DOT 0336

Dynamic Science Report No. 301-DYS-81-011

NEW VEHICLE ASSESSMENT AND STANDARDS ENFORCEMENT INDICANT TESTING

FMVSS 301-75

TOYO KOGYO CO., LTD
1981 MAZDA GLC 4-DOOR HATCHBACK
NHTSA 810507

Prepared by:

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DATE: MAY 29 1981

March 1981

FINAL REPORT

Prepared for:

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Prepared by Jerry Bird

Approved by E. Garrard

Date April 22, 1981

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NHTSA Contract Technical Manager

MAY 29 1981

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15. Supplementary Notes

16. Abstract

The vehicle was tested using test parameter values which are in excess of the current upper limits of the subject FMVSS in order to obtain research and vehicle rating data. This test, therefore, can only be viewed as an "indicant" test by the Office of Vehicle Safety Compliance.

The front of the test vehicle impacted the oblique 30° barrier at a speed of 35.28 mph.

The test was conducted at the Dynamic Science, Inc. Deer Valley facility on March 18, 1981.

The 1981 Mazda GLC appears to comply with the requirements of FMVSS 301-75.

17. Key Words	18. Distribution Statement
FMVSS 301 Standards Enforcement Testing, Fuel Tanks, Fuel Tank Filler Pipes, Fuel Tank Connections, Fuel System Integrity, Frontal Impact	Copies of this report are available from Technical Reference Division, National Highway Traffic Safety Administration, Room 5108, Nassif Building, 400 7th Street, S.W., Washington, D.C. 20590

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Unclassified	Unclassified	71	

Form DOT F 1700.7 (8-69)

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	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	metric ton	t
	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 (10 000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	metric ton (1000 kg)	1.1	short tons	
	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

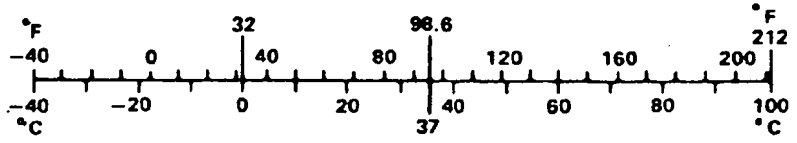


TABLE OF CONTENTS

SECTION 1
PURPOSE AND INTRODUCTION

PURPOSE

The purpose of the test was to subject a 1981 Mazda GLC 4-door Hatchback to the indicant test requirements of DOT Test Plan TP212-02, April 1, 1980, Standard Enforcement Indicant Testing for FMVSS 301-75, "Fuel System Integrity." The vehicle was tested using test parameters which are in excess of the current upper limits of the subject FMVSS in order to obtain research and vehicle rating data. This test, therefore, can only be viewed as an "indicant" test by the Office of Vehicle Safety Compliance (OVSC).

INTRODUCTION

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains Compliance Related Data for FMVSS 301-75 Indicant Testing, together with photographs related to this test. Appendix A contains pre-test and post-test vehicle and dummy photographs. Appendix B contains Calcomp plots. Appendix C contains dummy calibrations.

SECTION 2
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: Mazda GLC

Body Style: 4-door Hatchback Model Year: 1981

NHTSA No.: 810507 DSI No. 1138 Color: Silver

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Toyo Kogyo Co., Ltd.

Date of Manufacture: 7/80 ; VIN: JM1BD2416B0500372

GVWR: 2800 lb; GAWR: Front = 1700 lb; Rear = 1700 lb

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL

Vehicle Capacity: FRONT REAR RECOMMENDED LOAD RANGE:

Tire Pressure: 26 psi 26 psi TIRE SIZE: B

155SR-13

Designated Seating: 2 Front 2 Rear 4 Total

Cargo load = 80 lb Is Spare Tire: Space Saver? Yes

TOTAL = 680 lb Standard Equipment? No

Engine: 4 cylinder, transverse, 91-cubic inch displacement

Transmission: 5-speed manual, front-wheel drive

Date Vehicle Received by Laboratory: 11/19/80 Odometer: 56.0

Dealer Name & Address: Meyer's Mazda

4539 W. Glendale Ave., Glendale, AZ 85301

Remarks: Standard production vehicle with 3-point lap and torso seat belts.

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

Right Front = 627 lb Right Rear = 374 lb

Left Front = 640 lb Left Rear = 379 lb

TOTAL FRONT WEIGHT = 1267 lb (62.7 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 753 lb (37.3 % of Total Vehicle Weight)

TOTAL DELV. WEIGHT = 2020 lb

TARGET WEIGHT = UDW + Cargo Load + 328 lbs Dummies = 2428 lb

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 80 lb CARGO:

Right Front = 704 lb Right Rear = 519 lb

Left Front = 688 lb Left Rear = 516 lb

TOTAL FRONT WEIGHT = 1392 lb (57.4 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 1035 lb (42.6 % of Total Vehicle Weight)

TOTAL TEST WEIGHT = 2427 lb

Weight of ballast secured in vehicle trunk area = 0 lb

VEHICLE ATTITUDE: (inches)

	RF	LF	RR	LR
Delivered Attitude:	29.0	29.0	29.0	29.0
Test Attitude:	29.0	28.6	27.9	28.0

GENERAL TEST AND VEHICLE PARAMETER DATA (CONTD)

POST-TEST DATA

Type of Test: Frontal Oblique (30°) Impact on left (driver) side.
Date of Test: 3/18/81 Time: 1123 Temperature 70 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = 35.28 mph Secondary = 35.23 mph

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.)

		R	L
Vehicle Length:	Pre-test =	157.5	157.5
	Post-test =	156.4	123.7
	Crush =	33.8	1.8
Distance from front of test vehicle to point of impact.		*	*

VISIBLE DUMMY CONTACT POINTS

	Driver	Passenger
Head	Top rim of steering wheel	Top of forehead hit on dash above radio
Chest	None	None
Abdomen	None	None
Left Knee	Extreme left side of dash	Dash
Right Knee	Fuse box area	Glovebox

DOOR OPENING

	Front		Rear	
	Left	Right	Left	Right
	Tools Required	Easy	Difficult	Easy

SEAT MOVEMENT

Seatback Failure	None	None		
Seat Shift (in.)	None	None		

GLAZING DAMAGE

Windshield/Backlight: Windshield cracked.

*Vehicle skidded off barrier; measurement not possible.

OTHER NOTABLE IMPACT EFFECTS: Severe downward buckle over left side B pillar. Left front tire flat. Right front and both rear doors locked on impact; window broken inside driver door. Steering wheel pushed slightly to left. Severe toeboard intrusion on driver side. Driver door bowed out; upper window frame separated from roof.

SECTION 3

COMPLIANCE-RELATED DATA
FMVSS 301-75 INDICANT TESTING

The following data sheets and photographs document compliance data.

PRE-IMPACT DATA

Make/Model: Mazda GLC
Body Style: 4-door Hatchback Model Year: 1981
NHTSA No. 810507 DSI No. 1138 Color: Silver

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Toyo Kogyo Co., Ltd.
Date of Manufacture: 7/80; VIN: JM1BD2416B0500372
GVWR: 2800 lb; GAWR: Front = 1700 lb; Rear 1700 lb

POST-IMPACT DATA

Type of Test: Frontal Oblique (30°) Impact on left (driver) side.
Date of Test: 3/18/81 Time: 1123 Temperature 70 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = 35.28 mph Secondary = 35.23 mph
Test Weight: 2427 lb Static Crush: 33.8 in.
Rebound: N/A in.

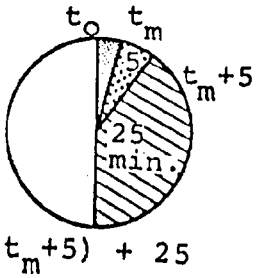
FUEL SYSTEM DATA

Test Fluid: Stoddard Solvent Specific Gravity: 0.764
Kinematic Viscosity: 0.99 centistokes Temperature: 70 °F
Test Volume: 10.2 U.S. gallons

Test vehicle fuel tank filled to 93% of "usable" plus "unusable" capacity with Stoddard Solvent and with electric fuel pump operating (if it will operate without engine operation) until start of static roll. Part 572 test dummies located at each front designated seating position.

DETAILS OF FUEL SYSTEM: Filler cap is located on left rear quarter panel. Metal fuel tank is located under rear seat and is held in by flange bolts. Metal fuel lines proceed forward on left side, up left side of firewall to filter mounted inside left front wheelwell. Rubber lines extend to mechanical pump on left rear of engine, then up to the carburetor on rear of engine.

FUEL SPILLAGE MEASUREMENT



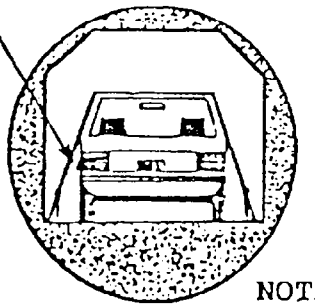
		ACTUAL	MAXIMUM ALLOWABLE
1.	From impact until vehicle motion ceases	0	1 oz
2.	For 5-minute period after vehicle motion ceases	0	5 oz
3.	For next 25 minutes	0	1 oz/1 min

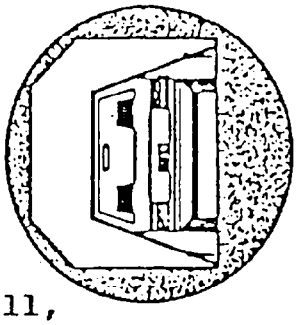
SOLVENT SPILLAGE DETAILS: None

STATIC ROLLOVER DATA SHEET

TEST PHASE: 0° to 90° VEHICLE NHTSA NO. 810507

Fuel Filler Cap Location





NOTE: If side fill, rotate so that filler cap is down.

DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 40 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 40 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

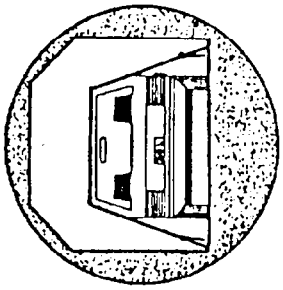
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	Trace	Trace	Trace	-----

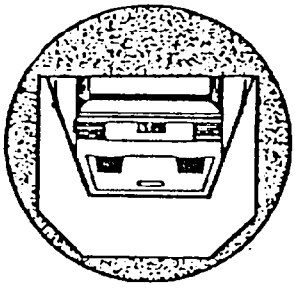
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): Carburetor

STATIC ROLLOVER DATA SHEET

TEST PHASE: 90° to 180° VEHICLE NHTSA NO. 810507





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 37 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 37 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

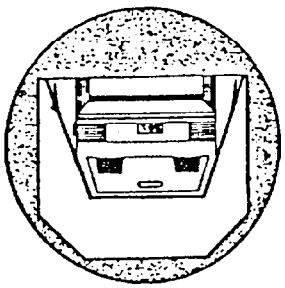
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	-----

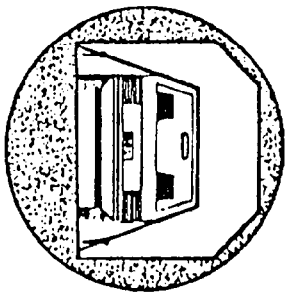
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None

STATIC ROLLOVER DATA SHEET

TEST PHASE: 180° to 270° VEHICLE NHTSA NO. 810507





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 36 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 36 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

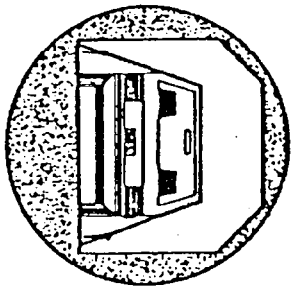
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	Trace	0	0	-----

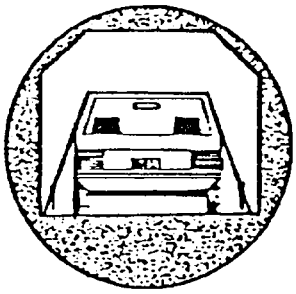
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): Carburetor

STATIC ROLLOVER DATA SHEET

TEST PHASE: 270° to 360° VEHICLE NHTSA NO. 810507





DETERMINATION OF SOLVENT COLLECTION TIME PERIOD:

Rollover Fixture 90° Rotation Time.... = 1 min, 38 sec +
(Spec. Range = 1 to 3 min)

FMVSS 301 Position Hold Time..... = 5 min, 0 sec =

Total..... = 6 min, 38 sec

Next Whole Minute Interval..... = 7 min

FMVSS 301 REQUIREMENTS AND ACTUAL TEST RESULTS:

Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	-----

NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None

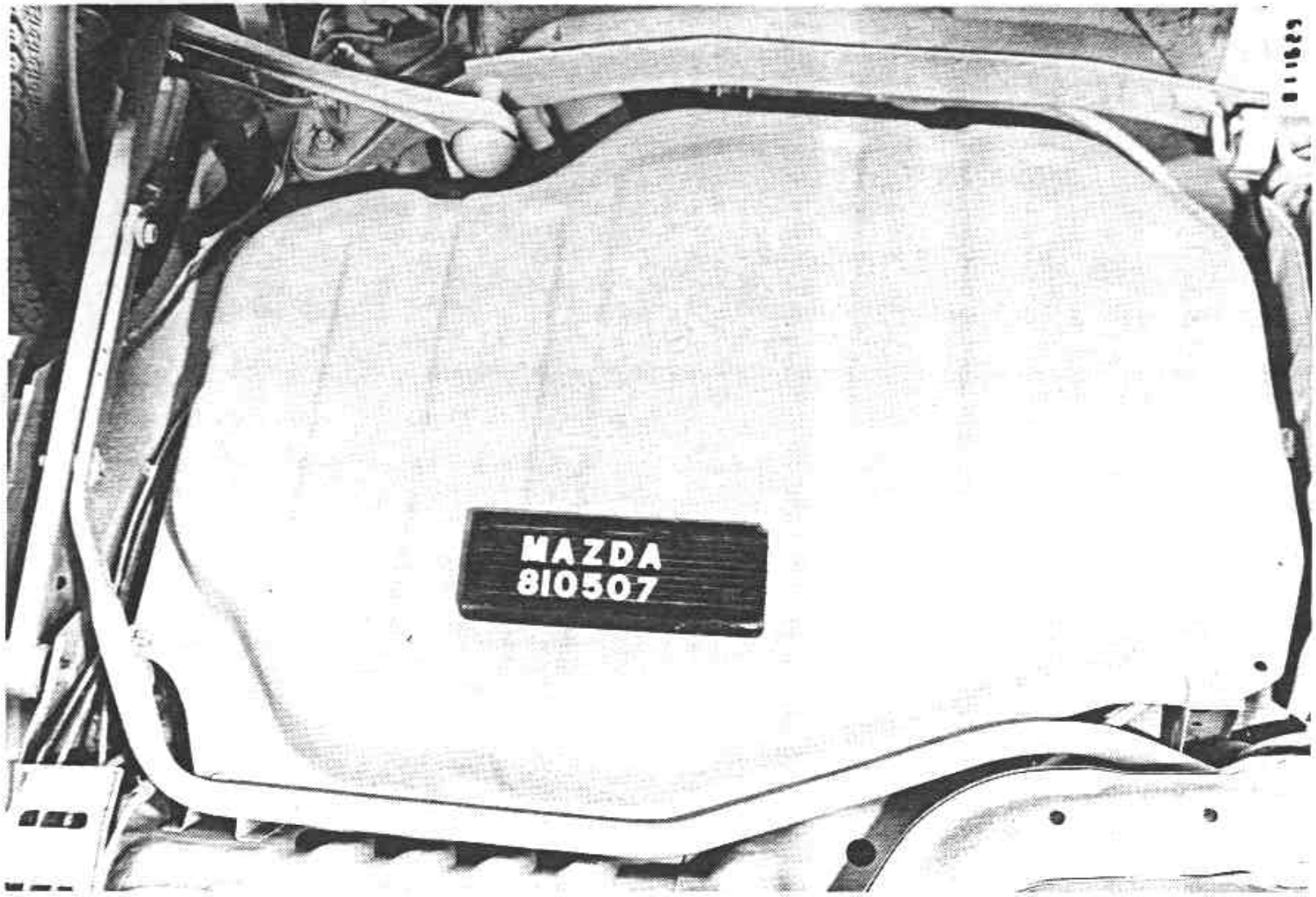


FIGURE 3-1. PRE-TEST FUEL TANK - 1981 MAZDA GLC - NHTSA 810507.

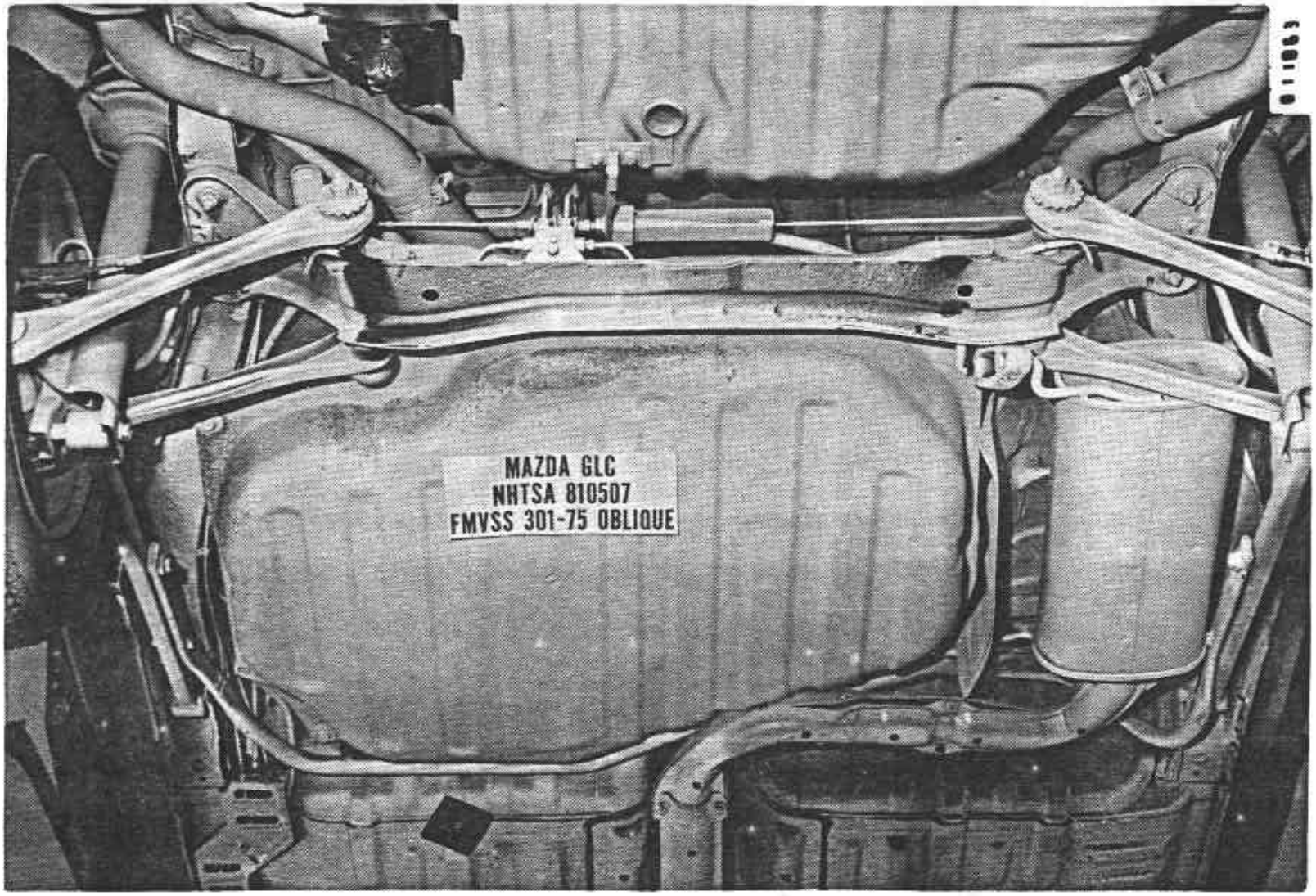


FIGURE 3-2. POST-TEST FUEL TANK - 1981 MAZDA GLC - NHTSA 810507.

