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APPROVED ENGINEERING TEST LABORATORIES / 1536 EAST VALENCIA / FULLERTON, CALIFORNIA 92631 / TEL. (714) 879-6110

A NATIONAL TECHNICAL SERVICES COMPANY

DOT#143

REPORT NO. 301-AETL-79-082-671-1489-82

NEW VEHICLE ASSESSMENT AND STANDARDS ENFORCEMENT INDICANT TESTING OF FMVSS 301-75 FUEL SYSTEM INTEGRITY

CHRYSLER CORPORATION
1979 PLYMOUTH HORIZON - 2 DOOR HATCHBACK
NHTSA 790317

APPROVED ENGINEERING TEST LABORATORIES
1536 EAST VALENCIA DRIVE
FULLERTON, CALIFORNIA 92631

SEPTEMBER 1979

FINAL REPORT

PREPARED FOR

U. S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
- ENFORCEMENT -
OFFICE OF VEHICLE SAFETY COMPLIANCE
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Final Report Accepted By:

Robert Krauss
NHTSA Contract Technical Manager

12/27/79
Date of Report Acceptance

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
301-AETL-79-082		

4. Title and Subtitle	5. Report Date
New Vehicle Assessment and Standards Enforcement Indicant Testing of FMVSS 301-75 - 1979 Plymouth Horizon - 2 Door Hatchback - NHTSA 790317	November 14, 1979
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
D. H. Hand Project Engineer	671-1489-82

9. Performing Organization Name and Address	10. Work Unit. No.
Approved Engineering Test Laboratories 1536 East Valencia Drive Fullerton, California 92631 Phone No.: (714) 879-6110	11. Contract or Grant No. DOT-HS-6-01477

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U. S. Department of Transportation National Highway Traffic Safety Admin. Enforcement Office of Vehicle Safety Compliance 400 Seventh Street S. W. Washington, D. C. 20590	Final Report August 30 - September 13, 1979
	14. Sponsoring Agency Code

15. Supplementary Notes

Approved: D. C. Valenzuela Mechanical Dept. Supervisor
Approved Engineering Test Labs.

16. Abstract

A 1979 Plymouth Horizon - 2 Door Hatchback, NHTSA 790317, was impact tested for compliance indicant with FMVSS 301-75 (Fuel System Integrity) and vehicle assessment data.

As a parallel effort with FMVSS 301-75 vehicle safety test, the anthropomorphic dummies and the test vehicle were instrumented with accelerometers to measure occupant response and vehicle acceleration.

The average moving barrier impact speed was 35.500 mph in the rear (0°) mode. Test date was September 13, 1979 and the ambient temperature was 78°F.

17. Key Words	18. Distribution Statement
New Vehicle Assessment Standards Enforcement Indicant FMVSS 301-75 - Fuel System Integrity	

19. Security Class. (of this report)	20. Security Class. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	103	

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1.0 INTRODUCTION

This report contains information regarding a joint program for the Office of Vehicle Safety Compliance (OVSC), Office of Automotive Ratings (OAR), and Research and Development (R & D) for a vehicle assessment and standards enforcement indicant test of fuel system integrity relative to Federal Motor Vehicle Safety Standard (FMVSS) No. 301-75. This test was performed under Contract Number DOT-HS-6-01477 by Approved Engineering Test Laboratories, 1536 East Valencia Drive, Fullerton, California in accordance with the Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures (TP212-01).

The specific purpose of this test was to obtain research and vehicle rating data in conjucntion with fuel system integrity indicant data, when a vehicle is impacted in excess of the velocity (30 mph) requirement of FMVSS 301-75.

Section 2 contains vehicle fuel system compliance related data, while Section 3 contains occupant response and vehicle acceleration summary data. Section 4 is the test results and photographs. Section 5 discusses AETL's test facilities and data acquisition and reduction system.

1.1 ADMINISTRATIVE DATA

A. References

1. Federal Motor Vehicle Safety Standard 301-75 "Fuel System Integrity" as published in the Federal Register, Volume 38, No. 22397, dated August 20, 1973

2. National Highway Traffic Safety Administration - Office of Vehicle Safety Compliance Laboratory Procedures for Vehicle Assessment and Indicant Testing for "Windshield Mounting", FMVSS 212 - "Windshield Zone Intrusion", FMVSS 219 - "Fuel System Integrity", FMVSS 301-75, TP212-01, dated March 20, 1979.

SECTION 1

B. Description of Test Vehicle

1. 1979 Plymouth Horizon - 2 Door Hatchback
2. Vehicle Identification No.: ML24A9D200789
3. NHTSA No.: 790317
4. Manufactured Date: December 1978
5. GVWR: 3,300 pounds

C. Dates

1. Vehicle Received: March 26, 1979
2. Start of Test: August 30, 1979
3. Completion of Test: September 13, 1979

SECTION 2

SECTION 2

2.0 TEST DATA

The 1979 Plymouth Horizon - 2 Door Hatchback was subjected to a rear moving barrier impact and a static rollover maneuver as required by Federal Motor Vehicle Safety Standard 301-75.

Color motion picture coverage of the impact, along with the static rollover test are considered part of the accumulated pertinent data. Where applicable, still photographs are presented in this report; while the motion picture coverage is submitted separately.

TABLE I

SUMMARY OF TEST CONDITIONS

TEST VEHICLE INFORMATION:

Manufacturer: Chrysler Corporation

Make/Model: Plymouth Horizon

Body Style: 2 Door Hatchback Model Year: 1979

VIN: ML24A9D200789 Build Date: December 1978

NHTSA No.: 790317 Color: Blue

Engine Data: Four (4) Cylinders; 105.7 Cu. In. Displ.

Transmission Data: Three (3) Speed ( ) Manual (XX) Automatic

Major Options: Power Brakes, Air Condition

VEHICLE ATTITUDE:

Delivered Attitude: LF 25.75 in.; RF 25.75 in.; LR 25.50 in.; RR 25.50 in

Test Attitude: LF 24.35 in.; RF 24.35 in.; LR 24.00 in.; RR 24.75 in

VEHICLE TIRE DATA:

Recommended Cold Tire Pressure: Front = 29 psi

(Up to Vehicle Load Capacity) Rear = 29 psi

Recommended Tire Size: P165/75R13 Load Range: B

Tires on Vehicle: P165/75R13 - w/s/w - Firestone

Spare Tire: x Yes; No; Space Saver: Yes; x No

TABLE Ia

SUMMARY OF TEST CONDITIONS (Cont'd)

TEST CONDITIONS:

Date of Test: September 13, 1979 Time of Test: 1002

Ambient Temperature: 78 °F at Impact Area

VEHICLE CAPACITY:

Type of Seats: ____ Bench; X Bucket; ____ Split Bench

Designated Seating Capacity: Front 2
Center 0
Rear 2
Total 4

Cargo: 115 lbs.

Total 715 lbs. (Vehicle Capacity Weight)

GVWR: 3,300 lbs. (Taken From Certification Label)

GAWR: Front 1,805 lbs.; Rear 1,545 lbs.

VEHICLE DELIVERED WEIGHT: (Fluids to Capacity)

Left Front 772 lbs. Left Rear 430 lbs.
Right Front 725 lbs. Right Rear 448 lbs.
Total Front Weight 1,497 lbs. (63.0 % of Total Vehicle Weight)
Total Rear Weight 878 lbs. (37.0 % of Total Vehicle Weight)
Total Delivered Weight 2,375 lbs.

CALCULATED VEHICLE TEST WEIGHT: 2,818 lbs.
(With Required Dummies and 115 lbs. Cargo)

ACTUAL VEHICLE TEST WEIGHT:

Left Front 841 lbs. Left Rear 570 lbs.
Right Front 812 lbs. Right Rear 586 lbs.
Total Front Weight 1,653 lbs. (58.8 % of Total Vehicle Weight)
Total Rear Weight 1,156 lbs. (41.2 % of Total Vehicle Weight)
Total Test Weight 2,809 lbs.

TABLE Ib

SUMMARY OF TEST CONDITIONS (Cont'd)

TEST FLUID DATA:

Test Fluid Type: Red Stoddard Solvent; Specific Gravity: 0.764

Kinematic Viscosity: 1.31

Spill Point Volume: 14.76 gals. (SPV)

Test Volume: 13.28 gals. (90-93% of SPV)

Fuel System Capacity: 13.00 gals.
(Data from Owner's Manual)

Electric Fuel Pump: _____ Yes; X No; Fuel Injection: _____ Yes; X No

Does Electric Fuel Pump Operate with Ignition Switch "On"

And the Engine Not Operating: _____ Yes; _____ No; X N/A

Details of Fuel System: Fuel filler located on right rear fender aft of rear wheel opening, fuel tank located horizontally between frame side rails in front of rear axle under rear seat cushion floor pan.

VEHICLE CRUSH AND REBOUND:

Overall Length of Test Vehicle: Pre-Test = Left 171.75 in.; Right 171.50 in.

Post-Test = Left 149.00 in.; Right 149.50 in.

Crush: Left 22.75 in.; Right 22.00 in.

Rebound (From Rigid Barrier Only): N/A in.

TABLE III

POST IMPACT SUMMARY

Vehicle 1979 Plymouth Horizon

NHTSA No. 790317 Test Date September 13, 1979

TYPE OF TEST: [ ] 0° Frontal Impact

[ ] 30° Oblique Impact (Driver/Passenger) Side

[XXXX] Rear Impact

REQUIRED IMPACT VELOCITY RANGE: 34.5 to 35.5 mph

IMPACT VELOCITY: (Traps within 5 feet of impact event)

Trap 1 = 35.49 mph

Trap 2 = 35.51 mph

Average 35.50 mph

Actual distance from impact point to midpoint of Traps = 2 ft.

VEHICLE STATIC CRUSH: Driver's Side = 22.75 inches

Passenger's Side = 22.00 inches

Average = 22.375 inches

Crush Details: Hatchback window shattered, both rear wheels jammed, both doors jammed, roof buckled over both "B" posts, fuel filler cap cover severed from inner housing, both dummy heads impacted rear seat back cushion.

VEHICLE REBOUND: (From rigid barrier only)

Driver's Side = N/A inches

Passenger's Side = N/A inches

Average = N/A inches

TABLE VI

POST IMPACT SUMMARY

FUEL SYSTEM INTEGRITY - FMVSS 301-75

Vehicle 1979 Plymouth Horizon

NHTSA No. 790317 Test Date September 13, 1979

	Actual	Max. Allow.
Fuel spillage from impact until vehicle motion ceases.	- 0 -	1 ounce
Fuel spillage for 5 minute period following cessation of vehicle motion after impact.	- 0 -	5 ounces
Fuel spillage for next 25 minute period.	- 0 -	1 ounce/ 1 minute
Time duration from impact until start of rollover test periods.	22 minutes	30 minutes

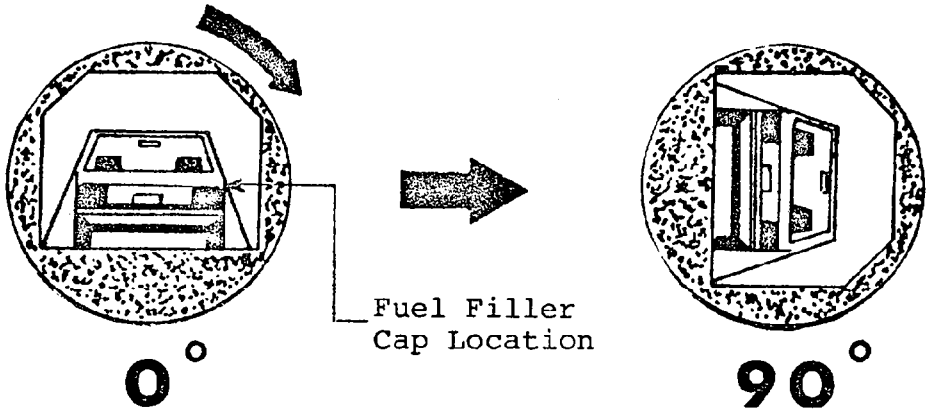
Fuel Spillage Location: Not Applicable

TABLE VII

FUEL SYSTEM INTEGRITY - FMVSS 301-75

STATIC ROLLOVER

Vehicle 1979 Plymouth Horizon **NHTSA No.** 790317



	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 10 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

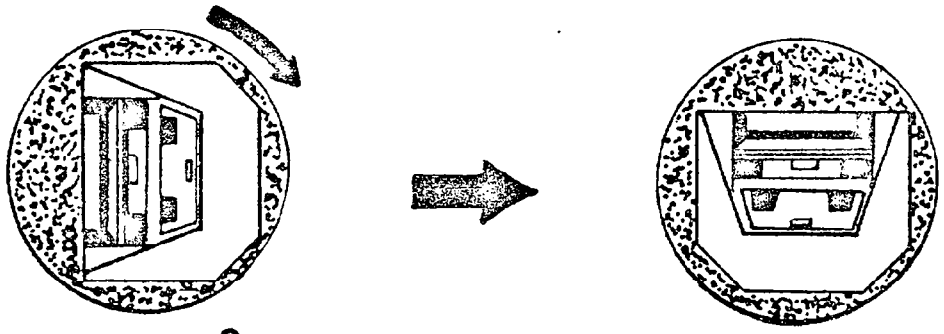
Fuel Spillage Location: Not Applicable

TABLE VIII

FUEL SYSTEM INTEGRITY - FMVSS 301-75

STATIC ROLLOVER

Vehicle 1979 Plymouth Horizon **NHTSA No.** 790317



	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 11 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

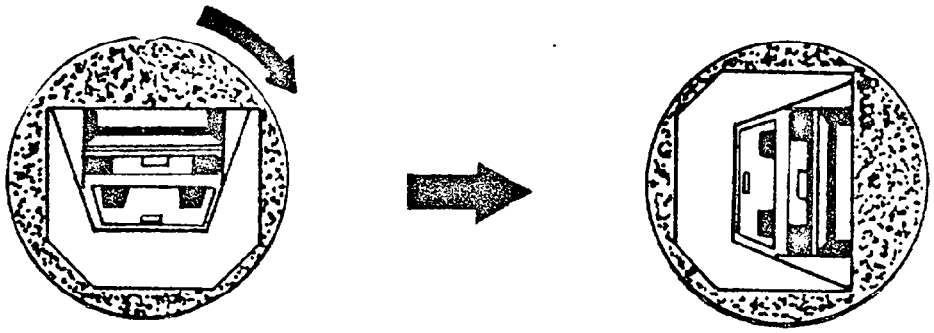
Fuel Spillage Location: Not Applicable

TABLE IX

FUEL SYSTEM INTEGRITY - FMVSS 301-75

STATIC ROLLOVER

Vehicle 1979 Plymouth Horizon **NHTSA No.** 790317



180° **270°**

	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 14 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

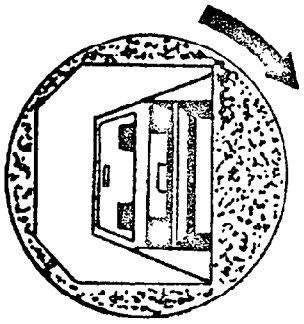
Fuel Spillage Location: Not Applicable

TABLE X

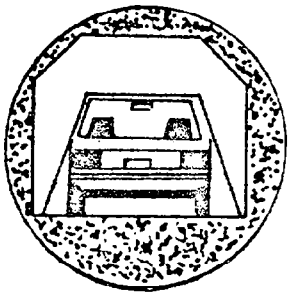
FUEL SYSTEM INTEGRITY - FMVSS 301-75

STATIC ROLLOVER

Vehicle 1979 Plymouth Horizon NHTSA No. 790317



270°



360°

	Actual	Max. Allowed
Rollover fixture 90° rotation time	2 min. 17 sec.	1 to 3 Minutes
Fuel spillage during 5 minute period from onset of rotation	- 0 -	5 ounces
Fuel spillage during 6th minute period from onset of rotation	- 0 -	1 ounce
Fuel spillage during 7th minute period from onset of rotation	- 0 -	1 ounce

Fuel Spillage Location: Not Applicable

SECTION 3

SECTION 3

3.0 OCCUPANT RESPONSE AND VEHICLE ACCELERATION SUMMARY DATA

The following data sheets summarize:

A. The occupant response data (Part 572 Dummy Data Sheet)

B. The vehicle acceleration data (Vehicle Structural Data Sheet)

C. The Pre and Post-Test vehicle dimensions data (Vehicle Measurement Data Sheets)

More comprehensive data is presented in Appendix A in the form of computer-generated plots.

3.1 INSTRUMENTATION MALFUNCTION

The driver dummy lateral chest accelerometer response (Tape 1, channel 6) and passenger dummy lateral chest accelerometer response (Tape 2, channel 6) data was not acquired after impact initiation due to apparent accelerometer/cable failure.

TABLE 3-1
PART 572 DUMMY DATA

Vehicle 1979 Plymouth Horizon NHTSA No. 790317

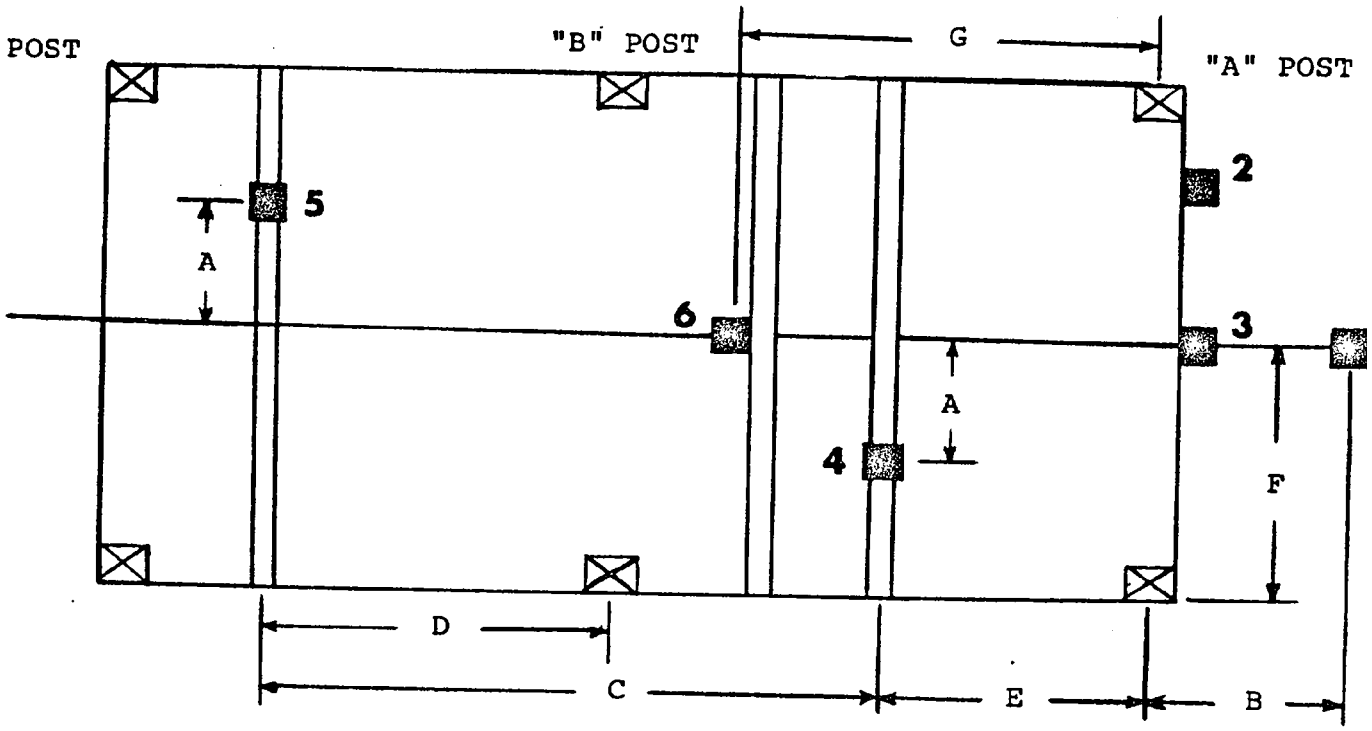
	DRIVER				PASSENGER			
	Positive* Direction		Negative* Direction		Positive* Direction		Negative* Direction	
	Peak G	Time (msec)	Peak G	Time (msec)	Peak G	Time (msec)	Peak G	Time (msec)
Head Acceleration								
Longitudinal	43.0	119.5	2.1	283.5	34.5	122.0	3.1	267.0
Lateral	1.9	57.5	13.7	123.5	2.5	147.0	18.8	128.0
Vertical	15.9	127.0	33.8	118.5	4.0	411.5	27.0	109.0
Resultant	54.1	119.0			38.8	222.0		
HIC	115.4 (51.1g - 3 msec clip)				146.5 (38.0g - 3 msec clip)			
Chest Acceleration								
Longitudinal	16.5	94.5	2.1	326.5	26.5	88.5	3.3	180.5
Lateral		No Data Acquired				No Data Acquired		
Vertical	1.1	139.0	7.5	80.5	4.0	409.0	12.1	103.0
Resultant	17.3	94.5			26.6	88.5		
Severity Index	31.4 (17.3g-3 msec clip)				70.9 (25.1g-3 msec clip)			
Femur Loads	(lb)	Time (msec)	(lb)	Time (msec)	(lb)	Time (msec)	(lb)	Time (msec)
Left	26	367.0	185	64.0	55	321.5	314	101.0
Right	56	139.5	165	48.0	78	374.0	302	91.0
Belt Load								
Torso	30	162.0	N/A	N/A	42	176.5	N/A	N/A

