~~DOT#189~~

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Report No. (to be assigned by NHTSA)

LIGHT TRUCK AGGRESSIVITY STUDY

TEST REPORT 2

TRUCK-TO-CAR 90° LEFT SIDE

IMPACT TESTS

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Contract DOT-HS-8-01942
$60,048

November 1978

TEST REPORT

Prepared for:

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
2100 SECOND STREET, S.W.
WASHINGTON, D.C. 20590

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TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle LIGHT TRUCK AGGRESSIVITY STUDY - TEST REPORT 2 - TRUCK-TO-CAR 90° LEFT SIDE IMPACT TESTS		5. Report Date November 1978 6. Performing Orgn Code
7. Author(s) R. Yee, R. Cropper, S. Davis		8. Performing Orgn Rpt No. 3051-78-190A
9. Performing Organization Name and Address Dynamic Science, Inc. A Talley Industries Company 1850 West Pinnacle Peak Road Phoenix, Arizona 85027		10. Work Unit No. 11. Contract or Grant No. DOT-HS-8-01942 13. Type of Report and Period Covered TEST REPORT October 1978
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Washington, D.C. 20590		14. Sponsoring Agency Code

15. Supplementary Notes

Tests No. 3 and 4 of a series of 7 tests.

16. Abstract

A series of seven full-scale truck-to-car crash tests was conducted as required under Task 2 of DOT-HS-8-01942, "Light Truck Aggressivity Study," sponsored by the National Highway Traffic Safety Administration. This test report presents the results of Tests 3051-3 and 3051-4, 90° left side truck-to-car collisions. Two 1979 Chevrolet C-10, 8-foot, full-bed, 8-cylinder, pickup trucks (bullet vehicle) were used for the tests. The car (target vehicle) used in Test No. 3051-3 was a 1978 Plymouth Horizon 4-door sedan. The car used in Test No. 3051-4 was a 1979 Chevrolet Impala 4-door sedan. The centerline of the bullet vehicle struck the H-point of the driver's side of the target vehicle.

The object of these tests is to provide truck-to-car collision data. The crash test data from this program will be used to study the aggressivity of light trucks compared to passenger cars, support current vehicle standards, and provide information to upgrade future standards.

17. Key Words	18. Distribution Statement
Bullet Vehicle, Target Vehicle, Chevrolet C-10 Truck, Plymouth Horizon, Chevrolet Impala, Aggressivity, 90° Left Side Impact	Document is available to the public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. Pages	22. Price
Unclassified	Unclassified	115	

Form DOT F 1700.7 (8-69)

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1.0 INTRODUCTION

A series of seven full-scale truck-to-car crash tests was conducted as required under Task 2 of DOT-HS-8-01942, "Light Truck Aggressivity Study," sponsored by the National Highway Traffic Safety Administration. This test report presents the results of Tests 3051-3 and 3051-4, 90° left side, truck-to-car collisions. Two 1979 Chevrolet C-10, 8-foot, full-bed, 8-cylinder, pickup trucks were used for the tests. The car used in Test 3051-3 was a 1978 Plymouth Horizon 4-door sedan. The car used in Test 3051-4 was a 1979 Chevrolet Impala 4-door sedan. The centerline of the truck struck the H-point of the left front occupant of the car. The car was stationary at impact.

1.1 TEST OBJECTIVE

The object of these tests is to provide truck-to-car collision data. The crash test data from this program will be used to study the aggressivity of light trucks compared to passenger cars, support current vehicle standards, and provide information to upgrade future standards.

1.2 TEST SCOPE

The test matrix and summary of test conditions for conducting truck-to-car collisions are shown in Table 1-1. For these tests, the truck is designated as the bullet vehicle and the car designated as the target car. The target vehicle (Vehicle B) contained two instrumented Alderson Part 572 male 50th percentile anthropomorphic dummies (GFE) in the left front and left rear seating positions.

TABLE 1-1. SUMMARY OF CAR-TO-CAR TEST CONDITIONS - 3051

Test No.	Test Date	Test Condition	Test Vehicle*	Test Weight (lb)	Closing Speed (mph)
3051-1	10/10/78	Head-On (Symmetric)	A - 1979 C-10 Chevrolet Pickup Truck	5180	61.54
			B - 1978 Plymouth Horizon	2688	
3051-2	10/12/78	Head-On (Symmetric)	A - 1979 C-10 Chevrolet Pickup Truck	5182	74.50
			B - 1979 Chevrolet Impala	4404	
3051-3	10/23/78	Left Side - 90° (℄ of A at H-pt.)	A - 1979 C-10 Chevrolet Pickup Truck	5189	29.74
			B - 1978 Plymouth Horizon	2686	
3051-4	11/17/78	Left Side - 90° (℄ of A at H-pt.)	A - 1979 C-10 Chevrolet Pickup Truck	5183	29.99
			B - 1979 Chevrolet Impala	4398	
3051-5	10/30/78	Right Offset (21 in.)	A - 1979 C-10 Chevrolet Pickup Truck	5183	61.62
			B - 1978 Plymouth Horizon	2682	
3051-6	11/28/78	Right Offset (21 in.)	A - 1979 C-10 Chevrolet Pickup Truck	5176	75.78
			B - 1979 Chevrolet Impala	4397	
3051-7	2/01/79	Rear-End (Symmetric)	A - 1979 C-10** Chevrolet Pickup Truck	5178	40.28
			B - 1978 Plymouth Horizon	3008	

*A = Bullet Vehicle; B = Target Car
**Repaired truck from Test 3

The truck (Vehicle A) contained one Alderson Part 572 instrumented 50th percentile (driver) dummy and one Alderson Part 572 uninstrumented 50th percentile (passenger) dummy used as ballast. Each occupant was properly restrained with the vehicle's production restraint system. The seat tracks were put at midposition but not welded in place.

2.0 PRESENTATION OF RESULTS (TEST 3051-3)

This section of the report presents the results of Test No. 3051-3, a 90° left side truck-to-car crash test. The centerline of a 1979 Chevrolet C-10 pickup truck (bullet vehicle) struck the approximate H-point of the driver of a 1978 Plymouth Horizon 4-door sedan (stationary target vehicle).

This report presents all test results without analysis or discussion. Included in this document are: still photographs, film chronologies, vehicle damage sketches and tabulated pre- and post-test dimensions, accelerometer location identification, summaries of electronic data, and summaries of the simulated occupant data, including injury criteria values. High-speed motion pictures were also obtained for this test and have been submitted to the sponsor. Appendix A contains CalComp plots of all electronic data for this test.

TABLE 2-1. CRASH TEST SUMMARY (TEST 3051-3)

TEST NO. 3051-3 CONTRACT: DOT-HS-8-01942

TEST DATE: October 23, 1978 TIME: 1526 TEMPERATURE: 72 °F

TEST CONFIGURATION: Truck-to-Car 90° Left Side

VEHICLE NO. 1: 1979 Chevrolet C-10 Truck

VEHICLE NO. 2: 1978 Plymouth Horizon, 4-Door Sedan

VEHICLE DATA	VEHICLE NO. 1	VEHICLE NO. 2
Overall Length/Width (in.)	217.0/78.0	163.3/66.2
Test Weight by Wheel (lb)	LF 1417 RF 1336 LR 1227 RR 1209	LF 782 RF 716 LR 649 RR 539
Total Weight (lb)	5189	2686
Wheelbase (in.)	131.6	99.1
Longitudinal C.G. (From Center of Front Axle) (in.)	61.8	43.8
Impact Angle (deg)*	0	90
Offset Distance (in.)	0	H-point of Driver**
Car Speed (mph)	+29.7	0
Final Speed (mph @ msec)	+18.5 @ 113	+19.6 @ 113
Velocity Change (mph)	11.2	19.6
Maximum Compartment Acceleration (G @ msec)	-17.3 @ 31	+19.2 @ 11
Maximum Engine Acceleration (G @ msec)	-12.2 @ 46	NO DATA
Maximum Mutual Dynamic Crush (Film Data) (in.)	26.2	
Maximum Static Crush • Hood Level (in.) • Between Hood/Bumper (in.) • Bumper Level (in.)	 2.6 5.2 8.3	 Windowsill 18.0 Middoor 17.6 Doorsill 13.5
Maximum Post-test Intrusion (in.)	None	16.8
OCCUPANTS		
Type	Alderson Part 572	Alderson Part 572
Location	LF - Driver RF - Passenger	LF - Driver LR - Passenger
Restraints	Standard Lap/ Shoulder Belt	Standard Lap/ Shoulder Belt
INSTRUMENTATION		
Number of Data Channels	14	28
Number of Cameras	5	

*With respect to tow truck centerline.
**83.9 inches from rear bumper.

TABLE 2-2. BULLET VEHICLE INSPECTION SHEET (TEST 3051-3)

Contractor: Dynamic Science, Inc. Contract No.: DOT-HS-8-01942

VIN NO.: CCL 449F319894 Make: Chevrolet

NHTSA No.: R&D

Year: 1979 Color: White Model: C-10 Truck

Auto Trans:	yes ☐ no ☒	Pwr Steering:	yes ☒ no ☐	Seats: (front)	Bench: X
Pwr Brakes:	yes ☒ no ☐	Auto Speed Cont:	yes ☐ no ☒		Bucket:
Pwr Seats:	yes ☐ no ☒	Anti Skid Brake:	yes ☐ no ☒		Split Bench:
Pwr Windows:	yes ☐ no ☒	Air Conditioning:	yes ☒ no ☐		
Tinted Glass:	yes ☒ no ☐	Rear Window Def.:	yes ☐ no ☒		Split Back Bench:
Radio:	yes ☐ no ☒	Brakes: drum: R	disc: F		
Clock:	yes ☐ no ☒				

F - glass belt

Tire Size: L78-15 Ply Rating: Mfg. & Line: Uniroyal R - snow plow

Bias Ply: Belted: X Radial / Eng. Type: V-8 Cylinders: 8 Total Displ: 350 CID

Trans, # Fwd. Speeds: 4 Shipping Weight: Odometer: 23

Dealer (name, address, and phone number)
Courtesy Chevrolet
1233 East Camelback Road
Phoenix, Arizona

Remarks (list additional accessories not listed above)

Dual Fuel Tanks

Date of Manufacture: 9-78 Dynamic Science No.: 760 Date Received: 10-12-78

Tilting Steering Wheel: yes ☐ no ☒ Telescoping Steering Wheel: yes ☐ no ☒

Fuel Capacity: (from owner's manual) "Space Saver" Spare Tire yes ☐ no ☒

Restraint System: Standard Lap and Shoulder Belts

1. Is the vehicle stock throughout? Describe: Yes. Except mirrors removed. All fluids drained except 100% water in both fuel tanks. 180 pounds of lead added as ballast placed over rear axle.
2. Does vehicle show evidence of prior accident history? Describe: No
3. Does vehicle show any significant corrosion? Describe: No
4. Check condition of the front bumper and frame: Okay

TABLE 2-3. TARGET VEHICLE INSPECTION SHEET (TEST 3051-3)

Contractor: Dynamic Science, Inc. Contract No.: DOT-HS-8-01942

VIN NO.: ML44A8D246555 Make: Plymouth

NHTSA No.: R&D

Year: 1978 Color: Brown Model: Horizon 4-door sedan

Auto Trans:	yes [X] no [ ]	Pwr Steering:	yes [ ] no [X]	Seats: (front)	Bench:
Pwr Brakes:	yes [ ] no [X]	Auto Speed Cont.:	yes [ ] no [X]		Bucket: X
Pwr Seats:	yes [ ] no [X]	Anti Skid Brake:	yes [ ] no [X]		Split Bench:
Pwr Windows:	yes [ ] no [X]	Air Conditioning:	yes [ ] no [X]		
Tinted Glass:	yes [ ] no [X]	Rear Window Def.:	yes [X] no [ ]		Split Back Bench:
Radio:	yes [X] no [ ]	Brakes: drum: R	disc: F		
Clock:	yes [ ] no [X]				

Tire Size: P155/80R-13 Ply Rating: Mfg. & Line: Firestone Deluxe Champion

Bias Ply: Belted: Radial X / Eng. Type: Trans-verse Cylinders: 4 Total Displ: 105 CID

Trans, # Fwd. Speeds: 3 Shipping Weight: Odometer: 521

Dealer (name, address, and phone number)

Auto Driveway
Riverside, California

Remarks (list additional accessories not listed above)

Date of Manufacture: 6-78 Dynamic Science No.: 758 Date Received: 10-12-78

Tilting Steering Wheel: yes [ ] no [X] Telescoping Steering Wheel: yes [ ] no [X]

Fuel Capacity: (from owner's manual) "Space Saver" Spare Tire yes [ ] no [X]

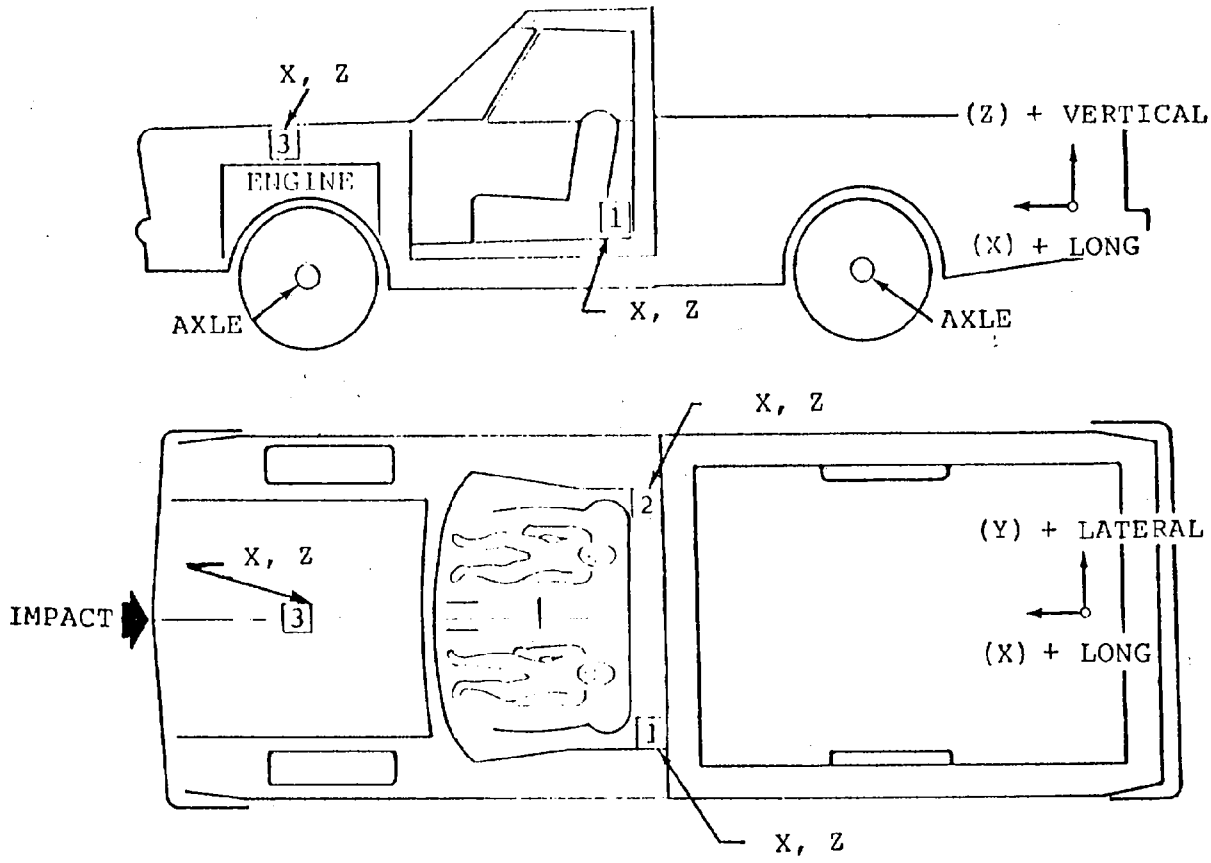
Restraint System: Standard Lap and Shoulder Belts

1. Is the vehicle stock throughout? Describe: Carpeting, floor insulation removed from right side of vehicle, spare tire and jack removed. Water in gas tank 100% full. Windshield wipers removed. Empty fluids. 36 pounds of lead on floorboard of right front passenger seat as ballast.

2. Does vehicle show evidence of prior accident history? Describe: No

3. Does vehicle show any significant corrosion? Describe: No

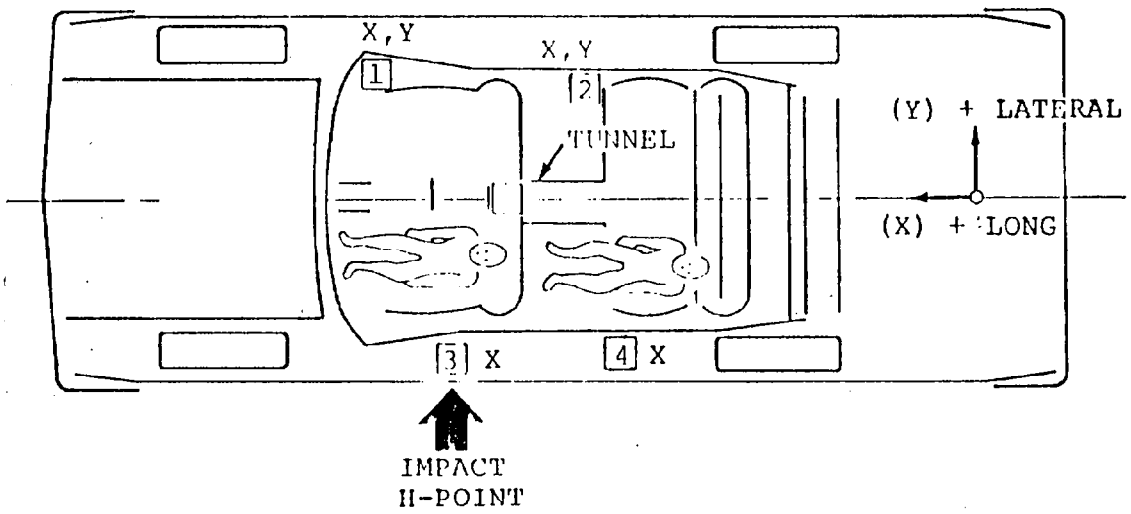
4. Check condition of the front bumper and frame: Okay



NO.	DESCRIPTION OF LOCATION	VEHICLE ACCELEROMETER LOCATIONS AND PHYSICAL COORDINATES X**	Y**	Z**	MAXIMUM EXPECTED READINGS LONG*	LAT*	VERT*
1	Rocker panel near B-pillar behind driver's seat	112	-27	30	50		50
2	Rocker panel near B-pillar behind passenger's seat	112	+28	30	50		50
3	Top of engine block	179	0	36	200		200

*G's
**Reference points:
X - Direction - Centerline of rear bumper
Y - Direction - Centerline of vehicle - left centerline (-), right centerline (+)
Z - Direction - Ground level
***For use in offset impact tests only (instead of vertical)

Figure 2-1. 1979 Chevrolet C-10 Truck Accelerometer Instrumentation (Test 3051-3).



VEHICLE ACCELEROMETER LOCATIONS AND PHYSICAL COORDINATES					MAXIMUM EXPECTED READINGS		
NO.	DESCRIPTION OF LOCATION	X**	Y**	Z**	LONG*	LAT*	VERT*
1	Right side of vehicle near A-pillar on rocker panel	113	+26	16	50	50	
2	Right side of vehicle near B-pillar on rocker panel	65	+20	13	50	50	
3	H-point of driver on rocker panel	83	-29	25		200	
4	H-point of rear passenger door	50	-30	25		200	

*G's

**Reference points:

X - Direction - Centerline of rear bumper

Y - Direction - Centerline of vehicle - left centerline (-), right centerline (+)

Z - Direction - Ground level

Figure 2-2. 1978 Plymouth Horizon Accelerometer Instrumentation (Test 3051-3).

TABLE 2-4. INSTRUMENTATION SUMMARY (TEST 3051-3)

TEST NO. 3051-3 VEHICLE: 1979 Chevrolet C-10 Truck

Instrument	Numbers	Total No. of Data Channels
Vehicle Accelerometers*	3 locations	6
Dummy Instrumentation = Head (3), Chest (3)	1 location	6
Seat Belt Load Cells = Lap (1), Shoulder (1)	1 location	2
	TOTAL	14 - 1 RSCM
VEHICLE: 1978 Plymouth Horizon		
Vehicle Accelerometers**	4 locations	6
Dummy Instrumentation = Head (3), Chest (3), Femur (2)	2 locations	16
Seat Belt Load Cells = Lap (2),	2 locations	4
= Shoulder (1)	1 location	1
Impact Switch		1
	TOTAL	28 - 2 RSCM's

*See Figure 2-1 for locations.
**See Figure 2-2 for locations.

TABLE 2-5. CAMERA LOCATIONS - SIDE IMPACT (TEST 3051-3)

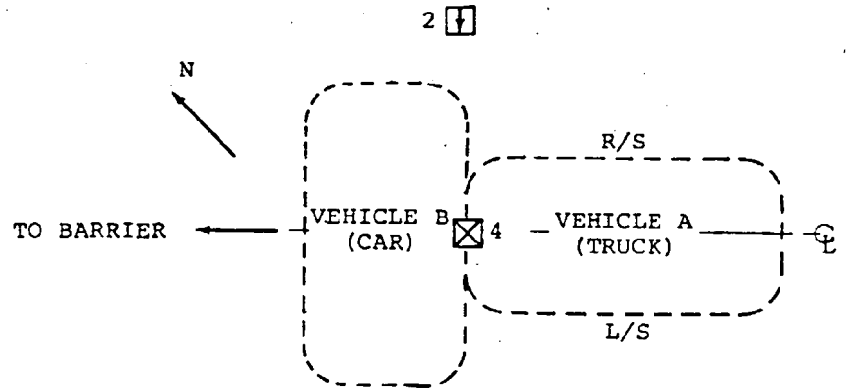
Test No: 3 Test Date: See Table 1-1

Test Type: Truck-to-Car Side Impact

Vehicle A (Away): 1979 Chevrolet C-10 Pickup Truck

Vehicle B (Barrier): 1978 Plymouth Horizon

Comments: _____



CAMERA	YES
STILLS	X
SLIDES	X
MOVIE	X
POLAROID	

CAMERA SYMBOLS

- PIT
- GROUND
- BARRIER
- OVERHEAD
- ON-BOARD

FRAME RATE

1. 1000 fr/sec
2. 200 fr/sec
3. Other 24 fr/sec
4. 400 fr/sec
5. 500 fr/sec

TIMING LIGHT SPEED

1. 100 Hz (10 msec/light)
2. 200 Hz (5 msec/light)
3. Other _____

Loc. No.	Location	Field of View	Lens Size	Frm Rate	Tmng Spd	Ser No	Impact Dist-X	C.L. Dist-Y	CAM Hght-Z
1	Left Side	Overall of Truck and Car	13	1	1				
2	Right Side	Left Rear Car B Crush & Left Rear Occupant Compartment	25	1	1				
3	Left Side	Right Front Car B Crush & Right Front Occupant Compartment	25	1	1				
4	Overhead	Front Half of Vehicle A and All of Vehicle B	8	4	1				
5	Left Side	Panning Test and Overall Results		3					
6	Left Side	Impact of Cars at ≃ 100 msec (Still Camera 4x5 Negative)							

TABLE 2-6. SUMMARY OF PRE-TEST ENGINE/BUMPER/FIREWALL CHARACTERISTICS - CHEVROLET TRUCK (TEST 3051-3)

Test No.	3051-3	Type	90° Left Side Impact
Car Model	Chevrolet C-10 Truck	Dynamic Science No.	760

Engine Size	350 CID
Engine Weight* (lb)	675 lb
Engine Height/Width (in.)	35.4/21.0
Bumper to Engine (in.)	29.5
Engine Length (in.)	21.0
Engine to Firewall (in.)	2.5
Bumper to Firewall (in.)	53.0
Bumper Height (max./min.) (in.)	23.9/14.6

*Includes engine and rigid attachments such as transmission and drive train.

TABLE 2-7. CHEVROLET C-10 TRUCK PRE-TEST DUMMY POSITIONS (TEST 3051-3)

Distances (in.)	Driver	Passenger
Chest to Steering Wheel Hub (horizontal)	12.3	
Nose to Steering Wheel Upper Rim	15.3	
Nose to Windshield (horizontal)	25.1	24.0
Knee to Lower Panel (closest point)		
Left	8.3	9.8
Right	8.5	8.5
Chest to Dash (horizontal)	25.5	22.9
Forehead to Header	19.3	18.0
Dummy Serial Number	A03	A04

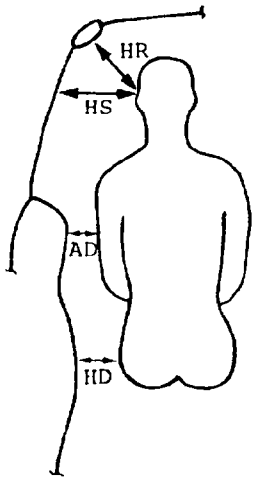
TABLE 2-8. PLYMOUTH HORIZON PRE-TEST DUMMY POSITIONS (TEST 3051-3)

Distances (in.)	Driver	Passenger
Chest to Steering Wheel Hub (horizontal)	15.7	
Nose to Steering Wheel Upper Rim	16.8	
Nose to Windshield (horizontal)	18.2	NA
Knee to Lower Panel (closest point)		
Left	8.4	NA
Right	8.8	NA
Chest to Dash (horizontal)	20.8	NA
Forehead to Header	12.2	NA

TABLE 2-9. PLYMOUTH HORIZON PRE-TEST SIDE IMPACT DUMMY POSITIONS (TEST 3051-3)

	Dimension (in.)	
Measurement	Left Front Occupant	Left Rear Occupant
Head to Door Glass (HS)	9.2	7.2*
Head to Side Header (HR)	7.2	7.5*
Upper Arm to Door Panel (AD)	3.1	3.3
H-point to Door Panel (HD)	4.8	6.0
Dummy ℄ to Vehicle ℄	12.1	11.9
Dummy Serial Number	759	760

*To C-pillar panel.



a) Pre-test

b) Post-test

Figure 2-3. Pre- and Post-test Vehicle Configuration (Test 3051-3).

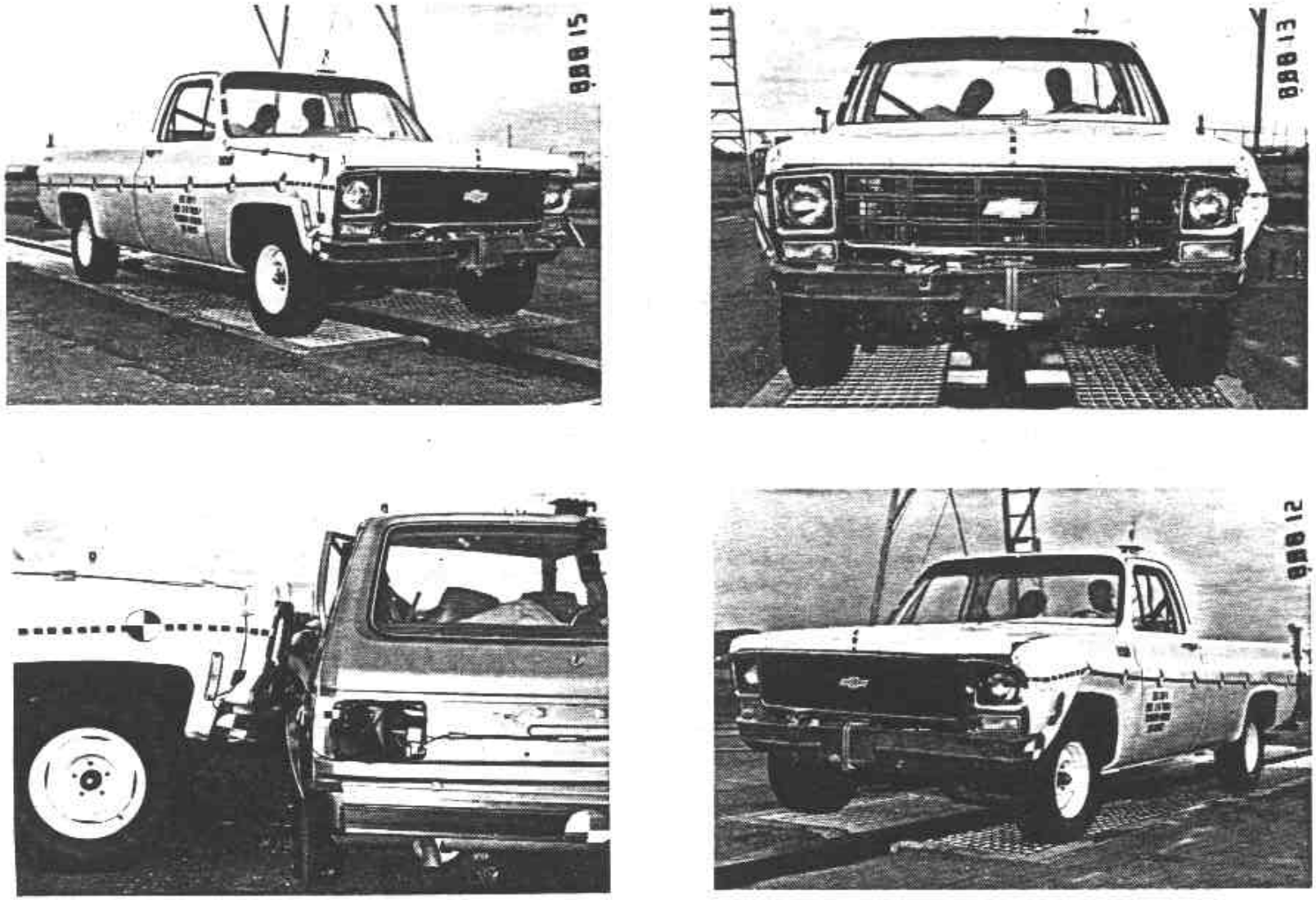


Figure 2-4. Post-test Chevrolet C-10 Truck Configuration (Test 3051-3).

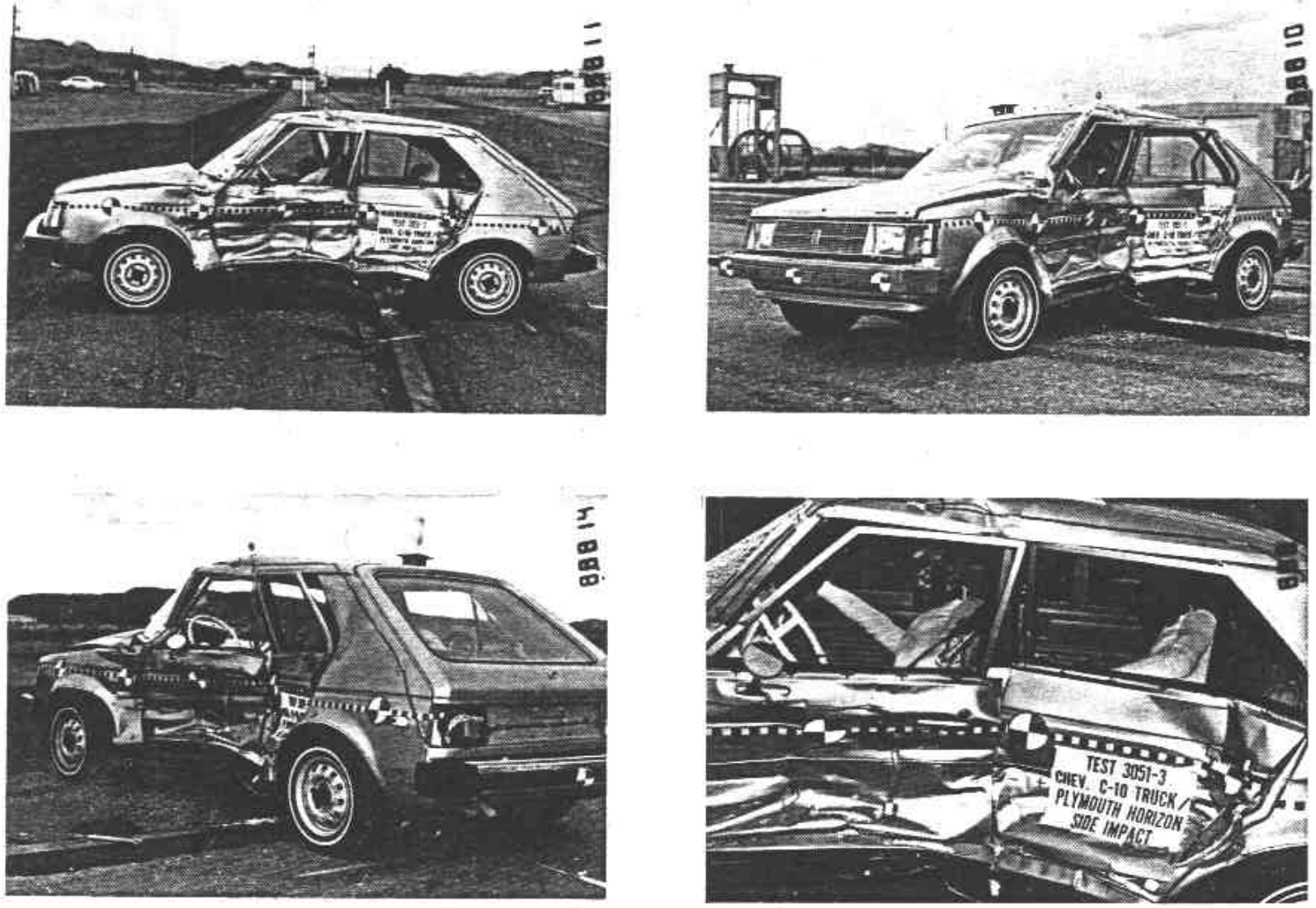
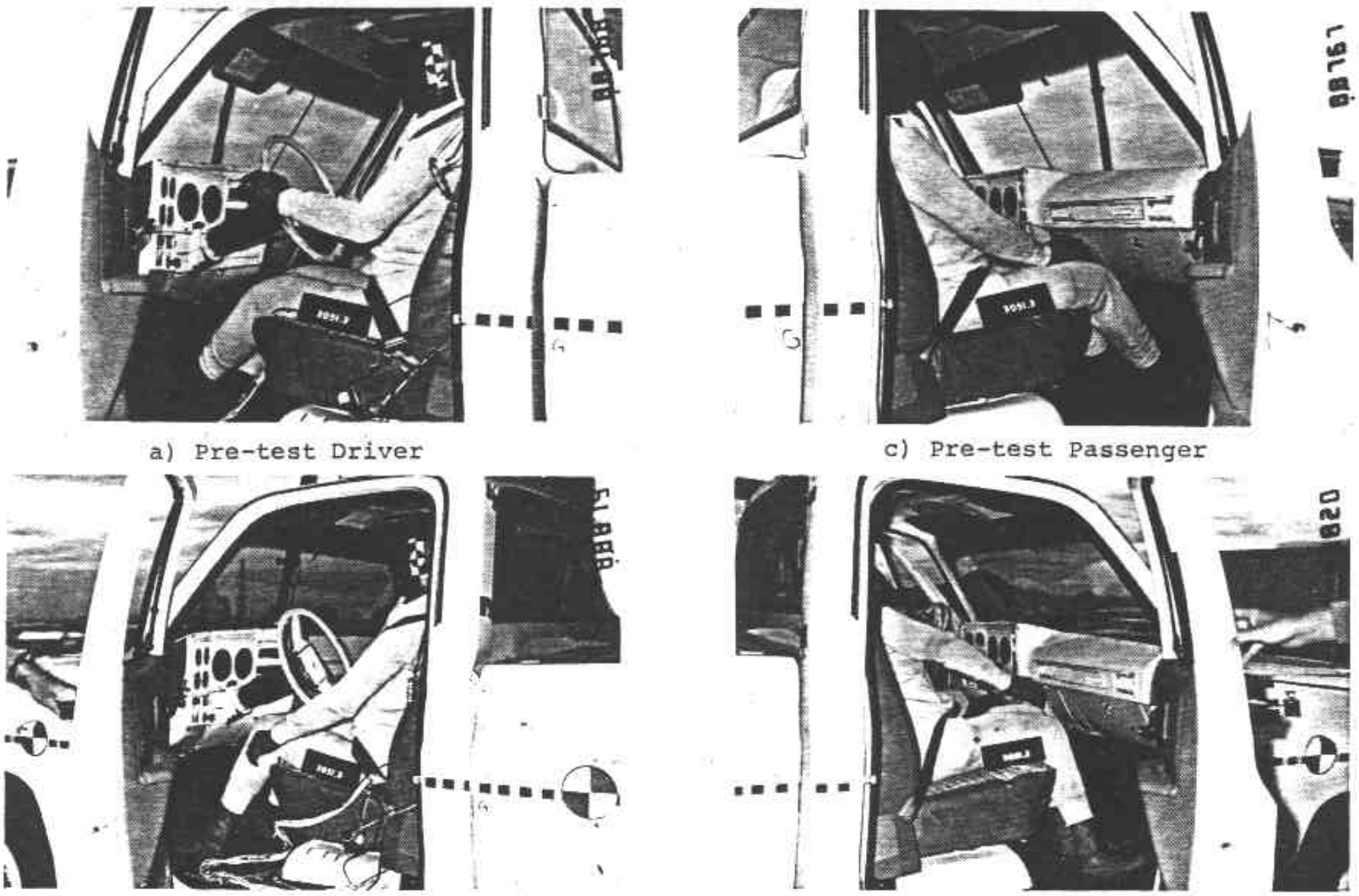


Figure 2-5. Post-test Plymouth Horizon Configuration (Test 3051-3).



a) Pre-test Driver

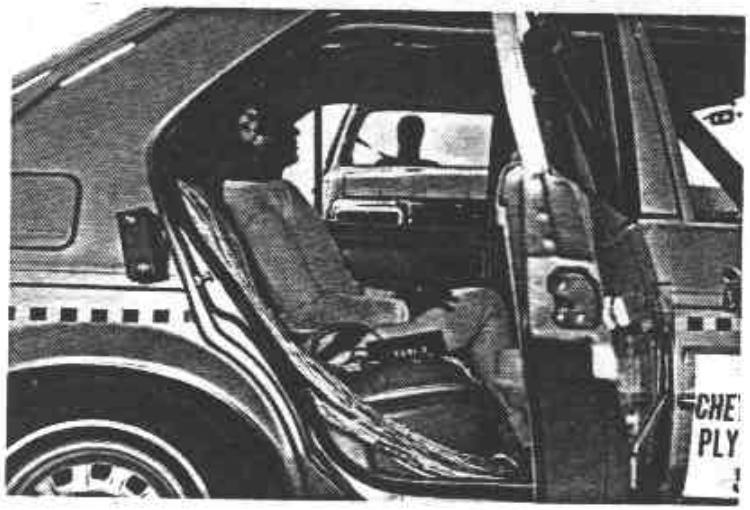
c) Pre-test Passenger

b) Post-test Driver

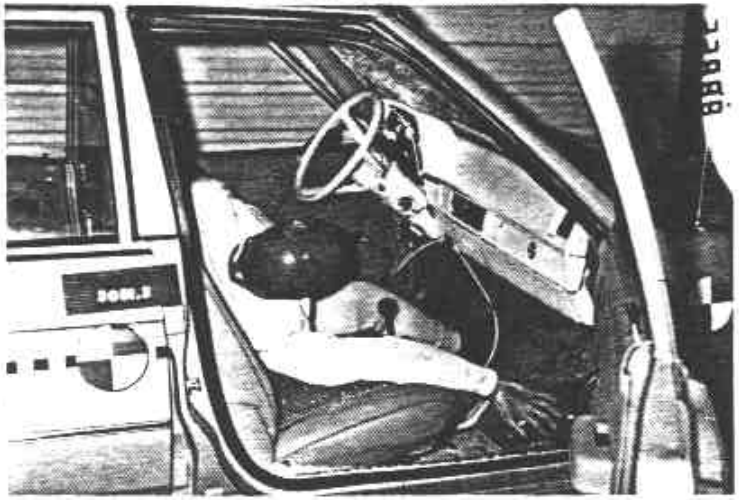
d) Post-test Passenger

Figure 2-6. Chevrolet C-10 Truck Dummy Configuration (Test 3051-3).

