DOT#164

164

REF# 8321-4.7

A SUBSIDIARY OF TALLEY INDUSTRIES

1850 WEST PINNACLE PEAK ROAD · PHOENIX, ARIZONA 85027 · (602) 942-3300

Report No. (to be assigned by NHTSA)

TEST REPORT 5
60° SIDE IMPACTOR-TO-OLDSMOBILE CUTLASS TEST 4.7 AT 35 MPH

Contract DOT-HS-8-01933

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A Talley Industries Company
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Phoenix, Arizona 85027

December 1979

TEST REPORT

Document is available to the public through the
National Technical Information Service
Springfield, Virginia 22161

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

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Test Number 8321-4.7

16. Abstract

A series of five full-scale Side Impactor-to-car crash tests were conducted as required under Task 4 of DOT-HS-8-01933, "Test Device and Test Procedure to Assess Side Structures." This program is sponsored by the National Highway Traffic Safety Administration. This test report presents the results of Test 8321-4.7, a 60° Side Impactor-to-car collision. The bullet vehicle was the NHTSA Side Impactor, the target vehicle was a 1979 Oldsmobile Cutlass Salon 4-door Sedan. The target vehicle was struck at the right side DOR point. This vehicle had been involved in a 30° angular frontal collision in Test 8321-2.3.

The object of these tests was to gather and provide data necessary to design a frontal honeycomb face representative of the characteristics of a 50th percentile 1978 automobile when involved in 60° front-to-side impact crashes with other vehicles.

17. Key Words	18. Distribution Statement
NHTSA Side Impactor, Oldsmobile Cutlass, 60° Angular Side Impact, Side Structures	Document is available to the public through the National Technical Information Service Springfield, Virginia 22161

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1.0 INTRODUCTION

A series of five full-scale Side Impactor-to-car crash tests were conducted as required under Task 4 of DOT-HS-8-01933, "Test Device and Test Procedure to Assess Side Structures." This program is sponsored by the National Highway Traffic Safety Administration. This test report presents the results of Test No. 8321-4.7, a 60-degree, Side Impactor-to-car side collision. The bullet vehicle was the NHTSA Side Impactor. The target vehicle was a 1979 Oldsmobile Cutlass Salon four-door sedan. The target vehicle was struck just aft of the right side DOR point. This vehicle had been previously crashed in Test 8321-2.3, a 30-degree angular frontal impact on the driver's side. There was no significant compartment damage in that test. The DSL 1172-9 honeycomb face was used in Test 4.7.

1.1 TEST OBJECTIVE

The objective of this test was to gather and provide the necessary data to evaluate the Energy-Absorbing Face characteristics of the Side Impactor in an actual car side crash. The primary purpose was to evaluate the frontal geometric shape and load/deflection characteristics of a generic 50th percentile 1978 automobile when involved in a 60-degree, front-to-side impact with the NHTSA-selected vehicle (1979 Oldsmobile Cutlass).

The positioning of the test vehicle and the Side Impactor for the 60-degree impact is shown in Figure 1-1, where initial impact is one-inch aft of the Door Opening Reference Point (see SAE J972a).

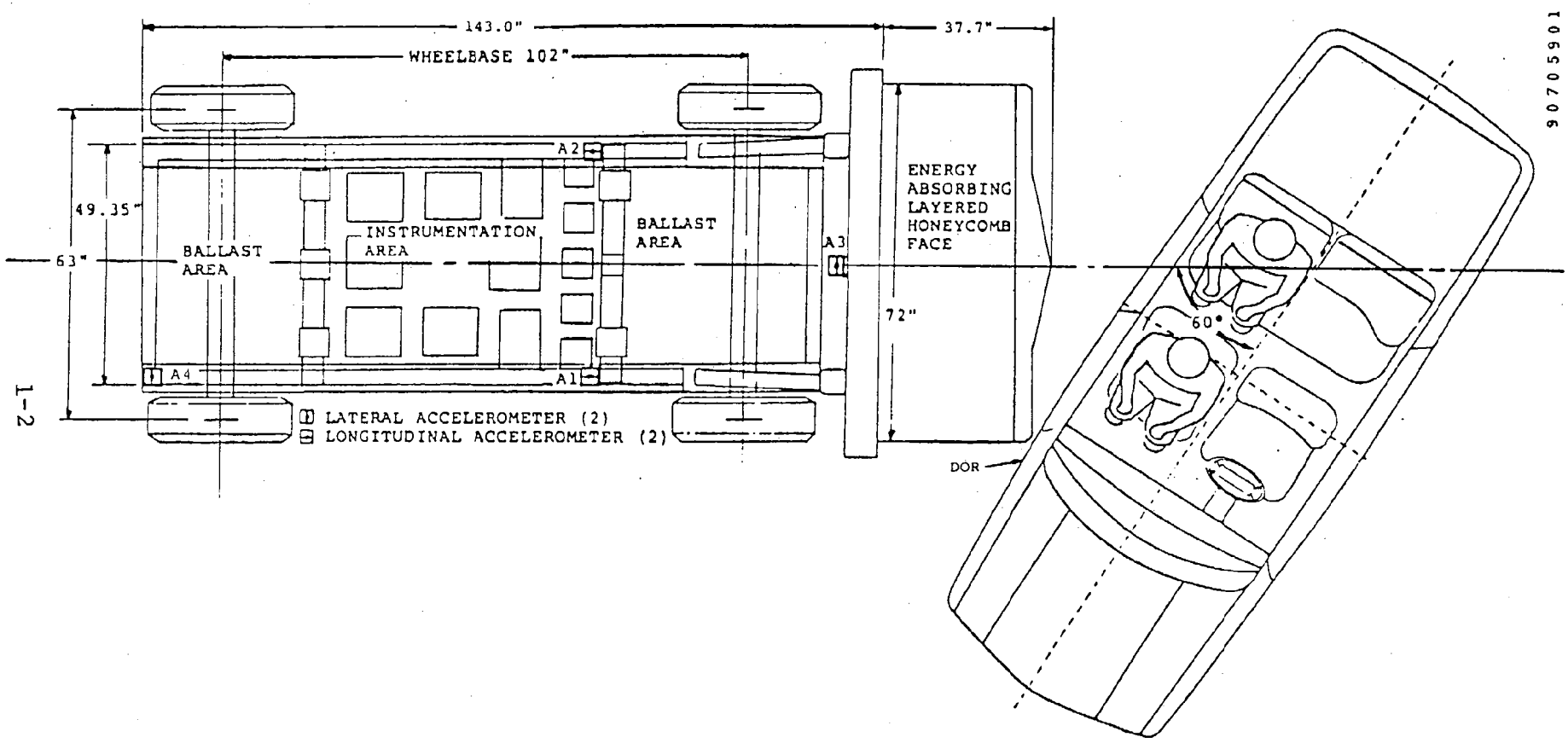


Figure 1-1. Side Impactor-to-Car at 60°.

1.2 TEST SCOPE

Dynamic crush evaluation of the Side Impactor provided data to evaluate the Energy-Absorbing Face configuration and force/deflection characteristics. Two instrumented Part 572 Alderson anthropomorphic dummies were in the two right seating positions (one in front and one in the rear) of the target vehicle. Each occupant was unrestrained. The seat tracks were welded in their midrange position to prevent breakaway from the seat tracks. The test matrix and a summary of test conditions for the moving Side Impactor-to-side of stationary car collisions completed for Phase I are shown in Table 1-1.

1.3 E/A FACE SPECIFICATIONS

The honeycomb crushing strength specifications and the fabrication details for the Side Impactor Energy-Absorbing Face are presented in Appendix B.

TABLE 1-1. TASK 4 SIDE IMPACTOR-TO-SIDE OF CAR TESTS (8321)

Test No.	Test Date	Test Configuration	Target Car Model	Car Test Weight (lb)	Impactor Weight (lb)	Closing Velocity (mph)
4.1	12/05/78	Side Impactor A-to-1976 Plymouth Volare 60° side impact (left)	1976 Plymouth Volare 4-door Sedan	4009	3640	35.56
4.2	01/02/79	Side Impactor A-to-1976 VW Rabbit 60° side impact (left)	1976 VW Rabbit 2-door Sedan	2401	3628	30.34
4.5	06/18/79	Side Impactor B-to-1976 VW Rabbit 60° side impact (left)	1976 VW Rabbit 2-door Sedan	2394	3654	29.30
4.6	06/21/79	Side Impactor B-to-1976 Plymouth Volare 60° side impact (left)	1976 Plymouth Volare 4-door Sedan	4047	3648	34.98
●4.7	07/16/79	Side Impactor C-to-1979 Oldsmobile Cutlass Salon 60° side impact (right)	1979 Oldsmobile Cutlass Salon 4-door Sedan	3769	3668	34.89

●Test addressed in this report.

2.0 PRESENTATION OF RESULTS - TEST 8321-4.7

This section of the report presents the results of Test No. 8321-4.7, a 60-degree side impact crash test between the NHTSA Side Impactor (bullet vehicle) and a 1979 Oldsmobile Cutlass four-door sedan (target vehicle).

This section presents all test results for Test 8321-4.7. 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 CTM. Appendix A contains Calcomp plots of all electronic data for this test. A summary of the test results is presented in Appendix C.

TABLE 2-1. CRASH TEST SUMMARY (TEST 8321-4.7)

TEST NO. 8321-4.7 CONTRACT: DOT-HS-8-01933

TEST DATE: July 16, 1979 TIME: 1516 TEMPERATURE: 103 °F

TEST CONFIGURATION: 60° Side Impactor (Right Side)

VEHICLE NO. 1: NHTSA Side Impactor with DSL 1172-9 Face

VEHICLE NO. 2: 1979 Oldsmobile Cutlass Salon 4-door Sedan

VEHICLE DATA	VEHICLE NO. 1		VEHICLE NO. 2
Overall Length/Width (in.)	180.7/78.3		193.9/71.9
Test Weight by Wheel (lb)	LF 1131 RF 1093 LR 764 RR 680		LF 789 RF 958 LR 1064 RR 958
Total Weight (lb)	3668		3769
Wheelbase (in.)	102.0		106.8
Longitudinal C.G. (From Center of Front Axle) (in.)	39.9		57.3
Impact Angle (deg)*	0		60
Vehicle C.G. to C.G. Offset Distance (in.)**	0		26.5
Impact Speed (mph)	34.9		0
Maximum Resultant Velocity Change (mph @ msec)	20.3 @ 166		14.6 @ 148
Maximum Resultant Compartment Acceleration (G @ msec)	11.7 @ 71		19.4 @ 42
Maximum Door Acceleration*** (G @ msec)	N/A		-125.8 @ 33
Maximum Static Crush (in.)			
• Row G	14.2	• Window Top Level	2.5
• Row C	9.8	• Windowsill Level	15.5
• Row A	9.9	• Door Center Level	20.3
		• Axle Level	12.0
Maximum Post-test Intrusion (in.)	N/A		18.0
OCCUPANTS			
Type	N/A		Alderson Part 572
Location	N/A		RF - Passenger RR - Passenger
Restraints	N/A		Unrestrained
INSTRUMENTATION			
Number of Data Channels	9		41
Number of Cameras	9		

*With respect to tow track centerline.
**Extreme left edge of honeycomb struck Oldsmobile Cutlass Salon DOR point 134.5 inches from rear bumper centerline.
***At Location 9.
N/A - Not Applicable.

TABLE 2-2. RECEIVING INSPECTION OF VEHICLES (TEST 8321-4.7)

Contractor: Dynamic Science, Inc. Contract No.: DOT-HS-8-01933

VIN NO.: 3G09A9A9R454168 Make: Oldsmobile

NHTSA No.: R&D

Year: 1979 Color: Blue Model: Cutlass Salon

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: P195/75R14 Ply Rating: Mfg. & Line: Goodyear Polysteel

Bias Ply: Belted: Radial X /Eng.Type: V-6 Cylinders: 6 Total 3.8 Displ: litre

Trans, # Fwd. Speeds: 3 Shipping Weight: Odometer: 41.5

Dealer (name, address, and phone number)
Holiday Oldsmobile
3530 North Scottsdale Road
Scottsdale, AZ 85251

Remarks (list additional accessories not listed above)

Date of Manufacture: 2-79 Dynamic Science No.: 899 Date Received: 3-22-79

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]

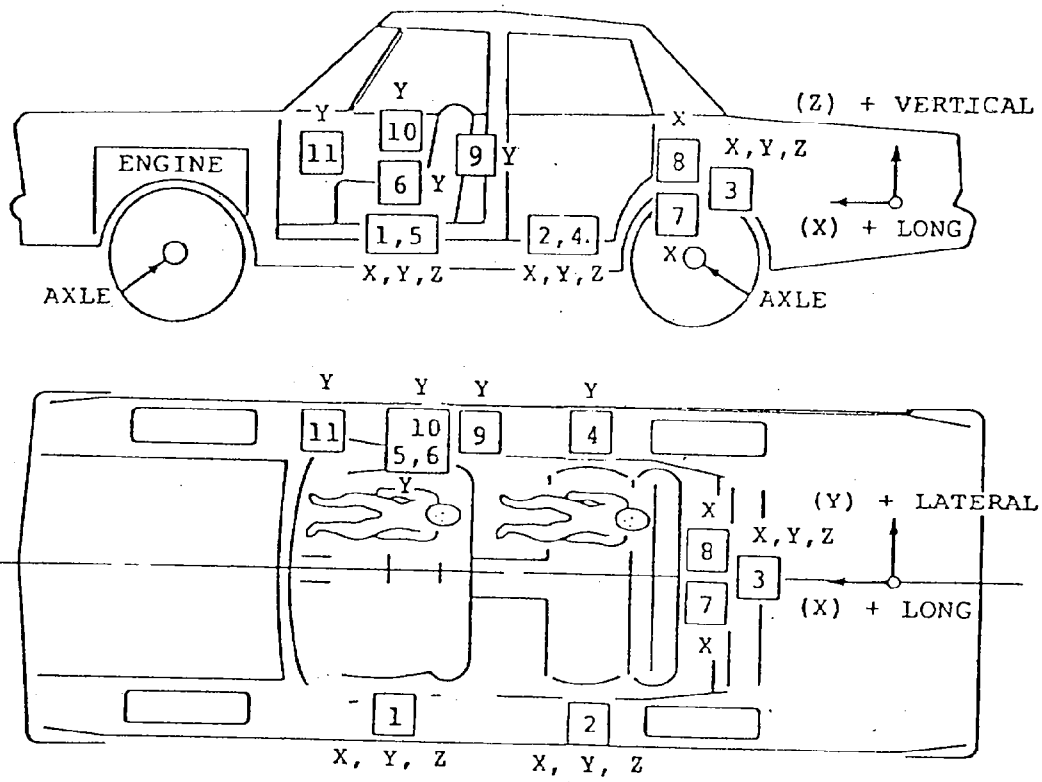
Restraint System: Standard lap and shoulder belt

1. Is the vehicle stock throughout? Describe: Mirrors, spare tire, jack, wheel covers, hood, rear and left rear side windows, and all fluids removed.

2. Does vehicle show evidence of prior accident history? Describe: Used in Test 8321-2.3, 30° frontal left side angular impact. Extensive damage to engine compartment. Left front tire pushed to back of the fender well. Vehicle tilts toward left front corner. No significant damage to occupant compartment other than the need to weld the left front door to keep it closed.

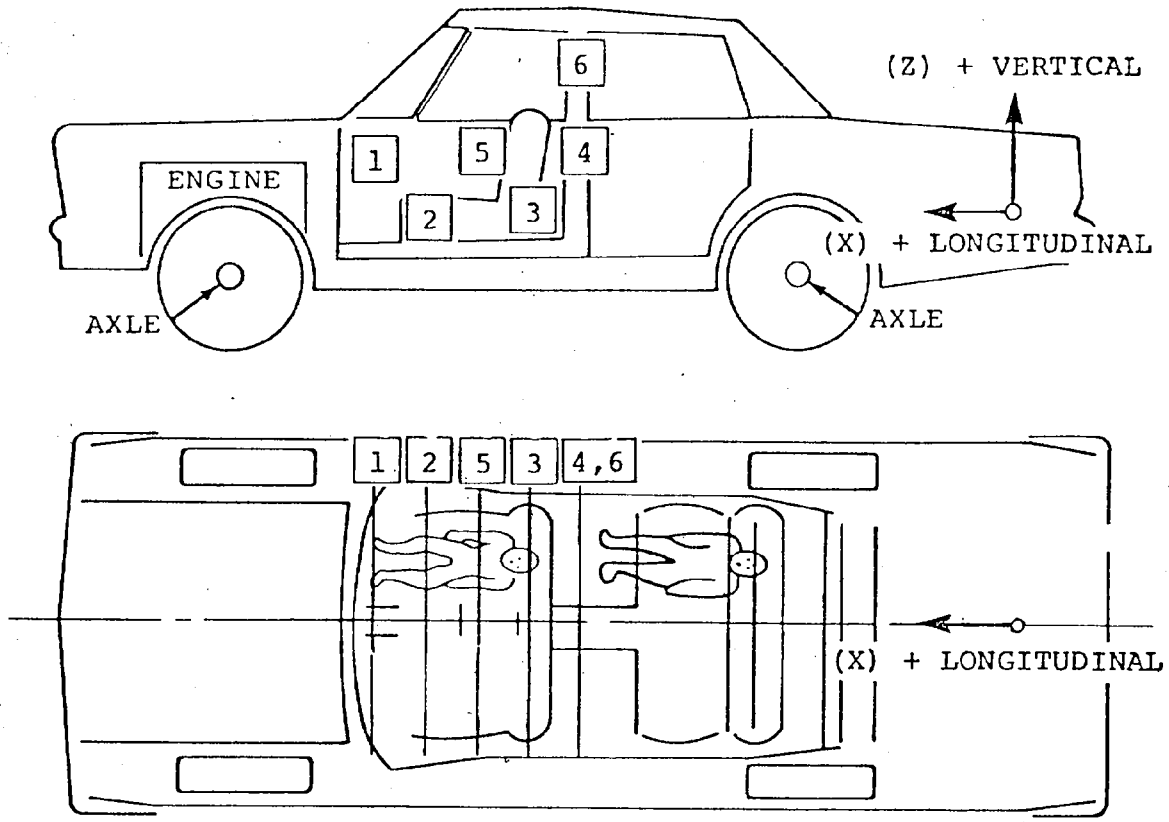
3. Does vehicle show any significant corrosion? Describe: None.

4. Check condition of the front bumper and frame: Rear bumper satisfactory. Front bumper mounts broken in previous test. No frame damage rearward of A-pillars.



TEST VEHICLE ACCELEROMETER LOCATIONS AND PHYSICAL COORDINATES (IN.)					MAXIMUM EXPECTED READINGS (G)		
No.	Description of Location	X	Y	Z	LONG	LAT	VERT
1	Left sill next to front seat	112	-26	13	20	50	10
2	Left sill next to rear seat	86	-24	11	20	50	10
3	Deck over rear axle	50	0	25	20	50	10
4	Right sill next to rear seat	85	24	14		100	
5	Right sill next to front seat	111	26	16		200	
6	Right front door centerline	114	29	22		300	
7	Left rear compartment	49	17	25	20		
8	Right rear compartment	49	-17	25	20		
9	Midrear of right front door	100	29	30		200	
10	Upper right front door centerline	113	29	31		200	
11	Midfront of right front door	123	29	26		300	

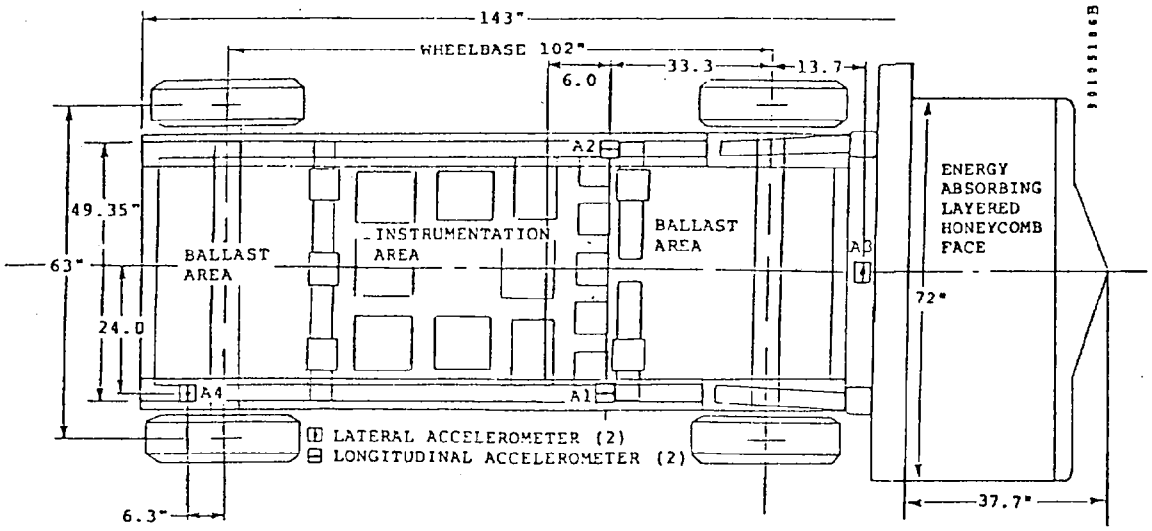
Figure 2-1. Test Vehicle Accelerometer Locations (Test 8321-4.7).



VEHICLE STRING POTENTIOMETER LOCATIONS AND PHYSICAL COORDINATES

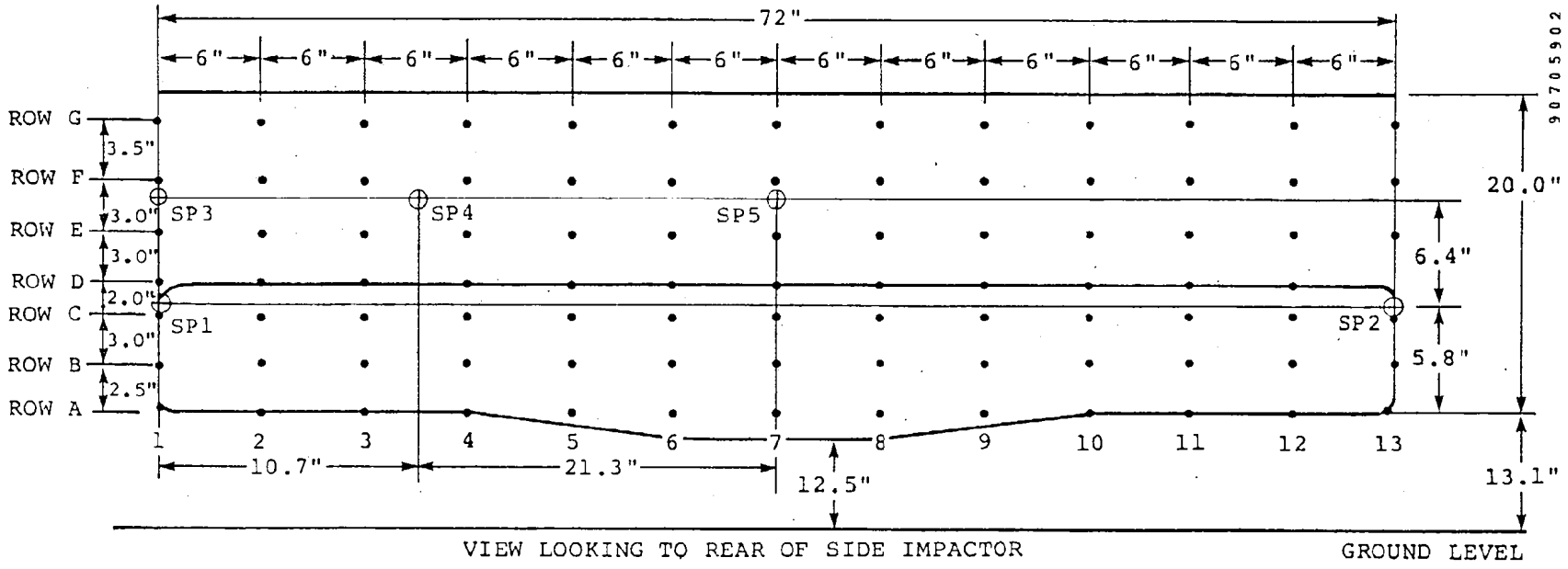
No.	Description of Location	Height Above Ground (in.)	Distance From Rear Bumper (in.)	Maximum Expected Readings
1	Midfront of right front door and just above driver's knees	26	25	25 in.
2	Sill just ahead of front seat and behind driver's feet	14	27	20 in.
3	Sill just behind front seat and in front of passenger's feet	12	-3	15 in.
4	Right B-pillar just below window sill	44	0	10 in.
5	Right front door center-line just below window sill	30	16	15 in.
6	Right B-pillar at window top height	53	0	10 in.

Figure 2-2. Test Vehicle String Potentiometer Locations (Test 8321-4.7).



No.	TEST VEHICLE ACCELEROMETER LOCATIONS AND PHYSICAL COORDINATES (IN.) Description of Location	X	Y	Z	MAXIMUM EXPECTED READINGS (G) LONG	LAT	VERT
1	Right frame rail	84	23	20	50		
2	Left frame rail	84	-23	20	50		
3	Front crossmember at centerline	130	0	24		50	
4	Right rear vertical frame rail	9	22	16		50	

Figure 2-3. Side Impactor Accelerometer Locations (Test 8321-4.7).



⊕ LOCATION OF STRING POTENTIOMETER (5 PLACES)

NOTE: PROFILE MEASUREMENTS WERE TAKEN USING POINTS DESIGNATED IN THE ROWS AND COLUMNS (WHEN APPLICABLE)

Figure 2-4. Front View of Side Impactor Face (Looking Aft) Showing String Potentiometer Locations (Test 8321-4.7).

TABLE 2-3. INSTRUMENTATION SUMMARY (TEST 8321-4.7)

1979 Oldsmobile Cutlass Salon		Side Impactor	
Required Number of Channels	Channel Function	Required Number of Channels	Channel Function
17	Accelerometers	4	Accelerometers
6	String Potentiometers	5	String Potentiometers
2	Impact Switches		
16	Dummy Accelerometers		
41		9	
42 channels available (3 RSCM's)		14 channels available (1 RSCM)	

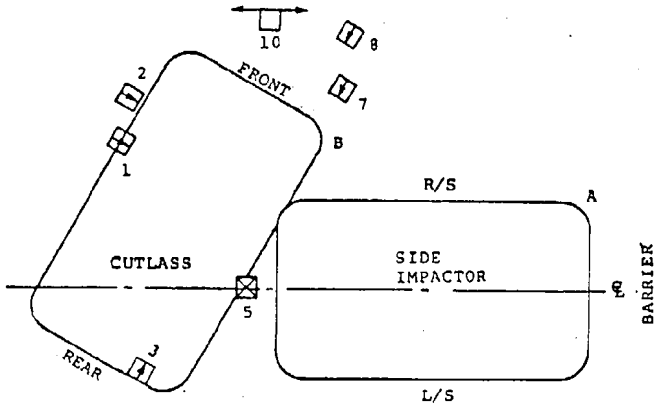
Test No: 8321-4.7 Test Date July 16, 1979

Test Type: Moving Side Impactor-to-Stationary Test
Vehicle Positioned at 60° Clockwise

VEHICLE A (Barrier) Side Impactor

VEHICLE B (Away) 1979 Cutlass Salon

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

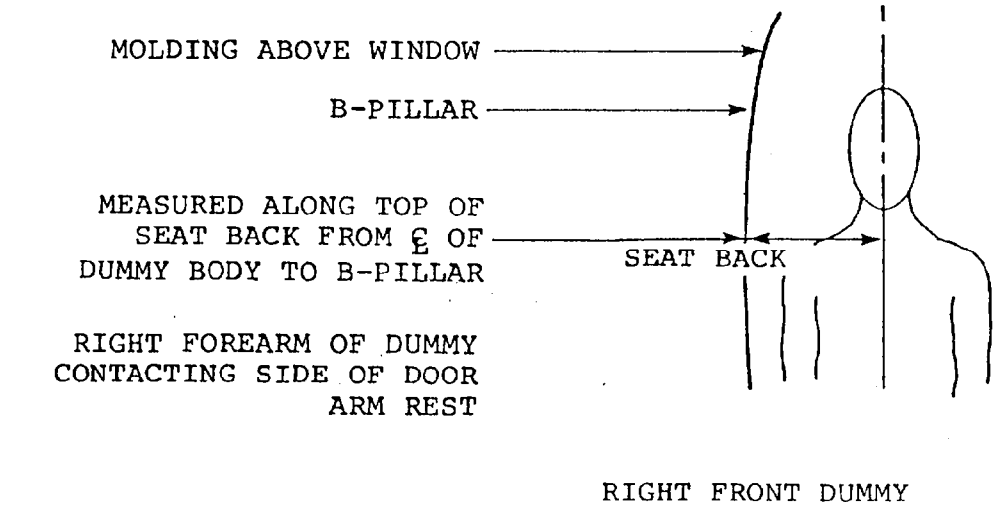
Loc. No.	Location	Field of View	Lens Size	Frm Rate	Tmng Spd	Ser No.	Impact Dist-X	C.L. Dist-Y	CAM Hght-Z
1	On-Board	Cut hole in roof, views dummies	8	1	1				
2	On-Board	Look through window, views dummies	8	1	1				
3	On-Board	Looks along interior side wall, views dummies interaction with side	8	1	1				
4	Ground Based	Closeup of occupants	25	1	1				
5	Overhead	Views impact zone	10	5	1				
6	Ground Based	Right side view of impact zone (perpendicular to side impactor A)	25	1	1				
7	Ground Based	Left side view of impact zone (parallel to test vehicle B)	25	1	1				
8	Ground Based	Left side view of impact zone (parallel to test vehicle B)	15	5	1				
9	Ground Based	Right side view of impact zone (perpendicular to side impactor A)	13	5	1				
10	Ground Based	Panning overall test	-	3	-				

Figure 2-5. Camera Locations for Test 8321-4.7.