Average Vehicle Impact Speed 35.000 mph

*Positive Direction - Longitudinal: Forward
Lateral: Leftward
Vertical: Upward
Femur: Tension

*Negative Direction - Longitudinal: Rearward
Lateral: Rightward
Vertical: Downward
Femur: Compression

TABLE 3-2
VEHICLE STRUCTURAL DATA



DIMENSIONS			
LOCATION	MEASUREMENT (IN.)	LOCATION	MEASUREMENT (IN.)
A	12.5	E	12.0
B	N/A	F	33.0
C	24.0	G	35.5
D	-6.0 (Ahead of "B" Post)		

ACCELERATION PEAKS

ACCELEROMETER LOCATION	POSITIVE* DIRECTION		NEGATIVE* DIRECTION	
	PEAK "G"	TIME (MSEC)	PEAK "G"	TIME (MSEC)
NO. 1 LONGITUDINAL	N/A	N/A	N/A	N/A
NO. 1 VERTICAL	N/A	N/A	N/A	N/A
NO. 2 LONGITUDINAL	N/A	N/A	N/A	N/A
NO. 2 VERTICAL	N/A	N/A	N/A	N/A
NO. 3 LONGITUDINAL	N/A	N/A	N/A	N/A
NO. 3 VERTICAL	N/A	N/A	N/A	N/A
NO. 4 LONGITUDINAL	24.2	2.0	3.1	20.5
NO. 4 VERTICAL	21.8	83.0	22.6	79.5
NO. 5 LONGITUDINAL	24.8	0.0	7.2	26.5
NO. 5 VERTICAL	30.0	28.5	19.7	94.5
NO. 6 LONGITUDINAL	N/A	N/A	N/A	N/A
NO. 6 LATERAL	N/A	N/A	N/A	N/A
NO. 6 VERTICAL	N/A	N/A	N/A	N/A

*POSITIVE DIRECTION - LONGITUDINAL: Forward; LATERAL: Leftward; VERTICAL: Upward

*NEGATIVE DIRECTION - LONGITUDINAL: Rearward; LATERAL: Rightward; VERTICAL: Downward

TABLE 3-3
PRE-TEST
VEHICLE MEASUREMENT DATA

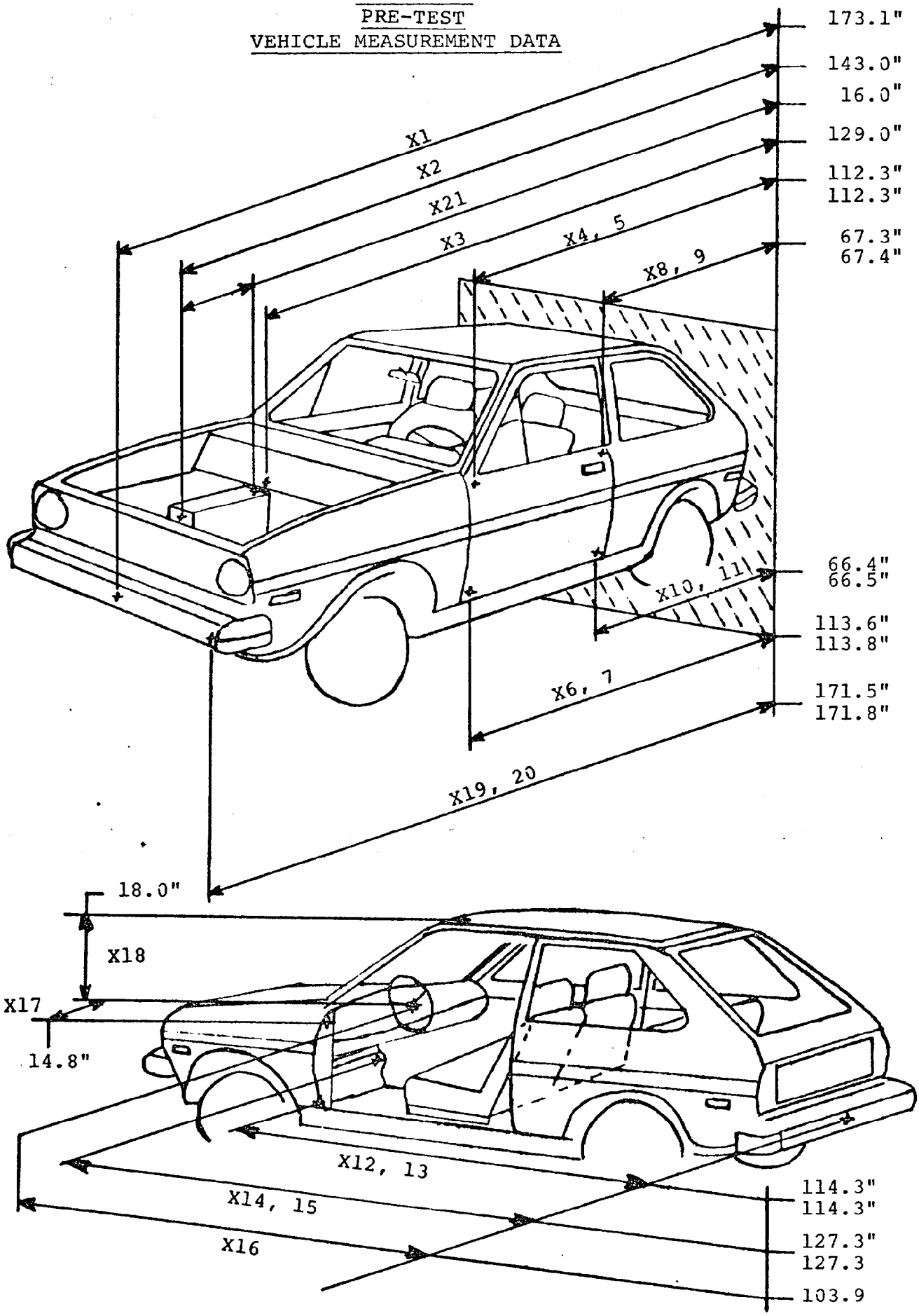
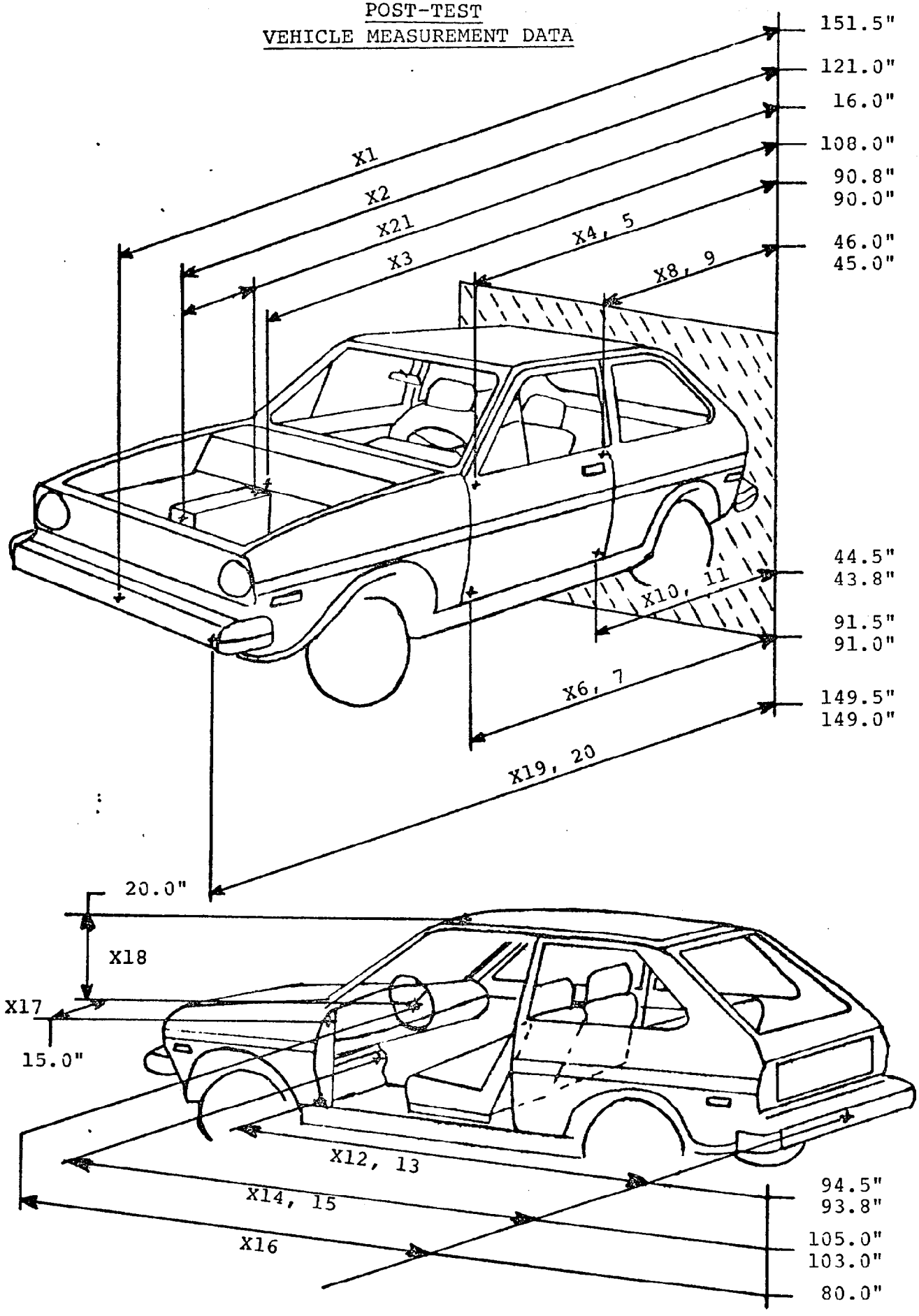


TABLE 3-4
POST-TEST
VEHICLE MEASUREMENT DATA



SUMMARY

PRE-TEST AND POST-TEST VEHICLE DIMENSIONS

Measurement Point	Pre-Test	Post-Test	Difference
X1	173.1"	151.5"	21.6"
X2	143.0"	121.0"	22.0"
X3	129.0"	108.0"	21.0"
X4	112.3"	90.8"	21.5"
X5	112.3"	90.0"	22.3"
X6	113.6"	91.5"	22.1"
X7	113.8"	91.0"	22.8"
X8	67.3"	46.0"	21.3"
X9	67.4"	45.0"	22.4"
X10	66.4"	44.5"	21.9"
X11	66.5"	43.8"	22.7"
X12	114.3"	94.5"	19.8"
X13	114.3"	93.8"	20.5"
X14	127.3"	105.0"	22.3"
X15	127.3"	103.0"	24.3"
X16	103.9"	80.0"	23.9"
X17	14.8"	15.0"	0.2"
X18	18.0"	20.0"	2.0"
X19	171.5"	149.5"	22.0"
X20	171.8"	149.0"	22.8"
X21	16.0"	16.0"	0.0"

SECTION 4

SECTION 4

4.0 TEST RESULTS AND PHOTOGRAPHS

The test vehicle performance was determined by a rear moving barrier impact at an average speed of 35.500 mph followed by a static rollover test.

Two (2) Part 572 test dummies were positioned in each designated outboard seating position and were restrained by the belt system in the test vehicle. Just prior to the impact event the driver dummy head was painted with white chalk and the passenger dummy head painted with red chalk to provide post visual inspection of possible dummy head contact with interior components during the impact event.

Post-impact inspection of the test vehicle revealed almost all crush occurred rearward of the front doors. The hatch-back window and both rear quarter windows shattered. The roof buckled over both "B" posts. Both rear fenders yielded forward, leaving the outer door shells overlapping the fender. The left and right door could not be unlatched and were impossible to open manually. Both rear wheels were jammed and the spare tire/well rotated upward and forward. The spare tire remained inflated. The left rear upper shock

mounting assembly tore loose and the fuel filler cap cover severed from the inner cap housing, which remained installed in the filler neck. Both front seat assemblies deformed inward and each seat back bent backward into the rear seat cushion. Both driver and passenger dummy heads made contact with the rear seat back cushion.

No fuel spillage was recorded following the moving barrier impact, nor during the time period before the start of the rollover test. No fuel spillage was recorded during the rollover test increment time periods.

Figure 4-1

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Pre-Test, Full Rear View


Horizon

Figure 4-2

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Pre-Test, Right Side View


NHTSA
790317

Figure 4-3

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Pre-Test, Driver Dummy View

Figure 4-4

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Pre-Test, Passenger Dummy View


NHTSA

Figure 4-5

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Post-Impact, Left Side View


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Figure 4-6

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Post-Impact, Full Rear View


Horizon

Figure 4-7

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Post-Impact, Right Side View


S4
30317

Figure 4-8

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Post-Impact, Fuel Filler Cap View

Figure 4-9

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Post-Impact, Driver Dummy View

Figure 4-10

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Post-Impact, Passenger Dummy View

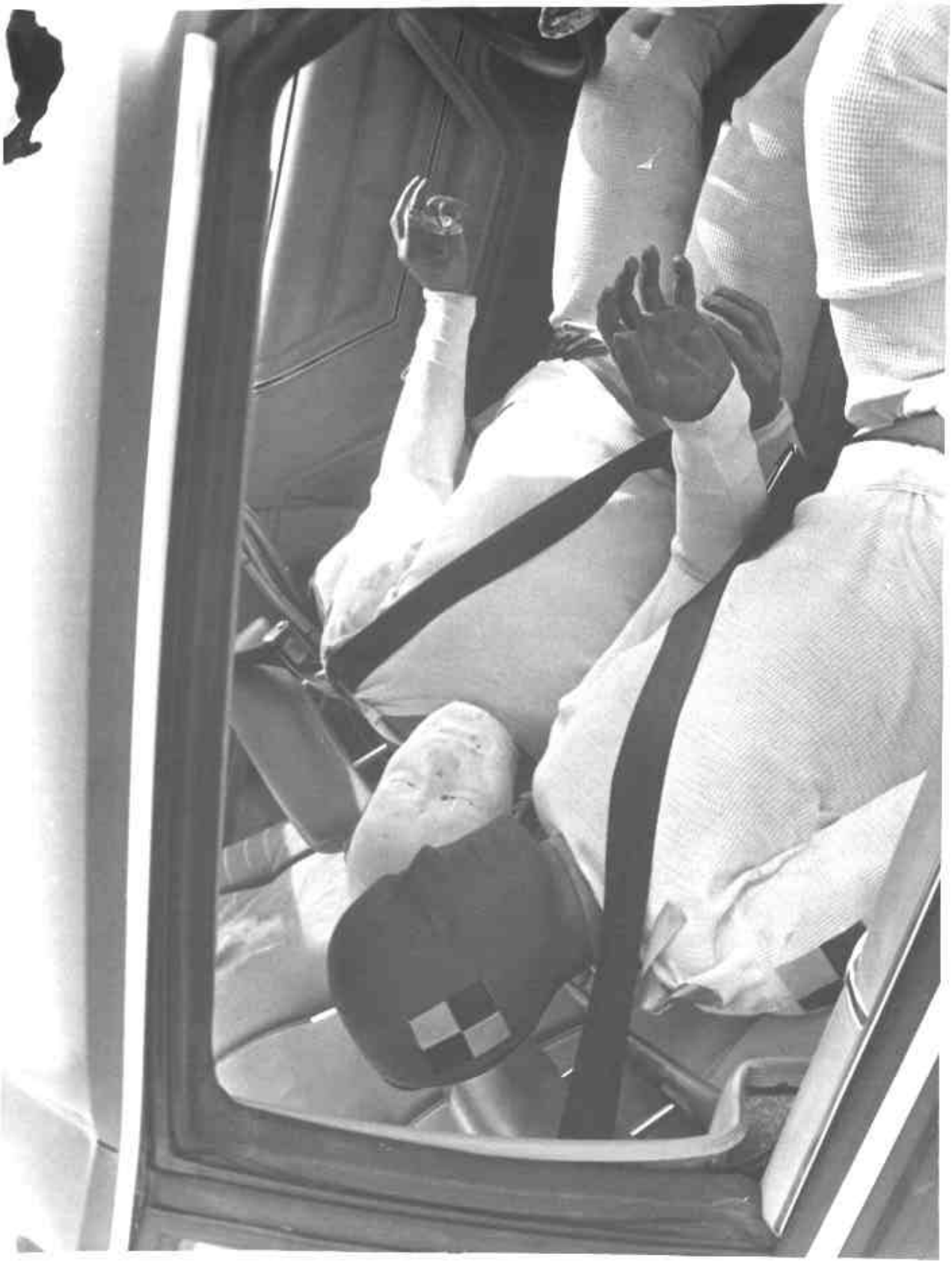
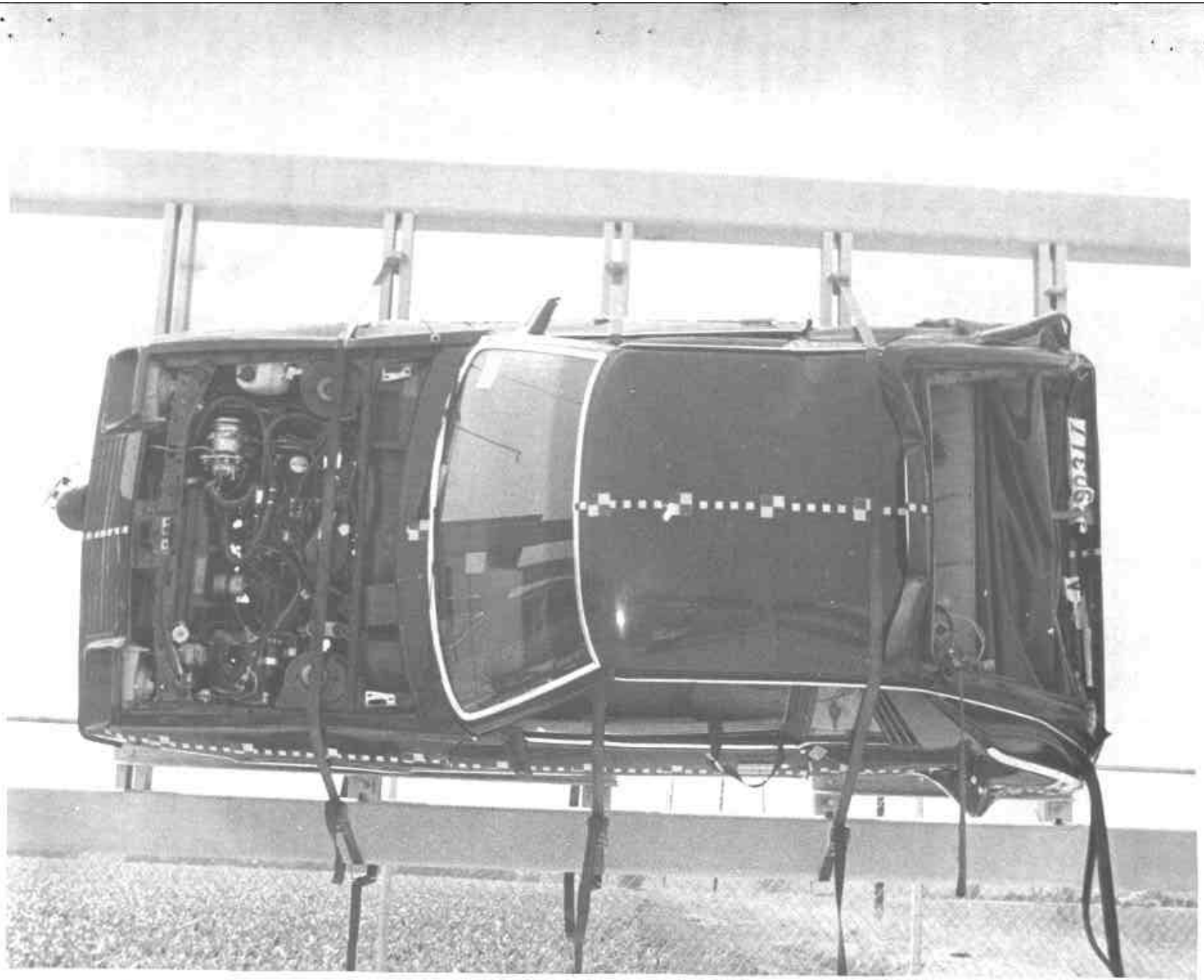


Figure 4-11

1979 Plymouth Horizon - 2 Door Hatchback

NHTSA 790317

Post-Impact, Rollover Machine, 90° Increment



SECTION 5

SECTION 5

5.0 TEST FACILITIES AND EQUIPMENT

Approved Engineering Test Laboratories (AETL) collision barriers, vehicle static rollover machine, and data processing/computer analysis test facilities are located at the Fullerton, California Division.

