

DOT 511

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 34.23 MPH

Prepared by:

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TEST REPORT
FEBRUARY 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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Date 2-4-83

Report Accepted by:

Contract Technical Manager
Office of Vehicle Safety Compliance

Date

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. RD1-DYS-83-001	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle NEW VEHICLE ASSESSMENT FOR SIDE IMPACT PROTECTION - CAR-TO-CAR SIDE IMPACT TESTING - 19° CRABBED SIDE IMPACTOR TO 1982 VOLKS-WAGEN RABBIT 2-DOOR HATCHBACK AT 34.23 MPH		5. Report Date February 1983	
		6. Performing Orgn Code	
7. Author(s) M. Rodack, Project Engineer		8. Performing Orgn Rpt No. 3144-83-006/2064	
9. Performing Organization Name and Address Dynamic Science, Inc. An Exodyne Company 1850 West Pinnacle Peak Road Phoenix, Arizona 85027		10. Work Unit No.	
		11. Contract or Grant No. DTNH22-81-C-07113 T.O. 5	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration 400 Seventh Street, S.W. Washington, D.C. 20590		13. Type of Report and Period Covered January 1983 FINAL REPORT	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract			
New Vehicle Assessment for Side Impact Protection Car-to-Car Side Impact Testing was conducted at the Dynamic Science Phoenix, AZ facility on a 1982 Volkswagen Rabbit 2-Door Hatchback. The 19° crabbed side impactor impact speed was 34.23 mph. The test simulates a two vehicle moving 60° impact with the "bullet-to target" velocity ratio of 2:1. Test date was January 5, 1983. The ambient temperature was 67°F. Side impact dummies were placed in the left front and left rear outboard seating positions.			
17. Key Words Occupant Side Impact Protection		18. Distribution Statement Copies are available from Technical Reference Division, National Highway Traffic Safety Administration, Room 5108, 400 Seventh Street, S.W., Washington, D.C. 20590	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. Pages 170	22. Price

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 degrees add 32)	degrees Fahrenheit	°F

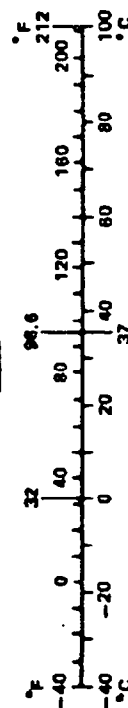


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1.0 PURPOSE AND TEST INTRODUCTION

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 was conducted at the Dynamic Science side impact facility on January 5, 1983. The 19 degree side impactor was accelerated to a test speed of 34.23 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 37 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 26 mph and the target vehicle moving at 13 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.: R&D DSI No. 1300 Color: Red

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Volkswagen of America
 Date of Manufacture: 4/82; VIN: 1VWAB0177CV085014
 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 P155/80R-13
 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 1055
 Dealer Name & Address: Rocky Mountain Volkswagen, Inc.
1000 Cordova, Santa Fe, New Mexico

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

Right Front = 617 lb Right Rear = 324 lb
 Left Front = 622 lb Left Rear = 345 lb
 TOTAL FRONT WEIGHT = 1239 lb (65 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 669 lb (35 % of Total Vehicle Weight)
 TOTAL DELV. WEIGHT = 1908 lb

TARGET WEIGHT = UDW + Cargo Load + 328 lbs Dummies = 2421 lb

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 223 LB CARGO:

Right Front = 650 lb Right Rear = 502 lb
 Left Front = 700 lb Left Rear = 585 lb
 TOTAL FRONT WEIGHT = 1350 lb (55 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1087 lb (45 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 2437 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 27-1/2 LF 27-3/8 RR 25-1/4 LR 25-1/8

REMARKS: _____

GENERAL TEST AND VEHICLE PARAMETER DATA (CONT)

POST-IMPACT DATA

Type of Test: Side (60°) Impact
 Date of Test: 1/5/83 Time: 1418 Temperature 67 °F
 Required Impact Velocity Range: 33.9 to 34.9 mph
 Impact Velocity: Primary = 34.23 mph Secondary = 34.26 mph
 Temperature in Occupant Compartment: 72 °F
 Windshield Moulding Temperature: 67 °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>60.6</u>	C	<u>60.2</u>
	Post-test = A	<u>51.3</u>	B	<u>39.7</u>	C	<u>51.4</u>
	Crush = A	<u>9.3</u>	B	<u>20.6</u>	C	<u>8.8</u>

19 Degree Crabbed Side Impactor Weight 3014 pounds.

VISIBLE DUMMY CONTACT POINTS

	<u>Driver (HSRI 122)</u>	<u>Passenger (SID 7)</u>
Head	<u>Striking vehicle</u>	<u>Headliner over left rear window</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>Side of vehicle</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>Opened</u>	<u>NA</u> <u>NA</u>
	<u>required</u> <u>easily</u>	

SEAT MOVEMENT

Seat Back Failure	<u>Bent to</u> <u>None</u>	
	<u>right</u>	
Seat Shift (in.)	<u>NA</u> <u>NA</u>	

GLAZING DAMAGE

Backlight/Windshield Left side windows shattered. Windshield cracked. No retention loss.

OTHER NOTABLE IMPACT EFFECTS: Driver left knee broken, ankle pinned by door. Door overrode sill. Fender torn from A-pillar near sill. Left rear tire flat, severe cuts are visible in the side-wall near the vehicle rim. A slight bend was also noted in the upper left corner of the windshield framing.

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: 1/5/83 Time: 1418 Temperature 67 °F
NHTSA No.: R&D VIN: 1VWAB0177CV085014
Required Impact Velocity Range: 33.9 to 34.9 mph
Impact Velocity: Primary = 34.23 mph Secondary = 34.26 mph
Vehicle Static Crush: Amount of Crush = 20.7 inches on left side
Crush Details: Driver left knee broken, ankle pinned by door.
Door overrode sill. Fender torn from A-pillar near sill. Left
rear tire flat, severe cuts are visible in the sidewall near
the vehicle rim. A slight bend was also noted in the upper left
corner of the windshield framing.

DUMMY IN-VEHICLE POSITION RECORDING SHEET

PRE-IMPACT DATA

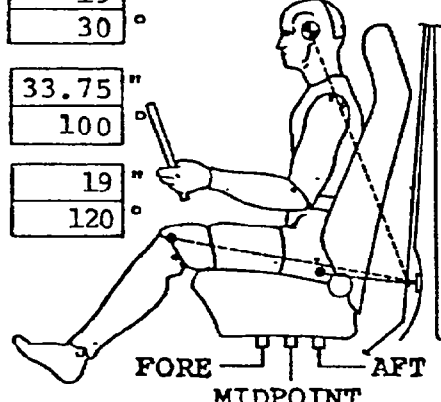
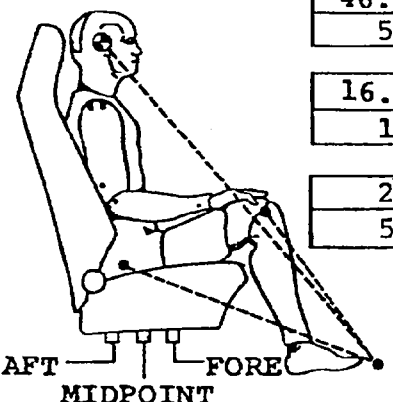
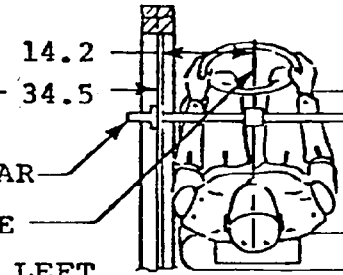
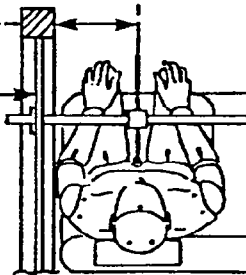
Make/Model: Volkswagen Rabbit
 Body Style: 2-Door Hatchback Model Year: 1982
 NHTSA No. R&D DSI No. 1300 Color: Red

DATA FROM CERTIFICATION LABEL

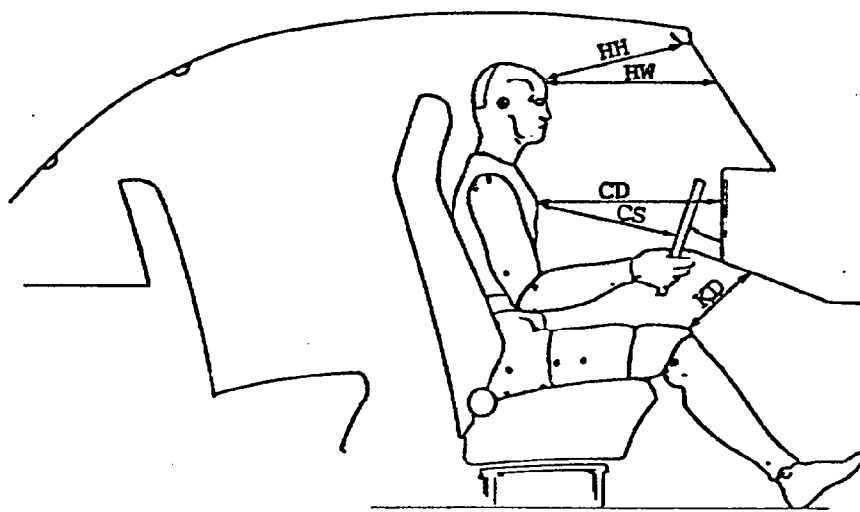
Vehicle Manufacturer: Volkswagen of America
 Date of Manufacture: 4/82; VIN: 1VWAB0177CV085014
 GVWR: 2822 lb; GAWR: Front = 1609 lb; Rear = 1275 lb

POST-IMPACT DATA

Type of Test: Side (60°) Impact
 Date of Test: 1/5/83 Time: 1418 Temperature 67 °F
 Required Impact Velocity Range: 33.9 to 34.9 mph
 Impact Velocity: Primary = 34.23 mph Secondary = 34.26 mph
 Seat Type: Bucket Adjuster Type: Manual
 Bucket Seat Type Back: High back, not adjustable
 Technicians: M. Rodack, L. Johnson

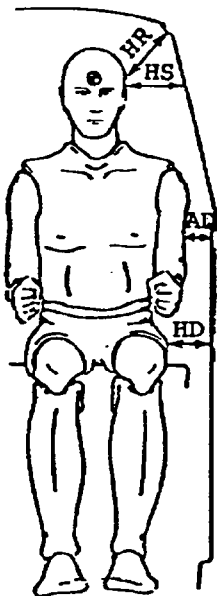
DRIVER DUMMY# <u>122</u> HEAD TARGET <u>19</u>" <u>30</u>° KNEE JOINT <u>33.75</u>" <u>100</u>° APPROXIMATE "H" POINT <u>19</u>" <u>120</u>°  FORE MIDPOINT AFT	PASSENGER DUMMY # <u>SID 7</u> HEAD TARGET <u>46.8</u>" <u>55</u>° KNEE JOINT <u>16.5</u>" <u>12</u>° APPROXIMATE "H" POINT <u>22</u>" <u>50</u>°  AFT MIDPOINT FORE
DOOR * <u>14.2</u> GLASS HEIGHT <u>34.5</u> LATERAL BAR ADJUSTABLE POINTER LEFT FRONT DOOR DRIVER DUMMY # <u>122</u> 	DOOR GLASS HEIGHT <u>14.4</u> <u>33.0</u> LEFT SIDE OF CAR PASSENGER DUMMY # <u>SID 7</u> 

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



301

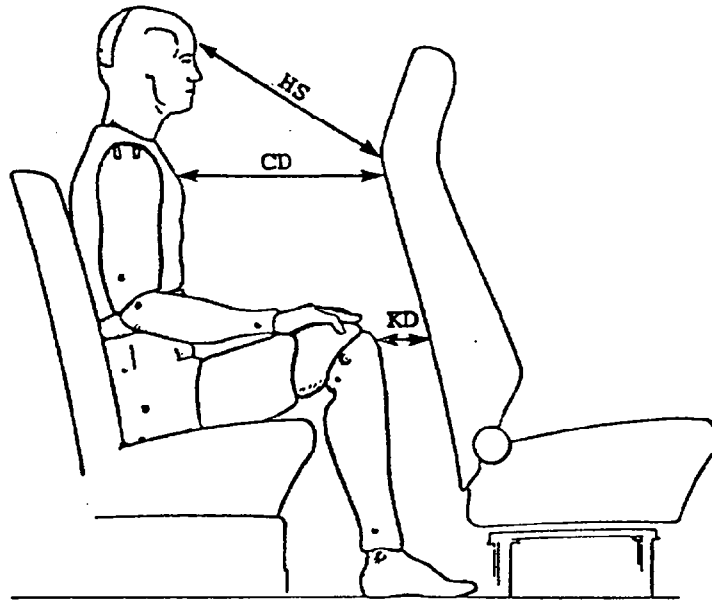
HH = 17.0 INCHES
 HW = 24.0 INCHES
 CD = 20.5 INCHES
 CS = 12.8 INCHES
 KD = 3.5 INCHES/3.5 INCHES



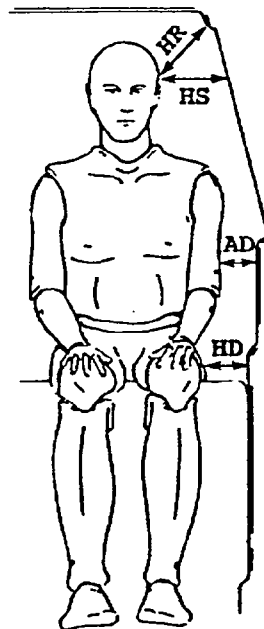
HR = 8.0 INCHES
 HS = 9.5 INCHES
 AD = 4.1 INCHES
 HD = 6.2 INCHES

DRIVER CLEARANCE DIMENSIONS.

0027 00 00501



HS = 22.8 INCHES
CD = 17.2 INCHES
KD = 3.5 INCHES/3.2 INCHES (L)



HR = 7.0 INCHES
HS = 8.6 INCHES
AD = 3.3 INCHES
HD = 6.0 INCHES

REAR PASSENGER CLEARANCE DIMENSIONS.

SIDE IMPACT DUMMY RESPONSE SUMMARY

TEST NO. 3144-1

TEST DATE 1/5/83

TEST CONFIGURATION:

Target Vehicle 1982 VW Rabbit Speed 0.0 mph
 Bullet Vehicle 19° Crabbed Side Impactor Speed 34.23 mph
 Impact Location Left edge of side impactor face contacted the target vehicle 37 inches forward of the wheelbase centerline. Angle 60°
 Dummy Model HSRI 122 (Driver)

HEAD RESPONSE:

	Positive Peak (G)	ms	Negative Peak (G)	ms
Longitudinal	40.0	209	61.4	109
Lateral	87.8	109	33.1	210
Vertical	76.7	85	27.6	240
Resultant	111.9	109	-	-
HIC	664.3	Between 71.8 and 116.3 ms.		

CHEST RESPONSE:

DEFLECTION (IN.): LRDY 1.7 in. @ 129 ms

Location	Pk A (G @ ms)		3ms Clip (G)	SI	ΔV_y (MPH)	Impact Time (ms)
	+	-				
Upper Thorax						
Longitudinal	15.9 @ 71	23.9 @ 82	-	-	-	-
Lateral (P)	102.9 @ 84	140.2 @ 83	86.0	-	24.7	38
Lateral (R)	99.8 @ 67	87.7 @ 83	86.6	-	25.5	39
Vertical	23.6 @ 55	24.9 @ 83	-	-	-	-
Resultant	140.9 @ 83	-	87.8	1042	-	-
Resultant (R)	100.4 @ 67	-	82.7	911	-	-
Lower Thorax						
Longitudinal	55.6 @ 83	51.0 @ 84	-	-	-	-
Lateral (P)	75.0 @ 67	79.6 @ 83	62.3	-	30.0	37
Lateral (R)	73.4 @ 66	104.7 @ 83	68.6	-	26.8	37
Vertical	81.0 @ 65	173.0 @ 84	-	-	-	-
Resultant	181.8 @ 84	-	88.5	1185	-	-
Resultant (R)	196.9 @ 83	-	83.6	1294	-	-
Left Upper Rib						
Lateral (P)	94.1 @ 62	14.2 @ 93	84.0	-	25.8	43
Lateral (R)	89.4 @ 62	10.9 @ 93	84.0	-	26.6	42
Left Lower Rib						
Lateral (P)	114.9 @ 58	21.4 @ 79	100.3	-	29.9	39
Lateral (R)	95.1 @ 58	19.4 @ 79	89.1	-	28.8	40

SIDE IMPACT DUMMY RESPONSE SUMMARY (Continued)

PELVIS RESPONSE

	Positive Peak (G)	ms	Negative Peak (G)	ms
Longitudinal	32.0	240	41.8	52
Lateral	118.8	51	17.1	90
Vertical	10.1	69	57.6	54
Resultant	121.5	51	-	-
ΔV_y 31.0 mph SI 1242	Contact Time 36 ms			

COMMENTS: HSRI 122 post-test inspection revealed a broken left knee casting.
Also the leather rib backing plate contained some small cracks near the rib
attachment points.

SIDE IMPACT DUMMY RESPONSE SUMMARY

TEST NO. 3144-1 TEST DATE 1/5/83

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>34.23 mph</u>
Impact Location	<u>Left edge of side impactor face contacted the target vehicle 37 inches forward of the wheelbase centerline</u>		Angle
Dummy Model	<u>SID 7 (Left Rear Passenger)</u>		

HEAD RESPONSE:

	Positive Peak (G)	ms	Negative Peak (G)	ms
Longitudinal	24.0	236	18.5	152
Lateral	63.0	91	61.0	240
Vertical	67.1	129	52.7	116
Resultant	78.2	91	-	-
HIC	420.7 Between 88.8 and 137.6 ms.			

CHEST RESPONSE:

DEFLECTION (IN.): LRDY 1.3 in. @ 121 ms

Location	Pk A (G @ ms)		3ms Clip (G)	SI	ΔV_y (MPH)	Impact Time (ms)
	+	-				
Upper Thorax						
Longitudinal	62.8 @ 140	32.3 @ 90	-	-	-	-
Lateral (P)	57.2 @ 96	12.2 @ 146	49.9	-	24.8	72
Lateral (R)	59.2 @ 96	16.1 @ 74	49.4	-	22.8	72
Vertical	49.7 @ 90	20.6 @ 91	-	-	-	-
Resultant	65.5 @ 140	-	52.1	411	-	-
Resultant (R)	65.3 @ 140	-	55.9	467	-	-
Lower Thorax						
Longitudinal	155.2 @ 89	166.7 @ 88	-	-	-	-
Lateral (P)	107.6 @ 90	104.2 @ 74	63.5	-	22.1	70
Lateral (R)	89.9 @ 90	45.1 @ 74	60.4	-	27.0	70
Vertical	102.6 @ 74	27.4 @ 88	-	-	-	-
Resultant	190.0 @ 90	-	118.4	1344	-	-
Resultant (R)	181.8 @ 89	-	99.6	1194	-	-
Left Upper Rib						
Lateral (P)	48.8 @ 103	7.1 @ 109	45.2	-	27.0	76
Lateral (R)	50.1 @ 102	5.2 @ 159	44.9	-	22.9	74
Left Lower Rib						
Lateral (P)	76.5 @ 94	19.3 @ 111	67.1	-	20.8	76
Lateral (R)	83.1 @ 94	25.6 @ 109	66.9	-	23.8	75

SIDE IMPACT DUMMY RESPONSE SUMMARY (Continued)

PELVIS RESPONSE

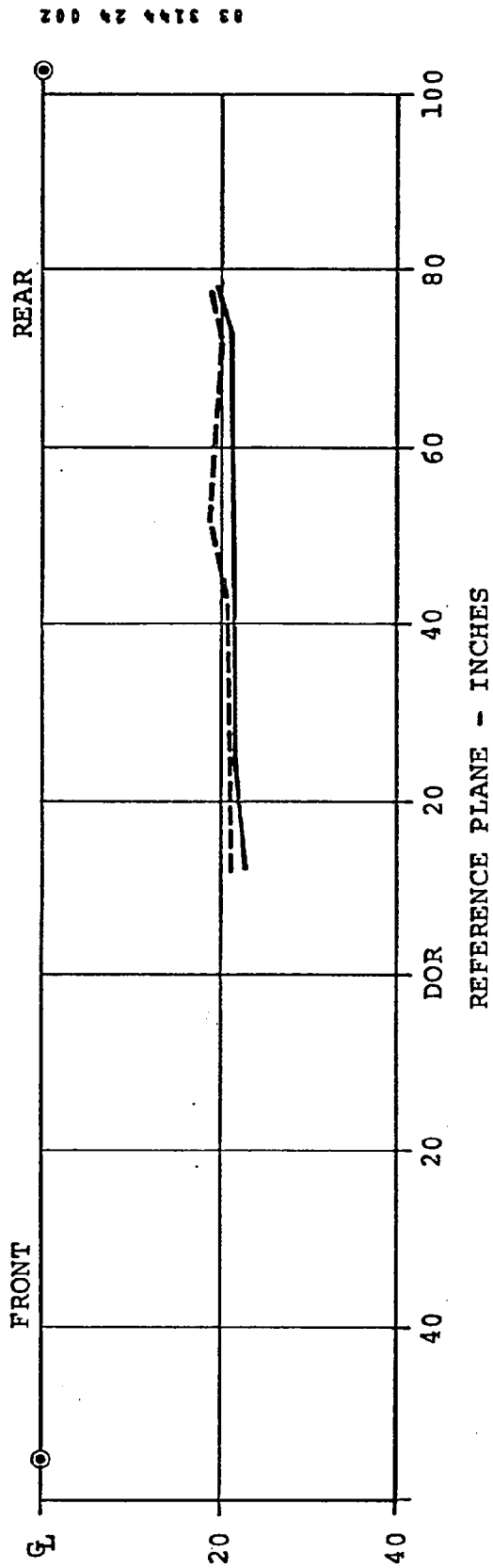
	Positive Peak (G)	ms	Negative Peak (G)	ms
Longitudinal	25.3	73	55.7	83
Lateral	201.1	83	51.9	74
Vertical	16.2	73	42.4	82
Resultant	212.4	83	-	-
ΔV_y 26.2 mph	SI 2351	Contact Time 58 ms		

COMMENTS: SID 7 post-test inspection revealed a broken heim joint on the damper shaft. The displacement pot shaft also contained a slight bend near the threaded end.

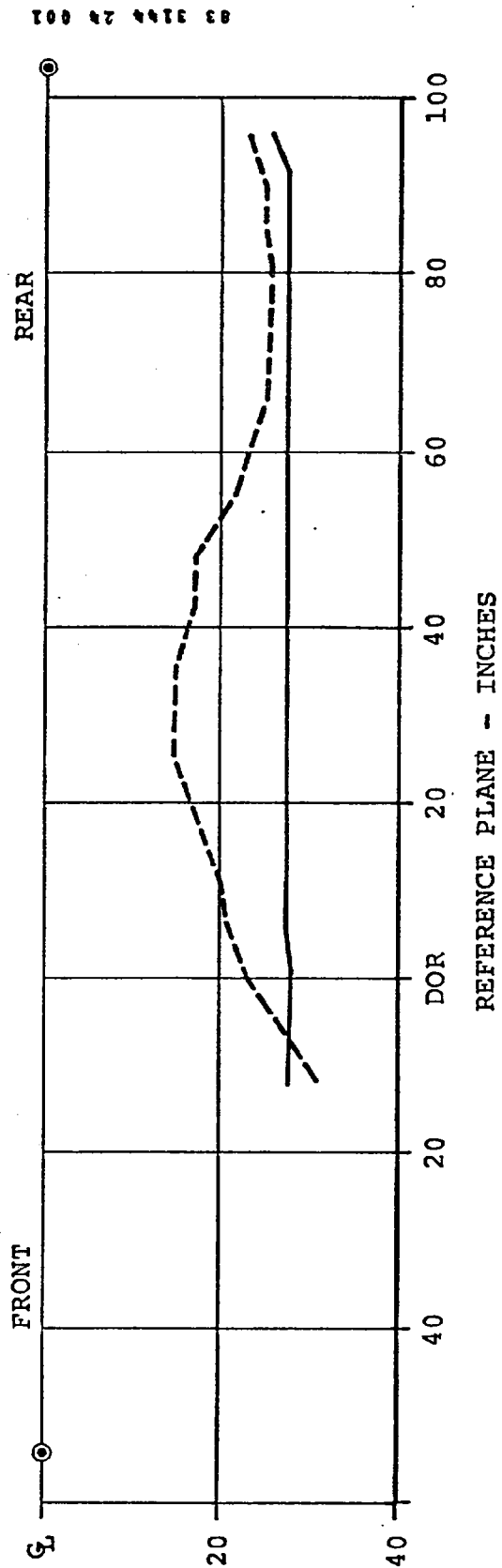
TEST VEHICLE EXTERIOR PROFILES AND STATIC CRUSH

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	9.2	9.5	X	11.4	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.7	11.8	11.9	12.0	X	X	X	X	15.0	X
DOR		X	X	X	X	10.2	10.0	10.0	10.0	10.0	10.0	10.1	10.0	10.2	10.2	10.2	10.1	X	X	X	X	12.7	X
Door Center		10.0	8.7	8.4	9.0	10.0	9.7	9.8	9.7	9.6	9.7	9.7	9.7	9.7	9.8	9.7	9.8	9.9	9.6	8.1	8.6	10.8	11.6
Window Sill		X	X	X	12.1	12.0	11.7	12.5	12.3	12.4	12.5	12.4	12.4	12.2	12.2	12.3	12.4	12.5	12.6	12.4	12.6	13.1	15.5
Window Top		X	X	X	X	X	X	X	17.7	18.0	18.1	18.1	18.1	18.0	18.2	18.2	18.2	18.2	18.2	20.2	X	X	X
Post-test Profile (Distance From R.P. - in.)																							
Axle Height		X	12.8	12.1	X	19.1	18.2	18.2	20.9	21.1	21.1	21.4	21.3	21.6	18.7	17.4	15.6	X	X	X	X	X	X
DOR		X	X	X	X	16.5	19.0	20.0	28.3	29.9	30.7	30.6	28.6	26.7	24.1	21.8	18.7	X	X	X	X	16.0	X
Door Center		13.7	11.2	9.2	14.3	12.9	18.8	21.1	26.0	26.8	27.1	27.2	26.8	25.6	25.3	21.9	18.4	13.3	11.7	11.4	13.8	14.2	16.3
Window Sill		X	X	X	9.2	13.1	16.1	19.3	21.9	23.7	25.1	25.9	24.9	22.5	22.2	19.0	16.4	15.5	14.4	14.2	14.9	15.6	17.2
Window Top		X	X	X	X	X	X	X	19.1	19.1	19.1	19.2	19.2	19.4	20.9	20.6	20.3	20.1	20.1	21.8	X	X	X
Post-test Static Crush (in.)																							
Axle Height		X	3.6	2.6	X	7.7	6.6	6.6	9.3	9.5	9.5	9.8	9.7	9.9	6.9	5.5	3.6	X	X	X	X	X	X
DOR		X	X	X	X	6.3	9.0	10.0	18.3	19.9	20.7	20.5	18.6	16.5	13.9	11.6	8.7	X	X	X	X	3.3	X
Door Center		3.7	2.5	0.8	5.3	2.9	9.1	11.3	16.3	17.2	17.4	17.5	17.1	15.8	15.6	12.1	8.5	3.7	3.6	2.8	3.0	2.6	3.7
Window Sill		X	X	X	-2.9	1.1	4.4	6.8	9.6	11.3	12.6	13.5	12.5	10.3	10.0	6.7	4.0	3.0	1.8	1.8	2.3	2.5	1.7
Window Top		X	X	X	X	X	X	X	1.4	1.1	1.0	1.1	1.1	1.4	2.7	2.4	2.1	1.9	1.9	1.6	X	X	X

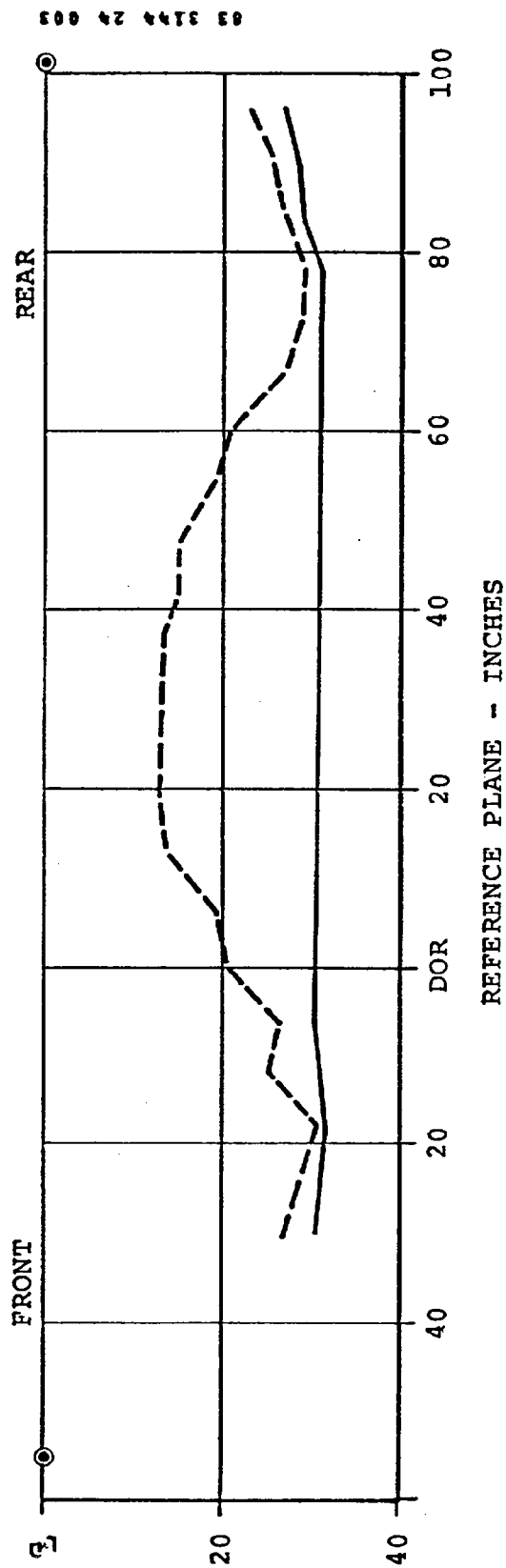
*Zero plane set up 40 inches from rear bumper centerline and 40 inches from front bumper centerline. This plane was set up parallel to the vehicle centerline.



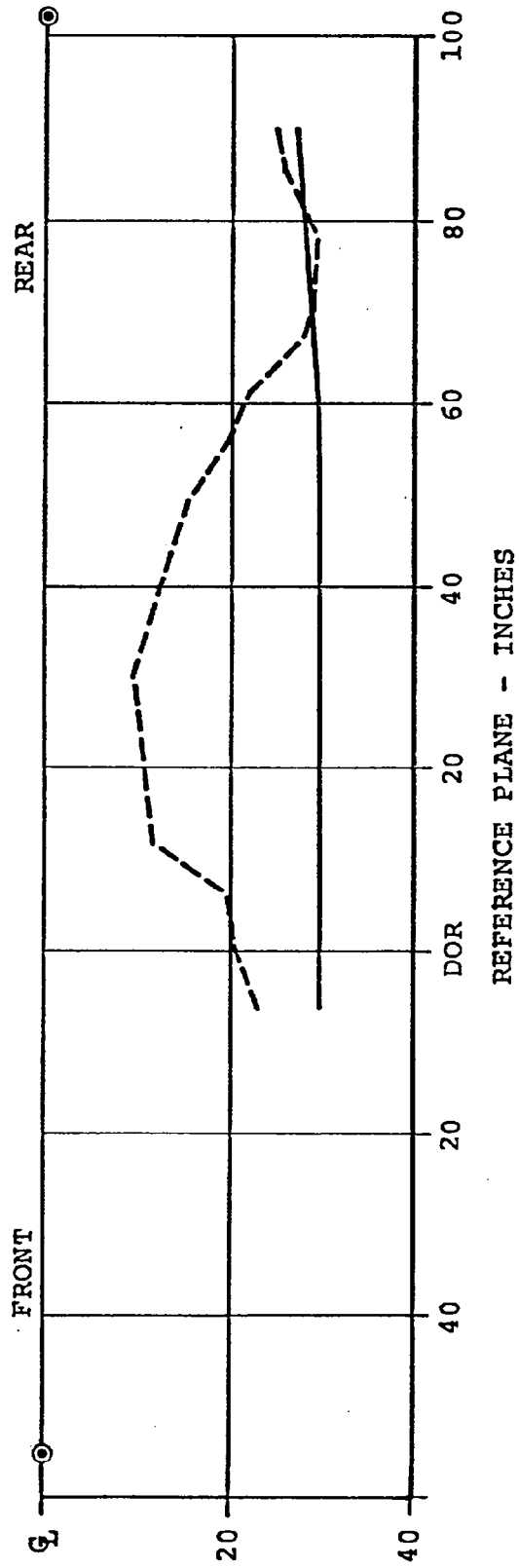
EXTERIOR VEHICLE PROFILE AND STATIC CRUSH MEASUREMENTS - WINDOW TOP LEVEL - 19 DEGREE SIDE IMPACTOR TO 1982 VOLKSWAGEN RABBIT - 34.23 MPH.



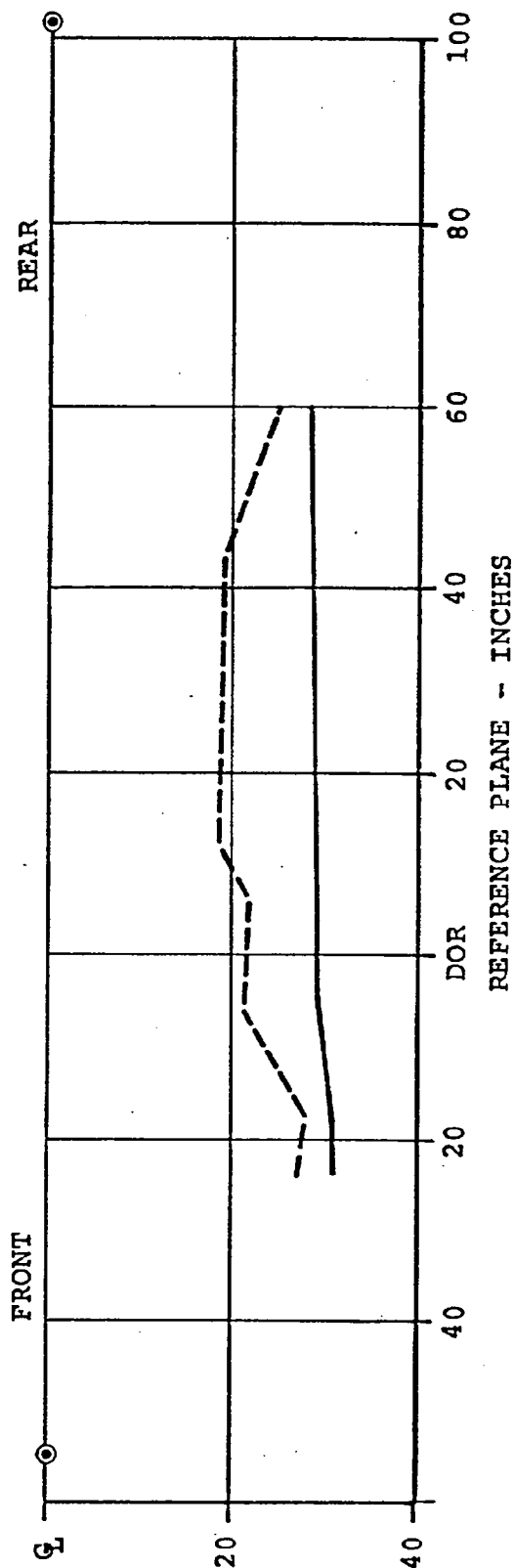
EXTERIOR VEHICLE PROFILE AND STATIC CRUSH MEASUREMENTS - WINDOW SILL LEVEL - 19 DEGREE CRABBED SIDE IMPACTOR TO 1982 VOLKSWAGEN RABBIT - 34.23 MPH.



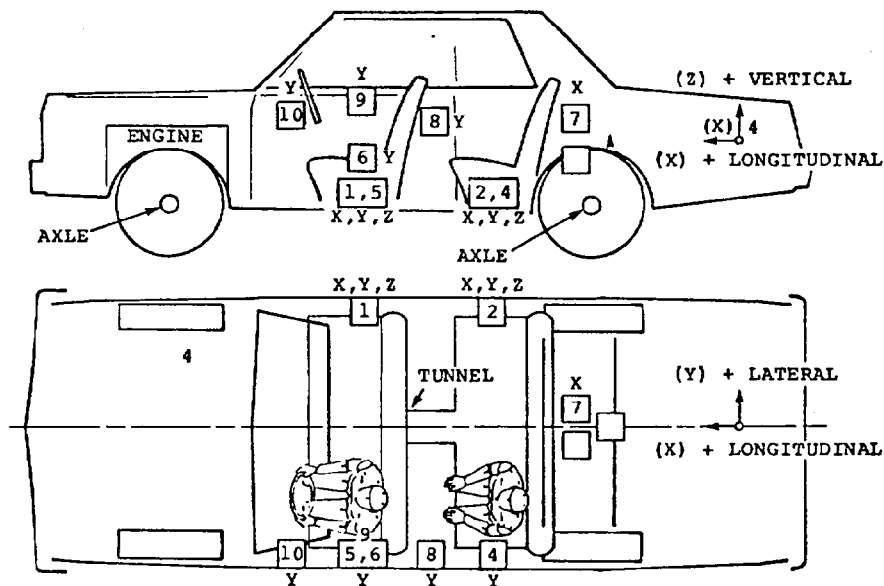
EXTERIOR VEHICLE PROFILE AND STATIC CRUSH MEASUREMENTS - MID-DOOR HEIGHT - 19 DEGREE SIDE IMPACTOR TO 1982 VOLKSWAGEN RABBIT - 34.23 MPH.



EXTERIOR VEHICLE PROFILE AND STATIC CRUSH MEASUREMENTS - DOR HEIGHT - 19 DEGREE SIDE IMPACTOR TO 1982 VOLKSWAGEN RABBIT - 34.23 MPH.



EXTERIOR VEHICLE PROFILE AND STATIC CRUSH MEASUREMENTS - AXLE HEIGHT - 19 DEGREE CRABBED
SIDE IMPACTOR TO 1982 VOLKSWAGEN RABBIT - 34.23 MPH.

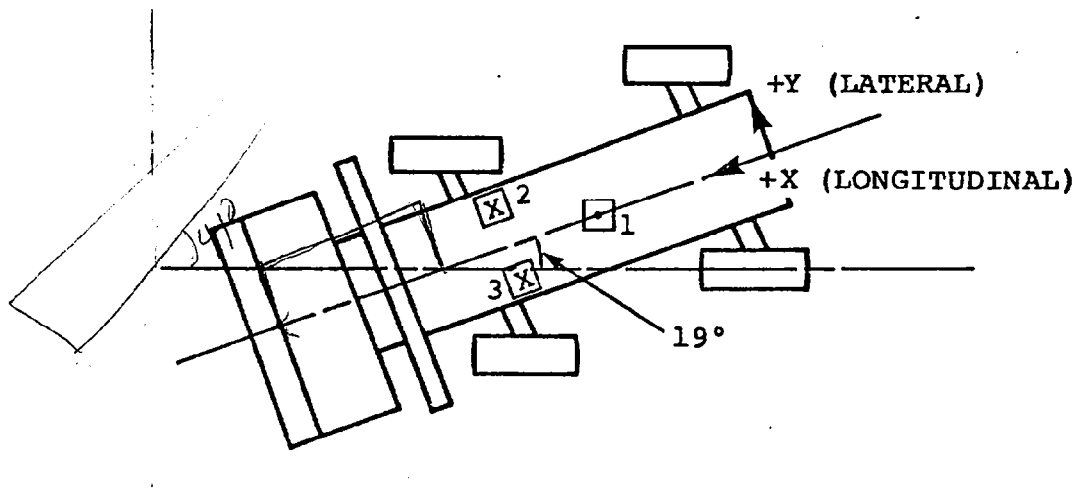


TEST VEHICLE ACCELEROMETER LOCATIONS AND PHYSICAL COORDINATES

No.	Description of Location	X*	Y*	Z*	Positive		Negative	
					G	MS	G	MS
1	Right sill next to front seat							
	(Longitudinal)	82.5	-23.5	10.5	1.5	15	5.6	54
	(Lateral)	$\Delta V = 11.3$ mph			11.4	59	2.3	157
	(Vertical)				13.5	47	8.0	53
2	Right sill next to rear seat							
	(Longitudinal)	62.0	-24.0	10.5	1.7	15	5.4	54
	(Lateral)	$\Delta V = 13.0$ mph			13.2	68	2.6	149
	(Vertical)				5.3	59	6.3	64
3	Deck over rear axle							
	(Longitudinal)	32.5	0.0	10.0	2.6	182	9.3	72
	(Lateral)	$\Delta V = 16.5$ mph			15.7	78	2.4	148
	(Vertical)				6.2	96	15.3	67
4	Left sill next to rear seat							
	(Lateral)	61.0	24.0	10.5	45.7	50	17.3	82
		$\Delta V = 14.9$ mph						
5	Left sill next to front seat							
	(Lateral)	82.0	23.6	10.5	Sensor probably excited at natural frequency.			
6	Left front door centerline							
	(Lateral)	81.7	25.5	24.0	102.8	15	93.2	42
		$\Delta V = 23.1$ mph						
7	Right rear compartment							
	(Longitudinal)	32.5	-15.5	12.5	2.2	180	7.3	72
8	Midrear of left front door							
	(Lateral)	60.2	25.5	24.5	Sensor damaged.			
9	Upper left front door centerline							
	(Lateral)	80.2	25.5	33.0	77.4	48	63.8	55
		$\Delta V = 25.7$ mph						
10	Midfront of left front door							
	(Lateral)	99.5	25.5	23.5	76.8	61	52.1	64
		$\Delta V = 6.6$ mph						

*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	13.25				
	(Longitudinal)							
	(Lateral)							
	(Vertical)							
2	Left side frame	67.5	23.0	14.0				
	(Longitudinal)							
	(Lateral)							
3	Right side frame	67.5	23.0	14.0				
	(Longitudinal)							
	(Lateral)							

*Positive values are forward of rear frame of side impactor, right of vehicle centerline.

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 perpendicular to barrier	Left side of test vehicle	0°	25 mm	405 fps	100 Hz	LC 327	264 in.	450 in	60 in.
2	Right side parallel to vehicle	Barrier contact - left side of vehicle	0°	25 mm	375 fps	100 Hz	M7	516 in.	330 in.	56.5 in.
3	Right side perpendicular to track	Left side of test vehicle	0°	17 mm	394 fps	101 Hz	LC 326	84 in.	798 in.	51.5 in.
4	Overhead	Barrier/vehicle contact	90°	10 mm	300 fps	100 Hz	M3	60 in.	54 in.	360 in.
5	Right side bullet vehicle	Real time documentary	0°	Var	24 fps	-	Scoopic	-	-	-
6	Onboard front	Left front occupant compartment (front)	0°	8 mm	367 fps	99 Hz	7	-	-	-
7	Onboard side front	Left front occupant compartment (side)	0°	8 mm	366 fps	99 Hz	12	-	-	-
8	Onboard side rear	Left rear occupant compartment (side)	0°	8 mm	370 fps	100 Hz	6	-	-	-
9	Onboard rear	Left rear occupant compartment (rear)	0°	8 mm	252 fps	99 Hz	4	-	-	-

TEST ANOMALIES AND LOSS OF DATA CHANNEL SUMMARY

The following data channels were lost during the conduct of this test. The left front door sill accelerometer appears to have been excited at its natural frequency. The sensor mounted in the midrear position of the left front door was damaged during the test event. Rabbit rear deck longitudinal accelerometer was noted to have an intermittent short post-test. No other data channels were damaged or lost during the test.

Post-test inspection of the left rear passenger dummy revealed the damper shaft detached from the ribs. The spherical rod end sheared off where the diameter of the threaded shaft reduces. The broken off portion of the rod end was removed from the damper shaft. The rod end was repaired post-test by inserting a one inch long 10/32 stud into the large diameter portion of the shaft. The rod end was then screwed into the damper shaft in the usual manner.

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. H. Hollowell

ATD Mfr.: ARL
 ATD Serial No.: SID 7/174
 Date Submitted: 1/10/83

Test Date	Test No.	Test Description*	Δv , [†] mph	$\angle$, ^{**} 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.	Michael J. Rockwell
11/19/82	3144-2	Left rear position, side impactor to Volkswagen Rabbit 60° side impact 2-car moving simulation	53.38	300	Left knee casting broken, damper heim joint bent, rib ballast on right side dented. Rib displacement transducer installed for remaining tests.	Michael J. Rockwell
1/5/83	3144-1	Left rear position, side impactor to Volkswagen Rabbit 60° side impact 2-car moving simulation	34.23	300	Heim joint broken on damper shaft. Displacement pot shaft bent.	Michael J. Rockwell

*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.

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: 1/10/83

Test Date	Test No.	Test Description*	$\Delta v, \uparrow$ mph	$\angle, \uparrow$ 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.	Michael J. Portlock
11/19/82	3144-2	Left front position, side impactor to Volkswagen Rabbit 60° side impact 2-car moving simulation	53.38	300	Rib ballast on right side dented, slight cracking in leather backing. Displacement transducer installed for remaining tests.	Michael J. Portlock
1/5/83	3144-1	Left front position, side impactor to Volkswagen Rabbit 60° side impact 2-car moving simulation	34.23	300	Left knee casting broken, cracking a little worse in leather backing.	Michael J. Portlock

*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 - 34.23 MPH.

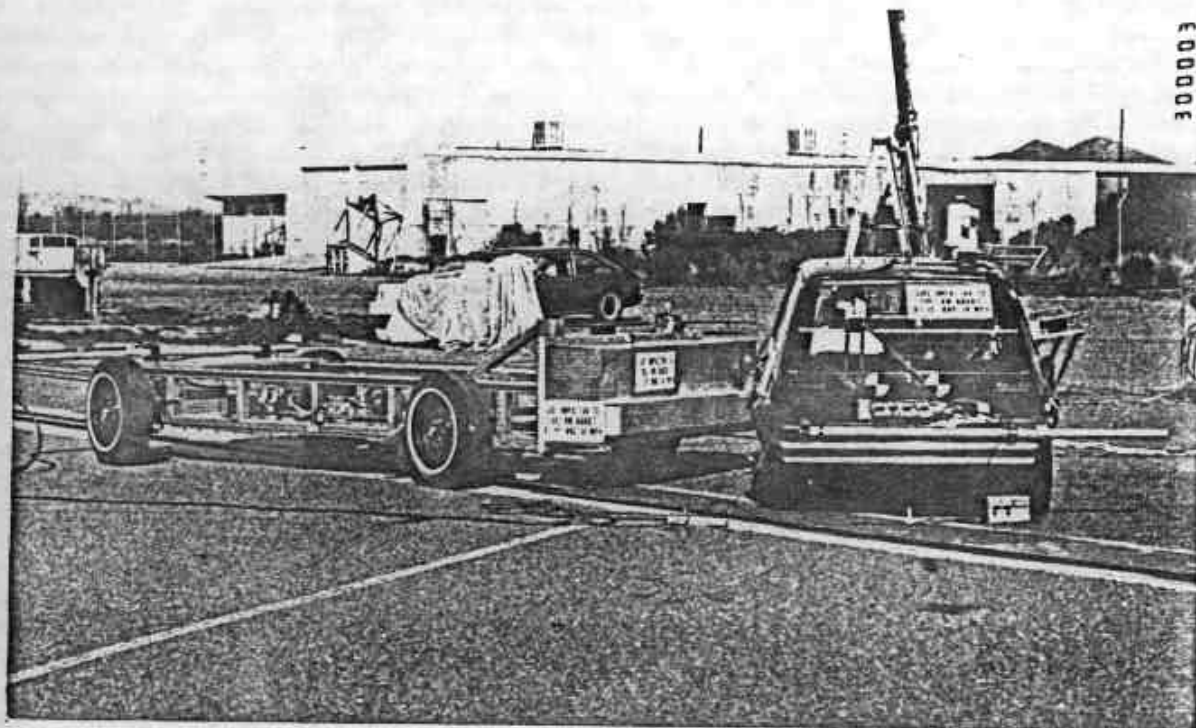


FIGURE A-2. PRE-TEST REAR VIEW OF VW RABBIT - 19° CRABBED
SIDE IMPACTOR TO 1982 VW RABBIT - 34.23 MPH.

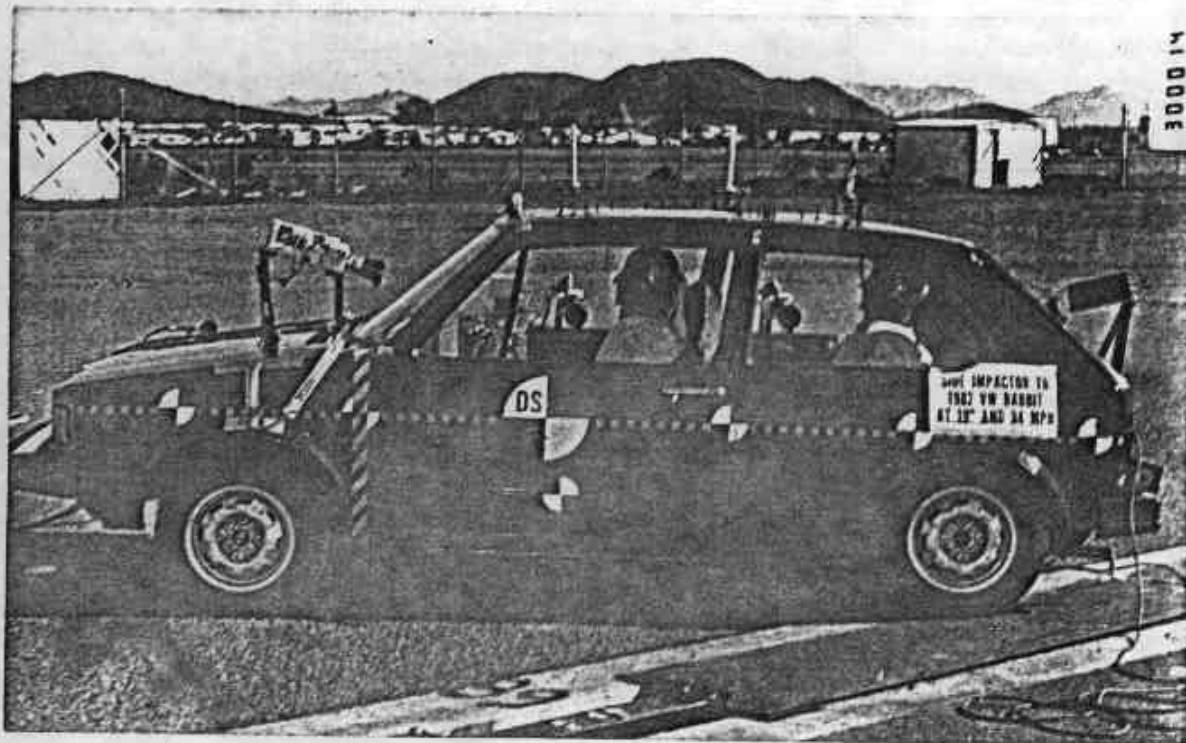


FIGURE A-3. PRE-TEST LEFT SIDE VIEW OF VW RABBIT - 19° CRABBED SIDE IMPACTOR TO 1982 VW RABBIT - 34.23 MPH.

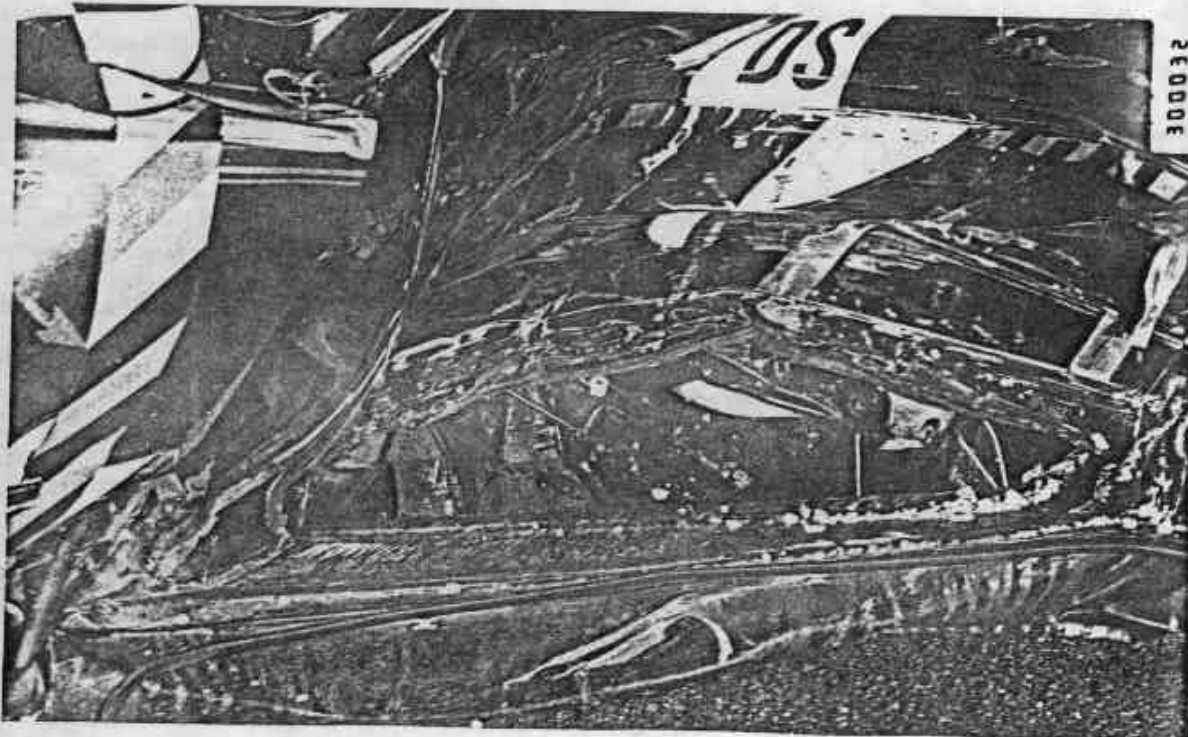


FIGURE A-4. POST-TEST LEFT SIDE VIEW OF VW RABBIT - 19° CRABBED SIDE IMPACTOR TO 1982 VW RABBIT - 34.23 MPH.

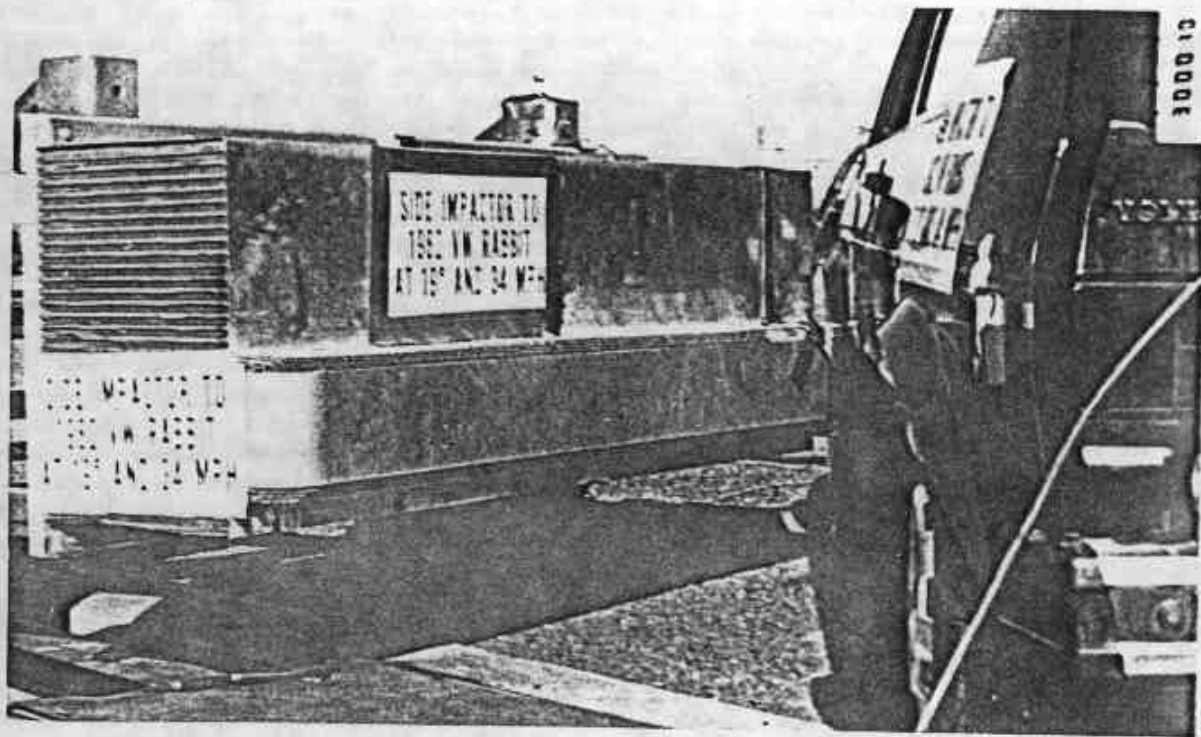


FIGURE A-5. PRE-TEST LEFT SIDE REAR VIEW OF VW RABBIT.



FIGURE A-6. POST-TEST LEFT SIDE REAR VIEW OF VW RABBIT.

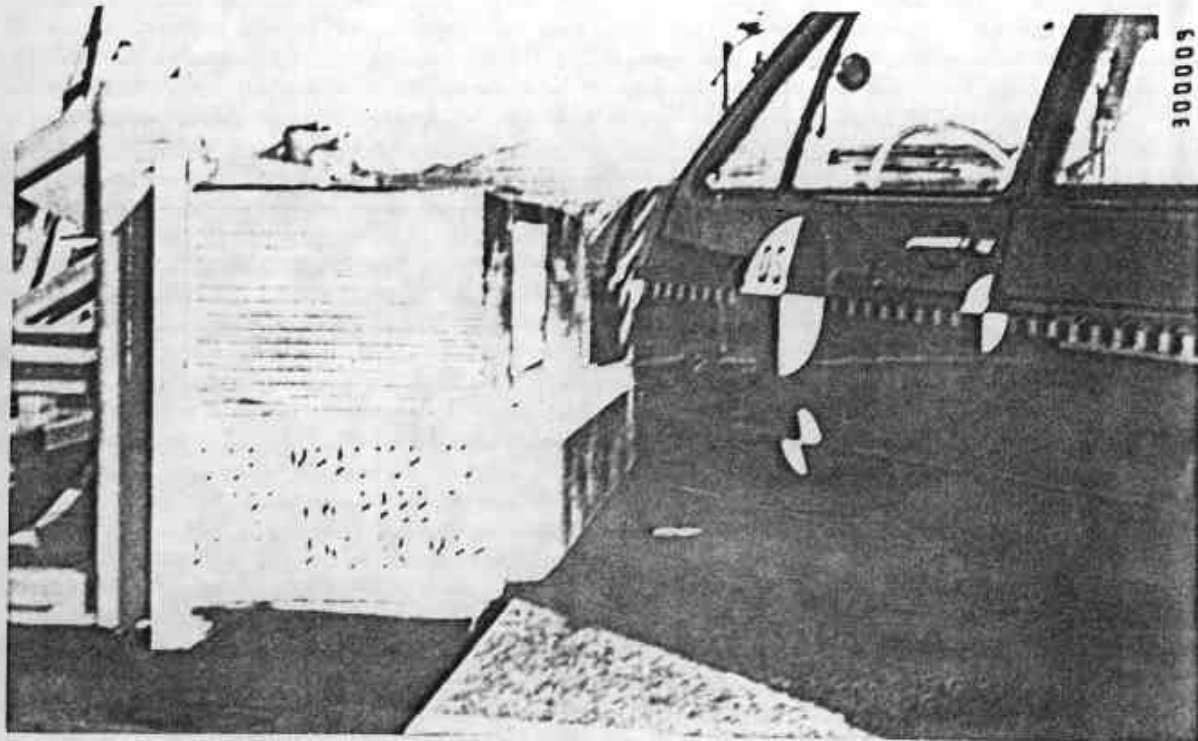


FIGURE A-7. PRE-TEST LEFT SIDE REAR OBLIQUE VIEW OF VW RABBIT.

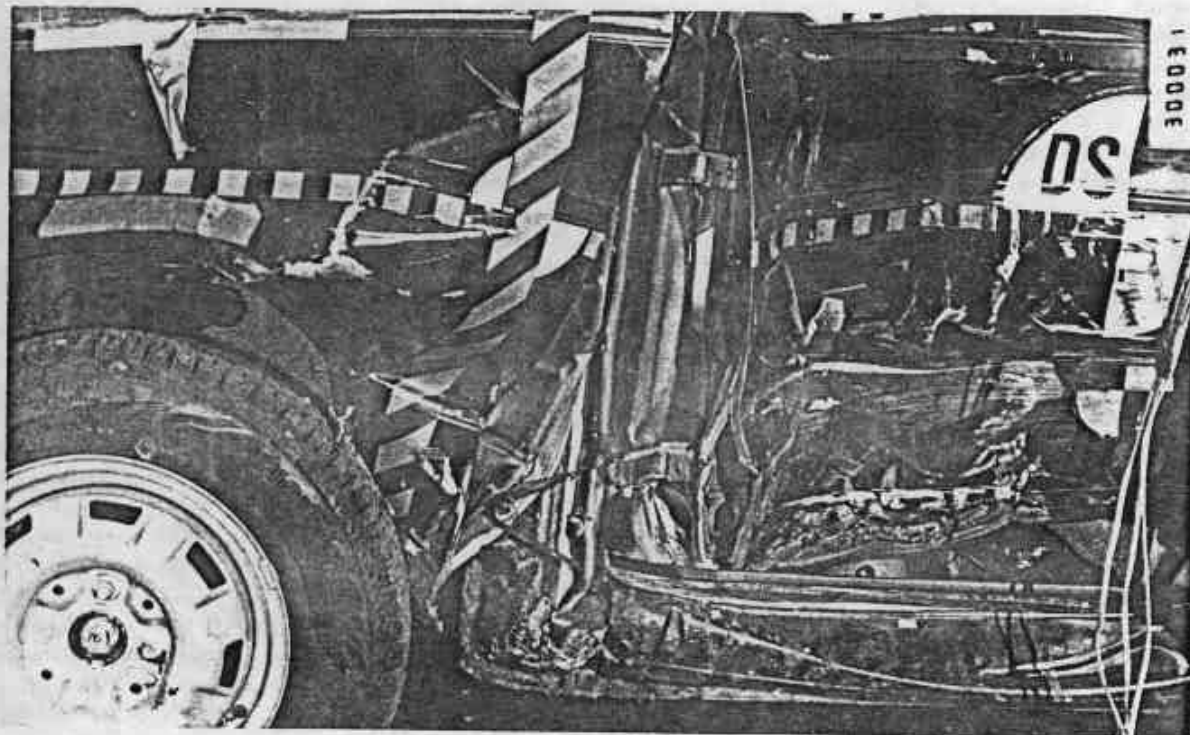


FIGURE A-8. POST-TEST LEFT SIDE OF VIEW OF PILLAR DEFORMATION OF VW RABBIT.

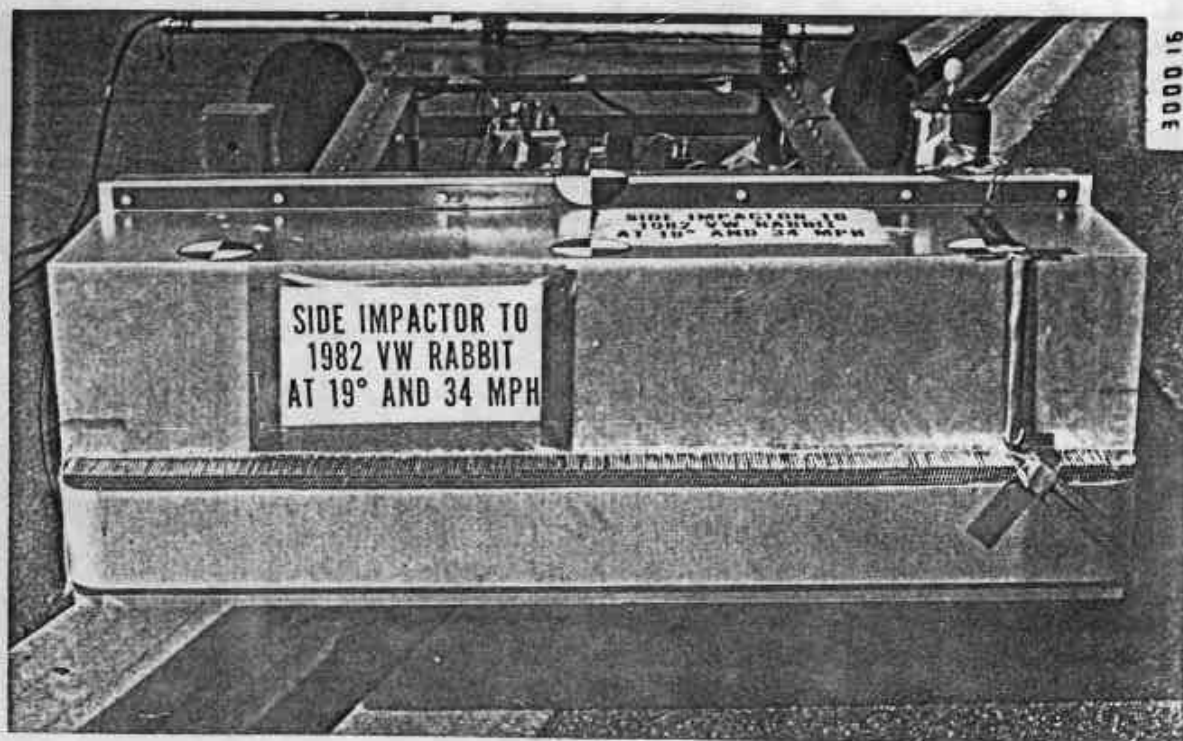


FIGURE A-9. PRE-TEST FRONTAL VIEW OF BARRIER FACE.