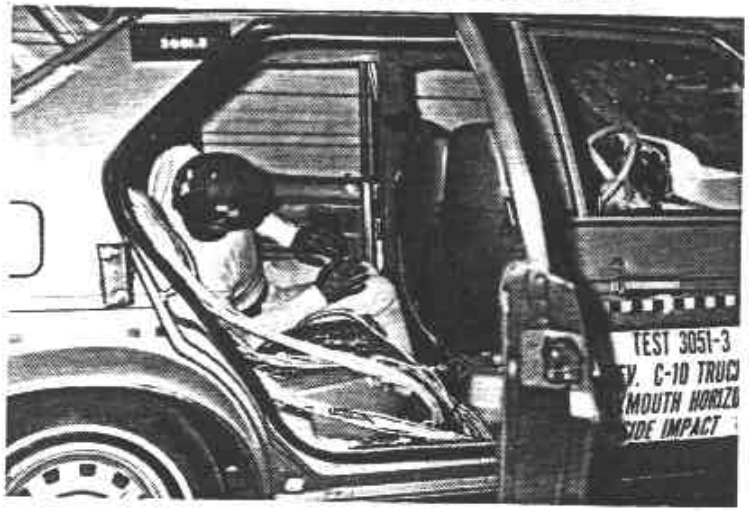
a) Pre-test Driver



c) Pre-test Rear Passenger



b) Post-test Driver



d) Post-test Rear Passenger

Figure 2-7. Plymouth Horizon Dummy Configuration (Test 3051-3).

TABLE 2-10. CHRONOLOGY OF EVENTS (TEST 3051-3)

Time (msec)	Chevrolet C-10 Truck	Time (msec)	Plymouth Horizon
1	Impact (visual contact)	0	Impact (visual contact)
7	Truck bumper compressed	10	Driver window pulls out of molding
26	Truck fender begins to bend under	12	Passenger head hits window. Rear door starts to open
32	Truck fender touches tire	19	Car fender caved in and hood begins to open
86	Maximum truck penetration into car (26.2 inches) and pushes from this point	21	Driver back rest moves to right
165+	Car and truck move down track together as one mass, stopping 37 feet from impact	34	Car moves (starts) down track
	NOTE: Truck occupants move forward only slightly - driver's forehead almost hits steering wheel.	46	B-pillar pushed in causing seat to be knocked away from driver
		51	Driver jerked to left, head hits side window
		56	Passenger head hits left rear window
		61	Driver head at greatest angle to left
		127	Driver right arm goes up on right front seat back as he falls toward right
		150	12° angle off ground (car)
		165	Passenger starts rebound movement fall to the right

TABLE 2-11. CHEVROLET C-10 TRUCK POST-TEST OBSERVATIONS (TEST 3051-3)

VEHICLE: 1979 Chevrolet C-10 Truck

Dummy Contact Points:	Left Front	Right Front
Head	No Contact	No Contact
Chest	No Contact	No Contact
Knees	No Contact	No Contact

Glazing: 100% intact

Doors: Left front door required tools to open, right front door opened easily.

Seat Belt Anchorages and Restraints: Okay, no seat movement.

Vehicle Centerline to Barrier Centerline: Front 12 inches to left, rear 2.5 inches to right.

Fuel Leakage: None

General Observations: Minor damage done to front of the truck. Bumper and left front fender damaged most severely. Left frame rail slightly deformed. Small cracks in grille, headlights not broken. No intrusion in occupant compartment. Truck appears to be driveable after test. Front of truck 37 feet from impact. Passenger dummy leaning 20° inboard of truck.

TABLE 2-12. PLYMOUTH HORIZON POST-TEST OBSERVATIONS (TEST 3051-3)

VEHICLE: 1978 Plymouth Horizon 4-door Sedan

Dummy Contact Points:	Left Front	Left Rear
Head	Left front window. Glass imbedded in head.	Left rear window. C-pillar structure.
Chest	None - Shoulder hit by door.	None - Shoulder hit left rear door.
Knees	None - Left leg hit by left front door.	None - Left leg hit by left rear door.

Glazing: 100% intact, but windshield broken.

Doors: Right front and right rear door opened easily. Left front and left rear doors were not opened but would have required tools.

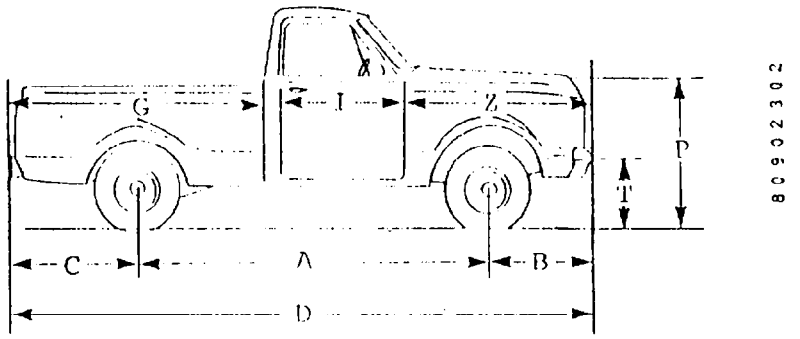
Seat Belt Anchorages and Restraints: OK, left front passenger seat had some rotation inboard. Rear seat slightly damaged.

Vehicle H-point to Barrier Centerline: Left front occupant H-point 24 in. forward. Right front occupant H-point 27 in. forward.

Fuel Leakage: None

General Observations: All windows on left side of car were shattered. Hood remained latched but was damaged from impact. Left side doors severely damaged. Roof was slightly deformed. Compartment intrusion on left side of car approximately 14 in. Both left front and left rear occupants leaning to the right after the test. Car and truck rolled down track together approximately 38 feet before stopping with the truck rolling backwards approximately 1 foot.

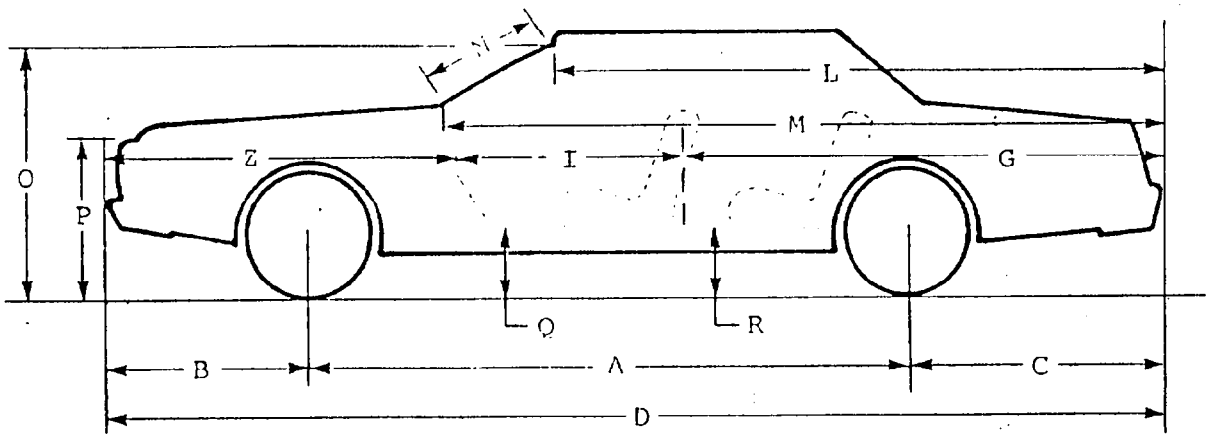
TABLE 2-13. PRE- AND POST-TEST DIMENSION MEASUREMENTS - BULLET VEHICLE (TEST 3051-3)



VEHICLE: 1979 Chevrolet C-10 Truck

	Pre-test (in.)		Post-test (in.)		Difference (in.)	
	LS	RS	LS	RS	LS	RS
A	131.4	131.8	130.9	131.8	0.5	0.0
B	33.4	33.2	31.8	32.2	1.6	1.0
C	52.1	52.1	52.0	52.2	0.1	-0.1
D	216.9	217.1	214.7	216.2	2.2	0.9
I	38.5	38.8	38.5	38.7	0.0	0.1
G	107.7	107.7	107.6	107.6	0.1	0.1
P	39.0	39.1	38.4	39.1	0.6	0.0
T	22.4	22.7	23.1	23.0	-0.7	-0.3
Z	64.3	63.7	61.0	62.9	3.3	0.8

TABLE 2-14. PRE- AND POST-TEST DIMENSION MEASUREMENTS - TARGET VEHICLE (TEST 3051-3)



VEHICLE: 1978 Plymouth Horizon 4-Door Sedan

	Pre-test (in.)		Post-test (in.)		Difference (in.)	
	LS	RS	LS	RS	LS	RS
A	99.2	98.9	100.1	95.0	-0.9	3.9
B	31.6	31.8	31.9	31.8	-0.3	0.0
C	32.5	32.7	32.0	32.9	0.5	-0.2
D	163.3	163.4	164.0	159.7	-0.7	3.7
I	37.5	37.5	37.6	38.6	0.1	-1.1
G	73.4	73.1	73.2	70.4	0.2	2.7
L	89.6	89.5	89.8	90.1	-0.2	-0.6
M	109.0	108.8	109.0	105.5	0.0	3.3
N	26.4	26.6	26.5	25.1	-0.1	1.5
O	53.3	53.5	53.5	55.5	-0.2	-2.0
P	29.1	29.0	28.6	29.1	0.5	-0.1
Q	13.7	13.7	13.5	15.1	0.2	-1.4
R	14.0	14.0	14.1	16.4	-0.1	-0.1
Z						

TABLE 2-15. CHEVROLET C-10 TRUCK EXTERIOR PROFILES AND STATIC CRUSH (TEST 3051-3)

Location	Height at ℄	RP**	Distance Left of Center (in.)* 36	30	24	18	12	6	0	Distance Right of Center (in.)* 6	12	18	24	30	36
Pre-test Profile (Distance from RP - in.)															
Hood Level	39.4	220	8.0	7.6	6.1	5.9	5.7	5.5	5.5	5.6	5.6	5.8	6.0	7.4	7.8
Between Bumper/Hood	30.9	220	8.9	10.0	6.9	6.6	6.5	6.4	6.3	6.4	6.5	6.6	6.8	10.0	8.6
Bumper Level	19.9	220	5.1	3.9	3.5	3.4	3.2	3.5	3.5	3.5	3.1	3.3	3.5	3.7	3.9
Post-test Profile (Distance from RP - in.)															
Hood Level	39.5	220	10.6	9.7	8.0	7.9	7.3	6.9	6.5	6.5	6.4	6.5	6.5	7.9	8.2
Between Bumper/Hood	31.1	220	14.1	14.3	9.8	9.0	8.4	8.0	7.8	7.6	7.4	7.1	7.0	9.6	10.1
Bumper Level	21.0	220	13.4	10.6	9.2	7.5	6.2	6.2	5.9	5.6	4.1	5.5	7.0	8.4	11.0
Post-test Static Crush (in.)															
Hood Level	-0.1		2.6	2.1	1.9	2.0	1.6	1.4	1.0	0.9	0.8	0.7	0.5	0.5	0.4
Between Bumper/Hood	-0.2		5.2	4.3	2.9	2.4	1.9	1.6	1.5	1.2	0.9	0.4	0.2	-0.4	1.5
Bumper Level	-0.1		8.3	6.7	5.7	4.1	3.0	2.7	2.4	2.1	1.0	2.2	3.5	4.7	7.1

*As viewed from driver position in truck.
**Reference Plane from rear bumper of truck.

TABLE 2-16. CHEVROLET C-10 TRUCK INTERIOR PROFILES AND STATIC CRUSH (TEST 3051-3)

Location	Height at ℄	RP**	Distance Left of Center (in.)*							Distance Right of Center (in.)*					
			36	30	24	18	12	6	0	6	12	18	24	30	36
Pre-test Profile (Distance from RP - in.)															
Dash Level	49.3	130		19.4	21.4	21.5	21.1	19.1	24.5	24.4	24.3	24.0	23.5	23.0	
Knee Level	37.1	130		20.5	22.5	22.7	22.5	20.6	23.6	23.7	23.6	23.7	23.3	23.2	
Floor Level	27.9	142		19.6	19.7	20.0	20.6	19.4	19.0	19.0	19.8	19.5	19.4	19.3	
Post-test Profile (Distance from RP - in.)															
Dash Level	49.3	130		19.4	21.4	21.5	21.1	19.1	24.5	24.4	24.3	24.0	23.5	23.0	
Knee Level	37.1	130		20.5	22.5	22.7	22.5	20.6	23.6	23.7	23.6	23.7	23.3	23.2	
Floor Level	27.9	142		19.6	19.7	20.0	20.6	19.4	19.0	19.0	19.8	19.5	19.4	19.3	
Post-test Static Crush (in.)															
Dash Level	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Knee Level	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Floor Level	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

*As viewed from driver position in truck.
**Reference Plane from rear bumper of truck.

TABLE 2-17. PLYMOUTH HORIZON VEHICLE LEFT SIDE EXTERIOR PROFILE (TEST 3051-3)

	Distance From H-point	Pre-test (in.)*			Post-test (in.)*			Static Crush (in.)		
		Door-sill	Mid-door	Window-sill	Door-sill	Mid-door	Window-sill	Door-sill	Mid-door	Window-sill
	Height	12.6	20.2	36.0	12.6	20.2	36.0			
	60									
VEHICLE FRONT	54		9.1	13.2		9.9	13.4		0.8	-0.2
	48		8.5	13.0		11.5	14.0		3.0	1.0
	42		8.5	12.9		13.5	15.1		5.0	2.2
	36	12.1	9.9	12.8	14.8	16.9	17.0	2.7	7.0	4.2
	30	12.4	10.1	12.7	17.4	20.4	17.9	5.0	10.3	4.7
	24	12.3	10.0	12.6	20.8	22.4	20.5	8.5	12.4	7.9
	18	12.2	9.9	12.9	21.3	23.9	21.5	9.1	14.0	8.6
	12	12.1	9.8	12.9	21.7	25.2	22.0	9.6	15.4	9.1
	6	12.1	9.6	12.9	22.2	25.5	22.4	10.1	15.9	9.5
Driver H-point	0	12.1	9.6	12.9	23.4	25.7	22.9	11.3	16.1	10.0
	6	12.1	9.5	12.9	24.1	25.9	24.3	12.0	16.4	11.4
	12	12.1	9.6	12.9	25.6	27.2	30.9	13.5	17.6	18.0
	18	12.1	9.7	12.9	23.7	26.5	27.7	11.6	16.8	14.8
	24	12.2	9.8	13.0	20.2	24.9	25.5	8.0	15.1	12.5
	30	12.3	9.9	13.0	16.4	22.7	23.1	4.1	12.8	10.1
	36	12.4	9.9	13.1	14.0	20.4	21.1	1.6	10.5	8.0
	42		8.9	13.2		11.7	17.7		2.8	4.5
VEHICLE REAR	48		8.1	12.4		10.4	15.0		2.3	2.6
	54									
	60									

*Reference Plane 73 inches from right front and right rear axle hub of vehicle's right side.

TABLE 2-18. PLYMOUTH HORIZON VEHICLE LEFT SIDE INTERIOR PROFILE (TEST 3051-3)

Level*		Height	Location ** C	H	B	E	A
Pre-test (in.)							
Roof	6	49.9	54.4	53.9	53.8	54.3	-
Window Edge	5	37.1	58.0	59.9	59.1	60.6	59.5
Middoor	4	31.0	57.4	59.6	59.4	60.0	60.8
H-point	3	24.7	57.8	60.0	59.4	60.2	59.9
Bumper	2	19.0	57.6	59.9	59.4	60.2	60.3
Sill Rail	1	15.5	-	58.8	59.0	59.6	59.2
Post-test (in.)							
Roof	6	44.3	52.3	50.7	48.5	48.7	-
Window Edge	5	38.0	55.4	48.9	42.3	51.5	52.3
Middoor	4	32.0	55.6	48.4	42.8	48.9	50.4
H-point	3	25.9	56.4	49.5	43.7	46.7	50.1
Bumper	2	20.5	56.5	51.6	44.7	47.8	50.4
Sill Rail	1	16.6	-	51.2	44.9	48.2	50.7
Static Crush (in.)							
Roof	6	5.6	2.1	3.2	5.3	4.6	-
Window Edge	5	-0.9	2.6	11.0	16.8	10.1	7.2
Middoor	4	1.0	1.8	11.2	16.6	11.1	10.4
H-point	3	-1.2	1.4	10.5	15.7	13.5	9.8
Bumper	2	-1.5	1.1	8.3	14.7	12.4	9.9
Sill Rail	1	-1.1	-	7.6	14.1	11.4	8.5

*Defined according to Figure 2-8.
**Distance to Reference Plane 2 inches right of right front and right rear axle hubs on right side of vehicle.

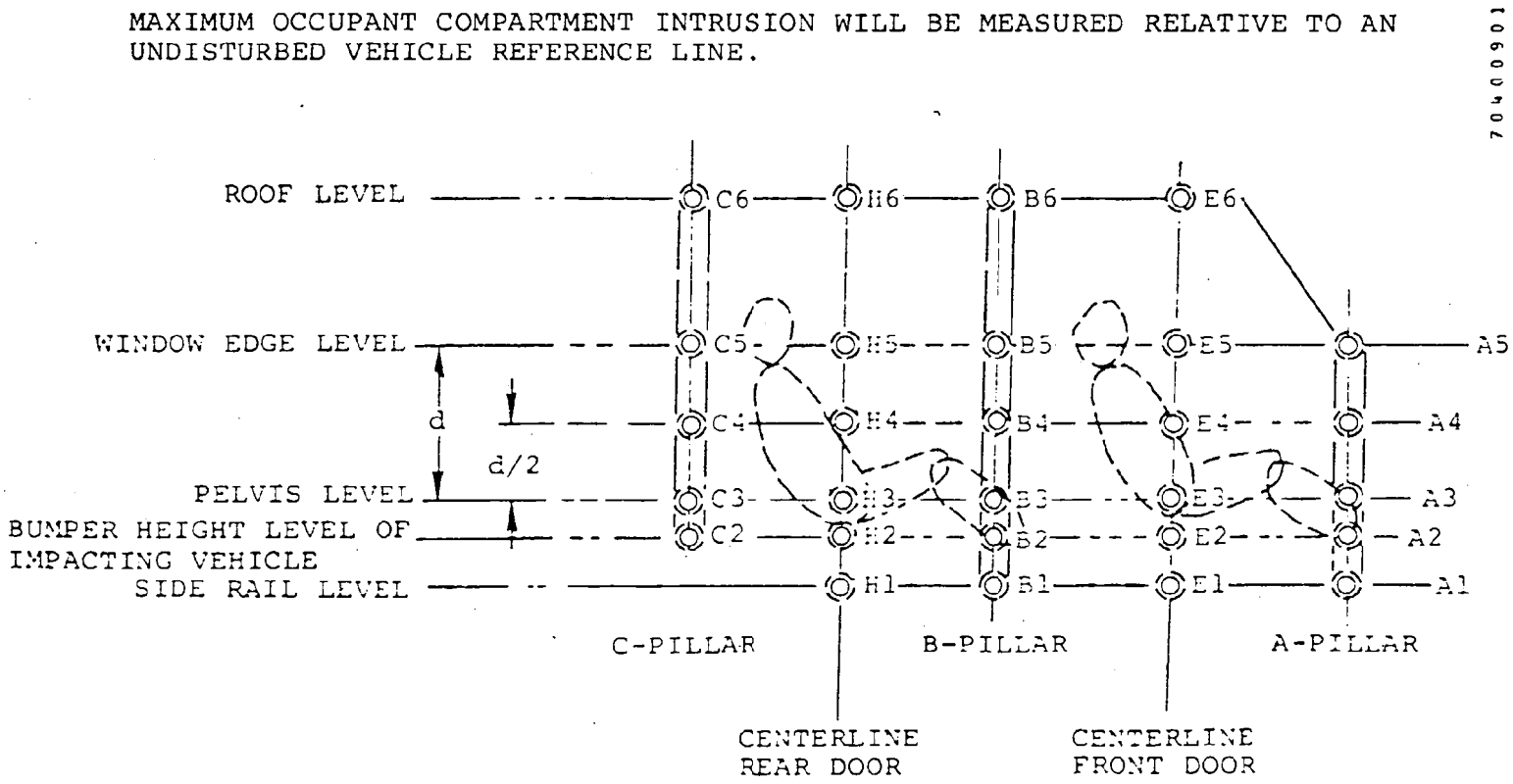


Figure 2-8. Intrusion Measurement Locations - Plymouth Horizon (Test 3051-3).

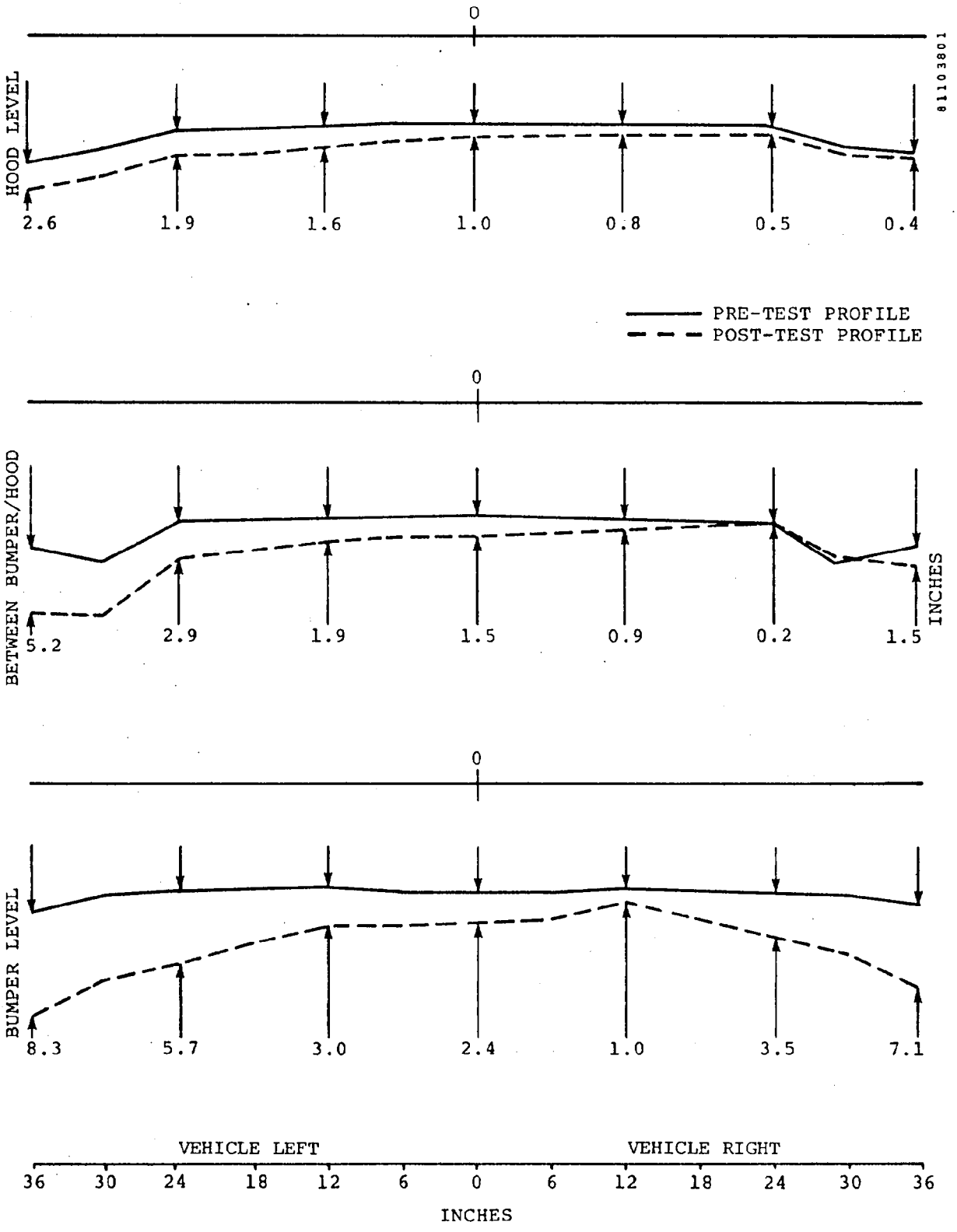


Figure 2-9. Chevrolet C-10 Truck Exterior Static Crush (Test 3051-3).

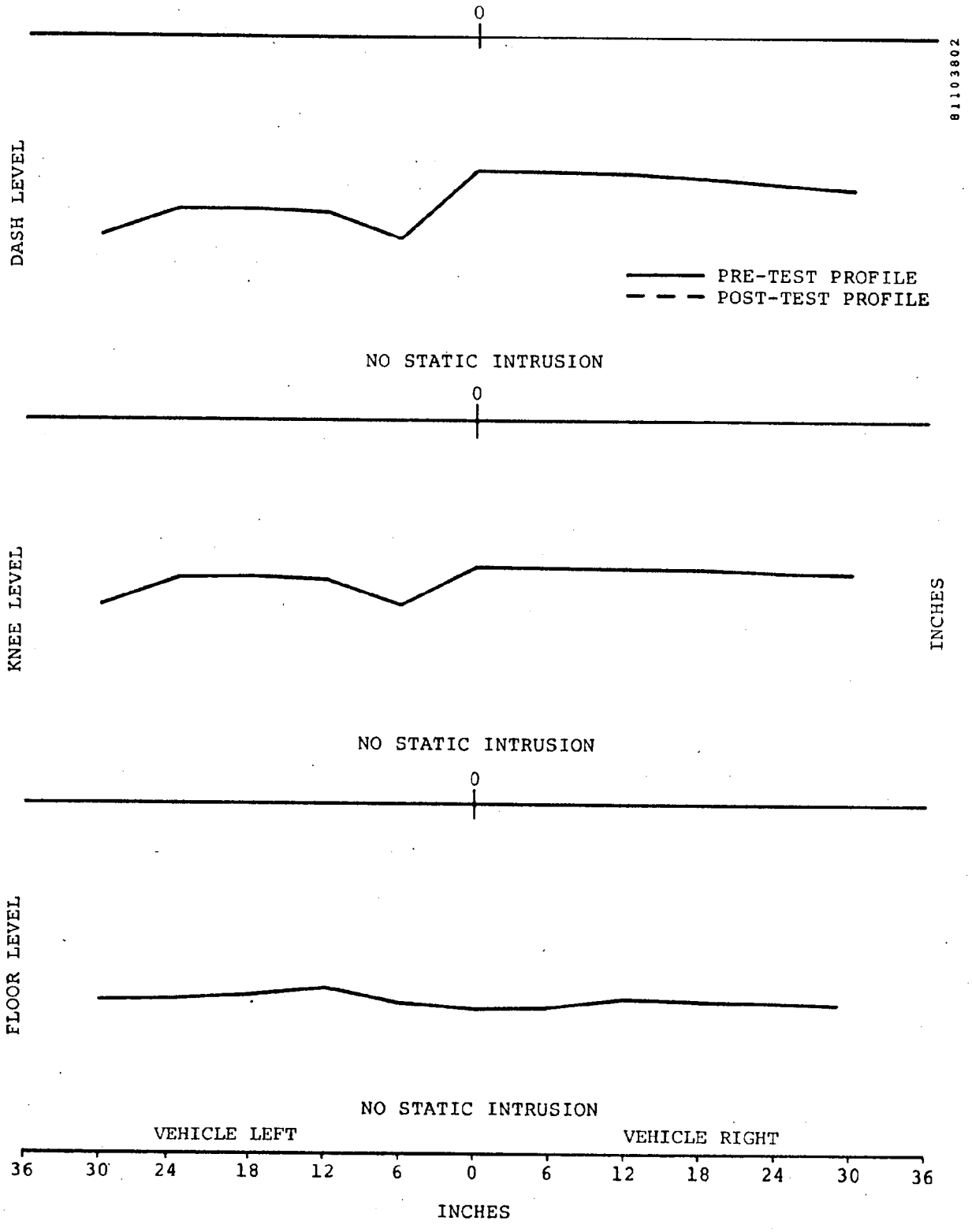


Figure 2-10. Chevrolet C-10 Truck Interior Intrusion (Test 3051-3).

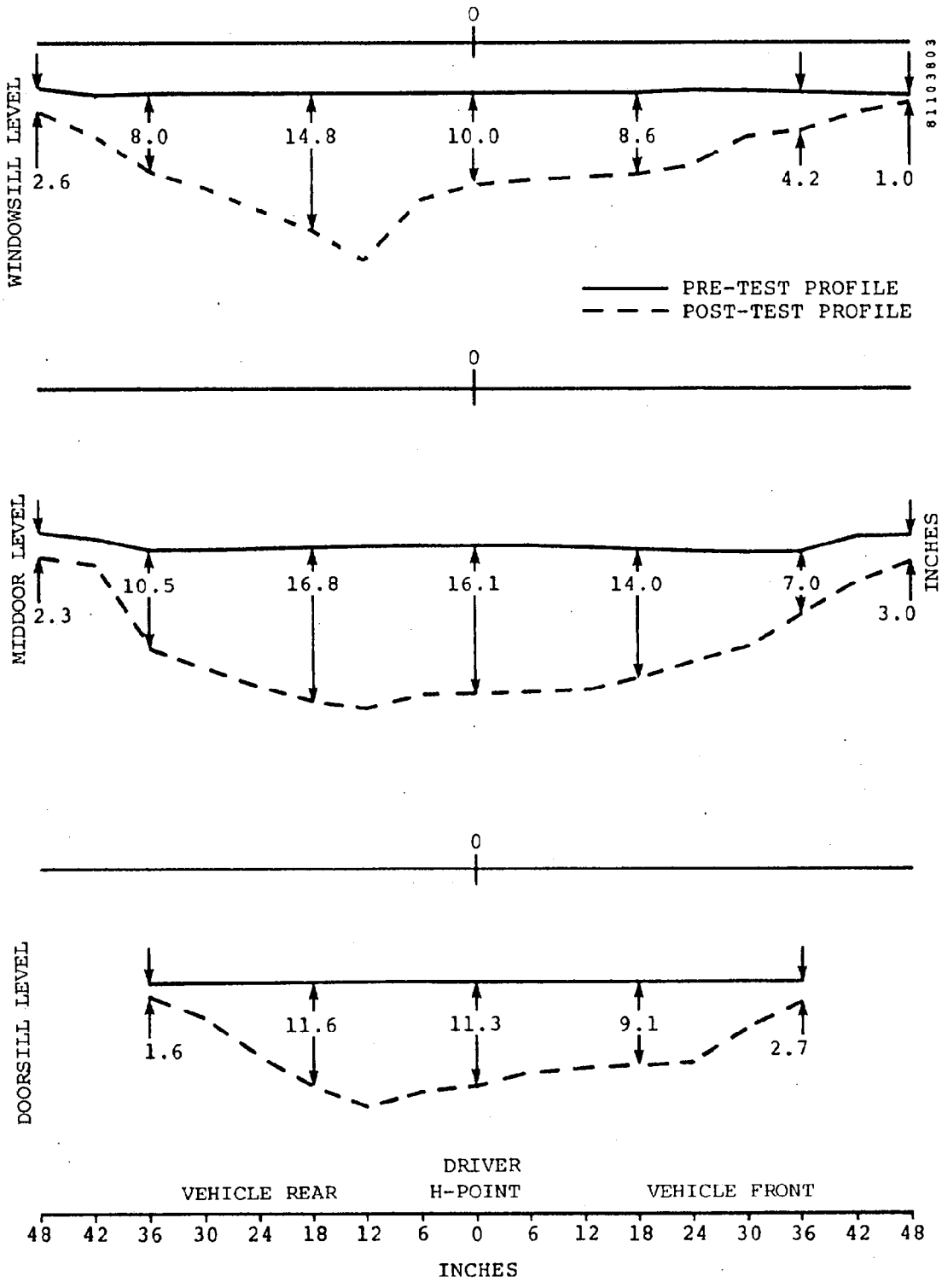


Figure 2-11. Plymouth Horizon Left Side Exterior Static Crush (Test 3051-3).

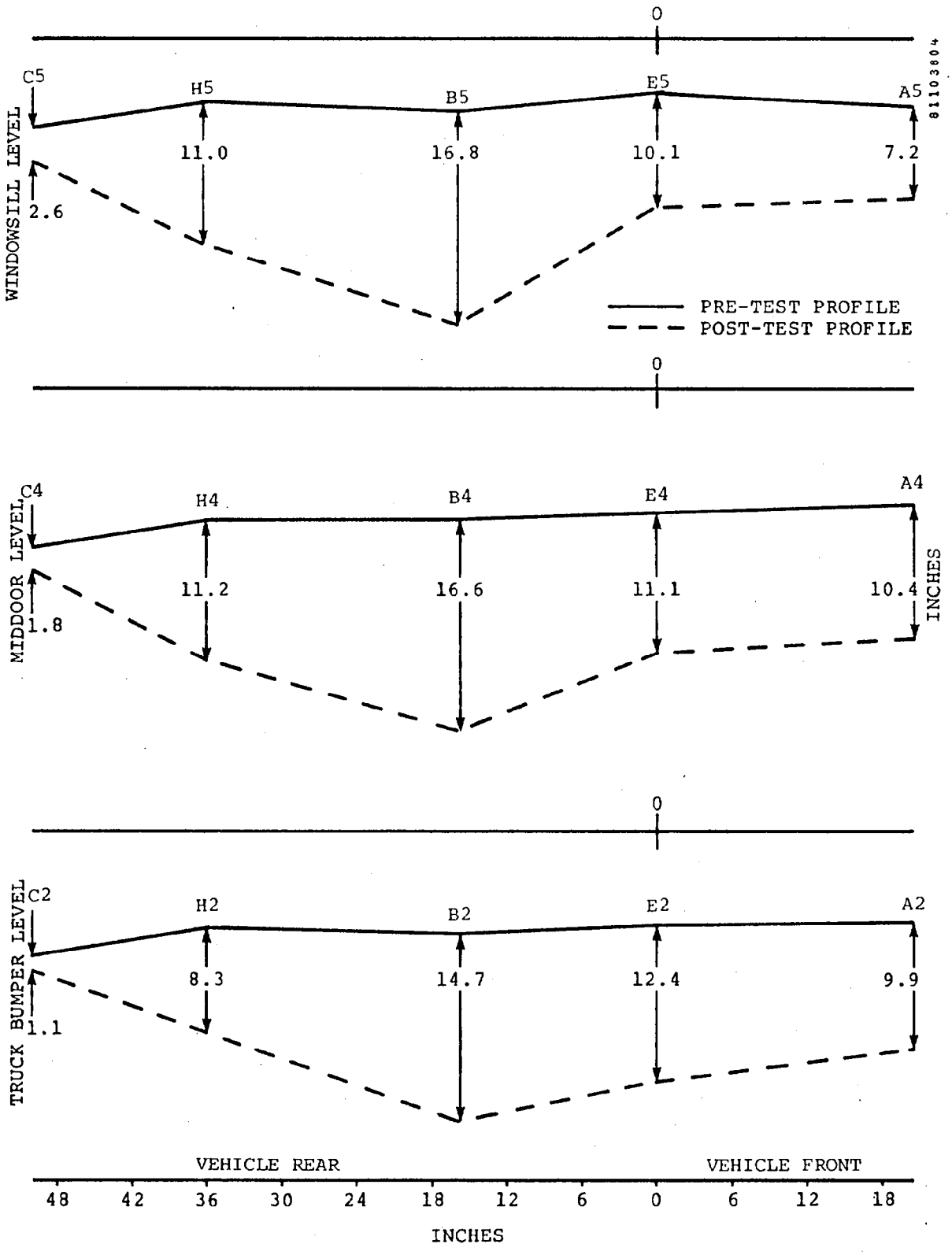


Figure 2-12. Plymouth Horizon Left Side Interior Static Crush (Test 3051-3).