This section discusses these specialized facilities, along with associated equipment and instrumentation required for the performance of this test.

5.1 FRONTAL COLLISION BARRIER FACILITY

5.1.1 The frontal (fixed) collision barrier conforms to the requirements as set by the NHTSA Office of Vehicle Safety Compliance (OVSC) and as defined in the Laboratory Procedures for FMVSS 212/219/301-75, TP219-02, dated January 9, 1979, with the following special characteristics.

5.1.2 The fixed collision barrier is a steel clad, steel reinforced concrete block with a 6'4" X 12' face. The face is 1" steel plate faced with 3/4 inch plywood. The total mass of the structure is approximately 200,000 pounds, with a substantial portion below ground to provide resistance against sliding or tipping of the barrier during impact.

SECTION 5

5.1.3 The facility consists of a 500 foot concrete paved runway, with a steel monorail embedded in the approach surface. Two camera pits are provided to allow photographing the test vehicle at impact. One pit is located immediately in front of the fixed collision barrier and is 36 inches wide (expandable to 48 inches), 7 feet deep, and 23 feet long (3 feet of the pit length extends under the barrier face). The second (mid) pit with removable monorail section is located approximately 160 feet from the fixed collision barrier and is 43 inches wide, 7 feet deep, and 23 feet long.

5.1.4 Tow propulsion is provided by a fixed prime mover and continuous cable drive system located near the mid camera pit position. The power plant for the tow cable system is a 200 h.p. synchrouous electric motor, coupled to an electronically controlled Eddy Current Clutch and a 4:1 gear reduction transfer assembly.

The endless 1/2 inch diameter steel tow cable is wrapped around the drive pulley and is tensioned by a pneumatic loaded idler wheel. The tow cable passes through the fixed collision barrier and around fixed idler pulleys to complete the loop. The test vehicle or moving collision barrier is towed by a dolly assembly attached to the vehicle

or moving collision barrier by a shear pin release mechanism. For a fixed collision barrier test, the test vehicle is towed within 20 feet of the fixed barrier, at which point the towing dolly assembly is disconnected from the test vehicle and the test vehicle proceeds under its own momentum for the final 20 feet to impact. For a moving collision barrier test, the moving collision barrier is towed within 5 feet of the test vehicle, at which point the towing dolly is disconnected from the moving collision barrier and the moving collision barrier proceeds under its own momentum for the final 5 feet to impact. Heavy steel stops actuate the tow cable release mechanism and prevent the towing dolly from continuing past the point of impact. The towing dolly is designed to fit inside the monorail such that it is constrained in the vertical and lateral directions, and capable of sliding freely along the monorail.

5.2 OBLIQUE ANGLE COLLISION BARRIER

5.2.1 The oblique angle collision barrier conforms to the requirements as set by NHTSA Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures TP219-02, with the following special characteristics.

SECTION 5

5.2.2 The oblique angle collision barrier is constructed of a flat 1 1/2 inch steel plate faced with 3/4 inch plywood. The barrier face is 6' X 12' and is adjustable for left or right angle impacts by means of seven tubular gussets that attach to the standard fixed frontal collision barrier to form a rigid buttress structure.

5.3 MOVING COLLISION BARRIER

5.3.1 The moving collision barrier conforms to the requirements as set by Federal Motor Vehicle Safety Standard No. 208, Paragraph S8.2 with the following special characteristics.

5.3.2 The chassis is constructed of 12 inch steel channel with tubular frame gussets. The flat impacting face plate is 1/2 inch steel plate faced with 3/4 inch plywood. The face plate is reinforced with 6 inch steel channel horizontally welded to the chassis to form a rigid symetrical structure. A camera boom extends above the barrier face plane to provide a view of barrier to vehicle impact. The barrier assembly weighs 3,977 pounds and has a four wheel electric brake system.

SECTION 5

5.4 VEHICLE STATIC ROLLOVER MACHINE

5.4.1 The vehicle static rollover machine conforms to the requirements as set by the NHTSA Office of Vehicle Safety Compliance (OVSC) Laboratory Procedures TP219-02 with the following special characteristics.

5.4.2 The vehicle static rollover machine is constructed of 10 inch square tube with adjustable wheelbase and tread width platforms to accommodate the various test vehicles. The total usable platform area is 8 feet wide and 25 feet long with special design feature to accomodate vehicles with a gross vehicle weight rating (GVWR) of 10,000 pounds or less with various body configuration heights to 12 feet. The test vehicle can be rotated left or right and can turn each 90° rotational increment in approximately two (2) minutes.

5.5 IMPACT VELOCITY MEASUREMENT

The test vehicle impact velocity is measured by two (2) separate certification timing trap systems located within five (5) feet of the fixed collision barrier face and to one side on the approach apron. Each trap contains two (2)

SECTION 5

carbon rods, mounted twenty-four (24) inches apart, in a mechanical housing assembly providing start and stop circuits to two (2) independant digital display counters. As the test vehicle traverses the impact apron, a blade attached to the test vehicle fender breaks each carbon rod providing the precise measurement of time interval for the test vehicle to advance the known distance. Each interval time measurement is stored in the digital display counters and photographically recorded.

The moving collision barrier impact velocity is measured by two (2) separate certification timing trap systems located within five (5) feet of the barrier to vehicle impact location. Each timing trap system is controlled by a twelve (12) inch long target blade attached to the moving collision barrier to provide the precise measurement of time interval required for the target blade to pass through an optical beam. Each interval of time measurement is stored in a digital display counter and photographically recorded.

SECTION 5

5.6 PHOTOGRAPH COVERAGE

Because FMVSS 212/219/301-75 maybe a combined test, it is necessary that all photographic coverage of the test vehicle be done at one time with specific photographs to document the areas for Vehicle Safety Compliance consideration; windshield area and the fuel system. Each report will utilize only those photographs pretaining to the Vehicle Safety Compliance Test being reported.

5.6.2 FIXED BARRIER IMPACT TEST

Motion picture coverage of the event employs four (4) 16mm 1B Photo-Sonics cameras and two (2) 16mm 51 Redlake Locam cameras using color film at 500 frames per second (fps). Also a 16mm Canon Scoopic 24 frames per second (fps) camera with color film is used to record vehicle pre-test condition, vehicle in-run, impact, and post-impact vehicle conditions including the rollover increments for documentary purposes. The six (6) high speed cameras are located at stationary positions near the point of impact. One is an overhead camera mounted on a tower above the fixed barrier face on centerline of the test vehicle at impact. Its field of view includes the barrier face and the front of the vehicle to a point about one foot aft of the windshield. A second camera is mounted on top of the fixed barrier with its field

of view concentrating on the windshield area (FMVSS 212/219). The third and fourth cameras each have a side view of the test vehicle at impact. The fifth and sixth cameras are located in the pit and positioned to photograph the underside of the engine compartment and fuel tank area.

5.6.3 MOVING BARRIER IMPACT TEST

Motion picture coverage of the event employs four (4) 16mm 1B Photo Sonics cameras and two (2) 16mm 51 Redlake Locam cameras using color film at 500 frames per second (fps). Also a 16mm Canon Scoopic 24 frames per second (fps) camera with color film is used to record vehicle pre-test condition, barrier in-run, impact, and post-impact vehicle conditions including the rollover increments for documentary purposes. Five (5) of the high speed cameras are located at stationary positions near the point of impact. Three (3) cameras are located in the pit and positioned to photograph the underside of the engine compartment, with overlapping field of views, aft to the fuel tank area. The fourth and fifth cameras each have a side view of the test vehicle at impact. The sixth camera is attached to the moving collision barrier to photograph the contact between the barrier and the test vehicle.

5.6.4 Time data from two (2) sources are contained in the high speed film coverage. The first time reference is a 100 pps timing pulse along the film edge. This pulse is generated by a pulse generator and fed to all high speed cameras. Thus, it is possible to relate film data to a real time base. The second time record is an indication of time zero (moment of impact). This is accomplished by a trip switch and strobe light system. The trip switch is positioned at the impact point so that it triggers the strobe light system at the moment of bumper-barrier contact. Thus, the particular film frame corresponding to the point of impact is clearly indicated on all the high speed film

5.7 DATA ACQUISITION AND REDUCTION

The data acquisition and analysis system used for acquiring occupant response and vehicle acceleration are shown schematically in Figure 5-1. A complete list of instrumentation is provided in Table 5-1. An itemized procedure for acquiring data is provided on Table 5-2.

Prior to the vehicle impact test the onboard instrumentation package is installed and a calibration and null reference check is performed to checkout all data analog devices including the FM magnetic tape recorders. The moment of impact trigger switch attached to the vehicle

is also checked out. Immediately following vehicle impact a post-impact calibration and null reference check is performed.

The analog data is then played back into a Hewlett Packard Digital Fourier Analyzer (DFA) system using a HP 2100S mini computer with 32K word core storage. This system uses four program controlled analog filters which provides predigitizing filter capability of 60 db/octave above 1250 Hz.

The DFA is a hard disc based system with standard HP design software for performing data acquisition and analysis functions. The HP software is programmed using direct keyboard functions to automate the data reduction process. The data is entered into temporary storage, four channels (one set) at a time with eight total sets. Table 5-3 defines each data channel and data set. The data sets are divided into driver and passenger tape recorder groups to facilitate simultaneous data acquisition for the head, chest and vehicle accelerometers to assure appropriate calibration of injury criteria and vehicle dynamics. At the time of entry, test personnel enter the appropriate calibration for each data channel and the computer then scales the data appropriately. When all data has been acquired it is moved as a vehicle set to permanent storage on a removable magnetic

disc. (Eight vehicle sets are stored on each magnetic disc. All magnetic discs and FM recorder tapes are retained on file at AETL).

The only modifications to the data at the time of permanent storage is the filtering and digitizing process of the FM tape recorder (2500 Hz) and the DFA (2000 Hz sampling for a 500 ms window). After the data is moved to permanent storage it is recalled by test personnel and plotted with the appropriate labels and vehicle designation. As the data is recalled, the DFA is programmed to automatically apply the appropriate SAE filter where applicable.

A 1250 Hz predigitizing analog filter with a rolloff of 60 db/octave, shown in figure 5-2, was applied to all data. Also shown in figure 5-2 are SAE class 60 and class 180 filters. These filters are in accordance with SAE J211a, Instrumentation for Impact Tests. These SAE recommended filters are quadratic double pole with 65% damping and a 12 db/octave rolloff. They are applied using a fast fourier transform of the data, frequency domain multiplication, and an inverse fast fourier transform of the product. The class 60 filters is applied to vehicle acceleration and belt restraint forces. The class 180 filter is applied to chest acceleration. SAE filters were not applied to head accelerations and femur forces.

SECTION 5

5.7.1 IMPACT DATA

All impact data is presented in computer plots of data digitized at 500 microseconds. Special SAE filters are applied to appropriate data sets. Each data plot includes labeling, defining the test vehicle, filter class, and the complete identification of the data plotted.

5.7.1.2 DUMMY HEAD DATA

The dummy head accelerations are processed and the Head Injury Criteria (HIC) calculation is performed. The HIC calculations are maximized for start time (T1) and end time (T2), using a manual iteration routine, usually requiring about ten interations and between 5,000 and 10,000 combinations of start and end times. Data output is in the form of computer plots with the final HIC calculations. Listing of data value and HIC calculations are available, but not provided in the final report.

SECTION 5

5.7.1.3 DUMMY CHEST DATA

The dummy chest accelerations are processed as class 180 data, and direct Chest Severity Index (CSI) calculations are performed. Data output is in the form of computer plots with the CSI calculations.

5.7.1.4 FEMUR LOAD DATA

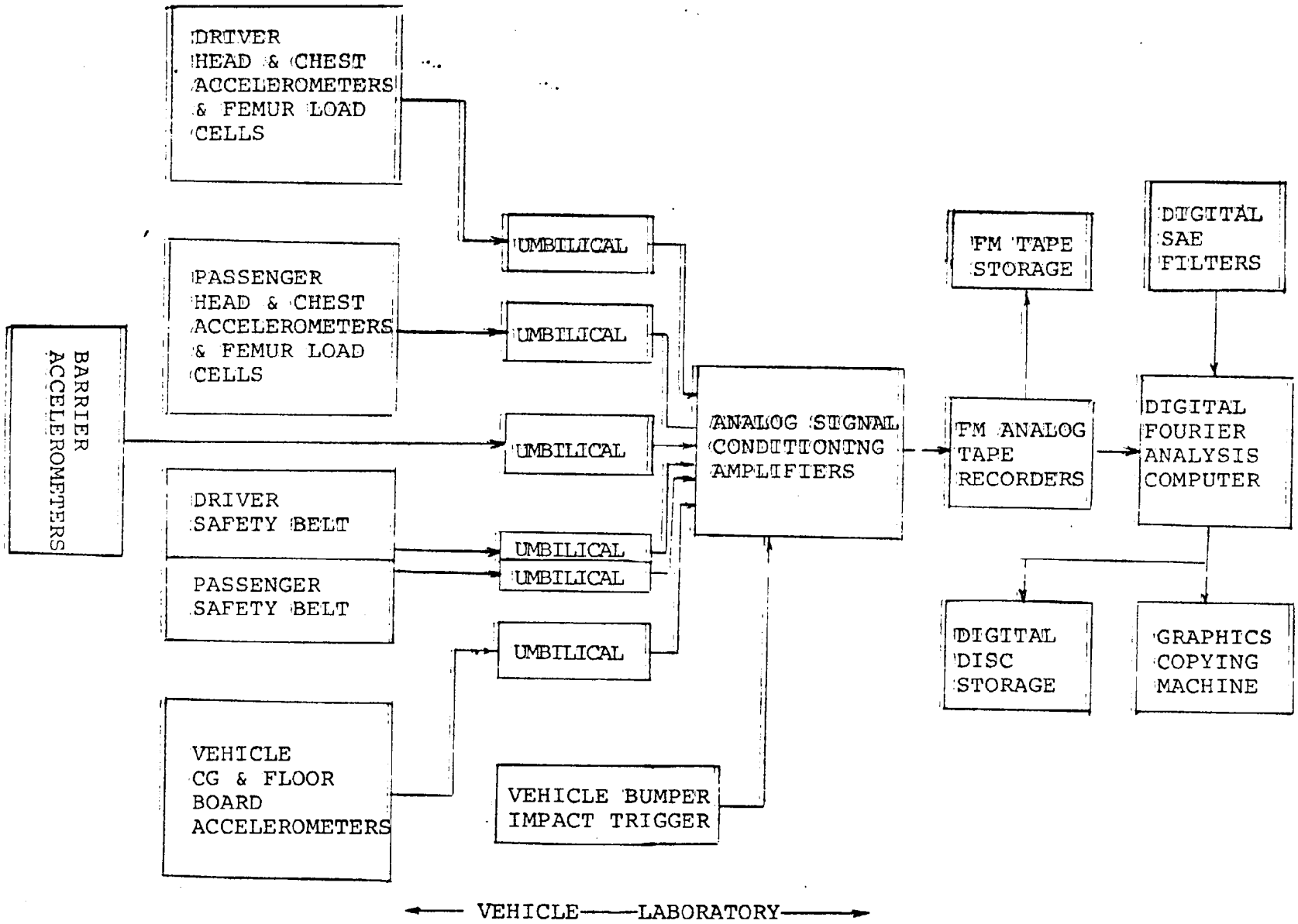
The dummy femur loads are processed and presented as computer plots.

5.7.1.5 RESTRAINT LOAD DATA

The dummy restraint loads are processed as class 60 data, and presented as computer plots.

5.7.1.6 VEHICLE ACCELERATION DATA

The vehicle accelerations are processed as class 60 data, and presented as computer plots.



VEHICLE AND OCCUPANT CRASH IMPACT DATA ACQUISITION SYSTEM

FIGURE 5-1

TABLE 5.1 INSTRUMENTATION FOR CRASH TEST

Instrument	Manufacturer	Model No.	Full Scale	Accuracy	Frequency Max.
Accelerometers, Head, Chest, Vehicle	Endevco	2262C-200	200g	±1%	3600 Hz
Load Cells, Femurs	GSE	2430	3000 lb	±1%	>3600 Hz
Load Cells, Safety Belts	GSE	2500	3000 lb	±1%	>3600 Hz
Contact Switch, Impact	AETL	-	2 V	-	<200 us rise time
FM Tape Recorder	Bell & Howell	4020	±2.8 V	47 db SNR	2500 Hz WB
Programmable Filter, All Data	Hewlett Packard	54440A	-	0.5%	1250 Hz, 60 db/oct
Analog-Digital Converter, All Data	Hewlett Packard	5466B	-	0.5%	200 us sampling
Analysis Computer, All Analysis	Hewlett Packard	2100S	32 K Words	16 Bit Word	-
Disc Drive	Hewlett Packard	7900A	5 Meg Words	-	-

TABLE 5-2

DATA ACQUISITION AND REDUCTION PROCESS

STEP	DESCRIPTION
1	DA System Installation
2	DA System Pre-Impact Calibration
3	Impact Trigger Checkout
4	Vehicle Impact Performed
5	DA System Post-Impact Calibration
6	Data Reproduced From FM Tape Into Computer a) Data analog filtered at 1250 Hz b) Data digitized at 500 ms sample rate c) Data sychronized by impact trigger signal
7	Digitized Data Examined
8	Data Transfered Permanent Disc Storage
9	Appropriate SAE Filters Are Applied
10	Each Data Signal Plotted With Lables
11	Chest Severity Index Values Determined
12	Head Injury Criteria Values Determined

TABLE 5-3

DATA DESIGNATIONS FOR VEHICLE CRASH IMPACT DATA ACQUISITION

DATA SET	TAPE NO.	CHANNEL NO.	DESCRIPTION
1	1	1	Driver Longitudinal Head Acceleration Ax
1	1	2	Driver Lateral Head Acceleration Ay
1	1	3	Driver Vertical Head Acceleration Az
1	1	4	Driver Right Femur Force
2	1	5	Driver Longitudinal Chest Acceleration Ax
2	1	6	Driver Lateral Chest Acceleration Ay
2	1	7	Driver Vertical Chest Acceleration Az
2	1	8	Driver Left Femur Force
3	1	9	Driver Restraint Belt Force
3	1	10	Vehicle Vertical CG Acceleration Az
3	1	11	Vehicle Lateral CG Acceleration Ay
3	1	12	Vehicle Longitudinal CG Acceleration Ax
4	1	13	Left Rear Floor Pan Longitudinal Acceleration Ax
4	1	14	Left Rear Floor Pan Vertical Acceleration Az
5	2	1	Passenger Longitudinal Head Acceleration Ax
5	2	2	Passenger Lateral Head Acceleration Ay
5	2	3	Passenger Vertical Head Acceleration Az
5	2	4	Passenger Right Femur Force
6	2	5	Passenger Longitudinal Chest Acceleration Ax
6	2	6	Passenger Lateral Chest Acceleration Ay
6	2	7	Passenger Vertical Chest Acceleration Az
6	2	8	Passenger Femur Force
7	2	9	Passenger Restraint Belt Force
7	2	10	Barrier Lateral Acceleration Ay
7	2	11	Barrier Longitudinal Acceleration Ax
7	2	12	Barrier Vertical Acceleration Az
8	2	13	Right Front Floor Pan Longitudinal Acceleration Ax
8	2	14	Right Front Floor Pan Vertical Acceleration Az

HP 5451 DATA PLOT APPROVED ENGINEERING TEST LABS

COMPARISON PLOT OF SAE CLASS 60, 180, 600, 1000 FILTERS AND THE DATA ANALYSIS 1250 HZ PREDIGITIZING ANALOG FILTER.