SECTION 4
DATA REQUIRED BY R&D AND OAR

The following pages are included in this section:

1. Dummy positional data
2. Dummy injury summaries
3. Vehicle crush data
4. Accelerometer location and data summary
5. High-speed moving camera location and specification summary.

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

PART 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET

PRE-IMPACT DATA

Make/Model: Mazda GLC

Body Style: 4-door Hatchback Model Year: 1981

NHTSA No. 810507 DSI No. 1138 Color: Silver

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Toyo Kogyo Co., Ltd.

Date of Manufacture: 7/80 ; VIN JM1BD2416B0500372

GVWR: 2800 lb; GAWR: Front = 1700 lb; Rear 1700 lb

POST-IMPACT DATA

Type of Test: Frontal Oblique (30°) Impact on left (driver) side.

Date of Test: 3/18/81 Time: 1123 Temperature 70 °F

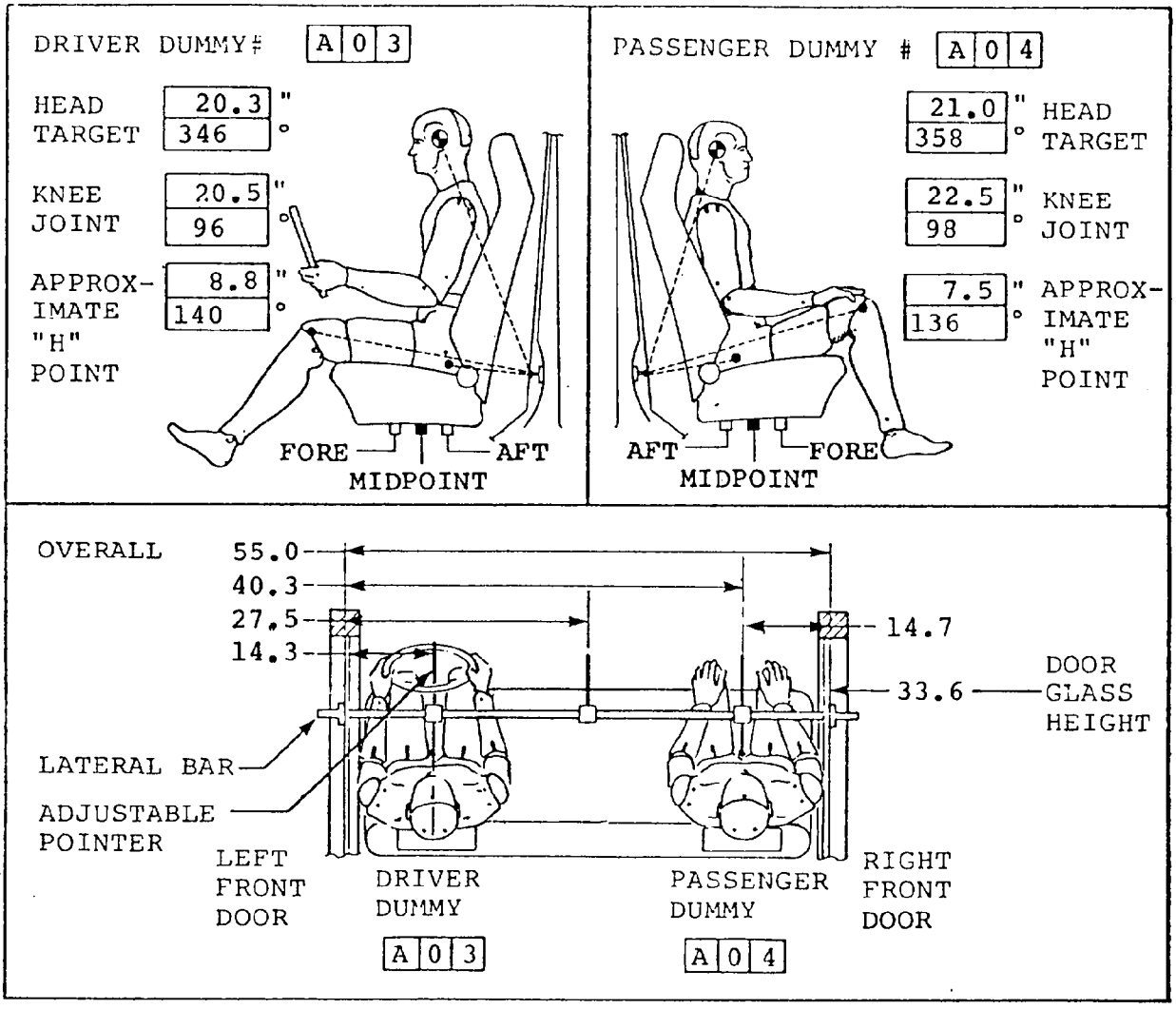
Required Impact Velocity Range: 34.5 to 35.5 mph

Impact Velocity: Primary = 35.28 mph Secondary = 35.23 mph

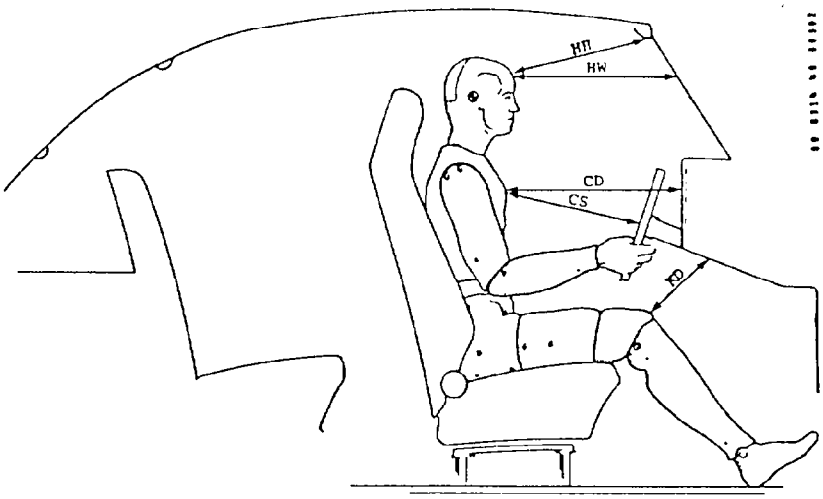
Seat Type: Bucket Adjuster Type: Manual

Seat Back Type: Adjustable

Technicians: T. Bjork, B. Ernyei



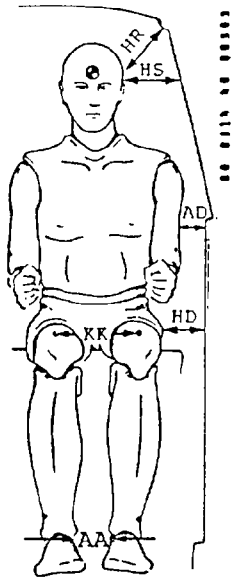
PART 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET



	Driver	Passenger
HH	16.5	15.5
HW	22.0	21.3
CD	23.0	22.5
CS	17.0	N/A
KD	6.0	7.0
Torso Angle	23°	25°
Seat Back Angle	25°	25°

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
AA = Ankle to Ankle

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



	Driver	Passenger
HR	6.0	5.5
HS	7.8	7.0
AD	3.5	3.3
HD	6.5	5.8
KK	9.0	9.0
AA	11.0	11.0

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	11.7	198	40.9	121	3.5	1	12.8	123
Lateral	18.0	120	3.1	195	26.7	124	4.0	66
Vertical	67.1	107	3.2	4	59.7	118	2.9	19
Resultant	69.0	107			61.2	118		
HIC	554.7 between 85 and 129 msec				515.6 between 86 and 149 msec			
Chest Acceleration								
Longitudinal	1.1	152	43.1	98	4.1	167	32.2	85
Lateral	22.3	83	1.8	151	18.4	90	1.3	54
Vertical	9.4	57	16.2	97	10.6	124	8.6	99
Resultant (Max)	49.7	98			36.5	87		
Resultant (clip)	48.1	85			35.2	85		
TIME > 60 G	0 msec				0 msec			
SEVERITY INDEX	262.3 @ 200 msec				211.4 @ 200 msec			
	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)
Femur Loads								
Left			313.2	85			283.7	57
Right			506.8	58			146.0	47
Belt Loads								
Lap	1380.5	84			2324.9	85		
Torso	1554.5	98			1637.6	91		

Vehicle Impact Speed (mph): 35.28

*Longitudinal:	Forward	**Longitudinal:	Rearward
Lateral:	Rightward	Lateral:	Leftward
Vertical:	Downward	Vertical:	Upward

Comments:

DUMMY KINEMATIC SUMMARY

DRIVER - After impact dummy began to rotate forward and lean slightly to the left. Knees were forced upward and loaded into underside of dash and steering column. Dummy's face struck left side rim of steering wheel which had rotated upward. Dummy rebounded toward right side of seat with no appreciable rotation and a slight rightward lean, and came to rest in nearly original seating position with only a slight rightward lean.

PASSENGER - After impact, dummy began to rotate forward, lean to the left, and rotate clockwise as torso belt began to arrest right shoulder. Knees loaded into underside of dash. Dummy continued forward, left, and clockwise motion and experienced a glancing head strike with left forehead hitting dash above radio. Dummy rebounded back and to right with continuing clockwise rotation. During rebound, dummy's right hand and lower right forearm were momentarily outside of compartment through window. Dummy came to rest rotated clockwise, leaning to left and rearward toward driver's seat.

VEHICLE PROFILE DATA SHEET

PRE-IMPACT DATA

Make/Model: Mazda GLC

Body Style: 4-door Hatchback Model Year: 1981

NHTSA No.: 810507 DSI No. 1138 Color: Silver

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Toyo Kogyo Co., Ltd.

Date of Manufacture: 7/80 ; VIN: JM1BD2416B0500372

GVWR: 2800 lb; GAWR: Front = 1700 lb; Rear = 1700 lb

POST-IMPACT DATA

Type of Test: Frontal Oblique (30°) Impact on left (driver) side.

Date of Test: 3/18/81 Time: 1123 Temperature 70 °F

Required Impact Velocity Range: 34.5 to 35.5 mph

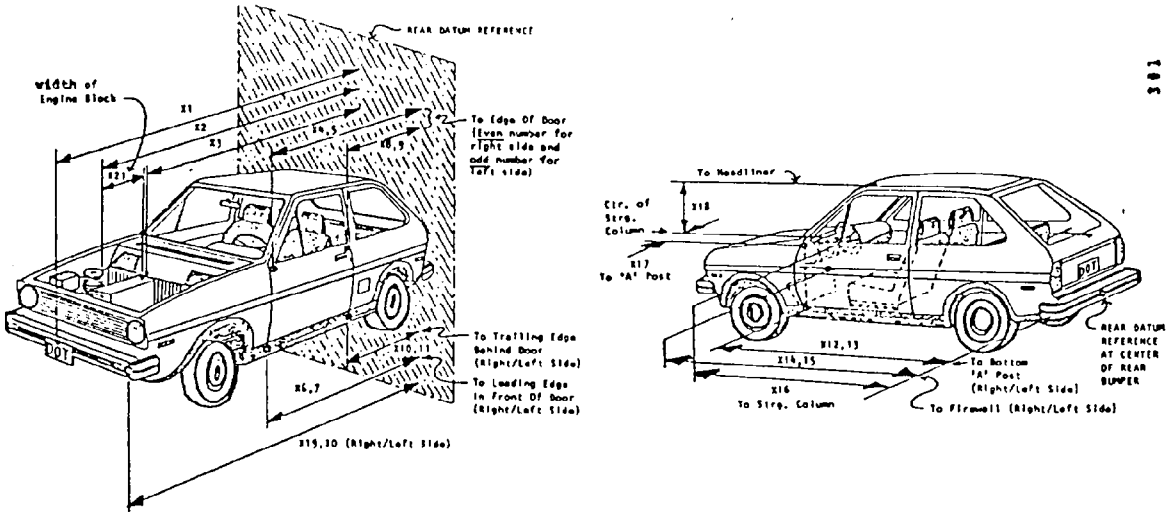
Impact Velocity: Primary = 35.28 mph Secondary = 35.28 mph

Vehicle Profile Data

Measurements Referenced to Plane 14 Feet Forward of Rear Bumper ℄

Location	Height	Vehicle Left (in.) 28.2 / 26.7	16.9 / 16.0	5.6 / 5.3	℄ / ℄	Vehicle Right (in.) 5.6 / 5.3	16.9 / 16.0	28.2 / 26.7
Pre-test Profile (in.)								
Top of Front Bumper	18.6	10.5	9.8	9.2	9.1	9.2	9.7	10.6
Front of Hood	27.8	16.9	16.0	15.5	15.3	15.5	16.0	17.0
Post-test Profile (in.)								
Top of Front Bumper	18.0	44.3	36.4	30.1	27.0	23.7	17.5	11.5
Front of Hood	27.3	42.5	36.8	30.8	28.0	25.3	20.7	17.5
Post-test Static Crush (in.)								
Top of Front Bumper	0.6	33.8	26.6	20.9	17.9	14.5	7.8	1.0
Front of Hood	0.5	25.6	20.8	15.3	12.7	9.8	4.7	0.5

PRE-/POST-TEST STATIC MEASUREMENT DATA



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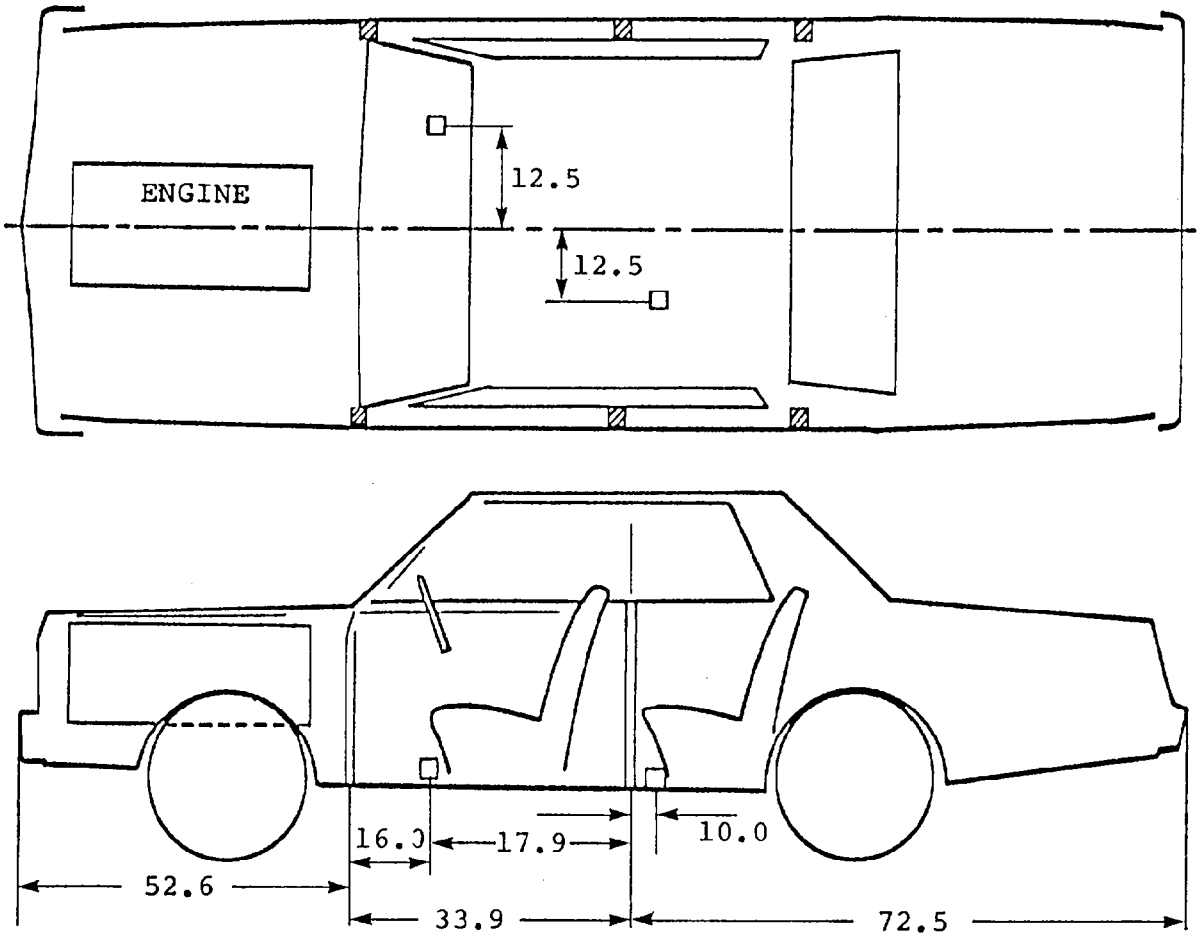
Vehicle: Mazda GLC NHTSA No.: 810507