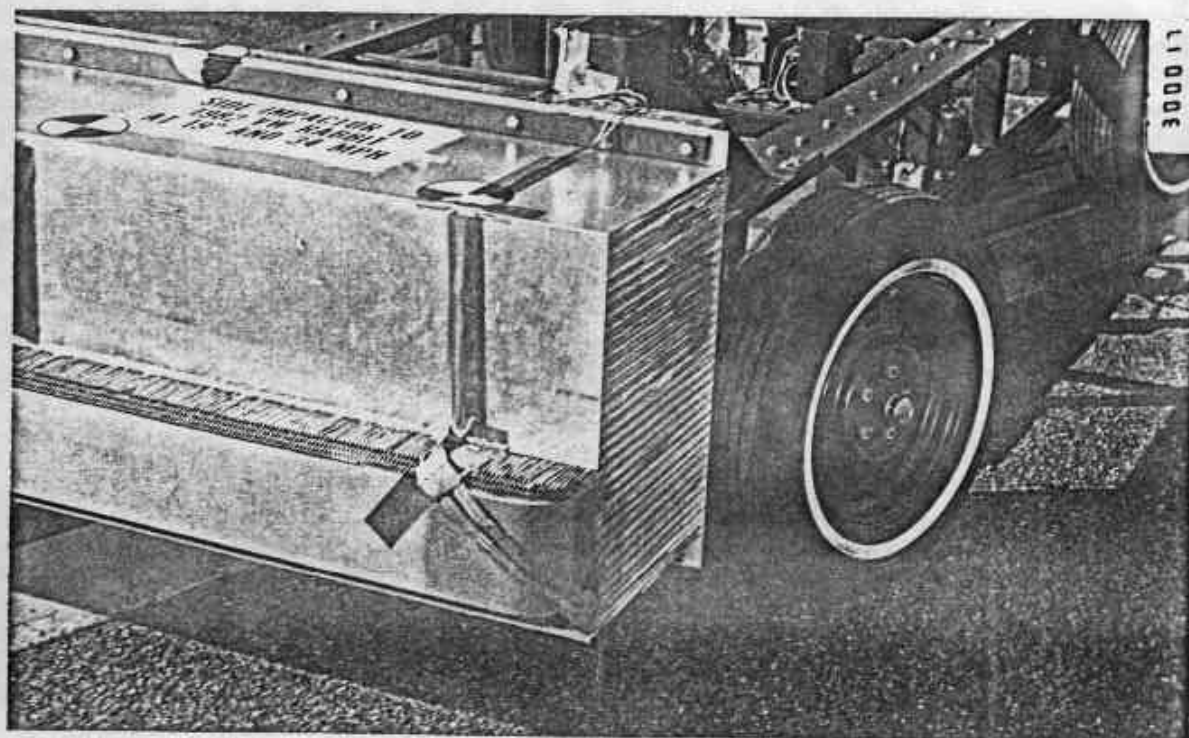


FIGURE A-10. PRE-TEST SIDE VIEW OF BARRIER FACE.

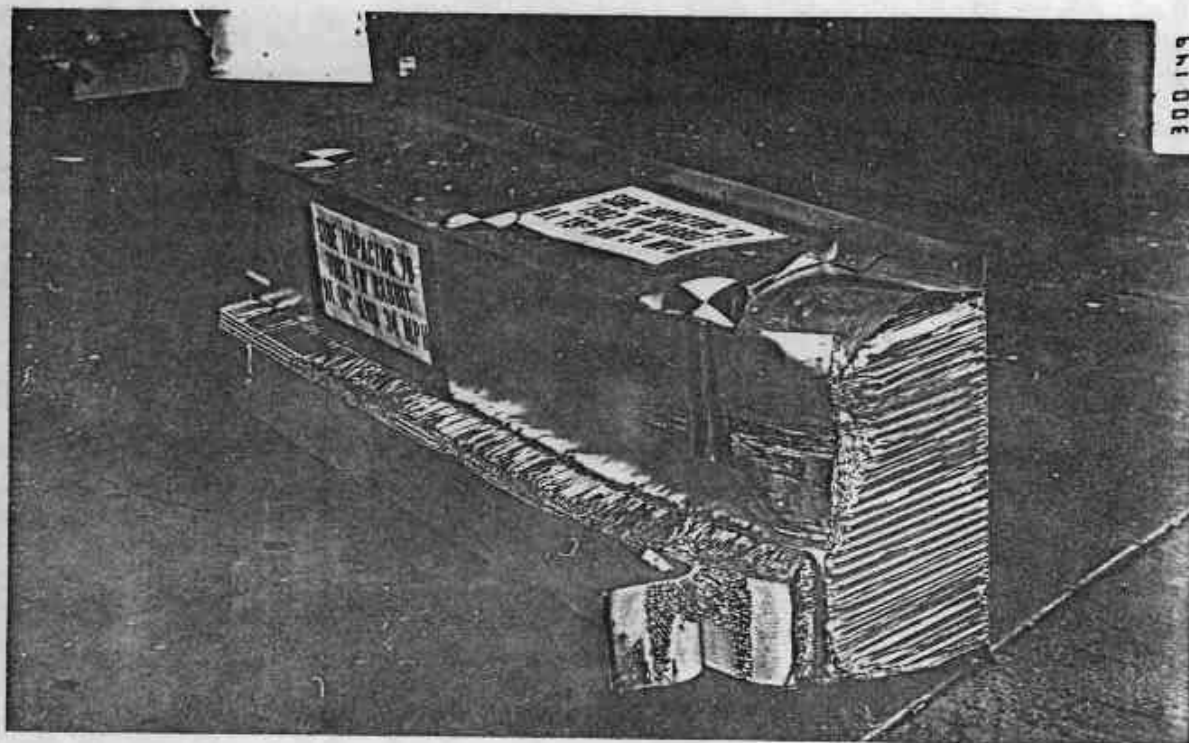


FIGURE A-11. POST-TEST LEFT SIDE VIEW OF BARRIER FACE.

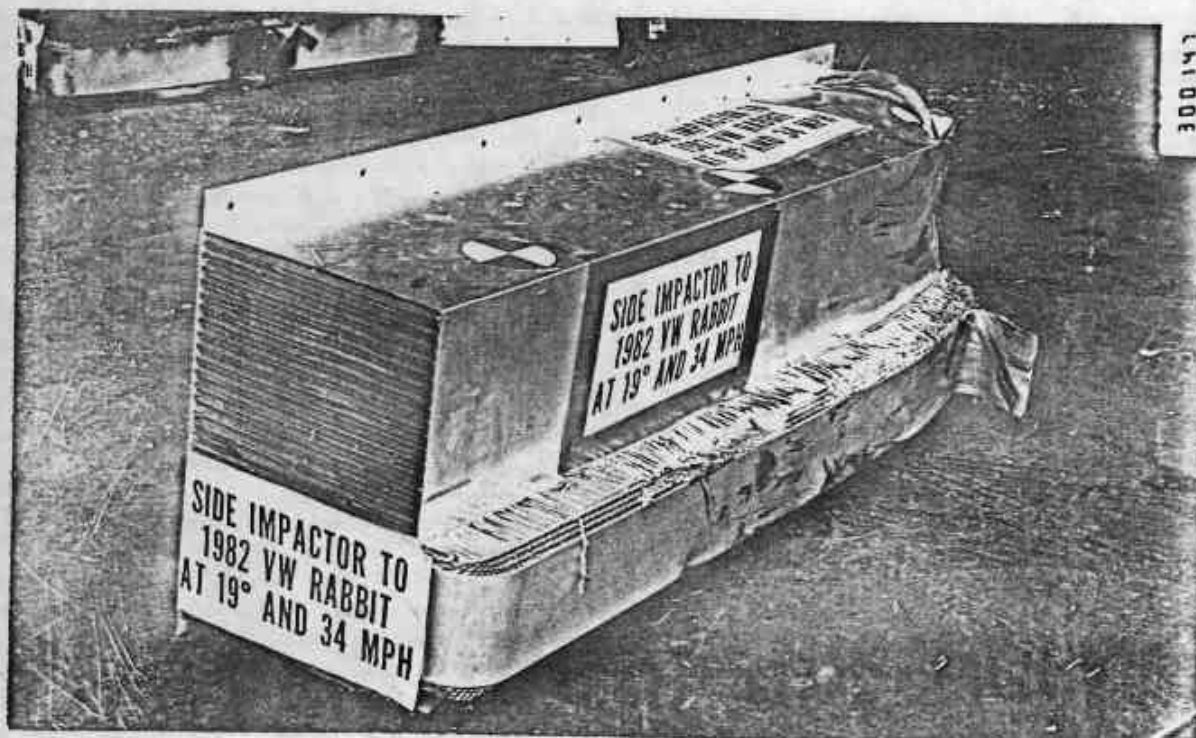


FIGURE A-12. POST-TEST RIGHT SIDE VIEW OF BARRIER FACE.

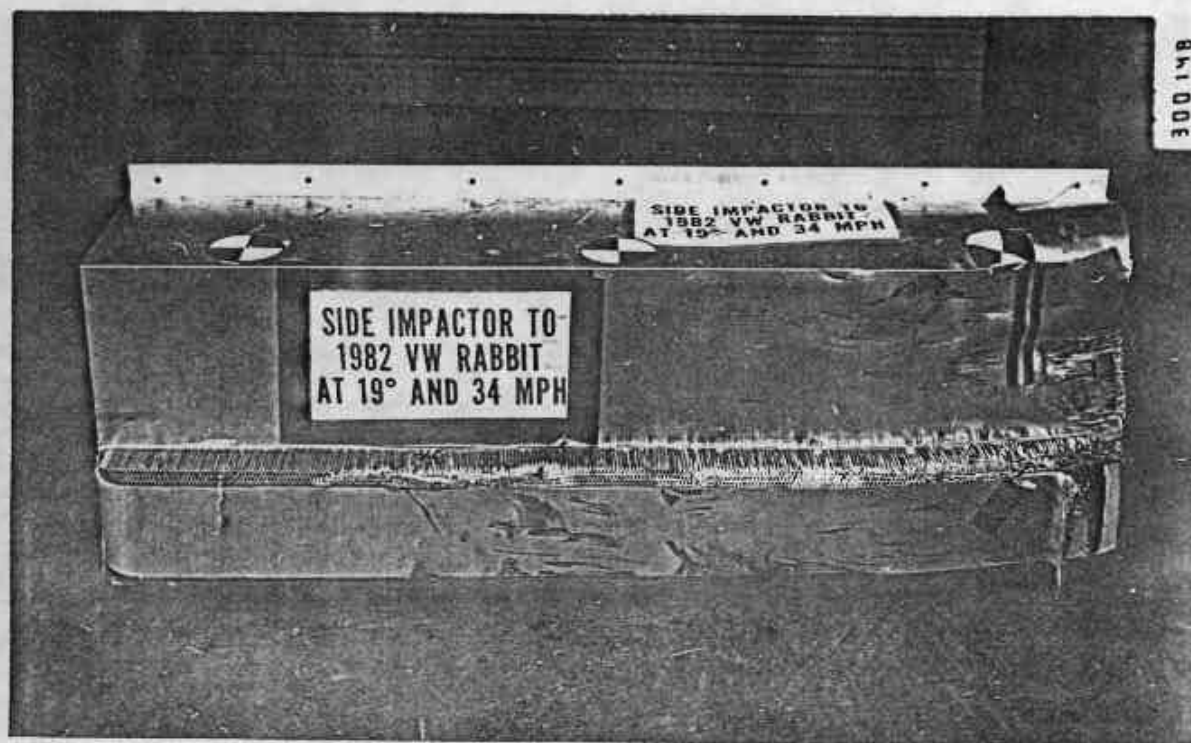


FIGURE A-13. POST-TEST FRONT VIEW OF BARRIER FACE.

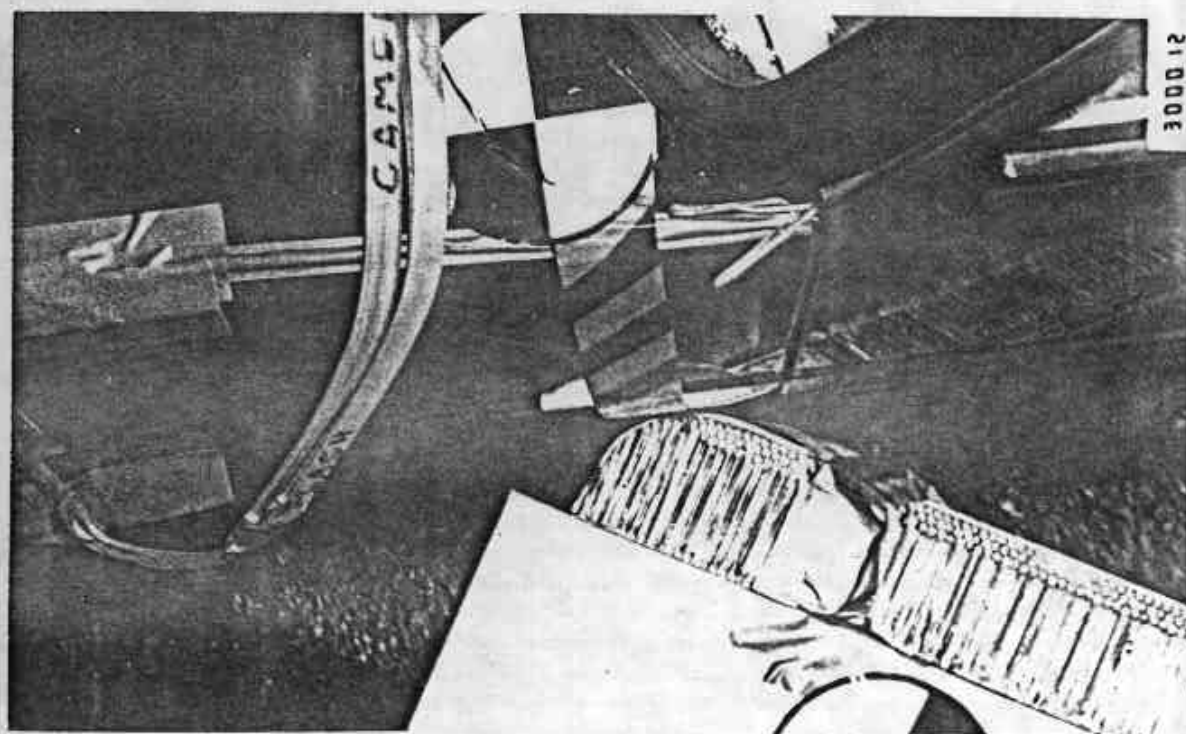


FIGURE A-14a. PRE-TEST SIDE IMPACTOR/VW RABBIT MATCHUP.

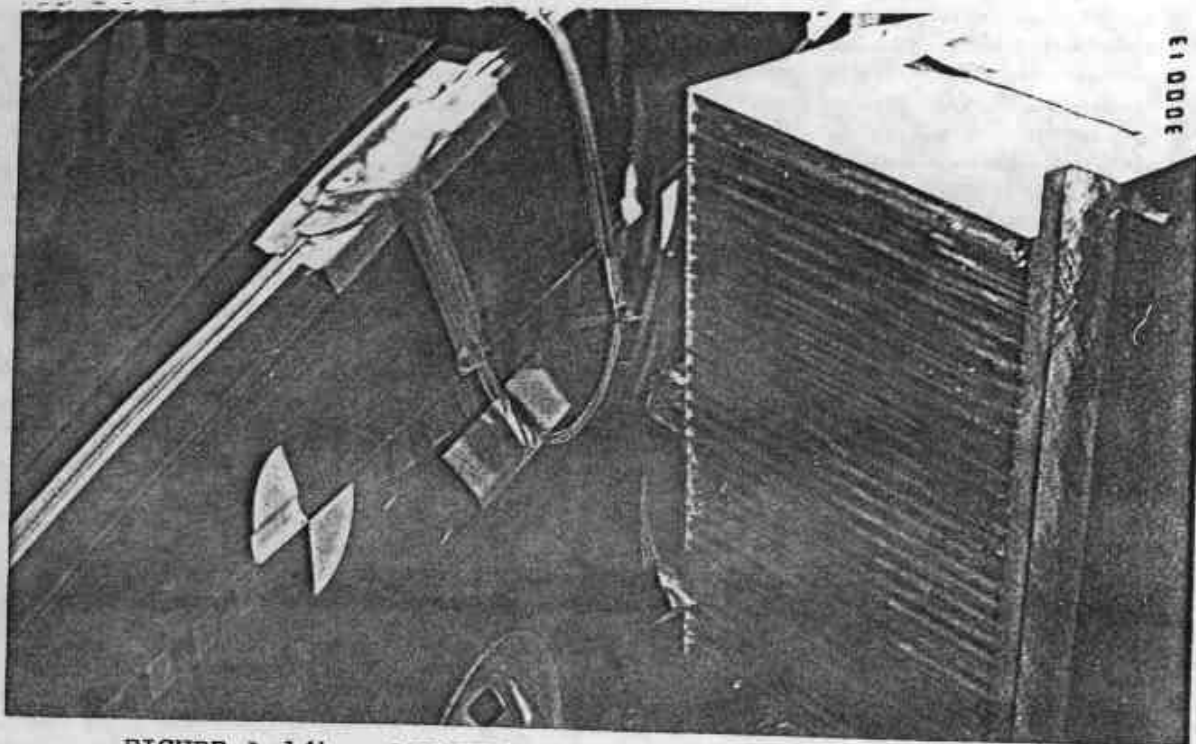


FIGURE A-14b. PRE-TEST IMPACTOR/VW RABBIT MATCHUP.

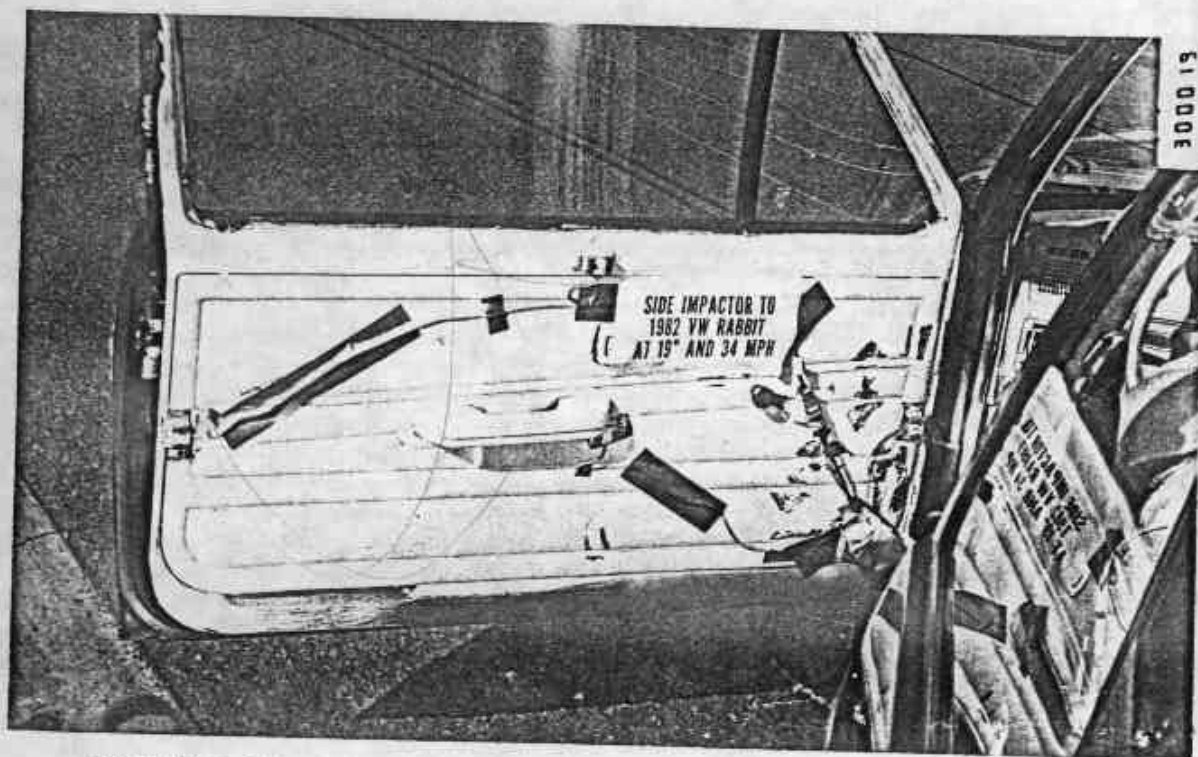


FIGURE A-15. PRE-TEST VW DOOR ACCELEROMETER LOCATIONS.

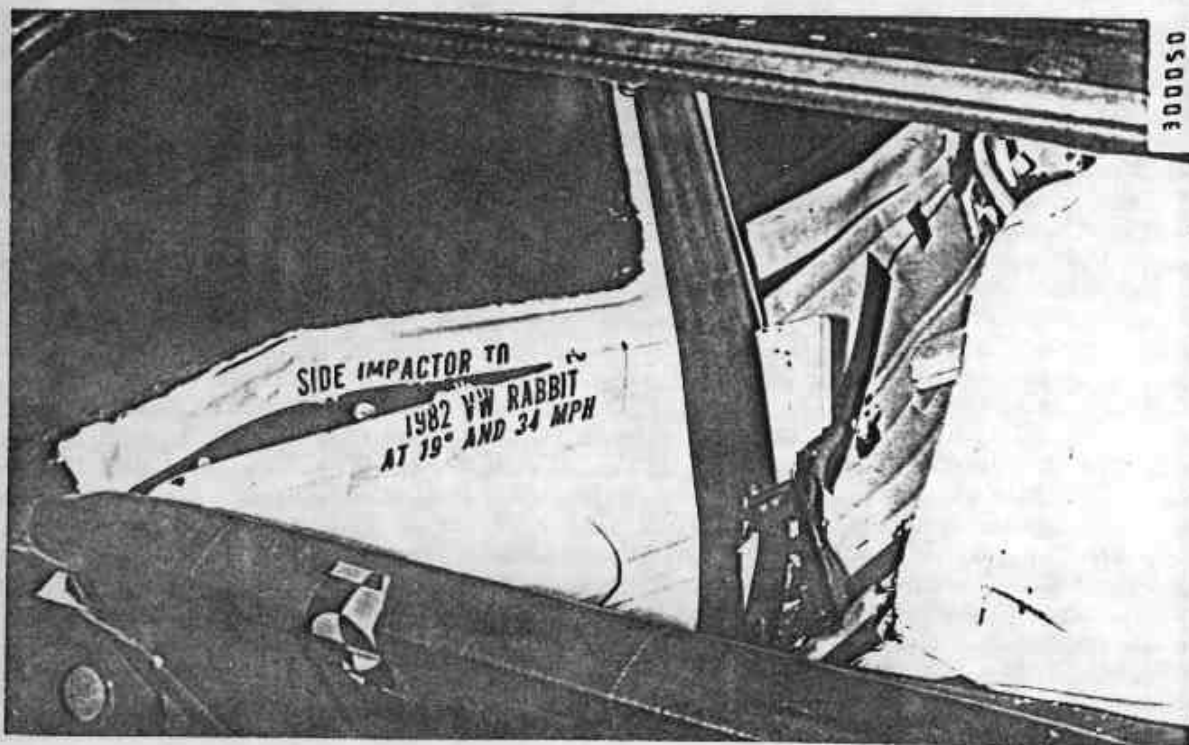


FIGURE A-16a. VW RABBIT POST-TEST INTERIOR DEFORMATION.

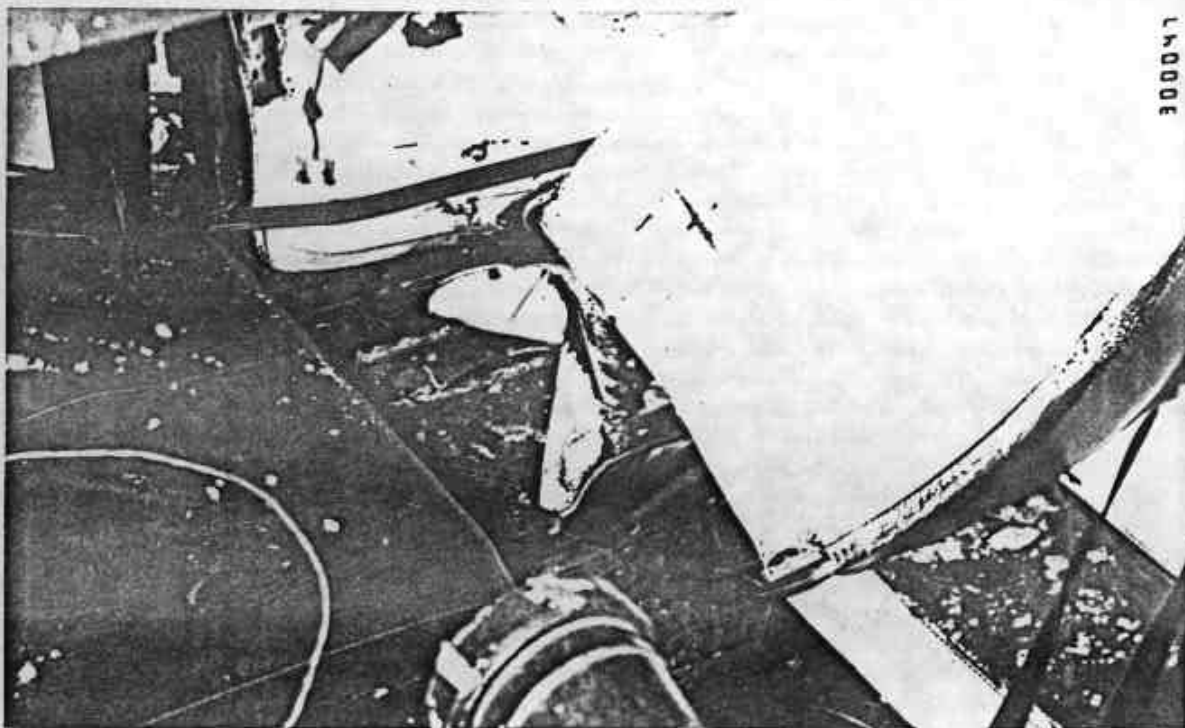


FIGURE A-16b. VW RABBIT POST-TEST INTERIOR DEFORMATION.



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

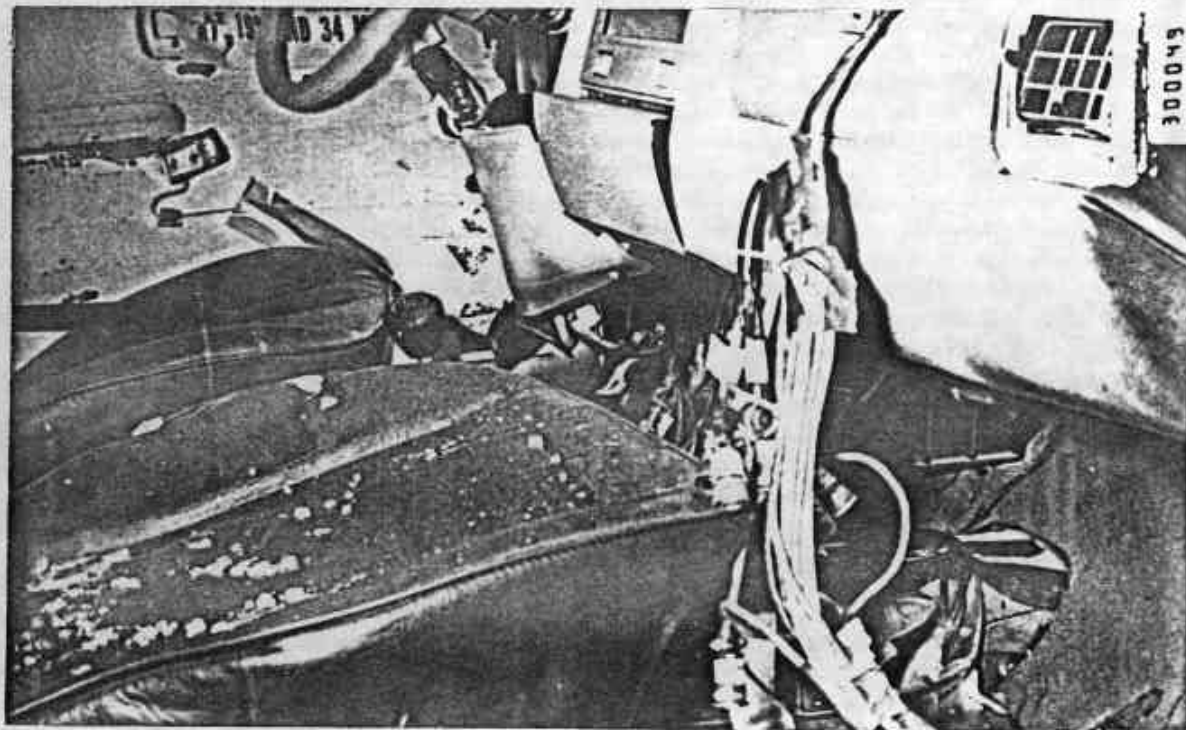


FIGURE A-16d. VW RABBIT POST-TEST INTERIOR DEFORMATION.



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



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



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

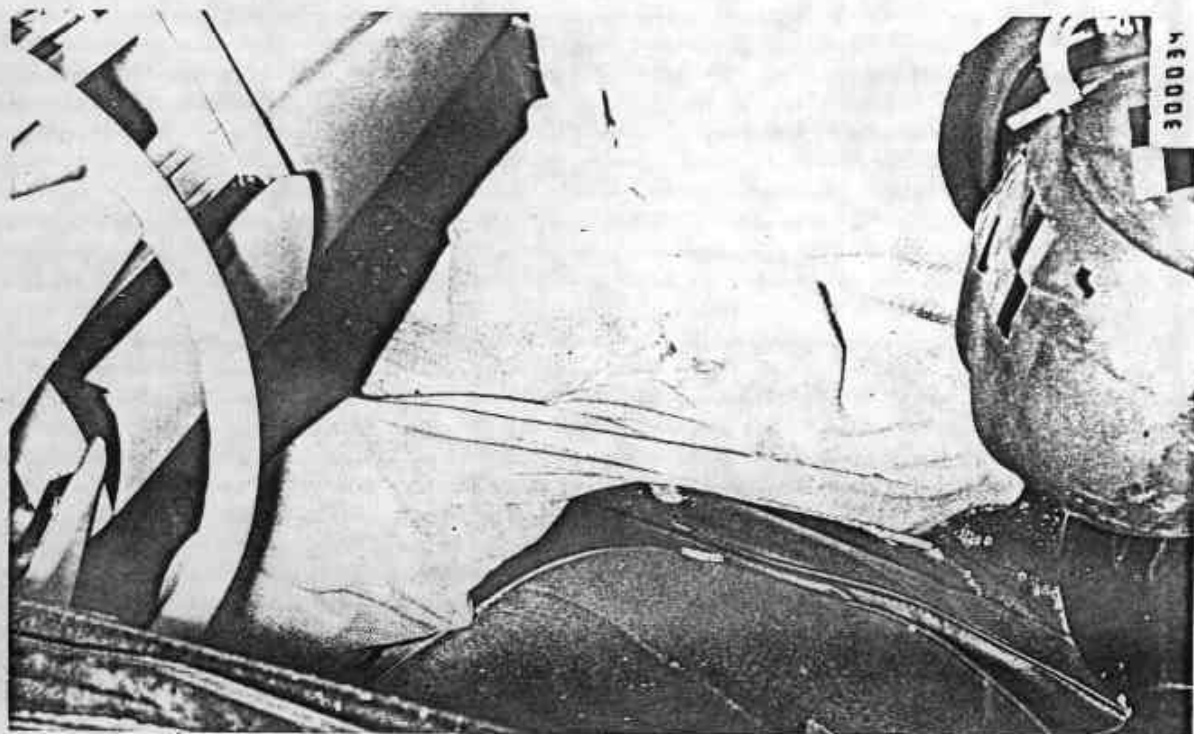


FIGURE A-18a. POST-TEST DRIVER DUMMY POSITION.

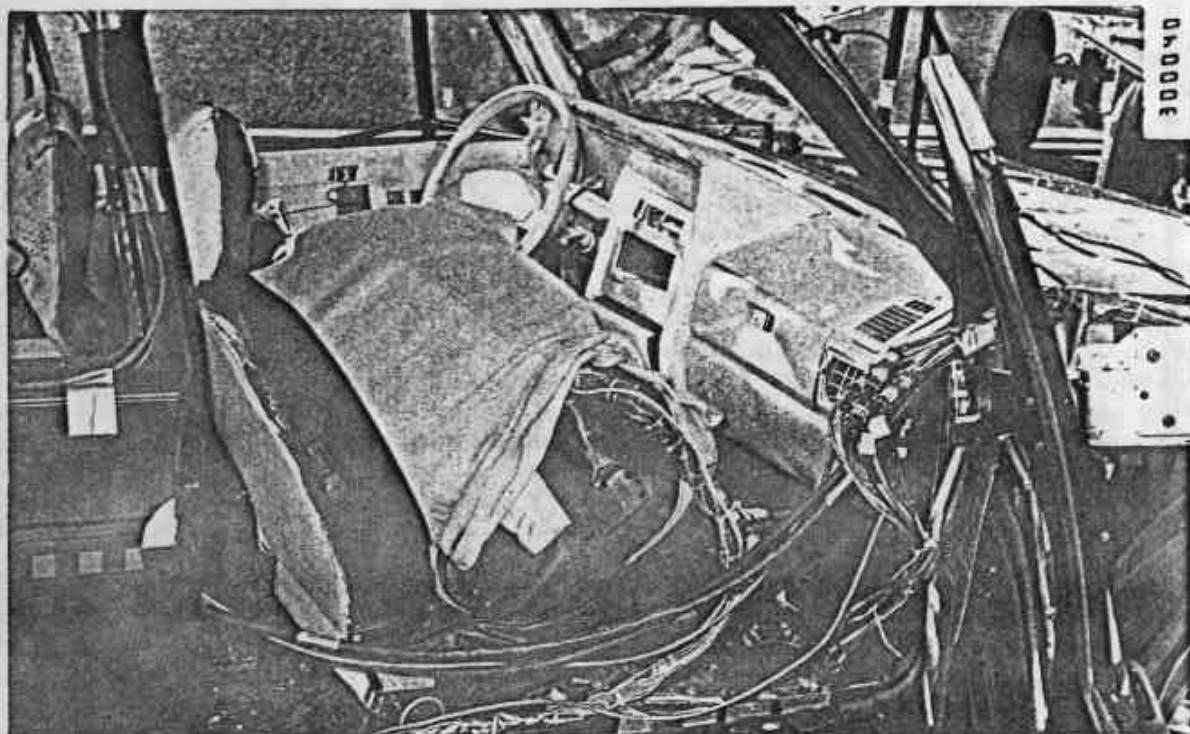


FIGURE A-18b. POST-TEST DRIVER DUMMY POSITION.



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

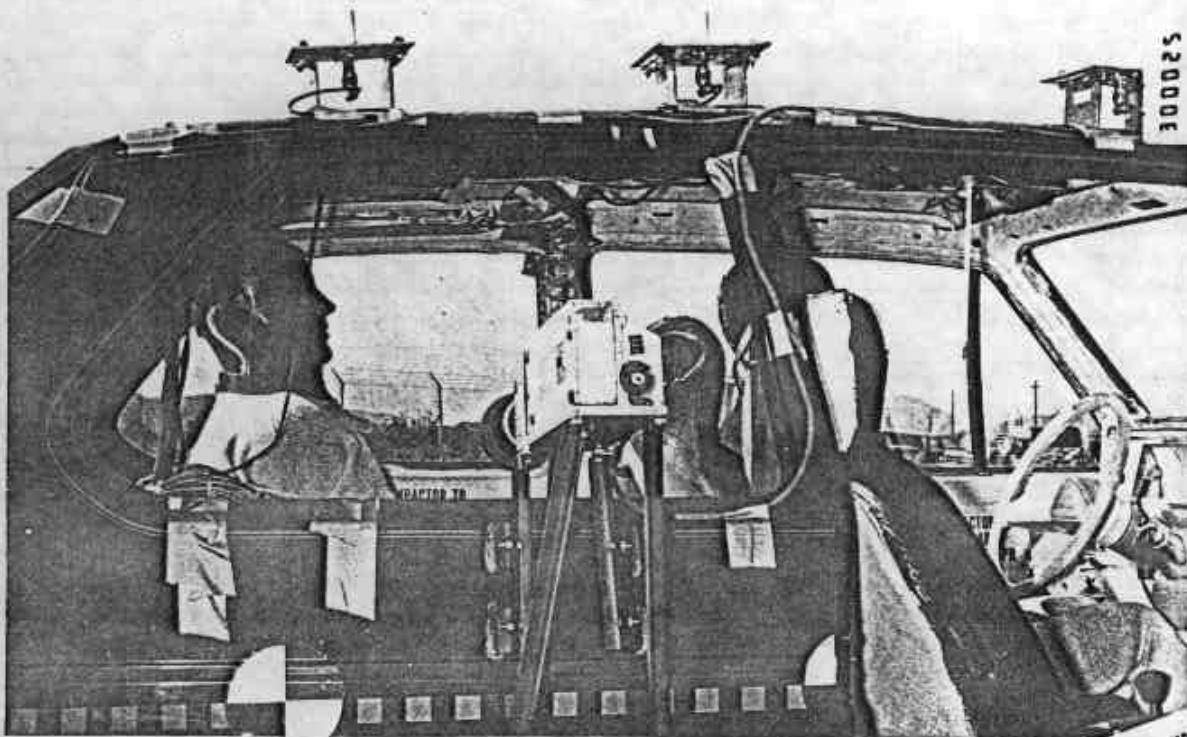


FIGURE A-19a. PRE-TEST LEFT REAR PASSENGER DUMMY POSITION.

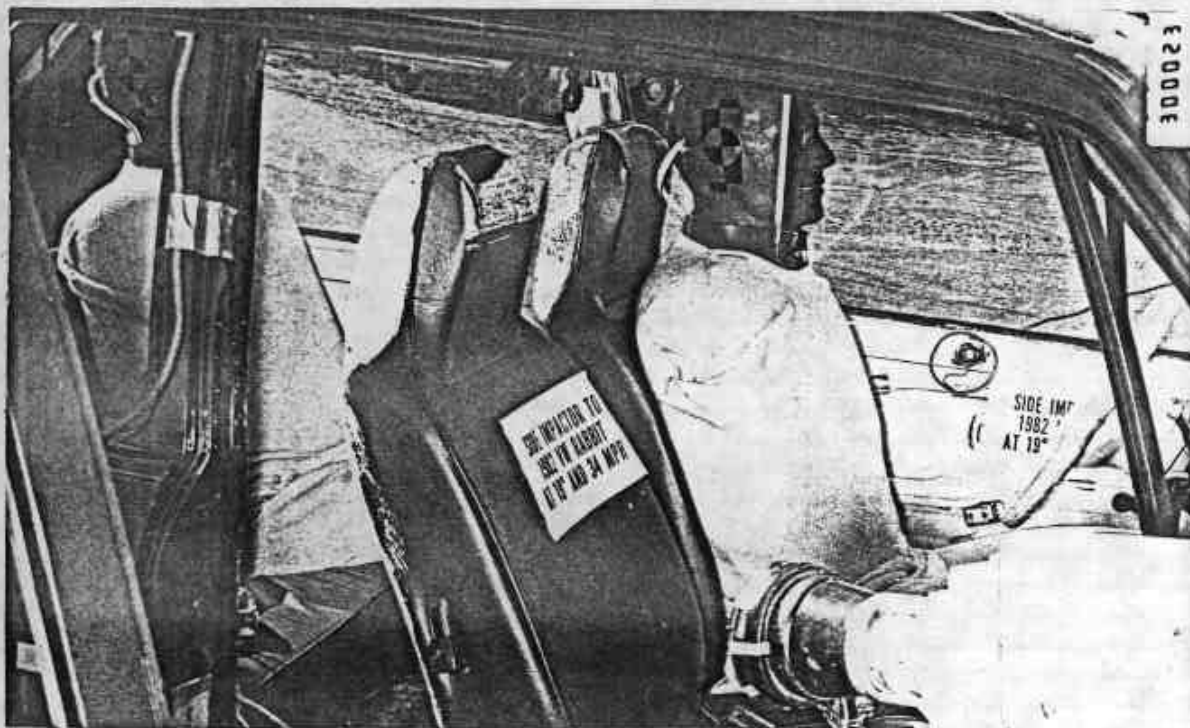


FIGURE A-19b. PRE-TEST LEFT REAR PASSENGER DUMMY POSITION.

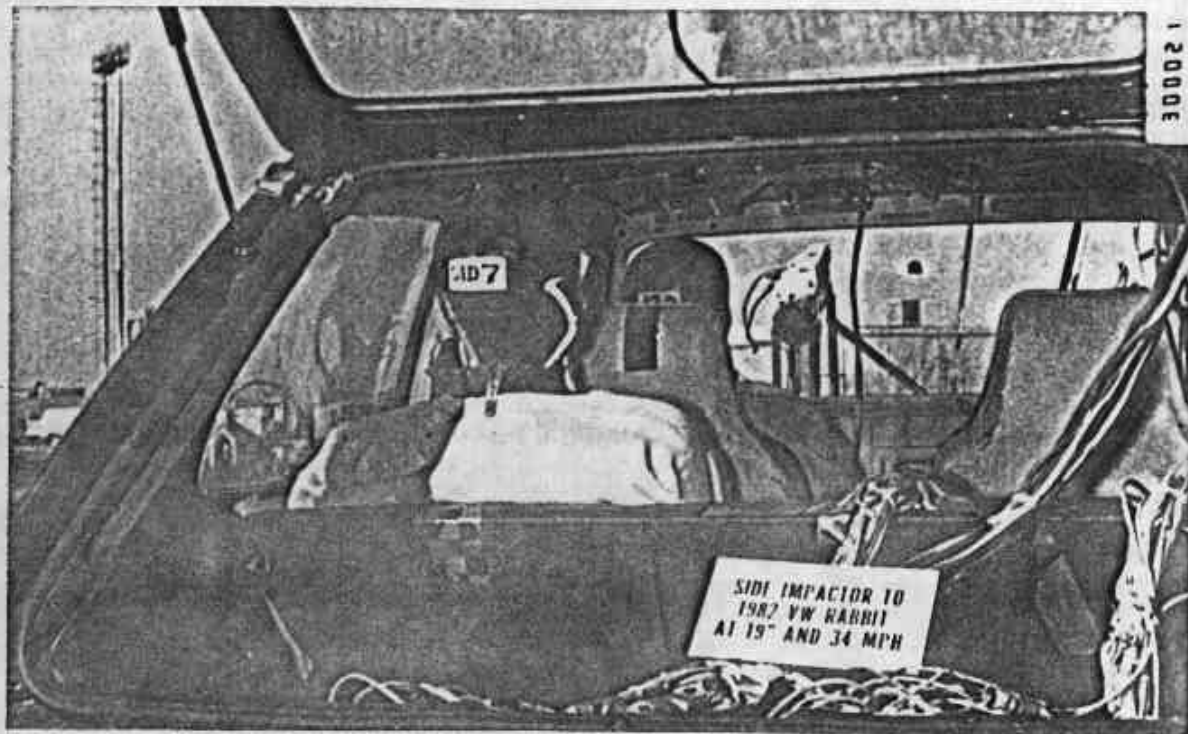


FIGURE A-19c. PRE-TEST LEFT REAR PASSENGER DUMMY POSITION.



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

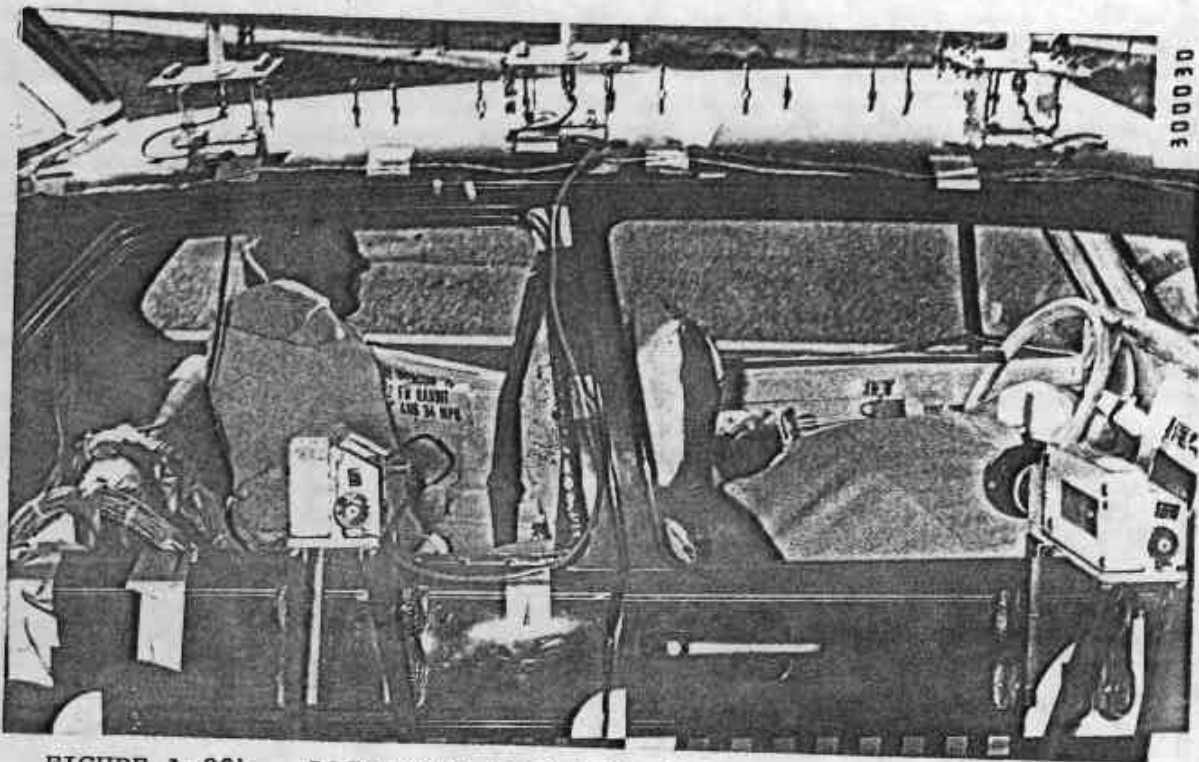


FIGURE A-20b. POST-TEST LEFT REAR PASSENGER DUMMY POSITION.

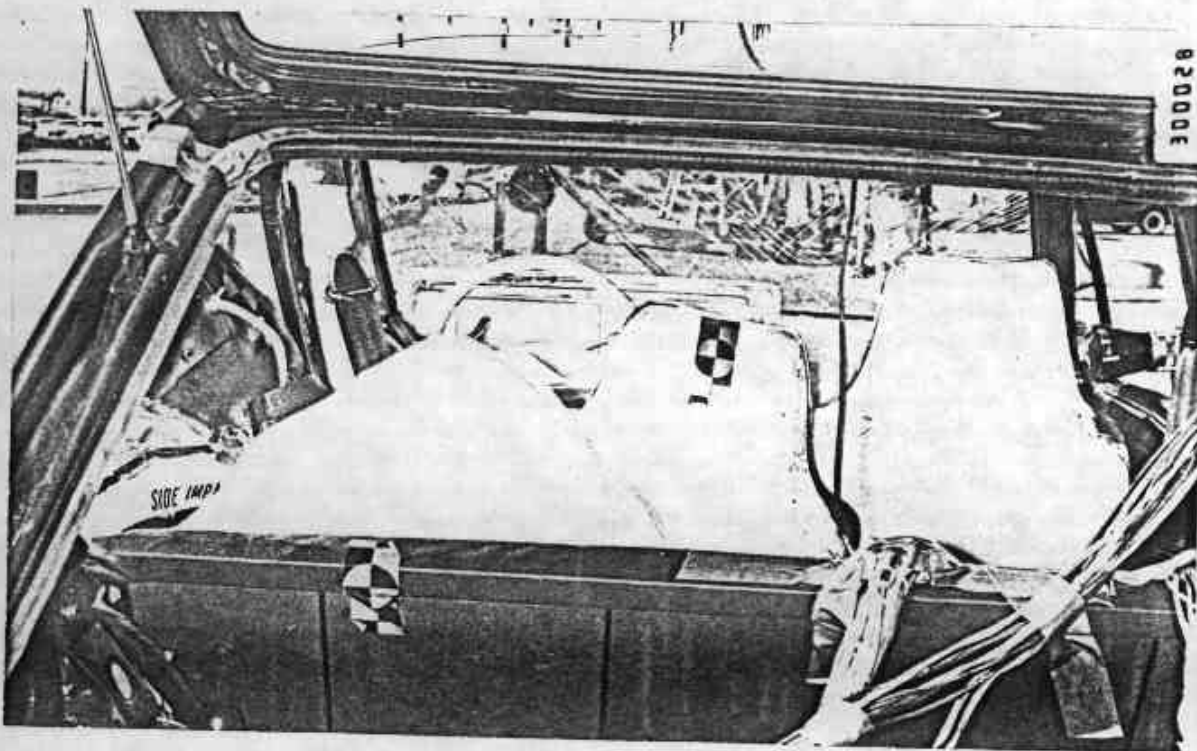
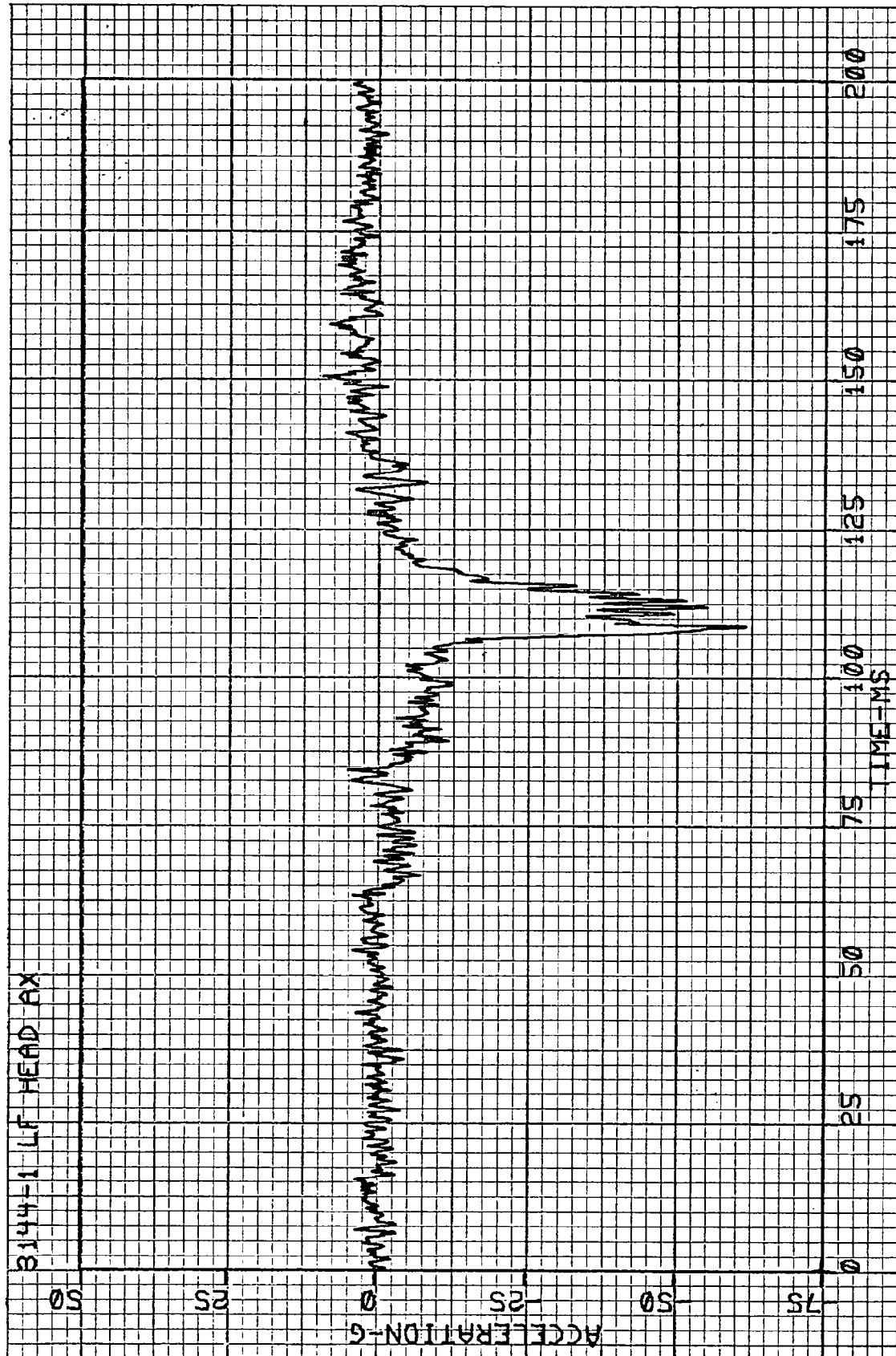
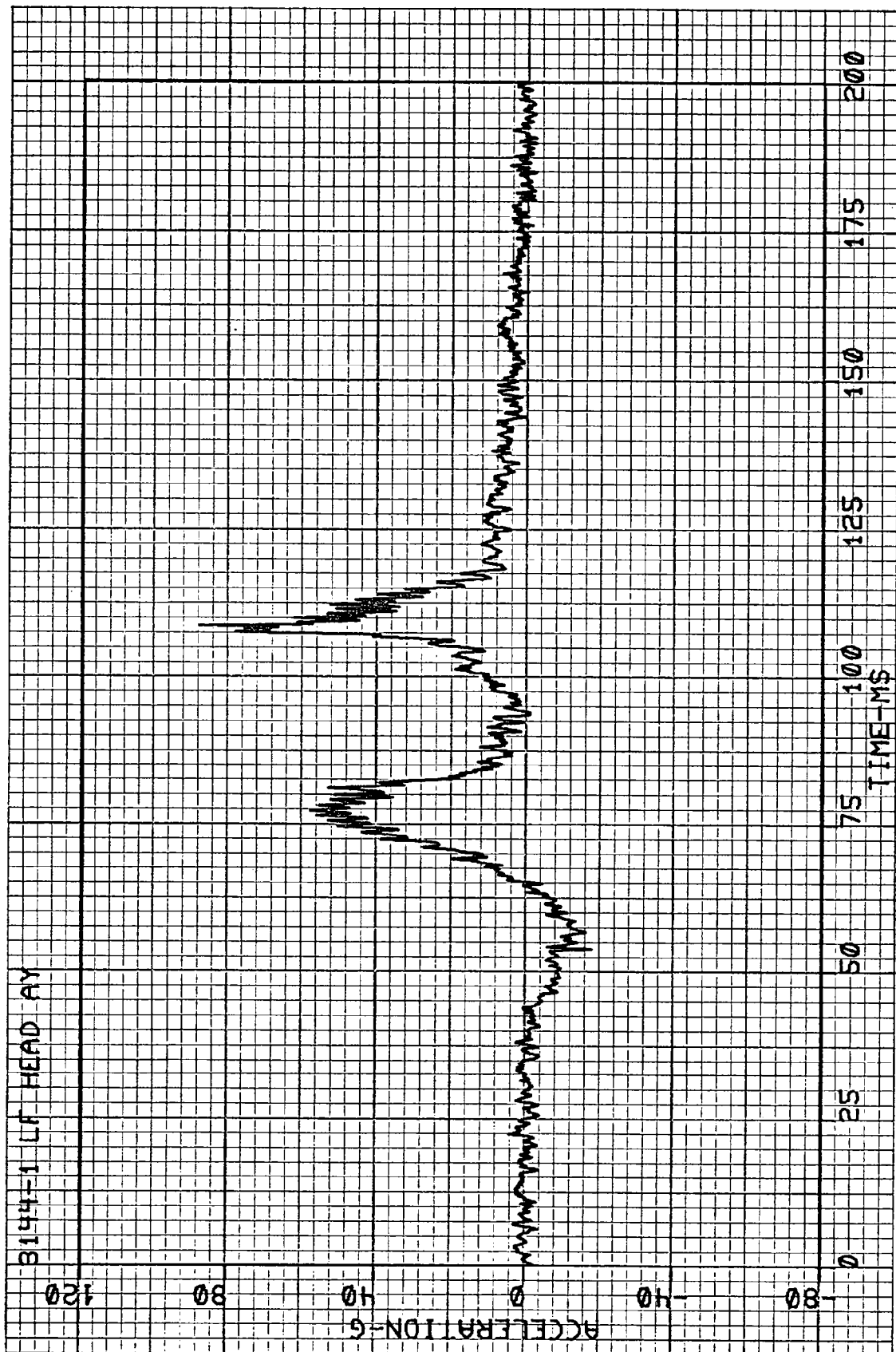
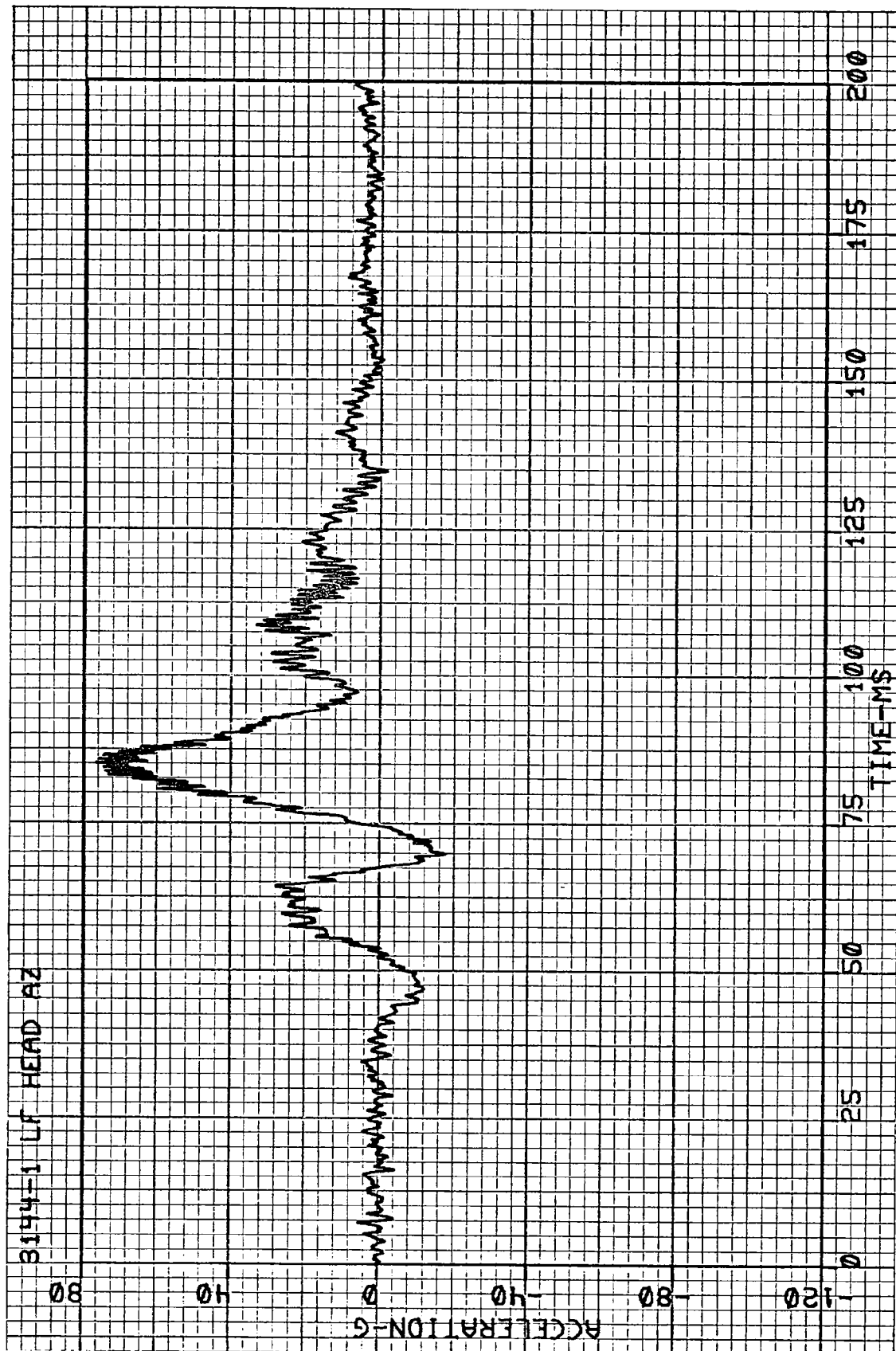


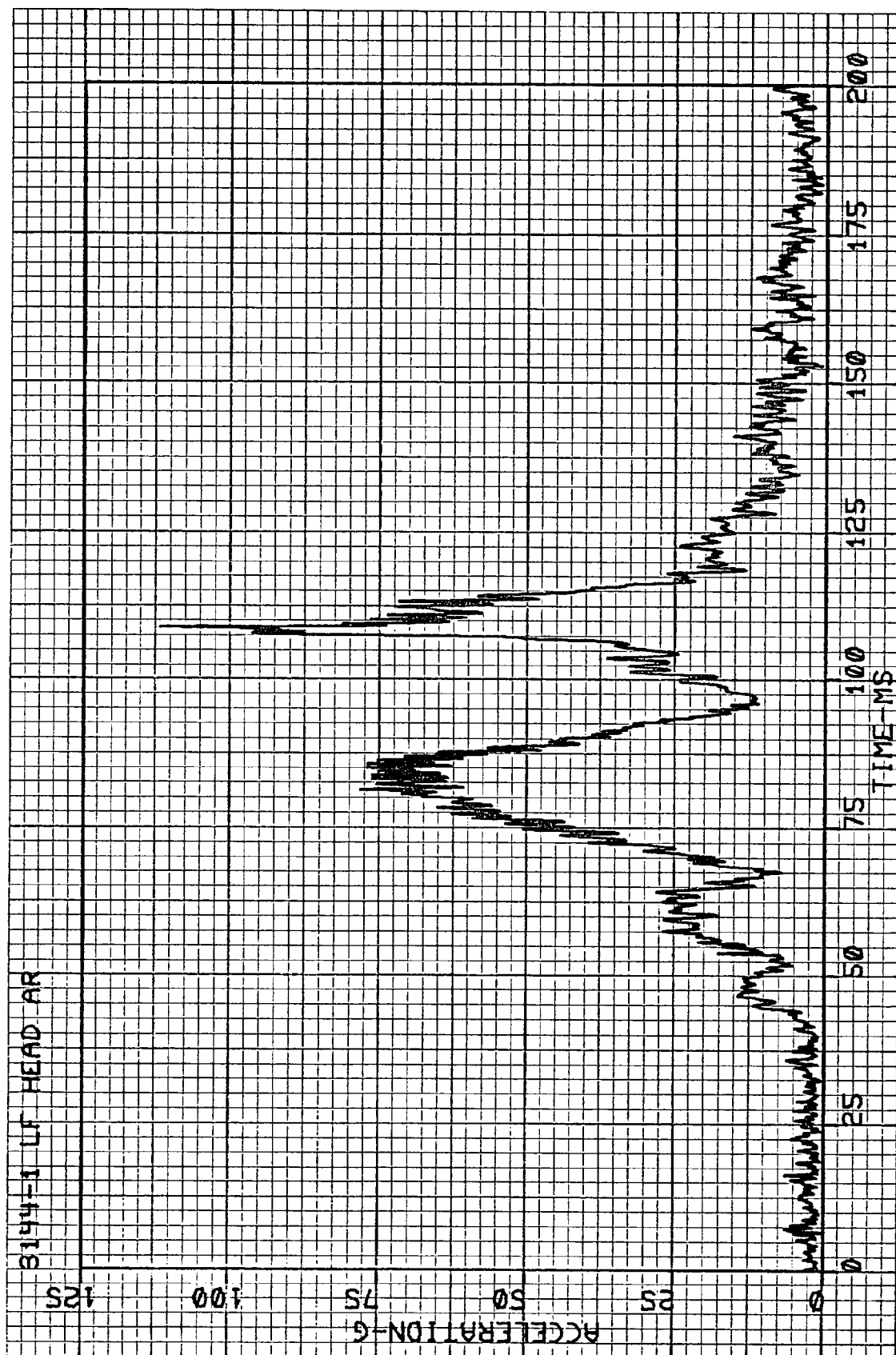
FIGURE A-20c. POST-TEST LEFT PASSENGER DUMMY POSITION.