SAE FILTERS ROLL OFF IS 12DB/OCT, ANALOG FILTER ROLL OFF IS 60DB/OCT

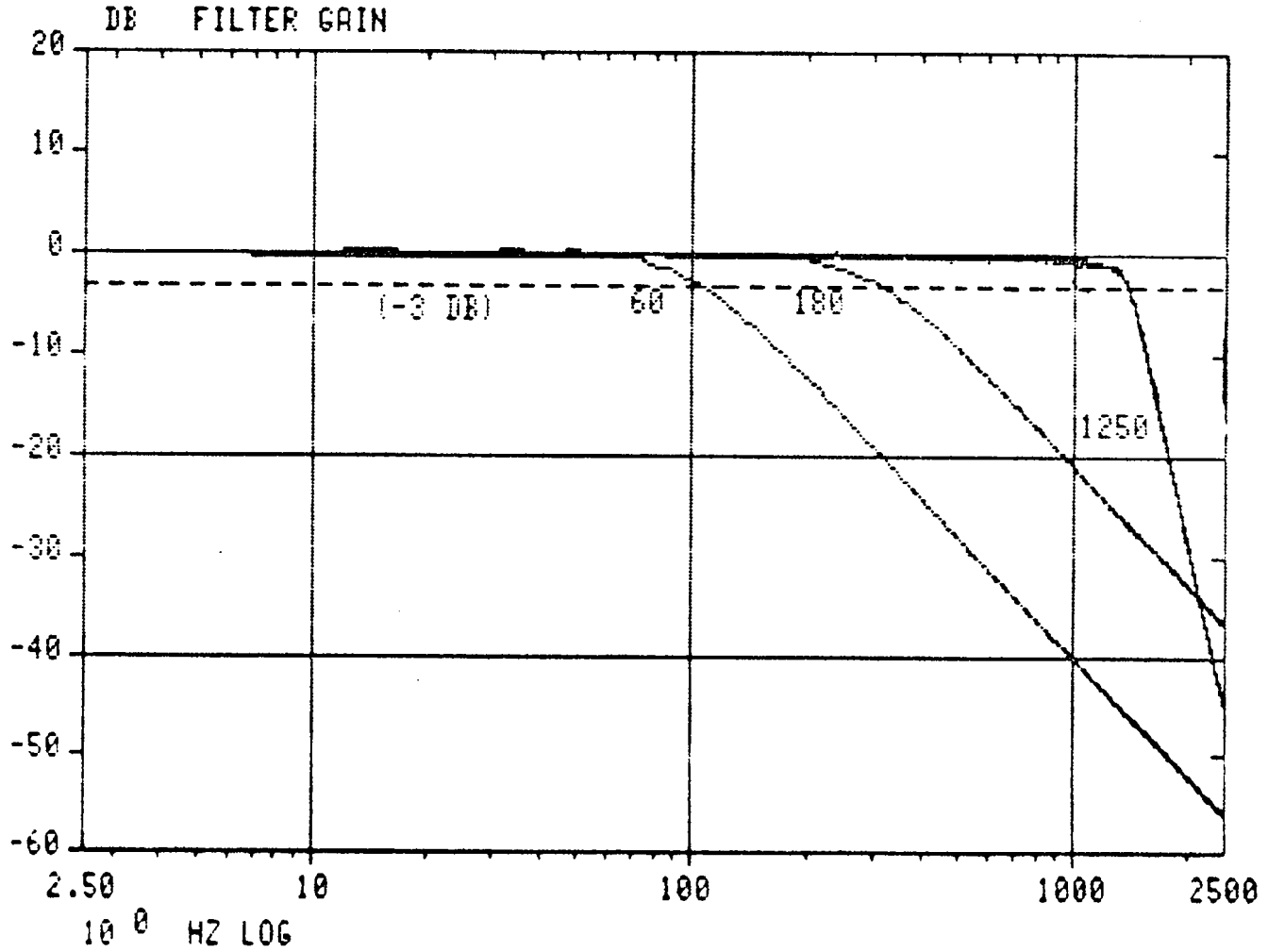


FIGURE 5-2

APPENDIX A

APPENDIX A

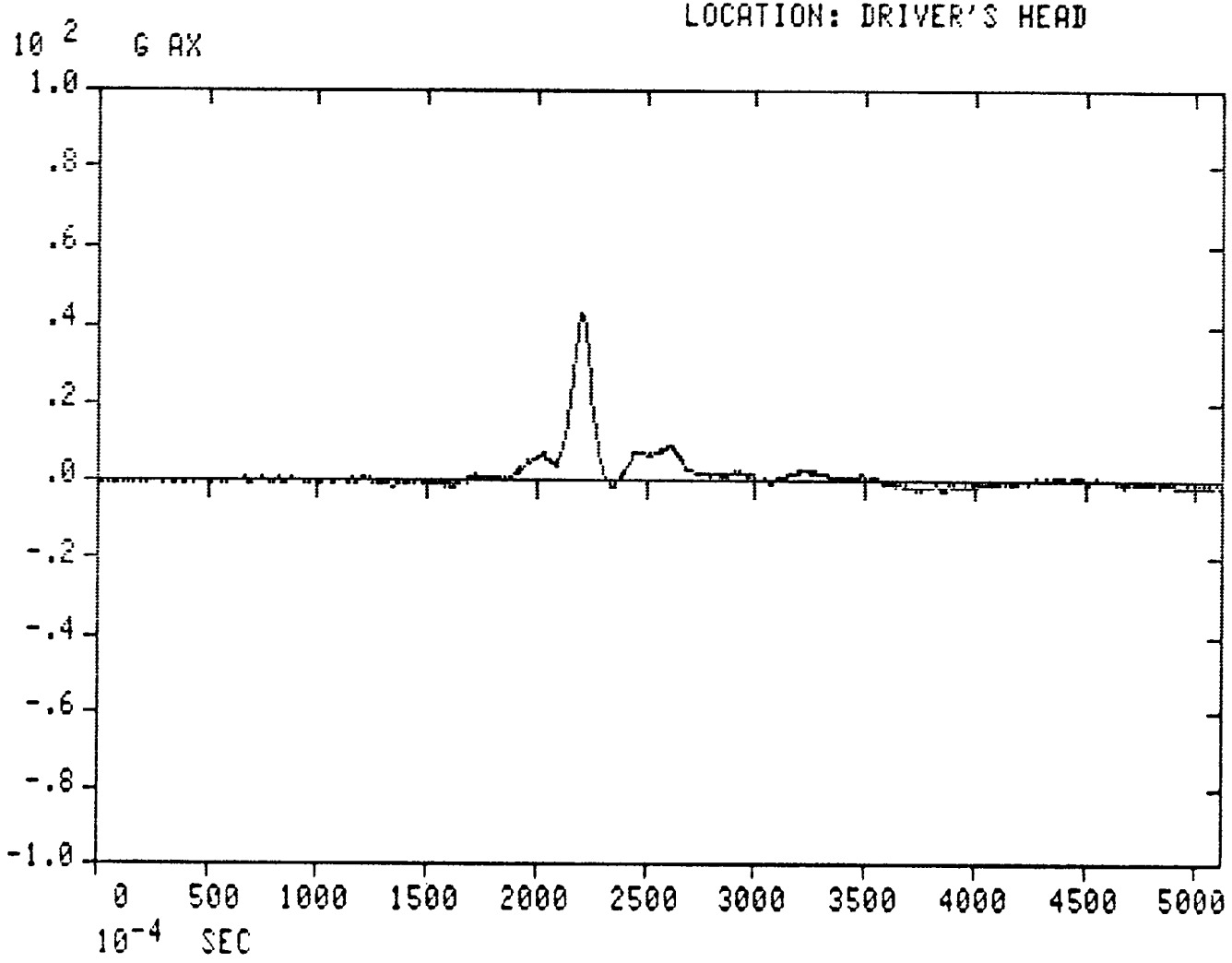
The following computer plots provide complete and comprehensive occupant response and vehicle acceleration during this rear impact test of a 1979 Plymouth Horizon - 2 Door Hatchback, NHTSA 790317. It should be noted that impact occurs at t = 100 msec on this set of plots.

DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 1000
ACCELEROMETER: TAPE 1, CH 1
DIRECTION: FORWARD
LOCATION: DRIVER'S HEAD

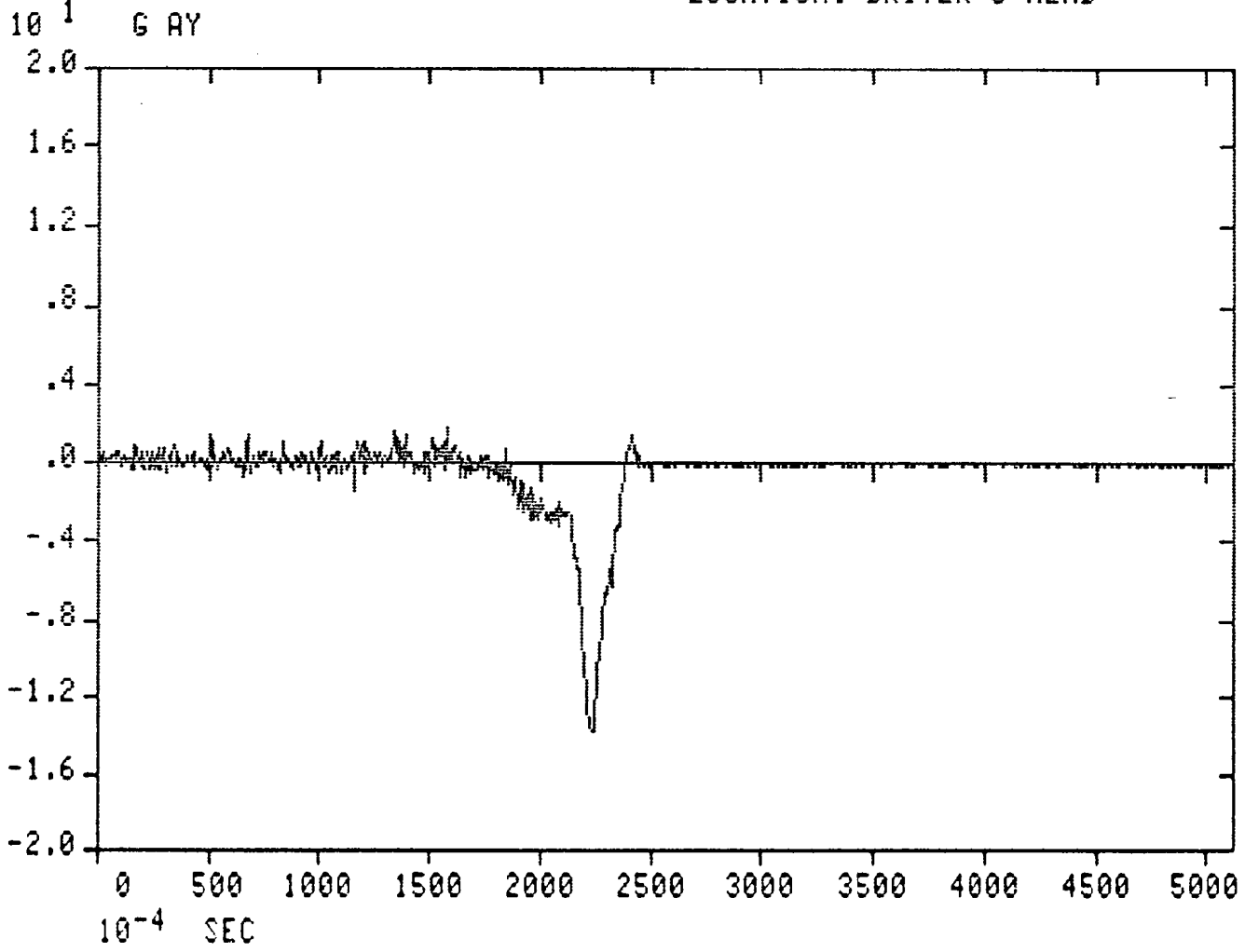


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 1000
ACCELEROMETER: TAPE 1, CH 2
DIRECTION: LEFT
LOCATION: DRIVER'S HEAD

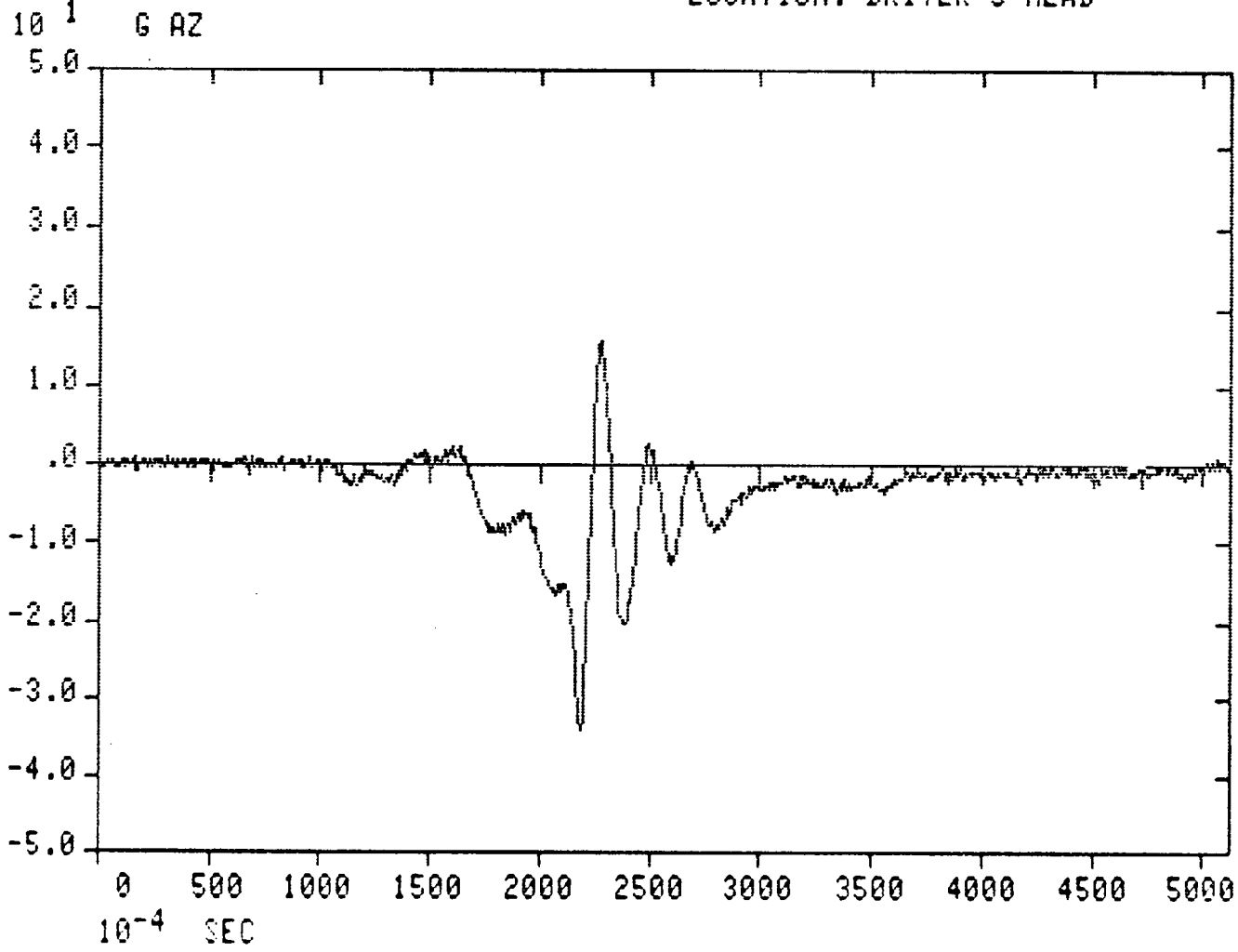


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 1000
ACCELEROMETR: TAPE 1, CH 3
DIRECTION: UPWARD
LOCATION: DRIVER'S HEAD

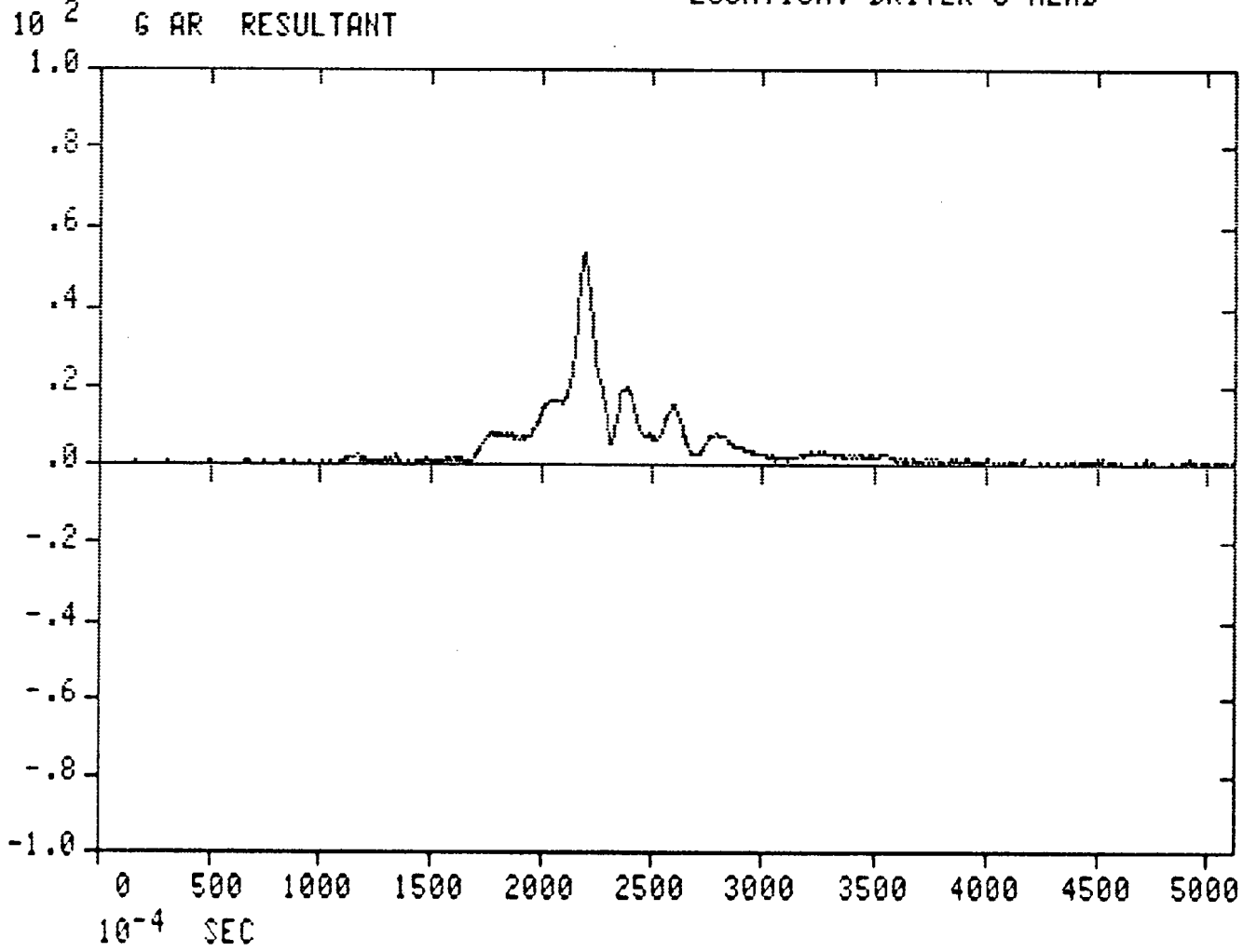


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 1000
ACCELEROMETER: TAPE 1, CH 1-3
DIRECTION: RESULTANT OF XYZ
LOCATION: DRIVER'S HEAD

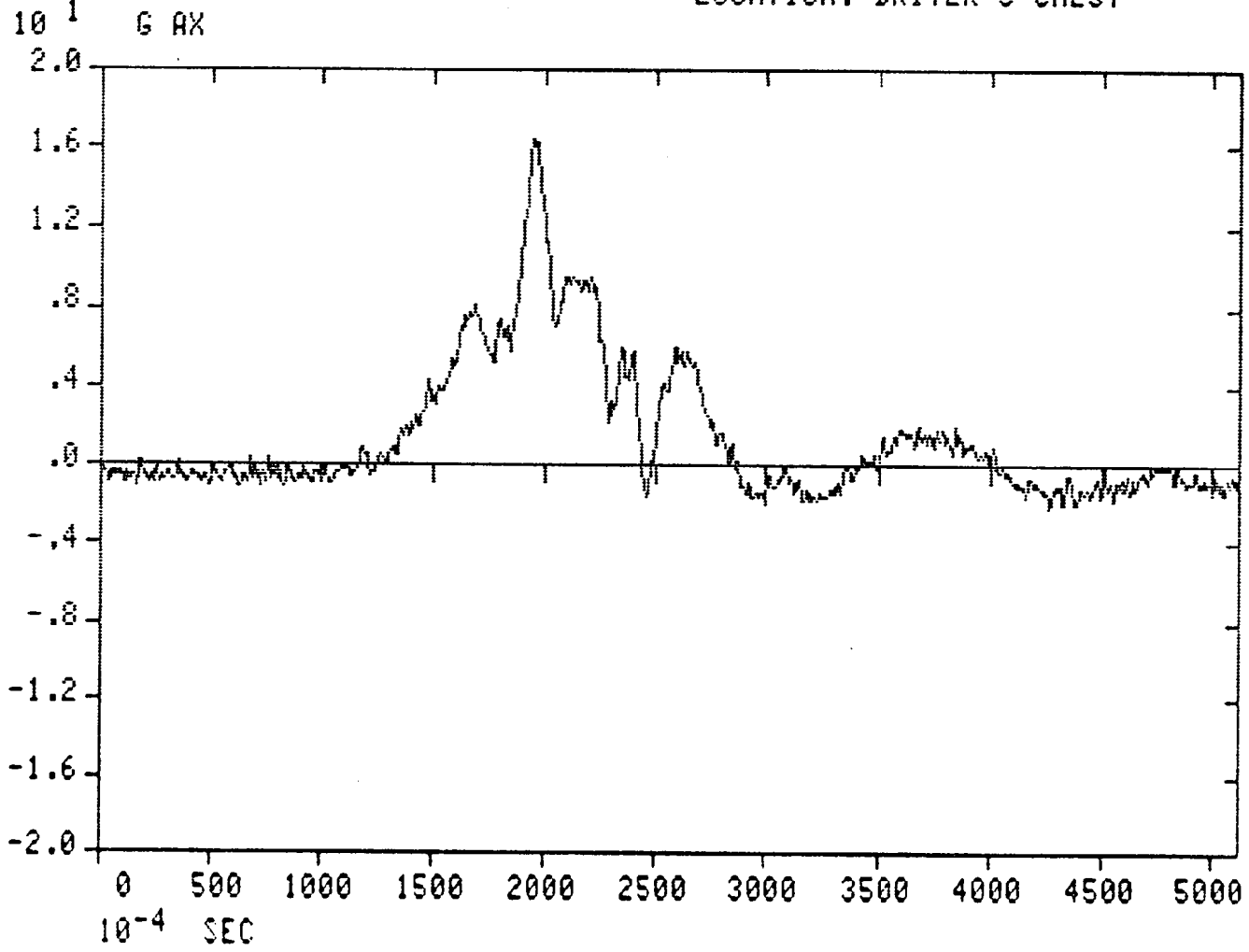


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 180
ACCELEROMETER: TAPE 1, CH 5
DIRECTION: FORWARD
LOCATION: DRIVER'S CHEST