Test Date: 3/18/81 D.S. No.: 1138

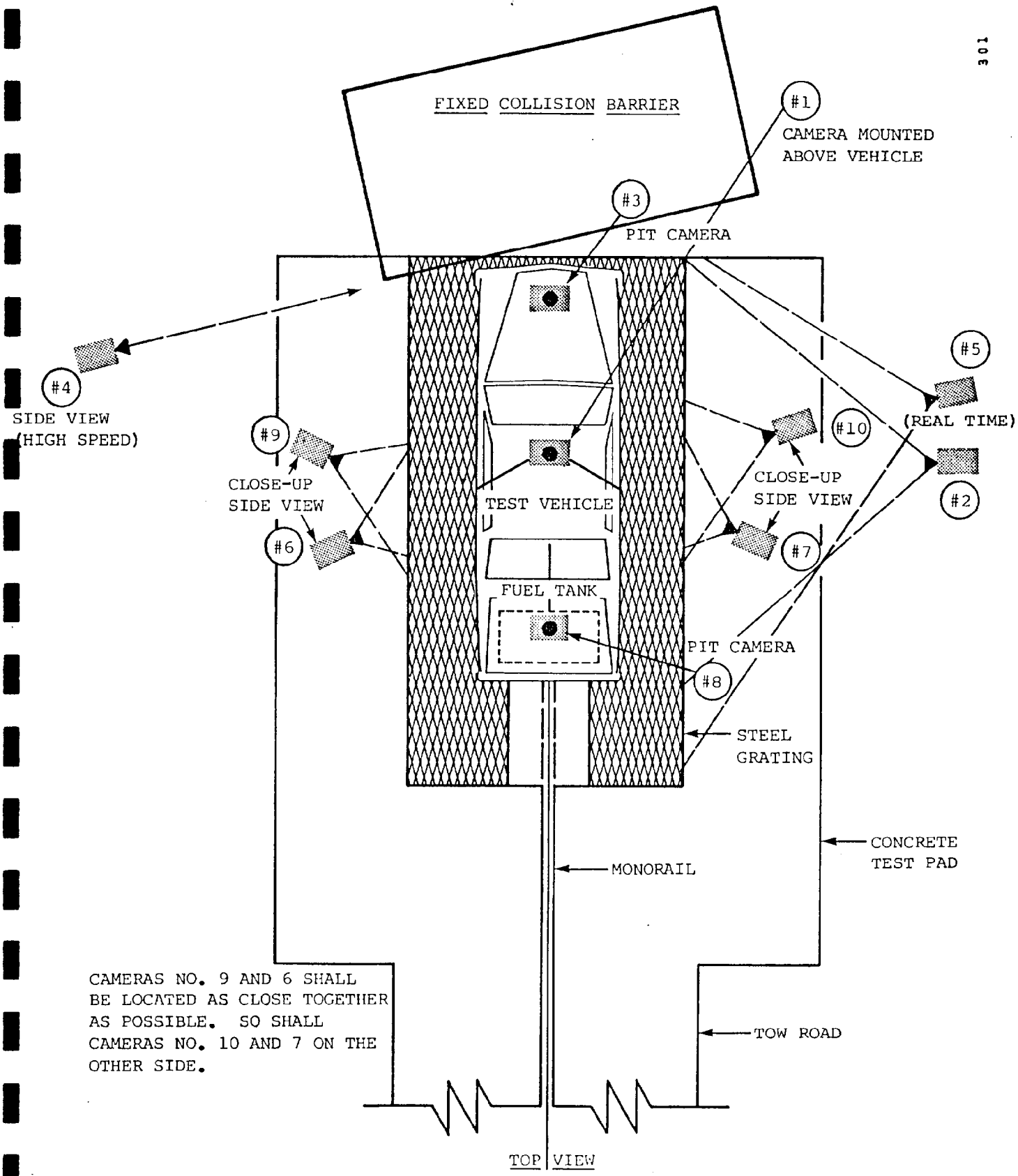
Reference Dimension	Pre-test Measurement	Post-test Measurement	Change
X_1	159.0	141.0	18.0
X_2	138.6	133.7	4.9
X_3	118.9	117.5	1.4
X_4	106.0	106.6	-0.6
X_5	106.1	103.5	2.6
X_6	107.3	107.1	0.2
X_7	107.5	101.5	6.0
X_8	70.4	70.8	-0.4
X_9	70.7	68.5	2.2
X_{10}	69.9	69.9	0.0
X_{11}	69.9	69.3	0.6
X_{12}	106.7	106.5	0.2
X_{13}	106.4	101.9	4.5
X_{14}	120.8	119.3	1.5
X_{15}	119.7	111.8	7.9
X_{16}	93.0	92.0	1.0
Y_{17}	15.5	14.5	1.0
Z_{18}	17.5	15.7	1.8
X_{19}	157.5	123.7	33.8
X_{20}	157.5	156.4	1.1
X_{21}	5.9	5.6	0.3

VEHICLE ACCELEROMETER SUMMARY



No.	Location Description	Component Direction* X	Y	Z	Data Summary Peak G @ msec X "+"	X "-"	Y "+"	Y "-"	Z "+"	Z "-"
1	Right front floor pan		✓		2.4 140	45.8 63				
2	Left rear floor pan		✓		2.8 30	42.7 56				

*Positive: X = Forward Y = Rightward Z = Downward
Negative: X = Rearward Y = Leftward Z = Upward


FIXED COLLISION BARRIER
#1
CAMERA MOUNTED
ABOVE VEHICLE
#3
PIT CAMERA
#4
SIDE VIEW
(HIGH SPEED)
#5
(REAL TIME)
#9
CLOSE-UP
SIDE VIEW
#10
CLOSE-UP
SIDE VIEW
#2
TEST VEHICLE
#6
#7
FUEL TANK
PIT CAMERA
#8
STEEL
GRATING
CONCRETE
TEST PAD
MONORAIL
TOW ROAD
CAMERAS NO. 9 AND 6 SHALL
BE LOCATED AS CLOSE TOGETHER
AS POSSIBLE. SO SHALL
CAMERAS NO. 10 AND 7 ON THE
OTHER SIDE.
TOP VIEW

SUMMARY OF CAMERA LOCATIONS AND DESCRIPTIONS

Loc. No.	Location	Field of View	Lens Size	Frame Rate	Timing Speed	Ser No.	Impact Dist-X	Center-line Dist-Y	Camera Height
1	Overhead	Views barrier and entire vehicle	10mm	400	100 HZ	M9	62"	-4"	23'1"
2	Ground Based (Right)	Views entire right side of vehicle	16mm	400	103 HZ	M7	84"	445"	53"
3	Pit	Engine underside and fuel pump	8mm	1000	100 HZ	10	67"	0	-8'
4	Ground Based (Left)	Views parallel to barrier face	16mm	400	101 HZ	M8	185"	290"	59"
5	Ground Based (Real Time)	Documentary	Zoom	24	N/A				
6	Ground Based (Left)	Driver dummy closeup	15mm	1000	101 HZ	8	88"	111"	63"
7	Ground Based (Right)	Passenger dummy closeup	13mm	1000	100 HZ	5	75"	133"	61"
8	Pit	Fuel tank	13mm	1000	104 HZ	4	134"	0	-8'
9	Ground Based (Left)	Same view as Camera No. 6	15mm	1000	101 HZ	6	99"	111"	63"
10	Ground Based (Right)	Same view as Camera No. 7	13mm	1000	100 HZ	7	90"	133"	61"

APPENDIX A

PHOTOGRAPHS

FIGURE A-1. PRE-TEST FRONT VIEW - 1981 MAZDA GLC - NHTSA 810507.

FIGURE A-2. POST-TEST FRONT VIEW - 1981 MAZDA GLC - NHTSA 810507.

FIGURE A-3. PRE-TEST SIDE VIEW - 1981 MAZDA GLC - NHTSA 810507.

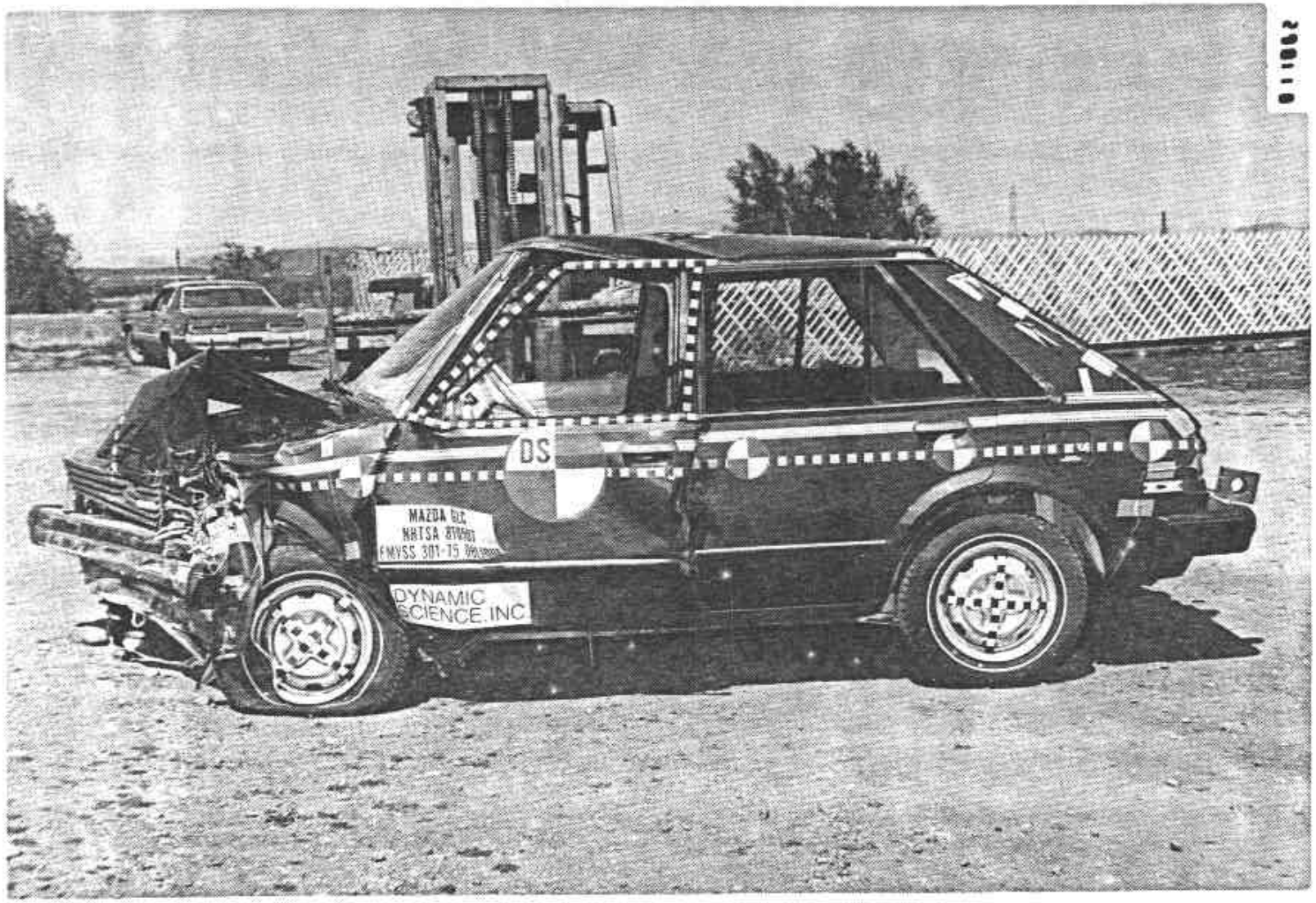


FIGURE A-4. POST-TEST DRIVER SIDE VIEW - 1981 MAZDA GLC - NHTSA 810507.

FIGURE A-5. POST-TEST PASSENGER SIDE VIEW - 1981 MAZDA GLC - NHTSA 810507.

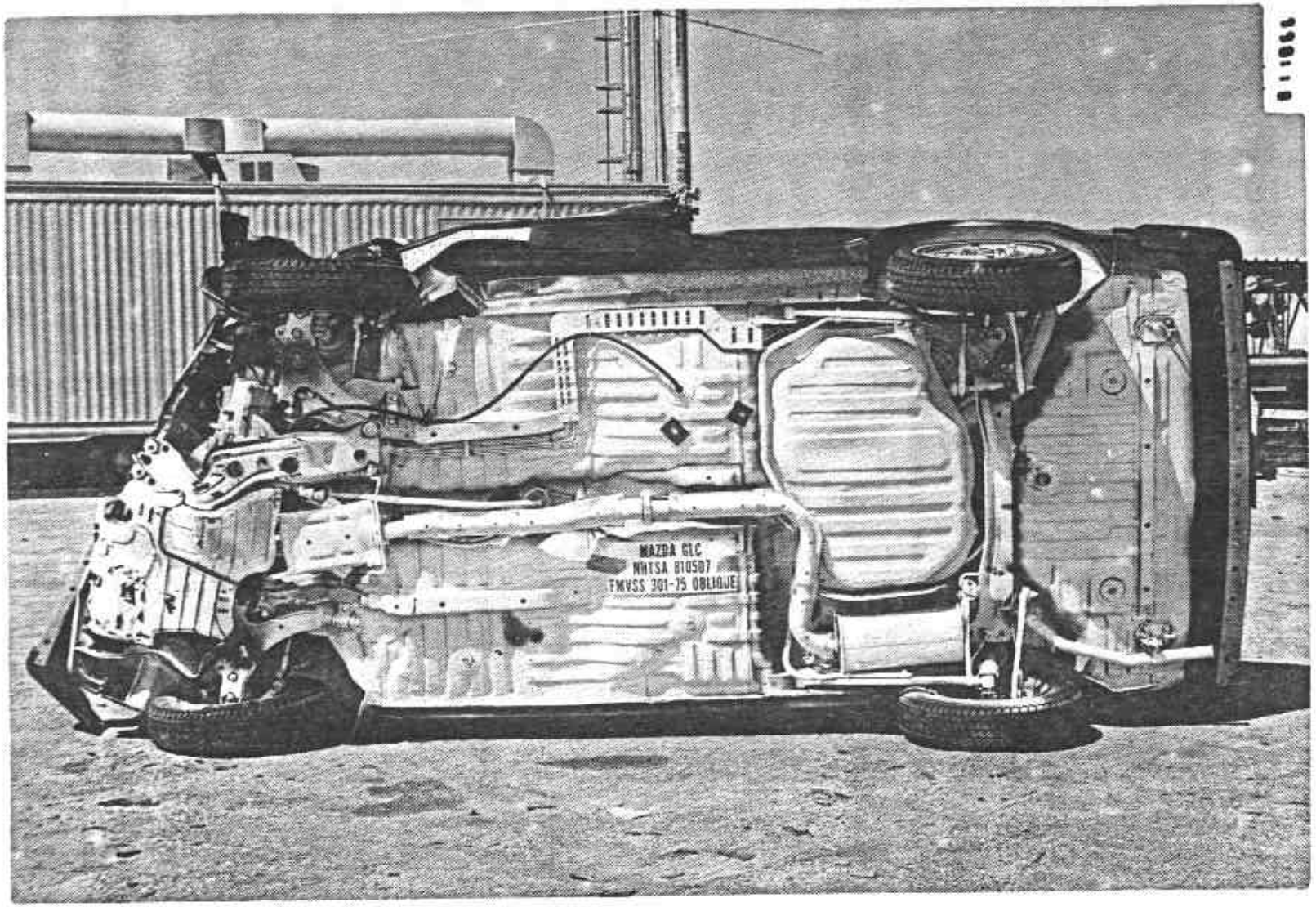


FIGURE A-6. POST-TEST OVERALL UNDERSIDE VIEW - 1981 MAZDA GLC - NHTSA 810507.

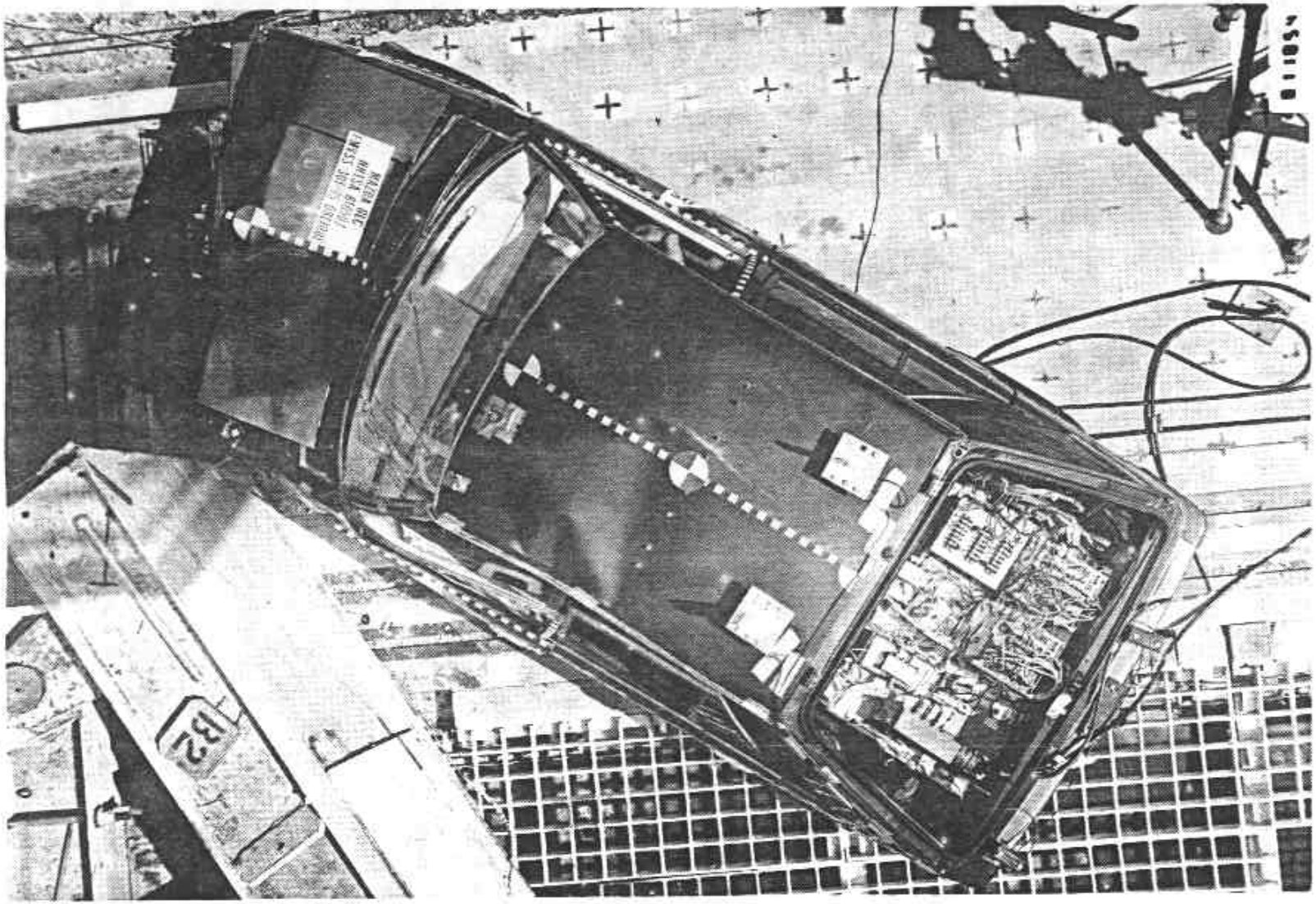


FIGURE A-7. POST-TEST OVERHEAD VIEW SHOWING POSITION OF VEHICLE RELATIVE TO BARRIER - 1981 MAZDA GLC - NHTSA 810507.

FIGURE A-8. PRE-TEST VIEW OF DRIVER DUMMY - 1981 MAZDA GLC - NHTSA 810507.

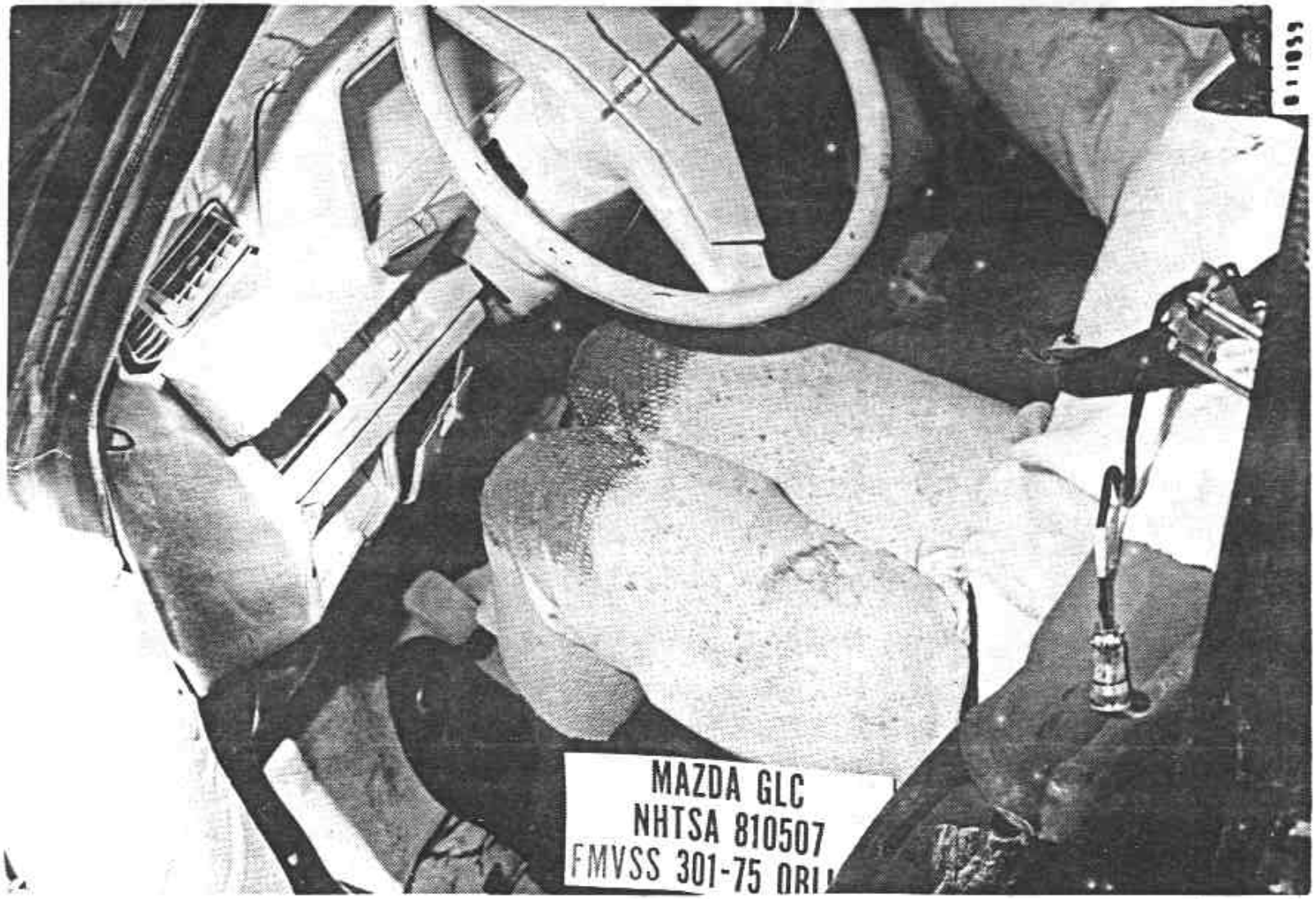


FIGURE A-9. POST-TEST VIEW OF DRIVER DUMMY - 1981 MAZDA GLC - NHTSA 810507.

