Dynamic Science Report No. 212-DYS-82-006
Dynamic Science Report No. 219-DYS-82-006
Dynamic Science Report No. 301-DYS-82-014

DOT 0452

NEW VEHICLE ASSESSMENT AND STANDARDS ENFORCEMENT INDICANT TESTING FMVSS 212, 219, AND 301-75

FORD MOTOR COMPANY
1982 FORD ESCORT 4-DOOR HATCHBACK
NHTSA 820210

Prepared by:

DYNAMIC SCIENCE, INC.
A Talley Industries Company
1850 West Pinnacle Peak Road
Phoenix, Arizona 85027

APPROVED: TOM GRUBBS
CONTRACT TECHNICAL MANAGER
FMVSS 204/208/212/301
DATE: JUL 21 1982

July 1982

FINAL REPORT

Prepared for:

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OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, S.W.
WASHINGTON, D.C. 20590

DYNAMIC SCIENCE, INC. | Talley™ Industries
1850 West Pinnacle Peak Road · Phoenix, Arizona 85027
(602) 869-9331

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Prepared by Michael J. Rodack

Approved by Rod Garn

Date 7-15-82

Report Accepted by:

TOM GRUBBS

Contract Technical Manager
Office of Vehicle Safety Compliance

JUL 21 1982

Date

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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 NHTSA fixed load-measuring barrier at a speed of 34.52 mph.

The test was conducted at the Dynamic Science, Inc. Phoenix Facility on June 15, 1982, with the following results:

a. FMVSS 212 - Loss of windshield periphery was within allowable range.

b. FMVSS 219 - No intrusion into windshield protected zone.

c. FMVSS 301 - Fuel leakage was within the allowable range.

The right front passenger experienced a HIC value of 1070, in excess of the limit specified in FMVSS 208 criteria. All other values from both adult dummies satisfy FMVSS 208.

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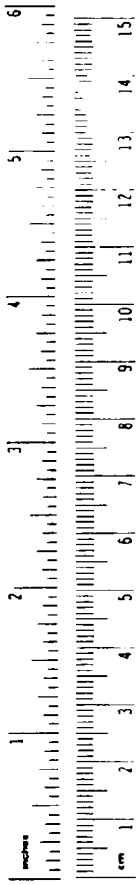
Form DOT F 1700.7 (8-69)

METRIC CONVERSION FACTORS

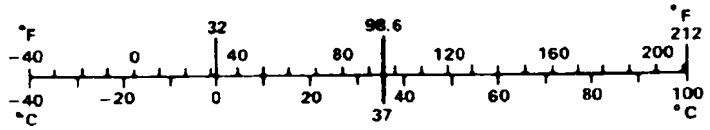
Approximate Conversions to Metric Measures

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



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1.0 PURPOSE AND TEST INTRODUCTION

1.1 PURPOSE

The purpose of the test was to subject a 1982 Ford Escort 4-Door Hatchback to the indicant test requirements of DOT Test Plan TP-212-02, April 4, 1980, Standard Enforcement Indicant Testing for FMVSS 212, "Windshield Mounting," FMVSS No. 219, "Windshield Zone Intrusion," and FMVSS No. 301-75, "Fuel System Integrity." Calibrated Part 572 50th-percentile male dummies were utilized to acquire data relative to FMVSS 208, "Occupant Crash Protection." 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).

1.2 INTRODUCTION

Section 2 contains General Test and Vehicle Parameter Data. Section 3 contains Compliance Related Data for FMVSS 212, 219, 301-75 Indicant Testing, together with photographs related to these tests. Section 4 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: Ford Escort

Body Style: 4-Door Hatchback Model Year 1982

NHTSA No. 820210 DSI No. 1247 Color: Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company

Date of Manufacture: 9/81 ; VIN: 1FABP0623CW146915

GVWR: 3030 lb; GAWR: Front = 1724 lb; Rear = 1422 lb

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL

Vehicle Capacity:	FRONT	REAR	RECOMMENDED TIRE SIZE:	LOAD RANGE:
Tire Pressure:	30 psi	30 psi	P165/80R13	STD

Designated Seating: 2 Front 2 Rear 4 Total

Cargo load = 150lb Is Spare Tire: Space Saver? P155/80D13

TOTAL = 750lb Standard Equipment? Yes

Engine: 4 Cylinder (CFM 1.6V2GKC2-EGR/A1P/TWC) 1.6 liter

Transmission: Manual 4 Speed Front Wheel Drive

Date Vehicle Received by Laboratory: 4/16/82 ; Odometer 405

Dealer Name & Address: NTS Via Auto Driveaway

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

Right Front = 639 lb Right Rear = 397 lb

Left Front = 634 lb Left Rear = 416 lb

TOTAL FRONT WEIGHT = 1273 lb (61 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 813 lb (39 % of Total Vehicle Weight)

TOTAL DELV. WEIGHT = 2086 lb

TARGET WEIGHT = UDW + Cargo Load + 328 lbs Dummies = 2564 lb

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 150 LB CARGO:

Right Front = 716 lb Right Rear = 592 lb

Left Front = 688 lb Left Rear = 588 lb

TOTAL FRONT WEIGHT = 1404 lb (54 % of Total Vehicle Weight)

TOTAL REAR WEIGHT = 1180 lb (46 % of Total Vehicle Weight)

TOTAL TEST WEIGHT = 2584 lb

Weight of ballast secured in vehicle trunk area = 0 lb

VEHICLE ATTITUDE: (inches)

Delivered Attitude: RF 30.00 LF 30.00 RR 30.00 LR 30.00

Test Attitude: RF 28-1/4 LF 29-1/2 RR 27-1/8 LR 27-1/4

REMARKS: Three-point belt system.

GENERAL TEST AND VEHICLE PARAMETER DATA (CONT)

POST-IMPACT DATA

Type of Test: Frontal (0°) Impact

Date of Test: 6/15/82 Time: 1348 Temperature 95 °F

Required Impact Velocity Range: 34.5 to 35.5 mph

Impact Velocity: Primary = N/A mph Secondary = 34.52 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 =	160.0	163.8	160.1
	Post-test =	138.5	140.4	136.1
	Crush =	21.6	23.4	24.0
Distance from front of test vehicle to point of impact:		17.3	17.3	17.3

VISIBLE DUMMY CONTACT POINTS

	Driver	Passenger
Head	Center of steering wheel hub, upper rim steering wheel	Top of head on dash
Chest	Lower rim of steering wheel	None
Abdomen	None	None
Left Knee	Dash panel	Glove box
Right Knee	Dash panel	Glove box

DOOR OPENING	Front		Rear	
	Left	Right	Left	Right
	Tools Required	Tools Required	Tools Required	Diffi-culty

SEAT MOVEMENT				
Seatback Failure	None	None		
Seat Shift (in.)	None	1-1/2" Forward		

GLAZING DAMAGE

Backlight/Windshield Severely cracked windshield.

OTHER NOTABLE IMPACT EFFECTS: Fender wells crushed to wheels. Steering column bent upwards. Severe crumpling in side rails under front seat compartment. Door outer skin of front doors underrode the outer forward skin of the rear doors.

3.0 COMPLIANCE-RELATED DATA FMVSS 212, 219, 301-75 INDICANT TESTING

The following data sheets and photographs document compliance data related to FMVSS 212, 219, and 301-75.

SUMMARY OF FMVSS 212 DATA

PRE-IMPACT DATA

Make/Model: Ford Escort
Body Style: 4-Door Hatchback Model Year: 1982
NHTSA No. 820210 DSI No. 1247 Color: Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company
Date of Manufacture: 9/81 ; VIN 1FABP0623CW146915
GVWR: 3030 lb; GAWR: Front = 1724 lb; Rear 1422 lb

POST-IMPACT DATA

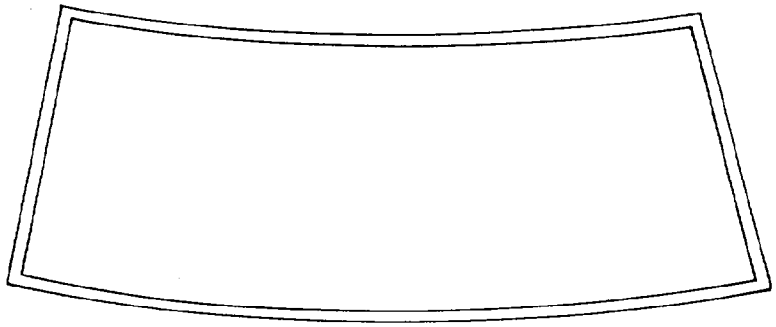
Type of Test: Frontal (0°) Impact
Date of Test: 6/15/82 Time: 1348 Temperature 95 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = N/A mph Secondary = 34.52 mph
Test Weight: 2584 lb Static Crush: 22.8 in.
Rebound Distance: 17.3 in.

DETAILS OF WINDSHIELD MOUNTING: The windshield is bonded all around the periphery. A 3/4-inch wide metal molding also traverses around the entire windshield.

	WINDSHIELD PERIPHERY		
	Pre-test	Post-test	Retention
RIGHT SIDE	70.3	70.3	100%
LEFT SIDE	70.0	70.0	100%
TOTAL	140.3	140.3	100%

The standard requires that POST-TEST be a minimum of 75 percent of the PRE-TEST total periphery measurement for vehicles not equipped with occupant passive restraints and 50 percent for each side of the windshield for vehicles which are equipped with occupant passive restraints.

SUMMARY OF FMVSS 212 DATA (Continued)



FRONT VIEW

AREA OF RETENTION FAILURE: None

SUMMARY OF FMVSS 219 DATA

PRE-IMPACT DATA

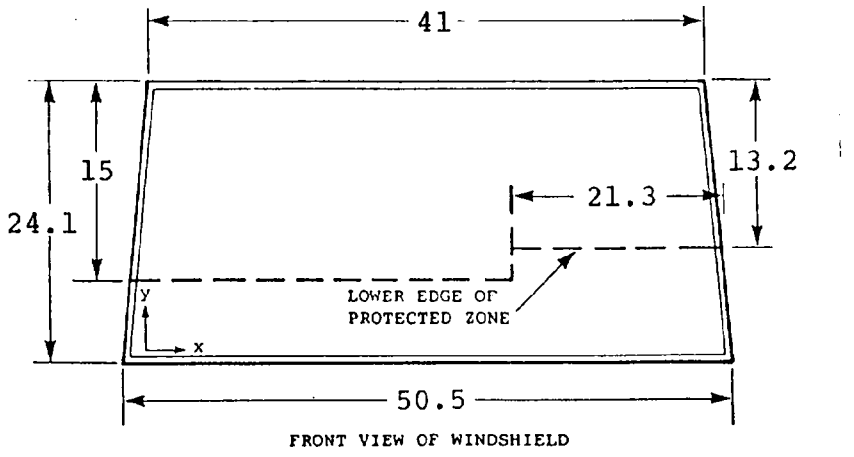
Make/Model: Ford Escort
Body Style: 4-Door Hatchback Model Year: 1982
NHTSA No.: 820210 DSI No. 1247 Color: Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company
Date of Manufacture: 9/81 ; VIN: 1FABP0623CW146915
GVWR: 3030 lb; GAWR: Front = 1724 lb; Rear = 1422 lb

POST-IMPACT DATA

Type of Test: Frontal (0°) Impact
Date of Test: 6/15/82 Time: 1348 Temperature 95 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = N/A mph Secondary = 34.52 mph
Test weight 2584 lb Static Crush 22.8 in. Rebound 17.3 in.



FRONT VIEW OF WINDSHIELD

A. The area that the "Protected Zone" template was penetrated more than 0.25 inch by a vehicle component other than one which is normally in contact with the windshield.

Coordinates

X	Y
None	None

SUMMARY OF FMVSS 219 DATA (CONTD)

B. The area beneath the "Protected Zone" that the inner surface of the windshield was penetrated by a vehicle component.

Coordinates	
X	Y
None	None

NOTE: There was no intrusion into the protected zone by any object.

SUMMARY OF FMVSS 301 DATA

PRE-IMPACT DATA

Make/Model: Ford Escort
Body Style: 4-Door Hatchback Model Year: 1982
NHTSA No.: 820210 DSI No. 1247 Color: Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company
Date of Manufacture: 9/81 ; VIN: 1FABP0623CW146915
GVWR: 3030 lb; GAWR: Front = 1724 lb; Rear = 1422 lb

POST-IMPACT DATA

Type of Test: Frontal (0°) Impact
Date of Test: 6/15/82 Time: 1348 Temperature 95 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = N/A mph Secondary = 34.52 mph
Test Weight 2584 lb Static Crush 22.8 in. Rebound 17.3 in.

FUEL SYSTEM DATA

Test fluid: Stoddard Solvent Specific Gravity: 0.764
Temperature: 95 °F
Kinematic Viscosity: 0.99 Centistokes Test Volume: 10.5 U.S. gal

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.

Details of fuel system: The rectangular shaped fuel tank is mounted under the rear seat by two 1-inch wide metal straps, hinged at the aft end and bolted to the floorpan at the front end. The filler tube is mounted on the right quarter panel aft of the rear wheel. The tube drops straight down until it is just below the right side frame rail, then it traverses forward and to the left at a 45° angle, then forward into the right rear of the fuel tank via a foot long rubber hose. Three lines exit the front of the tank as rubber hoses and connect to metallic lines at the rear of the foot floorpan. The three lines traverse forward along the inside edge of the right floorpan to the foremost edge of the pan. One line traverses to the inside edge of the left frame rail then forward to the firewall. It then travels up the firewall, along the left side of the engine compartment and connects to the vapor canister. The two other fuel

lines traverse forward along the inside of the right side frame rail to the firewall. The lines come up the right side of the firewall, below the front of the air cleaner, behind the engine, then attach to the fuel pump on the left side of the engine block. A line from the pump enters the carburetor.

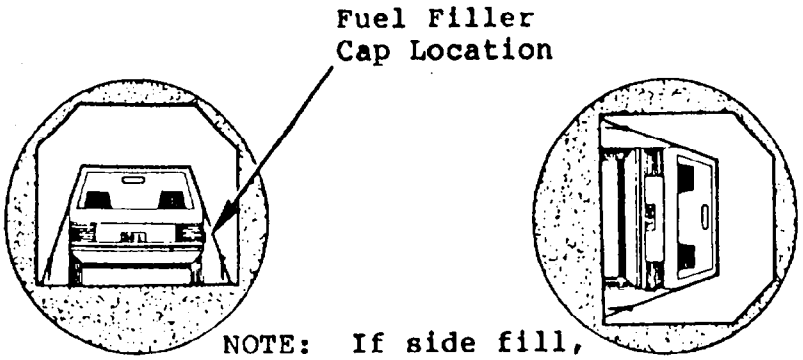
FUEL SPILLAGE MEASUREMENT

	ACTUAL	MAXIMUM ALLOWABLE
1. From impact until vehicle motion ceases. . . .	0.0	1 oz
2. For 5-minute period after vehicle motion ceases	0.0	5 oz
3. For next 25 minutes. . .	0.0	1 oz/min

SOLVENT SPILLAGE DETAILS: None.

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 0° to 90° VEHICLE NHTSA NO. 820210



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

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:

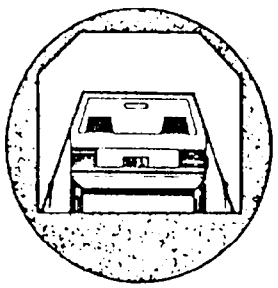
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	0	0	0	---

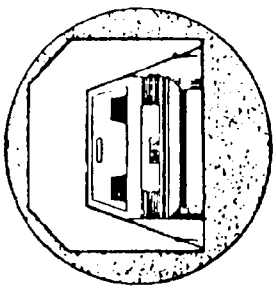
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): None.

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 90° to 180° VEHICLE NHTSA NO. 820210





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:

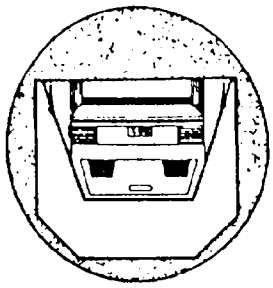
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	Trace	0	0	---

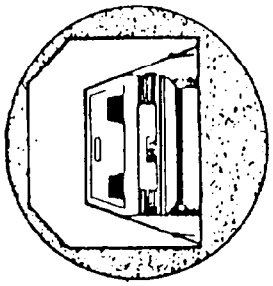
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): Air cleaner

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: 180° to 270° VEHICLE NHTSA NO. 820210





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:

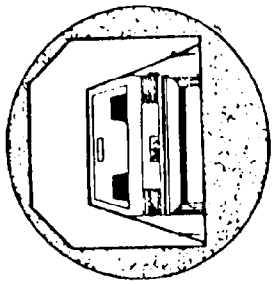
Time Period	First 5 min (from onset)	6th min	7th min	8th min (if req'd)
Maximum Spillage Allowed (oz)	5	1	1	1
Actual Spillage Recorded	Trace	0	0	---

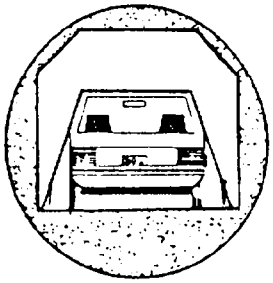
NOTE: Spillage is recorded in whole minute intervals only - as determined above.

SOLVENT SPILLAGE LOCATION(S): Air cleaner

FMVSS NO. 301 STATIC ROLLOVER DATA SHEET

TEST PHASE: **270°** to **360°** VEHICLE NHTSA NO. 820210





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.

FIGURE 3-1. PRE-TEST VIEW OF WINDSHIELD - 1982 FORD ESCORT, NHTSA 820210.

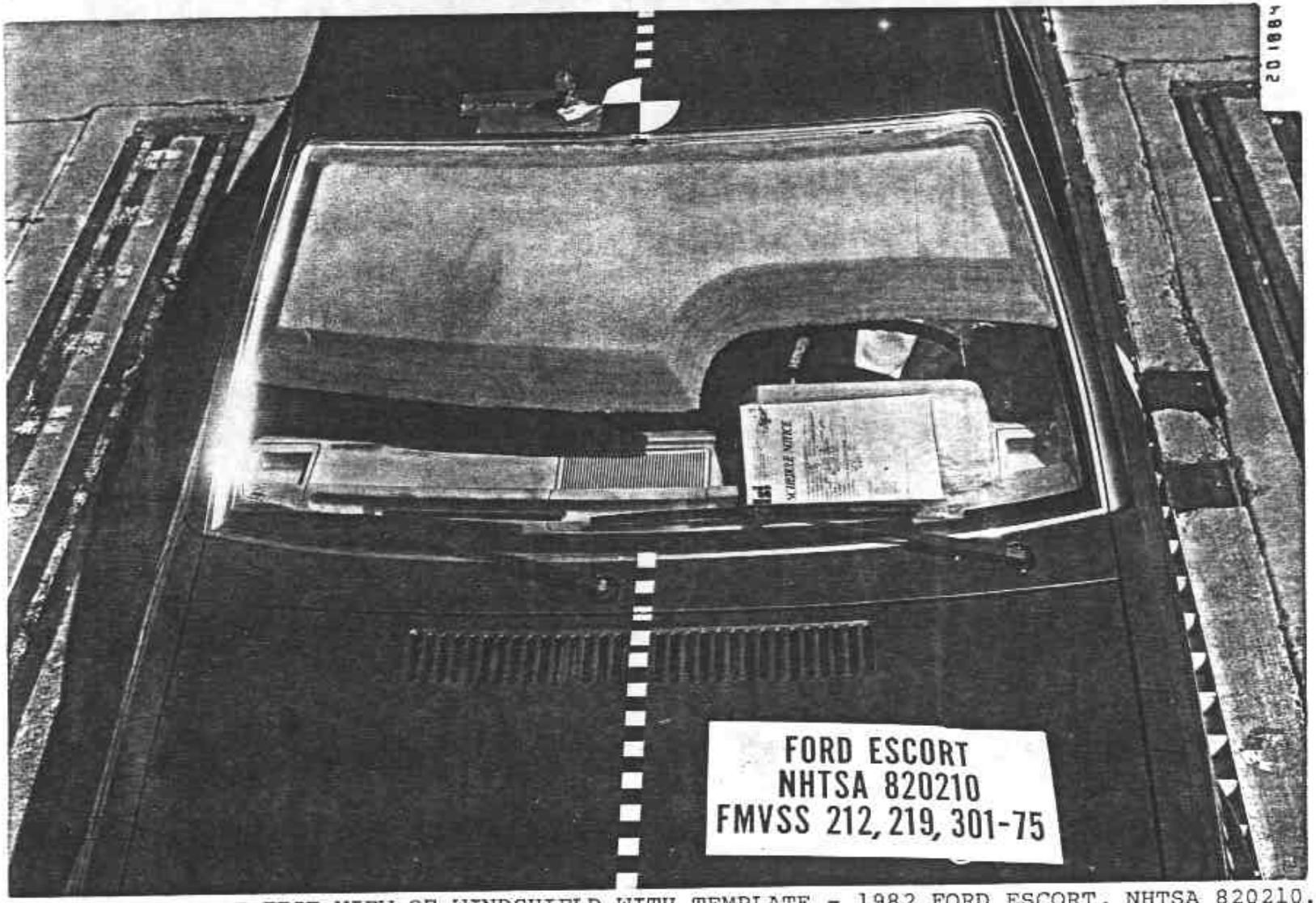


FIGURE 3-2. PRE-TEST VIEW OF WINDSHIELD WITH TEMPLATE - 1982 FORD ESCORT, NHTSA 820210.

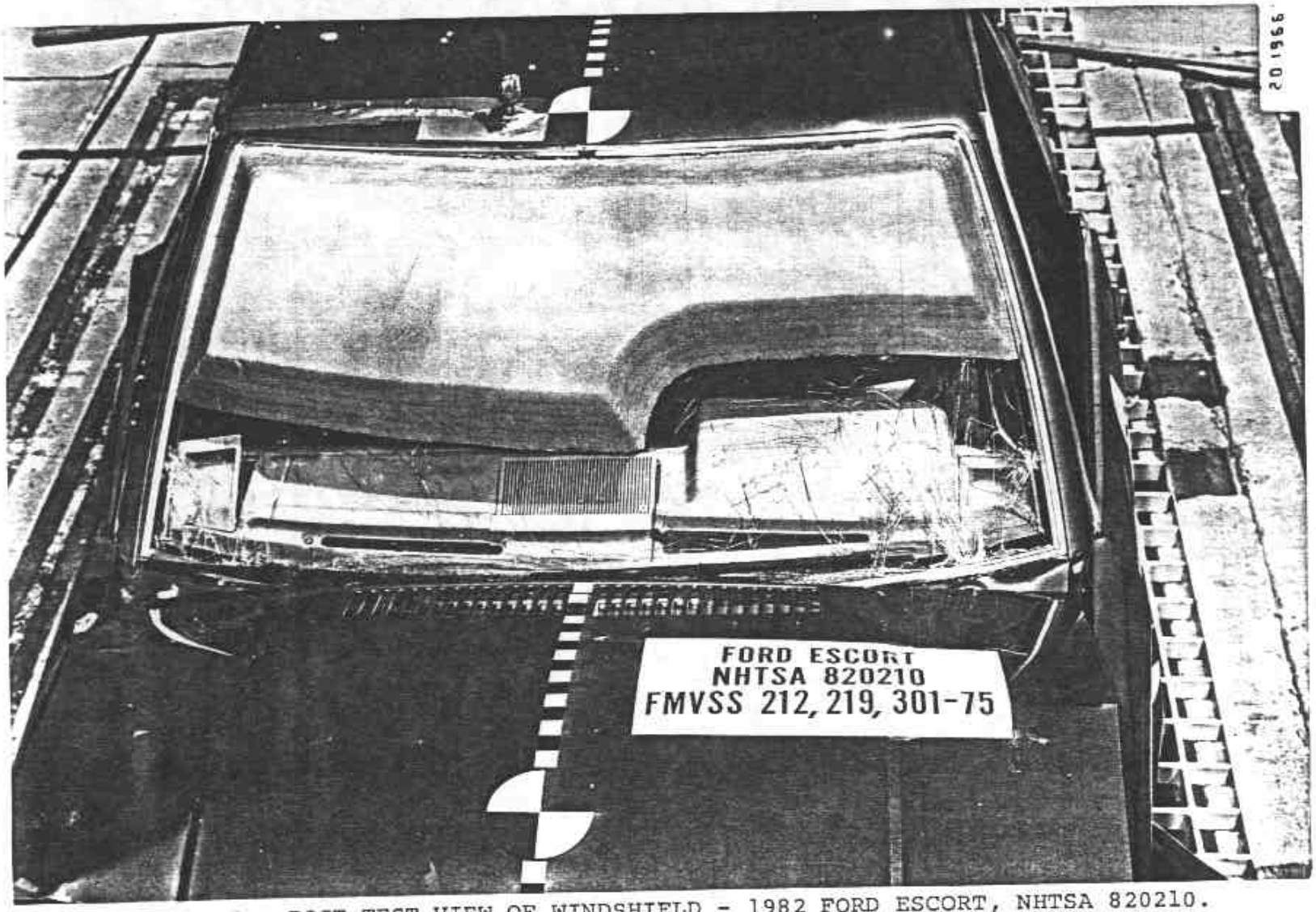


FIGURE 3-3. POST-TEST VIEW OF WINDSHIELD - 1982 FORD ESCORT, NHTSA 820210.

FIGURE 3-4. PRE-TEST VIEW OF FUEL TANK - 1982 FORD ESCORT, NHTSA 820210.

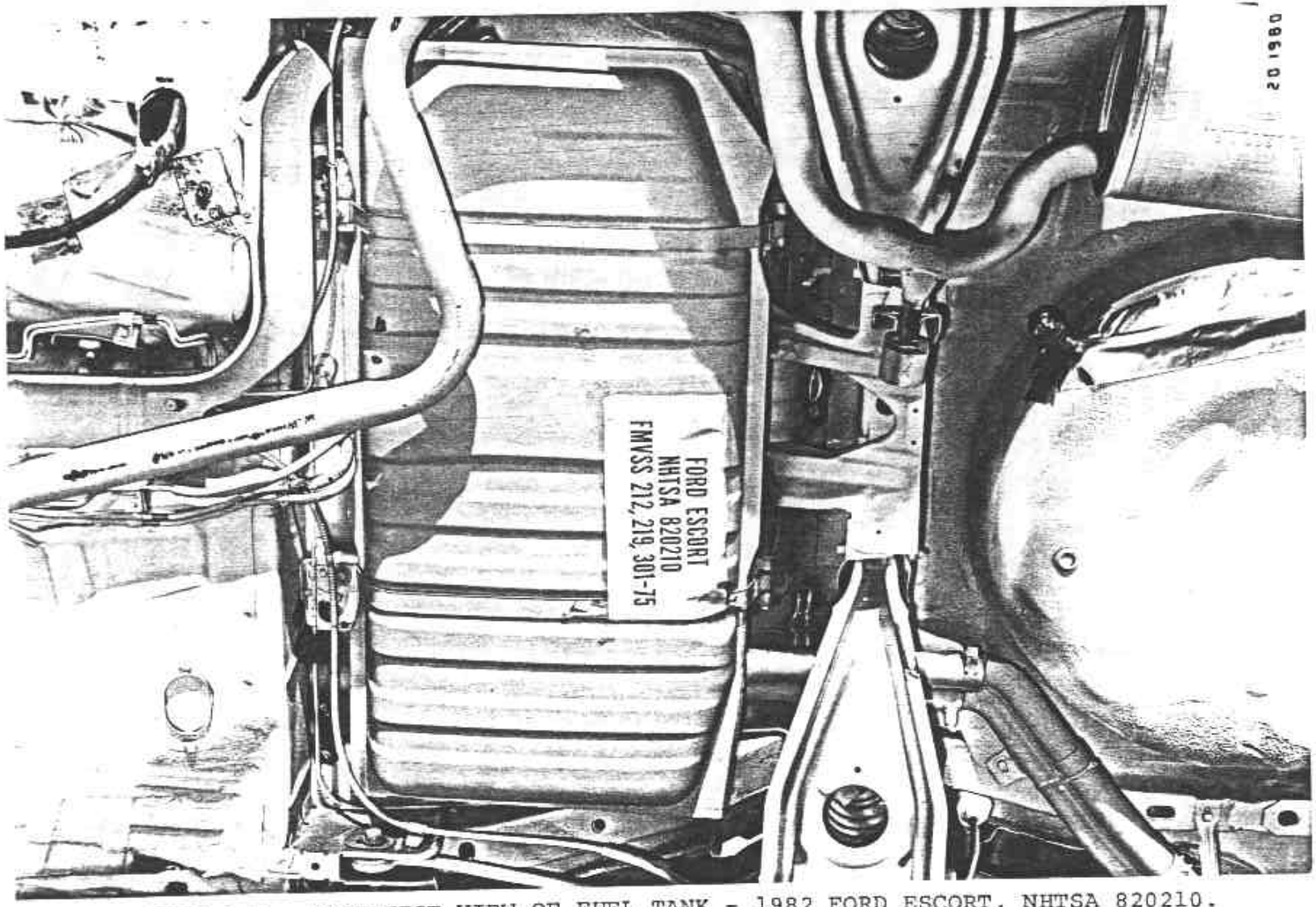


FIGURE 3-5. POST-TEST VIEW OF FUEL TANK - 1982 FORD ESCORT, NHTSA 820210.

4.0 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 movie 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.

Part 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET

PRE-IMPACT DATA

Make/Model: Ford Escort
Body Style: 4-Door Hatchback Model Year: 1982
NHTSA No.: 820210 DSI No. 1247 Color: Blue

DATA FROM CERTIFICATION LABEL

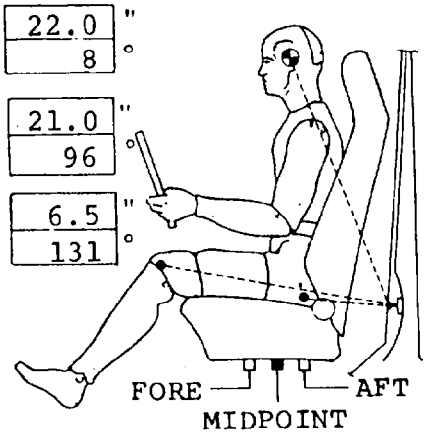
Vehicle Manufacturer: Ford Motor Company
Date of Manufacture: 9/81 ; VIN: 1FABP0623CW146915
GVWR: 3030 lb; GAWR: Front = 1724 lb; Rear = 1422 lb

POST-IMPACT DATA

Type of Test: Frontal (0°) Impact
Date of Test: 6/15/82 Time: 1348 Temperature 95 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = N/A mph Secondary = 34.52 mph
Seat Type: Bucket Adjuster Type: Manual
Rebound Distance 17.3 in. Static Crush: 22.8 in.
Technicians: M. Rodack, L. Johnson

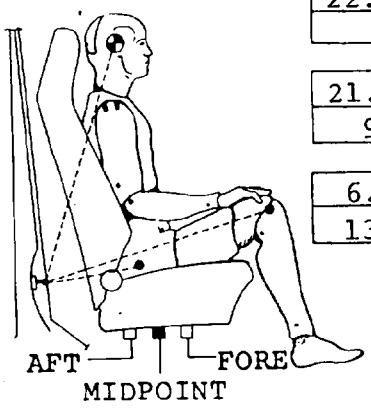
DRIVER DUMMY# A08

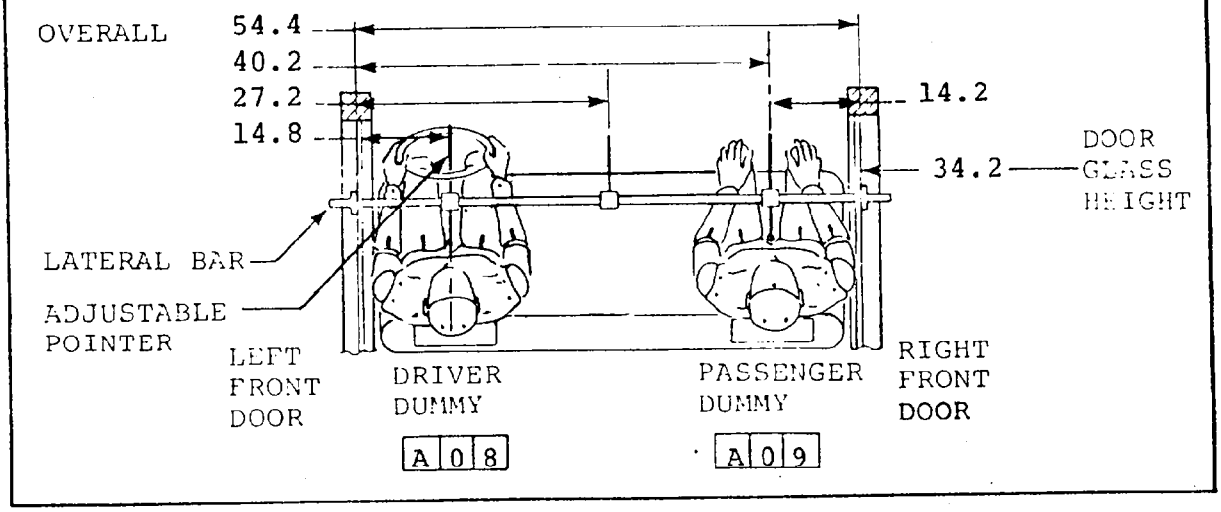
HEAD TARGET 22.0 " 8 °
KNEE JOINT 21.0 " 96 °
APPROX-IMATE "H" POINT 6.5 " 131 °



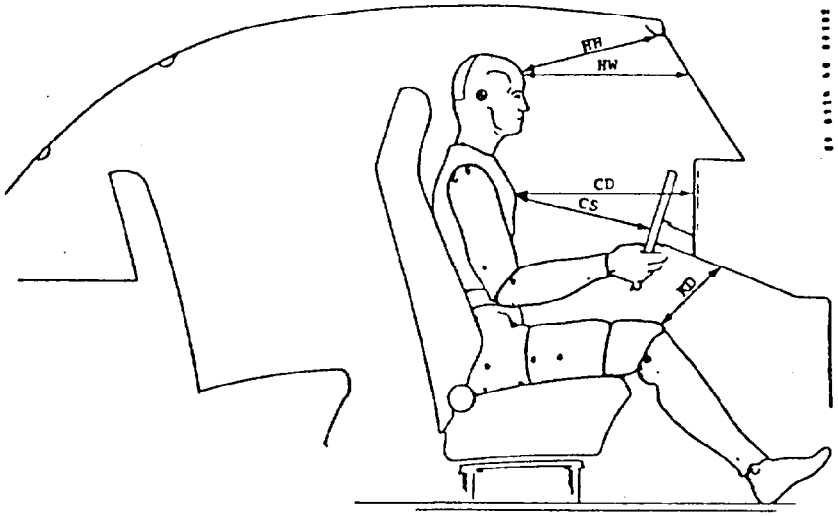
PASSENGER DUMMY # A09

22.0 " 8 ° HEAD TARGET
21.5 " 95 ° KNEE JOINT
6.5 " 130 ° APPROX-IMATE "H" POINT





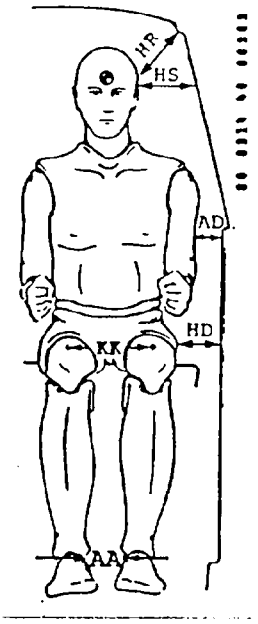
PART 572 DUMMY IN-VEHICLE POSITION RECORDING SHEET



	Driver	Passenger
HH	15.0	16.0
HW	21.1	22.1
CD	22.3	21.6
CS	14.6	N/A
KD L	6.7	5.0
KD R	6.5	5.0
Torso Angle	25°	Torso Angle 25°
Seat Back Angle	25°	Seat Back Angle 25°
HSW	21.5	N/A

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
Torso and seat back angles are relative to vertical.

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



	Driver	Passenger
HR	6.5	6.5
HS	7.2	7.2
AD	3.3	3.5
HD	6.0	5.8
KK	14.5	13.5
AA	11.0	9.0

PART 572 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	15.7	113	218.9	71	11.3	114	94.9	93
Lateral	20.0	71	22.4	73	19.0	100	10.5	110
Vertical	56.9	74	81.4	71	79.4	84	5.8	14
Resultant	232.9	71	-	-	110.6	84	-	-
HIC	950 between 68 and 82 msec,				1070 between 84 and 100 msec			
Chest Acceleration								
Longitudinal	5.2	157	52.0	62	2.4	198	40.2	92
Lateral	5.4	74	27.1	69	5.4	157	8.1	84
Vertical	12.3	106	20.5	83	6.5	95	15.5	85
Resultant (Max)	54.0	62	-	-	40.2	92	-	-
Resultant (clip)	47.4	61-64	-	-	38.8	91-94	-	-
TIME > 60 G	0 msec				0 msec			
SEVERITY INDEX	390 @ 200 msec				257 @ 200 msec			
	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)	Peak (lb)	Time (msec)
Femur Loads								
Left	216.3	47	1150.0	59	331.3	56	1517.9	40
Right	64.5	14	1050.2	59	720.2	48	1530.1	33
Belt Loads								
Lap	1131.2	62			955.9	70		
Torso	1461.2	66			1630.4	87		

Belt Stretch/ Spoolout Measurements	Peak (in.)	Time (msec)	Peak (in.)	Time (msec)
String Pot	3.17	73	4.23	80
Extensiometer @ Max Load	0.10 (2%)	66 (1461 lbs)	0.20 (4%)	87 (1630 lbs)
Extensiometer	0.10	66	0.20	87
Film Data	2.50	83	3.80	83

Vehicle Impact Speed (mph): 34.52

*Longitudinal: Forward
Lateral: Rightward
Vertical: Downward

**Longitudinal: Rearward
Lateral: Leftward
Vertical: Upward

218.9 vs 220.04

DUMMY KINEMATIC SUMMARY

1982 Ford Escort 4-Door Hatchback
NHTSA 820210

DRIVER - Dummy torso rotated forward after impact. Knees forced upward and loaded underside of dash. The dummy's chest struck the lower steering wheel rim at 59 ms. The dummy's forehead struck the upper steering wheel rim at 63 ms and his chin contacted the hub at 75 ms. The dummy rebounded into the seat with his head recontacting the head rest at 212 ms.

