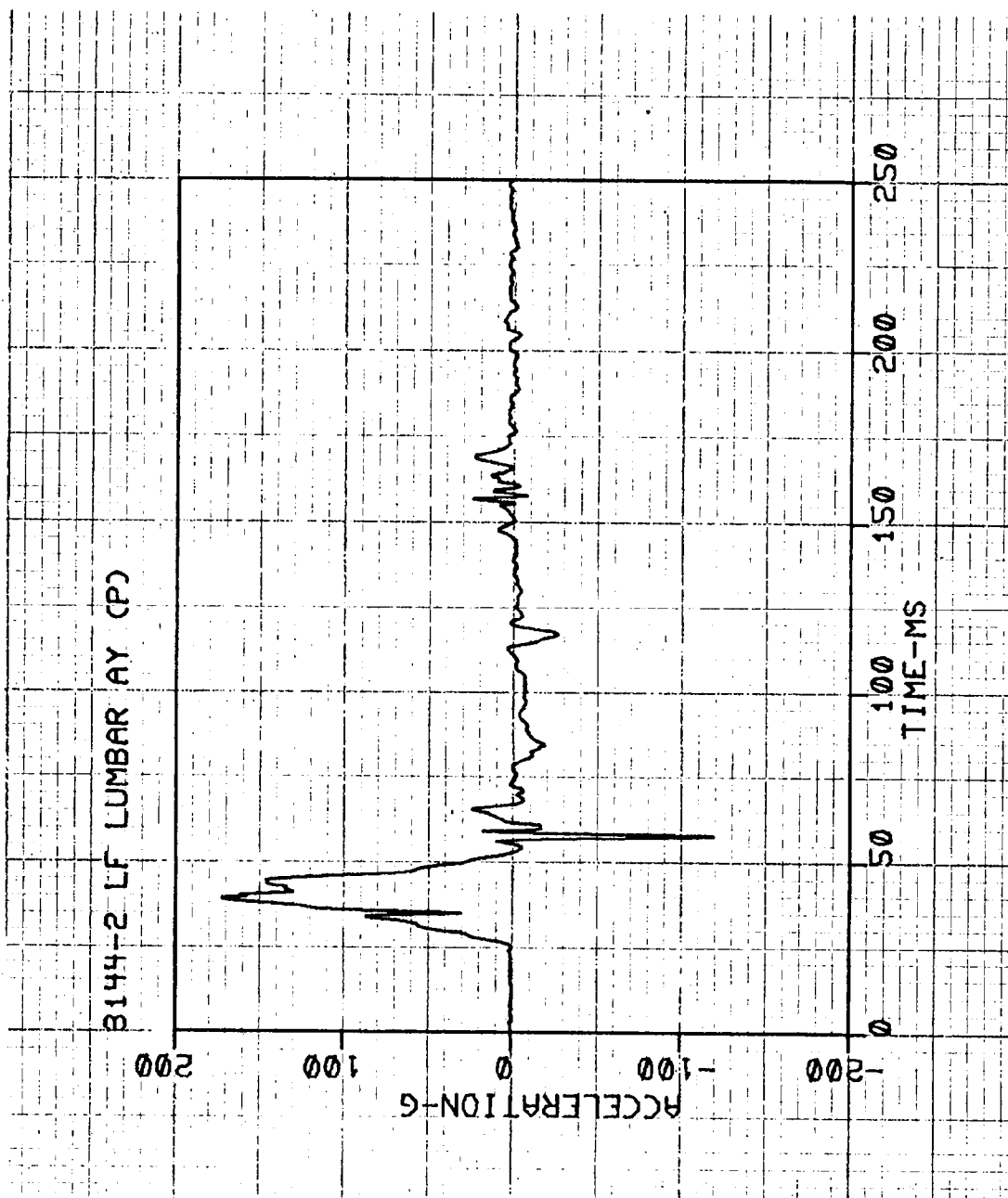


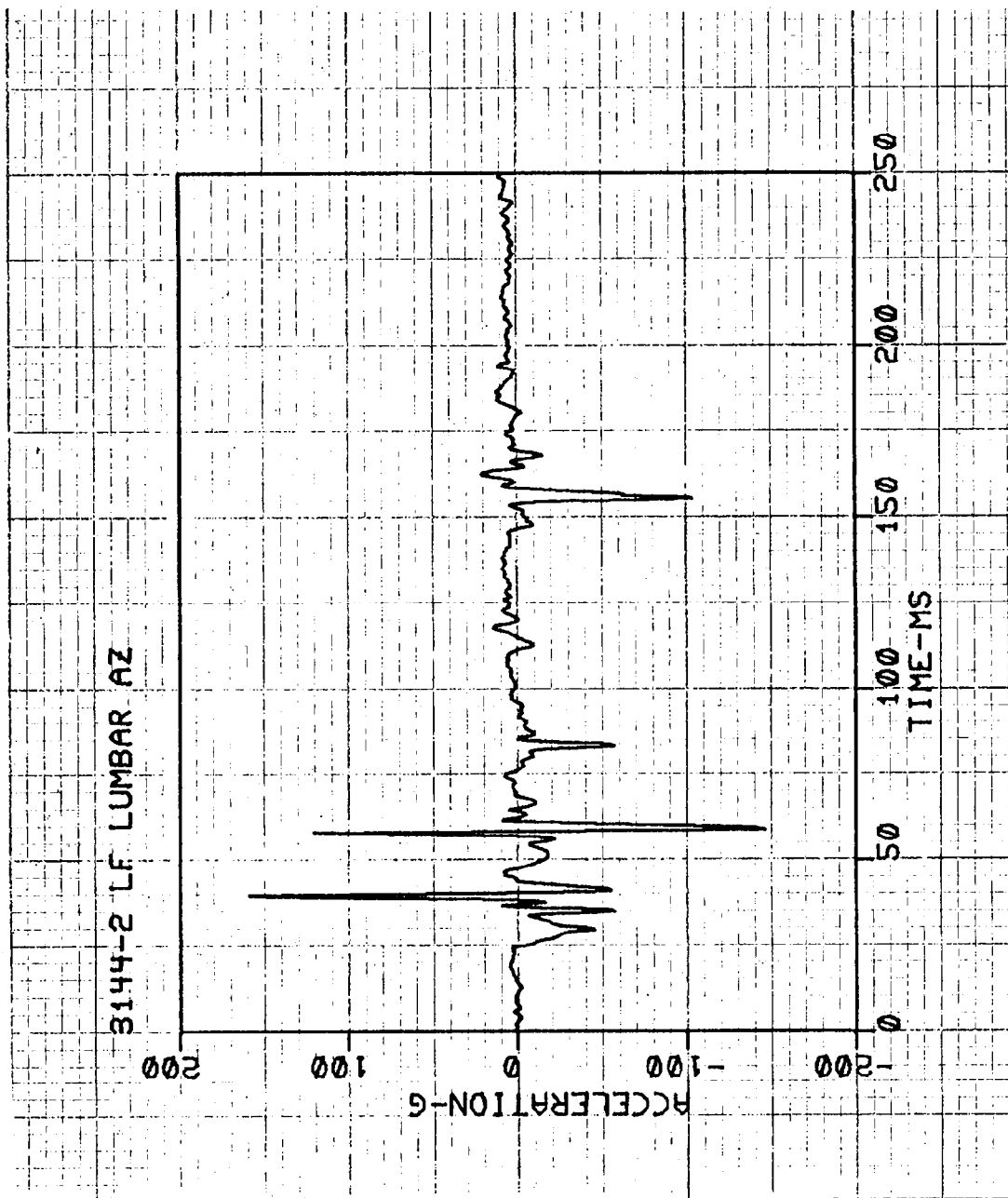


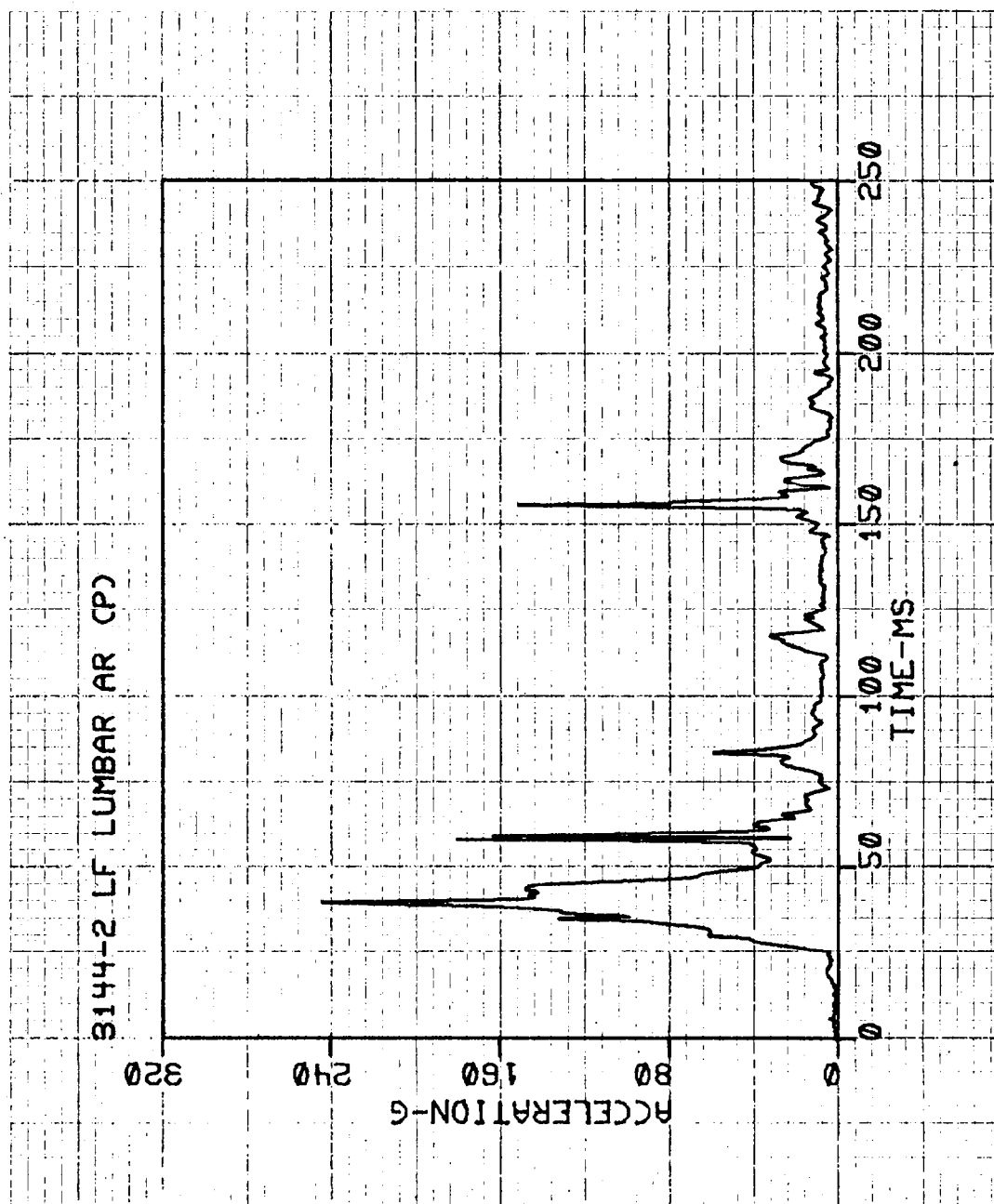


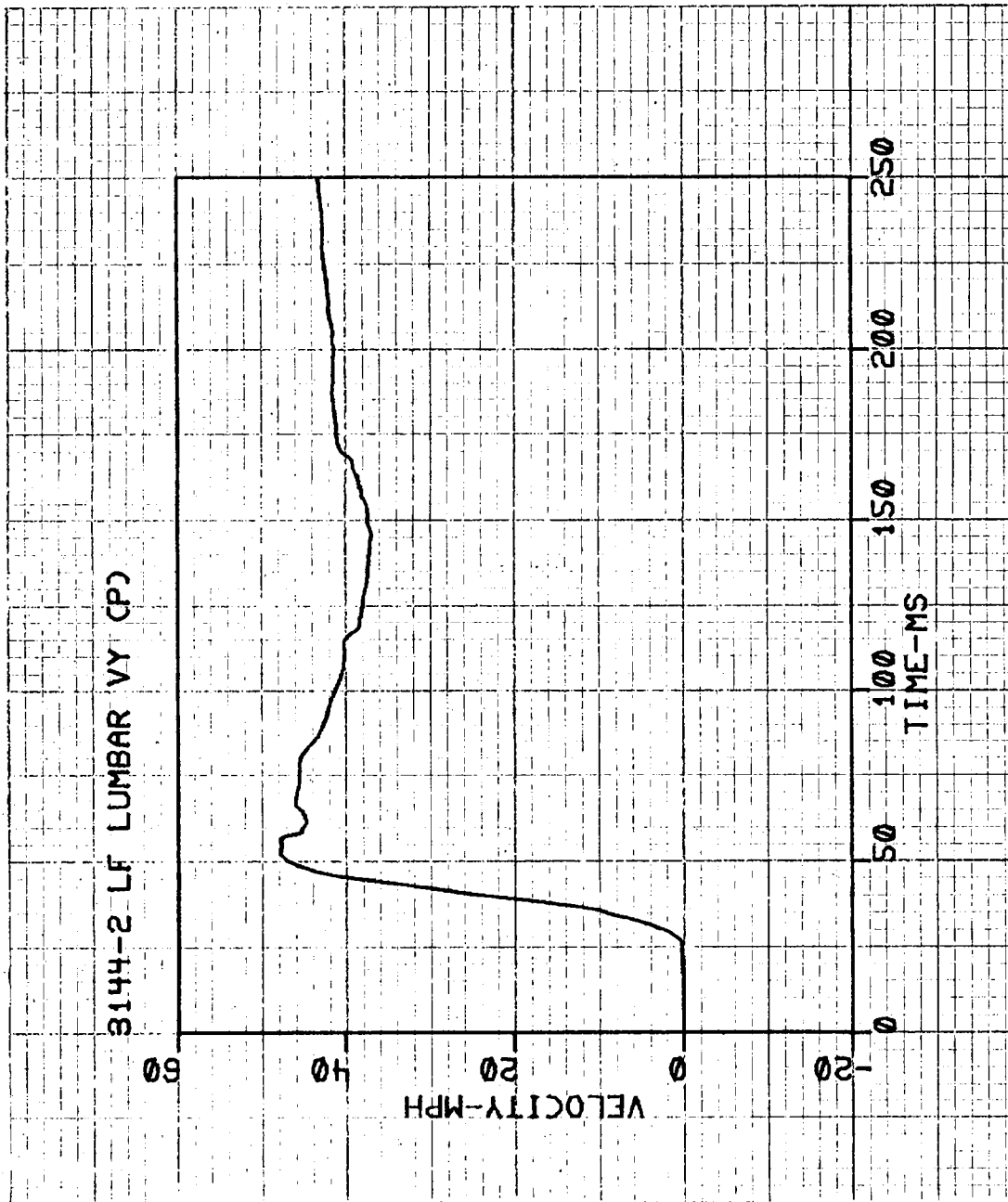


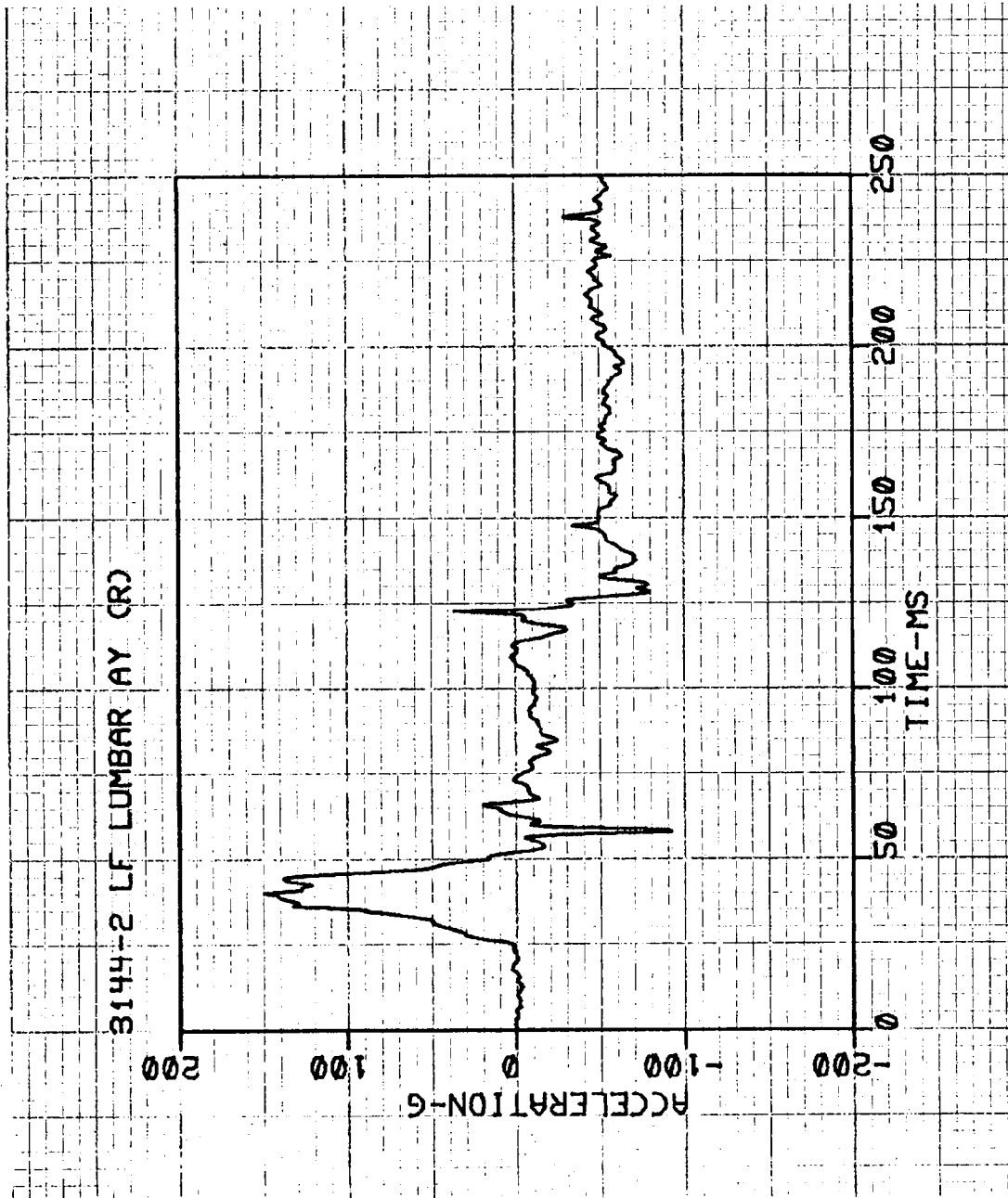


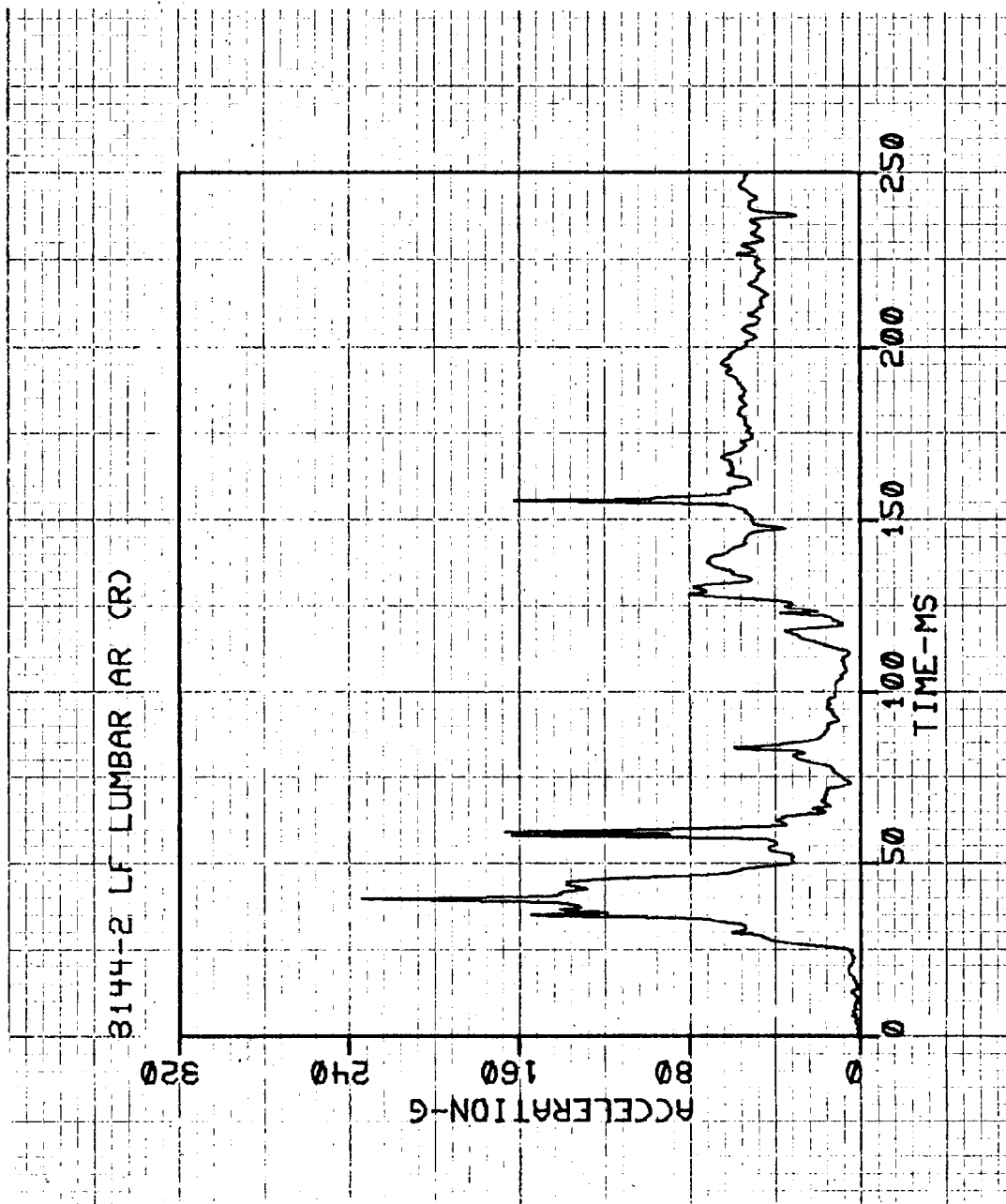


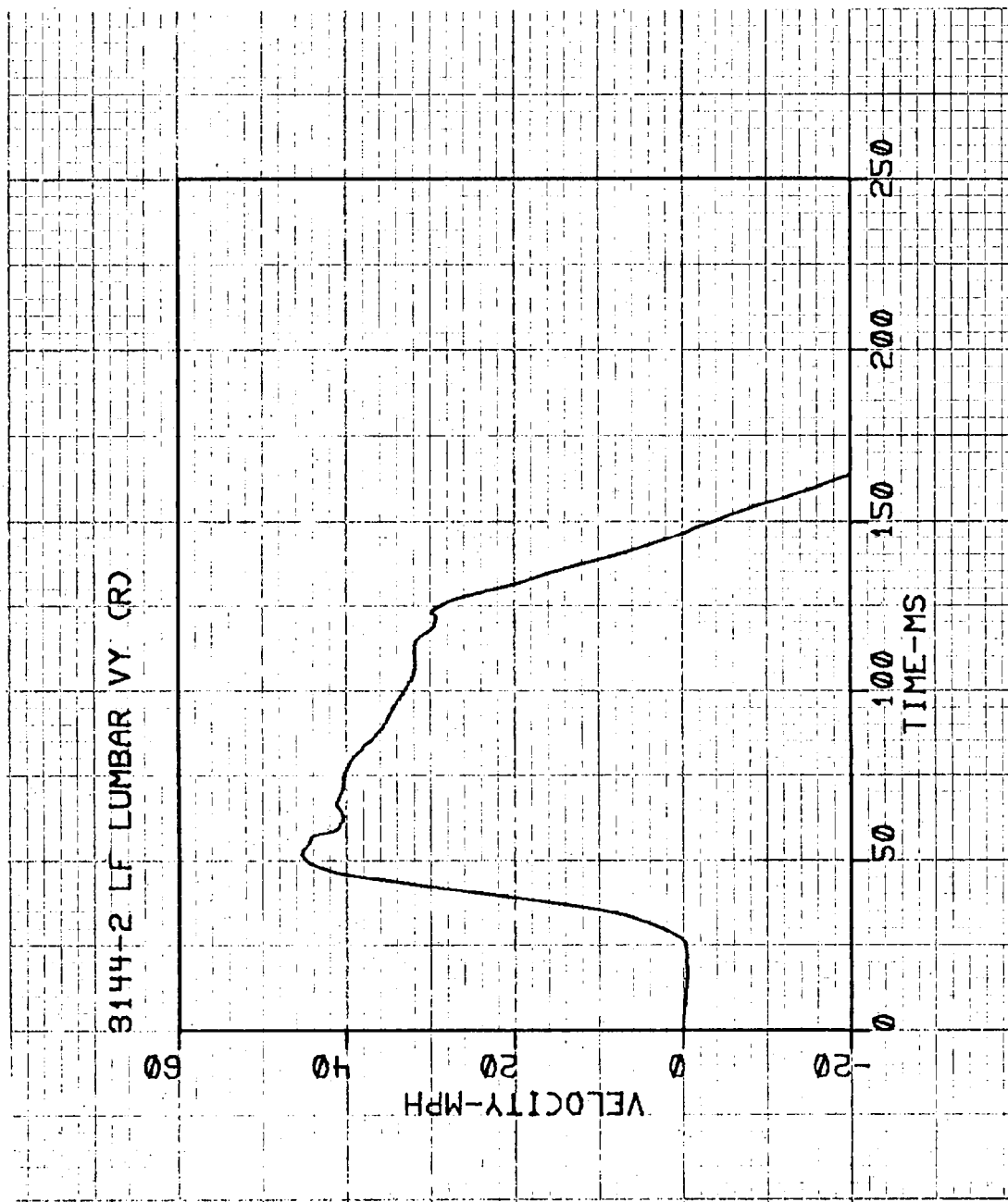


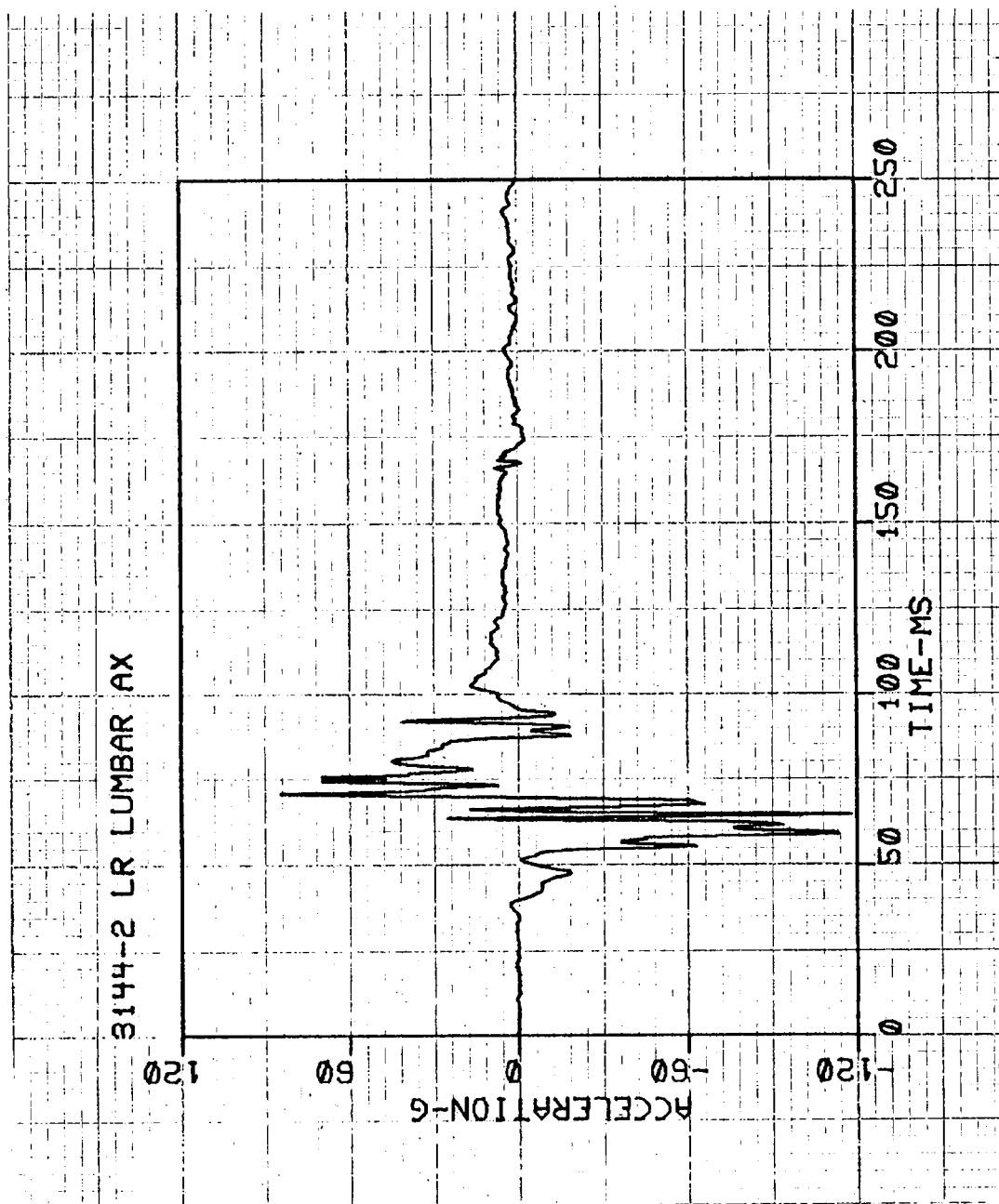


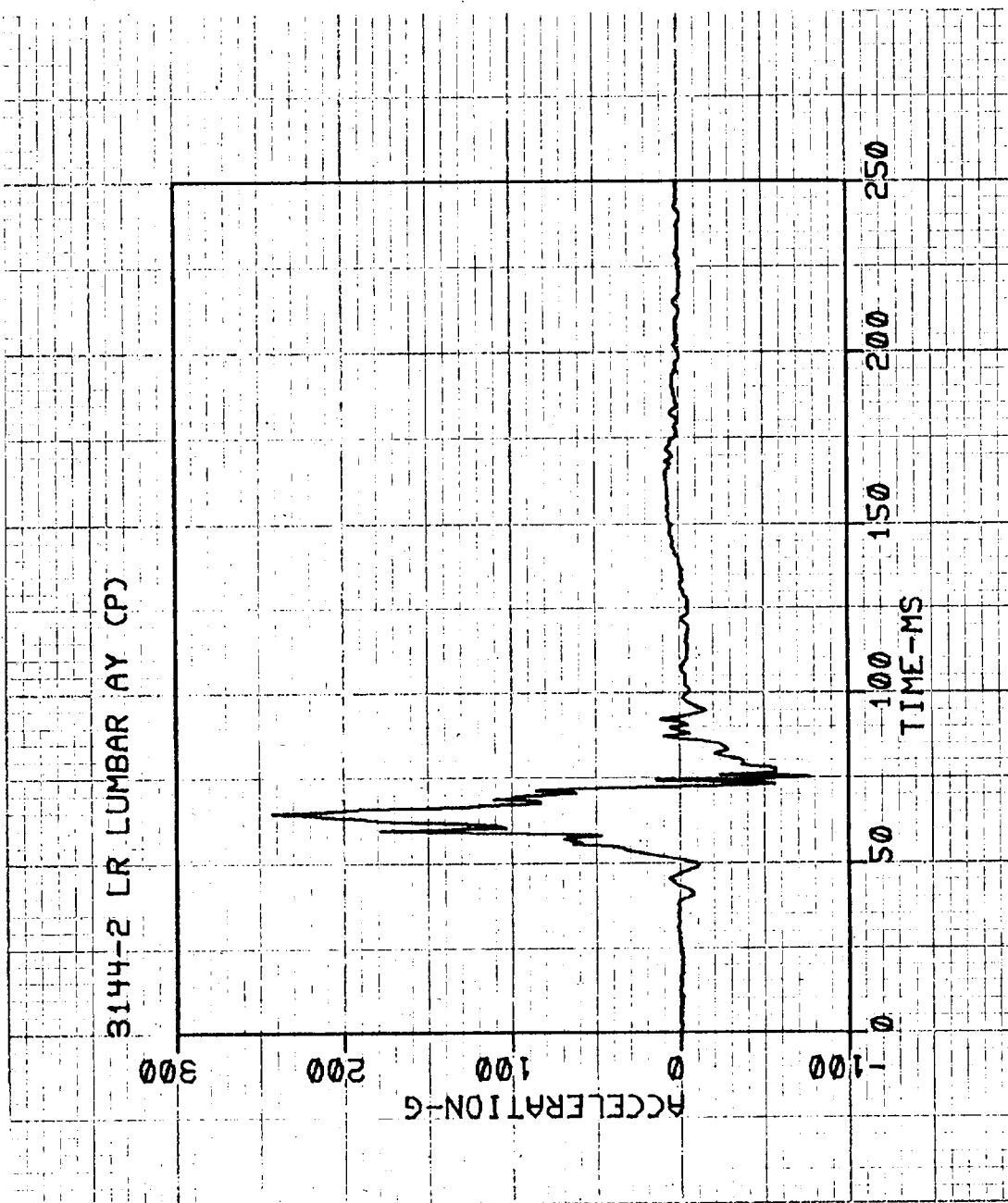


