

DOT 631

FRONTAL IMPACT CRASH TESTS
INVOLVING ALTERNATIVE VEHICLE
DESIGNS UNDER VARYING
CRASH CONDITIONS

TEST NO. 3156-4
1983 HONDA ACCORD-TO-
DEFORMABLE MOVING BARRIER
FULL FRONTAL TEST AT 62.5 MPH
2 DMB

Prepared by:

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An Exodyne Company
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November 1983

TEST REPORT

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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Prepared by Matthew J. Peaves

Approved by Rod Garm

Date 10 Jan. 1984

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Contract Technical Manager
Office of Vehicle Safety Compliance

Date

TECHNICAL REPORT STANDARD TITLE PAGE

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16. Abstract The objective of this test program is to obtain structural performance data for selected vehicle types when subjected to a range of impact conditions. Car-to-car, car-to-fixed object, and car-to-deformable moving barrier tests will be utilized to obtain baseline data for vehicles having dissimilar structural characteristics. This report contains results of all electronic instrumentation data obtained during full frontal impact testing of a 1983 Honda Accord 4-Door Sedan and the NHTSA Deformable Moving Barrier. Testing was conducted by Dynamic Science, Inc. on November 4, 1983 with a closing speed of 62.96 mph. Instrumented 50th percentile dummies were utilized to obtain occupant response data; unrestrained Hybrid III in the passenger position, and restrained standard Part 572 in the driver position.			
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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

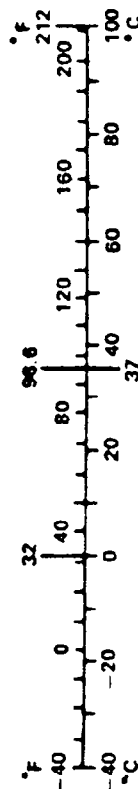


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1.0 PURPOSE AND TEST PROCEDURE

1.1 PURPOSE

A series of 32 impact tests is planned for inclusion in this program; the objective of each being to obtain structural performance data for selected vehicle types when subjected to a range of impact conditions.

Passenger car-to-passenger car, passenger car-to-fixed object, and passenger car-to-deformable moving barrier crash tests will be conducted to obtain baseline test data for vehicles having dissimilar structural characteristics. Electronic data to be collected will include occupant and structural responses of the striking and, when appropriate, struck vehicles.

1.2 TEST PROCEDURE

One 50th percentile Part 572 dummy and one 50th percentile Hybrid III dummy will be utilized in each test to obtain occupant response data relative to FMVSS 208 requirements. Various vehicle mounted accelerometers and a position rate gyro will be utilized to monitor vehicle response to the impact environment. In addition, load cells will be mounted behind the impact face of the deformable moving barrier and stationary pole barrier to monitor total force distribution generated by the impact event.

Actual procedures utilized for vehicle preparation and test conduct will be in general accordance with NHTSA New Car Assessment Program Test Procedure TP-212-02 with modifications and substitutions as directed by the Statement of Work for Contract No. DTNH22-82-A-17148 and the designated NHTSA Contract Technical Monitors.

2.0 REPORT ORGANIZATION

This report contains results of all electronic instrumentation data obtained during full frontal impact testing of a 1983 Honda Accord 4-Door Sedan and the NHTSA Deformable Moving Barrier. Testing was conducted by Dynamic Science, Inc. on November 4, 1983. Impact closing speed was 62.96 mph. NHTSA test designation is 2 DMB.

Summary test results are presented in tabulated format on the following data sheets:

- General Test and Vehicle Parameter Data
- Dummy Occupant In-Vehicle Position Recording Sheet
- Summary of Vehicle Accelerometer Data
- FMVSS 208 Dummy Data Summary
- Instrumentation Camera Locations
- Test Vehicle and Dummy Occupant High-Speed Film Kinematic Analysis Summary
- High-Speed Film Data Table
- Test Vehicle Frontal Profile Data Sheet
- Deformable Moving Barrier Frontal Profile Data Sheet
- Test Vehicle Pre- and Post-Test Exterior Static Measurement Data
- Test Vehicle Pre- and Post-Test Interior Static Intrusion Measurement Data
- Pre- and Post-Test Position of Test Vehicle Accelerometer Mounting Locations
- Miscellaneous Test-Related Data Summary Sheet

Calcomp plots of electronic data from the entire impact event are included in Appendix A. Selected pre- and post-test photographs are presented in Appendix B. Test log of anthropomorphic test devices are presented in Appendix C.

Complete test documentation includes one copy of all high-speed motion picture film and one magnetic computer tape containing all vehicle and occupant test results in digital format for

inclusion in the NHTSA Crash Test Data Base. These latter two items will be forwarded to the designated NHTSA CTM under separate cover.

GENERAL TEST AND VEHICLE PARAMETER DATA

PRE-IMPACT DATA

Make/Model: Honda Accord
 Body Style: 4-Door Sedan Model Year 1983
 NHTSA No. NA DSI No. 1392 Color: Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Honda Motor Company, Ltd
 Date of Manufacture: 8/83; VIN: JHMS25424DC185079
 GVWR: 3160 lb; GAWR: Front = 1640 lb; Rear = 1580 lb

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL

Vehicle Capacity: FRONT REAR RECOMMENDED LOAD RANGE:
 Tire Pressure: 26 psi 26 psi TIRE SIZE: Standard
P185/70R13

Designated Seating: 2 Front 3 Rear 5 Total
 Cargo load = 100 lb Is Spare Tire: Space Saver? Yes
 TOTAL = 850 lb Standard Equipment? Yes

Engine: 107 CID, 4 Cylinder
 Transmission: 5-Speed Manual Front Wheel Drive
 Date Vehicle Received by Laboratory: 10/12/83; Odometer 30.3
 Dealer Name & Address: Bob Simmons Pontiac, Inc., 4635 North
7th Street, Phoenix, AZ 85014

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

Right Front 659 lb Right Rear = 435 lb
 Left Front = 675 lb Left Rear = 464 lb
 TOTAL FRONT WEIGHT = 1334 lb (60 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 899 lb (40 % of Total Vehicle Weight)
 TOTAL DELV. WEIGHT = 2233 lb

TARGET WEIGHT SPECIFIED IN STATEMENT OF WORK = 2600 lb

Right Front = 728 lb Right Rear = 563 lb
 Left Front = 730 lb Left Rear = 590 lb
 TOTAL FRONT WEIGHT = 1458 lb (56 % of Total Vehicle Weight)
 TOTAL REAR WEIGHT = 1153 lb (44 % of Total Vehicle Weight)
 TOTAL TEST WEIGHT = 2611 lb

Weight of ballast secured in vehicle trunk area = 0 lb

VEHICLE ATTITUDE: (inches)

Delivered Attitude: RF 29.0 LF 29.0 RR 29.0 LR 29.0
 Test Attitude: RF 28.3 LF 28.4 RR 27.2 LR 27.3

REMARKS: _____

104555

GENERAL TEST AND VEHICLE PARAMETER DATA (CONT)

POST-IMPACT DATA

Type of Test: Full Frontal (DMB) (0°) Impact
 Date of Test: 11/04/83 Time: 1216 Temperature 75 °F
 Desired Impact Velocity Range: 62.3 to 63.7 mph
 Impact Velocity: Primary = 62.96 mph Secondary = N/A mph

VEHICLE REBOUND AND CRUSH (in.)

Vehicle Length: Pre-test = R 169.7 C 173.0 L 169.6
 Post-test = R 144.7 C 148.6 L 146.8
 Crush = R 25.0 C 24.4 L 22.8
 Distance from front of test vehicle to point of impact:
 R NA C 17.5' L NA

VISIBLE DUMMY CONTACT POINTS

	Driver	Passenger
Head	<u>Instrument panel and steering rim</u>	<u>Windshield</u>
Chest	<u>Steering wheel hub</u>	<u>Instrument panel</u>
Abdomen	<u>Steering wheel rim</u>	<u>Instrument panel</u>
Left Knee	<u>Lower instrument panel</u>	<u>Glove compartment</u>
Right Knee	<u>Steering column</u>	<u>Glove compartment</u>

DOOR OPENING	Front		Rear	
	Left	Right	Left	Right
	<u>Tools required</u>	<u>Tools required</u>	<u>Tools required</u>	<u>Tools required</u>

SEAT MOVEMENT	
Seat Back Failure	<u>None</u> <u>Failure, moved 20° forward</u>
Seat Shift (in.)	<u>Failure, moved full forward</u> <u>Failure, moved full forward</u>

GLAZING DAMAGE: Windshield shattered, loss of retention in lower right corner 5.5 inches and in lower left corner 20.0 inches.

NOTABLE IMPACT EFFECTS: Wheels pinned by sheet metal, deformation of floorpan through "C" pillar, instrument panel severely deformed remaining in contact with both driver and passenger knees.

DUMMY OCCUPANT IN-VEHICLE POSITION RECORDING SHEET

Test Description: Passenger Car-to-NHTSA Test Vehicle (DMB)
Full Frontal, 62.5 mph

Test Vehicle: 1983 Honda Accord DSI No. 1392

Seat Type: Bucket Adjust Type: 7 position manual

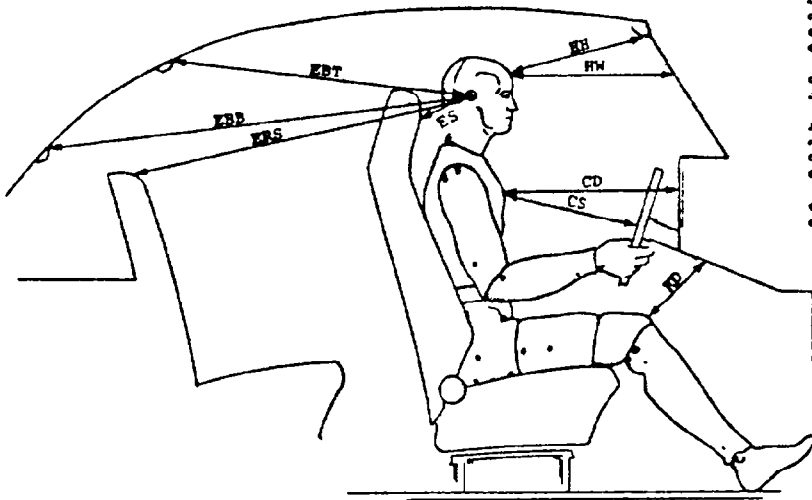
Seat Back Type: Low back with adjustable head rests fully extended

Dummy Description: Part 572 driver, restrained; Hybrid III
passenger, unrestrained

Dummy Interior Temperature Prior to Test Initiation: 70 °F

DRIVER DUMMY#		PASSENGER DUMMY #	
3 9 2		H 4 5	
HEAD TARGET	20.3" -5°	HEAD TARGET	20.7" 0°
KNEE JOINT	21.0" 98°	KNEE JOINT	21.8" 95°
APPROXIMATE "H" POINT	6.6" 130°	APPROXIMATE "H" POINT	7.3" 130°

DUMMY OCCUPANT IN-VEHICLE POSITION RECORDING SHEET

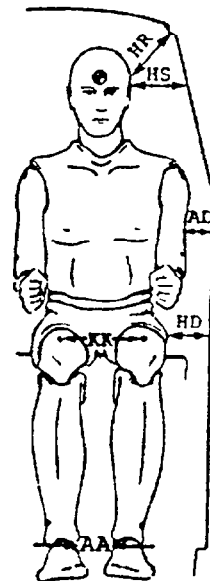


90 8314 40 00302

	Driver	Passenger
HH	16.0	15.5
HW	22.2	21.0
CD	22.0	20.0
CS	14.8	N/A
KD L	6.0	4.0
KD R	5.3	5.3
HIP	NA	26.5
Torso	Torso	
Angle	21°	Angle 21°
Seat Back	Seat Back	
Angle	21°	Angle 21°
HSW	21.2	NA

HH = Head to Windshield Header
 HW = Head to Windshield
 CD = Chest to Dash
 CS = Chest to Steering Wheel
 KD = Knees to Dash
 HR = Head to Side Roof
 HS = Head to Side Window
 AD = Arm to Door
 HD = Hip to Door
 KK = Knee to Knee
 HIP = Head to Instrument panel
 Torso and seat back angles
 are relative to vertical.

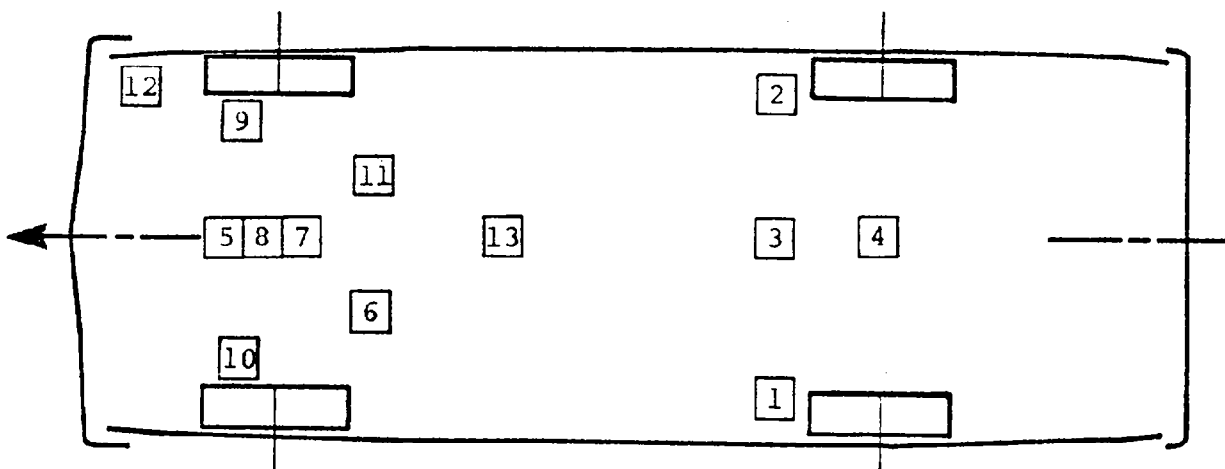
REMARKS: Dummies positioned with
reference to OVSC recommended
procedure for positioning Part
572 dummies in test vehicle.



80 8314 40 00303

	Driver	Passenger
HR	6.7	6.0
HS	9.0	9.3
AD	4.6	4.3
HD	7.2	6.7
KK	10.5	10.5
AA	11.0	11.0

SUMMARY OF VEHICLE ACCELEROMETER DATA



03 3156 03

Vehicle: 1983 Honda Accord

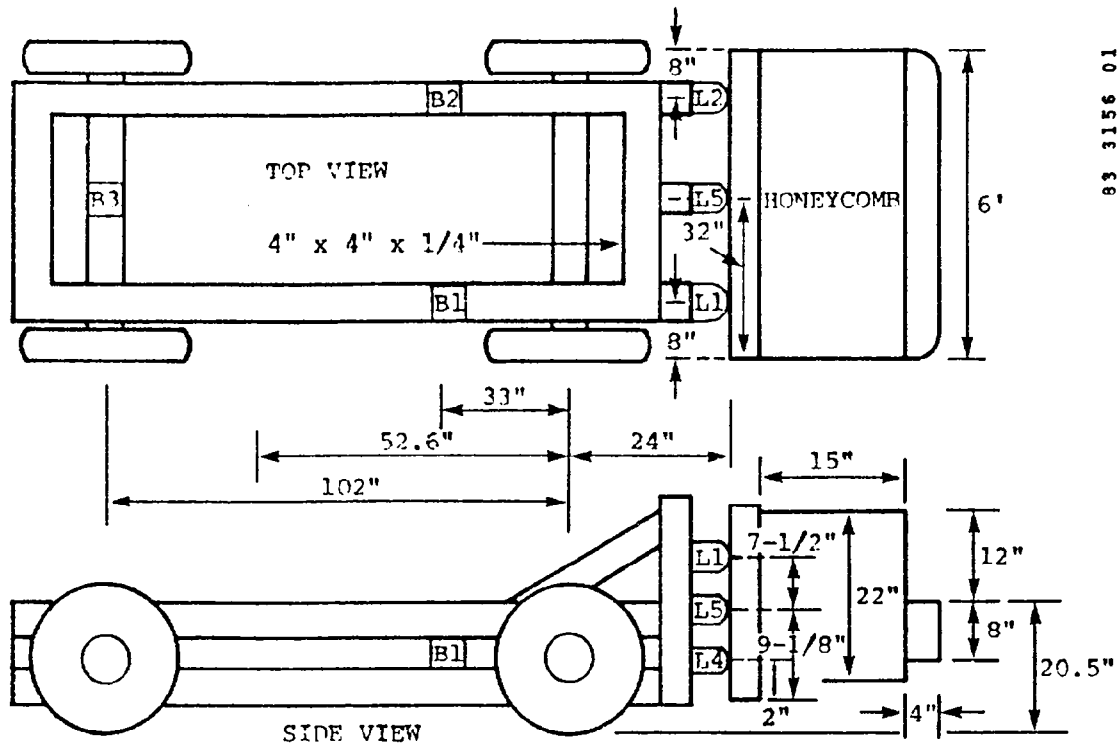
DSI No. 1392

Loc. No.	Description	Direction	Maximum Value			
			"-"	msec	"+"	msec
1	Rear seat X-member - left side primary	X	33.2	51.0	2.9	143.0
1*	Rear seat X-member - left side redundant	X	50.2	59.0	7.0	143.2
2	Rear seat X-member - right side primary	X	33.5	53.5	7.4	157.9
2*	Rear seat X-member - right side redundant	X	36.3	53.8	8.3	157.5
3	Rear seat X-member - centerline	X	44.6	54.9	8.0	200.0
3	Rear seat X-member - centerline	Y	6.3	65.9	12.7	71.3
3	Rear seat X-member - centerline	Z	26.4	59.8	20.6	79.8
4	Rear axle centerline	X	34.8	51.9	5.4	142.2
4	Rear axle centerline	Z	14.1	85.3	19.0	69.1
5	Top of engine block	X	130.9	30.8	43.8	49.3
5	Top of engine block	Z	22.5	48.5	33.4	35.9
6	Steering wheel hub	X	117.5	47.9	101.8	65.9
6	Steering wheel hub	Z	28.5	103.6	49.0	16.5
7	Front suspension X-member	X	66.2	13.1	27.8	50.6
7	Front suspension X-member	Z	16.2	20.8	19.2	14.1
8	Bottom of engine	X	112.0	19.9	29.2	51.5
9	Right front brake caliper	X	42.4	44.8	44.8	53.3
10	Left front brake caliper	X	42.7	19.5	27.6	55.6
11	Instrument panel**	X	21.4	30.3	124.1	40.3
11	Instrument panel	Z	78.1	52.8	75.4	41.0
12	Air bag sensor location**	X	117.8	40.4	35.5	28.8
13	Pitch rate gyro (deg)	X	1.2	88.0	2.4	36.0

*Mounted on rubber isolation pad.

**Sensor damaged and/or cable separated at approximately 60 msec.

SUMMARY OF MOVING BARRIER ACCELEROMETER DATA



83 3156 01

WEIGHT BY WHEEL

LF 984 RF 940 LR 530 RR 544 Total 2998 pounds

Loc. No.	Description	Direction	Maximum Value			
			"-"	msec	"+"	msec
B1	Right upper frame rail	X*	21.8	24.8	2.5	119.5
B1	Right upper frame rail	Z	15.5	26.5	23.8	44.0
B2	Left upper frame rail	X	27.3	14.2	2.6	294.8
B2	Left upper frame rail	Z*	27.6	12.4	27.5	43.1
B3	Rear axle centerline	X	28.4	12.0	4.6	119.1
B3	Rear axle centerline	Y	21.4	70.0	7.5	172.1
B3	Rear axle centerline	Z	16.8	24.1	17.6	84.3
L1	Top right load cell	X	22838	25.0	4322	86.0
L2	Top left load cell	X	21400	15.5	2898	85.5
L3	Bottom left load cell	X	16153	70.0	1968	172.0
L4	Bottom right load cell	X	17949	70.0	3660	172.0
L5	Center load cell	X	22050	31.4	619	149.8

*Mounted on rubber isolation pad.

FMVSS 208 DUMMY DATA SUMMARY

	Driver Dummy				Passenger Dummy			
	Positive Direction*		Negative Direction**		Positive Direction*		Negative Direction**	
	Peak (G)	Time (msec)	Peak (G)	Time (msec)	Peak (G)	Time (msec)	Peak (G)	Time (msec)
Head Acceleration								
Longitudinal	Data Invalid				27.6	70.0	106.9	84.8
Lateral	44.8	157.8	44.8	85.8	57.3	77.4	44.5	92.5
Vertical	95.7	84.1	28.0	21.3	130.5	76.4	106.4	98.8
Resultant	206.9†	83.5	-	-	151.3	76.4	-	-
HIC 3868.9 between 81.1 msec and 90.8 msec - driver.								
HIC 1641.8 between 72.0 msec and 105.0 msec - passenger.								
Chest Acceleration								
Longitudinal	28.1	157.5	63.9	72.8	53.1	71.6	97.5	93.3
Lateral	8.5	131.0	23.8	74.3	16.6	72.0	30.7	94.4
Vertical	13.7	48.0	15.0	62.6	78.3	75.9	14.7	55.4
Resultant (Max)	66.1	72.8	-	-	98.4	93.1	-	-
Resultant (Clip)	57.0	-	-	-	80.0	-	-	-
TIME > 60 G	2.5 msec				15.1 msec			
SEVERITY INDEX	563.5 @ 320 msec				1108.5 @ 320 msec			
Upper Sternum Acceleration								
Longitudinal	Not instrumented.				60.5	121.1	53.3	94.6
TIME > 60 G					0.3 msec			
Lower Sternum Acceleration								
Longitudinal	Not instrumented.				107.7	95.1	159.6	90.1
TIME > 60 G	N/A				8.6 msec			
*Longitudinal:	Forward				**Longitudinal:	Rearward		
Lateral:	Rightward				Lateral:	Leftward		
Vertical:	Downward				Vertical:	Upward		
†Invalid AX component.								

FMVSS 208 DUMMY DATA SUMMARY (Continued)

	Driver Dummy				Passenger Dummy			
	Positive Direction*		Negative Direction**		Positive Direction*		Negative Direction**	
	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)
Neck Loads								
Longitudinal					125.5	87.0	61.7	69.5
Lateral	Not instrumented.				228.4	76.5	129.5	99.5
Vertical Moment (ft-lb)					15.4	172.5	39.8	92.0
Femur Loads								
Left	230	93.0	1580	71.0	480	9.0	3200	70.0
Right	1563†	21.0†	2473†	69.0†	720	55.0	3100	72.0
Belt Loads								
Lap	1041.5	62.0	418.6	26.0	Belts not in use.			
Torso	1618.1	76.5	706.9	26.0				
Chest Pot	Not instrumented.				8.0	96.0	0.6	69.0
*Longitudinal:	Forward				**Longitudinal:	Rearward		
Lateral:	Rightward				Lateral:	Leftward		
Vertical:	Downward				Vertical:	Upward		
†Questionable data.								

CAMERA LOCATIONS

Test No: 3156-4 Test Date: 11/4/83

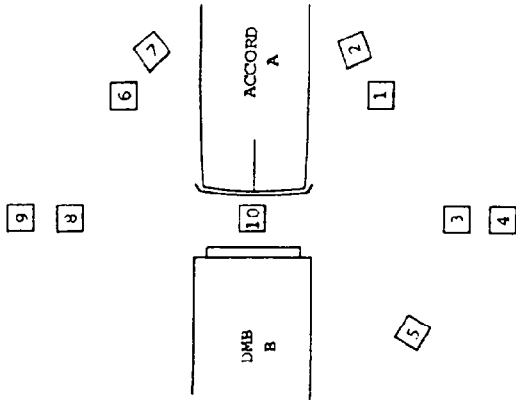
Test Type: DMB TO ACCORD FULL FRONTAL

Vehicle A (Away): 1983 HONDA ACCORD

Vehicle B (Barrier): DMB

Comments: BOTH VEHICLES MOVING, CAMERA LOCATIONS

VERIFIED BY CTM.



- CAMERA SYMBOLS
- ☐ PIT
 - ☐ GROUND
 - ☐ BARRIER
 - ☒ OVERHEAD
 - ☐ ON-BOARD
- FRAME RATE
- 1. 1000 fr/sec
 - 2. 200 fr/sec
 - 3. Other 24 fr/sec
 - 4. 400 fr/sec
 - 5. 500 fr/sec
- TIMING LIGHT SPEED
- 1. 100 Hz (10 msec/light)
 - 2. 200 Hz (5 msec/light)
 - 3. Other

CAMERA	YES
STILLS	
SLIDES	
MOVIE	
POLAROID	
VIDEO	

Loc. No.	Location	Field of View	Lens Size	Frm Rate	Trng Spd	Ser No	Impact Dist-X	C.L. Dist-Y	CAH Hght-2
1	Inline vehicle door left side	Driver dummy close-up - Hycam	25	1007	NA	168	6'2"	18'6"	4'2"
2	Oblique vehicle door left side	Driver dummy close-up - Photosonic	25	720	100	4	8'11"	12'5"	5'8"
3	Perpendicular to impact - left side	Overall impact close-up - Hycam	15	1.48	NA	228	6'0"	51'6"	3'9"
4	Perpendicular to impact - left side	Overall impact - Fastax	50	880	100	105	6'0"	54'3"	5'6"
5	Oblique to vehicle - left side	Front left of vehicle and driver dummy - Phot.	25	870	100	12	-14'11"	15'9"	6'1"
6	Inline vehicle door - right side	Passenger dummy close-up - Hycam	25	1010	100	109	5'9"	16'6"	4'0"
7	Oblique vehicle door right side	Passenger dummy close-up redundant - Phot.	25	1070	100	7	10'2"	15'0"	5'8"
8	Perpendicular to impact - right side	Overall impact close-up - Photosonic	50	1108	100	8	6'0"	44'4"	3'0"
9	Perpendicular to impact - right side	Overall impact - Photosonic	15	990	100	10	6'0"	48'4"	5'4"
10	Pit	Engine and front underside of Accord - Phot.	13	NA	NA	5	2'5"	0'0"	-10'9"
11	Left side impact	Overall panning - Canon Scopic	Var	24	NA	NA	NA	NA	NA

**TEST VEHICLE AND DUMMY OCCUPANT
HIGH-SPEED FILM KINEMATIC ANALYSIS SUMMARY**

<u>Time (msec)</u>	
0	Impact.
20	Instrument panel begins intrusion into occupant compartment.
39	Steering assembly begins intrusion into occupant compartment.
56	Driver head reference plane contacts steering wheel at 42 ft/sec. Reference contact velocity = velocity of reference plane - velocity of intruding wheel = $42 - (-7) = 49$ ft/sec.
57	Driver chest reference plane contacts steering wheel at 34 ft/sec.
64	Passenger head reference plane contacts windshield at 45 ft/sec, and driver chest contacts steering wheel at 26 ft/sec.
66	Passenger chest reference plane contacts instrument panel at 45.2 ft/sec, and steering assembly intrusion ends.
71	Driver head contacts upper steering rim at 29 ft/sec. Contact velocity = velocity of head - velocity of steering wheel = $29 - (-15) = 44$ ft/sec.
72	Vehicle and barrier reach common velocity.
76	Passenger head contacts windshield at 44 ft/sec.
78	Passenger chest contacts instrument panel at 44 ft/sec.
84	Instrument panel ends intrusion into occupant compartment.
86	Passenger head contacts deformed hood.

HIGH-SPEED FILM DATA TABLE

	Driver			Passenger		
	Head	Chest	Steering Column	Head	Chest	Instrument Panel
t_1	-	-	39 msec	-	-	20 msec
t_2	-	-	66 msec	-	-	84 msec
t_c	71 msec	64 msec	-	76 msec	78 msec	-
t_i	56 msec	57 msec	-	64 msec	66 msec	-
v_c	29 ft/sec	26 ft/sec	-15 ft/sec	44 ft/sec	44 ft/sec	-
v_i	42 ft/sec	34 ft/sec	-7 ft/sec	45 ft/sec	45 ft/sec	-
D_1	-	-	17.3 in.	-	-	9.9 in.
D_2	-	-	20.3 in.	-	-	20.1 in.
B_1	-	-	16.0 in.	-	-	9.8 in.
B_2	-	-	20.4 in.	-	-	21.8 in.
D_C	(Vehicle) 21.9 in.					
D_B	(Barrier) 21.3 in.					

Where:

t_1 = time beginning of intrusion or deformation

t_2 = time ending of intrusion or deformation

t_3 = time vehicle and barrier reach common velocity = 72 msec

t_c = time of contact

t_i = time 15 inch reference plane for head of 12 inch reference plane for chest contacts interior component

v_c = velocity at contact

v_i = velocity at reference plane

D_1 = vehicle travel from time of impact to t_1

D_2 = vehicle travel from time of impact to t_2

B_1 = barrier travel from time of impact to t_1

B_2 = barrier travel from time of impact to t_2

D_C = distance vehicle travels from time of impact to t_3

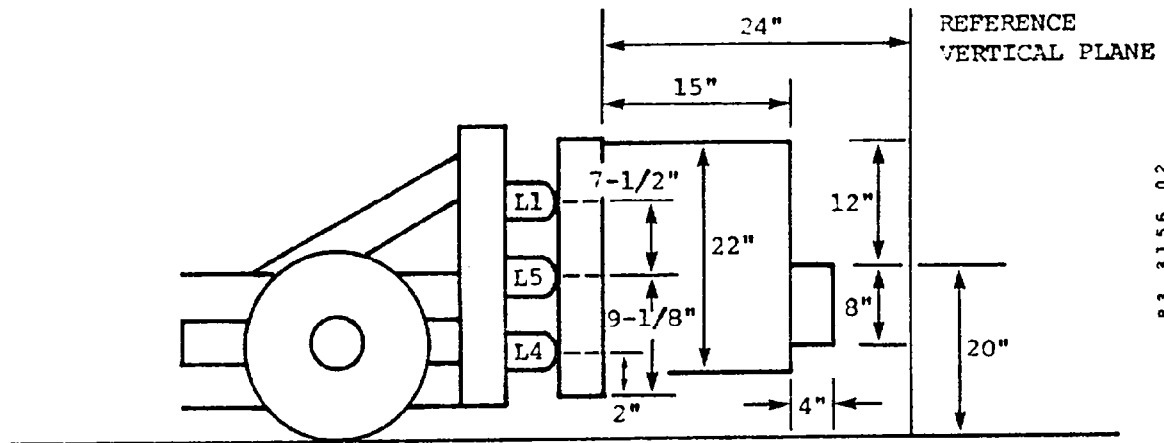
D_B = distance barrier travels from time of impact to t_3

TEST VEHICLE FRONTAL PROFILE DATA SHEET

Measurements referenced to plane 190 inches forward of rear bumper centerline.

		<u>Vehicle Left (In.)</u>						<u>Vehicle Right (In.)</u>			
	<u>Height</u>	<u>24</u>	<u>18</u>	<u>12</u>	<u>6</u>	<u>C</u>		<u>6</u>	<u>12</u>	<u>18</u>	<u>24</u>
<u>Pre-Test</u>											
Bottom of Front Bumper	15.7	19.7	18.2	17.4	17.3	17.0	17.1	17.3	18.2	20.0	
Top of Front Bumper	19.7	19.1	18.1	17.3	17.2	17.0	17.1	17.3	18.0	19.3	
Center of Grille Area	25.0	24.5	23.5	21.5	21.3	20.5	21.2	20.8	23.3	24.5	
Front of Hood	27.5	23.1	22.1	20.8	20.6	20.5	20.6	21.4	22.0	23.1	
<u>Post-Test</u>											
Bottom of Front Bumper	24.5	47.7	44.6	44.7	45.4	46.4	47.9	48.9	47.2	48.7	
Top of Front Bumper	28.5	47.5	46.4	46.5	47.1	47.9	48.7	48.7	48.0	48.0	
Center of Grille Area	31.5	50.9	50.6	50.0	51.3	51.2	51.7	51.8	52.0	52.0	
Front of Hood	34.0	52.0	52.8	51.9	52.5	52.7	53.5	52.8	57.0	52.6	
<u>Change</u>											
Bottom of Front Bumper		28.0	26.4	27.3	28.1	29.4	30.8	31.6	29.0	28.7	
Top of Front Bumper		28.4	28.3	29.2	29.9	30.9	31.6	31.4	30.0	28.7	
Center of Grille Area		26.4	27.1	28.5	30.0	30.7	30.5	31.0	28.7	27.5	
Front of Hood		28.9	30.7	31.1	31.9	32.2	32.9	31.4	35.0	29.5	

DEFORMABLE MOVING BARRIER (DMB) FRONTAL PROFILE DATA SHEET

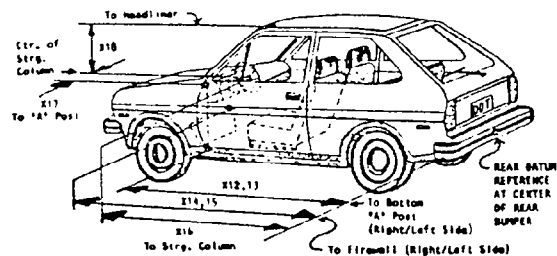
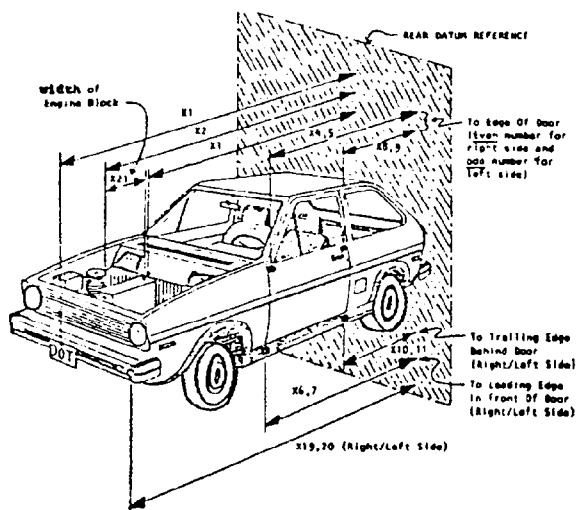


83 3156 02

Test Description Passenger Car-to-NHTSA DMB Full Frontal 62.5 mph

Measurements referenced from vertical plane 24 inch from front backing face of DMB.

	Height	30	24	18	12	6	6	6	12	18	24	30
<u>Pre-Test</u>												
Top of Face	32.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Midpoint of Face	26.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Top of Bumper	20.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Bottom of Bumper	12.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
<u>Post-Test</u>												
Top of Face	31.0	14.0	15.3	18.1	17.3	14.2	18.3	18.1	19.3	20.5	14.4	18.7
Midpoint of Face	25.0	11.0	12.5	15.0	13.7	18.2	14.6	14.9	16.3	17.3	11.2	13.6
Top of Bumper	18.0	13.0	14.0	12.9	12.8	12.9	13.9	14.6	15.8	15.0	15.3	15.8
Bottom of Bumper	13.0	12.8	10.8	10.4	10.1	10.2	10.3	10.3	10.1	10.0	10.3	10.6
<u>Crush</u>												
Top of Face		5.0	6.3	9.1	8.3	5.2	9.3	9.1	10.3	11.5	5.4	9.7
Midpoint of Face		2.0	3.5	6.0	4.7	9.2	5.6	5.9	7.3	8.3	2.2	4.6
Top of Bumper		8.0	9.0	7.9	7.8	7.9	8.9	9.6	10.8	10.0	6.3	6.8
Bottom of Bumper		7.8	5.8	5.4	5.1	5.2	5.3	5.3	5.1	5.0	5.3	5.6



TEST VEHICLE PRE-/POST-TEST EXTERIOR STATIC MEASUREMENT DATA

Vehicle: 1983 Honda Accord NHTSA No.: N/A
 Test Date: 11/04/83 D.S. No.: 1392

Reference Dimension	Pre-test Measurement	Post-test Measurement	Change
X ₁	173.0	148.6	24.4
X ₂	152.8	137.0	15.8
X ₃	131.0	122.0	9.0
X ₄	115.4	113.3	2.1
X ₅	115.5	113.4	2.1
X ₆	118.8	116.3	2.5
X ₇	118.9	116.7	2.2
X ₈	79.9	79.0	0.9
X ₉	80.0	78.8	1.2
X ₁₀	81.1	79.1	2.0
X ₁₁	81.2	79.9	1.3
X ₁₂	119.9	117.7	2.2
X ₁₃	120.0	118.2	1.8
X ₁₄	128.9	118.3	10.6
X ₁₅	128.9	118.2	10.7
X ₁₆	102.5	98.0	4.5
X ₁₇	15.5	12.0	3.5
X ₁₈	14.4	16.8	-2.4
X ₁₉	169.6	146.8	22.8
X ₂₀	169.7	144.7	25.0
X ₂₁	11.0	11.0	0.0

**TEST VEHICLE PRE- AND POST-TEST INTERIOR STATIC
INTRUSION MEASUREMENT DATA**

Test Description: Passenger Car-To-NHTSA Test Vehicle, Full
Frontal, 62.5 mph

Test Vehicle: 1983 Honda Accord DSI No. 1392

Measurements referenced from a vertical plane 90 inches from the rear bumper.

First Level = Top of driver instrument panel
Second Level = Center of instrument panel
Third Level = Bottom of instrument panel

	<u>24</u>	<u>18</u>	<u>12</u>	<u>6</u>	<u>6</u>	<u>12</u>	<u>18</u>	<u>24</u>
<u>Pre-Test</u>								
First Level		20.4	20.4	20.3				
Second Level	19.3	19.3	19.3	19.3	19.3	19.3	19.3	19.3
Third Level	25.2	25.2	25.2	25.2	20.0	26.2	26.9	26.9
<u>Post-Test</u>								
First Level		14.6	14.9	15.0				
Second Level	12.1	12.3	12.4	12.4	13.5	13.8	13.2	13.3
Third Level	21.0	20.0	19.0	18.5	13.0	13.4	13.4	13.4
<u>Intrusion</u>								
First Level		5.8	5.5	5.3				
Second Level	7.2	7.0	6.9	6.9				
Third Level	4.2	5.2	6.2	5.7	7.0	12.8	13.5	13.5

**PRE- AND POST-TEST POSITION OF TEST VEHICLE
ACCELEROMETER MOUNTING LOCATIONS**

Test Description: Passenger Car-To-NHTSA Test Vehicle, Full

Frontal, 62.5 mph

Test Vehicle: 1983 Honda Accord

DSI No. 1392

Reference Plane: _____

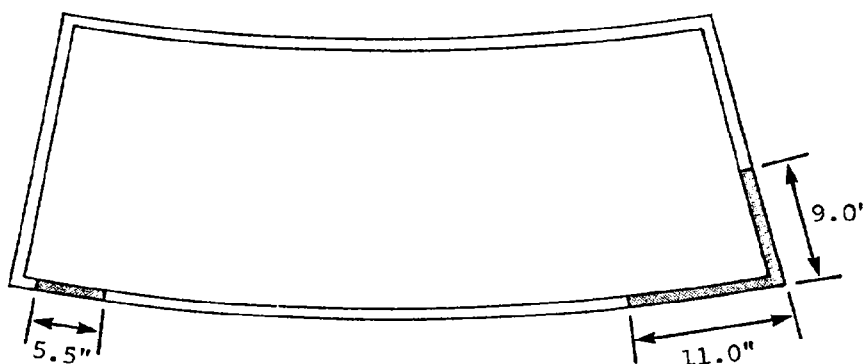
Accelerometer Description	Longitudinal Location		
	Pre-Test	Post-Test	Change
Rear seat X-member - left side primary	69.7	69.2	0.5
Rear seat X-member - left side redundant	64.5	64.2	0.3
Rear seat X-member - right side primary	70.8	70.5	0.3
Rear seat X-member - right side redundant	64.8	64.4	0.4
Rear seat X-member - centerline	69.0	68.7	0.3
Rear axle centerline	37.3	37.0	0.3
Top of engine block	148.2	131.7	16.5
Steering wheel hub	104.5	100.0	4.5
Front suspension X-member	151.0	138.7	12.3
Bottom of engine	143.3	136.5	6.8
Right front brake caliper	134.9	134.7	0.2
Left front brake caliper	134.8	134.7	0.1
Instrument panel	110.3	104.0†	6.3
Air bag sensor location	158.0	134.0	24.0
Yaw rate gyro	76.4	76.0	0.4

†Displaced from its position.

MISCELLANEOUS TEST RELATED DATA SUMMARY SHEET

Listed below is test related information of a general nature regarding the test vehicle, moving barrier, fixed barrier, or dummy occupants. Items of interest or anomalies from one test to another may be noted.

- A. Pre-test windshield perimeter of the Honda Accord measured 148.0 inches. Post-test inspection revealed a loss of windshield retention over an approximate total span of 25.5 inches (17.2 percent of pre-test measurement) located in the lower left and right hand corners.