PASSENGER - Rotated forward after impact until his head contacted the dash at 82 ms. The dummy then rebounded into the seat with his head recontacting the head rest at 245 ms.

VEHICLE PROFILE DATA SHEET

PRE-IMPACT DATA

Make/Model: Ford Escort
Body Style: 4-Door Hatchback Model Year: 1982
NHTSA No.: 820210 DSI No. 1247 Color: Blue

DATA FROM CERTIFICATION LABEL

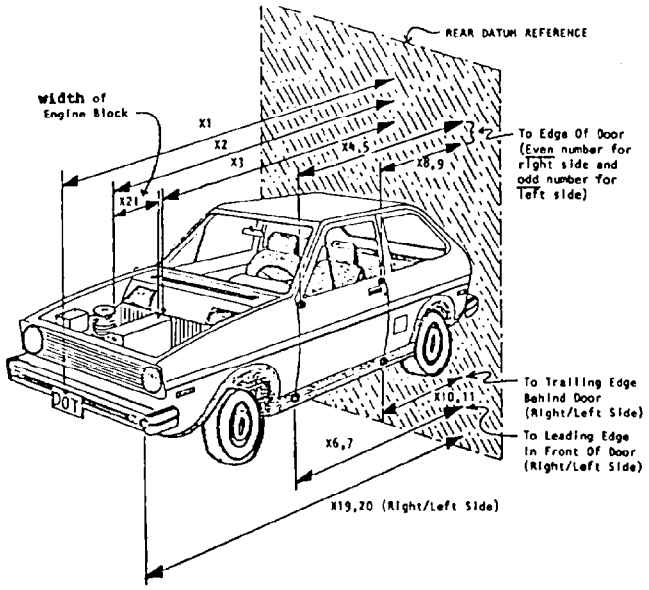
Vehicle Manufacturer: Ford Motor Company
Date of Manufacture: 9/81 ; VIN: 1FABP0623CW146915
GVWR: 3030 lb; GAWR: Front = 1724 lb; Rear = 1422 lb

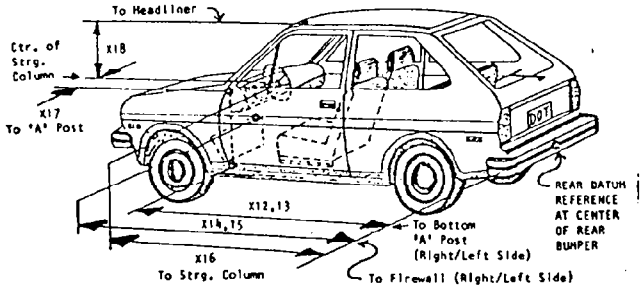
POST-IMPACT DATA

Type of Test: Frontal (0°) Impact
Date of Test: 6/15/82 Time: 1348 Temperature 95 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = N/A mph Secondary = 34.52 mph

Measurements Referenced to Plane 13.7 Feet Forward of Rear Bumper ℄

		Vehicle Left (in.)				Vehicle Right (in.)		
Location	Height	28.5	16.7	5.9	℄	5.9	16.7	28.5
		27.0	16.2	5.4	℄	5.4	16.2	27.0
		Pre-test Profile (in.)						
Top of Front Bumper		3.8	0.9	0.2	0.1	0.2	0.8	3.8
Front of Hood		10.1	7.7	7.0	7.0	7.0	7.6	10.1
		Post-test Profile (in.)						
Top of Front Bumper		27.7	25.0	24.2	24.0	23.7	23.8	25.3
Front of Hood		27.3	26.7	26.0	25.7	25.5	25.4	25.7
		Post-test Static Crush (in.)						
Top of Front Bumper		23.9	24.1	24.0	23.9	23.5	23.0	21.5
Front of Hood		17.2	19.0	19.0	18.7	18.5	17.8	15.6





301

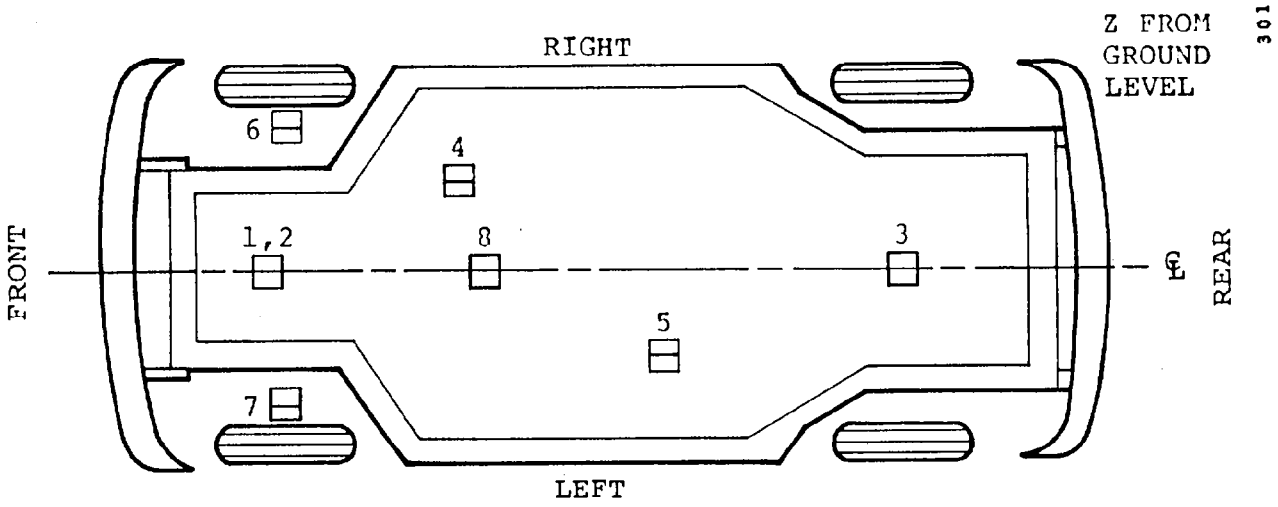
PRE-/POST-TEST STATIC MEASUREMENT DATA

Vehicle: Ford Escort NHTSA No.: 820210

Test Date: 6/15/82 D.S. No.: 1247

Reference Dimension	Pre-test Measurement	Post-test Measurement	Change
X_1	163.8	140.4	23.4
X_2	142.0	132.9	9.1
X_3	124.6	117.1	7.5
X_4	108.4	105.0	3.4
X_5	108.6	105.6	3.0
X_6	109.2	102.8	6.4
X_7	109.2	104.7	4.5
X_8	72.5	71.1	1.4
X_9	72.7	70.8	1.9
X_{10}	72.1	72.1	0.0
X_{11}	72.1	72.5	-0.4
X_{12}	107.9	102.8	5.1
X_{13}	107.9	104.3	3.6
X_{14}	124.6	117.3	7.3
X_{15}	124.6	117.9	6.7
X_{16}	96.3	94.2	2.1
X_{17}	14.2	13.7	0.5
X_{18}	16.8	15.0	1.8
X_{19}	160.0	138.5	21.5
X_{20}	160.1	136.1	24.0
X_{21}	13.6	13.6	0.0

VEHICLE ACCELEROMETER LOCATIONS AND SUMMARY

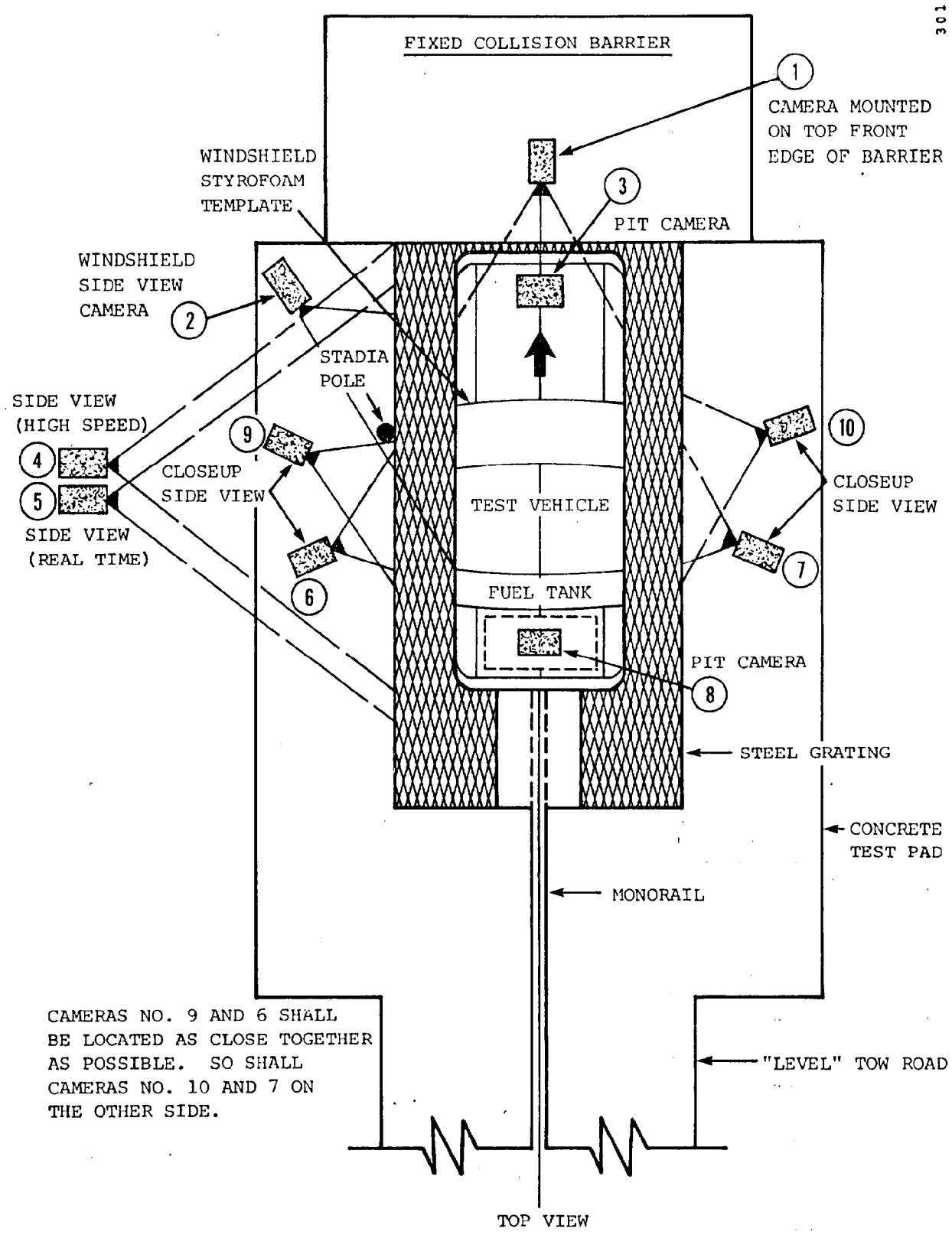


LINEAR ACCELEROMETERS

⊟ LONGITUDINAL

Vehicle Accelerometer Locations and Coordinates					Maximum Readings			
No.	Description of Location	X	Y	Z	+G's	MS	-G's	MS
1	Top of Engine	138.0	+10.1	32.6	50.9	41	110.9	31
2	Bottom of Engine	133.5	+11.2	11.2	*	34	151.1	26
3	Differential Housing	NA - Front Wheel Drive Vehicle						
4	Right Front Floorpan ΔV = 37.4 mph	94.7	+15.6	10.5	26.7	62	91.3	51
5	Left Rear Floorpan ΔV = 31.6 mph	61.6	-15.0	13.7	9.0	131	27.1	45
6	Right Front Brake Caliper	135.0	+20.8	11.9	34.7	54	72.0	38
7	Left Front Brake Caliper	135.0	-20.8	11.9	63.4	50	72.1	34
8	Vehicle C.G. ΔV = 31.3 mph	91.9	0.0	13.3	61.2	64	90.7	51

*Sensor damage at 34 ms.


301
FIXED COLLISION BARRIER
1
CAMERA MOUNTED ON TOP FRONT EDGE OF BARRIER
WINDSHIELD STYROFOAM TEMPLATE
3
PIT CAMERA
WINDSHIELD SIDE VIEW CAMERA
2
STADIA POLE
SIDE VIEW (HIGH SPEED)
4
5
SIDE VIEW (REAL TIME)
9
CLOSEUP SIDE VIEW
6
TEST VEHICLE
FUEL TANK
10
CLOSEUP SIDE VIEW
7
PIT CAMERA
8
STEEL GRATING
CONCRETE TEST PAD
MONORAIL
"LEVEL" 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	Serial Number	Impact Dist-X	Center-line Dist-Y	Camera Height
1	Overhead (Barrier)	Windshield stryrofoam up to barrier-vehicle contact if possible	10 mm	411 fps	101 Hz	M3	-1'	0	9'
2	Ground Based (Left)	Windshield	16 mm	382 fps	102 Hz	M7	-1'	11'	66"
3	Pit	Engine underside and fuel pump	13 mm	680 fps	109 Hz	6	4'	0	-8'
4	Ground Based (left)	Views entire left of vehicle	13 mm	379 fps	101 Hz	M9	8'	34'	52"
5	Ground Based (Real Time)	Documentary	Zoom	24 fps	-	Scoopic	-	-	-
6	Ground Based (Left)	Driver dummy closeup	13 mm	492 fps	101 Hz	LC 326	9'	16'	52"
7	Ground Based (Right)	Passenger dummy closeup	13 mm	488 fps	100 Hz	LC 327	9'	-12'	52"
8	Pit	Fuel tank	13 mm	550 fps	101 Hz	7	9'	0	-8'
9	Ground Based (Left)	Same view as Camera No. 6	15 mm	460 fps	100 Hz	8	8'	16'	52"
10	Ground Based (Right)	Same view as Camera No. 7	15 mm	590 fps	100 Hz	10	8'	-12'	54"
11	On-board	Driver retractor	8 mm	480 fps	101 Hz	12	-	-	-
12	On-board	Passenger retractor	8 mm	387 fps	101 Hz	11	-	-	-

APPENDIX A

PHOTOGRAPHS

FIGURE A-1. PRE-TEST FRONT VIEW - 1982 FORD ESCORT, NHTSA 820210.

FIGURE A-2. POST-TEST FRONT VIEW - 1982 FORD ESCORT, NHTSA 820210.

FIGURE A-3. PRE-TEST SIDE VIEW - 1982 FORD ESCORT, NHTSA 820210.

FIGURE A-4. POST-TEST SIDE VIEW - 1982 FORD ESCORT, NHTSA 820210.

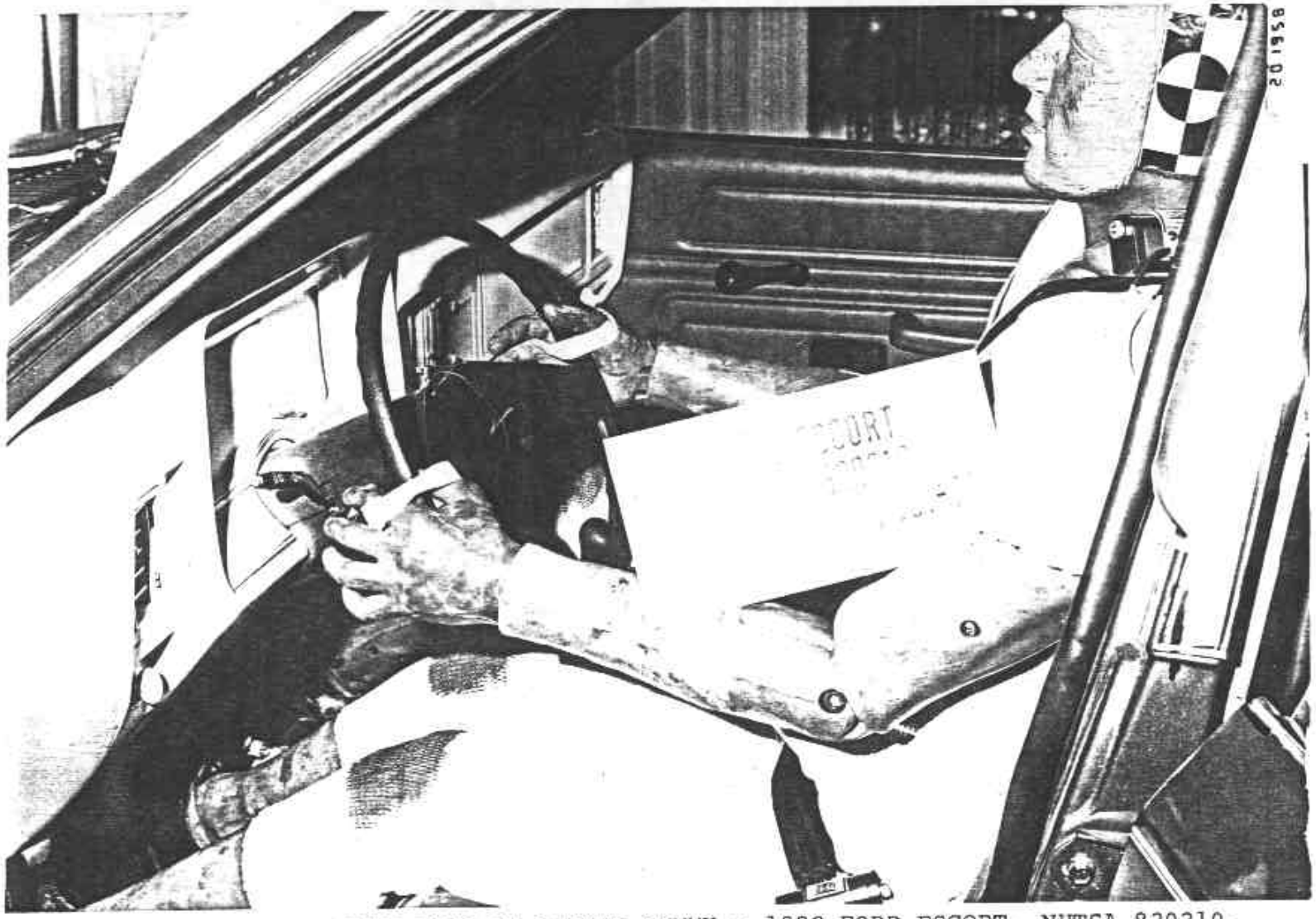


FIGURE A-5. PRE-TEST VIEW OF DRIVER DUMMY - 1982 FORD ESCORT, NHTSA 820210.

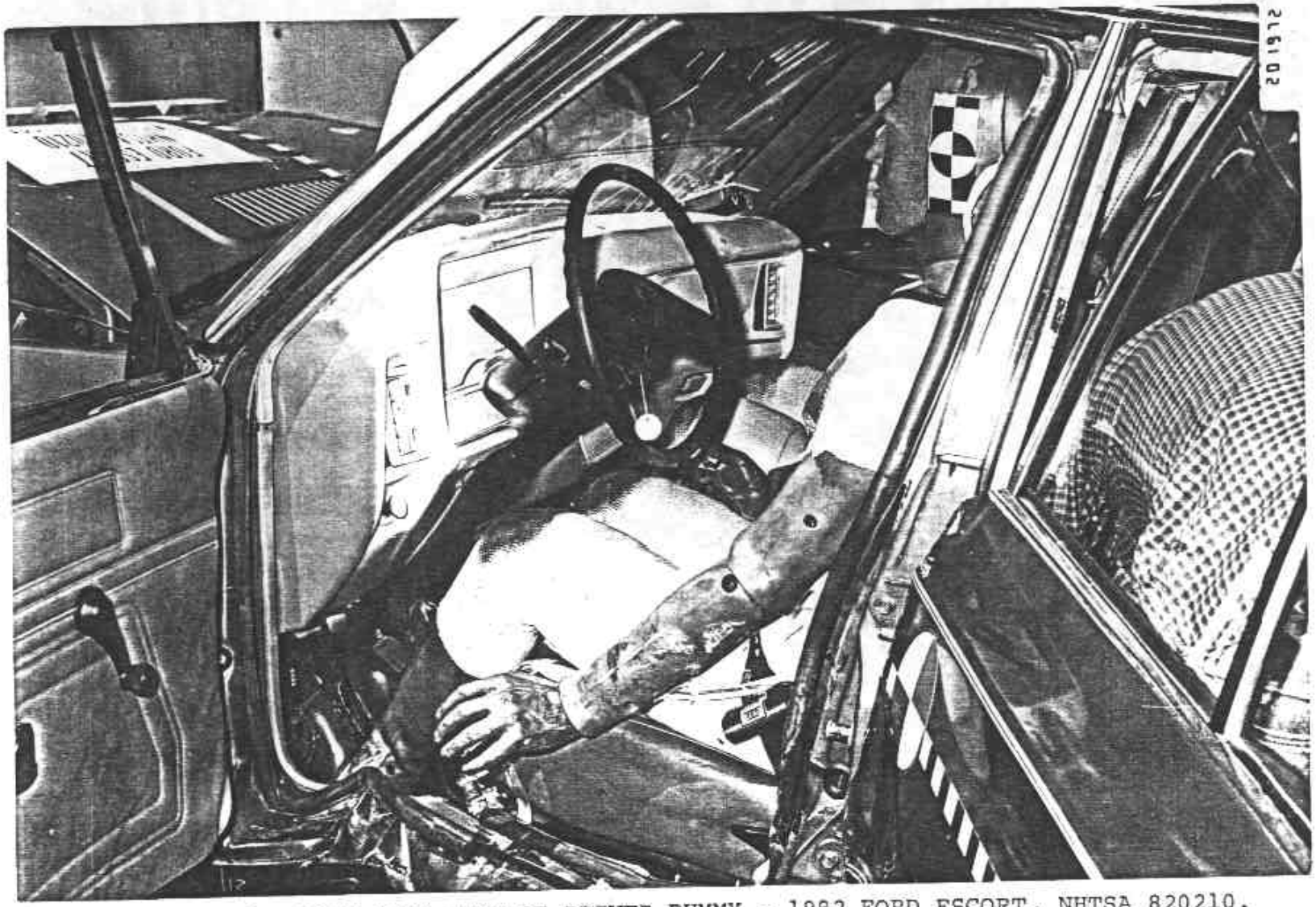


FIGURE A-6. POST-TEST VIEW OF DRIVER DUMMY - 1982 FORD ESCORT, NHTSA 820210.

FIGURE A-7. PRE-TEST VIEW OF PASSENGER DUMMY - 1982 FORD ESCORT, NHTSA 820210.

FIGURE A-8. POST-TEST VIEW OF PASSENGER DUMMY - 1982 FORD ESCORT, NHTSA 820210.

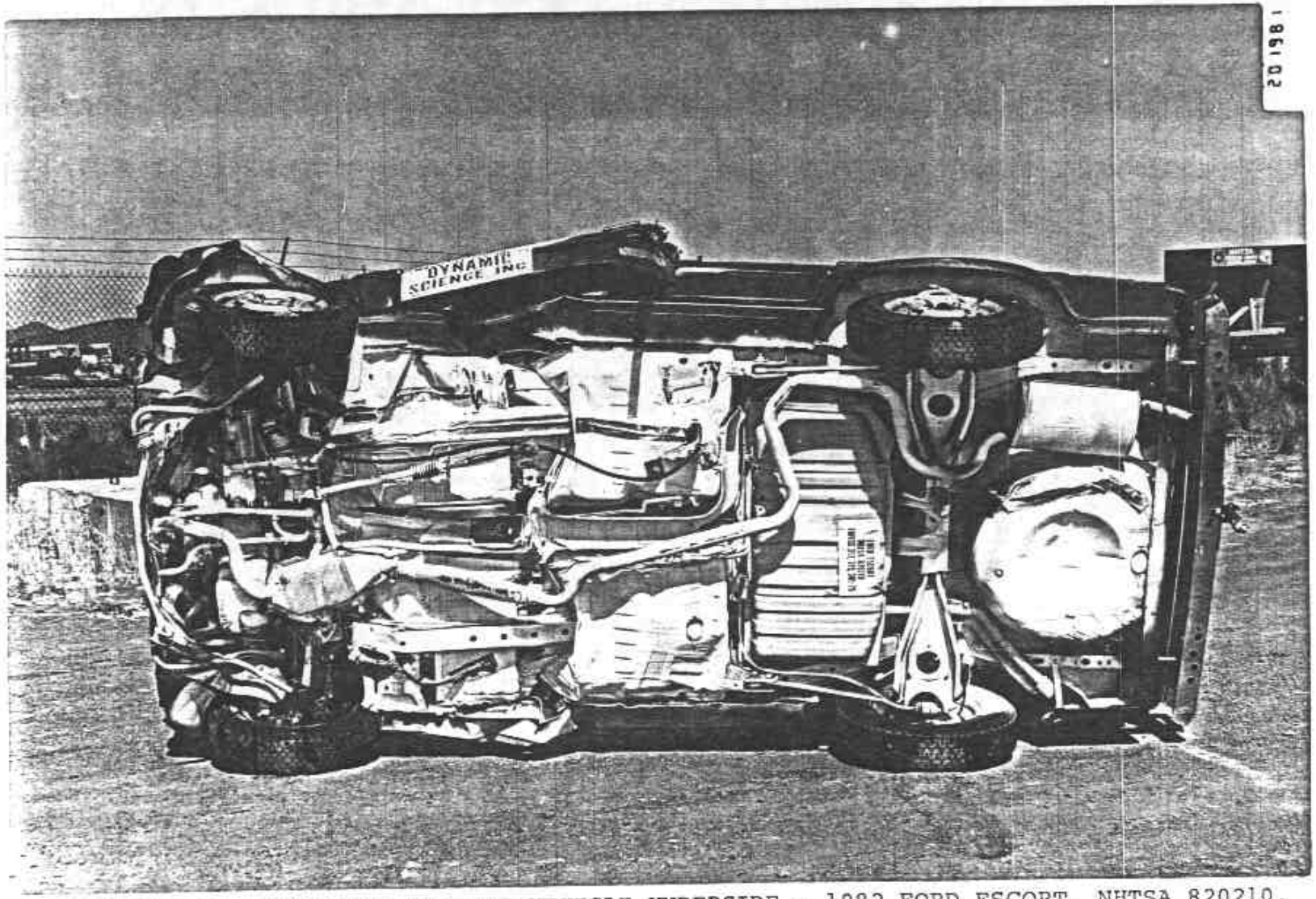


FIGURE A-9. POST-TEST VIEW OF VEHICLE UNDERSIDE - 1982 FORD ESCORT, NHTSA 820210.

APPENDIX B

CALCOMP PLOT PRESENTATION

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

PLOT LEGEND

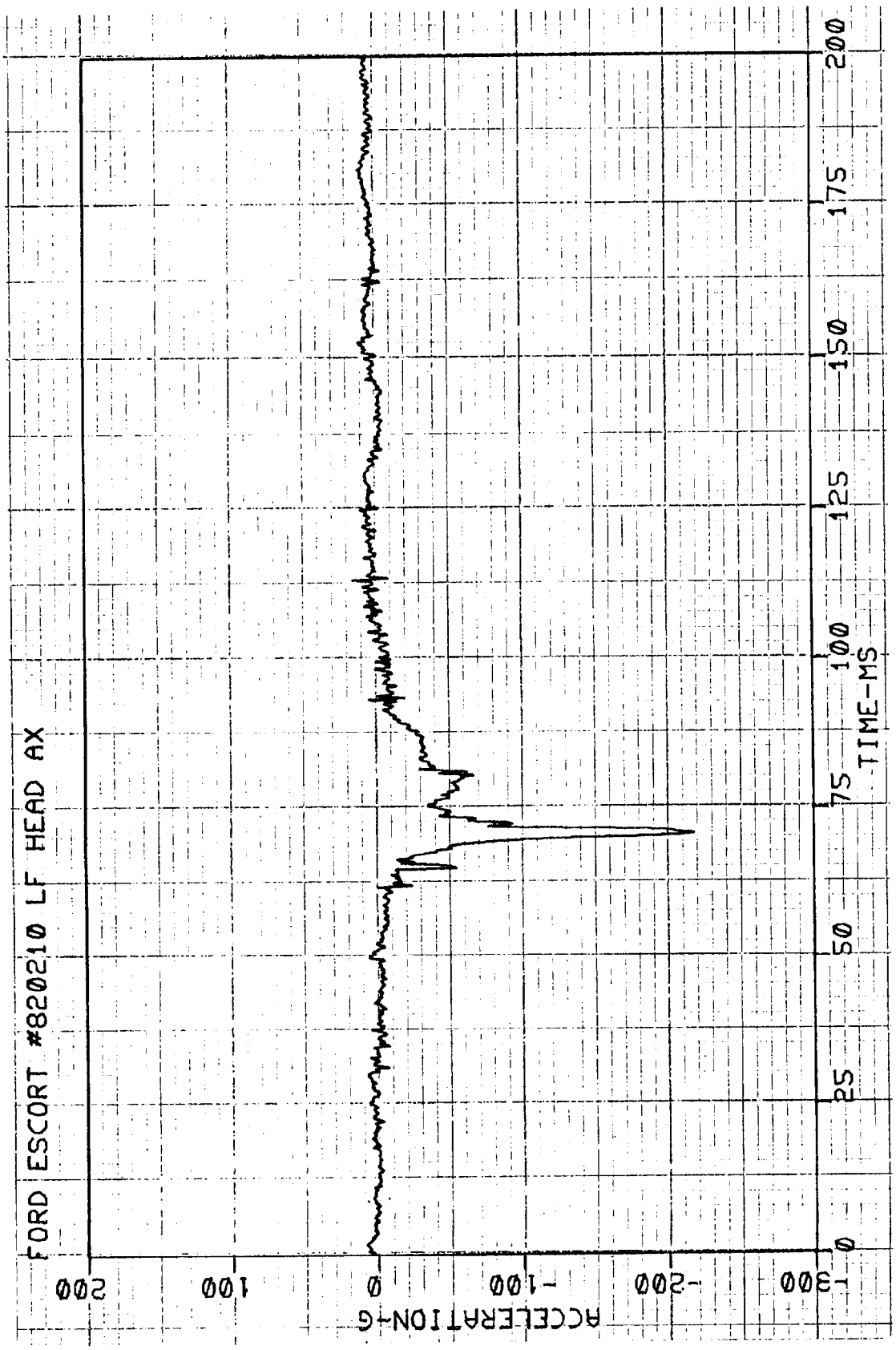
Dummy Data*

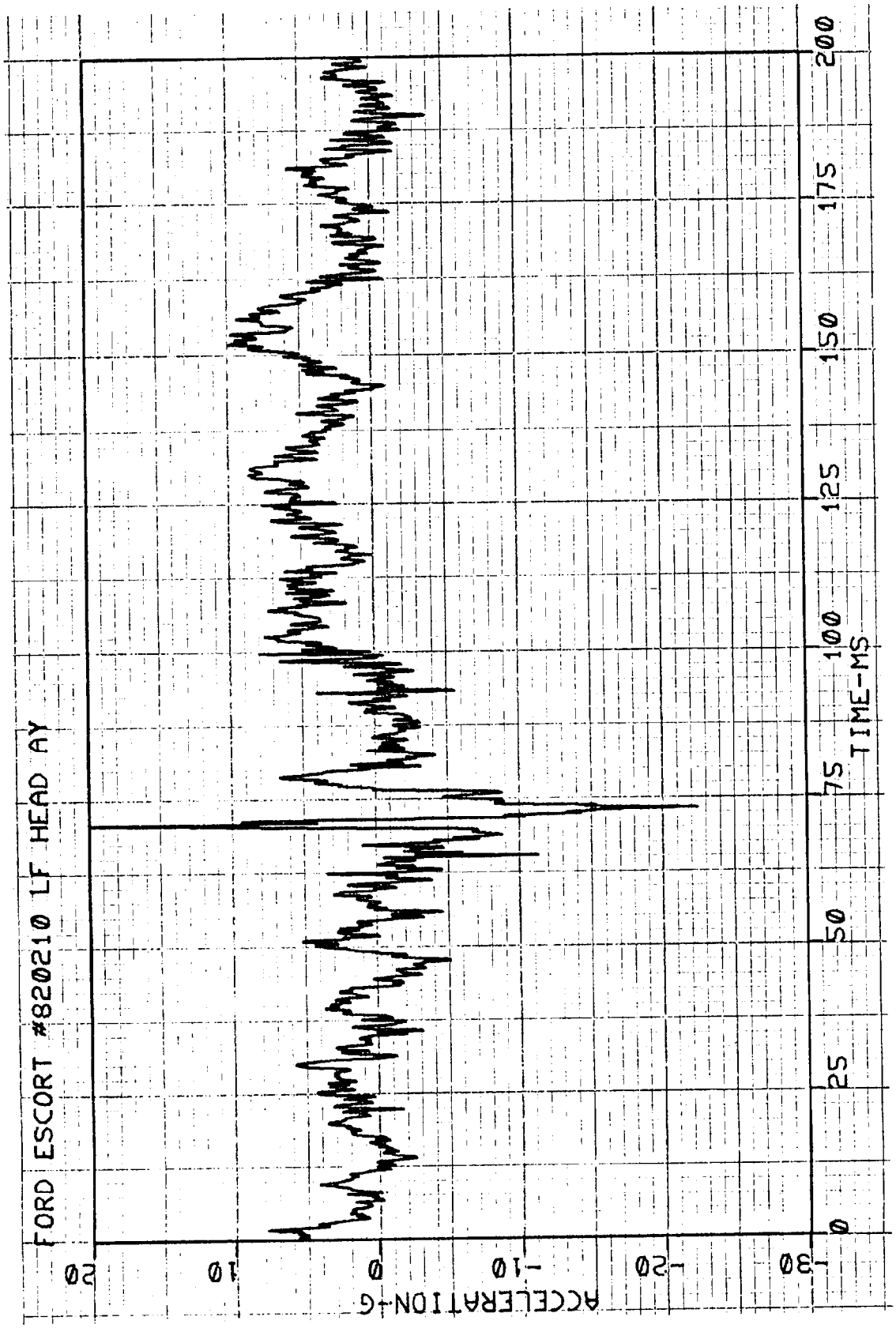
Driver	RF Outboard Passenger	Data Description
LF Head	RF Head	Head Acceleration (g)
LF Chest	RF Chest	Chest Acceleration (g)
LF Femurs	RF Femurs	Femur Loads (lb)
LF Belt Loads	RF Belt Loads	Lap and Torso Belt Loads (lb)
LF Belt Displacement	RF Belt Displacement	Belt Displacement (in.)
LF Extensiometer	RF Extensiometer	Belt Stretch