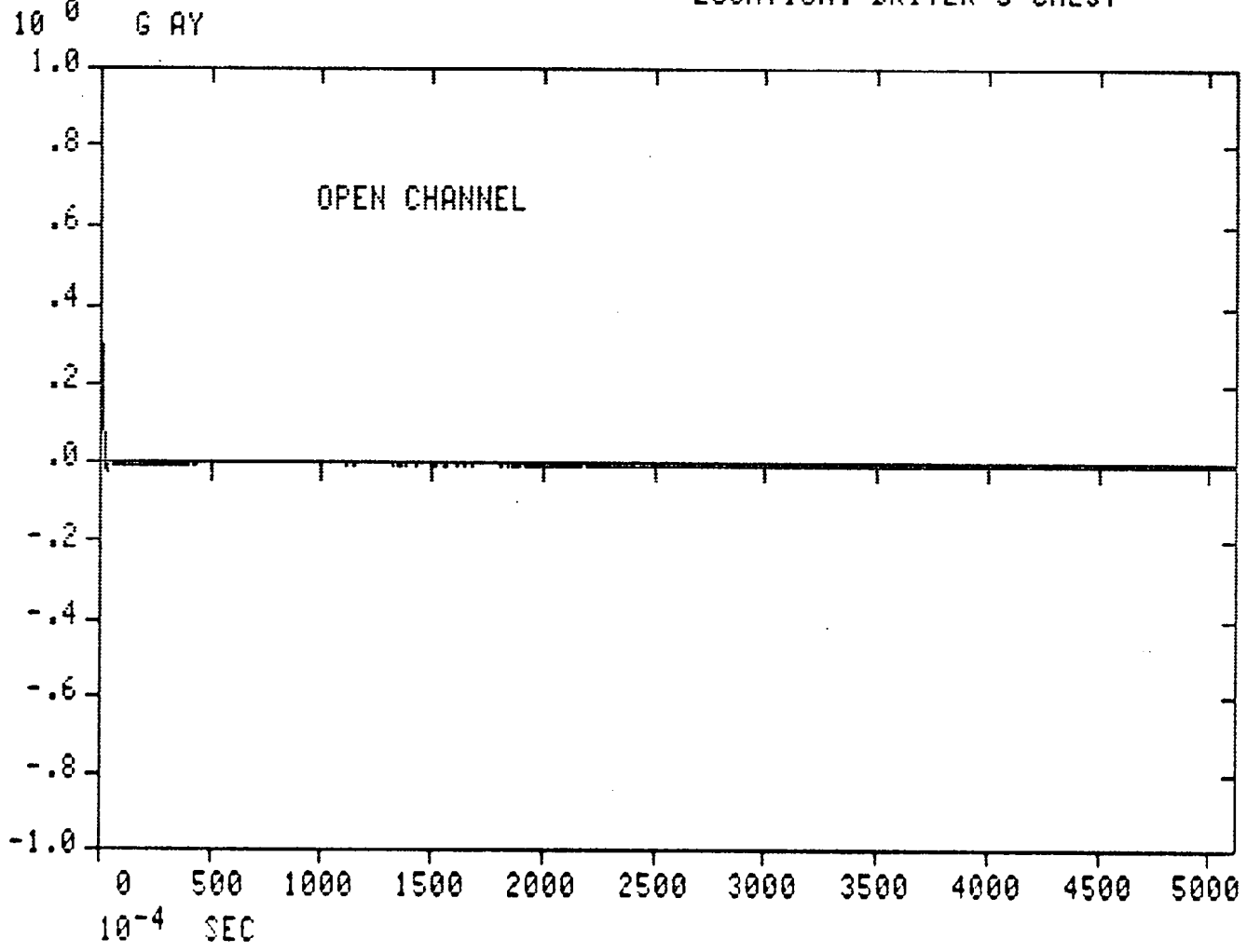


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 180
ACCELEROMETER: TAPE 1, CH 6
DIRECTION: LEFT
LOCATION: DRIVER'S CHEST

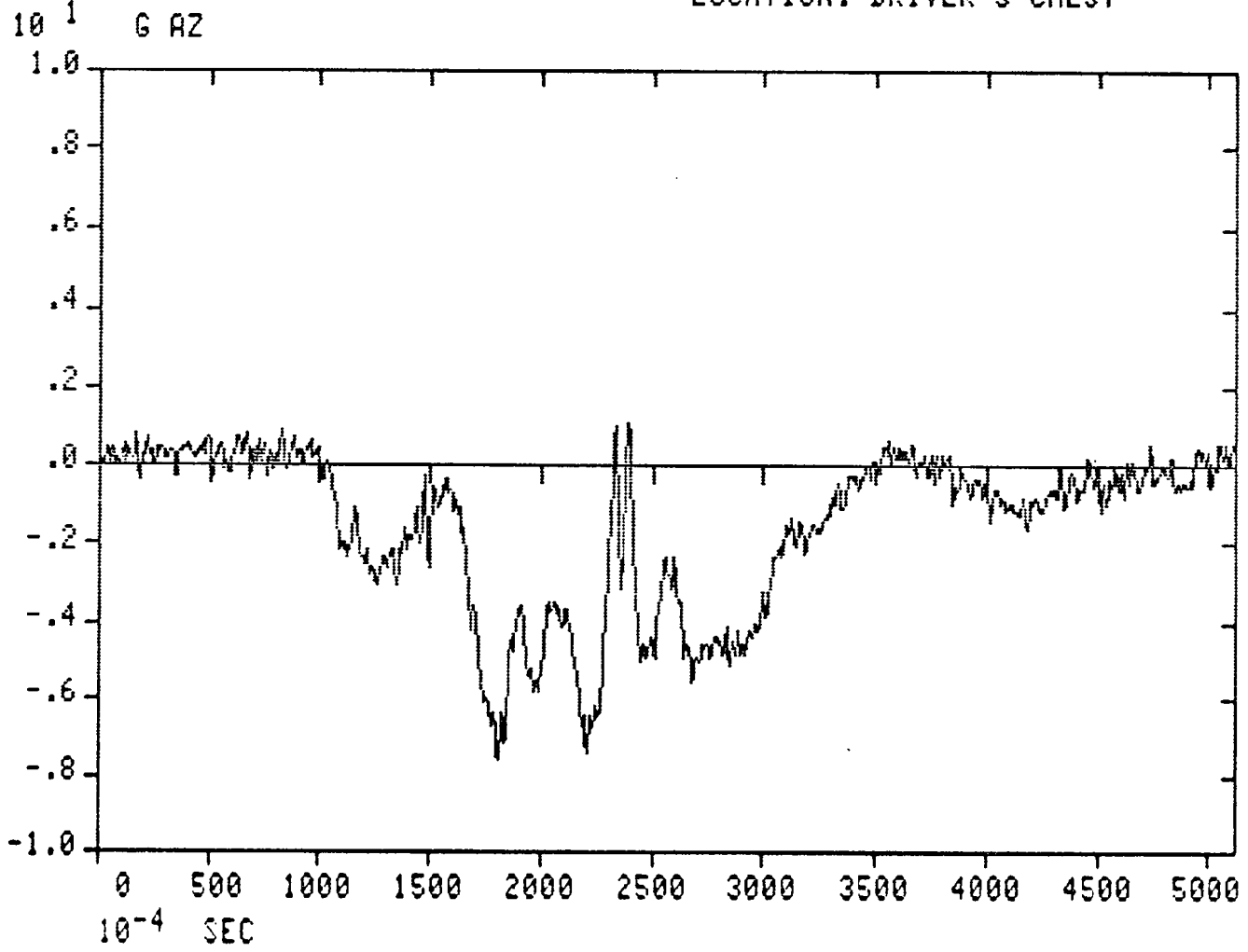


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 180
ACCELEROMETER: TAPE 1, CH 7
DIRECTION: UPWARD
LOCATION: DRIVER'S CHEST

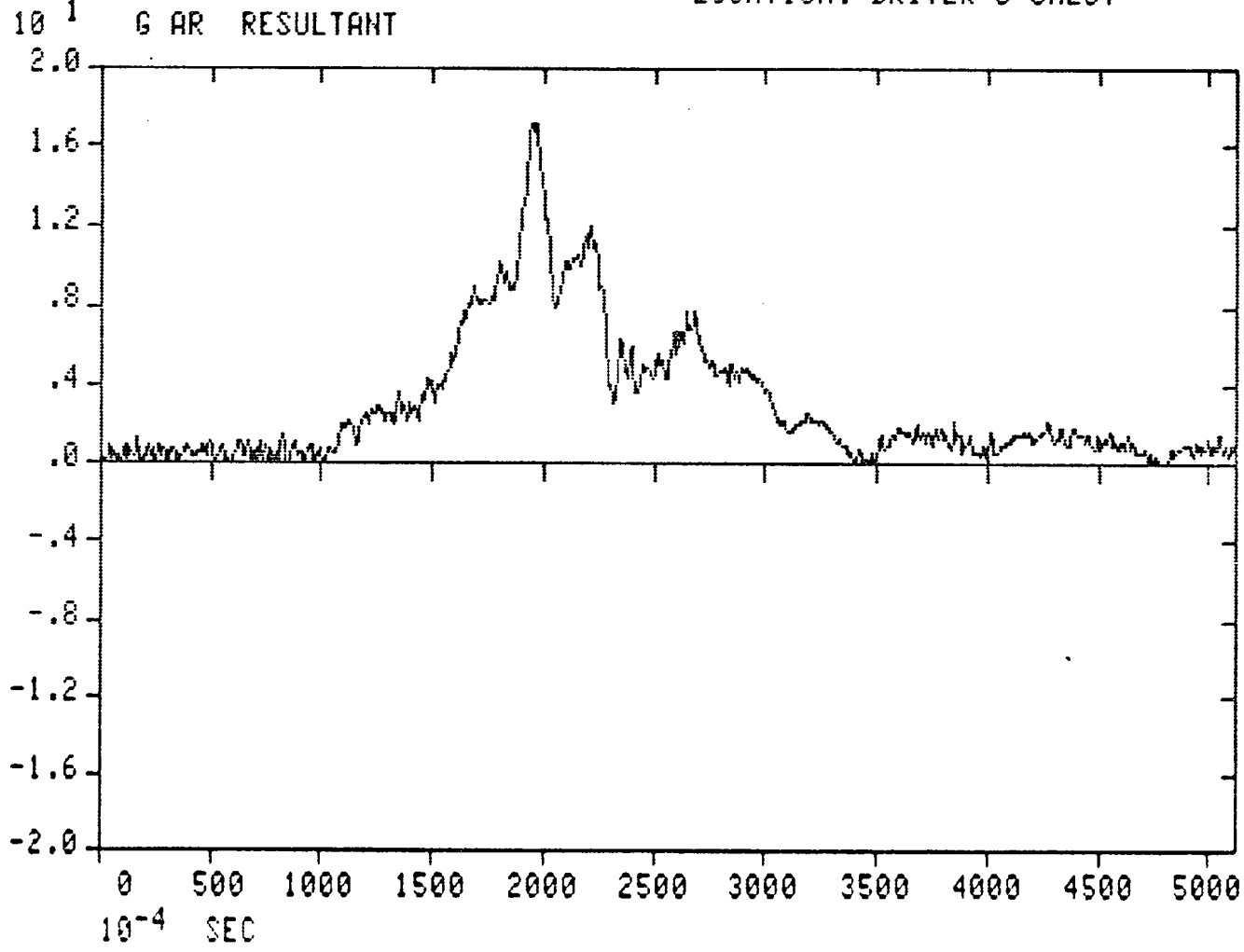


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 180
ACCELEROMETER: TAPE 1, CH 5-7
DIRECTION: RESULTANT OF XYZ
LOCATION: DRIVER'S CHEST

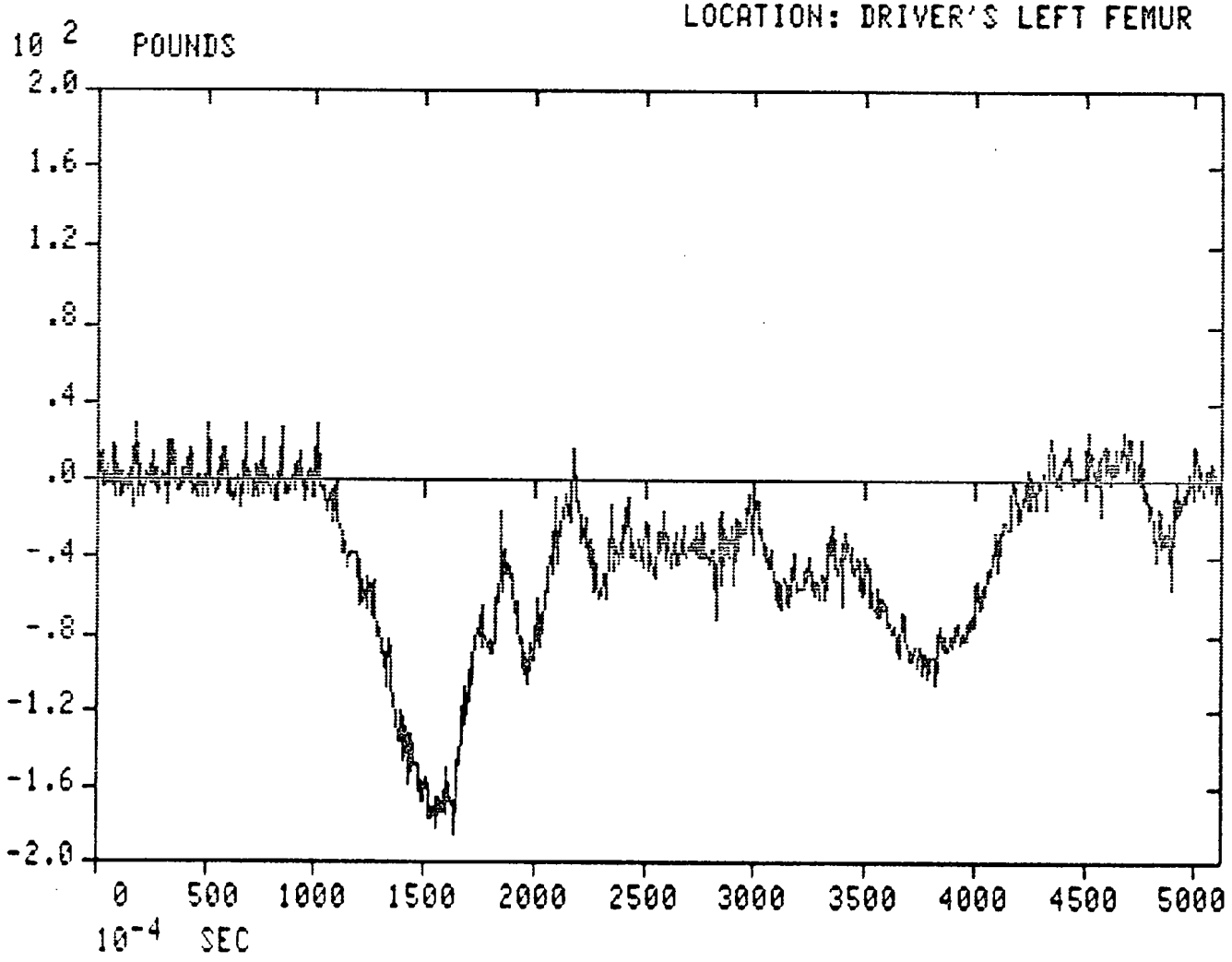


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 600
LOAD CELL: TAPE 1, CH 8
DIRECTION: TENSION
LOCATION: DRIVER'S LEFT FEMUR

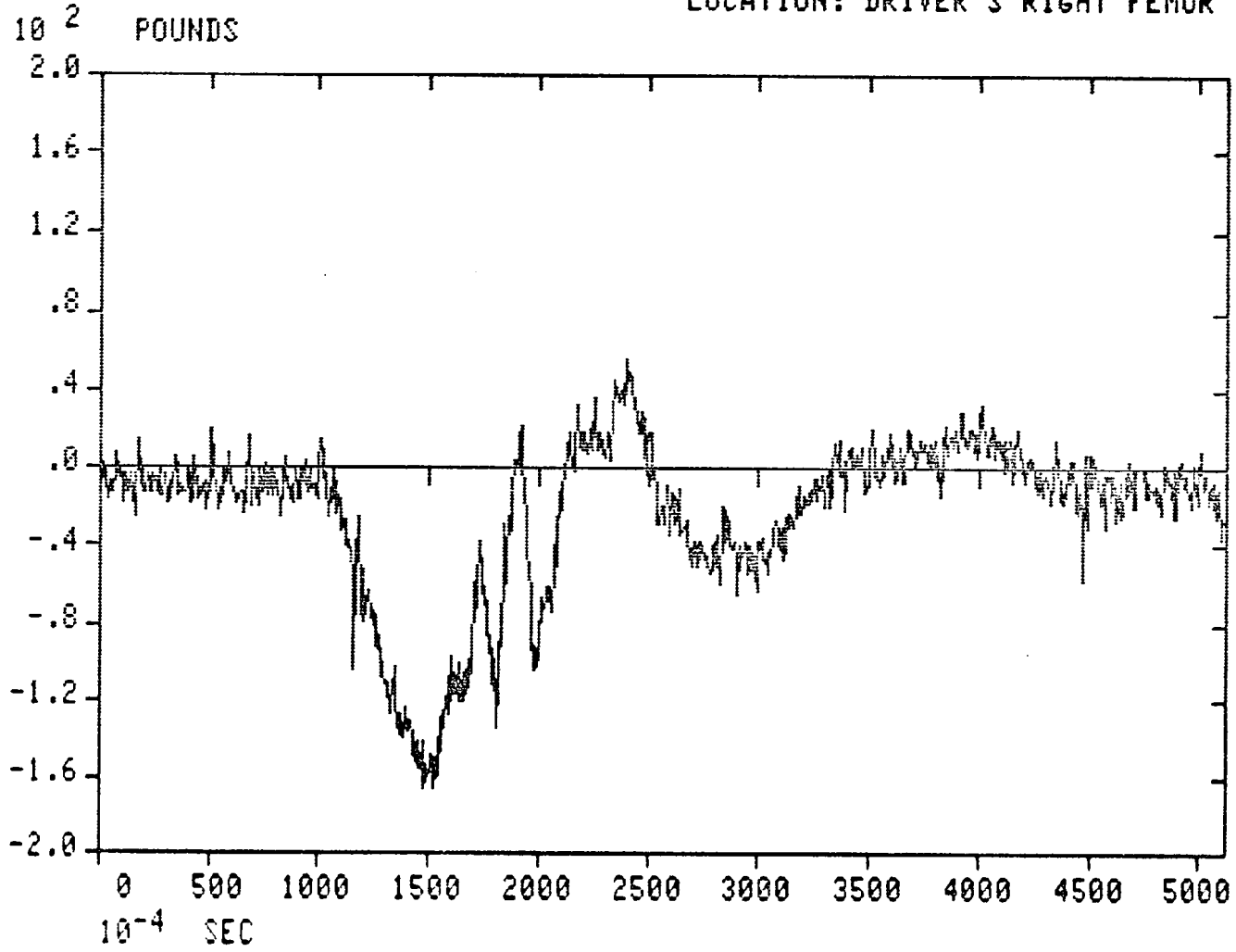


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 600
LOAD CELL: TAPE 1, CH 4
DIRECTION: TENSION
LOCATION: DRIVER'S RIGHT FEMUR