FRONT VIEW

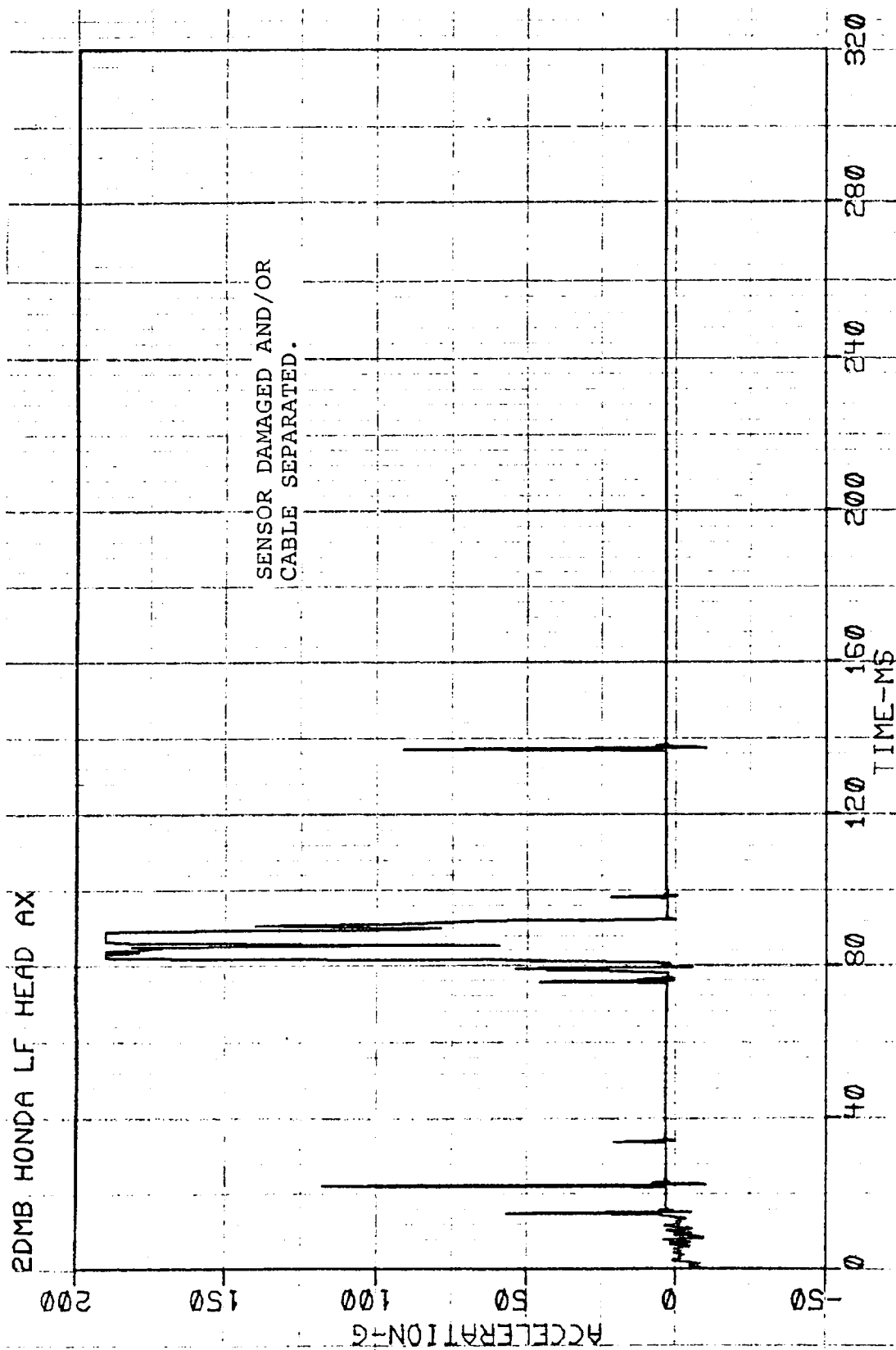
B. Comments on Data Acquisition

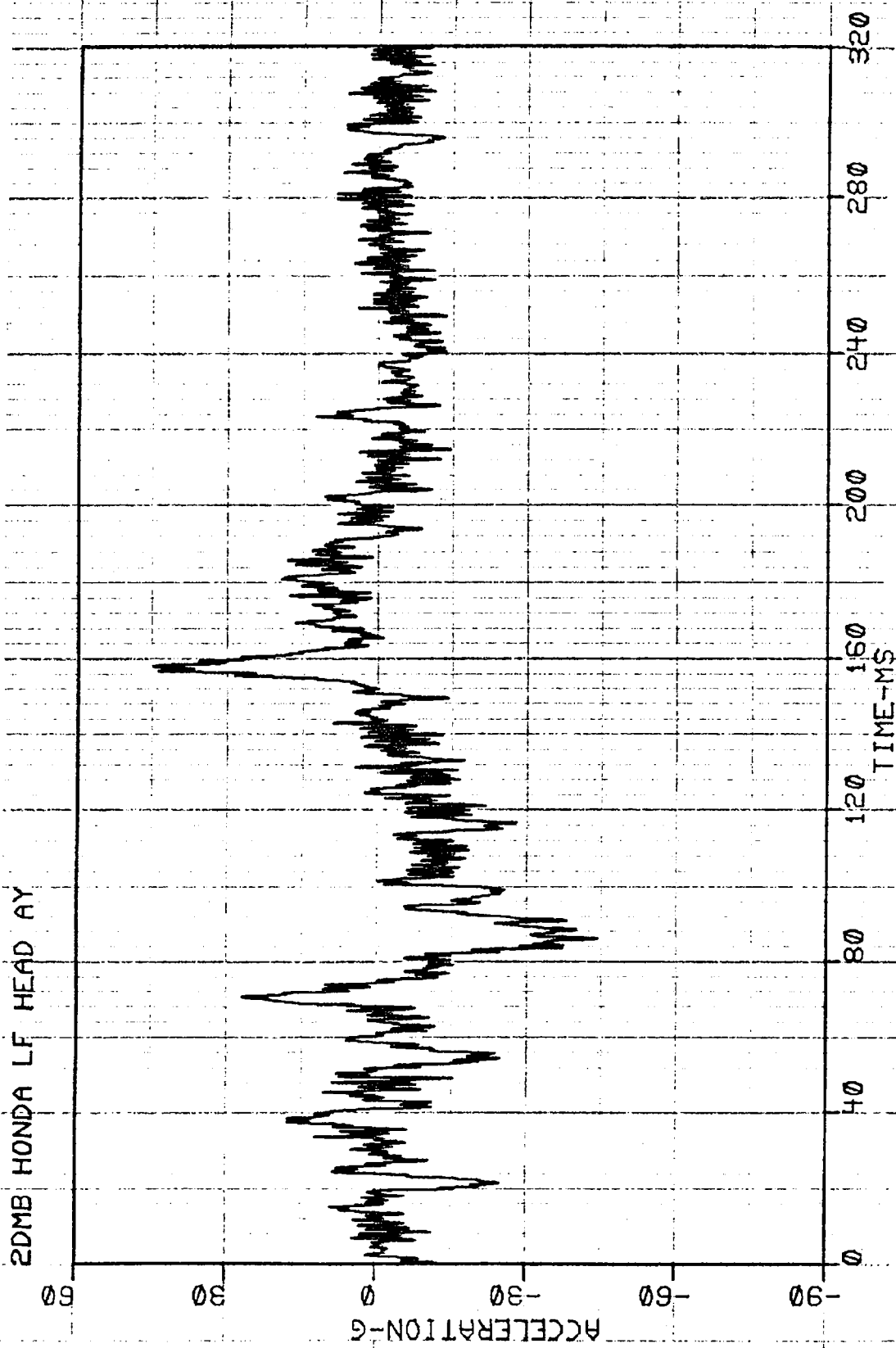
Transducer data transmission cables running from both the instrument panel and air bag sensor longitudinal mounting locations were severed approximately 60 milliseconds post impact.

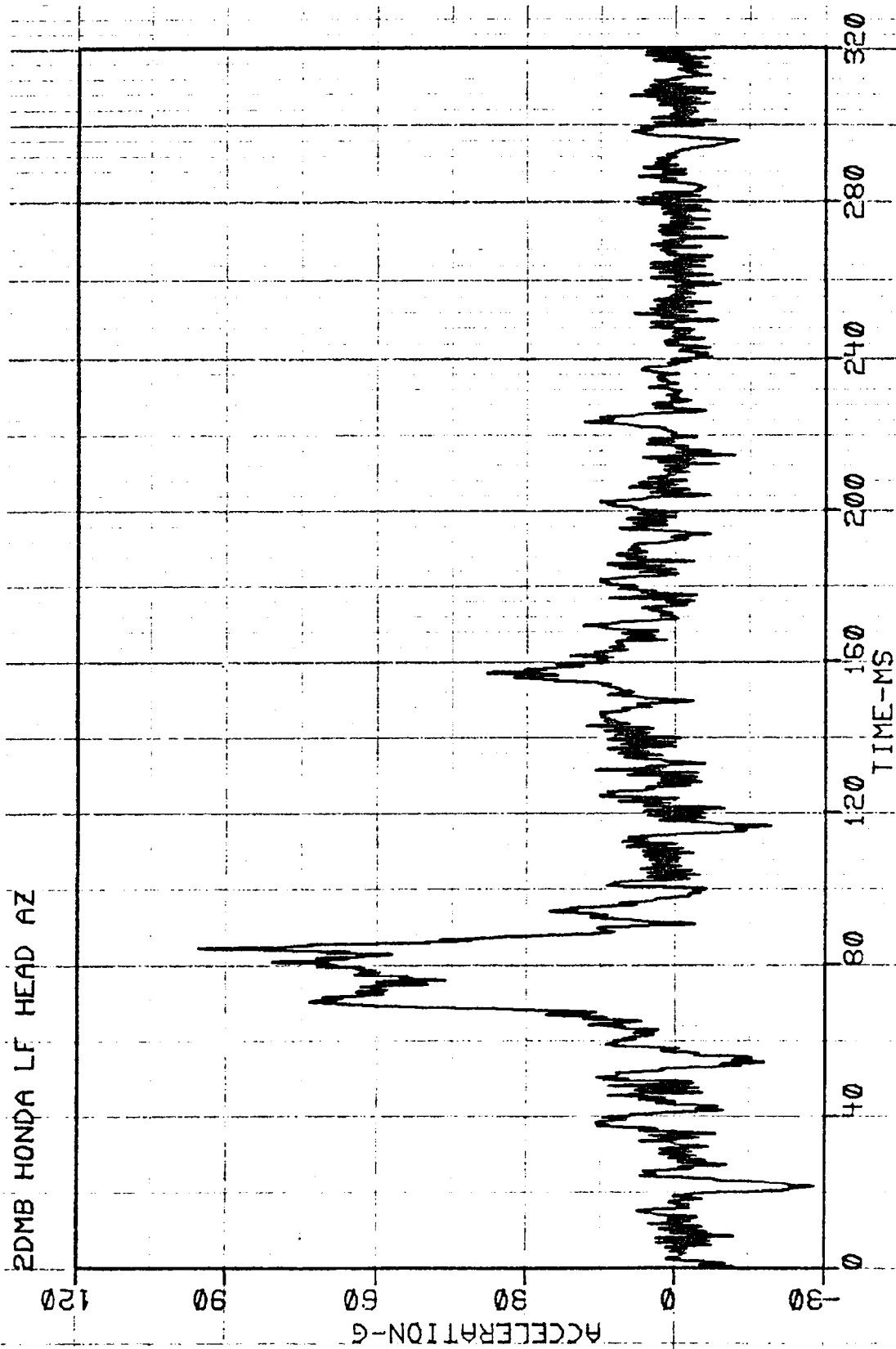
Valid data acquisition from the driver head longitudinally mounted sensor was interrupted approximately 12 milliseconds post impact. Consequently, data presented for the driver head resultant is contaminated by an invalid AX component. Cause of failure is believed due to a discontinuity in the transmission cable.

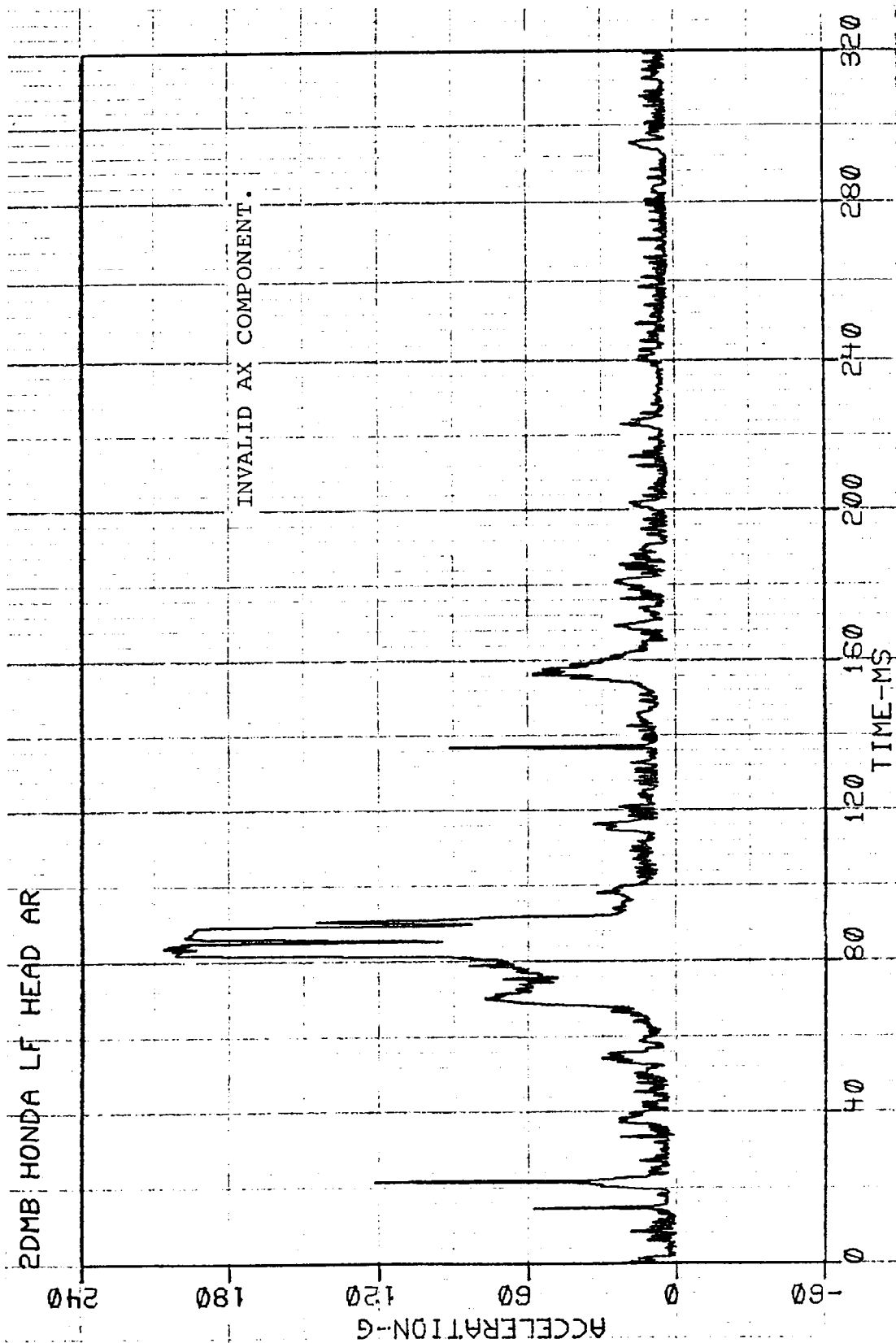
Data presented from the driver right femur location is deemed questionable due to the general shape of the trace signature. As no component malfunctions were identified, this effect is believed due to an incorrect "gain" value being assigned to this particular channel during the pre-test set-up process.

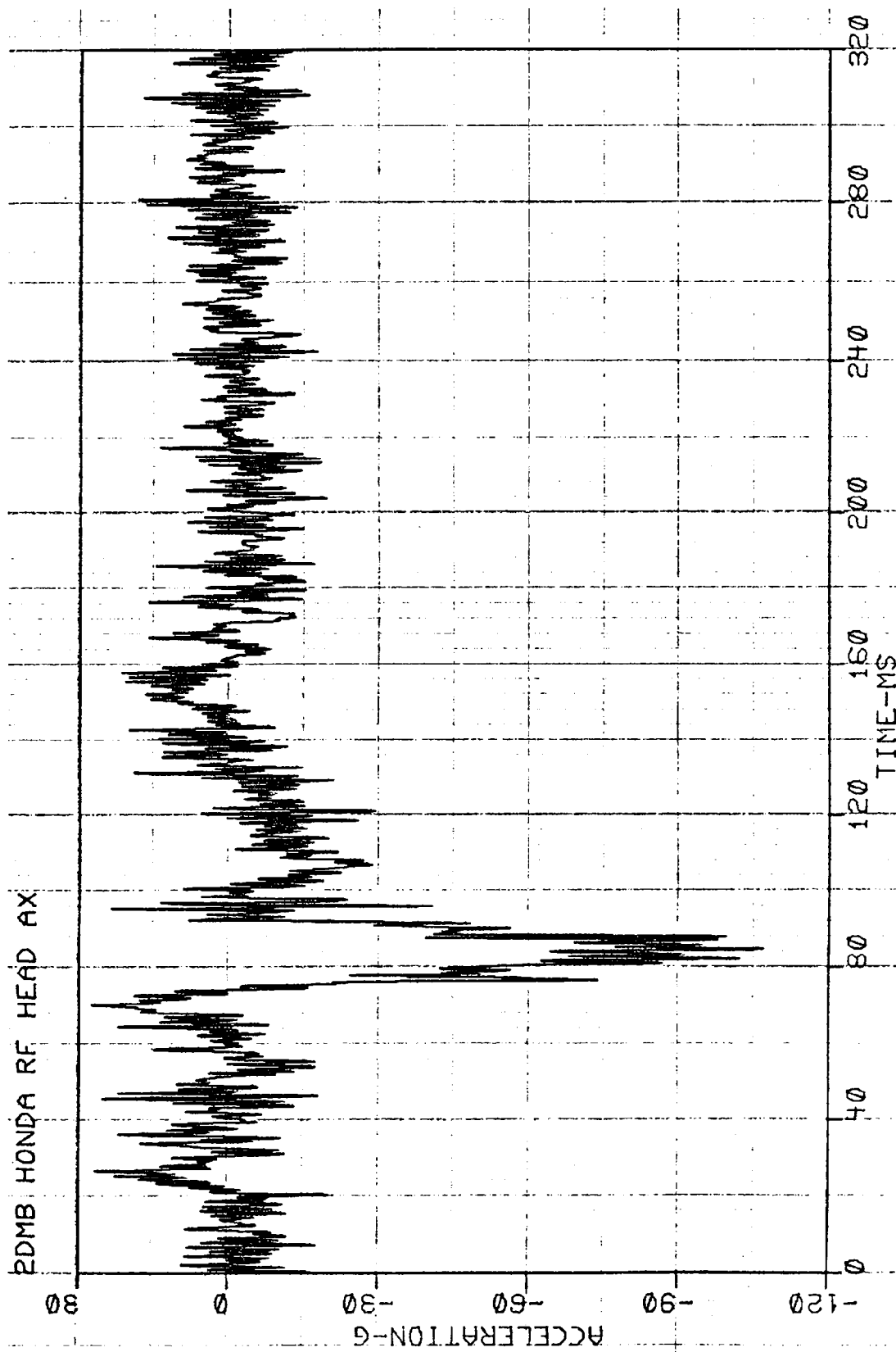
APPENDIX A
CALCOMP PLOTS OF ELECTRONIC DATA