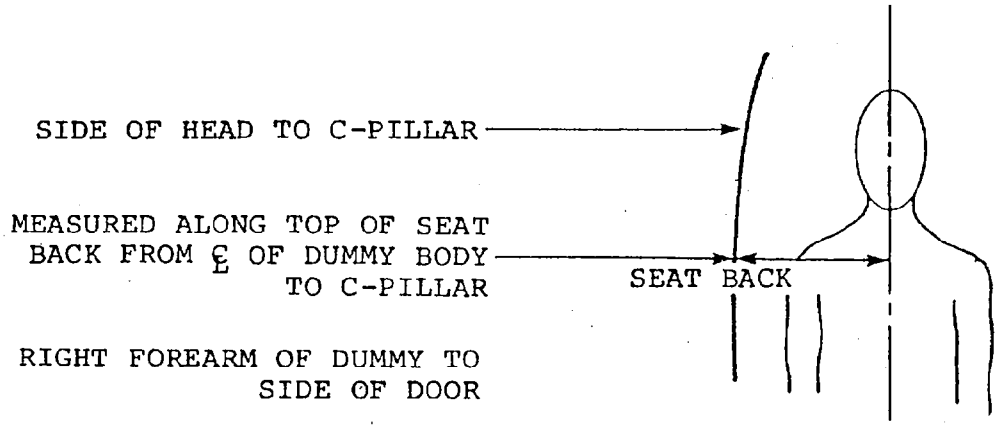
TABLE 2-4. DUMMY PRE-TEST POSITIONS RELATIVE TO SIDE OF CAR

VEHICLE 1979 Oldsmobile Cutlass Salon TEST DATE July 16, 1979

TEST NUMBER 8321-4.7



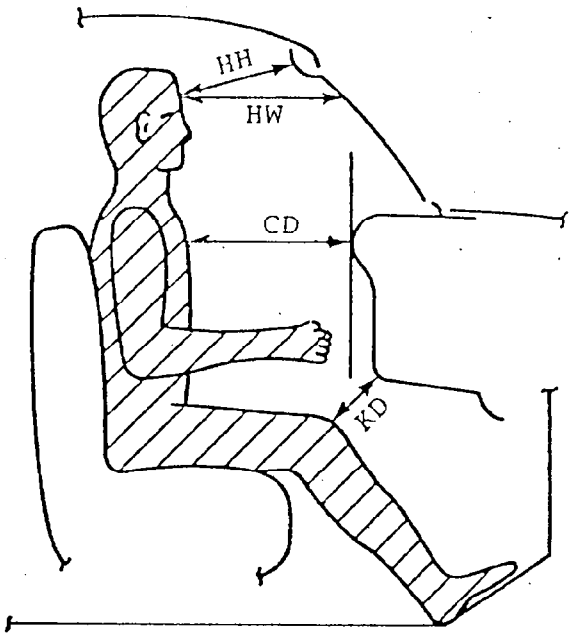
RIGHT FRONT DUMMY



RIGHT REAR DUMMY

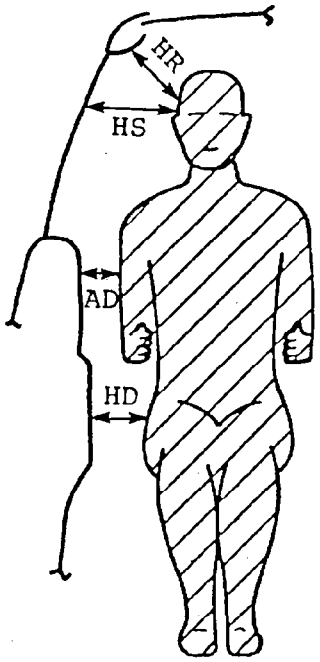
	PRE-TEST	POST-TEST
MOLDING ABOVE WINDOW	7.0	16.3
B-PILLAR	8.9	1.5
MEASURED ALONG TOP OF SEAT BACK FROM ℄ OF DUMMY BODY TO B-PILLAR	11.6	7.8
RIGHT FOREARM OF DUMMY CONTACTING SIDE OF DOOR ARM REST	0.0	1.5
SIDE OF HEAD TO C-PILLAR	9.8	14.6
MEASURED ALONG TOP OF SEAT BACK FROM ℄ OF DUMMY BODY TO C-PILLAR	16.0	19.5
RIGHT FOREARM OF DUMMY TO SIDE OF DOOR	4.7	4.3

9070506



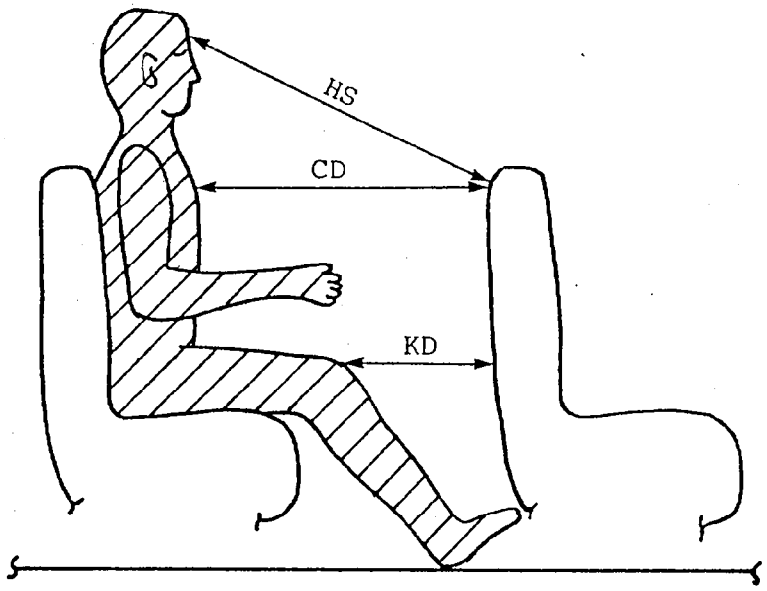
9 0 1 0 5 1 2 5 A

HH = 19.0 IN.
HW = 24.3 IN.
CD = 22.5 IN.
KD = 6.5 IN./6.4 IN.

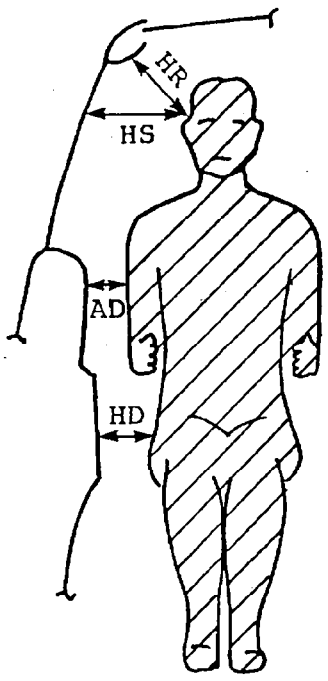


HR = 7.0 IN.
HS = 8.9 IN.
AD = 5.0 IN.
HD = 7.5 IN.

Figure 2-6. Front Passenger Pre-test Position (Test 8321-4.7).



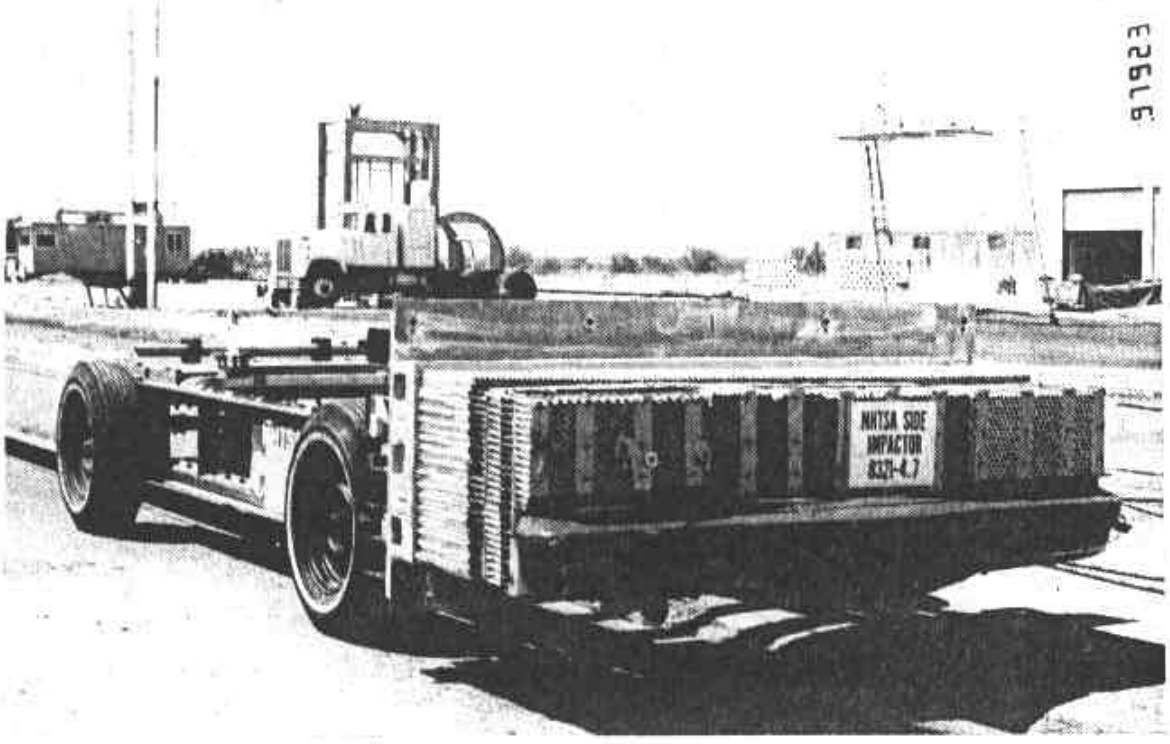
HS = 26.9 IN.
CD = 23.9 IN.
KD = 6.2 IN./6.7 IN.



HR = 8.4 IN.
HS = 9.8 IN.
AD = 5.5 IN.
HD = 8.5 IN.

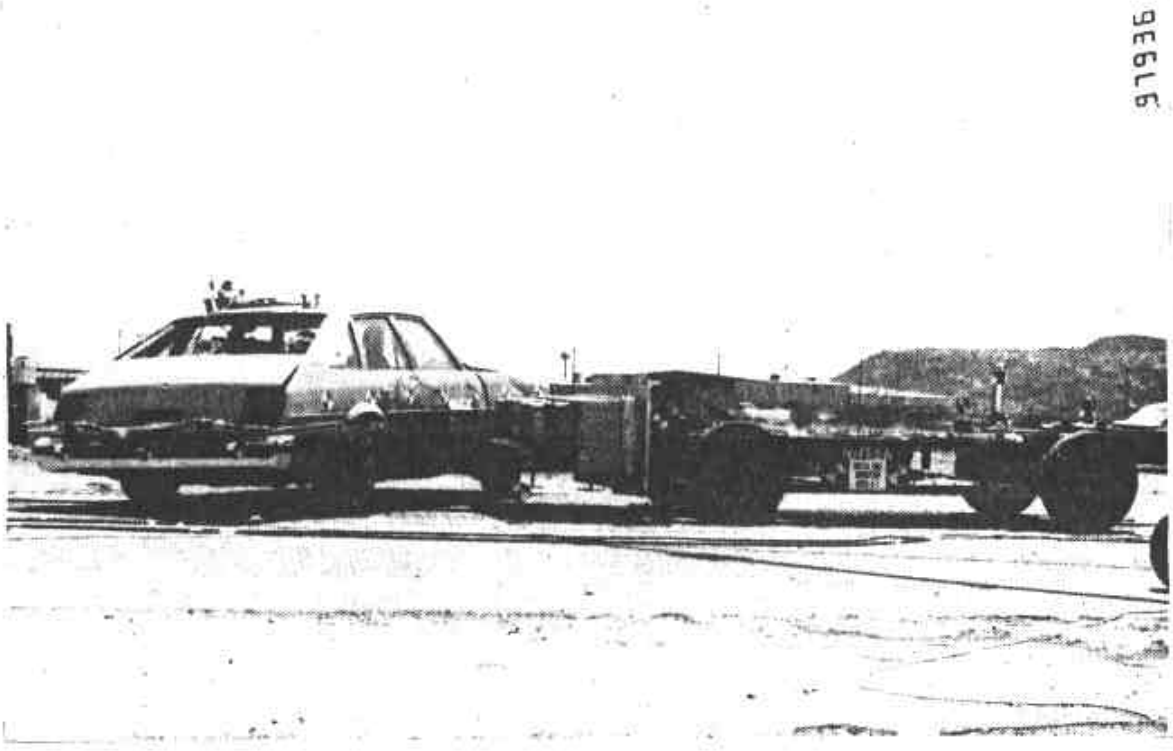
Figure 2-7. Rear Passenger Pre-test Position (Test 8321-4.7).

a) Pre-test Oldsmobile Cutlass

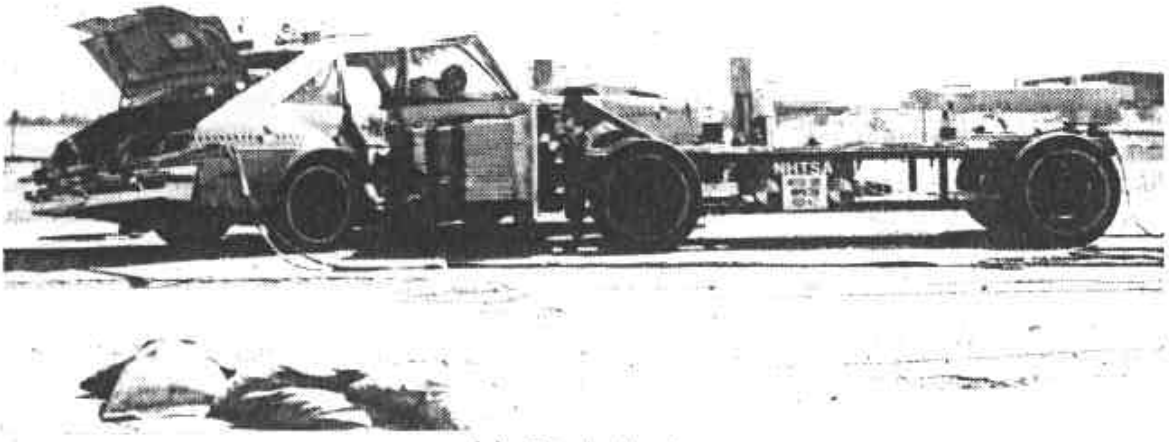


b) Pre-test Side Impactor

Figure 2-8. Pre-test Views of Vehicles (Test 8321-4.7).



a) Pre-test



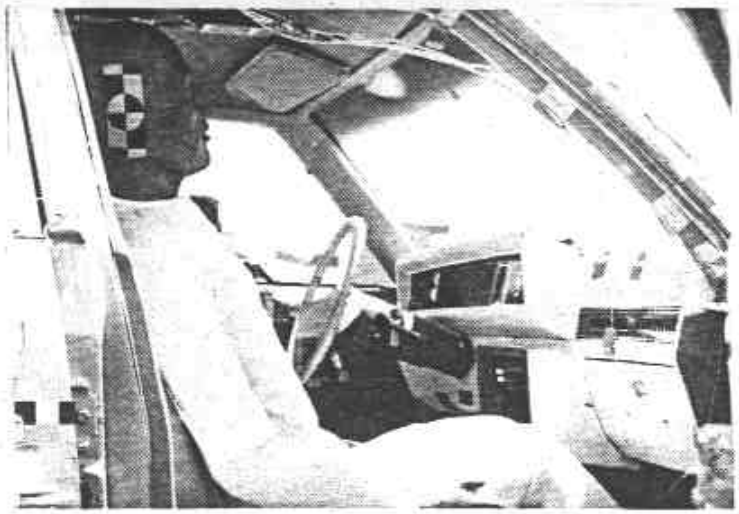
b) Post-test

Figure 2-9. Pre- and Post-test Vehicle Configuration (Test 8321-4.7).

a) Post-test Oldsmobile Cutlass

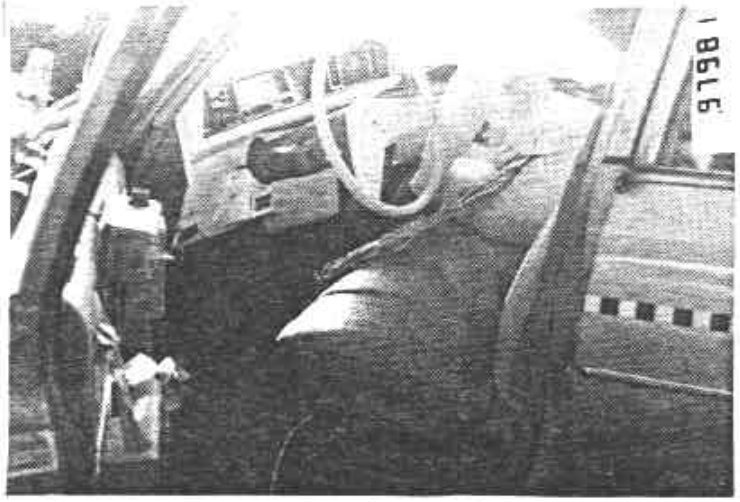
b) Post-test Side Impactor

Figure 2-10. Post-test Views of Vehicles (Test 8321-4.7).

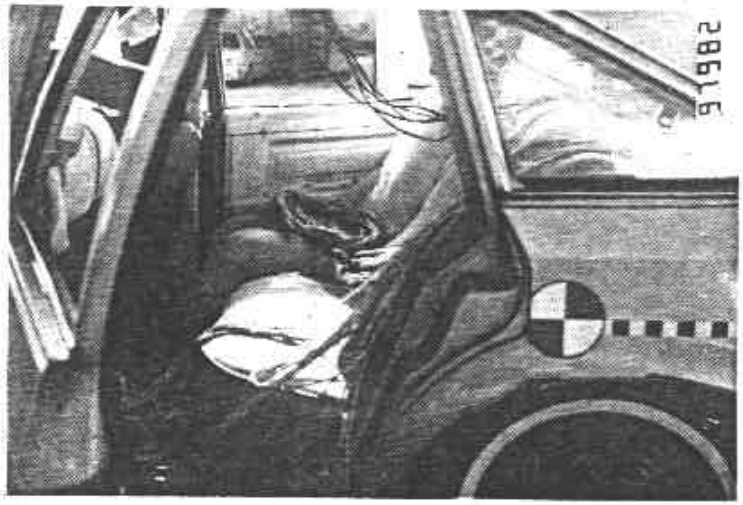


a) Pre-test Front Passenger

c) Pre-test Rear Passenger

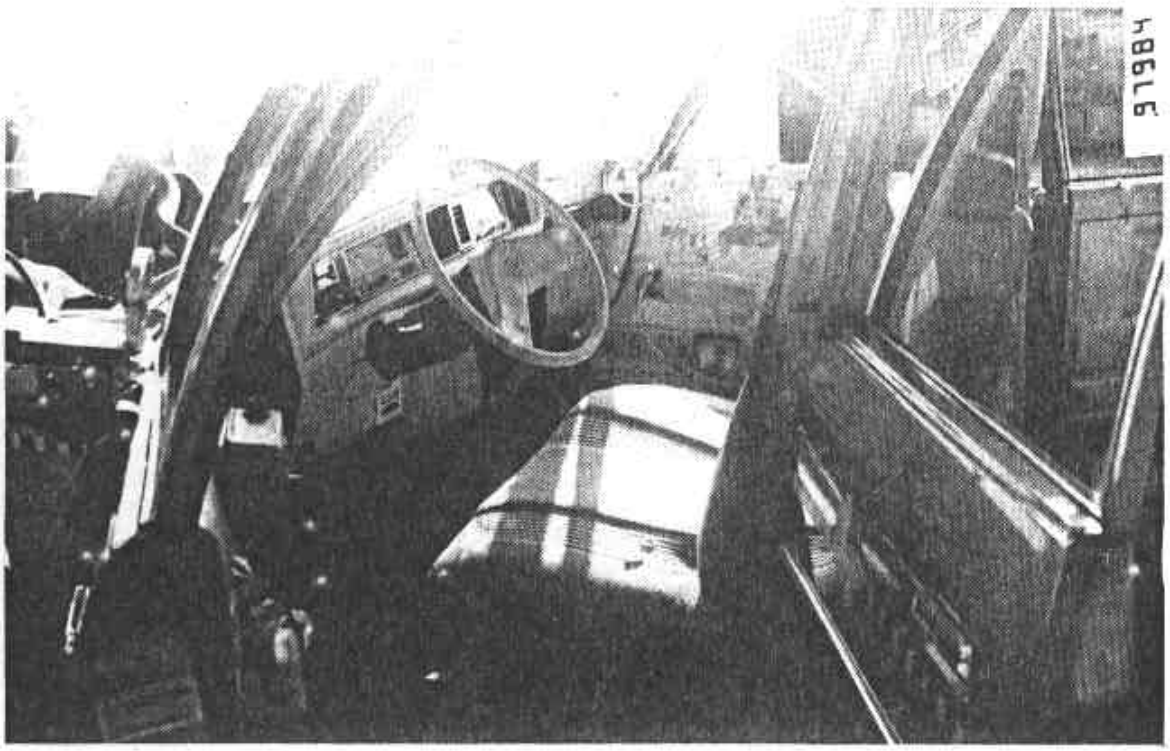


b) Post-test Front Passenger

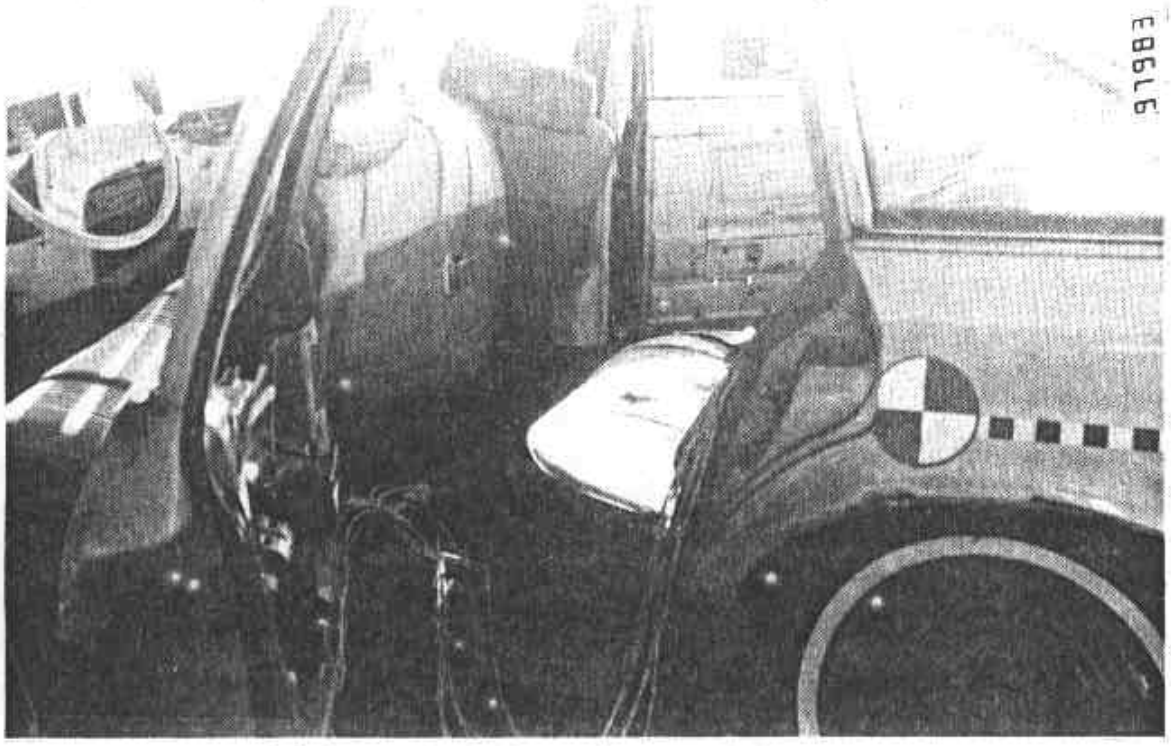


d) Post-test Rear Passenger

Figure 2-11. 1979 Oldsmobile Cutlass Salon Dummy Configuration (Test 8321-4.7).



a) Post-test Front Occupant Compartment



b) Post-test Rear Occupant Compartment

Figure 2-12. 1979 Oldsmobile Cutlass Salon Post-test Occupant Compartment (Test 8321-4.7).

TABLE 2-5. CHRONOLOGY OF CRASH EVENTS (TEST 8321-4.7)

VEHICLE: 1979 Oldsmobile Cutlass Salon 4-door Sedan

Time (msec)	Event
0	Impact (visual).
18	Windshield cracked and intrusion of front door panel began.
20	Row of honeycomb behind Side Impactor bumper separated from left side of honeycomb face.
22	B-pillar struck by Side Impactor; dummies' heads began lateral motion toward right.
24	B-pillar intrusion began.
33	Front dummy's torso started lateral motion toward right.
40	Right rear door pulled out of latch, but did not open; front dummy's hip is struck by arm rest.
43	Car began to move down track.
47	Right front side window broke; rear dummy's knees struck by rear door panel; C-pillar struck by Side Impactor.
51	Front dummy struck in shoulder by door panel.
53	Right rear window broke.
64	Side Impactor bumper recontacted honeycomb on left side; front dummy's torso rebounds from door panel.
70	Front seat buckled, pitching front dummy forward.
78	Rear dummy head struck on C-pillar.
83	Rear dummy's hip and shoulder struck by door panel.
101	Rear dummy's torso rebounds from door panel.
105	Rear dummy's head rebounds from C-pillar.
143	Front dummy raised off front seat and struck pelvis on steering wheel.
170	Front dummy struck windshield with left elbow.
238	Front dummy struck windshield with head.
350	Maximum vehicle roll (-6.5°).

TABLE 2-6. SUMMARY OF POST-TEST OBSERVATIONS (TEST 8321-4.7)

VEHICLE: 1979 Oldsmobile Cutlass Salon 4-door Sedan

Dummy Contact Points:	Right Front	Right Rear
Head	None	C-pillar
Shoulder	Door panel	Door panel
Hip	Arm rest	Door panel

Glazing: Right side windows broke out. Front windshield broken but 100% retained.

Doors: Right doors would not open. Left doors were welded shut before the test.

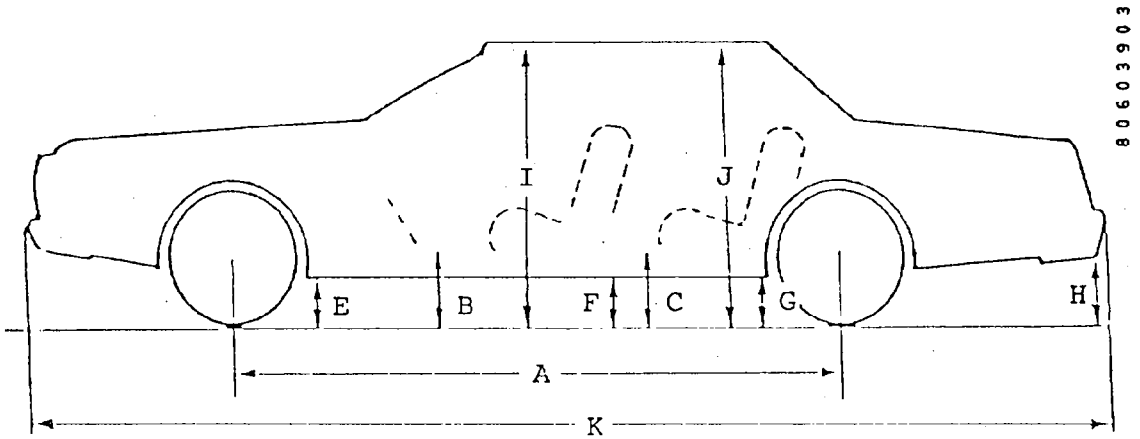
Seat Anchorages and Restraints: Front seat severely buckled on right side. Rear seat slightly buckled.

Side Impactor Centerline to Track Centerline: Front and rear 3 inches left.

Fuel Leakage: None

General Observations: Front door pushed over rocker sill and approximately 18 inches into the occupant compartment. Welds at top of B-pillar all broken. The hinges on the front door were bent but still attached to the A-pillar. Vehicles 44 feet apart post-impact. Side impactor bumper pulled out on left side due to tensile failure of honeycomb.

TABLE 2-7. PRE-TEST AND POST-TEST DIMENSION MEASUREMENTS (TEST 8321-4.7)



VEHICLE: 1979 Oldsmobile Cutlass Salon 4-door Sedan

	Pre-test (in.)		Post-test (in.)		Difference (in.)	
	LS	RS	LS	RS	LS	RS
A	105.0	108.6	104.1	109.9	0.9	-1.3
B	-	14.1	-	13.6	-	-0.5
C	-	14.4	-	13.3	-	-1.1
E	8.5	11.2	8.0	11.4	-0.5	0.2
F	8.3	11.3	8.3	11.7	0.0	0.4
G	8.4	11.5	9.3	10.0	0.9	-1.5
H	12.5	15.8	13.3	17.1	0.8	1.3
I	52.6	55.1	52.4	57.8	-0.2	2.7
J	50.9	53.6	52.0	53.0	-1.1	-0.6
K	172.5	196.6	172.2	193.9	0.3	2.7

TABLE 2-8. TEST VEHICLE EXTERIOR PROFILES AND STATIC CRUSH (TEST 8321-4.7)

Location	R.P.* (in.)	Height (in.)	Zero Distance Starting at DOR (in.)																			
			90	84	78	72	66	60	54	48	42	36	30	24	18	12	6 (Front)	0	6	12	18	24
Pre-test Profile (Distance from R.P. - in.)																						
Axle Height	85	12.2					14.6	14.6	14.6	14.7	14.7	14.7	14.8	14.8	14.8	15.0	14.9	14.6	14.5			
Door Center	85	19.7				10.3	11.3	11.2	11.1	11.0	11.0	11.0	11.0	11.1	11.1	11.2	11.4	11.5	10.9	9.0	8.5	
Window Sill	85	35.1	12.3	12.2	12.1	12.1	12.0	12.0	12.0	12.0	12.0	12.1	12.1	12.2	12.3	12.5	12.6	12.7	11.9	11.5	11.3	10.8
Window Top	85	54.6			23.1	22.7	22.5	22.6	22.8	23.0	23.0	23.0	23.0	23.0								
Post-test Profile (Distance from R.P. - in.)																						
Axle Height	85	13.5					19.2	21.0	22.9	25.6	26.7	24.7	22.9	21.4	20.0	18.8	18.2	17.3	15.1			
Door Center	85	22.9				14.0	18.0	22.0	24.6	26.6	28.2	29.6	31.1	31.4	31.2	29.4	24.3	21.5	12.1	10.3	9.6	
Window Sill	85	34.8	12.9	13.0	13.2	14.0	17.3	20.2	23.4	26.4	27.5	25.5	24.0	22.6	21.5	20.1	18.5	16.5	13.0	12.3	11.5	10.5
Window Top	85	57.5			23.3	23.5	23.5	24.0	24.6	25.0	25.5	25.3	25.1	25.0								
Post-test Static Crush (in.)																						
Axle Height	0.0	1.3					4.6	6.4	8.3	10.9	12.0	10.0	8.1	6.6	5.2	3.8	3.3	2.7	0.6			
Door Center	0.0	3.2				3.7	6.7	10.8	13.5	15.6	17.2	18.6	20.1	20.3	20.1	18.2	12.9	10.0	1.2	1.3	1.1	
Window Sill	0.0	-0.3	0.6	0.8	1.1	1.9	5.3	8.2	11.4	14.4	15.5	13.4	11.9	10.4	9.2	7.6	5.9	3.8	1.1	0.8	0.2	-0.3
Window Top	0.0	2.9			0.2	0.8	1.0	1.4	1.8	2.0	2.5	2.3	2.1	2.0								

*Zero plane set up 10.0 inches left of left rocker sill.