APPENDIX B
CALCOMP PLOTS FOR
19° CRABBED SIDE IMPACTOR
TO 1982 VOLKSWAGEN RABBIT
AT 34.23 MPH

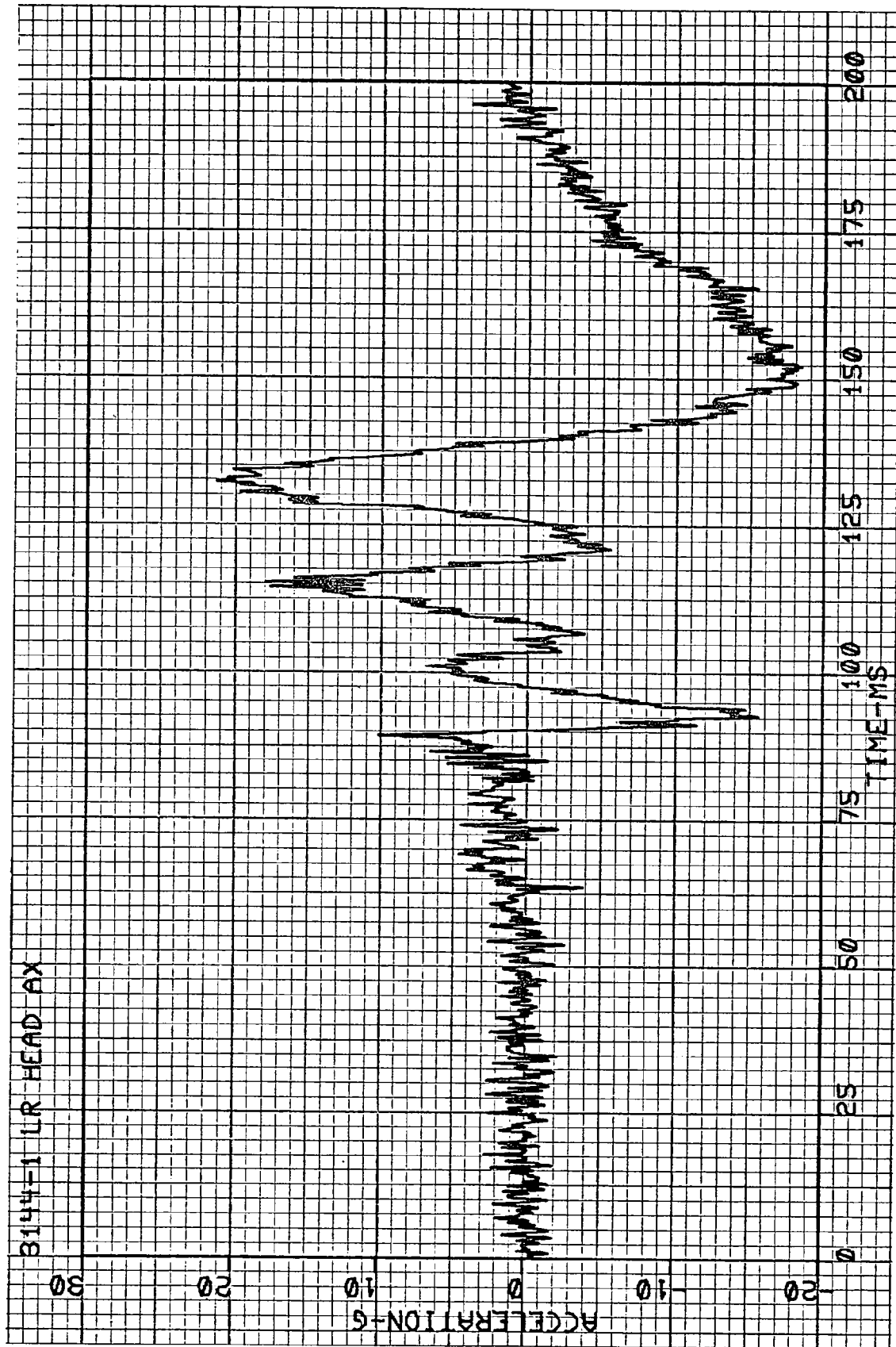


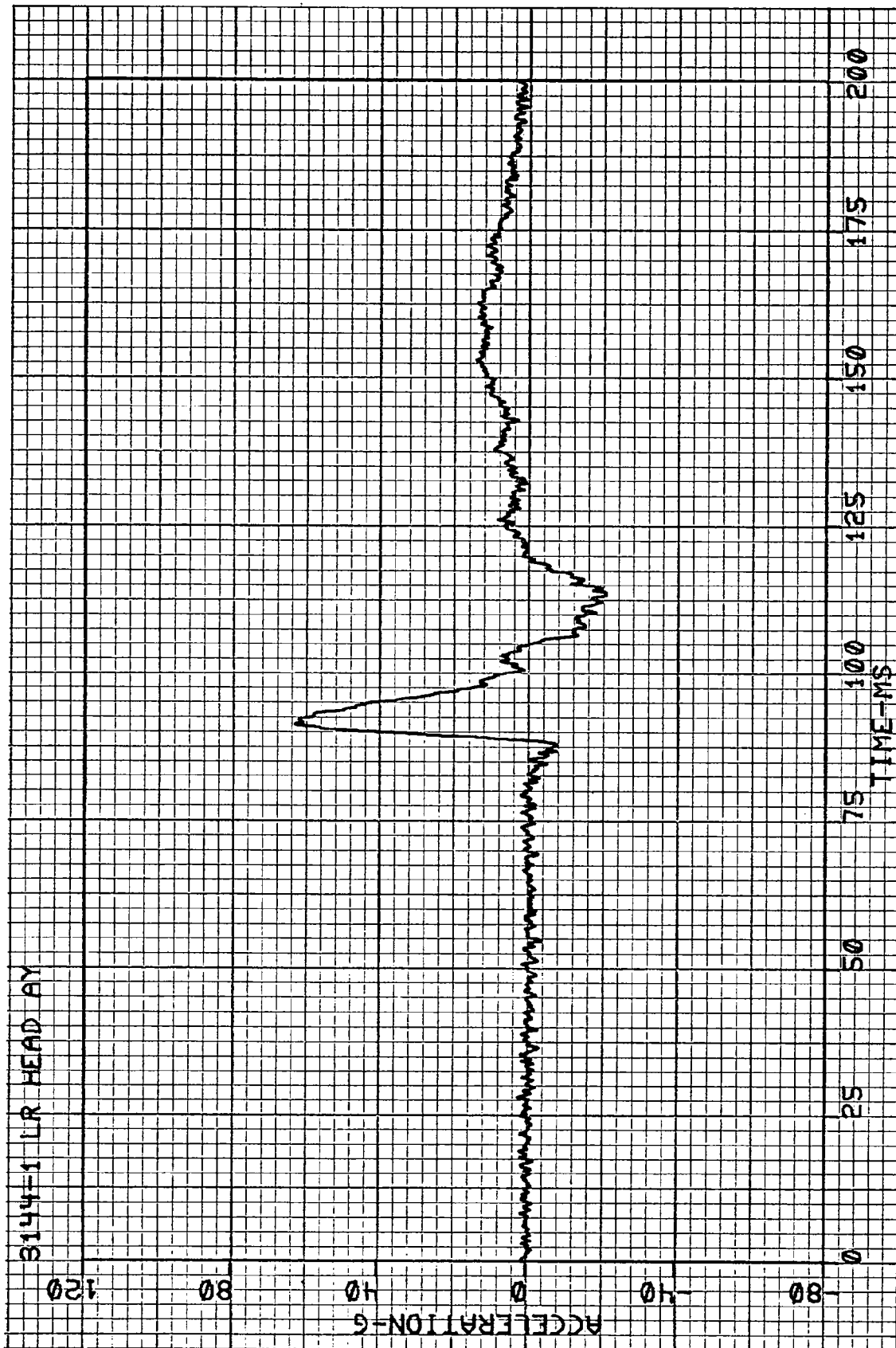


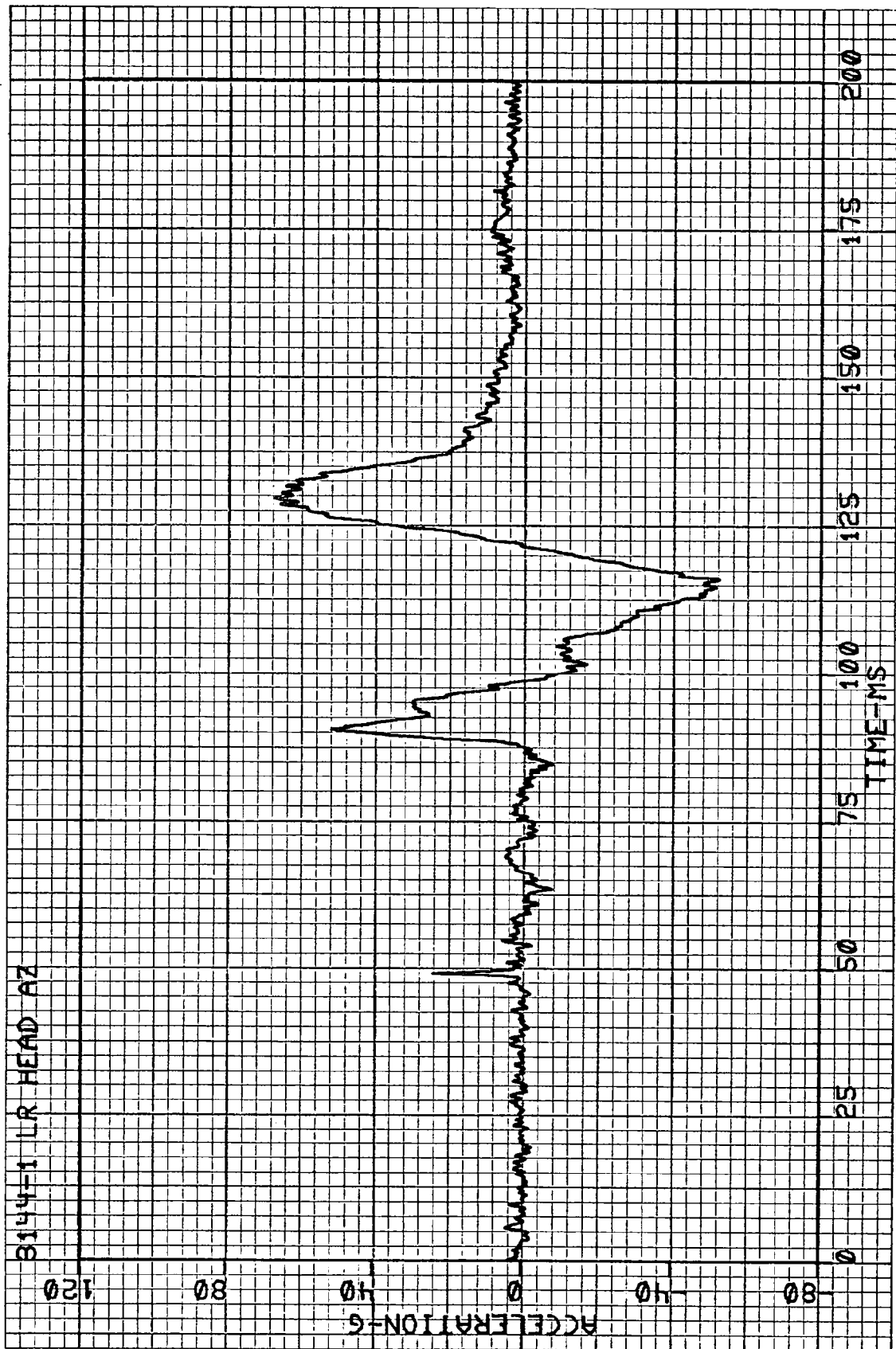


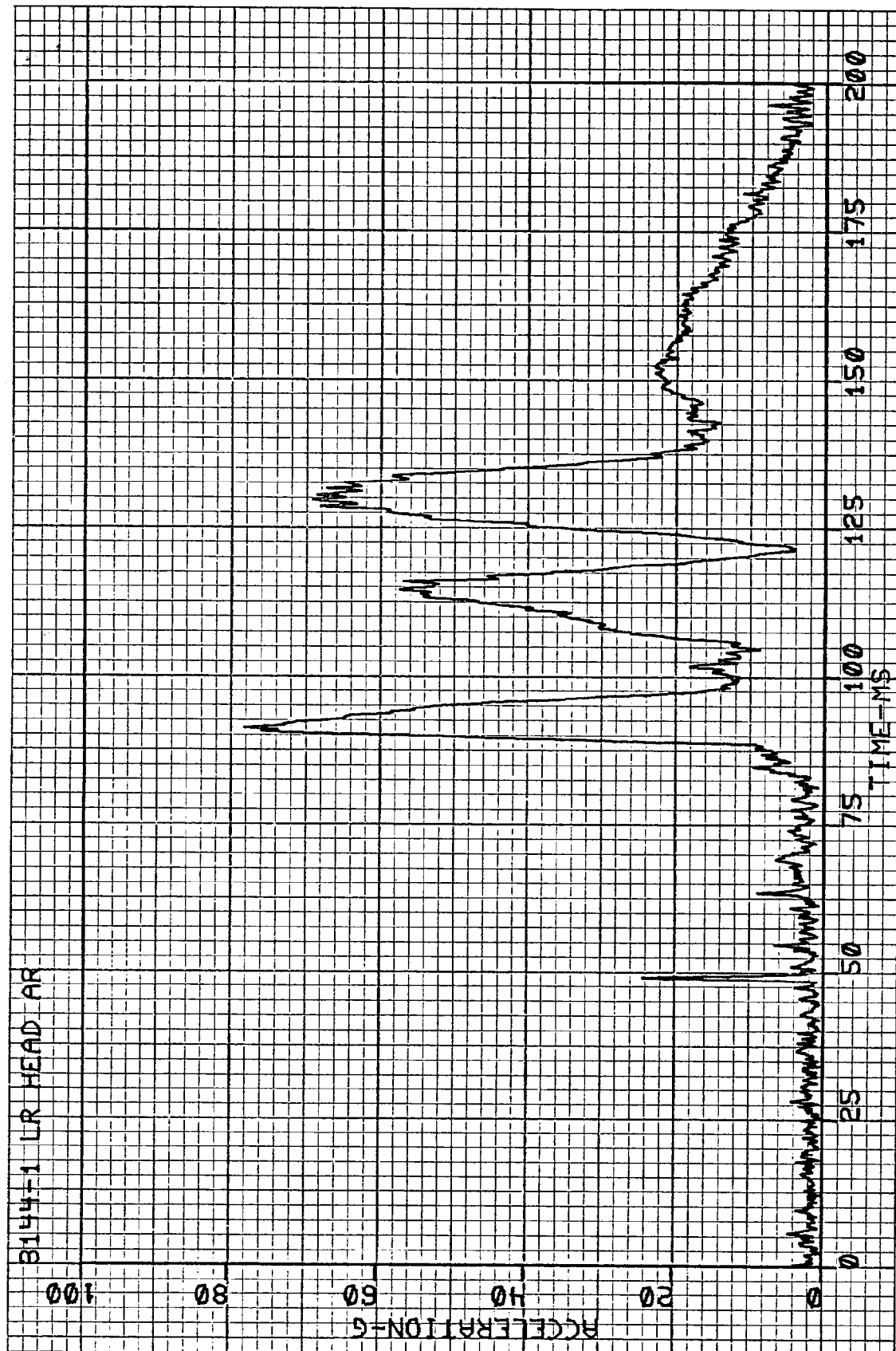


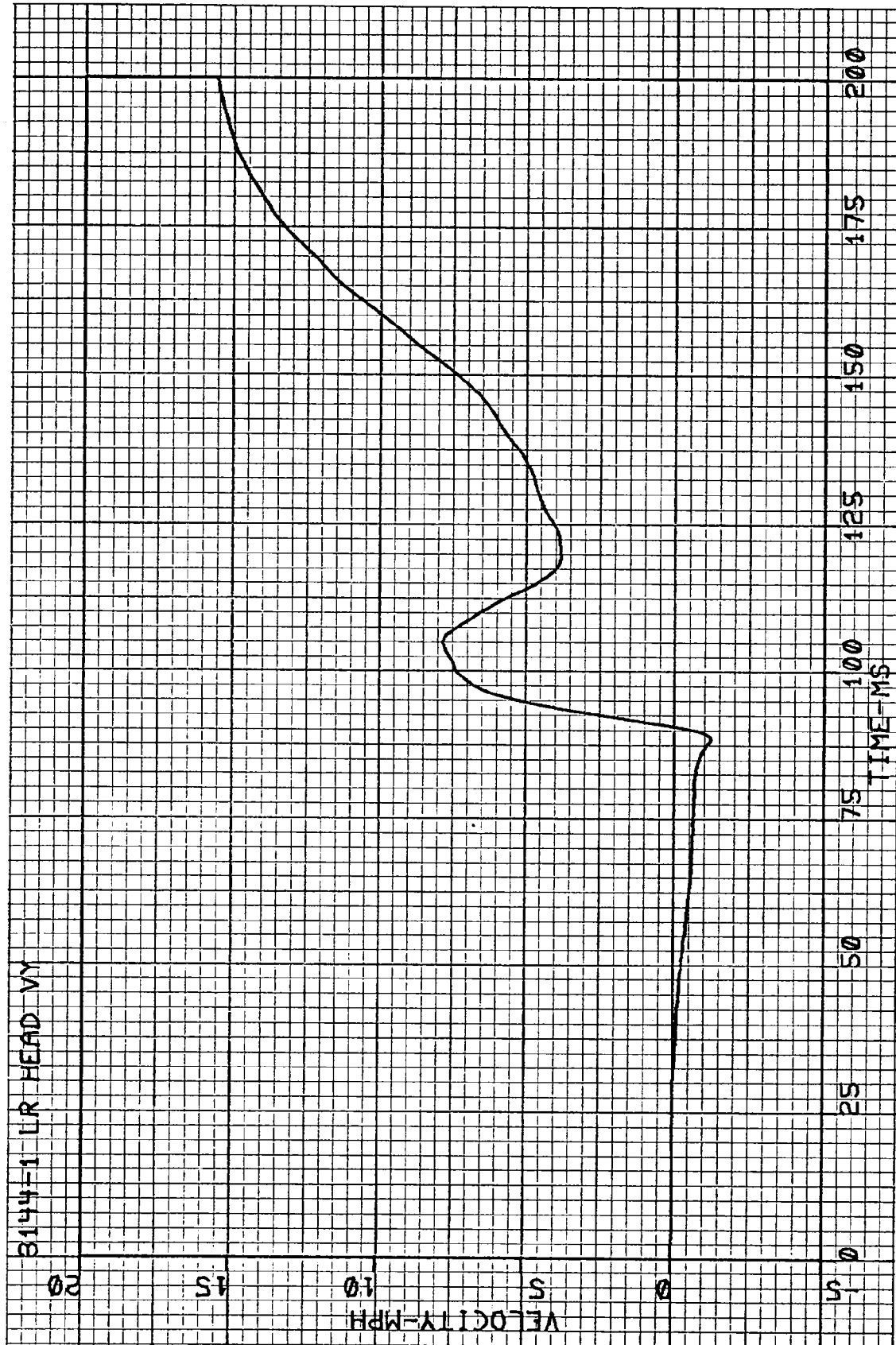


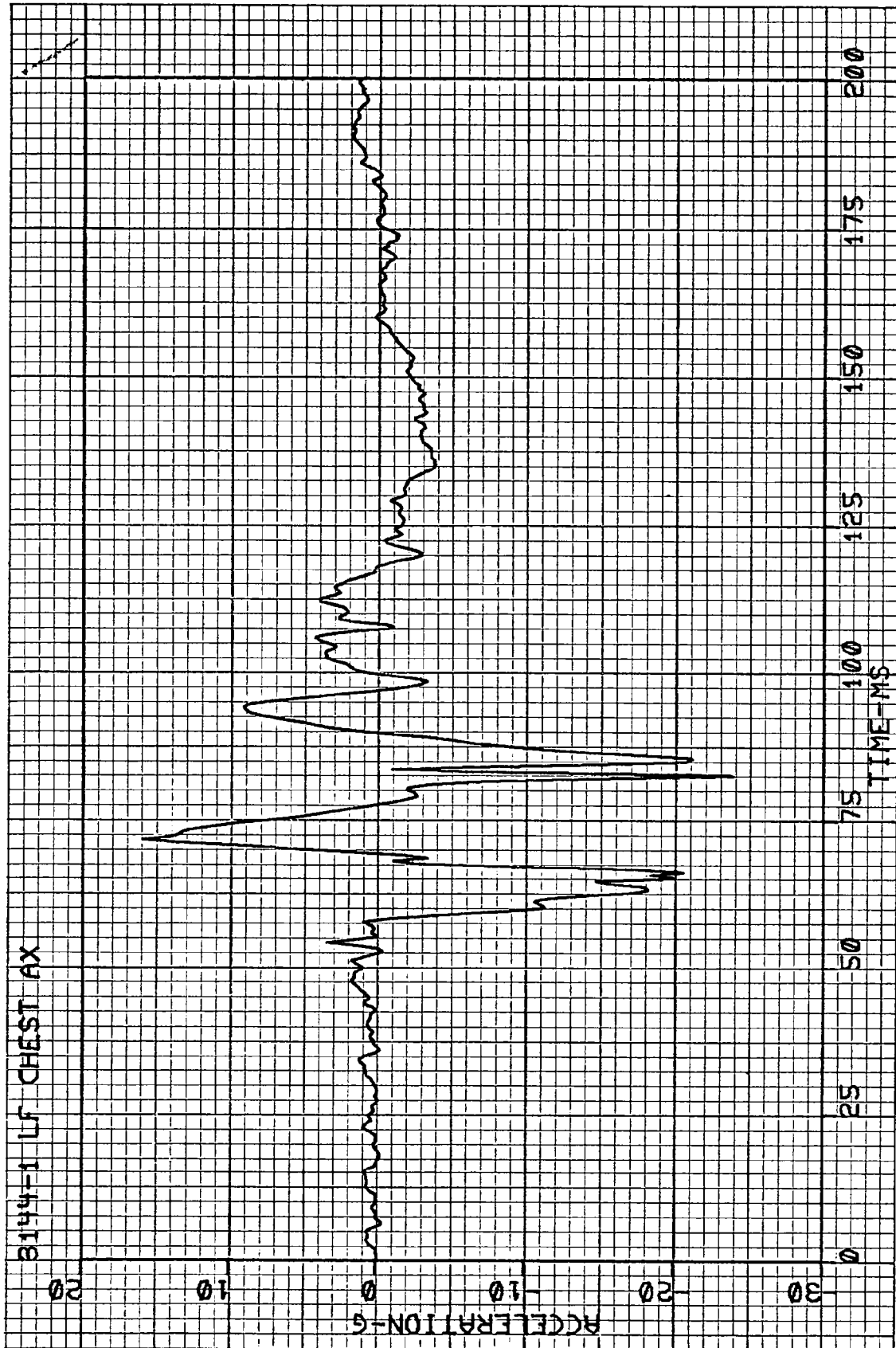


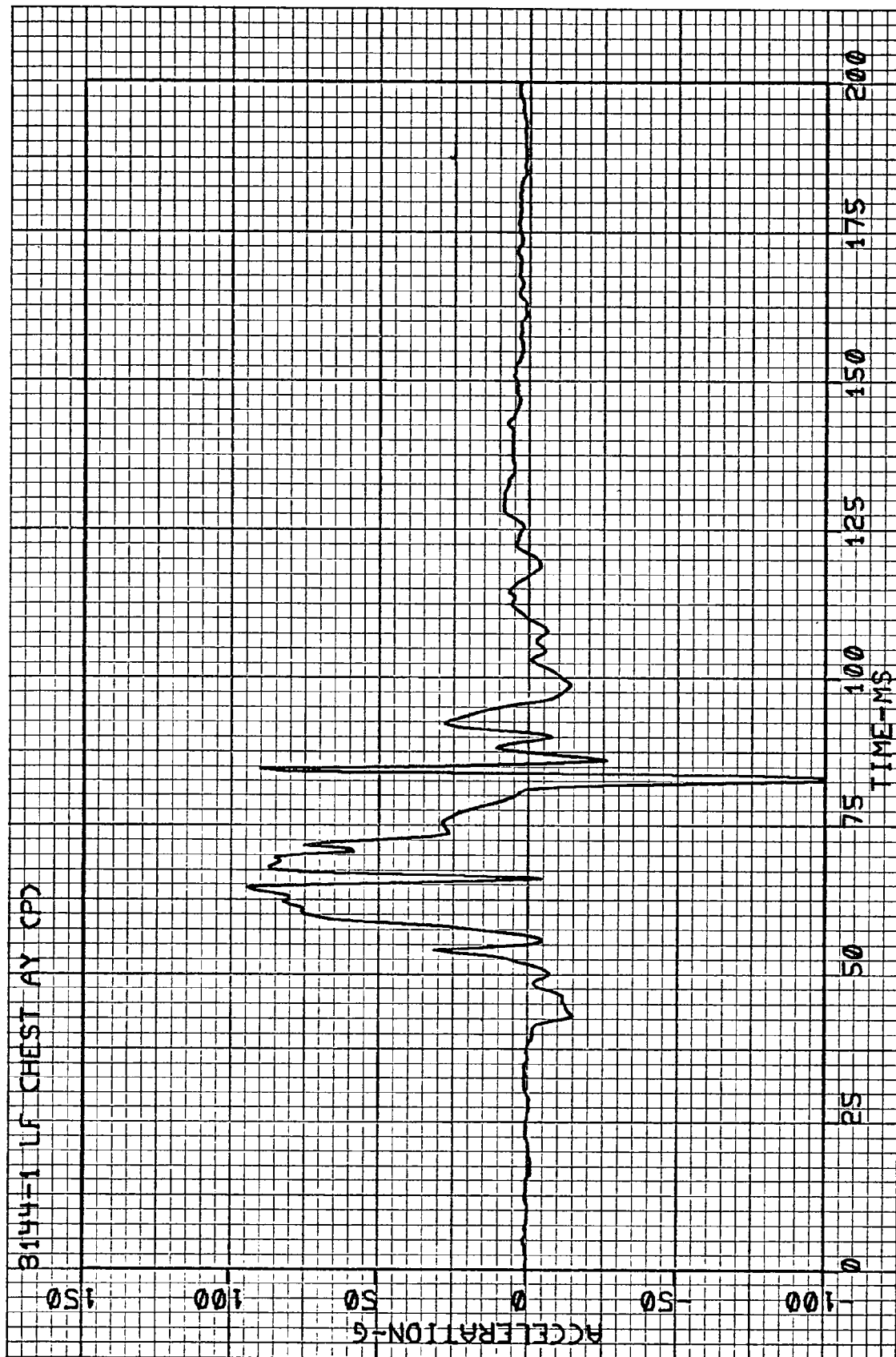




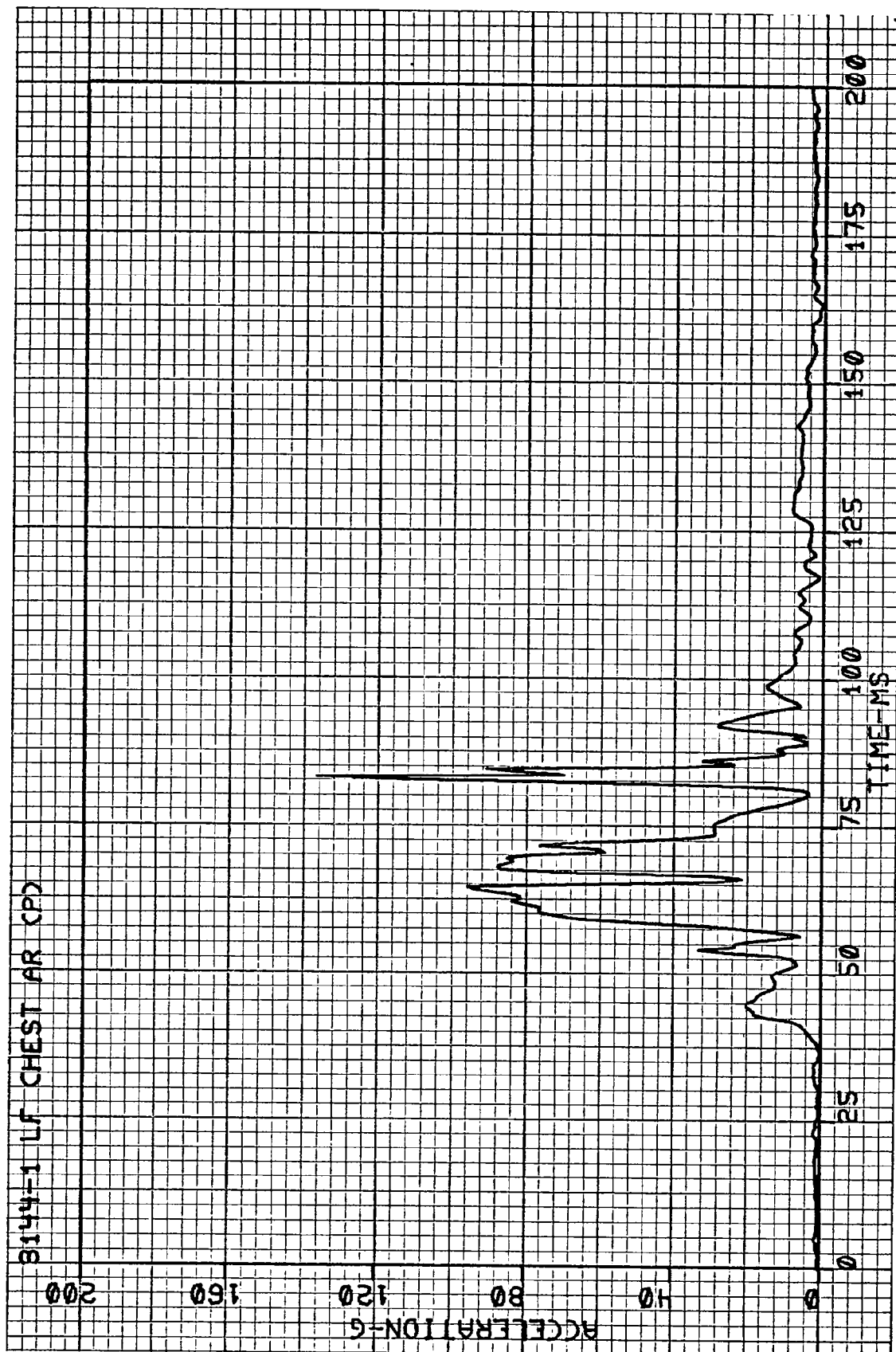


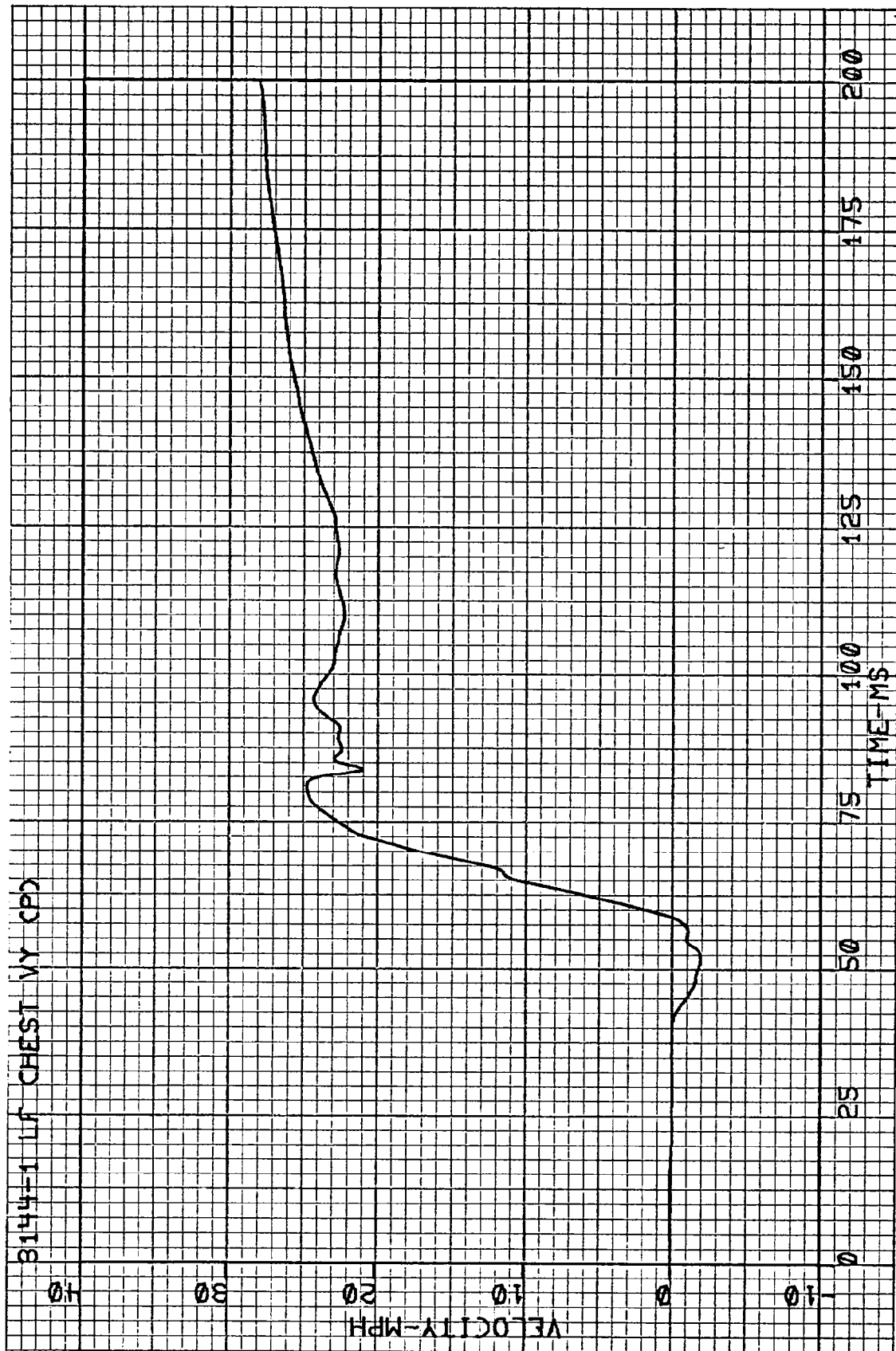


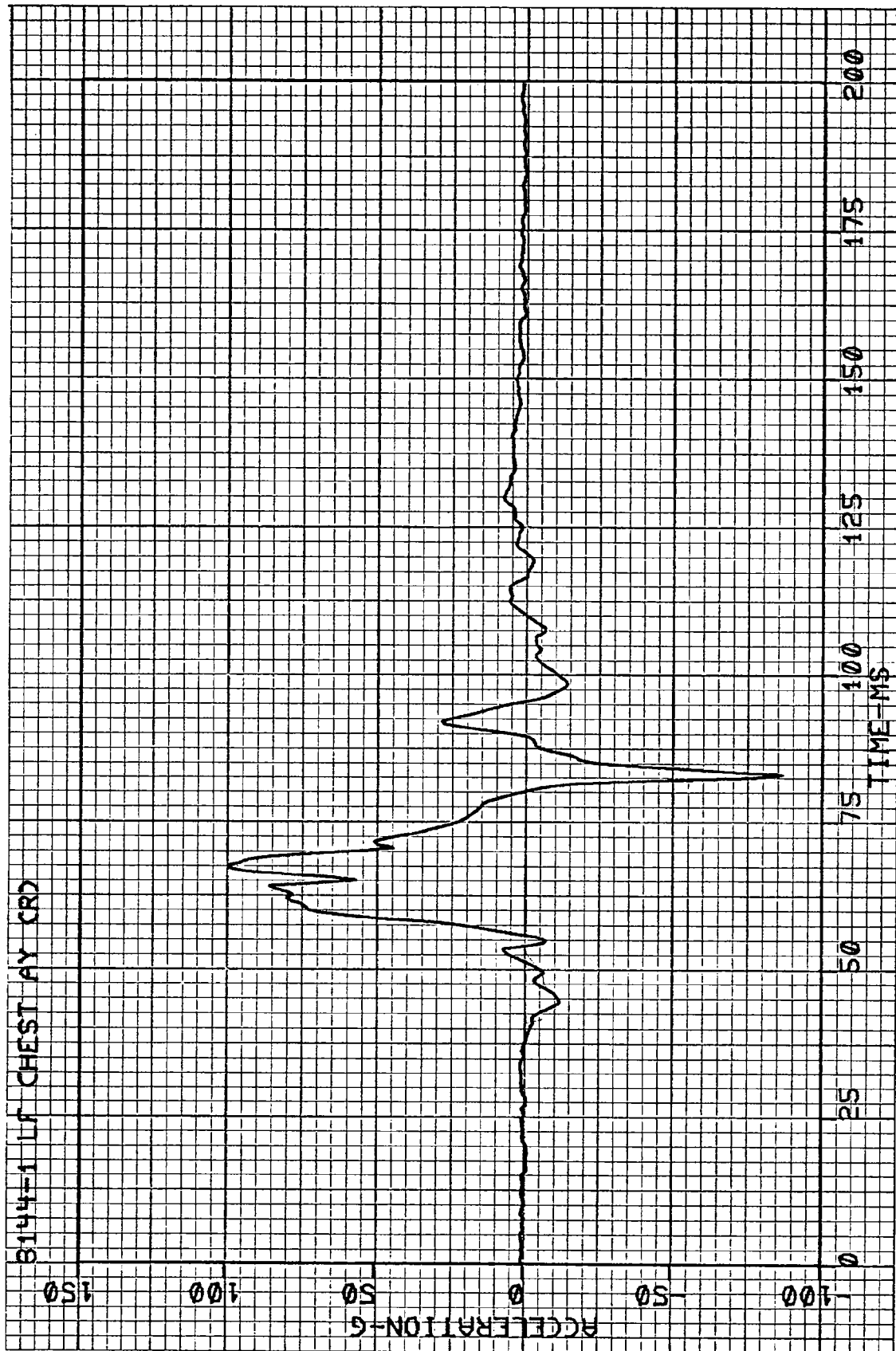


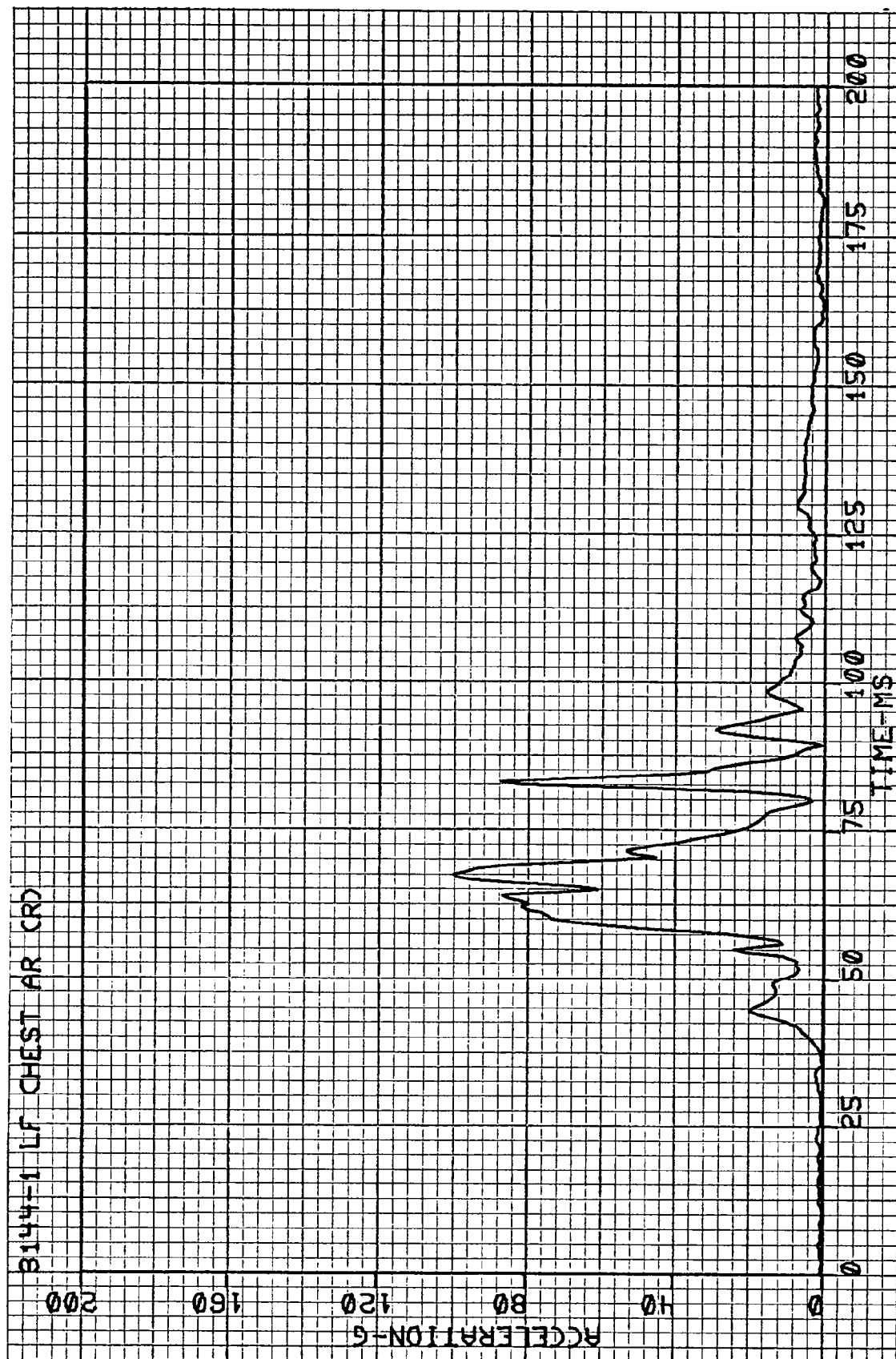




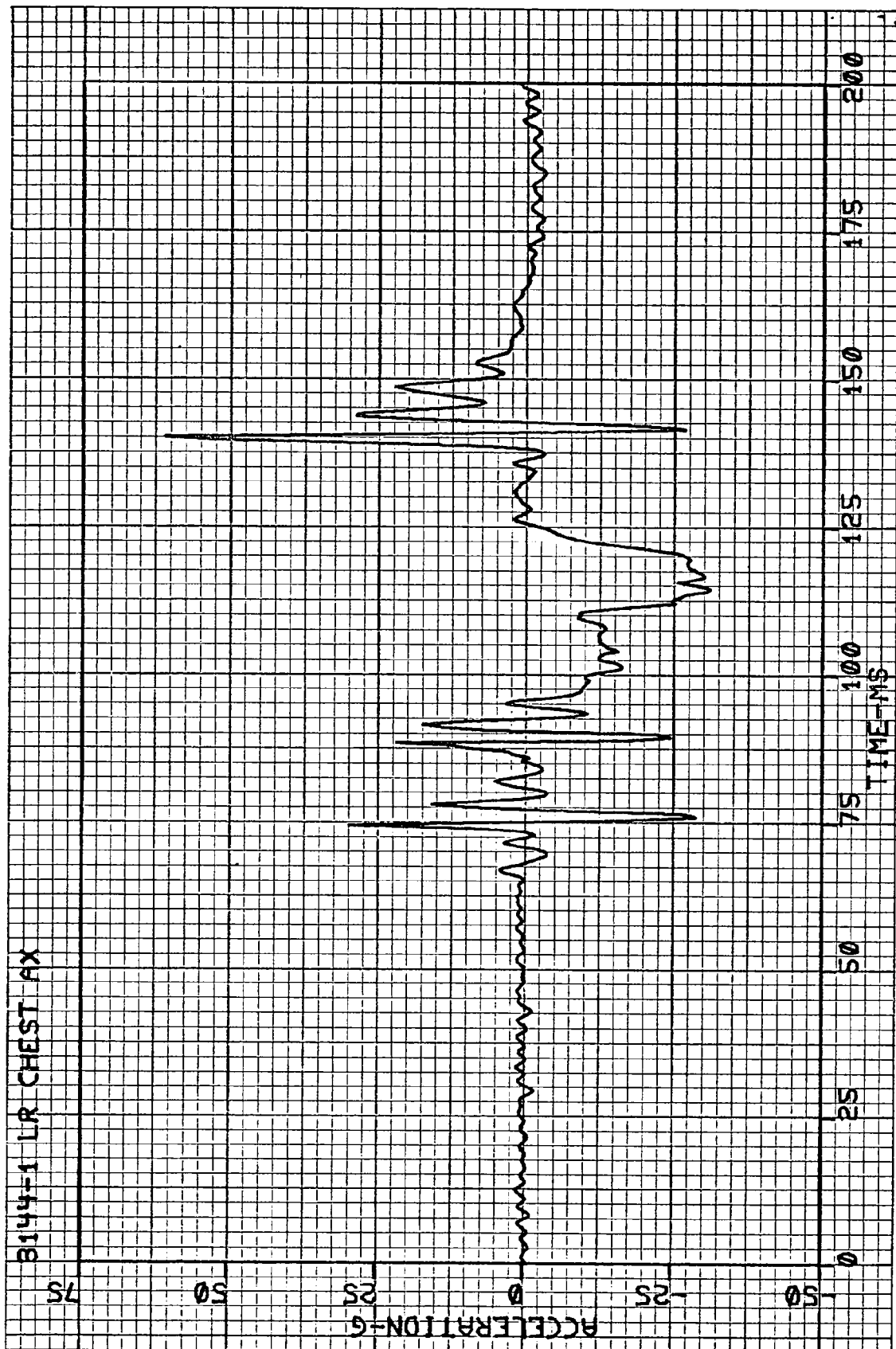


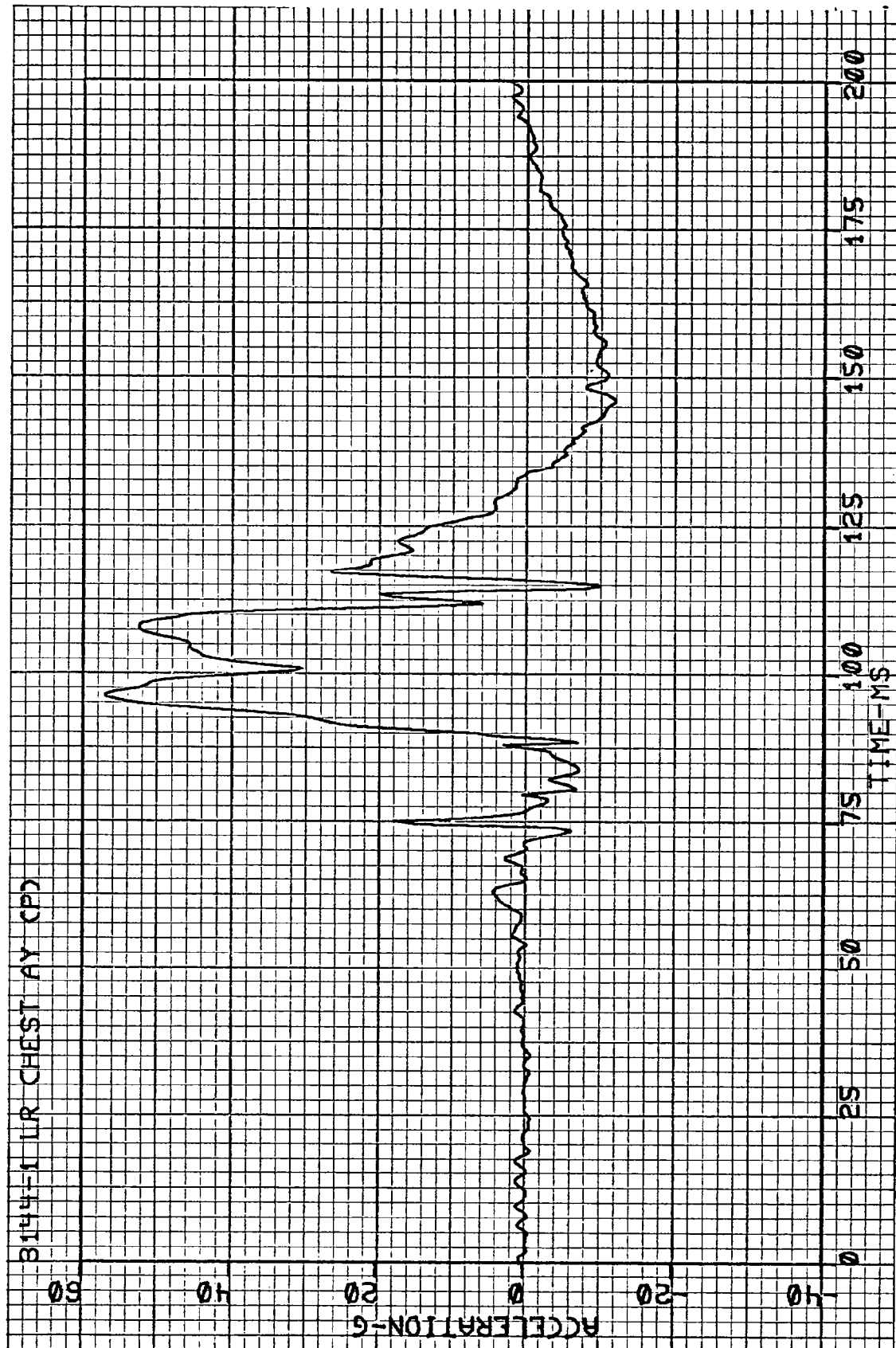


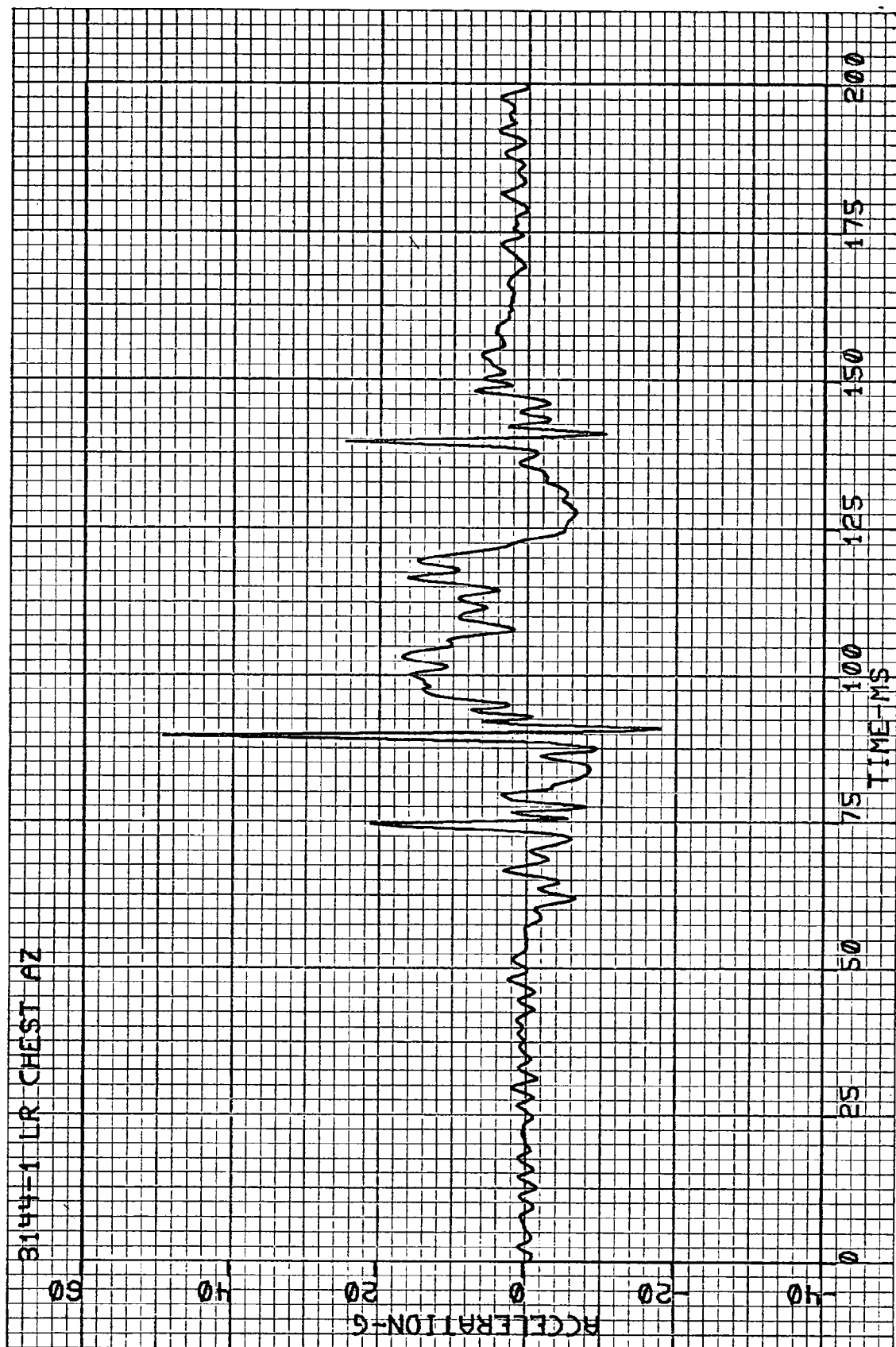


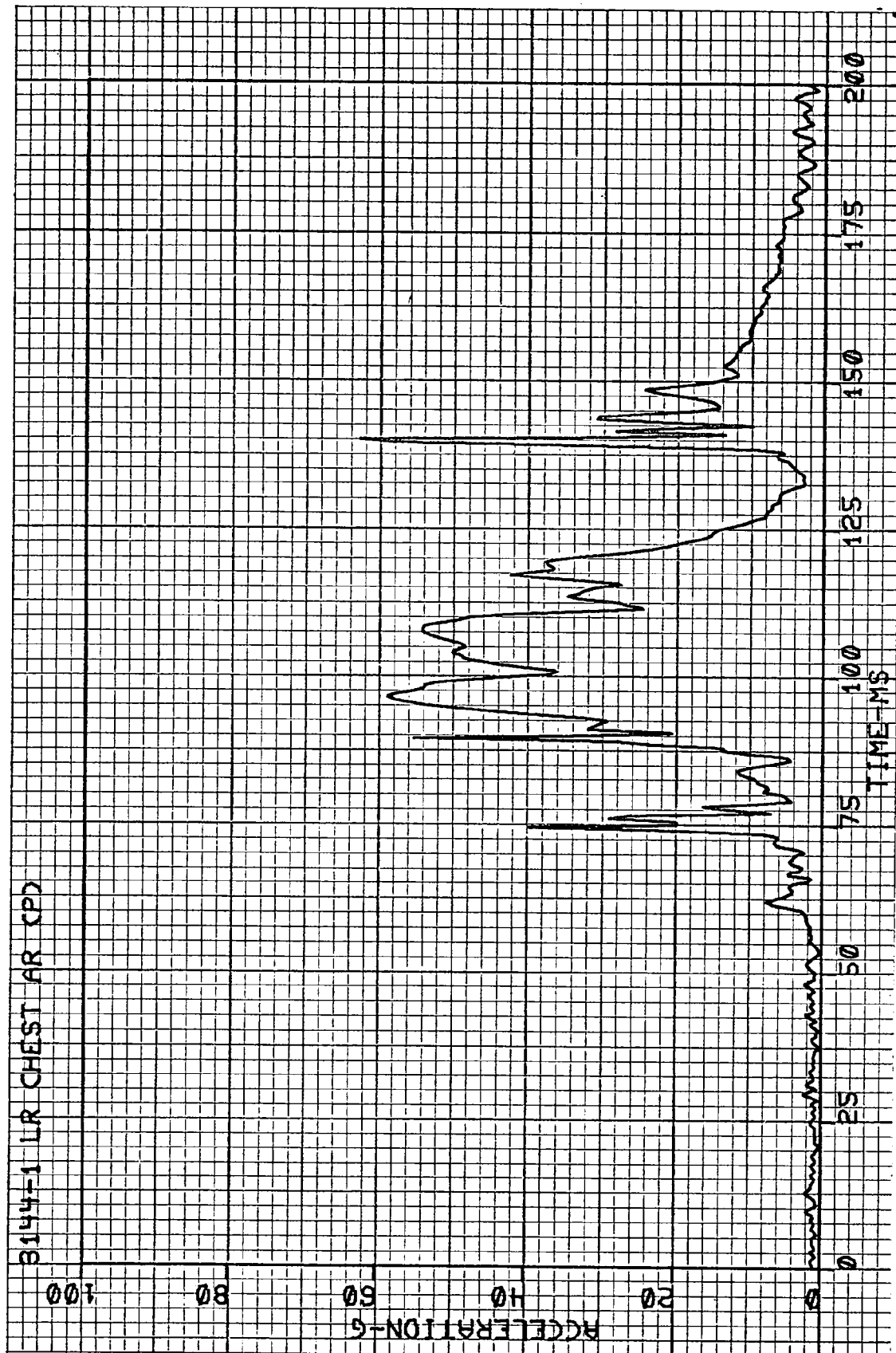


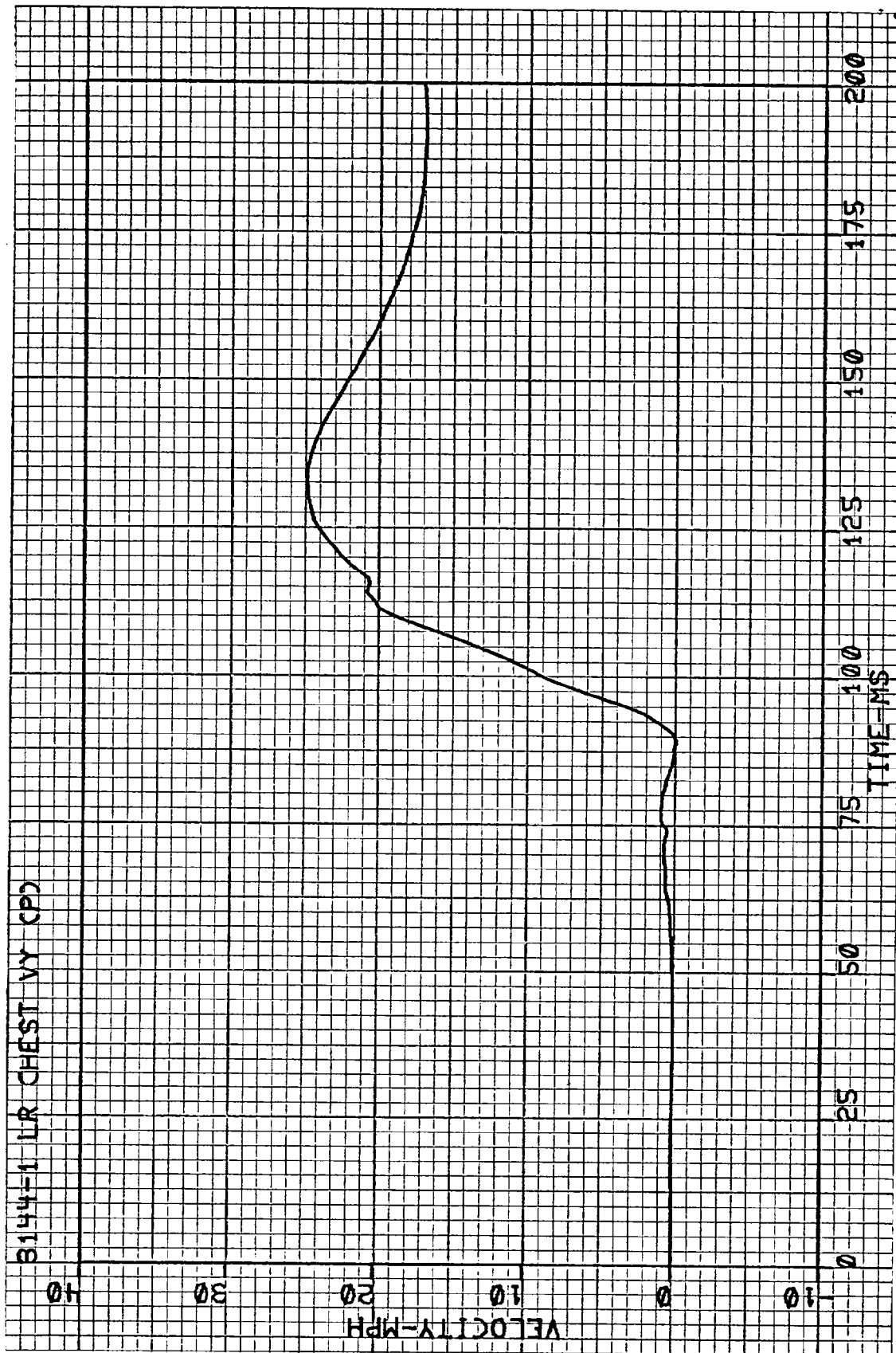


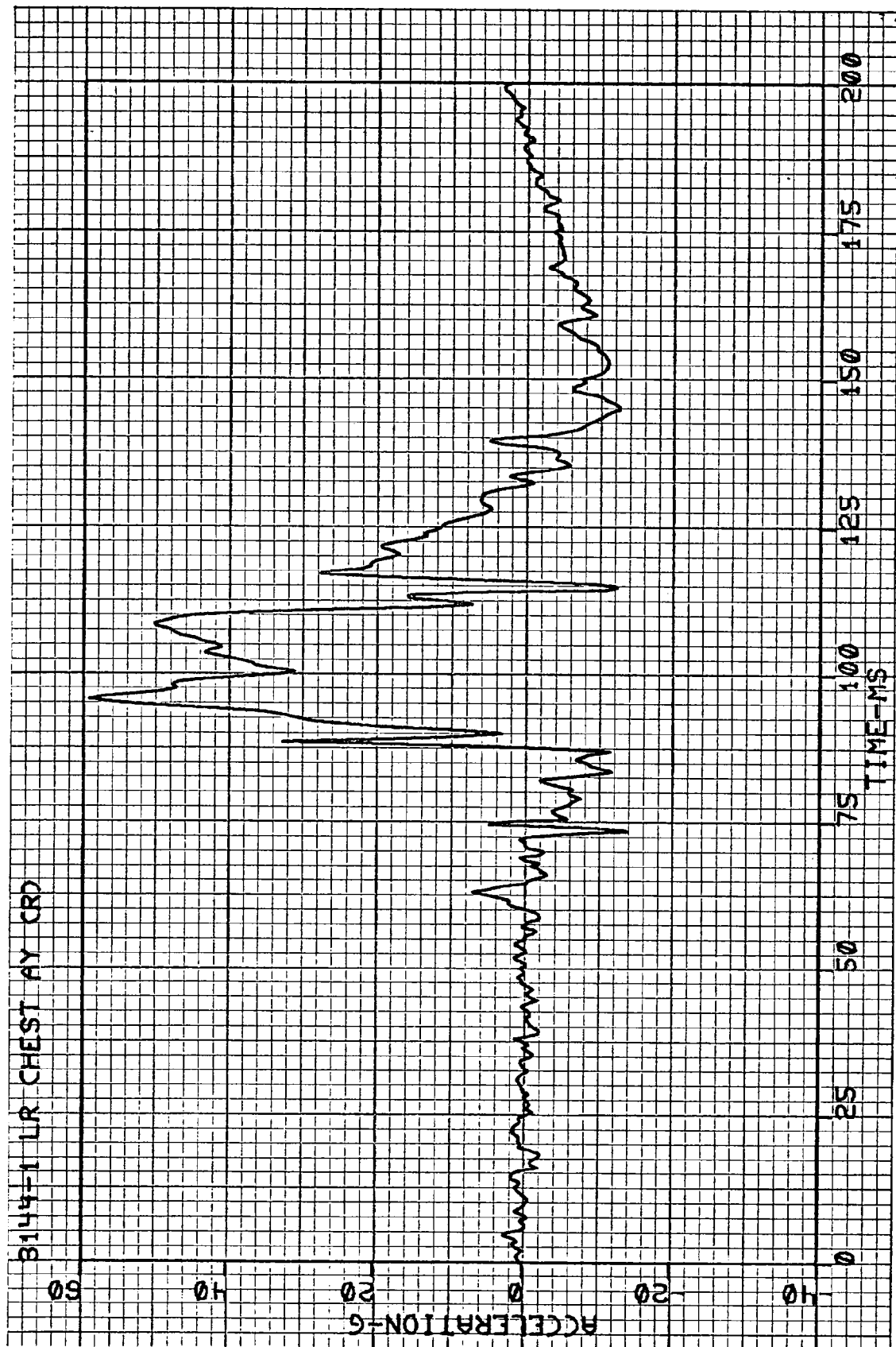


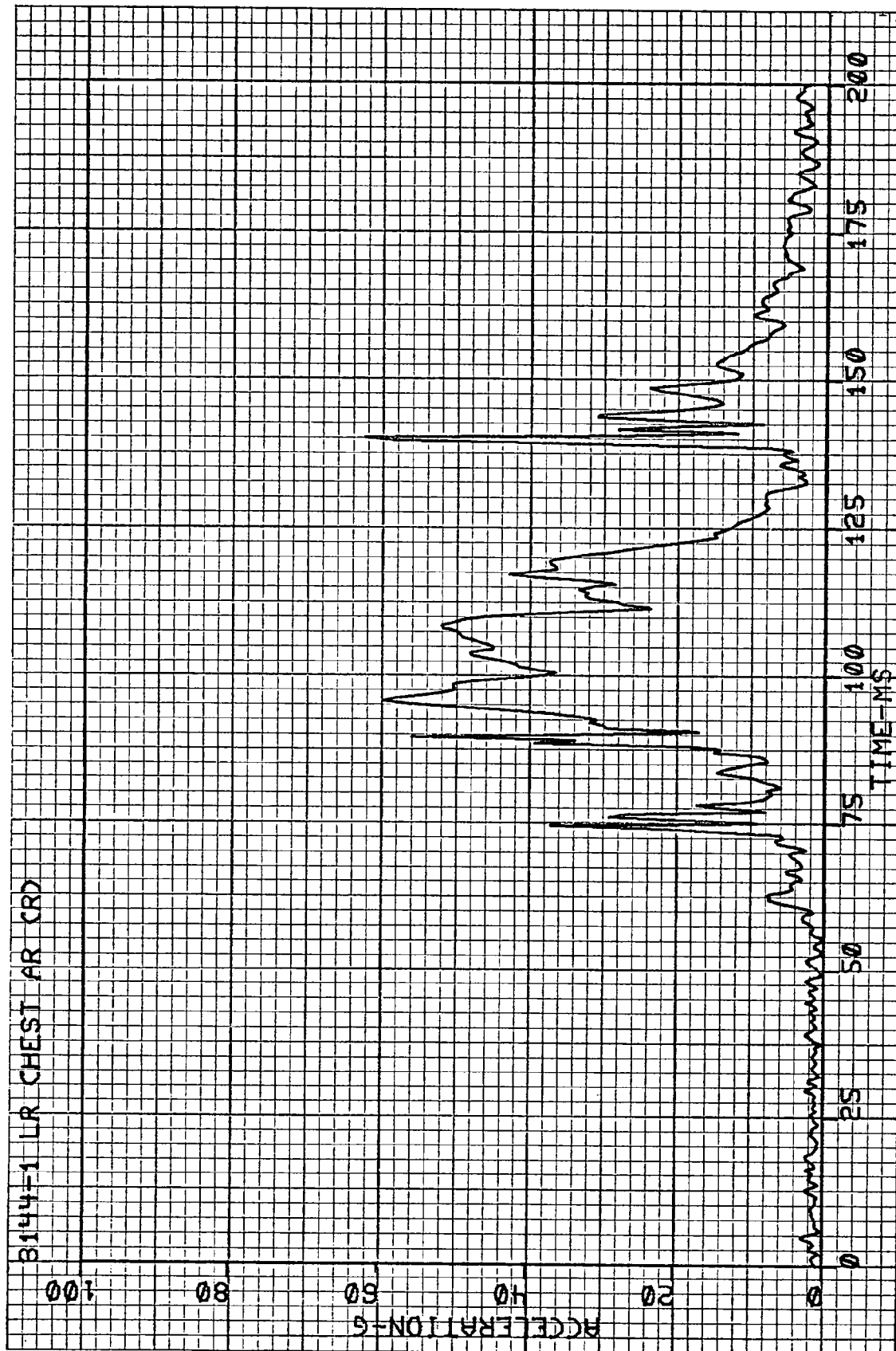