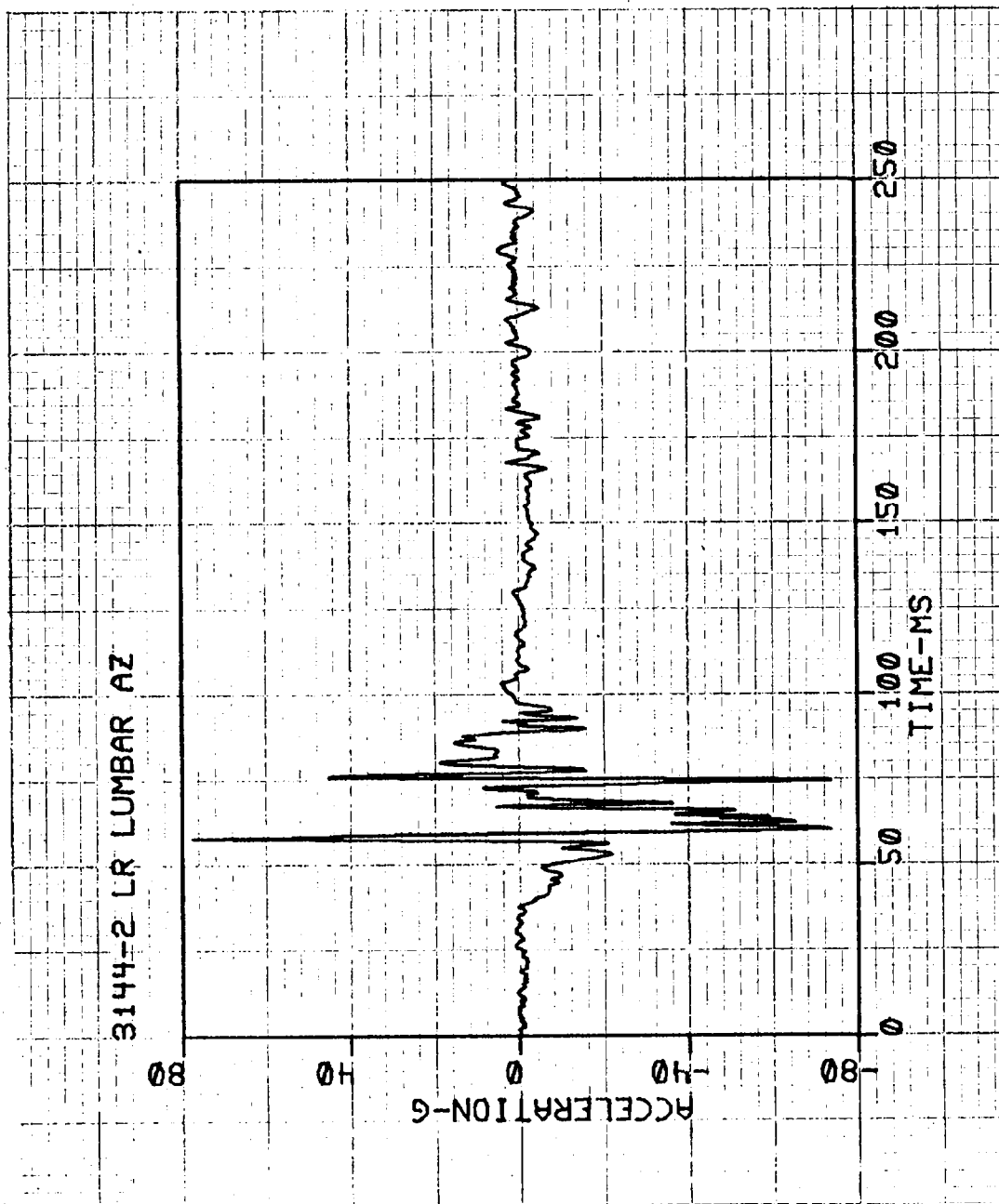


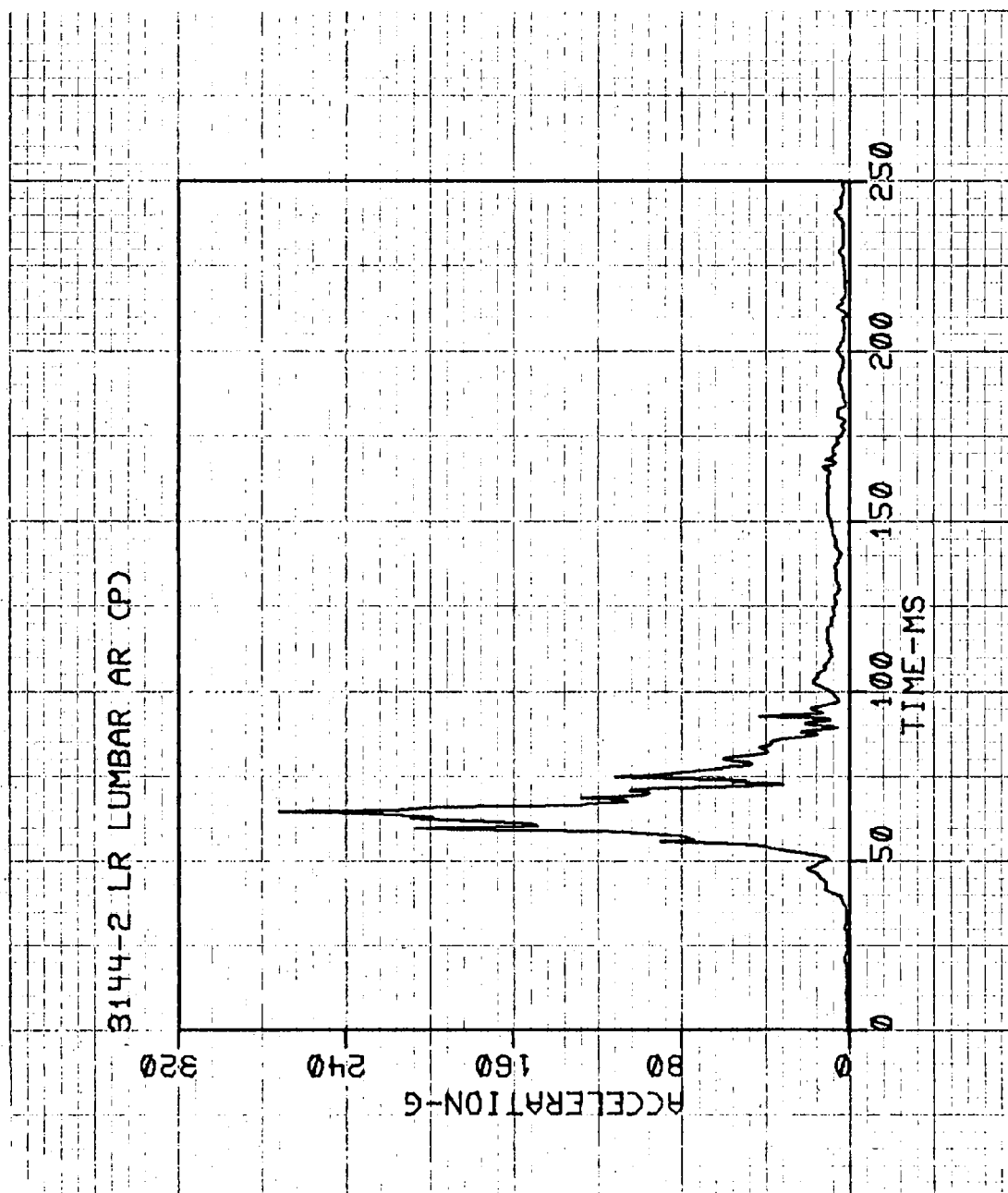


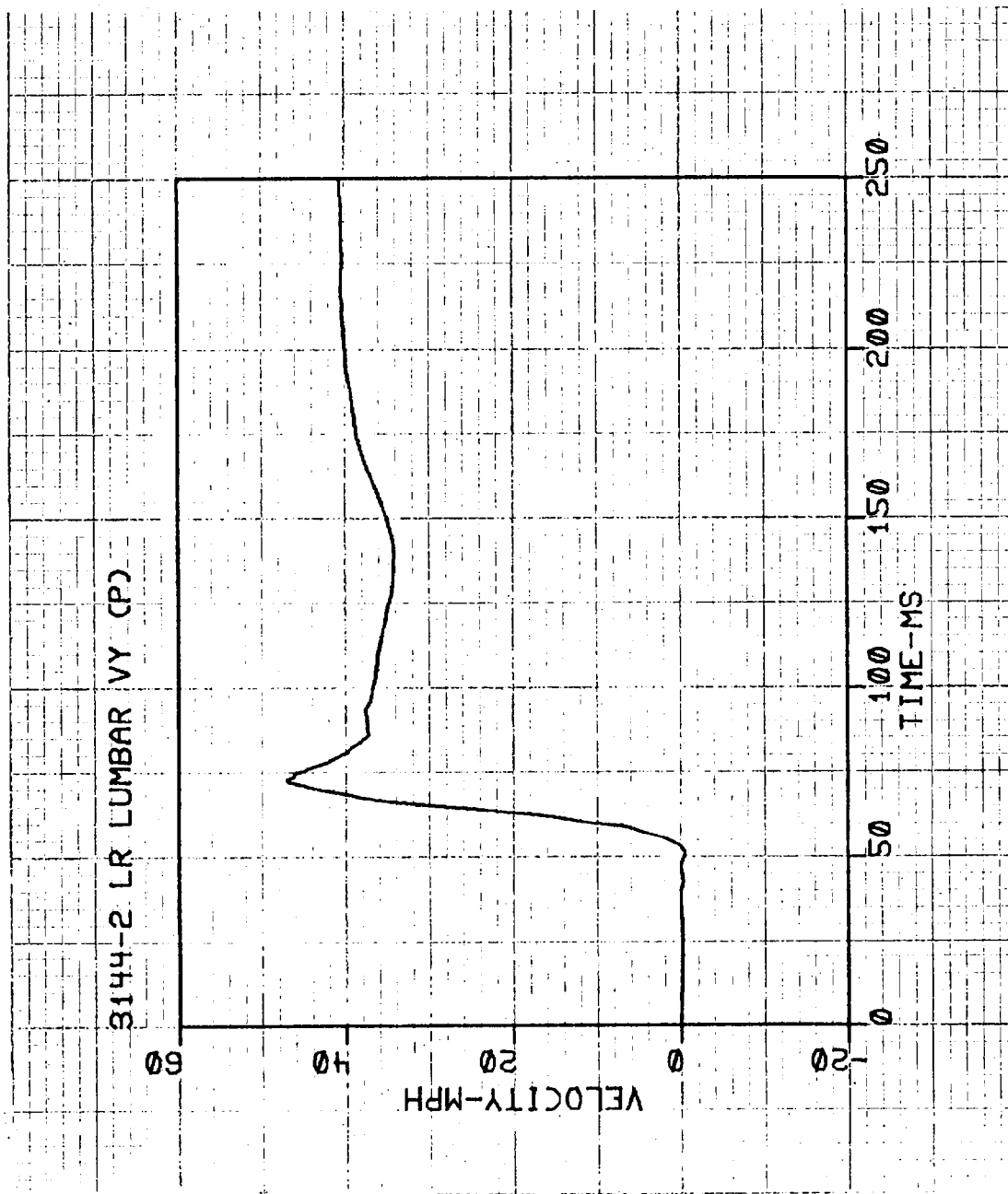


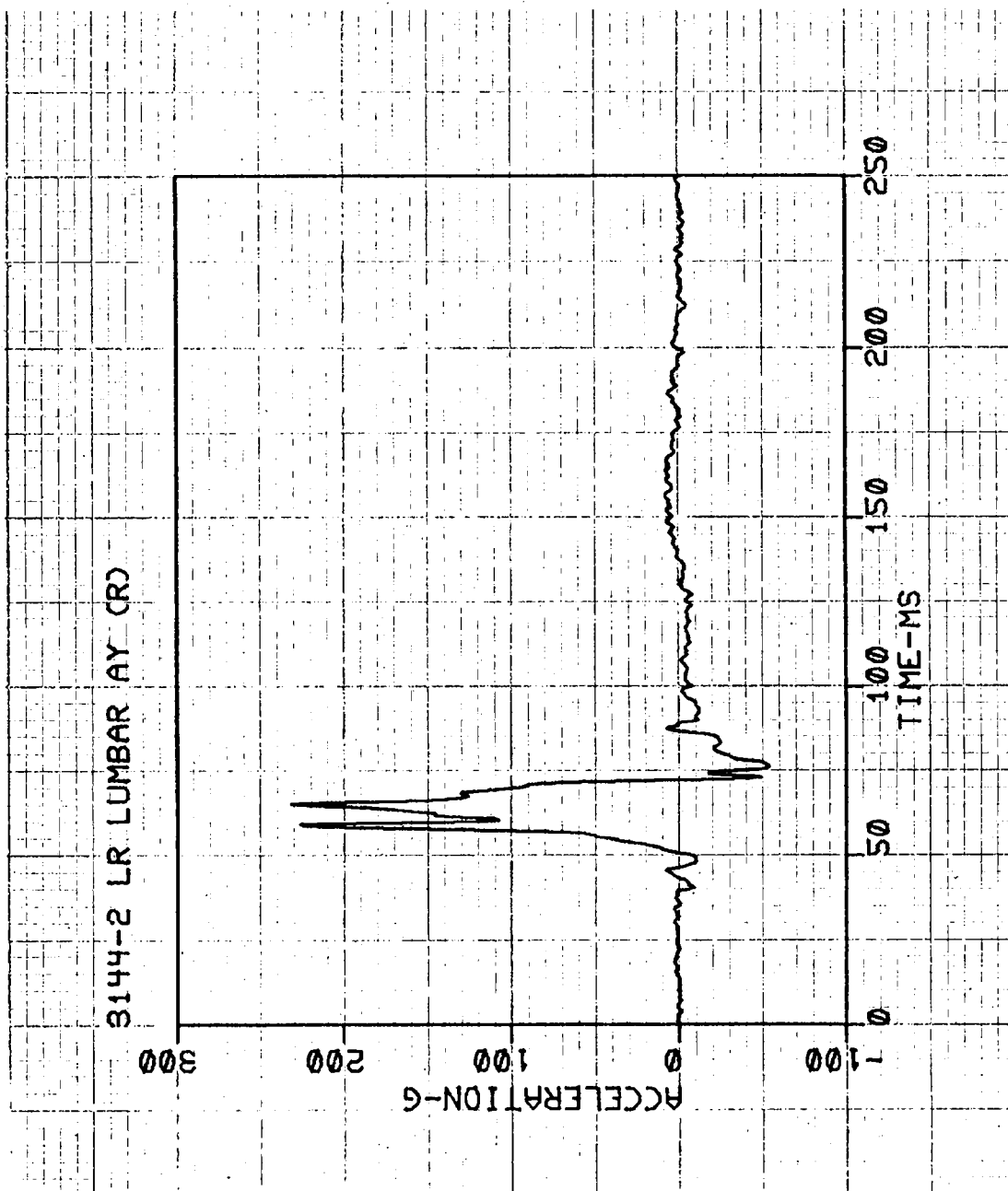


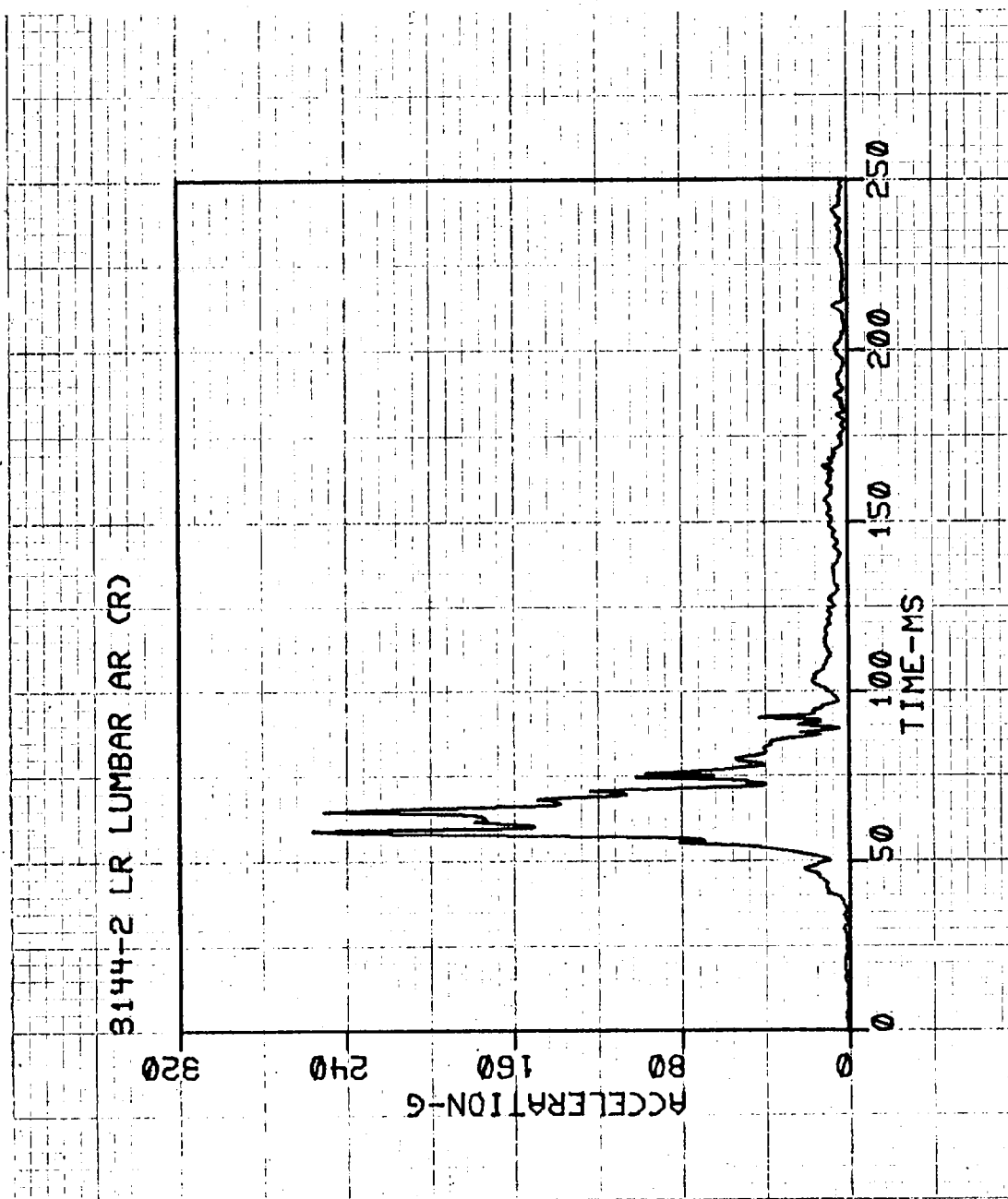


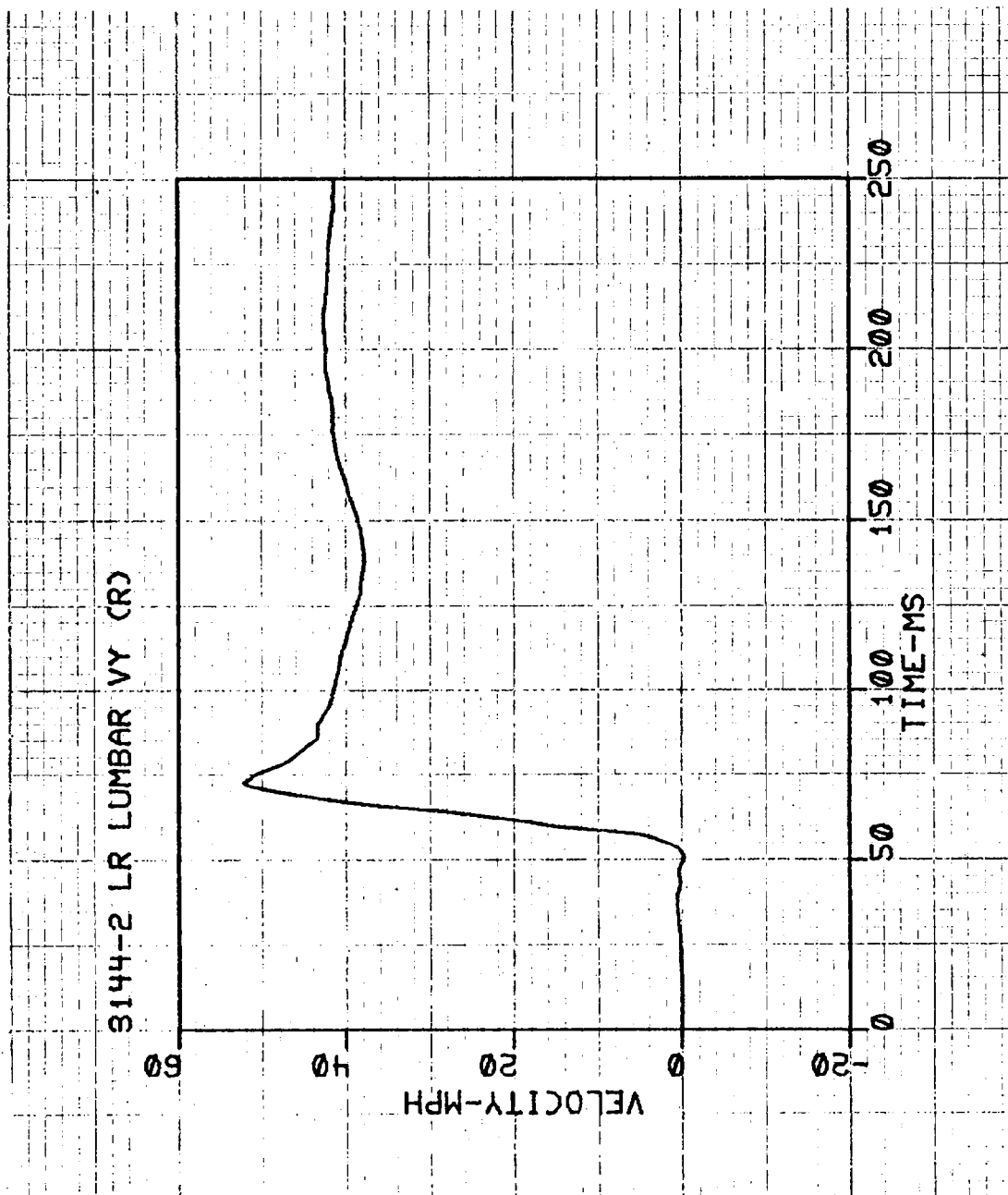


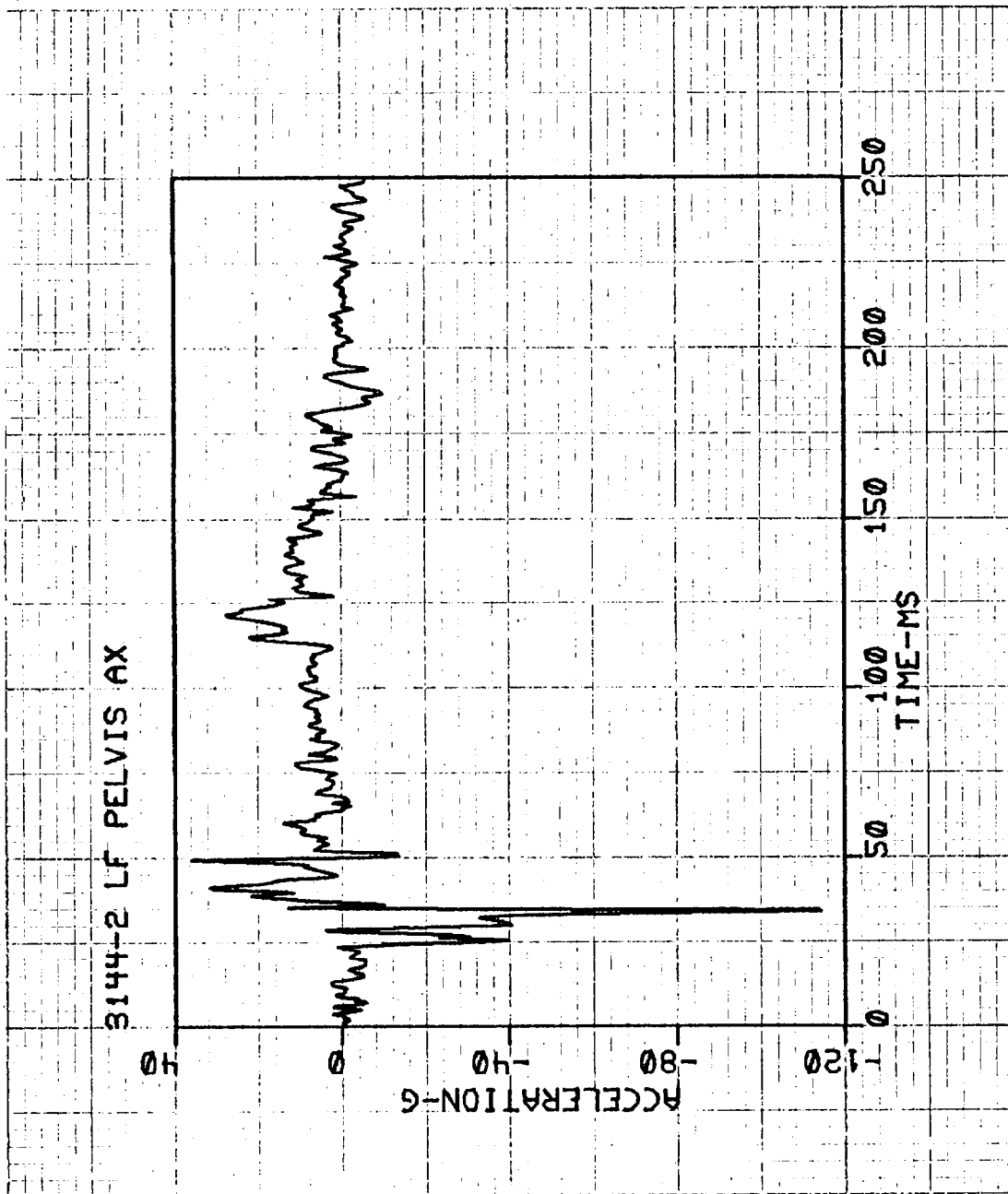


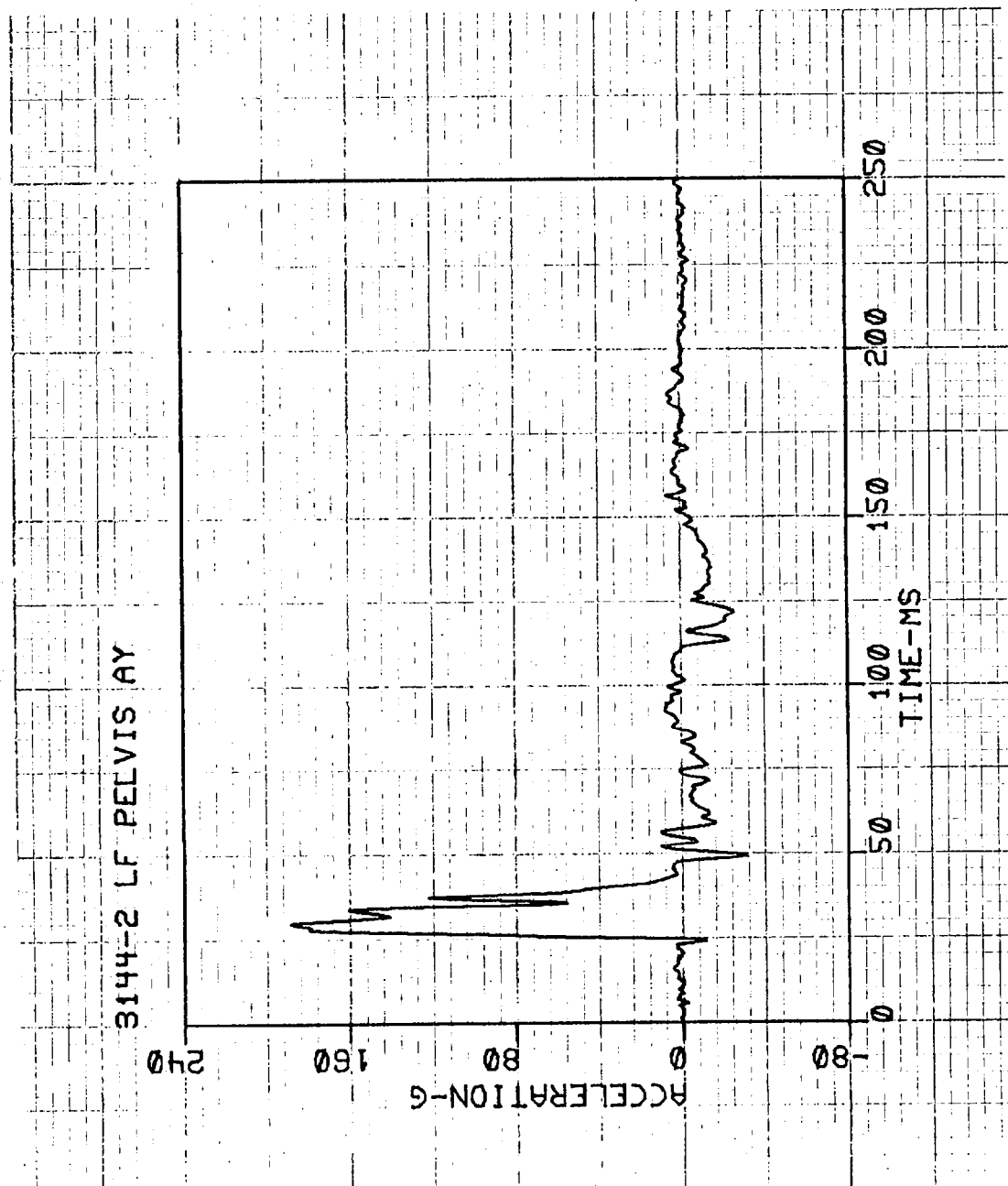


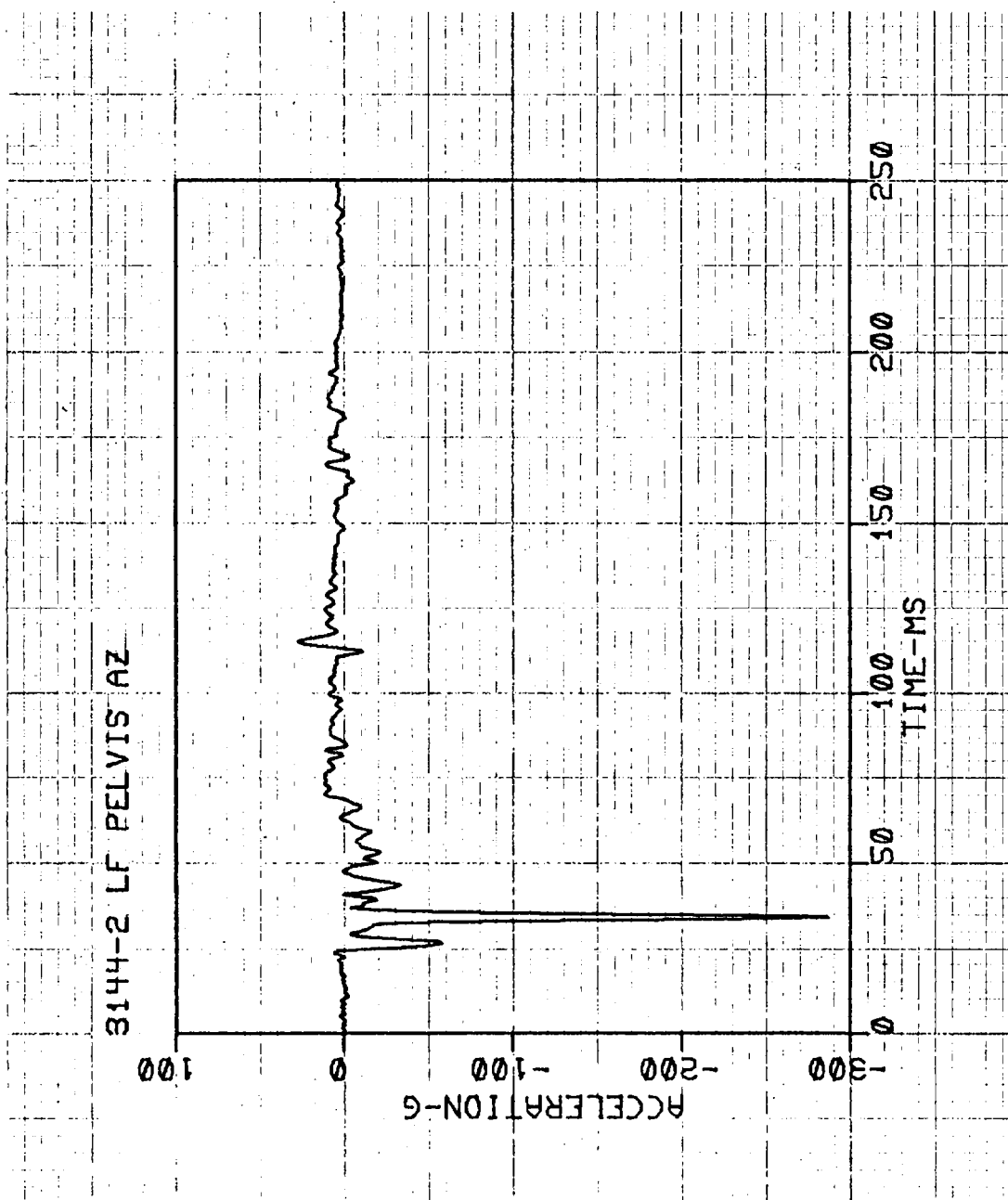