AXLE LEVEL - 12.2 IN. ABOVE GROUND
1979 OLDSMOBILE CUTLASS SALON
(DATA FROM TABLE 2-8)
SCALE: 0 6 12 IN.

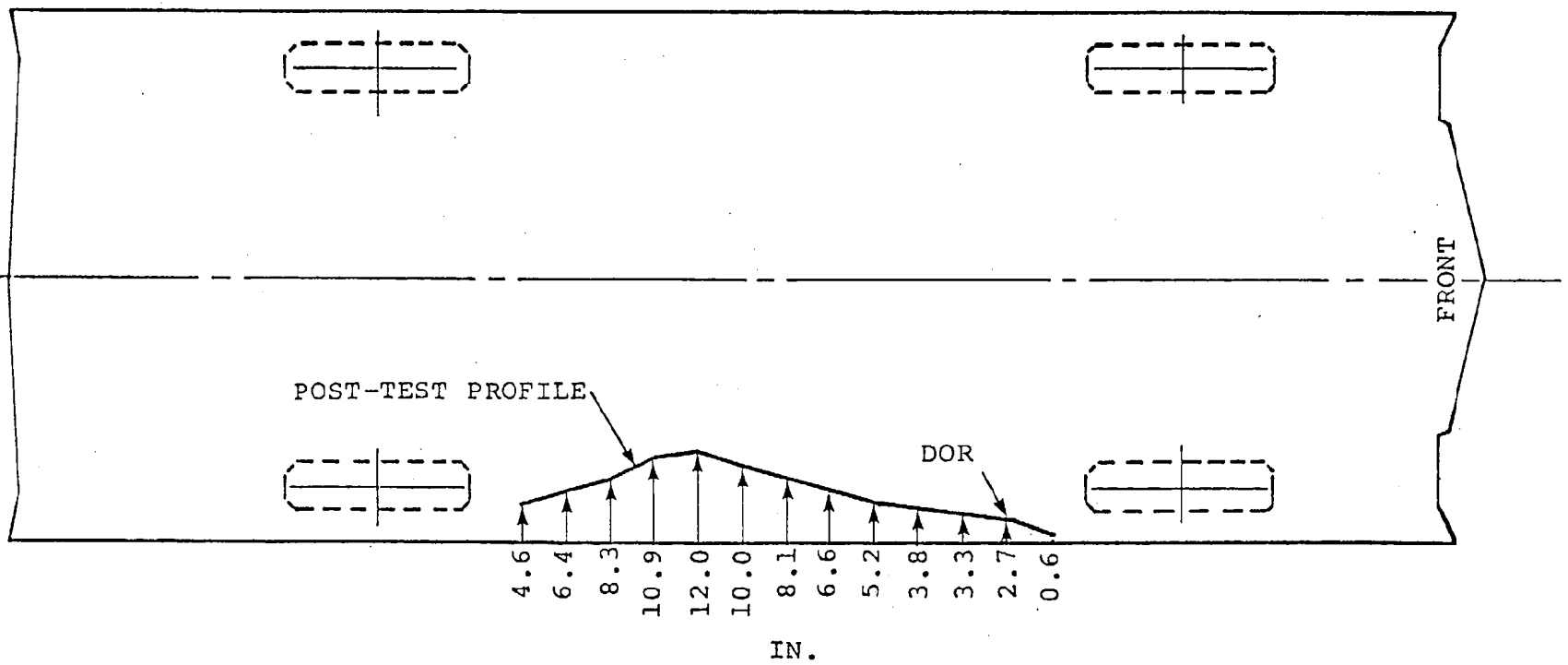


Figure 2-13. Exterior Vehicle Profile and Static Crush (Test 8321-4.7).

DOOR-CENTER LEVEL - 19.7 IN. ABOVE GROUND
1979 OLDSMOBILE CUTLASS SALON
(DATA FROM TABLE 2-8)
SCALE: 0 6 12 IN.

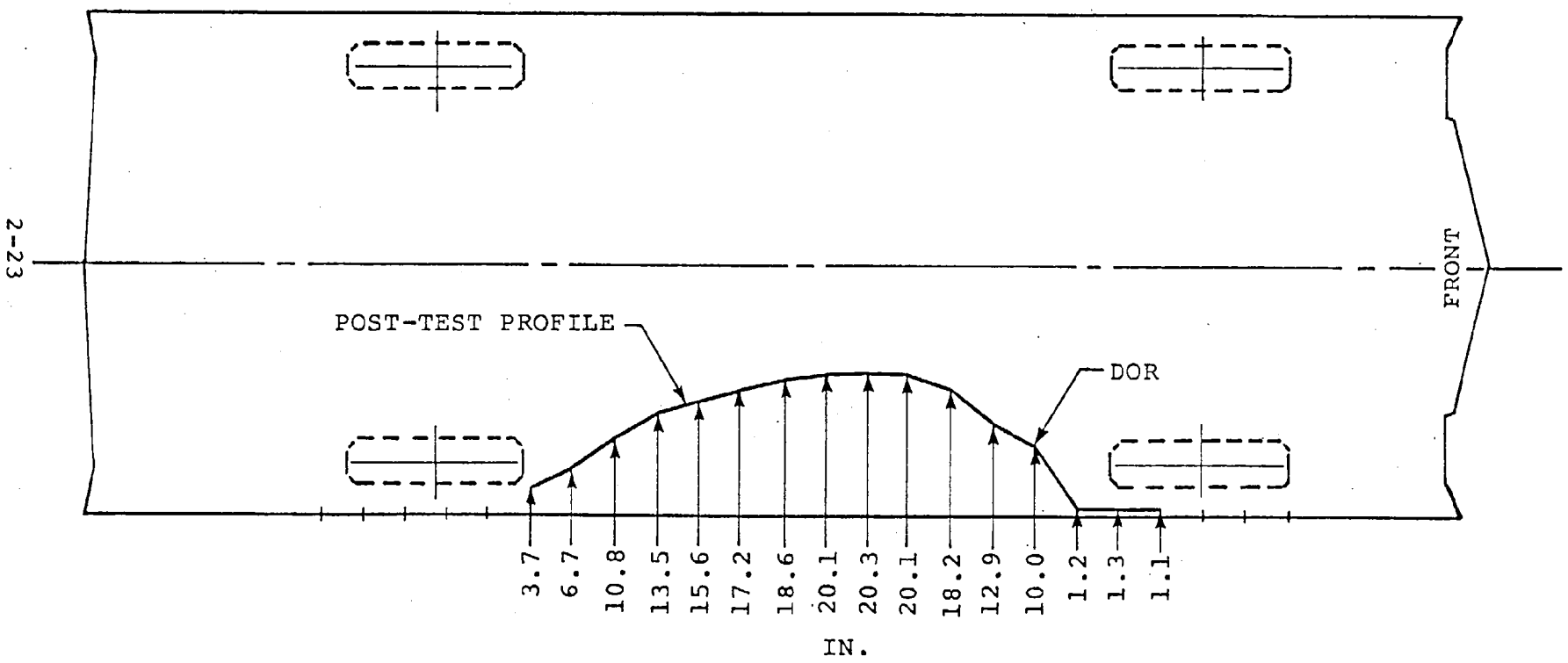


Figure 2-14. Exterior Vehicle Profile and Static Crush (Test 8321-4.7).

WINDOW SILL LEVEL - 35.1 IN. ABOVE GROUND
1979 OLDSMOBILE CUTLASS SALON
(DATA FROM TABLE 2-8)
SCALE: 0 6 12 IN.

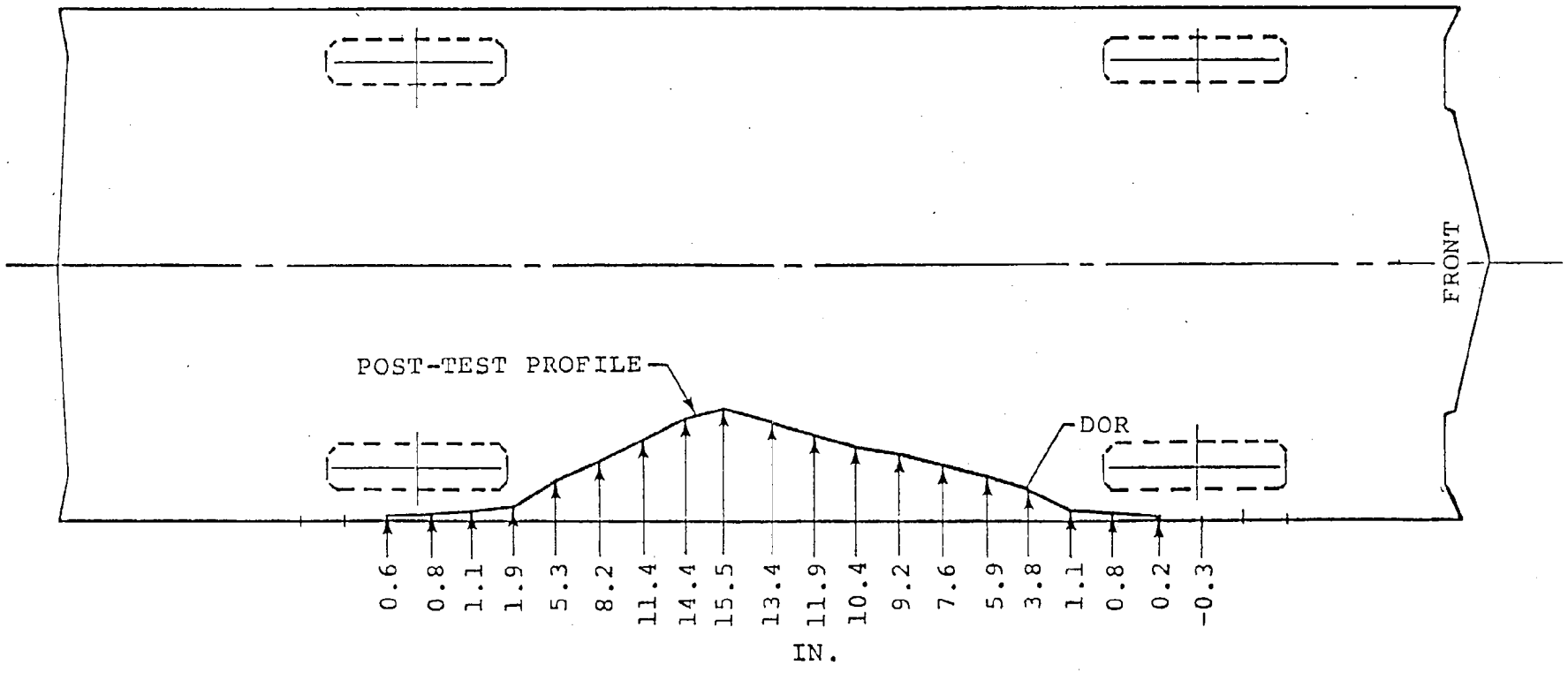


Figure 2-15. Exterior Vehicle Profile and Static Crush (Test 8321-4.7).

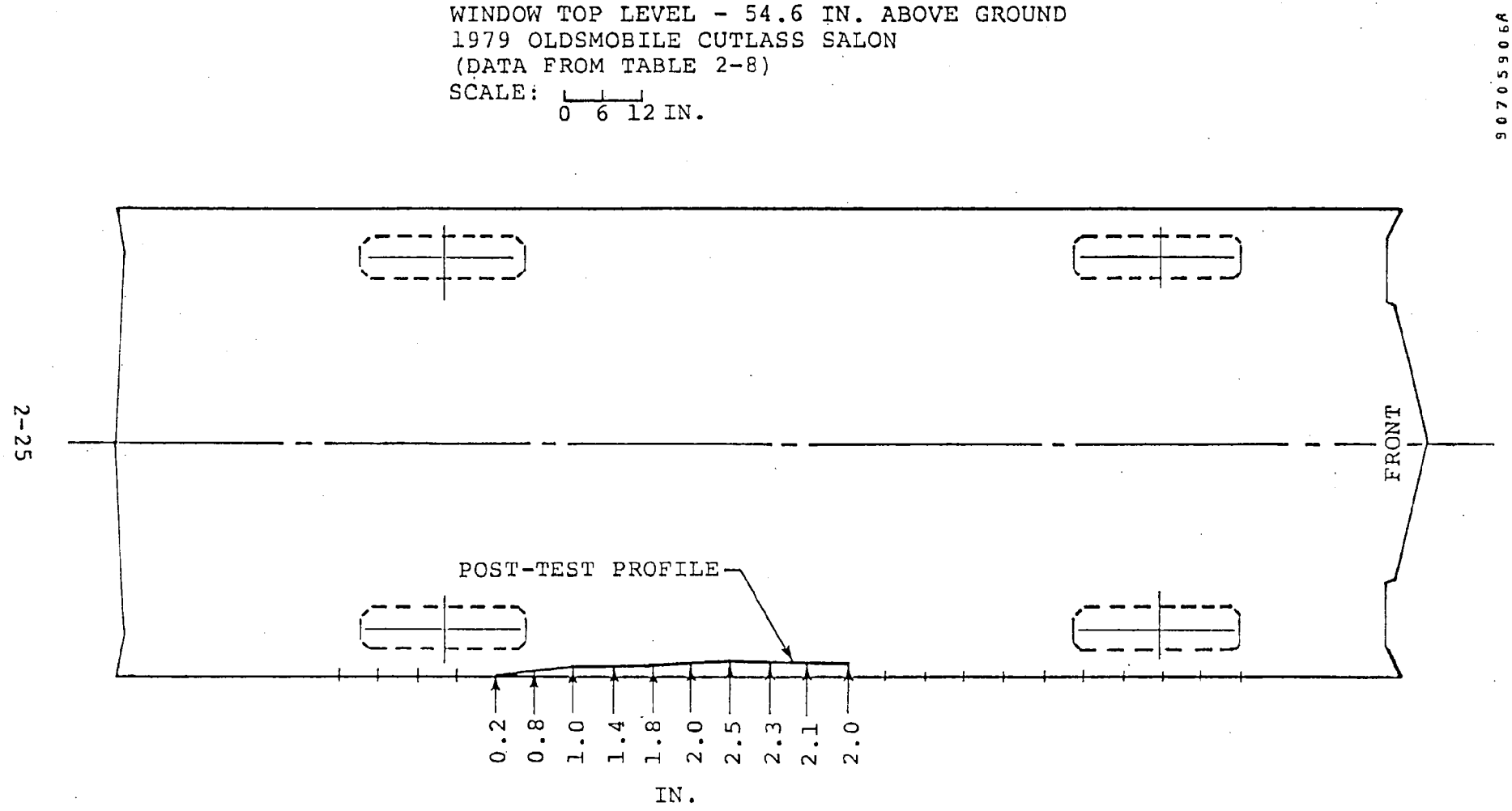


Figure 2-16. Exterior Vehicle Profile and Static Crush (Test 8321-4.7).

TABLE 2-9. VEHICLE INTERIOR INTRUSION (TEST 8321-4.7)

Location	Height @ B-pillar (in.)	Distance From Rearmost Edge of Rear Door Panel (in.) A-Pillar 66	60	54	48	42	36	B-pillar 30	24	18	12	C-pillar 6	0
Pre-test Width (in.)													
3/4-door Level	36.6		56.1	56.6	57.1	57.4	57.7	55.9	57.1	56.9	56.9	56.9	57.0
Door Beam Level	30.0		57.3	56.9	57.1	57.6	58.0	55.3	56.9	61.7	61.7	56.5	
1/4-door Level	22.6	55.4	55.7	56.3	56.6	56.4	55.9	51.1	56.1	56.0	55.9	55.7	
Post-test Width (in.)													
3/4-door Level	36.7		50.8	48.5	47.5	46.3	46.2	41.8	43.1	46.3	49.6	53.0	55.8
Door Beam Level	27.9		47.0	44.8	44.5	44.5	45.5	40.4	43.2	50.9	54.2	52.8	
1/4-door Level	20.0	43.9	42.2	41.2	41.0	40.0	37.9	35.9	42.6	46.3	49.4	50.2	
Post-test Static Intrusion (in.)													
3/4-door Level	0.1		5.3	8.1	9.6	11.1	11.5	14.1	14.0	10.3	7.0	3.9	1.2
Door Beam Level	-2.1		10.3	12.1	12.6	13.1	12.5	14.9	13.7	10.8	7.5	3.7	
1/4-door Level	-2.6	11.5	13.5	15.1	15.6	16.4	18.0	15.2	13.5	9.7	6.5	5.5	

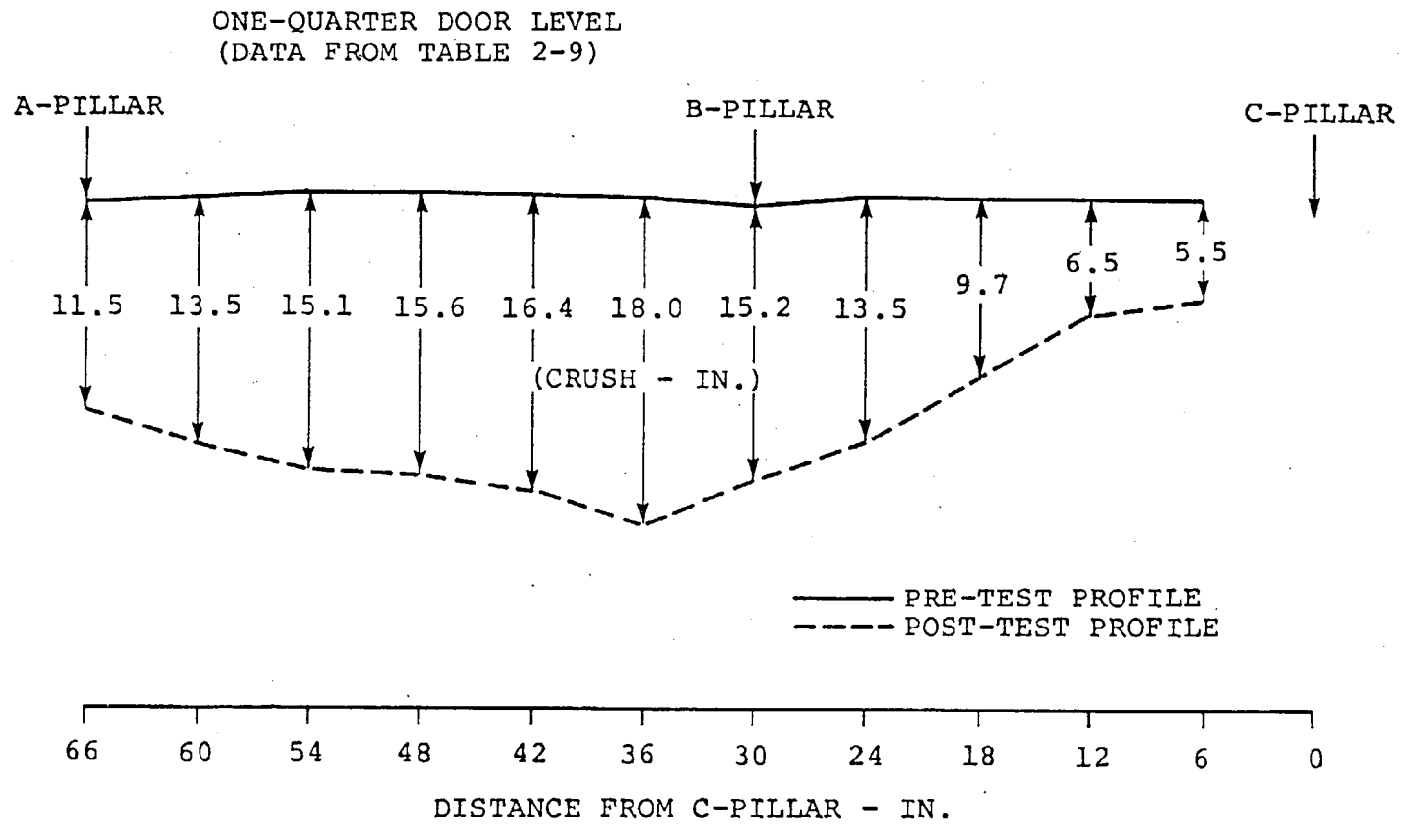


Figure 2-17. Interior Profile and Intrusion at One-quarter Door Level for 1979 Oldsmobile Cutlass (Test 8321-4.7).

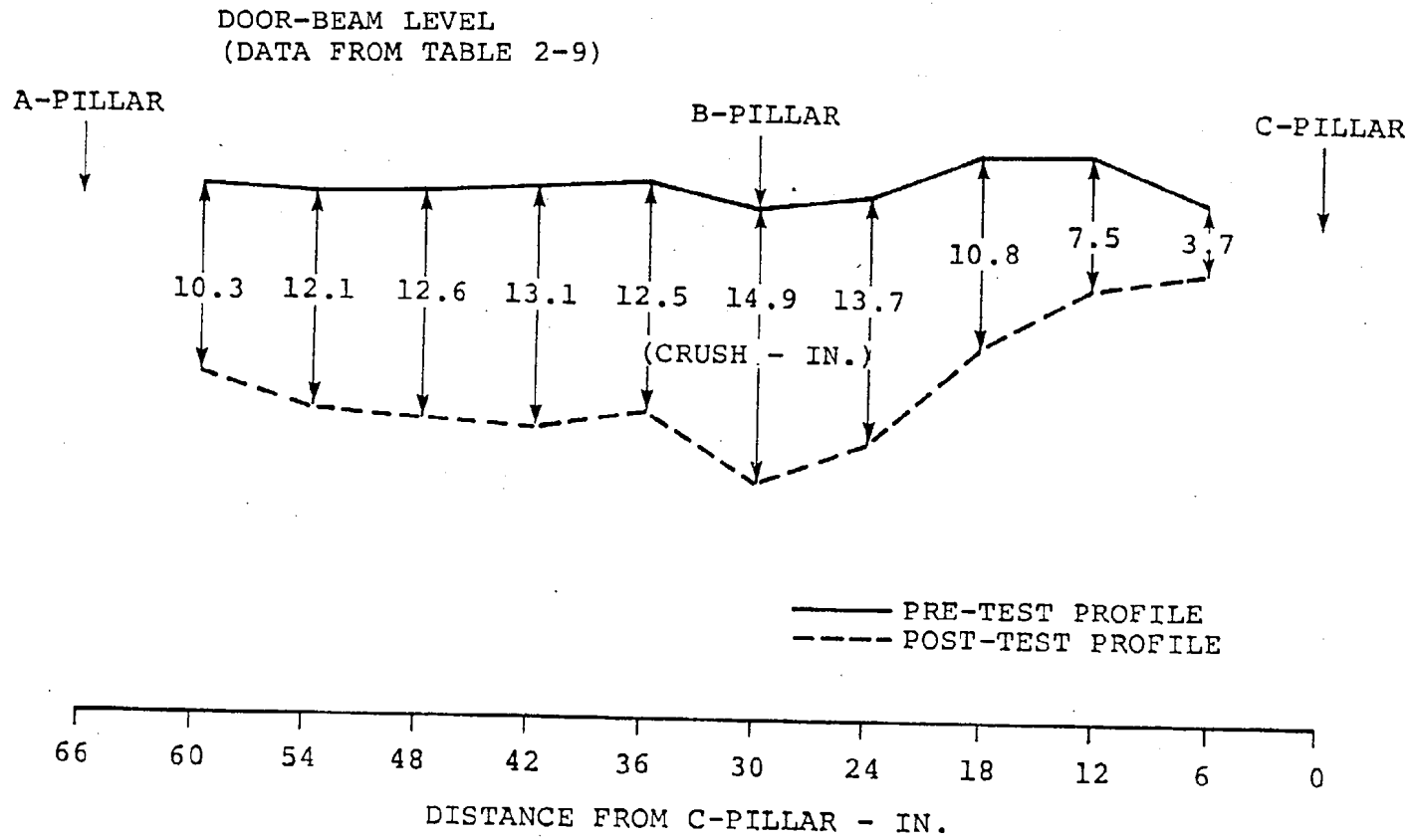


Figure 2-18. Interior Profile and Intrusion at Door Beam Level for 1979 Oldsmobile Cutlass (Test 8321-4.7).

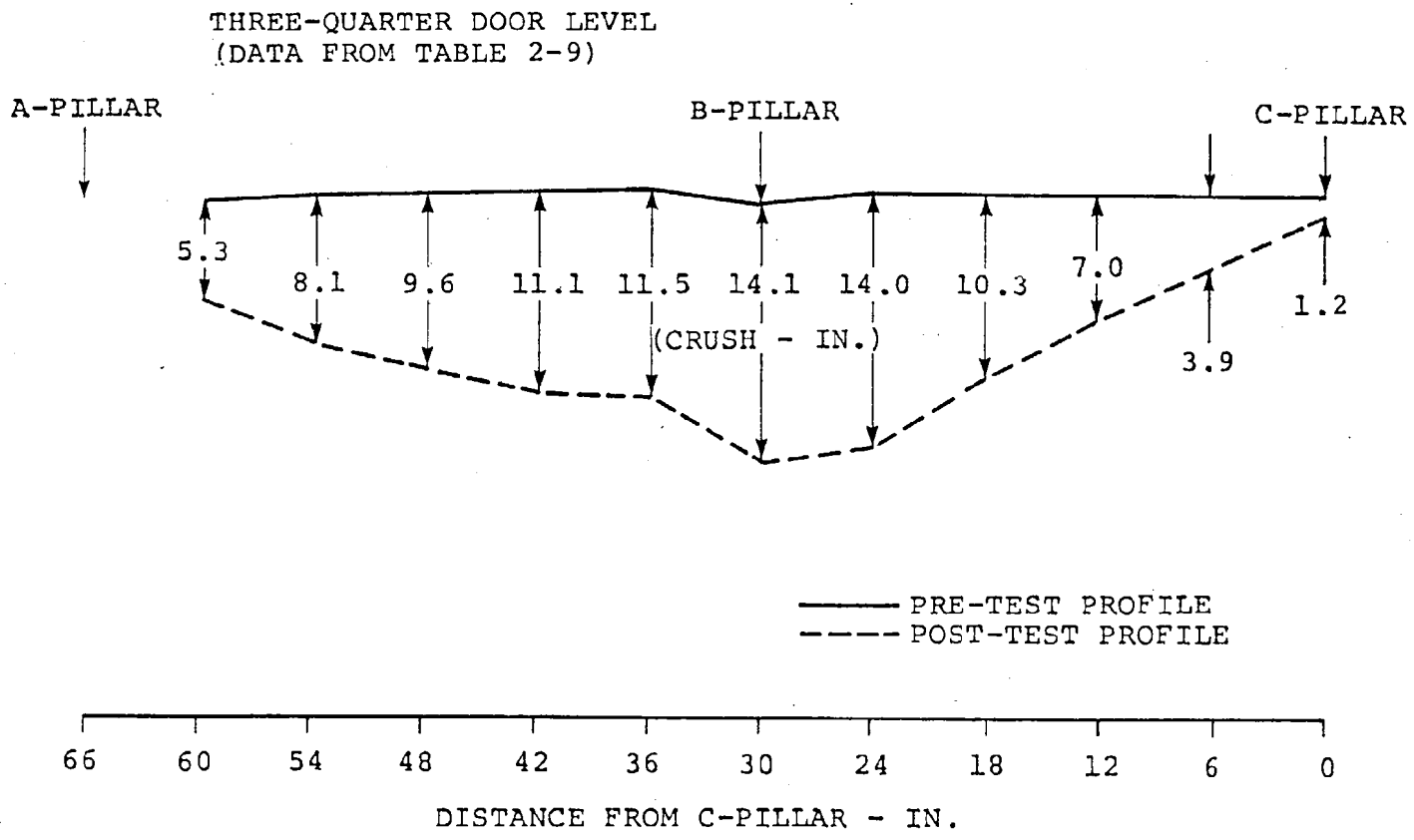


Figure 2-19. Interior Profile and Intrusion at Three-quarter Door Level for 1979 Oldsmobile Cutlass (Test 8321-4.7).

TABLE 2-10. SUMMARY OF TEST CAR ACCELEROMETER DATA (TEST 8321-4.7)

Accelerometer Number*	Maximum Acceleration A (G)	Maximum Acceleration Time (msec)	Maximum Velocity V (mph)	Maximum Velocity Time (msec)	Maximum Displacement (to 200 msec) S (in.)	Maximum Displacement (to 200 msec) Time (msec)
1X	10.3	33	4.7	137	10.0	200
1Y	-15.8	55	-11.7	156	-25.9	200
1Z	-14.4	43	-2.3	200	-4.7	200
2X	-10.3	33	-6.5	200	-14.3	200
2Y	-20.1	42	-17.6	148	-40.7	200
2Z	15.7	41	-1.8	93	-3.5	200
3X	17.9	76	-6.8	140	-12.6	200
3Y	-22.6	84	-20.4	146	-43.4	200
3Z	37.1	79	4.2	83	-0.5	69
4Y	-64.8	45	-15.1	81	-28.1	200
5Y	-69.8	26	-17.7	57	-40.8	200
6Y	-95.8	9	-27.1	65	-67.4	200
7X	-11.2	56	-5.6	144	-12.0	200
8X	-23.3	76	-7.5	99	-16.4	200
9Y	-125.8	33	-29.2	75	-66.7	200
10Y	53.0	51	-18.5	47	-46.8	200
11Y	97.2	33	-16.3	29	-39.8	200

*See Figure 2-1 for accelerometer locations.