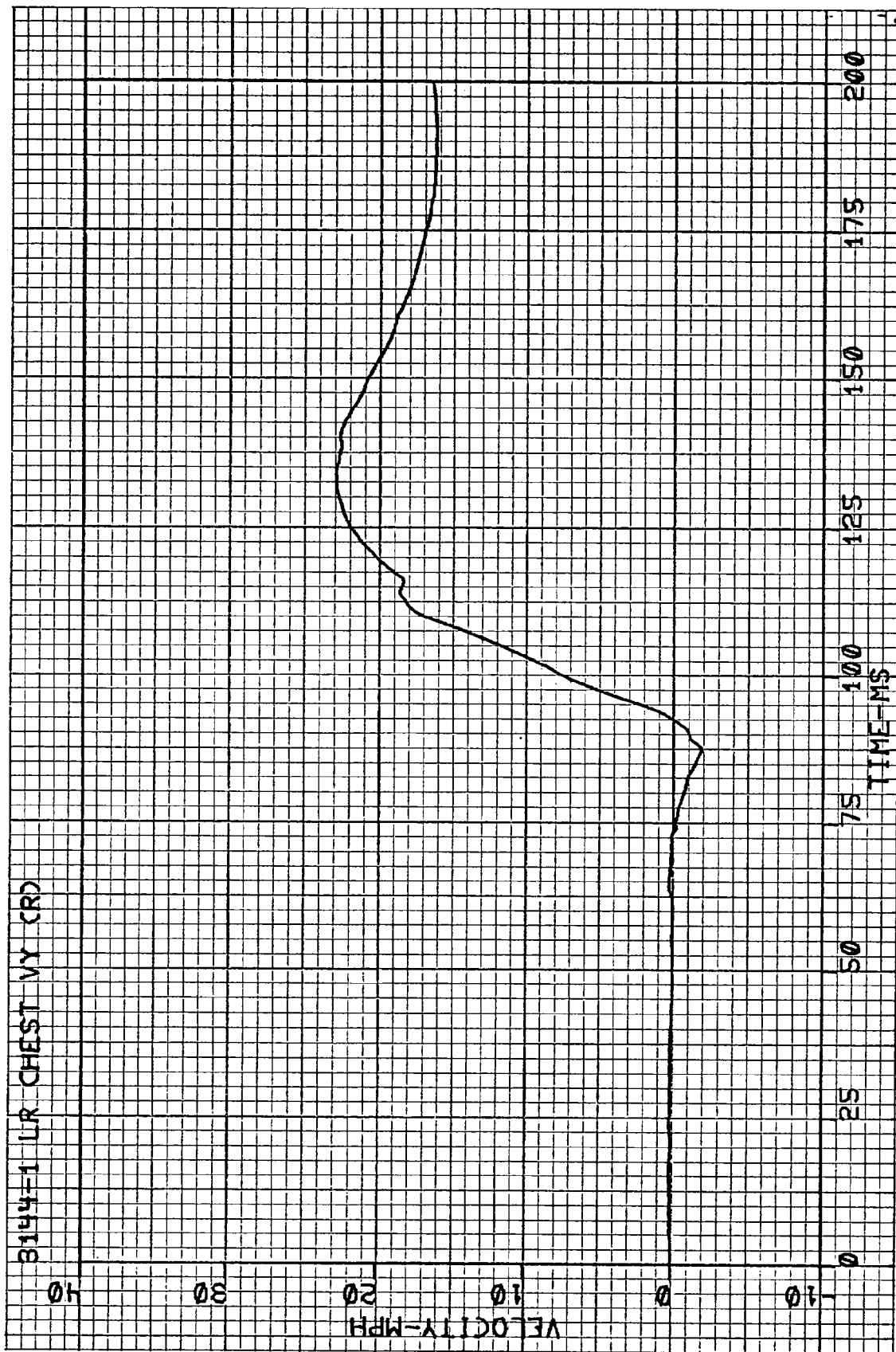


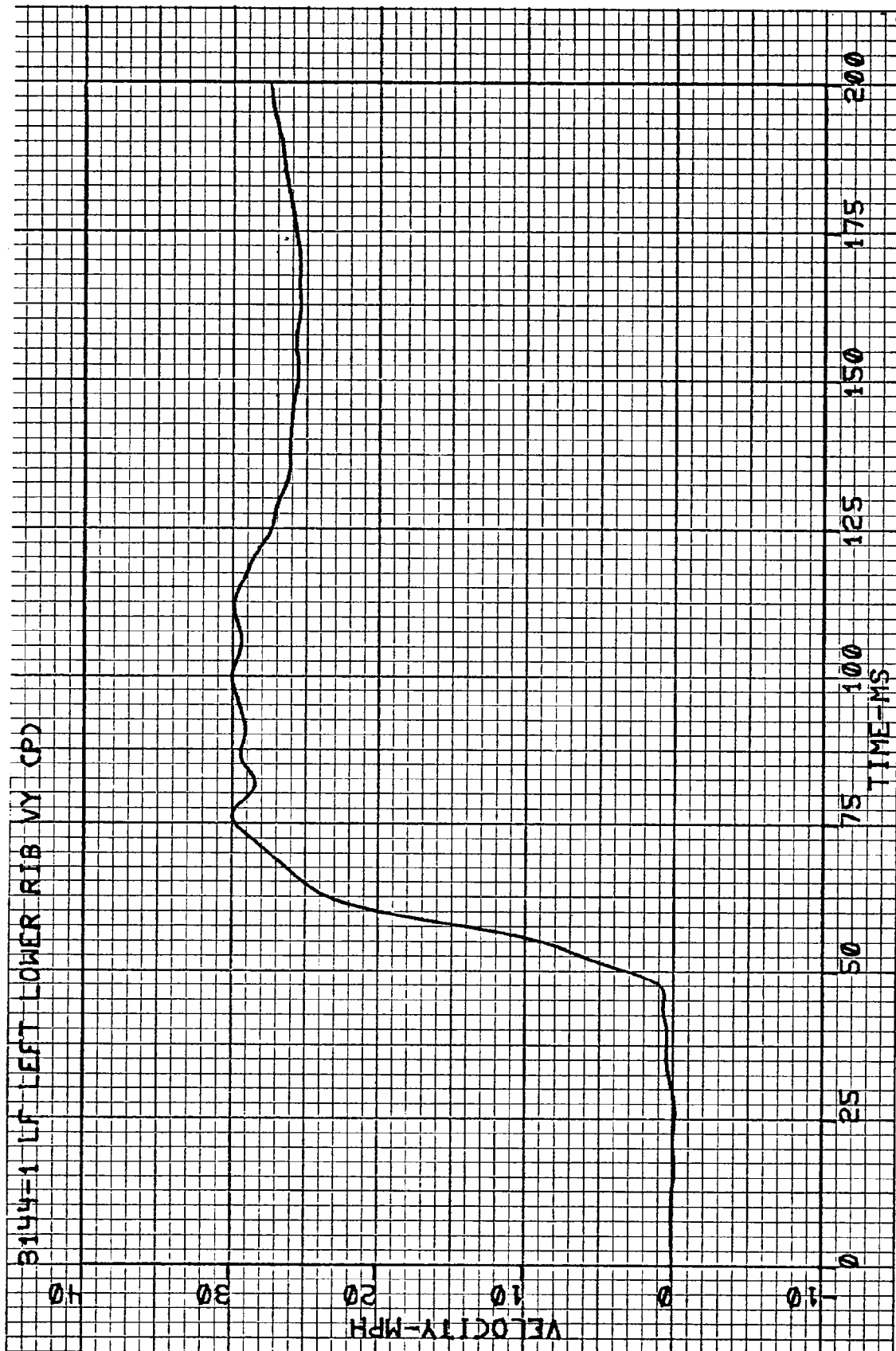


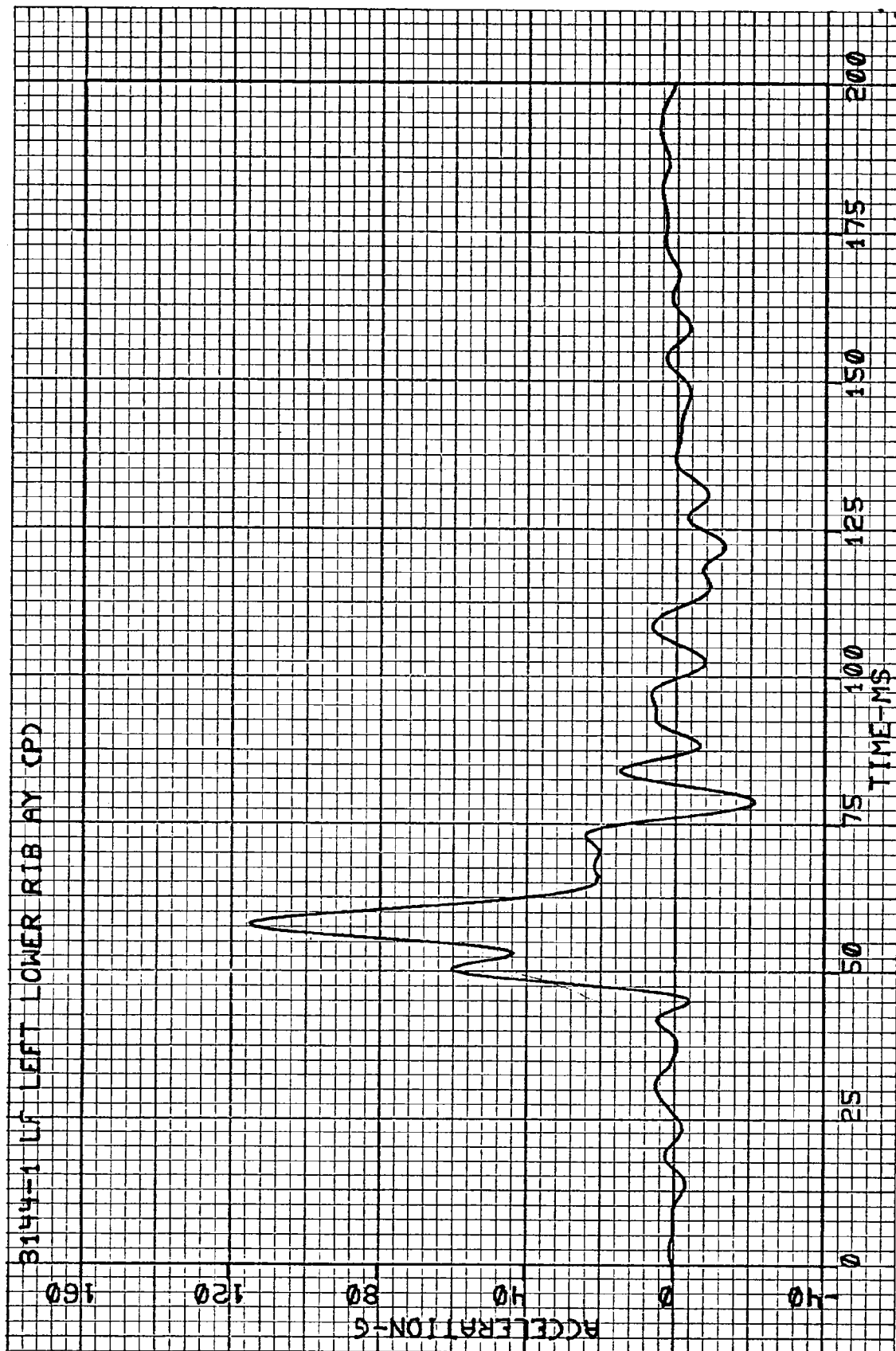


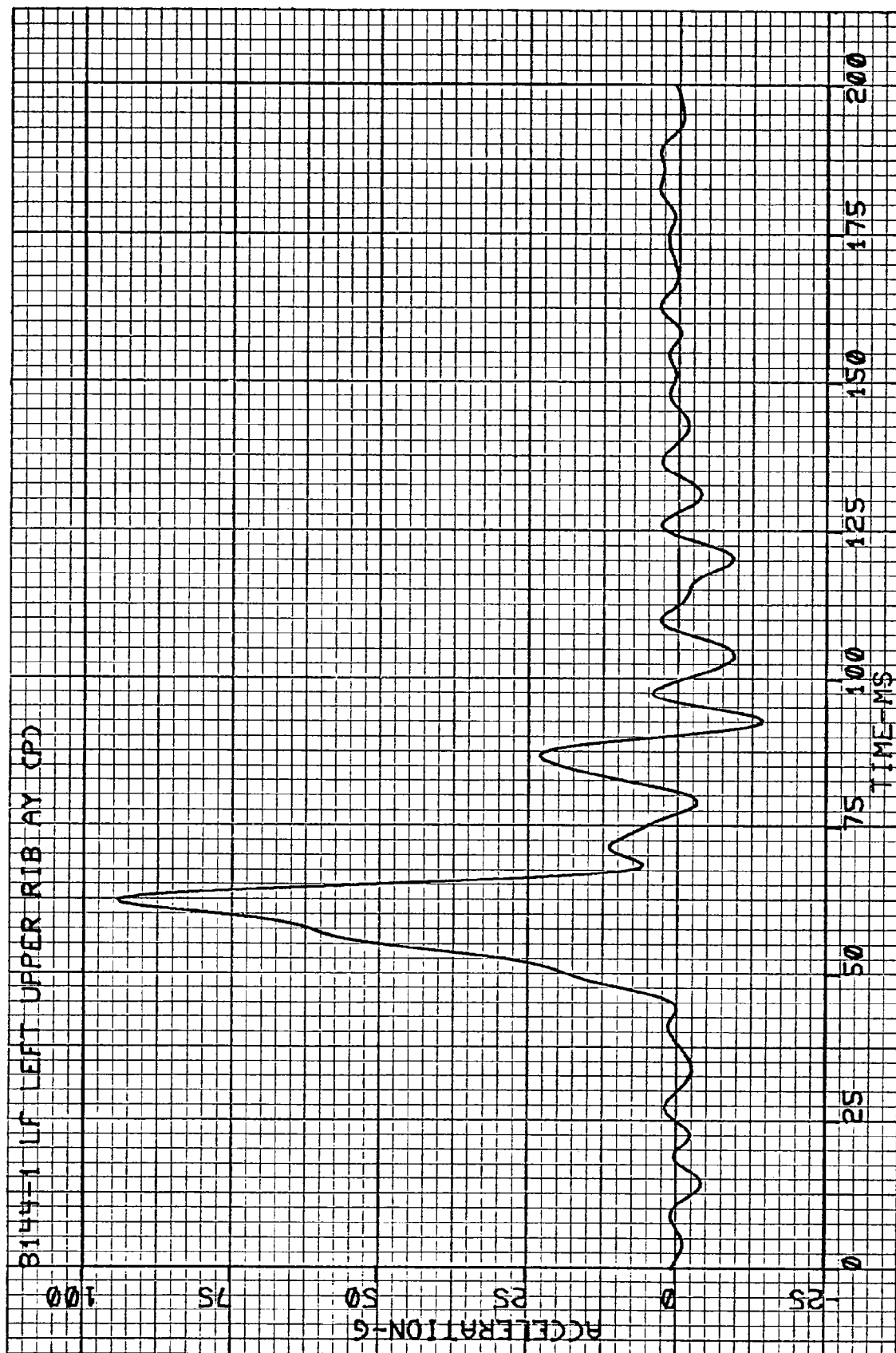


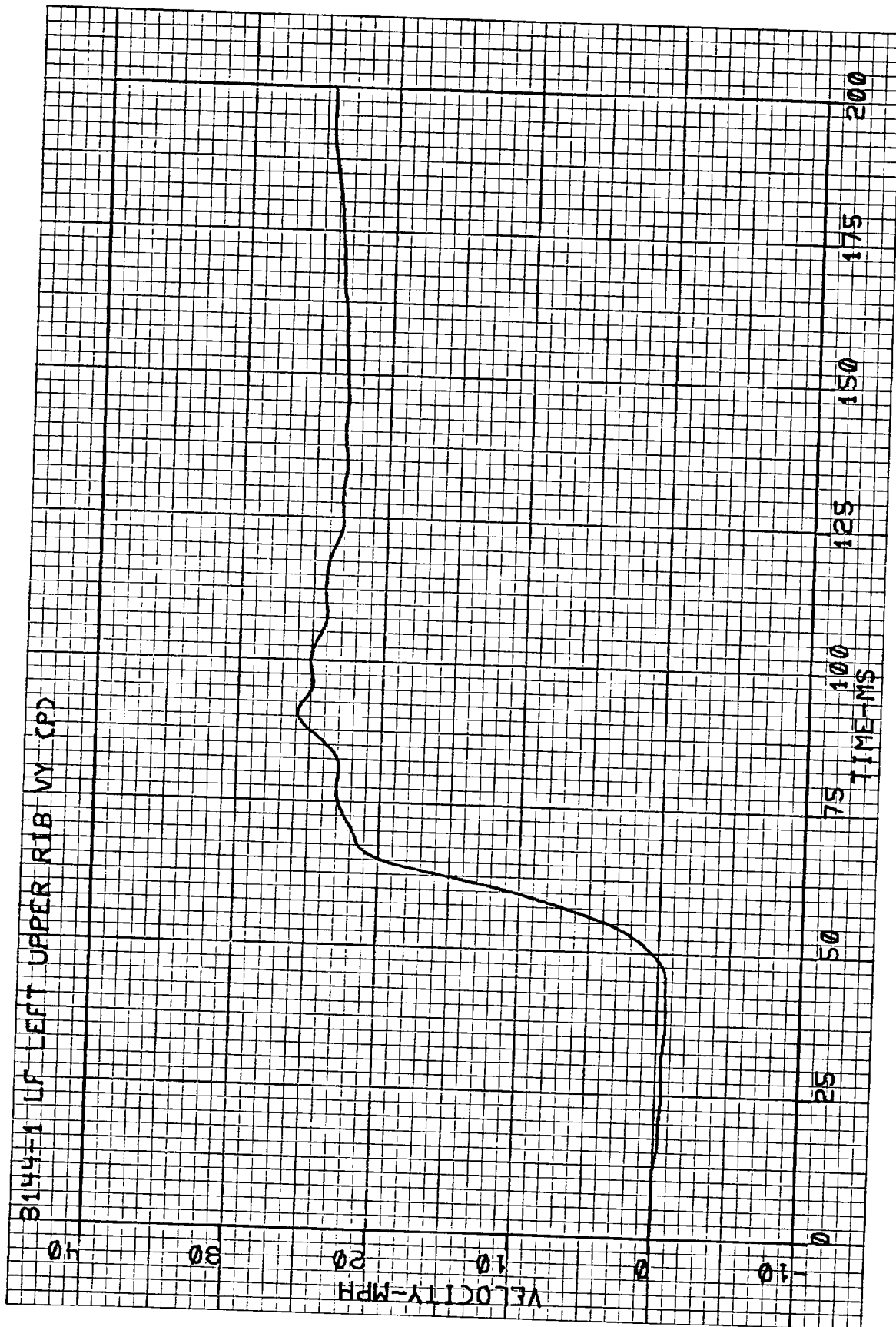


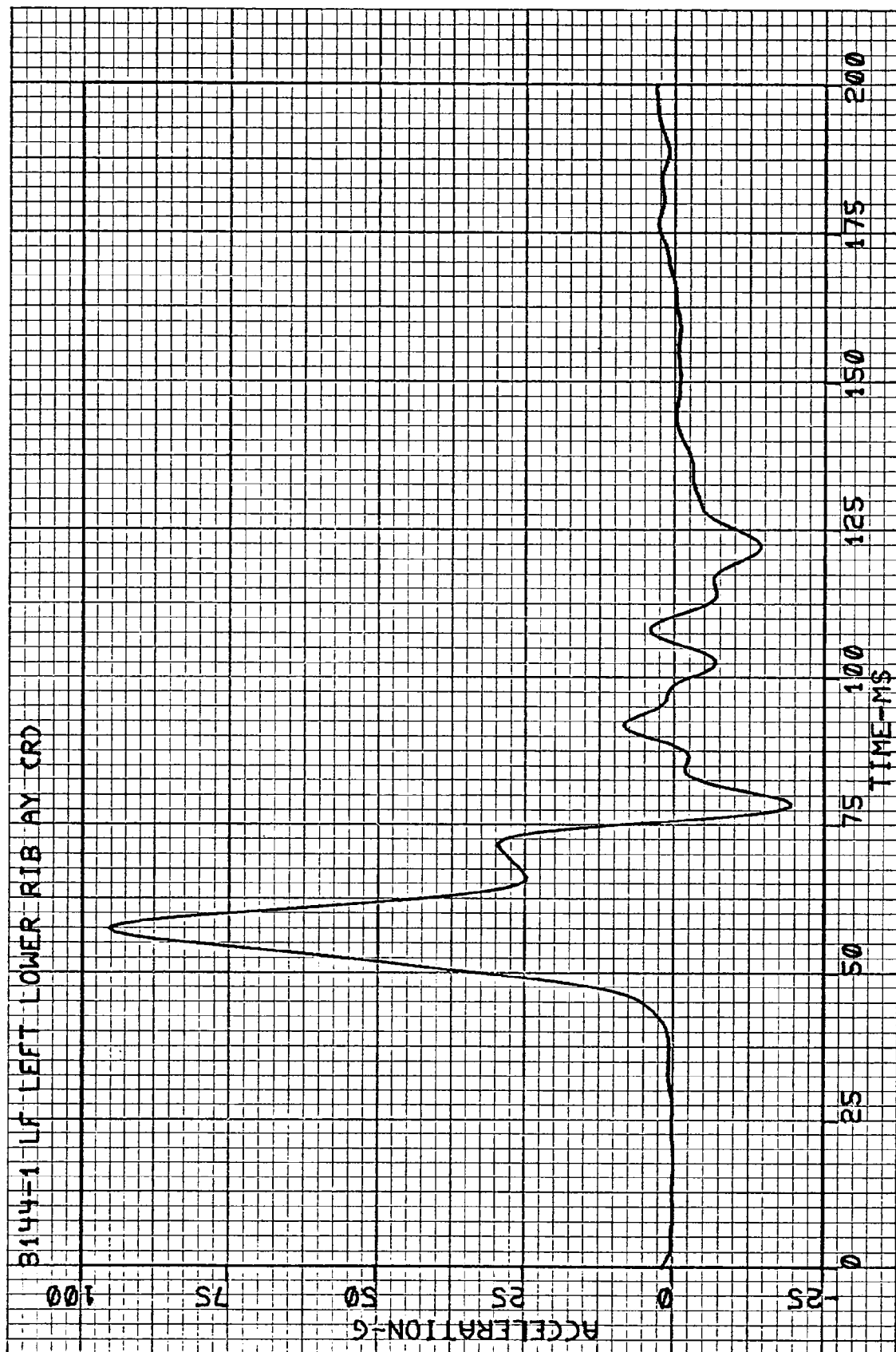


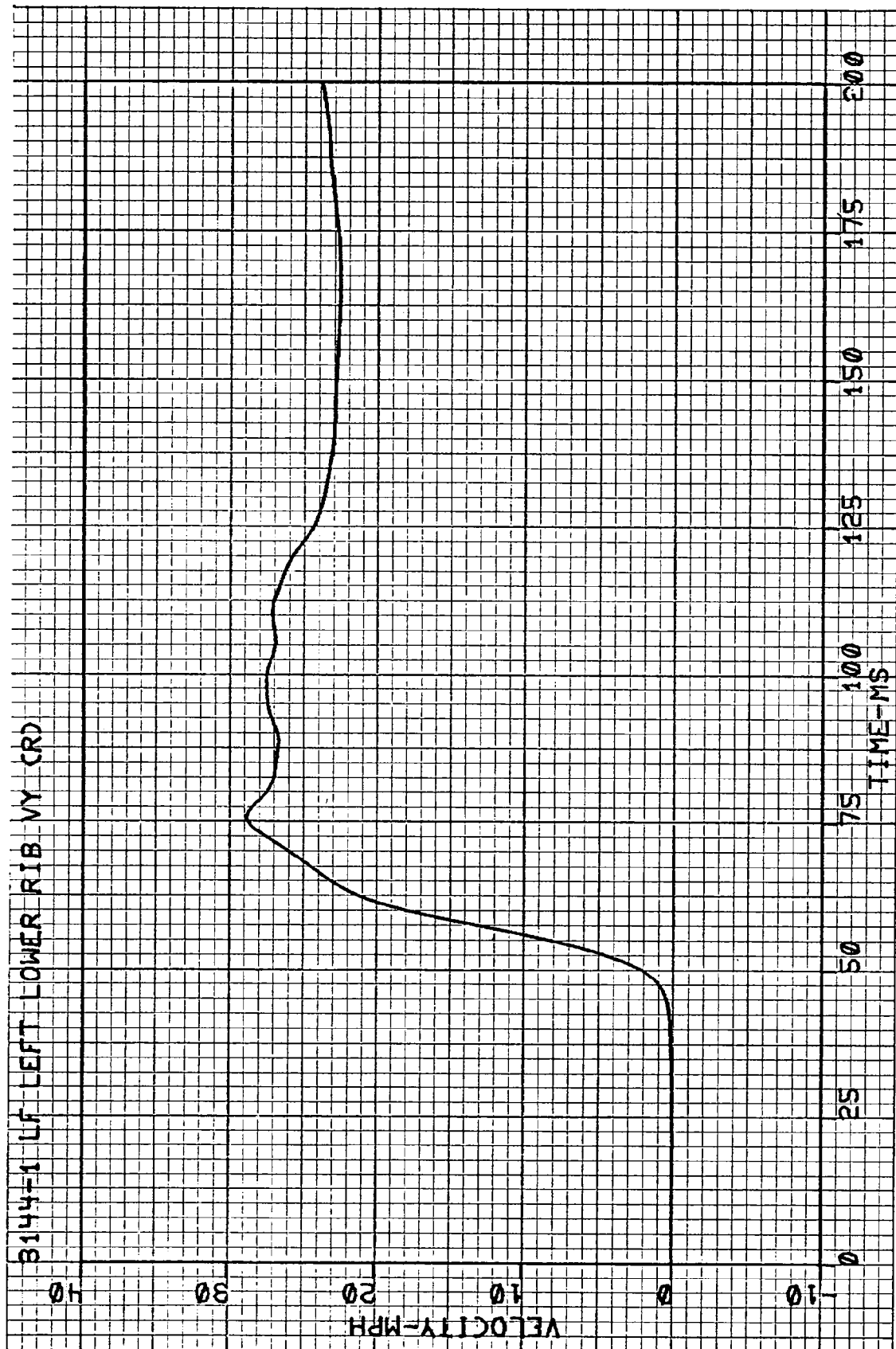


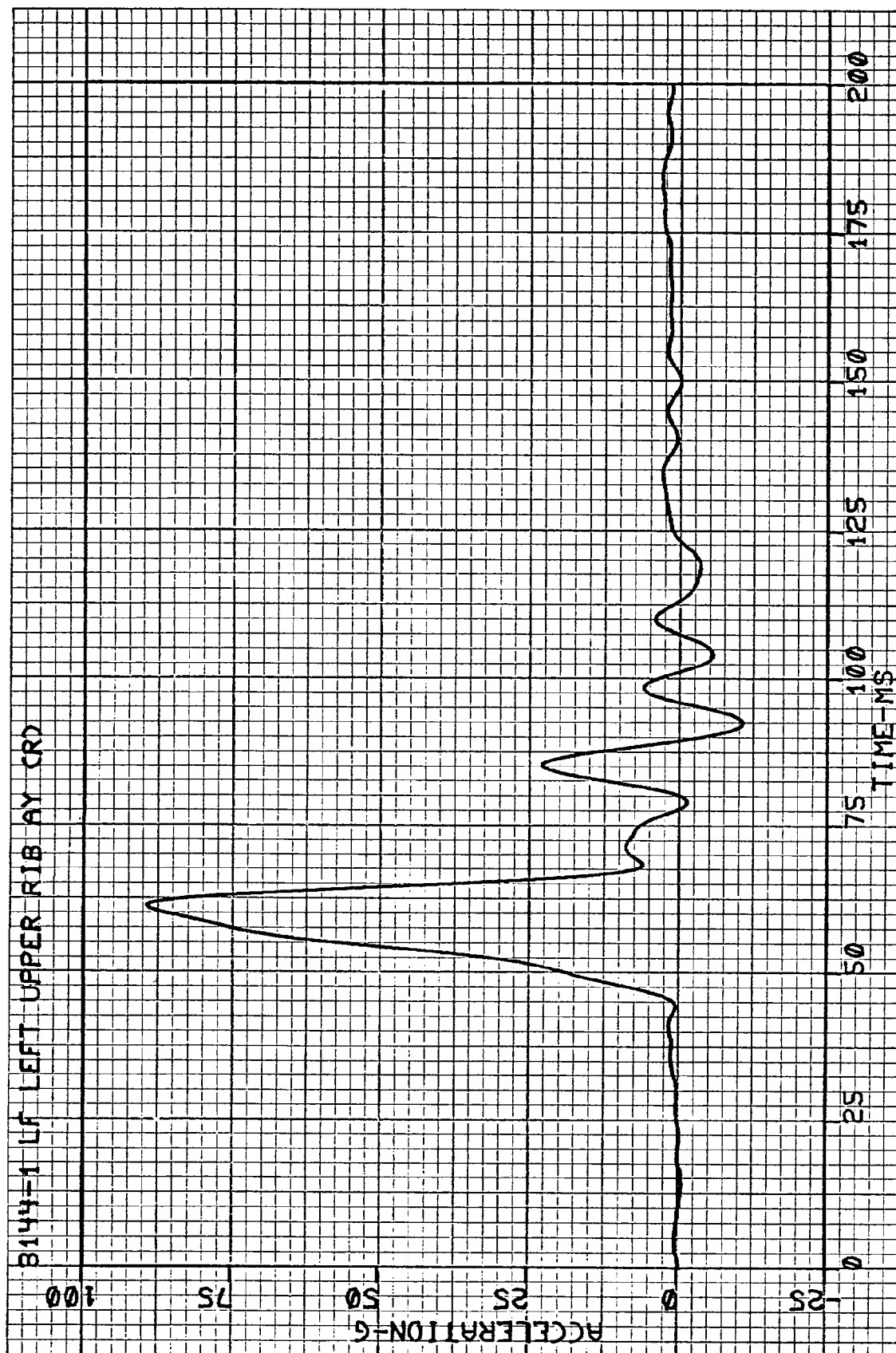


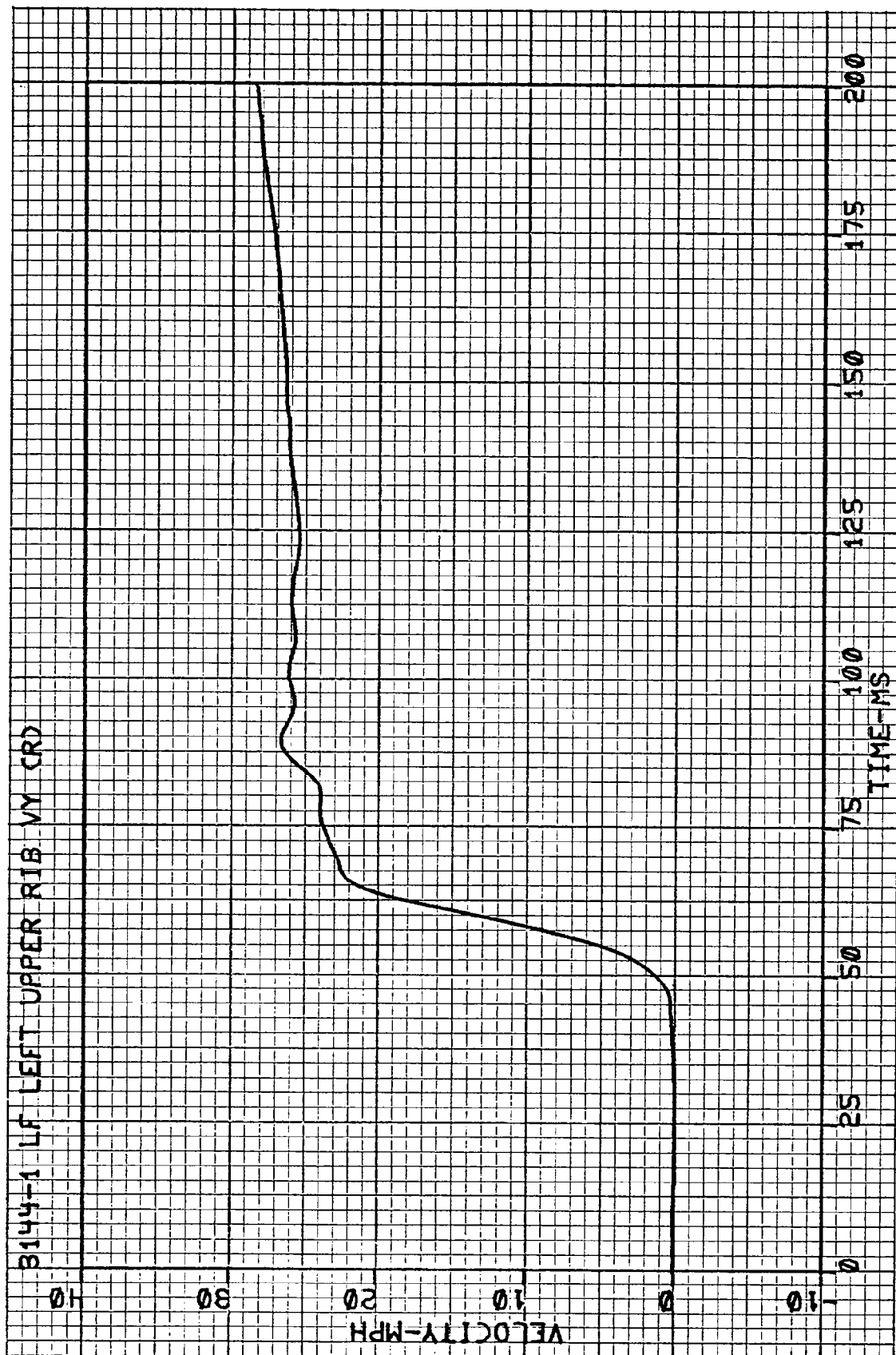


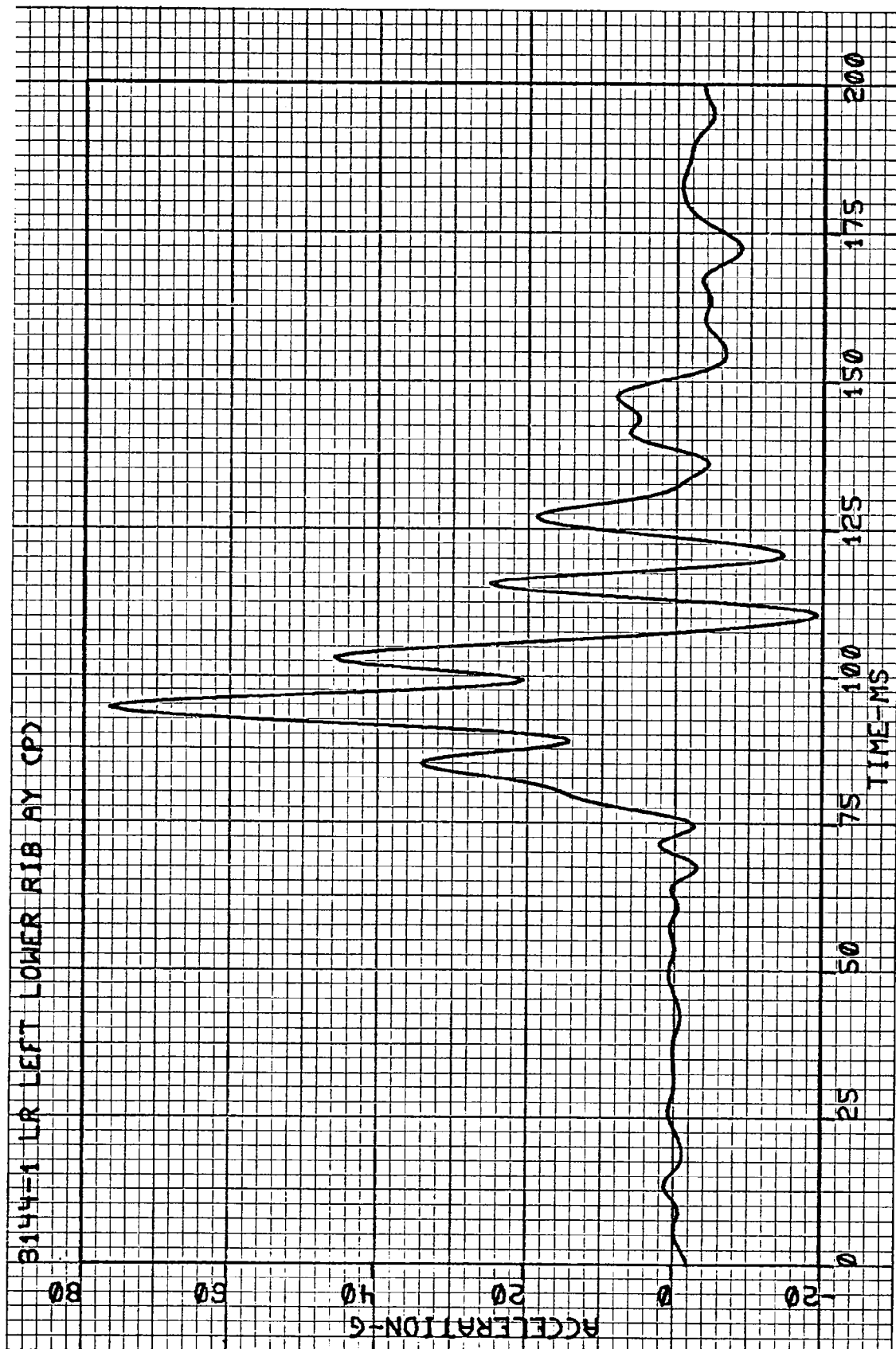


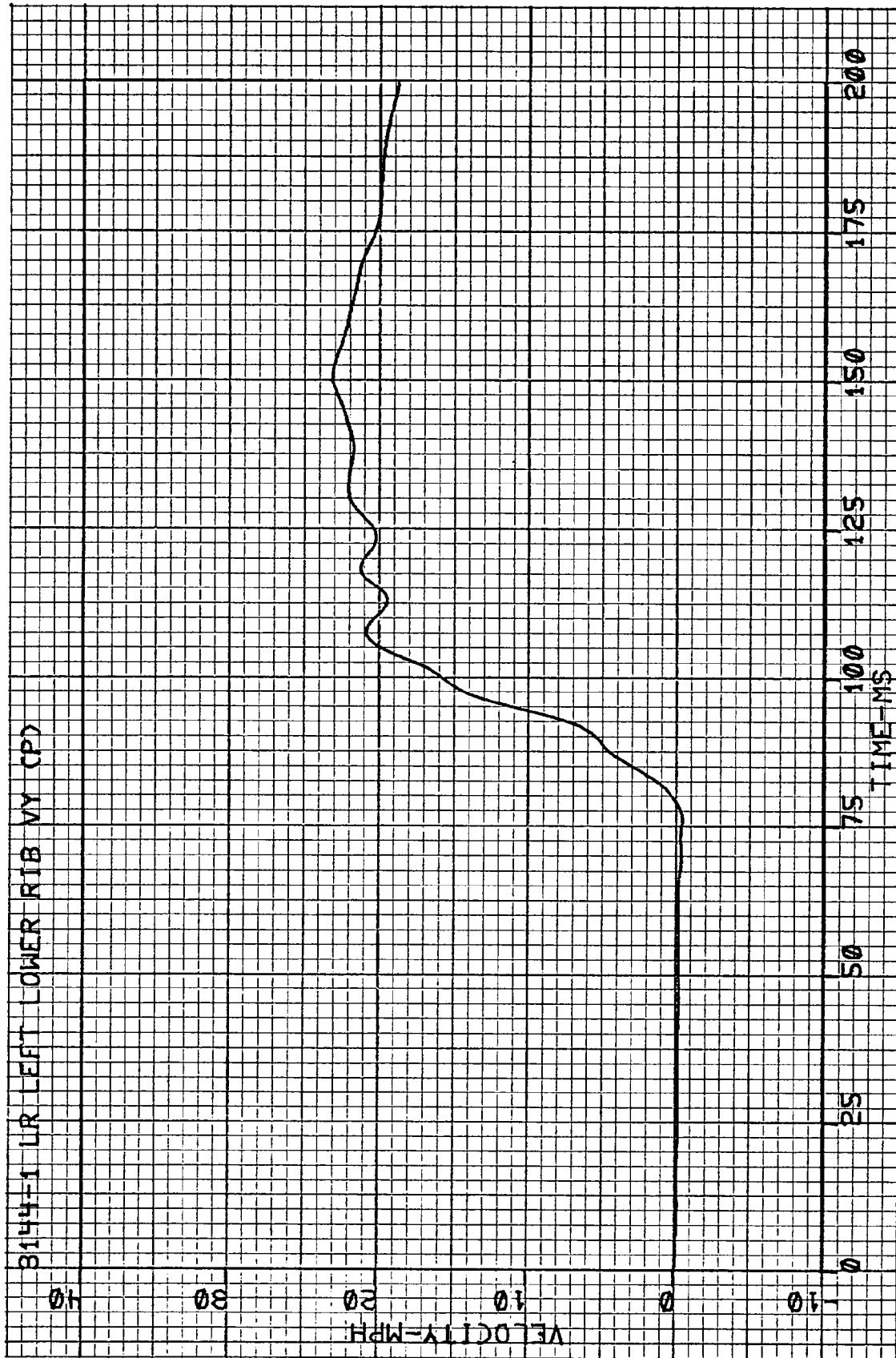


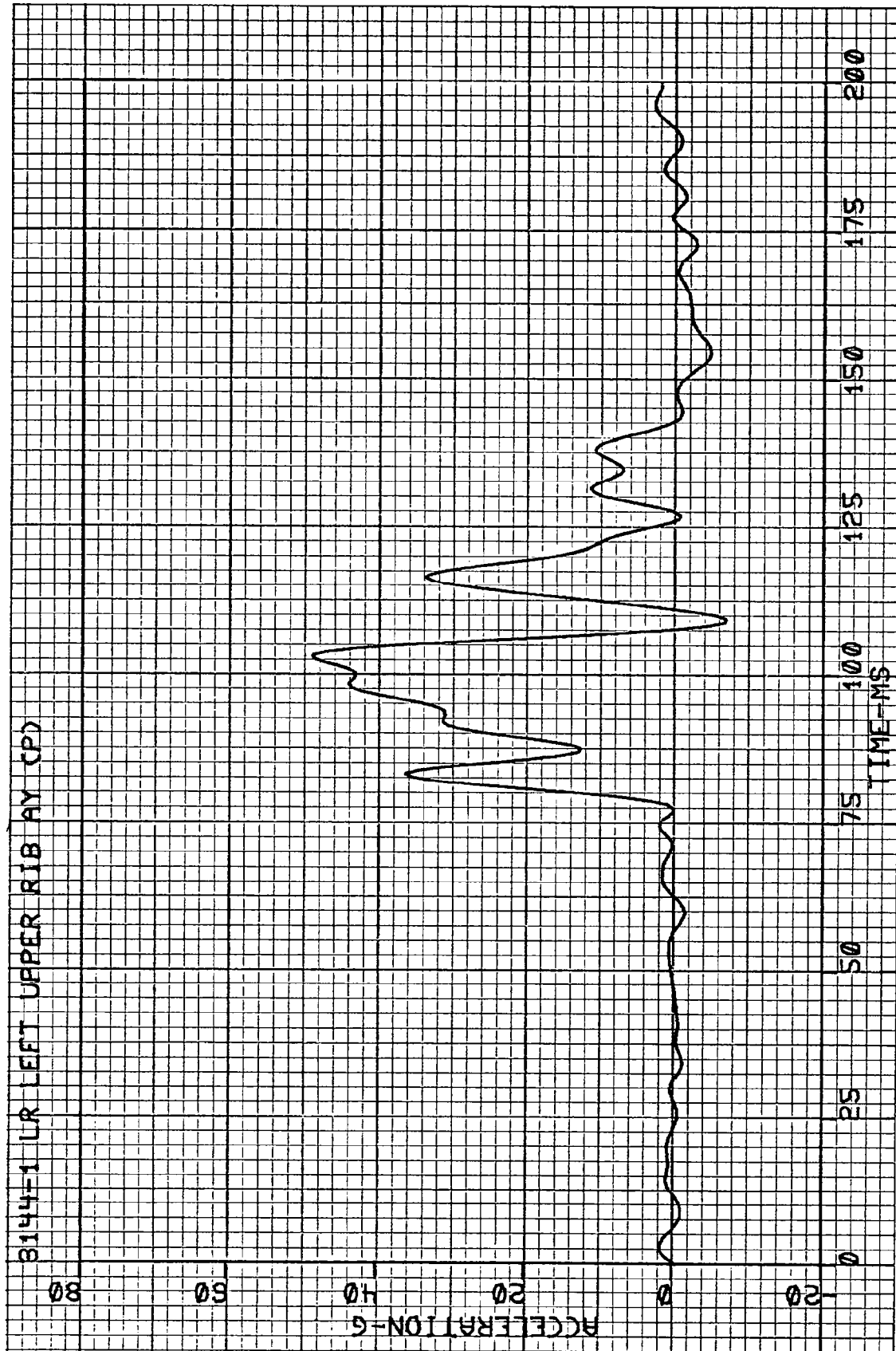


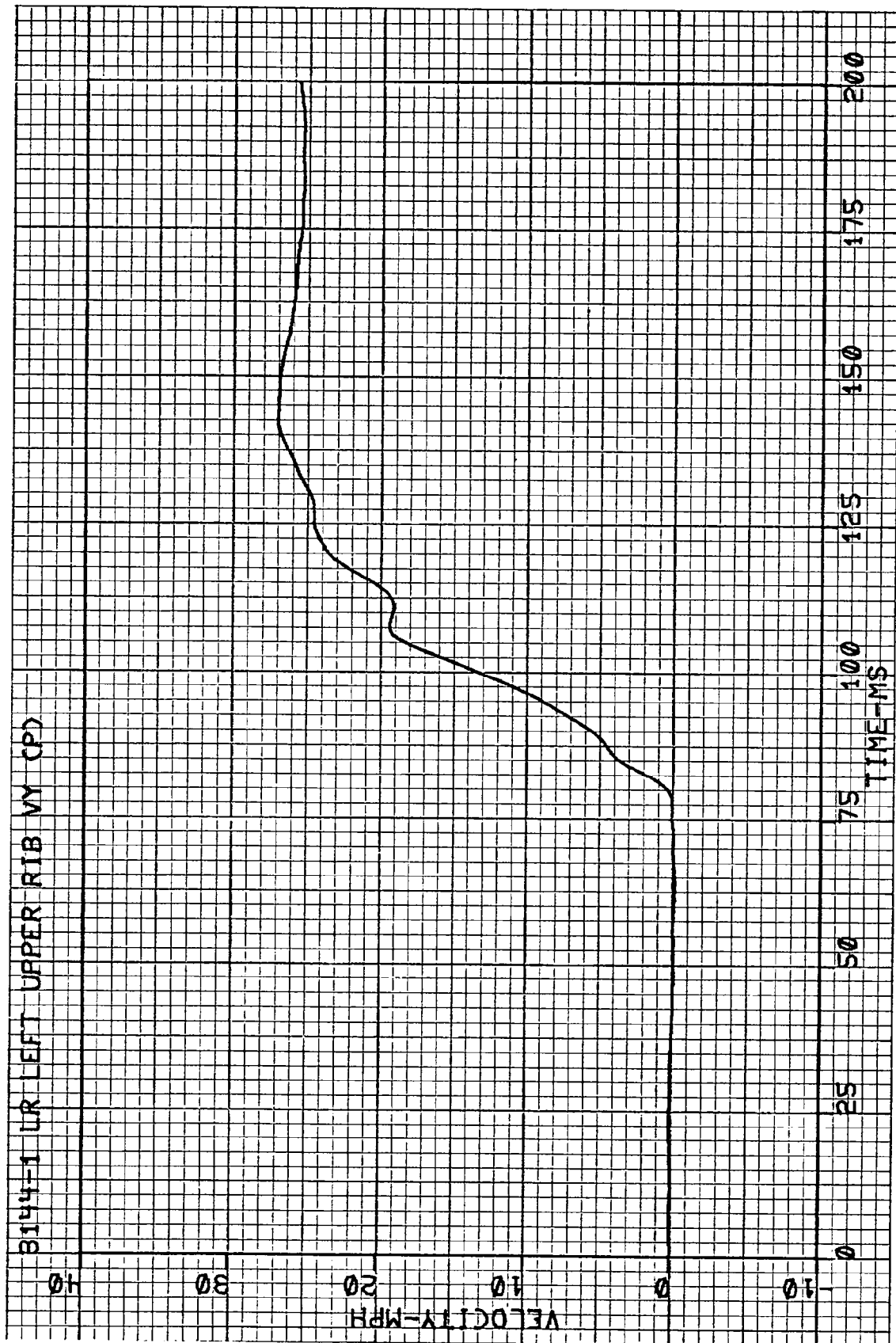


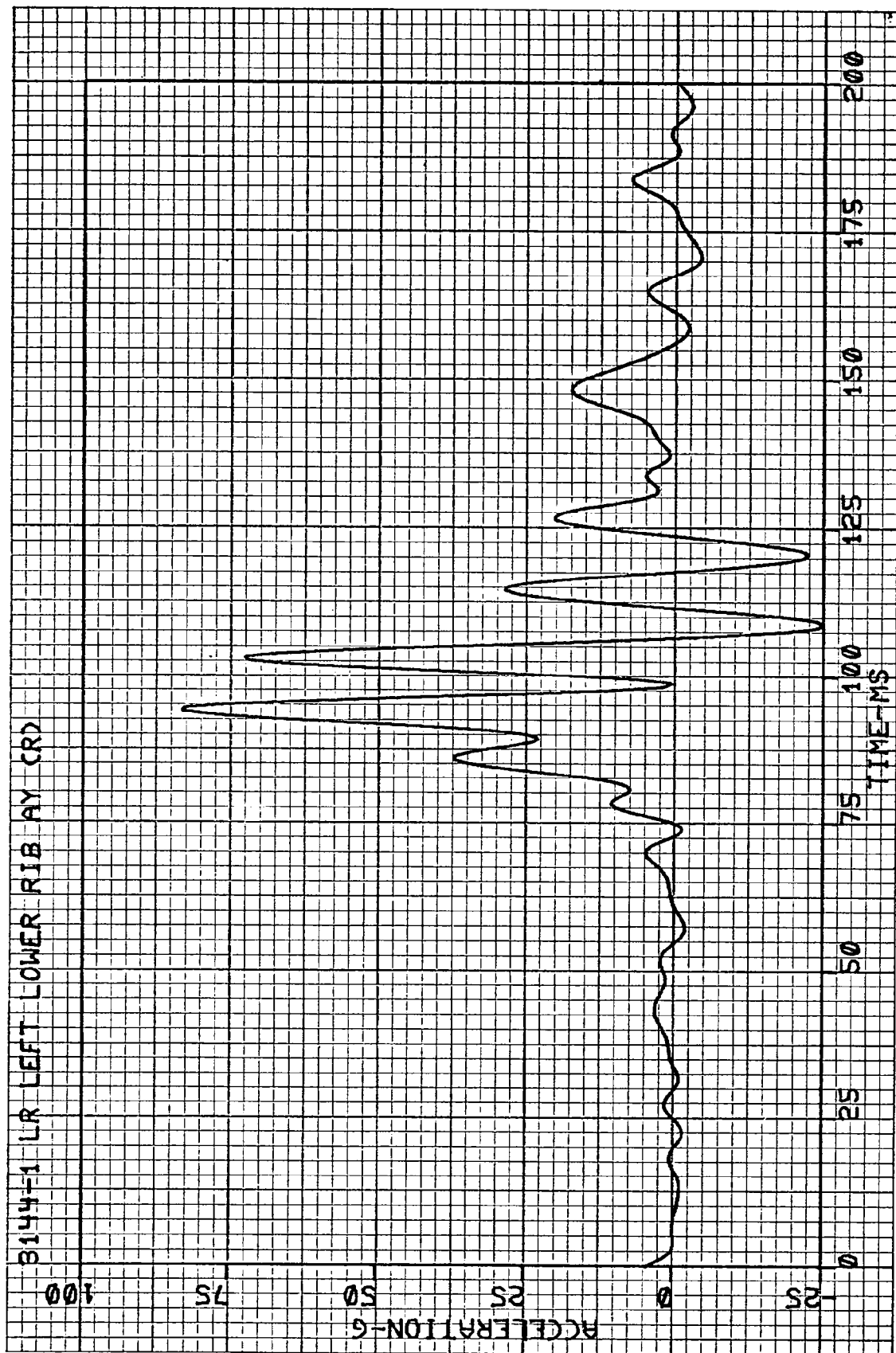


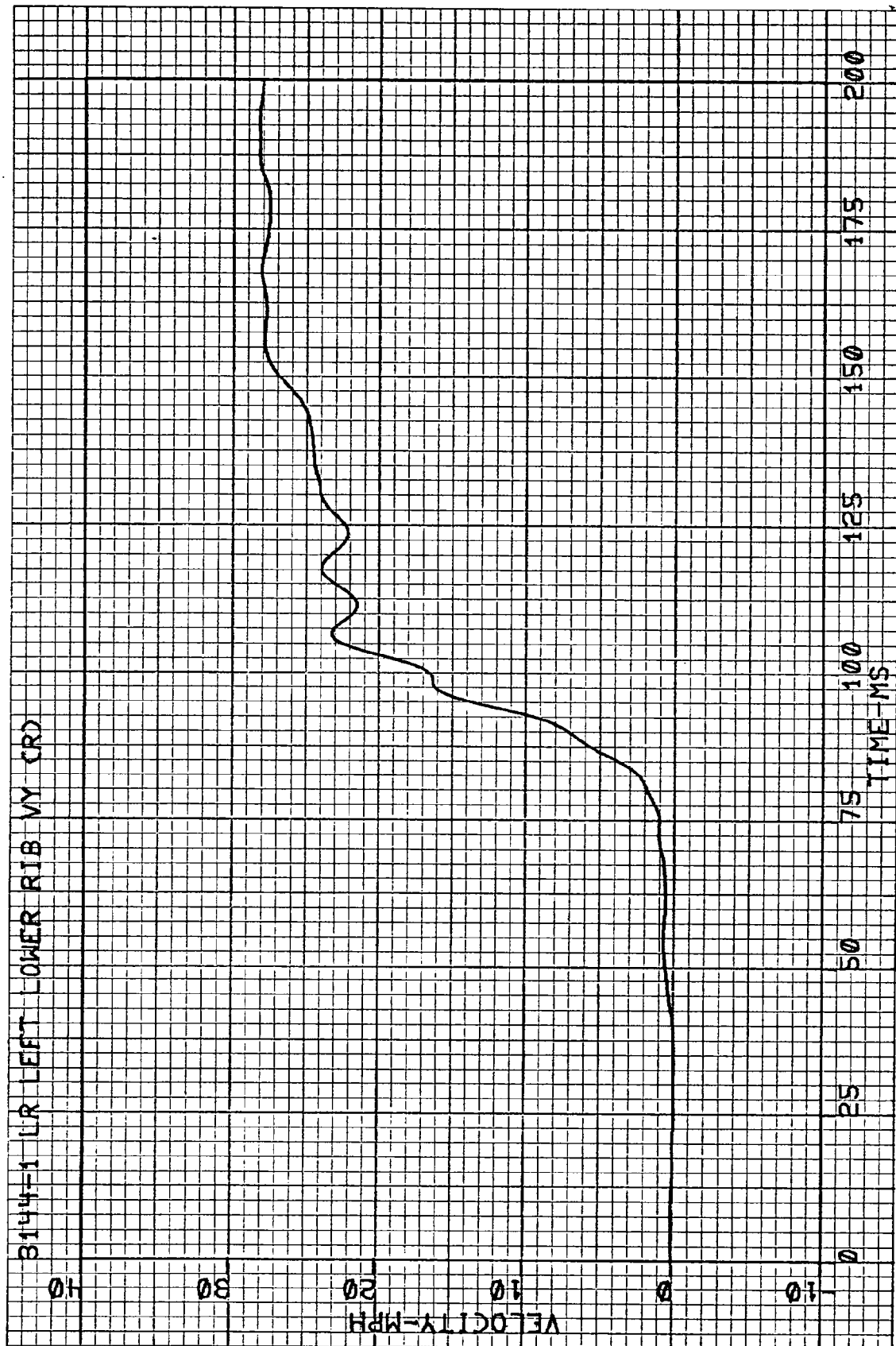


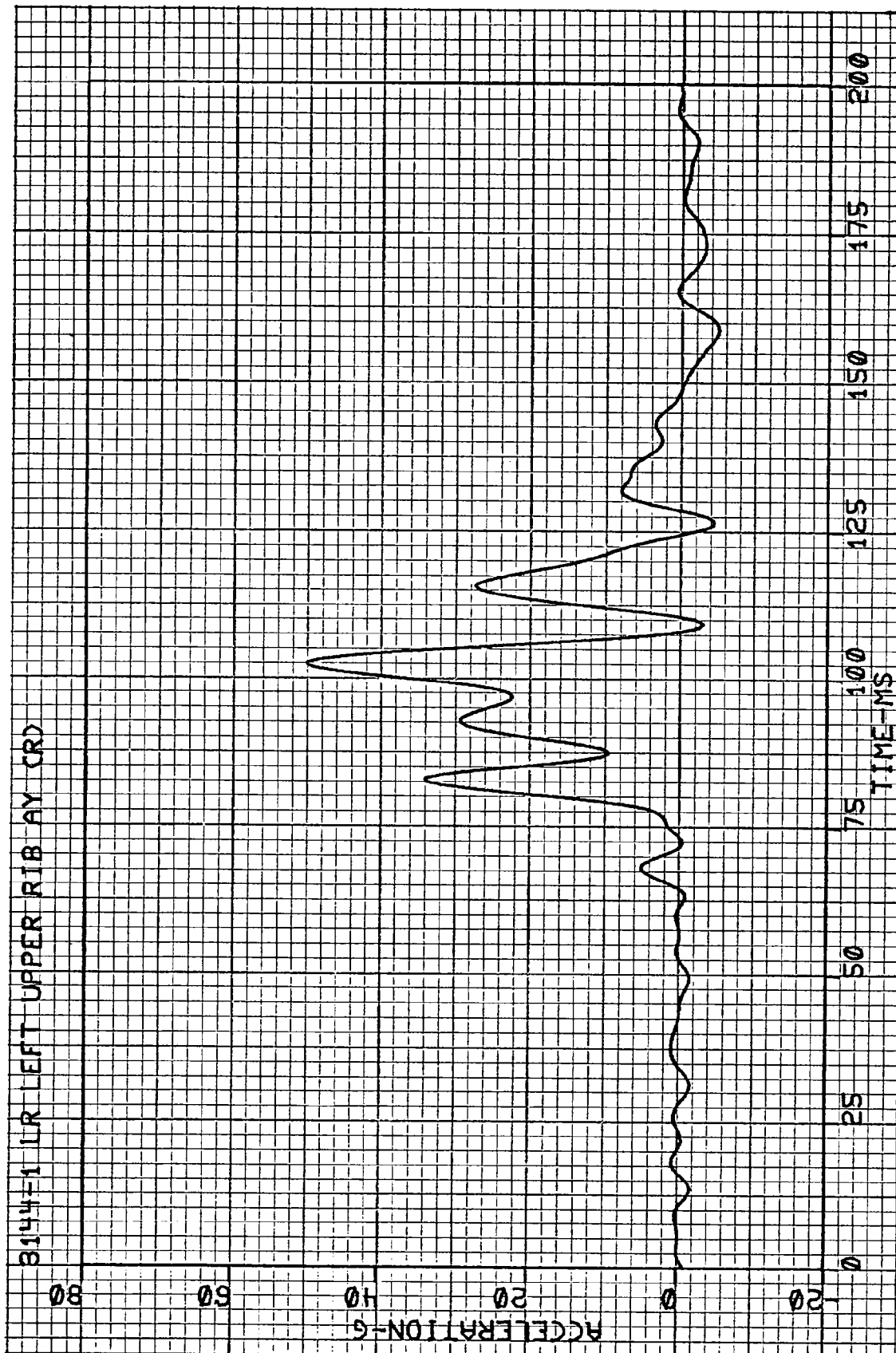


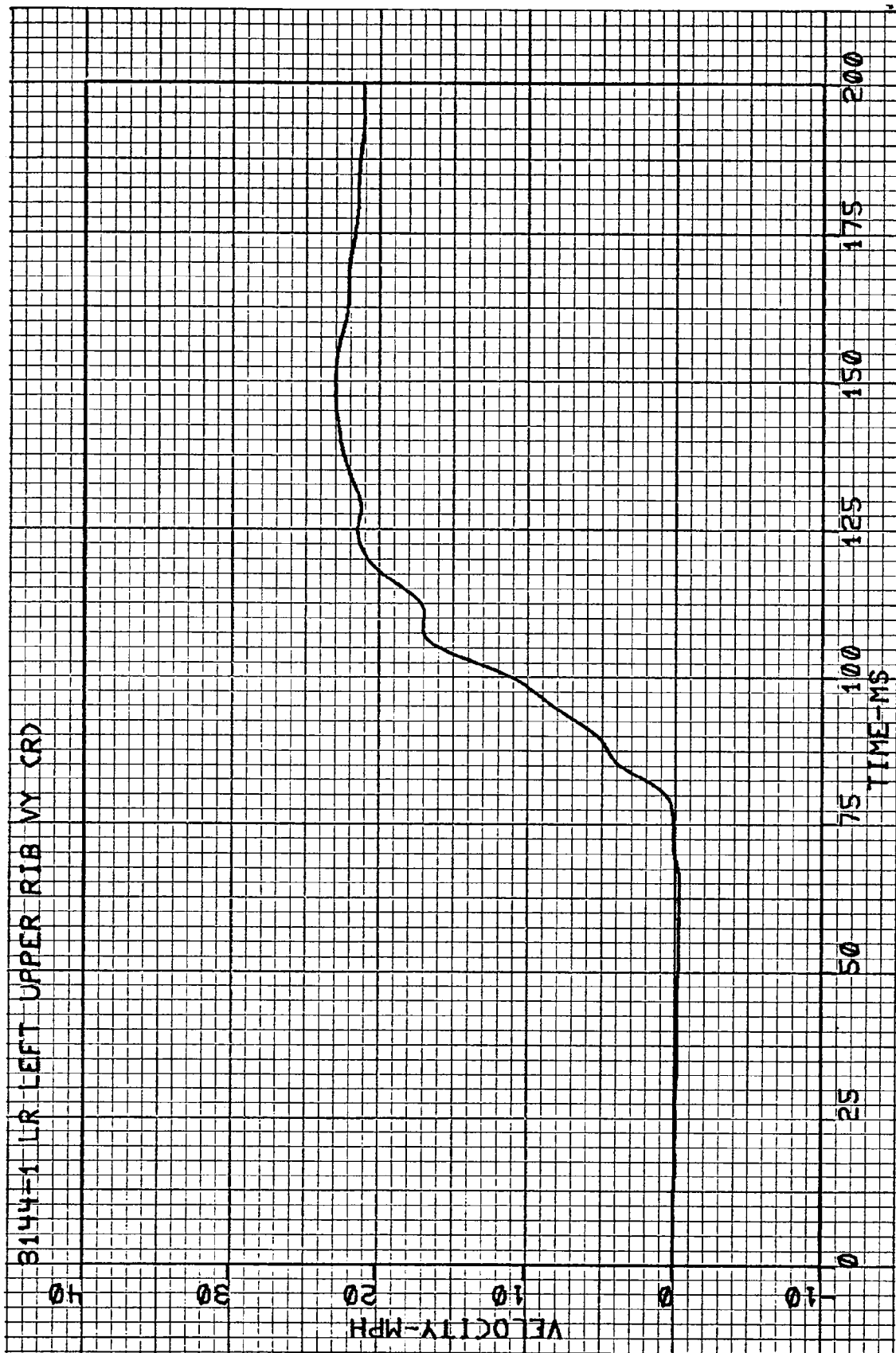


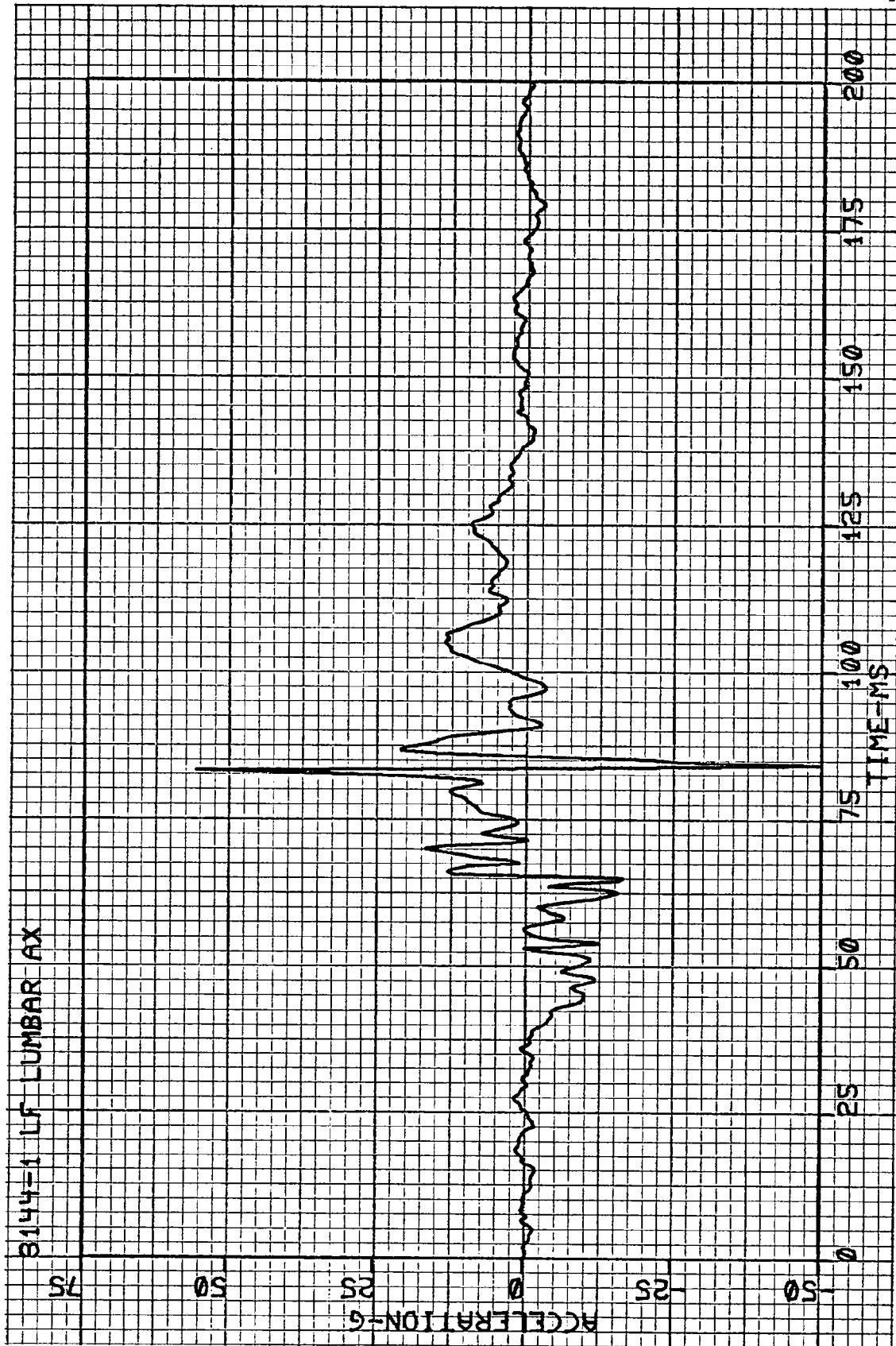


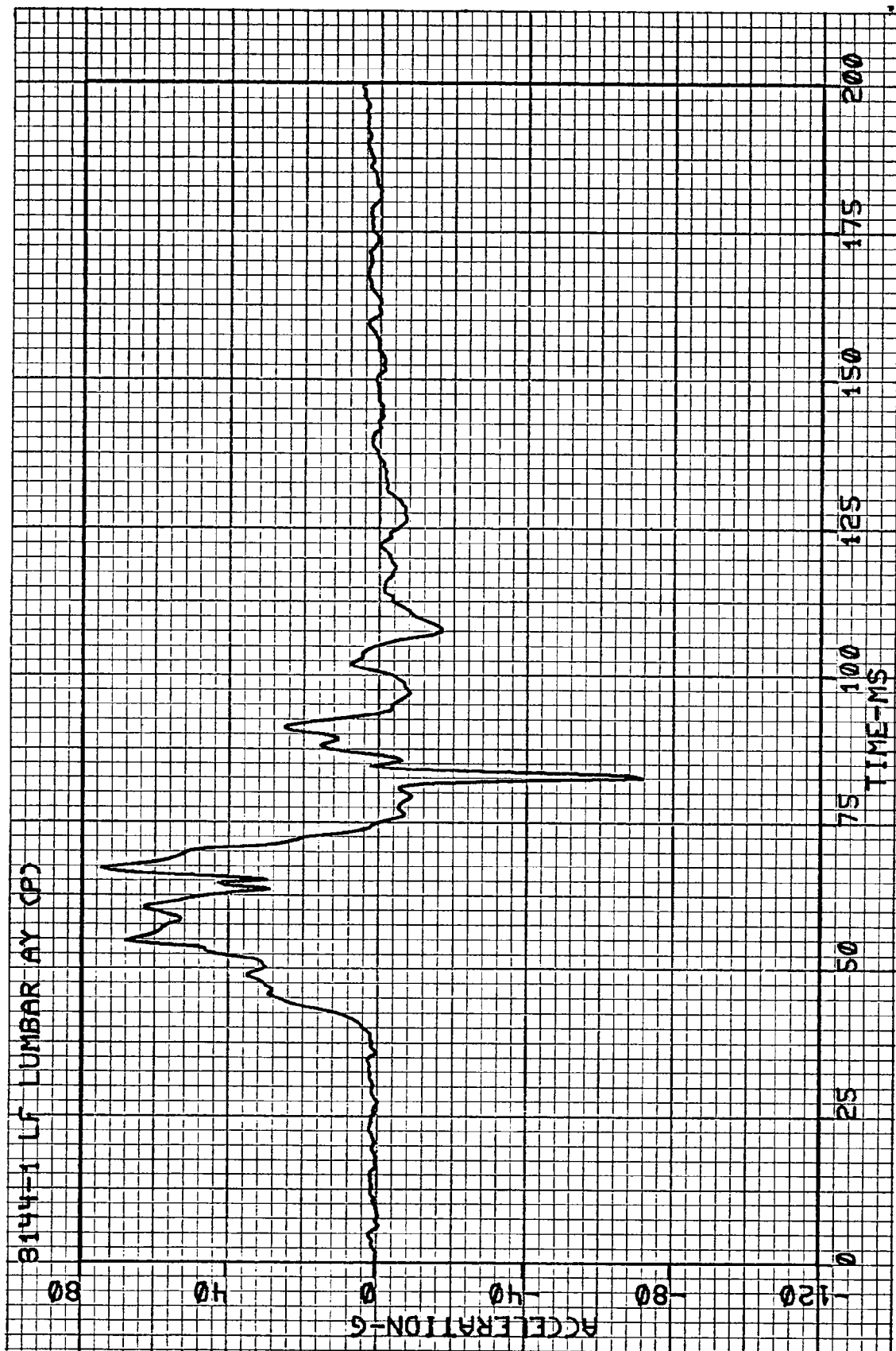


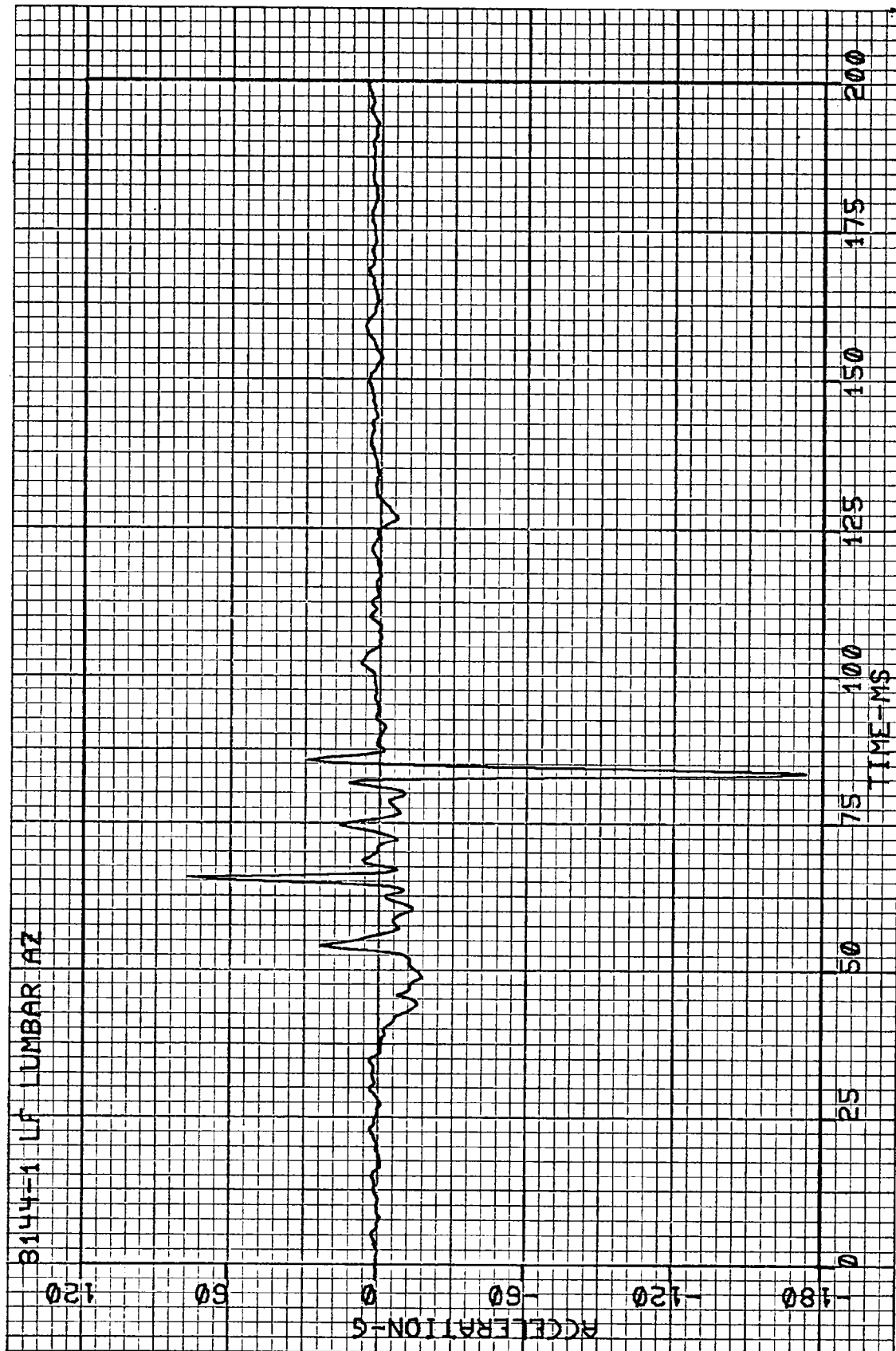