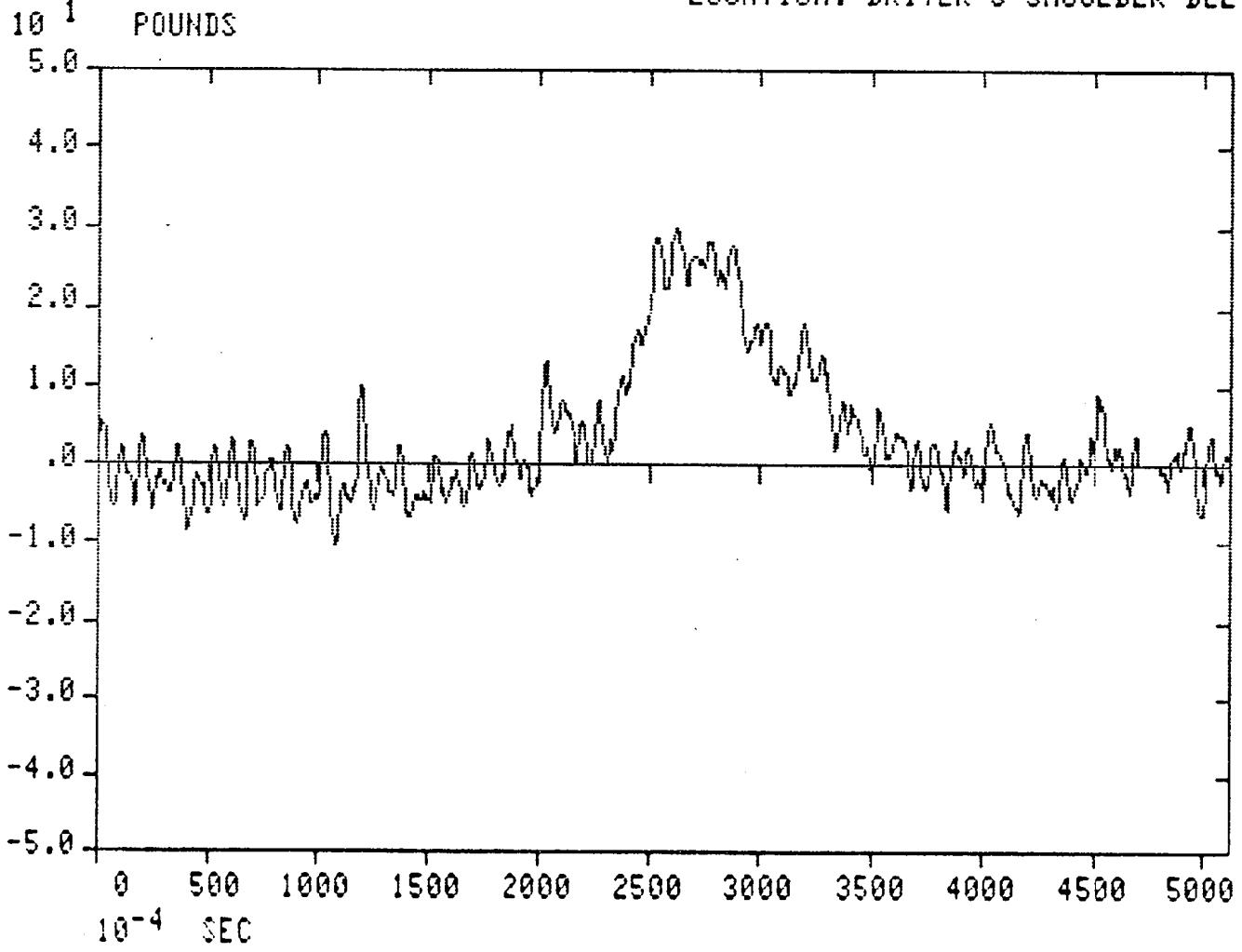


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 60
LOAD CELL: TAPE 1, CH 9
DIRECTION: TENSION
LOCATION: DRIVER'S SHOULDER BELT

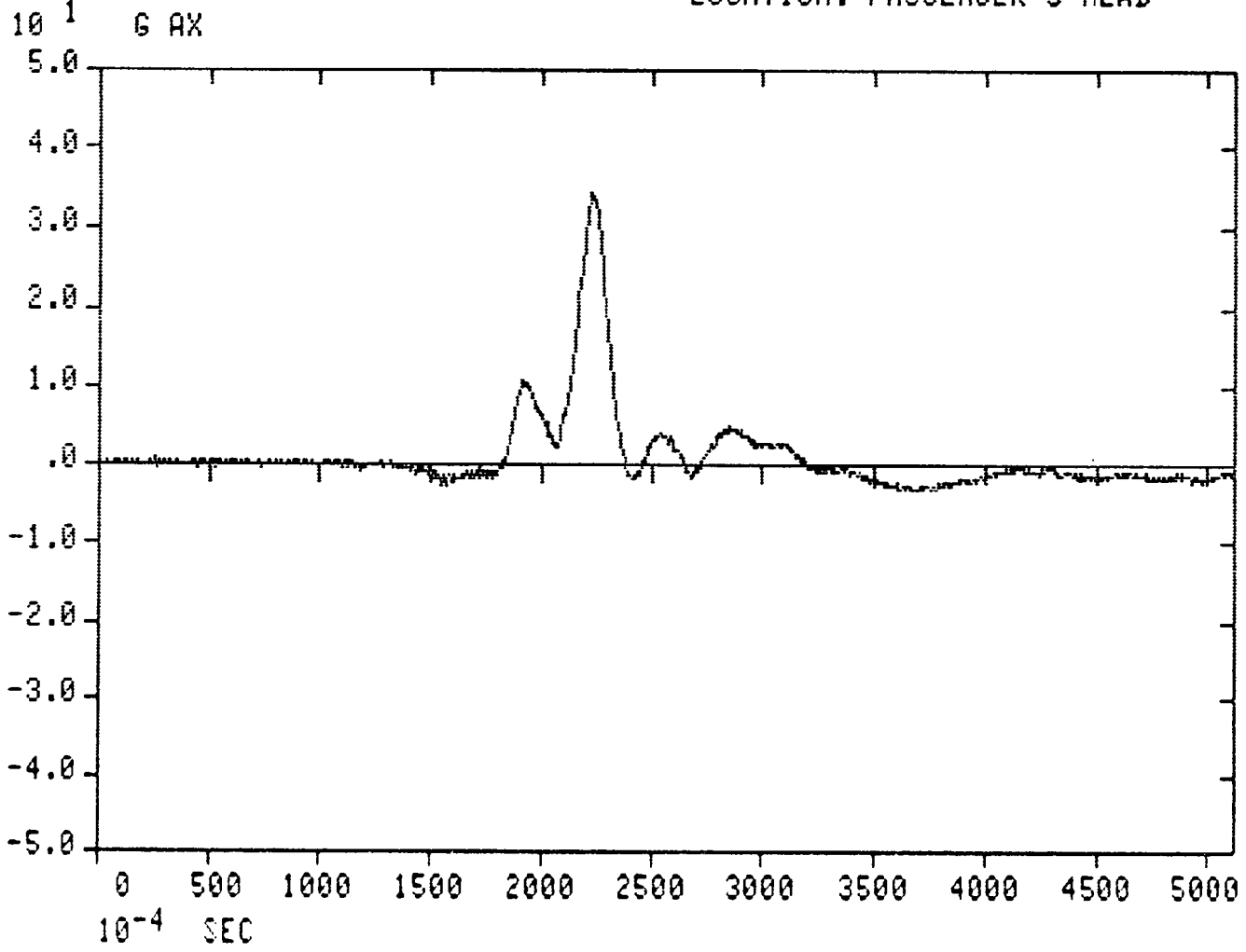


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 1
DIRECTION: FORWARD
LOCATION: PASSENGER'S HEAD

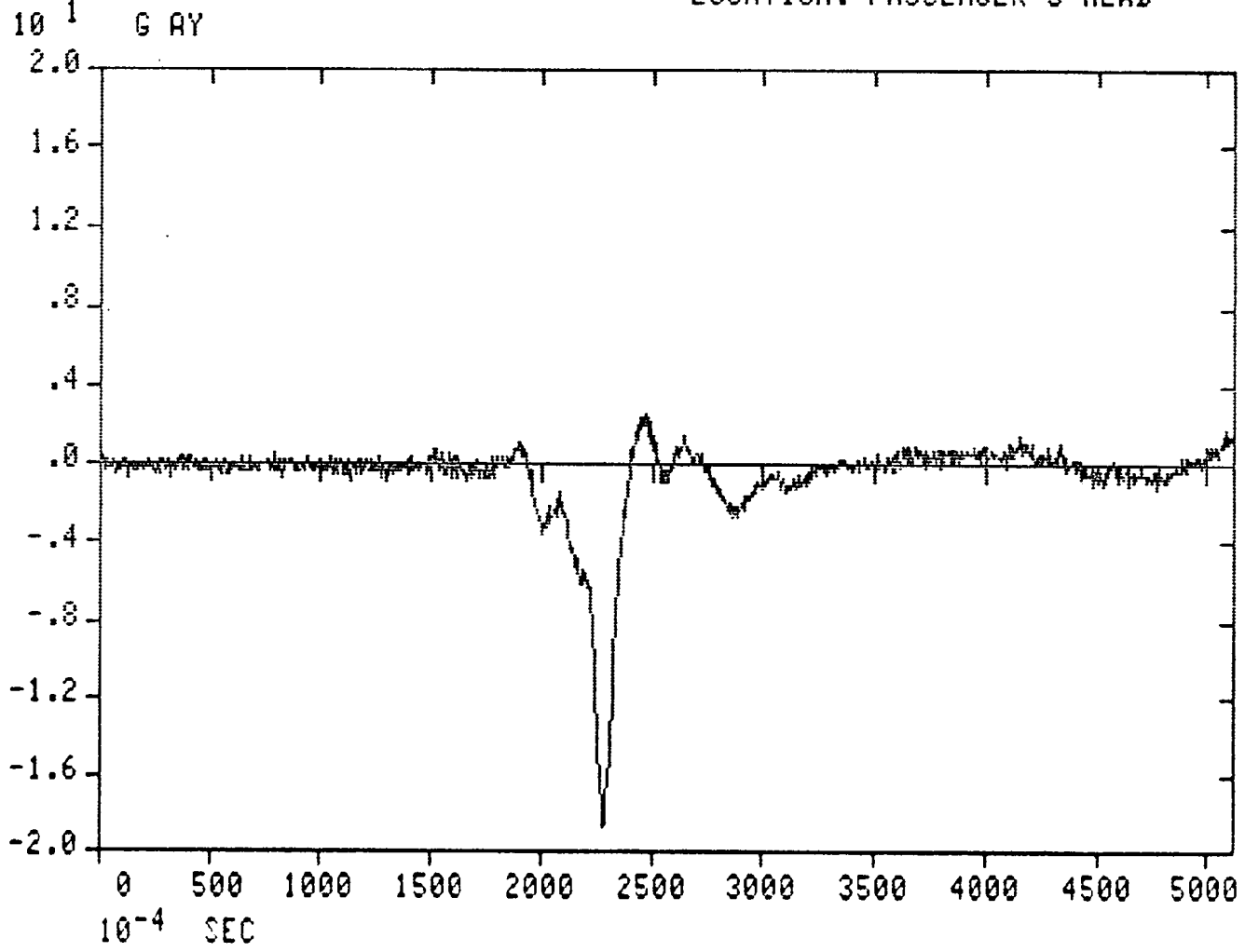


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 2
DIRECTION: LEFT
LOCATION: PASSENGER'S HEAD

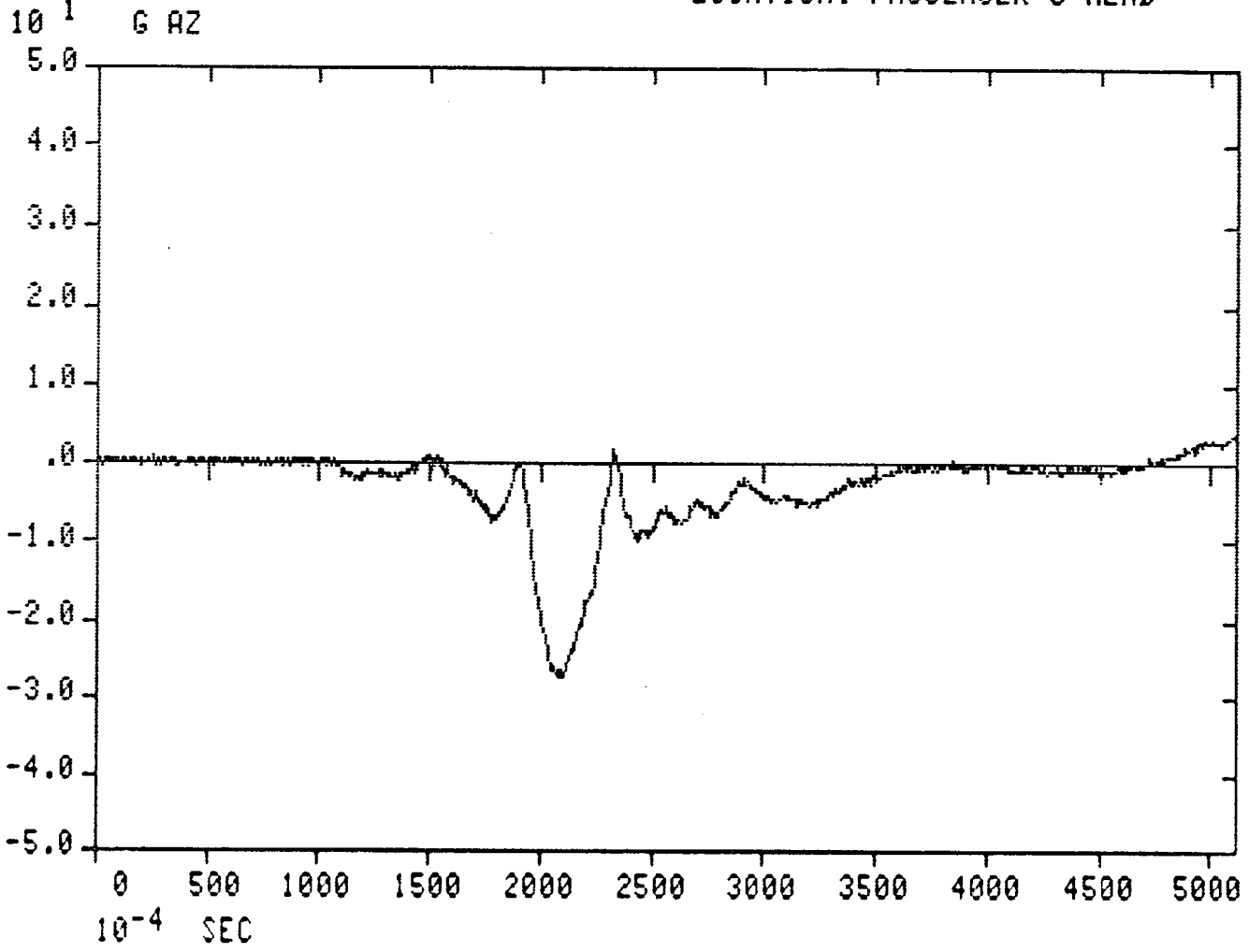


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 3
DIRECTION: UPWARD
LOCATION: PASSENGER'S HEAD

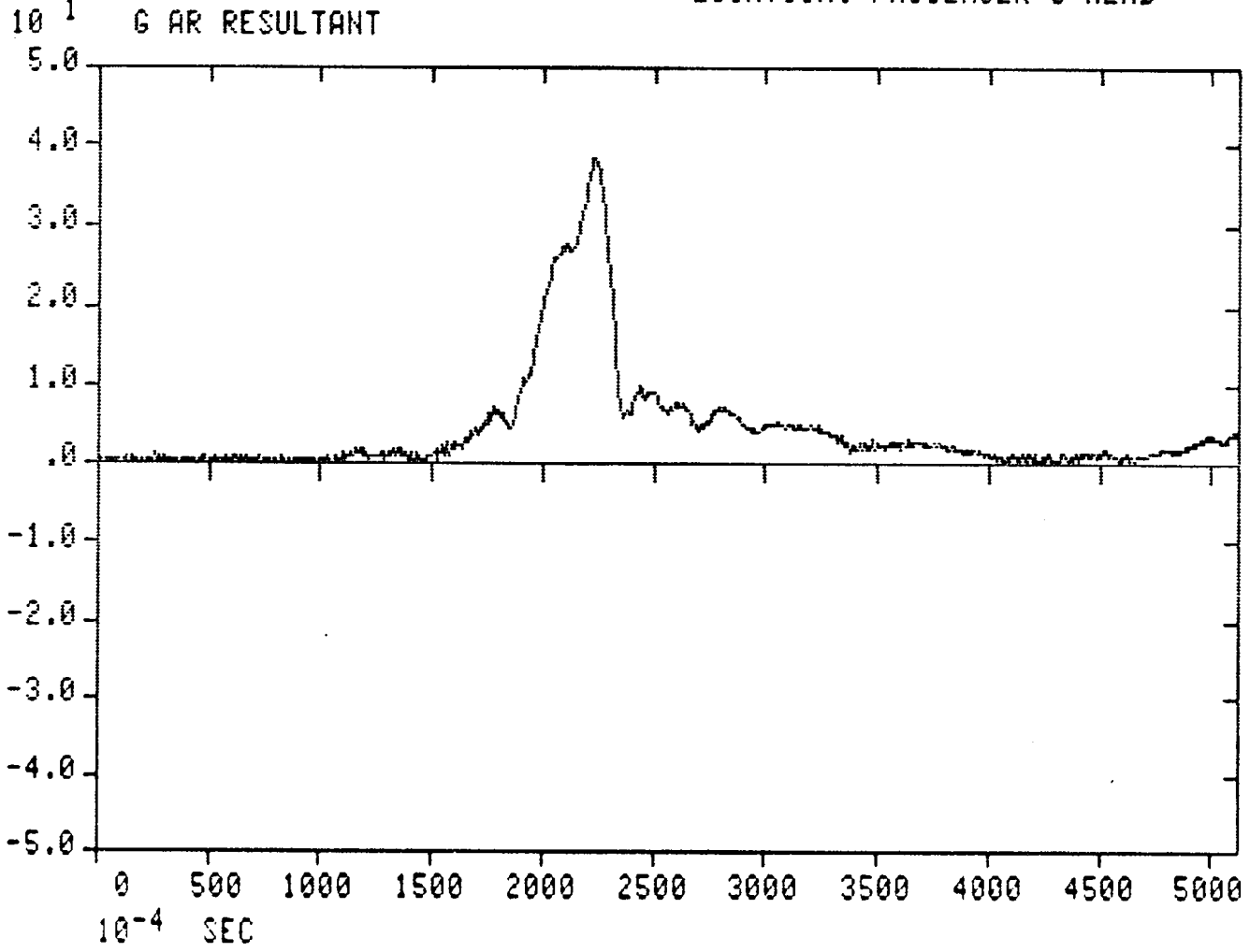


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 1-3
DIRECTION: RESULTANT OF XYZ
LOCATION: PASSENGER'S HEAD

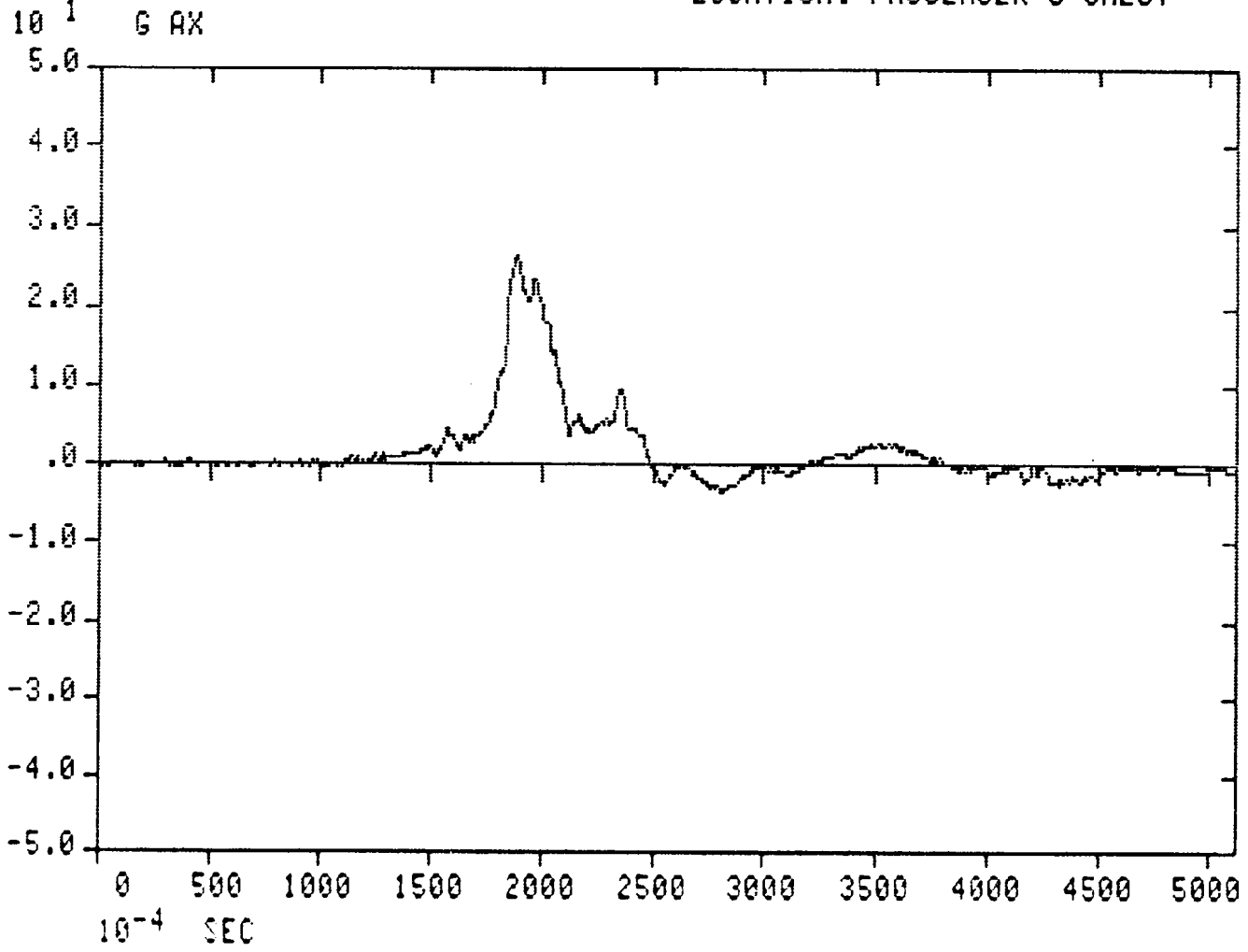


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 180
ACCELEROMETER: TAPE 2, CH 5
DIRECTION: FORWARD
LOCATION: PASSENGER'S CHEST