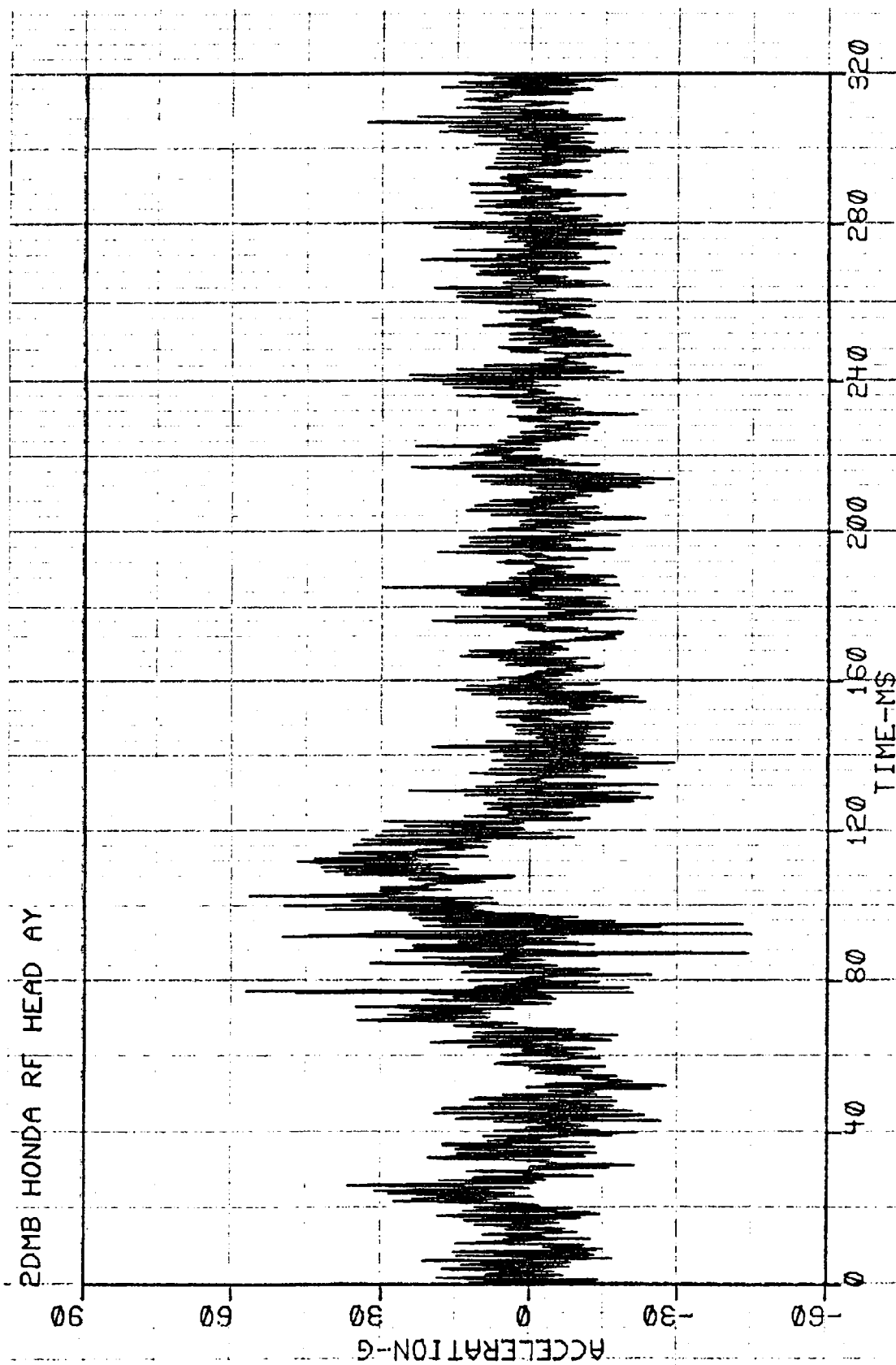


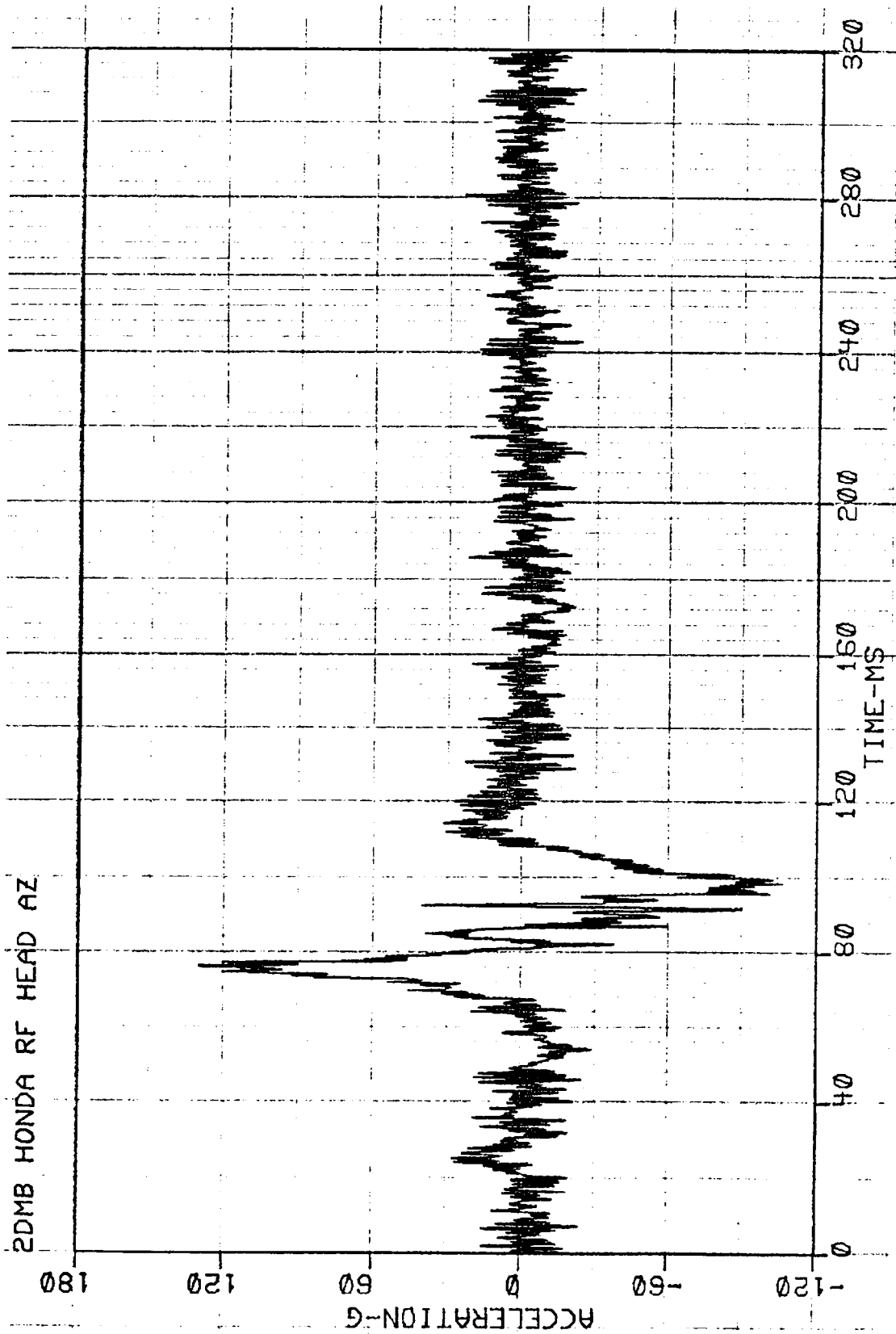


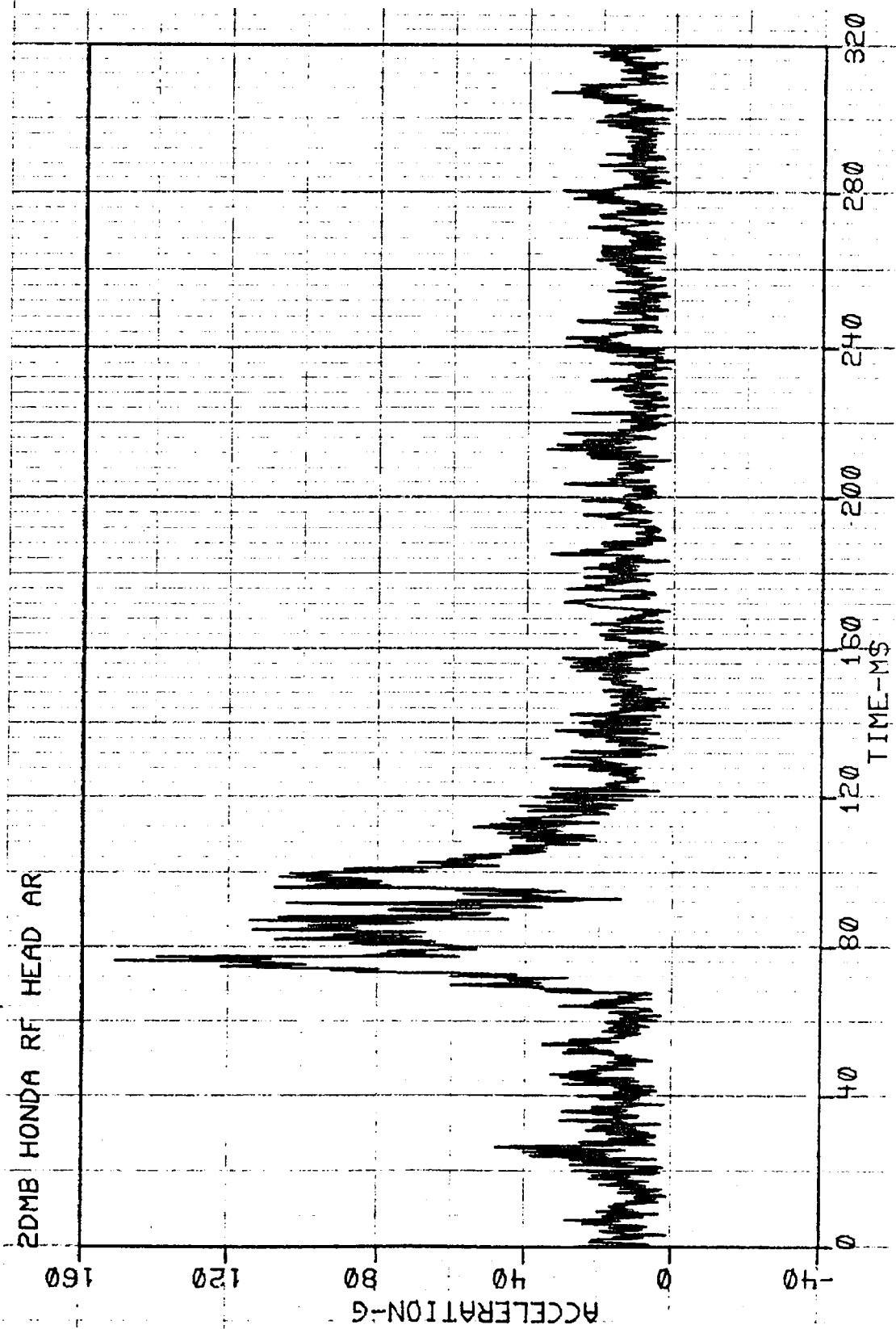


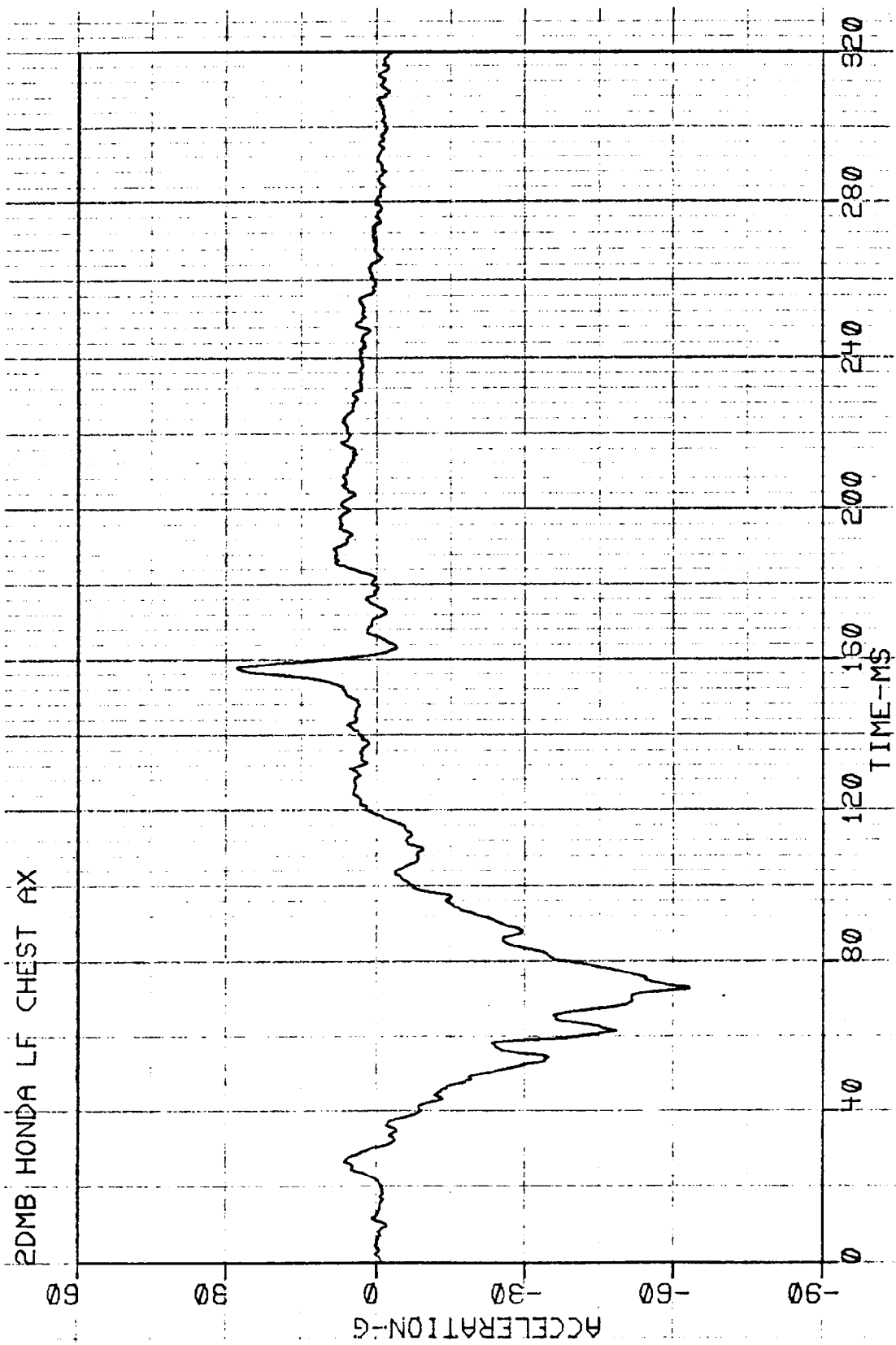


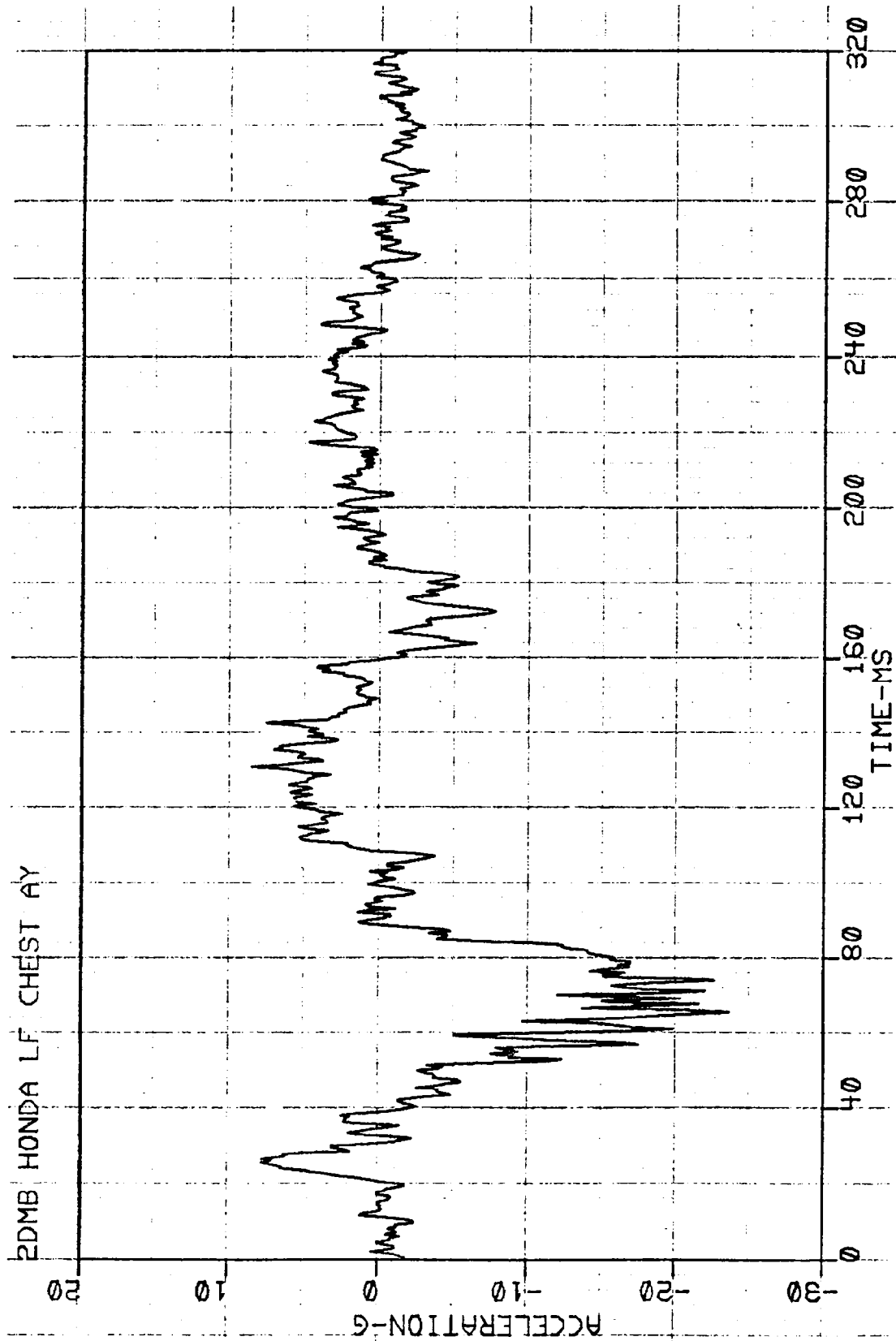


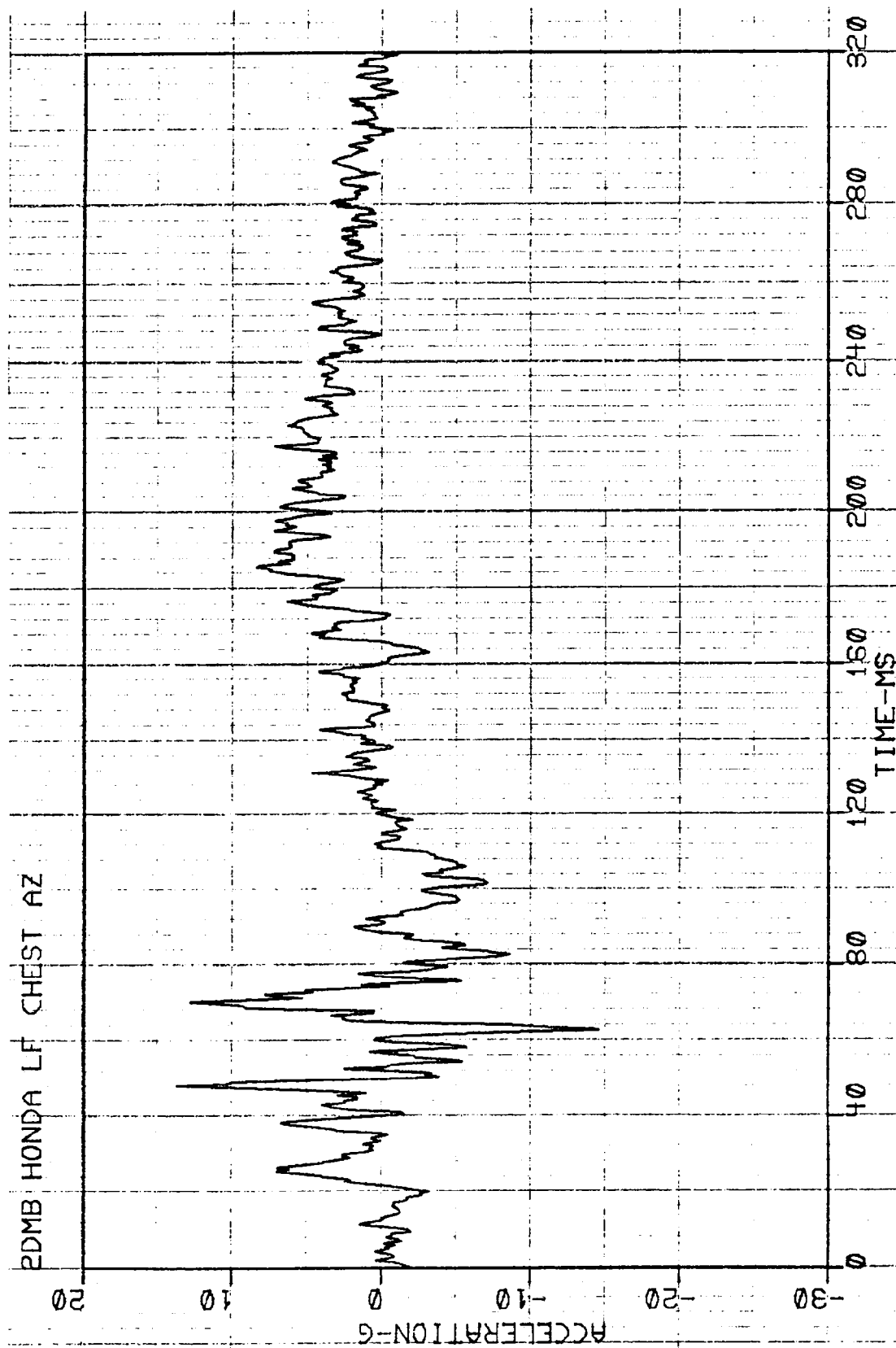


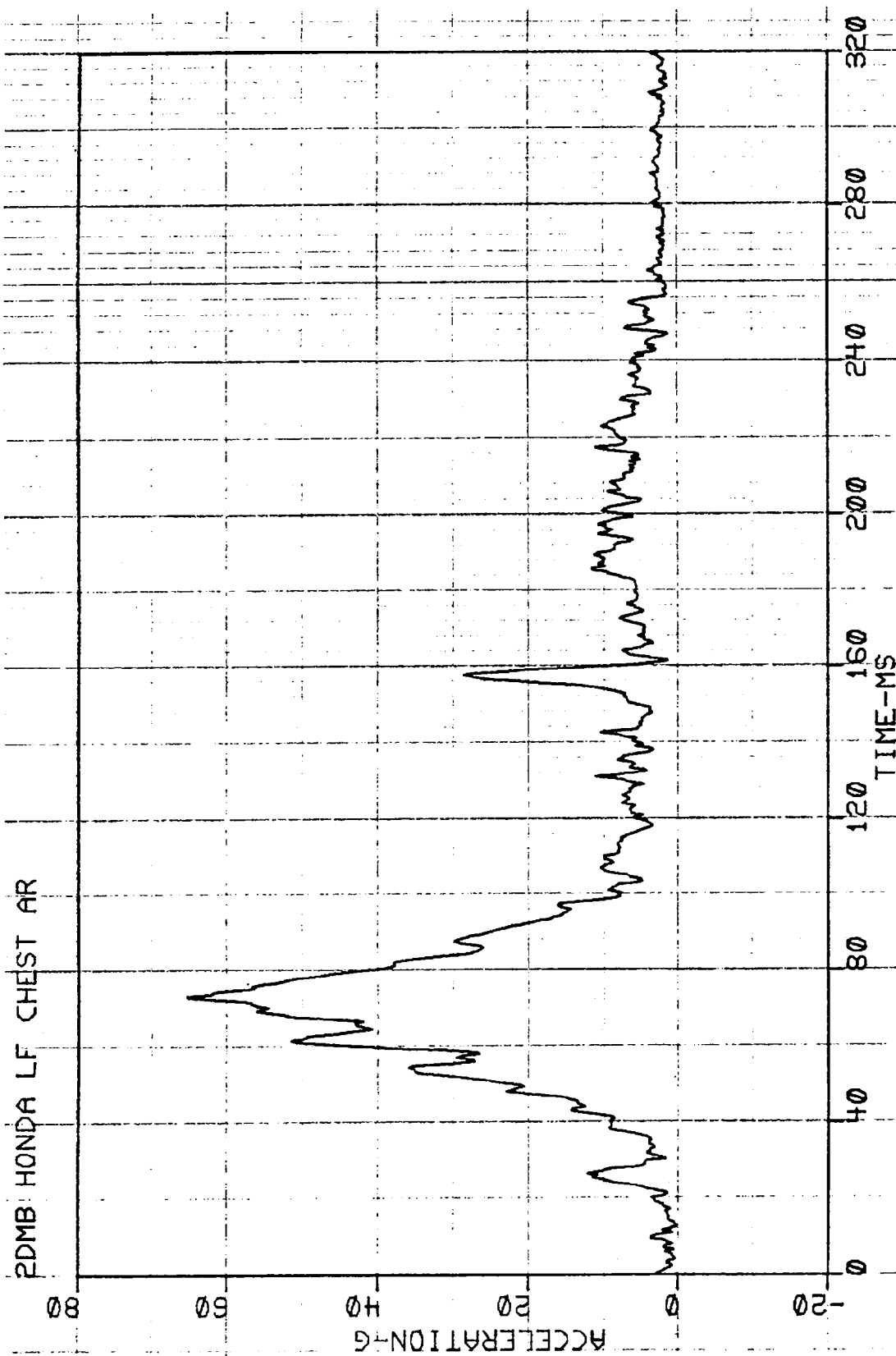


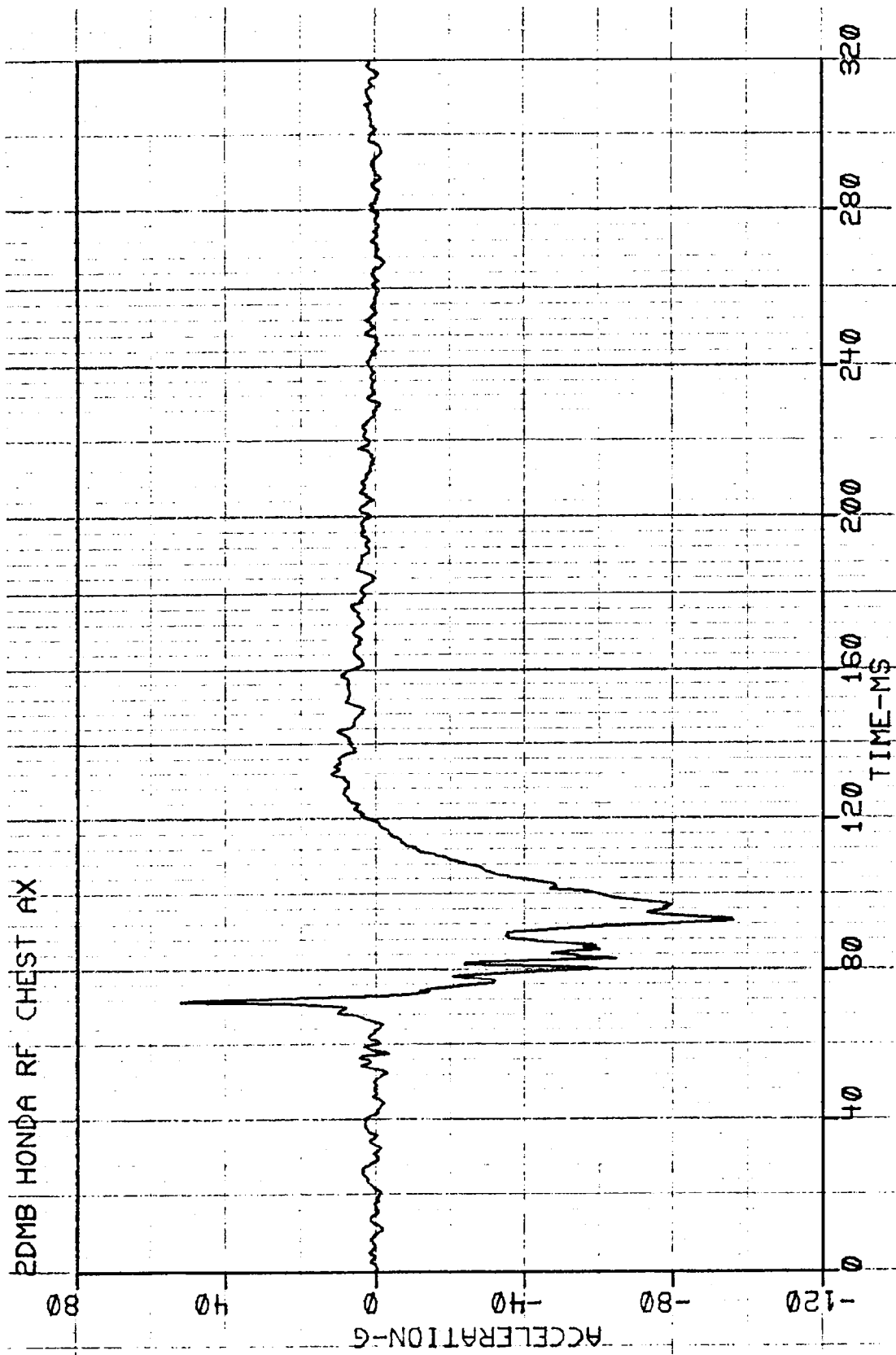


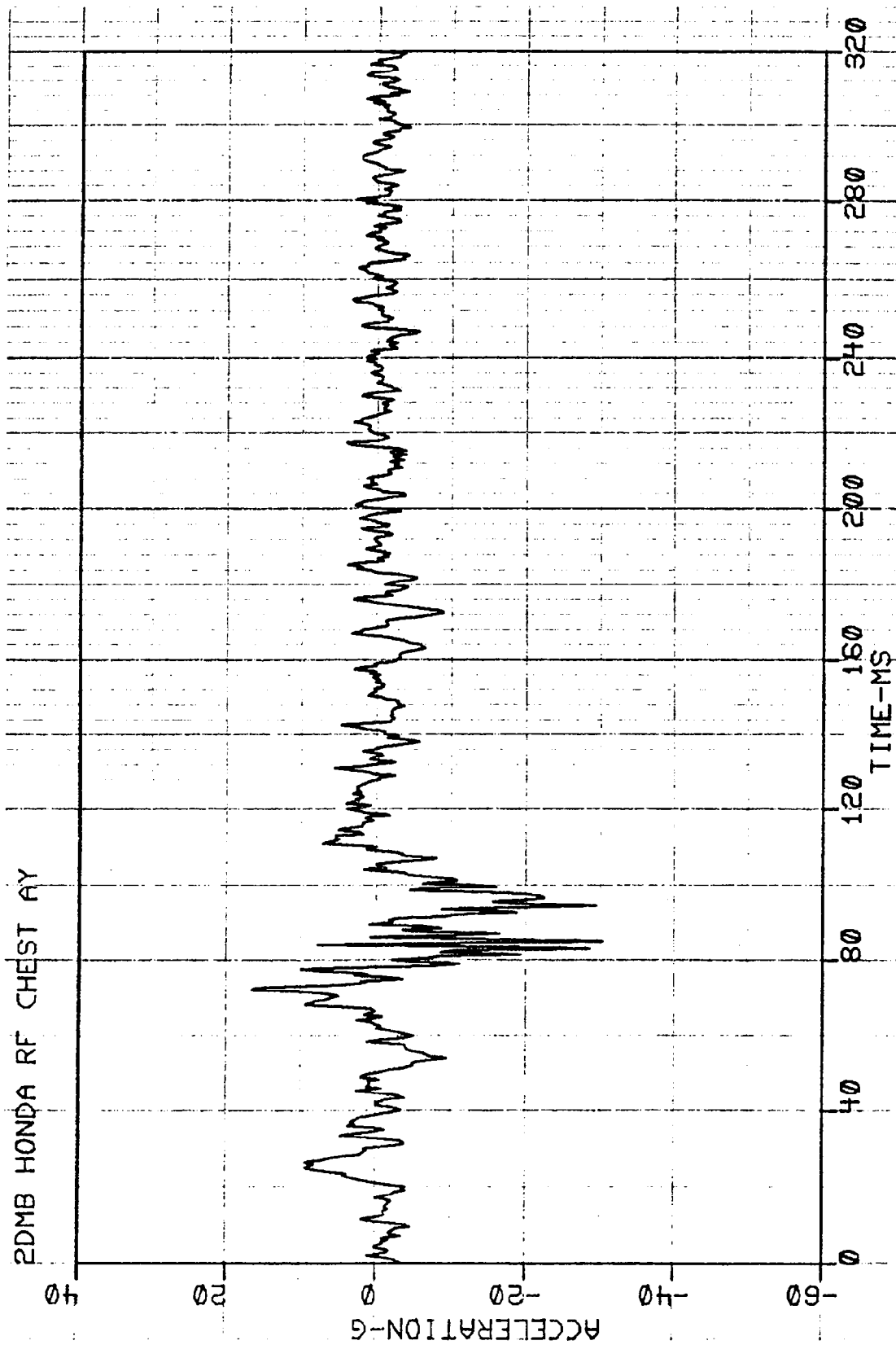


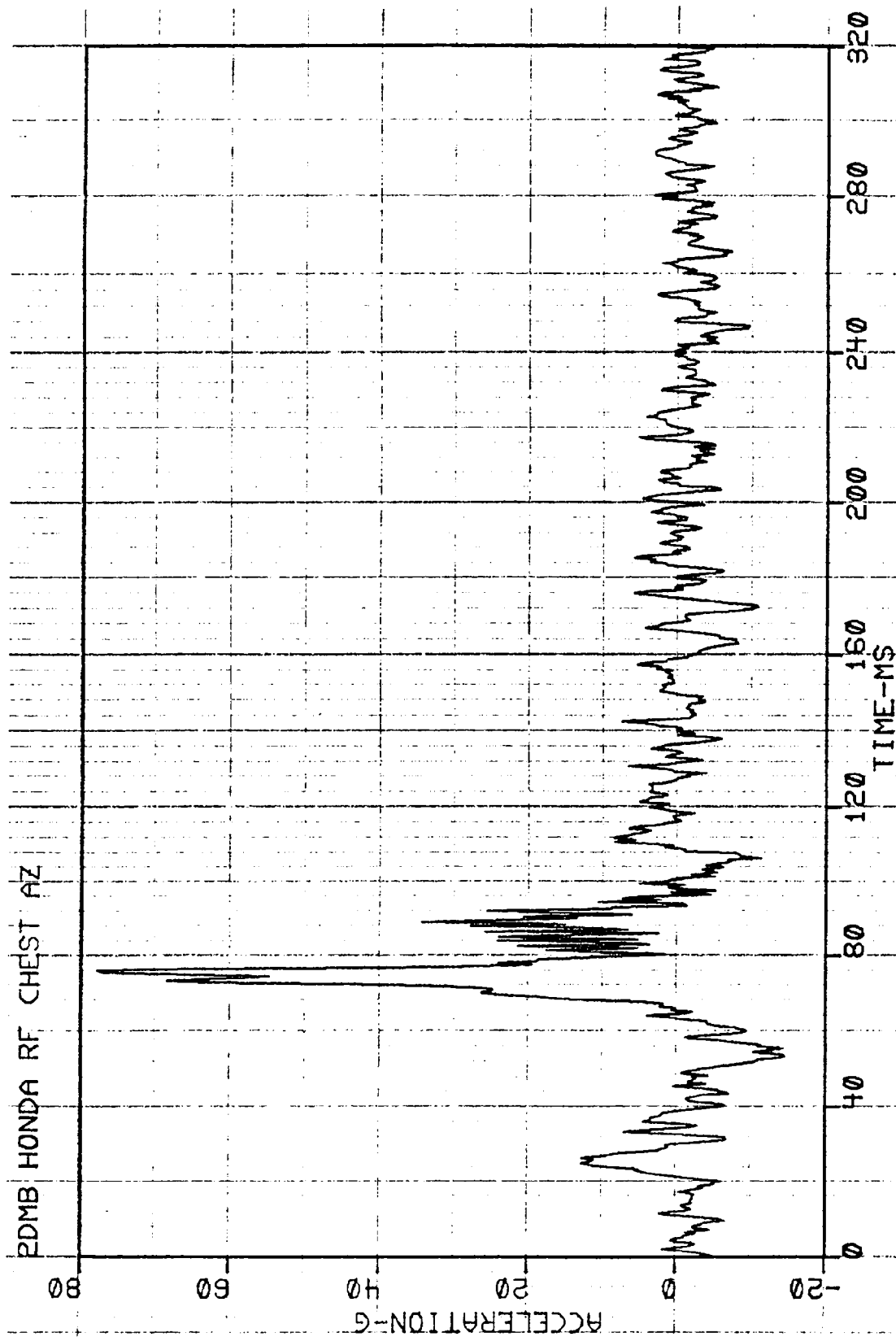


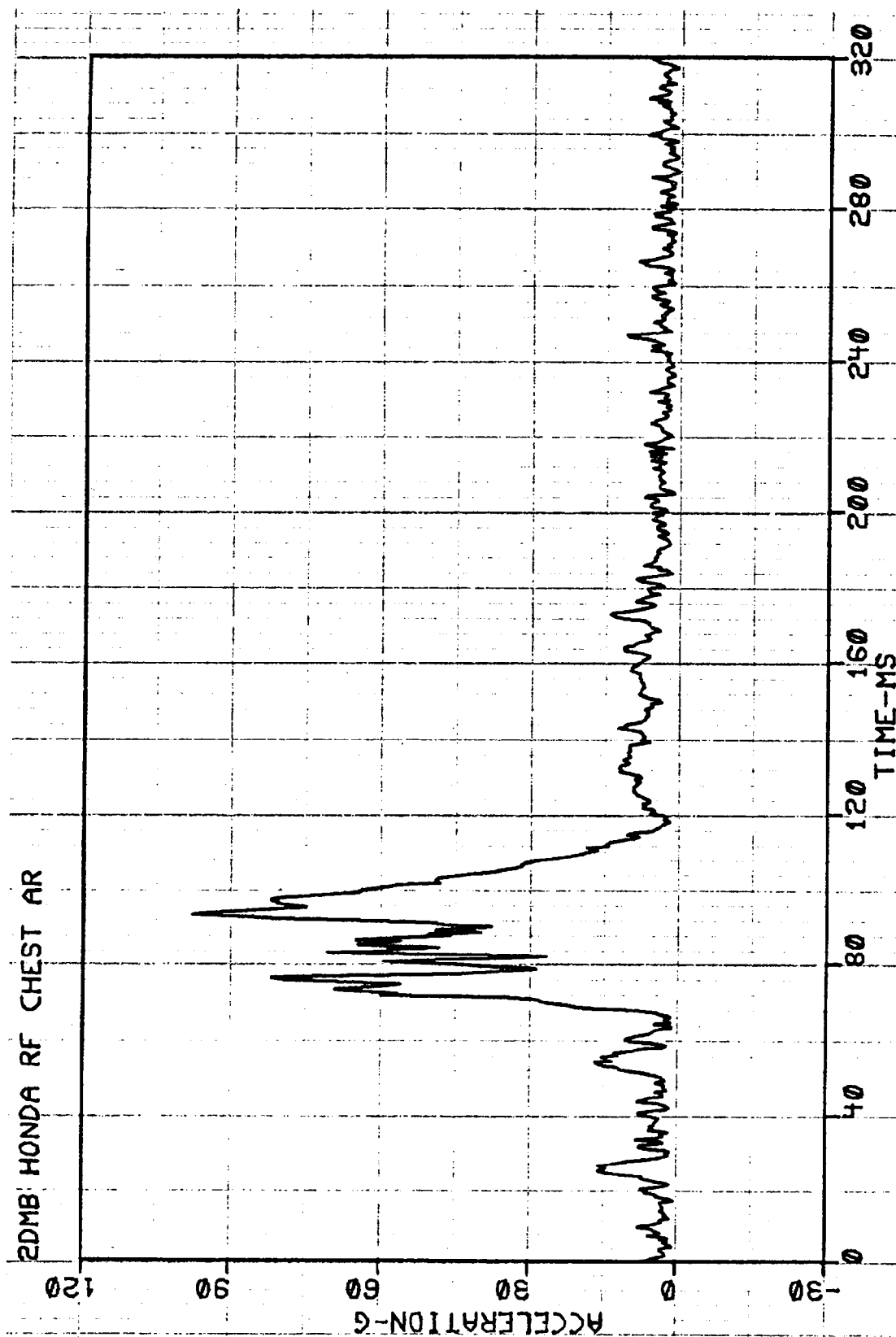


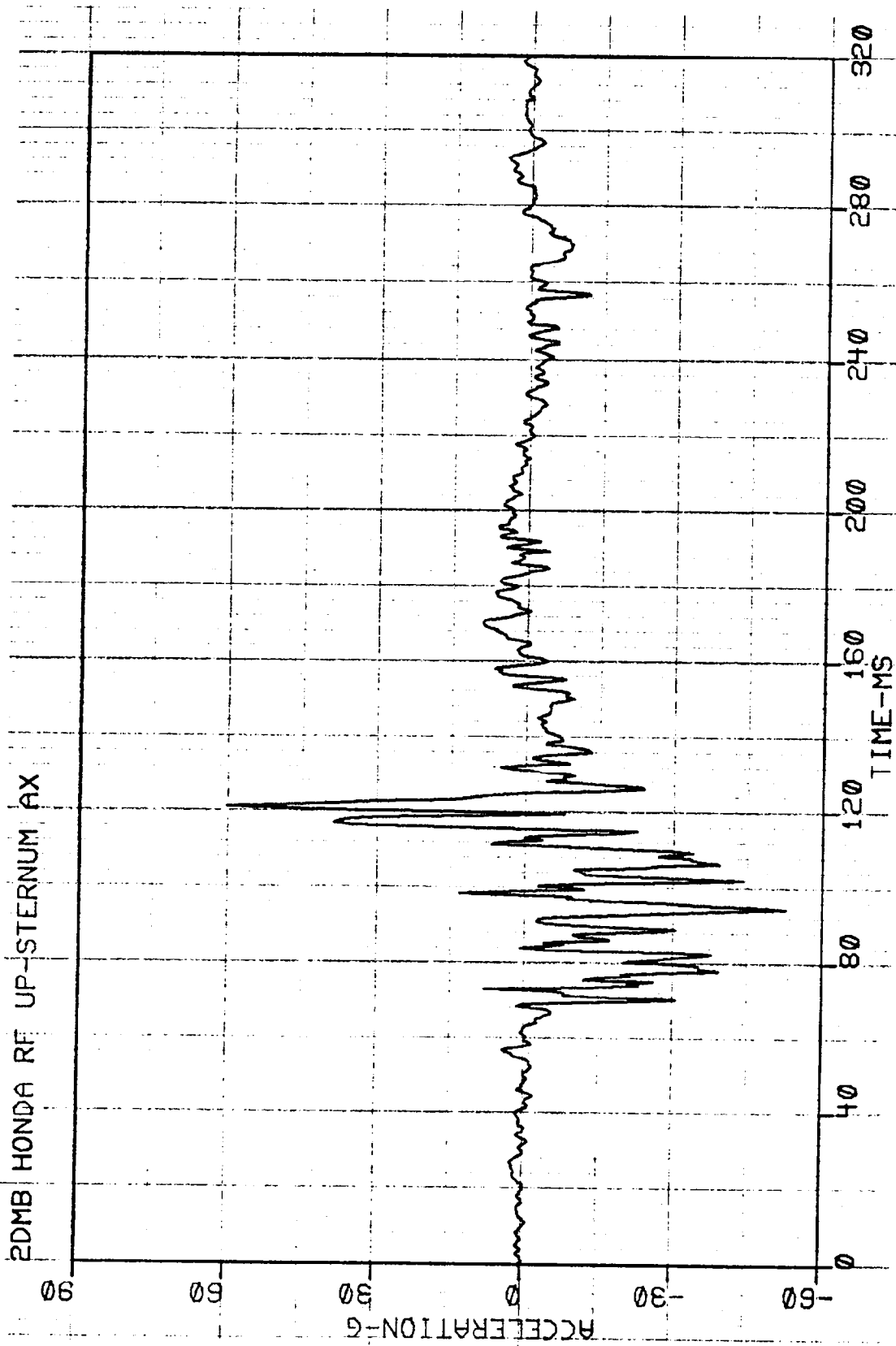


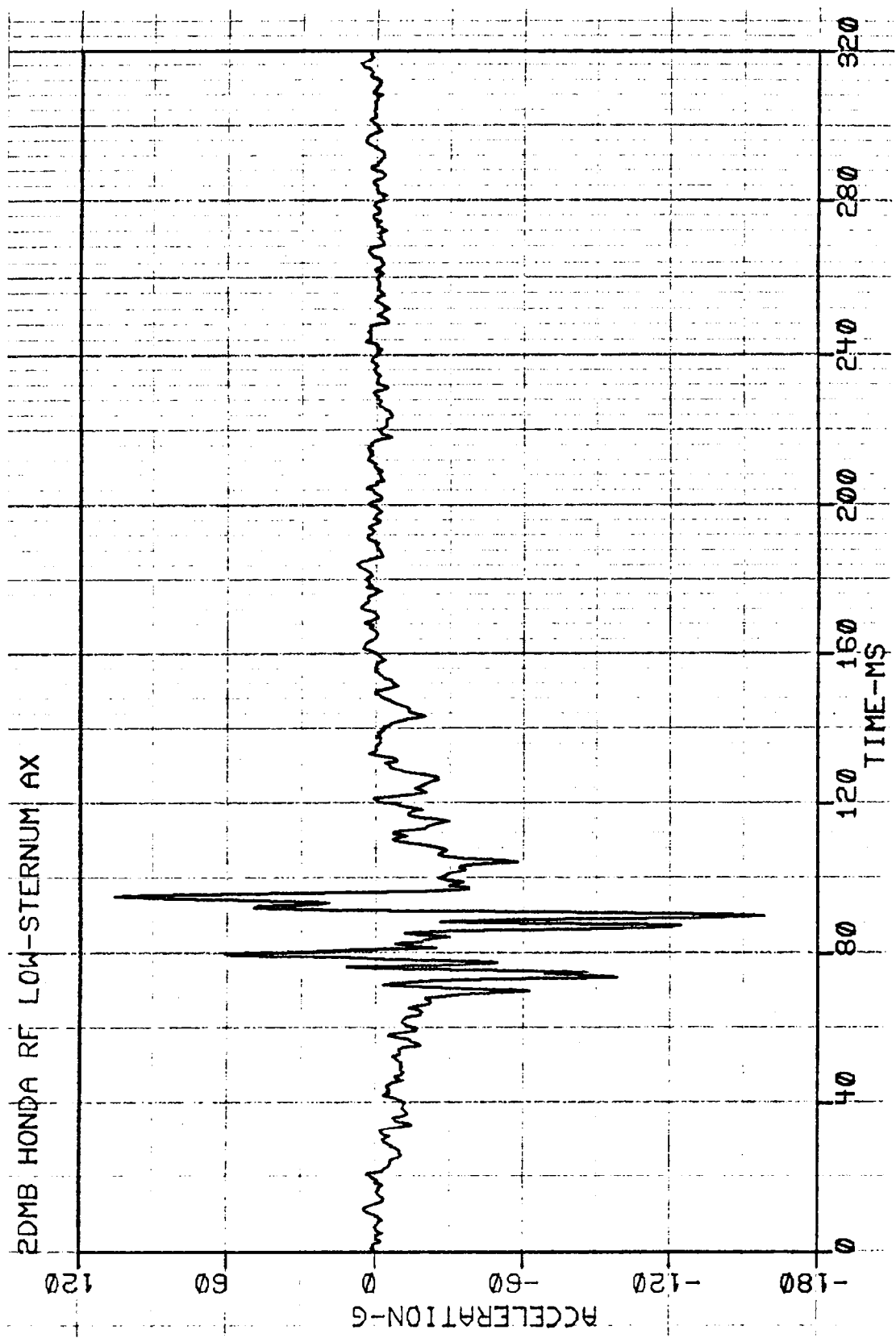


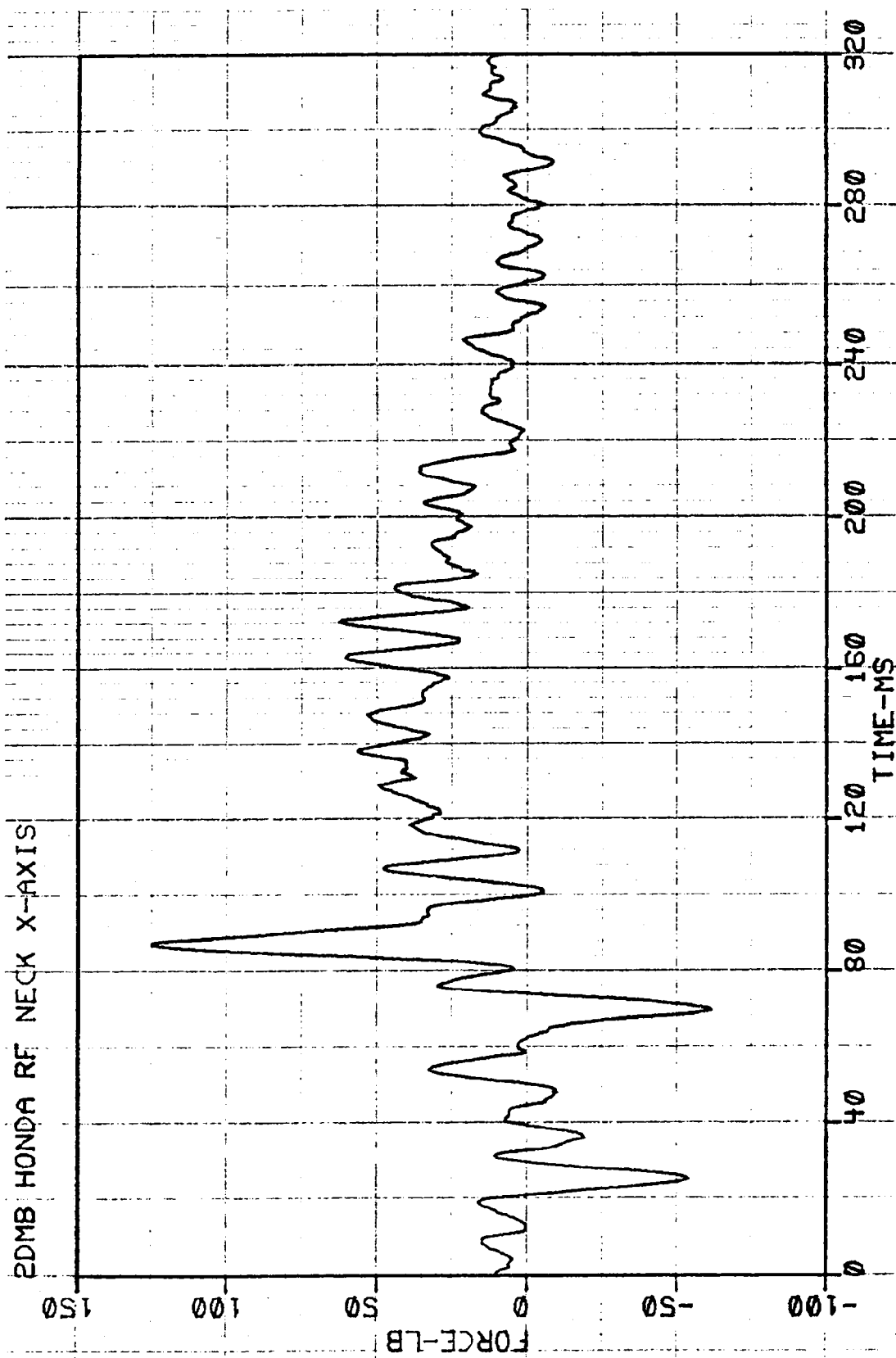


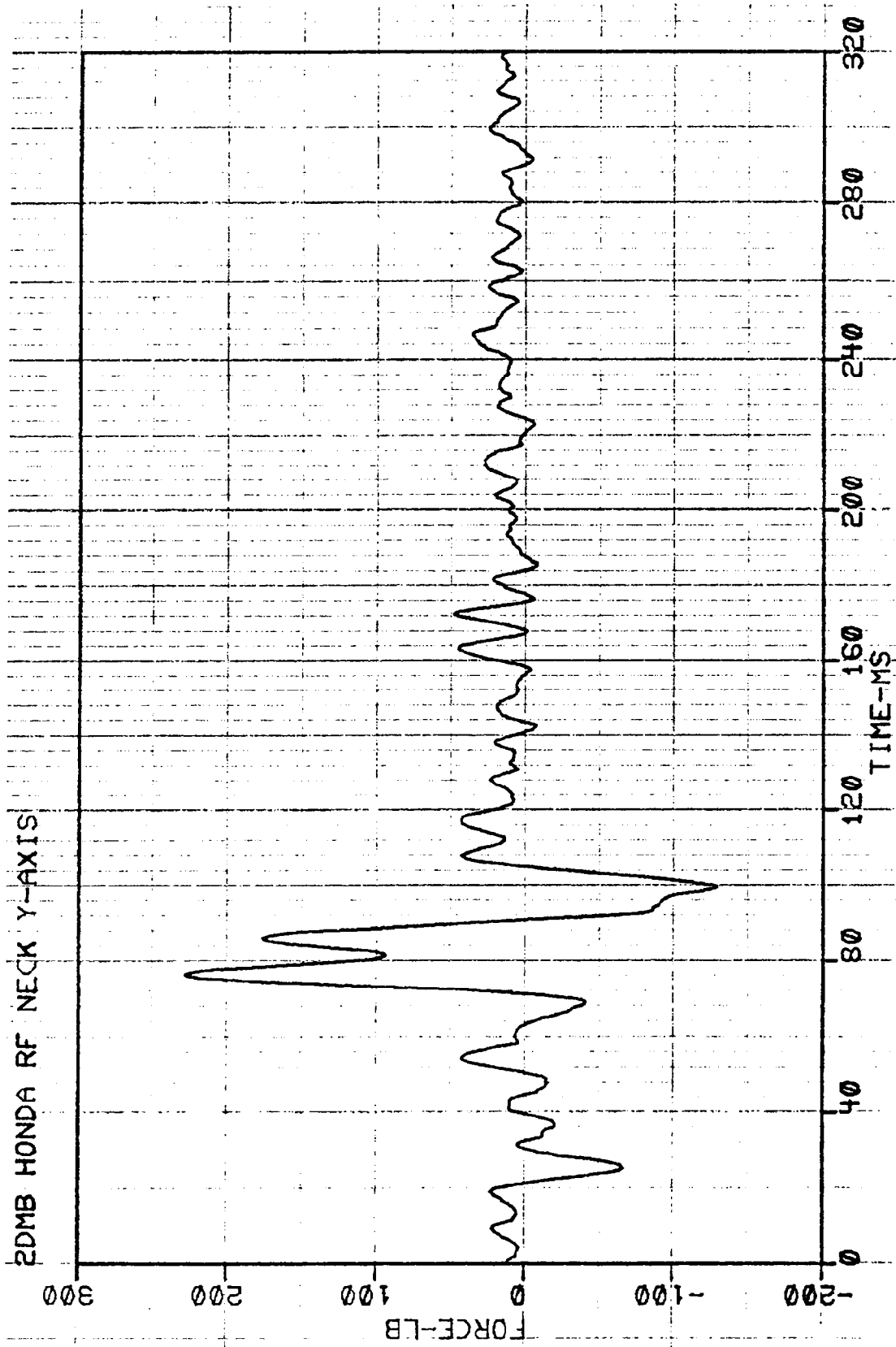


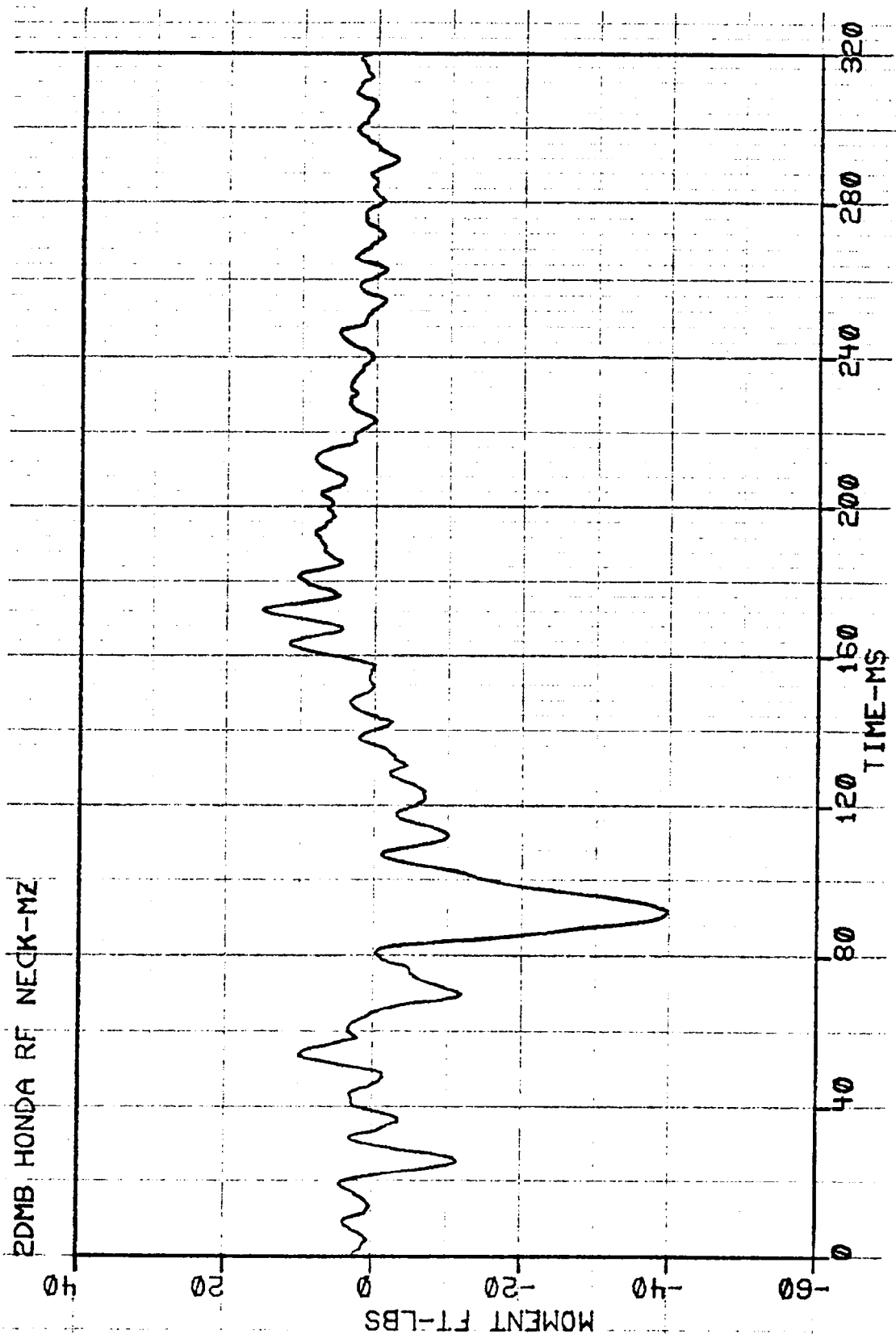




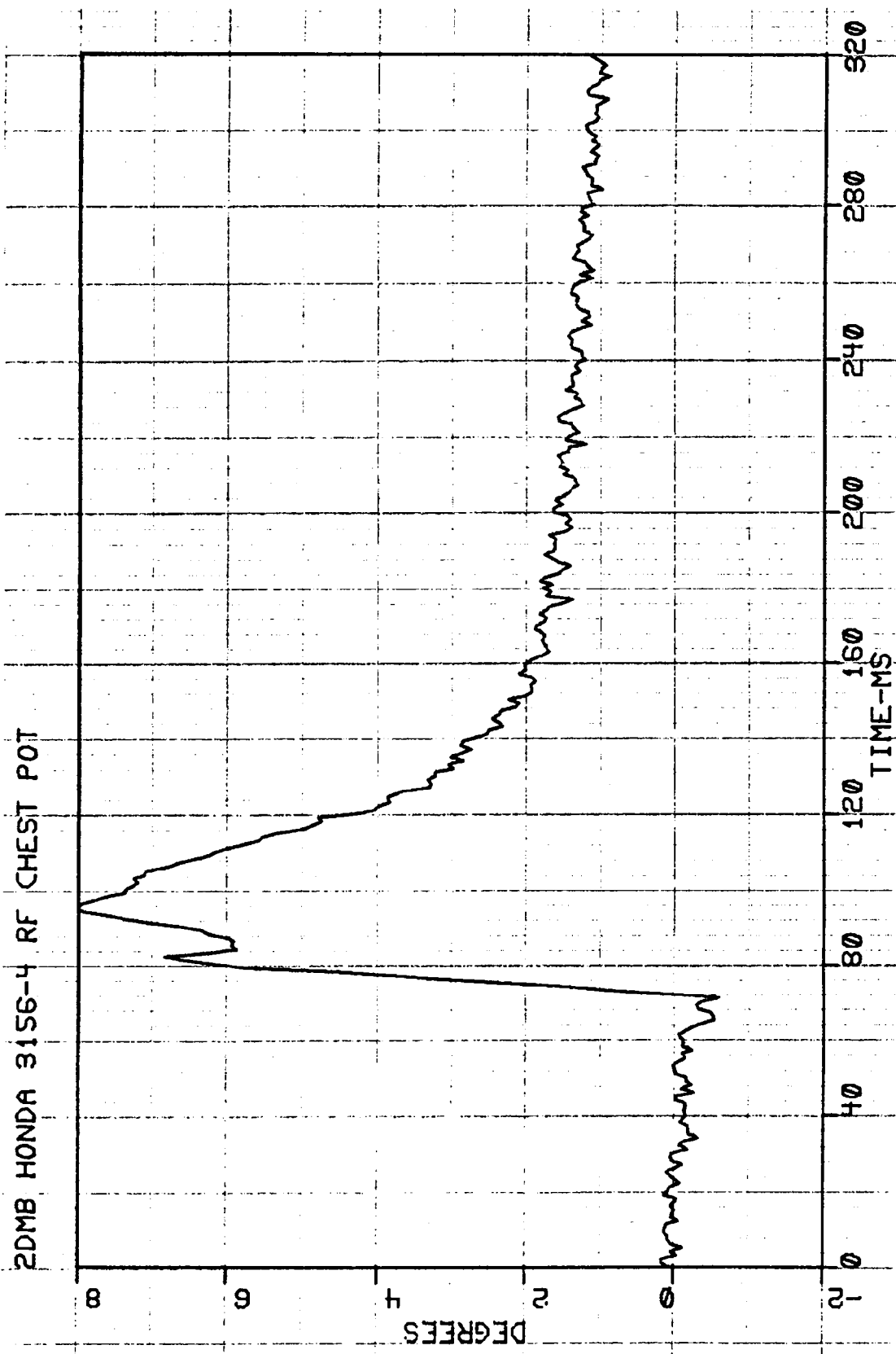


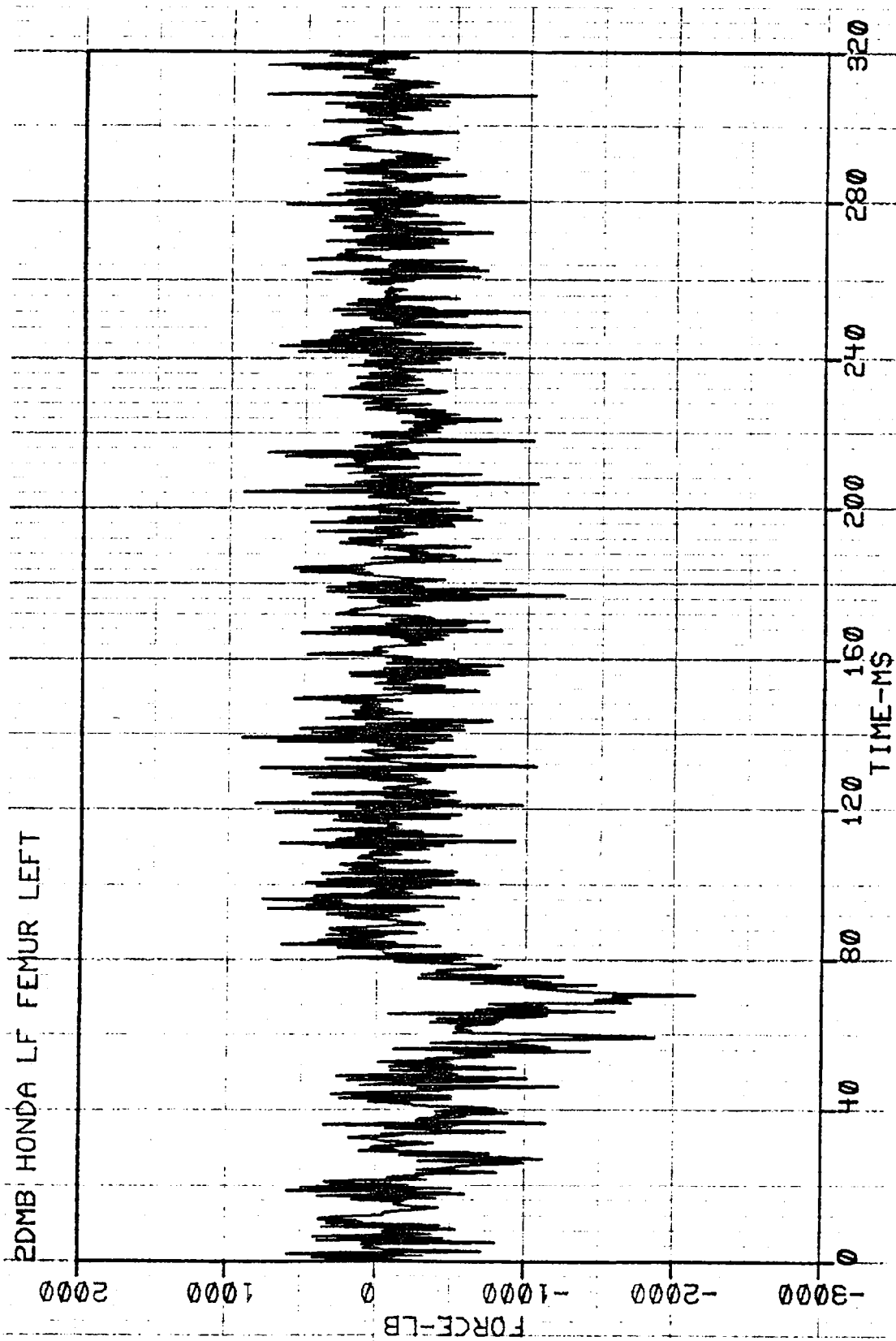


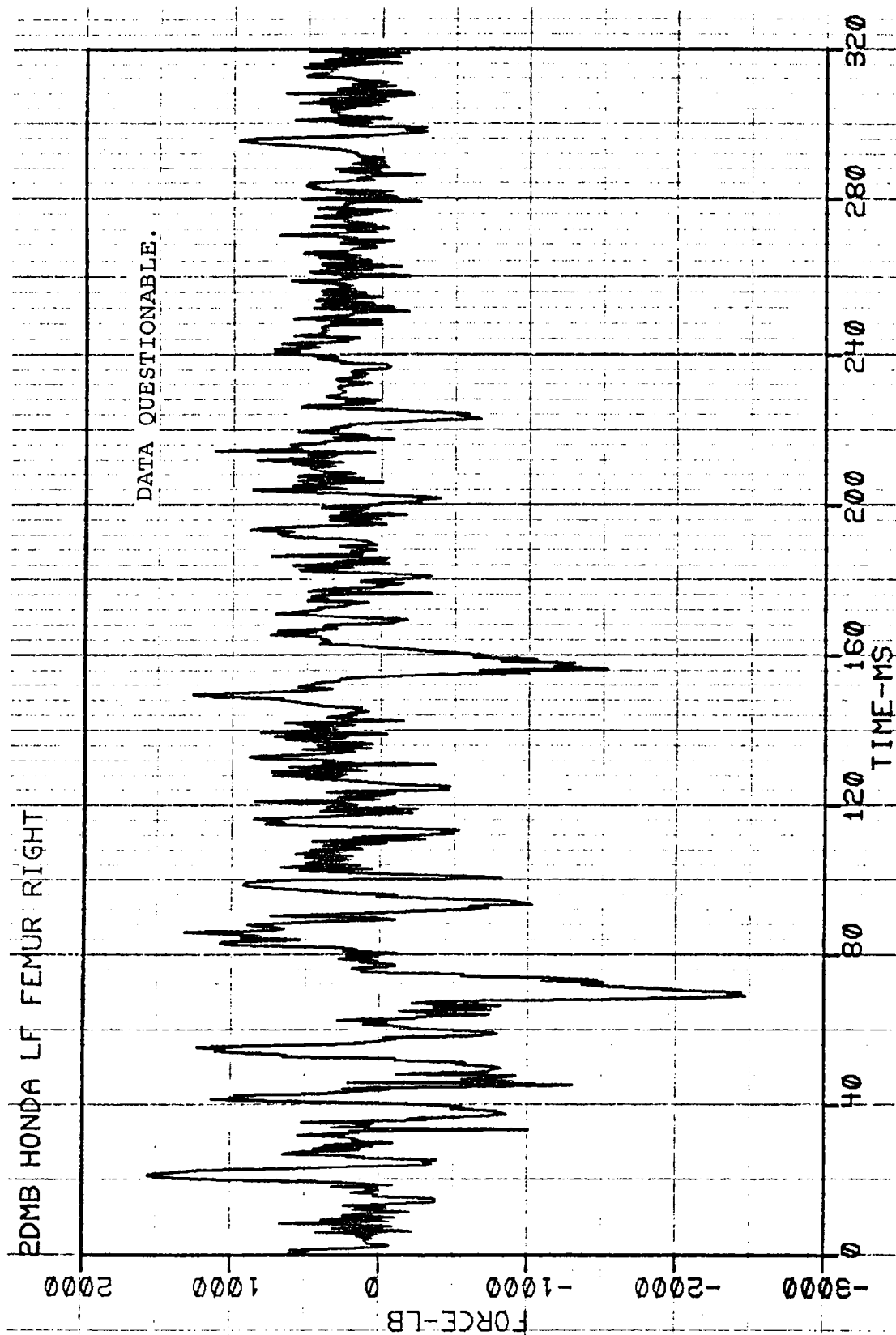


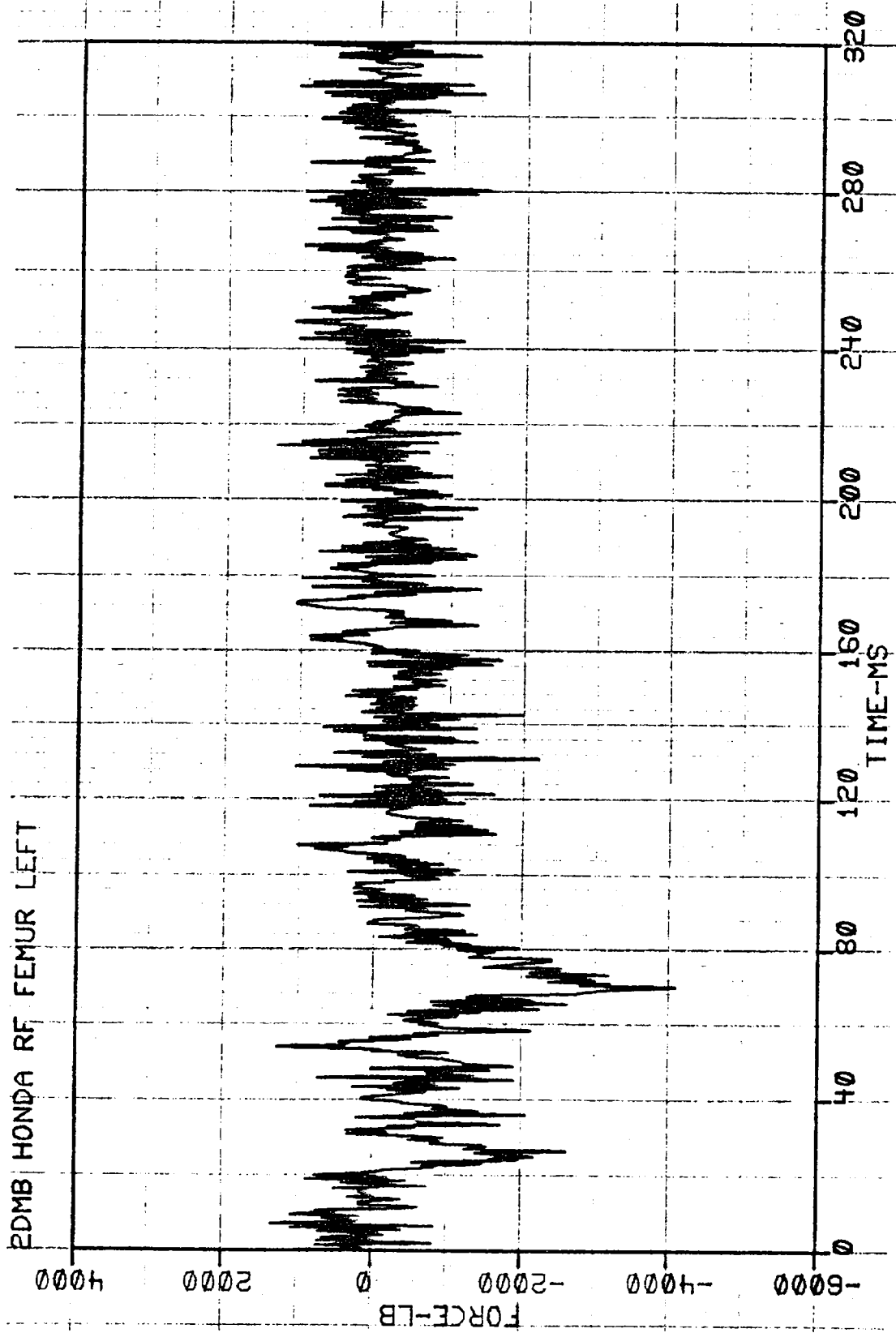


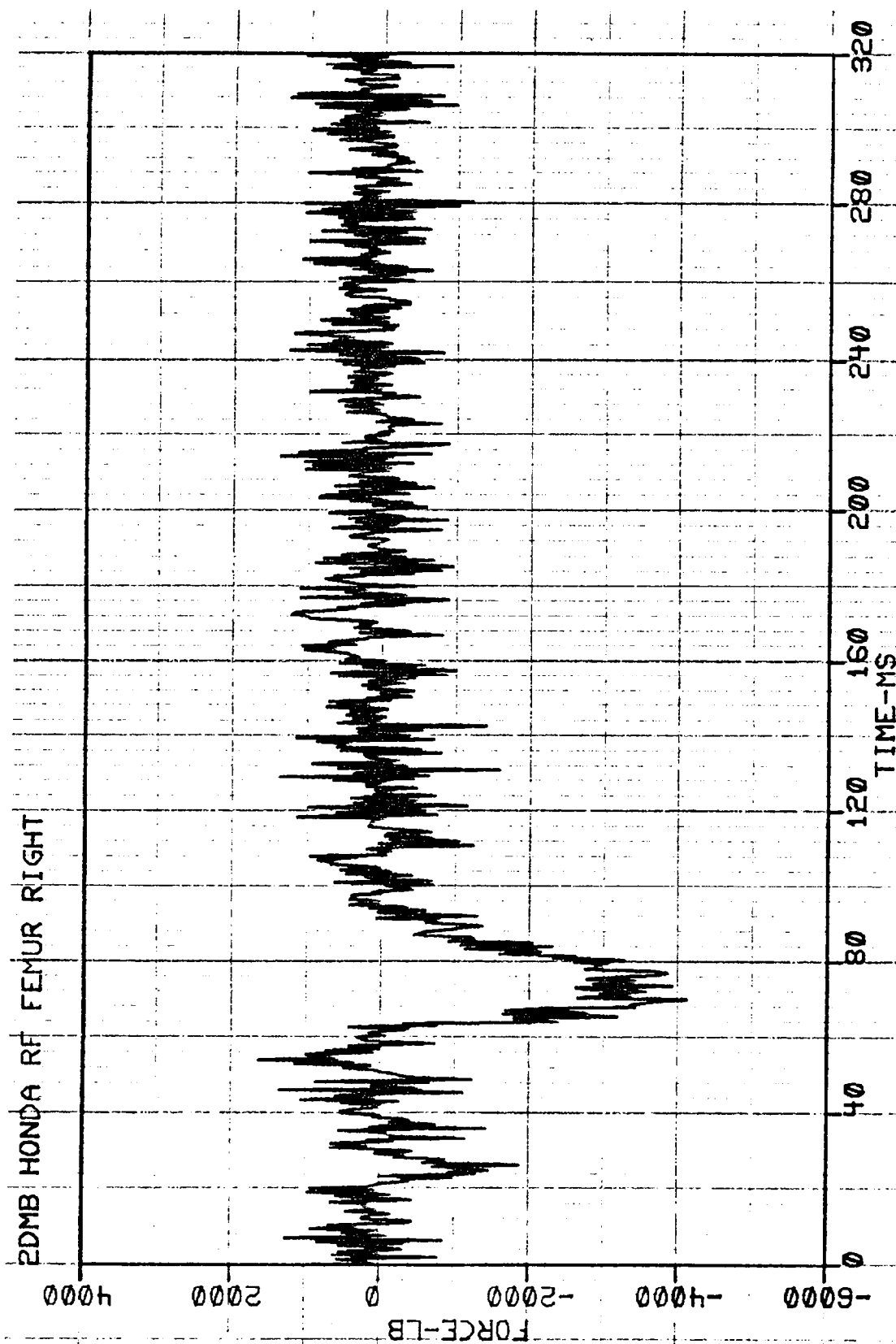
2DMB HONDA 3156-4 RF CHEST POT