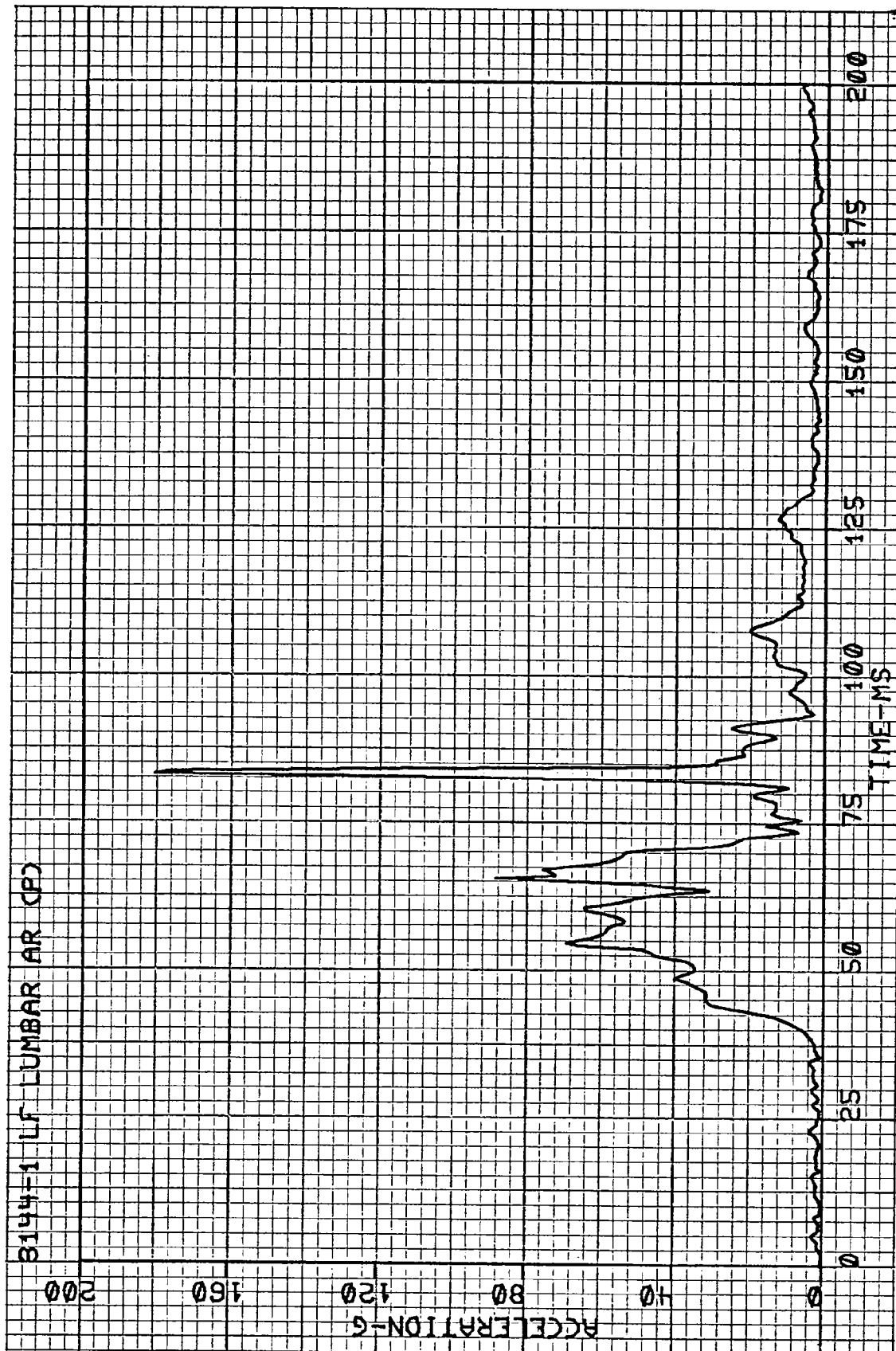


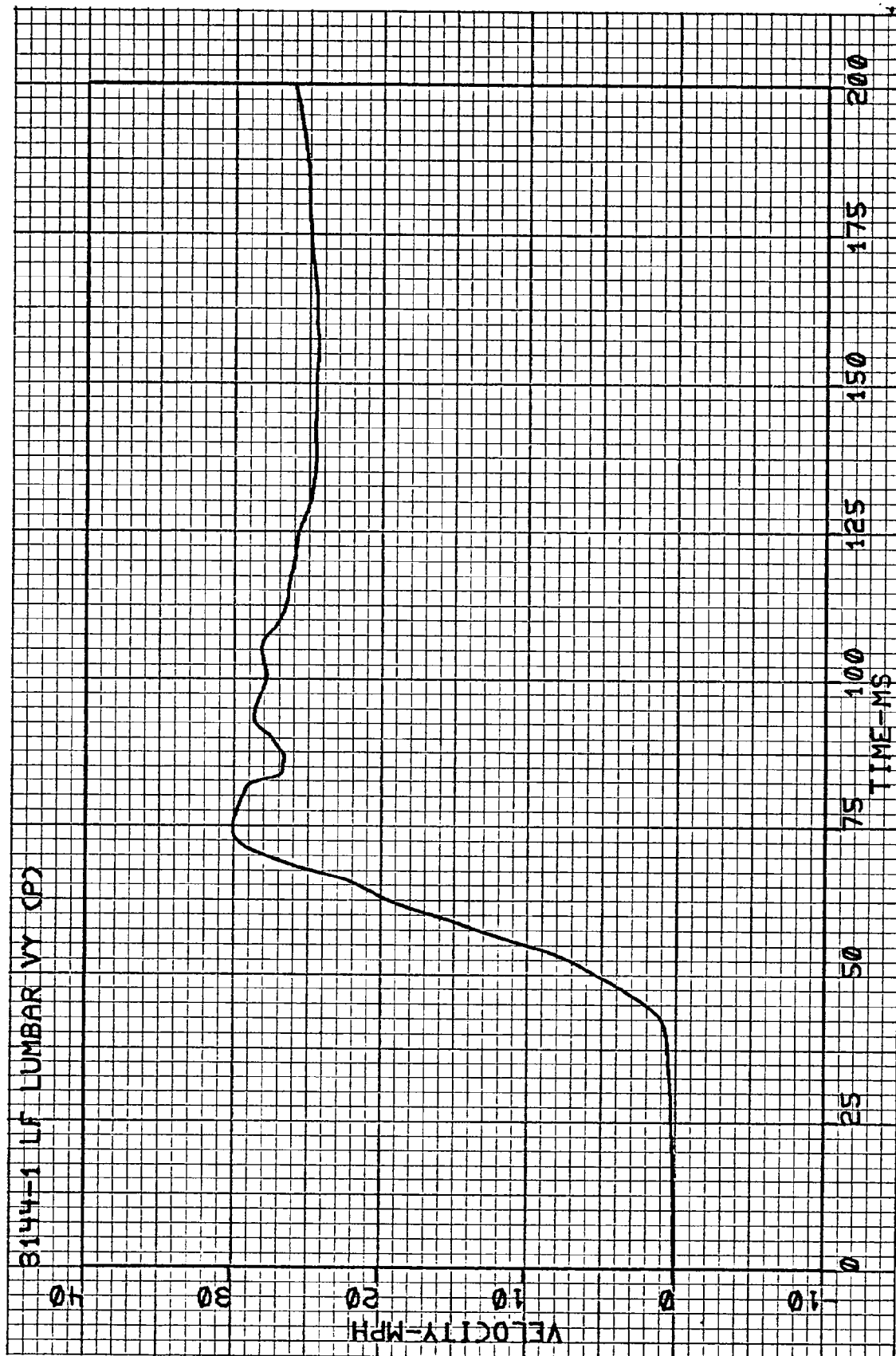


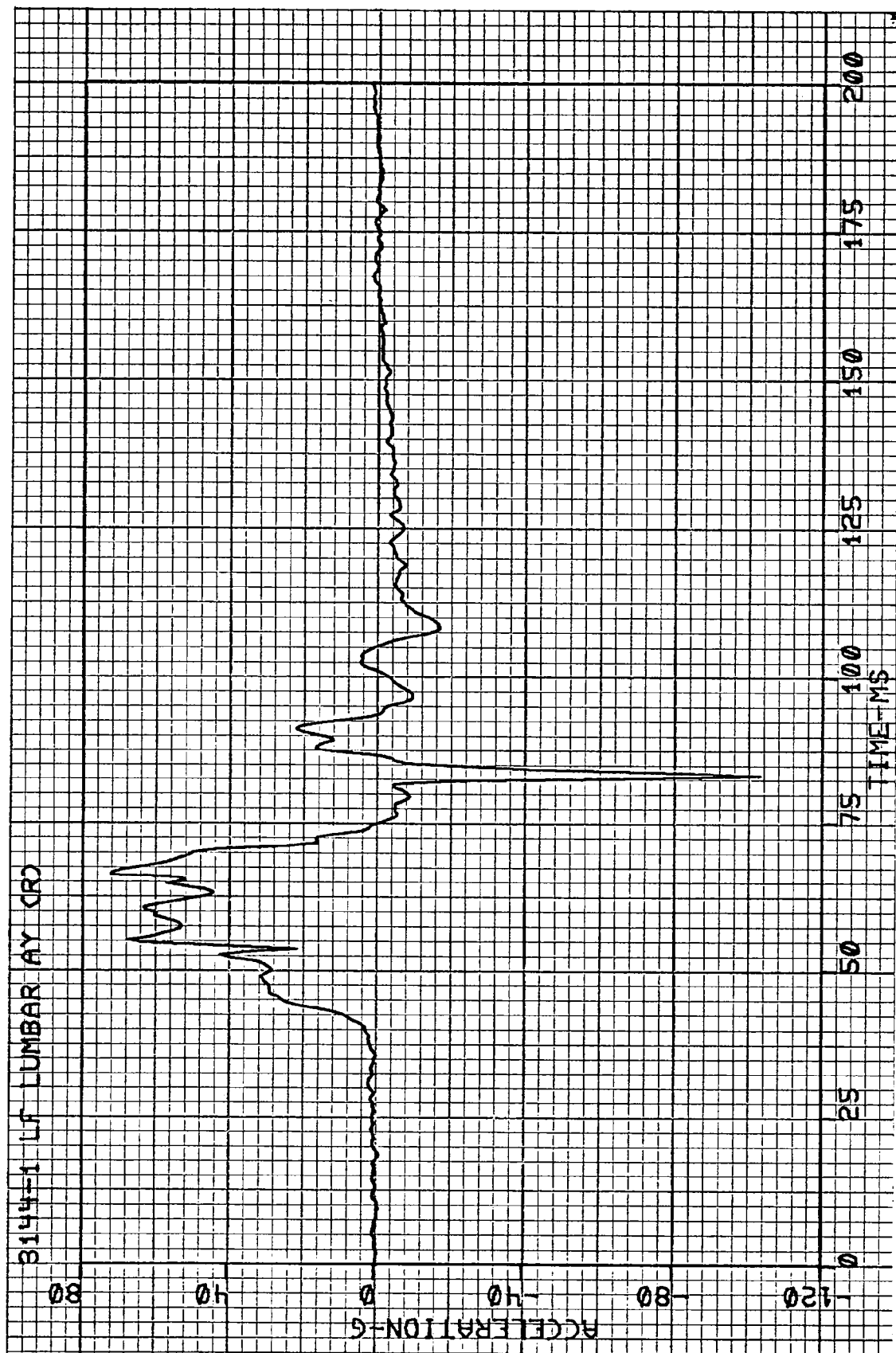


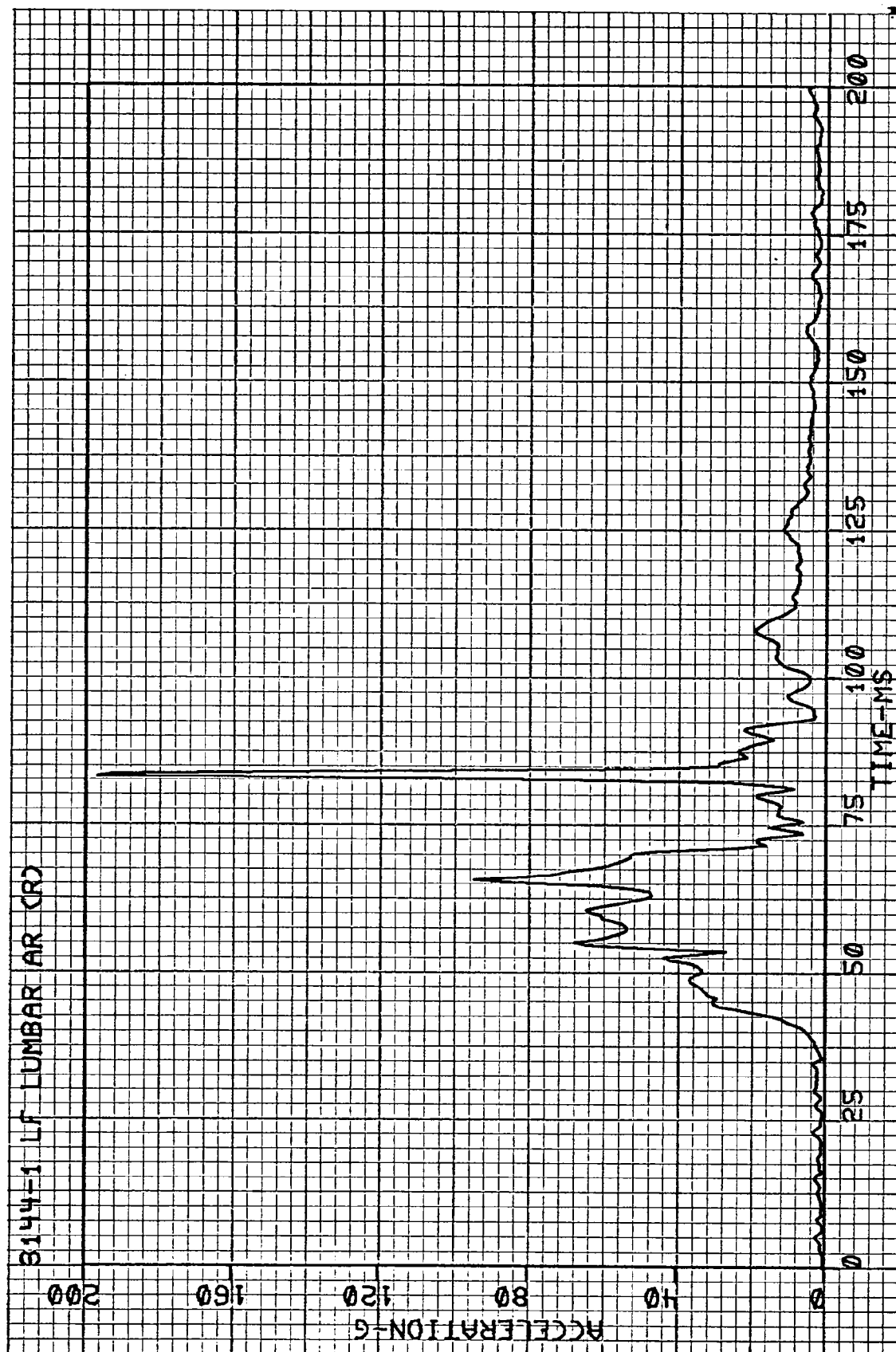


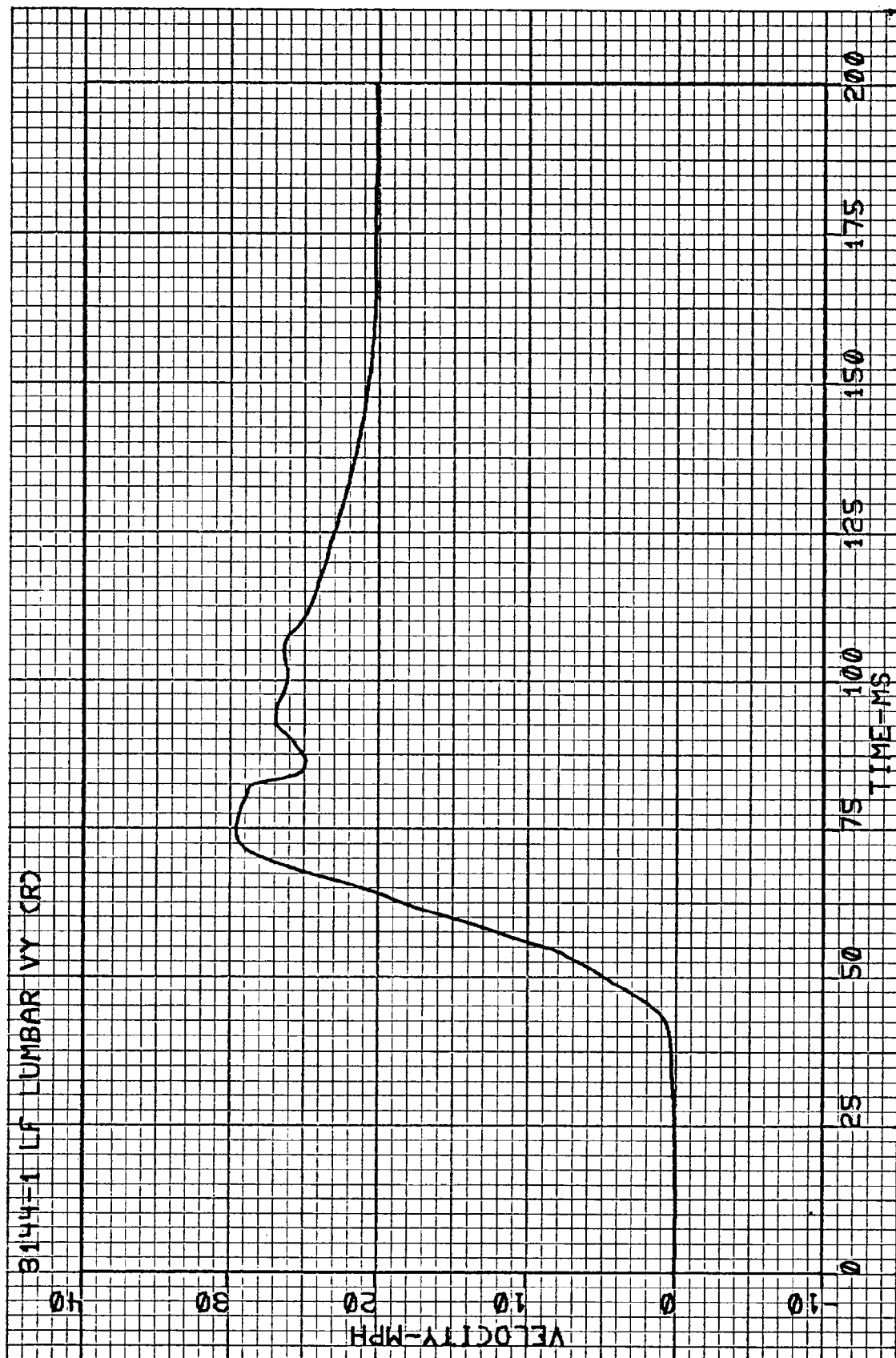


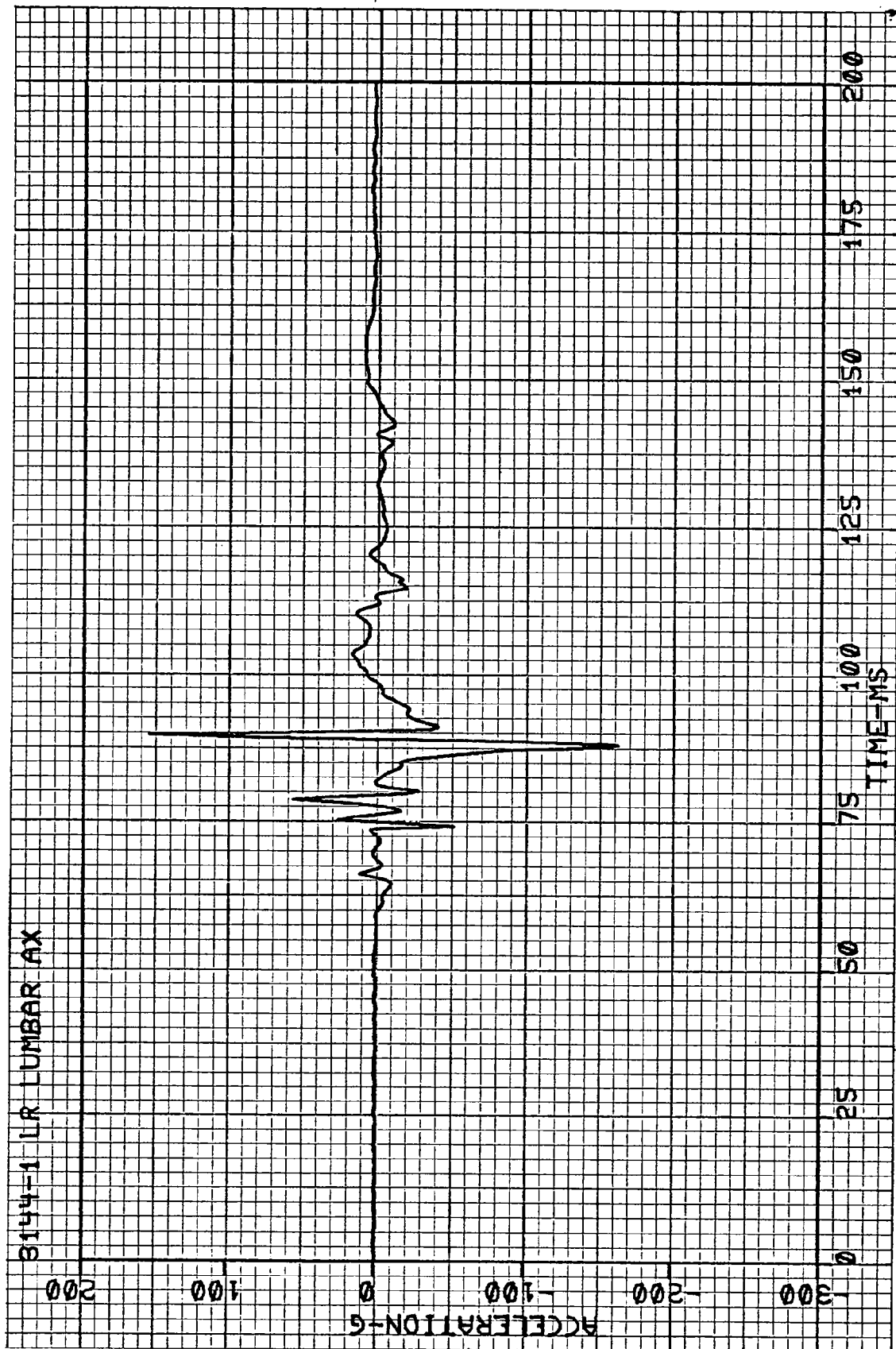


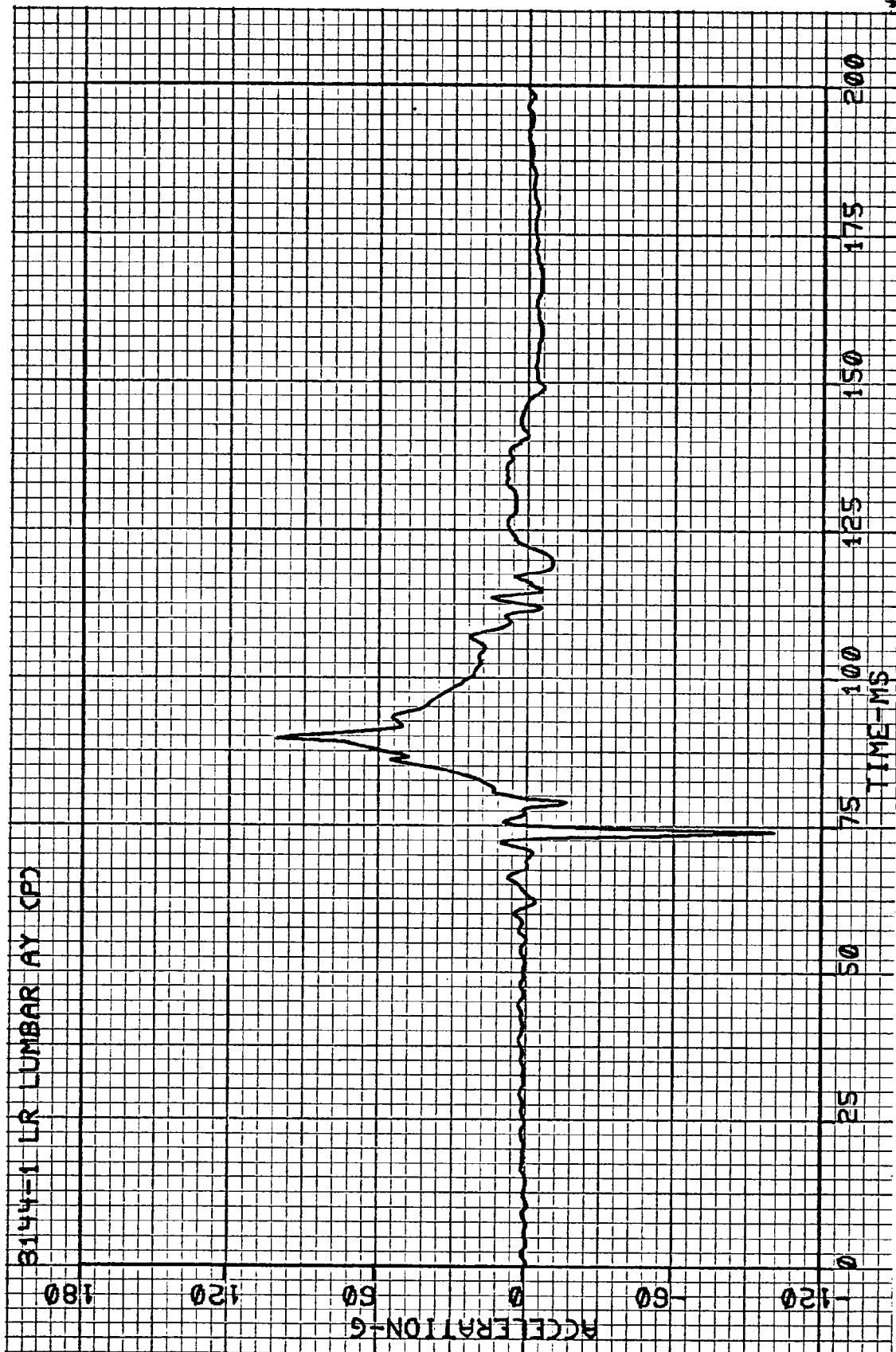


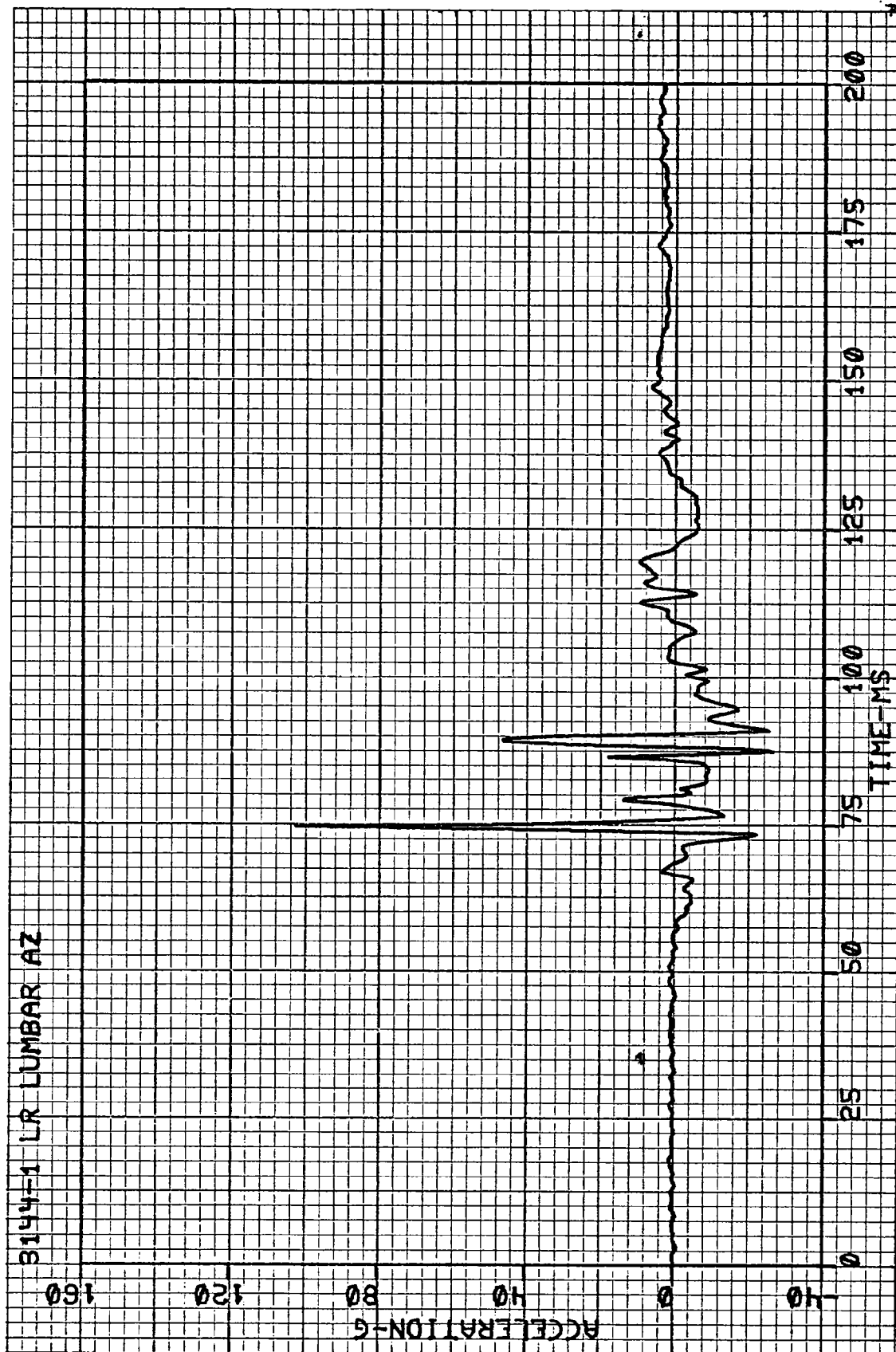


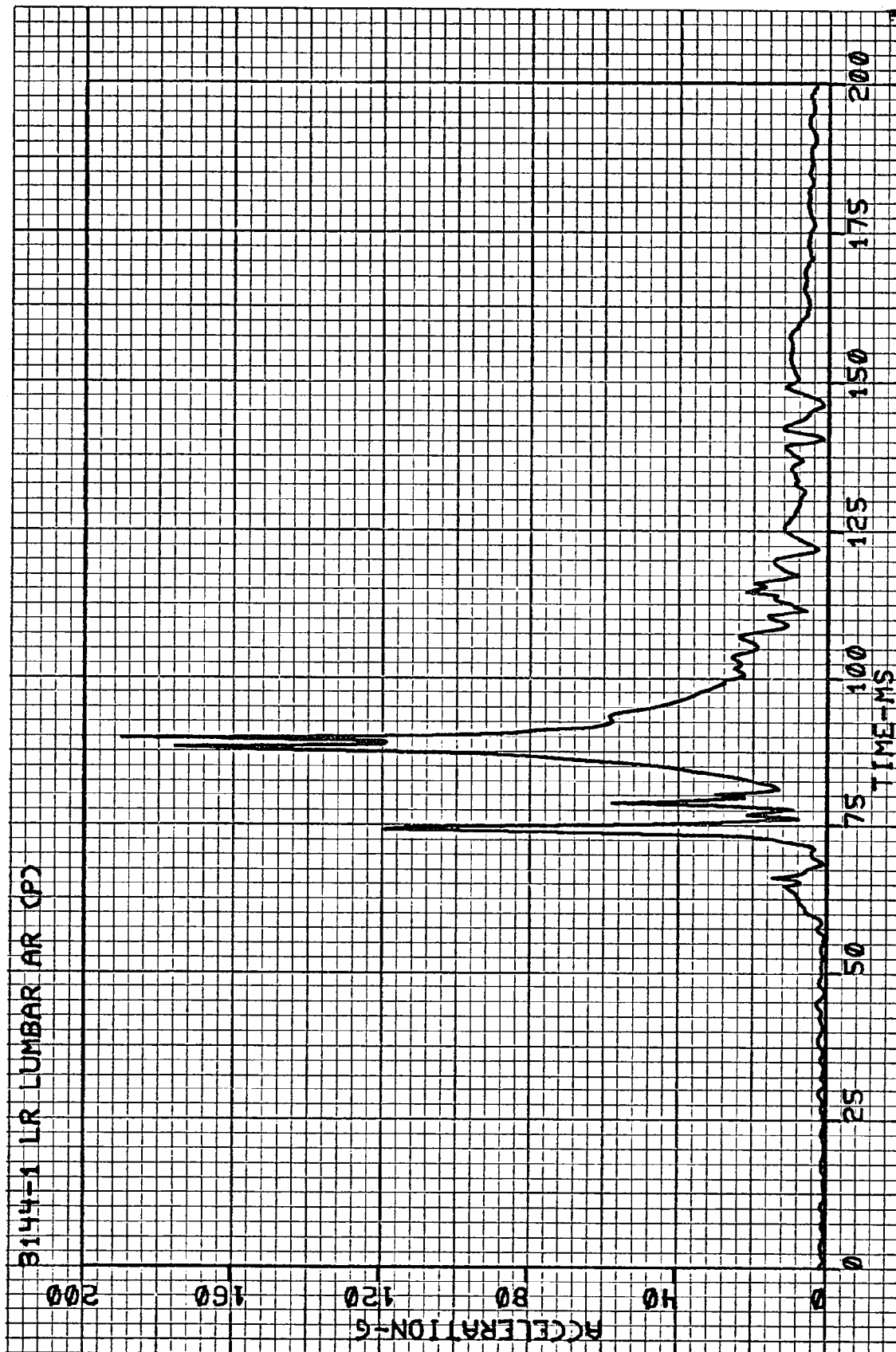


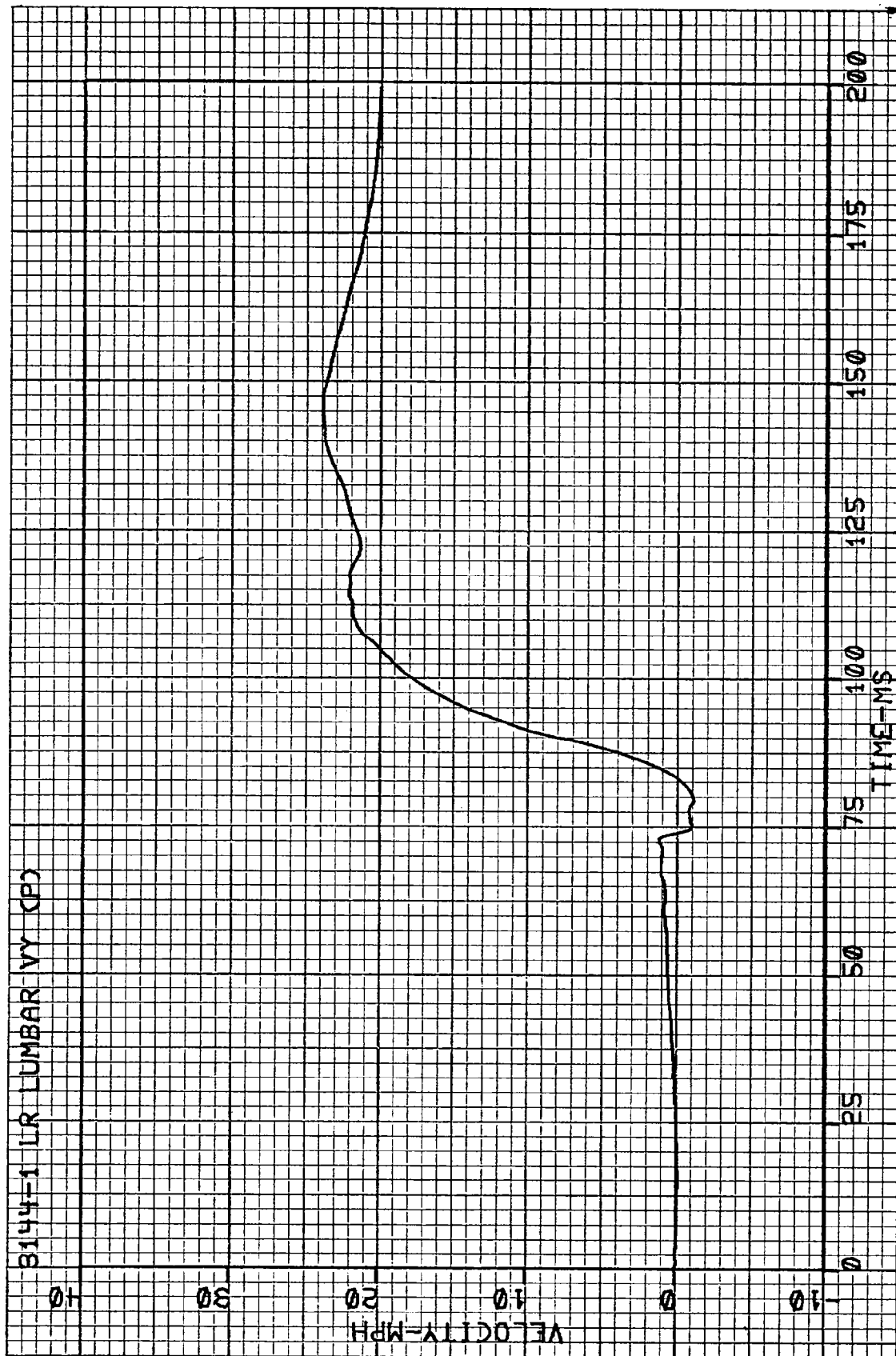


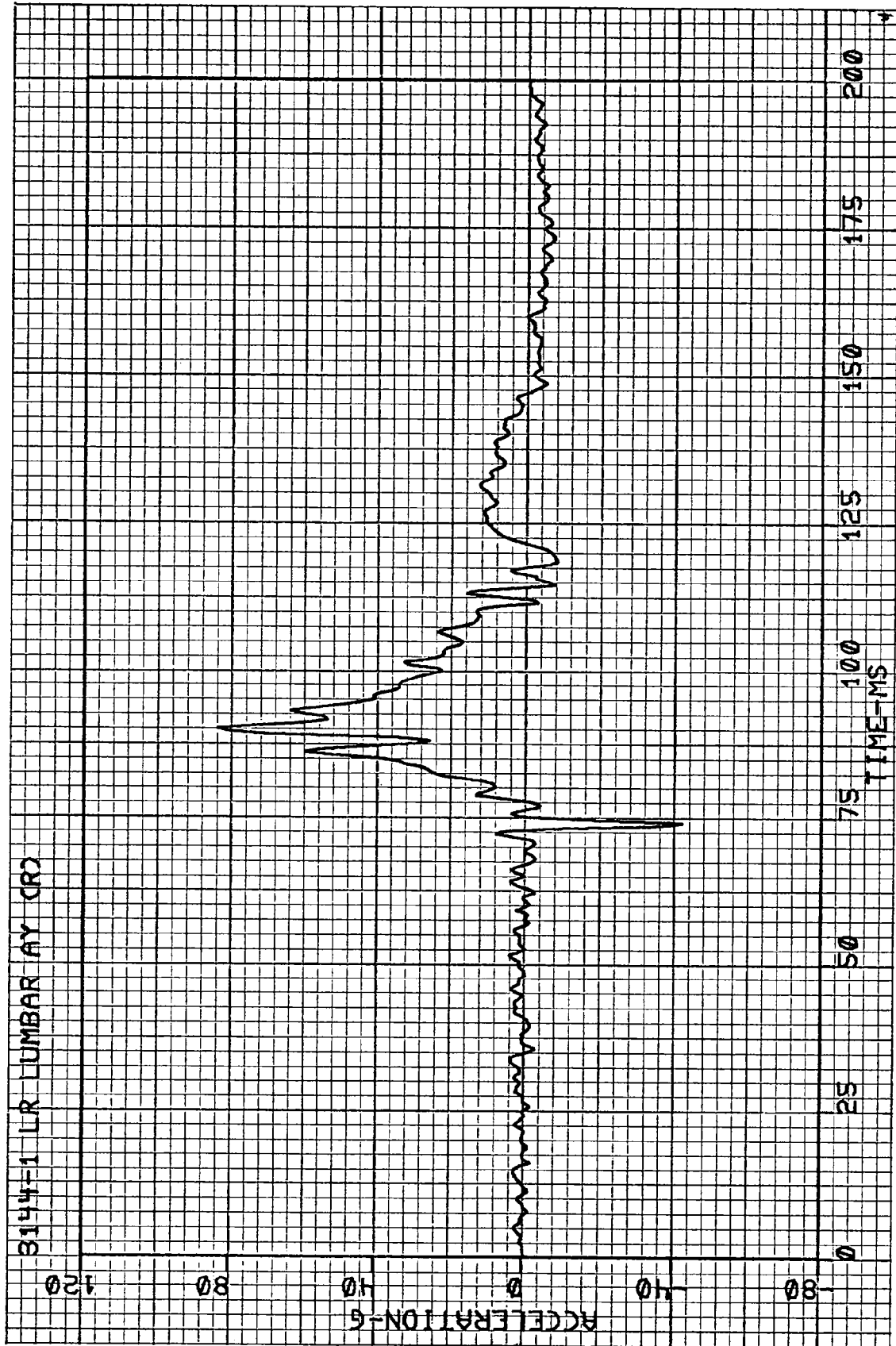


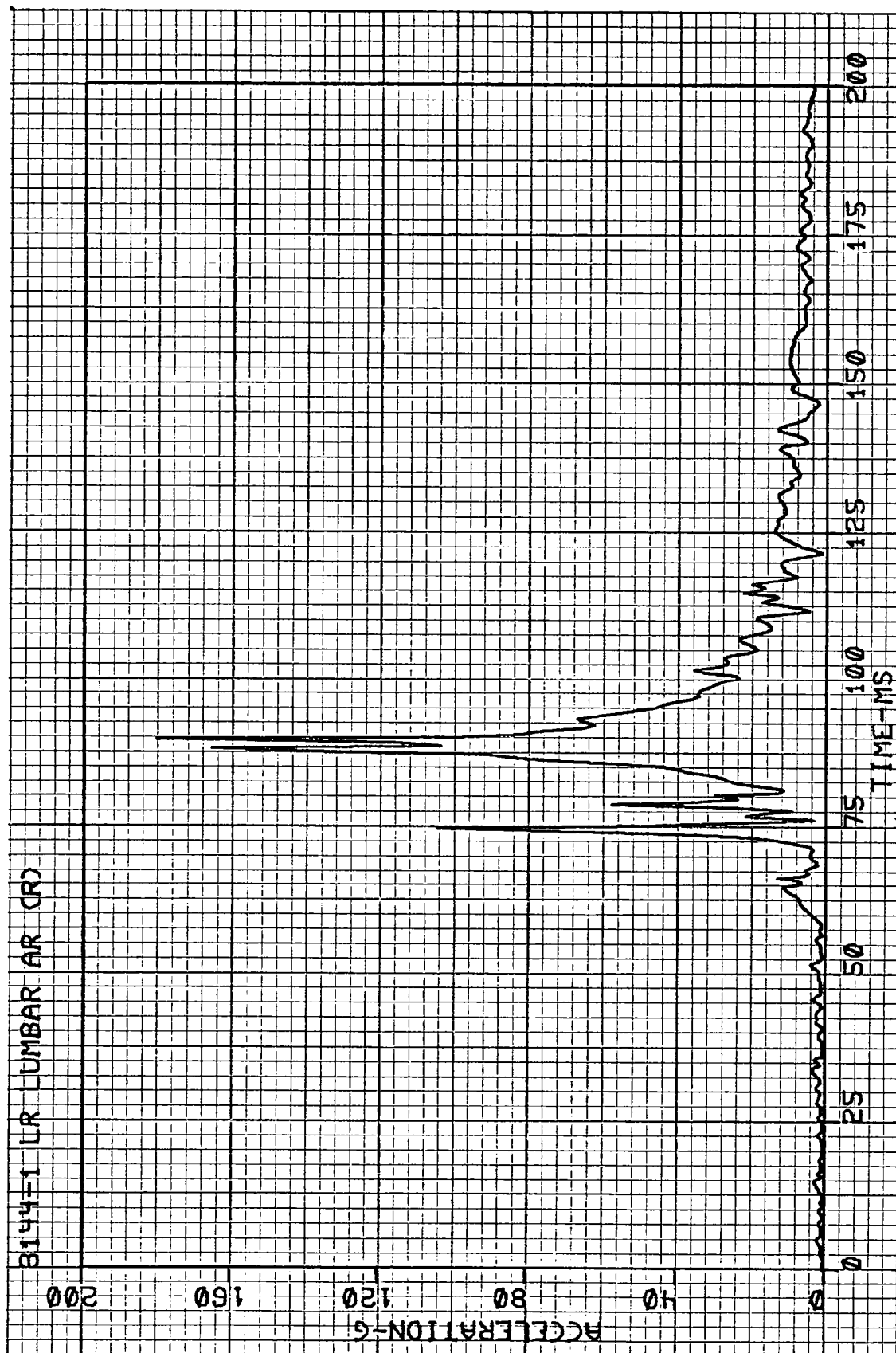


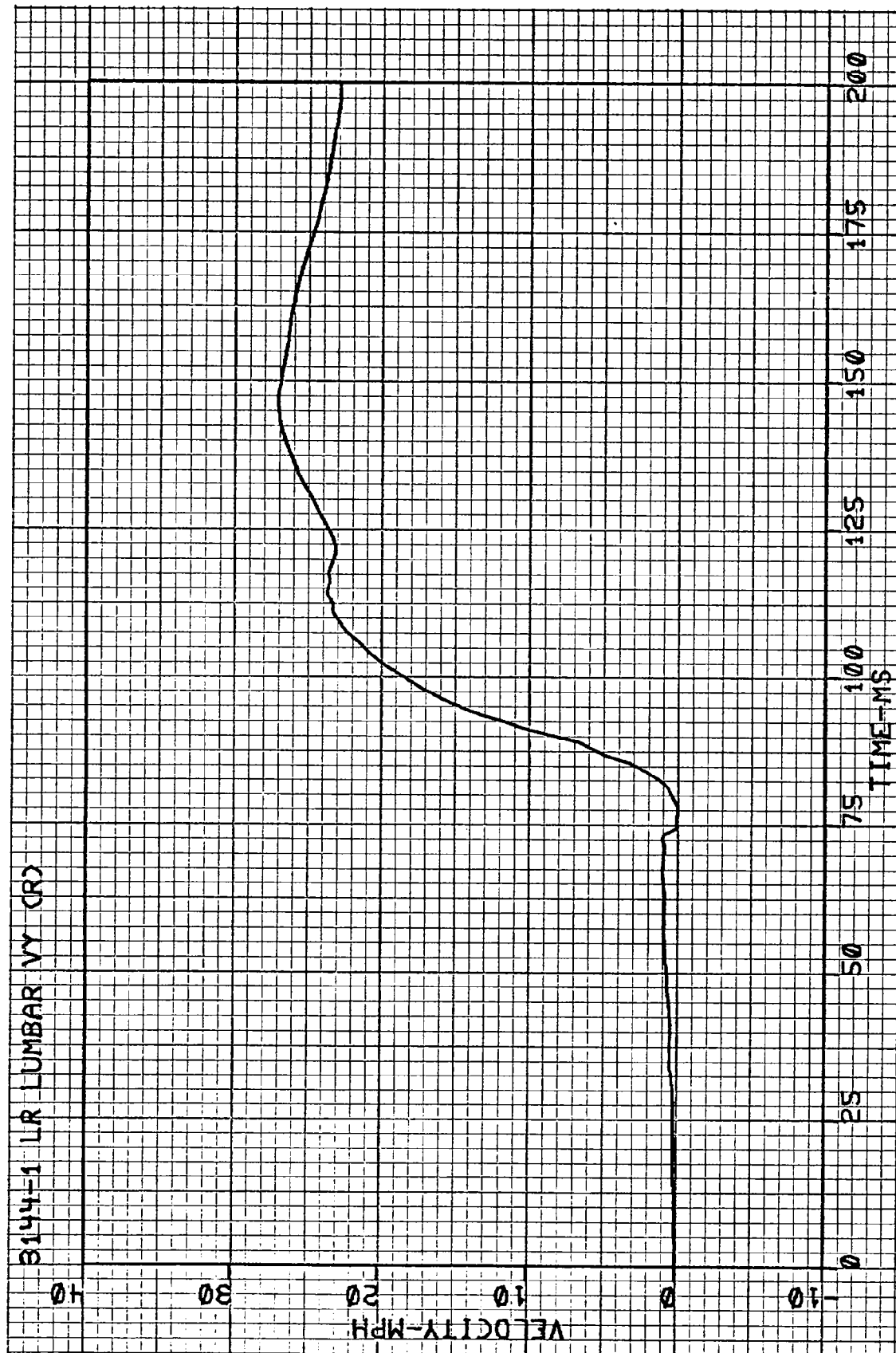


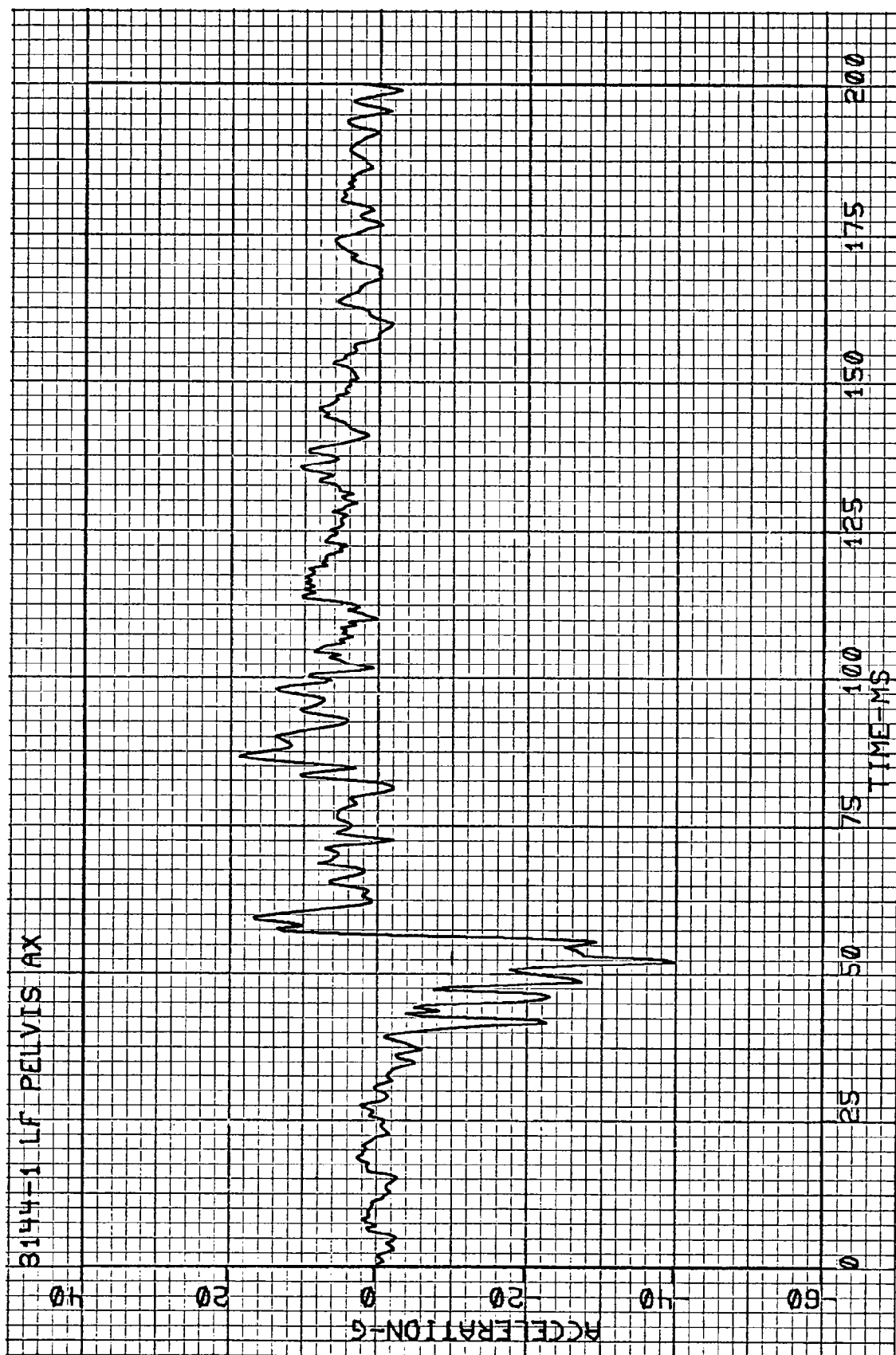


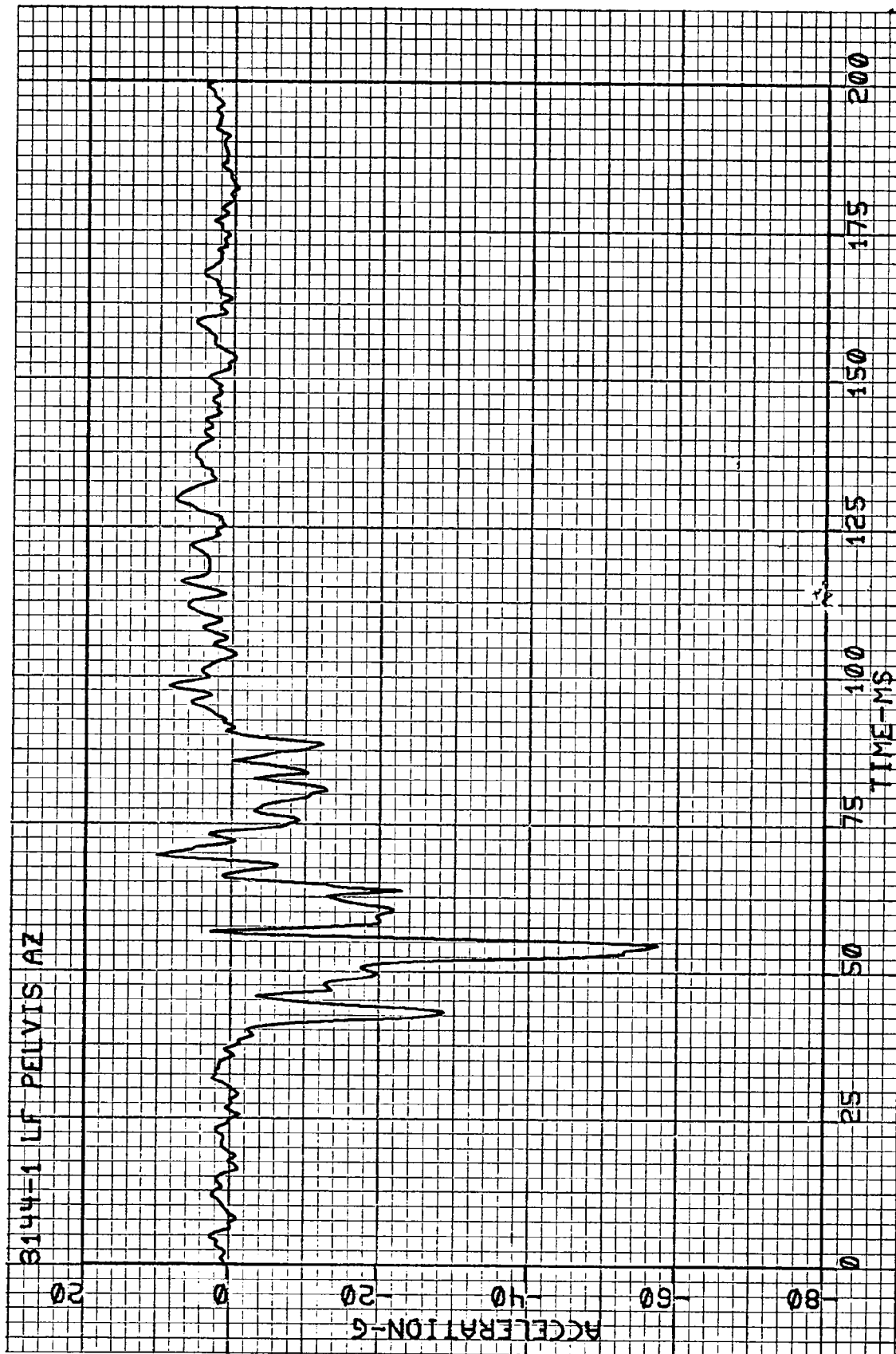


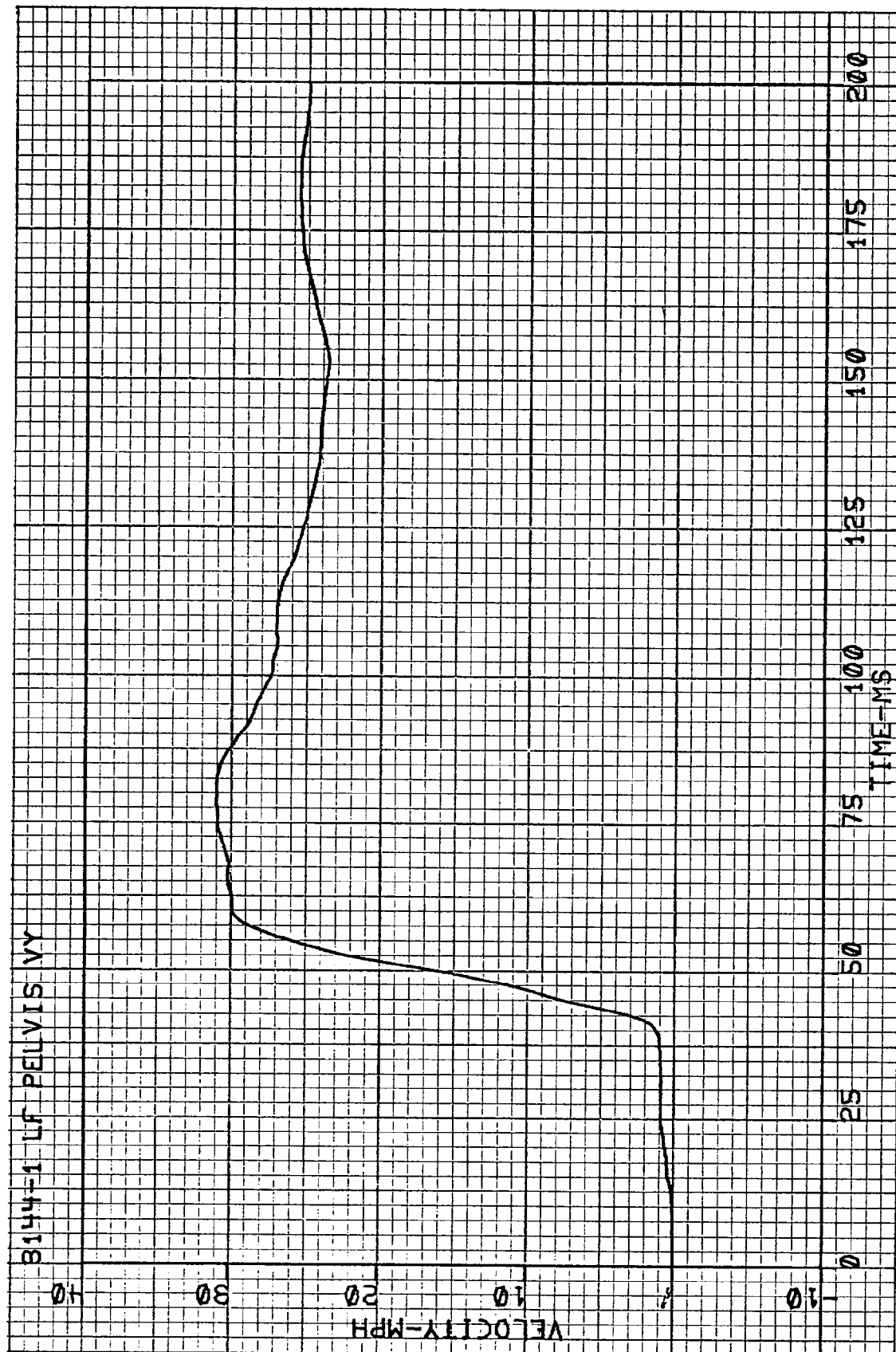


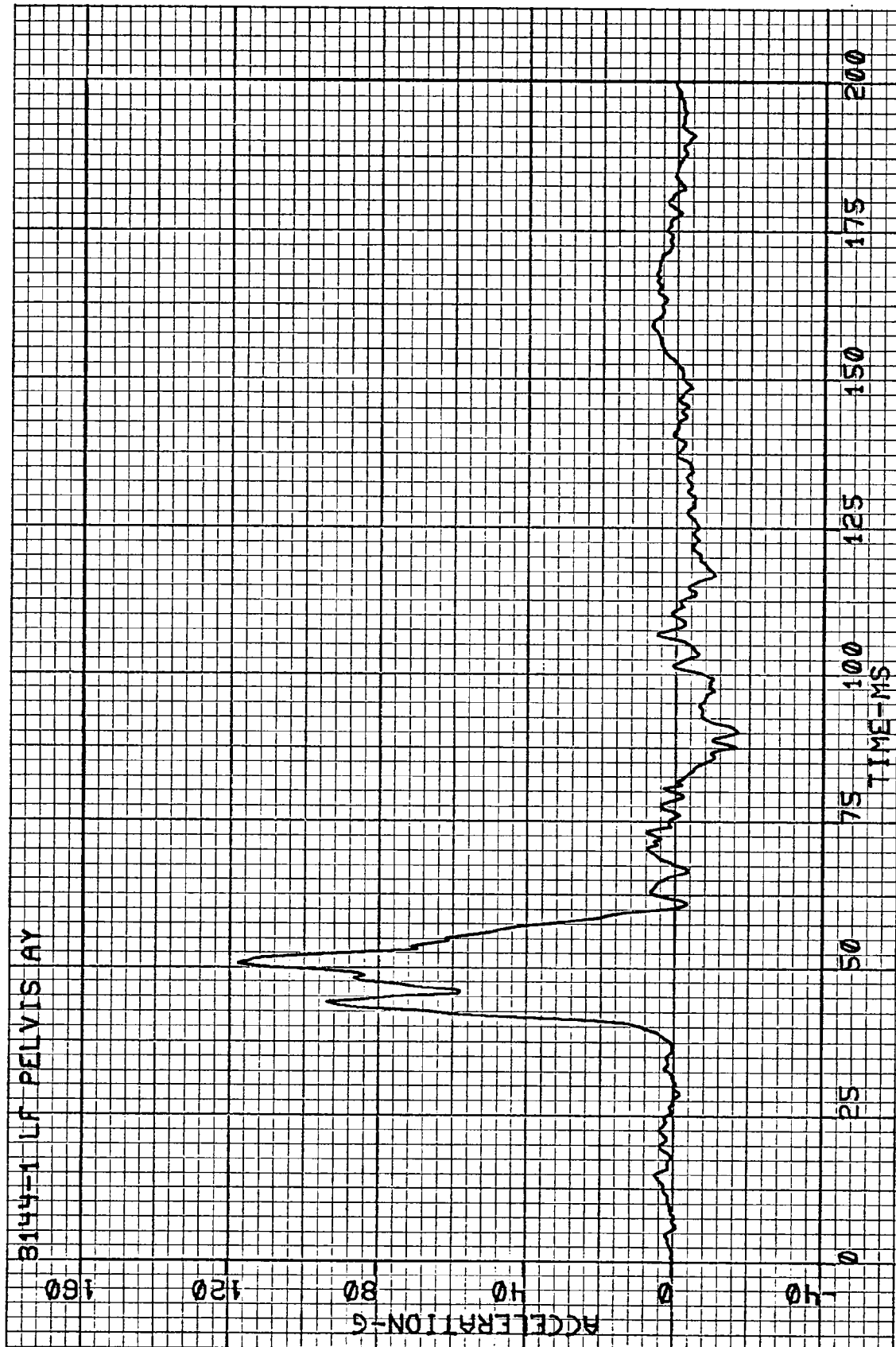


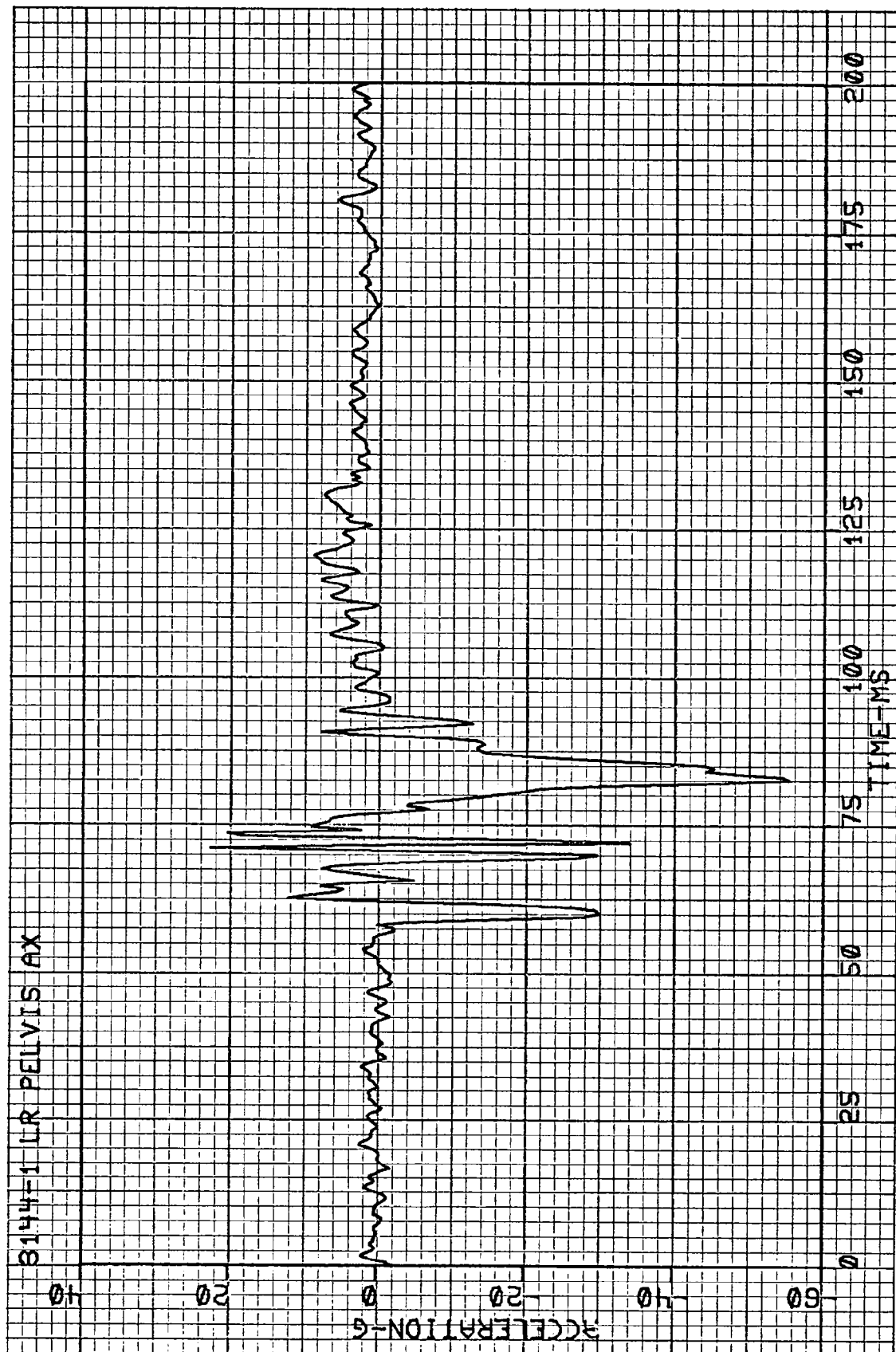


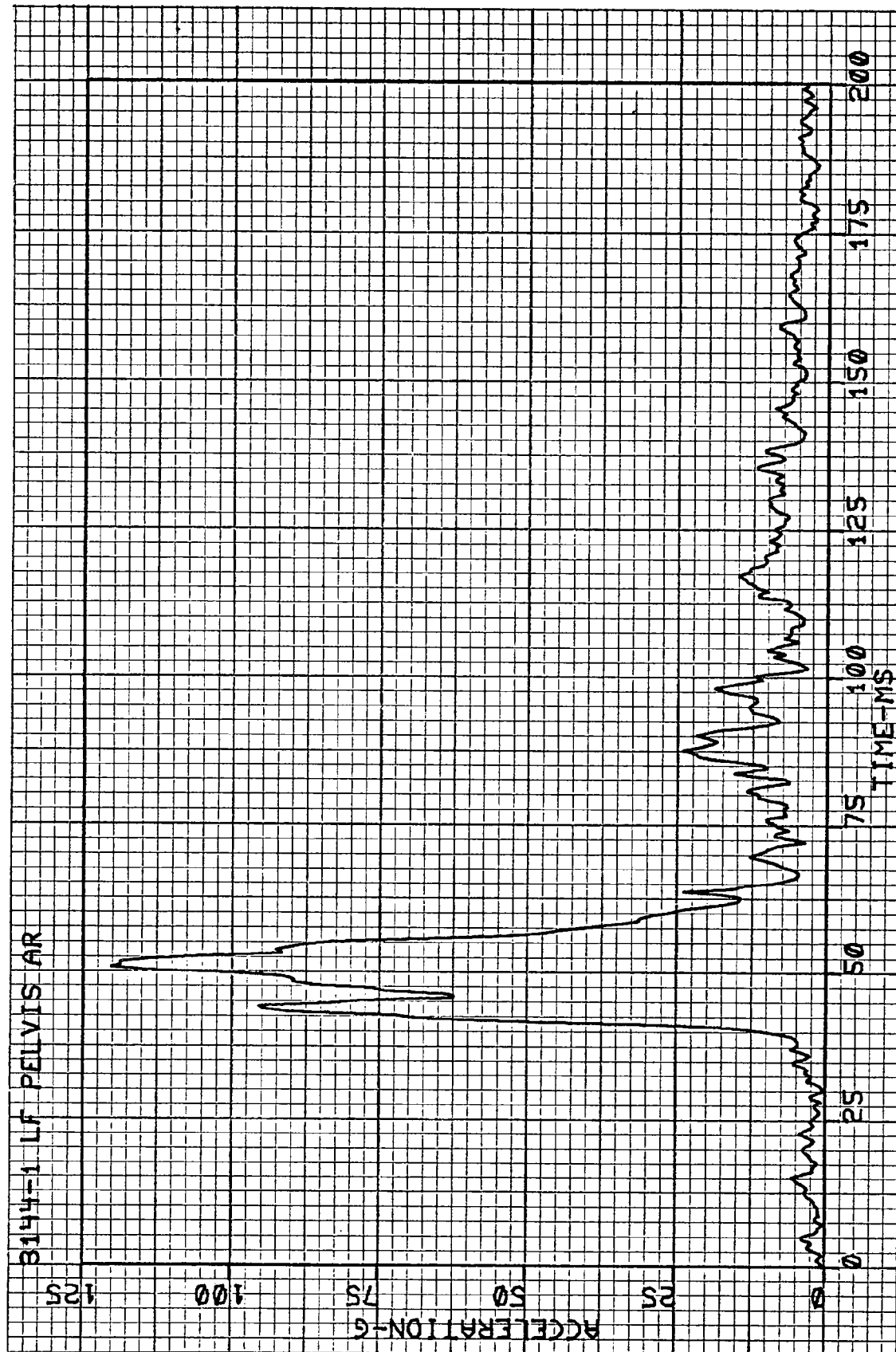


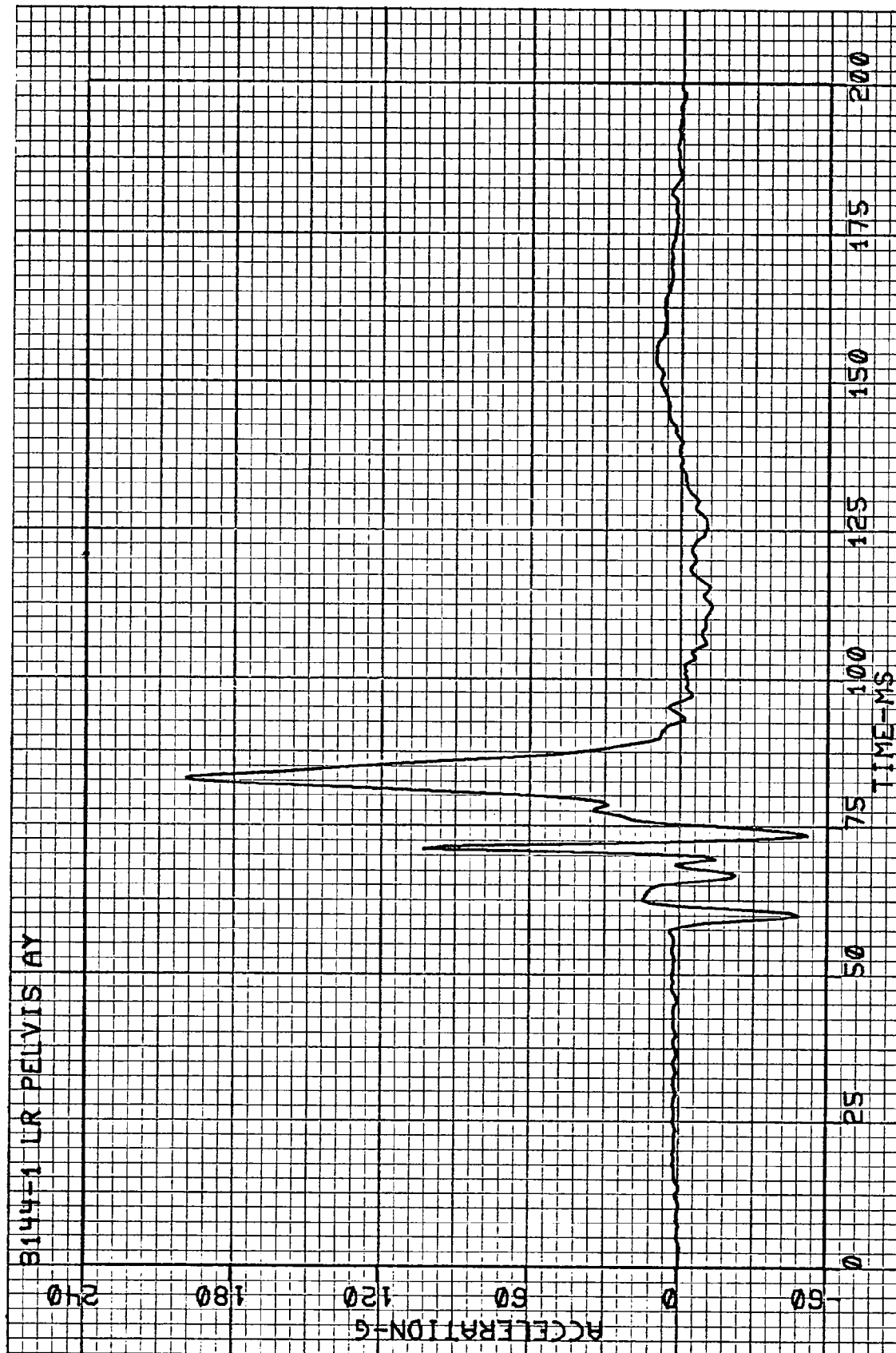