FIGURE A-10. PRE-TEST VIEW OF PASSENGER DUMMY - 1981 MAZDA GLC - NHTSA 810507.

FIGURE A-11. POST-TEST VIEW OF PASSENGER DUMMY - 1981 MAZDA GLC - NHTSA 810507.

APPENDIX B

CALCOMP PLOT PRESENTATION

APPENDIX B

CALCOMP PLOT PRESENTATION

Calcomp plots generated from the crash test data are presented on the following pages. All data will be recorded on magnetic tape for inclusion in the NHTSA crash test data base system. All data were filtered according to SAE J211. Plot legends and test anomalies are listed below:

PLOT LEGEND

Dummy Data*

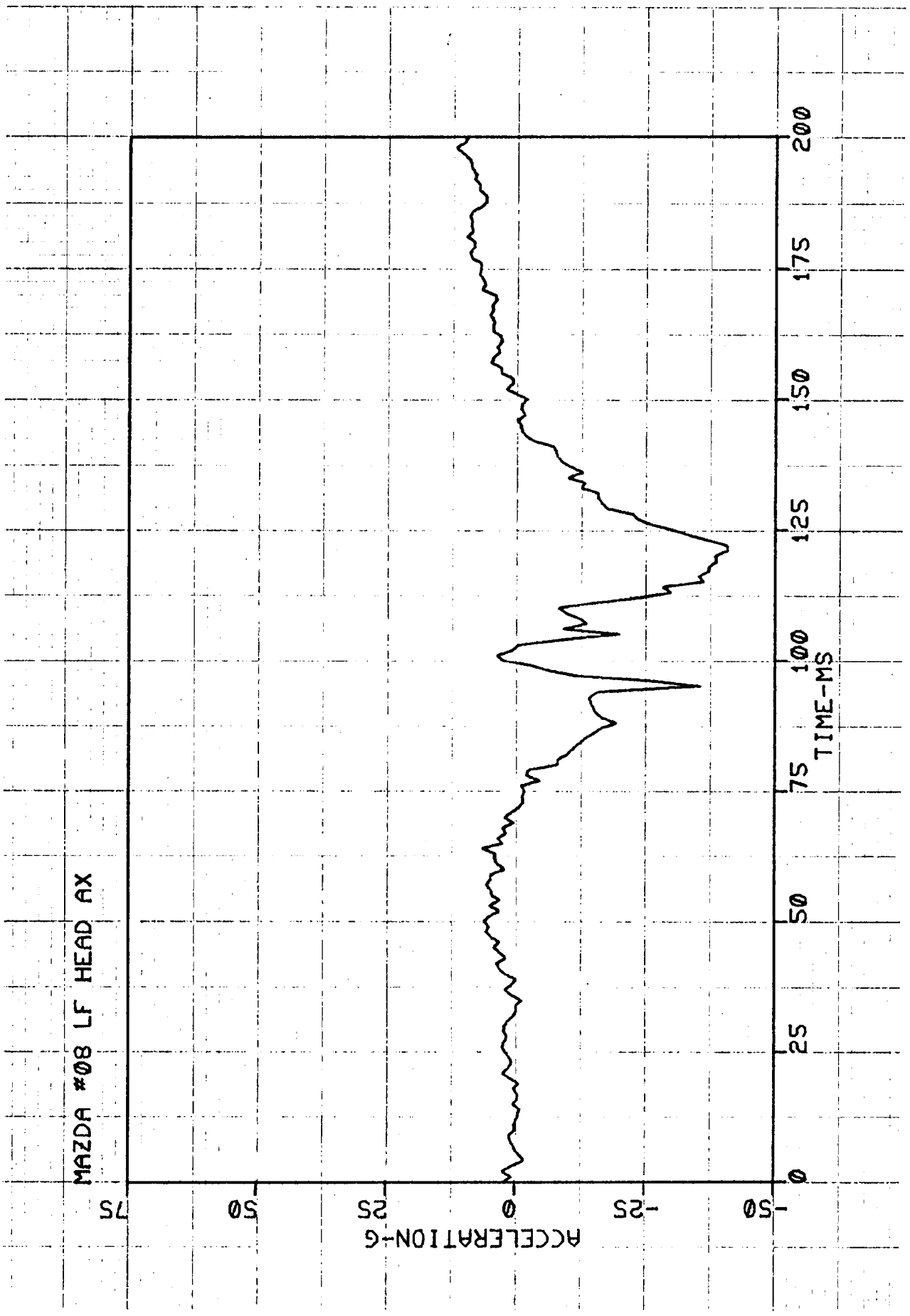
Driver	RF Outboard Passenger	Data Description
LF Head	RF Head	Head Acceleration (G)
LF Chest	RF Chest	Chest Acceleration (G)
LF Femurs	RF Femurs	Femur Loads (lb)
LF Belt Loads	RF Belt Loads	Lap and Torso Belt Loads (lb)

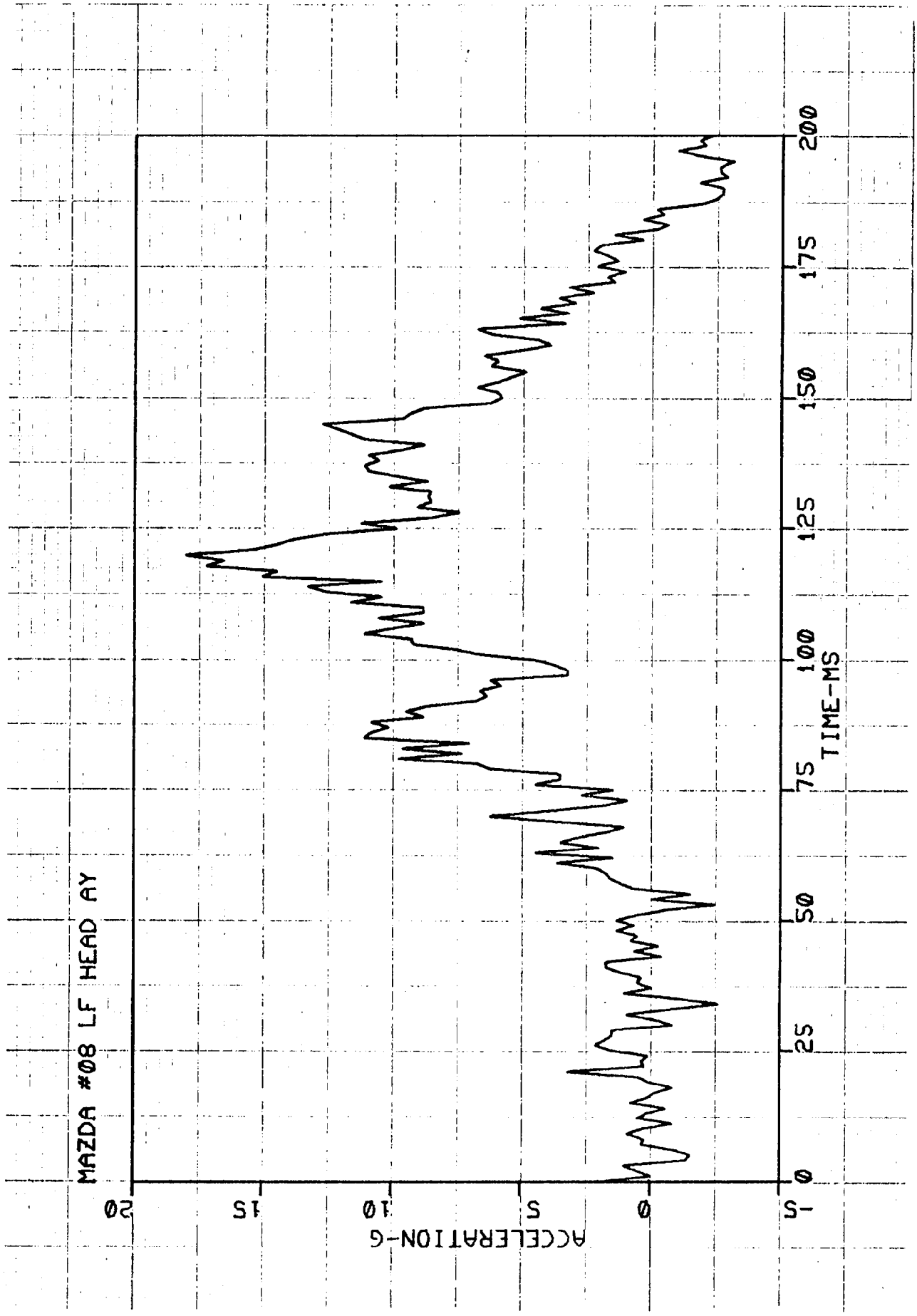
Vehicle Data**

Loc 1	Front Seat Area Acceleration (G)
Loc 2	Rear Seat Area Acceleration (G)

*Dummy Injury Summary presented on pages 4-4 and 4-5.