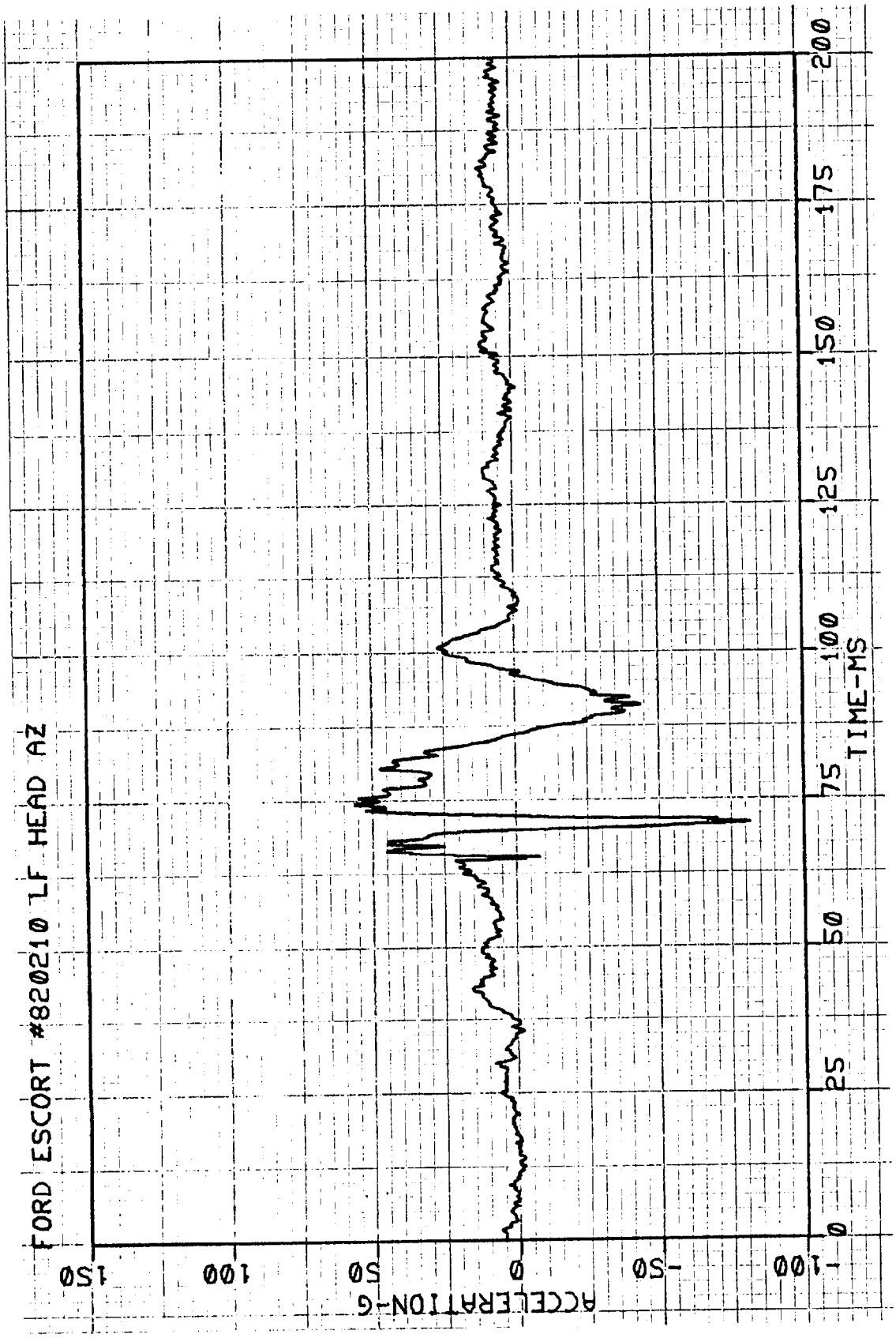
Vehicle Data**

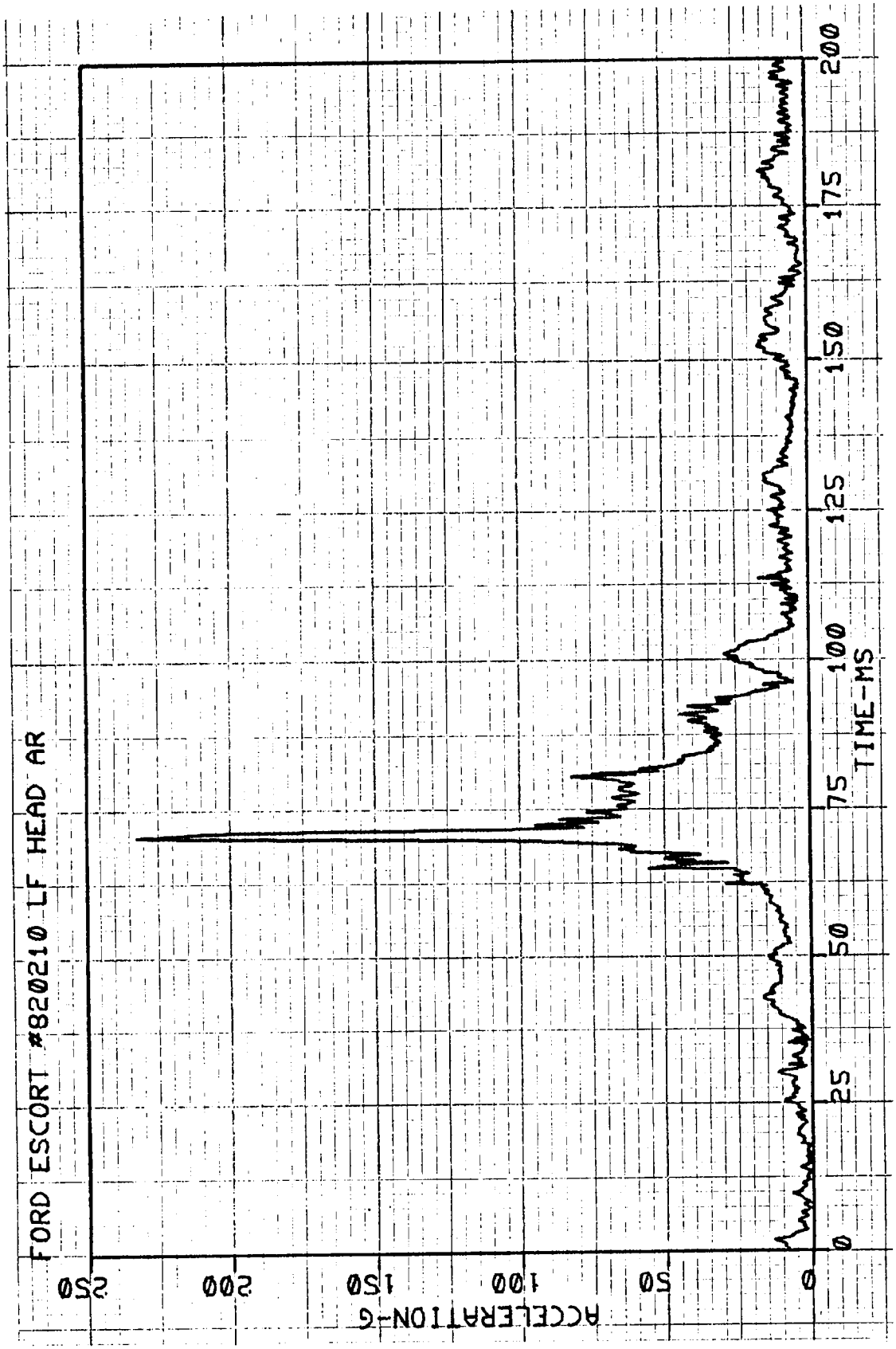
Location	Acceleration (g)
Loc 1	Top of Engine
Loc 2	Bottom of Engine
Loc 3	Differential Housing
Loc 4	Front Seat Area
Loc 5	Rear Seat Area
Loc 6	Right Front Brake Caliper
Loc 7	Left Front Brake Caliper
Loc 8	Vehicle C.G.

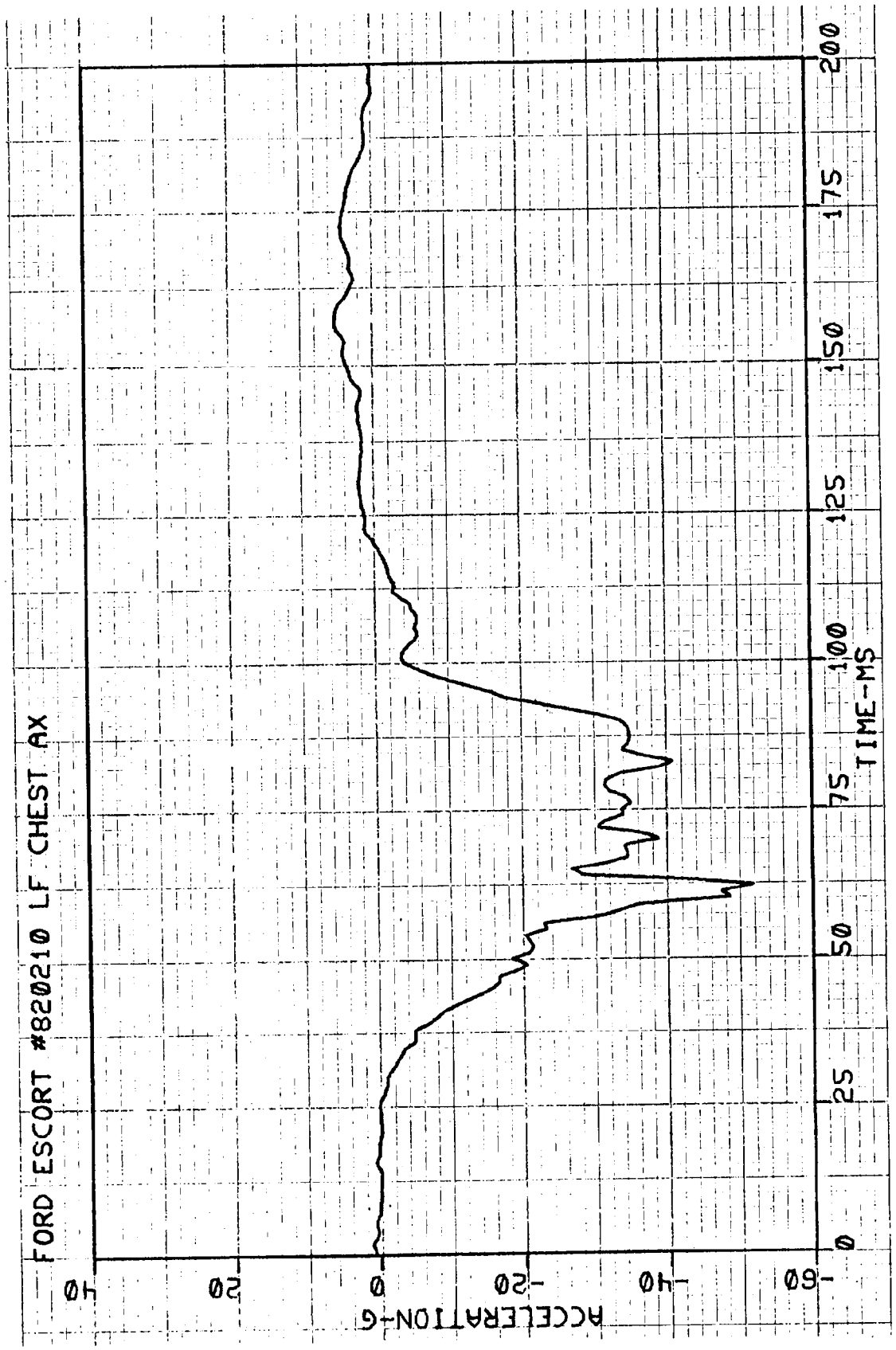
*Dummy Injury Summary presented on pages 4-4 and 4-5.
**Vehicle accelerometer locations and data summarized on page 4-8.

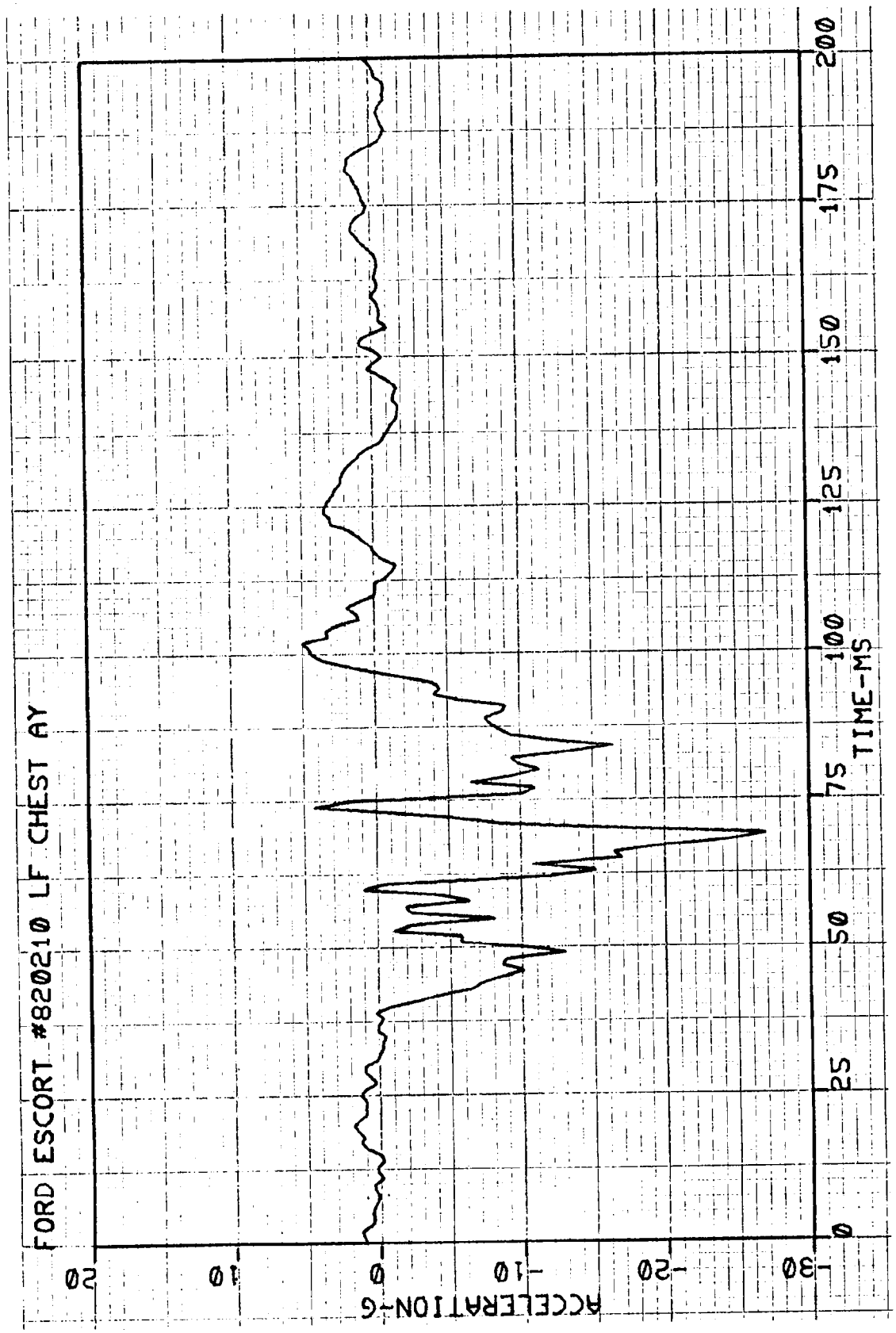

FORD ESCORT #820210 LF HEAD AX
ACCELERATION-G
TIME-MS
200
100
0
-100
-200
-300
0
25
50
75
100
125
150
175
200

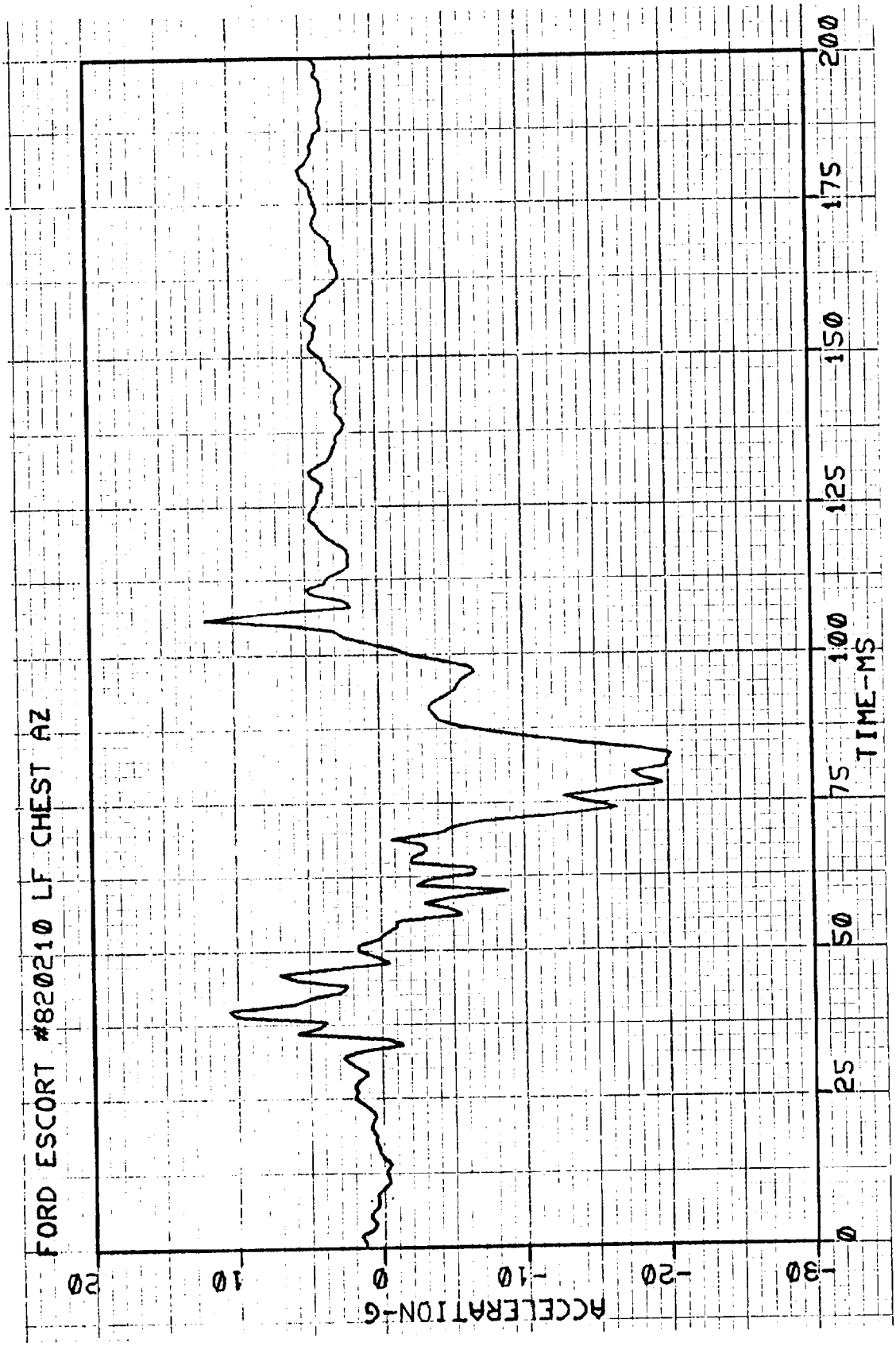

FORD ESCORT #820210 LF HEAD AY
ACCELERATION+G
20
10
0
-10
-20
-30
0
25
50
75
100
125
150
175
200
TIME-MS

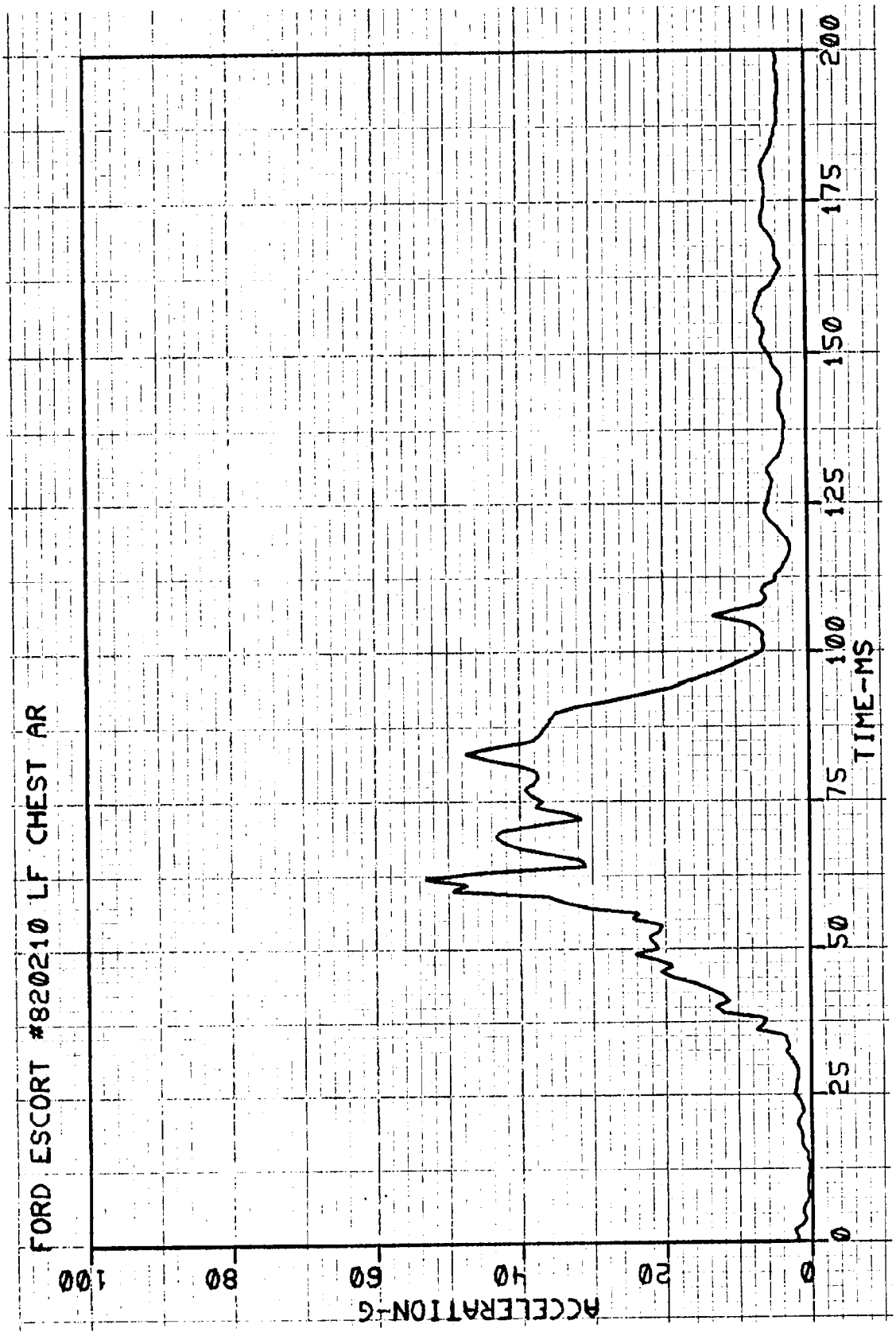

FORD ESCORT #820210 LF HEAD AZ
ACCELERATION-G
150
100
50
0
-50
-100
0
25
50
75
100
125
150
175
200
TIME-MS

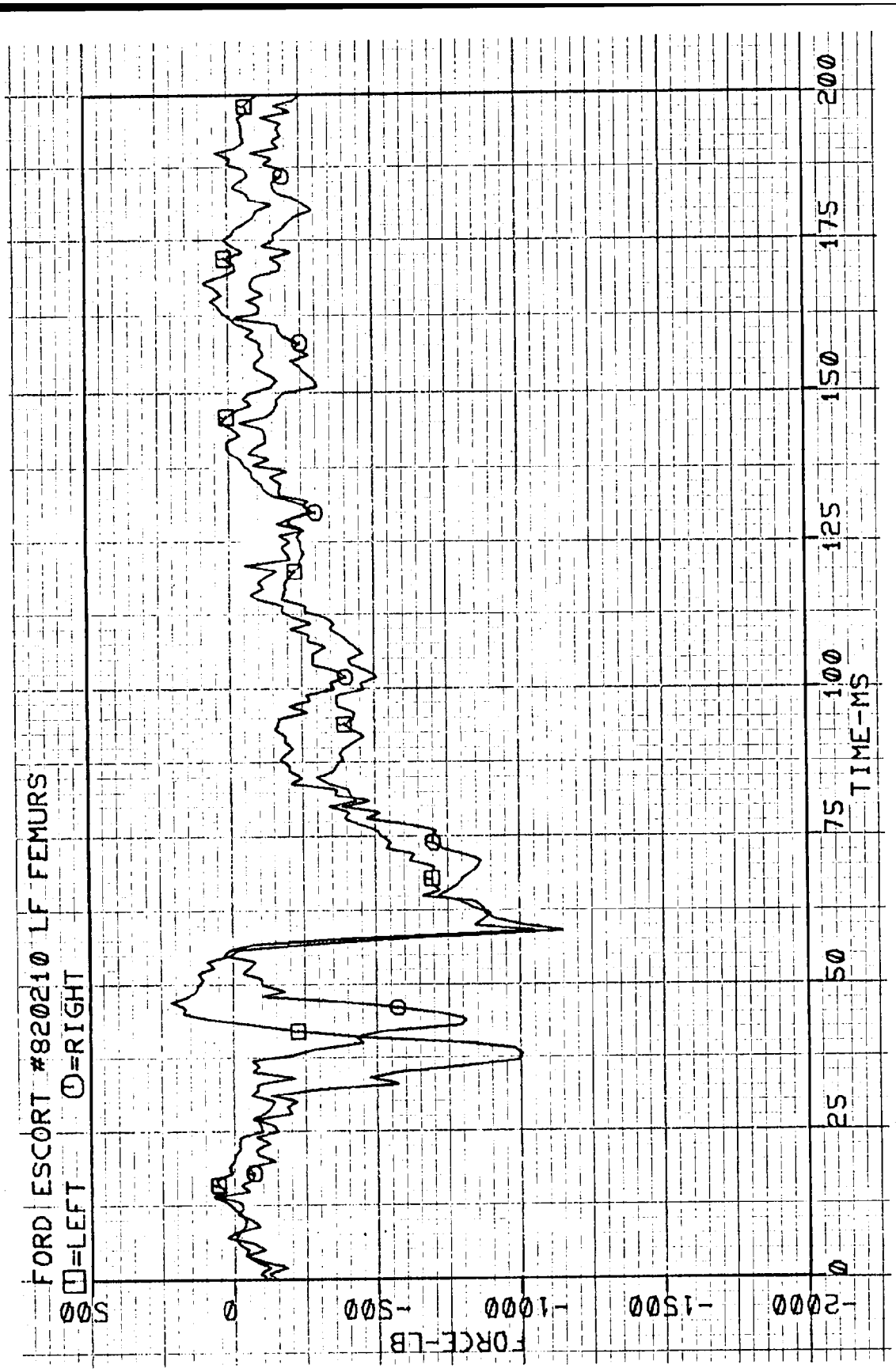

FORD ESCORT #820210 LF HEAD AR
ACCELERATION-G
0
50
100
150
200
250
TIME-MS
0
25
50
75
100
125
150
175
200

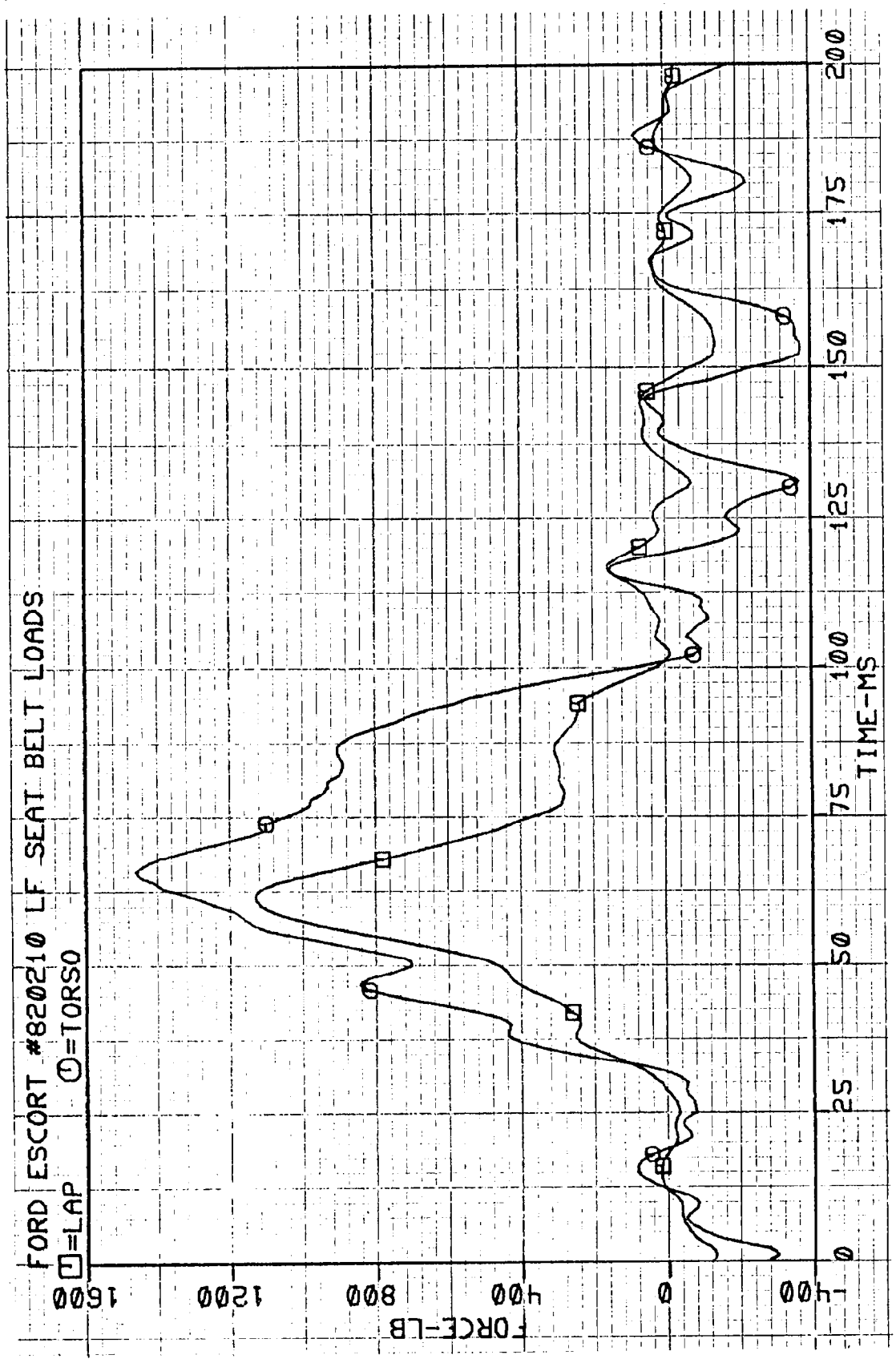

FORD ESCORT #820210 LF CHEST AX
ACCELERATION-G
TIME-MS
40
20
0
-20
-40
-60
0
25
50
75
100
125
150
175
200

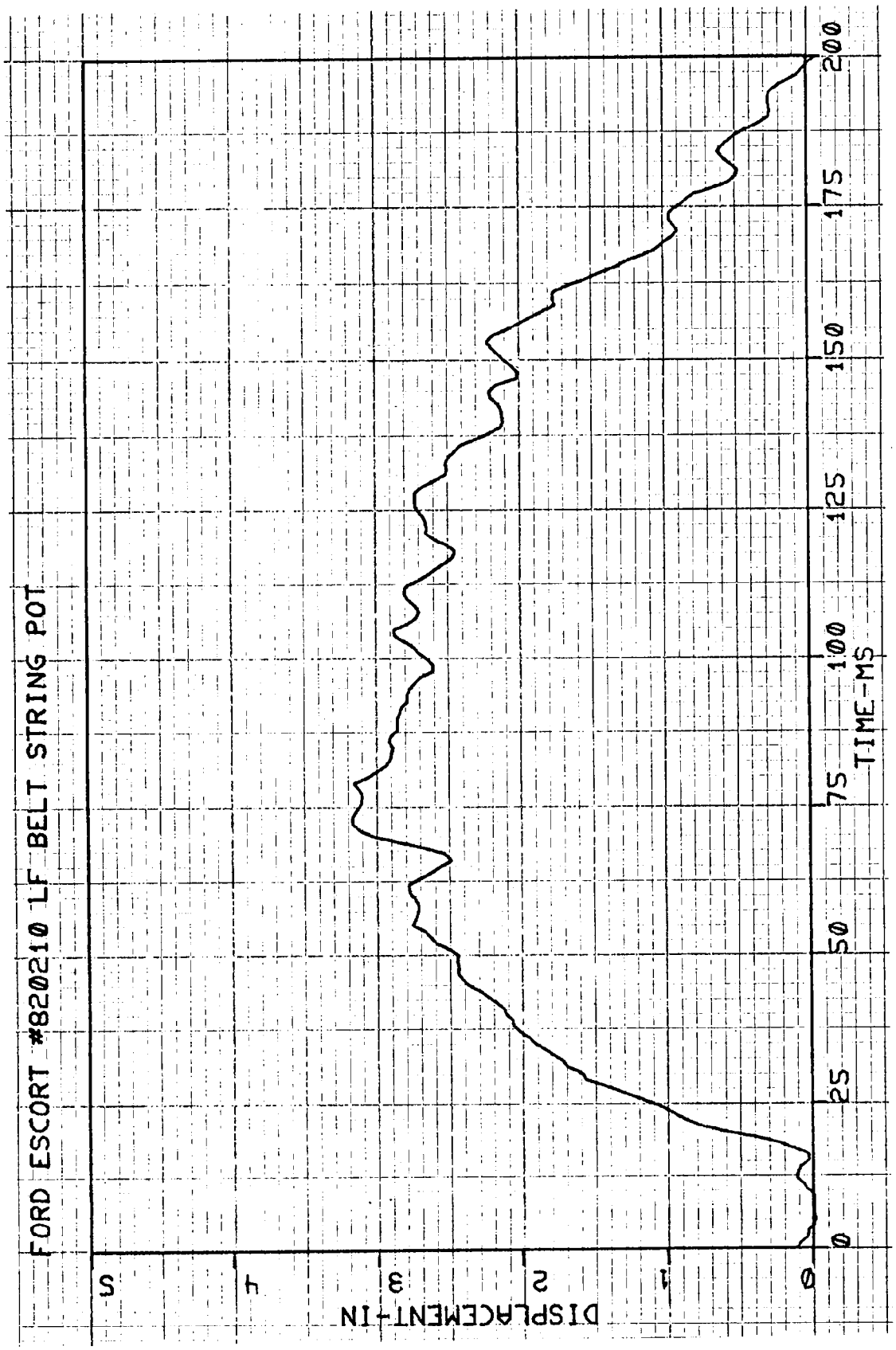

FORD ESCORT #820210 LF CHEST AY
ACCELERATION-G
20
10
0
-10
-20
-30
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LF CHEST AZ
ACCELERATION-G
20
10
0
-10
-20
-30
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LF CHEST AR
ACCELERATION-G
0
20
40
60
80
100
TIME-MS
0
25
50
75
100
125
150
175
200


FORD ESCORT #820210 LF FEMURS
□=LEFT ○=RIGHT
FORCE-LB
TIME-MS
500
0
-500
-1000
-1500
-2000
0
25
50
75
100
125
150
175
200