TABLE 2-19. CHEVROLET C-10 TRUCK STEERING WHEEL MEASUREMENTS AND DISPLACEMENT VALUES (TEST 3051-3)

Wheel Location	Pre-test (in.)			Post-test (in.)			Displacement (in.)		
	X*	Y*	Z*	X	Y	Z	X	Y	Z
Top	140.5	-18.4	52.3	140.4	-18.5	53.4	0.1	0.1	-1.1
Hub	138.7	-18.4	45.6	138.2	-18.5	46.1	0.5	0.1	-0.5
Bottom	134.8	-18.4	39.1	134.0	-18.5	39.7	0.8	0.1	-0.6

*References for X, Y, and Z measurements are rear bumper, vehicle centerline, and ground level, respectively.

TABLE 2-20. PLYMOUTH HORIZON STEERING WHEEL MEASUREMENTS AND DISPLACEMENT VALUES (TEST 3051-3)

Wheel Location	Pre-test (in.)			Post-test (in.)			Displacement (in.)		
	X*	Y*	Z*	X	Y	Z	X	Y	Z
Top	99.1	-12.5	41.4	99.0	-12.9	44.1	0.1	0.4	-2.7
Hub	99.3	-12.5	33.2	98.1	-12.9	36.1	1.2	0.4	-3.1
Bottom	92.4	-12.5	29.0	90.5	-12.9	32.8	0.8	0.4	-3.8

*References for X, Y, and Z measurements are rear bumper, vehicle centerline, and ground level, respectively.

TABLE 2-21. SUMMARY OF VEHICLE ACCELEROMETER DATA (TEST 3051-3)

Accelerometer No.*	Maximum Acceleration A (G)	Maximum Acceleration Time (msec)	Minimum Velocity V (mph)	Minimum Velocity Time (msec)	Maximum Displacement S (in.)	Maximum Displacement Time (msec)
VEHICLE: 1979 Chevrolet C-10 Truck (Bullet Vehicle)						
1X	-20.0	31	+17.7	174	+73.2	200
1Z	+8.9	41	-2.0	122	+0.8	178
2X	-15.3	30	+17.2	160	+72.5	200
2Z	+7.8	46	-3.3	121	-3.3	200
Average 1X and 2X	-17.3	31	+17.5	172	+72.8	200
3X	-12.2	46	+16.3	109	+71.3	200
3Y	-5.5	46	-2.1	79	-1.8	128
VEHICLE: 1978 Plymouth Horizon 4-door Sedan (Target Vehicle)						
1X	-5.3	15	-0.4	175	+1.1	159
1Y	+21.8	20	+19.5	113	+49.8	200
2X	+9.8	40	-0.1	26	+0.2	200
2Y	+21.3	11	+19.7	114	+51.8	200
Average 1Y and 2Y	+19.2	11	+19.6	113	+50.9	200
3Y	-241.1**	52	-26.1	173	-58.6	200
4Y	-104.9**	13	-8.4	200	-9.3	200

*See Figures 2-1 and 2-2 for definition of accelerometer locations.
**Noisy data due to ringing of accelerometer.

TABLE 2-22. OCCUPANT RESPONSE DATA SUMMARY (TEST 3051-3)

	1979 CHEVROLET C-10 TRUCK				1978 PLYMOUTH HORIZON 4-DR SEDAN			
	LEFT FRONT OCCUPANT		RIGHT FRONT OCCUPANT		LEFT FRONT OCCUPANT		LEFT REAR OCCUPANT	
	MAX VALUE (G)	T (msec)	MAX VALUE (G)	T (msec)	MAX VALUE (G)	T (msec)	MAX VALUE (G)	T (msec)
HEAD								
X	-12.3	132	ND		+11.9	55	+10.3	59
Y	-9.8	132	ND		+66.8	54	+115.2	54
Z	+12.7	65	ND		+69.4	53	+37.0	53
R*	14.0	136	ND		83.1	51	75.0	52
HIC	26.8 @ 60-162				581 @ 36-62		453 @ 51-57	
CHEST								
X	-13.1	78	ND		+18.2	46	-7.8	45
Y	-5.6	110	ND		+73.6	32	+47.5	43
Z	-5.6	129	ND		+41.8	28	+17.3	28
R*	12.8	79	ND		70.2	35	43.2	44
SI	21 @ 200				577 @ 200		158 @ 200	
	MAX VALUE (lb)	T (msec)	MAX VALUE (lb)	T (msec)	MAX VALUE (lb)	T (msec)	MAX VALUE (lb)	T (msec)
FEMURS								
LF	ND		ND		+225	40	-830	35
RT	ND		ND		+483	35	**	

*3-msec clip. **Data system failure. ND = No Data (Data not measured).

TABLE 2-23. SUMMARY OF RESTRAINT SYSTEM DATA (TEST 3051-3)

	Peak Load (lb) @ Time (msec)
VEHICLE: 1979 Chevrolet C-10 Truck	
Left Front Occupant	
Peak Shoulder Belt Load	617 @ 76
Peak Left Lap Belt Load	280 @ 78
Peak Right Lap Belt Load	ND
Right Front Occupant	
Peak Shoulder Belt Load	ND
Peak Left Lap Belt Load	ND
Peak Right Lap Belt Load	ND
VEHICLE: 1978 Plymouth Horizon 4-door Sedan	
Left Front Occupant	
Peak Shoulder Belt Load	619 @ 83
Peak Left Lap Belt Load	1232 @ 29*
Peak Right Lap Belt Load	475 @ 103
Left Rear Occupant	
Peak Shoulder Belt Load	ND
Peak Left Lap Belt Load	455 @ 37
Peak Right Lap Belt Load	35 @ 7

*Data system failure after 40 msec.
ND = No Data (Data not measured).

3.0 PRESENTATION OF RESULTS (TEST 3051-4)

This section of the report presents the results of Test 3051-4, a 90° left side truck-to-car crash test. The centerline of a 1979 Chevrolet C-10 pickup truck (bullet vehicle) struck the approximate H-point of the driver of a 1979 Chevrolet Impala 4-door sedan (stationary target vehicle).

This report presents all test results without analysis or discussion. Included in this document are: still photographs, film chronologies, vehicle damage sketches and tabulated pre- and post-test dimensions, accelerometer location identification, summaries of electronic data, and summaries of the simulated occupant data, including injury criteria values. High-speed motion pictures were also obtained for this test and have been submitted to the sponsor. Appendix B contains Calcomp plots of all electronic data for this test.

TABLE 3-1. CRASH TEST SUMMARY (TEST 3051-4)

TEST NO. 3051-4 CONTRACT: DOT-HS-8-01942

TEST DATE: November 17, 1978 TIME: 1534 TEMPERATURE: 66 °F

TEST CONFIGURATION: Front-to-Left Side - 90°

VEHICLE NO. 1: 1979 Chevrolet C-10 Truck

VEHICLE NO. 2: 1979 Chevrolet Impala, 4-Door Sedan

VEHICLE DATA:	VEHICLE NO. 1	VEHICLE NO. 2
Overall Length/Width (in.)	217.3/78.0	212.5/76.0
Test Weight by Wheel (lb)	LF 1418 RF 1347 LR 1209 RR 1209	LF 1129 RF 1105 LR 1088 RR 1076
Test Weight (lb)	5183	4398
Wheelbase (in.)	131.5	116.0
Longitudinal C.G. (From Center of Front Axle) (in.)	61.4	57.1
Impact Angle (deg)*	0	90
Offset Distance (in.)**	0	H-Point of Driver**
Car Speed (mph)	+29.99	0
Final Speed (mph @ msec)	+13.2 @ 146	+16.8 @ 146
Velocity Change (mph)	16.8	16.8
Maximum Compartment Acceleration (G @ msec)	-15.8 @ 27	+22.1 @ 13
Maximum Engine Acceleration (G @ msec)	-15.2 @ 65	N/A
Maximum Mutual Dynamic Crush (Film Data) (in.)	18.9	
Maximum Static Crush		
• Hood Level (in.)	9.9	Windowsill 13.9
• Between Hood/Bumper (in.)	10.0	Middoor 15.7
• Bumper Level (in.)	11.4	Doorsill 12.7
Maximum Post-test Intrusion (in.)	0.9	15.6
OCCUPANTS		
Type	Alderson Part 572	Alderson Part 572
Location	LF - Driver RF - Passenger	LF - Driver LR - Passenger
Restraints	Standard Lap/ Shoulder Belt	Standard Lap/ Shoulder Belt
INSTRUMENTATION		
Number of Data Channels	14	28
Number of Cameras	5	

*With respect to tow track centerline.

**111.9 inches from rear bumper.

TABLE 3-2. BULLET VEHICLE INSPECTION SHEET (TEST 3051-4)

Contractor: Dynamic Science, Inc. Contract No.: DOT-HS-8-01942

VIN NO.: CCL 449F319825 Make: Chevrolet

NHTSA No.: R&D

Year: 1979 Color: White Model: C-10 Truck

Auto Trans: yes ☐ no ☒	Pwr Steering: yes ☒ no ☐	Seats: (front)	Bench: x
Pwr Brakes: yes ☒ no ☐	Auto Speed Cont: yes ☐ no ☒		Bucket:
Pwr Seats: yes ☐ no ☒	Anti Skid Brake: yes ☐ no ☒		Split Bench:
Pwr Windows: yes ☐ no ☒	Air Conditioning: yes ☒ no ☐		
Tinted Glass: yes ☒ no ☐	Rear Window Def.: yes ☐ no ☒		Split Back Bench:
Radio: yes ☐ no ☒	Brakes: drum: R disc: F		
Clock: yes ☐ no ☒			

F - glass belt

Tire Size: L78-15 Ply Rating: Mfg. & Line: Uniroyal R - snow plow

Bias Ply: Belted: x Radial / Eng. Type: V-8 Cylinders: 8 Total Displ: 350 CID

Trans, # Fwd. Speeds: 4 Shipping Weight: Odometer: 22

Dealer (name, address, and phone number)

Courtesy Chevrolet
1233 East Camelback Road
Phoenix, Arizona

Remarks (list additional accessories not listed above)

Dual Fuel Tanks

Date of Manufacture: 9-78 Dynamic Science No.: 763 Date Received: 10/18/78

Tilting Steering Wheel: yes ☐ no ☒ Telescoping Steering Wheel: yes ☐ no ☒

Fuel Capacity: (from owner's manual) "Space Saver" Spare Tire yes ☐ no ☒

Restraint System: Standard Lap and Shoulder Belts

1. Is the vehicle stock throughout? Describe: Yes. Except mirrors removed. All fluids drained except 100% water in both fuel tanks. 180 pounds of lead added as ballast placed over rear axle.
2. Does vehicle show evidence of prior accident history? Describe: No
3. Does vehicle show any significant corrosion? Describe: No
4. Check condition of the front bumper and frame: Okay

TABLE 3-3. TARGET VEHICLE INSPECTION SHEET (TEST 3051-4)

Contractor: Dynamic Science, Inc. Contract No.: DOT-HS-8-01942

VIN NO.: 1L69L9C115824 Make: Chevrolet

NHTSA No.: R&D

Year: 1979 Color: White/Vinyl Model: Impala

Auto Trans: yes [X] no [ ] Pwr Steering: yes [X] no [ ] Seats: (front) Bench: X

Pwr Brakes: yes [X] no [ ] Auto Speed Cont: yes [ ] no [X] Bucket:

Pwr Seats: yes [ ] no [X] Anti Skid Brake: yes [ ] no [X] Split Bench:

Pwr Windows: yes [ ] no [X] Air Conditioning: yes [X] no [ ]

Tinted Glass: yes [X] no [ ] Rear Window Def.: yes [ ] no [X] Split Back Bench:

Radio: yes [X] no [ ] Brakes: drum: R disc: F

Clock: yes [ ] no [X]

Tire Size: FR78-15 Ply Rating: Mfg. & Line: Uniroyal

Bias Ply: Belted: Radial X / Eng. Type: V-8 Cylinders: 8 Total Displ: 350 CID

Trans, # Fwd. Speeds: 3 Shipping Weight: Odometer: 24

Dealer (name, address, and phone number)

Courtesy Chevrolet
1233 East Camelback Road
Phoenix, Arizona

Remarks (list additional accessories not listed above)

White Vinyl Roof

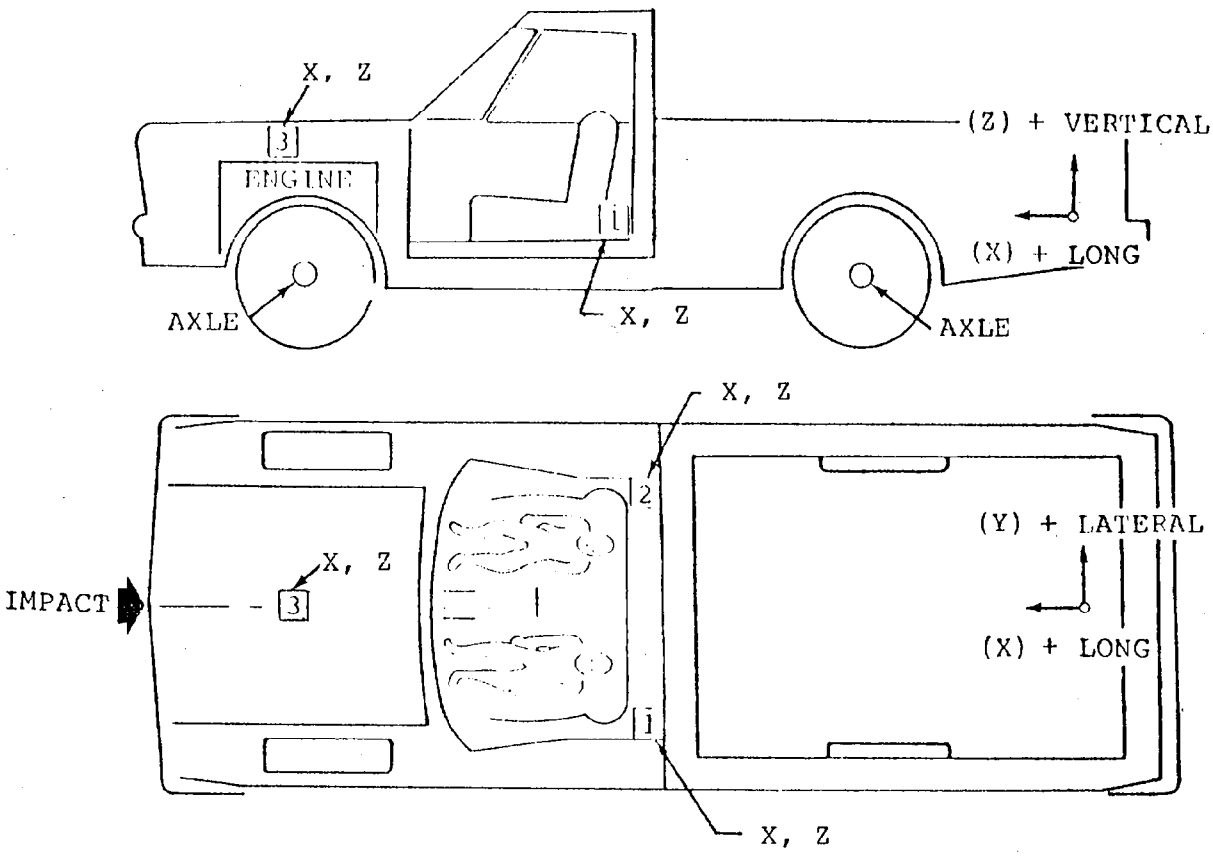
Date of Manufacture: 10/78 Dynamic Science No.: 769 Date Received: 11/8/78

Tilting Steering Wheel: yes [ ] no [X] Telescoping Steering Wheel: yes [ ] no [X]

Fuel Capacity: (from owner's manual) "Space Saver" Spare Tire yes [ ] no [X]

Restraint System: Standard lap/shoulder belts

1. Is the vehicle stock throughout? Describe: Yes, except windshield wipers, wheel covers, spare tire, jack removed. 150 lb of lead added as ballast in floorboard. 100% water in gas tank.
2. Does vehicle show evidence of prior accident history? Describe: No
3. Does vehicle show any significant corrosion? Describe: No
4. Check condition of the front bumper and frame: Okay, no bumper guards



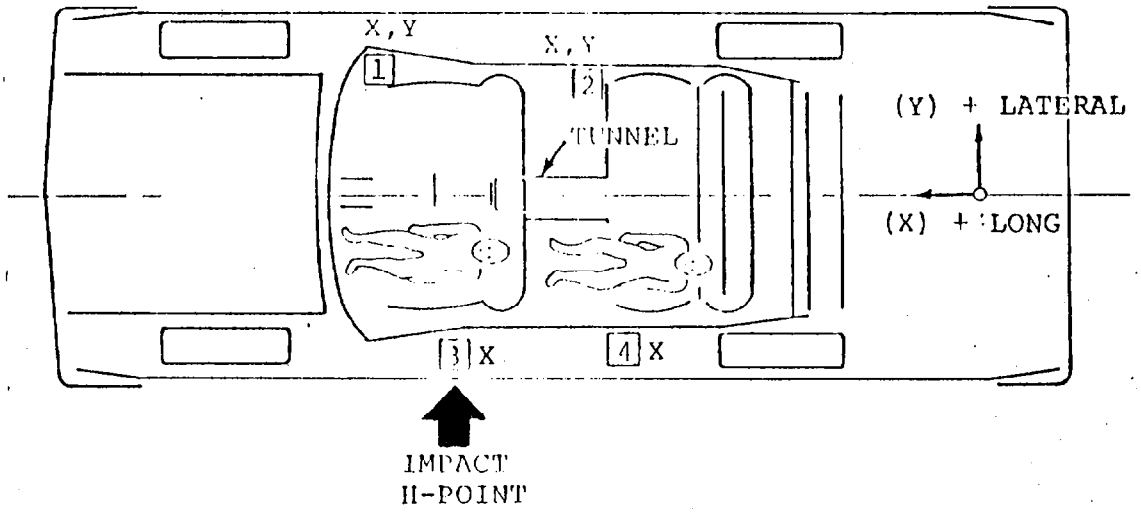
NO.	DESCRIPTION OF LOCATION	VEHICLE ACCELEROMETER LOCATIONS AND PHYSICAL COORDINATES X**	Y**	Z**	MAXIMUM EXPECTED READINGS LONG*	LAT*	VERT*
1	Rocker panel near B-pillar behind driver's seat	111	-27	29	50		50
2	Rocker panel near B-pillar behind passenger's seat	111	+27	29	50		50
3	Top of engine block	178	0	35	200		200

*G

**Reference points:
X - Direction - Centerline of rear bumper
Y - Direction - Centerline of vehicle - left centerline (-), right centerline (+)
Z - Direction - Ground level

***For use in offset impact tests only (instead of vertical)

Figure 3-1. 1979 Chevrolet C-10 Truck Accelerometer Instrumentation (Test 3051-4).



NO.	DESCRIPTION OF LOCATION	VEHICLE ACCELEROMETER LOCATIONS AND PHYSICAL COORDINATES X**	Y**	Z**	MAXIMUM EXPECTED READINGS LONG*	LAT*	VERT*
1	Right side of vehicle near **A-pillar** on rocker panel	135	24	15	50	50	
2	Right side of vehicle near **B-pillar** on rocker panel	98	24	14	50	50	
3	H-point of driver on rocker panel	113	-29	22		200	
4	H-point of rear passenger door	77	-29	26		200	

*G

**Reference points:

X - Direction - Centerline of rear bumper

Y - Direction - Centerline of vehicle - left centerline (-), right centerline (+)

Z - Direction - Ground level

Figure 3-2. 1979 Chevrolet Impala Accelerometer Instrumentation (Test 3051-4).

TABLE 3-4. INSTRUMENTATION SUMMARY (TEST 3051-4)

TEST NO. 3051-4 VEHICLE: 1979 Chevrolet C-10 Truck

Instrument	Numbers	Total No. of Data Channels
Vehicle Accelerometers*	3 locations	6
Dummy Instrumentation = Head (3), Chest (3)	1 location	6
Seat Belt Load Cells = Lap (1), Shoulder (1)	1 location	2
	TOTAL	14 - 1 RSCM
VEHICLE: 1979 Chevrolet Impala		
Vehicle Accelerometers**	4 locations	6
Dummy Instrumentation = Head (3), Chest (3), Femur (2)	2 locations	16
Seat Belt Load Cells = Lap (2),	2 locations	4
= Shoulder (1)	1 location	1
Impact Switch		1
	TOTAL	28 - 2 RSCM's

*See Figure 3-1 for locations.
**See Figure 3-2 for locations.

TABLE 3-5. CAMERA LOCATIONS - SIDE IMPACT (TEST 3051-4)

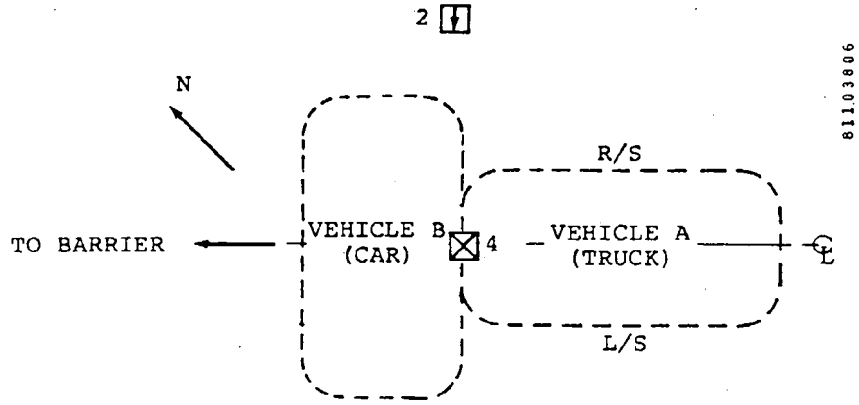
Test No: 4 Test Date: See Table 1-1

Test Type: Truck-to-Car Side Impact

Vehicle A (Away): 1979 Chevrolet C-10 Pickup Truck

Vehicle B (Barrier): 1979 Chevrolet Impala

Comments: _____



CAMERA	YES
STILLS	X
SLIDES	X
MOVIE	X
POLAROID	

CAMERA SYMBOLS

- PIT
- GROUND
- BARRIER
- OVERHEAD
- ON-BOARD

FRAME RATE

1. 1000 fr/sec
2. 200 fr/sec
3. Other 24 fr/sec
4. 400 fr/sec
5. 500 fr/sec

TIMING LIGHT SPEED

1. 100 Hz (10 msec/light)
2. 200 Hz (5 msec/light)
3. Other _____

Loc. No.	Location	Field of View	Lens Size	Frm Rate	Tmng Spd	Ser No	Impact Dist-X	C.L. Dist-Y	CAM Hght-Z
1	Left Side	Overall of Truck and Car	13	1	1				
2	Right Side*	Left Rear Car B Crush & Left Rear Occupant Compartment	25	1	1				
3	Left Side	Right Front Car B Crush & Right Front Occupant Compartment	25	1	1				
4	Overhead	Front Half of Vehicle A and All of Vehicle B	8	1	1				
5	Left Side	Panning Test and Overall Results		3					
6	Left Side	Impact of Cars at ≃ 100 msec (Still Camera 4x5 Negative)							

*Camera Failed During Test.

TABLE 3-6. SUMMARY OF PRE-TEST ENGINE/BUMPER/FIREWALL CHARACTERISTICS - CHEVROLET C-10 TRUCK (TEST 3051-4)

Test No.	3051-4	Type	90° Left Side Impact
Car Model	Chevrolet C-10 Truck	Dynamic Science No.	763

Engine Size	350 CID
Engine Weight* (lb)	675
Engine Height/Width (in.)	35.0/21.2
Bumper to Engine (in.)	28.9
Engine Length (in.)	21.7
Engine to Firewall (in.)	2.1
Bumper to Firewall (in.)	52.7
Bumper Height (max./min.) (in.)	24.0/14.6

*Includes engine and rigid attachments such as transmission and drive train.

TABLE 3-7. CHEVROLET C-10 TRUCK PRE-TEST DUMMY POSITIONS (TEST 3051-4)

Distances (in.)	Driver	Passenger
Chest to Steering Wheel Hub (horizontal)	11.5	
Nose to Steering Wheel Upper Rim	15.1	
Nose to Windshield (horizontal)	24.3	23.8
Knee to Lower Panel (closest point)		
Left	9.0	5.7
Right	9.0	6.7
Chest to Dash (horizontal)	25.1	21.8
Forehead to Header	19.0	20.6
Dummy Serial Number	A03	A04

TABLE 3-8. CHEVROLET IMPALA PRE-TEST DUMMY POSITIONS (TEST 3051-4)

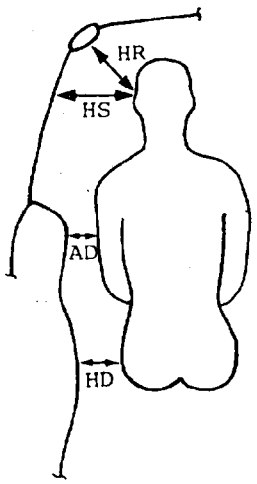
81103807

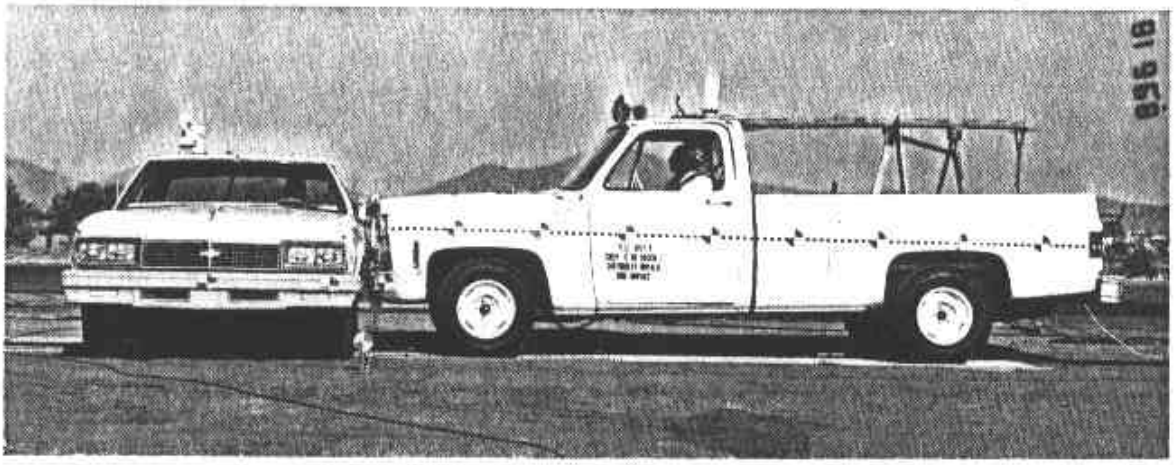
Distances (in.)	Driver	Passenger
Chest to Steering Wheel Hub (horizontal)	13.4	
Nose to Steering Wheel Upper Rim	15.4	
Nose to Windshield (horizontal)	23.1	NA
Knee to Lower Panel (closest point)		
Left	6.9	NA
Right	7.0	NA
Chest to Dash (horizontal)	21.8	NA
Forehead to Header	15.4	NA

TABLE 3-9. CHEVROLET IMPALA PRE-TEST SIDE IMPACT DUMMY POSITIONS (TEST 3051-4)

Measurement	Dimension (in.) Left Front Occupant	Left Rear Occupant
Head to Door Glass (HS)	12.0	12.1
Head to Side Header (HR)	8.7	10.8
Upper Arm to Door Panel (AD)	6.0	7.7
H-point to Door Panel (HD)	9.1	7.7
Dummy ℄ to Vehicle ℄	15.6	13.5
Dummy Serial Number	759	760

*To C-pillar panel.





a) Pre-test

b) Post-test

Figure 3-3. Pre- and Post-test Vehicle Configuration (Test 3051-4).

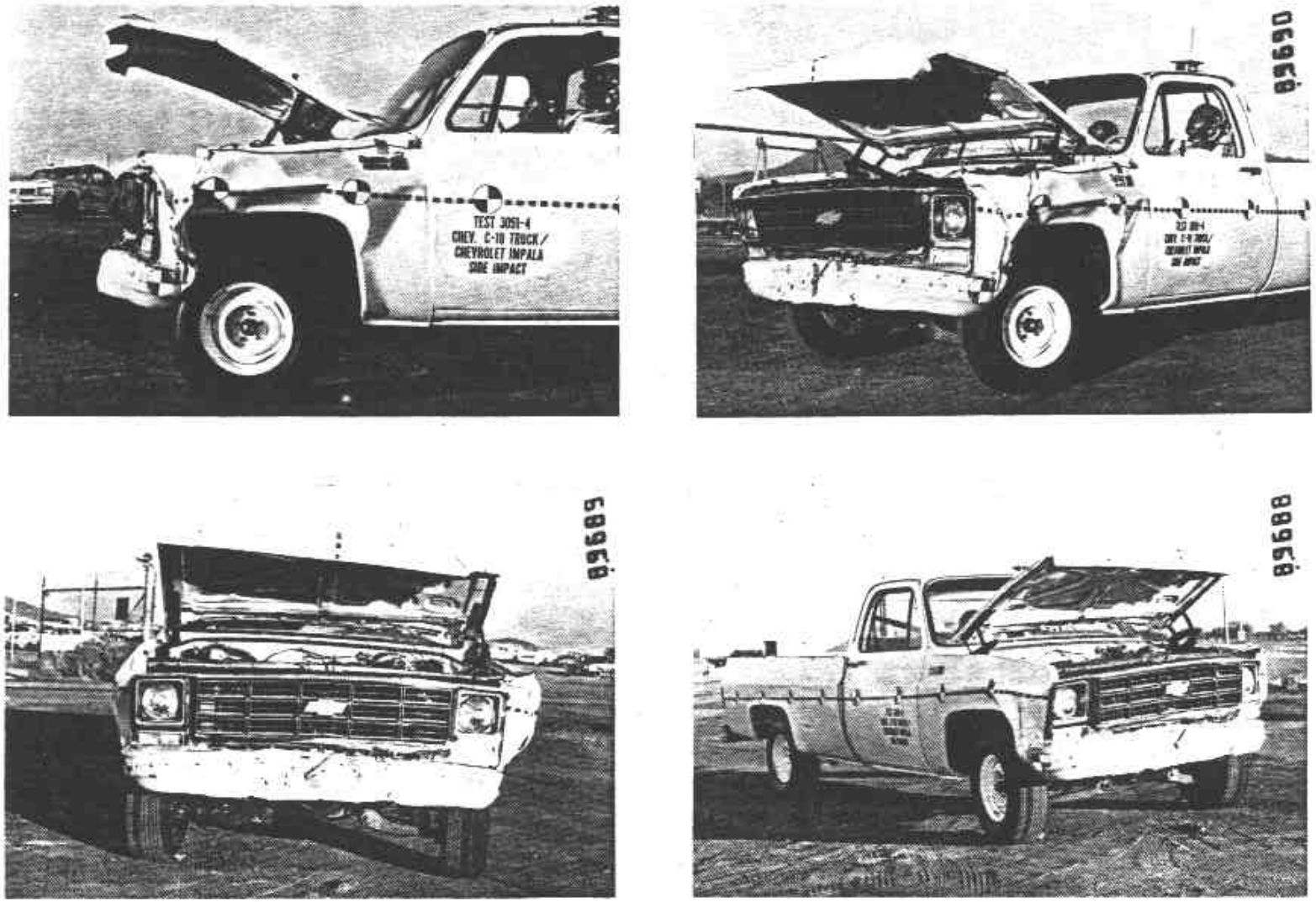


Figure 3-4. Post-test Chevrolet C-10 Truck Configuration (Test 3051-4).

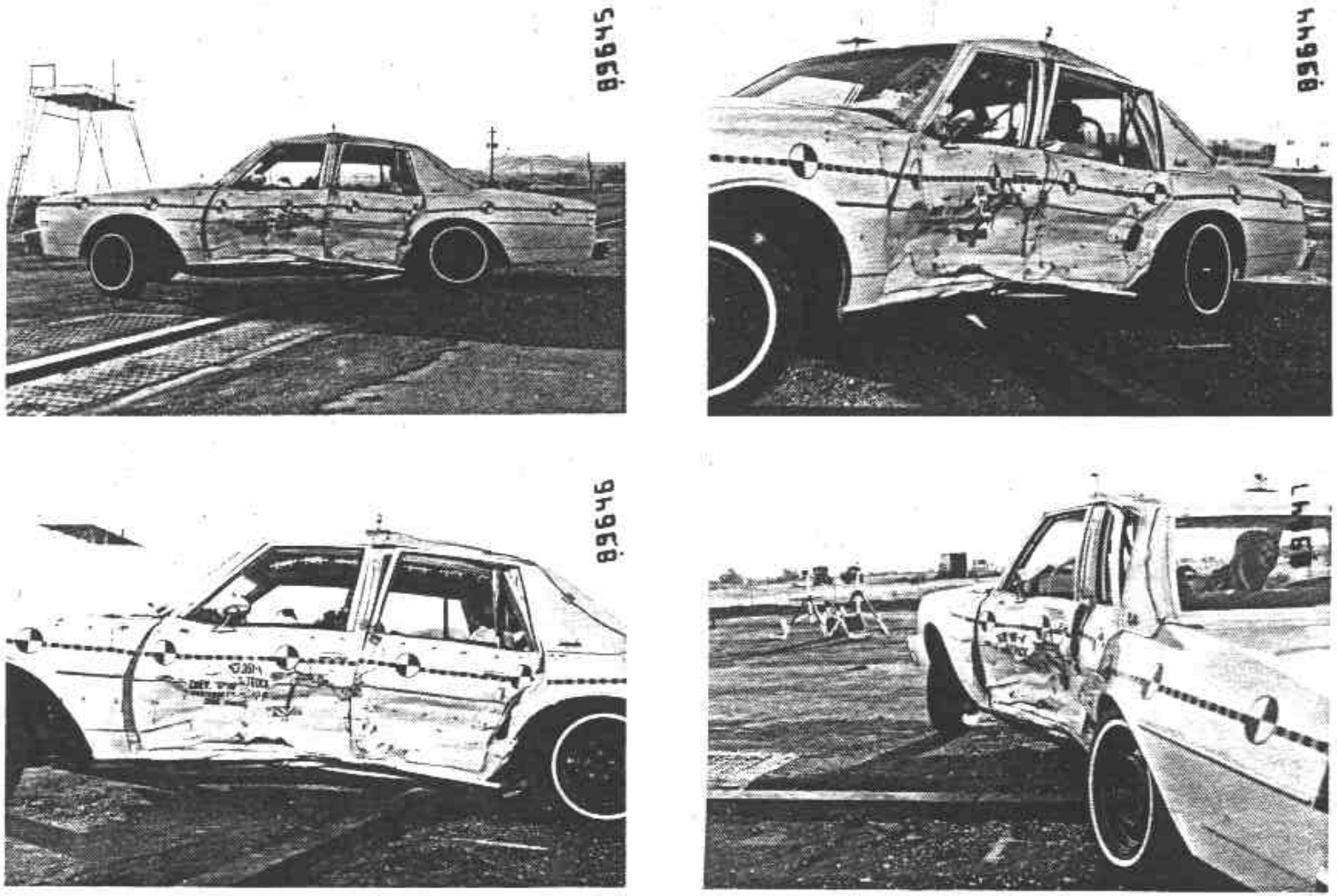
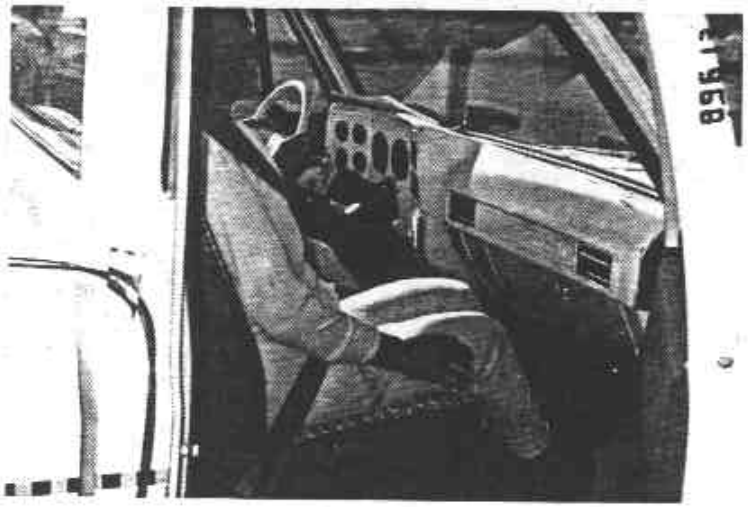


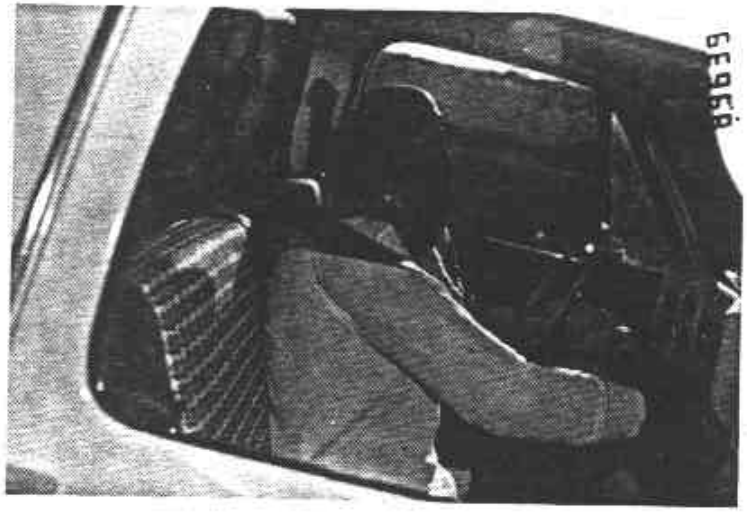
Figure 3-5. Post-test Chevrolet Impala Configuration (Test 3051-4).

a) Pre-test Driver



c) Pre-test Passenger

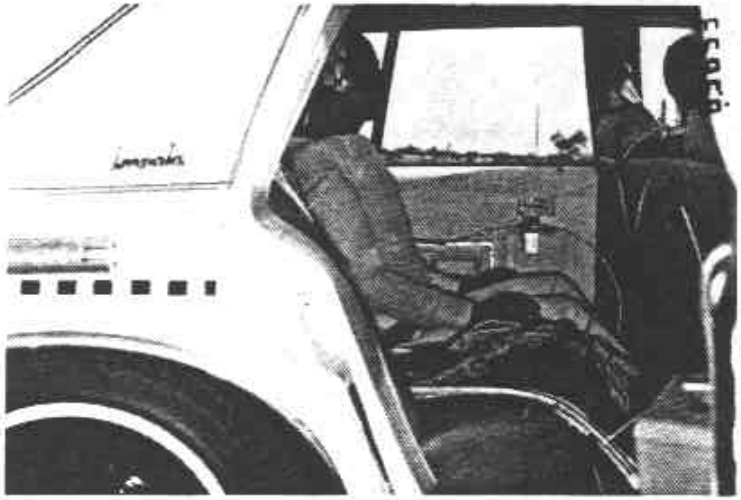
b) Post-test Driver



d) Post-test Passenger

Figure 3-6. Chevrolet C-10 Truck Dummy Configuration (Test 3051-4).

a) Pre-test Driver



c) Pre-test Passenger

b) Post-test Driver

d) Post-test Passenger

Figure 3-7. Chevrolet Impala Dummy Configuration (Test 3051-4).