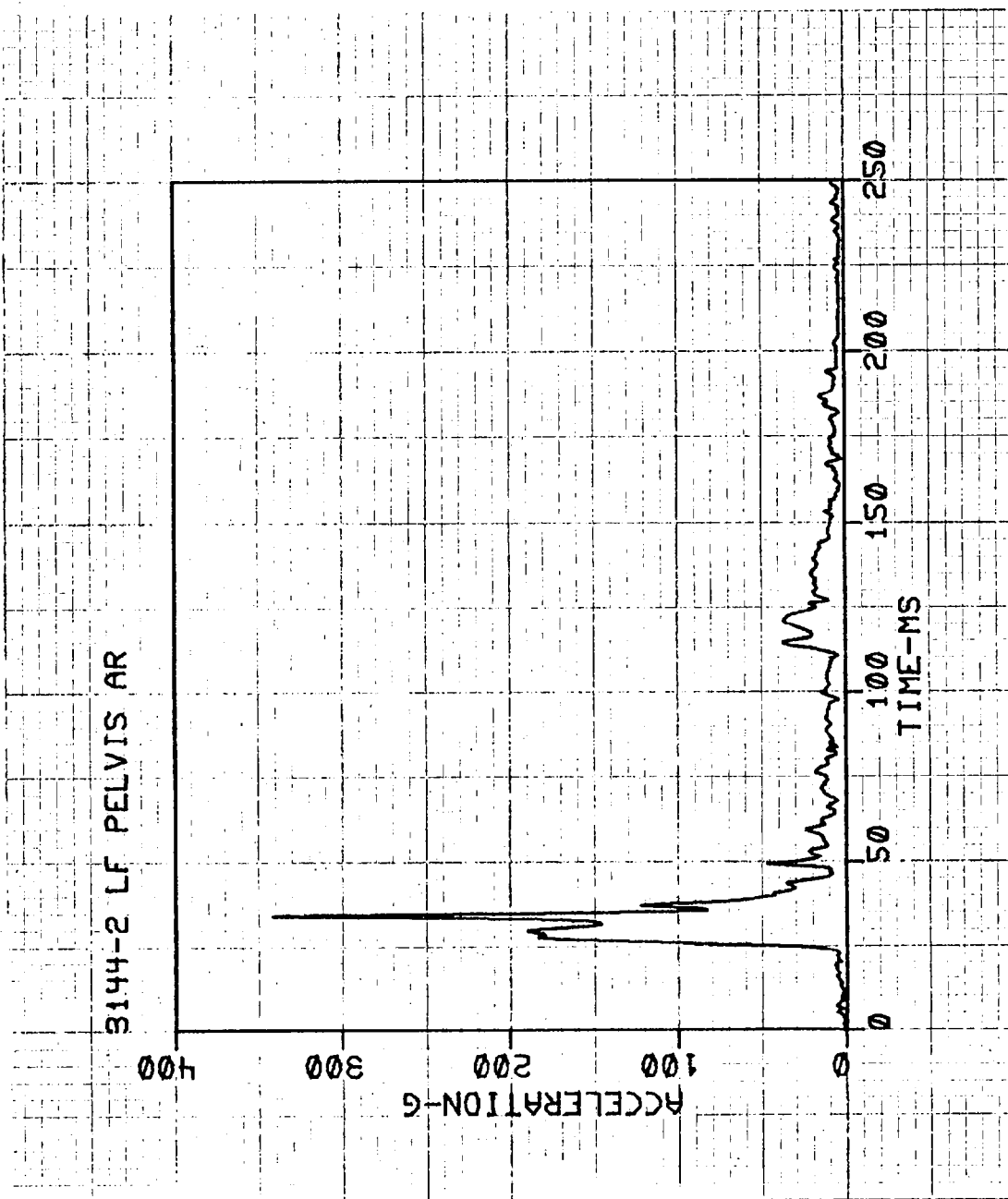


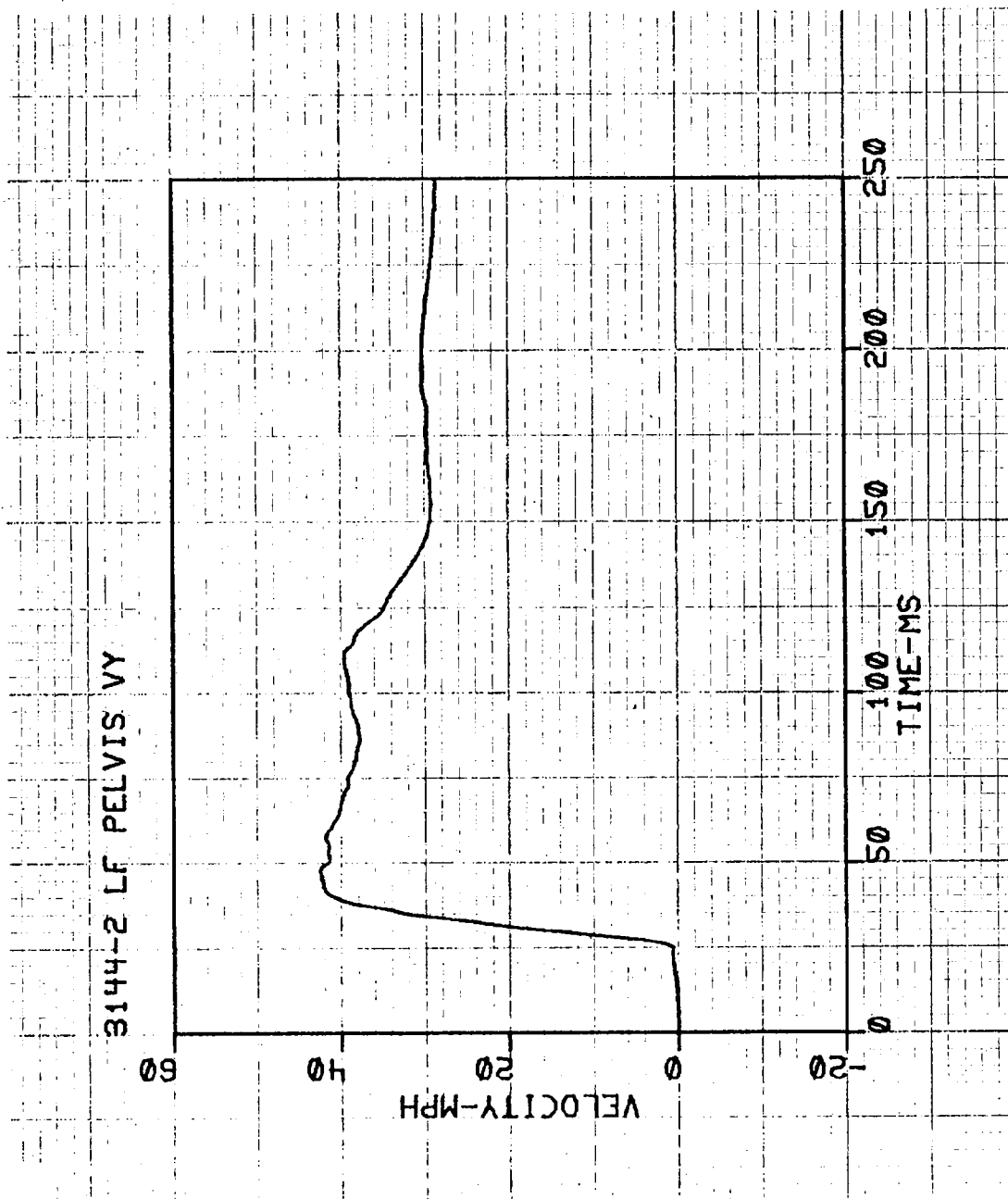


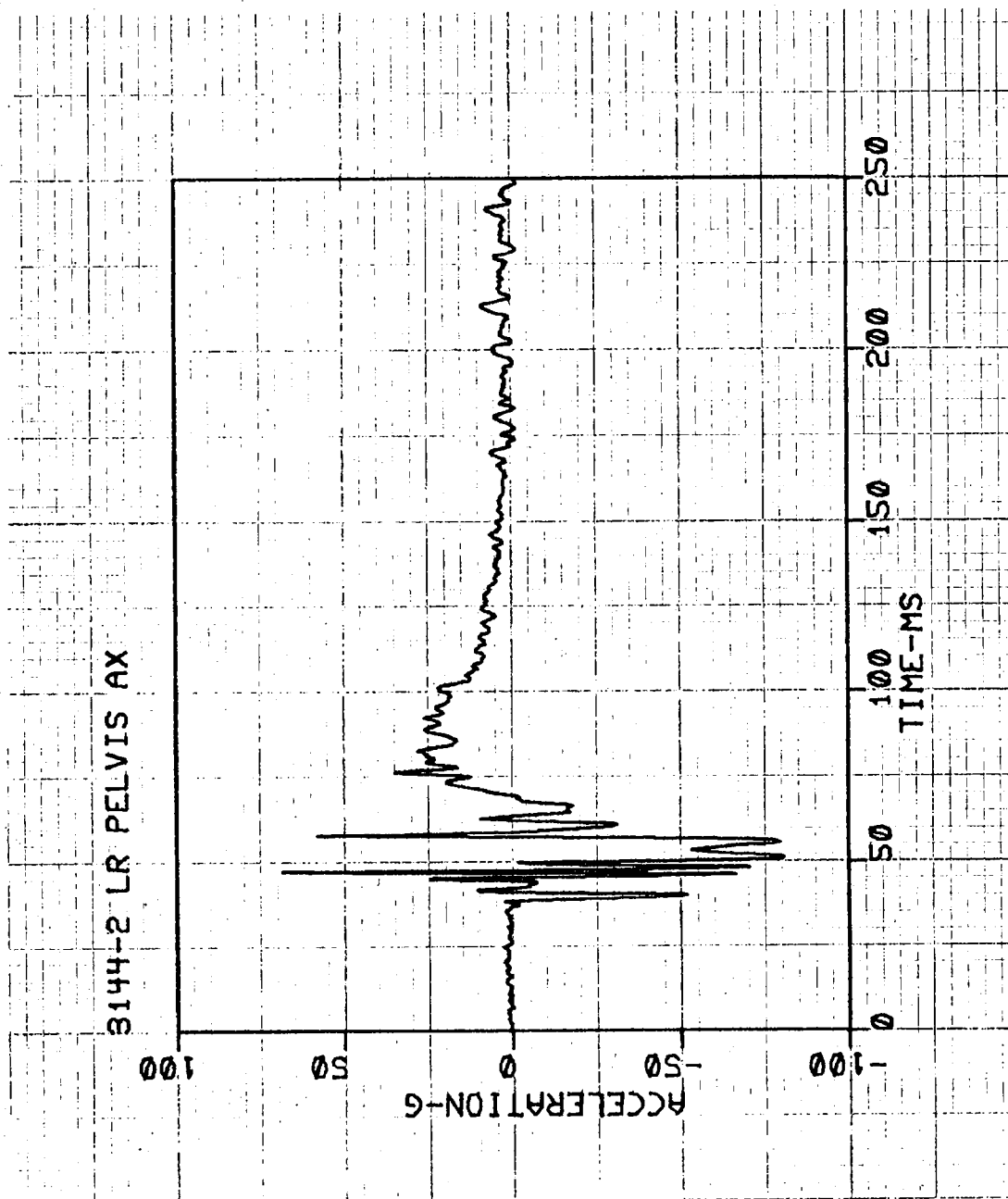


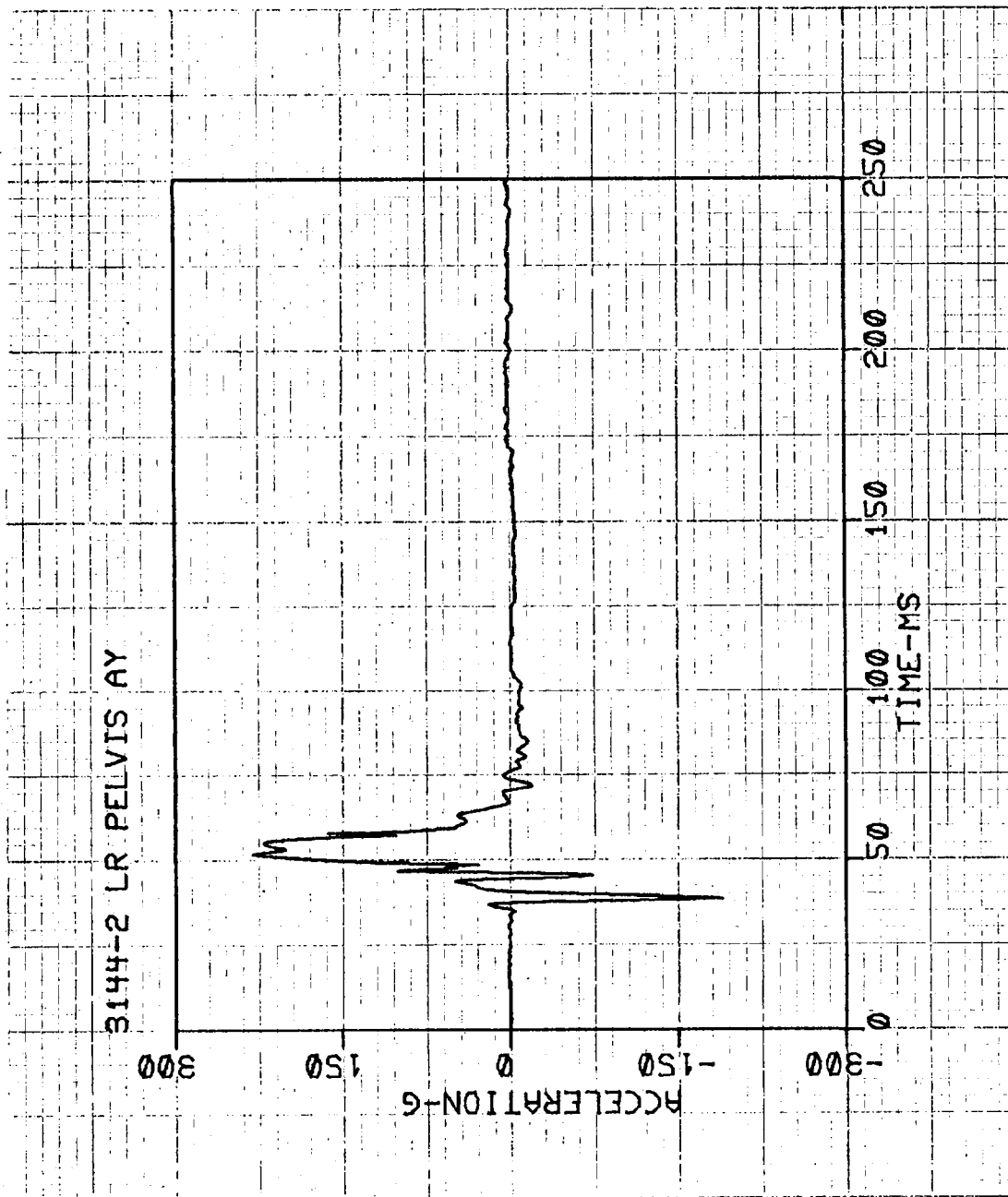


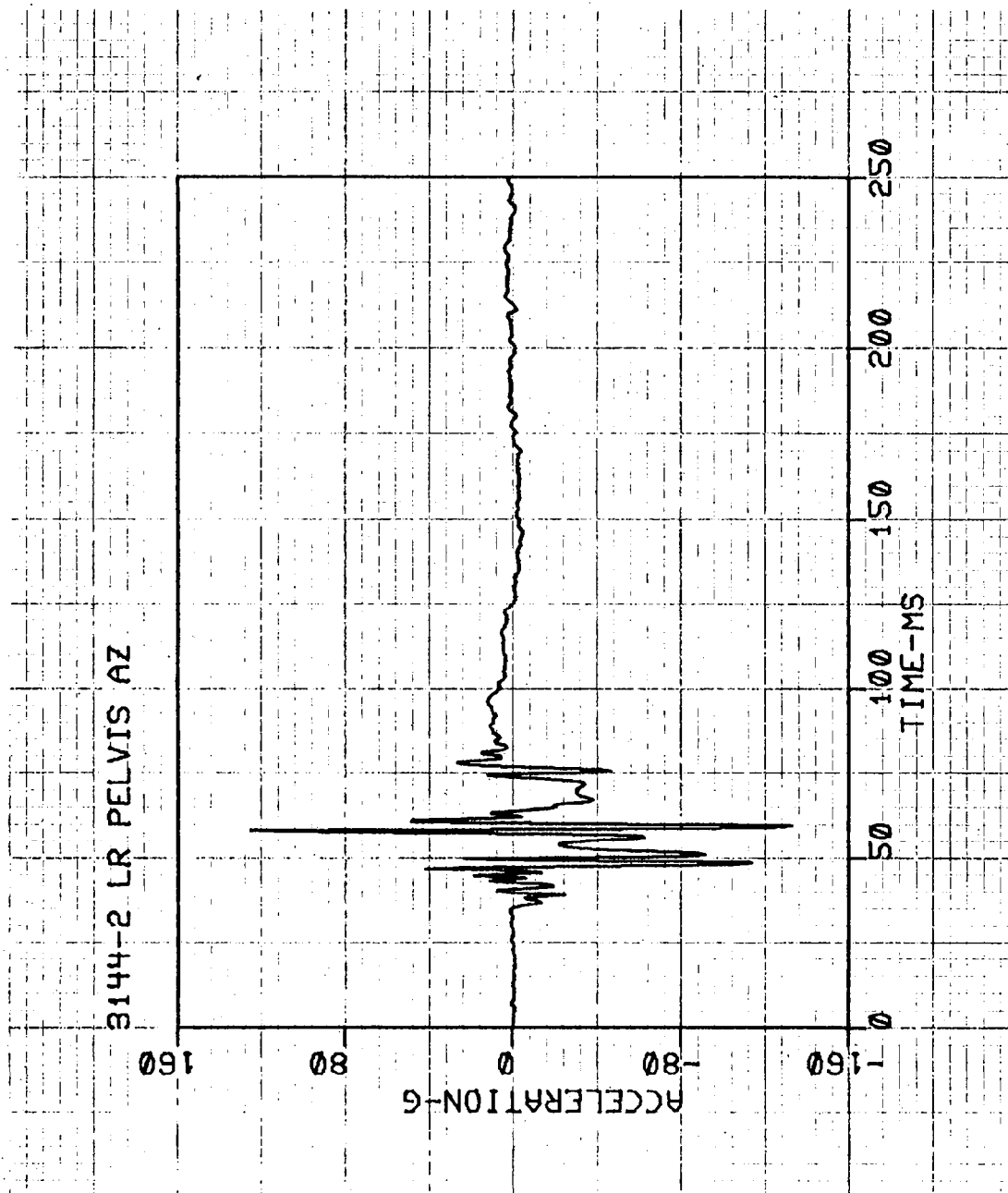


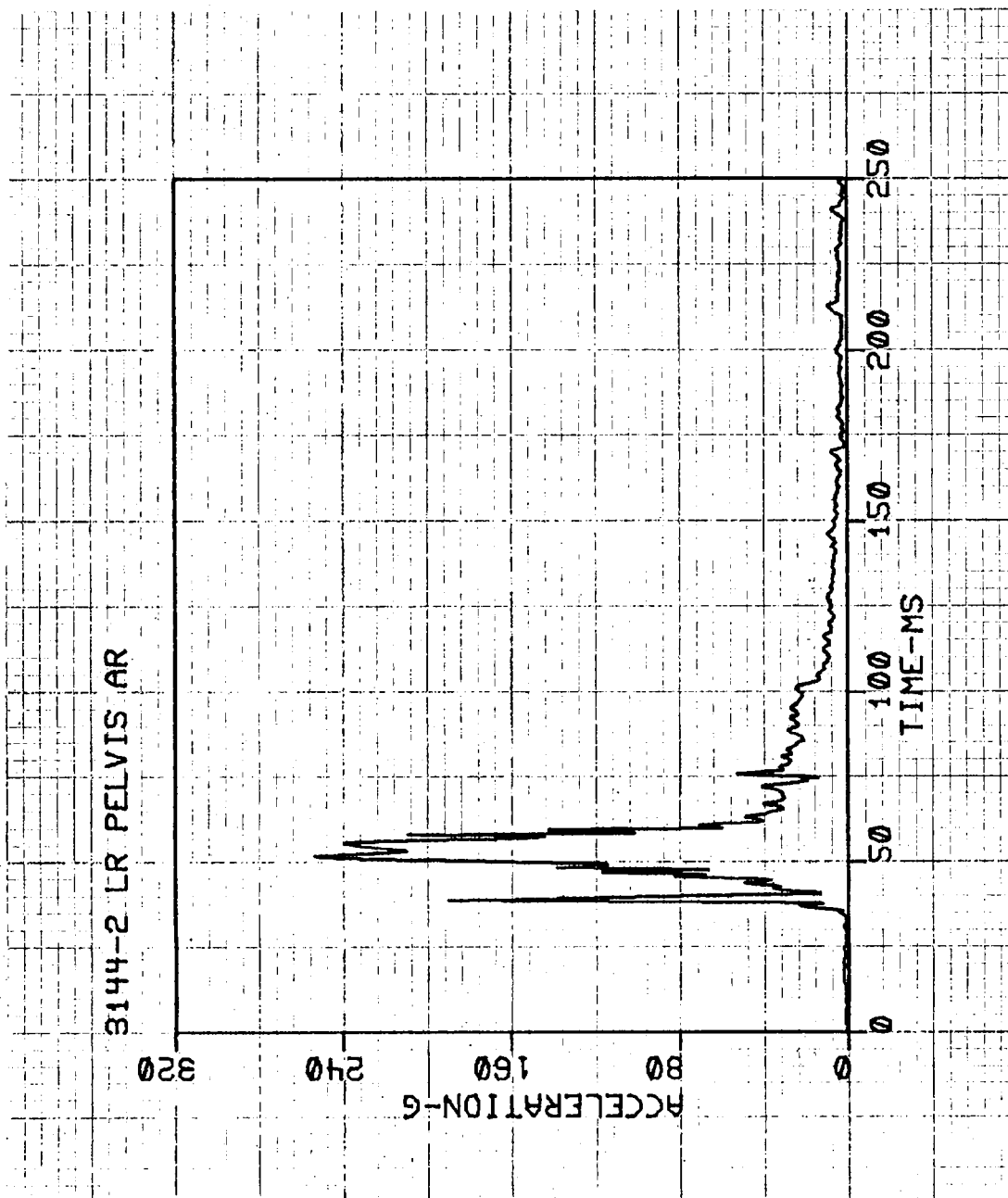


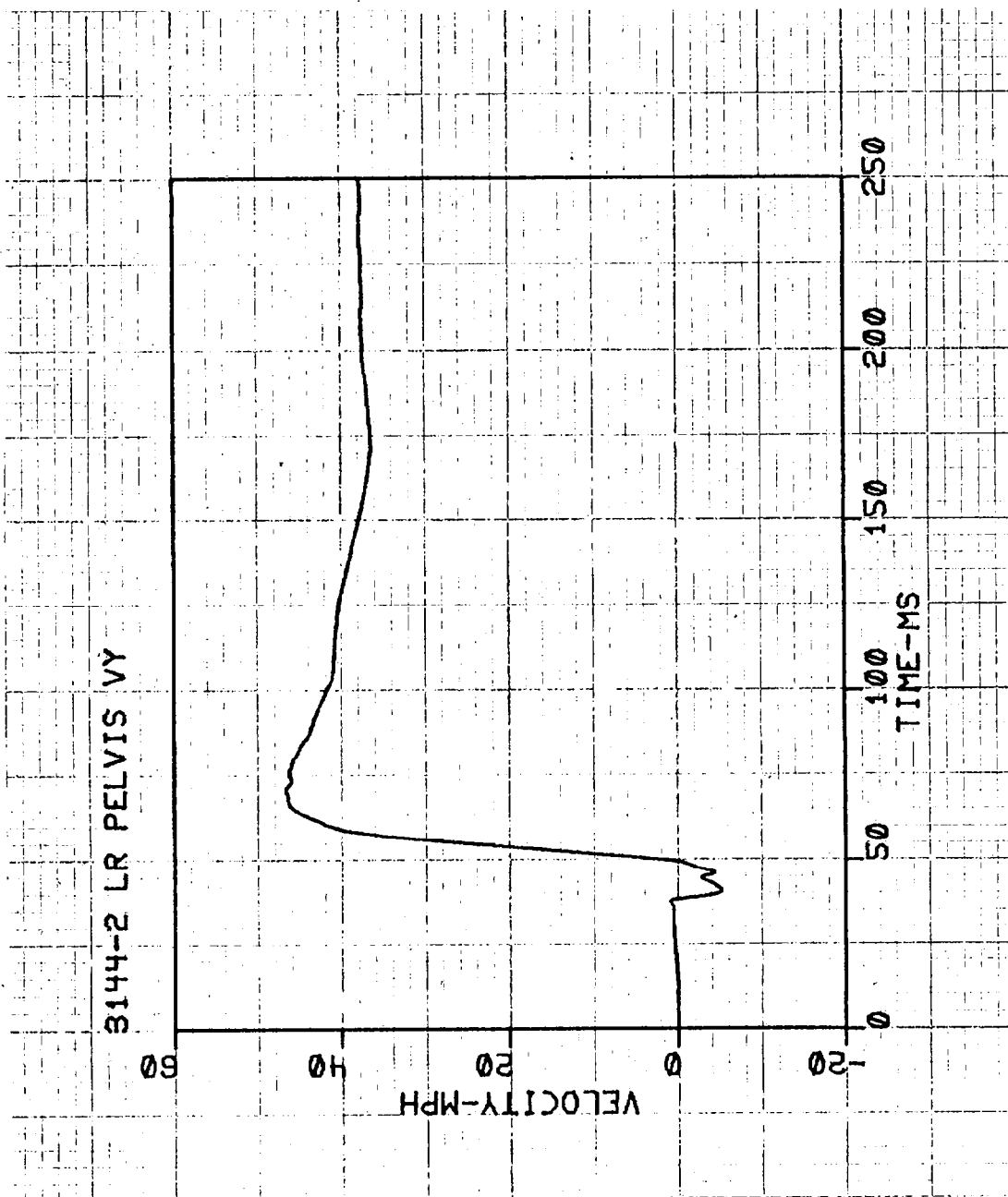


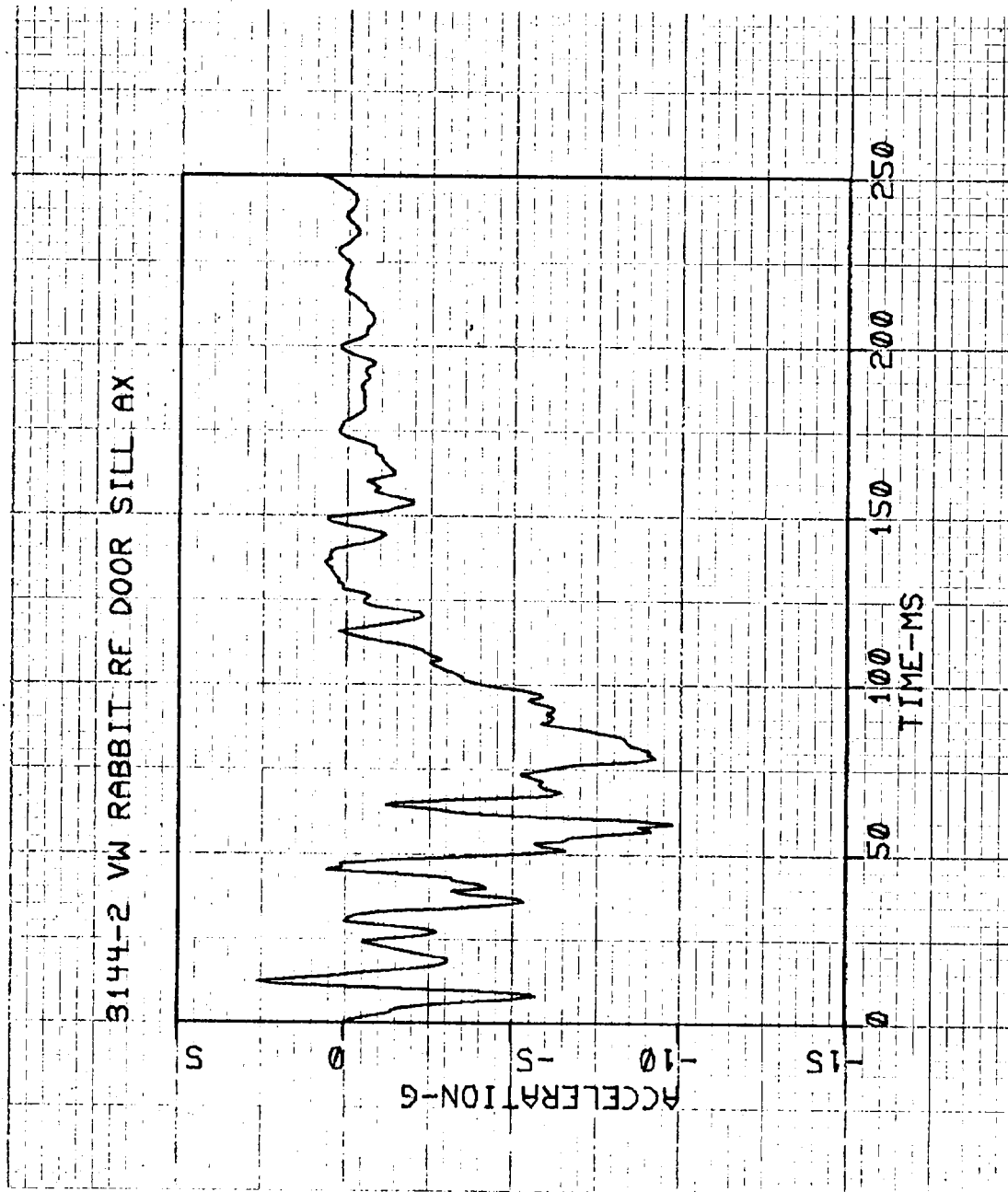


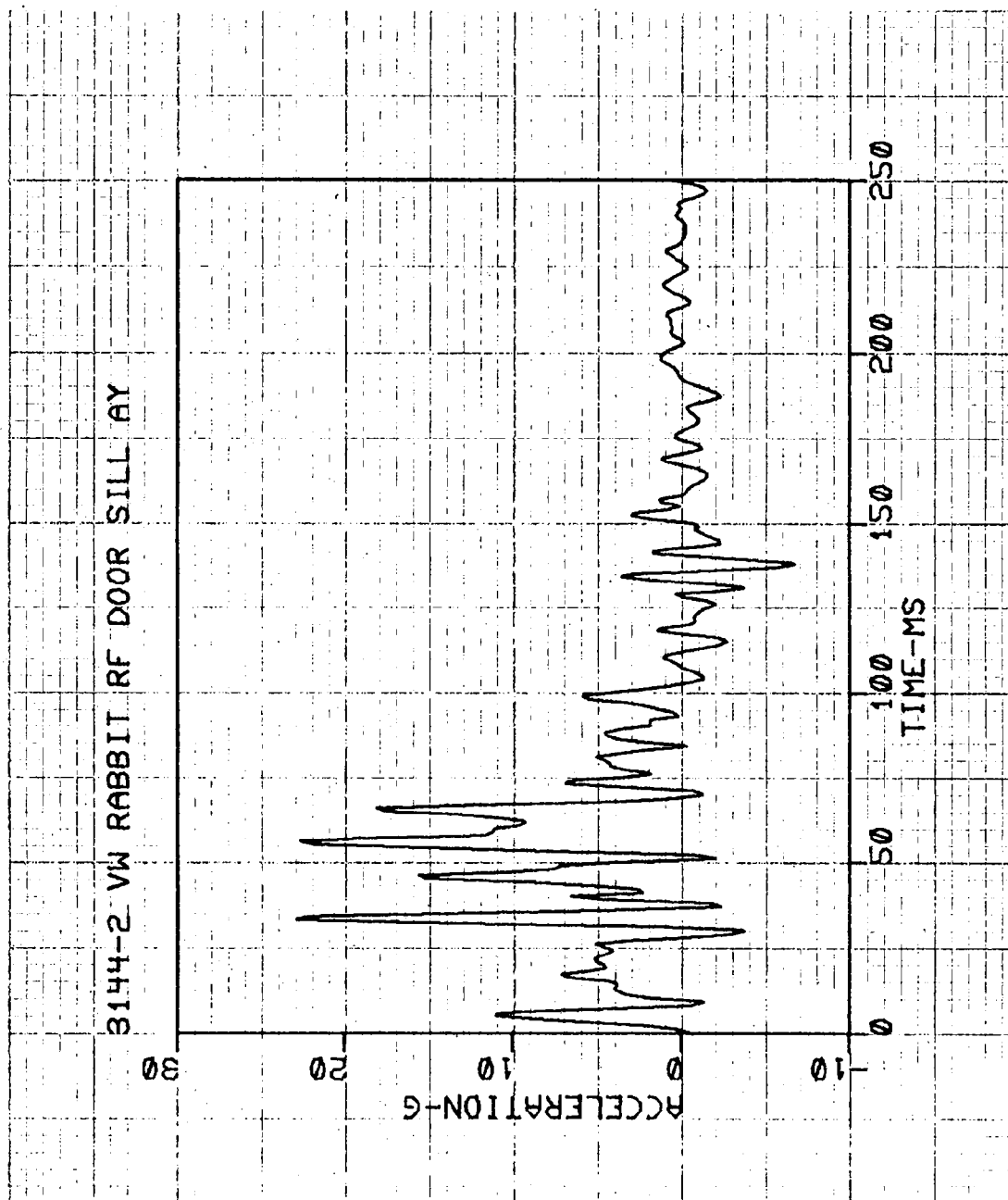