FORD ESCORT #820210 LF SEAT BELT LOADS
□=LAP
○=TORSO
FORCE-LB
-400
0
400
800
1200
1600
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LF BELT STRING POT
DISPLACEMENT-IN
0
1
2
3
4
5
TIME-MS
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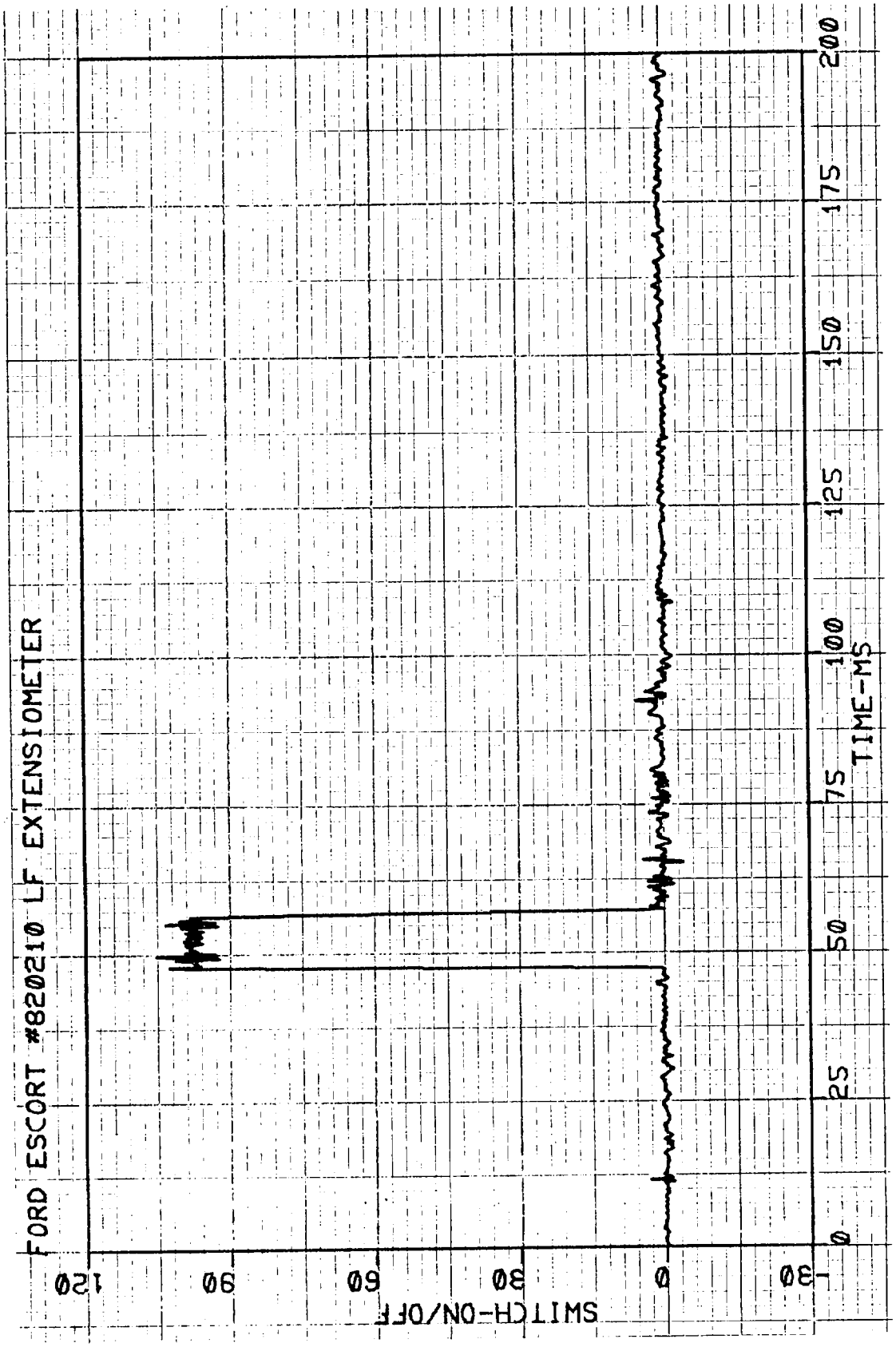
25
50
75
100
125
150
175
200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30
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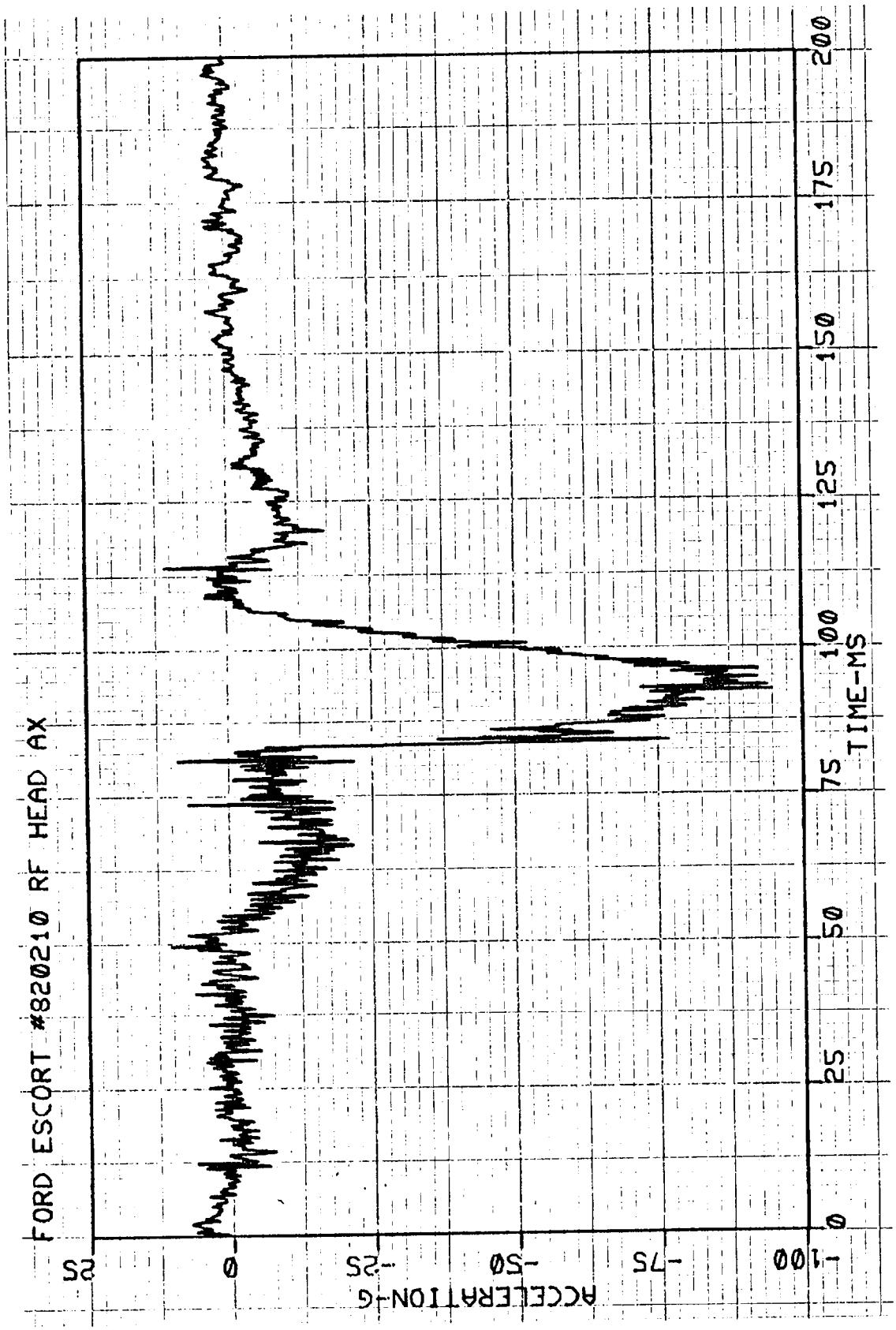
125
150
175
200
TIME-MS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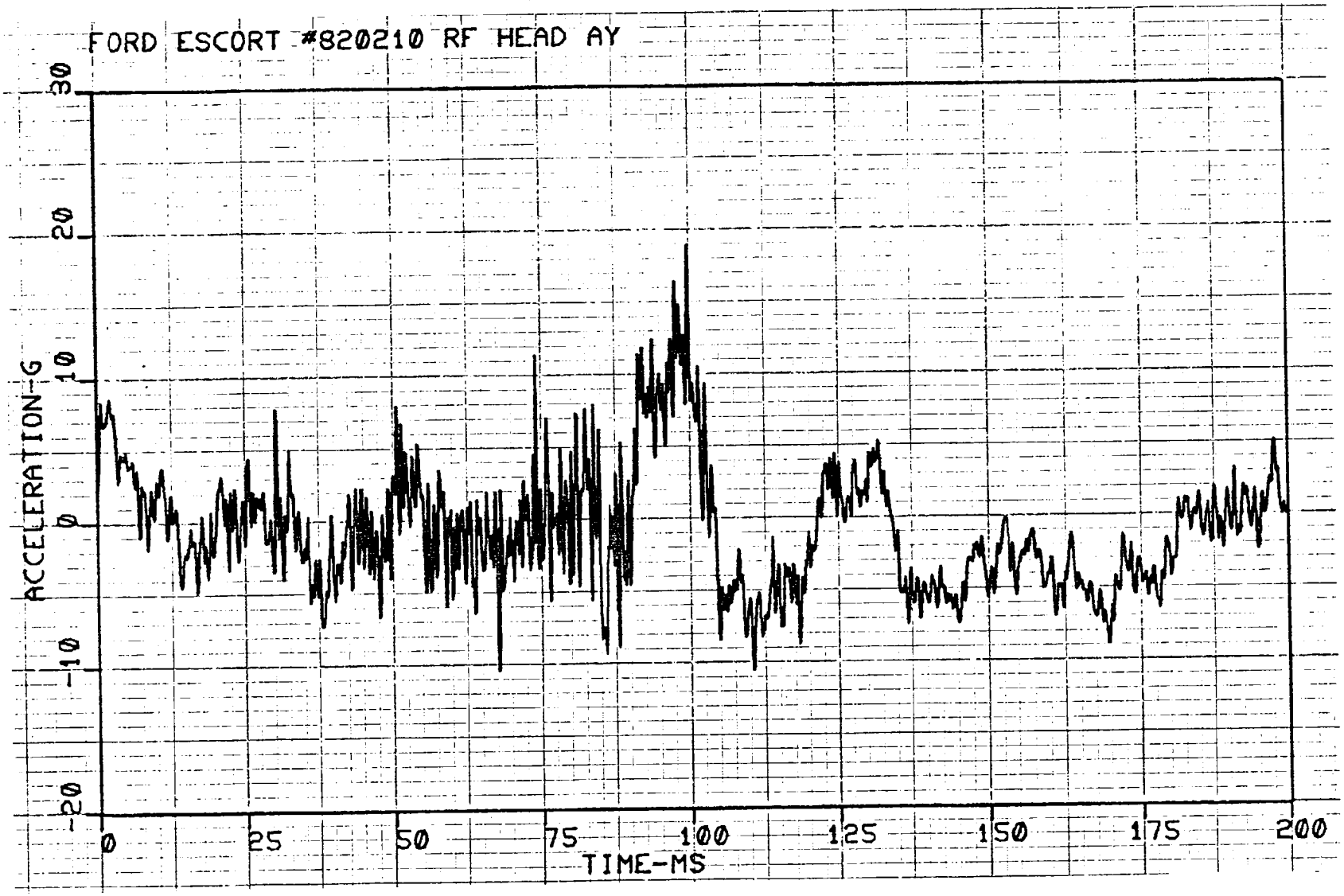
-25
-50
-75
-100
0
25
50
75
100
125
150
175
200
TIME-MS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20
10
0
-10
-20
0
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50
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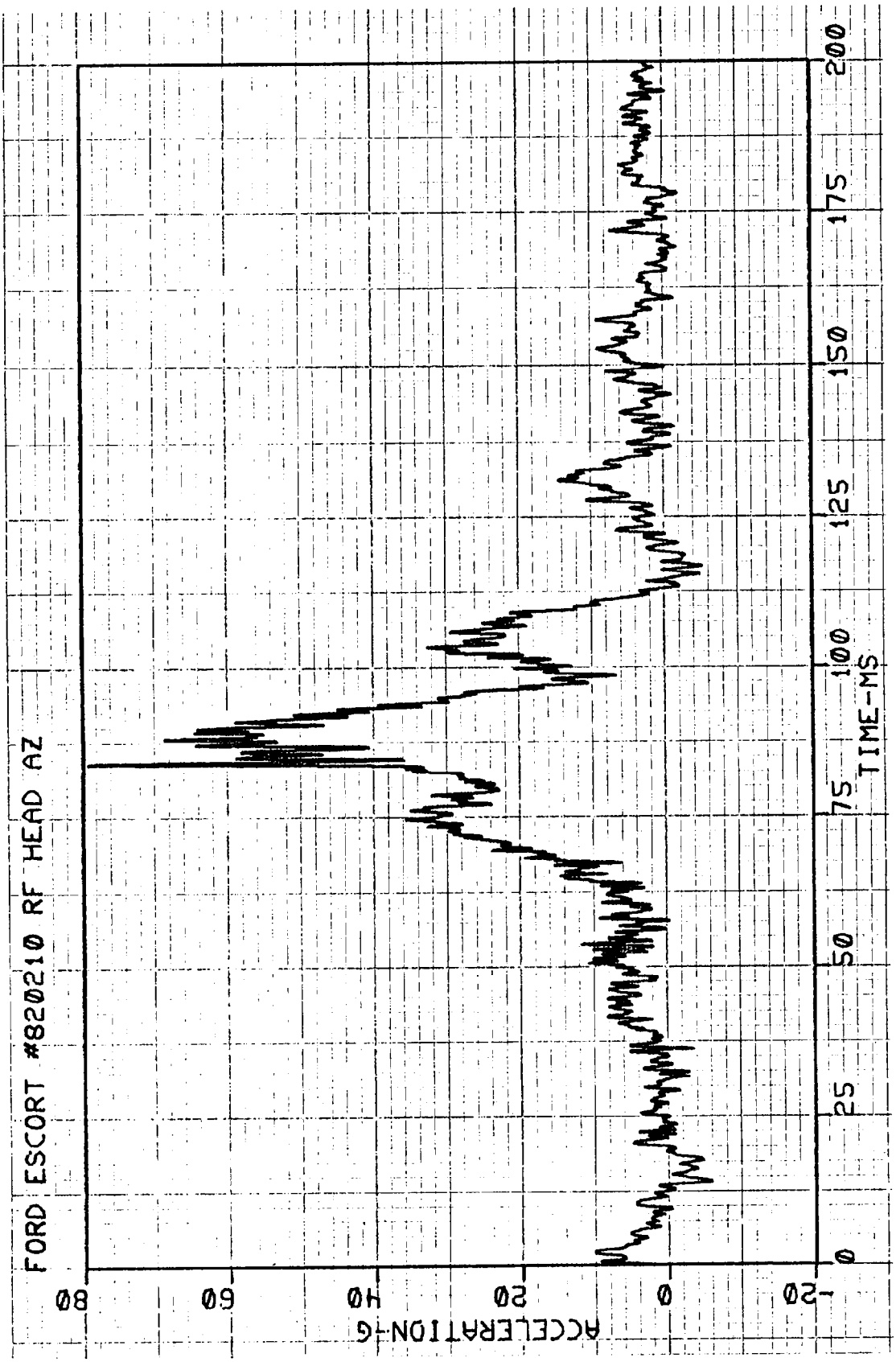
100
125
150
175
200
TIME-MS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ACCELERATION-G
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60
40
20
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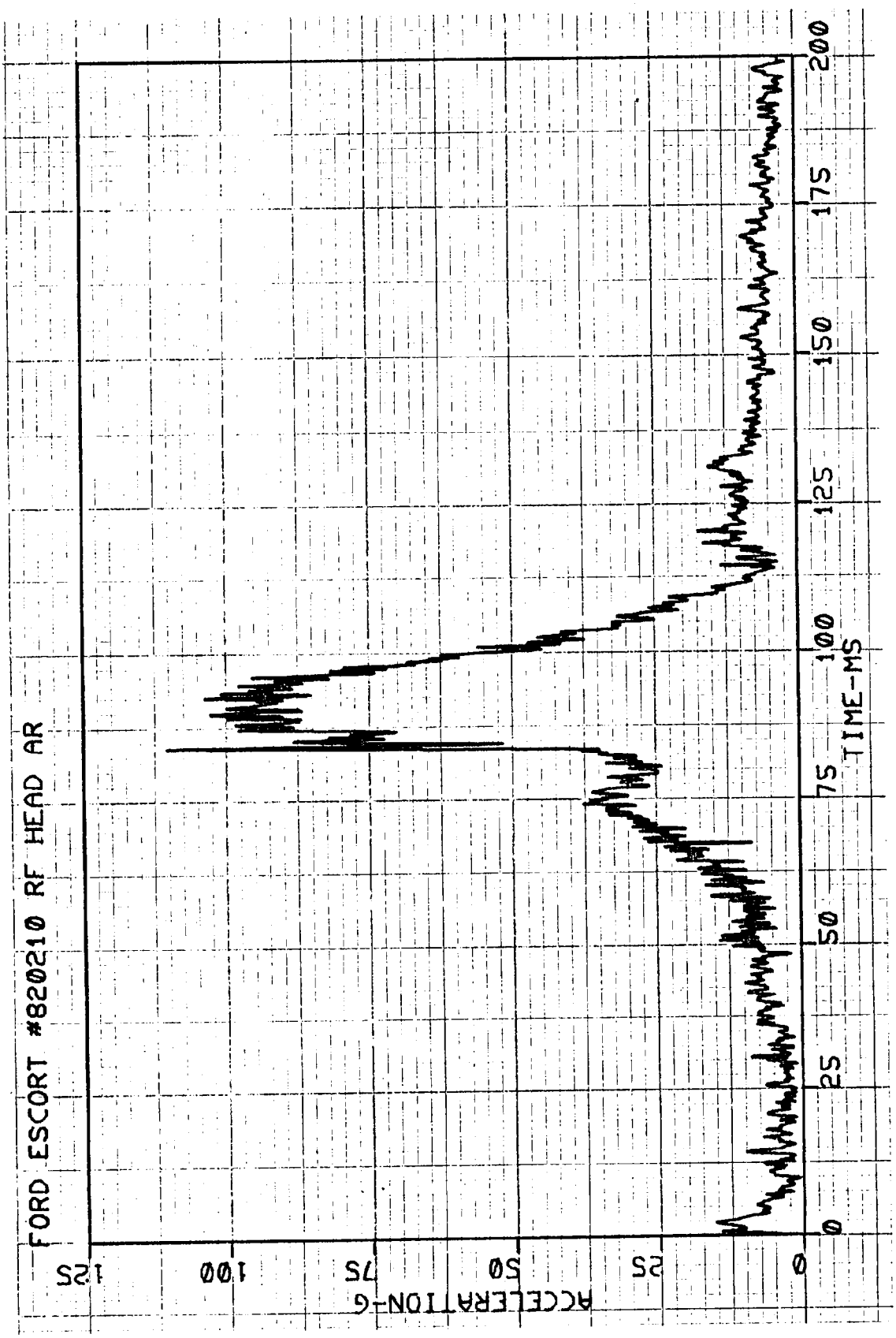
-20
0
25
50
75
100
125
150
175
200
TIME-MS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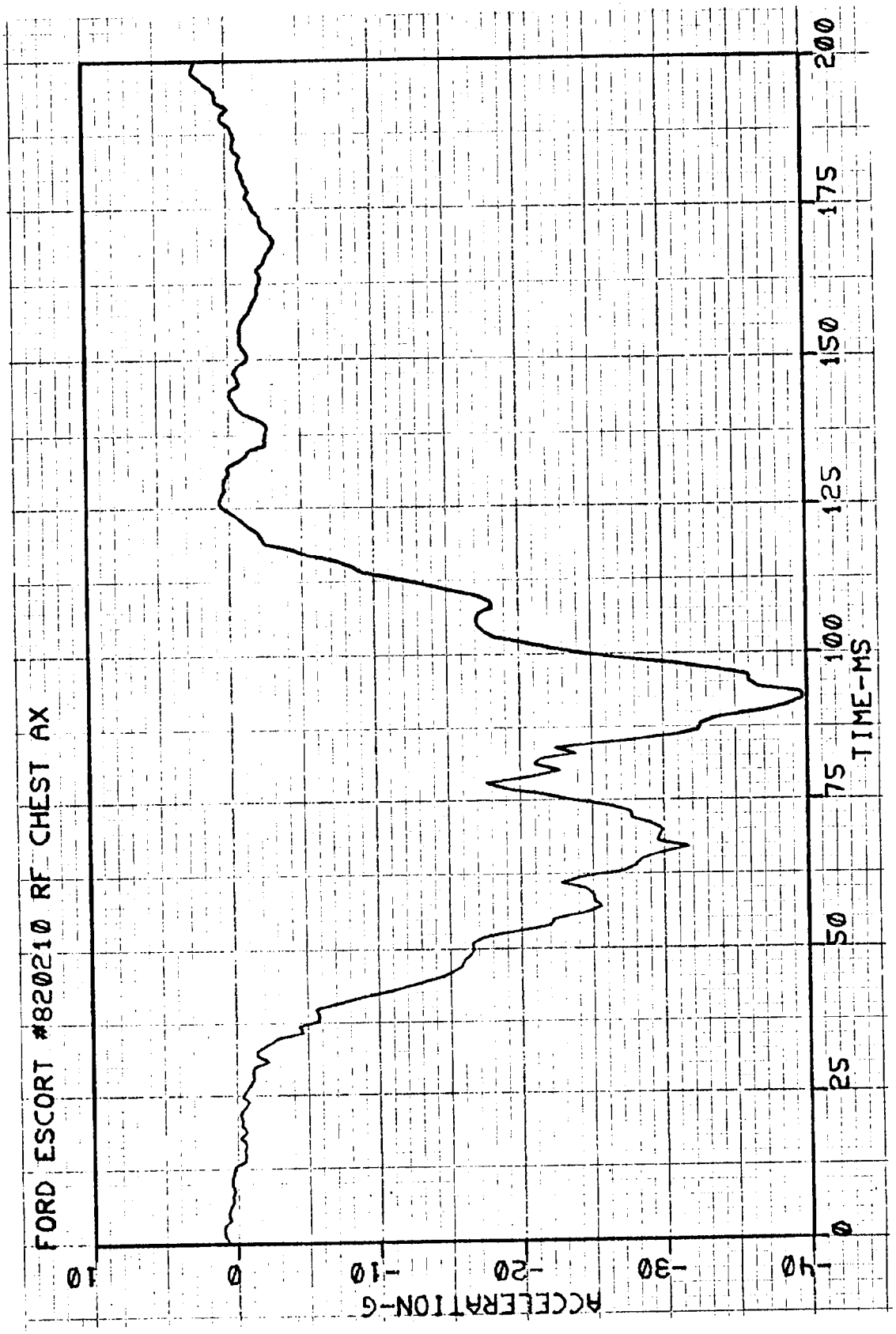
50
75
100
125
TIME-MS
0
25
50
75
100
125
150
175
200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0
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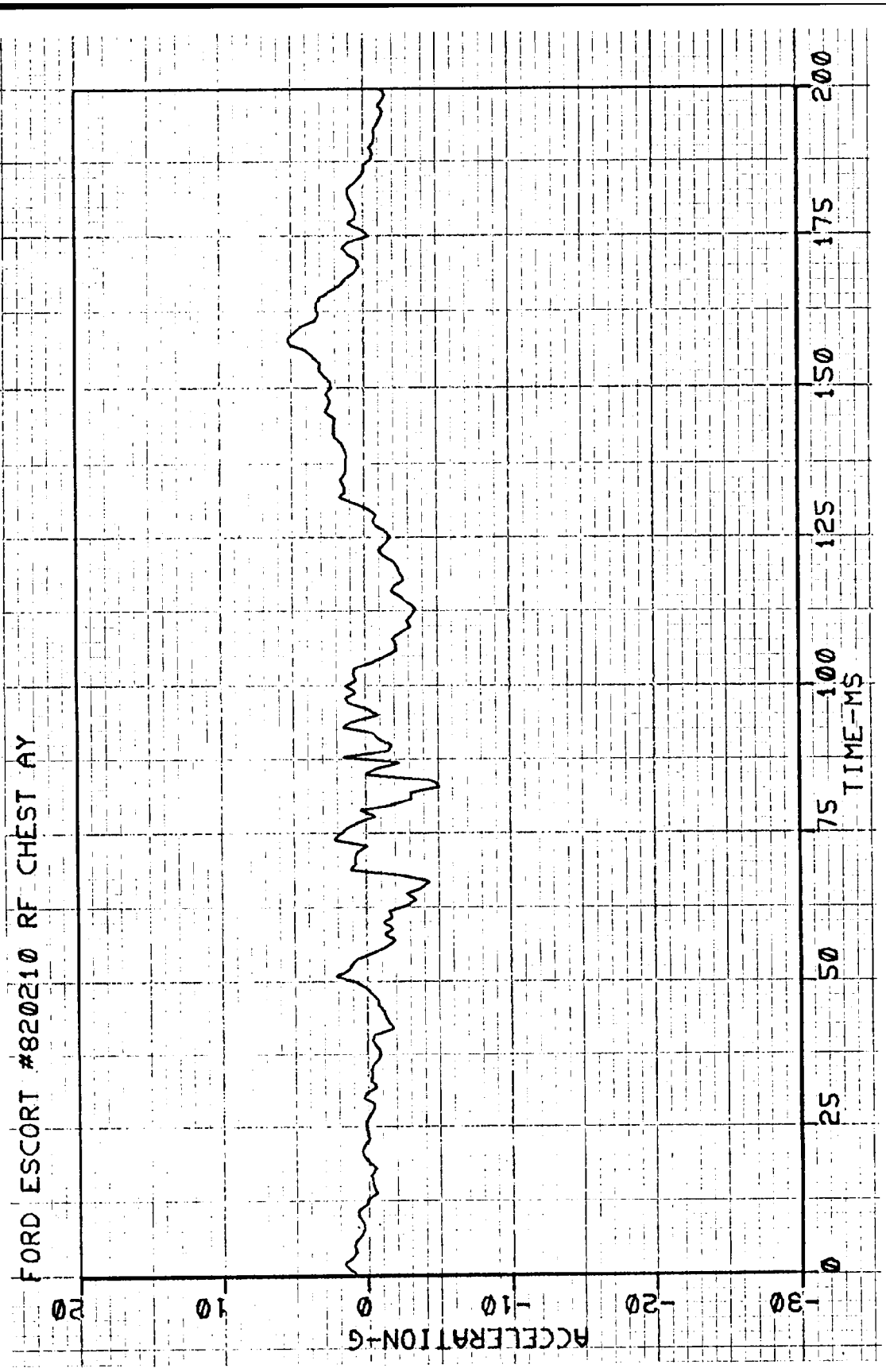
-20
-30
-40
0
25
50
75
100
125
150
175
200
TIME-MS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ACCELERATION-G
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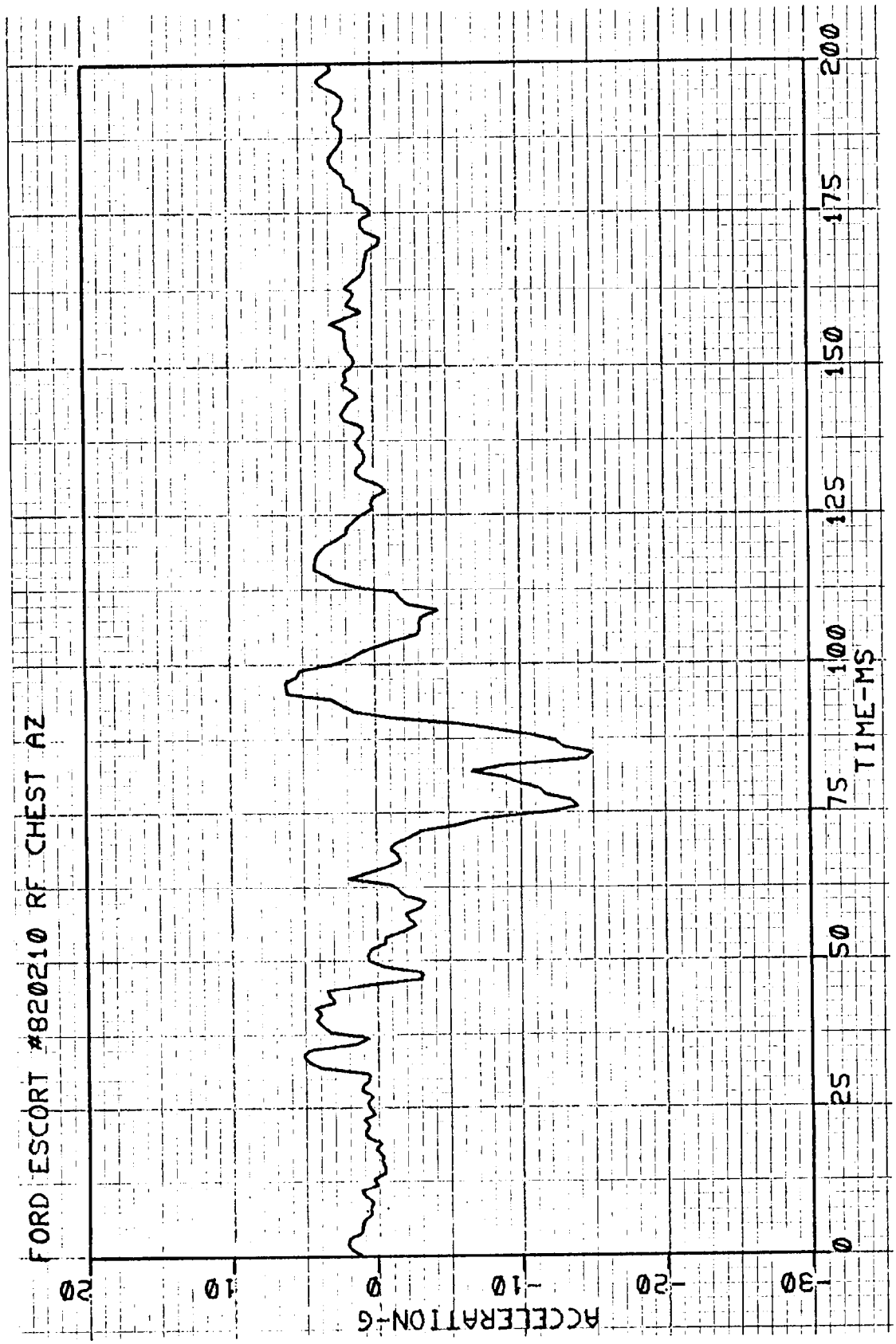
-10
-20
-30
0
25
50
75
100
125
150
175
200
TIME-MS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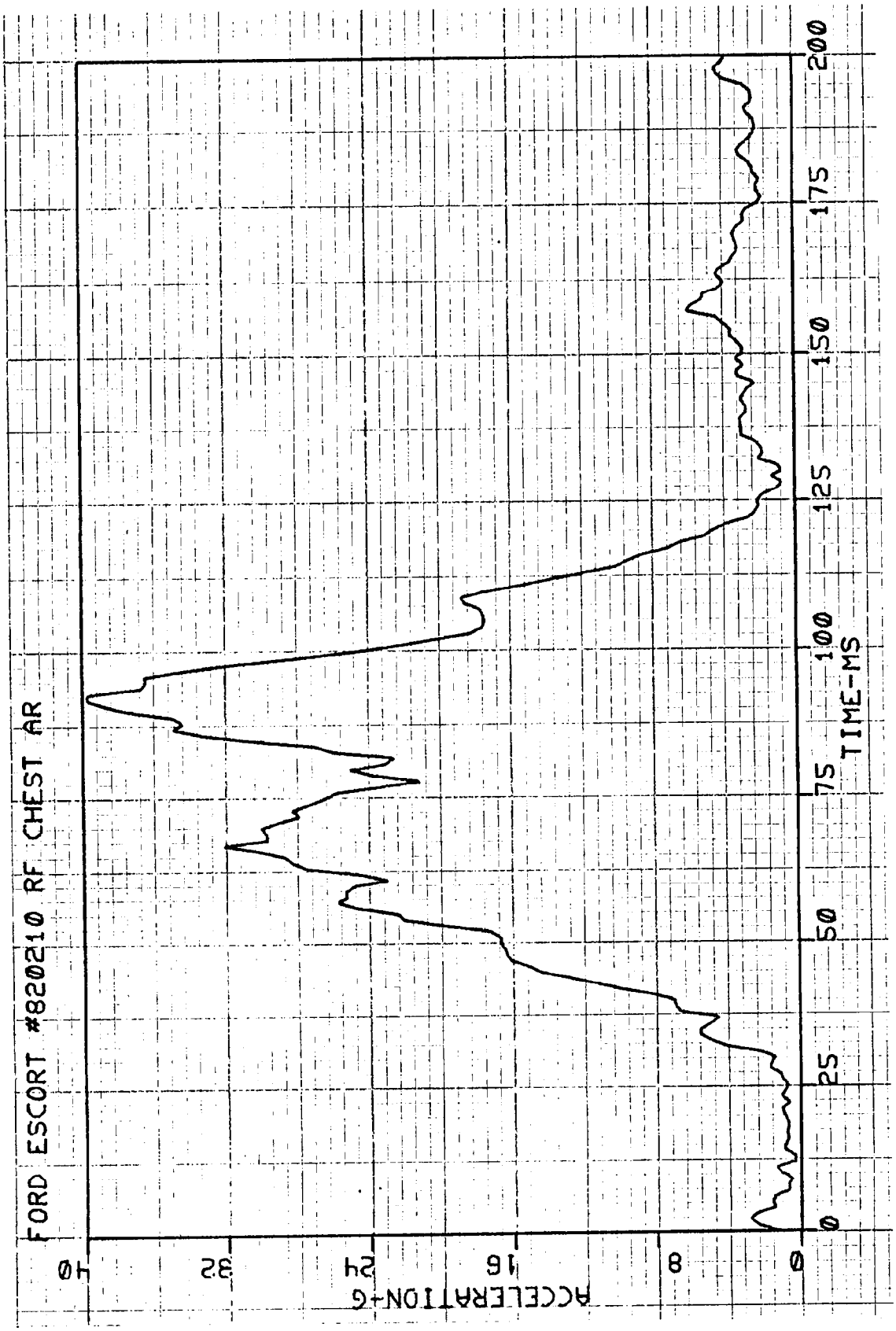
ACCELERATION-G
20
10
0
-10
-20
-30
0
25
50
75
100
125
150
175
200
TIME-MS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8
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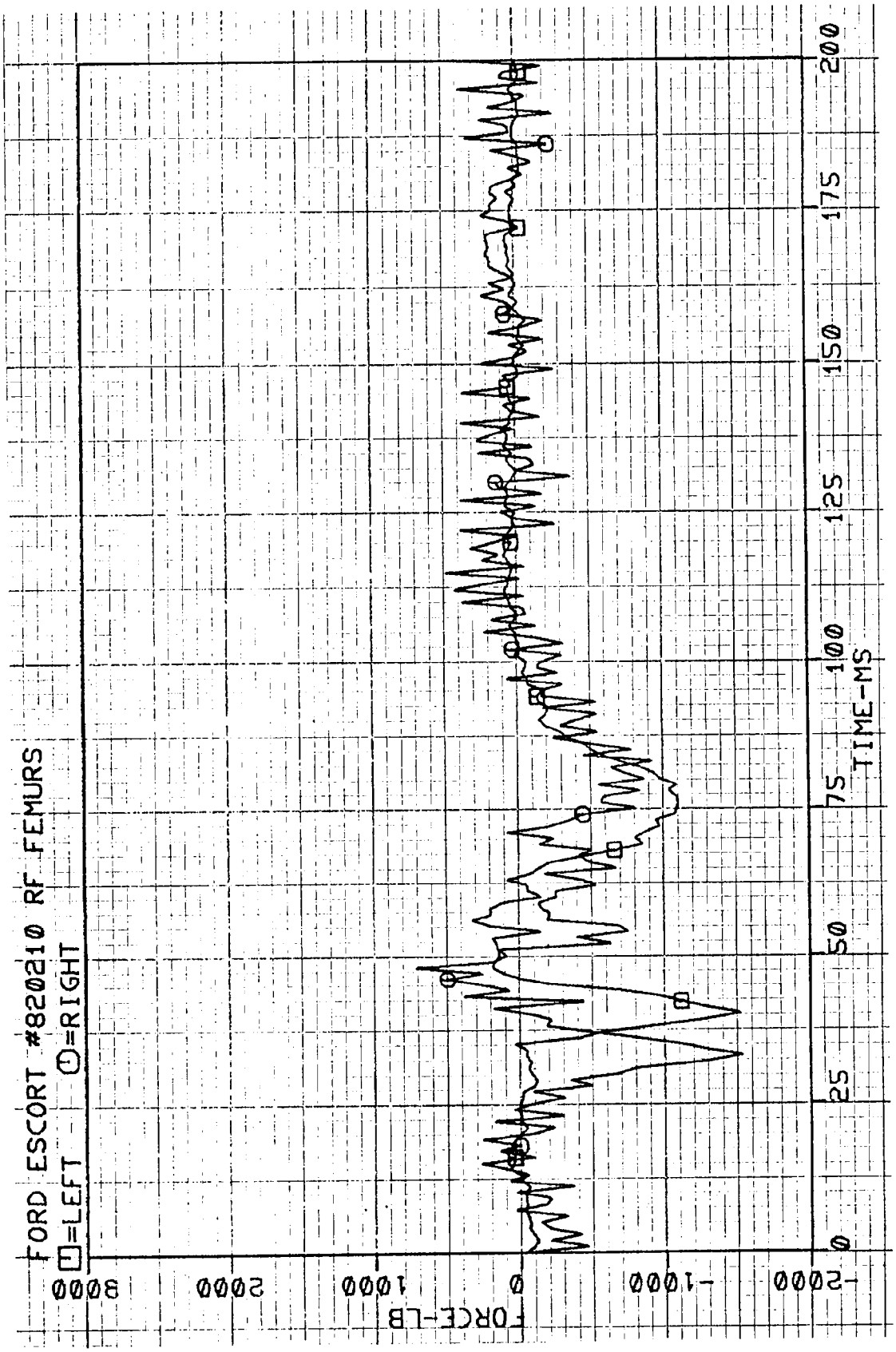
24
32
40
0
25
50
75
100
125
150
175
200
TIME-MS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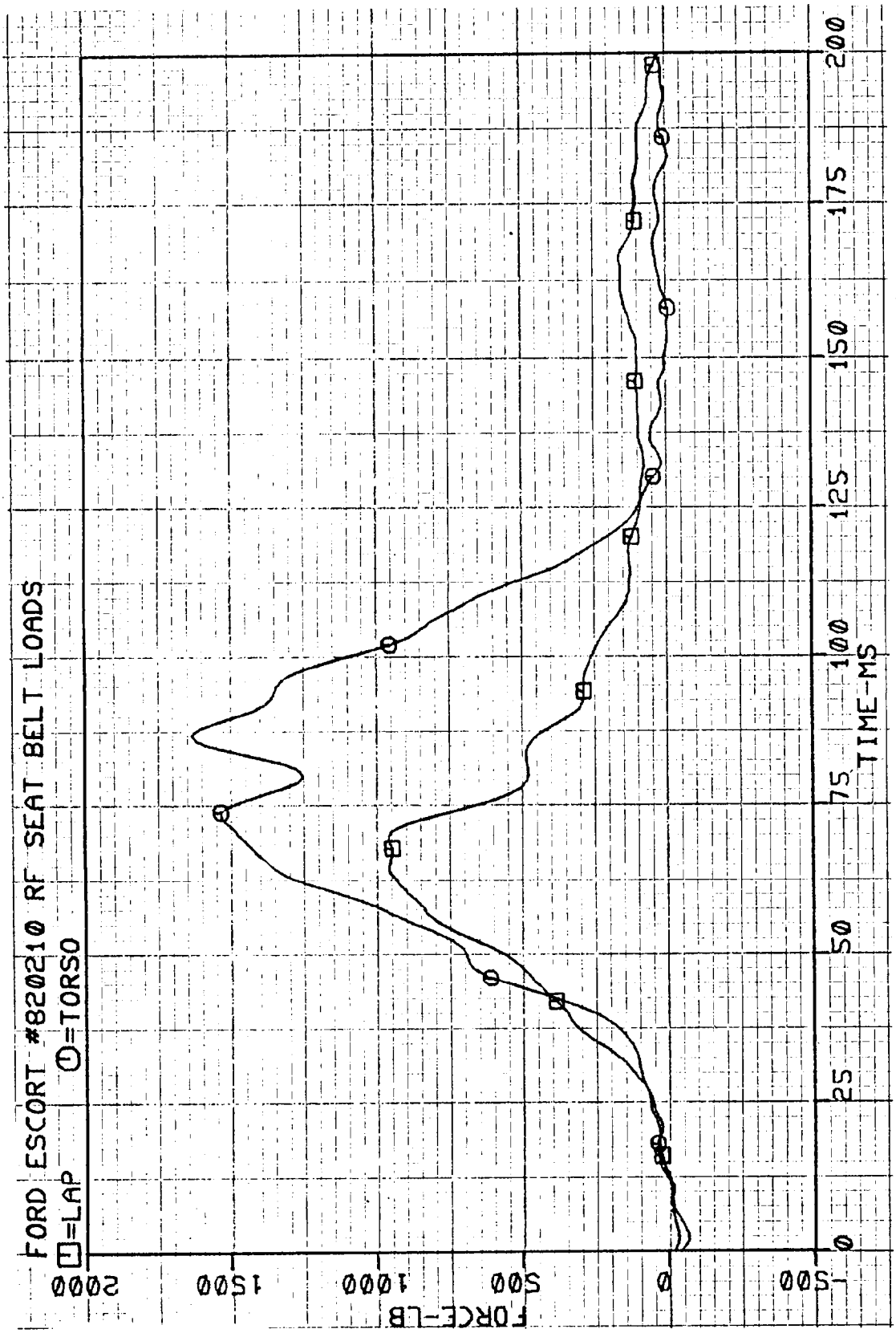
□=LEFT ○=RIGHT
FORCE-LB
8000
2000
1000
0
-1000
-2000
TIME-MS
0
25
50
75
100
125
150
175
200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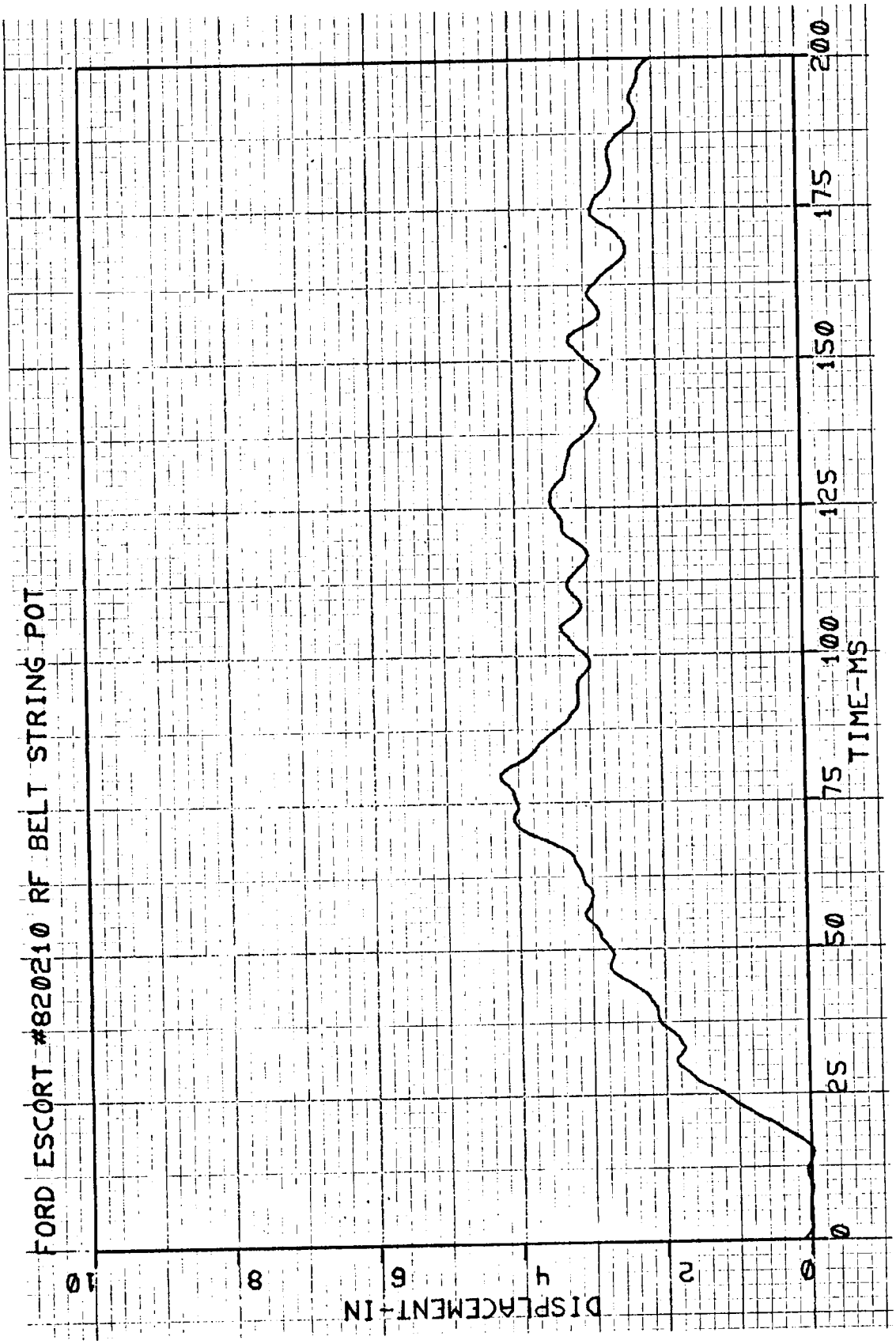
□=LAP
○=TORSO
FORCE-LB
2000
1500
1000
500
0
-500
TIME-MS
0
25
50
75
100
125
150
175
200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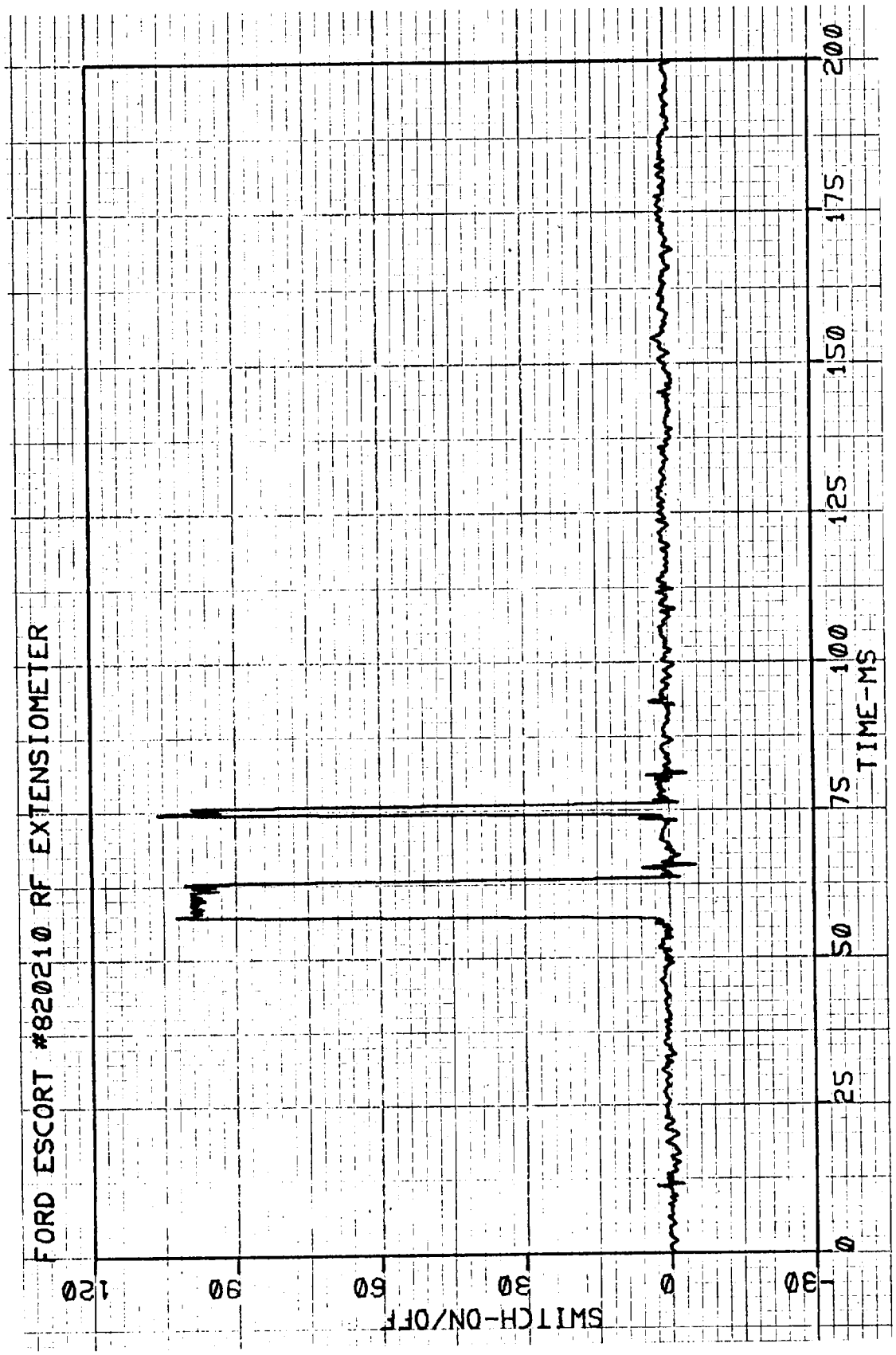
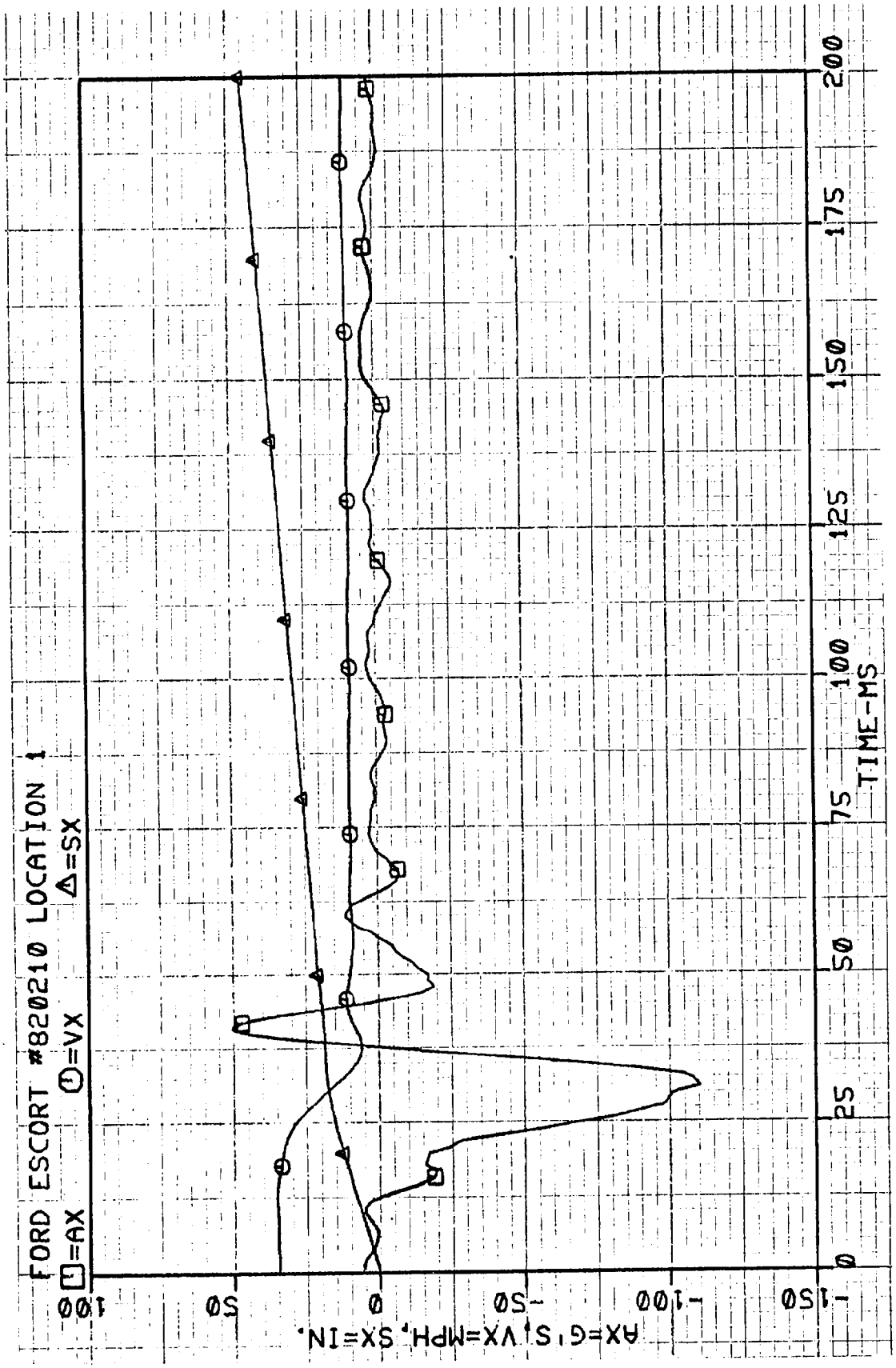
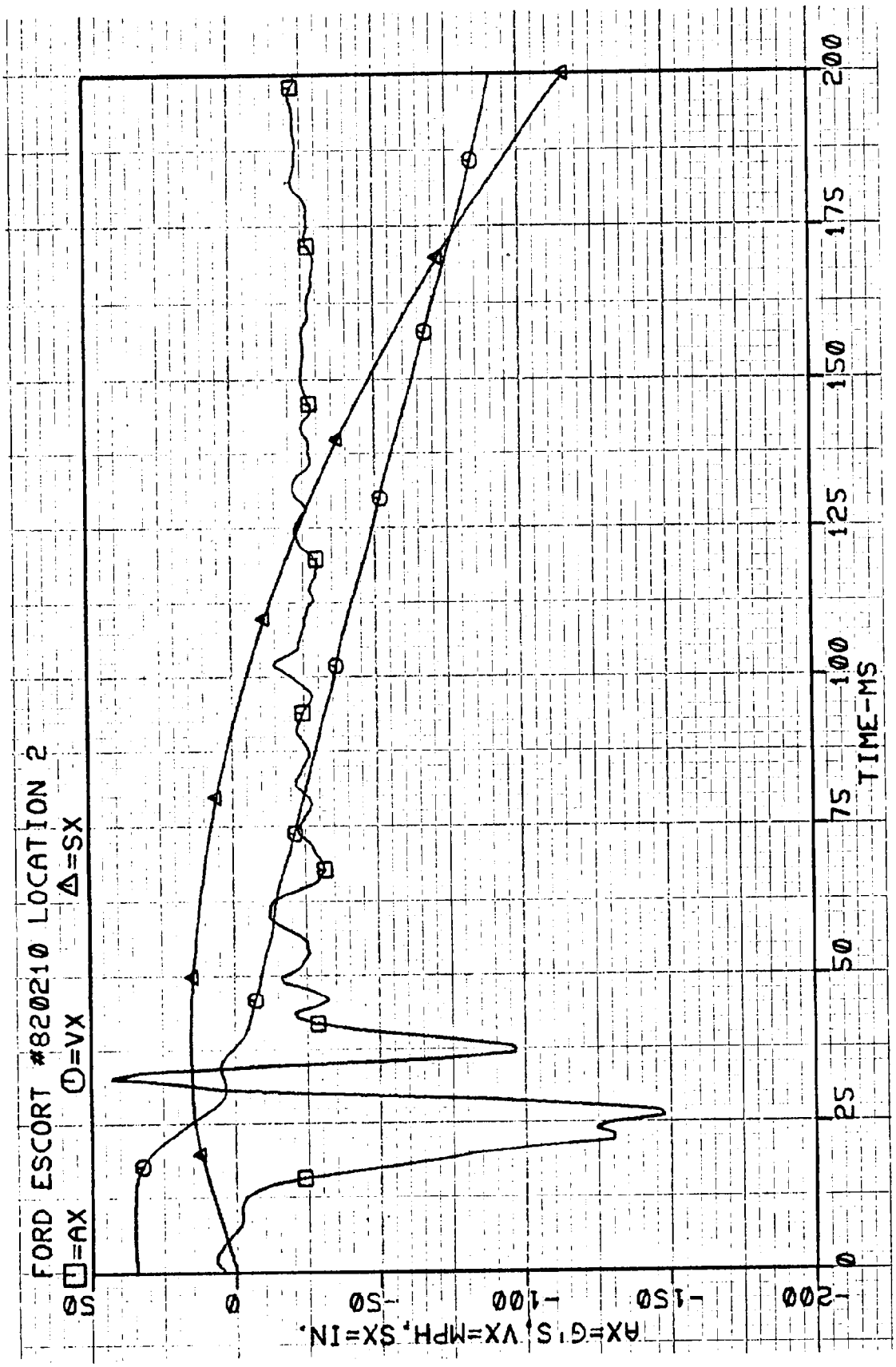
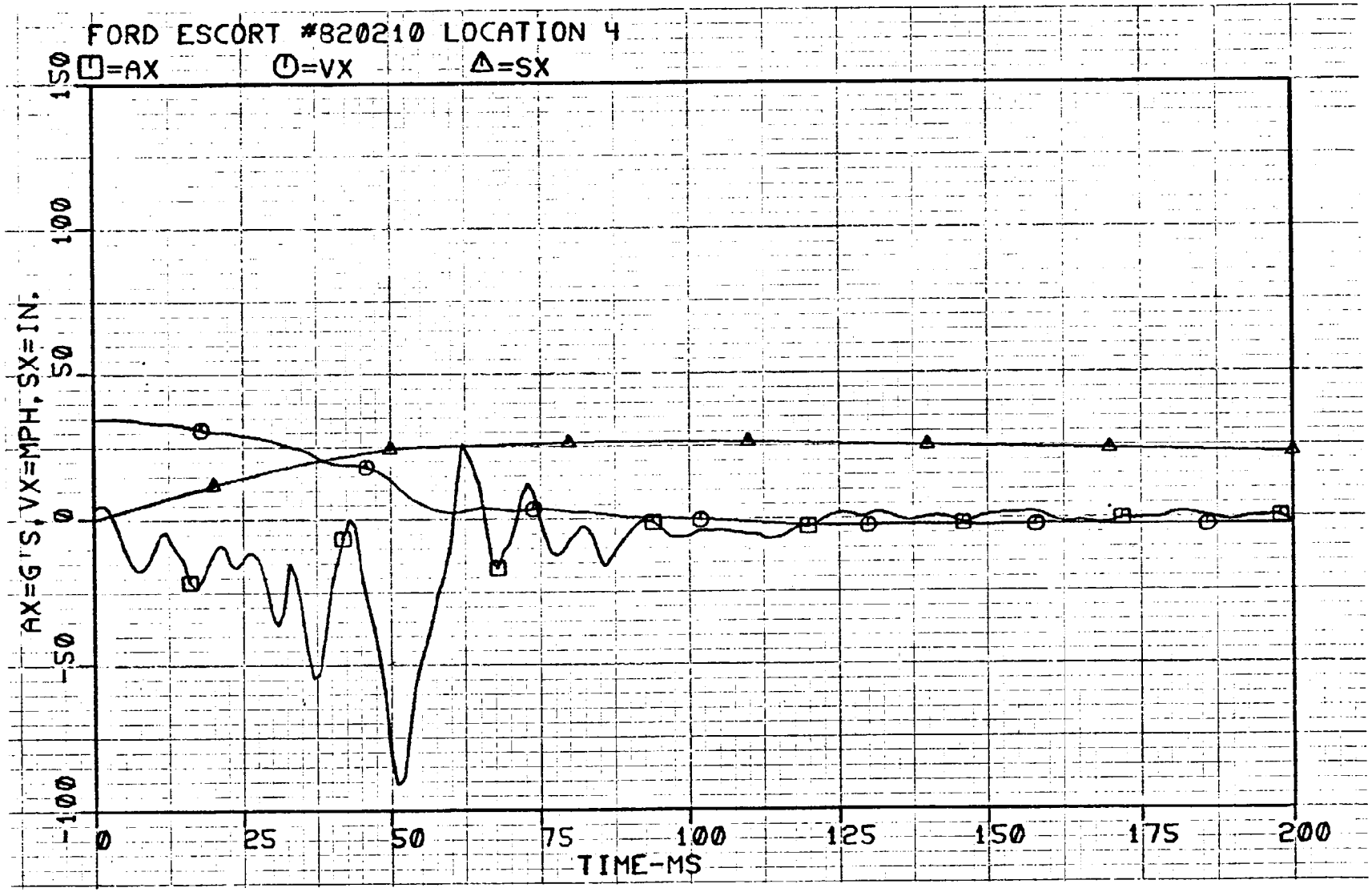
DISPLACEMENT-IN
TIME-MS
0
2
4
6
8
10
0
25
50
75
100
125
150
175
200