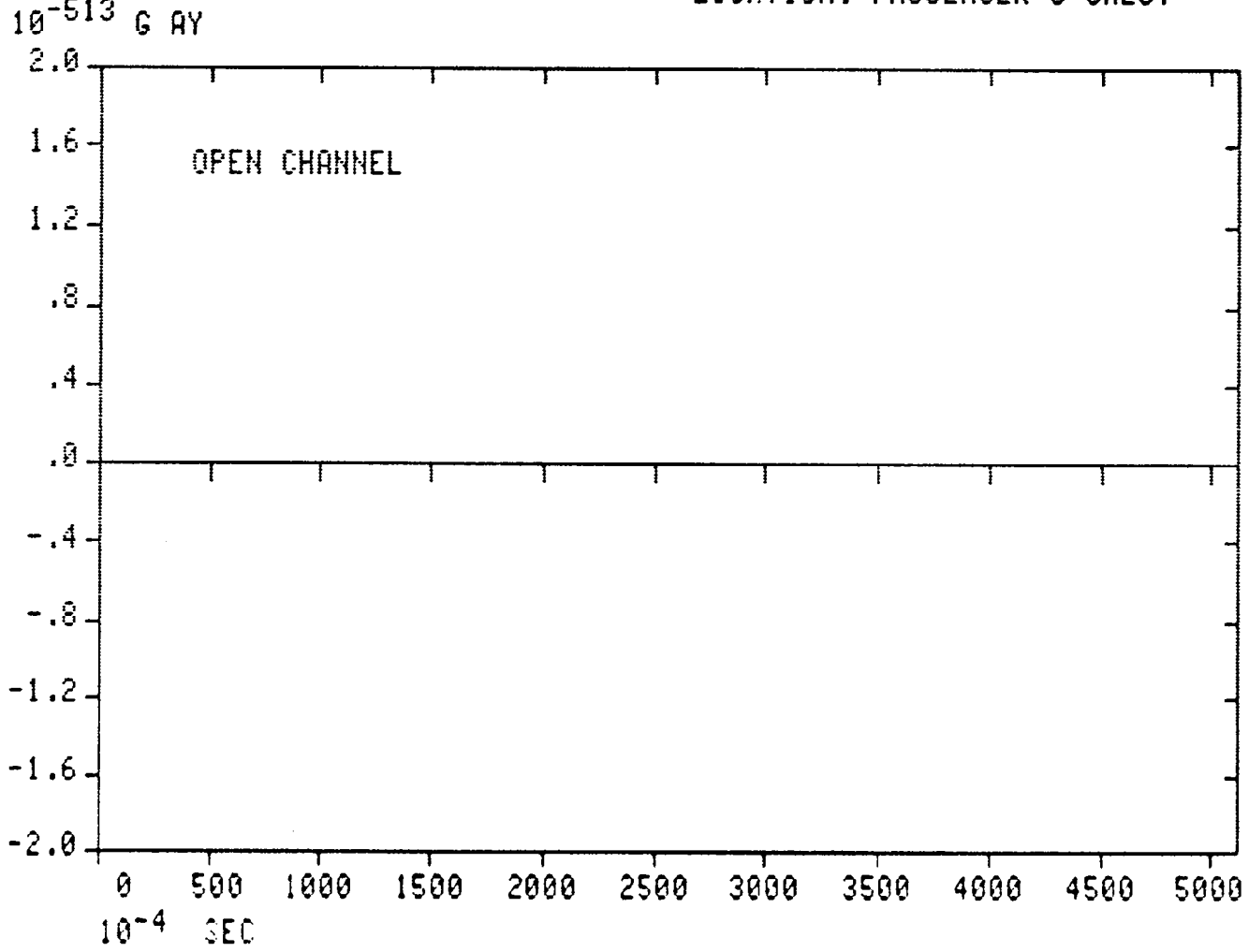


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 180
ACCELEROMETER: TAPE 2, CH 6
DIRECTION: LEFT
LOCATION: PASSENGER'S CHEST

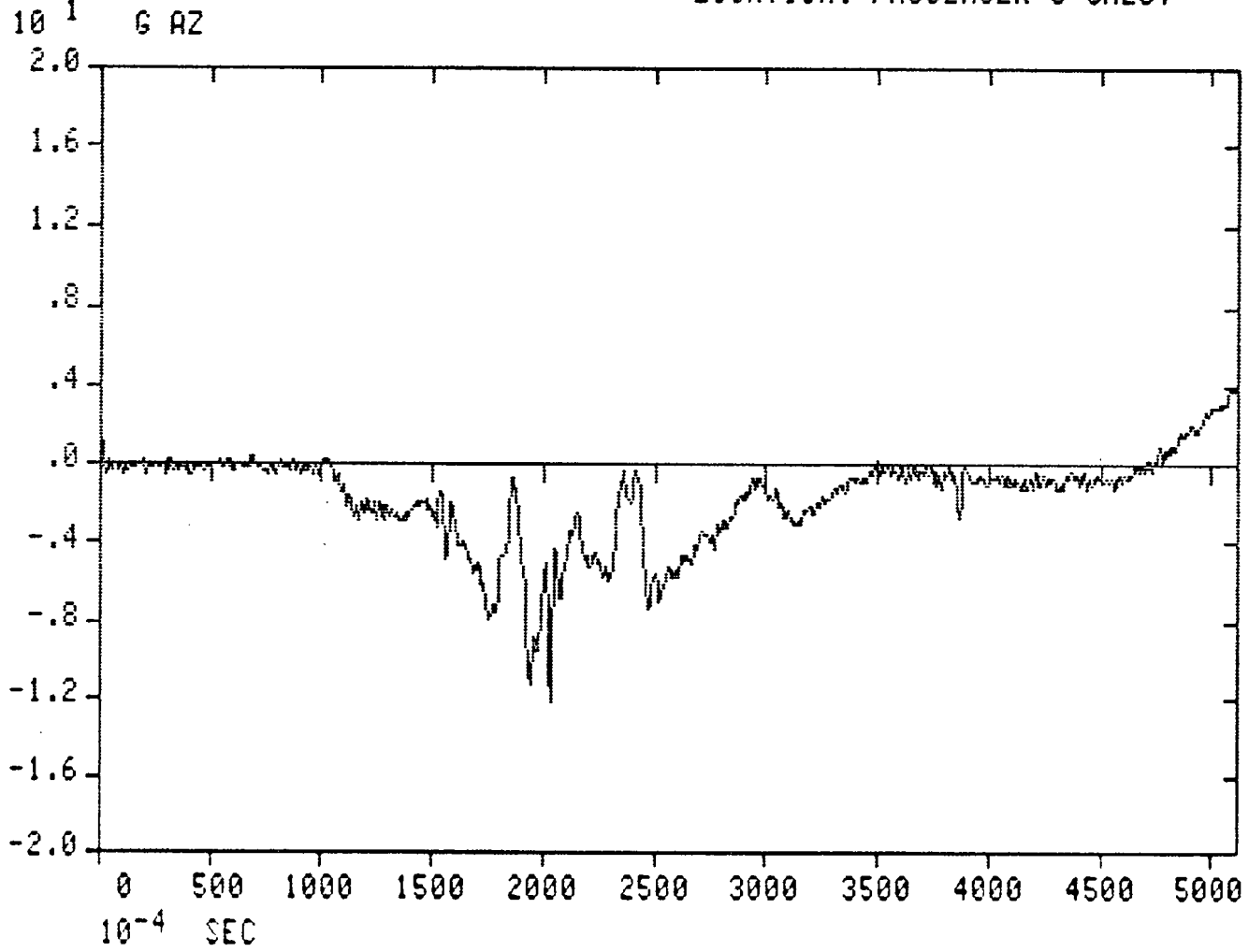


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

MJO NO. : 671-1489-82
FILTER: CLASS 180
ACCELEROMETER: TAPE 2, CH 7
DIRECTION: UPWARD
LOCATION: PASSENGER'S CHEST

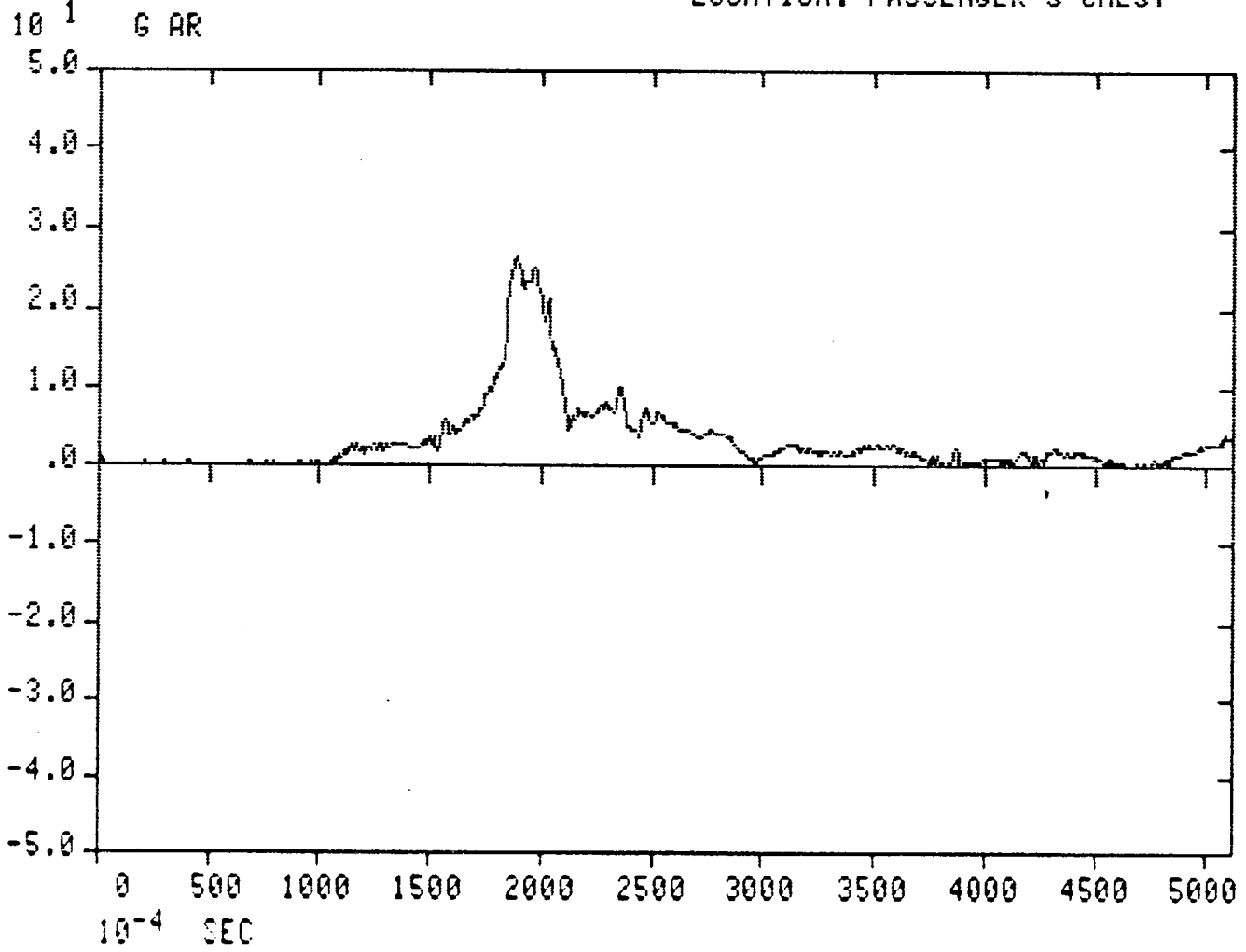


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 1000
ACCELEROMETER: TAPE 2, CH 5-7
DIRECTION: RESULTANT OF XYZ
LOCATION: PASSENGER'S CHEST

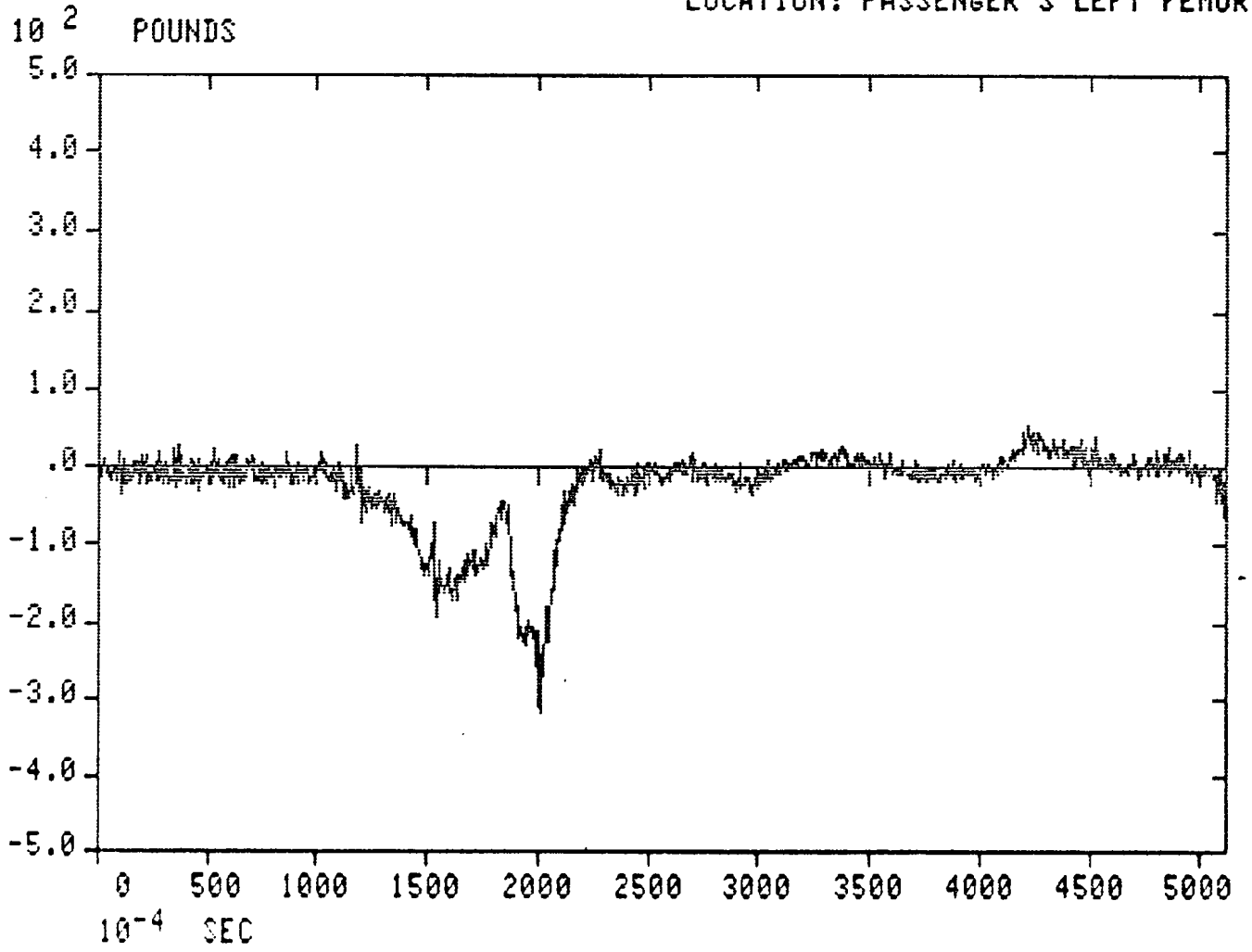


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 600
LOAD CELL: TAPE 2, CH 8
DIRECTION: TENSION
LOCATION: PASSENGER'S LEFT FEMUR

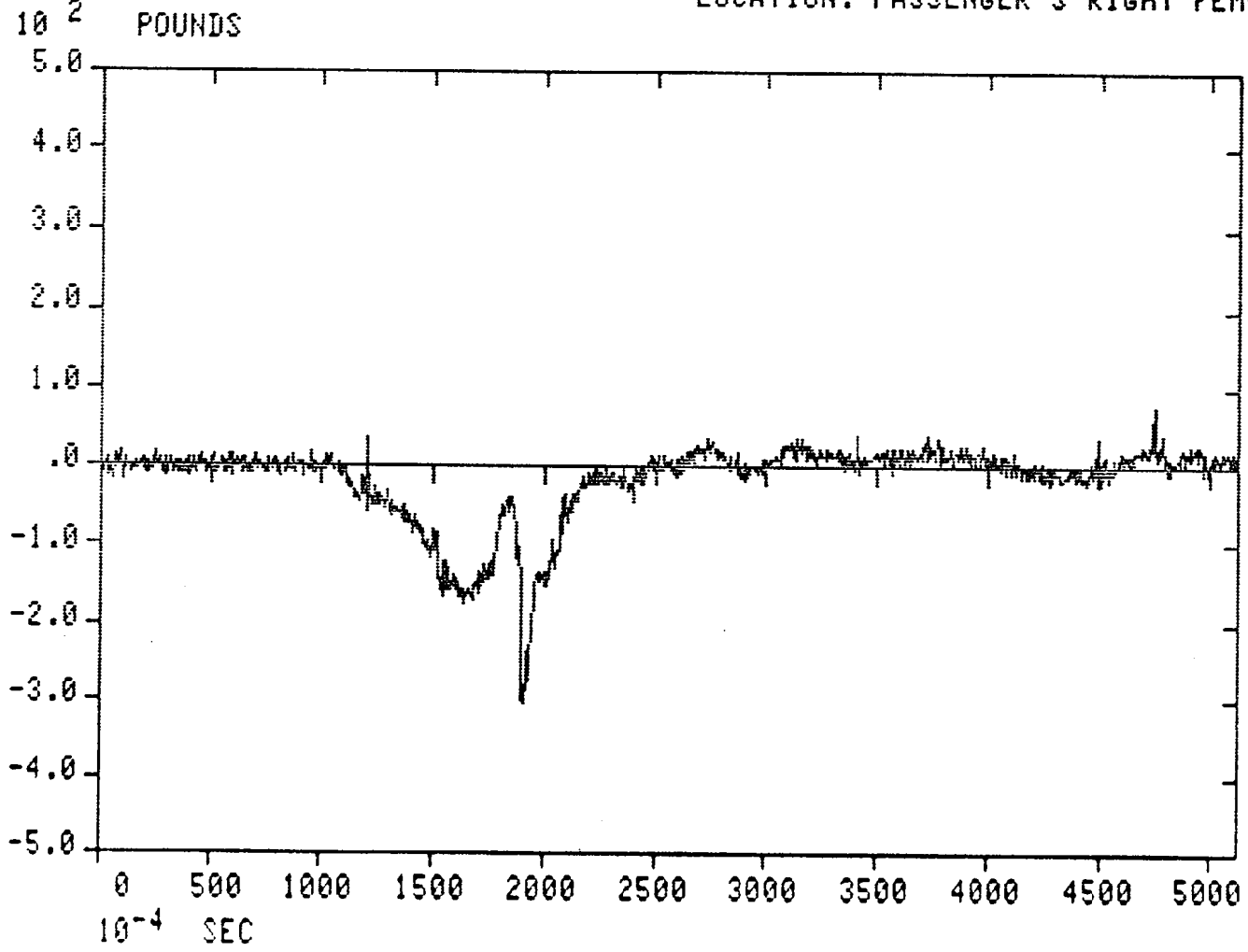


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 600
LOAD CELL: TAPE 2, CH 4
DIRECTION: TENSION
LOCATION: PASSENGER'S RIGHT FEMUR