TABLE 3-10. CHRONOLOGY OF EVENTS (TEST 3051-4)

Time (msec)	Chevrolet C-10 Truck	Time (msec)	Chevrolet Impala
0	Impact (visual contact)	0	Impact (visual contact)
11	Bumper pushed into car side	27	A-pillar begins to distort
25	Fender bent under - touches tire	30	Car begins to move down track
47	Hood latch fails - starts to open	40	Maximum mutual dynamic crush 18.9 in.
62	Hood buckles - car A-pillar holds hood down	57	Driver head hits left window
		58	Left side windows in car shatter
83	Driver chest hits steering wheel	59	Passenger head hits left window
117	Driver head snaps forward - hits steering wheel	177	Right rear tire blows out
135	Left front wheel turns right	217	Begins twist right
354	Driver head rebounds back to normal position	267	Maximum pitch - 10.25°
		706	Left front wheel turns sharp right - car swings right
		1615	Maximum push down track

NOTE: Car and truck move down track together for 20 feet. Car rotates counterclockwise and ends up at 20° angle from original position.

TABLE 3-11. CHEVROLET C-10 TRUCK POST-TEST OBSERVATIONS (TEST 3051-4)

VEHICLE: 1979 Chevrolet C-10 Truck

Dummy Contact Points:	Left Front	Right Front
Head	Top of steering wheel	None
Chest	Steering wheel hub	None
Knees	None	None

Glazing: 100% intact

Doors: Both doors difficult to open.

Seat Belt Anchorages and Restraints: Okay, no seat movement.

Vehicle Centerline to Barrier Centerline: Front = 8 in. right
Rear = 5.5 in. right

Fuel Leakage: None

General Observations: Hood latch failed. Light damage to front of truck. Grille and headlights intact. Fenders pushed back to tires. Left rear tire in trench. Dummies both rotated to the left. Front of truck 20 feet from impact. Truck struck car behind C.G. of car causing the car to rotate 20° counterclockwise.

TABLE 3-12. CHEVROLET IMPALA POST-TEST OBSERVATIONS (TEST 3051-4)

VEHICLE: 1979 Chevrolet Impala 4-door Sedan

Dummy Contact Points:	Left Front	Left Rear
Head	Side of head hit side window	Side of head hit side window
Chest	Upper arm and shoulder hit window sill	Upper arm and shoulder hit window sill
Knees	Hip and thighs hit arm rest	Hip and thighs hit arm rest

Glazing: Front windshield 10% broken, 100% retained. All left side windows shattered, 0% retained.

Doors: Left side would not open. Right side opened easily.

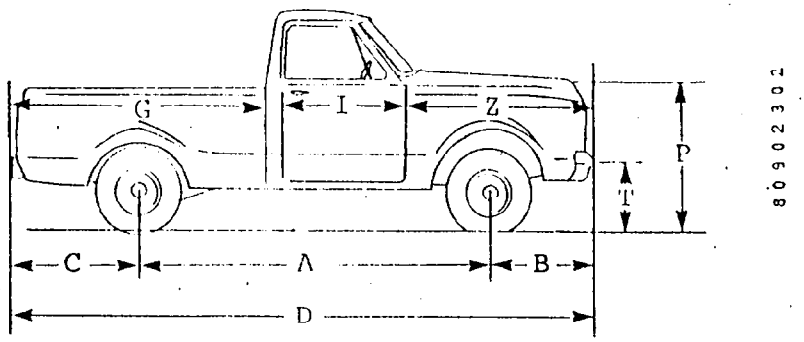
Seat Belt Anchorages and Restraints: Seat belts okay. Front seat moved forward 1.5 in.

Vehicle H-point to Barrier Centerline: Right front H-point - 42" left. Left front H-point - 8 in. right.

Fuel Leakage: None

General Observations: Right rear wheel in trench. Tire pulled off rim. Rear dummy upright, front dummy leaning to right at 60°. Vehicle rotated about 20° counterclockwise. Drive tunnel bent.

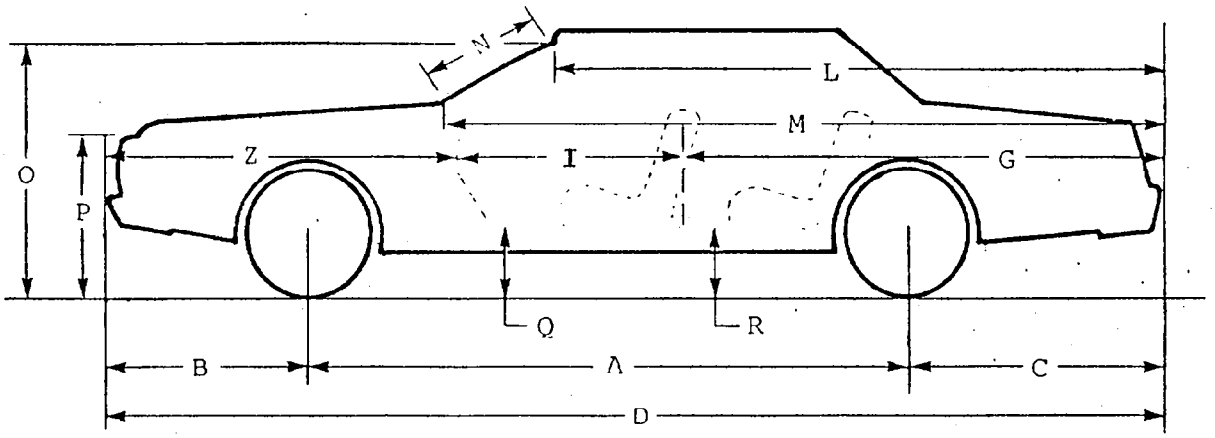
TABLE 3-13. PRE- AND POST-TEST DIMENSION MEASUREMENTS - BULLET VEHICLE (TEST 3051-4)



VEHICLE: 1979 Chevrolet C-10 Truck

	Pre-test (in.)		Post-test (in.)		Difference (in.)	
	LS	RS	LS	RS	LS	RS
A	131.5	131.6	131.1	131.9	0.4	-0.3
B	33.6	33.6	29.5	28.2	4.1	5.4
C	51.9	52.3	52.0	52.0	-0.1	0.3
D	217.0	217.5	212.6	212.1	4.4	5.4
I	38.8	39.0	38.6	38.6	0.2	0.4
G	107.5	108.1	107.5	107.9	0.0	0.2
P	39.2	39.2	41.1	39.5	-1.9	-0.3
T	22.5	23.0	24.7	24.0	-2.2	-1.0
Z	64.1	63.8	59.5	59.5	4.6	4.3

TABLE 3-14. PRE- AND POST-TEST DIMENSION MEASUREMENTS - TARGET VEHICLE (TEST 3051-4)



VEHICLE: 1979 Chevrolet Impala 4-door Sedan

	Pre-test (in.)		Post-test (in.)		Difference (in.)	
	LS	RS	LS	RS	LS	RS
A	116.1	115.9	115.7	115.1	0.4	0.8
B	40.1	40.2	39.8	40.3	0.3	-0.1
C	56.3	56.4	55.0	57.0	1.3	-0.6
D	212.5	212.5	210.5	212.4	2.0	0.1
I	38.1	38.0	37.1	38.1	1.0	-0.1
G	104.6	104.3	102.4	104.0	2.2	0.3
L	121.3	121.1	120.4	119.9	0.9	1.2
M	139.6	139.9	137.3	139.3	2.3	0.6
N	25.1	25.6	25.0	25.5	0.1	0.1
O	55.4	55.5	56.9	53.6	-1.5	1.9
P	30.9	30.7	32.8	31.4	-1.9	-0.7
Q	14.5	14.5	16.0	12.6	-1.5	1.9
R	14.5	14.3	15.4	11.9	-0.9	2.4
Z	69.8	70.2	70.0	70.3	-0.2	-0.1

TABLE 3-15. CHEVROLET C-10 TRUCK EXTERIOR PROFILES AND STATIC CRUSH (TEST 3051-4)

Location	Height at ℄	RP**	Distance Left of Center (in.)*							Distance Right of Center (in.)*					
			36	30	24	18	12	6	0	6	12	18	24	30	36
Pre-test Profile (Distance from RP - in.)															
Hood Level	39.6	220	8.1	7.8	6.2	6.0	5.8	5.6	5.5	5.5	5.5	5.6	5.9	7.3	7.6
Between Bumper/Hood	31.3	220	9.0	10.4	6.8	6.6	6.5	6.4	6.3	6.4	6.5	6.5	6.6	10.0	8.4
Bumper Level	19.9	220	5.1	4.0	3.6	3.4	3.2	3.5	3.5	3.5	3.0	3.1	3.3	3.6	4.8
Post-test Profile (Distance from RP - in.)															
Hood Level	41.5	220	18.0	17.3	14.8	13.6	12.6	11.8	11.0	10.3	9.7	9.1	8.6	9.4	9.4
Between Bumper/Hood	33.2	220	19.0	19.0	14.5	13.6	12.9	12.4	11.7	11.3	10.6	10.1	9.5	13.1	11.9
Bumper Level	23.1	220	16.5	14.0	12.0	10.2	8.5	9.3	9.6	10.1	9.1	9.2	9.7	10.1	12.0
Post-test Static Crush (in.)															
Hood Level	-1.9		9.9	9.5	8.6	7.6	6.8	6.2	5.5	4.8	4.2	3.5	2.7	2.1	1.8
Between Bumper/Hood	-1.9		10.0	8.6	1.7	7.0	6.4	6.0	5.4	4.9	4.1	3.6	2.9	3.1	3.5
Bumper Level	-3.2		11.4	10.0	8.4	6.8	5.3	5.8	6.1	6.6	6.1	6.1	6.4	6.5	7.2

*As viewed from driver position in truck.
**Reference Plane from rear bumper of truck.

TABLE 3-16. CHEVROLET C-10 TRUCK INTERIOR PROFILES AND STATIC CRUSH (TEST 3051-4)

Location	Height at ℄	RP**	Distance Left of Center (in.)*							Distance Right of Center (in.)*					
			36	30	24	18	12	6	0	6	12	18	24	30	36
Pre-test Profile (Distance from RP - in.)															
Dash	49.6	130		19.5	21.4	21.6	21.1	19.2	24.7	24.6	24.5	24.3	23.8	23.2	
Knee Level	35.6	130		20.4	22.4	22.7	22.6	20.8	23.5	23.6	23.5	23.5	23.4	23.3	
Floor	29.0	140		20.8	20.7	20.9	20.8	21.0	20.6	20.6	21.3	20.7	20.3	20.2	
Post-test Profile (Distance from RP - in.)															
Dash	50.7	130		19.1	21.0	21.1	20.6	18.7	24.1	24.0	23.8	23.5	22.9	22.4	
Knee Level	36.6	130		20.2	22.5	22.7	22.7	20.5	23.3	23.2	23.2	23.0	22.8	22.6	
Floor	30.1	140		21.0	21.0	21.0	20.9	21.1	20.8	20.6	21.5	20.8	20.3	20.1	
Post-test Static Crush (in.)															
Dash	-1.0			0.4	0.4	0.5	0.5	0.5	0.6	0.6	0.7	0.8	0.9	0.8	
Knee Level	-1.0			0.2	-0.1	0.0	-0.1	0.3	0.2	0.4	0.3	0.5	0.6	0.7	
Floor	-1.1			0.2	-0.3	-0.1	-0.1	-0.1	-0.2	0.0	-0.2	-0.1	0.0	0.1	

*As viewed from driver position in truck.
**Reference Plane from rear bumper of truck.

TABLE 3-17. CHEVROLET IMPALA VEHICLE LEFT SIDE EXTERIOR PROFILE (TEST 3051-4)

	Distance From H-point	Pre-test (in.)			Post-test (in.)			Static Crush (in.)		
		Door-sill	Mid-door	Window-sill	Door-sill	Mid-door	Window-sill	Door-sill	Mid-door	Window-sill
	Height	11.7	22.9	32.0	12.6	24.2	32.2	0.9	1.3	0.2
VEHICLE FRONT	60									
	54									
	48		9.3	11.4		10.8	13.4		1.5	2.0
	42	13.9	9.5	11.3	16.2	11.5	14.2	2.3	2.0	2.9
	36	13.9	9.5	11.2	16.6	13.1	15.1	2.7	3.6	3.9
	30	13.9	9.5	11.2	17.6	17.4	16.0	3.7	7.9	4.8
	24	13.9	9.5	11.1	18.5	20.7	18.8	4.6	11.2	7.7
	18	13.9	9.4	11.0	19.5	22.3	19.7	5.6	12.9	8.7
	12	13.9	9.3	10.9	20.3	23.6	20.6	6.4	14.3	9.7
	6	13.9	9.3	10.9	21.2	24.7	21.4	7.3	15.4	10.5
Driver H-point	0	13.9	9.2	10.9	22.4	24.9	22.0	8.5	15.7	11.1
	6	13.9	9.1	10.9	24.0	24.0	22.3	10.1	14.9	11.4
	12	13.9	9.1	10.9	26.6	24.0	24.8	12.7	14.9	13.9
VEHICLE REAR	18	13.8	9.2	10.8	24.6	24.7	24.5	10.8	15.5	13.7
	24	13.8	9.2	10.8	22.5	24.1	24.5	8.7	14.9	13.7
	30	13.8	9.2	10.8	20.7	23.7	24.3	6.9	14.5	13.5
	36	13.8	9.3	10.8	20.3	22.4	23.1	1.5	13.1	13.3
	42		9.0	10.9		15.6	19.2		6.6	8.3
	48			10.9			16.7			5.8
	54									
	60									

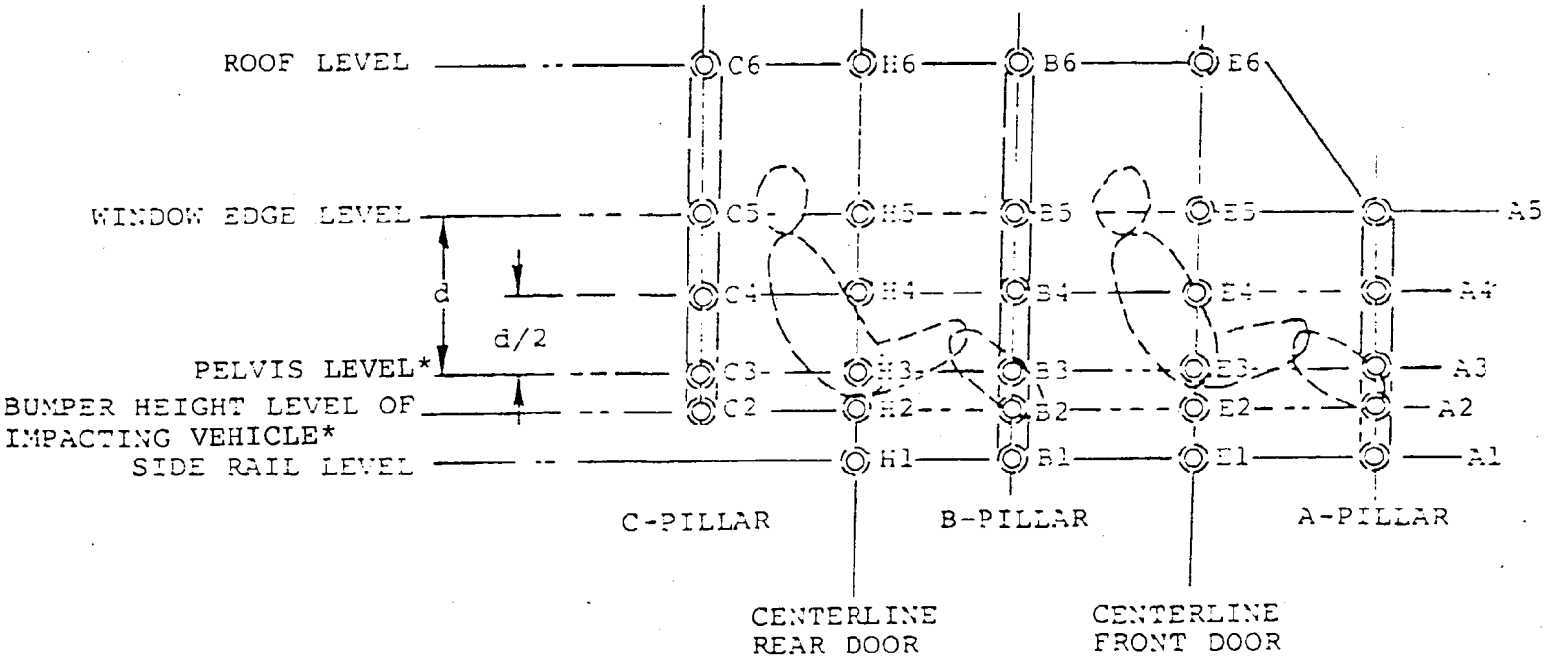
*Reference Plane 78 inches from doorsill of vehicle's right side.

TABLE 3-18. CHEVROLET IMPALA VEHICLE LEFT SIDE INTERIOR PROFILE (TEST 3051-4)

Level*		Height	Location ** C	H	B	E	A
Pre-test (in.)							
Roof	6	52.7	63.6	64.0	62.8	64.1	
Window Edge	5	37.9	68.7	70.0	68.3	70.4	68.6
Middoor	4	30.5	68.2	68.9	68.5	69.2	68.4
H-point	3	24.5	67.7	66.8	65.8	66.6	68.6
Bumper	2						
Sill Rail	1	15.7	66.4	67.1	66.1	68.0	66.6
Post-test (in.)							
Roof	6	54.4	59.7	57.9	56.1	59.5	
Window Edge	5	38.4	63.7	57.2	56.8	61.6	64.2
Middoor	4	31.1	61.0	57.3	55.2	59.7	62.1
H-point	3	24.9	59.6	55.3	52.9	56.3	60.4
Bumper	2						
Sill Rail	1	15.6	60.2	59.3	55.1	58.0	59.6
Static Crush (in.)							
Roof	6	-1.7	3.9	6.1	6.7	4.6	
Window Edge	5	-.5	5.0	12.8	11.5	8.8	4.4
Middoor	4	-.6	7.2	11.6	13.3	9.5	6.3
H-point	3	-.4	8.1	11.5	15.6	10.3	8.2
Bumper	2						
Sill Rail	1	-.1	6.2	7.8	11.0	10.0	7.0

*Defined according to Figure 3-8.
**Distance to Reference Plane 6 inches right of doorsill on right side of vehicle.

MAXIMUM OCCUPANT COMPARTMENT INTRUSION WILL BE MEASURED RELATIVE TO AN UNDISTURBED VEHICLE REFERENCE LINE.



O LOCATIONS AT WHICH INTRUSION MEASUREMENTS ARE MADE
*PELVIS AND BUMPER AT SAME LEVEL FOR TEST 3051-4

Figure 3-8. Intrusion Measurement Locations - Chevrolet Impala (Test 3051-4).

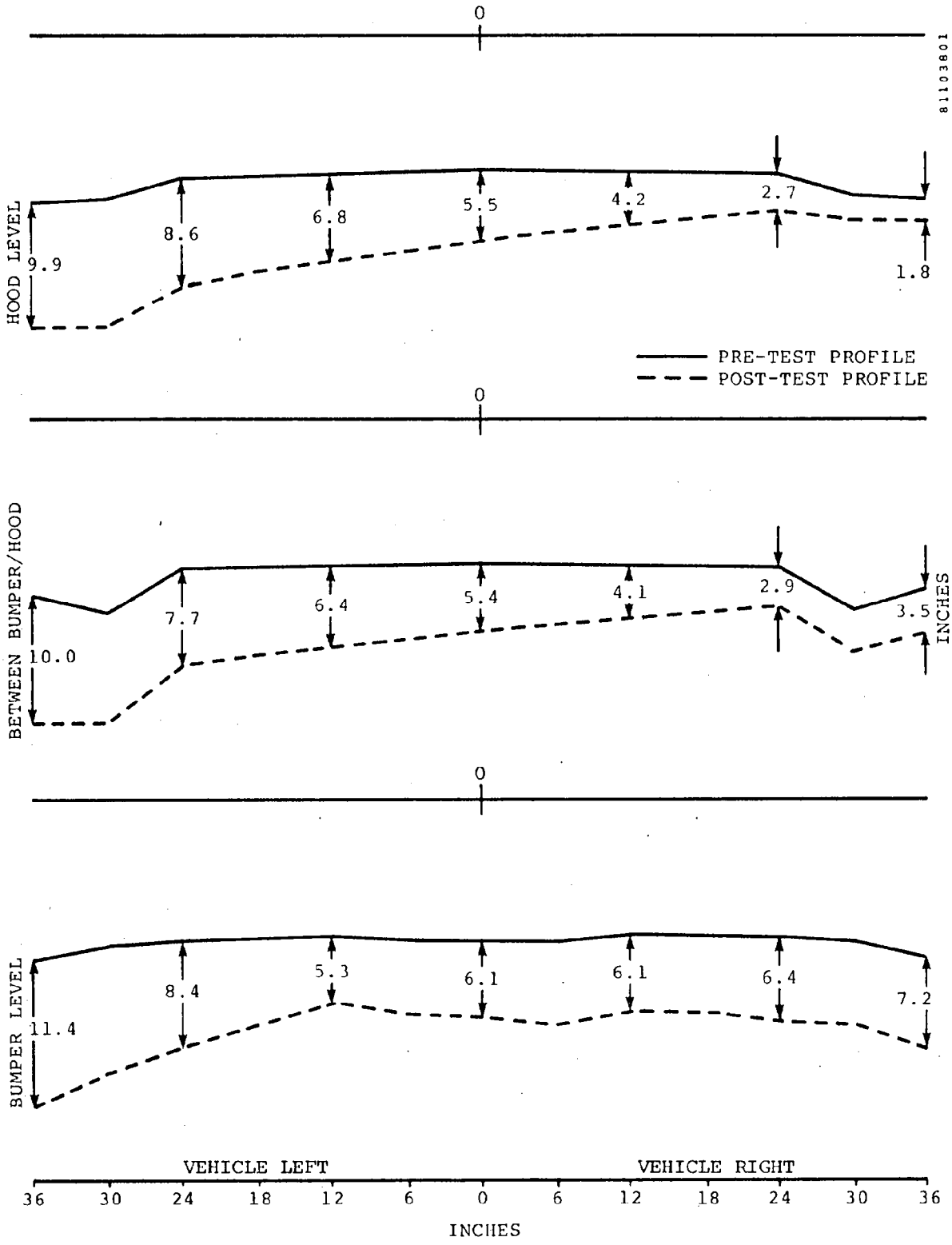


Figure 3-9. Chevrolet C-10 Truck Exterior Static Crush (Test 3051-4).

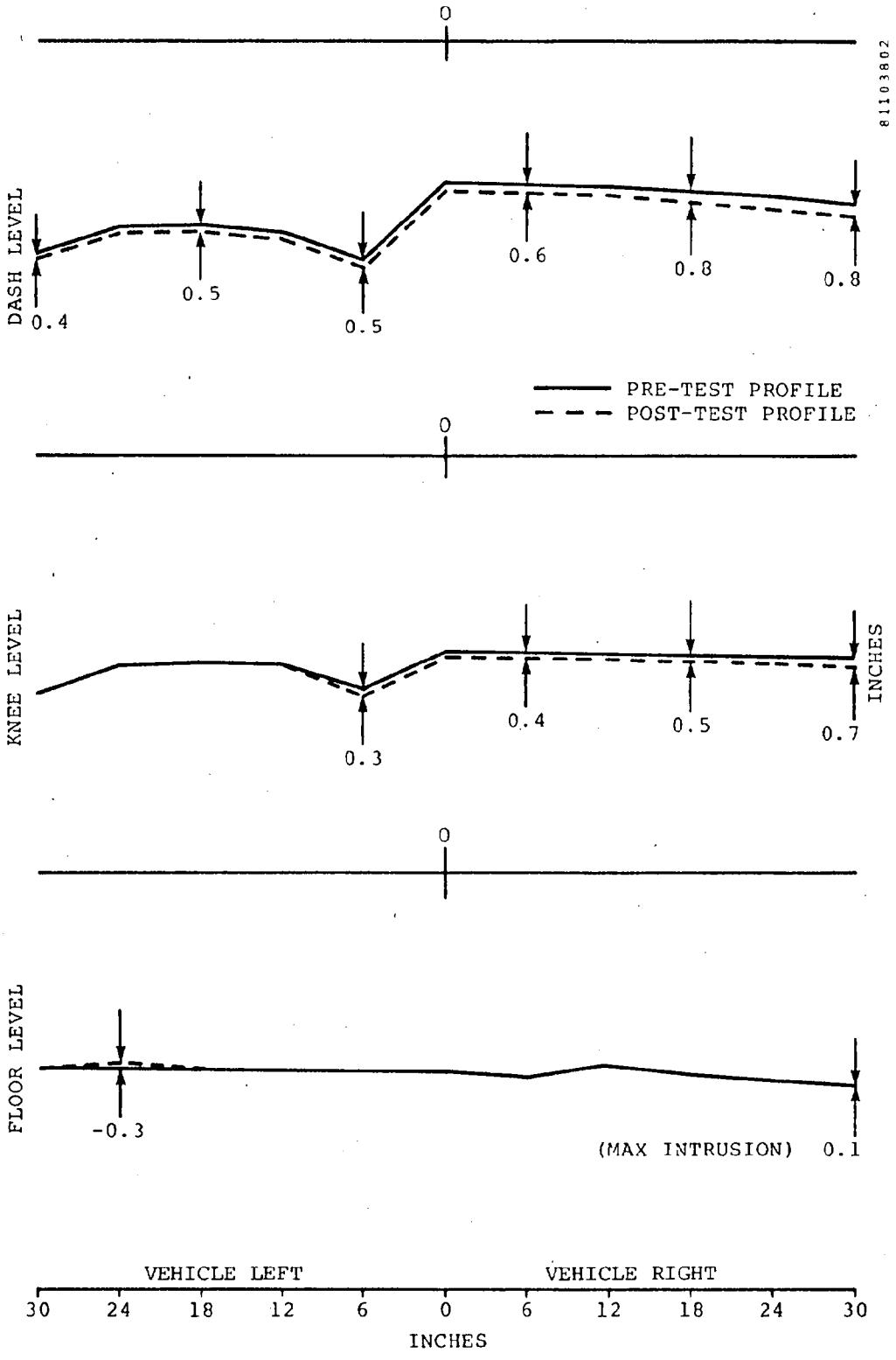


Figure 3-10. Chevrolet C-10 Truck Interior Intrusion (Test 3051-4).

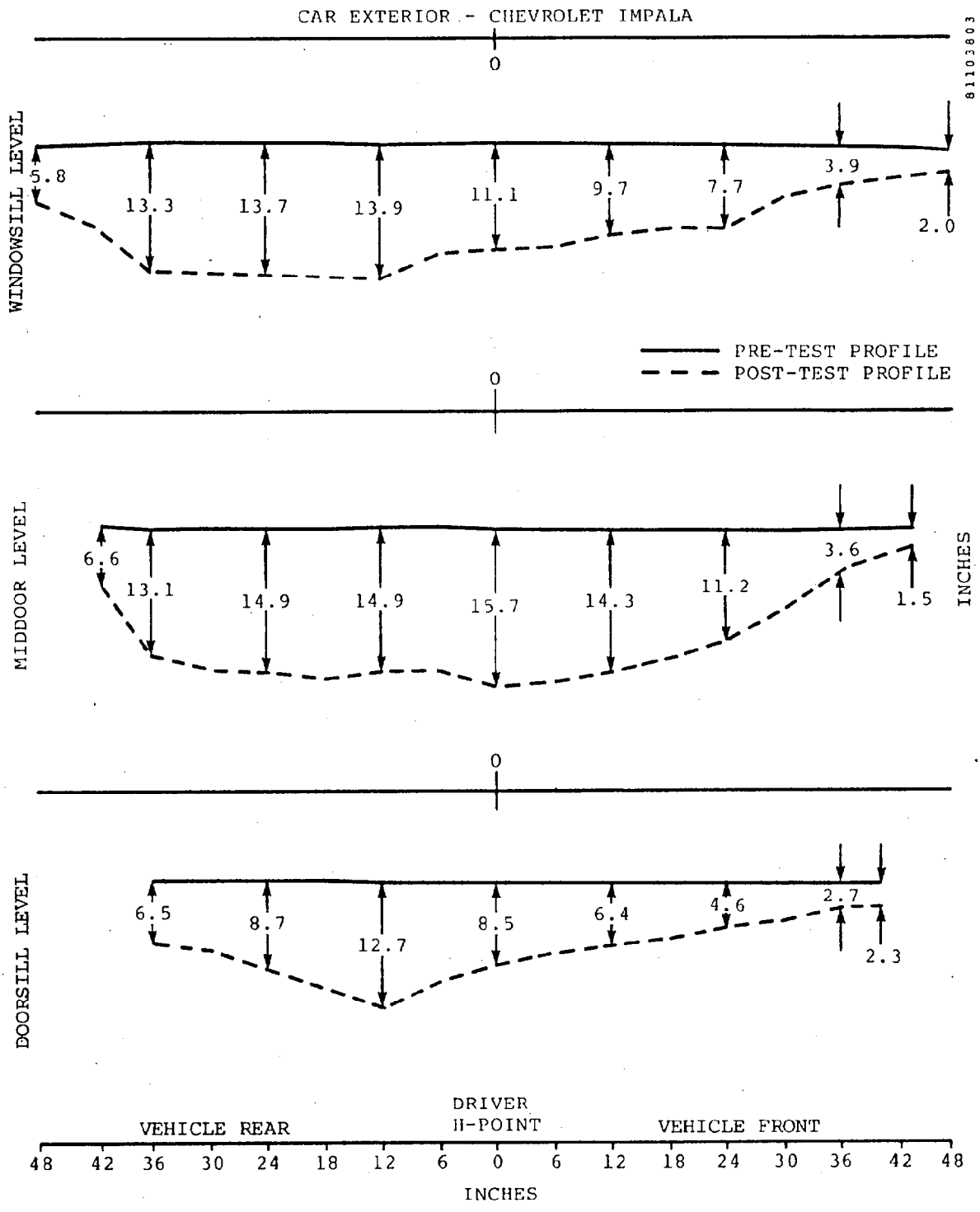


Figure 3-11. Chevrolet Impala Left Side Exterior Static Crush (Test 3051-4).

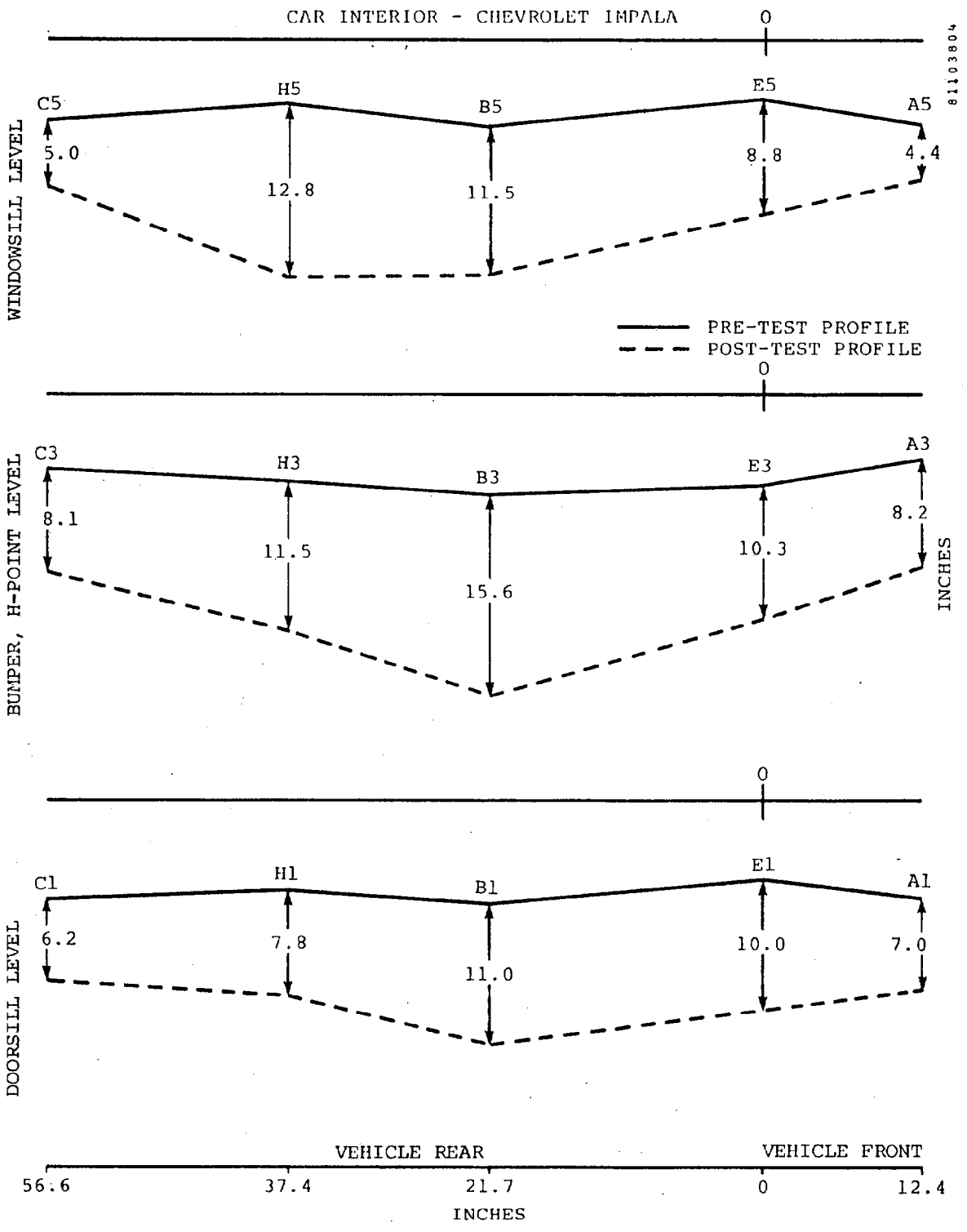


Figure 3-12. Chevrolet Impala Left Side Interior Static Intrusion (Test 3051-4).

TABLE 3-19. CHEVROLET C-10 TRUCK STEERING WHEEL MEASUREMENTS AND DISPLACEMENT VALUES (TEST 3051-4)

Wheel Location	Pre-test (in.)			Post-test (in.)			Displacement (in.)		
	X*	Y*	Z*	X	Y	Z	X	Y	Z
Top	140.7	-18.1	53.3	140.4	-18.1	53.4	0.3	0.0	-0.1
Hub	138.5	-18.1	45.5	138.3	-18.1	45.5	0.2	0.0	0.0
Bottom	134.6	-18.1	39.6	134.0	-18.1	39.7	0.6	0.0	-0.1

*Reference for X, Y, and Z measurements are rear bumper, vehicle centerline, and ground level, respectively.

TABLE 3-20. CHEVROLET IMPALA STEERING WHEEL MEASUREMENTS AND DISPLACEMENT VALUES (TEST 3051-4)

Wheel Location	Pre-test (in.)			Post-test (in.)			Displacement (in.)		
	X*	Y*	Z*	X	Y	Z	X	Y	Z
Top	126.5	-15.6	43.9	126.6	-15.8	46.0	-0.1	0.2	-2.1
Hub	125.5	-15.6	36.8	125.0	-15.8	39.0	0.5	0.2	-2.2
Bottom	122.0	-15.6	30.4	120.6	-15.8	32.8	1.4	0.2	-2.4

*Reference for X, Y, and Z measurements are rear bumper, vehicle centerline, and ground level, respectively.