FORD ESCORT #820210 RF EXTENSIOMETER
SWITCH-ON/OFF
120
90
60
30
0
-30
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOCATION 1
□=AX
○=VX
Δ=SX
AX=G'S, VX=MPH, SX=IN.
100
50
0
-50
-100
-150
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOCATION 2
□=AX ○=VX Δ=SX
AX=G'S, VX=MPH, SX=IN.
200
150
100
50
0
-50
-100
-150
-200
0
25
75
125
175
200
TIME-MS


FORD ESCORT #820210 LOCATION 4
□=AX
○=VX
△=SX
AX=G'S, VX=MPH, SX=IN.
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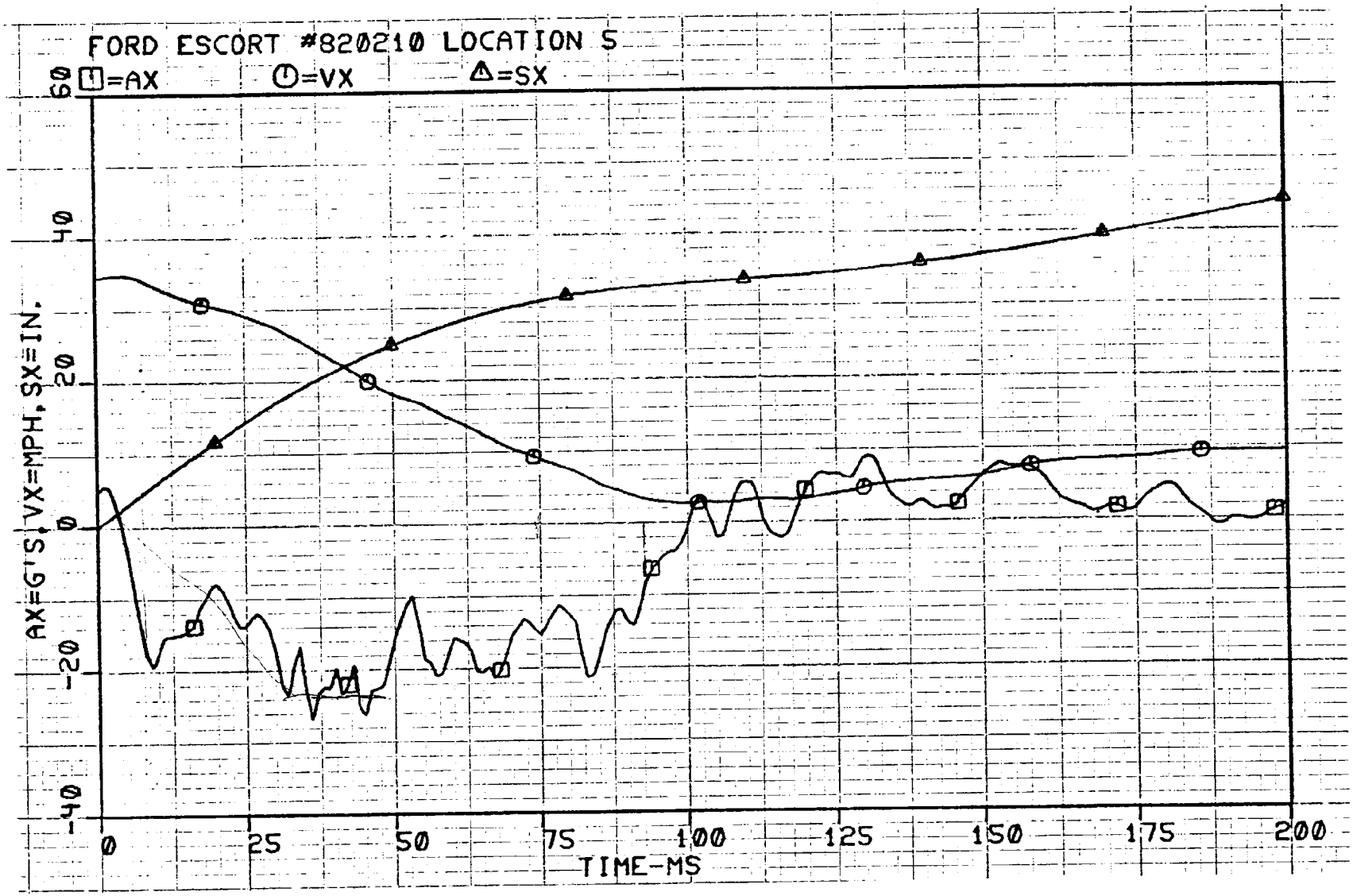
100
50
0
-50
-100
0
25
50
75
100
125
150
175
200
TIME-MS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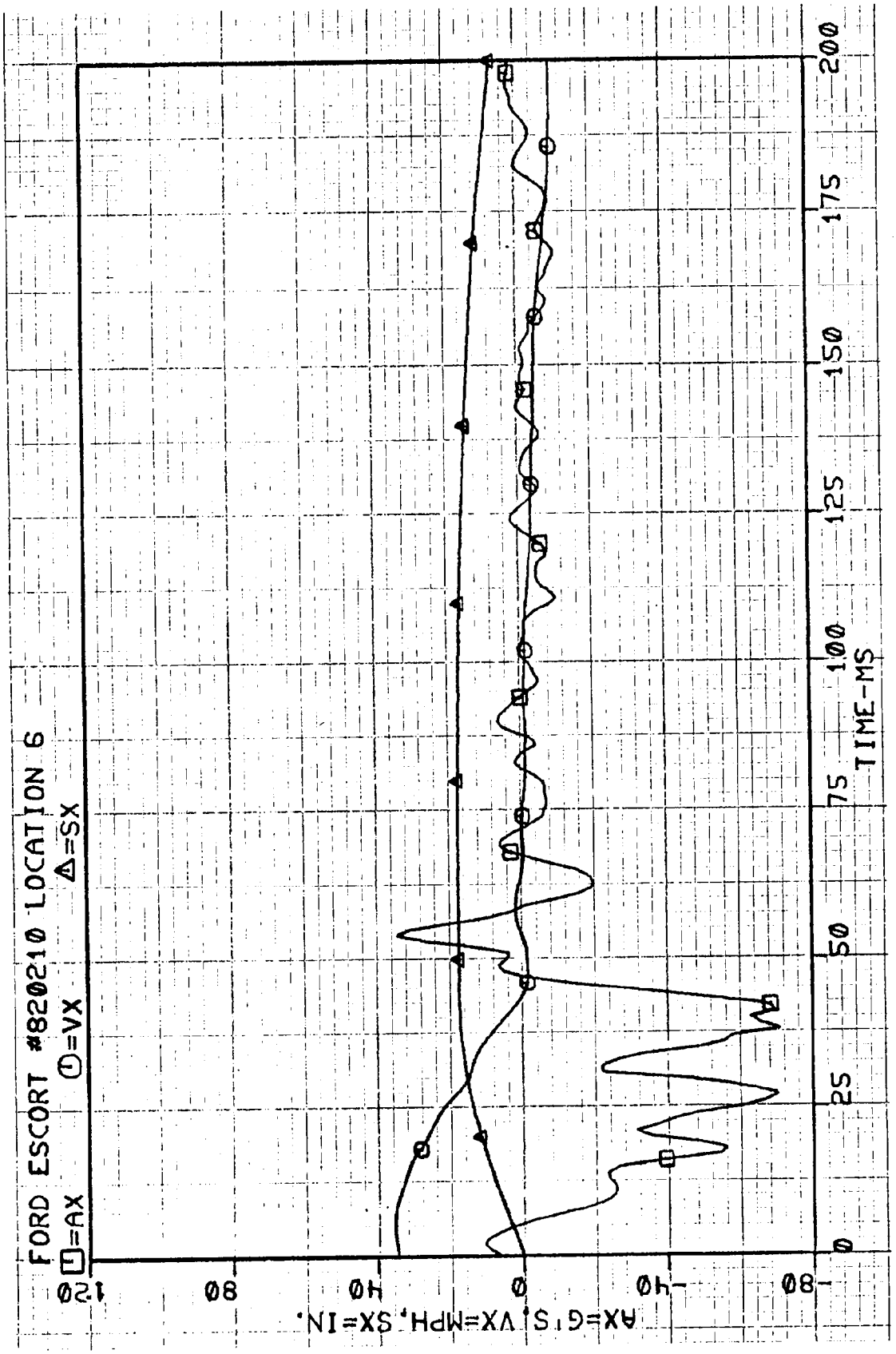
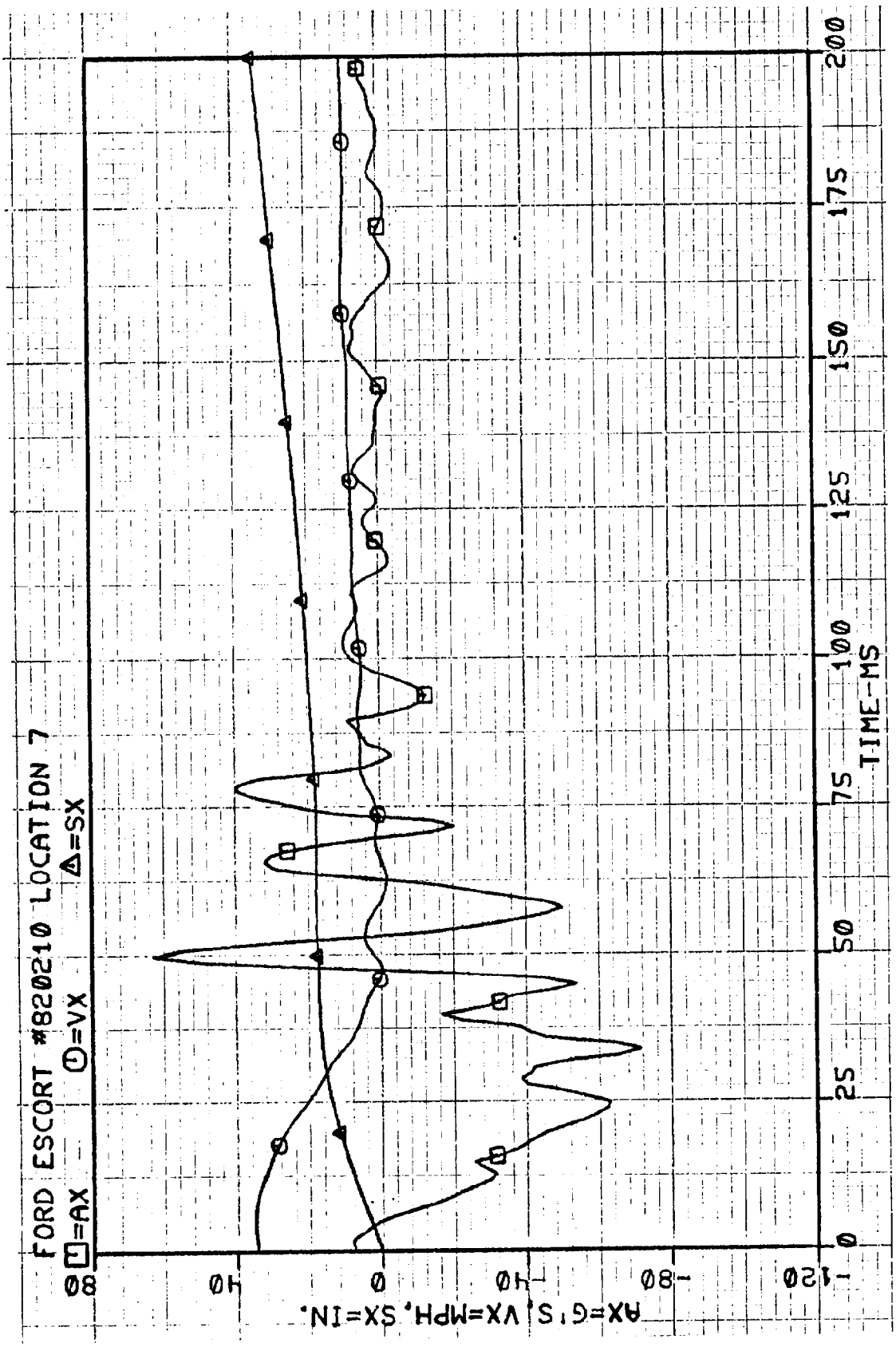
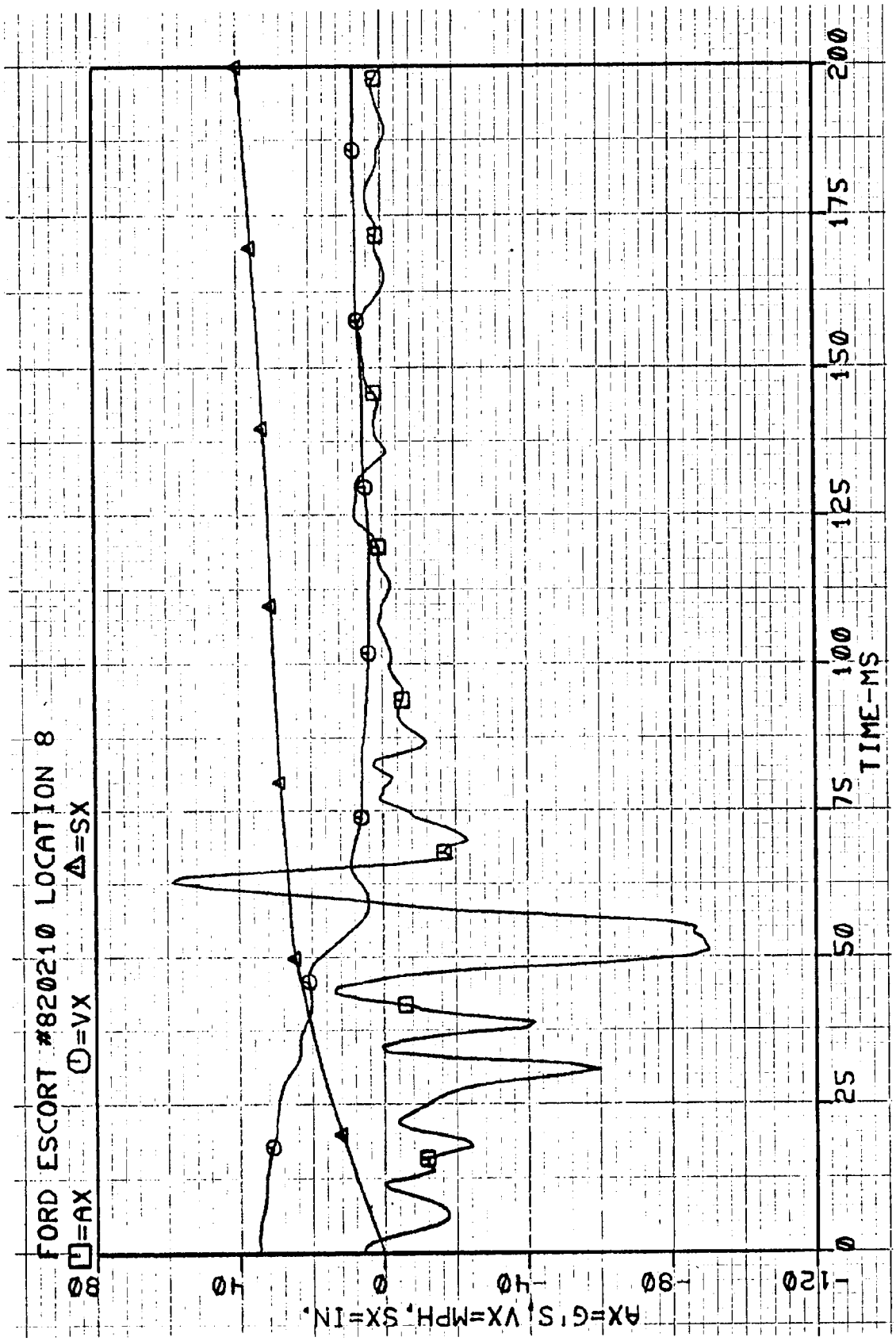
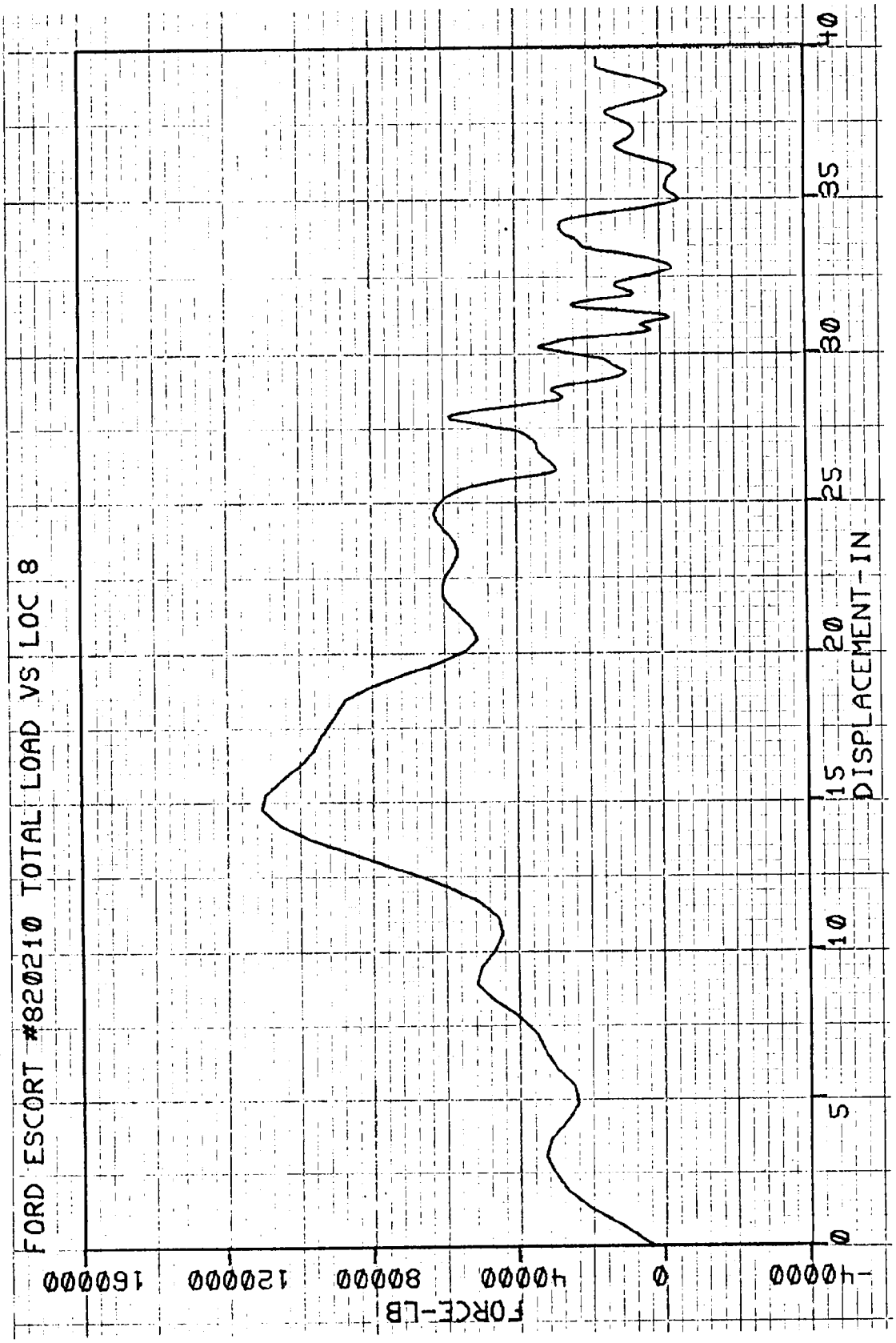
□=AX
○=VX
△=SX
60
40
20
0
-20
-40
AX=G'S, VX=MPH, SX=IN.
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOCATION 6
□=AX
①=VX
Δ=SX
AX=G'S, VX=MPH, SX=IN.
120
80
40
0
-40
-80
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOCATION 7
□=AX ○=VX Δ=SX
AX=G'S, VX=MPH, SX=IN.
80
40
0
-40
-80
-120
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOCATION 8
□=AX
○=VX
Δ=SX
AX=G'S, VX=MPH, SX=IN.
80
40
0
-40
-80
-120
0
25
50
75
100
125
150
175
200
TIME-MS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FORCE-LB
-40000
0
40000
80000
120000
160000
0
5
10
15
20
25
30
35
40
DISPLACEMENT-IN