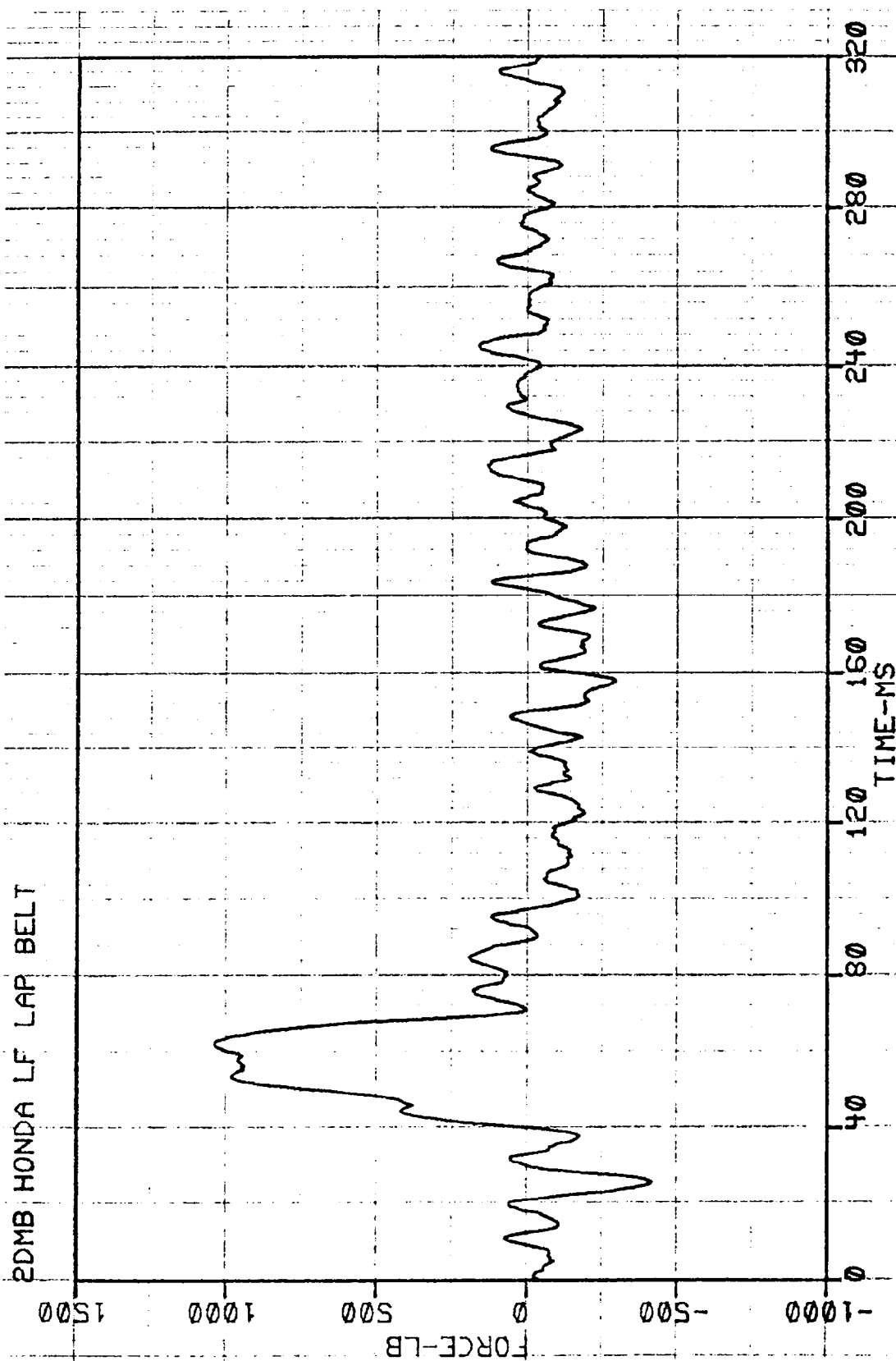


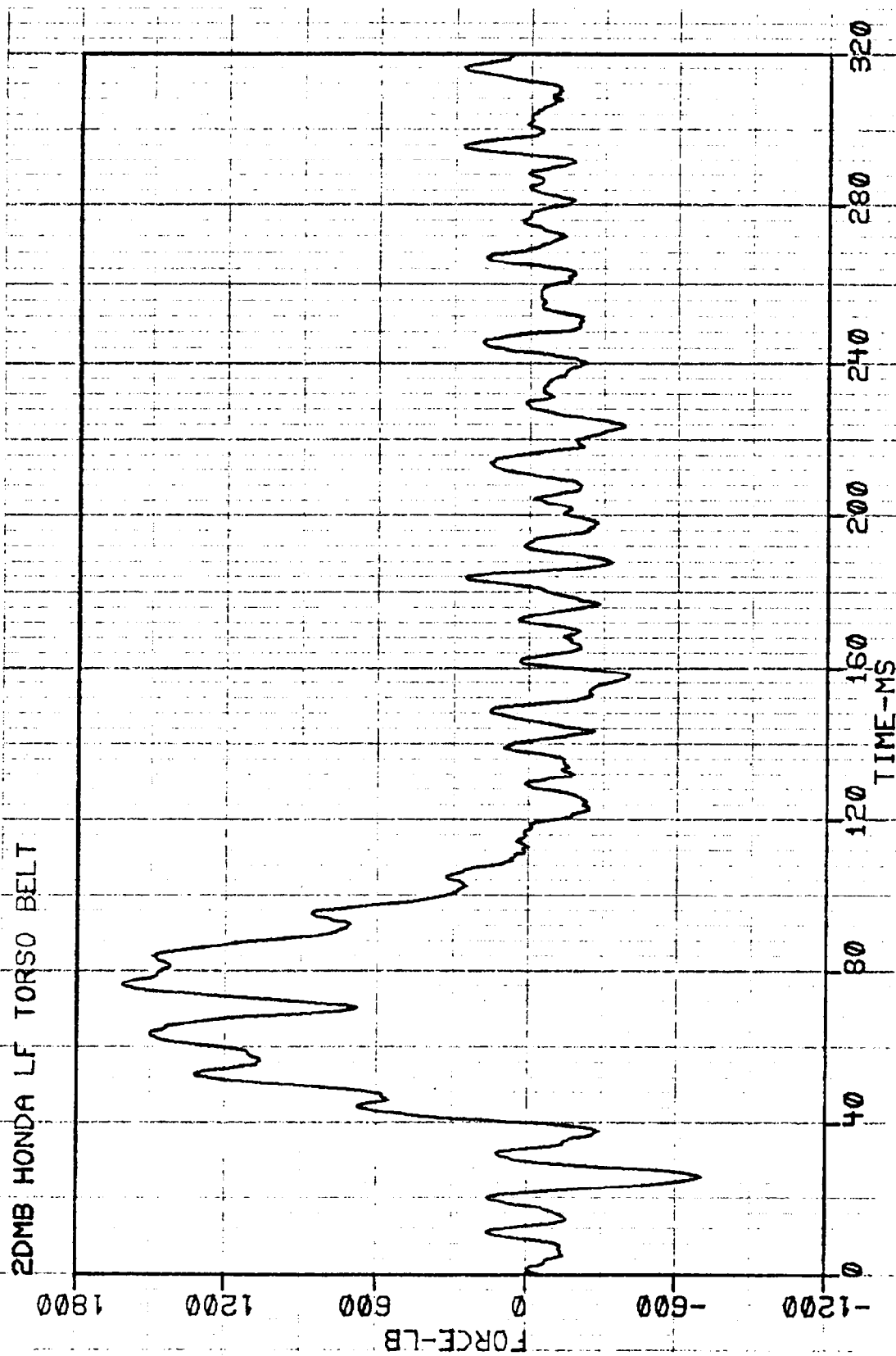


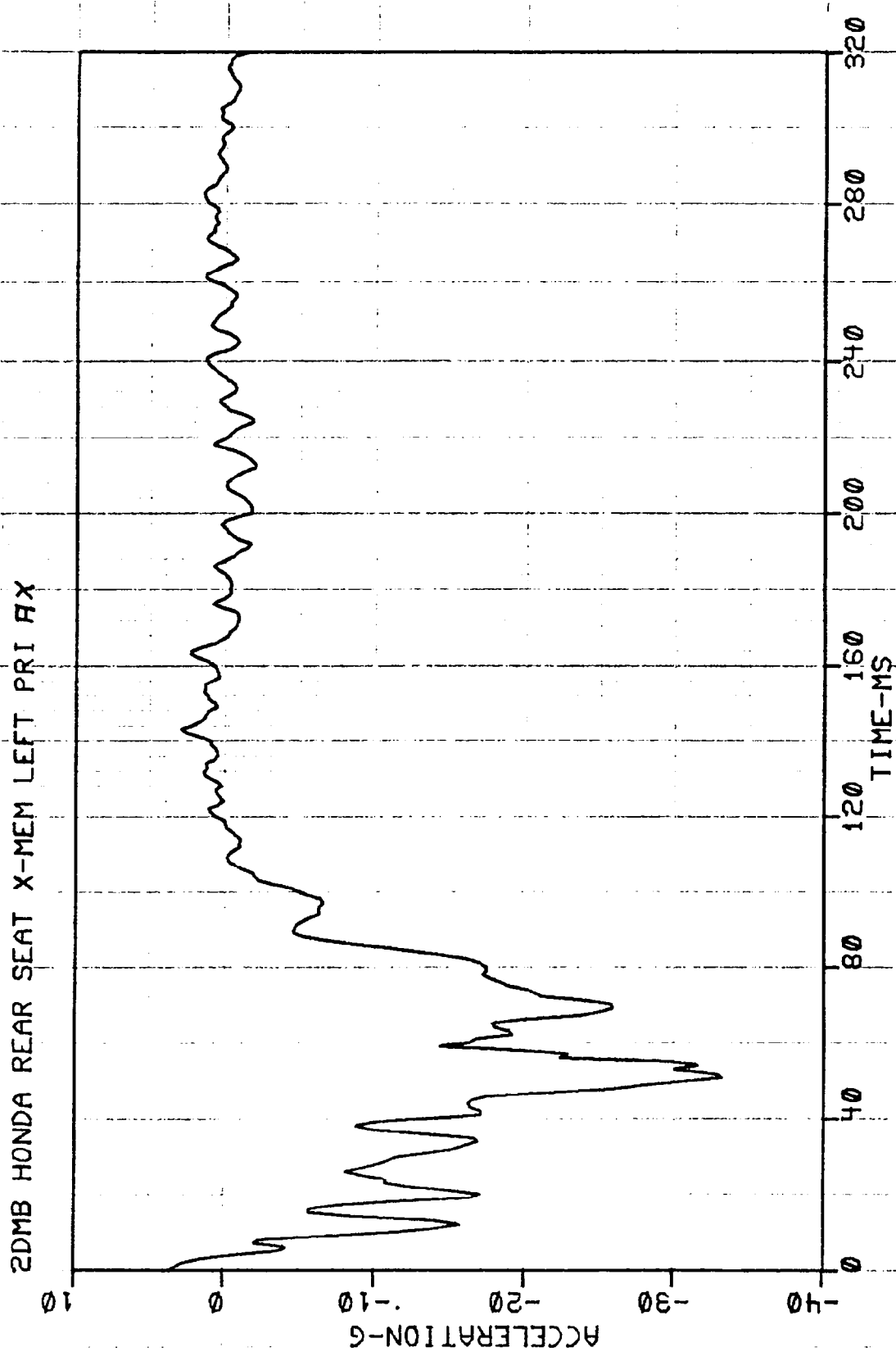


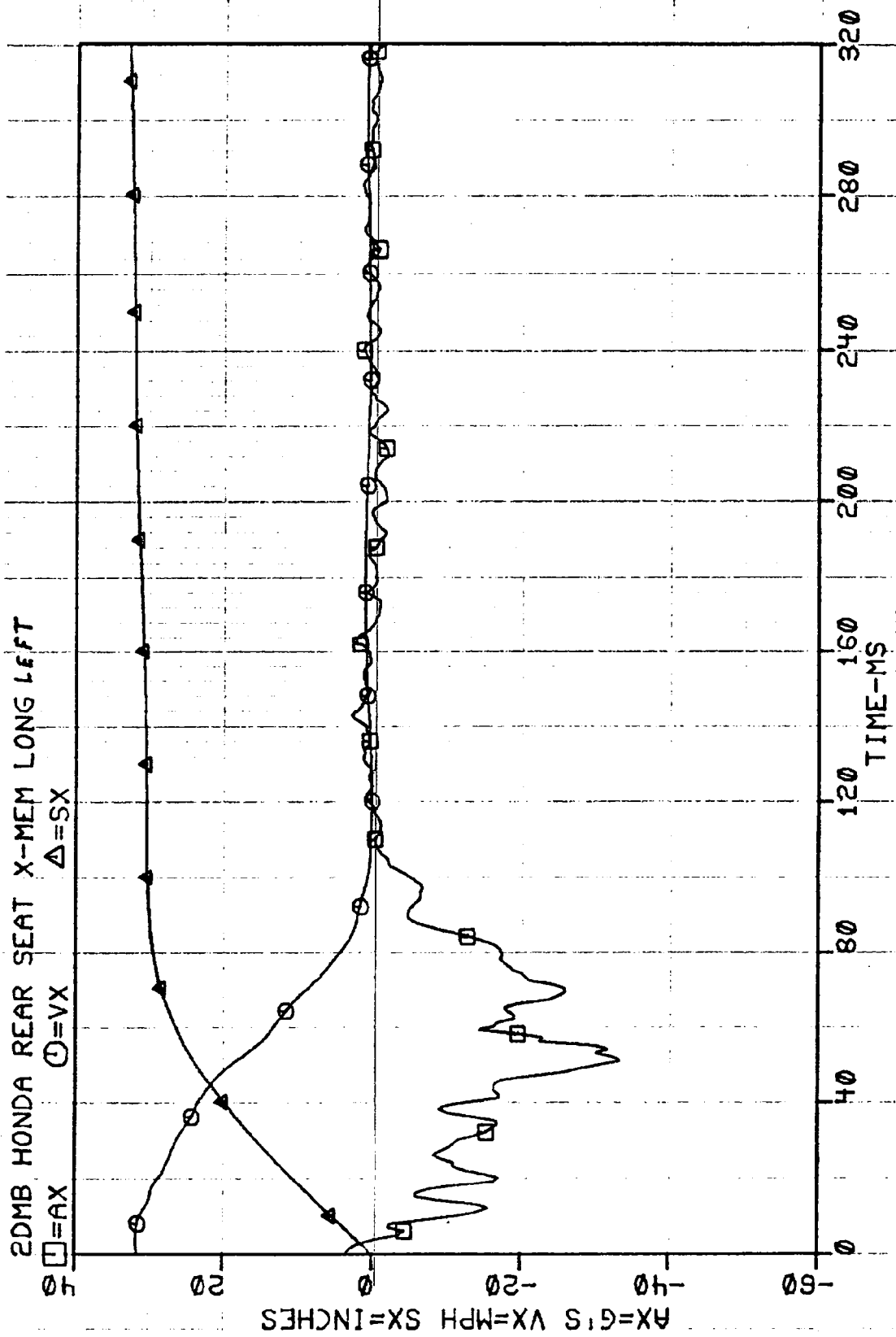


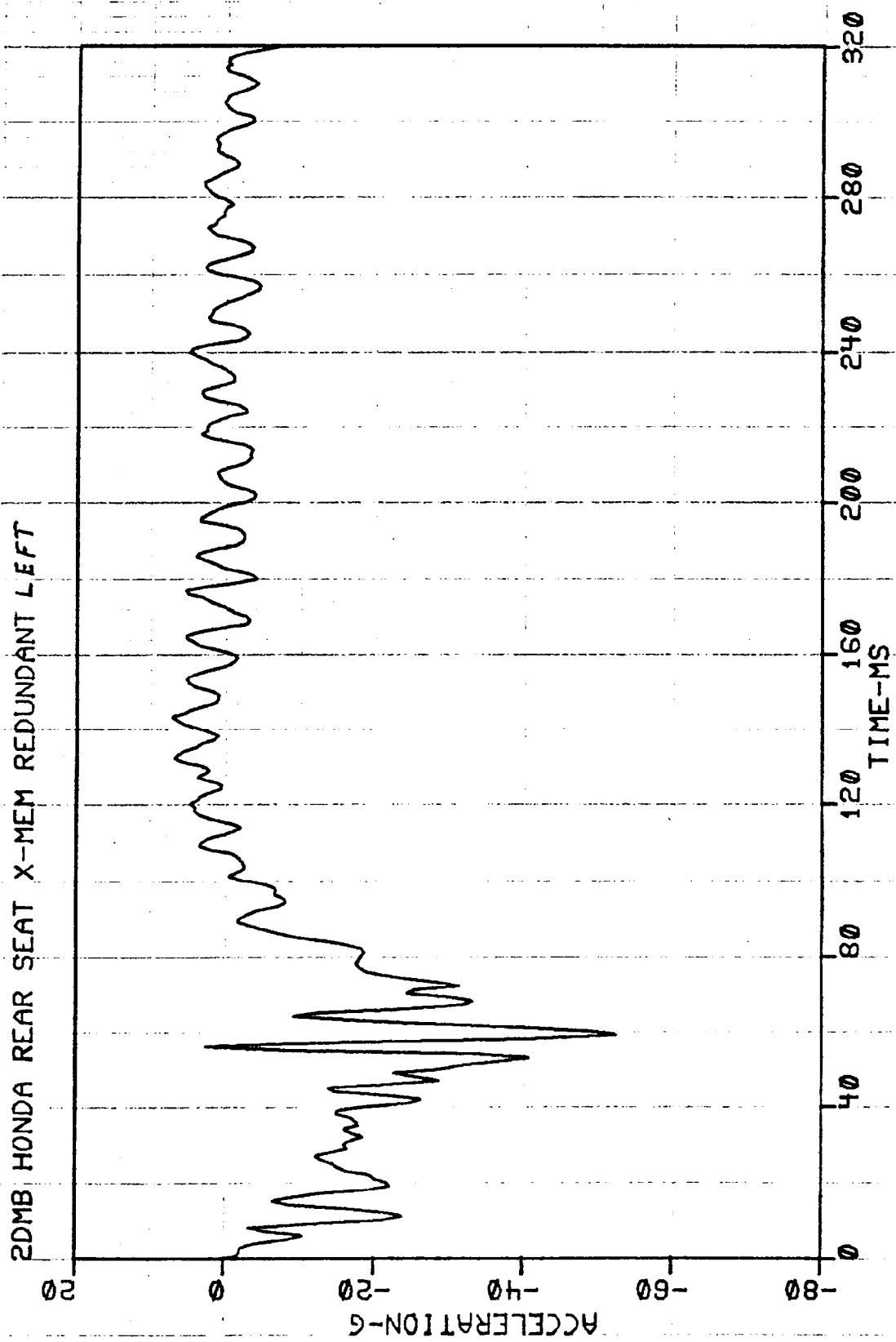


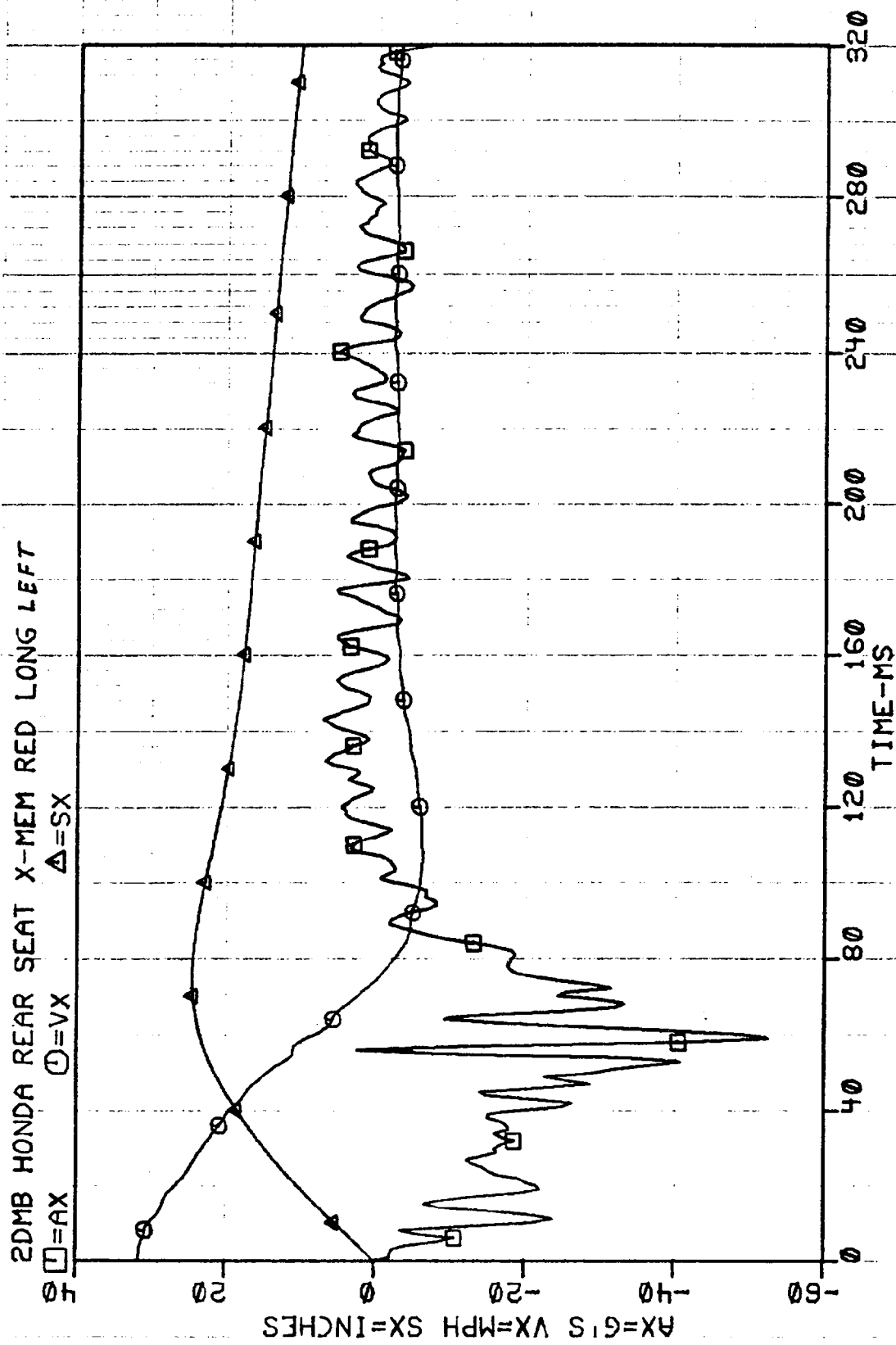


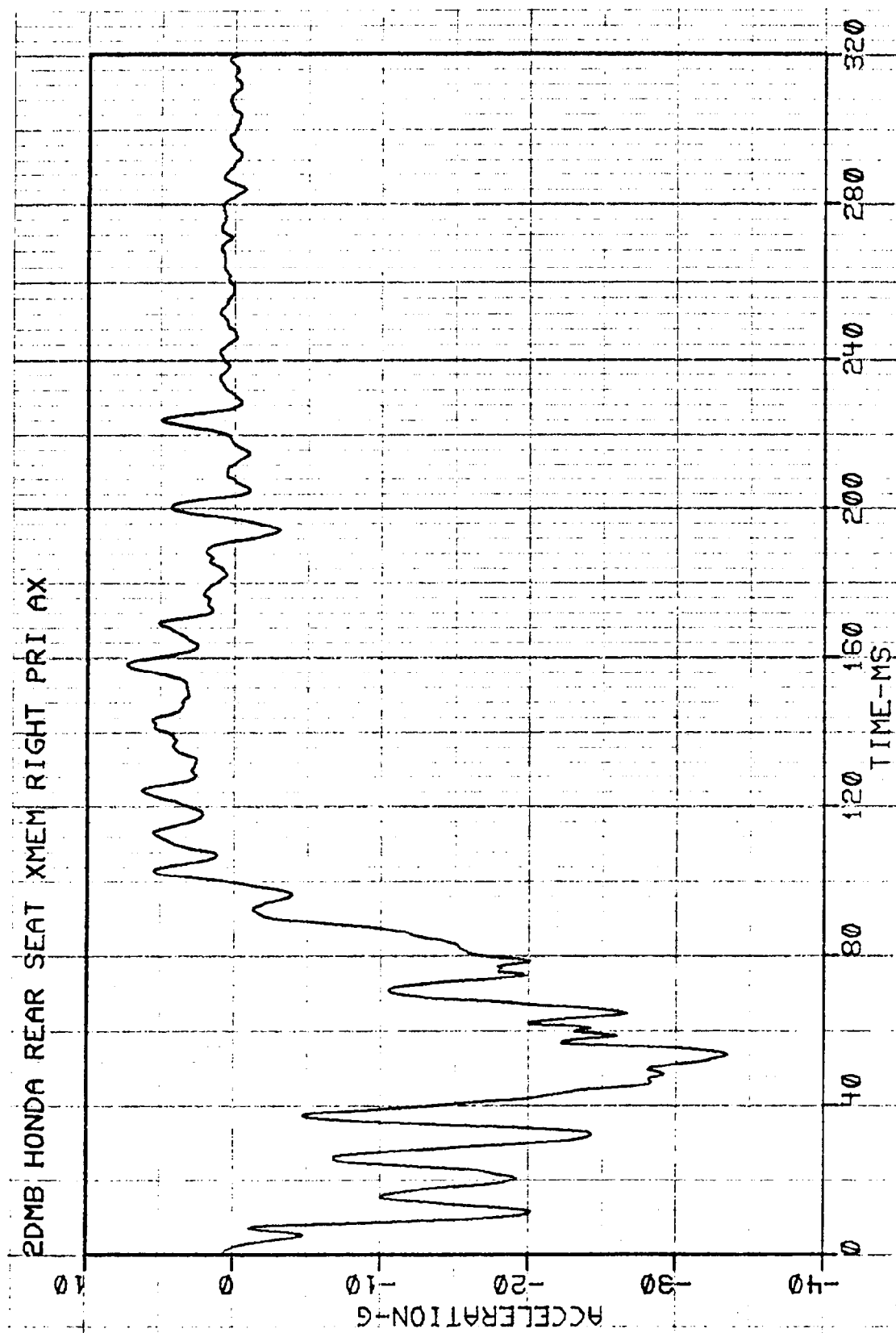


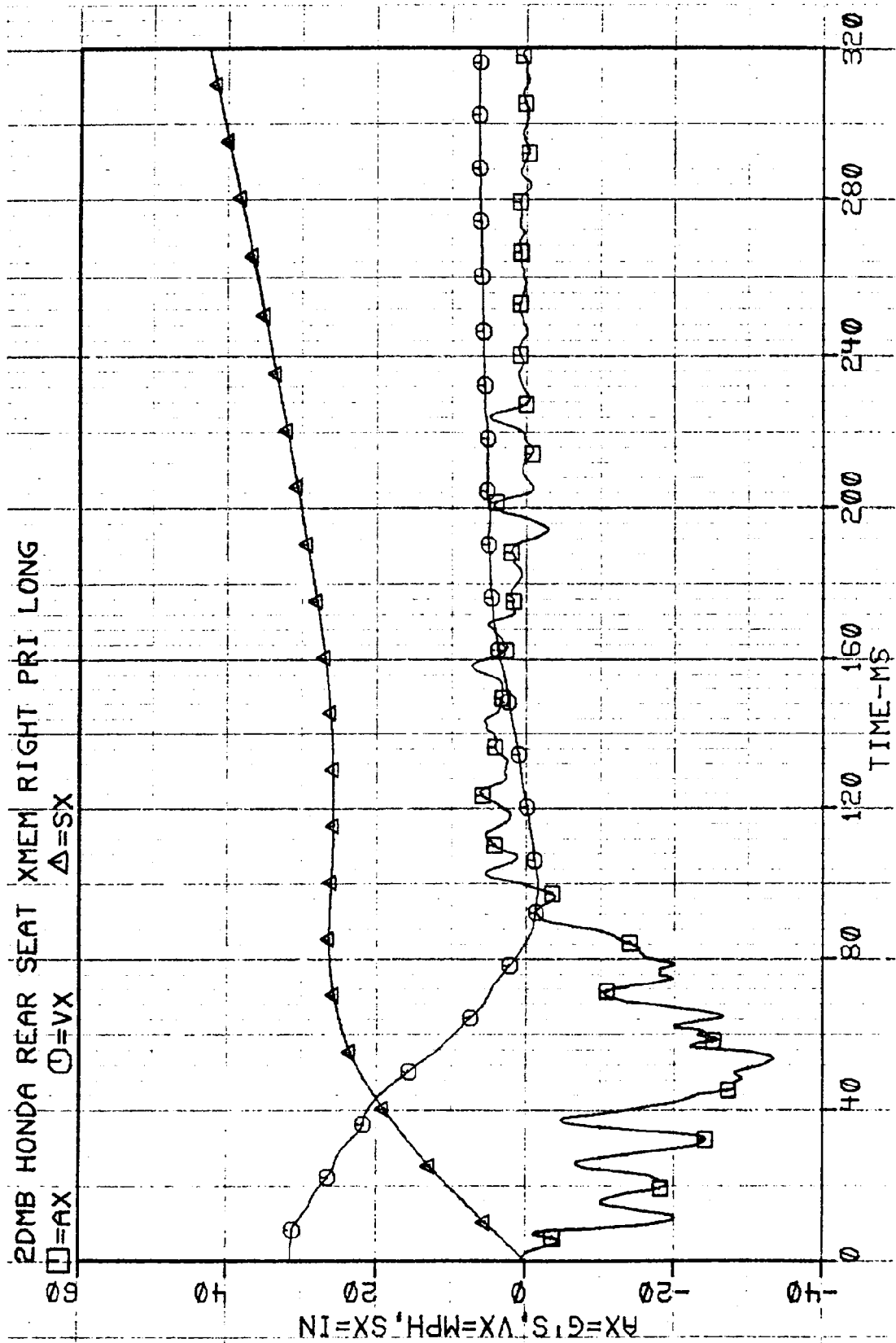


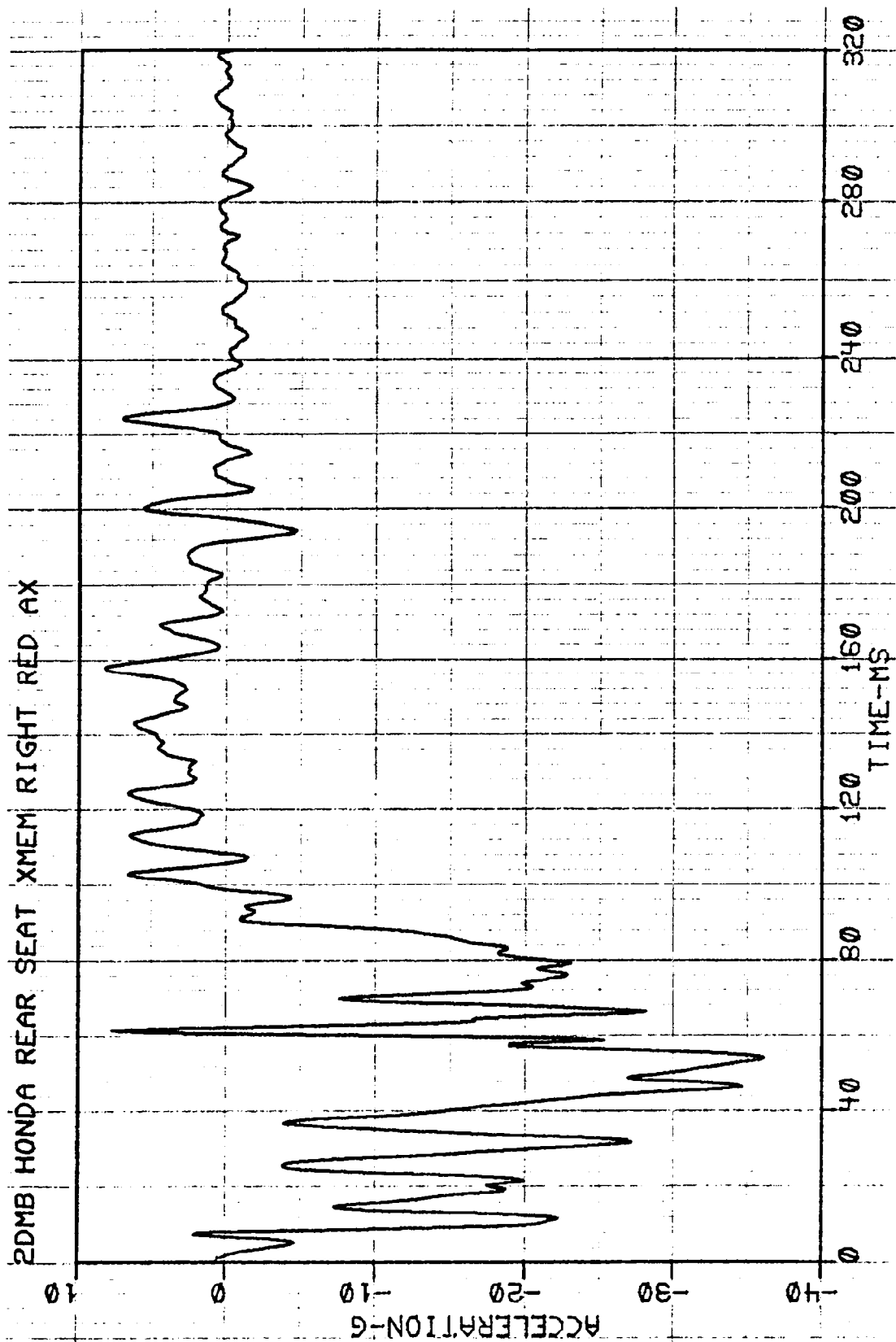


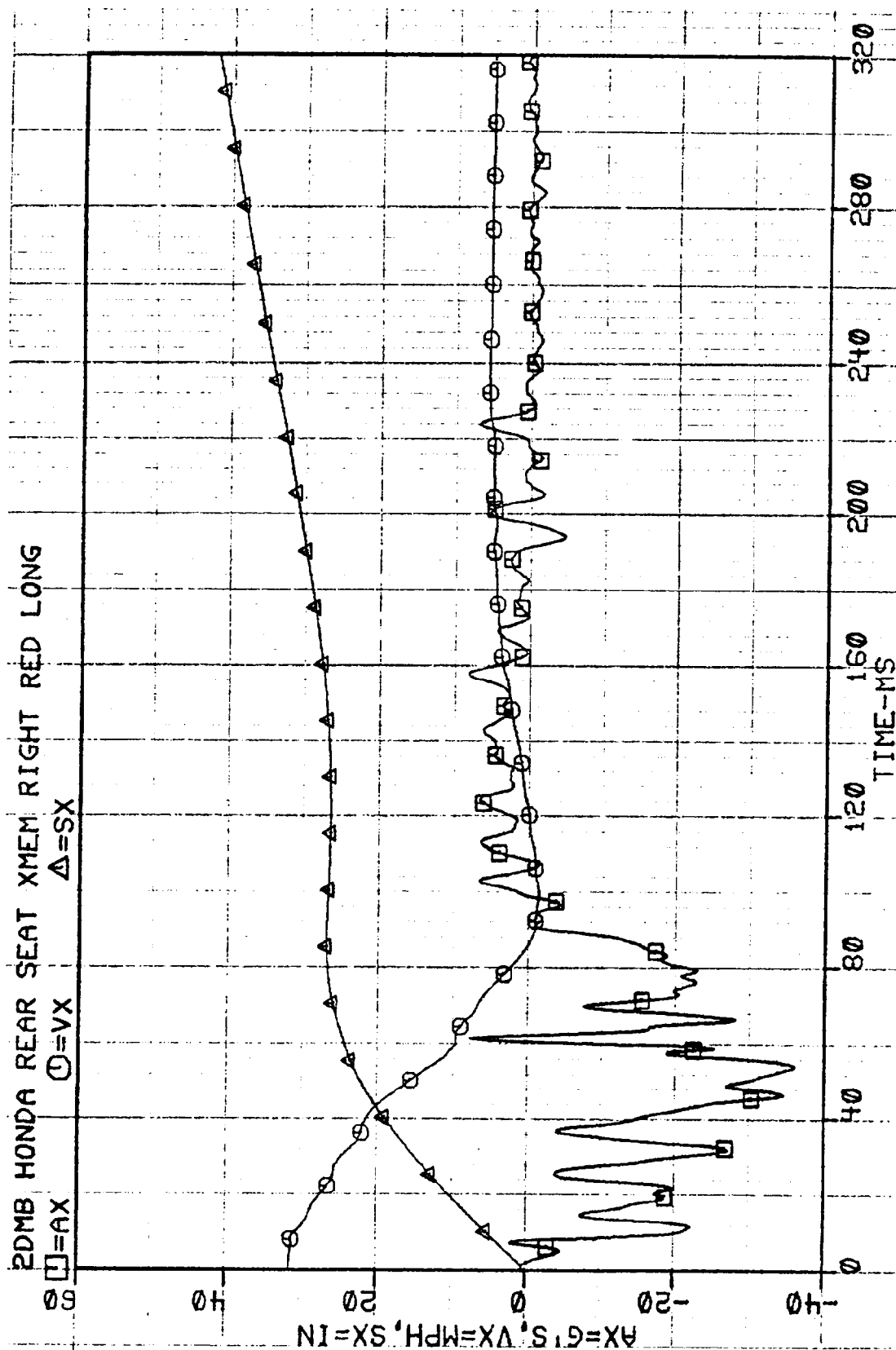


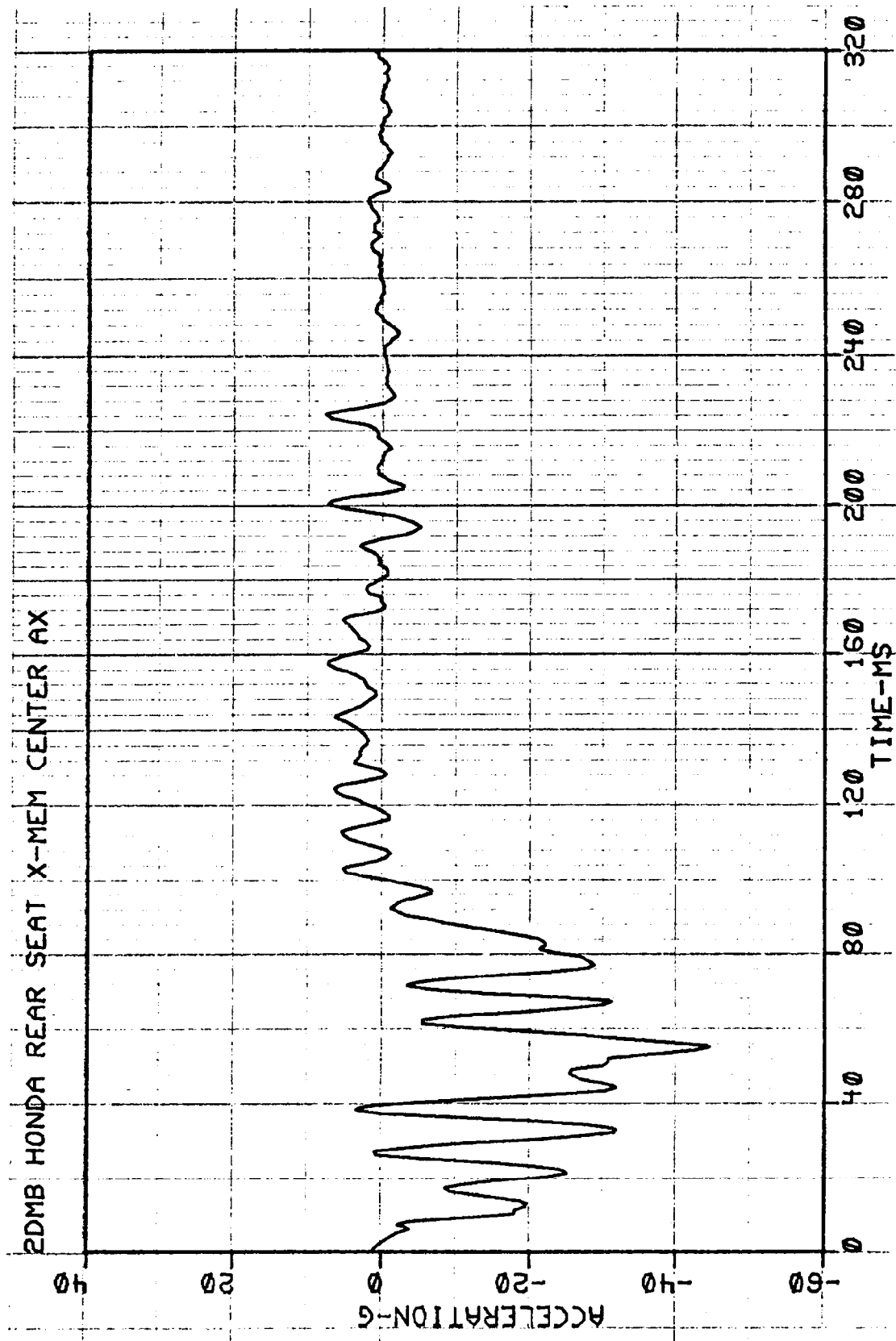


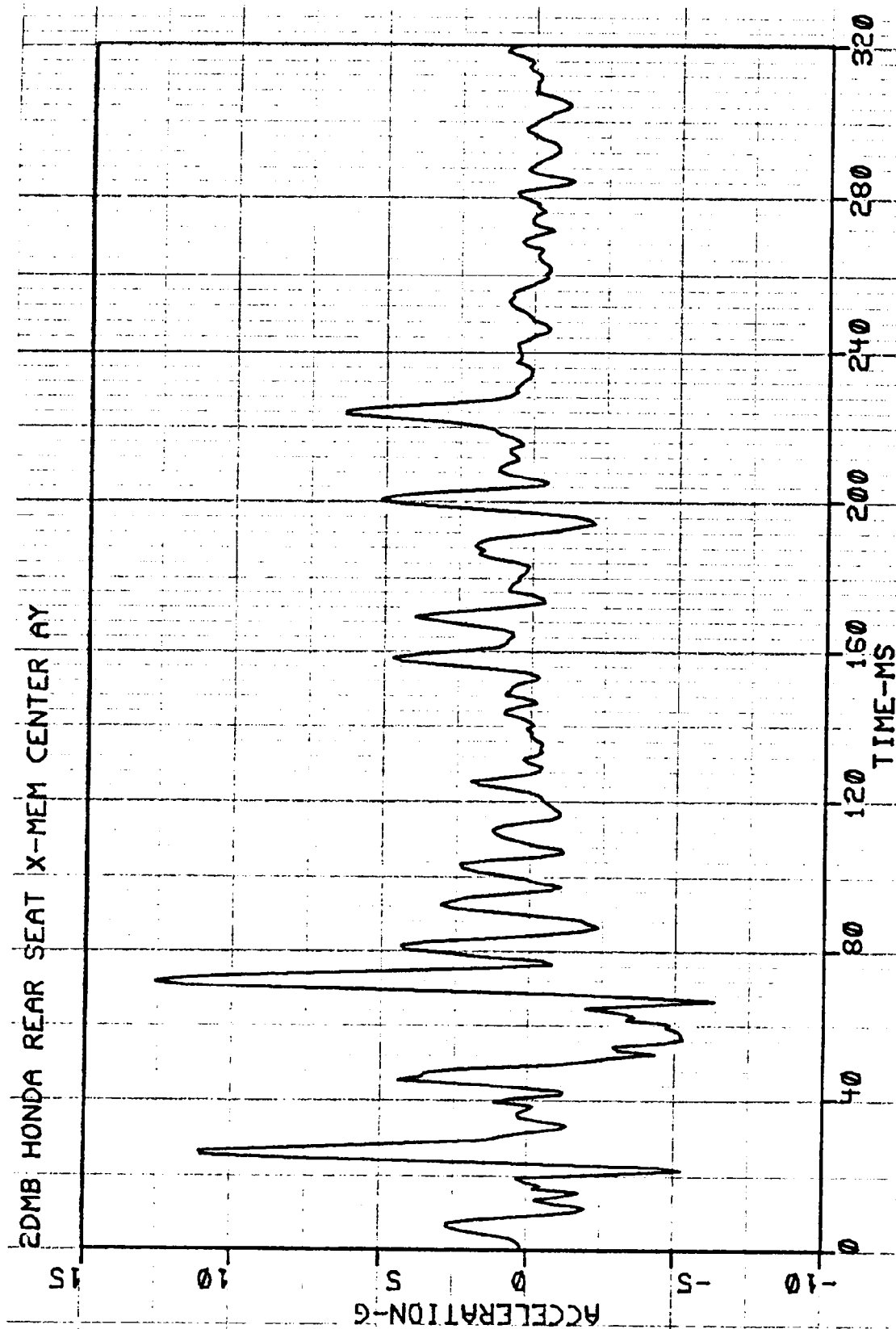


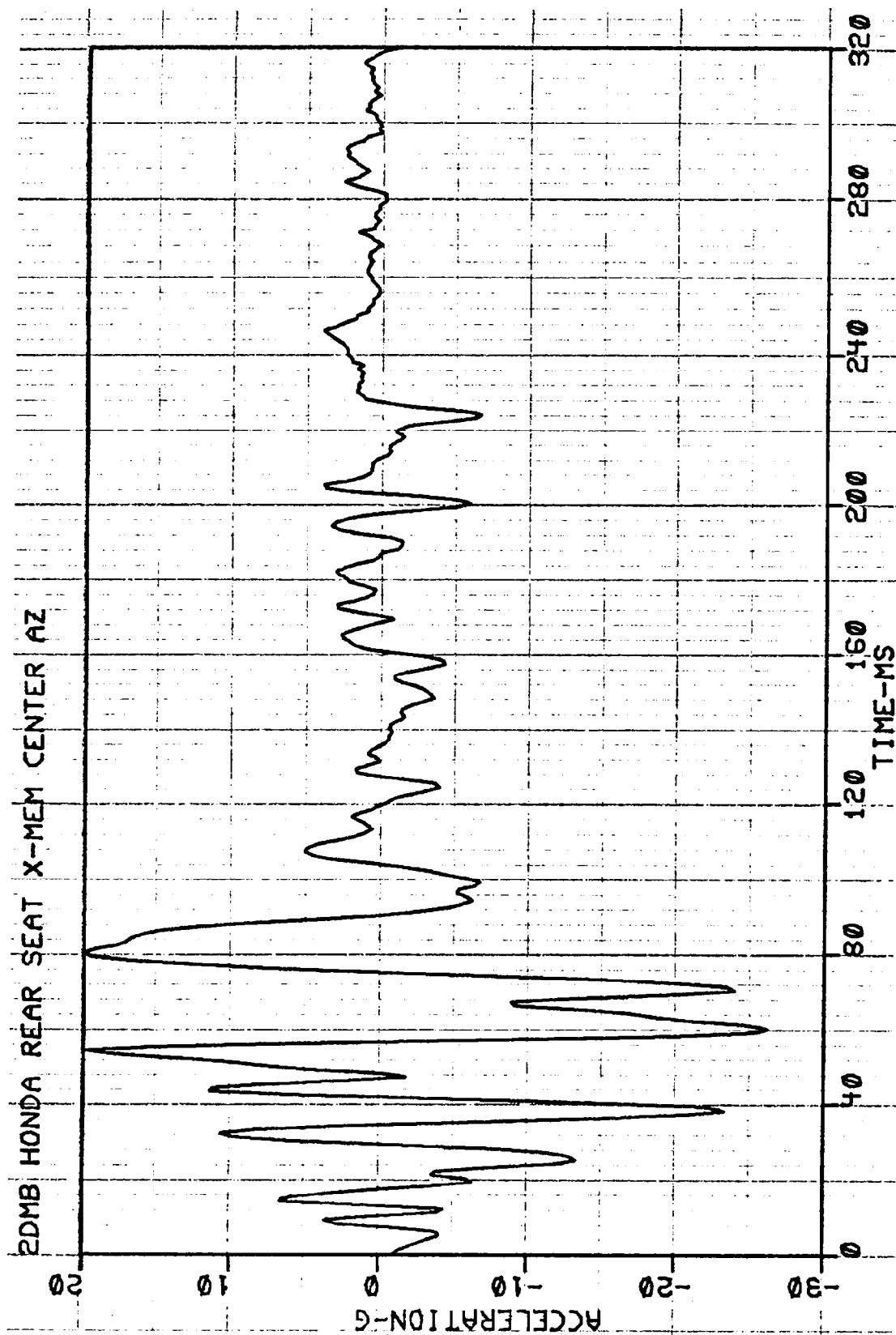


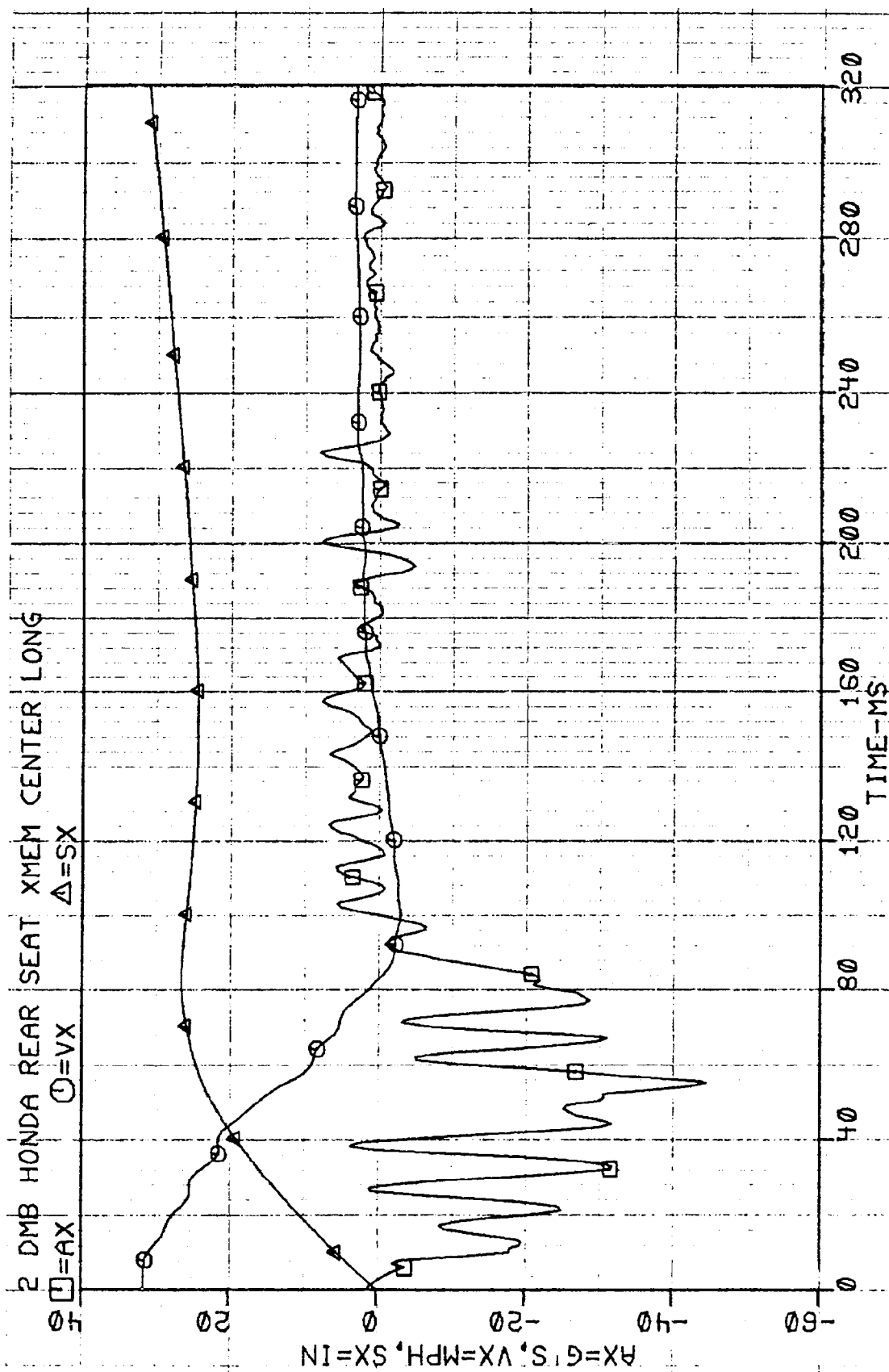


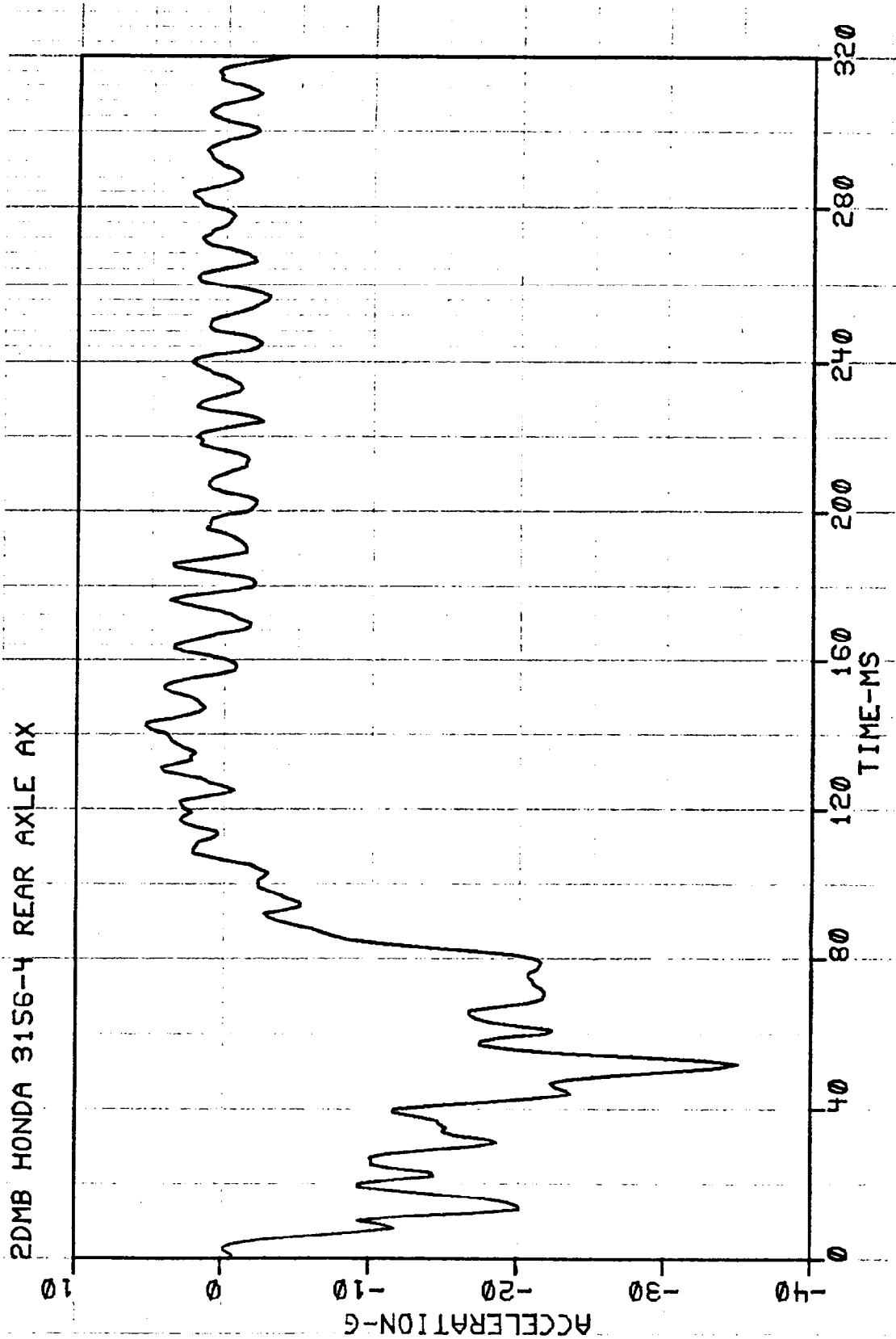


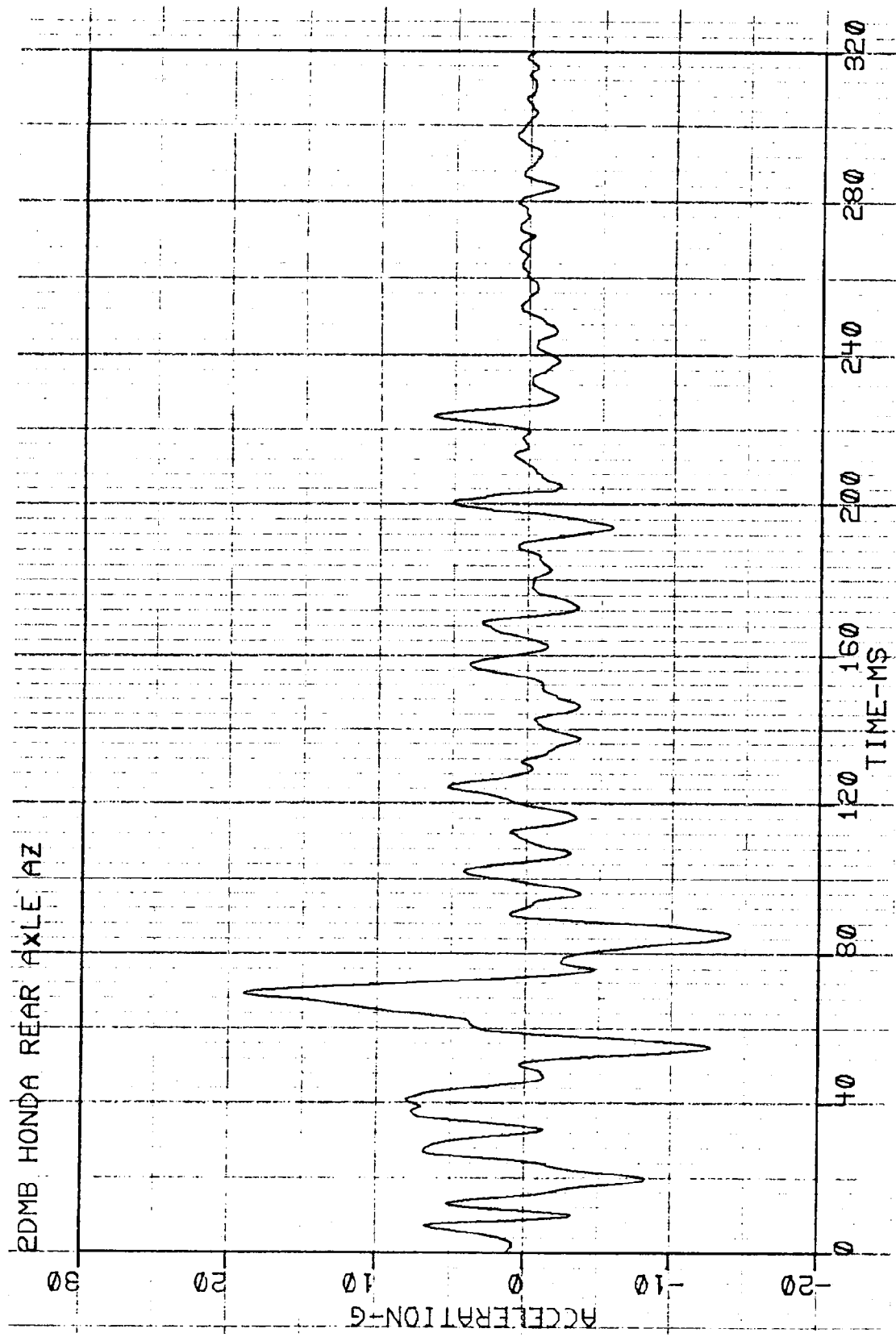


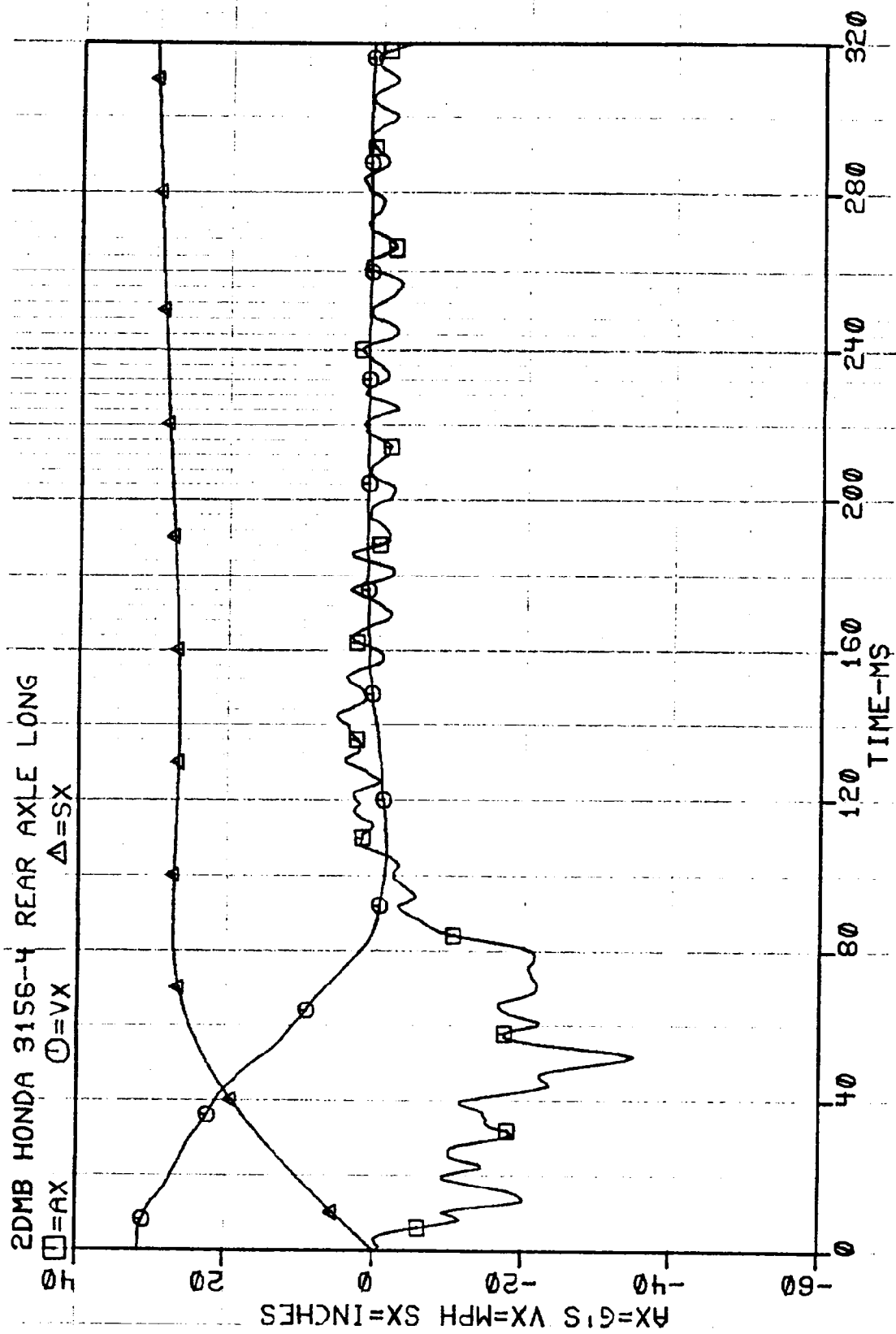


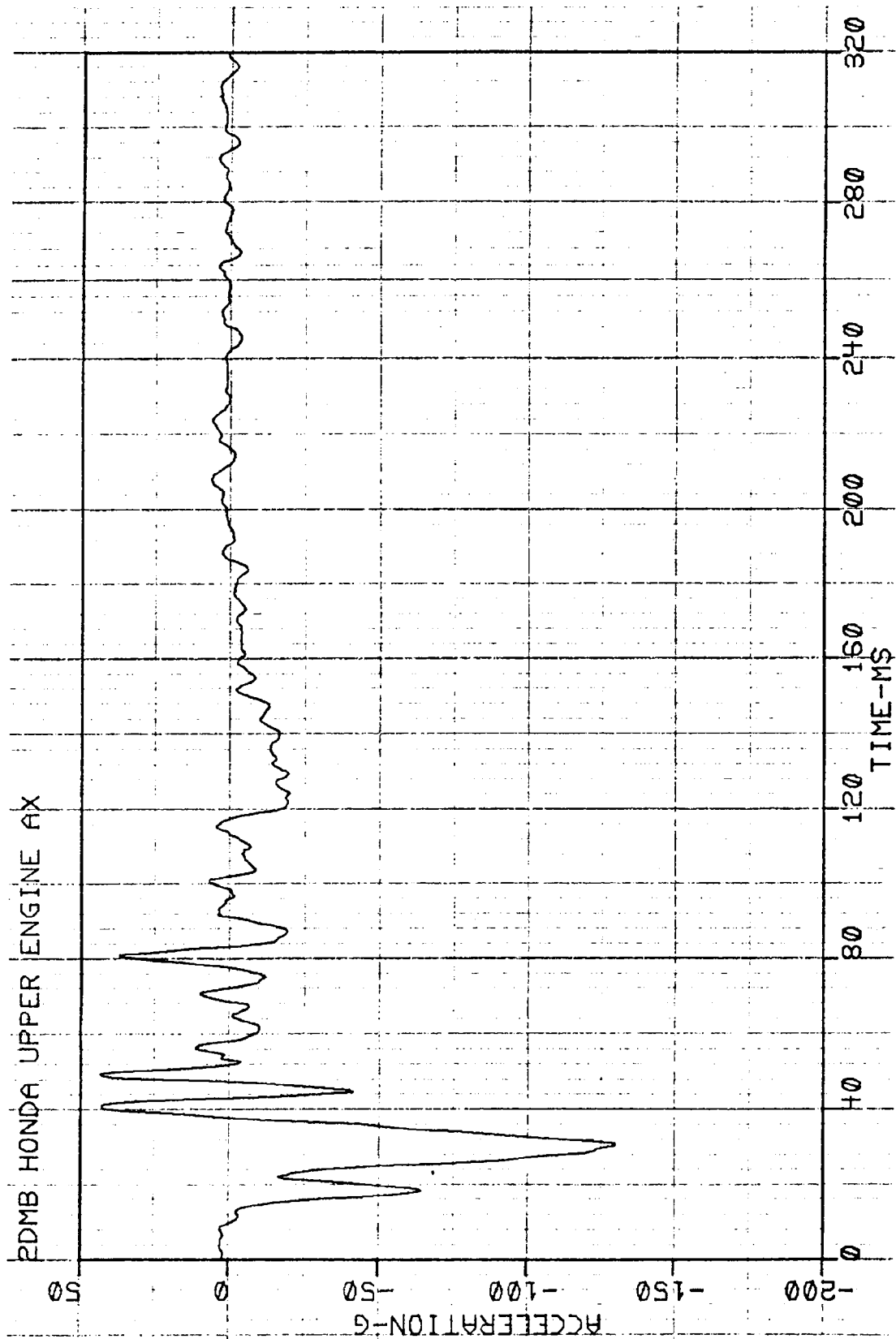


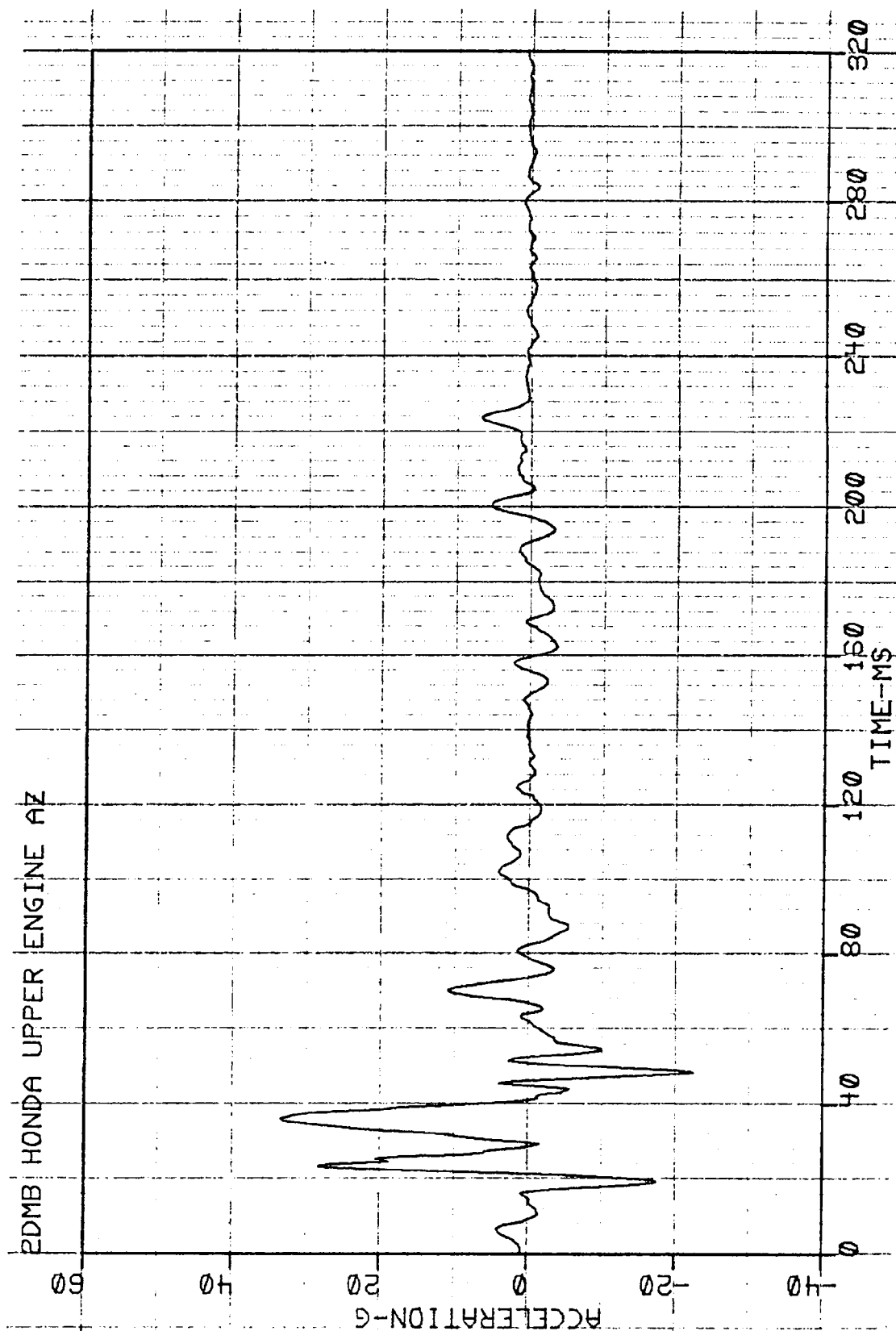


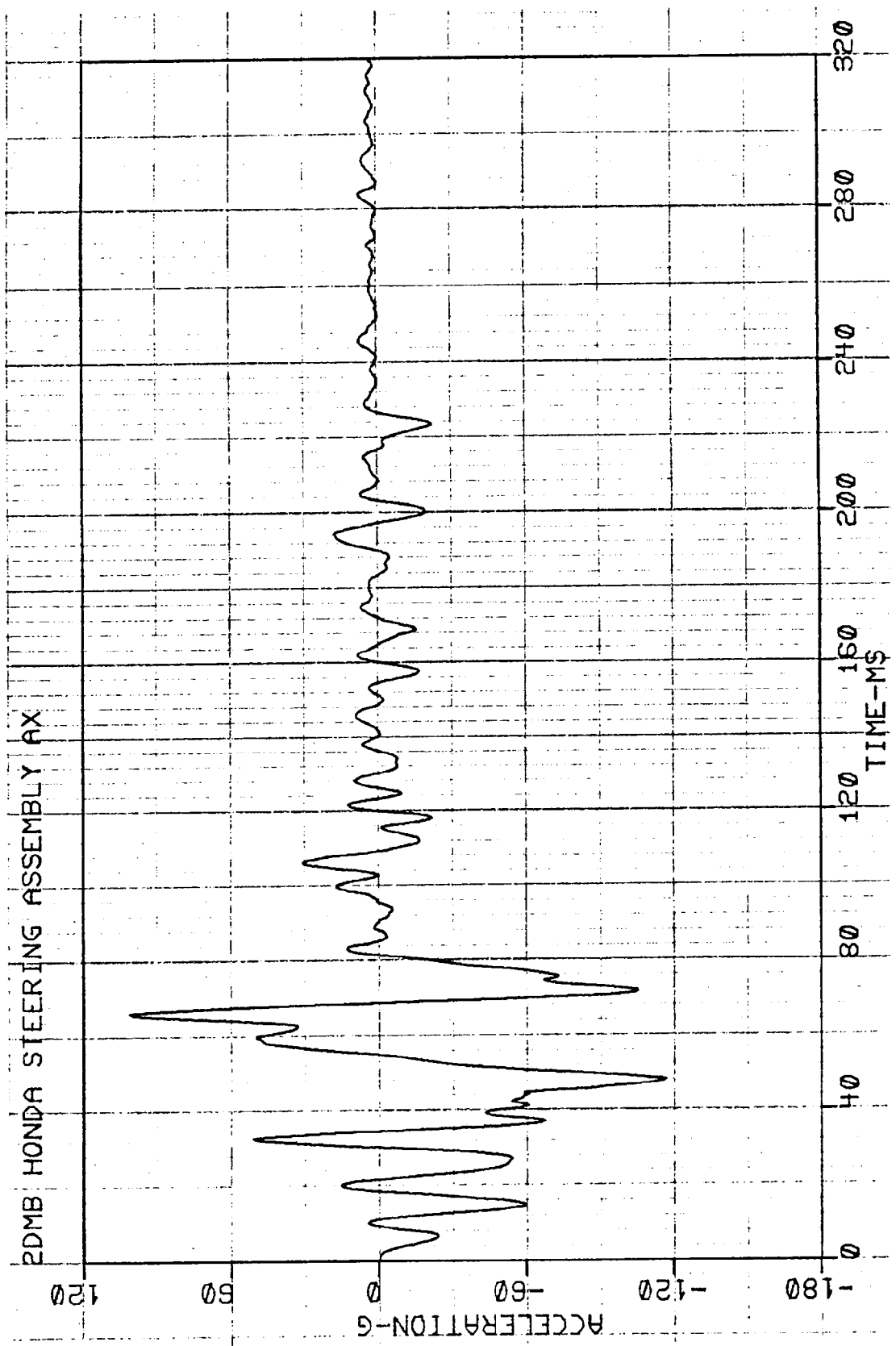


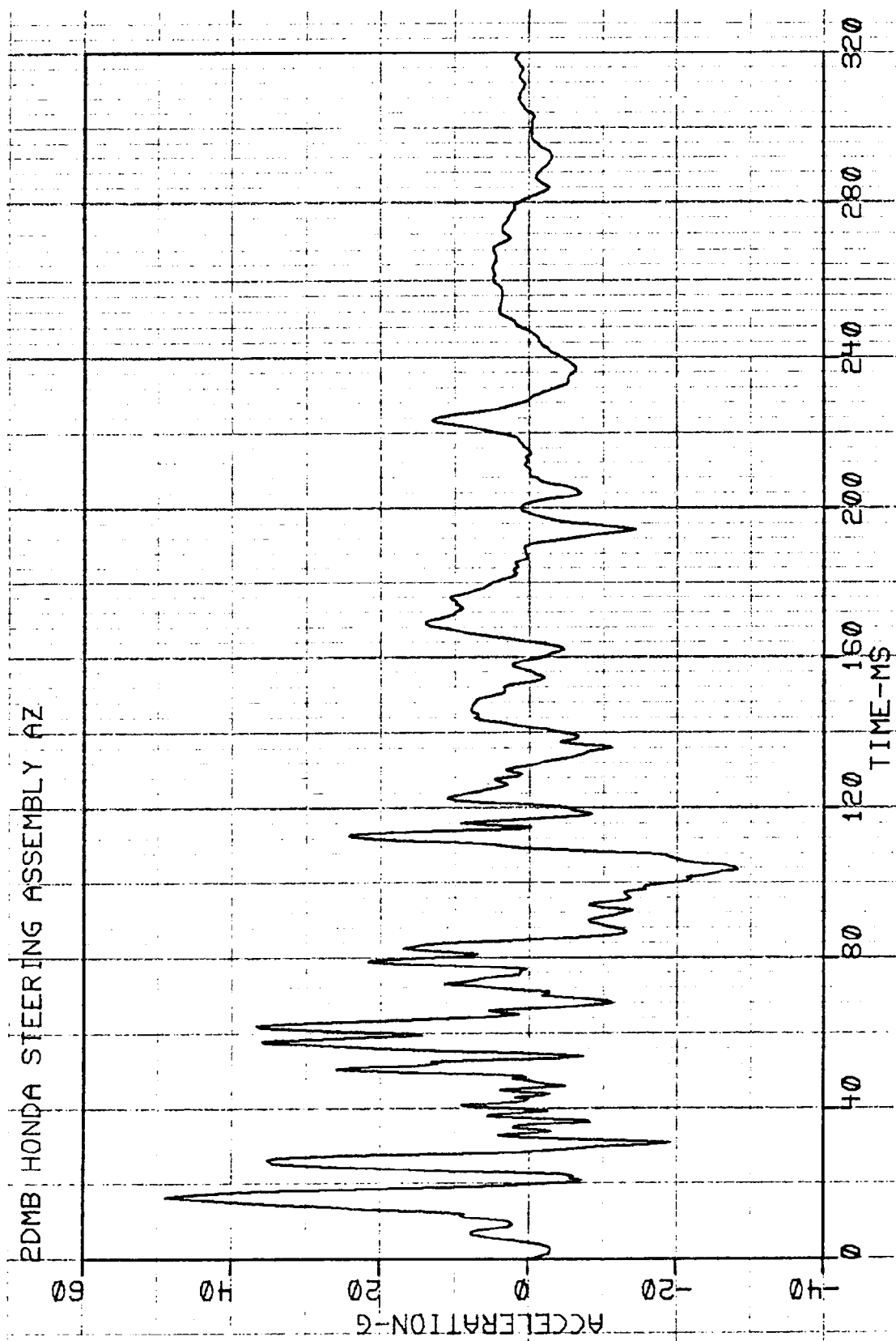


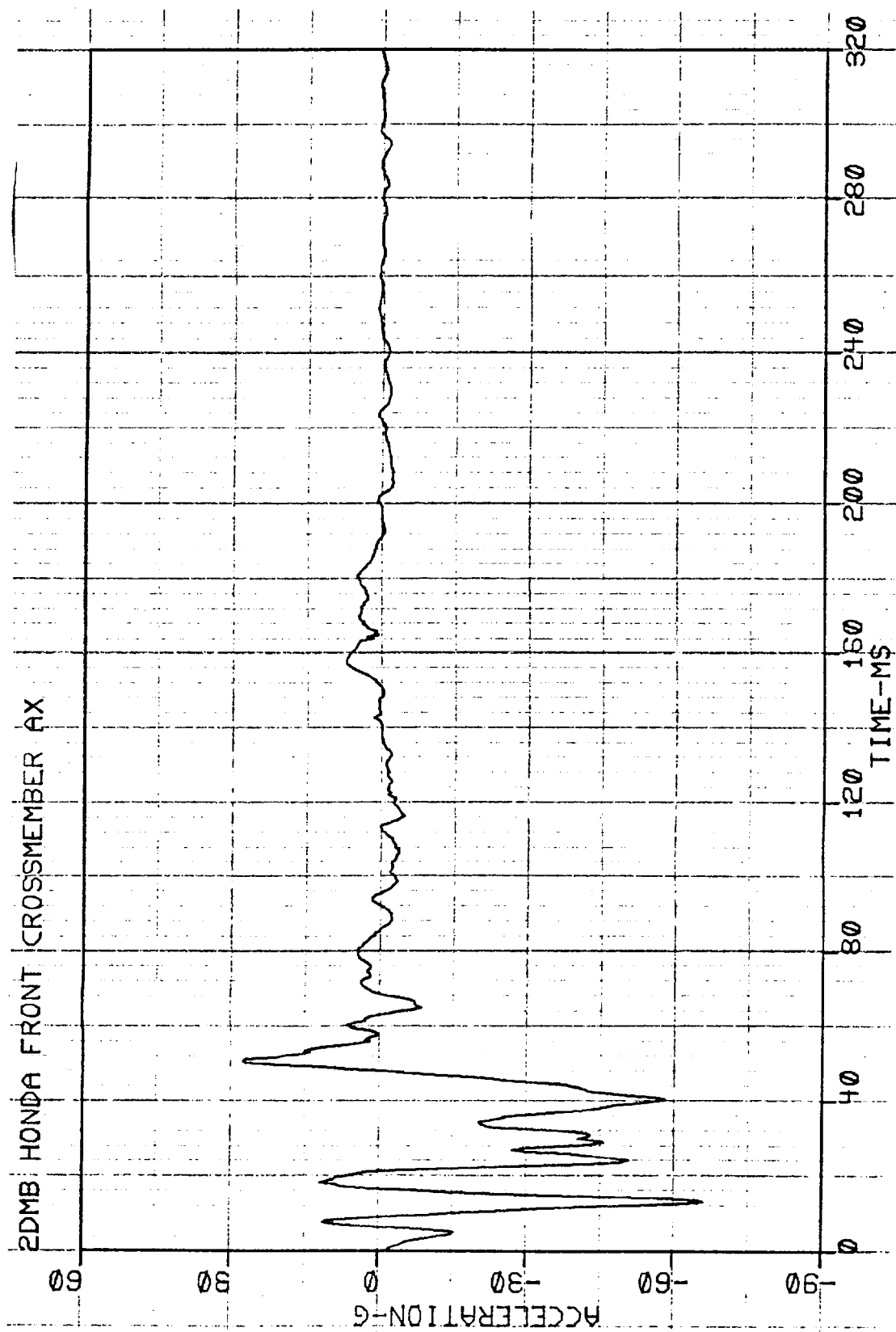