TABLE 3-21. SUMMARY OF VEHICLE ACCELEROMETER DATA (TEST 3051-4)

Accelerometer No.*	Maximum Acceleration A (G)	Maximum Acceleration Time (msec)	Minimum Velocity V (mph)	Minimum Velocity Time (msec)	Maximum Displacement S (in.)	Maximum Displacement Time (msec)
VEHICLE: 1979 Chevrolet C-10 Truck (Bullet Vehicle)						
1X	-19.7	27	+12.8	200	63.4	200
1Z	-8.7	74	-3.1	139	-3.9	200
2X	-15.9	36	+12.7	199	+63.8	200
2Z	-9.1	63	-2.4	135	3.0	200
Average 1X and 2X	-15.8	27	+12.7	200	63.6	200
3X	-15.2	65	+12.5	184	63.0	200
3Z	-4.8	64	-1.1	117	0.2	181
VEHICLE: 1979 Chevrolet Impala 4-door Sedan (Target Vehicle)						
1X	-7.0	16	-0.5	19	+1.7	200
1Y	+26.4	13	+17.1	147	+42.6	200
2X	-9.1	16	-0.7	19	-0.2	200
2Y	+17.7	13	+16.5	145	+40.7	200
Average 1Y and 2Y	+22.1	13	16.8	146	41.6	200
3Y	+89.7	9	+21.9	31	51.6	200
4Y	-136.8	22	+18.6	25	43.1	200

*See Figures 3-1 and 3-2 for definition of accelerometer locations.

TABLE 3-22. OCCUPANT RESPONSE DATA SUMMARY (TEST 3051-4)

	VEHICLE: 1979 Chevrolet C-10 Truck				VEHICLE: 1979 Chevrolet Impala			
	LEFT FRONT OCCUPANT		RIGHT FRONT OCCUPANT		LEFT FRONT OCCUPANT		LEFT REAR OCCUPANT	
	MAX VALUE (G)	T (MSEC)	MAX VALUE (G)	T (MSEC)	MAX VALUE (G)	T (MSEC)	MAX VALUE (G)	T (MSEC)
HEAD								
X	+109.7**	112	ND		+12.7	33	+10.5	160
Y	-6.7	120	ND		+33.9	39	+47.5	84
Z	+20.3	110	ND		+47.2	45	+38.3	79
R*	78.2**	113	ND		49.6	45	50.0	80
HIC	489 @ 110-120**				172 @ 31-61		202 @ 54-92	
CHEST								
X	-18.8	101	ND		+33.2	32	-12.4	52
Y	-5.8	110	ND		+75.6	33	+51.8	51
Z	-5.0	156	ND		-17.5	31	-8.0	59
R*	18.8	99	ND		71.0	34	45.3	53
SI	47 @ 200				309 @ 200		165 @ 200	
	MAX VALUE (LB)	T (MSEC)	MAX VALUE (LB)	T (MSEC)	MAX VALUE (LB)	T (MSEC)	MAX VALUE (LB)	T (MSEC)
FEMURS								
LF	ND		ND		+192	43	-292	49
RT	ND		ND		-287	59	+316	59

*3-msec clip
**Data System Failure - Data Invalid 109-120 msec
ND = No Data (Data not measured)

TABLE 3-23. SUMMARY OF RESTRAINT SYSTEM DATA (TEST 3051-4)

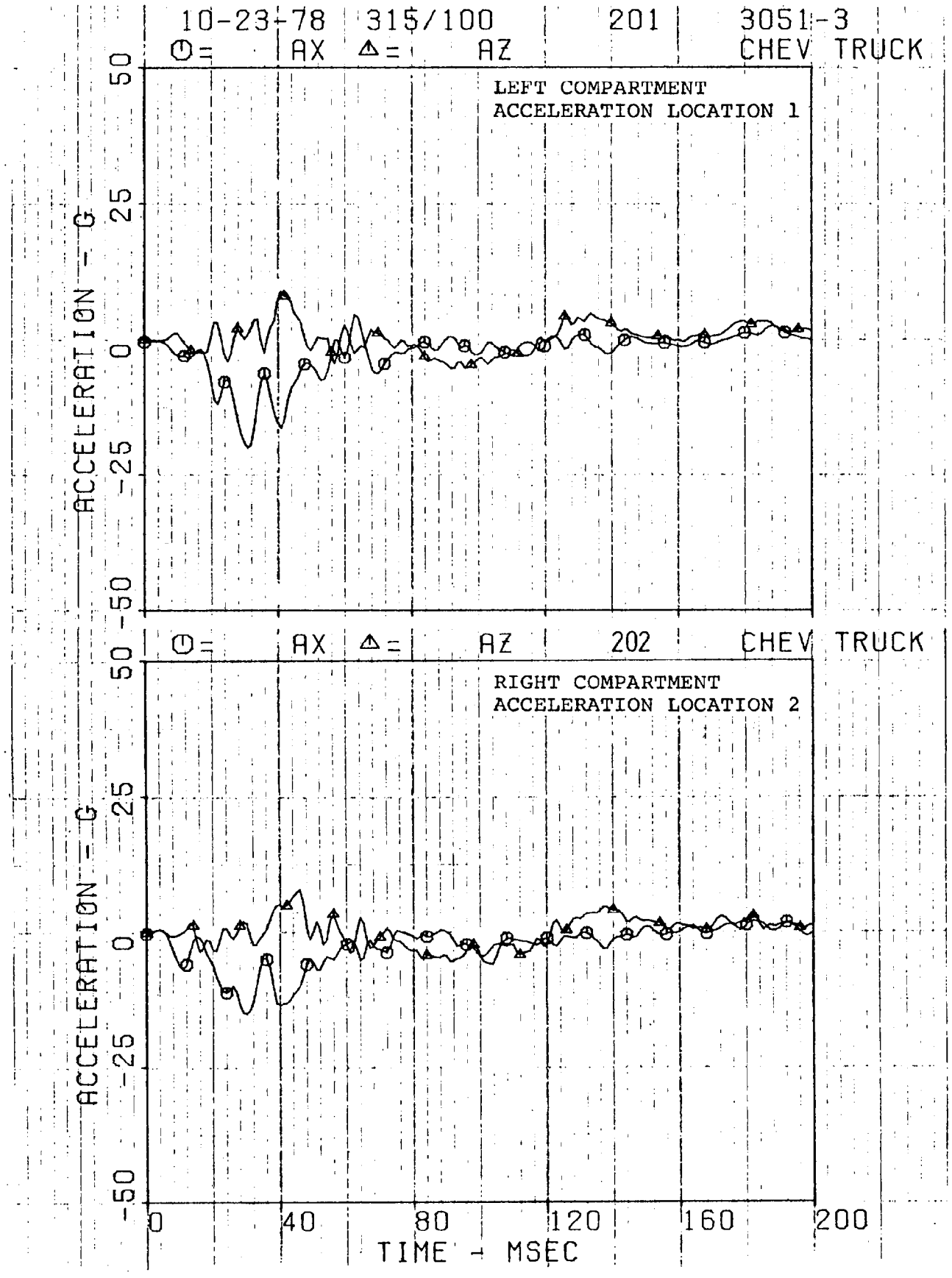
VEHICLE: 1979 Chevrolet C-10 Truck	Peak Load (lb) @ Time (msec)
Left Front Occupant	
Peak Shoulder Belt Load	879 @ 107
Peak Left Lap Belt Load	426 @ 101
Peak Right Lap Belt Load	ND
Right Front Occupant	
Peak Shoulder Belt Load	ND
Peak Left Lap Belt Load	ND
Peak Right Lap Belt Load	ND
VEHICLE: 1979 Chevrolet Impala 4-Door Sedan	
Left Front Occupant	
Peak Shoulder Belt Load	142 @ 107
Peak Left Lap Belt Load	803 @ 42
Peak Right Lap Belt Load	140 @ 131
Left Rear Occupant	
Peak Shoulder Belt Load	ND
Peak Left Lap Belt Load	93 @ 49
Peak Right Lap Belt Load	234 @ 168

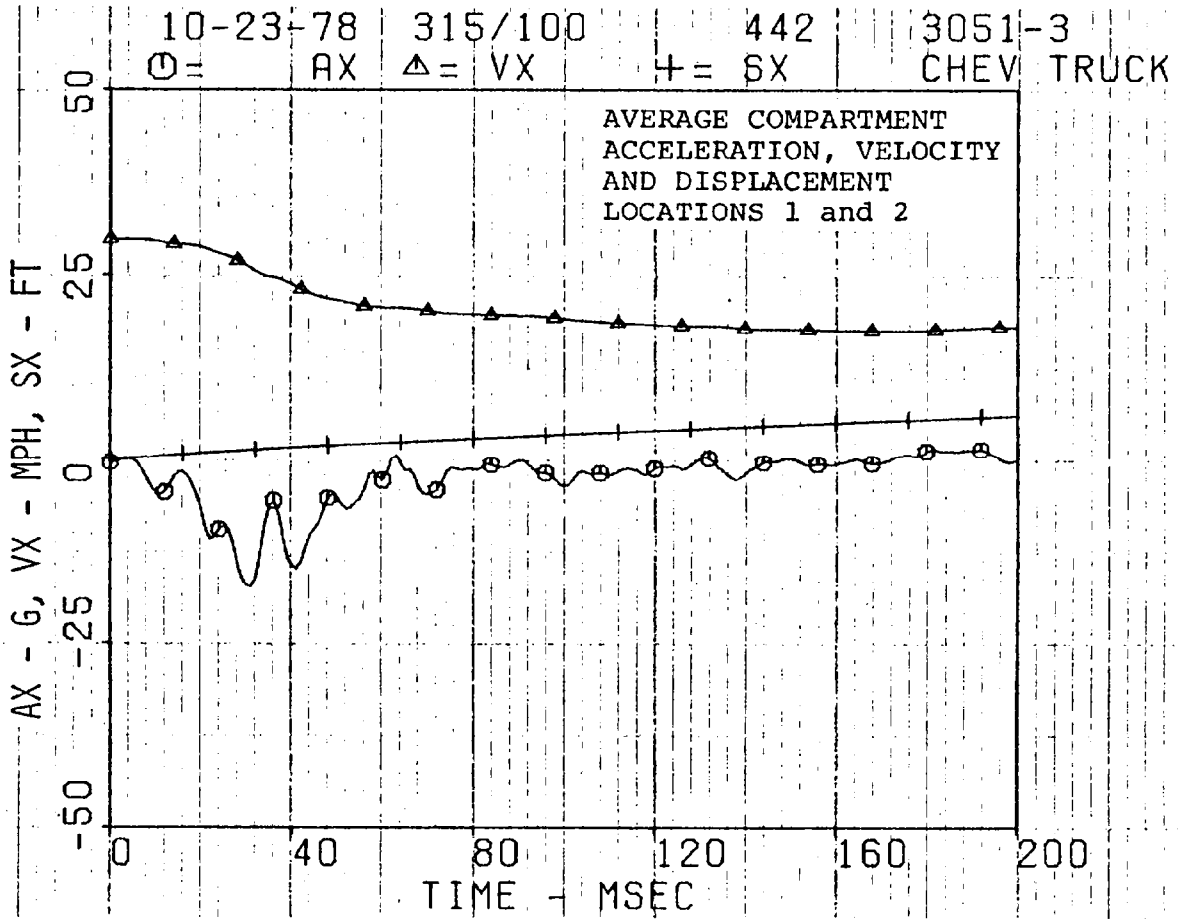
ND = No Data (Data not measured).

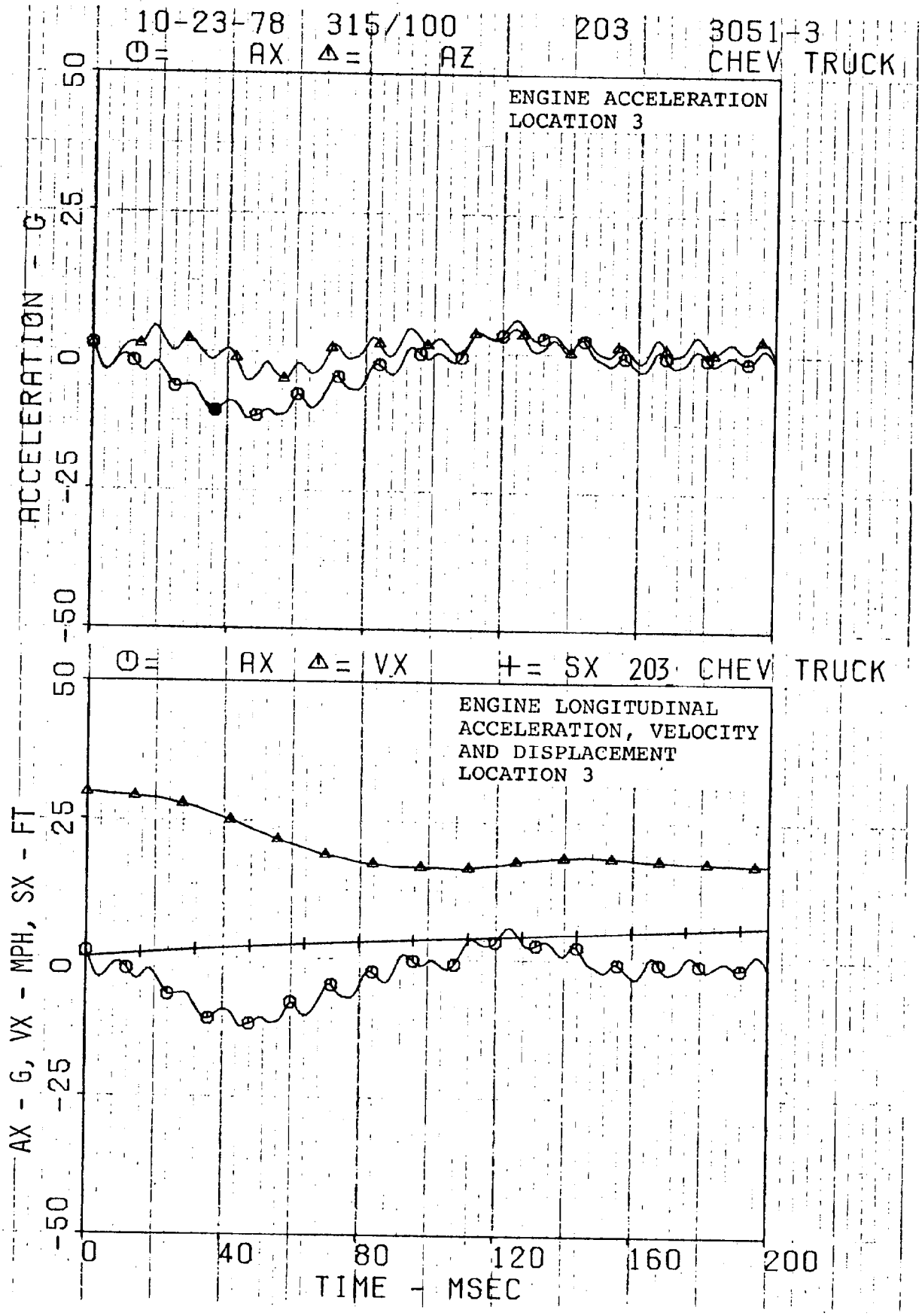
APPENDIX A

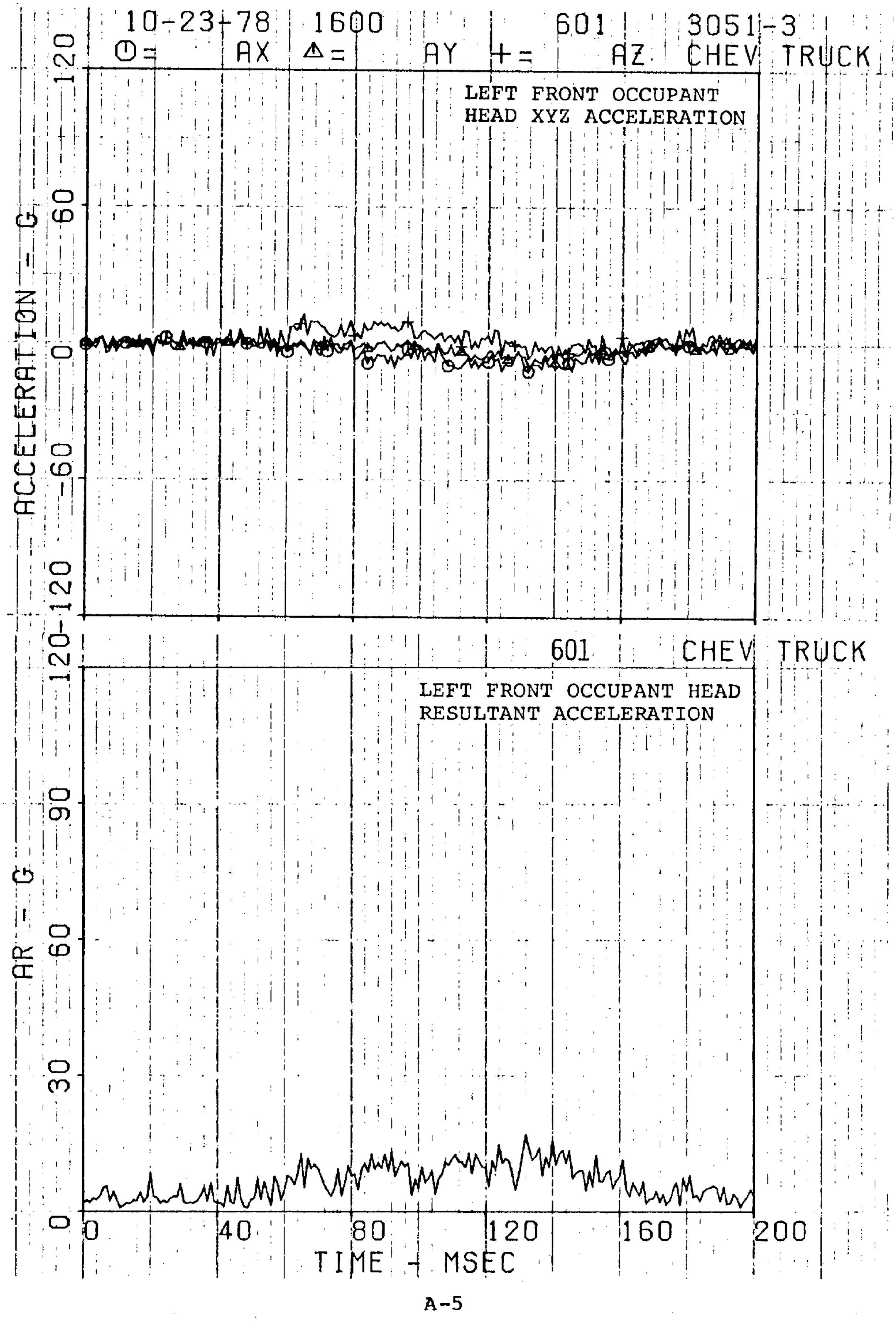
CALCOMP PLOTS

(TEST 3051-3)

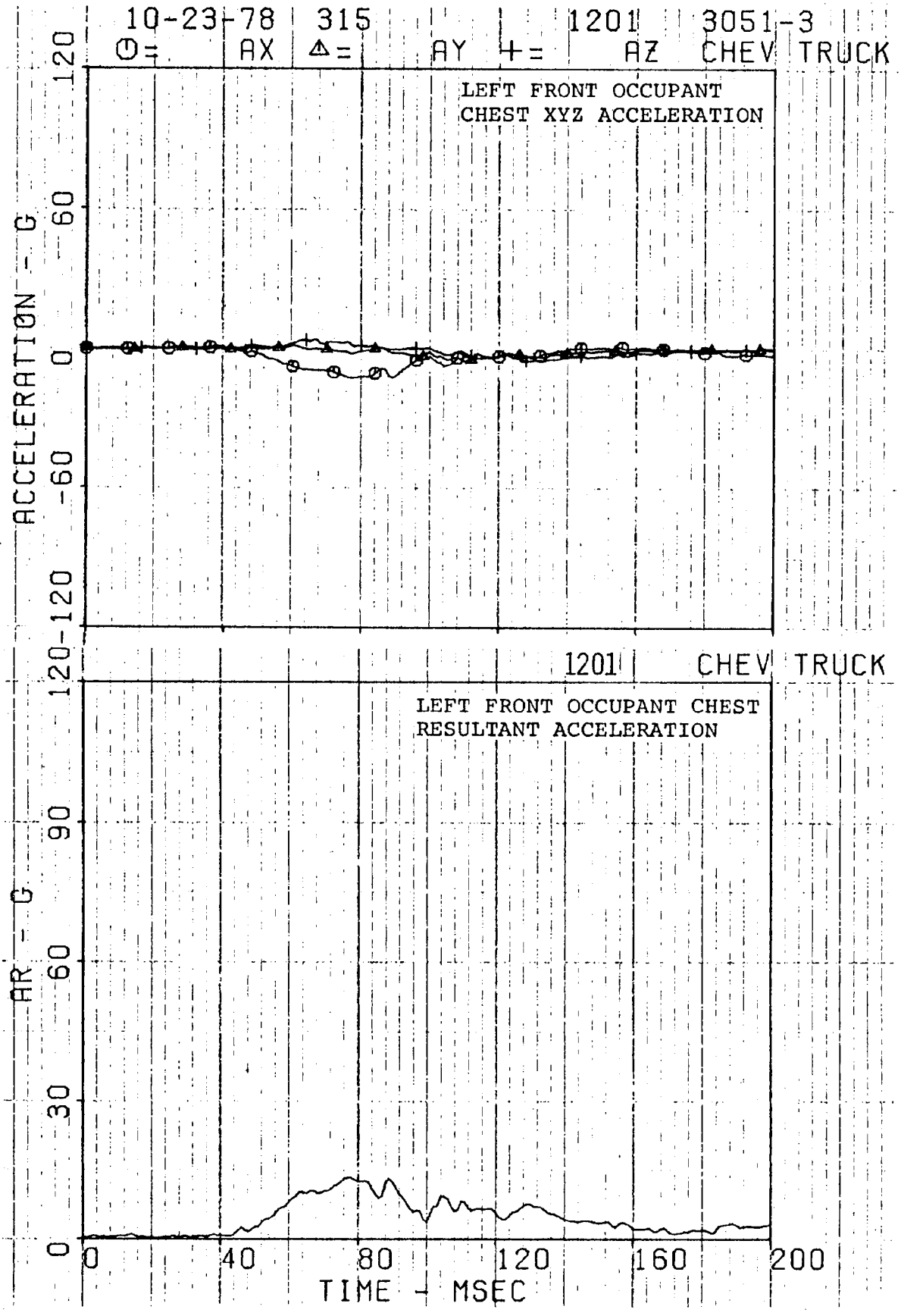

10-23-78 315/100 201 3051-3
⏲= AX △= AZ CHEV TRUCK
LEFT COMPARTMENT
ACCELERATION LOCATION 1
ACCELERATION - G
50
25
0
-25
-50
⏲= AX △= AZ 202 CHEV TRUCK
RIGHT COMPARTMENT
ACCELERATION LOCATION 2
ACCELERATION = G
50
25
0
-25
-50
0
40
80
120
160
200
TIME - MSEC

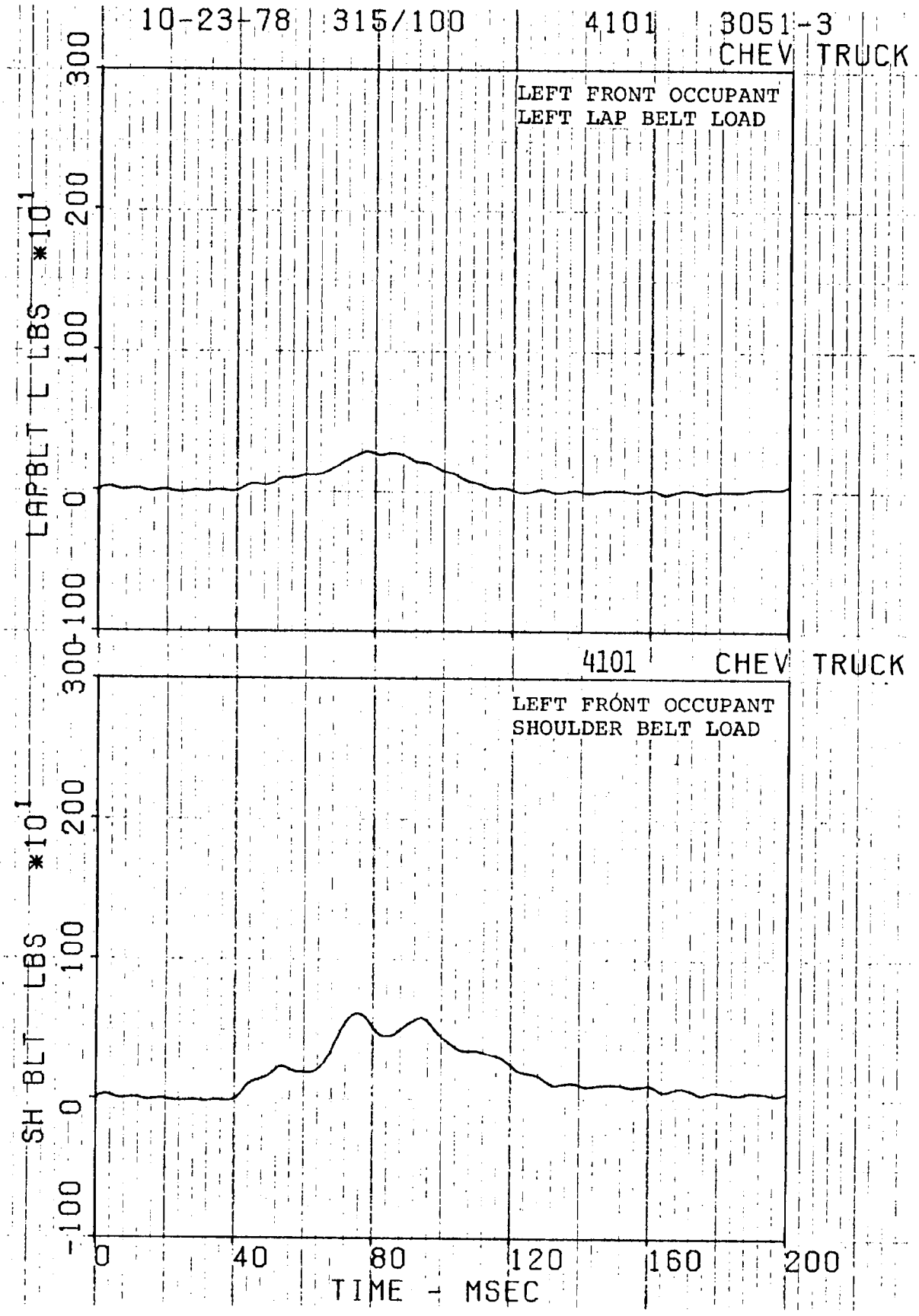

10-23-78 315/100 442 3051-3
⊙= AX △= VX += SX CHEV TRUCK
AVERAGE COMPARTMENT
ACCELERATION, VELOCITY
AND DISPLACEMENT
LOCATIONS 1 and 2
AX - G, VX - MPH, SX - FT
50
25
0
-25
-50
0
40
80
120
160
200
TIME - MSEC

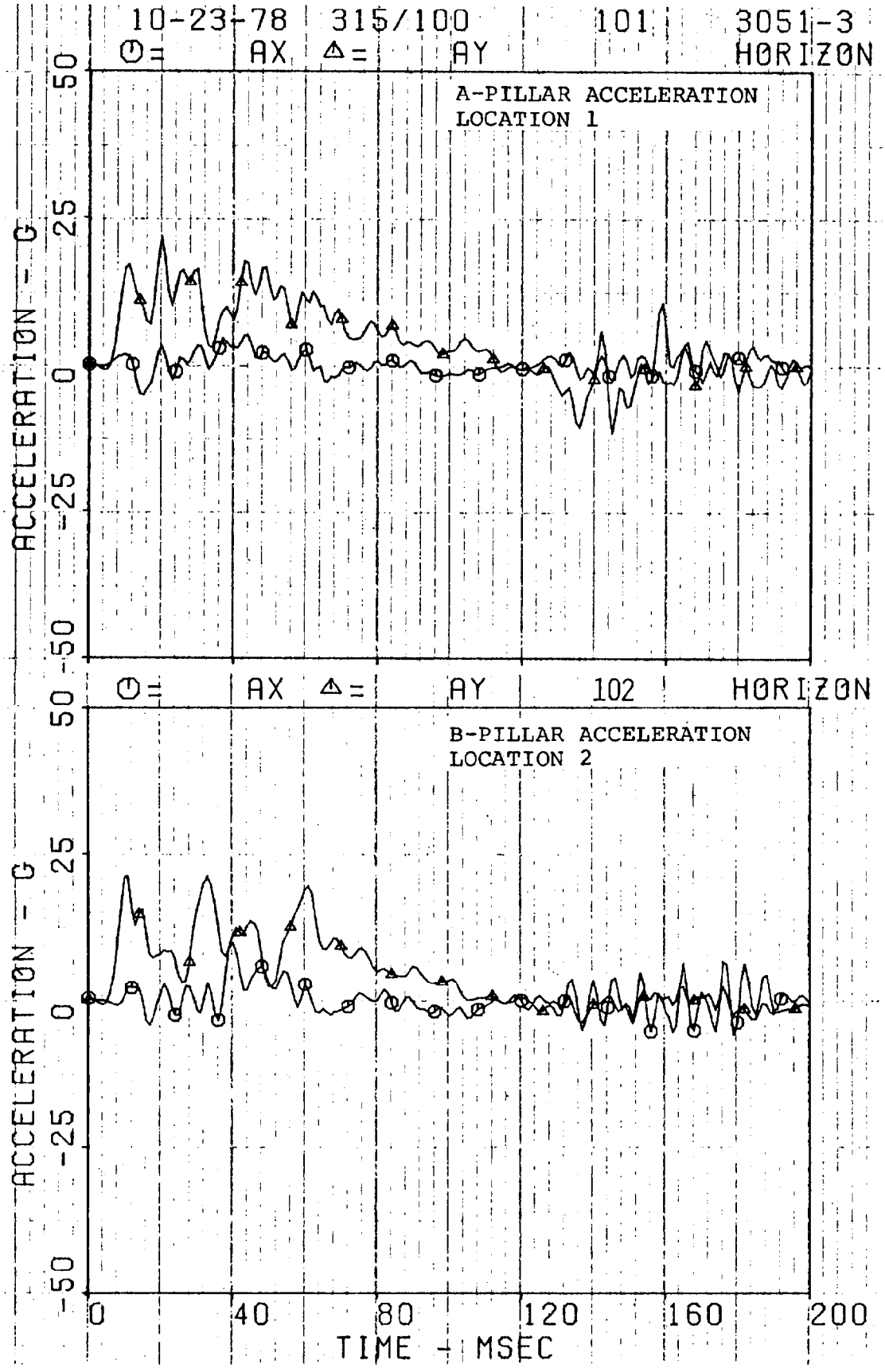

10-23-78 315/100 203 3051-3
○= AX △= AZ CHEV TRUCK
ENGINE ACCELERATION
LOCATION 3
ACCELERATION - G
50
25
0
-25
-50
○= AX △= VX += SX 203 CHEV TRUCK
ENGINE LONGITUDINAL
ACCELERATION, VELOCITY
AND DISPLACEMENT
LOCATION 3
AX - G, VX - MPH, SX - FT
50
25
0
-25
-50
0
40
80
120
160
200
TIME - MSEC

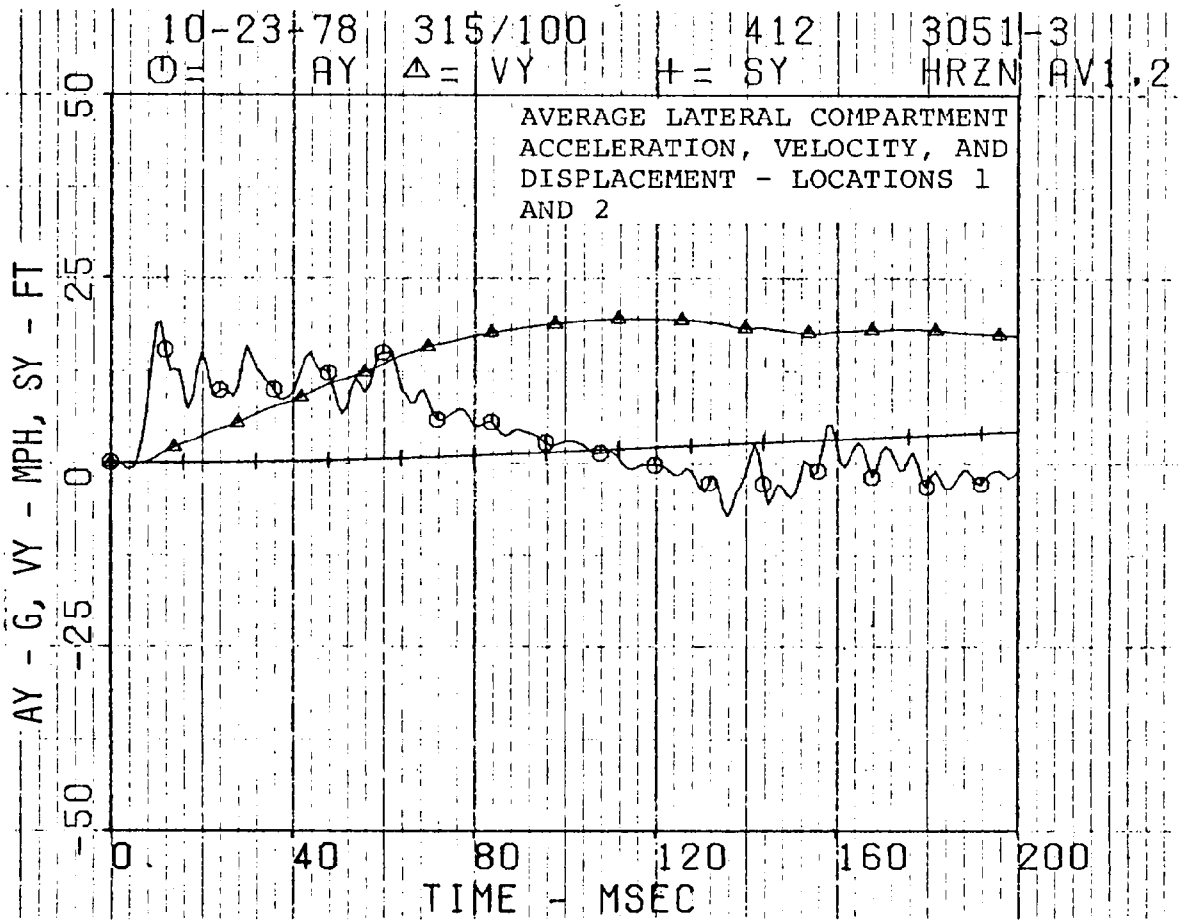


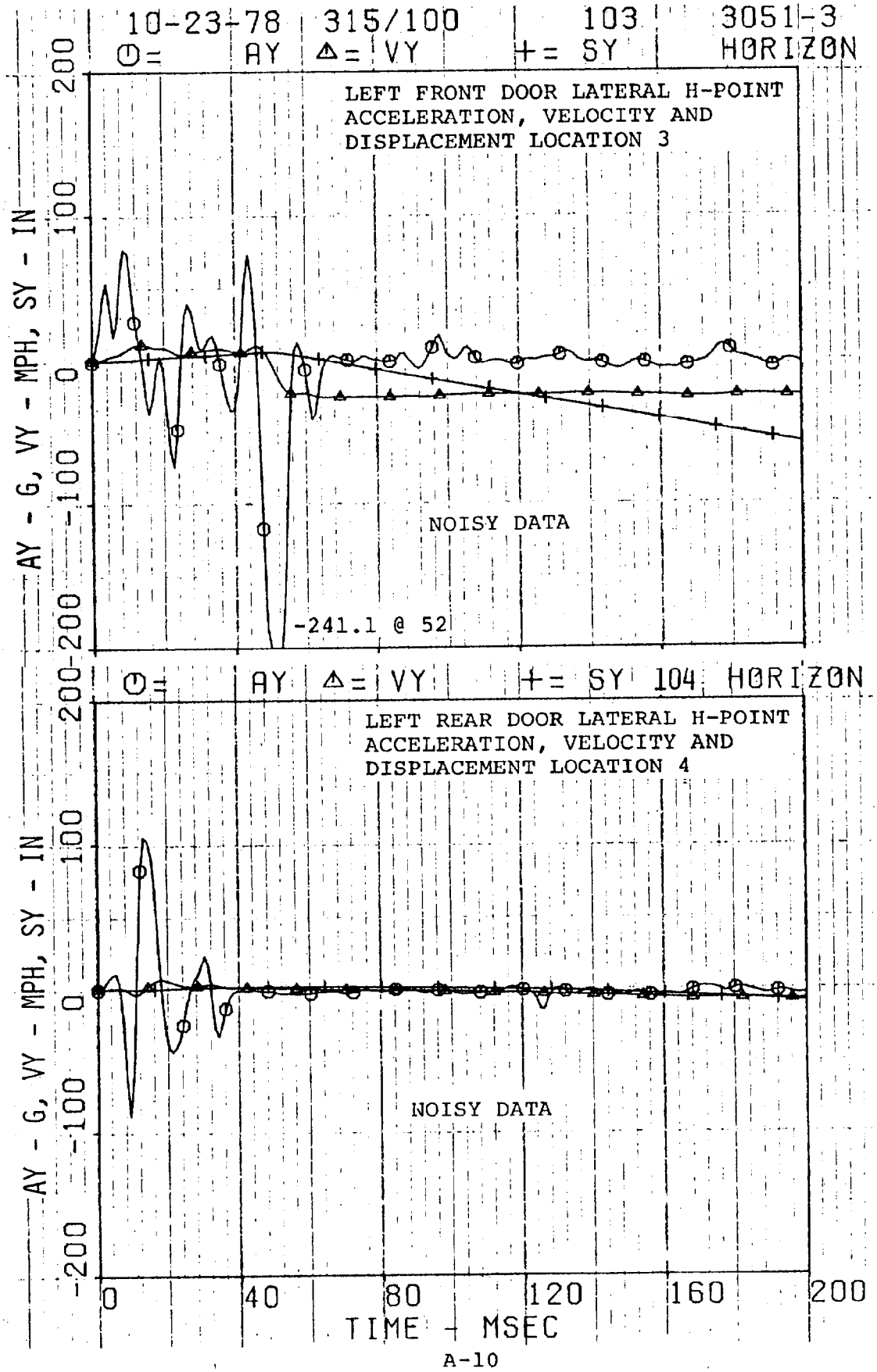
10-23-78 1600 601 3051-3
⊙= AX △= AY += AZ CHEV TRUCK
LEFT FRONT OCCUPANT
HEAD XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
601 CHEV TRUCK
LEFT FRONT OCCUPANT HEAD
RESULTANT ACCELERATION
AR - G
120
90
60
30
0
0 40 80 120 160 200
TIME - MSEC