APPENDIX C

DUMMY CALIBRATIONS

PART 572 DUMMY CALIBRATION TEST DATA

NHTSA Dummy I.D. No.: A08

Laboratory Technician: C. Brugalletta, S. Bacon

Instrumentation Engineer: V. Agnihotri

		Post-Test Calibration	Pre-test Calibration
Date of Dummy Calibration		7/12/82	5/10/82
Calibration Sequential Number for Dummy		46	45
Temperature in Lab. (Spec. = 66 to 78 °F)		70°	70°
Relative Humidity in Lab. (Spec. = 10 to 70%)		56%	50%
Test Parameter	**Specification**		
1. Head Drop Test:			
a. Peak Resultant Accel	210 - 260G	239	246
b. Peak Lateral Accel	$\leq$ 10G	4.3	5.3
c. Time above 100G (Resultant)	0.9 - 1.5 ms	1.1	1.1
2. Neck Bending Test:			
a. Pendulum Speed	21.5 - 25.5 fps	22.0	22.2
b. Pendulum Avg Decel (over $t_3 - t_2$)	20 - 24G	24	24
c. Peak Resultant Head Acceleration	26G Maximum	20	21
d. Pendulum Decel ($t_2 - t_1$)	$\leq$ 3 ms	2.5	3.0
e. Pendulum Decel ($t_3 - t_2$)	25 - 30 ms	27	25
f. Pendulum Decel ($t_4 - t_3$)	$\leq$ 10 ms	3	4
g. Pendulum Direction Reversal Time	$\geq$ 123 ms	N/A	N/A
h. Maximum Head Rotation	63 to 73°	70	67
i. Chordal Displacement:			
Head Rotation Angle			
0° Time	-2 - 2 ms	0.0	-2
0° Displ	-0.5 - 0.5 in.	0.0	0.0
30° Time	25.6 - 34.4 ms	28.0	26.0
30° Displ	2.1 - 3.1 in.	2.5	2.8
60° Time	40.3 - 51.7 ms	45.0	44.8
60° Displ	4.3 - 5.3 in.	4.6	4.7
Maximum 73° Time	53.2 - 66.8 ms	59.5	60.3
Maximum 73° Displ	5.0 - 6.0 in.	5.3	5.3

PART 572 DUMMY CALIBRATION TEST DATA (Continued)

NHTSA Dummy I.D. No.: A08

Test Parameter		Specification	Post-test Calibration	Pre-test Calibration
2. Neck Bending Test: (Continued)				
Head Rotation Angle				
60°	Time	67.0 - 83.0 ms	74.0	70.0
	Displ	4.3 - 5.3 in.	4.5	4.7
30°	Time	85.4 - 104.6 ms	90.5	92.0
	Displ	2.1 - 3.1 in.	2.4	3.1
0°	Time	101.0 - 123.0 ms	102.5	103.0
	Displ	-0.5 - 0.5 in.	0.4	0.1
3. Abdominal Compression Test: (Preload = 10 pounds)				
a. Force at 0.5 in.		14 - 26 lb	12	18
b. Force at 0.75 in.		27 - 40 lb	20	32
c. Force at 1.0 in.		40 - 53 lb	32	43
d. Force at 1.3 in.		63 - 78 lb	52	67
4. Lumbar Flexion Test:				
a. Force at 20°		22 - 34 lb	26	24
b. Force at 30°		34 - 46 lb	42	38
c. Force at 40°		46 - 58 lb	54	50
d. Return Angle		12° Maximum	4°	11°
5. Chest Impact Tests:				
a. High Speed				
1) Probe Speed		21.78-22.22 fps	22.02	22.02
2) Peak Deflection		1.7 in. Maximum	1.6	1.5
3) Peak Resistive Force		2250 lb Maximum	1604	1893
4) Internal Hysteresis		50 - 70%	53%	57%
b. Low Speed				
1) Probe Speed		13.86-14.14 fps	14.02	14.01
2) Peak Deflection		1.1 in. Maximum	1.1	1.0
3) Peak Resistive Force		1450 lb Maximum	1007	1205
4) Internal Hysteresis		50 - 70%	53%	60%

PART 572 DUMMY CALIBRATION TEST DATA (Continued)

NHTSA Dummy I.D. No.: A08

Test Parameter	Specification	Post-test Calibration	Pre-test Calibration
6. Knee Impact Tests:			
a. Right Side			
1) Probe Speed	6.76 - 7.04 fps	6.93	6.89
2) Maximum Force	1850 - 2500 lb	1807	1930
3) Time >1000 lb	1.7 ms Minimum	2.2	1.8
b. Left Side			
1) Probe Speed	6.76 - 7.04 fps	6.93	6.88
2) Maximum Force	1850 - 2500 lb	1783	1862
3) Time >1000 lb	1.7 ms Minimum	1.0	2.0

PART 572 DUMMY CALIBRATION TEST DATA

NHTSA Dummy I.D. No.: A09

Laboratory Technician: C. Brugalletta, J. Shiritt

Instrumentation Engineer: V. Agnihotri

		Post-Test Calibration	Pre-test Calibration
Date of Dummy Calibration		6/28/82	5/10/82
Calibration Sequential Number for Dummy		41	40
Temperature in Lab. (Spec. = 66 to 78 °F)		70°	70°
Relative Humidity in Lab. (Spec. = 10 to 70%)		40%	50%
Test Parameter	**Specification**		
1. Head Drop Test:			
a. Peak Resultant Accel	210 - 260G	218	250
b. Peak Lateral Accel	$\leq$ 10G	6	9
c. Time above 100G (Resultant)	0.9 - 1.5 ms	1.1	1.1
2. Neck Bending Test:			
a. Pendulum Speed	21.5 - 25.5 fps	22.2	22.2
b. Pendulum Avg Decel (over $t_3 - t_2$)	20 - 24G	23	24
c. Peak Resultant Head Acceleration	26G Maximum	19	20
d. Pendulum Decel ($t_2 - t_1$)	$\leq$ 3 ms	3	3
e. Pendulum Decel ($t_3 - t_2$)	25 - 30 ms	27	25
f. Pendulum Decel ($t_4 - t_3$)	$\leq$ 10 ms	4	6
g. Pendulum Direction Reversal Time	$\geq$ 123 ms	N/A	N/A
h. Maximum Head Rotation	63 to 73°	70	69
i. Chordal Displacement:			
Head Rotation Angle			
0° Time	-2 - 2 ms	0	-2
0° Displ	-0.5 - 0.5 in.	-5.0	0.0
30° Time	25.6 - 34.4 ms	30.5	27.5
30° Displ	2.1 - 3.1 in.	2.5	2.6
60° Time	40.3 - 51.7 ms	47.0	45.5
60° Displ	4.3 - 5.3 in.	4.6	4.7
Maximum 73° Time	53.2 - 66.8 ms	61.0	60.0
Maximum 73° Displ	5.0 - 6.0 in.	5.3	5.3

PART 572 DUMMY CALIBRATION TEST DATA (Continued)

NHTSA Dummy I.D. No.: A09

Test Parameter		Specification	Post-test Calibration	Pre-test Calibration
2. Neck Bending Test: (Continued)				
Head Rotation Angle				
60°	Time	67.0 - 83.0 ms	76.5	72.5
	Displ	4.3 - 5.3 in.	4.5	4.6
30°	Time	85.4 - 104.6 ms	94.0	92.5
	Displ	2.1 - 3.1 in.	2.4	2.7
0°	Time	101.0 - 123.0 ms	105.5	105.5
	Displ	-0.5 - 0.5 in.	0.4	0.1
3. Abdominal Compression Test: (Preload = 10 pounds)				
a. Force at 0.5 in.		14 - 26 lb	18	20
b. Force at 0.75 in.		27 - 40 lb	30	32
c. Force at 1.0 in.		40 - 53 lb	44	48
d. Force at 1.3 in.		63 - 78 lb	63	69
4. Lumbar Flexion Test:				
a. Force at 20°		22 - 34 lb	36	31
b. Force at 30°		34 - 46 lb	53	44
c. Force at 40°		46 - 58 lb	55	54
d. Return Angle		12° Maximum	6°	6°
5. Chest Impact Tests:				
a. High Speed				
1) Probe Speed		21.78-22.22 fps	22.05	22.03
2) Peak Deflection		1.7 in. Maximum	1.5	1.5
3) Peak Resistive Force		2250 lb Maximum	1682	1952
4) Internal Hysteresis		50 - 70%	54%	51%
b. Low Speed				
1) Probe Speed		13.86-14.14 fps	14.01	14.01
2) Peak Deflection		1.1 in. Maximum	1.1	0.9
3) Peak Resistive Force		1450 lb Maximum	1077	1210
4) Internal Hysteresis		50 - 70%	40%	60%

PART 572 DUMMY CALIBRATION TEST DATA (Continued)

NHTSA Dummy I.D. No.: A09

Test Parameter	Specification	Post-test Calibration	Pre-test Calibration
6. Knee Impact Tests:			
a. Right Side			
1) Probe Speed	6.76 - 7.04 fps	6.88	6.96
2) Maximum Force	1850 - 2500 lb	1927	1851
3) Time >1000 lb	1.7 ms Minimum	1.3	2.3
b. Left Side			
1) Probe Speed	6.76 - 7.04 fps	6.93	6.90
2) Maximum Force	1850 - 2500 lb	1870	2106
3) Time >1000 lb	1.7 ms Minimum	2.3	1.9

ADDENDUM

Dynamic Science Report No. 301-DYS-82-014A

BARRIER IMPACT LOAD DATA

FORD MOTOR COMPANY
1982 FORD ESCORT 4-DOOR HATCHBACK
NHTSA 820210

Prepared by:

DYNAMIC SCIENCE, INC.
A Talley Industries Company
1850 West Pinnacle Peak Road
Phoenix, Arizona 85027

Prepared for:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
----ENFORCEMENT----
OFFICE OF VEHICLE SAFETY COMPLIANCE
400 SEVENTH STREET, S.W.
WASHINGTON, D.C. 20590

DYNAMIC SCIENCE, INC. | Talley Industries
1850 West Pinnacle Peak Road · Phoenix, Arizona 85027
(602) 869-9331

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Prepared by Michael J. Pollock

Approved by Rod Garn

Date 7-15-82

Report Accepted by:

Contract Technical Manager
Office of Vehicle Safety Compliance

Date

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1.0 INTRODUCTION

This report is an addendum to Report No. 301-DYS-82-014 and presents the barrier load measurement data acquired in testing a 1982 Ford Escort 4-Door Hatchback, NHTSA 820210.

Barrier impact speed was 34.52 mph.

Section 2.0 presents information on the load cell barrier and vehicle accelerometers.

Section 3.0 provides general test and vehicle parametric data.

Section 4.0 presents plots of load cell and accelerometer data versus time.

2.0 INSTRUMENTATION DESCRIPTION

2.1 LOAD CELL BARRIER

The load cell barrier face is pictured in Figure 2-1. The barrier consists of a 9 x 4 array of 50 klb load cells each faced with a section of 1-3/4-inch thick plywood. Plywood sections for Rows C and D (upper two rows) each measure 10 inches high and 9 inches wide. Plywood sections for Rows A and B (lower two rows) each measure 9 inches high and 9 inches wide. Overall width of the barrier is 83 inches and overall height is 38-3/4 inches. The lower edge of the barrier is 2-5/8 inches above the surface of the ground.

2.2 PLACEMENT OF VEHICLE ACCELEROMETERS

Eight longitudinal accelerometers were located on the vehicle as schematically illustrated herein. Three instruments (Locations 4, 5, and 8) represent occupant compartment accelerations. Two (Locations 1 and 2) represent engine accelerations and two (Locations 6 and 7) represent front wheel accelerations. One additional instrument is included (Location 3) for rear axle drive vehicles mounted on the differential housing.

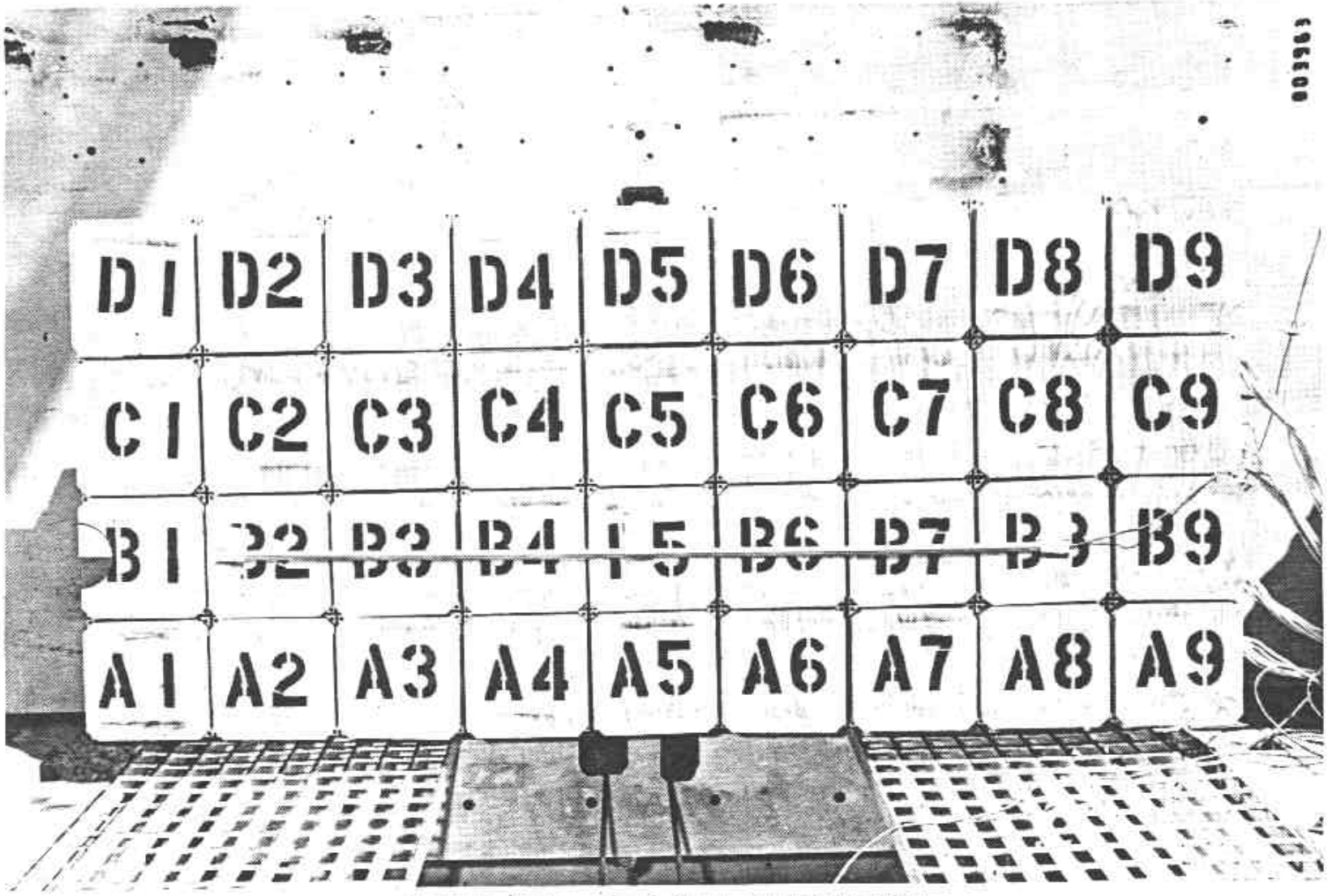
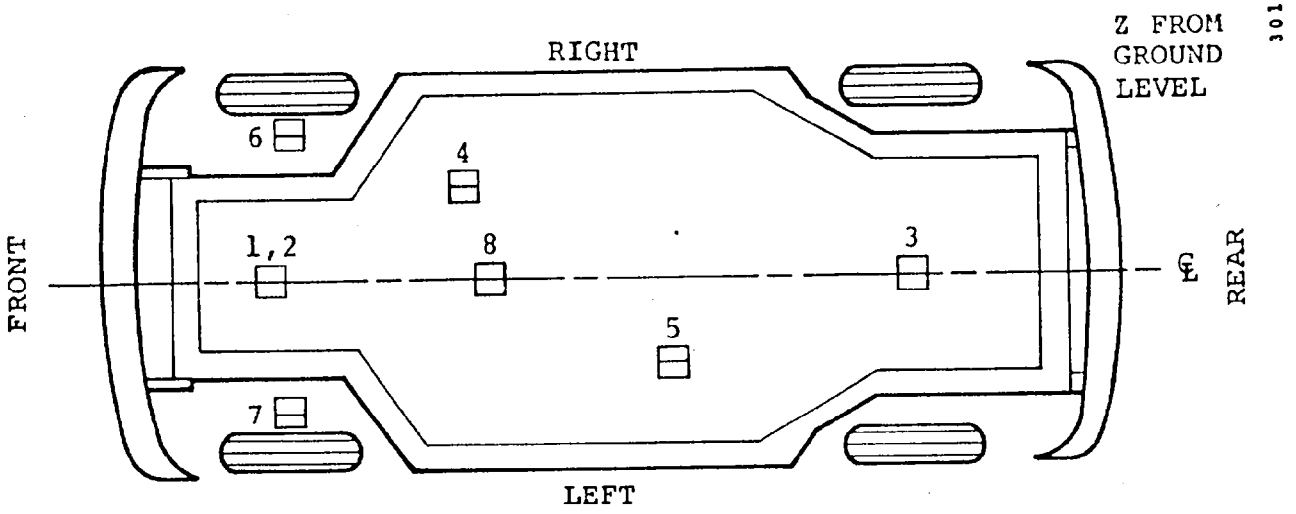


FIGURE 2-1. LOAD CELL BARRIER FACE.

VEHICLE ACCELEROMETER LOCATIONS AND SUMMARY



LINEAR ACCELEROMETERS

⊟ LONGITUDINAL

Vehicle Accelerometer Locations and Coordinates					Maximum Readings			
No.	Description of Location	X	Y	Z	+G's	MS	-G's	MS
1	Top of Engine	138.0	+10.1	32.6	50.9	41	110.9	31
2	Bottom of Engine	133.5	+11.2	11.2	*	34	151.1	26
3	Differential Housing	NA - Front Wheel Drive Vehicle						
4	Right Front Floorpan ΔV = 37.4 mph	94.7	+15.6	10.5	26.7	62	91.3	51
5	Left Rear Floorpan ΔV = 31.6 mph	61.6	-15.0	13.7	9.0	131	27.1	45
6	Right Front Brake Caliper	135.0	+20.8	11.9	34.7	54	72.0	38
7	Left Front Brake Caliper	135.0	-20.8	11.9	63.4	50	72.1	34
8	Vehicle C.G. ΔV = 31.3 mph	91.9	0.0	13.3	61.2	64	90.7	51

*Sensor damage at 34 ms.

3.0 GENERAL TEST AND VEHICLE PARAMETER DATA

This section consists of three tables which document vehicle information, test conditions, and the post-impact crush configuration.

GENERAL TEST AND VEHICLE PARAMETER DATA

PRE-IMPACT DATA

Make/Model: Ford Escort
Body Style: 4-Door Hatchback Model Year 1982
NHTSA No. 820210 DSI No. 1247 Color: Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company
Date of Manufacture: 9/81 ; VIN: 1FABP0623CW146915
GVWR: 3030 lb; GAWR: Front = 1724 lb; Rear = 1422 lb

DATA FROM "RECOMMENDED TIRE PRESSURE" LABEL

Vehicle Capacity:	FRONT	REAR	RECOMMENDED TIRE SIZE:	LOAD RANGE:
Tire Pressure:	30 psi	30 psi	P165/80R13	STD

Designated Seating: 2 Front 2 Rear 4 Total
Cargo load = 150lb Is Spare Tire: Space Saver? P155/80D13
TOTAL = 750lb Standard Equipment? Yes
Engine: 4 Cylinder (CFM 1.6V2GKC2-EGR/A1P/TWC) 1.6 liter
Transmission: Manual 4 Speed Front Wheel Drive
Date Vehicle Received by Laboratory: 4/16/82 ; Odometer 405
Dealer Name & Address: NTS Via Auto Driveaway

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

Right Front = 639 lb Right Rear = 397 lb
Left Front = 634 lb Left Rear = 416 lb
TOTAL FRONT WEIGHT = 1273 lb (61 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 813 lb (39 % of Total Vehicle Weight)
TOTAL DELV. WEIGHT = 2086 lb

TARGET WEIGHT = UDW + Cargo Load + 328 lbs Dummies = 2564 lb

WEIGHT OF TEST VEHICLE WITH REQUIRED DUMMIES AND 150 LB CARGO:

Right Front = 716 lb Right Rear = 592 lb
Left Front = 688 lb Left Rear = 588 lb
TOTAL FRONT WEIGHT = 1404 lb (54 % of Total Vehicle Weight)
TOTAL REAR WEIGHT = 1180 lb (46 % of Total Vehicle Weight)
TOTAL TEST WEIGHT = 2584 lb
Weight of ballast secured in vehicle trunk area = 0 lb

VEHICLE ATTITUDE: (inches)

Delivered Attitude: RF 30.00 LF 30.00 RR 30.00 LR 30.00
Test Attitude: RF 28-1/4 LF 29-1/2 RR 27-1/8 LR 27-1/4

REMARKS: Three-point belt system.

GENERAL TEST AND VEHICLE PARAMETER DATA (CONT)

POST-IMPACT DATA

Type of Test: Frontal (0°) Impact

Date of Test: 6/15/82 Time: 1348 Temperature 95 °F

Required Impact Velocity Range: 34.5 to 35.5 mph

Impact Velocity: Primary = N/A mph Secondary = 34.52 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 =	160.0	163.8	160.1
	Post-test =	138.5	140.4	136.1
	Crush =	21.6	23.4	24.0
Distance from front of test vehicle to point of impact:		17.3	17.3	17.3

VISIBLE DUMMY CONTACT POINTS

	Driver	Passenger
Head	Center of steering wheel hub, upper rim steering wheel	Top of head on dash
Chest	Lower rim of steering wheel	None
Abdomen	None	None
Left Knee	Dash panel	Glove box
Right Knee	Dash panel	Glove box

DOOR OPENING	Front		Rear	
	Left	Right	Left	Right
	Tools Required	Tools Required	Tools Required	Diffi-culty
SEAT MOVEMENT				
Seatback Failure	None	None		
Seat Shift (in.)	None	1-1/2" Forward		

GLAZING DAMAGE

Backlight/Windshield Severely cracked windshield.

OTHER NOTABLE IMPACT EFFECTS: Fender wells crushed to wheels. Steering column bent upwards. Severe crumpling in side rails under front seat compartment. Door outer skin of front doors underrode the outer forward skin of the rear doors.

VEHICLE PROFILE DATA SHEET

PRE-IMPACT DATA

Make/Model: Ford Escort
Body Style: 4-Door Hatchback Model Year: 1982
NHTSA No.: 820210 DSI No. 1247 Color: Blue

DATA FROM CERTIFICATION LABEL

Vehicle Manufacturer: Ford Motor Company
Date of Manufacture: 9/81 ; VIN: 1FABP0623CW146915
GVWR: 3030 lb; GAWR: Front = 1724 lb; Rear = 1422 lb

POST-IMPACT DATA

Type of Test: Frontal (0°) Impact
Date of Test: 6/15/82 Time: 1348 Temperature 95 °F
Required Impact Velocity Range: 34.5 to 35.5 mph
Impact Velocity: Primary = N/A mph Secondary = 34.52 mph

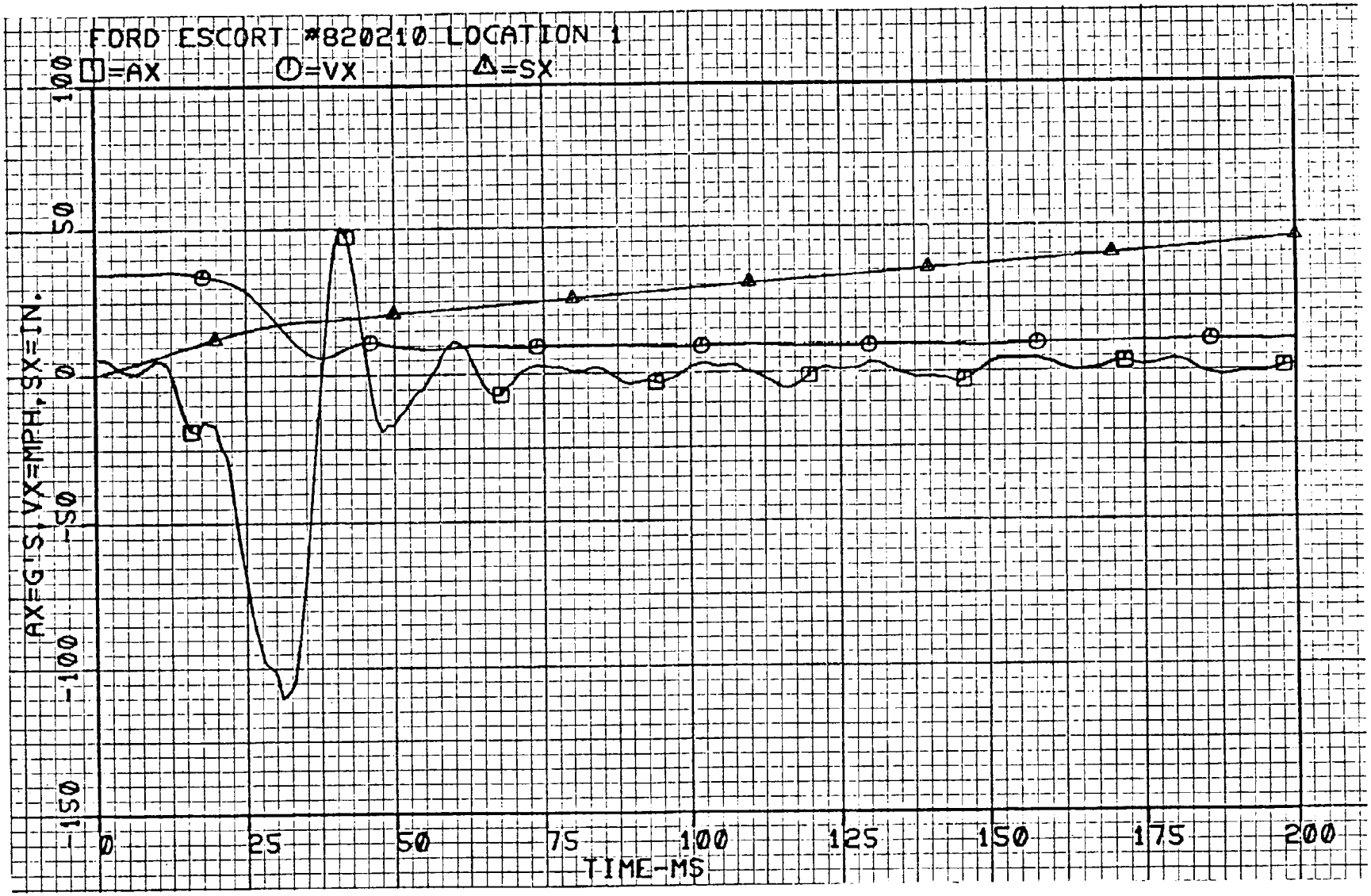
Measurements Referenced to Plane 13.7 Feet Forward of Rear Bumper ℄

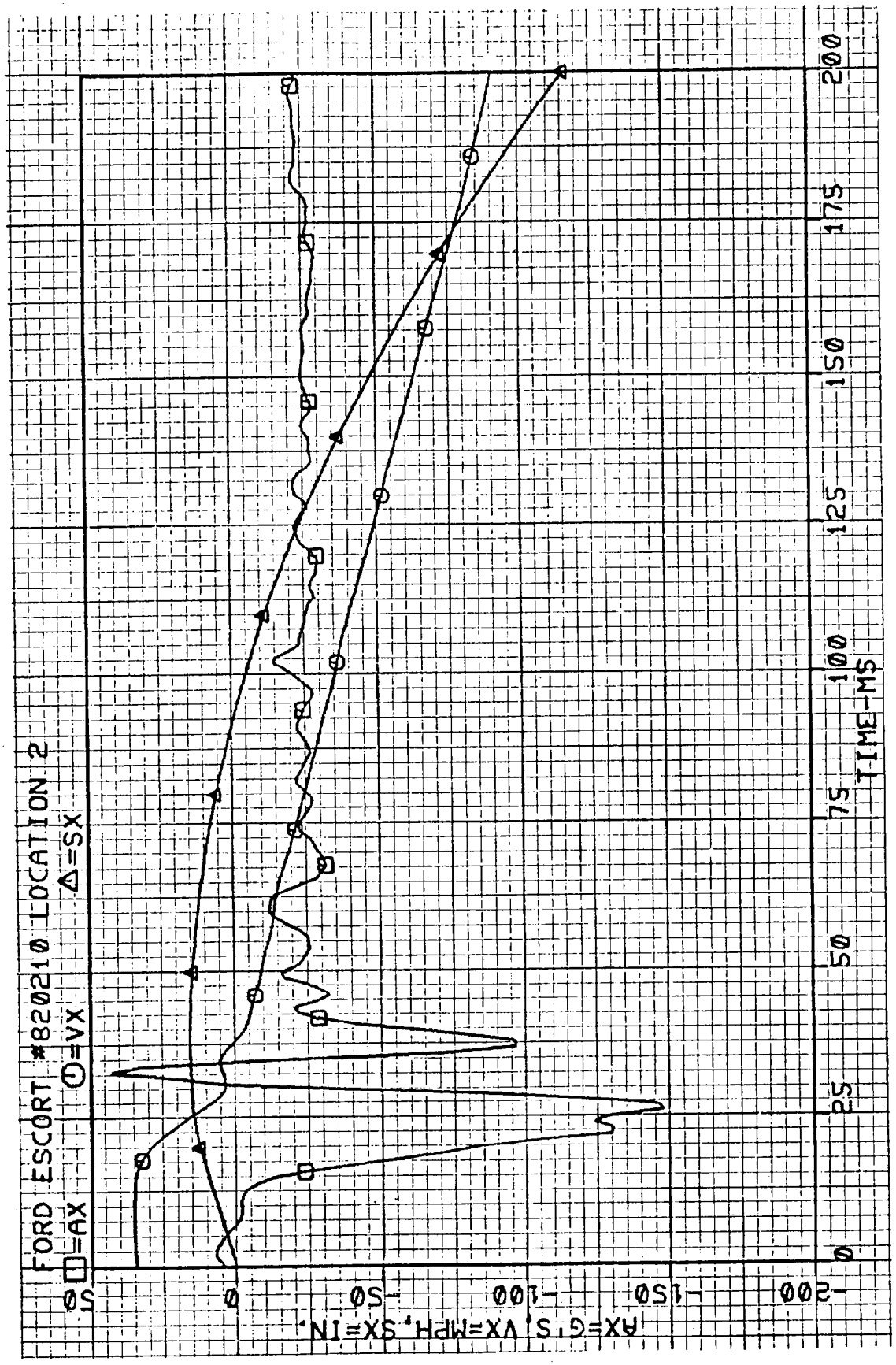
		Vehicle Left (in.)				Vehicle Right (in.)		
Location	Height	28.5	16.7	5.9	℄	5.9	16.7	28.5
		27.0	16.2	5.4	℄	5.4	16.2	27.0
		Pre-test Profile (in.)						
Top of Front Bumper		3.8	0.9	0.2	0.1	0.2	0.8	3.8
Front of Hood		10.1	7.7	7.0	7.0	7.0	7.6	10.1
		Post-test Profile (in.)						
Top of Front Bumper		27.7	25.0	24.2	24.0	23.7	23.8	25.3
Front of Hood		27.3	26.7	26.0	25.7	25.5	25.4	25.7
		Post-test Static Crush (in.)						
Top of Front Bumper		23.9	24.1	24.0	23.9	23.5	23.0	21.5
Front of Hood		17.2	19.0	19.0	18.7	18.5	17.8	15.6