**Vehicle accelerometer location and data summarized on page 4-8.


MAZDA #08 LF HEAD AX
ACCELERATION-G
75
50
25
0
-25
-50
0
25
50
75
100
125
150
175
200
TIME-MS


MAZDA #08 LF HEAD AY
ACCELERATION-G
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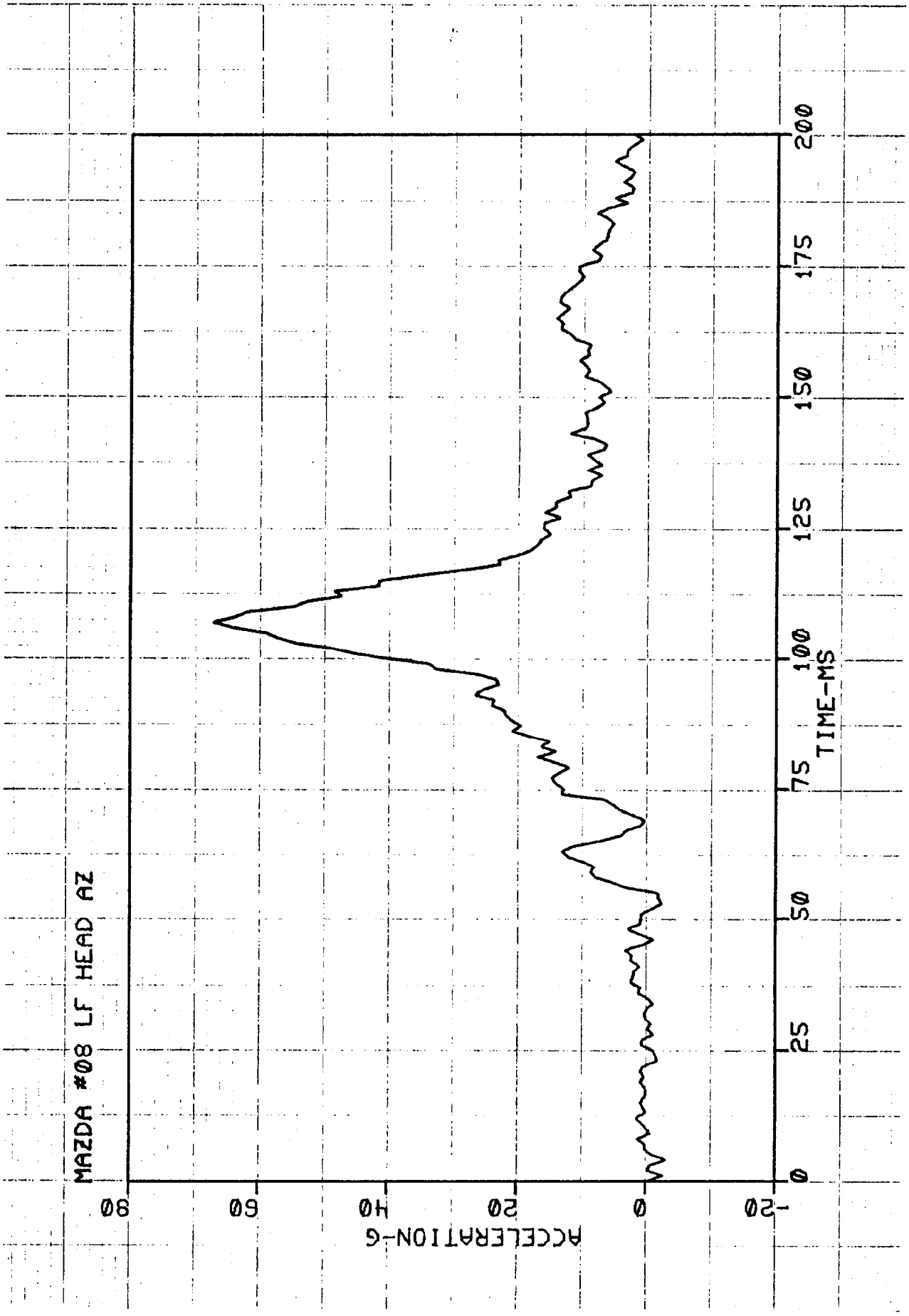
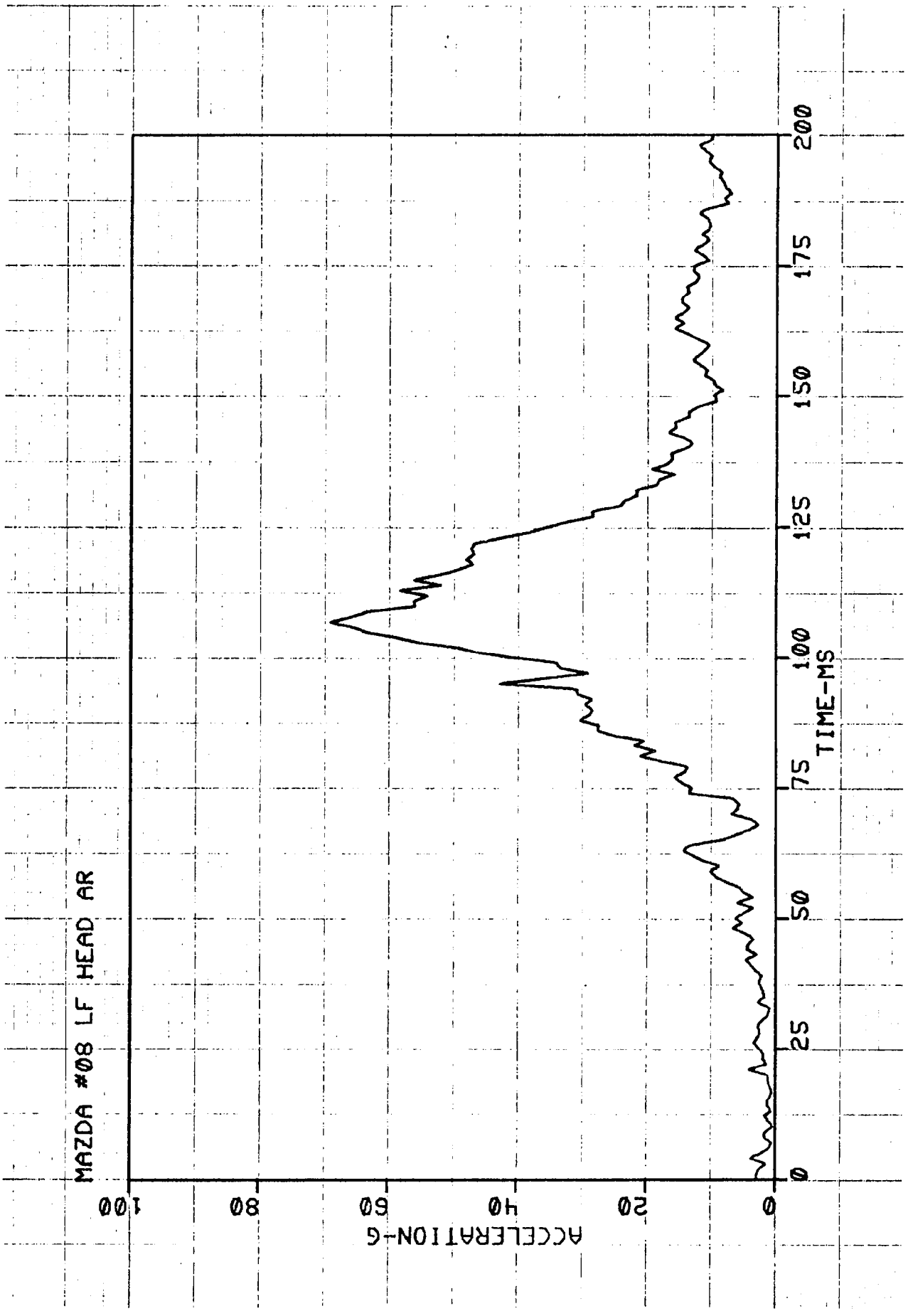
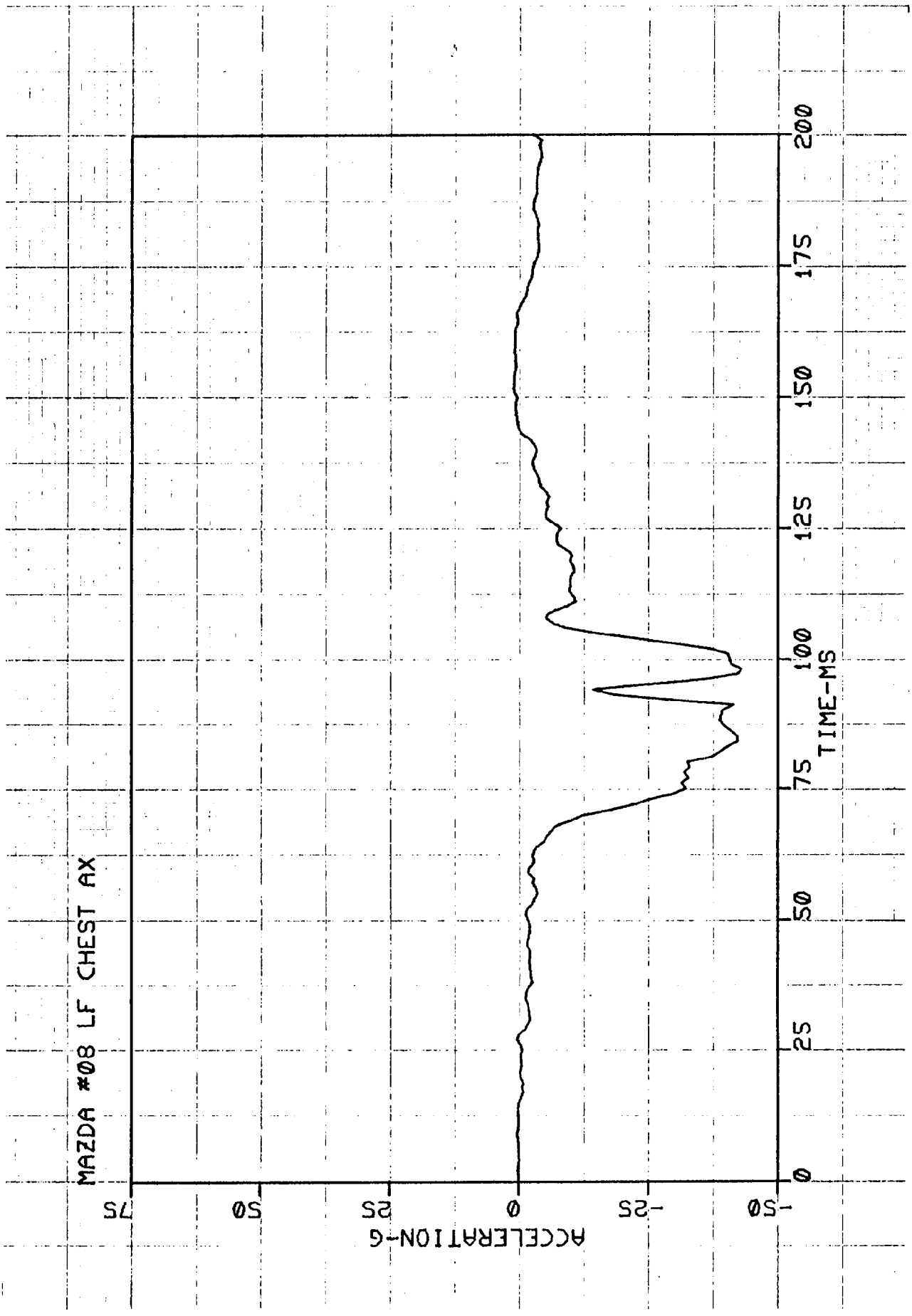
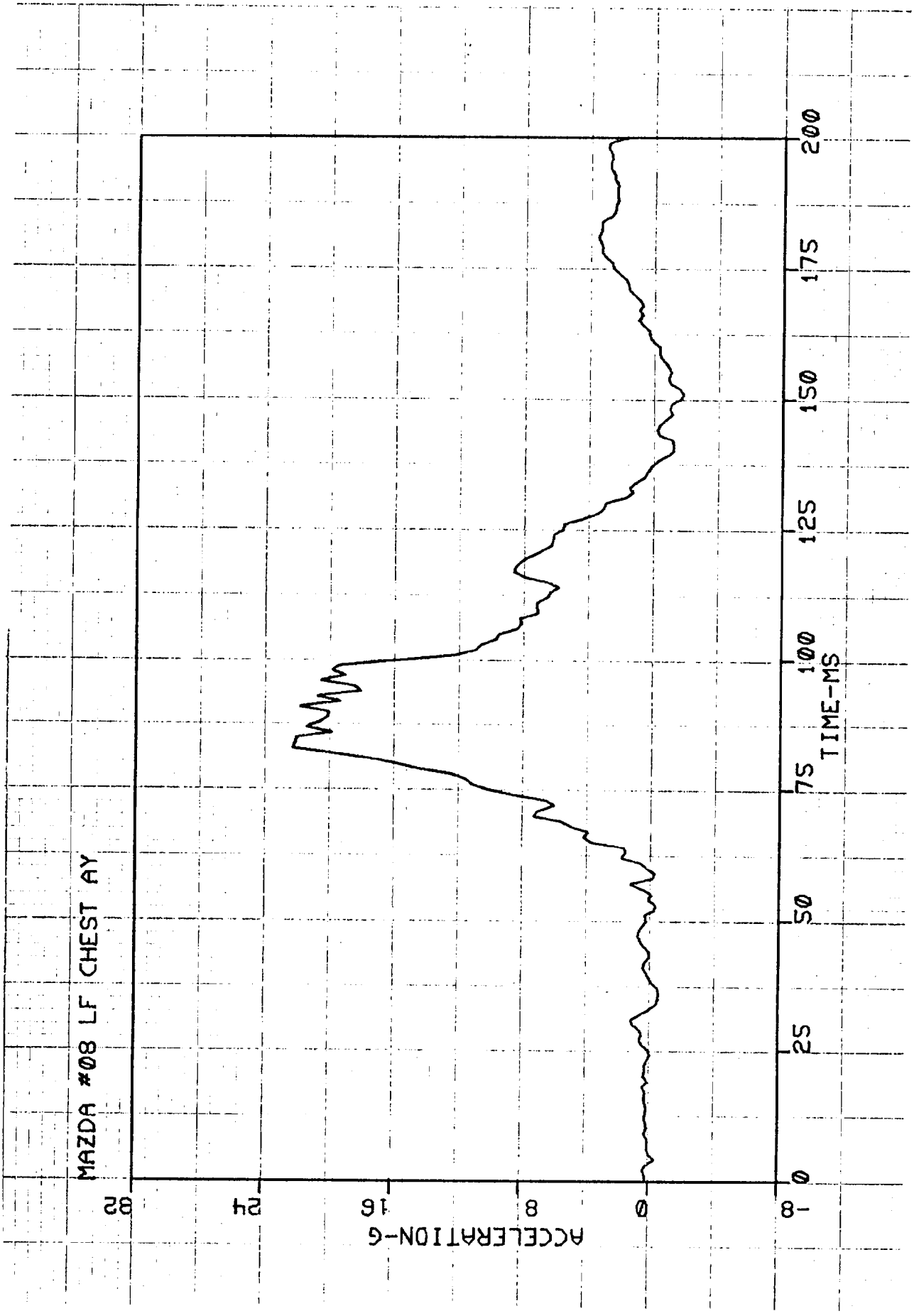
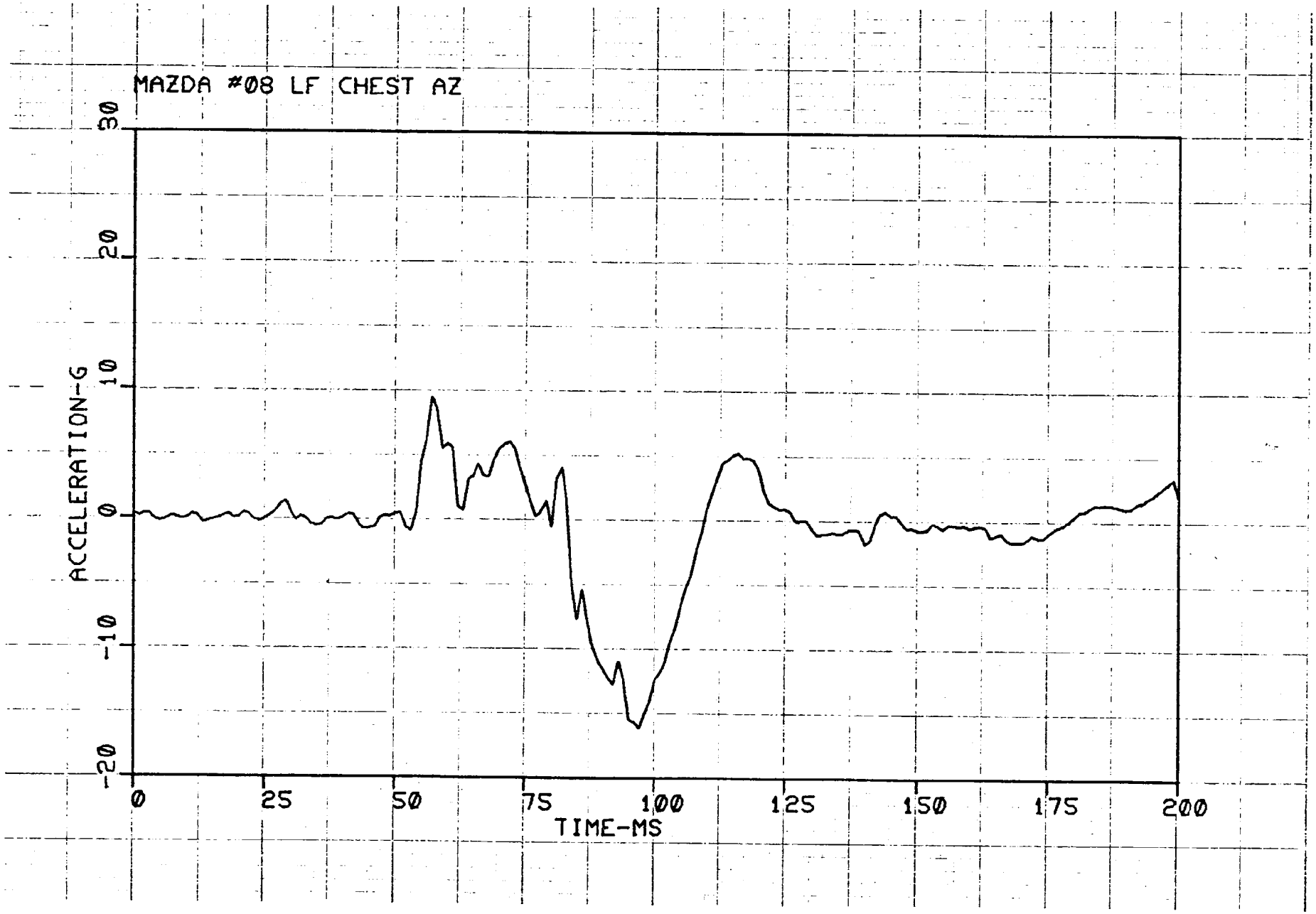
0
5
10
15
20
0
25
50
75
100
125
150
175
200
TIME-MS