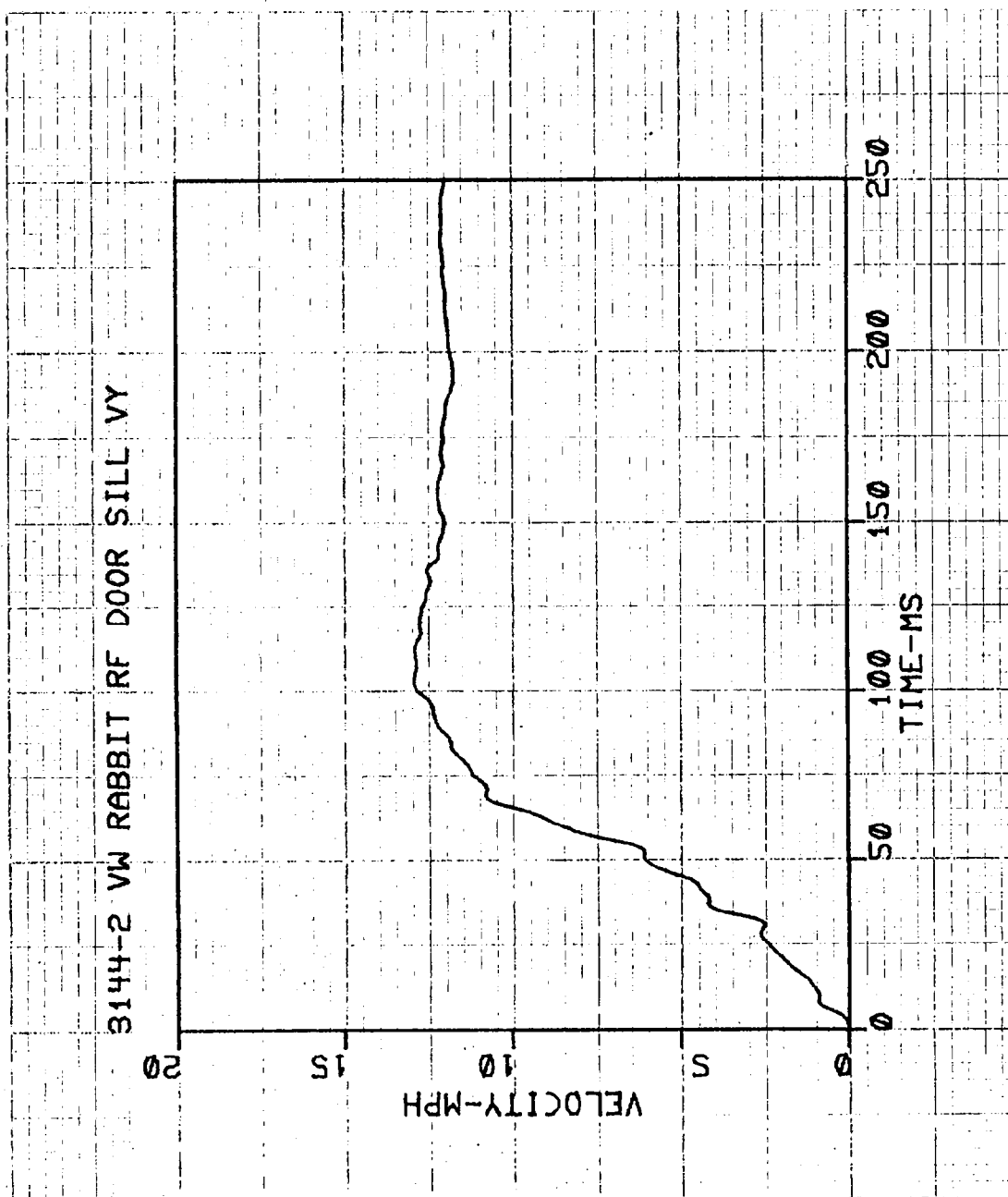


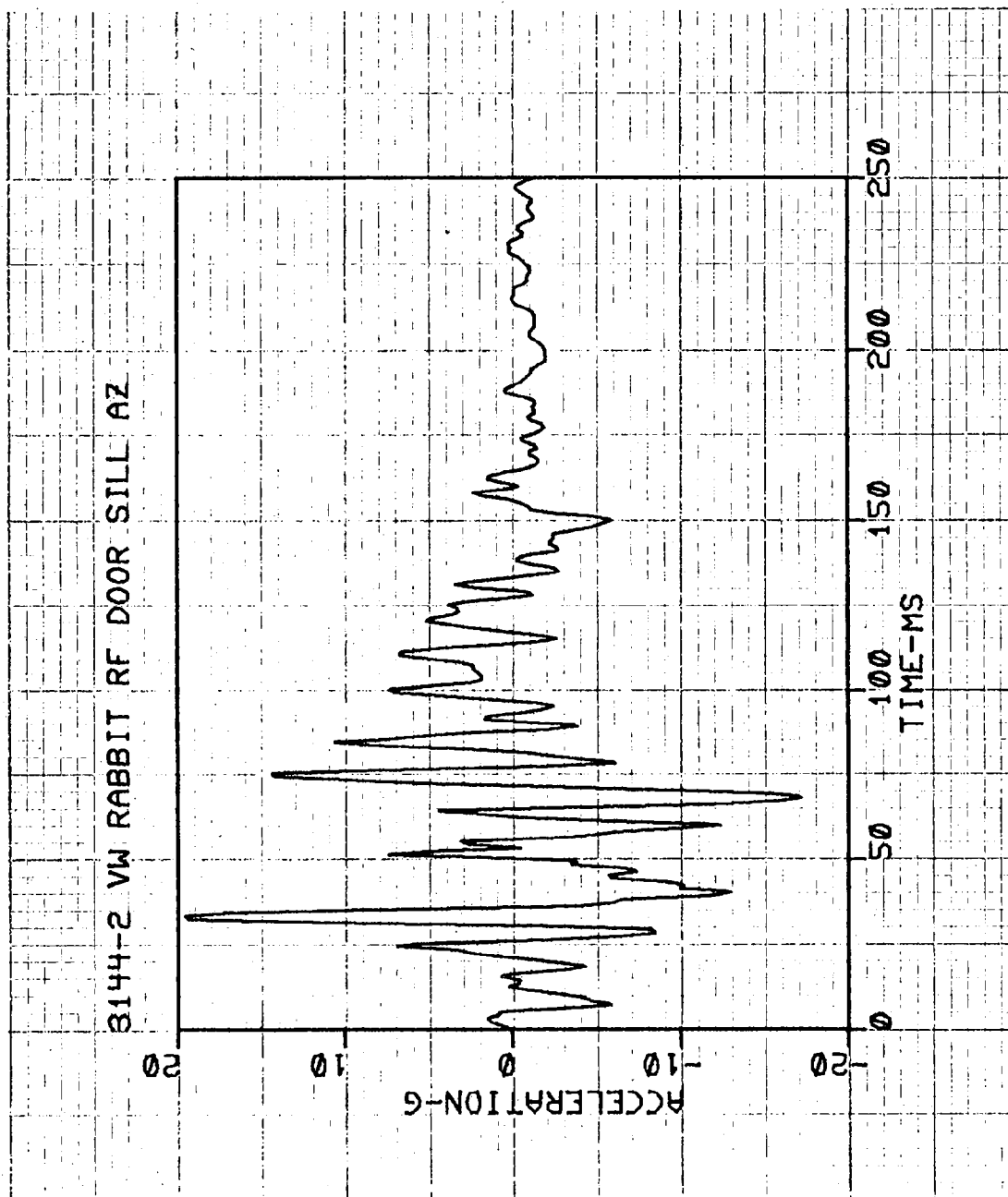




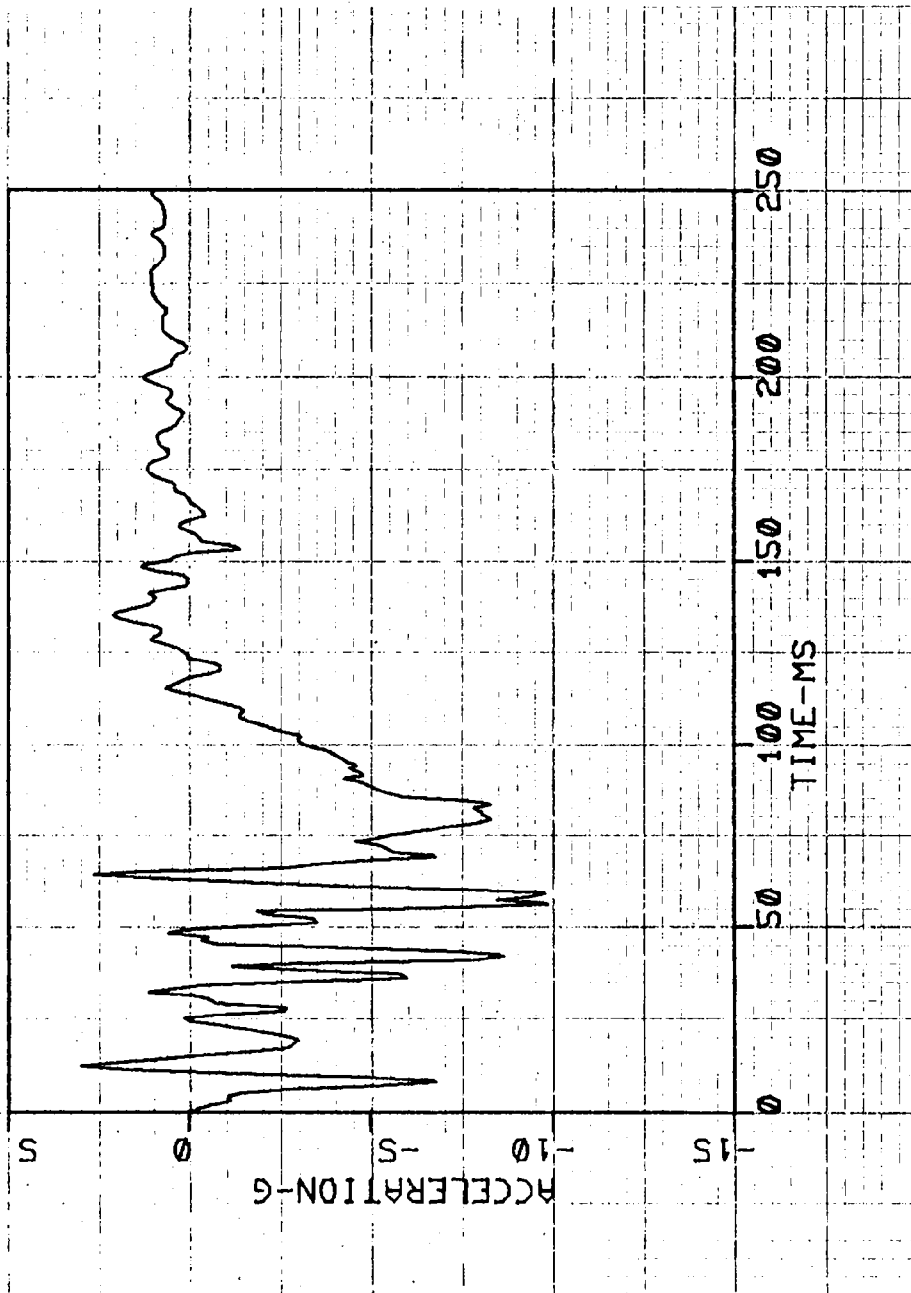


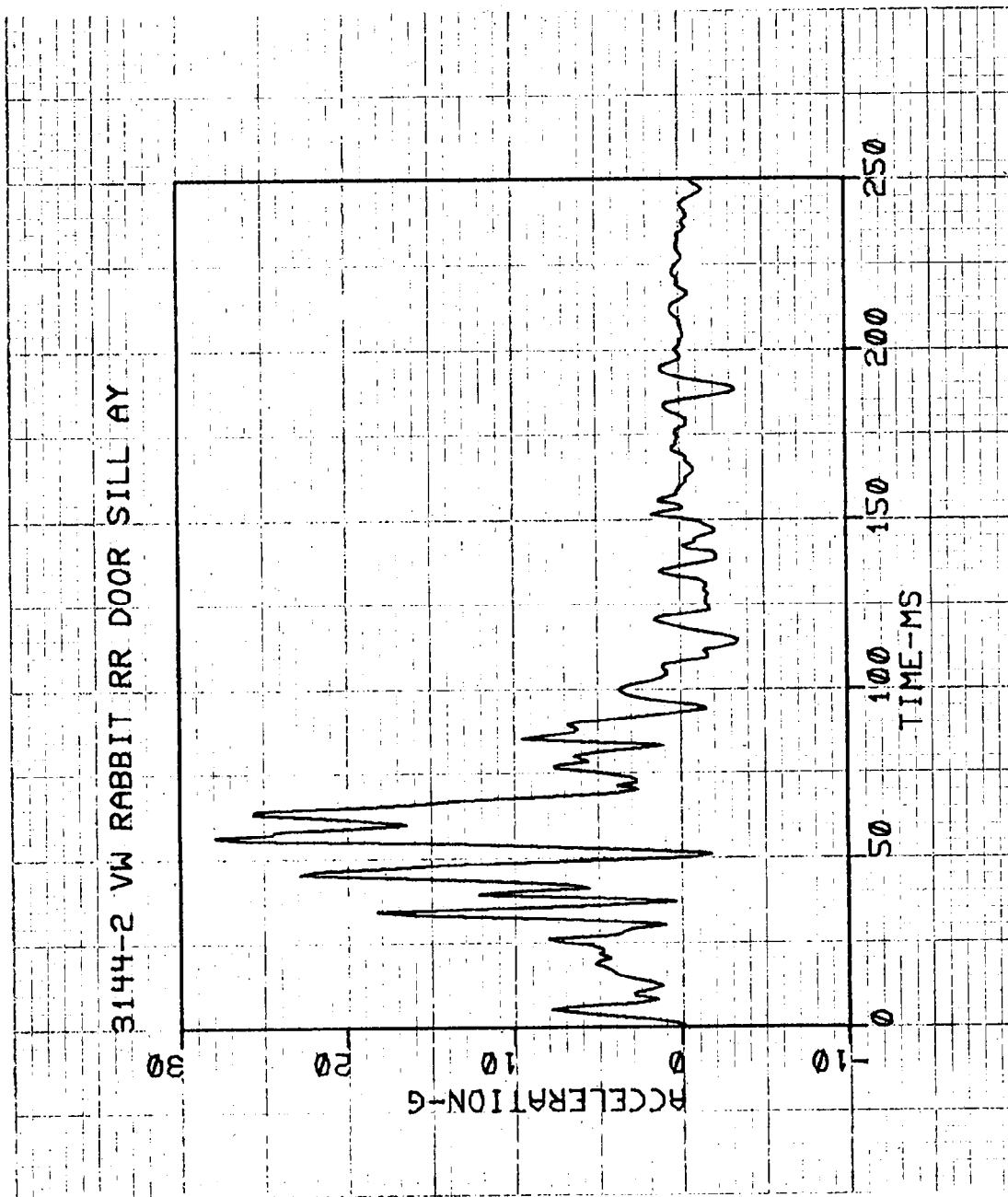


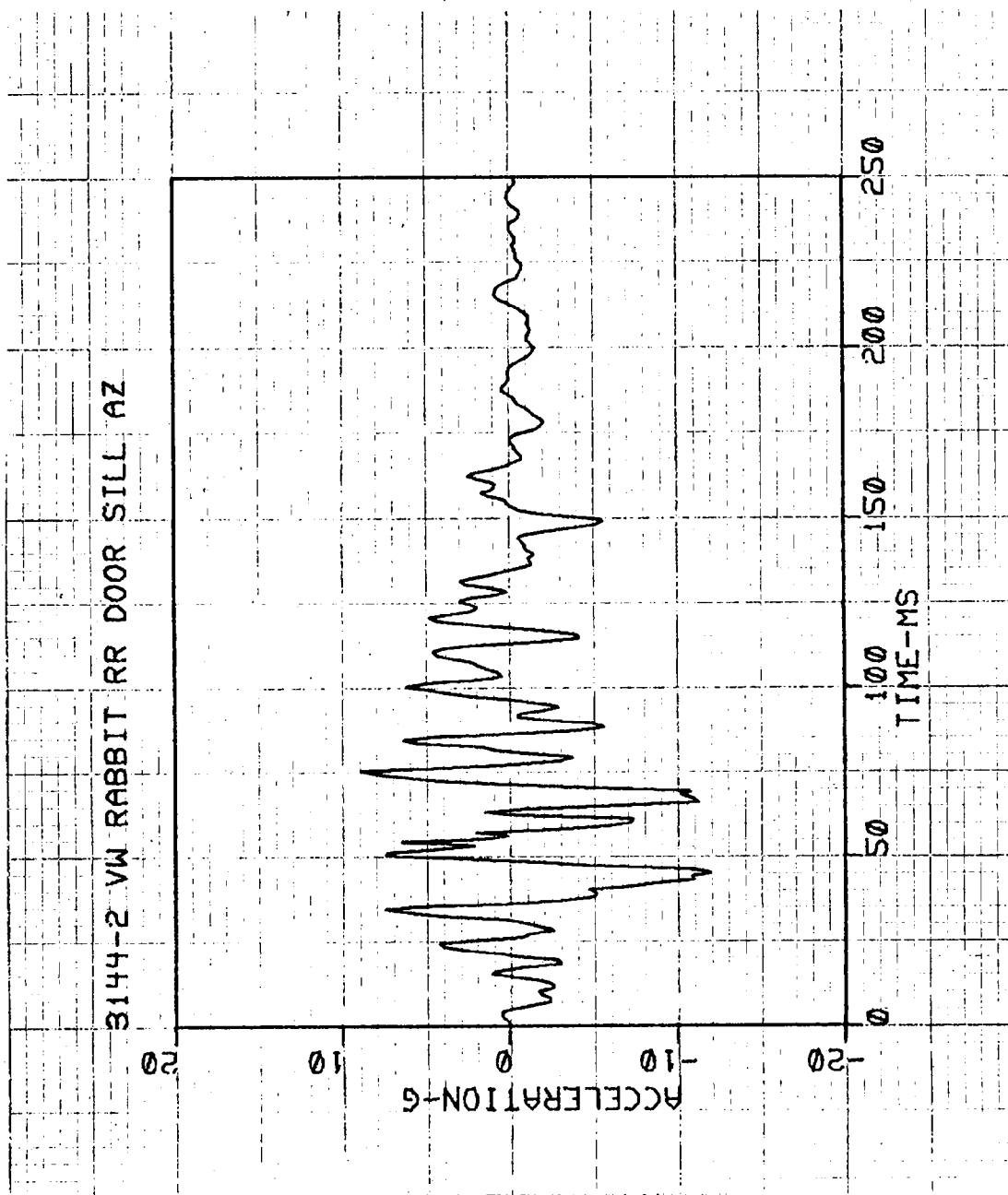


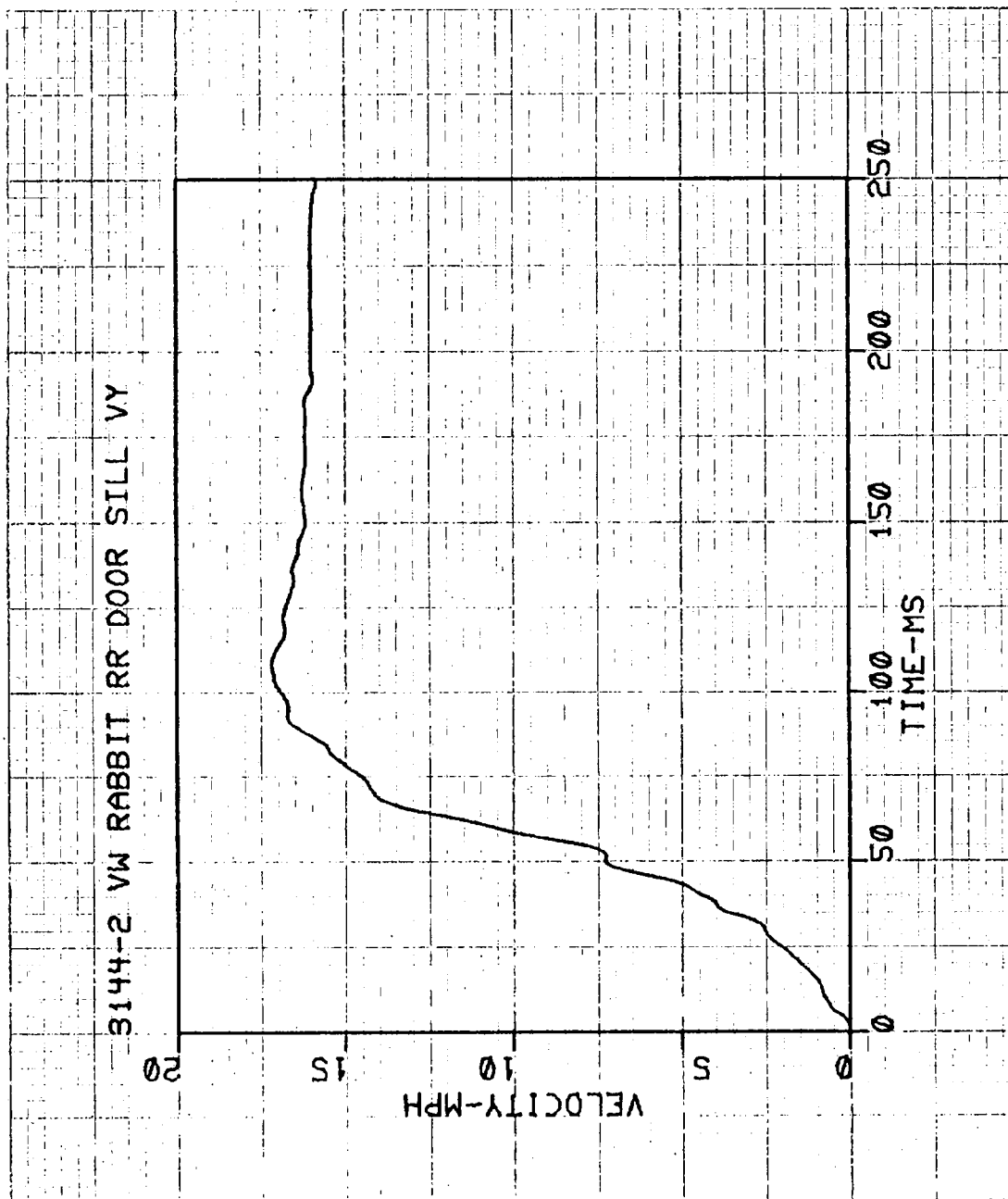


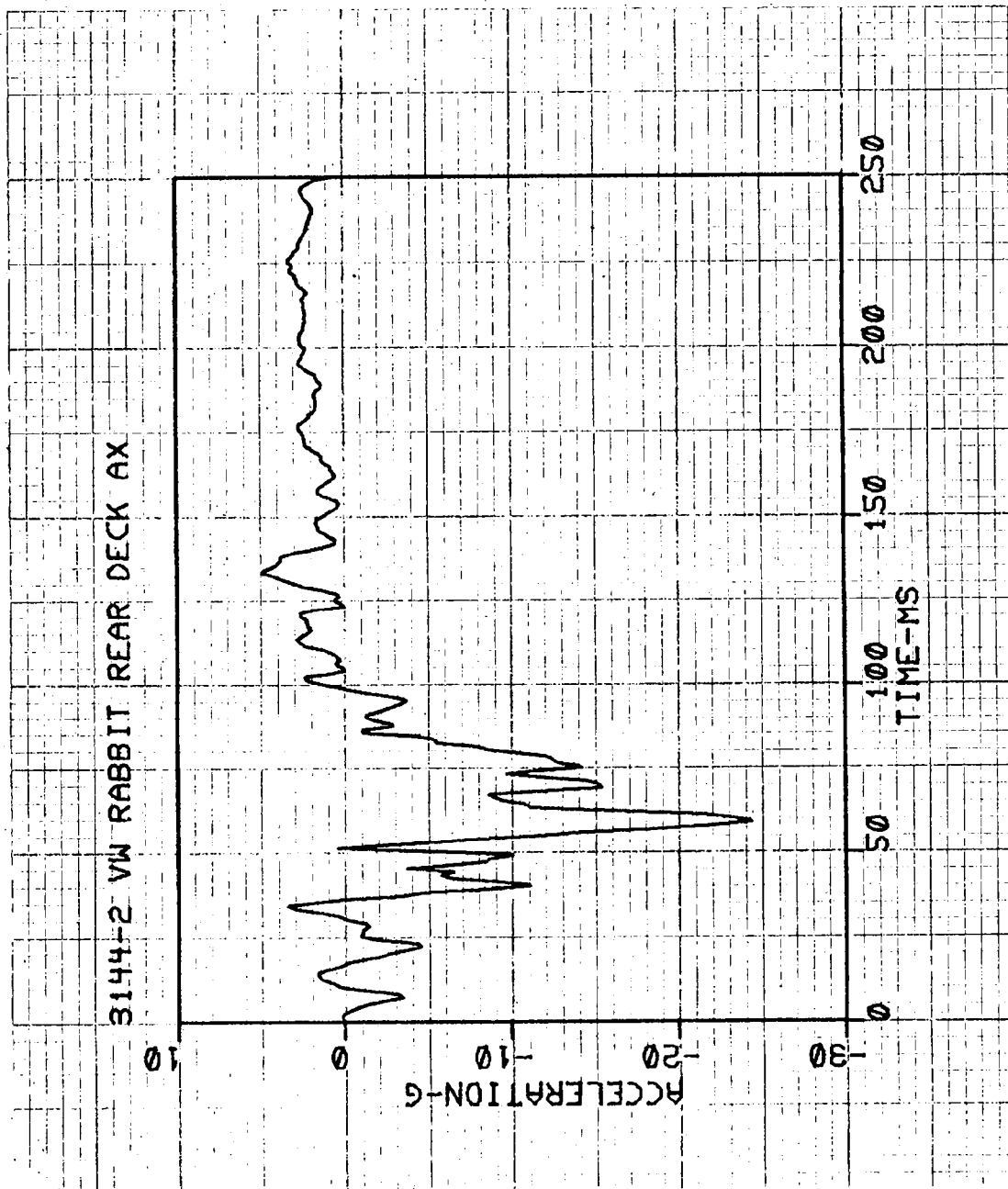
3144-2 VW RABBIT RR DOOR SILL AX

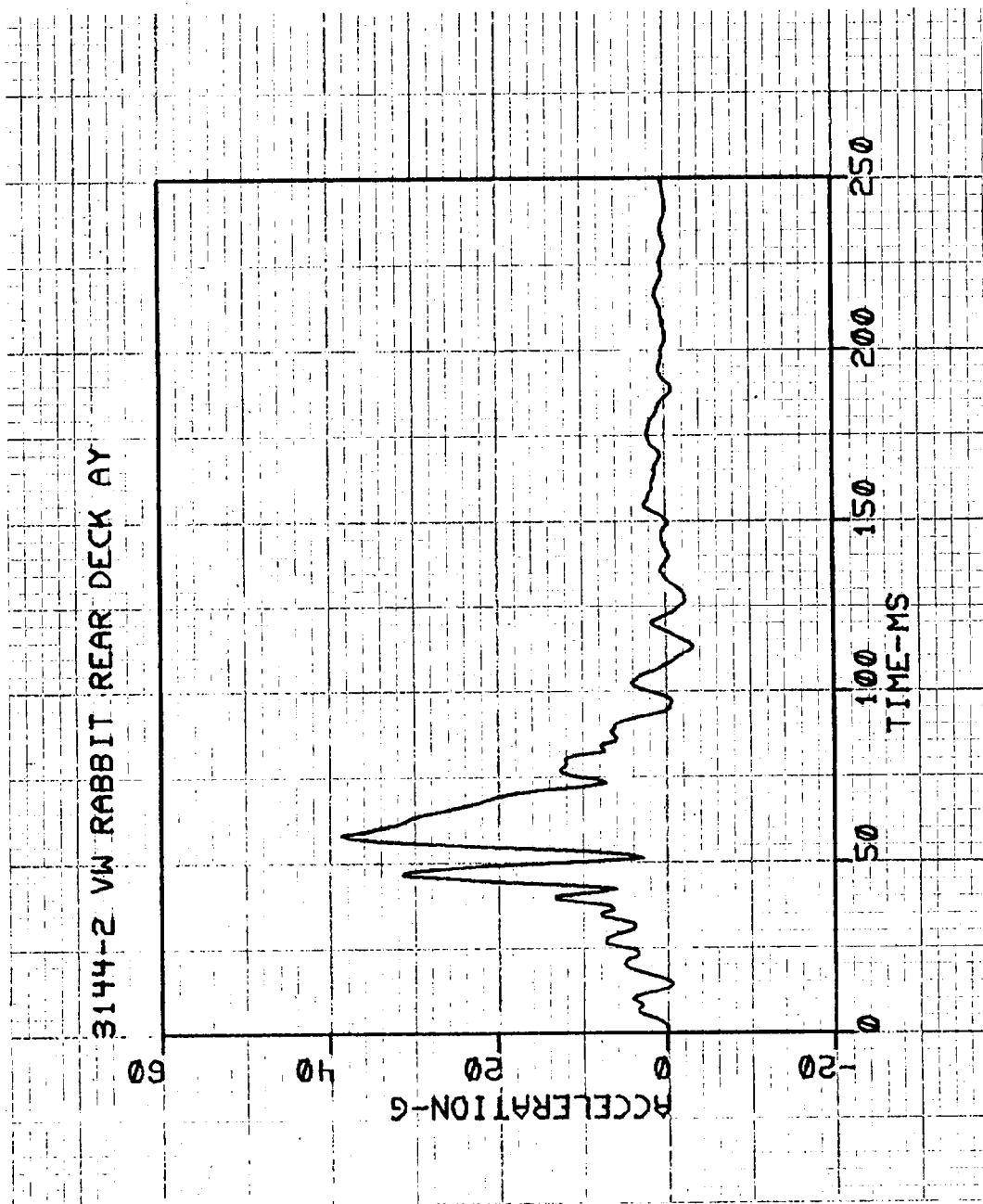