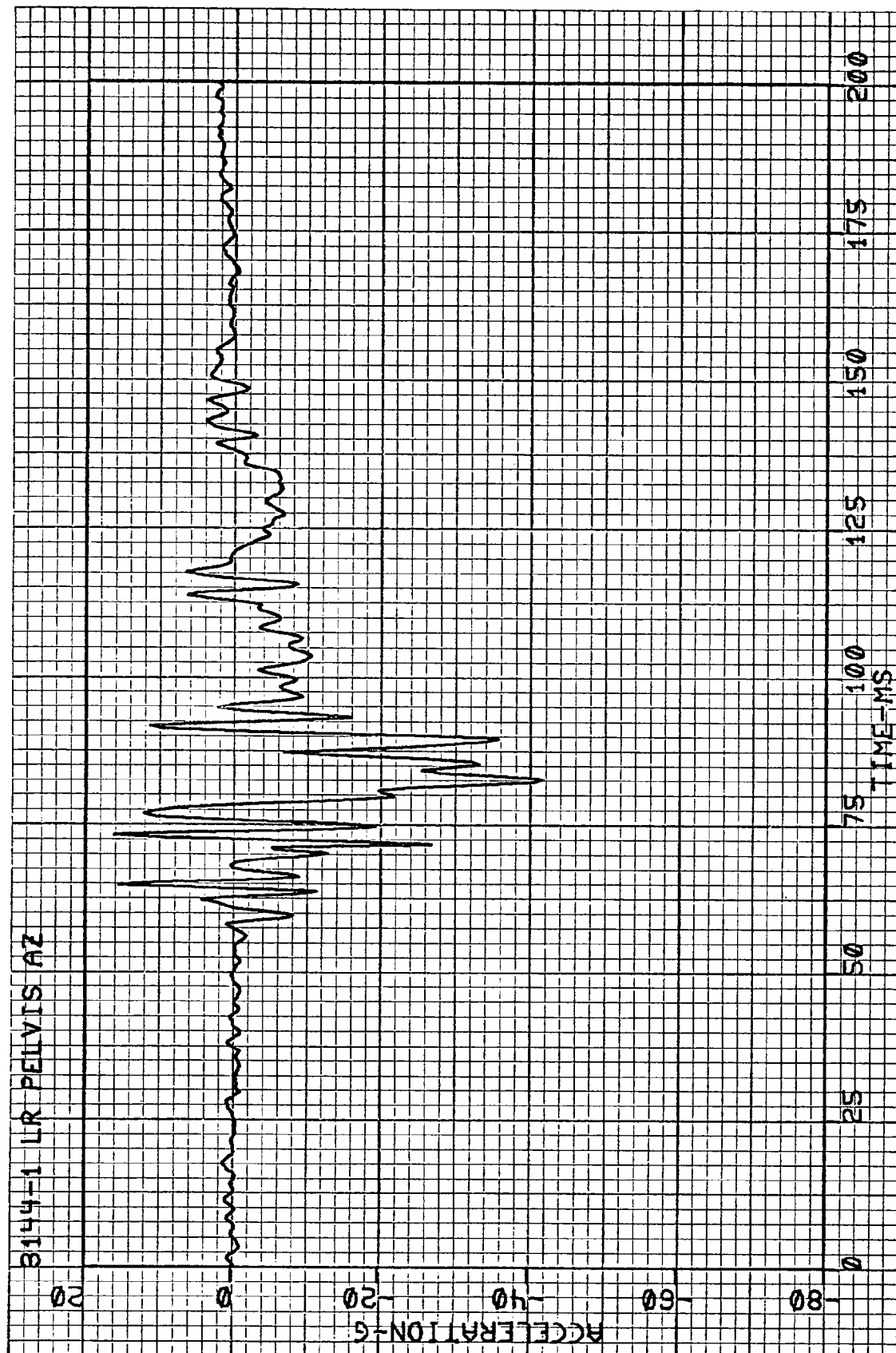


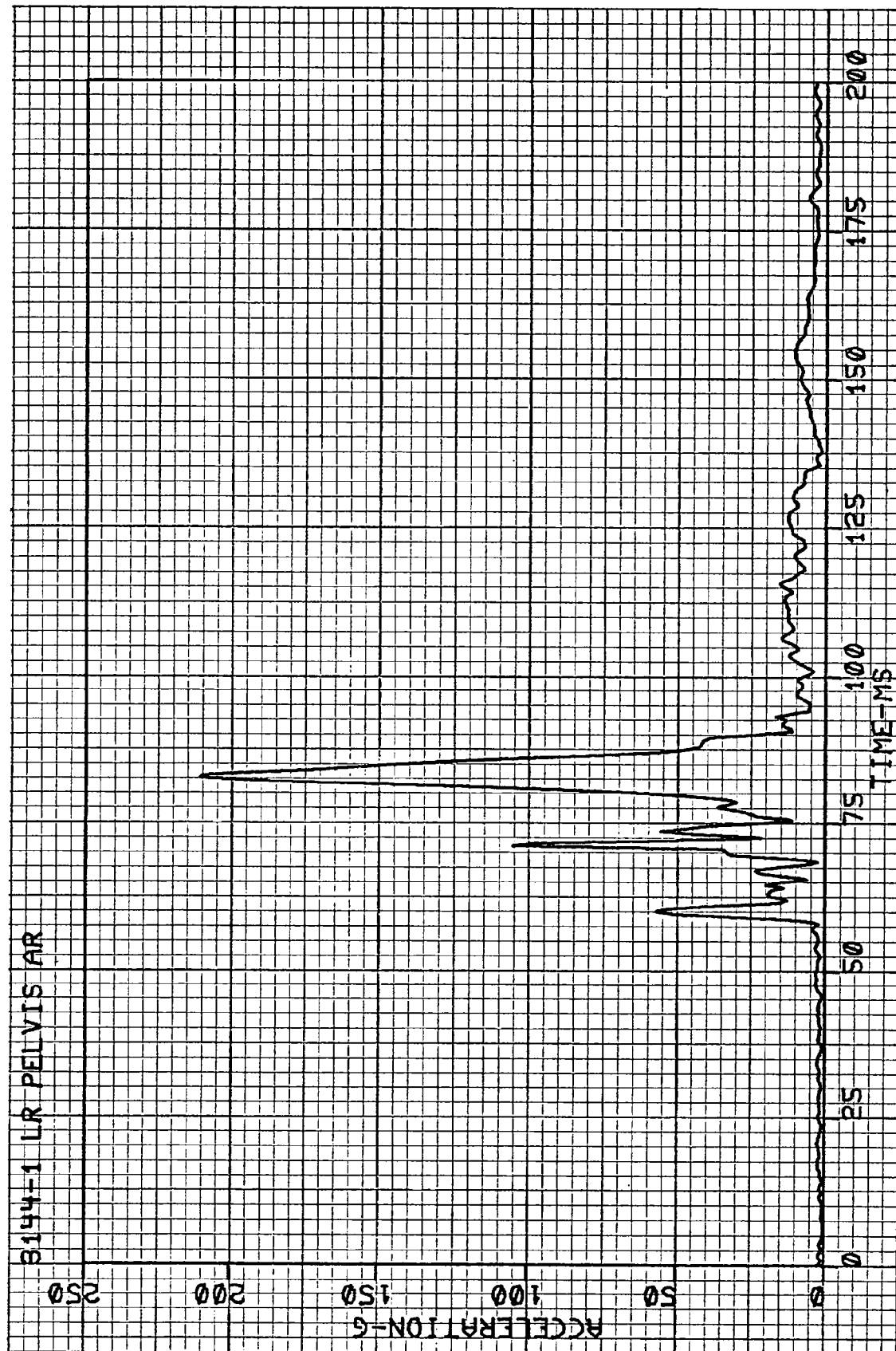


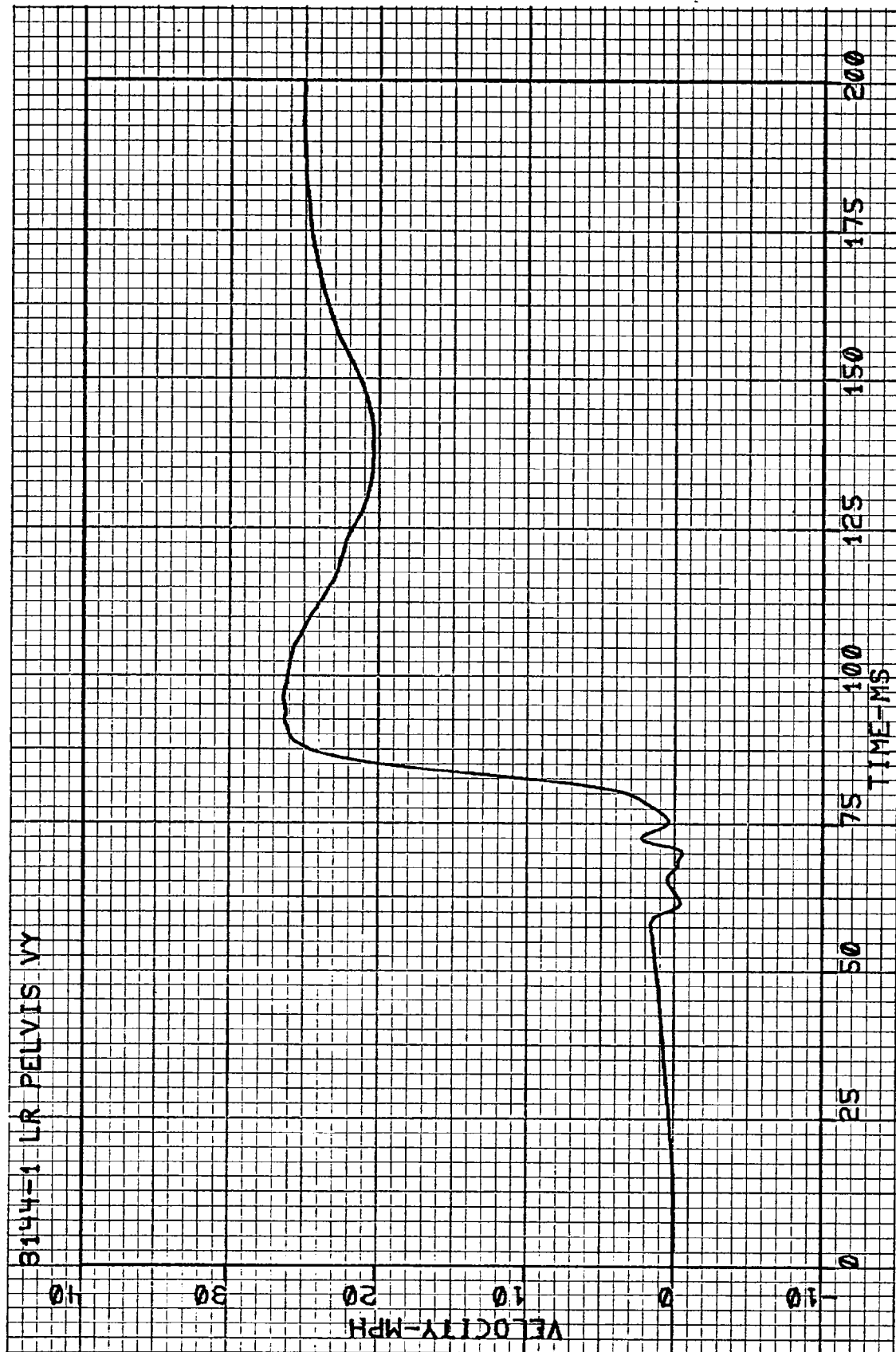


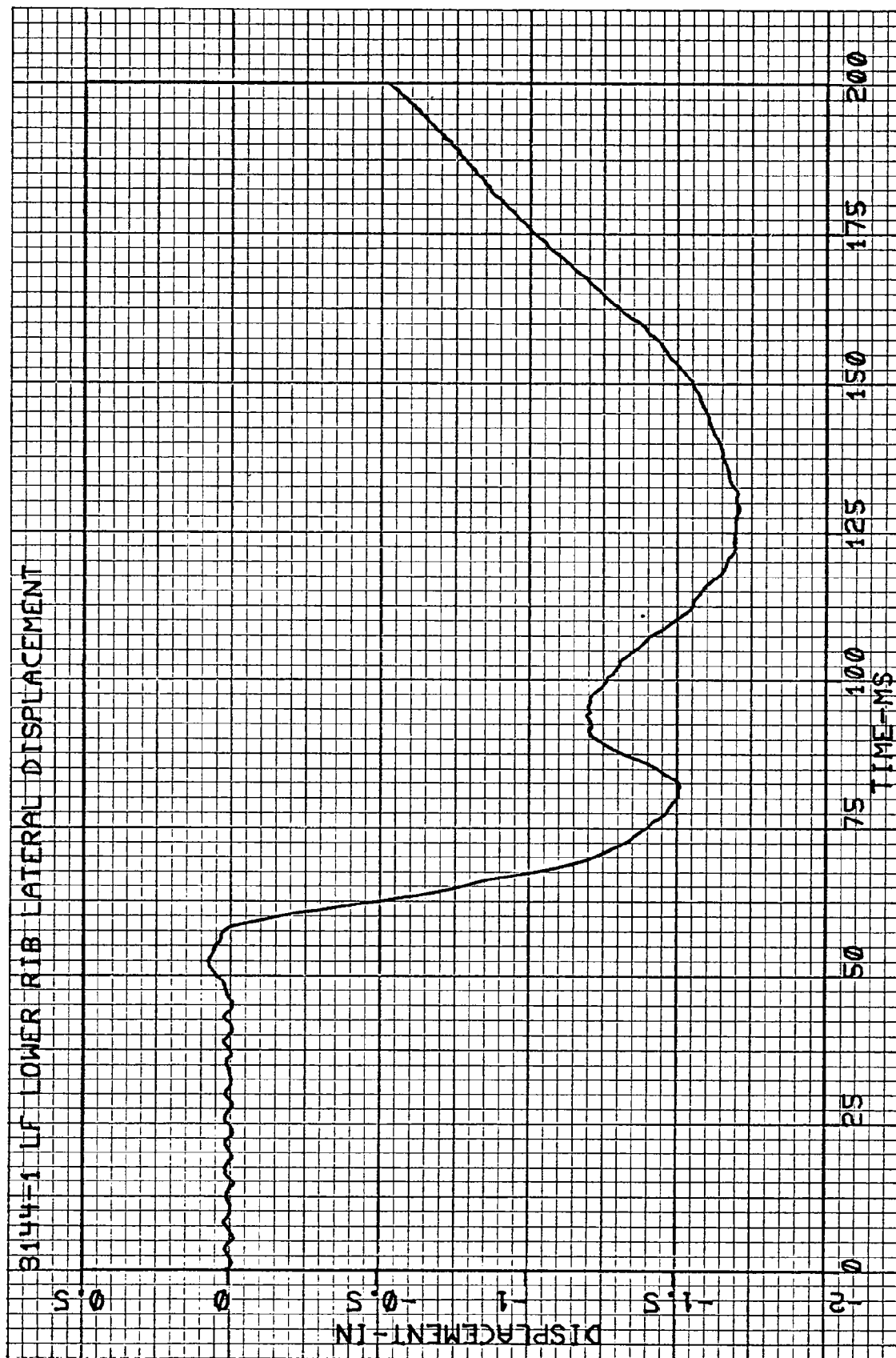


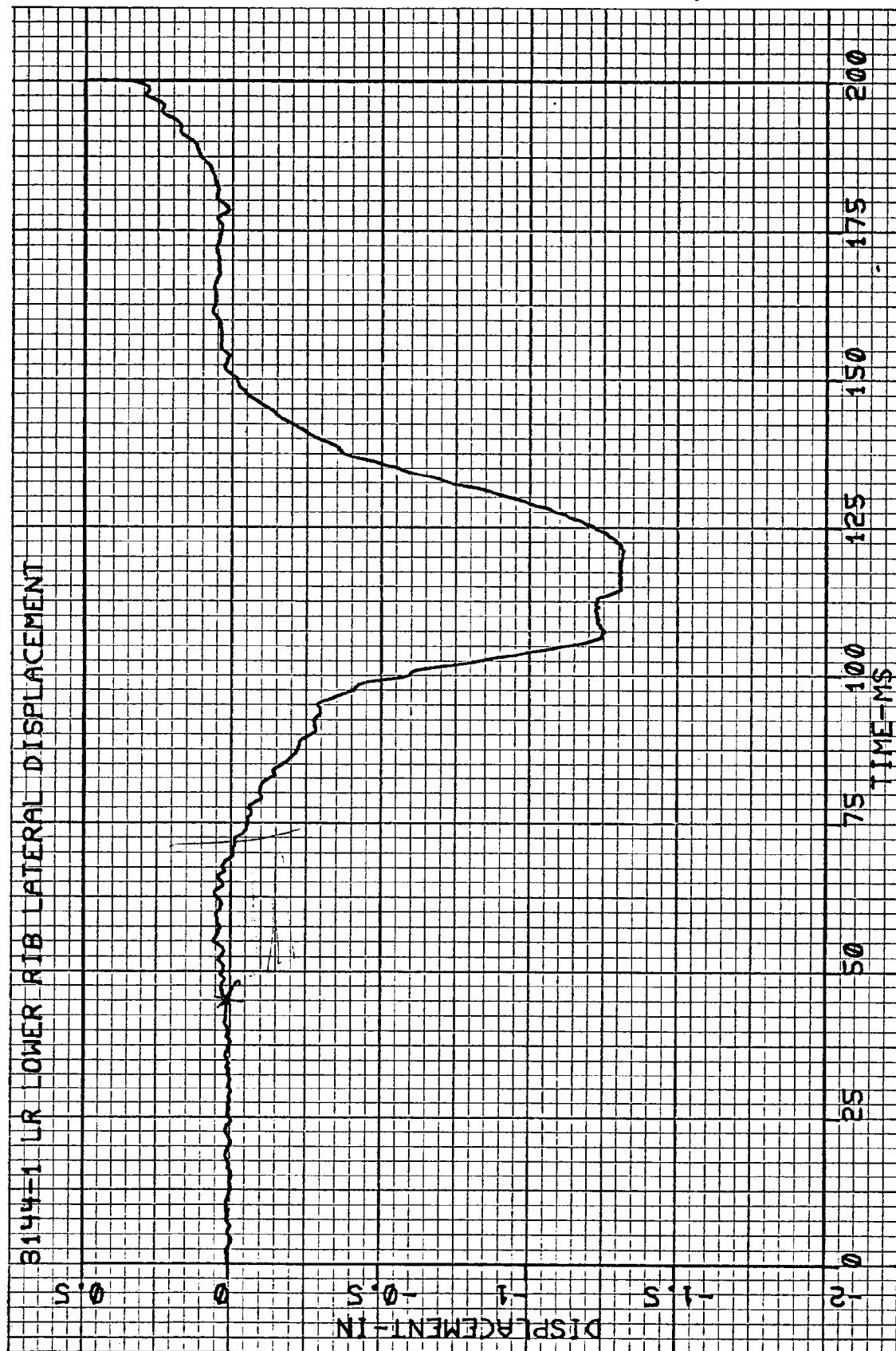


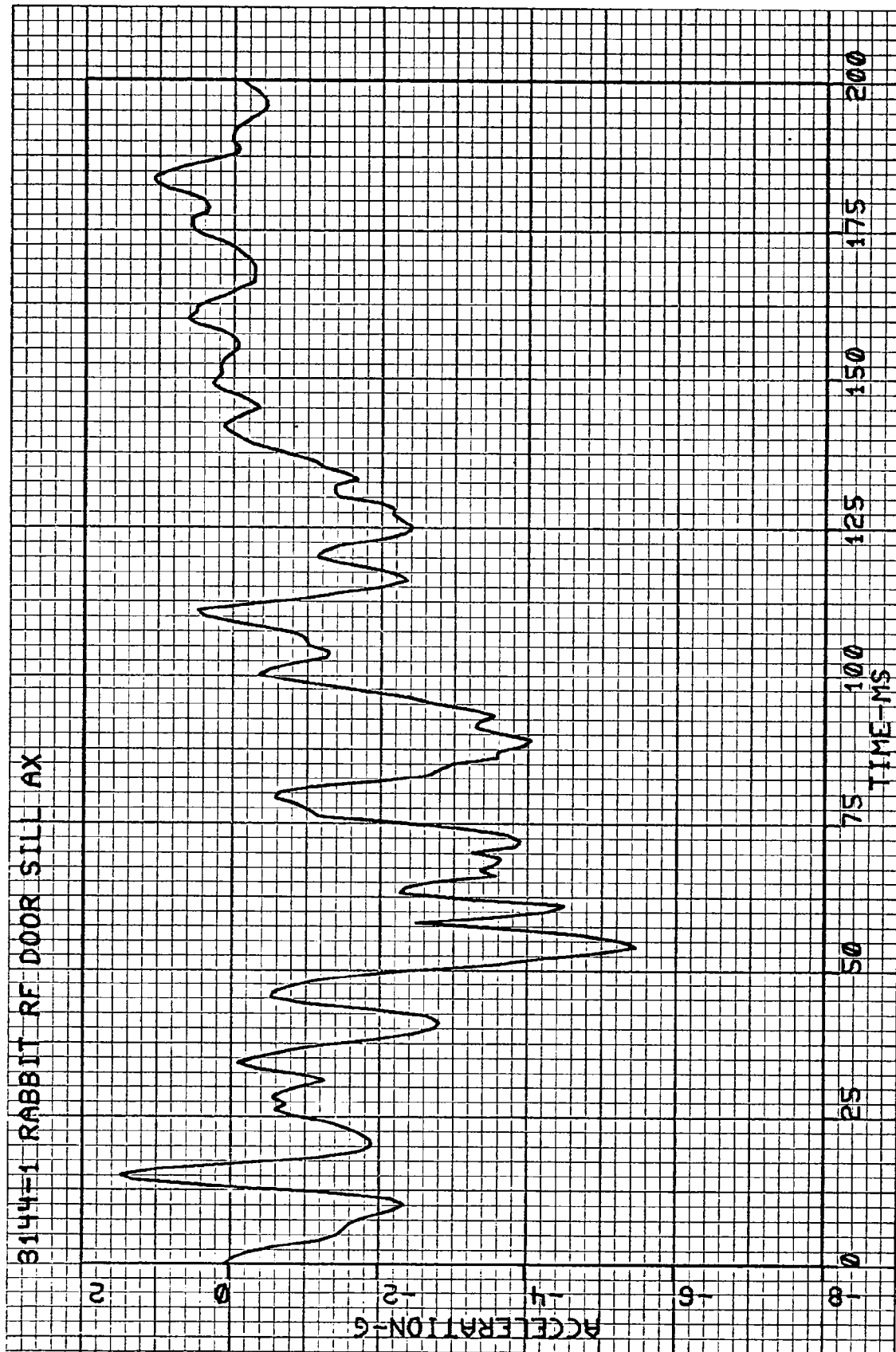


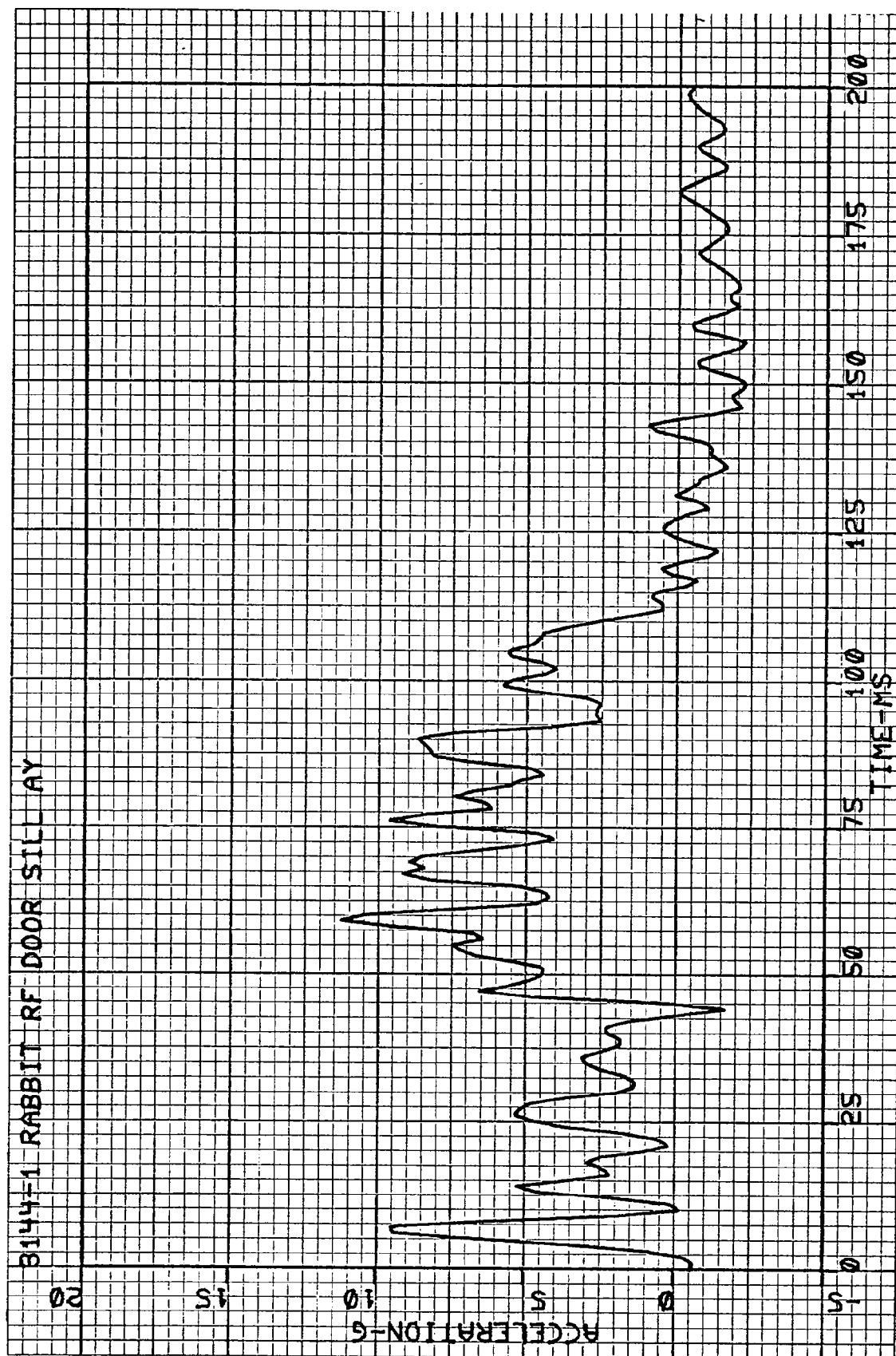


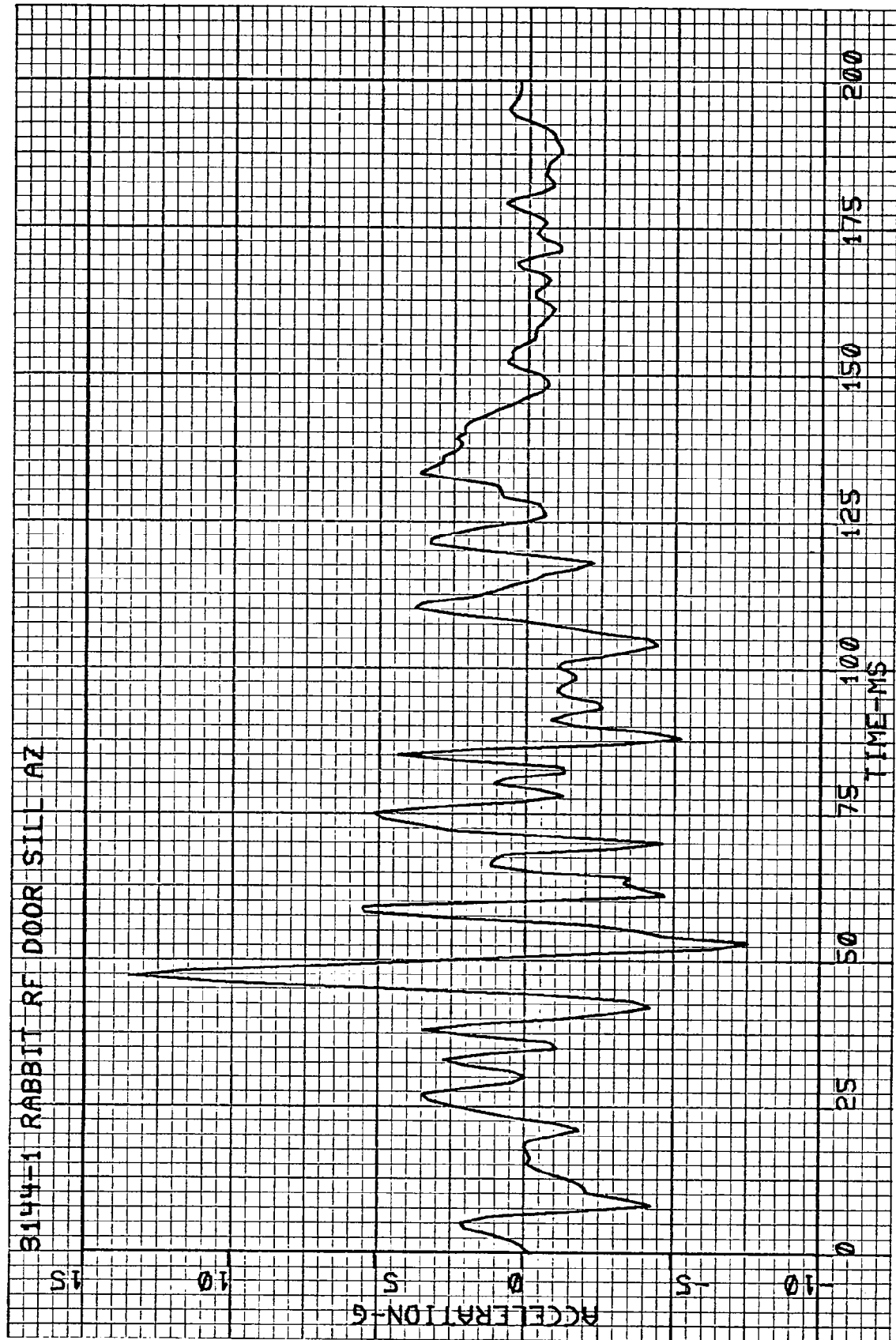


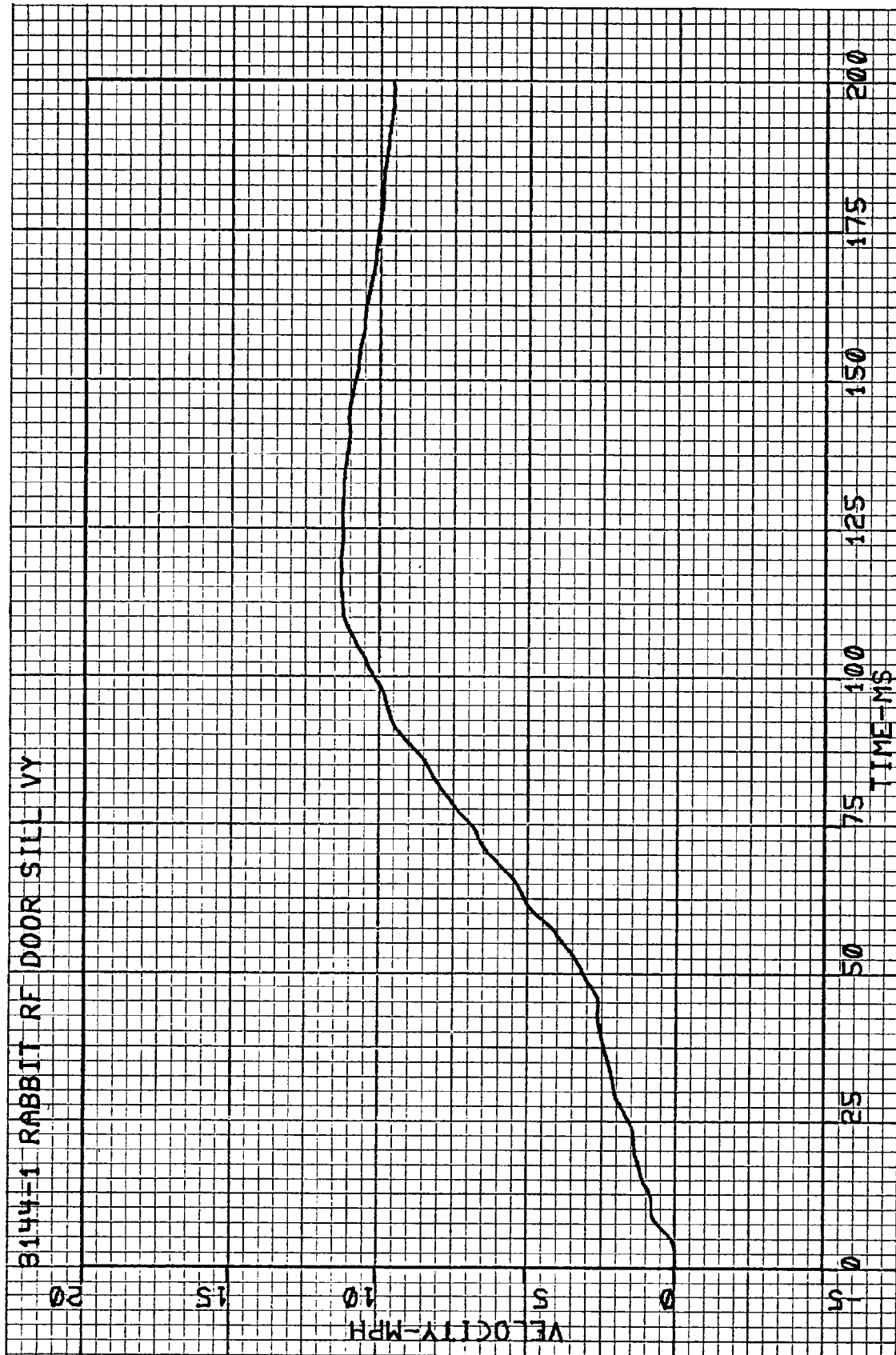


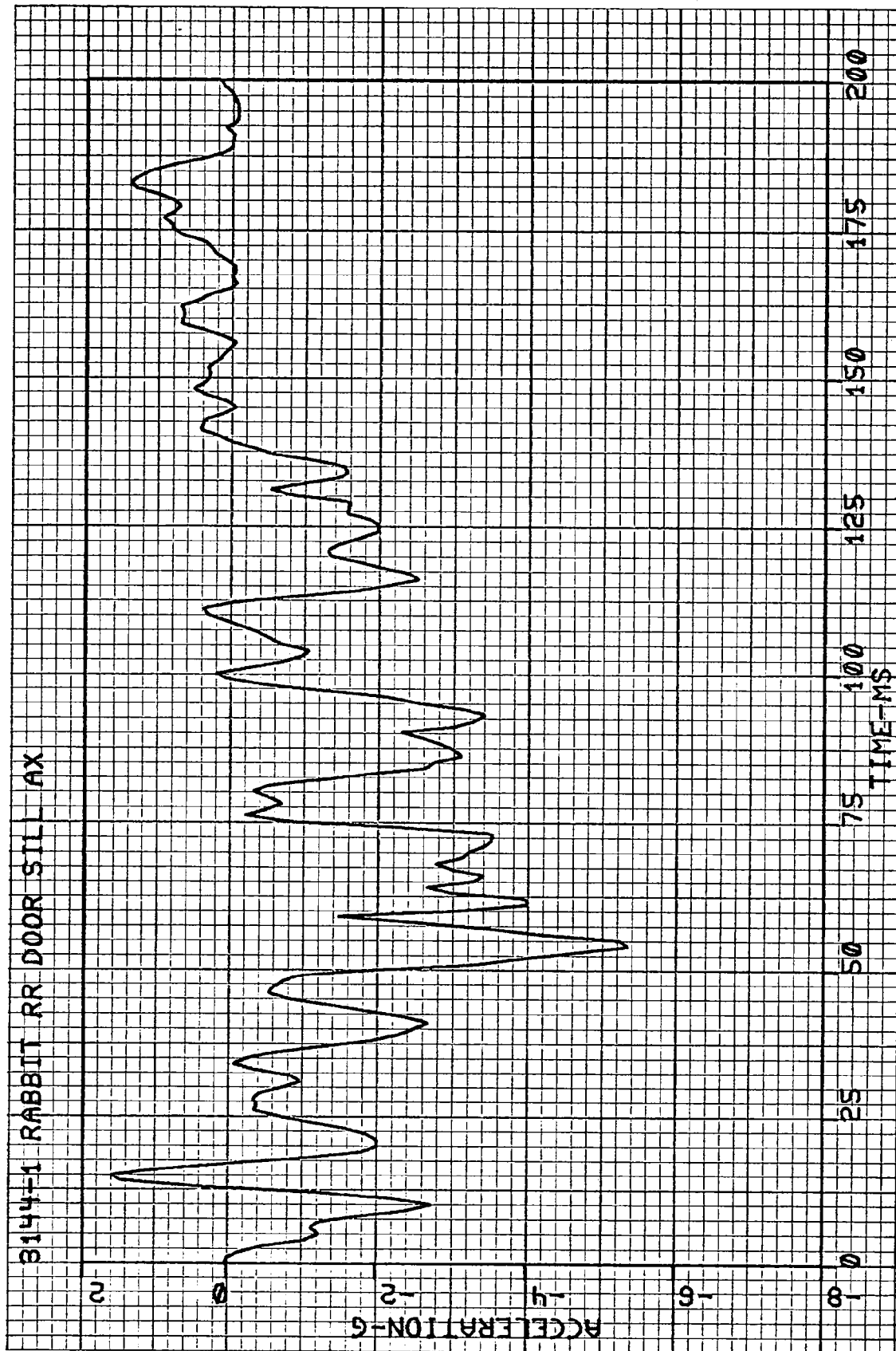


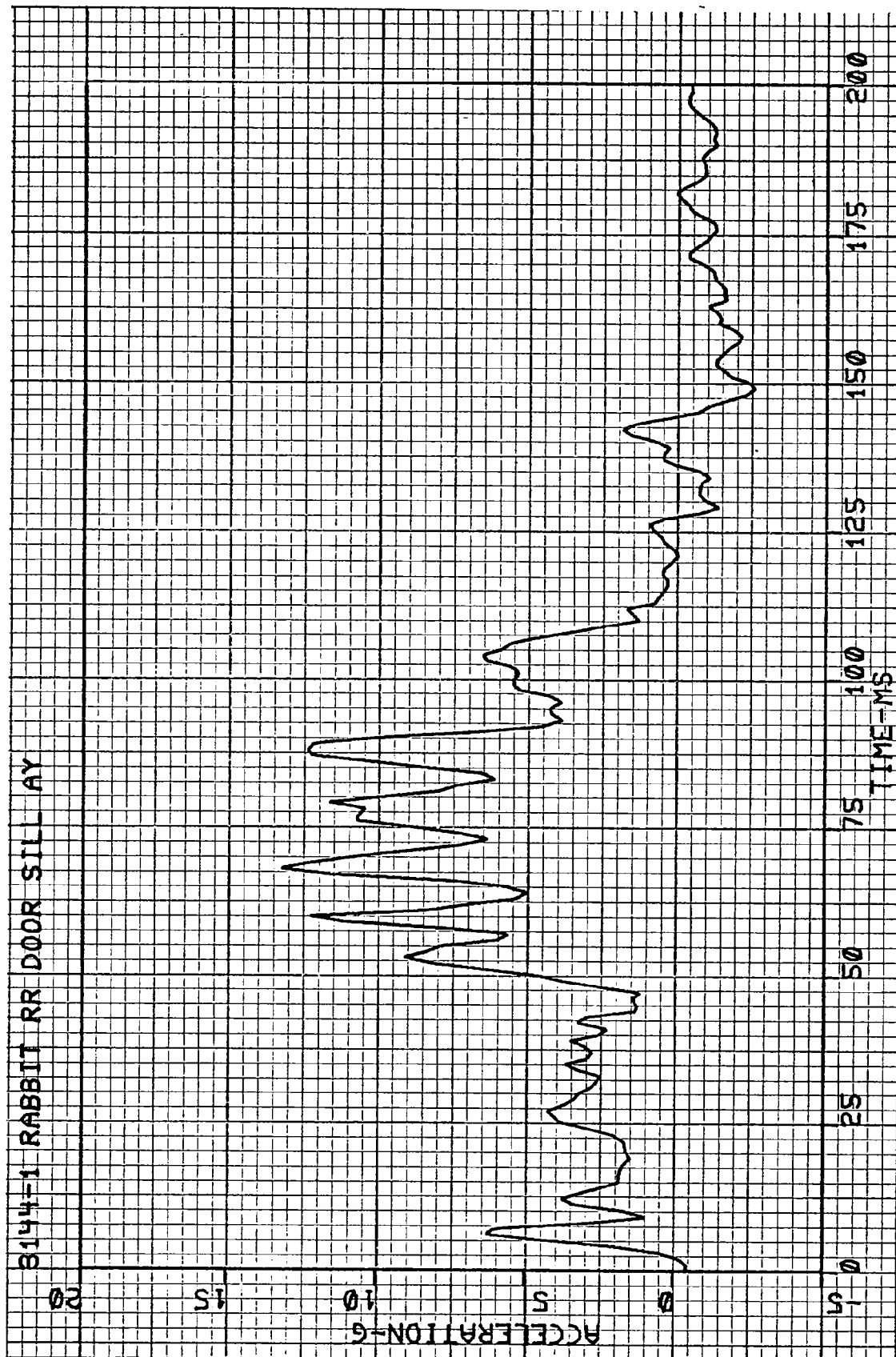


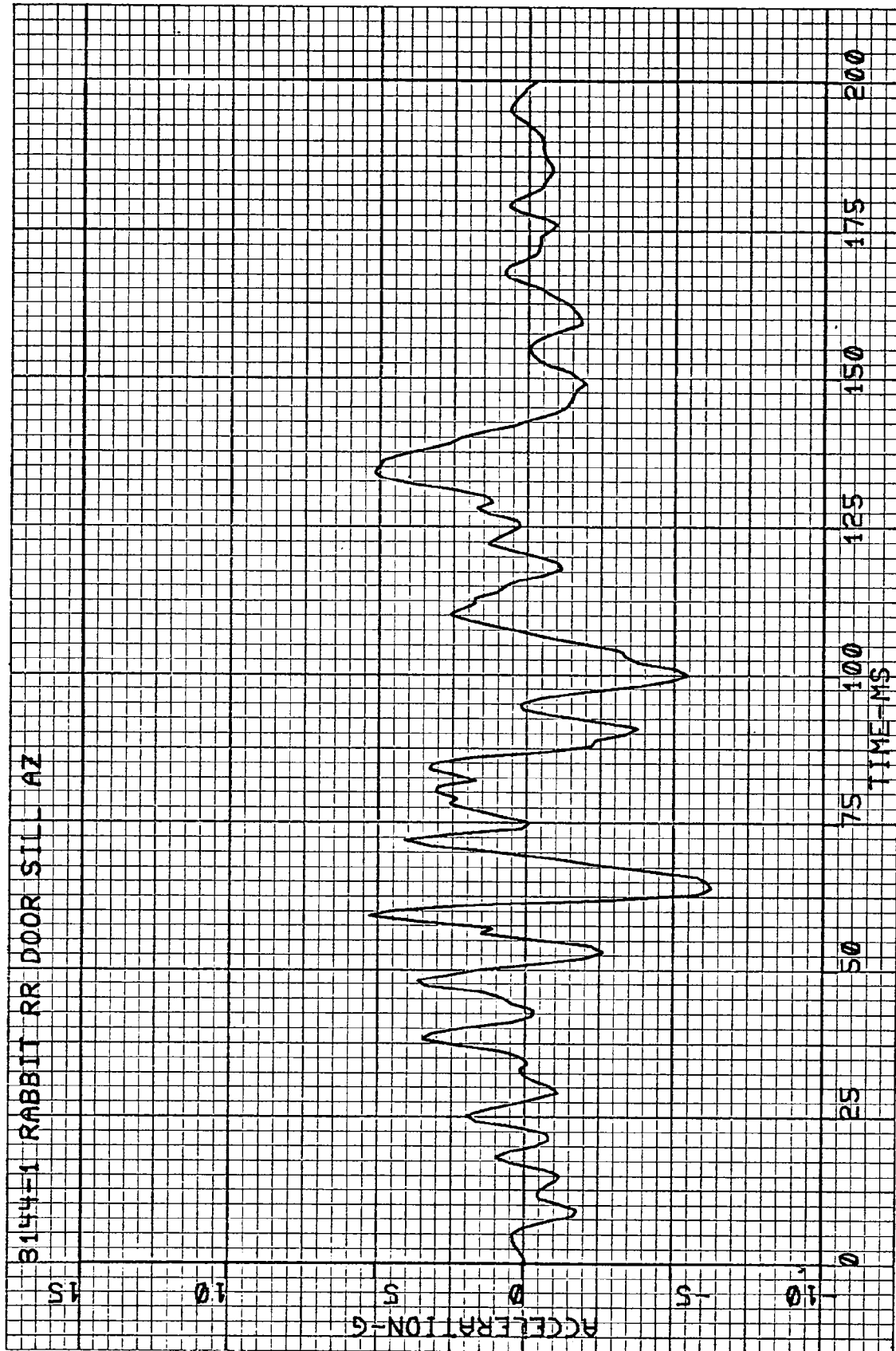


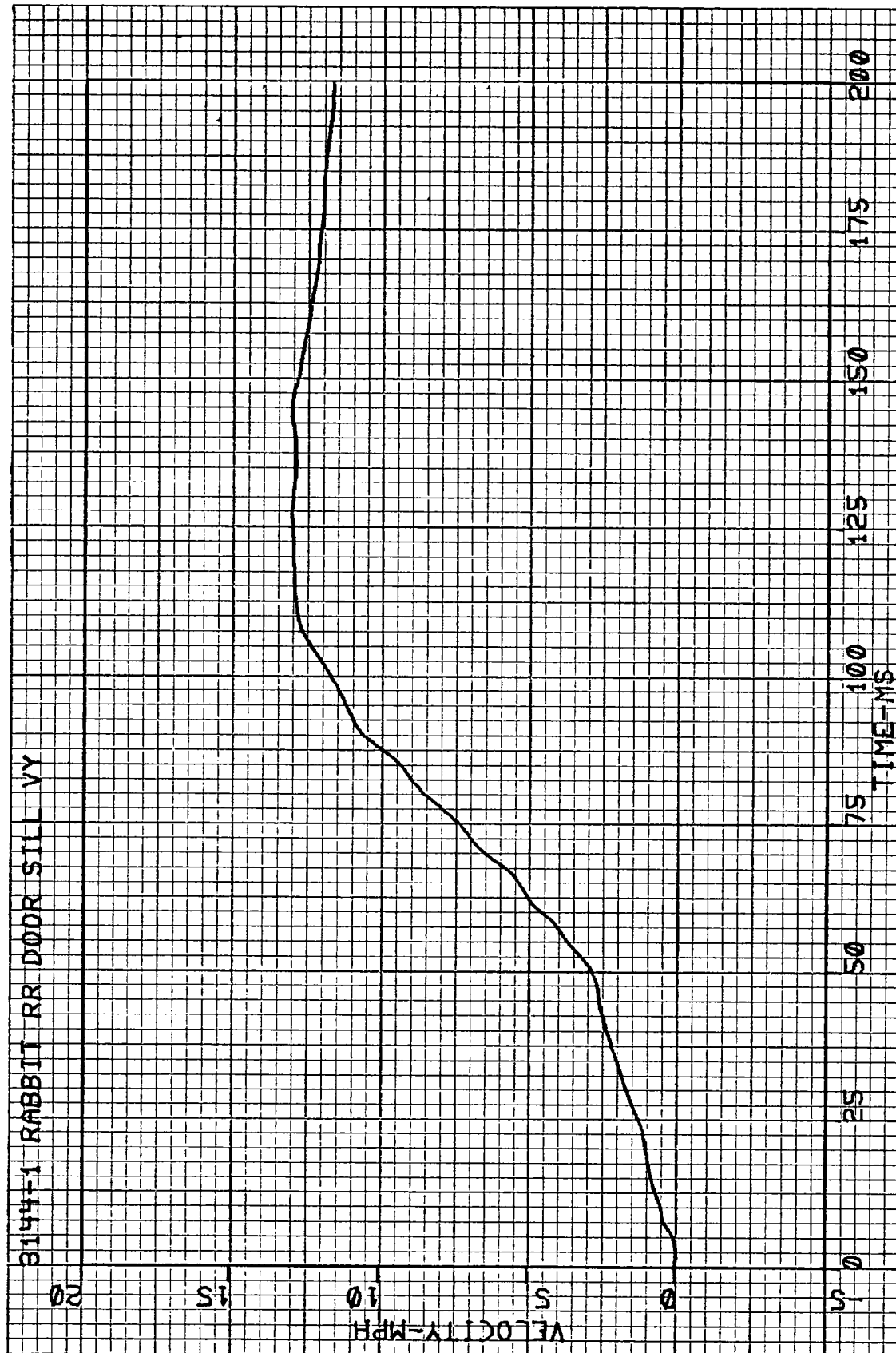


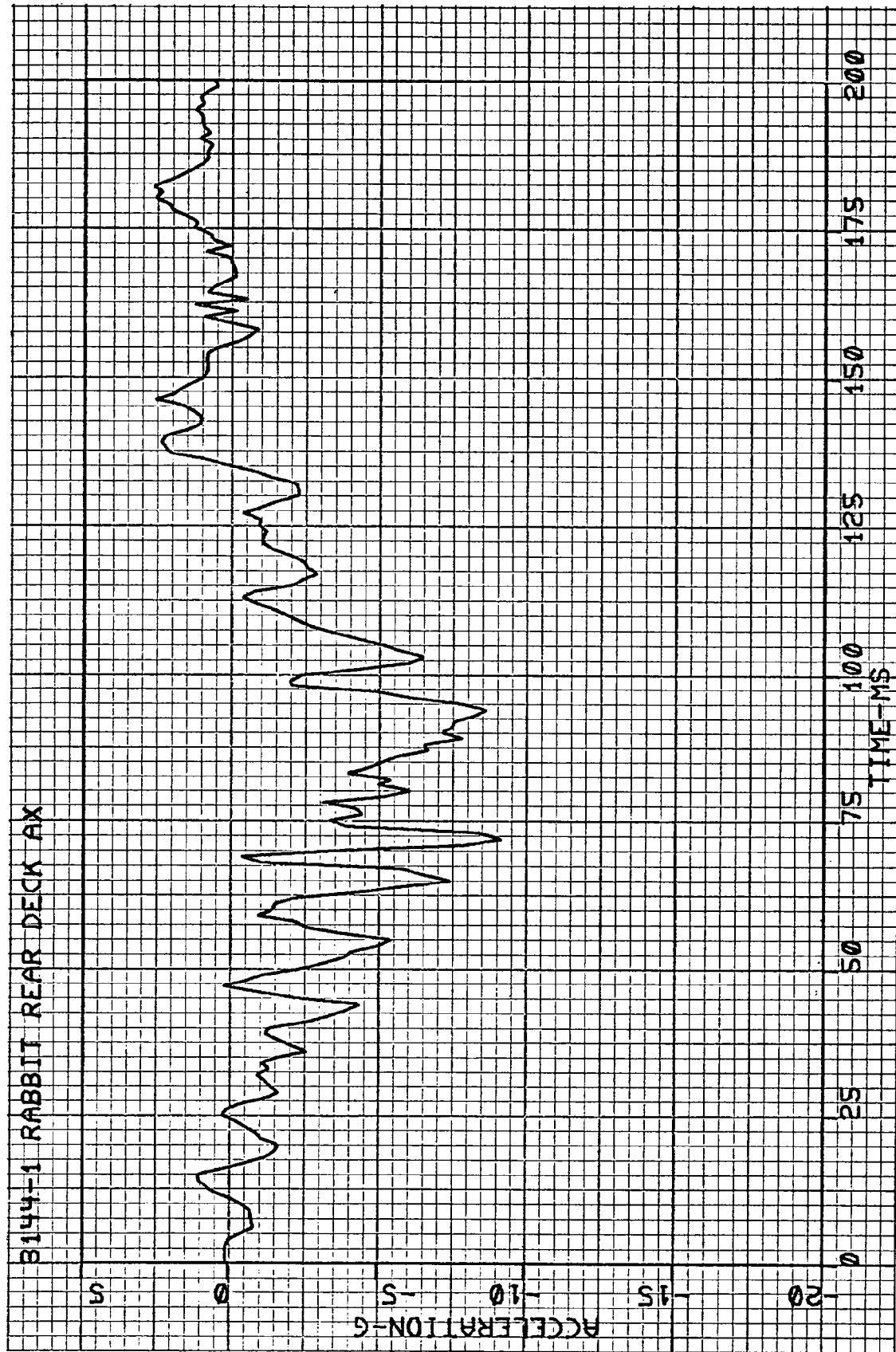


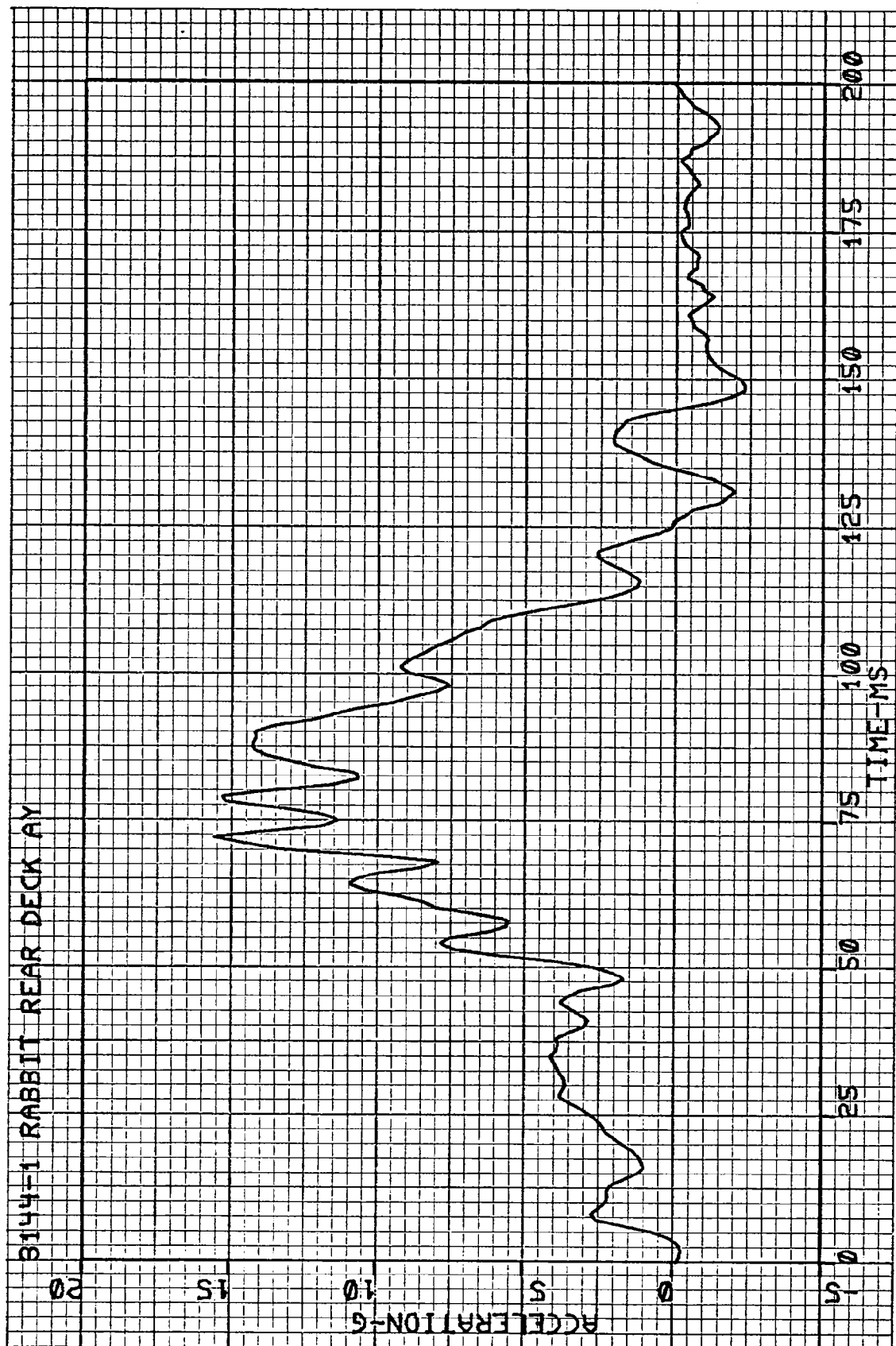


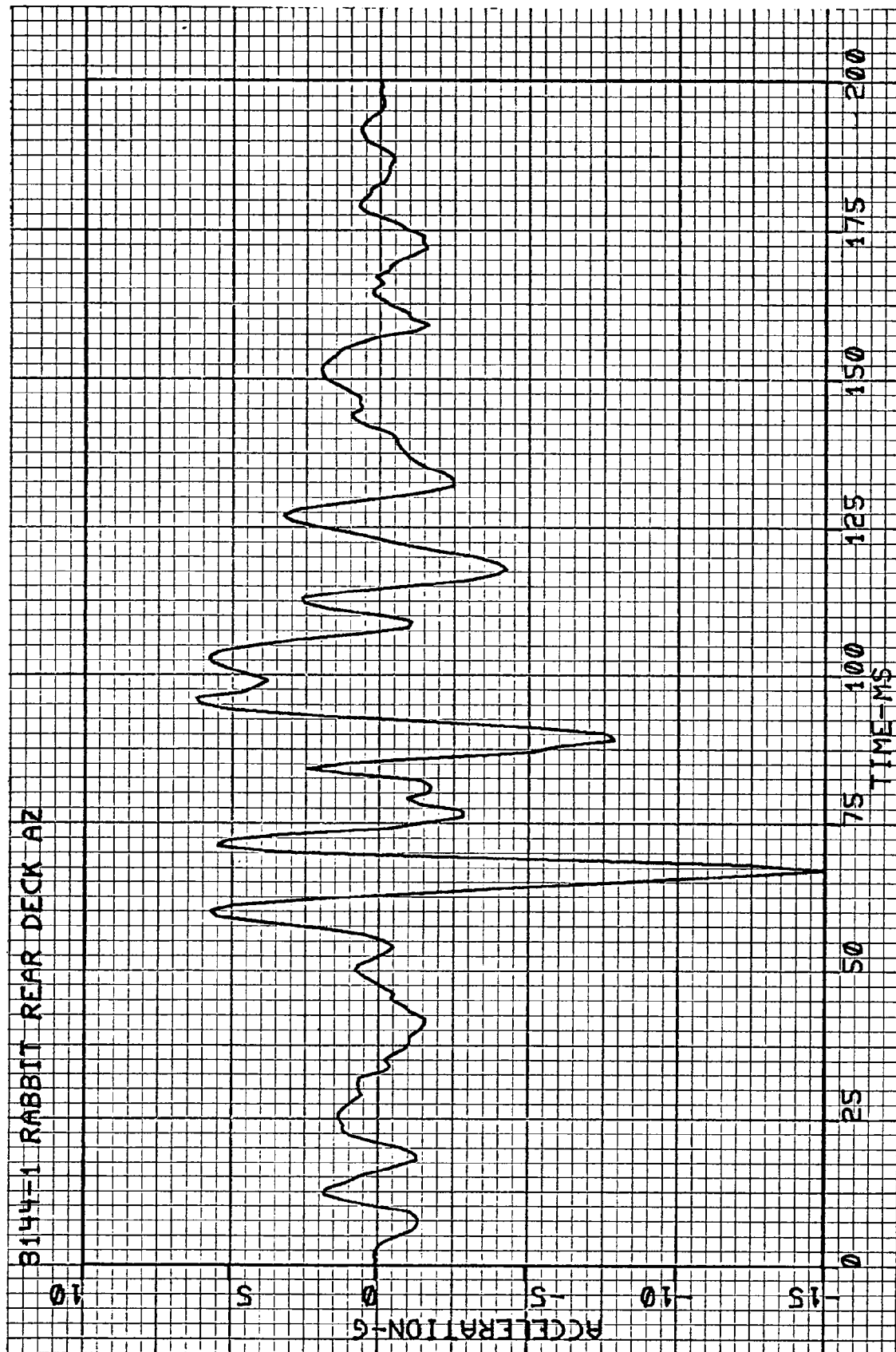


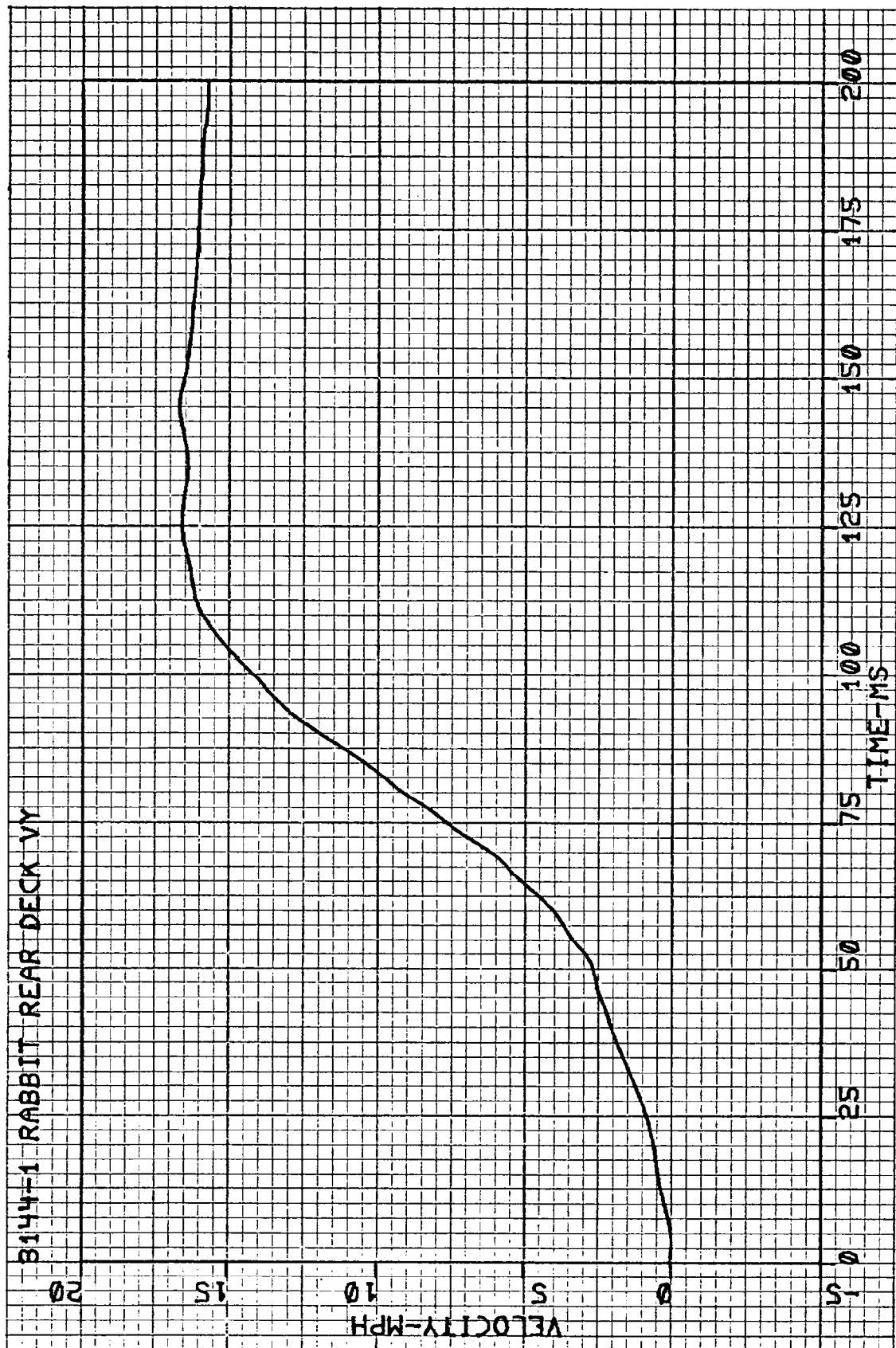


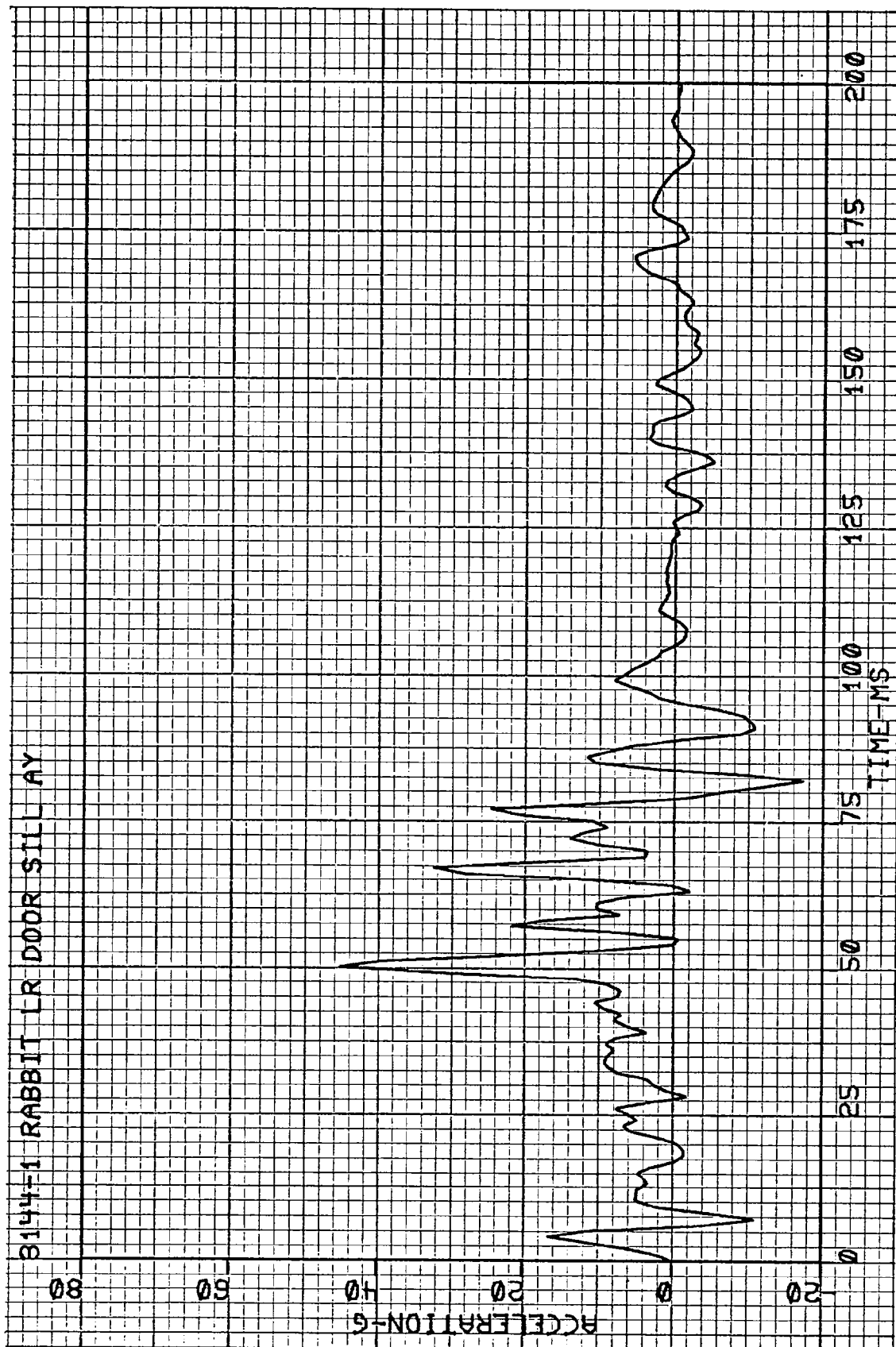


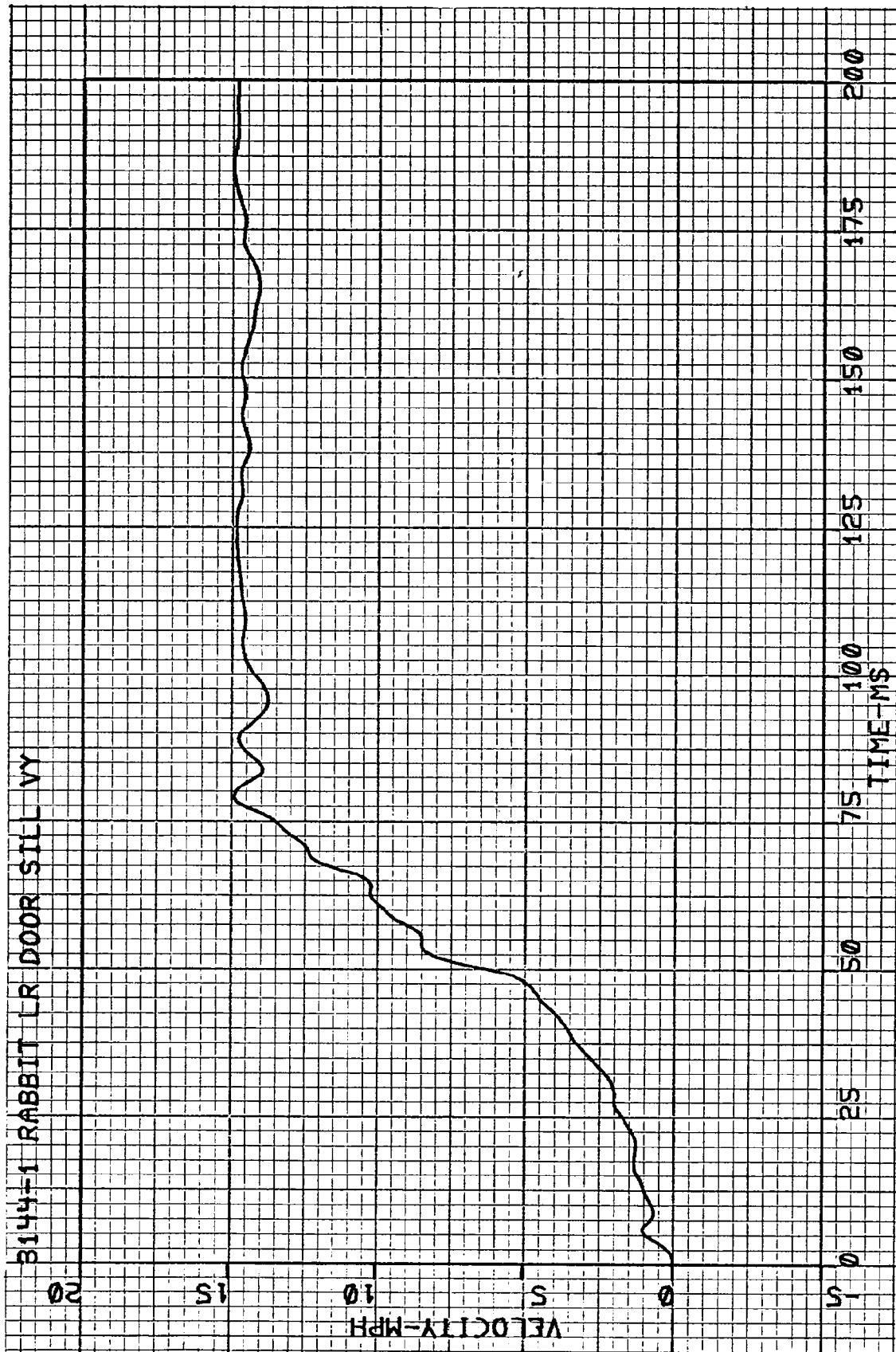


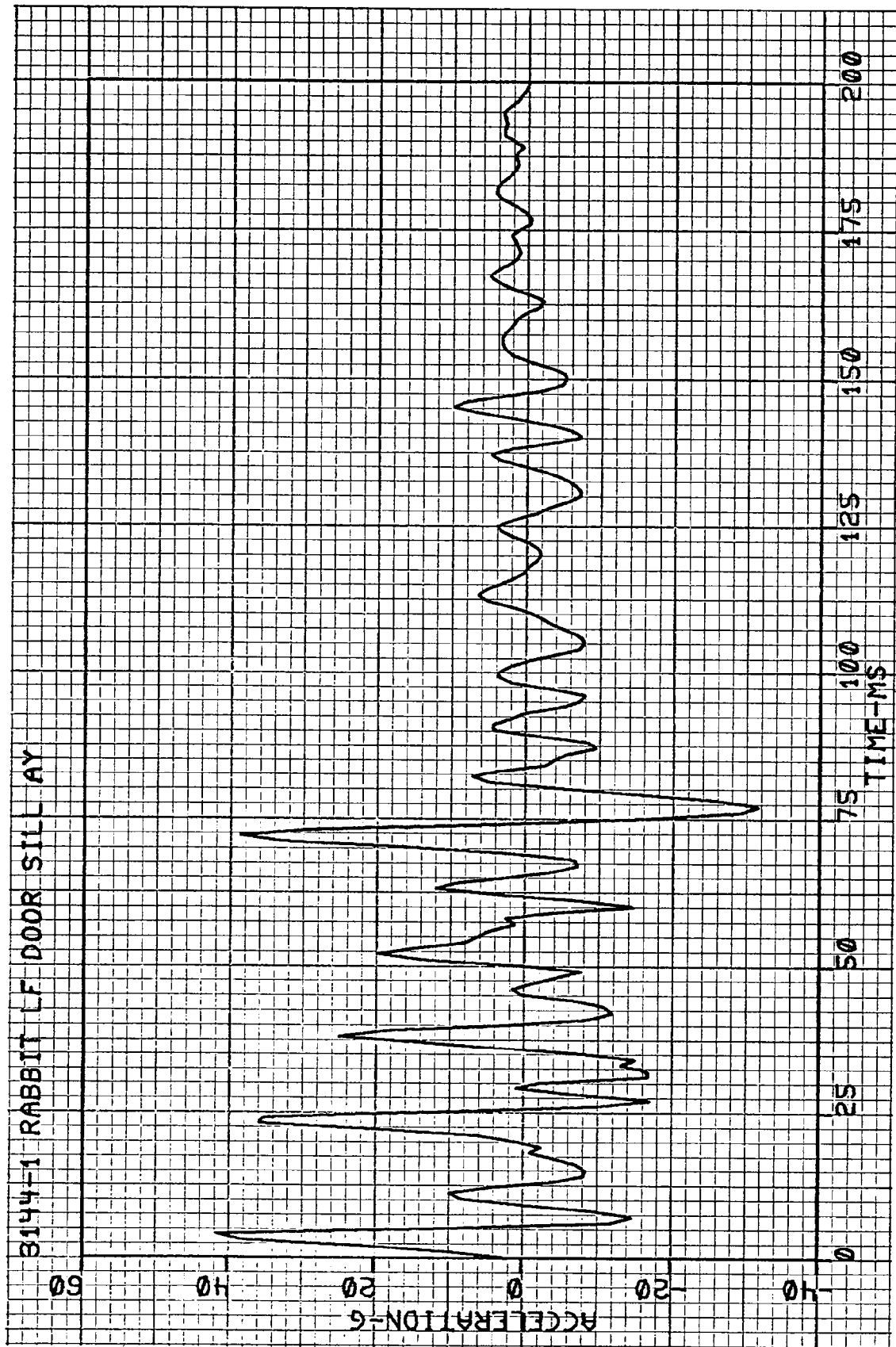