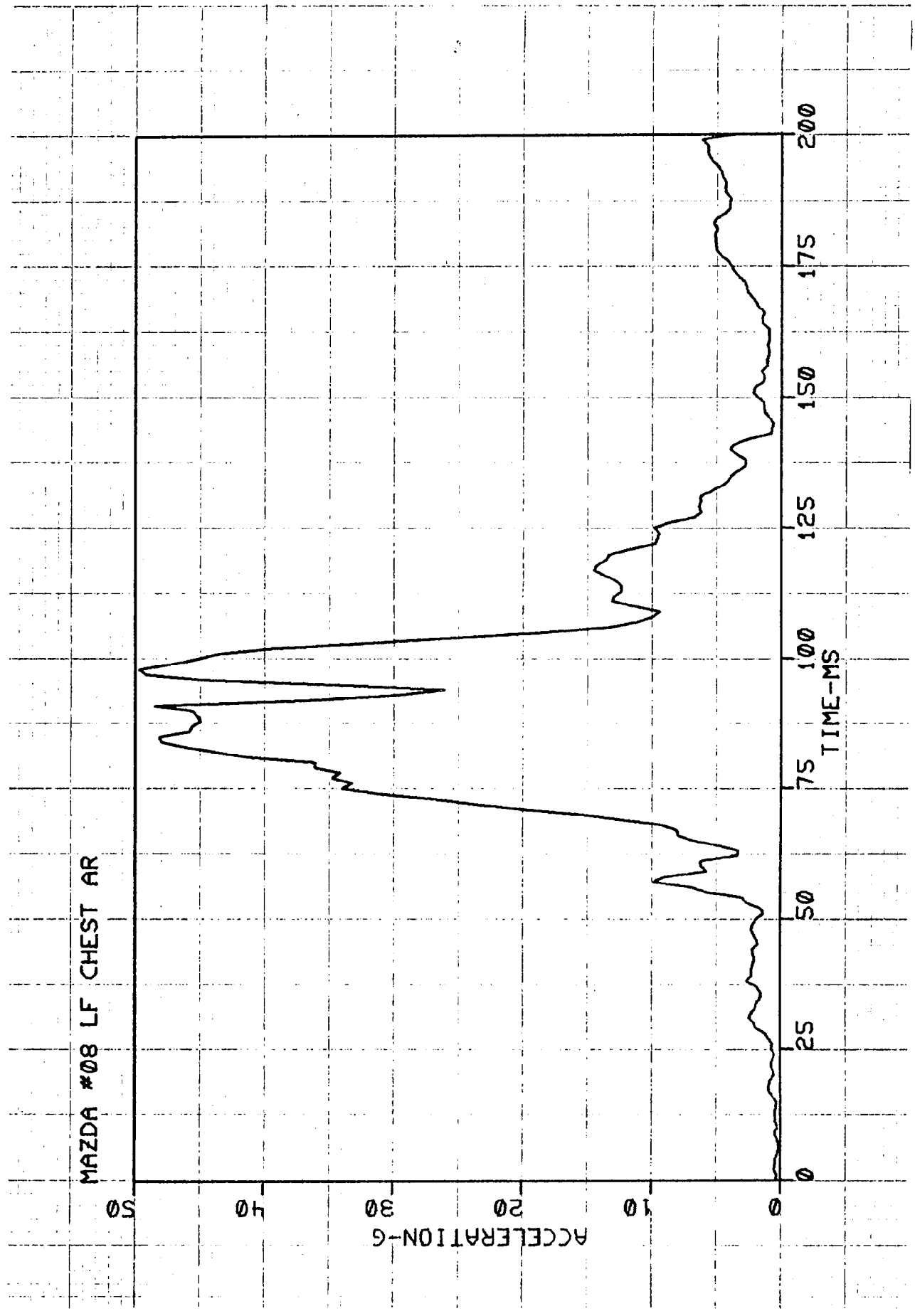

MAZDA #08 LF HEAD AZ
ACCELERATION-G
80
60
40
20
0
-20
0
25
50
75
100
125
150
175
200
TIME-MS


MAZDA #08 LF HEAD AR
ACCELERATION-G
0
20
40
60
80
100
TIME-MS
0
25
50
75
100
125
150
175
200


MAZDA #08 LF CHEST AX
ACCELERATION-G
75
50
25
0
-25
-50
TIME-MS
0
25
50
75
100
125
150
175
200


MAZDA #08 LF CHEST AY
ACCELERATION-G
32
24
16
8
0
-8
TIME-MS
0
25
50
75
100
125
150
175
200


MAZDA #08 LF CHEST AZ
ACCELERATION-G
30
20
10
0
-10
-20
0
25
50
75
100
125
150
175
200
TIME-MS


MAZDA #08 LF CHEST AR
ACCELERATION-G
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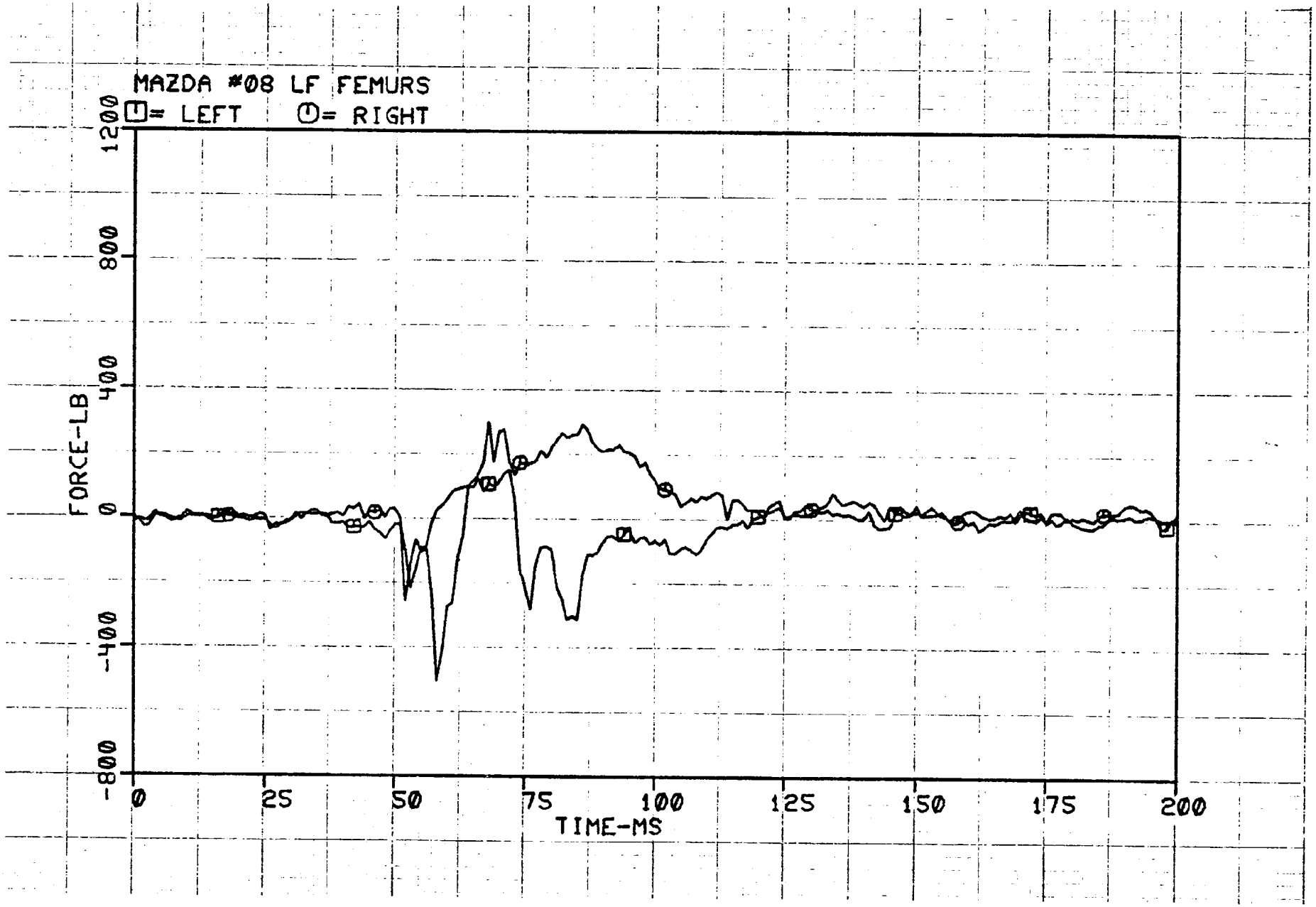
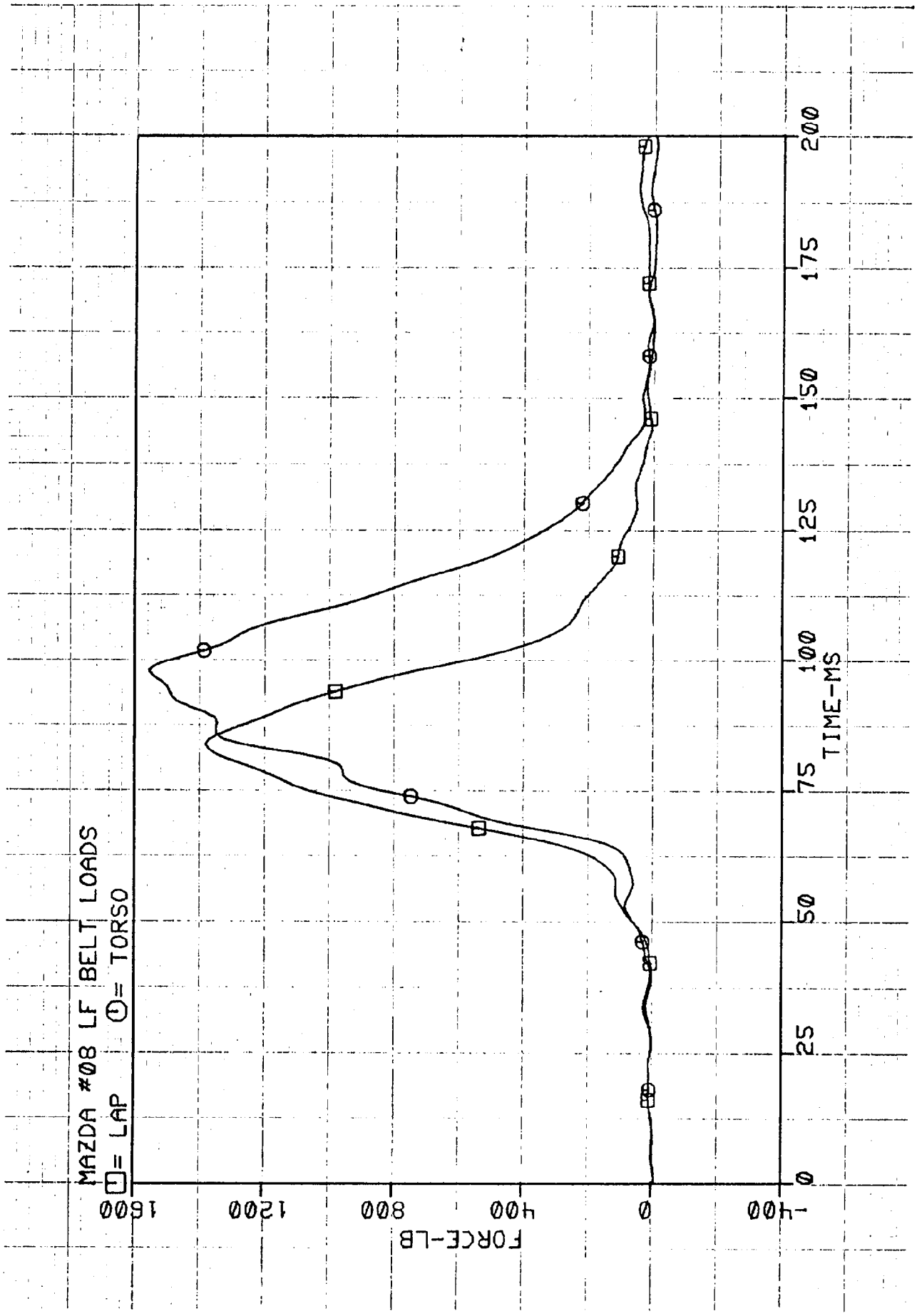
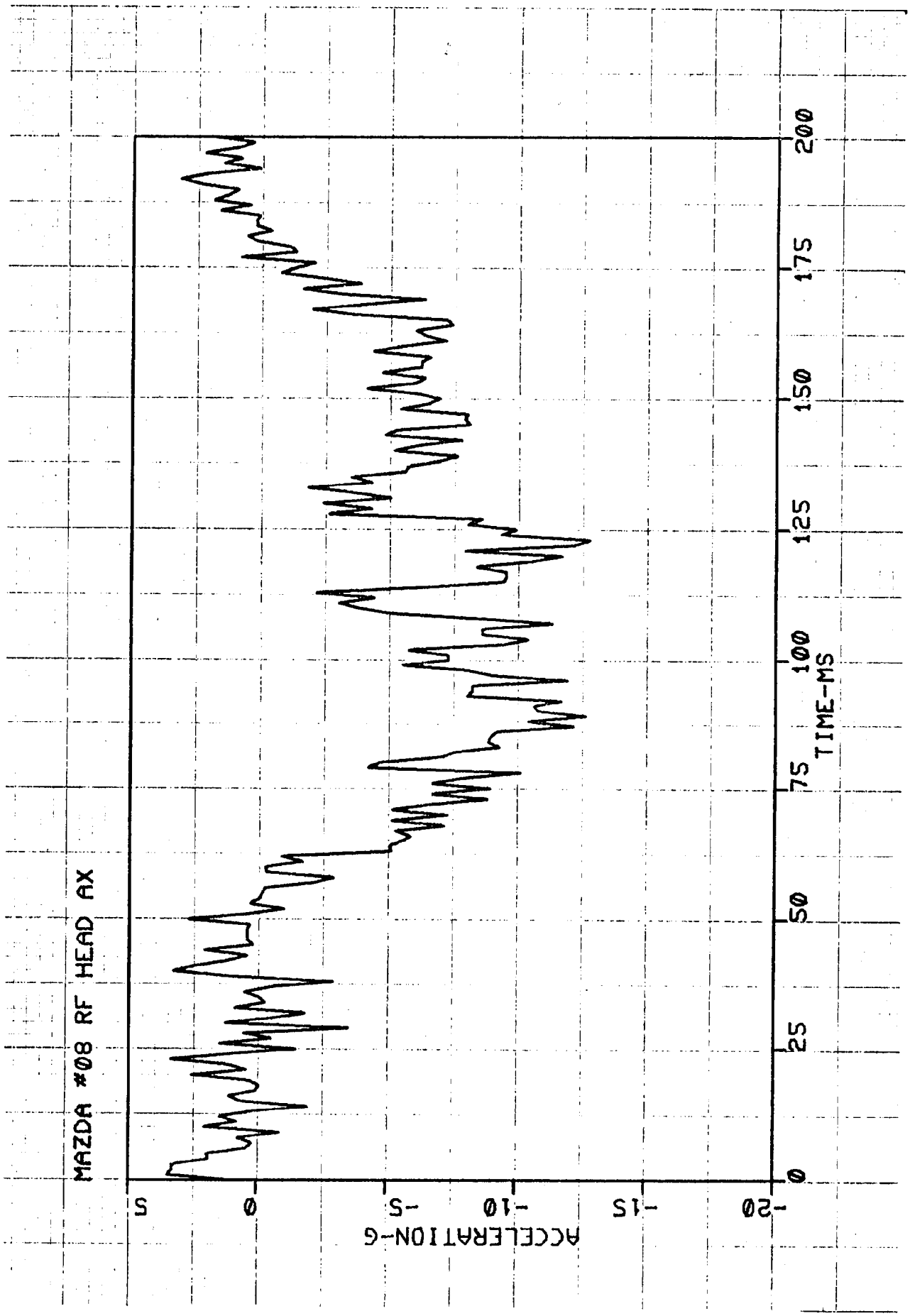
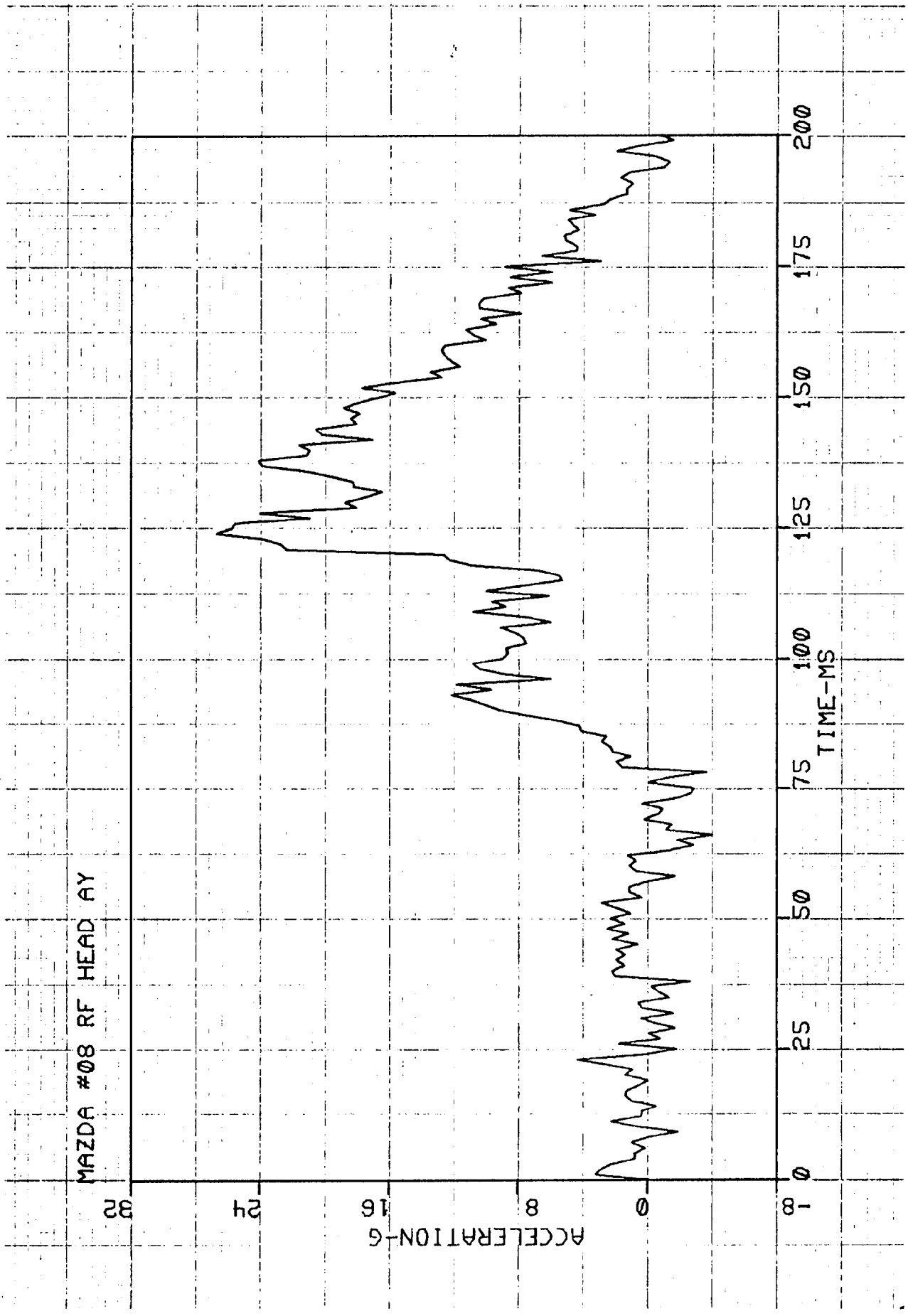
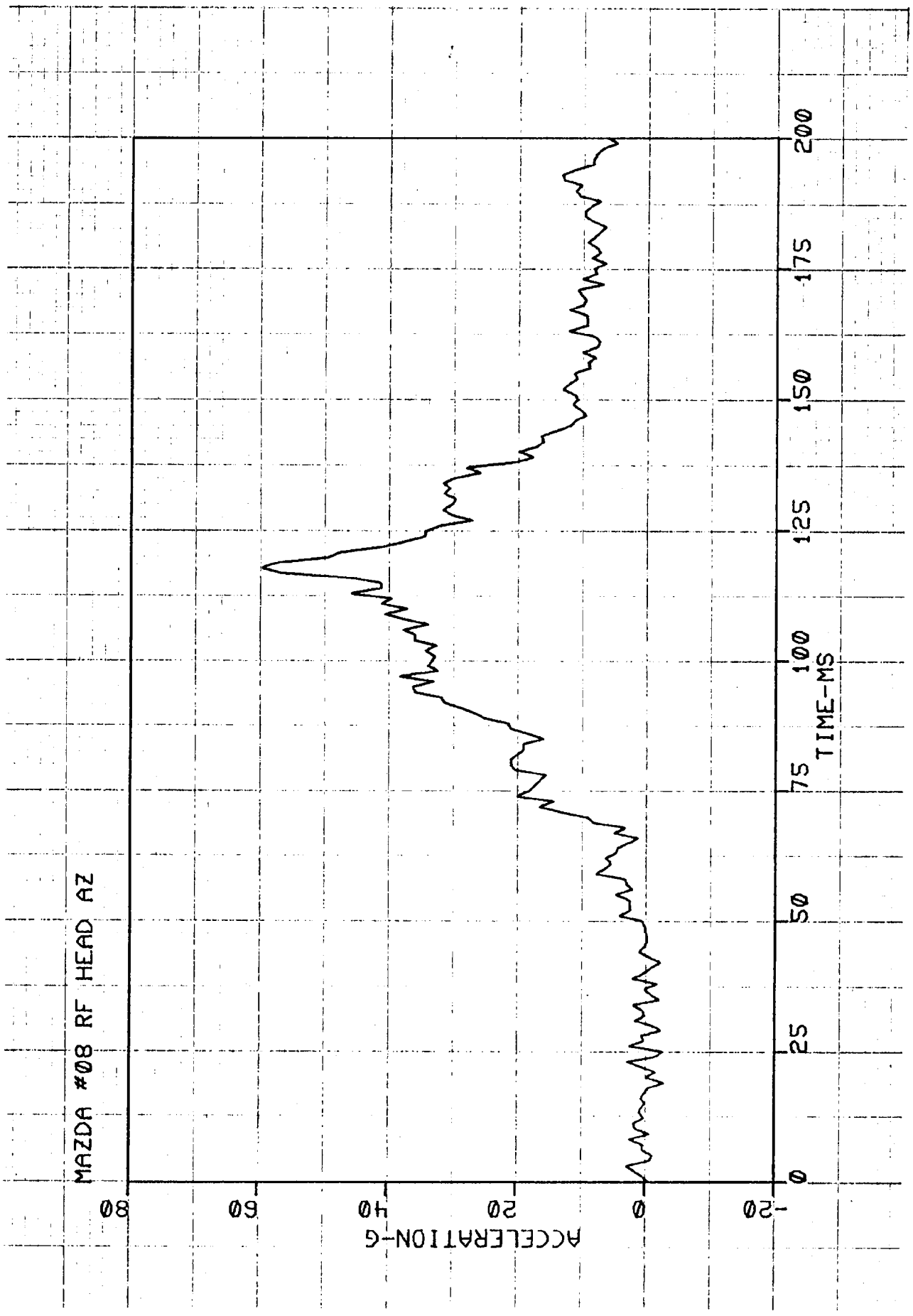
10
20
30
40
50
TIME-MS
0
25
50
75
100
125
150
175
200