TABLE 2-11. SUMMARY OF TEST CAR RESULTANT ACCELEROMETER DATA (TEST 8321-4.7)

Accelerometer Number*	Maximum Acceleration A (G)	Maximum Acceleration Time (msec)	Maximum Velocity V (mph)	Maximum Velocity Time (msec)	Maximum Displacement S (in.)	Maximum Displacement Time (msec)
Resultant Location 1	18.1	43	12.6	147	28.2	200
Resultant Location 2	24.7	41	18.7	197	43.2	200
Resultant Location 3	38.6	86	21.5	145	45.2	200

*See Figure 2-1 for accelerometer locations.

TABLE 2-12. SUMMARY OF CAR STRING POTENTIOMETER DATA (TEST 8321-4.7)

Displacement Potentiometer No.	Location*	Maximum Dynamic Displacement D (in.)	Maximum Dynamic Displacement Time (msec)	Static Displacement (in.)
1	Midfront door	13.4	115	11.2
2	Sill just ahead of front seat	17.2	105	11.8
3	Sill just behind front seat	13.8	108	13.3
4	B-pillar just below windowsill	10.8	114	9.4
5	Midtop door	9.2	100	10.9
6	B-pillar at top of window	3.9	117	2.7

*See Figure 2-2 for string potentiometer locations.

TABLE 2-13. DUMMY INJURY CRITERIA VALUES (TEST 8321-4.7)

Maximum Acceleration		Right Front Dummy (G)	Right Front Dummy Time (msec)	Right Rear Dummy (G)	Right Rear Dummy Time (msec)
Head	X	-13.2	62	-62.5	87
	Y	-20.8	51	-76.2	87
	Z	31.7	58	23.2	102
	R	34.1	62	99.0	87
Chest	X	31.1	72	-21.3	96
	Y	-63.4	45	-62.8	83
	Z	-17.1	53	-13.3	82
	R	65.1	45	63.9	83
Pelvis	X	-34.7	55	-32.3	55
	Y	-100.2	54	-61.4	87
	R	102.5	54	62.1	87
Injury Criteria*					
HIC		61	44-94	453	84-92
Chest Resultant Acceleration**		48.3	54	51.5	86
Severity Index					
Head		95	200	572	200
Chest		249	200	253	200

*As defined in FMVSS No. 208.
**3 msec clip.

TABLE 2-14. SUMMARY OF TIME OF IMPACTS

Impact Switch No.	Location of Switch*	Time of Impact of Specific Switch
1 - Test Car	Initial point of impact (134.5 in.)*	0 msec
2 - Test Car	B-pillar (91.0 in.)	25 msec
3 - Test Car	C-pillar (69.0 in.)	52 msec

*Numbers in parentheses indicate switch distance from rear bumper.

TABLE 2-15. SUMMARY OF SIDE IMPACTOR ACCELEROMETER DATA (TEST 8321-4.7)

Accelerometer Number**	Maximum Acceleration		Maximum/Minimum Velocity*		Maximum Displacement	
	A (G)	Time (msec)	V (mph)	Time (msec)	S (in.)	Time (msec)
1X	-13.2	76	13.7	157	75.8	200
2X	-12.4	67	15.0	165	78.7	200
3Y	4.6	86	-2.3	76	-4.5	200
4Y	-2.7	32	-3.8	124	-8.7	200

*Minimum Velocity for X-component, Maximum Velocity for Y-component.
**For location of accelerometers, see Figure 2-1.

TABLE 2-16. SIDE IMPACTOR HONEYCOMB POST-TEST CRUSH PROFILE (TEST 8321-4.7)

Crush Location*	Change in Height (in.)	Crush ℄ (in.) Column Designations* Right 1	2	3	4	5	6	7	8	9	10	Left 11	12	13
Row G	-0.9	14.2	12.0	8.2	4.9	1.7	0.2	-0.2	-0.1	-0.1	1.5	0.3	0.0	0.0
Row F	-0.9	13.8	11.0	7.6	5.1	1.7	0.4	0.4	0.2	0.2	2.4	0.0	0.0	0.0
Row E	-1.6	8.0	7.4	5.1	3.6	2.2	0.6	0.5	0.4	0.4	0.5	0.4	0.0	0.0
Row D	-0.1	7.0	6.2	5.5	5.9	4.4	3.7	-0.1	0.0	0.5	0.2	-0.2	0.0	-0.1
Row C	0.4	9.8	9.3	8.5	7.7	8.1	6.3	5.6	4.8	4.0	3.3	2.6	1.8	1.4
Row B	0.6	10.7	9.3	8.7	7.9	7.1	6.6	5.7	4.9	4.3	3.6	2.8	2.0	1.6
Row A	0.8	9.9	9.5	9.0	8.0	7.4	6.5	5.9	5.1	4.4	3.7	2.9	2.1	1.6

*See Figure 2-2.

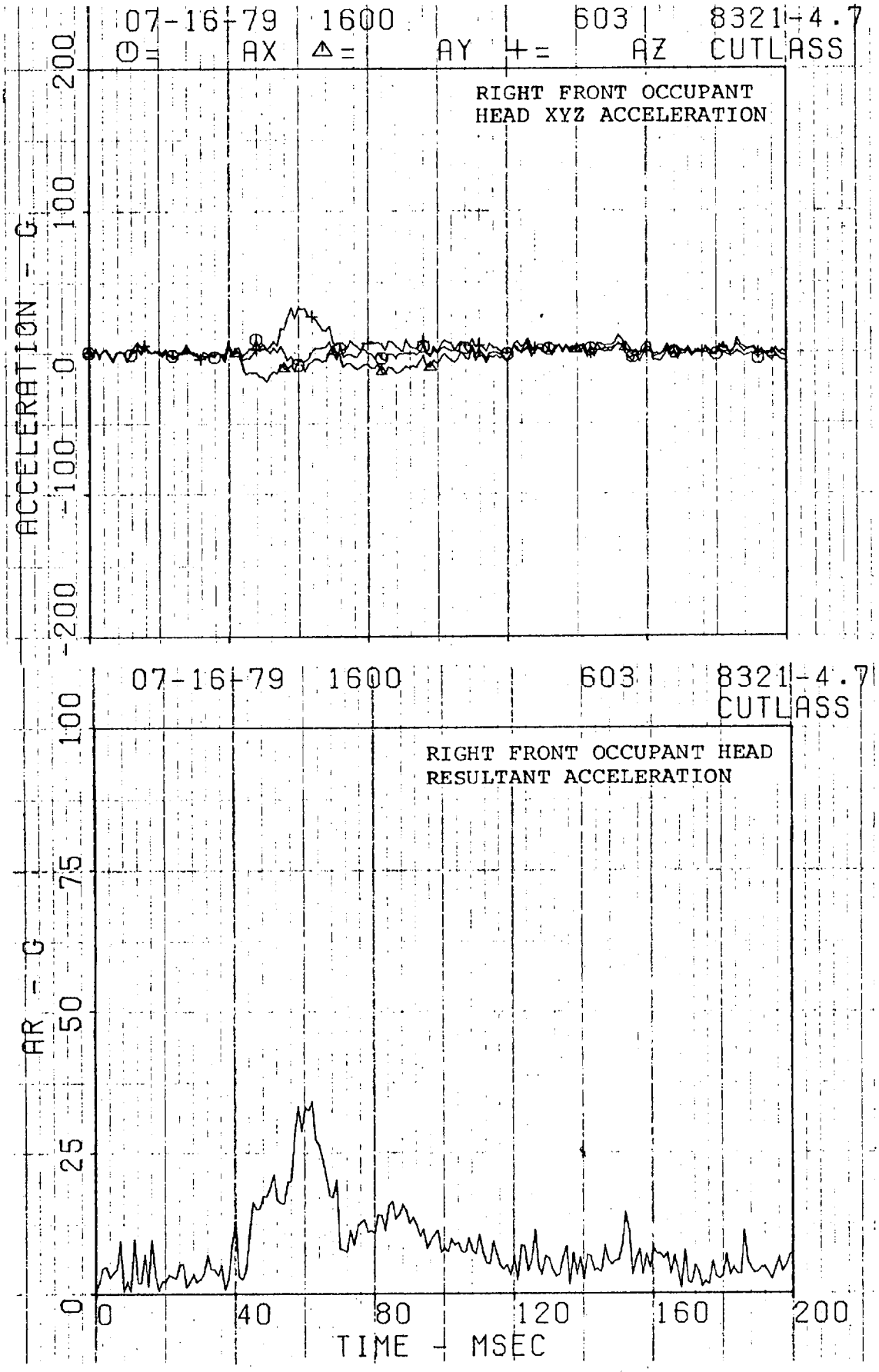
TABLE 2-17. SUMMARY OF SIDE IMPACTOR STRING POTENTIOMETER DATA (TEST 8321-4.7)

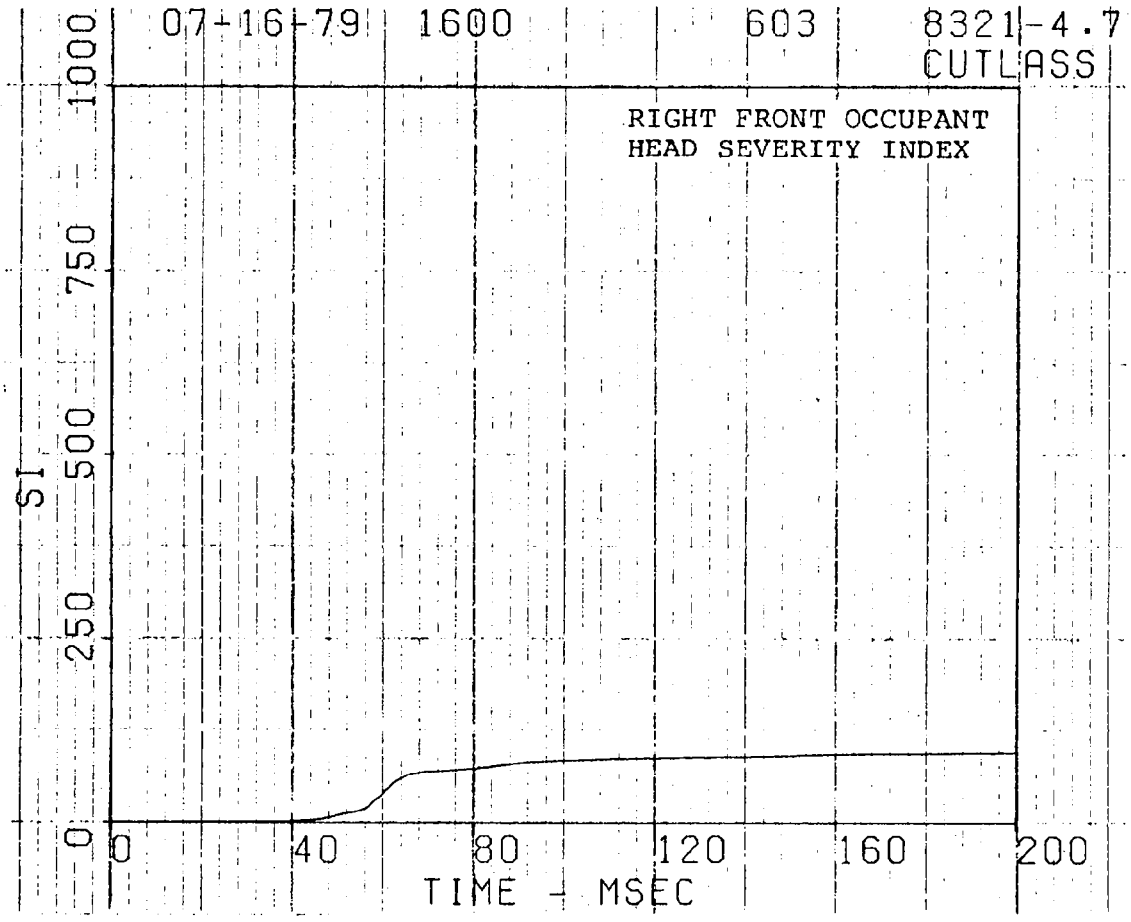
Displacement Potentiometer No.	Location*	Maximum Dynamic Displacement D (in.)	Maximum Dynamic Displacement Time (msec)	Residual Static Displacement (in.)
1	Bumper (right side)	8.6	56	9.8
2	Bumper (left side)	0.6	102	0.4
3	Honeycomb (right side)	11.1	195	13.8
4	Honeycomb (10" from right side)	6.2	115	7.6
5	Honeycomb at bogey C	0.7	166	0.4

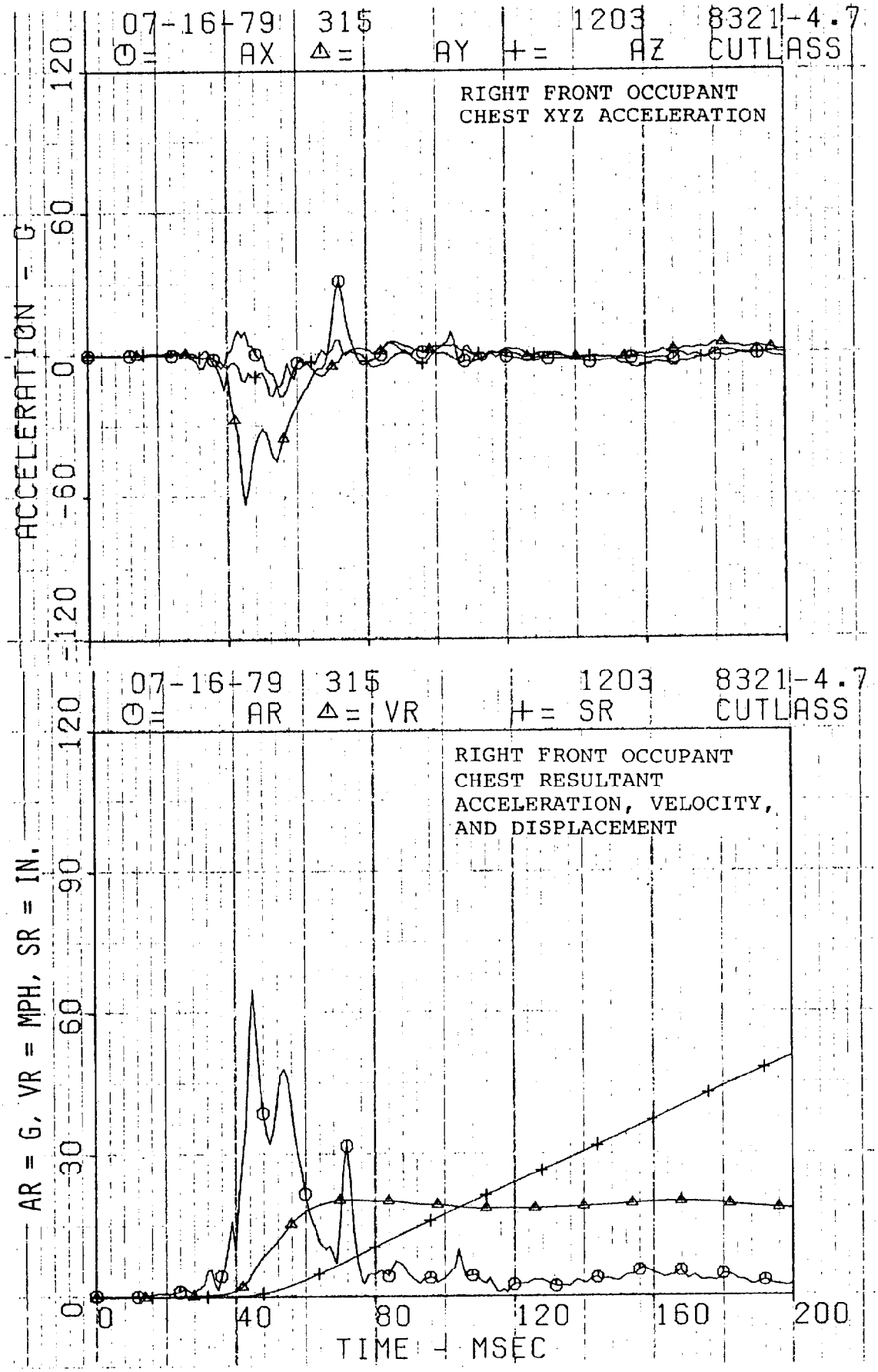
*For string potentiometer locations, see Figure 2-4.

APPENDIX A

CALCOMP PLOTS FOR TEST 8321-4.7


07-16-79 1600 603 8321-4.7
⊖= AX △= AY += AZ CUTLASS
RIGHT FRONT OCCUPANT
HEAD XYZ ACCELERATION
ACCELERATION - G
200
100
-0
-100
-200
07-16-79 1600 603 8321-4.7
CUTLASS
RIGHT FRONT OCCUPANT HEAD
RESULTANT ACCELERATION
AR - G
100
75
50
25
0
0
40
80
120
160
200
TIME - MSEC


07-16-79
1600
603
8321-4.7
CUTLASS
RIGHT FRONT OCCUPANT
HEAD SEVERITY INDEX
SI
1000
750
500
250
0
0
40
80
120
160
200
TIME - MSEC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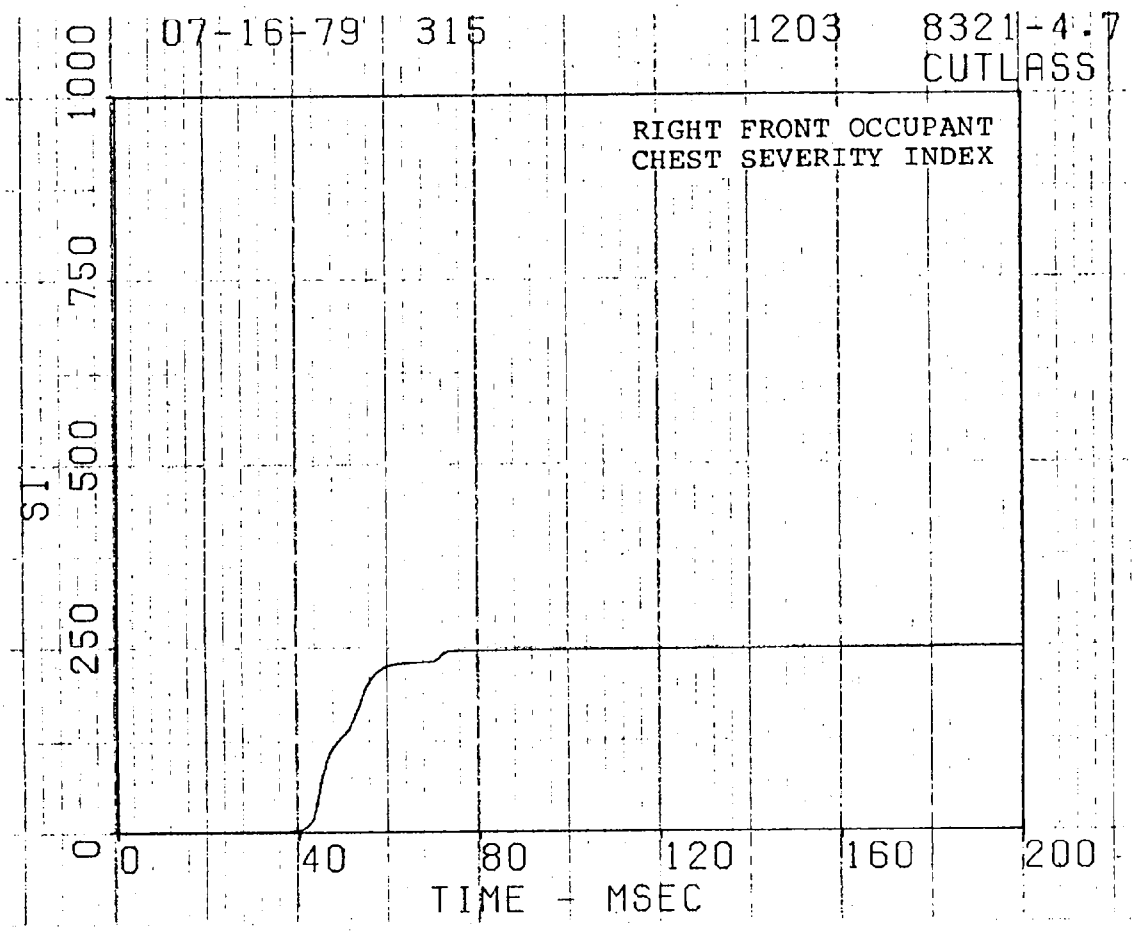
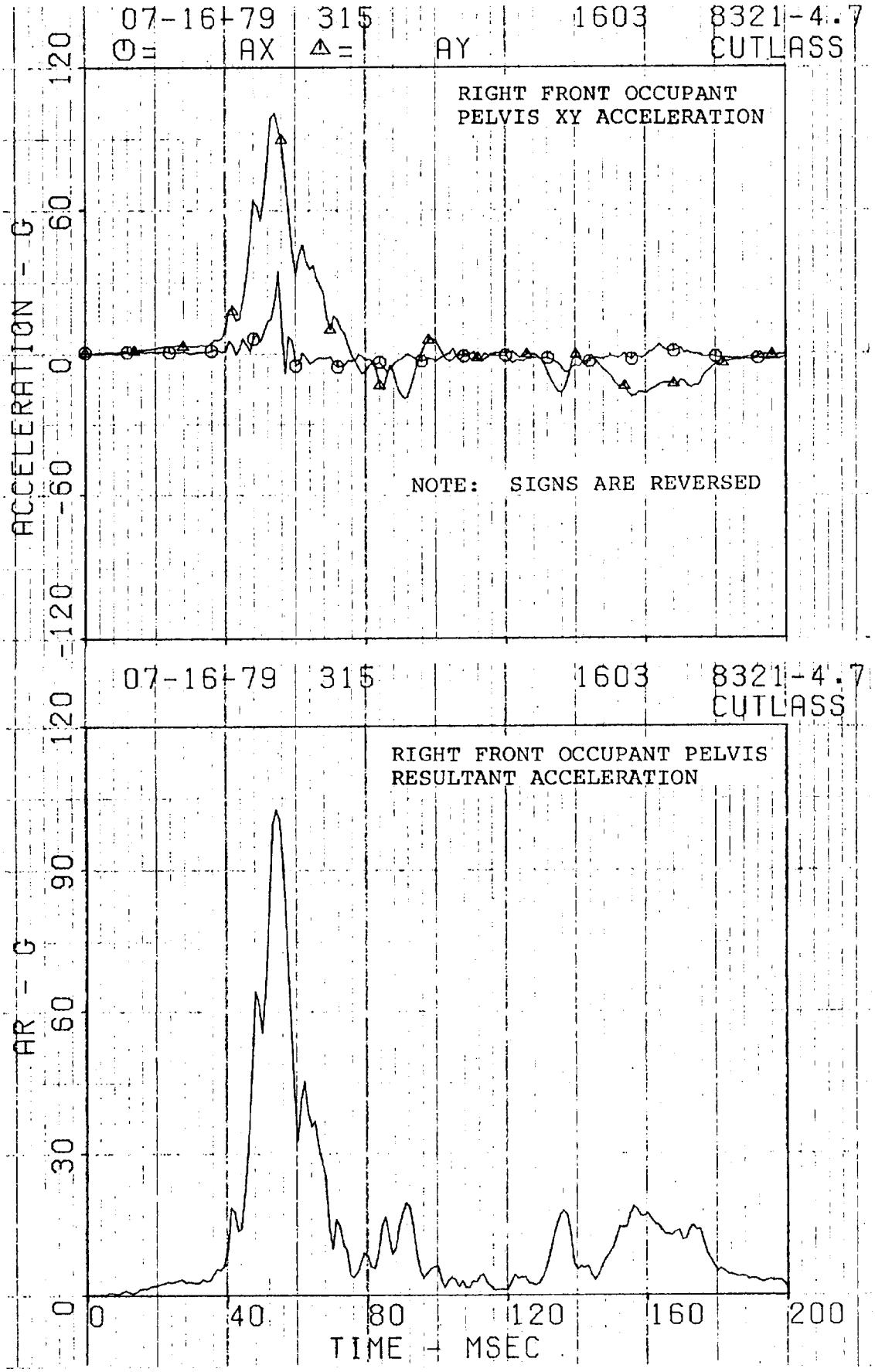
Θ= AX Δ= AY += AZ CUTLASS
RIGHT FRONT OCCUPANT
CHEST XYZ ACCELERATION
ACCELERATION = G
120
60
0
-60
-120
07-16-79 315 1203 8321-4.7
Θ= AR Δ= VR += SR CUTLASS
RIGHT FRONT OCCUPANT
CHEST RESULTANT
ACCELERATION, VELOCITY,
AND DISPLACEMENT
AR = G, VR = MPH, SR = IN.
120
90
60
30
0
0
40
80
120
160
200
TIME - MSEC