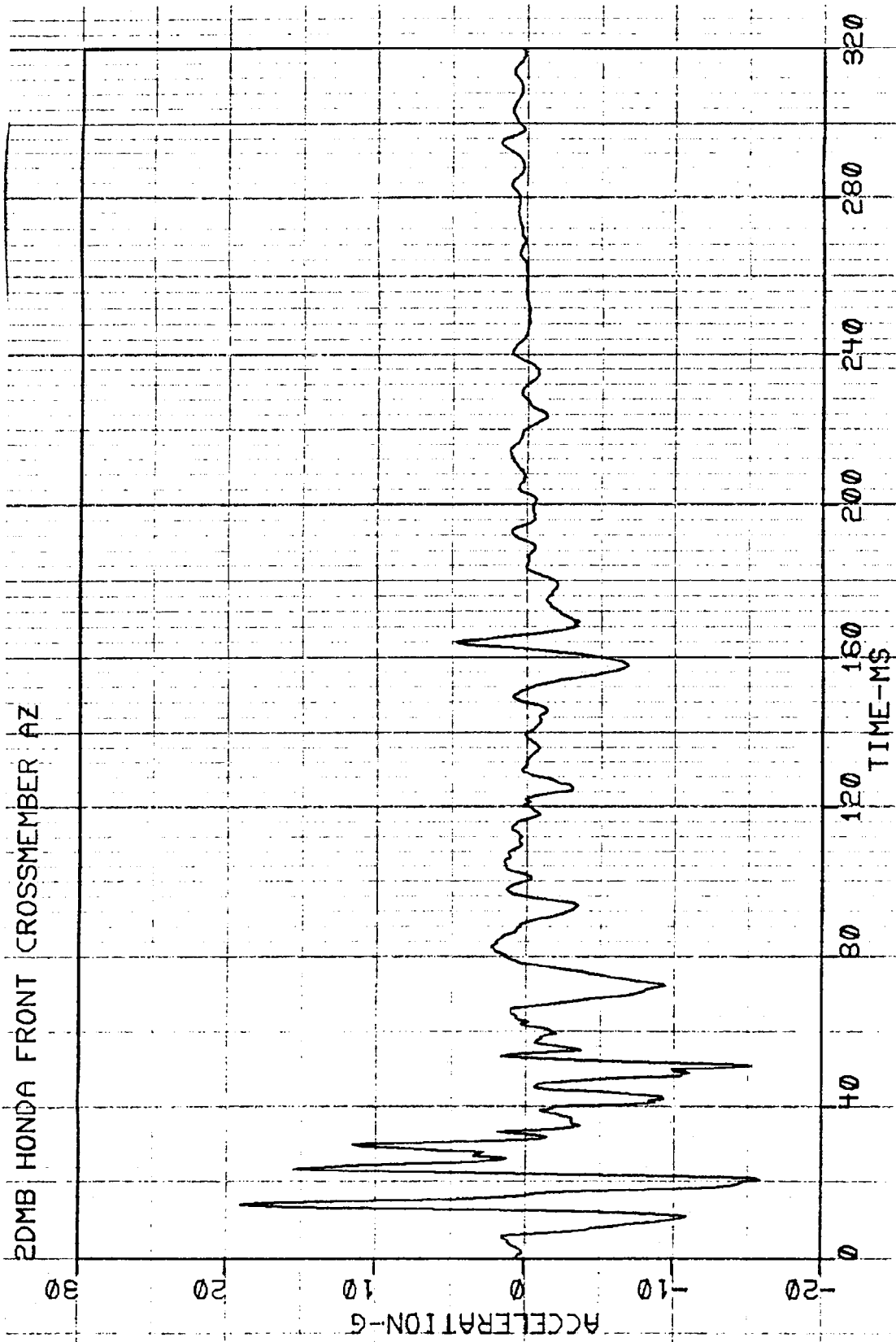


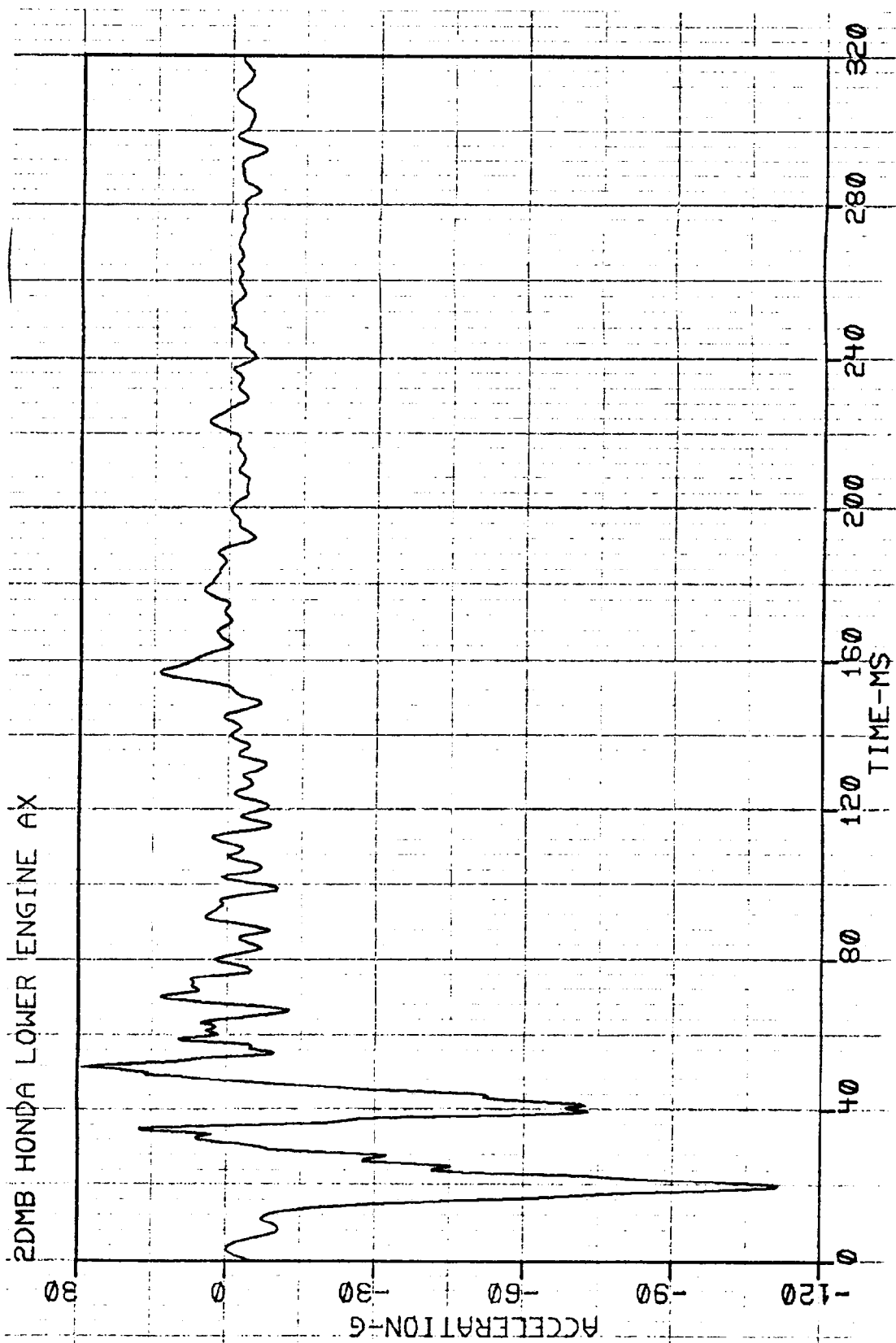


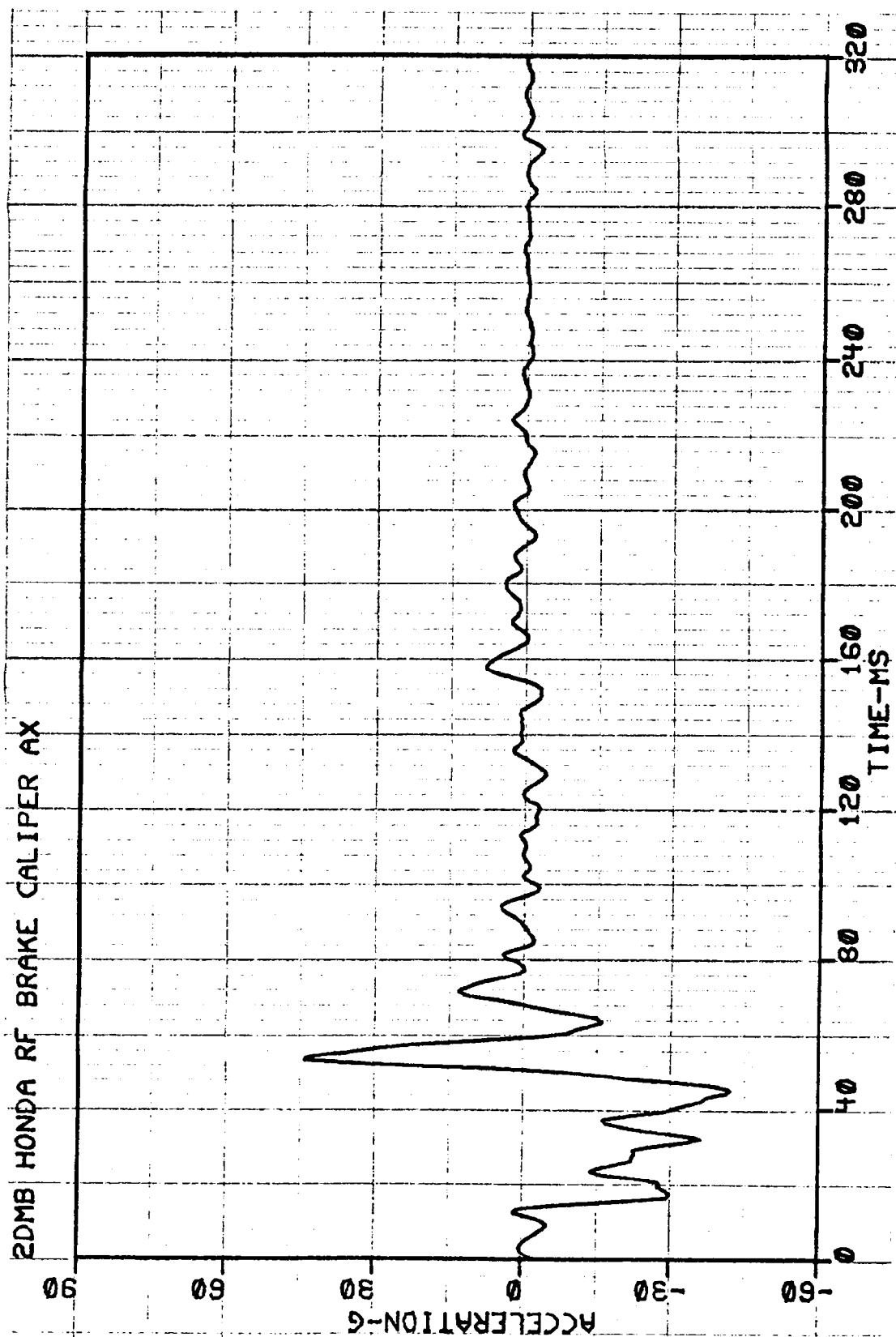


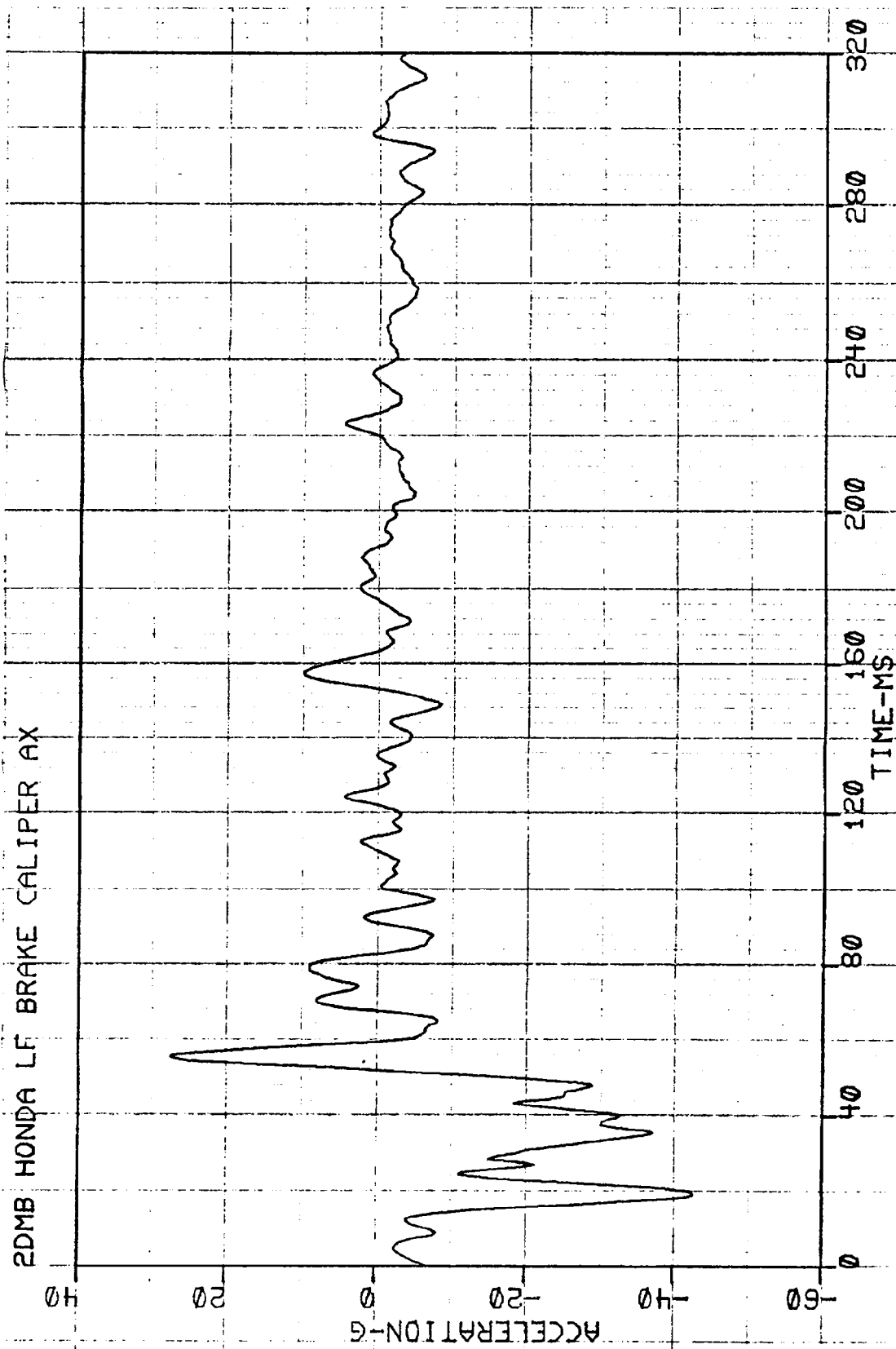


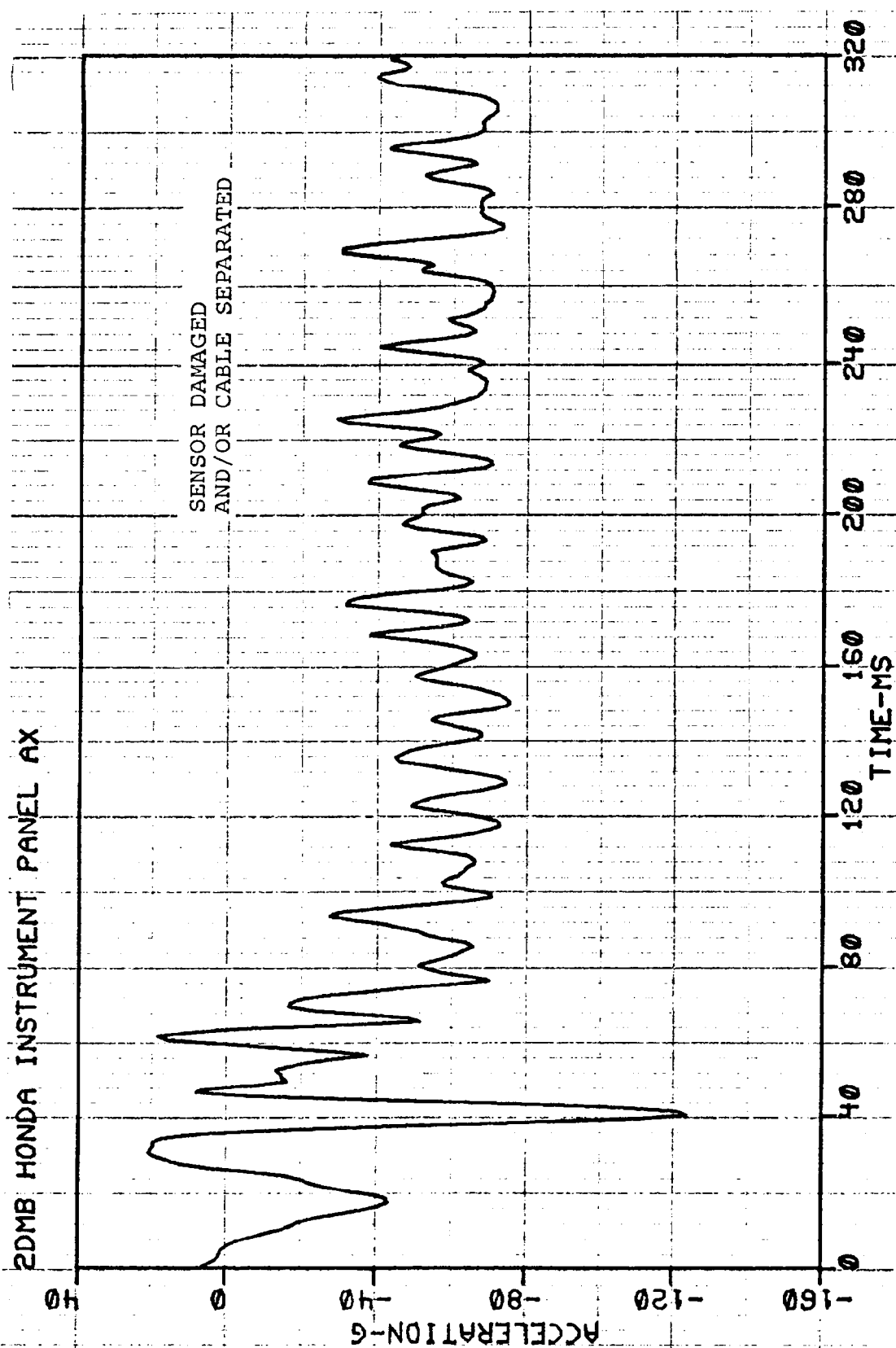


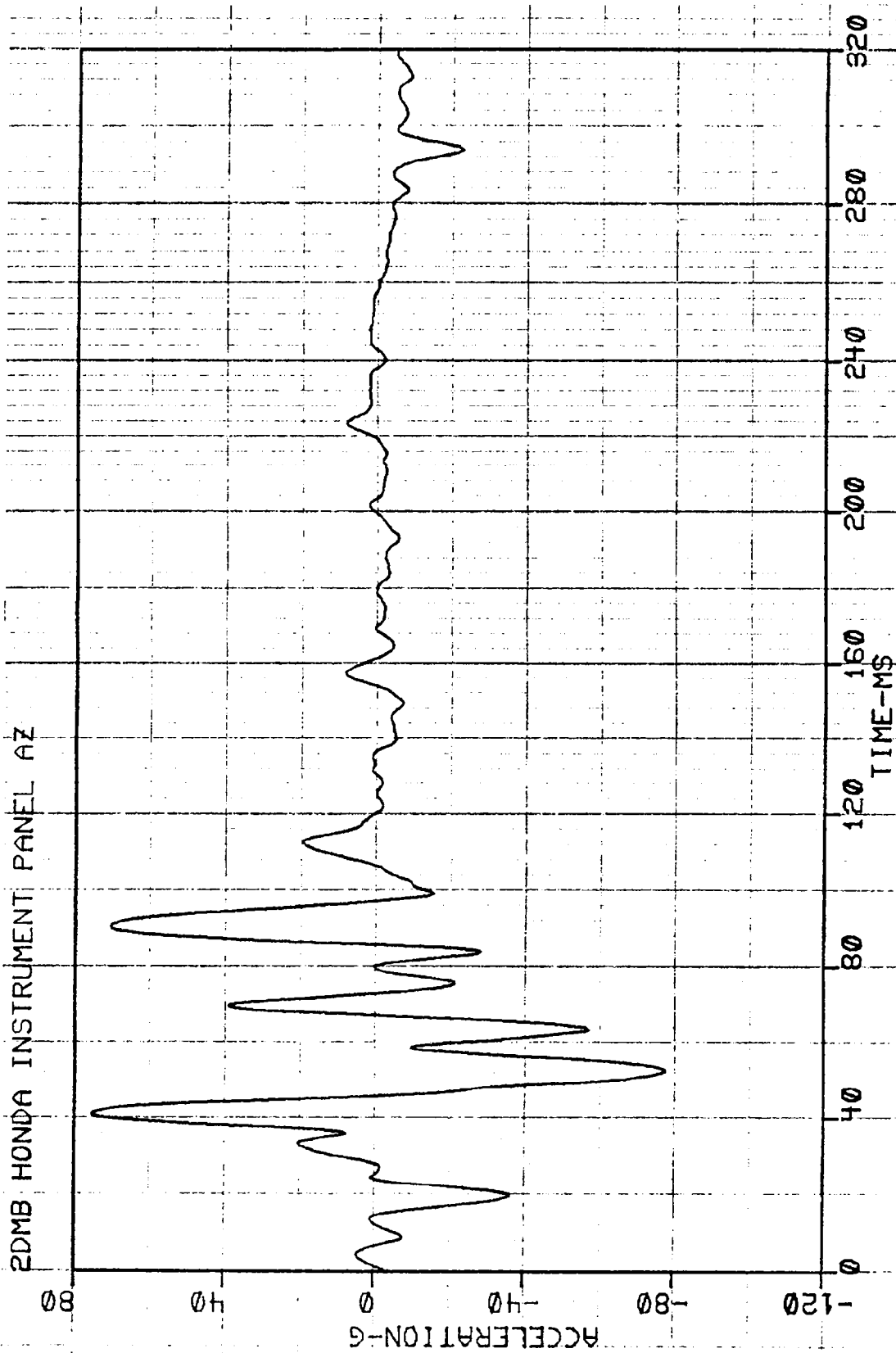


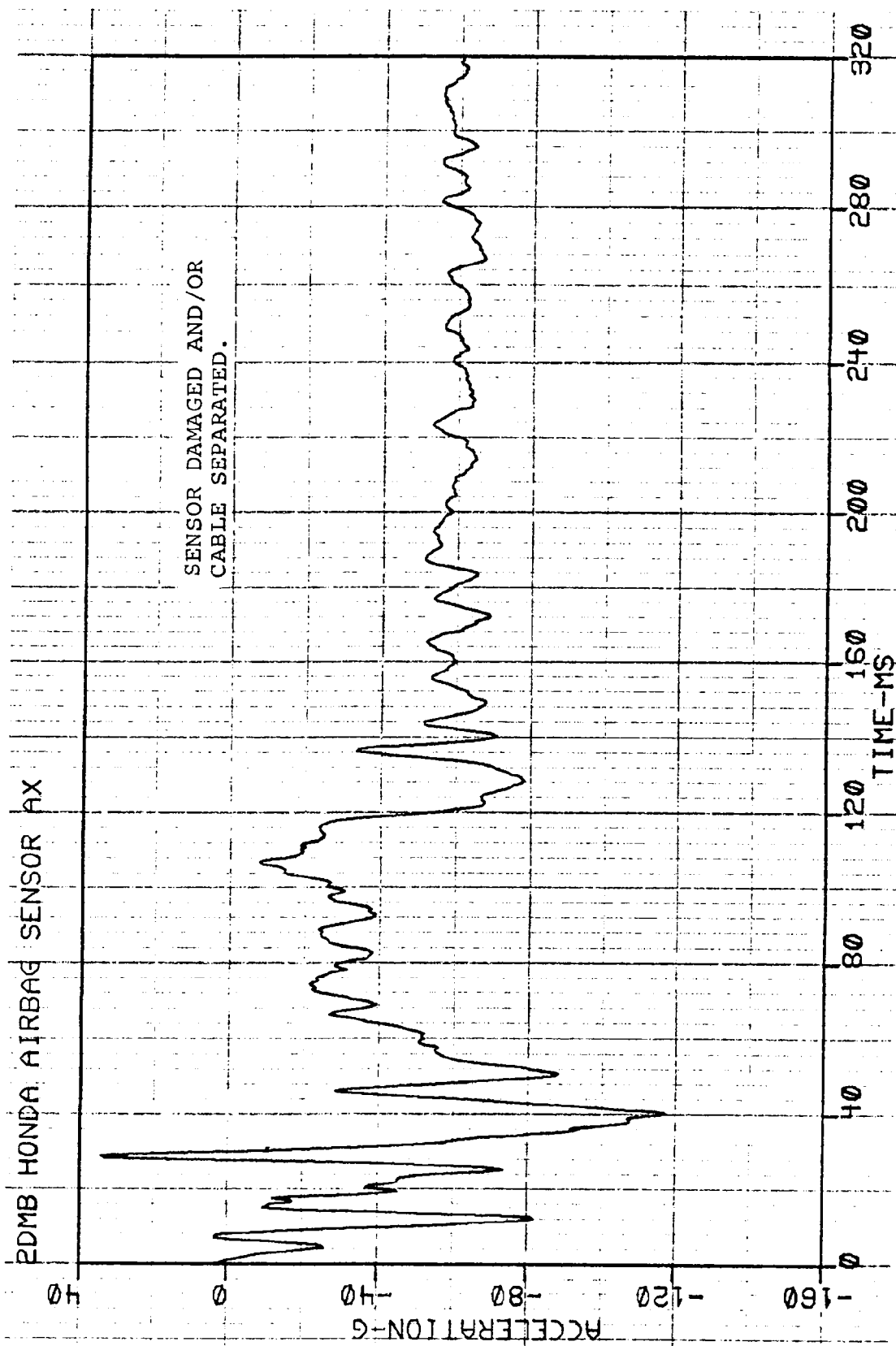




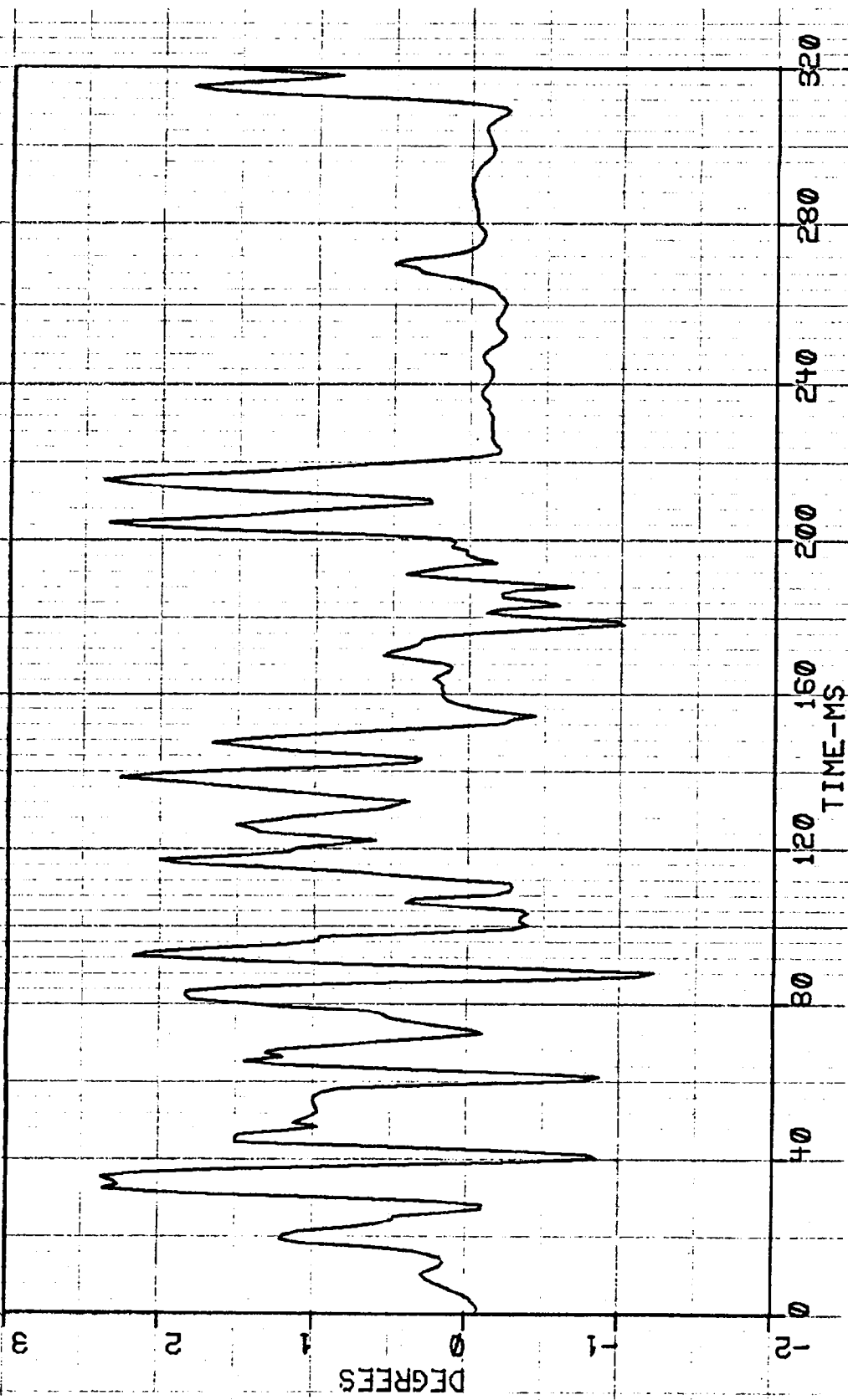




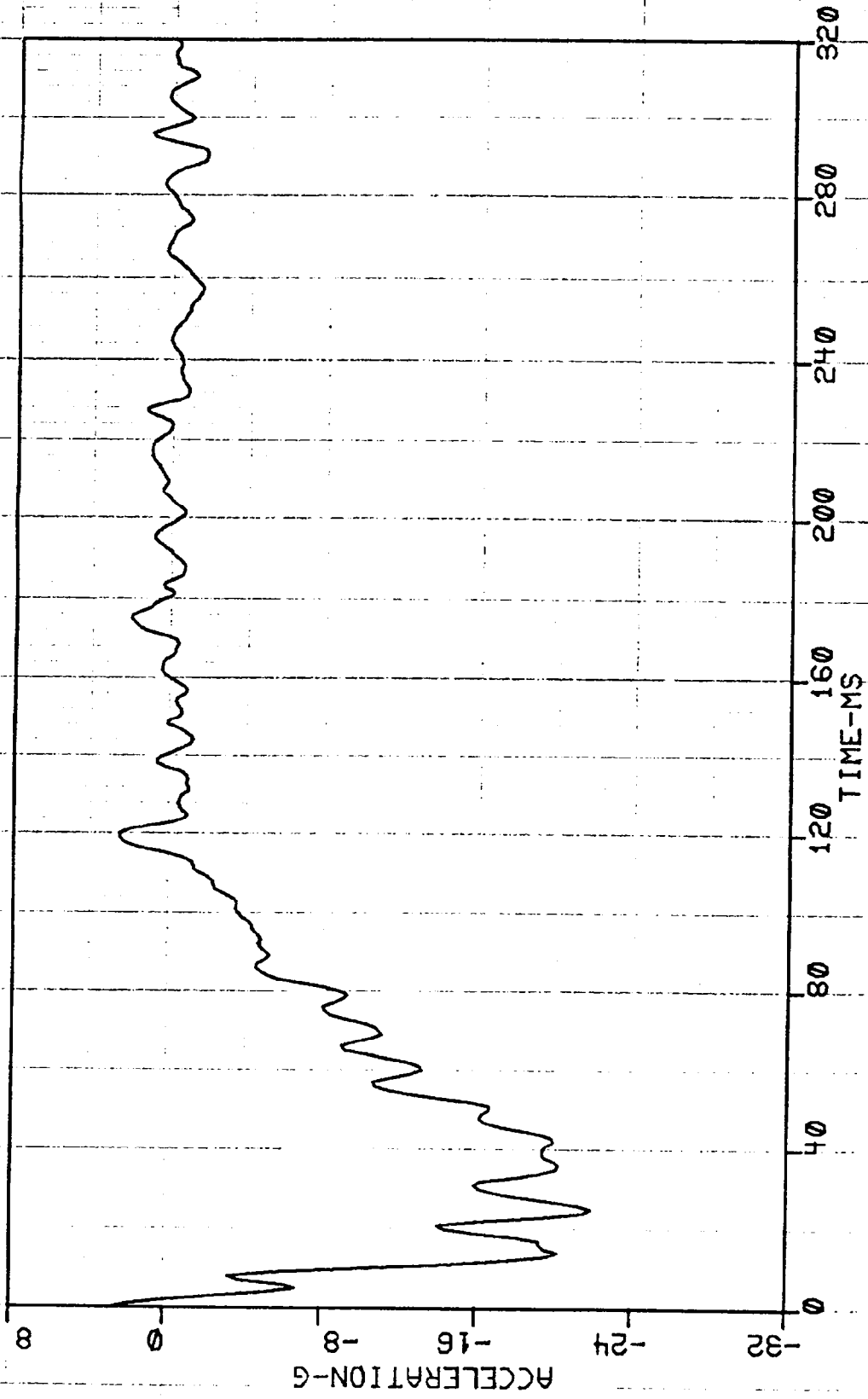


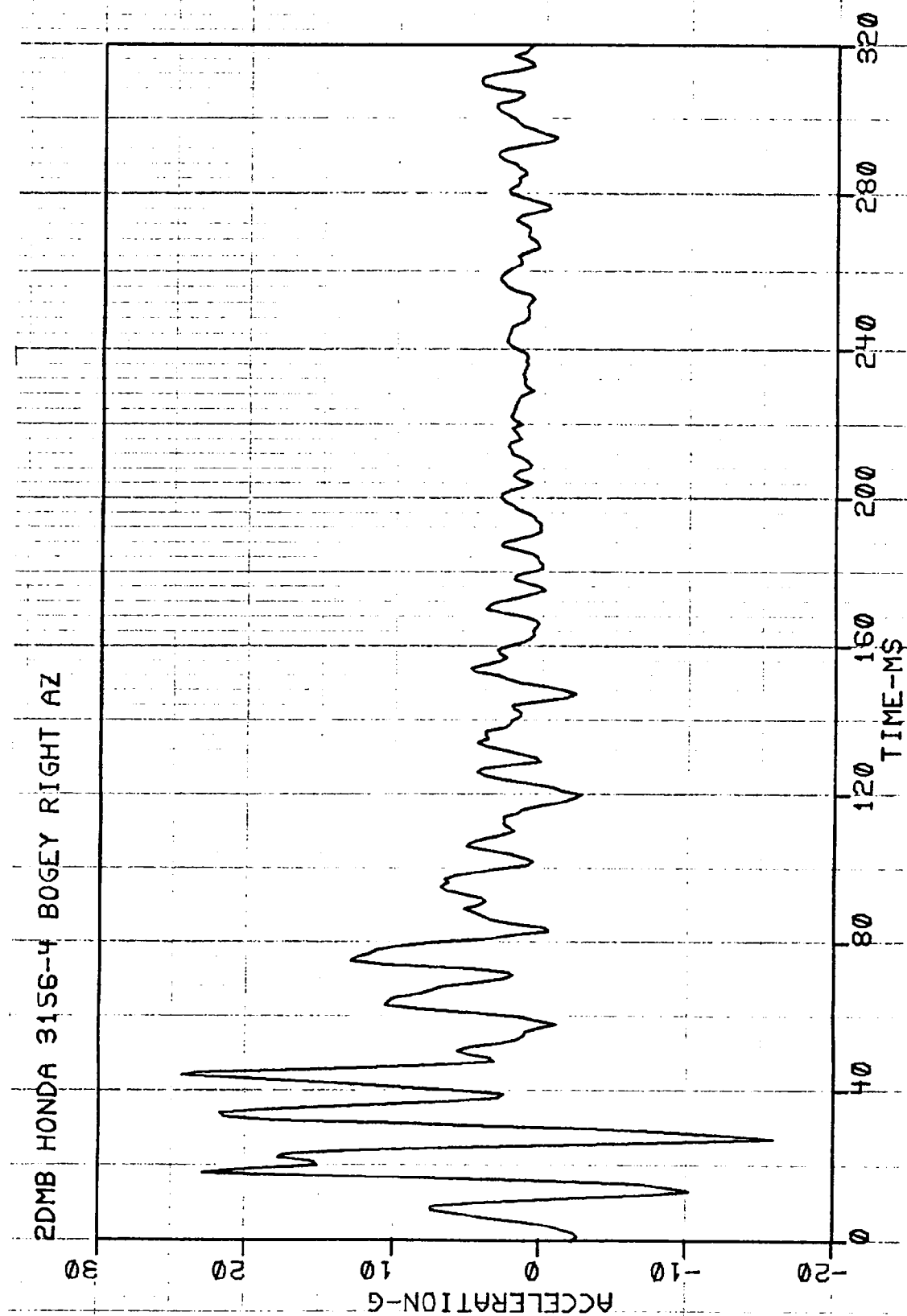


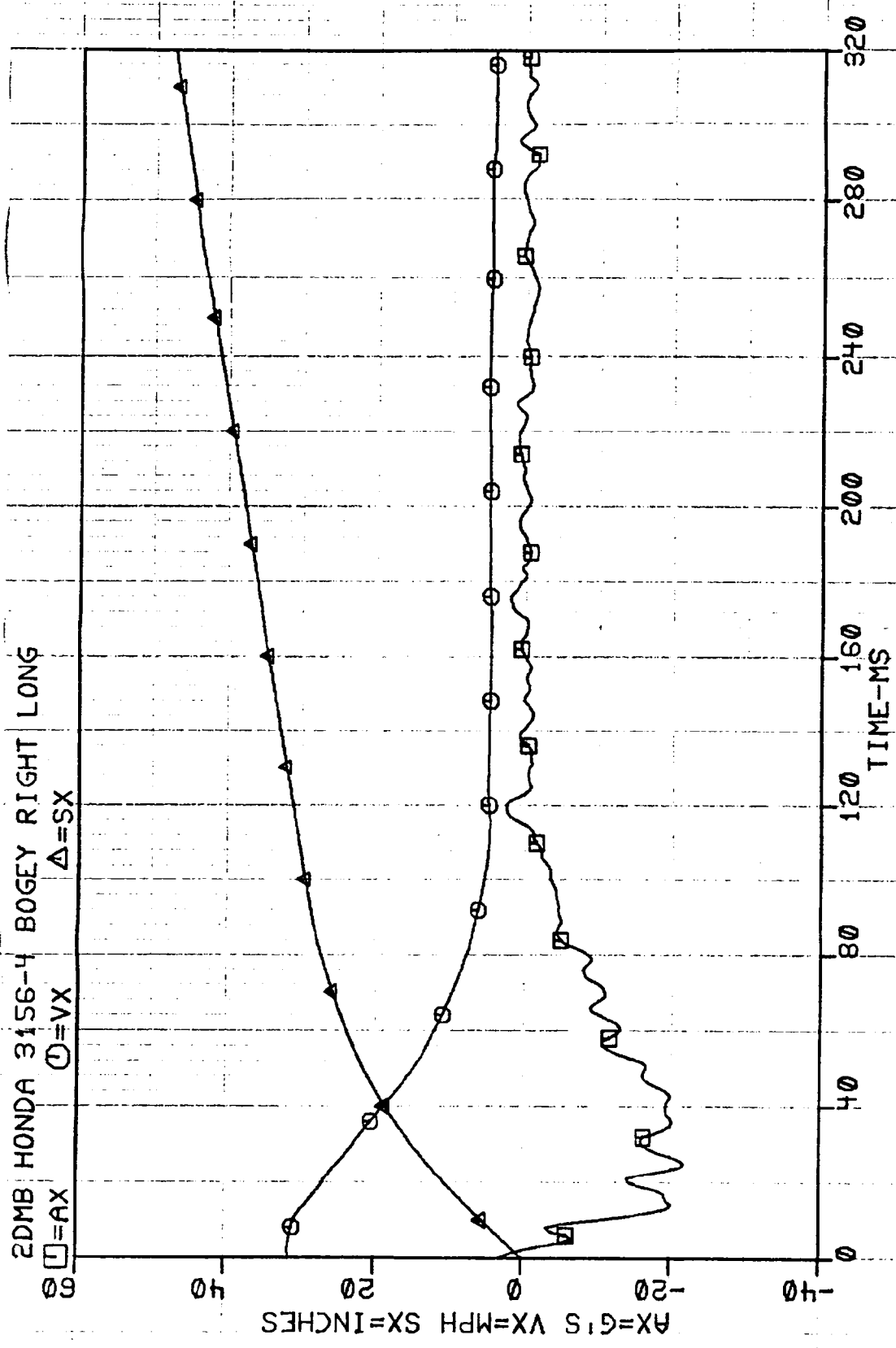
2DMB HONDA 3156-4 PITCH RATE GYRO

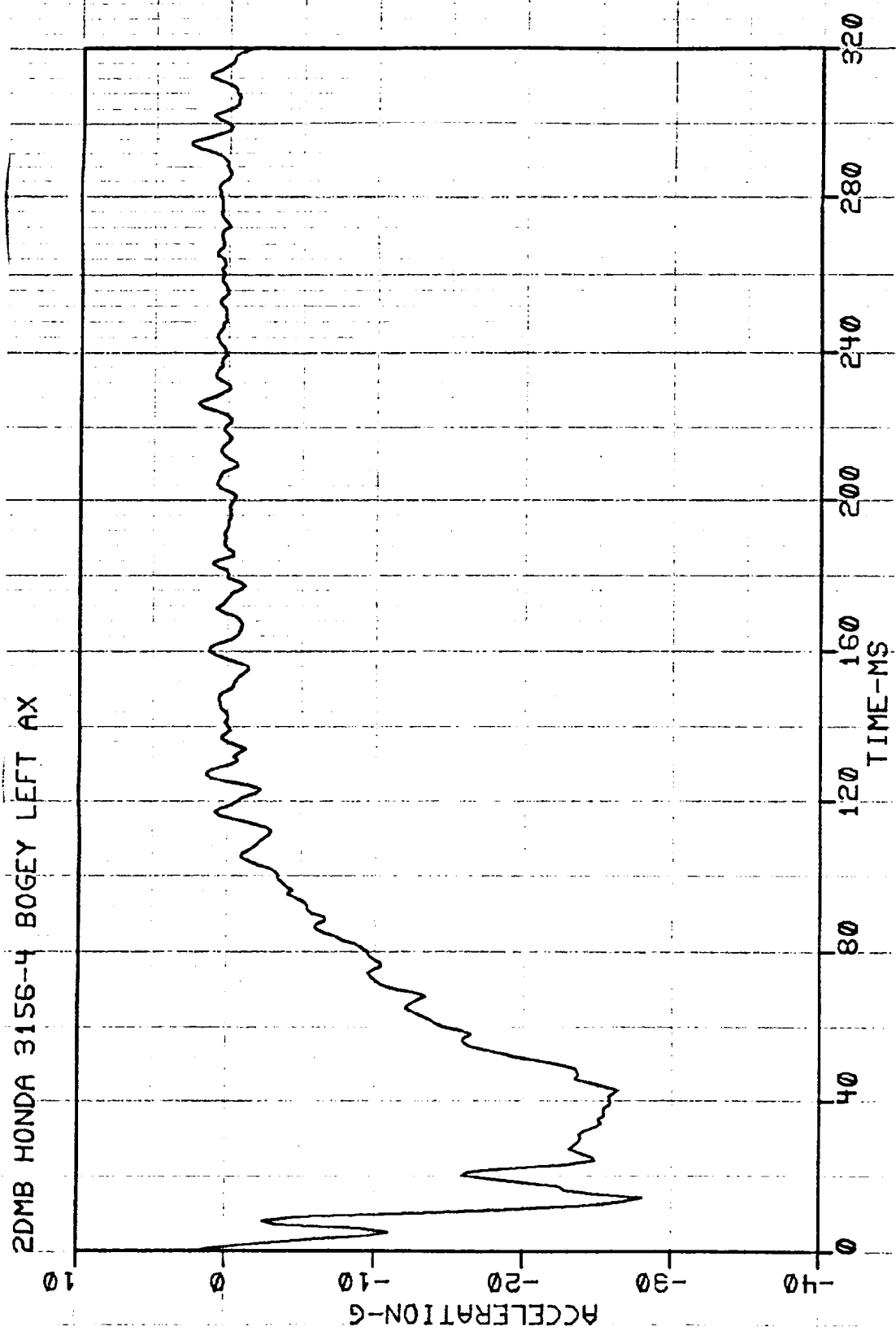


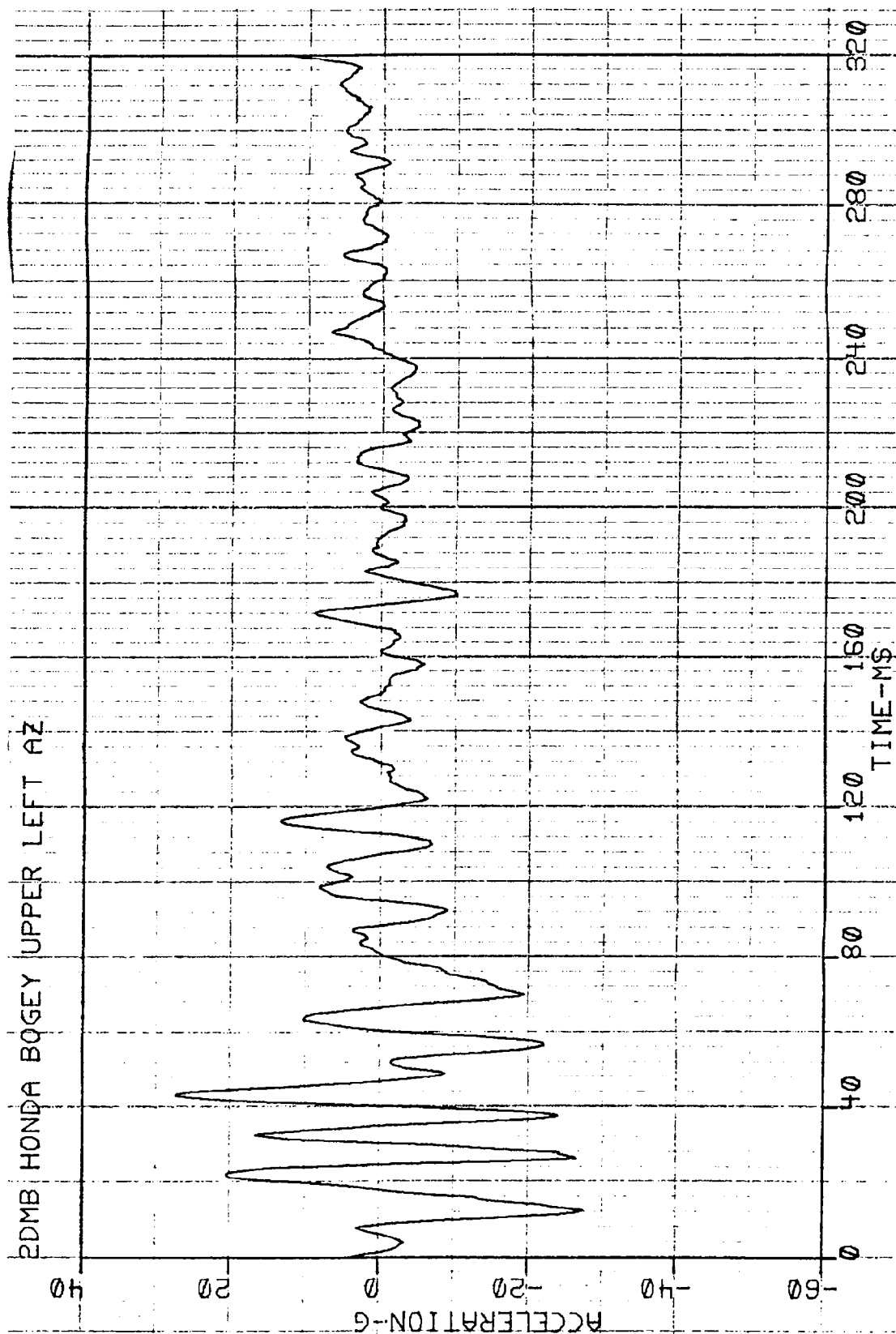
EDMB HONDA 3156--4 BOGEY RIGHT AX

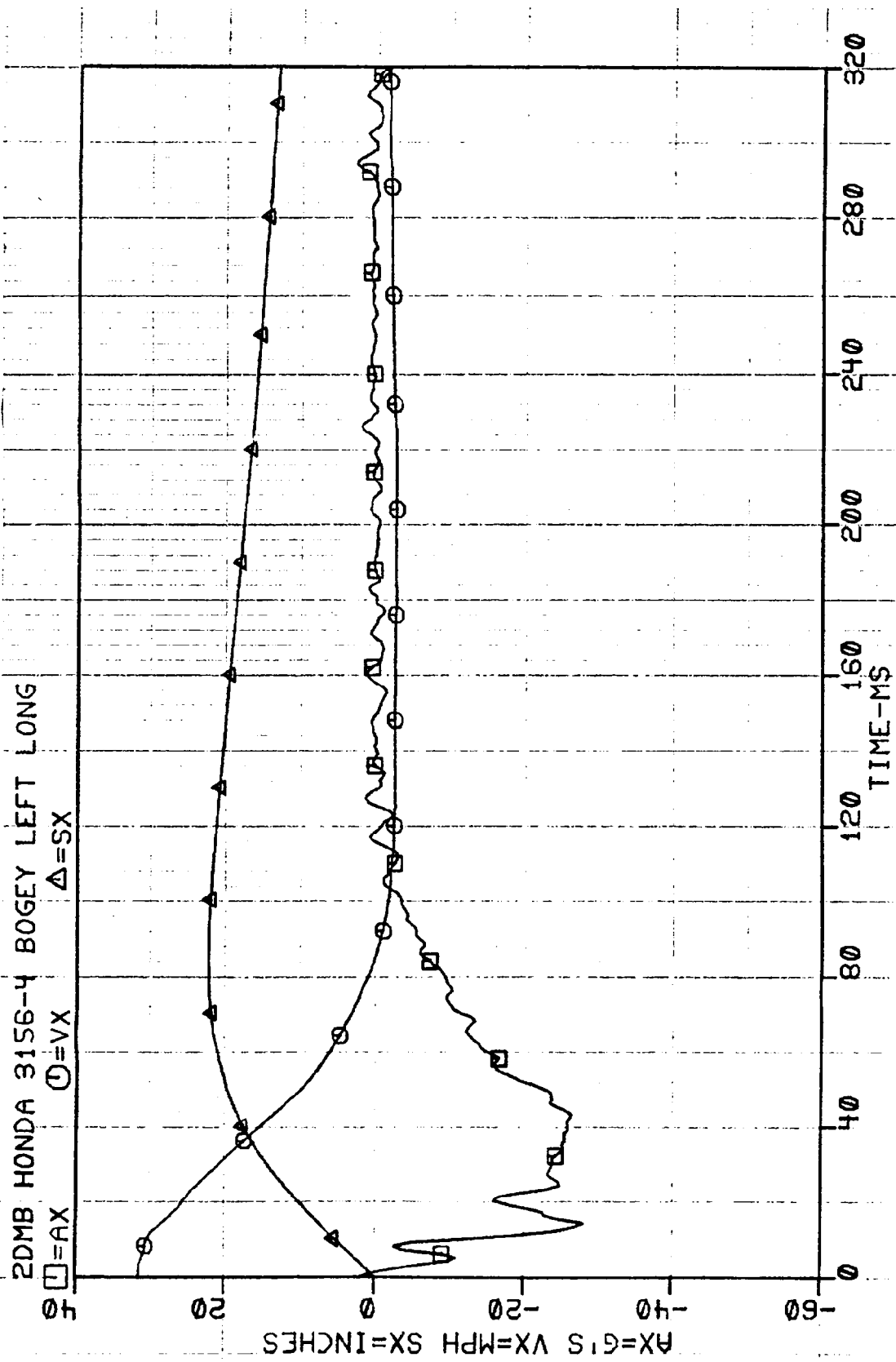


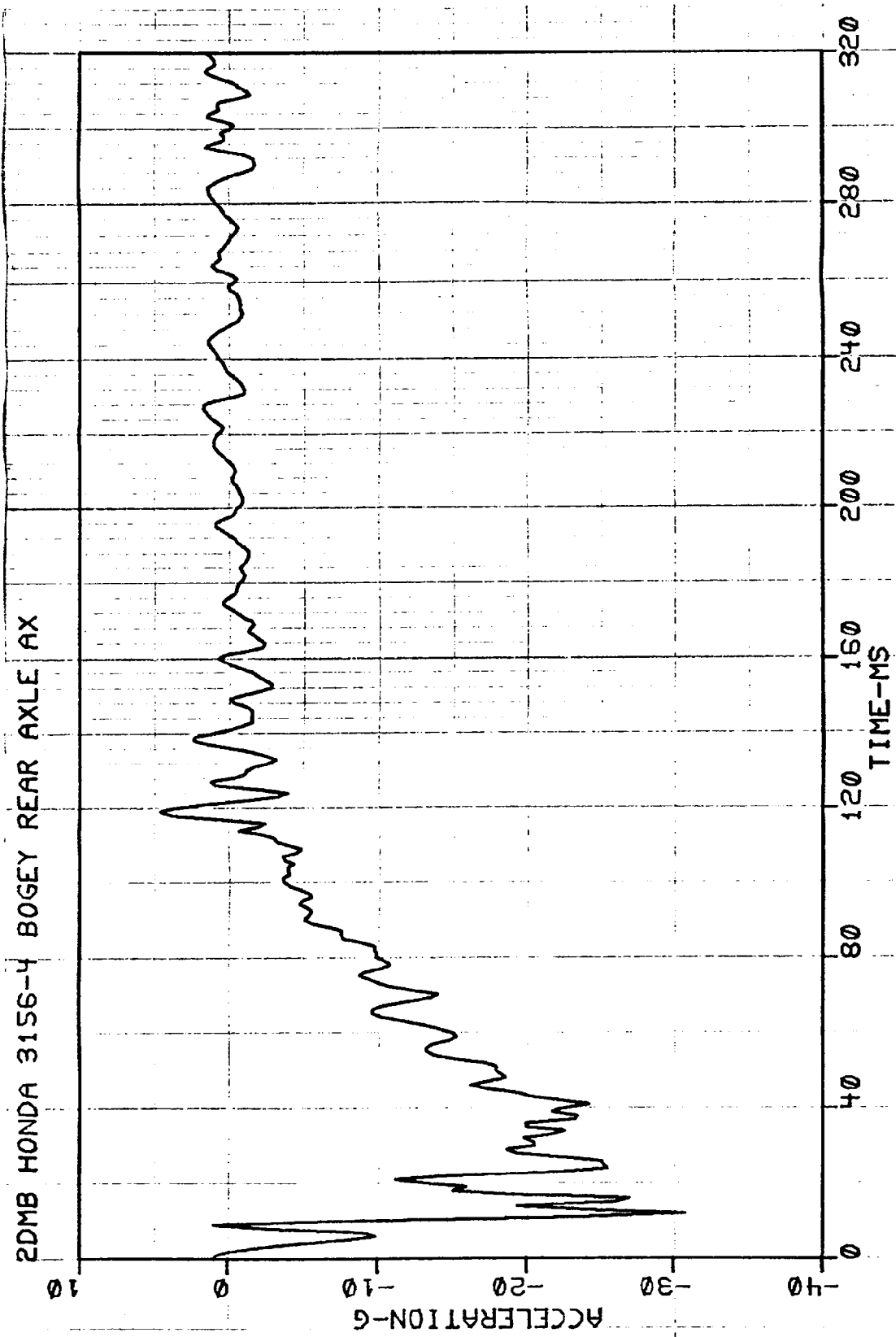


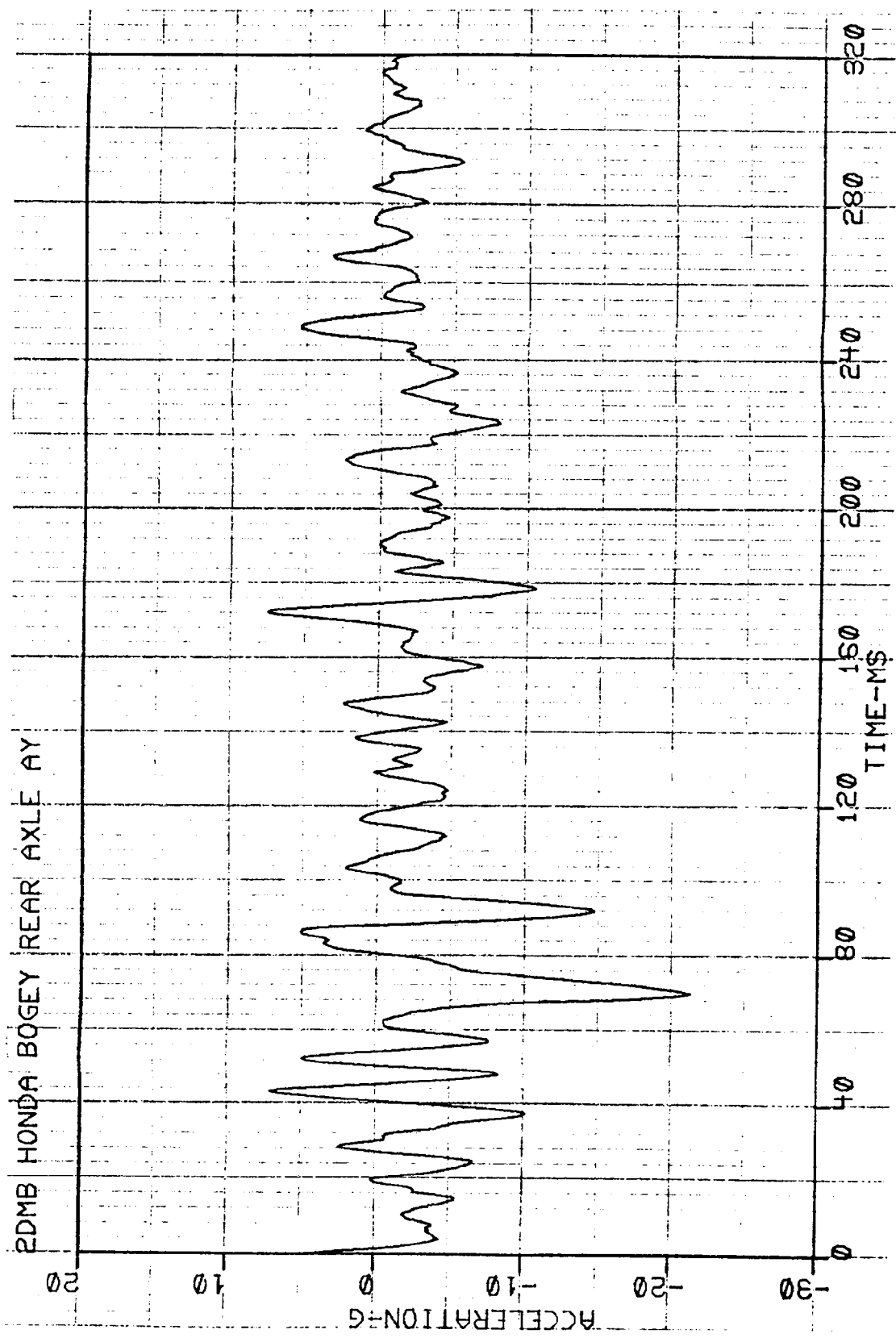


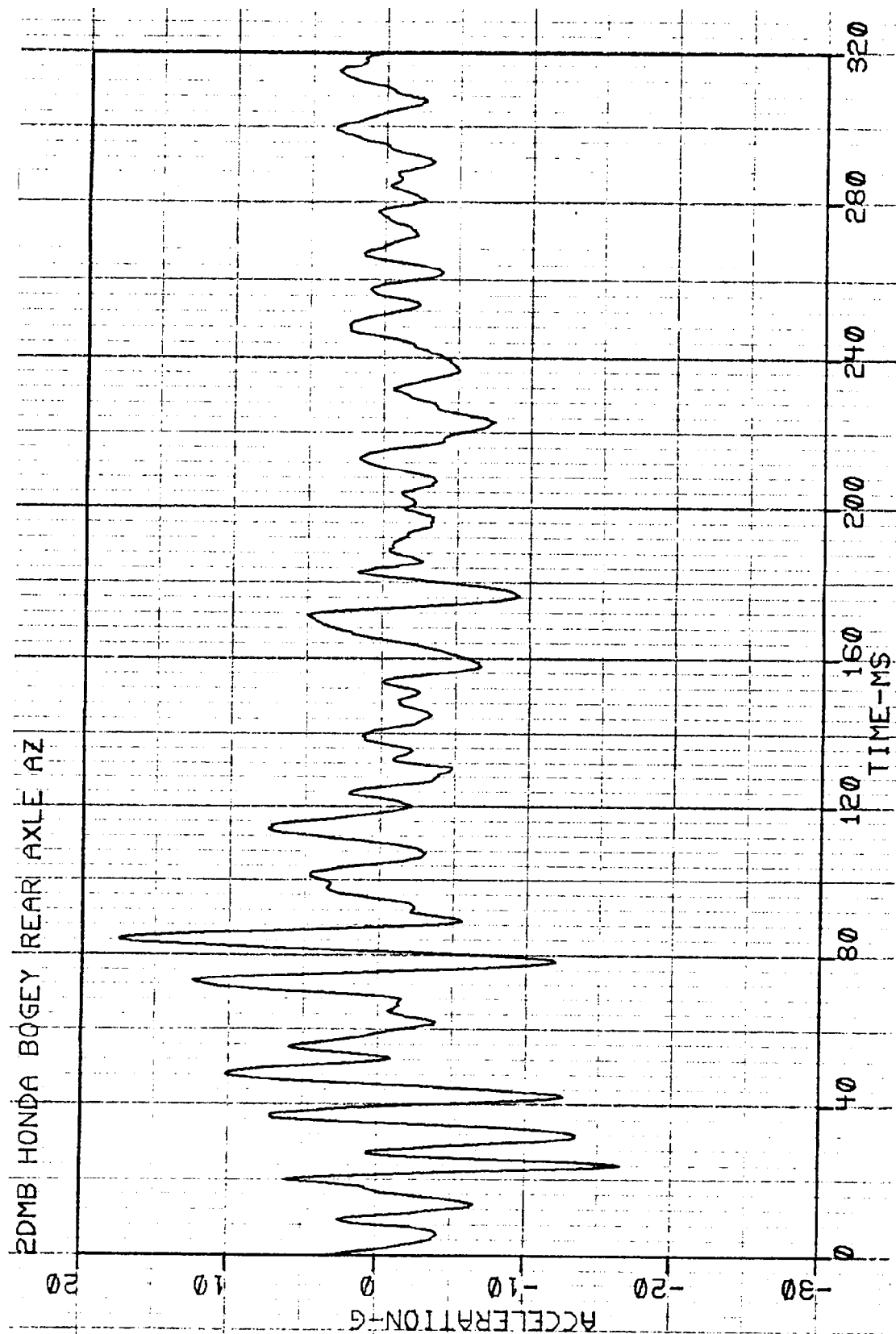


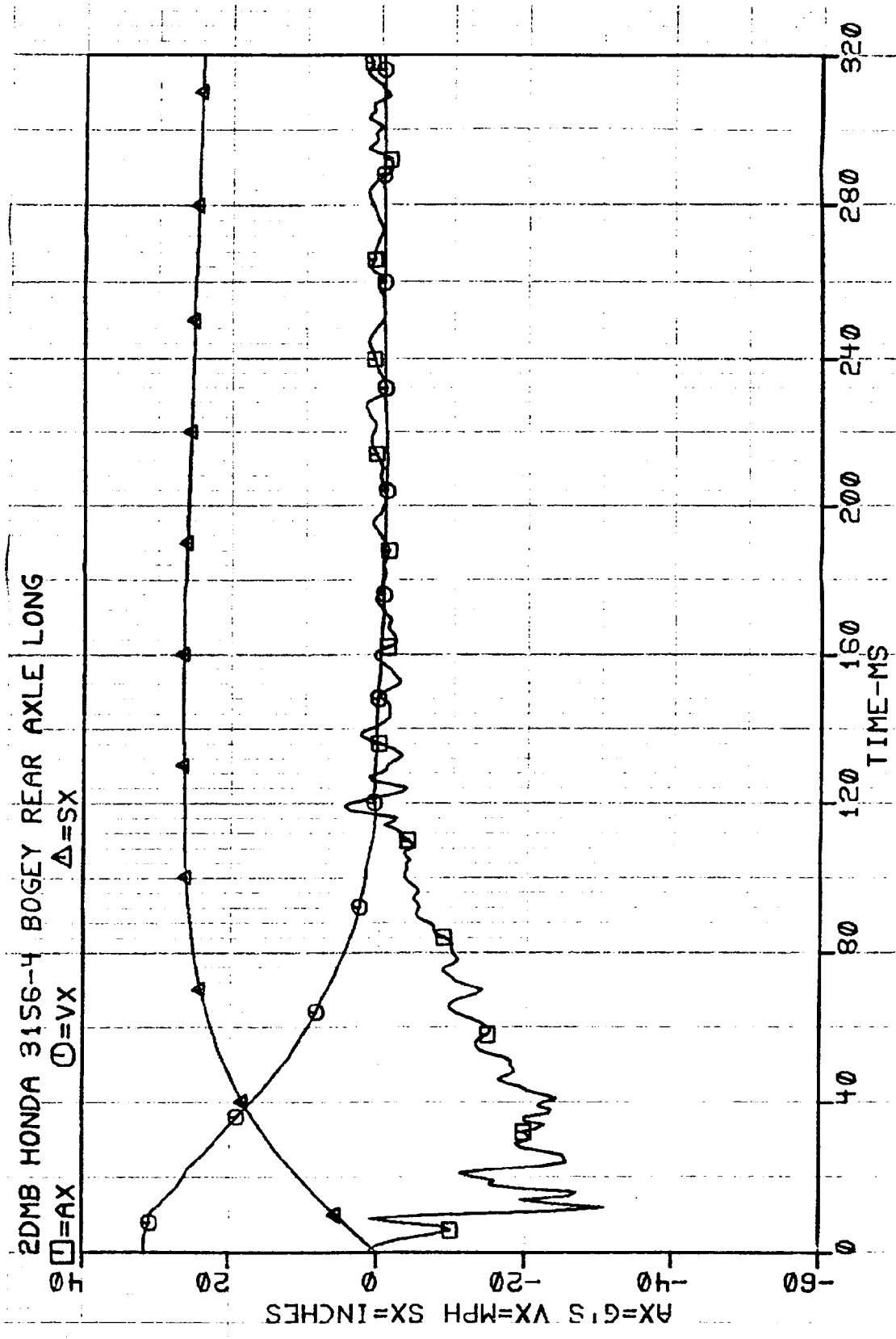


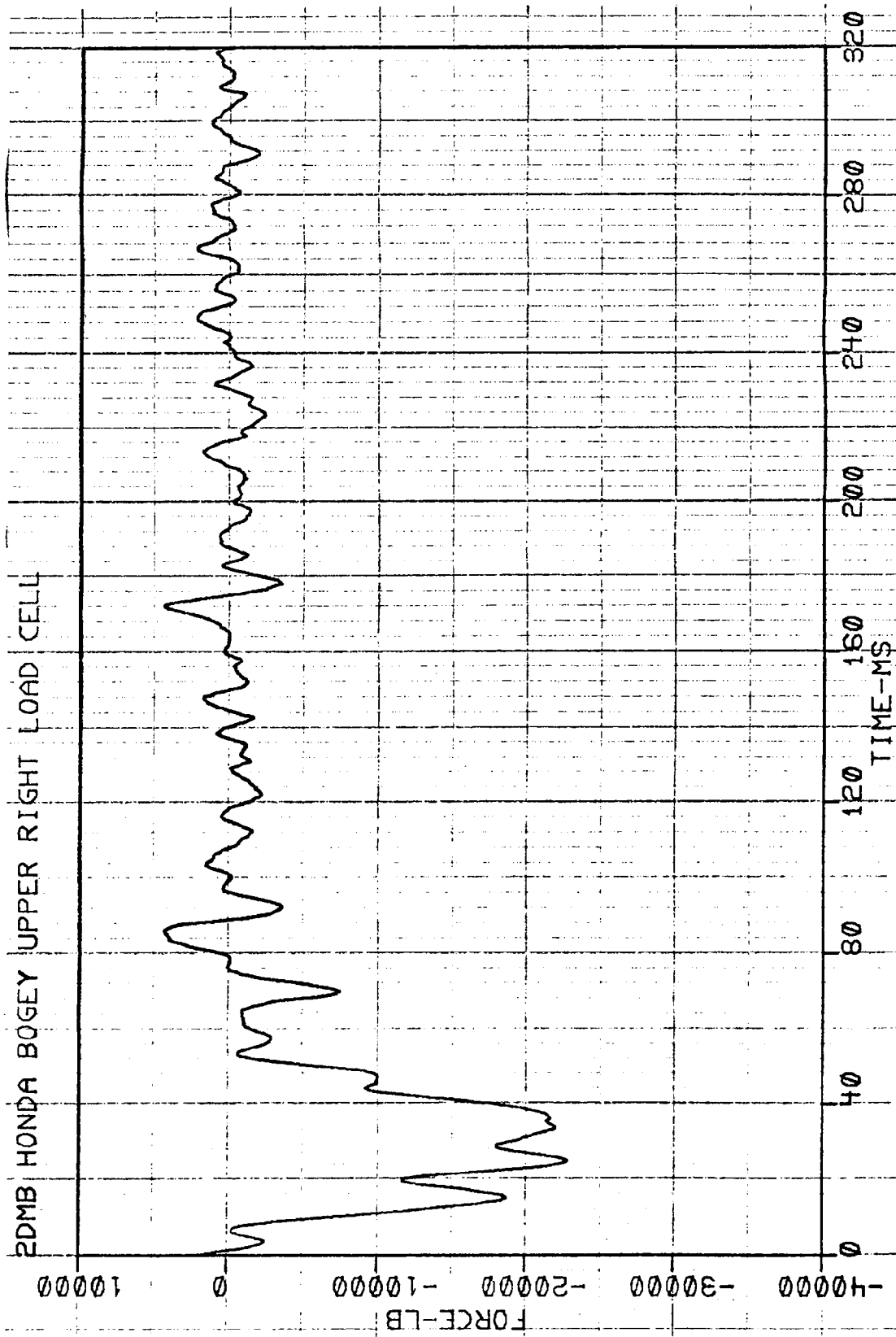


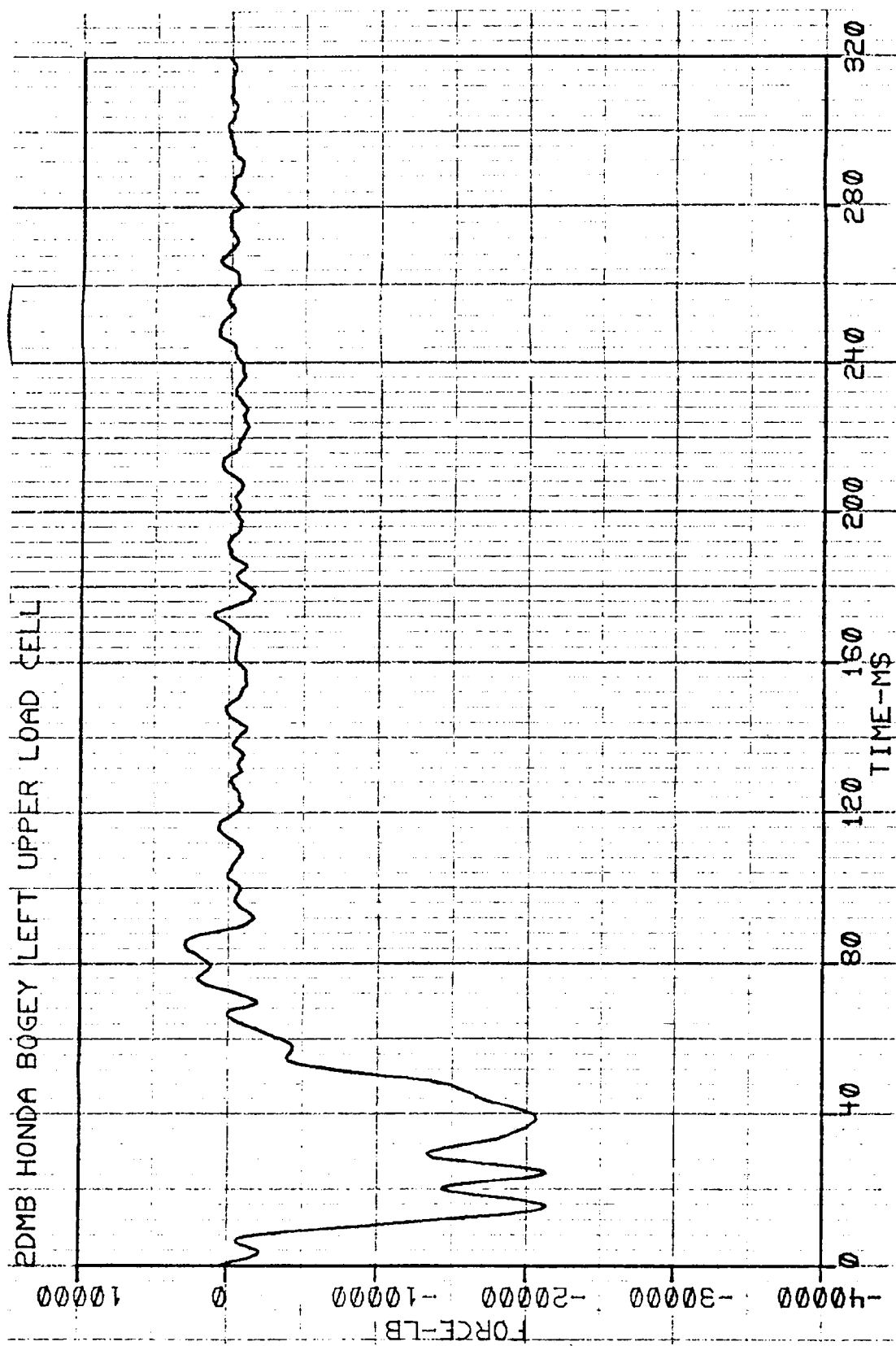