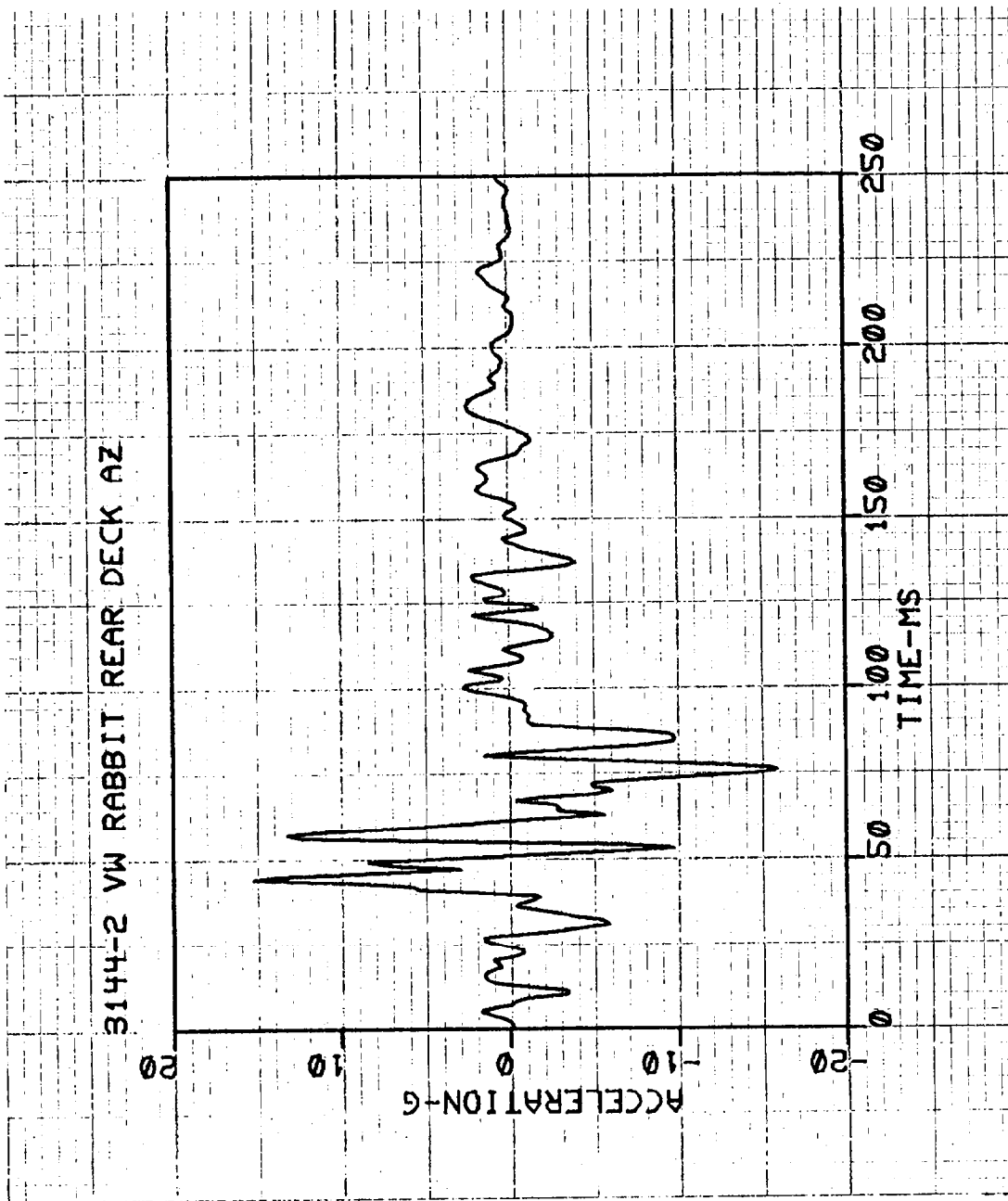


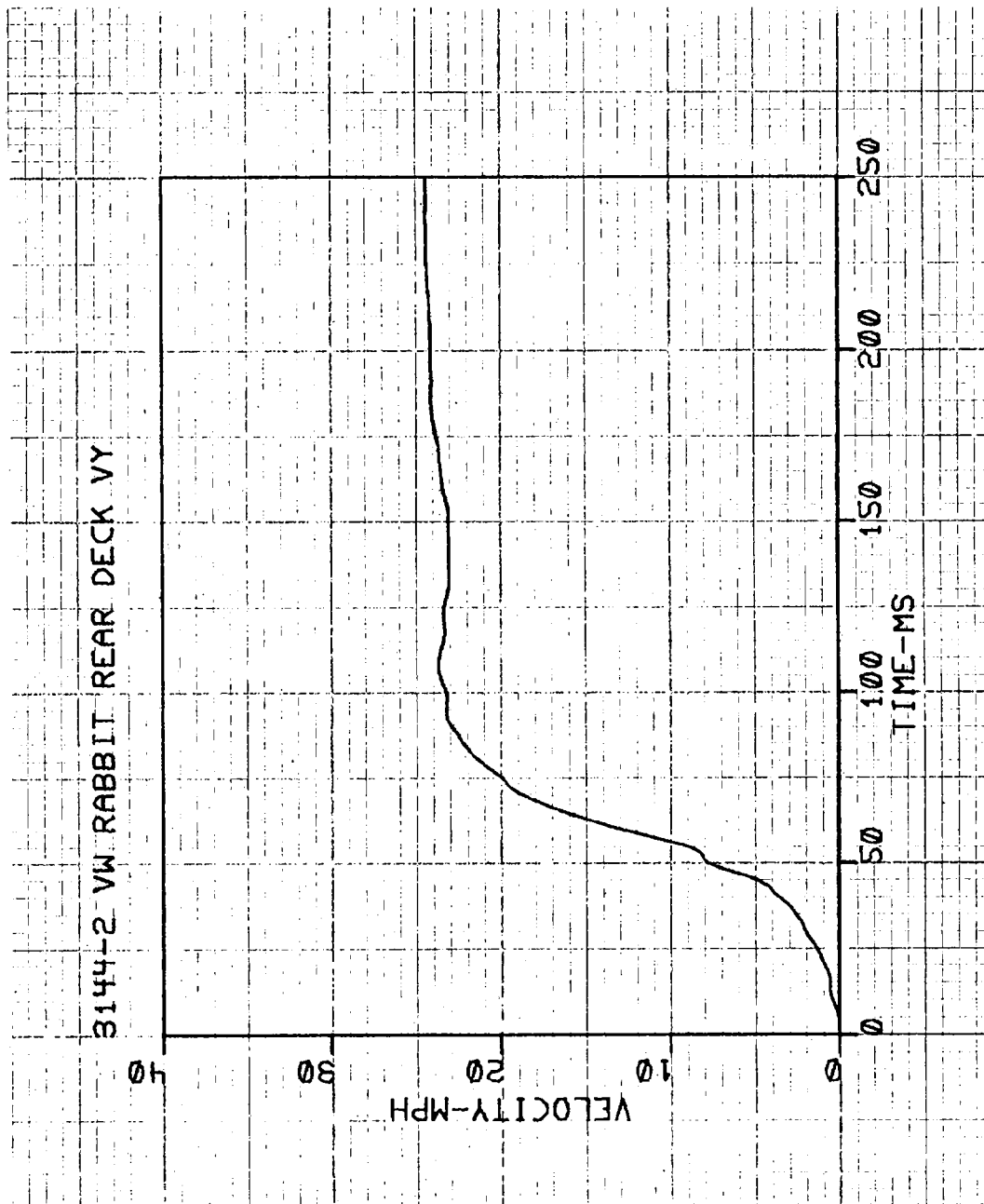


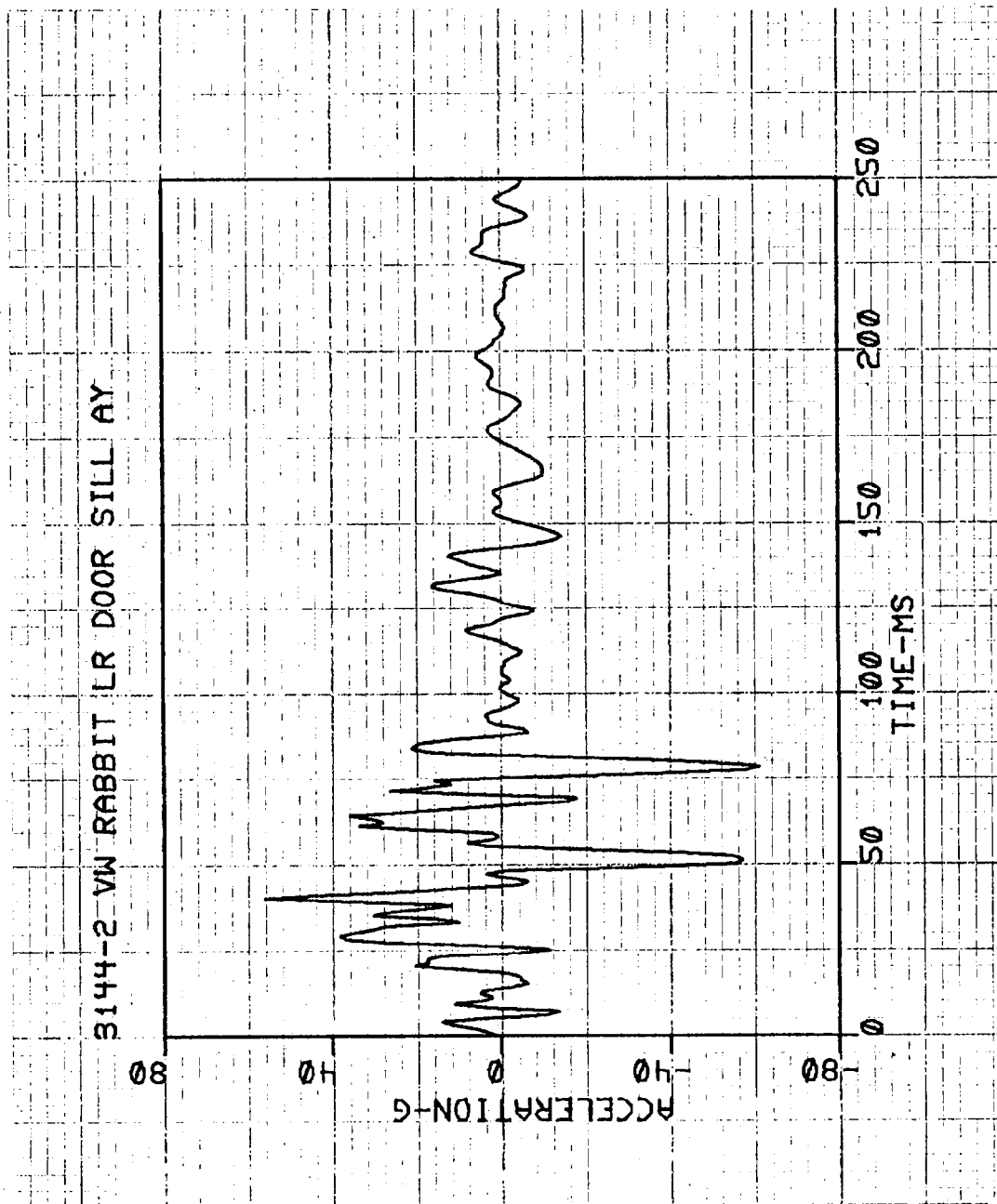


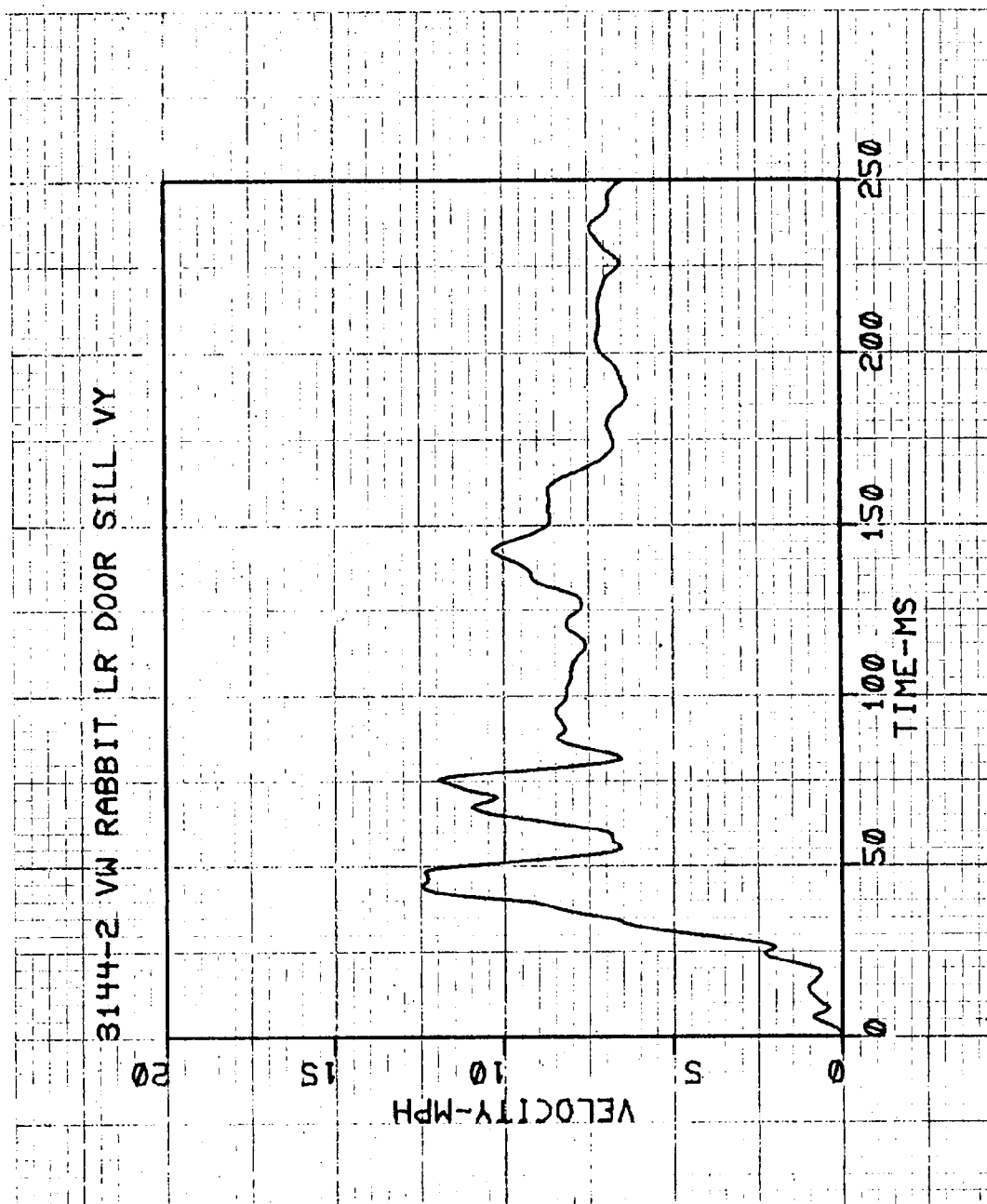




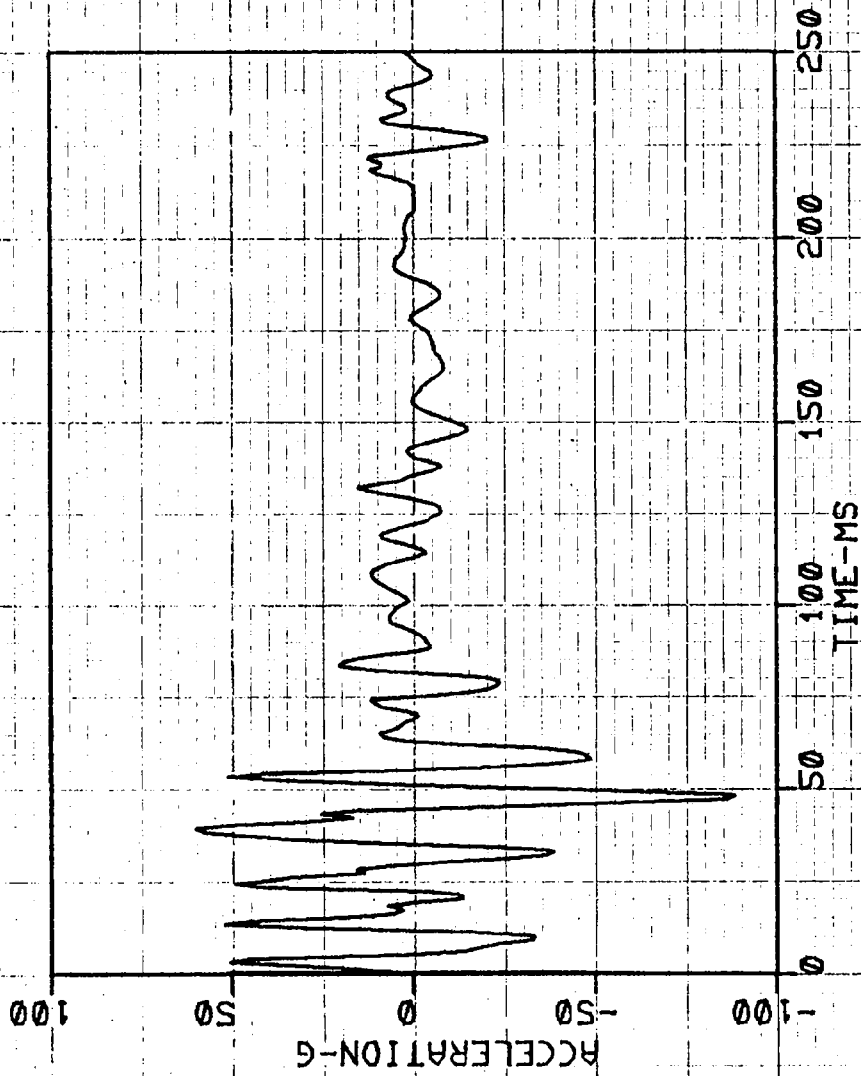


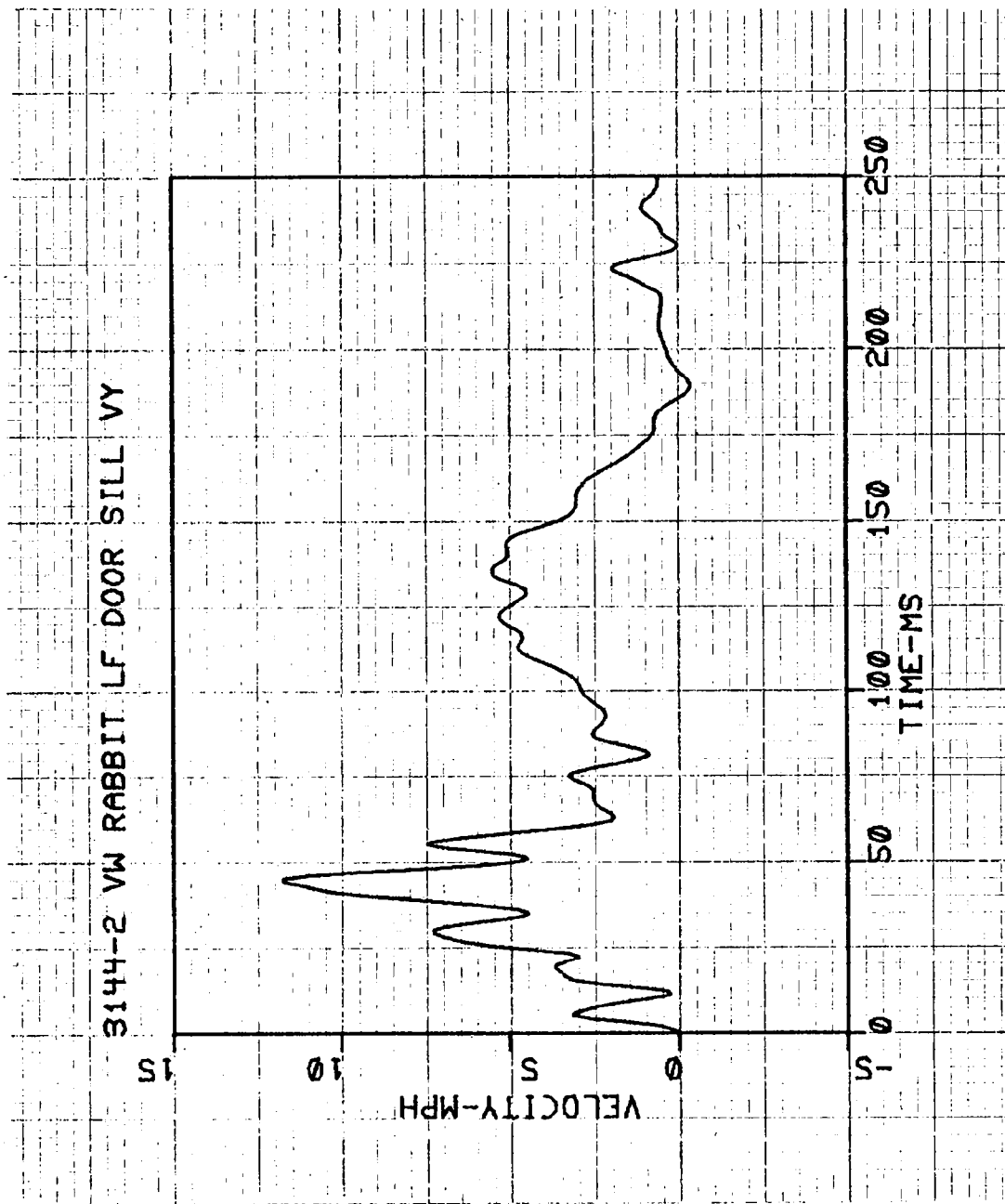


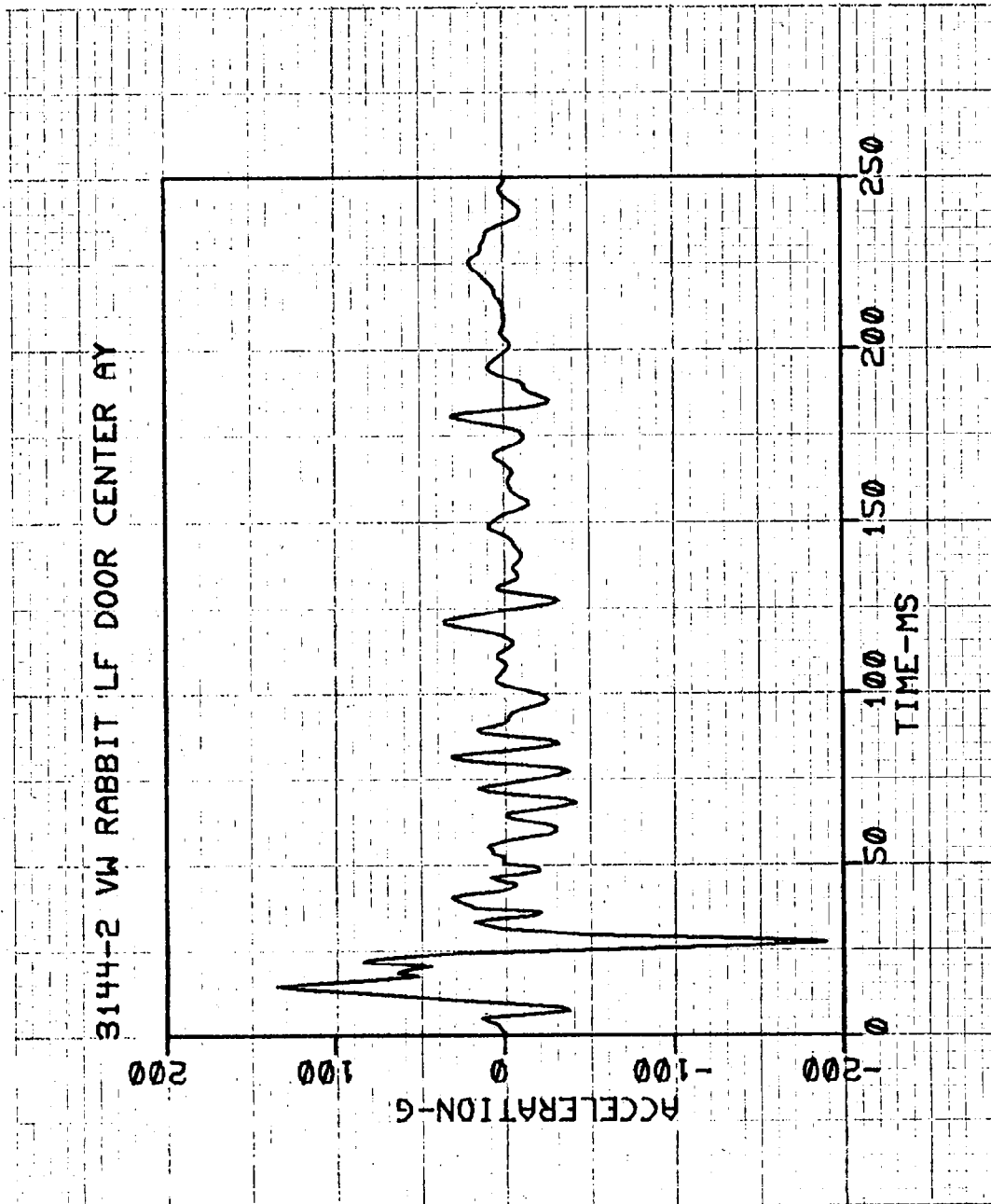


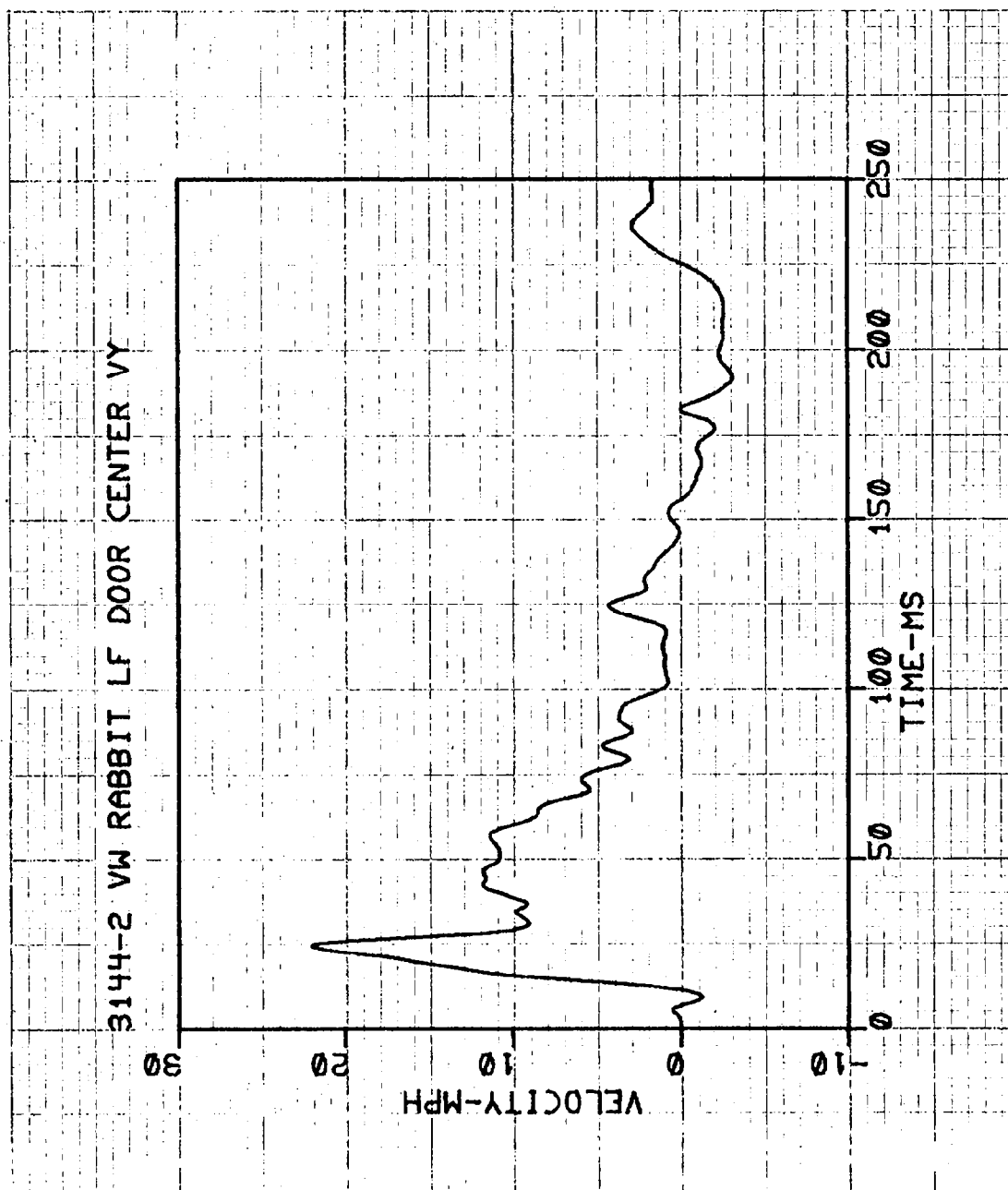


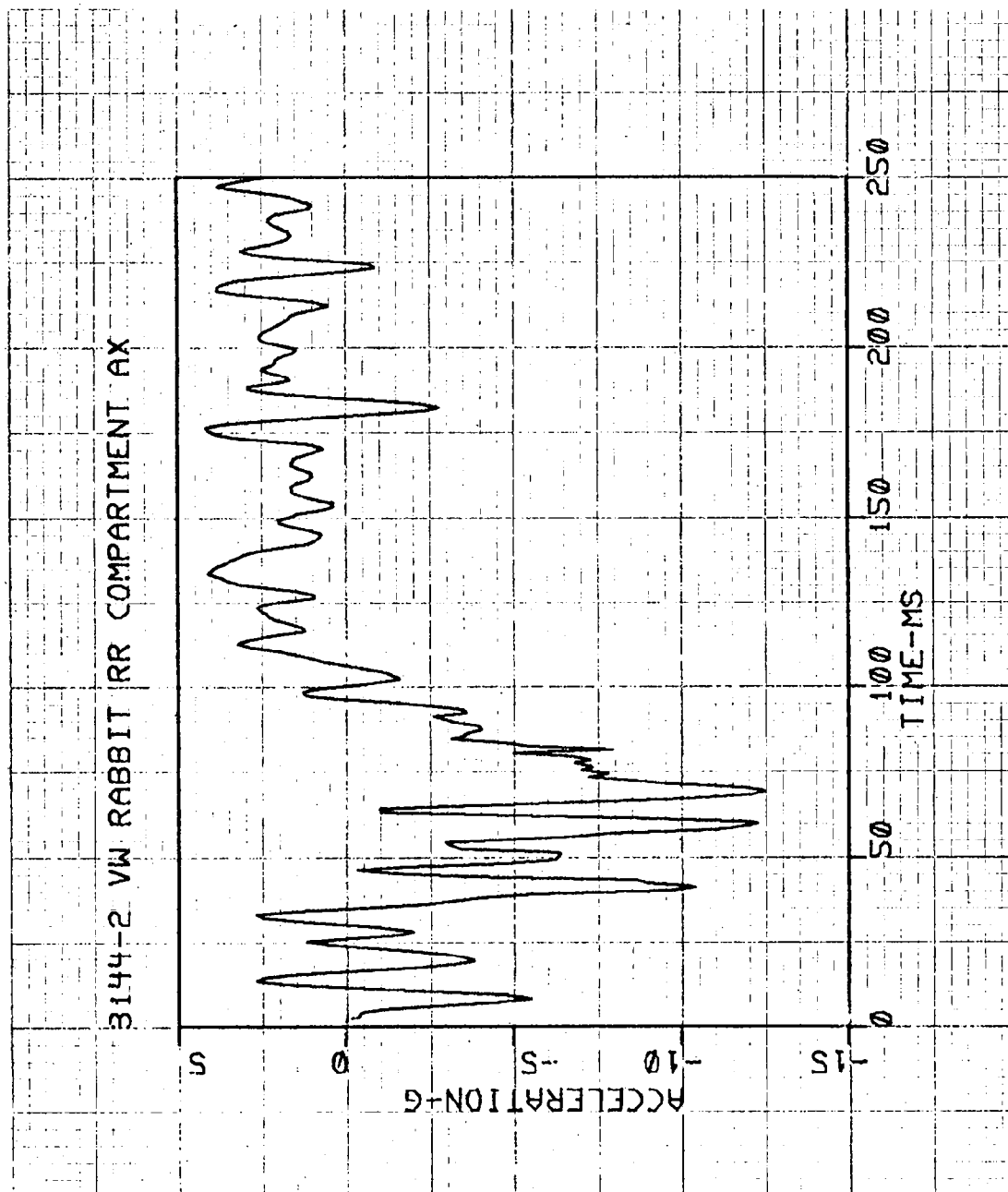