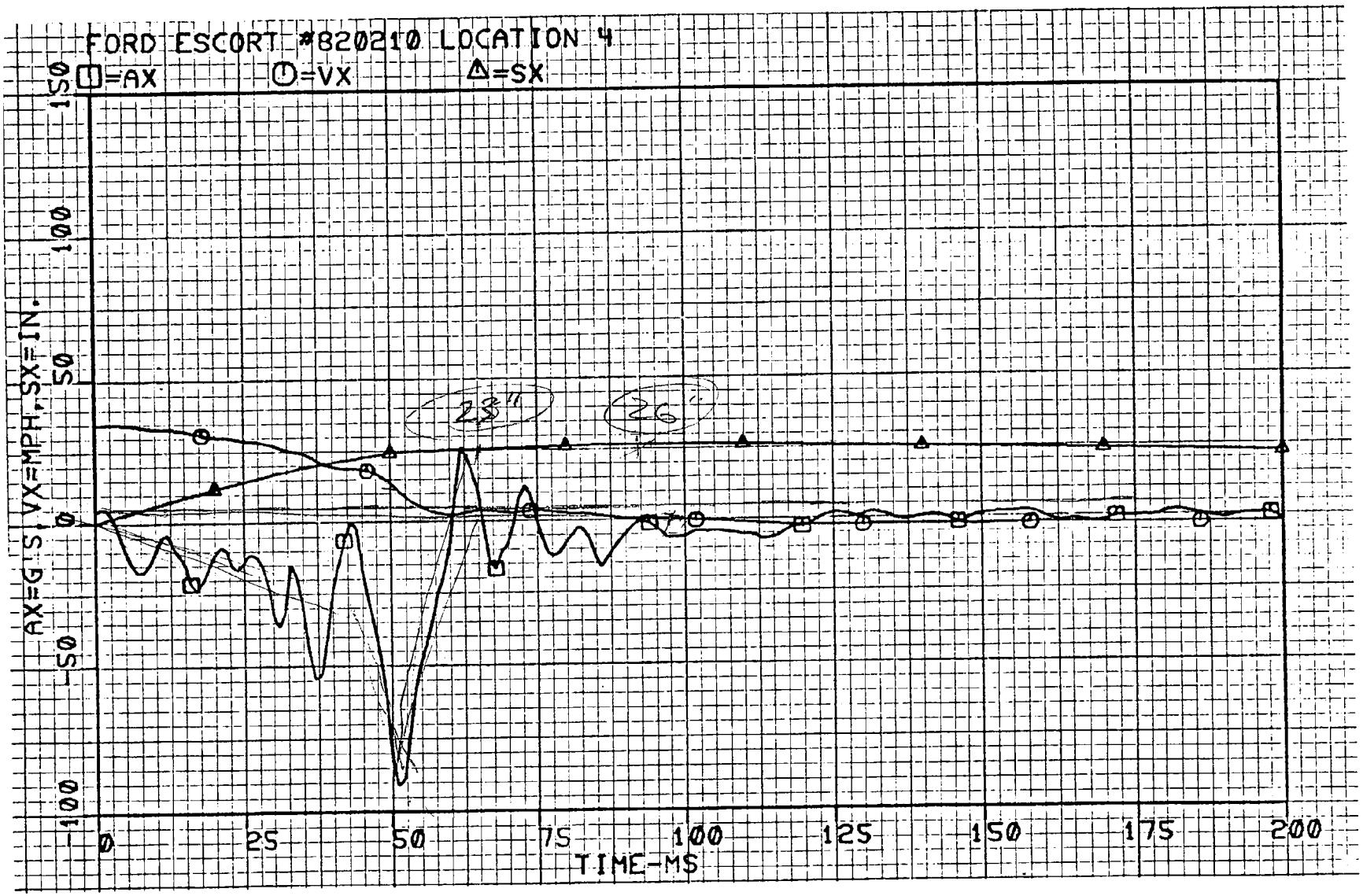
4.0 DATA PRESENTATION

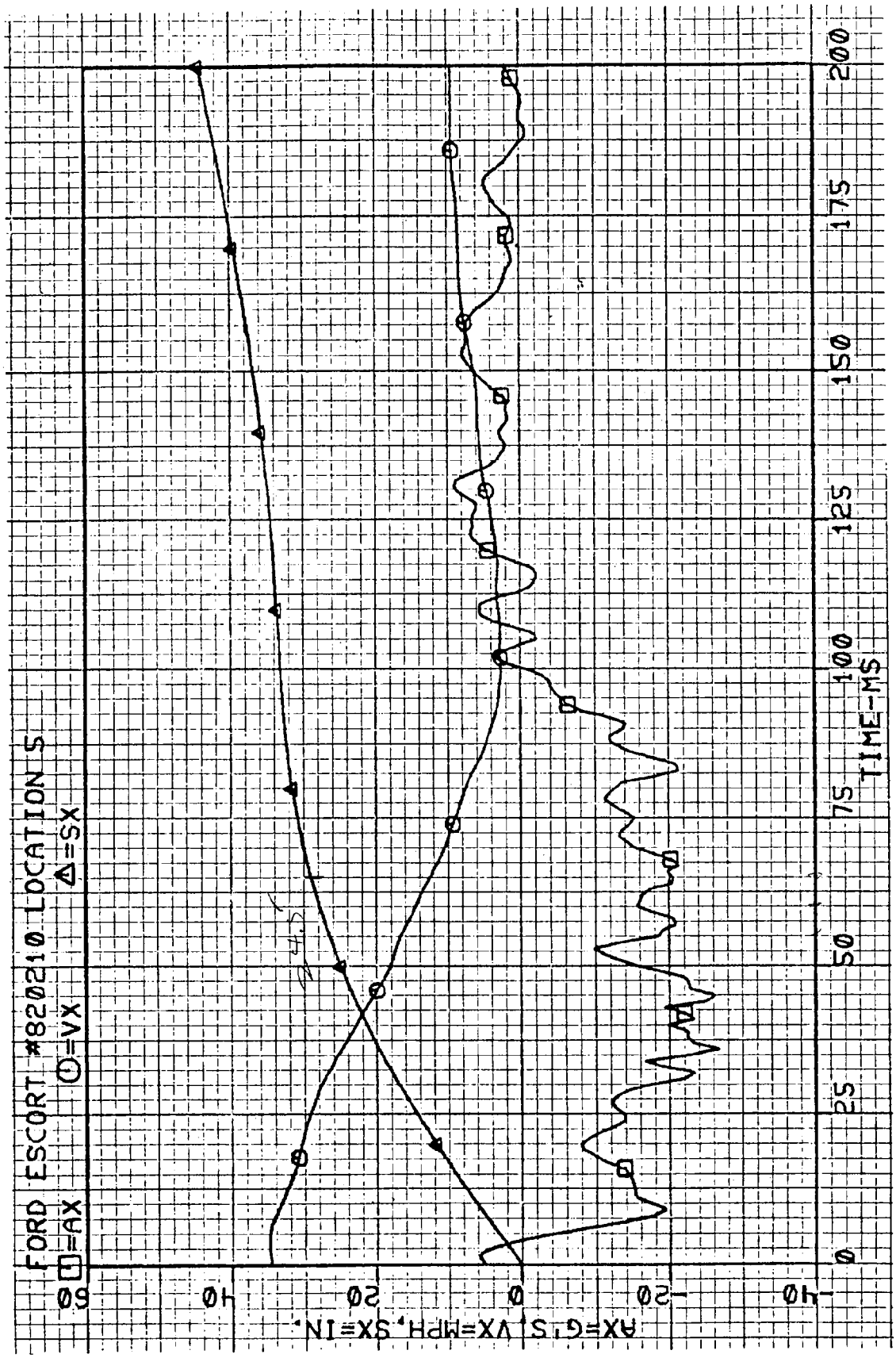
Data plots are presented for each accelerometer and consist of the accelerometer data plus the first integral versus time (velocity) and the second integral versus time (displacement) of the acceleration data.

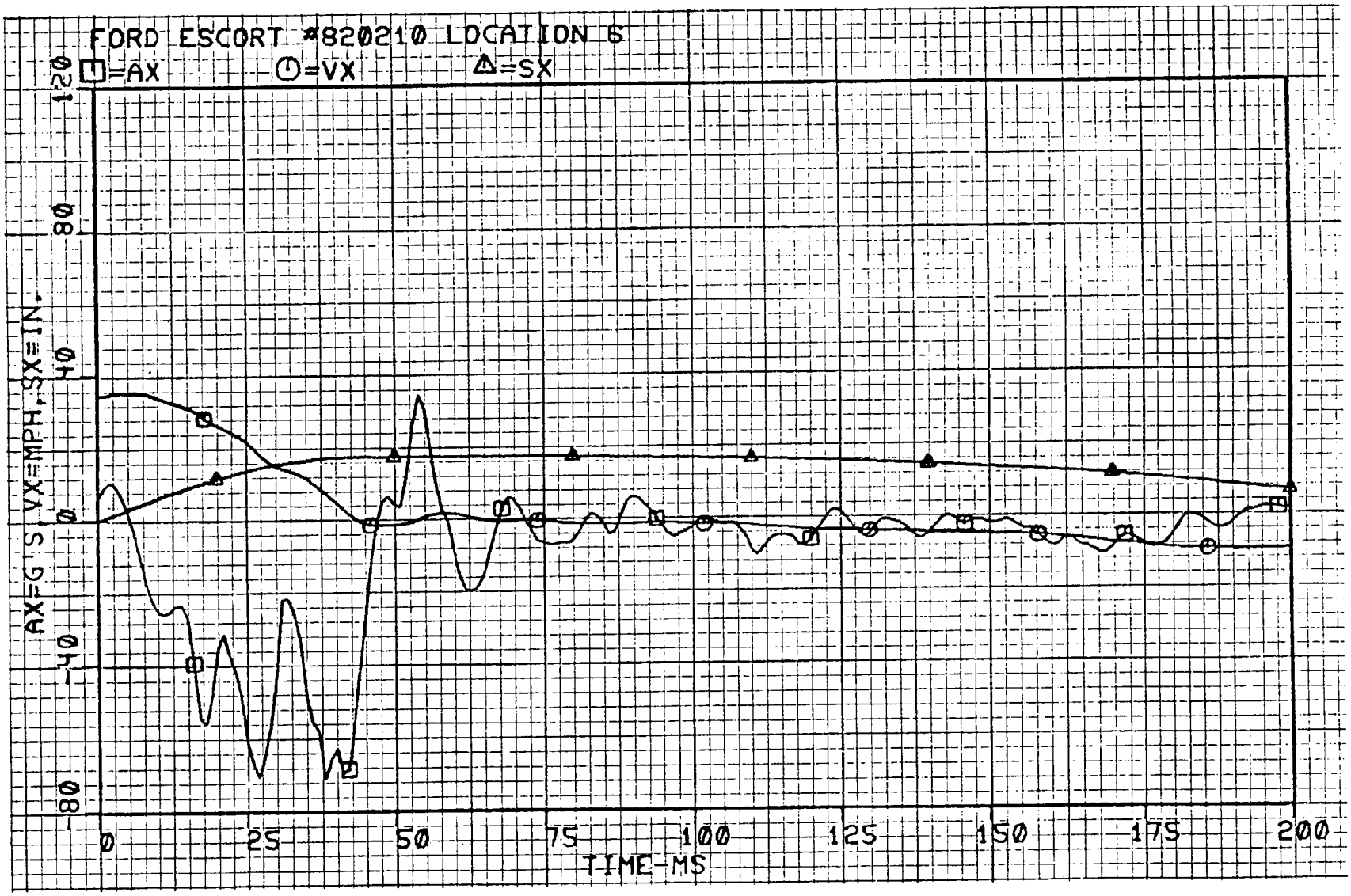
For the load cells, all data are summed and presented as total load versus time, upper two rows (C and D) summed versus time and lower two rows (A and B) summed versus time. Additional plots are presented for each cell multi-plotted by column. Individual loads may be difficult to discern on some of these plots. Tabular data can be provided if necessary.

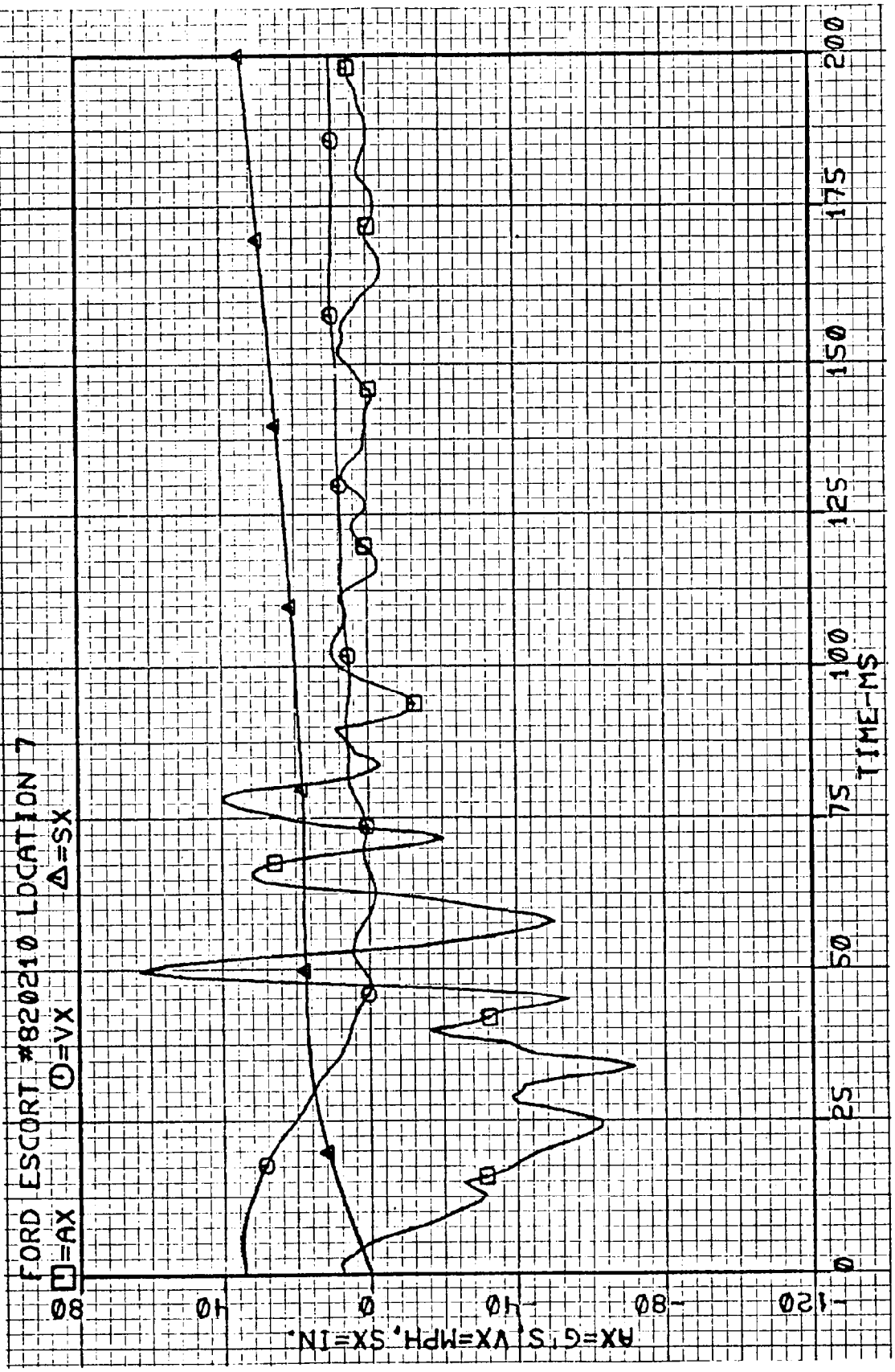

FORD ESCORT #820210 LOCATION 1
□=AX
○=VX
△=SX
100
50
0
-50
-100
-150
AX=G'S, VX=MPH, SX=IN.
0
25
50
75
100
125
150
175
200
TIME-MS

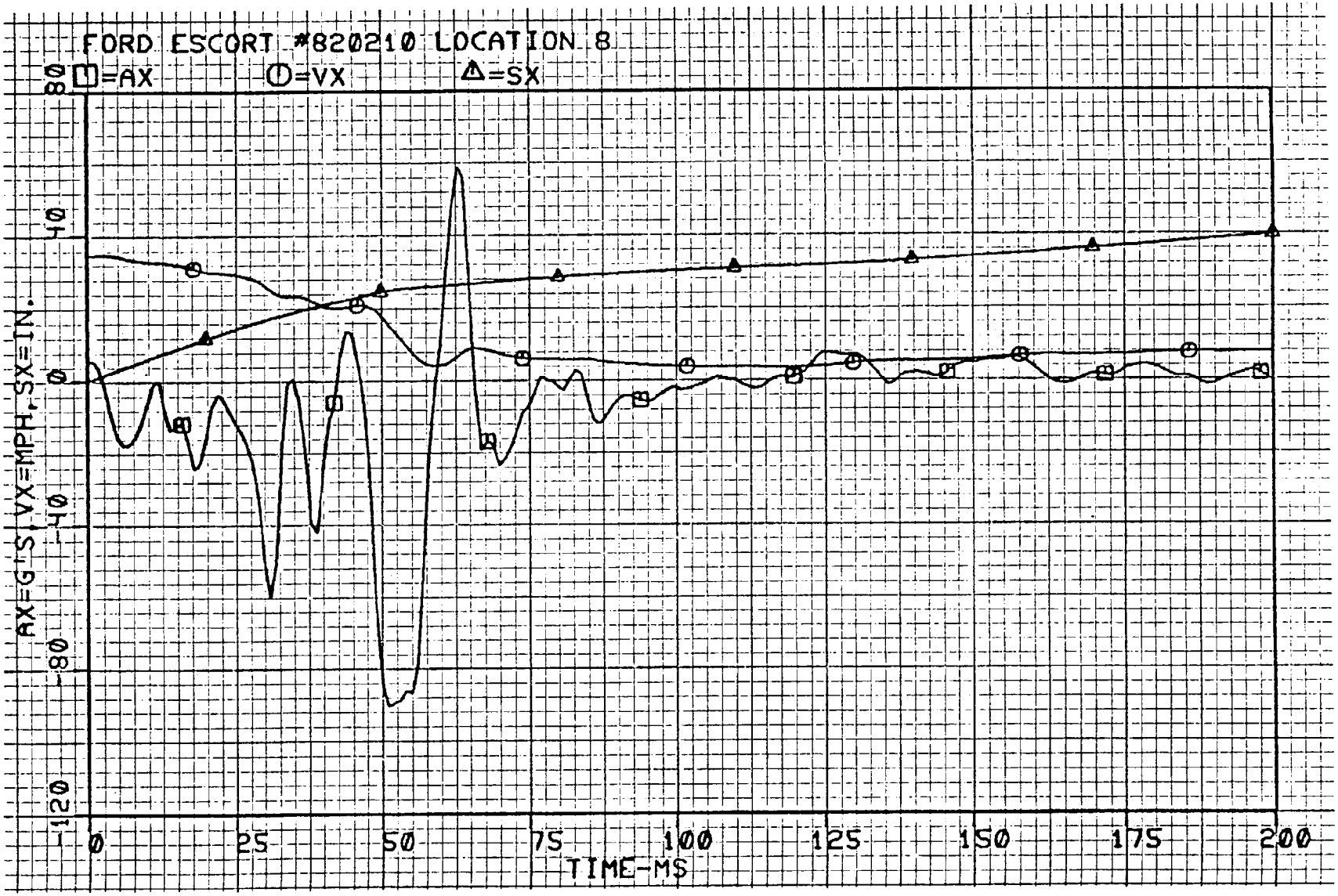

FORD ESCORT #820210 LOCATION 2
□=AX
○=VX
Δ=SX
AX=G'S, VX=MPH, SX=IN.
TIME-MS
0
25
50
75
100
125
150
175
200
-50
-100
-150
-200

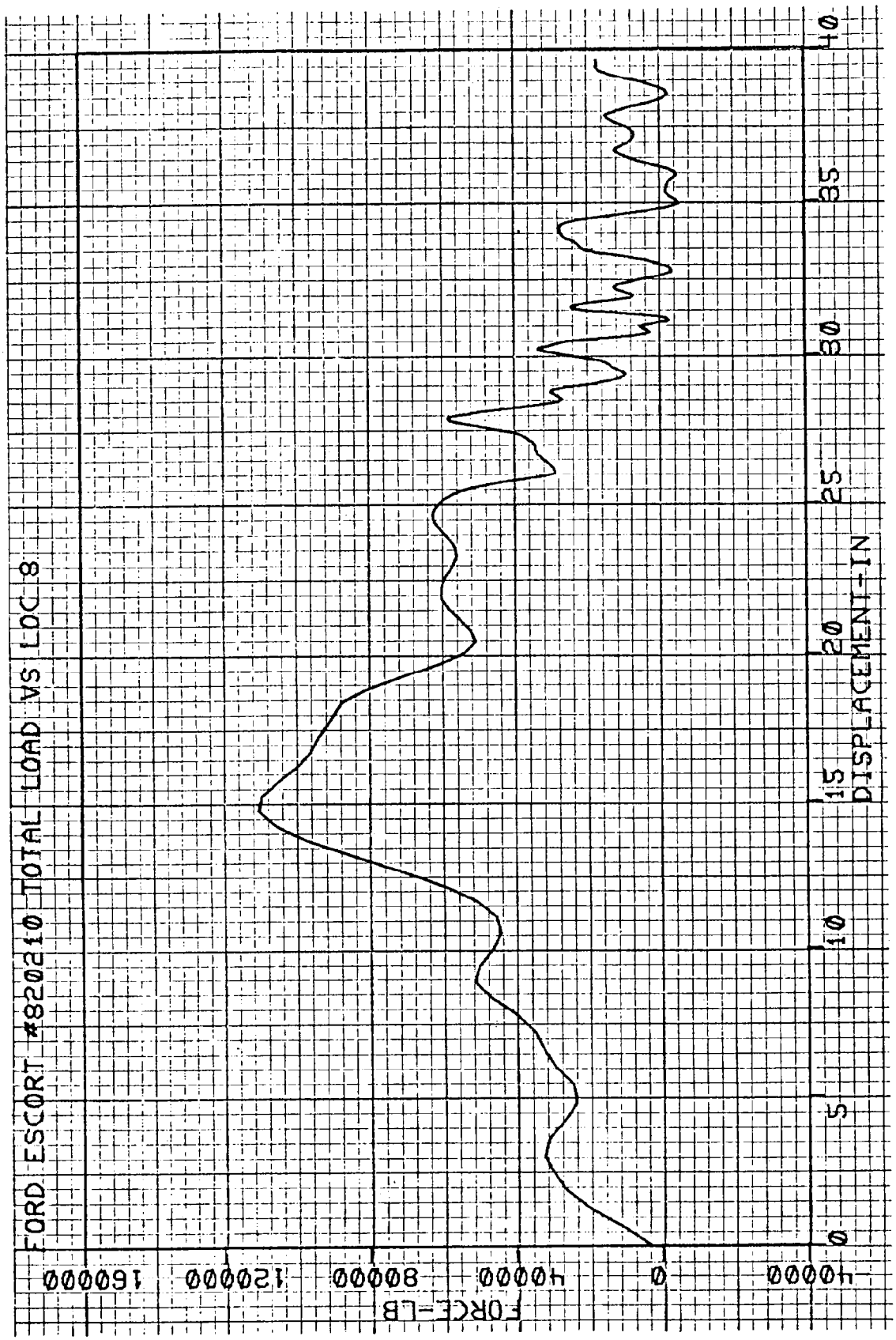

FORD ESCORT #820210 LOCATION 4
□=AX
○=VX
△=SX
AX=G'S, VX=MPH, SX=IN.
150
100
50
0
-50
-100
0
25
50
75
100
125
150
175
200
TIME-MS
23"
26"

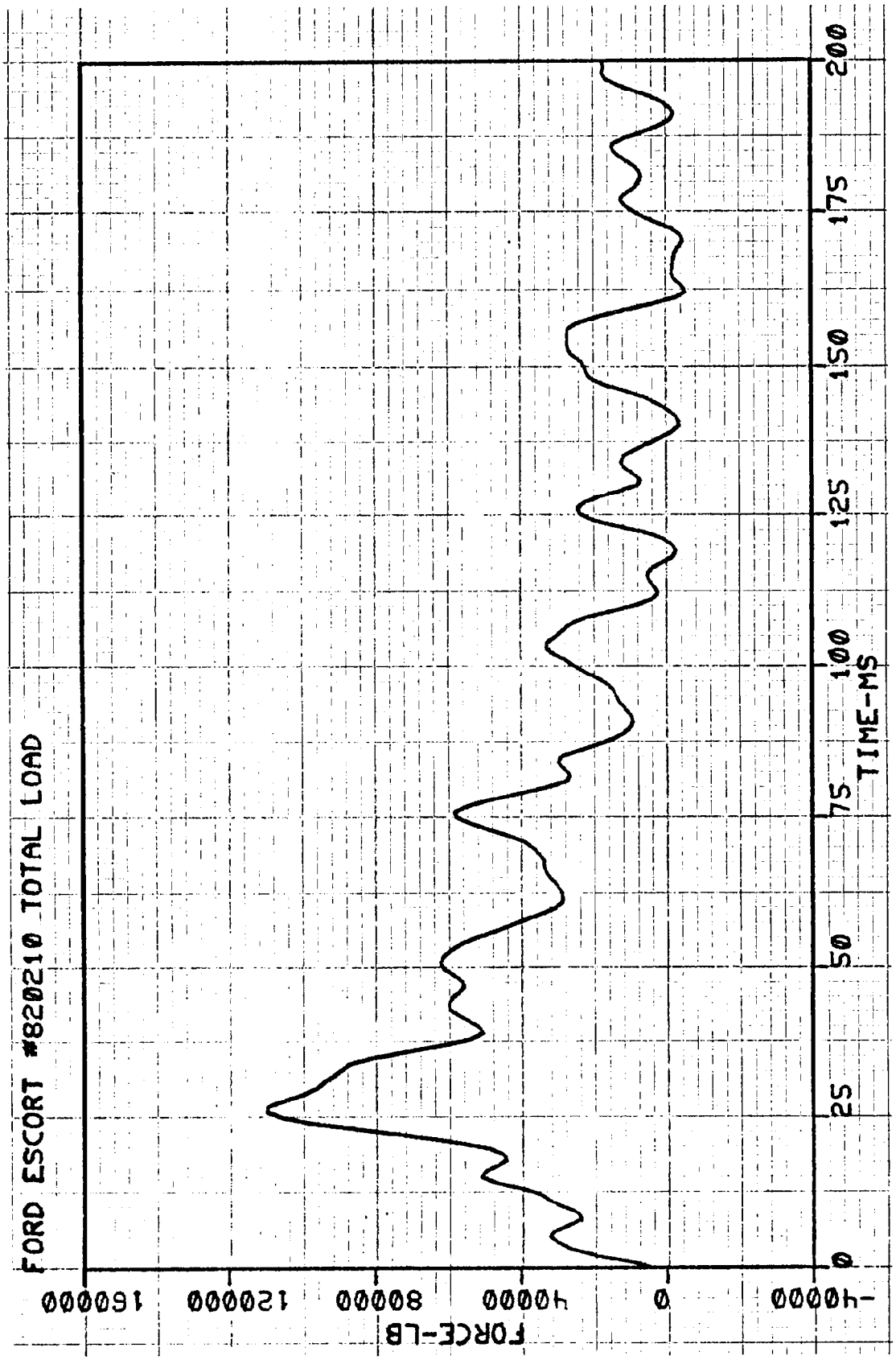

FORD ESCORT #820210 LOCATION S
□=AX ○=VX Δ=SX
AX=G'S VX=MPH, SX=IN.
-40
-20
0
20
40
60
0
25
50
75
100
125
150
175
200
TIME-MS

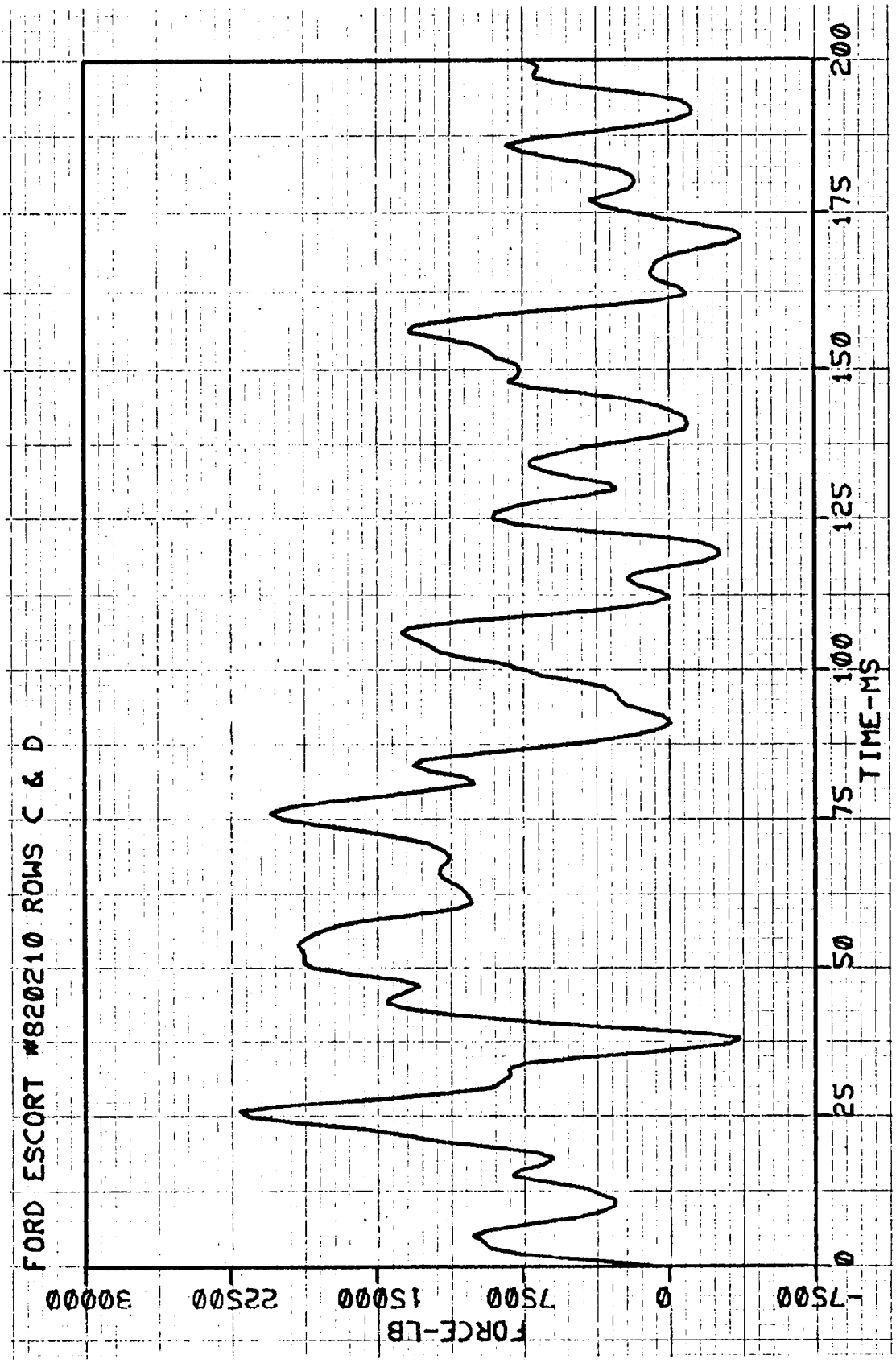

FORD ESCORT #820210 LOCATION 6
□=AX
○=VX
△=SX
AX=G'S VX=MPH SX=IN.
12Ø
8Ø
4Ø
Ø
4Ø
8Ø
Ø
25
50
75
100
125
150
175
200
TIME-MS

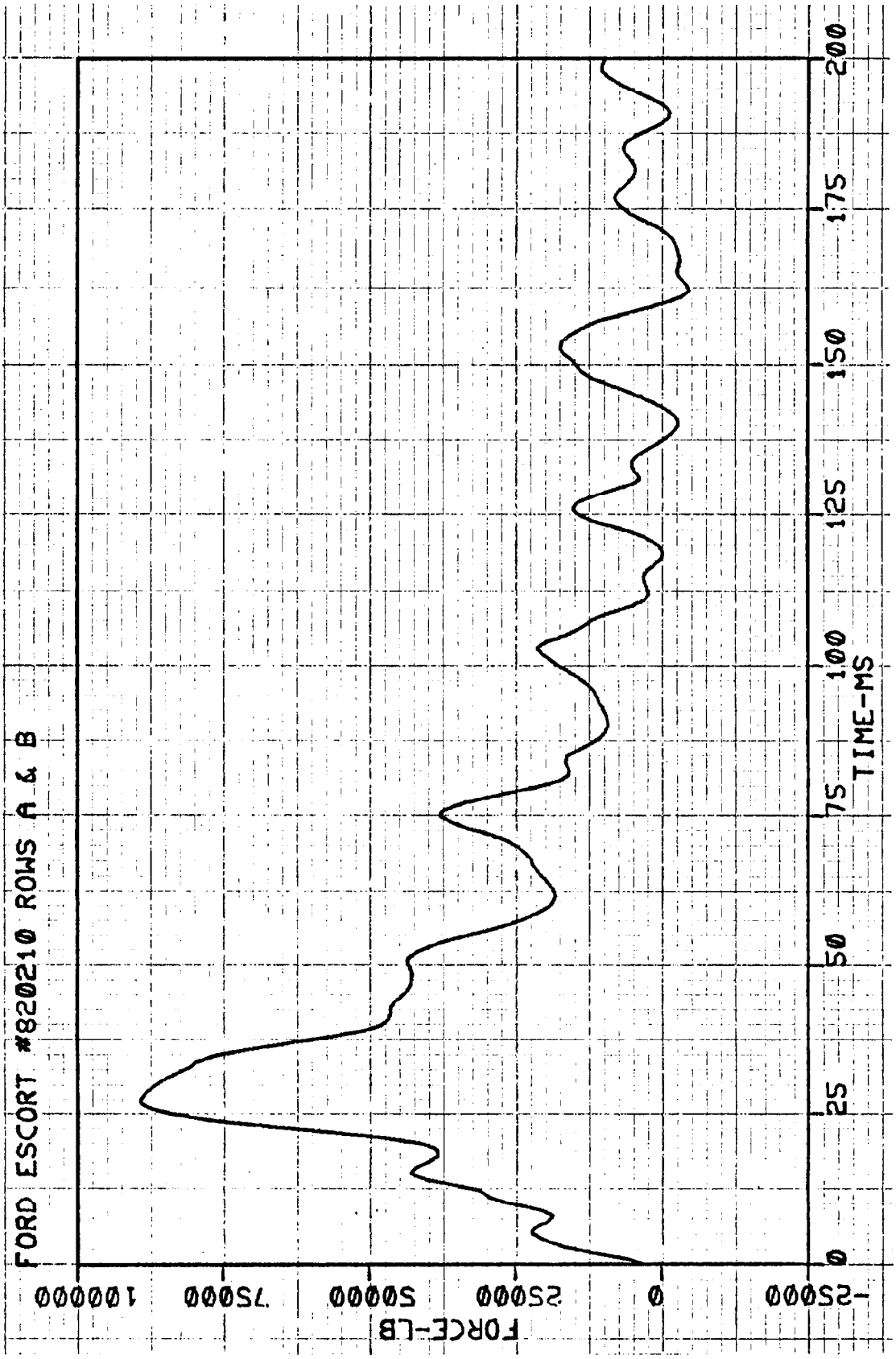

FORD ESCORT #820210 LOCATION 7
□=AX ○=VX Δ=SX
AX=G'S, VX=MPH, SX=IN.
80
40
0
-40
-80
-120
0
25
50
75
100
125
150
175
200
TIME-MS

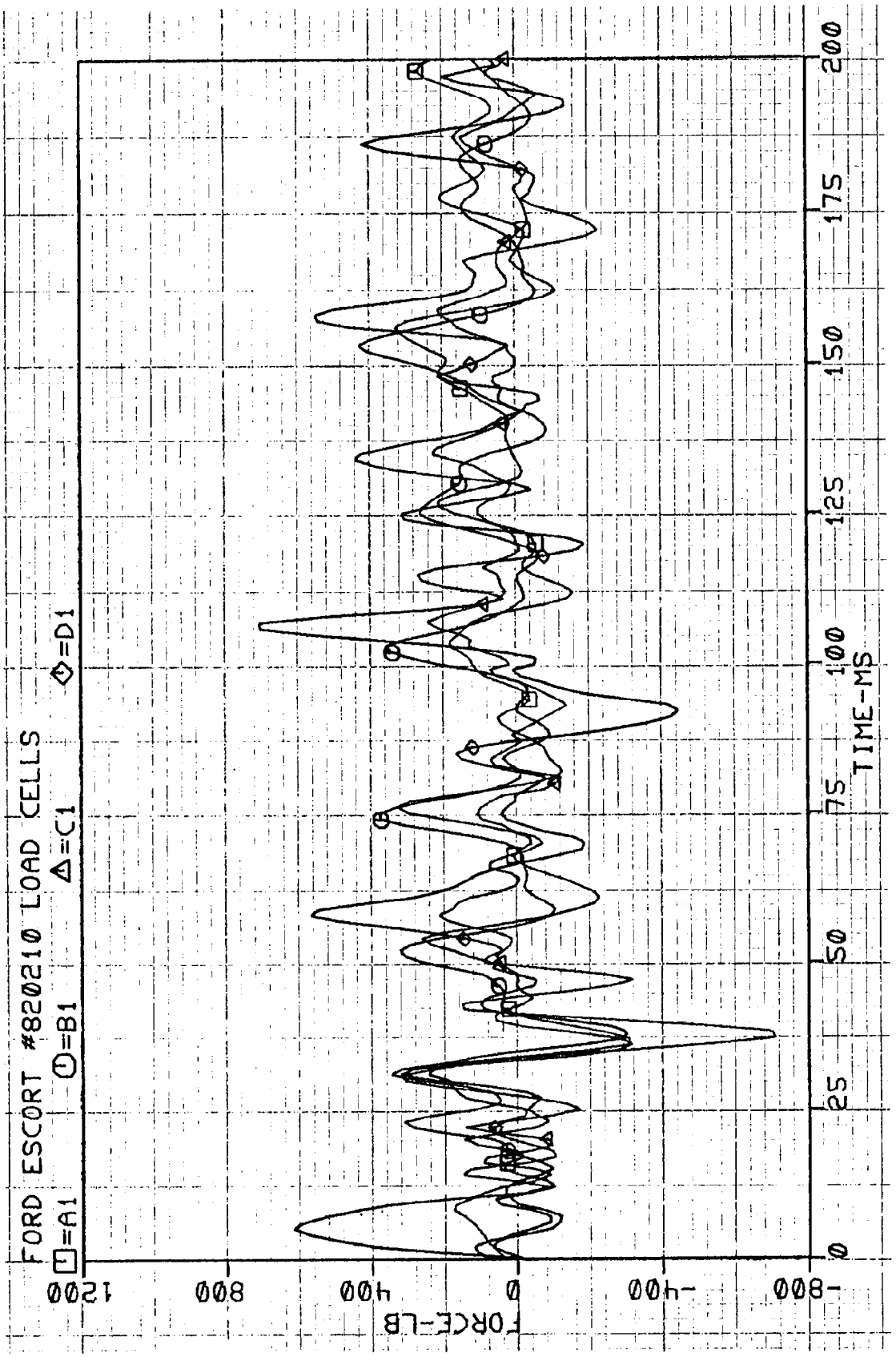

FORD ESCORT #820210 LOCATION 8
□=AX
○=VX
△=SX
AX=G'S, VX=MPH, SX=IN.
80
40
0
-40
-80
-120
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #8202210 TOTAL LOAD VS LOC 8
FORCE-LB
160000
120000
80000
40000
0
40000
0
5
10
15
20
25
30
35
40
DISPLACEMENT-IN