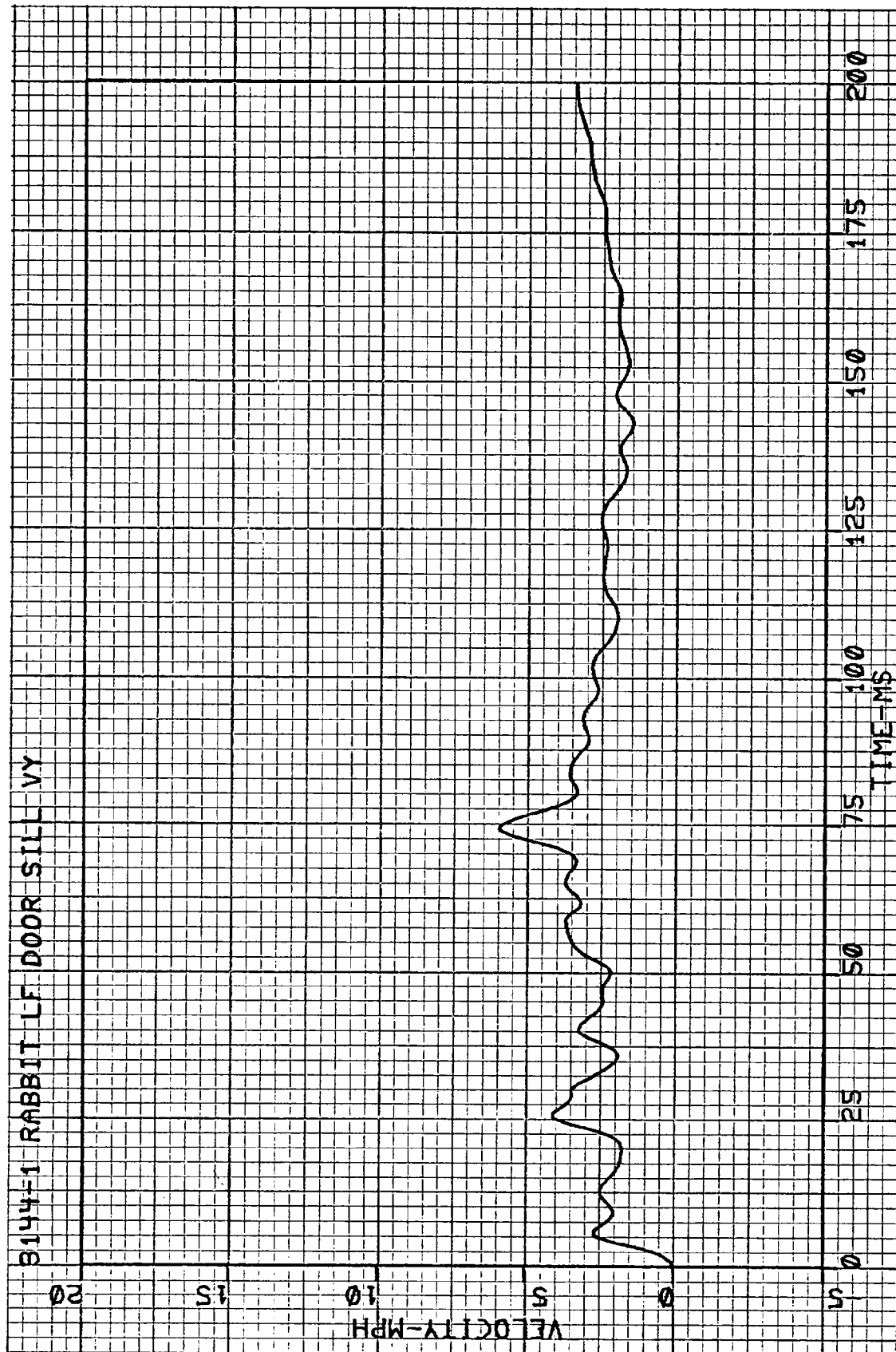


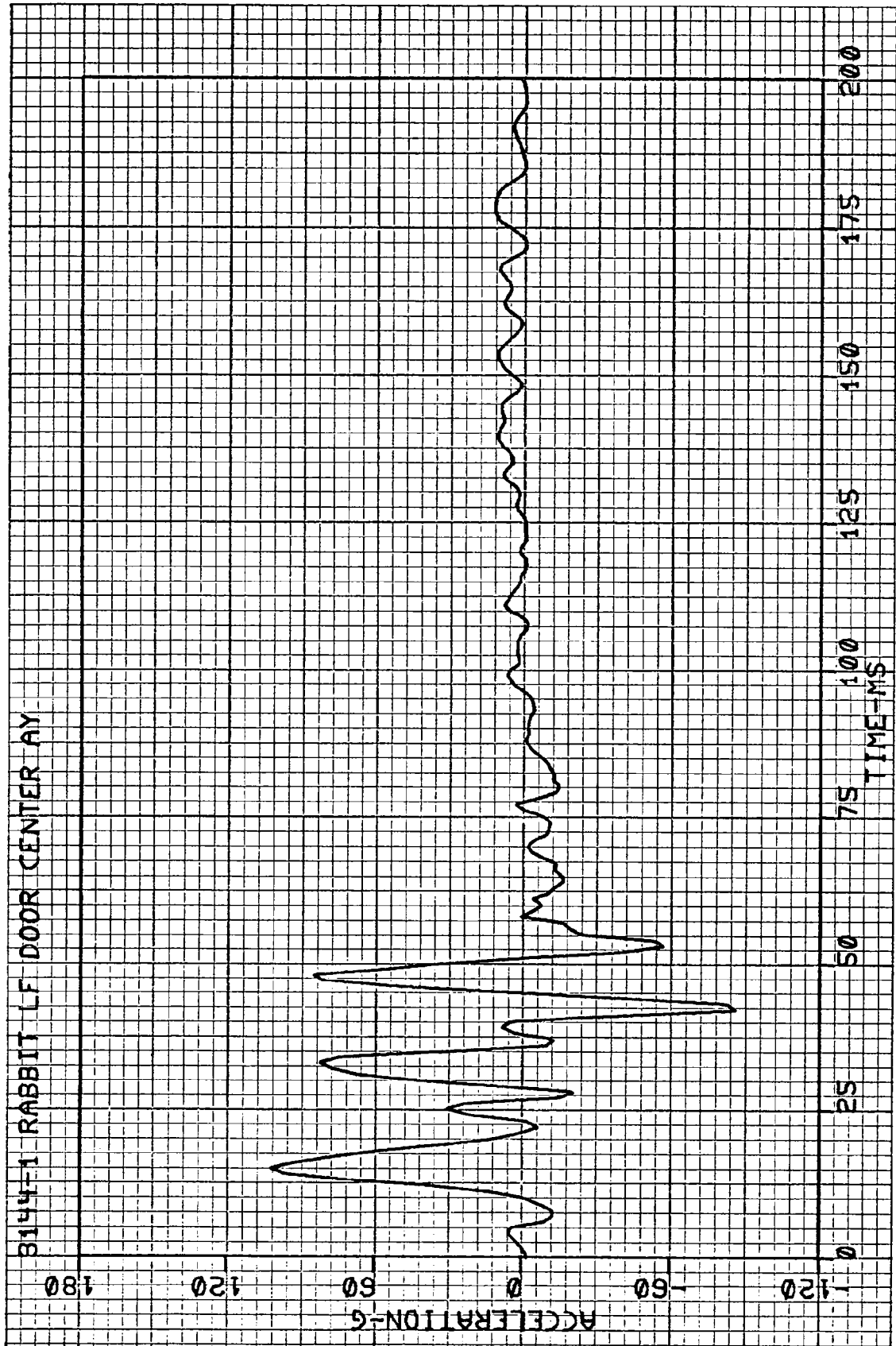


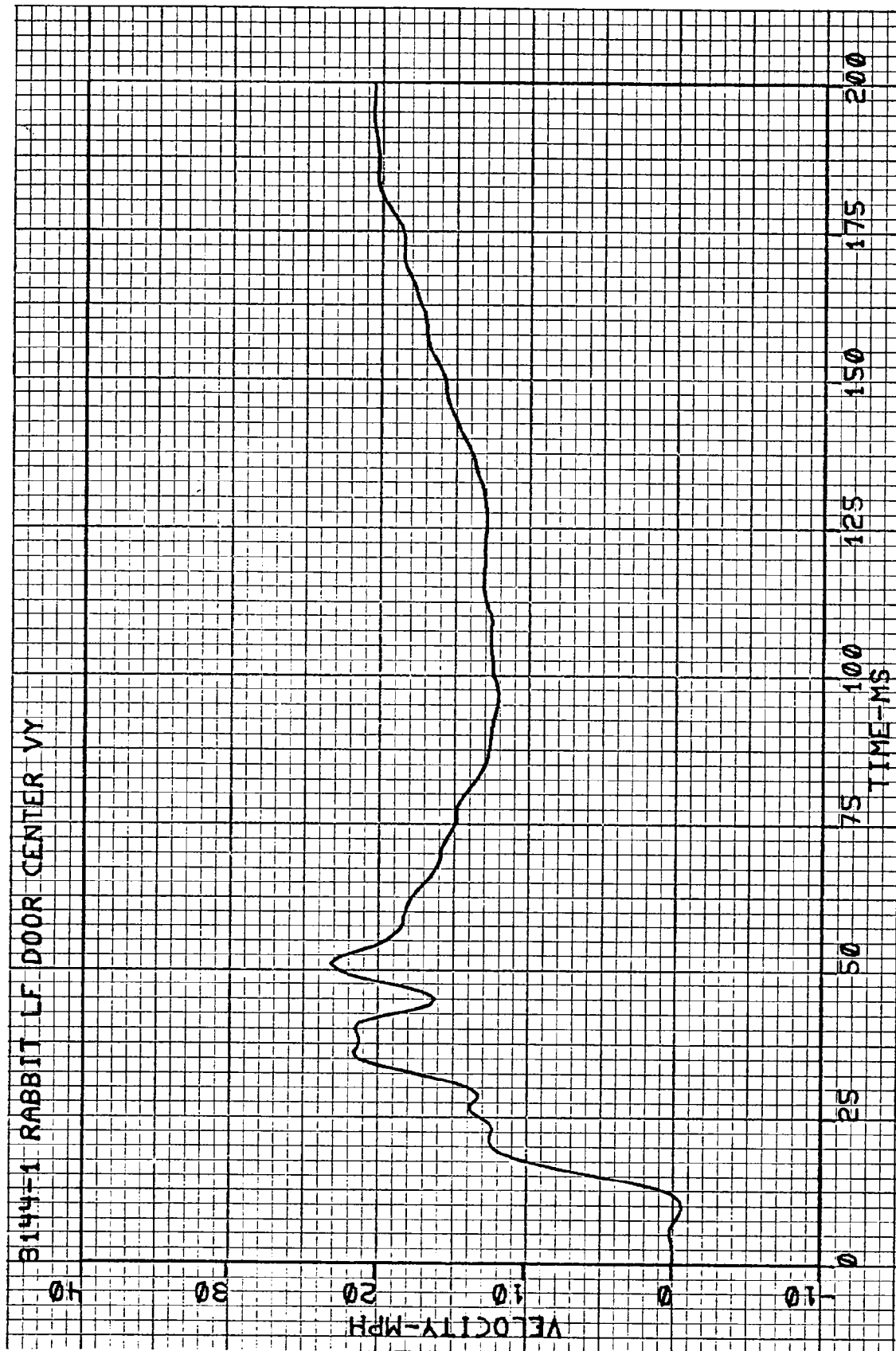


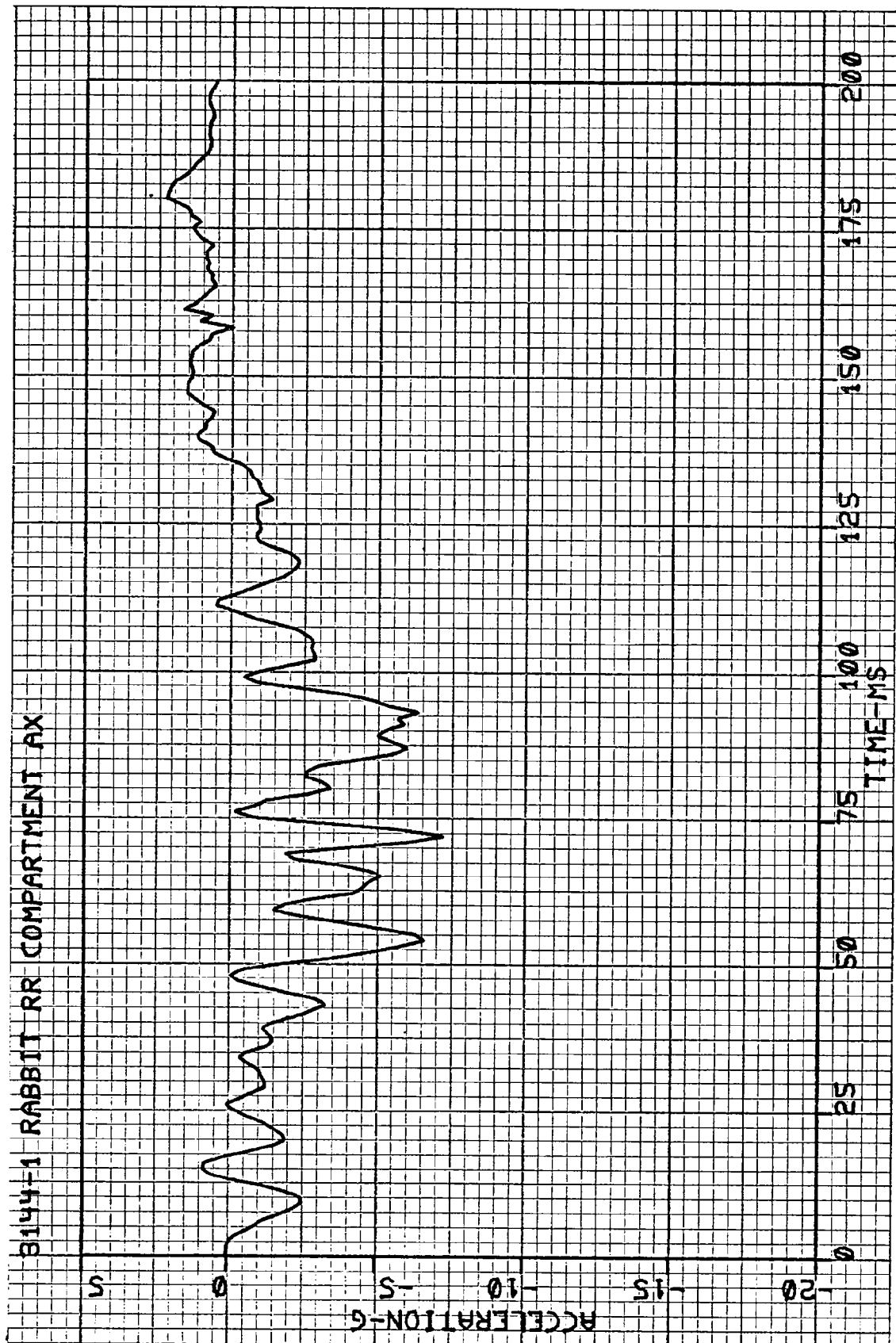


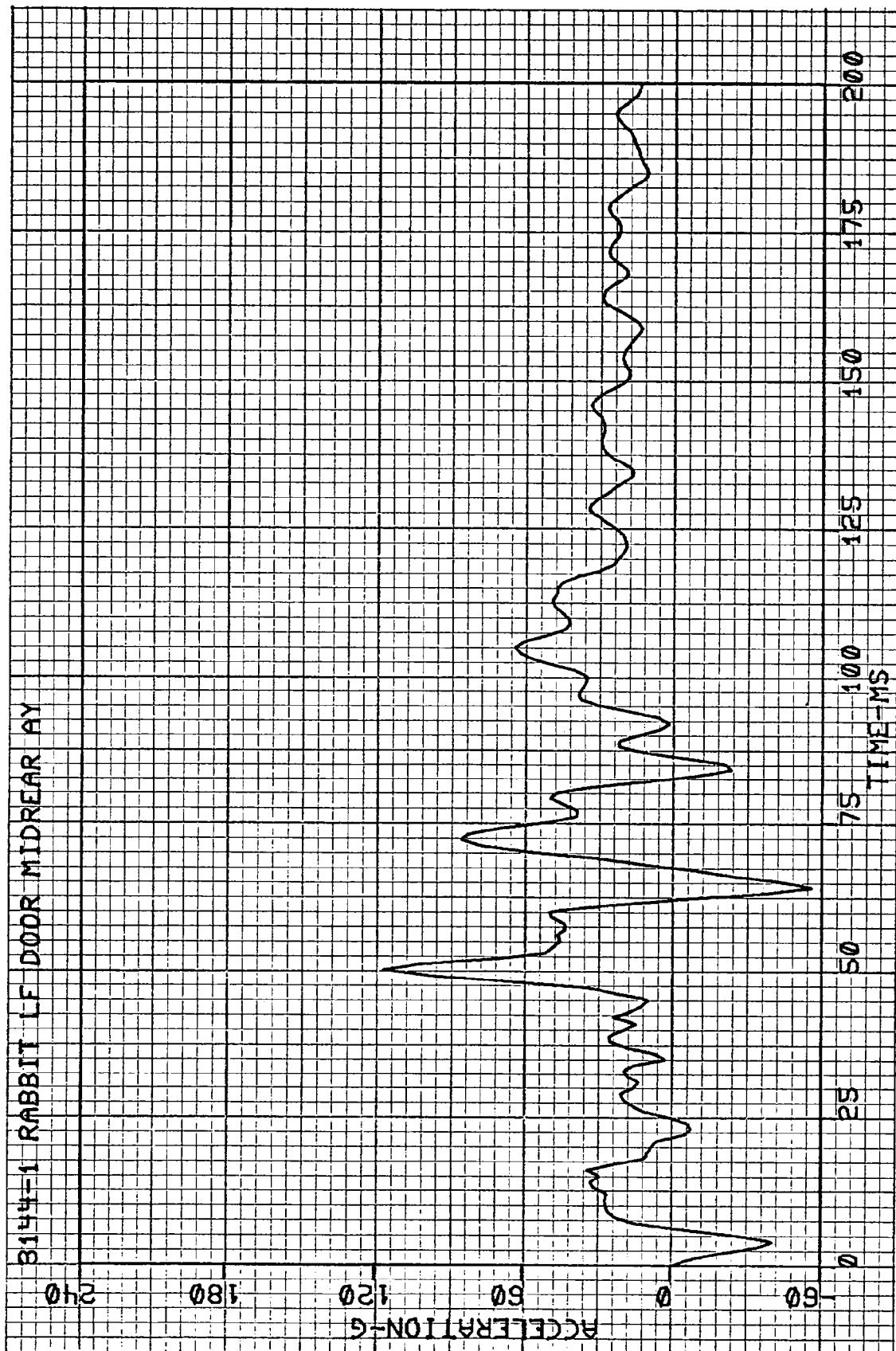


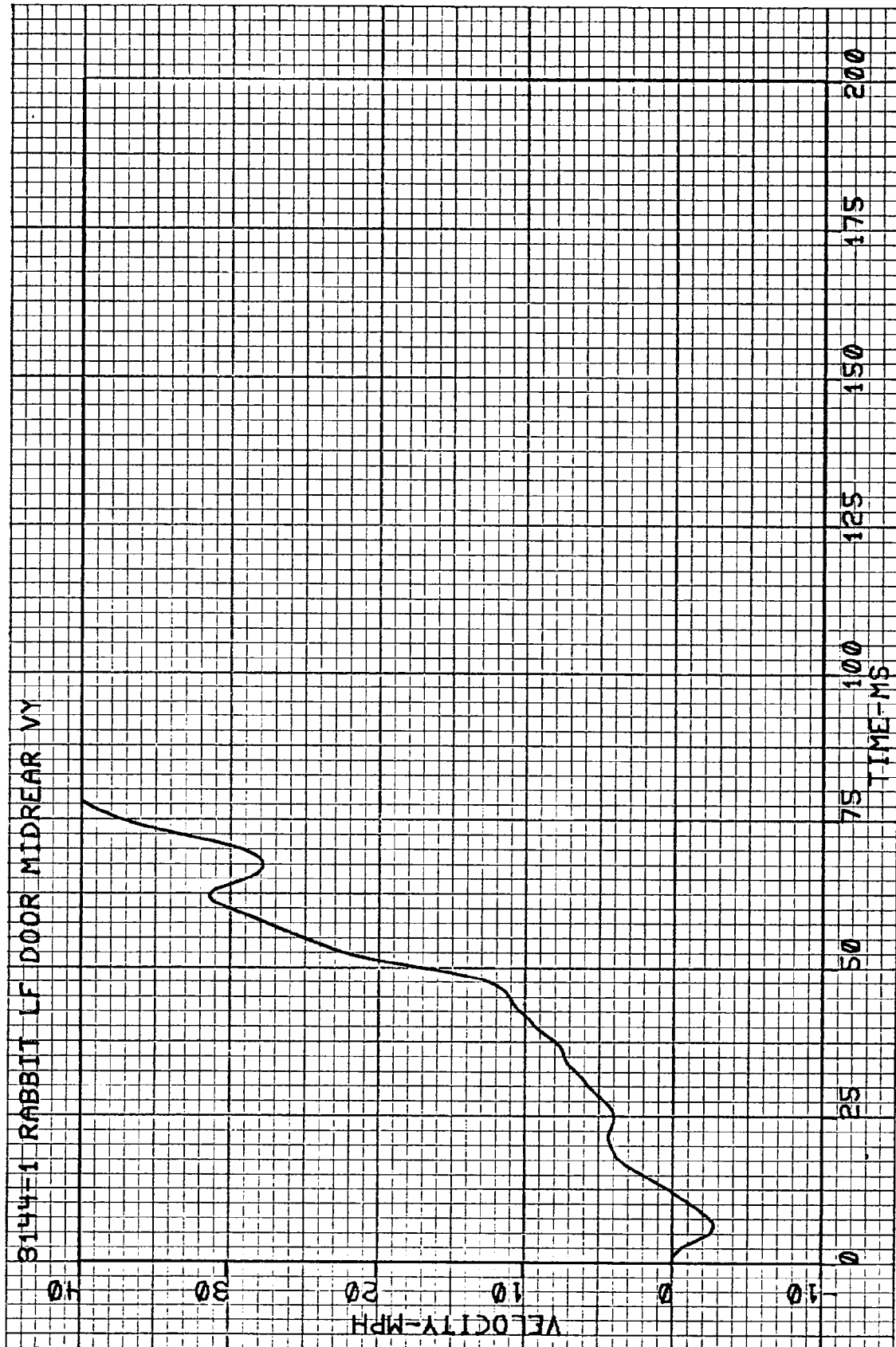


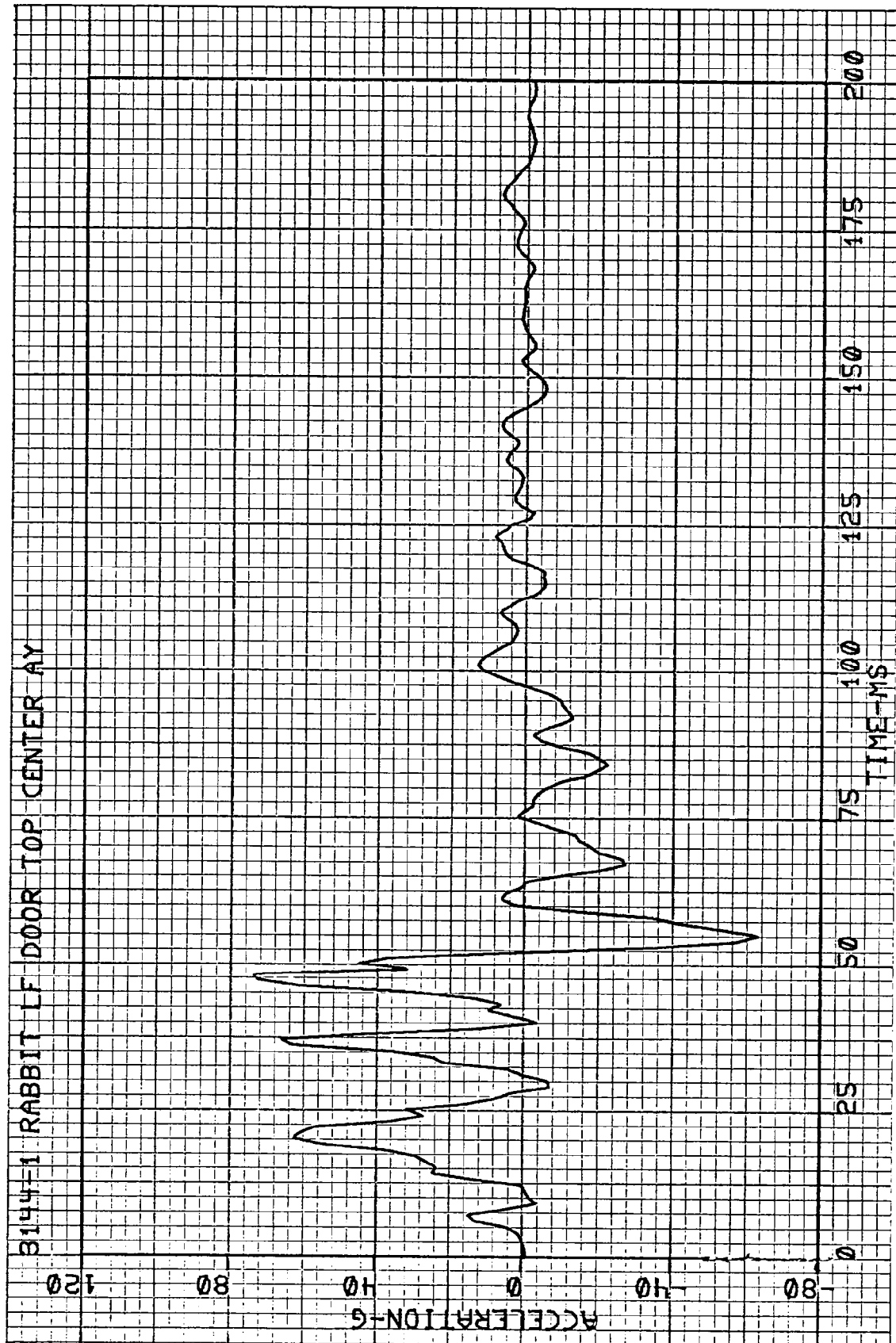


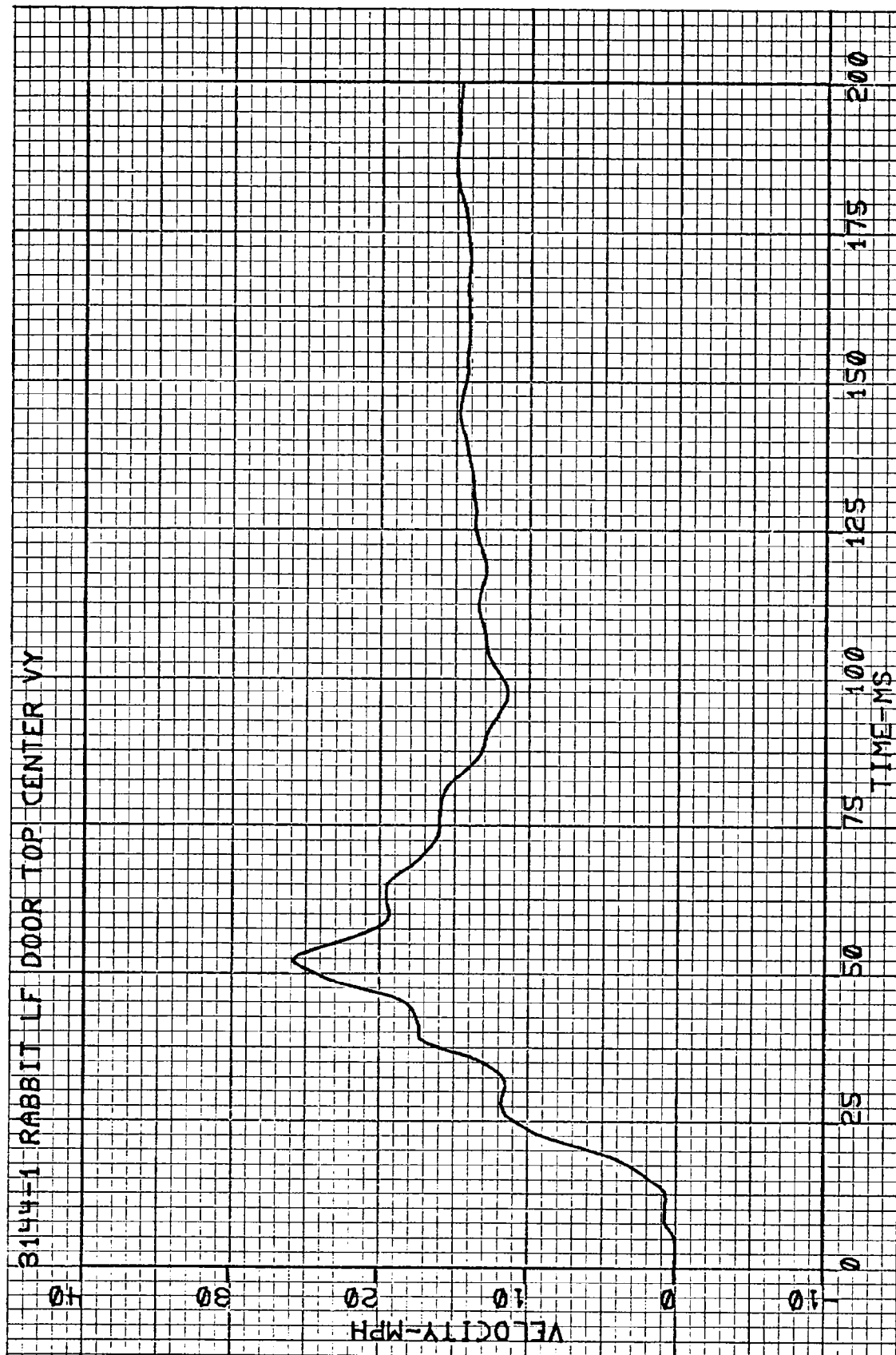


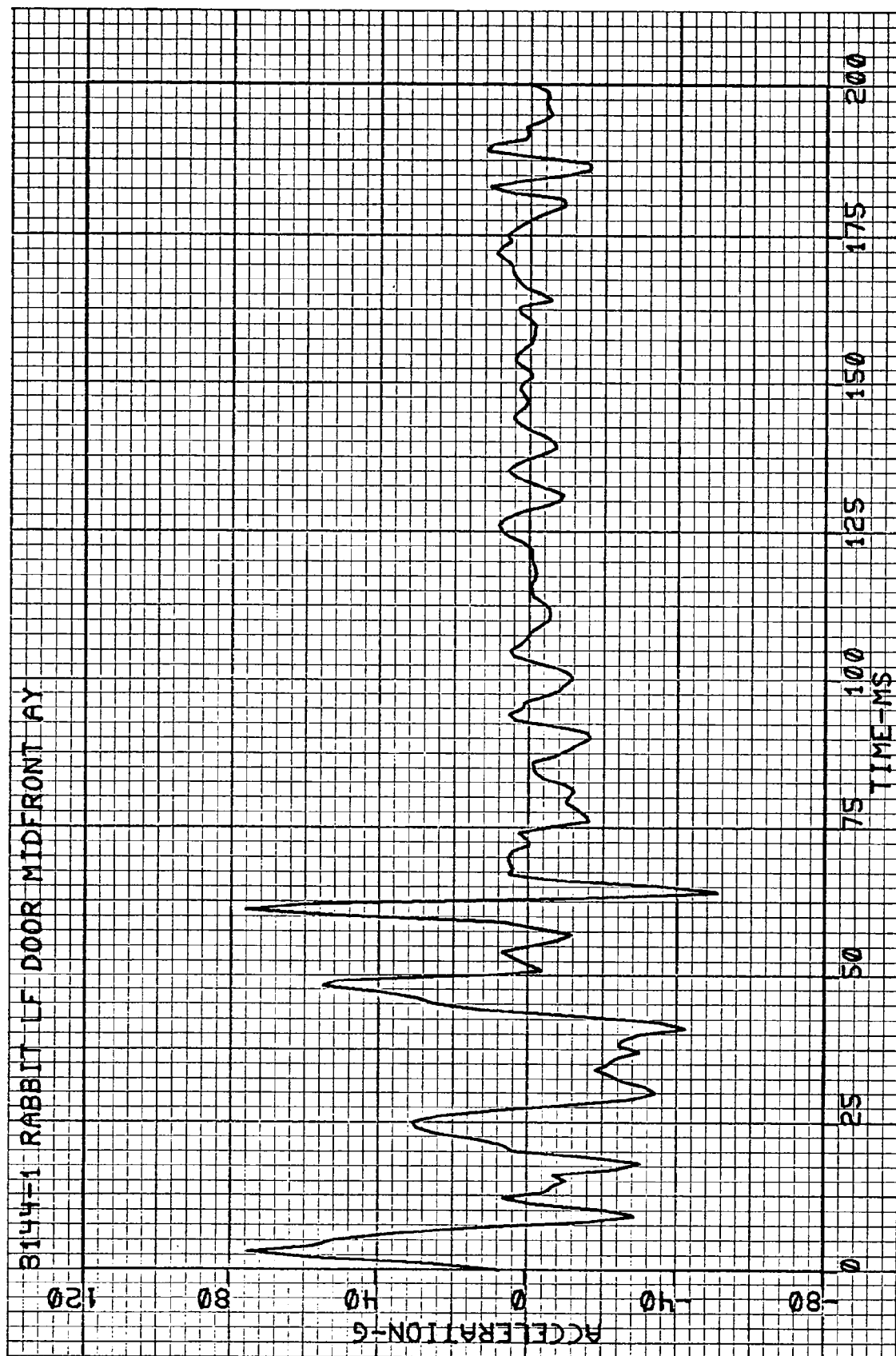


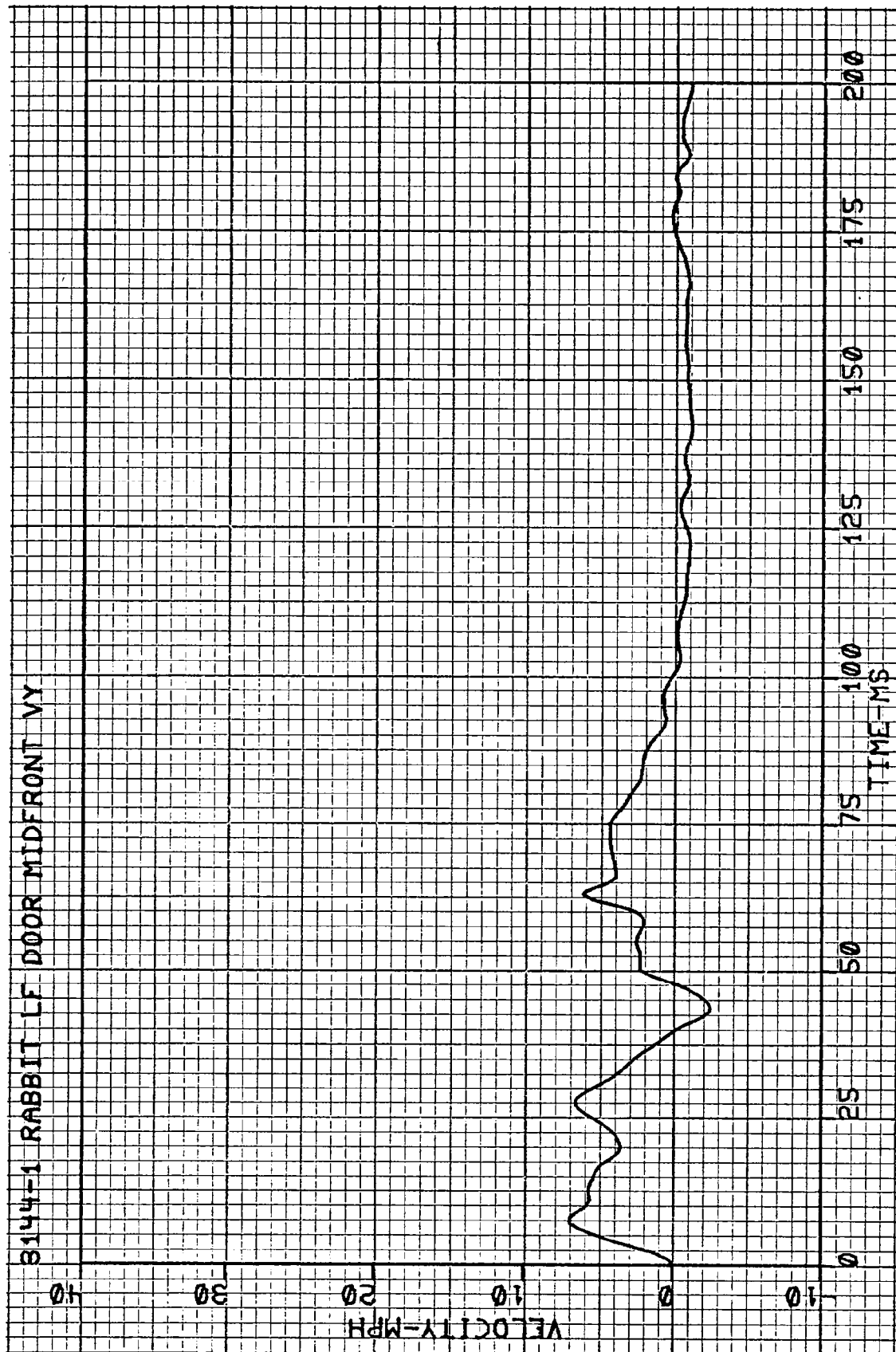


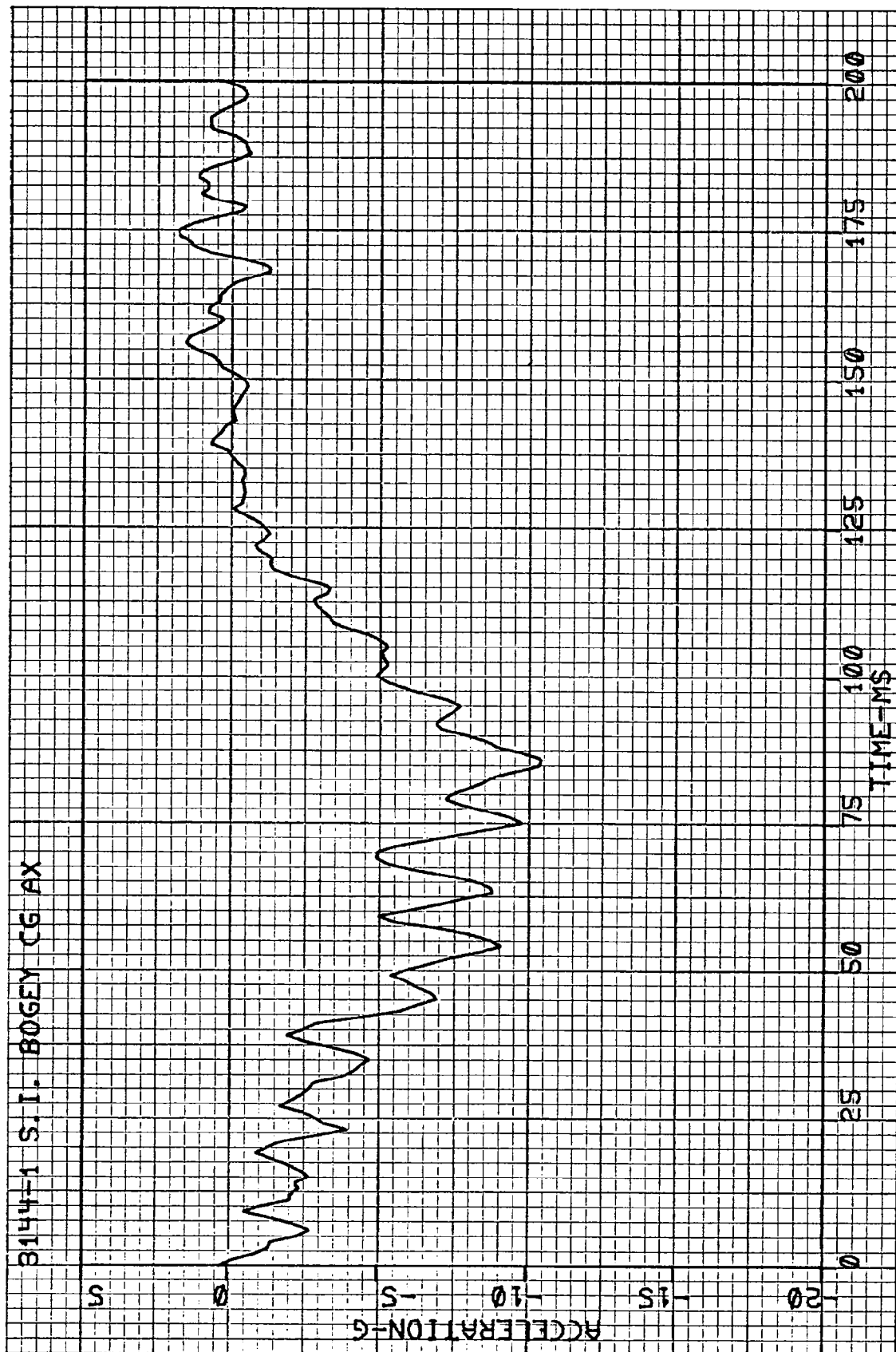


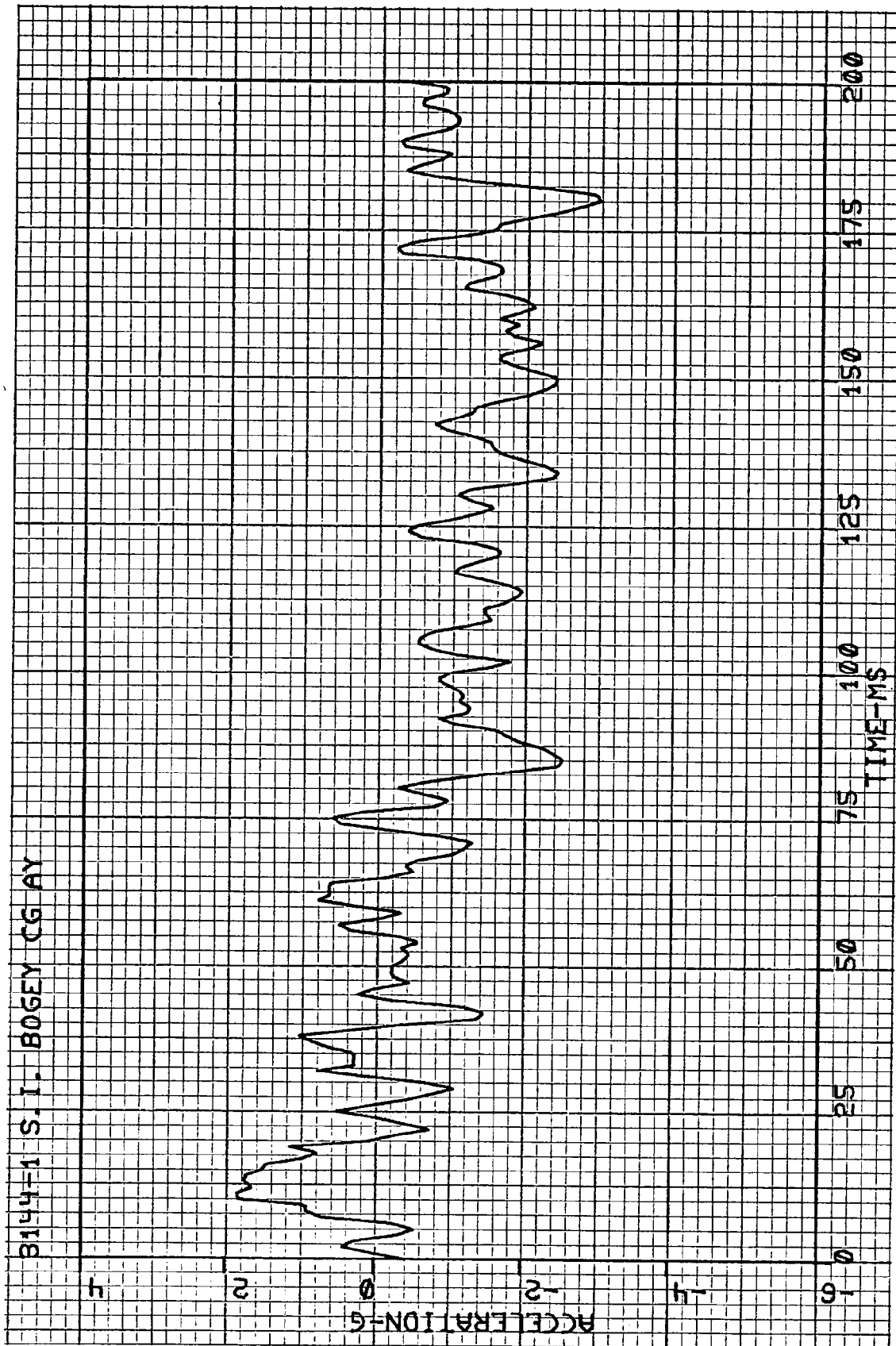


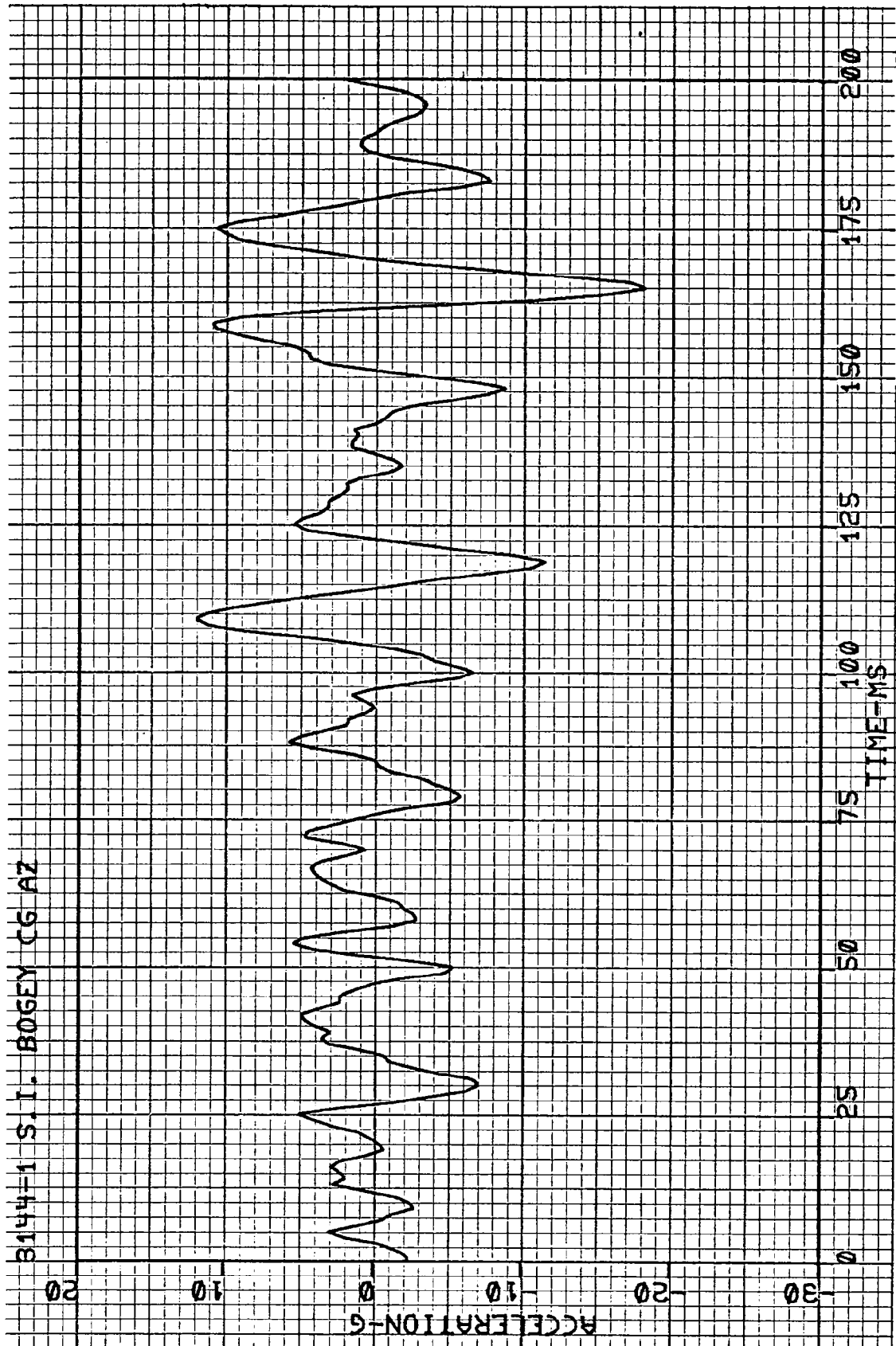


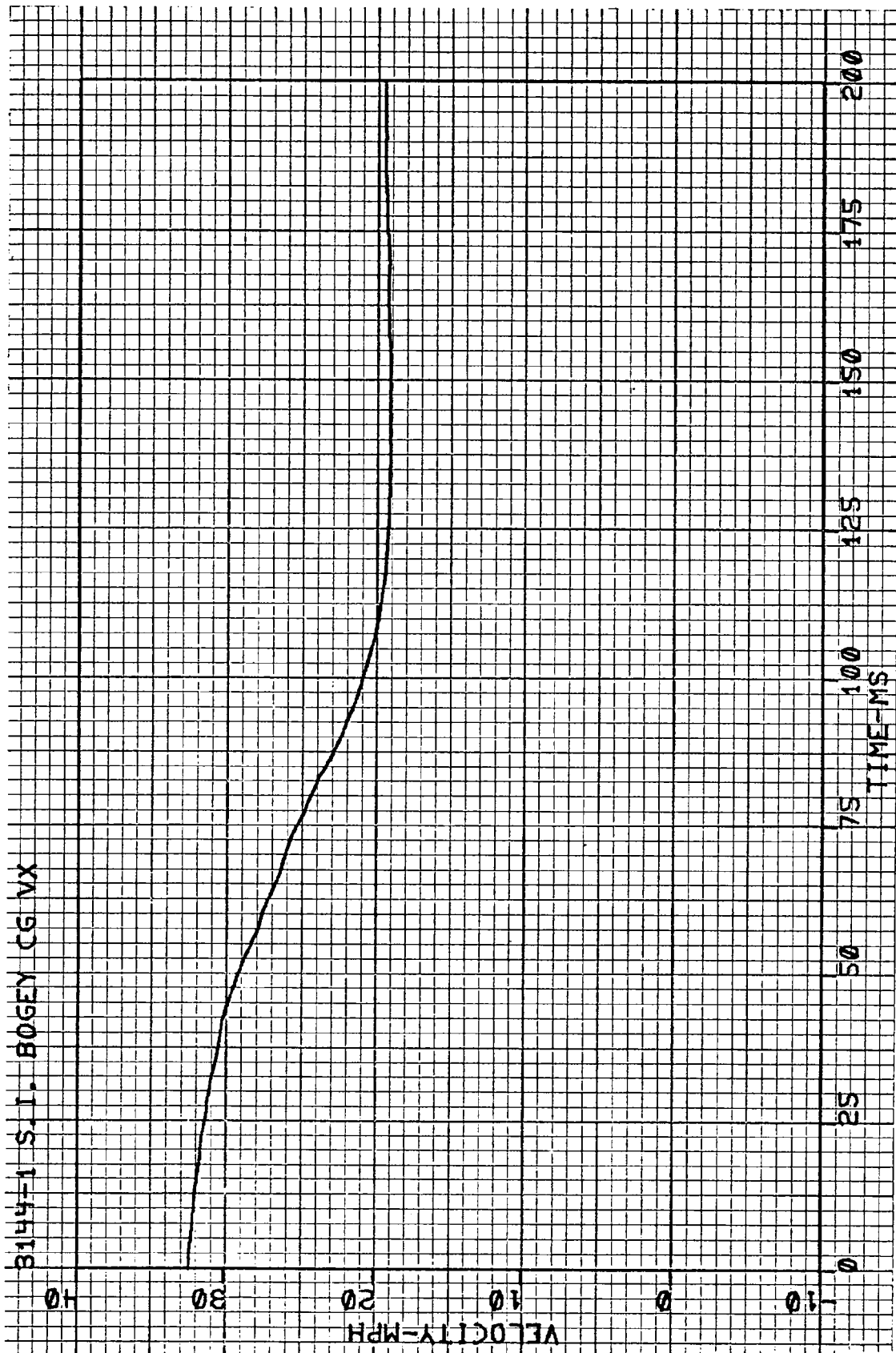


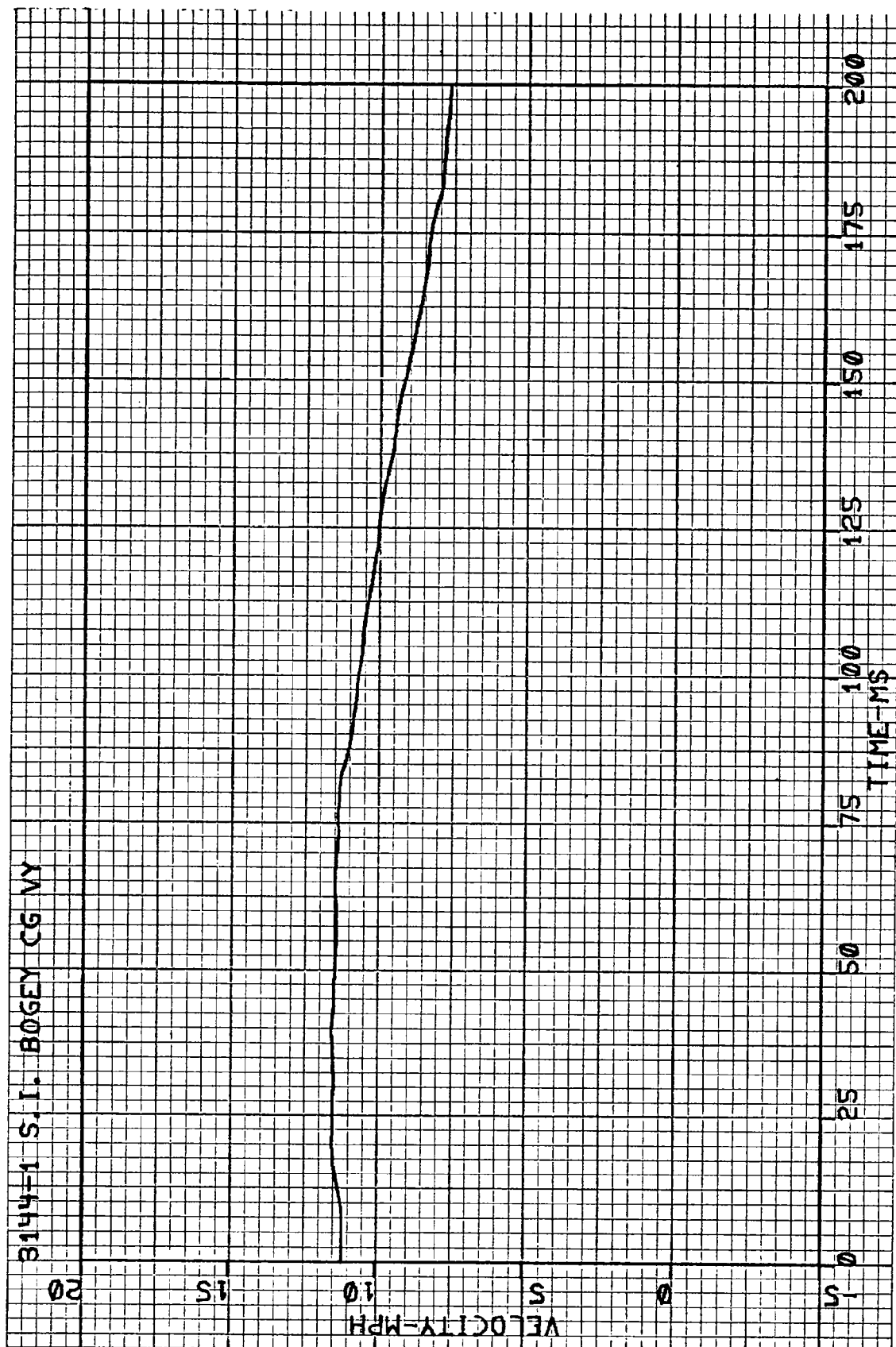


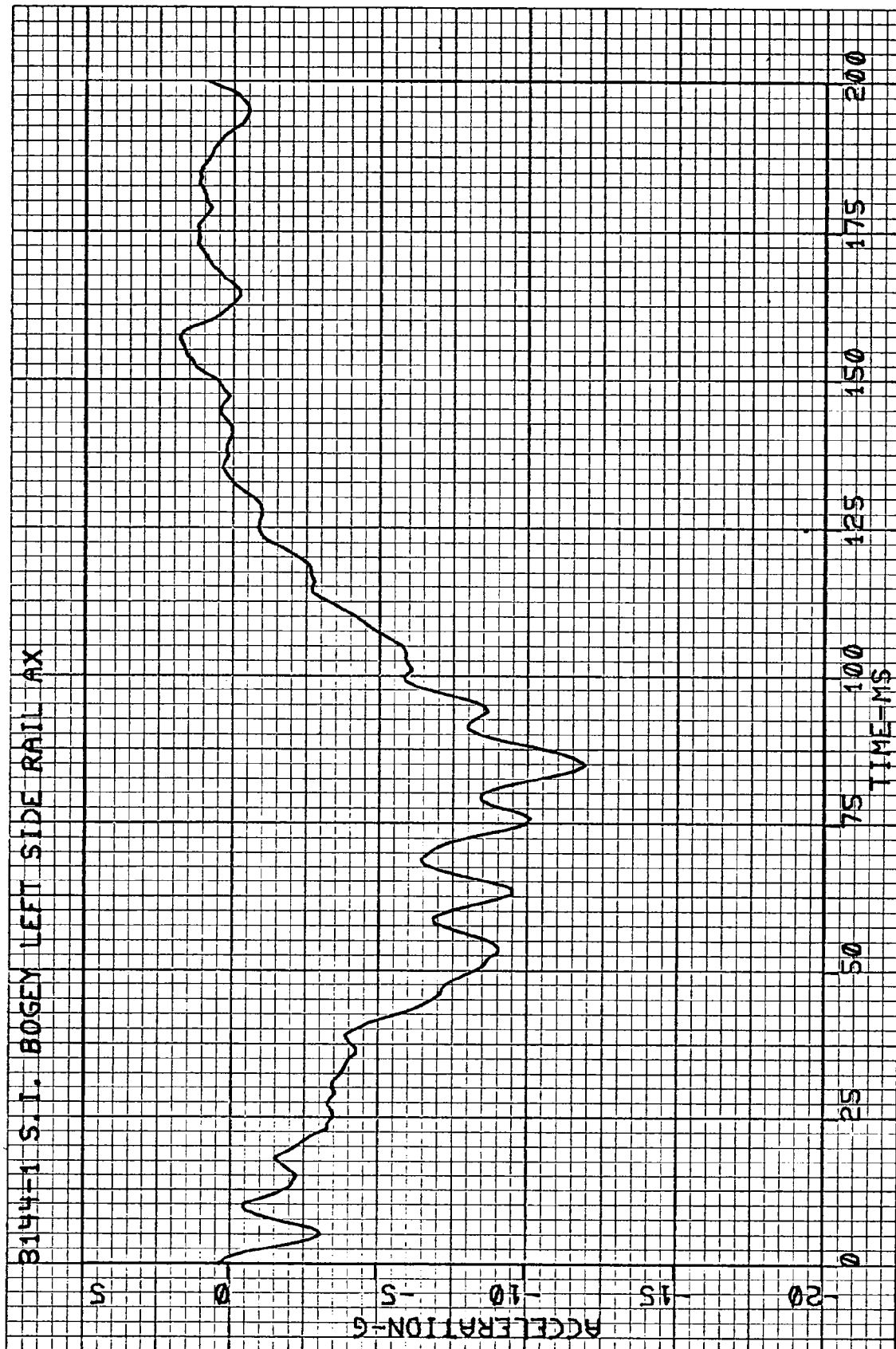


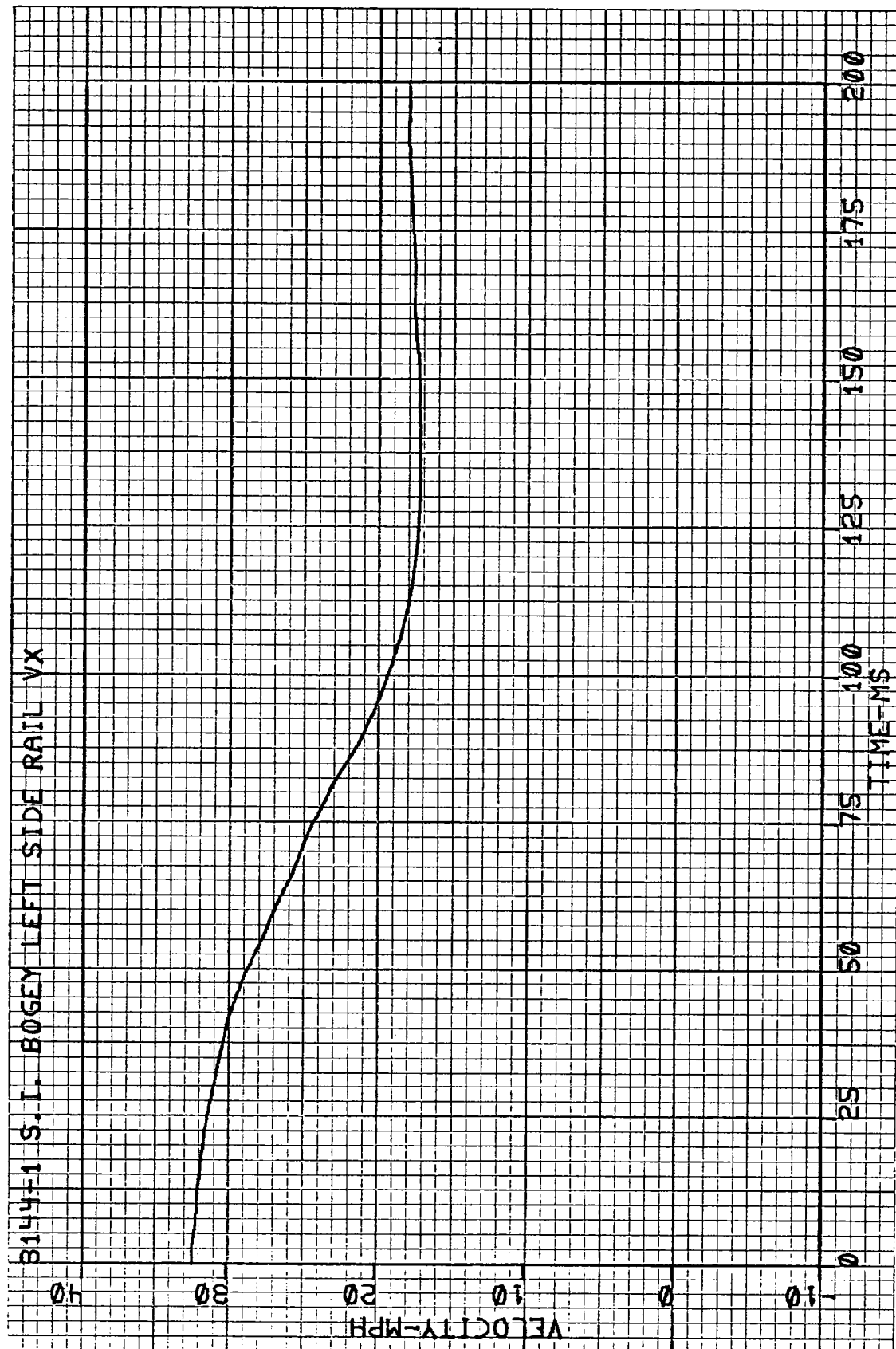


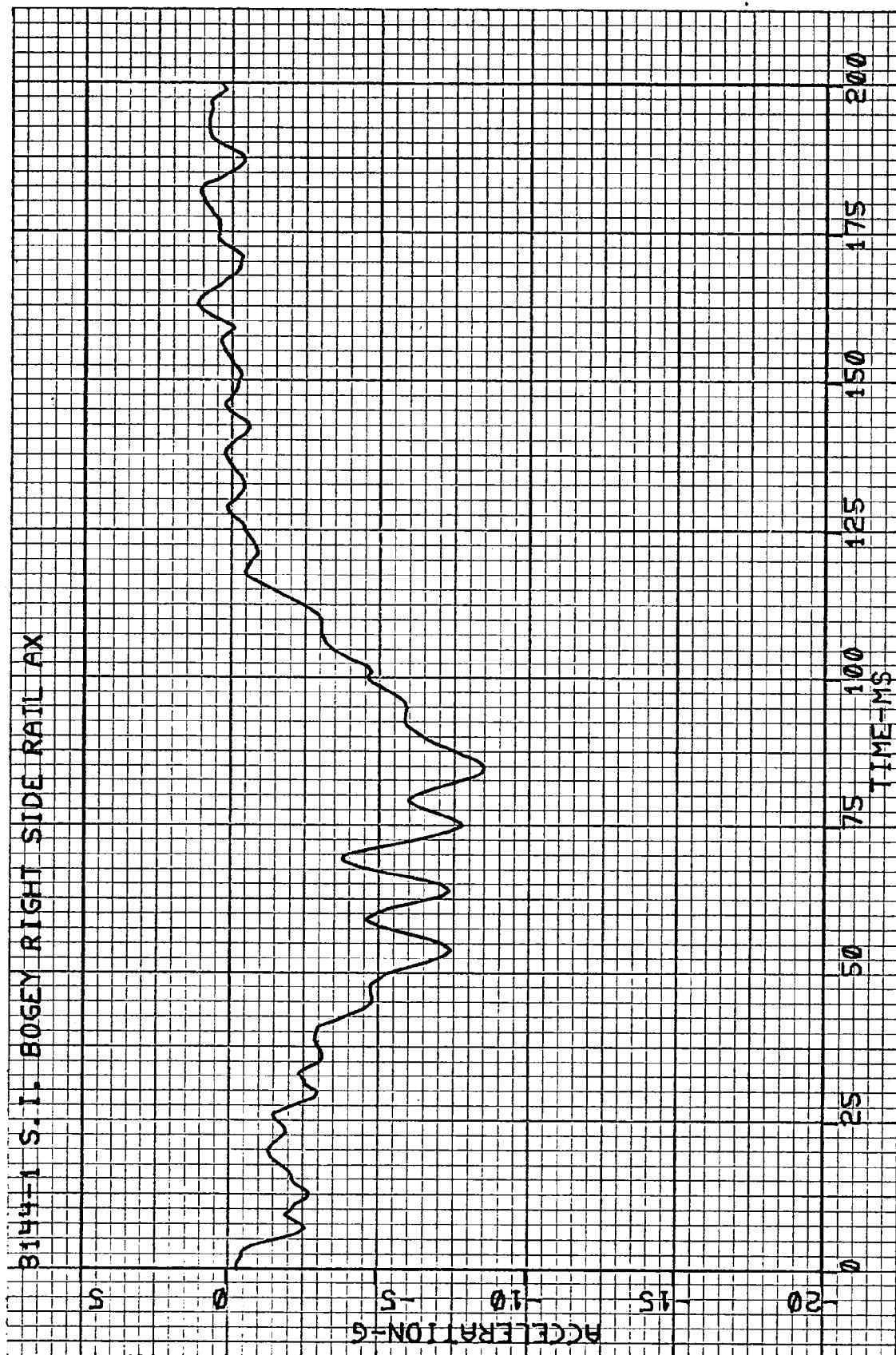


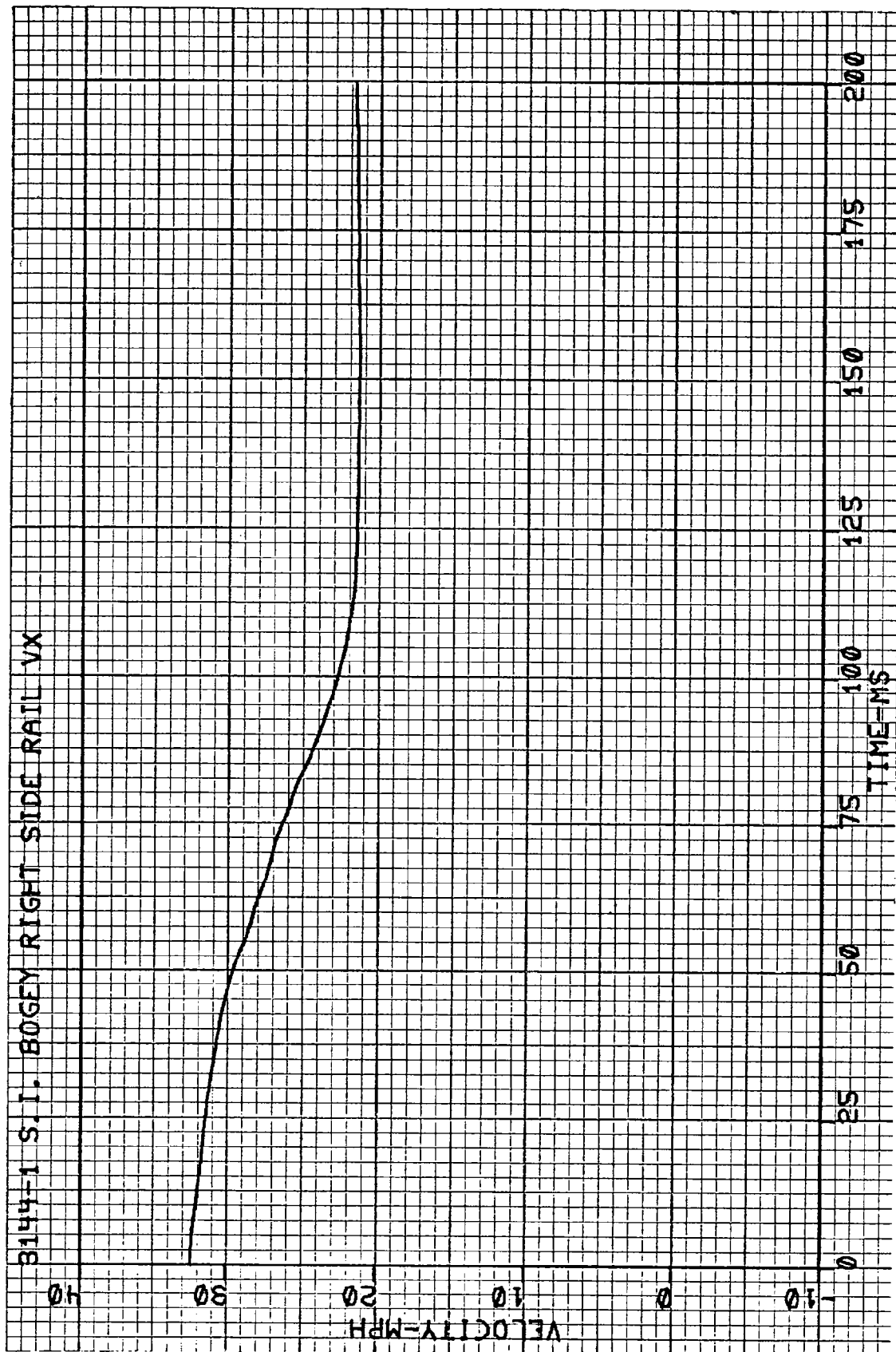




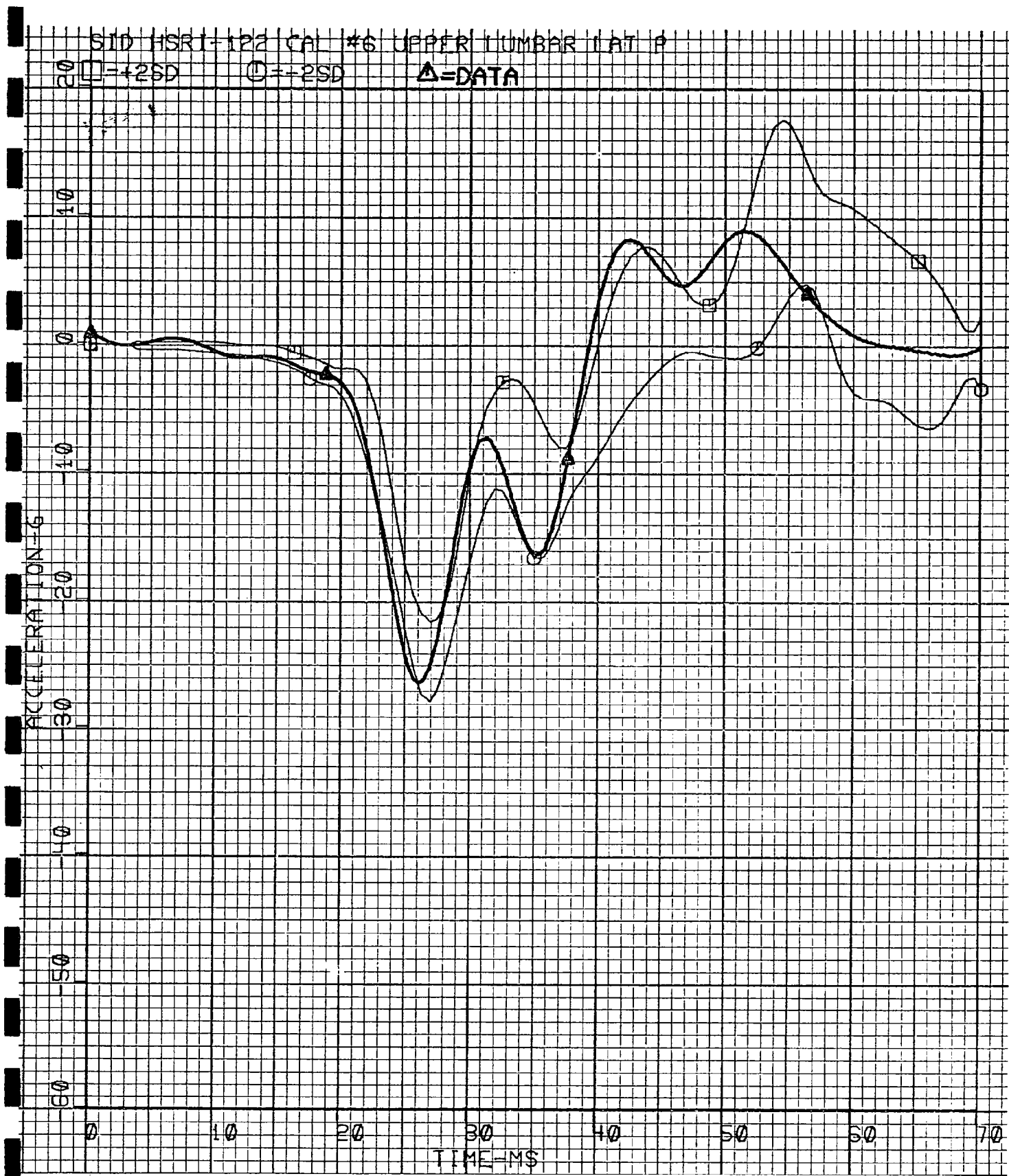