07-16-79
315
1203
8321-4.7
CUTLASS
RIGHT FRONT OCCUPANT
CHEST SEVERITY INDEX
SI
1000
750
500
250
0
0
40
80
120
160
200
TIME - MSEC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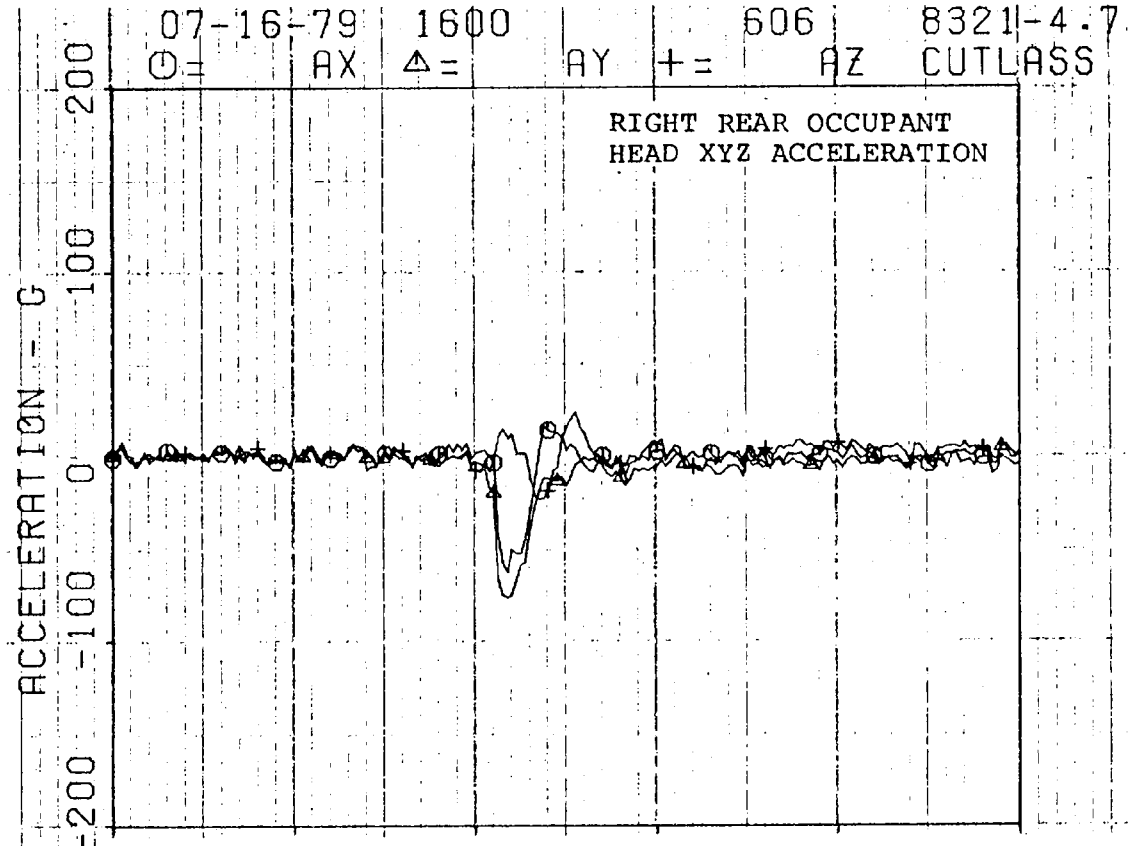
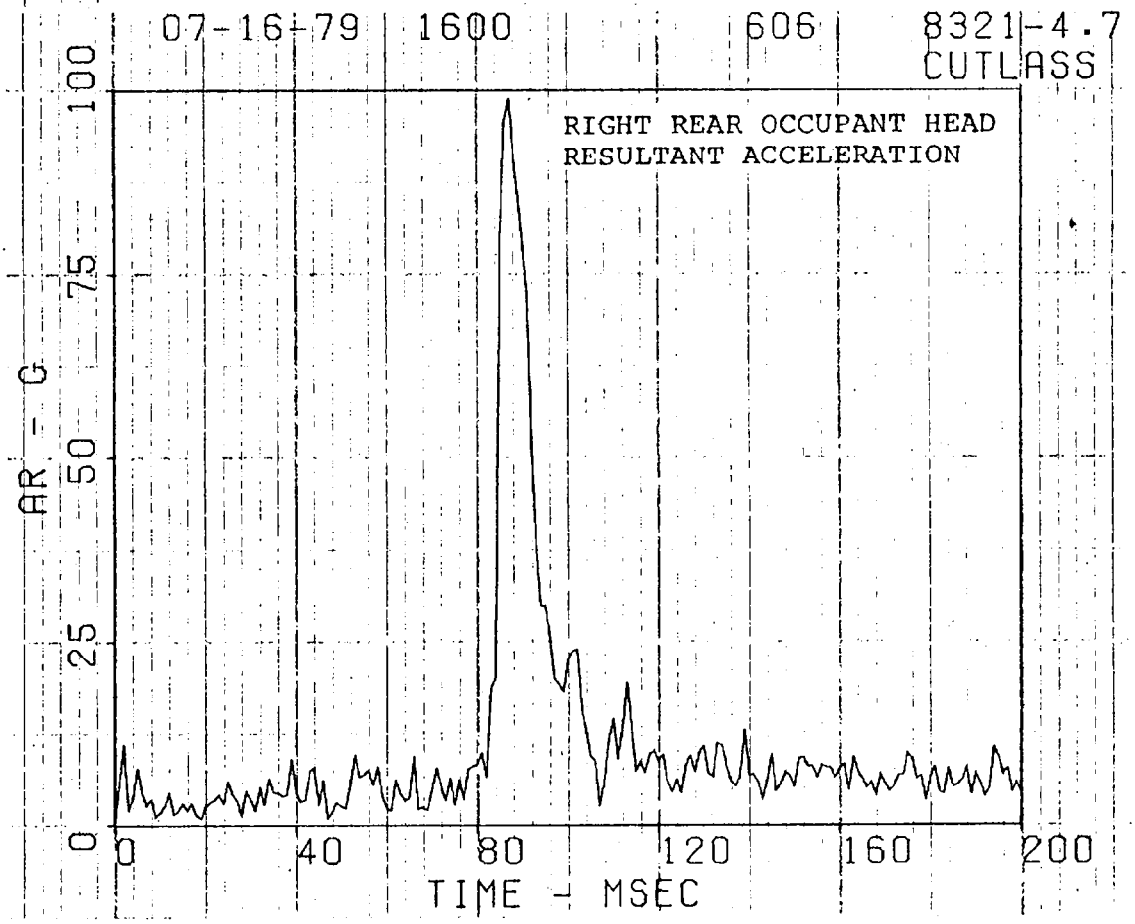
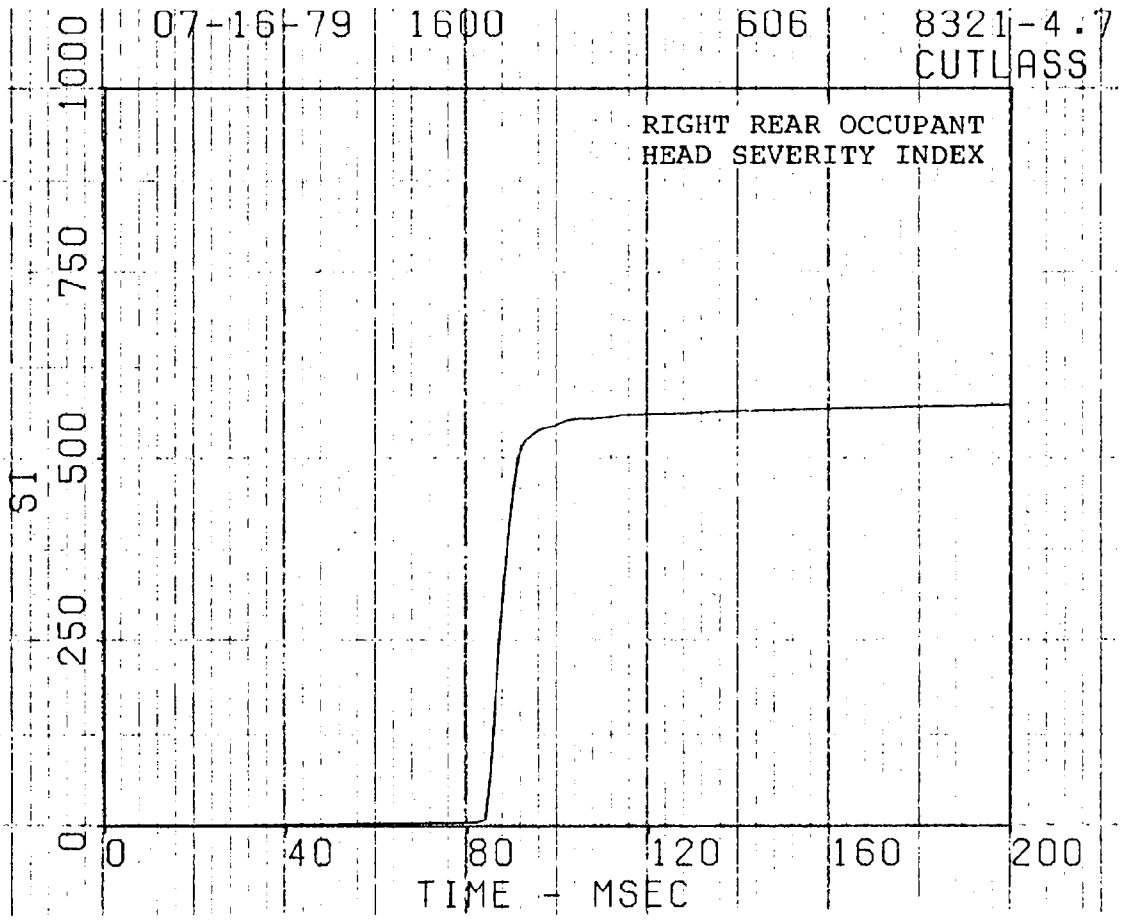
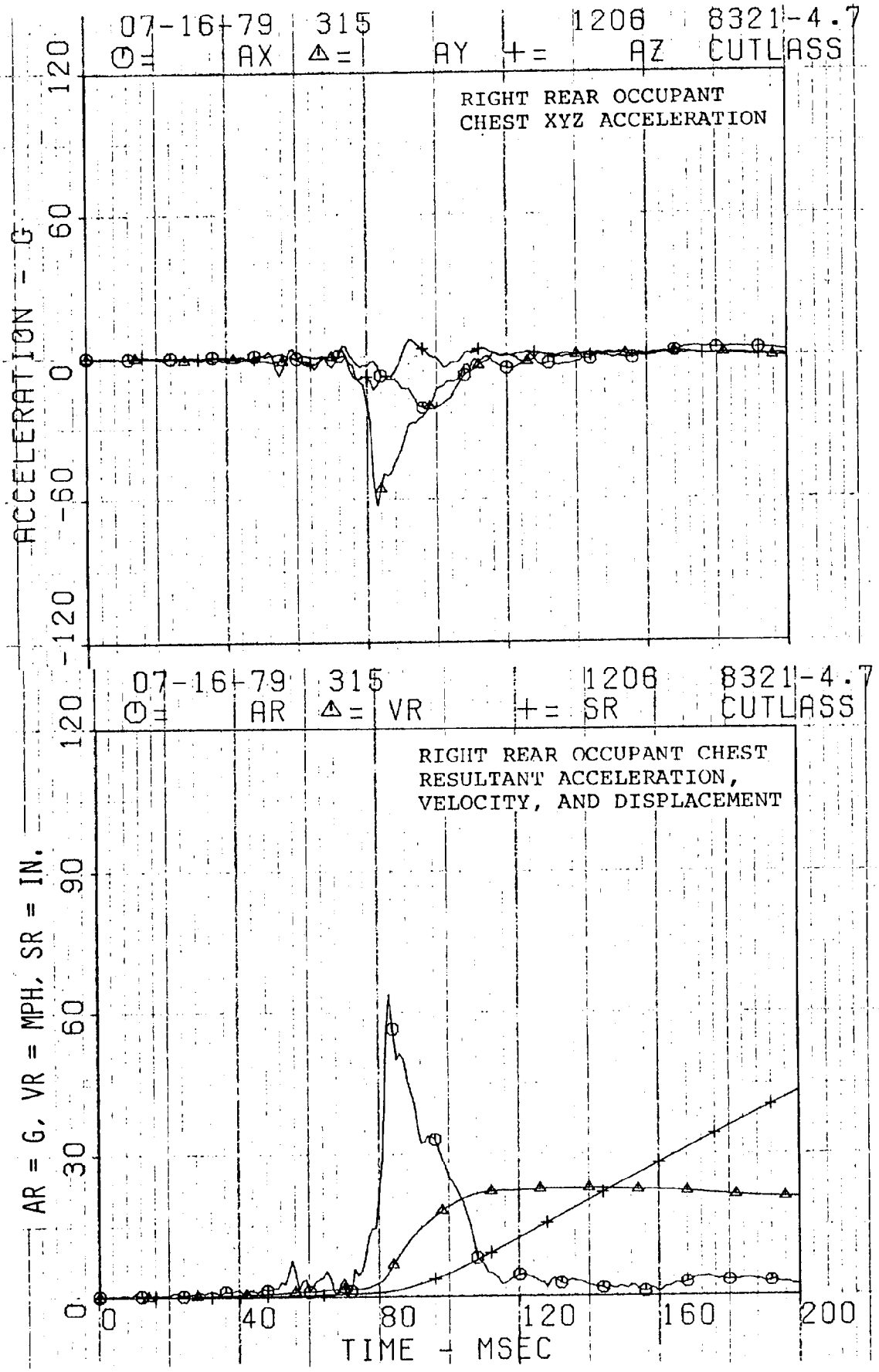
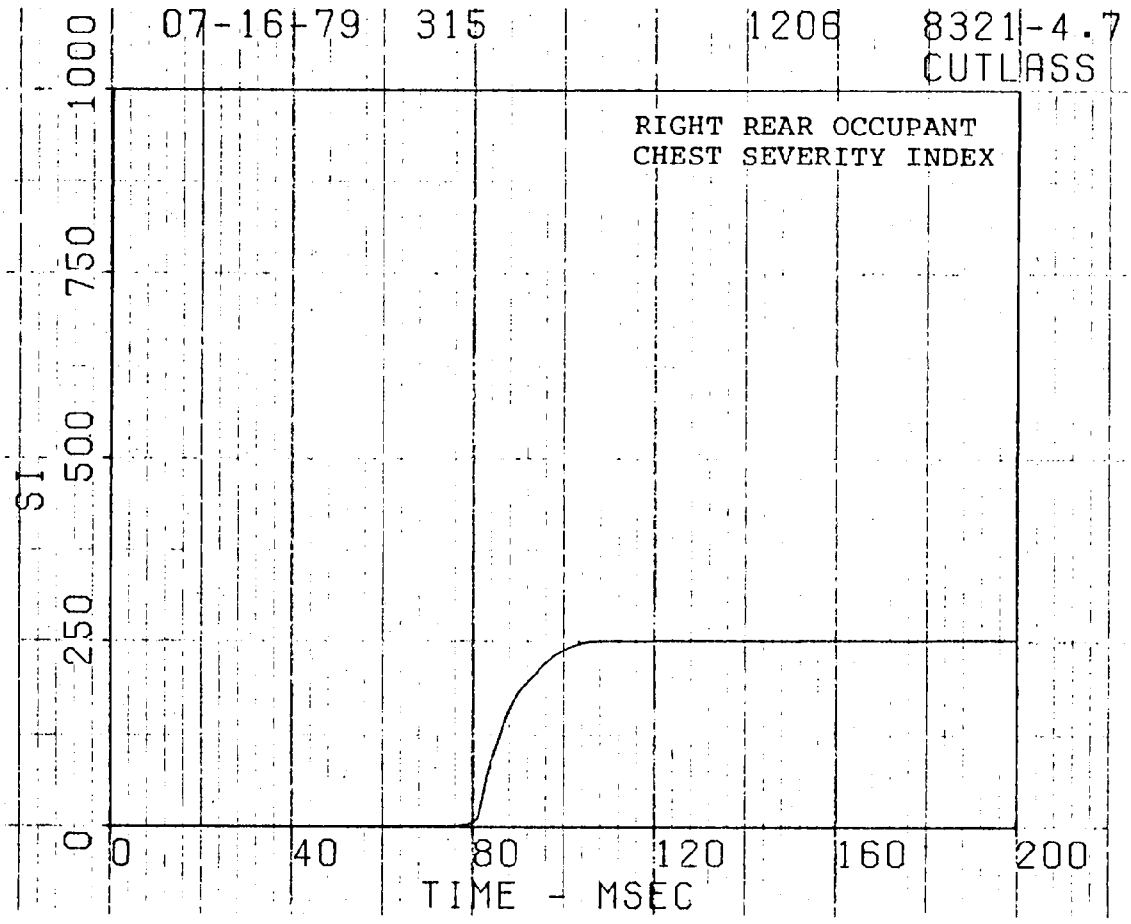
○= AX △= AY CUTLASS
RIGHT FRONT OCCUPANT
PELVIS XY ACCELERATION
NOTE: SIGNS ARE REVERSED
ACCELERATION - G
120
60
0
-60
-120
07-16-79 315 1603 8321-4.7
CUTLASS
RIGHT FRONT OCCUPANT PELVIS
RESULTANT ACCELERATION
AR - G
120
90
60
30
0
0
40
80
120
160
200
TIME - MSEC

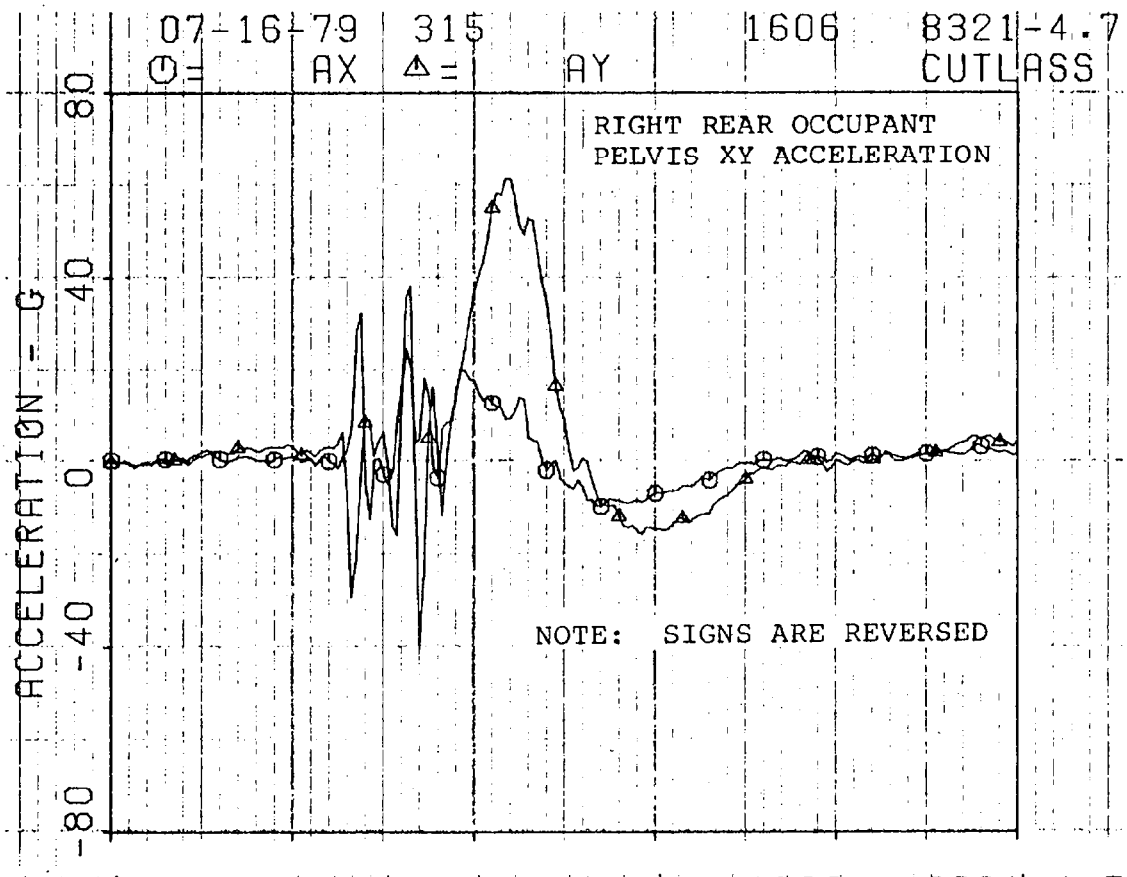

07-16-79 1600 606 8321-4.7
⊙= AX △= AY += AZ CUTLASS
RIGHT REAR OCCUPANT
HEAD XYZ ACCELERATION
ACCELERATION - G
200
100
0
-100
-200

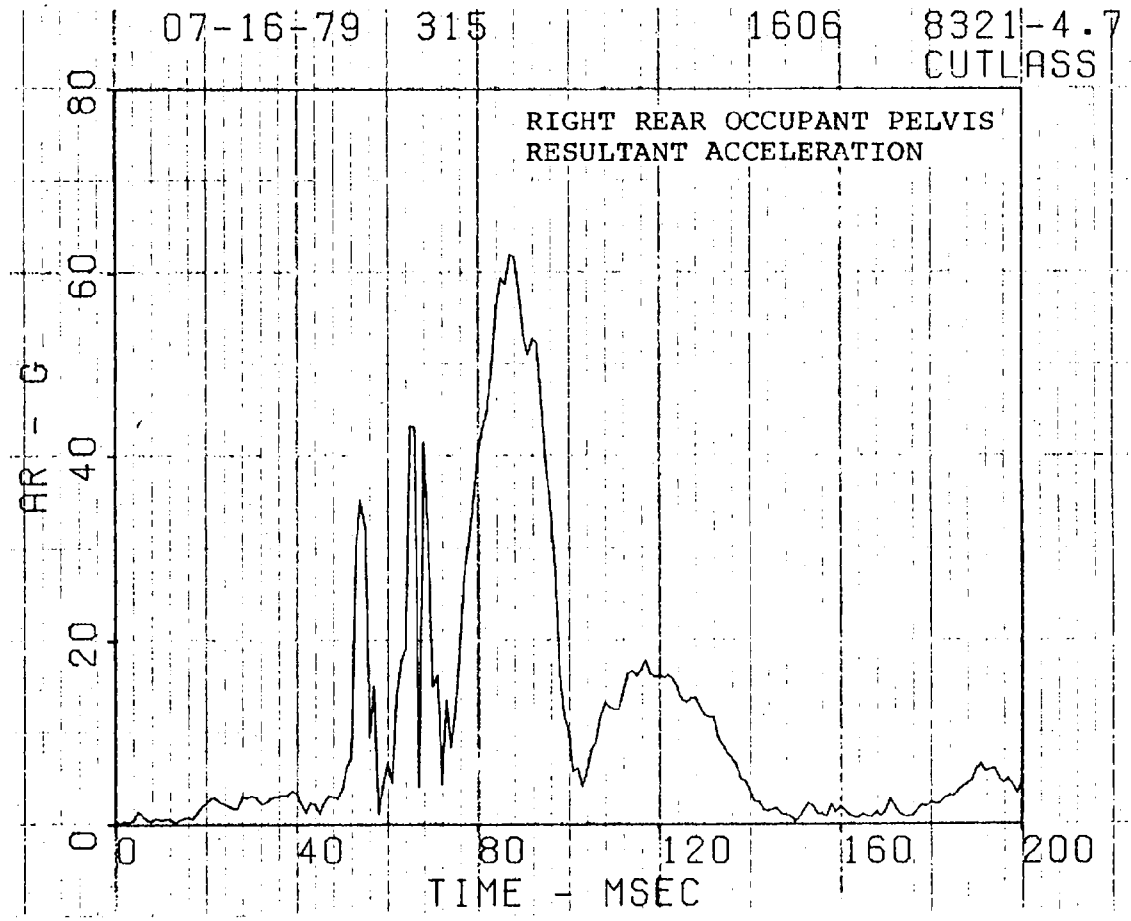

07-16-79 1600 606 8321-4.7
CUTLASS
RIGHT REAR OCCUPANT HEAD
RESULTANT ACCELERATION
AR - G
100
75
50
25
0
0
40
80
120
160
200
TIME - MSEC

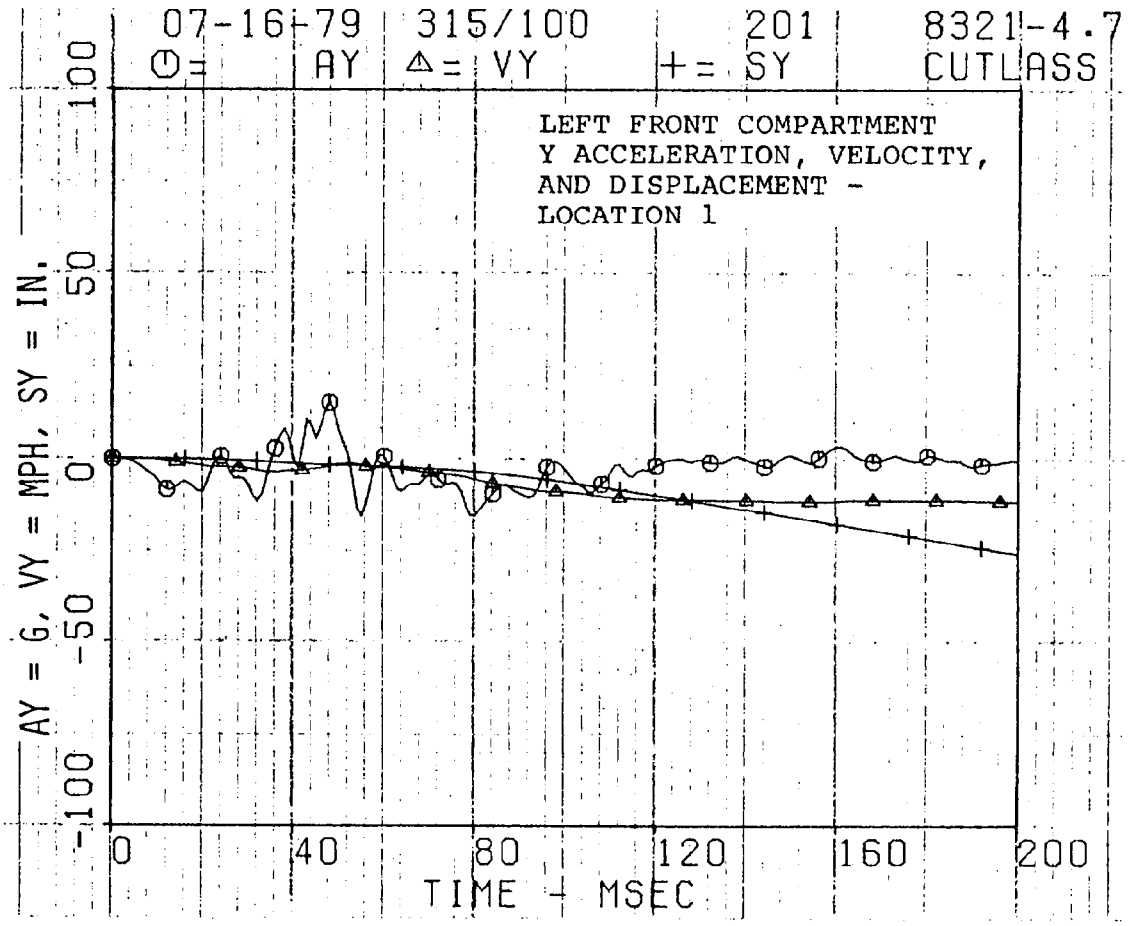

07-16-79 1600
606
8321-4.7
CUTLASS
RIGHT REAR OCCUPANT
HEAD SEVERITY INDEX
SI
1000
750
500
250
0
0
40
80
120
160
200
TIME - MSEC

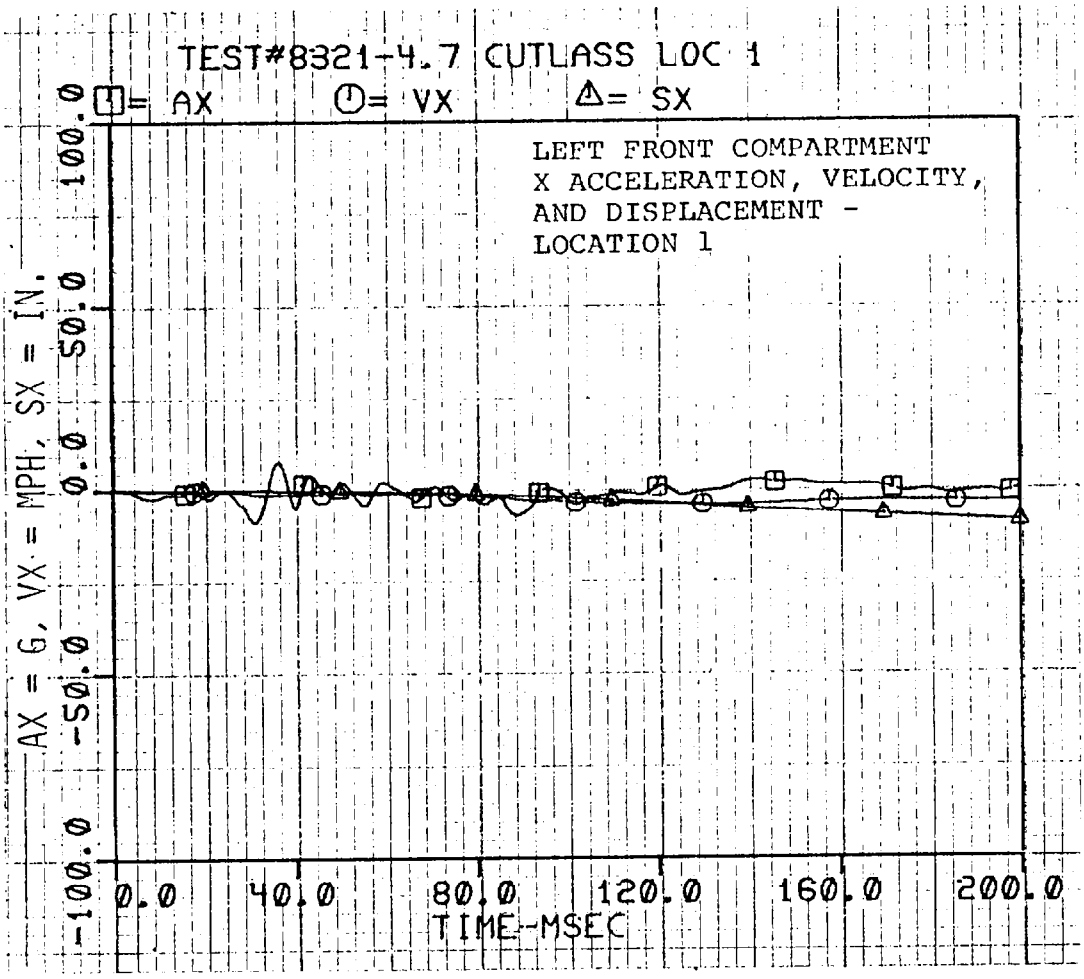

07-16-79 315 1206 8321-4.7
○= AX △= AY += AZ CUTLASS
RIGHT REAR OCCUPANT
CHEST XYZ ACCELERATION
ACCELERATION = G
120
60
0
-60
-120
07-16-79 315 1206 8321-4.7
○= AR △= VR += SR CUTLASS
RIGHT REAR OCCUPANT CHEST
RESULTANT ACCELERATION,
VELOCITY, AND DISPLACEMENT
AR = G, VR = MPH, SR = IN.
120
90
60
30
0
0
40
80
120
160
200
TIME - MSEC

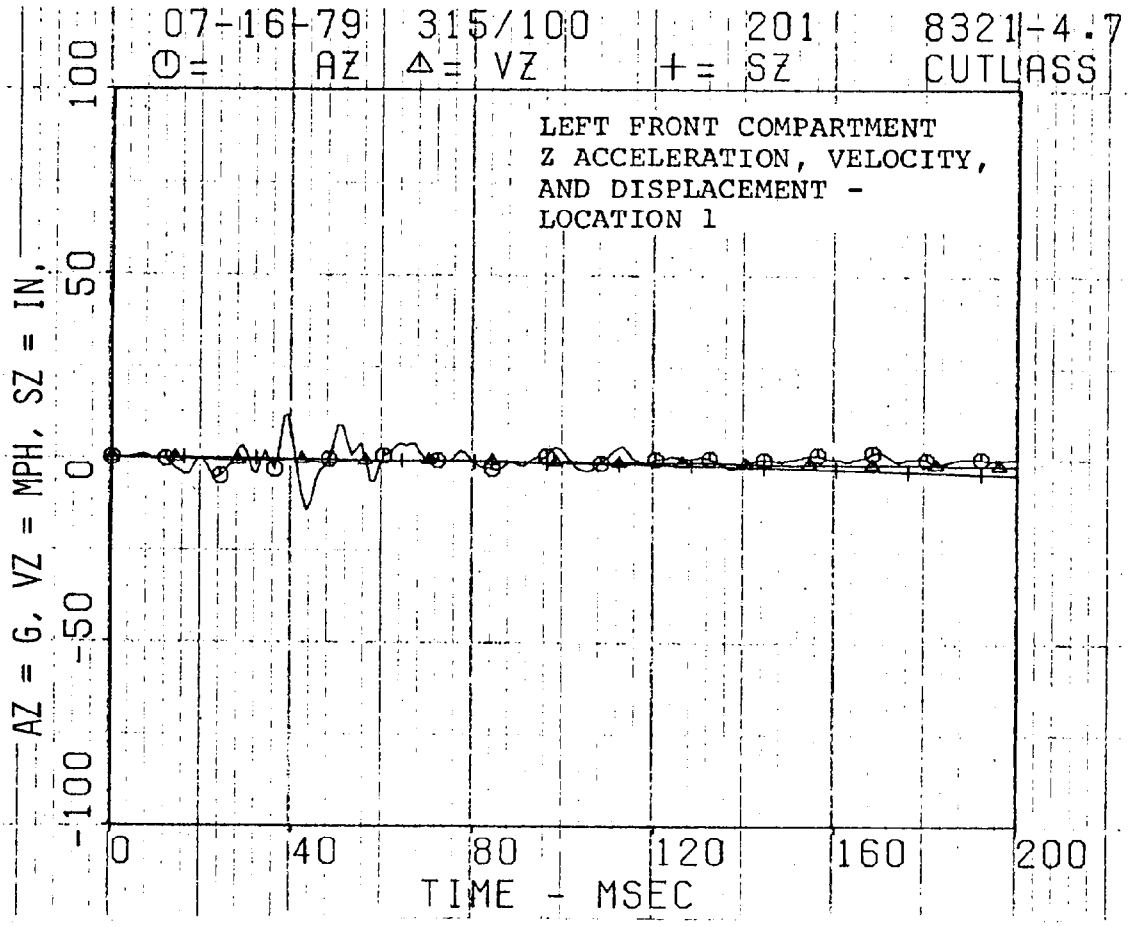

07-16-79 315 1206 8321-4.7
CUTLASS
RIGHT REAR OCCUPANT
CHEST SEVERITY INDEX
SI
1000
750
500
250
0
0
40
80
120
160
200
TIME - MSEC