FORD ESCORT #820210 TOTAL LOAD
FORCE-LB
-40000
0
40000
80000
120000
160000
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 ROWS C & D
FORCE-LB
-7500
0
7500
15000
22500
30000
TIME-MS
0
25
50
75
100
125
150
175
200


FORD ESCORT #820210 ROWS A & B
FORCE-LB
-25000
0
25000
50000
75000
100000
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOAD CELLS
□=A1 ○=B1 Δ=C1 ◇=D1
FORCE-LB
1200
800
400
0
-400
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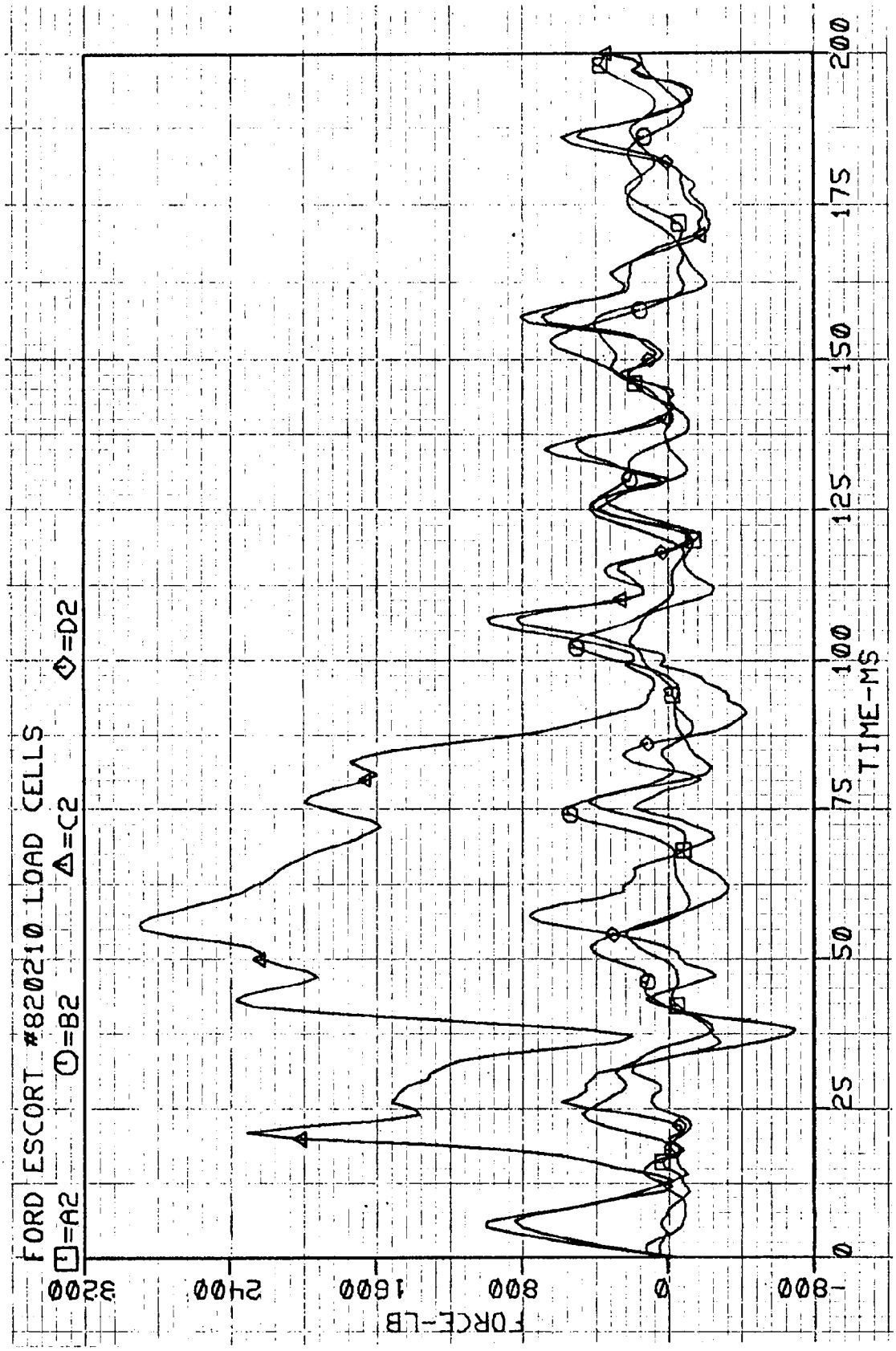
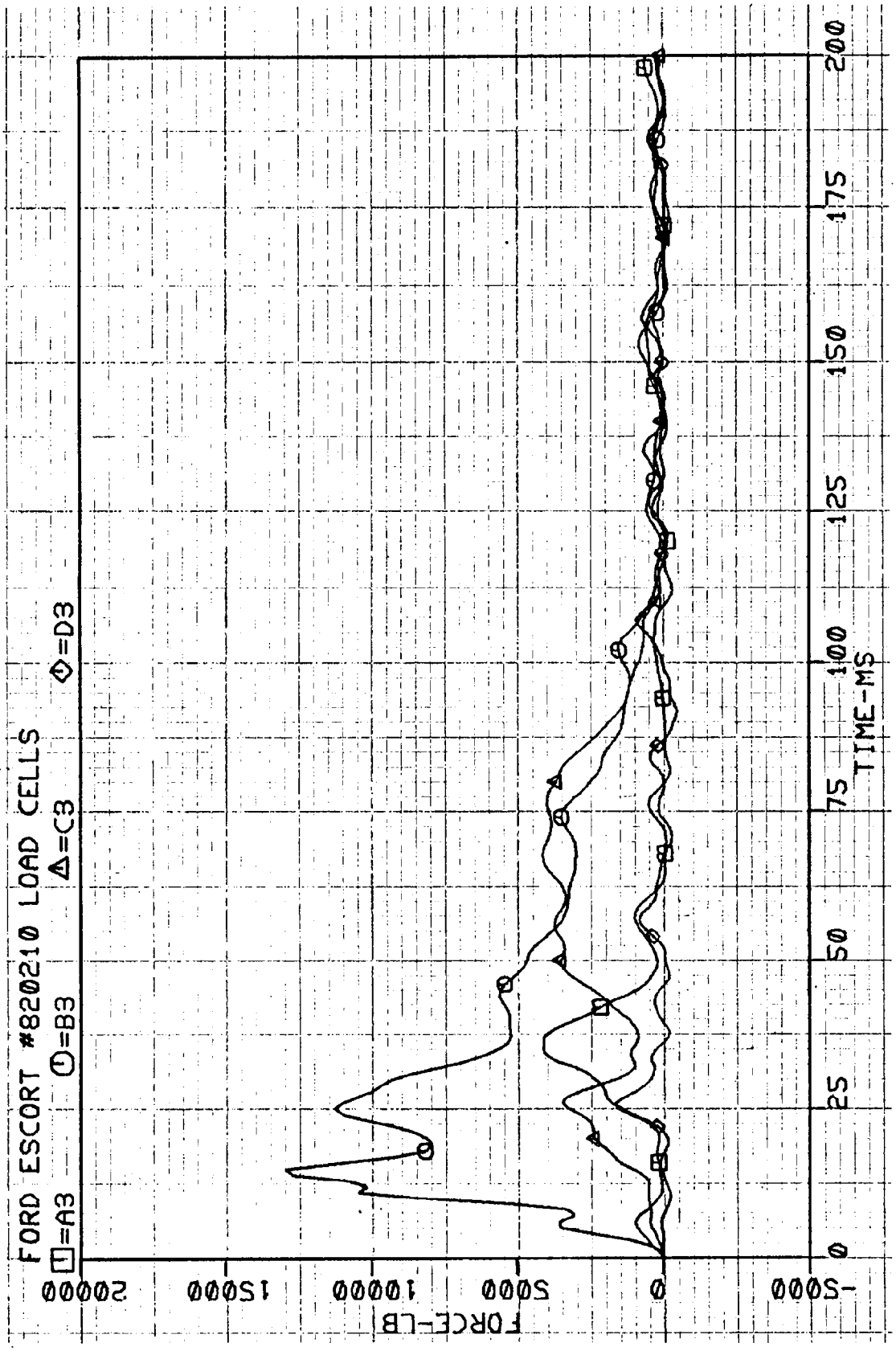
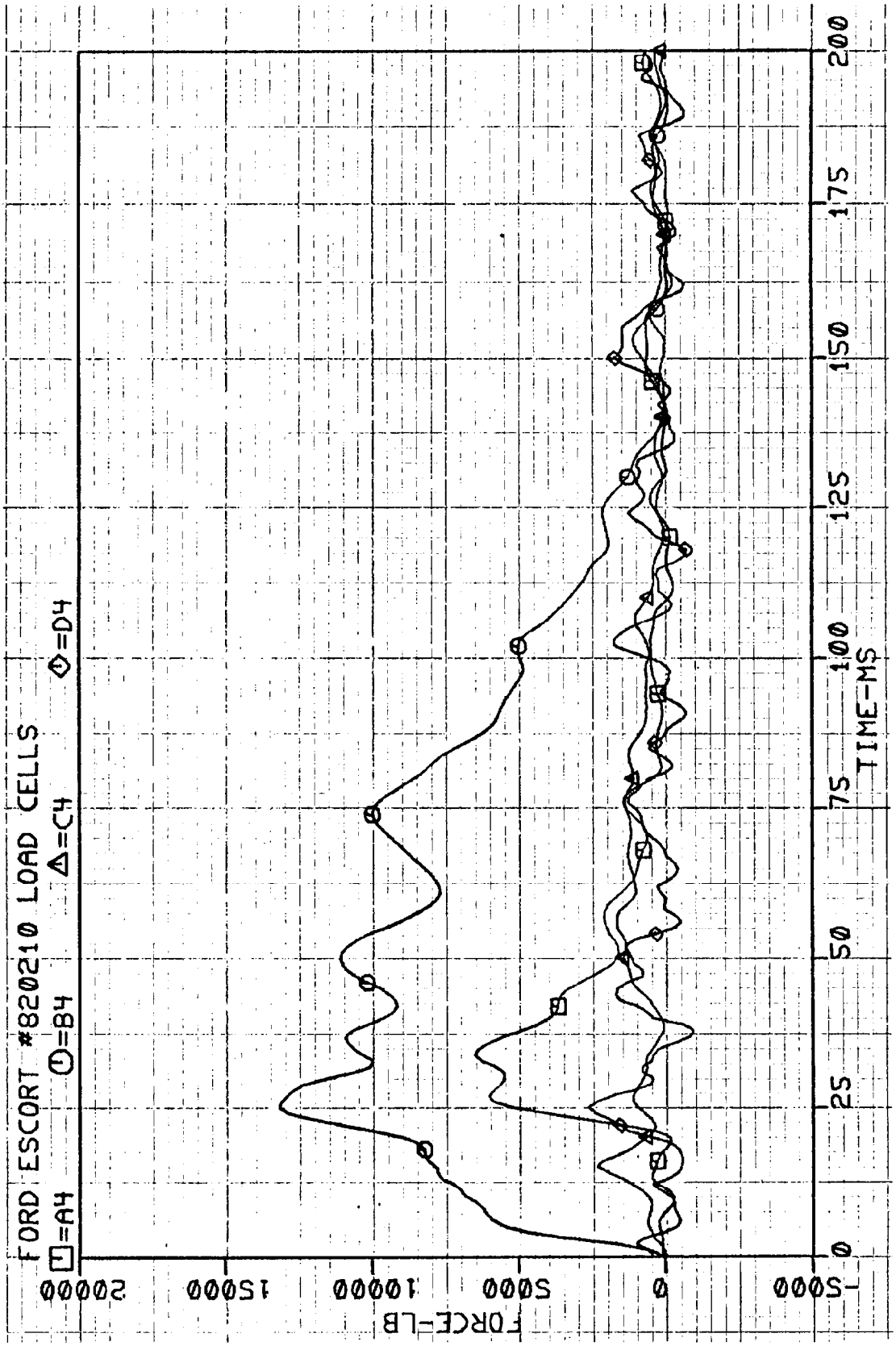
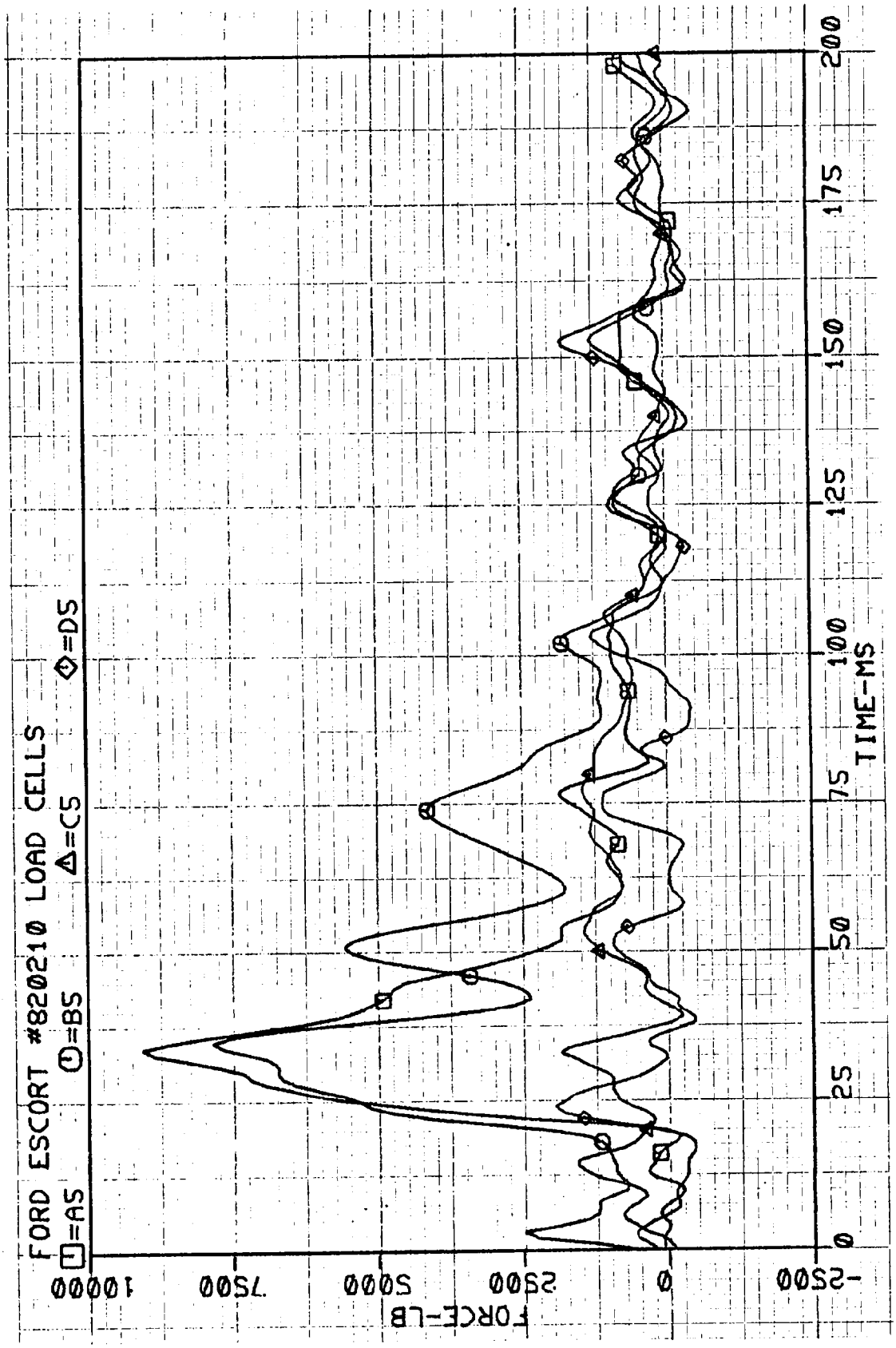
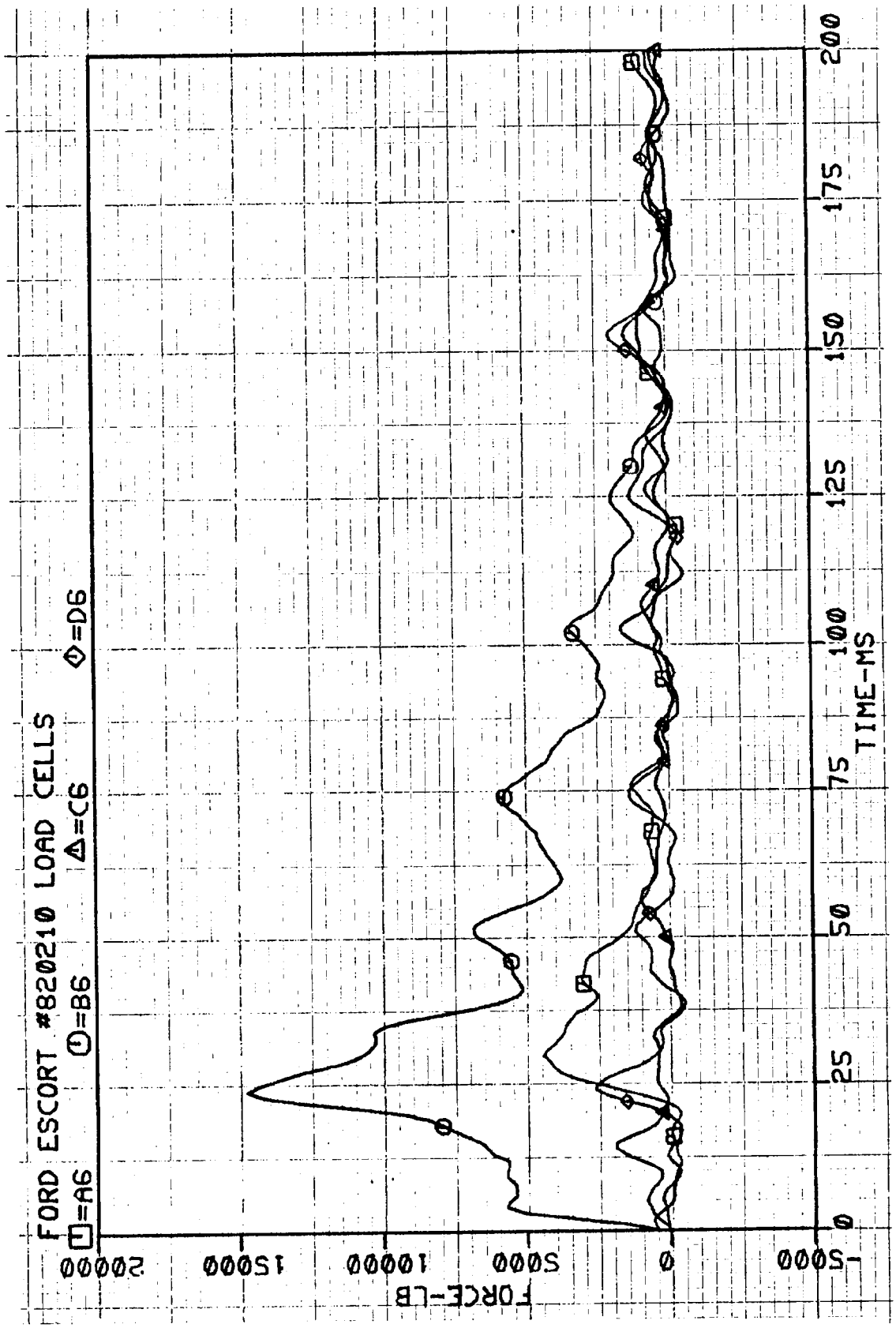
25
50
75
100
125
150
175
200
TIME-MS

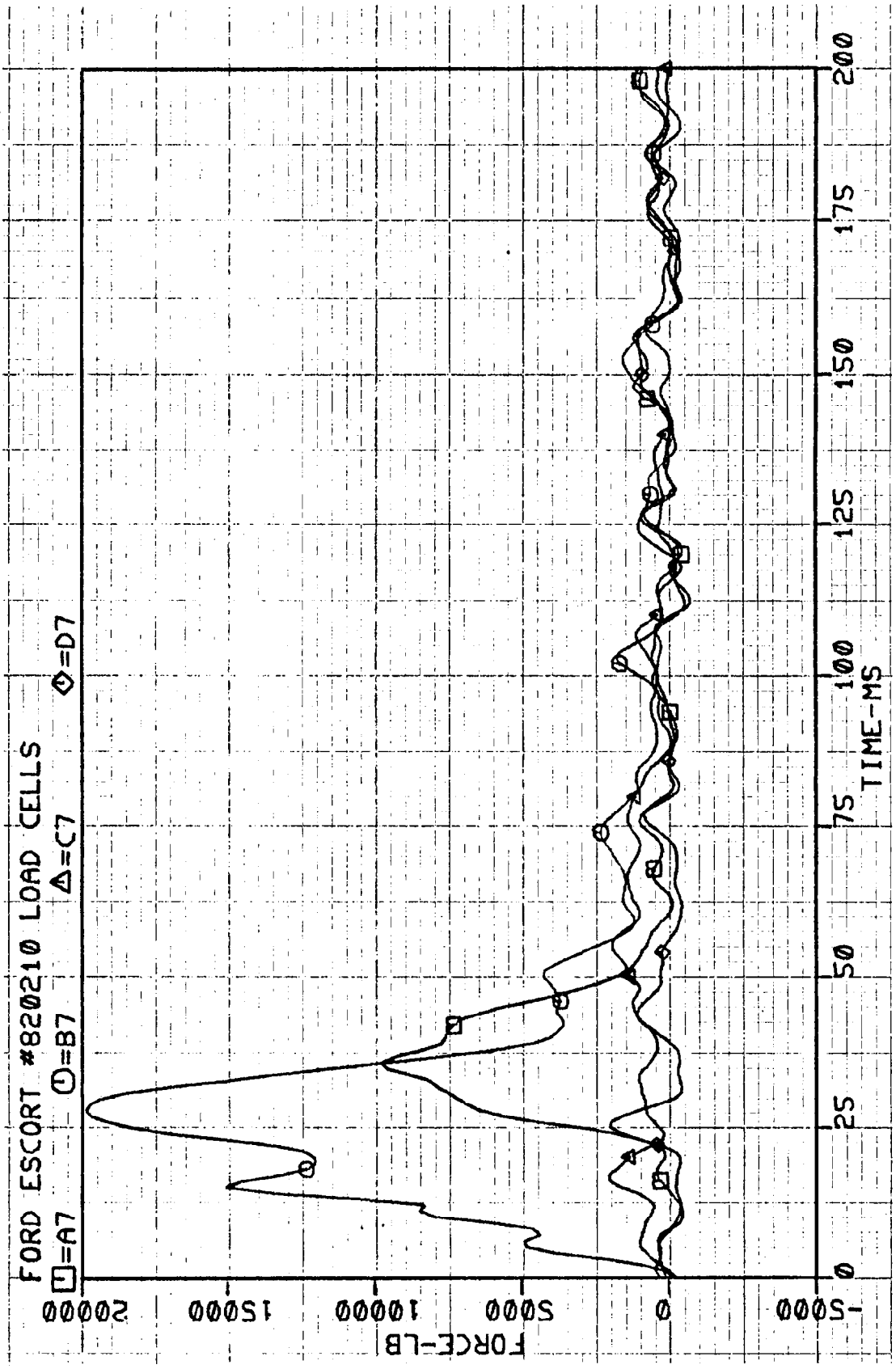

FORD ESCORT #820210 LOAD CELLS
□=A2
○=B2
△=C2
◇=D2
FORCE-LB
3200
2400
1600
800
0
-800
0
25
50
75
100
125
150
175
200
TIME-MS

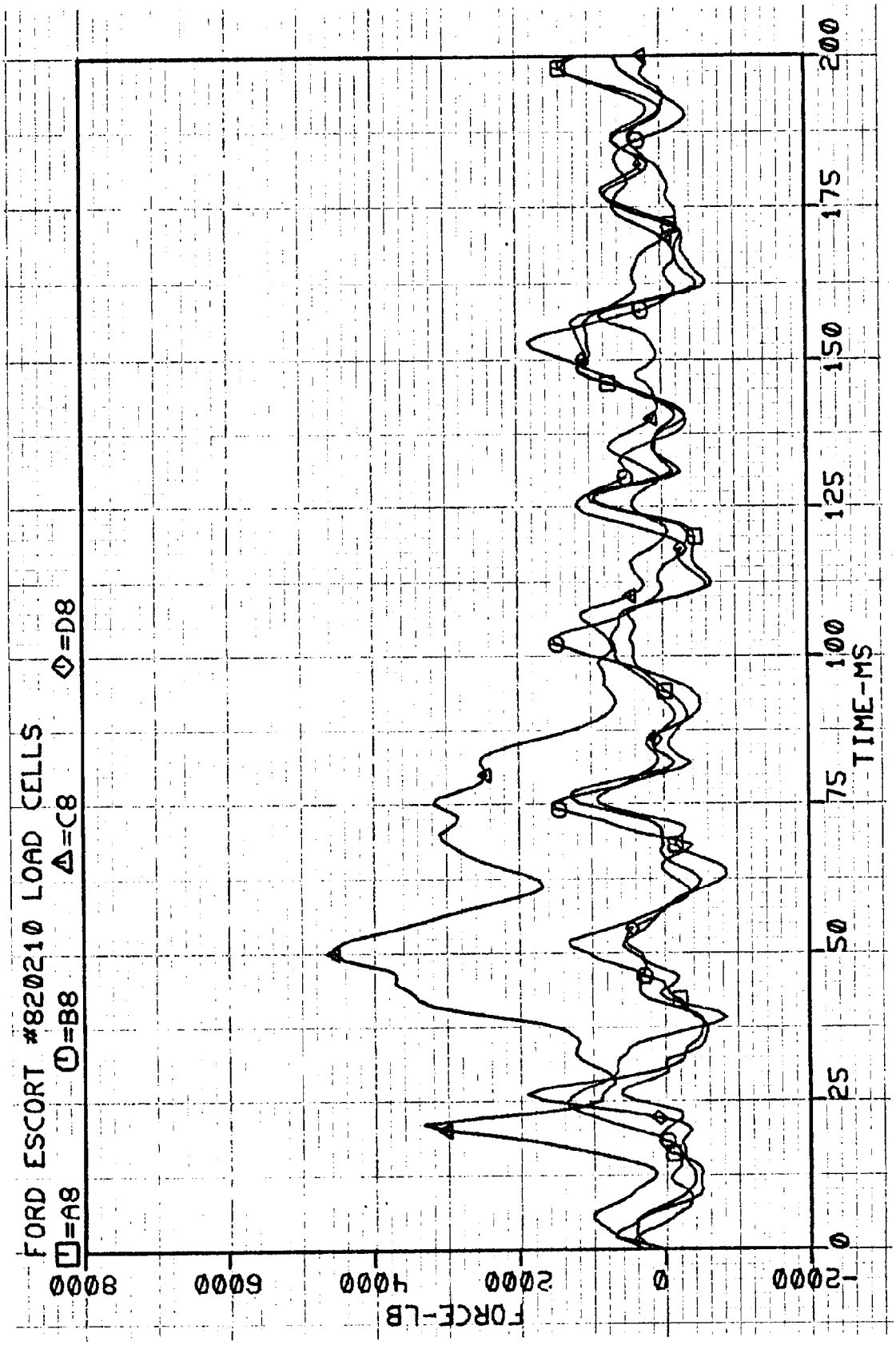

FORD ESCORT #820210 LOAD CELLS
□=A3 ○=B3 △=C3 ◇=D3
FORCE-LB
-5000
0
5000
10000
15000
20000
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOAD CELLS
□=A4 ○=B4 Δ=C4 ◇=D4
FORCE-LB
-5000
0
5000
10000
15000
20000
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOAD CELLS
□=AS ○=BS △=CS ◇=DS
FORCE-LB
10000
7500
5000
2500
0
-2500
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOAD CELLS
□=A6 ○=B6 △=C6 ◇=D6
FORCE-LB
-5000
0
5000
10000
15000
20000
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOAD CELLS
□=A7
○=B7
△=C7
◇=D7
FORCE-LB
-5000
0
5000
10000
15000
20000
0
25
50
75
100
125
150
175
200
TIME-MS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□=A8
○=B8
△=C8
◇=D8
FORCE-LB
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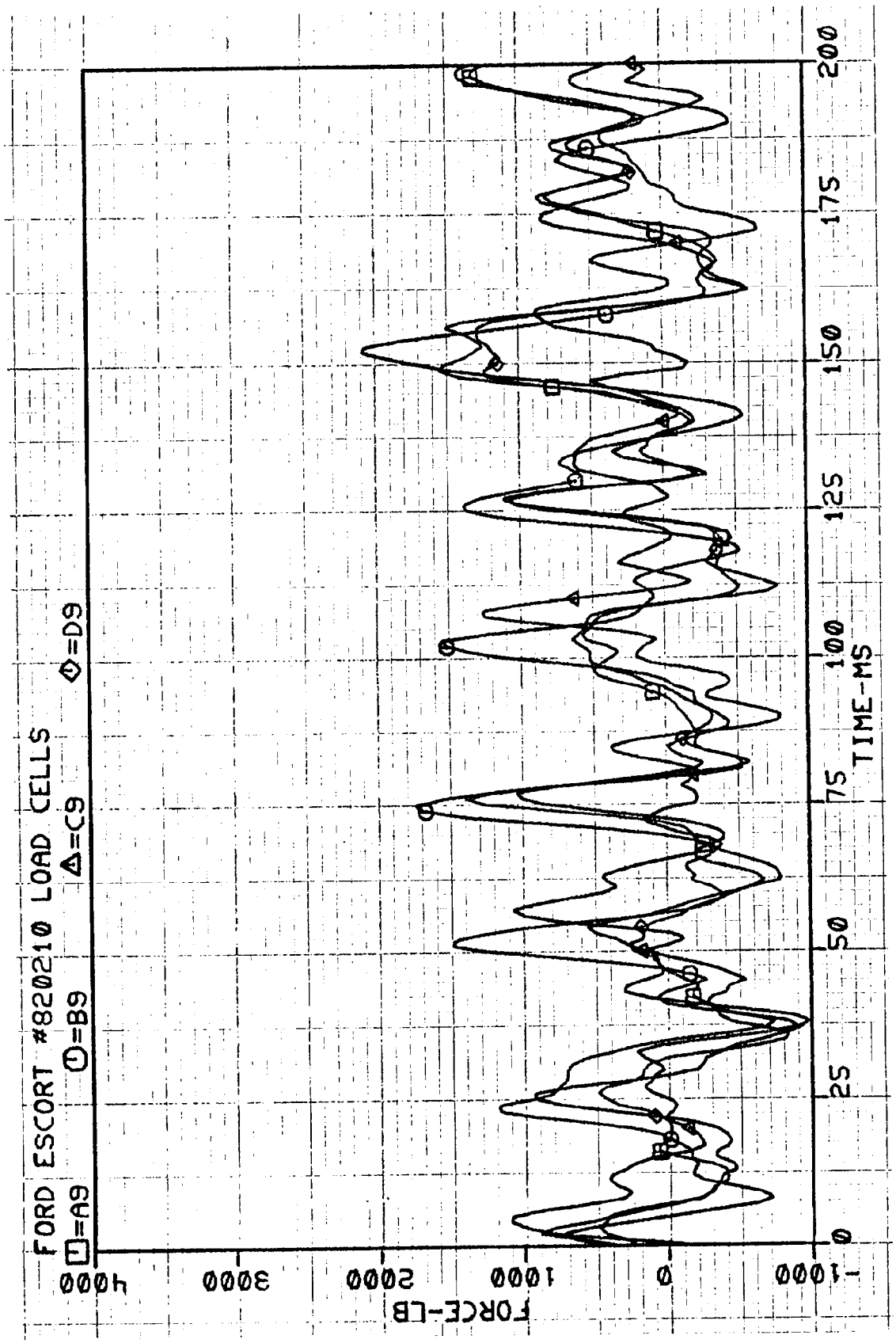
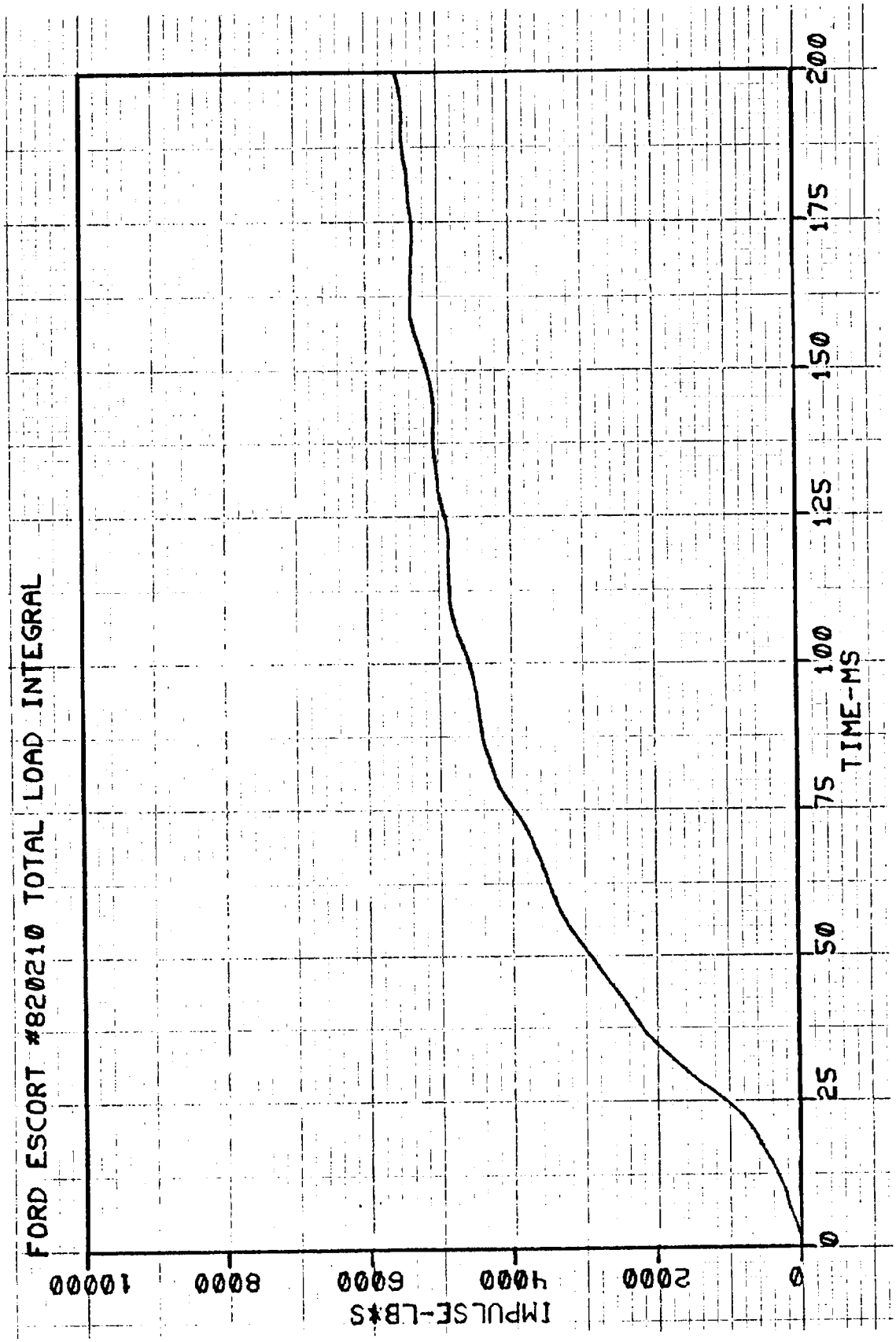
6000
4000
2000
0
-2000
0
25
50
75
100
125
150
175
200
TIME-MS


FORD ESCORT #820210 LOAD CELLS
□=A9 ○=B9 △=C9 ◇=D9
FORCE-LB
4000
3000
2000
1000
0
-1000
TIME-MS
0
25
50
75
100
125
150
175
200


FORD ESCORT #820210 TOTAL LOAD INTEGRAL
IMPULSE-LB*S
0
2000
4000
6000
8000
10000
TIME-MS
0
25
50
75
100
125
150
175
200