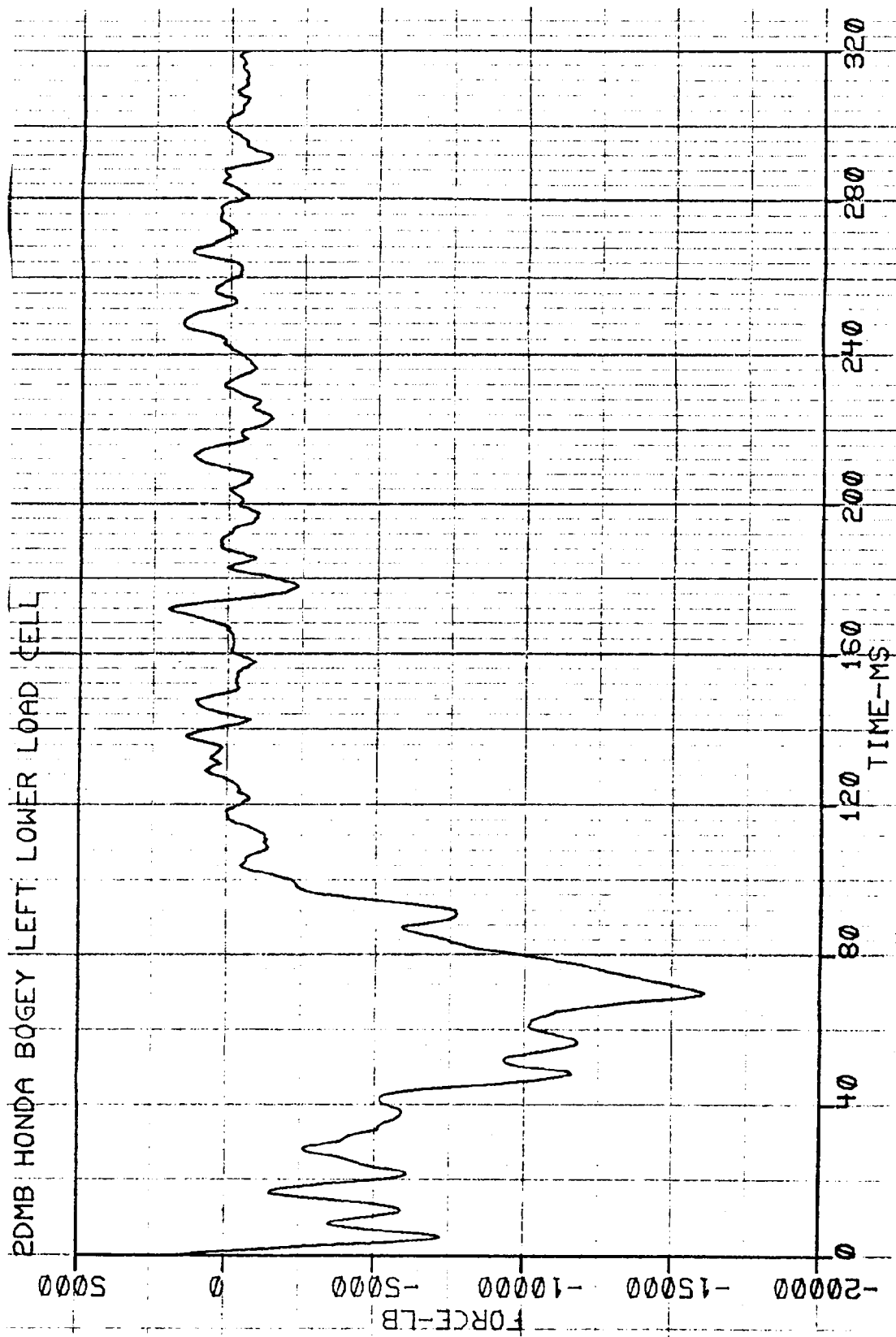


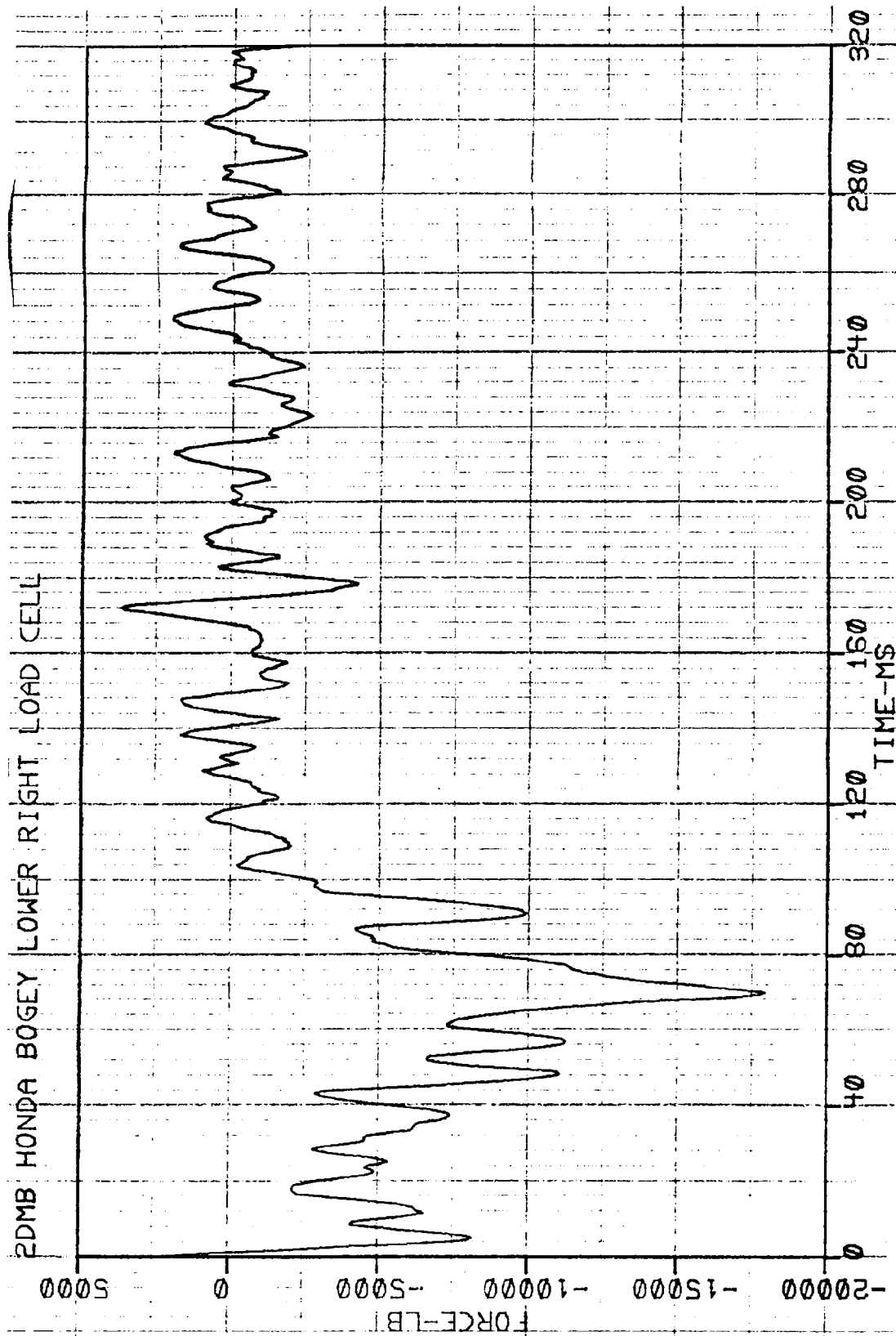


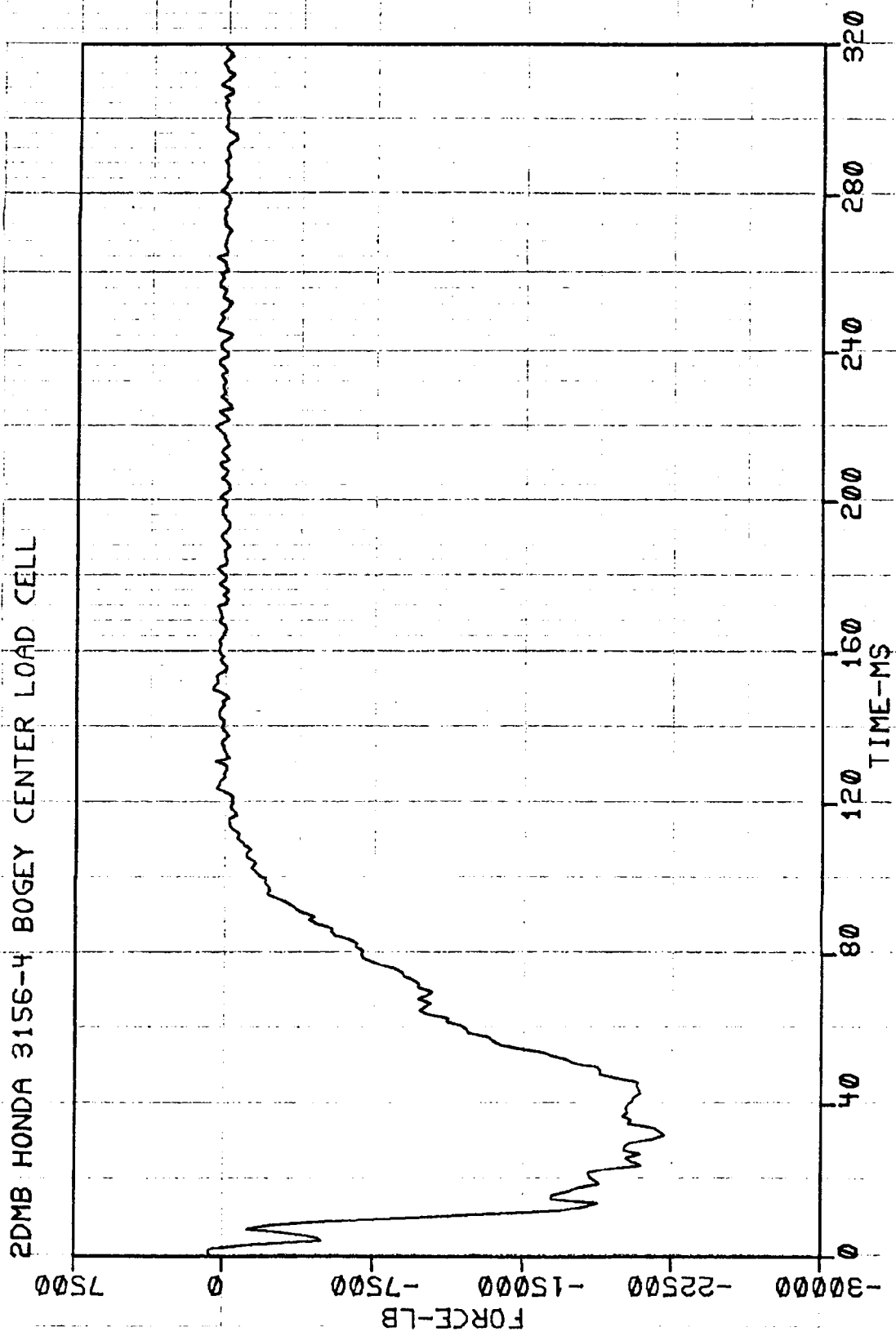


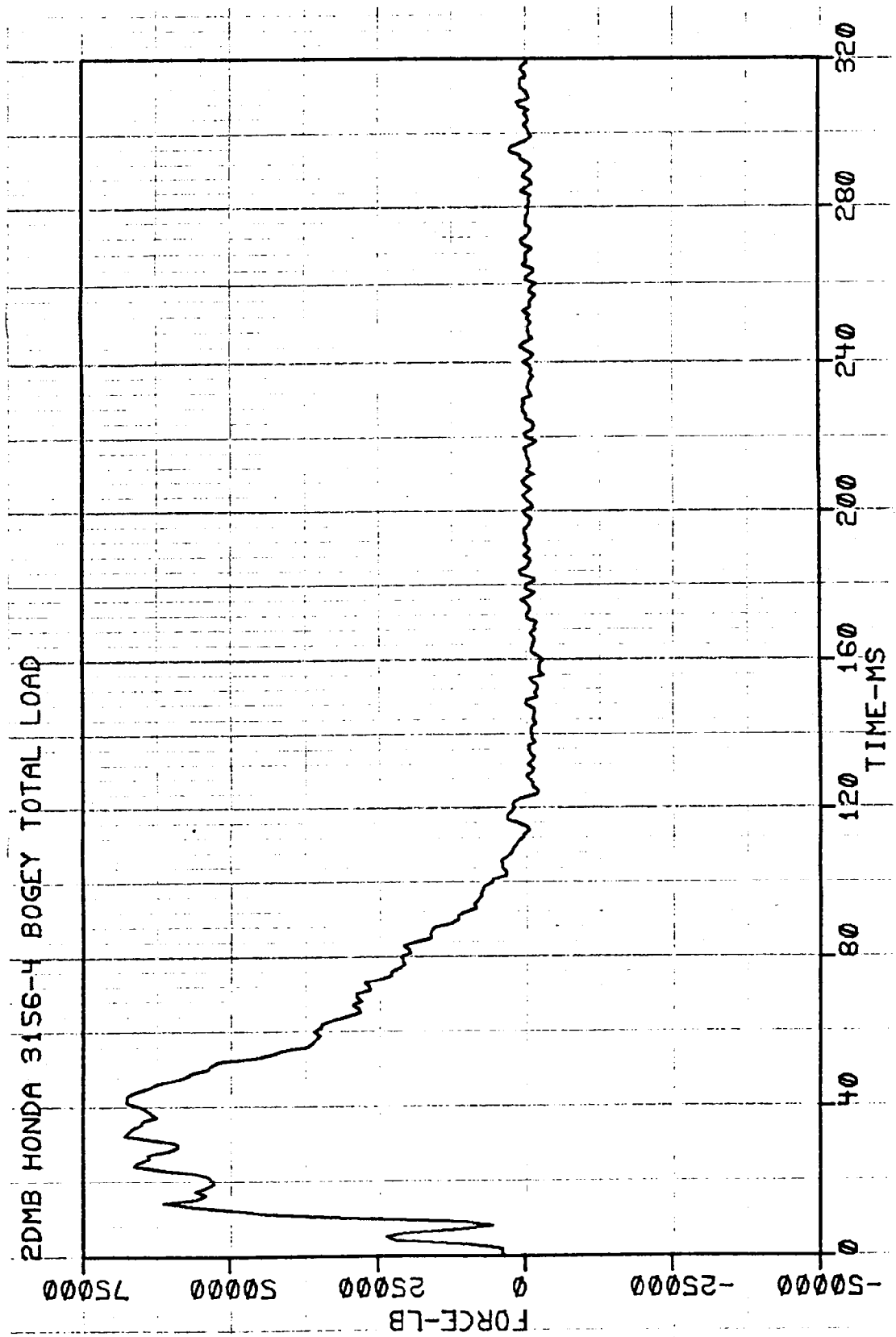


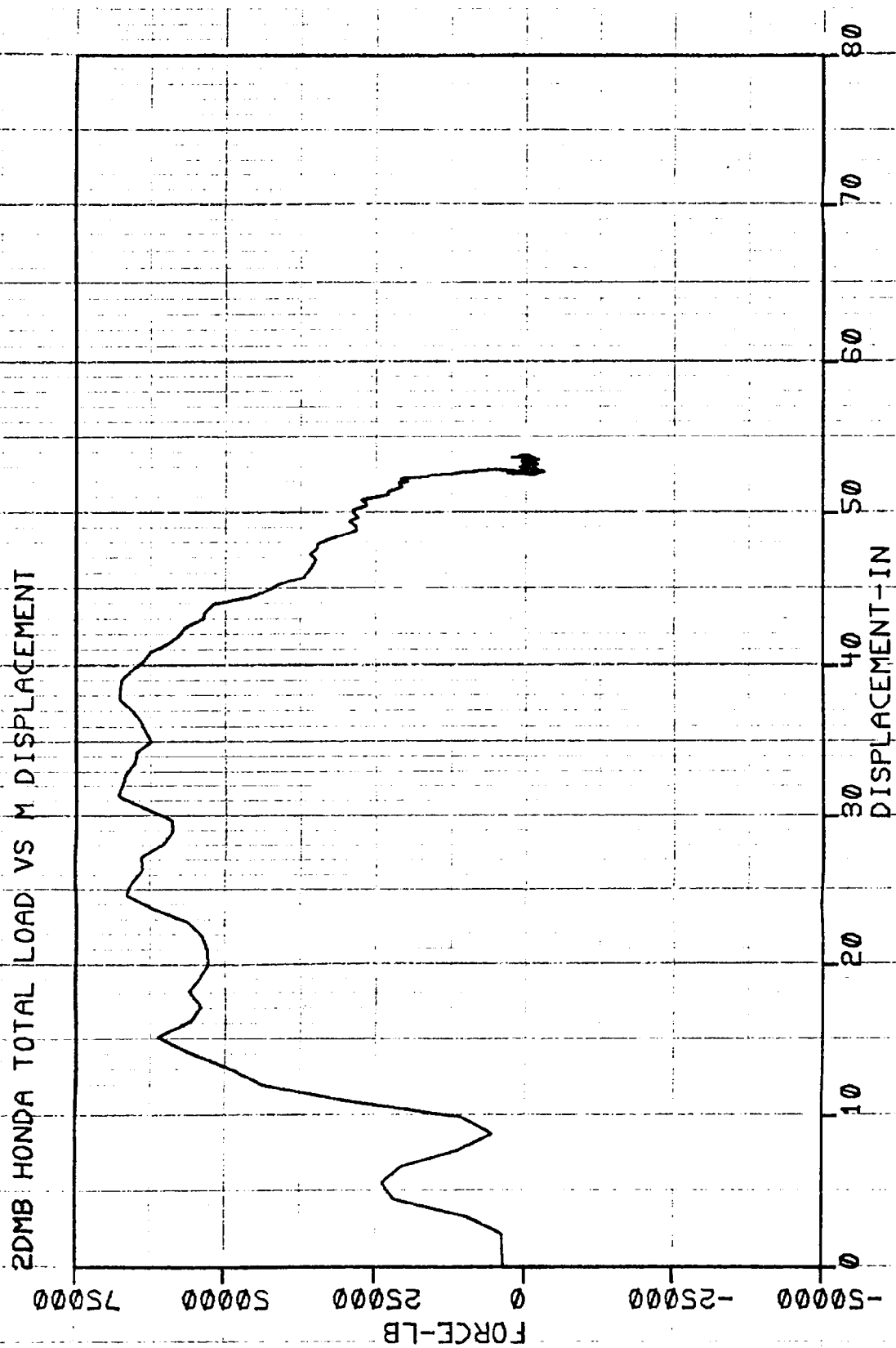












APPENDIX B
PHOTOGRAPHS



FIGURE B-1. PRE-TEST OBLIQUE FRONTAL VIEW OF 1983 HONDA ACCORD.

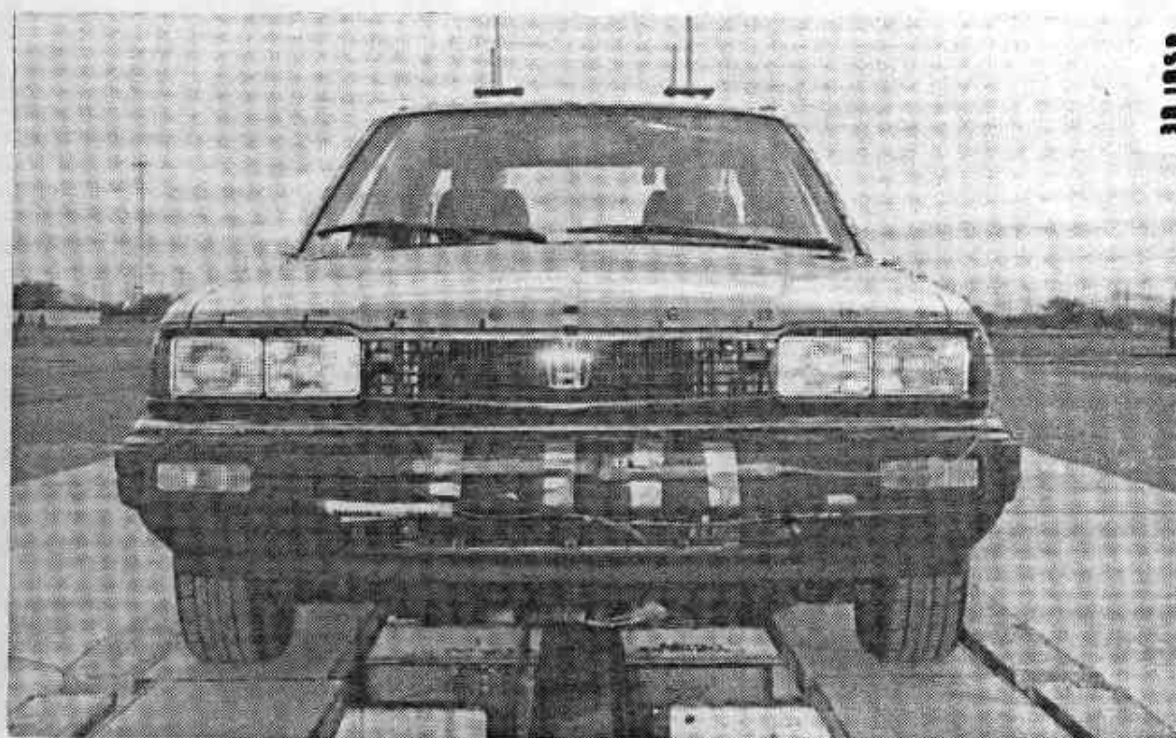


FIGURE B-2. PRE-TEST FRONTAL VIEW OF 1983 HONDA ACCORD.

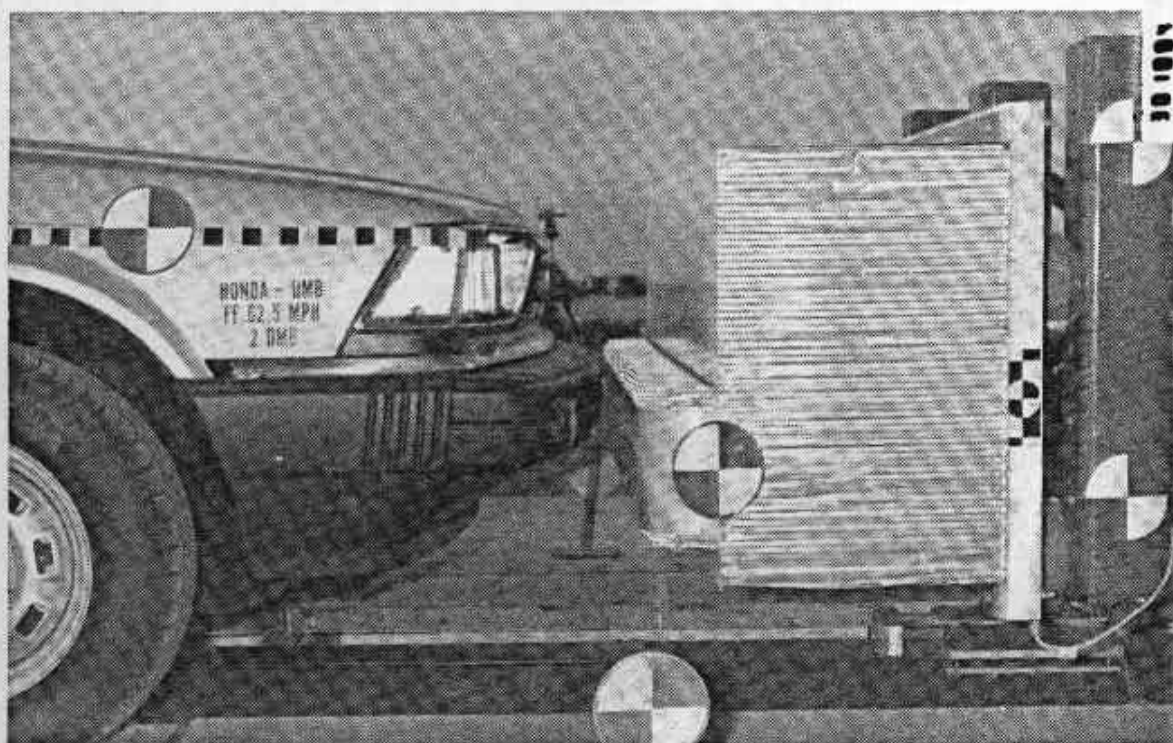


FIGURE B-3. PRE-TEST VIEW OF BUMPER MATCH-UP.

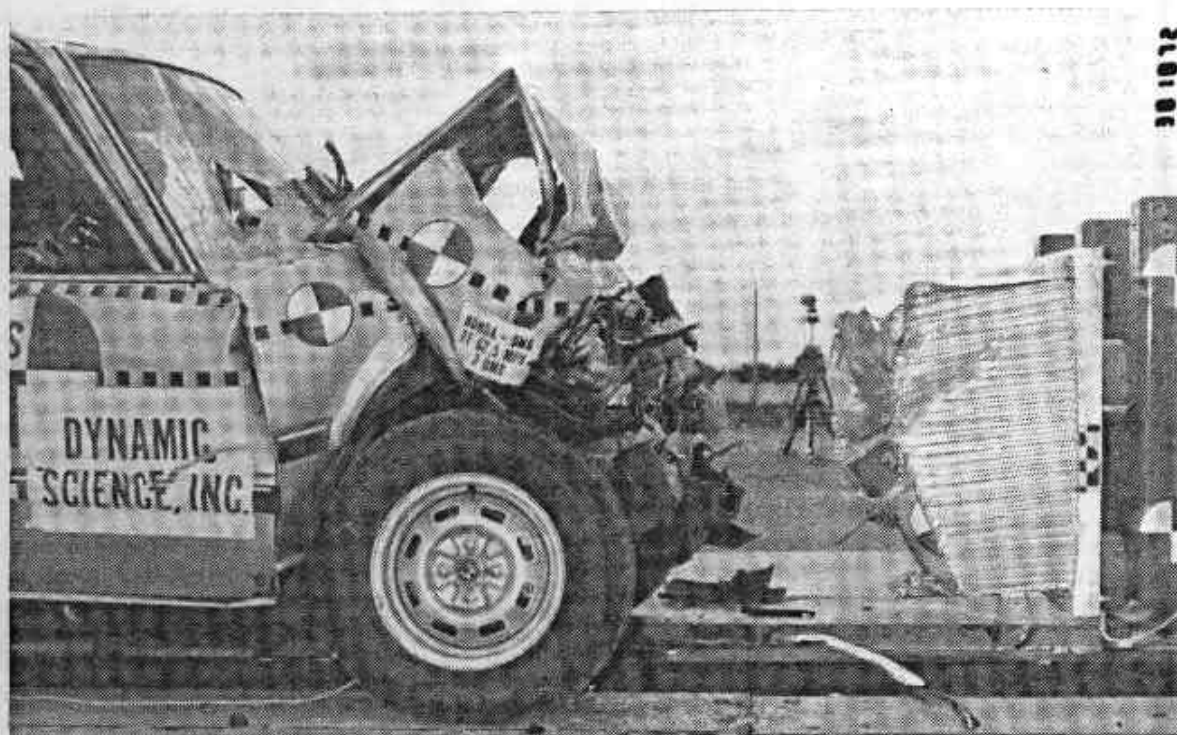


FIGURE B-4. POST-TEST VIEW OF BUMPER MATCH-UP.

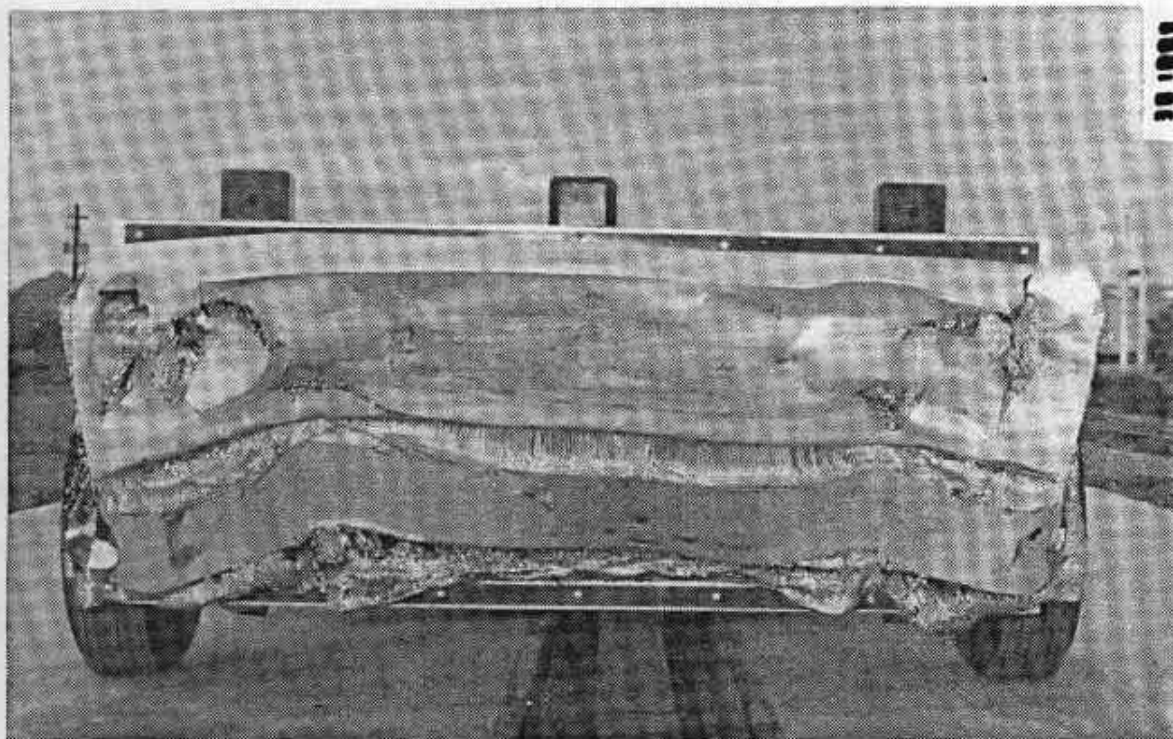


FIGURE B-5. POST-TEST FRONTAL VIEW OF DEFORMABLE MOVING BARRIER.

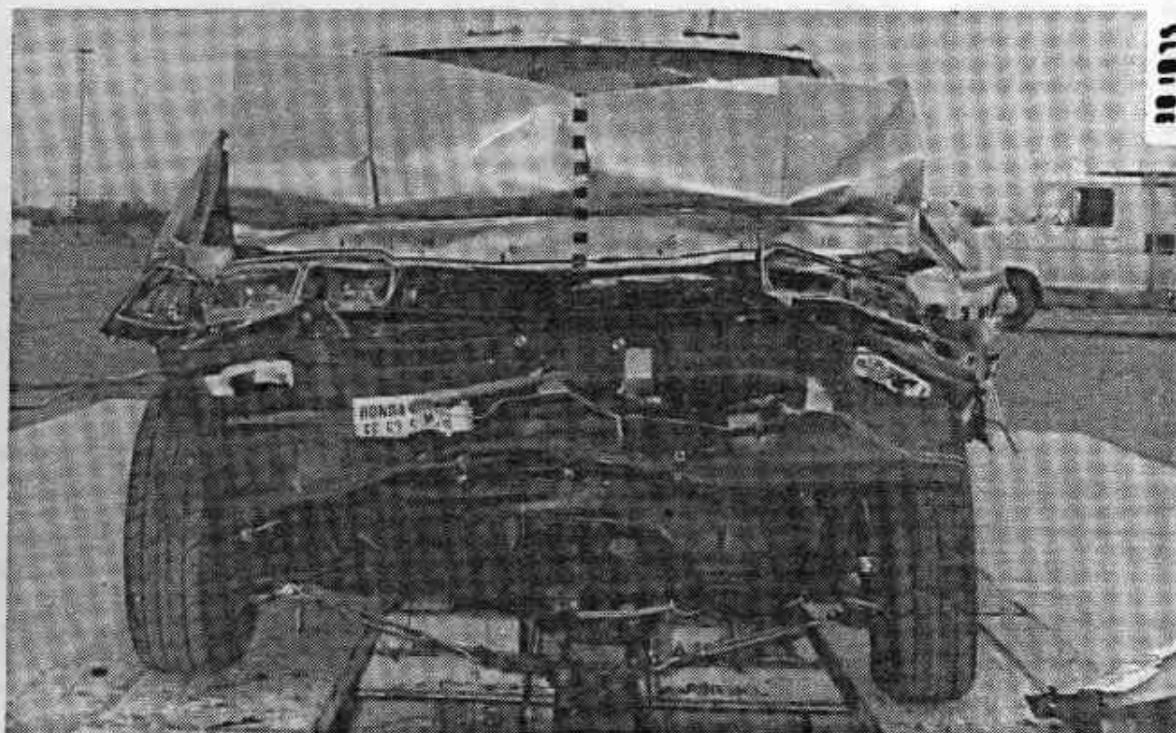


FIGURE B-6. POST-TEST FRONTAL VIEW OF 1983 HONDA ACCORD.

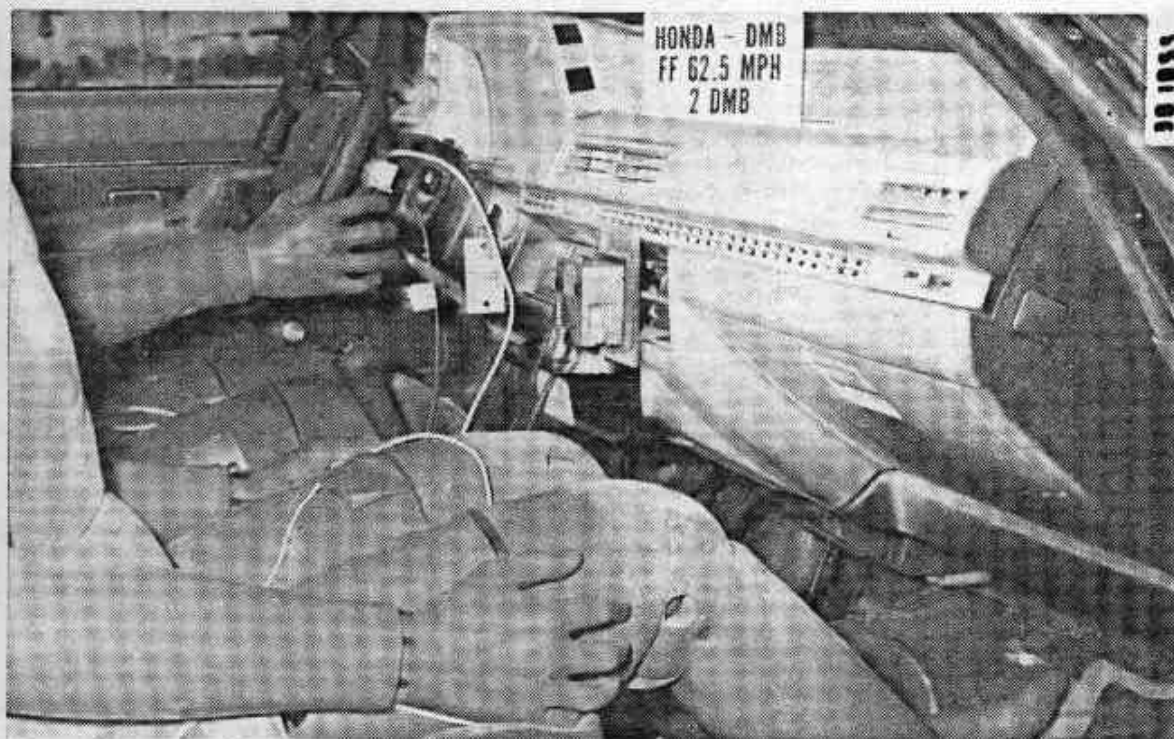


FIGURE B-7. PRE-TEST VIEW OF OCCUPANT COMPARTMENT, PASSENGER SIDE.