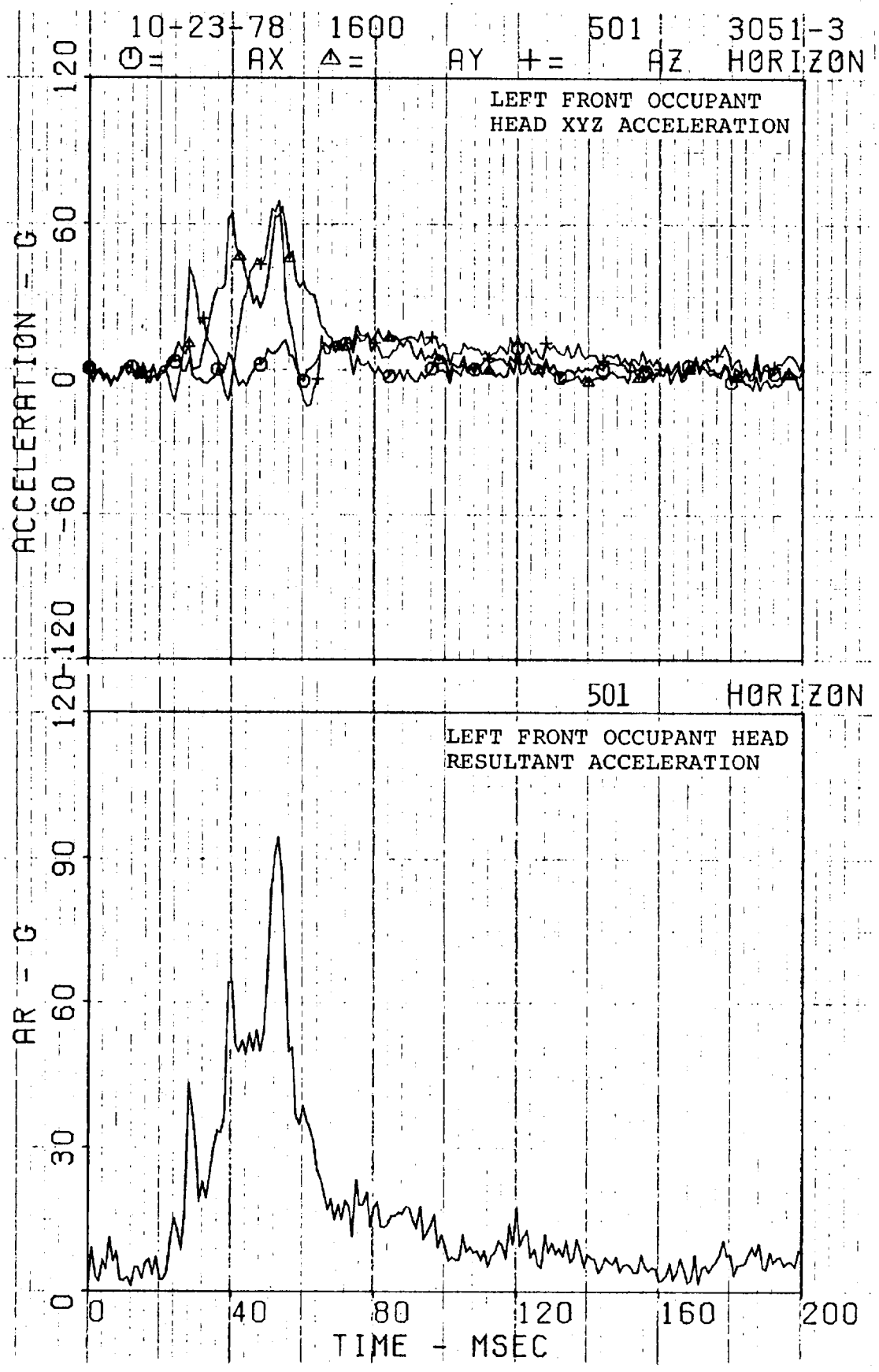

10-23-78 315 1201 3051-3
AX AY AZ CHEV TRUCK
LEFT FRONT OCCUPANT
CHEST XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
1201 CHEV TRUCK
LEFT FRONT OCCUPANT CHEST
RESULTANT ACCELERATION
AR - G
90
60
30
0
0
40
80
120
160
200
TIME - MSEC

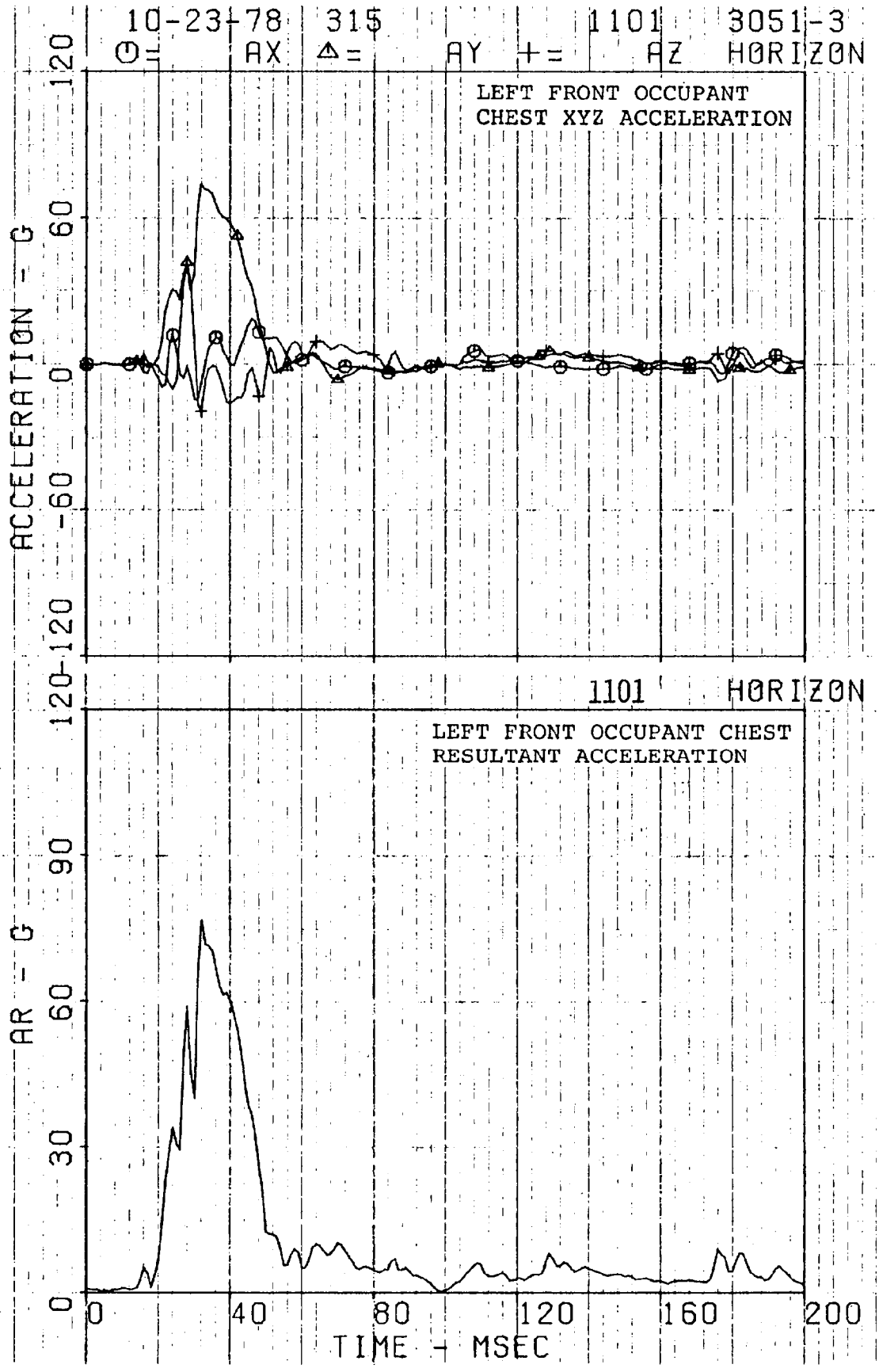

10-23-78 315/100 4101 3051-3
CHEV TRUCK
LEFT FRONT OCCUPANT
LEFT LAP BELT LOAD
LAPBLT L LBS *10-1
300
200
100
0
-100
4101 CHEV TRUCK
LEFT FRONT OCCUPANT
SHOULDER BELT LOAD
SH BLT LBS *10-1
300
200
100
0
-100
0
40
80
120
160
200
TIME - MSEC

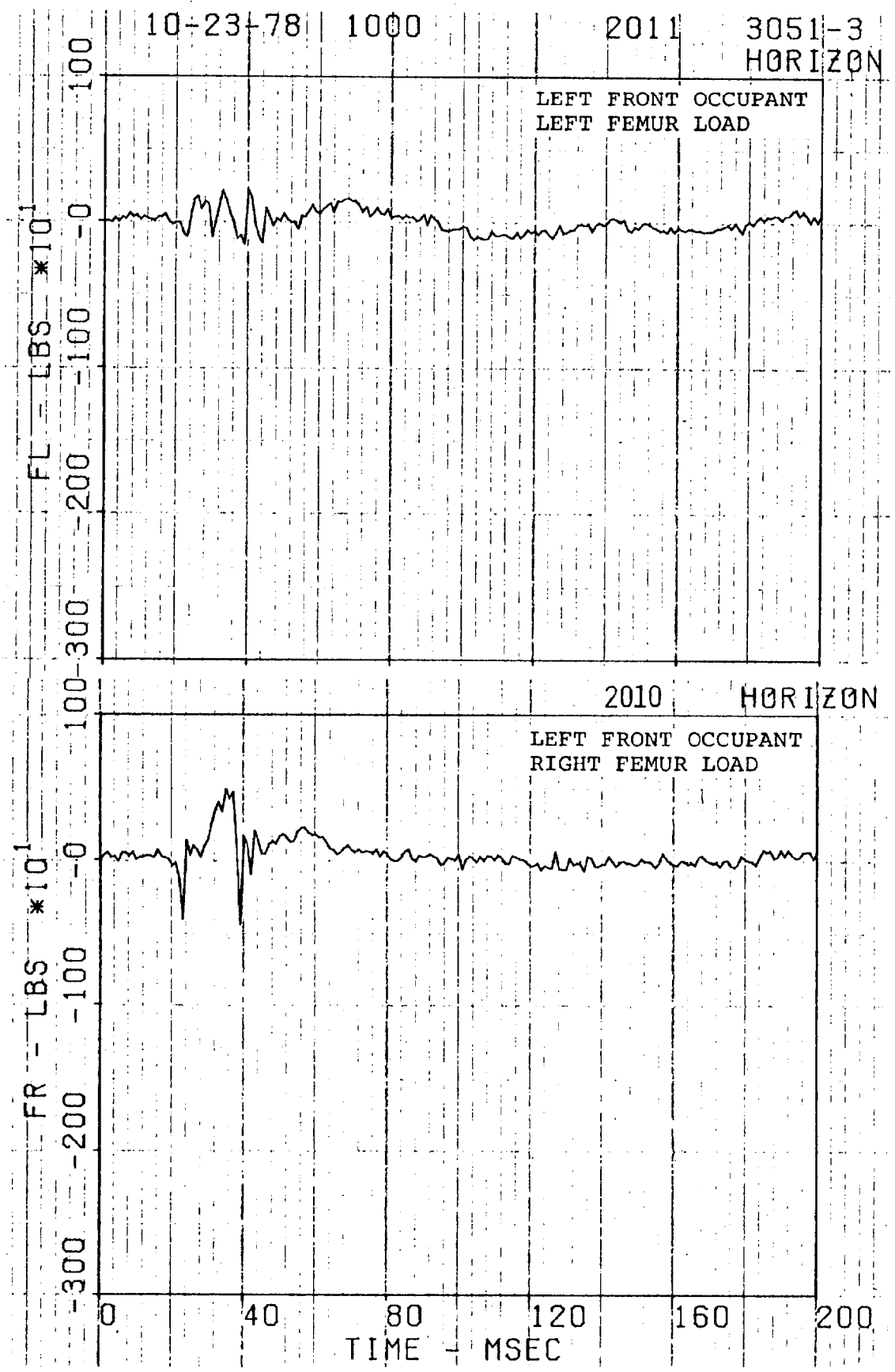

10-23-78 315/100 101 3051-3
AX AY HORIZON
A-PILLAR ACCELERATION
LOCATION 1
ACCELERATION - G
50
25
0
-25
-50
AX AY 102 HORIZON
B-PILLAR ACCELERATION
LOCATION 2
ACCELERATION - G
50
25
0
-25
-50
0
40
80
120
160
200
TIME - MSEC

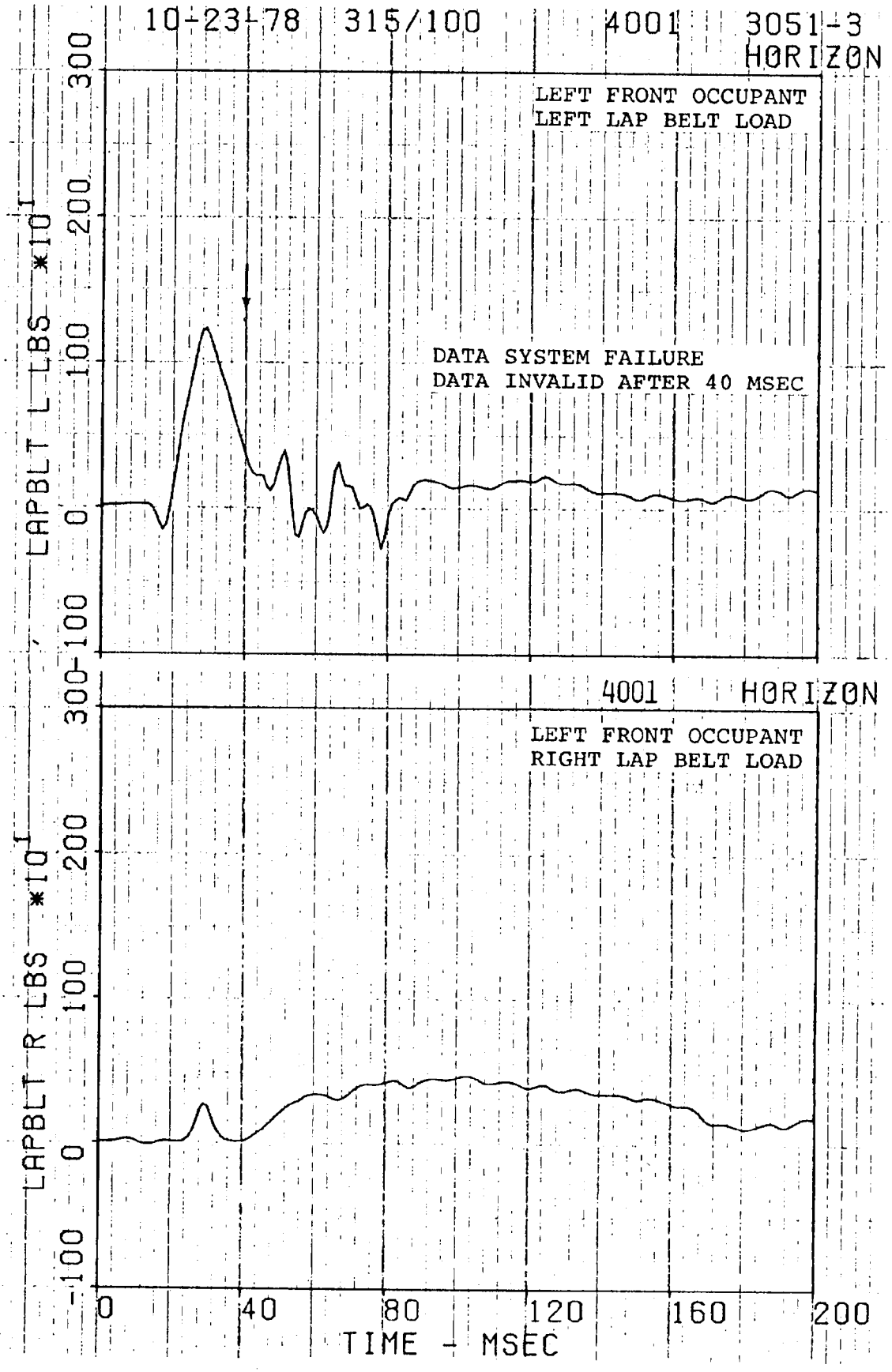

10-23-78 315/100 412 3051-3
○ = AY △ = VY + = SY HRZN AV1.2
AVERAGE LATERAL COMPARTMENT ACCELERATION, VELOCITY, AND DISPLACEMENT - LOCATIONS 1 AND 2
AY - G, VY - MPH, SY - FT
50
25
0
-25
-50
0
40
80
120
160
200
TIME - MSEC

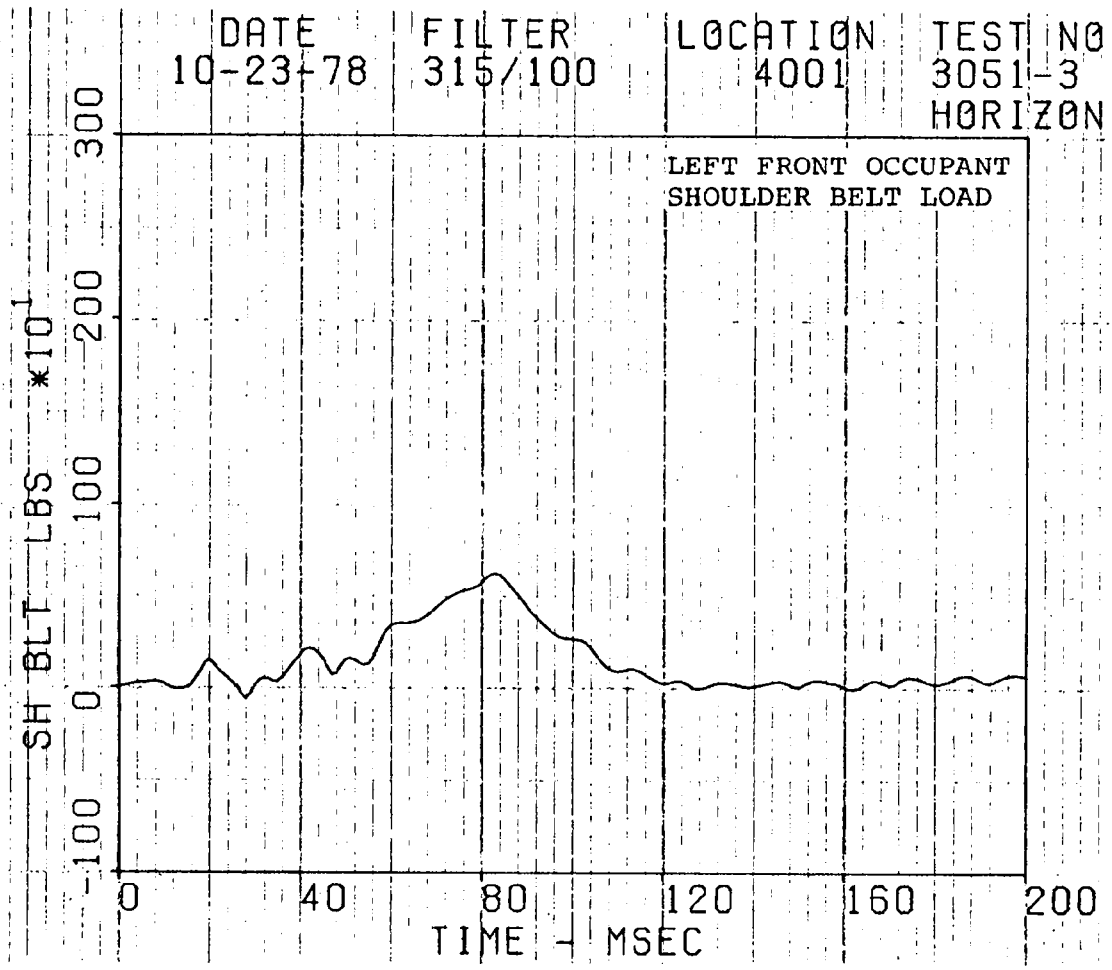

10-23-78 315/100 103 3051-3
○= AY △= VY += SY HORIZON
LEFT FRONT DOOR LATERAL H-POINT ACCELERATION, VELOCITY AND DISPLACEMENT LOCATION 3
NOISY DATA
-241.1 @ 52
○= AY △= VY += SY 104 HORIZON
LEFT REAR DOOR LATERAL H-POINT ACCELERATION, VELOCITY AND DISPLACEMENT LOCATION 4
NOISY DATA
AY - G, VY - MPH, SY - IN
200
100
0
-100
-200
0
40
80
120
160
200
TIME - MSEC

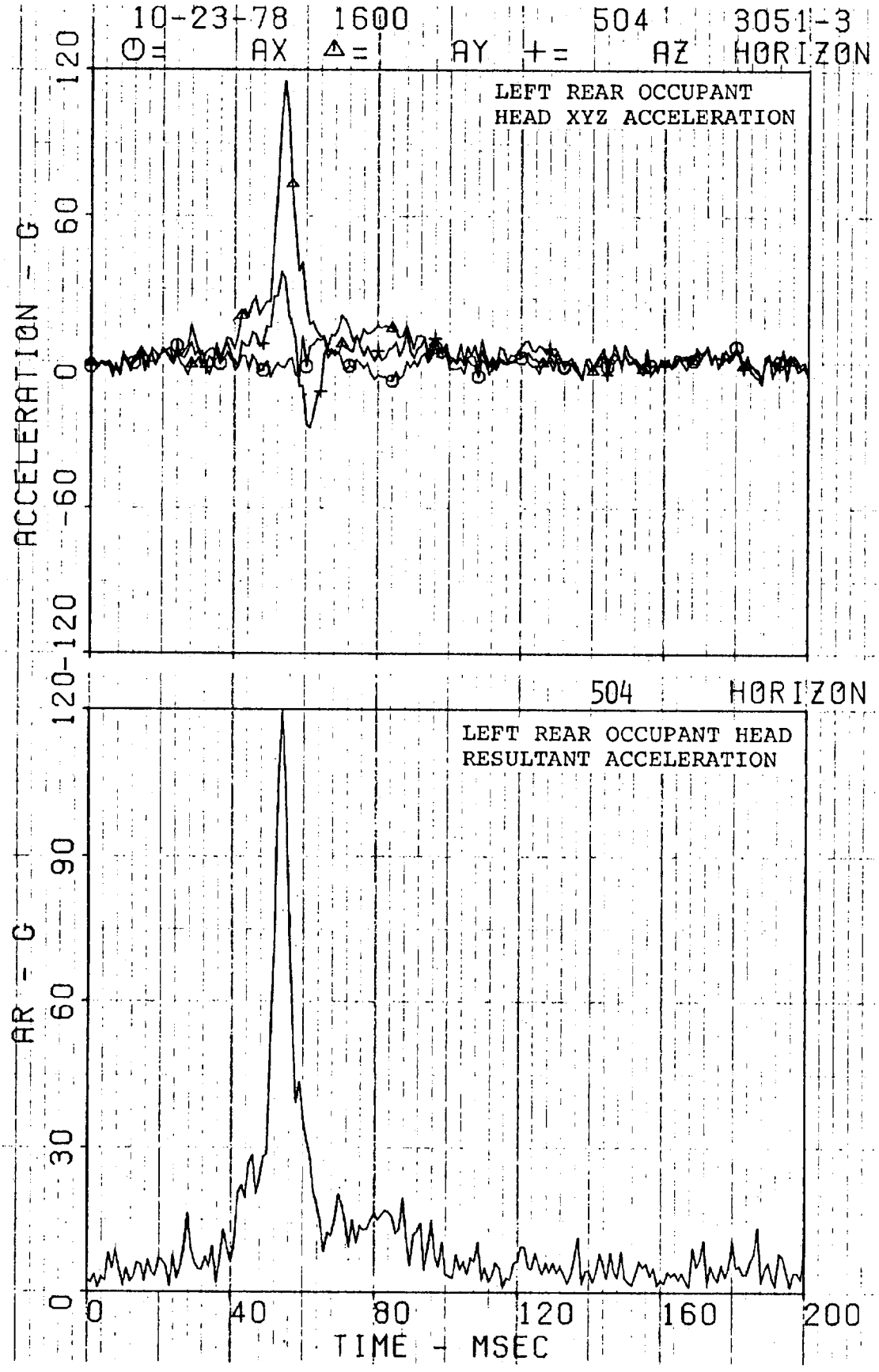

10-23-78 1600 501 3051-3
Θ= AX Δ= AY += AZ HORIZON
LEFT FRONT OCCUPANT
HEAD XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
501 HORIZON
LEFT FRONT OCCUPANT HEAD
RESULTANT ACCELERATION
AR - G
90
60
30
0
0
40
80
120
160
200
TIME - MSEC

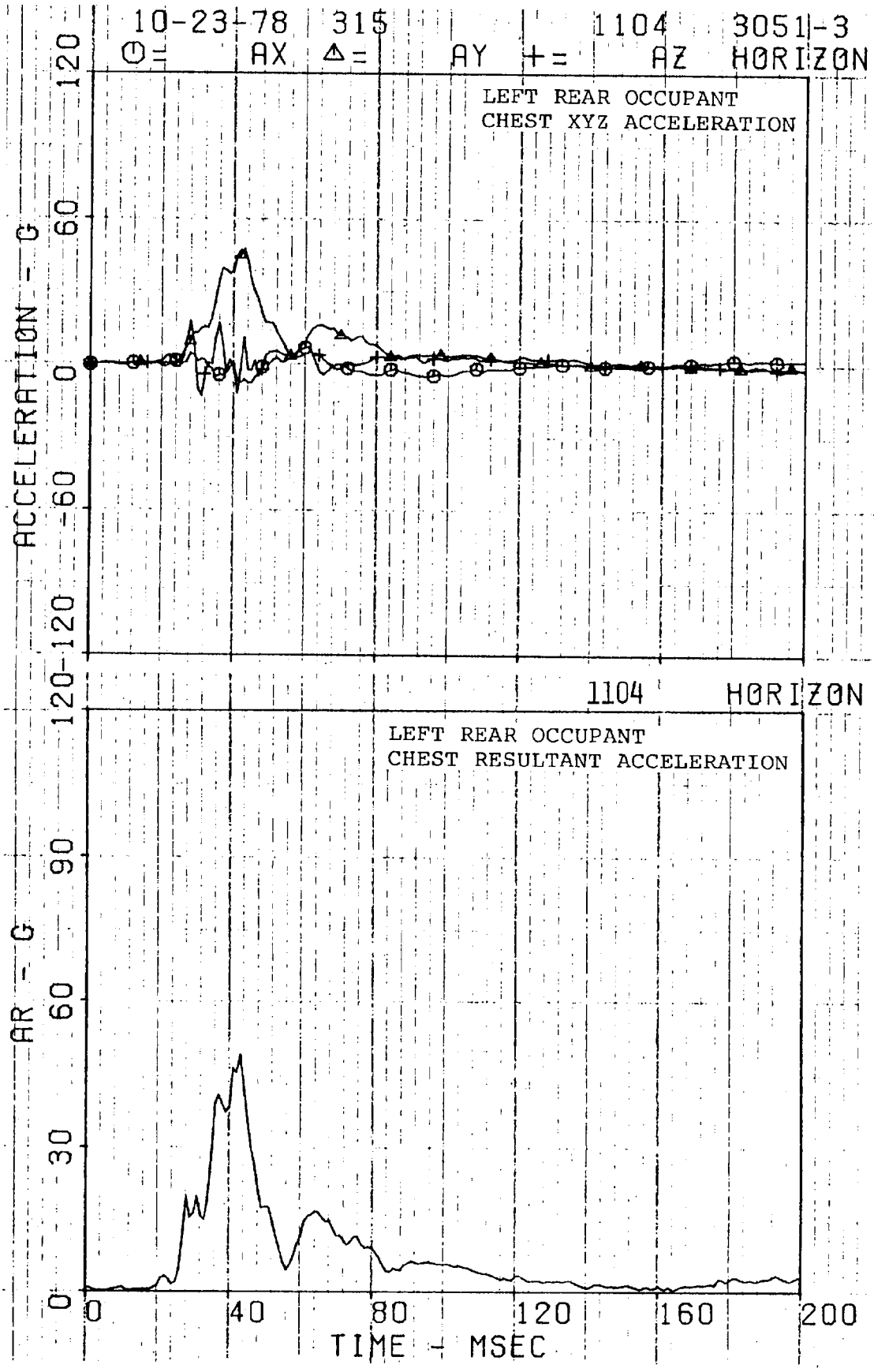

10-23-78 315 1101 3051-3
AX AY AZ HORIZON
LEFT FRONT OCCUPANT
CHEST XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
1101 HORIZON
LEFT FRONT OCCUPANT CHEST
RESULTANT ACCELERATION
AR - G
120
90
60
30
0
0
40
80
120
160
200
TIME - MSEC

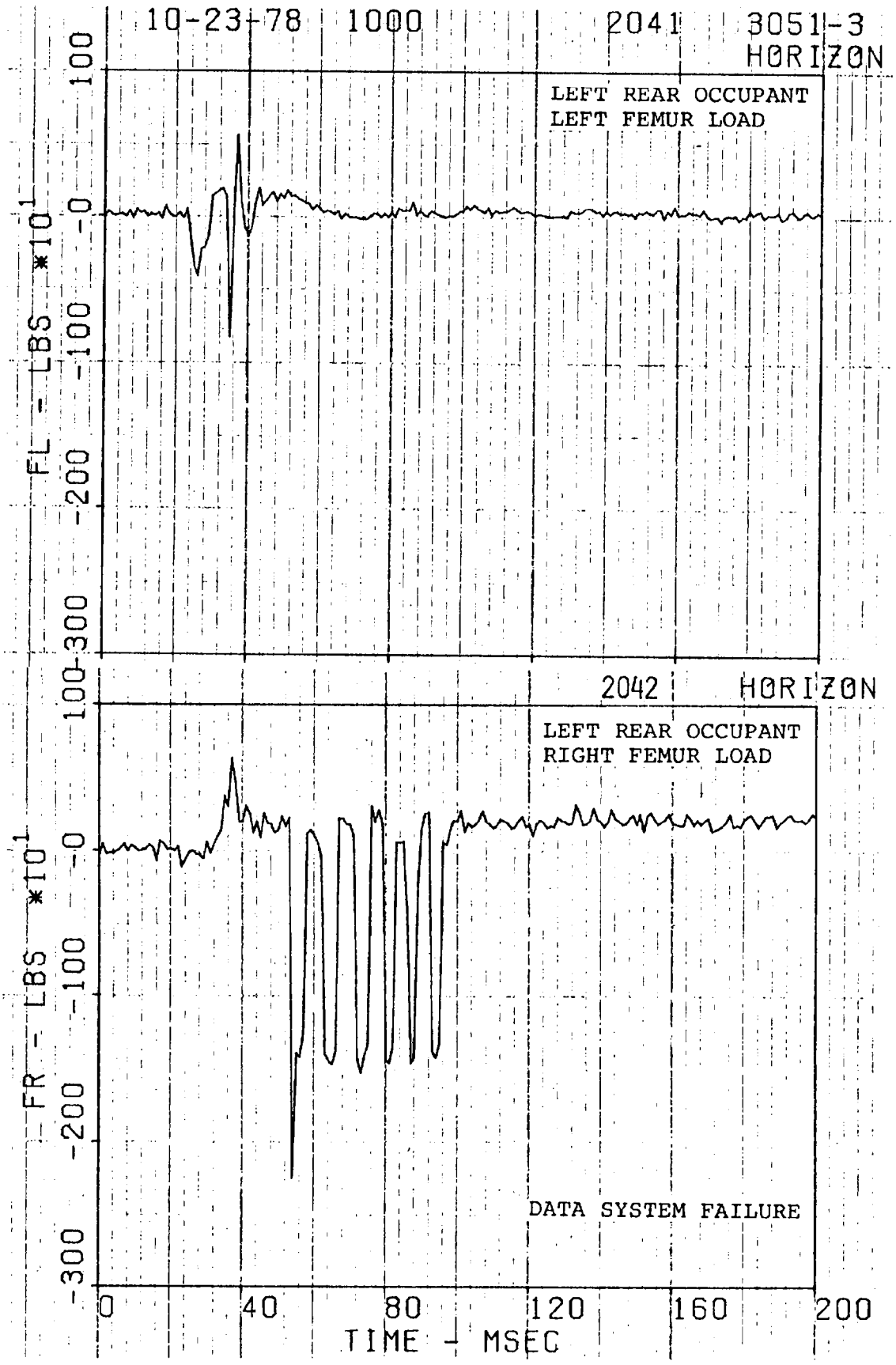

10-23-78 1000
2011 3051-3
HORIZON
LEFT FRONT OCCUPANT
LEFT FEMUR LOAD
FL - LBS *10^1
100
-0
-100
-200
-300
2010 HORIZON
LEFT FRONT OCCUPANT
RIGHT FEMUR LOAD
FR - LBS *10^1
100
-0
-100
-200
-300
0
40
80
120
160
200
TIME - MSEC

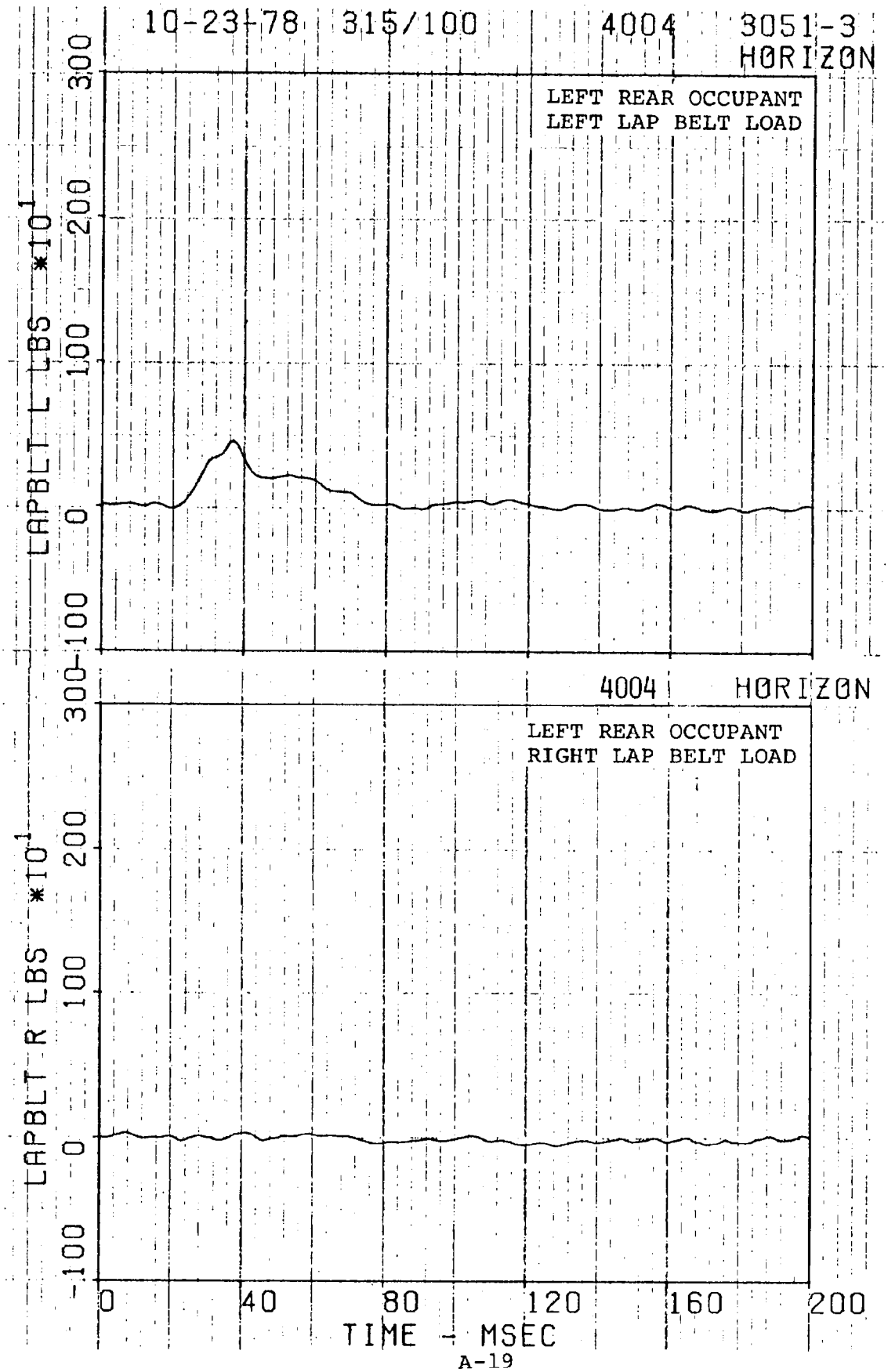

10-23-78 315/100 4001 3051-3
HORIZON
LEFT FRONT OCCUPANT
LEFT LAP BELT LOAD
DATA SYSTEM FAILURE
DATA INVALID AFTER 40 MSEC
LAPBLT L LBS *10
300
200
100
0
-100
4001 HORIZON
LEFT FRONT OCCUPANT
RIGHT LAP BELT LOAD
LAPBLT R LBS *10
300
200
100
0
-100
0
40
80
120
160
200
TIME - MSEC