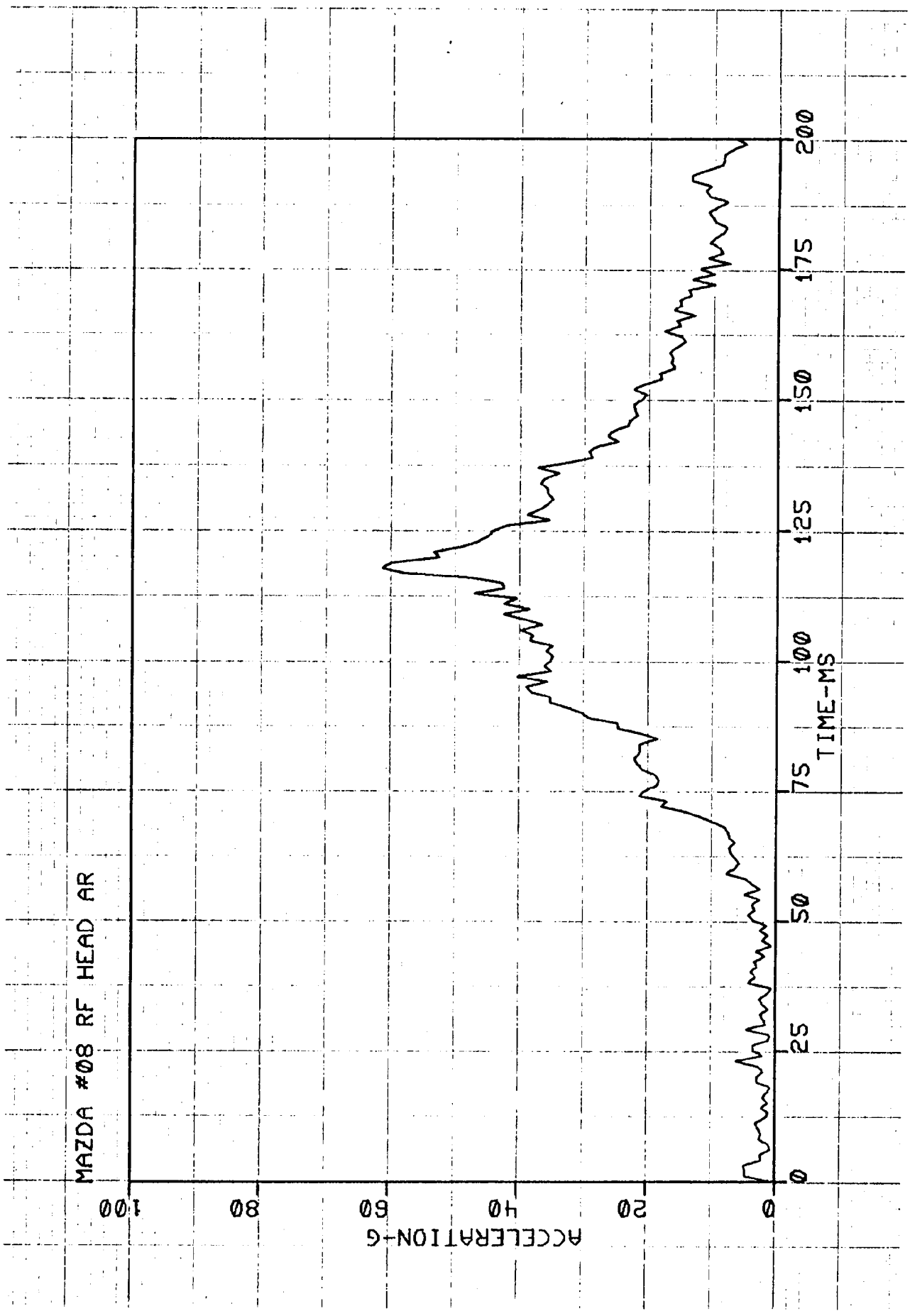

MAZDA #08 LF FEMURS
□= LEFT
○= RIGHT
1200
800
400
0
-400
-800
FORCE-LB
0
25
50
75
100
125
150
175
200
TIME-MS


MAZDA #08 LF BELT LOADS
□= LAP ○= TORSO
FORCE-LB
-400
0
400
800
1200
1600
TIME-MS
0
25
50
75
100
125
150
175
200


MAZDA #08 RF HEAD AX
ACCELERATION-G
5
0
-5
-10
-15
-20
TIME-MS
0
25
50
75
100
125
150
175
200


MAZDA #08 RF HEAD AY
ACCELERATION-G
32
24
16
8
0
-8
0
25
50
75
100
125
150
175
200
TIME-MS


MAZDA #08 RF HEAD AZ
ACCELERATION-G
80
60
40
20
0
-20
TIME-MS
0
25
50
75
100
125
150
175
200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40
60
80
100
TIME-MS
0
25
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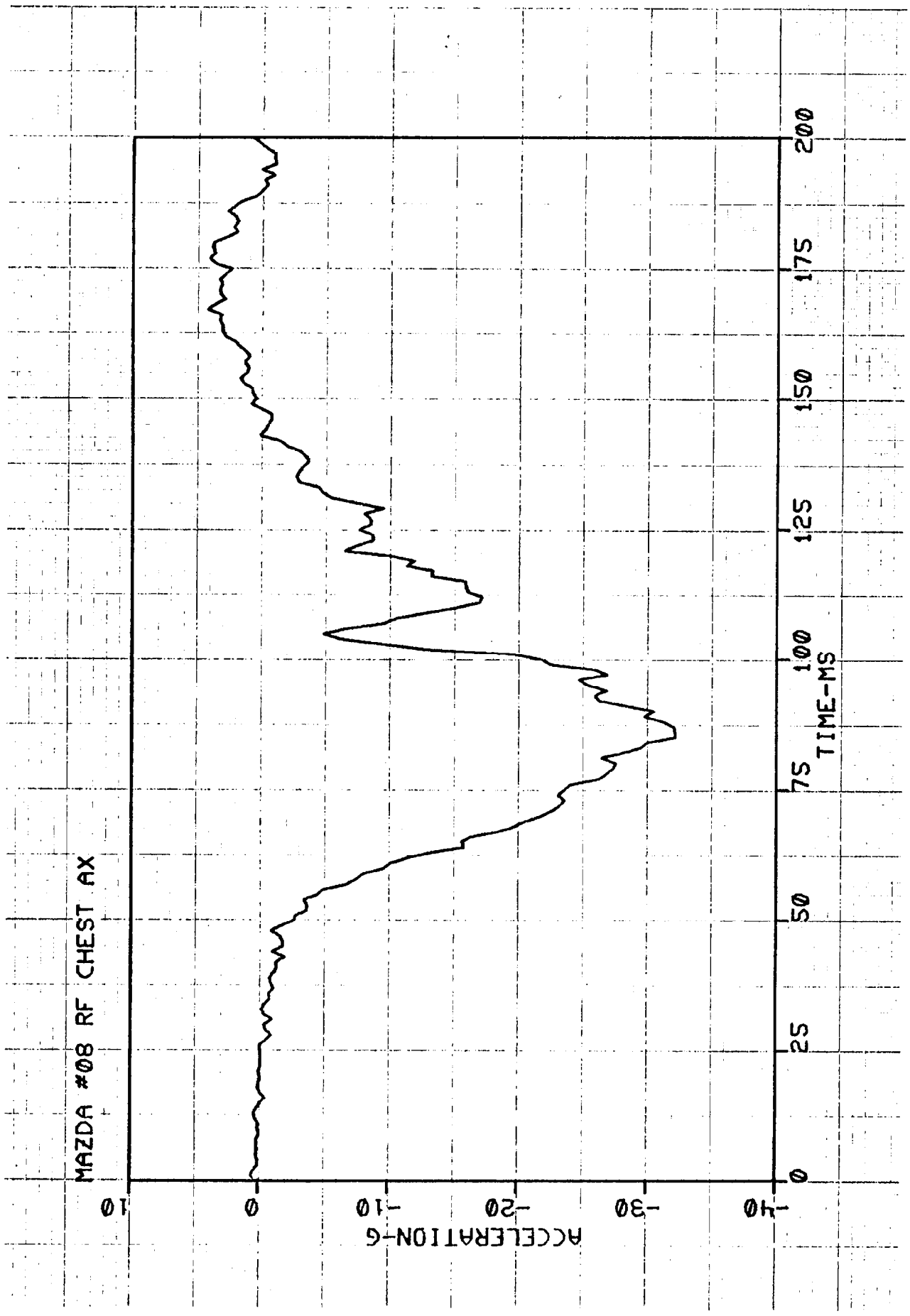
100
125
150
175
200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ACCELERATION-G
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-10
-20
-30
-40
TIME-MS
0
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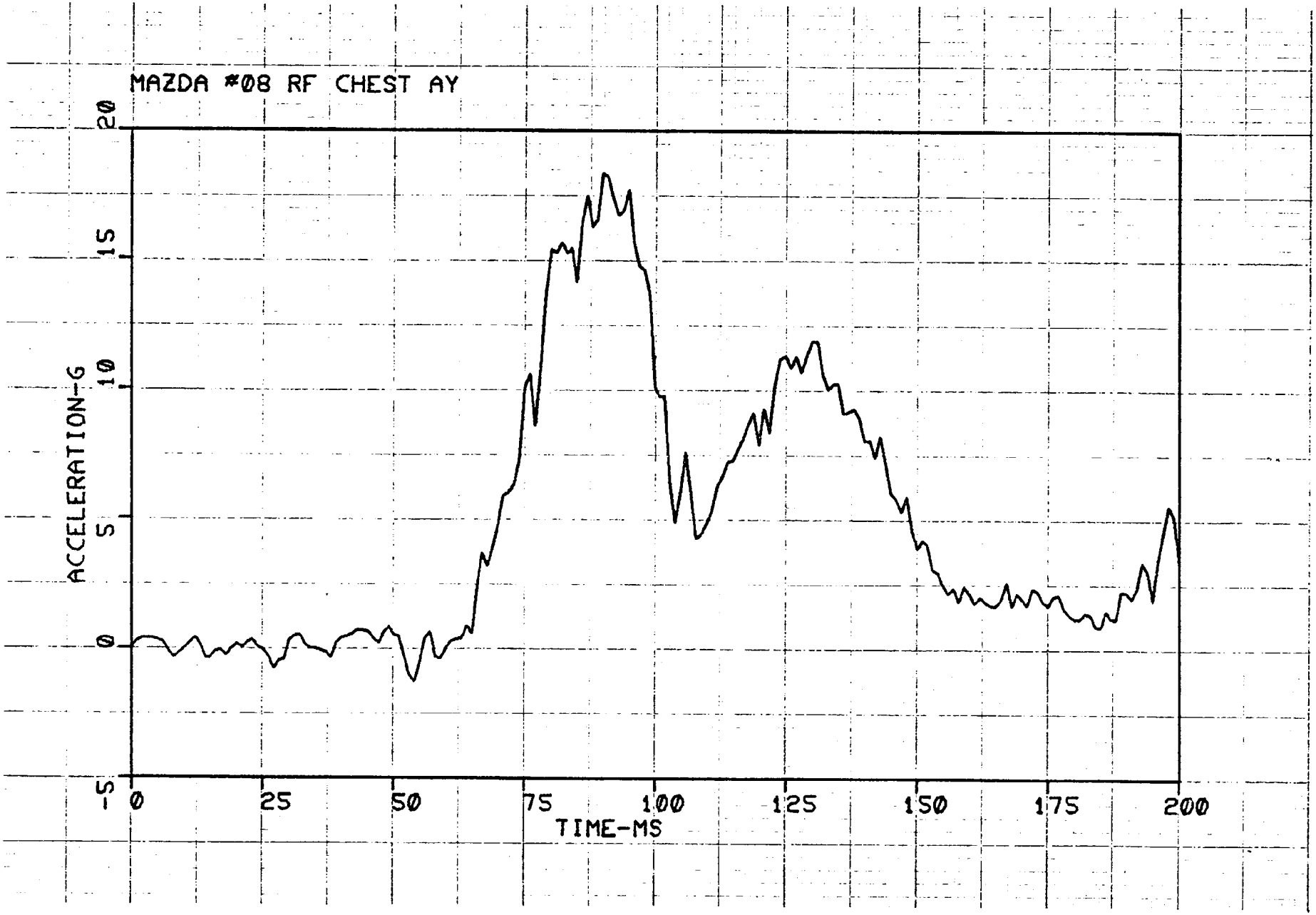
50
75
100
125
150
175
200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ACCELERATION-G
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15
10
5
0
-5
0
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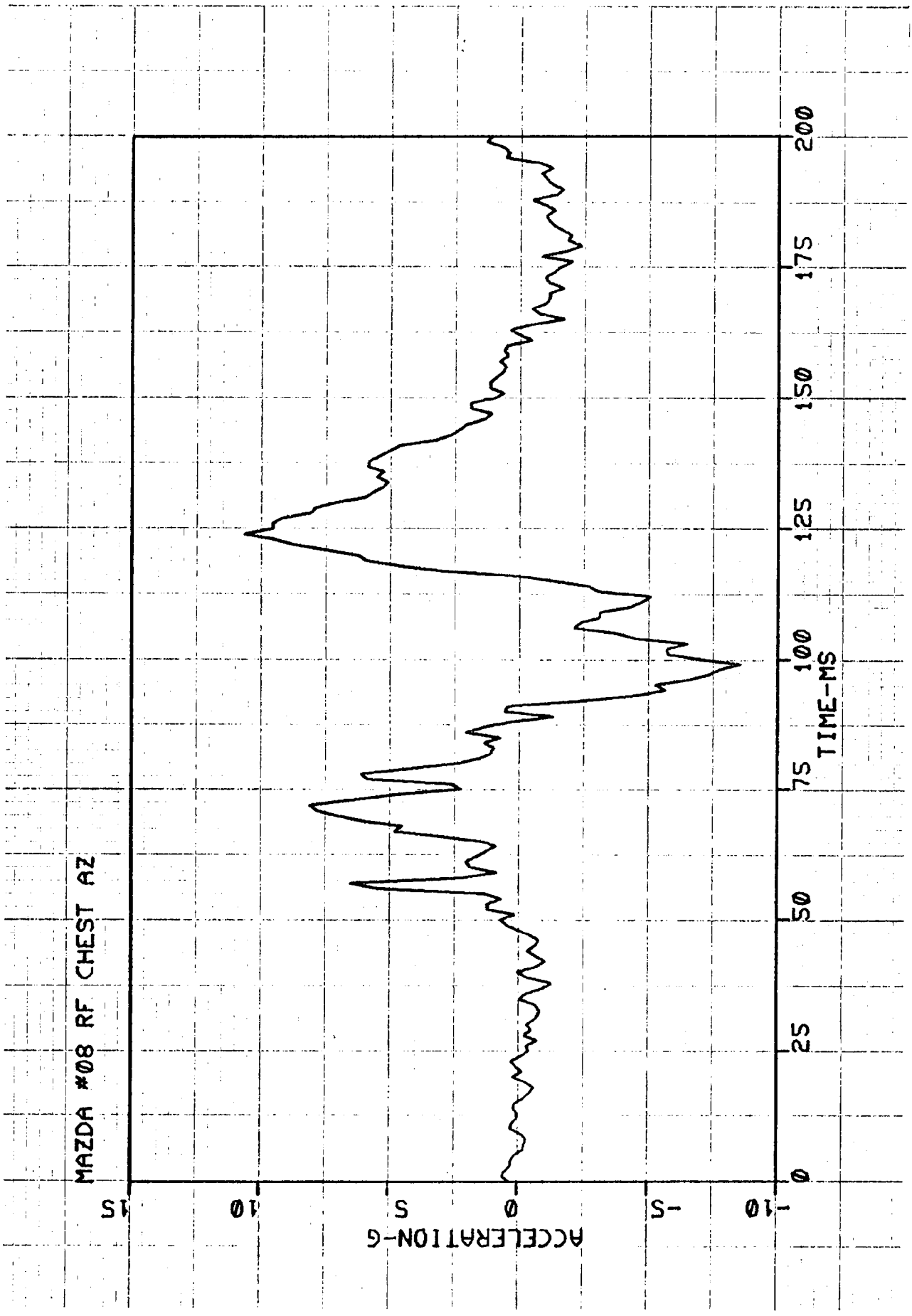
50
75
100
125
150
175
200
TIME-MS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ACCELERATION-G
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10
5
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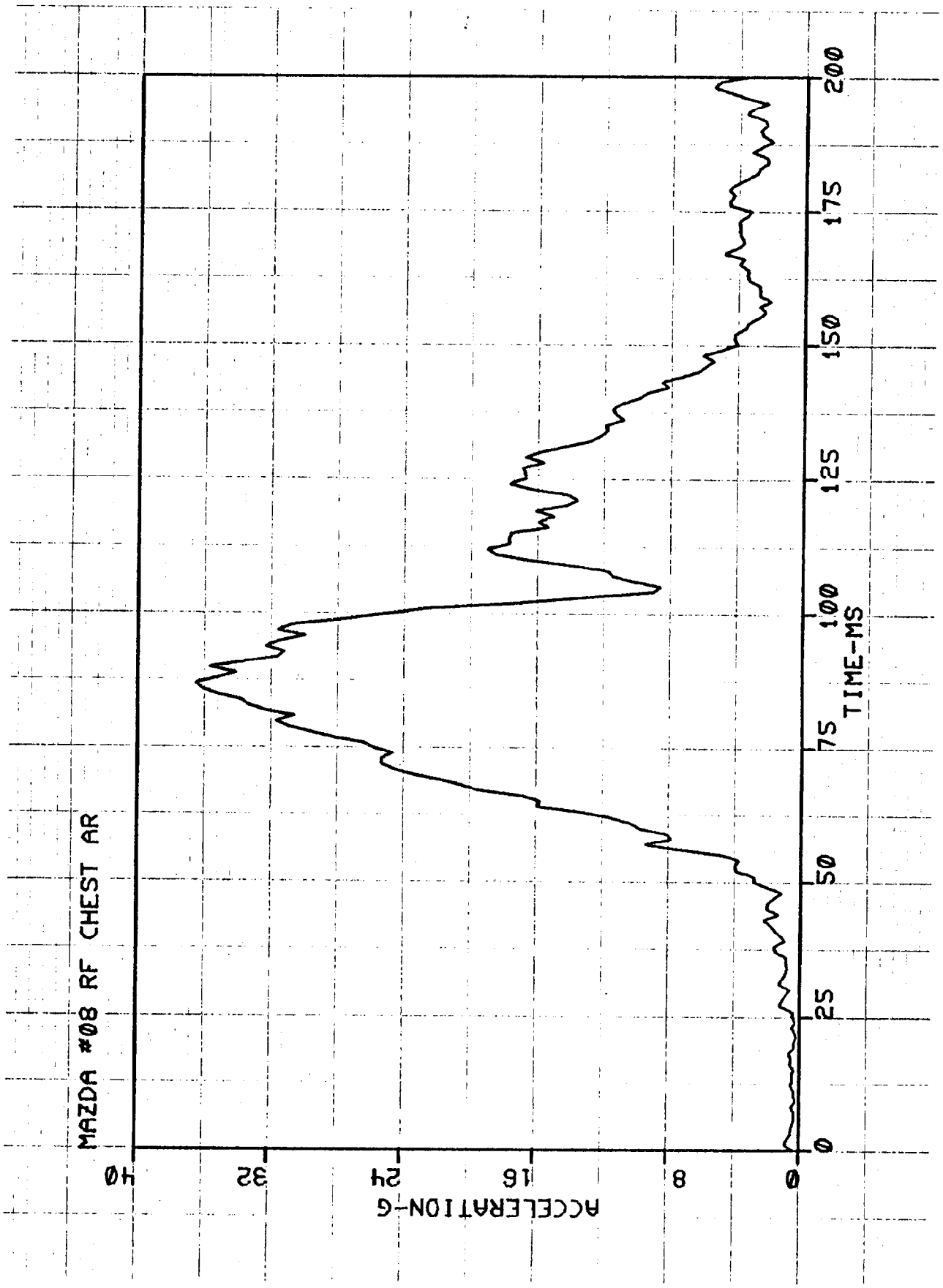
-5
-10
0
25
50
75
100
125
150
175
200
TIME-MS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16
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32
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TIME-MS
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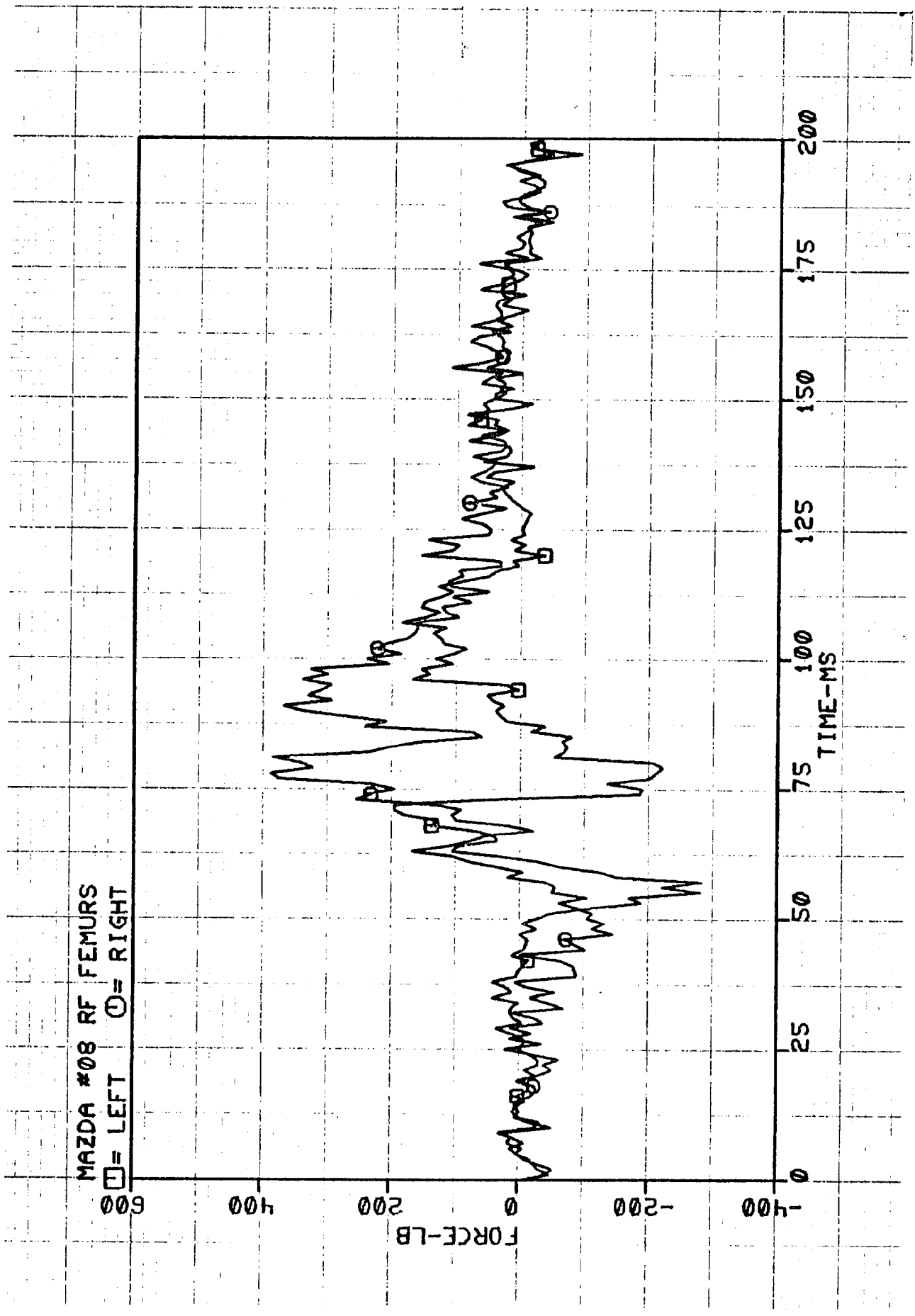
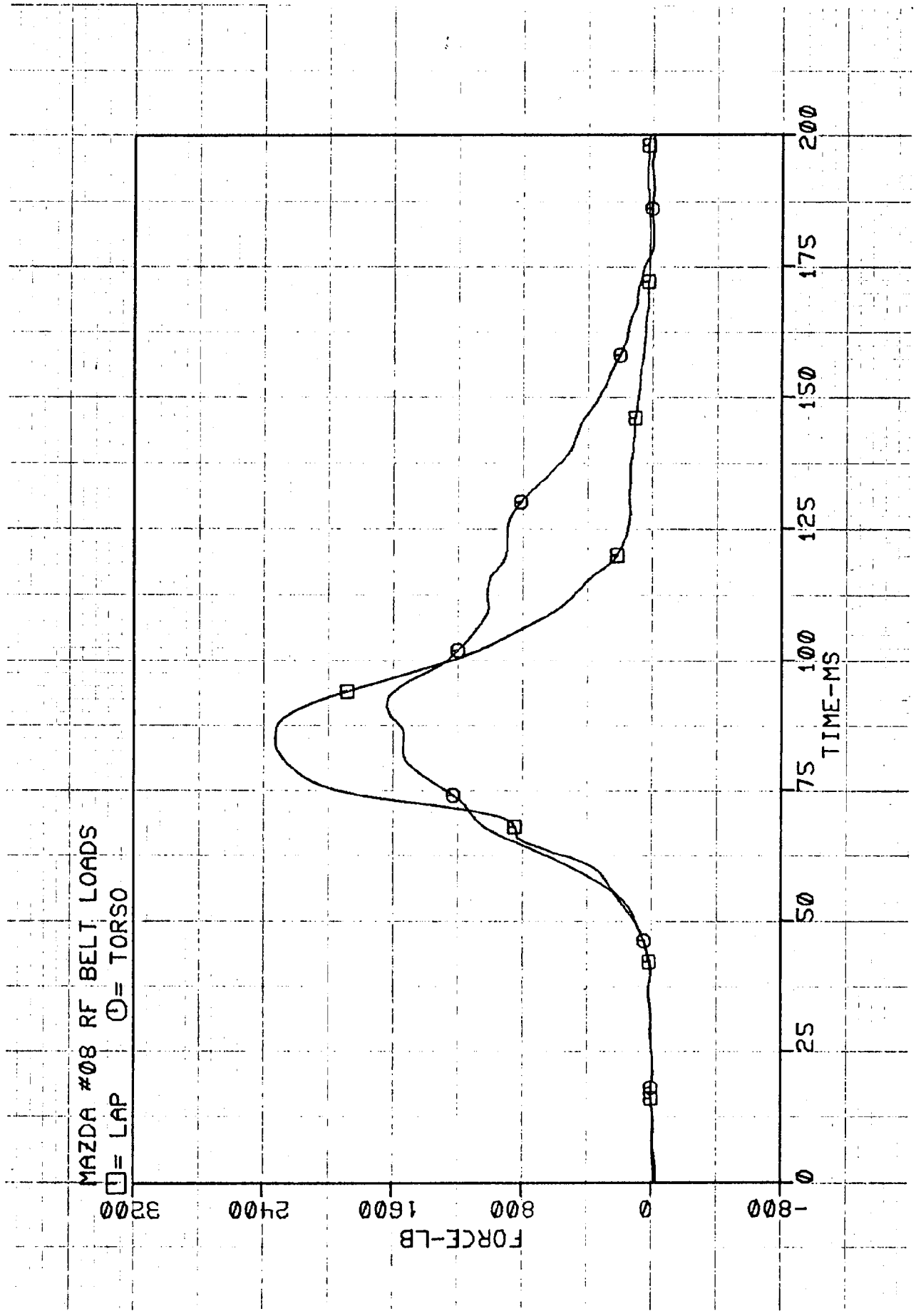