FIGURE B-8. POST-TEST VIEW OF OCCUPANT COMPARTMENT, PASSENGER SIDE.

APPENDIX C
TEST LOG OF ANTHROPOMORPHIC TEST DEVICE

TEST LOG OF ANTHROPOMORPHIC TEST DEVICE

Contractor: DYNAMIC SCIENCE, INC.
 Contract Title: MOVING CAR TO MOVING BARRIER
 Contract No.: DTNH22-82-A-17148
 Contract Technical Manager: CARL RAGLAND

ATD Mfr.: ALDERSON
 ATD Serial No.: 392

Date Submitted:

Test Date	Test No.	Test Description*	$\Delta v, \uparrow$ mph	$\angle, \uparrow$ deg.	Location and Description of Damage (if any)	Project Engineer
11/2/83	3156-00	INSPECTION	—	—	NO DEFECTS, CERTIFICATION 11/1/83	
11/3/83	3156-04	INSTRUMENTED DUMMY IN DRIVER SEAT. SEAT BELT FASTENED, INSTALLED IN HONDA.	62.96	0°	DASH HAD TRAPPED DUMMY IN THE CAR. HEAD - HEAD HIT THE DASH RIGHT ARM - THUMB RIPPED LEGS - PINNED BY DASH DUMMY DIED IN THIS CRASH.	<i>Matthew J. Reany</i> 12-1-83

*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: MOVING CAR TO MOVING BARRIER
 Contract No.: DTNH22-82-A-17148