3144-2 VW RABBIT LF DOOR SILL AY

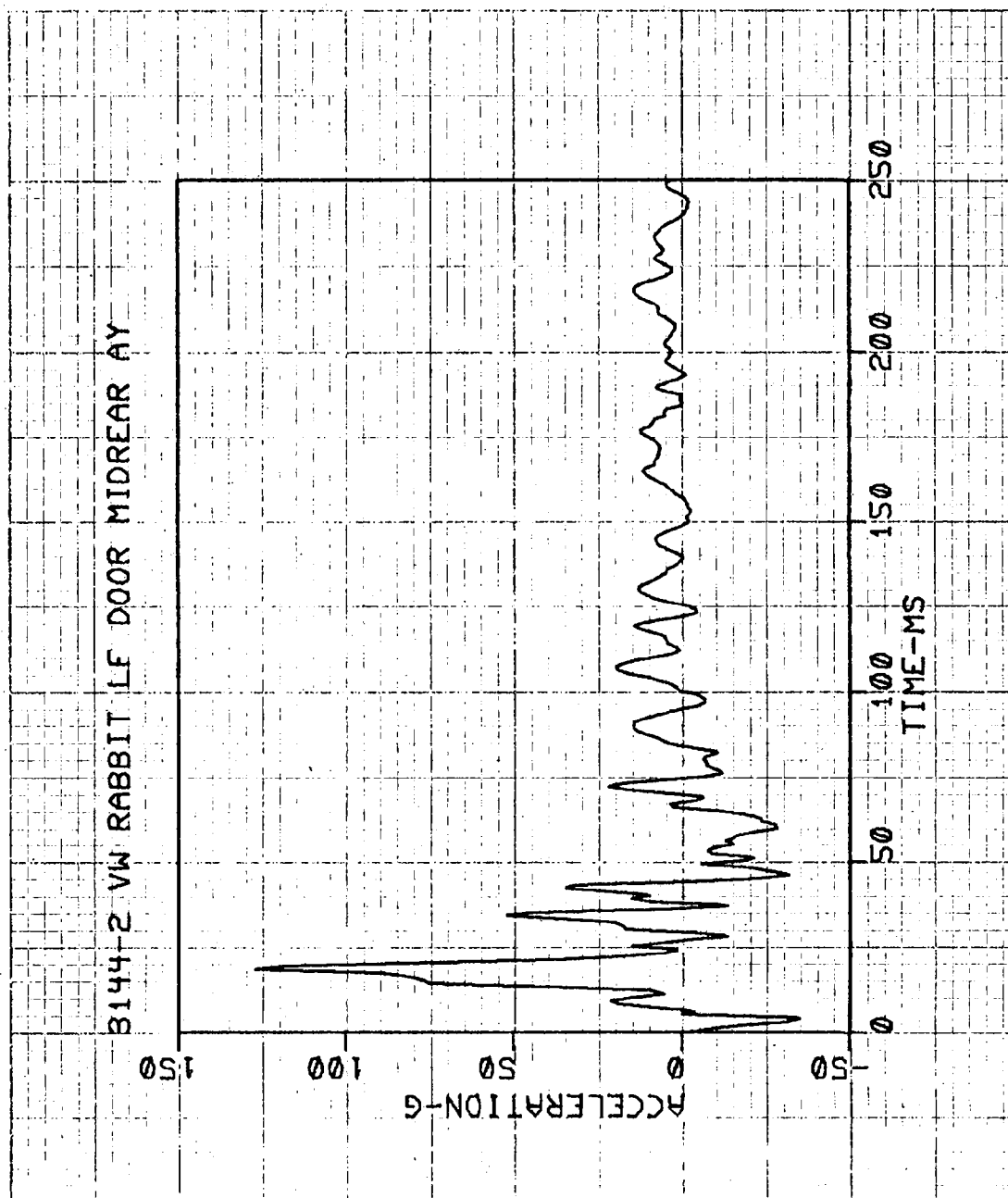


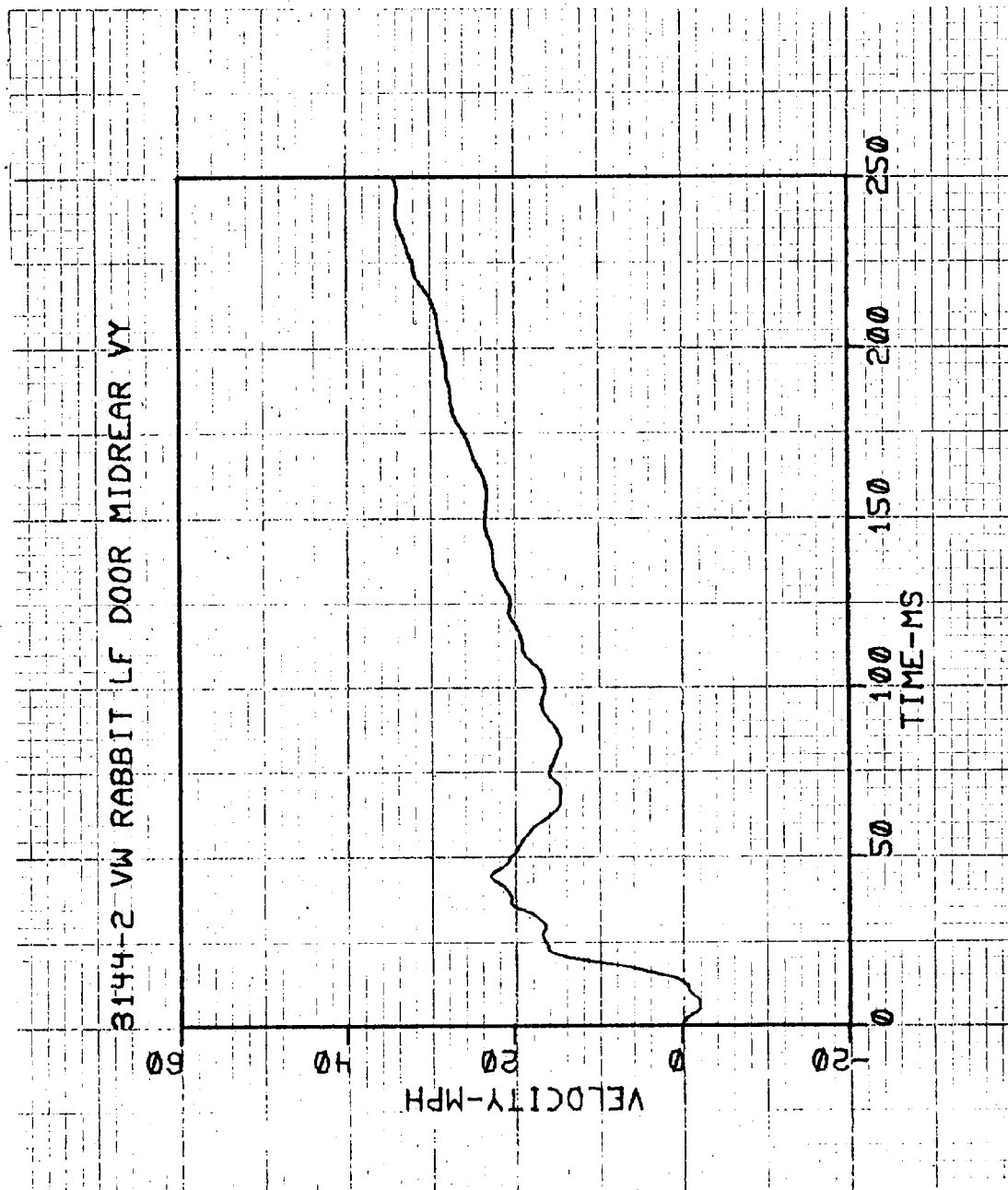


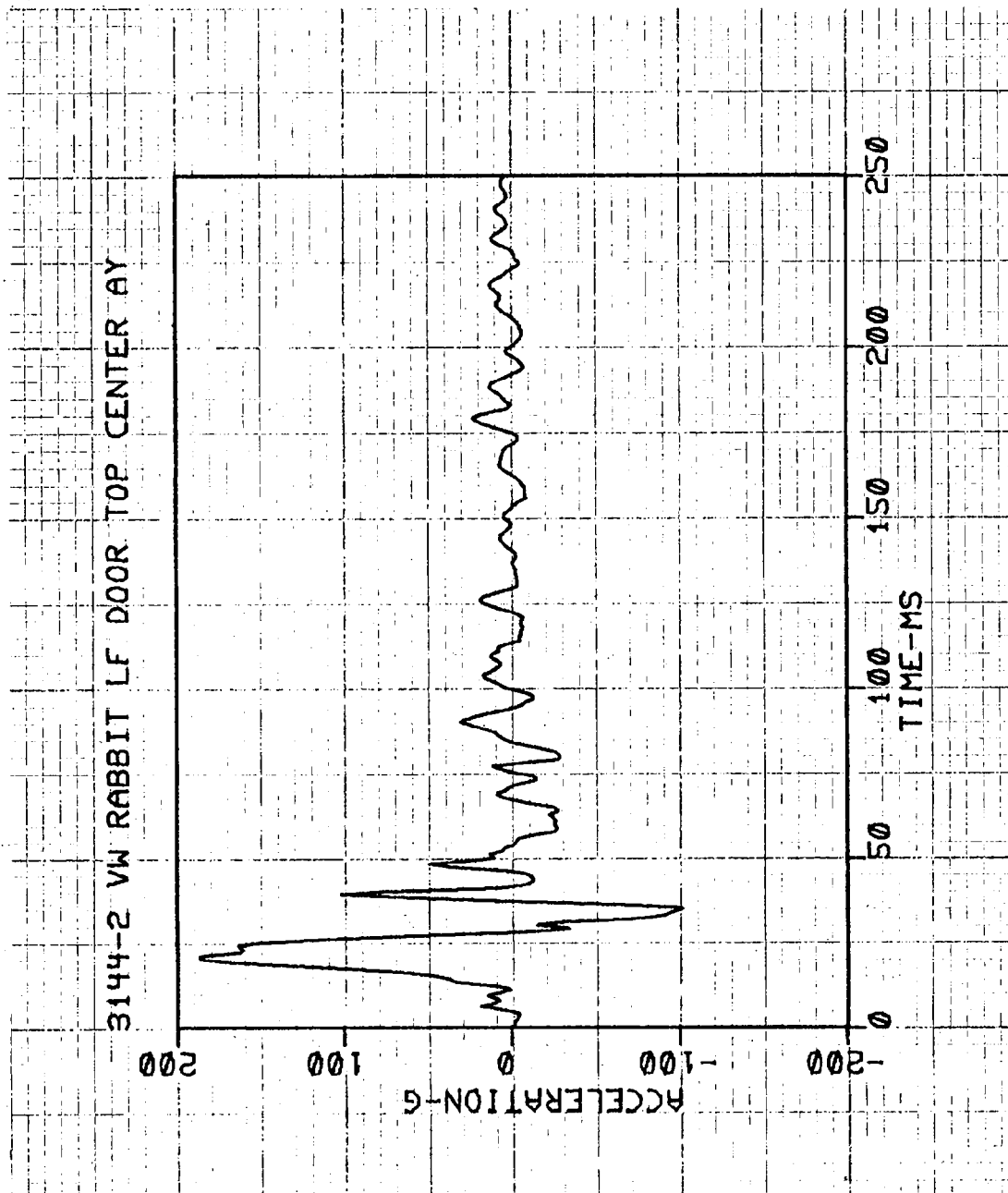


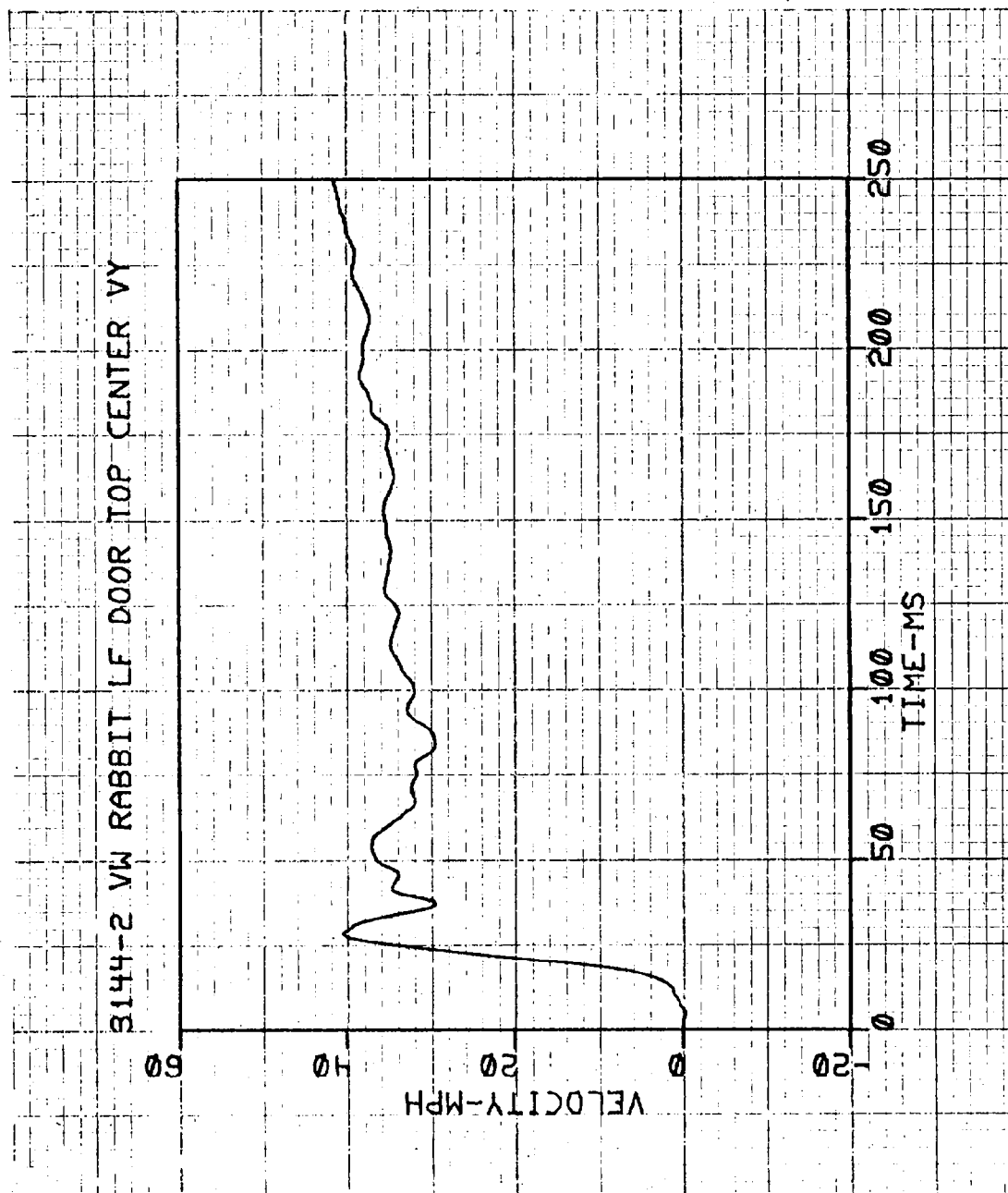


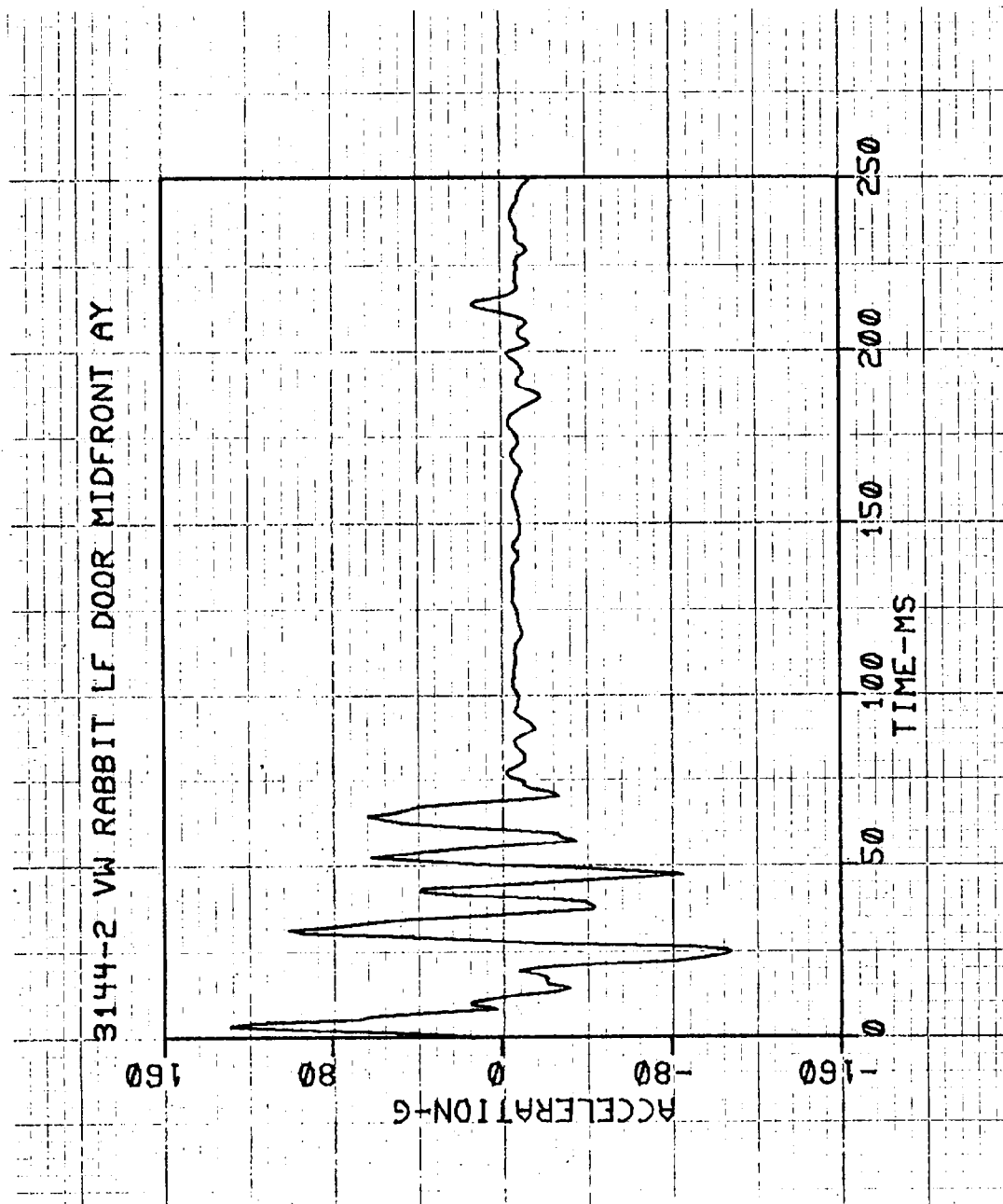


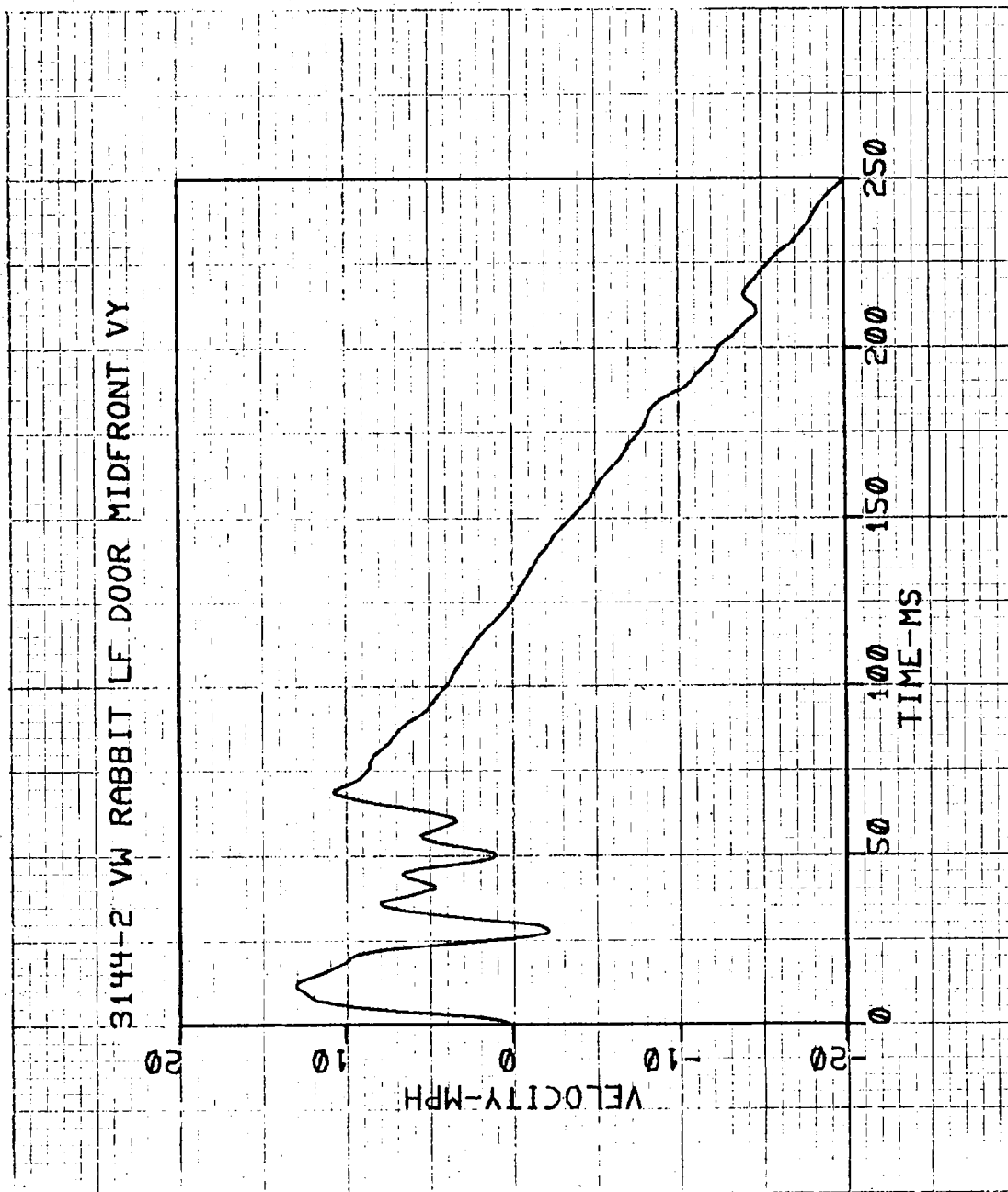


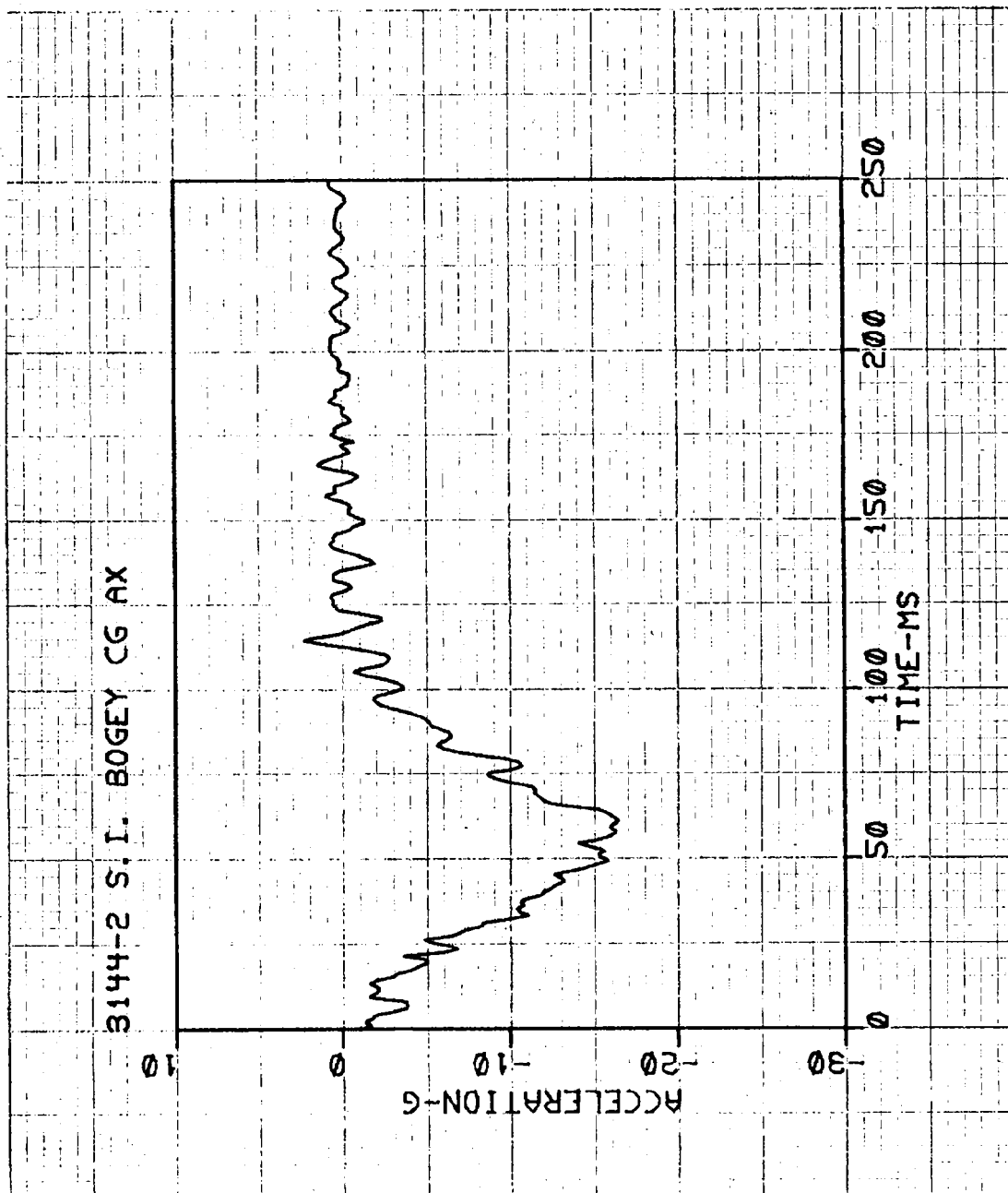




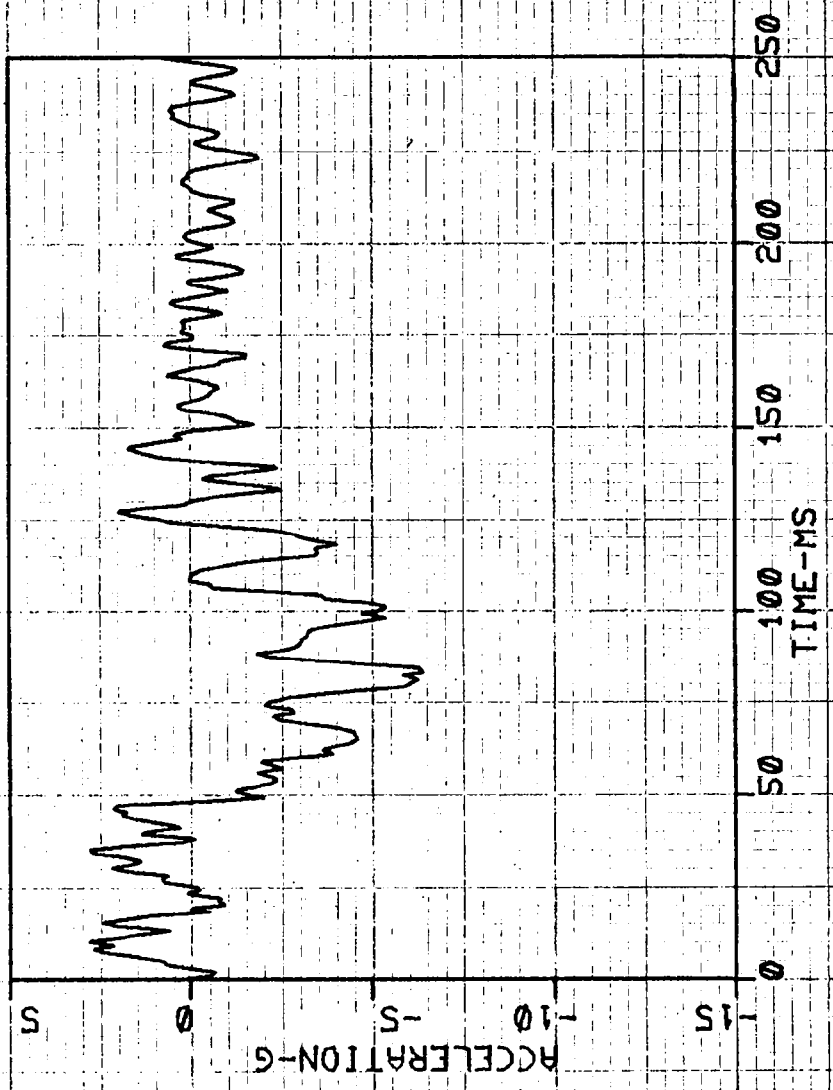