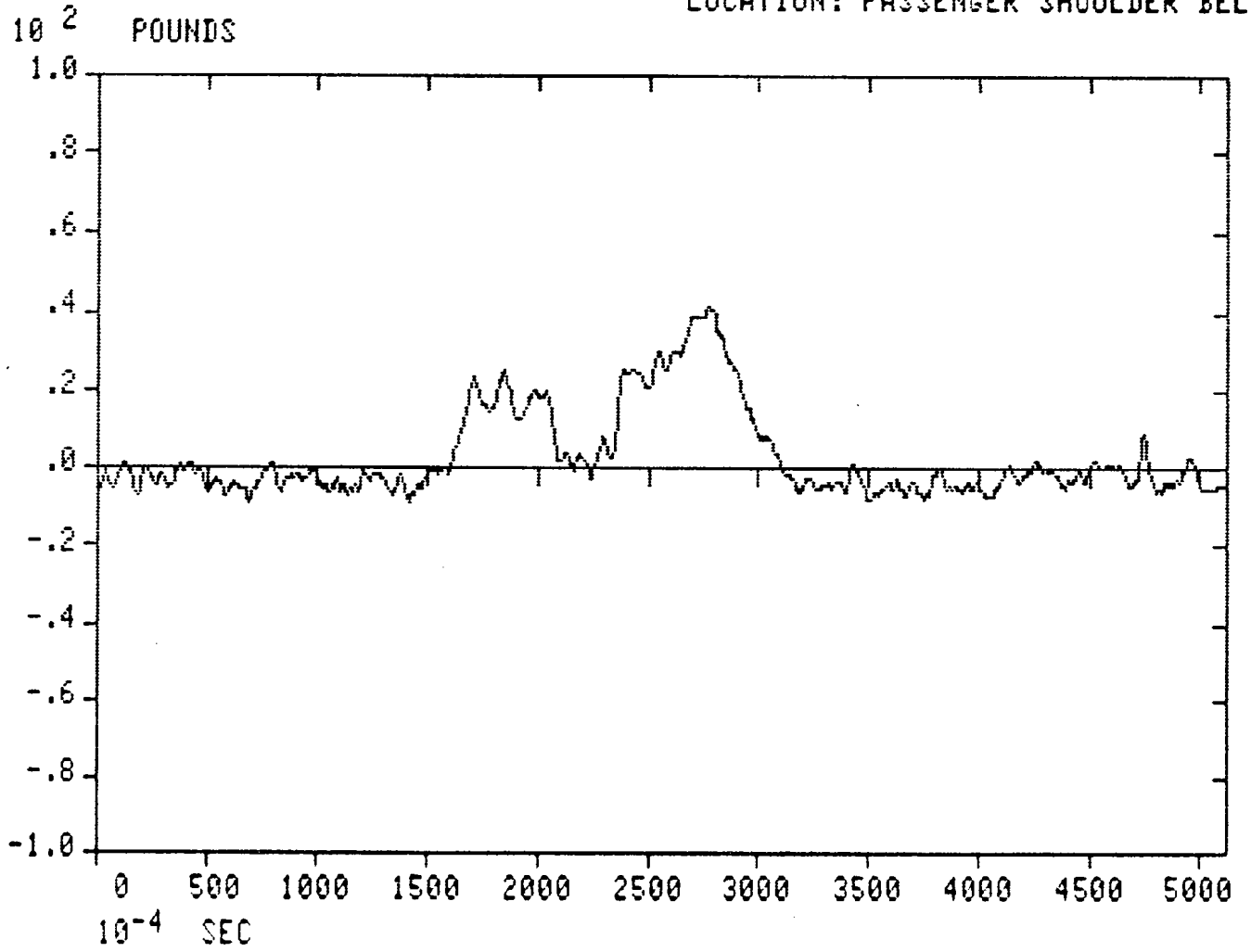


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

MJO NO. : 671-1489-82
FILTER: CLASS 60
LOAD CELL: TAPE 2, CH 9
DIRECTION: TENSION
LOCATION: PASSENGER SHOULDER BELT

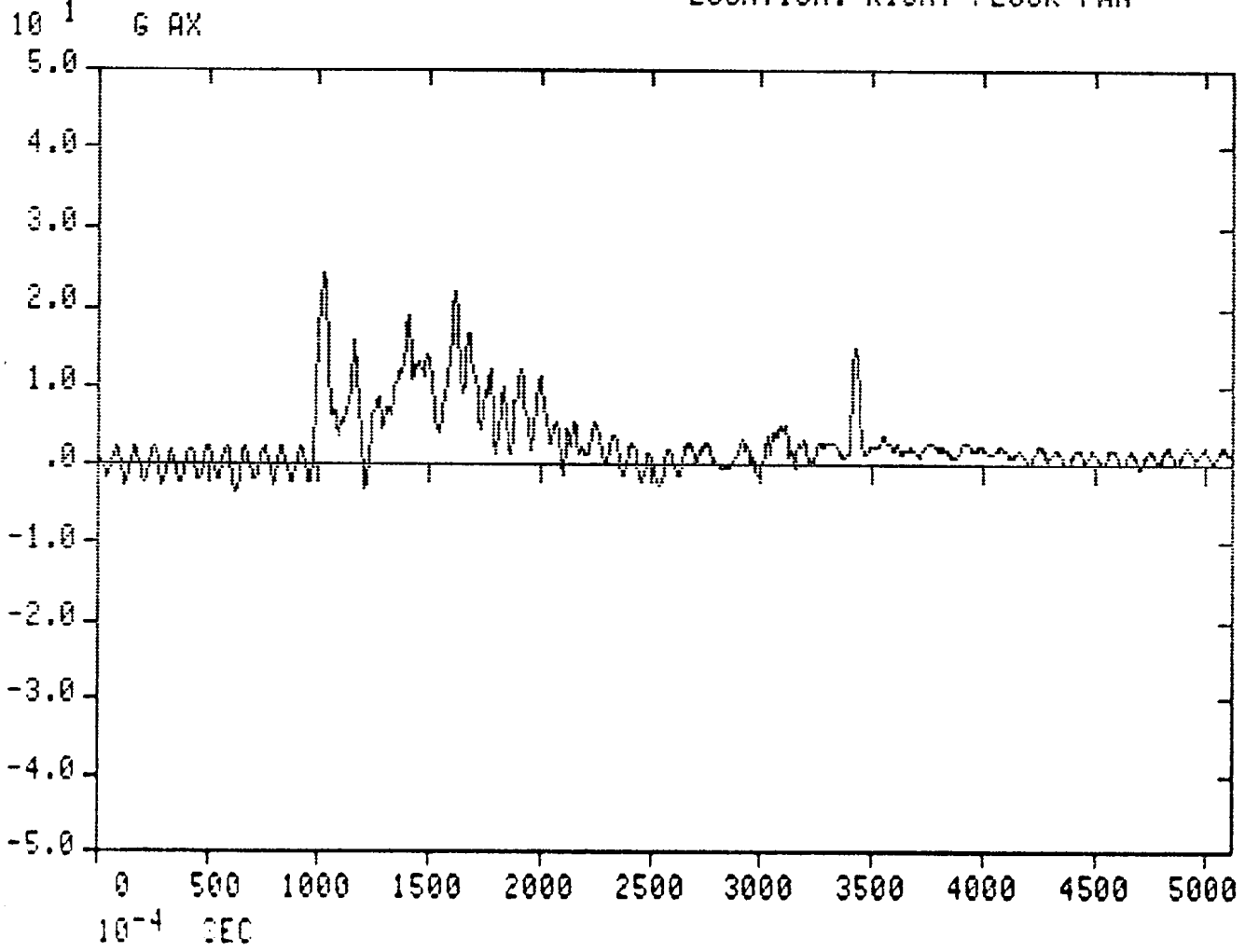


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

MJO NO. : 671-1489-82
FILTER: CLASS 60
ACCELEROMETER: TAPE 2, CH 13
DIRECTION: FORWARD
LOCATION: RIGHT FLOOR PAN

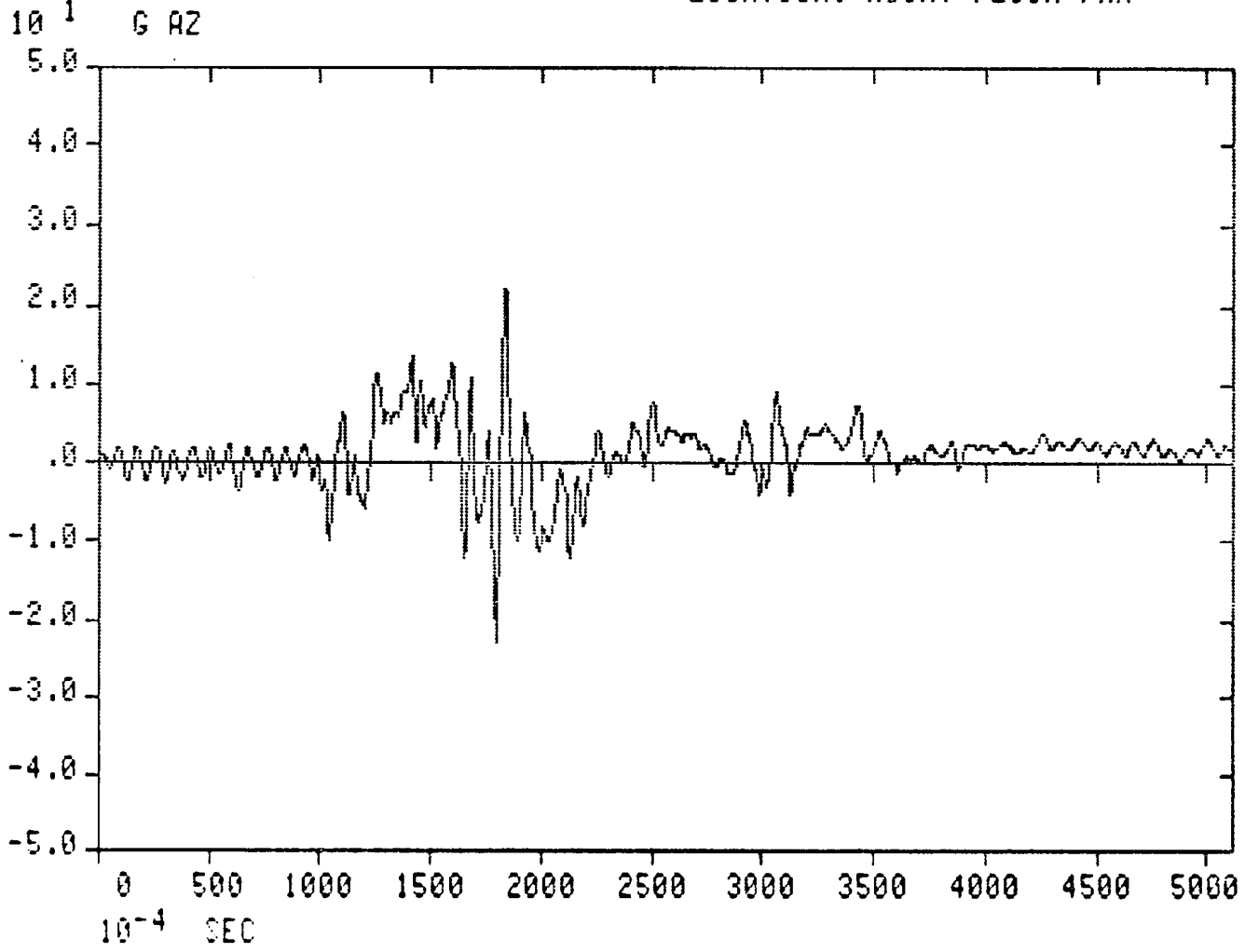


DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 60
ACCELEROMETER: TAPE 2, CH 14
DIRECTION: UPWARD
LOCATION: RIGHT FLOOR PAN

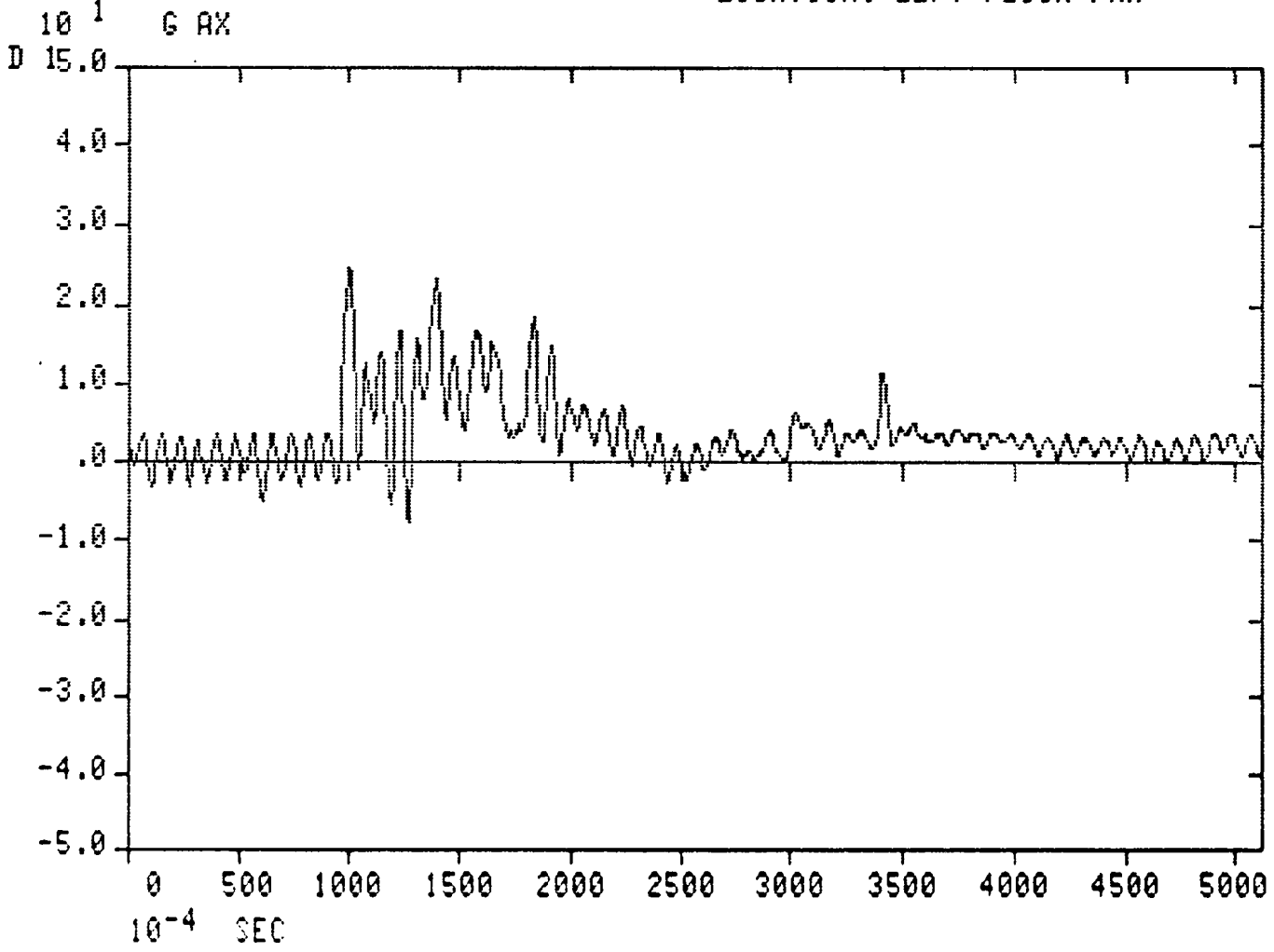


DOT CRASH PROGRAM

APPROVED ENGINEERING TEST LABS

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
DATE: SEPTEMBER 13, 1979

MJO NO. : 671-1489-82
FILTER: CLASS 60
ACCELEROMETER: TAPE 1, CH 13
DIRECTION: FORWARD
LOCATION: LEFT FLOOR PAN



DOT CRASH PROGRAM

VEHICLE: PLYMOUTH HORIZON
VEHICLE ID: NHTSA 790317
TEST FILE NO. : 21 REAR
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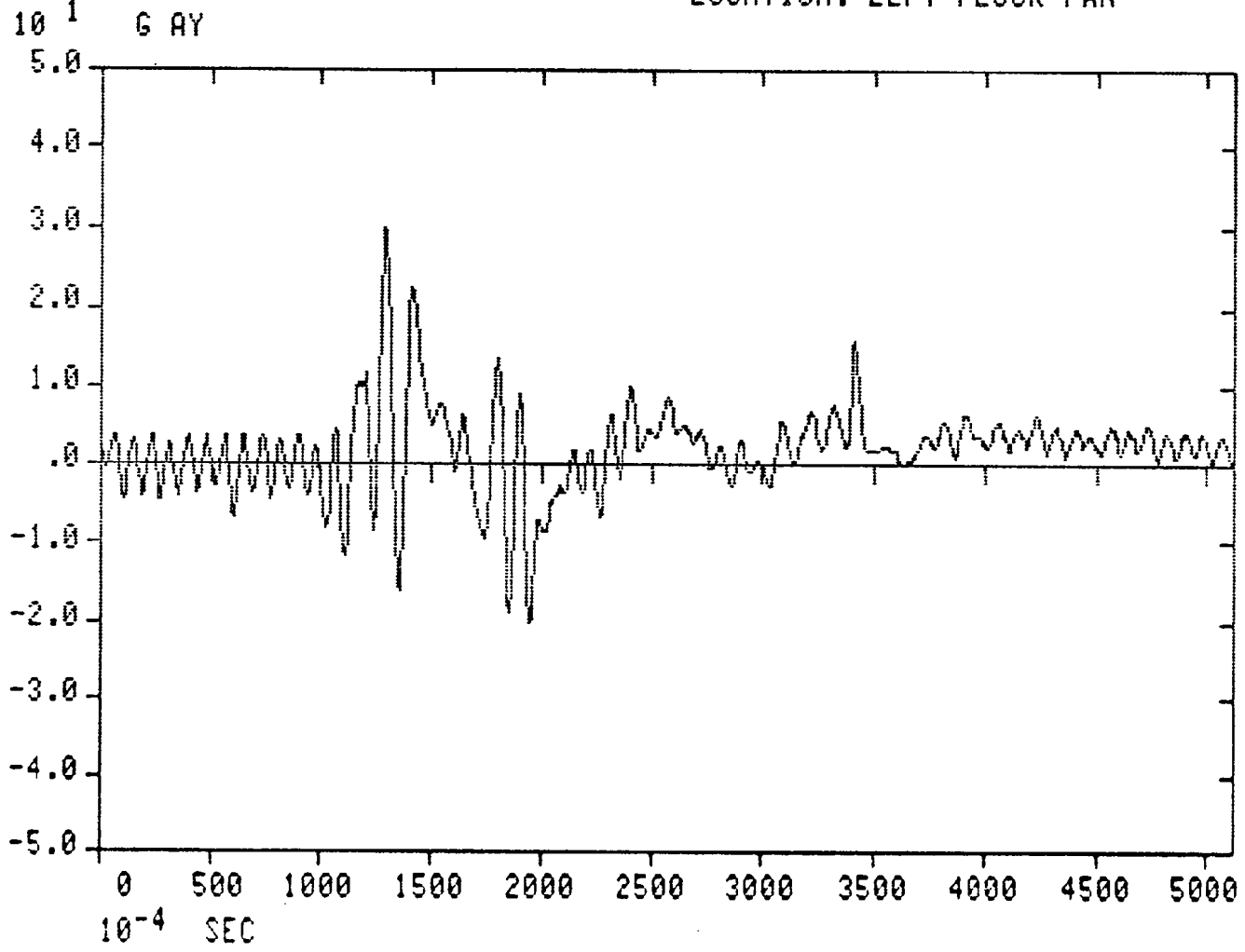
APPROVED ENGINEERING TEST LABS

MJO NO. : 671-1489-82
FILTER: CLASS 60
ACCELEROMETER: TAPE 1, CH 14
DIRECTION: UPWARD
LOCATION: LEFT FLOOR PAN



APPROVED ENGINEERING TEST LABORATORIES

SERVICE FOR: U. S. Department of Transportation
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
400 Seventh Street S. W.
Washington, D. C. 20590

PURCHASE ORDER NUMBER: DOT-HS-6-01477

I hereby certify that the preceding report is true and correct to the best of my knowledge.

APPROVED ENGINEERING TEST LABORATORIES

R. D. Short, Division Manager

D. H. Hand, Project Engineer

R. E. Allen, Dynamics
R & D Department Manager

G. J. Valenzuela, Mechanical
Department Supervisor

R. J. McKelligott, P.E.,
Quality Assurance Manager

rmh