 Contract Technical Manager: CARL RAGLAND

ATD Mfr.: HUMANOID
 ATD Serial No.: H45
 Date Submitted:

Test Date	Test No.	Test Description*	Δv , [†] mph	$\angle$, ^{**} deg.	Location and Description of Damage (if any)	Project Engineer
11/2/83	3156-00	INSPECTION	-	-	HEAD - REMOVED GLASS FROM THE FACE FROM THE LAST TEST. RESMOOTHED THE SURFACE OF THE FACE. CHEST - SECOND RIB STILL CRACKED. RIGHT LEG - RESMOOTHED THE RIP IN THE KNEE. DUMMY CERTIFIED 11/1/83.	Matthew J. Harvey 12-1-83
11/3/83	3156-04	INSTRUMENTED DUMMY IN PASSENGER SEAT. DUMMY NOT RESTRAINED, INSTALLED IN HONDA.	62.96	0°	DUMMY WAS TRAPPED IN THE VEHICLE. RUBBER SHOCK ABSORBERS LOCATED ON INSIDE OF STERNUM WERE SEPARATED FROM THEIR ORIGINAL MOUNTED LOCATIONS. FACE WAS LACERATED FROM CHIN TO FOREHEAD AND FROM EAR TO EAR. ALSO, THE AREA UNDER THE JAW WAS SCRAPPED. RIGHT LEG - KNEE PUNCTURED. DUMMY DIED IN CRASH.	

*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.