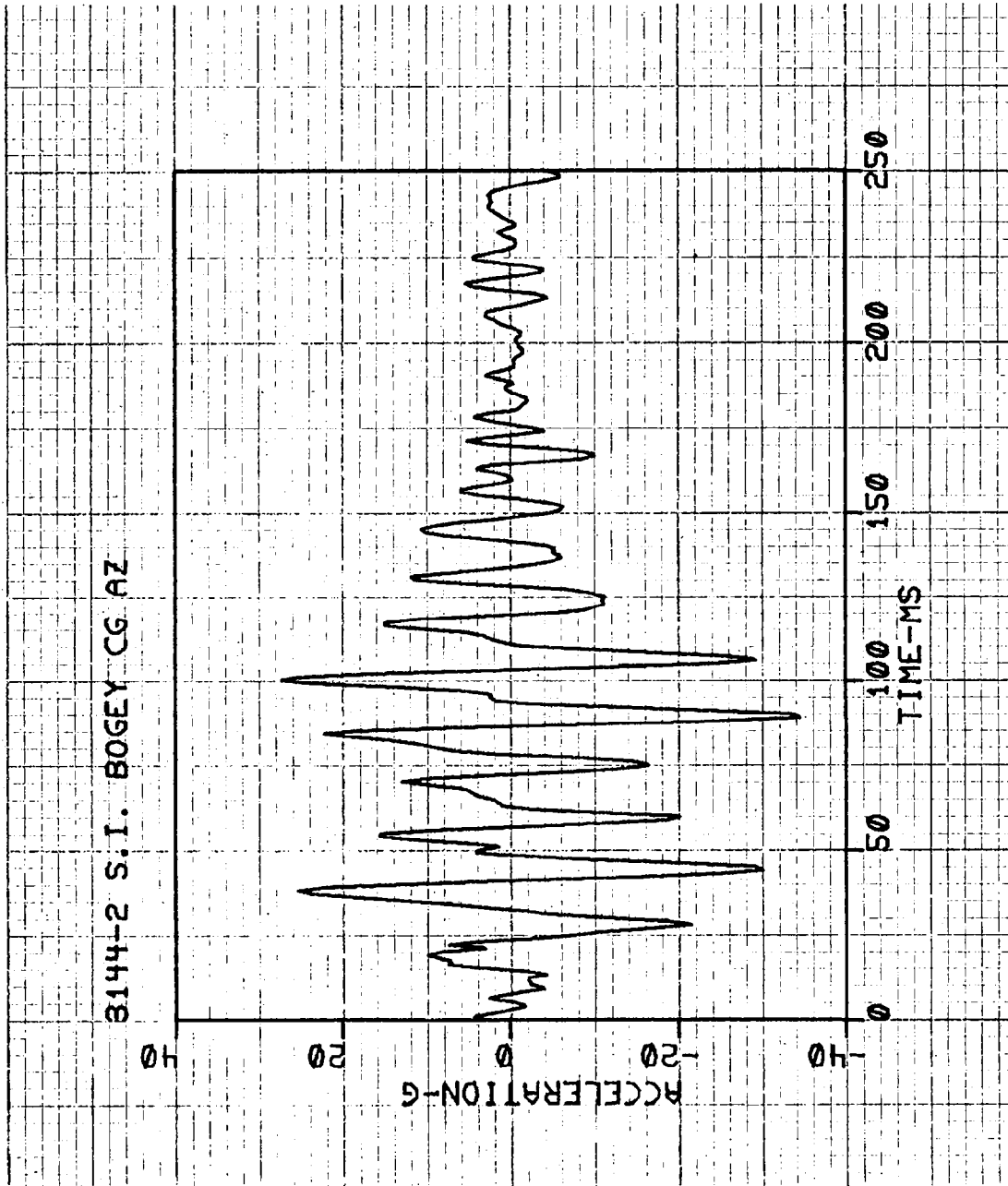


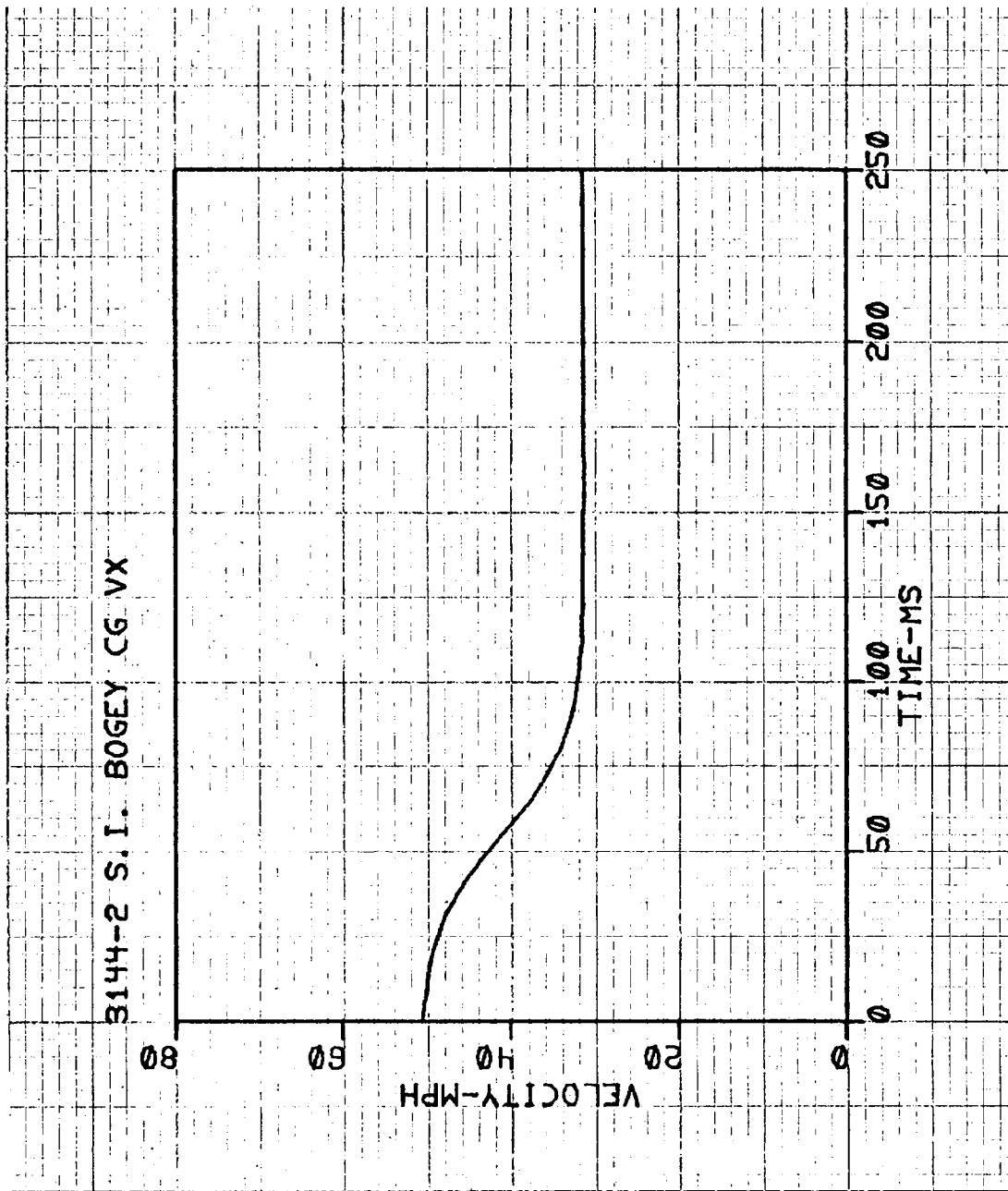


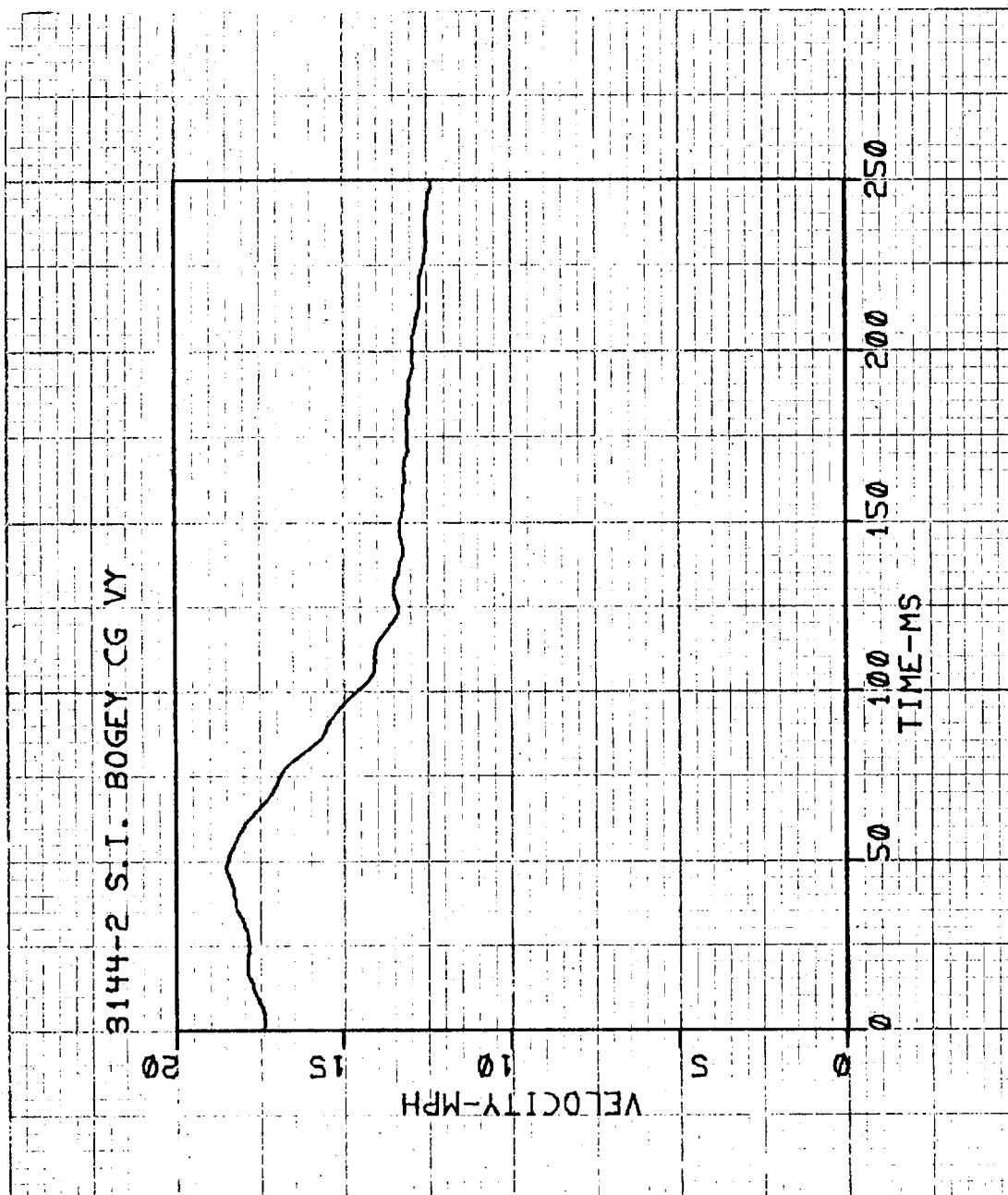


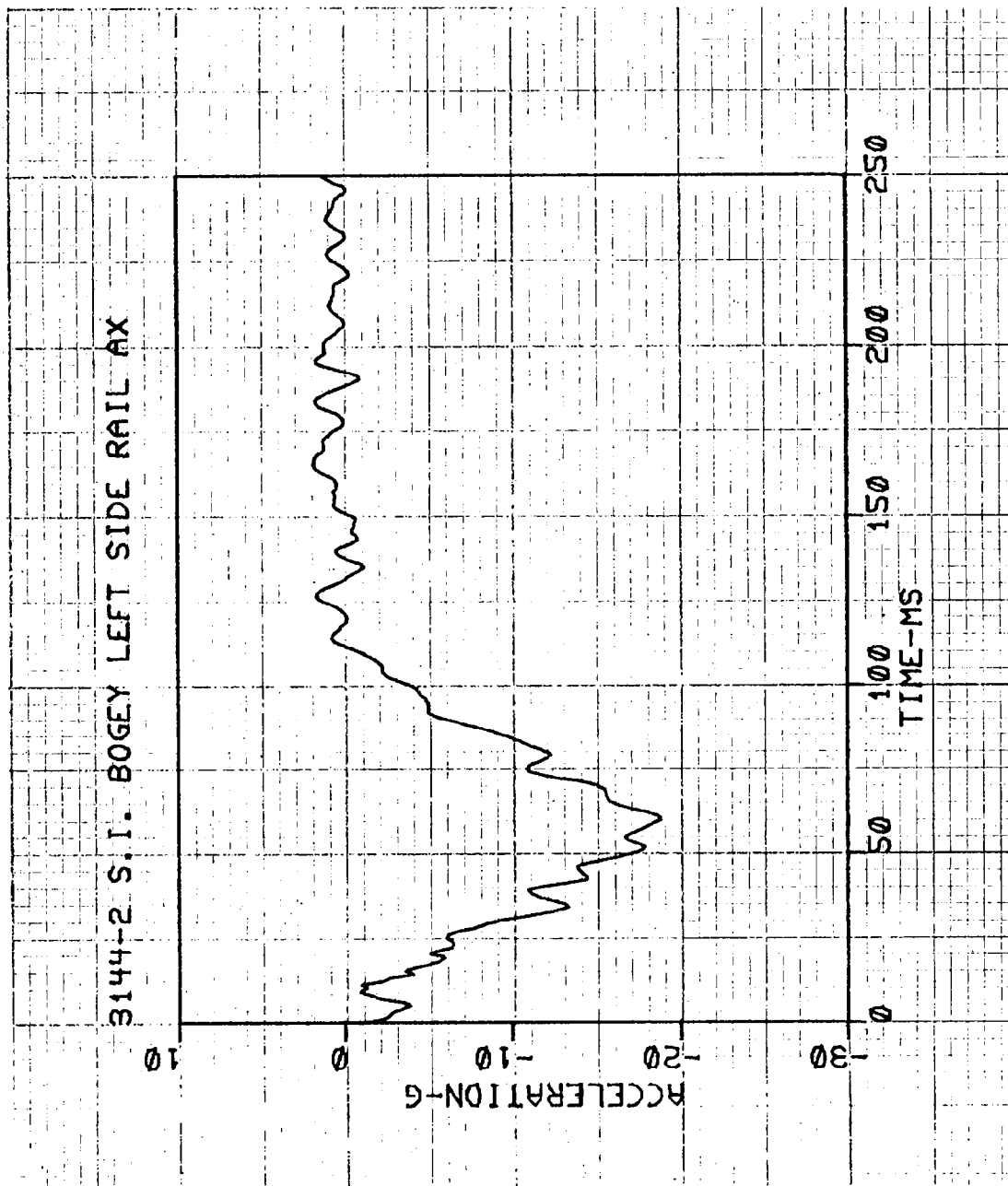
3144-2 S.I. BOGEY CG AY

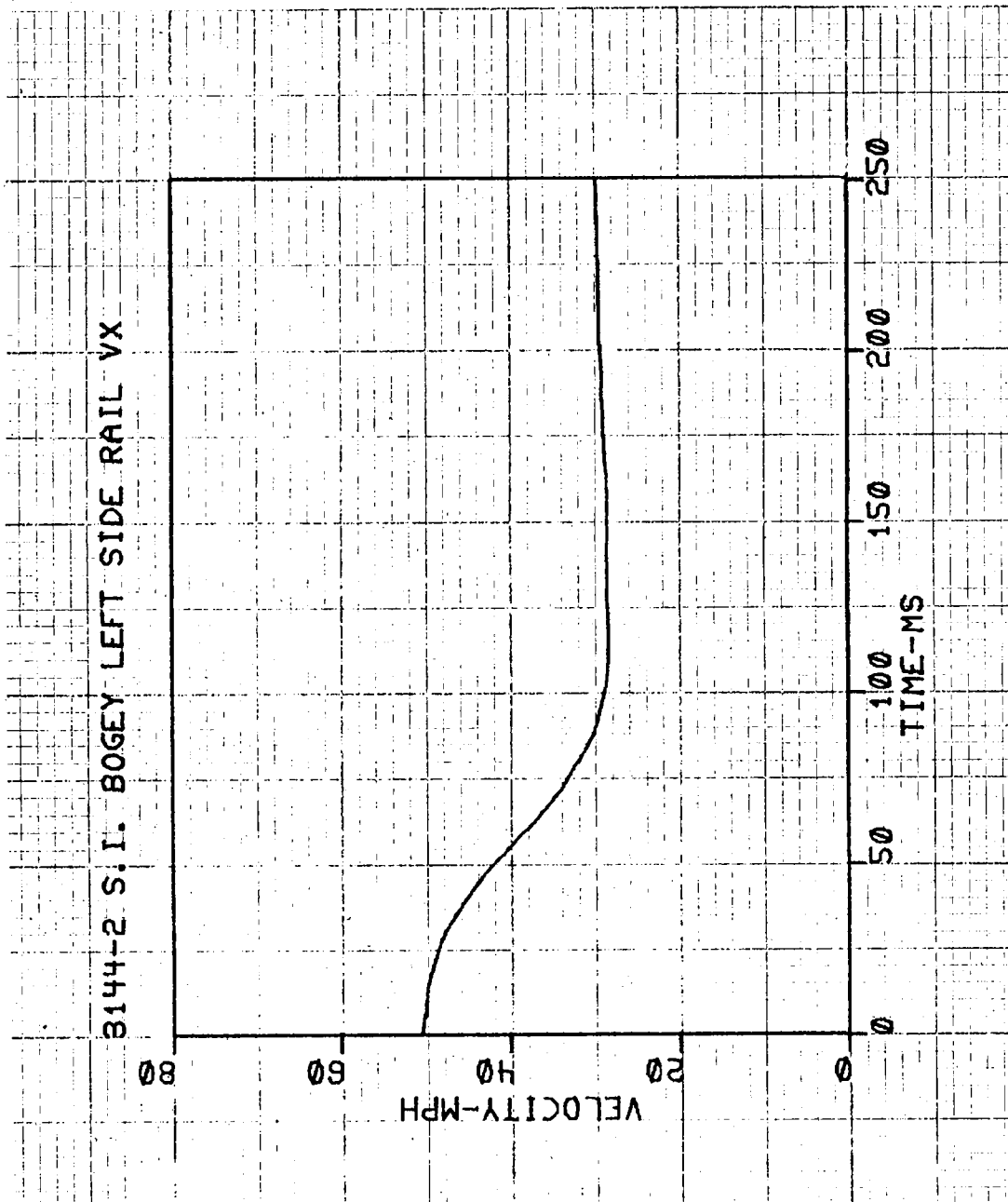


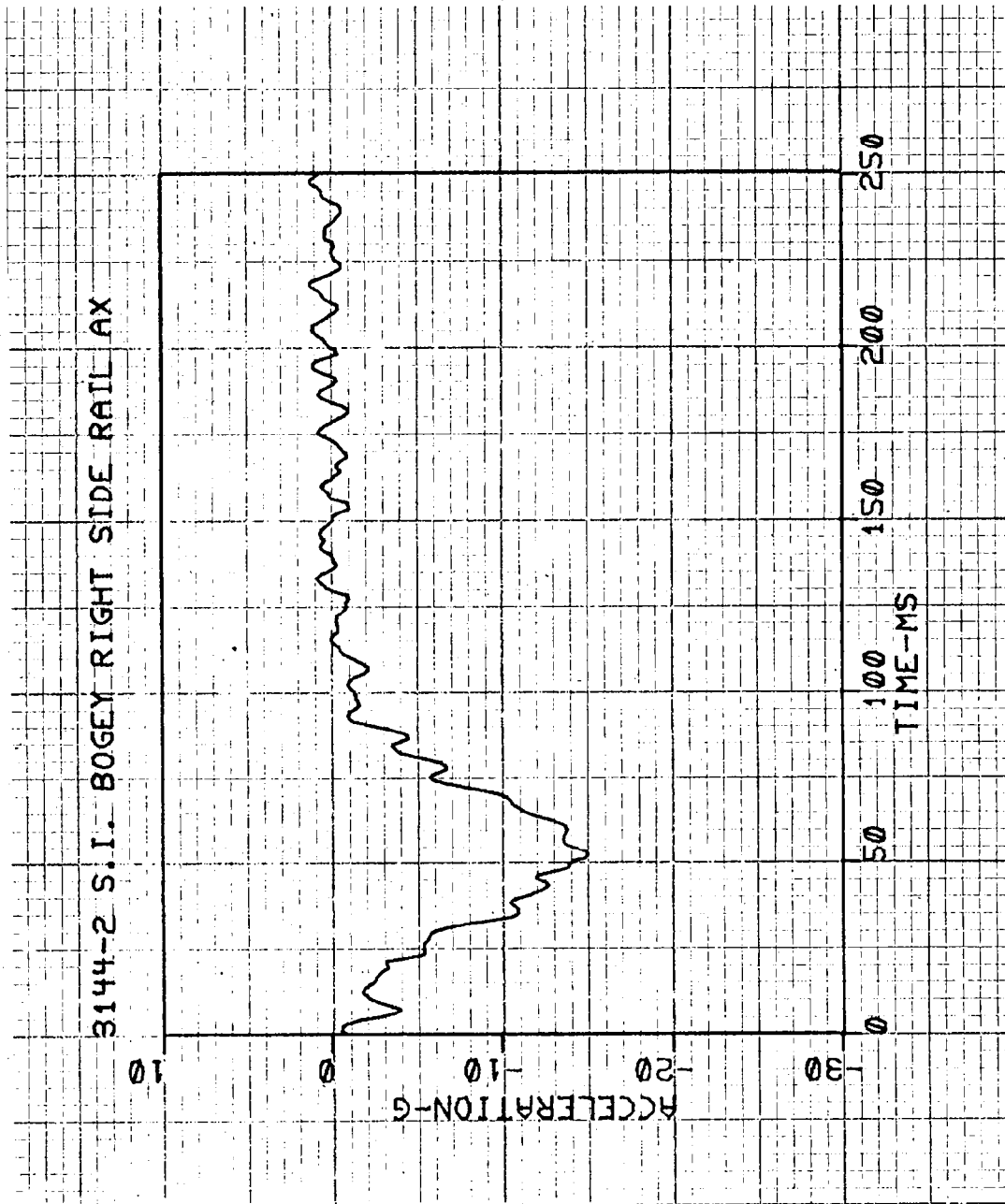


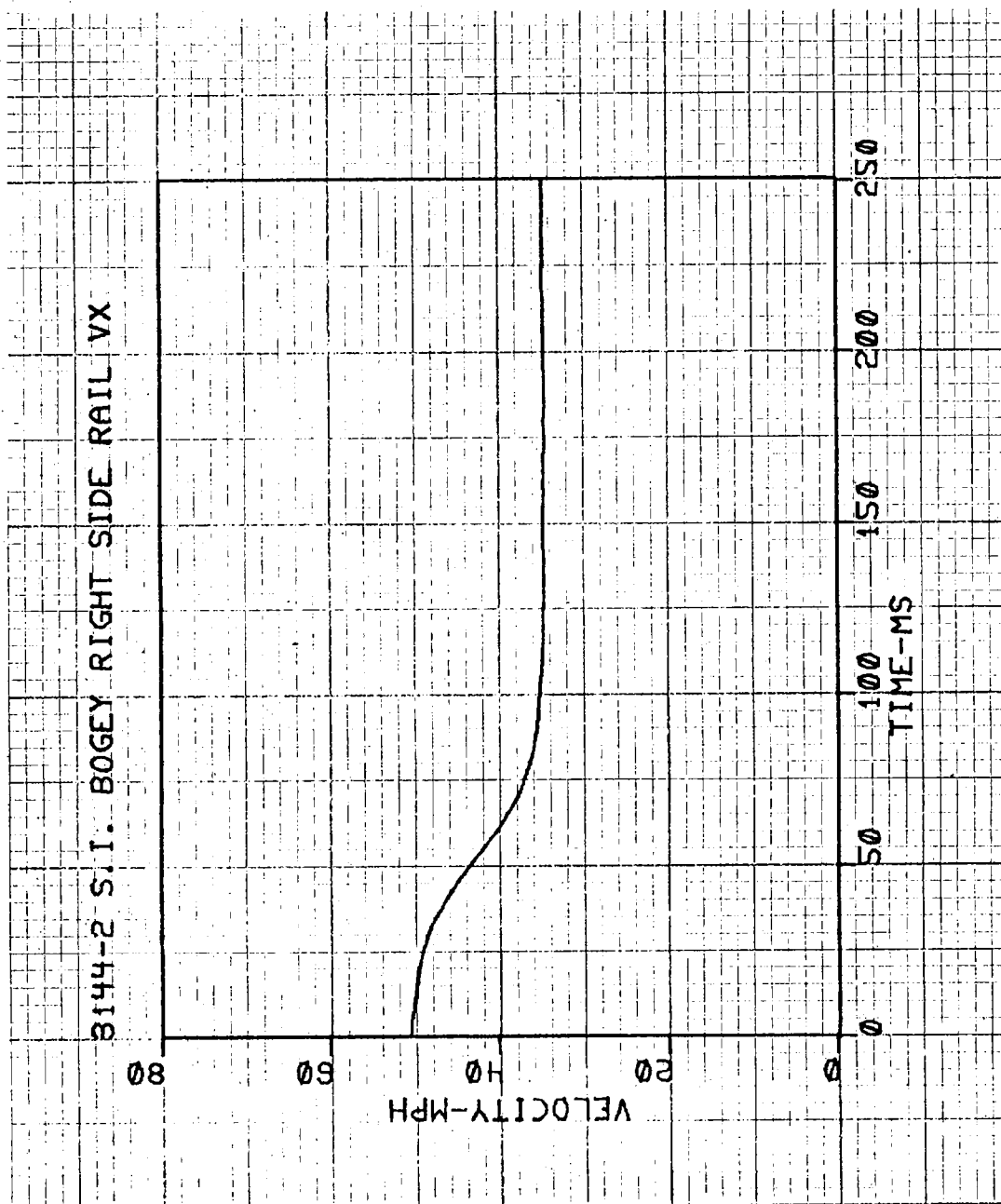










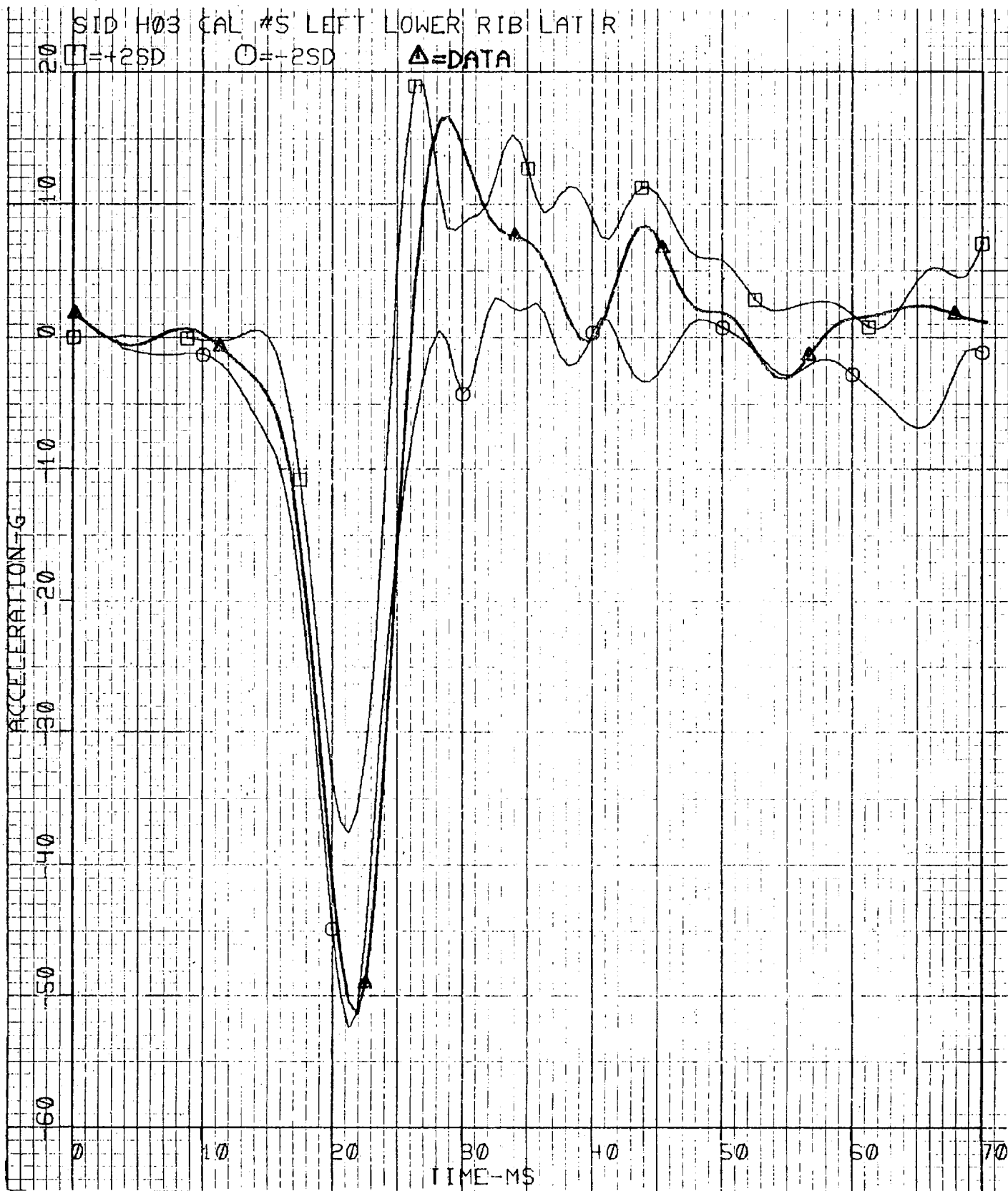


APPENDIX C