MAZDA #08 RF FEMURS
□= LEFT ⊖= RIGHT
FORCE-LB
600
400
200
0
-200
-400
0
25
50
75
100
125
150
175
200
TIME-MS


MAZDA #08 RF BELT LOADS
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FORCE-LB
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800
1600
2400
3200
TIME-MS
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50
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125
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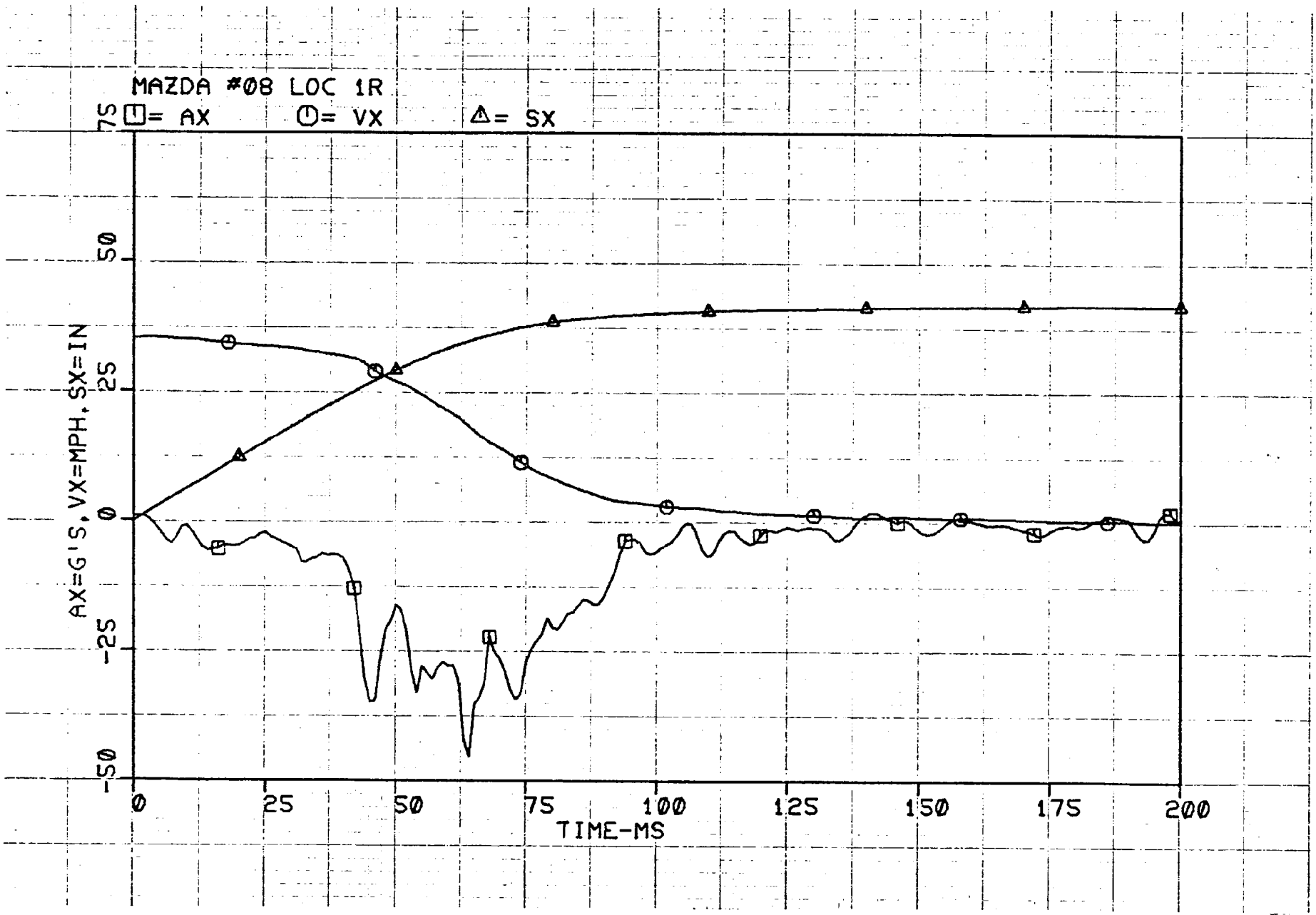
175
200


MAZDA #08 LOC 1R
□= AX
○= VX
△= SX
AX=G'S, VX=MPH, SX=IN
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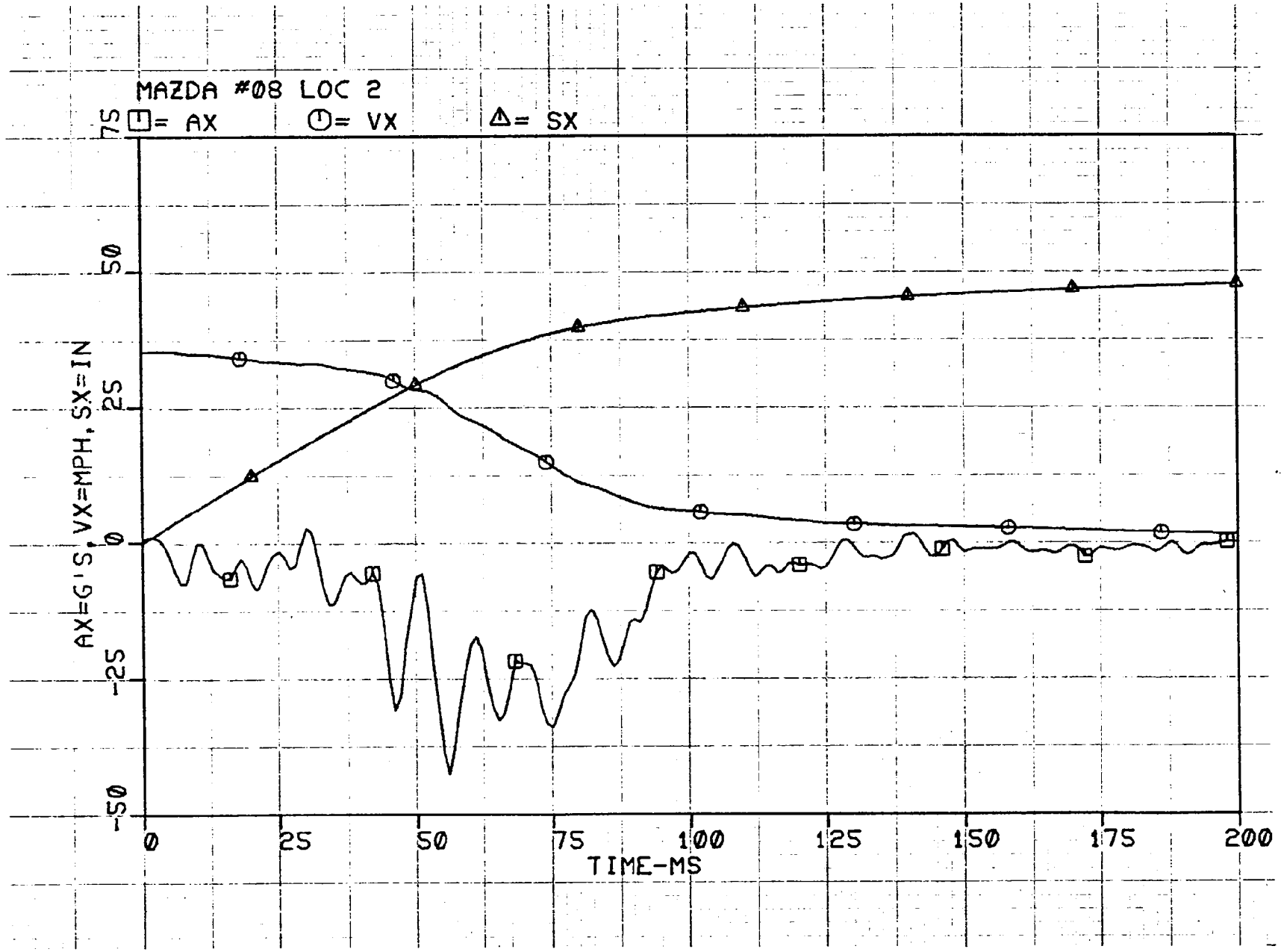
50
25
0
-25
-50
0
25
50
75
100
125
150
175
200
TIME-MS


MAZDA #08 LOC 2
□= AX
○= VX
△= SX
AX=G'S, VX=MPH, SX=IN
75
50
25
0
-25
-50
0
25
50
75
100
125
150
175
200
TIME-MS

APPENDIX C

DUMMY CALIBRATION

PART 572 DUMMY CALIBRATION TEST DATA*

NHTSA Dummy I.D. No.: A03

Laboratory Technicians: C. Haymaker

		Pre-test Calibration	Post-test Calibration
Date of Dummy Calibration		3/9/81	
Calibration Sequential Number for Dummy		24	
Temperature in Lab. (Spec. = 66 to 78 °F)		74	
Relative Humidity in Lab. (Spec. = 10 to 70%)		46	
Test Parameter	**Specification**		
1. Head Drop Test:			
a. Peak Resultant Accel	210 - 260G	221	
b. Peak Lateral Accel	$\leq$ 10G	3	
c. Time above 100G	0.9 - 1.5 ms	1.0	
2. Neck Bending Test:			
a. Pendulum Speed	21.5 - 25.5 fps	22.1	
b. Pendulum Avg Decel (over $t_3 - t_2$)	20 - 24G	22	
c. Peak Resultant Head Acceleration	26G Maximum	21	
d. Pendulum Decel ($t_2 - t_1$)	$\leq$ 3 ms	2	
e. Pendulum Decel ($t_3 - t_2$)	25 - 30 ms	28	
f. Pendulum Decel ($t_4 - t_3$)	$\leq$ 10 ms	8	
g. Pendulum Direction Reversal Time	$\geq$ 123 ms		
h. Maximum Head Rotation	63 to 73°	70	
i. Chordal Displacement:			
Head Rotation Angle			
0°	Time -2 - 2 ms	0.0	
	Displ -0.5 - 0.5 in.	0.0	
30°	Time 25.6 - 34.4 ms	28.0	
	Displ 2.1 - 3.1 in.	2.3	
60°	Time 40.3 - 51.7 ms	43.0	
	Displ 4.3 - 5.3 in.	4.4	
Maximum (73°)	Time 53.2 - 66.8 ms	59.0	
	Displ 5.0 - 6.0 in.	5.1	

* According to criteria established in NHTSA laboratory procedure TP-212-02, dated April 1, 1980, no post-test dummy calibration was required.

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A03

Test Parameter		Specification	Pre-test Calibration	Post-test Calibration
2. Neck Bending Test: (Continued)				
Head Rotation Angle				
60°	Time	67.0 - 83.0 ms	72.0	
	Displ	4.3 - 5.3 in.	4.4	
30°	Time	85.4 - 104.6 ms	91.0	
	Displ	2.1 - 3.1 in.	2.3	
0°	Time	101.0 - 123.0 ms	107	
	Displ	-0.5 - 0.5 in.	0.1	
3. Abdominal Compression Test: (Preload = 10 pounds)				
a. Force at 0.5 in.		14 - 26 lb	24	
b. Force at 0.75 in.		27 - 40 lb	39	
c. Force at 1.0 in.		40 - 53 lb	45	
d. Force at 1.3 in.		63 - 78 lb	68	
4. Lumbar Flexion Test:				
a. Force at 20°		22 - 34 lb	26	
b. Force at 30°		34 - 46 lb	41	
c. Force at 40°		46 - 58 lb	47	
d. Return Angle		12° Maximum	9	
5. Chest Impact Tests:				
a. High Speed				
1) Probe Speed		21.78-22.22 fps	22.00	
2) Peak Deflection		1.7 in. Maximum	1.5	
3) Peak Resistive Force		2250 lb Maximum	2117	
4) Internal Hysteresis		50 - 70%	63	
b. Low Speed				
1) Probe Speed		13.86-14.14 fps	14.00	
2) Peak Deflection		1.1 in. Maximum	1.0	
3) Peak Resistive Force		1450 lb Maximum	1354	
4) Internal Hysteresis		50 - 70%	58	

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A03

Test Parameter	Specification	Pre-test Calibration	Post-test Calibration
6. Knee Impact Tests:			
a. Right Side			
1) Probe Speed	6.76 - 7.04 fps	6.96	
2) Maximum Force	1850 - 2500 lb	1854	
3) Time >1000 lb	1.7 ms Minimum	1.8	
b. Left Side			
1) Probe Speed	6.76 - 7.04 fps	6.86	
2) Maximum Force	1850 - 2500 lb	1857	
3) Time >1000 lb	1.7 ms Minimum	1.8	

PART 572 DUMMY CALIBRATION TEST DATA*

NHTSA Dummy I.D. No.: A04

Laboratory Technicians: C. Haymaker

		Pre-test Calibration	Post-test Calibration
Date of Dummy Calibration		2/20/81	
Calibration Sequential Number for Dummy		24	
Temperature in Lab. (Spec. = 66 to 78 °F)		72	
Relative Humidity in Lab. (Spec. = 10 to 70%)		44	
Test Parameter	**Specification**		
1. Head Drop Test:			
a. Peak Resultant Accel	210 - 260G	256	
b. Peak Lateral Accel	$\leq$ 10G	0	
c. Time above 100G	0.9 - 1.5 ms	1.0	
2. Neck Bending Test:			
a. Pendulum Speed	21.5 - 25.5 fps	22.0	
b. Pendulum Avg Decel (over $t_3 - t_2$)	20 - 24G	23	
c. Peak Resultant Head Acceleration	26G Maximum	21	
d. Pendulum Decel ($t_2 - t_1$)	$\leq$ 3 ms	2	
e. Pendulum Decel ($t_3 - t_2$)	25 - 30 ms	28	
f. Pendulum Decel ($t_4 - t_3$)	$\leq$ 10 ms	4	
g. Pendulum Direction Reversal Time	$\geq$ 123 ms		
h. Maximum Head Rotation	63 to 73°	67	
i. Chordal Displacement:			
Head Rotation Angle			
0° Time	-2 - 2 ms		
0° Displ	-0.5 - 0.5 in.	0.0	
30° Time	25.6 - 34.4 ms	26.0	
30° Displ	2.1 - 3.1 in.	2.3	
60° Time	40.3 - 51.7 ms	43.0	
60° Displ	4.3 - 5.3 in.	4.4	
Maximum (73°) Time	53.2 - 66.8 ms	59.0	
Maximum (73°) Displ	5.0 - 6.0 in.	5.1	

* According to criteria established in NHTSA laboratory procedure TP-212-02, dated April 1, 1980, no post-test dummy calibration was required.

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A04

Test Parameter		Specification	Pre-test Calibration	Post-test Calibration
2. Neck Bending Test: (Continued)				
Head Rotation Angle				
60°	Time	67.0 - 83.0 ms	72.0	
	Displ	4.3 - 5.3 in.	4.4	
30°	Time	85.4 - 104.6 ms	91.0	
	Displ	2.1 - 3.1 in.	2.3	
0°	Time	101.0 - 123.0 ms	104.0	
	Displ	-0.5 - 0.5 in.	0.1	
3. Abdominal Compression Test: (Preload = 10 pounds)				
a. Force at 0.5 in.		14 - 26 lb	23	
b. Force at 0.75 in.		27 - 40 lb	35	
c. Force at 1.0 in.		40 - 53 lb	48	
d. Force at 1.3 in.		63 - 78 lb	69	
4. Lumbar Flexion Test:				
a. Force at 20°		22 - 34 lb	34	
b. Force at 30°		34 - 46 lb	45	
c. Force at 40°		46 - 58 lb	48	
d. Return Angle		12° Maximum	5	
5. Chest Impact Tests:				
a. High Speed				
1) Probe Speed		21.78-22.22 fps	21.99	
2) Peak Deflection		1.7 in. Maximum	1.4	
3) Peak Resistive Force		2250 lb Maximum	2114	
4) Internal Hysteresis		50 - 70%	68	
b. Low Speed				
1) Probe Speed		13.86-14.14 fps	13.96	
2) Peak Deflection		1.1 in. Maximum	0.9	
3) Peak Resistive Force		1450 lb Maximum	1333	
4) Internal Hysteresis		50 - 70%	62	

PART 572 DUMMY CALIBRATION TEST DATA (CONTINUED)

NHTSA Dummy I.D. No.: A04

Test Parameter	Specification	Pre-test Calibration	Post-test Calibration
6. Knee Impact Tests:			
a. Right Side			
1) Probe Speed	6.76 - 7.04 fps	6.90	
2) Maximum Force	1850 - 2500 lb	1874	
3) Time >1000 lb	1.7 ms Minimum	2.0	
b. Left Side			
1) Probe Speed	6.76 - 7.04 fps	6.80	
2) Maximum Force	1850 - 2500 lb	2152	
3) Time >1000 lb	1.7 ms Minimum	2.0	