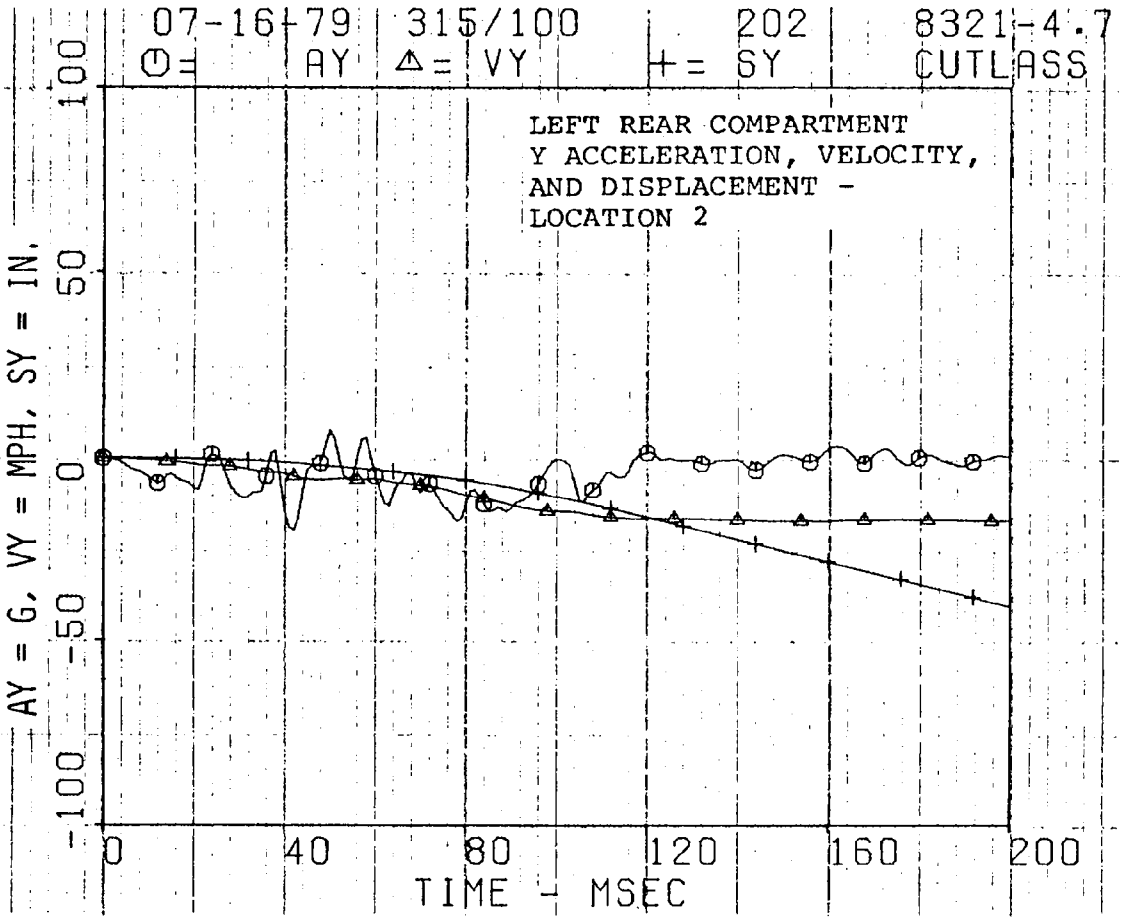

07-16-79 315 1606 8321-4.7
○= AX △= AY CUTLASS
RIGHT REAR OCCUPANT
PELVIS XY ACCELERATION
NOTE: SIGNS ARE REVERSED
ACCELERATION - G
80
40
0
-40
-80

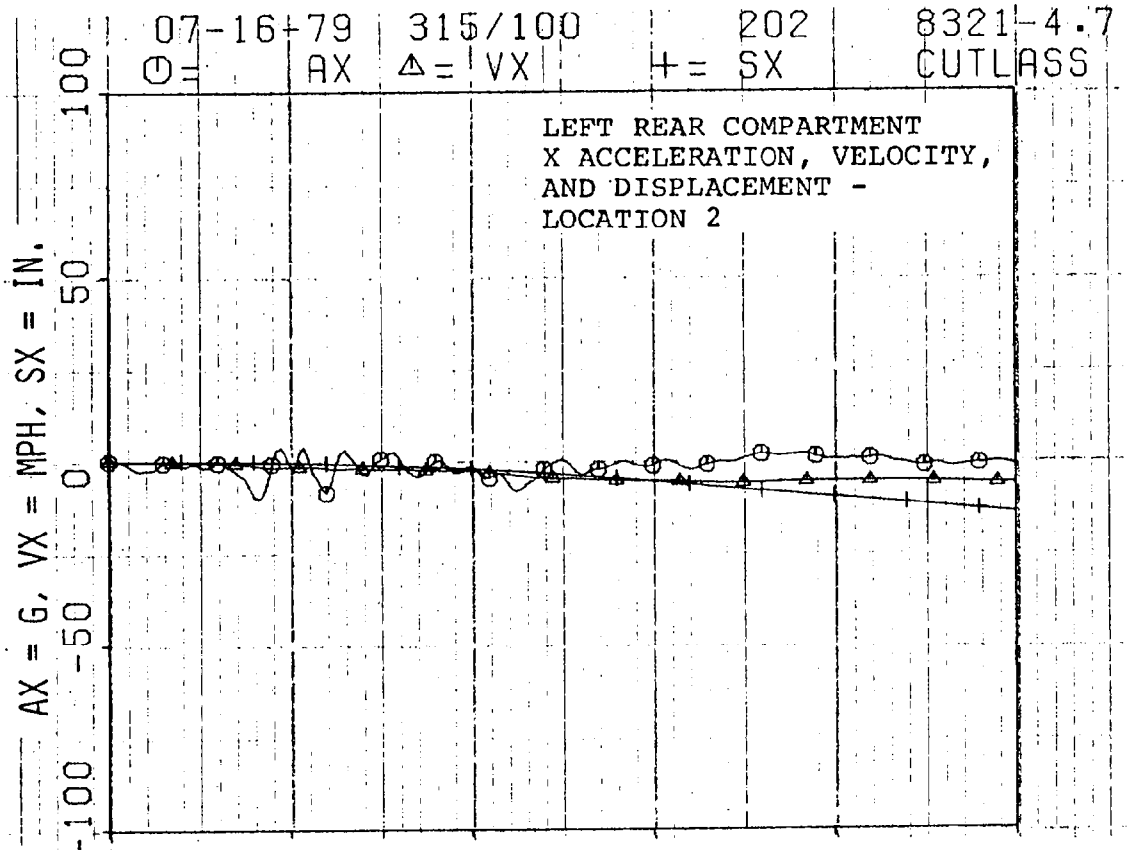

07-16-79 315 1606 8321-4.7
CUTLASS
RIGHT REAR OCCUPANT PELVIS
RESULTANT ACCELERATION
AR - G
80
60
40
20
0
0
40
80
120
160
200
TIME - MSEC

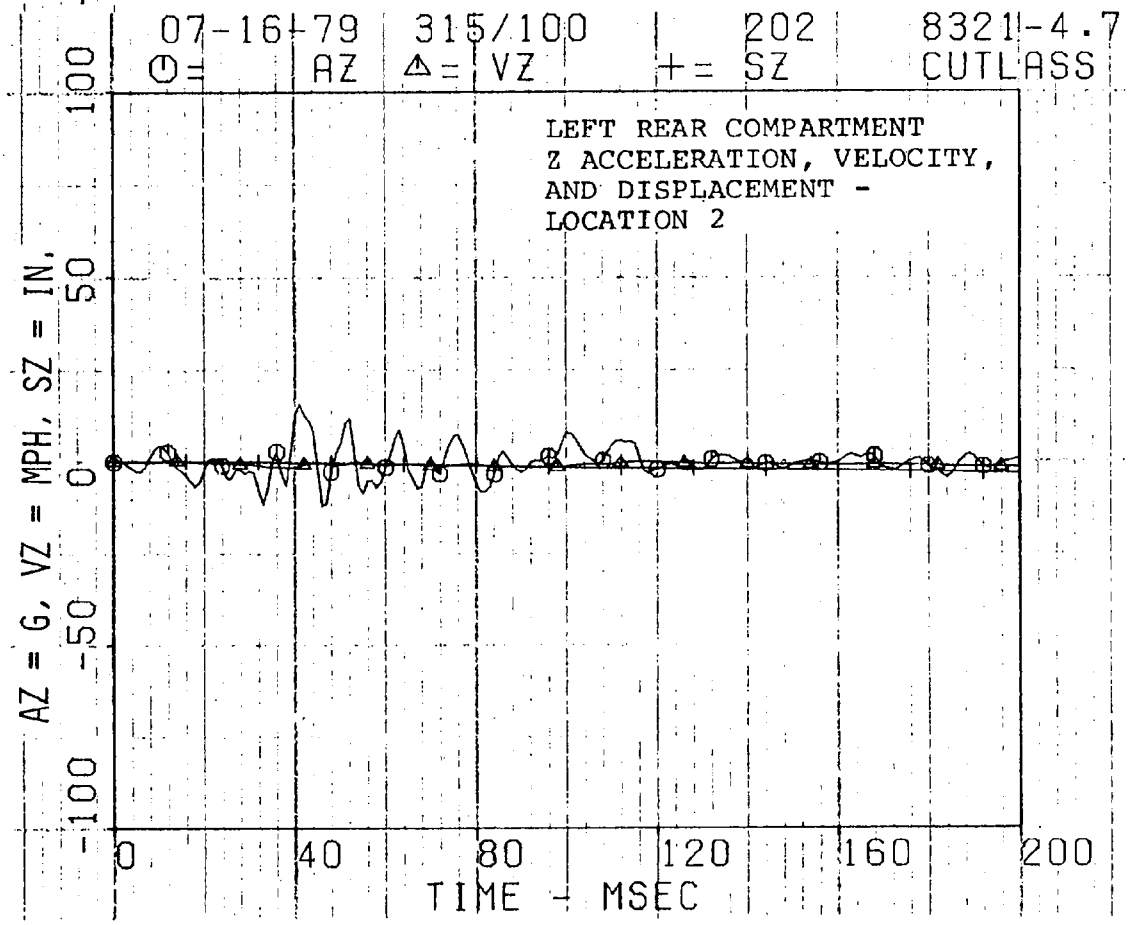

07-16-79 315/100 201 8321-4.7
○= AY △= VY += SY CUTLASS
LEFT FRONT COMPARTMENT
Y ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 1
AY = G, VY = MPH, SY = IN.
100
50
0
-50
-100
0
40
80
120
160
200
TIME - MSEC

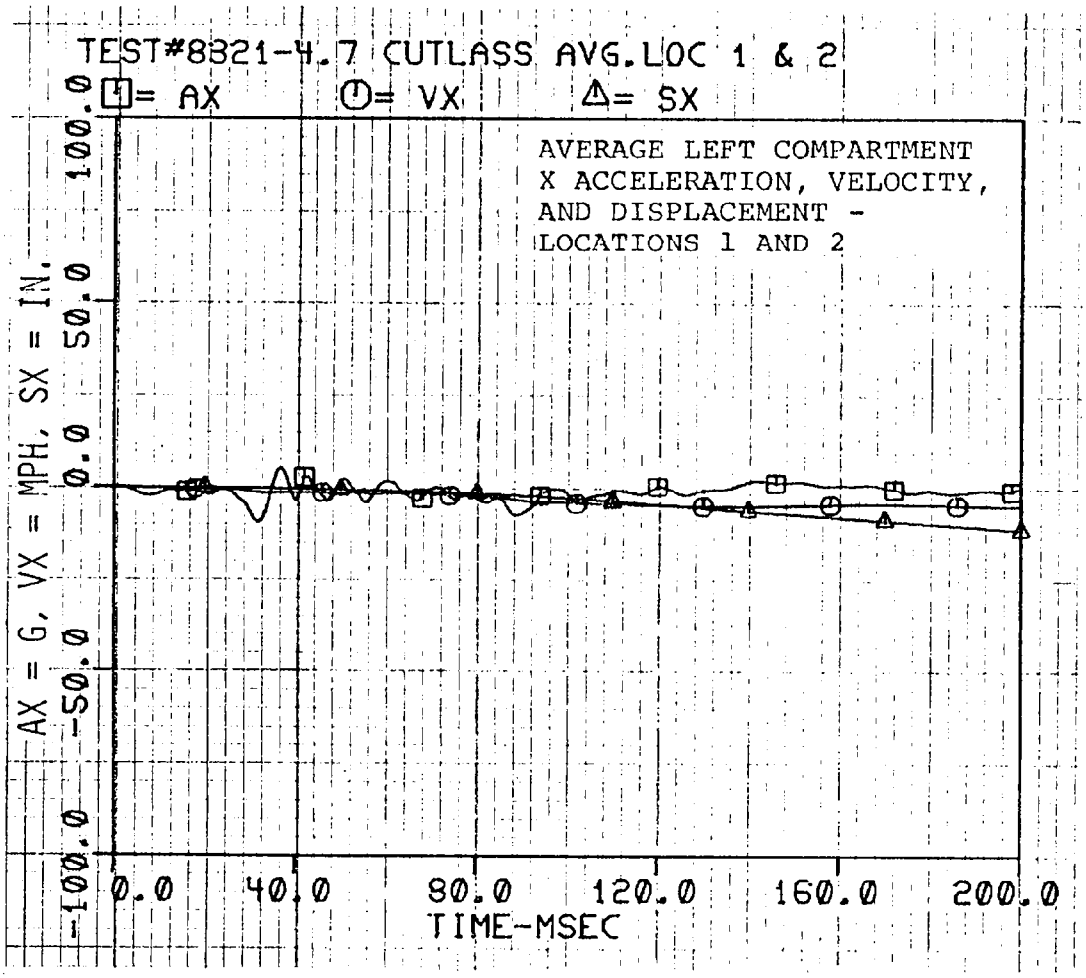

TEST#8321-4.7 CUTLASS LOC 1
□= AX
○= VX
△= SX
LEFT FRONT COMPARTMENT
X ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 1
AX = G, VX = MPH, SX = IN.
100.0
50.0
0.0
-50.0
-100.0
0.0
40.0
80.0
120.0
160.0
200.0
TIME-MSEC

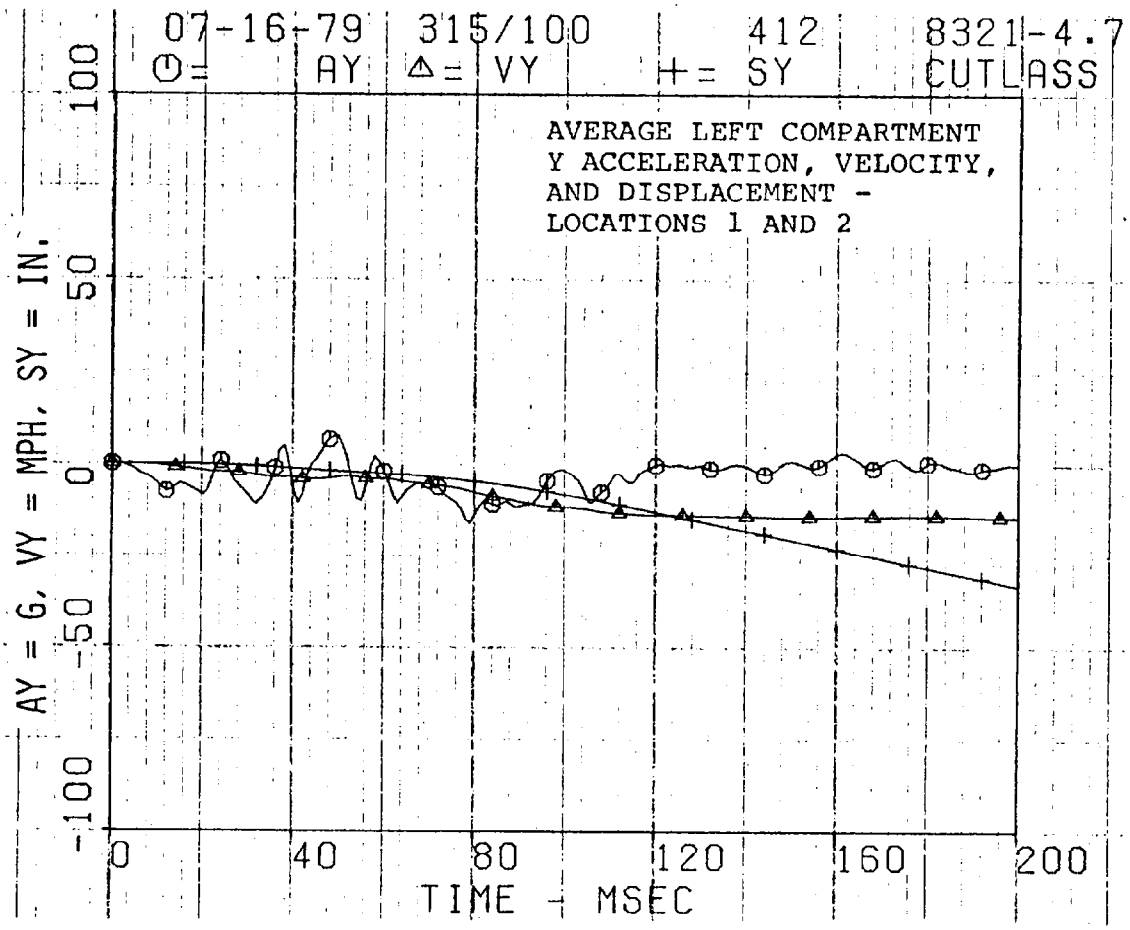

07-16-79 315/100 201 8321-4.7
Θ= AZ Δ= VZ += SZ CUTLASS
LEFT FRONT COMPARTMENT
Z ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 1
AZ = G, VZ = MPH, SZ = IN.
100
50
0
-50
-100
0
40
80
120
160
200
TIME - MSEC

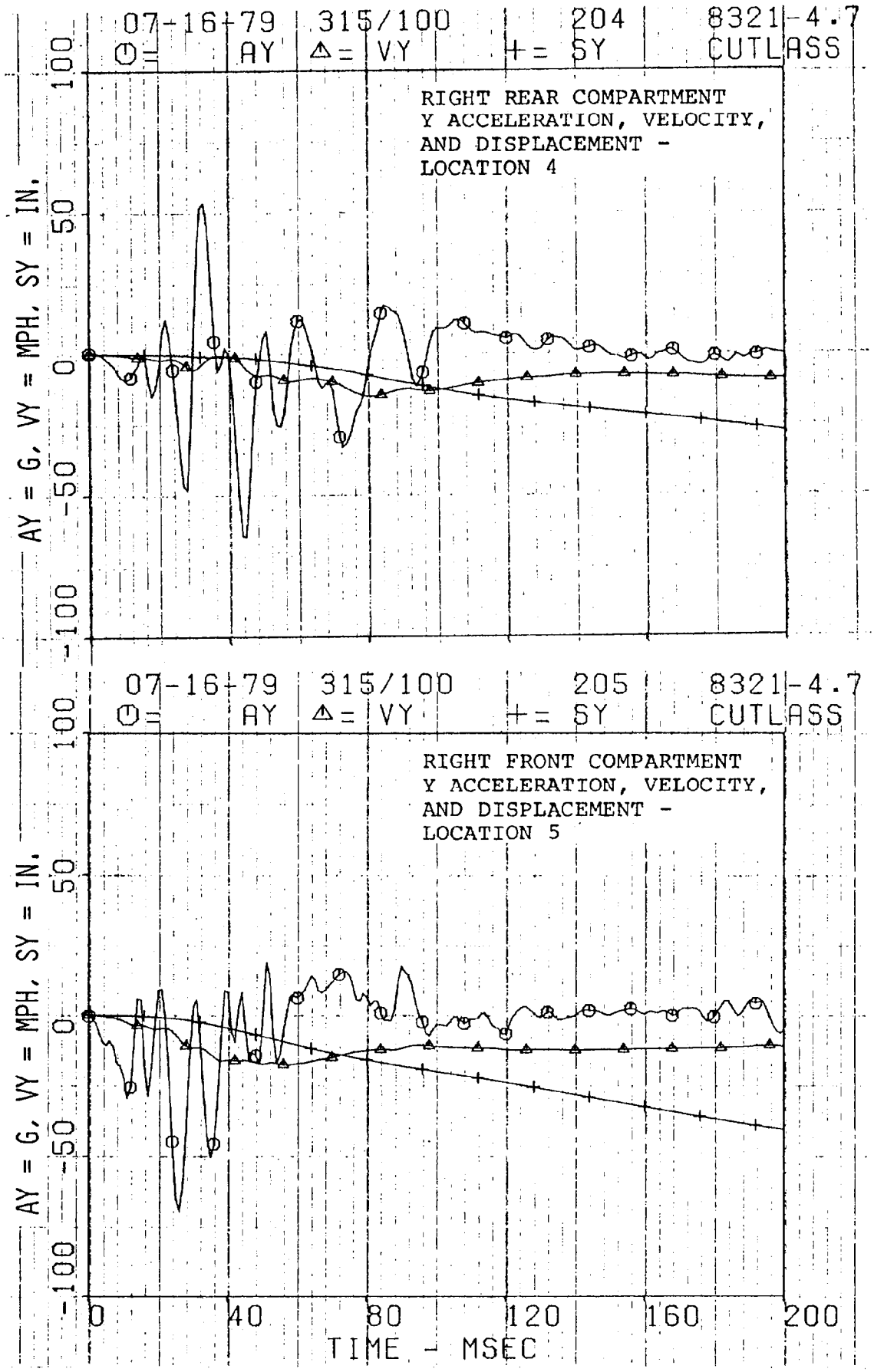

07-16-79 315/100 202 8321-4.7
⊖= AY △= VY += SY CUTLASS
LEFT REAR COMPARTMENT
Y ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 2
AY = G, VY = MPH, SY = IN.
100
50
0
-50
-100
0
40
80
120
160
200
TIME - MSEC

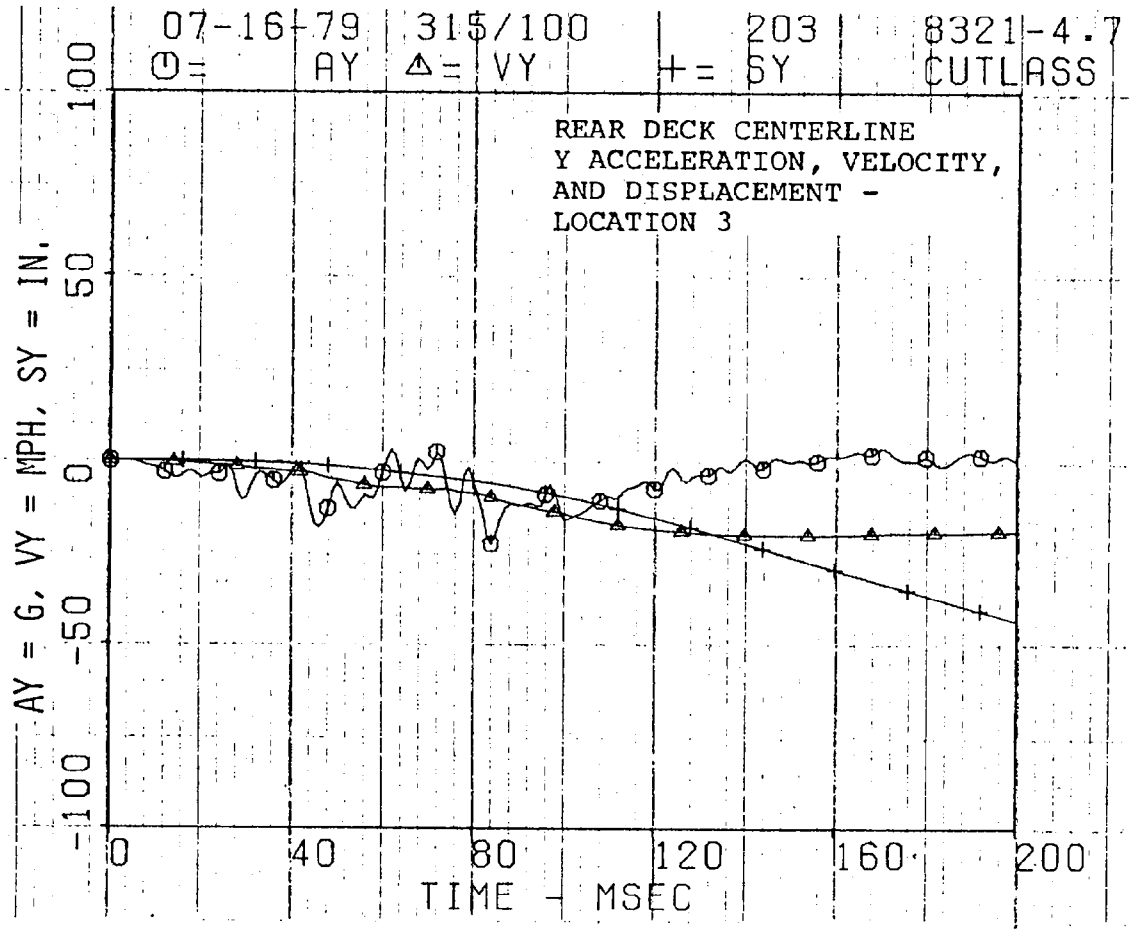

07-16-79 315/100 202 8321-4.7
⊖= AX △= VX += SX CUTLASS
LEFT REAR COMPARTMENT
X ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 2
AX = G, VX = MPH, SX = IN.
100
50
0
-50
-100

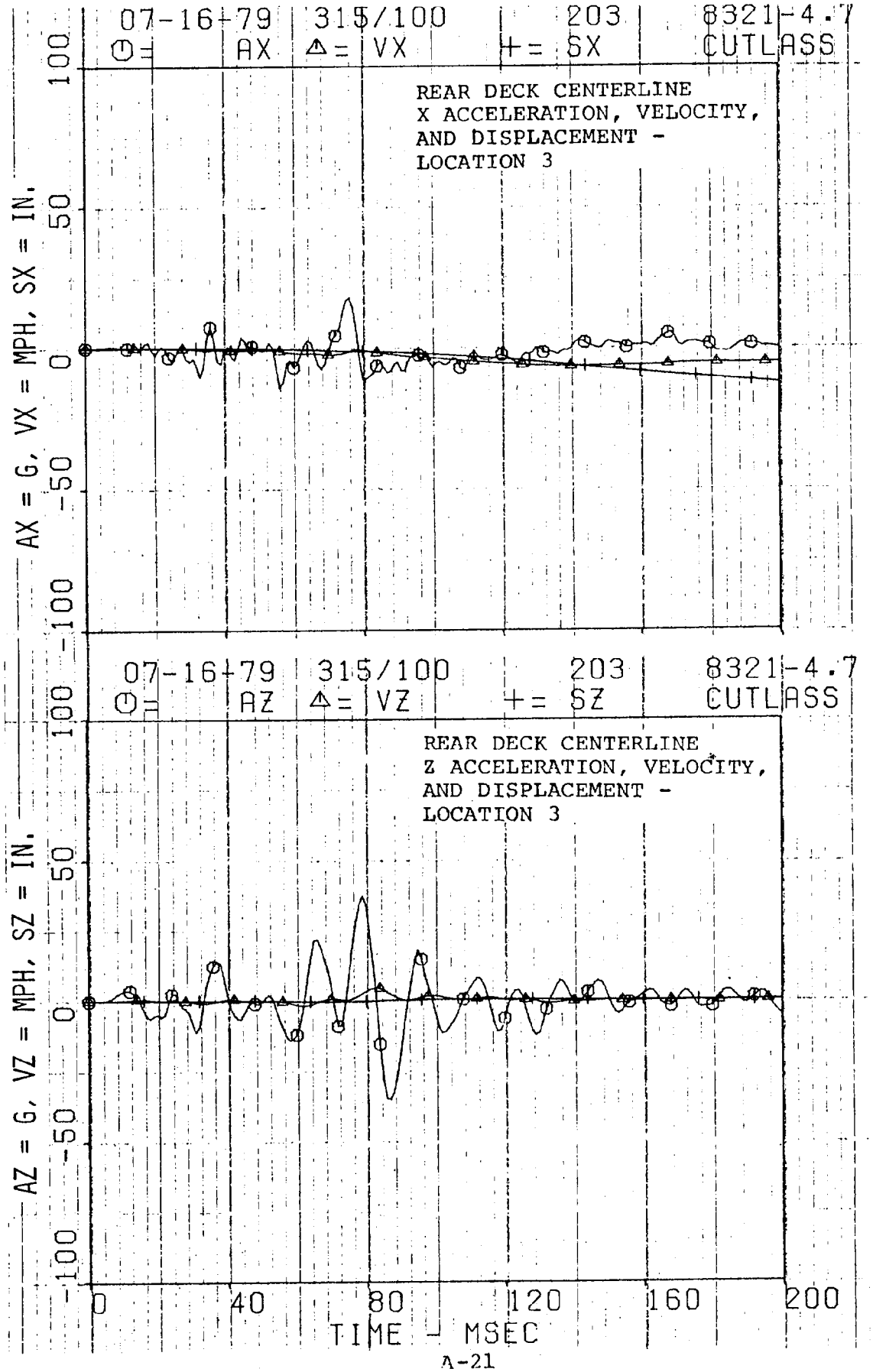

07-16-79 315/100 202 8321-4.7
⊖= AZ △= VZ += SZ CUTLASS
LEFT REAR COMPARTMENT
Z ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 2
AZ = G, VZ = MPH, SZ = IN.
100
50
0
-50
-100
0
40
80
120
160
200
TIME - MSEC