DUMMY CALIBRATION DATA
FOR HSRI 122 AND SID 7
19° CRABBED SIDE IMPACTOR TO
1982 VOLKSWAGEN RABBIT
AT 53.38 MPH



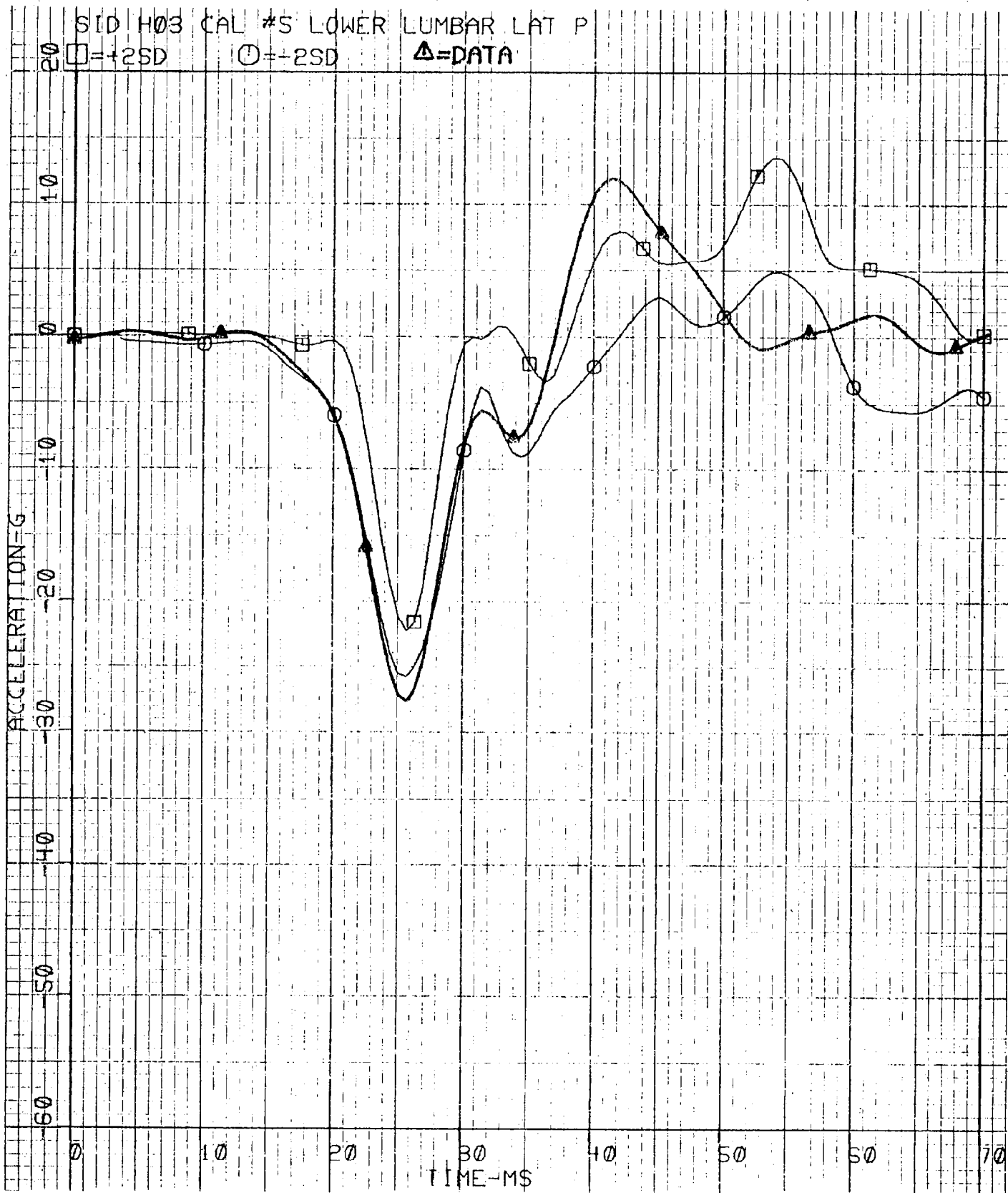


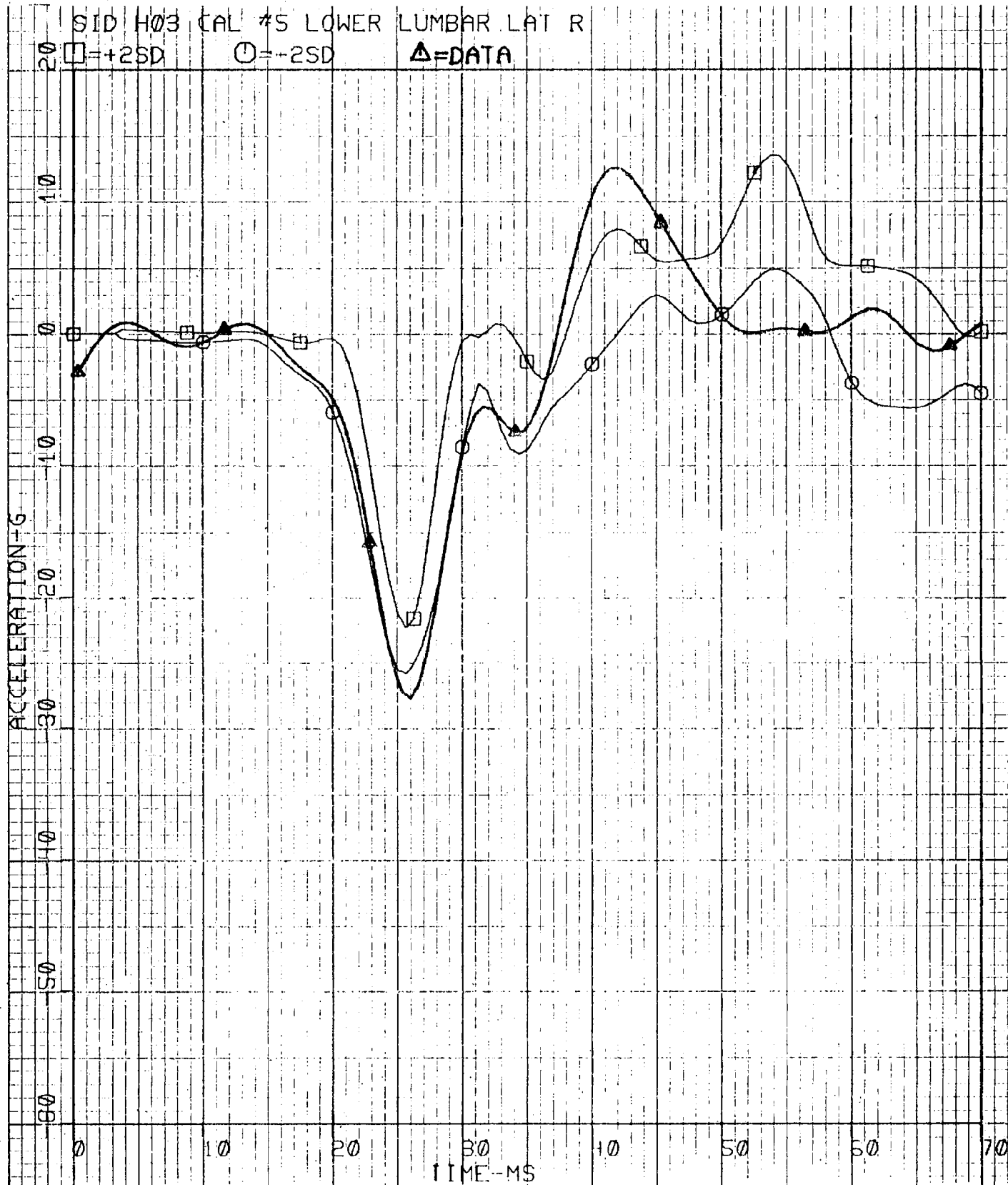


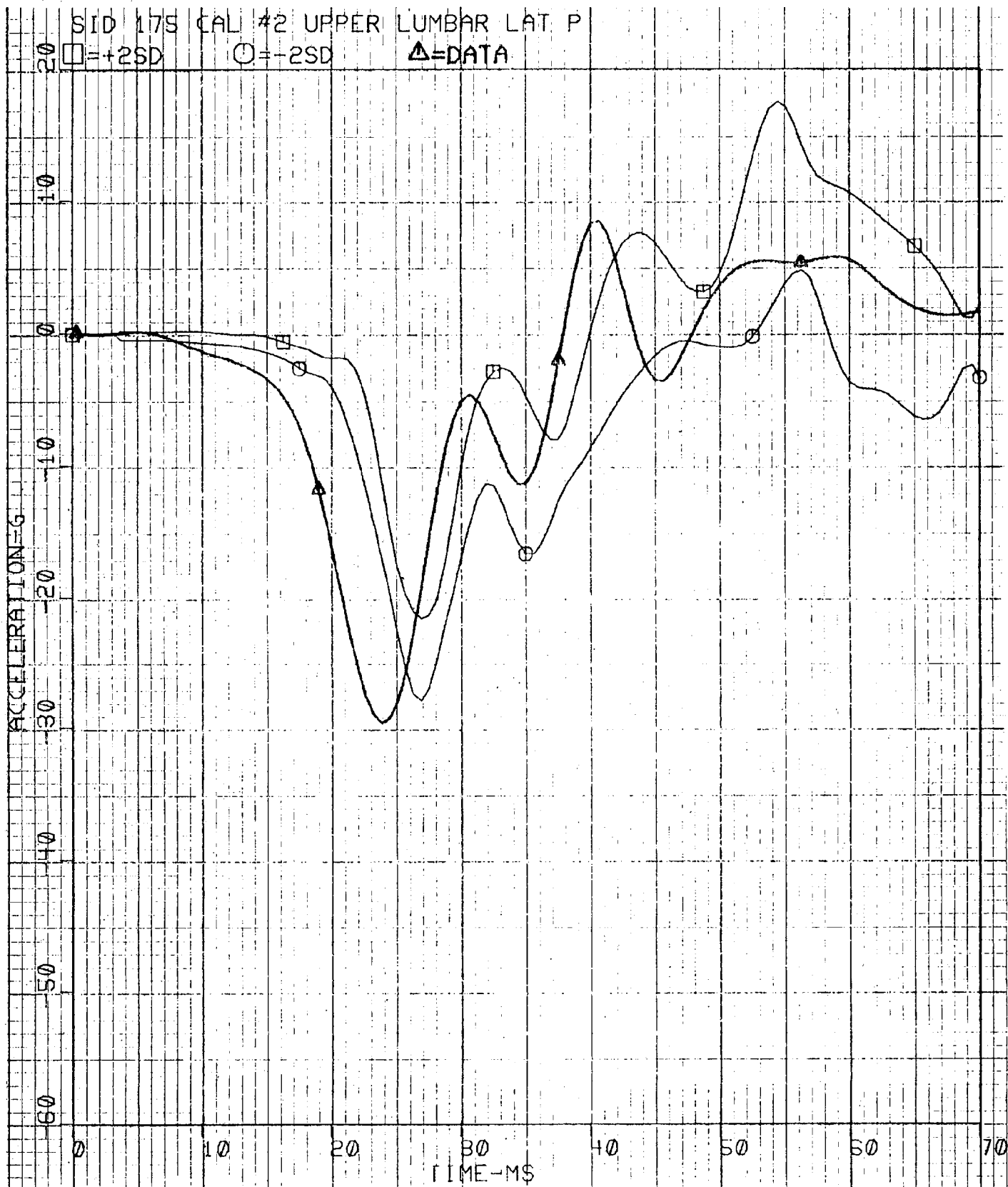


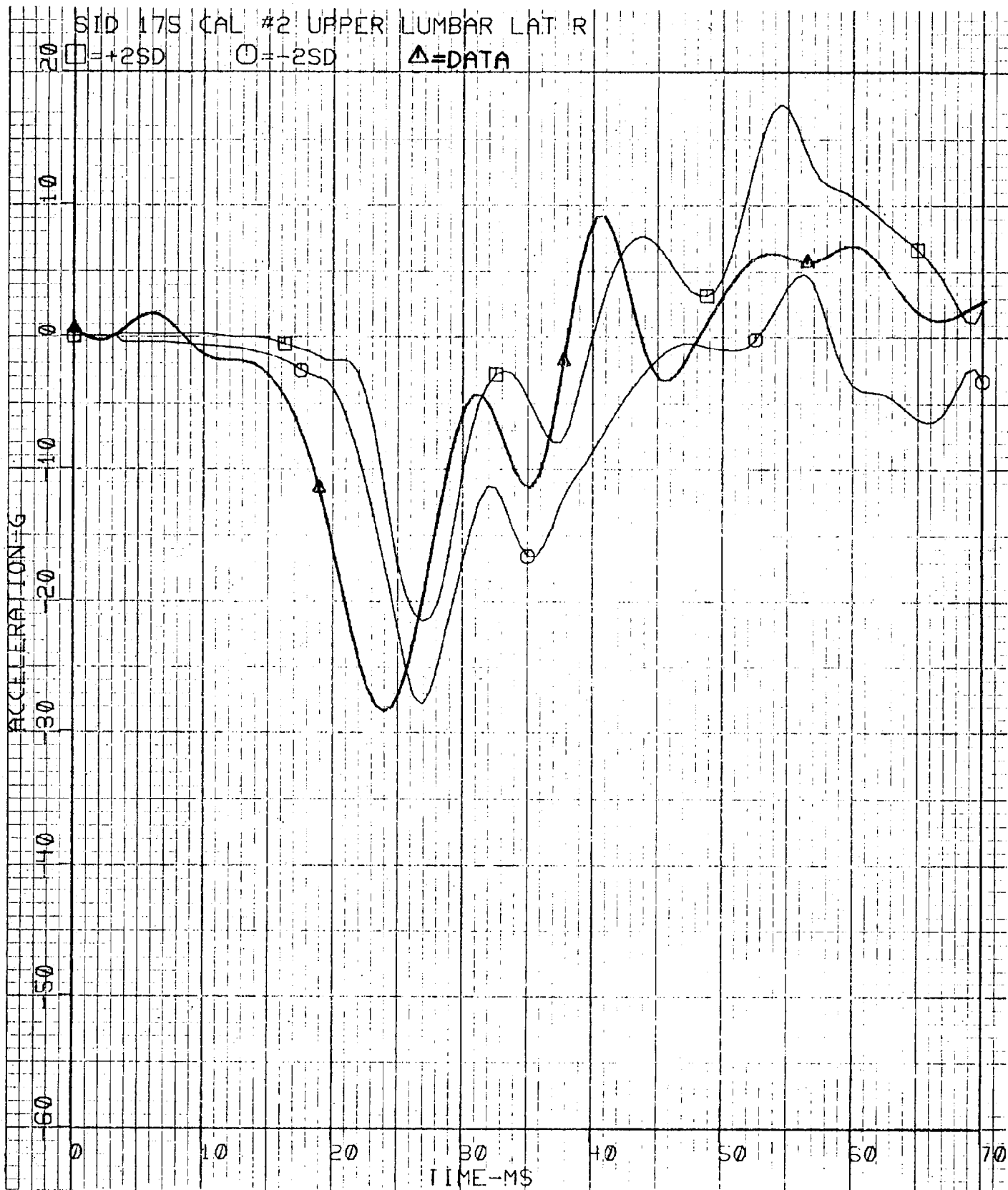












SID 175 CAL #2 LEFT LOWER RIB LAT P

$\square = +2SD$ $\circ = -2SD$ $\Delta = DATA$