DATE
10-23-78
FILTER
315/100
LOCATION
4001
TEST NO
3051-3
HORIZON
LEFT FRONT OCCUPANT
SHOULDER BELT LOAD
SH BLT LBS *10-1
300
200
100
0
-100
0
40
80
120
160
200
TIME - MSEC


10-23-78 1600 504 3051-3
⏲= AX △= AY += AZ HORIZON
LEFT REAR OCCUPANT
HEAD XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
504 HORIZON
LEFT REAR OCCUPANT HEAD
RESULTANT ACCELERATION
AR - G
90
60
30
0
0
40
80
120
160
200
TIME - MSEC


10-23-78 315 1104 3051-3
AX AY AZ HORIZON
LEFT REAR OCCUPANT
CHEST XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
1104 HORIZON
LEFT REAR OCCUPANT
CHEST RESULTANT ACCELERATION
AR - G
90
60
30
0
0
40
80
120
160
200
TIME - MSEC

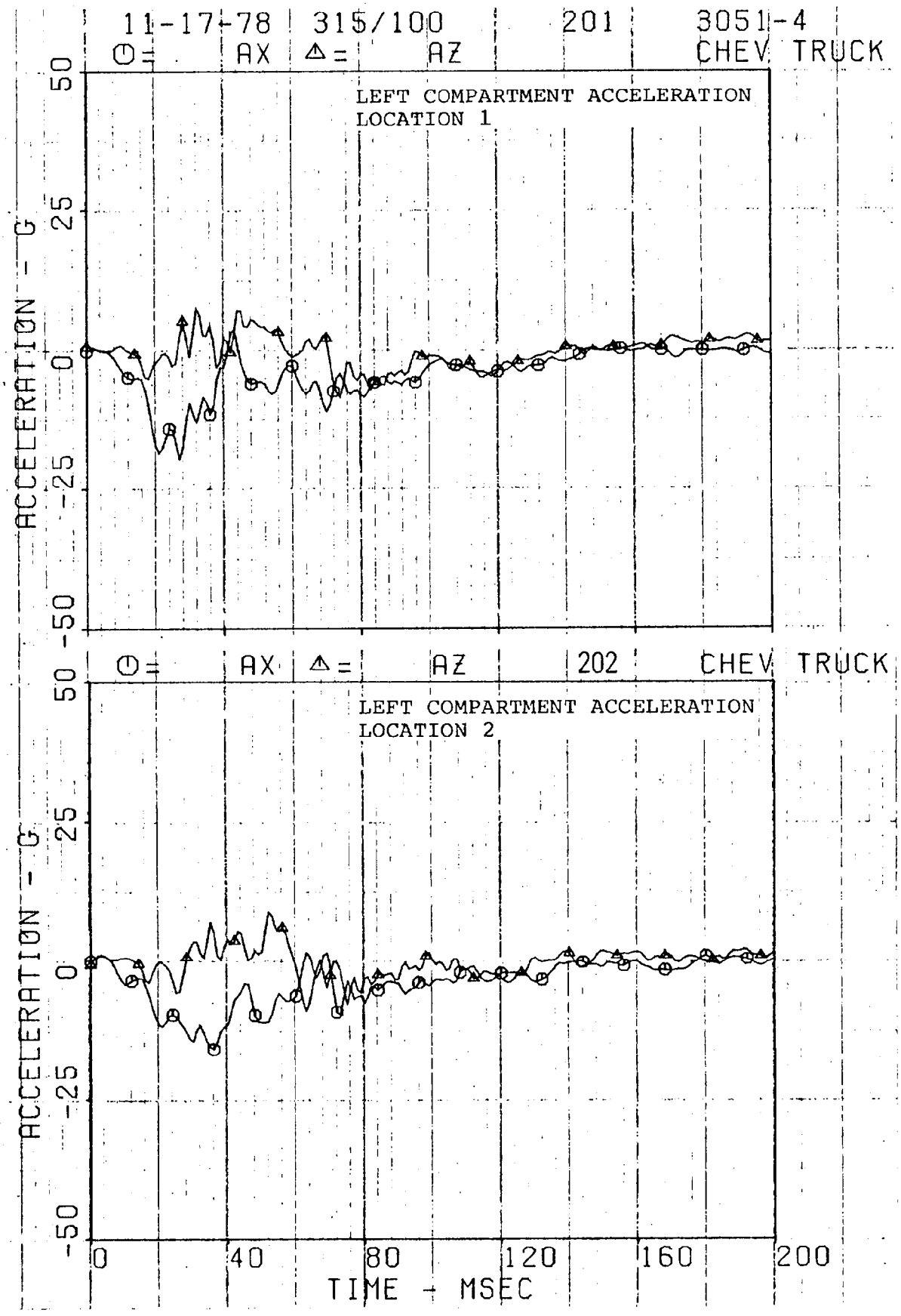

10-23-78 1000
2041 3051-3
HORIZON
LEFT REAR OCCUPANT
LEFT FEMUR LOAD
FL - LBS *10^1
100
-0
-100
-200
-300
2042 HORIZON
LEFT REAR OCCUPANT
RIGHT FEMUR LOAD
FR - LBS *10^1
DATA SYSTEM FAILURE
0
40
80
120
160
200
TIME - MSEC

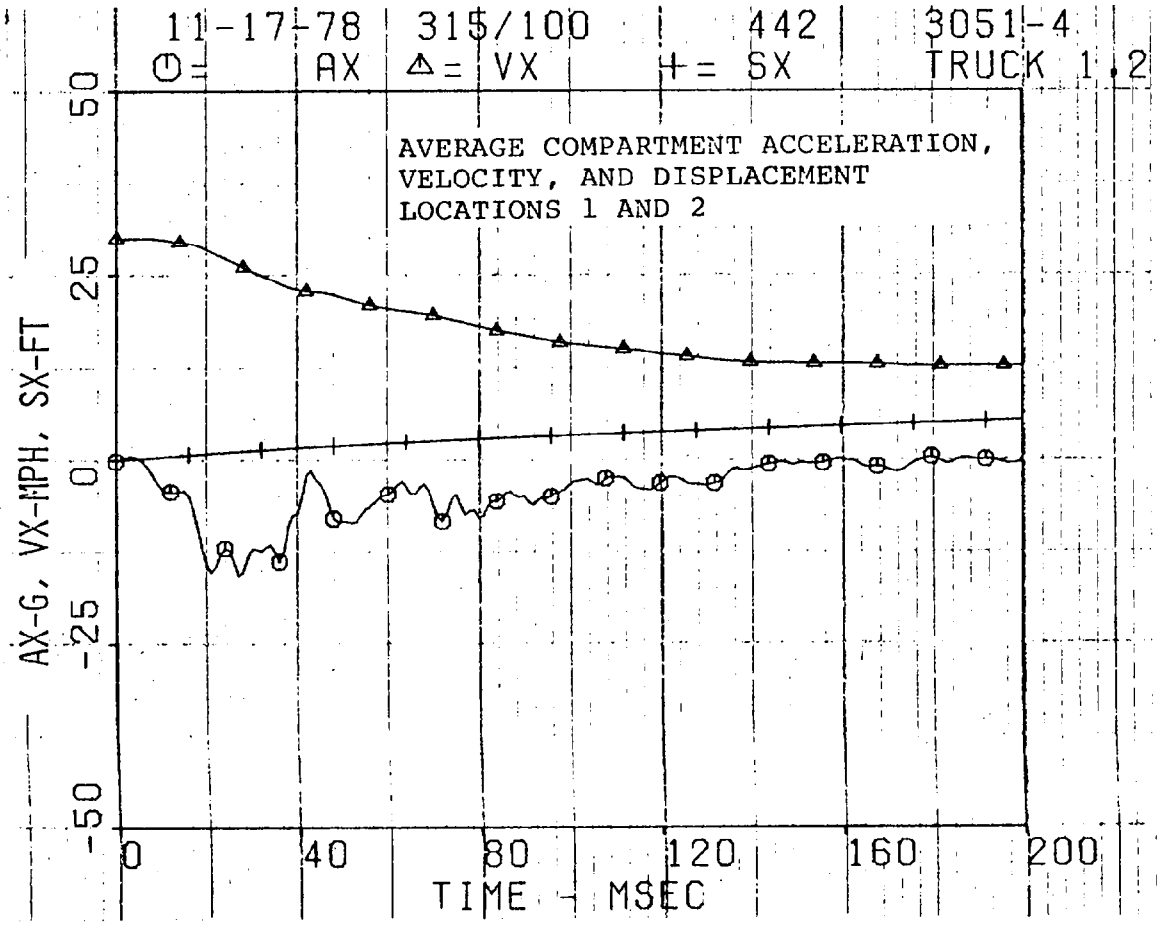

10-23-78 315/100 4004 3051-3
HORIZON
LEFT REAR OCCUPANT
LEFT LAP BELT LOAD
LAPBLT L LBS *10-1
300
200
100
0
-100
4004 HORIZON
LEFT REAR OCCUPANT
RIGHT LAP BELT LOAD
LAPBLT R LBS *10-1
300
200
100
0
-100
0
40
80
120
160
200
TIME - MSEC

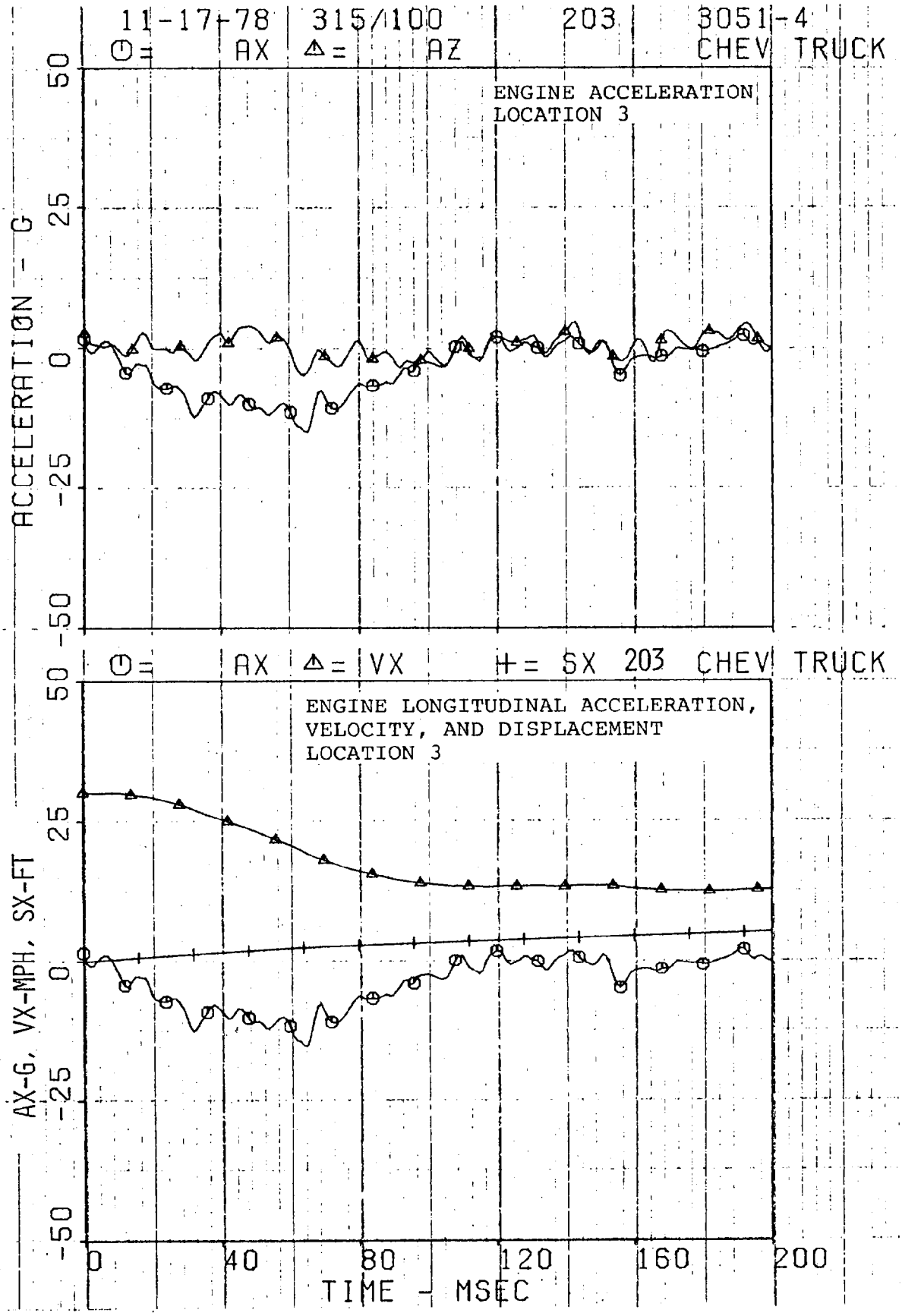
APPENDIX B

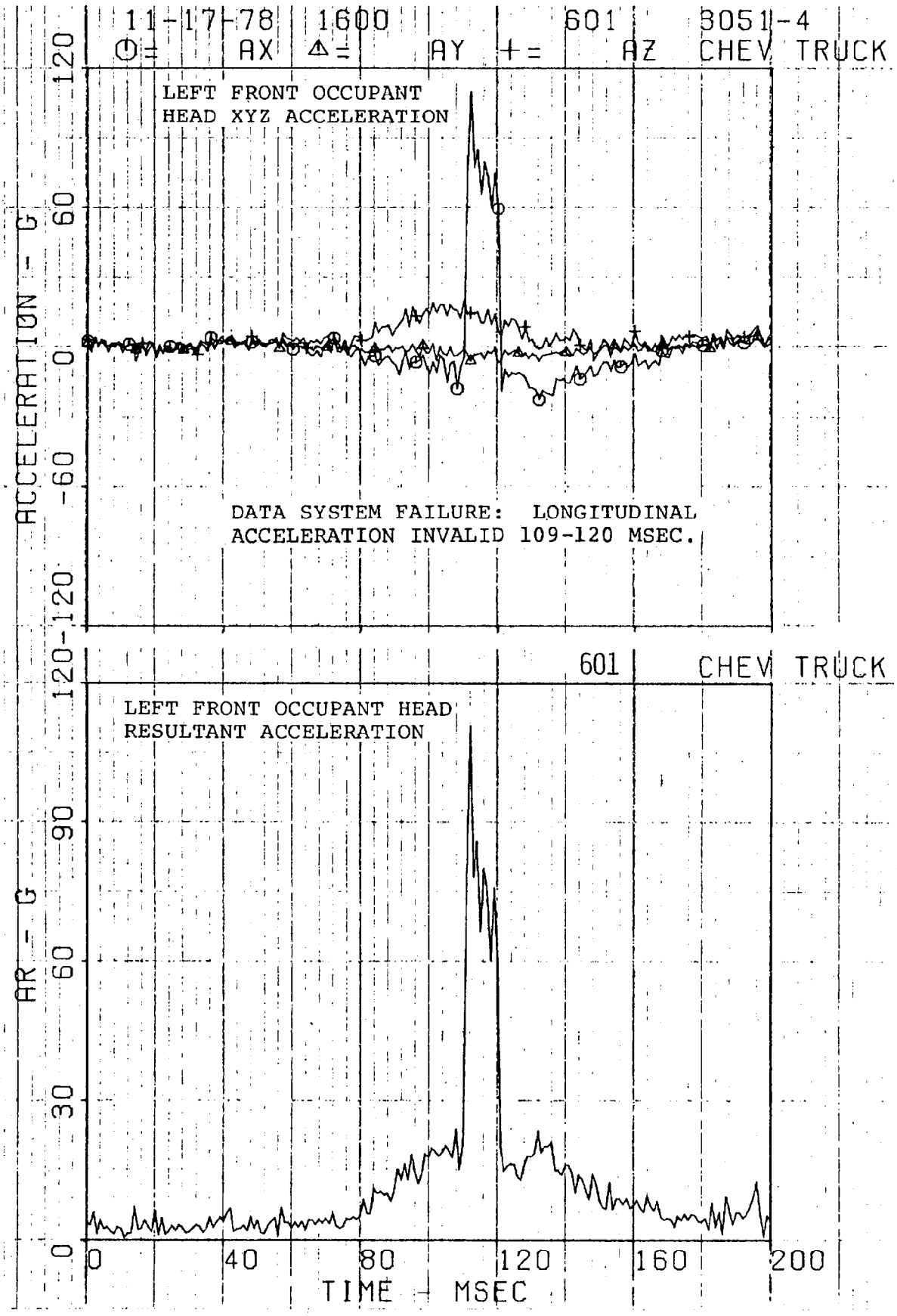
CALCOMP PLOTS

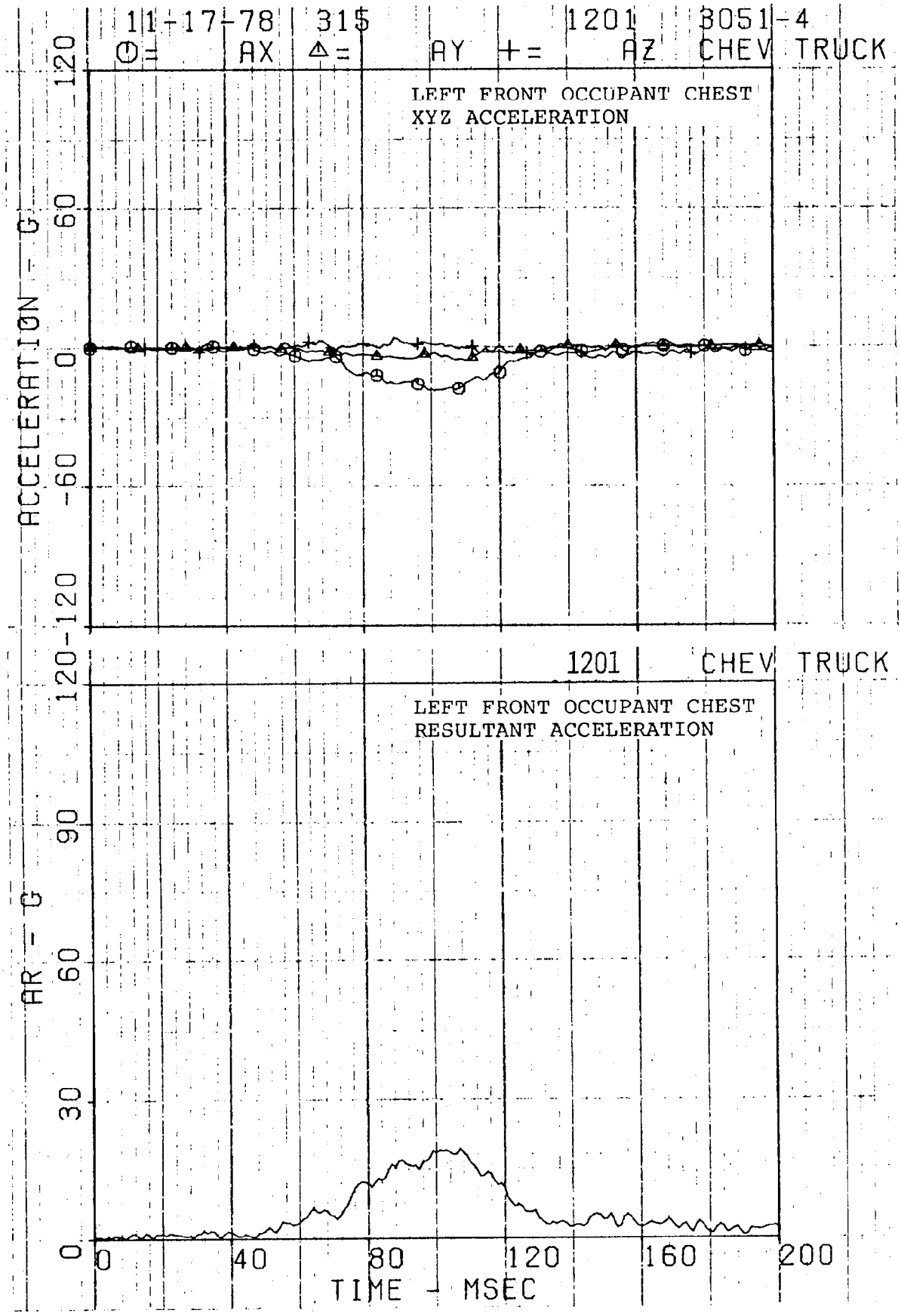
(TEST 3051-4)

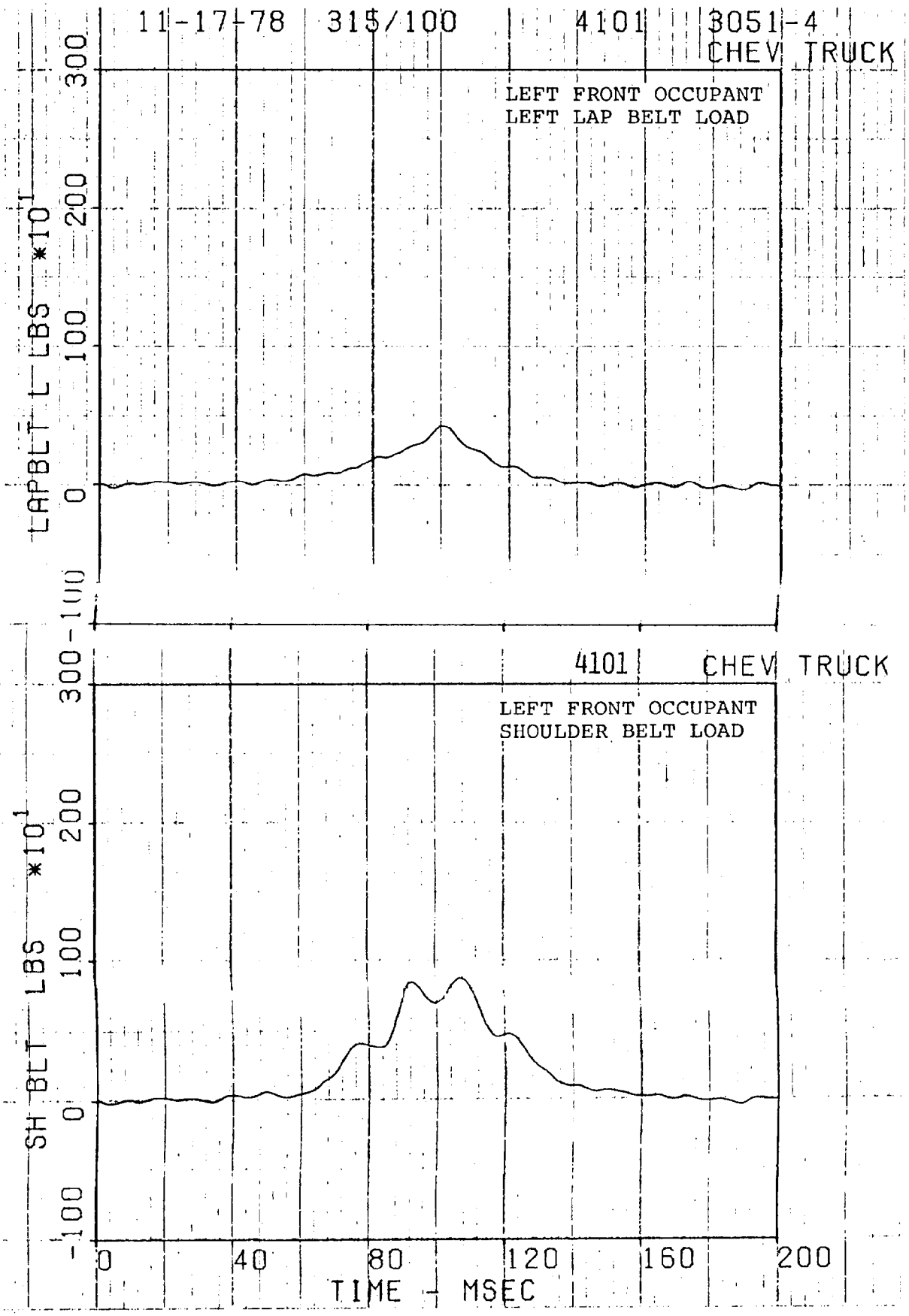

11-17-78 315/100 201 3051-4
⊖= AX △= AZ CHEV TRUCK
LEFT COMPARTMENT ACCELERATION
LOCATION 1
ACCELERATION - G
50
25
0
-25
-50
⊖= AX △= AZ 202 CHEV TRUCK
LEFT COMPARTMENT ACCELERATION
LOCATION 2
ACCELERATION - G
50
25
0
-25
-50
0
40
80
120
160
200
TIME - MSEC

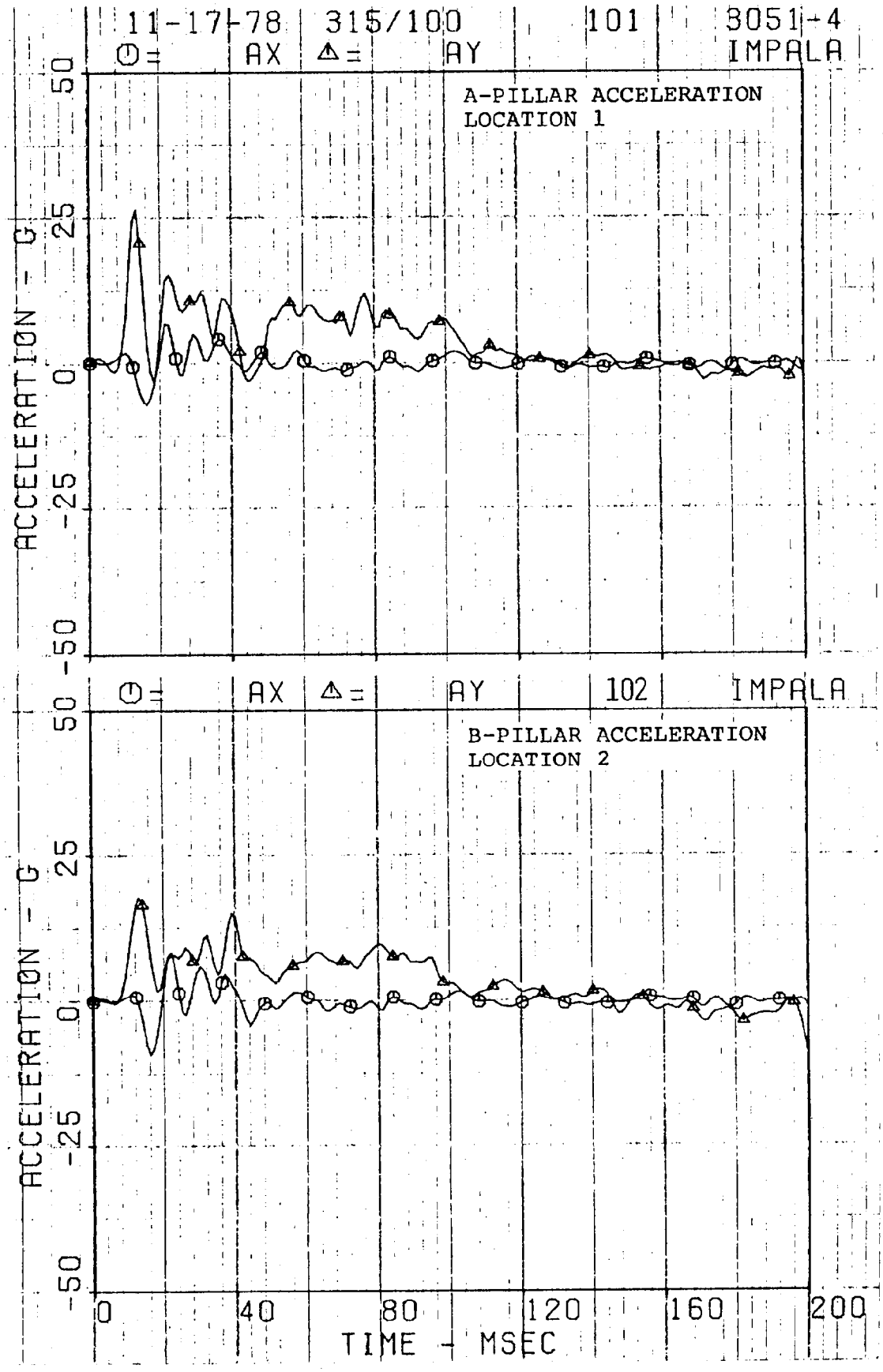

11-17-78 31$/100 442 3051-4
○ = AX △ = VX + = SX TRUCK 1,2
AVERAGE COMPARTMENT ACCELERATION,
VELOCITY, AND DISPLACEMENT
LOCATIONS 1 AND 2
AX-G, VX-MPH, SX-FT
50
25
0
-25
-50
0
40
80
120
160
200
TIME - MSEC

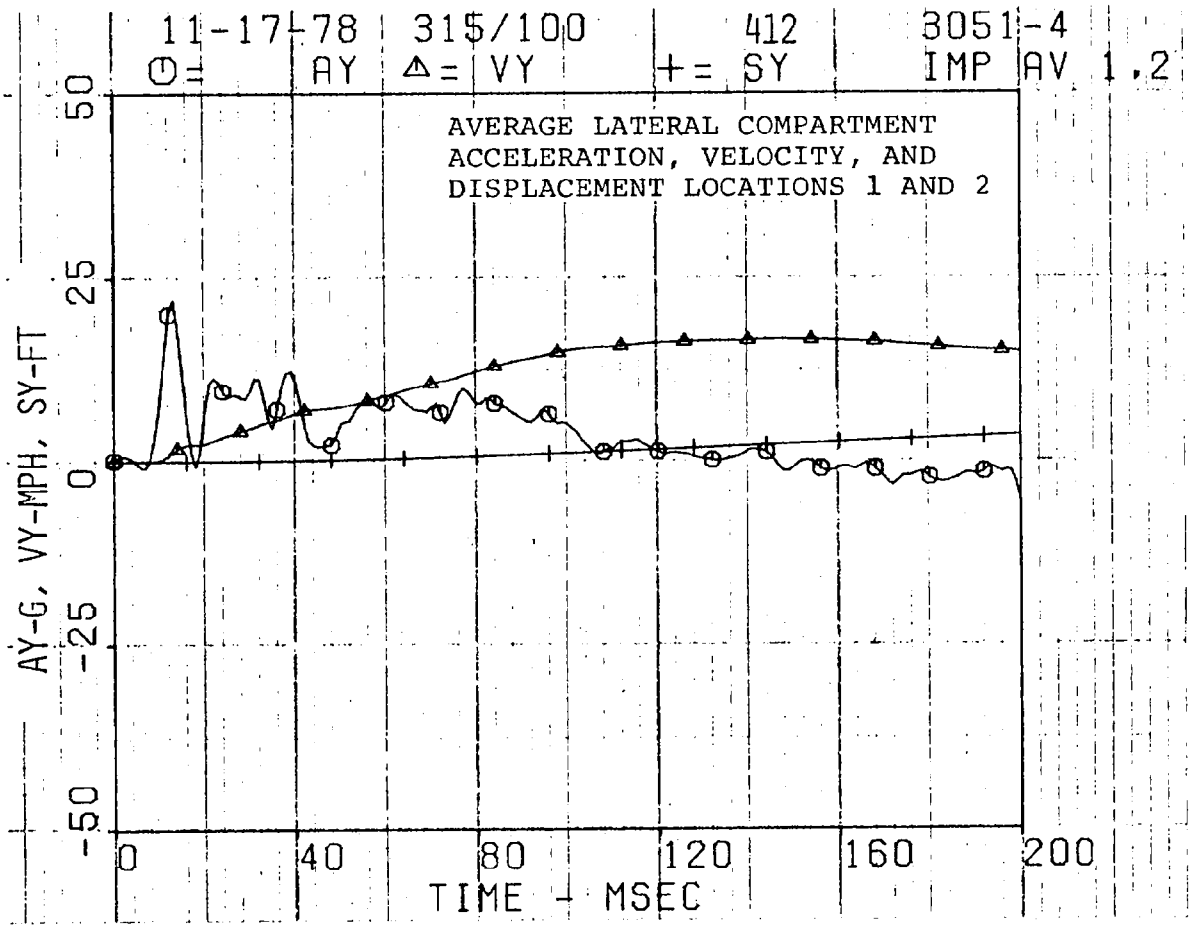

11-17-78 315/100 203 3051-4
○= AX △= AZ CHEV TRUCK
ENGINE ACCELERATION
LOCATION 3
ACCELERATION - G
50
25
0
-25
-50
○= AX △= VX +=SX 203 CHEV TRUCK
ENGINE LONGITUDINAL ACCELERATION,
VELOCITY, AND DISPLACEMENT
LOCATION 3
AX-G, VX-MPH, SX-FT
50
25
0
-25
-50
0
40
80
120
160
200
TIME - MSEC

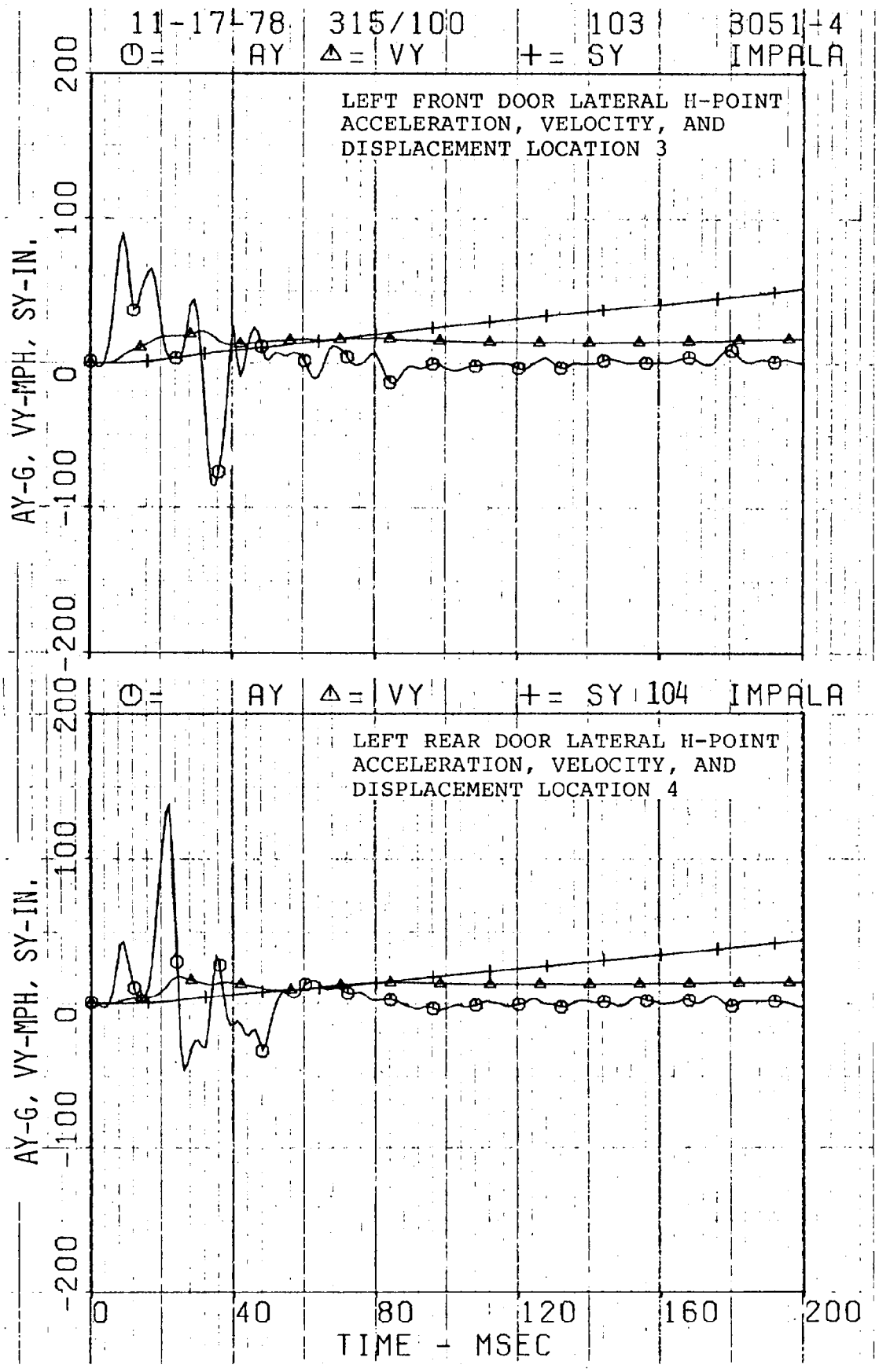

11-17-78 1600 601 3051-4
○= AX △= AY += AZ CHEV TRUCK
LEFT FRONT OCCUPANT
HEAD XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
DATA SYSTEM FAILURE: LONGITUDINAL
ACCELERATION INVALID 109-120 MSEC.
601 CHEV TRUCK
LEFT FRONT OCCUPANT HEAD
RESULTANT ACCELERATION
AR - G
120
90
60
30
0
0
40
80
120
160
200
TIME - MSEC