APPENDIX C
DUMMY CALIBRATION DATA
FOR HSRI 122 AND SID 7
19° CRABBED SIDE IMPACTOR TO
1982 VOLKSWAGEN RABBIT
AT 34.23 MPH

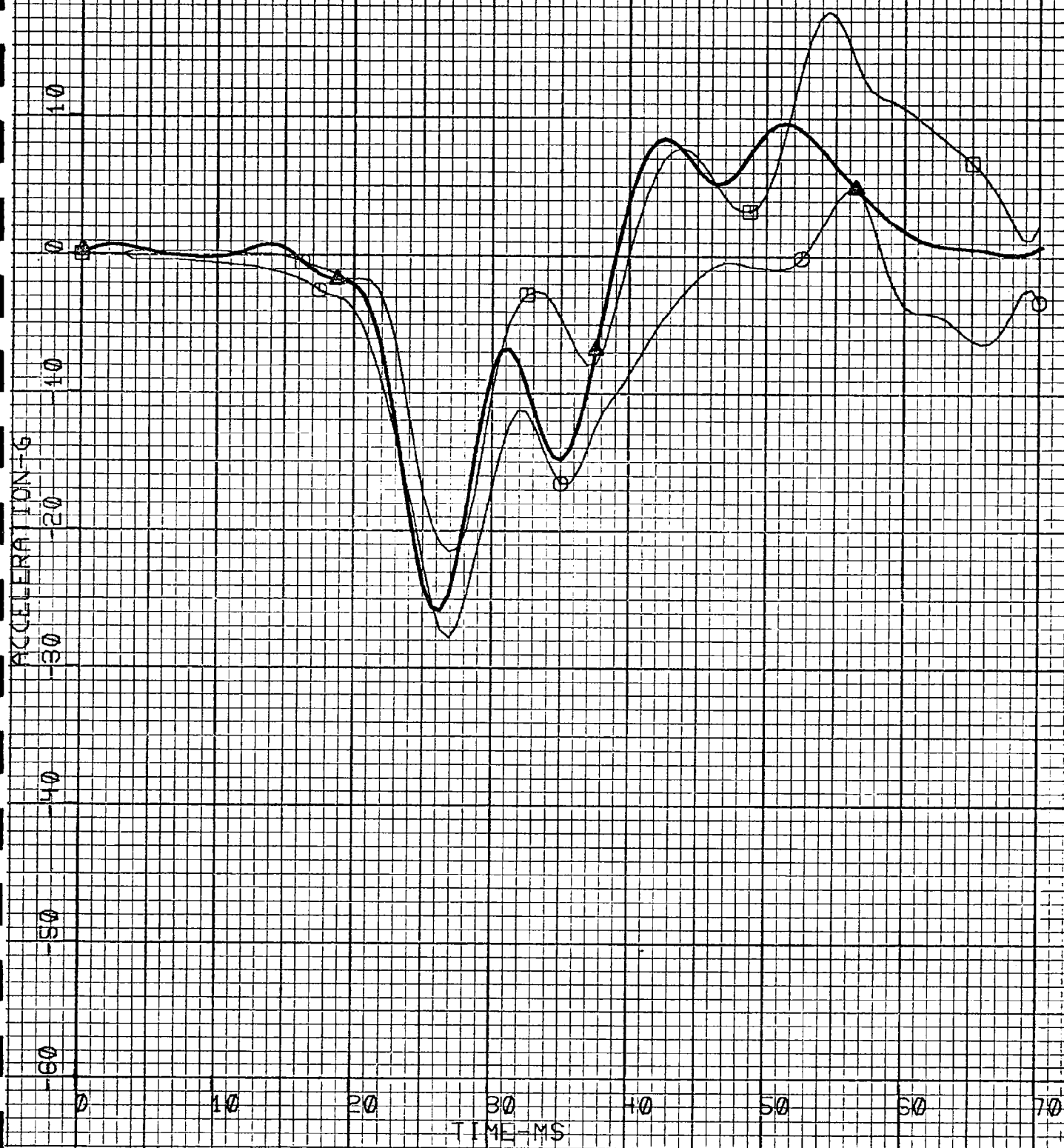


SID HSRI-122 CAL #8 UPPER LUMBAR LAT R

□ = +2SD

○ = -2SD

Δ = DATA



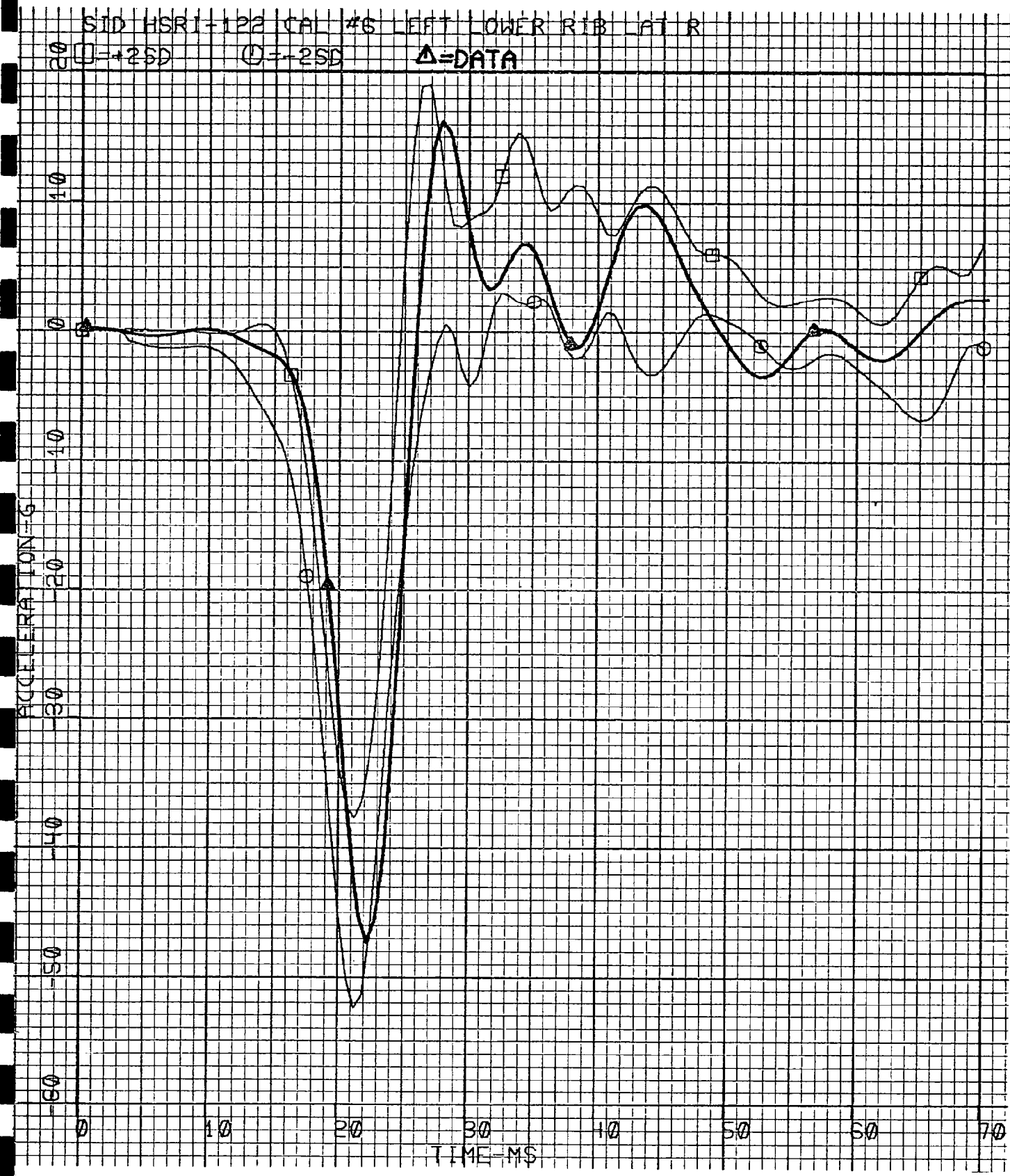
SID HSRI-122 CAL #6 LEFT LOWER RIB LAT P

□ = +250

○ = -250

△ = DATA





SID HSRI-122 CAL #6 LEFT UPPER RIB LAT P

□ = +2SD

○ = -2SD

Δ = DATA

ACCELERATION-G

0

10

20

30

40

50

60

70

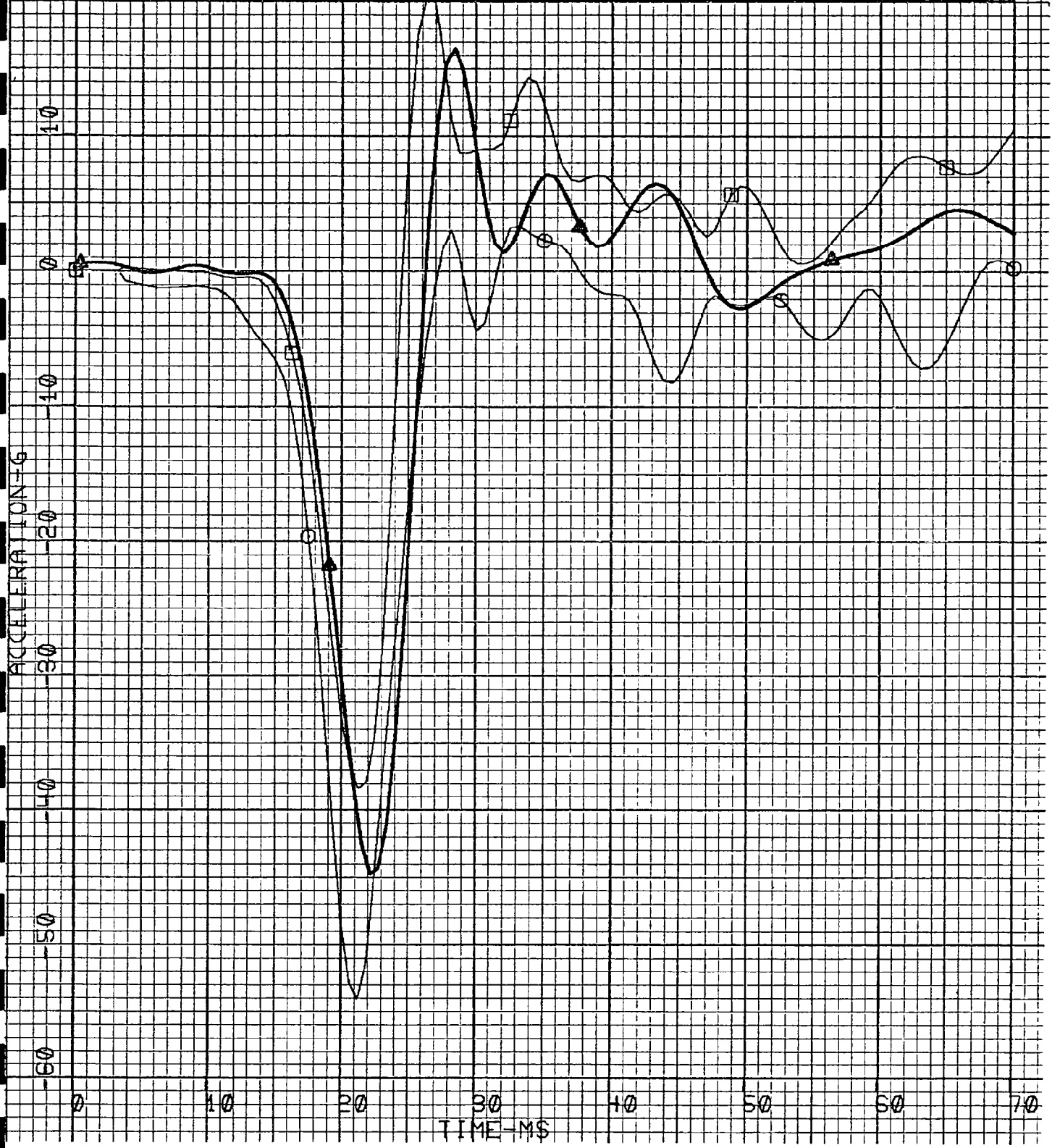
TIME-MS

STD HSRI-122 CAL #6 LEFT UPPER RIB LAT R

□ = +2SD

○ = -2SD

▲ = DATA

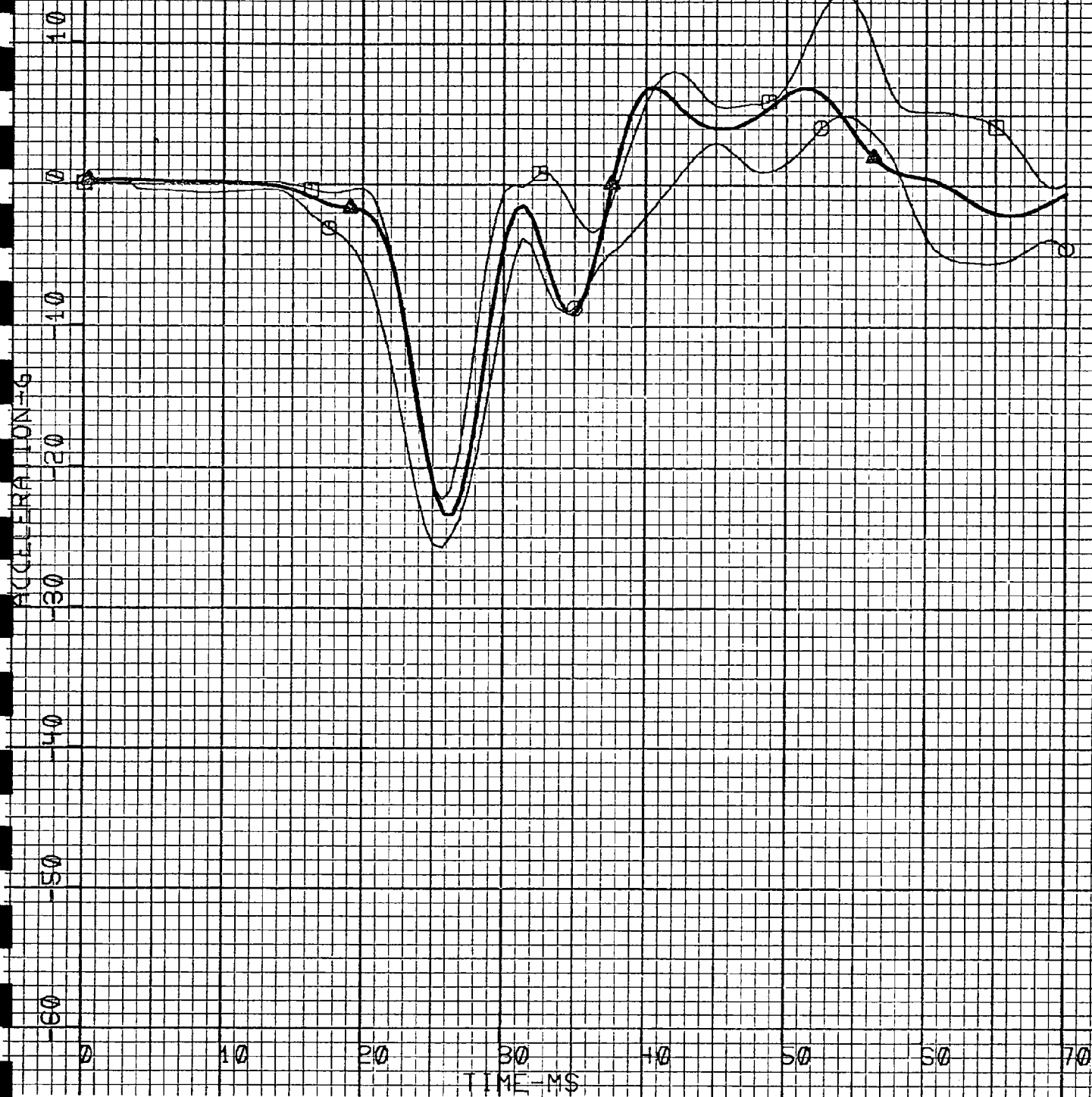


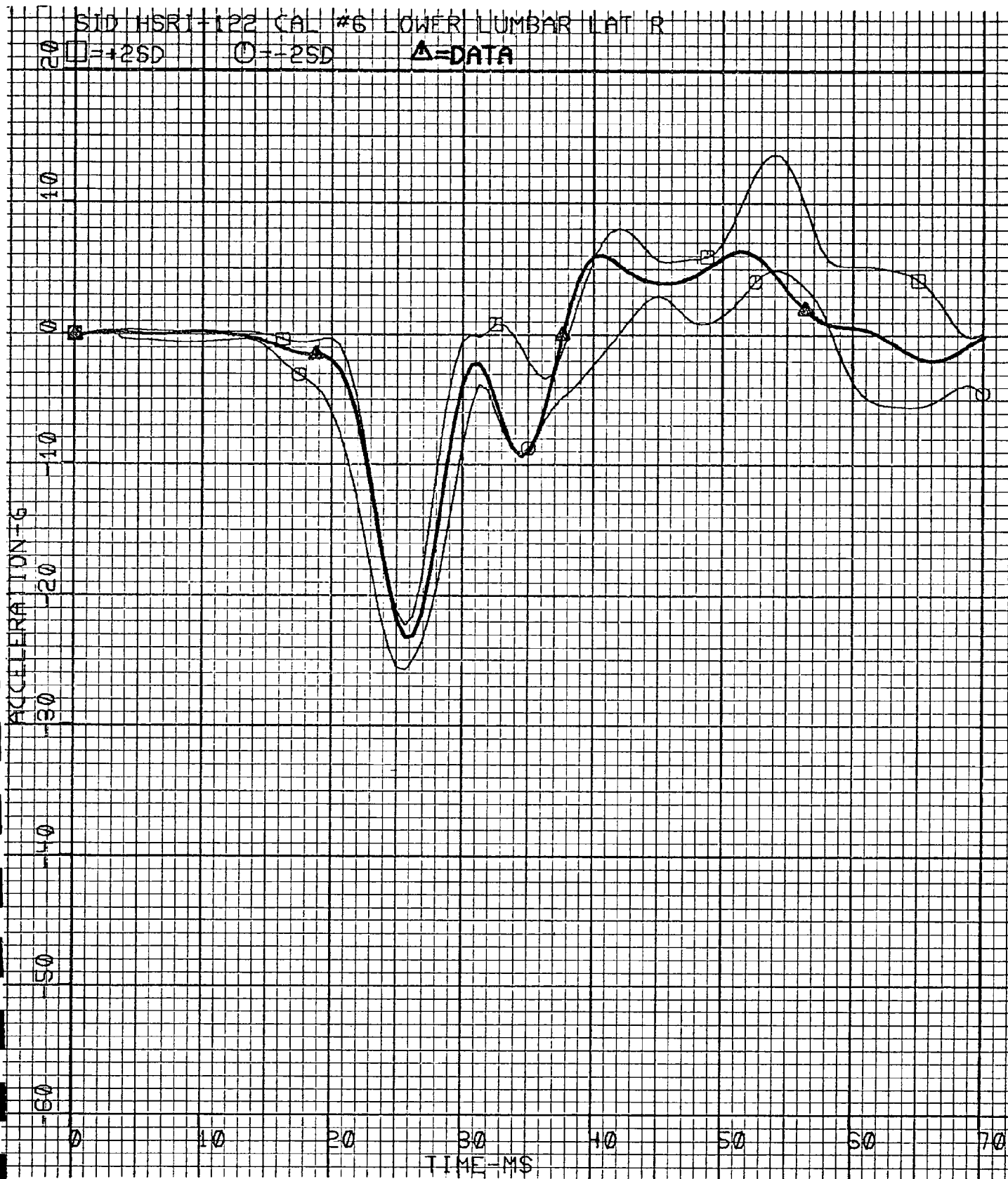
SID HSRI-122 CAL #6 LOWER LUMBAR LAT P

□ = +2SD

○ = -2SD

Δ = DATA





SID 7 CAL #3 UPPER LUMBAR LAT P

□=+2SD

○=-2SD

△#DATA

ACCELERATION-G

TIME-MS