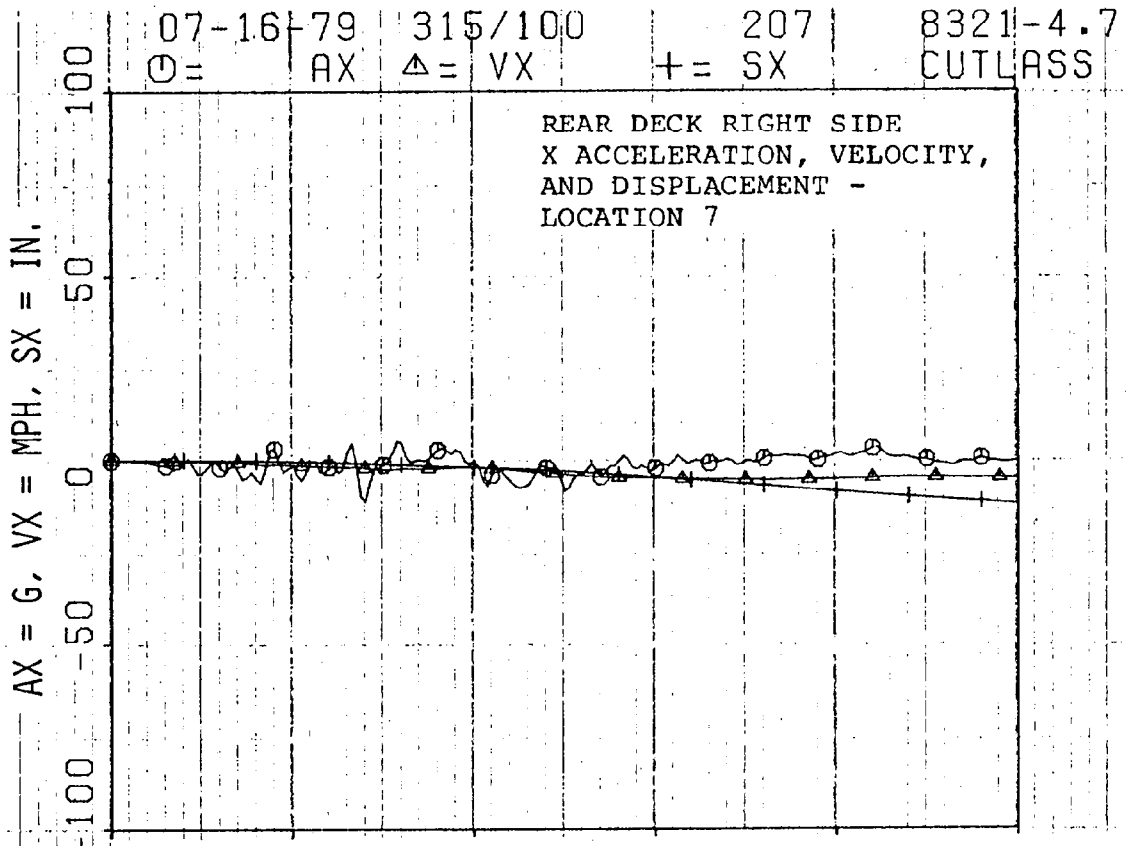

TEST#8321-4.7 CUTLASS AVG.LOC 1 & 2
□= AX
○= VX
△= SX
AVERAGE LEFT COMPARTMENT
X ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATIONS 1 AND 2
AX = G, VX = MPH, SX = IN.
100.0
50.0
0.0
-50.0
-100.0
0.0
40.0
80.0
120.0
160.0
200.0
TIME-MSEC

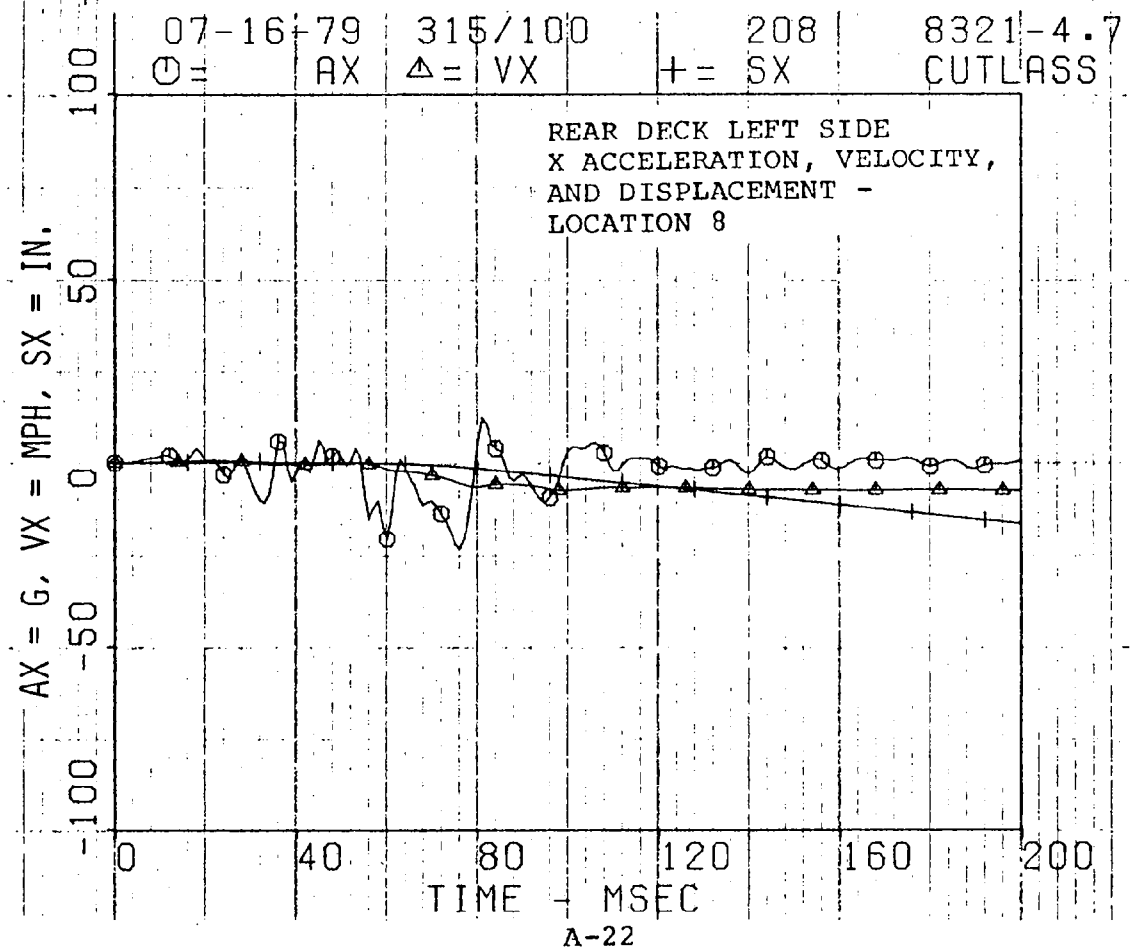

07-16-79 315/100 412 8321-4.7
O= AY Δ= VY += SY CUTLASS
AVERAGE LEFT COMPARTMENT
Y ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATIONS 1 AND 2
AY = G, VY = MPH, SY = IN.
100
50
0
-50
-100
0
40
80
120
160
200
TIME - MSEC

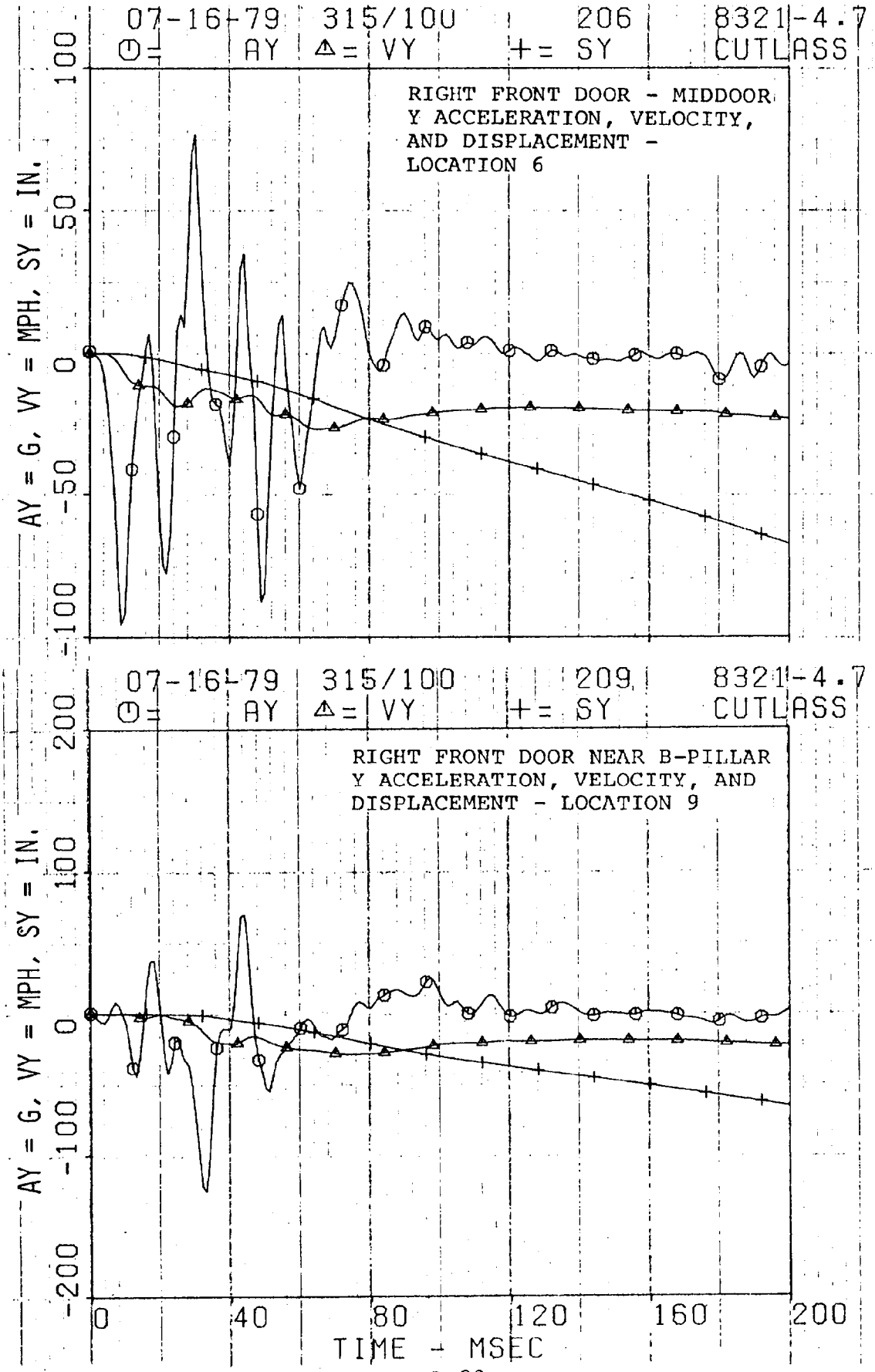

07-16-79 315/100 204 8321-4.7
AY VY SY CUTLASS
RIGHT REAR COMPARTMENT
Y ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 4
07-16-79 315/100 205 8321-4.7
AY VY SY CUTLASS
RIGHT FRONT COMPARTMENT
Y ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 5
AY = G, VY = MPH, SY = IN.
100
50
0
-50
-100
0
40
80
120
160
200
TIME - MSEC

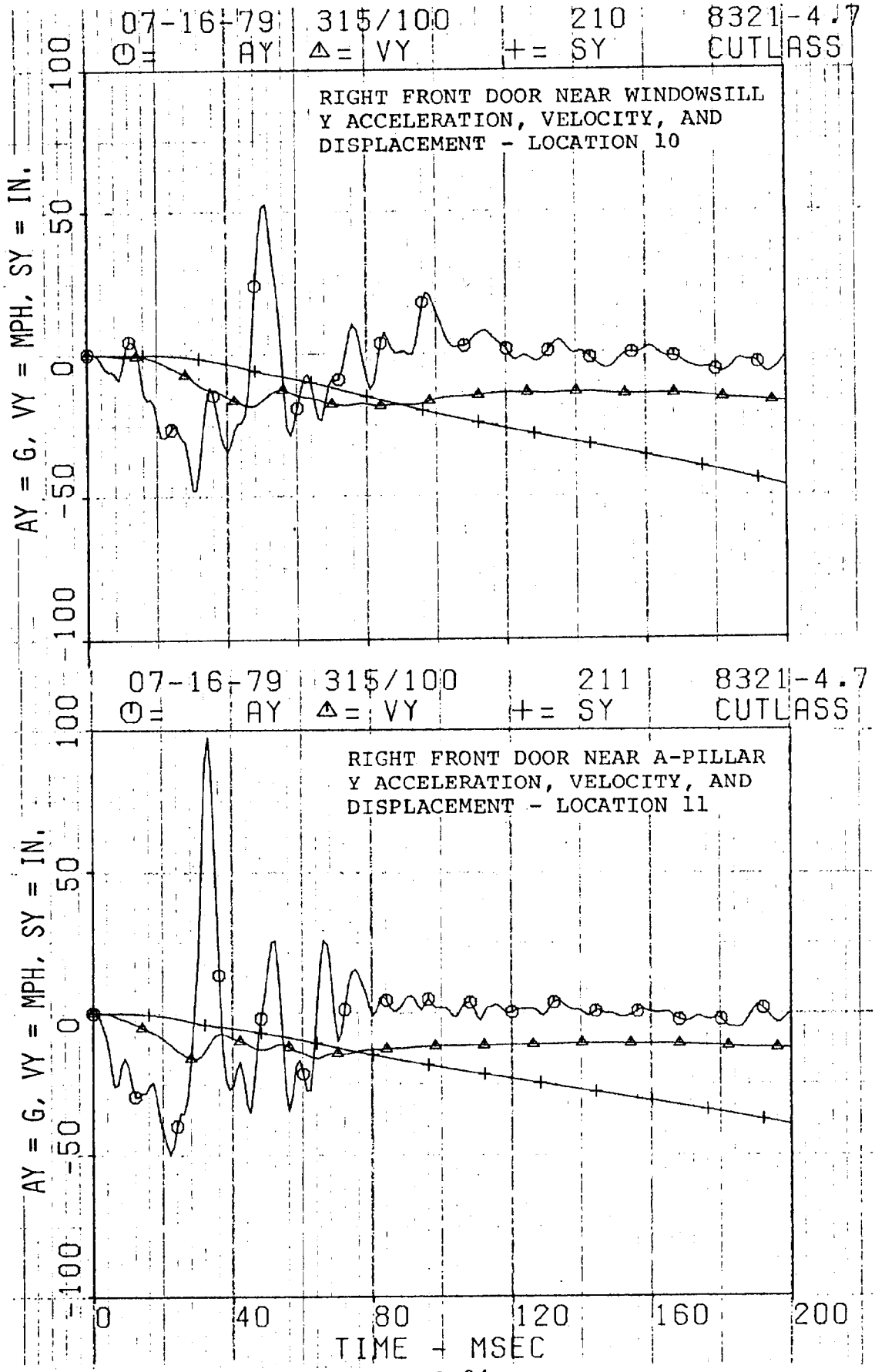

07-16-79 315/100 203 8321-4.7
○= AY △= VY += SY CUTLASS
REAR DECK CENTERLINE
Y ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 3
AY = G, VY = MPH, SY = IN.
100
50
0
-50
-100
0
40
80
120
160
200
TIME - MSEC

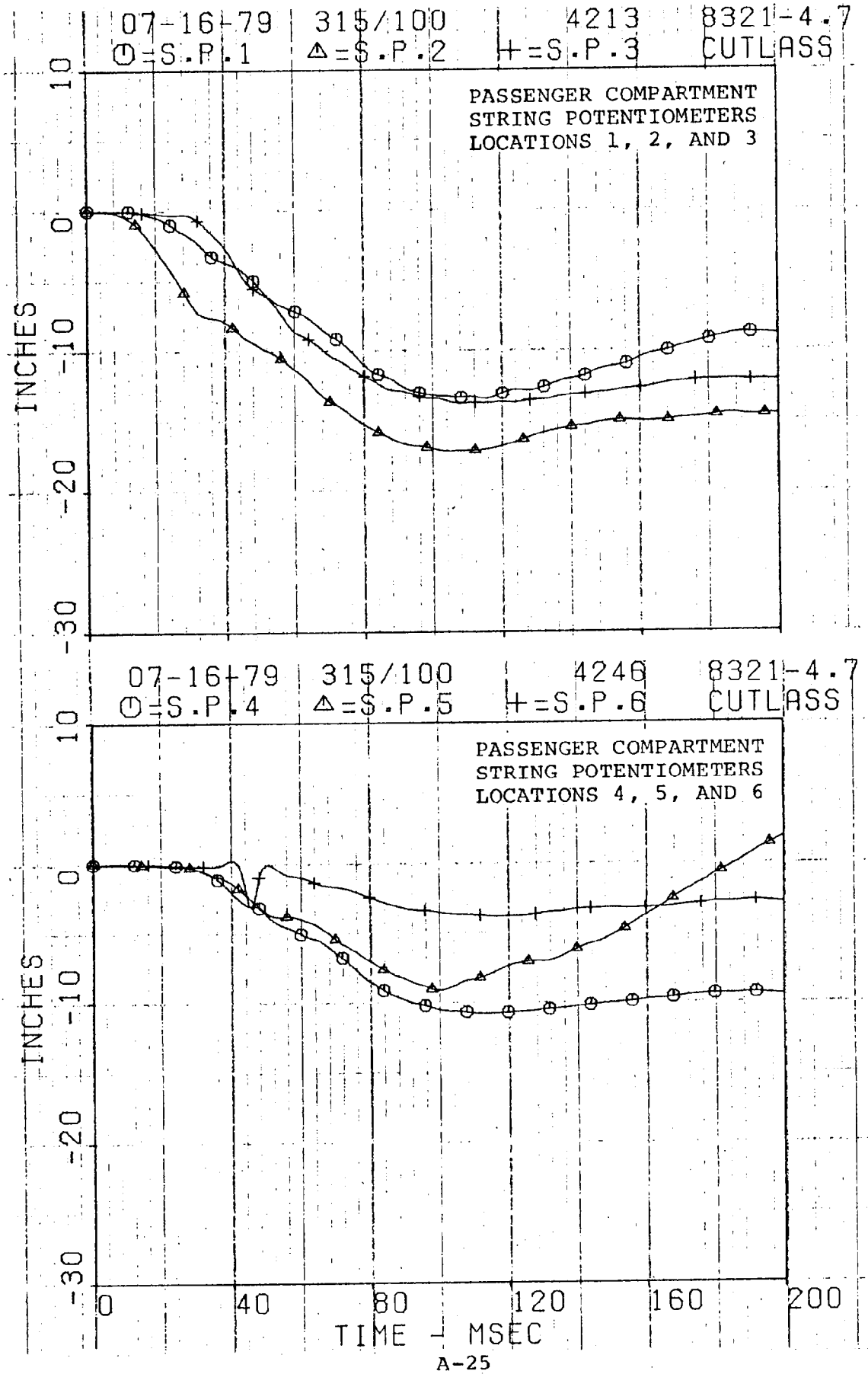

07-16-79 315/100 203 8321-4.7
○= AX △= VX += SX CUTLASS
REAR DECK CENTERLINE
X ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 3
AX = G, VX = MPH, SX = IN.
100
50
0
-50
-100
07-16-79 315/100 203 8321-4.7
○= AZ △= VZ += SZ CUTLASS
REAR DECK CENTERLINE
Z ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 3
AZ = G, VZ = MPH, SZ = IN.
100
50
0
-50
-100
0
40
80
120
160
200
TIME - MSEC

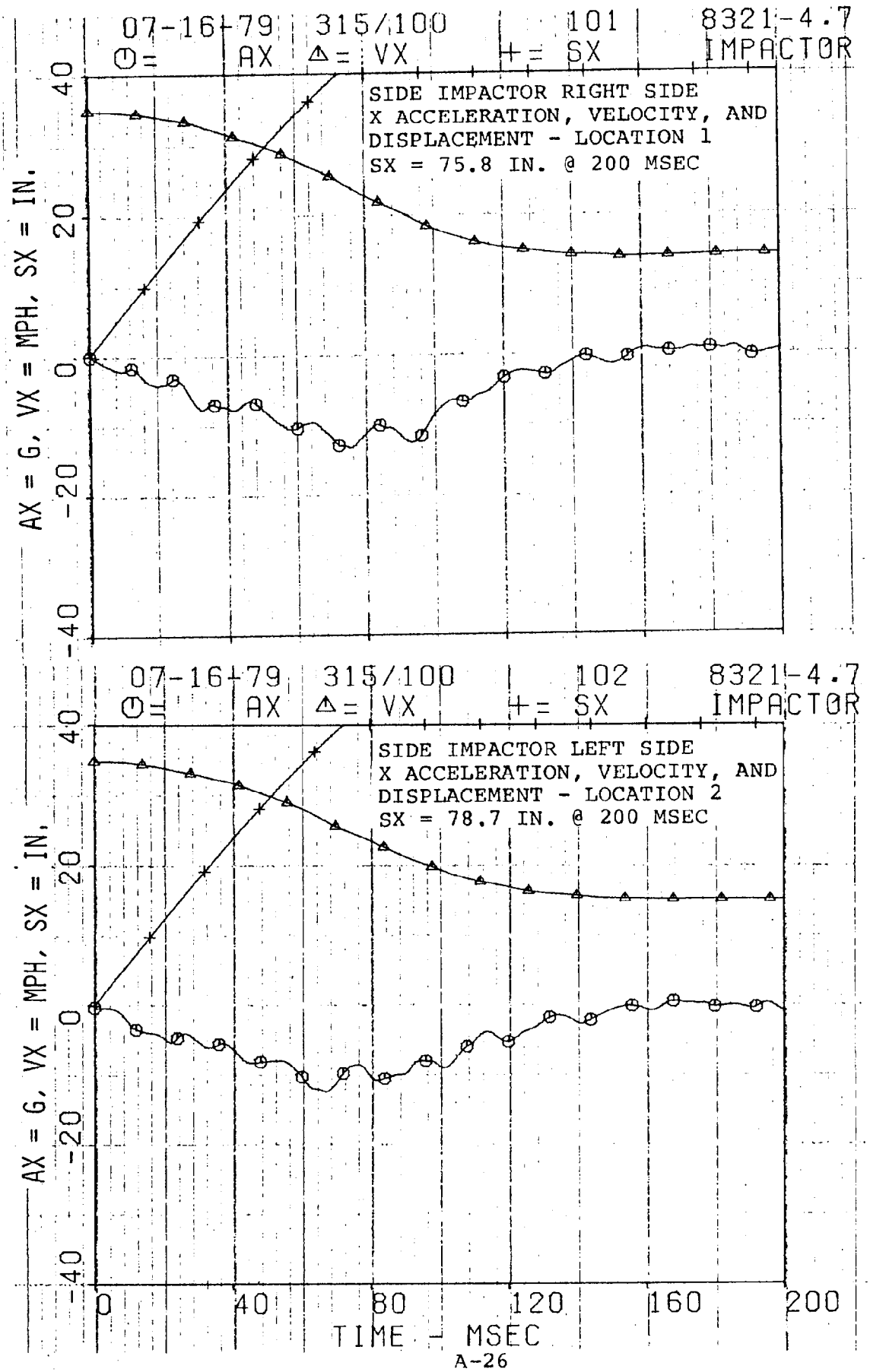

07-16-79 315/100 207 8321-4.7
⊖= AX △= VX += SX CUTLASS
REAR DECK RIGHT SIDE
X ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 7
AX = G, VX = MPH, SX = IN.
100
50
0
-50
-100

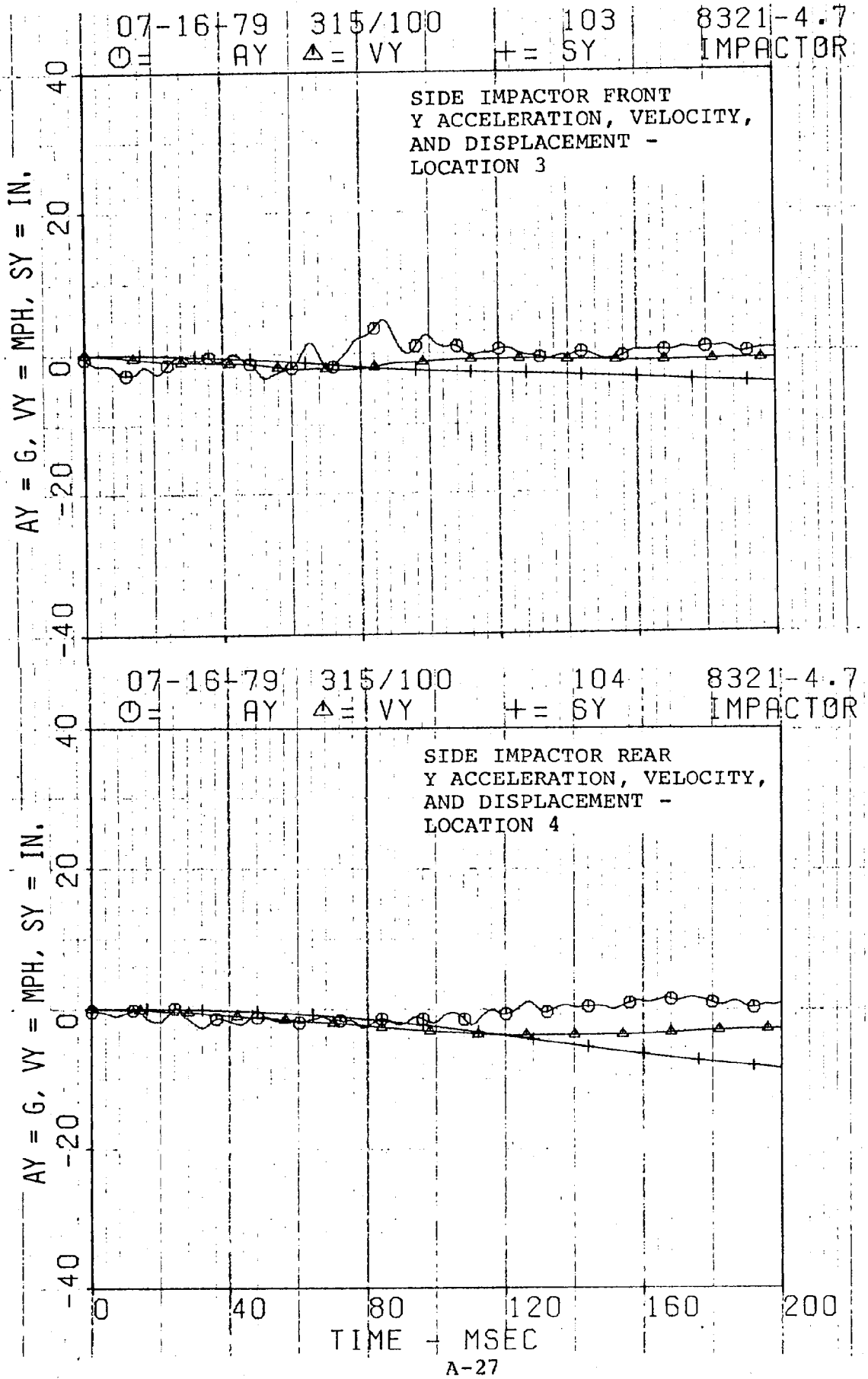

07-16-79 315/100 208 8321-4.7
⊖= AX △= VX += SX CUTLASS
REAR DECK LEFT SIDE
X ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 8
AX = G, VX = MPH, SX = IN.
100
50
0
-50
-100
0
40
80
120
160
200
TIME - MSEC

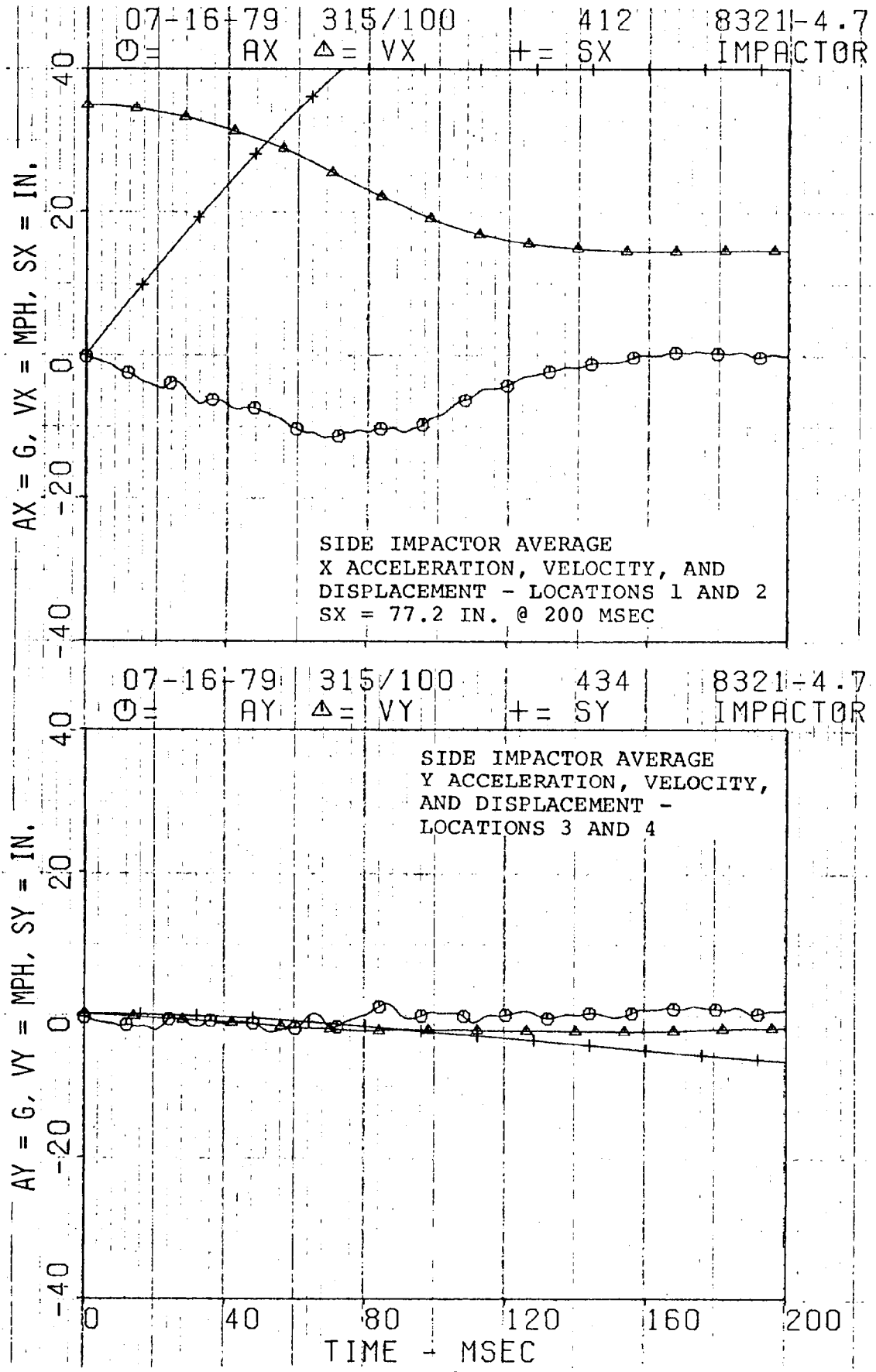

07-16-79 315/100 206 8321-4.7
○= AY △= VY += SY CUTLASS
RIGHT FRONT DOOR - MIDDOOR
Y ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 6
AY = G, VY = MPH, SY = IN.
100
50
0
-50
-100
07-16-79 315/100 209 8321-4.7
○= AY △= VY += SY CUTLASS
RIGHT FRONT DOOR NEAR B-PILLAR
Y ACCELERATION, VELOCITY, AND
DISPLACEMENT - LOCATION 9
AY = G, VY = MPH, SY = IN.
200
100
0
-100
-200
0
40
80
120
160
200
TIME - MSEC