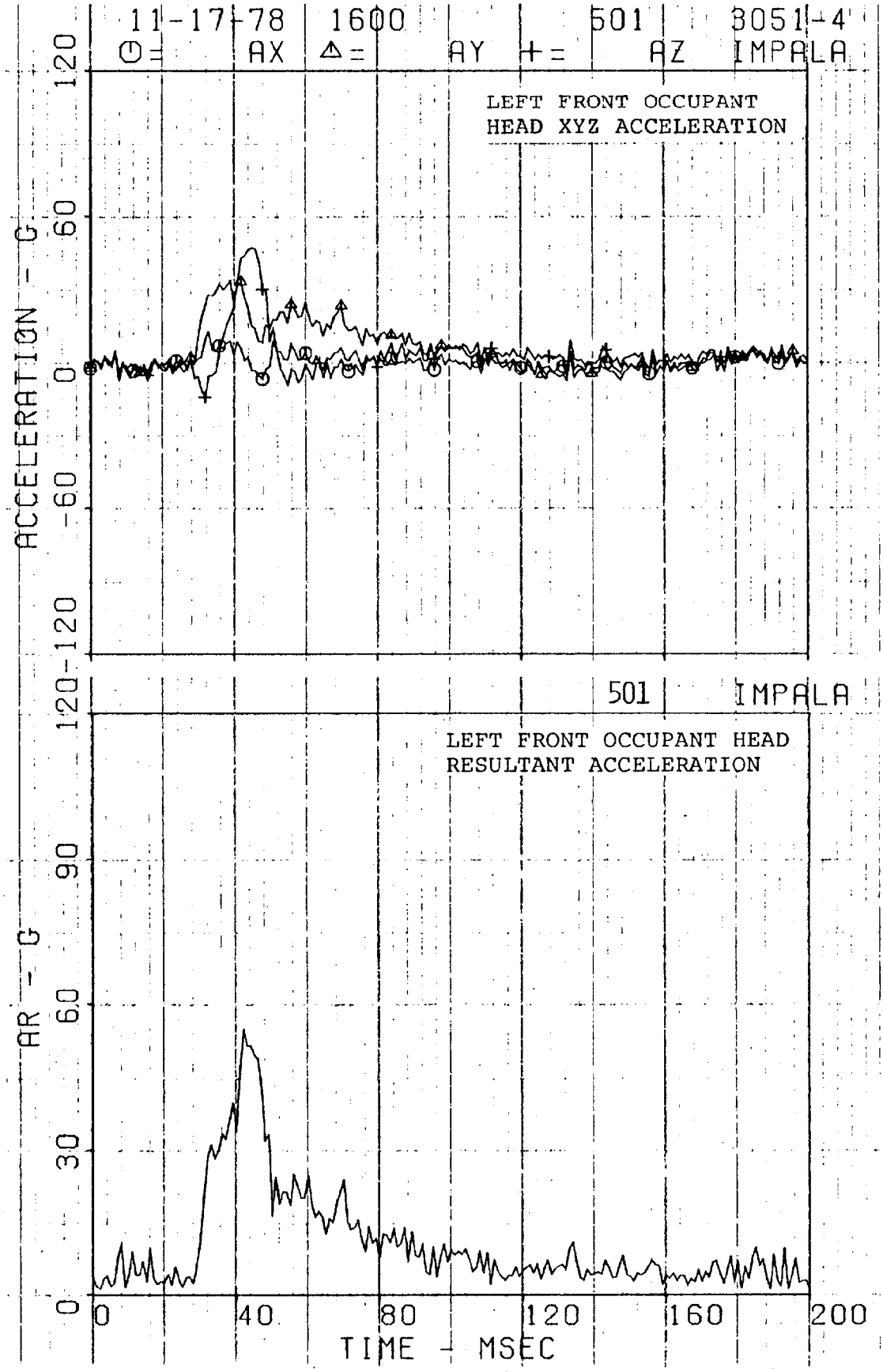

11-17-78 315 1201 3051-4
○= AX △= AY += AZ CHEV TRUCK
LEFT FRONT OCCUPANT CHEST
XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
1201 CHEV TRUCK
LEFT FRONT OCCUPANT CHEST
RESULTANT ACCELERATION
AR - G
120
90
60
30
0
0
40
80
120
160
200
TIME - MSEC

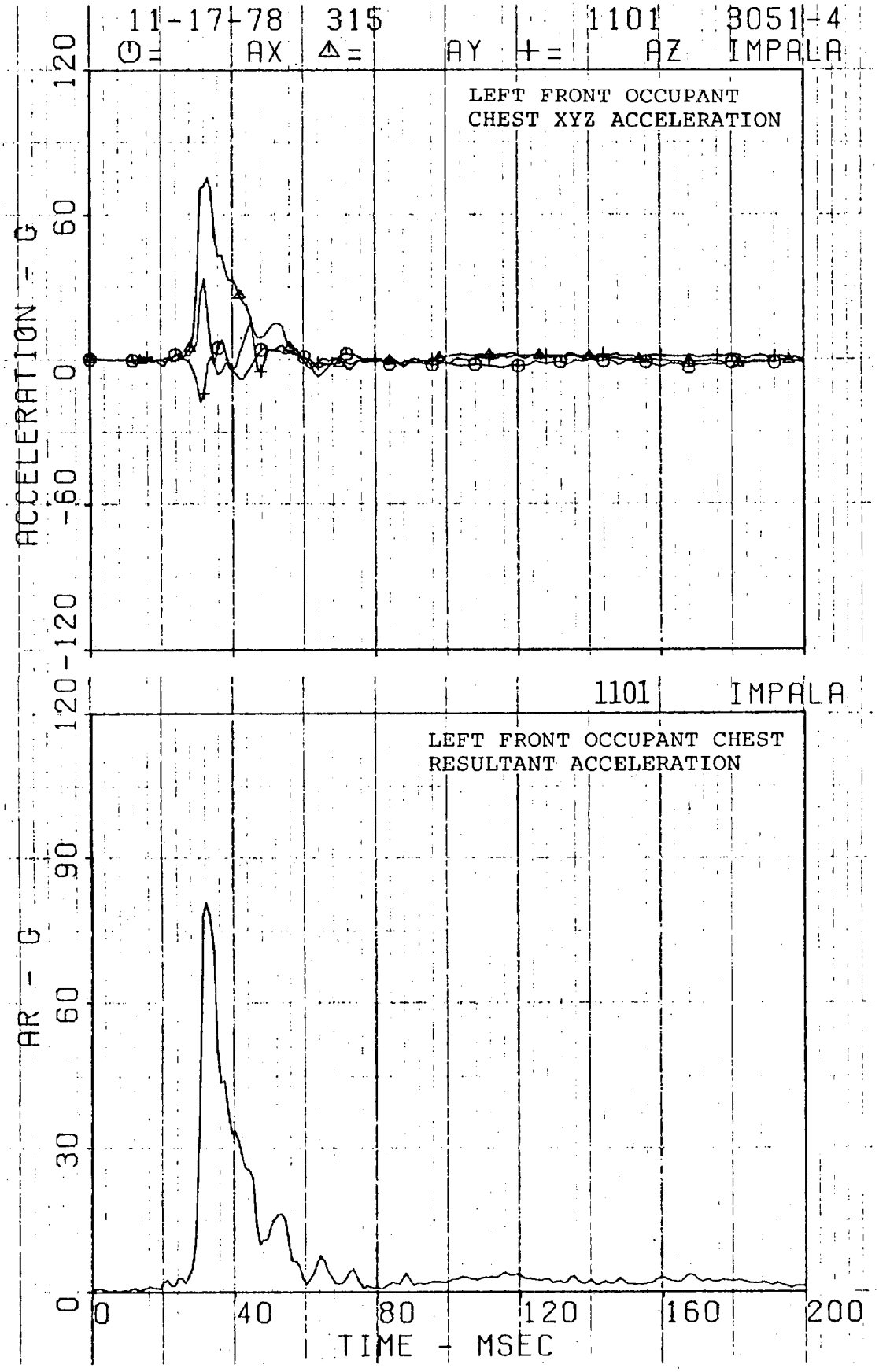

11-17-78 315/100 4101 3051-4
CHEV TRUCK
LEFT FRONT OCCUPANT
LEFT LAP BELT LOAD
LAPBLT L LBS *10^1
300
200
100
0
-100
4101 CHEV TRUCK
LEFT FRONT OCCUPANT
SHOULDER BELT LOAD
SH BLT LBS *10^1
300
200
100
0
-100
0
40
80
120
160
200
TIME - MSEC

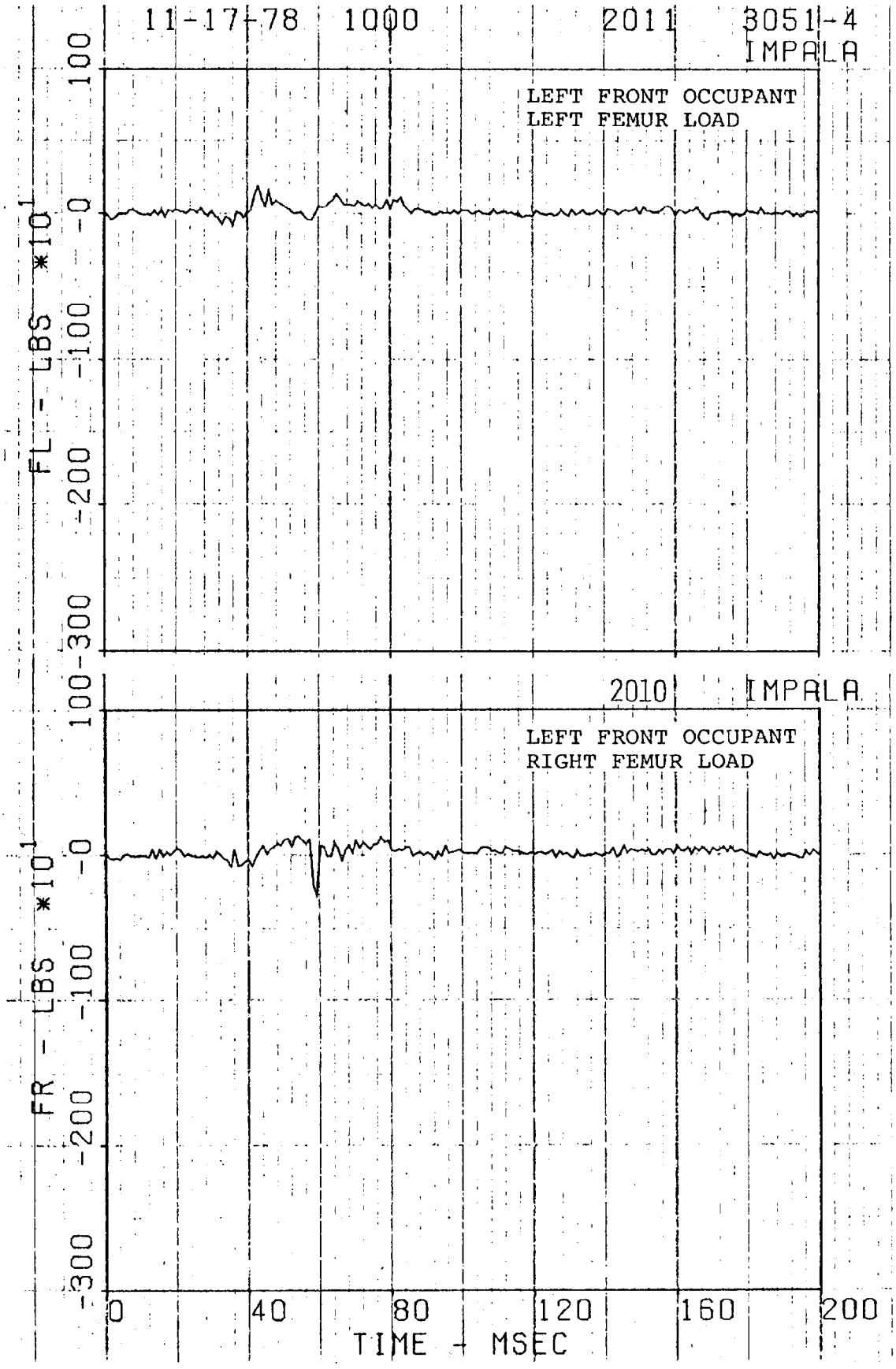

11-17-78 315/100 101 3051-4
AX AY IMPALA
A-PILLAR ACCELERATION
LOCATION 1
ACCELERATION - G
50
25
0
-25
-50
AX AY 102 IMPALA
B-PILLAR ACCELERATION
LOCATION 2
ACCELERATION - G
50
25
0
-25
-50
0
40
80
120
160
200
TIME - MSEC

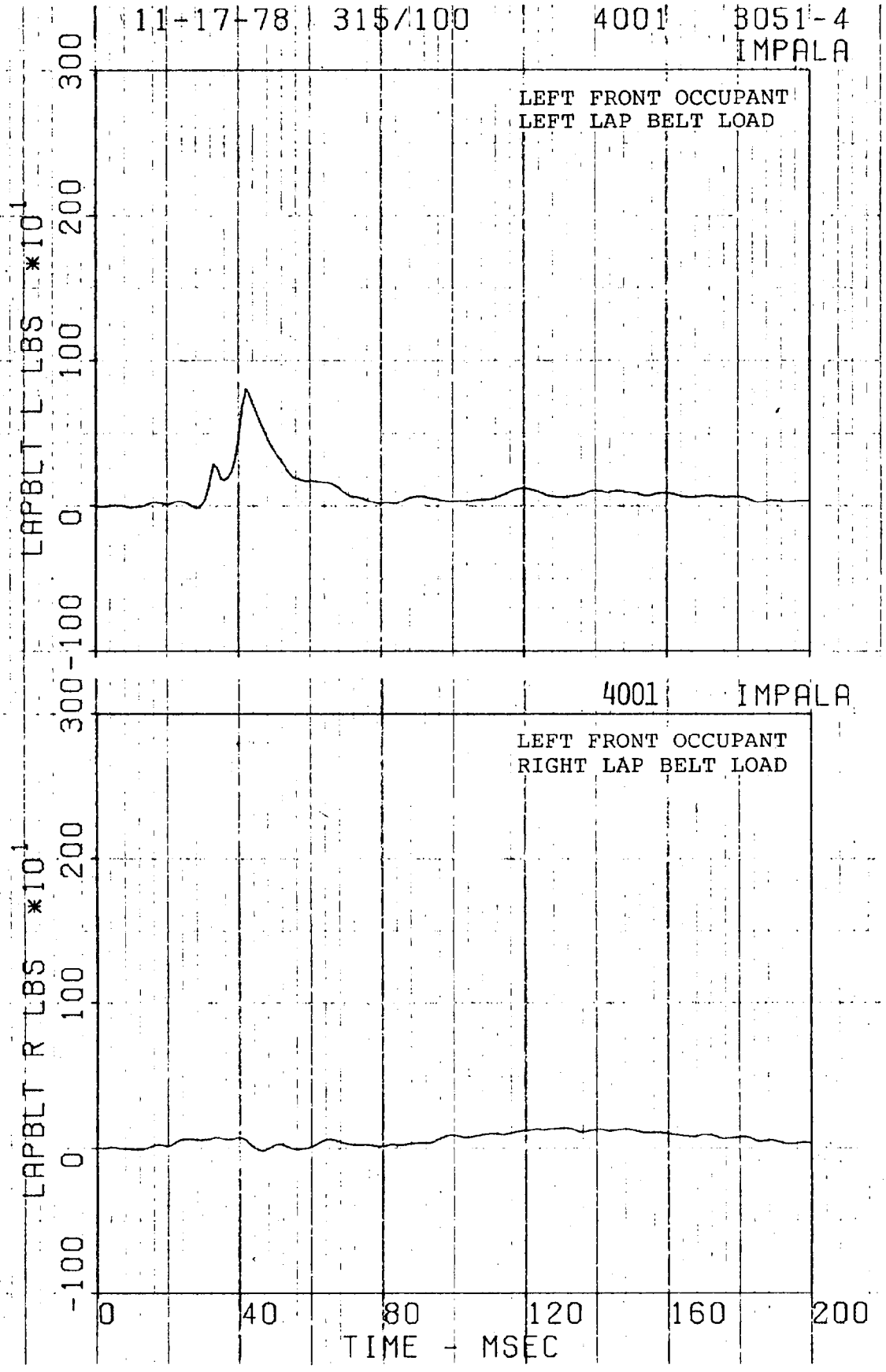

11-17-78 315/100 412 3051-4
○= AY △= VY += SY IMP AV 1.2
AVERAGE LATERAL COMPARTMENT
ACCELERATION, VELOCITY, AND
DISPLACEMENT LOCATIONS 1 AND 2
AY-G, VY-MPH, SY-FT
50
25
0
-25
-50
0
40
80
120
160
200
TIME - MSEC

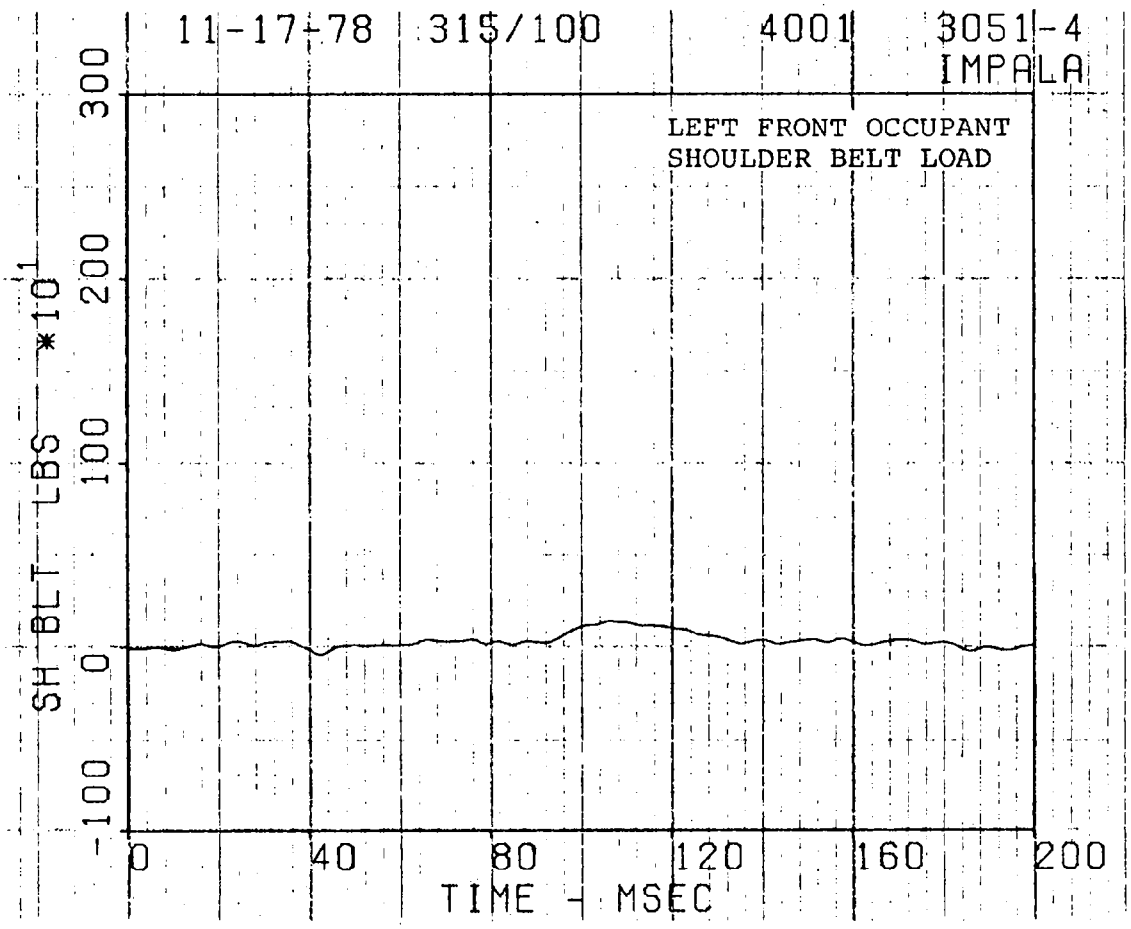

11-17-78 315/100 103 3051-4
○= AY △= VY += SY IMPALA
LEFT FRONT DOOR LATERAL H-POINT ACCELERATION, VELOCITY, AND DISPLACEMENT LOCATION 3
AY-G, VY-MPH, SY-IN.
200
100
0
-100
-200
○= AY △= VY += SY 104 IMPALA
LEFT REAR DOOR LATERAL H-POINT ACCELERATION, VELOCITY, AND DISPLACEMENT LOCATION 4
AY-G, VY-MPH, SY-IN.
200
100
0
-100
-200
0
40
80
120
160
200
TIME - MSEC

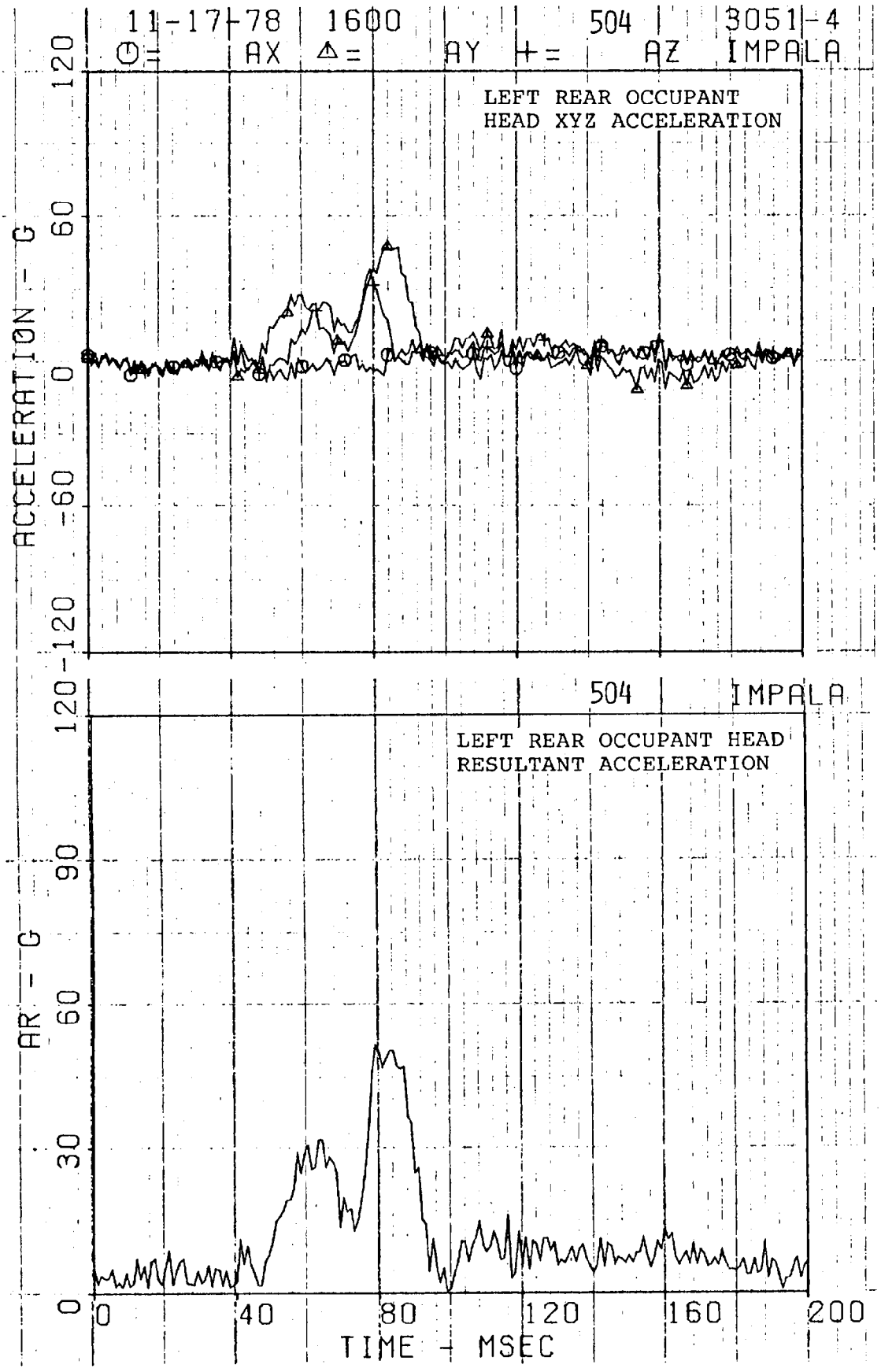

11-17-78 1600 501 3051-4
⊙= AX △= AY += AZ IMPALA
LEFT FRONT OCCUPANT
HEAD XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
501 IMPALA
LEFT FRONT OCCUPANT HEAD
RESULTANT ACCELERATION
AR - G
90
30
0
0
40
80
120
160
200
TIME - MSEC

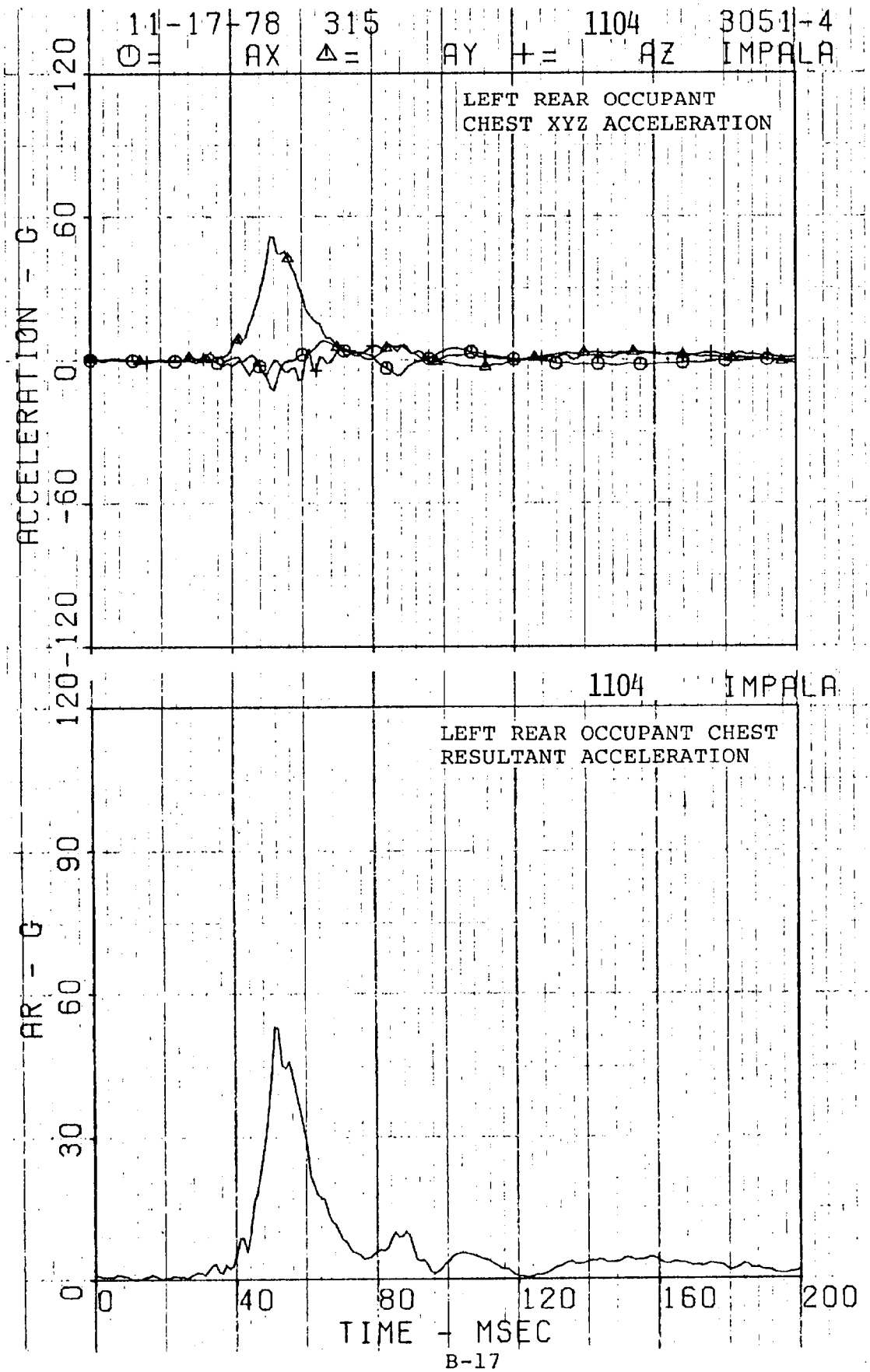

11-17-78 315$ 1101 3051-4
○= AX △= AY +=
AZ IMPALA
LEFT FRONT OCCUPANT
CHEST XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
1101 IMPALA
LEFT FRONT OCCUPANT CHEST
RESULTANT ACCELERATION
AR - G
120
90
60
30
0
0
40
80
120
160
200
TIME - MSEC

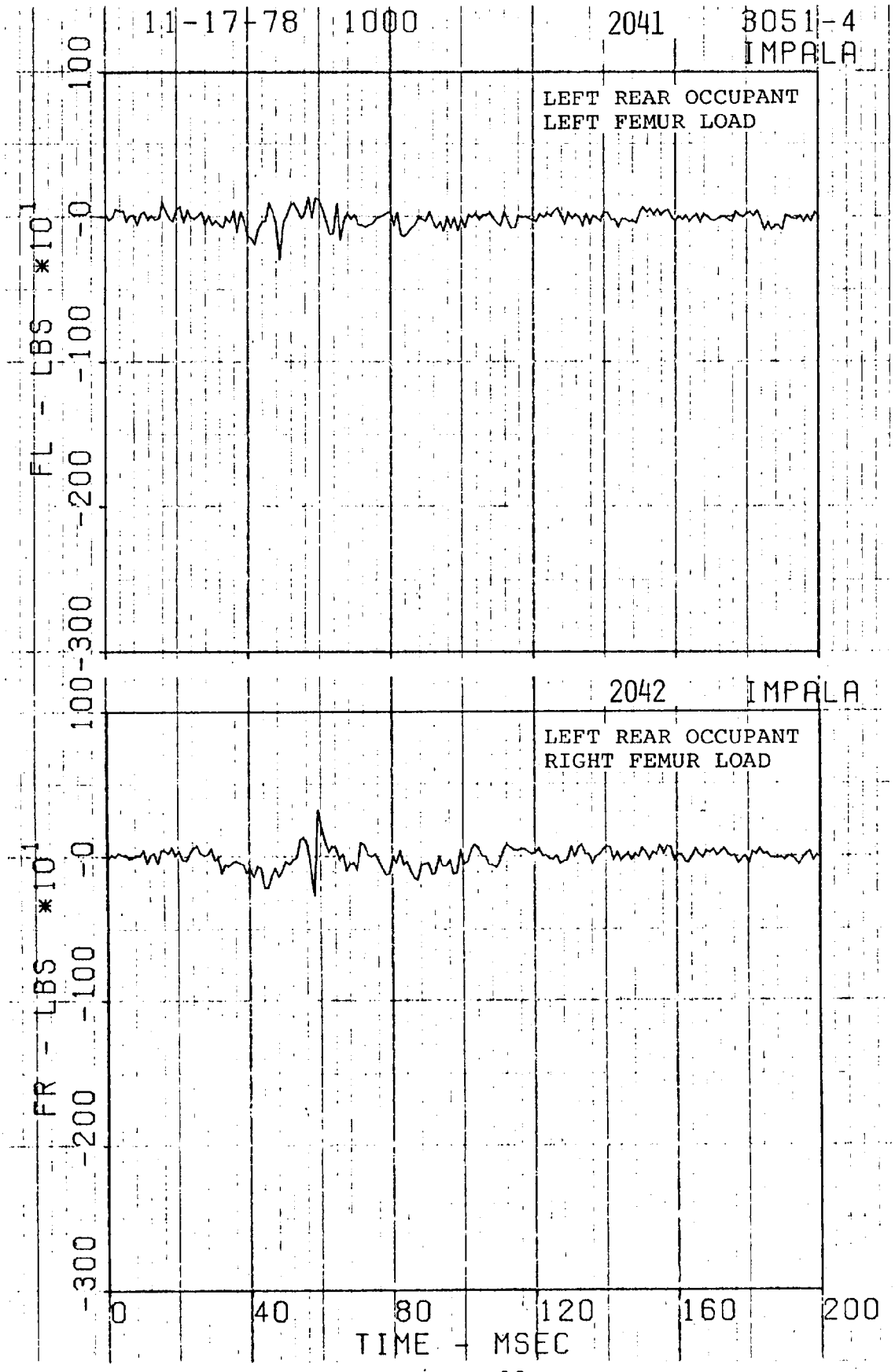

11-17-78 1000 2011 3051-4
IMPALA
LEFT FRONT OCCUPANT
LEFT FEMUR LOAD
FL - LBS *10
100
-0
-100
-200
-300
2010 IMPALA
LEFT FRONT OCCUPANT
RIGHT FEMUR LOAD
FR - LBS *10
100
-0
-100
-200
-300
0
40
80
120
160
200
TIME - MSEC

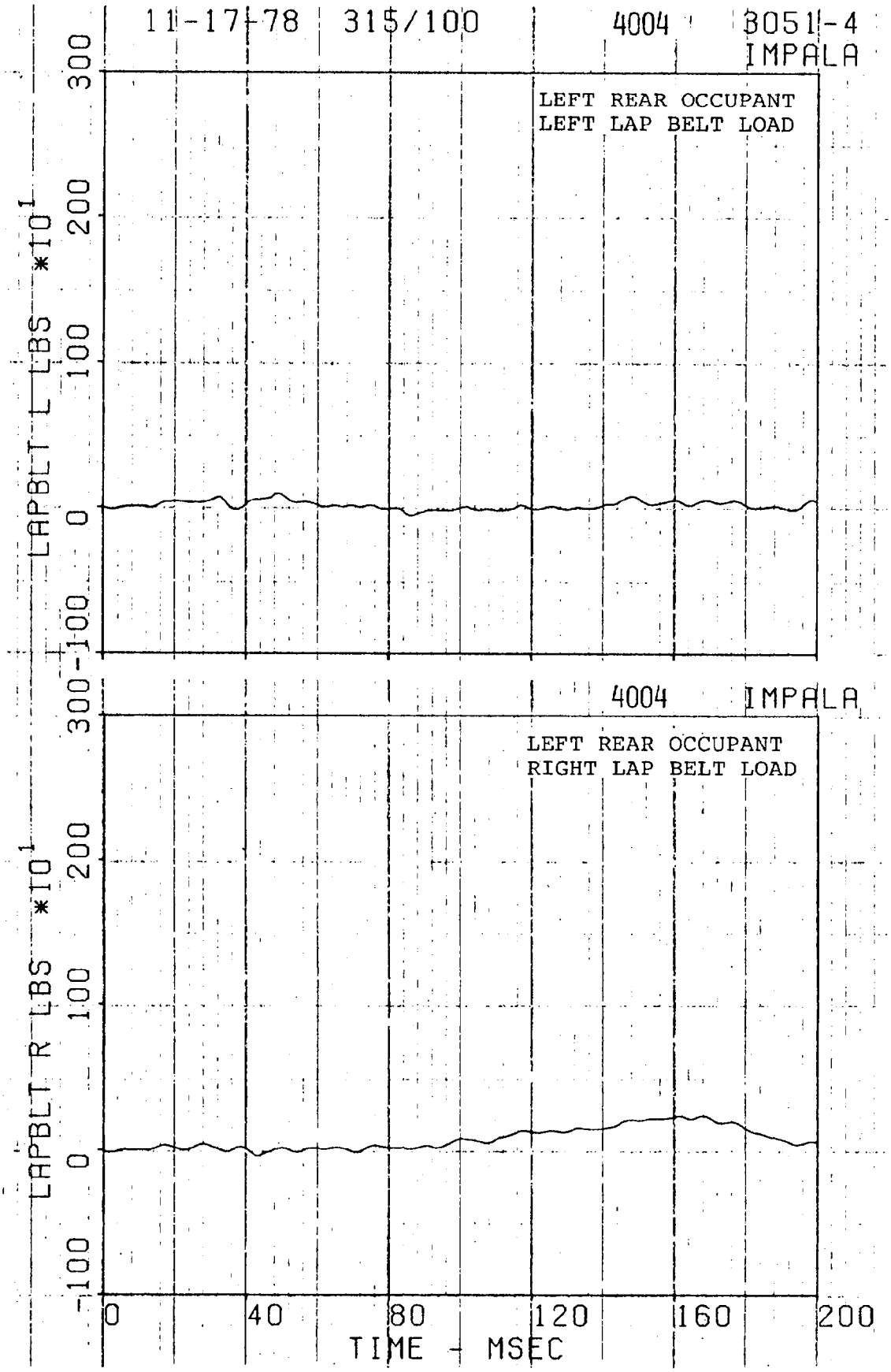

11-17-78 315/100 4001 3051-4
IMPALA
LEFT FRONT OCCUPANT
LEFT LAP BELT LOAD
LAPBLT L LBS *10-1
300
200
100
0
-100
4001 IMPALA
LEFT FRONT OCCUPANT
RIGHT LAP BELT LOAD
LAPBLT R LBS *10-1
300
200
100
0
-100
0
40
80
120
160
200
TIME - MSEC


11-17-78 315/100 4001 3051-4
IMPALA
LEFT FRONT OCCUPANT
SHOULDER BELT LOAD
SH BLT LBS *10^1
300
200
100
0
-100
0
40
80
120
160
200
TIME - MSEC


11-17-78 1600 504 3051-4
AX AY AZ IMPALA
LEFT REAR OCCUPANT
HEAD XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
504 IMPALA
LEFT REAR OCCUPANT HEAD
RESULTANT ACCELERATION
AR - G
90
30
0
40
80
120
160
200
TIME - MSEC


11-17-78 315 1104 3051-4
○= AX △= AY += AZ IMPALA
LEFT REAR OCCUPANT
CHEST XYZ ACCELERATION
ACCELERATION - G
120
60
0
-60
-120
1104 IMPALA
LEFT REAR OCCUPANT CHEST
RESULTANT ACCELERATION
AR - G
120
90
60
30
0
0
40
80
120
160
200
TIME - MSEC


11-17-78 1000 2041 3051-4
IMPALA
LEFT REAR OCCUPANT
LEFT FEMUR LOAD
FL - LBS *10-1
100
-0
-100
-200
-300
2042 IMPALA
LEFT REAR OCCUPANT
RIGHT FEMUR LOAD
FR - LBS *10-1
100
-0
-100
-200
-300
0
40
80
120
160
200
TIME - MSEC


11-17-78 315/100 4004 3051-4
IMPALA
LEFT REAR OCCUPANT
LEFT LAP BELT LOAD
LAPBLT L LBS *10¹
300
200
100
0
-100
4004 IMPALA
LEFT REAR OCCUPANT
RIGHT LAP BELT LOAD
LAPBLT R LBS *10¹
300
200
100
0
-100
0
40
80
120
160
200
TIME - MSEC