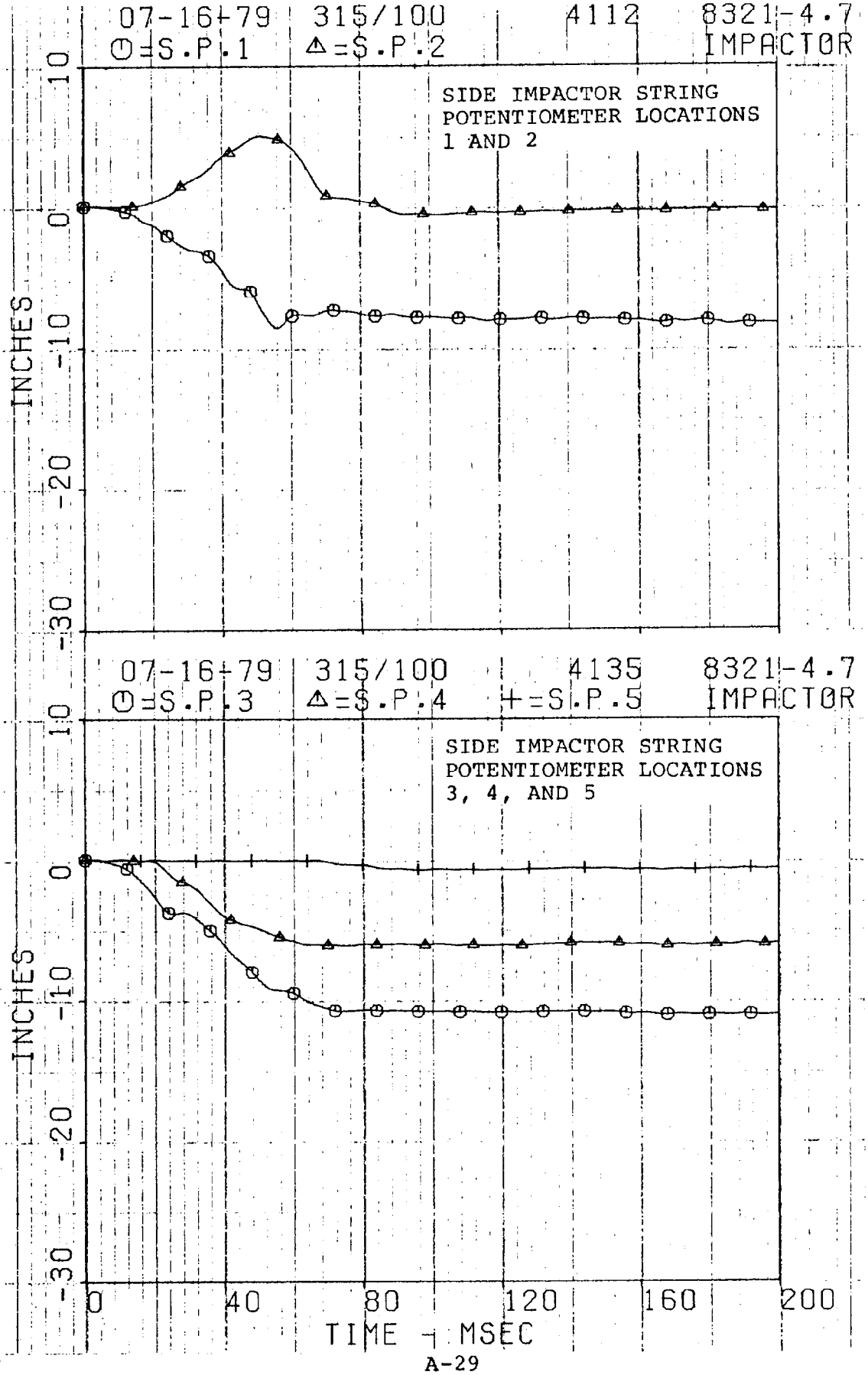

07-16-79 315/100 210 8321-4.7
⊖= AY △= VY += SY CUTLASS
RIGHT FRONT DOOR NEAR WINDOWSILL
Y ACCELERATION, VELOCITY, AND
DISPLACEMENT - LOCATION 10
AY = G, VY = MPH, SY = IN.
100
50
0
-50
-100
07-16-79 315/100 211 8321-4.7
⊖= AY △= VY += SY CUTLASS
RIGHT FRONT DOOR NEAR A-PILLAR
Y ACCELERATION, VELOCITY, AND
DISPLACEMENT - LOCATION 11
AY = G, VY = MPH, SY = IN.
100
50
0
-50
-100
0
40
80
120
160
200
TIME - MSEC


07-16-79 315/100 4213 8321-4.7
⊖=S.P.1 △=S.P.2 +=S.P.3 CUTLASS
PASSENGER COMPARTMENT
STRING POTENTIOMETERS
LOCATIONS 1, 2, AND 3
INCHES
10
0
-10
-20
-30
07-16-79 315/100 4246 8321-4.7
⊖=S.P.4 △=S.P.5 +=S.P.6 CUTLASS
PASSENGER COMPARTMENT
STRING POTENTIOMETERS
LOCATIONS 4, 5, AND 6
INCHES
10
0
-10
-20
-30
0
40
80
120
160
200
TIME - MSEC


07-16-79 315/100 101 8321-4.7
AX VX SX IMPACTOR
SIDE IMPACTOR RIGHT SIDE
X ACCELERATION, VELOCITY, AND
DISPLACEMENT - LOCATION 1
SX = 75.8 IN. @ 200 MSEC
AX = G, VX = MPH, SX = IN.
40
20
0
-20
-40
07-16-79 315/100 102 8321-4.7
AX VX SX IMPACTOR
SIDE IMPACTOR LEFT SIDE
X ACCELERATION, VELOCITY, AND
DISPLACEMENT - LOCATION 2
SX = 78.7 IN. @ 200 MSEC
AX = G, VX = MPH, SX = IN.
40
20
0
-20
-40
0
40
80
120
160
200
TIME - MSEC


07-16-79 315/100 103 8321-4.7
⊖= AY △= VY += SY IMPACTOR
SIDE IMPACTOR FRONT
Y ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 3
AY = G, VY = MPH, SY = IN.
40
20
0
-20
-40
07-16-79 315/100 104 8321-4.7
⊖= AY △= VY += SY IMPACTOR
SIDE IMPACTOR REAR
Y ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATION 4
AY = G, VY = MPH, SY = IN.
40
20
0
-20
-40
0
40
80
120
160
200
TIME - MSEC


07-16-79 315/100 412 8321-4.7
AX VX SX IMPACTOR
AX = G, VX = MPH, SX = IN.
40
20
0
-20
-40
SIDE IMPACTOR AVERAGE
X ACCELERATION, VELOCITY, AND
DISPLACEMENT - LOCATIONS 1 AND 2
SX = 77.2 IN. @ 200 MSEC
07-16-79 315/100 434 8321-4.7
AY VY SY IMPACTOR
AY = G, VY = MPH, SY = IN.
SIDE IMPACTOR AVERAGE
Y ACCELERATION, VELOCITY,
AND DISPLACEMENT -
LOCATIONS 3 AND 4
0
40
80
120
160
200
TIME - MSEC


07-16-79 315/100 4112 8321-4.7
○=S.P.1 △=S.P.2 IMPACTOR
SIDE IMPACTOR STRING
POTENTIOMETER LOCATIONS
1 AND 2
INCHES
10
0
-10
-20
-30
07-16-79 315/100 4135 8321-4.7
○=S.P.3 △=S.P.4 +=S.P.5 IMPACTOR
SIDE IMPACTOR STRING
POTENTIOMETER LOCATIONS
3, 4, AND 5
INCHES
10
0
-10
-20
-30
0
40
80
120
160
200
TIME - MSEC

APPENDIX B

ENERGY-ABSORBING FACE

SPECIFICATIONS FOR TEST 8321-4.7

TABLE B-1. COMPONENT FABRICATION SPECIFICATION - ITEM 9 (TEST 4.7)

Layer Number	Load Panel	Material	Precrush (T/B)	Face Skin Thickness (T/B) (in.)	Mat'l Code	Dimensions* T (in.)	L (in.)	W (in.)	Coring Characteristics: Number of Holes	Hole Pattern DSL-	Uncored Area Left (%)	Contour Engineering Drawing DSL-	Tapered Angle (α, β, δ) (deg)
	Plate A	6061-T6 AL	-	-		.25	(DSL 1180)						
1	I	ACG SPEC 1				5	72	20	SALVAGE FROM PREVIOUS IMPACTOR				
	II_D	(CS = 750 psi)				TWO PIECES							
	II_P					5 x 72 x 10							
	III_D												
	III_P												
	IV												
	Plate B	6061-T6 AL	-	-		.025	72	20					
2	I					SKIP THIS LAYER							
	II_D												
	II_P												
	III_D												
	III_P												
	IV												
	Plate C					NO PLATE							

*Refer to Detail A for definition of honeycomb core orientation (of grain).

TABLE B-1. COMPONENT FABRICATION SPECIFICATION - ITEM 9 (TEST 4.7) (CONTD)

Layer Number	Load Panel	Material	Precrush (T/B)	Face Skin Thickness (T/B) (in.)	Mat'l Code	Dimensions* T (in.)	L (in.)	W (in.)	Coring Characteristics: Number of Holes	Hole Pattern DSL-	Uncored Area Left (%)	Contour Engineering Drawing DSL-	Tapered Angle (α, β, Δ) (deg)
3	I	ACG-3/4-.003	Yes/Yes	No/No	45.4 AAAA	12	72	19	0				
	II_D												
	II_P					ONE PIECE							
	III_D												
	III_P												
	IV												
	Plate D	REYNOLDS EHD	-	.001		AL. FOIL	72	19					
4	I					SKIP THIS LAYER							
	II_D												
	II_P												
	III_D												
	III_P												
	IV												
	Plate E												

*Refer to Detail A for definition of honeycomb core orientation (of grain).

TABLE B-1. COMPONENT FABRICATION SPECIFICATION - ITEM 9 (TEST 4.7) (CONTD)

Layer Number	Load Panel	Material	Precrush (T/B)	Face Skin Thickness (T/B) (in.)	Mat'l Code	Dimensions* T (in.)	L (in.)	W (in.)	Coring Characteristics: Number of Holes	Hole Pattern DSL-	Uncored Area Left (%)	Contour Engineering Drawing DSL-	Tapered Angle (α, β, Δ) (deg)
5	I					SKIP THIS LAYER							
	II_D												
	II_P												
	III_D												
	III_P												
	IV												
	Plate F	NONE											
6	I					SKIP THIS LAYER							
	II_D												
	II_P												
	III_D												
	III_P												
	IV												
	Plate G	NONE											

*Refer to Detail A for definition of honeycomb core orientation (of grain).

TABLE B-1. COMPONENT FABRICATION SPECIFICATION - ITEM 9 (TEST 4.7) (CONTD)

Layer Number	Load Panel	Material	Precrush (T/B)	Face Skin Thickness (T/B) (in.)	Mat'l Code	Dimensions* T (in.)	L (in.)	W (in.)	Coring Characteristics: Number of Holes	Hole Pattern DSL-	Uncored Area Left (%)	Contour Engineering Drawing DSL-	Tapered Angle (α,β,Δ) (deg)
7	I	ACG-3/4-.003	Yes/Yes	No/No	45.4 AAAA	3	32.0	7.4	0	CUT FROM 12" BLOCK			
	II_D	ACG-3/4-.003	Yes/Yes	No/No	38.3A	3	19.6	7.4	0				
	II_P	ACG-3/4-.003	Yes/Yes	No/No	38.3A	3	19.6	7.4	0				
	III_D	ACG-3/4-.003	Yes/Yes	No/No	38.3A	3	19.6	10.6	0				
	III_P	ACG-3/4-.003	Yes/Yes	No/No	38.3A	3	19.6	10.6	0				
	IV	3/8-5052-.0007	Yes/Yes	No/No	45.4 AAAA	12	32.0	10.6	0				
	Plate H	6061-T6 AL	-	-		.025	71.2	18.0	(WITH CUT-OUT)				
8	I	ACG-3/4-.003	Yes/Yes	No/No	45.4 AAAA	12	32.0	7.4	CONTOUR FRONT FACE TO MATCH BUMPER SURFACE FOR GLUEING.				
	II_D	ACG-3/4-.003	Yes/Yes	No/No	38.3A	3	19.5	7.4					
	II_P	ACG-3/4-.003	Yes/Yes	No/No		3	19.5	7.4					
	III_D	ACG-3/4-.003	Yes/Yes	No/No		3	19.5	10.3					
	III_P	ACG-3/4-.003	Yes/Yes	No/No		3	19.5	10.3					
	IV	OMIT THIS	LAYER										
	Plate I	REYNOLDS EHD	-	.001		AL FOIL							

*Refer to Detail A for definition of honeycomb core orientation (of grain).

TABLE B-1. COMPONENT FABRICATION SPECIFICATION - ITEM 9 (TEST 4.7) (CONTD)

Layer Number	Load Panel	Material	Precrush (T/B)	Face Skin Thickness (T/B) (in.)	Mat'l Code	Dimensions* T (in.)	L (in.)	W (in.)	Coring Characteristics: Number of Holes	Hole Pattern DSL-	Uncored Area Left (%)	Contour Engineering Drawing DSL-	Tapered Angle (α, β, Δ) (deg)
9	I		SKIP THIS LAYER						0				
	II_D	ACG-3/4-.003	Yes/Yes	No/No	38.3A	3	19.4	7.4					
	II_P	ACG-3/4-.003			38.3A	3	19.4	7.4					
	III_D	ACG-3/4-.003			38.3A	3	19.4	10.3					
	III_P	ACG-3/4-.003			38.3A	3	19.4	10.3					
	IV		OMIT THIS LAYER										
	Plate J	REYNOLDS EHD		.001									
10	I		OMIT THIS LAYER										
	II_D	ACG-3/4-.003	Yes/Yes	No/No	38.3A	3	19.3	7.4	0				
	II_P	AGC-3/4-.003	Yes/Yes	No/No	38.3A	3	19.3	7.4					
	III_D	ACG-3/4-.003	Yes/Yes	No/No	38.3A	3	19.3	10.3					
	III_P	ACG-3/4-.003	Yes/Yes	No/No	38.3A	3	19.3	10.3					
	IV		OMIT THIS LAYER										
	Plate K	REYNOLDS EHD		.001									

*Refer to Detail A for definition of honeycomb core orientation (of grain).

TABLE B-1. COMPONENT FABRICATION SPECIFICATION - ITEM 9 (TEST 4.7) (CONTD)

Layer Number	Load Panel	Material	Precrush (T/B)	Face Skin Thickness (T/B) (in.)	Mat'l Code	Dimensions* T (in.)	Dimensions* L (in.)	Dimensions* W (in.)	Coring Characteristics: Number of Holes	Coring Characteristics: Hole Pattern DSL-	Coring Characteristics: Uncored Area Left (%)	Coring Characteristics: Contour Engineering Drawing DSL-	Tapered Angle (α, β, Δ) (deg)
	Plate A												
11	I	THIS LAYER CONSISTS OF A 1976 VOLARE BUMPER WITH 1/4" STEEL SUPPORT PLATES ATTACHED WITH											
	II_D	HEXCELITE EPOXY (HP 326)											
	II_P												
	III_D												
	III_P												
	IV												
	Plate B												
12	I												
	II_D												
	II_P												
	III_D												
	III_P												
	IV												
	Plate C												

*Refer to Detail A for definition of honeycomb core orientation (of grain).

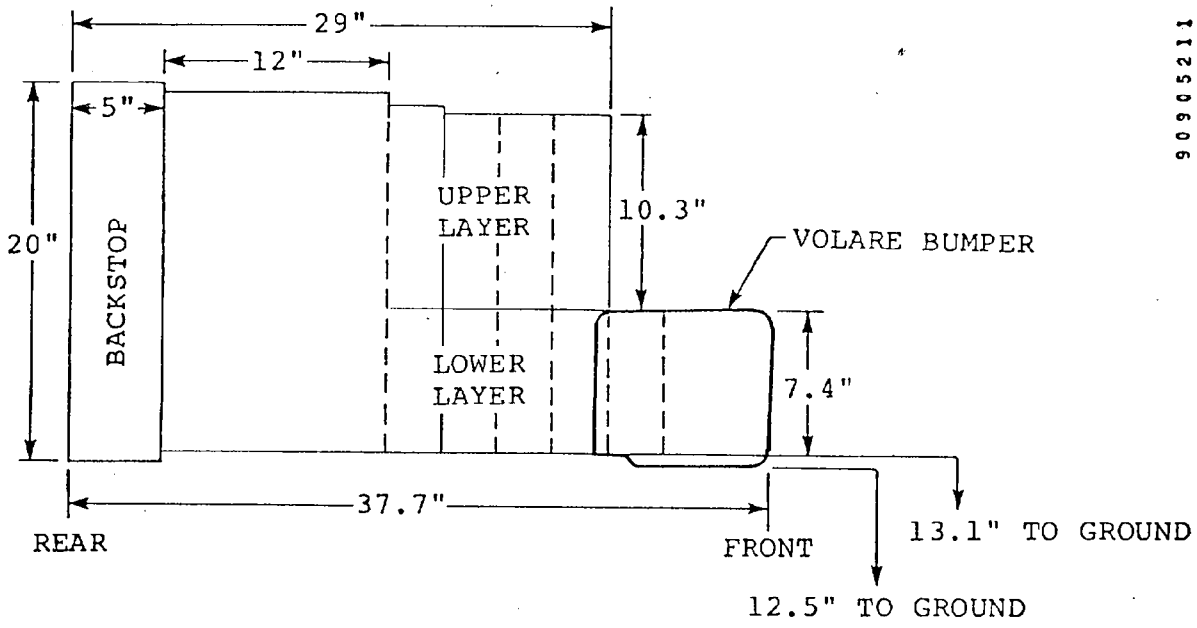


Figure B-1. Side View of -9 Assembly Honeycomb Face (Test 4.7).

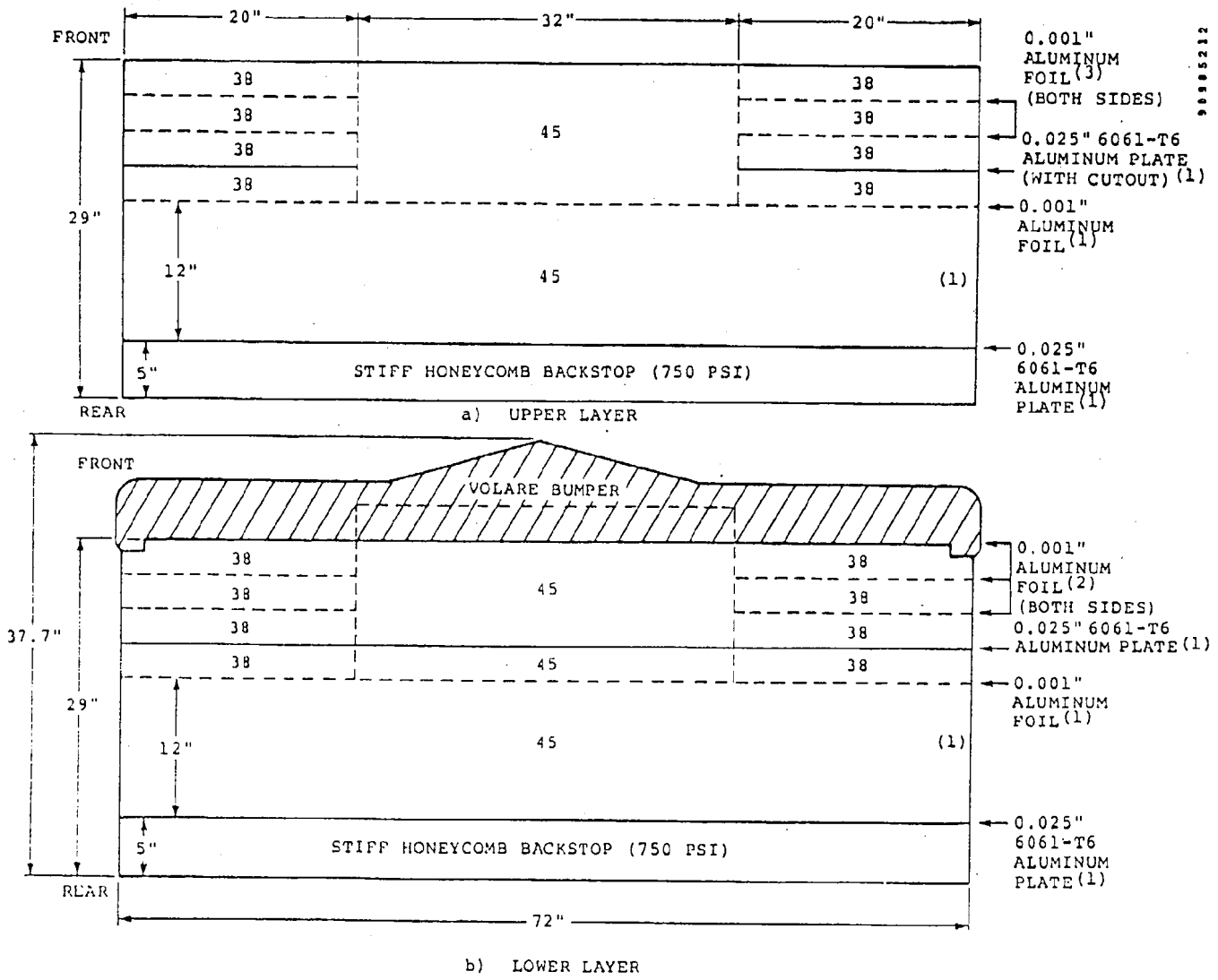


Figure B-2. Top View Schematic of -9 Assembly Honeycomb Face Showing Crush Strengths (psi) of Honeycomb Blocks (Test 4.7).

APPENDIX C

SUMMARY OF TEST RESULTS FROM

TEST 8321-4.7

A summary of the test results from Test 8321-4.7 is presented in Table C-1. At the time of publication, there were no other 60-degree Cutlass tests which could be compared with Test 4.7. When additional 60-degree tests are conducted on the Cutlass, their results will be compared with those from Test 4.7.

As may be seen from Table C-1, the injury criteria levels for both dummies are well below the maximum allowed in FMVSS 208, although the head injury levels for the rear dummy were caused by its head striking the C-pillar during the impact.

The force versus mutual crush of the two vehicles is shown in Figure C-1. Similar curves will be generated and compared with this curve when future Cutlass tests are conducted.

TABLE C-1. SUMMARY OF TEST RESULTS FOR 60° SIDE IMPACT INTO OLDSMOBILE CUTLASS (TEST 8321-4.7)

Test Number		4.7*
Test Speed (mph)		34.9
Bullet Vehicle		Side Impactor
Bullet Test Weight (lb)		3,668
Maximum Side Exterior Intrusion (Crush) (Target)		20.3
Target Maximum Vehicle Acceleration (G) (Lateral)		
Center of Door (Inside) at H-point Height (Impacted Side)		95.8
Directly Below No. 1 Mounted on Rocker Panel (Inside) (Impacted Side)		69.8
Inside on Rocker Panel Front Door Area (Non-impacted Side)		15.8
Bullet Maximum Vehicle Acceleration (G) (Longitudinal)		
Corresponding to Rocker Panel Inside Car (Impacted Side)		13.2
Corresponding to Rocker Panel Inside Car (Non-impacted Side)		12.4
Dummy Maximum Acceleration (G)		
Front Dummy Head	X	13.2
	Y	20.8
	Z	31.7
	R	34.0
Rear Dummy Head	X	62.5
	Y	76.2
	Z	23.2
	R	99.0
Front Dummy Chest	X	31.1
	Y	63.4
	Z	17.1
	R	65.1
Passenger Chest	X	21.3
	Y	62.8
	Z	13.3
	R	63.9
HIC		
Front Dummy		61
Rear Dummy		453
Severity Index		
Front Dummy Head		95
Rear Dummy Head		572
Front Dummy Chest		249
Rear Dummy Chest		253

*Oldsmobile Cutlass struck on right side.

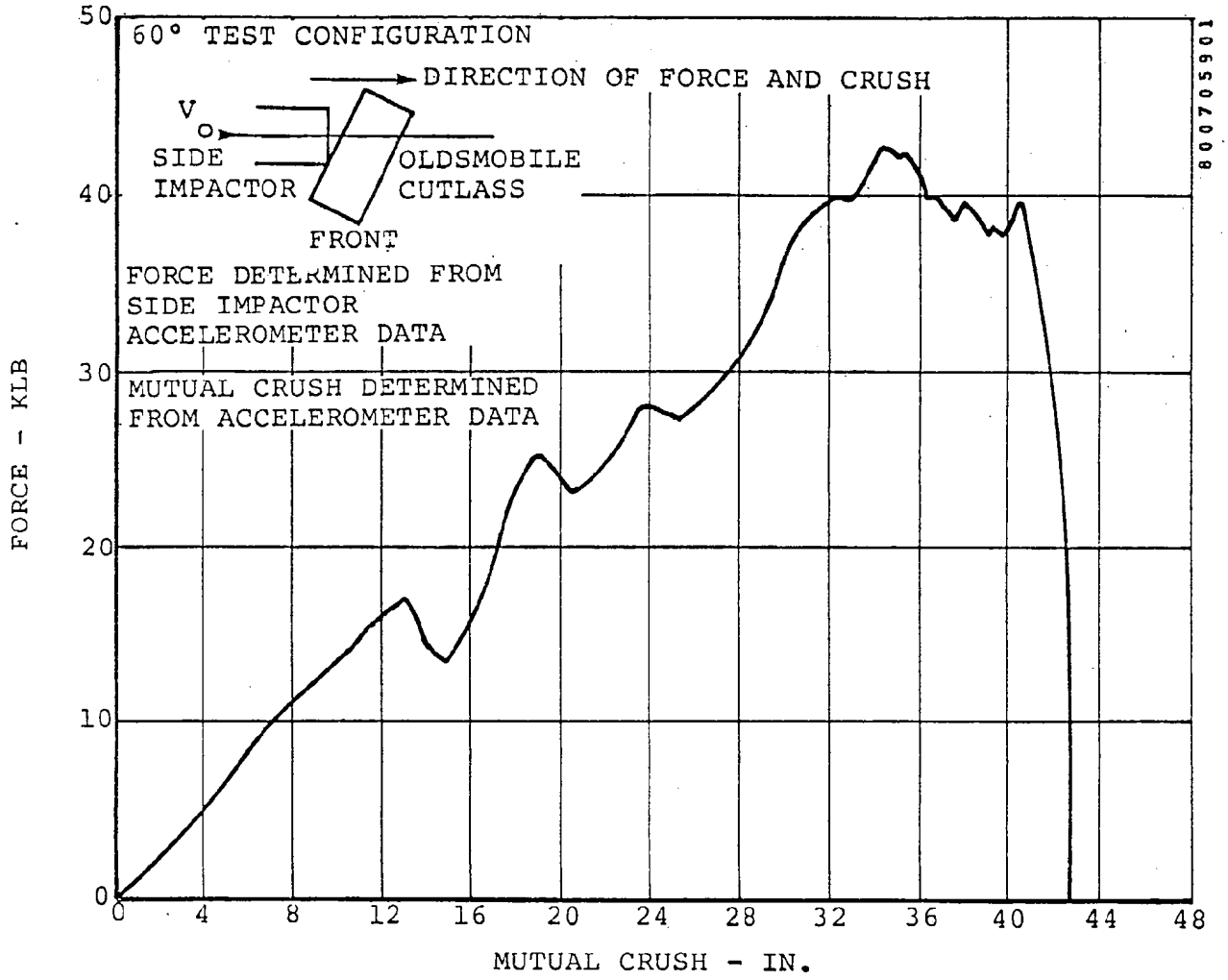


Figure C-1. Side Impactor Force Versus Mutual Crush in Direction of Impactor (Test 8321-4.7).

dsi DynamicScience Inc.
a TALLEY INDUSTRIES Company

8321

February 8, 1980

Mr. Carl Ragland (NRD-12)
Contract Technical Manager
National Highway Traffic Safety
Administration
Nassif Building
400 Seventh Street, S.W.
Washington, D.C. 20590

Subject: Transmittal of Reproducible Test Report 5 - Side Impactor-to-Car Test 8321-4.7

Reference: Contract No. DOT-HS-8-01933, "Test Device and Test Procedures to Assess Side Structures"

Dear Carl:

I am forwarding a reproducible and ten (10) copies of Test Report 5 - Side Impactor-to-Car Test 8321-4.7, which covers the following test:

- Test 8321-4.7 - NHTSA Side Impactor-to-1979 Oldsmobile Cutlass Salon, 60° Angular Side Impact (V_o = 34.89 mph).

Sincerely,

Sol Davis

Sol Davis, Director
Research Operations

SD:pm

Enclosures